SIEMENS

SINUMERIK 840D sl/840Di sl/ SINAMICS S120

Detailed Maschine Data Description

Valid for:

Conrols

SINUMERIK 840D sl	1.4
SINUMERIK 840DE sl (export version)	1.4
SINUMERIK 840Di sl	1.1
SINUMERIK 840DiE sl (export version)	1.1

Drive

SINAMICS S120

11/2006 Edition

SINUMERIK® Documentation

Printing history

Brief details of this edition and previous editions are listed below.

The status of each edition is shown by the code in the "Remarks" column.

Status codes in the "Remarks" column.

A .... New documentation.

B .... Unrevised reprint with new Order No.

C .... Revised edition with new status.

If factual changes have been made on a page since the last edition, this is indicated by a new edition coding in the header on that page.

Edition	Order-No.	Remarks
05.05	-	**A**
03/2006	-	C
11/2006	-	C

Preface

Structure of the documentation

The SINUMERIK documentation is organized in 3 parts:

- General documentation
- User documentation
- Manufacturer/service documentation

An overview of publications (updated monthly) indicating the language versions available can be found on the Internet at:

http://www.siemens.com/motioncontrol
Select "Support" -> "Technical Documentation" ->"Overview of Publications"

The Internet version of the DOConCD (DOConWEB) is available at:
http://www.automation.siemens.com/doconweb

Information about training courses and FAQs (Frequently Asked Questions) can be found at the following web site:

http://www.siemens.com/motioncontrol under menu option "Support"

Target group

This documentation is intended for project engineers, commissioning engineers, machine operators, service and maintenance personnel.

Benefits

The Parameter Manual enables the intended target group to evaluate error and fault indications and to respond accordingly.

With the help of the Parameter Manual, the target group has an overview of the various diagnostic options and diagnostic tools.

Standard version

This Parameter Manual only describes the functionality of the standard version. Extensions or changes made by the machine tool manufacturer are documented by the machine tool manufacturer.

Other functions not described in this documentation might be executable in the control. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

Further, for the sake of simplicity, this documentation does not contain all detailed information about all types of the product and cannot cover every conceivable case of installation, operation or maintenance.

Technical Support

If you have any questions, please get in touch with our Hotline:f

	Europe / Africa	Asia / Australia	America
Phone	+49 180 5050 - 222	+86 1064 719 990	+1 423 262 2522
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Note

Country telephone numbers for technical support are provided under the following Internet address:

http://www.siemens.com/automation/service&support

Questions about the documentation

If you have any queries (suggestions, corrections) in relation to this documentation, please fax or e-mail us:

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SINUMERIK Internet address

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Questions about the Manual

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Fax: +49 (0) 9131 / 98 - 63315

E-mail: mailto:motioncontrol.docu@siemens.com

Fax form: See the reply form at the end of the document.

Safety Instructions

This Manual contains information which you should carefully observe to ensure your own personal safety and the prevention of material damage. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring to property damage only have no safety alert symbol The warnings appear in decreasing order of risk as given below.

Danger

Indicates an imminently hazardous situation which, if not avoided, **will** result in death or serious injury or in substantial property damage.

t

Warning

Indicates that death or severe personal injury will result if proper precautions are not taken.

Caution

with a warning triangle indicates that minor personal injury can result if proper precautions are not taken.

Caution

without a warning triangle indicates that property damage **can** result if proper precautions are not taken.

Notice

indicates a potential situation which, if not avoided, **may** result in an undesirable event or state.

If several hazards of different degrees occur, the hazard with the highest degree must always be given priority. A warning notice accompanied by a safety alert symbol indicating a risk of bodily injury can also indicate a risk of property damage.

Qualified Personnel

The associated device/system may only be set up and operated using this documentation. Commissioning and operation of a device/system may only be performed by qualified personnel. Qualified persons are defined as persons who are authorized to commission, to ground, and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

Table of Contents

Machine and Setting Data 1

1.1 Explanations

Note

There is also a comprehensive description of the machine data and setting data on the DOCONCD:

You can learn more about the functional contexts of the machine data if you follow the cross-reference.

In addition, the online help available on the controller provides all the detailed information on the machine data.

1.1.1 General information

Tables

There are various kinds of tables for the machine data and setting data.

For following tables are used for the following areas:

- General Machine Data
- Channelspecific Machine Data
- AxisSpecific Machine Data
- Setting Data

MD number	Name of identifier			Display filter	Reference
Unit	Name			Data type	Activation
Attributes					
System	Dimension	Default value	Minimum value	Maximum value	Protection

Expanded tables

Machine data values that differ depending on the system can be found in the additional lines under the table header. In such cases, the fourth row represents the default values and the fifth and remaining rows represent deviating values for the specified systems. A minus symbol in a field indicates: The default value from row 4 applies.

In the "Protection" field, the entry "-1" indicates that the machine data for the specified system is not available.

Example:

10050	SYSCLOCK.CYCLE_TIME			N01, N05, N11	G3
s	Basic system clock cycle			DOUBLE	POWER ON
				SFCO	
-	-	0.004	0.000125	0.031	7/2
710-2a2c	-	0.002	0.001	0.008	-/-
840di-universal	-	0.002	0.001	0.008	-/-

For following table is used for the area:

- Display machine data

MD number	Name of identifier			Display filter	Reference
Unit	Name			Data type	Activation
				SW version	
System		Default value	Minimum value	Maximum value	Protection

For following table is used for the area:

- Drive machine data

MD number	Name of identifier			Display filter	Reference
Unit	Name			Data type	Activation
			Type		Rot/Lin
System		Default value	Minimum value	Maximum value	Protection

For following table is used for the area:

- Machine data of the hydraulic module:

MD number	Name of identifier			Display filter	Reference
Unit	Name			Data type	Activation
			Type	SW version	
System		Default value	Minimum value	Maximum value	Protection

Explanations of the terms specified in the table fields can be found in the following.

Number

In the "Number" field, the number of the machine data (MD) and the setting data (SD) is specified. This number is displayed via HMI in a list on the screen.

Name of identifier

In the field "Identifier", you see the name of the data. This name is displayed via HMI in a list on the screen.

Reference

The "Reference" field designates the document which contains the description of the context in which the machine data is used.

Reference is made to the following documents:

/FB1/	Function Manual of basic machines, supporting manuals: A2, A3, B1, B2, D1, F1, G2, H2, K1, K2, N2, P1, P3pl, P3sl, R1, S1, V1, W1, Z1
/FB2/	Function Manual of expanded functions, supporting manuals: A4, B3, B4, F3, H1, K3, K5, M1. M5, N2, N4, P2, P5, R2, S3, S7, T1, W3, W4
/FB3/	Function Manual of special functions, supporting manuals: F2, G1, G3, K6, M3, S9, T3, TE01, TE02, TE1, TE2, TE3, TE4, TE6, TE7, TE8, V2, W5
/FBA/	Function manual of drive functions, supporting manuals: DB1, DD1, DD2, DE1, DF1, DG1, DL1, DM1, DS1, DÜ1
/FBU/	Function Manual SIMODRIVE 611 universal
/FBSI/	Function Manual Safety Integrated
/IAC/	810D Installation & Start-Up Guide
/IAD/	840D/611D Installation & Start-Up Guide
/POS3/	POSMO SI/CD/CA User Manual
/FBHLA/	Function Manual HLA module
/IAM/	Commissioning CNC Part 2 (HMI), supporting manuals: BE1, HE1, IM2, IM4
/FBO/	Configuring OP 030 Operator Interface
/FBT/	Function Manual ShopTurn
/FBSP/	Function Manual ShopMill
/BAS/	Operating/Programming ShopMill
/BAD/	Operator's Guide HMI Advanced
/BEM/	HMI Embedded Operator's Guide

/FBW/	Function Manual Tool Management
/FBMA/	Function Manual ManualTurn
/FBFA/	Function Manual ISO Dialects for SINUMERIK
/FBSY/	Function Manual Synchronized Actions
/PGA/	Programming Manual Job Planning

Unit

The unit refers to the default setting of the machine data.

If the machine data is not based on a physical unit, then the field is marked with "-".

Note

For machine data of the Performance 2 [P2] control module, the unit(s) (together with a filter) are shown in row 2 column 1.

The following machine data influence the scaling of other machine data:

- MD_$MN_10220_SCALING_USER_DEF_MASK
- MD_$MN_10230_SCALING_FACTORS_USER_DEF
- MD_$MN_10240_SCALING_SYSTEM IS METRIC
- MD_$MN_SCALING_VALUE_INCH
- MD_$MN_IS_ROT_AX

Depending on MD 10240 SCALING_SYSTEM_IS_METRIC, the physical units differ as follows:

MD 10240 = 1	MD 10240 = 0
mm	inch
mm/min	inch/min
m/s2	inch/s2
m/s3	inch/s3
mm/rev.	inch/rev.

Name

The function of the data is described in the "Name" field.

Activation

In the "Activation" field, the following short designator specifies when the data takes effect after a change.

po	POWER ON	"RESET" key on the front plate of the NCU module
cf	NEW_CONF	– The "Activate MD" softkey on the HMI – "RESET" key on the control unit – It is possible to modify block limits during program operation
re	RESET	– at end of program M2/M30 or – "RESET" key on the control unit
so	IMMEDI-ATELY	After entry of value

The levels of effectiveness have been listed above in order of priority.

Protection

The levels of protection 0 to7 are specified in the "Protection" field. The first number specifies the protection level for writing and the second number specifies the protection level for reading.

0 or 10: SIEMENS

1 or 11: OEM HIGH

2 or 12: OEM LOW

3 or 13: End user

4 or 14: Keyswitch setting

5 or 15: Key switch position 2

6 or 16: Key switch position 1

7 or 17: Key switch position 0

In expanded tables, the entry "-1" indicates that the machine data for the specified system is not available.

Complete protection:

The numbers in the range of 0 to 7 establish whether assigned data in the NC program and in MDA mode is writeable or readable.

Conditional protection:

The numbers in the range of 10 to 17 establish (only for user data (GUD)) whether the data in the NC program and in MDA mode is writeable or readable.

The operation and display are always under protection for both types of protection.

The locking for protection levels 0 to 3 can be cleared by setting the password,

and the locking for 4 through 7 can be cleared via a keyswitch position.

The user only has access to information related to the current protection level and the levels below it. The machine data is assigned different protection levels by default.

The user can change the priority of the protection levels. Only protection levels of lower priority can be assigned to the machine data, setting data can also be assigned protection levels of higher priority.

The passwords are required for redefinition by the user.

Specify read access APR (Access protection read) and

write access APW (Access protection write).

The protection level follows the password in the form of a number.

Example: Changing rights in individual machine data

%_N_SGUD_DEFFile for global variables

;$PATH=/_N_DEF_DIR

REDEF $MA_CTRLOUT_SEGMENT_NR APR 2 APW 2

REDEF $MA_ENC_SEGMENT_NR APR 2 APW 2

REDEF $SN_JOG_CONT_MODE_LEVELTRIGGRD APR 2 APW 2

M30

The files become active when the next _N_INITIAL_INI is read in.

Display filter

A short designator for the filter setting is listed in the "Display filter" field. With the aid of this filter setting, it is possible to selectively reduce the number of the displayed machine/setting data of a section.

Display criteria:

EXP Expert mode:

- Active: the MD is assigned to the expert mode (display of MD)

Depending on the machine data section, there are different display filters. These short designations return in the operator interface to activate the filters.

The short designations of the display filter and their meanings are listed below for the individual machine data.

Drive machine data

D01 Controller data

D02 Monitors/Limitations

D03 Message data

D04 Status data

D05 Motor / Power module

D06 Measuring system

D07 Safety Integrated

D08 Standard machine

General machine data

N01 Configuration / Scaling

N02 Memory configuration

N03 PLC machine data

N04 Drive control

N05 Status data/Diagnostics

N06 Monitors/Limitations

N07 Auxiliary functions

N08 Corrections/Compensations

N09 Technological functions

N10 Peripheral configuration

N11 Standard machine

N12 NC language ISO dialect

Channelspecific machine data

C01 Configuration

C02 Memory configuration

C03 Initial settings

C04 Auxiliary functions

C05 Velocities

C06 Monitors/Limitations

C07 Transformations

C08 Corrections/Compensations

C09 Technological functions

C10 Standard machine

C11 NC language ISO dialect

Axis-specific machine data

A01 Configuration (including memory)

A02 Measuring system

A03 Machine geometry

A04 Speeds/Accelerations

A05 Monitors/Limitations

A06 Spindle

A07 Controller data

A08 Status data

A09 Corrections/Compensations

A10 Technological functions

O11 Standard machine

A12 NC language ISO dialect

Display machine data

You will find the following short designators for the machine display data:

H01 ShopMill

H02 ShopTurn

H03 ManualTurn

H04 Access levels

H05 Standard machine

Default value

The machine data is preset using this value. If default values for the channels differ, this is indicated by "/".

Some machine data are preset with different default values depending on the NCU used.

Note

Inputs via HMI are limited to ten digits plus comma and sign.

System

The system is specified in the "System" field if the the machine data only applies to one system:

840D	840D systems
810D	810D system
Adv	HMI Advanced
Emb	HMI Embedded
OP30	OP030
MT	ManualTurn
SM	ShopMill
ST	ShopTurn

If the machine data applies to all systems, the field remains empty.

Other identifiers:

iajc	"i" stands for axes, "j" stands for channels, e.g. 6a2c = 6 axes, 2 channels
7x0- iaja	identifies solution line systems
x	1, 2, 3

Dimension

The number of elements of a machine data field is indicated in the field marked "Dimension".

The machine data can be accessed via the field index [n] or [n,AX<axis number>].

Value range

The input limits are specified in the fields "Minimum value", "Maximum value" and "Data type".

If no range of values is specified, the value in the "Data type" field determines the input limits and the field is marked with "***".

Data type

In the "Data type" field, the short designators indicate the data types. The have the following meanings:

BOOLEAN	Machine data bit (1 or 0)
BYT E	Integer values (from -128 to 127)
DOUBLE	Real and integer values (from ± 4.19 x 10^{-307} to ± 1.67 x 10^{308})

DWORD	Integer values (from ± -2.147 x 10^9 to ± 2.147 x 10^9)
DWORD	Hex values (from 00000000 to FFFFFFFF)
STRING	Character string (max. 16 characters) consisting of capital letters with digits and underscore
UNSIGNED WORD	Integer values (from 0 to 65536)
SIGNED WORD	Integer values (from -32768 to 32767)
UNSIGNED DWORD	Integer values (from 0 to 4294967300)
SIGNED DWORD	Integer values (from -2147483650 to 2147483649)
WORD	Hex values (from 0000 to FFFF)
FLOAT DWORD	Real values (from ± 8.43 x 10^{-37} to ± 3.37 x 10^{38})
UBYTE	Integer values (from 0 to -255)
LONG	Integer values (from 4294967296 to -4294967295)

Rot/Lin

The type of motor to which the machine data applies is indicated in the "Rot/Lin" field.

Rot Rotary motors

Lin Linear motors

Type

The abbreviations of the following drive types are given in the "Type" field:

MSD for Main Spindle Drive

SLM for Synchronous Linear Motor

FD for Feed Drive

SW version

The "SW version" field shows which software version the machine data and setting data apply to.

Attributes

Short designators are listed for some machine data in the "Attributes" field. The have the following meanings:

- NBUP no Back Up: The data is not entered in the data backup
- ODLD only Download: Data can only be loaded from a file
- READ read Only: Data can only be read
- NDLD no Download: Data cannot be loaded from the file

- SFCO safety Configuration: MD for Safety Integrated System
- SCAL scaling Alarm: Alarm regarding design
- LINK Link Description: MD describes NCU link
- CTEQ Container Equal: MD must be identical in all NCUs that are linked
- CTDE Container Description: MD describes axis container

1.1.2 Overview of machine and setting data

The machine data and setting data are divided into the following areas:

Range	Description
from 1000 to 1799	Machine data for SIMODRIVE drives
from 5000 to 6000	Machine data of the hydraulic module
from 9000 to 9999	Display machine data
from 10000 to 18999	General machine data
from 19000 to 19999	Reserved
from 20000 to 28999	Channelspecific machine data
from 29000 to 29999	Reserved
from 30000 to 38999	AxisSpecific Machine Data
from 39000 to 39999	Reserved
from 41000 to 41999	General setting data
from 42000 to 42999	Channel-specific setting data
from 43000 to 43999	Axis-specific setting data
from 50000 bis 60999	Reserved
from 61000 to 61999	General machine data for compile cycles
from 62000 to 62999	Channel-specific machine data for compile cycles
from 63000 to 63999	Axis-specific machine data for compile cycles

Data IDs

With HMI, the designation of the machine data is displayed. The internal "designator" of the data requires additional IDs. If machine data is changed by programming or if it is read-in via the serial interface, these IDs must also be specified.

Data areas

$MM_	Display machine data
$MN_/$SN_	General machine data/setting data
$MC_/$SC_	Channel-specific machine data/setting data
$MA_/$SA_	Axis-specific setting data/machine data
$MD_	Drive machine data

The meanings are as follows:

$	System variables
M (GND)	Machine data
S	Setting data
M, N, C, A, D	Subarea (second letter)

Axis data is addressed via the axis name. The axis name can be the internal axis designator (AX1, AX2 ... AX8) or the designator specified by MD 10000: AX-CONF_NAME_TAB.

Example:
$MA_JOG_VELO[Y1]=2000
The JOG speed of axis Y1 is 2000 mm/min.

If the contents of the machine data is a STRING (e.g. X1) or a hexadecimal value (e.g. H41), then the contents must be between " ' " (e.g. 'X1' or 'H41').

Example:
$MN_DRIVE_INVERTER_CO[0]='H14'

FD module 9/18 A on slot 1 of the drive bus.

For addressing different contents of the machine data, the specifications must be in brackets.

Example:
$MA_FIX_POINT_POS**[0,X1]**=500.000

The first fixed point position (0=1, 1=2, 2=3, etc.) of axis X1 is 500

Example:
$MN_AUXFU_GROUP_SPEC[2]='H41'
Output time of the auxiliary functions of the third auxiliary function group.

$MN_AXCONF_MACHAX_NAME_TAB[0]='X1'
The name of the first machine axis is X1.

$MA_REF_SET_POS[0,X1]=100.00000
The first reference point value of axis X1 is 100 mm.

Assignment of channel-specific machine data:

CHANDATA (1)	Assignment of channel 1
$MC_CHAN_NAME='CHAN1'	Channel name for channel 1
$MC_AXCONF_GEOAX_NAME_TAB[1]='Y'	The name of the second geometry axis in channel 1 is Y
R10 = 33.75 ...	R10 from channel 1
CHANDATA (2)	Assignment of channel 2
$MC_CHAN_NAME='CHAN2' ...	Channel name for channel 2
R10 = 96.88 ...	R10 from channel 2

1.2 Display machine data

Number	Identifier			Display filter	Reference
Unit	Name			Data type	Active
				SW	
System		Default value	Minimal value	Maximum value	Protection

Description

9000	LCD_CONTRAST			H05	**QV:** A2
-	Contrast			BYTE	Power On
				-	
Adv, Emb		Emb: 7	0	15	3/4

Description

In this machine data, you can adapt the contrast of LCD operator panels to the environmental conditions.
Lower value: darker
Higher value: brighter

9001	DISPLAY_TYPE			H05	**QV:** A2
-	Type of operator panel			BYTE	Power On
Adv, Emb		Emb: 1	0	2	0/0

Description

The relevant monitor type is determined for optimal color adjustment.
The MD is set by the system.
The following assignment applies:
Monitor
0 OP031 slimline operator panel LCD, monochrome display
1 OP031 slimline operator panel LCD, color display
2 OP032 color monitor

9002	**DISPLAY_MODE**				**QV:** A2
-	External monitor			BYTE	Power On
				1	
			0	2	3/4

Description

Indicate the external monitor type which is connected to the MMC, for optimum color adjustment. Assignment:

0 no monitor
1 monochrome monitor
2 color monitor

9003	**FIRST_LANGUAGE**			H05	**QV:** A2
-	Foreground language			BYTE	Power On
				1.1	
Emb		Emb: 1	1	2	3/4

Description

For SINUMERIK 840D/840Di/810D and FM NC two languages are available simultaneously. Via machine data Foreground language you can set the language which is displayed automatically after each system startup.

Additionally, you can switchover the language via softkey in the Diagnosis area.

After power ON the language defined via MD 9003 FIRST_LANGUAGE will be active again.

Further references:

/BA/, Operator's Guide, /IM3/ Installation and Startup MMC 103

9004	**DISPLAY_RESOLUTION**			H05	**QV:** A2
-	Display resolution			BYTE	Immediately
				-	
Adv, Emb		Emb: 3	0	5	3/4

Description

This machine data defines the number of decimal places for position displays on the operator panel.

9004	**DISPLAY_RESOLUTION**			H05	**QV:** A2
-	Display resolution			BYTE	Power On
				-	
Adv, Emb		Emb: 3	0	5	3/4

Description

This machine data defines the number of decimal places for position displays on the operator panel.

9005	**PRG_DEFAULT_DIR**			H05	**QV:** A2
-	Basic setting program directory			BYTE	Immediately
				-	
Emb		Emb: 1	1	5	3/4

Description

Via this machine data, the basic setting is defined by the program directory.

Note:

The basic setting Program Directory can only be selected with HMI Embedded.

9006	**DISPLAY_BLACK_TIME**			H05	**QV:** A2
-	Time for screen saver			BYTE	Power On
				SW2	
Emb		Emb: 15	0	60	3/4

Description

Via this machine data, the period of time is defined, after the expiry of which the screen automatically switches to dark, provided that no keys are pressed in the meantime.

By setting value 0, automatic switching to dark is deactivated.

Note:

Automatic switching of the screen to dark is only possible via HMI Embedded. It is activated only if the IF Screen dark = 0.

Relating to:

IS Screen dark (DB19, ... DBX0.1)

9007	**TABULATOR_SIZE**			H05	**QV:** A2
-	Tab length			BYTE	Immediately
				SW2	
Emb		Emb: 4	0	30	3/4

Description

This machine data defines the tab length.

Note:

The tab length can only be changed in HMI Embedded.

9008	**KEYBOARD_TYPE**			H05	**QV:** A2
-	Type of keyboard			BYTE	Power On
				SW3.6	
Adv, Emb		Emb: 0	0	1	3/4

Description

This machine data defines the type of keyboard.

Basic configuration for the type of keyboard:

0: OP keyboard

1: MFII/QWERTY

Note: (SW 6.1 and higher)

The type of keyboard can be set in HMI Embedded .

9009	**KEYBOARD_STATE**			H05	**QV:** A2
-	Keyboard shift behavior at booting			BYTE	Power On
				SW3.6	
Adv, Emb		Emb: 2	0	2	3/4

Description

This machine data defines the shift response of the keyboard.
Basic configuration for the shift response of the keyboard
0: single shift is active after booting

2: CAPSLOCK is active after booting (applies for MFII only)
CAPSLOCK in the MMC corresponds to hardware CAPSLOCK
CAPSLOCK in the HMI corresponds to software CAPSLOCK

Note: (SW 6.1 and higher)
The basic configuration for the shift response of the keyboard can be changed in HMI Embedded and in HMI Advanced.

9010	**SPIND_DISPLAY_RESOLUTION**			H05	**QV:** A2
-	Display resolution for spindle values			BYTE	Immediately
				SW 4	
Adv			0	5	3/4

Description

This machine data defines the number of decimal places for position displays of spindles on the operator panel.

9011	**DISPLAY_RESOLUTION_INCH**			H05	**QV:** A2
-	Disp. resolution for INCH meas. system			BYTE	Immediately
				SW 5.1	
Adv, Emb		Emb: 4	0	6	3/4

Description

This machine data defines the number of decimal places for position displays on the operator panel.

9011	**DISPLAY_RESOLUTION_INCH**			H05	**QV:** A2
-	Disp. resolution for INCH meas. system			BYTE	Power On
				SW 5.1	
Adv, Emb		Emb: 4	0	6	3/4

Description

This machine data defines the number of decimal places for position displays on the operator panel.

9012	**ACTION_LOG_MODE**			H05	**QV:** IM1, IM3, IM4
-	Set action mode for trip recorder			INTEGER	Power On
				5.2	
Adv, Emb		Emb: 254	0	0xFFFF	1/1

Description

With this MD you can switch on/off the trip recorder and determine a selection of data to be recorded.

Bit 0 = 1 trip recorder ON (default)
= 0 trip recorder OFF

Bit 1 = 1 MMC 103: Variable services (writing access to geometry data, e.g. tool offset) are recorded.
See the Help function in the operating area Parameter under Variables (default) for the meaning of the variables.
= 0 variable services are not recorded

Bit 2 = 1 MMC 103: PI services (e.g. program selection) are recorded. See the Help function in the operating area Parameter under Variables (default) for the meaning of the variables.
= 0 PI services are not recorded

Bit 3 = 1 MMC 103: Domain services (e.g. load/unload program) are recorded (default)
= 0 domain services are not recorded

Bit 4 = 1 alarm status changes are recorded (default)
= 0 alarm status changes are not recorded

Bit 5 = 1 key strokes are recorded (default)
= 0 key strokes are not recorded

Bit 6 = 1 channel status/override is recorded (default)
= 0 channel status/override is not recorded

Bit 7 = 1 MMC 103: Softkey operations and menu changes are recorded For Siemens-internal use only (default)
MMC100.2: ID of the open and closed window is recorded. For Siemens-internal use only (default)
= 0 softkey operations and menu changes are recorded

9013	**SYS_CLOCK_SYNC_TIME**			H05	**QV:**
-	Synchronization time MMC/HMI time with PLC			REAL	Power On
Emb		Emb: 0	0	199	0/0

Description

9014	**USE_CHANNEL_DISPLAY_DATA**			H05	**QV:** FBT, FBSP, EMB, ADV
-	Use channel-specific display MDs			INTEGER	Immediately
				6.3	
Adv, Emb		Emb: 0	0	1	3/4

Description

General display MD for changeover of the display to the new channel-specific display MDs for HMI_ADV =6.02.01 and NCK 6.2 and higher.

9016	**SWITCH_TO_AREA**			H05	**QV:** IAM, BE1
-	Default ramp-up menu selectable			INTEGER	Power On
				SW 5, Erw. 6.3	
Emb		Emb: -1	-1	10000	3/4

Description

Meaning:

-1 (default): Machine date is not evaluated
1...16: Number of startup softkeys, 9...16 designating
the softkeys on the
1st switching level.
128...135: For HT6: Startup in the operator area assigned to the keys U1..U8 (128 --> U1; ... 135 --> U8).
136...137: For HT6: Startup in the operator area assigned to the keys S1 / S2 (136 --> key S1, 137 --> key S2)

In the delivery status, the value 12 is entered in the MD SWITCH_TO_AREA
to activate the CUSTOM operator area during startup..

9020	**TECHNOLOGY**			H05	**QV:** A2, FBT
-	Technology for NC prog. and simulation			BYTE	Power On
				SW4.3, ST 6.1 SW5.1 MMC103	
Adv, Emb		Emb: 1	0	2	3/4

Description

Basic configuration for simulation:

0: No specific assignment
1: Turning machine configuration
2: Milling machine configuration

9021	**LAYOUT_MODE**			H05	**QV:** IM4
-	HMI design			BYTE	Power On
				6.3	
Adv, Emb		Emb: 0	1	1	3/4

Description

Meaning: 0 = changed colors and softkeys
1 = user interface design used up to now

9021	**LAYOUT_MODE**			H05	**QV:** IM4
-	HMI design			INTEGER	Power On
				6.3	
Adv, Emb		Emb: 0	0	0	3/4

Description

Meaning: 0 = changed colors and softkeys
1 = user interface design used up to now

9025	**DISPLAY_BACKLIGHT**				**QV:** IM2
-	Brightness level background lighting			BYTE	Power On
				5.3	
			0	31	3/4

Description

Brightness of the background light
(HT6 only). The highest brightness is preset (15). Select lower values for dimming.

9026	**TEACH_MODE**				**QV:** IM2
-	Teach mode to be activated			REAL	Power On
				5.3	
			0	0	3/4

Description

Teach-in mode which is to be activated via teach-in key (HT6 only):

1 Standard teach-in

2 Standard teach-in with the possibility to block the acceptance of the teach-in set.

9027	**NUM_AX_SEL**				**QV:** IM2
-	Number of axis groups for traversing keys			REAL	Power On
				5.3	
			0	4	3/4

Description

Number of axis groups on which the traversing keys can have an effect (HT6 only).

9030	**EXPONENT_LIMIT**			H05	**QV:** A2
-	Digits for represent. without exponent			BYTE	Power On
				SW 5.1	
Emb		Emb: 6	0	20	3/4

Description

This machine data defines the number of places which is displayed without exponent.

9031	**EXPONENT_SCIENCE**			H05	**QV:** A2
-	Exponent in technical representation			BYTE	Power On
				SW 5.1	
Emb		Emb: 1	0	1	3/4

Description

This machine data defines the representation of exponents in steps of three.

9032	**HMI_MONITOR**			H05	**QV:** FBT, FBSP, EMB, ADV
-	Define PLC data for HMI screen info			STRING	Power On
				6.2	
Adv, Emb		Emb: 0	0	0	2/4

Description

Offset-prone pointer to a PLC data block. It is used to report HMI monitor information to the PLC, e.g. active HMI task.
Format: PLC-specific format to indicate a data block with byte offset.
e.g. DB60.DBB10 for data block 60, Byte 10
The monitor information reported by the HMI is max. 8 Bytes.

9033	**MA_DISPL_INV_DIR_SPIND_M3**			H05	**QV:** ADV
-	Display of spindle direction of rotation			INTEGER	Immediately
				6.2	
Adv			0	0x7FFFFFFF	3/4

Description

Bit-serial coding of the direction of rotation represented in the spindle window
The spindle number is the index in the bit list.
Bit[spindle index]=0 --> M3 is represented as CW rotation in the bitmap.
Bit[spindle index]=1 --> M3 is represented as CCW rotation in the bitmap.

The 1st spindle corresponds to bit 0.

9034	**MA_NUM_DISPLAYED_CHANNELS**			H05	**QV:** BAD
-	Number of machine channels displayed			REAL	Power On
				6.4	
Adv			0	2	3/4

Description

Setting the no. of channels displayed simultaneously in the Machine operating area

9050	**STARTUP_LOGO**			H05	**QV:** FBT, FBSP, EMB, ADV
-	Activate OEM boot screen			BYTE	Power On
				6.2	
Adv, Emb		Emb: 0	0	1	1/4

Description

The OEMs can integrate their own boot screen as WINDOWS BMP file with 256 colors. With this MD, the default screen is replaced by the OEM boot screen.

9052	**SHOW_CHANNEL_SPANNING_STATE**			H05	**QV:** FBT, FBSP
-	Change cross-channel status display			BYTE	Power On
				6.3	
Adv, Emb		Emb: 0	0	1	2/4

Description

Toggle value for cross-channel status display:
0 = display of the previous [program status left side bottom in the header]
1 = displays the [program status, left side bottom in the header]line according to the configuration in the file Header.ini.

9053	**PLC_SYMBOL_SORT**			H05	**QV:** IM4
-	Sorting algorithm for PLC symbols			INTEGER	Immediately
				6.3	
Adv, Emb		Emb: 0	0	4	3/4

Description

Sorting algorithm for PLC symbols
The following sorting algorithms are made available:

0 :
unsorted, i.e. as included in the PLC symbol file

1 :
sorted in ascending and alphanumerical order, according to the symbolic address

2 :
sorted in descending and alphanumerical order, according to the symbolic address

3 :
sorted in ascending and alphanumerical order, according to the absolute address

4 : sorted in descending and alphanumerical order, according to the absolute address

9054	**PLC_SYMBOL_FILTER**			H05	**QV:** BAD, BEM
-	Filter settings for PLC symbols			REAL	Immediately
				6.3	
Adv, Emb		Emb: 0	0	0xFFFF	3/4

Description

Filter settings for PLC symbols
By means of the Filter function, individual symbol groups (I/Q/M/T/C/DB) can be
displayed (Bit = 0)
or hidden (Bit = 1)
Bit0 : Inputs (I/E)
Bit1 : Outputs (Q/A)
Bit2 : Flags (M)
Bit3 : Timers (T)
Bit4 : Counters (C/Z)
Bit5 : Data blocks (DB)

9054	**PLC_SYMBOL_FILTER**			H05	**QV:** BAD, BEM
-	Filter settings for PLC symbols			REAL	Immediately
				6.3	
Adv, Emb		Emb: 0	0	0xFFFF	3/4

Description

Filter settings for PLC symbols
By means of the Filter function, individual symbol groups (I/Q/M/T/C/DB) can be
displayed (Bit = 0)
or hidden (Bit = 1)
Bit0 : Inputs (I/E)
Bit1 : Outputs (Q/A)
Bit2 : Flags (M)
Bit3 : Timers (T)
Bit4 : Counters (C/Z)
Bit5 : Data blocks (DB)

9055	**PLC_ALARM_PICTURE**			H05	**QV:** IM4
-	Select acknowledgement symb. of PLC alarms			INTEGER	Power On
				6.3	
Adv, Emb		Emb: 1	-1	1	3/4

Description

Select which picture is displayed as acknowledgement symbol for PLC alarms.

-1: Do not display any symbol
0: Display symbol with text PLC
1: Display Cancel (BigMac) symbol

9056	**ALARM_ROTATION_CYCLE**			H05	**QV:**
-	Rotation cycle time for alarm display			INTEGER	Immediately
				6.4	
Emb		Emb: 0	0	10000	3/4

Description

Rotation cycle time in the alarm display:
<500 : no rotation, i.e. the latest alarm is displayed
500 - 10000 : cycle duration of the alarm rotation in ms
If a valid cycle time is set, all alarms (NCK, PLC or MMC) are displayed one after the other in the alarm line.
Each alarm is displayed during the time period stated before the next alarm is displayed.
If no alarm is pending, cycle alarms or program messages are possibly displayed. These, however, do not rotate.

9180	**USER_CLASS_READ_TCARR**			H04, H05	**QV:** A2
-	Protect. level read tlh offsets			BYTE	Immediately
				6.1	
Emb		Emb: 7	0	7	3/4

Description

With this MD you can define who has read-only access to the toolholder offset.

9181	**USER_CLASS_WRITE_TCARR**			H04, H05	**QV:** A2
-	Protect. level write tlh offsets			BYTE	Immediately
				6.1	
Emb		Emb: 7	0	7	3/4

Description

With this MD you can define who has write access to the toolholder offset.

9182	**USER_CLASS_INCH_METRIC**			H04, H05	**QV:** EMB
-	Protect. level inch-metric switchover			BYTE	Immediately
				6.2	
Emb		Emb: 7	0	7	3/4

Description

The inch-metric changeover option via softkey is protected via access level in the MACHINE area.

9183	**USER_WRITE_TOOLFRAME**			H04, H05	**QV:** A2
-	Write toolholder protection level			BYTE	Immediately
				6.4	
Adv, Emb		Emb: 7	0	7	3/4

Description

Toolholder frame protection level

9184	**USER_WRITE_PARTFRAME**			H04, H05	**QV:** A2
-	Write tool ref. point protection level			BYTE	Immediately
				6.4	
Adv, Emb		Emb: 7	0	7	3/4

Description

Tool reference point frame protection level

9185	**USER_WRITE_WPFRAME**			H04, H05	**QV:** A2
-	Write workpiece ref. point protec. level			BYTE	Immediately
				6.4	
Adv, Emb		Emb: 7	0	7	3/4

Description

Tool reference point frame protection level

9186	**USER_WRITE_CYCFRAME**			H04, H05	**QV:** A2
-	Write cycle frame protection level			BYTE	Immediately
				6.4	
Adv, Emb		Emb: 7	0	7	3/4

Description

Cycle frame protection level

9187	**USER_WRITE_TRAFRAME**			H04, H05	**QV:** A2
-	Write transformation frame protec. level			BYTE	Immediately
				6.4	
Adv, Emb		Emb: 7	0	7	3/4

Description

Transformation frame protection level

9188	**USER_WRITE_EXTFRAME**			H04, H05	**QV:** A2
-	Write external WO protection level			BYTE	Immediately
				6.4	
Adv, Emb		Emb: 7	0	7	3/4

Description

Protection level write external work offset

9200	**USER_CLASS_READ_TOA**			H04, H05	**QV:** A2
-	Protect. level read tool offsets			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

The machine date defines the protection level for reading all tool offsets.

9201	**USER_CLASS_WRITE_TOA_GEO**			H04, H05	**QV:** A2
-	Protection level write tool geometry			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine date defines the protection level for writing tool geometry data.

9202	**USER_CLASS_WRITE_TOA_WEAR**			H04, H05	**QV:** A2
-	Protection level write tool wear data			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine date defines the protection level for writing tool wear data.

9203	**USER_CLASS_WRITE_FINE**			H04, H05	**QV:** A2
-	Protection level fine			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine data defines the protection level for write fine in the machine data:

MD 9450: MM_WRITE_TOA_FINE_LIMIT

MD 9451: MM_WRITE_ZOA_FINE_LIMIT.

9204	**USER_CLASS_WRITE_TOA_SC**			H04, H05	**QV:** A2
-	Change prot.level for tool sum offsets			BYTE	Immediately
				SW 5	
Adv			0	7	3/4

Description

This machine data defines the protection level for changing the tool sum offset.

9205	**USER_CLASS_WRITE_TOA_EC**			H04, H05	**QV:** A2
-	Prot. level change tool setup offsets			BYTE	Immediately
				SW 5	
Adv			0	7	3/4

Description

This machine data defines the protection level for changing the tool setup offset.

9206	**USER_CLASS_WRITE_TOA_SUPVIS**			H04, H05	**QV:** A2
-	Prot. level change tool mon. limits			BYTE	Immediately
				SW 5	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine data defines the protection level for changing the tool monitoring limit values. One authorization is valid for all limit values:

Quantity, service life, wear and type of monitoring.

9207	**USER_CLASS_WRITE_TOA_ASSDNO**			H04, H05	**QV:** A2
-	Modify assigned DNo of a tool cutting edge			BYTE	Immediately
				SW 5	
Adv			0	7	3/4

Description

This machine data defines the protection level for changing assigned D numbers of a tool edge.

9208	**USER_CLASS_WRITE_MAG_WGROUP**			H04, H05	**QV:** A2
-	Modify wear group mag. pos./magazine			BYTE	Immediately
				SW 5	
Adv			0	7	3/4

Description

This machine data defines the protection level for changing the wear group of the magazine location/magazine.

9209	**USER_CLASS_WRITE_TOA_ADAPT**			H04, H05	**QV:** A2
-	Protect. level write tool adaptat. data			BYTE	Immediately
				SW5	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine data defines the protection level for writing the tool adapter geometrical data.

9210	**USER_CLASS_WRITE_ZOA**			H04, H05	**QV:** A2
-	Write protect. level of sett. zero offs.			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine data defines the protection level for writing the settable zero offset.

9211	**USER_CLASS_READ_GUD_LUD**			H04, H05	**QV:** A2
-	Read protection level of user variables			BYTE	Immediately
				SW6.1	
Adv, Emb		Emb: 7	0	7	3/4

Description

The MD defines the protection level for reading user variables.

9213	**USER_CLASS_OVERSTORE_HIGH**			H04, H05	**QV:** A2
-	Protection level extended overstore			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine data defines the protection level for extended overstore.

9214	**USER_CLASS_WRITE_PRG_CONDIT**			H04, H05	**QV:** A2
-	Protection level program control			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine data defines the protection level for changing the program control settings.

9215	**USER_CLASS_WRITE_SEA**			H04, H05	**QV:** A2
-	Protection level write setting data			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine data defines the protection level for writing the setting data.

9216	**USER_CLASS_READ_PROGRAM**			H04, H05	**QV:** A2
-	Read protection level of part program			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

The MD defines the protection level for reading part programs.

9217	**USER_CLASS_WRITE_PROGRAM**			H04, H05	**QV:** A2
-	Write part program protection level			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

The MD defines the protection level for entering part programs.

9218	**USER_CLASS_SELECT_PROGRAM**			H04, H05	**QV:** A2
-	Protection level program selection			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine data defines the protection level for selecting a program.

9219	**USER_CLASS_TEACH_IN**			H04, H05	**QV:** A2
-	Protection level TEACH IN			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine data defines the protection level for performing
Wrigth moving information into MDA buffer with TEACH IN.

9220	**USER_CLASS_PRESET**			H04, H05	**QV:** A2
-	Protection level PRESET			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine data defines the protection level for entering a new control zero in the machine coordinate system.

9221	**USER_CLASS_CLEAR_RPA**			H04, H05	**QV:** A2
-	Protection level delete R variables			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine data defines the protection level for deleting R parameters.

9222	**USER_CLASS_WRITE_RPA**			H04, H05	**QV:** A2
-	Protection level write R variables			BYTE	Immediately
				-	
Adv, Emb		Emb: 7	0	7	3/4

Description

This machine data defines the protection level for writing R parameters.

9223	**USER_CLASS_SET_V24**			H04, H05	**QV:** A2
-	Prot. level RS-232-C parameterization			BYTE	Immediately
				-	
Emb		Emb: 7	0	7	3/4

Description

This MD defines the protection level for parameterizing the V24 interface.

9224	**USER_CLASS_READ_IN**			H04, H05	**QV:** A2
-	Protect. level read in data			BYTE	Immediately
				-	
Emb		Emb: 7	0	7	3/4

Description

The MD defines the protection level for reading in data.

9225	**USER_CLASS_READ_CST**			H04, H05	**QV:** A2
-	Protect. level standard cycles			BYTE	Immediately
				SW2	
Emb		Emb: 7	0	7	3/4

Description

The MD defines the protection level for access to standard cycles.

9226	**USER_CLASS_READ_CUS**			H04, H05	**QV:** A2
-	Protect. level user cycles			BYTE	Immediately
				SW2	
Emb		Emb: 7	0	7	3/4

Description

The MD defines the protection level for access to user cycles.

9227	**USER_CLASS_SHOW_SBL2**			H04, H05	**QV:** A2
-	Skip single block2 (SBL2)			BYTE	Immediately
				SW3.5	
Emb		Emb: 7	0	7	3/4

Description

Function SBL2 will only be offered on the interface for selection if the current protection level exceeds or equals the access rights defined in this MD.

Special cases, errors:

If you select SBL2 and set the protection level to a value which SBL2 cannot display any more, SBL2 will remain selected. You will then have the option to change to SBL1 if required. SBL2 will select it automatically.

9228	**USER_CLASS_READ_SYF**			H04, H05	**QV:** A2
-	Access level for selecting directory SYF			BYTE	Immediately
				SW4.2	
Emb		Emb: 7	0	7	3/4

Description

The MD defines the access level for selecting the SYF directory.

9229	**USER_CLASS_READ_DEF**			H04, H05	**QV:** A2
-	Access level for selecting directory DEF			BYTE	Immediately
				SW4.2	
Emb		Emb: 7	0	7	3/4

Description

The MD defines the access level for selecting the DEF directory.

9230	**USER_CLASS_READ_BD**			H04, H05	**QV:** A2
-	Access level for selecting directory BD			BYTE	Immediately
				SW4.2	
Emb		Emb: 3	0	7	3/4

Description

The MD defines the access level for selecting the BD directory.

9231	**USER_CLASS_WRITE_RPA_1**			H04, H05	**QV:** A2
-	Protection level for the first RPA area			BYTE	Immediately
				SW5.1	
Adv			0	7	3/4

Description

This machine data defines the write protection for the first RPA area.

9232	**USER_BEGIN_WRITE_RPA_1**			H04, H05	**QV:** A2
-	Beginning of the first RPA area			WORT	Immediately
				SW5.1	
Adv			0	0	3/4

Description

This machine data defines the start of the first RPA area.

9233	**USER_END_WRITE_RPA_1**			H04, H05	**QV:** A2
-	End of the first RPA area			WORT	Immediately
				SW5.1	
Adv			0	0	3/4

Description

This machine data defines the end of the first RPA area.

9234	**USER_CLASS_WRITE_RPA_2**			H04, H05	**QV:** A2
-	Protection level for the second RPA area			BYTE	Immediately
				SW5.1	
Adv			0	7	3/4

Description

This machine data defines the write protection for the second RPA area.

9235	**USER_BEGIN_WRITE_RPA_2**			H04, H05	**QV:** A2
-	Beginning of the second RPA area			WORT	Immediately
				SW5.1	
Adv			0	0	3/4

Description

This machine data defines the start of the second RPA area.

9236	**USER_END_WRITE_RPA_2**			H04, H05	**QV:** A2
-	End of the second RPA area			WORT	Immediately
				SW5.1	
Adv			0	0	3/4

Description

This machine data defines the end of the second RPA area.

9237	**USER_CLASS_WRITE_RPA_3**			H04, H05	**QV:** A2
-	Protection level for the third RPA area			BYTE	Immediately
				SW5.1	
Adv			0	7	3/4

Description

This machine data defines the write protection for the third RPA area.

9238	**USER_BEGIN_WRITE_RPA_3**			H04, H05	**QV:** A2
-	Beginning of the third RPA area			WORT	Immediately
				SW5.1	
Adv			0	0	3/4

Description

This machine data defines the start of the third RPA area.

9239	**USER_END_WRITE_RPA_3**			H04, H05	**QV:** A2
-	End of the third RPA area			WORT	Immediately
				SW5.1	
Adv			0	0	3/4

Description

This machine data defines the end of the third RPA area.

9240	**USER_CLASS_WRITE_TOA_NAME**			H04, H05	**QV:** A2
-	Change tool designation and duplo			BYTE	Immediately
				5	
Adv			0	7	3/4

Description

The machine data defines the protection level for changing the tool identifier and duplo.

9241	**USER_CLASS_WRITE_TOA_TYPE**			H04, H05	**QV:** A2
-	Change tool type			BYTE	Immediately
				5	
Adv			0	7	3/4

Description

The machine data defines the protection level for changing the tool type.

9242	**MA_STAT_DISPLAY_BASE**			H05	**QV:** K2
-	Number basis display articul. pos. STAT			WORT	Immediately
				6.1	
Adv, Emb		Emb: 0	0	16	3/4

Description

This MD defines the number system (bin, dec, hex) for the display
of the STAT position of joint locations for special kinematics
and robots.
Some possible values are listed in the following:
2: Display as binary value with STAT=B00001101
10: Display as decimal value with STAT=13
13: Display as hexadecimal value with STAT='H0D'

9243	**MA_TU_DISPLAY_BASE**			H05	**QV:** K2
-	Number basis display rot. axis pos. TU			WORT	Immediately
				6.1	
Adv, Emb		Emb: 0	0	16	3/4

Description

The availability in operating mode machine depends on the access level.

This MD defines the number system (bin, dec, hex) for the display
of the TU position of rotary axes for robots
Some possible values are listed in the following:
2: Display as binary value with TU='00001101'
10: Display as decimal value with TU=13
16: Display as hexadecimal value with TU='H0D

9244	**MA_ORIAXES_EULER_ANGLE_NAME**			H05	**QV:** K2
-	Orientation axes as Euler angle			WORT	Immediately
				6.1	
Adv			0	1	3/4

Description

The availability in operating mode machine depends on the access level.

This MD defines whether the Euler angle name or the channel geo axis name is the axis identifier of the orientation axis.
Some possible values are listed in the following:

0: Orientation axis name from the channel block Geo axis name with index 3 to 5

1: Orientation axis name is the name of the Euler angle from the general machine data

9245	**MA_PRESET_FRAMEIDX**			H05	**QV:** K2
-	Scratching value storage + preset.act.val.			WORT	Immediately
				6.1	
Adv			1	10	3/4

Description

Index of the basic frame in which the functions 'scratching' and 'preset actual value' enter their values. The index must be within a range defined by the channel-specific machine data:

$MC_MM_NUM_BASE_FRAMES (number of required basic frames).

The MD will not be relevant if the values for 'scratching' and 'actual value setting' are entered in the system frame when the system frame is activated.

9246	**USER_CLASS_SYS_ZERO_OFF**			H04, H05	**QV:** A2
-	Access level write system frames			BYTE	Immediately
				Adv.: 6.03, Emb.: 6.02	
Adv, Emb		Emb: 7	0	7	2/2

Description

Access level from which system frames can be written.

9247	**USER_CLASS_BASE_ZERO_OFF_PA**			H04, H05	**QV:** K2
-	Access level basic offset PA			BYTE	Immediately
				5.3	
Adv, Emb		Emb: 7	0	7	2/2

Description

Via MD 9247 MM_USER_CLASS_BASE_ZERO_OFF_PA you can set from which access level the softkey Basic ZO is offered in the zero offset window in the Parameters operating area. At the same time, the basic frames are also displayed or skipped in the zero offset window and in the Active ZO + offsets window.

9248	**USER_CLASS_BASE_ZERO_OFF_MA**			H04, H05	**QV:** IAM, IM1
-	Access level basic offset MA			BYTE	Immediately
				5.3	
Adv, Emb		Emb: 7	0	7	2/2

Description

Via MD 9248 MM_USER_CLASS_BASE_ZERO_OFF_MA you can set from which access level in the Machine operating area the softkey Basic ZO is offered in the Scratch function or the entry G500 is possible in the zero offset array.

The Set actual value function is also offered depending on this MD.

As a result, the user cannot change the basic zero offset values any more without having the corresponding access rights.

9249	**USER_CLASS_VERT_MODE_SK**			H04, H05	**QV:** K2
-	Protect. level vertical SKs of area SKs			DOUBLE	Immediately
				SW6.1	
Emb		Emb: 2004318071	0	0x77777777	3/4

Description

Via MD 9249 USER_CLASS_VERT_MODE_SK you can protect vertical softkeys of the area softkeys as required.

Note: (SW 6.1 and higher)

This functionality is only available in HMI Embedded.

9251	**USER_CLASS_TM_SKTLLIST**			H04, H05	**QV:** FBW
-	Display of tool list			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9252	**USER_CLASS_TM_SKTOOLLOAD**			H04, H05	**QV:** FBW
-	Protection level for loading tools			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9253	**USER_CLASS_TM_SKTOOLUNLOAD**			H04, H05	**QV:** FBW
-	Prot. level for unloading tools			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9254	**USER_CLASS_TM_SKTOOLMOVE**			H04, H05	**QV:** FBW
-	Protection level for tool relocation			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9256	**USER_CLASS_TM_SKMGLREPR2**			H04, H05	**QV:** FBW
-	Prot. level for display of 2nd mag. list			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9257	**USER_CLASS_TM_SKMGLREPR3**			H04, H05	**QV:** FBW
-	Prot. level for display of 3rd mag. list			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9258	**USER_CLASS_TM_SKNCNEWTOOLE**			H04, H05	**QV:** FBW
-	Prot.level for creating new cuttinng edges			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9259	**USER_CLASS_TM_SKNCDELTOOL**			H04, H05	**QV:** FBW
-	Protection level for deleting tools			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9260	**USER_CLASS_TM_SKMGBUFFER**			H04, H05	**QV:** FBW
-	Prot. level for buffer on/off			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9261	**USER_CLASS_TM_SKMGFIND**			H04, H05	**QV:** FBW
-	Protection level for search			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9262	**USER_CLASS_TM_SKMGLISTPOS**			H04, H05	**QV:** FBW
-	Protection level for positioning			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9263	**USER_CLASS_TM_SKMGNEXT**			H04, H05	**QV:** FBW
-	Prot. level f. paging to next magazine			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9264	**USER_CLASS_TM_SKTLNEWTOOL**			H04, H05	**QV:** FBW
-	Protection level for creating tools			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9265	**USER_CLASS_TM_SKTLLREPR1**			H04, H05	**QV:** FBW
-	Prot. level for display of 1st mag. list			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9266	**USER_CLASS_TM_SKTLLREPR2**			H04, H05	**QV:** FBW
-	Prot. level for display of 2nd tool list			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9267	**USER_CLASS_TM_SKTLLREPR3**			H04, H05	**QV:** FBW
-	Prot. level for display of 3rd tool list			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9269	**USER_CLASS_TM_SKFINDPLACE**			H04, H05	**QV:** FBW
-	Empty softkey loc., display tool list			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9270	**USER_CLASS_TM_SKACTPLACE**			H04, H05	**QV:** FBW
-	Prot. level f. load. to current location			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9271	**USER_CLASS_TM_SKLDTOOLDAT**			H04, H05	**QV:** FBW
-	Check and edit the tool data			BYTE	Power On
				SW4.1	
Emb		Emb: 7	0	7	3/4

Description

9272	**USER_CLASS_APPLICATION**			H04, H05	**QV:** A2
-	Protec. level for operating area selection			BYTE	Immediately
				6.4	
Emb		Emb: 0	0	7	3/4

Description

This MD defines the access level for the individual operating areas.
The array index refers to the softkey on which the corresponding operating area was defined,
i.e. index 1 for the operating range configured on the first softkey.
Index 0 is reserved for future extensions.

9273	**USER_CLASS_APP_PARAMETER**			H04, H05	**QV:**
-	Protection level for softkeys in parameter			BYTE	Immediately
				7.1	
Emb		Emb: 0	0	7	3/4

Description

This MD defines the access level for the individual softkeys in the Parameter operating area.

The array index represents the corresponding softkey, that means, e.g. Index 1 stands for the first softkey.

Index 0 is reserved for later extensions.

9300	**V24_USER_XON**			H05	**QV:** K4
-	User: X on character			REAL	Immediately
				-	
Emb		Emb: 17	0	0xFF	3/4

Description

XON character: This is the character which starts a transmission: It applies for device type XON/XOFF only.

With the special function Start with XON active, the program waits for an XON character from the connected device during read-in before it starts.

Device control character 1 (DEVICE CONTROL 1 (X-ON) or DC 1 follow standard 11H.

This standard value is set as default.

Input: via digital input in the Parameter screen under XON (hex)

9301	**V24_USER_XOFF**			H05	**QV:** K4
-	User: X off character			REAL	Immediately
				-	
Emb		Emb: 19	0	0xFF	3/4

Description

XOFF character: This is the character which stops a transmission: It applies for device type XON/XOFF only.

Device control character 3 (DEVICE CONTROL 3 (X-OFF) or DC 3 follow standard 13H. This standard value is set as default.

Input: via digital input in the Parameter screen under XOFF (hex)

9302	**V24_USER_EOF**			H05	**QV:** K4
-	User: end-of-transmission character			REAL	Immediately
				-	
Emb		Emb: 26	0	0xFF	3/4

Description

This is the character which stops a transmission.

Value 1A is set as default. DOS character for file end in text files.

Input: via digital input in the Parameter screen under end of transmission

The character is active when Stop with end of transmission character is checked.

9303	**V24_USER_CONTROLS**			H05	**QV:** K4
-	User: special bits			REAL	Immediately
				-	
Emb		Emb: 76	0	0x3FF	3/4

Description

These special bits store the special functions which can be activated in the Parameter screen. Set bit means: special function is active.

Stored in the MD as bit with the following assignment:

Bit 0 Start with XON

1: The transmission is started as soon as the character defined for XON appears in the data stream. It only applies when XON/XOFF is set as device type.

0: start is independent of an XON character

Bit 1 program start with LF

currently without any effect

Bit 2 Block end with CR LF

1: When output in punched tape format, the CR characters (carriage return, hexadecimal 0D) are inserted. When input in punched tape format, the CR characters are removed.

0: no additional characters are inserted.

Bit 3 Stop with end of transmission character

1: end of transmission character is analyzed

0: end of transmission character is not analyzed (required for binary data analysis).

Bit 4 Analyze the DSR signal

1: The transmission is interrupted when the DSR signal is missing (port 6 of the X6 or X7 connector; with MMC 101/103 only).

0: The DSR signal has no effect.

Bit 5 Leader and trailer

1: Skip leader during input
Output 120x0 (hex) during output
(feed in front of and after the data)

0: leader and trailer are read in also
No 0(hex) leader during output

Bit 6 Punched tape format

1: Read-in of programs accord. to DIN 66025, e.g. programs of SINUMERIK 3/8: start with % file name, %MPFxxx or %SPFxxx.

0: read-in of archives in SINUMERIK 840D/810D archive format

Bit 7 Time monitoring

1: if transmission problems occur, the transmission will be aborted after 10 seconds
Time monitoring is controlled via timer, which is reset after each transmitted character.

0: no transmission abort

9303	**V24_USER_CONTROLS**			H05	**QV:** K4
-	User: special bits			REAL	Immediately
				-	
Emb		Emb: 76	0	0x3FF	3/4

Description

These special bits store the special functions which can be activated in the Parameter screen. Set bit means: special function is active.

Stored in the MD as bit with the following assignment:

Bit 0 Start with XON

1: The transmission is started as soon as the character defined for XON appears in the data stream. It only applies when XON/XOFF is set as device type.

0: start is independent of an XON character

Bit 1 program start with LF

currently without any effect

Bit 2 Block end with CR LF

1: When output in punched tape format, the CR characters (carriage return, hexadecimal 0D) are inserted. When input in punched tape format, the CR characters are removed.

0: no additional characters are inserted.

Bit 3 Stop with end of transmission character

1: end of transmission character is analyzed

0: end of transmission character is not analyzed (required for binary data analysis).

Bit 4 Analyze the DSR signal

1: The transmission is interrupted when the DSR signal is missing (port 6 of the X6 or X7 connector; with MMC 101/103 only).

0: The DSR signal has no effect.

Bit 5 Leader and trailer

1: Skip leader during input
Output 120x0 (hex) during output
(feed in front of and after the data)

0: leader and trailer are read in also
No 0(hex) leader during output

Bit 6 Punched tape format

1: Read-in of programs accord. to DIN 66025, e.g. programs of SINUMERIK 3/8: start with % file name, %MPFxxx or %SPFxxx.

0: read-in of archives in SINUMERIK 840D/810D archive format

Bit 7 Time monitoring

1: if transmission problems occur, the transmission will be aborted after 10 seconds
Time monitoring is controlled via timer, which is reset after each transmitted character.

0: no transmission abort

9304	**V24_USER_RTS**			H05	**QV:** K4
-	User: line-controlled			BYTE	Immediately
				-	
Emb		Emb: 0	0	1	3/4

Description

Two device types are supported for transmission control: XON/XOFF and RTS/CTS.

1: XON/XOFF
One of the options to control the transmission is the use of the control characters XON (DC1, DEVICE CONTROL 1) and XOFF
(DC3). When the buffer of the I/O device is full, it will send XOFF. When it is ready to receive data, it will send XON.

0: RTS/CTS
The signal RTS (request to send) controls the transmission mode of the data communications equipment. Active:
data shall be transmitted. Passive: do not exit the transmission mode until all transferred data are transmitted.
The signal CTS (clear to send) shows as acknowledgement signal for RTS that the data communications equipment is ready for transmission.
Input: via selection in the Parameter screen under device type

9305	**V24_USER_BAUD**			H05	**QV:** K4
-	User: baud rate			BYTE	Immediately
				-	
Emb		Emb: 5	0	8	3/4

Description

This is the stepping rate in baud, a unit for the data transmission rate.
Input: via selection in the Parameter screen under baud rate

0: 300 baud
1: 600 baud
2: 1200 baud
3: 2400 baud
4: 4800 baud
5: 9600 baud
6: 19200 baud for SW 3.1 and higher

9306	**V24_USER_DATABITS**			H05	**QV:** K4
-	User: data bits			BYTE	Immediately
				-	
Emb		Emb: 1	0	1	3/4

Description

Number of data bits for asynchronous transmission.
Input: via selection in the Parameter screen under data bits

0: 7 data bits
1: 8 data bits

9307	**V24_USER_PARITY**			H05	**QV:** K4
-	User: parity bits			BYTE	Immediately
				-	
Emb		Emb: 0	0	2	3/4

Description

Parity bits are used for troubleshooting: parity bits are added to the coded signs to make the number of digit positions set to 1” to an odd number (odd parity) or an even number (even parity).

Input: via selection in the Parameter screen under parity

0: no parity
1: even parity
2: odd parity

9308	**V24_USER_STOPBIT**			H05	**QV:** K4
-	User: stop bits			BYTE	Immediately
				-	
Emb		Emb: 0	0	1	3/4

Description

Number of stop bits for asynchronous data transmission.

Input: via selection in the Parameter screen under stop bits

0: 1 stop bit
1: 2 stop bits

9309	**V24_USER_LINE**			H05	**QV:** K4
-	User: RS-232 interface (COM1/COM2)			BYTE	Immediately
				SW5	
Emb		Emb: 1	1	2	3/4

Description

Defines via which V24 interface a file transfer shall be initiated.

Input: via selection in the Parameter screen under V24 interface

1: COM1
2: COM2

9310	**V24_PRINTER_XON**			H05	**QV:** K4
-	Printer: X on character			REAL	Immediately
				-	
Emb		Emb: 17	0	0xFF	3/4

Description

XON character: This is the character which starts a transmission: It applies for device type XON/XOFF only.

With the special function Start with XON active, the program waits for an XON character of the connected device during read-in before it starts.

Device control character 1 (DEVICE CONTROL 1 (X-ON) or DC 1 follow standard 11H.

This standard value is set as default.

Input: via digital input in the Parameter screen under XON (hex)

9311	**V24_PRINTER_XOFF**			H05	**QV:** K4
-	Printer: X off character			REAL	Immediately
				-	
Emb		Emb: 19	0	0xFF	3/4

Description

XOFF character: This is the character which stops a transmission: It applies for device type XON/XOFF only.

Device control character 3 (DEVICE CONTROL 3 (X-OFF) or DC 3 follow standard 13H. This standard value is set as default.

Input: via digital input in the Parameter screen under XOFF (hex)

9312	**V24_PRINTER_EOF**			H05	**QV:** K4
-	Printer: end-of-transmission character			REAL	Immediately
				-	
Emb		Emb: 12	0	0xFF	3/4

Description

This is the character which stops a transmission.

Value 1A is set as default. DOS character for file end in text files.

Input: via digital input in the Parameter screen under end of transmission

The character is active when Stop with end of transmission character is checked.

9313	**V24_PRINTER_CONTROLS**			H05	**QV:** K4
-	Printer: special bits			REAL	Immediately
				-	
Emb		Emb: 76	0	0x3FF	3/4

Description

These special bits store the special functions which can be activated in the Parameter screen. Set bit means: special function is active.

Stored in the MD as bit with the following assignment:

Bit 0 Start with XON

1: The transmission is started as soon as the character defined for XON appears in the data stream. It only applies when XON/XOFF is set as device type.

0: start is independent of an XON character

Bit 1 program start with LF

currently without any effect

Bit 2 Block end with CR LF

1: When output in punched tape format, the CR signs (carriage return, hexadecimal 0D) are inserted.
When input in punched tape format, the CR signs are removed.

0: no additional signs are inserted.

Bit 3 Stop with end of transmission character

1: end of transmission character is analyzed

0: end of transmission character is not analyzed
(required for binary data analysis).

Bit 4 Analyze the DSR signal

1: The transmission is interrupted when the DSR signal is missing (port 6 of the X6 or X7 connector; with MMC 101/103 only).

0: The DSR signal has no effect.

Bit 5 Leader and trailer

1: Skip leader during input
Output 120x0 (hex) during output
(feed in front of and after the data)

0: leader and trailer are read in, too
No 0(hex) leader during output

Bit 6 Punched tape format

1: Read-in of programs accord. to DIN 66025, e.g. programs of SINUMERIK 3/8:
start with % file name, %MPFxxx or %SPFxxx.

0: read-in of archives in SINUMERIK 840D/810D archive format

Bit 7 Time monitoring

1: if transmission problems occur, the transmission will be aborted after 10 seconds Time monitoring is controlled via timer, which is reset after each transmitted character.

0: no transmission abort

9313	**V24_PRINTER_CONTROLS**			H05	**QV:** K4
-	Printer: special bits			REAL	Immediately
				-	
Emb		Emb: 76	0	0x3FF	3/4

Description

These special bits store the special functions which can be activated in the Parameter screen. Set bit means: special function is active.

Stored in the MD as bit with the following assignment:

Bit 0 Start with XON

1: The transmission is started as soon as the character defined for XON appears in
the data stream. It only applies when XON/XOFF is set as device type.

0: start is independent of an XON character

Bit 1 program start with LF

currently without any effect

Bit 2 Block end with CR LF

1: When output in punched tape format, the CR signs (carriage return, hexadecimal
0D) are inserted.
When input in punched tape format, the CR signs are removed.

0: no additional signs are inserted.

Bit 3 Stop with end of transmission character

1: end of transmission character is analyzed

0: end of transmission character is not analyzed
(required for binary data analysis).

Bit 4 Analyze the DSR signal

1: The transmission is interrupted when the DSR signal is missing (port 6 of the X6 or
X7 connector; with MMC 101/103 only).

0: The DSR signal has no effect.

Bit 5 Leader and trailer

1: Skip leader during input
Output 120x0 (hex) during output
(feed in front of and after the data)

0: leader and trailer are read in, too
No 0(hex) leader during output

Bit 6 Punched tape format

1: Read-in of programs accord. to DIN 66025, e.g. programs of SINUMERIK 3/8: start with % file name, %MPFxxx or %SPFxxx.

0: read-in of archives in SINUMERIK 840D/810D archive format

Bit 7 Time monitoring

1: if transmission problems occur, the transmission will be aborted after 10 seconds Time monitoring is controlled via timer, which is reset after each transmitted character.

0: no transmission abort

9314	**V24_PRINTER_RTS**			H05	**QV:** K4
-	Printer: line-controlled			BYTE	Immediately
				-	
Emb		Emb: 0	0	1	3/4

Description

Two device types are supported for transmission control: XON/XOFF and RTS/CTS.

1: XON/XOFF
One of the options to control the transmission is the use of the control characters XON (DC1, DEVICE CONTROL 1) and XOFF
(DC3). When the buffer of the I/O device is full, it will send XOFF. When it is ready to receive data, it will send XON.

0: RTS/CTS
The signal RTS (request to send) controls the transmission mode of the data communications equipment. Active:
data shall be transmitted. Passive: do not exit the transmission mode before all transferred data are transmitted.
The signal CTS (clear to send) shows as acknowledgement signal for RTS that the data communications equipment is ready for transmission.
Input: via selection in the Parameter screen under device type

9315	**V24_PRINTER_BAUD**			H05	**QV:** K4
-	Printer: baud rate			BYTE	Immediately
				-	
Emb		Emb: 5	0	8	3/4

Description

This is the stepping rate in baud, a unit for the data transmission rate.
Input: via selection in the Parameter screen under baud rate

0: 300 baud
1: 600 baud
2: 1200 baud
3: 2400 baud
4: 4800 baud
5: 9600 baud
6: 19200 baud for SW 3.1 and higher

9316	**V24_PRINTER_DATABITS**			H05	**QV:** K4
-	Printer: data bits			BYTE	Immediately
				-	
Emb		Emb: 1	0	1	3/4

Description

Number of data bits for asynchronous transmission.

Input: via selection in the Parameter screen under data bits

0: 7 data bits

1: 8 data bits

9317	**V24_PRINTER_PARITY**			H05	**QV:** K4
-	Printer: parity bits			BYTE	Immediately
				-	
Emb		Emb: 0	0	2	3/4

Description

Parity bits are used for troubleshooting: parity bits are assigned to the coded signs to make the number of the digit positions set to 1” to an odd number (odd parity) or an even number (even parity).

Input: via selection in the Parameter screen under parity

0: no parity

1: even parity

2: odd parity

9318	**V24_PRINTER_STOPBIT**			H05	**QV:** K4
-	Printer: stop bits			BYTE	Immediately
				-	
Emb		Emb: 0	0	1	3/4

Description

Number of stop bits for asynchronous data transmission.

Input: via selection in the Parameter screen under stop bits

0: 1 stop bits

1: 2 stop bits

9319	**V24_PRINTER_LINE**			H05	**QV:** K4
-	Printer: RS-232 interface (COM1/COM2)			BYTE	Immediately
				-	
Emb		Emb: 1	1	2	3/4

Description

Defines via which V24 interface a file transfer shall be initiated.

Input: via selection in the Parameter screen under V24 interface

1: COM1

2: COM2

9320	**V24_PG_PC_XON**			H05	**QV:** K4
-	PG: X on character			REAL	Immediately
				-	
Emb		Emb: 17	0	0xFF	3/4

Description

XON character: This is the character which starts a transmission: It applies for device type XON/XOFF only.

With the special function Start with XON active, the program waits for an XON character of the connected device during read-in before it starts.

Device control character 1 (DEVICE CONTROL 1 (X-ON) or DC 1 follow standard 11H.

This standard value is set as default.

Input: via digital input in the Parameter screen under XON (hex)

9321	**V24_PG_PC_XOFF**			H05	**QV:** K4
-	PG: X off character			REAL	Immediately
				-	
Emb		Emb: 19	0	0xFF	3/4

Description

XOFF character: This is the character which stops a transmission: It applies for device type XON/XOFF only.

Device control character 3 (DEVICE CONTROL 3 (X-OFF) or DC 3 follow standard 13H. This standard value is set as default.

Input: via digital input in the Parameter screen under XOFF (hex)

9322	**V24_PG_PC_EOF**			H05	**QV:** K4
-	PG: end-of-transmission character			REAL	Immediately
				-	
Emb		Emb: 26	0	0xFF	3/4

Description

This is the character which stops a transmission.

Value 1A is set as default. DOS character for file end in text files.

Input: via digital input in the Parameter screen under end of transmission

The character is active when Stop with end of transmission character is checked.

9323	**V24_PG_PC_CONTROLS**			H05	**QV:** K4
-	PG: special bits			REAL	Immediately
				-	
Emb		Emb: 144	0	0x3FF	3/4

Description

These special bits store the special functions which can be activated in the Parameter screen. Set bit means: special function is active.

Stored in the MD as bit with the following assignment:

Bit 0 Start with XON

1: The transmission is started as soon as the character defined for XON appears in the data stream. It only applies when XON/XOFF is set as device type.

0: start is independent of an XON character

Bit 1 program start with LF

currently without any effect

Bit 2 Block end with CR LF

1: When output in punched tape format, the CR signs (carriage return, hexadecimal 0D) are inserted.
When input in punched tape format, the CR signs are removed.

0: no additional signs are inserted.

Bit 3 Stop with end of transmission character

1: end of transmission character is analyzed

0: end of transmission character is not analyzed
(required for binary data analysis).

Bit 4 Analyze the DSR signal

1: The transmission is interrupted when the DSR signal is missing (port 6 of the X6 or X7 connector; with MMC 101/103 only).

0: The DSR signal has no effect.

Bit 5 Leader and trailer

1: Skip leader during input
Output 120x0 (hex) during output
(feed in front of and after the data)

0: leader and trailer are read in also
No 0(hex) leader during output

Bit 6 Punched tape format

1: Read-in of programs accord. to DIN 66025, e.g. programs of SINUMERIK 3/8: start with % file name, %MPFxxx or %SPFxxx.

0: read-in of archives in SINUMERIK 840D/810D archive format

Bit 7 Time monitoring

1: if transmission problems occur, the transmission will be aborted after 10 seconds
Time monitoring is controlled via timer, which is reset after each transmitted character.

0: no transmission abort

9323	**V24_PG_PC_CONTROLS**			H05	**QV:** K4
-	PG: special bits			REAL	Immediately
				-	
Emb		Emb: 144	0	0x3FF	3/4

Description

These special bits store the special functions which can be activated in the Parameter screen. Set bit means: special function is active.

Stored in the MD as bit with the following assignment:

Bit 0 Start with XON

1: The transmission is started as soon as the character defined for XON appears in the data stream. It only applies when XON/XOFF is set as device type.

0: start is independent of an XON character

Bit 1 program start with LF

currently without any effect

Bit 2 Block end with CR LF

1: When output in punched tape format, the CR signs (carriage return, hexadecimal 0D) are inserted.
When input in punched tape format, the CR signs are removed.

0: no additional signs are inserted.

Bit 3 Stop with end of transmission character

1: end of transmission character is analyzed

0: end of transmission character is not analyzed
(required for binary data analysis).

Bit 4 Analyze the DSR signal

1: The transmission is interrupted when the DSR signal is missing (port 6 of the X6 or X7 connector; with MMC 101/103 only).

0: The DSR signal has no effect.

Bit 5 Leader and trailer

1: Skip leader during input
Output 120x0 (hex) during output
(feed in front of and after the data)

0: leader and trailer are read in also
No 0(hex) leader during output

Bit 6 Punched tape format

1: Read-in of programs accord. to DIN 66025, e.g. programs of SINUMERIK 3/8: start with % file name, %MPFxxx or %SPFxxx.

0: read-in of archives in SINUMERIK 840D/810D archive format

Bit 7 Time monitoring

1: if transmission problems occur, the transmission will be aborted after 10 seconds
Time monitoring is controlled via timer, which is reset after each transmitted character.

0: no transmission abort

9324	**V24_PG_PC_RTS**			H05	**QV:** K4
-	PG: line-controlled			BYTE	Immediately
				-	
Emb		Emb: 0	0	1	3/4

Description

Two device types are supported for transmission control: XON/XOFF and RTS/CTS.

1: XON/XOFF
One of the options to control the transmission is the use of the control characters XON (DC1, DEVICE CONTROL 1) and XOFF
(DC3). When the buffer of the I/O device is full, it will send XOFF. When it is ready to receive data, it will send XON.

0: RTS/CTS
The signal RTS (request to send) controls the transmission mode of the data communications equipment. Active:
data shall be transmitted. Passive: do not exit the transmission mode before all transferred data are transmitted.
The signal CTS (clear to send) shows as acknowledgement signal for RTS that the data communications equipment is ready for transmission.
Input: via selection in the Parameter screen under device type

9325	**V24_PG_PC_BAUD**			H05	**QV:** K4
-	PG: baud rate			BYTE	Immediately
				-	
Emb		Emb: 5	0	8	3/4

Description

This is the stepping rate in baud, a unit for the data transmission rate.
Input: via selection in the Parameter screen under baud rate

0: 300 baud
1: 600 baud
2: 1200 baud
3: 2400 baud
4: 4800 baud
5: 9600 baud
6: 19200 baud for SW 3.1 and higher

9326	**V24_PG_PC_DATABITS**			H05	**QV:** K4
-	PG: data bits			BYTE	Immediately
				-	
Emb		Emb: 1	0	1	3/4

Description

Number of data bits for asynchronous transmission.
Input: via selection in the Parameter screen under data bits

0: 7 data bits
1: 8 data bits

9327	**V24_PG_PC_PARITY**			H05	**QV:** K4
-	PG: parity bits			BYTE	Immediately
				-	
Emb		Emb: 0	0	2	3/4

Description

Parity bits are used for troubleshooting: parity bits are assigned to the coded signs to make the number of the digit positions set to 1” an odd number (odd parity) or an even number (even parity).

Input: via selection in the Parameter screen under parity

0: no parity
1: even parity
2: odd parity

9328	**V24_PG_PC_STOPBIT**			H05	**QV:** K4
-	PG: stop bits			BYTE	Immediately
				-	
Emb		Emb: 0	0	1	3/4

Description

Number of stop bits in asynchronous data transmission.

Input: by selecting in the Parameter screen under stop bits

0: 1 stop bit
1: 2 stop bits

9329	**V24_PG_PC_LINE**			H05	**QV:** K4
-	PG: RS-232 interface (COM1/COM2)			BYTE	Immediately
				-	
Emb		Emb: 1	1	2	3/4

Description

Selects the V24 interface for file transfer initiation.

Input: by selecting in the Parameter screen under V24 interface

1: COM1
2: COM2

9400	**TOOL_REF_GEO_AXIS1**			H05	**QV:** BA
-	Abs.dim.f.tool length offset f.geoaxis 1			DOUBLE	Immediately
				-	
Emb		Emb: 0	0	0	3/4

Description

Via machine data MD 9400 TOOL_REF_GEO_AXIS1 you can set the absolute dimension in the operating area Parameter, Tool offsets or Determine compensation for the geometry axis.

The corresponding geometry axis no. 1 is selected via Toggle key. The reference value can be changed via the numerical keyboard.

After pressing the OK softkey, the current position and this reference value are considered for calculating the selected tool parameter.

The following applies: position - reference value = input value.

9401	**TOOL_REF_GEO_AXIS2**			H05	**QV:** BA
-	Abs.dim.f.tool length offset f.geoaxis 2			DOUBLE	Immediately
				-	
Emb		Emb: 0	0	0	3/4

Description

Via machine data MD 9400 TOOL_REF_GEO_AXIS2 you can set the absolute dimension in the operating area Parameter, Tool offsets or Determine compensation for the geometry axis.

The corresponding geometry axis no. 1 is selected via Toggle key. The reference value can be changed via the numerical keyboard.

After pressing the OK softkey, the current position and this reference value are considered for calculating the selected tool parameter.

It applies: position - reference value = input value.

9402	**TOOL_REF_GEO_AXIS3**			H05	**QV:** BA
-	Abs.dim.f.tool length offset f.geoaxis 3			DOUBLE	Immediately
				-	
Emb		Emb: 0	0	0	3/4

Description

Via machine data MD 9400 TOOL_REF_GEO_AXIS3 you can set the absolute dimension in the operating area Parameter, Tool offsets or Determine compensation for the geometry axis.

The corresponding geometry axis no. 1 is selected via Toggle key. The reference value can be changed via the numerical keyboard.

After pressing the OK softkey, the current position and this reference value are considered for calculating the selected tool parameter.

It applies: position - reference value = input value.

9410	**TM_LOAD_PLACE**			H05	**QV:** BA
-	Number of load location			INTEGER	Power On
				-	
Emb		Emb: 0	0	0	3/4

Description

9411	**TM_NUM_MAG**			H05	**QV:** BA
-	Number of work magazine			INTEGER	Power On
				-	
Emb		Emb: 0	0	0	3/4

Description

9412	**TM_DEFAULT_TOOLSIZE**			H05	**QV:** FBW
-	Preset value for tool size			REAL	Immediately
				SW4.1	
Emb		Emb: 1111	1111	7777	3/4

Description

9414	**TM_KIND_OF_TOOLMANAGEMENT**			H01, H02, H05	**QV:** FBW
-	Type of tool management representation			BYTE	Power On
				SW5	
SM, ST, Emb		Emb: 0, SM: 1, ST: 1	0	1	3/4

Description

Mode of representing the tool management

0: old,

1: new (SW 5.2 and higher)

9415	**TM_DEFAULT_TOOLPLACESPEC**			H05	**QV:** FBW
-	Default value for location type			BYTE	Immediately
				SW4.2	
Emb		Emb: 1	1	99	3/4

Description

9416	**TM_DEFAULT_TOOLTYPE**			H05	**QV:** FBW
-	Preset value for type of location			REAL	Immediately
				SW4.1	
Emb		Emb: 120	100	900	3/4

Description

9417	**TM_DEFAULT_TOOLSTATE**			H05	**QV:** FBW
-	Preset value for tool status loading			INTEGER	Immediately
				SW4.1	
Emb		Emb: 2	0	255	3/4

Description

9419	**TM_DEFAULT_DELETE_TOOL**			H05	**QV:** FBW
-	Preset tool data for automatic deletion			BYTE	Immediately
				SW4.1	
Emb		Emb: 0	0	1	3/4

Description

9420	**MA_ONLY_MKS_DIST_TO_GO**			H05	**QV:** FBW
-	Distance-to-go display in work window			BYTE	Immediately
				SW4.1	
Emb		Emb: 0	0	1	3/4

Description

9421	**MA_AXES_SHOW_GEO_FIRST**			H05	**QV:** K1
-	Actual value display with leading axes			BYTE	Immediately
				SW2	
Adv, Emb		Emb: 1	0	1	3/4

Description

If the machine data has a value of 1, the geo axes of the channel are displayed first.

9422	**MA_PRESET_MODE**			H05	**QV:** K1
-	Select PRESET/Basic offset in JOG			BYTE	Immediately
				SW5	
Adv, Emb		Emb: 1	0	3	3/4

Description

0 = no preset, no actual-value setting
1 = Preset
2 = Actual-value setting
NCK without system frame: Setting only possible with active G500 in basis offset 1, otherwise error message.

NCK with system frame: Setting always possible in the system frame. Basis no more used.

3 = Actual-value setting
NCK with/without system frame: Setting possible in the currently active frame.

9423	**MA_MAX_SKP_LEVEL**			H05	**QV:** K1
-	Max. skip levels in NC program			BYTE	Power On
				SW5	
Adv, Emb		Emb: 1	1	10	3/4

Description

This machine data defines how many skip levels are used in the operation.

9424	**MA_COORDINATE_SYSTEM**			H05	**QV:** K2
-	Coord.syst. for act.val. display			BYTE	Immediately
				SW5	
Adv, Emb		Emb: 0	0	1	3/4

Description

Coordinate system for actual-value display
0 WCS
1 SZS (settable zero system)

9424	**MA_COORDINATE_SYSTEM**			H05	**QV:** K2
-	Coord.syst. for act.val. display			BYTE	Power On
				SW5	
Adv, Emb		Emb: 0	0	1	3/4

Description

Coordinate system for actual-value display

0 WCS

1 SZS (settable zero system)

9425	**MA_SCRATCH_DEFAULT_MODE**			H05	**QV:** K2
-	Tool offset calculation Scratching			DOUBLE	Immediately
				5.3	
Emb		Emb: 0	0	2236962	3/4

Description

In MD 9425 MA_SCRATCH_DEFAULT_MODE you can preset the tool offset directions for scratching in the Machine area.

The calculation directions can be set as follows:

```
3-digit basis          || 3-digit geo+wear for geo axis  1/2/3
Axis    1 |   2 |   3 ||   1 |  2 |  3 |
----------------------------||------------------|
        |     |     |     ||     |    |    |
```

HEX values:

0: without

1: + direction

2: - direction

Note: (SW 6.1 and higher)

This functionality is only available in HMI Embedded.

9426	**MA_AX_DRIVELOAD_FROM_PLC1**			H01, H02, H05	**QV:**
-	Mach.axis ind. analog spindle power displ.			BYTE	Power On
				Emb: 6.5 Adv: 6.4	
SM, ST, Adv, Emb		Emb: 0, SM: , ST:	0	31	3/4

Description

Machine axis index of a spindle (analog) fetching the performance data from the PLC DB19.DBB6

9427	**MA_AX_DRIVELOAD_FROM_PLC2**			H01, H02, H05	**QV:**
-	Mach.axis ind. analog spindle power displ.			BYTE	Power On
				Emb: 6.5 Adv: 6.4	
SM, ST, Adv, Emb		Emb: 0, SM: , ST:	0	31	3/4

Description

Machine axis index of a spindle (analog) fetching the performance data from the PLC DB19.DBB7

9428	**MA_SPIND_MAX_POWER**			H01, H02, H05	**QV:** IM4
%	Maximum value of spindle power rating disp			REAL	Power On
				Emb: 6.5 Adv: 6.4	
SM, ST, Adv, Emb		Emb: 100, SM: , ST:	100	0xFFFF	3/4

Description

Maximum value of the spindle performance display in percent

9429	**MA_SPIND_POWER_RANGE**			H01, H02, H05	**QV:** IM4
%	Display range of spindle power rating disp			REAL	Power On
				Emb: 6.5 Adv: 6.4	
SM, ST, Adv, Emb		Emb: 100, SM: 200, ST: 200	100	0xFFFF	3/4

Description

Display range of the utilization bar of the spindle performance display in percent

9440	**ACTIVATE_SEL_USER_DATA**			H05	**QV:** K2
-	Activate active offset immediately			BYTE	Immediately
				SW4.3	
Adv, Emb		Emb: 0	0	1	3/4

Description

Active data (frames) are immediately effective after a change.

9442	**MA_AUXFU_GROUPS**			H01, H02, H05	**QV:**
-	Auxiliary function groups displayed			STRING	Power On
				7.1	
SM, ST, Adv, Emb		Emb: 0, SM: , ST:	0	0	3/4

Description

Comma-separated list of auxiliary function groups displayed in the auxiliary functions window .
Max. 15 auxiliary functions can be displayed.

9449	**WRITE_TOA_LIMIT_MASK**			H05	**QV:** K2
-	MD9449 appl. to wear (bit0) SC(1) EC(2)			BYTE	Immediately
				5.2	
Adv			0	7	3/4

Description

Bit 0: Application to cutting edge data, wear values
Bit 1: Application to SC data (location-dependent offsets, wear values)
Bit 2: Application to EC data (location-dependent offsets, setup values)
Default value 7: Application to all data

9450	**WRITE_TOA_FINE_LIMIT**			H05	**QV:** K2
mm	Limit value for wear fine			DOUBLE	Immediately
				SW4.2	
Adv, Emb		Emb: 0.999	0	0	3/4

Description

When the tool offsets are entered, the maximum value of the change between the existing value and the new value is the value set here.

With WRITE_TOA_FINE_LIMIT, the change of a tool wear is limited by increments, when the current protection level is equal to or higher than the value set in USER_CLASS_WRITE_FINE. No incremental limiting is performed, if the protection level is equal to or higher than USER_CLASS_WRITE_TOA_WEAR. Absolute and incremental wear limiting can be combined, i.e. the wear can be changed in increments up to the absolute limit. S. MD 9639.

Note

When channel-specific display machine data with MD 9014 are used, the MD is in the NC and is then part of NC series commissioning. It then allows channel-specific inch/metric consideration.

9451	**WRITE_ZOA_FINE_LIMIT**			H05	**QV:** K2
mm	Limit value for offset fine			DOUBLE	Immediately
				SW4.2	
Adv, Emb		Emb: 0.999	0	0	3/4

Description

When the zero offsets are entered, the maximum value of the change between the existing value and the new value is the value set here.

Note

When channel-specific display machine data with MD 9014 are used, the MD is in the NC and is then part of NC series commissioning. It then allows channel-specific inch/metric consideration.

9459	**PA_ZOA_MODE**			H05	**QV:** K2, IM2
-	Display mode zero offset			BYTE	Immediately
				SW 6.1	
Emb		Emb: 1	0	1	3/4

Description

Display mode of the zero offset:

0 screen mode same as for SW 5 and lower

1 screen mode for HMI-Embedded (SW 6.1 and higher)

Note: (SW 6.1 and higher)

This functionality is only available in HMI Embedded.

9460	**PROGRAM_SETTINGS**			H05	**QV:** A2
-	Settings in Program area			INTEGER	Immediately
				SW5.1	
Adv, Emb		Emb: 128	0	0	3/4

Description

Data storage for settings in the PROGRAM range. The settings are maintained via RESET.

Bit 0, Bit 1 internall used

Bit 2: 1 Autom. Release for program

0 No automatic release for programs, presetting for SW 5.1

Bit 3: 1 SK labeling contour calculator with icons

0 SK labeling contour calculator as text, presetting for SW 5.1

Bit 4: 1 The LF sign is hidden in the editor, SW 6.1 and higher

0 The LF sign is displayed in the editor, SW 6.1 and higher

9461	**CONTOUR_END_TEXT**			H05	**QV:** A2
-	String to be added to end of contour			STRING	Immediately
				SW5.1	
Emb		Emb: """"	0	0	3/4

Description

After a contour entry, this string is added to the end of the contour.

Example(s) for application M30

9464	**MAX_PROGRAMM_SIZE_CHECK**			H05	**QV:**
-	File size from which no test is performed			INTEGER	Immediately
				6.4	
Emb		Emb: 102400	51200	0x7FFFFFFF	3/4

Description

If the corresponding bit in MM_PROGRAM_SETTINGS is set, the contents define the limit as from which no checks are performed. Smaller programs are still checked.

The file size is indicated in KByte (mold making programs exceeding approx. 300KByte)

9477	**TO_TRACE**			H01, H02, H05	**QV:**
-	For internal test purposes			REAL	Power On
SM, ST, Emb		Emb: 0, SM: 0, ST: 0	0	0xFFFF	3/4

Description

Internal

9477	**TO_TRACE**			H01, H02, H05	**QV:**
-	For internal test purposes			REAL	Power On
SM, ST, Emb		Emb: 0, SM: 0, ST: 0	0	0xFFFF	3/4

Description

Internal

9478	**TO_OPTION_MASK**			H01, H02, H05	**QV:**
-	For internal purposes			INTEGER	Power On
SM, ST, Emb		Emb: 0, SM: 1, ST: 1	0	0	2/2

Description

Internal

9479	**TO_MAG_PLACE_DISTANCE**			H02, H05	**QV:** FBSP
mm	Distance betw. indiv. magazine locations			DOUBLE	Power On
				6.3	
ST, Emb		Emb: 0, ST: 0	0	10000	3/4

Description

Distance of the individual magazine locations.

Used for the graphical representation of the magazine and the tools in the JobShop tool management.

9480	**MA_SIMULATION_MODE**			H05	**QV:** BAD
-	Simulation type			BYTE	Immediately
				6.4	
Adv			-1	2	3/4

Description

Type of simulation:

-1: only HMI standard simulation/Shopmill simulation

0 : always selection menu HMI standard simulation or quick view (not with Shopmill)

1 : always quick view for HMI standard and Shopmill

2 : depending on the size of the program to be displayed (can be set via the machine data) automatically quick view or HMI standard simulation/Shopmill simulation

9481	**MA_STAND_SIMULATION_LIMIT**			H05	**QV:** BAD
-	Standard simulation limit in KB			INTEGER	Immediately
				6.4	
Adv			200	2000000	3/4

Description

Part program limit in kByte up to which the HMI standard simulation/Shopmill simulation is started

9500	**NC_PROPERTIES**			H05	**QV:** A2
-	NC properties			BYTE	Immediately
				SW2	
Emb		Emb: 255	0	0xFF	3/4

Description

Basic configuration of the NC properties:
Bit0 = 1 digital drives
Bit1 = 1 software start-up switch
Bit2...4: reserved

9500	**NC_PROPERTIES**			H05	**QV:** A2
-	NC properties			BYTE	Immediately
				SW2	
Emb		Emb: 255	0	0xFF	3/4

Description

Basic configuration of the NC properties:
Bit0 = 1 digital drives
Bit1 = 1 software start-up switch
Bit2...4: reserved

9509	**USER_CLASS_DIRECTORY_CHG**			H04, H05	**QV:** FBT, FBSP, EMB
-	Protect. level for network configuration			BYTE	Immediately
				6.2	
Emb		Emb: 1	0	7	3/4

Description

The setting screen form for network configuration can be protected via access level.

9510	**USER_CLASS_DIRECTORY1_P**			H04, H05	**QV:** A2
-	Protection level for network drive1 progr.			BYTE	Immediately
				6.1	
Adv, Emb		Emb: 1	0	7	3/4

Description

The MD defines the protection level of network drive 1 for the Program and Services area.

(HMI Advanced)

9511	**USER_CLASS_DIRECTORY2_P**			H04, H05	**QV:** A2
-	Protection level for network drive2 progr.			BYTE	Immediately
				6.1	
Adv, Emb		Emb: 1	0	7	3/4

Description

The MD defines the protection level of network drive 2 for the Program and Services area.

(HMI Advanced)

9512	**USER_CLASS_DIRECTORY3_P**			H04, H05	**QV:** A2
-	Protection level for network drive3 progr.			BYTE	Immediately
				6.1	
Adv, Emb		Emb: 1	0	7	3/4

Description

The MD defines the protection level of network drive 3 for the Program and Services area.

(HMI Advanced)

9513	**USER_CLASS_DIRECTORY4_P**			H04, H05	**QV:** A2
-	Protection level for network drive4 progr.			BYTE	Immediately
				6.1	
Adv, Emb		Emb: 1	0	7	3/4

Description

The MD defines the protection level of network drive 4 for the Program and Services area.

(HMI Advanced)

9516	**USER_CLASS_DIRECTORY1_M**			H04, H05	**QV:** A2
-	Protection level for network drive1 mach.			BYTE	Immediately
				6.1	
Adv, Emb		Emb: 0	0	7	3/4

Description

The MD defines the protection level of network drive 1 for the Machine area.

(HMI Advanced)

9517	**USER_CLASS_DIRECTORY2_M**			H04, H05	**QV:** A2
-	Protection level for network drive2 mach.			BYTE	Immediately
				6.1	
Adv, Emb		Emb: 0	0	7	3/4

Description

The MD defines the protection level of network drive 2 for the Machine area.

(HMI Advanced)

9518	**USER_CLASS_DIRECTORY3_M**			H04, H05	**QV:** A2
-	Protection level for network drive3 mach.			BYTE	Immediately
				6.1	
Adv, Emb		Emb: 0	0	7	3/4

Description

The MD defines the protection level of network drive 3 for the Machine area.

(HMI Advanced)

9519	**USER_CLASS_DIRECTORY4_M**			H04, H05	**QV:** A2
-	Protection level for network drive4 mach.			BYTE	Immediately
				6.1	
Adv, Emb		Emb: 0	0	7	3/4

Description

The MD defines the protection level of network drive 4 for the Machine area.

(HMI Advanced)

9550	**CTM_CYC_ROUGH_RELEASE_DIST**			H02, H03	**QV:** FBMA
mm	Return distance for contour roughing			DOUBLE	Immediately
				5.2 (840D), 3.2 (810D)	
ST, MT		MT: 1, ST: 1	0.001	10.0	3/4

Description

This MD specifies the amount of retraction in both axes during roughing.

9551	**CTM_CYC_ROUGH_RELEASE_ANGLE**			H02, H03	**QV:** FBMA
degrees	Return angle for contour roughing			DOUBLE	Immediately
				5.2 (840D), 3.2 (810D)	
ST, MT		MT: 45, ST: 45	0.0	90.0	3/4

Description

This MD specifies the angle of retraction from the contour during roughing.

9552	**CTM_CYC_ROUGH_BLANC_OFFS**			H02, H03	**QV:** FBMA
mm	Blank allowance for contour roughing			DOUBLE	Immediately
				5.2 (840D), 3.2 (810D)	
ST, MT		MT: 1, ST: 1	0.0	100.0	3/4

Description

This MD specifies the distance from the blank part from which onwards a changeover from G0 to G1 is performed to compensate potential blank oversizes.

9553	**CTM_CYC_ROUGH_TRACE_ANGLE**			H02, H03	**QV:** FBMA
degrees	Rounding angle for contour cutting			DOUBLE	Immediately
				5.2 (840D), 3.2 (810D)	
ST, MT		MT: 5, ST: 5	0.0	90.0	3/4

Description

This MD determines the angle between the tool nose and the contour. From this angle, the contour is retraced to remove residual material.

9554	**CTM_CYC_ROUGH_MIN_REST_MAT1**			H02, H03	**QV:** FBMA
%	Diff. dimension resid. mat. machin. axis 1			DOUBLE	Immediately
				5.2 (840D), 3.2 (810D)	
ST, MT		MT: 50, ST: 50	0.0	1000.0	3/4

Description

This MD specifies the limit value for removing residual material in the direction of axis 1.

Example:

If the MD is set to 50 % and if the final machining allowance is 0.5 mm, residual material which is thinner than 0.25 mm is not removed in a separate machining step, but is removed during finishing.

9555	**CTM_CYC_ROUGH_MIN_REST_MAT2**			H02, H03	**QV:** FBMA
%	Diff. dimension resid. mat. machin. axis 2			DOUBLE	Immediately
				5.2 (840D), 3.2 (810D)	
ST, MT		MT: 50, ST: 50	0.0	1000.0	3/4

Description

This MD specifies the limit value for removing residual material in the direction of axis 2.

Example:

If the MD is set to 50 % and if the final machining allowance is 0.5 mm, residual material which is thinner than 0.25 mm is not removed in a separate machining step, but is removed during finishing.

9556	**CTM_CYC_ROUGH_VAR_DEPTH**			H02, H03	**QV:** FBT
%	Percentage variable cutt. depth cont. rot.			BYTE	Immediately
				6.3	
ST, MT		MT: , ST: 20	0	50	3/4

Description

Percentage of variable cutting depth in contour turning

9557	**CTM_CYC_ROUGH_FEED_INT_TIME**			H02, H03	**QV:** FBMA
	Feed interrupt time contour turning			DOUBLE	Immediately
				6.4	
ST, MT		MT: , ST: -1	0	0	3/4

Description

9558	**CTM_CYC_ROUGH_INT_REL_DIST**			H02, H03	**QV:** FBMA
mm	Retr. path feed interrupt contour turning			DOUBLE	Immediately
				6.4	
ST, MT		MT: , ST: 0	0	10	3/4

Description

Feed interruption return path with contour turning, contour-grooving and plunge-turning:

>0: return path with feed interruption (MD 9557 is here no longer active !)

=0: w/o return path

9560	**CTM_TURN_GROOV_TOOL_BEND**			H02, H03	**QV:** FBT
mm	Retr. due to tool bending plunge-turning			DOUBLE	Immediately
				6.3	
ST, MT		MT: , ST: 0.1	0.0	1.0	3/4

Description

Retraction due to tool bending in plunge turning

9561	**CTM_TURN_GROOV_FREE_CUT_VAL**			H02, H03	**QV:** FBT
mm	Retr. depth prior to plunge turning oper.			DOUBLE	Immediately
				6.3	
ST, MT		MT: , ST: 0.1	0.0	1.0	3/4

Description

Retraction depth prior to plunge turning

9599	**CTM_OPTION_MASK**			H03	**QV:** FBMA
-	ManualTurn settings			INTEGER	Immediately
				6.3	
MT		MT:	0	0	2/2

Description

Bit 0:

Do not return automatically to the spindle mode after processing hole circles

Bit 1 to 7: reserved

Bit 8: Hide Teach In softkey

9600	**CTM_SIMULATION_DEF_X**			H01, H02, H03, H05	**QV:** FBMA, FBSP
-	Simulation of default value X			INTEGER	Power On
				SW2.1 (810D), 4.3 (840D)	
SM, ST, MT, Emb		Emb: 0, MT: 0, SM: 0, ST: 0	-10000	10000	3/4

Description

This MD specifies the X coordinate of the displayed area. During simulation, the value pre-specified here is reached when actuating the TO ORIGIN softkey.

9601	**CTM_SIMULATION_DEF_Y**			H01, H02, H03, H05	**QV:** FBMA, FBSP
-	Simulation default value Z			INTEGER	Power On
				SW2.1 (810D), 4.3 (840D)	
SM, ST, MT, Emb		Emb: 0, MT: 0, SM: 0, ST: 0	-10000	10000	3/4

Description

This MD specifies the Z coordinate of the displayed area. During simulation, the value pre-specified here is reached when actuating the TO ORIGIN softkey.

9602	**CTM_SIMULATION_DEF_VIS_AREA**			H01, H02, H03, H05	**QV:** FBMA, FBSP
-	Simulation of display area default value			INTEGER	Power On
				SW2.1 (810D), 4.3 (840D)	
SM, ST, MT, Emb		Emb: 100, MT: 100, SM: 100, ST: 100	-10000	10000	3/4

Description

This MD is used to specify the size of the displayed area by means of the X coordinate. The Z coordinate is determined automatically from this value.

9603	**CTM_SIMULATION_MAX_X**			H01, H02, H03, H05	**QV:** FBMA, FBSP
-	Simulation of maximum display X			INTEGER	Power On
				SW2.1 (810D), 4.3 (840D)	
SM, ST, MT, Emb		Emb: 0, MT: 0, SM: 0, ST: 0	-10000	10000	3/4

Description

This MD defines the size of the X coordinate of a second display range
(e.g. for larger workpieces).
In the simulation, you reach the value preset here after actuating the Softkey MAX.

Related to:
MD 9604: $MM_CTM_SIMULATION_MAX_Z
MD 9605: $MM_CTM_SIMULATION_MAX_VIS_AREA

9604	**CTM_SIMULATION_MAX_Y**			H01, H02, H03, H05	**QV:** FBMA, FBSP
-	Simulation maximum display Z			INTEGER	Power On
				840D SW 4.3, 810D SW 2.1	
SM, ST, MT, Emb		Emb: 0, MT: 0, SM: 0, ST: 0	-10000	10000	3/4

Description

This MD defines the size of the Z coordinate of a second display range
(e.g. for larger workpieces).
In the simulation, you reach the value preset here after actuating the Softkey MAX.

Related to:
MD 9603: $MM_CTM_SIMULATION_MAX_X
MD 9605: $MM_CTM_SIMULATION_MAX_VIS_AREA

9605	**CTM_SIMULATION_MAX_VIS_AREA**			H01, H02, H03, H05	**QV:** FBMA, FBSP
-	Simulation of maximum display area			INTEGER	Power On
				840D SW 4.3, 810D SW 2.1	
SM, ST, MT, Emb		Emb: 1000, MT: 1000, SM: 1000, ST: 1000	-10000	10000	3/4

Description

This MD defines the second display range via the X coordinate. The Z coordinate is calculated automatically from this value.

Related to:

MD 9603: $MM_CTM_SIMULATION_MAX_X

MD 9604: $MM_CTM_SIMULATION_MAX_Z

9606	**CTM_SIMULATION_TIME_NEW_POS**			H01, H02, H03, H05	**QV:** FBMA, FBT
-	Simulation of actual value update rate			INTEGER	Power On
				840D SW 4.3, 810D SW 2.1, ST 6.1	
SM, ST, MT, Emb		Emb: 100, MT: 100, SM: 250, ST: 250	0	4000	3/4

Description

This MD specifies the intervals of time at which the simulation graphics is updated to the current machining operating on the machine tool.

Value = 9 means no update.

9607	**CTM_ENABLE_RAPID_FEED**			H03	**QV:** FBMA
-	Enable selection option rapid traverse			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 1	0	1	3/4

Description

0 = RAPID TRAVERSE cannot be selected in parameter field F (feed).

1 = RAPID TRAVERSE can be selected in parameter field F (feed).

9608	**CTM_ENABLE_FEED_P_MIN**			H03	**QV:** FBMA
-	Enable selection option feed in mm/min			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 1	0	1	3/4

Description

0 = feed mm/min cannot be selected in parameter field F (feed).

1 = feed mm/min can be selected in parameter field F (feed).

9609	**CTM_SPEED_FIELD_DISPLAY_RES**			H03	**QV:** FBMA
-	Decimal places in speed entry field			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 0	0	4	3/4

Description

This MD specifies the number of decimal points in parameter field S (speed).

9610	**CTM_POS_COORDINATE_SYSTEM**			H03, H05	**QV:** FBMA
-	Position of coord. system for turning			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT, Adv, Emb		Emb: 2, MT: 2	0	7	3/4

Description

Position of the coordinate system for turning (MD 9020 = 1)

In the ManualTurn user interface
- the help displays
- the sequence diagram
- and the input fields with rotation direction specifications

change automatically according to the selected position.

9611	**CTM_CROSS_AX_DIAMETER_ON**			H02, H03, H05	**QV:** FBMA, FBT
-	Diameter display active for transv. axes			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1, ST 6.1	
ST, MT, Emb		Emb: 1, MT: 1, ST: 1	0	1	3/4

Description

= 0:
Inputs as radius value for absolute values
Zero offsets always in radius
Tool lengths always in radius
Tool wear always in radius

= 1:
Position display in diameter
Residual distance in diameter
Absolute distances in diameter

9612	**CTM_TEACH_STORE_MANUAL_ABS**			H03	**QV:** FBMA
-	Save setup motions as absolute values			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 1	0	1	3/4

Description

If the TEACH-IN function is activated, setup movements are stored as incremental/absolute values.

0 = incremental

1 = absolute

9613	**CTM_TEACH_STORE_START_ABS**			H03	**QV:** FBMA
-	Save starting position as absolute value			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 1	0	1	3/4

Description

If the TEACH-IN function is activated, the start position is stored as incremental/absolute value.

0 = incremental

1 = absolute

9614	**CTM_TEACH_STORE_MANUAL_AUTO**			H03	**QV:** FBMA
-	Save setup motions automatically			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 1	0	1	3/4

Description

For each direction change or stop, the traverse path is

0 = not saved

1 = saved

9615	**CTM_TEACH_HANDW_FEED**			H03	**QV:** FBMA
-	Handwheel feedrate			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 0	0	2	3/4

Description

Handwheel displacements are saved with the following feed type:

0 = mm/rev

1 = mm/min

2 = as set for MANUAL operating mode

9616	**CTM_TEACH_HANDW_FEED_P_MIN**			H03	**QV:** FBMA
mm/min	Path feed			DOUBLE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 10	1	3000	3/4

Description

Path feed for handwheel movements which is saved if
$MM_CTM_TEACH_HANDW_FEED = 0 is set.

9617	**CTM_TEACH_HANDW_FEED_P_REV**			H03	**QV:** FBMA
	Revolutional feedrate			DOUBLE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 1	0.01	10000	3/4

Description

Revolutional feed for handwheel movements which becomes effective if $MM_CTM_TEACH_HANDW_FEED = 1.

9618	**CTM_ENABLE_C_AXIS**			H03	**QV:** FBMA
-	Enable C axis for interface			BYTE	Power On
				840D SW 4.3, 810D SW 2.1	
MT		MT: 1	0	2	3/4

Description

0 = The C axis is not displayed in the user interface.
1 = The C axis is displayed in the user interface.

9619	**CTM_G91_DIAMETER_ON**			H02, H03, H05	**QV:** FBMA, FBT
-	Incremental infeed			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1, ST 6.1	
ST, MT, Emb		Emb: 1, MT: 1, ST: 0	0	1	3/4

Description

0 = Input in radius
1 = Input in diameter

9620	**CTM_CYCLE_SAFETY_CLEARANCE**			H03	**QV:** FBMA
mm	Safety clearance ManualTurn cycles			DOUBLE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 1	0.0	1000	3/4

Description

This MD specifies the safety distance for all variants of the grooving and undercut cycles of the ManualTurn cycles.

9621	CTM_CYCLE_DWELL_TIME	H03	QV: FBMA
	Tool clearance time for cycles	DOUBLE	Immediately
		840D SW 4.3, 810D SW 2.1	

MT		MT: -1	-100	100	3/4

Description

If the tool clearance time occurs during a cycle, e.g during deep hole drilling or grooving, this MD is used. The tool clearance time is suppressed in case of a:

- negative value of the spindle revolutions
- positive value in seconds

9622	CTM_ENABLE_REFPOINT	H03	QV: FBMA
-	Enable ref. pt. approach for ManualTurn	REAL	Immediately
		840D SW 4.3, 810D SW 2.1	

MT		MT: 1	0	1	3/4

Description

Reference point approach for ManualTurn:

0 = not selected

1 = selected

9623	CTM_START_WITHOUT_REFPOINT	H03	QV: FBMA
-	Enable NC start without referenced axes	BYTE	Power On
		840D SW 4.3, 810D SW 2.1	

MT		MT: 0	0	1	3/4

Description

Release NC Start

0 = NC Start release only if all axes are referenced.
Exception: Ref. point approach with NC Start MANUAL operating mode

1 = NC Start release without referenced axes

9624	CTM_MODE_SELECT_BY_SOFTKEY	H03	QV: FBMA
-	Mode switchover via vertical softkeys	BYTE	Power On
		840D SW 4.3, 810D SW 2.1	

MT		MT: 0	0	1	3/4

Description

Operating mode changeover if

0 = select via operating mode selector

1 = select via vertical softkeys of the operator panel

9625	**CTM_CUSTOMER_START_PICTURE**			H03	**QV:** FBMA
-	Customer start-up screen			BYTE	Power On
				840D SW 4.3, 810D SW 2.1	
MT		MT: 0	0	1	3/4

Description

Boot screen is activated if

0 = Siemens boot screen

1 = Customer boot screen

9626	**CTM_TRACE**			H01, H02, H03	**QV:** FBMA
-	Testflags f. intern ManualTurn diagnosis			INTEGER	Immediately
				840D SW 4.3, 810D SW 2.1	
SM, ST, MT		MT: 1, SM: 1, ST: 1	0	0x7FFFFFFF	3/4

Description

Used for internal diagnostics and cannot be modified.

9626	**CTM_TRACE**			H01, H02, H03	**QV:** FBMA
-	Testflags f. intern ManualTurn diagnosis			INTEGER	Immediately
				840D SW 4.3, 810D SW 2.1	
SM, ST, MT		MT: 1, SM: 1, ST: 1	0	0x7FFFFFFF	3/4

Description

Used for internal diagnostics and cannot be modified.

9627	**CTM_COUNT_GEAR_STEPS**			H03	**QV:** FBMA
-	Number of gear stages			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 1	0	5	3/4

Description

This MD is used to specify the number of gear stages which can be selected through the user interface.

9628	**CTM_TOOL_INPUT_DIAM_ON**			H03	**QV:** FBMA
-	Display tool data X as diameter			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 0	0	1	3/4

Description

This MD is used to specify how the tool correction data X is displayed:

0 = Radius

1 = Diameter

9629	**CTM_WEAR_INPUT_DIAM_ON**			H03	**QV:** FBMA
-	Display tool wear data X diameter			BYTE	Immediately
				840D SW 4.3, 810D SW 2.1	
MT		MT: 0	0	1	3/4

Description

This MD is used to specify how the tool wear data X is displayed:

0 = Radius

1 = Diameter

9630	**CTM_FIN_FEED_PERCENT**			H02, H03	**QV:** FBMA, FBT
%	Roughing feedrate in percent			REAL	Immediately
				840D SW 4.3, 810D SW 2.3, ST 6.1	
ST, MT		MT: 100, ST: 100	1	100	3/4

Description

This MD is used to enter a feedrate for the finishing procedure when selecting complete machining roughing and finishing. This feedrate corresponds to the percentage of the value entered at parameter F (feed).

9631	**CTM_CYCLE_DWELL_TIME_SEC**			H03	**QV:** FBMA
	Dwell time for cycles in seconds			DOUBLE	Immediately
				840D SW 4.4, 810D SW 2.4	
MT		MT: 1	0	100	3/4

Description

Indicates the dwell time for cycles (during deep hole drilling) in seconds.

9632	**CTM_ANGLE_REFERENCE_AXIS**			H03, H05	**QV:** FBMA
-	Angle reference axis			REAL	Immediately
				840D SW 4.4, 810D SW 2.4	
MT, Emb		Emb: 1, MT: 1	0	1	3/4

Description

The reference axis of an angle can be changed in the INCLINED, CIRCULAR and CONTOUR operating modes. The direction of rotation changes, too.

In the contour calculator of the CONTOUR operating mode, circular angles are dimensioned like for CAD systems.

9633	**CTM_INC_DEC_FEED_PER_MIN**			H03	**QV:** FBMA
mm/min	Increments for feedrate in mm/min			DOUBLE	Immediately
				840D SW 4.4, 810D SW 2.4	
MT		MT: 10	0.001	1000	3/4

Description

With this MD, you can specify the increment in mm/min which can be incremented or decremented in the feedrate input field F by actuating the plus or minus key.

9634	**CTM_INC_DEC_FEED_PER_ROT**			H03	**QV:** FBMA
mm	Increments for feedrate in mm/rev			DOUBLE	Immediately
				840D SW 4.4, 810D SW 2.4	
MT		MT: 0.1	0.001	10	3/4

Description

This MD specifies the increment in mm/revolutions which can be incremented or decremented in the feedrate input field F by actuating the plus or minus key.

9636	**CTM_ENABLE_S_TOOL_TABLE**			H03	**QV:** FBMA
-	Enable cutting speed from tool table			BYTE	Immediately
				840D SW 4.4, 810D SW 2.4	
MT		MT: 0	0	1	3/4

Description

With this MD, you can assign a constant cutting rate to each tool in the tool table.

0=Column constant cutting rate is not available in the tool table

1=Column constant cutting rate is available in the tool table

9637	**CTM_MAX_INP_FEED_P_MIN**			H03	**QV:** FBMA
mm/min	Upper input limit for feedrate in mm/min			DOUBLE	Immediately
				840D SW 4.4, 810D SW 2.4	
MT		MT: 2000	0	100000	3/4

Description

This MD is used to specify the upper feedrate input limit for mm/min.

9638	**CTM_MAX_INP_FEED_P_ROT**			H03	**QV:** FBMA
mm	Upper input limit for feedrate in mm/rev			DOUBLE	Immediately
				840D SW 4.4, 810D SW 2.4	
MT		MT: 1	0	10000	3/4

Description

This MD is used to enter the upper feedrate input limit for mm/rev.

9639	**CTM_MAX_TOOL_WEAR**			H03, H05	**QV:** FBMA
mm	Upper limit tool wear input			DOUBLE	Power On
				840D SW 4.4, 810D SW 2.4	

MT, Adv		MT: 1	0	10	3/4

Description

CTM_MAX_TOOL_WEAR specifies an abolute limit of the max. possible value of a tool wear, independently of the current protection level (keyswitch position), i.e. also independently of USER_CLASS_WRITE_TOA_WEAR. Absolute and incremental wear limiting can be combined, i.e. the wear can be changed in increments up to the absolute limit. S. MD 9450.

9640	**CTM_ENABLE_CALC_THREAD_PITC**			H01, H02, H03	**QV:** FBMA
-	Automatic calculation of thread depth			BYTE	Immediately
				840D SW 4.4, 810D SW 2.4	

SM, ST, MT		MT: 0, SM: 0, ST: 0	0	1	3/4

Description

This MD is used to calculate the thread depth K of an ISO thread in relation to the pitch P (mm/rev.) and the thread type (external/internal thread).

0=No calculation of the thread depth K

1= thread depth K is calculated

9641	**CTM_ENABLE_G_CODE_INPUT**			H03	**QV:** FBMA
-	Enable of G code input			BYTE	Immediately
				840D SW 4.4, 810D SW 2.4	

MT		MT: 0	0	1	3/4

Description

This MD serves to specify if the G code input via the ManualTurn user interface is released (Softkey G_CODE is displayed).

0=Input G code is not supported via the ManualTurn user interface.

1=Input G code is supported via the ManualTurn user interface.

9642	**CTM_ENABLE_CIRCLE_HOLE_CYCL**			H03	**QV:** FBMA
-	Enable drilling of hole circle			BYTE	Immediately
				840D SW 4.4, 810D SW 2.4	

MT		MT: 0	0	1	3/4

Description

With this MD, the user can specify if the hole circle drilling function via the ManualTurn user interface is supported (softkey HOLE CIRCLE DRILLING is displayed).

0=Hole circle drilling function is not released

1=Hole circle drilling function is released

9643	**CTM_ENABLE_DRIVEN_TOOL**			H03	**QV:** FBMA
-	Enable support of driven tools			BYTE	Immediately
				840D SW 4.4, 810D SW 2.4	
MT		MT: 0	0	2	3/4

Description

With this MD, you can define how a driven tool shall be supported.
0=No support of the driven tool
(2nd spindle not controlled)
1= Support of a driven tool via PLC
(2nd spindle controlled)
2= Support of a driven tool via NC
((2nd spindle closed-loop controlled)

9644	**CTM_CIRC_TAP_DWELL_TIME_1**			H03	**QV:** FBMA
	Dwell time bottom, tapping on hole circle			DOUBLE	Immediately
				840D SW 4.4, 810D SW 2.4	
MT		MT: 0	0	100	3/4

Description

The MD is required for tapping to hole circle using a controlled spindle.
It serves to specify the dwell time (in s) of the tap in the final thread drilling depth.

9645	**CTM_CIRC_TAP_DWELL_TIME_2**			H03	**QV:** FBMA
	Dwell time top, tapping on hole circle			DOUBLE	Immediately
				840D SW 4.4, 810D SW 2.4	
MT		MT: 0	0	100	3/4

Description

The MD is required for tapping to hole circle using a controlled spindle.
It serves to specify the dwell time (in s) of the tap in the return plane of the workpiece.

9646	**CTM_FACTOR_O_CALC_THR_PITCH**			H01, H02, H03	**QV:** FBMA, FBT
-	Mode for retraction distance external mach			DOUBLE	Immediately
				6.3	
SM, ST, MT		MT: 0.6134, SM: 0.6134, ST: 0.6134	0	0	3/4

Description

This MD specifies the conversion factor of the thread pitch in the thread depth for metric DIN external threads.

9647	**CTM_FACTOR_I_CALC_THR_PITCH**			H01, H02, H03	**QV:** FBMA, FBT
-	Mode for return dist. stock rem. int.mach.			DOUBLE	Immediately
				6.3	
SM, ST, MT		MT: 0.5413, SM: 0.5413, ST: 0.5413	0	0	3/4

Description

This MD specifies the conversion factor for the pitch in the thread depth in case of metric DIN inside threads.

9648	**CTM_ROUGH_O_RELEASE_DIST**			H02, H03	**QV:** FBMA, FBT
mm	Return dist. stock rem. for ext.machining			DOUBLE	Immediately
				840D SW 4.4, 810D SW 2.4, ST 6.1	
ST, MT		MT: 1.0, ST: 1.0	-1	100	3/4

Description

This MD is used to enter the distance by which the tool is retracted from the outside contour with removing external machining.

This does not apply for stock removal of a contour.

-1= the distance is specified internally.

9649	**CTM_ROUGH_I_RELEASE_DIST**			H02, H03	**QV:** FBMA, FBT
mm	Return dist. stock rem. for int.machining			DOUBLE	Immediately
				840D SW 4.4, 810D SW 2.4, ST 6.1	
ST, MT		MT: 0.5, ST: 0.5	-1	100	3/4

Description

This MD is used to enter the distance by which the tool is retracted from the inside contour with removing internal machining. This does not apply to stock removal of a contour.

-1= the distance is specified internally.

9650	**CMM_POS_COORDINATE_SYSTEM**			H01, H02, H05	**QV:** FBSP, FBT
-	Coordinate system position			BYTE	Immediately
				SW4.3 , ST 6.1	
SM, ST, Adv, Emb		Emb: 0, SM: 0, ST: 34	0	47	3/4

Description

Position of the coordinate system for non-turning (MD 9020 <> 1)

In the ShopMill user interface

- the help displays
- the sequence diagram
- the simulation
- and the input fields with rotation direction specifications

change automatically according to the selected position.

9651	**CMM_TOOL_MANAGEMENT**			H01, H02, H05	**QV:** FBSP, FBT
-	Tool management concept			BYTE	Power On
				6.1, ST 6.1	
SM, ST, Adv, Emb		Emb: 4, SM: 4, ST: 4	1	4	3/4

Description

Selects from two tool management versions (see section Tool Management):

2: Tool management without loading/unloading

4: Tool management with loading/unloading

9652	**CMM_TOOL_LIFE_CONTROL**			H01, H02, H05	**QV:** FBSP, FBT
-	Tool monitoring			BYTE	Power On
				6.1	
SM, ST, Adv, Emb		Emb: 1, SM: 1, ST: 1	0	1	3/4

Description

With this MD you can enable the tool monitoring. Tool monitoring consists of tool life monitoring and tool loading monitoring:

0 = tool monitoring is not displayed

1 = tool monitoring is displayed

9653	**CMM_ENABLE_A_AXIS**			H01	**QV:** FBSP
-	Enable 4th axis for user interface			BYTE	Immediately
				840D SW 4.3, 810D SW 2.3	
SM		SM: 0	0	3	3/4

Description

Release 4th axis (e.g. A axis) for user interface:

0 = 4th axis is not displayed in the user interface

1 = 4th axis is displayed in the user interface

2 = 4th axis is displayed in the user interface and can be programmed

3 = 4th axis is displayed in the user interface only during reference point approach

9654	**CMM_SPEED_FIELD_DISPLAY_RES**			H01, H02	**QV:** FBSP, FBT
-	Decimal places in speed entry field			BYTE	Immediately
				840D SW 4.3, 810D SW 2.3, ST 6.1	
SM, ST		SM: 0, ST: 0	0	4	3/4

Description

This MD specifies the number of decimal places in parameter field S (speed).

9655	**CMM_CYC_PECKING_DIST**			H01	**QV:** FBSP
mm	Amount of retract.for deep hole drilling			DOUBLE	Immediately
				840D SW 4.3, 810D SW 2.3	
SM		SM: -1	-1.0	100.0	3/4

Description

This MD specifies the amount of retraction during deep hole drilling with chip breakage.

9656	**CMM_CYC_DRILL_RELEASE_DIST**			H01, H02	**QV:** FBSP
mm	Amount of retraction for boring			DOUBLE	Immediately
				840D SW 4.3, 810D SW 2.3	
SM, ST		SM: -1, ST: 0.1	-1.0	10.0	3/4

Description

This MD determines the amount by which the tool retracts in the X direction while a hole is drilled.

Note: -1 means that the value of the amount of retraction D can be entered into the user interface.

9657	**CMM_CYC_MIN_CONT_PO_TO_RAD**			H01, H02	**QV:** FBSP, FBT
%	Deviation from minimum cutter radius			REAL	Immediately
				840D SW 4.3, 810D SW 2.3, ST 6.1	
SM, ST		SM: 5, ST: 5	0	50	3/4

Description

This MD is required for contour pocket milling. This parameter specifies by which percentage the radius of a milling tool in operation may be smaller than the radius used for generation.

9658	**CMM_CYC_MAX_CONT_PO_TO_RAD**			H01, H02	**QV:** FBSP, FBT
mm	Deviation from maximum cutter radius			DOUBLE	Immediately
				840D SW 4.3, 810D SW 2.3, ST 6.1	
SM, ST		SM: 0.01, ST: 0.01	0.0	10	3/4

Description

This MD is required for contour pocket milling. This parameter specifies by which amount the radius of a milling tool in operation may be greater than the radius used for generation.

9659	**CMM_CYC_DRILL_RELEASE_ANGLE**			H01	**QV:** FBSP
degrees	Retraction angle for boring			DOUBLE	Immediately
				840D SW 4.3, 810D SW 2.3	
SM		SM: -1	-1.0	360.0	3/4

Description

This MD specifies at which spindle position (0...360 0) the tool, e.g. a turning tool, comes to standstill in a bore hole.

Note:

-1 means that the value of the tool orientation angle can be entered in the user interface.

9660	**CMM_ENABLE_PLANE_CHANGE**			H01	**QV:** FBSP
-	Switch to machining plane			BYTE	Immediately
				840D SW 4.3, 810D SW 2.3	
SM		SM: 1	0	1	3/4

Description

Release switching to machining level (G17, G18, G19):

0 = Changeover to machining level (G17, G18, G19) not possible

1 = Changeover to machining level (G17, G18, G19) possible

9662	**CMM_COUNT_GEAR_STEPS**			H01	**QV:** FBSP
-	Number of gear stages			BYTE	Immediately
				840D SW 4.3, 810D SW 2.3	
SM		SM: 1	0	5	3/4

Description

This MD is used to specify the number of gear levels (0 to 5) for the spindle. The input options via the user interface are restricted in this way.

9663	**CMM_TOOL_DISPLAY_IN_DIAM**			H01, H02, H05	**QV:** FBSP, FBT
-	Display of radius/diameter for tool			BYTE	Power On
				840D SW 4.3, 810D SW 2.3, ST 6.1	
SM, ST, Adv, Emb		Emb: 1, SM: 1, ST: 1	0	1	3/4

Description

This MD specifies how the tool is displayed or entered:

0 = Radius

1 = Diameter

9664	**CMM_MAX_INP_FEED_P_MIN**			H01, H02	**QV:** FBSP, FBT
mm/min	Feedrate in mm/min			DOUBLE	Immediately
				840D SW 4.3, 810D SW 2.3, ST 6.1	
SM, ST		SM: 10000.0, ST: 10000.0	0	100000	3/4

Description

This MD specifies the upper feedrate input limit for mm/min.

9665	**CMM_MAX_INP_FEED_P_ROT**			H01, H02	**QV:** FBSP, FBT
	Feedrate in mm/rev			DOUBLE	Immediately
				840D SW 4.3, 810D SW 2.3, ST 6.1	
SM, ST		SM: 1.0, ST: 1.0	0	10	3/4

Description

This MD specifies the upper feedrate input limit for mm/revolutions.

9666	**CMM_MAX_INP_FEED_P_TOOTH**			H01, H02	**QV:** FBSP, FBT
	Feedrate in mm/tooth			DOUBLE	Immediately
				840D SW 4.3, 810D SW 2.3, ST 6.1	
SM, ST		SM: 1.0, ST: 1.0	0	5	3/4

Description

This MD specifies the upper feedrate input limit for mm/tooth.

9667	**CMM_FOLLOW_ON_TOOL_ACTIVE**			H01, H02	**QV:** FBSP, FBT
-	Tool preselection active			BYTE	Immediately
				840D SW 4.3, 810D SW 2.3, ST 6.1	
SM, ST		SM: 1, ST: 0	0	1	3/4

Description

This machine data is used to specify if a tool preselection is active in a magazine (e.g. chain magazine), i.e. before a tool change, the follow-on tool is already taken to the loading station.

0 = tool preselection not active

1 = tool preselection active

Note ST: No tool preselection is possible for a turret, i.e. the MD must be set to 0.

9668	**CMM_M_CODE_COOLANT_I_AND_II**			H01, H02	**QV:** FBSP, FBT
-	M code coolants I and II			INTEGER	Immediately
				840D SW 4.4, 810D SW 2.4, ST 6.1	
SM, ST		SM: -1, ST: -1	-1	32767	3/4

Description

This machine data specifies the M code if coolant I and II are selected simultaneously in the tool list.

Value:

-1 = no M code

xy = Mxy for coolant I and II (xy = value of MD 9668)

9669	**CMM_FACE_MILL_EFF_TOOL_DIAM**			H01, H02	**QV:** FBSP
%	Effective mill diameter for face milling			DOUBLE	Immediately
				840D SW 4.4, 810D SW 2.4	
SM, ST		SM: 85.0, ST: 85.0	50.0	100.0	3/4

Description

For face milling, this MD specifies the actual miller diameter. Via the d/D > MD 9669 ratio (d = cut diameter, D = greater than miller diameter), you can determine to what extent the miller travels beyond the workpiece during face milling.

9670	**CMM_START_RAD_CONTOUR_POCKE**			H01, H02	**QV:** FBSP, FBT
mm	Approach circle rad. finish. cont. pock.			DOUBLE	Immediately
				840D SW 4.4, 810D SW 2.4, ST 6.1	
SM, ST		SM: -1.0, ST: -1.0	-1.0	100.0	3/4

Description

This MD influences the radius of the approach circle during finishing of contour pockets.

-1 = The specified radius must ensure that the safety distance to the finishing allowance is obeyed in the start point.

>0 = The specified radius must ensure that the value of this MD to the finishing allowance is obeyed in the start point.

9671	**CMM_TOOL_LOAD_DEFAULT_MAG**			H01, H02	**QV:** FBSP
-	Load default magazine tool			BYTE	Power On
				6.4	
SM, ST		SM: 0, ST: 0	0	30	3/4

Description

Default magazine for loading tools

0 = w/o default magazine

9672	**CMM_FIXED_TOOL_PLACE**			H01, H02, H05	**QV:** FBSP, FBT
-	Fixed location coding			BYTE	Power On
				840D SW 4.4, 810D SW 2.4, ST 6.1	
SM, ST, Adv, Emb		Emb: 0, SM: 0, ST: 1	0	1	3/4

Description

This MD specifies the status of the tools:

0 = Tools with variable location coding in the magazine

1 = Tools with fixed location coding in the magazine

Note ST: If a turret is used, the tools are always assigned to a fixed position, i.e. the MD must be set to 1.

9673	**CMM_TOOL_LOAD_STATION**			H01, H02, H05	**QV:** FBSP, FBT
-	Number of load station			BYTE	Power On
				840D SW 4.4, 810D SW 2.4, ST 6.1	
SM, ST, Adv, Emb		Emb: 1, SM: 1, ST: 1	1	2	3/4

Description

This MD specifies at which loading station the magazine shall be loaded and unloaded.

1 = loading station 1

2 = loading station 2

9674	**CMM_ENABLE_TOOL_MAGAZINE**			H01, H02, H05	**QV:** FBSP, FBT
-	Display of magazine list			BYTE	Power On
				840D SW 4.4, 810D SW 2.4, ST 6.1	
SM, ST, Adv, Emb		Emb: 1, SM: 1, ST: 1	0	1	3/4

Description

0 = Magazine list is not displayed

1 = Magazine list is displayed

9675	**CMM_CUSTOMER_START_PICTURE**			H01, H02	**QV:** FBSP, FBT
-	Customer start-up screen			BYTE	Immediately
				840D SW 4.4, 810D SW 2.4 mit SM	
SM, ST		SM: 0, ST: 0	0	1	3/4

Description

The customer boot screen is activated if

0 = Siemens customer boot screen

1 = customer boot screen of the customer

9676	**CMM_DIRECTORY_SOFTKEY_PATH1**			H01, H02, H05	**QV:** FBSP, FBT
-	Path to drive names in directory manag.			STRING	Power On
				840D SW 4.4, 810D SW 2.4 mit SM	
SM, ST, Adv, Emb		Emb: 0, SM: """", ST: """"	0	0	3/4

Description

With this machine data you define the path for the drive name of the second softkey (horizontal softkey bar) in the directory management with hard disk network link. This softkey is not implemented if an empty string is entered in the machine data display.

9677	**CMM_DIRECTORY_SOFTKEY_PATH2**			H01, H02, H05	**QV:** FBSP, FBT
-	Path to drive names in directory manag.			STRING	Power On
				840D SW 4.4, 810D SW 2.4 mit SM	
SM, ST, Adv, Emb		Emb: 0, SM: """", ST: """"	0	0	3/4

Description

With this machine data you define the path for the drive name of the third softkey (horizontal softkey bar) in the directory management with hard disk network link. If an empty string is entered in the machine data display the softkey is not implemented.

9678	**CMM_DIRECTORY_SOFTKEY_PATH3**			H01, H02, H05	**QV:** FBSP, FBT
-	Path to drive names in directory manag.			STRING	Power On
				840D SW 4.4, 810D SW 2.4 mit SM	
SM, ST, Adv, Emb		Emb: 0, SM: """", ST: """"	0	0	3/4

Description

With this machine data you define the path for the drive name of the fourth softkey (horizontal softkey bar) in the directory management

with hard disk network link. If an empty string is entered in the machine data display the softkey is not implemented.

9679	**CMM_DIRECTORY_SOFTKEY_PATH4**			H01, H02, H05	**QV:** FBSP, FBT
-	Path to drive names in directory manag.			STRING	Power On
				840D SW 4.4, 810D SW 2.4 mit SM	
SM, ST, Adv, Emb		Emb: 0, SM: """", ST: """"	0	0	3/4

Description

With this machine data you define the path for the drive name of the fifth softkey (horizontal softkey bar) in the directory management with hard disk network link. If an empty string is entered in the machine data display the softkey is not implemented.

9680	**CMM_M_CODE_COOLANT_I**			H01, H02	**QV:** FBSP
-	M code coolant I			INTEGER	Immediately
				840D SW 4.4, 810D SW 2.4 mit SM	
SM, ST		SM: 8, ST: 8	0	32767	3/4

Description

This MD specifies the M code of coolant I. This code is output during tool change.

9681	**CMM_M_CODE_COOLANT_II**			H01, H02	**QV:** FBSP
-	M code coolant II			INTEGER	Immediately
				840D SW 4.4, 810D SW 2.4 mit SM	
SM, ST		SM: 7, ST: 7	0	32767	3/4

Description

This MD specifies the M code of coolant II. This code is output during tool change.

9682	**CMM_CYC_BGF_BORE_DIST**			H01	**QV:** FBSP
mm	Mode for return value boring			DOUBLE	Immediately
				6.3	
SM		SM: 1	0.0	100.0	3/4

Description

This MD specifies the preboring depth for drill and thread milling.

9686	**CMM_M_CODE_COOLANT_OFF**			H01, H02	**QV:** BAS
-	M code for coolant OFF			INTEGER	Immediately
				6.3	
SM, ST		SM: 9, ST: 9	0	32767	3/4

Description

M code for coolant off

9687	**CMM_TOOL_MOVE_DEFAULT_MAG**			H01, H02	**QV:** FBSP
-	Relocate default magazine tool			BYTE	Power On
				6.4	
SM, ST		SM: 0, ST: 0	0	30	3/4

Description

Default magazine for relocating tools

0 = w/o default magazine

9688	**CMM_COUNT_GEAR_STEPS_S2**			H01	**QV:**
-	Number of gear stages for 2nd spindle			BYTE	Immediately
SM		SM: 1	0	5	3/4

Description

Number of gear stages for the 2nd spindle (spindle attachment)

9690	**CMM_OEM_FUNCTION_MASK_1**			H01	**QV:** BAS
-	OEM display machine data 1			INTEGER	Immediately
				6.2	
SM		SM: 0	0	0	6/6

Description

OEM display machine data 1

9691	**CMM_OEM_FUNCTION_MASK_2**			H01	**QV:** BAS
-	OEM display machine data 2			INTEGER	Immediately
				6.2	
SM		SM: 0	0	0	6/6

Description

OEM display machine data 2

9703	**CMM_INDEX_AXIS_4**			H01	**QV:** FBSP
-	Axis index for 4th axis			BYTE	Immediately
				840D SW 5.3, 810D SW 3.3	
SM		SM: 0	0	127	3/4

Description

This MD is used to enter the number of the channel axis.

9704	**CMM_INDEX_AXIS_5**			H01	**QV:** FBSP
-	Axis index for 5th axis			BYTE	Immediately
				840D SW 5.3, 810D SW 3.3	
SM		SM: 0	0	127	3/4

Description

This MD is used to enter the number of the channel axis.

9705	**CMM_INDEX_SPINDLE**			H01	**QV:** FBSP
-	Axis index for spindle			BYTE	Immediately
				840D SW 5.3, 810D SW 3.3	
SM		SM: 4	1	127	3/4

Description

This MD is used to enter the number of the channel axis.

9706	**CMM_GEOAX_ASSIGN_AXIS_4**			H01	**QV:** FBSP
-	Fourth axis assigned to geometry axis			BYTE	Immediately
				6.4	
SM		SM: 0	0	6	3/4

Description

Assignment of the 4th axis to a geometry axis:
0 = w/o assignment
1 = 4th axis in the direction of the first geometry axis (X) -> A axis
2 = 4th axis in the direction of the second geometry axis (Y) -> B axis
3 = 4th axis in the direction of the third geometry axis (Z) -> C axis

9707	**CMM_GEOAX_ASSIGN_AXIS_5**			H01	**QV:** FBSP
-	Fifth axis assigned to geometry axis			BYTE	Immediately
				6.4	
SM		SM: 0	0	6	3/4

Description

Assignment of the 5th axis to a geometry axis:
0 = w/o assignment
1 = 5th axis in the direction of the first geometry axis (X) -> A axis
2 = 5th axis in the direction of the second geometry axis (Y) -> B axis
3 = 5th axis in the direction of the third geometry axis (Z) -> C axis

9708	**CMM_INDEX_SPINDLE_2**			H01	**QV:**
-	Axis index for 2nd spindle			BYTE	Immediately
SM		SM: 0	0	127	3/4

Description

Axis index for a 2nd spindle (spindle attachment)

9718	**CMM_OPTION_MASK_2**			H01, H02	**QV:** FBSP, FBT
-	Settings for ShopMill 2			INTEGER	Immediately
				6.3	
SM, ST		SM: 2, ST: 2	0	0	2/2

Description

Bit 0:
Do not jump to the Automatic mode, when a program is selected externally (i.e. via PLC) for processing.

9719	**CMM_OPTION_MASK**			H01, H02	**QV:** FBSP
-	Settings for ShopMill			INTEGER	Immediately
				840D SW 5.3, 810D SW 3.3	
SM, ST		SM: 5, ST: 5	0	0	2/2

Description

Bit 0: display softkey ShopMill when creating new programs.
Bit 1: reserved
Bit 2: MDA buffer is not deleted automatically.
Bit 3: reserved
Bit 4: reserved
Bit 5: reserved
Bit 6: reserved
Bit 7: reserved
Bit 8: reserved
Bit 12: Swivel: Display parameter Hold tool tip.
Bit 13: Swivel: Display swivel variant Solid angle.
Bit 14: Swivel: Display swivel variant Projection angle.

9720	**CMM_ENABLE_B_AXIS**			H01	**QV:** FBSP
-	Enable B axis			BYTE	Immediately
				840D SW 4.4, 810D SW 2.4 mit SM	
SM		SM: 0	0	3	3/4

Description

Release 5th axis (e.g. B axis) for user interface:
0 = 5th axis is not displayed in the user interface
1 = 5th axis is displayed in the user interface
2 = 5th axis is displayed in the user interface and can be programmed
3 = 5th axis is displayed in the user interface only during reference point approach

9721	**CMM_ENABLE_TRACYL**			H01	**QV:** FBSP
-	Enable cylinder periph. transformation			BYTE	Immediately
				840D SW 4.4, 810D SW 2.4 mit SM	
SM		SM: 0	0	1	3/4

Description

Proceed as follows to activate the cylinder surface transformation function via the user interface:
0 = The cylinder surface transformation function is not displayed in the user interface
1 = The cylinder surface transformation function is displayed in the user interface
The cylinder surface transformation function can only be used if the function has been set up in the standard.
Reference: /FB2/, M1, Kinematic Transformation

9723	**CMM_ENABLE_SWIVELLING_HEAD**			H01, H02	**QV:** FBSP
-	Enable inclinable heads			BYTE	Immediately
				840D SW 4.4, 810D SW 2.4 mit SM	
SM, ST		SM: 0, ST: 0	0	1	3/4

Description

This MD specifies if inclinable heads can be used with the machine.

0= No screens are offered for supporting inclinable heads.

1= Screens supporting inclinable heads are offered.

9724	**CMM_CIRCLE_RAPID_FEED**			H01, H02	**QV:** FBT
mm/min	Rap. trav. feed positioning on circle path			DOUBLE	Immediately
				840D SW 6.1, 810D SW 4.1	
SM, ST		SM: 5000, ST: 5000	0	100000	3/4

Description

This MD specifies the rapid feed in mm/min for positioning on the circular path.

9725	**CMM_ENABLE_QUICK_M_CODES**			H01, H02	**QV:** FBSP
-	Enable fast M functions			BYTE	Immediately
				6.4	
SM, ST		SM: 0, ST: 0	0	0	3/4

Description

Enable quick M functions:

Bit 0: coolant 1 on

Bit 1: coolant 2 on

Bit 2: coolants 1 and 2 on

Bit 3: coolant off

9725	**CMM_ENABLE_QUICK_M_CODES**			H01, H02	**QV:** FBSP
-	Enable fast M functions			BYTE	Immediately
				6.4	
SM, ST		SM: 0, ST: 0	0	0	3/4

Description

Enable quick M functions:

Bit 0: coolant 1 on

Bit 1: coolant 2 on

Bit 2: coolants 1 and 2 on

Bit 3: coolant off

9726	**CMM_DISPLAY_MD_IS_METRIC**			H01, H02	**QV:** FBSP
-	Display machine data unit (inch/mm)			BYTE	Immediately
				6.4	
SM, ST		SM: 1, ST: 1	0	0	3/4

Description

Current unit of display machine data:
(automatically adapted with inch/metric changeover)
0 = inch
1 = mm

9727	**CMM_ENABLE_POS_A_B_AXIS**			H01	**QV:** FBSP
-	A/B axis support enable			BYTE	Immediately
				6.4	
SM		SM:	0	0	3/4

Description

Enable support for A/B axis with angular values for position patterns:
0 = Function not activated
>0 = Function activated (amount = number of channel axis A)
<0 = Function activated (amount = number of channel axis B)

9728	**CMM_DISPL_DIR_A_B_AXIS_INV**			H01	**QV:** FBSP
-	Direction of rotation of A/B axis adjusted			BYTE	Immediately
				6.4	
SM		SM:	0	1	3/4

Description

Inversion of the rotational direction to display the A/B axis on the interface

9729	**CMM_G_CODE_TOOL_CHANGE_PROG**			H01, H02	**QV:** FBSP
-	Tool change program in G code			STRING	Immediately
				6.4	
SM, ST		SM: """", ST: """"	0	0	3/4

Description

Program called up with tool change in the G code

9739	**CMM_M_CODE_TOOL_FUNC_1_ON**			H01	**QV:** FBST
-	M code for tool-specific function 1 ON			INTEGER	Immediately
SM		SM: -1	-1	32767	3/4

Description

M code for tool-specific function 1 ON
The value -1 means that the M function is not output.
If both M functions of a function are -1, the relevant interface array is not displayed.

9740	**CMM_M_CODE_TOOL_FUNC_1_OFF**			H01	**QV:** FBST
-	M code for tool-specific function 1 OFF			INTEGER	Immediately
SM		SM: -1	-1	32767	3/4

Description

M code for tool-specific function 1 OFF

The value -1 means that the M function is not output.

If both M functions of a function are -1, the relevant interface array is not displayed.

9741	**CMM_M_CODE_TOOL_FUNC_2_ON**			H01	**QV:** FBSP
-	M code for tool-specific function 2 ON			INTEGER	Immediately
SM		SM: -1	-1	32767	3/4

Description

M code for tool-specific function 2 ON

The value -1 means that the M function is not output.

If both M functions of a function are -1, the relevant interface array is not displayed.

9742	**CMM_M_CODE_TOOL_FUNC_2_OFF**			H01	**QV:** FBSP
-	M code for tool-specific function 2 OFF			INTEGER	Immediately
SM		SM: -1	-1	32767	3/4

Description

M code for tool-specific function 2 OFF

The value -1 means that the M function is not output.

If both M functions of a function are -1, the relevant interface array is not displayed.

9743	**CMM_M_CODE_TOOL_FUNC_3_ON**			H01	**QV:** FBST
-	M code for tool-specific function 3 ON			INTEGER	Immediately
SM		SM: -1	-1	32767	3/4

Description

M code for tool-specific function 3 ON

The value -1 means that the M function is not output.

If both M functions of a function are -1, the relevant interface array is not displayed.

9744	**CMM_M_CODE_TOOL_FUNC_3_OFF**			H01	**QV:** FBST
-	M code for tool-specific function 3 OFF			INTEGER	Immediately
SM		SM: -1	-1	32767	3/4

Description

M code for tool-specific function 3 OFF

The value -1 means that the M function is not output.

If both M functions of a function are -1, the relevant interface array is not displayed.

9745	**CMM_M_CODE_TOOL_FUNC_4_ON**			H01	**QV:** FBST
-	M code for tool-specific function 4 ON			INTEGER	Immediately
SM		SM: -1	-1	32767	3/4

Description

M code for tool-specific function 4 ON
The value -1 means that the M function is not output.
If both M functions of a function are -1, the relevant interface array is not displayed.

9746	**CMM_M_CODE_TOOL_FUNC_4_OFF**			H01	**QV:** FBST
-	M code for tool-specific function 4 OFF			INTEGER	Immediately
SM		SM: -1	-1	32767	3/4

Description

M code for tool-specific function 4 OFF
The value -1 means that the M function is not output.
If both M functions of a function are -1, the relevant interface array is not displayed.

9747	**CMM_ENABLE_MEAS_AUTO**			H01	**QV:**
-	Automatic workpiece measurement enable			BYTE	Immediately
				7.1	
SM		SM: 1	0	1	3/4

Description

Automatic workpiece measurement enabled

9748	**CMM_MKS_POSITION_MAN_MEAS**			H01	**QV:** FBSP
mm	Posit. of man. tool meas. with fixed point			DOUBLE	Immediately
				6.4	
SM		SM:	0	0	3/4

Description

Machine position for manual tool measurement with fixed point
(MD can also be preset by adjustment of fixed point)

9749	**CMM_ENABLE_MEAS_T_AUTO**			H01, H02	**QV:** FBSP, FBT
-	Enable automatic tool measuring			INTEGER	Immediately
				6.3	
SM, ST		SM: 1, ST: 1	0	1	3/4

Description

With this MD you release the Automatic tool measurement function.

9750	**CMM_MEAS_PROBE_INPUT**			H01, H02	**QV:** FBSP, FBT
-	Measuring input for workpiece probe			REAL	Immediately
				6.3	
SM, ST		SM: 0, ST: 0	0	1	3/4

Description

This MD specifies the measuring input for a workpiece probe.

0 = Measuring input 1 activated

1 = Measuring input 2 activated

9751	**CMM_MEAS_T_PROBE_INPUT**			H01, H02	**QV:** FBSP, FBT
-	Measuring input for tool probe			REAL	Immediately
				6.3	
SM, ST		SM: 1, ST: 0	0	1	3/4

Description

This MD specifies the measuring input for a tool probe.

0 = Measuring input 1 activated

1 = Measuring input 2 activated

9752	**CMM_MEASURING_DISTANCE**			H01, H02	**QV:** FBSP, FBT
mm	Max. meas. dist. f. workp. meas. in progr.			DOUBLE	Immediately
				6.3	
SM, ST		SM: 5, ST: 5	1	1000	3/4

Description

This MD specifies the max. measurement path before and after the switching position to be expected (workpiece edge) during workpiece measurement in the program. If no switching signal is transmitted within the range, the error message Probe does not respond is displayed.

9753	**CMM_MEAS_DIST_MAN**			H01, H02	**QV:** FBSP, FBT
mm	Max. meas. dist. f. manual workp. meas.			DOUBLE	Immediately
				6.3	
SM, ST		SM: 10, ST: 10	0.01	1000	3/4

Description

This MD specifies the max. measurement path before and after the switching position to be expected (workpiece edge) during workpiece measurement in the manual mode. If no switching signal is transmitted within the range, the error message Probe does nor respond is displayed.

9754	**CMM_MEAS_DIST_TOOL_LENGTH**			H01, H02	**QV:** FBSP, FBT
mm	Max. meas. dist. f. tool lgth rotat. spin.			DOUBLE	Immediately
				6.3	
SM, ST		SM: 2, ST: 10	0.001	1000	3/4

Description

This MD specifies the max. measurement path before and after the switching position to be expected (tool length) during tool length measurement with a rotating spindle. If no switching signal is transmitted within the range, the error message Probe does not respond is displayed.

9755	**CMM_MEAS_DIST_TOOL_RADIUS**			H01, H02	**QV:** FBSP, FBT
mm	Max. meas. dist. f. tool rad. rotat. spin.			DOUBLE	Immediately
				6.3	
SM, ST		SM: 1, ST: 1	0.001	1000	3/4

Description

This MD specifies the max. measurement path before and after the switching position to be expected (tool radius) during tool radius measurement in the program. If no switching signal is transmitted within the range, the error message Probe does not respond is displayed.

9756	**CMM_MEASURING_FEED**			H01, H02	**QV:** FBSP, FBT
mm/min	Meas. feedrate f. workpiece meas.			DOUBLE	Immediately
				6.3	
SM, ST		SM: 300, ST: 300	10	5000	3/4

Description

This MD specifies the measuring feed during workpiece measurement.

9757	**CMM_FEED_WITH_COLL_CTRL**			H01, H02	**QV:** FBSP, FBT
mm/min	Plane feed with collision detection			DOUBLE	Immediately
				6.3	
SM, ST		SM: 1000, ST: 1000	10	5000	3/4

Description

To protect the measuring probe, intermediate positionings in the plane are traversed as measuring sets for collision detection with this feed. This feed must be selected to ensure that the max. deflection of the measuring probe is not exceeded in case of a collision.

9758	**CMM_POS_FEED_WITH_COLL_CTRL**			H01, H02	**QV:** FBSP, FBT
mm/min	Infeed rate with collision detection			DOUBLE	Immediately
				6.3	
SM, ST		SM: 1000, ST: 1000	10	5000	3/4

Description

To protect the measuring probe, intermediate positionings in the tool axis are traversed as measuring sets for collision detection with this feed. This feed must be selected to ensure that the max. deflection of the measuring probe is not exceeded in case of a collision.

9759	**CMM_MAX_CIRC_SPEED_ROT_SP**			H01, H02	**QV:** FBSP, FBT
	Max.periph.speed f.tool meas.w.rot.spin.			DOUBLE	Immediately
				6.3	
SM, ST		SM: 100, ST: 100	1	200	3/4

Description

This MD specifies the max. permissible grinding wheel surface speed of the tools to be measured during tool measuring with a rotating spindle. Depending on the MD, the admissible spindle speed is calculated during tool measuring. The measurement is then performed with this speed.

9760	**CMM_MAX_SPIND_SPEED_ROT_SP**			H01, H02	**QV:** FBSP, FBT
	Max. speed f. tool meas. w. rot. spindle			DOUBLE	Immediately
				6.3	
SM, ST		SM: 1000, ST: 1000	100	25000	3/4

Description

This MD specifies the max. permissible speed of the tools to be measured during tool measurement with a rotating spindle.

9761	**CMM_MIN_FEED_ROT_SP**			H01, H02	**QV:** FBSP, FBT
mm/min	Min. feedr. f. tool meas. w. rot.spindle			DOUBLE	Immediately
				6.3	
SM, ST		SM: 10, ST: 10	1	1000	3/4

Description

This MD specifies the minimum feed during tool measurement with a rotating spindle. Otherwise, a very small feed results for tools with a very large radius and a high measuring accuracy requested.

9762	**CMM_MEAS_TOL_ROT_SP**			H01, H02	**QV:** FBSP, FBT
mm	Meas. acc. f. tool meas. w. rot. spindle			DOUBLE	Immediately
				6.3	
SM, ST		SM: 0.01, ST: 0.01	0.001	1	3/4

Description

This MD specifies the measuring accuracy desired during tool measurement with a rotating spindle.

9763	**CMM_TOOL_PROBE_TYPE**			H01, H02	**QV:** FBSP, FBT
-	Type of tool probe			REAL	Immediately
				6.3	
SM, ST		SM: 0, ST: 0	0	999	3/4

Description

This MD specifies the type of the tool probe.

0 = Measuring cube

101 = measuring disk in XY (1st and 2nd geometry axis)

201 = measuring disk in ZX (3rd and 1st geometry axis)

301 = measuring disk in YZ (2nd and 3rd geometry axis)

9764	**CMM_TOOL_PROBE_ALLOW_AXIS**			H01, H02	**QV:** FBSP, FBT
-	Permiss. axis direct. tool probe			REAL	Immediately
				6.3	
SM, ST		SM: 133, ST: 133	0	333	3/4

Description

This MD specifies the permissible axes and axis directions in which measurements can be performed on the tool probe. The value to be indicated is composed of ZYX. On of the following attributes can be indicated for each axis:

0 = not possible

1 = in negative direction only

2 = in positive direction only

3 = in both directions

Application example:

Default setting 133 means:

1st number (1): Measuring in Z only possible in negative direction

2nd number (3): Measuring in Y in both directions possible

3rd number (3): Measuring in X in both directions possible

9765	**CMM_T_PROBE_DIAM_LENGTH_MEA**			H01, H02	**QV:** FBSP, FBT
mm	Dia. of tool probe f. length measurement			DOUBLE	Immediately
				6.3	
SM, ST		SM: 0, ST: 0	0	100000	3/4

Description

This MD specifies the effective diameter or the effective edge of the tool probe for tool length measurement.

9766	**CMM_T_PROBE_DIAM_RAD_MEAS**			H01, H02	**QV:** FBSP, FBT
mm	Dia. of tool probe f. radius measurement			DOUBLE	Immediately
				6.3	
SM, ST		SM: 0, ST: 0	0	100000	3/4

Description

This MD specifies the effective diameter or the effective edge of the tool probe for radius measurement.

9767	**CMM_T_PROBE_DIST_RAD_MEAS**			H01, H02	**QV:** FBSP, FBT
mm	Infeed f.top edge of t-probe f.rad.meas.			DOUBLE	Immediately
				6.3	
SM, ST		SM: 0, ST: 0	0	100000	3/4

Description

This MD specifies the distance between the tool measurement probe upper edge and the tool lower edge for radius measurement.

9768	**CMM_T_PROBE_APPROACH_DIR**			H01, H02	**QV:** FBSP, FBT
-	Plane approach dir. tool probe			BYTE	Immediately
				6.3	
SM, ST		SM: -1, ST: -1	-2	2	3/4

Description

This MD specifies the direction of approach in the plane, in which the tool approaches the tool probe.
-1 = 1st plane axis in negative direction
+1 = 1st plane axis in positive direction
-2 = 2nd plane axis in negative direction
+2 = 2nd plane axis in positive direction

9769	**CMM_FEED_FACTOR_1_ROT_SP**			H01, H02	**QV:** FBSP
-	Feedrate fact. 1 tool meas. w. rot. spin.			DOUBLE	Immediately
				6.3	
SM, ST		SM: 0, ST: 0	0	100	3/4

Description

Feedrate factor for 1st measuring procedure during tool measuring with rotating spindle

0: Only measured once
>0: 1st measuring procedure with measuring feedrate * factor 1
2nd measuring procedure with measuring feedrate

9770	**CMM_FEED_FACTOR_2_ROT_SP**			H01, H02	**QV:** FBSP
-	Feedrate fact. 2 tool meas. w. rot. spin.			DOUBLE	Immediately
				6.3	
SM, ST		SM: 0, ST: 0	0	50	3/4

Description

Feedrate factor for 2nd measuring procedure during tool measuring with rotating spindle

This factor is only effective if $MM_CMM_FEED_FACTOR_1_ROT_SP > 0.
It should be smaller than $MM_CMM_FEED_FACTOR_1_ROT_SP.

0:
It should be measured only twice (see $MM_CMM_FEED_FACTOR_1_ROT_SP)

>0:
1st measuring procedure with measuring feed * factor 1
2nd measuring procedure with measuring feed * factor 2
3rd measuring procedure with measuring feed

9771	**CMM_MAX_FEED_ROT_SP**			H01, H02	**QV:** FBSP
mm/min	Max. feedr. f. tool meas. w. rot. spindle			DOUBLE	Immediately
				6.3	
SM, ST		SM: 20, ST: 20	1	1000	3/4

Description

Maximum feed during tool measuring with rotating spindle [mm/min]

9772	**CMM_T_PROBE_MEASURING_DIST**			H01, H02	**QV:** FBSP
mm	Meas.dist. f. tool meas. w. non-rot. spin.			DOUBLE	Immediately
				6.3	
SM, ST		SM: 5, ST: 10	0.01	1000	3/4

Description

Measuring path during tool measuring and calibration
Tool probe with stationary spindle

9773	**CMM_T_PROBE_MEASURING_FEED**			H01, H02	**QV:** FBSP
mm/min	Feedrate f. tool meas. w. non-rot. spindle			DOUBLE	Immediately
				6.3	
SM, ST		SM: 300, ST: 300	10	5000	3/4

Description

Feed during tool measurement and calibration
Tool probe with stationary spindle [mm/min]

9774	**CMM_T_PROBE_MANUFACTURER**			H01, H02	**QV:** FBSP
-	Tool probe manufacturer			INTEGER	Immediately
				6.3	
SM, ST		SM: 0, ST: 0	0	2	3/4

Description

Tool probe manufacturer
0 no information
1 Heidenhain
2 Renishaw

9775	**CMM_T_PROBE_OFFSET**			H01, H02	**QV:** FBSP
-	Tool meas. offset w. rot. spindle			INTEGER	Immediately
				6.3	
SM, ST		SM: 0, ST: 0	0	2	3/4

Description

Correction during tool measurement with rotating spindle
0 no correction
1 automatic correction
(internal correction in case of Heidenhain and Renishaw)
2 Correction via user-defined correction data
(also when Heidenhain or Renishaw indicated)

9776	**CMM_MEAS_SETTINGS**			H01, H02	**QV:** FBSP
-	Settings for measuring cycles			INTEGER	Immediately
				6.4	
SM, ST		SM: 0, ST: 0	0	0	3/4

Description

Settings for measuring cycles:

Bit 0:

0 = probe rotated to a defined initial position via SPOS in the cycle with tool measurement

1 = user specifies the spindle position e.g. via CYCLE198; the spindle is not positioned in the shell cycle except when calibrating with E_MS_CAL where the probe is rotated only through 180 related to the spindle position found.

9777	**CMM_ENABLE_TIME_DISPLAY**			H01	**QV:** FBSP
-	Time display enable			BYTE	Immediately
				6.4	
SM		SM: 127	0	0	3/4

Description

Release of the displays in the timers status display.

Bit coding MD9777 - CMM_ENABLE_TIME_DISPLAY:

Bit 0 = 1 - Display estimated remaining program execution time

Bit 1 = 1 - Display time

Bit 2 = 1 - Display date

Bit 3 = 1 - Display machine runtime

Bit 4 = 1 - Display machining time

Bit 5 = 1 - Display utilization

9778	**CMM_MEAS_PROBE_SOUTH_POLE**			H01	**QV:** FBST
-	Probe length in relation to the lower edge			BYTE	Immediately
SM		SM: 1	0	1	3/4

Description

Reference point for tool probe length:

0 = Ball center

1 = Bottom edge of ball (South Pole)

9779	**CMM_MEAS_PROBE_IS_MONO**			H01	**QV:** FBST
-	Workpiece probe is mono probe			BYTE	Immediately
SM		SM: 0	0	1	3/4

Description

The tool probe is a monoprobe:

0 = No

1 = Yes

A monoprobe can be rotated to any angle via SPOS.

It is positioned such that always the same edge is applied to the workpiece.

9802	**ST_INDEX_AXIS_C_SUB**			H02	**QV:**
-	Axis index for C axis of counterspindle			BYTE	Immediately

ST		ST: 0	0	127	3/4

Description

9803	**ST_INDEX_AXIS_4**			H02	**QV:** FBT
-	Axis index for 4th axis			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	

ST		ST: 5	0	127	3/4

Description

Enter the axis number of the 4th axis to be displayed (e.g. Y axis) in this MD.

9804	**ST_INDEX_SPINDLE_MAIN**			H02, H03	**QV:** FBT
-	Axis index for main spindle			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	

ST, MT		MT: , ST: 3	1	127	3/4

Description

Enter the axis number of the main spindle into this MD.

9805	**ST_INDEX_SPINDLE_TOOL**			H02, H03	**QV:** FBT
-	Axis index for tool spindle			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	

ST, MT		MT: , ST: 4	0	127	3/4

Description

Enter the axis number of the tool spindle in this MD.

9806	**ST_INDEX_SPINDLE_SUB**			H02	**QV:** FBT
-	Axis index for counterspindle			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	

ST		ST: 0	0	127	3/4

Description

Enter the axis number of the counterspindle in this MD.

9807	**ST_INDEX_AXIS_C**			H02	**QV:** FBT
-	Axis index for C axis			BYTE	Immediately
				6.3	

ST		ST: 0	0	127	3/4

Description

Enter the axis number of the C axis in this MD.

9808	**ST_INDEX_AXIS_B**			H02	**QV:**
-	Axis index for B axis			BYTE	Immediately

ST		ST:	0	127	3/4

Description

9810	**ST_GEAR_STEPS_SPINDLE_MAIN**			H02	**QV:** FBT
-	Number of main spindle threads			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	

ST		ST: 0	0	5	3/4

Description

This MD specifies the number of gear stages of the main spindle.

9811	**ST_GEAR_STEPS_SPINDLE_TOOL**			H02	**QV:** FBT
-	Number of tool spindle threads			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	

ST		ST: 0	0	5	3/4

Description

This MD specifies the number of gear stages of the tool spindle.

9812	**ST_GEAR_STEPS_SPINDLE_SUB**			H02	**QV:** FBT
-	Number of counter spindle threads			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	

ST		ST: 0	0	5	3/4

Description

This MD specifies the number of gear stages of the counterspindle.

9820	**ST_MAGN_GLASS_POS_1**			H02	**QV:** FBT
mm	Measure zoom-in pos. to tool, 1st axis			DOUBLE	Immediately
				840D SW 6.1, 810D SW 4.1	

ST		ST: 0	0	0	3/4

Description

This MD specifies the X coordinate of the magnifier.

9821	**ST_MAGN_GLASS_POS_2**			H02	**QV:** FBT
mm	Measure zoom-in pos. to tool, 2nd axis			DOUBLE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 0	0	0	3/4

Description

Enter the Z coordinate of the magnifier in this MD.

9822	**ST_DISPL_DIR_MAIN_SPIND_M3**			H02	**QV:** FBT
-	Displ. direction of rot. main spindle M3			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 0	0	1	3/4

Description

This machine data specifies which direction of rotation of the main spindle is indicated in the user interface for the M function M3.

0 = right

1 = left

9823	**ST_DISPL_DIR_SUB_SPIND_M3**			H02	**QV:** FBT
-	Displ. direction of rot. counterspindle M3			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 0	0	1	3/4

Description

This machine data specifies which direction of rotation of the counterspindle is displayed in the user interface for the M function M3.

0 = right

1 = left

9824	**ST_DISPL_DIR_MAIN_C_AX_INV**			H02	**QV:** FBT
-	Direction of rotation of C axis main spind			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 0	0	1	3/4

Description

This machine data specifies which direction of rotation of the C axis (main spindle) is displayed in the user interface for the M function M3.

0 = right

1 = left

9825	**ST_DISPL_DIR_SUB_C_AX_INV**			H02	**QV:** FBT
-	Direction of rotation of C axis counterspi			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 0	0	1	3/4

Description

This machine data specifies which direction of rotation of the C axis (counterspindle) is displayed in the user interface for the M function M3.

0 = right

1 = left

9826	**ST_DEFAULT_DIR_TURN_TOOLS**			H02	**QV:** FBT
-	Main dir. of rot. for all turning tools			BYTE	Power On
				840D SW 6.1, 810D SW 4.1	
ST		ST: 3	3	4	3/4

Description

This machine date specifies the main direction of rotation of all rotatable tools.

3 = M3

4 = M4

9827	**ST_DEFAULT_MACHINING_SENSE**			H02	**QV:** FBT
-	Basic sett. f. machining direction milling			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 0	0	1	3/4

Description

This machine data specifies the basic setting for the machining direction of rotation during millling, except path milling.

0 = reverse rotation

1 = synchronism

9828	**ST_MEAS_T_PROBE_INPUT_SUB**			H02	**QV:** FBT
-	Meas. input f. tool probe counterspindle			REAL	Immediately
				6.3	
ST		ST: 1	0	1	3/4

Description

With this MD you specify the number of the input for the tool probe for the counterspindle.

0 = Probe 1 is effective for tool measurement counterspindle

1 = Probe 2 is effective for tool measurement counterspindle

9829	**ST_SPINDLE_CHUCK_TYPES**			H02	**QV:** FBT
-	Spindle chuck selection			BYTE	Immediately
				6.4	
ST		ST: 0	0	0	3/4

Description

Selection of the spindle chuck:

Bit 0: Types of jaws GSP (0 = w/o jaw dimension, 1 = with jaw dimension)

9829	**ST_SPINDLE_CHUCK_TYPES**			H02	**QV:** FBT
-	Spindle chuck selection			BYTE	Immediately
				6.4	
ST		ST: 0	0	0	3/4

Description

Selection of the spindle chuck:

Bit 0: Types of jaws GSP (0 = w/o jaw dimension, 1 = with jaw dimension)

9830	**ST_SPINDLE_PARA_ZL0**			H02	**QV:** FBT
mm	Main spindle chuck dimension			DOUBLE	Immediately
				6.4	
ST		ST: 0	0	0	3/4

Description

Main spindle chuck dimension

9831	**ST_SPINDLE_PARA_ZL1**			H02	**QV:** FBT
mm	Counterspindle chuck dimension			DOUBLE	Immediately
				6.4	
ST		ST: 0	0	0	3/4

Description

Counterspindle chuck dimension

9832	**ST_SPINDLE_PARA_ZL2**			H02	**QV:** FBT
mm	Counterspindle stop dimension			DOUBLE	Immediately
				6.4	
ST		ST: 0	0	0	3/4

Description

Counterspindle stop dimension

9833	**ST_SPINDLE_PARA_ZL3**			H02	**QV:** FBT
mm	Counterspindle jaw dimension			DOUBLE	Immediately
				6.4	
ST		ST: 0	0	0	3/4

Description

Counterspindle jaw dimension

9836	**ST_TAILSTOCK_DIAM**			H02	**QV:** FBT
mm	Tailstock diameter			DOUBLE	Immediately
				7.1	
ST		ST:	0	0	3/4

Description

Tailstock diameter

9837	**ST_TAILSTOCK_LENGTH**			H02	**QV:** FBT
mm	Tailstock length			DOUBLE	Immediately
				7.1	
ST		ST:	0	0	3/4

Description

Tailstock length

9838	**ST_BORDER_TOOL_LEN_X_REV_2**			H02	**QV:**
mm	Limit value tool length X for second turre			DOUBLE	Immediately
ST		ST:	0	0	3/4

Description

Limit value of tool lengh X for the 2nd turret:

Limit value = 0: There is only one turret.

Tool length < limit value: The tool belongs to the 1st turret/Multifix

Tool length >= limit value: The tool belongs to the 2nd turret/Multifix

9840	**ST_ENABLE_MAGN_GLASS**			H02	**QV:** FBT
-	Zoom-in under manual: tool meas.			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 0	0	1	3/4

Description

This machine data can be used to activate the function Measure tool by means of magnifier.

0 = Function not available

1 = Function available

9841	**ST_ENABLE_PART_OFF_RECEPT**			H02	**QV:** FBT
-	Enable receptacle function for cut-off			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 0	0	1	3/4

Description

This machine data is used to release the drawer function in the user interface during cutting off.

During cutting off, you can extract a drawer to collect the separated part.

9842	**ST_ENABLE_TAILSTOCK**			H02	**QV:** FBT
-	Enable tailstock			BYTE	Immediately
				6.2	
ST		ST: 0	0	1	3/4

Description

This MD activates the Tailstock parameter in the Program header screen.

9843	**ST_ENABLE_SPINDLE_CLAMPING**			H02	**QV:** FBT
-	Spindle clamping enable (C axis)			BYTE	Immediately
				6.3	
ST		ST: 0	0	1	3/4

Description

Parameter CP for Enable face Y

9849	**ST_CYCLE_SUB_SP_PARK_POS_Y**			H02	**QV:**
mm	Parkposition der Y-Achse bei Gegenspindel			DOUBLE	Immediately
ST		ST: 0	0	0	3/4

Description

9850	**ST_CYCLE_THREAD_RETURN_DIST**			H02	**QV:** FBT
mm	Return distance f. thread turning			DOUBLE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 2	0.001	1000	3/4

Description

With this machine data, you can specify the distance to the workpiece to which retraction is performed between the infeeds during thread cutting.

9851	**ST_CYCLE_SUB_SP_WORK_POS**			H02	**QV:** FBT
mm	Retract position Z for counterspindle			DOUBLE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 0	0	0	3/4

Description

This machine data specifies the position in the Z direction of the counterspindle during machining.

9852	**ST_CYCLE_SUB_SP_DIST**			H02	**QV:** FBT
mm	Counterspindle: travel path to fixed stop			DOUBLE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 10	0.001	1000	3/4

Description

This machine data specifies the distance to the programmed target position. From this distance onwards, the counterspindle travels at a special feedrate during travel to fixed stop.

Specify the feed in MD 9853 $MM_ST_CYCLE_SUB_SP_FEED.

9853	**ST_CYCLE_SUB_SP_FEED**			H02	**QV:** FBT
mm/min	Counterspindle: travel feed to fixed stop			DOUBLE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 0	0	0	3/4

Description

This machine data specifies the feedrate at which the counterspindle travels to fixed stop. In MD 9852 $MM_ST_CYCLE_SUB_SP_DIST, you can specify the distance from which onwards this feedrate is used for travelling.

9854	**ST_CYCLE_SUB_SP_FORCE**			H02	**QV:** FBT
	Counterspin.: travel force to fixed stop			BYTE	Immediately
				840D SW 6.1, 810D SW 4.1	
ST		ST: 10	1	100	3/4

Description

This machine data is used to specify the percentage from which onwards the drive force of the counterspindle shall stop during traveling to fixed stop.

9855	**ST_CYCLE_TAP_SETTINGS**			H02	**QV:** FBT
-	Tapping settings			INTEGER	Immediately
				6.3	
ST		ST: 0	0	0	3/4

Description

Settings for tapping

xxx0 ==> same exact stop response active as prior to cycle call

xxx1 ==> exact stop G601

xxx2 ==> exact stop G602

xxx3 ==> exact stop G603

xx0x ==> with/without feedforward control active, same as prior to cycle call

xx1x ==> with feedforward control FFWON

xx2x ==> without feedforward control FFWOF

x0xx ==> SOFT/BRISK/DRIVE active, same as prior to cycle call

x1xx ==> with jerk limitation SOFT

x2xx ==> without jerk limitation BRISK

x3xx ==> reduced acceleration DRIVE

0xxx ==> reactivate spindle mode at MCALL

1xxx ==> remain in position control at MCALL

9856	**ST_CYCLE_TAP_MID_SETTINGS**			H02	**QV:** FBT
-	Centric tapping settings			INTEGER	Immediately
ST		ST: 0	0	0	3/4

Description

Settings for centric tapping
xxx0 ==> same exact stop response active as before cycle call
xxx1 ==> exact stop G601
xxx2 ==> exact stop G602
xxx3 ==> exact stop G603
xx0x ==> with/without feedforward control active, same as prior to cycle call
xx1x ==> with feedforward control FFWON
xx2x ==> without feedforward control FFWOF
x0xx ==> SOFT/BRISK/DRIVE active, same as prior to cycle call
x1xx ==> with jerk limitation SOFT
x2xx ==> without jerk limitation BRISK
x3xx ==> reduced acceleration DRIVE
0xxx ==> reactivate spindle mode at MCALL
1xxx ==> remain in position control at MCALL

9857	**ST_CYCLE_RET_DIST_FIXEDSTOP**			H02	**QV:** FBT
mm	Retr.path prior to chuck. after fixed stop			DOUBLE	Immediately
				6.3	
ST		ST: 0	0	10	3/4

Description

Retraction path prior to clamping after travel to fixed stop

9858	**ST_CYCLE_RET_DIST_PART_OFF**			H02	**QV:** FBT
mm	Retr. path prior to cut-off w. count.sp.			DOUBLE	Immediately
				6.3	
ST		ST: 0	0	1	3/4

Description

Retraction path prior to cut-off with counterspindle

9859	**ST_CYCLE_PART_OFF_CTRL_DIST**			H02	**QV:** FBT
mm	Path for cut-off check			DOUBLE	Immediately
				6.3	
ST		ST: 0.1	0	10	3/4

Description

Path for cut-off control

9860	**ST_CYCLE_PART_OFF_CTRL_FEED**			H02	**QV:** FBT
mm/min	Feedrate for cut-off check			DOUBLE	Immediately

ST		ST: 0	0	0	3/4

Description

Feed for cut-off control

9861	**ST_CYCLE_PART_OFF_CTRL_FORC**			H02	**QV:** FBT
%	Force in percent for cut-off check			BYTE	Immediately
				6.3	

ST		ST: 10	1	100	3/4

Description

Force in percent for cut-off control

9862	**ST_CYC_DRILL_MID_MAX_ECCENT**			H02	**QV:** FBT
mm	Max. center offset f. center boring			DOUBLE	Immediately
				6.4	

ST		ST: 0.5	0.0	10.0	3/4

Description

Maximum center offset with center boring

9863	**ST_MAX_INP_AREA_GAMMA**			H02	**QV:**
-	Max. input area alignment angle gamma			DOUBLE	Immediately

ST		ST: 5	0	90	3/4

Description

9890	**ST_USER_CLASS_MEAS_T_CAL**			H02	**QV:**
-	Protection level for calibration of tool p			BYTE	Immediately
				7.1	

ST		ST: 3	0	7	3/4

Description

Calibration of tool probe protection level

9897	**ST_OPTION_MASK_MAN_FUNC**			H02	**QV:** FBT
-	Settings for ShopTurn manual functions			INTEGER	Immediately
				7.1	

ST		ST: 8	0	0	3/4

Description

Settings for manual ShopTurn functions:

Bit 0: Main spindle control (0 = machine control panel; 1 = user interface)

Bit 1: Tool spindle control (0 = machine control panel; 1 = user interface)

Bit 2: Reserved (counterspindle control)

Bit 3: 0 = Multifix; 1 = tool turret

9898	**ST_OPTION_MASK**			H02	**QV:** FBT
-	ShopTurn settings			INTEGER	Immediately
				6.3	
ST		ST: 28672	0	0	2/2

Description

Bit 0: Processing inside/backside released in the screens which specify the machining level autonomously
Bit 1 to Bit 5: reserved
Bit 6: Accept simultaneous recording despite program start
Bit 7 and Bit 8: reserved
Bit 9: Block input of an offset in X in the zero point offset list
Bit 10: Display program view during simultaneous recording
Bit 11: reserved
Bit 12: Release functions Parting-off cutting and Parting-off cutting residual material
Bit 13: Release functions Plunge-cutting and Plunge-cutting residual material
Bit 14: Accept negative final machining allowance during contour turning
Bit 15: Counterspindle: Accept clamping internal/external
Bit 16: Additional measuring probe available on the counterspindle
Bit 17: Tool measuring for rotating tools with rotating spindle
Bit 18: Display the Rotation column in the zero-point offset list

9899	**ST_TRACE**			H02	**QV:** FBT
-	Test flags internal ShopTurn diagnosis			REAL	Immediately
				6.3	
ST		ST: 0	0	0xFFFF	3/4

Description

reserved

9899	**ST_TRACE**			H02	**QV:** FBT
-	Test flags internal ShopTurn diagnosis			REAL	Immediately
				6.3	
ST		ST: 0	0	0xFFFF	3/4

Description

reserved

9900	**MD_TEXT_SWITCH**			H05	**QV:** -
-	Plaintexts instead of MD identifier			BOOL	Immediately
				SW2	
Adv, Emb		Emb: 0	0	0	3/4

Description

If the machine data has been set to 1, plaintexts are displayed on the operator panel instead of machine data identifiers.

9950	**MD_NC_TEA_FILTER**			H05	**QV:**
-	General machine data display options			INTEGER	Power On
Emb		Emb: 67108865	0	0	0/0

Description

Internal

9950	**MD_NC_TEA_FILTER**			H05	**QV:**
-	General machine data display options			INTEGER	Power On
Emb		Emb: 67108865	0	0	0/0

Description

Internal

9951	**MD_NC_TEA_IDX_LIMIT**			H05	**QV:**
-	Index filter for general machine data			INTEGER	Power On
Emb		Emb: 0	0	0	0/0

Description

Internal

9952	**MD_AX_TEA_FILTER**			H05	**QV:**
-	Axis machine data display options			INTEGER	Power On
Emb		Emb: 67108865	0	0	0/0

Description

Internal

9952	**MD_AX_TEA_FILTER**			H05	**QV:**
-	Axis machine data display options			INTEGER	Power On
Emb		Emb: 67108865	0	0	0/0

Description

Internal

9953	**MD_AX_TEA_IDX_LIMIT**			H05	**QV:**
-	Index filter for axis machine data			INTEGER	Power On
Emb		Emb: 0	0	0	0/0

Description

Internal

9954	**MD_CH_TEA_FILTER**			H05	**QV:**
-	Channel machine data display options			INTEGER	Power On
Emb		Emb: 33554433	0	0	0/0

Description

Internal

9954	**MD_CH_TEA_FILTER**			H05	**QV:**
-	Channel machine data display options			INTEGER	Power On
Emb		Emb: 33554433	0	0	0/0

Description

Internal

9955	**MD_CH_TEA_IDX_LIMIT**			H05	**QV:**
-	Index filter for channel machine data			INTEGER	Power On
Emb		Emb: 0	0	0	0/0

Description

Internal

9956	**MD_DRV_TEA_FILTER**			H05	**QV:**
-	Drive machine data display options			INTEGER	Power On
Emb		Emb: 8388609	0	0	0/0

Description

Internal

9956	**MD_DRV_TEA_FILTER**			H05	**QV:**
-	Drive machine data display options			INTEGER	Power On
Emb		Emb: 8388609	0	0	0/0

Description

Internal

9957	**MD_DRV_TEA_IDX_LIMIT**			H05	**QV:**
-	Index filter for drive machine data			INTEGER	Power On
Emb		Emb: 0	0	0	0/0

Description

Internal

9958	**MD_SNX_FILTER**			H05	**QV:**
-	Display options Sinamics parameters			INTEGER	Power On
Emb		Emb: 0	0	0	0/0

Description

9959	**MD_SNX_IDX_LIMIT**			H05	**QV:**
-	Index filter for Sinamics parameters			INTEGER	Power On
Emb		Emb: 0	0	0	0/0

Description

9980	**LANGUAGE_SETTINGS**			H05	**QV:**
-	Internal language settings			INTEGER	Power On
Emb		Emb: 513	0	0	0/0

Description

9990	**SW_OPTIONS**			H05	**QV:** FBSP, FBT
-	Enable MMC/HMI software options			INTEGER	Power On
				5.3	
Adv, Emb		Emb: 0	0	0	2/2

Description

MMC software options can be activated here

9991	**HMI_HELP_SYSTEMS**			H05	**QV:** FBSP, FBT
-	Enable MMC/HMI auxiliary systems			INTEGER	Power On
				6.1	
Emb		Emb: 1	0	0	2/2

Description

HMI help system can be switched on/off bit by bit

Bit 0: 0 help displays for pocket calculator off

Bit 0: 1 help displays for pocket calculator active (default value)

9992	**HMI_TESTAUTOMAT_OPTION**			H05	**QV:** FBT, FBSP, EMB
-	Options for autom. HMI test machine			INTEGER	Power On
				6.3	
Emb		Emb: 0	0	0	2/2

Description

Options for the automatic HMI testing machine

Bit 0 = 0: automatic HMI testing machine cannot be activated

Bit 0 = 1: automatic HMI testing machine can be activated via PLC

9993	**HMI_WIZARD_OPTION**			H05	**QV:** FBT, FBSP, EMB
-	Options for wizard			INTEGER	Power On
				6.3	
Emb		Emb: 0	0	0	2/2

Description

Options for the wizard:

Bit 0 = 1: wizard displays configuring lines which were recognized as faulty on the dialog line

Bit 8 = 1: wizard cannot be started via PLC

9999	**TRACE**			H05	**QV:** -
-	Test flags for internal diagnosis			INTEGER	Power On
				-	
Adv, Emb		Emb: 0	0	0xFFFF	2/2

Description

Not intended for user.

1.3 General machine data

Number	Identifier			Display filters	Reference
Unit	Name			Data type	Active
Attributes					
System	Dimension	Default value	Minimum value	Maximum value	Protection

Description:

Description

1.3.1 System settings

10000	AXCONF_MACHAX_NAME_TAB			N01, N11	K2
-	Machine axis name			STRING	POWER ON
-					
-	31	"X1","Y1","Z1","A1", "B1","C1","U1"...	-	-	7/2
710-6a2c	-	"X1","Y1","Z1","A1", "B1","C1"	-	-	-/-
720-6a2c	-	"X1","Y1","Z1","A1", "B1","C1"	-	-	-/-
730-6a2c	-	"X1","Y1","Z1","A1", "B1","C1"	-	-	-/-
840di-basic	-	"X1","Y1","Z1","A1", "B1","C1"	-	-	-/-

Description:

List of the machine axis identifiers.
The name of the machine axis is entered in this MD.
In addition to the fixed, defined machine axis identifiers "AX1", "AX2" ..., user-defined identifiers for the machine axes can also be assigned in this data.
The identifiers defined here can be used parallel to the fixed, defined identifiers for addressing axial data (e.g. MD) and machine axis-related NC functions (reference point approach, axial measurement, travel to fixed stop).

Special cases:
- The input machine axis name must not conflict with the designation and assignment of the geometry axes (MD 20060: AXCONF_GEOAX_NAME_TAB, MD 20050: AXCONF_GEOAX_ASSIGN_TAB) or channel axes (MD 20080: AXCONF_CHA-NAX_NAME_TAB, MD 20070: AXCONF_MACHAX_USED).

- The input machine axis name must not be the same as the names for Euler angles (MD 10620: EULER_ANGLE_NAME_TAB), names for path-relevant orientation (MD 10624: ORIPATH_LIFT_VECTOR_TAB), names for normal vectors (MD 10630: NORMAL_VECTOR_NAME_TAB), names for directional vectors (MD 10640: DIR_VECTOR_NAME_TAB), names for rotator vectors (MD 10642: ROT_VECTOR_NAME_TAB), names for intermediate vector component (MD 10644: INTER_VECTOR_NAME_TAB), names for intermediate circle point coordinates with CIP (MD 10660: INTERMEDIATE_POINT_NAME_TAB) and the names for interpolation parameters (MD 10650: IPO_PARAM_NAME_TAB).

- The input machine axis name must not include any of the following reserved address letters:

```
D Tool offset            (D function)      E Reserved
F Feedrate               (F function)      G Preparatory function
H Auxiliary function     (H function)      L Subroutine call
M Miscellaneous function (M function)      N Subblock
P Subroutine number of passes              R Arithmetic parameters
S Spindle speed          (S function)      T Tool (T function)
```

The name must not include any keywords (e.g. DEF, SPOS etc.) or pre-defined identifiers (e.g. ASPLINE, SOFT).

The use of an axis identifier consisting of a valid address letter (A, B, C, I, J, K, Q, U, V, W, X, Y, Z), followed by an optional numerical extension (1-99) gives slightly better block cycle times than a general identifier.

If no identifier is assigned to a machine axis then the predefined name ("AXn") shall apply to the nth machine axis.

Related to:
MD 20060: AXCONF_GEOAX_NAME_TAB (geometry axis name in the channel [GEOAxisno.]
MD 20080 :AXCONF_CHANAX_NAME_TAB (channel axis name in the channel [Channelaxisno.]

10002	**AXCONF_LOGIC_MACHAX_TAB**			N01	B3
-	Logical NCK machine axis image			STRING	POWER ON
-					
-	31	"AX1","AX2","AX3","AX4","AX5","AX6"...	-	-	3/2

Description:

List of machine axes available on an NCU. (Logical NCK machine axis image)

The MD $MN_AXCONF_LOGIC_MACHAX_TAB creates another NCK global, logical layer between the channel axis layer and the machine axes in an NCU or NCU_Verband. This layer is called the Logic NckMachineAxImage, abbreviation: LAI).

Axes can only be assigned between different NCUs via this new intermediate layer!
The entry $MN_AXCONF_LOGIC_MACHAX_TAB[n] = NCj_AXi assigns the machine axis i on the NCU j to the axis index "n" in the LAI.

This makes the following assignments possible:
1. Local axes (default setting: AX1, AX2 ... AX31)
   The entry $MN_AXCONF_LOGIC_MACHAX_TAB[n] = AX3 assigns the local axis AX3 to axis index n. (Default setting AX3 is present for n = 3 . Thus there is compatibility in software version 5 for MD blocks for software versions up to 4).

2. Link axes (axes that are physically connected to another NCU). The entry $MN_AXCONF_LOGIC_MACHAX_TAB[n] = NCj_AXi assigns axis AXi on NCU j to axis index n (link axis).
Limits:
   n Machine axis address (of the local NCU)1 ... 31
   jNCU number1 ... 16
   iMachine axis address (of the local/remote NCU)1 ... 31

3. Axis container in which there are once again either local or link axes. The entry $MN_AXCONF_LOGIC_MACHAX_TAB[n] = CTr_SLs assigns container r and slot s to axis index n.
Limits:
   nMachine axis address (of the local NCU)1 ... 31
   rContainer number1 ... 16
   sSlot number (location) in the container1 ... 32

The channel layer is formed via the related machine data $MC_AXCONF_MACHAX_USED and no longer points (small P5) directly to the machine axes but to the new LAI layer.

$MC_AXCONF_MACHAX_USED [k]=n assigns the LAI axis number "n" to the axis index "k" in the channel layer.

The machine axis and the corresponding NCK can then be determined from the LAI axis number.

If a number of NCUs point to the same machine axis in the cluster as a result of $MN_AXCONF_LOGIC_MACHAX_TAB, then the axial machine data $MA_AXCONF_ASSIGN_MASTER_NCU must define which NCU generates the master NCU and the setpoint values for the position controller after startup.

Related to:
   AXCT_AXCONF_ASSIGN_TABi (make entries in containers i)

10010	**ASSIGN_CHAN_TO_MODE_GROUP**			N01, N02, N11	K1,IAD
-	Channel valid in mode group			DWORD	POWER ON
-					
-	10	1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	10	7/2
710-6a2c	-	-	-	2	-/-
720-6a2c	-	-	-	2	-/-
730-6a2c	-	-	-	2	-/-
840di-basic	-	-	-	2	-/-
840di-universal	-	-	-	2	-/-

Description:

```
This MD assigns the channel to a mode group
Entry value 1 => Assigned to 1st mode group
Entry value 2 => Assigned to 2nd mode group
etc.
From software version 4, it is permissible not to assign a mode group number
to individual channels.
Channel gaps are allowed, in order to favor uniform configuration in similar
types of machines. In this case, the number 0 is assigned to the channel
instead of assigning a mode group number equal to or greater than 1. The chan-
nel is not activated, however it is handled like an active channel when coun-
ting the channels.
E.g.
ASSIGN_CHAN_TO_MODE_GROUP[0] = 1
ASSIGN_CHAN_TO_MODE_GROUP[1] = 1
ASSIGN_CHAN_TO_MODE_GROUP[2] = 0   ; gap
ASSIGN_CHAN_TO_MODE_GROUP[3] = 1

Application example:
Select desired channel via HMI and enter with ASSIGN_CHAN_TO_MODE_GROUP = 1.

Note:
This MD must still be entered even when only one mode group is present.
```

10050	**SYSCLOCK_CYCLE_TIME**			N01, N05, N11, -	G3
s	System clock cycle			DOUBLE	POWER ON
SFCO					
-	-	0.004	0.000125	0.031	7/2
710-6a2c	-	0.002	0.001	0.008	-/-
720-6a2c	-	0.002	0.001	0.008	-/-
730-6a2c	-	0.002	0.001	0.008	-/-
710-31a10c	-	0.002	0.001	0.008	-/-
720-31a10c	-	0.002	0.001	0.008	-/-
730-31a10c	-	0.002	0.001	0.008	-/-
840di-basic	-	0.002	0.001	0.008	-/-
840di-universal	-	0.002	0.001	0.008	-/-
840di-plus	-	0.002	0.001	0.008	-/-

Description:

```
Basic cycle time of the system software

The cycle times settings of cyclical tasks (position controller/IPO ) are mul-
tiples of this basic cycle. Apart from special applications in which
POSCTRL_SYSCLOCK_TIME_RATIO is set greater than 1, the  basic cycle corres-
ponds to the position controller cycle.

When using a digital drive the basic cycle time and
POSCTRL_SYSCLOCK_TIME_RATIO must be set so that the position controller cycle
time is not longer than 16 ms (otherwise there will be a drive alarm). The set
value may be changed by automatic corrections during startup (alarm).

In the case of systems with a PROFIBUS DP connection, this MD corresponds to
the PROFIBUS DP cycle time. This time is read from the configuration file
(SDB-Type-2000) during startup and written to the MD.
This MD can only be changed via the configuration file.
Note:
    Reducing this MD can result in an automatic correction of
    POSCTRL_CYCLE_DELAY that cannot be undone by a subsequent increase!

Details:
    The basic cycle is incremented in multiples ( SYSCLOCK_SAMPL_TIME_RATIO )
    of units of the measured value sampling cycle. During system startup, the
    entered value is automatically rounded up to a multiple of this incrementa-
    tion.

Note:
    Discrete timer division ratios can give rise to the entered value produ-
    cing a value that is not an integer after a Power OFF/ON.
E.g.:
Input                           = 0.005s
                                after Power OFF/ON  =0.00499840
                      or
Input                           = 0.006s
                                after Power OFF/ON  =0.0060032
```

10059	**PROFIBUS_ALARM_MARKER**			N05	G3
-	Profibus alarm flag (internal only)			BYTE	POWER ON
NBUP, NDLD					
-	-	0	-	-	0/0

Description:

```
Profibus alarm flag:
In this machine data, alarm requests for the Profibus layer are stored beyond
a reboot.
If conflicts arise between machine data 10050, 10060, 10070 and the data in
SDB-Type-2000 on startup, the machine data are matched according to SDB and an
alarm is output on the next start up. These alarm requests are stored here.

Related to:
    SYSCLOCK_CYCLE_TIME,
    SYSCLOCK_SAMPL_TIME_RATIO
```

10060	**POSCTRL_SYSCLOCK_TIME_RATIO**			N01, N05	G3
-	Factor for position control cycle			DWORD	POWER ON
SFCO					
-	-	1	1	31	7/2
840di-basic	-	-	-	-	0/0
840di-universal	-	-	-	-	0/0
840di-plus	-	-	-	-	0/0

Description:

```
The position-control cycle is stated as a multiple of the time units of the
system basic cycle SYSCLOCK_CYCLE_TIME.
The regular setting is 1. The position-control cycle then corresponds to the
system basic cycle SYSCLOCK_CYCLE_TIME.

Setting values > 1 costs computing time for the operating system to calculate
the additional timer interrupts, and should therefore only be used in those
cases in which there is a task in the system that is to run faster than the
position-control cycle.

When using a digital drive, the set value of the position-control cycle can be
changed by automatic corrections during startup. Alarm 4101 "position-control
cycle for digital drives reduced to [ ] ms" is then issued.

In the case of systems with a PROFIBUS DP connection, this MD represents the
ratio between the PROFIBUS DP cycle and the position controller cycle.
```

10061	**POSCTRL_CYCLE_TIME**			N01, N05	G3
-	Position control cycle			DOUBLE	POWER ON
READ					
-	-	0.0	-	-	7/0

Description:

```
Position controller cycle time:
Display of the position controller cycle time (not modifiable !).
It is compiled internally from the machine data SYSCLOCK_CYCLE_TIME and
POSCTRL_SYSCLOCK_TIME_RATIO.
```

10062	**POSCTRL_CYCLE_DELAY**			N01, N05	G3
s	Position control cycle offset			DOUBLE	POWER ON
-					
-	-	0.003	0.000	0.008	7/2
710-6a2c	-	0.0	-	-	-/-
720-6a2c	-	0.0	-	-	-/-
730-6a2c	-	0.0	-	-	-/-
710-31a10c	-	0.0	-	-	-/-
720-31a10c	-	0.0	-	-	-/-
730-31a10c	-	0.0	-	-	-/-
840di-basic	-	0.001550	-	-	-/-
840di-universal	-	0.001550	-	-	-/-
840di-plus	-	0.001550	-	-	-/-

Description:

```
Only relevant for operation with PROFIBUS drives.
NCK position controller cycle offset in relation to the PROFIBUS DP cycle.
Offsets that exceed the DP cycle set or that are smaller than the max. Tdx,
are automatically corrected to a substitute value half the size of the DP
cycle.

MD10062 > 0:Default for position controller offset
MD10062 = 0:Automatic determination of the position controller offset with
max. Tdx from STEP7 project

Tdx_max is determined through all equidistant busses.
The actually active offset value is displayed in MD10063[1].

Note:
    With MD10062 > 0 reducing SYSCLOCK_CYCLE_TIME can result in an automatic
    correction of this MD that cannot be undone by a subsequent increase!

Recommendation:
    In this case set the original value or default value once again.
```

10063	**POSCTRL_CYCLE_DIAGNOSIS**			N01, N05, EXP	-
s	Active timing			DOUBLE	POWER ON
-, READ					
-	3	0.0,0.0,0.0	-	-	7/2

Description:

```
Diagnostic data related to the PROFIBUS DP cycle.
[0]: Latest date at which the actual values must be available (Tdx)
[1]: Actually active position controller cycle offset (Tm)
[2]: Latest date at which the setpoints were output by the position controller
Diagnostic data are initialized with ZERO with each NCK power up
```

10065	**POSCTRL_DESVAL_DELAY**			N01	B3
s	Position setpoint delay			DOUBLE	POWER ON
-					
-	-	0.0	-0.1	0.1	7/2

Description:

```
This MD can parameterize a delay of the setpoints in the position contoller.
The area of application is NCU-link when different position control cycles are
parameterized on the NCUs and if the axes should nevertheless interpolate with
one another. (Used for example for non-circular turning.)
This MD is used to optimize the automatic setting.

Related to:
    $MA_POSCTRL_DESVAL_DELAY_INFO
```

10070	**IPO_SYSCLOCK_TIME_RATIO**			N01, N05, N11, -	G3
-	Factor for interpolation cycle			DWORD	POWER ON
SFCO					
-	-	4	1	100	7/2

Description:

```
The interpolator cycle is stated as a multiple of the time units of the sys-
tem basic cycle SYSCLOCK_CYCLE_TIME.
Only integer multiples of the position control cycle can be set (set in
POSCTRL_SYSCLOCK_TIME_RATIO). Values that are not an integer multiple of the
position control cycle are automatically increased to the next integer mul-
tiple of the position control cycle before they become active (on next power
up).
This is accompanied by alarm 4102 "IPO cycle increased to [ ] ms".
```

10071	**IPO_CYCLE_TIME**			N01, N05, N11, -	G3
-	Interpolator cycle			DOUBLE	POWER ON
READ					
-	-	0.0	-	-	7/0

Description:

```
Interpolation time
Display of the interpolator cycle time (not modifiable !).
It is compiled internally from the machine data SYSCLOCK_CYCLE_TIME and
IPO_SYSCLOCK_TIME_RATIO.
```

10072	**COM_IPO_TIME_RATIO**			N01, N05	-
-	Division ratio between IPO and communication task			DOUBLE	POWER ON
-					
-	-	1.0	0.0	100.0	7/2

Description:

```
Division ratio between IPO and communication tasks. A value of 2 means, e.g.,
that the communication task is only processed in every second IPO cycle. This
makes more time available for the other tasks. Overlarge values slow down the
communication between the HMI and NCK.

Numerical values less than 1 downscale the IPO cycle. This value is adjusted
so that only runtimes that are a multiple of the position controller time are
possible for the communication task. A call period of about 10 ms is practi-
cal for the communication task.
```

10073	**COM_IPO_STRATEGY**			EXP	-
-	Strategy for activation of communication.			DWORD	POWER ON
-					
-	-	0x2B	1	0x7F	0/0

Description:

```
The call frequency of the communication task can be controlled by machine data
COM_IPO_TIME_RATIO.

The communication tasks are activated cyclically. That has some advantages and
disadvantages:

Advantages:
-   The communication behavior of the NCK is deterministic in relation to the
    communication task.
```

Disadvantages:
- The communication task can lead to level overflows.
- In an unloaded NCK system, the speed of communication is determined by machine data COM_IPO_TIME_RATIO. As this machine data is power on it cannot adapt to the current NCK operating mode. A typical problem is that uploading a part program can take a very long time on an unloaded NCK. In this case, the bottleneck is the communication task that only progresses in the relation defined by machine data COM_IPO_TIME_RATIO.

This machine data has been introduced to eliminate the above-mentioned disadvantages. It enables control of the times at which the communication software is activated. The machine data is bit-coded. The bits have the following meanings:

Bit 0:
The communication software is calculated cyclically
Bit 1:
The level time overflow monitoring is switched off for the cyclical communication task. This bit is only useful if bit is set to zero. The task is implemented in a non-cyclical level that has a higher priority than the preparation/communication level. The communication task makes a delay of the time defined in COM_IPO_TIME_RATIO after each cycle.
Bit 2:
The communication software is calculated at the start of the task which the domain services accept.
Bit 3:
The communication software is calculated at the end of the task which the domain services accept.
Bit 4:
The communication software is calculated at the start of the task which the domain services accept if a PDU upload has arrived. This bit is only useful if bit 2 is set.
Bit 5:
The communication software is calculated at the end of the task which the domain services accept if a PDU upload has arrived. This bit is only useful if bit 3 is set.

This machine data is only active in systems containing the Softbus communication software. This is in P6 the 840Di with MCI2 software and the Solutionline systems for P7.

The default value is 0x2B (bit 0,1,3,5). This means that the communication software is calculated cyclically, the level time overflow monitoring is switched off. The communication software is also calculated when a PDU upload arrives. That currently gives the best possible setting. The value 1 would be compatible with the previous versions.

10074	**PLC_IPO_TIME_RATIO**			N01, N05	-
-	Factor of PLC task for the main run.			DWORD	POWER ON
-					
-	-	1	1	50	0/0

Description:

Division ratio between IPO and PLC tasks.
A value of 2 means, e. g. that the PLC task is only processed in every second IPO cycle. This makes more runtime available for the other tasks.

10075	**PLC_CYCLE_TIME**			N01, N05	-
-	PLC cycle time			DOUBLE	POWER ON
READ					
-	-	0.0	-	-	1/1

Description:

```
Display of the PLC cycle time (not modifiable !)
It is compiled internally from the machine data IPO_CYCLE_TIME and
PLC_IPO_TIME_RATIO.
```

10080	**SYSCLOCK_SAMPL_TIME_RATIO**			EXP, N01	G3
-	Division ratio for actual value recording cycle time			DWORD	POWER ON
-					
-	-	5	1	31	0/0

Description:

```
SYSCLOCK_SAMPL_TIME_RATIO sets the division factor of a cycle divider
that is arranged as hardware between the cycle of the measured value sampling
and the interrupt controller.
-   The sampler cycle (upstream of the divider) taps the actual value inputs and
    triggers the digital analog converter.
-   The output of the divider generates a timer interrupt as the basic cycle of
    the
operating system ( SYSCLOCK_CYCLE_TIME ).
A value greater than 1 may only be entered in SYSCLOCK_SAMPL_TIME_RATIO in
exceptional cases:
Values > 1 increase the size of the increments in which the basic cycle can be
set. ( see SYSCLOCK_CYCLE_TIME )

Special cases:
1.  When using the conventional drive interface ( analog speed interface ), the
divider is set according to the following criteria:
    It is advantageous for the control to keep the dead time between reading in
    the current axis actual positions and outputting the corresponding set-
    point values as short as possible. The delay time of the position control-
    ler output can be set in fractions of the position control cycle time by
    setting SYSCLOCK_SAMPL_TIME_RATIO to values > 1. The difficulty with this
    is reliably determining the time after which the position controller deli-
    vers valid results. Multiple triggering of the input/output hardware during
    one position controller cycle could also be achieved by setting
    POSCTRL_SYSCLOCK_TIME_RATIO to values > 1. However, the disdvantage with
    this is the unnecessarily high rate of generating timer interrupts for the
    operating system. This procedure is not recommended.
2.  When using the digital drive controller the division factor is set auto-
matically. The sample cycle time is then set as the 1, 2, 3, ... 8-fold of
125µs.

The 611D drive can synchronize its own clock generation with these values.
```

10082	**CTRLOUT_LEAD_TIME**			EXP, N01, -	K3
%	Shift of setpoint transfer time			DOUBLE	POWER ON
-					
-	-	0.0	0.0	100.0	7/2

Description:

```
Lead time for outputting speed setpoints.
The larger the value entered, the sooner the drive accepts the speed set-
points.
-    0 % Setpoints are accepted at the beginning of the next position control
    cycle.
-    50 % Setpoints are already accepted after execution of half of the position
    control cycle.
A lead time that is useful for practical purposes can be determined only by
measuring the maximum position control calculating time.
MD 10083: CTRLOUT_LEAD_TIME_MAX suggests a value measured by the control. As
this is a net value, it is advisable for the user to make a reduction for
safety of, for example, 5 %.

If lead times that are too high are input, this can cause output of drive
alarm 300506.
The input value is rounded down to the next speed controller cycle in the
drive.
If the speed controller cycle settings of the drives are different, changing
the value will not necessarily lead to the same degree of  improvement of
closed-loop control properties for all configured drives.

Note:
    This MD is relevant only to axes with digital drives.

Related to:
    MD 10083: CTRLOUT_LEAD_TIME_MAX
```

10083	**CTRLOUT_LEAD_TIME_MAX**			EXP, N01	K3
%	Max. settable offset of setpoint transfer time			DOUBLE	NEW CONF
-					
-	-	100.0	0.0	100.0	7/2

Description:

```
Maximum permissible lead time for outputting speed setpoints on the SIMODRIVE
611D.
MD 10083 is a setting aid for MD 10082.
The displayed value can be accepted, with a reduction for safety, directly
into MD 10082.
The permissible lead time is determined from the maximum measured CPU time
requirement of the position controller. It reduces as the CPU time require-
ment of the position controller increases.
Reducing the position controller sampling rate via MD 10060 or 10050 also
leads to a reduction of the permissible lead time.
```

The lead time is measured during the entire period of operation. The displayed value can only be increased by manual input.
If the entered lead time is greater than the permissible value (e.g. 100 %) a new determination is made automatically.
Note:
This MD is relevant only to axes with digital drives.

Related to:
MD 10050: SYSCLOCK_CYCLE_TIME (system clock cycle)
MD 10060: POSCTRL_SYSCLOCK_TIME_RATIO (factor for position control cycle)
MD 10082: CTRLOUT_LEAD_TIME

10088	**REBOOT_DELAY_TIME**			EXP	-
s	Reboot delay			DOUBLE	SOFORT
-					
-	-	0.2	0.0	1.0	2/2

Description:

The reboot following PI "_N_IBN_SS" is delayed by the time $MN_REBOOT_DELAY_TIME.

The suppressable NOREADY alarm 2900 is activated immediately with PI "_N_IBN_SS".

If $MN_REBOOT_DELAY_TIME falls below the $MA_SERVO_DISABLE_DELAY_TIME value of an axis, the axis is decelerated during $MN_REBOOT_DELAY_TIME. The servo enable is disabled afterwards, i.e. the full $MA_SERVO_DISABLE_DELAY_TIME is NOT waited.

Alarm 2900 does not become active with $MN_REBOOT_DELAY_TIME = 0.0 and there is no reboot delay.

The NCK waits beyond the stated delay time until the PI has been able to be acknowledged to the HMI. The delay time may total up to 2 s.

10089	**SAFE_PULSE_DIS_TIME_BUSFAIL**			N01, N06, -	FBSI
s	Delay time pulse suppr. for bus failure			DOUBLE	POWER ON
-					
-	-	0.0	0	0.8	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Time after the failure of the drive bus at which safe pulse disable takes place. The drive can still respond autonomously to the bus failure during this time (see extended stop and retract)

This time is not waited before disabling pulses in the following cases:

- On selection of an external Stop A, a test stop or a test stop external switch off
- If SBH is active or on selection of SBH

- A pulse disable is parameterized immediately if an SG stage is active or on selection of an SG stage for which an immediate pulse disable is parameterized in $MA_SAFE_VELO_STOP_MODE or $MA_SAFE_VELO_STOP_REACTION.

Note:
$MN_SAFE_PULSE_DIS_TIME_BUSFAIL is transferred to the drive MD 1380 with the copy function of the SI-MD and compared in the data cross-check. This general machine data is contained in the axial checksum calculation of the safety relevant machine data ($MA_SAFE_ACT_CHECKSUM, $MA_SAFE_DES_CHECKSUM).

10090	**SAFETY_SYSCLOCK_TIME_RATIO**			N01, N06, -	FBSI
-	Factor for monitoring cycle			DWORD	POWER ON
SFCO					
-	-	3	1	50	7/1
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Ratio between the monitoring cycle and the system clock cycle. The monitoring cycle is the product of this data and $MN_SYSCLOCK_CYCLE_TIME.

Special cases:
The monitoring cycle is checked during power on:
- It must be an integer multiple of the position-control cycle
- It must be < 25 ms

The factor is rounded down to the next possible value if the conditions are not fulfilled. The actual set monitoring cycle is displayed by $MN_INFO_SAFETY_CYCLE_TIME.

A new value is also generated for the cross-check cycle, which is displayed by data $MN_INFO_CROSSCHECK_CYCLE_TIME.

Note:
The monitoring cycle defines the monitoring response time. It must be noted that the CPU load increases as the monitoring cycle becomes shorter.

Related to:
MD 10050: $MN_SYSCLOCK_CYCLE_TIME
MD 10091: $MN_INFO_SAFETY_CYCLE_TIME
MD 10092: $MN_INFO_CROSSCHECK_CYCLE_TIME

10091	**INFO_SAFETY_CYCLE_TIME**			N01, N06, N05, -	FBSI
s	Display of monitoring cycle time			DOUBLE	POWER ON
READ					
-	-	0.0	-	-	7/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Display data: Displays the actually active monitoring cycle. The data cannot
be written.

The data value is recalculated as soon as one of the following data are chan-
ged:
SAFETY_SYSCLOCK_TIME_RATIO,
POSCTRL_SYSCLOCK_TIME_RATIO
SYSCLOCK_CYCLE_TIME
The new value does not become active until after the next Power On.

Related to:
    MD 10090: $MN_SAFETY_SYSCLOCK_TIME_RATIO
```

10092	**INFO_CROSSCHECK_CYCLE_TIME**			N01, N06, N05, -	FBSI
s	Display of cycle time for cross-checking			DOUBLE	POWER ON
READ					
-	-	0.0	-	-	7/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Display data: Maximum cross-checking cycle in seconds.
Derived from INFO_SAFETY_CYCLE_TIME and the number of data to be cross-che-
cked (this may vary according to the type of drive used for the individual
axes).

The data value is recalculated as soon as one of the following data are chan-
ged:
SAFETY_SYSCLOCK_TIME_RATIO,
POSCTRL_SYSCLOCK_TIME_RATIO
SYSCLOCK_CYCLE_TIME
The new value does not become active until after the next Power On.

Related to:
    MD 10090: $MN_SAFETY_SYSCLOCK_TIME_RATIO
    MD 36992: $MA_SAFE_CROSSCHECK_CYCLE
```

10093	**INFO_NUM_SAFE_FILE_ACCESS**			EXP, N06, N05, -	FBSI
-	Number of SPL file accesses			DWORD	POWER ON
READ					
-	-	0	-	-	0/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Display data: SPL file /_N_CST_DIR/_N_SAFE_SPF has been accessed n-times in a
protected state. This MD is intended for service purposes only. The MD can
only take the values 0 and 1. The value cannot be changed.
```

10094	**SAFE_ALARM_SUPPRESS_LEVEL**			EXP, N06, N05, -	FBSI
-	Alarm suppress level			BYTE	POWER ON
-					
-	-	2	0	13	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Affects the display of safety alarms. The monitoring channels NCK and 611D or
NCK and PLC display alarms with the same meaning in several situations.
To reduce the volume of the alarm display, this MD is set to define whether
safety alarms with the same meaning are to be hidden or not. This does affect
the dual-channel stop response.
0 =
    Dual-channel triggered alarms are displayed in full
-   Dual-channel display of all axial safety alarms
-   Alarm 27001, error code 0 is displayed
-   Alarms 27090, 27091, 27092, 27093 and 27095 are dual-channel and displayed
    several times.
1 =
    Alarms with the same meaning are only displayed once
    This includes the following alarms:
    27010 = 300907
    27011 = 300914
    27012 = 300915
    27013 = 300906
    27020 = 300910
    27021 = 300909
    27022 = 300908
    27023 = 300901
    27024 = 300900
```

In the case of these alarms, only one of the alarms listed (270xx or 3009xx) is displayed. The alarm of the monitoring channel that later triggers the alarm with the same meaning is no longer displayed.
Furthermore, alarm 27001 with error code 0 is suppressed.
This alarm is triggered as a result of drive alarm 300911. In this case, drive MDs 1391, 1392, 1393, 1394 give further explanations of the cause of the error.

2 =
Default: In addition to the functionality with MD value = 1, the alarms from the SPL processing (27090, 27091, 27092, 27093 and 27095) are displayed in one channel and only once.
This also applies to the alarms for PROFIsafe communication (27250 and subsequent). This machine data must be set to 0 to create an acceptance log, so that the triggering of all alarms can be logged.

3 =
Axial alarms 27000 and 300950 are replaced by alarm message 27100 for all axes/drives.

12 =
The alarms are prioritized beyond the functionality with MD value = 2.
Obvious subsequent alarms are no longer displayed or automatically deleted from the display.
The following alarms can be affected by this:
27001, 27004, 27020, 27021, 27022, 27023, 27024, 27091,
27101, 27102, 27103, 27104, 27105, 27106, 27107

13 =
The alarms are prioritized beyond the functionality with MD value = 3 as for MD value 12.

The machine data must be set to 0 to create an acceptance log, so that the triggering of all alarms can be logged.

10095	**SAFE_MODE_MASK**			EXP, N05, -	FBSI
-	'Safety Integrated' operating modes			DWORD	POWER ON
-					
-	-	0	0	0x0001	7/2
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Bit 0 = 0: the system variables $A_INSI[1...64] have the default "0".
Bit 0 = 1: the system variables $A_INSI[1...64] have the default "1".

The default is made in 32 bit groups, and only if an axial SGA has been parameterized on at least one of the system variables in this group.
(Compatibility mode for older PLC software versions)
These functions are only supported on one channel by the NCK. This data is not included in the calculation of the axial MD check sum SAFE_ACT_CHECKSUM.

10096	**SAFE_DIAGNOSIS_MASK**			EXP, N06, N05, -	FBSI
-	'Safety Integrated' diagnosis functions			DWORD	NEW CONF
-					
-	-	1	0	0x0003	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Bit 0 = 0:
    SGE differences between NCK and 611D digital monitoring channel are not
    displayed
Bit 0 = 1:
    Default: SGE differences between NCK and drive monitoring channel are dis-
    played. Differences between the following SGEs are displayed (the bit num-
    bers stated refer to the axial map of the SGEs, they correspond to the
    assignment of the axial VDI interface):

Bit  0:  SBH/SG deselection  = DB3<x>.DBX22.0
Bit  1:  SBH deselection  = DB3<x>.DBX22.1
Bit  3:  SG selection, bit 0 = DB3<x>.DBX22.3
Bit  4:  SG selection, bit 1 = DB3<x>.DBX22.4
Bit 12:  SE selection  = DB3<x>.DBX23.4
Bit 28:  SG override, bit 0 = DB3<x>.DBX33.4
Bit 29:  SG override, bit 1 = DB3<x>.DBX33.5
Bit 30:  SG override, bit 2 = DB3<x>.DBX33.6
Bit 31:  SG override, bit 3 = DB3<x>.DBX33.7

The differences are displayed by message alarm 27004.

Bit 1 = 0: Default: Display of a non-executed SPL start after expiry of the
timer defined in MD SAFE_SPL_START_TIMEOUT
          with alarm 27097
Bit 1 = 1: Display of alarm 27097 is suppressed

    Alarm 27097 indicates, that despite the SPL configuration an SPL start has
    not been executed after expiration of the time specified in MD
    SAFE_SPL_START_TIMEOUT. For reasons, see alarm description 27097.
```

10097	**SAFE_SPL_STOP_MODE**			N01, N06, -	FBSI
-	Stop reaction for SPL errors			BYTE	POWER ON
-					
-	-	3	3	4	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Selection of the stop response when the NCK / PLC SPL cross-check detects
errors.

3: Stop D
4: Stop E

Entering the value 4 in this MD (Stop E) leads to alarm 27033, "Axis %1 Para-
meterization of MD MN_SAFE SPL STOP MODE is invalid" unles external Stop E is
enabled in all axes with SI function enable ($_MA_SAFE_FUNCTION_ENABLE is not
equal to 0).
As a remedy, either Stop D must be parameterized, or bits 4 and 6 must be set
in $MA_SAFE_FUNKTION_ENABLE for all affected axes.
If this MD is set to 4, DBX36.1 must also be set to 1 in DB18 to make this
parameterization known to the PLC. A different parameterization leads to alarm
27909, "Error in NCK / PLC data cross check"
```

10098	**PROFISAFE_IPO_TIME_RATIO**			N01, N06, -	FBSI
-	Factor for PROFIsafe communication			DWORD	POWER ON
SFCO					
-	-	1	1	25	7/1
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Ratio between PROFIsafe communication and interpolator cycle. The actual PRO-
FIsafe communication cycle is the product of this data and IPO_CYCLE_TIME, and
is displayed in MD INFO_PROFISAFE_CYCLE_TIME. The OB40 on the PLC side is
triggered from the NCK side in this cycle to run the communication between F
master and F slaves.
The PROFIsafe communication must not exceed 25 ms.
```

10099	**INFO_PROFISAFE_CYCLE_TIME**			N01, N06, N05, -	FBSI
s	PROFIsafe communication cycle time			DOUBLE	POWER ON
READ					
-	-	0.0	-	-	7/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Display data: Time frame in which F master and F slave communicate with one another. The value results from the interpolator cycle and $MN_PROFISAFE_IPO_TIME_RATIO. The value cannot be changed. The PROFIsafe communication via the OB40 on the PLC runs in this time frame.

10100	**PLC_CYCLIC_TIMEOUT**			EXP, N01, N06	P3
s	Maximum PLC cycle time			DOUBLE	POWER ON
-					
-	-	0.1	-	-	7/2

Description:

Cyclical PLC monitoring time.
This machine data specifies the maximum monitoring time after which the PLC must have incremented its sign of life. Incrementing takes place within the interpolation cycles.

10110	**PLC_CYCLE_TIME_AVERAGE**			N01, N07	B1
s	Average PLC acknowledgement time			DOUBLE	POWER ON
-					
-	-	0.05	-	-	7/2

Description:

Time information for the CNC about the OB1 cycle time. During this cycle time, it is guaranteed that the auxiliary functions will be acknowledged.
By means of the MD, the status transitions:
"channel operates/ channel in RESET/ channel failure --> channel interrupted" can be delayed for the PLC in case of a RESET. With the output "channel interrupted", the NCK waits at least the time indicated in the MD + 1 IPO cycle.

With the time indication, the path feedrate during path control operation in case of an auxiliary function output during motion is controlled in a way to ensure that the minimum travel time corresponds to the time information. This ensures a uniform velocity behavior which is not disturbed by waiting for the PLC acknowledgement. The internal incrementation is performed in the interpolation cycle.
For the auxiliary function output in the continuous-path mode, the MD is also relevant for the FM357 and 802/802s systems. With SW 5.1 and higher, the other systems are parameterized directly via the PLC.

10120	**PLC_RUNNINGUP_TIMEOUT**			EXP, N01, N06	H2
s	Monitoring time for PLC power up			DOUBLE	POWER ON
-					
-	-	50.0	-	-	7/2

Description:

```
Power up PLC monitoring time
This machine data specifies the maximum monitoring time within which the PLC
must report its first sign of life to the NCK. During the power up routine,
the monitoring function has the task of verifying that the PLC has properly
assumed cyclic operation. If the PLC does not issue a message within this
time, the NC issues an alarm message when it powers up; NC-READY is not set.
The incrementing takes place within the interpolation cycles.
```

10130	**TIME_LIMIT_NETTO_COM_TASK**			EXP, N01	OEM
s	Runtime limitation of communication to HMI			DOUBLE	POWER ON
-					
-	-	0.005	.001	0.100	7/1

Description:

```
Net runtime limit of the communication sub-task
Preprocessing and the communications task share the time that is not used up
by the cyclical tasks. Of this remaining time, communication uses the set time
at the expense of preprocessing time; in other words, the net block cycle time
is increased by the set value. This machine data serves the purpose of optimi-
zing the block cycle time with the function "Reloading part programs block-by-
block".
```

10131	**SUPPRESS_SCREEN_REFRESH**			EXP	A2
-	Screen refresh response under overload			BYTE	POWER ON
-					
-	-	0	0	2	7/2

Description:

```
There are part programs in which the main run (HL) has to wait until the pre-
processing (VL) makes new blocks available.
The pre-processing and display update compete for NC computing time. The MD
defines how the NC is to respond when the pre-processing is too slow.

0:  When the VL of a channel is too slow, the updating of the display is sup-
pressed in all channels.
1:  When the VL of a channel is too slow, the updating of the display is sup-
pressed only in the time-critical channels in order to gain time for the pre-
processing.
2:  The updating of the display is never suppressed.
```

10132	**MMC_CMD_TIMEOUT**			EXP, N01, N06	PA,M4
s	Monitoring time for HMI command in the part program			DOUBLE	POWER ON
-					
-	-	3.0	0.0	100.0	7/2

Description:

Monitoring time in seconds until the HMI acknowledges a command from the part program.

The following times are monitored:
- In the case of an HMI command without acknowledgement: time from triggering the transfer of the command string until successful transmission to the HMI
- In the case of an HMI command with synchronous and asynchronous acknowledgement: time from triggering the transfer of the command strings until receipt of the acceptance acknowledgement from the HMI
- For EXTCALL command and execution from external drives: time between the transmission triggering of the command string and the successful sending to the HMI.

10134	**MM_NUM_MMC_UNITS**			EXP, N01, N02	B3
-	Possible number of simultaneous HMI communication partners			DWORD	POWER ON
-					
-	-	6	1	10	2/2

Description:

Possible number of simultaneous HMI communication partners with which the NCU can exchange data.
This value affects then number of communication orders that the NCK can manage. The higher the value, the more HMIs that can be simultaneously connected to the NCK without leading to communication problems.

DRAM is made available for this function in the NCU corresponding to the input in the machine data. The inputs for changing the memory areas have to be taken into account.
The unit of MD 10134 is a "resource unit".
A standard OP030 needs 1 resource unit, an HMI100/103 needs 2. OEM variants may need more or less resources.

- If the value is set lower than would be needed for the number of connected HMIs, this is not inevitably problematical. Actions may not function sporadically during multiple, simultaneous, communication-intensive operations (e.g. loading a program): Alarm 5000 is displayed. The operation then has to be repeated.

- If the value is et higher, more dynamic memory is occupied than necessary. The value should be reduced appropriately if the memory is required for other purposes.

References: /FB/, S7, "Memory Configuration"

10136	**DISPLAY_MODE_POSITION**			N01	-
-	Display mode for actual position in the WCS			DWORD	RESET
-					
-	-	0	0	1	7/1

Description:

Defines how the position and the distance to go are displayed in the WCS.
0: Display as in software version 5 and earlier
1: At end of block, the actual value display is in principle the same as the programmed end point, irrespective of where the machine actually is (e.g. as a result of the tool radius compensation). The distance to go is the same as the actual distance to be traversed. This means that the displayed actual postion has to be the same as the displayed end position minus the distance to go, irrespective of the actual machine position. If the block end points are changed by chamfers, radii, contour definitions, splines or SAR in comparison to the NC programm, then these changes are reflected in the display as if thay had been programmed. This does not apply to changes resulting from tool radius compensation or smoothing.

10140	**TIME_LIMIT_NETTO_DRIVE_TASK**			EXP, N01	ECO
s	Runtime limit of drive communications sub-task			DOUBLE	POWER ON
-					
-	-	0.02	.001	.5	7/1

Description:

Net runtime limit of the drive communication sub-task
The preprocessing and the communications tasks (drive communication and domain service) share the time that is not used up by the cyclical tasks.

10150	**PREP_DRIVE_TASK_CYCLE_RATIO**			EXP, N01	ECO
-	Factor for communication with drive			DWORD	POWER ON
-					
-	-	2	1	50	7/1

Description:

This machine data specifies the division ratio used for activation of the drive communication task in the non-cyclic time level. This allows the time share of preparation in the non-cyclic time level to be increased, which reduces block cycle times. Communication with the digital drives is slowed down in particular during program execution.

10160	**PREP_COM_TASK_CYCLE_RATIO**			EXP, N01	ECO
-	Factor for communication with HMI			DWORD	POWER ON
-					
-	-	3	1	50	7/1

Description:

This machine data specifies the division ratio used for activating the communication task in the non-cyclic time level. This allows the time share of preparation in the non-cyclic time level to be increased, which reduces block cycle times. External communication (file transfer) is slowed down in particular during program execution (block reload).

10161	**COM_CONFIGURATION**			EXP, N01	-
-	Configuration of communication			DWORD	POWER ON
-					
-	8	5, 5,18, 1,16, 8,18,18	-	-	0/0

Description:

Values 1-3 define the maximum number of PDUs that are accepted in one pass.
Value 0 stands for infinite, i.e. all present jobs are executed immediately.
These three values become active after PowerOn.
1st value: max. number of variable job PDUs executed per pass.
2nd value: max. number of PI job PDUs executed per pass.
3rd value: max. number of domain job PDUs executed per pass.

Values 4-8 define the credit assignment for optimized download.

4th value: number of PDUs that are assigned as credit at the begin of acknowledgement under opt. domain service (here, the file header and therefore the file on NCK are still unknown)
5th value: number of PDUs that will be requested by default under opt. domain service, if there is no explicit memory limit for the file
6th value: min. number of PDUs that are requested with the data request message (so that data request messages are not displayed again and again)
7th value: max. number of PDUs that are requested with the data request message (max. value is 255, as the log cannot handle more than that!)
8th value: max. number of PDUs that may be present in total

10185	**NCK_PCOS_TIME_RATIO**			EXP, N01	-
-	Processing time share NCK			DWORD	POWER ON
-					
-	-	100	0	100	0/0
710-6a2c	-	65	10	90	7/2
720-6a2c	-	65	10	90	7/2
730-6a2c	-	65	10	90	7/2
710-31a10c	-	65	10	90	7/2
720-31a10c	-	65	10	90	7/2
730-31a10c	-	65	10	90	7/2
840di-basic	-	50	10	75	7/2
840di-universal	-	50	10	75	7/2
840di-plus	-	50	10	75	7/2

Description:

This machine data defines the maximum proportion of CPU time given to the NCK in a PC-based system. The division specified by the user is implemented as well as possible.
When implementing the specification, the system takes into account limiting values for the absolute proportion of CPU time that must not be over or undershot.
Adaptations are made without generating an alarm.

10190	**TOOL_CHANGE_TIME**			N01	BA
-	Tool changing time for simulation			DOUBLE	POWER ON
-					
-	-	0.	-	-	7/2

Description:

This data defines how much time is estimated for a tool change (only relevant for a simulation).

10192	**GEAR_CHANGE_WAIT_TIME**			N01	S1
s	Gear stage change waiting time			DOUBLE	POWER ON
-					
-	-	10.0	0.0	1.0e5	7/2

Description:

External events which trigger reorganization, wait for the end of a gear stage change. GEAR_CHANGE_WAIT_TIME now determines the waiting time for the gear stage change. Time unit in seconds.
When this time expires without the gear stage change having been terminated, the NCK reacts with an alarm.
Among others, the following events will cause reorganization:
User ASUB
Mode change
Delete distance-to-go
Axis replacement
Activate user data

10200	**INT_INCR_PER_MM**			N01	G2
-	Calculation resolution for linear positions			DOUBLE	POWER ON
-					
-	-	1000.	1.0	1.0e9	7/2

Description:

```
MD: INT_INCR_PER_MM defines the number of internal increments per millimeter.
Internal calculation accuracy for linear positions.
The internal representation of linear positions and their time derivation is
scaled in "internal calculation accuracies" and IPO cycles.

The accuracy of the input of linear positions is limited to the calculation
accuracy by rounding the product of the programmed value and the calculation
accuracy to an integer. In order to keep the executed rounding easily under-
standable it is useful to use powers of 10 for the calculation accuracy.
```

10210	**INT_INCR_PER_DEG**			N01	G2
-	Calculation resolution for angular positions			DOUBLE	POWER ON
-					
-	-	1000.0	1.0	1.0e9	7/2

Description:

```
INT_INCR_PER_DEG defines the number of internal increments per degree. The
internal calculation accuracy for angular positions. The internal representa-
tion of angular positions and their time derivation is scaled in "internal
calculation accuracies" and IPO cycles. The accuracy of the input of angular
positions is limited to the calculation accuracy by rounding the product of
the programmed value and the calculation accuracy to an integer.
In order to keep the executed rounding easily understandable it is useful to
use powers of 10 for the calculation accuracy.

Application example: The calculation accuracy can be changed to >1000 incr./
degree for a  high-resolution rotary axis.
```

10220	**SCALING_USER_DEF_MASK**			EXP, N01	G2
-	Activation of scaling factors			DWORD	POWER ON
SCAL					
-	-	0x200	0	0x3FFF	7/2

Description:

```
Bit mask for selecting the base values for the data (e.g. machine and setting
data) that have a physical unit, they are interpreted in the default units
shown below according to the basic system (metric/inch). If other input/out-
put units are to be selected for individual physical units then these are
activated with the scale factors associated with this machine data (entered in
MD 10230: SCALING_FACTORS_USER_DEF[n]).
This does not affect the programming of geometry and feed values.
```

Bit set:
Data of the assigned physical variable (see list) are scaled to the unit defined by MD: SCALING_FACTORS_USER_DEF[n].

Bit not set:
Data of the assigned physical variable are scaled to the default unit shown below.

Assigned physical variable	Default units for: MD 10240: SCALING_SYSTEM_IS_METRIC	
Bit no. (Stated as hex value)	1 = METRIC	0 = INCH
0 Linear position	1 mm	1 inch
1 Angular position	1 degree	1 degree
2 Linear velocity	1 mm/min	1 inch/min
3 Angular speed	1 rpm	1 rpm
4 Linear acceleration	1 m/s^2	1 $inch/s^2$
5 Angular acceleration	1 rev/s^2	1 rev/s^2
6 Linear jerk	1 m/s^3	1 $inch/s^3$
7 Angular jerk	1 rev/s^3	1 rev/s^3
8 Time	1 s	1 s
9 Position-controller servo gain	1/s	1/s
10 Revolutional feedrate	1 mm/rev	1 mm/rev
11 Compensation value linear pos.	1 mm	1 mm
12 Compensation value angular pos.	1 degree	1 degree
13 Cutting rate	1 m/min	1 feet/min

Example:
SCALING_USER_DEF_MASK =?H3?; (Bit nos. 0 and 1 as hex values)
The scale factor defined in the associated MD: SCALING_FACTORS_USER_DEF[n] is activated for linear and angular positions.
If this machine data is changed, a startup is required as otherwise the associated machine data that have physical units would be incorrectly scaled.
Proceed as follows:

- MD changed manually
  First start up and then enter the associated machine data with physical units.
- MD changed via machine data file
  First start up and then reload the machine data file so that the new physical units are taken into account.

If the machine data are altered, alarm 4070 "Scaling machine data altered" is output.

Application example: Input/output of linear velocities is to be in cm/min:
SCALING_USER_DEF_MASK = 0x4 (bit no. 2 as hex value)
SCALING_FACTORS_USER_DEF[2] = 0.1666666667 (10/60)

[Related to:
MD 10230: SCALING_FACTORS_USER_DEF[n] (scaling factors of the physical variables)

10230	SCALING_FACTORS_USER_DEF			EXP, N01	G2
-	Scaling factors of physical variables			DOUBLE	POWER ON
SCAL					
-	15	1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0...	1e-9	-	7/2

Description:

The scale factor of a physical variable that has a unit other than the default unit setting (set bit in MD 10220: SCALING_FACTORS_USER_DEF_MASK) is entered in this MD. The factor must refer to the unit used internally for the physical variable in question.

Index [n]	Assigned physical variable	Internal unit
0	Linear position	1 mm
1	Angular position	1 degree
2	Linear velocity	1 mm/s
3	Angular speed	1 degree/s
4	Linear acceleration	1 mm/s²
5	Angular acceleration	1 degree/s²
6	Linear jerk	1 mm/s³
7	Angular jerk	1 degree/s³
8	Time	1 s
9	Position-controller servo gain	1/s
10	Revolutional feedrate	1 mm/degree
11	Compensation value linear position	1 mm
12	Compensation value angular position	1 degree
13	Cutting rate	1 mm/s

The scaling factor is assigned to the physical variable using the index [0...12]. If this machine data is changed, a startup is required because otherwise the associated machine data that have physical units would be incorrectly scaled.

Proceed as follows:
- MD changed manually
  First start up and then enter the associated machine data with physical units.
- MD changed via machine data file
  First start up and then reload the machine data file so that the new physical units are taken into consideration.

If the machine data are altered, alarm 4070 "Scaling machine data altered" is output.

Application example(s):
Input/output of angular speeds is to be in new degree/min:
SCALING_FACTORS_USER_DEF_MASK = 'H8'; (bit no. 3 as hex value)
SCALING_FACTORS_USER_DEF[3] = 0.01851852; (400/360/60)
[3]: Index for angular speed.

Related to:
MD 10220: SCALING_USER_DEF_MASK (activation of scaling factors).

10240	**SCALING_SYSTEM_IS_METRIC**			N01	G2
-	Basic system metric			BOOLEAN	POWER ON
SCAL					
-	-	TRUE	-	-	7/2

Description:

```
The MD defines the basic system used by the control for scaling length-depen-
dent physical variables for data input/output.
All corresponding data are stored internally in the basic units of 1 mm, 1
degree and 1 sec.
In the case of access from the interpreter ( part program and download ), from
the operator panel ( variable service ) or through external communication,
scaling takes place in the following units:
SCALING_SYSTEM_IS_METRIC = 1: scaled in:
                                          mm,
                                          mm/min,
                                          m/s ² ,
                                          m/s ³,
                                          mm/rev.
SCALING_SYSTEM_IS_METRIC = 0: scaled in:
                                          inch,
                                          inch/min,
                                          inch/s ²,
                                          inch/s ³,
                                          inch/rev.
The selection of the basic system also defines the interpretation of the pro-
grammed F value for linear axes:
                   metric                 inch
G94                mm/min                 inch/min
G95                mm/rev.                inch/rev.
If this machine data is changed, a startup is required because otherwise the
associated machine data that have physical units would be incorrectly scaled.
Proceed as follows:
-   MD changed manually
    First start up and then enter the associated machine data with physical
    units.
-   MD changed via machine data file
    First start up and then reload the machine data file so that the new physi-
    cal units are  taken into consideration.
If the machine data are altered, alarm 4070 "Scaling machine data altered" is
output.

Application example(s):
Startup in the metric system and then change to inch system.

Special cases, errors:
The factor used for changing from 1 mm to 1 inch can be changed with MD 10250:
SCALING_VALUE_INCH.
```

10250	**SCALING_VALUE_INCH**			EXP	G2
-	Conversion factor for INCH			DOUBLE	POWER ON
SCAL					
-	-	25.4	1e-9	-	0/0

Description:

```
The MD contains the conversion factor from metric to inch.
This factor is only active with the selection of the non-metric basic system
(MD 10240: SCALING_SYSTEM_IS_METRIC = 0) in the following conversions:
-   Programmed F values for linear axes
-   Input/output of lengths and length-dependent data (e.g. when uploading ma-
    chine data, work offsets)
Programmed geometry axis positions are converted by this factor when the
measuring system programmed with G70/G71 is different from the selected basic
system (SCAL-ING_ SYSTEM_IS_METRIC).

Programmed synchronous axis positions are converted by the corresponding axial
factors (MD 31200: SCALING_FAKTOR_G70_G71) when the measuring system program-
med with G70/G71 is different from the selected basic system (SCALING_SYS-TEM_
IS_METRIC). Settings other than the default 25.4 should only be made in excep-
tional cases as the correct display of the unit on the operator interface
depends on this value.
If this machine data is changed, a startup is required because otherwise the
associated machine data that have physical units would be incorrectly scaled.
Proceed as follows:
-   MD changed manually
    --> Start up and then enter the associated machine data with physical
    units.
-   MD changed via machine data file
    -->Start up and then reload the machine data file so that the new physical
    units are  taken into consideration.
If the machine data are altered, alarm 4070 "Scaling machine data altered" is
output.

Application example(s):
This conversion factor is used if a changeover is made from metric to inch or
a customized measuring system after startup. Then all the input machine data,
among other things, are converted by this factor. The converted values are
then given at the next read out and on the operator panel.

Related to:
    MD 10240: SCALING_SYSTEM_IS_METRIC
```

10260	**CONVERT_SCALING_SYSTEM**			EXP	A3,G2
-	Enable basic system conversion			BOOLEAN	POWER ON
LINK					
-	-	FALSE	-	-	1/1

Description:

```
Determines the handling of MD10240 $MN_SCALING_SYSTEM_IS_METRIC.
0:  Inch/metric behavior conforms to SW1-SW4
1:  Inch/metric behavior from SW5
Inch/metric functionality of SW5:
1.  Switch over the systems of units with HMI softkey
2.  New G codes G700/G710
3.  Data backup with system of unit recognition INCH/METRIC
4.  Automatic data conversion on change of system of units
-   All zero point offsets
-   Compensation data (EEC, QEC)
-   Tool offsets
-   etc.
The change from $MN_CONVERT_SCALING_SYSTEM leads to alarm 4070!
This alarm is designed to indicate that data which remain active after a
POWERON are not subjected to automatic conversion from SW1-SW4 and SW5 for-
mats.
```

10270	**POS_TAB_SCALING_SYSTEM**			N01, N09	T1
-	System of units of position tables			BYTE	RESET
-					
-	-	0	0	1	7/2

Description:

```
Defines the measuring system for the positional data for the following machine
data
MD10910 INDEX_AX_POS_TAB_1
MD10930 INDEX_AX_POS_TAB_2
MD41500 SW_CAM_MINUS_POS_TAB_1
MD41501 SW_CAM_PLUS_POS_TAB_1
MD41502 SW_CAM_MINUS_POS_TAB_2
MD41503 SW_CAM_PLUS_POS_TAB_2
MD41504 SW_CAM_MINUS_POS_TAB_3
MD41505 SW_CAM_PLUS_POS_TAB_3
MD41506 SW_CAM_MINUS_POS_TAB_4
MD41507 SW_CAM_PLUS_POS_TAB_4

0:  metric
1:  inch
```

This machine data is only evaluated for MD10260 CONVERT_SCALING_SYSTEM = 1.

Related to:
MD10260: CONVERT_SCALING_SYSTEM
MD10910: INDEX_AX_POS_TAB_1
MD10930: INDEX_AX_POS_TAB_2
MD41500: SW_CAM_MINUS_POS_TAB_1
MD41501 SW_CAM_PLUS_POS_TAB_1
MD41502: SW_CAM_MINUS_POS_TAB_2
MD41503: SW_CAM_PLUS_POS_TAB_2
MD41504: SW_CAM_MINUS_POS_TAB_3
MD41505: SW_CAM_PLUS_POS_TAB_3
MD41506: SW_CAM_MINUS_POS_TAB_4
MD41507: SW_CAM_PLUS_POS_TAB_4

10280	**PROG_FUNCTION_MASK**			EXP, N01	K1
-	Comparing (> and <) compatible with SW6.3			DWORD	POWER ON
-					
-	-	0x0	0	0x2	7/2

Description:

Bit mask for parameterizing various sub-program commands

Bit no.Hexadec.Meaning with bit set
Value

0: 0x1 Comparison commands ">" and "<" are processed as for SW 6.3 and earlier:

Sub-program data of the type REAL are mapped internally in the IEEE 64 bit format. This mode maps decimal numbers inaccurately if this format's 52-bit wide mantissa is inadequate to map the number in binary notation. To solve this problem, all comparison commands (==, <>, >=, <=, > and <) are checked for a relative equality of 1E-12.

This procedure is switched off for greater than (>) and lesser than (<) comparisons by setting bit 0. (Compatibility setting for software releases earlier than SW 6.4)

1: 0x2 Programming the channel names from machine data $MC_CHAN_NAME

By setting bit 1 the channel name stored in machine data $MC_CHAN_NAME acan be programmed in the part program. Thus, the channel name can be programmed instead of a numerical value for the channel number in programming coordination commands such as (START(), INIT(), WAIT() etc.

10284	**DISPLAY_FUNCTION_MASK**			EXP, N01	-
-	BTSS-variable lastBlockNoStr active			DWORD	POWER ON
-					
-	-	0x0	-	-	7/2

Description:

```
Bit mask for parameterizing various display variables:

BitNo.   Hexadec.        Meaning with bit set
         value

Bit0:    0x1
    Parameters are assigned to the OPI variable lastBlockNoStr in the SPARP and
    SPARPP blocks.
Bit1:    0x2
    Concerns the OPI variable cmdSpeed in the SPARPP block. If the bit is set,
    the variable returns the programmed speed even if the spindle is at a
    standstill or in another mode (positioning mode, axis mode).
Bit2     0x4
    Concerns the OPI variable cmdSpeed in the SPARPP block. (reserved for con-
    stant cutting speed)
Bit8:    0x100
    Servotrace manages larger numerical values internally. Overruns in data
    format are avoided. The accuracy may be reduced with large numerical
    values.
```

10290	**CC_TDA_PARAM_UNIT**			N09	G2
-	Physical units of tool data for compile cycles			DWORD	POWER ON
-					
-	10	0,0,0,0,0,0,0,0,0,0	0	9	2/2

Description:

```
Physical units for the user-defined tool-specific data:

0 ;No unit
1 ;Linear position       [ mm ; inch ]
2 ;Angular position      [ degree ; degree ]
3 ;Linear velocity       [ mm/min ; inch/min ]
4 ;Angular speed         [ rpm ; rpm ]
5 ;Linear acceleration   [ m/s²  ; inch/s² ]
6 ;Angular acceleration. [ rev/s ² ; rev/s ² ]
7 ;Linear jerk           [ m/s ³ ; inch/s ³  ]
8 ;Angular jerk          [ rev/s ³ ; rev/s ³ ]
9 ;Revolutional feedrate [ mm/rev ; inch/rev ]

Only available if bit 2 (0x4) is set in MD 18080: MM_TOOL_MANAGEMENT_MASK
```

10291	**CCS_TDA_PARAM_UNIT**			N09	-
-	physical units of SIEMENS-OEM tool data			DWORD	POWER ON
-					
-	10	0,0,0,0,0,0,0,0,0,0	0	9	2/2

Description:

```
Physical units for application-specific tool-specific data:

0:  No unit
1:  Linear position               [ mm; inch ]
2:  Angular position              [ degree ; degree ]
3:  Linear velocity               [ mm/min ; inch/min ]
4:  Angular speed                 [ rev/min ; rev/min ]
5:  Linear acceleration           [ m/s² ; inch/s² ]
6:  Angular acceleration          [ rev/s² ; rev/s² ]
7:  Linear jerk                   [ m/s³ ; inch/s³ ]
8:  Angular jerk                  [ rev/s³ ; rev/s³ ]
9:  Feedrate per revolution       [ mm/rev; inch/rev]

Only available if Bit 2 (0x4) is set in MD MM_TOOL_MANAGEMENT_MASK.
Related to: MM_NUM_CCS_TDA_PARAM
```

10292	**CC_TOA_PARAM_UNIT**			N09	G2
-	Physical units of cutting edge data for compile cycles			DWORD	POWER ON
-					
-	10	0,0,0,0,0,0,0,0,0,0	0	9	2/2

Description:

```
Physical units for the user-defined cutting edge data:

0  ;No unit
1  ;Linear position        [ mm ; inch ]
2  ;Angular position       [ degree ; degree ]
3  ;Linear velocity        [ mm/min ; inch/min ]
4  ;Angular speed          [ rpm ; rpm ]
5  ;Linear acceleration    [ m/s²  ; inch/s² ]
6  ;Angular acceleration.  [ rev/s ² ; rev/s ² ]
7  ;Linear jerk            [ m/s ³ ; inch/s ³  ]
8  ;Angular jerk           [ rev/s ³ ; rev/s ³ ]
9  ;Revolutional feedrate  [ mm/rev ; inch/rev ]

Only available if bit 2 (0x4) is set in MD 18080: MM_TOOL_MANAGEMENT_MASK
```

10293	CCS_TOA_PARAM_UNIT			N09	-
-	Physical units of SIEMENS-OEM cutting edge data			DWORD	POWER ON
-					
-	10	0,0,0,0,0,0,0,0,0,0	0	9	2/2

Description:

```
Physical units for application-specific cutting data:

0 :  No unit
1 :  Linear position              [ mm ; inch ]
2 :  Angular position             [ degree ; degree ]
3 :  Linear velocity              [ mm/min ; inch/min ]
4 :  Angular speed                [ rev/min ; rev/min ]
5 :  Linear acceleration          [ m/s² ; inch/s² ]
6 :  Angular acceleration         [ rev/s² ; rev/s² ]
7 :  Linear jerk                  [ m/s³ ; inch/s³ ]
8 :  Angular jerk                 [ rev/s³ ; rev/s³ ]
9 :  Feedrate per revolution      [ mm/rev; inch/rev]

Only available if Bit 2 (0x4) is set in MD MM_TOOL_MANAGEMENT_MASK.
Related to: MM_NUM_CCS_TOA_PARAM
```

10300	FASTIO_ANA_NUM_INPUTS			N10	A4
-	Number of active analog NCK inputs			BYTE	POWER ON
-					
-	-	0	0	8	7/2

Description:

```
This machine data defines the number of usable analog NCK inputs on the cont-
rol.

Only these analog NCK inputs can be addressed by the NC part program or assig-
ned by NC functions.

If more analog NCK inputs are defined with the machine data than are avai-
lable in the hardware of the control, the binary analog actual value is set to
zero in the control for the inputs that do not exist in the hardware. The NCK
value can be altered by the PLC.

Note:
    CPU computing time on the interpolation level is required for processing
    the digital and analog NCK I/Os. The number of active NCK I/Os should
    therefore be limited to the demands of the machine so that the interpola-
    tion cycle time is not unnecessarily loaded.
```

10310	FASTIO_ANA_NUM_OUTPUTS			N10	A4
-	Number of active analog NCK outputs			BYTE	POWER ON
-					
-	-	0	0	8	7/2

Description:

This machine data defines the number of usable analog NCK outputs on the control.

Only these analog NCK outputs can be addressed by the NC part program or assigned by NC functions.

If more analog NCK outputs are defined with the machine data than are available in the hardware of the control, no alarm is triggered. The analog values specified by the part program can be read by the PLC.

Note:
CPU computing time on the interpolation level is required for processing the digital and analog NCK I/Os. The number of active NCK I/Os should therefore be limited to the demands of the machine so that the interpolation cycle time is not unnecessarily loaded.

10320	FASTIO_ANA_INPUT_WEIGHT			N10	A4
-	Weighting factor for analog NCK inputs			DWORD	POWER ON
-					
-	8	10000,10000,10000,10000,10000,10000...	1	10000000	7/2

Description:

A weighting factor can be defined with this MD for each analog NCK input [n] to enable adaptation to the various analog-to-digital converters (depending on the I/O module).

The value to be entered in this machine data is the value that is to be read in the part program with the command x = $A_INA[n] if the associated analog input [n] is set to the maximum value or the value +32767 is defined for this input via the PLC interface.

The value read from the analog-to-digital converter or the PLC interface is multiplied by the factor (FASTIO_ANA_INPUT_WEIGHT / 32767) before it can be read in the part program with the system variable $A_INA[n].

An internal value of - 32767 is formed when the maximum input voltage is at the analog-to-digital converter.

Use of the weighting factor for "Analog NCK inputs without hardware": With a weighting factor of 32767, the values defined by the part program and the PLC are numerically identical (1:1 communication between part program and PLC). This is advantageous when the analog NCK inputs/outputs are used purely as PLC inputs/outputs without analog hardware.

Note:
The comparator threshold values MD 41600: COMPAR_THRESHOLD_1 and MD 41601: COMPAR_THRESHOLD_2 are also normalized to FASTIO_ANA_INPUT_WEIGHT corresponding to their assignment to an analog input.

The CC access to analog values is not affected by FASTIO_ANA_INPUT_WEIGHT.

Related to:
IS "PLC setting value for analog NCK inputs" (DB10, DBB148 - 163)
IS "PLC setting value for analog NCK outputs" (DB10, DBB170 - 185)
IS "Setpoint for analog NCK outputs" (DB10, DBB210 - 225)

10330	**FASTIO_ANA_OUTPUT_WEIGHT**			N10	A4
-	Weighting factor for analog NCK outputs			DWORD	POWER ON
-					
-	8	10000,10000,10000,10000,10000,10000...	1	10000000	7/2

Description:

A weighting factor can be defined with this MD for each analog NCK output [n] to enable adaptation to the various analog-to-digital converters (depending on the I/O module used).

[hw] = Index (0 to 7) for addressing the external analog outputs

The value x to be entered in this machine data is the value that is to effect the maximum set value of the associated analog output [n] when programming $A_OUTA[n] = x in the part program or is to generate the value +32767 in the PLC interface for this output. Thus an internal value of -32767 generates the maximal output voltage at the digital-to-analog converter.

Use of the weighting factor for "Analog NCK outputs without hardware": With a weighting factor of 32767, the values defined by the part program and the PLC are numerically identical (1:1 communication between part program and PLC). This is advantageous when the analog NCK outputs are used purely as PLC outputs without analog hardware.

Related to:
IS "PLC setting value for analog NCK inputs" (DB10, DBB148 - 163)
IS "PLC setting value for analog NCK outputs" (DB10, DBB170 - 185)
IS "Setpoint for analog NCK outputs" (DB10, DBB210 - 225)

10350	**FASTIO_DIG_NUM_INPUTS**			N10	A4
-	Number of active digital NCK input bytes			BYTE	POWER ON
-					
-	-	1	0	5	7/2

Description:

```
The number of bytes of the digital NCK inputs that can be used on the control
are defined in this machine data.

These digital NCK inputs can be read directly by the part program. Moreover,
the signal state at the HW inputs can also be changed by the PLC.

If more digital NCK inputs are defined in the machine data than are available
in the control hardware, a signal status of 0 is set in the control for the
inputs that do not exist in the hardware. The NCK value can be altered by the
PLC.

Related to:
    IS "Disable the digital NCK inputs" (DB10, DBB0, DBB122 ...)
    IS "PLC setting for digital NCK inputs" (DB10, DBB1, DBB123 ...)
    IS "Actual value for digital NCK inputs" (DB10, DBB60, DBB186 ...)
```

10360	**FASTIO_DIG_NUM_OUTPUTS**			N10	A4
-	Number of active digital NCK output bytes			BYTE	POWER ON
-					
-	-	0	0	5	7/2

Description:

```
The number of bytes for digital NCK outputs that can be used on the control
are defined in this machine data.

These digital NCK outputs can be set directly by the part program. The PLC is
able to
-   set the digital outputs to "0"  in a defined way with IS "Disable the digital
    NCK outputs".
-   alter the NCK value with IS "Overwrite mask for digital NCK outputs".
-   specify a PLC value with IS "Setting mask for digital NCK outputs".

If more digital NCK outputs are defined in the machine data than are avai-
lable in the control hardware, no alarm is triggered. The signal states speci-
fied by the part program can be read by the PLC.

Special cases:
Digital NCK outputs 5 to 8 can be processed only by the PLC (no hardware out-
puts).

Related to:
    IS "Disable the digital NCK outputs" (DB10, DBB4, DBB130 ...)
    IS "Overwrite mask for digital NCK outputs" (DB10, DBB5, DBB131 ...)
    IS "PLC setting for digital NCK outputs" (DB10, DBB6, DBB132 ...)
    IS "Setting mask for digital NCK outputs" (DB10, DBB7, DBB133 ...)
    IS "Setpoint for digital NCK outputs" (DB10, DBB64, DBB190 ...)
```

10361	FASTIO_DIG_SHORT_CIRCUIT			N10	A2
-	Short circuit of digital inputs and outputs			DWORD	POWER ON
-					
-	10	0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
Defined short circuits between digital output and input signals of the high-
speed NCK I/Os are realized by linking the signals read in from the high-speed
NCK I/Os or the PLC interface to defined output signals.

The output signals always remain unchanged by the link, the inputs that have
to be taken into account internally arise from the read inputs and the link.
If a plurality of output bits are specified for one input bit in overwrite
mode, the last defined assignment in the list determines the result.

The definition of non-existent or non-activated inputs/outputs is ignored wit-
hout an alarm.


Bits 0-7:Number of the input byte to be written ( 1 - 5 )
Bits 8-15:Bit number within the input byte ( 1 - 8 )

Link:
The type of link is selected by adding a hexadecimal number to the input bit
number:
    00   Overwrite input identically to output
    A0   Input is AND-gated to the read input with the status of the stated
    output
    B0   Input is OR-gated to the read input with the status of the stated out-
    put

Bits 16-23:Number of the output byte to be used ( 1 - 5 )
Bits 24-31:Bit number within the output byte ( 1 - 8 )

Example:
$MN_FASTIO_DIG_SHORT_CIRCUIT[ 0 ] = 0x04010302
    Input:  3rd bit of the 2nd byte
    Output:  4th bit of the 1st byte ( = 4th onboard NCU output )
    The input status is overwritten by the specified output

$MN_FASTIO_DIG_SHORT_CIRCUIT[ 1 ] = 0x0705A201
    Input:  2nd bit of the 1st byte ( = 2nd onboard NCU input )
    Output:  7th bit of the 5th byte
    The input status is AND-gated with the specified output

$MN_FASTIO_DIG_SHORT_CIRCUIT[ 2 ] = 0x0103B502
    Input:  5th bit of the 2nd byte
    Output:  1st bit of the 3rd byte
    The input status is OR-gated with the specified output

Related to:
    MD 10350: FASTIO_DIG_NUM_INPUTS,
    MD 10360: FASTIO_DIG_NUM_OUTPUTS.

References:         /FB/, A4, "Digital and Analog NCK I/Os"
```

10362	HW_ASSIGN_ANA_FASTIN			N10	A4
-	Hardware assignment of the fast analog NCK inputs			DWORD	POWER ON
-					
-	8	0x01000000,0x01000000,0x01000000...	0x01000000	0x060003FF	7/2

Description:

```
The following 4 bytes assign the external analog NCK inputs to the hardware:

   1st byte:      I/O no.
   2nd byte:      Submodule no.
   3rd byte:      Module no.
   4th byte:      Segment no.

As soon as value 0 is entered in byte 3 (module no.), external I/Os are no
longer processed by the control.

The hardware assignment is control specific and therefore different on the
SINUMERIK 840D/810D and FM-NC.

The individual bytes are explained in MD 10366: HW_ASSIGN_DIG_FASTIN.

[hw] = Index (0 to 7) for addressing the external analog inputs

Related to:
    MD 10366: HW_ASSIGN_DIG_FASTIN
    MD 10368: HW_ASSIGN_DIG_FASTOUT
    MD 10364: HW_ASSIGN_ANA_FASTOUT
```

10364	HW_ASSIGN_ANA_FASTOUT			N10	A4
-	Hardware assignment of external analog NCK outputs			DWORD	POWER ON
-					
-	8	0x01000000,0x01000000,0x01000000...	0x01000000	0x060003FF	7/2

Description:

```
The following 4 bytes assign the external analog NCK outputs to the hardware:
     1st byte:      I/O no.
     2nd byte:      Submodule no.
     3rd byte:      Module no.
     4th byte:      Segment no.

As soon as value 0 is entered in byte 3 (module no.), external I/Os are no
longer processed by the control.
The individual bytes are explained in MD 10366: HW_ASSIGN_DIG_FASTIN.

Related to:
    MD 10366: HW_ASSIGN_DIG_FASTIN
    MD 10368: HW_ASSIGN_DIG_FASTOUT
    MD 10362: HW_ASSIGN_ANA_FASTIN
```

10366	HW_ASSIGN_DIG_FASTIN			N10	A4
-	Hardware assignment of external digital NCK inputs			DWORD	POWER ON
-					
-	10	0x01000000,0x01000000,0x01000000...	0x01000000	0x060003FF	7/2

Description:

```
The following 4 bytes assign the external digital NCK I/Os to the hardware:

      1st byte:     I/O no.
      2nd byte:     Submodule no.
      3rd byte:     Module no.
      4th byte:     Segment no.

As soon as value 0 is entered in byte 3 (module no.), the output byte concer-
ned is not processed by the control.

 I/O no.:
    Number of the I/O byte on the DP compact module (range: 1 to 2; always 1
    with analog inputs/outputs)
Submodule no.:
    Submodule slot on the terminal block into which the DP compact module is
    inserted (range: 1 to 8)
Module no.:
    Number of the logical slot into which the terminal block with the external
    I/Os is inserted. The  logical slot is assigned to a physical slot by MD
    13010: DRIVE_LOGIC_NR (logical drive number). Each module occupies a physi-
    cal slot. The first 6 slots are permanently occupied on the 810D.
Segment no.:
    Always 1 for 840D/810D (ID for 611D bus)

       Example:
               HW_ASSIGN_DIGITAL_FASTIN[3] = 01 04 03 02
   1st byte: 02 =     2nd input byte of a 16 bit input module
   2nd byte: 03 =     Input module inserted in slot 3 of the terminal block
   3rd byte: 04 =     Terminal block inserted at logical drive number 4
   4th byte: 01 =     ID for 611D bus
PROFIBUS DP:
Segment no.: 5 = PROFIBUS DP
             6 = PROFIBUS DP link module

Module no.:   1 ... MD_MAXNUM_SIMO611D_AXES:
    Number of the logical slot in which the terminal block with the external I/
    Os is inserted. The logical slot is assigned to a physical slot by
    $MN_DRIVE_LOGIC_NR, it is activated by $MN_DRIVE_IS_ACTIVE.
1st + 2nd bytes give the logical start address of the I/O slot on the PROFIBUS
1st byte = low byte
2nd byte = high byte
Value 0000 means NO active slots
Values 0001..007F  are reserved for the PLC (NCK can also read the value for
input slots without error, but output slots are forbidden in this range and
lead to an alarm during startup)
Values 0080..02FF  are valid
Values > 02FF  are invalid
```

```
Example:
HW_ASSIGN_DIGITAL_FASTIN[3] = '05000302'
1st + 2nd byte:   0302 (hex) = logical start address 770 (decimal)
3rd byte:   00 = no significance
4th byte:   05 = ID for PROFIBUS DP

Related to:
    MD 10368: HW_ASSIGN_DIG_FASTOUT
    MD 10362: HW_ASSIGN_ANA_FASTIN
    MD 10364: HW_ASSIGN_ANA_FASTOUT
```

10368	**HW_ASSIGN_DIG_FASTOUT**			N10	A4
-	Hardware assignment of external digital NCK outputs			DWORD	POWER ON
-					
-	4	0x01000000,0x01000000,0x01000000...	0x01000000	0x060003FF	7/2

Description:

```
The following 4 bytes assign the external digital NCK outputs to the hardware:

                1st byte:     I/O no.
                2nd byte:     Submodule no.
                3rd byte:     Module no.
                4th byte:     Segment no.

As soon as value 0 is entered in byte 3 (module no.), the output byte concer-
ned is not processed by the control.
The hardware assignment is control specific and therefore different on the
SINUMERIK 840D/810D and FM-NC.

The individual bytes are explained under MD: HW_ASSIGN_DIG_FASTIN.

[hw] = Index (0 to 3) for addressing the external digital output bytes

Related to:
    MD 10366: HW_ASSIGN_DIG_FASTIN
    MD 10362: HW_ASSIGN_ANA_FASTIN
    MD 10364: HW_ASSIGN_ANA_FASTOUT
```

10380	HW_UPDATE_RATE_FASTIO			EXP, N10	A4
-	Updating rate of clocked external NCK I/Os			BYTE	POWER ON
-					
-	5	2,2,2,2,3	2	3	7/2

Description:

```
The cycle frequency is selected for the clock-synchronous input and output of
the external NCK I/Os with this machine data (840D only).
The cycle time applies to all I/O modules on a terminal block that are opera-
ted in synchronization with the clock (MD 10384:
HW_CLOCKED_MODULE_MASK[tb]=1).
The selection can be made from the following cycle frequencies:

Value =
1:  Synchronous input/outputs in hardware cycles (not in software release 2)
(SYSCLOCK_CYCLE_TIME / SYSCLOCK_SAMPL_TIME_RATIO)

2:  Synchronous input/outputs in the position control cycle (default setting)
(MD: POSCTR_SYSCLOCK_TIME_RATIO)

3:  Synchronous inputs/outputs in the interpolation cycle (MD:
IPO_SYSCLOCK_TIME_RATIO)

Note on index [tb] (tb = 0 to 1):
Index [tb] identifies the connected NCU terminal blocks in ascending order of
the defined logical module numbers (parameterization with MD: DRIVE_LOGIC_NR
"logical drive number").

Example:
    An additional 2 terminal blocks which are parameterized with the logical
    drive numbers 6 and 7 are connected to the drive bus.

    The following assignments are made for the terminal blocks in the control:
-   HW_UPDATE_RATE_FASTIO[0] parameterizes terminal block 1 with no. 6
-   HW_UPDATE_RATE_FASTIO[1] parameterizes terminal block 2 with no. 7
    This assignment applies analogously to:
    MD 10380: HW_UPDATE_RATE_FASTIO[tb] and
    MD 10384: HW_CLOCKED_MODULE_MASK [tb]
For more detailed information see
References: /FB/, G2, "Velocities, Setpoint/Actual Value Systems, Cycle Times"

Note:
    Please consider the hardware response times of the external I/O modules
    used.

References: /PHD/, SINUMERIK 840D, NCU Manual
MD irrelevant for: SINUMERIK FM-NC
Related to:
    MD 10382: HW_LEAD_TIME_FASTIO
    MD 10384: HW_CLOCKED_MODULE_MASK
    POSCTR_SYSCLOCK_TIME_RATIO
    IPO_SYSCLOCK_TIME_RATIO
    SYSCLOCK_SAMPL_TIME_RATIO
    DRIVE_LOGIC_NR
```

10382	HW_LEAD_TIME_FASTIO			EXP, N10	A4
-	Lead time of clocked external NCK I/Os			DWORD	POWER ON
-					
-	5	100,100,100,100,100	-	-	7/2

Description:

A lead time can be defined for digital and analog NCK I/Os (MD 10384: HW_CLOCKED_MODULE_MASK = 1) operated in synchronization with the clock.

The input signal is stored this length of time before the defined cycle. The output signal is sent to the hardware this same length of time before the defined cycle.
With analog NCK inputs, for example, this makes it possible to consider the hardware-specific conversion time of the analog-to-digital converter so that the digitized analog value is available at the cycle time point.

If the value set in this machine data exceeds the set cycle time (MD 10380: HW_UPDATE_RATIO_FASTIO), it is limited internally to the largest possible off-set (i.e. to the parameterized cycle time).

The lead time applies to all NCK inputs/outputs of the terminal block addressed with index [tb] which are operated in synchronization with the clock.

Note on index [tb] see MD 10380: HW_UPDATE_RATE_FASTIO.

MD irrelevant for: SINUMERIK FM-NC

Related to:
MD 10380: HW_UPDATE_RATIO_FASTIO
MD 10384: HW_CLOCKED_MODULE_MASK

10384	HW_CLOCKED_MODULE_MASK			N10	A4
-	Synchronous processing of external NCK I/Os			BYTE	POWER ON
-					
-	5	0,0,0,0,0	-	-	7/2

Description:

The I/O modules of the external NCK I/Os can be operated in the following ways with SINUMERIK 840D:

- Asynchronously, i.e. the input and output values are made available in cycles set by the terminal block which are asynchronous to the internal NC processing cycles.

```
-   Synchronously, i.e. the input and output values are made available synchro-
    nously to a settable internal NC processing cycle.
These modes of operation can be set via a bit mask (bits 0 to 7) for each
individual I/O module of the terminal block addressed with index [tb] (bit 0
for I/O module on slot 1 ... bit 7 for I/O module on slot 8).

Each bit has the following meaning:

Bit n = 0: I/O module on slot n+1 is operated asynchronously
Bit n = 1: I/O module on slot n+1 is operated synchronously

The value is of no significance for the unassigned slots of a terminal block.

Example:
    HW_CLOCKED_MODULE_MASK[0] = 30 (bit mask: 0011 0000)
    The I/O modules on slots 5 and 6 of terminal block 1 are operated in syn-
    chronization with the clock.

Note:
Digital NCK inputs/outputs are generally always operated asynchronously. When
analog NCK inputs/outputs are used in closed control loops, values often have
to be read in and out in synchronization with the clock.

Note on index [tb] see MD 10380: HW_UPDATE_RATE_FASTIO.

MD irrelevant for: SINUMERIK FM-NC (always operated asynchronously)

Related to:
    MD 10382: HW_LEAD_TIME_FASTIO
    MD 10380: HW_UPDATE_RATIO_FASTIO
```

10385	**PROFISAFE_MASTER_ADDRESS**			N01, N06, -	FBSI
-	PROFIsafe address PROFIsafe master module			DWORD	POWER ON
-					
-	-	0	0	0x0500FA7D	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Definition of the PROFIsafe address of the F master NCK/PLC. Used for unique
assignment between F master and F slave. This parameter must be entered corre-
sponding to the parameter "F_source_address" set in S7-ES for the F slaves.
Communication is only attempted to be set up with F slaves which have this
address entered.
```

10386	**PROFISAFE_IN_ADDRESS**			N01, N06, -	FBSI
-	PROFIsafe address input module			DWORD	POWER ON
-					
-	16	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	0x0501FFFF	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
PROFIsafe destination address of an input module
Format: 0s 0x aaaa
s: Bus segment (5 = DP connection on the PLC side)
x: Sub-slot address
    Value range: 0...1
    x = 0 addresses the F user data signals 1...32
    x = 1 adresses the F user data signals 33...64
aaaa: Hexadecimal PROFIsafe address of the F module
```

10387	**PROFISAFE_OUT_ADDRESS**			N01, N06, -	FBSI
-	PROFIsafe-address output module			DWORD	POWER ON
-					
-	16	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	0x0501FFFF	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
PROFIsafe destination address of an output module
Format: 0s 0x aaaa
s: Bus segment (5 = DP connection on the PLC side)
x: Sub-slot address
    Value range: 0...1
    x = 0 addresses the F user data signals 1...32
    x = 1 adresses the F user data signals 33...64
aaaa: Hexadecimal PROFIsafe address of the F module
```

10388	**PROFISAFE_IN_ASSIGN**			N01, N06, -	FBSI
-	Input.assignment $A_INSE to PROFIsafe module			DWORD	POWER ON
-					
-	16	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	64064	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Assignment between external SPL interface $A_INSE and PROFIsafe input module

The three lower digits indicate the least significant $A_INSE variable to be
fed.
The three higher digits indicate the most significant $A_INSE variable to be
fed.

Example:
PROFISAFE_IN_ASSIGN[0] = 4001:
The system variables $A_INSE[1...4] are fed with the state of the input termi-
nals of the PROFIsafe module specified by MD PROFISAFE_IN_ADDRESS[0].
```

10389	**PROFISAFE_OUT_ASSIGN**			N01, N06, -	FBSI
-	Outp.assignment $A_OUTSE to PROFIsafe module			DWORD	POWER ON
-					
-	16	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	64064	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Assignment between external SPL interface $A_OUTSE and PROFIsafe output module
The three lower digits indicate the least significant $A_OUTSE variable to be
connected.
The three higher digits indicate the most significant $A_OUTSE variable to be
connected.

Example:
PROFISAFE_OUT_ASSIGN[0] = 64011:
The system variables $A_OUTSE[61...64] are fed to the output terminals of the
PROFIsafe module specified by MD PROFISAFE_OUT_ADDRESS[0].
```

10390	**SAFE_IN_HW_ASSIGN**			N01, N06, -	FBSI
-	Input assignment of external SPL interface			DWORD	POWER ON
-					
-	8	0,0,0,0,0,0,0,0	-	-	7/2
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
An input byte of the NCK I/Os can be assigned byte by byte to the system vari-
ables $A_INSE[x] with this machine data.

n   System variables  Comment
=0  $A_INSE[1...8]    Assignment for 1st byte
=1  $A_INSE[9..16]    Assignment for 2nd byte
=2  $A_INSE[17..24]   Assignment for 3rd byte
=3  $A_INSE[25..32]   Assignment for 4th byte
=4  $A_INSE[33..40]   Assignment for 5th byte
=5  $A_INSE[41..48]   Assignment for 6th byte
=6  $A_INSE[49..56]   Assignment for 7th byte
=7  $A_INSE[57..64]   Assignment for 8th byte

Related to:
    MD 10392: §MN_SAFE_OUT_HW_ASSIGN

See MD 10366:$MN_HW_ASSIGN_DIG_FASTIN for structure.
This involves the restriction that an I/O module has to be addressed via this
MD. Assignment to another system variable is not possible.
```

10392	SAFE_OUT_HW_ASSIGN			N01, N06, -	FBSI
-	Output assignment ext. interface SPL			DWORD	POWER ON
-					
-	8	0,0,0,0,0,0,0,0	-	-	7/2
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
An output byte of the NCK I/Os can be assigned byte by byte to the system
variables $A_OUTSE[x] with this machine data.

n    System variables   Comment
=0   $A_OUTSE[1..8]     Assignment for 1st byte
=1   $A_OUTSE[9..16]    Assignment for 2nd byte
=2   $A_OUTSE[17..24]   Assignment for 3rd byte
=3   $A_OUTSE[25..32]   Assignment for 4th byte
=4   $A_OUTSE[33..40]   Assignment for 5th byte
=5   $A_OUTSE[41..48]   Assignment for 6th byte
=6   $A_OUTSE[49..56]   Assignment for 7th byte
=7   $A_OUTSE[57..64]   Assignment for 8th byte

Related to:
    MD 10390: $MN_SAFE_IN_HW_ASSIGN
```

10393	SAFE_DRIVE_LOGIC_ADDRESS			N01, N06, -	-
-	Logical drive addresses SI			DWORD	POWER ON
-					
-	31	6700,6724,6748,6772,6796,6820,6844...	258	8191	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Logical I/O addresses of the SI message frames of the drives on the PROFIBUS.
One address is assigned to one drive.
```

10394	PLCIO_NUM_BYTES_IN			N10	A2
-	Number of directly readable input bytes of the PLC I/Os			BYTE	POWER ON
-					
-	-	0	0	32	7/2

Description:

```
The number of PLC I/O input bytes that can be read directly by the NC.

These bytes are not transmitted by the PLC user program but via an interrupt
of the PLC operating system.
The access delay is less than 0.5 ms.
The bytes can be read by the part program and from synchronized actions with
the system variables:
$A_PBB_IN,
$A_PBW_IN,
$A_PBD_IN,
$A_PBR_IN
.

Attention:
    The machine data MD 10394: PLCIO_NUM_BYTES_IN and MD 10395:
    PLCIO_LOGIC_ADDRESS_IN must be consistent with the configuration by the
    PLC.

Related to:
    MD 10395: PLCIO_LOGIC_ADDRESS_IN
```

10395	PLCIO_LOGIC_ADDRESS_IN			N10	A2
-	Start addr. of the directly readable input bytes of the PLC I/Os			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
The PLC hardware must configure a number of  MD 10394: PLCIO_NUM_BYTES_IN for
direct use by the NC starting from this address. These bytes are not transmit-
ted by the PLC user program but directly via an interrupt of the PLC opera-
ting system. The access delay is less than 0.5 ms. The bytes can be read by
the part program and from synchronized actions with the system variables:

$A_PBB_IN,
$A_PBW_IN,
$A_PBD_IN,
$A_PBR_IN
.

Attention:
    The machine data MD 10394: PLCIO_NUM_BYTES_IN and MD 10395:
    PLCIO_LOGIC_ADDRESS_IN must be consistent with the configuration by the
    PLC.
Related to:
    MD 10394: PLCIO_NUM_BYTES_IN
```

10396	PLCIO_NUM_BYTES_OUT			N10	A2
-	Number of directly writable output bytes of the PLC I/Os			BYTE	POWER ON
-					
-	-	0	0	32	7/2

Description:

```
The number of PLC I/O output bytes that can be written directly by the NC.
These bytes are not transmitted by the PLC user program but via an interrupt
of the PLC operating system.
The access delay is less than 0.5 ms.
The bytes can be written by the part program and from synchronized actions
with the system variables:
$A_PBB_OUT,
$A_PBW_OUT,
$A_PBD_OUT,
$A_PBR_OUT
on the NC side.

Attention:
    The machine data MD 10396: PLCIO_NUM_BYTES_OUT and MD 10397:
    PLCIO_LOGIC_ADDRESS_OUT must be consistent with the configuration by the
    PLC, otherwise other PLC output signals will be overwritten.
```

10397	PLCIO_LOGIC_ADDRESS_OUT			N10	A2
-	Start addr. of the directly writable output bytes of PLC I/O			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
The PLC hardware must configure a number of MD 10396: PLCIO_NUM_BYTES_OUT for
direct use by the NC starting from this address.
These bytes are not transmitted by the PLC user program but directly via an
interrupt of the PLC operating system.
The access delay is less than 0.5 ms.
The bytes can be written by the part program and from synchronized actions
with the system variables:
$A_PBB_OUT,
$A_PBW_OUT,
$A_PBD_OUT,
$A_PBR_OUT
.

Attention:
    The machine data MD 10396: PLCIO_NUM_BYTES_OUT and MD 10397:
    PLCIO_LOGIC_ADDRESS_OUT must be consistent with the configuration by the
    PLC.

Related to:
    MD 10396: PLClO_NUM_BYTES_OUT
```

10398	**PLCIO_IN_UPDATE_TIME**			N10	A4
s	Update time for PLCIO input cycle			DOUBLE	POWER ON
-					
-	-	0.0	0	10000	7/2

Description:

Specification of the time span during which the data of the PLC I/Os directly readable via $A_PBx_IN system variables are updated.
This time span is rounded up internally to the next-higher multiple of the time predefined by the IPO cycle.

10399	**PLCIO_TYPE_REPRESENTATION**			N10	A4
-	Little/Big Endian for PLCIO			BYTE	POWER ON
-					
-	-	0	0	1	7/2

Description:

Little/big-Endian format representation of the $A_PBx_OUT, $A_PBx_IN system variable for PLC I/Os directly controllable by NCK.
Value = 0 ; the system variable is represented in the little-Endian format
Value = 1 ; the system variable is represented in the big-Endian format
As a rule, the PLC I/Os must always be controlled in the big-Endian format (value = 1). For compatibility reasons, however, the default setting is the little-Endian format (value = 0).

10400	**CC_VDI_IN_DATA**			EXP, N02	OEM
-	Number of input bytes for compile cycles			DWORD	POWER ON
-					
-	-	0	0	1024	7/1

Description:

The compile cycle user can freely define data within a data block on the PLC user interface. As the user, he determines the size of the interface from PLC to NCK. This machine data describes the length of the area on the VDI interface in bytes which defines the NCK input interface. The sum of this MD and the machine data CC_VDI_OUT_DATA must not exceed 400 for software version 1.

10410	**CC_VDI_OUT_DATA**			EXP, N02	OEM
-	Number of output bytes for compile cycles			DWORD	POWER ON
-					
-	-	0	0	1024	7/1

Description:

The compile cycle user can freely define data within a data block on the PLC user interface. As the user, he determines the size of the interface from PLC to NCK. This machine data describes the length of the area on the VDI interface in bytes which defines the NCK output interface. The sum of this MD and the machine data CC_VDI_IN_DATA must not exceed 400.

10420	**CC_ASSIGN_FASTOUT_MASK**			EXP, N10	OEM
-	Reservation of external outputs for compile cycles			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
Reservation of high-speed hardware outputs for CC applications
Bit 0(LSB)-14:  Mask of the digital output bytes reserved for the CC applica-
tion

Bits 16-30:         Mask of the analog outputs reserved for the CC application

The hardware outputs reserved here are included in the multiple assignment
monitoring routine when the system is powered up. It is recommended to regis-
ter all the hardware outputs used by CC applications here.

Bit 15: Suppresses power-up alarm 4275 (multiple assignment of digital output)
Bit 31: Suppresses power-up alarm 4275 (multiple assignment of analog output)
```

10430	**CC_HW_DEBUG_MASK**			EXP	OEM
-	Hardware debug mask for compile cycles			DWORD	POWER ON
NBUP, NDLD					
-	-	0	-	-	7/1

Description:

```
Setting of special responses to peripheral HW interfaces for NCK debug

For practical debugging of NCK software, among other things, the response of
peripheral units to the loss of the NCK sign of life must be suppressed when
the NCK software has run to a breakpoint.

Bit 0(LSB)-3:
    For practical debugging of NCK software, among other things, the response
    of peripheral units to the loss of the NCK sign of life must be suppressed
    when the NCK software has run to a breakpoint.

Meaning of set bits:
Bit 0:
    Drive modules ignore the loss of the NCK sign of life
Bit 1:
    Terminal blocks ignore the loss of the NCK sign of life
Bit 3:
    PLC ignores the loss of the NCK sign of life
Bit 4:
    Recording of internal and external control commands. Recording the control
    sequences and storing them in a file in the passive file system. One can
    trace the exact sequence between the incoming harware signals of the PLC
    interface and the internal sequences with the aid of the recording file.
Bit 5:
    Servotrace: Enable physical addresses without access control
```

Bit10:
Test for measuring function. If this bit is set, one can use the GUD Variables CHAN INT MEA_TASK and CHAN INT MEA_COUNTER to transfer the inverse transformation of the measured values into cyclical and non-cyclical tasks.
Bit11:
No EMERGENCY STOP alarm on loss of PLC sign of life. If the PLC sign of life is not obtained within the time defined in MD PLC_CYCLIC_TIMEOUT, an alarm is not issued, merely the axis release withdrawn. (Application case: debugging the PLC user program)

Bit15:
Reserved for gantry startup help.

10450	**SW_CAM_ASSIGN_TAB**			N09	N3
-	Assignment of software cams to machine axes			BYTE	POWER ON
-					
-	32	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	31	7/2

Description:

This machine data allows one machine axis to be assigned to each of the 16 possible cam pairs (each is comprised of one minus and one plus cam).

If a "0" is entered, the corresponding cam is not processed.

The cam signal output is activated via the axial IS "Cam activation" (DB31-48, DBX2.0).

Index [n] of the machine data addresses the cam pair: n = 0, 1, ... , 15 correspond to cam pairs 1, 2, ... , 16

Related to IS "Cam activation" (DB31-48, DBX2.0)

Example:
Cam pair 1 is to be assigned to machine axis 3 and cam pair 3 to machine axis 4. Cam pair 2 is not to be assigned to an axis.
MD: SW_CAM_ASSIGN_TAB[0]= 3
MD: SW_CAM_ASSIGN_TAB[1]= 0
MD: SW_CAM_ASSIGN_TAB[2]= 4

10460	SW_CAM_MINUS_LEAD_TIME			N09	N3
s	Lead or delay time at minus cams 1-16			DOUBLE	POWER ON
-					
-	32	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/2

Description:

```
A lead or delay time can be assigned in this machine data to each minus cam 1-
16 to compensate for delay times.
The switching edge of the associated cam signal is advanced or delayed by the
time value entered.

Positive value:       -->         Lead time
Negative value:       -->         Delay time

Serves to compensate for the constant proportion of the internal delay time
between actual value acquisition and signal output.
Index [n] of the machine data addresses the cam pair:
n = 0, 1, ... , 15 correspond to cam pairs 1, 2, ... , 16

This machine data is added to the setting data SW_CAM_MINUS_TIME_TAB_1[n] and
SW_CAM_MINUS_TIME_TAB_2[n].

Related to:
    SD: SW_CAM_MINUS_TIME_TAB_1[n] (lead or delay time on minus cams 1 - 8)
    SD: SW_CAM_MINUS_TIME_TAB_2[n] (lead or delay time on minus cams 9 - 16)
```

10461	SW_CAM_PLUS_LEAD_TIME			N09	N3
s	Lead or delay time at plus cams 1-16			DOUBLE	POWER ON
-					
-	32	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/2

Description:

```
A lead or delay time can be assigned in this machine data to each plus cam 1-
16 to compensate for delay times.

The switching edge of the associated cam signal is advanced or delayed by the
time value entered.

Positive value:       -->         Lead time
Negative value:       -->         Delay time

Serves to compensate for the constant proportion of the internal delay time
between actual value acquisition and signal output.

Index [n] of the machine data addresses the cam pair:
n = 0, 1, ... , 15 correspond to cam pairs 1, 2, ... , 16
This machine data is added to the setting data SW_CAM_PLUS_TIME_TAB_1[n] and
SW_CAM_PLUS_TIME_TAB_2[n].
Related to:
    SD: SW_CAM_PLUS_TIME_TAB_1[n] (lead or delay time on plus cams 1 - 8)
    SD: SW_CAM_PLUS_TIME_TAB_2[n] (lead or delay time on plus cams 9 - 16)
```

10470	SW_CAM_ASSIGN_FASTOUT_1			N09	N3
-	Hardware assignment for output of cams 1-8 to NCK I/Os			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
The cam signal status can be output to the NCK I/Os as well as to the PLC.

The hardware assignment of the minus and plus cam signals to the digital out-
put bytes used for the NCK I/Os is made in this machine data for cam pairs 1 -
8.

The assigned output signals can also be inverted with this machine data.

The MD is coded as follows:
Bits 0-7:      No. of 1st HW byte used with digital outputs
Bits 8-15:     No. of 2nd HW byte used with digital outputs
Bits 16-23:    Inversion mask for writing 1st HW byte used
Bits 24-31:    Inversion mask for writing 2nd HW byte used
               Bit=0:             Do not invert
               Bit=1:             Invert

If both HW bytes are specified, the 1st byte contains the minus cam signals
and the 2nd byte the plus cam signals.

If the 2nd byte is not specified (= "0"), then the 8 cams are output as an AND
operation of the minus and plus cam signals via the 1st HW byte using the 1st
inversion mask.
The status of the non-inverted output signal for linear axes and for rotary
axes with "plus cam - minus cam < 180 degrees" is:
             "1" between minus and plus cams
             "0" outside this range

The status of the non-inverted output signal for rotary axes with "plus cam -
minus cam >= 180 degrees" is:
             "0" between minus and plus cams
             "1" outside this range

The following must be specified as the byte address for the digital outputs:
1:               for on-board byte
2 - 5:           for external bytes
```

10471	SW_CAM_ASSIGN_FASTOUT_2			N09	N3
-	Hardware assignment for the output of cams 9-16 to NCK I/Os			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
The cam signal status can be output to the NCK I/Os as well as to the PLC.

The hardware assignment of the minus and plus cam signals to the digital out-
put bytes used for the NCK I/Os can be made in this machine data for cam pairs
9 - 16.

The assigned output signals can also be inverted with this machine data.

The MD is coded as follows:

Bits 0-7:     No. of 1st HW byte used with digital outputs
Bits 8-15:    No. of 2nd HW byte used with digital outputs
Bits 16-23:   Inversion mask for writing 1st HW byte used
Bits 24-31:   Inversion mask for writing 2nd HW byte used
                Bit=0:           Do not invert
                Bit=1:           Invert

If both HW bytes are specified, the 1st byte contains the minus cam signals
and the 2nd byte the plus cam signals.

If the 2nd byte is not specified (= "0"), then the 8 cams are output as an AND
operation of the minus and plus cam signals via the 1st HW byte using the 1st
inversion mask.
The status of the non-inverted output signal for linear axes and for rotary
axes with "plus cam - minus cam < 180 degrees" is:
                     "1" between minus and plus cams
                     "0" outside this range

The status of the non-inverted output signal for rotary axes with "plus cam -
minus cam >= 180 degrees" is:
                      "0" between minus and plus cams
                      "1" outside this range
The following must be specified as the byte address for the digital outputs:
1:        for on-board byte
2 - 5:    for external bytes
```

10472	SW_CAM_ASSIGN_FASTOUT_3			N09	N3
-	Hardware assignment for output of cams 17-24 to NCK I/Os			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
The cam signal status can be output to the NCK I/Os as well as to the PLC.

The hardware assignment of the minus and plus cam signals to the digital out-
put bytes of the NCK I/Os used can be made in this machine data for cam pairs
17 - 24.

The assigned output signals can also be inverted with this machine data.

The MD is coded as follows:
Bits 0-7:     Number of 1st HW byte used with digital outputs
Bits 8-15:    Number of 2nd HW byte used with digital outputs
Bits 16-23:   Inversion mask for writing 1st HW byte used
Bits 24-31:   Inversion mask for writing 2nd HW byte used
                 Bit=0:          Do not invert
                 Bit=1:          Invert

If both HW bytes are specified, the 1st byte contains the minus cam signals
and the 2nd byte the plus cam signals.

If the 2nd byte is not specified (= "0"), then the 8 cams are output as an AND
operation of the minus and plus cam signals via the 1st HW byte using the 1st
inversion mask.
The status of the non-inverted output signal for linear axes and for rotary
axes with "plus cam - minus cam < 180 degrees" is:
                "1" between minus and plus cams
                "0" outside this range

The status of the non-inverted output signal for rotary axes with "plus cam -
minus cam >= 180 degrees" is:
                "0" between minus and plus cams
                "1" outside this range

The following must be specified as the byte address for the digital outputs:
1:      for on-board byte
2 - 5:  for external bytes
```

10473	SW_CAM_ASSIGN_FASTOUT_4			N09	N3
-	Hardware assignment for output of cams 25-32 to NCK I/Os			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
The cam signal status can be output to the NCK I/Os as well as to the PLC

The hardware assignment of the minus and plus cam signals to the digital out-
put bytes of the NCK I/Os used can be made in this machine data for cam pairs
25 - 32.

The assigned output signals can also be inverted with this machine data.

The MD is coded as follows:
Bits 0-7:     Number of 1st HW byte used with digital outputs
Bits 8-15:    Number of 2nd HW byte used with digital outputs

Bits 16-23:   Inversion mask for writing 1st HW byte used
Bits 24-31:   Inversion mask for writing 2nd HW byte used
               Bit=0:            Do not invert
               Bit=1:            Invert

If both HW bytes are specified, the 1st byte contains the minus cam signals
and the 2nd byte the plus cam signals.

If the 2nd byte is not specified (= "0"), then the 8 cams are output as an AND
operation of the minus and plus cam signals via the 1st HW byte using the 1st
inversion mask.
The status of the non-inverted output signal for linear axes and for rotary
axes with "plus cam - minus cam < 180 degrees" is:
                "1" between minus and plus cams
                "0" outside this range

The status of the non-inverted output signal for rotary axes with "plus cam -
minus cam >= 180 degrees" is:
                "0" between minus and plus cams
                "1" outside this range

The following must be specified as the byte address for the digital outputs:
1:      for on-board byte
2 - 5:  for external bytes
```

10480	SW_CAM_TIMER_FASTOUT_MASK			N09	N3
-	Mask for output of cam signals via timer interr. to NCU			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
A timer-controlled output to the 4 on-board outputs of the NCK I/Os can be
selected in this machine data for 4 cam pairs.

In this case, the minus and plus signals of a cam pair are EXCLUSIVE OR'd for
output as one signal.

Meaning for set bit:
Associated cam (minus and plus cam signals EXCLUSIVE OR'd) is output via a
timer interrupt at one of the 4 on-board outputs of the NCU.

The on-board outputs are assigned in order of increasing machine axis numbers
(with assigned cam pairs).

Example:
Machine axis 3  = cam pair 1  -->   on-board output 3
Machine axis 1  = cam pair 2  -->   on-board output 1
Machine axis 7  = cam pair 3  -->   on-board output 4
Machine axis 2  = cam pair 4  -->   on-board output 2

If a plurality of cam pairs are set for one machine axis, then this axis is
assigned in ascending order of the cam pairs.
Example:
Machine axis 3  = cam pair 1  -->   on-board output 2
Machine axis 3  = cam pair 2  -->   on-board output 3
Machine axis 7  = cam pair 3  -->   on-board output 4
Machine axis 2  = cam pair 4  -->   on-board output 1

This function works independently of the assignment set in MD:
SW_CAM_ASSIGN_FASTOUT_1 or MD: SW_CAM_ASSIGN_FASTOUT_2.

Note:
    The on-board byte must not be used more than once.

If there is more than one signal change in the IPO cycle for the cam pairs
specified in the MD, then the cam pair with the lowest number determines the
instant of output. The other signal changes take place at the same time.
```

10485	**SW_CAM_MODE**			N09	N3
-	Behavior of SW cams			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
Meaning of the individual bits:
Bit 0(LSB) = 0:
    If more than 1 signal change per interpolation cycle is due for the cams
    specified in MD SW_CAM_TIMER_FASTOUT_MASK, the cam having the lowest num-
    ber will determine the output instant. The other signals change at the same
    instant. That is, a maximum of one interrupt-controlled output is effected
    per interpolation cycle.

Bit 0(LSB) = 1:
    Each cam specified in MD SW_CAM_TIMER_FASTOUT_MASK will be output pre-
    cisely at the time of the interpolation cycle. There is no output priority
    of the cams. A maximum of 8 interrupt-controlled outputs can be performed
    per interpolation cycle.

Bit 1 = 0:
    Inversion of signal behavior from plus cam where plus cam - minus cam >=
    180 degr .
Bit 1 = 1:
    No inversion of signal behavior from plus cam where plus cam - minus cam >=
    180 degr.
    Signal behavior on-board output:
    Overtravelling:
    Minus cam plus cam
    Traversing direction:
    positive   0->1          1->0
    negative   1->0          0->1

Bit 2 = 0:
    No path-time cam
Bit 2 = 1:
    Path-time cam for cams where minus position = plus position. The lead/delay
    time applied is independent of:
-   velocity of the axis
-   position of the axis
-   reversal of traversing direction
    The cam is only activated on overtravelling of the cam position. A lead/
    delay time applied to the minus cam is active and leads to a shift of the
    whole cam.

Bit 3 = 0:
    No alignment signal in case of measurement area selection.
Bit 3 = 1:
    Output of an alignment signal for measurement area selection (FM only). On-
    board output 8 is used permanently.
    On-board output 8 = 1: Measurement possible (active range enabled)
    On-board output 8 = 0: Measurement not possible

Bit 4 = 0:
    and following free
```

10490	**SW_CAM_COMP_NCK_JITTER**			N09	-
s	Cam jitter compensation			DOUBLE	NEW CONF
-					
-	-	0	0.0	0.0001	7/2

Description:

```
The compensation value reduces system-related time inaccuracies during output
of highly precise cam signals. The default time encumbers the cyclic time
level of the control and should therefore be selected as short as possible. It
is recommended to return a cam signal to a measuring input of the control and
to increase the compensation value until the dispersion of the measured posi-
tions cannot be reduced any further.
Currently only active for MD10485 Bit0 = 0
```

10500	**DPIO_LOGIC_ADDRESS_IN**			N10	-
-	Logical slot address of the PROFIBUS I/Os			DWORD	POWER ON
-					
-	MD_MAXNUM_DPIO_RANGE_IN	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	8191	7/2

Description:

```
Logical slot address of the PROFIBUS I/Os usable by the NCK.

The logical slot address is defined in STEP 7, hardware configuration.
```

10501	**DPIO_RANGE_LENGTH_IN**			N10	-
-	Length of the PROFIBUS I/O range			DWORD	POWER ON
-					
-	MD_MAXNUM_DPIO_RANGE_IN	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	MD_MAXNUM_DPIO_BYTES_RANGE_IN	7/2

Description:

```
Length of the PROFIBUS I/O range consistently usable for the NCK. This range
must be defined in STEP 7, hardware configuration.
 0: only the first data slot is used.
 x: length of the consistent PROFIBUS I/O range
```

10502	**DPIO_RANGE_ATTRIBUTE_IN**			N10	-
-	Attributes of the PROFIBUS I/Os			DWORD	POWER ON
-					
-	MD_MAXNUM_DPIO_RANGE_IN	0x01,0x01,0x01,0x01,0x01,0x01,0x01...	0x00	0x0F	7/2

Description:

```
Attributes of the PROFIBUS I/Os

  Bit 0: Little/Big Endian format of the system variable $A_DPx_IN[n,m]
         0: Little Endian format
         1: Big Endian format

  Bit 1: (reserved)

  Bit 2: Read input data
         0: Read possible through system variable and CC binding (increased
performance requirements)
         1: Read only possible for CC binding (low performance requirements)

  Bit 3: Slot sign-of-life alarm
         0: Slot sign-of-life alarms are output
         1: Slot sign-of-life alarms are suppressed
```

10510	**DPIO_LOGIC_ADDRESS_OUT**			N10	-
-	Logical slot address of the PROFIBUS I/Os			DWORD	POWER ON
-					
-	MD_MAXNUM_DPIO_RANGE_OUT	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	8191	7/2

Description:

```
Logical slot address of the PROFIBUS I/Os usable by the NCK.

The logical slot address is defined in STEP 7, hardware configuration.
```

10511	**DPIO_RANGE_LENGTH_OUT**			N10	-
-	Length of the PROFIBUS I/O range			DWORD	POWER ON
-					
-	MD_MAXNUM_DPIO_RANGE_OUT	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	MD_MAXNUM_DPIO_BYTES_RANGE_OUT	7/2

Description:

```
Length of the PROFIBUS I/O range consistently usable for the NCK. This range
must be defined in STEP 7, hardware configuration.
 0: only the first data slot is used.
 x: length of the consistent PROFIBUS I/O range
```

10512	DPIO_RANGE_ATTRIBUTE_OUT			N10	-
-	Attributes of the PROFIBUS I/Os			DWORD	POWER ON
-					
-	MD_MAXNUM_DPIO_RANGE_OUT	0x01,0x01,0x01,0x01,0x01,0x01,0x01...	0x00	0x0F	7/2

Description:

```
Attributes of the PROFIBUS I/Os

  Bit 0: Little/Big Endian format of system variable $A_DPx_OUT[n,m]
         0: Little Endian format
         1: Big Endian format

  Bit 1: Write output data
         0: Write only through system variable
         1: Write only through CC binding

  Bit 2: (reserved)

  Bit 3: Slot sign-of-life alarm
         0: Slot sign-of-life alarms are output
         1: Slot sign-of-life alarms are suppressed
```

10530	COMPAR_ASSIGN_ANA_INPUT_1			N10	A4
-	Hardware assignment of analog inputs for comparator byte 1			BYTE	POWER ON
-					
-	8	0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
This MD assigns analog inputs 1 to 8 to a bit number of comparator byte 1.
This input bit of the comparator is set to "1" if the comparison between the
applied analog value and the associated threshold value (MD 41600:
COMPAR_THRESHOLD_1 fulfills the condition parameterized in (MD 10540:
COMPAR_TYPE_1).

An analog input can be assigned to a plurality of comparator input bits.

The following generally applies to comparator byte 1:

    COMPAR_ASSIGN_ANA_INPUT_1 [b] = n
    with index:  b = number of comparator input bit (0 to 7)
                 n = number of analog input (1 to 8)
Example:
           COMPAR_ASSIGN_ANA_INPUT_1[0] = 1
           COMPAR_ASSIGN_ANA_INPUT_1[1] = 2
           COMPAR_ASSIGN_ANA_INPUT_1[2] = 1
           COMPAR_ASSIGN_ANA_INPUT_1[3] = 3
           COMPAR_ASSIGN_ANA_INPUT_1[4] = 3
           COMPAR_ASSIGN_ANA_INPUT_1[5] = 1
           COMPAR_ASSIGN_ANA_INPUT_1[6] = 1
           COMPAR_ASSIGN_ANA_INPUT_1[7] = 1
```

```
Analog input 1 affects input bits 0, 2 , 5, 6 and 7 of comparator byte 1
Analog input 2 affects input bit 1 of comparator byte 1
Analog input 3 affects input bits 3 and 4 of comparator byte 1

Related to:
    MD 10540: COMPAR_TYPE_1
    MD 10541: COMPAR_TYPE_2
```

10531	**COMPAR_ASSIGN_ANA_INPUT_2**			N10	A4
-	Hardware assignment of analog inputs for comparator byte 2			BYTE	POWER ON
-					
-	8	0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
This MD assigns analog inputs 1 to 8 to a bit number of comparator byte 2.
This input bit of the comparator is set to "1" if the comparison between the
applied analog value and the associated threshold value (MD 41601:
COMPAR_THRESHOLD_2 fulfills the condition parameterized in (MD 10541:
COMPAR_TYPE_2).

An analog input can be assigned to a plurality of comparator input bits.

The following generally applies to comparator byte 2:
            COMPAR_ASSIGN_ANA_INPUT_2 [b] = n
            with index:b = number of comparator input bit (0 to 7)
                       n = number of analog input (1 to 8)

Example:
    COMPAR_ASSIGN_ANA_INPUT_2[0] = 1
    COMPAR_ASSIGN_ANA_INPUT_2[1] = 2
    COMPAR_ASSIGN_ANA_INPUT_2[2] = 1
    COMPAR_ASSIGN_ANA_INPUT_2[3] = 3
    COMPAR_ASSIGN_ANA_INPUT_2[4] = 3
    COMPAR_ASSIGN_ANA_INPUT_2[5] = 1
    COMPAR_ASSIGN_ANA_INPUT_2[6] = 1
    COMPAR_ASSIGN_ANA_INPUT_2[7] = 1

Analog input 1 affects input bits 0, 2 , 5, 6 and 7 of comparator byte 2
Analog input 2 affects input bit 1 of comparator byte 2
Analog input 3 affects input bits 3 and 4 of comparator byte 2

Related to:
    MD 10540: COMPAR_TYPE_1
    MD 10541: COMPAR_TYPE_2
```

10540	COMPAR_TYPE_1			N10	A4
-	Parameterization for comparator byte 1			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
This MD can be used to make the following settings for the individual output
bits (0 to 7) of comparator byte 1:

-   Bits 0 to 7: Comparison type mask (for comparator output bits 0 to 7)
          Bit = 1: output bit = 1 if analog value >= threshold value
          Bit = 0: output bit = 1 if analog value < threshold value
          (Threshold value defined by MD 41600: COMPAR_THRESHOLD_1)

-   Bits 8 to 15:      Not used (defined to be set to 0)

-   Bits 16 to 23:     Assignment of a HW output byte for outputting
          the comparator states (statement of the byte address)
          Byte = 0:  No output via digital NCK outputs
          Byte = 1:  Output via digital onboard NCK outputs (1 to 4)
          Byte = 2:  Output via external digital NCK outputs 9 to 16
          Byte = 3:  Output via external digital NCK outputs 17 to 24
          Byte = 4:  Output via external digital NCK outputs 25 to 32
          Byte = 5:  Output via external digital NCK outputs 33 to 40

-   Bits 24 to 31:      Inversion mask for the output of the comparator states
    (bits 0 to 7)
          Bit = 0:   Output bit is not inverted
          Bit = 1:   Output bit is inverted

Related to:
    MD 10530: COMPAR_ASSIGN_ANA_INPUT_1
    MD 10531: COMPAR_ASSIGN_ANA_INPUT_2
    MD 41600: COMPAR_THRESHOLD_1
    MD 41601: COMPAR_THRESHOLD_2
    MD 10360: FASTIO_DIG_NUM_OUTPUTS
```

10541	COMPAR_TYPE_2			N10	A4
-	Parameterization of comparator byte 2			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
This MD can be used to make the following settings for the individual output
bits (0 to 7) of comparator byte 2:

-   Bits 0 to 7:  Comparison type mask (for comparator output bits 0 to 7)
     Bit = 1: output bit = 1 if analog value >= threshold value
     Bit = 0: output bit = 1 if analog value < threshold value
     (Threshold value defined by MD 41601: COMPAR_THRESHOLD_2)

-   Bits 8 to 15:       not used (defined to be set to 0)
```

- Bits 16 to 23: Assignment of a HW output byte for outputting the comparator states (statement of the byte address)

- Byte = 0: no output via digital NCK outputs
  Byte = 1: output via digital onboard NCK outputs (1 to 4)
  Byte = 2: output via external digital NCK outputs 9 to 16
  Byte = 3: output via external digital NCK outputs 17 to 24
  Byte = 4: output via external digital NCK outputs 25 to 32
  Byte = 5: output via external digital NCK outputs 33 to 40

- Bits 24 to 31: Inversion mask for the output of the comparator states (bits 0 to 7)
  Bit = 0: Output bit is not inverted
  Bit = 1: Output bit is inverted

Related to:
MD 10530: COMPAR_ASSIGN_ANA_INPUT_1
MD 10531: COMPAR_ASSIGN_ANA_INPUT_2
MD 41600: COMPAR_THRESHOLD_1
MD 41601: COMPAR_THRESHOLD_2
MD 10360: FASTIO_DIG_NUM_OUTPUTS

10600	**FRAME_ANGLE_INPUT_MODE**			EXP, N01, N09	K2
-	Sequence of rotation in FRAME			BYTE	POWER ON
-					
-	-	1	1	2	7/2

Description:

FRAME_ANGLE_INPUT_MODE sets how the rotations (ROT and AROT) around the three geometry axes are defined if more than one rotation is programmed in a block. The order in which these rotations are programmed within the block is irrelevant.

The rotations can be set to be calculated according to:

- Euler angle with FRAME_ANGLE_INPUT_MODE = 2
  The rotations are calculated according to the Euler angle in the following order:
  1. Rotation around Z
  2. Rotation around X
  3. Rotation around Y

- RPY with FRAME_ANGLE_INPUT_MODE = 1
  The rotations are calculated according to the Euler angle in the following order:
  1. Rotation around Z
  2. Rotation around Y
  3. Rotation around X

10602	**FRAME_GEOAX_CHANGE_MODE**			EXP, N01, N09	K2
-	Frames when changing geometry axes			BYTE	POWER ON
-					
-	-	0	0	5	7/2

Description:

```
Geometry axes can be switched over in the following states:
-   Selection and deselection of transformations
-   Switchable geometry axes GEOAX()

The current total frame is then defined as follows:
0:  The current total frame is canceled.

1:  The current total frame is recalculated when geometry axes are switched
over. Translations, scaling and mirroring for the new geometry axes become
active. The rotations of the old geometry axes still apply.

2:  The current total frame is recalculated when geometry axes are switched
over. Translations, scaling and mirroring for the new geometry axes become
active. If rotations were active before switching over to the current base
frames, current settable frame or programmable frame, switchover is aborted
with an alarm.

3:  The current total frame is deleted when selecting and deselecting transfor-
mations.When the GEOAX() command is entered, the frame is recalculated and
transaction, scaling and mirroring for the new geometry axes become active.
The rotations of the old geometry axes still apply.
```

10604	**WALIM_GEOAX_CHANGE_MODE**			EXP, N01, N09	A3
-	Working area limitation by changing geometry axes			BYTE	POWER ON
-					
-	-	0	0	1	7/2

Description:

```
This machine data specifies whether a potentially active  working area limita-
tion will remain active after geo axis replacement, or whether it will be
deactivated.
Meaning of the MD values:
= 0  Working area limitation will be deactivated when replacing geo axis.
= 1 Working area limitation will remain activated when replacing geo axis.
```

10610	**MIRROR_REF_AX**			EXP, N01, N09	K2
-	Reference axis for mirroring			BYTE	POWER ON
-					
-	-	0	0	3	7/2

Description:

```
0: Mirroring always takes place in the stated axis, without scaling.

The mirroring of a geometry axis can always be related to a defined
reference axis.

1: x is the reference axis
    Mirroring of the x axis is unique.
    Mirroring of the y axis  is mapped on:
     a mirroring of the x axis and
     a rotation of the z axis through 180 degrees.
    Mirroring of the z axis is mapped on:
     a mirroring of the x axis and
     a rotation of the x axis through 180 degrees and
     a rotation of the z axis through 180 degrees

2: y is the reference axis
    Mirroring of the x axis is mapped on:
      a mirroring of the y axis and
      a rotation of the z axis through 180 degrees.
    Mirroring of the y axis is unique.
    Mirroring of the z axis  is mapped on:
      a mirroring of the y axis and
      a rotation of the x axis through 180 degrees

3: z is the reference axis
    Mirroring of the x axis is mapped on:
      a mirroring of the z axis and
      a rotation of the z axis through 180 degrees and
      a rotation of the x axis through 180 degrees
    Mirroring of the y axis is mapped on:
      a mirroring of the z axis and
      a rotation of the x axis through 180 degrees.
    Mirroring of the z axis is unique.
```

10612	**MIRROR_TOGGLE**			EXP, N01, N09	K2
-	Mirror toggle			BYTE	POWER ON
-					
-	-	1	0	1	7/2

Description:

```
Mirror toggle function.
1:  Programmed axis values are not evaluated. Toggle switching behavior.
0:  Programmed axis values are evaluated.
The axes are mirrored in the case of values not equal to 0 if they are not
already mirrored. Mirroring is disabled if the value is 0.
```

10613	**NCBFRAME_RESET_MASK**			EXP	K2
-	Active NCU global base frames after reset			DWORD	RESET
-					
-	-	0xFFFF	0	0xFFFF	7/2

Description:

```
Bit mask for the reset setting of the NCU global base frames which are inclu-
ded in the channel.
The following applies:
In the case of $MC_RESET_MODE_MASK bit0 = 1 and bit14 = 1
    The entire base frame on reset is created from the linking of the NCU glo-
    bal base frame field elements whose bit in the bit mask is 1.

In the case of $MC_RESET_MODE_MASK bit0 = 1 and bit14 = 0
    The entire base frame is deselected on reset.
```

10615	**NCBFRAME_POWERON_MASK**			EXP, N12	K2
-	Reset global base frames after power on			DWORD	POWER ON
-					
-	-	0	0	0xFFFF	7/2

Description:

```
This machine data defines whether global base frames are reset in the data
management on Power On.
That is
-   Offsets are set to 0,
-   Scalings are set to 1.
-   Mirroring is disabled.
The individual base frames can be selected separately.
Bit 0 means base frame 0,  bit 1 base frame 1 etc.
Value=0: Base frame is retained on Power On
Value=1: Base frame is reset in the data management on Power On.

Related to:
    $MC_CHBFRAME_POWERON_MASK
```

10617	**FRAME_SAVE_MASK**			EXP	K1,PGA
-	Behavior of frames in SAVE subroutines			DWORD	POWER ON
-					
-	-	0	0	0x3	7/2

Description:

This machine data is used to define which frames are restored with SAVE attribute at return from a subprogram.

Bit 0: Settable frames G54 through G599

Value = 0:
If the same G code is active at subprogram return and subprogram call, the active settable frame is maintained. If not, the settable frame is reactivated when the subprogram is called.

Value = 1:
At subprogram return, the settable frame is reactivated when the subprogram is called.

Bit 1: Basic frame

Value = 0:
The active basic frame is not changed at subprogram return. This is also the case, if a basic frame change is carried out in the subprogram by an operation or by an implicit frame deselection (possibly through TRAFOOF).

Value = 1:
At subprogram return, the basic frame is reactivated when the subprogram is called.

10618	**PROTAREA_GEOAX_CHANGE_MODE**			EXP, N01, N09	A3
-	Protection range on change of geometry axes			BYTE	POWER ON
-					
-	-	0	0	3	7/2

Description:

This machine data is used to define whether any active protection zones will remain active after a transformation change or geo axis replacement, or whether they will be deactivated.

The machine data is bit-coded with the following meanings:

Bit 0 = 0
    Protection zones deactivated on transformation change.
Bit 0 = 1
    Active protection zones remain active after transformation change.

Bit 1 = 0
    Protection zones deactivated on geo axis replacement.
Bit 1 = 1
    Active protection zones remain active after geo axis replacement.

10619	**COLLISION_TOLERANCE**			EXP	-
mm	Tolerance for collision check			DOUBLE	NEW CONF
-					
-	-	1	0.001	1000.0	7/2

Description:

This parameter is used to set the required collision check accuracy. This means: If the distance between two protection zones is smaller than this value, a collision of those two protection zones may be signalled. But: Two protection zones that overlap by less than this value cannot be classified as colliding.

10620	**EULER_ANGLE_NAME_TAB**			N01, N09	F2
-	Name of Euler angle			STRING	POWER ON
-					
-	3	"A2","B2","C2"	-	-	7/2

Description:

- The name entered must not conflict with the designation and assignment of machine and geometry axis names.
- The name entered must not conflict with channel axis names in the channel (MD 20080: AXCONF_CHANAX_NAME_TAB), names for directional vectors (MD 10640: DIR_VECTOR_NAME_TAB), names for intermediate point coordinates for CIP (MD 10660: INTERMEDIATE_POINT_NAME_TAB) or the names for interpolation parameters (MD 10650: IPO_PARAM_NAME_TAB).
- The name entered must not contain the following reserved address letters:

  - D Tool offset (D function)
  - E Reserved
  - F Feedrate (F function)
  - G Preparatory function
  - H Auxiliary function (H function)
  - L Subprogram call
  - M Special function (M function)
  - N Subblock
  - P Number of subroutine repetitions
  - R Arithmetic parameter
  - S Spindle speed (S function)
  - T Tool (T function)

- Nor are keywords (e.g. DEF, SPOS etc.) and predefined identifiers (e.g. ASPLINE, SOFT) allowed.
- An angle identifier consists of a valid address letter (A, B, C, I, J, K, Q, U, V, W, X, Y, Z), followed by an optional numerical extension (1-99).

10624	**ORIPATH_LIFT_VECTOR_TAB**			N01, N09	-
-	Name of retraction vector for path-relative orientation.			STRING	POWER ON
-					
-	3	"A8","B8","C8"	-	-	7/2

Description:

List of identifiers for components of the retraction vector during reorientations for path relative interpolation of the tool orientation.

The rules for axis identifiers as described in $MC_AXCONF_CHANAX_NAME_TAB apply to the selection of identifiers. The identifiers must be selected so that they do not cause any conflicts with other identifiers (axes, normal vectors, direction vectors, conical interpolation vectors, interpolation parameters, intermediate point coordinates).

10626	**ORIPATH_LIFT_FACTOR_NAME**			N01, N09	-
-	Name of relative safety clearance with ORIPATH			STRING	POWER ON
-					
-	-	"ORIPLF"	-	-	7/2

Description:

Identifier for relative factor for determining a safety clearance for the retracting movement during reorientations for path relative interpolation of the tool orientation.

The rules for axis identifiers as described in $MC_AXCONF_CHANAX_NAME_TAB apply to the selection of identifiers. The identifiers must be selected so that they do not cause any conflicts with other identifiers (axes, normal vectors, direction vectors, conical interpolation vectors, interpolation parameters, intermediate point coordinates).

10630	**NORMAL_VECTOR_NAME_TAB**			N01, N09	F2
-	Name of normal vectors			STRING	POWER ON
-					
-	6	"A4","B4","C4","A5", "B5","C5"	-	-	7/2

Description:

Normal vector programming from software version 3.2

List of identifiers for the normal vector components at the beginning and end of the block.

The rules for axis identifiers described in $MC_AXCONF_CHANAX_NAME_TAB apply to the selection of identifiers.

The identifiers must be selected so that they do not cause any conflicts with other identifiers (axes, Euler angles, direction vectors, interpolation parameters, intermediate point coordinates).

10640	**DIR_VECTOR_NAME_TAB**			N01, N09	F2
-	Name of direction vectors			STRING	POWER ON
-					
-	6	"A3","B3","C3","AN3","BN3","CN3"	-	-	7/2

Description:

```
List of identifiers for the direction vector components. (A3 to C3)

List of identifiers for the vector components perpendicular to the direction
vector (AN3 to CN3)

The rules for axis identifiers described in $MC_AXCONF_CHANAX_NAME_TAB apply
to the selection of identifiers.

The identifiers must be selected so that they do not cause any conflicts with
other identifiers (axes, Euler angles, normal vectors, interpolation parame-
ters, intermediate point coordinates).
```

10642	**ROT_VECTOR_NAME_TAB**			N01, N09	F2
-	Name of rotation vectors			STRING	POWER ON
-					
-	3	"A6","B6","C6"	-	-	7/2

Description:

```
List of identifiers for the rotation vector components in taper direction

The rules for axis identifiers as described in $MC_AXCONF_CHANAX_NAME_TAB
apply to the selection of identifiers.

The identifiers must be selected so that they do not cause any conflicts with
other identifiers (axes, Euler angles, normal vectors, interpolation parame-
ters, intermediate point coordinates).
```

10644	**INTER_VECTOR_NAME_TAB**			N01, N09	F2
-	Name of intermediate vector components			STRING	POWER ON
-					
-	3	"A7","B7","C7"	-	-	7/2

Description:

```
List of identifiers for the intermediate vector components

The rules for axis identifiers described in $MC_AXCONF_CHANAX_NAME_TAB apply
to the selection of identifiers.

The identifiers must be selected so that they do not cause any conflicts with
other identifiers (axes, Euler angles, normal vectors, interpolation parame-
ters, intermediate point coordinates).
```

10646	**ORIENTATION_NAME_TAB**			N01, N09	F2
-	Identifiers for programming a second orientation path			STRING	POWER ON
-					
-	3	"XH","YH","ZH"	-	-	7/2

Description:

```
List of identifiers for programming of the 2nd space curve for tool orienta-
tion

The rules for axis identifiers as described in $MC_AXCONF_CHANAX_NAME_TAB
apply to the selection of identifiers.

The identifiers must be selected so that they do not cause any conflicts with
other identifiers (axes, Euler angles, normal vectors, interpolation parame-
ters, intermediate point coordinates).
```

10648	**NUTATION_ANGLE_NAME**			N01, N09	F2
-	Name of aperture angle			STRING	POWER ON
-					
-	-	"NUT"	-	-	7/2

Description:

```
Identifier for the opening angle for orientation interpolation

The rules for axis identifiers as described in $MC_AXCONF_CHANAX_NAME_TAB
apply to the selection of identifiers.

The identifiers must be selected so that they do not cause any conflicts with
other identifiers (axes, Euler angles, normal vectors, direction vectors,
intermediate point coordinates).
```

10650	**IPO_PARAM_NAME_TAB**			EXP, N01	K2
-	Name of interpolation parameters			STRING	POWER ON
-					
-	3	"I","J","K"	-	-	7/2

Description:

```
List of identifiers for the interpolation parameters

The rules for axis identifiers described in $MC_AXCONF_CHANAX_NAME_TAB apply
to the selection of identifiers.

The identifiers must be selected so that they do not cause any conflicts with
other identifiers (axes, Euler angles, normal vectors, direction vectors,
intermediate point coordinates).

Related to:
   INTERMEDIATE_POINT_NAME_TAB

References:          /PA/, Programming Guide: Fundamentals
```

10652	**CONTOUR_DEF_ANGLE_NAME**			EXP, N01, N12	FBFA
-	Name of angle for contour definitions			STRING	POWER ON
-					
-	-	"ANG"	-	-	0/0

Description:

```
Identifier for contour angle
The identifier must be selected so that no conflict arises with other identi-
fiers (e.g. axes, Euler angles, normal vectors, direction vectors, interpola-
tion point coordinates).
```

10654	**RADIUS_NAME**			EXP, N01, N12	FBFA
-	Name of radius for contour definitions			STRING	POWER ON
-					
-	-	"RND"	-	-	0/0

Description:

```
Identifier for contour radius
The identifier must be selected so that no conflict arises with other identi-
fiers (e.g. axes, Euler angles, normal vectors, direction vectors, intermedi-
ate point coordinates).
```

10656	**CHAMFER_NAME**			EXP, N01, N12	FBFA
-	Name of chamfer for contour definitions			STRING	POWER ON
-					
-	-	"CHR"	-	-	0/0

Description:

```
Identifier for contour chamfer
The identifier must be selected so that no conflict arises with other identi-
fiers (e.g. axes, Euler angles, normal vectors, direction vectors, intermedi-
ate point coordinates).
```

10660	**INTERMEDIATE_POINT_NAME_TAB**			EXP, N01	K2
-	Name of interpolation point coordinates for G2/G3			STRING	POWER ON
-					
-	3	"I1","J1","K1"	-	-	7/2

Description:

```
List of identifiers for the intermediate point coordinates
The rules for axis identifiers described in $MC_AXCONF_CHANAX_NAME_TAB apply
to the selection of identifiers. The identifiers must be selected so that they
do not cause any conflicts with other identifiers (axes, Euler angles, normal
vectors, direction vectors, intermediate point coordinates).

Related to: IPO_PARAM_NAME_TAB

References:           /PA/, Programming Guide: Fundamentals
```

10670	**STAT_NAME**			N01, N09	F2
-	Name of state information			STRING	POWER ON
-					
-	-	"STAT"	-	-	7/2

Description:

```
Identifier for position information for solving ambiguities in
Cartesian PTP travel.
An identifier must be chosen that does not conflict with other identifiers
(e.g. axes, Euler angles, normal vectors, direction vectors, intermediate
point coordinates).
```

10672	**TU_NAME**			N01, N09	F2
-	Name of state information of axes			STRING	POWER ON
-					
-	-	"TU"	-	-	7/2

Description:

```
Identifier for position information of axes for solving ambiguities in
Cartesian PTP travel.
An identifier must be chosen that does not conflict with other identifiers
(e.g. axes, Euler angles, normal vectors, direction vectors, intermediate
point coordinates).
```

10674	**PO_WITHOUT_POLY**			N01	F2
-	Polynomial programming programmable without G function POLY			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

```
Until now, the G function POLY has always had to be active during polynomial
programming
with PO[xx] = (xx), otherwise an alarm was output.
If machine data PO_WITHOUT_POLY is set to TRUE, no alarm is output with POLY
inactive during polynomial programming. The end point of the polynomial is
then approached with the linear interpolation G1.
There is no polynomial interpolation if POLY is inactive.
```

10700	**PREPROCESSING_LEVEL**			N01, N02	V2
-	Program preprocessing level			BYTE	POWER ON
-					
-	-	1	-	-	2/2

Description:

```
Bit 0= 0:
    No preprocessing

Bit 0= 1:
    The call description of the cycles is formed during control power on. All
    the programs in the directories _N_CUS_DIR, _N_CMA_DIR and _N_CST_DIR can
    be called in the part program without EXTERNAL declaration. If the parame-
    ter interface of a cycle is changed in the control, then this change does
    not become active until after Power On.

Bit 1=1:
    During control power on, all cycles in the directories _N_CUS_DIR,
    _N_CMA_DIR and _N_CST_DIR are preprocessed to form a process-optimizing
    compilation. These cycles are then processed more quickly. Changes to the
    cycle programs do not become active until after the next Power On.

Bit 2=1:
    During control power on, the Siemens cycles in the directory _N_CST_DIR are
    preprocessed to form a process-optimizing compilation (from SW 3.5).

Bit 3=1:
    During control power on, the user cycles in the directory _N_CUS_DIR  are
    preprocessed to form a process-optimizing compilation (from SW 3.5).

Bit 4=1:
    Preprocessing the user cycles in the directory _N_CMA_DIR

Bit 5=1:
    All files marked with PREPRO in the PROG statement line are preprocessed
    (from SW 6.4)
Bit 5=0:
    During control power on, all cycles in the directories activated by bits 1
    to 4 are preprocessed. This also applies to programs that are not marked
    with PREPRO.
Bit 6=1:
    The compilation is stored in SRAM if there is inadequate space in DRAM
    (from SW 7.1).
 Memory space is required for preprocessing cycles. Better utilization of
memory can be achieved by selective setting of the preprocessing:
    The runtime-critical cycles are brought together in one directory. The
    remaining cycles are in the other directory.

References:
    /PG/, "Programming Guide Fundamentals" (EXTERNAL declaration)
```

10702	**IGNORE_SINGLEBLOCK_MASK**			N01	K1
-	Prevents stopping at specific blocks in single block mode			DWORD	POWER ON
-					
-	-	0	0	0xFFFF	7/2

Description:

```
This machine data prevents stopping at certain blocks with
single block.

Single block stop can be prevented with the following bits of the mask:

Bit0 = 1
    Means that there is no stop in any internal ASUB block. Exception: the sin-
    gle block stop has been explicitly activated by the SBLON command.

    There are three different internal ASUBs that are triggered by different
    events.
    - Repos: In the case of the events: change of operating mode to a manual
    mode (JOG, JOGREF,...) unless MODESWITCH_MASK is not set, switch skip block
    on and off, activate machine data, switch-on overstore, axis replacement,
    subroutine level abort, switch-on single block, switch dry run feedrate on
    and off, alarm with compensation block.

    - Return: Delete distance-to-go, switchover after TEACH-IN, or deselection
    of MDI with corrsponding MODESWITCH_MASK.

    - _N_PROG_EVENT_SPF: Parameterizing MD 20108 $MC_PROG_EVENT_MASK paramete-
    rizes the events whereby _N_PROG_EVENT_SPF is executed.

Bit1 = 1
    Means that there is no stop in any user ASUB block. Exception: The single
    block stop has been explicitly activated via the SBLON command.
    User ASUBs are linked to an interrupt channel by the part program command
    SETINT or via the PI- _N_ASUP__. The interrupt channel is then activated
    via PLC or the high-speed inputs, and the user ASUBs are retracted.

    This disables machine data IGNORE_SINGLEBLOCK_ASUP. The NCK behavior corre-
    sponds to the machine data assignment IGNORE_SINGLEBLOCK_ASUP= FFFFFFFF.

Bit2 = 1
    Means that there is no stop in any intermediate block. Intermediate blocks
    are generated at, among other events, tool change, ADIS und complicated
    geometry.

Bit3 = 1
    Means that there is no stop in the block search pickup block. The block
    search pickup block is the 1st block that is loaded into the main run at
    the start after search target has been found in the program.

Bit4 = 1
    Means that there is no stop in the INIT blocks. INIT blocks are generated
    from reset immediately after a part program start.
```

Bit5 = 1
Means that there is no stop in any subprogram block with the parameter DISPLOF.

Bit6 = 1
Means that there is no stop in any block in which the NCK cannot reorganize.
Reorganize is an internal procedure that is needed for mode change after JOG/JOGREF..., switch skip block on and off, activate machine data, axis replacement, switch on overstore, switch on single block, switch dry run feedrate on and off, subroutine level abort, user ASUBs delete distance-to-go, switchover after TEACH-IN. Reorganize is never needed in Reset state.

Example blocks in which reorganize is impossible:
- Tool change
- 1st block after the Repos procedure
- Block after an ASUB from Jog/aborted

Bit7 = 1
Means that there cannot be a stop in any block in which repositioning is impossible.

Reposition is an internal procedure that is needed for mode change after JOG/JOGREF..., switch skip block on and off, activate machine data, axis replacement, switch on overstore, switch on single block, switch dry run feedrate on and off, subroutine level abort and possibly user ASUBs. Reposition is never needed in Reset state.

Example blocks in which reposition is impossible:
- G33 + blocks in which reorganize is impossible.

Bit8 = 1
Means that there is no stop in a residual block that does not contain traversing information.

Bit9 = 1
Means that there is no stop in a run in/main run synchronization block (e.g.STOPRE, $Variable) that is repeated because of an interruption with Reorg (e.g. mode change).

Bit10= 1
Means that there is no stop in a "tool selection block". "Tool selection block" only occurs with tool management (magazine management or TMMG) active. This block gives the corresponding tool change command to the PLC. This block is generally generated by T programming from the part program. Example block "N1010 T="Drill" M6 D1"

Depending on machine data, the "tool selection block" can be held in the interpolator until the PLC has acknowledged the corresponding tool change (see $MC_TOOL_MANAGEMENT_MASK). However the program status remains in "run".

Bit11= 1
The control has to automatically generate implicit GET blocks for the axis replacement function (axis replacement: 2 or more channels control one axis alternately) if no explicit GET(D) has been programmed and the following block wants to traverse the axis. (The other channel had previously used this axis).

An explicitly programmed GET may appear as follows "getd(x1,y1,z1) oder get(x1,y1,z1)".

There is no stop at explicit or implicit GET blocks in the single block with this bit 11.

Bit12= 1
There is no stop in the single block type 2 in the SBLON block.

Bit13= 1
If an axis is pulled out in the middle of a block and possibly assigned to another channel, then there is no stop at the PREMATURE end of this block. This block follows a REPOSA in order to traverse it to the end, there is no stop until this end has been reached.

Related to:
IGNORE_SINGLEBLOCK_ASUP

10704	**DRYRUN_MASK**			N01	V1
-	Dry run feedrate activation			BYTE	POWER ON
-					
-	-	0	0	2	7/2

Description:

DRYRUN_MASK == 0

Dryrun can only be switched on or off at the end of the block.

When DRYRUN_MASK = 1 is set, the dry run feedrate can also be activated during program execution (in the part program block).

NOTICE!
After activating dry run feedrate, the axes are stopped for the duration of the reorganization process.

DRYRUN_MASK == 2

Dryrun can be switched on or off in every phase and the axes are not stopped.

NOTICE:
However, the function does not become active until a "later" block in the program execution and this is with the next (implicit) StopRe block.

Related to:
SD 42100: DRY_RUN_FEED

10706	**SLASH_MASK**			N01	PG,A2
-	Activation of block skip			BYTE	POWER ON
-					
-	-	0	0	2	7/2

Description:

```
If SLASH_MASK = 0, skip block can only be activated when stopped at the end of
the block

If SLASH_MASK = 1, skip block can also be activated during program execution.

NOTICE!
    After activating skip block, the axes are stopped for the duration of the
    reorganization process.

If SLASH_MASK = 2 ,skip block can be activated in every phase.

Notice!
    However, the function does not become active until a "later" block in the
    program execution, and this is with the next (implicit) StopRe block.
```

10707	**PROG_TEST_MASK**			N01	K1
-	Program test mode			DWORD	POWER ON
-					
-	-	1	0	1	7/2

Description:

```
Bit-coded mask for program test
Bit 0 == 1  Program test cannot be deselected in 'Stopped' program status.
Bits 1..31  Still unused.
```

10708	**SERUPRO_MASK**			N01	K1
-	Seach run modes			DWORD	POWER ON
-					
-	-	0	0	15	7/2

Description:

```
Bit-coded mask for block search via program test (abbr. SERUPRO).

SERUPRO block search is activated by the PI service  _N_FINDBL  mode paramter
== 5.

SERUPRO means SEarchRUn by PROgram test, that is proceed under program test
from start of program to search target. Note: Program test does not move any
axis.

Bit 0 == 0
    There is a stop at M0 during the search phase
Bit 0 == 1
    There is no stop at M0 during the search phase
```

Bit 1 == 0

Alarm 16942 aborts the search phase upon the part programm command START.

Bit 1 == 1

Alarm 16942 is switched off.
NOTICE:
A start program command may really start the other channel!

Bit 2 == 0

Switches the function "Group Serupro" off

Bit 2 == 1

Switches the function "Group Serupro" on.

"Group-Serupro" enables a search routine in which the start part program command is changed into a search routine for the other channel.

Bit 3 == 0

Compels all channels that have started Serupro to end Serupro simultaneously unless they are aborted via Reset or the channel reaches M30 without finding the search taget. In other words, all channels that find the search target (including self-acting Serupro) terminate SERUPRO simultaneously.

Bit 3 == 1

Switches this function off

Bits 4 .. 31

Still unused.

10710	**PROG_SD_RESET_SAVE_TAB**			EXP, N01	K1
-	Setting data to be updated			DWORD	POWER ON
-					
-	30	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	-	-	7/2

Description:

Setting data to be backed up
The values of the SDs listed in this table are stored in non-volatile memory, i.e. remain valid after power ON. The setting data whose HMI numbers were entered in the backup list are written into the (buffered) active file system after the description of the part program on RESET.

```
Programmable setting data are:
                                                    (GCODE)
SD 42000   $SC_THREAD_START_ANGLE                   SF
SD 42400   $SC_PUNCH_DWELLTIME                      PDELAYON
SD 42800   $SC_SPIND_ASSIGN_TAB                     SETMS
SD 43210   $SA_SPIND_MIN_VELO_G25                   G25
SD 43220   $SA_SPIND_MAX_VELO_G26                   G26
SD 43230   $SA_SPIND_MAX_VELO_LIMS                  LIMS
SD 43300   $SA_ASSIGN_FEED_PER_REV_SOURCE           FPRAON
SD 43420   $SA_WORKAREA_LIMIT_PLUS                  WALIMOF
SD 43430   $SA_WORKAREA_LIMIT_MINUS                 WALIMON
SD 43510   $SA_FIXED_STOP_TORQUE                    FXST
SD 43520   $SA_FIXED_STOP_WINDOW                    FXSW
SD 43700   $SA_OSCILL_REVERSE_POS1                  OSP1
SD 43710   $SA_OSCILL_REVERSE_POS2                  OSP2
SD 43720   $SA_OSCILL_DWELL_TIME1                   OST1
SD 43730   $SA_OSCILL_DWELL_TIME2                   OST2
SD 43740   $SA_OSCILL_VELO                          FA
SD 43750   $SA_OSCILL_NUM_SPARK_CYCLES              OSNSC
SD 43760   $SA_OSCILL_END_POS                       OSE
SD 43770   $SA_OSCILL_CTRL_MASK                     OSCTRL
SD 43780   $SA_OSCILL_IS_ACTIVE                     OS

The values of SD 43420: WORKAREA_LIMIT_PLUS (working area limitation plus) and
SD 43430: WORKAREA_LIMIT_MINUS (working area limitation minus) are to be
stored in the buffered RAM after every RESET, M02, M30 or M17.
    -->  PROG_SD_RESET_SAVE_TAB[0] = 43420
    -->  PROG_SD_RESET_SAVE_TAB[1] = 43430
```

10711	**NC_LANGUAGE_CONFIGURATION**			EXP, N01	-
-	NC language commands of inactive options / functions			DWORD	POWER ON
-					
-	-	0	0	4	0/0

Description:

```
Manner of handling language commands whose associated option or function has
not been activated.
All programmable commands in an NC program or cycle program are language com-
mands. Detailed information is available in the description of the language
command STRINGIS.

ValueMeaning
 ---------------------------------------------------------------
0:  All language commands are known - especially those whose function has not
been activated. That means that all language commands are programmable. Whe-
ther the required function is active is not detected until execution. If not,
then a specific alarm is generated.

Option approved / not approved (for functions without options "Option appro-
ved" applies implicitly):
 ---------------------------------------------------------------------------
--------------------------
```

1: All language commands are known. Language commands with options that have not been approved, are recognized at the beginning of the program interpretation and rejected with alarm 12553 "Option/function inactive".
Example:
If the option data for cylinder transformation has not been set, programming of TRACYL will be rejected with alarm 12553.

2: Only those language commands are known that correspond to the current scope of approved NCK software options. This means that options that are not approved are rejected with 12550 "Name not defined or option/function not available". In this case it is not possible to decide whether the relevant command is not known in Siemens NC language in general or whether it is simply not available on this system.
Example:
If the option data for cylinder transformation has not been set, programming of TRACYL will be rejected with alarm 12550.

Function active/inactive:

3: All language commands are known. Language commands with inactive functions are recognized at the beginning of the program interpretation and rejected with alarm 12553 "Option/function inactive".
Example:
If the option data for cylinder transformation has been set, but transformation has not been activated with MD $MC_TRAFO_TYPE_1, programming of TRACYL will be rejected with alarm 12553.

4: Only those language commands are known that correspond to the current scope of active NCK software functions. This means that any command regarding inactive functions are rejected with alarm 12550 "Name not defined or option/function not available". In this case it cannot be decided whether the relevant command is not known in the Siemens NC language in general or whether it is simply not available on this system.
Example:
If the option data for cylinder transformation has been set, but transformation has not been activated with MD $MC_TRAFO_TYPE_1, programming of TRACYL will be rejected with alarm 12550.

Example:
See description for the STRINGIS language command.

10712	**NC_USER_CODE_CONF_NAME_TAB**			EXP, N01, N12	PA
-	List of reconfigured NC codes			STRING	POWER ON
-					
-	200	...	-	-	2/2

Description:

List of identifiers of the NC codes reconfigured by the user.
The list is to be structured as follows:
Even address: Identifier to be changed
Subsequent odd address: New identifier
The following three types of NC codes can reconfigured:
1. G codes e.g.: G02, G64, ASPLINE...
2. NC addresses e.g.: RND, CHF, ...
3. Pre-defined subprograms e.g.: CONTPRON, ...

10713	**M_NO_FCT_STOPRE**			EXP, N12, N07	-
-	M function with preprocessing stop			DWORD	POWER ON
-					
-	15	-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1...	-	-	7/2

Description:

The M functions defined by machine data $MN_M_NO_FCT_STOPRE perform an implicit preprocessing stop.
That is, the interpretation of the next part program line will be stopped until the block with the M function defined in that way has been processed completely
(PLC acknowledgement, motion, etc.).

10714	**M_NO_FCT_EOP**			EXP, N07	S1
-	M function for spindle active after reset			DWORD	POWER ON
-					
-	-	-1	-	-	7/2

Description:

For spindles where a '2' is configured in $MA_SPIND_ACTIVE_AFTER_RESET, no spindle reset is enabled with this M function when the part program is terminated. The spindle therefore remains active after the end of the part program.

Proposal: M32
Restrictions: see machine data 10715: $MN_M_NO_FCT_CYCLE

Related to:
$MA_SPIND_ACTIVE_AFTER_RESET
$MN_M_NO_FCT_EOP,
$MN_M_NO_FCT_CYCLE,
$MC_SPIND_RIGID_TAPPING_M_NR,
$MC_AUXFU_ASSOC_M0_VALUE

For external language mode:
$MN_EXTERN_M_NO_MAC_CYCLE,
$MN_EXTERN_M_NO_SET_INT
$MN_EXTERN_M_NO_DISABLE_INT,
$MN_EXTERN_CHAN_SYNC_M_NO_MIN,
$MN_EXTERN_CHAN_SYNC_M_NO_MAX
$MC_EXTERN_RIGID_TAPPING_M_NR

For nibbling:
$MC_NIBBLE_PUNCH_CODE

10715	**M_NO_FCT_CYCLE**			EXP, N12, N07	FBFA,K1
-	M function to be replaced by a subroutine			DWORD	POWER ON
-					
-	10	-1,-1,-1,-1,-1,-1,-1,-1,-1,-1	-	-	7/2

Description:

M number with which a subprogram is called.
The name of the subprogram is stated in $MN_M_NO_FCT_CYCLE_NAME[n]. If the M function defined with $MN_M_NO_FCT_CYCLE[n] is programmed in a part program block, the subprogram defined in M_NO_FCT_CYCLE_NAME[n] is started at the end of the block. If the M function is programmed again in the subprogram, substitution by a subprogram call is then not carried out. $MN_M_NO_FCT_CYCLE[n] acts both in Siemens mode G290 and in external language mode G291.

The subprograms configured with $MN_M_NO_FCT_CYCLE_NAME[n] and $MN_T_NO_FCT_CYCLE_NAME must not be active simultaneously in one block (line of a part program). That means no more than one M/T function replacement can be active in any one block. Neither an M98 nor a modal subprogram call can be programmed in a block with the M function replacement.
Subprogram return and end of part program are also not permitted. Alarm 14016 is output in the event of a conflict.

Restrictions:
M functions with a fixed meaning and configurable M functions are checked for conflicting settings. A conflict is reported with an alarm.
The following M functions are checked:
- M0 to M5,
- M17,M30,
- M19,
- M40 to M45,
- M function for 'Spindle active after part program end' according to machine data $MN_M_NO_FCT_EOP
- M function for subprogram calls according to machine data $MN_M_NO_FCT_CYCLE
- M function for spindle/axis mode switchover according to machine data $MC_SPIND_RIGID_TAPPING_M_NR
- Additional M function for program stop according to machine data $MC_AUXFU_ASSOC_M0_VALUE
- Additional M function for conditional program stop according to machine data $MC_AUXFU_ASSOC_M1_VALUE

For external language mode only:
- M function for 'Macro call via M function' according to machine data $MN_EXTERN_M_NO_MAC_CYCLE
- M functions for interrupt programming according to configuration by $MN_EXTERN_M_NO_SET_INT and $MN_EXTERN_M_NO_DISABLE_INT
- M functions for channel synchronisation according to configuration by $MN_EXTERN_CHAN_SYNC_M_NO_MIN und $MN_EXTERN_CHAN_SYNC_M_NO_MAX
- M function for spindle/axis mode switchover with external language applied according to machine data $MC_EXTERN_RIGID_TAPPING_M_NR
- Additionally M98 and M99 with external language applied ($MN_MM_EXTERN_LANGUAGE).

For nibbling:
- M functions for nibbling/punching according to configuration by $MC_NIBBLE_PUNCH_CODE provided that they have been activated by $MC_PUNCHNIB_ACTIVATION.

Exception:
The M function for the tool change defined by $MC_TOOL_CHANGE_M_CODE must not be used in $MN_M_NO_FCT_CYCLE.

Related to:
$MN_M_NO_FCT_EOP,
$MN_M_NO_FCT_CYCLE,
$MC_SPIND_RIGID_TAPPING_M_NR,
$MC_AUXFU_ASSOC_M0_VALUE,

With external language mode:
$MN_EXTERN_M_NO_MAC_CYCLE,
$MN_EXTERN_M_NO_SET_INT
$MN_EXTERN_M_NO_DISABLE_INT,
$MN_EXTERN_CHAN_SYNC_M_NO_MIN,
$MN_EXTERN_CHAN_SYNC_M_NO_MAX
MC_EXTERN_RIGID_TAPPING_M_NR

With nibbling:
$MC_NIBBLE_PUNCH_CODE

10716	**M_NO_FCT_CYCLE_NAME**			EXP, N12, N07	FBFA,K1
-	Subroutine name for M function replacement			STRING	POWER ON
-					
-	10		-	-	7/2

Description:

The machine data contains the name of the cycle. This cycle is called if the M function has been programmed from machine data $MN_M_NO_FCT_CYCLE.
If the M function is programmed in a motion block, the cycle is executed after the motion.

$MN_M_NO_FCT_CYCLE is active in both Siemens mode G290 and in external language mode G291.
If a T number is programmed in the call block, then the programmed T number can be polled in the cycle under the variable $P_TOOL.

M and T function replacements must not be programmed simultaneously in one block. That means not more than one M or T function replacement may be active in any one block.
Neither an M98 nor a modal subprogram call may be programmed in a block with M function replacement.
Moreover, neither subprogram return nor part program end are allowed.
Alarm 14016 is issued if there is a conflict.

Related to:
$MN_M_NO_FCT_CYCLE,
$MN_T_NO_FCT_CYCLE_NAME

10717	**T_NO_FCT_CYCLE_NAME**			EXP, N12, N07	FBFA,K1
-	Name of tool-changing cycle for T function replacement			STRING	POWER ON
-					
-	-		-	-	7/2

Description:

```
Cycle name for tool change routine on call-up with a T function.
If a T function is programmed in a part program block, the subprogram defined
in  T_NO_FCT_CYCLE_NAME is called at the end of the block.
The T number programmed can be polled in the cycle via system variables $C_T /
$C_T_PROG as a decimal value and via $C_TS / $C_TS_PROG as a string (only with
tool management). $MN_T_NO_FCT_CYCLE_NAME is active both in Siemens mode G290
and in external language mode G291.

$MN_M_NO_FCT_CYCLE_NAME and $MN_T_NO_FCT_CYCLE_NAME must not be active in one
block at the same time, i.e. no more than one M/T function replacement can be
active per block. In the block with the T function replacement, neither an M98
nor a modal subprogram call can be programmed. Furthermore, neither subpro-
gram return nor part program end are allowed.

In the event of a conflict alarm 14016 is output.

Related to:
    $MN_M_NO_FCT_CYCLE,
    $MN_M_NO_FCT_CYCLE_NAME
```

10718	**M_NO_FCT_CYCLE_PAR**			EXP, N12, N07	-
-	M function replacement with parameters			DWORD	POWER ON
-					
-	-	-1	-	-	7/2

Description:

```
If an M function replacement was configured with $MN_M_NO_FCT_CYCLE[n] /
$MN_M_NO_FCT_CYCLE_NAME[n], a parameter transfer via system variable can be
specified for one of these M functions using $MN_M_NO_FCT_CYCLE_PAR, in the
same way as T function replacement. The parameters stored in the system vari-
ables always refer to the part program line where the M function to be
replaced was programmed.

The following system variables are available:
$C_ME      : Address extension of the replaced M function
$C_T_PROG  : TRUE if address T was programmed
$C_T       : Value of address T ( Integer )
$C_TE      : Address extension of address T
$C_TS_PROG : TRUE if address TS was programmed
$C_TS      : Value of address TS (string, only with tool management )
$C_D_PROG  : TRUE if address D was programmed
$C_D       : Value of address D
$C_DL_PROG : TRUE if address DL was programmed
$C_DL      : Value of address DL
```

10719	**T_NO_FCT_CYCLE_MODE**			EXP, N12, N07	K1
-	Setting of T function substitution			DWORD	POWER ON
-					
-	-	0	0	7	7/2

Description:

```
This machine data parameterizes the execution of the replacement subprogram
for the tool and tool offset selection.

Bit 0 = 0:
     D or DL number is transferred to the replacement subprogram (default
    value)

Bit 0 = 1:
    The D or DL number is not transferred to the replacement subprogram if the
    following conditions are fulfilled: $MC_TOOL_CHANGE_MODE = 1   Programming
    D/DL with T or M function with which the tool change cycle is called, in a
    part program line.

Bit 1 = 0
    Execution of the replacement subprogram at end of block (default value)
Bit 1 = 1
    Execution of the replacement subprogram at block start

Bit 2 = 0:
    Execution of the replacement subprogram according to the settin of bit 1
Bit 2 = 1:
    Execution of the replacement subprogram at block start and at end of block.
```

10720	**OPERATING_MODE_DEFAULT**			N01	H2
-	Setting of mode after power ON			BYTE	POWER ON
-					
-	10	7,7,7,7,7,7,7,7,7,7	0	12	7/2

Description:

```
Default modes of the mode groups after power ON.
If no mode is selected by the PLC, all the channels associated with mode group
n are in the mode preset by OPERATING_MODE_DEFAULT[ n -1 ] after power ON:
0 = Automatic mode
1 = Automatic mode, submode REPOS
2 = MDI mode
3 = MDI mode, submode REPOS
4 = MDI mode, submode Teach In
5 = MDI mode, submode Reference point approach
6 = JOG mode
7 = JOG mode, submode Reference point approach
8 = AUTO mode, submode Teach In
9 = AUTO mode, submode Teach In, submode Reference point approach
10 = AUTO mode, submode Teach In, submode  Repos
11 = MDI mode, submode Teach In, submode  Reference point approach
12 = MDI mode, submode Teach In, submode Repos
```

10722	AXCHANGE_MASK			EXP, N01	K5
-	Paramameters for axis replacement behavior			DWORD	POWER ON
-					
-	-	0	0	0xFFFF	7/2

Description:

```
The axis replacement behavior can be changed with this
machine data.

Bit0 = 1
    Means that there is an automatic axis replacement via channels even if the
    axis has been brought into a neutral state by Waitp.

Bit1 = 1
    Means that an AXCTSWE fetches all the axis container axes that can be assi-
    gned to the channel by means of implicit GET or GETD, and an axis replace-
    ment is not permitted again until after the axis container rotation.

Bit2 = 1
    Means that, in the case of a GET, an intermediate block without  preproces-
    sing stop is generated, and whether a reorganization is needed is not che-
    cked until main run.

Bit3 = 1 means, that the NC carries out an axis replacement request for the
VDI interface only for:
         - an axis exclusively controlled by the PLC ($MA_BASE_FUNCTION_MASK
Bit 4 == 1)
         - a permanently assigned PLC axis ($MA_BASE_FUNCTION_MASK Bit 5 == 1)
         For such axes, the VDI interface signal 'Axis replacement possible'
is always 1.
         For all other axes, the VDI interface signal 'Axis replacement pos-
sible' is always 0.
         For permanently assigned PLC axes, an axis replacement is possible
only from neutral axis to PLC axis
         or from PLC axis to neutral axis.
Bit3 = 0 means that an axis replacement can be requested by the PLC for each
axis.
         For permanently assigned PLC axes, an axis replacement is only pos-
sible from neutral axis to PLC axis
         or from PLC axis to neutral axis.
```

10731	JOG_MODE_KEYS_EDGETRIGGRD			EXP, N01	IAF
-	Functioning of the JOG keys			BOOLEAN	POWER ON
-					
-	-	TRUE	-	-	0/0

Description:

```
This data determines whether the signals of the VDI interface, which set the
JOG mode (progressive INC10000, ... INC1), work as switches (level triggered)
or as push buttons (edge triggered). In the latter case, a setting is made in
the NCK to retain the function of the key last pressed.
```

10735	**JOG_MODE_MASK**			EXP, N01	-
-	Enable JOG in automatic			DWORD	POWER ON
-					
-	-	0	0	0x1	7/2

Description:

```
Bit 0:
    Enables JOG in automatic.

    JOG is enabled in automatic when all channels in the mode group are in the
    RESET state and no channel of the DRF mode group has been selected. The
    mode group changes internally to JOG with the +/- key and the handwheel,
    and the axis moves. After the JOG motion has ended, a change back to AUTO
    is also made internally.


Bits 1-31:
    Currently unassigned.
```

10760	**G53_TOOLCORR**			N12	FBFA
-	Method of operation of G53, G153 and SUPA			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

```
With this MD you define whether tool length offset and tool radius offset are
also to be suppressed with language commands G53, G153 and SUPA
0: G53,G153 and SUPA cause block-by-block suppression of zero offsets. The
active tool length offset and tool radius offset remain active.

1: G53,G153 and SUPA cause block-by-block suppression of zero offsets, active
tool length offset and tool radius offset.
```

10780	**UNLOCK_EDIT_MODESWITCH**			EXP, N01	-
-	Cancel start disable when editing a part program			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	0/0

Description:

```
To avoid inconsistent states, a start disable is forced in Teach In mode when
a part program is edited.
This start disable during editing can be canceled together with the operating
algorithms of the individual MMCs by an NC reset or a mode group change.

0: Start disable when editing is also canceled with NC Reset

1: Start disable when editing is also canceled on a mode group change.
```

10800	EXTERN_CHAN_SYNC_M_NO_MIN			EXP, N12	FBFA
-	1st M function for channel synchronization			DWORD	POWER ON
-					
-	-	-1	-	-	7/2

Description:

M number of the first M function which can be used to perform a channel (program) synchronization in ISO2/3 mode.
To avoid conflicts with standard M functions the lowest permissible value is 100. If you enter a value between 0 and 99, alarm 4170 will be issued.

10802	EXTERN_CHAN_SYNC_M_NO_MAX			EXP, N12	FBFA
-	Last M function for channel synchronization			DWORD	POWER ON
-					
-	-	-1	-	-	7/2

Description:

M number of the last M function which can be used to perform a channel (program) synchronization in ISO2/3 mode. In combination with $MN_EXTERN_CHAN_SYNC_M_NO_MIN, the machine data defines an M number range reserved for channel synchronization. This range may be a maximum of 10 times the amount of channels since only 10 WAIT marks may be set for each channel.
If you enter a value between 0 and 99 or less than $MN_EXTERN_CHAN_SYNC_M_NO_MIN, alarm 4170 is issued.

10804	EXTERN_M_NO_SET_INT			EXP, N12	FBFA
-	M function to activate ASUB			DWORD	POWER ON
-					
-	-	96	-	-	7/2

Description:

M function number used to activate an interrupt program (ASUB) in ISO2/3 mode.
The interrupt program is always started by the 1st high-speed input of the numerical control.
The M number defined in the machine data replaces M96 in external language mode.
Restrictions: Refer to machine data 10715: $MN_M_NO_FCT_CYCLE
Related to:
    $MN_M_NO_FCT_EOP,
    $MN_M_NO_FCT_CYCLE,
    $MC_SPIND_RIGID_TAPPING_M_NR,
    $MC_AUXFU_ASSOC_M0_VALUE
For external language mode:
    $MN_EXTERN_M_NO_MAC_CYCLE,
    $MN_EXTERN_M_NO_SET_INT
    $MN_EXTERN_M_NO_DISABLE_INT,
    $MN_EXTERN_CHAN_SYNC_M_NO_MIN,
    $MN_EXTERN_CHAN_SYNC_M_NO_MAX
    $MC_EXTERN_RIGID_TAPPING_M_NR
For nibbling:
    $MC_NIBBLE_PUNCH_CODE

10806	**EXTERN_M_NO_DISABLE_INT**			EXP, N12	FBFA
-	M function to deactivate ASUB			DWORD	POWER ON
-					
-	-	97	-	-	7/2

Description:

```
M function number used to deactivate an interrupt program (ASUB) in ISO2/3
mode. The M number defined in the machine data replaces M97 in external langu-
age mode.
Restrictions: refer to machine data 10715 $MN_M_NO_FCT_CYCLE

    $MN_M_NO_FCT_EOP,
    $MN_M_NO_FCT_CYCLE,
    $MC_SPIND_RIGID_TAPPING_M_NR,
    $MC_AUXFU_ASSOC_M0_VALUE

For external language mode:
    $MN_EXTERN_M_NO_MAC_CYCLE,
    $MN_EXTERN_M_NO_SET_INT
    $MN_EXTERN_M_NO_DISABLE_INT,
    $MN_EXTERN_CHAN_SYNC_M_NO_MIN,
    $MN_EXTERN_CHAN_SYNC_M_NO_MAX
    $MC_EXTERN_RIGID_TAPPING_M_NR

For nibbling:
    $MC_NIBBLE_PUNCH_CODE
```

10808	**EXTERN_INTERRUPT_BITS_M96**			EXP, N12	FBFA
-	Activate interrupt program (ASUB)			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
Setting the various bits can influence the processing of the interrupt rou-
tine activated by M96 P...
Bit 0 = 0,
    No interrupt program possible, M96/M97 are normal M functions
Bit 0 = 1,
    Using M96/M97 to activate an interrupt program is allowed
Bit 1 = 0,
    Continue processing part program at the final position of the next block
    after the interrupt block
Bit 1 = 1,
    Continue processing part program from interrupt position
Bit 2 = 0,
    The interrupt signal immediately interrupts the current block and starts
    the interrupt routine
Bit 2 = 1,
    The interrupt routine will not be started until the end of the block
Bit 3 = 0,
    Interrupt machining cycle at an interupt signal
Bit 3 = 1,
    Do not start interrupt program until the end of a machining cycle.
```

10810	EXTERN_MEAS_G31_P_SIGNAL			EXP, N12	FBFA
-	Config. of measuring inputs for G31 P..			BYTE	POWER ON
-					
-	4	1,1,1,1	0	3	7/2

Description:

This machine data defines the assignment of measurement inputs 1 and 2 to the P numbers programmed with G31 P1 (- P4). The machine data is bit-coded. Only bits 0 and 1 are evaluated. For example, if bit 0 = 1 in $MN_EXTERN_MEAS_G31_P_SIGNAL[1] the 1st measurement input is activated with G31 P2. If $MN_EXTERN_MEAS_G31_P_SIGNAL[3]=2, the 2nd measurement input is activated with G31 P4.

```
Bit 0:   = 0, Do not evaluate measurement input 1 with G31 P1 (- P4)
Bit 0:   = 1, Activate measurement input 1 with G31 P1 (- P4)
Bit 1:   = 0, Do not evaluate measurement input 2 with G31 P1 (- P4)
Bit 1:   = 1, Activate measurement input 2 with G31 P1 (- P4)
```

10812	EXTERN_DOUBLE_TURRET_ON			EXP, N12	FBFA
-	Double turret with G68			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

This machine data is used to determine whether double-slide machining (channel synchronization for 1st and 2nd channel) is to be started using G68 or whether the second tool of a double turret (= two closely-linked tools at a distance defined in the setting data $SC_EXTERN_DOUBLE_TURRET_DIST) is to be activated.

```
FALSE:
    Channel synchronization for double-slide machining

TRUE:
    Load 2nd tool of a double turret  (that is, activate
    $SC_EXTERN_DOUBLE_TURRET_DISTANCE as additive zero offset and mirroring
    around Z axis)
```

10814	**EXTERN_M_NO_MAC_CYCLE**			EXP, N12	FBFA
-	Macro call via M function			DWORD	POWER ON
-					
-	10	-1,-1,-1,-1,-1,-1,-1,-1,-1,-1	-	-	7/2

Description:

```
A macro is called with this M number.

The name of the subprogram is stated in $MN_EXTERN_M_NO_MAC_CYCLE_NAME[n].

If the M function specified with $MN_EXTERN_M_NO_MAC_CYCLE[n] is programmed in
a part program block, the subprogram defined in  EXTERN_M_NO_MAC_CYCLE_NAME[n]
is started. All addresses programmed in the block are written into the corres-
ponding variables.

If the M function is programmed again in the subprogram, the replacement by a
subprogram call does not take place any more.

$MN_EXTERN_M_NO_MAC_CYCLE[n] is only active in the external language mode
G291.

The subprograms configured with  $MN_EXTERN_M_NO_MAC_CYCLE_NAME[n] must not be
active simultaneously in a block (part program line), i.e. maximally one M
function replacement can  become active in a block. Neither an M98 nor a modal
subprogram call may be programmed in the block with the M function replace-
ment.

Subprogram return and the part program end arealso  not permitted. Alarm 14016
is issued in case of a conflict. Restrictions: see machine data 10715:
$MN_M_NO_FCT_CYCLE

Related to:
    $MN_M_NO_FCT_EOP,
    $MN_M_NO_FCT_CYCLE,
    $MC_SPIND_RIGID_TAPPING_M_NR,
    $MC_AUXFU_ASSOC_M0_VALUE

For external language mode:
    $MN_EXTERN_M_NO_MAC_CYCLE,
    $MN_EXTERN_M_NO_SET_INT
    $MN_EXTERN_M_NO_DISABLE_INT,
    $MN_EXTERN_CHAN_SYNC_M_NO_MIN,
    $MN_EXTERN_CHAN_SYNC_M_NO_MAX
    $MC_EXTERN_RIGID_TAPPING_M_NR

For nibbling:
    $MC_NIBBLE_PUNCH_CODE
```

10815	**EXTERN_M_NO_MAC_CYCLE_NAME**			EXP, N12	FBFA
-	Name of subroutine for M function macro call			STRING	POWER ON
-					
-	10		-	-	7/2

Description:

Name of the subprogram started by a call via the M function defined by $MN_EXTERN_M_NO_MAC_CYCLE[n].

10816	**EXTERN_G_NO_MAC_CYCLE**			EXP, N12	FBFA
-	Macro call via G function			DOUBLE	POWER ON
-					
-	50	-1.,-1.,-1.,-1.,-1.,-1.,-1.,-1.,-1.,-1....	-	-	7/2

Description:

G number for calling a macro.
The name of the subprogram is stated in $MN_EXTERN_G_NO_MAC_CYCLE_NAME[n].
If the G function specified with $MN_EXTERN_G_NO_MAC_CYCLE[n] is programmed in a part program block, the subprogram defined in EXTERN_M_NO_MAC_CYCLE_NAME[n] is started. All addresses programmed in the block are written in the corresponding $C_xx variables.
No subprogram call is executed if a subprogram call is already active via an M/G macro or an M replacement. If a standard G function is programmed in this case, this code is executed. Otherwise, alarm 12470 is issued.

$MN_EXTERN_G_NO_MAC_CYCLE[n] is only active in the external language mode G291.
Only a single subprogram call may be included in a block. This means that only a single M/G function replacement may be programmed in a block and no additional subprogram (M98) or cycle call may be included in the block.
Furthermore, a subprogram return and a part program end are not permitted in the same block.

Alarm 14016 is issued in case of a conflict.

10817	**EXTERN_G_NO_MAC_CYCLE_NAME**			EXP, N12	FBFA
-	Name of subroutine for G function macro call			STRING	POWER ON
-					
-	50		-	-	7/2

Description:

Name of the subprogram started by call via the G function defined by $MN_EXTERN_G_NO_MAC_CYCLE[n].

10818	**EXTERN_INTERRUPT_NUM_ASUP**			EXP, N12	FBFA
-	Interrupt number for ASUP start (M96)			BYTE	POWER ON
-					
-	-	1	1	8	7/2

Description:

Number of the interrupt input starting an asynchronous subprogram activated in ISO mode. (M96 <program number>)

10820	**EXTERN_INTERRUPT_NUM_RETRAC**			EXP, N12	FBFA
-	Interrupt number for rapid retraction (G10.6)			BYTE	POWER ON
-					
-	-	2	1	8	7/2

Description:

Number of the interrupt input triggering rapid retraction to the position programmed with G10.6 in ISO mode.

10850	**MM_EXTERN_MAXNUM_OEM_GCODES**			EXP, N01, N12	-
-	Maximum number of OEM G codes			DWORD	POWER ON
-					
-	-	0	0	1000	1/1

Description:

This machine data is used to define the number of G codes implemented for an external language via an OEM application.

10880	**MM_EXTERN_CNC_SYSTEM**			N01, N12	FBFA
-	Definition of the control system to be adapted			DWORD	POWER ON
-					
-	-	1	1	3	7/2

Description:

Definition of the external CNC system whose part programs are to be executed on the SINUMERIK control in addition to SINUMERIK code (ISO_1):

1: ISO_2: System Fanuc0 milling (from software version 5.1)
2: ISO_3: System Fanuc0 turning (from P5.2)
3: External language via OEM application (from software version 6.2)

10881	MM_EXTERN_GCODE_SYSTEM			N01, N12	FBFA
-	ISO_3 Mode: GCodeSystem			DWORD	POWER ON
-					
-	-	0	0	2	7/2

Description:

```
Definition of the GCodeSystem to be actively executed in ISO_3 Mod (turning):

Value = 0 :   ISO_3: Code system B
Value = 1 :   ISO_3: Code system A
Value = 2 :   ISO_3: Code system C
```

10882	NC_USER_EXTERN_GCODES_TAB			N12	FBFA
-	List of user-specific G commands of an external NC language			STRING	POWER ON
-					
-	60		-	-	2/2

Description:

```
List of G commands of external NC languages which have been reconfigured by
the user.
The implemented G commands are to be taken from the current Siemens documenta-
tion for this programming language.
The list is structured as follows:
Even address:                G command to be changed
Subsequent odd address:      New G command
Only G codes can be reconfigured, e.g.: G20, G71.
```

10884	EXTERN_FLOATINGPOINT_PROG			N12	FBFA
-	Evaluation of programmed values without decimal point			BOOLEAN	POWER ON
-					
-	-	TRUE	-	-	7/2

Description:

```
This MD defines how programmed values without a decimal point are evaluated:

0: Values without a decimal point are interpreted in internal units. For
example,  X1000  = 1 mm (for 0.001 mm input resolution) X1000.0 = 1000 mm

1: Values without decimal point are interpreted as mm, inch or degrees. For
example, X1000 = 1000 mm X1000.0 = 1000 mm

Related to:
    EXTERN_INCREMENT_SYSTEM
```

10886	**EXTERN_INCREMENT_SYSTEM**			N12	FBFA
-	Incremental system in external language mode			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

```
This machine data is active for external programming languages, that is if MD
18800: MM_EXTERN_LANGUAGE = 1.

This machine data specifies which incremental system is active:
0: Incremental system  IS-B = 0.001 mm/degree
                                                = 0.0001 inch
1: Incremental system  IS-C = 0.0001 mm/degree
                                                = 0.00001 inch
Related to:
    EXTERN_FLOATINGPOINT_PROG
```

10888	**EXTERN_DIGITS_TOOL_NO**			N12	FBFA
-	Digits for T number in ISO mode			BYTE	POWER ON
-					
-	-	2	0	8	7/2

Description:

```
This machine data is only active when $MN_MM_EXTERN_CNC_SYSTEM = 2.
Number of digits of the tool number in the programmed T word.
From the programmed T word, the number of leading digits specified in
$MN_EXTERN_DIGITS_TOOL_NO are interpreted as the tool number.
The following digits address the offset memory.
```

10890	**EXTERN_TOOLPROG_MODE**			N12	FBFA
-	Tool change programming for external language			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
Configuration for programming the tool change in an external programming lan-
guage:
Bit0=0:
    Only active if $MN_MM_EXTERN_CNC_SYSTEM =2: The tool number and offset num-
    ber are programmed in the T word. $MN_DIGITS_TOOLNO defines the number of
    leading digits that the tool number generates.
    Example:
    $MN_DIGITS_TOOLNO = 2
    T=1234    ; Tool number 12,
              ; Offset number 34
```

```
 Bit0=1:
    Only active if $MN_MM_EXTERN_CNC_SYSTEM =2: Only the tool number is pro-
    grammed in the T word. Offset number = Tool number. $MN_DIGITS_TOOLNO is
    irrelevant.
    Example:
    T=12      ; Tool number 12
              ; Offset number 12

 Bit1=0:
    Only active if $MN_MM_EXTERN_CNC_SYSTEM =2: A leading 0 is added if the
    number of digits programmed in the T word is the same as that in
    $MN_EXTERN_DIGITS_TOOL_NO.
 Bit1=1:
    Only active if $MN_MM_EXTERN_CNC_SYSTEM =2: If the number of digits pro-
    grammed in the T word is equal to the number of digits defined in
    $MN_EXTERN_DIGITS_TOOL_NO, the programmed number is both the offset number
    and the tool number

 Bit2=0:
    Only active if $MN_MM_EXTERN_CNC_LANGUAGE =2: ISO T offset selection only
    with D (Siemens cutting edge number)
 Bit2=1:
    Only active if $MN_MM_EXTERN_CNC_LANGUAGE =2: ISO T offset selection only
    with H ($TC_DPH[t,d])

 Bit3=0:
    Only active if $MN_MM_EXTERN_CNC_SYSTEM =2: Each H number is only allowed
    once in each TOA, except H=0. If bit3 1 -> 0 is set, no H number may occur
    more than once in a TO unit. Otherwise an alarm will be issued at the next
    restart.

 Bit3=1:
    Only active if $MN_MM_EXTERN_CNC_SYSTEM =2: Each H number is only allowed
    more than once in each TOA.

 Bit6=0:
    Only active if MN_MM_EXTERN_CNC_SYSTEM =1: Tool length cannot be selected
    under address H
 Bit6=1:
    Only active if MN_MM_EXTERN_CNC_SYSTEM =1: Tool length selected under
    address H

 Bit7=0:
    Only active if MN_MM_EXTERN_CNC_SYSTEM =1: Tool length cannot be selected
    under address D
 Bit7=1:
    Only active if MN_MM_EXTERN_CNC_SYSTEM =1: Tool length selected under
    address D.

Selection under address D or H is possible if bits 6 and 7 have been set.
```

10900	INDEX_AX_LENGTH_POS_TAB_1			N09	T1
-	Number of positions for indexing axis table 1			DWORD	RESET
-					
-	-	0	0	60	7/2

Description:

The indexing position table is used to assign the axis positions in the valid unit of measurement (mm, inches or degrees) to the indexing positions [n] on the indexing axis. The number of indexing positions used in table 1 is defined by the MD: INDEX_AX_LENGTH_POS_TAB_1.

These indexing positions must contain valid values in table 1. Any indexing positions in the table above the number specified in the machine data are ignored. Up to 60 indexing positions (0 to 59) can be entered in the table. Table length = 0 means that the table is not evaluated. If the length is not equal to 0, then the table must be assigned to an axis with the MD: INDEX_AX_ASSIGN_POS_TAB.

If the indexing axis is defined as a rotary axis (MD: IS_ROT_AX = "1") with modulo 360° (MD: ROT_IS_MODULO = "1"), the machine data defines the last indexing position after which, with a further traversing movement in the positive direction, the indexing positions begin again at 1 .

Special cases:
    Alarm 17090 "Value violates upper limit" if values over 60 are entered in the MD: INDEX_AX_LENGTH_POS_TAB_1.

Related to:
    MD: INDEX_AX_ASSIGN_POS_TAB (axis is an indexing axis)
    MD: INDEX_AX_POS_TAB_1 (indexing position table 1)
    MD: IS_ROT_AX (rotary axis)
    MD: ROT_IS_MODULO (modulo conversion for rotary axis)

10910	INDEX_AX_POS_TAB_1			N09	T1
mm/inch, degrees	Indexing position table 1			DOUBLE	RESET
-					
-	60	0.,0.,0.,0.,0.,0.,0.,0., 0.,0.,0.,0.,0....	-	-	7/2

Description:

The indexing position table is used to assign the axis positions in the valid unit of measurement (mm, inches or degrees) to the indexing positions [n] on the indexing axis.
[n] = indexing for the entry of the indexing positions in the indexing position table.
Range: 0 y n x 59, where 0 is the 1st indexing position and 59 corresponds to the 60th indexing position.

Note.
Programming with the absolute indexing position (e.g. CAC) starts with indexing position 1. This corresponds to the indexing position with indexing n = 0 in the indexing position table.

The following should be noted when entering the indexing positions:
- Up to 60 different indexing positions can be stored in the table.
- The 1st entry in the table corresponds to indexing position 1; the nth entry corresponds to indexing position n.
- The indexing positions must be entered in the table in ascending order (starting with the negative to the positive traversing range) with no gaps between the entries. Consecutive position values must not be identical.
- If the indexing axis is defined as a rotary axis (MD: IS_ROT_AX = "1") with modulo 360° (MD: ROT_IS_MODULO = "1"), then the position values are limited to a range of 0° x pos. < 360°.

The number of indexing positions used in the table is defined by the MD: INDEX_AX_LENGTH_POS_TAB_1.
Entering the value 1 in the axial machine data: INDEX_AX_ASSIGN_POS_TAB assigns indexing position table 1 to the current axis.

Special cases:
Alarm 17020 "illegal array index" if over 60 positions are entered in the table.

Related to:
MD: INDEX_AX_ASSIGN_POS_TAB (axis is an indexing axis)
MD: INDEX_AX_LENGTH_POS_TAB_1 (no. of indexing positions used in table 1)
MD: IS_ROT_AX (rotary axis)
MD: ROT_IS_MODULO (modulo conversion for rotary axis)

10920	**INDEX_AX_LENGTH_POS_TAB_2**			N09	T1
-	Number of positions for indexing axis table 2			DWORD	RESET
-					
-	-	0	0	60	7/2

Description:

The indexing position table is used to assign the axis positions in the valid unit of measurement (mm, inches or degrees) to the indexing positions [n] on the indexing axis. The number of indexing positions used in table 2 is defined by the MD: INDEX_AX_LENGTH_POS_TAB_2.

These indexing positions in table 2 must contain valid values. Any indexing positions in the table above the number specified in the machine data are ignored.
Up to 60 indexing positions (0 to 59) can be entered in the table.
Table length = 0 means that the table is not evaluated. If the length is not equal to 0, the table must be assigned to an axis with the MD: INDEX_AX_ASSIGN_POS_TAB.
If the indexing axis is defined as a rotary axis (MD: IS_ROT_AX = "1") with modulo 360° (MD: ROT_IS_MODULO = "1"), the machine data defines the last indexing position after which, with a further traversing movement in the positive direction, the indexing positions begin again at 1.
Not relevant for tool magazines (revolvers, chain magazines)

Special cases:
Alarm 17090 "Value violates upper limit" if a value over 60 is entered in the MD:INDEX_AX_LENGTH_POS_TAB_2.

Related to:
MD: INDEX_AX_ASSIGN_POS_TAB (axis is an indexing axis)
MD: INDEX_AX_POS_TAB_2 (indexing position table 2)
MD: IS_ROT_AX (rotary axis)
MD: ROT_IS_MODULO (modulo conversion for rotary axis)

10930	**INDEX_AX_POS_TAB_2**			N09	T1
mm/inch, degrees	Indexing position table 2			DOUBLE	RESET
-					
-	60	0.,0.,0.,0.,0.,0.,0.,0., 0.,0.,0.,0.,0....	-	-	7/2

Description:

The indexing position table is used to assign the axis positions in the valid unit of measurement (mm, inches or degrees) to the indexing positions [n] on the indexing axis.
[n] = indexing for the entry of the indexing positions in the indexing position table.
Range: 0 y n x 59, where 0 is the 1st indexing position and 59 corresponds to the 60th indexing position.

Note:
Programming with the absolute indexing position (e.g. CAC) starts with indexing position 1. This corresponds to the indexing position with indexing n = 0 in the table.

The following should be noted when entering the indexing positions:
- Up to 60 different indexing positions can be stored in the table.
- The 1st entry in the table corresponds to indexing position 1; the nth entry corresponds to indexing position n.
- The indexing positions should be entered in the table in ascending order (starting with the negative to the positive traversing range) with no gaps between the entries. Consecutive position values must not be identical.
- If the indexing axis is defined as a rotary axis (MD: IS_ROT_AX = "1") with modulo 360° (MD: ROT_IS_MODULO = "1"), then the position values are limited to a range of 0° x pos. < 360°.

The number of indexing positions used in the table is defined by the MD: INDEX_AX_LENGTH_POS_TAB_2.
Entering the value 1 in the axial machine data: INDEX_AX_ASSIGN_POS_TAB assigns indexing position table 1 to the current axis.

Special cases:
Alarm 17020 "illegal array index" if over 60 positions are entered in the table.

Related to:
MD: INDEX_AX_ASSIGN_POS_TAB (axis is an indexing axis)
MD: INDEX_AX_LENGTH_POS_TAB_2 (no. of indexing positions used in table 2)
MD: IS_ROT_AX (rotary axis)
MD: ROT_IS_MODULO (modulo conversion for rotary axis)

10940	**INDEX_AX_MODE**			EXP	-
-	Settings for indexing position			DWORD	POWER ON
-					
-	-	0	0	1	7/2

Description:

```
Affects the display of indexing positions (AA_ACT_INDEX_AX_POS_NO and aaActIn-
dexAxPosNo).
Bit 0 = 0:
    Indexing position display changes on reaching/passing the indexing posi-
    tion (indexing range lies between the indexing positions, compatible beha-
    vior).
Bit 0 = 1:
    Indexing position display changes on passing the half indexing axis posi-
    tion (indexing range lies quasi symmetrically round the indexing position)
```

11100	**AUXFU_MAXNUM_GROUP_ASSIGN**			N01, N07, N02	H2
-	Number of auxiliary functions distr. amongst aux. fct. groups			DWORD	POWER ON
-					
-	-	1	1	255	7/2

Description:

```
The maximum number of auxiliary functions that can be assigned to a group by
AUXFU_ASSIGN_TYPE,
AUXFU_ASSIGN_EXTENTION,
AUXFU_ASSIGN_VALUE and
AUXFU_ASSIGN_GROUP.
This number includes only the user-defined auxiliary functions, not the prede-
fined auxiliary functions.

Related to:
    MD 22010: AUXFU_ASSIGN_TYPE[n]
```

11110	**AUXFU_GROUP_SPEC**			N07	H2
-	Auxiliary function group specification			DWORD	POWER ON
-					
-	64	0x81,0x21,0x41,0x41,0x41,0x41,0x41...	-	-	7/2

Description:

```
Defines the output options for the auxiliary functions belonging to a group.

Bit 0=1
    Output duration 1 OB1 pass (normal auxiliary function)
Bit 1=1
    Output duration 1 OB40 pass, alarm-controlled (high-speed auxiliary func-
    tion)
Bit 2         Reserved
Bit 3=1
    No output to PLC (may only be set as single bit)
```

```
Bit 4=1
    Spindle response after acknowledgement by the PLC
Bit 5=1
    Output prior to motion
Bit 6=1
    Output during motion
Bit 7=1
    Output at end of block
Bit 8=1
    No output after block search

The MD must be defined for each existing auxiliary function group.
The index [n] indicates the number of the auxiliary function group: 0...14
[0]  = 1st auxiliary function group, [1]  = 2nd auxiliary function group ...

The assignment of individual auxiliary functions to specific groups is defi-
ned in channel-specific machine data ( AUXFU_ASSIGN_TYPE,
AUXFU_ASSIGN_EXTENTION, AUXFU_ASSIGN_VALUE,  AUXFU_ASSIGN_GROUP ). M0, M1, M2,
M17 and M30 are assigned to group 1 by default.
The specification of this group ( 0x81: output duration 1 OB1 pass, output at
end of block ) must not be changed.
All spindle-specific auxiliary functions ( M3, M4, M5, M19, M70 ) are assig-
ned to group 2 by default.
If several auxiliary functions with different output types ( before / during /
at end of motion ) are programmed in one motion block, then the output of the
individual auxiliary functions occurs in accordance with their output types.
All auxiliary functions are output simultaneously in a block without motion.

Default setting:
    AUXFU_GROUP_SPEC[0]=81H
    AUXFU_GROUP_SPEC[1]=21H
    AUXFU_GROUP_SPEC[2]=41H
...
    AUXFU_GROUP_SPEC[n]=41H
```

11120	**LUD_EXTENDED_SCOPE**			N01	PG
-	Function "program global user data (PUD)" is active			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

```
Activate function "Program-global user data (PUD)":
MD = 0: User data of the main program level are only active on this level.
MD = 1: User data of the main program level are also visible in the subpro-
gram levels.
```

11140	**GUD_AREA_SAVE_TAB**			N01	-
-	Additional saving for GUD modules			DWORD	SOFORT
-					
-	9	0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
This data indicates with which additional area the contents of the GUD module
are saved.
$MN_GUD_AREA_SAVE_TAB[0] : SGUD_DEF
$MN_GUD_AREA_SAVE_TAB[1] : MGUD_DEF
$MN_GUD_AREA_SAVE_TAB[2] : UGUD_DEF
$MN_GUD_AREA_SAVE_TAB[3] : GUD4_DEF
$MN_GUD_AREA_SAVE_TAB[4] : GUD5_DEF
$MN_GUD_AREA_SAVE_TAB[5] : GUD6_DEF
$MN_GUD_AREA_SAVE_TAB[6] : GUD7_DEF
$MN_GUD_AREA_SAVE_TAB[7] : GUD8_DEF
$MN_GUD_AREA_SAVE_TAB[8] : GUD9_DEF

BitNo.   Hexadec        Meaning when bit is set
Value
0 (LSB)  0x00000001     Area TOA
```

11160	**ACCESS_EXEC_CST**			N01	-
-	Execution right for /_N_CST_DIR			BYTE	POWER ON
-					
-	-	7	-	-	7/2

Description:

```
 Execution right assigned to the program stored in directory /_N_CST_DIR :
 Value  0: Siemens password
 Value  1: Machine OEM password
 Value  2: Password of startup engineer, service
 Value  3: End user password
 Value  4: Keyswitch position 3
 Value  5: Keyswitch position 2
 Value  6: Keyswitch position 1
 Value  7: Keyswitch position 0
 Machine data can only be written with values 0 and 1, and with the correspon-
ding password also active.
```

11161	**ACCESS_EXEC_CMA**			N01	-
-	Execution right for /_N_CMA_DIR			BYTE	POWER ON
-					
-	-	7	-	-	7/2

Description:

```
Execution right assigned to the programs stored in directory /_N_CMA_DIR :
 Value  0: Siemens password
 Value  1: Machine OEM password
 Value  2: Password of startup engineer, service
 Value  3: End user password
 Value  4: Keyswitch position 3
 Value  5: Keyswitch position 2
 Value  6: Keyswitch position 1
 Value  7: Keyswitch position 0
 Machine data can only be written with values 0 and 1, and with the correspon-
ding password also active.
```

11162	**ACCESS_EXEC_CUS**			N01	-
-	Execution right for /_N_CUS_DIR			BYTE	POWER ON
-					
-	-	7	-	-	7/3

Description:

```
Execution right assigned to the programs stored in directory /_N_CUS_DIR :
 Value  0: Siemens password
 Value  1: Machine OEM password
 Value  2: Password of startup engineer, service
 Value  3: End user password
 Value  4: Keyswitch position 3
 Value  5: Keyswitch position 2
 Value  6: Keyswitch position 1
 Value  7: Keyswitch position 0
 Machine data can only be written with values 0, 1 and 2, and with the corres-
ponding password also active.
```

11165	**ACCESS_WRITE_CST**			N01	-
-	Write protection for directory /_N_CST_DIR			DWORD	POWER ON
-					
-	-	-1	-	-	7/2

Description:

```
 Set write protection for cycle directory /_N_CST_DIR:
 Assigned to the programs:
 Value -1: Keep the value currently set
 Value  0: Siemens password
 Value  1: Machine OEM password
 Value  2: Password of startup engineer, service
 Value  3: End user password
 Value  4: Keyswitch position 3
 Value  5: Keyswitch position 2
 Value  6: Keyswitch position 1
 Value  7: Keyswitch position 0
 The machine data can only be written with values 0 and 1, and with the corre-
sponding password also active.
```

11166	**ACCESS_WRITE_CMA**			N01	-
-	Write protection for directory /_N_CMA_DIR			DWORD	POWER ON
-					
-	-	-1	-	-	7/2

Description:

```
 Set write protection for cycle directory /_N_CMA_DIR:
 Assigned to the programs:
 Value -1: Keep the value currently set
 Value  0: Siemens password
 Value  1: Machine OEM password
 Value  2: Password of startup engineer, service
 Value  3: End user password
 Value  4: Keyswitch position 3
 Value  5: Keyswitch position 2
 Value  6: Keyswitch position 1
 Value  7: Keyswitch position 0
 The machine data can only be written with values 0 and 1, and with the corre-
sponding password also active.
```

11167	**ACCESS_WRITE_CUS**			N01	-
-	Write protection for directory /_N_CUS_DIR			DWORD	POWER ON
-					
-	-	-1	-	-	7/3

Description:

```
 Set write protection for cycle directory /_N_CUS_DIR:
 Assigned to the programs:
 Value -1: Keep the value currently set
 Value  0: Siemens password
 Value  1: Machine OEM password
 Value  2: Password of startup engineer, service
 Value  3: End user password
 Value  4: Keyswitch position 3
 Value  5: Keyswitch position 2
 Value  6: Keyswitch position 1
 Value  7: Keyswitch position 0
 The machine data can only be written with values 0, 1 and 2, and with the
corresponding password also active.
```

11170	**ACCESS_WRITE_SACCESS**			N01	-
-	Write protection for _N_SACCESS_DEF			BYTE	POWER ON
-					
-	-	7	-	-	7/2

Description:

```
 Set write protection for definition file /_N_DEF_DIR/_N_SACCESS_DEF:
 Value  0: Siemens password
 Value  1: Machine OEM password
 Value  2: Password of startup engineer, service
 Value  3: End user password
 Value  4: Keyswitch position 3
 Value  5: Keyswitch position 2
 Value  6: Keyswitch position 1
 Value  7: Keyswitch position 0
 The machine data can only be written with values 0 and 1, and with the corre-
sponding password also active.
```

11171	**ACCESS_WRITE_MACCESS**			N01	-
-	Write protection for _N_MACCESS_DEF			BYTE	POWER ON
-					
-	-	7	-	-	7/2

Description:

```
 Set write protection for definition file /_N_DEF_DIR/_N_SACCESS_DEF:
 Value  0: Siemens password
 Value  1: Machine OEM password
 Value  2: Password of startup engineer, service
 Value  3: End user password
 Value  4: Keyswitch position 3
 Value  5: Keyswitch position 2
 Value  6: Keyswitch position 1
 Value  7: Keyswitch position 0
 The machine data can only be written with values 0 and 1, and with the corre-
sponding password also active.
```

11172	**ACCESS_WRITE_UACCESS**			N01	-
-	Write protection for _N_UACCESS_DEF			BYTE	POWER ON
-					
-	-	7	-	-	7/3

Description:

```
 Set write protection for definition file /_N_DEF_DIR/_N_UACCESS_DEF:
 Value  0: Siemens password
 Value  1: Machine OEM password
 Value  2: Password of startup engineer, service
 Value  3: End user password
 Value  4: Keyswitch position 3
 Value  5: Keyswitch position 2
 Value  6: Keyswitch position 1
 Value  7: Keyswitch position 0
 The machine data can only be written with values 0, 1 and 2, and with the
corresponding password also active.
```

11200	**INIT_MD**			EXP, N01	IAF,IAD,IA
-	Standard machine data loaded at next Power On			BYTE	POWER ON
-					
-	-	0	-	-	7/2

Description:

A power on must be triggered after setting MD: INIT_MD. The function is executed and the MD reset to "0" at power on.

Meaning of the input:
Bit 0 set:
All machine data (with the exception of the memory-configuring data) will be overwritten with the compiled values at the next NCK power on.

Bit 1 set:
All memory-configuring machine data will be overwritten with the compiled values at the next NCK power on.

Bit 2 set:
The OEM machine data brought in by compile cycles will be deleted from the buffered memory at the next power on.

Bit 3 set:
All setting data will be overwritten with the compiled values at the next power on.

Bit 4 set: All option data will be overwritten with the compiled values at the next power on.

INIT_MD is automatically set to 0 at power on.

Memory configuring MDs are described in:
References: /IAD/, Installation and Startup Guide, Memory Configuration
- MD 10010: ASSIGN_CHAN_TO_MODE_GROUP
- All machine data starting with "MM_"
  MD 18000 - 18999 (general MD)
  MD 28000 - 28999 (channel-specific MD)
  MD 38000 - 38999 (axis-specific MD)

11210	**UPLOAD_MD_CHANGES_ONLY**			N01, N05	IAD
-	Machine data backup of changed machine data only			BYTE	SOFORT
-					
-	-	0xFF	-	-	7/3

Description:

This MD can be set so that only changed MD and setting data are backed up. It can be set to output either all data or only data which deviates from the default setting via the RS232C.

If a value is changed in a data which is stored as an array, then the complete MD array will always be output (e.g. MD 10000: AXCONF_MA-CHAX_NAME_TAB).

```
Select differential MD upload:

Bit0(LSB)  Effectiveness of the differential upload with TEA files
0: All data is output
1: Only MDs which have changed in comparison to the compiled value are output

Bit1           As bit 0

Bit2 Change to a field element
0: Complete array is output
1: Only changed field elements of an array are output

Bit3 R parameters (only for INI files)
0: All R parameters are output
1: Only R parameters not equal to '0' are output

Bit4 Frames (only for INI files)
0: All frames are output
1: Only frames which are not zero frames are output.

Bit5 Tool data (cutting edge parameters) (only for INI files)
0: All tool data is output
1: Only tool data not equal to '0' is output.

Bit6 Buffered system variables ($AC_MARKER[], $AC_PARAM[] only for INI files)
0: All system variables are output
1: Only  system variables not equal to '0' are output

Bit7 Synchronized actions GUD (for INI files only)
0: All Syna GUD are output
1: Only Syna GUD  not equal to '0' are output

Active: The change in the data becomes active on the start of the upload for
the next area.
```

11220	**INI_FILE_MODE**			N01, N05	IAD
-	Error response to INI file errors			BYTE	RESET
-					
-	-	1	0	2	7/2

Description:

```
If, while reading machine data files (INI files) into controls, data are read
in
-   that are faulty or
-   do not agree with the check sum
then alarms are generated and the reading in may be aborted. The following
control behaviors can be selected via machine data
settings:
0: Output of an alarm, abort on detection of 1st error. (As SW versions 1 and
2).

1: Output of an alarm, continuation of execution. An alarm with the number of
errors is output at the end of execution.

2: Execution continues despite possible errors. An alarm with the number of
errors is output at the end of execution.
```

11230	**MD_FILE_STYLE**			N01, N05	IAD
-	Structure of machine data backup files			BYTE	SOFORT
-					
-	-	3	-	-	7/3

Description:

```
Appearance of a machine data file at 'upload'
Bit 0 (LSB): Line check sum is generated
Bit 1:
    MD numbers are generated
Bit 2:
    Channel axis name as field index with axis-MD in the TEA file
Bit 3:
    With an NCU-link, the MDs of the LINK axes are also output.
Bit 4:
    All local axes are output (even when they are not activated by
    $MC_AXCONF_MACHAX_USED)

Active:
The change in the data becomes active on the start of the upload for the next
area.

Default setting:
The line check sums and MD numbers are generated, but not channel names as
field index with axis-MD.
```

11240	**PROFIBUS_SDB_NUMBER**			N01, N05	K4,FBU
-	SDB number			DWORD	POWER ON
-					
-	4	-1,-1,-1,-1	-1	7	2/2
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-

Description:

```
Number of the system data block (SDB-Type-2000) used for configuring the Pro-
fibus I/Os.
```

11241	**PROFIBUS_SDB_SELECT**			N01, N05	-
-	SDB source selection			DWORD	POWER ON
-					
-	-	0	0	3	2/2
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-

Description:

```
With MD11240 > 0, SDBs are loaded directly from the directory:
MD11241=0: /siemens/sinumerik/sdb/...
MD11241=1: /addon/sinumerik/sdb/...
MD11241=2: /oem/sinumerik/sdb/...
MD11241=3: /user/sinumerik/sdb/...
```

11250	**PROFIBUS_SHUTDOWN_TYPE**			EXP, N01	G3,FBU
-	Profibus shutdown handling			BYTE	POWER ON
-					
-	-	0	0	2	7/2

Description:

```
Handling of PROFIBUS when shutting down NCK (NCK reset)
Value 0:
    The bus is shut down directly from cyclic operation, without 'prewarning'

Value 1:
    When shutting down NCK, the PROFIBUS is changed to the CLEAR state for at
    least 20 cycles. Then, it is shut down. If this is not possible on the
    hardware side, the procedure described for value 2 is used instead.

Value 2:
    When shutting down NCK, the PROFIBUS is changed to a state where all drives
    are sent a zero word as control word1 and control word2 (pseudoclear) for
    at least 20 cycles. The bus itself remains in the Operate status.
```

11270	DEFAULT_VALUES_MEM_MASK			N01	PGA
-	Activation of default values for NC language elements			DWORD	POWER ON
-					
-	-	0	-	-	7/2

Description:

```
Activation of the function 'Memory for initialization values of
NC language elements'
Bit   Hex.    Meaning
       value
-------------------------------
0: (LSB)   0x1 default values GUD

Meaning of the individual bits:
Bit 0 = 0:
    The default values stated for the definition are not stored

Bit 0 = 1:
    The default values stated for the definition are stored persistently. The
    memory reserved via MD $MN_MM_GUD_VALUES_MEM is used for this purpose.

The memory reserved via $MN_MM_GUD_VALUES_MEM should be increased by the size
required for default values.
If this size cannot be determined, the memory should be doubled and adaptati-
ons should be made later if required.
The stored default values can be restored, provided that the corresponding
programming (REDEF) has been performed.
```

11280	WPD_INI_MODE			N01	IAD
-	Handling of INI files in workpiece directory			BYTE	POWER ON
-					
-	-	0	0	1	7/2

Description:

```
Processing mode of INI files in the workpiece directory:

Value = 0:
    An INI file,  _N_werkstück_INI, stored in the workpiece directory is exe-
    cuted on the first NC start after workpiece selection.
Value = 1:
    INI files with the names of the selected part program and extensions are
    executed on the first NC start after workpiece selection

SEA,
GUD,
RPA,
UFR,
PRO,
TOA,
TMA and
CEC
.
```

11285	**MACH_MODEL_MODE**			EXP	IAD
-	Type of file with machine model			BYTE	SOFORT
-					
-	-	0	0	1	3/3

Description:

```
If 3D protection zones have been defined, creation of a machine model can be
requested with this machine data.

Value 0: No model is created.

Value 1: After each change (including activation) of the 3D protection zones,
a machine model is created in user directory /_N_VRML_DIR with the name
_N_VRMLMODEL_WRL.
```

11290	**DRAM_FILESYSTEM_MASK**			N01	IAD
-	Select directories in DRAM			DWORD	POWER ON
-					
-	-	0	-	-	2/2
710-6a2c	-	0x3f	-	-	0/0
720-6a2c	-	0x3f	-	-	0/0
730-6a2c	-	0x3f	-	-	0/0
710-31a10c	-	0x3f	-	-	0/0
720-31a10c	-	0x3f	-	-	0/0
730-31a10c	-	0x3f	-	-	0/0

Description:

```
Bit0-n =  0:
    The files of the corresponding directory should be stored in SRAM
           1:
    The files of the corresponding directory should be stored in DRAM.

Bit0      CST directory (Siemens cycles)
Bit1      CMA directory (machine manufacturer's cycles)
Bit2      CUS directory (user cycles)
Bit3      MPF directory (main programs)
Bit4      SPF directory (subprograms)
Bit5      WPD directory (workpieces)
```

11291	DRAM_FILESYST_SAVE_MASK			N01	IAD
-	Selection of directories in DRAM			DWORD	POWER ON
-					
-	-	0x07	-	-	2/2
710-6a2c	-	0x3f	-	-	0/0
720-6a2c	-	0x3f	-	-	0/0
730-6a2c	-	0x3f	-	-	0/0
710-31a10c	-	0x3f	-	-	0/0
720-31a10c	-	0x3f	-	-	0/0
730-31a10c	-	0x3f	-	-	0/0

Description:

```
Bit0-n =  0:
    No backup is performed. The files stored on NCK are lost if the control is
    switched off.
           1:
    Backup in the FFS of the NC card takes place if the files are located in
    DRAM.

Bit0      CST directory (Siemens cycles)
Bit1      CMA directory (machine manufacturer cycles)
Bit2      CUS directory (user cycles)
Bit3      MPF directory (main programs)
Bit4      SPF directory (subprograms)
Bit5      WPD directory (workpieces)
```

11292	DRAM_FILESYST_CONFIG			EXP	-
-	Configuration of the DRAM file system			BYTE	POWER ON
-					
-	-	0x01	-	-	0/0
710-6a2c	-	0x22	-	-	-/-
720-6a2c	-	0x22	-	-	-/-
730-6a2c	-	0x22	-	-	-/-
710-31a10c	-	0x22	-	-	-/-
720-31a10c	-	0x22	-	-	-/-
730-31a10c	-	0x22	-	-	-/-

Description:

```
Configuration of the DRAM file system.
It is not permitted to change the default value!

Bit0/1:
    Background memory for the DRAM file system
Bit4/5:
    Memory for a fast backup during editing of DRAM files.
```

11294	**SIEM_TRACEFILES_CONFIG**			EXP	-
-	Configuration of the SIEM* trace file			DWORD	POWER ON
-					
-	-	0	-	-	2/2

Description:

```
Configuration of the tracefiles SIEM*
  Bit0:
    Additional information about the PDUs sent is to be entered in
    _N_SIEMDOMAINSEQ_MPF for download
  Bit1:
    Additional information about the PDUs received is to be entered in
    _N_SIEMDOMAINSEQ_MPF for download
```

11295	**PROTOC_FILE_MEM**			N01	-
-	Memory type for log files			BYTE	POWER ON
-					
-	10	0,0,0,0,0,0,0,0,0,0	0	1	1/1
710-6a2c	-	1,1,1,1,1,0,0,1,1,1	-	-	-/-
720-6a2c	-	1,1,1,1,1,0,0,1,1,1	-	-	-/-
730-6a2c	-	1,1,1,1,1,0,0,1,1,1	-	-	-/-
710-31a10c	-	1,1,1,1,1,0,0,1,1,1	-	-	-/-
720-31a10c	-	1,1,1,1,1,0,0,1,1,1	-	-	-/-
730-31a10c	-	1,1,1,1,1,0,0,1,1,1	-	-	-/-

Description:

```
Type of memory in which the contents of log files are stored.
0: SRAM
1: DRAM area TMP
With Powerline, a DRAM file system must be configured with
$MM_DRAM_FILE_MEM_SIZE if files are to be stored in DRAM.
```

11297	**PROTOC_IPOCYCLE_CONTROL**			N01	-
-	Prevent overrun of IPO time level			BYTE	POWER ON
-					
-	10	1,1,1,1,1,1,1,1,1,1	0	1	1/1

Description:

```
Setting whether an overflow of the time level is to be prevented during the
recording of data in the time level of the IPO.
If applicable, data sets are discarded when the function is active, and are
not entered in the log file in order to prevent an impending overflow of the
IPO time level.
This may mean that data sets are also then lost if a level overflow would not
yet have occurred with the function inactive.
```

11298	**PROTOC_PREPTIME_CONTROL**			N01	-
-	Interruption time prep time level in seconds.			DOUBLE	POWER ON
-					
-	10	1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0...	-	-	1/1

Description:

```
Time in seconds, for which the prep time level may be blocked. If the PREP
does not manage to pass through within the set time, the cyclic events are not
logged. It is thus ensured that operation cannot be completely blocked by data
recording.
```

11300	**JOG_INC_MODE_LEVELTRIGGRD**			N01	H1
-	INC and REF in jog mode			BOOLEAN	POWER ON
-					
-	-	TRUE	-	-	7/2

Description:

```
1:   Jog mode for JOG-INC and reference point approach
    JOG-INC:
    When the traversing key is pressed in the required direction (e.g. +), the
    axis begins to traverse the set increment. If the key is released before
    the increment has been completely the traversed, the movement is interrup-
    ted and the axis stops. If the same key is pressed again, the axis comple-
    tes the remaining distance-to-go until this is 0.

0:   Continuous operation for JOG-INC and reference point approach
    JOG-INC:
    When the traversing key is pressed (first rising edge) the axis travels the
    whole set increment. If the same key is pressed again (second rising edge)
    before the axis has completed traversing the increment, the movement is
    aborted, i.e. not completed.

The differences in axis travel behavior between the jog mode and continuous
operation in incremental traversing are described in detail in the relevant
chapters.
For travel behavior in reference point approach see

References:          /FB/, R1, "Reference Point Approach"

MD irrelevant for:
    Continuous traversing (JOG continuous)
```

11310	**HANDWH_REVERSE**			N09	H1
-	Threshold for direction change handwheel			BYTE	POWER ON
-					
-	-	2	-	-	7/2

Description:

```
Handwheel travel:
Value = 0:
    No immediate travel in the opposite direction

Value > 0:
    Immediate travel in the opposite direction if the handwheel is turned at
    least the stated number of pulses in the opposite direction.

Whether this machine data is also active for handwheel travel with DRF depends
on bit10 of machine data 29624: $MC_HANDWH_CHAN_STOP_COND.
```

11320	**HANDWH_IMP_PER_LATCH**			N09	H1
-	Handwheel pulses per detent position			DOUBLE	POWER ON
-					
-	6	1.,1.,1.,1.,1.,1.	-	-	7/2

Description:

```
The connected handwheels are adapted to the control in MD:
HANDW_IMP_PER_LATCH.

The number of pulses generated by the handwheel for each handwheel detent
position is to be entered. The handwheel pulse weighting must be defined sepa-
rately for each connected handwheel (1 to 3). With this adaptation, each hand-
wheel detent position has the same effect as one press of the traversing key
in incremental traversal.
If a negative value is entered, the  direction of rotation of the handwheel is
reversed.

Related to:
                    MD: JOG_INCR_WEIGHT
                    (weighting of an increment of a machine axis for
                    INC/manual).
```

11322	**CONTOURHANDWH_IMP_PER_LATCH**			N09	H1
-	Contour handwheel pulses per detent position			DOUBLE	POWER ON
-					
-	6	1.,1.,1.,1.,1.,1.	-	-	7/2

Description:

```
Adaptation factor to the hardware of the contour handwheel:
Enter the number of pulses issued per detent position by the contour
handwheel.
Because of this normalization, a detent position of the contour handwheel
corresponds to one press of a key with incremental jog processes.
Sign reversal reverses the direction of evaluation.
```

11324	**HANDWH_VDI_REPRESENTATION**			N01	OEM
-	Display of handwheel number in VDI Interface			DWORD	POWER ON
-					
-	-	0	0	1	7/2

Description:

```
The number of the handwheel is displayed in the channel/axis-specific signals
of the
VDI interface:

Value = 0 :
Bit coded (1 of 3, only 3 handwheels can be displayed)

Value = 1 :
Binary coded (6 handwheels can be displayed)
```

11330	**JOG_INCR_SIZE_TAB**			EXP, N09	H1
-	Increment size for INC/handwheel			DOUBLE	POWER ON
-					
-	5	1.,10.,100.,1000.,10 000.	-	-	7/2

Description:

```
In incremental traversal or handwheel travel, the number of increments to be
traversed by the axis can be defined by the user, e.g. via the machine cont-
rol panel.
In addition to the variable increment sizes (INCvar), 5 fixed increment sizes
(INC...) can also be set.
The increment size for each of these 5 fixed increments is defined collec-
tively for all axes by entering values in JOG_INCR_SIZE_TAB [n]. The default
setting is INC1, INC10, INC100, INC1000 and INC10000.
The entered increment sizes are also active for DRF.
The size of the variable increment is defined in SD: JOG_VAR_INCR_SIZE.

Related to:
             MD: JOG_INCR_WEIGHT(weighting of an increment for INC/manual)
             IS "Active machine function: INC1; ...; INC10000"
                 (DB21-28, DBB41 ff)
             IS "Active machine function: INC1; ...; INC10000"
                 (DB31-48, DBB69).
```

11340	**ENC_HANDWHEEL_SEGMENT_NR**			EXP, N01	FBMA
-	3rd handwheel: type of drive			BYTE	POWER ON
-					
-	-	1	1	1	0/0

Description:

```
Number of the bus segment over which the 3rd handwheel (encoder connection) is
addressed:
Related to:           $MN_ENC_HANDWHEEL_MODULE_NR
                      $MN_ENC_HANDWHEEL_INPUT_NR
```

11342	**ENC_HANDWHEEL_MODULE_NR**			N01	FBMA
-	3rd handwheel: drive number / measuring circuit number			BYTE	POWER ON
-					
-	-	0	0	31	7/2

Description:

```
Number of the module within a segment ($MN_ENC_HANDWHEEL_SEG-MENT_ NR) by
which the 3rd handwheel is addressed. On the 611D, the logical drive number
must be entered here (see MD 13010: DRIVE_LOGIC_NR). For axes on the local
bus, the module number must be entered here (counting from left to right).

= 0: The configuration of a 3rd handwheel is deactivated,
     the settings of $MN_ENC_HANDWHEEL_SEGMENT_NR and
     $MN_ENC_HANDWHEEL_INPUT_NR are irrelevant in this case.

Related to             MD 13010: DRIVE_LOGIC_NR
                       $MN_ENC_HANDWHEEL_SEGMENT_NR
                       $MN_ENC_HANDWHEEL_INPUT_NR
```

11344	**ENC_HANDWHEEL_INPUT_NR**			N01	FBMA
-	3rd handwheel: Input to module/meas. circ. Board			BYTE	POWER ON
-					
-	-	1	1	2	7/2

Description:

```
Name of the input on a module over which the 3rd handwheel is addressed.
840D: 1/2 = upper/lower actual value input
810D: always 1

Related to              $MN_ENC_HANDWHEEL_SEGMENT_NR
                        $MN_ENC_HANDWHEEL_MODULE_NR
```

11346	**HANDWH_TRUE_DISTANCE**			N01	FBMA
-	Handwheel default path or velocity			BYTE	POWER ON
-					
-	-	1	0	3	7/2

Description:

```
Setting the behavior for traversing with the handwheel, contour handwheel and
with FDA=0:

Value = 1:  (default value)
The default settings of the handwheel are path defaults. No pulses are lost.
Residual axes motions occur as a result of the limitation to a maximal permis-
sible velocity.
```

```
Value = 0:
The default settings of the handwheel are velocity defaults. The axes stop as
soon as the handwheel stops. The motion is immediately braked if no pulses
come from the handwheel in an interpolation cycle. Therefore, only a short
residual motion of the axes can
occur as a result of the braking ramp. The handwheel pulses supply no path
default.

Value = 2:
The default settings of the handwheel are velocity defaults. The axes are to
stop as soon as the handwheel stops. The motion is immediately braked if no
pulses come from the handwheel in an interpolation cycle.
However in contrast to
value = 0 braking is not along the shortest possible path but
on the next possible point of a notional incrementation.
In each case this incrementation corresponds to a displacement which the
selected
axis travels per handwheel detent position (see $MA_JOG_INCR_WEIGHT and
$MN_JOG_INCR_SIZE_TAB, $MC_HANDWH_GEOAX_MAX_INCR_SIZE,
$MA_HANDWH_MAX_INCR_SIZE). The start of the traversing is taken as the zero
point
of the incrementation.

Value = 3:
The default settings of the handwheel are path defaults. If premature braking
is required
on account of settings in other machine data ($MN_HANDWH_REVERSE != 0,
$MC_HANDWH_CHAN_STOP_COND,
$MA_HANDWH_STOP_COND), then in
contrast to value = 1 braking is not along the shortest possible path,
but on the next possible point of a notional incrementation (see
value = 2).
```

11350	**HANDWHEEL_SEGMENT**			N09	-
-	Handwheel segment			BYTE	POWER ON
-					
-	6	0,0,0,0,0,0	-	-	7/2
840di-basic	-	1,1,0,0,0,0	-	-	-/-
840di-universal	-	1,1,0,0,0,0	-	-	-/-
840di-plus	-	1,1,0,0,0,0	-	-	-/-

Description:

```
Machine data defines which
hardware segment the handwheel is connected to:
  0 = SEGMENT_EMPTY     ;no handwheel
  1 = SEGMENT_840D_HW   ;handwheel at 840D HW
  2 = SEGMENT_802DSL_HW ;handwheel at 802DSL HW
  5 = SEGMENT_PROFIBUS  ;handwheel at PROFIBUS
  7 = SEGMENT_ETHERNET  ;handwheel at Ethernet
```

11351	**HANDWHEEL_MODULE**			N09	-
-	Handwheel module			BYTE	POWER ON
-					
-	6	0,0,0,0,0,0	0	6	7/2
840di-basic	-	1,1,0,0,0,0	-	-	-/-
840di-universal	-	1,1,0,0,0,0	-	-	-/-
840di-plus	-	1,1,0,0,0,0	-	-	-/-

Description:

```
Machine data specifies the hardware module to which
the handwheel is connected.
(Content dependent on $MN_HANDWHEEL_MODUL):
  0 = no handwheel configured
    $MN_HANDWHEEL_MODUL =
  1    ;SEGMENT_840D_HW
  1    ;SEGMENT_802DSL_HW
  1..6;SEGMENT_PROFIBUS  ;Index for $MN_HANDWHEEL_LOGIC_ADDRESS[(x-1)]
```

11352	**HANDWHEEL_INPUT**			N09	-
-	Handwheel connection			BYTE	POWER ON
-					
-	6	0,0,0,0,0,0	0	6	7/2
840di-basic	-	1,2,0,0,0,0	-	-	-/-
840di-universal	-	1,2,0,0,0,0	-	-	-/-
840di-plus	-	1,2,0,0,0,0	-	-	-/-

Description:

```
Machine data which is intended to select
the handwheels connected to
a hardware module:
  0 = No handwheel configured
  1..6 = Handwheel connection to HW module
```

11353	**HANDWHEEL_LOGIC_ADDRESS**			N04, N10	-
-	Logical handwheel slot addresses			DWORD	POWER ON
-					
-	6	0,0,0,0,0,0	0	8191	7/2

Description:

```
Logical start address of the hand wheel slots if handwheels are connected by
PROFIBUS ($MN_HANDWHEEL_SEGMENT = 5)
```

11380	MONITOR_ADDRESS			EXP, N06	STZ
-	Test MD for changing the NCK code or data for Safety Integrated			DWORD	SOFORT
NBUP, NDLD					
-	-	0	-	-	0/0

Description:

Address of an NCU memory location whose content is displayed in the MDs MONITOR_DISPLAY_INT and MONITOR_DISPLAY_REAL.

There are no protective measures incorporated to prevent unauthorized access. That is the input address points to a memory area protected by the system or unoccupied, so refreshing the MD values MONITOR_DISPLAY_INT and MONITOR_DISPLAY_REAL causes a time-out and the NCU remains at a standstill (watchdog LED lights up)!

There is a list of permisible addresses for the test, which depends on the software version.

A restart resets the address to its starting value.
It then points to any writable and readable memory location that is not used by any other system function.

11382	MONITOR_DISPLAY_INT			EXP, N06	STZ
-	INTEGER display of the addressed location			DWORD	SOFORT
NBUP, NDLD					
-	-	0	-	-	0/0

Description:

INTEGER display of the addressed location SW3.2
This MD displays the content of the NCU memory location that is defined in MD MONITOR_ADDRESS. The displayed values contains the four consecutive bytes from the stated address, whereby the first byte is on the extreme right and the fourth on the extreme left.
This MD is a display MD whose content is read anew on every display refresh. Writing to this MD is ignored (without alarm).

11384	MONITOR_DISPLAY_REAL			EXP, N06	STZ
-	REAL display of the addressed location			DOUBLE	SOFORT
NBUP, NDLD					
-	-	0.0	-	-	0/0

Description:

REAL display of the addressed location SW3.2
This MD displays the content of the NCU memory location that is defined in MD MONITOR_ADDRESS. The displayed value interprets the eight consecutive memory locations from the stated address as a floating point number with double accuracy (64 bit IEEE format). 0.0 is displayed if this value does not correspond to a valid floating point number.
This MD is a display MD whose content is read anew on every display refresh. Writing to this MD is ignored (without alarm).

11386	**MONITOR_INPUT_INT**			EXP, N06	STZ
-	INTEGER input for the addressed location			DWORD	SOFORT
NBUP, NDLD					
-	-	0	-	-	0/0

Description:

```
INTEGER input for addressed location, SW3.2
The value is written with the aid of MD MONITOR_INPUT_STROBE into the address
selected with MD MONITOR_ADDRESS. The 4 bytes from the stated address are
taken over by writing the value 1 in the MD MONITOR_INPUT_STROBE.
In so doing, the byte moves to the extreme right of the memory location
MONITOR_ADDRESS, the byte to its left into the memory location
MONITOR_ADDRESS+1, etc.
```

11388	**MONITOR_INPUT_REAL**			EXP, N06	STZ
-	REAL input for addressed location			DOUBLE	SOFORT
NBUP, NDLD					
-	-	0.0	-	-	0/0

Description:

```
REAL input for addressed location, SW3.2
The value is written with the aid of MD MONITOR_INPUT_STROBE into the address
selected with MD MONITOR_ADDRESS. The 8 bytes from the stated address are
taken over by writing the value 2 in the MD MONITOR_INPUT_STROBE.
In so doing, the input floating point number is converted into 64 bit IEEE
format.
```

11390	**MONITOR_INPUT_STROBE**			EXP, N06	STZ
-	Overwrite the addressed location with MONITOR_INT/REAL			BYTE	SOFORT
NBUP, NDLD					
-	-	0	0	2	0/0

Description:

```
Overwriting the addressed location with MONITOR_INPUT_INT/REAL, SW3.2
An input into this MD takes over the content of the MD MONITOR_INPUT_INT or
the MD MONITOR_INPUT_REAL. The input value decides which data is taken over:

0: No action
1: Content of MD MONITOR_INPUT_INT is written in four NCU bytes from MD
MONITOR_ADDRESS.
2: Content of MD MONITOR_INPUT_REAL is written in eight NCU bytes from MD
MONITOR_ADDRESS.

The content of MONITOR_INPUT_STROBE is reset to 0 after the takeover (no
action). A new input can therefore be made immediately.

In order to familiarize oneself with this function, one should first leave MD
MONITOR_ADDRESS at its default value. One can then write data without causing
damage.
```

```
Examples:
    MONITOR_INPUT_INT = 55AA
    MONITOR_INPUT_STROBE = 1
    => in MONITOR_DISPLAY_INT appears 55AA

    MONITOR_INPUT_REAL = 1.234
    MONITOR_INPUT_STROBE = 2
    => in MONITOR_DISPLAY_REAL appears 1.234

Caution!!!
    Writing data to unknown addresses can even destroy the NCK system program!
    That may have unforeseen consequences (danger to machine and people!). If
    the machine and those present survive such an action undamaged, the system
    program can usually be restored by power off/on.
```

11398	**AXIS_VAR_SERVER_SENSITIVE**			EXP	B3
-	Axis-Var server response			BYTE	POWER ON
-					
-	-	0	-	-	7/2

Description:

The axis-variable server supplies the data for the OPI blocks SMA/SEMA, SGA/SEGA and SSP.
If no value can be supplied for an axis (e.g. because the axis is a link axis) then a default value (usually 0) is returned.

For debugging purposes, this machine data can be used to set the axis-var-server to sensitive so that an error message is returned instead of a default value.

0: default value
1: error message

11400	**TRACE_SELECT**			EXP	-
-	Activation of internal trace functions			DWORD	POWER ON
-					
-	-	0	-	-	0/0

Description:

Bit string for activating internal trace functions for NCK time measurements, analog output of variables etc.

11405	**TCI_TRACE_ACTIVE**			EXP	-
-	Activation of internal task trace function			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	0/0

Description:

Control the activation of the TCI interface for the NRKpro. It will activate the tci and kernel task traces modules.

11410	**SUPPRESS_ALARM_MASK**			EXP, N06	D1
-	Mask for support of special alarm outputs			DWORD	POWER ON
-					
-	-	0x108000	-	-	7/2

Description:

```
Mask for suppressing special alarm outputs
Bit set: The corresponding alarm (warning) is NOT generated.
Bit 0:
    Alarm 15110 "Channel %1 block %2 REORG not possible"
Bit 1:
    Alarm 10763 "Channel %1 block %2. The path component of the block in the
    contour plane is zero"
Bit 2:
    Alarm 16924 "Channel %1 Caution: program testing can modify tool/magazine
    data"
    --> Note: The alarm is only a message alarm
Bit 3:
    Alarm 22010 "Channel %1 spindle %2 block %3.  Actual gear stage does not
    correspond to the set gear stage"
Bit 4:
    Alarm 17188 "Channel %1 D number %2 with tool T nos. %3 and %4 defined"
    Alarm 17189 "Channel %1 D number %2 of the tools at magazine/ magazine
    locations %3 and %4 defined". The two alarms are of equal status and only
    message alarms.
Bit 5:
    Alarm 22071  "TO unit %1 tool %2 duplo no. %3 is active but not in the
    active wear grouping." The alarm is only a message alarm.
Bit 6:
    Alarm 4027 "NOTICE! MD %1 was also changed for the other axes of the axis
    container %2 "
    Alarm 4028 "NOTICE! The axial MDs in the axis container will be aligned on
    the next runup "
Bit 7:
    Alarm 22070 "TO unit %1 please change tool T= %2 into magazine. Repeat data
    backup". The alarm is only a message alarm.
Bit 8:
    Alarm 6411 "Channel %1 tool %2 with duplo no. %3 has reached tool prewar-
    ning limit"
    Alarm 6413 "Channel %1 tool %2 with duplo no. %3 has reached tool monito-
    ring limit."
    The two alarms are only message alarms. They occur during the program exe-
    cution.
Bit 9:
    Alarm 6410  "TO unit %1 tool %2 with duplo no. %3 has reached tool prewar-
    ning limit ."
    Alarm 6412 "TO unit %1 tool %2 with duplo no. %3 has reached tool monito-
    ring limit ".
    The two alarms are only message alarms. They occur as a result of an opera-
    tor action.
Bit10:
    Alarm 10604 "channel %1 block %2 "Thread lead increase too high"
    Alarm 10605 "channel %1 block %2 "Thread lead decrease too high"
```

```
Bit 11:
    Alarm 14088 "Channel 51 block %2 axis %3 doubtful position".
Bit 12:
    Alarm 10607 "Channel %1 block %2 tapping cannot be executed with frame."
Bit13:
    Alarm 10704 " channel %1 block %2 Protection area monitoring is not
                                        guaranteed."
Bit14:
    Alarm 21701 "Measuring reactivated too soon (<2 IPO cycles)"
Bit15:
    Alarm  5000  "Communication order cannot be executed"
Bit16:
    Alarm 21600 "Monitoring active for ESR"
Bit17:
    Alarm 16945 "Channel %1 action %2<ALNX> is delayed until block end"
    Note: The alarm is a only message alarm.
Bit18:
    Alarm 10750 "Channel %1 block %2 Activation of the tool radius compensa-
    tion without tool number"
Bit19:  Alarm 17193 "Channel %1 block %2 The active tool ist no longer at tool
holder no./spindle no. %3, program %4"
Bit20:
    Alarm  2900 "Reboot is delayed"
Bit21:
    Alarm 22012 "Channel %1 block %2. Leading axis %3 is in simulation mode"
    Alarm 22013 "Channel %1 block %2. Following axis %3 is in simulation mode"
    Alarm 22014 "Channel %1 block %2. The dynamics of leading axis %3 and fol-
    lowing axis %4 are very different"
Bit22:
    Alarm 26080 "Channel %1 retraction position of axis %2 not programmed or
    invalid"
    Alarm 26081 "Channel %1 single axis trigger axis %2 is triggered, but axis
    is not PLC controlled"
Bit23:
    Alarm 16949 "Correspondence between marks of channel %1 and channel %2
                                is invalid"
Bit24:
    Alarm 16950 "Channel %1 search run with holding block"
Bit25:
    Alarm 22016 "Channel %1 block %2 following spindle %3 in range of reduced
    acceleration capacity"
Bit26:
    Alarm 22015 "Channel %1 block %2 following spindle %3 no dynamic for addi-
    tional motion"
Bit27:
    Alarms 16112 and 22030  "Channel %1 block %2 following spindle %3 impermis-
    sible programming"
Bit28:
    Alarm 26083 "Channel %1 ESR for PLC controlled axis %2 was triggered"
Bit29:
    Alarm 16772 "Channel %1 block %2 axis %3 is following axis, coupling is
    opened"
Bit30:
    Alarm 16600 "Channel %1 block %2 spindle %3 gear stage change not possible"
Bit31:
    Alarm 16774 "Channel %1 axis %2 synchronizsation aborted"
```

11411	**ENABLE_ALARM_MASK**			EXP	-
-	Activation of warnings			DWORD	RESET
-					
-	-	0	-	-	7/2

Description:

```
Mask for generating alarms that are normally suppressed

Bit set:Alarms of this alarm group are output.
Bit not set:Alarms of this alarm group are not output

Bit Hex. AlarmMeaning
    value
==============================================================================
0:  0x1  Alarms that have SHOWALARMAUTO as the alarm response are output
1:  0x2  Alarms that have SHOWWARNING as the alarm response are output
2:  0x4  Alarm 22280 'Thread power up path too short' is output.
3:  0x8  Alarms that are triggered by the NCU LINK MODULE are switched on.
4:  0x10 Alarm 10883 'Chamfer or rounding must be shortened' allowed
5:  0x20 Alarm 20096 'Brake test aborted' is output
6:  0x40 Alarm 16956 'Program cannot be started because of global start
disable' is output
    Alarm14005 'Program cannot be started because of program-specific start
    disable' is output. Alarm can only be switched on in channel status RESET,
    in all other channel states it is output without conditions.
7:  0x80 Alarm 16957 'Stop delay range is suppressed' is output
8:  0x100Alarm 1011 fine coding150019 or 150020 'Incorrect axis number in the
LINK'
9:   0x200Alarm 22033 Diagnostics for 'track synchronism' (synchronous spindle)
10: 0x400Alarm 15122 'PowerOn after Powerfail: %1 data were restored, thereof
%2 machine data, %3 errors' is output
11: 0x800Alarms 10722, 10723, 10732 or 10733 are output instead of alarms
10720, 10721, 10730 or 10731.
```

11412	**ALARM_REACTION_CHAN_NOREADY**			EXP, N01	D1
-	Alarm response CHAN_NOREADY permitted			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

```
If this MD is not set, then BAG_NOREADY is executed instead of CHAN_NOREADY.
With SW version 4.1 and higher, it is possible to set CHANNEL_NOREADY on the
PLC in response to alarms.
If this MD is not set, then the alarm handler internally re-configures
CHAN_NOREADY into BAG_NOREADY.
The purpose of this MD is solely to provide compatibility with PLC systems
with versions earlier than SW4.1.
```

11413	**ALARM_PAR_DISPLAY_TEXT**			EXP, N01	D1
-	Alarm parameter as text output			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	0/0

Description:

```
If the MD is set, texts can be output as alarm parameters instead of numbers.
```

11414	**ALARM_CLR_NCSTART_W_CANCEL**			EXP, N01	D1
-	Clear NCSTART alarms with CANCEL			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

```
If this MD is set, then alarms that have ClearInfo=NCSTART are cleared by the
Alarm Cancel button as well as by NC-Start.
If this MD is not set, then NCSTART alarms are not cleared by Cancel.
The purpose of this MD is to provide compatibility with system behavior.
```

11415	**SUPPRESS_ALARM_MASK_2**			EXP, N06	-
-	Masking of alarm outputs			DWORD	POWER ON
-					
-	-	0x0	-	-	7/2

Description:

```
Mask for suppressing special alarm outputs

Bit set:Corresponding alarm (warning) is NOT triggered.

Bit Hex. Meaning
    value
================================================================================
======
0:  0x1  16773  "Channel %1 axis %3 is following axis. The axis/spindle disab-
les of the leading axes are different."
1:  0x2  2100  "NCK battery warning level reached"
    2101  "NCK battery alarm"
    2102  "NCK battery alarm"
2:  0x4  2120 "NCK fan alarm"
3:  0x8  15120 "PowerFail: Display buffer overflow"
4:  0x10 15187 "Error during execution of PROGEVENT file"
5:  0x20 15188 "Error during execution of ASUB file"
6:  0x40 26120 &AA_ESR_ENABLE = 1 and axis is to become neutral
    26121 axis is neutral and $AA_ESR_ENABLE =1 is to be set
    26123 $AA_ESR_ENABLE = 1 is to be set, but $MA_ESR_REACTION is not set
    26124 $AC_TRIGGER triggered, but axis is neutral, ESR ignores this axis
7:  0x80:10724 Software limit violated at block start
    10734 Operating range limit violated at block start
    10737 WCS operating range limit violated at block start
8:  0x100:14008 WRITE command in /_N_EXT_DIR
```

11420	**LEN_PROTOCOL_FILE**			N01	PGA
-	Size of protocol files (kB)			DWORD	POWER ON
-					
-	-	1	1	1000000	7/2

Description:

Blocks from the part program can be stored in a file with the WRITE command. The length of the log file is limited. If this maximum length is exceeded, the WRITE command produces an error.

11450	**SEARCH_RUN_MODE**			EXP, N01	K1
-	Parameterization for search run			DWORD	POWER ON
-					
-	-	0	0	0x3F	7/2

Description:

```
The behavior during the action blocks after search run can be affected by the
following bits:

Bit 0 = 0:
    Machining is stopped after loading of the last action block after search
    run, the VDI signal "last action block active" is set (DB21, ... DBX32.6)
    and alarm 10208 is output.
Bit 0 = 1:
    Machining is stopped with the loading of the last action block after search
    run, and the VDI signal "last action block active" is set. Alarm 10208 is
    not output until the PLC requests it by setting the VDI signal "PLC action
    finished".

Usage:
    Starting an ASUB from the PLC after search run.
    The message to the operator that another NC start is required in order to
    continue with the program is not to be displayed until after the end of the
    ASUB.

Bit1 == 1
    Automatic ASUB start after output of the action blocks (see also
    $MN_PROG_EVENT_NAME). Alarm 10208 is not output unitl the ASUB has fini-
    shed.

Bit2 == 0:
    Spindle: The auxiliary functions are output in the action blocks
Bit2 == 1:
    The output of the auxiliary functions in the action blocks is suppresed.
    The spindle programming collected by search run can be output at a later
    point in time (e.g. in an ASUB).
    The program data for this are stored in the following system variables:
        $P_SEARCH_S,
        $P_SEARCH_SDIR,
        $P_SEARCH_SGEAR,
        $P_SEARCH_SPOS,
        $P_SEARCH_SPOSMODE.
```

```
Bit 3 = 1:
    The cascaded search run is disabled (default setting: release).
    Cascaded search run means that the search run is restarted immediately
    after finding a search target.

Bit 4:Reserved

Bit 5 = 0:
    During block search on a nibbling block the 1st nibbling stroke is not exe-
cuted.
Bit 5 = 1:
    During block search on a nibbling block a punching stroke is triggered at
    block start (1st nibbling stroke).
```

11460	**OSCILL_MODE_MASK**			N09	P5
-	Mode mask for asynchronous oscillation			DWORD	POWER ON
-					
-	-	0x0	0	0xFFFF	7/2

Description:

```
Bit 0
Value 1
    In the case of block search, the oscillation movement is started immedia-
    tely after NC start, i.e. during approach to approach position, provided it
    has been activated in the program section being processed.

Value 0
    (default value)
    The oscillation movement is not started until the approach position is rea-
    ched.
```

11470	**REPOS_MODE_MASK**			EXP, N01	K1
-	Repositioning properties			DWORD	POWER ON
-					
-	-	0x8	0	0xFFFF	7/2

Description:

```
This bit mask can be used to set the behavior of the control during repositio-
ning.

Bit no.      Meaning when bit set
-------------------------------------------------------------------------------
0 (LSB)
    The dwell time is continued in the residual block from where it was inter-
    rupted. (If the bit is not set, the dwell time is repeated completely).
1   Reserved
2   When the bit is set, the repositioning of individual axes can be prevented
or delayed via the VDI interface.
3   When the bit is set, positioning axes are repositioned in the approach
block during search run via program test.
4   As 3, but after every Repos, not only during search run.
5   When the bit is set, changed feeds and spindle speeds already become valid
in the residual block, otherwise not until the following block.
```

6 When the bit is set, neutral axes and positioning spindles are repositioned after SERUPRO as command axes in the approach block.
7 The bit changes the behavior of the VDI-AXIN interface signal "Repos Delay". The level of "Repos Delay" is read if REPOSA is interpreted. Axes that are neither geo nor orientation axes are then excluded from the REPOS, that is REPOS does NOT move these axes.

11480	**PLC_OB1_TRACE_DEPTH**			EXP, N03, N09	-
-	Buffer depth of PLC trace data at OB1			DWORD	POWER ON
-					
-	-	2	2	8	2/2

Description:

Buffer depth of PLC trace data at OB1.

Multiple values of PLC data are buffered, between the time of collection in the PLC and the time of inspection in NCK. Variables traced at "OB1" are collected once per complete PLC scan, but can only be inspected once per IPO cycle.

The buffer size must accomodate at least one more value than the number of buffered values to be inspected. This is to prevent NCK from inspecting a value that the PLC is in the process of collecting.

A good value to start with is one more than machine data item PLC_IPO_TIME_RATIO.

The larger the buffer depth, the fewer PLC variables that can be traced, because there is a single, small, fixed pool of data slots for sending data samples from the PLC to NCK (64 data slots). Every PLC variable being traced is allocated as many data slots from the pool as the value of the buffer depth.

The single pool of data slots is shared by data collected at OB1, OB35, and OB40 (even though the buffer depths of OB1, OB35, and OB40 can be configured to be different from each other). It is also shared by all concurrent users of trace, even though the users might have no knowledge of one another.

11481	**PLC_OB35_TRACE_DEPTH**			EXP, N03, N09	-
-	Buffer depth of PLC trace data at OB35			DWORD	POWER ON
-					
-	-	2	2	8	2/2

Description:

Buffer depth of PLC trace data at OB35.

Multiple values of PLC data are buffered, between the time of collection in the PLC and the time of inspection in NCK. Variables traced at "OB35" are collected every time the PLC timer interrupts, but can only be inspected once per IPO cycle.
The buffer size must accomodate at least one more value than the number of buffered values to be inspected. This is to prevent NCK from inspecting a value that the PLC is in the process of collecting.

A good value to start with is one more than the number of PLC timer interrupts expected to occur every IPO cycle.

The larger the buffer depth, the fewer PLC variables that can be traced, because there is a single, small, fixed pool of data slots for sending data samples from the PLC to NCK (64 data slots). Every PLC variable being traced is allocated as many data slots from the pool as the value of the buffer depth.

The single pool of data slots is shared by data collected at OB1, OB35, and OB40 (even though the buffer depths of OB1, OB35, and OB40 can be configured to be different from each other). It is also shared by all concurrent users of trace, even though the users might have no knowledge of one another.

11482	**PLC_OB40_TRACE_DEPTH**			EXP, N03, N09	-
-	Buffer depth of PLC trace data at OB40			DWORD	POWER ON
-					
-	-	2	2	8	2/2

Description:

Buffer depth of PLC trace data at OB40.

Multiple values of PLC data are buffered, between the time of collection in the PLC and the time of inspection in NCK. Variables traced at "OB40" are collected just when the PLC receives the special, programmably initiated OB40 interrupt from NCK, but can only be inspected once per IPO cycle.

The buffer size must accomodate at least one more value than the number of buffered values to be inspected. This is to prevent NCK from inspecting a value that the PLC is in the process of collecting.

If the OB40 interrupt is issued less frequently than once per IPO cycle, then the OB40 buffer depth should be 2. Otherwise it should be one more than the largest number of interrupts expected during any one IPO cycle.

The larger the buffer depth, the fewer PLC variables that can be traced, because there is a single, small, fixed pool of data slots for sending data samples from the PLC to NCK (64 data slots). Every PLC variable being traced is allocated as many data slots from the pool as the value of the buffer depth.

The single pool of data slots is shared by data collected at OB1, OB35, and OB40 (even though the buffer depths of OB1, OB35, and OB40 can be configured to be different from each other). It is also shared by all concurrent users of trace, even though the users might have no knowledge of one another.

11500	**PREVENT_SYNACT_LOCK**			N01, N09	S5,FBSY
-	Protected synchronized actions			DWORD	POWER ON
-					
-	2	0,0	0	255	7/2

Description:

```
First and last IDs of a protected synchronized action area.
Synchronized actions with ID numbers in the protected area can no longer be
-   overwritten
-   disabled (CANCEL)
-   locked (LOCK)
once they have been defined. Furthermore, protected synchronized actions can-
not be locked by the PLC (LOCK). They are shown at the interface to the PLC as
non-lockable.
Note:
    The protection should be suspended while creating the synchronized actions
    to be protected, as otherwise a Power On will be necessary after every
    change in order to be able to redefine the logic. There is no area of pro-
    tected synchronized actions with 0.0. The function is disabled. The values
    are read as absolute values, and over and under values can be given in any
    order.
```

11510	**IPO_MAX_LOAD**			N01, N05	-
%	Max. permitted IPO load			DOUBLE	POWER ON
-					
-	-	0.00	0.0	100.0	7/2

Description:

```
Enable utilization analysis via synchronized actions.
This $MN_IPO_MAX_LOAD sets the IPO computing time (in % of the IPO cycle)
after which the variable $AN_IPO_LOAD_LIMIT is to be set to TRUE. The vari-
able is reset to FALSE if the value falls below this after having once excee-
ded it.
This diagnostics function is disabled if the machine data is 0.
```

11550	**STOP_MODE_MASK**			N01	-
-	Defines the stop behavior.			DWORD	POWER ON
-					
-	-	0	0	0x1	7/2

Description:

```
This MD describes the stop behavior of the NCK under certain conditions:
Bit no.  Meaning
Bit 0 == 0 :=
    No stop if G codes G331/G332 are active and a path motion or G4 has also
    been programmed.
Bit 0 == 1 :=
    Same behavior as until SW version 6.4, i.e. a stop is possible during G331/
    G332.
Bits 1.....15
    Not assigned
```

11600	**BAG_MASK**			N01	K1
-	Defines the mode group behavior			DWORD	POWER ON
-					
-	-	0	0	0x3	7/2

Description:

```
This MD describes the effect of the VDI signals on the channels of a mode
group in respect of ASUBs and interrupt routines.
Bit no.  Hexadec.   Meaning when bit set
         value

Bit0:    0x0        Normal response to mode group signals in all channels of
the mode group (as SW 3)
                    All channels switch into a program operating mode on
interrupt.
Bit0:    0x1        No response to other mode group VDI signale in the chan-
nel in which an
                    interrupt handling (ASUB) is running. (BAG-RESET, BAG-
STOP. individual types
                    A and B, mode selection)

Bit1:    0x1       There is an operating mode changeover only in those chan-
nels
                    which have received an interrupt request.
                    (Only when bit 0 is set!)
```

11602	**ASUP_START_MASK**			N01, -	K1
-	Ignore stop conditions for ASUP			DWORD	POWER ON
-					
-	-	0	0	0xf	7/2

Description:

```
This machine data defines which stop conditions are to be ignored at an ASUB
start. The ASUB is started, or the following stop conditions are ignored:

Bit 0 :
    STOP reason: STOP key , M0 or M01
    An ASUB is started immediately if NCK is in RESET state (or JOG mode)(no
    ASUB can be started in RESET/JOG without this bit).
    NOTICE:
    - This bit is set implicitly if $MC_PROG_EVENT_MASK deviates from zero in a
    channel!
    - This bit is set implicitly if BIT 1 is set in $MN_SEARCH_RUN_MODE!
Bit 1 :
    Start allowed even if not all axes have yet been referenced.
```

```
Bit 2:
    Start allowed even if a read-in disable is active,that is the blocks of the
    ASUB program are loaded and executed immediately. This disables machine
    data IGNORE_INHIBIT_ASUP. The NCK behavior corresponds to the machine data
    contents of IGNORE_INHIBIT_ASUP== FFFFFFFF.
    If the bit is not set:
    then the ASUB is internally selected, but not processed until the read-in
    disable is canceled.
    The assignment of the machine data IGNORE_INHIBIT_ASUP is evaluated.
    If IGNORE_INHIBIT_ASUP = 0 also applies, then an ASUB is triggered inter-
    nally, but the blocks of the ASUB program are not loaded until the read-in
    disable is canceled.
    The path is immediately decelerated when the ASUB is triggered (except with
    option BLSYNC).
    The read-in disable is set once more in the ASUB program.

Bit 3:
    Notice:
    The following function is implemented in single-channel systems ONLY and it
    is active only for those ASUBs that were activated from program status
    Abort (channel status Reset). If only one other channel is added to the
    machine data, the function will disappear automatically.

    If an ASUB is started automatically from JOG, the user may stop in the
    middle of the ASUB program. The JOG mode is continuously displayed for the
    user. With bit 3 set, the user may jog in this situation. This is not pos-
    sible without bit 3. In this case mode change is locked with alarm 16927.
    By pressing the Start key, the user can continue the ASUB program. As long
    as the ASUB program is running, the user is naturally not able to jog.
    After ASUB program end the user may jog again.

Bits 4 to 15:Reserved

Related to:
    MD 11604: ASUP_START_PRIO_LEVEL
```

11604	**ASUP_START_PRIO_LEVEL**			N01, -	K1
-	Priorities from which 'ASUP_START_MASK' is effective			DWORD	POWER ON
-					
-	-	0	0	128	7/2

Description:

```
This machine data defines the ASUB priority from which machine data
ASUP_START_MASK is to be applied. MD ASUP_START_MASK is applied from the level
specified here up to the highest ASUB priority level 1.

Related to:
    ASUP_START_MASK
```

11610	ASUP_EDITABLE			N01	K1
-	Activation of a user-specific ASUP program			DWORD	POWER ON
-					
-	-	0	0	3	7/2

Description:

```
This MD determines whether user-specific routine: _N_ASUP_SPF stored in direc-
tory _N_CUS_DIR is to be used to process RET and REPOS instead of routines
provided by the system.

Value:    Meaning:

0   Routine _N_ASUP_SPF is not activated for either RET or REPOS.

1   User-specific routine _N_ASUP_SPF is executed for RET, the routine sup-
plied by the system is executed for REPOS.

2   User-specific routine _N_ASUP_SPF is executed for REPOS, the routine sup-
plied by the system is executed for RET

3   User-specific routine _N_ASUP_SPF is executed for both RET and REPOS

Related to:
    MD 11612: ASUP_EDIT_PROTECTION_LEVEL

References:
    /IAD/  "Installation and Start-Up Guide"
```

11612	ASUP_EDIT_PROTECTION_LEVEL			N01	K1
-	Protection level of the user-specific ASUP program			DWORD	POWER ON
-					
-	-	2	0	7	7/2

Description:

```
Protection level of the user-specific ASUB program for RET and/or REPOS
The data is active only if MD 11610: ASUP_EDITABLE is set to a value other
than 0.
This machine data defines the protection level of the program _N_ASU_CUS.

MD irrelevant for:
    ASUP_EDITABLE set to 0

Related to:
    ASUP_EDITABLE
```

11620	**PROG_EVENT_NAME**			EXP, N12	-
-	Program name for PROG_EVENT			STRING	POWER ON
-					
-	-		-	-	7/2

Description:

```
Name of the user program called by the functions "Event-controlled program
calls" and "Automatic ASUB start after block search" ($MN_SEARCH_RUN_MODE
Bit1). _N_PROG_EVENT_SPF is preset.
The presetting becomes active if $MN_PROG_EVENT_NAME includes a blank string.
If the machine data does not contain a blank string, then the syntax of the
string is checked as in the case of a subprogram identifier. This means that
the first two characters must be letters or underscores (not numbers). If this
is not the case, alarm 4010 is output during power on.
The program must be located in a cycle directory. The following search path is
run through when it is called:

    1. /_N_CUS_DIR/_N_PROG_EVENT_SPF
    2. /_N_CMA_DIR/_N_PROG_EVENT_SPF
    3. /_N_CST_DIR/_N_PROG_EVENT_SPF

The prefix (_N_) and the suffix (_SPF) of the program name are added automati-
cally if they have not been declared.
```

11640	**ENABLE_CHAN_AX_GAP**			N01, N11	K2
-	Allow channel axis gaps in AXCONF_MACHAX_USED			DWORD	POWER ON
-					
-	-	0x0	0	0x1	2/2

Description:

```
Bit0 = 1
Machine data allows configuration of channel axis gaps in the machine data
$MC_AXCONF_MACHAX_USED.
Permits following MD assignment:
$AXCONF_MACHAX_USED[0] = 1     ; 1st  MA is 1st axis in channel
$AXCONF_MACHAX_USED[1] = 2     ; 2nd MA is 2nd axis in channel
$AXCONF_MACHAX_USED[2] = 0     ; Channel axis gap
$AXCONF_MACHAX_USED[3] = 3     ; 3rd MA is 3rd axis in channel
$AXCONF_MACHAX_USED[4] = 0

C A U T I O N:
(BIT0 set with $MC_AXCONF_MACHAX_USED):
    If a geo axis is placed in a channel axis gap with
    $MC_AXCONF_GEOAX_ASSIGN_TAB[1]= 3, the control responds as with
    $MC_AXCONF_GEOAX_ASSIGN_TAB[1]= 0. This eliminates the geo axis!

Transformation machine data must not be assigned a channel axis number speci-
fied as a gap.

BIT1 - BIT31:  not used.
```

```
Related to:
    AXCONF_CHANAX_NAME_TAB,
    AXCONF_GEOAX_ASSIGN_TAB,
    AXCONF_GEOAX_NAME_TAB
    AXCONF_MACHAX_USED
    TRAFO_AXES_IN_X
    TRAFO_GEOAX_ASSIGN_TAB_X
```

11660	**NUM_EG**			N09	M3
-	Number of possible 'electronic gear units'			BYTE	POWER ON
-					
-	-	0	-	-	1/1

Description:

The size of memory space specified here is reserved in DRAM for implementing the function "Electronic Gear". The number of EG axis groupings stated here is the maximum number that can be defined simultaneously with EGDEF.

11700	**PERMISSIVE_FLASH_TAB**			EXP, N01	IAD
-	Codes for NC card			DWORD	POWER ON
-					
-	6	0,0,0,0,0,0,0,0	-	-	1/1

Description:

Normally, the NCK knows the program algorithms for writing on the flash of the PCMCIA card, however, if "new" cards with another ManufactorCode and/or DeviceCode are used, then these values can be entered here. Whereby, the ManufactorCode must be entered in the first line, and the DeviceCode in the following line.

11717	**D_NO_FCT_CYCLE_NAME**			EXP, N12, N07	-
-	Subroutine name for D function replacement			STRING	POWER ON
-					
-	-		-	-	7/2

Description:

Cycle name for replacement routine of the T function.
If a D function is programmed in a part program block, then, depending on machine data $MN_T_NO_FCT_CYCLE_NAME, $MN_T_NO_FCT_CYCLE_MODE and $MN_M_NO_FCT_CYCLE_PAR, the subprogram defined in D_NO_FCT_CYCLE_NAME is called.

The programmed D number can be polled in the cycle via system variable $C_D / $C_D_PROG.

$MN_D_NO_FCT_CYCLE_NAME is only active in Siemens mode (G290).
No more than one M/T/D function replacement can be active per part program line.
A modal subprogram call must not be programmed in the block with the D function replacement. Furthermore, neither subprogram return nor part program end are allowed.
In the event of a conflict alarm 14016 is output.

11750	**NCK_LEAD_FUNCTION_MASK**			N09	-
-	Functions for master value coupling			DWORD	NEW CONF
-					
-	-	0x00	0	0x10	1/1

Description:

```
Special functions of the master value coupling are set with this MD.
The MD is bit-coded, the following bits are assigned:

Bits 0-3:
    reserved

Bit 4 == 0:
    the following axis of a master value coupling decelerates independently on
    NC or mode group stop or channel-specific feed disable
Bit 4 == 1:
    the following axis of a master value coupling does not decelerate indepen-
    dently on NC or mode group stop or channel-specific feed disable

 Bits 5-31:
    reserved
```

11752	**NCK_TRAIL_FUNCTION_MASK**			N09	-
-	Functions for coupled motion			DWORD	NEW CONF
-					
-	-	0x200	0	0x210	1/1

Description:

```
Special functions for coupled motions are set with this MD.
The MD is bit-coded; the following bits are assigned:

Bits 0-3:
    reserved

Bit 4 = 0:
    the following axis of a coupled axis grouping activated by a synchronized
    action decelerates independently on NC or mode group stop or channel-speci-
    fic feed disable
Bit 4 = 1:
    the following axis of a coupled axis grouping activated by a synchronized
    action does not decelerate independently on NC or mode group stop or chan-
    nel-specific feed disable

Bit 5-31:
    reserved
```

11754	**COUPLE_CYCLE_MASK**			EXP, N09	-
-	Replacement of coupling language commands by machining cycles			DWORD	POWER ON
-					
-	-	0x0	0	0x3F	1/1

Description:

```
This machine data defines which predefined procedures for axis-spindle coup-
ling are replaced by machining cycles.
This MD is bit-coded; the following bits have been assigned:

Bit 0 == 0:
    The predefined procedures EGDEL, EGOFC, EGOFS, EGON, EGONSYN and EGONSYNE
    are executed
Bit 0 == 1:
    The predefined procedures EGDEL, EGOFC, EGOFS, EGON, EGONSYN and EGONSYNE
    are replaced by calling machining cycles

Bit 1 == 0:
    The predefined procedures LEADON and LEADOF are executed
Bit 1 == 1:
    The predefined procedures LEADON and LEADOF are replaced by calling machi-
    ning cycles

Bit 2 == 0:
    The predefined procedures TRAILON and TRAILOF are executed
Bit 2 == 1:
    The predefined procedures TRAILON and TRAILOF are replaced by calling
    machining cycles

Bit 3 == 0:
    The predefined procedures COUPDEF, COUPDEL, COUPOF, COUPOFS, COUPON, COU-
    PONC and COUPRES are executed
Bit 3 ==1:
    The predefined procedures COUPDEF, COUPDEL, COUPOF, COUPOFS, COUPON, COU-
    PONC and COUPRES are replaced by calling machining cycles

Bit 4 == 0:
    The predefined procedures LEADON and LEADOF are executed in synchronized
    actions
Bit 4 == 1:
    The predefined procedures LEADON and LEADOF are replaced in synchronized
    actions by calling machining cycles as technology cycles

Bit 5 == 0:
    The predefined procedures TRAILON and TRAILOF are executed in synchronized
    actions
Bit 5 == 1:
    The predefined procedures TRAILON and TRAILOF are replaced in synchronized
    actions by calling machining cycles as technology cycles
```

1.3.2 Override switch settings

12000	**OVR_AX_IS_GRAY_CODE**			EXP, N10	V1
-	Axis feedrate override switch Gray-coded			BOOLEAN	POWER ON
-					
-	-	TRUE	-	-	7/2

Description:

This machine data is used to adapt the axis feed override switch to the interface coding of the PLC interface.

1: The 5 least significant bits of the "feed override" PLC interface signal (DB31, ... DBB0) are interpreted as a Gray code. The value which is read corresponds to a switch setting. It is used as an index for selecting the correct override factor from the table of MD 12010: OVR_FACTOR_AX_SPEED [n].

0: The feed override byte of the PLC interface is interpreted as a binary representation of the override value in percent (limit 200 percent).

Related to:
IS " Feed override" (DB31, ... DBB0), (axis-specific)
MD 12010: OVR_FACTOR_AX_SPEED [n]
(Evaluation of the axis feed override switch)

12010	**OVR_FACTOR_AX_SPEED**			EXP, N10	V1
-	Evaluation of axis feedrate override switch			DOUBLE	POWER ON
-					
-	31	0.00,0.01,0.02,0.04, 0.06,0.08,0.10...	0.00	2.00	7/2

Description:

Evaluation of the axis velocity override switch with Gray-coded interface.

Not relevant with:
MD 12000: OVR_AX_IS_GRAY_CODE = 0

Related to:
IS "Feedrate override" (DB31, ... DBB0), (axis specific)

12020	**OVR_FEED_IS_GRAY_CODE**			EXP, N10	V1
-	Path feedrate override switch Gray-coded			BOOLEAN	POWER ON
-					
-	-	TRUE	-	-	7/2

Description:

This machine data is used to adapt the path feed override switch to the interface coding of the PLC interface.
1: The 5 least significant bits of the "feed override" PLC interface signal are interpreted as a Gray code. The value which is read corresponds to a switch setting. It is used as an index for selecting the correct override factor from the table of MD 12030: OVR_FACTOR_FEEDRATE [n].

```
0:  The feed override byte of the PLC interface is interpreted as a binary rep-
resentation of the override value in percent (limit 200 percent).

Related to:
    IS " Feed override" (DB21, ... DBB4)
    MD 12030: OVR_FACTOR_FEEDRATE [n]
    (Evaluation of the path feed override switch)
```

12030	**OVR_FACTOR_FEEDRATE**			EXP, N10	V1
-	Evaluation of path feedrate override switch			DOUBLE	POWER ON
-					
-	31	0.00,0.01,0.02,0.04, 0.06,0.08,0.10...	0.00	2.00	7/2

Description:

```
Evaluation of the feedrate override switch with Gray-coded interface.
Special function of the 31st value for the velocity control:
The setting of the 31st override value defines the dynamic reserves which take
the velocity control to be an excessive increase in the path feed. The set-
ting should correspond to the highest override factor actually used.
Thus, the function of the 31st value is identical to the effect of the MD
OVR_FACTOR_LIMIT_BIN when using the binary-coded interface.

Not relevant with:
    MD 12020: OVR_FEED_IS_GRAY_CODE = 0

Related to:
    IS "Feedrate override" (DB21, ... DBB4)
```

12040	**OVR_RAPID_IS_GRAY_CODE**			EXP, N10	V1
-	Rapid traverse override switch Gray-coded			BOOLEAN	POWER ON
-					
-	-	TRUE	-	-	7/2

Description:

```
This machine data is used to adapt the rapid traverse override switch to the
interface coding of the PLC interface.

1:  The 5 least significant bits of the "rapid traverse override" PLC inter-
face signal are interpreted as a Gray code. The value which is read corres-
ponds to a switch setting.
    It is used as an index for selecting the correct override factor from the
    table of MD 12050: OVR_FACTOR_RAPID_TRA. [n].
0:  The rapid traverse override byte of the PLC interface is interpreted as a
binary representation of the override value in percent (limit 200 percent).

Related to:
    IS " Rapid traverse override" (DB21, ... DBB5)
    MD 12050: OVR_FACTOR_RAPID_TRA[n]
    (Evaluation of the rapid traverse override switch)
```

12050	OVR_FACTOR_RAPID_TRA			EXP, N10	V1
-	Evaluation of rapid traverse override switch			DOUBLE	POWER ON
-					
-	31	0.00,0.01,0.02,0.04, 0.06,0.08,0.10...	0.00	1.00	7/2

Description:

```
Evaluation of the rapid traverse override switch with Gray-coded interface.
Not relevant with:
   MD 12040: OVR_RAPID_IS_GRAY_CODE = 0
Related to:
   IS "Rapid traverse override" (DB21, ... DBB5)
```

12060	OVR_SPIND_IS_GRAY_CODE			EXP, N10	V1
-	Spindle override switch Gray-coded			BOOLEAN	POWER ON
-					
-	-	TRUE	-	-	7/2

Description:

```
This machine data is used to adapt the spindle speed override switch to the
interface coding of the PLC interface.
1:  The 5 least significant bits of the "spindle speed override" PLC interface
signal are interpreted as a Gray code. The value which is read corresponds to
a switch setting. It is used as an index for selecting the correct override
factor from the table of MD 12070: OVR_FACTOR_SPIND_ SPEED [n].
0:  The spindle speed override byte of the PLC interface is interpreted as a
binary representation of the override value in percent (limit 200 percent).
Related to:
   IS "Spindle speed override" (DB31, ... DBB0)
   MD 12070: OVR_FACTOR_SPIND_SPEED[n]
   (Evaluation of the spindle speed override switch)
```

12070	OVR_FACTOR_SPIND_SPEED			EXP, N10	V1
-	Evaluation of spindle override switch			DOUBLE	POWER ON
-					
-	31	0.5,0.55,0.60,0.65,0 .70,0.75,0.80...	0.00	2.00	7/2

Description:

```
Evaluation of the spindle-specific override switch with Gray-coded interface.
Special function of the 31st value for the velocity control:
The setting of the 31st override value defines the dynamic reserves which take
the velocity control to be an excessive increase in the spindle feed. The set-
ting should correspond to the highest override factor actually used.
Thus, the function of the 31st value is thus identical to the effect of the MD
OVR_FACTOR_LIMIT_BIN when using the binary-coded interface.

Not relevant for:
   MD 12060: OVR_SPIND_IS_GRAY_CODE = 0
Related to:
   IS "Spindle override" (DB31, ... DBB0)
```

12080	**OVR_REFERENCE_IS_PROG_FEED**			N10, N09	V1
-	Override reference speed			BOOLEAN	POWER ON
-					
-	-	TRUE	-	-	7/2

Description:

```
The entry in this MD specifies whether the spindle override given by the IS
refers to the speed limited by MD/SD or to the programmed speed.
1:  Spindle override acts with reference to the programmed speed
    (programmed speed _ spindle override 100%)
0:  Spindle override acts on the speed limited by MD or SD
    (speed limited by MD/SD _ spindle override 100%)

Related machine data:
    A speed limitation is effected by the following MDs or SDs:
    MD 35100: SPIND_VELO_LIMIT          Maximum spindle speed
    MD 35130: GEAR_STEP_MAX_VELO_LIMIT  Maximum speed of gear stage
    MD 35160: SPIND_EXTERN_VELO_LIMIT   Spindle speed limitation by PLC
    SD 43220: SPIND_MAX_VELO_G26        Maximum spindle speed
    SD 43230: SPIND_MAX_VELO_LIMS       Spindle speed limitation with G96
```

12082	**OVR_REFERENCE_IS_MIN_FEED**			N10, N09	V1
-	Specification of the reference of the path override			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

```
The reference speed for the path feed override specified via the machine cont-
rol panel can be set differently from the standard.
0:  Standard:
    The override is relative to the programmed feed.

1:  Special case:
    The override is relative to the programmed feed or to the path feed limit,
    depending on which resulting value is lower. In this way, even for a great
    feed reduction (due to the permissible axis dynamics), the effect of the
    override value (in the range 0 to 100%) is always visible.
```

12090	**OVR_FUNCTION_MASK**			N01, N10, N09	-
-	Selection of override specifications			DWORD	RESET
-					
-	-	0	0	0x01	7/2

Description:

```
The functionality of the override switches can be affected by the bits.
Bit 0: = 0,
    Standard: Spindle override active with G331/G332
       = 1,
    Path override is active instead of spindle override with G331/G332
    (Tapping without compensating chuck)
```

12100	**OVR_FACTOR_LIMIT_BIN**			EXP, N10	V1
-	Limitation for binary-coded override switch			DOUBLE	POWER ON
-					
-	-	1.2	0.0	2.0	7/2

Description:

```
This machine data can be used as an additional limit for the override factor
when using the binary-coded interface for path, axis and spindle feeds.
In this case, the maximum values

-   200% for channel-specific feed override
-   100% for channel-specific rapid traverse override
-   200% for axis-specific feed override
-   200% for spindle override

are replaced with the limit value entered in MD: OVR_FACTOR_LIMIT_BIN when
this value is lower.

Example: OVR_FACTOR_LIMIT_BIN = 1.20
 -->  maximum override factor for
-   channel-specific feed override               =120%
-   channel-specific rapid traverse override     =100%
-   axis-specific feed override                  =120%
-   spindle override                             =120%

This value also defines the dynamic reserves maintained by the speed control
for increasing the path and spindle feedrates.

References:
    /FB/, B1, "Continuous Path Mode, Exact Stop and Look Ahead"
```

12200	**RUN_OVERRIDE_0**			N01, N09	FBMA,V1
-	Traversing response with override 0			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

```
= 0
    Override 0 is active and means deceleration (JOG mode, safety function).
Bits 0 and 1 in $MA_HANDWH_STOP_COND for hand wheels and in
$MC_HANDW_CHAN_STOP_COND for machine axes define whether the pulses are coll-
ected for geometry axes and contour handwheel.

= 1
    Traversing with handwheels and in JOG mode with fixed feedrates is also
    possible with a 0 % override.

Related to:
    $MA_HANDWH_STOP_COND
    $MC_HANDW_CHAN_STOP_COND
```

12202	PERMANENT_FEED			N01, N09	FBMA,V1
mm/min	Fixed feedrates for linear axes			DOUBLE	RESET
-					
-	4	0.,0.,0.,0.	-	-	7/2

Description:

```
In AUTOMATIC mode:
After activating a fixed feedrate via an interface signal, traversing is done
with a fixed feedrate instead of the programmed feedrate.
Note:
The fixed feedrate is also evaluated in continuous-path mode in order to opti-
mize the overhead for the Look Ahead calculation. Unnecessarily high values
should therefore be avoided. Enter zero if a fixed feedrate is not wanted

In JOG mode:
After activating a fixed feedrate via an interface signal, and traversing the
linear axis with a traversing key, traversing proceeds in the selected direc-
tion with the fixed feedrate.

n = 0, 1, 2, 3 mean fixed feedrates 1, 2, 3, 4. The values must be entered in
ascending order.

Special cases, errors, ......
    The maximum velocity defined by $MA_MAX_AX_VELO is active. An override set-
    ting of 100 % is assumed. $MN_RUN_OVERRIDE_0 is active if the override is
    0.

Related to:
    $MN_RUN_OVERRIDE_0
```

12204	PERMANENT_ROT_AX_FEED			N01, N09	FBMA
rev/min	Fixed feedrates for rotary axes			DOUBLE	RESET
-					
-	4	0.,0.,0.,0.	-	-	7/2

Description:

```
Fixed feedrate values:
In AUTOMATIC mode:
After activating a fixed feedrate via an interface signal, traversing is done
with a fixed feedrate instead of the programmed feedrate.

Note: PERMANENT_ROT_AX_FEED is used instead of PERMANENT_FEED for the path
motion if all synchronously traversed axes in the current block are rotary
axes. PERMANENT_FEED applies if linear and rotary axes are to be synchro-
nously traversed together.
The fixed feedrate is also evaluated in continuous-path mode in order to opti-
mize the overhead for the Look Ahead calculation. Unnecessarily high values
should therefore be avoided. Enter zero if a fixed feedrate is not wanted
```

```
In JOG mode:
After activating a fixed feedrate via an interface signal, and traversing the
rotary axis with a traversing key, traversing proceeds in the selected direc-
tion with the fixed feedrate.

n = 0, 1, 2, 3 mean fixed feedrates 1, 2, 3, 4.

Special cases, errors, ......
    The maximum velocity defined by $MA_MAX_AX_VELO is active. An override set-
    ting of 100 % is assumed. $MN_RUN_OVERRIDE_0 is active if the override is
    0.

Related to:
    $MN_RUN_OVERRIDE_0
```

12205	**PERMANENT_SPINDLE_FEED**			N01, N09	FBMA
rev/min	Fixed feedrates for spindles			DOUBLE	RESET
-					
-	4	0.,0.,0.,0.	-	-	7/2

Description:

```
Fixed feedrate values:
JOG: A spindle is traversed with a fixed feedrate by activating the traver-
sing keys and activating the appropriate signals in the PLC interface.

The override is not active.
Depending upon MD $MN_RUN_OVERRIDE_0, traversing also takes place with over-
ride 0.
The value defined by $MA_MAX_AX_VELO is taken as the upper limit. If the fixed
feedrate has a larger value, the aforementioned limiting value applies.
```

12300	**CENTRAL_LUBRICATION**			N01, N09	-
-	Central lubrication active			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

```
When a settable axial path has been exceeded, the axial VDI signals request a
lubrication pulse from the PLC (compare $MA_LUBRICATION_DIST). These axial
pulses act (by default) independently of each other.

If the machine construction requires a central lubrication, i.e. the lubrica-
tion pulse of any axis is acting on all axes, the corresponding path monito-
ring of all axes must be restarted after lubrication pulse output. This start
synchronization of the monitoring is executed via
$MN_CENTRAL_LUBRICATION=TRUE.
```

12510	**NCU_LINKNO**			N01	B3
-	NCU number in an NCU cluster			DWORD	POWER ON
-					
-	-	1	1	16	7/2

Description:

```
Number or name for identifying an NCU within an NCU grouping.
In an NCU grouping (NCU cluster), the NCUs are connected to one another by a
link bus.

Related to:
    MM_NCU_LINK_MASK
```

12520	**LINK_TERMINATION**			N01	B3
-	NCU numbers for which bus termination resistances are activated			BYTE	POWER ON
LINK					
-	2	0,1	0	15	3/2

Description:

```
LINK_TERMINATION defines with which NCUs the bus termination resistances for
the timing circuit must be switched in through the link module.

Related to:
    MM_NCU_LINK_MASK
```

12540	**LINK_BAUDRATE_SWITCH**			N01	B3
-	Link bus baud rate			DWORD	POWER ON
LINK					
-	-	9	0	9	3/2

Description:

```
The assigned baud rate for the link communication is defined by the values
entered:

Set value                                Rate
 0                                        9,600   kBd
 1                                       19,200   kBd
 2                                       45,450   kBd
 3                                       93,750   kBd
 4                                      187,000   kBd
 5                                      500,000   kBd
 6                                        1,500   MBd
 7                                        3,000   MBd
 8                                        6,000   MBd
 9                                       12,000   MBd

Not relevant for:
    Systems without link modules
Related to:
    MM_NCU_LINK_MASK
```

12550	LINK_RETRY_CTR			N01	B3
-	maximum number of message frame transmission retries			DWORD	POWER ON
LINK					
-	-	4	1	15	3/2

Description:

```
Maximum retry limit in cases of error.

Not relevant for:
    Systems without link modules

Related to:
    MM_NCU_LINK_MASK
```

12701	AXCT_AXCONF_ASSIGN_TAB1			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Structure of entries:
NCm_AXn              with NCU number m: 1..16
                     and machine axis address n: 1... 31

Example:
NC2_AX1            ; The axis is on the NCU2 and is the
                   ; 1st machine axis there.
AX5                ; local axis 5 only with one NCU
                   ; the axis container mechanism is only used by
                   ; several channels of one NCU.

The reference to an axis container location of a channel is defined by the
definitions in MD $MC_AXCONF_MACHAX_USED and  MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The actually assigned axis at a specific time is dependent upon the  contai-
ner rotation status. All channels that access an axis container use the same
axis entries stored there. If channels of various NCUs access this container,
then inter-NCU consistency must be ensured.
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9 $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed via NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12702	AXCT_AXCONF_ASSIGN_TAB2			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Structure of entries:
NCm_AXn              with NCU number m: 1..16
                     and machine axis address n: 1... 31
Example:
NC2_AX1            ; The axis is on the NCU2 and is the
                   ; 1st machine axis there.
AX5                ; local axis 5 only with one NCU
                   ; the axis container mechanism is only used by
                   ; several channels of one NCU.
The reference to an axis container location of a channel is defined by the
definitions in MD $MC_AXCONF_MACHAX_USED and  MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The actually assigned axis at a specific time is dependent upon the  contai-
ner rotation status. All channels that access an axis container use the same
axis entries stored there. If channels of various NCUs access this container,
then inter-NCU consistency must be ensured.
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9
$MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed via NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12703	AXCT_AXCONF_ASSIGN_TAB3			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn              with NCU number m: 1..16
                     and machine axis address n: 1... 31
Example:
NC2_AX1 ; The axis is on the NCU2 and is the
                  ; 1st machine axis there
AX5               ; local axis 5, with only one NCU
                  ; the axis container mechanism is only used by
                  ; several channels of one NCU.
```

```
The reference to an axis container location of a channel is determined by the
definitions in
MD $MC_AXCONF_MACHAX_USED and MD $MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!

Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12704	**AXCT_AXCONF_ASSIGN_TAB4**			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn             with NCU number m: 1..16
                    and machine axis address n: 1... 31
Example:
NC2_AX1 ; The axis is on the NCU2 and is the
                  ; 1st machine axis there
AX5               ; local axis 5, with only one NCU
                  ; the axis container mechanism is only used by
                  ; several channels from one NCU.
The reference to an axis container location of a channel is determined by the
definitions in MD $MC_AXCONF_MACHAX_USED and MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12705	AXCT_AXCONF_ASSIGN_TAB5			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn           with NCU number m: 1..16
                  and machine axis address n: 1... 31
Example:
NC2_AX1         ; The axis is on the NCU2 and is the
                ; 1st machine axis there
AX5             ; local axis 5, with only one NCU
                ; the axis container mechanism is only used by
                ; several channels of one NCU.
The reference to an axis container location of a channel is determined by the
definitions in MD $MC_AXCONF_MACHAX_USED and MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9
$MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12706	AXCT_AXCONF_ASSIGN_TAB6			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn              with NCU number m: 1..16
                     and machine axis address n: 1... 31
Example:
NC2_AX1            ; The axis is on the NCU2 and is the
                   ; 1st machine axis there
AX5                ; local axis 5, with only one NCU
                   ; the axis container mechanism is only used by
                   ; several channels from one NCU.
```

```
The reference to an axis container location of a channel is determined by the
definitions in MD $MC_AXCONF_MACHAX_USED and MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12707	**AXCT_AXCONF_ASSIGN_TAB7**			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn          with NCU number m: 1..16
                 and machine axis address n: 1... 31
Example:
NC2_AX1        ; The axis is on the NCU2 and is the
               ; 1st machine axis there
AX5            ; local axis 5, with only one NCU
               ; the axis container mechanism is only used by
               ; several channels from one NCU.
```


```
The reference to an axis container location of a channel is determined by the
definitions in MD $MC_AXCONF_MACHAX_USED and MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12708	**AXCT_AXCONF_ASSIGN_TAB8**			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn            with NCU number m: 1..16
                   and machine axis address n: 1... 31
Example:
NC2_AX1          ; The axis is on the NCU2 and is the
                 ; 1st machine axis there
AX5              ; local axis 5, with only one NCU
                 ; the axis container mechanism is only used by
                 ; several channels from one NCU.
The reference to an axis container location of a channel is determined by the
definitions in MD $MC_AXCONF_MACHAX_USED and MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12709	**AXCT_AXCONF_ASSIGN_TAB9**			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn         with NCU number m: 1..16
                and machine axis address n: 1... 31
Example:
NC2_AX1       ; The axis is on the NCU2 and is the
              ; 1st machine axis there
AX5           ; local axis 5, with only one NCU
              ; the axis container mechanism is only used by
              ; several channels from one NCU.
```

```
The reference to an axis container location of a channel is determined by the
definitions in MD $MC_AXCONF_MACHAX_USED and MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12710	**AXCT_AXCONF_ASSIGN_TAB10**			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn        with NCU number m: 1..16
               and machine axis address n: 1... 31
Example:
NC2_AX1      ; The axis is on the NCU2 and is the
             ; 1st machine axis there
AX5          ; local axis 5, with only one NCU
             ; the axis container mechanism is only used by
             ; several channels from one NCU.
The reference to an axis container location of a channel is determined by the
definitions in MD $MC_AXCONF_MACHAX_USED and MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12711	AXCT_AXCONF_ASSIGN_TAB11			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn         with NCU number m: 1..16
                and machine axis address n: 1... 31
Example:
NC2_AX1       ; The axis is on the NCU2 and is the
              ; 1st machine axis there
AX5           ; local axis 5, with only one NCU
              ; the axis container mechanism is only used by
              ; several channels from one NCU.
The reference to an axis container location of a channel is determined by the
definitions in MD $MC_AXCONF_MACHAX_USED and MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
   AXCONF_LOGIC_MACHAX_TAB
```

12712	AXCT_AXCONF_ASSIGN_TAB12			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn          with NCU number m: 1..16
                 and machine axis address n: 1... 31
Example:
NC2_AX1        ; The axis is on the NCU2 and is the
               ; 1st machine axis there
AX5            ; local axis 5, with only one NCU
               ; the axis container mechanism is only used by
               ; several channels from one NCU.
```

```
The reference to an axis container location of a channel is determined by the
definitions in MD $MC_AXCONF_MACHAX_USED and MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12713	**AXCT_AXCONF_ASSIGN_TAB13**			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn         with NCU number m: 1..16
                and machine axis address n: 1... 31
Example:
NC2_AX1       ; The axis is on the NCU2 and is the
              ; 1st machine axis there
AX5           ; local axis 5, with only one NCU
              ; the axis container mechanism is only used by
              ; several channels from one NCU.
The reference to an axis container location of a channel is determined by the
definitions in
MD $MC_AXCONF_MACHAX_USED and MD $MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12714	AXCT_AXCONF_ASSIGN_TAB14			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn          with NCU number m: 1..16
                 and machine axis address n: 1... 31
Example:
NC2_AX1        ; The axis is on the NCU2 and is the
               ; 1st machine axis there
AX5            ; local axis 5, with only one NCU
               ; the axis container mechanism is only used by
               ; several channels from one NCU.
The reference to an axis container location of a channel is determined by the
definitions in MD $MC_AXCONF_MACHAX_USED and MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12715	AXCT_AXCONF_ASSIGN_TAB15			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn          with NCU number m: 1..16
                 and machine axis address n: 1... 31
Example:
NC2_AX1        ; The axis is on the NCU2 and is the
               ; 1st machine axis there
AX5            ; local axis 5, with only one NCU
               ; the axis container mechanism is only used by
               ; several channels from one NCU.
```

```
The reference to an axis container location of a channel is determined by the
definitions in MD $MC_AXCONF_MACHAX_USED and MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12716	**AXCT_AXCONF_ASSIGN_TAB16**			N01	B3
-	Assignment of an axis container location			STRING	POWER ON
CTDE					
-	32		-	-	3/2

Description:

```
Assignment of an axis container location (slot s) to a machine axis or link
axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn           with NCU number m: 1..16
                  and machine axis address n: 1... 31
Example:
NC2_AX1         ; The axis is on the NCU2 and is the
                ; 1st machine axis there
AX5             ; local axis 5, with only one NCU
                ; the axis container mechanism is only used by
                ; several channels from one NCU.
```


```
The reference to an axis container location of a channel is determined by the
definitions in MD $MC_AXCONF_MACHAX_USED and MD
$MN_AXCONF_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container
rotation status. All channels that access an axis container use the same axis
entries stored there. If channels from various NCUs access this container,
ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9    $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.

Related to:
    AXCONF_LOGIC_MACHAX_TAB
```

12750	**AXCT_NAME_TAB**			N01	B3
-	Axis container identifier			STRING	POWER ON
CTDE					
-	16	"CT1","CT2","CT3","CT4","CT5","CT6"...	-	-	1/1

Description:

```
List of axis container identifiers
In addition to the channel identifier of an axis, the axis container identi-
fier, which can be defined by the user here, can also be used as an axis con-
tainer name for e.g. a rotation of an axis container (AXCTSWE(CT1)).
```

12970	**PLC_DIG_IN_LOGIC_ADDRESS**			N10	-
-	Logical start address of the digital PLC input address			DWORD	POWER ON
-					
-	-	0	0	1023	0/0

Description:

```
Logical start address of the digital input addresses of the PLC

Related to:
    PLC_DIG_IN_NUM
```

12971	**PLC_DIG_IN_NUM**			N10	-
-	Number of digital input addresses			DWORD	POWER ON
-					
-	-	64	1	1023	0/0

Description:

```
Number of digital input addresses as from the start address

Related to:
    PLC_DIG_IN_LOGIC_ADDRESS
```

12974	**PLC_DIG_OUT_LOGIC_ADDRESS**			N10	-
-	Logical start address of the digital PLC output addresses			DWORD	POWER ON
-					
-	-	0	0	1023	0/0

Description:

```
Logical start address of the digital output addresses of the PLC

Related to:
    PLC_DIG_OUT_NUM
```

12975	**PLC_DIG_OUT_NUM**			N10	-
-	Number of digital output addresses			DWORD	POWER ON
-					
-	-	48	1	1023	0/0

Description:

```
Number of digital output addresses as from the start address
```

12978	**PLC_ANA_IN_LOGIC_ADDRESS**			N10	-
-	Logical start address of the analog PLC input addresses			DWORD	POWER ON
-					
-	-	0	0	1023	0/0

Description:

```
Logical start address of the analog input addresses of the PLC
Related to: PLC_ANA_IN_NUM
```

12979	**PLC_ANA_IN_NUM**			N10	-
-	Number of analog input addresses			DWORD	POWER ON
-					
-	-	0	0	1023	0/0

Description:

```
Number of analog input addresses as from the start address
Related to: PLC_ANA_IN_LOGIC_ADDRESS
```

12982	**PLC_ANA_OUT_LOGIC_ADDRESS**			N10	-
-	Logical start address of the analog PLC output addresses			DWORD	POWER ON
-					
-	-	0	0	1023	0/0

Description:

```
Logical start address of the analog output addresses of the PLC
Related to: PLC_ANA_OUT_NUM
```

12983	**PLC_ANA_OUT_NUM**			N10	-
-	Number of analog output addresses			DWORD	POWER ON
-					
-	-	0	0	1023	0/0

Description:

```
Number of analog output addresses as from the start address
Related to: PLC_ANA_OUT_LOGIC_ADDRESS
```

1.3.3 Central drive data

13000	**DRIVE_IS_ACTIVE**			EXP	G2
-	Drive activation (611D)			BOOLEAN	POWER ON
-					
-	31	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

Only applies to drives with SIMODRIVE 611D!
A drive is activated/deactivated with this MD.
1: Drive is active
0: Drive is not active.
The drive is not supplied with setpoints and is not monitored. No input [actual value] or output [setpoint] can be configured on this module. This module is only taken into account during basic initialization of the drive bus.
The machine data
MD 13020: DRIVE_INVERTER_CODE,
MD 13010: DRIVE_LOGIC_NR,
MD 13030: DRIVE_MODULE_TYPE and
MD 13040: DRIVE_TYPE
must be parameterized.
The slot number of a real available drive is used as the index [n]. [Slot nos.] : 0-14
The index is numbered from the beginning of the drive bus starting with "0" (corresponds to 1st real drive available) and continues in ascending order to the end. 810D is assigned the slot nos. 0-5.

Example(s) for application:
deactivating an available drive for testing purposes.

13010	**DRIVE_LOGIC_NR**			EXP	G2
-	Logical drive number			BYTE	POWER ON
-					
-	31	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	31	7/2

Description:

Only applies to drives with SIMODRIVE 611D!
A "logical drive number" must be assigned to each real drive. This parameterization defines how the actual order of the modules connected to one drive bus relate to the logical drive numbers.
A non-existing drive module is assigned the logical drive number "0". In this way it is possible to create positions for modules that do not yet exist but are to be inserted at this point in the drive bus at a later time.

The logical drive number is used in assigning actual values and setpoints (MD 30220: ENC_MODULE_NR[n], MD 30110: CTRLOUT_MODULE_NR[n]).
The slot number of a real available drive is used as the index [n]. [Slot no.] : 0-14
The index is numbered from the beginning of the drive bus starting with "0" (= _ 1st real drive available) and continues in ascending order to the end. 810D is assigned the slot nos. 0-5.

Each drive must only be assigned one logical drive number.

The following alarms may be output if an input error occurs:

- Alarm 300001 "Drive number not possible"
- Alarm 300002 "Drive number defined several times"
- Alarm 300005 "At least 1 module too many on drive bus"
- Alarm 300006 "At least 1 module too few on drive bus"

13020	**DRIVE_INVERTER_CODE**			EXP	G2
-	Power section code of drive module			DWORD	POWER ON
-					
-	31	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	-	-	7/2

Description:

Only applies to drives with SIMODRIVE 611D or SINUMERIK 810D!
The power section code of the MSD or FDD module being used is entered (as hex value) in the MD.

Power section code for FDD modules:

Code number (hex)	Power section MLFB	Current
00	no power section specified	-----
11	6SN1130-1Dx1x-0HA0	3/6 A
12	6SN1130-1Dx1x-0AA0	5/10 A
13	6FC5447-1Dx1x-0AA0	6/12 A (810D)
14	6SN1130-1Dx1x-0BA0	9/18 A
16	6SN1130-1Dx1x-0CA0	18/36 A
17	6SN1130-1Dx1x-0DA0	28/56 A
19	6SN1130-1Dx1x-0EA0	56/112 A
1A	6SN1130-1Dx1x-0FA0	70/140 A
1E	6FC5447-1Dx1x-0AA0	18/36 A (810D)

Power section code for MSD modules:

Code number (hex)	Power section MLFB	Current
06	6SN1135-1DA1x-0CA0	24/32/36 A
07	6SN1135-1DA1x-0DA0	30/40/56 A
08	6SN1135-1DA1x-0GA0	45/60/80 A
09	6SN1135-1DA1x-0EA0	60/80/106 A
0A	6SN1135-1DA1x-0FA0	85/110/140 A
0E	6FC5447-1DA1x-0AA0	24/32 A (810D)

The slot number of a real available drive is used as the index [n]. [Slot no.] : 0-14
The index is numbered from the beginning of the drive bus starting with "0" (= 1st real drive available) and continues in ascending order to the end.

13030	**DRIVE_MODULE_TYPE**			EXP	G2
-	Module ID			BYTE	POWER ON
-					
-	31	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1...	0	10	7/2

Description:

Only applies to drives with SIMODRIVE 611D!
An identifier for the module type used is entered in this MD.
0: No module or module has been removed (SW 6.3 and higher)
1: 1-axis module
2: 2-axis module
6: SINUMERIK 810D 6 axis controls / 3 power sections
9: Terminal block for digital/analog I/Os
The slot number of a real available drive is used as the index [n]. [Slot no.] : 0-14
The index is numbered from the beginning of the drive bus starting with "0" (= 1st real drive available) and continues in ascending order to the end.
If the wrong module type is assigned to an axis module, alarm 300003 "Wrong module type (1-/2-axis)" is output.

13040	**DRIVE_TYPE**			EXP	G2,FBHY
-	ID for drive type (1: FDD, 2: MSD, 3: LIN)			BYTE	POWER ON
-					
-	31	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1...	0	5	7/2

Description:

Only applies to drives with SIMODRIVE 611D!
An identifier for the drive type is entered in this MD:
0: No drive
1: FDD
2: MSD
3: Linear drive
4: Analog drive (spec. hydraulic)
5: Hydraulic drive

The slot number of a real available drive is used as the index [n]. [Slot no.] : 0-14
The index is numbered from the beginning of the drive bus starting with "0" (= 1st real drive available) and continues in ascending order to the end. If the wrong drive type is assigned to a drive, alarm 300004, "Incorrect drive type (FDD, MSD, linear drive)" is output.

13050	DRIVE_LOGIC_ADDRESS			N04, N10	G2
-	Logical drive addresses			DWORD	POWER ON
-					
-	31	272,292,312,332,352,372,392,412,432...	258	8191	7/2
710-6a2c	-	4100,4140,4180,4220,4260,4300,4340...	-	-	-/-
720-6a2c	-	4100,4140,4180,4220,4260,4300,4340...	-	-	-/-
730-6a2c	-	4100,4140,4180,4220,4260,4300,4340...	-	-	-/-
710-31a10c	-	4100,4140,4180,4220,4260,4300,4340...	-	-	-/-
720-31a10c	-	4100,4140,4180,4220,4260,4300,4340...	-	-	-/-
730-31a10c	-	4100,4140,4180,4220,4260,4300,4340...	-	-	-/-
840di-basic	-	4100,4140,4180,4220,4260,4300,4340...	-	-	-/-
840di-universal	-	4100,4140,4180,4220,4260,4300,4340...	-	-	-/-
840di-plus	-	4100,4140,4180,4220,4260,4300,4340...	-	-	-/-

Description:

```
Logical I/O addresses of the drives on the PROFIBUS. An address is assigned to
a drive.
This applies only to the PROFIBUS-DP!
This MD is the link to the description of the PROFIBUS configuration in PROFI-
BUS SDB.
The MD value is the address index of the logical I/O drive address assigned
with HW-Config (SIMATIC Manager S7).
Example:
DRIVE_LOGIC_ADDRESS[1] = 272 (The start address 272 is assigned to drive 1.)

The PROFIBUS SDB defines the logical I/O address of the drives on the PROFI-
BUS. An address is assigned to a drive or to a slave.
The address index is used for actual-value and setpoint-value assignment
(MD 30220: ENC_MODULE_NR[n], MD 30110: CTRLOUT_MODULE_NR[n]).
```

```
Note:
The same drive (I/O address) must be assigned to the MD 30220:
ENC_MODULE_NR[0] and MD 30110: CTRLOUT_MODULE_NR[0]
of a machine axis.
Each drive or slave must be assigned to a single logical address index.
The index [n] of the machine data has the following coding: [Drive index]:
Drive 1 -->n-=0
Drive 2 -->n-=1,
```

13060	**DRIVE_TELEGRAM_TYPE**			N04, N10	G2
-	Standard message frame type for Profibus DP			DWORD	POWER ON
-					
-	31	102,102,102,102,102,102,102,102,102...	-	-	7/2
710-6a2c	-	116,116,116,116,116,116,116,116,116...	-	-	-/-
720-6a2c	-	116,116,116,116,116,116,116,116,116...	-	-	-/-
730-6a2c	-	116,116,116,116,116,116,116,116,116...	-	-	-/-
710-31a10c	-	116,116,116,116,116,116,116,116,116...	-	-	-/-
720-31a10c	-	116,116,116,116,116,116,116,116,116...	-	-	-/-
730-31a10c	-	116,116,116,116,116,116,116,116,116...	-	-	-/-

Description:

```
Standard message frame type for PROFIBUS axes:
            0 = No standard type, user-defined
                (Message frame type 103 is then used inside the NCK,
                whereby other PZDs are permissible.)
        1...  6 = PROFIdrive type
      101...107 = 611U type
               116 = 611U type 106 plus trace data
      201...203 = internal type

Note: Alarm 26015 is issued with reference to this machine data:
a.  If less data has been configured on the bus (message length) than required
for the message frame type selected here.

b.  If the message frame configuration contains inconsistencies, that is the
message frame type selected here of the NCK side does not correspond to the
message frame type set on the drive (see parameter P922), and the PZD configu-
ration does not match (see parameters P923, P915, P916). The check for mes-
sage frame configuring errors can be disabled by MD DRIVE_FUNCTION_MASK bit15.
```

13070	**DRIVE_FUNCTION_MASK**			N04, N10	G2
-	DP functions used			DWORD	POWER ON
-					
-	31	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	-	-	7/2
710-6a2c	-	2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2...	-	-	-/-
720-6a2c	-	2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2...	-	-	-/-
730-6a2c	-	2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2...	-	-	-/-
710-31a10c	-	2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2...	-	-	-/-
720-31a10c	-	2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2...	-	-	-/-
730-31a10c	-	2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2...	-	-	-/-

Description:

Bit-coded mask for skipping the scope of available functions for PROFIBUS axes expected from NCK.

Significance of set bits:

Bit 0:Deactivation of axial drive alarm display
Bit 1:Deactivation of 611U description file intermediate storage in the NCK
Bit 2:Deactivation of axial encoder driver parameter accesses
Bit 3:Deactivation of axial output driver parameter accesses
Bit 4:reserved (previously activation of DSC bits)
Bit 5:Deactivation of the 611U-specific drive parking (STW2.7/STA2.7)
Bit 6:Deactivation of the 611U-specific travel to fixed stop (STW2.8/STA2.8)
Bit 7:Deactivation of the 611U-specific motor switching int. (STW2.9 to 2.11)
Bit 8:Deactivation of the 611U-specific ramp block (STW1.11+13)
Bit 9:Deactivation of the 611U-specific function generator bits (STW1.8/ STA1.13)
Bit 10:Deactivation of the control of the holding brake (STW1.12 / STA2.5)
Bit 11:Deactivation of the effect of OFF2/OFF3 on "driveReady" (DB31, ... DBX93.5)
Bit 14:Selection of non-cyclical communication 0 = DPT 1 = DPV1
Bit 15: Deactivation of the consistency check of the PROFIBUS telegram configuration

The configuration of bits 4-8 which are new for SW 6.3 and higher allows an adaptation of certain PROFIdrive profiles of non-standardized PROFIBUS control or status bits of SIMODRIVE 611 universal. Bits 4 to 8 may have a different significance in the default setting of external drives.

13080	**DRIVE_TYPE_DP**			EXP	G2
-	Drive type Profibus			BYTE	POWER ON
-					
-	31	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	4	7/2

Description:

MD is relevant for drives at the PROFIBUS:
Drive type:
0: No drive or drive type unknown (default),
software-internally treated as:
1: FDD drive (SRM: Synchronous rotary drive)
2: MSD drive (ARM: Asynchronous rotary drive)
3: Linear drive
4: Analog drive (no automatic entry)
Note:
In general, the drive type is entered automatically with Siemens drives as soon as the drives start operating.

With non-Siemens drives (at least with linear drives) the value must be entered manually if automatic drive recognition is not possible.

13100	**DRIVE_DIAGNOSIS**			EXP, N05	IAD,Kap.3
-	Diagnosis drive link			DWORD	POWER ON
-					
-	9	0,0,0,0,0,0,1,0,0	-	-	7/2

Description:

Relevant to Simodrive 611D diagnostics:
1. General output of drive message frames for test purposes
DRIVE_DIAGNOSIS[0] Activation of message frame simulation (!=0 active on PowerOn)
DRIVE_DIAGNOSIS[1] Message frame number (!=0)
DRIVE_DIAGNOSIS[2] NC number of the 611D axis (1-8)
DRIVE_DIAGNOSIS[3] Additional parameter (not currently used)

A message frame is issued by changing the message frame number.

2. Special function of DRIVE_DIAGNOSIS[6]
2.1.Standard preassignment
Content = 1:
Initiates the output of
1. current setpoint
2. speed setpoint
3. actual speed value
to the 3 digital-to-analog converter outputs of all active drive modules.
These outputs are made for the 1st axis for 2-axis modules.

Content = 2:
Initiates the output of the values for the 2nd axis of 2-axis modules.

```
2.2.Expansion reset-resistant digital-to-analog converters
Content = 0:
    No reset-resistant digital-to-analog converters
Content = 1:
    Default value 1 is activated, every further change is retained.
Content = 2:
    Default value 2  is activated, every further change is retained.If a change
    in the content is detected during NCK restart, the information stored up to
    this point is deleted.
3.  Transport trace. DRIVE_DIAGNOSIS[7]   Activation of transport trace (!=0,
active on PowerOn)
4.  If MD13100 DRIVE_DIAGNOSIS[8] contains a value other than zero, then the
control has found at least one closed-loop control module that does not sup-
port the measuring. The machine axis affected is entered bit-coded in the
machine data.
1st example:
Only axis 1 is affected --> DRIVE_DIAGNOSIS[8] = 0x0001
2nd example:
Axis 3 and axis 4 are affected ---> DRIVE_DIAGNOSIS[8] = 0x000C
```

13110	**PROFIBUS_TRACE_ADDRESS**			EXP	-
-	PROFIBUS trace of I/O slots			DWORD	NEW CONF
-					
-	14	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	8191	2/2

Description:

```
Logical I/O address that is to be recorded.
```

13111	**PROFIBUS_TRACE_TYPE**			EXP	-
-	PROFIBUS trace settings			DWORD	NEW CONF
-					
-	-	0	0	2	2/2
840di-basic	-	-	-	0	-/-
840di-universal	-	-	-	0	-/-
840di-plus	-	-	-	0	-/-

Description:

```
0: Recording into the part program memory /_N_MPF_DIR/_N_SIEMDPTRC_MPF
1: Recording into the mass storage /user/sinumerik/data/temp/siemdptrc.trc
2: Recording into the part program memory with runtime measurement
```

13112	**PROFIBUS_TRACE_FILE_SIZE**			EXP	-
-	Maximum trace file size in kbytes			DWORD	NEW CONF
-					
-	-	40	-	-	2/2

Description:

```
  0: Trace without file size limitation
 >0: Trace with file size limitation
```

13113	**PROFIBUS_TRACE_START**			EXP	-
-	Activation of PROFIBUS trace			DWORD	SOFORT
-					
-	-	0	0	1	2/2

Description:

```
0: Trace off
1: Trace on
MD13112 > 0: Trace is automatically disabled when the file size is reached.
```

13114	**PROFIBUS_TRACE_START_EVENT**			EXP	-
-	Trigger conditions for PROFIBUS trace			DWORD	NEW CONF
-					
-	14	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0x00000000	0x111fffff	2/2

Description:

```
The trigger frequency is configured bit-by-bit
Bits  0-15: 0x0001-0xffff: bit mask
Bits 16-23: 0x01-0x14: PZD number (a maximum of 20 words are permissible)
Bits 24-27:0x01: status change 0->1
           0x00: status change 1->0
Bits 28-31:0x10: send slot
           0x00: receive slot
The trigger is not active if the PZD number=0
The trigger is immediately active if MD13114=1 and MD13114=0x0
```

13120	**CONTROL_UNIT_LOGIC_ADDRESS**			N04, N10	-
-	Logical address of SINAMICS CU			DWORD	POWER ON
-					
-	7	0,0,0,0,0,0,0	0	8191	7/2
710-6a2c	-	6500,0,0,0,0,0,0	-	-	-/-
720-6a2c	-	6500,0,0,0,0,0,0	-	-	-/-
730-6a2c	-	6500,0,0,0,0,0,0	-	-	-/-
710-31a10c	-	6500,0,0,0,0,0,0	-	-	-/-
720-31a10c	-	6500,0,0,0,0,0,0	-	-	-/-
730-31a10c	-	6500,0,0,0,0,0,0	-	-	-/-

Description:

```
Logical I/O address of a SINAMICS-CU (Control Unit) on the PROFIBUS-DP.
The cyclic DP communication with SINAMICS-CU is activated by taking over the
associated slot address from the STEP7 project. The onboard I/Os cannot be
accessed until after configuration.
```

13150	**SINAMICS_ALARM_MASK**			N04, N05	-
-	Activate fault and warning buffer output for Sinamics			DWORD	SOFORT
-					
-	-	0x0	-	-	7/2

Description:

```
Relevant to SINAMICS diagnostics:

Mask for displaying the SINAMICS DOS fault and warning buffers

Bit set:Alarms in this DO group are output
Bit not set:Alarms in this DO group are not output

Bit Hex.  Meaning
    value
================================================================================
======
0:  0x1   Output faults of the Control Units
1:  0x2   Reserved
2:  0x4   Output faults of the Drive Controls
3:  0x8   Output faults of the Line Modules
4:  0x10  Output faults of the Terminal Boards
5:  0x20  Output faults of the Terminal Modules

8:  0x100 Output warnings of the Control Units
9:  0x200 Output warnings of the Communication Objects
10: 0x400 Output warnings of the Drive Controls
11: 0x800 Output warnings of the Line Modules
12: 0x1000 Ouptut warnings of the Terminal Boards
13: 0x2000 Output warnings of the Terminal Modules
```

13200	**MEAS_PROBE_LOW_ACTIVE**			N10, N09	M5
-	Polarity reversal of sensor			BOOLEAN	POWER ON
-					
-	2	FALSE,FALSE	-	-	7/2

Description:

```
The electrical polarity of each connected sensor is defined by this MD.
Value 0:
    (default setting)
    Non-deflected state        0 V
    Deflected state           24 V
Value 1:
    Non-deflected state       24 V
    Deflected state            0 V

The programmed edges of the sensor are independent of the electrical polarity
and are to be regarded as purely mechanical. The programming of a positive
edge always means the transition from the non-deflected into the deflected
state. The programming of a negative edge always means the transition from the
deflected into the non-deflected state.
```

13210	**MEAS_TYPE**			N10, N09	M5
-	Meas. type with decentralized drives			BYTE	POWER ON
-					
-	-	1	0	1	7/2
710-6a2c	-	0	-	-	-/-
720-6a2c	-	0	-	-	-/-
730-6a2c	-	0	-	-	-/-
710-31a10c	-	0	-	-	-/-
720-31a10c	-	0	-	-	-/-
730-31a10c	-	0	-	-	-/-
840di-basic	-	0	-	-	-/-
840di-universal	-	0	-	-	-/-
840di-plus	-	0	-	-	-/-

Description:

```
This MD sets the measuring function of decentralized drives.
The MD currently only functions for PROFIBUS drives.

MEAS_TYPE = 0 defines:
A probe is used that is connected centrally to the NC.
However, as the encoders only provide actual position values in cycles, the
actual measuring position is found by interpolation.

MEAS_TYPE = 1 defines:
The probe must be wired decentralized to ALL drives.
The measuring functionality of the drive is then used,
saving the actual encoder values in the hardware at the time of the measuring
edge.
This method is more accurate than that with MEAS_TYPE = 0, but it requires a
more complex wiring and drives that support this measuring functionality (e.g.
611U).
```

13211	**MEAS_CENTRAL_SOURCE**			N10, N09	-
-	Data source for central measurement with Profibus drives			BYTE	POWER ON
-					
-	-	3	1	3	0/0
840di-basic	-	1	-	-	-/-
840di-universal	-	1	-	-	-/-
840di-plus	-	1	-	-	-/-

Description:

```
This MD is used to set the method used to obtain the time stamps for central
measurement with Profibus drives.

The following applies if MEAS_CENTRAL_SOURCE = 1:
  NRK accesses are used to access the onboard measuring registers.
  For this purpose, the appropriate hardware which allows this must be
  available, e.g. 840Di with MCI extension board.

The following applies if MEAS_CENTRAL_SOURCE = 2:
  The SINAMICS DO1 telegram is used (telegram type 391),
  variant "Cyclic measurement" without
  handshake.
  For this purpose, an integrated SINAMICS must be available, e.g. NCU 710.
  (Not available until supported by SINAMICS).

The following applies if MEAS_CENTRAL_SOURCE = 3:
  The SINAMICS DO1 telegram is used (telegram type 391),
  in the variant with handshake. This procedure is
  fault-tolerant, however, allows a measuring edge only every 4 Profibus
  cycles, i.e. it is considerably slower.
  For this purpose, an integrated SINAMICS must be available, e.g. NCU 710.

  This MD is only relevant, if MD 13210 MEAS_TYPE == 0.
```

13220	**MEAS_PROBE_DELAY_TIME**			N10, N09	FBA/IAD
s	Delay time between probe deflection and recognition			DOUBLE	POWER ON
-					
-	2	0.0,0.0	0	0.1	7/2

Description:

```
For probes with e.g. radio transmission, the probe deflection can be detected
in the NC only with delay.
With this MD, the transmission link delay between the probe deflection and its
detection is set in the control.
The measured value is corrected internally by the control by the distance that
corresponds to the traversing motion during this time before measuring (mode-
ling). It is practicable to set values only up to a maximum of 15 position
controller cycles.
Anyhow, the modeling could not work with the expected accuracy with values
greater than that. In this case, the input value is therefore limited inter-
nally by the software to 15 position controller cycles (without any further
feedback).
```

13300	**PROFISAFE_IN_FILTER**			N01, N06, -	-
-	Useful F data filter IN			DWORD	POWER ON
-					
-	16	0xFFFFFFFF,0xFFFFFFFF,0xFFFFFFFF...	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Filter between F user data and $INSE variables

Machine data $MN_PROFISAFE_IN_FILTER defines which F user data bits of the
PROFIsafe module are accepted from the F user data interface of the PROFIsafe
module into the NCK for further processing.

The filtered F user data bits are compressed internally in the NCK to form a
contiguous bit field.

Machine data $MN_PROFISAFE_IN_ASSIGN then also defines the $INSE variables to
which the filtered F user data bits are transferred.

Example:

Note:
    Only 16 bits are shown for the sake of simplicity.

Parameterization:
    $MN_PROFISAFE_IN_FILTER = 1010100101000100
    $MN_PROFISAFE_IN_ASSIGN = 011006

 n = 16        11         6         1
     |x|x|x|x|x|1|1|1|0|0|1|x|x|x|x|x|
    $INSE[n], x = irrelevant

     |0|0|0|0|0|0|0|0|0|0|1|1|1|0|0|1|
    NCK-internal image of F user data

     |1|0|1|0|1|0|0|1|0|1|0|0|0|1|0|0|
    $MN_PROFISAFE_IN_FILTER

     |1|0|1|0|1|0|0|0|0|0|0|0|0|1|0|0|
    Exemplary value present at F user data interface of the PROFIsafe module
```

13301	**PROFISAFE_OUT_FILTER**			N01, N06, -	-
-	Useful F data filter OUT			DWORD	POWER ON
-					
-	16	0xFFFFFFFF,0xFFFFFFFF,0xFFFFFFFF...	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Filter between $OUTSE variables and F user data

Machine data $MN_PROFISAFE_OUT_ASSIGN defines which $OUTSE[n] variables are
transferred to the F user data bits of the PROFIsafe module.

Machine data $MN_PROFISAFE_OUT_FILTER defines the F user data bit to which the
relevant $OUTSE[n] variable is transferred.

Example:

Note: Only 16 bits are shown for the sake of simplicity.

Parameterization:
    $MN_PROFISAFE_OUT_FILTER = 1010100101000100
    $MN_PROFISAFE_OUT_ASSIGN = 011006

n = 16        11         6         1
    |x|x|x|x|x|1|1|1|1|1|1|x|x|x|x|x|
    Exemplary value present in the $OUTSE variables, x = irrelevant

    |0|0|0|0|0|0|0|0|0|0|1|1|1|1|1|1|
    NCK-internal image of F user data

    |1|0|1|0|1|0|0|1|0|1|0|0|0|1|0|0|
    $MN_PROFISAFE_OUT_FILTER

    |1|0|1|0|1|0|0|1|0|1|0|0|0|1|0|0|
    F user data of the PROFIsafe module
```

13310	**SAFE_SPL_START_TIMEOUT**			N01, N05, -	FBSI
-	Delay in display of alarm 27097			DOUBLE	POWER ON
-					
-	-	20.	1.	60.	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
After powerup of the control, alarm 27097 is displayed after the time if the
SPL start is not carried out.
```

14504	**MAXNUM_USER_DATA_INT**			N03	P3
-	Number of user data (INT)			DWORD	POWER ON
-					
-	-	0	0	256	7/2

Description:

`Number of NC/PLC user data of type INT`

14506	**MAXNUM_USER_DATA_HEX**			N03	A2,P3
-	Number of user data (HEX)			DWORD	POWER ON
-					
-	-	0	0	256	7/2

Description:

`Number of NC/PLC user data (HEX)`

14508	**MAXNUM_USER_DATA_FLOAT**			N03	A2,P3
-	Number of user data (FLOAT)			DWORD	POWER ON
-					
-	-	0	0	32	7/2

Description:

`Number of NC/PLC user data of type FLOAT`

14510	**USER_DATA_INT**			N03	A2,P3
-	User data (INT)			DWORD	POWER ON
-					
-	256	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	-32768	32767	7/2

Description:

`User data is stored in the NCK-PLC interface and can be read by the PLC user from the DB20 during the runup.`

14512	**USER_DATA_HEX**			N03	A2,P3
-	User data (HEX)			DWORD	POWER ON
-					
-	256	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	0x0FF	7/2

Description:

`User data is stored in the NCK-PLC interface and can be read by the PLC user from the DB20 during the runup.`

14514	**USER_DATA_FLOAT**			N03	A2,P3
-	User data (FLOAT)			DOUBLE	POWER ON
-					
-	32	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-3.40e38	3.40e38	7/2

Description:

User data is stored in the NCK-PLC interface and can be read by the PLC user from the DB20 during the runup.

14516	**USER_DATA_PLC_ALARM**			N03	A2,P3
-	User data (HEX)			BYTE	POWER ON
-					
-	64	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	-	-	0/0

Description:

User data is stored in the NCK-PLC interface and can be evaluated by the PLC basic system (currently for software PLC 2xx).

15700	**LANG_SUB_NAME**			N01	-
-	Name for substitution subroutine			STRING	POWER ON
-					
-	-		-	-	7/2

Description:

Name of the user program called on the basis of a substitution configured by $MA_AXIS_LANG_SUB_MASK.
The user program is called with the path configured by $MN_LANG_SUB_PATH.

15702	**LANG_SUB_PATH**			N01	-
-	Call path for substitution subroutine			BYTE	POWER ON
-					
-	-	0	0	2	7/2

Description:

Path with which the user program set by $MN_LANG_SUB_NAME is called on the basis of a substitution configured by $MA_AXIS_LANG_SUB_MASK:

0: /_N_CMA_DIR (default)
1: /_N_CUS_DIR
2: /_N_CST_DIR

17200	**GMMC_INFO_NO_UNIT**			EXP	K1
-	Global HMI information (without physical unit)			DOUBLE	POWER ON
-					
-	16	3.,4.,3.,1.,0.,0.,0.,0., 0.,0.,0.,0.,0....	-	-	0/7

Description:

```
The HMI stores the global display machine data

-   $MM_DISPLAY_RESOLTION
-   $MM_DISPLAY_RESOLTION_INCH
-   $MM_SPIND_DISPLAY_RESOLUTION
-   $MM_MA_COORDINATE_SYSTEM

in the NCK machine data from $MN_GMMC_INFO_NO_UNIT[0] to
$MN_GMMC_INFO_NO_UNIT[3]. This enables these display machine data to be
accessed from the NCK.
```

17201	**GMMC_INFO_NO_UNIT_STATUS**			EXP	K1
-	Global HMI status info (without physical unit)			BYTE	POWER ON
-					
-	16	1,1,1,1,0,0,0,0,0,0,0 ,0,0,0,0,0	-	-	0/7

Description:

```
Value 0: input not assigned
Value 1: input assigned
```

17400	**OEM_GLOBAL_INFO**			A01, A11	-
-	OEM version information			STRING	POWER ON
-					
-	5		-	-	7/2

Description:

```
A version information freely available to the user
(is indicated in the version screen)
```

17500	**MAXNUM_REPLACEMENT_TOOLS**			N09	FBW
-	Maximal number of replacement tools.			DWORD	POWER ON
-					
-	-	0	0	32	7/2

Description:

```
Only relevant if the tool management function is active.

Maximum number of replacement tools.
Value = 0
    means that the number of replacement tools is not monitored. (compatible to
    prior versions)
```

```
Value = 1
    means that exactly one tool may be given to an identifier.
The data does not influence the memory requirement. It is solely for monito-
ring purposes.
See also
    MM_TOOL_MANAGEMENT_MASK,
    TOOL_MANAGEMENT_MASK
```

17510	TOOL_UNLOAD_MASK			N09	FBW
-	Behavior of tool data when unloading			DWORD	POWER ON
-					
-	-	0	0	0xF	7/2

Description:

```
When unloading a tool, certain tool data can be set to store fixed values.

Bit no.Bit valueHEXMeaning
0   0   Tool status 'active' remains unchanged.
    10x1Tool status 'active' is deleted ($TC_TP8, Bit 0).
1   0   Tool status 'was in use' remains unchanged.
    10x2Tool status 'was in use' is deleted ($TC_TP8, Bit 7).
2   0   Tool parameter $TC_TP10 remains unchanged.
    10x4Tool parameter $TC_TP10 is set to zero. That is, the tool replacement
    change strategy is reset.
3   0   Tool parameter $TC_TP11 remains unchanged.
    10x8Tool parameter $TC_TP11 is set to zero. That is, the assignment to the
    tool subgroup is resolved.
```

17515	TOOL_RESETMON_MASK			N09	-
-	Tool data behavior with RESETMON			DWORD	POWER ON
-					
-	-	0x14	0	0x49F	7/2

Description:

```
The 5th parameter of the RESETMON command defines which tool status is to be
reset. If the 5th parameter is omitted, it is replaced by the value in this
MD. With the PI service "_N_TRESMON", work is always done with this value.
In that case the bits are always assigned as the bits in the tool status
$TC_TP8[i].

Bit Value/HEXMeaning
0   0   Tool status "active" remains unchanged
    1 /0x1Tool status "active" is deleted
1   0   Tool status "released" remains unchanged
    10x2Tool status "released" is set
2   0   Tool status "locked" remains unchanged
    1 / 0x4Tool status "locked" is deleted, if this is permitted by the monito-
    ring data and the 4th parameter is set correspondingly.
3   0   Tool status "measure" remains unchanged
    1 / 0x8Tool status "measure" is set
4   0   Tool status "prewarning limit" remains unchanged
    1/ 0x10Tool status "prewarning limit" is deleted, if this is permitted by
    the monitoring data and the 4th parameter is set correspondingly.
```

```
5       Not permitted (tool status "tool is being changed")
6       Not permitted (tool status "tool is fixed-location-coded")
7   0   Tool status "was in use" remains unchanged
    1 / 0x80Tool status "was in use" is deleted
8       Not permitted (tool status "is in retract")
9       Not permitted (tool status "locked is ignored")
10  0   Tool status "to unload" remains unchanged
    1 / 0x400Tool status "to unload" is deleted
11      Not permitted (tool status "to load")
12      Not permitted (tool status "master tool")
13,ff   Not permitted (reserved)

The default setting corresponds to the previous behavior.
Bits not defined here are ignored when writing the machine data.
```

17520	TOOL_DEFAULT_DATA_MASK			N09	FBW
-	Create new tool: default settings			DWORD	POWER ON
-					
-	-	0	0	0x1F	7/2

Description:

```
When defining a tool for the first time, certain data of the tool can be set
to fixed default values. This can prevent simple applications from dealing
with data which do not necessarily have to be assigned individual values.

Bit no.Bit valueHEXMeaning
-------------------------------------------------------------------------------
-------------------------------------------
0   0   Default value of tool status ($TC_TP8), Bit1=0 = 'not released'
    10x1Default value of tool status ($TC_TP8), Bit1=1 = 'released'
1   0   Default value of tool status ($TC_TP8), Bit6=0 = 'not fixed-location-
coded'
    10x2Default value of tool status ($TC_TP8), Bit6=1 = 'fixed-location-coded'
2   0   Only when the explicit write command for the tool name is used, is the
tool accepted in the tool group. Only then can it be loaded via programming.
    10x4The tool is automatically accepted in the tool group corresponding to
    the tool name when it is defined for the first time. The tool can then be
    changed using the default name ("t" = t-No.). The term 'tool name'
    ($TC_TP2) can be hidden from the user. (This only makes sense if you do not
    use replacement tools or if the tool name is not written explicitly. As
    this may give rise to data consistency problems.)
3   0   Only with TMMG: Default value of location type ($TC_TP7) = 9999 = 'not
defined'
    10x8Only with TMMG: Default value of location type ($TC_TP7) = 1 and conse-
    quently, default value of magazine location type ($TC_MPP2) = 1. This means
    that all magazine locations can accept all tools.
4   0   Only with TMMG + active consider adjacent location: With SET/RESET of
the magazine location status 'disabled', the magazine location status 'Over-
lapping allowed' remains unchanged.
    10x10Only with TMMG + active consider adjacent location: With SET/RESET of
    the magazine location status 'disabled' the magazine location status 'Over-
    lapping allowed' occurs automatically with SET/RESET.
```

17530	**TOOL_DATA_CHANGE_COUNTER**			EXP, N01	FBW
-	Mark tool data change for HMI			DWORD	POWER ON
-					
-	-	0	0	0xF	7/2

Description:

```
HMI display support. This data enables individual data to be explicitly taken
into account or not taken into account in the OPI variables (block C/S) tool-
Counter, toolCounterC, toolCounterM.

Bit no.  Bit value   HEX   Meaning
-------------------------------------------------------------------------------
-
0         0                Changes to the value of the tool status ($TC_TP8)
                           are not taken into account in toolCounterC
          1         'H1'   Changes to the value of the tool status ($TC_TP8)
                           are taken into account in toolCounterC
1         0                Changes to the remaining number of tools ($TC_MOP4)
                           are not taken into account in toolCounterC
          1         'H2'   Changes to the remaining number of tools ($TC_MOP4)
                           are taken into account in toolCounterC
2         0                Changes to the value of the tool data
                           are not taken into account in the tool data update
service
          1         'H4'   Changes to the value of the tool data
                           are taken into account in the tool data update ser-
vice
3         0                Changes to the value of the magazine data
                           are not taken into account in the tool data update
service
          1         'H8'   Changes to the value of the magazine data
                           are taken into account in the tool data update ser-
vice.
```

17540	**TOOLTYPES_ALLOWED**			N09	-
-	Permitted tool types			DWORD	POWER ON
-					
-	-	0x3FF	0	0x3FF	7/2

Description:

```
Definition of the tool types permitted in NCK (see $TC_DP1) with the tool off-
set selection, i.e. tools of any type may be loaded in the NCK; but only the
tools types defined here may be defined in the offset defining tool.

A bit value = 1 means that the named tool type range is permitted for the off-
set selection.
A bit value = 0 means that the named tool type range is refused with a compen-
sation block capable alarm in the case of an attempted offset selection of a
cutting edge of this type.

The special value = 0, 9999 for the tool type means 'undefined'. Tool offsets
with this tool type value generally cannot be selected
```

```
Bit no.        ValueMeaning

0               0x1Tool types   1 to  99 permitted

1               0x2Tool types 100 to 199 permitted
                         (milling tools typically have these types)

2               0x4Tool types 200 to 299 permitted
                         (drilling tools typically have these types)

3               0x8Tool types 300 to 399 permitted

4              0x10Tool types 400 to 499 permitted
                         (grinding tools have these types)

5              0x20Tool types 500 to 599 permitted
                         (turning tools typically have these types)

6              0x40Tool types 600 to 699 permitted

7              0x80Tool types 700 to 799 permitted
                         (the slotting saw has the fixed type 700)

8             0x100Tool types 800 to 899 permitted

9             0x200Tool types 900 to 999 permitted
                         (special tools have the fixed type 999)

See also
    $MN_MM_NUM_CUTTING_EDGES_IN_TOA
```

17600	**DEPTH_OF_LOGFILE_OPT**			EXP, N01	-
-	Depth of log memory optimization in REORG			DWORD	RESET
-					
-	-	5	0	300	3/3

Description:

```
The depth of memory optimization in the REORG log file
(=search depth to determine if a parameter to be written is already included
in the REORG log file).
The value of the machine data can be increased if alarm 15110 occurs during
program execution and if this alarm is to be avoided.
(Alternatively, the size of the REORG log file can be increased with
$MC_MM_REORG_LOG_FILE_MEM, provided that the operator has the access rights
required. This procedure should generally be preferred.)

Value
0       = No optimization,
    That is each write operation creates an input into the REORG log file. Wri-
    ting a variable value is therefore very time-efficient, but requires more
    memory.
```

0< n <= Maximum value

When a new variable value is written, the n previously entered write operations (but maximally up to the previous indicatable block) are checked to determine if the parameter now to be written has already been written in the past. If this is the case, a new entry is not made in the REORG log file.

If this is not the case, an entry is made. A variable value can therefore be written in a very memory-efficient way, but requires more time.

Example:
$MN_DEPTH_OF_LOGFILE_OPT is assumed to be 5 and the following would be a typical program sequence:

```
x10     ; Executable NC block
r1=1    ; The first write command since x10
        ; -> Save old value in log file. 1st entry
r2=1    ; Determine that r2 is not yet included
        ; -> Save old value in log file. 2nd entry
r3=1    ; Determine that r3 is not yet included
        ; -> Save old value in log file. 3rd entry
r4=1    ; Determine that r4 is not yet included
        ; -> Save old value in log file. 4th entry
r5=1    ; Determine that r5 is not yet included
        ; -> Save old value in log file. 5th entry
r6=1    ; Determine that r6 is not yet included
        ; -> Save old value in log file. 6th entry
r2=1    ; Determine that r2 is already included
        ; (5th oldest entry) -> no renewed saving
r3=1    ; Determine that r3 is already included
        ; (4th oldest entry) -> no renewed saving
r1=2    ; As $MN_DEPTH_OF_LOGFILE_OPT = 5 it is not detected that
        ; r1 is already included
        ; (6th oldest entry) -> save old value in log file.
        ; 7th entry
x20     ; Executable NC block
r1=3    ; The first write command since x20
        ; -> Save old value in log file. 1st entry
r1=4    ; Determine that r1 is already included
        ; (Only one entry) -> no renewed saving
```

The setting of the MD is particularly useful if a small number of verious parameters
are written frequently (e.g. in a loop) and if alarm 15110 occurs for this reason.

17610	**DEPTH_OF_LOGFILE_OPT_PF**			EXP, N01	-
-	Depth of the PowerFail log memory optimization			DWORD	RESET
-					
-	3	10,0,4	0	300	0/0

Description:

```
Depth of the memory optimization in the PowerFail log file (=search depth, to
find out
whether a parameter to be written is already included in the PowerFail log
file).
It is possible to increase the value of the machine data if
alarm 15120 occurs during program processing and if you wish to avoid it.

(Alternatively, you can increase the size of the PowerFail log file itself
by means of $MC_MM_ACTFILESYS_LOG_FILE_MEM, if you have the necessary access
right
and if the required memory is available.

Value
0       = No optimization. This means that every write operation leads to an
entry in the
          PowerFail log file.
          Writing of a variable value is therefore very time-efficient at the
          cost of the required memory.

0< n <= Maximum value
        = Writing of a new variable value leads, prior to saving of the new
          variable value in the PowerFail log file, to the last n write
          operations which have been being checked to see whether
          the new parameter to be written has already been written once.
          If yes, the new value is not entered again in the PowerFail log
          file, but the old value is overwritten with the new one.
          If no, the new value is entered.
          At the cost of the required time, writing of a variable value
          can therefore be designed very memory-efficiently.

Changing of the data can shorten/increase the time requirement of the present
application.
Changing of the data can fill the available log buffers faster/more slowly.
Frequent occuring of alarm 15120 -> Increase values for index=0,1,2.
The value indicating the index to be changed can be deducted from the parame-
ter of alarm 15120:
if it is the value for $MC_MM_ACTFILESYS_LOG_FILE_MEM[0], then increase the
value for index 0;
or increase $MC_MM_ACTFILESYS_LOG_FILE_MEM[0] itself.
Index Meaning
0     Search depth in preprocessing buffer
1     Search depth in buffer for data changes within the range of tool change
2     Search depth in buffer for data changes of main processing (especially
synchronized actions)
```

17900	**VDI_FUNCTION_MASK**			EXP, N09	-
-	Setting to VDI signals			DWORD	POWER ON
-					
-	-	0x0	0	0x1	7/2

Description:

```
Settings for VDI signals:
Bit 0 == 0:
    The VDI signals motion command + / motion command - are already issued if
    there is a travel request (default).
Bit 0 == 1:
    The VDI signals motion command + / motion command - are issued only if the
    axis actually moves.
```

1.3.4 System specific memory settings

18000	**VDI_UPDATE_IN_ONE_IPO_CYCLE**			EXP, N01	P3
-	PLC interface update			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	0/0

Description:

```
1:  Complete reading/writing of the VDI interface in one IPO cycle
0:  Complete reading/writing of the VDI interface in two IPO cycles
```

18030	**HW_SERIAL_NUMBER**			N05	-
-	Hardware series number			STRING	POWER ON
READ					
-	1		-	-	7/2

Description:

```
During power on of the control, a unique hardware serial number is stored in
this MD:
-   For Powerline series modules this is the serial number of the NCU module
-   For Solutionline series modules this is the serial number of the CF card, or
    the unique number of the MCI module in the case of PC-based systems

This data cannot be written.
```

18040	**VERSION_INFO**		N05	IAD
-	Version and possibly data of the PCMCIA card, not FM-NC		STRING	POWER ON
READ				

Description:

```
Version identifiers of the system software
The identifiers of the PCMCIA card (assigned by the configuration management)
and the 'system_date_time' from the NCK are stored in this MD during control
power on. A unique assignment can always be made with this data from the MD
block (startup file or INITIAL_INI) to a software release.
```

18050	**INFO_FREE_MEM_DYNAMIC**			N01, N02, N05	S7
-	Display data of free dynamic memory			DWORD	POWER ON
READ					
-	-	430080	-	-	7/2
710-6a2c	-	1048576	-	-	-/-
720-6a2c	-	1048576	-	-	-/-
730-6a2c	-	1048576	-	-	-/-
710-31a10c	-	1048576	-	-	-/-
720-31a10c	-	1048576	-	-	-/-
730-31a10c	-	1048576	-	-	-/-
840di-basic	-	1048576	-	-	-/-
840di-universal	-	1048576	-	-	-/-
840di-plus	-	1048576	-	-	-/-

Description:

```
The data is used for
a)  manufacturer's presetting of the memory size [ bytes ] available to the
user for each channel after cold restart.
b)  Displaying the available dynamic memory [ bytes ]
    The data cannot be written.

The contents of the data states how much unbuffered memory is available per
channel for the increase of unbuffered user data storage area via MD.
One should check whether the available memory is sufficient before increa-
sing, for example, the number of LUDs, number of functional parameters or the
size of the IPO buffer.
If necessary, proceed step by step:
-   increase by 1, note (old) value
-   NCK startup (= 'warm start' or NCK reset), read off new value
-   memory requirement = new value - old value

On the first NCK startup or cold restart of the control (=deletion of user
data) the data $MN_MM_USER_MEM_DYNAMIC is set by the NCK software so that at
least the preset value results for $MN_INFO_FREE_MEM_DYNAMIC.
That is the value is automatically increased if the initial value of
$MN_MM_USER_MEM_DYNAMIC is too low.
```

The following also applies to multichannel systems:
- The preset value applies to each possible channel. That is, if there are ten possible channels the data $MN_MM_USER_MEM_DYNAMIC is set by the NCK SW so that at least the 'preset value* ten' results for $MN_INFO_FREE_MEM_DYNAMIC.
- On activation of a channel, the data $MN_MM_USER_MEM_DYNAMIC will, if necessary, also be increased so that the memory free at the time of activation will continue to be free (provided that the memory structure permits this) after the channel has become active.
- The activation of the maximum possible number of axes is ensured by increasing the data $MN_MM_USER_MEM_DYNAMIC if necessary so that memory free at the time of activation will continue to be free (provided that the memory structure permits this) after the axis has become active.

'If necessary' in the previous sentences means that the adjustment is automatic if the channel/axis could not be activated with the current values of $MN_MM_USER_MEM_DYNAMIC/$MN_INFO_FREE_MEM_DYNAMIC.

18060	**INFO_FREE_MEM_STATIC**			N01, N02, N05	S7
-	Display data of free static memory			DWORD	POWER ON
READ					
-	-	1048576	-	-	7/2
710-6a2c	-	2097152	-	-	-/-
720-6a2c	-	2097152	-	-	-/-
730-6a2c	-	2097152	-	-	-/-
710-31a10c	-	2097152	-	-	-/-
720-31a10c	-	2097152	-	-	-/-
730-31a10c	-	2097152	-	-	-/-
840di-basic	-	5242880	-	-	-/-
840di-universal	-	5242880	-	-	-/-
840di-plus	-	5242880	-	-	-/-

Description:

The following applies to PowerLine control models:
Output of the buffered memory available in the passive file system [bytes].
The data cannot be written.

The preset value states the minimum number of bytes available to the user when the NCK starts up with a cold restart.

The contents of the data state how much battery-backed memory is available for the passive file system at the time of startup.
After a non-buffered startup, the maximum memory available in the file system can be read.
If MDs that affect the requirement for buffered memory (e.g. MM_NUM_GUD_VALUES_MEM, MM_ENC_COMP_MAX_POINTS) are changed then this changes the amount of memory available for the passive file system, as the amount of memory allocated to the passive file system consists of MM_USER_MEM_BUFFERED minus all other buffered user data.
(See also the document on MM_USER_FILE_MEM_MINIMUM)
At the first NCK startup or cold restart of the control (=deletion of user data) the data $MN_MM_USER_MEM_BUFFERED is set by the NCK software so that at least the default value results for $MN_INFO_FREE_MEM_STATIC.

That is $MN_MM_USER_MEM_BUFFERED is automatically increased if its initial value is too low.

The following applies to SolutionLine control models:
The data reserves the available memory for the data that are not the passive file system.
(The data $MN_MM_USER_FILE_MEM_MINIMUM[0] dimensions the passive file system.)
Machine data for setting the active file system (tools, GUDs, ...) can be increased until this memory has all been allocated.

18070	**INFO_FREE_MEM_DPR**			EXP, N01, N02, N05	S7
-	Display data of free memory in DUAL PORT RAM			DWORD	POWER ON
READ					
-	-	0	-	-	7/2

Description:

Output of the available memory in the Dual Port RAM (Bytes).
The data cannot be written.

18072	**INFO_FREE_MEM_CC_MD**			EXP, N01, N05	-
-	Display of free memory in CC-MD memory			DWORD	POWER ON
READ					
-	-	0	-	-	0/0

Description:

Output of the available memory for compile cycle MDs (bytes).
The data cannot be written.

18074	**MM_TOOL_MANAGEMENT_TRACE_SZ**			N02, N09	/FBW/, "Description of Functions, Tool Management"
-	Max. size of the tool management diagnostic ring buffers			DWORD	POWER ON
-					
-	2	25,25	4	500	7/2

Description:

The number of entries in the tool management diagnostic ring buffers.
Index 0 = IPO trace buffer size.
Index 1 = Prep trace buffer size.

There are separate IPO trace buffers in each channel, and a Prep trace buffer in channel 1 only.
The buffers are allocated only if bit 0 (0x0001) is ON at warm start, in both MD 18080: MM_TOOL_MANAGEMENT_MASK and per-channel MD 20310: TOOL_MANAGEMENT_MASK.

Trace data is written to the buffers when bit 13 (0x2000) is ON in per-channel MD 20310: TOOL_MANAGEMENT_MASK.

18075	**MM_NUM_TOOLHOLDERS**			N02, N09	/FBW/, "Description of Functions, Tool Management"
-	Max. number of tool holders per TOA			DWORD	POWER ON
-					
-	-	32	1	SLMDMAXMAGLOCATIONSWITHDISTANCE	7/2

Description:

```
Max. number of definable tool holders per TO range.
The address extension e of commands Te=t, Me=6 (*) is the number of the tool
holder.
t=T number/tool name - depending on the function activated in the NCK.
(*) if: $MC_TOOL_CHANGE_MODE=1 and $MC_TOOL_CHANGE_M_CODE=6 applies

Normally the tool holder of milling machines is a spindle.
Also see $MC_SPIND_DEF_MASTER_SPIND.
For turning machines the tool holder normally is not a spindle axis.
Also see $MC_TOOL_MANAGEMENT_TOOLHOLDER.
In this case it should reasonably apply that $MN_MM_NUM_TOOLHOLDERS is larger
or equal to $MC_SPIND_DEF_MASTER_SPIND/$MC_TOOL_MANAGEMENT_TOOLHOLDER.
If bit 0 = 1 in $MN_MM_TOOL_MANAGEMENT_MASK and $MC_TOOL_MANAGEMENT_MASK is
set (=magazine management (TOOLMAN))
it will apply for reasonable values that $MN_MM_NUM_TOOLHOLDERS is smaller or
equal to $MN_MM_NUM_LOCS_WITH_DISTANCE.
A maximum of $MN_MM_NUM_TOOLHOLDERS intermediate memory locations of the type
spindle
($TC_MPP1[9998,x]=2) can then be defined.

Example: TOOLMAN inactive
$MC_SPIND_DEF_MASTER_SPIND shall be =3, $MN_MM_NUM_TOOLHOLDERS shall be =3.
Then T1=t, T2=t, T3=t, T=t can be programmed.

Example: TOOLMAN active, milling machine with Me=6 as tool change command
$MN_MM_NUM_TOOLHOLDERS shall be = 14, $MN_MM_NUM_LOCS_WITH_DISTANCE=20,
10 channels shall be active, all channels have TOOLMAN active and have the
same tool and magazine data
(=one TO range for all channels). $MC_SPIND_DEF_MASTER_SPIND=1,.....10 for the
channels.
Then up to 14 locations of the kind 'tool holder'/'spindle' can be defined in
the intermediate magazine memory.
Additional 6 grippers or others can be defined.
These 20 locations max. can be linked to magazines.
In the channels T1=t, .... T14=t and Tt, or M1=6,....M14=6 and M6 can be pro-
grammed.
```

18076	**MM_NUM_LOCS_WITH_DISTANCE**			N02, N09	/FBW/, "Description of Functions, Tool Management"
-	Max. number of magazine locations per TOA with remote connection			DWORD	POWER ON
-					
-	-	32	1	SLMDMAXMAGLOCATIONSWITHDISTANCE	7/2

Description:

```
This machine data is reasonable, if the magazine management function, TOOL-
MAN, is active
 - See $MN_MM_TOOL_MANAGEMENT_MASK, $MC_TOOL_MANAGEMENT_MASK; for each bit 0 =
1.
Max. number of magazine locations (spindles, load locations,...) per TOA, that
can
have a remote connection to a magazine, defined by $TC_MDPx[n,m].

Example: TOOLMAN shall be active: $MN_MM_NUM_LOCS_WITH_DISTANCE shall be = 5
and $MN_MM_NUM_DIST_REL_PER_MAGLOC = 2.
Two TO units shall be defined with three tool holders/spindles and two load
locations each.
Furthermore, two grippers each shall be defined in each TO unit.
This means that a total of 14 locations shall be defined in the intermediate
memory magazine/load magazine for the distances and assignments.
4 magazines shall be defined for TO unit 1, 6 magazines for TO unit 2.
With the value set to $MN_MM_NUM_LOCS_WITH_DISTANCE = 5 each tool holder and
each load location
of the two TO units with up to two magazines ($MN_MM_NUM_DIST_REL_PER_MAGLOC =
2) per remote relationship
can be connected; (see $TC_MDP1 and $TC_MDP2) and for each tool holder max.
two more grippers
($MN_MM_NUM_DIST_REL_PER_MAGLOC = 2) can be assigned; (see $TC_MLSR).
One tool holder / one spindle location can subsequently have two tables - one
distance table for magazines and
one assignment table for grippers and similar locations.
```

18077	**MM_NUM_DIST_REL_PER_MAGLOC**			N02, N09	/FBW/, "Description of Functions, Tool Management"
-	Max. no. of magazines in the distance table of a magazine loc.			DWORD	POWER ON
-					
-	-	SLMDMAXLINKED MAGAZINES	0	SLMDMAXLINK EDMAGAZINES	7/2

Description:

```
This machine data will only be active, if the magazine management, TOOLMAN
function is active.
-   See $MN_MM_TOOL_MANAGEMENT_MASK, $MC_TOOL_MANAGEMENT_MASK.
Two sizes are defined with this magazine data:
1.) Max. number of magazines in the distance table of a magazine location
(spindle, load location, ...)
2.) Max. number of locations (gripper, ...) in the connection table of a
spindle/tool holder location.

Example: $MN_MM_NUM_DIST_REL_PER_MAGLOC shall be = 3.
Two TO units shall be defined with two tool holder/spindles each and one load
location each.
Furthermore four grippers shall be defined in each TO unit.
4 magazines shall be defined for TO unit 1; 6 magazines shall be defined for
TO unit 2.

Then, each tool holder can define max. three distances for the magazines (see
$TC_MDP2)
and additionally a max. of three relationships to the grippers ($TC_MLSR).
```

18078	**MM_MAX_NUM_OF_HIERARCHIES**			N02, N09	/FBW/, "Description of Functions, Tool Management"
-	The maximum number of hierarchies for magazine location types			DWORD	POWER ON
-					
-	-	8	0	32	7/2

Description:

```
The machine data only has effect if the function 'tool magazine management',
TMMG, is activated  - see $MN_MM_TOOL_MANAGEMENT_MASK,
$MC_TOOL_MANAGEMENT_MASK.
The maximum number of hierarchies for magazine location types.
In variable $TC_MPTH[n,m], the allowed range of n is from 0 to
($MN_MM_MAX_NUM_OF_HIERARCHIES - 1).
(The maximum of index m is given by $MN_MM_MAX_HIERARCHY_ENTRIES.)
Value = 0 means that the function 'magazine location type hierchies' is not
available.
```

18079	**MM_MAX_HIERARCHY_ENTRIES**			N02, N09	/FBW/, "Description of Functions, Tool Management"
-	The max. number of entries in a mag. location type hierarchy.			DWORD	POWER ON
-					
-	-	8	1	32	7/2

Description:

```
The machine data only has effect if the function 'tool magazine management',
TMMG, is activated  - see $MN_MM_TOOL_MANAGEMENT_MASK,
$MC_TOOL_MANAGEMENT_MASK - and if $MN_MM_MAX_NUM_OF_HIERARCHIES is greater
than zero.
The maximum number of entries in a magazine location type hierarchy.
In variable $TC_MPTH[n,m], the allowed range of m is from 0 to
($MN_MM_MAX_HIERARCHY_ENTRIES - 1).
(The maximum of index n is given by $MN_MM_MAX_NUM_OF_HIERARCHIES.)
```

18080	**MM_TOOL_MANAGEMENT_MASK**			N02, N09	FBW
-	Step-by-step memory reservation for tool management (SRAM)			DWORD	POWER ON
-					
-	-	0x0	0	0xFFFF	7/1

Description:

```
Step-by-step memory reservation for the tool management (TOOLMAN)
Bit-coded activation data. That is the memory for the TOOLMAN can be activa-
ted in various versions.
The data is evaluated only during startup of the software.
The TOOLMAN data are battery-backed.
The TOOLMAN-specific memory reservation that is defined in detail by the
machine data
 MD 18086:   $MN_MM_NUM_MAGAZINE_LOCATION
 MD 18084:   $MN_MM_NUM_MAGAZINE
 MD 18096:   $MN_MM_NUM_CC_TOA_PARAM
 MD 18094:   $MN_MM_NUM_CC_TDA_PARAM
 MD 18098:   $MN_MM_NUM_CC_MON_PARAM
 MD 18092:   $MN_MM_NUM_CC_MAGLOC_PARAM
 MD 18090:   $MN_MM_NUM_CC_MAGAZINE_PARAM
is made as a function of this data.
(Further TOOLMAN-specific memory is determined by other machine data, see
below.)
Value = 0 ->None of the above memory is reserved: That is TOOLMAN is not avai-
lable, only the basic functionality can be programmed.

Bit no.HexaMeaning when bit set
       value
```

```
--------------------------------------------------------------------------------
-
0 (LSB)0x1Tool management data (TMMG) are made available; the memory-reser-
ving MDs must be set correspondingly ($MN_MM_NUM_MAGAZINE_LOCATION,
$MN_MM_NUM_MAGAZINE). The machine data $MN_MM_NUM_TOOL,
$MN_MM_NUM_CUTTING_EDGES_IN_TOA, which make the memory available for the basic
functionality with and without TOOLMAN, must be set correspondingly. The TOOL-
MAN-specific memory is added to the memory determined by $MN_MM_NUM_TOOL.

1   0x2  Monitoring data (TMMO) are made available; the memory-reserving MDs
must be set correspondingly ($MN_MM_NUM_MAGAZINE_LOCATION,
$MN_MM_NUM_MAGAZINE). The memory for the monitoring data is added to the cut-
ting edges (-> $MN_MM_NUM_CUTTING_EDGES_IN_TOA ).

2   0x4  OEM, CC data (individually determined by $MN_MM_NUM_CC_...) are made
available, the memory-reserving MDs must be set correspondingly.

3   0x8  Memory reserved for consider adjacent location

4   0x10 Memory and function release for the PI service  _N_TSEARC = 'Complex
search for tools in magazines'. Depending on the function characteristic, the
function requires memory of the order of 10KB.

5   0x20 Reserve memory and function release for wear monitoring

6   0x40 The classification of the magazine in wear groups is released

7   0x80 Reserve memory for the adapter of the magazine locations according to
the information in MM_NUM_TOOL_ADAPTER

8   0x100Reserve memory for sum offsets and/or setup offsets according to the
information in MM_NUM_SUMCORR, MM_KIND_OF_SUMCORR

9   0x200Value 1 = Tools in a revolver are handled in OPI variable blocks so
that they are not 'shown' on toolholder locations, but always in the revolver
location. That means that, in particular, tools in a revolver no longer leave
their revolver locations when there is a tool change (as far as the display is
concerned).
    Value 0 = Default behavior; Tools in a revolver are 'displayed' on the OPI
    according to their actual location (as far as the data is concerned).

Example 1:
MM_TOOL_MANAGEMENT_MASK =  1  -> Memory is made available for tool management
data
                                 (TMMG).
MM_TOOL_MANAGEMENT_MASK =  2  -> Memory is made available for monitoring data
                                 (TMMO).
MM_TOOL_MANAGEMENT_MASK =  3  -> Memory is made available for TMMG and TMMO.

MM_TOOL_MANAGEMENT_MASK =  4  -> Memory available for OEM/CC data
MM_TOOL_MANAGEMENT_MASK =  9  -> Memory available for TMMG and
                                 consider adjacent location
MM_TOOL_MANAGEMENT_MASK = 17  -> Memory is made available for TMMG data
                                 and the PI service  _N_TSEARC can be used
                                 (decimal 17 = 0x11 = bits 0 and 4)
```

Example 2:
The complete TOA area has 20 tools and 60 cutting edges. All other above-mentioned memory-reserving MDs =0. The TOOLMAN is not active.
Bit 0 (LSB) is now assigned.
The battery-backed memory is deleted after a renewed start of the software because now additional memory has been reserved for the TOOLMAN. Additional memory is reserved for each of the 20 tools.

References:
/FBW/, "Description of Functions, Tool Management"

18082	**MM_NUM_TOOL**			N02, N09	FBW,S7
-	Number of tools the NCK can manage (SRAM)			DWORD	POWER ON
-					
-	-	30	0	600	7/2

Description:

The NC cannot manage more tools than the number entered in the MD. A tool has at least one cutting edge.

Buffered user memory is used.

The maximum possible number of tools is equal to the number of cutting edges!
The MD must also be set when TOOLMAN is not used!
The battery-backed data are lost when the machine data is changed!

Note:
The data did not exist in product version 1. It must be set as from product version 2.
Related to:
MD 18100: MM_NUM_CUTTING_EDGES_IN_TOA
(Number of tool offsets in the NCK)

18084	**MM_NUM_MAGAZINE**			N02, N09	FBW
-	Number of magazines the NCK can manage (SRAM)			DWORD	POWER ON
-					
-	-	3	0	32	7/2

Description:

Number of magazines which the NCK can manage.

Buffered user memory is used.

The MDs for TOOLMAN MD 20310: TOOL_MANAGEMENT_MASK, MD 18080: MM_TOOL_MANAGEMENT_MASK and the optional TOOLMAN $ON_TECHNO_FUNCTION_MASK must be set.

Irrelevant:
MD is irrelevant if TOOLMAN is not in use.

```
Special cases:
    Only tool management version 2:
    Value = 0 -> TOOLMAN version 2 cannot be activated because no memory area
    has been set up for the data.
    The battery-backed data are lost if this machine data is altered!

Related to:
    MD 18080: MM_TOOL_MANAGEMENT_MASK
    (Mask for reserving memory for TOOLMAN)
    MD 20310: TOOL_MANAGEMENT_MASK
    (Activation of different versions of tool management)
    $ON_TECHNO_FUNCTION_MASK

References:
    /FBW/, "Description of Functions, Tool Management"
```

18086	**MM_NUM_MAGAZINE_LOCATION**			N02, N09	FBW
-	Number of magazine locations the NCK can manage (SRAM)			DWORD	POWER ON
-					
-	-	30	0	600	7/2

Description:

```
Number of magazine locations which the NCK can manage.

Buffered user memory is used.

The MDs for TOOLMAN MD 20310: TOOL_MANAGEMENT_MASK, MD 18080:
MM_TOOL_MANAGEMENT_MASK and the optional TOOLMAN $ON_TECHNO_FUNCTION_MASK must
be set.

Irrelevant:
    MD is irrelevant if TOOLMAN is not in use.

Special cases:
    Only tool management version 2:
    Value = 0 -> tool management version 2 cannot be activated because no
    memory area has been set up for the data.
    The battey-backed data are lost if this machine data is altered!

Related to:
    MD 18080: MM_TOOL_MANAGEMENT_MASK
    (Mask for reserving memory for TOOLMAN)
    MD 20310: TOOL_MANAGEMENT_MASK
    (Activation of different versions of tool management)
    $ON_TECHNO_FUNCTION_MASK

References:
    /FBW/, "Description of Functions, Tool Management"
```

18088	MM_NUM_TOOL_CARRIER			N02, N09	W1
-	Maximum number of definable tool holders			DWORD	POWER ON
-					
-	-	0	0	MD_SLMAXNOOFTOOLCARRIERS	7/2

Description:

```
Maximum number of definable toolholders for orientable tools in the TO area.
The value is divided by the number of active TO units. The integer result sta-
tes how many toolholders can be defined for each TO unit. The data for defi-
ning a toolholder are set with the system variables $TC_CARR1, ... $TC_CARR14.
The data are stored in battery-backed memory.

Application example(s):
2 channels are active, there is one TO on each channel  (=default setting). 3
holders are to be defined in channel 1, one holder in channel 2. The value to
be set is 6. Because 6 / 2 = 3. That is a maximum of 3 holder definitions in
each TO unit.
```

18090	MM_NUM_CC_MAGAZINE_PARAM			N02, N09	FBW
-	Number of magazine data generated and evaluated by the CC (SRAM)			DWORD	POWER ON
-					
-	-	0	0	10	2/2

Description:

```
Only if MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 0=1 (0x1) and bit 2=1 (0x4), is
set for TMMG  (and option is set):

Number of magazine data (format IN_Int.) which are created and can be evalua-
ted by compile cycles.
See also: MM_NUM_MAGAZINE

Buffered user memory is used.

Warning:
    The battery-backed data are lost if this machine data is altered!

Related to:
    MD 18080: MM_TOOL_MANAGEMENT_MASK
    (Mask for reserving memory for TOOLMAN)
    MD 18084: MM_NUM_MAGAZINE
    (Number of magazines managed by the NC)

References:
    /FBW/, "Description of Functions, Tool Management"
```

18091	**MM_TYPE_CC_MAGAZINE_PARAM**			N02, N09	-
-	Type of OEM magazine data (SRAM)			DWORD	POWER ON
-					
-	10	3,3,3,3,3,3,3,3,3,3	1	6	2/2

Description:

```
Only when MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 0=1 (0x1) and bit2=1 (0x4), is
set for TMMG (and option is set):

Type of magazine-specific user data configured by MM_NUM_CC_MAGAZINE_PARAM.
Each parameter can be assigned its own type. Permissible types are:

 Type      Value of machine data
 (See types
 of the NC language)
 ----------------------------------------------------------------
 BOOL      1
 CHAR      2
 INT       3
 REAL      4
 STRING    5 (identifier may be up to 31 characters long)
 AXIS      6
 FRAME     not defined

See also:
   MM_NUM_CC_MAGAZINE_PARAM, MM_NUM_MAGAZINE
Buffered user memory is used.
```

18092	**MM_NUM_CC_MAGLOC_PARAM**			N02, N09	FBW
-	Number of OEM magazine location data (SRAM)			DWORD	POWER ON
-					
-	-	0	0	10	2/2

Description:

```
Only if MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 0=1 (0x1) and bit 2=1 (0x4), is
set for TMMG  (and option is set):

Number of magazine location data (format IN_int.) which are created for the
memory area and can be evaluated by compile cycles.
Buffered user memory is used.

Irrelevant:
   MD is irrelevant if TOOLMAN is not activated

Warning:
   The battery-backed data are lost if this machine data is altered!

Related to:
   MD 18080: MM_TOOL_MANAGEMENT_MASK
   (Mask for reserving memory for TOOLMAN)
   MD 18086: MM_NUM_MAGAZINE_LOCATION
References:
   /FBW/, "Description of Functions, Tool Management"
```

18093	**MM_TYPE_CC_MAGLOC_PARAM**			N02, N09	-
-	Type of OEM magazine location data (SRAM)			DWORD	POWER ON
-					
-	10	3,3,3,3,3,3,3,3,3,3	1	6	2/2

Description:

```
Only when MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 0=1 (0x1) and bit 2=1 (0x4), is
set for TMMG (and option is set):

Individual types can be assigned to the parameters in this way. The array
index n can accept values from 0 to the value of MD 18090: MM_NUM_CC_MAGA-
ZINE_PARAM.
The possible values of the MD = 1, 2, 3, 4 and 6 represent the NC language
types
1       BOOL,
2       CHAR,
3       INT,
4       REAL and
6       AXIS
The value 5, type STRING, is here explicitly not possible. The value 5 is tre-
ated like 2. The type FRAME cannot be defined here.
Example:
MD 18090: MM_NUM_CC_MAGAZINE_PARAM=1
MD 18091: MM_TYPE_CC_MAGAZINE_PARAM=2
"A" can then be programmed for the parameter $TC_MPPC1.
Battery-backed working memory is used. A value change can - but need not -
lead to reconfiguration of the battery-backed memory.
```

18094	**MM_NUM_CC_TDA_PARAM**			N02, N09	FBW
-	Number of OEM tool data (SRAM)			DWORD	POWER ON
-					
-	-	0	0	10	2/2

Description:

```
Only if MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 2=1 (0x4), is set:
User or OEM tool data
Number of tool-specific data (format IN_int.) which are created for the memory
area and can be evaluated by compile cycles.
Buffered user memory is used.

Irrelevant:
    MD is irrelevant if TOOLMAN is not activated

Warning:
    The battery-backed data are lost if this machine data is altered!

Related to:
    MD 18080: MM_TOOL_MANAGEMENT_MASK
    (Mask for reserving memory for TOOLMAN)
    MD 18082:  MM_NUM_TOOL
    (Number of tools managed by the NCK)
References:
    /FBW/, "Description of Functions, Tool Management"
```

18095	MM_TYPE_CC_TDA_PARAM			N02, N09	-
-	Type of OEM tool data (SRAM)			DWORD	POWER ON
-					
-	10	4,4,4,4,4,4,4,4,4,4	1	6	2/2

Description:

```
Only when MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 2=1 (0x4), is set:
User or OEM data in the tool management.

Individual types can be assigned to the parameters in this way. The array
index n can accept values from 0 to the value of MD 18094:
MM_NUM_CC_TDA_PARAM.
The possible values of the MD = 1, 2, 3, 4, 5 and 6 represent the NC language
types
1   BOOL,
2   CHAR,
3   INT,
4   REAL,
5   STRING and
6   AXIS.
The type FRAME cannot be defined here. The type STRING can be up to 31 charac-
ters long.
Example:
MD 18094: MM_NUM_CC_TDA_PARAM=1
MD 18095: MM_TYPE_CC_TDA_PARAM=5
"UserCuttingEdge" can then be programmed for parameter $TC_TPC1.
Battery-backed working memory is used. A value change can - need not - lead to
reconfiguration of the battery-backed memory.
```

18096	MM_NUM_CC_TOA_PARAM			N02, N09	FBW
-	Number of data per tool edge for compile cycles (SRAM)			DWORD	POWER ON
-					
-	-	0	0	10	2/2

Description:

```
Only when MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 2=1 (0x4), is set:
Number of tool-specific data per tool edge (format real) which are created for
the memory area and can be evaluated by compile cycles.
Buffered user memory is used.
Irrelevant:
    MD is irrelevant if TOOLMAN versions 1 and 2 are not activated.

Special cases:
    The battery-backed data are lost if this machine data is altered!

Related to:
    MD 18080: MM_TOOL_MANAGEMENT_MASK
    (Mask for reserving memory for TOOLMAN)
    MD 18100: MM_NUM_CUTTING_EDGES_IN_TOA
    (Number of tool offsets in the NCK)
References:
    /FBW/, "Description of Functions, Tool Management"
```

18097	**MM_TYPE_CC_TOA_PARAM**			N02, N09	-
-	Type of OEM data per cutting edge (SRAM)			DWORD	POWER ON
-					
-	10	4,4,4,4,4,4,4,4,4	1	6	2/2

Description:

```
Only when MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 2=1 (0x4), is set:
User or OEM data in the tools.
Type of the cutting-edge-specific user data configured via
MM_NUM_CC_TOA_PARAM. Only the default setting may be used.
Individual types can be assigned to the parameters in this way. The array
index n can accept values from 0 to the value of MD 18096:
MM_NUM_CC_TOA_PARAM.
The possible values of the MD = 1, 2, 3, 4 and 6 represent the NC language
types
1   BOOL,
2   CHAR,
3   INT,
4   REAL and
6   AXIS.
The type FRAME cannot be defined here. (5   STRING is not explicitly possible
here; the value 5 is treated like value 2).
Example:
MD 18096: MM_NUM_CC_TOA_PARAM=1
MD 18097: MM_TYPE_CC_TOA_PARAM=2
"A" can then be programmed for parameter $TC_DPC1
Battery-backed working memory is used. A value change can - but need not -
lead to reconfiguration of the battery-backed memory.
```

18098	**MM_NUM_CC_MON_PARAM**			N02, N09	FBW
-	Number of monitoring data per tool for compile cycles			DWORD	POWER ON
-					
-	-	0	0	10	2/2

Description:

```
Only when $MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 0=1 or bit 1=1 and bit 2=1
0x4), is set:
For TOOLMAN compile cycles:
Number of monitor data which are created for each tool and which can be evalu-
ated by compile cycles.
Buffered user memory is used.
Irrelevant:
    MD is irrelevant if TOOLMAN is not activated.
Special cases:
    The battery-backed data are lost if this machine data is altered!
Related to:
    MD 18080: MM_TOOL_MANAGEMENT_MASK
    (Mask for reserving memory for TOOLMAN)
    MD 18100: MM_NUM_CUTTING_EDGES_IN_TOA
    (Number of tool offsets in the NCK)
References:
    /FBW/, "Description of Functions, Tool Management"
```

18099	**MM_TYPE_CC_MON_PARAM**			N02, N09	FBW
-	Type of OEM monitor data (SRAM)			DWORD	POWER ON
-					
-	10	3,3,3,3,3,3,3,3,3,3	1	6	2/2

Description:

```
Individual types can be assigned to the parameters in this way. The array
index n can accept values from 0 to the value of MD 18098: MM_NUM_CC_MON_PA-
RAM
Possible values of the MD = 1, 2, 3, 4 and 6 represent the NC language types
1   BOOL,
2   CHAR,
3   INT,
4   REAL and
6   AXIS.
The FRAME type cannot be defined here.
(5   STRING is not possible explicitly here; the value 5 is treated like value
2).
Example:
MD 18098: MM_NUM_CC_MON_PARAM=1
MD 18099: MM_TYPE_CC_MON_PARAM=2

"A" can then be programmed for the parameter $TC_MOPC1
A battery-backed working memory is used. A value change can - but need not -
lead to reconfiguration of the battery-backed memory.
```

18100	**MM_NUM_CUTTING_EDGES_IN_TOA**			N02, N09	S7
-	Tool offsets in the TO range (SRAM)			DWORD	POWER ON
-					
-	-	30	0	1500	7/2

Description:

```
Defines the number of tool cutting edges in a TO area. This machine data
reserves approximately 250 bytes of battery-backed memory per TOA block for
each tool cutting edge, irrespective of the tool type.

Tools with cutting edges of type 400-499 (= grinding tools) also occupy the
location of a cutting edge.
Example:
Defining 10 grinding tools each of which has one cutting edge. Then at least:
MM_NUM_TOOL = 10
MM_NUM_CUTTING_EDGES_IN_TOA = 20 must apply.
See also MM_NUM_TOOL

Buffered user memory is used.

Special cases:
    The battery-backed data are lost if this machine data is altered.

References:
    /FBW/, "Description of Functions, Tool Management"
```

18102	**MM_TYPE_OF_CUTTING_EDGE**			N02, N09	W1
-	Type of D No. programming (SRAM)			DWORD	POWER ON
-					
-	-	0	0	1	7/2

Description:

```
This MD activates the 'flat D number management'.
The type of D programming can be determined by individual values:
-   direct or
-   indirect programming.

The default value is zero. This means that the NCK manages the T and D num-
bers.

The NCK only accepts a value > 0 if bit 0 is not set in MD
$MN_MM_TOOL_MANAGEMENT_MASK. That means the tool managment function cannot be
active simultaneously.

Value:   Meaning
-------------------------------------------------------------------------------
-----
0:  No 'flat D number management' active
1:  D numbers are programmed directly and absolutely
2:  D numbers are programmed indirectly and relatively.
    That means the programmed D number is the index to a table in the VDI. The
    PLC writes the absolute D number in this table. The NCK reads this number
    and selects the corresponding offset.
    The NCK and PLC are synchronized while doing so. The NCK may have to wait
    until the PLC has made the D number(s) available.
    The PLC receives the trigger for this by evaluating the T no.
    The NC block containing the change command triggers the synchronization and
    the waiting for the D numbers.

3   As 2, with simulation of the D numbers by the PLC. Only for testing the NCK
functionality.
    In this case, the D numbers are placed by the NCK itself. They can be assi-
    gned via the R parameters R1,...R9. In which case the value of R1 is map-
    ped onto D1 etc.
    Activation (value changed from 0 to > 0) and deactivation (value changed
    from > 0 to 0) reconfigure the battery-backed memory, that is delete the
    data!
```

18104	**MM_NUM_TOOL_ADAPTER**			N02, N09	FBW
-	Tool adapters in TO area (SRAM)			DWORD	POWER ON
-					
-	-	-1	-1	600	7/2

Description:

```
Number of tool adapters in the TO area.
The function can only be used if there are magazine locations in the NCK.
The tool management function must be active.
Bit 7 (=0x80) must also be set in MD $MN_MM_TOOL_MANAGEMENT_MASK to enable the
setting to become active.
```

Number of tool adapter data blocks available in the NCK.
Battery-backed memory is used.

Changing the data reorganizes the battery-backed memory in the NCK. The data can only be used properly if magazine locations are defined.
Adapter data blocks and the cutting edge-specific basic/adapter dimensions are mutually exclusive. This means that if adapter data are defined, then the parameters $TC_DP21, $TC_DP22, $TC_DP23 and their values are generally not available in the NCK. However, provided that a tool is assigned to a magazine location, then via the cutting edge-specific parameters
$TC_DP21,
$TC_DP22,
$TC_DP23
the magazine location-specific adapter parameters
$TC_ADPT[n, 1], $TC_ADPT[n, 2], $TC_ADPT[n, 3]
can be read and written.

Value: Meaning
-1 An adapter is automatically assigned to each magazine location.
This means that internally the same number of adapters are provided as magazine locations are provided by machine data
$MN_MM_NUM_MAGAZINE_LOCATION.

0 No adapter data definitions possible. The cutting edge-specific parameters $TC_DP21, $TC_DP22, $TC_DP23 are available provided that adapters are used outside the active TMMG.

> 0 Number of adapter data blocks. This enables adapters to be defined irrespective of magazine locations. An additional step after defining the data assigns the adapters to the magazine locations. This enables one adapter, for example, to be assigned to several magazine locations.
(Saves memory, simplifies the handling of identical adapters)
See the machine data:
$MN_MM_TOOL_MANAGEMENT_MASK,
$MC_TOOL_MANAGEMENT_MASK,
$MN_MM_NUM_MAGAZINE,
$MN_MM_NUM_MAGAZINE_LOCATION

18105	**MM_MAX_CUTTING_EDGE_NO**			N02, N09	W1
-	maximum value of D number (DRAM)			DWORD	POWER ON
-					
-	-	9	1	32000	7/2

Description:

Maximum value of the D number.
This does not affect the maximum number of D numbers per cutting edge.
The monitoring of the D number assignment associated with this value is only active when the D numbers are redefined. This means that existing data blocks are not subsequently checked if the MD is changed.
Extra memory is required if MM_MAX_CUTTING_EDGE_NO > MM_MAX_CUTTING_EDGE_PERTOOL is valid. Work can then be done with the function 'unique D numbers'.
The machine data is not evaluated with the function 'flat D number' and therefore has no significance there.
The data can affect the memory requirement.

18106	**MM_MAX_CUTTING_EDGE_PERTOOL**			N02, N09	W1
-	maximum number of D numbers per tool (DRAM)			DWORD	POWER ON
-					
-	-	9	1	12	7/2

Description:

```
Maximum number of cutting edges (D offsets) per tool (per T number).
This enables more safety to be achieved in the data definition. The value can
be set to one if only tools with one cutting edge are used. That prevents more
than one cutting edge being assigned to a tool in the data definition.
Extra memory is required if MM_MAX_CUTTING_EDGE_NO >
MM_MAX_CUTTING_EDGE_PERTOOL is valid. Work can then be done with the function
'unique D numbers'.
The machine data is not evaluated with the function 'flat D number' and there-
fore has no significance there.
The data can affect the memory requirement.
```

18108	**MM_NUM_SUMCORR**			N02, N09	W1
-	Resulting offsets in TO area (SRAM)			DWORD	POWER ON
-					
-	-	-1	-1	9000	7/2

Description:

```
Total number of resulting offsets in the NCK.
The value = -1 means that the number of resulting offsets is equal to the num-
ber of cutting edges multiplied by the number of resulting offsets per cut-
ting edge.
See also cutting edge offset, insert offsets.
Battery-backed data is reserved.

See also:
MM_NUM_CUTTING_EDGES_IN_TOA,
MM_MAX_SUMCORR_PER_CUTTEDGE
```

18110	**MM_MAX_SUMCORR_PER_CUTTEDGE**			N02, N09	S7
-	Max. number of additive offsets per edge			DWORD	POWER ON
-					
-	-	1	1	6	7/2

Description:

```
Maximum number of resulting offsets per cutting edge.
If MM_NUM_SUMCORR > 0 then:
The data is not memory defining, but is only used for monitoring.
If MM_NUM_SUMCORR = -1 then:
The data is memory defining.
See also
MM_NUM_SUMCORR,
MM_NUM_CUTTING_EDGES_IN_TOA.
```

18112	MM_KIND_OF_SUMCORR			N02, N09	W1
-	Properties of resulting offsets in TO area (SRAM)			DWORD	POWER ON
-					
-	-	0	0	0x1F	7/2

Description:

```
Properties of the resulting offsets in NCK.
Bit no.        Value   Significance
0                0     Resulting offsets are backed up when the tool
                       data are backed up.
0                1     Resulting offsets are not  backed up when the
                       tool data are backed up.

1                0     Set-up offsets are backed up when the tool
                       data are backed up.
1                1     Set-up offsets are not backed up when the
                       tool data are backed up.

2                0     If work is done with the function 'tool management':
                       Existing resulting offsets are not affected
                       when the tool status is
                       set to 'active'.
2                1     Existing resulting offsets are set to zero when the
                       tool status is set to 'active'.

3               0      If work is done with the function 'tool management'
                       and adapter:
                       Transformation of the resulting offsets
3               1      No transformation of the resulting offsets

4               0      No set-up offset data blocks
4               1      Set-up offset data blocks are additionally created.
                       Whereby the resulting offset is composed of the
                       sum of the set-up offset + 'resulting offset fine'

Changing the status of bits 0, 1, 2, 3 does not change the memory structure.
Changing the status of bit 4 triggers restructuring of the battery-backed
memory after the next PowerOn.

See also
$MN_MM_NUM_CUTTING_EDGES_IN_TOA
$MN_MM_NUM_SUMCORR
$MN_MM_MAX_SUMCORR_PER_CUTTEDGE
$MN_MM_TOOL_MANAGEMENT_MASK,
$MC_TOOL_MANAGEMENT_MASK,
$MN_MM_NUM_MAGAZINE_LOCATION,
$MN_MM_NUM_TOOL_ADAPTER
```

18114	MM_ENABLE_TOOL_ORIENT			N02, N09	W1
-	Assign tool cutting edge orientation			DWORD	POWER ON
-					
-	-	0	0	3	7/2

Description:

```
The function allows an orientation deviating from the default value to be
assigned to each tool cutting edge.

Value = 0:
    The tool orientation function is inactive.

Value = 1:
    The system parameter $TC_DPV[n, m] is assigned to each tool cutting edge
    D=m of the tool T=n, with the aid of which one of 6 possible tool orienta-
    tions in positive or negative coordinate direction can be defined.

Value = 2:
    Not only the system parameter $TC_DPV[n, m] but also the additional three
    system parameters $TC_DPV3[n, m], $TC_DPV4[n, m] and $TC_DPV5[n, m] are
    assigned to each tool cutting edge D=m of the tool T=n, with the aid of
    which any spatial tool orientation can be defined

T, D are the NC addresses T and D with which the tool change or the tool
selection and the offset selection are programmed.
Value = 3:
    Not only the system parameters $TC_DPV[n, m] and $TC_DPV3 - $TC_DPV5  but
    also the additional three system parameters $TC_DPVN3[n, m], $TC_DPVN4[n,
    m] and $TC_DPVN5[n, m] are assigned to each tool cutting edge D=m of the
    tool T=n, with the aid of which a vector (normal vector) can be defined
    that is preferably perpendicular to the tool orientation. The normal vec-
    tor may be modified so that it lies in the plane formed by the orientation
    and the programmed normal vector but perpendicular to the orientation
    The orientation and the possibly modified normal vector together define a
    complete orientation coordinate system. The machine data affects the
    requirement for battery-backed memory.
```

18116	MM_NUM_TOOL_ENV			N02, N09	S7
-	Number of tool environments in the TO area (SRAM)			DWORD	POWER ON
-					
-	-	0	0	MD_MAXNUM_ TOOLENVS	7/2

Description:

```
Total number of tool environments in the NCK.
Battery-backed memory is reserved.
```

18118	MM_NUM_GUD_MODULES			N02	S7
-	Number of GUD files in active file system (SRAM)			DWORD	POWER ON
-					
-	-	7	1	9	7/2

Description:

```
A GUD block corresponds to a file in which user-defined data can be stored. 9
GUD blocks are available of which 3 are already assigned to specific users/
applications.
UGUD_DEF_USER (block for user)
SGUD_DEF_USER (block for SIEMENS)
MGUD_DEF_USER (block for machine manufacturer)

Special cases:
    The number of GUD modules is determined by the GUD module with the highest
    number entered.
    Example:
    If the following GUD modules are defined,
      UGUD
      MGUD
      GUD5
      GUD8
    then the machine data must be set to a value of 8, signifying a memory
    requirement of 8 x 120 bytes = 960 bytes.

It is therefore advisable to selected the "lowest" possible GUD module. If GUD
modules UGUD and MGUD have not been assigned elsewhere, then they may be used
for this purpose.

Related to:
    MD 18150: MM_GUD_VALUES_MEM
    (Memory space for user variables)
```

18120	MM_NUM_GUD_NAMES_NCK			N02	S7
-	Number of global user variable names (SRAM)			DWORD	POWER ON
-					
-	-	50	0	32000	7/2

Description:

```
Defines the number of user variables for NCK global user data (GUD). Approxi-
mately 80 bytes of memory per variable are reserved in the SRAM for the names
of the variables. The additional memory required for the value of the vari-
able depends on the data type of the variable. The number of available NCK
global user data is exhausted on reaching the limit value set in
MM_NUM_GUD_NAMES_NCK or MD 18150: MM_GUD_VALUES_MEM (memory space for user
variables).
Buffered user memory is used.
Special cases:
    The battery-backed data are lost if this machine data is altered.
Related to:
    MD 18150: MM_GUD_VALUES_MEM
    (Memory space for user variables)
```

18130	MM_NUM_GUD_NAMES_CHAN			N02	S7
-	Number of channel-specific user variable names (SRAM)			DWORD	POWER ON
-					
-	-	150	0	32000	7/2

Description:

```
Defines the number of user variable names for channel-specific global user
data (GUD). Approximately 80 bytes of memory are reserved in the SRAM for each
variable name. The additional memory required for the value of the variable is
equal to the size of the data type of the variable multiplied by the number of
channels. This means that each channel has its own memory available for the
variable values. The number of available channel-specific global user data is
exhausted on reaching the limit value set in MD 18130: MM_NUM_GUD_NAMES_CHAN
or MD 18150: MM_GUD_VALUES_MEM (memory space for user variables).

The name created with the DEF statement is valid for all channels.
The memory requirement for the variable value is equal to the size of the data
type multiplied by the number of channels.

Buffered user memory is used.

Special cases:
    The battery-backed data are lost if this machine data is altered.

Related to:
    MD 18150: MM_GUD_VALUES_MEM
    (Memory space for user variables)
```

18150	MM_GUD_VALUES_MEM			N02	S7
-	Memory location for global user variable values (SRAM)			DWORD	POWER ON
-					
-	-	32	0	32000	7/2

Description:

```
The specified value reserves memory space for the variable values of the glo-
bal user data (GUD). The dimensioning of the memory depends to a large extent
on the data types used for the variables.
Overview of the memory requirements of the data types:

Data type          Memory requirement
REAL                8 bytes
INT                 4 bytes
BOOL                1 byte
CHAR                1 byte
STRING              1 byte per character, 100 characters permitted per string
AXIS                4 bytes
FRAME               up to 1KB depending on control model
```

The total memory required by a channel or axis-specific global user variable is the memory requirement of the variables multiplied by the number of channels or axes. The number of global user variables available is given when the limit defined in the MD: MM_NUM_GUD_NAMES_xxxx or MM_GUD_VALUES_MEM is reached.
Buffered user memory is used.

Special cases:
    The battery-backed data are lost if this machine data is altered!

Relating to:
    MD 18118: MM_NUM_GUD_MODULES:
    (Number of GUD blocks)
    MD 18120: MM_NUM_GUD_NAMES_NCK
    (Number of global user variables)
    MD 18130: MM_NUM_GUD_NAMES_CHAN
    (Number of channel-specific user variables)

18160	**MM_NUM_USER_MACROS**			N02	S7
-	Number of macros (DRAM)			DWORD	POWER ON
-					
-	-	50	0	32000	7/2

Description:

Defines the number of macros that can be stored in the files _N_SMAC_DEF, _N_MMAC_DEF und _N_UMAC_DEF. Each of these files which is opened occupies at least one kbyte memory space for the file code in the part program memory. Another kbyte of memory is reserved for the file when the one kbyte file code limit is exceeded.
The dynamic user memory is used. For the stated number of macros, approximately 375 bytes are reserved per macro for management tasks.

18170	**MM_NUM_MAX_FUNC_NAMES**			N02	S7
-	Number of miscellaneous functions (cycles, DRAM)			DWORD	POWER ON
-					
-	-	100	0	32000	7/2

Description:

The data limits the maximum number of special functions over and above the predefined functions (such as sine, cosine, etc.) which can be used in
- cycle programs
- compile cycle software.

The function names are entered in the global NCK dictionary and must not conflict with the names that already exist.
The SIEMENS cycle package contains special functions that are taken into account by the default setting of the MD.
The data are stored in unbuffered memory. Approximately 150 bytes are required for each special function for management purposes.

Related to:
    MD 18180: MM_NUM_MAX_FUNC_PARAM
    (Number. of additional parameters)

18180	**MM_NUM_MAX_FUNC_PARAM**			N02	S7
-	Number of additional parameters for cycles according to MD 18170			DWORD	POWER ON
-					
-	-	1000	0	32000	7/2

Description:

```
Defines the maximum number of parameters required for the special functions in
-   cycle programs
-   compile cycle software.
50 parameters are required for the special functions of the SIEMENS cycle
package, software version 1.
The data are stored in unbuffered memory. 72 bytes of memory are reserved for
each parameter.

Related to:
    MD 18170: MM_NUM_MAX_FUNC_NAMES
    (Number of special functions)
```

18190	**MM_NUM_PROTECT_AREA_NCK**			N12, N02, N06, N09	S7
-	Number of files for machine-related protection zones (SRAM)			DWORD	POWER ON
-					
-	-	0	0	10	7/2

Description:

```
This machine data defines how many blocks are created for the protection zones
available in the NCK.

Buffered memory is used.

Special cases:
    The battery-backed data are lost if this machine data is altered.

References:
    /FB/, A3, "Axis Monitoring, Protection Zones"
```

18200	**MM_NUM_CCS_MAGAZINE_PARAM**			N02, N09	FBW
-	Number of Siemens OEM magazine data (SRAM)			DWORD	POWER ON
-					
-	-	0	0	10	2/2

Description:

```
Only when MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 0=1 ('H1') and bit 2=1 ('H4'),
is set for TMMG (and option is set):
User or OEM data in the tool management (TMMG).

Number of Siemens OEM magazine data (standard format IN_Int).
See also: MM_NUM_CC_MAGAZINE_PARAM, MM_NUM_MAGAZINE
Buffered user memory is used
```

18201	MM_TYPE_CCS_MAGAZINE_PARAM			N02, N09	FBW
-	Type of Siemens OEM magazine data (SRAM)			DWORD	POWER ON
-					
-	10	3,3,3,3,3,3,3,3,3,3	1	6	2/2

Description:

```
Only when MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 0=1 ('H1') and bit 2=1 ('H4'),
is set for TMMG (and option is set):

User or OEM data in the tool management.
Type of magazine-specific Siemens user data configured by
MM_NUM_CCS_MAGAZINE_PARAM.
Each parameter can be assigned its own type. The permissible types are:
Type                              Value of the machine data
(See types
of the NC language)
-----------------------------------------------------------------
BOOL                                  1
CHAR                                  2
INT                                   3
REAL                                  4
STRING                                5 (permits identifier up to 31 charac-
ters long)
AXIS                                  6
FRAME                                 not defined
See also: MM_NUM_CCS_MAGAZINE_PARAM, MM_NUM_MAGAZINE
Buffered user memory is used
```

18202	MM_NUM_CCS_MAGLOC_PARAM			N02, N09	FBW
-	No. of Siemens OEM magazine location data (SRAM)			DWORD	POWER ON
-					
-	-	0	0	10	2/2

Description:

```
Only when MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 0=1 ('H1') and bit 2=1 ('H4'),
is set for TMMG (and option is set):
User or OEM data in the tool management.
Number of Siemens OEM magazine location data (standard format IN_Int).
See also: MM_NUM_CC_MAGLOC_PARAM,  MM_NUM_MAGAZINE_LOCATION
Buffered user memory is used
```

18203	MM_TYPE_CCS_MAGLOC_PARAM			N02, N09	FBW
-	Type of Siemens OEM magazine location data (SRAM)			DWORD	POWER ON
-					
-	10	3,3,3,3,3,3,3,3,3,3	1	6	2/2

Description:

```
Only when MD $MN_MM_TOOL_MANAGEMENT_MASK, bit 0=1 ('H1') and bit 2=1 ('H4'),
is set for TMMG (and option is set)
User or OEM data in the tool management.
Type of magazine-specific Siemens user data configured by
MM_NUM_CCS_MAGLOC_PARAM.
Each parameter can be assigned its own type. The permissible types are:
Type                          Value of the machine data
(See types of the NC language)
-----------------------------------------------------------------
BOOL                            1
CHAR                            2
INT                             3
REAL                            4
-        (STRING is explicitly impossible here; value 5 is treated like value 2)
AXIS                            6
FRAME                           not defined
See also: MM_NUM_CCS_MAGLOC_PARAM, MM_NUM_MAGLOC
Buffered user memory is used
```

18204	MM_NUM_CCS_TDA_PARAM			N02, N09	FBW
-	Number of Siemens OEM tool data (SRAM)			DWORD	POWER ON
-					
-	-	0	0	10	2/2

Description:

```
Only when $MN_MM_TOOL_MANAGEMENT_MASK, bit 2=1 ('H4'), is set:
User or OEM data of the tools.
Number of Siemens OEM TDA (=tool-specific) data (standard format Int).
See also: MM_NUM_CC_TDA_PARAM, MM_NUM_TOOL
Buffered user memory is used
```

18205	MM_TYPE_CCS_TDA_PARAM			N02, N09	FBW
-	Type of Siemens OEM tool data (SRAM)			DWORD	POWER ON
-					
-	10	4,4,4,4,4,4,4,4,4	1	6	2/2

Description:

```
Only when $MN_MM_TOOL_MANAGEMENT_MASK, bit 2=1 ('H4'), is set:
User or OEM data in the tool management.
Type of tool-specific Siemens user data configured by MM_NUM_CCS_TDA_PARAM.
Each parameter can be assigned its own type. The permissible types are
Type                              Value of the machine data
(See types of the NC language)
----------------------------------------------------------------
BOOL                                1
CHAR                                2
INT                                 3
REAL                                4
STRING                              5 (permits identifiers up to 31 charac-
ters long)
AXIS                                6
FRAME                               not defined
See also: MM_NUM_CCS_TDA_PARAM, MM_NUM_TOOL
Buffered user memory is used
```

18206	MM_NUM_CCS_TOA_PARAM			N02, N09	FBW
-	No. of Siemens OEM data per cutting edge (SRAM)			DWORD	POWER ON
-					
-	-	0	0	10	2/2

Description:

```
Only when $MN_MM_TOOL_MANAGEMENT_MASK, bit 2=1 ('H4'), is set:
User or OEM data of the tools.
Number of Siemens OEM TOA data (standard format IN_Real).
See also: MM_NUM_CC_TOA_PARAM, MM_NUM_CUTTING_EDGES_IN_TOA
Buffered user memory is used
```

18207	MM_TYPE_CCS_TOA_PARAM			N02, N09	FBW
-	Type of Siemens OEM data per cutting edge (SRAM)			DWORD	POWER ON
-					
-	10	4,4,4,4,4,4,4,4,4,4	1	6	2/2

Description:

```
Only when $MN_MM_TOOL_MANAGEMENT_MASK, bit 2=1 ('H4'), is set:
User or OEM data in the tool management.
Type of cutting-edge-specific Siemens user data configured by
MM_NUM_CCS_TOA_PARAM.
Each parameter can be assigned its own type. The permissible types are
Type                                    Value of the machine data
(See types of the NC language)
-----------------------------------------------------------------
BOOL                                     1
CHAR                                     2
INT                                      3
REAL                                     4
-        (STRING is explicitly impossible here; value 5 is treated like value 2)
AXIS                                     6
FRAME                                    not defined
See also: MM_NUM_CCS_TOA_PARAM, MM_NUM_CUTTING_EDGES_IN_TOA
Buffered user memory is used
```

18208	MM_NUM_CCS_MON_PARAM			N02, N09	FBW
-	No. of Siemens OEM monitor data (SRAM)			DWORD	POWER ON
-					
-	-	0	0	10	2/2

Description:

```
Only when $MN_MM_TOOL_MANAGEMENT_MASK, bit 0 = 1 or bit 1 = 1 and bit 2=1
('H4'), is set:

User or OEM data in the tool management.
Number of Siemens OEM monitoring data; standard format IN_Int).
See also: MM_NUM_CC_MON_PARAM, MM_NUM_CUTTING_EDGES_IN_TOA
Buffered user memory is used
```

18209	MM_TYPE_CCS_MON_PARAM			N02, N09	FBW
-	Type of Siemens OEM monitor data (SRAM)			DWORD	POWER ON
-					
-	10	3,3,3,3,3,3,3,3,3,3	1	6	2/2

Description:

```
Only when $MN_MM_TOOL_MANAGEMENT_MASK, bit 0 = 1 or bit 1 = 1 and bit 2=1
('H4'), is set:
User or OEM data in the tool management.
Type of monitoring-specific Siemens user data configured by
MM_NUM_CCS_MON_PARAM.
Each parameter can be assigned its own type. The permissible types are
Type                                Value of the machine data
(See types of the NC language)
-----------------------------------------------------------------
BOOL                                 1
CHAR                                 2
INT                                  3
REAL                                 4
-        (STRING is explicitly impossible here; value 5 is treated like value 2)
AXIS                                 6
FRAME                                not defined

See also: MM_NUM_CCS_MON_PARAM, MM_NUM_CUTTING_EDGES_IN_TOA
Buffered user memory is used
```

18210	MM_USER_MEM_DYNAMIC			EXP, N02	S7
-	User memory in DRAM [KB]			DWORD	POWER ON
-					
-	-	3000	0	4000000	7/2
710-6a2c	-	-	-	15000	-/-
720-6a2c	-	-	-	15000	-/-
730-6a2c	-	-	-	15000	-/-
710-31a10c	-	-	-	55000	-/-
720-31a10c	-	-	-	55000	-/-
730-31a10c	-	-	-	55000	-/-
840di-basic	-	-	-	55000	-/-
840di-universal	-	-	-	55000	-/-
840di-plus	-	-	-	55000	-/-

Description:

```
The DRAM in the NC is used jointly by the system and the user.
MM_USER_MEM_DYNAMIC defines the size of the DRAM available to the user. The
input limits depend upon the hardware and software configurations of the CNC.
There are various types of user data in this memory area, for example.
-   Local user data
-   IPO block buffers
-   User macros
-   Diagnostics functions such as trace recording of times,.....
-   Tool management trace
```

```
-   Communication with 1-n HMIs; Value of n: See data $MN_MM_NUM_MMC_UNITS.
-   Reorg Log file (required for internal purposes of the NC program sequence)
-    ...
Each additionally active channel occupies a substantial amount of memory here.
Each activated axis requires part of this memory.
Exactly how much that is depends largely on the control model and the soft-
ware version.
The settable values depend on the hardware and software configurations.
The value of NCK is automatically set after unbuffered startup of the NCK or
deletion of the memory. The value is then such that the free memory defined in
$MN_INFO_FREE_MEM_DYNAMIC is available to the user.
(See the description of $MN_INFO_FREE_MEM_DYNAMIC).

If the value is set too high (in the sense that the memory required is
more than that available on the memory module), the NCK responds at the next
NCK reset/power on by automatically reducing the machine data value to the
maximum possible value that the hardware permits.
Message alarm 6030 advises of this process. This corresponds to a legal
response of the NCK and is not an incorrect response.

The essential significance of the machine data is not to release the entire
memory to the user because the memory is shared between the system and the
user. A part of the physically existing memory is reserved for future develo-
ments of the NCK.

The maximum amount of memory available on the hardware can be found by selec-
ting a value for the data that is so large that, after the subsequent
restart, message alarm 6030 indicates the maximum available memory. Applicati-
ons that use the maximum available memory will in all probability have memory
problems with a software conversion to a newer NCK version.

Upper and lower limits are not necessary. The software rejects values outside
the permissible range and then automatically sets suitable values.
(See also message alarm 6030.)

The data in the dynamic memory are not battery-backed.

Note:
    During power on, the system software compares the sum of all requests for
    dynamic memory with the value in MD: MM_USER_MEM_DYNAMIC. Alarm 6000
    "Memory allocated with standard machine data" is output if the memory
    required exceeds the memory capacity set with the MD. Alarm 6030 "User
    memory limit has been adapted" is output if the control detects during the
    power on that the memory capacity required by MM_USER_MEM_DYNAMIC is lar-
    ger than the physical memory.
Related to:
    The available dynamic memory can be taken from MD 18050:
    INFO_FREE_MEM_DYNAMIC (display data of the free dynamic memory).
```

18220	**MM_USER_MEM_DPR**			EXP, N02	-
-	User memory in DUAL PORT RAM (DPR)			DWORD	POWER ON
-					
-	-	0	-	-	0/0

Description:

The functionality is not available in previous software versions.

18230	MM_USER_MEM_BUFFERED			N02	S7
-	User memory in SRAM			DWORD	POWER ON
-					
-	-	0	0	4000000	7/1
710-6a2c	-	-	-	15360	-/-
720-6a2c	-	-	-	21504	-/-
730-6a2c	-	-	-	21504	-/-
710-31a10c	-	-	-	15360	-/-
720-31a10c	-	-	-	21504	-/-
730-31a10c	-	-	-	21504	-/-

Description:

```
Battery-backed user memory (in kbyte).
Various types of user data are stored in this memory area.
For example:
-   NC part programs
-   R parameters
-   Global user data (GUD)
-   Definitions of the protection zones
-   Correction tables EEC, CEC, QEC
-   Tool / magazine data
        ...
This data is retained after control power off.
(Provided the data backup (battery,...) is in good working order and the Init
switch is correctly set on the control).
This means that they are available unchanged after restart.

In the case of control models without a backup battery (e.g. 802S,...) there
is, as a rule, an option of , specifically backing up the data by operation,
so that they are available again after the next power on process.

The settable values depend on the hardware and software configurations.
The set values are designed for the minimum memory configuration of the parti-
cular control model.

256, 512 and 2000, 4000KB of battery-backed memory are available on the hard-
ware.
Approximately 30KB of this physically present memory is used for internal pur-
poses. This means that approximately 226, 482, 1970, 3970KB of user memory can
be set.

After all the NCK functions have taken 'their' memory corresponding to the
relevant machine data values, the rest of the memory is added to the part pro-
gram memory. As a rule, the user will thus have more part program memory avai-
lable than that guaranteed in the sales brochure. This 'more' may however vary
from version to version.

If there are various memory configuration options for a control model then the
data may have to be increased correspondingly when using the larger memory
variants.
In this respect, see the meaning of $MN_INFO_FREE_MEM_STATIC
Special cases:
    The battery-backed data are lost if this machine data is altered.
```

18231	MM_USER_MEM_BUFFERED_TYPEOF			N02	-
-	Technology for data buffering			DWORD	POWER ON
-					
-	3	0,0,0	0	1	0/0
710-6a2c	-	1,1,1	-	-	-/-
720-6a2c	-	1,1,1	-	-	-/-
730-6a2c	-	1,1,1	-	-	-/-
710-31a10c	-	1,1,1	-	-	-/-
720-31a10c	-	1,1,1	-	-	-/-
730-31a10c	-	1,1,1	-	-	-/-

Description:

```
Type of technology used for data back-up
Value = 0 SRAM memory only
Value = 1 SRAM and flash/disk memory
If the value = 1 then see also $MN_MM_ACTFILESYS_LOG_FILE_MEM
Index 0 = Reserved
Index 1 = Definition for the battery-backed data of the active file system
(incl. machine data).
Index 2 = Definition for the battery-backed data of the passive file system
(part programs, cycles, ...).
          This value is in each case automatically derived during power on
          from $MN_DRAM_FILESYST_CONFIG.
```

18232	MM_ACTFILESYS_LOG_FILE_MEM			N02	-
-	System: logfile size in SRAM [KB]			DWORD	POWER ON
-					
-	3	0,0,0	0	32000	0/0
710-6a2c	-	200,5,30	-	-	-/-
720-6a2c	-	200,5,30	-	-	-/-
730-6a2c	-	200,5,30	-	-	-/-
710-31a10c	-	200,5,30	-	-	-/-
720-31a10c	-	200,5,30	-	-	-/-
730-31a10c	-	200,5,30	-	-	-/-

Description:

```
Battery-backed log file for battery-backed data of the active file system ( in
kbyte ). Systems with slow data buffer media store changed battery-backed data
in the internal system SRAM. After a power failure (spontaneous voltage loss),
data that had not yet been made persistent at the time of the power failure
can be restored from this buffer.
The log file serves to minimize or totally avoid data loss in the event of
power failure. 1000 entries require approximately 50KB.
A value greater than 0 is only practicable if $MN_MM_USER_MEM_BUFFERED_TYPEOF
= 1.
Index Meaning
0     Preprocessing buffer
1     Buffer for data changes within the range of tool change
2     Buffer for data changes of main processing (especially synchronized
actions)
```

18233	**IS_CONTINOUS_DATA_SAVE_ON**			EXP, N02	-
-	System: Automatic saving of persistent data			BOOLEAN	POWER ON
-					
-	3	FALSE,FALSE,FALSE	-	-	7/2
710-6a2c	-	TRUE,TRUE,TRUE	-	-	-/-
720-6a2c	-	TRUE,TRUE,TRUE	-	-	-/-
730-6a2c	-	TRUE,TRUE,TRUE	-	-	-/-
710-31a10c	-	TRUE,TRUE,TRUE	-	-	-/-
720-31a10c	-	TRUE,TRUE,TRUE	-	-	-/-
730-31a10c	-	TRUE,TRUE,TRUE	-	-	-/-

Description:

```
The machine data is relevant only if $MN_MM_USER_MEM_BUFFERED_TYPEOF = 1.
The default value should be changed only if the system is operated in an envi-
ronment,
Value = 0 : Continuous saving of persistent data on disk/flash/etc. is deacti-
vated.
           The dynamic response of the software on systems of the Solution-
Line range can thus be improved.
Value = 1 : Continuous automatic saving of persistent data on disk/flash/etc.
is active.

Index 0 = Reserved
Index 1 = Definition for the buffered data of the active file system (incl.
machine data).
Index 2 = Definition for the buffered data of the passive file system (part
programs, cycles, ....).

The default value should be changed only for diagnostic purposes or for opti-
mizing the dynamic response.
The default value should be changed only if the system is operated in an envi-
ronment,
where no spontaneous shutdown of the system / spontaneous power failure
occurs.
Otherwise, persistent data can be lost.
```

18237	**MM_CYC_DATA_MEM_SIZE**			EXP, N02	-
-	Cycle/display setting data in SRAM [kB]			DWORD	POWER ON
READ					
-	-	0	0	32000	7/2

Description:

```
Size of the buffered memory for 'Setting data for cycles and display' [kB]
```

18238	**MM_CC_MD_MEM_SIZE**			N02	-
-	Compile cycle machine data in SRAM [kB]			DWORD	POWER ON
-					
-	-	1	1	32000	7/1

Description:

```
Battery-backed user memory for compile cycles (in kbyte)
```

18240	**MM_LUD_HASH_TABLE_SIZE**			EXP, N02	S7
-	Hash table size for LUD (DRAM)			DWORD	POWER ON
-					
-	-	37	11	107	0/0

Description:

```
Defines the size of the hash table for local user data (LUD). The value ente-
red must be a primary number. The setting allows the optimization of
-   the interpreter execution time (low value = longer execution time) and
-   memory requirements (low value = less memory).
A larger table requires a smaller number of decoding operations for inter-
nally decoding the variables and consequently a shorter interpreter execution
time. The value of this machine data affects the amount of dynamic memory
required for managing the blocks for local user variables with REORG, see MD
28010: MM_NUM_REORG_LUD_MODULES (Number of blocks for local user variables
with REORG (DRAM)).
Note:
    This machine data is assigned internally by the control and must not be
    altered by the user.
```

18242	**MM_MAX_SIZE_OF_LUD_VALUE**			N02	S7
-	Maximum memory block size for LUD/GUD values			DWORD	POWER ON
-					
-	-	920	920	SLMAXVARBYTES	0/0

Description:

```
Defines the net memory array size for LUD/GUD variables. Each NC program that
defines at least one LUD/GUD variable or has call parameters then occupies at
least one memory array of this size.
The LUD/GUD variables of a program may occupy the complete LUD/GUD value
memory set for the channel. However, then there is no memory available for
other programms.
The memory for the LUD/GUD variables (that is defined for LUD by the channel-
specific MD MM_LUD_VALUES_MEM and for GUD by the NCK-specific MD
MM_GUD_VALUES_MEM) is divided into equally sized arrays of the size
MM_MAX_SIZE_OF_LUD_VALUE.
Example:
MM_LUD_VALUES_MEM = 12 (kbytes gross)
MM_MAX_SIZE_OF_LUD_VALUE = 660 (bytes net)
                         + 16 (bytes management data per array)
                         --------------------------------------
                          676 (bytes gross)
```

```
One then obtains 12*1024 / 676 = 18 memory arrays each of 660 bytes.
This means that 12 NC programs can either each occupy one array or one NC pro-
gram can define, for example, 18 variables of type Frame (whose size is appro-
ximately 660 bytes.

Data type            Memory requirement
REAL                        8 bytes
INT                         4 bytes
BOOL                        1 byte
CHAR                        1 byte
STRING                      1 byte per character,
                                  100 characters are possible per string
AXIS                        4 bytes
FRAME                up to 1 kbyte (depending on control model)

Related to:
    MD 28040: MM_LUD_VALUES_MEM
    (Memory size for local user variables (DRAM))

Warning:
    The battery-backed data are lost when this machine data is changed!
    The size of the NC language type Frame depends on the maximum number of
    channel axes generated by the NCK.
    There are NCK systems with a maximum number of channel axes from 4 to 20.
    In the case of 20 axes, the type Frame then has a size of 660 bytes.
```

18250	**MM_CHAN_HASH_TABLE_SIZE**			EXP, N02	S7
-	Hash table size for channel-specific data (DRAM)			DWORD	POWER ON
-					
-	-	23	3	193	0/0

Description:

```
Defines the size of the hash table for channel-specific names. The value ente-
red must be a primary number. The setting allows the optimization of

-   the interpreter execution time (low value = longer execution time) and
-   memory requirements (low value = less dynamic memory).

A larger table requires a smaller number of decoding operations for inter-
nally decoding the variables and consequently a shorter interpreter execution
time. The value of this machine data affects the amount of dynamic memory
required.
The memory required per channel in bytes is equal to the value entered multip-
lied by 68.

Note:
    This machine data is assigned internally by the control and must not be
    altered by the user.

Warning:
    The battery-backed data are lost if this machine data is altered!
```

18260	**MM_NCK_HASH_TABLE_SIZE**			EXP, N02	S7
-	Hash table size for global data (DRAM)			DWORD	POWER ON
-					
-	-	4001	537	4327	0/0

Description:

Defines the size of the NCK-specific names. The value entered must be a primary number. The setting allows the optimization of

- the interpreter execution time (low value = longer execution time) and
- memory requirements (low value = less dynamic memory).

A larger table requires a smaller number of decoding operations for internally decoding the variables and consequently a shorter interpreter execution time. The value of this machine data affects the amount of dynamic memory required. The memory required in bytes is equal to the value entered multiplied by 68.

Note:
This machine data is assigned internally by the control and must not be altered by the user.

18270	**MM_NUM_SUBDIR_PER_DIR**			N02	S7
-	Number of subdirectories (DRAM)			DWORD	POWER ON
-					
-	-	30	24	250	7/1

Description:

Defines the maximum number of subdirectories that a directory in the passive file system can have. The number of directories is limited by MD 18310: MM_NUM_DIR_IN_FILESYSTEM (number of directories in the passive file system). The memory requirement for the number of files per directory is contained in the memory (see MD 18260: MM_NUM_FILES_PER_DIR).

Related to:
MD 18310: MM_NUM_DIR_IN_FILESYSTEM
(Number of directories in the passive file system)

18280	MM_NUM_FILES_PER_DIR			N02	S7
-	Number of files per directory (DRAM)			DWORD	POWER ON
-					
-	-	100	64	512	7/1

Description:

Specifies the maximum number of files which can be created in a directory or subdirectory of the passive file system. The total number of files is limited by MD 18320: MM_NUM_FILES_IN_FILESYSTEM (number of files in the passive file system). The memory space in bytes required for the management of files in the directory is the value entered multiplied by 40. The highest value of MD 18280: MM_NUM_FILES_PER_DIR (number of files per directory) and MD 18270: MM_NUM_SUBDIR_PER_DIR (number of subdirectories) must be entered as the MD setting. The memory required to manage files in the passive file system is reserved by MD 18320: MM_NUM_FILES_IN_FILESYSTEM (number of files in the passive file system).

Special cases:
The battery-backed data are lost if this machine data is altered.
Note
An alteration of the MD has an effect on directories created after this. This means that if the number of files in an existing directory is to be altered, the existing directory must first be deleted and then a new directory created (but only after first saving the files)!

Related to:
MD 18320: MM_NUM_FILES_IN_FILESYSTEM
(Number of files in the passive file system)

18290	MM_FILE_HASH_TABLE_SIZE			EXP, N02	S7
-	Hash table size for files of a directory (SRAM)			DWORD	POWER ON
-					
-	-	47	3	299	0/0

Description:

Defines the size for the files of a directory. The value entered must be a primary number. The setting allows the optimization of

- the interpreter execution time (low value = longer execution time) and
- memory requirements (low value = less memory).

The value of this machine data affects the amount of static memory required for the management of directories, see MD 18310: MM_NUM_DIR_IN_FILESYSTEM (number of directories in the passive file system)

Buffered user memory is used.

Note:
This machine data is assigned internally by the control and must not be altered by the user.
Special cases:
The battery-backed data are lost if this machine data is altered!

18300	MM_DIR_HASH_TABLE_SIZE			EXP, N02	S7
-	Hash table size for subdirectories (SRAM)			DWORD	POWER ON
-					
-	-	11	3	349	0/0

Description:

```
Defines the size of the subdirectories of a directory. The value entered must
be a primary number. The setting allows the optimization of

-   the interpreter execution time (low value = longer execution time) and
-   memory requirement (low value = less memory).

The value of this machine data affects the amount of static memory required
for the management of directories, see MD 18310: MM_NUM_DIR_IN_FILESYSTEM
(number of directories in the passive file system).

Buffered user memory is used.

Note:
    This machine data is assigned internally by the control and must not be
    altered by the user.

Special cases:
    The battery-backed data are lost if this machine data is altered!
```

18310	MM_NUM_DIR_IN_FILESYSTEM			N02	S7
-	Number of directories in passive file system (SRAM)			DWORD	POWER ON
-					
-	-	30	30	256	7/2

Description:

```
This machine data limits the number of directories in the passive file system.
It can be used to reserve memory in the SRAM for the management of the direc-
tories. The directories and subdirectories of the passive file system set up
by the system are included in this machine data. The memory required for the
management of the directories can be calculated as follows:

Memory required = a (440+28 (b+c)) bytes
a = Input value of MD 18310: MM_NUM_DIR_IN_FILESYSTEM
(no. of directories in passive file system)
b = Input value of MD 19300: MM_DIR_HASH_TABLE_SIZE
(HASH table size for subdirectories)
c = Input value of MD 18290: MM_FILE_HASH_TABLE_SIZE
(hash table size for the files of a directory)

Buffered user memory is used.

Special cases:
    The battery-backed data are lost if this machine data is altered.

Related to:
    MD 18270: MM_NUM_SUBDIR_PER_DIR
    (Number of subdirectories)
```

18320	**MM_NUM_FILES_IN_FILESYSTEM**			N02	S7
-	Number of files in passive file system (SRAM)			DWORD	POWER ON
-					
-	-	150	64	512	7/2

Description:

```
Defines the number of files available in the part program memory. This machine
data is used to reserve memory in SRAM - approximately 320 bytes per file -
for managing the file memory. Each file created requires a minimum of one
kbyte of memory for the file code. If the one kbyte limit for the file code is
exceeded another kbyte is reserved for the file.

Buffered user memory is used.

Special cases:
    The battery-backed data are lost if this machine data is altered.

Related to:
    MD 18280: MM_NUM_FILES_PER_DIR
    (Number of files in directories)
```

18331	**MM_FLASHFILESYS_MEM**			N01, N02	-
-	Reserved for FFS (DRAM)			BYTE	POWER ON
-					
-	8	0,0,0,0,0,0,0,0	-	-	0/0

Description:

```
Reserved for FFS
```

18332	**MM_FLASH_FILE_SYSTEM_SIZE**			N01, N02	IAD
-	Size of FFS			DWORD	POWER ON
-					
-	-	0	0	4096	7/1

Description:

```
Size of the flash file system on the PCNC (in kbyte)
Entries have to be made in steps of 128KB. Apart from 0, the smallest pos-
sible value is 512KB.

If the flash file system is used as a backup memory for the DRAM file system,
then $MN_MM_FLASH_FILE_SYSTEM_SIZE must be at least 3 times the size of the
largest file in the  DRAM file system larger than $MN_MM_DRAM_FILE_MEM_SIZE.
Additional memory space is needed in the DRAM file system for log files if
this has been configured by $PROTOC_FILE_MEM.
```

18342	**MM_CEC_MAX_POINTS**			N01, N02	K3
-	max. number of interpolation points on sag compensation (SRAM)			DWORD	POWER ON
-					
-	62	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	2000	7/2

Description:

The MD defines the memory space available for the compensation tables.

When MM_CEC_MAX_POINTS = 0, no memory is set up for the table. The sag compensation function cannot then be used.

Caution!

If MD 18342: MM_CEC_MAX_POINTS[t] is changed, when the system is powered up the battery-backed NC user memory is automatically newly set. Whereby all user data in the battery-backed user memory (e.g. drive and HMI machine data, tool offsets, part programs etc.) is deleted.

Related to:
SD 41300: CEC_TABLE_ENABLE[t] release
Evaluation of the sag compensation table (t).

References:
/FB/, S7, "Memory Configuration"

18350	**MM_USER_FILE_MEM_MINIMUM**			EXP, N02	S7
-	minimum part program memory (SRAM)			DWORD	POWER ON
-					
-	-	20	0	100	0/0
710-6a2c	-	0	-	0	-/-
720-6a2c	-	0	-	0	-/-
730-6a2c	-	0	-	0	-/-
710-31a10c	-	0	-	0	-/-
720-31a10c	-	0	-	0	-/-
730-31a10c	-	0	-	0	-/-

Description:

Valid only for PowerLine control models.
Minimum user memory for files in the passive file system (in kbyte)

There are various types of user data in this memory area.
Defines the minimum remaining battery-backed memory area for the files of the passive file system (in kbyte). The settable value depends on the hardware and software configurations (memory allocation SRAM) and on MD 18230: MM_USER_MEM_BUFFERED (user memory in the SRAM). During the memory allocation of the SRAM, the files of the passive file system are assigned to the end of the remaining memory.

The remaining memory must have at least the memory space stated in MM_USER_FILE_MEM_MINIMUM available for the file system to be able to work. If this is not ensured, the control assigns the pre-assigned data to the memory during power on, as a consequence of which all the battery-backed data entered by the user is lost. Alarm 6000 "Memory allocation with standard machine data" is also output.

The available part program memory can be taken from the MD 18060: INFO_FREE_MEM_STATIC (display data of the free static memory).

Special cases:

The battery-backed data are lost if this machine data is changed and the remaining memory is less than the value of MM_USER_FILE_MEM_MINIMUM.

18351	**MM_DRAM_FILE_MEM_SIZE**			EXP, N02	IAD
-	Size of part program memory (DRAM)			DWORD	POWER ON
-					
-	-	0	0	32768	7/1
710-6a2c	-	-	-	-	0/0
720-6a2c	-	-	-	-	0/0
730-6a2c	-	-	-	-	0/0
710-31a10c	-	-	-	-	0/0
720-31a10c	-	-	-	-	0/0
730-31a10c	-	-	-	-	0/0

Description:

Size of memory for files in the DRAM of the passive file system (in kbyte).

If the flash file system is used as a background memory for the DRAM file system then $MN_MM_FLASH_FILE_SYSTEM_SIZE must be at least 3 times the size of the largest file in the DRAM file system and be larger than $MN_MM_DRAM_FILE_MEM_SIZE.

18352	**MM_U_FILE_MEM_SIZE**			EXP, N02	-
-	End user memory for part programs/cycles/files			DWORD	POWER ON
-					
-	3	0,0,0	0	0	2/2
710-6a2c	-	2560,0,0	-	9216	-/-
720-6a2c	-	2560,0,0	-	15360	-/-
730-6a2c	-	2560,0,0	-	15360	-/-
710-31a10c	-	2560,0,0	-	9216	-/-
720-31a10c	-	2560,0,0	-	15360	-/-
730-31a10c	-	2560,0,0	-	15360	-/-

Description:

```
The machine data is not available or not defined for PowerLine control models.

End user memory for files in the passive file system ( in kbyte ).

There are various types of user data in this memory area.
E.g.: NC part programs, cycle programs of the end user, diagnostic files, ....

The settable values depend on the hardware and software configurations.
The settable size of the part program memory is, apart from the upper limit
value,
determined by the MD $MN_MM_USER_MEM_BUFFERED and can also
be determined by a software option.

Index 0 = Size of the battery-backed part program / cycle program memory
Index 1 = Reserved
Index 2 = Reserved
```

18353	**MM_M_FILE_MEM_SIZE**			EXP, N02	-
-	Memory capacity for machine manufacturer's cycles/ files			DWORD	POWER ON
-					
-	3	0,0,0	0	0	1/1
710-6a2c	-	512,0,0	-	9216	-/-
720-6a2c	-	512,0,0	-	15360	-/-
730-6a2c	-	512,0,0	-	15360	-/-
710-31a10c	-	512,0,0	-	9216	-/-
720-31a10c	-	512,0,0	-	15360	-/-
730-31a10c	-	512,0,0	-	15360	-/-

Description:

```
The machine data is not available or not defined for PowerLine control models.

Memory for machine manufacturer files in the passive file system ( in kbyte ).

The machine manufacturer's files are in this memory area of the passive file
system.
E.g.: cycle programs
```

The settable values depend on the hardware and software configurations.
The settable size of the memory is, apart from the upper limit value, determined by the MD $MN_MM_USER_MEM_BUFFERED.

Index 0 = Minimum size of the battery-backed (persistent) part program / cycle program memory
Index 1 = Reserved
Index 2 = Reserved

18354	**MM_S_FILE_MEM_SIZE**			EXP, N02	-
-	Memory capacity for NC manufacturer's cycles/files			DWORD	POWER ON
-					
-	3	0,0,0	0	0	0/0
710-6a2c	-	2048,0,100	-	3072	-/-
720-6a2c	-	2048,0,100	-	3072	-/-
730-6a2c	-	2048,0,100	-	3072	-/-
710-31a10c	-	2048,0,100	-	3072	-/-
720-31a10c	-	2048,0,100	-	3072	-/-
730-31a10c	-	2048,0,100	-	3072	-/-

Description:

The machine data is not available or not defined for PowerLine control models.

Memory for the control manufacturer's files in the passive file system (in kbyte).

The control manufacturer's files are in this memory area of the passive file system.
E.g.: cycle programs, system files

The settable values depend on the hardware and software configurations.
The settable size of the memory is, apart from the upper limit value, for index = 0 determined by MD $MN_MM_USER_MEM_BUFFERED.
For index 1 = Reserved.
For index 2 = limited by the size of the internally availble battery-backed memory (SRAM).

Index 0 = Size of the battery-backed cycle program memory
Index 1 = Reserved
Index 2 = Size of the battery-backed memory for system files

18355	**MM_T_FILE_MEM_SIZE**			EXP, N02	-
-	Memory size for temporary files			DWORD	POWER ON
-					
-	-	1000	-	-	7/2

Description:

The machine data is not available or not defined for PowerLine control models.

Memory for temporary files in the passive file system (in kbyte)
For example: Compilate of cycles (preprocessing), system traces

18356	**MM_E_FILE_MEM_SIZE**			EXP, N02	-
-	Memory size for the clipboard of external files			DWORD	POWER ON
-					
-	3	0,0,0	0	15360	0/0
710-6a2c	-	512,0,0	-	9216	-/-
710-31a10c	-	512,0,0	-	15360	-/-

Description:

```
For PowerLine control models the machine data is not available or has not been
defined.

Memory for the clipboard of external files in the passive file system (in kB)

The settable values depend on the hardware and software configuration.
The settable memory size is limited, except for the upper limit value,
for index = 0 by $MN_MM_USER_MEM_BUFFERED.
for index = 1 reserved
for index = 2 reserved

Index 0 = size of the buffered clipboard
Index 1 = reserved
Index 2 = reserved
```

18360	**MM_EXT_PROG_BUFFER_SIZE**			N01	A2
-	FIFO buffer size for processing from external source (DRAM)			DWORD	POWER ON
-					
-	-	50	30	1000000	7/2

Description:

```
A FIFO buffer is needed on the NCK for each program level (main program or
subprogram) that is processed externally (reload mode).

The size of the FIFO buffer is defined in kbyte by
$MN_MM_EXT_PROG_BUFFER_SIZE.

$MN_MM_EXTPROG_NUM sets the number of FIFO buffers which are simultaneously
available.

During startup, the memory size determined by multiplying
$MN_MM_EXT_PROG_BUFFER_SIZE by $MN_MM_EXTPROG_NUM is reserved in the DRAM.

If the stated value exceeds the available memory space, alarm 4077 is output
when writing the machine data.

References:
    /PGA/Programming Guide Advanced, Section 2
```

18362	**MM_EXT_PROG_NUM**			N01	A2
-	Number of program levels which can be simultaneously processed			BYTE	POWER ON
-					
-	-	1	0	13	7/2

Description:

Number of program levels that can simultaneously be in "Processing from external source" mode NCK-wide.
System resources are reserved for the HMI <-> NCK communication during "Processing from external source". Machine data EXT_PROG_NUM defines the number of possible program levels.
The memory space is reserved during power on by MD 18360 + MD 18362. If it is found during program execution that all system resources are occupied, this is reported by alarm 14600.

18370	**MM_PROTOC_NUM_FILES**			N02	D1,OEM
-	Max.no. of log files in passive file system			DWORD	POWER ON
-					
-	10	2,0,0,0,0,2,2,0,0,3	0	10	1/1

Description:

Maximum number of log files in the passive file system.

18371	**MM_PROTOC_NUM_ETPD_STD_LIST**			N02	D1,OEM
-	Number of standard data lists ETPD.			DWORD	POWER ON
-					
-	10	25,0,0,0,0,25,25,0,0,3	0	25	1/1

Description:

Number of standard data lists in the OPI module ETPD (user-specific)

18372	**MM_PROTOC_NUM_ETPD_OEM_LIST**			N02	D1,OEM
-	Number of OEM data lists ETPD.			DWORD	POWER ON
-					
-	10	0,0,0,0,0,0,0,0,0,0	0	20	1/1

Description:

Number of OEM data lists in the OPI module ETPD (user-specific).

18373	**MM_PROTOC_NUM_SERVO_DATA**			N02	D1
-	Number of servo data for log			DWORD	POWER ON
-					
-	10	0,0,0,0,0,10,10,0,0,0	0	20	1/1

Description:

Number of servo data which must be recordable at the same time (user-specific).

18374	**MM_PROTOC_FILE_BUFFER_SIZE**			N02	-
-	Size of log file buffer			DWORD	POWER ON
-					
-	10	8000,8000,8000,8000,8000,8000,8000...	5000	-	1/1

Description:

Size of the data buffer between the IPO and preprocessing time levels of a log file.

18375	**MM_PROTOC_SESS_ENAB_USER**			N02	-
-	Users enabled for sessions			BYTE	POWER ON
-					
-	10	0,0,0,0,0,1,1,0,0,0	0	1	1/1

Description:

Users that are available for session management.

18390	**MM_COM_COMPRESS_METHOD**			EXP, N01, N02	-
-	Supported compression methods.			DWORD	POWER ON
-					
-	-	0x01	-	-	2/2

Description:

Setting for the compression methods to be supported.

18400	**MM_NUM_CURVE_TABS**			N02, N09	M3
-	Number of curve tables (SRAM)			DWORD	POWER ON
-					
-	-	0	-	-	1/1

Description:

Defines the maximum number of curve tables that can be stored in the SRAM of the entire system. A curve table consists of a number of curve segments.
Related to
MD 18402: MM_NUM_CURVE_SEGMENTS

18402	MM_NUM_CURVE_SEGMENTS			N02, N09	M3
-	Number of curve segments (SRAM)			DWORD	POWER ON
-					
-	-	0	-	-	1/1

Description:

```
Defines the maximum number of curve segments that can be stored in the SRAM of
the entire system. The curve segments are a component of a curve table.
Related to
    MD 18400: MM_NUM_CURVE_TABS
```

18403	MM_NUM_CURVE_SEG_LIN			N02, N09	-
-	Number of linear curve segments (SRAM)			DWORD	POWER ON
-					
-	-	0	-	-	1/1

Description:

```
Number of linear curve segments in the SRAM available throughout the NCK.
A curve table may consist of "normal" curve segments and linear segments. The
number of "normal" curve segments in the SRAM is defined by MD
MM_NUM_CURVE_SEGMENTS, these curve segments can accommodate polynomials.
Linear curve segments can only accommodate straight lines.
These linear curve segments are stored in battery-backed memory.
```

18404	MM_NUM_CURVE_POLYNOMS			N02, N09	M3
-	Number of curve table polynomials (SRAM)			DWORD	POWER ON
-					
-	-	0	-	-	1/1

Description:

```
Defines the maximum total number of polynomials for curve tables that can be
stored in the SRAM of the entire system. The polynomials are a component of a
curve segment. A maximum of 3 polynomials are required for a curve segment. As
a rule, only 2 polynomials are used for each curve segment.
Related to
    MD 18400: MM_NUM_CURVE_TABS
    MD 18402: MM_NUM_CURVE_SEGMENTS
```

18406	MM_NUM_CURVE_TABS_DRAM			N02, N09	M3
-	Number of curve tables (DRAM)			DWORD	POWER ON
-					
-	-	0	-	-	1/1

Description:

```
Number of curve tables in the DRAM available throughout the NCK.
The curve tables are stored either in the buffer  memory or in the dynamic
memory.
This MD is used to set the number of curve tables in the dynamic memory
(DRAM).
```

18408	**MM_NUM_CURVE_SEGMENTS_DRAM**			N02, N09	M3
-	Number of curve segments (DRAM)			DWORD	POWER ON
-					
-	-	0	-	-	1/1

Description:

Number of polynomial curve segments in the DRAM available throughout the NCK. The curve segments are stored either in the buffer memory or in the dynamic memory.

This MD is used to set the number of segments in the dynamic memory (DRAM).

18409	**MM_NUM_CURVE_SEG_LIN_DRAM**			N02, N09	-
-	Number of linear curve segments (DRAM)			DWORD	POWER ON
-					
-	-	0	-	-	1/1

Description:

Number of linear curve segments in the DRAM available throughout the NCK.
A curve table may consist of "normal" curve segments and linear segments. The number of "normal" curve segments in the DRAM is defined by MD MM_NUM_CURVE_SEGMENTS_DRAM, these curve segments can accommodate polynomials. Linear curve segments can only accommodate straight lines.
The curve segments are stored either in the buffer memory or in the dynamic memory. This MD defines the number of curve segments in the dynamic memory (DRAM).

18410	**MM_NUM_CURVE_POLYNOMS_DRAM**			N02, N09	M3
-	Number of curve table polynomials (DRAM)			DWORD	POWER ON
-					
-	-	0	-	-	1/1

Description:

Number of polynomials for curve tables in the DRAM available throughout the NCK.
The polynomials for curve tables are stored in the buffer memory or in the dynamic memory.
This MD is used to set the number of polynomials for curve tables in the dynamic memory (DRAM).

18450	**MM_NUM_CP_MODULES**			N02, N09	-
-	Max. number of CP modules			DWORD	POWER ON
-					
-	-	4	0	48	1/1

Description:

Number of CP coupling modules available within the NCK
The MD defines the max. permissible number of CP couplings and reserves the required dynamic memory (DRAM).

18452	**MM_NUM_CP_MODUL_LEAD**			N02, N09	-
-	Maximum number of CP master values			DWORD	POWER ON
-					
-	-	4	0	99	1/1

Description:

Number of NCK-wide available CP master values.

This MD defines the max. permissible number of CP master values and reserves the required dynamic memory (DRAM).

18500	**MM_EXTCOM_TASK_STACK_SIZE**			EXP, N02	S7
-	Stack size for external communications task (DRAM)			DWORD	POWER ON
-					
-	-	19	10	60	0/0

Description:

Defines the size (KB) of the stack for external communication. The dynamic memory area is used.

Note:
This machine data is assigned internally by the control and must not be altered by the user.

18502	**MM_COM_TASK_STACK_SIZE**			EXP, N02	-
-	Stack size in KB for communication task (DRAM)			DWORD	POWER ON
-					
-	-	20	4	40	0/0

Description:

Size of the stacks of the communication task in kbyte.
The dynamic memory is used.

18510	**MM_SERVO_TASK_STACK_SIZE**			EXP, N02	S7
-	Stack size of servo task (DRAM)			DWORD	POWER ON
-					
-	-	20	4	40	0/0

Description:

Defines the stack size for the SERVO task. The dynamic memory is used for this purpose.

Note:
This machine data is assigned internally by the control and must not be altered by the user.

18512	**MM_IPO_TASK_STACK_SIZE**			EXP, C02	-
-	Stack size of IPO task (DRAM)			DWORD	POWER ON
-					
-	-	30	12	40	0/0

Description:

```
Size of the IPO task stack in kbyte.
The dynamic memory is used.
```

18520	**MM_DRIVE_TASK_STACK_SIZE**			EXP, N02	S7,ECO
-	Stack size of drive task (DRAM)			DWORD	POWER ON
-					
-	-	20	6	40	0/0

Description:

```
The size of the stack (KB) for the SIMODRIVE task is defined with this machine
data.
The stack is stored in the dynamic memory area.

Note:
    This machine data is assigned internally by the control and must not be
    altered by the user.
```

18540	**MM_PLC_TASK_STACK_SIZE**			EXP, N02	-
-	Stack size of the PLC task (DRAM)			DWORD	POWER ON
-					
-	-	30	20	40	0/0

Description:

```
Size of the stack of the PLC task in kbyte.
Dynamic memory is used.
```

18600	**MM_FRAME_FINE_TRANS**			N02	K2
-	Fine offset with FRAME (SRAM)			DWORD	POWER ON
-					
-	-	1	0	1	7/2

Description:

```
0:  The fine offset cannot be entered or programmed.
    Disabling fine offset saves a maximum of 10KB SRAM, (depending on MD 28080:
    MM_NUM_USER_FRAMES).
1:  The fine offset is possible for settable frames, the basic frame and the
programmable frame by operator input or via program.
```

18601	MM_NUM_GLOBAL_USER_FRAMES			N02	K2
-	Number of global predefined user frames (SRAM).			DWORD	POWER ON
-					
-	-	0	0	100	7/2

Description:

```
Number of global predefined user frames.
The value corresponds to the number of field elements for the predefined field
$P_UIFR[].
If the value of the data is greater than 0, then all settable fields are only
global. The MD $MC_MM_NUM_USER_FRAMES is then ignored.
```

18602	MM_NUM_GLOBAL_BASE_FRAMES			N02	K2
-	Number of global base frames (SRAM).			DWORD	POWER ON
-					
-	-	0	0	16	7/2

Description:

```
Number of NCU basic frames.
The value corresponds to the number for the predefined field $P_NCBFR[].
```

18660	MM_NUM_SYNACT_GUD_REAL			N02	-
-	Number of configurable GUD variables of type REAL			DWORD	POWER ON
-					
-	9	0,0,0,0,0,0,0,0	0	32767	7/2

Description:

```
The machine data $MN_MM_NUM_SYNACT_GUD_REAL[ ] can be used to extend indivi-
dual GUD blocks by additional channel-specific parameter areas of type REAL.
The GUD blocks are differentiated by the field index:
$MN_MM_NUM_SYNACT_GUD_REAL[0] = <value> -> extension of the SGUD block
$MN_MM_NUM_SYNACT_GUD_REAL[1] =  <value> -> extension of the MGUD block
$MN_MM_NUM_SYNACT_GUD_REAL[2] =  <value> -> extension of the UGUD block
$MN_MM_NUM_SYNACT_GUD_REAL[3] =  <value> -> extension of the GUD4 block
$MN_MM_NUM_SYNACT_GUD_REAL[8] =  <value> -> extension of the GUD9 block
In each case, fields with the following properties are created:
Data type REAL
Field size corresponding to <value> of the relevant machine data
Predefined names:
    SYG_RS[ ] -> Synact parameter of type REAL in the SGUD block
    SYG_RM[ ] -> Synact parameter of type REAL in the MGUD block
    SYG_RU[ ] -> Synact parameter of type REAL in the UGUD block
    SYG_R4[ ] -> Synact parameter of type REAL in the GUD4 block
    ....
    SYG_R9[ ] -> Synact parameter of type REAL in the GUD9 block
The parameters can be read and written both by the part program and also via
synchronous actions.
```

18661	MM_NUM_SYNACT_GUD_INT			N02	-
-	Number of configurable GUD variables of type integer			DWORD	POWER ON
-					
-	9	0,0,0,0,0,0,0,0,0	0	32767	7/2

Description:

```
The machine data $MN_MM_NUM_SYNACT_GUD_INT[ ] can be used to extend indivi-
dual GUD blocks by additional channel-specific parameter areas of type INTE-
GER. The GUD blocks are differentiated by the field index:
$MN_MM_NUM_SYNACT_GUD_INT[0] = <value> -> extension of the SGUD block
$MN_MM_NUM_SYNACT_GUD_INT[1] =  <value> -> extension of the MGUD block
$MN_MM_NUM_SYNACT_GUD_INT[2] =  <value> -> extension of the UGUD block
$MN_MM_NUM_SYNACT_GUD_INT[3] =  <value> -> extension of the GUD4 block
$MN_MM_NUM_SYNACT_GUD_INT[8] =  <value> -> extension of the GUD9 block
In each case, fields with the following properties are created:
Data type BOOL. Field size corresponding to <value> of the relevant machine
data. Predefined names:
    SYG_IS[ ] -> Synact parameter of type INT in the SGUD block
    SYG_IM[ ] -> Synact parameter of type INT in the MGUD block
    SYG_IU[ ] -> Synact parameter of type INT in the UGUD block
    SYG_I4[ ] -> Synact parameter of type INT in the GUD4 block
    ....
    SYG_I9[ ] -> Synact parameter of type INT in the GUD9 block
The parameters can be read and written both by the part program and also via
synchronous actions.
```

18662	MM_NUM_SYNACT_GUD_BOOL			N02	-
-	Number of configurable GUD variables of type Boolean			DWORD	POWER ON
-					
-	9	0,0,0,0,0,0,0,0,0	0	32767	7/2

Description:

```
The machine data $MN_MM_NUM_SYNACT_GUD_BOOL[ ] can be used to extend indivi-
dual GUD blocks by additional channel-specific parameter areas of type Boo-
lean. The GUD blocks are differentiated by the field index:
$MN_MM_NUM_SYNACT_GUD_BOOL[0] =  <value> -> extension of the SGUD block
$MN_MM_NUM_SYNACT_GUD_BOOL[1] =  <value> -> extension of the MGUD block
$MN_MM_NUM_SYNACT_GUD_BOOL[2] =  <value> -> extension of the UGUD block
$MN_MM_NUM_SYNACT_GUD_BOOL[3] =  <value> -> extension of the GUD4 block
$MN_MM_NUM_SYNACT_GUD_BOOL[8] =  <value> -> extension of the GUD9 block
In each case, fields with the following properties are created:
Data type BOOL. Field size corresponding to <value> of the relevant machine
data. Predefined names:
    SYG_BS[ ] -> Synact parameter of type Boolean in the SGUD block
    SYG_BM[ ] -> Synact parameter of type Boolean in the MGUD block
    SYG_BU[ ] -> Synact parameter of type Boolean in the UGUD block
    SYG_B4[ ] -> Synact parameter of type Boolean in the GUD4 block
    ....
    SYG_B9[ ] -> Synact parameter of type Boolean in the GUD9 block
The parameters can be read and written both by the part program and also via
synchronous actions.
```

18663	**MM_NUM_SYNACT_GUD_AXIS**			N02	-
-	Number of configurable GUD variables of type Axis			DWORD	POWER ON
-					
-	9	0,0,0,0,0,0,0,0,0	0	32767	7/2

Description:

```
The machine data $MN_MM_NUM_SYNACT_GUD_AXIS[ ] can be used to extend indivi-
dual GUD blocks by additional channel-specific parameter areas of type AXIS.
The GUD blocks are differentiated by the field index:
$MN_MM_NUM_SYNACT_GUD_AXIS[0] =  <value> -> extension of the SGUD block
$MN_MM_NUM_SYNACT_GUD_AXIS[1] =  <value> -> extension of the MGUD block
$MN_MM_NUM_SYNACT_GUD_AXIS[2] =  <value> -> extension of the UGUD block
$MN_MM_NUM_SYNACT_GUD_AXIS[3] =  <value> -> extension of the GUD4 block
$MN_MM_NUM_SYNACT_GUD_AXIS[8] =  <value> -> extension of the GUD9 block
In each case, fields with the following properties are created:
Data type AXIS
Field size corresponding to <value> of the relevant machine data
Predefined names:
    SYG_AS[ ] -> Synact parameter of type AXIS in the SGUD block
    SYG_AM[ ] -> Synact parameter of type AXIS in the MGUD block
    SYG_AU[ ] -> Synact parameter of type AXIS in the UGUD block
    SYG_A4[ ] -> Synact parameter of type AXIS in the GUD4 block
    ....
    SYG_A9[ ] -> Synact parameter of type AXIS in the GUD9 block
The parameters can be read and written both by the part program and also via
synchronous actions.
```

18664	**MM_NUM_SYNACT_GUD_CHAR**			N02	-
-	Configurable GUD variable of type Char			DWORD	POWER ON
-					
-	9	0,0,0,0,0,0,0,0,0	0	32767	7/2

Description:

```
The machine data $MN_MM_NUM_SYNACT_GUD_CHAR[ ]
can be used to extend individual GUD blocks by additional
channel-specific parameter areas of type CHAR.
The GUD blocks are differentiated by the field index:
$MN_MM_NUM_SYNACT_GUD_CHAR[0] =  <value> -> extension of the SGUD block
$MN_MM_NUM_SYNACT_GUD_CHAR[1] =  <value> -> extension of the MGUD block
$MN_MM_NUM_SYNACT_GUD_CHAR[2] =  <value> -> extension of the UGUD block
$MN_MM_NUM_SYNACT_GUD_CHAR[3] =  <value> -> extension of the GUD4 block
$MN_MM_NUM_SYNACT_GUD_CHAR[8] =  <value> -> extension of the GUD9 block
In each case, fields with the following properties are created:
Data type CHAR. Field size corresponding to <value> of the relevant machine
data. Predefined names:
   SYG_CS[ ] -> Synact parameter of type CHAR in the SGUD block
   SYG_CM[ ] -> Synact parameter of type CHAR in the MGUD block
   SYG_CU[ ] -> Synact parameter of type CHAR in the UGUD block
   SYG_C4[ ] -> Synact parameter of type CHAR in the GUD4 block
   ....
   SYG_C9[ ] -> Synact parameter of type CHAR in the GUD9 block
The parameters can be read and written both by the part program
and also via synchronous actions.
```

18665	MM_NUM_SYNACT_GUD_STRING			N02	-
-	Configurable GUD variable of type STRING			DWORD	POWER ON
-					
-	9	0,0,0,0,0,0,0,0,0	0	25	7/2

Description:

```
The machine data $MN_MM_NUM_SYNACT_GUD_STRING[ ] can be
used to extend individual GUD blocks by additional channel-specific
parameter areas of type STRING.
The GUD blocks are differentiated by the field index:
$MN_MM_NUM_SYNACT_GUD_STRING[0] =  <value> -> extension of the SGUD block
$MN_MM_NUM_SYNACT_GUD_STRING[1] =  <value> -> extension of the MGUD block
$MN_MM_NUM_SYNACT_GUD_STRING[2] =  <value> -> extension of the UGUD block
$MN_MM_NUM_SYNACT_GUD_STRING[3] =  <value> -> extension of the GUD4 block
$MN_MM_NUM_SYNACT_GUD_STRING[8] =  <value> -> extension of the GUD9 block
In each case, fields with the following properties are created:
Data type STRING
Field size corresponding to <value> of the relevant machine data
The maximum length of a string is 31 characters.
Predefined names:
   SYG_SS[ ] -> Synact parameter of type STRING in the SGUD block
   SYG_SM[ ] -> Synact parameter of type STRING in the MGUD block
   SYG_SU[ ] -> Synact parameter of type STRING in the UGUD block
   SYG_S4[ ] -> Synact parameter of type STRING in the GUD4 block
   ....
   SYG_S9[ ] -> Synact parameter of type STRING in the GUD9 block
The parameters can be read and written both by the part program
and also via synchronous actions.
```

18700	MM_SIZEOF_LINKVAR_DATA			N02	B3
-	Size of NCU-link variable memory			DWORD	POWER ON
LINK					
-	-	0	-	-	7/2

Description:

```
Number of bytes of the NCK link memory for the variables $A_DLx.
```

18710	MM_NUM_AN_TIMER			N02	-
-	Number of global time variable for synchronized actions			DWORD	POWER ON
-					
-	-	0	0	10000	7/2

Description:

```
Number of global time variables for motion-synchronous actions (DRAM)
```

18720	**MM_SERVO_FIFO_SIZE**			EXP, N01	-
-	Setpoint value for buffer size between IPO and position control			DWORD	POWER ON
-					
-	-	2	2	35	3/2

Description:

```
The machine data determines the size of the setpoint value buffer between
interpolator and position control, and has a direct effect on the dynamic user
memory requirement.
That is normally 2. If several NCUs are connected via NCU link for e.g. rotary
indexing machines, the value should be set to 3 on all NCUs. This will balance
the transmission rates of the setpoint values via the link.
In a master value application (e.g. line shaft), the value should be set to 4,
but only on the NCU that generates the master value. For all the other NCUs,
the preset value should be maintained at 2.
Note:
In control loops that are connected via interpolator, every increase of the
value generates a further dead-time.
When the IPO cycles of the NCUs within an NCU group are set to different
values, the link communication will only run in the slowest IPO cycle. The MD
must be increased in the ratio of the NCU IPO cycle to the slowest IPO cycle
in the NCU group, in order to achieve a synchronized output of the setpoint
values on the drive interface. The formula for this is as follows:
MM_SERVO_FIFO_SIZE = 2 * IPO cycle ratio + 1
Example:
In an IPO cycle ratio of 4:1, the value on the fast NCU should be set to 9
instead of 3. On the slow NCU, the value must be set to 3.
```

18780	**MM_NCU_LINK_MASK**			N01	B3
-	Activation of NCU-link communication			DWORD	POWER ON
-					
-	-	0	0	3	3/2

Description:

```
Activating NCU link communication
Bit-coded activation data. That is the NCU link communication can be activa-
ted in various forms.
Bit-coded activation data:
Bit 0 = 0x1: Link communication is to be activated.
Bit 1 = 0x2: Different IPO and position-control cycles can be enabled.
(See description FAST_IPO_LINK)
Irrelevant for:
    Systems without link modules
Related to:
    IS_LOCAL_LINK_AXIS,
    NCU_LINK_NO,
    LINK_TERMINATION,
    LINK_NUM_OF_MODULES,
    LINK_BAUDRATE_SWITCH,
    LINK_RETRY_CTR
```

18781	NCU_LINK_CONNECTIONS			N01	B3
-	Number of internal link connections			DWORD	POWER ON
LINK					
-	-	0	0	32	3/1

Description:

```
Value = 0
The software calculates the internal link connnections itself.

Value > 0
Number of internal link connnections from each NCU to each other NCU.
These link connnections do not accommodate the non-cyclic messages.
Each of these connections can transfer 240 bytes of raw data.

Non-cyclic messages occur with alarms, container switches and link variablen.
```

18782	MM_LINK_NUM_OF_MODULES			N01, N02	B3
-	Number of NCU-link modules			DWORD	POWER ON
-					
-	-	2	2	16	3/2

Description:

```
LINK_NUM_OF_MODULES defines how many link modules can participate in the link
communication.
```

18788	MM_CC_STATION_CHAN_MASK			N01	-
-	Channel bit mask for allocating CC stations			DWORD	POWER ON
-					
-	MD_MAXNUM_CC_STATIONS	1,0	-	-	1/1

Description:

```
Machine data for channel-specific creation of special additional software sta-
tions for compile cycles.
Enter a bit mask with the bits set for the channels, in which a compile cycle
shall use the relevant station.
Meaning of the individual array elements:

$MN_MM_CC_STATION_CHAN_MASK[0]:
Creates a CC station at the end of the geometry preparation and prior to velo-
city planning in the preparation task. A compile cycle application can buffer
the blocks there and manipulate their contents.

$MN_MM_CC_STATION_CHAN_MASK[1]:
Creates another CC-Station that is called directly after the first CC station
(see above) and permits the internal block contents independently of this
manipulation.
```

18790	MM_MAX_TRACE_LINK_POINTS			EXP, N02, N06	B3
-	Trace data buffer size for NCU-Link			DWORD	POWER ON
NBUP					
-	-	8	0	20000	2/2

Description:

```
MM_MAX_TRACE_LINK_DATAPOINTS defines the size of an internal data buffer which
contains the trace recordings for the NCU-link functionality.
The MD is only evaluated if bit 0 is set in MM_TRACE_LINK_DATA_FUNCTION BIT0.

Related to:
    TRACE_SCOPE_MASK,
    MM_TRACE_DATA_FUNCTION,
    MM_MAX_TRACE_DATAPOINTS
    TRACE_STARTTRACE_EVENT,
    TRACE_STARTTRACE_STEP,
    TRACE_STOPTRACE_EVENT,
    TRACE_STOPTRACE_STEP,
    TRACE_VARIABLE_NAME,
    TRACE_VARIABLE_INDEX,
    MM_TRACE_LINK_DATA_FUNCTION
```

18792	MM_TRACE_LINK_DATA_FUNCTION			EXP, N02, N06	B3
-	Specifies the contents of the NCU-link files			DWORD	POWER ON
NBUP					
-	-	0	0	0x7FFFFFFF	2/2

Description:

```
The NCK sends and receives 32 buffers with a length of 240 bytes in each
interpolation cycle.
These buffers are saved in an FIFO (first in-first out) memory of the length
MM_MAX_TRACE_LINK_POINTS, and written to a file (ncsctr01.mpf for the 1st
channel) if a "trigger event" occurs (e.g. Cancel Alarm button, see  MD
TRACE_STOPTRACE_EVENT and TRACE_STARTTRACE_EVENT).

The machine data should be interpreted as bit mask and has the following mea-
ning:
BIT0 = 1
    Enables the NCU-link trace file.
    The others are only evaluated when this bit is set!
    MD MM_MAX_TRACE_LINK_POINTS is only evaluated with this bit.
BIT1 = 1
    The stored buffer contents are analyzed according to their meanings and
    stored in the file in plain text. This means that one can, for example,
    recognize the setpoint transfer by means of the  text items "desVal",
    actual value transfer under the identifiers "actVal"....

BIT1 = 0
    The buffers contents are displayed in HEX and not analyzed.
BIT2 = 1
    Only those buffers are recorded that contain a sporadically occuring commu-
    nication message(dynamic message) between the NCUs.
```

This include, for example, the following events:
- Set machine data
- Set link variables
- Alarms spanning NCUs
- Axis container rotation

18794	**MM_TRACE_VDI_SIGNAL**			EXP, N02, N06	-
-	Trace specification of VDI signals			DWORD	POWER ON
NBUP					
-	-	0	0	0x7FFFFFFF	2/2

Description:

The NCK sends and receives PLC VDI signals. The Trace function stores the signals which have changed in each interpolation cycle in an FIFO memory (first in-first out) having a size of MM_MAX_TRACE_POINTS.
The FIFO is written to a file (for the 1st channel: ncsctr01.mpf) when a "trigger event" occurs (e.g. Cancel Alarm key, see MD TRACE_STOPTRACE_EVENT and TRACE_STARTTRACE_EVENT).

The machine data should be interpreted as bit mask. The corresponding VDI signals are recorded depending on which bit is set.

Bits 1.. 6 describe which axial VDI input signals are recorded in the trace (see .. TRACE_DATA_FUNCTION).

18800	**MM_EXTERN_LANGUAGE**			N01, N12	FBFA
-	Activation of external NC languages			DWORD	POWER ON
-					
-	-	0x0000	0x0000	0x0001	7/2

Description:

The corresponding NC language must be activated to execute part programs of other control manufacturers. Only one external NC language can be selected.
The range of instructions which is made available in each case is to be taken from the current documentation.

Bit 0 (LSB):
Execution of part programs ISO_2 or ISO_3.
See $MN_MM_EXTERN_CNC_SYSTEM for coding.

18860	**MM_MAINTENANCE_MON**			EXP, N01	-
-	Activation of maintenance data recording			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

Maintenance data is recorded when this MD has the value TRUE.
The axial MD $MA_MAINTENANCE_DATA sets which data are to be recorded.
Details are to be found in the service documentation.

18870	**MM_MAXNUM_KIN_CHAINS**			EXP, N01	-
-	Max. number of kinematic chains			DWORD	POWER ON
-					
-	-	0	-	200	7/2

Description:

Maximum number of kinematic chains in the system

18880	**MM_MAXNUM_KIN_CHAIN_ELEM**			EXP, N01	-
-	maximum number of elements in kinematic chains			DWORD	POWER ON
-					
-	-	0	-	1000	7/2

Description:

Maximum number of links in kinematic chains. If this MD has the value 0 (default value) then no kinematic chains at all are possible.

18890	**MM_MAXNUM_3D_PROT_AREAS**			EXP, N01	-
-	Maximum number of elements in 3D protection areas			DWORD	POWER ON
-					
-	-	0	-	200	7/2

Description:

Maximum number of elements in protection zones. If this MD has the value 0 (default value) then no protection zones are possible.

18892	**MM_MAXNUM_3D_PROT_AREA_ELEM**			EXP, N01	-
-	Max. number of protection zone elements			DWORD	POWER ON
-					
-	-	0	0	1000	7/2

Description:

Maximum number of protection zone elements. If this MD is 0 (default value), no protection zones are possible.

18894	**MM_MAXNUM_3D_PROT_GROUPS**			EXP, N01	-
-	Max. number of protection zone groups			DWORD	POWER ON
-					
-	-	0	0	100	7/2

Description:

Maximum number of protection zone groups in the system

18896	**MM_MAXNUM_3D_COLLISION**			EXP, N01	-
-	Max. number of temp. memories for collision check			DWORD	POWER ON
-					
-	-	0	0	MAX_SIZE_3D_S_MATRIX_MD	7/2

Description:

Maximum size of a temporary memory area, which is required for the collision check of two protection zones.
If the two protection zones have m or n elements and a number of machine axes k, a memory space of 4 * n * m * k elements is required.
Each memory space requires 4 bytes (FLOAT).
If this machine data is 0, the size of the required memory is automatically derived from machine data $MN_MM_MAXNUM_3D_PROT_AREA_ELEM and $MN_MM_MAXNUM_3D_PROT_AREAS.
If this memory size is not sufficient, it can explicitly be defined via this machine data.

18897	**MM_MAXNUM_3D_INTRERFACE_IN**			EXP, N01	-
-	Max. no. of interf. bits for pre-activation of protection zones			DWORD	POWER ON
-					
-	-	16	0	MAXNUM_3D_INTERFACEBITS_IN_MD	7/1

Description:

Defines how many input bits are available on the VDI interface for pre-activation of 3D protection zones.
It will influence the size of the memory space required for each NC block.
If this machine data has value n, a memory size of approximately n * (n + 1) / 16 bytes will be required per block.
This machine data will be evaluated and will cause reservation of memory space, only if machine data $MN_MM_MAXNUM_3D_PROT_AREAS is inequal to 0.

18898	**PROT_AREA_3D_TYPE_NAME_TAB**			EXP, N12, N07	-
-	Table of names for protection zone types			STRING	POWER ON
-					
-	10	"BOX","SPHERE","CYLINDER","CONE"...	-	-	7/2

Description:

```
Contains the names for the protection zone types. The meaning of the entry is
determined by the postition in the list. A change of name does therefore not
cause a change of function.
Meaning of entries:
1. Empty (no protection zone defined)
2. Cuboid
3. Sphere
4. Cylinder
5. Cone
6. Truncated cone
7. Square pyramid
8. Rectangular pyramid
9. Square truncated pyramid
10.Rectangular truncated pyramid

Example: If the third entry "SPHERE" is changed into "CUBOID", this new key-
word "CUBOID" still designates a sphere.
A meaningful change would be, for example "SP".
```

18900	**FPU_ERROR_MODE**			EXP	-
-	System reaction to FPU calculation error			DWORD	POWER ON
NBUP, NDLD					
-	-	0x1	-	-	0/0

Description:

```
System response to floating point unit arithmetic errors
Bit 0  =  0: (LSB)
    The response to an FPU arithmetic error takes place during a station change
    by the station controller polling the FPU status word. (For CPUs without
    exception handling)

Bit 0   = 1:
    There is an immediate branch into an exception when an FPU arithmetic error
    occurs:
    The address at which the arithmetic error occurred can be exactly locali-
    zed in the alarm output
```

18910	**FPU_CTRLWORD_INIT**			EXP	-
-	Basic initialization of FPU control word			DWORD	POWER ON
NBUP, NDLD					
-	-	0x37F	-	-	0/0

Description:

```
The basic initialization of the FPU control word enables the FPU mode of ope-
ration (e.g. rounding mode) to be changed.
Significance of the bit: see manual of the FPU used.
```

18920	**FPU_EXEPTION_MASK**			EXP	-
-	Exception mask for FPU calculation errors			DWORD	POWER ON
NBUP, NDLD					
-	-	0xD	-	-	0/0

Description:

```
The exception mask for FPU calculation errors enables selection of the FPU
error for which an exception was issued.
Significance of the bits for Intel 486:
Bit 0 (LSB):
    invalid operation
Bit 1:
    denormalized operand: | operand | < as the smallest 2nd power
Bit 2:
    zero divide
Bit 3:
    overflow: result is larger than the largest displayable number
Bit 4:
    underflow: result is smaller than the smallest displayable number
Bit 5:
    precision: result cannot be displayed exactly (e.g. 1/3)

Significance of the bits for Intel 960:
Bit 12:
    integer overflow
Bit 24:
    floating overflow
Bit 25:
    floating underflow
Bit 26:
    invalid operation
Bit 27:
    zero divide
Bit 28:
    floating inexact (precision): result cannot be displayed exactly
Bit 29:
    denormalized operand
```

18930	**COREFILE_NAME**			EXP	-
-	Path for core file creation			STRING	POWER ON
-					
-	-		-	-	7/1

Description:

File name with path name under which a core file is created in the case of a control crash.
The core file is used for problem analysis by NCK development.
A core file will be created, if a valid file name is entered in this MD.

1.4 Channel specific machine data

Number	Identifier			Display filters	Reference
Unit	Name			Data type	Active
Attributes					
System	Dimension	Default value	Minimum value	Maximum value	Protection

Description:

Description

1.4.1 Basic channel machine data

20000	CHAN_NAME			C01, C10	K1
-	Channel name			STRING	POWER ON
-					
-	-	"CHAN1","CHAN2", "CHAN3","CHAN4". ..	-	-	7/2

Description:

The channel name can be defined in this MD. The channel name is only used for the display on the HMI.

20050	AXCONF_GEOAX_ASSIGN_TAB			C01, C10	K2
-	Assignment of geometry axis to channel axis			BYTE	POWER ON
-					
-	3	1, 2, 3,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/2

Description:

This MD is used to specify which channel axis the geometry axis is assiged to. The assignment must be made channel-specifically for all geometry axes. If a geometry axis is not assigned to a channel axis, this geometry axis is not existing and cannot be programmed (with the name defined under AXCONF_GEOAX_NAME_TAB).
For example: Turning machine without transformation:

```
$MC_AXCONF_GEOAX_ASSIGN_TAB[ 0 ] = 1  ; 1st geometry axis = 1st channel axis
$MC_AXCONF_GEOAX_ASSIGN_TAB[ 1 ] = 0  ; 2nd geometry axis not defined
$MC_AXCONF_GEOAX_ASSIGN_TAB[ 2 ] = 2  ; 3rd geometry axis = 2nd channel axis
```

The assignment made here is valid if no transformation is active. With active transformation n, the transformation-specific assignment table TRAFO_GEOAX_ASSIGN_TAB_n becomes active.

20060	**AXCONF_GEOAX_NAME_TAB**			C01, C11, C10	K2
-	Geometry axis name in channel			STRING	POWER ON
-					
-	3	"X", "Y", "Z","X", "Y", "Z"...	-	-	7/2

Description:

This MD is used to enter the names of the geometry axes for the channel separately. Geometry axes can be programmed in the part program using the names specified here.

Special cases:

- The specified geometry axis name must not conflict with the designation and assignment of the machine and channel axis names.
- The entered machine axis name must not be the same as the names entered for Euler angles (MD 10620: EULER_ANGLE_NAME_TAB), names specified for directional vectors (MD 10640: DIR_VECTOR_NAME_TAB), names given to intermediate point coordinates in the case of CIP (MD 10660: INTERMEDIATE_POINT_NAME_TAB) and the names of interpolation parameters (MD 10650: IPO_PARAM_NAME_TAB).

- The geometry axis name must not include any of the following reserved address letters:
  - D Tool offset (D function)
  - E Reserved
  - F Feedrate (F function)
  - G Preparatory function
  - H Auxiliary function (H function)
  - L Subroutine call
  - M Miscellaneous function (M function)
  - N Subblock
  - P Subroutine number of passes
  - R Arithmetic parameters
  - S Spindle speed (S function)
  - T Tool (T function)

- The name must not include any keywords (e.g. DEF, SPOS etc.) or pre-defined designations (e.g. ASPLINE, SOFT).
- The use of axis designations consisting of a valid address letter (A, B, C, I, J, K, Q, U, V, W, X, Y, Z), followed by an optional numerical extension (1-99) gives slightly better block cycle times than a general designation.
- Identical names may be given to geometry axes assigned to different channels.

Related to:

MD 10000: AXCONF_MACHAX_NAME_TAB
(machine axis name [axis no.])
MD 20080: AXCONF_CHANAX_NAME_TAB
(channel axis name in the channel [channel axis no.])

20070	AXCONF_MACHAX_USED			C01, C10	K2
-	Machine axis number valid in channel			BYTE	POWER ON
-					
-	20	1, 2, 3, 4, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	31	7/2
710-6a2c	-	1, 2, 3, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	-	-	-/-
720-6a2c	-	1, 2, 3, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	-	-	-/-
730-6a2c	-	1, 2, 3, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	-	-	-/-
840di-basic	-	1, 2, 3, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	-	-	-/-

Description:

This MD is used to specify the machine axis which the channel axis/special axis is assigned to. Each channel axis has to be assigned to a specific channel. A machine axis that is not assigned to a channel is not active, i.e. the axis control is not computed, the axis is not shown on the screen and it cannot be programmed in any channel.

From software version 5, it is permissible not to assign a machine axis to a channel axis for reasons of uniform configuration. The MD for the machine axis is set to 0 in this case. At the same time, MD 11640: ENABLE_CHAN_AX_GAP must be set to 1 (channel axis gaps are permitted).

From software version 5, the machine data MD 20070: AXCONF_MACHAX_USED does not directly refer to the machine axes created with MD 10000: AXCONF_MACHAX_NAME_TAB, but to the logical machine axis map which is defined with MD 10002: AXCONF_LOGIC_MACHAX_TAB.

MD 10002: AXCONF_LOGIC_MACHAX_TAB refers:
- directly to a local machine axis on the NCU,
- to a machine axis of another NCU in the NCU grouping or
- indirectly to an axis container with local or remote machine axes.

If the default values AX1, AX2, ..., AX31 are entered with MD 10002: AXCONF_LOGIC_MACHAX_TAB, then the NCK behaves in the same way as up to software version 4, this means that machine data MD 20070: AXCONF_MACHAX_USED refers to the corresponding local machine axis.

Special cases:
- Each geometry axis must be assigned to a channel axis and a machine axis so that it can be programmed.
- If a machine axis is assigned to several channels by means of AXCONF_MACHAX_USED, then the number of the channel from which the axis must be programmed must be entered in MD 30550: AXCONF_ASSIGN_MASTER_CHAN.
- Up to software version 4, the list of entries must not contain any gaps (from software version 5 see above). In contrast, the machine axes used may contain gaps.

```
For example:
Permissible:
    AXCONF_MACHAX_USED [0] = 3; 3rd MA is 1st axis in channel
    AXCONF_MACHAX_USED [1] = 1; 1st MA is 2nd axis in channel
    AXCONF_MACHAX_USED [2] = 5; 5th MA is 3rd axis in channel
    AXCONF_MACHAX_USED [3] = 0

Error for software version 4, permissible for version 5:
    AXCONF_MACHAX_USED [0] = 1; 1st MA is 1st axis in channel
    AXCONF_MACHAX_USED [1] = 2; 2nd MA is 2nd axis in channel
    AXCONF_MACHAX_USED [2] = 0; gap in the list ...
    AXCONF_MACHAX_USED [3] = 3; ... of the channel axes

Axis identifiers must be defined in the corresponding list places of
AXCONF_CHANAX_NAME_TAB for axes activated in the channel.
Related to:
    MD 30550: AXCONF_ASSIGN_MASTER_CHAN
    (Initial setting of the channel for axis change)
    MD 20080: AXCONF_CHANAX_NAME_TAB
    (Channel axis name in the channel [channel axis number])
    MD 10002: AXCONF_LOGIC_MACHAX_TAB
    MD 11649: ENABLE_CHAN_AX_GAP
Reference:
    Description of Functions B3.
```

20080	**AXCONF_CHANAX_NAME_TAB**			C01, C11, C10	K2
-	Channel axis name in channel			STRING	POWER ON
-					
-	20	"X", "Y", "Z", "A", "B", "C", "U", "V", "X11", "Y11"...	-	-	7/2

Description:

```
This MD is used to set the name of the channel axis/special axis. The first
three channel axes are normally occupied by the three assigned geometry axes
(see also MD 20050: AXCONF_GEOAX_ASSIGN_TAB). The remaining channel axes are
also designated as special axes. The channel axis/special axis is always dis-
played on the screen in the WCS (workpiece coordinate system) with the name
set in this MD.
Special cases:
-   The specified channel axis name/special axis name must not conflict with the
    designation and assignment of the machine and geometry axis names.
-   The specified channel axis name must not be the same as the names entered for
    Euler angles (MD 10620: EULER_ANGLE_NAME_TAB), names specified for directio-
    nal vectors (MD 10640: DIR_VECTOR_NAME_TAB), names given to intermediate
    point coordinates in the case of CIP (MD 10660: INTERMEDIATE_POINT_NAME_TAB)
    and the names of interpolation parameters (MD 10650: IPO_PARAM_NAME_TAB).
-   The channel axis name entered must not include any of the following reserved
    address letters:
    - D  Tool offset (D function)                      - E  Reserved
    - F   Feedrate (F function)                         - G  Preparatory func-
    tion
    - H  Auxiliary function (H function)             - L  Subroutine call
    - M  Miscellaneous function (M function)  - N  Subblock
    - P  Subroutine number of passes           - R  Arithmetic parameters
    - S  Spindle speed (S function)                - T   Tool (T function)
```

- The name must not include any keywords (e.g. DEF, SPOS etc.) or pre-defined identifiers (e.g. ASPLINE, SOFT).
- The use of axis identifiers consisting of a valid address letter (A, B, C, I, J, K, Q, U, V, W, X, Y, Z), followed by an optional numerical extension (1-99) gives slightly better block cycle times than a general identifier.
- No special names need be entered in this MD for channel axes to which geometry axes are assigned (normally the first three channel axes) .

Axis identifiers that are not allowed are rejected with an alarm during runup.

20082	**AXCONF_CHANAX_DEFAULT_NAME**			C01, C11, C10	-
-	Default axis name for axis variables in the channel			STRING	POWER ON
-					
-	-		-	-	7/2

Description:

Variables or parameters of type Axis which have not been initialized are initialized with a default axis identifier. The identifier can be configured via the machine data $MC_AXCONF_CHANAX_DEFAULT_NAME. If this machine data is set with an empty string, the 1st geometry axis is used, as previously.
$MC_AXCONF_CHANAX_DEFAULT_NAME can be set by default with all available, valid axis identifiers. The value of this machine data should generally always correspond to a value of $MC_AXCONF_GEOAX_NAME_TAB, $MC_AXCONF_CHANAX_NAME_TAB or $MN_AXCONF_MACHAX_NAME_TAB.
If an invalid axis name is entered as a value or if this name has been changed, for example, in $MC_AXCONF_CHANAX_NAME_TAB but not in $MC_AXCONF_CHANAX_DEFAULT_NAME, this is indicated with alarm 4041 channel %1 block %2 axis identifier %3 is invalid".
For $MC_AXCONF_CHANAX_DEFAULT_NAME, only valid axis identifiers, empty string, and "NO_AXIS" are allowed. "NO_AXIS" is used for recognition of a non-initialized axis variable, empty string means previous behavior, i.e. each variable is initialized with the 1st geometry axis.

20090	**SPIND_DEF_MASTER_SPIND**			C01, C03	S1
-	Initial setting of master spindle in channel			BYTE	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	1	20	7/2

Description:

Each channel must have a master spindle for the following functions:
- G95 Revolutional feedrate
- G96 /G961 S1 --> Spindle 1 constant cutting speed in m/min (SINUMERIK FM-NC only)
- G97 /G971 Cancel G96/G961 and freeze last spindle speed
- G63 Tapping with compensating chuck
- G33 Thread cutting
- G34 Thread lead increase (progress. speed change)
- G35 Thread lead increase (degress. speed change)
- G331/G332 Rigid tapping
- G4 S1 --> Spindle 1 dwell time in spindle revolutions

The master spindle can also be programmed with the program commands M3, M4, M5, S, SPOS, WAITS, SPOSA, M19, M40, M41 to M45 without specifying the spindle number.
The spindle number of the channel's master spindle is entered in MD 20090: SPIND_DEF_MASTER_SPIND. The initial setting of the master spindle applies until a new master spindle is defined with the SETMS program command. The SETMS setting is deleted with NC start. Following an M02/M30 and new NC start, the spindle defined in SPIND_DEF_MASTER_SPIND is always the master spindle.

20092	**SPIND_ASSIGN_TAB_ENABLE**			C01, C03, C10	S1
-	Enable/disable the spindle converter.			BYTE	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/7

Description:

Value 0:
The spindle converter function is deactivated. The contents of SD 42800: SPIND_ASSIGN_TAB[..] are not evaluated.

Value 1:
The spindle converter is activated. Conversion from logical to physical spindle takes place. For more information, see SD 42800: SPIND_ASSIGN_TAB.

Note:
The spindle converter is deactivated after "Delete SRAM" (startup switch to position "1").

Related to:
SD 42800: SPIND_ASSSIGN_TAB

20094	**SPIND_RIGID_TAPPING_M_NR**			C01, C03, C10	FBFA
-	M function for switching into controlled axis mode			DWORD	POWER ON
-					
-	-	70,70,70,70,70,70,70,70,70,70,70,70,70,70 ...	-	-	7/2

Description:

This machine data defines the M auxiliary function number with which the spindle is switched over to the axis mode.
The M number defined in the machine data replaces M70 in the Siemens language mode.

Note:
On the VDI interface, M70 with the corresponding address extension is always output as an identifier for the switchover to the axis mode.
Restrictions: Refer to machine data 10715: $MN_M_NO_FCT_CYCLE

```
Related to:
    $MN_M_NO_FCT_EOP,
    $MN_M_NO_FCT_CYCLE,
    $MC_SPIND_RIGID_TAPPING_M_NR,
    $MC_AUXFU_ASSOC_M0_VALUE

For external language mode:
    $MN_EXTERN_M_NO_MAC_CYCLE,
    $MN_EXTERN_M_NO_SET_INT
    $MN_EXTERN_M_NO_DISABLE_INT,
    $MN_EXTERN_CHAN_SYNC_M_NO_MIN,
    $MN_EXTERN_CHAN_SYNC_M_NO_MAX
    $MC_EXTERN_RIGID_TAPPING_M_NR

For nibbling:
    $MC_NIBBLE_PUNCH_CODE
```

20095	**EXTERN_RIGID_TAPPING_M_NR**			C01, C11, C03, C10	FBFA
-	M function for switching to controlled axis mode(external mode)			DWORD	POWER ON
-					
-	-	29,29,29,29,29,29,29,29,29,29,29,29,29 ...	-	-	7/2

Description:

```
This machine data defines the M function number, with which switchover to con-
trolled spindle/axis mode is to be carried out.
The M number defined in the machine data replaces M29 in external language
mode.
Pre-defined M numbers such as M00,M1,M2,M3, etc. are not allowed as M number.

Restrictions: See machine data 10715 $MN_M_NO_FCT_CYCLE

Related to:
    $MN_M_NO_FCT_EOP,
    $MN_M_NO_FCT_CYCLE,
    $MC_SPIND_RIGID_TAPPING_M_NR,
    $MC_AUXFU_ASSOC_M0_VALUE

For external language mode:
    $MN_EXTERN_M_NO_MAC_CYCLE,
    $MN_EXTERN_M_NO_SET_INT
    $MN_EXTERN_M_NO_DISABLE_INT,
    $MN_EXTERN_CHAN_SYNC_M_NO_MIN,
    $MN_EXTERN_CHAN_SYNC_M_NO_MAX
    $MC_EXTERN_RIGID_TAPPING_M_NR

For nibbling:
    $MC_NIBBLE_PUNCH_CODE
```

20096	**T_M_ADDRESS_EXT_IS_SPINO**			C01, C04, C09	W1,FBW
-	Meaning of address extension at T, M tool change			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/2

Description:

```
This MD is only significant if the functions 'Tool management'/'flat D num-
bers' are inactive.

FALSE

The contents of the address extension of the NC addresses T and M 'tool change
command number' are not evaluated  by the NCK. The PLC decides on the signifi-
cance of the programmed extension.

TRUE

The address extension of the NC addresses T  and M 'tool change command num-
ber' - 'tool change command number'=TOOL_CHANGE_M_CODE with 6 as the default
value - are interpreted as the spindle number.
NCK treats the extension in the same way as the active functions 'tool manage-
ment', and 'flat D number management'.
That is, the programmed D number always refers to the T number of the program-
med main spindle number.

See also:
    $MC_SPIND_DEF_MASTER_SPIND,
    $MC_TOOL_CHANGE_MODE,
    $MC_TOOL_CHANGE_M_CODE
```

20098	DISPLAY_AXIS			EXP, C01	IAD
-	Display axis on HMI			DWORD	SOFORT
-					
-	20	0xFFFFFFFF, 0xFFFFFFFF, 0xFFFFFFFF, 0xFFFFFFFF, 0xFFFFFFFF...	-	-	7/2

Description:

```
Identification whether the axis is to be displayed by the HMI as a machine,
geometry or auxiliary axis.
This data is only evaluated by the HMI.


Bit 0 to 15: MCS
Bit 0= 1 Display machine axis in the actual-value windows
       0       Hide machine axis in the actual-value windows
Bit 1= 1 Display machine axis in the reference-point windows
       0       Hide machine axis in the reference-point windows
Bit 2=1  Display machine axis in the present/basic offset/scratch window
       0        Hide machine axis in the present/basic offset/scratch window
Bit 3= 1 Display machine axis in the handwheel selection window
       0       Hide machine axis in the handwheel selection window

Bit 16 to 31: WCS
Bit 16= 1 Display geometry axis in the actual-value window
        0     Hide geometry axis in the actual-value window
(Bit 17)   not assigned
Bit 18= 1 Display geometry axis in the basic offset window
        0   Hide geometry axis in the basic offset window
Bit 19= 1 Display geometry axis in the handwheel selection window
        0     Hide geometry axis in the handwheel selection window
```

20100	DIAMETER_AX_DEF			C01, C10	P1
-	Geometry axis with transverse axis function			STRING	POWER ON
-					
-	-		-	-	7/2

Description:

```
This MD is used to determine a geometry axis as a transverse axis. Only one
transverse axis can be defined here for each channel.
Further transverse axes for axis-specific diameter programming can be activa-
ted via MD30460, bit 2.
The axis identifier of an active geometry axis that has been defined via chan-
nel-specific MD 20050: AXCONF_GEOAX_ASSIGN_TAB[n] or MD 24120:
TRAFO_AX_GEOAX_ASSIGN_TAB_1[n] (from SW 4) and MD 20060:
AXCONF_GEOAX_NAME_TAB[n] must be specified.
```

If space characters are entered or if an axis identifier is specified for an axis which is not defined as a geometry axis, this leads to the following alarms:

- during runup, to alarm 4032 "Channel %1 wrong identifier for transverse axis in %2, if the "Diameter programming" function (DIAMON) or constant cutting velocity G96/G961/G962 is the switch-on setting.
- when the "Diameter programming (DIAMON)" function is activated, to alarm 16510 "Channel %1 block %2 No transverse axis available for diameter programming", if no axis has been permitted via DIAMCHANA[AX] for channel-specific diameter programming.
- when G96/G961/G962 has been programmed, to alarm 10870 "Channel %1 block %2 No transverse axis defined as reference axis for G96/G961/G962", if no geometry axis has been defined via the instruction SCC[ax] as reference axis for G96/G961/G962.

Related to:
MD 20050: AXCONF_GEOAX_ASSIGN_TAB[n]
(assignment of geometry axis to channel axis)
MD 20060: AXCONF_GEOAX_NAME_TAB[n]
(geometry axis name in the channel)
MD 24120: TRAFO_AX_GEOAX_ASSIGN_TAB_1[n]
(assignment of GEO axis to channel axis for transformation 1)
MD 30460: BASE_FUNCION_MASK
(Bit2 == 1: Axis-specific diameter programming)

20106	**PROG_EVENT_IGN_SINGLEBLOCK**			N01	-
-	Prog-Events ignore single block			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x1F	7/2

Description:

Event-controlled programm calls (Prog-Events) can be set regarding their single block behavior.

Bit 0 = 1 :
Prog-Event after part program start causes block change without restart
Bit 1 = 1 :
Prog-Event after part program end causes block change without restart
Bit 2 = 1 :
Prog-Event after OP reset causes block change without restart
Bit 3 = 1 :
Prog-Event after runup causes block change without restart
Bit 4 = 1 :
Prog-Event after 1st start after search run causes block change without restart

20107	**PROG_EVENT_IGN_INHIBIT**			N01	-
-	Prog-Events ignore read-in disable			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x1F	7/2

Description:

```
Event-controlled programm calls (Prog-Events) can be set regarding their read-
in disable behavior.

Bit 0 = 1 :
    Prog-Event after part program start causes block change despite read-in
    disable
Bit 1 = 1 :
    Prog-Event after part program end causes block change despite read-in
    disable
Bit 2 = 1 :
    Prog-Event after OP reset causes block change despite read-in disable
Bit 3 = 1 :
    Prog-Event after runup causes block change despite read-in disable
Bit 4 = 1 :
    Prog-Event after 1st start after search run causes block change despite
    read-in disable
```

20108	**PROG_EVENT_MASK**			N01, -	K1
-	Setting of event-driven programm calls			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0xF	7/2

Description:

```
Parameterization of the events, at which the user program set with
$MN_PROG_EVENT_NAME (default: _N_PROG_EVENT_SPF) is called implicitly:
Bit 0 = 1 : Part program start
Bit 1 = 1 : Part program end
Bit 2 = 1 : Operator panel reset
Bit 3 = 1 : Runup

The user program is called via the following search path:
    1. /_N_CUS_DIR/_N_PROG_EVENT_SPF
    2. /_N_CMA_DIR/_N_PROG_EVENT_SPF
    3. /_N_CST_DIR/_N_PROG_EVENT_SPF
```

20109	**PROG_EVENT_MASK_PROPERTIES**			N01	K1
-	Properties of Prog-Events			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x1	7/2

Description:

```
Parameterization of additional properties of the event-controlled program
calls (in short, Prog-Event), that is, the MD $MC_PROG_EVENT_MASK is further
parameterized.
Bit 0 = 1 :
    An ASUB started from channel status RESET does not result in a Prog-Event.
```

20110	**RESET_MODE_MASK**			C11, C03	K1
-	Definition of basic control settings after reset/PP end			DWORD	RESET
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x7FFFF	7/2
710-6a2c	-	0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1...	-	-	-/-
720-6a2c	-	0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1...	-	-	-/-
730-6a2c	-	0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1...	-	-	-/-
710-31a10c	-	0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1...	-	-	-/-
720-31a10c	-	0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1...	-	-	-/-
730-31a10c	-	0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1...	-	-	-/-
840di-basic	-	0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1...	-	-	-/-
840di-universal	-	0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1...	-	-	-/-
840di-plus	-	0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1...	-	-	-/-

Description:

```
Definition of the initial setting of the control after runup and on reset /
end-of-part-program with regard to the G codes (in particular the active plane
and the settable zero offset), tool length compensation and transformation by
setting the following bits:
```

```
Bit Hex. Meaning
    value
 0: 0x1  Reset mode
 1: 0x2  Suppress aux. funct. output on tool selection
 2: 0x4  Select reset response after POWER ON (e.g. tool offset)
 3: 0x8  Relevant only without active tool management:
    Select reset response after end of test mode with reference to active tool
    offsets.
    The bit is only relevant when bits 0 and 6 (0x41) are set.
    It defines what 'Current setting for active tool length compensation'
    refers to:
    - the program which was active at the end of test mode
    - the program which was active before test mode was switched on
 4: 0x10 Reserved!   Setting now via
 5: 0x20 Reserved!   $MC_GCODE_RESET_MODE[]
 6: 0x40 Reset response "Active tool length compensation"
 7: 0x80 Reset response "Active kinematic transformation"
 8: 0x100Reset response "Coupled-motion axes"
 9: 0x200Reset response "Tangential follow-up"
10: 0x400Reset response "Synchronous spindle"
11: 0x800Reset response "Revolutional feedrate"
12: 0x1000Reset response "Geo-axis replacement"
13: 0x2000Reset response "Master value coupling"
14: 0x4000Reset response "Basic frame"
15: 0x8000Reset response "Electronic gearbox"
16: 0x10000Reset response "Master spindle"
17: 0x20000Reset response "Master tool holder"
18: 0x40000Reset response "Reference axis for G96/G961/G962"

Bits 4 to 11, 16 and 17 are only evaluated when bit 0 = 1.

Meaning of each bit:

Bit 0 (LSB) = 0 : corresponds to response of SW version 1

    Initial setting after power-up:
    - G codes acc. to $MC_GCODE_RESET_VALUES;
    - Tool length compensation not active
    - Transformation not active
    - No coupled axis groupings active
    - No tangential follow-up active
    - No axial revolutional feedrate active
    - Path revolutional feedrate with master spindle (default)

    Initial setting after reset or end of part program:
    The current settings are retained.
    When next part program is started, the following reset state is in effect:
    - G codes acc. to $MC_GCODE_RESET_VALUES;
    - Tool length compensation not active
    - Transformation not active
    - No tangential follow-up active
    - No coupled axis grouping active
    - No master value coupling active
    - No axial revolutional feedrate active
    - Path revolutional feedrate with master spindle (default)

Bit 0(LSB) = 1:
```

```
    Initial setting after power-up:
    - G codes acc. to $MC_GCODE_RESET_VALUES;
    - Tool length compensation active acc. to  $MC_TOOL_RESET_VALUE,
    $MC_CUTTING_EDGE_RESET_VALUE and $MC_SUMCORR_RESET_VALUE
    - Transformation active acc. to $MC_TRAFO_RESET_VALUE
    - Geometry axis change acc. to $MC_GEOAX_CHANGE_RESET
    - No coupled axis groupings active
    - No tangential follow-up active

    Initial setting after reset or end of part program:
    Depending on $MC_GCODE_RESET_MODE the current settings are retained for the
    G groups or the initial settings stored in $MC_GCODE_RESET_VALUES are set.

    Initial setting after reset or end of part program:
    Depending on $MC_RESET_MODE_MASK bits 6 to 7,
    the current settings are retained or the initial settings stored in the MDs
    are set for
     - tool length compensation
     - transformation.
    Depending on bits 8 and 9, the current settings of coupled motion axes or
    tangentially corrected axes are either deactivated or retained.
     - Synchronous spindle coupling configured:
    The coupling is deselected depending on the setting in
    $MC_COUPLE_RESET_MODE_1.
     - Synchronous spindle coupling not configured:
    Depending on bit 10, the copling is either deactivated or retained.
    Depending on bit 14, the basic frame is either retained or deselected.

Bit 1 = 0:
    Aux. funct. output (D, T, M) to PLC on tool selection according to MDs
    $MC_TOOL_RESET_VALUE, $MC_CUTTING_EDGE_RESET_VALUE,
    $MC_TOOL_PRESEL_RESET_VALUE and $MC_TOOL_CHANGE_MODE. With active magazine
    management, T, M are generally not output as auxiliary functions.
    The function uses its own communication in order to output T, M to the PLC.
Bit 1 = 1:
    Suppress aux. funct. output to PLC on tool selection. When
    the tool management or magazine management function is active, T, M are
    generally not output as auxiliary functions.
Bit 2 = 0:
    When tool or magazine management not active:
    - No tool offset after POWER ON active Active and programmed T depend on
    the further settings of the machine data  (bits 0, 6).
    When tool or magazine management active:
    - Not relevant.
Bit 2 = 1:
    When tool or magazine management not active:
    - If bit 0 and bit 6 = 1 (0x41), the tool offset of the last active tool in
    NCK is active after the first resedt after Power ON.
    (The value of the programmed tool depends on the value of machine data
    $MC_TOOL_PRESEL_RESET_VALUE.)
    Notice: The NCK does not know the conditions at the machine
    When tool or magazine management active:
    - Not rellevant.
```

```
Bit 3 = 0:
    With and without active tool management:
    End of test mode: "Current setting for active tool length compensation is
    retained" (bits 0 and 6 set) refers to the program which was active before
    activation (!) of test mode.
Bit 3 = 1:
    Relevant only without active tool management:
    End of test mode: "Current setting for active tool length compensation is
    retained" (bits 0 and 6 set) refers to the program which was active at the
    end of test mode. (When tool management is active, the tool on the spindle
    is generally the active tool. Exception only for $MC_CUTTING_EDGE_DEFAULT =
    -2)

Bit 4 = 0:Reserved!Setting now via
Bit 4 = 1:Reserved!$MC_GCODE_RESET_MODE[]

Bit 5 = 0:Reserved!Setting now via
Bit 5 = 1:Reserved!$MC_GCODE_RESET_MODE[]

Bit 6 = 0:
    Initial setting for active tool length compensation after reset/part pro-
    gram end acc. to $MC_TOOL_RESET_VALUE,$MC_CUTTING_EDGE_RESET_VALUE,
    $MC_USEKT_RESET_VALUE and $MC_SUMCORR_RESET_VALUE.
    If $MC_TOOL_CHANGE_MODE = 1, the tool specified in
    $MC_TOOL_PRESEL_RESET_VALUE is also preselected.
    When the tool or magazine management function is active, data
    $MC_TOOL_RESET_VALUE is not used but $MC_TOOL_RESET_NAME instead.
Bit 6 = 1:
    Current setting for active tool length compensation is retained after
    reset/end of part program.
    When the tool or magazine management function is active, the tool that is
    currentlly on the master spindle (generally=master tool holder) is selec-
    ted.
    If the tool on the master spindle is blocked, the 'blocked' status is igno-
    red.

    It must be observed that after program end, program abort either the value
    for master spindle or master tool holder programmed last in the program or
    the value defined by $MC_SPIND_DEF_MASTER_SPIND or
    $MC_TOOL_MANAGEMENT_TOOLHOLDER defines the master spindle or master tool
    holder.
    (selected via bit16 or bit17)

    For $MC_CUTTING_EDGE_DEFAULT = -2 the following applies especially:
    If a tool has been changed in onto the spindle, but a new compensation D
    has not yet been programmed, the previous tool is still active in the NCK.
    If machining is aborted in this status, e.g. with the Reset key, the com-
    pensation is determined with the smallest D number of the master spindle
    tool.

Bit 7 = 0:
    Initial setting for active transformation after reset/part program end
    according to  $MC_TRAFO_RESET_VALUE.
Bit 7 = 1:
    The current setting for the active transformation is retained after reset/
    end of part program.
```

```
Bit 8 = 0:
    Coupled axis groupings are ungrouped after reset/end of part program.
Bit 8 = 1:
    Coupled axis groupings remain active after reset/end of part program.

Bit 9 = 0:
    Tangential follow-up is switched off at reset/end of part program.
Bit 9 = 1:
    Tangential follow-up remains active after reset/end of part program.

Bit 10 = 0:
    Non-configured synchronous spindle coupling is switched off at reset/end of
    part program.
Bit 10 = 1:
    Non-configured synchronous spindle coupling remains active after reset/end
    of part program.

Bit 11 = 0:
    On reset/end of part program,  the setting data
    $SA_ASSIGN_FEED_PER_REV_SOURCE is reset to 0 for all non-active axes/spind-
    les, i.e. traversing at revolutional feedrate is cancelled and the setting
    for path and synchronous axes is reset to the master spindle (default).
Bit 11 = 1:
    The current setting for revolutional feedrate is retained after reset/end
    of part program. At the start of the part program, the setting data
    $SA_ASSIGN_FEED_PER_REV_SOURCE is reset to 0 for all non-active axes/spind-
    les, i.e. traversing at revolutional feedrate is cancelled and the setting
    for path and synchronous axes is reset to the master spindle (default).

Bit 12 = 0:
    With machine data $MC_GEOAX_CHANGE_RESET set, a changed geometry axis assi-
    gnment is cancelled with reset/end of part program. The initial setting for
    the geometry axis assignment defined in the machine data becomes active.
Bit 12 = 1:
    A changed geometry axis assignment remains active after reset/end of part
    program.

Bit 13 = 0:
    Master value couplings are cancelled with reset/end of part program.
Bit 13 = 1:
    Master value couplings remain active after reset/end of part program.

Bit 14 = 0:
    The basic frame is deselected.
Bit 14 = 1:
    The current setting of the basic frame is retained.

Bit 15 = 0:
    Active electronic gearboxes remain active after reset/end of part program.
Bit 15 = 1:
    Active electronic gearboxes are cancelled with reset/end of part program.
```

```
Bit 16 = 0:
    Initial setting for the master spindle according to
    $MC_SPIND_DEF_MASTER_SPIND.
Bit 16 = 1:
    The current setting of the master spindle (SETMS) is retained.
    With $MC_TOOL_MANAGEMENT_TOOLHOLDER=0, this bit has also an effect on the
    response of bit6.

Bit 17 = 0:
    Initial setting for the master tool holder according to
    $MC_TOOL_MANAGEMENT_TOOLHOLDER
Bit 17 = 1:
    The current setting of the master tool holder (SETMTH) is retained
    (Bit17 is relevant only with active tool or magazine management and if
    $MC_TOOL_MANAGEMENT_TOOLHOLDER> 0. Otherwise, the setting for master
    spindle bit 16 applies with active tool or magazine management. This bit
    has also an effect on the response of bit6.

Bit 18 = 0:
    Reference axis for G96/G961/G962 in accordance with MD 20100:
    $MC_DIAMETER_AX_DEF.
    When using SCC with its own spindle reset, it is recommended to set bit 18
    = 1 (also see MD 20112: $MC_START_MODE_MASK, bit 18).
Bit 18 = 1:
    Reference axis for G96/G961/G962 is retained.

Bit 19: Reserved!
(Bit 19 = 0:
    The two changeable software limit switches are deleted after reset and are
    no longer effective.
Bit 19 = 1:
    The two changeable software limit switches remain active after reset.
```

20112	START_MODE_MASK			C03	K1
-	Definition of basic control settings at NC Start			DWORD	RESET
-					
-	-	0x400,0x400,0x400, 0x400,0x400,0x400. ..	0	0x7FFFF	7/2

Description:

```
Definition of the initial setting of the control at the start of the part pro-
gram with respect to G codes (in particular, active plane and active settable
zero offset), active tool length compensation, transformation and axis cou-
plings by setting of the following bits:

Bit Meaning

 0: (LSB)  0x1   Not assigned; $MC_START_MODE_MASK is evaluated every time a
part program is started.
 1: Suppress aux. funct. output on tool selection.
 2  - Not assigned, but reserved (see corresponding bit in RESET_MODE_MASK)
 3: - Not assigned (reserved) (see corresponding bit in RESET_MODE_MASK).
 4: Start response for G code "Current plane"
 5: Start response for G code "Settable zero offset"
 6: Start response for "Active tool length compensation"
 7: Start response for "Active transformation"
 8: Start response for "Coupled-motion axes"
 9: Start response for "Tangential follow-up"
10: Start response for "Synchronous spindle"
11: - Not assigned (reserved) (see corresponding bit in RESET_MODE_MASK).
12: Start response for "Geometry axis change"
13: Start response for "Master value coupling"
14: - Not assigned (reserved) (see corresponding bit in RESET_MODE_MASK).
15: - Not assigned (reserved) (see corresponding bit in RESET_MODE_MASK).
16: Start response for "Master spindle"
17: Start response for "Master tool holder"
18: Start response for "Reference axis for G96/G961/G962"

Meaning of individual bits:

Bit 1 = 0:
    Auxiliary function output (D,T,M,DL) to PLC with tool selection according
    to the following MDs:$MC_TOOL_RESET_VALUE, $MC_CUTTING_EDGE_RESET_VALUE,
    $MC_TOOL_PRESEL_RESET_VALUE and $MC_TOOL_CHANGE_MODE.
    Note:
    With active tool or magazine management only auxiliary functions D and DL
    are output.
Bit 1 = 1:
    Suppress auxiliary function output to PLC on tool selection.
    Bit 1 is not relevant with active tool or magazine management.

Bit 2 :  Reserved (reset response after Power On)

Bit 3 :  Reserved (end of test mode)
```

```
Bit 4 = 0:
    The current setting for a G code "current plane" is retained.
Bit 4 = 1:
    Initial setting for G code "current plane" according to
    $MC_GCODE_RESET_VALUES.

Bit 5 = 0:
    The current setting for G code "settable zero offset" is retained.
Bit 5 = 1:
    Initial setting for G code "settable zero offset" according to
    $MC_GCODE_RESET_VALUES.

Bit 6 = 0:
    The current setting for the active tool length compensation is retained.
    With active tool or magazine management, the tool currently on the active
    tool holder (spindle) is always selected.
    If the tool that is currently on the spindle is blocked, it is automati-
    cally replaced by a suitable spare tool.
    If such a spare tool does not exist, an alarm is output.
Bit 6 = 1:
    Initial setting for active tool length compensation according to
    $MC_TOOL_RESET_VALUE, $MC_CUTTING_EDGE_RESET_VALUE, $MC_USEKT_RESET_VALUE
    and $MC_SUMCORR_RESET_VALUE.
    If $MC_TOOL_CHANGE_MODE == 1, the tool selected via
    $MC_TOOL_PRESEL_RESET_VALUE s preselected in addition.
    With active tool or magazine management, MD $MC_TOOL_RESET_VALUE is not
    used, but $MC_TOOL_RESET_NAME instead.

Bit 7 = 0:
    The current setting for the active transformation is retained.
Bit 7 = 1:
    Initial setting for active transformation after reset/ end of part program
    according to $MC_TRAFO_RESET_VALUE.

Bit 8 = 0:
    Coupled axis groupings remain active.
Bit 8 = 1:
    Coupled axis groupings are ungrouped.

Bit 9 = 0:
    Tangential follow-up remains active.
Bit 9 = 1:
    Tangential follow-up is switched off.

Bit 10 = 0:
    Non-configured synchronous spindle coupling remains active.
Bit 10 = 1:
    Non-configured synchronous spindle coupling is switched off.

Bit 11 :   Reserved (revolutional feedrate)

Bit 12 = 0:
    A changed geometry axis assignment remains active when the part program is
    started.
Bit 12 = 1:
    When the machine data $MC_GEOAX_CHANGE_RESET is set, a changed geometry
    axis assignment is deleted when the part program is started.
```

```
Bit 13 = 0:
    Master value couplings remain active.
Bit 13 = 1:
    Master value couplings are cancelled.

Bit 14 :   Reserved (basic frame)

Bit 15 = 0:
    Active electronic gearboxes remain active.
Bit 15 = 1:
    Active electronic gearboxes are cancelled.

Bit 16 = 0:
    The current setting of the master spindle (SETMS) is retained.
Bit 16 = 1:
    Initial setting for the master spindle according to
    $MC_SPIND_DEF_MASTER_SPIND.

Bit 17 = 0:
    The current setting of the master tool holder (SETMTH) is retained (rele-
    vant only with active tool or magazine management)
Bit 17 = 1:
    Only if $MC_TOOL_MANAGEMENT_TOOLHOLDER> 0: Inital setting for the master
    tool holder according to  $MC_TOOL_MANAGEMENT_TOOLHOLDER.
    Otherwise, the setting for the master spindle applies.

Bit 18 = 0:
    Reference axis for G96/G961/G962 in accordance with MD20100
    $MC_DIAMETER_AX_DEF.
    When using SCC with its own spindle reset it is recommended to set bit 18 =
    1 (see also MD 20110: $MC_RESET_MODE_MASK, Bit 18).
Bit 18 = 1:
    Reference axis for G96/G961/G962 is retained.
```

20114	**MODESWITCH_MASK**			C03	K1
-	Interruption MDA by mode change			DWORD	RESET
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0xFFFF	7/2

Description:

```
After program interruption in MDI mode (e.g. in order to carry out a measure-
ment on the workpiece and to correct the tool wear values or after tool brea-
kage) the tool can be manually withdrawn from the contour by changing into JOG
mode.
In this case, the control stores the coordinates of the position of the inter-
ruption and indicates the path differences traversed by the axes in JOG mode
as "Repos offset". When MDI mode is selected again, the axis is repositioned
on the contour. This response can be canceled by means of this machine data.

Bit 0 (LSB)= 0:
    When MDI (JOG, JOGREF, JOGREPOS, MDIREF and MDIREPOS) are deselected in
    stopped status, the system ASUB Repos is selected.
```

```
Bit 0 (LSB) = 1:
    When MDI (JOG, JOGREF, JOGREPOS, MDIREF and MDIREPOS) are deselected in
    stopped status, the system ASUB Repos is not selected.
Bit 1 (LSB) = 0:
    If the NCK stops at a part program block in the program execution in which
    repositioning is not possible, alarm 16916 is generated if an attempt is
    made to switch to manual mode.
Bit 1 (LSB) = 1:
    If the NCK stops at a part program block in the program execution in which
    repositioning is not possible, no alarm is generated if an attempt is made
    to switch to manual mode.
```

20116	**IGNORE_INHIBIT_ASUP**			C01	K1
-	Execuite interrupt program despite read-in disable			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
In spite of the set read-in disable, an assigned user ASUB is completely exe-
cuted for the interrupt channel with the set bit.
Bit 0 is assigned to interrupt channel 1.
Bit 1 is assigned to interrupt channel 2, etc.

Related to:
    IGNORE_SINGLEBLOCK_ASUP
```

20117	**IGNORE_SINGLEBLOCK_ASUP**			C01	K1
-	Execute interrupt program completely despite single block			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
In spite of the set single-block processing mode, an assigned user ASUB is
completely executed for the relevant channel with the set bit.
Bit 0 is assigned to interrupt channel 1.
Bit 1 is assigned to interrupt channel 2, etc.
The MD is only active with single block type 1.

Related to:
    IGNORE_INHIBIT_ASUP
```

20118	**GEOAX_CHANGE_RESET**			C03	K1
-	Enable automatic geometry axis change			BOOLEAN	RESET
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

```
0:  The current configuration of the geometry axes remains unchanged on reset
and on part program start. With this setting, the response is identical to
older software versions without geometry axis replacement.

1:  The configuration of the geometry axes remains unchanged on reset or part
program end, depending on MD 20110: RESET_MODE_MASK and, on part program
start, depending on MD 20112: START_MODE_MASK or is switched to the initial
state defined by MD 20050: AXCONF_GEOAX_ASSIGN_TAB.

Related to:
    MD 20050: AXCONF_GEOAX_ASSIGN_TAB
    MD 20110: RESET_MODE_MASK
    MD 20112: START_MODE_MASK
```

20120	**TOOL_RESET_VALUE**			C03	K1
-	Tool with length compens. during runup (reset/part program end).			DWORD	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	32000	7/2

Description:

```
Definition of tool for which tool length compensation is selected during runup
or on reset or part program end as a function of MD 20110: RESET_MODE_MASK
and, on part program start, depending on MD 20112: START_MODE_MASK.
MD irrelevant for:
    MD 20110: RESET_MODE_MASK, bit 0 = 0
```

20121	**TOOL_PRESEL_RESET_VALUE**			C03	FBW,K1
-	Preselected tool on RESET			DWORD	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	32000	7/2

Description:

```
Definition of preselected tool for which tool length compensation is selected
during runup or on reset or part program end as a function of MD 20110:
RESET_MODE_MASK and, on part program start, depending on MD 20112:
START_MODE_MASK.
The MD is valid only without tool management.
MD irrelevant for:
    MD 20110: RESET_MODE_MASK, bit 0 = 0
    MD 22550: TOOL_CHANGE_MODE = 0
```

20122	**TOOL_RESET_NAME**			C03	FBW
-	Active tool at RESET/START with tool management			STRING	RESET
-					
-	-		-	-	7/2

Description:

```
This MD is used only with active tool or magazine management (i.e.
$MN_MM_TOOL_MANAGEMENT_MASK / $MC_TOOL_MANAGEMENT_MASK, with bit0=1 each time)
and the setting which indicates that init blocks are to be processed
($MC_TOOL_MANAGEMENT_MASK, bit10=1 -'H4000'-).

Definition of tool for which tool length compensation is selected during runup
or on reset or part program end as a function of $MC_RESET_MODE_MASK (see bits
0, 6)  and, on part program start, depending on $MC_START_MODE_MASK (see bit
6).
If $MC_TOOL_RESET_NAME="" applies, this has the same content as the program-
ming of T0, if a tool is on the tool holder at that moment.

Related to:
    MD 20110: RESET_MODE_MASK,
    MD 20112: START_MODE_MASK
    MD 20124: TOOL_MANAGEMENT_TOOLHOLDER
    MD 20130: CUTTING_EDGE_RESET_VALUE

References:
    Description of Functions: Coordinate Systems (K2)
```

20123	**USEKT_RESET_VALUE**			C03	-
-	Preselected value of $P_USEKT on RESET			DWORD	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	0xF	7/2

Description:

```
The system variable $P_USEKT is set with the value of this MD:

-   after run-up:
    depending on  $MC_START_MODE_MASK

-   after RESET or part program end:
    depending on $MC_RESET_MODE_MASK
```

20124	TOOL_MANAGEMENT_TOOLHOLDER			C03	FBW
-	Tool holder number			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	20	7/2

Description:

```
This MD is only relevant with tool management active.
The TM must know on which tool holder a tool has to be loaded.
The data is only evaluated if the value is greater than zero.
Then the numbers $TC_MPP5 are no longer regarded as spindle numbers but as
tool holder numbers.
The automatic address extension of T and of M=6 is then the value of this
machine data and no longer the value of $MC_SPIND_DEFMASTER_SPIND.
The MD defines the master tool holder number to which a tool preparation or a
tool change refers.
Reference is also made to this value for the determination of the tool on the
tool holder for the setting 'retain old offset' of MD $MC_RESET_MODE_MASK.
If a machine has several tool holders, but no defined master spindle then the
MD serves as a default value for determining the tool holder on which the tool
is to be loaded during a tool change (reset, start, T='identifier', M6).

When defining the magazine locations of an internal magazine (see documenta-
tion for TM), locations of the type 'SPINDEL' - $TC_MPP1=2 = spindle location
can be given a 'location kind index' ($TC_MPP5). This assigns the location to
a concrete tool holder.
The tool holder with the number n can be declared the master tool holder with
the language command SETMTH(n). That is, the offsets of a tool which is loa-
ded in a provisional buffer memory location of the type 'SPINDLE' and with the
value $TC_MPP5=n, corrects the tool path .

Tool change on 'SPINDLE' locations with $TC_MPP5 unequal to the number of the
master tool holder do not influence the path.
The tool holder defined in the MD is again declared as the master tool holder
with SETMTH.

Related to:
    MD 20110: RESET_MODE_MASK,
    MD 20112: START_MODE_MASK
    MD 20122: TOOL_RESET_NAME
    MD 20130: CUTTING_EDGE_RESET_VALUE

References:
    Description of Functions: Coordinate Systems (K2)
```

20125	**CUTMOD_ERR**			C08	-
-	Error handling for function CUTMOD			DWORD	SOFORT
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

```
When function CUTMOD becomes active (through explicit call or tool selec-
tion), various error conditions may occur. For any of these error conditions
it can be set with this machine data whether the error shall trigger an alarm
and, if so, whether such an alarm shall only be displayed (warning) or whe-
ther the interpretation of the part program shall be aborted.
Two machine data bits are assigned to each error condition (see also the
description of alarm 14162).

Bit Hex. Meaning
    Value
--------------------------------
0   0x1  Display error "Invalid cutting direction"
1   0x2  Program stop after error "Invalid cutting direction"
2   0x4  Display error "Undefined cutting angles"
3   0x8  Progam stop after error "Undefined cutting angles"
4   0x10 Display error "Invalid clearance angle"
5   0x20 Progam stop after error "Invalid clearance angle"
6   0x40 Display error "Invalid holder angle"
7   0x80 Progam stop after error "Invalid holder angle"
8   0x100Display error "Invalid insert angle"
9   0x200Progam stop after error "Invalid insert angle"
10  0x400Error "Invalid combination of cutting edge position and holder angle"
11  0x800Progam stop after error "Invalid combination of cutting edge position
and holder angle"
12  0x1000Display error "Invalid rotation"
13  0x2000Progam stop after error "Invalid rotation"
```

20126	**TOOL_CARRIER_RESET_VALUE**			C03	W1
-	Active tool holder on RESET			DWORD	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
Definition of tool holder for which tool length compensation is selected
during runup or on reset or part program end as a function of
$MC_RESET_MODE_MASK and, on part program start, depending on
$MC_START_MODE_MASK. This machine data is valid only without tool management.

References:
    /FBW/, Tool Management
```

20127	**CUTMOD_INIT**			C08	-
-	Initialize CUTMOD after power ON			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-2	999999999	7/2

Description:

The value programmable with NC command CUTMOD is initialized automatically on power ON with the value stored in this machine data. If the value of the machine data equals -2, CUTMOD will be set to the value included in MD 20126: $MC_TOOL_CARRIER_VALUE.

20128	**COLLECT_TOOL_CHANGE**			C04	FBW,K1
-	Tool change commands to PLC after search run			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	-	-	1/1

Description:

This MD is only relevant with active magazine management ($MN_MM_TOOL_MANAGEMENT_MASK, $MC_TOOL_MANAGEMENT_MASK).
It defines whether tool change commands, tool preparation command (tool change commands in general) are output or not output to the PLC after block search with calculation.

1: Tool change commands, tool preparation commands are gathered and output to the PLC with program start after reaching of the search target
0: All tool/magazine-specific commands that have been gathered during block search are not output to the PLC with a subsequent program start! That means that programmed POSM, TCI, TCA commands are not output either.

Note 1:
Without active magazine management, the tool change M code is not gathered if it is not assigned to an auxiliary function group. With active magazine management, this corresponds to MD value = 0
Note 2:
Value = 0 is appropriate, for example if, after reaching of the search target, the gathered tool change commands are output to the PLC in an ASUB by means of the GETSELT, GETEXET commands

20130	CUTTING_EDGE_RESET_VALUE			C03	K1
-	Tool edge with length compens. during runup (reset/ end of pp)			DWORD	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0	0	32000	7/2

Description:

```
Definition of cutting edge for which tool length compensation is selected
during runup or on reset or part program end as a function of MD 20110:
RESET_MODE_MASK and, on part program start, depending on MD 20112:
START_MODE_MASK.
With active tool management and with the selection bit 0 and bit 6 are set in
$MC_RESET_MODE_MASK,  the last offset of the active tool at power OFF - as a
rule the  tool on the spindle - is effective after runup.

MD irrelevant for:
    MD 20110: RESET_MODE_MASK, bit 0 = 0
```

20132	SUMCORR_RESET_VALUE			C03	W1
-	Effective resulting offset on RESET			DWORD	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0	0	6	7/2

Description:

```
Definition of the resulting offset with which the tool length compensation is
selected in the runup and on reset or part program end as a function of
machine data $MC_RESET_MODE_MASK and, on part program start, depending on
machine data $MC_START_MODE_MASK.
The machine data $MN_MAX_SUMCORR_PERCUTTING_EDGE determines the maximum use-
ful value which can be entered.
```

20140	TRAFO_RESET_VALUE			C03	K1
-	Transformation data block selected during runup (reset/pp end)			BYTE	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0	0	10	7/2

Description:

```
Definition of transformation data block which is selected during runup and on
reset or part program end as a function of MD 20110: RESET_MODE_MASK and, on
part program start, depending on MD 20112: START_MODE_MASK.
Number of transformation data block (1...10) corresponding to MD TRAFO_TYPE_1
to TRAFO_TYPE_10.

MD irrelevant for: MD 20110:
    RESET_MODE_MASK, bit 0 = 0
```

20144	TRAFO_MODE_MASK			C07	M1
-	Function selection of kinematic transformation			BYTE	RESET
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x01	7/2

Description:

```
Selects certain functionality of kinematic transformation by setting the fol-
lowing bits:

Bit 0 = 0:
    Default behavior.

Bit 0 = 1:
    Transformation as defined in $MC_TRAFO_RESET_VALUE is persistent, i. e. it
    is also selected with TRAFOOF and not shown in the display. It requires
    that transformation as defined in $MC_TRAFO_RESET_VALUE is selected auto-
    matically after RESET and START via $MC_RESET_MODE_MASK and
    $MC_START_MODE_MASK, i. e.:
    $MC_RESET_MODE_MASK bit 0 = 1 and bit 7 = 0,
    $MC_START_MODE_MASK bit 7 = 1
    $MC_GEOAX_CHANGE_RESET = TRUE
```

20150	GCODE_RESET_VALUES			C11, C03	K1,G2,F2
-	Initial setting of G groups			BYTE	RESET
-					
-	60	2, 0, 0, 1, 0, 1, 1, 1, 0, 1, 0, 1, 2, 1, 2, 1, 1, 1, 1, 1, 1...	-	-	7/2

Description:

```
Definition of G codes which become active on runup and reset or at part pro-
gram end depending on MD 20110 RESET_MODE_MASK (up to software version 4) and
MD 20152: GCODE_RESET_MODE (from software version 5) and at part program start
depending on MD 20112 START_MODE_MASK.
The index of the G codes in the respective groups must be programmed as the
default value.
For a list of the G groups with the G functions they contain, please refer to
References:
    /PG/, Programming Manual, Fundamentals

Title                                                Group          Default
setting on 840D/810D/ FM-NC
GCODE_RESET_VALUES[0]         1                  2 (G01)
GCODE_RESET_VALUES[1]         2                  0 (inactive)
GCODE_RESET_VALUES[2]         3                  0 (inactive)
GCODE_RESET_VALUES[3]         4                  1 (START FIFO)
GCODE_RESET_VALUES[4]         5                  0 (inactive)
GCODE_RESET_VALUES[5]         6                  1 (G17)
GCODE_RESET_VALUES[6]         7                  1 (G40)
GCODE_RESET_VALUES[7]         8                  1 (G500)
GCODE_RESET_VALUES[8]         9                  0 (inactive)
```

```
GCODE_RESET_VALUES[9]       10                  1 (G60)
GCODE_RESET_VALUES[10]     11                  0 (inactive)
GCODE_RESET_VALUES[11]     12                  1 (G601)
GCODE_RESET_VALUES[12]     13                  2 (G71)
GCODE_RESET_VALUES[13]     14                  1 (G90)
GCODE_RESET_VALUES[14]     15                  2 (G94)
GCODE_RESET_VALUES[15]     16                  1 (CFC)
GCODE_RESET_VALUES[16]     17                  1 (NORM)
GCODE_RESET_VALUES[17]     18                  1 (G450)
GCODE_RESET_VALUES[18]     19                  1 (BNAT)
GCODE_RESET_VALUES[19]     20                  1 (ENAT)
GCODE_RESET_VALUES[20]     21                  1 (BRISK)
GCODE_RESET_VALUES[21]     22                  1 (RTCPOF)
GCODE_RESET_VALUES[22]     23                  1 (CDOF)
GCODE_RESET_VALUES[23]     24                  1 (FFWOF)
GCODE_RESET_VALUES[24]     25                  1 (ORIWKS)
GCODE_RESET_VALUES[25]     26                  2 (RMI)
GCODE_RESET_VALUES[26]     27                  1 (ORIC)
GCODE_RESET_VALUES[27]     28                  1 (WALIMON)
GCODE_RESET_VALUES[28]     29                  1 (DIAMOF)
GCODE_RESET_VALUES[29]     30                  1 (COMPOF)
GCODE_RESET_VALUES[30]     31                  1 (inactive)
GCODE_RESET_VALUES[31]     32                  1 (inactive)
GCODE_RESET_VALUES[32]     33                  1 (FTCOF)
GCODE_RESET_VALUES[33]     34                  1 (OSOF)
GCODE_RESET_VALUES[34]     35                  1 (SPOF)
GCODE_RESET_VALUES[35]     36                  1 (PDLAYON)
GCODE_RESET_VALUES[36]     37                  1 (FNOORM)
GCODE_RESET_VALUES[37]     38                  1 SPF1)
GCODE_RESET_VALUES[38]     39                  1 (CPRECOF)
GCODE_RESET_VALUES[39]     40                  1 (CUTCONOF)
GCODE_RESET_VALUES[40]     41                  1 (LFOF)
GCODE_RESET_VALUES[41]     42                  1 (TCOABS)
GCODE_RESET_VALUES[42]     43                  1 (G140)
GCODE_RESET_VALUES[43]     44                  1 (G340)
GCODE_RESET_VALUES[44]     45                  1 (SPATH)
GCODE_RESET_VALUES[45]     46                  1 (LFTXT)
GCODE_RESET_VALUES[46]     47                  1 (G290 SINUMERIK_MODE)
GCODE_RESET_VALUES[47]     48                  3 (G462)
GCODE_RESET_VALUES[48]     49                  1 (CP)
GCODE_RESET_VALUES[49]     50                  1 (ORIEULER)
GCODE_RESET_VALUES[50]     51                  1 (ORIVECT)
GCODE_RESET_VALUES[51]     52                  1 (PAROTOF)
GCODE_RESET_VALUES[52]     53                  1 (TOROTOF)
GCODE_RESET_VALUES[53]     54                  1 (ORIROTA)
GCODE_RESET_VALUES[54]     55                  1 (RTLION)
GCODE_RESET_VALUES[55]     56                  1 (TOWSTD)
GCODE_RESET_VALUES[56]     57                  1 (FENDNORM)
GCODE_RESET_VALUES[57]     58                  1 (RELIEVEON)
GCODE_RESET_VALUES[58]     59                  1 (DYNNORM)
GCODE_RESET_VALUES[59]     60                  1 (WAPCS0)
GCODE_RESET_VALUES[60]     61                  1 (ORISOF)
                          :                   :
GCODE_RESET_VALUES[69]     70                  1 (not defined)
```

20152	GCODE_RESET_MODE			C03	K1
-	Reset response of G groups			BYTE	RESET
-					
-	60	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	1	7/2

Description:

```
This MD is only evaluated if bit 0 is set in $MC_RESET_MODE_MASK!
This MD used to determine for each entry in MD $MN_GCODE_RESET_VALUES (there-
fore for each G group) whether, in the case of a reset/part program end, the
setting according to $MC_GCODE_RESET_VALUES is taken again ( MD = 0 ), or the
current setting is retained ( MD = 1 ).

Example:
    Here the basic setting for the 6th G group (current level) is read out of
    the machine data $MC_GCODE_RESET_VALUES at each reset / part program end:
$MC_GCODE_RESET_VALUES[5]=1  ;Reset value of the 6th G group is M17
$MC_GCODE_RESET_MODE[5]=0    ;Basic setting for 6th G group corresponds, after
                             ;reset / part program end
                             ;to $MC_GCODE_RESET_VALUES[5]
However, if the current setting for the 6th G group (current level) is to be
retained after reset / part program end, then the following setting results:
$MC_GCODE_RESET_VALUES[5]=1  ;Reset value of the 6th G group is M17
$MC_GCODE_RESET_MODE[5]=1     ;Current setting for 6th G group
                             ;is retained
                             ;even after reset / part program end
```

20154	EXTERN_GCODE_RESET_VALUES			C11, C03	FBFA
-	Initial setting of G groups in ISO mode			BYTE	RESET
-					
-	31	1, 1, 1, 2, 1, 1, 1, 3, 4, 1, 1, 2, 2, 1, 3, 2, 1, 0, 1, 1, 1...	-	-	2/2

Description:

```
When an external NC programming language is used, definition of G codes which
become active on runup and reset or at part program end depending on machine
data $MC_RESET_MODE_MASK and at part program start depending on machine data
$MC_START_MODE_MASK.
The following external programming languages are possible:
    ISO2 dialect Milling
    ISO3 dialect Turning
The G group division to be used is indicated in the current SINUMERIK documen-
tations.
The following groups within the MD EXTERN_GCODE_RESET_VALUES are writable:
ISO2 dialect M:
    G group 2:  G17/G18/G19
    G group 3:  G90/G91
    G group 5:  G94/G95
    G group 6:  G20/G21
    G group 13: G96/G97
    G group 14: G54-G59
```

```
ISO3 dialect T:
    G group 2:  G96/G97
    G group 3:  G90/G91
    G group 5:  G94/G95
    G group 6:  G20/G21
    G group 16: G17/G18/G19
```

20156	**EXTERN_GCODE_RESET_MODE**			C03	K1
-	Reset response of external G groups			BYTE	RESET
-					
-	31	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	1	7/2

Description:

```
This MD is evaluated only if bit0 in $MC_RESET_MODE_MASK (see there) is set!
This MD is used to define for each entry in MD $MN_EXTERN_GCODE_RESET_VALUES
(i.e. for each G group), whether the setting as per
$MC_EXTERN_GCODE_RESET_VALUES is adopted again after a reset / part program
end ( MD = 0 ) or if the current setting is retained ( MD = 1 ).

Example for ISO dialect M:
Here, the basic setting for the 14th G group (settable zero offset) is read
out of machine data $MC_EXTERN_GCODE_RESET_VALUES after each reset / part pro-
gram end:

$MC_EXTERN_GCODE_RESET_VALUES[13]=1 ;reset value of the 14th G group
                                    ;is G54
$MC_EXTERN_GCODE_RESET_MODE[13]=0   ;basic setting for the 14th G group is
                                    ;defined  by
                                    ;$MC_EXTERN_GCODE_RESET_VALUES[13]
                                    ;after reset / part program end

However, if the current setting for the 14th G group is to be retained beyond
reset / part program end, this results in the following setting:

$MC_EXTERN_GCODE_RESET_VALUES[13]=1 ;reset value of the 14th G group
                                    ;is G54
$MC_EXTERN_GCODE_RESET_MODE[13]=1   ;current setting for the 14th
                                    ;G group is retained even after
                                    ;reset / part program end
```

20160	**CUBIC_SPLINE_BLOCKS**			EXP, C09	K1
-	Number of blocks for C spline			BYTE	POWER ON
-					
-	-	8,8,8,8,8,8,8,8,8,8,8,8,8,8,8	4	9	7/2

Description:

```
Number of motion blocks across which a spline section is calculated with the
cubic spline (CSPLINE) function.
The larger the value, the closer the generated contour is to the ideal mathe-
matical cubic spline, which in the boundary condition CUBIC_SPLINE_BLOCKS =
reaches infinity.
However, the higher the value, the longer the block search calculation time.

References:
    /PA/, Programming Guide: Fundamentals
```

20170	**COMPRESS_BLOCK_PATH_LIMIT**			C09	K1,PGA
mm	Maximum traversing distance of an NC block with compression			DOUBLE	NEW CONF
-					
-	-	1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0...	-	-	7/2

Description:

```
The machine data defines the maximum traversing length of a block that can be
compressed. Longer blocks interrupt the compression and are traversed in the
normal way.
Related to:
    MD 33100: COMPRESS_POS_TOL (maximum deviation with compression)
References:
    /PA/, Programming Guide: Fundamentals
```

20172	**COMPRESS_VELO_TOL**			C09	V1,PGA
mm/min	Max. permissible deviation of path feedrate with compression			DOUBLE	POWER ON
-					
-	-	60000.0,60000.0,60000.0,60000.0...	-	-	7/2

Description:

```
The value indicates the maximum permissible deviation for the compression for
the path feedrate. The larger the value, the more short blocks can be com-
pressed into a long block. The maximum number of compressible blocks is
limited by the size of the spline buffer.
Related to:
    $MA_COMPRESS_POS_TOL[AXn]
    $MC_COMPRESS_BLOCK_PATH_LIMIT
References:
    /PGA/, Programming Guide, Advanced
```

20178	**ORISON_BLOCK_PATH_LIMIT**			C09	K1,PGA
mm	Maximum traversing length with orientation smoothing			DOUBLE	NEW CONF
-					
-	-	20.0,20.0,20.0,20.0, 20.0,20.0,20.0...	-	-	7/2

Description:

```
The machine data defines the maximum traversing length of a block, for which
the orientation is still being smoothed with G code ORISON. Longer blocks
interrupt the smoothing and are run as programmed.
```

20180	**TOCARR_ROT_ANGLE_INCR**			C08	W1
-	Rotary axis increment of orientable tool holder			DOUBLE	NEW CONF
-					
-	2	0.0, 0.0,0.0, 0.0,0.0, 0.0,0.0, 0.0...	-	-	7/3

Description:

```
For orientable tool holders, this machine data indicates the size of the mini-
mum increment (in degrees) by which the first or second orientation axis can
be changed (e.g. for Hirth tooth systems).
A programmed or calculated angle is rounded to the nearest value resulting
from
phi = s + n * d
 with integer n.
Where
s = $MC_TOCARR_ROT_ANGLE_INCR[i]
d = $MC_TOCARR_ROT_ANGLE_OFFSET[i]
with i equal 0 for the 1st and i equal 1 for the 2nd axis.
If this machine data is equal to zero, no rounding is performed.
```

20182	**TOCARR_ROT_ANGLE_OFFSET**			C08	W1
-	Rotary axis offset of orientable tool holder			DOUBLE	NEW CONF
-					
-	2	0.0, 0.0,0.0, 0.0,0.0, 0.0,0.0, 0.0...	-	-	7/3

Description:

```
For orientable tool holders, this machine data indicates the offset of the
rotary axis if its position cannot be continuously changed.
It is only evaluated if $MC_TOCARR_ROT_ANGLE_INCR is not equal to zero.
For the precise meaning of this machine data, see the description of
$MC_TOCARR_ROT_ANGLE_INCR.
```

20184	**TOCARR_BASE_FRAME_NUMBER**			C08	W1
-	Base frame number for holding machine table offset			DWORD	NEW CONF
-					
-	-	-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1...	-1	15	7/3

Description:

This machine data indicates into which channel-specific base frame the table offset of an orientable tool holder with a rotary table is written.
This machine data must refer to a valid base frame.
If its content is less than 0 or greater than or equal to the maximum number of base frames set in MM_NUM_BASE_FRAMES, selection of a corresponding tool holder causes an alarm.

20188	**TOCARR_FINE_LIM_LIN**			C07	-
mm	Limit of linear fine offset TCARR			DOUBLE	SOFORT
-					
-	-	1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0...	-	-	7/3

Description:

Indicates for each channel the input limit for the linear fine offset values of an orientable tool holder.

20190	**TOCARR_FINE_LIM_ROT**			C07	-
degrees	Limit of rotary fine offset TCARR			DOUBLE	SOFORT
-					
-	-	1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0...	-	-	7/3

Description:

Indicates for each channel the input limit for the rotary fine offset values of an orientable tool holder.

20200	**CHFRND_MAXNUM_DUMMY_BLOCKS**			EXP, C02, C06, C09	K1
-	Empty blocks with chamfer/radii			BYTE	POWER ON
-					
-	-	3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3	0	15	7/2

Description:

Indicates the maximum number of blocks without traversing information in the compensation plane (dummy blocks) that can be programmed between two blocks with traversing information when chamfer/rounding are active.

20201	CHFRND_MODE_MASK			C09	V1
-	Chamfer/rounding behavior			DWORD	RESET
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0xFFFF	7/2

Description:

```
Determination of the chamfer/rounding behavior
Bit 0: (LSB)  Assignment of the chamfer/rounding to the preceding or follo-
wing block.
This influences:
-   The technology of the chamfer/rounding (feed, type of feed, M commands ...)
-   The execution of the blocks without movement in the active plane (e.g. M com-
    mands, movement in the applicate) before or after a modal rounding (RNDM)
Bit 1: free
    Meaning of the individual bits:
Bit 0 = 0
    Chamfer/rounding is derived from the following block (default value).
    The technology of the chamfer/rounding is determined by the following
    block. Blocks without movement (M commands) or movement only in the appli-
    cate between two movement blocks in the plane are executed before the modal
    rounding.
Bit 0 = 1:
    Chamfer/rounding is derived from the preceding block.
    The technology of the chamfer/rounding is determined by the preceding
    block. Blocks without movement (M commands) or movement only in the appli-
    cate between two movement blocks in the plane are executed after the modal
    rounding.
```

20202	WAB_MAXNUM_DUMMY_BLOCKS			C02, C06	W1
-	maximum number of blocks w/o traversing movement with SAR			BYTE	RESET
-					
-	-	5,5,5,5,5,5,5,5,5,5,5,5,5,5,5,5	0	10	7/2

Description:

```
Maximum number of blocks which can appear between the SAR (soft approach and
retraction) block and the traversing block which determines the direction of
the approach or retraction tangent.
```

20204	WAB_CLEARANCE_TOLERANCE			C06	W1
mm	Change of direction with SAR			DOUBLE	POWER ON
-					
-	-	0.01,0.01,0.01,0.01, 0.01,0.01,0.01...	-	-	7/2

Description:

In the case of smooth approach and retraction, the point defined with DISCL, from which, in the case of infeed from the initial plane, traversing is carried out at lower speed (G341) or the point in which the actual approach movement begins (G 340), must lie between the initial plane and the approach plane.

If this point lies outside this interval and the deviation is less than or equal to this machine data, it is assumed that the point lies in the approach or retraction plane.

If the deviation is greater, then alarm 10741 is output.

Example:
An approach is made from position Z = 20. The SAR plane is at Z = 0. The point defined by DISCL must therefore lie between these two values. If it lies between 20.000 and 20.010 or between 0 and -0.010, it is assumed that the value 20.0 or 0.0 was programmed (under the condition that the MD has the value 0.010). The alarm is output if the position is greater than 20.010 or less than -0.010.

20210	CUTCOM_CORNER_LIMIT			C08, C06	W1
degrees	Maximum angle f. compensation blocks in tool radius compensation			DOUBLE	RESET
-					
-	-	100.,100.,100.,100., 100.,100.,100....	0.0	150.	7/2

Description:

Where outer corners are very pointed, G451 can result in long idle paths. The system therefore switches automatically from G451 (intersection) to G450 (transition circle, with DISC where appropriate) when the outer corners are very pointed. The contour angle which can be traversed following this automatic switchover (intersection ---> transition circle) can be defined in CUTCOM_CORNER_LIMIT.

20220	**CUTCOM_MAX_DISC**			C08, C06	W1
-	Maximum value for DISC			DOUBLE	RESET
-					
-	-	50.0,50.0,50.0,50.0, 50.0,50.0,50.0...	0.0	75.0	7/2

Description:

```
The G450 transition circle cannot produce sharp outer contour corners, because
the path of the tool center point through the transition circle is controlled
so that the cutting edge stops at the outer corner (programmed position).
Where sharp outer corners are to be machined with G450, the DISC instruction
can be used in the program to program an overshoot. This transforms the tran-
sition circle into a conic section and the cutting edge lifts off from the
outer corner.

The value range of the DISC instruction extends from 0 to theoretically 100 in
steps of 1.
DISC = 0      ...Overshoot disabled, transition circle active
DISC = 100  ...Overshoot large enough to theoretically produce a
               response similar to intersection (G451).

Programmed values of DISC which are higher than those stored in
CUTCOM_MAX_DISC are limited to this maximum value without output of a mes-
sage. A severely non-linear alteration in the path speed can thus be avoided.

Special cases:
    It is not generally meaningful to enter values higher than 50 in DISC.
    It is therefore not possible to enter values > 75.
```

20230	**CUTCOM_CURVE_INSERT_LIMIT**			C08, C06	W1
-	Maximum angle for calculation of intersection with TRC			DOUBLE	RESET
-					
-	-	10.,10.,10.,10.,10.,1 0.,10.,10.,10....	0.0	150.	7/2

Description:

```
Where outer corners are very flat, G450 (transition circle) and G451 (inter-
section) approximate each other more and more. In such a case, it is no lon-
ger useful to insert a transition circle. Especially with 5-axis machining, it
is not allowed to insert a transition circle at these outer corners, as this
might lead to losses in velocity during continuous-path mode (G64).

That is why the system switches automatically from G450 (transition circle,
possibly with DISC) to G451 (intersection) in the case of very flat outer cor-
ners. The contour angle (in degrees), as of which the automatic switchover
(transition circle ---> intersection) is to be carried out, can be specified
in CUTCOM_CURVE_INSERT_LIMIT.
```

20240	**CUTCOM_MAXNUM_CHECK_BLOCKS**			C08, C02	W1
-	Blocks for look-ahead contour calculation with TRC			DWORD	POWER ON
-					
-	-	4,4,4,4,4,4,4,4,4,4,4,4,4,4,4	2	-	7/2

Description:

Indicates the maximum number of blocks with traversing information at the off-set plane that are considered simultaneously for collision detection with active radius compensation.

20250	**CUTCOM_MAXNUM_DUMMY_BLOCKS**			C08, C02	W1
-	maximum number of blocks without traversing motion in TRC			DWORD	POWER ON
-					
-	-	3,3,3,3,3,3,3,3,3,3,3,3,3,3,3	-	-	7/2

Description:

During active TRC only program blocks with movements of geometry axes perpendicular to the current tool orientation are normally programmed. Nevertheless, individual intermediate blocks that do not contain such path information may also be programmed during active TRC. For example:

- Movements in the direction of tool orientation
- Movements in axes that are not geometry axes
- Auxiliary functions
- In general: Blocks that are taken over into the main run and executed there

The maximum number of intermediate blocks is defined with this MD. If the value is exceeded, alarm 10762 "Too many empty blocks between 2 traversing blocks during active tool radius compensation" is output.

Note:
Comment blocks, arithmetic blocks and empty blocks are not intermediate blocks in the sense of this MD and can therefore be programmed in any number (without an alarm being triggered).

20252	**CUTCOM_MAXNUM_SUPPR_BLOCKS**			EXP, C01, C08, C02	W1
-	Maximum number of blocks with compensation suppression			DWORD	POWER ON
-					
-	-	5,5,5,5,5,5,5,5,5,5,5,5,5,5,5,5	-	-	7/2

Description:

Indicates the maximum number of blocks for active tool radius compensation, in which the function "Keep radius offset constant" (CUTCONON or reprogramming of G41 / G42 during active TRC) may be active.

Note:
The restriction of the number of blocks with active CUTONON is necessary in order to carry out repositioning in this situation too. Increasing this value for the machine data can lead to an increased memory requirement for NC blocks.

20254	**ONLINE_CUTCOM_ENABLE**			EXP, C01, C08	W4
-	Real-time tool radius compensation enabled			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

This data enables online tool radius compensation. When the function is enabled, the control reserves the necessary memory space required for online tool radius compensation after POWER ON.

ONLINE_CUTCOM_ENABLE = 0:
Online tool radius compensation can be used
ONLINE_CUTCOM_ENABLE = 1:
Online tool radius compensation cannot be used

20256	**CUTCOM_INTERS_POLY_ENABLE**			C09	W1
-	Intersection procedure for polynomials is possible			BOOLEAN	POWER ON
-					
-	-	TRUE,TRUE,TRUE,TRUE,TRUE,TRUE,TRUE...	-	-	7/2

Description:

If this machine data is TRUE and tool radius compensation active, the transitions at outer corners where polynomes (splines) are involved can be treated with the intersection mode. If the machine data is FALSE, conic sections (circles) are always inserted in this case.

If the machine data is FALSE, the response is identical to that of software releases older than 4.0.

20260	**PATH_IPO_IS_ON_TCP**			EXP, C09, C05	-
-	Velocity control with spline			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	0/0

Description:

```
For SW-internal function optimization.
```

20262	**SPLINE_FEED_PRECISION**			EXP, C09, C05	-
-	Permissible rel. error of path velocity for spline			DOUBLE	POWER ON
-					
-	-	0.001,0.001,0.001,0.001,0.001,0.001...	0.000001	1.0	0/0

Description:

```
This machine data is evaluated only if MD MM_ARCLENGTH_SEGMENTS is larger than
0.
The factor indicates how large the relative error of the path velocity may be
for splines, compressor and polynomial interpolation. The smaller the factor
the more computing time is required for preprocessing.
Furthermore, more memory is required for the display of the arc length func-
tion (see MD MM_ARCLENGTH_SEGMENTS).

Example:
SPLINE_FEED_PRECISION=0.1, programmed path velocity=1000 mm/min.
The actual path velocity for polynomial and spline interpolations can then
vary in the range between 900 mm/min and 1100 mm/min.
```

20270	**CUTTING_EDGE_DEFAULT**			C11, C03	W1
-	Initial position of tool cutting edge without programming			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	-2	32000	7/2

Description:

```
Default cutting edge after tool change
If no cutting edge is programmed after a tool change, the default cutting edge
number set in CUTTING_EDGE_DEFAULT will be used.

Value
:= 0
    Initially, no cutting edge is active after a tool change.
    The cutting edge is not selected until D programming.
:= 1
    MD_SLMAXCUTTINGEDGENUMBER
    No. of cutting edge (up to P4, MD_SLMAXCUTTINGEDGENUMBER=9 is valid)
:= -1
    Cutting edge number of old tool applies also to new tool.
:= -2
    Cutting edge (correction) of old tool remains active until D is program-
    med. That means that the old tool remains the active tool until D is pro-
    grammed. In other words: the tool on the spindle remains the programmed
    tool until D is programmed.

Example:
MD: CUTTING_EDGE_DEFAULT = 1;
    After a tool change, the first cutting edge is active if no other cutting
    edge has been programmed.
```

20272	**SUMCORR_DEFAULT**			C03	W1
-	Initial position resulting offset without program			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-1	6	7/2

Description:

```
The number of the resulting offset of the cutting edge which becomes active if
a new cutting edge correction is activated without a programmed DL value being
available.
Machine data $MN_MAX_SUMCORR_PERCUTTING_EDGE determines the maximum useful
value which can be entered.
Value        Meaning
> 0            Number of the resulting offset
= 0            No resulting offset active with D programming
= 1            The resulting offset number for the previously programmed D is
used.

See also: $MC_CUTTING_EDGE_DEFAULT.
```

20310	TOOL_MANAGEMENT_MASK			C09	FBW
-	Activation of tool management functions			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0xFFFFFFF	7/2

Description:

```
Activation of tool or magazine management (TM) (only if option TM is set).
Bit-coded activation data. That is, the TM can be activated in various versi-
ons.
Comment:
    The entire tool change process is essentially composed of two commands to
    the PLC --> tool change preparation and tool change ON.These terms must be
    known if one wants to use the following setting options.
    (Tool change preparation and ON-T combine both steps from the NCK into one
    if no M6 is used for programming).
    Transport acknowledgement means that the PLC has received the tool change
    preparation or tool change ON command from the NCK. That is, the tool
    management command number output from the NCK is acknowledged by the PLC
    with the value zero (see PLC description).

Comment:
    Bits 5, 6, 7, 8 slow down the block processing sequence. Bits 7, 8 have a
    greater slowing effect than bits 5, 6.
Comment:
    Bit 18 lengthens the search procedure for a suitable tool, above all if
    there are many disabled replacement tools present.
Comment:
    Bit 19 in conjunction with set bits 5,6,7,8 slows down block processing.

Notice:
    Bits 5 and 7, or 6 and 8 can only be set alternatively.
    That is either bit 5 or bit 7; or bit 6 or bit 8.
    If bits 5 and 7 or 6 and 8 are set simultaneously then bit 5 or bit 6 will
    become active with priority over bit 7 or 8.
    (Simply formulated: The transport acknowledgement is given priority over
    the end acknowledgement.)

 Bit no.Hexadec.Meaning of set bit
    Value
 0 (LSB)0x00001Tool or magazine management active (only possible with option
release).

 1  0x00002TM monitoring functions active (only possible with option release.
If the magazine management is activated then that option is sufficient for
this function.)

 2  0x00004OEM functions, compile cycles functions can become active.

 3  0x00008Adjacent location is treated.
```

4 0x00010The PLC has the option of requesting a tool change preparation again (PLC command numbers = 2,4,5) with changed parameters. Rejected by acknowledging with status = 2, or status = 7. That is, if the PLC uses this option the tool selection is recalculated in NCK and a corresponding new command output to the PLC. If acknowledged with status=2, the tool proposed by the NCK is also disabled. If these two status numbers 2 and 7 are used although the bit has the value=0, an alarm is generated.

The PLC must not reject the tool defined by the NCK for tool selection after the first start of "block search with calculation". An alarm is generated if this is done nevertheless. The same applies if a tool selection is refused within the scope of an init block.

Programming which needs the selected T number (e.g. GETSELT) must wait until the end acknowledgement = 1 is received (or one of the acknowledgements 103, 105 that show that the T no. is defined).

5 0x00020The main run PLC synchronization with tool change ON command for the main spindle/main tool holder takes place at the same time as the transport acknowledgement to NCK (see PLC description). If bit 19 (0x80000) = 0 -> synchronization with respect to the tool command output (tool change). This means that the command is not regarded as output until the stated acknowledgement from the PLC is present in the NCK. If bit 19 (0x80000) = 1 -> Synchronization with respect to the IPO block. That is, the main run block remains active at least until the stated acknowledgement from the PLC is present in the NCK.

```
Example: Value = 1
M6    ; the next block is processed if the transport acknowledgement
     ; has been made for the tool change ON command.
X5
D2 ; latest possible time for synchronization.
    ; That is, at the time D2 is processed, the PLC must have
    ; acknowledged the two commands tool preparation,
    ; tool change ON as ended.
```

6 0x00040In the case of a tool change ON command for a secondary spindle resp. a secondary tool holder, the main run PLC synchronization takes place at the same time as the transport acknowledgement. If bit 19 (0x80000) = 0 -> Synchronization with respect to the tool command output (tool change). That is, the command is not regarded as output until the stated acknowledgement from the PLC is present in the NCK. If bit 19 (0x80000) = 1 -> Synchronization with respect to the IPO block. That is the main run block remains active at least until the stated acknowledgement from the PLC is received in the NCK.

7 0x00080The main run PLC synchronization with tool change ON command for the main spindle resp. a main tool holder does not take place until receipt of the PLC acknowledgement that the tool change ON command has finished. If bit 19 (0x80000) = 0 -> Synchronization with respect to the tool command output (tool change). This means that the command is not regarded as output until the stated acknowledgement from the PLC is present in the NCK. If bit 19 (0x80000) = 1 -> Synchronization with respect to the IPO block. That is the main run block remains active at least until the stated acknowledgement from the PLC is received in the NCK.

```
    Example: Value=1
    M6   ; the next block is processed if the end acknowledgement
    X5
    D2   ; latest possible time for synchronization.
        ; That is, at the time D2 is processed, the PLC must have
        ; acknowledged the two commands tool preparation,
        ; tool change as ended.
```

8 0x00100The main run PLC synchronization with tool change ON command for an auxiliary spindle resp. an auxiliary tool holder does not take place until receipt of the PLC acknowledgement that the tool change ON command has finished. If bit 19 (0x80000) = 0 -> Synchronization with respect to the tool command output (tool change). This means that the command is not regarded as output until the stated acknowledgement from the PLC is present in the NCK. If bit 19 (0x80000) = 1 -> Synchronization with respect to the IPO block. That is the main run block remains active at least until the stated acknowledgement from the PLC is received in the NCK.

9 0x00200This bit is only used for test purposes. Simulation of the PLC acknowledgements for tool motion and change active. It is used for testing the data transport to NCK and HMI - without the otherwise necessary PLC program. NCK gives itself the necessary acknowledgements from the PLC.

10 0x00400The tool change ON command (PLC command number= 3) is not output until a PLC preparation acknowledgement is received.

11 0x00800The tool preparation command (PLC command numbers=2,4,5) is also executed if the same tool preparation command has already been made. (Commands 4,5 contain the tool preparation)

```
    Example: (Tool change made with M6 (PLC command no.= 3):
    T="Tool1" ; tool preparation
    M6 ; Tool change
    T="Tool2" ; 1st tool preparation after M6 (for same tool holder) is always
    output to PLC
    T="Tool2" ; 2nd tool preparation is only output as command to the PLC; if
    bit 11 = 1.
    ; This tool preparation counts as the first if the state of the tool has
    changed since the previous tool preparation such that it would no longer be
    serviceable. That can, for example, be an asynchronous unloading of the
    tool. This tool preparation then attempts to select a replacement tool.
```

12 0x01000The tool preparation command (PLC command numbers=2,4,5) is also executed if the tool is already in the spindle/tool holder.

```
    T="Tool1" ; tool preparation
    M6   ; Tool change
    T="Tool1" ;Tool is already in the tool holder
    ; 1st tool preparation after M6 (for the same tool holder) is only output
    to the PLC if; bit 12 = 1.
    ; An unserviceable tool (e.g. disabled because of tool monitoring.) on the
    tool holder does not count as being on the tool holder. This tool prepara-
    tion then attempts to select a replacement tool.
    T="Tool1" ; 2. Tool preparation - the rules of bit 11 apply to the output.
```

13 0x02000This bit is only used for test purposes. Recording of the tool sequences in a diagnosis buffer. On reset, the commands are retrieved from the diagnosis buffer and stored in a file in the part program memory. The diagnosis file can be used to investigate problems in the set up of the NCK-PLC communication (of the PLC program).

14 0x04000Automatic tool change on Reset and Start as per the machine data:
$MC_TOOL_RESET_NAME,$MC_RESET_MODE_MASK,
$MC_TOOL_MANAGEMENT_TOOLHOLDER .

15 0x08000No return transport of the tool from any defined buffers if there are multiple preparation commands (Tx->Tx) during the power on process.

16 0x10000Programming T 'location number' is active, otherwise T=''identifier'.

17 0x20000Value 1 = Control of the time monitoring via the PLC. That is the PLC starts/stops the time monitoring counter.
Value = 0 standard. That is, traversing blocks unequal to G00 let the counter run.

18 0x40000Message to the PLC if the last replacement tool is loaded from a tool group.

19 0x80000Value 0 = The synchronizations defined by bits 5,6,7,8 (0x20,...0x100) refer to the TM command output.
Value 1 = The synchronizations defined by bits 5,6,7,8 (0x20,...0x100) refer to the main run block.

20 0x100000Value 0 = Standard setting: If the PLC signal 'program test active' is present, then the commands generated are not output to the PLC! NCK acknowledges the commands itself. No magazine data is changed. Tool data are not changed. Exception: The tool status of the tool activated in test mode can assume the status 'active'.
Value 1 = If the PLC signal 'program test active' is present, then the commands generated are output to the PLC. Depending upon the type of acknowledgement by the PLC, tool/magazine data can be changed in the NCK. If the acknowledgement parameters for the 'target magazine' are given the values of the 'source magazine', then there is no tool transport and thus also no data change in the NCK. Exception: The tool status of the tool activated in test mode can assume the status 'active'.

21 0x200000Value 0 = Standard setting: Ignore the tool state 'W' during tool selection (0x20 = tool is being changed).
Value 1 = Tools in the state 'W' cannot be selected by another tool change/ tool preparation command.

22 0x400000Value 0 = Standard setting
Value 1 = If the function T='location number' (bit16) is active then the tool groups are divided into subgroups. $TC_TP11 is the grouping parameter.During the transition to the replacement tool, only those tools of the group are recognized as replacement tools that have set at least one bit of the tool on the programmed location in the $TC_TP11 value.

23 0x800000Value 0 = Standard setting: TMMG selects the tool in the main run optimally and safely. That is, in a serious case of offset selection, the interpreter must wait for the end of the tool selection.
Value 1 = For simple applications. Interpreter selects the tool itself. That is there is no synchronization with the main run is required for off-set selection. (However, an 'uncorrectable' alarm may be issued if the tool becomes unserviceable after selection but before being loaded.)

24 0x1000000Value 0 = Standard setting: If the PLC commands 8 and 9 want to move a tool to a location reserved for another tool, then this is rejected with an alarm.
Value 1 = If the PLC commands 8 and 9 want to move a tool to a location reserved for another tool with 'reserved for tool from buffer' (bit value= 'H4'), then this is possible. This location reservation is removed before the execution of the motion ('reserved for new tool to be loaded' (bit value= 'H8') remains effective).

With the default setting - Bit6-9 = 0 - the synchronization is related to a tool change for main spindle/main tool holder in the block in which a cutting edge of the new tool has been selected for the first time.
The synchronization can either be made via the transport acknowledgement or via the end acknowledgement.
If the option for the tool management or magazine management is missing, bit no. 0 cannot be set.
If the option for the tool monitoring is missing, bit no. 1 cannot be set. (However, if bit no. 0 can be set, then that also gives the right to set bit no. 1.)

All functions as from bit no. 3 only become effective if bit no. 0 is set.

Examples:
TOOL_MANAGEMENT_MASK = 0x1 -> tool and/or magazine management active
TOOL_MANAGEMENT_MASK = 0x3 -> TM + tool monitoring function active
TOOL_MANAGEMENT_MASK = 0x20003 -> TM + tool monitoring function active;
PLC controls time monitoring
TOOL_MANAGEMENT_MASK = 0x2 -> tool monitoring function active without TM

20320	**TOOL_TIME_MONITOR_MASK**			C06, C09	FBW
-	Time monitoring for tool in tool holder			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	-	-	7/2

Description:

Activation of the tool time monitoring for the tool holders / spindles 1..x. As soon as the path axes are traversed (not with G00, always with G63), the tool time monitoring data of the active D compensation for the tool that is present in the selected tool holder, which is also the master tool holder, are updated.

Notice:
The time monitoring can be switched off through the PLC.

```
Notice:
   With test mode activated, the time monitoring is switched off automati-
   cally.


Bit No.         Meaning when bit is set
-----------------------------------------------------------------------------
0...x-1        Monitoring of tool in tool holder 1...x


Example: $MC_TOOL_TIME_MONITOR_MASK = 'H5' or = 'B101'.
The two tool holders with numbers 1 and 3 are generally time-monitored.
If tools are present on tool holders 1, 2, 3 and if the active tool is on mas-
ter tool holder 1, then exactly this tool is monitored, and the actual time
value of the active D compensation reduced.
If the active tool is later on tool holder 2, then it is not time-monitored,
as bit 1 (for tool holder=2) of $MC_TOOL_TIME_MONITOR_MASK is not set.

Note:
   If you are working with setting $MC_CUTTING_EDGE_DEFAULT=-2, then there can
   be programming situations, where the active tool does not equal the tool
   changed in. In this situation, the tool of the master tool holder is moni-
   tored (instead of the active tool).
   And this only, if the active D compensation number is also known to the
   tool on the tool holder. Otherwise, there will be no time monitoring.
```

20350	**TOOL_GRIND_AUTO_TMON**			C06, C09	W4
-	Activation of tool monitoring. 0/1: Monitoring off/on			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/2

Description:

```
This MD is used to define whether tool monitoring is switched on automati-
cally if tool length compensation for a grinding tool with monitoring is
selected (odd type number types 401 - 499).
TOOL_GRIND_AUTO_TMON = 1 : Automatic monitoring switched on
TOOL_GRIND_AUTO_TMON = 0 : Automatic monitoring switched off
```

20360	TOOL_PARAMETER_DEF_MASK			C09	W1
-	Definition of tool parameters			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0xFFFF	7/2

Description:

```
Definition of effects of tool parameters.


Bit no. Meaning when bit is set
-------------------------------------------------------------------------------
Bit 0: (LSB):
    For turning and grinding tools, the wear parameter of the transverse axis
    is allowed for as diameter value.
For SW 5.3 and higher:
Bit 1:
    For turning and grinding tools, the tool length component of the trans-
    verse axis is allowed for as diameter value.
Bit 2:
    If a wear component or a length component is allowed for as diameter value,
    the tool may be used only in the plane that was active when the tool was
    selected. A plane change leads to an alarm.
Bit 3:
    Zero offsets in frames in the transverse axis are allowed for as diameter
    value.
Bit 4:
    PRESET value is allowed for as diameter value
Bit 5:
    Allow for external zero offset in the transverse axis as diameter value
Bit 6:
    Read actual values of the transverse axis as diameter value (AA_IW, AA_IEN,
    AA_IBN, AA_IB, caution: but not AA_IM)
Bit 7:
    Display of all actual values of the transverse axis as diameter value inde-
    pendent of the G code of group 29 (DIAMON / DIAMOF)
Bit 8:
    Display of the distance-to-go in the WCS always as radius
Bit 9:
    During DRF handwheel travel of a transverse axis, only half the distance of
    the specified increment is traveled (on the condition that
    $MN_HANDWHEEL_TRUE_DISTANCE = 1).
Bit10:
    Activate the tool component of an active orientable tool holder even if no
    tool is active.
Bit11:
    The tool parameter $TC_DP6 is not interpreted as tool radius but as tool
    diameter.
Bit12:
    The tool parameter $TC_DP15 is not interpreted as wear of the tool radius
    but as wear of the tool diameter.
```

20370	**SHAPED_TOOL_TYPE_NO**			C01, C08	-
-	Tool type number for contour tools			DWORD	SOFORT
-					
-	4	0, 0, 0, 0,0, 0, 0, 0,0, 0, 0, 0...	-	-	7/2

Description:

Indicates for each channel max. two number ranges for tool types that are treated as forming tools. Therefore individual ranges are possible both for grinding and for turning tools.
The first range is specified by the first and the second number, the second range by the third and fourth number.
If the first number is not smaller than the second one (the same applies for the third and fourth number), no range will be defined, but two individual numbers will be specified instead.
The numbers 400 through 599 are permissible (tool type numbers for turning and grinding tools), and also value 0 (no tool type number defined).
Examples:

```
400 405  590 596 : Tool types 400-405 and 590-596 are contour tools
410 400  590 596 : tool types 400, 410 and 590-596 are contour tools
450   0  420 430 : Tool types 450 and 420-430 are contour tools
```

20372	**SHAPED_TOOL_CHECKSUM**			C01, C08	-
-	Checksum test for contour tools			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/5

Description:

Indicates for each channel whether for completion of the contour tool definition an edge must be available that includes the negative sums of tool length components and tool radius of the previous edges.

20380	**TOOL_CORR_MODE_G43G44**			C01, C08, C11	FBFA
-	Treatment of tool length compensation with G43 / G44			BYTE	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	2	7/2

Description:

This machine data determines in ISO dialect M (G43 / G44) the way in which length compensations programmed with H are processed.

```
0:  Mode A
    Tool length H always acts on the third geometry axis (usually Z)
```

```
1:  Mode B
    Tool length H acts, depending on the active plane, on one of the three geo-
    metry axes. This means with
     G17 on the 3rd geometry axis (usually Z)
     G18 on the 2nd geometry axis (usually Y)
     G19 on the 1st geometry axis (usually X)
    In this mode, compensations in all three geometry axes can be configured
    through multiple programming, i.e. through the activation of one compo-
    nent, the length compensation possibly active in another axis is not dele-
    ted.
2:  Mode C
    The tool length acts, independent of the active plane, on the axis that has
    simultaneously been programmed with H. Otherwise, the response is the same
    as with mode B.
```

20382	**TOOL_CORR_MOVE_MODE**			C01, C08	FBFA
-	Traversing of tool length compensation			BOOLEAN	RESET
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

```
This machine data determines how the tool length compensations are traversed.

0:  A tool length compensation is only traversed if the associated axis has
been programmed (behavior as in previous software versions)

1:  Tool lengths are always traversed independently of whether the associated
axes are programmed or not.
```

20384	**TOOL_CORR_MULTIPLE_AXES**			C01, C08, C11	FBFA
-	Tool length compensation in several axes simultaneously			BOOLEAN	RESET
-					
-	-	TRUE,TRUE,TRUE,TRUE,TRUE,TRUE,TRUE...	-	-	7/2

Description:

```
This machine data determines for tool length compensation in ISO dialect M
(ISO2) (G43 / G44), whether the compensation shall be allowed in mode C
(selection of the axis on which the compensation is acting by specifying the
corresponding axis letter) to act on several axes simultaneously.

If this machine data is 1, this type of programming is allowed; otherwise it
is rejected with an alarm.
```

20390	**TOOL_TEMP_COMP_ON**			C01, C08	W1
-	Activation of temperature compensation for tool length			BOOLEAN	RESET
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/2

Description:

This machine data activates the temperature compensation in tool direction (see also setting data TOOL_TEMP_COMP)

20392	**TOOL_TEMP_COMP_LIMIT**			C01, C08	W1,BAS,PG
mm	Max. temperature compensation for tool length			DOUBLE	RESET
-					
-	3	1.0, 1.0 , 1.0,1.0, 1.0 , 1.0...	-	-	7/7

Description:

With temperature compensation, this machine data indicates the maximum permissible value for the tool length for each geometry axis.
If a temperature compensation value larger than this limit value is entered, it will be limited without an alarm.

20396	**TOOL_OFFSET_DRF_ON**			C01, C08	W1
-	Handwheel override in tool direction			BOOLEAN	RESET
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/2
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

This machine data activates the handwheel override in tool direction.
When this machine data is set, a handwheel override is active in the axis that is assigned to length L1 of the active tool, in the direction defined by tool orientation.

Example:
G17 is active; the tool is a milling tool; tool length L1 is therefore assigned to the Z axis (the 3rd geometry axis).
When the tool (e.g. with active 5-axis transformation) is turned around the Y axis by 90 degrees, so that it shows in X direction, a handwheel override becomes active in the 3rd axis in the X axis.

20400	**LOOKAH_USE_VELO_NEXT_BLOCK**			EXP, C05	B1
-	LookAhead following block velocity			BOOLEAN	POWER ON
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/2

Description:

For SW-internal function optimization.

20430	**LOOKAH_NUM_OVR_POINTS**			EXP, C02, C05	B1
-	Number of override characteristics for LookAhead			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1 ,1,1,1,1,1	0	2	7/2

Description:

For SW-internal function optimization.

20440	**LOOKAH_OVR_POINTS**			EXP, C05	B1
-	Override switch points for Look Ahead			DOUBLE	POWER ON
-					
-	2	1.0, 0.2,1.0, 0.2,1.0, 0.2,1.0, 0.2...	0.2	2.0	7/2

Description:

For SW-internal function optimization.

20450	**LOOKAH_RELIEVE_BLOCK_CYCLE**			EXP, C05	B1
-	Relief factor for block cycle time			DOUBLE	POWER ON
-					
-	-	0.0,0.0,0.0,0.0,0.0,0 .0,0.0,0.0,0.0...	-	-	7/2

Description:

Block cycle problems occur for the following reason:
The traversing length of the NC blocks to be processed is so short that the Look Ahead function must reduce the machine velocity to provide enough time for block preparation. In this situation, constant deceleration and acceleration of the path motion can occur.

This machine data defines the extent to which such velocity fluctuations are to be smoothed.

Special cases:
    Values up to approx. 1.0 are appropriate.
    The value 0.0 means that the function is deactivated.

20455	**LOOKAH_FUNCTION_MASK**			EXP, C05	FBSI
-	Look Ahead special functions			BYTE	NEW CONF
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	0	1	7/2

Description:

Look Ahead special functions:
Bit 0 = 1:
    The Safety Integrated setpoint limitation is already taken into account in Look Ahead.

20460	**LOOKAH_SMOOTH_FACTOR**			EXP, C05	B1
%	Smoothing factor for Look Ahead			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.	500.0	7/2

Description:

A smoothing factor can be defined to give a more stable path velocity control. It defines the maximum permitted productivity loss.
Acceleration procedures which contribute less than this factor to a shorter program run time are then not executed.

In this case, only those acceleration procedures whose frequency lies above the frequency parameterized in MD $MA_LOOKAH_FREQUENCY are taken into account. The entry of 0.0 deactivates the function.

20462	**LOOKAH_SMOOTH_WITH_FEED**			EXP, C05	B1
-	Path velocity smoothing with programmed feed			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE,TRUE,TRUE,TRUE,TRUE...	-	-	7/2

Description:

The MD defines whether the programmed feed is also taken into account with tool path velocity smoothing. In these cases, the defined factor of MC_LOOKAH_SMOOTH_FACTOR can be met better when the override is set to 100%.

Related to:
    $MA_LOOKAH_FREQUENCY,
    $MC_LOOKAH_SMOOTH_FACTOR

20464	**PATH_MODE_MASK**			EXP, C05	-
-	Path behavior			DWORD	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	0xffff	7/2

Description:

```
This machine data is used to influence the path action

Bit0:
    If only rotary axes are traversed in the block as path axes with active
    G700, the programmed rotary axis velocity corresponds to
0:  [degrees/min]
1:  [25.4*degrees/min]
```

20465	**ADAPT_PATH_DYNAMIC**			EXP, C05	B1
-	Adaptation of path dynamic response			DOUBLE	NEW CONF
-					
-	2	1.0, 1.0,1.0, 1.0,1.0, 1.0,1.0, 1.0...	1.0	100.0	7/2

Description:

```
This adaptation factor can be used to reduce the dynamics of changes in tool
path velocity.
ADAPT_PATH_DYNAMIC[0] is effective with Brisk, reducing the permissible acce-
leration
ADAPT_PATH_DYNAMIC[1] is effective with Soft, reducing the permissible jerk
Considering only acceleration processes using a frequency above the frequency
parameterized in MD $MA_LOOKAH_FREQUENCY.
To disable this function, enter 1.0.
```

20470	**CPREC_WITH_FFW**			EXP, C06, C05	K6,B1
-	Programmable contour accuracy			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/2

Description:

```
This machine data defines the behavior of the programmable function CPRECON in
conjunction with feedforward control.

FALSE: The CPRECON function is inactive when feedforward control is activated
simultaneously.

TRUE:  CPRECON is also active with feedforward control.

Related to:
    $SC_CONTPREC, $SC_MINFEED
```

20480	**SMOOTHING_MODE**			EXP	B1
-	Behavior of smoothing with G64x			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	15344	7/7

Description:

Configuration of smoothing with G641 and G642 or G643.
The MD is decimal-coded. The units digits define the behavior of G643 and the tens digits the behavior of G642. With the hundreds digit, you can define whether, with G641 or G642, the axes are possibly accelerated within the smoothing area or traversed at constant velocity. With the thousands and ten-thousands digit, smoothing with G644 is configured.
x0: G643 uses axis-specific tolerances. They are set with the axis-specific MD MA_COMPRESS_POS_TOL.
x1: G643 uses the contour tolerance SC_SMOOTH_CONTUR_TOL for the geometry axes at smoothing. The remaining axes are smoothed by using the axis-specific tolerances MA_COMPRESS_POS_TOL.
x2: The orientation movement is smoothed by using the angular tolerance SC_SMOOTH_ORI_TOL. For all other axes, the axis-specific tolerances MA_COMPRESS_POS_TOL are used.
x3: Combination of the two possibilities 01 and 02. That means, G643 uses the tolerances SC_SMOOTH_CONTUR_TOL and SC_SMOOTH_ORI_TOL. Any further axes are smoothed with axis-specific tolerance.
x4: G643 uses the smoothing length programmed with ADIS= or ADISPOS=. Specification of possible axis-specific tolerances or the contour and orientation tolerance is ignored.

0x: G642 uses axis-specific tolerances. They are set with the axis-specific MD MA_COMPRESS_POS_TOL.
1x: G642 uses the contour tolerance for the geometry axes at smoothing. The remaining axes are smoothed by using the axis-specific tolerances MA_COMPRESS_POS_TOL.
2x: The orientation movement of G642 is smoothed by using the angular tolerance SC_SMOOTH_ORI_TOL. For all other axes, the axis-specific tolerances MA_COMPRESS_POS_TOL are used.
3x: Combination of the two possibilities 10 and 20. That means, G642 uses the tolerances SC_SMOOTH_CONTUR_TOL and SC_SMOOTH_ORI_TOL. Any further axes are smoothed with axis-specific tolerance.
x4: G642 uses the smoothing length programmed with ADIS= or ADISPOS=. Specification of possible axis-specific tolerances or the contour and orientation tolerance is ignored.

< 100:
Within the smoothing range, a profile of the limit velocity is calculated, as it results from the specified maximum values for acceleration and jerk of the axes or the path involved. This can lead to an increase of the path velocity in the smoothing range and consequently to an acceleration of the axes involved.

```
>=100:
    For smoothing blocks with G641/G642, a profile of the limit velocity is not
    calculated. Only a constant limit velocity is specified. Thus, it can be
    avoided that, during smoothing with G641/G642, the involved axes are pos-
    sibly accelerated in the smoothing range. However, this setting can pos-
    sibly lead to smoothing blocks being traversed at a velocity that is too
    low, especially with large smoothing ranges.

1xx:
    No velocity profile for G641
2xx:
    No velocity profile for G642

Possible values for the thousands digit (configuration of G644):

0xxx:
    When smoothing with G644, the maximum deviations of each axis specified in
    MD COMPRESS_POS_TOL are adhered to. If the dynamic response of the axis
    allows it, the specified tolerance is possibly not fully utilized.
1xxx:
    When smoothing with G644, the smoothing distance is specified.
2xxx:
    When smoothing with G644, the maximum occuring frequency of the smoothing
    movement of each axis will be limited. The maximum frequency is specified
    in MD $MA_LOOKAH_FREQUENCY.
3xxx:
    When smoothing with G644, neither the tolerance nor the smoothing sitance
    are monitored. Each axis traverses around a corner with the maximum pos-
    sible dynamic response. With SOFT, both the maximum acceleration and the
    maximum jerk of each axis is observed. With BRISK, the jerk is not limited;
    instead each axis traverses with the maximum possible acceleration.
4xxx:
    When smoothing with G644, the maximum deviations of each axis specified in
    MD COMPRESS_POS_TOL are adhered to. Differing from value 0xxx, the speci-
    fied tolerance is fully utilized where possible. The axis then does not
    reach its maximum possible dynamic response.
5xxx:
    When smoothing with G644, the smoothing distance is specified (ADIS or
    ADISPOS). Differing from value 1xxx, the specified smoothing distance is
    fully utilized here, if possible. The axes involved then possibly do not
    reach their maximum possible dynamic response.

Possible values for the ten-thousands digit (configuration of G644):

0xxxx:
    The velocity profiles of the axes are defined in the smoothing range wit-
    hout jerk limitiation when BRISK is active and with jerk limitation when
    SOFT is active.
1xxxx:
    The velocity profiles of the axes are defined in the smoothing range always
    with jerk limitation independent of whether BRISK or SOFT is active.

The values of the units, tens, hundreds and thousands digits are added.

Related to:
    $MA_COMPRESS_POS_TOL,
    $SC_SMOOTH_CONTUR_TOL,
    $SC_SMOOTH_ORI_TOL
```

20482	COMPRESSOR_MODE			EXP	F2,PGA
-	Mode of compressor			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	33	7/7

Description:

```
This MD is used to set the compressor operating mode.
The units digits and the tens digits have different meanings.
The following possibilities are available:

0:  With the compressor, the tolerances specified via $MA_COMPRESS_POS_TOL are
met for all axes (geometry and orientation axes).
1:  With the compressor, the contour tolerances specified via
$SC_COMPRESS_CONTUR_TOL become active for the geometry axes.
    For the orientation axes, the axis-specific tolerances $MA_COMPRESS_POS_TOL
    become active.
2:  With the compressor, the axis-specific tolerances $MA_COMPRESS_POS_TOL
become active for the geometry axes. The orientation movement is compressed
with the maximum angular deviations specified via $SC_COMPRESS_ORI_TOL and
$SC_COMPRESS_ORI_ROT_TOL being observed.
3:  With the compressor, the contour tolerance $SC_COMPRESS_CONTUR_TOL becomes
active for the geometry axes and the maximum angular deviation
$SC_COMPRESS_ORI_TOL or $SC_COMPRESS_ORI_ROT_TOL for the orientation axes.

The tens digits of this MD can be used to set a compressor response that is
compatible with previous software releases (< SW 6.3).

0x: All blocks with orientations and value assignments are compressed.
    This is the default setting.
    Notice: This response is incompatible with previous software releases!

1x: Blocks with value assignments are not compressed (e.g. X=100 ... etc.)

2x: Blocks with a programmed tool orientation are not compressed.
    (e.g. A3= B3= C3=).

3x: All blocks with value assignments and/or programmed tool orientation are
not compressed. With this setting, the response is fully compatible with pre-
vious software releases (< 6.3).
```

20484	COMPRESSOR_PERFORMANCE			EXP	PGA
-	Compressor power			BYTE	RESET
-					
-	-	9,9,9,9,9,9,9,9,9,9,9,9,9,9,9,9	0	9	0/0

Description:

```
This MD is used to set the compressor power. Higher values ensure better sur-
faces, but also require a higher computer power. The correct value is prespe-
cified for each NCU. For this reason, this MD should only be modified in
exceptional cases.
```

20488	**SPLINE_MODE**			EXP	-
-	Setting for spline interpolation			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	7	7/7

Description:

This MD is used to determine the settings for spline interpolation. The allocation of the spline segments to the NC blocks can thus be influenced. With spline interpolation, the spline blocks are combined, if possible, in such a way, that there are no blocks that are too short and could lead to a reduction in the possible path velocity.

Bit 0: With BSPLINE, blocks that are too short are avoided.
Bit 1: With BSPLINE/ORICURVE, blocks that are too short are avoided.
Bit 2: With CSPLINE, blocks that are too short are avoided.

20490	**IGNORE_OVL_FACTOR_FOR_ADIS**			EXP	-
-	G641/G642 independent of overload factor			BOOLEAN	NEW CONF
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/2

Description:

A block transition is normally only smoothed with G641 and G642 when the tool path velocity at block transition is reduced due to the set overload factor (MD $MA_MAX_ACCEL_OVL_FACTOR). When SOFT is active, the maximum jerk at block transitions is limited additionally by machine data $MA_PATH_TRANS_JERK_LIM. This means that the effect of smoothing with G641 and G642 depends on the set values for the overload factor and possibly for the maximum jerk.

By setting MD $MC_IGNORE_OVL_FACTOR_FOR_ADIS = TRUE, you can achieve that a block transition is smoothed with G641 and G642 independent of the set values for the overload factor.

20500	CONST_VELO_MIN_TIME			EXP, C05	B2
s	Minimum time with constant velocity			DOUBLE	POWER ON
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.0	0.1	7/2

Description:

Defines the minimum time for constant velocity during transition from acceleration to deceleration in short blocks in which the set velocity cannot be reached. Entering a time of at least several IPO cycles prevents a direct transition from the acceleration to the deceleration phase and thus reduces the acceleration jump to half. This acceleration limitation is only active with the acceleration profile BRISK.

MD irrelevant for:
Look Ahead does not take account of this function.

20550	EXACT_POS_MODE			EXP	B1
-	Exact stop conditions on G00/G01.			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	33	7/2

Description:

Configuration of the exact stop conditions for G00 and other G codes of the 1st G code group.
The MD is decimal-coded. The units digits define the behavior at G00 (infeed motion) and the tens digits the behavior of all the other G codes of the 1st group ("machining G codes").
x0: At G00, the relevant programmed exact stop conditions become active.
x1: At G00, G601 (fine positioning window) becomes active independent of the programmed exact stop condition.
x2: At G00, G602 (coarse positioning window) becomes active independent of the programmed exact stop condition.
x3: At G00, G603 (setpoint value reached) becomes active independent of the programmed exact stop condition.

0x: At the machining G codes, the relevant programmed exact stop conditions become active.
1x: At the machining G codes, G601 (fine positioning window) becomes active independent of the programmed exact stop condition.
2x: At the machining G codes, G602 (coarse positioning window) becomes active independent of the programmed exact stop condition.
3x: At the machining G codes, G603 (setpoint value reached) becomes active independent of the programmed exact stop condition.
The values of the units digits and tens digits are added.

For example, the value of EXACT_POS_MODE = 2 means that the exact stop condition G602 is always activated automatically at G00, independently of which exact stop condition was programmed. At all other G codes of group 1, the programmed exact stop condition becomes active.

20552	**EXACT_POS_MODE_G0_TO_G1**			EXP	PG
-	Exact stop condition at G00-G01 transition			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	5	7/2

Description:

```
Configuration of a stop at transition from G00 to a different G code of the
1st G code group, and also vice versa, at transition from non-G00 to G00 in
continuous-path mode.
In exact-stop mode, the positioning window programmed or set in
$MC_EXACT_POS_MODE is used.
The following applies:
0:  No additional stop, no control of exact stop
1:  Behavior active as with G601 (positioning window, fine).
2:  Behavior active as with G602 (positioning window, coarse).
3:  Behavior active as with G603 (setpoint reached).

4:  As 0,
    in addition, the override of the subsequent non-G00 block is taken into
    account in the G00 block via LookAhead in the case of a change from G00 to
    non-G00.

5:  As 0,
    in addition, the override of the subsequent block is taken into account via
    LookAhead in the case of a change from G00 to non-G00 and non-G00 to G00.
```

20600	**MAX_PATH_JERK**			C05	B2
m/s³	Path-related maximum jerk			DOUBLE	NEW CONF
-					
-	5	100., 100., 100., 100., 100....	1.e-9	-	7/2

Description:

```
The jerk limitation restricts the path acceleration change in SOFT mode. The
path acceleration divided by the jerk limitation value produces a time in
which the acceleration change takes place.
The jerk limitation is activated on the path by the NC command SOFT, and deac-
tivated by BRISK.
MD irrelevant for:
    Error states that lead to a rapid stop. In addition, the limitation is also
    inactive for positioning axes.

There is an entry for each dynamic G code group.
```

20602	**CURV_EFFECT_ON_PATH_ACCEL**			EXP, C05	B1
-	Effect of path curvature on path dynamic			DOUBLE	NEW CONF
-					
-	5	0., 0., 0., 0., 0.,0., 0., 0., 0., 0....	0.	0.95	7/2

Description:

```
This MD is used to determine whether the reaction of path curvature on path
acceleration and path velocity is taken into account

  0:
    Not taken into account
> 0:
    If required, path velocity and path acceleration are reduced to keep a suf-
    ficient reserve on the machine axes for centripetal acceleration.
    0.75: Recommended setting.
$MC_CURV_EFFECT_ON_PATH_ACCEL indicates the share of the axis accelerations
(see $MA_MAX_AX_ACCEL[..]), which can be used for centripetal acceleration.
The remainder is used for changes in path velocity.
Centripetal acceleration is not required for linear blocks; therefore, full
axis acceleration is available for path acceleration. On slightly curved con-
tours or with a sufficiently low maximum path feedrate
$MC_CURV_EFFECT_ON_PATH_ACCEL has no full or no effect at all. Correspondin-
gly, path acceleration is higher than specified via (1. -
$MC_CURV_EFFECT_ON_PATH_ACCEL) * $MA_MAX_AX_ACCEL[..].

There is an entry for each dynamic G code group.
```

20603	**CURV_EFFECT_ON_PATH_JERK**			EXP, C05	B1
-	Effect of path curvature on path jerk			DOUBLE	NEW CONF
-					
-	5	0., 0., 0., 0., 0.,0., 0., 0., 0., 0....	0.	1000.	7/2

Description:

```
Allows the reaction of the path curvature on the path jerk to be taken into
account on especially jerk-sensitive machines.

Entry for each dynamic G code group.
```

20610	**ADD_MOVE_ACCEL_RESERVE**			C05	K1,B1,B2
-	Acceleration margin for overlaid movements			DOUBLE	POWER ON
-					
-	-	.2,.2,.2,.2,.2,.2,.2,.2,.2, .2,.2,.2,.2,.2...	0.	0.9	7/2

Description:

```
This machine data contains the factor which defines the acceleration margin
which is not used by a path movement in order to provide sufficient accelera-
tion reserves for an overlaid movement for the velocity control.
A factor of 0.2 means that the path axes utilize 80% of the path acceleration
in normal operation. Only when a request for overlaid movement is made, can
100% of the path acceleration be utilized.

MD irrelevant for:
    Error states that lead to a rapid stop. In addition, the limitation is also
    ineffective for positioning axes.

Special cases:
    At the moment the machine data is only taken into account if the function
    "Fast retraction" is first activated.

Related to:
    MD 32300: MAX_AX_ACCEL (axis acceleration)
```

20620	**HANDWH_GEOAX_MAX_INCR_SIZE**			C08, C06	H1
mm	Limitation handwheel increment for geometry axes			DOUBLE	POWER ON
-					
-	-	0.0,0.0,0.0,0.0,0.0,0 .0,0.0,0.0,0.0...	-	-	7/2

Description:

```
> 0: Limitation of the size of the selected increment for geometry axes
    $MN_JOG_INCR_SIZE0[<increment/VDI signal>] or
    $SN_JOG_VAR_INCR_SIZE for geometry axes

 0: No limitation on geometry axes
```

20621	HANDWH_ORIAX_MAX_INCR_SIZE			C08, C06	F2
degrees	Limiting of handwheel increment for orientation axes			DOUBLE	POWER ON
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/2

Description:

```
> 0: Limitation of the size of the selected increment for orientation axes
    $MN_JOG_INCR_SIZE[<increment/VDI signal>] or
    $SN_JOG_VAR_INCR_SIZE for orientation axes

= 0:  No limitation on orientation axes
```

20622	HANDWH_GEOAX_MAX_INCR_VSIZE			C08, C06, C05	H1
mm/min	Path velocity override			DOUBLE	POWER ON
-					
-	-	500.,500.,500.,500.,500.,500.,500....	-	-	7/2

Description:

```
The following applies to the velocity override of the path:

> 0: Limitation of the size of the selected increment
    ($MN_JOG_INCR_SIZE_[<increment/VDI signal>] or
    $SN_JOG_VAR_INCR_SIZE) / 1000*IPO sampling time
= 0: No limitation
```

20623	HANDWH_ORIAX_MAX_INCR_VSIZE			C08, C06, C05	F2
rev/min	Orientation velocity overlay			DOUBLE	POWER ON
-					
-	-	0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1...	-	-	7/2

Description:

```
For the orientation velocity overlay:

> 0: Limitation of the size of the selected increment
    ($MN_JOG_INCR_SIZE[< increment/VDI signal>] or
    $SN_JOG_VAR_INCR_SIZE) / 1000 * IPO sampling time
= 0: No limitation
```

20624	HANDWH_CHAN_STOP_COND			EXP, C09	H1
-	Definition of response of handwheel travel, channel-specific			DWORD	POWER ON
-					
-	-	0x13FF,0x13FF,0x13FF,0x13FF,0x13FF...	0	0xFFFF	7/2

Description:

```
Definition of the behavior for handwheel travel to channel-specific VDI inter-
face signals (bit 0 to bit 7):

Bit = 0:
    Interruption or gathering of the displacements entered via the handwheel

Bit = 1:
    Stop of traversing and no gathering

Bit assignment

Bit  0: Mode group stop
Bit  1: Mode group stop, axes plus spindle
Bit  2: NC stop
Bit  3: NC stop, axes plus spindles
Bit  4: Feed disable (exceptions for $MA_BASE_FUNCTION_MASK bit 6)
    For bit 4 feed disable it must be considered that a PLC-controlled axis,
    for which $MA_BASE_FUNCTION_MASK bit 6 = 1, is not stopped by the feed
    disable and that no interruption and no abort is triggered here.
Bit  5: Feedrate override
Bit  6: Rapid traverse override
Bit  7: Feed stop, geometry axis

Bit 8 = 0:
    The maximum feedrate for handwheel travel is that specified in machine data
    JOG_AX_VELO of the corresponding machine axis/axes.
Bit 8 == 1:
    The maximum feedrate for handwheel travel is that specified in machine data
    MAX_AX_VELO of the corresponding machine axis/axes.

Bit 9 == 0:
    The override is active during handwheel travel
Bit 9 == 1:
    During handwheel travel, the override is assumed to be 100% independent of
    the position of the override switch.
    Exception: override 0, which is always active.

Bit 10 = 0:
    Machine data $MN_HANDWH_REVERSE is not active for DRF, i.e. handwheel tra-
    vel with DRF is carried out as if $MN_HANDWH_REVERSE == 0.
Bit 10 == 1:
    Machine data $MN_HANDWH_REVERSE is active for DRF.

Bit 11 = 0:
    When the contour handwheel is deselected, program processing is continued
    automatically.
```

```
Bit 11 = 1:
     When the contour handwheel is deselected, an NCSTOP is triggered auto-
matically. Program processing is not continued until NCSTART is entered.

Bit 12 = 0
    NC start has no effect on handwheel travel
Bit 12 = 1:
    After NC start the paths collected so far will be rejected.

Bit 13 = 0:
    For DRF, bits 0 - 3 and bit 12: bit == 0 / bit == 1 are active,
Bit 13 = 1:
    For DRF, bits 0 - 3 and bit 12 are NOT active: the DRF motion is not inter-
    rupted by a stop, and even in the 'Automatic interrupted' state (achieved
    by NC Stop), a DRF motion can be carried out.
    Note:
    If an alarm leads to an axis stop and if such an alarm is pending, no DRF
    motion can take place.

Bit 14 == 0:
    The maximum feedrate for handwheel travel  is that specified in setting
    data $SN_JOG_REV_SET_VELO or in machine data $MA_JOG_REV_VELO (for revolu-
    tional feedrate) or in $MA_JOG_REV_VELO_RAPID (for rapid traverse) of the
    corresponding machine axis, allowing for the spindle or rotary axis fee-
    drate.
Bit 14 == 1:
    The maximum feedrate for handwheel travel in the case of rotational fee-
    drate is that specified in machine data $MA_MAX_AX_VELO of the correspon-
    ding machine axis (see also bit 6).
Bit 15 == 0:
    If the geometry axis is traversed in the channel as a transverse axis, only
    half of the distance of the specified increment is traveled during hand-
    wheel travel (HANDWH_TRUE_DISTANCE == 1).
Bit 15 == 1:
    If the geometry axis is traversed in the channel as a transverse axis, the
    specified increment is fully traveled during handwheel travel
    (HANDWH_TRUE_DISTANCE == 1).
```

20700	**REFP_NC_START_LOCK**			C01, C03	R1
-	NC start disable without reference point			BOOLEAN	RESET
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/2

Description:

```
0:  The IS "NC Start" (DB21, ... DBX7.1) for starting of part programs or part
program blocks (MDI and overstore) is active even if one or all axes of the
channel has/have not yet been referenced.
    To ensure that the axes nevertheless reach the correct position after NC
    Start, the workpiece coordinate system (WCS) must be set to the correct
    value by means of other methods (scratch method, automatic zero offset
    determination, etc.).
1:  Those axes, for which the axial MD $MA_REFP_CYCLE_NR specifies that a refe-
rence point is obligate (value > -1), must have been referenced before NC
Start is allowed.
```

20730	**G0_LINEAR_MODE**			C09	P2
-	G0 interpolation mode			BOOLEAN	POWER ON
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/2

Description:

```
This machine data defines the interpolation behavior of G0:

0:  Non-linear interpolation: Every path axis interpolates as individual axis
(positioning axis) independently of the other axes at rapid traverse of the
axis ($MA_MAX_AX_VELO).

1:  Linear interpolation: The path axes are interpolated jointly. With the part
program command G0LINOF, the non-linear interpolation can be selected; with
G0LINON it can be deselected.

Related to:
    $MC_EXTERN_G0_LINEAR_MODE
```

20732	**EXTERN_G0_LINEAR_MODE**			N12	P2
-	G00 interpolation mode			BOOLEAN	POWER ON
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/2

Description:

```
This machine data defines the interpolation behavior of G00:
0: Axes are traversed as positioning axes
1: Axes interpolate with each other

Related to:
    EXTERN_INCREMENT_SYSTEM
```

20734	**EXTERN_FUNCTION_MASK**			N12	FBFA
-	Function mask for external language			DWORD	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0	0	0xFFFF	7/2

Description:

```
This machine data is used to influence functions in ISO mode.
Bit0: 0:
    ISO mode T: "A" and "C" are interpreted as axes. If contour definition has
    been programmed, "A" or "C" must be preceded by a comma.
```

```
      1:
    "A" and "C" in the part program are always interpreted as a contour defini-
    tion. An axis "A" or "C" is not allowed.

Bit1: 0:
    ISO mode T: G10 P < 100 tool geometry
                    P > 100 tool wear
      1:
                G10 P < 10000 tool geometry
                    P > 10000 tool wear

Bit2: 0:
    G04 dwell time: always [s] or [ms]
      1:
    If G95 is active, in spindle revolutions

Bit3: 0:
    Errors in ISO scanner lead to an alarm
      1:
    Errors in ISO scannner are not output, the block is transferred to the Sie-
    menstranslator.

Bit4: 0:
    G00 is traversed with the current exact stop - continuous-path mode G code
      1:
    G00 is always traversed with G09

Bit5: 0:
    Modulo rotary axis is positioned at the shortest possible distance
      1:
    Direction of rotation of modulo rotary axis depends on sign

Bit6: 0:
    Only 4-digit program number allowed.
      1:
    8-digit program number allowed. If the program number has less than 4
    digits, it is expanded to 4 digits with 0.

Bit7: 0:
    Axis programming for geometry axis exchange/parallel axes is ISO mode-com-
    patible.
      1:
    Axis programming for geometry axis exchange/parallel axes is compatible in
    ISO mode with Siemensmode.

Bit8: 0:
    With cycles, the F value transferred  is always interpreted as a feedrate.
      1:
    With threading cycles, the F value transferred is interpreted as pitch.
Bit9: 0:
    Multiplication with 0.01mm / 0.0001inch is carried out in ISO mode T for
    G84, G88 and in standard mode F for G95.
      1:
    Multiplication with 0.001mm / 0.00001inch is carried out in ISO mode T for
    G84, G88 and in standard mode F for G95.
```

```
Bit10: 0:
    With M96 Pxx, the program programmed with Pxx is always called in the case
    of an interrupt
       1:
    With M96 Pxx, CYCLE396.spf is always called in the case of an interrupt

Bit11: 0:
    With G54 Pxx, only G54.1 is displayed
       1:
    With G54 Pxx, the programmed program is displayed after the point, e.g.
    G54.48

Bit12: 0:
    When the subroutine defined with M96 Pxx is called, $P_ISO_STACK is not
    modified
       1:
    When the subroutine defined with M96 Pxx is called, $P_ISO_STACK is incre-
    mented
```

20750	**ALLOW_G0_IN_G96**			C09, C05	V1
-	G0 logic with G96			BOOLEAN	POWER ON
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/2

Description:

```
This machine data defines the speed regulation characteristic of the spindle
in G0 blocks with constant cutting rate (G96, G961) selected .

1:  In a G0 block, the spindle speed is kept constant at the last value of the
previous block that was unequal G0.
    Prior to a subsequent block that does not contain G0, the spindle speed is
    increased to a value that belongs to the transverse axis position of the
    subsequent block.
0:  In a G0 block, the spindle speed changes against the transverse axis posi-
tion.
```

20800	**SPF_END_TO_VDI**			C04, C03	H2
-	End of subroutine to PLC			BYTE	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	-	-	7/2

Description:

```
Bit 0 = 1:
    The M functions for subroutine end (M17 and/or M2/M30) are transferred to
    the PLC interface.

Bit 0 = 0:
    The M functions for subroutine end (M17 and/or M2/M30) are not transferred
    to the PLC interface.

Note:
    To prevent stopping in continuous-path mode, M17 must not be programmed
    alone in a block.
Example of a subroutine:  G64 F2000 G91 Y10 X10
                             X10 Z10 M17
Bit 1 = 0:
    M01:
    conditional program stop is always output to PLC, irrespective of whether
    the M01 signal is active or not.
    Fast auxiliary function output M=QU(1) is inactive because M01 is assigned
    to the 1st M function group and thus is always output at block end.

Bit 1 = 1:
    M01:
    conditional program stop is only output to PLC, if M01 is also active.
    This thus enables optimal run-time processing of the part program.
    With fast auxiliary function output M=QU(1), M1 is output during the move-
    ment; thus it is possible to traverse blocks in continuous-path mode with
    programmed M01 as long as M01 is not active.
    The request of the M01 signal with M=QU(1) no longer occurs at block end
    but during the movement.
```

20850	**SPOS_TO_VDI**			C04, C03	S1
-	Output of M19 to PLC on SPOS/SPOSA			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
Bit 0 = 0:
    SPOS and SPOSA are not output to the VDI interface.
    Therefore there is no acknowledgement time of the M function, which can
    cause faults in the case of the very short spindle positioning blocks and
    SPOSA blocks.

Bit 0 = 1:
    In the case of SPOS and SPOSA, "M19" is output to the VDI interface.
    The response is the same as that of a programmed "M19".
```

20900	**CTAB_ENABLE_NO_LEADMOTION**			EXP	M3
-	Curve tables with jump of slave axis			BYTE	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	2	7/2

Description:

This MD is used to configure the way jumps of the slave axis are processed in curve tables. A jump of the slave axis results from the presence of a movement of the slave axis in a segment of the curve table with no corresponding movement of the master axis.
The jumps of the slave axis may be programmed directly, or they are created internally in the control.
These segments may be created especially if a curve table with active tool radius compensation is generated.

The following configurations are possible:

0: No curve tables are created that contain a jump of the slave axis. If a jump of the slave axis occurs, alarm 10949 (CTAB_NO_LEADMOTION) is issued and program processing is terminated. This setting is compatible with previous software versions.
1: Curve tables containing a jump of the slave axis may be implemented. If a jump of the slave axis occurs, alarm 10955 (CTAB_NO_LEADMOTIONWARNING) is issued without terminating program processing.
2: Curve tables with jumps of the slave axis are implemented without issuing an alarm or a note.

20905	**CTAB_DEFAULT_MEMORY_TYPE**			EXP	M3
-	Default memory type for curve tables			BYTE	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/2

Description:

This machine data defines the memory (SRAM or DRAM) in which the curve tables are created by default.

This MD is only relevant if no memory type was specified when defining a curve table using CTABDEF().

The following settings can be selected:
0: By default, curve tables are created in the SRAM.
1: By default, curve tables are created in the DRAM.

21000	**CIRCLE_ERROR_CONST**			C06	K1
mm	Circle end point monitoring constant			DOUBLE	POWER ON
-					
-	-	0.01,0.01,0.01,0.01, 0.01,0.01,0.01...	-	-	7/2

Description:

```
This machine data is used to specify the permissible absolute circle error
[mm].
When a circle is programmed, the radius from the programmed center point to
the start point and to the end point are usually not equal (the circle is
"overdefined").

The maximum permissible difference of those two radii that is accepted wit-
hout an alarm is defined by the larger value of the following data:
-   CIRCLE_ERROR_CONST
-   Start radius multiplied with MD 21010: CIRCLE_ERROR_FACTOR
This means that for small circles the tolerance is a fixed value
(CIRCLE_ERROR_CONST) and for large circles it is proportional to the start
radius.

Related to:
    MD 21010: CIRCLE_ERROR_FACTOR
    (circle end point monitoring factor)
```

21010	**CIRCLE_ERROR_FACTOR**			C06	K1
-	Circle end point monitoring factor			DOUBLE	POWER ON
-					
-	-	0.001,0.001,0.001,0 .001,0.001,0.001...	-	-	7/2

Description:

```
Factor for permissible radius difference.
Defines the factor for large circles by which the starting radius and end
radius may deviate from each other
(see also MD 21000: CIRCLE_ERROR_CONST (circle end point monitoring constant).
```

21015	**INVOLUTE_RADIUS_DELTA**			C06	PG
mm	Involute end point monitoring			DOUBLE	POWER ON
-					
-	-	0.01,0.01,0.01,0.01, 0.01,0.01,0.01...	-	-	7/2

Description:

```
Permissible absolute difference of radius at involute interpolation [mm].
At involute interpolation, the radius of the basic circle determined by the
end point may differ from the programmed radius.
This data is used to limit the permissible maximum difference between start
radius and end radius.
```

21016	**INVOLUTE_AUTO_ANGLE_LIMIT**			C06	PG
-	Automatic angle limitation during involute interpolation			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

```
If the angle of rotation is programmed for an involute (AR=angle), the maxi-
mum angle of rotation is limited in case the involute is travelling towards
the basic circle (AR < 0). The maximum angle of rotation is reached when the
involute touches the basic circle.
Normally, if an angle larger than the maximum angle is programmed, an alarm is
issued and the NC program aborted.
If this MD is set to TRUE any angle is accepted without an alarm for program-
ming. If required, this angle is limited automatically.
```

21020	**WORKAREA_WITH_TOOL_RADIUS**			C03, C06	A3
-	Consideration of tool radius for working area limitation			BOOLEAN	RESET
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

```
This machine data indicates whether the tool radius is taken into account with
working area limitation.
0:  It is checked whether the tool center lies within the working area limits
(corresponds to version P2)

1:  The tool radius is taken into account when the working area limitation is
checked. This means that the working area is reduced by the tool radius.
```

21050	**CONTOUR_TUNNEL_TOL**			C06	F2
mm	Response threshold for contour tunnel monitoring			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/2

Description:

```
Response threshold for contour tunnel monitoring. Defines the radius of the
"tunnel" around the path of the tool tip.

If three geometry axes are defined, the tunnel can be regarded as a tube
through the center of which the path of the tool tip travels.
If only two geometry axes are defined, this tube can be regarded as squashed
flat in the plane of the two geometry axes.
```

```
Monitoring is only active if:
-   option contour tunnel monitoring is present and
-   $MC_CONTOUR_TUNNEL_TOL is larger than 0.0 and
-   at least two and at most three geometry axes are defined.

Related to:
    CONTOUR_TUNNEL_REACTION,
    CONTOUR_ASSIGN_FASTOUT,
    ENC_CHANGE_TOL
```

21060	**CONTOUR_TUNNEL_REACTION**			C06	F2
-	Reaction when contour tunnel monitoring responds			BYTE	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	0	2	7/2

Description:

```
Reaction to response of the alarm
0:  Only display alarm, continue machining
1:  Ramp stop
2:  Rapid stop

MD irrelevant:
    if 'contour tunnel monitoring' option is not available

Related to:
    CONTOUR_TUNNEL_TOL, CONTOUR_ASSIGN_FASTOUT
```

21070	**CONTOUR_ASSIGN_FASTOUT**			C01, C06	F2
-	Assignment of an analog output for the output of contour error			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	8	7/2

Description:

```
Assignment of an analog output on which the calculated contour error can be
output.

0:  No output
1:  Output on output 1
2:  Output on output 2
etc.
8:  Output on output 8

An error in the amount of the response threshold $MC_CONTOUR_TUNNEL_TOL
appears on the output as a voltage of 10V.
Multiple assignment of the same output through other signals is checked auto-
matically.

MD irrelevant:
    if 'contour tunnel monitoring' option is available
```

Related to:
CONTOUR_TUNNEL_TOL, CONTOUR_TUNNEL_REACTION

21080	CUTCOM_PARALLEL_ORI_LIMIT			C08, C06	W5
degrees	Minimum angle (path tangent / tool orientation) in 3D TRC			DOUBLE	RESET
-					
-	-	3.,3.,3.,3.,3.,3.,3.,3., 3.,3.,3.,3.,3....	0.1	89.	7/2

Description:

With 3D tool radius compensation, the angle between the path tangent and the tool orientation may not drop below a certain limit angle. This machine data specifies this angle (in degrees).
Generally speaking, the lower the value entered in this machine data, the greater the computing capacity required to check that the above conditions are fulfilled.
Linear blocks with constant orientation are an exception.

21082	CUTCOM_PLANE_ORI_LIMIT			C08, C06	W5
degrees	Minimum angle between surface normal vector and tool orientation			DOUBLE	RESET
-					
-	-	3.,3.,3.,3.,3.,3.,3.,3., 3.,3.,3.,3.,3....	1.0	89.	7/2

Description:

This machine data applies to 3D face milling operations and specifies the minimum angle that must exist between the surface normal vector and the tool orientation on every point of the path if the applied lateral angle is not equal to zero and the tool is not a ball mill. Otherwise, machining is aborted with an alarm if the angle is smaller than the value set here.
Generally speaking, the lower the value entered in this machine data, the greater the computing capacity required to check that the above conditions are fulfilled.This data has no effect in linear blocks with constant orientation. The angle between the surface normal vector and tool orientation may be as small as desired in such cases, even if the lateral angle is not equal to zero.

21084	**CUTCOM_PLANE_PATH_LIMIT**			C08, C06	W5
degrees	Min. angle betw. surface normal vector and path tangent vector			DOUBLE	RESET
-					
-	-	3.,3.,3.,3.,3.,3.,3.,3., 3.,3.,3.,3.,3....	1.0	89.	7/2

Description:

This machine data applies to 3D face milling operations and specifies the minimum angle that must exist between the surface normal vector and the path tangent vector on every point of the path. Otherwise machining is aborted with an alarm if the angle is smaller than the value set here.
Generally speaking, the lower the value entered in this machine data, the greater the computing capacity required to check that the above conditions are fulfilled.

21090	**MAX_LEAD_ANGLE**			C08, C09	-
degrees	Maximum value of permitted lead angle for orientation progr.			DOUBLE	NEW CONF
-					
-	-	80.,80.,80.,80.,80.,80.,80.,80.,80.,80....	0.	80.	7/7

Description:

Maximum permissible value of the lead angle in degrees.

21092	**MAX_TILT_ANGLE**			C08, C09	-
degrees	Maximum value of permitted side angle for orientation progr.			DOUBLE	NEW CONF
-					
-	-	180.,180.,180.,180., 180.,180.,180....	-180.	180.	7/7

Description:

Maximum permissible value of the tilt angle in degrees.

21094	**ORIPATH_MODE**			C02	-
-	Setting for ORIPATH path-relative orientation			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	211	7/7

Description:

This MD is used to set the behavior for ORIPATH, i.e. path-relevant interpolation of tool orientation.
With the various digits of this machine data various functions for ORIPATH are activated.

Meaning of the units digit: Activation of the "real" path-relative orientation interpolation

xx 0:
Only at the end of the block, the tool orientation has the relation programmed with LEAD and TILT to the path tangent and the normal vector; within the block, the orientation does not follow the path tangent. This corresponds to the behavior of SW release 6.xx.

xx1:
The relation of the tool orientation to the path tangent and the surface normal vector programmed with LEAD/TILT is retained during the whole block. Meaning of the tens digit: Interpretation of the TILT angle

x0x:
LEAD = Rotation around direction vertical to tangent and normal vector (forward angle)
TILT = Rotation of orientation around normal vector
This is the interpretation of the LEAD/TILT angles in SW releases < 7.2

x1x:
LEAD = Rotation around direction vertical to tangent and normal vector (forward angle)
TILT = Rotation of orientation around vector in direction of tangent (tilt angle)

Meaning of hundreds digit: Activation of a retract movement in the case of re-orientation.

0xx:
In the case of re-orientation with ORIPATH, a retract movement is not carried out.

1xx:
In the case of re-orientation with active ORIPATH, a retract movement in the direction of the programmed vector is carried out. The programmed vector for the direction of the retract movement refers to the coordinate system defined by the current tool direction (z coordinate) and the change in orientation (x coordinate).

```
2xx:
    In the case of re-orientation with active ORIPATH, a retract movement in
    the direction of the programmed vector is carried out. The programmed vec-
    tor for the direction of the retract movement refers to the coordinate sys-
    tem defined by the current surface normal vector (z coordinate) and the
    change in orientation (x coordinate).

A retract movement is possible only with a "real" path-relative orientation
interpolation, i.e. if the units digit of the MD has the value one.
```

21100	**ORIENTATION_IS_EULER**			C01, C09	F2
-	Angle definition for orientation programming			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

```
This data is only active for $MC_ORI_DEF_WITH_G_CODE = 0

MD = 0 (FALSE):
    The values programmed with A2, B2, C2 during orientation programming are
    interpreted as an RPY angle (in degrees).
    The orientation vector is produced by rotating a vector in direction Z
    first by C2 around the Z axis, then by B2 around the new Y axis and finally
    by A2 around the new X axis. In contrast to Euler angle programming, all
    three values influence the orientation vector in this case.

MD = 1 (TRUE):
    The values programmed with A2, B2, C2 during orientation programming are
    interpreted as Euler angles (in degrees).
    The orientation vector is produced by rotating a vector in direction Z
    first by A2 around the Z axis, then by B2 around the new X axis and finally
    by C2 around the new Z axis. This means that the value of C2 is meaning-
    less.
```

21102	**ORI_DEF_WITH_G_CODE**			C01, C07	F2
-	Definition of orientation axes with G code			BOOLEAN	NEW CONF
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/2

Description:

```
Definition of the orientation angles A2, B2, C2
0: Definition as per MD $MC_ORIENTATION_IS_EULER
1: Definition as per G code ( ORIEULER, ORIRPY, ORIVIRT1, ORIVIRT2)
```

21103	**ORI_ANGLE_WITH_G_CODE**			C01, C07	-
-	Definition of orientation angles via G code			BOOLEAN	NEW CONF
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

```
Definition of the orientation angles A2, B2, C2:
    FALSE: Definition as per MD $MC_ORIENTATION_IS_EULER
    TRUE : Definition as per G code ( ORIEULER, ORIRPY, ORIVIRT1, ORIVIRT2)
Only programming of angles with A2, B2, C2 is interpreted in accordance with G
codes ORIEULER, ORIRPY, ORIVIRT1, ORIVIRT2 and not programming of angles by
means of the orientation axes, as is the case with MD $MC_ORI_DEF_WITH_G_CODE
= 1.
```

21104	**ORI_IPO_WITH_G_CODE**			C01, C07	F2
-	G code for orientation interpolation			BOOLEAN	NEW CONF
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

```
Definition of the type of interpolation for the orientation
FALSE:Referred to G codes ORIWKS and ORIMKS
TRUE :Referred to G codes ORIAXES, ORIVECT, ORIPLANE, ORICONxx and ORICURVE of
the 51st G code group
```

21106	**CART_JOG_SYSTEM**			C01, C07	H1
-	Coordinate systems for Cartesian JOG			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	7	7/2

Description:

This machine data has two meanings. First, it is used to activate the "Cartesian manual traverse" function. Second, it is used to determine the reference systems between which a switchover can be performed.
The meaning of the individual bits is determined as follows:

Bit 0 : Basic coordinate system
Bit 1 : Workpiece coordinate system
Bit 2 : Tool coordinate system

21108	**POLE_ORI_MODE**			C07	-
-	Response with vector interpolation in pole position			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	122	7/7

Description:

This MD defines how the change in orientation in the case of vector interpolation is treated if the orientation runs through the pole taper, which is defined by MD $TRAFO5_POLE_LIMIT_1/2.
Vector interpolation is present, if tool orientation is interpolated independent of the kinematics, e.g. by means of large circle interpolation (orientation is swiveled in a plane), taper interpolation or through interpolation of a 2nd reference point on the tool (ORICURVE), and not directly the orientation axes.

In the pole, the pole axis can have any position. For large circle interpolation, however, this axis requires a certain orientation.

If the start orientation is equal or close to the pole orientation and the end orientation of the block lies outside the tolerance circle defined by machine data TRAFO5_POLE_LIMIT_1/2, the pole axis can be moved to a position suitable to ensure that the subsequent vector interpolation can be carried out. This is set via the units and tens digits of this machine data.

The units digits can have the following values (active if start orientation equal to pole orientation):

0: The interpolation is carried out as an axis interpolation. The specified orientation path (large circle) is followed only if the pole axis (coincidentally) has the right position and the basic orientation is perpendicular to the 2nd rotary axis.

1: A block, that positions the pole axis to a position enabling large circle interpolation to be carried out in the subsequent block, is inserted before the block where the situation described occurs.

2: If the block preceding the block in which the situation described occurs contains a geometry axis movement but no orientation movement the required positioning movement of the pole axis is additionally carried out in this previous block.

If one of the two conditions is not fulfilled (block does not contain a geometry axis movement or block contains an orientation movement), the pole axis movement is carried out in a separate block (same behavior as under 1.)

The tens digits can have the following values (active if the start orientation differs from the pole orientation, but lies within the tolerance circle defined by TRAFO5_POLE_LIMIT_1/2):

00: The interpolation is carried out as an axis interpolation. The specified orientation path (large circle) is followed only if the pole axis (coincidentally) has the right position hat and the basic orientation is perpendicular to the 2nd rotary axis.

10: A block, which positions the two rotary axes to the point where the programmed large circle interpolation intersects with the tolerance circle defined by TRAFO5_POLE_LIMIT_1/2, is inserted before the block where the situation described occurs. In the original block, large circle interpolation is applied as of this point.

20: If the block preceding the block in which the described situation occurs contains a geometry axis movement but no orientation movement the necessary positioning movements of the two rotary axes are additionally carried out in this previous block. The residual movement in the original block is the same as that of value 10 of this machine data.

If one of the two conditions is not fulfilled (block does not contain a geometry axis movement or block contains an orientation movement), the pole axis movement is carried out in a separate block (same behavior as under 10.)

The behavior for the case that the orientation runs through the pole taper or ends within the pole taper is set with the hundreds digit of this MD.
The hundreds digit can have the following values:

000:A block with the orientation running within the pole taper is subdivided only if the start orientation is equal to the pole orientation (with POLE_ORI_MODE = 1) or is close to the pole orientation (with POLE_ORI_MODE = 10). If the pole orientation occurs at an arbitrary point in the block, the whole change in orientation is traversed by means of rotary axis interpolation. In general, this leads to a more or less significant deviation from the programmed orientation path.

100:If the programmed orientation path runs through the pole taper, the block is subdivided in up to 3 parts, so that there is a deviation from the orientation path only within the pole taper. Outside the pole taper, the orientation is interpolated exactly on the programmed orientation path.

The values of the units, tens and hundreds digits are added.

21110	X_AXIS_IN_OLD_X_Z_PLANE			EXP, C01, C09	M1
-	Coordinate system for automatic frame definition			BOOLEAN	POWER ON
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

```
1 = With automatic definition of a frame (TOFRAME), the Z direction of which
equals the current tool orientation, the new coordinate system is additio-
nally rotated around the new Z axis so that the new X axis is in the old Z-X
plane.
0 = With automatic definition of a frame (TOFRAME), the Z direction of which
equals the current tool orientation, the new coordinate system is maintained
as it results from the kinematics of the machine, i.e. it is assumed that the
coordinate system is fixed to the tool and rotates with the tool (orienta-
tion).

From SW 5.3:
This machine data is only effective when the three lowest value decimal posi-
tions (units, tens, hundreds) of the setting data 42980 (TOFRAME_MODE) equal
zero. Otherwise the frame definition is specified by TOFRAME_MODE.

MD irrelevant for:
    No orientation programming

Related to:
    MD 21100

Further references:
    /PG/, Programming Guide, Fundamentals
```

21120	ORIAX_TURN_TAB_1			C07	F2
-	Definition of reference axes for orientation axes			BYTE	NEW CONF
-					
-	3	1, 2, 3,1, 2, 3,1, 2, 3,1, 2, 3...	0	3	7/2

Description:

```
Defines the assignment of the rotations of the orientation axes around the
reference axes for each channel (definition 1).
This orientation description is activated with the G code ORIVIRT1

0:   No rotation
1:   Rotation around reference axis X
2:   Rotation around reference axis Y
3:   Rotation around reference axis Z

Example :
$MC_ORIAX_TURN_TAB_1[ 0 ] = 3   ; 1st ORI axis rotates around reference axis Z
$MC_ORIAX_TURN_TAB_1[ 1 ] = 2   ; 2nd ORI axis rotates around reference axis Y
$MC_ORIAX_TURN_TAB_1[ 2 ] = 1   ; 3rd ORI axis rotates around reference axis X
```

21130	**ORIAX_TURN_TAB_2**			C07	F2
-	Definition of reference axes for orientation axes			BYTE	NEW CONF
-					
-	3	1, 2, 3,1, 2, 3,1, 2, 3,1, 2, 3...	0	3	7/2

Description:

```
Defines the assignment of the rotations of the orientation axes around the
reference axes for each channel (definition 2).
This orientation description is activated with the G code ORIVIRT2

0:  No rotation
1:  Rotation around reference axis X
2:  Rotation around reference axis Y
3:  Rotation around reference axis Z

Example :
$MC_ORIAX_TURN_TAB_1[ 0 ] = 3   ; 1st ORI axis rotates around reference axis Z
$MC_ORIAX_TURN_TAB_1[ 1 ] = 2   ; 2nd ORI axis rotates around reference axis Y
$MC_ORIAX_TURN_TAB_1[ 2 ] = 1   ; 3rd ORI axis rotates around reference axis X
```

21150	**JOG_VELO_RAPID_ORI**			C07	-
rev/min	JOG rapid traverse for orientation axes			DOUBLE	RESET
-					
-	3	10.0, 10.0, 10.0,10.0, 10.0, 10.0...	-	-	7/2

Description:

```
Velocity in JOG mode with rapid traverse override for orientation axes in the
channel [degrees/min]
```

21155	**JOG_VELO_ORI**			C07	-
rev/min	Jog feedrate for orientation axes			DOUBLE	RESET
-					
-	3	2.0, 2.0, 2.0,2.0, 2.0, 2.0...	-	-	7/2

Description:

```
Velocity in JOG mode for orientation axes in the channel
```

21160	**JOG_VELO_RAPID_GEO**			C07	F2
mm/min	JOG rapid traverse for geometry axes			DOUBLE	RESET
-					
-	3	10000., 10000.0, 10000.,10000., 10000.0, 10000....	-	-	7/2

Description:

Velocity in JOG mode with rapid traverse override for geometry axes in the channel (mm/min)

21165	**JOG_VELO_GEO**			C07	F2
mm/min	Jog feedrate for geometry axes			DOUBLE	RESET
-					
-	3	1000., 1000., 1000.,1000., 1000., 1000....	-	-	7/2

Description:

JOG velocity for geometry axes in the channel (mm/min)

21170	**ACCEL_ORI**			C07	-
rev/s²	Acceleration for ORI axes			DOUBLE	NEW CONF
-					
-	3	.05, .05, .05,.05, .05, .05...	-	-	7/2

Description:

Acceleration for orientation axes in the channel

21180	**ROT_AX_SWL_CHECK_MODE**			C07	F2
-	Check of software limits for orientation axes			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	112	7/7

Description:

This machine data is evaluated only with generic 5-axis transformation.
If block preparation shows that the programmed path causes a violation of the software limits of the orientation axes, this machine data determines the type of modification rotary axes may travel if the direction is programmed.
The units digit of the MD is used to determine how alternative end positions of the rotary axes are created if the software limits are violated. The tens digit is used to determine how the axes approach those end positions. The hundreds digit is used to activate an automatic limitation of the axis that swivels through the pole (non-pole axis).

Meaning of the units digit:
0: The path is not modified. If it is not possible to travel the shortest path, alarm 10720 (SW_LIMITSWITCH) is issued.
1: If the orientation path determined first violates the axis limits of the orientation axes, the end point will be adapted to try a motion.
In a first attempt, the second solution will be used. (In general, there are always two solutions when converting orientation ==> angle of axis). If this solution will violate the limits of the axis as well, there will be an attempt to find a permissible solution modifying both rotary axes by multiples of 360 degrees with both solutions.
The modifications of final positions described will only be performed if axis interpolation of rotary axes is activated.
2: Monitoring and modifications of rotary-axis positions - if applicable - correspond to value 1 of the machine data.
However, modifications are also permissible if vector interpolation (large-circle interpolation, outside-of-the-taper interpolation, etc.) is activated. If in such a case the rotary-axes positions have to be modified, there will be a switchover to axis interpolation. The orientation path programmed originally will usually not be followed.

Meaning of the tens digit:
0x: The orientation axes travel simultaneously to the possible end position. There may possibly be more or less large deviations from the original orientation path.

1x: If possible, the orientation is first turned into pole direction. In the pole position, the pole axis is then positioned so that the final orientation can then be approached by turning the orientation from the pole position into the programmed direction. The originally programmed orientation path is then followed.

Meaning of the hundreds digit:
0xx: The range of the non-pole axis is determined by its software limits or working area limitations.

1xx:The range of the non-pole axis is limited either to the positive or negative travel range. The possible range is determined by the limits (positive or negative value) with the largest absolute value.
Examples:
1. $MA_POS_LIMIT_MINUS[AX5] = -5.0 and $MA_POS_LIMIT_PLUS[AX5] = 135.0, the possible range of axis AX5 is 0 ... 135.0
2. $MA_POS_LIMIT_MINUS[AX5] = -100.0 and $MA_POS_LIMIT_PLUS[AX5] = 10.0, the possible range of axis AX5 is -100.0 ... 0.0
3. $MA_POS_LIMIT_MINUS[AX5] = 5.0 and $MA_POS_LIMIT_PLUS[AX5] = 120.0, the possible range is 5.0 ... 120.0, there is no automatic limitation of the travel range.

21186	**TOCARR_ROT_OFFSET_FROM_FR**			C01, C07	-
-	Offset of TOCARR rotary axes from WO			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/2

Description:

Rotary axes offset for the orientable tool holder is automatically accepted from the work offset activated on activation of the orientable tool holder for the rotary axes.

21190	**TOFF_MODE**			C08	F2
-	Mode of correction in tool direction			BYTE	RESET
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

This machine data specifies the online correction mode in tool direction via $AA_TOFF[ ].

Bit 0: Behavior of $AA_TOFF in case of a RESET
0: $AA_TOFF is deseclected in case of a RESET
1: $AA_TOFF is maintained also after RESET

Bit 1: Effect of the value assignment on the 1st component of $AA_TOFF[ ]
0: absolute value
1: incremental value (integrator)

Bit 2: Effect of the value assignment on the 2nd component of $AA_TOFF[ ]
0: absolute value
1: incremental value (integrator)

Bit 3: Effect of the value assignment on the 3rd component of $AA_TOFF[ ]
0: absolute value
1: incremental value (integrator)

21194	**TOFF_VELO**			C08	F2
mm/min	Feedrate for online correction in tool direction			DOUBLE	NEW CONF
-					
-	3	0., 0., 0.,0., 0., 0.,0., 0., 0....	-	-	7/2

Description:

Feedrate for online correction in tool direction [mm/min] via $AA_TOFF[ ]

21196	TOFF_ACCEL			C08	F2
m/s²	Acceleration for online correction in tool direction			DOUBLE	NEW CONF
-					
-	3	100., 100., 100.,100., 100., 100....	1.0e-3	-	7/2

Description:

```
Acceleration for online correction in tool direction [ m/s**2 ] via $AA_TOFF[
]
```

21200	LIFTFAST_DIST			C09	K1
mm	Traversing distance on rapid lift from contour			DOUBLE	POWER ON
-					
-	-	0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1...	-	-	7/2

Description:

```
The machine data determines the absolute value of the traverse movement for
rapid lift. The direction of the traverse movement is defined in the part pro-
gram by the command ALF.

References:
    /PA/, Programming Guide: Fundamentals
```

21202	LIFTFAST_WITH_MIRROR			C09	K1
-	Rapid retract with mirrorring			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/2

Description:

```
1:  When determining the retraction direction, if mirroring of the contour is
active then the retraction direction is also mirrored. Mirroring of the
retraction direction only refers to the directional components vertical to the
tool direction.

0:  Mirroring of the contour is NOT taken into account when determining the
retraction direction.
```

21204	**LIFTFAST_STOP_COND**			C09	PGA
-	Stop behavior with fast retraction			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
Specifies the stop behavior of the liftfast motion under different stop condi-
tions

Bit0:  Axial VDI signal feed stop DB31 DBB4.3
=0 Stop of the retraction motion in case of an axial feed stop
=1 No stop of the retraction motion in case of an axial feed stop

Bit1:  Feed disable in channel DB21 DBB6.0
=0 Stop of the retraction motion in case of the feed stop in the channel
=1 No stop of the retraction motion in case of the feed stop in the channel
```

21210	**SETINT_ASSIGN_FASTIN**			C01, C09	K1
-	HW assignment of ext. NCK input byte for NC progr. interrupts			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	-	-	7/2

Description:

```
HW assignment of the fast input byte for NC program interrupts
Bit 0 to 7:
    Number of input used
Bit 16 to 23:
    Mask of signals that the channel is not to evaluate
Bit 24 to 31:
    Mask of signals that are to be evaluated in inverted form
    Bit set: Interrupt initiated by falling edge.

Possible inputs:
1:
    On board-inputs of the 840D (4 fast + 4 bits via VDI default)
2 - 5:
    External digital inputs (fast NCK I/Os or VDI default)
128 - 129:
    Comparator byte (results from fast analog inputs or VDI default)
```

21220	MULTFEED_ASSIGN_FASTIN			C01, C09	V1
-	Assignment of the NCK I/Os for 'several feedrates in the block'			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
In MD: MULTFEED_ASSIGN_FASTIN (assignment of the input bytes of the NCK I/Os
for "Multiple feeds in one block"), at most two digital input bytes or compa-
rator input bytes of the NCK I/Os can be assigned to the input byte for the
"Multiple feeds in one block" function.
Furthermore, the assigned input signals can be inverted with the machine data.

The MD is coded as follows:
Bit 0-7:
    No. of 1st digital input byte or comparator input byte used
Bit 8 - 15:
    No. of 2nd digital input byte or comparator input byte used
Bit 16 - 23:
    Inversion mask for describing the 1st byte
Bit 24 - 31:
    Inversion mask for describing the 2nd byte
    Bit=0:   do not invert
    Bit=1:   invert

If a 2nd byte is entered, the contents of the 1st and 2nd bytes are ORed
before being used.

The number for the digital inputs should be specified as follows:
1:                 for the on-board byte
2 - 5:            for external bytes

The number for a comparator input byte should be specified as follows:
128:             for comparator 1 (corresponds to 80Hex)
129:             for comparator 2 (corresponds to 81Hex)
```

21230	**MULTFEED_STORE_MASK**			C01, C09	V1
-	Memory response for 'several feedrates in the block'			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

The priority of the signals for feeds F2 - F7 of the "Multiple feeds in one block" function decreases as the bit number increases in the input byte. The highest priority signal determines the current feed.

The MD: MULTFEED_STORE_MASK (store input signals of the "Multiple feeds in one block" function) can be used to specify the response when the highest priority input drops out:

Set bit 2 - 7 has the effect that the associated feed (F2 to F7) that has been selected by the highest priority input signal in each case is retained, even if the input signal drops out and a lower priority is present.

The MD is coded as follows:
Bit 0 - 1: No significance
Bit 2 - 7: Storage response of the feed signals
Bit 8 - 31: Reserved

21240	**PREVENT_SYNACT_LOCK_CHAN**			C01, C09	FBSY
-	Protected synchronized actions			DWORD	POWER ON
-					
-	2	-1, -1,-1, -1,-1, -1,-1, -1,-1, -1...	-1	255	7/2

Description:

The machine data specifies a range of synchronized action IDs.

Synchronized actions with IDs in this range cannot be overwritten, cancelled or locked via synchronized actions.

With 0.0, there is no range of protected synchronized actions. The values are read as absolute values; the upper value and the lower value can be indicated in any order.

If a value is configured with -1, the configuration of the general machine data becomes active.

Note:
During the creation of protected static synchronized actions, the protection should be cancelled; otherwise, a power ON would be necessary for each change in order to be able to redefine the logic.

21300	COUPLE_AXIS_1			C09	S3
-	Synchr.spindle pair def, mach.axis no: follow.sp[0], lead.sp[1]			BYTE	POWER ON
-					
-	2	0, 0,0, 0,0, 0,0, 0,0, 0,0, 0,0, 0...	0	31	7/2

Description:

```
One synchronized spindle pair per NC channel can be defined in a fixed confi-
guration with this machine data.

The machine axis numbers (channel-specific MD: AXCONF_MACHAX_USED) applicable
in the NC channel must be entered for the following spindle [n=0] and the lea-
ding spindle [1].

If a value of "0" is entered, then the coupling is not configured, thus lea-
ving 2 couplings to be configured freely via the NC part program.

MD irrelevant for:
    User-defined coupling

Related to:
    Channel-specific MD; COUPLING_MODE_1
    (type of coupling in synchronous spindle mode)
    Channel-specific MD: COUPLE_IS_WRITE_PROT_1
    (write-protection for coupling parameters)
    Channel-specific MD: COUPLE_RESET_MODE_1
    (coupling abort response)
    Channel-specific MD: COUPLE_BLOCK_CHANGE_CTRL_1
    (block change response in synchronous spindle mode)
    SD: $SC_COUPLE_RATIO_1
    (speed ratio parameters for synchronous spindle mode)
```

21310	COUPLING_MODE_1			C03, C09	S3
-	Type of coupling in synchronous spindle operation			BYTE	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	0	2	7/2

Description:

```
This machine data determines the type of coupling for the fixed coupling con-
figuration defined with machine data COUPLE_AXIS_1[n].

1:  Setpoint coupling activated.
    With a setpoint coupling, the reference variable for the following spindle
    is calculated from the position setpoint for the leading spindle, allowing
    the setpoints for the FS and LS to be input simultaneously. This has a par-
    ticularly positive effect on the spindle synchronization during accelera-
    tion and deceleration processes.
    Better command behavior to setpoint changes is thus obtained with the set-
    point coupling than with the actual-value coupling.
```

When a setpoint coupling is selected, the following conditions must be fulfilled before synchronous mode is activated:
- The LS must be assigned to the same NC channel as the FS
- The FS and LS must be in position control mode (SPCON)
- The FS and LS must have the same dynamic control response

0: Actual-value coupling activated.
With an actual-value coupling, the command variable for the following spindle is calculated from the position actual value of the leading spindle. With this type of coupling, the following drive must be significantly more dynamic than the leading drive, but never vice versa.

The actual-value coupling can be used, for example, in the following cases:
- The LS must be assigned to a different NC channel than the FS
- For leading spindles which are not suitable for position control
- In cases where the dynamic control response of the leading spindle is considerably slower than that of the following spindle. As soon as the actual-value coupling is active, the IS "Actual-value coupling" for the FS is set to "1-signal".

2: Velocity coupling activated.
Internally, velocity coupling is a setpoint coupling. The dynamic requirements placed on FS and LS are lower. A defined position relation between FS and LS cannot be established.

Velocity coupling is applied in the following cases:
- LS and/or FS are not in position control.
- There are no measuring systems present.

The coupling type can be altered in the NC part program when the coupling is deactivated by means of language instruction COUPDEF provided this option has not been inhibited by channel-specific MD: COUPLE_IS_WRITE_PROT_1. The parameterized value of channel-specific MD: COUPLING_MODE_1 does not, however, get altered.

MD irrelevant for:
User-defined coupling

Related to:
Channel-specific MD: COUPLE_AXIS_1
(definition of pair of synchronous spindles)
Channel-specific MD: COUPLE_IS_WRITE_PROT_1
(write-protection for configured parameters)
IS "Actual-value coupling" (DB31-48, DBX98.2)

21320	COUPLE_BLOCK_CHANGE_CTRL_1			C09	S3
-	Block change behavior in synchronous spindle operation			BYTE	POWER ON
-					
-	-	3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3	0	3	7/2

Description:

This machine data determines the condition on which a block change must be executed when synchronous mode is activated for the fixed coupling configuration defined in channel-specific machine data COUPLE_AXIS_ [n].

The following options are available:

0: Block change is enabled immediately
1: Block change in response to "Fine synchronization"
2: Block change in response to "Coarse synchronization"
3: Block change in response to IPOSTOP (i.e. after setpoint-based synchronization)

The block change response can be altered in the NC part program with language instruction COUPDEF provided this option has not been inhibited by channel-specific MD: COUPLE_IS_WRITE_PROT_1. The parameterized value of channel-specific MD: COUPLE_BLOCK_CHANGE_CTRL_1 does not, however, get altered.

The selected block change response remains valid even when the velocity ratio is changed or a defined angular offset is programmed while the coupling is active.

MD irrelevant for:
User-defined coupling

Related to:
Channel-specific MD; COUPLE_AXIS_1
(definition of pair of synchronous spindles)
Channel-specific MD: COUPLE_IS_WRITE_PROT_1
(change of coupling parameters not possible)
Channel-specific MD: COUPLE_POS_TOL_COARSE or COUPLE_VELO_TOL_COARSE
(threshold value for coarse synchronization)
Channel-specific MD: COUPLE_POS_TOL_FINE or COUPLE_VELO_TOL_FINE
(threshold value for fine synchronization)

21330	**COUPLE_RESET_MODE_1**			C03, C09	S3
-	Coupling abort behavior			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	0	0x3FF	7/2

Description:

```
This machine data defines the behavior of the synchronous mode for the pair of
synchronous spindles configured with machine data COUPLE_AXIS_1[n].

Bit 0=0:
    Synchronous mode remains active with a new program start and can be can-
    celled only with COUPOF as long as the control remains switched on.
Bit 0=1:
    Synchronous mode is cancelled with program start (from the reset condi-
    tion).
Bit 1=0:
    Synchronous mode remains active even with program end and reset and can be
    cancelled only with COUPOF as long as the control remains switched on.
Bit 1=1:
    Synchronous mode is cancelled with program end or RESET.
Bit 5=1:
    The configured data are activated with program start.
Bit 6=1:
    The configured data are activated with program end or RESET.
Bit 9=1:
    Synchronous mode is switched on with program start.

Note:
    Synchronous mode is not deselected with NC Start after NC Stop!

MD irrelevant for:
    User-defined coupling

Related to:
    Channel-specific MD; COUPLE_AXIS_1 (definition of pair of synchronous
    spindles)
    IS "Synchronous mode" (DB31-48, DBX84.4)
```

21340	**COUPLE_IS_WRITE_PROT_1**			C09	S3
-	Coupling parameters cannot be altered			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

This machine data defines whether or not the coupling parameters (velocity ratio, block change response, coupling type) for the pair of synchronous spindles configured with channel-specific machine data COUPLE_AXIS_1[n] may be altered by the NC part program.

1: Coupling parameters may not be altered by the NC program (write-protection active)
An alarm message is generated if an attempt is made to change the parameters.

0: NC part program may alter coupling parameters using language instruction COUPDEF.

MD irrelevant for:
User-defined coupling

Related to:
Channel-specific MD: COUPLE_AXIS_1
(definition of pair of synchronous spindles)
Channel-specific MD: COUPLING_MODE_1
(type of coupling in synchronous spindle mode)
Channel-specific MD: COUPLE_RESET_MODE_1
(coupling abort response)
Channel-specific MD: COUPLE_BLOCK_CHANGE_CTRL_1
(block change response in synchronous spindle mode)
SD: $SC_COUPLE_RATIO_1
(velocity ratio parameters for synchronous spindle mode)

21380	**ESR_DELAY_TIME1**			EXP, N09	M3
s	Delay time ESR axes			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/2

Description:

When, for example, an alarm occurs, this MD can be used to delay deceleration in order, for example, to enable a retraction from the tooth gap (ESR) in gear wheel machining.

21381	**ESR_DELAY_TIME2**			EXP, N09	M3
s	ESR time for IPO controlled braking			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/2

Description:

When time $MN_ESR_DELAY_TIME1 has expired, the time ($MN_ESR_DELAY_TIME2) specified for interpolatory braking is still available.
When time $MN_ESR_DELAY_TIME2 has expired, rapid deceleration with following follow-up is initiated.

1.4.2 Machine data for grinding function

21500	**TRACLG_GRINDSPI_VERT_OFFSET**			C07	S8
mm	Vertical position offset of grinding axis in centerless grinding			DOUBLE	POWER ON
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-	-	7/2

Description:

The vertical offset of the grinding axis is specified in this MD.

21501	**TRACLG_GRINDSPI_HOR_OFFSET**			C07	S8
mm	Horiz. position offset of grinding axis in centerless grinding			DOUBLE	POWER ON
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-	-	7/2

Description:

Horizontal position offset of the grinding axis in centerless grinding.
The setting in this MD is significant only when MD: TRAFO_AXES_IN_n[0] = 0, i.e. no axis is programmed for the grinding wheel.

21502	**TRACLG_CTRLSPI_VERT_OFFSET**			C07	S8
mm	vert. position offset of regulating axis in centerless grinding			DOUBLE	POWER ON
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-	-	7/2

Description:

The vertical offset for the regulating axis is specified in this MD.

21504	**TRACLG_SUPPORT_VERT_OFFSET**			C07	S8
mm	Vertical offset of work blade in centerless grinding			DOUBLE	POWER ON
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0., 0.,0.,0.,0.,0....	-	-	7/2

Description:

```
Y offset for work blade
Rule: X(0) = Y(offset) + Q1 <Y(direction vectorQ1) + Q2 < Y(direction vector
Q2)
```

21506	**TRACLG_SUPPORT_HOR_OFFSET**			C07	S8
mm	Horizontal offset of work blade in centerless grinding			DOUBLE	POWER ON
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0., 0.,0.,0.,0.,0....	-	-	7/2

Description:

```
X offset for work blade
Rule: X(0) = X(offset) + Q1 <X(direction vector Q1) + Q2 < X(direction vector
Q2)
```

21508	**TRACLG_VERT_DIR_SUPPORTAX_1**			C07	S8
-	Vertical component of work blade direction vector for Q1			DOUBLE	POWER ON
-					
-	-	1.,1.,1.,1.,1.,1.,1.,1., 1.,1.,1.,1.,1....	-	-	7/2

Description:

```
Y component of blade direction vector for Q1
Rule: Y0 = Y(offset) + Q1 <Y(direction vectorQ1) + Q2 < Y(direction vector Q2)
```

21510	**TRACLG_HOR_DIR_SUPPORTAX_1**			C07	S8
-	Horizontal component of work blade direction vector for Q1			DOUBLE	POWER ON
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0., 0.,0.,0.,0.,0....	-	-	7/2

Description:

```
X component of blade direction vector for Q1
Rule: X(0) = X(offset) + Q1 <X(direction vector Q1) + Q2 < X(direction vector
Q2)
```

21512	TRACLG_VERT_DIR_SUPPORTAX_2			C07	S8
-	Vertical component of work blade direction vector for Q2			DOUBLE	POWER ON
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-	-	7/2

Description:

```
Y component of blade direction vector for Q2
Rule: Y(0) = Y(offset) + Q1 <Y(direction vectorQ1) + Q2 < Y(direction vector
Q2)
```

21514	TRACLG_HOR_DIR_SUPPORTAX_2			C07	S8
-	Horizontal component of work blade direction vector for Q2			DOUBLE	POWER ON
-					
-	-	1.,1.,1.,1.,1.,1.,1.,1.,1.,1.,1.,1.,1....	-	-	7/2

Description:

```
X component of blade direction vector for Q2
Rule: X(0) = X(offset) + Q1 <X(direction vector Q1) + Q2 < X(direction vector
Q2)
```

21516	TRACLG_SUPPORT_LEAD_ANGLE			C07	S8
degrees	Lead angle of work blade in centerless grinding			DOUBLE	POWER ON
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-90.	90.	7/2

Description:

```
The angle of lead of the work blade (a) is entered here.
```

21518	TRACLG_CONTACT_UPPER_LIMIT			C07	S8
mm	Upper contact limit of work blade with work in centerl. grinding			DOUBLE	POWER ON
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-	-	7/2

Description:

```
It is necessary to specify the upper contact limit of the blade with the part
to be ground (d1) for the purpose of monitoring the support range limits.

Related to:
    MD: TRACLG_CONTACT_LOWER_LIMIT
```

21520	TRACLG_CONTACT_LOWER_LIMIT			C07	S8
mm	Lower contact limit of work blade with work in centerl. grinding			DOUBLE	POWER ON
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-	-	7/2

Description:

```
It is necessary to specify the lower contact limit of the blade with the part
to be ground (d2) for the purpose of monitoring the support range limits.

Related to:
    MD: TRACLG_CONTACT_UPPER_LIMIT
```

21522	TRACLG_GRINDSPI_NR			C07	S8
-	Definition of grinding spindle for centerless grinding			BYTE	POWER ON
-					
-	-	2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2	1	20	7/2

Description:

```
The number of the grinding spindle is specified in this MD.
```

21524	TRACLG_CTRLSPI_NR			C07	S8
-	Definition of regulating spindle for centerless grinding			BYTE	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	1	20	7/2

Description:

```
The number of the regulating spindle is specified in this MD.
```

21526	**TRACLG_G0_IS_SPECIAL**			C07	S8
-	Special logic for G0 in centerless grinding			BOOLEAN	POWER ON
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/2

Description:

This MD can be used to define how the speed of the regulating wheel must respond in the case of transitions from motion blocks with G0 and without G0 (see table).

TRACLG_G0_IS_SPECIAL = 1:
On transition from a motion block with G0 to one without G0, the speed of the regulating wheel is increased during the G0 block to the desired initial speed in the block without G0.

TRACLG_G0_IS_SPECIAL = 0:
The speed of the regulating wheel is controlled only for motion blocks without G0 (the transitions from a motion block with G0 to one without G0 are not taken into account).

1.4.3 Channel auxiliary function settings

22000	**AUXFU_ASSIGN_GROUP**			C04	H2
-	Auxiliary function group			BYTE	POWER ON
-					
-	255	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,1, 1...	1	64	7/2

Description:

See MD 22010: AUXFU_ASSIGN_TYPE [n] (auxiliary function type)

22010	AUXFU_ASSIGN_TYPE			C04	H2
-	Auxiliary function type			STRING	POWER ON
-					
-	255	"", "…	-	-	7/2

Description:

```
Machine data  AUXFU_ASSIGN_TYPE[n] (auxiliary function type),
AUXFU_ASSIGN_EXTENSION[n] (auxiliary function extension),
AUXFU_ASSIGN_VALUE[n] (auxiliary function value) and
AUXFU_ASSIGN_GROUP[n] (auxiliary function group) can be used to assign an
auxiliary function type (M,S,H,T,D), the associated extension and the auxili-
ary function value to an auxiliary function group .
Example:
                             M 0 = 100  =>  Group 5  (corr. M100)
                             | |    |             |
                             | |    |             |
Auxiliary function type     -| |    |             |
Auxiliary function extension ---|    |             |
Auxiliary function value    --------|             |
Auxiliary function group    ----------------------|
MD: AUXFU_ASSIGN_TYPE[0] = "M"
MD: AUXFU_ASSIGN_EXTENSION[0] = 0
MD: AUXFU_ASSIGN_VALUE[0] = 100
MD: AUXFU_ASSIGN_GROUP[0] = 5              ; (5th group)

M00, M01, M02, M17 and M30 are assigned to group 1 as default.
M3, M4, M5 and M70 of the master spindle are assigned to group 2 as default.
The S functions of the master spindle are assigned to group 3 as default.
The set synchronization with respect to the PLC interface and a programmed
movement can be taken from MD: AUXFU_GROUP_SPEC [n] (auxiliary function group
specification) when assigning an auxiliary function to a group. The defaults
defined in machine data MD: AUXFU_[M,S,H,T,D,F] _SYNC_TYPE (output time of the
[M,S,H,T,D,F] functions) are not considered for the selected auxiliary func-
tions. Even a programmed fast auxiliary function (e.g. M=QU(100)) is not taken
into account.
The index [n] of the machine data indicates the auxiliary function number in
the channel: 0-49. All auxiliary functions which are assigned to auxiliary
function groups must be numbered in ascending consecutive order.
[0]81st auxiliary function [1]82nd.
The four machine data for assigning an auxiliary function to an auxiliary
function group must always be given the same index [n].
Note:
    It is not possible to assign type DL.
Special cases:
    If the auxiliary function value of an auxiliary function is less than 0,
    all auxiliary functions of this type and extension are assigned to one
    group.
Example:
    S2 = -1  => group 9
          (all S values of the 2nd spindle are assigned to group 9)
Related to:
    MD 11100: AUXFU_MAXNUM_GROUP_ASSIGN
```

22020	AUXFU_ASSIGN_EXTENSION			C04	H2
-	Auxiliary function extension			BYTE	POWER ON
-					
-	255	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	99	7/2

Description:

```
See MD 22010: AUXFU_ASSIGN_TYPE [n] (auxiliary function type)

Special cases:
    The auxiliary function extensions 1 to 4 are reserved for spindle func-
    tions with S and M functions.
```

22030	AUXFU_ASSIGN_VALUE			C04	H2
-	Auxiliary function value			DWORD	POWER ON
-					
-	255	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	-	-	7/2

Description:

```
See MD 22010: AUXFU_ASSIGN_TYPE [n] (auxiliary function type)
```

22035	AUXFU_ASSIGN_SPEC			C04	H2
-	Output specification			DWORD	POWER ON
-					
-	255	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	-	-	7/2

Description:

```
Specification of the output behavior of the user-defined auxiliary functions.

Bit 0 (LSB) = 1 -> Acknowledgement "normal" after an OB1 cycle
Bit 1       = 1  -> Acknowledgement "quick" with OB40
Bit 2       = 1  -> No predefined auxiliary function
Bit 3       = 1  -> No output to VDI (may only be set as a single bit)
Bit 4       = 1  -> Spindle reaction after acknowledgement by the PLC
Bit 5       = 1  -> Output before the motion
Bit 6       = 1  -> Output during the motion
Bit 7       = 1  -> Output at block end
Bit 8       = 1  -> No output after block search
```

22040	AUXFU_PREDEF_GROUP			C04	H2
-	Predefined auxiliary function groups			BYTE	POWER ON
-					
-	33	1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 4, 4, 4, 4, 4, 4, 3, 1, 1, 1...	0	64	7/2

Description:

Group assignment of predefined auxiliary functions

The predefined groups cannot be changed for indices 0, 1, 2, 3, 4, 22, 23, 24.

22050	AUXFU_PREDEF_TYPE			C04	H2
-	Predefined auxiliary function type			STRING	POWER ON
-					
-	33	"M", "M", "M", "M", "M", "M", "M", "M", "M", "M","M", "M", "M"...	-	-	7/2

Description:

The address codes of the predefined auxiliary functions are fix.

This setting cannot be changed!

22060	AUXFU_PREDEF_EXTENSION			C04	H2
-	Predefined auxiliary function extension			BYTE	POWER ON
-					
-	33	0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0...	0	99	7/2

Description:

Address extension for predefined auxiliary functions:

This setting can be changed only for indices 6 to 17!

22070	AUXFU_PREDEF_VALUE			C04	H2
-	Predefined auxiliary function value			DWORD	POWER ON
-					
-	33	0, 1, 2, 17, 30, 6, 3, 4, 5, 19, 70, 40, 41, 42, 43, 44, 45, -1...	-	-	7/2

Description:

Value of predefined auxiliary functions:

This setting cannot be changed!

22080	AUXFU_PREDEF_SPEC			C04	H2
-	Output specification			DWORD	POWER ON
-					
-	33	0x81, 0x81, 0x81, 0x81, 0x81, 0x21, 0x21, 0x21, 0x21, 0x21,0x21...	-	-	7/2

Description:

```
Specification of the output behavior of the predefined auxiliary functions.

The settings for the indices 0 to 5 and 22 to 24 cannot be changed!

Bit 0 (LSB)    = 1 -> Acknowledgement "normal" after an OB1 cycle
Bit 1          = 1 -> Acknowledgement "quick" with OB40
Bit 2          = 1 -> No predefined auxiliary function
Bit 3          = 1 -> No output to VDI (only a single bit may be set)
Bit 4          = 1 -> Spindle reaction after acknowledgement by PLC
Bit 5          = 1 -> Output before motion
Bit 6          = 1 -> Output during motion
Bit 7          = 1 -> Output at block end
Bit 8          = 1 -> No output after block search
```

22100	AUXFU_QUICK_BLOCKCHANGE			C04	H2
-	Block change delay with quick auxiliary functions.			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/2

Description:

```
Block change is not delayed with quick auxiliary functions.
0:  With the quick auxiliary function output the block change is delayed until
acknowledgement by the PLC (OB40).
1:  With the quick auxiliary function output to the PLC the block change is not
delayed.

MD irrelevant for:
    Auxiliary functions with normal acknowledgement

References:
    /FBSY/, Synchronized Actions
```

22110	**AUXFU_H_TYPE_INT**			C11, C04	H2
-	Data format of H auxiliary functions (integer/real)			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/2

Description:

```
0:  The values of H auxiliary functions are present in floating point format.
    The maximum value range is +/-3.4028 ex 38.
1:  The value of H auxiliary functions is rounded and changed to an integer.
    The basic program in the PLC must interpret the value as an integer.
    The maximum value range is -2147483648 to 2147483647.
```

22200	**AUXFU_M_SYNC_TYPE**			C04	H2
-	Output time of M functions			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	3	7/2

Description:

```
Synchronization of the M auxiliary functions with regard to a simultaneously
programmed axis motion.
0 = Output before motion
1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)

Notice:
    The synchronization type of the group, which can be assigned individual
    auxiliary functions via configuration, has a higher priority!
```

22210	**AUXFU_S_SYNC_TYPE**			C04	H2
-	Output time of S functions (see MD22200 for values)			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	4	7/2

Description:

```
Synchronization of the S auxiliary functions with regard to a simultaneously
programmed axis motion.
0 = Output before motion
1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)
4 = Output in accordance with the predefined output specification

Notice:
    The synchronization type of the group, which can be assigned individual
    auxiliary functions via configuration, has a higher priority!
```

22220	AUXFU_T_SYNC_TYPE			C11, C04	H2
-	Output time for T functions (see MD22200 for values)			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	4	7/2

Description:

```
Synchronization of the T auxiliary functions with regard to a simultaneously
programmed axis motion.
0 = Output before motion
1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)
4 = Output in accordance with the predefined output specification

Notice:
    The synchronization type of the group, which can be assigned individual
    auxiliary functions via configuration, has a higher priority!
```

22230	AUXFU_H_SYNC_TYPE			C04	H2
-	Output time for H functions (see MD22200 for values)			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	3	7/2

Description:

```
Synchronization of the H auxiliary functions with regard to a simultaneously
programmed axis motion.
0 = Output before motion
1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)

Notice:
    The synchronization type of the group, which can be assigned individual
    auxiliary functions via configuration, has a higher priority!
```

22240	AUXFU_F_SYNC_TYPE			C04	H2
-	Output time for F functions (see MD22200 for values)			BYTE	POWER ON
-					
-	-	3,3,3,3,3,3,3,3,3,3,3,3,3,3,3	0	4	7/2

Description:

```
Synchronization of the F auxiliary functions with regard to a simultaneously
programmed axis motion.
0 = Output before motion
1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)
4 = Output in accordance with the predefined output specification

Notice:
    The synchronization type of the group, which can be assigned individual
    auxiliary functions via configuration, has a higher priority!
```

22250	AUXFU_D_SYNC_TYPE			C04	H2
-	Output time for D functions (see MD22200 for values)			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	4	7/2

Description:

```
Synchronization of the D auxiliary functions with regard to a simultaneously
programmed axis motion.
0 = Output before motion
1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)
4 = Output in accordance with the predefined output specification

Notice: The synchronization type of the group, which can be assigned indivi-
dual auxiliary functions via configuration, has a higher priority!
```

22252	**AUXFU_DL_SYNC_TYPE**			C04	H2
-	Output time of DL functions			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	4	7/2

Description:

```
Synchronization of the auxiliary function with regard to a simultaneously pro-
grammed motion.
0 = Output before motion
1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)
4 = Output in accordance with the predefined output specification

Notice:
    The synchronization type of the group, which can be assigned individual
    auxiliary functions via configuration, has a higher priority!
```

22254	**AUXFU_ASSOC_M0_VALUE**			C01, C03, C10	H2
-	Additional M function to stop a program			DWORD	POWER ON
-					
-	-	-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1...	-	-	7/2

Description:

```
This machine data defines an additional, predefined M function behaving in the
same way as M0. The value of the machine data corresponds to the number of the
auxiliary M function.
Predefined M numbers such as M0, M1, M2, M3, etc. are not allowed.

Restriction:
    See MD 10715: M_NO_FCT_CYCLE

Related to:
    $MN_M_NO_FCT_EOP,
    $MN_M_NO_FCT_CYCLE,
    $MC_SPIND_RIGID_TAPPING_M_NR,
    $MC_AUXFU_ASSOC_M0_VALUE

For external language mode:
    $MN_EXTERN_M_NO_MAC_CYCLE,
    $MN_EXTERN_M_NO_SET_INT
    $MN_EXTERN_M_NO_DISABLE_INT,
    $MN_EXTERN_CHAN_SYNC_M_NO_MIN,
    $MN_EXTERN_CHAN_SYNC_M_NO_MAX
    $MC_EXTERN_RIGID_TAPPING_M_NR

For nibbling:
    $MC_NIBBLE_PUNCH_CODE
```

22256	**AUXFU_ASSOC_M1_VALUE**			C01, C03, C10	H2
-	Additional M function for conditional stop			DWORD	POWER ON
-					
-	-	-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1...	-	-	7/2

Description:

```
This machine data defines an additional, predefined M function behaving the
same way as M1. The value of the machine data corresponds to the number of the
auxiliary M function.
Predefined M numbers such as M0, M1, M2, M3, etc. are not allowed.

Restriction:
    See MD 10715: M_NO_FCT_CYCLE

Related to:
    $MN_M_NO_FCT_EOP,
    $MN_M_NO_FCT_CYCLE,
    $MC_SPIND_RIGID_TAPPING_M_NR,
    $MC_AUXFU_ASSOC_M0_VALUE

For external language mode:
    $MN_EXTERN_M_NO_MAC_CYCLE,
    $MN_EXTERN_M_NO_SET_INT
    $MN_EXTERN_M_NO_DISABLE_INT,
    $MN_EXTERN_CHAN_SYNC_M_NO_MIN,
    $MN_EXTERN_CHAN_SYNC_M_NO_MAX
    $MC_EXTERN_RIGID_TAPPING_M_NR

For nibbling:
    $MC_NIBBLE_PUNCH_CODE
```

22400	**S_VALUES_ACTIVE_AFTER_RESET**			C04, C03, C05	S1
-	S function active beyond RESET			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

```
1:  The last S values set in the main run are still active after a RESET.

0:  The various S values are equal to 0 after a RESET and must therefore be
reprogrammed.
```

22410	**F_VALUES_ACTIVE_AFTER_RESET**			C04, C03, C05	V1
-	F function active beyond RESET			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/2

Description:

```
1:  The last programmed F, FA, OVR and OVRA values are still active after
RESET.
0:  The various values are set to their default values after reset.

Related to:
    MD 22240: AUXFU_F_SYNC_TYPE  Output time of the F functions
```

22420	**FGROUP_DEFAULT_AXES**			C11	FBFA
-	Default setting for FGROUP command			BYTE	POWER ON
-					
-	8	0, 0, 0, 0, 0, 0, 0, 0,0, 0, 0, 0, 0, 0, 0, 0...	-	-	7/7

Description:

```
Default setting for FGROUP command. You can specify up to 8 channel axes whose
resulting velocity is equivalent to the programmed path feed.
If all eight values are zero (default), the geo axis entered in
$MC_AXCONF_GEOAX_ASSIGN_TAB are active as the default setting for the FGROUP
command as previously.
```

22510	**GCODE_GROUPS_TO_PLC**			C04	K1
-	G codes output at NCK-PLC interface on block change/RESET			BYTE	POWER ON
-					
-	8	0, 0, 0, 0, 0, 0, 0, 0,0, 0, 0, 0, 0, 0, 0, 0...	-	-	7/2

Description:

```
Specification of the G codes, that are output to the NCK/PLC interface in case
of block change/ reset.
The interface is updated after each block change and reset.

Notice:
    It is not guaranteed that a PLC user program has at all times a block-syn-
    chronous relation between the active NC block and the G codes present.
    Example: Path mode with very short blocks
```

22512	**EXTERN_GCODE_GROUPS_TO_PLC**			C11, C04	FBFA
-	Send G commands of an external NC language to PLC			BYTE	POWER ON
-					
-	8	0, 0, 0, 0, 0, 0, 0, 0,0, 0, 0, 0, 0, 0, 0, 0, 0...	-	-	7/2

Description:

```
Specification of the G commands of external NC languages which are output at
the NCK -> PLC interface.

The interface is updated at each block change and after RESET.

Notice:
    It is not guaranteed that a PLC user program has at all times a block-syn-
    chronous relation between the active NC block and the G codes present.
    (Example: Path mode with very short blocks).
```

22515	**GCODE_GROUPS_TO_PLC_MODE**			C04	-
-	Behavior of G group transfer to PLC			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/2

Description:

```
For setting the behavior, i.e. how the G groups are to be interpreted in the
PLC with regard to data.

With the current behavior (bit 0 = 0), the G group is the array index of a 64-
byte field (DBB 208 - DBB 271).
Maximally the 64th G group can be reached in this way.

With the new behavior (bit 0 = 1), the data storage in the PLC consists of
max. 8 bytes (DBB 208 - DBB 215).

With this procedure, the array index of this byte array is identical with the
index of the MD $MC_GCODE_GROUPS_TO_PLC[Index] and
$MC_EXTERN_GCODE_GROUPS_TO_PLC[Index].
Each index (0 - 7) may only be set for one of the two machine data; the value
0 must be entered for the other MD.

Bit 0(LSB) = 0:
    Behavior as before, the 64-byte field is used for displaying the G codes
Bit 0(LSB) = 1:
    The user specifies for which G groups the first 8 bytes are to be used
```

22530	**TOCARR_CHANGE_M_CODE**			C04	W1
-	M code at change of tool holder			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-99999999	99999999	7/2

Description:

The absolute value of this machine data indicates the number of the M code, which is output at the VDI interface when a tool holder is activated.
- If the MD is positive, the unchanged M code is always output.
- If the MD is negative, the number of the tool holder is added to the absolute value of the machine data and the number is output.

Special cases:
N M code is output, if the number of the M code to be output or the absolute value of this MD is set to one of the values 0 to 6, 17 or 30. It is not monitored whether an M code created in this way will conflict with other functions.

References:
/FB/, H2, Auxiliary Function Output to PLC

22532	**GEOAX_CHANGE_M_CODE**			C04	K2
-	M code at change of geo axes			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	99999999	7/2

Description:

Number of the M code, which is output at the VDI interface in the case of a switchover of the geometry axes.
No M code is output if this MD is set to one of the values 0 to 6, 17 or 30.
It is not monitored whether an M code created in this way will conflict with other functions.

22534	**TRAFO_CHANGE_M_CODE**			C04	M1
-	M code at change of transformation			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	99999999	7/2

Description:

Number of the M code that is output at the VDI interface in the case of a transformation changeover of the geometry axes.
No M code is output if this MD is set to one of the values 0 to 6, 17 or 30.
It is not monitored whether an M code created in this way will conflict with other functions.

22550	**TOOL_CHANGE_MODE**			C01, C11, C04, C09	W1
-	New tool compensation for M function			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/2

Description:

The T function is used to select a tool in the program. The setting in this machine data determines whether the new tool is loaded immediately on execution of the T function:

MD: TOOL_CHANGE_MODE = 0

The new tool is loaded immediately on execution of the T function. This setting is used mainly on turning machines with tool turrets.

MD: TOOL_CHANGE_MODE = 1

The new tool is prepared for loading on execution of the T function. This setting is used mainly on milling machines with a tool magazine, in order to bring the new tool into the tool change position without interrupting the machining process. The M function entered in MD 22560: TOOL_CHANGE_M_CODE is used to remove the old tool from the spindle and load the new tool onto the spindle. This tool change is required to be programmed with the M function M06, in accordance with DIN 66025.

Related to:

MD 22560: TOOL_CHANGE_M_CODE

22560	**TOOL_CHANGE_M_CODE**			C01, C04, C09	W1
-	M function for tool change			DWORD	POWER ON
-					
-	-	6,6,6,6,6,6,6,6,6,6,6,6,6,6,6,6	0	99999999	7/2

Description:

If the T function is only used to prepare a new tool for a tool change (this setting is used mainly on milling machines with a tool magazine, in order to bring the new tool into the tool change position without interrupting the machining process), another M function must be used to trigger the tool change.

The M function entered in TOOL_CHANGE_M_CODE triggers the tool change (remove old tool from the spindle and load new tool into the spindle). This tool change is required to be programmed with M function M06, in accordance with DIN 66025.

Related to:

MD 22550: TOOL_CHANGE_MODE

22562	**TOOL_CHANGE_ERROR_MODE**			C09	W1
-	Response to tool change errors			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0xFF	7/2

Description:

```
Behavior if faults/problems occur during programmed tool change.
Bit-coded activation data.
Bit no.Hexadec.
    ValueMeaning
-------------------------------------------------------------------------------
0 (LSB)0x00001
    Value 0Standard behavior: Stop on the faulty NC block
    Value 1If a fault is detected in the block with the tool change prepara-
    tion, the alarm is delayed until the corresponding tool change command
    (M06) is interpreted in the program sequence. Not earlier than that will
    the alarm that has been triggered by the preparation command be output. The
    operator can take corrective measures in this block.
    Value = 1 is relevant only if the setting $MC_TOOL_CHANGE_MODE = 1 is used.

1   0x00002Relevant only with active tool management:
    Value 0Standard behavior: Only tools with data assigned to a magazine are
    detected during tool change preparation.
    Value 1Manual tools can be loaded. A tool will also be loaded, if its data
    are known in the NCK but are not assigned to a magazine. In this case, the
    tool data will automatically be assigned to the programmed tool holder.
    Corresponding messages prompt the user to carry out the necessary actions
    (insert tools into and remove tools from the tool holder).

2   0x00004Qualifying the offset programming
    Value 0Standard behavior:
    T0 and Dx - with x larger 0 - results in offset zero
    D0 and DL=x - with x larger 0 - results in offset zero
    (and thus also total offset zero)
    Value 1T0 and Dx - with x larger 0 - leads to an alarm message
    D0 and DL=x - with x larger 0 - leads to an alarm message

Bits 3 and 4:    Only relevant with active tool management.

Function:
Control of the behavior of the init block generation on program START, if a
disabled tool is on the spindle and this tool is to be activated.
In particular, see
    $MC_START_MODE_MASK,
    $MC_RESET_MODE_MASK.
In particular on RESET, the behavior "Keep disabled tool on the spindle
active" is not influenced hereby.
-------------------------------------------------------------------------------
```

3 0x00008
Value 0Standard: If the tool on the spindle is disabled: Create a tool change command, which request a replacement tool. If there is no such replacement tool, an alarm will be generated.
Value 1The disabled status of the spindle tool is ignored. The tool becomes active. The subsequent part program should be formulated in such a way that no parts are machined with the disabled tool.

4 0x00010
Value 0Standard: The system tries to activate the spindle tool or its replacement tool.
Value 1If the tool on the spindle is disabled, T0 is programmed in the START init block.

5 Reserved

6 0x00040
Value 0Standard: With T0 or D0, only T0 or D0 is exactly programmed. This means that with programming of T0 machine data $MC_CUTTING_EDGE_DEFAULT and $MC_SUMCORR_DEFAULT determine the value of D, DL.

Example: $MC_CUTTING_EDGE_DEFAULT = 1, $MC_SUMCORR_DEFAULT = 2, $MC_TOOL_CHANGE_MODE = 0 (tool change with T programming)

N10 T0 ; T no. 0 has active numbers D1 and DL=2 which results in offset zero
If bit 2 is set in addition:
Programming of
a) T0 ; for tool deselection
b) D0 ; for offset deselection
generates an alarm, if
a) at least one of the machine data $MC_CUTTING_EDGE_DEFAULT or $MC_SUMCORR_DEFAULT is unequal to zero (T0 D0 DL=0 is the correct programming).
b) machine data $MC_SUMCORR_DEFAULT is unequal to zero (D0 DL=0 is the correct programming).

Value 1Controls the NCK behavior when (x, y, z all larger than zero) is programmed, if at least one of the machine data $MC_CUTTING_EDGE_DEFAULT or $MC_SUMCORR_DEFAULT is unequal to zero.
a) Tx Dy --> T0:
With T0, D0 or D0 DL=0 is automatically programmed in the NCK; i.e. values of machine data $MC_CUTTING_EDGE_DEFAULT, $MC_SUMCORR_DEFAULT unequal to zero are treated as values equal to zero.
b) Tx Dy --> T0 Dy, or T0 DL=z, or T0 Dy DL=z, or T0 D0 DL=z
Explicitly programmed values of D, DL are not influenced.
c) Dy DL=z --> D0
With D0, DL=0 is automatically programmed in the NCK; i.e. values of machine data $MC_SUMCORR_DEFAULT unequal to zero are treated as values equal to zero.
d) Dy DL=z --> D0 DL=z
Explicitly programmed values of DL are not influenced. If bit 2 is set in addition:
You only have to program T0 / D0 for tool/offset deselection and you don't get an alarm. The statements with regard to $MC_SUMCORR_DEFAULT or DL are valid only if the 'Total offset' function is active (see $MN_MM_TOOL_MANAGEMENT_MASK, bit 8).

```
7   0x00080
    Value 0 =Standard behavior:
    When Tx is programmed, a check is carried out to see whether a tool with
    the T number x is known in the TO unit of the channel. If not, the program
    is stopped in this block with alarm 17190

    Value 1 =Only if tool basic functionality is active
    ($MC_TOOL_MANAGEMENT_MASK, bit0,1=0) and ($MN_MM_TYPE_OF_CUTTING_EDGE=0):
    When Tx is programmed, an unknown Tx will firstly be ignored and the alarm
    with regard to the preparation command (Tx) will also be ignored until the
    D selection is interpreted in the program sequence. Only then will alarm
    17191, which has been triggered by the preparation command, be output. This
    means that the operator can take corrective measures in this block. When
    the program is continued, the incorrect NC block will again be interpreted
    and the preparation command will be automatically executed again inter-
    nally.
    (Is of interest for Cutting-Edge-Default=0 or =-2 or D0 programming, other-
    wise the D of Cutting-Edge-Default will be selected on tool change.)
    This variant is justified, if you wish to program "Tool number = Location"
    (revolver as tool holder) without tool management. The revolver can now
    positioned on a location for which a tool has not (yet) been defined.
    If bit0=1 of this MD (alarm delay) is set, this bit has no meaning.
    This behavior is compatible with software versions older than P6.5.13.
```

22600	**SERUPRO_SPEED_MODE**			EXP	-
-	Speed for block search run type 5			DWORD	SOFORT
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	-	-	2/2

Description:

```
This machine data specifies the search run mode: SERUPRO
SERUPRO search run is activated with PI service _N_FINDBL mode parameter = 5.
SERUPRO means SEarchRUn by PROgram test, i.e. traversing under program test
from beginning of program to search target.
Note:
    Program test does not move any axes/spindles.
Bit0 and Bit1:
==========
0:  Under program test, the axes/spindles are traversed at the following
speeds:
    Axes:      $MC_SERUPRO_SPEED_FACTOR*dry run feed.
    Spindles:  $MC_SERUPRO_SPEED_FACTOR*programmed speed.
    Dynamic axis / spindle limitations are not taken into account.
1:     Under program test, the axes/spindles are traversed at the following
speeds:
    Axes:     at the same speed as dry run feed.
    Spindles: at the programmed speed.
    Dynamic axis / spindle limitations are taken into account.
2:      Under program test, the axes/spindles are traversed at the programmed
velocity/speed.
    Dynamic axis /spindle limitations are taken into account.
3:      Not assigned.

Related to:
    $SC_DRY_RUN_FEED, $MC_SERUPRO_SPEED_FACTOR
```

22601	**SERUPRO_SPEED_FACTOR**			EXP	K1
-	Speed factor for search run type 5			DOUBLE	SOFORT
-					
-	-	10.0,10.0,10.0,10.0, 10.0,10.0,10.0...	1.0	-	2/2

Description:

```
SERUPRO means SEarch RUn by PROgram test, i.e. traversing under program test
from beginning of program to search target.

Note:
    Program test does not move any axes / spindles.

The machine data is relevant only if the first two bits of
$MC_SERUPRO_SPEED_MODE are 0. The sign of the machine data has the following
meaning:

Axes: MD specifies the factor by which the test run feedrate is multiplied.
Spindles: MD specifies the factor by which the programmed speed is multiplied.
Dynamic limitations of axes / spindles are always ignored.

Related to:
    $MC_DRY_RUN_FEED, $MC_SERUPRO_SPEED_MODE
```

22620	**START_MODE_MASK_PRT**			EXP, C03	K1
-	Initial setting on special starts			DWORD	RESET
-					
-	-	0x400,0x400,0x400, 0x400,0x400,0x400. ..	0	0xFFFF	7/2

Description:

```
This machine data is activated via $MC_ENABLE_START_MODE_MASK_PRT.
If $MC_ENABLE_START_MODE_MASK_PRT is in its initial setting,
$MC_START_MODE_MASK_PRT is inactive.

If $MC_START_MODE_MASK_PRT is activated in the case of a "search via program
test" (abbr. SERUPRO),  $MC_START_MODE_MASK_PRT will replace the machine data
$MC_START_MODE_MASK if "search via program test" is started.

In this case, a behavior deviating from PLC start can be set at the start of
the search. The meaning of the bit-oriented assignment of
$MC_START_MODE_MASK_PRT is the same as $MC_START_MODE_MASK.
```

22621	**ENABLE_START_MODE_MASK_PRT**			EXP, C03	K1
-	Enables $MC_START_MODE_MASK_PRT			DWORD	RESET
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x1	7/2

Description:

```
The machine data $MC_START_MODE_MASK_PRT is activated via
$MC_ENABLE_START_MODE_MASK_PRT.

If $MC_ENABLE_START_MODE_MASK_PRT is at its initial setting
$MC_START_MODE_MASK_PRT is inactive.

Bit0 =  1:
    If a "search via program test" (abbr. SERUPRO) is started from RESET  (PI
    service  _N_FINDBL  mode paramter == 5), $MC_START_MODE_MASK_PRT will
    replace the machine data $MC_START_MODE_MASK.

This method can be used to set a start behavior differing from PLC start when
the search
is started.
```

22622	**DISABLE_PLC_START**			EXP	-
-	Enable part program start via PLC			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	-	-	2/2

Description:

```
Allow part program start via PLC.

This machine data will ONLY be evaluated, if "Group-Serupro" mode is switched
on.

"Group-Serupro" is switched on by means of "$MC_SERUPRO_MODE BIT2".

BIT0 = 0
    A part program can be started in this channel only via the PLC. Starting
    via the part program command "START" is interlocked.

BIT0 = 1
    A part program can be started in this channel only by means of the part
    program command "START" from another channel. Starting via the PLC is
    interlocked.
```

22680	**AUTO_IPTR_LOCK**			EXP, C03	-
-	Disable interrupt pointer			DWORD	RESET
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x3	7/2

Description:

With $MC_AUTO_IPTR_LOCK program areas are defined in which the individually indicated coupling types are active. If a program abort is executed in a program range that is defined as such, it will not be the currently executed part program block that is stored in the interrupt pointer (OPI module InterruptionSearch),but the last block prior to activation of the coupling.

22700	**TRACE_STARTTRACE_EVENT**			EXP, C06	BA,S5,FBSY
-	Diagnostic data rec. starts with event TRACE_STARTTRACE_EVENT.			STRING	POWER ON
NBUP					
-	-		-	-	2/2

Description:

The machine data is used for diagnostics.
The recording of the diagnostic data does not start until the event (TRACE_STARTTRACE_EVENT) has occurred at the trace point (TRACE_STARTTRACE_TRACEPOINT) and in the correct step (TRACE_STARTTRACE_STEP).
The permissible input values are to be taken from the NCSC design documentation.

22702	**TRACE_STARTTRACE_STEP**			EXP, C06	BA,S5,FBSY
-	Conditions for start of trace recording			STRING	POWER ON
NBUP					
-	2	"","","","","","","","","",""	-	-	2/2

Description:

The machine data is only intended for diagnostic use.
See TRACE_STARTTRACE_EVENT

In the case of TRACE_STARTTRACE_EVENT BLOCK_CHANGE the string TRACE_STARTTRACE_STEP is interpreted as a file name and block number.

In the case of BSEVENTTYPE_SETALARM the string is interpreted as an alarm number.

The permissible input values are to be taken from the NCSC design documentation.

22704	**TRACE_STOPTRACE_EVENT**			EXP, C06	BA,S5,FBSY
-	Conditions for stop of trace recording			STRING	POWER ON
NBUP					
-	-	"CLEARCANCELALARM_M","CLEARCANCELALARM_M"...	-	-	2/2

Description:

```
The machine data is only used for diagnostics.
The recording of the diagnostic data ends when the event
(TRACE_STOP_ART_EVENT) has occurred at the trace point
(TRACE_STOPTRACE_TRACEPOINT) and in the correct step (TRACE_STOPTRACE_STEP).
(After reaching the stop condition, the previously recorded diagnostic data is
stored in a file "NCSCTRyy.MPF" or for NCU-LINK in "NCxxTRyy.MPF" in the MPF
directory.

The permissible input values are to be taken from the NCSC design documenta-
tion.
```

22706	**TRACE_STOPTRACE_STEP**			EXP, C06	BA,S5,FBSY
-	CommandSequenzStep with which the recording ends			STRING	POWER ON
NBUP					
-	2	"","","","","","","","","","…"	-	-	2/2

Description:

```
The machine data is only intended for diagnostic use.

The permissible input values are to be taken from the NCSC design documenta-
tion.
```

22708	**TRACE_SCOPE_MASK**			EXP, C06	BA,S5,FBSY
-	Selects the contents of the trace file			STRING	POWER ON
NBUP					
-	-		-	-	2/2

Description:

```
The machine data is only intended for diagnostic purposes.
Specific trace contents are selected with the MD datum.
The entry:
SETALARM
records the alarm environment and the block change in the main run is also
logged by means of BLOCK_CHANGE.

The permissible input values are to be taken from the NCSC design documenta-
tion.
```

22710	**TRACE_VARIABLE_NAME**			-	BA,S5,FBSY
-	Definition of trace data			STRING	POWER ON
NBUP					
-	10	"BL_NR", "TR_POINT", "EV_TYPE", "EV_SRC", "CS_ASTEP"...	-	-	2/2

Description:

```
The machine data is only intended for diagnostic purposes.
The MD datum defines which data are recorded in the trace file..

The permissible input values are to be taken from the NCSC design documenta-
tion.
```

22712	**TRACE_VARIABLE_INDEX**			EXP, C06	BA,S5,FBSY
-	Index for trace recording data			DWORD	POWER ON
NBUP					
-	10	0x0, 0x0, 0x0, 0x0, 0x0, 0x0, 0x0, 0x0, 0x0, 0x0...	0	0xFFFF	2/2

Description:

```
The machine data is only intended for diagnostic use.
The MD data, together with TRACE_VARIABLE_NAME, determines which data are
recorded in the trace file.
It enables access to an array element.
E.g. use as an axis index when accessing axis data.
```

22714	**MM_TRACE_DATA_FUNCTION**			EXP, C02, C06	BA,S5,FBSY
-	Activating diagnostics			DWORD	POWER ON
NBUP					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0xFFFF	2/2

Description:

```
The machine data is only intended for diagnostic use.
Activating the diagnostics

An internal ring buffer records important events.
After a trigger event, with the 'Cancel alarm' key set as default,
the ring buffer is briefly freezed, read and converted into an ASCII file
in the part program directory. The file name for the 1st channel
is ncsctr01.mpf and for the 7th channel it is ncsctr07.mpf.
The data in the ring buffer are subsequently called dynamic data.
In addition to the trigger event, further current data are read from the
NCK and transferred to the ASCII file. These recordings do
NOT   have a history and are subsequently called static data.

Bit no.   Significance when bit is set
```

```
-------------------------------------------------------------------
0 (LSB)Recording of the dynamic data (see TRACE_VARIABLE_NAME)
1      Recording of the block control static data
2      Recording of the alarm data static data
3      Recording of the process data static data
4      Recording of the command sequence static data
5      Recording of the tool management static data
6      Recording of the NCK version file. Static data
7      Recording of the statuses of the current block
       Various statuses of the axes and the SPARPI.  Static data
8      Recording of various statuses of the channel.  Static data
9      Error statuses in the NCK memory management are scanned during trace
generation.
       An error renames the trace file. Static data

       Possible names and their meaning:
       NCFIER.MPF   Error in the file system
       NCSLER.MPF   Error during string creation
       NCFIER.MPF   Error on New/Delete


10     All block changes in the interpreter are recorded. Dynamic data.
11     Axial VDI signals are recorded. Dynamic data.
       Only in conjunction with $MN_MM_TRACE_VDI_SIGNAL
12     OEM traces are activated. Dynamic data.
13     Synchronized actions are recorded. Dynamic data.
       NOTICE:  In applications with an intensive use of
       synchronized actions, the trace buffer is almost exclusively
       filled with these trace points, other events are ignored!
       That is why this bit should remain at 0 in these cases.
14     Not assigned.
15     Recording of the station commands.    Dynamic data.
       Note: Most important output of the NCK module NCSC!
```

22800	**TRACE_COMPRESSOR_OUTPUT**			EXP, C01	D1
-	Activation of trace output for compressor			BYTE	POWER ON
NBUP					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	0/0

Description:

```
A trace output of the compressor can be activated with this machine data. With
this, the polynomials created by the compressor can be output in an internal
file. If this MD is active, the NCK works like a preprocessor, i.e. there is
also no program execution.
The following values are possible for this MD:
0:  Trace output not active.
1:  Polynomials created by the compressor are output.
2:  The following are also output:
-   Type of continuousness of the block transitions generated by the compressor
-   Compression rate (number of compressed blocks)
-   Corner detection
```

22900	**STROKE_CHECK_INSIDE**			EXP, C01, C11	FBFA
-	Direction (inside/outside) in which prot. zone 3 is effective			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

```
This MD defines whether protection zone 3 is a protection zone inside or out-
side.
Meaning:
0:  Protection zone 3 is a protection zone inside, i.e. the protection zone
must not entered inwardly.
1:  Protection zone 3 is a protection zone outside
```

22910	**WEIGHTING_FACTOR_FOR_SCALE**			EXP, C01, C11	FBFA
-	Input resolution for scaling factor			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

```
Definition of the unit for the scaling factor P and for the axial scaling fac-
tors I, J, K
Meaning:
0   Scale factor in 0.001
1   Scale factor in 0.00001

Related to:
    DEFAULT_SCALEFACTOR_AXIS,
    DEFAULT_SCALE_FACTOR_P
```

22914	**AXES_SCALE_ENABLE**			EXP, C01, C11	FBFA
-	Activation for axial scaling factor (G51)			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/2

Description:

```
Axial scaling is enabled with this MD.
Meaning:
0:  axial scaling not possible
1:  axial scaling possible -> MD DEFAULT_SCALE_FACTOR_AXIS is active

Related to:
    DEFAULT_SCALE_FACTOR_AXIS
```

22920	**EXTERN_FIXED_FEEDRATE_F1_ON**			EXP, C01, C11	FBFA
-	Activation of fixed feedrates F1 - F9			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/2

Description:

```
This MD is used to activate the fixed feedrates from the setting data
$SC_EXTERN_FIXED_FEEDRATE_F1_F9[].
Meaning:
0:  no fixed feedrates with F1 - F9
1:  the feedrates set in setting data $SC_EXTERN_FIXED_FEEDRATE_F1_F9[] will
become active when programming F1 - F9
```

22930	**EXTERN_PARALLEL_GEOAX**			EXP, C01, C11	FBFA
-	Assignment of a parallel channel axis to the geometry axis			BYTE	POWER ON
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/2

Description:

```
Assignment table of the axes positioned parallel to the geometry axes.
This table can be used to assign channel axes positioned parallel to the geo-
metry axes. The parallel axes can then be activated as geometry axes in ISO
mode using the G functions of plane selection (G17 - G19) and the axis name of
the parallel axis. The axis is then replaced by the axis defined via
$MC_AXCONF_GEOAX_ASSIGN_TAB[].
Prerequisite:
    The channel axes used must be active. ( list position assigned in
    AXCONF_MACHAX_USED ). Entering zero deactivates the corresponding parallel
    geometry axis:
```

24000	**FRAME_ADD_COMPONENTS**			C03	K2
-	Frame components for G58 and G59			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/7

Description:

```
Additive programmable frame components can be separately programmed and modi-
fied.
0:  Additive translations which have been programmed with ATRANS are stored in
the frame together with the absolute translation (prog. with TRANS).
    G58 and G59 are not possible.
1:  The sum of the additive translations are stored in the fine offset of the
programmable frame. The absolute and the additive translations can be changed
independently of one another.
    G58 and G59 are possible.
```

24002	CHBFRAME_RESET_MASK			C03	K2
-	Active channel-specific base frames after reset			DWORD	RESET
-					
-	-	0xFFFF,0xFFFF,0xFFFF,0xFFFF,0xFFFF...	0	0xFFFF	7/2

Description:

```
Bit mask for the reset setting of the channel-specific base frames which are
included in the channel.
The following apply:
If $MC_RESET_MODE_MASK bit0 = 1 and BIT14 = 1
    Entire base frame is derived on reset from linking the base frame field
    elements whose bit is 1 in the bit mask.

If $MC_RESET_MODE_MASK bit0 = 1 and BIT14 = 0
    The entire base frame is deselected on reset
```

24004	CHBFRAME_POWERON_MASK			C03	FBFA
-	Reset channel-specific base frames after power on			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0xFFFF	7/2

Description:

```
This machine data defines whether channel-specific base frames are reset in
the data management on Power On.
That is
-   Offsets and rotations are set to 0,
-   Scalings are set to 1.
-   Mirror image machining is disabled.
The selection can be made separately for individual base frames.

Bit 0 means base frame 0, bit 1 base frame 1 etc.
Value=0:  Base frame is retained on Power On
Value=1:  Base frame is reset in the data management on Power On.

Related to:
    $MN_NCBFRAME_POWERON_MASK
```

24006	CHSFRAME_RESET_MASK			C03	K2
-	Active system frames after reset			DWORD	RESET
-					
-	-	0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1,0x1...	0	0x000007FF	7/2

Description:

```
Bit mask used for the reset setting of the channel-specific system frames
included in the channel.

Bit 0: System frame for actual value setting and scratching is active after
reset.
Bit 1: System frame for external work offset is active after reset.
Bit 2: Reserved, for TCARR and PAROT see $MC_GCODE_RESET_VALUES[].
Bit 3: Reserved, for TOROT and TOFRAME see $MC_GCODE_RESET_VALUES[].
Bit 4: System frame for workpiece reference points is active after reset.
Bit 5: System frame for cycles is active after reset.
Bit 6: Reserved; reset behavior dependent on $MC_RESET_MODE_MASK.
Bit 7:System frame $P_ISO1FR (ISO G51.1 Mirror) active after reset
Bit 8:System frame $P_ISO2FR (ISO G68 2DROT) active after reset
Bit 9:System frame $P_ISO3FR (ISO G68 3DROT) active after reset
Bit 10:System frame $P_ISO4FR (ISO G51 Scale) active after reset

Related to:
    MD 28082: MM_SYSTEM_FRAME_MASK
```

24007	CHSFRAME_RESET_CLEAR_MASK			C03	-
-	Deletion of system frames after reset			DWORD	RESET
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x000007FF	7/2

Description:

```
Bit mask used to delete channel-specific system frames in data management on
reset.

Bit 0: System frame for actual value setting and scratching is deleted on
reset.
Bit 1: System frame for exernal work offset is deleted on reset.
Bit 2: Reserved, for TCARR and PAROT see $MC_GCODE_RESET_VALUES[].
Bit 3: Reserved, for TOROT and TOFRAME see $MC_GCODE_RESET_VALUES[].
Bit 4: System frame for workpiece reference point is deleted on reset.
Bit 5: System frame for cycles is deleted on reset.
Bit 6: Reserved; reset behavior depends on $MC_RESET_MODE_MASK.
Bit 7:System frame $P_ISO1FR (ISO G51.1 Mirror) is deleted on reset.
Bit 8:System frame $P_ISO2FR (ISO G68 2DROT) is deleted on reset.
Bit 9:System frame $P_ISO3FR (ISO G68 3DROT) is deleted on reset.
Bit 10:System frame $P_ISO4FR (ISO G51 Scale) is deleted on reset.
```

24008	CHSFRAME_POWERON_MASK			C03	K2
-	Reset channel system frames after power on			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x000007FF	7/2

Description:

```
This machine data defines whether channel-specific system frames are reset in
the data management on Power On. That is offsets and rotations are set to 0,
scalings to 1. Mirroring is disabled.

The selection can be made separately for individual system frames.

Bit 0:System frame for set actual value and scratching is deleted after Power
On.
Bit 1:System frame for external work offset is deleted after Power On.
Bit 2:System frame for TCARR and PAROT is deleted after Power On.
Bit 3:System frame for TOROT and TOFRAME is deleted after Power On.
Bit 4:System frame for work piece reference points deleted after Power On.
Bit 5:System frame for cycles retained after Power On.
Bit 6:System frame for transformations deleted after Power On.
Bit 7:System frame $P_ISO1FR (ISO G51.1 Mirror) is deleted after power ON.
Bit 8:System frame $P_ISO2FR (ISO G68 2DROT) is deleted after power ON.
Bit 9:System frame $P_ISO3FR (ISO G68 3DROT) is deleted after power ON.
Bit 10:System frame $P_ISO4FR (ISO G51 Scale) is deleted after power ON.

Related to:
   MD 28082: MM_SYSTEM_FRAME_MASK
```

24010	PFRAME_RESET_MODE			C03	K2
-	Reset mode for programmable frame			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/2

Description:

```
0: Programmable frame is deleted at reset.
1: Programmable frame remains active at reset.
```

24020	FRAME_SUPPRESS_MODE			C03	K2
-	Positions for frame suppression			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x0000003	7/2

Description:

```
Bit mask for configuring the positions for frame suppressions (SUPA, G153,
G53).
The following rule applies:
Bit 0: Positions for display (OPI) without frame suppression
Bit 1: Position variables without frame suppression
```

24030	FRAME_ACS_SET			C03	K2
-	Adjustment of SZS coordinate system			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/2

Description:

```
0:  SZS results from the WCS transformed with $P_CYCFRAME and $P_PFRAME.


1:  SZS results from the WCS transformed with the $P_CYCFRAME.
```

24040	FRAME_ADAPT_MODE			C03	-
-	Adaptation of active frames			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x0000007	7/2

Description:

```
Bit mask for adapting the active frames or axis configuration
The following applies:
Bit 0:
    Rotations in active frames that rotate coordinate axes for which there are
    no geometry axes are deleted from the active frames.
Bit 1:
    Shear angles in active frames are orthogonalized.
Bit 2:
    Scalings of all geometry axes in the active frames are set to value 1.
```

24050	FRAME_SAA_MODE			C03	-
-	Saving and activating of data management frames			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x0000003	7/2

Description:

```
Bit mask for saving and activating data handling frames.
The following applies:
Bit 0:
    Data handling frames are only activated by programming the bit masks
    $P_CHBFRMASK, $P_NCBFRMASK and $P_CHSFRMASK. G500..G599 only activate the
    relevant settable frame. The reset behavior is independent of this.

Bit 1:
    Data handling frames are not written implicitly by system functions such as
    TOROT, PAROT, ext. work offset, transformations.
```

1.4.4 Transformation definitions in channel

24100	TRAFO_TYPE_1			C07	F2
-	Definition of transformation 1 in channel			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

```
This MD specifies the first available transformation in each channel.
The 4 low-value bits identify the specific transformation of a specific trans-
formation group. The transformation group is identified by a number starting
with the 5th bit.
Meaning:
0   No transformation
16 and higher
    5-axis transformation with turnable tool
32 and higher
    5-axis transformation with turnable workpiece
48 and higher
    5-axis transformation with turnable tool and turnable workpiece
72 Generic 5-axis transformation. Type and kinematic data are determined by an
associated, orientable tool holder, see MD $MC_TRAFO5_TCARR_NO_1 and
$MC_TRAFO5_TCARR_NO_2 The 4 low-value bits have the following meaning for a 5-
axis transformation:
    0  Axis sequence AB
    1  Axis sequence AC
    2  Axis sequence BA
    3  Axis sequence BC
    4  Axis sequence CA
    5  Axis sequence CB
    8  Generic orientation transformation (3- 5 axes)
256 and higher
    TRANSMIT transformation
512 and higher
    TRACYL transformation
1024 and higher
    TRAANG transformation
2048
    TRACLG: centerless transformation
From 4096 to 4098
    OEM transformation
8192 and higher
    TRACON: cascaded transformations
Example:
    A 5-axis transformation with turnable tool and axis sequence CA (i.e. C
    axis turns A axis) has number 20 ( = 16 + 4)
Attention:
    Not all combinations of group numbers and axis sequences are allowed. If
    you enter a number for a non-existing transformation, you will not get an
    error message.
Related to:
    TRAFO_TYPE_2, TRAFO_TYPE_3, ... TRAFO_TYPE_8
References:
    /FB/, F2, "5-Axis Transformation"
```

24110	TRAFO_AXES_IN_1			C07	F2
-	Axis assignment for the 1st transformation in the channel			BYTE	NEW CONF
-					
-	20	1, 2, 3, 4, 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	20	7/7

Description:

```
Axis assignment at input point of 1st transformation

The index input at the nth position states which axis is mapped internally
from the transformation to axis n.

Not relevant:
    No transformation


Releated to:
    TRAFO_AXES_IN_2, TRAFO_AXES_IN_3, ...
    TRAFO_AXES_IN_8

References:
    /FB/, F2, "5-Axis Transformation"
```

24120	TRAFO_GEOAX_ASSIGN_TAB_1			C07	F2
-	Assignment of geometry axes to channel axes for transformation 1			BYTE	NEW CONF
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/7

Description:

```
This MD states the channel axes on which the axes of the cartesian coordinate
system are mapped for active transformation 1.

Not relevant:
    No transformation

Related to:
    $MC_AXCONF_GEOAX_ASSIGN_TAB, if no transformation is active.

References:
    /FB/, K2, "Coordinate Systems, Axis Types, Axis Configurations, Workpiece-
    Related Actual Value System, External Work Offset"
```

24130	**TRAFO_INCLUDES_TOOL_1**			C07	M1,F2
-	Tool handling with 1st active transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

```
This machine data states for each channel whether the tool is handled during
the 1st transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with refe-
rence to the Basic Coordinate System cannot be changed by the transformation.
In standard transformations, only the "inclined-axis transformation" fulfills
this condition.
If this machine data is set, the Basic Coordinate System (BCS) refers to the
tool reference point even with active transformations. Otherwise, it refers to
the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations
varies correspondingly.
```

24200	**TRAFO_TYPE_2**			C07	F2
-	Definition of the 2nd transformation in the channel			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0	-	-	7/7

Description:

```
This MD states the second available transformation in each channel.

Same as TRAFO_TYPE_1, but for the second available transformation in the chan-
nel.

References:
    /FB/, F2, "5-Axis Transformation"
```

24210	**TRAFO_AXES_IN_2**			C07	F2
-	Axis assignment for transformation 2			BYTE	NEW CONF
-					
-	20	1, 2, 3, 4, 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	20	7/7

Description:

```
TRAFO_AXES_IN_2(n)

Axis assignment at input of 2nd to 8th transformation.
Same meaning as for TRAFO_AXES_IN_1.
```

24220	**TRAFO_GEOAX_ASSIGN_TAB_2**			C07	F2
-	Assignment of geometry axes to channel axes for transformation 2			BYTE	NEW CONF
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/7

Description:

```
This MD states the channel axes on which the axes of the cartesian coordinate
system are mapped for active transformation 2.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.
```

24230	**TRAFO_INCLUDES_TOOL_2**			C07	M1,F2
-	Tool handling with active 2nd transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

```
This machine data states for each channel whether the tool is handled during
the 2nd transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with refe-
rence to the Basic Coordinate System cannot be changed by the transformation.
In standard transformations, only "inclined-axis transformation" fulfills this
condition.
If this machine data is set, the Basic Coordinate System (BCS) refers to the
tool reference point even with active transformations. Otherwise, it refers to
the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations
varies correspondingly.
```

24300	**TRAFO_TYPE_3**			C07	F2
-	Definition of the 3rd transformation in the channel			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0	-	-	7/7

Description:

```
This MD states the third available transformation in each channel.

Same as TRAFO_TYPE_1, but for the third available transformation in the chan-
nel.

References:
    /FB/, F2, "5-Axis Transformation"
```

24310	**TRAFO_AXES_IN_3**			C07	F2
-	Axis assignment for transformation 3			BYTE	NEW CONF
-					
-	20	1, 2, 3, 4, 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	20	7/7

Description:

Axis assignment at the input point of the 3rd transformation in the channel. Meaning is the same as TRAFO_AXES_IN_1, but for the third available transformation in the channel.

24320	**TRAFO_GEOAX_ASSIGN_TAB_3**			C07	F2
-	Assignment of geometry axes to channel axes for transformation 3			BYTE	NEW CONF
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/7

Description:

This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 3.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

24330	**TRAFO_INCLUDES_TOOL_3**			C07	M1,F2
-	Tool handling with active 3rd transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

This machine data states for each channel whether the tool is handled during the 3rd transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to to the Basic Coordinate System cannot be changed by the transformation. In standard transformations, only "inclined-axis transformation" fulfills this condition.
If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations varies correspondingly.

24400	TRAFO_TYPE_4			C07	F2
-	Definition of the 4th transformation in the channel			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

```
This MD states the fourth available transformation in each channel.

Same as TRAFO_TYPE_1, but for the fourth available transformation in the chan-
nel.

References:
    /FB/, F2, "5-Axis Transformation"
```

24410	TRAFO_AXES_IN_4			C07	F2
-	Axis assignment for the 4th transformation in the channel			BYTE	NEW CONF
-					
-	20	1, 2, 3, 4, 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	20	7/7

Description:

```
Axis assignment at the input point of the 4th transformation in the channel.
Meaning is the same as TRAFO_AXES_IN_1, but for the fourth available transfor-
mation in the channel.
```

24420	TRAFO_GEOAX_ASSIGN_TAB_4			C07	F2
-	Assignment of geometry axes to channel axes for transformation 4			BYTE	NEW CONF
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/7

Description:

```
This MD states the channel axes on which the axes of the cartesian coordinate
system are mapped for active transformation 4.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.
```

24426	**TRAFO_INCLUDES_TOOL_4**			C07	M1,F2
-	Tool handling with active 4th transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

This machine data states for each channel whether the tool is handled during the 4th transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to to the Basic Coordinate System cannot be changed by the transformation. In standard transformations, only "inclined-axis transformation" fulfills this condition.
If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations varies correspondingly.

24430	**TRAFO_TYPE_5**			C07	F2,M1
-	Type of transformation 5 in the channel			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

Type of transformation available as the fifth in the channel. See $MC_TRAFO_TYPE_1 for explanation.

24432	**TRAFO_AXES_IN_5**			C07	F2,M1
-	Axis assignment for transformation 5			BYTE	NEW CONF
-					
-	20	1, 2, 3, 4, 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	20	7/7

Description:

Axis assignment at the input point of the 5th transformation. See TRAFO_AXES_IN_1 for explanation.

24434	**TRAFO_GEOAX_ASSIGN_TAB_5**			C07	F2,M1
-	Assignment of geometry axes to channel axes for transformation 5			BYTE	NEW CONF
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/7

Description:

This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 5.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

24436	**TRAFO_INCLUDES_TOOL_5**			C07	M1,F2
-	Tool handling with active 5th transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

This machine data states for each channel whether the tool is handled during the 5th transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to the Basic Coordinate System cannot be changed by the transformation.
In standard transformations, only "inclined-axis transformation" fulfills this condition.
If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations varies correspondingly.

24440	**TRAFO_TYPE_6**			C07	F2,M1
-	Type of transformation 6 in the channel			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

Type of transformation available as the sixth in the channel. See $MC_TRAFO_TYPE_1 for explanation.

24442	**TRAFO_AXES_IN_6**			C07	F2,M1
-	Axis assignment for transformation 6			BYTE	NEW CONF
-					
-	20	1, 2, 3, 4, 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	20	7/7

Description:

Axis assignment at the input point of the 6th transformation. See TRAFO_AXES_IN_1 for explanation.

24444	**TRAFO_GEOAX_ASSIGN_TAB_6**			C07	F2,M1
-	Assignment of geometry axes to channel axes for transformation 6			BYTE	NEW CONF
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/7

Description:

This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 6.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

24446	**TRAFO_INCLUDES_TOOL_6**			C07	M1,F2
-	Tool handling with active 6th transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

This machine data states for each channel whether the tool is handled during the 6th transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to the Basic Coordinate System cannot be changed by the transformation.
In standard transformations, only "inclined-axis transformation" fulfills this condition.
If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations varies correspondingly.

24450	**TRAFO_TYPE_7**			C07	F2,M1
-	Type of transformation 7 in the channel			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

Type of transformation available as the seventh in the channel. See $MC_TRAFO_TYPE_1 for explanation.

24452	**TRAFO_AXES_IN_7**			C07	F2,M1
-	Axis assignment for transformation 7			BYTE	NEW CONF
-					
-	20	1, 2, 3, 4, 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	20	7/7

Description:

Axis assignment at the input point of the 7th transformation. See TRAFO_AXES_IN_1 for explanation.

24454	**TRAFO_GEOAX_ASSIGN_TAB_7**			C07	F2,M1
-	Assignment of geometry axes to channel axes for transformation 7			BYTE	NEW CONF
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/7

Description:

This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 7.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

24456	**TRAFO_INCLUDES_TOOL_7**			C07	M1,F2
-	Tool handling with active 7th transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

This machine data states for each channel whether the tool is handled during the 7th transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to the Basic Coordinate System cannot be changed by the transformation.
In standard transformations, only "inclined-axis transformation" fulfills this condition.
If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations varies correspondingly.

24460	**TRAFO_TYPE_8**			C07	F2,M1
-	Type of transformation 8 in the channel			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

Type of transformation available as the eighth in the channel. See $MC_TRAFO_TYPE_1 for explanation.

24462	**TRAFO_AXES_IN_8**			C07	F2,M1
-	Axis assignment for transformation 8			BYTE	NEW CONF
-					
-	20	1, 2, 3, 4, 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	20	7/7

Description:

Axis assignment at the input point of the 8th transformation. See TRAFO_AXES_IN_1 for explanation.

24464	**TRAFO_GEOAX_ASSIGN_TAB_8**			C07	F2,M1
-	Assignment of geometry axes to channel axes for transformation 8			BYTE	NEW CONF
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/7

Description:

This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 8.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

24466	**TRAFO_INCLUDES_TOOL_8**			C07	M1,F2
-	Tool handling with 8th active transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

This machine data states for each channel whether the tool is handled during the 8th transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to the Basic Coordinate System cannot be changed by the transformation.
In standard transformations, only "inclined-axis transformation" fulfills this condition.
If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations varies correspondingly.

24470	**TRAFO_TYPE_9**			C07	M1
-	Type of transformation 9 in the channel			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

Type of transformation available as the ninth in the channel. See $MC_TRAFO_TYPE_1 for explanation.

24472	**TRAFO_AXES_IN_9**			C07	M1
-	Axis assignment for transformation 9			BYTE	NEW CONF
-					
-	20	1, 2, 3, 4, 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	20	7/7

Description:

Axis assignment at the input point of the 9th transformation. See TRAFO_AXES_IN_1 for explanation.

24474	**TRAFO_GEOAX_ASSIGN_TAB_9**			C07	M1
-	Assignment of geometry axes to channel axes for transformation 9			BYTE	NEW CONF
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/7

Description:

This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 9.

24476	**TRAFO_INCLUDES_TOOL_9**			C07	M1
-	Treatment of tool with active 9th transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

Same as TRAFO_INCLUDES_TOOL_1, but for the 9th transformation.

24480	**TRAFO_TYPE_10**			C07	M1
-	Transformation 10 in channel			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0	-	-	7/7

Description:

Same as TRAFO_TYPE_1, but for the tenth available transformation in the channel.

24482	**TRAFO_AXES_IN_10**			C07	M1
-	Axis assignment for transformation 10			BYTE	NEW CONF
-					
-	20	1, 2, 3, 4, 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	20	7/7

Description:

Axis assignment at the input of the 10th transformation. See TRAFO_AXES_IN_1 for explanation.

24484	**TRAFO_GEOAX_ASSIGN_TAB_10**			C07	M1
-	Assignment of geometry axes to channel axes f. transformation 10			BYTE	NEW CONF
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/7

Description:

Assignment table of geometry axes with transformation 10
Same as AXCONF_GEOAX_ASSIGN_TAB, but only effective when transformation 10 is active.

24486	**TRAFO_INCLUDES_TOOL_10**			C07	M1
-	Treatment of tool with active 10th transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

Same as TRAFO_INCLUDES_TOOL_1, but for the 10th transformation.

24500	**TRAFO5_PART_OFFSET_1**			C07	F2
mm	Offset vector of 5-axis transformation 1			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

This machine data designates an offset of the workpiece carrier for the first (MD: TRAFO5_PART_OFFSET_1) or second (MD: TRAFO5_PART_OFFSET_2) 5-axis transformation of a channel and has a specific meaning for the different machine types:

Machine type 1 (two-axis swivel head for tool):
Vector from machine reference point to zero point of workpiece table. This will generally be a zero vector if both coincide.

Machine type 2 (two-axis rotary table for workpiece):
Vector from the second rotary joint of workpiece rotary table to zero point of table.

Machine type 3 (single-axis rotary table for workpiece and single-axis swivel head for tool):
Vector from rotary joint of workpiece table to zero point of table.
MD irrelevant:
    if the "5-Axis Transformation" option is not installed.

24510	**TRAFO5_ROT_AX_OFFSET_1**			C07	F2
degrees	Position offset of rotary axes 1/2/3 for 5-axis transformation 1			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0, 0.0,0.0, 0.0, 0.0...	-	-	7/7

Description:

This machine data designates the angular offset of the first or second rotary axis in degrees for the first 5-axis transformation of a channel.
MD irrelevant:
    if the "5-Axis Transformation" option is not installed.

24520	**TRAFO5_ROT_SIGN_IS_PLUS_1**			C07	F2
-	Sign of rotary axis 1/2/3 for 5-axis transformation 1			BOOLEAN	NEW CONF
-					
-	3	TRUE, TRUE, TRUE,TRUE, TRUE, TRUE...	-	-	7/7

Description:

This machine data designates the sign with which the two rotary axes are included in the first (MD: TRAFO5_ROT_SIGN_IS_PLUS_1) or the second (MD: TRAFO5_ROT_SIGN_IS_PLUS_2) 5-axis transformation of a channel.
MD = 0 (FALSE):
    Sign is reversed.
MD = 1 (TRUE) :
    Sign is not reversed and the traversing direction is defined according to AX_MOTION_DIR.
This machine data does not mean that the rotational direction of the rotary axis concerned is to be reversed, but specifies whether its motion is in the mathematically positive or negative direction when the axis is moving in the positive direction.
The result of a change to this machine data is not therefore a change in the rotational direction, but a change in the compensatory motion of the linear axes.
However, if a directional vector and thus, implicitly, a compensatory motion is specified, the result is a change in the rotational direction of the rotary axis concerned.
On a real machine, therefore, the machine data may be set to FALSE (or zero) only if the rotary axis is turning in an anti-clockwise direction when moving in a positive direction.
MD irrelevant:
    if the "5-Axis Transformation" option is not installed.

24530	TRAFO5_NON_POLE_LIMIT_1			C07	F2
degrees	Definition of pole range for 5-axis transformation 1			DOUBLE	NEW CONF
-					
-	-	2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0...	-	-	7/7

Description:

```
This MD designates a limit angle for the fifth axis of the first 5-axis trans-
formation with the following properties: if the path runs below this angle
past the pole, the traverse will pass through the pole.
For the 5-axis transformation, the two orientation axes of the tool form a
coordinate system of length and width circles on a  spherical surface. If ori-
entation programming (that is the orientation vector lies in a plane) leads
the path so close past the pole that the angle defined by the MD is undershot
then there is a deviation from the defined interpolation such that the inter-
polation runs through the pole.
Alarm 14112 is output if this modification of the path gives a deviation grea-
ter than a tolerance defined by MD 24540: TRAFO5_POLE_LIMIT_1.
MD irrelevant:
    If the "5-Axis Transformation" option is not installed.
    Also irrelevant with programming in the machine coordinate system ORIMKS.
Related to:
    MD: TRAFO5_POLE_LIMIT _2
```

24540	TRAFO5_POLE_LIMIT_1			C07	F2
degrees	End angle toler. with interpol. through pole for 5-axis transf.			DOUBLE	NEW CONF
-					
-	-	2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0...	-	-	7/7

Description:

```
This MD designates an end angle tolerance for the fifth axis of the first (MD:
TRAFO5_POLE_LIMIT_1) or the second (MD: TRAFO5_POLE_LIMIT_2) 5-axis transfor-
mation with the following properties:
With the interpolation through the pole point, only the fifth axis moves, the
fourth axis retains its starting position. If a motion is programmed that does
not run exactly through the pole point but is to run near the pole within the
area given by MD: TRAFO5_NON_POLE_LIMIT then there is a deviation from the
defined path as the interpolation runs exactly through the pole point. This
results in a deviation in the position of the end point of the fourth axis
(the polar axis) from the programmed value.
This MD defines the angle by which the polar axis may deviate from the pro-
grammed value with 5-axis transformation when switching from the programmed
interpolation to the interpolation through the pole point.
Alarm 14112 is output if there is a greater deviation and the interpolation is
not executed.
MD irrelevant:
    If the "5-Axis Transformation" option is not installed.
    Also irrelevant with programming in the machine coordinate system ORIMKS.
Related to:
    MD: TRAFO5_NON_POLE_LIMIT_1 and _2
```

24542	**TRAFO5_POLE_TOL_1**			C07	-
degrees	End angle tolerance for pole interpolation			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0	-	7/7

Description:

```
End angle tolerance for interpolation through the pole for the 1st 5/6-axis
transformation.
This MD is evaluated only by the generic 5/6-axis
transformation.
If the end orientation lies within the pole cone and within the tolerance cone
specified by means of this MD, the pole axis does not move
and retains it start position. The other rotary axis, however,
moves to the programmed angle.
This results in a deviation of the end orientation
from the programmed orientation.
The maximum active value of this MD is the value of MD TRAFO5_POLE_LIMIT_1,
which is used to define the pole cone.
```

24550	**TRAFO5_BASE_TOOL_1**			C07	F2
mm	Vector of base tool on activation of 5-axis transformation 1			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
This MD specifies the vector of the base tool which takes effect when the
first transformation (MD: TRAFO5_BASE_TOOL_1) or the second (MD:
TRAFO5_BASE_TOOL_2) is activated without a length compensation being selec-
ted. Programmed length compensations have an additive effect with respect to
the base tool.

MD irrelevant:
    if the "5-Axis Transformation" option is not installed.
```

24558	**TRAFO5_JOINT_OFFSET_PART_1**			C07	F2
mm	Vector of kinematic table offset			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
This machine data is only evaluated for generic 5-axis transformations with
rotatable workpiece and rotatable tool (TRAFO_TYPE = 56, mixed kinematics).

It indicates the part of the vector between table and turning head assigned to
the table.
Only the sum of this MD and MD TRAFO5_JOINT_OFFSET is entered in the transfor-
mation equations.
```

A difference results only when reading the whole tool length using the function GETTCOR. In this case, only the MD TRAFO5_JOINT_OFFSET is considered.

On a machine with mixed kinematics, this machine data can be used to assign the machine data of the 5-axis transformation and the parameters of the orientable tool holder uniquely to one another as follows:

Orientable tool holder	5-axis transformation (1st transformation)
1	TRAFO5_JOINT_OFFSET_1
2	TRAFO5_BASE_TOOL_1
3	TRAFO5_JOINT_OFFSET_PART_1
4	TRAFO5_PART_OFFSET_1

24560	**TRAFO5_JOINT_OFFSET_1**			C07	F2
mm	Vector of the kinem.offset of the 1st 5-axis transf. in channel			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

This machine data designates the vector from the first to the second joint for the first (MD: TRAFO5_JOINT_OFFSET_1) or second (MD: TRAFO5_JOINT_OFFSET_2) transformation of a channel and has a specific meaning for the various machine types:

Machine type 1 (two-axis swivel head for tool) and:

Machine type 2 (two-axis rotary table for workpiece):
Vector from first to second joint of tool rotary head or workpiece rotary table.

Machine type 3 (single-axis rotary table for workpiece and single-axis swivel head for tool):
Vector from machine reference point to joint of workpiece table.

MD irrelevant:
if the "5-Axis Transformation" option is not installed. The same applies for 3-axis and 4-axis transformations.

24561	**TRAFO6_JOINT_OFFSET_2_3_1**			C07	-
mm	Vector of kinematic offset			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

In the case of 6-axis transformations, defines the offset between the 2nd and third rotary axes for the 1st transformation of each channel.

24562	**TRAFO5_TOOL_ROT_AX_OFFSET_1**			C07	F2
mm	Offset of swivel point of 1st rotary axis on 5-axis transform. 1			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
In the case of 5-axis transformation with swiveling linear axis, the value
indicates the offset of the rotary axis which swivels the linear axis with
reference to machine zero for the 1st transformation.

MD irrelevant for:
    other 5-axis transformations

Related to:
    MD 24662
```

24564	**TRAFO5_NUTATOR_AX_ANGLE_1**			C07	F2
degrees	Nutating head angle in 5-axis transformation			DOUBLE	NEW CONF
-					
-	-	45.0,45.0,45.0,45.0, 45.0,45.0,45.0...	-89.	89.	7/7

Description:

```
Angle between the second rotary axis and the axis corresponding to it in the
rectangular coordinate system
MD irrelevant for: Transformation type other than "universal milling head".

Related to:
    TRAFO_TYPE_n
```

24566	**TRAFO5_NUTATOR_VIRT_ORIAX_1**			C07	-
-	Virtual orientation axes			BOOLEAN	NEW CONF
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/7

Description:

```
The MD has the following values:

0:  The axis angles of the orientation axes are machine axis angles.

1:  Virtual orientation axes are defined that form a rectangular coordinate
system and the axis angles are rotations around these virtual axes.
```

24570	**TRAFO5_AXIS1_1**			C07	F2
-	Direction of 1st rotary axis			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

The MD indicates the vector that describes the direction of the first rotary axis in the general 5-axis transformation (TRAFO_TYPE_* = 24).
The vector can have any magnitude.

Example:
Both with (0, 1, 0) and with (0, 7.21, 0), the same axis is described (in the direction of the 2nd geometry axis, i.e. usually Y).
Valid for the first transformation of a channel.

24572	**TRAFO5_AXIS2_1**			C07	F2
-	Direction of 2nd rotary axis			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

Indicates the vector that describes the direction of the second rotary axis in the general 5-axis transformation (TRAFO_TYPE_* = 24, 40, 56).
The vector can have any magnitude except zero.

Example:
Both with (0, 1, 0) and with (0, 7.21, 0), the same axis is described (in the direction of the 2nd geometry axis, i.e. usually Y).
Valid for the first transformation of a channel.

24573	**TRAFO5_AXIS3_1**			C07	-
-	Direction of third rotary axis			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

Indicates the vector which defines the direction of the third rotary axis in the case of the general 6-axis transformation (TRAFO_TYPE_* = 24, 40, 56, 57).
The vector may have any value except zero.
Example:
The same axis is defined with both (0, 1, 0) and (0, 7.21, 0) (in the direction of the 2nd geometry axis, that is as a rule Y).

Valid for the first orientation transformation of a channel.

24574	**TRAFO5_BASE_ORIENT_1**			C07	-
-	Vector of the tool base orientation for 5-axis transformation			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
Indicates the vector of the tool orientation in the general 5-axis transforma-
tion (TRAFO_TYPE_* = 24, 40, 56) if this is not defined on the transformation
call or read from a programmed tool.
The vector can have any magnitude except zero.
```

24576	**TRAFO6_BASE_ORIENT_NORMAL_1**			C07	-
-	Normal tool vector in 6-axis transformation			DOUBLE	NEW CONF
-					
-	3	0.0, 1.0 , 0.0,0.0, 1.0 , 0.0...	-	-	7/7

Description:

```
Indicates a vector that is perpendicular to the tool orientation
(TRAFO5_BASE_ORIENTATION_1) in the case of the general 6-axis transformation
(TRAFO_TYPE_* = 24, 40, 56, 57).
If TRAFO6_BASE_ORIENT_NORMAL_1 and TRAFO5_BASE_ORIENTATION_1 are neither
orthogonal nor parallel, then the two vectors are orthogonalized by modifying
the normal vector.The two vectors must not be parallel.
The vector may have any value other than zero.
Valid for the first orientation transformation of a channel.
```

24580	**TRAFO5_TOOL_VECTOR_1**			C07	F2
-	Direction of orientation vector for the first 5-axis transf.			BYTE	NEW CONF
-					
-	-	2,2,2,2,2,2,2,2,2,2,2,2,2,2,2	0	2	7/2

Description:

```
Indicates the direction of the orientation vector for the first 5-axis trans-
formation for each channel.
0: Tool vector in x direction
1: Tool vector in y direction
2: Tool vector in z direction
```

24582	**TRAFO5_TCARR_NO_1**			C07	-
-	TCARR number for the first 5-axis transformation			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

If the value of this machine data is not zero and if machine data $MC_TRAFO_TYPE_X that points to the first orientation transformation has value 72, the kinematics data (offsets etc.) that parameterize the first 5-axis transformation, will not be read from the machine data, but from the data of the orientable tool holder to which this machine data refers.

24585	**TRAFO5_ORIAX_ASSIGN_TAB_1**			C07	F2
-	Orientation axis / channel axis assignment transformation 1			BYTE	NEW CONF
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/2

Description:

Assignment table of the orientation axes for 5-axis transformation 1
Only active with active 5-axis transformation 1.

24590	**TRAFO5_ROT_OFFSET_FROM_FR_1**			C01, C07	-
-	Offset of transformation rotary axes from WO.			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/2

Description:

The programmable offset for orientation axes is automatically accepted from the work offset active for the orientation axes on switch-on of an orientation transformation.

24600	**TRAFO5_PART_OFFSET_2**			C07	F2
mm	Offset vector of the 2nd 5-axis transformation in the channel			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

This machine data designates an offset of the workpiece carrier for the first (MD: TRAFO5_PART_OFFSET_1) or second (MD: TRAFO5_PART_OFFSET_2) 5-axis transformation of a channel and has a specific meaning for the different machine types:

Machine type 1 (two-axis swivel head for tool):
Vector from machine reference point to zero point of workpiece table. This will generally be a zero vector if both coincide.

Machine type 2 (two-axis rotary table for workpiece):
Vector from second joint of workpiece rotary table to zero point of table.

Machine type 3 (single-axis rotary table for workpiece and single-axis swivel head for tool):
Vector from joint of workpiece table to zero point of table.

MD irrelevant:
if the "5-Axis Transformation" option is not installed.

24610	**TRAFO5_ROT_AX_OFFSET_2**			C07	-
degrees	Position offset of rotary axes 1/2/3			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0, 0.0,0.0, 0.0, 0.0...	-	-	7/7

Description:

Indicates the offset for each channel of the rotary axes in degrees for the second orientation transformation.

24620	**TRAFO5_ROT_SIGN_IS_PLUS_2**			C07	F2
-	Sign of rotary axis 1/2/3 for 5-axis transformation 2			BOOLEAN	NEW CONF
-					
-	3	TRUE, TRUE, TRUE,TRUE, TRUE, TRUE...	-	-	7/7

Description:

This machine data designates the sign with which the two rotary axes are included in the first (MD: TRAFO5_ROT_SIGN_IS_PLUS_1) or the second (MD: TRAFO5_ROT_SIGN_IS_PLUS_2) 5-axis transformation of a channel.
MD = 0 (FALSE):
Sign is reversed.
MD = 1 (TRUE) :
Sign is not reversed and the traversing direction is defined according to AX_MOTION_DIR.
This machine data does not mean that the rotational direction of the rotary axis concerned is to be reversed, but specifies whether its motion is in the mathematically positive or negative direction when the axis is moving in the positive direction.
The result of a change to this data is not therefore a change in the rotational direction, but a change in the compensatory motion of the linear axes. However, if a directional vector and thus, implicitly, a compensatory motion is specified, the result is a change in the rotational direction of the rotary axis concerned.
On a real machine, therefore, the machine data may be set to FALSE (or zero) only if the rotary axis is turning in an anti-clockwise direction when moving in a positive direction.
MD irrelevant:
if the "5-Axis Transformation" option is not installed.

24630	TRAFO5_NON_POLE_LIMIT_2			C07	F2
degrees	Definition of pole range for 5-axis transformation 2			DOUBLE	NEW CONF
-					
-	-	2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0...	-	-	7/7

Description:

```
This MD designates a limit angle for the fifth axis of the second 5-axis
transformation with the following properties: if the path runs below this
angle past the pole, the traverse will pass through the pole.
For the 5-axis transformation, the two orientation axes of the tool form a
coordinate system of length and width circles on a  spherical surface. If ori-
entation programming (that is the orientation vector lies in a plane) leads
the path so close past the pole that the angle defined by this MD is
undershot, then there is a deviation from the defined interpolation such that
the interpolation runs through the pole.
Alarm 14112 is output if this modification of the path gives a deviation grea-
ter than a tolerance defined by MD 24640: TRAFO5_POLE_LIMIT_2.
MD irrelevant:
    If the "5-Axis Transformation" option is not installed.
    Also irrelevant with programming in the machine coordinate system ORIMKS.
Related to:
    MD: TRAFO5_POLE_LIMIT_1
```

24640	TRAFO5_POLE_LIMIT_2			C07	F2
degrees	End angle toler. with interpol. through pole for 5-axis transf.			DOUBLE	NEW CONF
-					
-	-	2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0,2.0...	-	-	7/7

Description:

```
This MD designates an end angle tolerance for the fifth axis of the second 5-
axis transformation with the following properties:
With the interpolation through the pole point, only the fifth axis moves, the
fourth axis retains its starting position. If a motion is programmed that does
not run exactly through the pole point but is to run near the pole within the
area given by MD: TRAFO5_NON_POLE_LIMIT then there is a deviation from the
defined path as the interpolation runs exactly through the pole point. This
results in a deviation in the position of the end point of the fourth axis
(the polar axis) from the programmed value.
This MD defines the angle by which the polar axis may deviate from the pro-
grammed value with 5-axis transformation when switching from the programmed
interpolation to the interpolation through the pole point.
An error message (alarm 14112) is output if there is a greater deviation and
the interpolation is not executed.
MD irrelevant:
    If the "5-Axis Transformation" option is not installed.
    Also irrelevant with programming in the machine coordinate system ORIMKS.
Related to:
    MD: TRAFO5_NON_POLE_LIMIT_1
```

24642	**TRAFO5_POLE_TOL_2**			C07	-
degrees	End angle tolerance for pole interpolation			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0	-	7/7

Description:

```
End angle tolerance for interpolation through the pole for the 2nd 5/6-axis
transformation.
This MD is evaluated only by the generic 5/6-axis
transformation.

If the end orientation lies within the pole cone and within the tolerance cone
specified by means of this MD, the pole axis does not move
and retains it start position. The other rotary axis, however,
moves to the programmed angle.
This results in a deviation of the end orientation
from the programmed orientation.
The maximum active value of this MD is the value of MD TRAFO5_POLE_LIMIT_2,
which is used to define the pole cone.
```

24650	**TRAFO5_BASE_TOOL_2**			C07	F2
mm	Vector of base tool on activation of 5-axis transformation 2			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
This MD indicates the vector of the base tool which takes effect when the
first transformation is activated without a length compensation being selec-
ted. Programmed length compensations have an additive effect with respect to
the base tool.

MD irrelevant:
    if the "5-Axis Transformation" option is not installed.
```

24658	**TRAFO5_JOINT_OFFSET_PART_2**			C07	F2
mm	Vector of kinematic table offset			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
Same as MD 24558: TRAFO5_JOINT_OFFSET_PART_1, but for the second transforma-
tion.
```

24660	**TRAFO5_JOINT_OFFSET_2**			C07	F2
mm	Vector of the kinem.offset of the 2nd 5-axis transformation			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
This machine data designates the vector from the first to the second joint for
the first (MD: TRAFO5_JOINT_OFFSET_1) or second (MD: TRAFO5_JOINT_OFFSET_2)
transformation of a channel and has a specific meaning for the various machine
types:

Machine type 1 (two-axis swivel head for tool) and:

Machine type 2 (two-axis rotary table for workpiece):
    Vector from first to second joint of tool rotary head or workpiece rotary
    table.

Machine type 3 (single-axis rotary table for workpiece and single-axis swivel
head for tool):
    Vector from machine reference point to joint of workpiece table.

MD irrelevant:
    if the "5-Axis Transformation" option is not installed. The same applies
    for 3-axis and 4-axis transformations.
```

24661	**TRAFO6_JOINT_OFFSET_2_3_2**			C07	-
mm	Vector of kinematic offset			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
As TRAFO6_JOINT_OFFSET_2_3_1 but for the second transformation.
```

24662	**TRAFO5_TOOL_ROT_AX_OFFSET_2**			C07	F2
mm	Offset swivel point of 2nd 5-axis transf. (swivelled lin.axis)			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
In the case of 5-axis transformation with swiveled linear axis, the value
indicates the offset of the rotary axis which swivels the linear axis with
reference to machine zero for the 2nd transformation.
MD irrelevant for:
    other 5-axis transformations
Related to:
    MD 24562
```

24664	**TRAFO5_NUTATOR_AX_ANGLE_2**			C07	F2
degrees	Nutating head angle			DOUBLE	NEW CONF
-					
-	-	45.0,45.0,45.0,45.0, 45.0,45.0,45.0...	-89.	89.	7/7

Description:

```
Angle between the second rotary axis and the axis corresponding to it in the
rectangular coordinate system

MD irrelevant for:
    Transformation type other than "universal milling head"

Related to:
    TRAFO5_NUTATOR_AX_ANGLE_1
```

24666	**TRAFO5_NUTATOR_VIRT_ORIAX_2**			C07	-
-	Virtual orientation axes			BOOLEAN	NEW CONF
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/7

Description:

```
The MD has the following values:

0:  The axis angles of the orientation axes are machine axis angles.

1:  Virtual orientation axes are defined that form a rectangular coordinate
system and the axis angles are rotations around these virtual axes.
```

24670	**TRAFO5_AXIS1_2**			C07	F2
-	Direction of 1st rotary axis			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
As for TRAFO5_AXIS1_1 but for the second orientation transformation of a chan-
nel.
```

24672	**TRAFO5_AXIS2_2**			C07	F2
-	Direction of 2nd rotary axis			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
As for TRAFO5_AXIS2_1 but for the second transformation of a channel.
```

24673	**TRAFO5_AXIS3_2**			C07	-
-	Direction of third rotary axis			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

As TRAFO5_AXIS3_1 but for the second orientation transformation of a channel.

24674	**TRAFO5_BASE_ORIENT_2**			C07	F2
-	Basic tool orientation			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

As for TRAFO5_BASE_ORIENT_1 but for the second transformation of a channel.

24676	**TRAFO6_BASE_ORIENT_NORMAL_2**			C07	-
-	Normal tool vector			DOUBLE	NEW CONF
-					
-	3	0.0, 1.0 , 0.0,0.0, 1.0 , 0.0...	-	-	7/7

Description:

As TRAFO6_BASE_ORIENT_NORMAL_1 but for the second orientation transformation

24680	**TRAFO5_TOOL_VECTOR_2**			C07	F2
-	Direction of orientation vector			BYTE	NEW CONF
-					
-	-	2,2,2,2,2,2,2,2,2,2,2,2,2,2,2	0	2	7/2

Description:

Indicates the direction of the orientation vector for the second 5-axis transformation for each channel.
0: Tool vector in x direction
1: Tool vector in y direction
2: Tool vector in z direction

24682	**TRAFO5_TCARR_NO_2**			C07	-
-	TCARR number for the second 5-axis transformation			DWORD	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

Same as TRAFO5_TCARR_NO_1, but for the second orientation transformation.

24685	**TRAFO5_ORIAX_ASSIGN_TAB_2**			C07	F2
-	Orientation axis / channel axis assignment transformation 1			BYTE	NEW CONF
-					
-	3	0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0...	0	20	7/2

Description:

Assignment table of the orientation axes for 5-axis transformation 2
Only active with active 5-axis transformation 2.

24690	**TRAFO5_ROT_OFFSET_FROM_FR_2**			C01, C07	-
-	Offset of transformation rotary axes from WO.			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/2

Description:

Same as TRAFO5_ROT_OFFSET_FROM_FR_1, but for the 2nd transformation of a channel

24700	**TRAANG_ANGLE_1**			C07	M1
degrees	Angle between Cartesian axis and real (inclined) axis			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/7

Description:

Indicates for the first agreed TRAANG transformation of the channel the angle of the inclined axis in degrees between the 1st machine axis and the 1st basic axis while TRAANG is active. The angle is measured positively clockwise.

Related to:
TRAANG_ANGLE_2

24710	TRAANG_BASE_TOOL_1			C07	M1
mm	Vector of base tool for 1st TRAANG transformation			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
Indicates a basic offset of the tools zero for the 1st TRAANG transformation.
The offset is referenced to the geometry axes valid when TRAANG is active. The
basic offset is included with and without selection of the tool length compen-
sation. Programmed length corrections have an additive effect with respect to
the basic tool.
The index i takes the values 0, 1, 2  for the 1st to 3rd geometry axes.

Related to:
    $MC_TRAANG_BASE_TOOL_2
```

24720	TRAANG_PARALLEL_VELO_RES_1			C07	M1
-	Velocity margin for 1st TRAANG transformation			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.0	1.0	7/7

Description:

```
Indicates the axis velocity reserve for jog, positioning and oscillating move-
ments for each channel for the first TRAANG transformation, which is held
ready on the parallel axis (see $MC_TRAFO_AXES_IN_n[1]) for the compensating
movement.
Velocity reserve to be provided for jog, positioning and oscillating move-
ments on the parallel axis to handle the compensating movement as a conse-
quence of the inclined axis.

0.0 means that the control or the transformation itself determines the reserve
according to the angle of the inclined axis and the velocity capacity of the
inclined and parallel axes. - The criterion for this is that the same speed
limit is to be maintained in the direction of the parallel axis and the verti-
cal (virtual) axis.

>0.0 means that a fixed reserve has been set (TRAANG_PARALLEL_VELO_RES_1 *
MAX_AX_VELO of the parallel axis). The velocity capacity in the virtual axis
is determined by this. The lower TRAANG_PARALLEL_VELO_RES_1 has been set, the
lower it is

Related to:
    TRAANG_PARALLEL_ACCEL_RES_2
```

24721	TRAANG_PARALLEL_ACCEL_RES_1			C07	M1
-	Acceleration margin of parallel axis for the 1st TRAANG transf.			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.0	1.0	7/7

Description:

```
Indicates the acceleration margin for jog, positioning and oscillating move-
ments which is held ready on the parallel axis (see $MC_TRAFO_AXES_IN_n[1])
for the compensatory movement; MD setting applies to the first TRAANG trans-
formation for each channel.

Related to:
    $MC_TRAANG_PARALLEL_VELO_RES_1
```

24750	TRAANG_ANGLE_2			C07	M1
degrees	Angle between Cartesian axis and real (inclined) axis			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/7

Description:

```
Indicates for the second agreed TRAANG transformation of the channel the angle
of the inclined axis in degrees between the 1st machine axis and the 1st basic
axis while TRAANG is active. The angle is measured positively clockwise.

Related to:
    TRAANG_ANGLE_1
```

24760	TRAANG_BASE_TOOL_2			C07	M1
mm	Vector of base tool for 2nd TRAANG transformation			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
Indicates a basic offset of the tools zero for the 2nd TRAANG transformation.
The offset is referenced to the geometry axes valid when TRAANG is active. The
basic offset is included with and without selection of the tool length compen-
sation. Programmed length corrections have an additive effect with respect to
the basic tool.
The index i takes the values 0, 1, 2  for the 1st to 3rd geometry axes.

Related to:
    $MC_TRAANG_BASE_TOOL_1
```

24770	TRAANG_PARALLEL_VELO_RES_2			C07	M1
-	Velocity margin for 2nd TRAANG transformation			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.0	1.0	7/7

Description:

Indicates the axis velocity reserve for jog, positioning and oscillating movements which is held ready on the parallel axis (see $MC_TRAFO_AXES_IN_n[1]) for the compensatory movement; MD setting applies to the second TRAANG transformation for each channel.

Related to:
TRAANG_PARALLEL_ACCEL_RES_2

24771	TRAANG_PARALLEL_ACCEL_RES_2			C07	M1
-	Acceler. margin of parallel axis for the 2nd TRAANG transform.			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.0	1.0	7/7

Description:

Indicates the axis acceleration margin for jog, positioning and oscillating movements which is held ready on the parallel axis (see $MC_TRAFO_AXES_IN_n[1]) for the compensatory movement; MD setting applies to the second TRAANG transformation for each channel.

Related to:
$MC_TRAANG_PARALLEL_RES_1

24800	TRACYL_ROT_AX_OFFSET_1			C07	M1
degrees	Offset of rotary axis for the 1st TRACYL transformation			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/7

Description:

Indicates the offset of the rotary axis for the first agreed TRACYL transformation in degrees in relation to the neutral position while TRACYL is active.

Related to:
TRACYL_ROT_AX_OFFSET_2

24805	**TRACYL_ROT_AX_FRAME_1**			C07	-
-	Rotary axis offset TRACYL 1			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	2	7/7

Description:

```
0:  axial rotary axis offset is not considered.
1:  axial rotary axis offset is considered.
2:  axial rotary axis offset is considered until SZS.
    SZS frames include transformed axial rotary axis offsets.
```

24808	**TRACYL_DEFAULT_MODE_1**			C07	M1
-	TRACYL mode selection			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/7

Description:

```
Default setting of TRACYL type 514:
0:  without groove side offset (i.e. TRACYL type 514 - equals 512)
1:  with groove side offset (i.e. TRACYL type 514 - equals 513)

With $MC_TRAFO_TYPE_.. = 514 it can be decided via the selection parameters,
whether calculation is made with or without groove side offset. The parameter
will define the variable to be selected, if no selection is made in the call
parameters.
If $MC_TRACYL_DEFAULT_MODE_1 = 1, it will be sufficient to program TRACYL(30)
in the part program instead of TRACYL(30,1,1).
```

24810	**TRACYL_ROT_SIGN_IS_PLUS_1**			C07	M1
-	Sign of rotary axis for 1st TRACYL transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

```
Indicates the sign with which the rotary axis is taken into account in the
TRACYL transformation for the first agreed TRACYL transformation.

Related to:
    TRACYL_ROT_SIGN_IS_PLUS_2
```

24820	TRACYL_BASE_TOOL_1			C07	M1
mm	Vector of base tool for 1st TRACYL transformation			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
Indicates a basic offset of the tools zero for the 1st TRACYL transformation.
The offset is referenced to the geometry axes valid when TRACYL is active. The
basic offset is included with and without selection of the tool length compen-
sation. Programmed length corrections have an additive effect with respect to
the basic tool.
The index i takes the values 0, 1, 2  for the 1st to 3rd geometry axes.

Related to:
    $MC_TRACYL_BASE_TOOL_2
```

24850	TRACYL_ROT_AX_OFFSET_2			C07	M1
degrees	Offset of rotary axis for the 2nd TRACYL transformation			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/7

Description:

```
Indicates the offset of the rotary axis in degrees in relation to the neutral
position for the 2nd agreed TRACYL transformation for each channel.

MD irrelevant:
    If no TRACYL is active

Related to:
    TRACYL_ROT_AX_OFFSET_1
```

24855	TRACYL_ROT_AX_FRAME_2			C07	-
-	Rotary axis offset TRACYL 2			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	2	7/7

Description:

```
0:  axial rotary axis offset is not considered.
1:  axial rotary axis offset is considered.
2:  axial rotary axis offset is considered until SZS.
    SZS frames include transformed axial rotary axis offsets.
```

24858	**TRACYL_DEFAULT_MODE_2**			C07	M1
-	TRACYL mode selection			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/7

Description:

```
Default setting of TRACYL type 514 for the 2nd TRACYL:
0:  without groove side offset (i.e. TRACYL type 514 - equals 512)
1:  with groove side offset (i.e. TRACYL type 514 - equals 513)

With $MC_TRAFO_TYPE_.. = 514 it can be decided via the selection parameters,
whether calculation is made with or without groove side offset. The parameter
defines the variable to be selected, if no selection is made in the call para-
meters.
If $MC_TRACYL_DEFAULT_MODE_2 = 1, it will be sufficient to program TRA-
CYL(30,2) in the part program instead of TRACYL(30,2,1).
```

24860	**TRACYL_ROT_SIGN_IS_PLUS_2**			C07	M1
-	Sign of rotary axis for 2nd TRACYL transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

```
Indicates the sign with which the rotary axis is taken into account in the
TRACYL transformation for the 2nd agreed TRACYL transformation for each chan-
nel.

Related to:
    TRACYL_ROT_SIGN_IS_PLUS_1
```

24870	**TRACYL_BASE_TOOL_2**			C07	M1
mm	Vector of base tool for 2nd TRACYL transformation			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
Indicates a basic offset of the tools zero for the 2ndTRACYL transformation.
The offset is referenced to the geometry axes valid when TRACYL is active. The
basic offset is included with and without selection of the tool length compen-
sation. Programmed length corrections have an additive effect with respect to
the basic tool.
The index i takes the values 0, 1, 2  for the 1st to 3rd geometry axes.

Related to:
    $MC_TRACYL_BASE_TOOL_1
```

24900	TRANSMIT_ROT_AX_OFFSET_1			C07	M1
degrees	Offset of rotary axis for the 1st TRANSMIT transformation			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/7

Description:

```
Indicates the offset of the rotary axis for the first agreed TRANSMIT trans-
formation in degrees in relation to the neutral position while TRANSMIT is
active.

Related to:
    TRANSMIT_ROT_AX_OFFSET_2
```

24905	TRANSMIT_ROT_AX_FRAME_1			C07	-
-	Rotary axis offset TRANSMIT 1			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	2	7/7

Description:

```
0:  axial rotary axis offset is not considered.
1:  axial rotary axis offset is considered.
2:  axial rotary axis offset is considered until SZS.
    SZS frames include transformed rotations around the rotary axis.
```

24910	TRANSMIT_ROT_SIGN_IS_PLUS_1			C07	M1
-	Sign of rotary axis for 1st TRANSMIT transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE,TRUE,TRUE,TRUE,TRUE...	-	-	7/7

Description:

```
Indicates the sign with which the rotary axis is taken into account in the
TRANSMIT transformation for the first agreed TRANSMIT transformation for each
channel.

Related to:
    TRANSMIT_ROT_SIGN_IS_PLUS_2
```

24911	TRANSMIT_POLE_SIDE_FIX_1			C07	M1
-	Restr. working range before/behind the pole, 1. TRANSMIT			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	2	7/7

Description:

```
Restriction of the working area in front of/behind pole or no restriction,
i.e. traversal through the pole.
The assigned values have the following meanings:
1:  Working area of linear axis for positions >=0,
    (if tool length compensation parallel to linear axis equals 0)

2:  Working area of linear axis for positions <=0,
    (if tool length compensation parallel to linear axis equals 0)

0:  No restriction of working area. Traversal through pole.
```

24920	TRANSMIT_BASE_TOOL_1			C07	M1
mm	Vector of base tool for 1st TRANSMIT transformation			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
Indicates a basic offset of the tools zero for the 1st TRANSMIT transforma-
tion. The offset is referenced to the geometry axes valid when TRANSMIT is
active. The basic offset is included with and without selection of the tool
length compensation. Programmed length corrections have an additive effect
with respect to the basic tool.
The index i takes the values 0, 1, 2  for the 1st to 3rd geometry axes.

Related to:
    $MC_TRANSMIT_BASE_TOOL_2
```

24950	TRANSMIT_ROT_AX_OFFSET_2			C07	M1
degrees	Offset of rotary axis for the 2nd TRANSMIT transformation			DOUBLE	NEW CONF
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/7

Description:

```
Indicates the offset of the rotary axis for the second agreed TRANSMIT trans-
formation in degrees in relation to the neutral position while TRANSMIT is
active.

Related to:
    TRANSMIT_ROT_AX_OFFSET_1
```

24955	**TRANSMIT_ROT_AX_FRAME_2**			C07	-
-	Rotary axis offset TRANSMIT 2			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	2	7/7

Description:

```
0:  axial rotary axis offset is not considered.
1:  axial rotary axis offset is considered.
2:  axial rotary axis offset is considered until SZS.
    SZS frames include transformed rotations around the rotary axis.
```

24960	**TRANSMIT_ROT_SIGN_IS_PLUS_2**			C07	M1
-	Sign of rotary axis for 2nd TRANSMIT transformation			BOOLEAN	NEW CONF
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

```
Indicates the sign with which the rotary axis is taken into account in the
TRANSMIT transformation for the second agreed TRANSMIT transformation for each
channel.

Related to:
    TRANSMIT_ROT_SIGN_IS_PLUS_1
```

24961	**TRANSMIT_POLE_SIDE_FIX_2**			C07	M1
-	Restr. of working range before/behind the pole, 2. TRANSMIT			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	2	7/7

Description:

```
Restriction of working area in front of/behind pole or no restriction, i.e.
traversal through pole.
The assigned values have the following meanings:
1:  Working area of linear axis for positions >=0,
    (if tool length compensation parallel to linear axis equals 0)
2:  Working area of linear axis for positions <=0,
    (if tool length compensation parallel to linear axis equals 0)
0:  No restriction of working area. Traversal through pole.
```

24970	TRANSMIT_BASE_TOOL_2			C07	M1
mm	Vector of base tool for 2nd TRANSMIT transformation			DOUBLE	NEW CONF
-					
-	3	0.0, 0.0 , 0.0,0.0, 0.0 , 0.0...	-	-	7/7

Description:

```
Indicates a basic offset of the tools zero for the 2nd TRANSMIT transforma-
tion. The offset is referenced to the geometry axes valid when TRANSMIT is
active. The basic offset is included with and without selection of the tool
length compensation. Programmed length corrections have an additive effect
with respect to the basic tool.
The index i takes the values 0, 1, 2  for the 1st to 3rd geometry axes.

Related to:
    $MC_TRANSMIT_BASE_TOOL_1
```

24995	TRACON_CHAIN_1			C07	M1
-	Transformation grouping			DWORD	NEW CONF
-					
-	4	0, 0, 0, 0,0, 0, 0, 0,0, 0, 0, 0...	0	8	7/7

Description:

```
Transformation chain of the first concatenated transformation.
In the table, the numbers of the transformations which are to be concatenated
are given in the order in which the transformation has to be executed from BCS
into MCS.
Example:
A machine can be operated optionally either as a 5-axis machine or as a trans-
mit machine. A linear axis is not arranged at a right-angles to the other
linear axes (inclined axis).
5 transformations must be set via the machine data, e.g.
TRAFO_TYPE_1 =   16         (5-axis transformation)
TRAFO_TYPE_2 =  256        (Transmit)
TRAFO_TYPE_3 = 1024       (Inclined axis)
TRAFO_TYPE_4 = 8192       (Concatenated transformation)
TRAFO_TYPE_5 = 8192       (Concatenated transformation)

If the 4th transformation concatenates the 5-axis transformation / inclined
axis and the 5th transformation concatenates the transmit / inclined axis,
then (1, 3, 0, 0) is entered in the first table TRACON_CHAIN_1, and (2, 3, 0,
0) in the table TRACON_CHAIN_2. The entry 0 means no transformation.

The order in which the transformations are assigned (TRAFO_TYPE_1 to
TRAFO_TYPE_8) is arbitrary. The linked transformations do not have to be the
last. However, they must always stand behind all the transformations which
occur in a transformation chain. In the previous example, this means that,
e.g. the third and fourth transformations must not be switched.
However, it would be possible to define a further, sixth transformation, if
this does not go into a linked transformation.
```

Transformations cannot be linked with one another at will.
The following limitations apply in SW version 5:
The first transformation in the chain must be an orientation transformation (3- , 4- , 5-axis transformation, nutator) transmit or peripheral curve transformation. The second transformation must be an inclined axis transformation.
No more than two transformations may be linked.

24996	**TRACON_CHAIN_2**			C07	M1
-	Transformation grouping			DWORD	NEW CONF
-					
-	4	0, 0, 0 ,0,0, 0, 0, 0,0, 0, 0, 0...	0	8	7/7

Description:

Transformation chain of the first concatenated transformation.
In the table, the numbers of the transformations which are to be concatenated are given in the order in which the transformation has to be executed from BCS into MCS.
Example:
A machine can be operated optionally either as a 5-axis machine or as a transmit machine. A linear axis is not arranged at a right-angles to the other linear axes (inclined axis).
Transformation chain of the second concatenated transformation.

```
Example: 5 transformations must be set via the machine data
TRAFO_TYPE_1 =   16         (5-axis transformation)
TRAFO_TYPE_2 =  256        (Transmit)
TRAFO_TYPE_3 = 1024       (Inclined axis)
TRAFO_TYPE_4 = 8192       (Concatenated transformation)
TRAFO_TYPE_5 = 8192       (Concatenated transformation)
```

If the 4th transformation concatenates the 5-axis transformation / inclined axis and the 5th transformation concatenates the transmit / inclined axis, then (1, 3, 0, 0) is entered in the first table TRACON_CHAIN_1, and (2, 3, 0, 0) in the table TRACON_CHAIN_2. The entry 0 means no transformation.

The order in which the transformations are assigned (TRAFO_TYPE_1 to TRAFO_TYPE_8) is arbitrary. The cocatenated transformations do not have to be the last. However, they must always follow all the transformations which occur in a transformation chain. In the previous example, this means that, e.g. the third and fourth transformations must not be switched.
However, it would be possible to define a further, sixth transformation, if this does not go into a concatenated transformation.

Transformations cannot be concatenated with one another at will.
The following limitations apply in SW version 5:
The first transformation in the chain must be an orientation transformation (3- , 4- , 5-axis transformation, nutator) transmit or peripheral curve transformation.
The second transformation must be an inclined axis transformation.
No more than two transformations may be concatenated.

24997	**TRACON_CHAIN_3**			C07	M1
-	Transformation grouping			DWORD	NEW CONF
-					
-	4	0, 0, 0 ,0,0, 0, 0, 0,0, 0, 0, 0...	0	8	7/7

Description:

```
Transformation chain of the third concatenated transformation.
See TRACON_CHAIN_1 for documentation.
```

24998	**TRACON_CHAIN_4**			C07	M1
-	Transformation grouping			DWORD	NEW CONF
-					
-	4	0, 0, 0 ,0,0, 0, 0, 0,0, 0, 0, 0...	0	8	7/7

Description:

```
Transformation chain of the fourth concatenated transformation.
See TRACON_CHAIN_1 for documentation.
```

1.4.5 Punching and nibbling

26000	**PUNCHNIB_ASSIGN_FASTIN**			C01, C09	N4
-	Hardware assignment for input byte for stroke control			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0	-	-	7/2

Description:

```
Assignment of the high-speed input byte for "punching and nibbling"
Bit 0-7:    Number of the input byte used
Bit 8-15:   Free
Bit 16-23:  Inversion mask for writing the hardware byte
Bit 24-31:  Free

This data defines which input byte is to be used for the signal "travel
active".

= 1:
    On-board inputs (4 high-speed NCK outputs) are used.

2, 3, 4, 5
    The external digital NCK inputs are used

128-129:
    Comparator byte (results from high-speed analog inputs or VDI specifica-
    tion)
```

```
Related to:
    NIBBLE_PUNCH_INMASK[n]

References:
    /FB/, A4, Digital and Analog NCK I/Os

The signal is high active as default from software 3.2. That is there is wire
break monitoring. If the signal is low active then, e.g., the MD must be set
to the value MD ="H 0001 0001" for the outboard inputs.
```

26002	PUNCHNIB_ASSIGN_FASTOUT			C01, C09	N4
-	Hardware assignment for output byte for stroke control			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
This data defines which output byte is to be used for the stroke control.
Number of the high-speed output byte for "punching and nibbling"
Bit 0-7:    Number of the output byte used
Bit 8-15:   Free
Bit 16-23:  Inversion mask for writing the hardware byte
Bit 24-31:  Free

Possible inputs:
1:
    840D on-board outputs (4 high-speed + 4 bits via VDI specification)

2, 3, 4, 5
    External digital outputs (high-speed NCK O/I or VDI specification)

Related to:
    NIBBLE_PUNCH_OUTMASK[n]
References:
    /FB/, A4, Digital and Analog NCK I/Os
```

26004	NIBBLE_PUNCH_OUTMASK			C01, C09	N4
-	Mask for fast output bits			BYTE	POWER ON
-					
-	8	1, 0, 0, 0, 0, 0, 0, 0,0, 0, 0, 0, 0, 0, 0, 0...	-	-	7/2

Description:

```
Mask for high-speed output bits for punching and nibbling.
Byte 1:    Contains the bit for stroke release
Bytes 2-8: Currently free
Special cases:
    Only NIBBLE_PUNCH_OUTMASK[0] is significant.
    This is used to define the output bit for the signal "Release stroke".
Related to:
    PUNCHNIB_ASSIGN_FASTOUT
```

26006	NIBBLE_PUNCH_INMASK			C01, C09	N4
-	Mask for fast input bits			BYTE	POWER ON
-					
-	8	1, 0, 0, 0, 0, 0, 0, 0,0, 0, 0, 0, 0, 0, 0, 0, 0...	-	-	7/2

Description:

```
This data can define up to 8 byte masks for the output of the high-speed bits.
The standard assignment of this data is as follows:

NIBBLE_PUNCH_INMASK[0]=1:
2° = first bit for the first punch interface (SPIF1)
NIBBLE_PUNCH_INMASK[1]=4:
Second punch interface (SPIF2), not available as standard
NIBBLE_PUNCH_INMASK[2]=0
...
NIBBLE_PUNCH_INMASK[7]=0
Note:
The significance of the bit to be defined must be input as a value (refer to
MD 26004: NIBBLE_PUNCH_OUTMASK[n]).
Special cases:
    Only NIBBLE_PUNCH_INMASK[0] is relevant. This is used to define the input
    bit for the signal "Stroke active".
Related to:
    PUNCHNIB_ASSIGN_FASTIN
```

26008	NIBBLE_PUNCH_CODE			C09	N4
-	Definition of M functions			DWORD	POWER ON
-					
-	8	0,23,22, 25, 26, 0, 0, 0,0, 0, 0, 0, 0, 0, 0, 0, 0...	-	-	7/2

Description:

```
This data defines the special M functions for punching and nibbling.
                              Standard value              Example
NIBBLE_PUNCH_CODE[0] =  0        20        End punching, nibbling with M20
NIBBLE_PUNCH_CODE[1] = 23        23        End punching, nibbling with M23
NIBBLE_PUNCH_CODE[2] = 22        22        Start nibbling
NIBBLE_PUNCH_CODE[3] = 25        25        Start punching
NIBBLE_PUNCH_CODE[4] = 26        26        Activate dwell time
NIBBLE_PUNCH_CODE[5] =122       122        Start nibbling with pretension,
                                             stroke control at servo level
NIBBLE_PUNCH_CODE[6] =125       125        Start punching with pretension,
                                             stroke control at servo level
NIBBLE_PUNCH_CODE[7] =  0         0        Not used
                                             (in preparation)
Special cases:
If MD: PUNCHNIB_ACTIVATION = 2 (M functions are interpreted directly by the
software), then MD: NIBBLE_PUNCH_CODE[0] =20 has to be set.
Related to:
    PUNCHNIB_ACTIVATION
```

26010	PUNCHNIB_AXIS_MASK			C09	N4
-	Definition of punching and nibbling axes			DWORD	POWER ON
-					
-	-	7,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
Defines the axes involved in punching and nibbling. That is all the axes defi-
ned here must be at rest during punching and nibbling.
Related to:
    PUNCH_PARTITION_TYPE
```

26012	PUNCHNIB_ACTIVATION			C09	N4
-	Activation of punching and nibbling functions			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
This MD defines the ways in which punching and nibbling functions can be acti-
vated:

PUNCHNIB_ACTIVATION = 0
None of the punching or nibbling functions can be activated. The automatic
path segmentation is the only exception if it is enabled via MD:
PUNCH_PATH_SPLITTING.

PUNCHNIB_ACTIVATION = 1
The functions are activated via language commands. If M functions are to be
used, then they must be programmed using macros.

PUNCHNIB_ACTIVATION = 2
The M functions are interpreted directly by the software. Language commands
can still be used.

Note:
    This option is intended only as a temporary solution.

Related to:
    PUNCH_PATH_SPLITTING
    NIBBLE_PUNCH_CODE[n]
```

26014	PUNCH_PATH_SPLITTING			C09	N4
-	Activation of automatic path segmentation			DWORD	POWER ON
-					
-	-	2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2	-	-	7/2

Description:

```
Activation data for automatic path segmentation.

Value   Significance
-----------------------------------------------------------------
0 =
    Automatic path segmentation only active with punching and nibbling.

1 =
    Automatic path segmentation can also be activated without punching and
    nibbling functions;
    that is, it is programmable and be used NC internally

2 =
    Automatic path segmentation can only be used NC internally;
    that is it cannot be programmed.
```

26016	PUNCH_PARTITION_TYPE			C09	N4
-	Behavior of individual axes with automatic path segmentation			DWORD	POWER ON
-					
-	-	1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
This machine data defines how single axes that are also nibbling axes within
the meaning of MD: PUNCHNIB_AXIS_MASK are to behave.
In this case, there are the following options for the behavior of the single
axes during path segmentation and stroke control:
PUNCH_PARTITION_TYPE = 0
No special behavior during automatic path segmentation. If the single axes are
programmed together with path axes in one block then their total traversing
path is split up according to the path axes. That is the pure geometric rela-
tionship between the single axes and path axes is identical to the undivided
motion. If the single axes are programmed without the path axes but with
SPN=<value>  then the path is divided accordng to the programmed SPN value.
PUNCH_PARTITION_TYPE = 1
In this case, the path of the single axes, if they are programmed together
with path axes, are generally traversed in the first section (that is indepen-
dently of the currently active type of interpolation).
PUNCH_PARTITION_TYPE = 2
In this case the single axes behave with linear interpolation in the same way
as with PUNCH_PARTITION_TYPE = 1, with all other types of interpolation, in
the same way as with PUNCH_PARTITION_TYPE = 0.
Related to:
    PUNCHNIB_AXIS_MASK
```

26018	**NIBBLE_PRE_START_TIME**			C09	N4
s	Delay time for nibbling/punching with G603			DOUBLE	POWER ON
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0., 0.,0.,0.,0.,0....	-	-	7/2

Description:

```
To minimize any dead times due to the reaction time of the punching unit, it
is possible to release the stroke before reaching the in-position window of
the axes. The reference time for this is the interpolation end. Since there is
normally a delay of some interpolation cycles after reaching the interpola-
tion end (depending on the machine dynamics) until the axes actually come into
position, the prestart time is a delay time with respect to reaching the
interpolation end.
The function is therefore coupled to G603 (block change at the end of interpo-
lation).
The time can be set via the machine data NIBBLE_PRE_START_TIME).

Example:
    With an interpolation cycle of 5 µs, a stroke shall be released 2 cycles
    after reaching the interpolation end. In this case, the value 0.010 s must
    be selected for NIBBLE_PRE_START_TIME. If a value that is not integrally
    divisible by the set interpolation time is selected, then the stroke is
    initiated in the interpolation cycle following the set time.
```

26020	**NIBBLE_SIGNAL_CHECK**			C09	N4
-	Alarm on chattering punching signal			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0	-	-	7/2

Description:

```
When stroke active signal is set, for example by punch overshoots between the
strokes, then the interpolation is stopped. It is also possible to generate
the message "unclean punch signal" as a function of machine data
NIBBLE_SIGNAL_CHECK.
0:  No error message when the punching signal is irregular
1:  Alarm, when the punching signal is irregular between strokes
```

27100	**ABSBLOCK_FUNCTION_MASK**			N01	-
-	Parameterize the block display with absolute values			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x 0,0x0,0x0,0x0,0x0...	0	0x1	7/2

Description:

```
Parameterization of the "block display with absolute values" function
Bit 0 = 1 :
    The position values of the transverse axis are always displayed as diame-
    ter values.
    Transverse axes can be applied via MD20100 or MD30460, bit2.
```

27200	**MMC_INFO_NO_UNIT**			EXP, -	-
-	HMI info (without physical unit)			DOUBLE	POWER ON
-					
-	80	45., 2., 0., 1., 0., -1., 0., 1., 100., 1., 1., 0., 0., 0., 0....	-	-	0/2

Description:

-

27201	**MMC_INFO_NO_UNIT_STATUS**			EXP, -	-
-	HMI status info (without physical unit)			BYTE	POWER ON
-					
-	80	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1...	-	-	0/2

Description:

-

27202	**MMC_INFO_POSN_LIN**			EXP, -	-
mm	HMI info (linear positions)			DOUBLE	POWER ON
-					
-	50	0., 0., 1., 1., 0., 0., 100., 0., 0., 1000., 1., 1....	-	-	0/2

Description:

-

27203	**MMC_INFO_POSN_LIN_STATUS**			EXP, -	-
-	HMI status info (linear positions)			BYTE	POWER ON
-					
-	50	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1...	-	-	0/2

Description:

-

27204	**MMC_INFO_VELO_LIN**			EXP, -	-
mm/min	HMI info (linear velocities)			DOUBLE	POWER ON
-					
-	16	10., 10., 2000., 10000., 300., 1000., 1000., 10., 0.,0.,0.,0....	-	-	0/2

Description:

-

27205	**MMC_INFO_VELO_LIN_STATUS**			EXP, -	-
-	HMI status info (linear velocities)			BYTE	POWER ON
-					
-	16	1,1,1,1,1,1,1,1,0,0,0,0,0,0,0,0...	-	-	0/2

Description:

-

27206	**MMC_INFO_CUT_SPEED**			EXP, -	-
m/min	HMI info (cutting speed)			DOUBLE	POWER ON
-					
-	5	100.,0.,0.,0.,0.,100., 0.,0.,0.,0....	-	-	0/2

Description:

-

27207	**MMC_INFO_CUT_SPEED_STATUS**			EXP, -	-
-	HMI status info (cutting speed)			BYTE	POWER ON
-					
-	5	1,0,0,0,0,1,0,0,0,0,1,0,0,0,0...	-	-	0/2

Description:

-

27208	**MMC_INFO_REV_FEED**			EXP, -	-
mm/rev	HMI info (feed)			DOUBLE	POWER ON
-					
-	10	1.,0.100,1.,1.,0.,0.,0.,0.,0.,0....	-	-	0/2

Description:

-

27209	**MMC_INFO_REV_FEED_STATUS**			EXP, -	-
-	HMI status info (feed)			BYTE	POWER ON
-					
-	10	1,1,1,1,0,0,0,0,0,0,1,1,1,1,0,0,0,0,0,0...	-	-	0/2

Description:

-

27400	**OEM_CHAN_INFO**			A01, A11	-
-	OEM version information			STRING	POWER ON
-					
-	3	"", "", "", "", "", "", "", "", "", "...	-	-	7/2

Description:

```
A version information freely available to the user
(is indicated in the version screen)
```

27800	**TECHNOLOGY_MODE**			C09	A2
-	Mode of technology in channel			BYTE	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
This machine data can be used for stating the technology independently of the
channel.
This information is used, among other things, for evaluating HMI, PLC and
standard cycles.

Meaning:

MD = 0:Milling
MD = 1:Turning
MD = 2:Grinding
    21: Cylindrical grinding
    22: Surface grinding
MD = 3:Nibbling
MD = 4:...

(Enter additional technologies as and when required)
```

27860	PROCESSTIMER_MODE			C09	K1
-	Activation of program runtime measurement			DWORD	RESET
-					
-	-	0x00,0x00,0x00,0x00,0x00,0x00,0x00...	0	0x0FF	7/2

Description:

```
Timers are provided as system variables under the function program runtime.
Whereas the NCK-specific timers are always activated (for time measurements
since the last control power on), the channel-specific timers have to be star-
ted via this machine data.
Meaning:
Bit 0 = 0
    No measurement of total operating time for all part programs
Bit 0 = 1
    Measurement of total operating time for all part programs is active
    ($AC_OPERATING_TIME)
Bit 1 = 0
    No measurement of current program runtime
Bit 1 = 1
    Measurement of current program runtime is active ($AC_CYCLE_TIME)
Bit 2 = 0
    No measurement of tool operation time
Bit 2 = 1
    Measurement of tool operation time is active ($AC_CUTTING_TIME)
Bit 3
    Reserved

Other bits only when bit 0,1,2 = 1:

Bit 4 = 0   No measurement with active dry run feed
Bit 4 = 1   Measurement also with active dry run feed
Bit 5 = 0   No measurement with program test
Bit 5 = 1   Measurement also with program test

Bit 6 only when Bit 1 = 1:
Bit 6 = 0
    Delete $AC_CYCLE_TIME also with start by ASUB and PROG_EVENTs
Bit 6 = 1
    $AC_CYCLE_TIME is not deleted on start by ASUB and PROG_EVENTs.

Bit 7 only when Bit 2 = 1:
Bit 7 = 0
    $AC_CUTTING_TIME counts only with active tool
Bit 7 = 1
    $AC_CUTTING_TIME counts irrespective of tool

Bits 8 to 31
    Reserved
```

27880	PART_COUNTER			C09	K1
-	Activation of workpiece counter			DWORD	RESET
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x0FFFF	7/2

Description:

```
The part counters can be configured with this machine data.
Significance of the individual bits:
Bits 0 - 3:Activating $AC_REQUIRED_PARTS
-----------------------------------------------------------------------
Bit 0 = 1:Counter $AC_REQUIRED_PARTS is active
Further significance of bits 1-3 only when bit 0 =1:
Bit 1 = 0:Alarm/VDI output if $AC_ACTUAL_PARTS corresponds to
$AC_REQUIRED_PARTS
Bit 1 = 1:Alarm/VDI output if $AC_SPECIAL_PARTS corresponds to
$AC_REQUIRED_PARTS
Bit 2Reserved!
Bit 3Reserved!

Bits 4 - 7:Activating $AC_TOTAL_PARTS
------------------------------------------------------------------------
Bit 4 = 1:Counter $AC_TOTAL_PARTS is active
Further significance of bits 5-7 only when bit4 =1:
Bit 5 = 0:Counter $AC_TOTAL_PARTS is incremented by 1 with a VDI output of
M02/M30
Bit 5 = 1:Counter $AC_TOTAL_PARTS  is incremented by 1 with output of the M
command from MD PART_COUNTER_MCODE[0]
Bit 6 = 0:$AC_TOTAL_PARTS also active with program test/block search
Bit 7Reserved!

Bits 8 - 11:Activating $AC_ACTUAL_PARTS
------------------------------------------------------------------------
Bit 8 = 1:Counter $AC_ACTUAL_PARTS is active
Further significance of bits 9-11 only when bit8 =1:
Bit 9 = 0:Counter $AC_ACTUAL_PARTS is incremented by 1 with a VDI output of
M02/M30
Bit 9 = 1:Counter $AC_ACTUAL_PARTS  is incremented by 1 with output of the M
command from MD PART_COUNTER_MCODE[1]
Bit 10 = 0:$AC_ACTUAL_PARTS also active with program test/block search
Bit 10 = 1:No machining $AC_ACTUAL_PARTS with program test/block search
Bit 11Reserved!

Bit 12 - 15:Activating $AC_SPECIAL_PARTS
------------------------------------------------------------------------
Bit 12 = 1:Counter $AC_SPECIAL_PARTS is active
Further significance of bits 13-15 only when bit12 =1:
Bit 13 = 0:Counter $AC_SPECIAL_PARTS  is incremented by 1 with a VDI output of
M02/M30
Bit 13 = 1:Counter $AC_SPECIAL_PARTS  is incremented by 1 with  output of the
M command from MD PART_COUNTER_MCODE[2]
```

```
Bit 14 = 0:$AC_SPECIAL_PARTS also active with program test/block search
Bit 14 = 1:No machining $AC_SPECIAL_PARTS with program test/block search
Bit 15Reserved!

Related to:
    PART_COUNTER_MCODE
```

27882	**PART_COUNTER_MCODE**			C09	K1
-	Workpiece counting with user-defined M command			BYTE	POWER ON
-					
-	3	2, 2, 2,2, 2, 2,2, 2, 2,2, 2, 2...	0	99	7/2

Description:

```
If part counter is activated via MD PART_COUNTER the count pulse can be trig-
gered via a special M command.
Only then are values defined here taken into account:

Meaning:
The part counters are incremented by 1 in the VDI output of the described M
command, where:

$PART_COUNTER_MCODE[0] for $AC_TOTAL_PARTS
$PART_COUNTER_MCODE[1] for $AC_ACTUAL_PARTS
$PART_COUNTER_MCODE[2] for $AC_SPECIAL_PARTS
```

27900	**REORG_LOG_LIMIT**			EXP, C02	S7
-	Percentage of IPO buffer for enabling log file			BYTE	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	-	-	0/0

Description:

```
The machine data defines the percentage of the IPO buffer above which data in
the REORG LOG memory can be released in stages, if the block preparation has
been interrupted due to an overflow of the REORG LOG data memory.
The released data are no longer available to the REORG function (References: /
FB /, K1, "Mode Groups, Channels, Program Operation Mode").
A consequence of this status is that a further REORG command is cancelled with
an error message.
If the status of "non-reorganizability" occurs, warning 15110 is output. The
output of the warning can be suppressed by enabling the highest significant
bit. The bit is set by adding the value 128 to the input value in
REORG_LOG_LIMIT.
In addition to the instructions of the NC blocks, the size of the IPO buffer
and the REORG data memory also affect the frequency of data release.

Related to:
    MD 28000: MM_REORG_LOG_FILE_MEM
    (memory size for REORG)
    MD 28060: MM_IPO_BUFFER_SIZE
    (number of blocks in the IPO buffer)
```

1.4.6 Channel-specific memory settings

28000	**MM_REORG_LOG_FILE_MEM**			EXP, C02	S7
-	Memory space for REORG (DRAM)			DWORD	POWER ON
-					
-	-	50,50,50,50,50,50,50,50,50,50,50,50,50 ...	1	500	7/2

Description:

```
Definition of the size (in kbyte) of the dynamic memory for the REORG-LOG
data. The size of the memory determines the quantity of the data available for
the function REORG.

References:
    /FB/, K1, "Mode Groups, Channel, Program Operation"
```

28010	**MM_NUM_REORG_LUD_MODULES**			EXP, C02	S7
-	Number of blocks for local user variables in REORG (DRAM)			DWORD	POWER ON
-					
-	-	8,8,8,8,8,8,8,8,8,8,8,8,8,8,8	0	SLMAXNUMBEROF_USERMODULES	7/2

Description:

```
Defines the number of additional LUD data blocks available for the function
REORG (see Description of Functions, Channels, Mode Groups, Program Operation
(K1)).
This value can be 0 if the function REORG is not used. The CNC always opens 12
LUD data blocks, of which 8 are used for NC programs and 4 for the ASUBs.
An LUD data block is needed for each NC program and ASUB in which a local user
variable is defined. This value may have to be increased for the function
REORG if a large IPO buffer is present and a large number of short NC pro-
grams in which LUD variables are defined are active (prepared NC blocks of the
programs are located in the IPO buffer).
An LUD data block is needed for each of these programs. The size of the reser-
ved memory is affected by the number of LUDs per NC program and their indivi-
dual memory requirements. The LUD data blocks are stored in the dynamic
memory.

The memory requirement for managing the blocks for local user variables with
REORG can be determined as follows:

The size of the LUD blocks depends on the number of active LUDs and their data
type. The memory for the LUD blocks is limited by the MD 28000:
MM_REORG_LOG_FILE_MEM (memory size for REORG).
```

28020	MM_NUM_LUD_NAMES_TOTAL			C02	S7
-	Number of local user variables (DRAM)			DWORD	POWER ON
-					
-	-	400,400,400,400,400,400,400,400,400...	0	32000	7/2

Description:

Defines the number of variables for the local user data (LUD) which are permitted to exist in the active sections of the program. Approximately 150 bytes of memory per variable are reserved for the names of the variables and the variable values. The memory required for the variable value is equal to the size of the data type. If the total of the local user variables from the active main program and the related subprograms is larger than the defined limit, the variables which are over the limit are not accepted during execution of the program. Dynamic memory is used for the variable names and variable values.

Overview of the memory used by the data types:

Data type	Memory used
REAL	8 bytes
INT	4 bytes
BOOL	1 byte
CHAR	1 byte
STRING	1 byte per character, 200 characters per string are possible
AXIS	4 bytes
FRAME	400 bytes

28040	MM_LUD_VALUES_MEM			C02	S7
-	Memory space for local user variables (DRAM)			DWORD	POWER ON
-					
-	-	50,50,50,50,50,50,50,50,50,50,50,50,50...	0	32000	7/2

Description:

This MD defines the amount of memory space available for LUD variables.
The number of available LUDs is exhausted when one of the limit values in either MD 28020: MM_NUM_LUD_NAMES_TOTAL or MM_LUD_VALUES_MEM is reached.
The memory defined here is subdivided into (MM_LUD_VALUES_MEM * 1024) / MM_MAX_SIZE_OF_LUD_VALUE blocks and allocated to part programs which request memory. Each part program which contains at least one definition of an LUD variable or which has call parameters uses at least one such block.
It should be remembered that several part programs can be open at once and thus use memory in the NCK. The number depends on the type of programming, the program length and the size of the internal NCK block memory upwards of (MM_IPO_BUFFER_SIZE, MM_NUM_BLOCKS_IN_PREP).

Related to:
MD 28020: MM_NUM_LUD_NAMES_TOTAL
(number of local user variables (DRAM))

28050	**MM_NUM_R_PARAM**			C02	S7
-	Number of channel-specific R parameters (SRAM)			DWORD	POWER ON
-					
-	-	100,100,100,100,100,100,100,100,100...	0	32535	7/2

Description:

```
Defines the number of R parameters available in the channel. A maximum of
32535 R parameters are available per channel. This machine data reserves 8
bytes of buffered user memory per R parameter.
R parameters  have a considerably lower management overhead in comparison to
LUD and GUD variables.

Attention:
    The buffered data are lost when this machine data is changed!
```

28060	**MM_IPO_BUFFER_SIZE**			C02	S7
-	Number of NC blocks in IPO buffer (DRAM)			DWORD	POWER ON
-					
-	-	10,10,10,10,10,10,10,10,10,10,10,10,10...	2	300	7/2

Description:

```
Defines the number of blocks for the interpolation buffer. This buffer con-
tains prepared NC blocks available for the interpolation. A number of kbytes
of the dynamic user memory are reserved for each NC block. The data also
limits the number of blocks for look ahead consideration of speed limitation
for the LookAhead function.
The MM_IPO_BUFFER_SIZE is set by the system.
Related to:
    MD 28070: MM_NUM_BLOCKS_IN_PREP
    (number of blocks for block preparation)
```

28070	**MM_NUM_BLOCKS_IN_PREP**			EXP, C02	S7
-	Number of blocks for block preparation (DRAM)			DWORD	POWER ON
-					
-	-	50,50,50,50,50,50,50,50,50,50,50,50,50...	20	500	7/2

Description:

```
Defines the number of NC blocks available for NC block preparation. This
figure is determined mainly by the system software and is used largely for
optimization. Approximately 10 Kbytes of dynamic memory is reserved per NC
block.

Related to:
    MD 28060: MM_IPO_BUFFER_SIZE
    (number of NC blocks with IPO buffer)
```

28080	**MM_NUM_USER_FRAMES**			C11, C02	S7
-	Number of settable frames (SRAM)			DWORD	POWER ON
-					
-	-	5,5,5,5,5,5,5,5,5,5,5,5,5,5,5	5	100	7/2

Description:

```
Defines the number of predefined user frames. Approximately 400 bytes of
backup memory are reserved per frame.
The standard system configuration provides four frames for G54 to G57 and one
frame for G500.

Special cases:
    The backup data are lost if this machine data is altered!
```

28081	**MM_NUM_BASE_FRAMES**			C02	K2
-	Number of base frames (SRAM)			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	0	16	7/2

Description:

```
Number of channel-specific base frames per channel.
The value corresponds to the number of field elements for the predefined field
$P_CHBFR[].
Buffered memory is reserved for this.
```

28082	**MM_SYSTEM_FRAME_MASK**			C02	K2
-	System frames (SRAM)			DWORD	POWER ON
-					
-	-	0x21,0x21,0x21,0x21,0x21,0x21,0x21...	0	0x000007FF	7/2

Description:

```
Bit mask for configuring channel-specific system frames included in the chan-
nel. The following applies:

Bit 0: System frame for setting actual value and scratching
Bit 1: System frame for external work offset
Bit 2: System frame for TCARR aund PAROT
Bit 3: System frame for TOROT and TOFRAME
Bit 4: System frame for workpiece reference points
Bit 5: System frame for cycles
Bit 6: System frame for transformations
Bit 7:System frame $P_ISO1FR for ISO G51.1 Mirror
Bit 8:System frame $P_ISO2FR for ISO G68 2DROT
Bit 9:System frame $P_ISO3FR for ISO G68 3DROT
Bit 10:System frame $P_ISO4FR for ISO G51 Scale
```

28083	**MM_SYSTEM_DATAFRAME_MASK**			C02	-
-	System frames (SRAM)			DWORD	POWER ON
-					
-	-	0x79F,0x79F,0x79F,0x79F,0x79F,0x79F...	0	0x000007FF	7/2

Description:

```
Bit mask for configuring channel-specific system frames in the data storage
(SRAM). The following applies:

Bit 0: System frame for setting actual value and scratching
Bit 1: System frame for external work offset
Bit 2: System frame for TCARR aund PAROT
Bit 3: System frame for TOROT and TOFRAME
Bit 4: System frame for workpiece reference points
Bit 5: System frame for cycles
Bit 6: System frame for transformations
Bit 7:System frame $P_ISO1FR for ISO G51.1 Mirror
Bit 8:System frame $P_ISO2FR for ISO G68 2DROT
Bit 9:System frame $P_ISO3FR for ISO G68 3DROT
Bit 10:System frame $P_ISO4FR for ISO G51 Scale
```

28085	**MM_LINK_TOA_UNIT**			C02, C09	FBW,S7
-	Assignment of a TO unit to a channel (SRAM)			DWORD	POWER ON
-					
-	-	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	1	10	7/2

Description:

```
A TO unit is assigned to each channel through a default setting. The memory is
thus reserved for the data blocks (tools, magazines).

A TOA unit can also be assigned to several channels.

Def.: The TOA area is the sum of all TOA and magazine blocks in the NC.

The TOA unit consists of a TOA block and, with activated TM function, a maga-
zine block.

Special cases:
    The backup data are lost if this machine data is altered!
```

28090	**MM_NUM_CC_BLOCK_ELEMENTS**			EXP, C02	S7
-	Number of block elements for compile cycles (DRAM)			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	130	7/1

Description:

The input value defines the number of block elements that can be used for compile cycles.
In the case of software version 2, approximately 1.2KB of dynamic memory is required per block element.

28100	**MM_NUM_CC_BLOCK_USER_MEM**			EXP, C02	S7
-	Size of block memory for compile cycles (DRAM), in KB			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	64000	7/1

Description:

The value defines the total capacity of block memory available to the user in the dynamic memory area for the compile cycles. The memory is allocated in staggered blocks of 128 bytes.

28105	**MM_NUM_CC_HEAP_MEM**			EXP, C02	S7
-	Heap memory in kbytes for compile-cycle applications (DRAM)			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	64000	7/2

Description:

Size of the heap memory in kbytes which can be used by the compile cycle user.
Dynamic memory is reserved.
The memory is allocated in subdivisions of 128 byte blocks.
The start address and the size of the reserved memory is made available via a binding, the management lies in the hands of the CC user.

28150	MM_NUM_VDIVAR_ELEMENTS			C02	P3
-	Number of elements for writing PLC variables			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	32000	7/2

Description:

The MD defines the number of elements which the user has available for writing PLC variables ($A_DBx=...). This number also applies to block search, but not to synchronized actions.

The memory requirement is ca. 24 bytes per element. One element is needed for each write action when writing PLC variables in quick succession.
However, the number of elements can be reduced if the accessing actions are made separately (block transport has already been accomplished). Writing accesses (var=$A_DBx) are unlimited.

28160	MM_NUM_LINKVAR_ELEMENTS			C02	B3
-	Number of elements for writing NCU-link variables			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	32000	7/2

Description:

Defines the number of elements which the user has available for programming link variables ($A_DLx). This number also applies to block search, but not to synchronized actions.
The memory requirement is ca. 24 bytes per element.
One element is needed for each write action when writing NCU-link variables in quick succession. However, the number of elements can be reduced if the accessing actions are made separately (block transport has already been accomplished).

28180	MM_MAX_TRACE_DATAPOINTS			EXP, C02, C06	BA,S5,FBSY
-	Length of the trace data buffer			DWORD	POWER ON
NBUP					
-	-	100,100,100,100,100,100,100,100,100...	0	20000	2/2

Description:

MM_MAX_TRACE_DATAPOINTS defines the size of an internal data buffer which contains the trace recordings.

28200	**MM_NUM_PROTECT_AREA_CHAN**			C02, C06, C09	S7
-	Number of files for channel-specific protection zones (SRAM)			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	10	7/2

Description:

```
This machine data defines how many blocks are set up for channel-specific pro-
tection zones.

Related to:
    MD 28210: MM_NUM_PROTECT_AREA_ACTIVE
    (number of simultaneously active protection zones)
    MD 18190: MM_NUM_PROTECT_AREA_NCK
    (number of files for machine-related protection zones (SRAM))

References:
    /FB/, A3, "Axis/Contour Tunnel Monitoring, Protection Zones"
```

28210	**MM_NUM_PROTECT_AREA_ACTIVE**			C11, C02, C06, C09	S7
-	Number of simultaneously active protection zones in one channel			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	10	7/2

Description:

```
This machine data defines the number of protection zones that may be activa-
ted simultaneously for each channel.

It is not practical to enter a numerical value higher than MD 18190:
MM_NUM_PROTECT_AREA_NCK + MD 28200: MM_NUM_PROTECT_AREA_CHAN.

Related to:
    MD 28200: MM_NUM_PROTECT_AREA_CHAN
    (Number of blocks for channel-specific protection zones)
    MD 18190: MM_NUM_PROTECT_AREA_NCK
    (Number of files for machine-related protection zones (SRAM))

References:
/FB1/ Function Manual Basic Functions; Axis Monitoring, Protection Zones (A3)
```

28212	**MM_NUM_PROTECT_AREA_CONTOUR**			C11, C02, C06, C09	-
-	Elements for active protection zones (DRAM)			DWORD	POWER ON
-					
-	-	30,30,30,30,30,30,30,30,30,30,30,30,30,30...	0	50	7/2

Description:

```
This machine data defines for each channel how many internal contour elements
in total are held available for active protection zones.

Dynamic memory is used.

The MD affects the memory requirements for the activated protection zones.

This machine data is active only if $MC_MM_NUM_PROTECT_AREA_ACTIVE is not
equal to 0.
```

28250	**MM_NUM_SYNC_ELEMENTS**			C02, -	S5,FBSY
-	Number of elements for expressions in synchronized actions			DWORD	POWER ON
-					
-	-	159,159,159,159,159,159,159,159,159,159...	0	32000	7/2

Description:

```
The expressions of the motion-synchronous actions are stored in memory ele-
ments in the control. A motion-synchronous action occupies at least 4 ele-
ments.
It occupies:
-   1 element for each operand in the condition
-   >= 1 element for each action
-   2 elements for each assignment
-   1 element for each further operand in complex expressions.

One element is ca 64 bytes.

The option "Synchronous actions stage 2" is required if the MD is to be chan-
ged beyond its default value.

References:
    Programming Guide, Advanced
```

28251	**MM_NUM_SAFE_SYNC_ELEMENTS**			C02, -	S5,FBSI
-	Number of elements for expressions in Safety synchr. actions			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	32000	7/2

Description:

```
The expressions of motion-synchronous actions are stored in memory elements of
the control. A motion-synchronous action assigns at least 4 elements.
Assignments:
    Each operand in the condition:1 element
    Each action:>= 1 element
    Each assignment:2 elements
    Each additional operand in complex expressions:1 element

Also see:
    MD 28250: $MC_MM_NUM_SYNC_ELEMENTS
```

28252	**MM_NUM_FCTDEF_ELEMENTS**			C02	S5,FBSY
-	Number of FCTDEF elements			DWORD	POWER ON
-					
-	-	3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3	0	100	7/2

Description:

```
Defines the number of FCTDEF elements.
```

28254	**MM_NUM_AC_PARAM**			C02	FBSY
-	Dimension of $AC_PARAM.			DWORD	POWER ON
-					
-	-	50,50,50,50,50,50,50,50,50,50,50,50,50,50,50 ...	0	20000	7/2

Description:

```
Panel size of $AC_PARAM.
```

28255	**MM_BUFFERED_AC_PARAM**			C02	FBSY
-	$AC_PARAM[] is stored in SRAM.			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/2

Description:

```
$AC_PARAM[] is stored in SRAM.
```

28256	**MM_NUM_AC_MARKER**			C02	FBSY
-	Dimension of $AC_MARKER			DWORD	POWER ON
-					
-	-	8,8,8,8,8,8,8,8,8,8,8,8,8,8	0	20000	7/2

Description:

Number of channel-specific markers $AC_MARKER for motion-synchronous actions.

DRAM or SRAM is required depending on $MC_MM_BUFFERED_AC_MARKER.

28257	**MM_BUFFERED_AC_MARKER**			C02	FBSY
-	$AC_MARKER[] is stored in SRAM.			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	7/2

Description:

$AC_MARKER[] is stored in SRAM.

28258	**MM_NUM_AC_TIMER**			C02	S5,FBSY
-	Number of time variables $AC_TIMER (DRAM)			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	10000	7/2

Description:

Number of channel-specific time variables $AC_TIMER for motion-synchronous actions (DRAM)

28260	**NUM_AC_FIFO**			C01	S5,FBSY
-	Number of FIFO variable for synchronized actions			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	10	7/2

Description:

```
Number of FIFO variables $AC_FIFO1 - $AC_FIFO10 for motion-synchronous
actions.
FIFO variables are used for product tracking. A piece of information (e.g. the
product length) for each part can be temporarily stored on a band in each FIFO
variable.
FIFO variables are stored in R parameters.
The MD $MC_START_AC_FIFO defines the number of the R parameter from which the
FIFO variables can be stored.  All R parameters with lower numbers can be used
freely in the part program.
R parameters above the FIFO range cannot be written from the part program.
The number of R parameters must set via machine data MD $MC_MM_NUM_R_PARAM so
that all FIFI variables can be accommodated from the start of the R parame-
ters:
$MC_MM_NUM_R_PARAM=$MC_MM_START_FIFO + $MC_NUM_AC_FIFO*($MC_LEN_AC_FIFO+6)
The FIFO variables bear the names $AC_FIFO1 to $AC_FIFOn.
They are stored as fields.
The indices 0 - 5 have special meanings:
n= 0:
    A new value is stored in the FIFO when writing with index 0.
    The oldest element is read and removed from the FIFO when writing with
    index 0.
n=1:  Access to the first element read in
n=2:  Access to the last element 1 read in
n=3:  Sum of all FIFO elements
n=4:  Number of elements available in the FIFO
n=5:  Current write index relative to FIFO start
n=6:  1st element read in
```

28262	**START_AC_FIFO**			C01	S5,FBSY
-	FIFO variables store from R parameter			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	32535	7/2

Description:

```
Number of the R parameter from which FIFO variables are stored. All R parame-
ters with lower numbers can be used freely in the part program. R parameters
above the FIFO range cannot be written from the part program.
The number of R parameters must set via machine data MD 28050:
$MC_MM_NUM_R_PARAM so that all FIFI variables can be accommodated  from the
start of the R parameters:
$MC_MM_NUM_R_PARAM=$MC_START_FIFO + $MC_NUM_AC_FIFO*($MC_LEN_AC_FIFO+6)
The FIFO variables bear the names $AC_FIFO1 to $AC_FIFOn. They are stored as
fields.
```

```
The indices 0 - 5 have special meanings:
n= 0:
    A new value is stored in the FIFO when writing with index 0.
    The oldest element is read and removed from the FIFO  when writing with
    index 0.
n=1:  Access to the first element read in
n=2:  Access to the last element read in
n=3:  Sum of all FIFO elements
n=4:  Number of elements available in the FIFO
n=5:  Current write index relative to FIFO start

Related to:
    MD 28260: NUM_AC_FIFO
```

28264	**LEN_AC_FIFO**			C01	S5,M5,FBSY
-	Length of FIFO variables AC_FIFO1-AC_FIFO10			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	32535	7/2

Description:

```
Length of the FIFO variables $AC_FIFO1 to $AC_FIFO10.
All FIFO variables are the same length.
```

28266	**MODE_AC_FIFO**			C01	S5,FBSY
-	Mode of FIFO processing			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	-	7/2

Description:

```
Mode of FIFO processing:
Bit 0 = 1:
    The sum of all FIFO contents is updated at each write access.
Bit 0 = 0:
    No summation

Related to:
    MD 28260: NUM_AC_FIFO
```

28274	**MM_NUM_AC_SYSTEM_PARAM**			EXP, C02	FBSY
-	Number of $AC_SYSTEM_ PARAM for motion-synchronous actions			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	20000	7/2

Description:

```
Number of $AC_SYSTEM_ PARAM parameters for motion-synchronous actions.
Depending on $MC_MM_BUFFERED_AC_PARAM, DRAM or SRAM  is required.

Reserved for SIEMENS applications.
```

28276	**MM_NUM_AC_SYSTEM_MARKER**			EXP, C02	FBSY
-	Number of $AC_SYSTEM_MARKER for motion-synchronous actions			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	20000	7/2

Description:

```
Number of $AC_SYSTEM_MARKER markers for motion-synchronous actions.
Depending on $MC_MM_BUFFERED_AC_MARKER, DRAM or SRAM is required.

Reserved for SIEMENS applications.
```

28290	**MM_SHAPED_TOOLS_ENABLE**			C01, C08, C02	-
-	Enable tool radius compensation for contour tools			BOOLEAN	POWER ON
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/0

Description:

```
The function "Tool radius compensation for contour tools" is enabled with this
tool.
Modification of this machine data will cause a reconfiguration of the memory.
```

28300	**MM_PROTOC_USER_ACTIVE**			C02	D1,OEM
-	Activation of logging for a user			BOOLEAN	POWER ON
-					
-	10	TRUE, FALSE, FALSE, FALSE, FALSE, TRUE, TRUE, FALSE, FALSE...	-	-	1/1

Description:

```
Activation of recording for a user.
The users 0 and 1, and 5 - 9 are reserved for system functions.
The users 2, 3 and 4 can be used by OEM.
```

28301	**MM_PROTOC_NUM_ETP_OEM_TYP**			C02	D1,OEM
-	Number of OEM event types ETP.			DWORD	POWER ON
-					
-	10	0, 0, 0, 0, 0, 0, 0, 0, 0, 0...	0	20	1/1

Description:

```
Number of OEM event types in OPI module ETP.
```

28302	**MM_PROTOC_NUM_ETP_STD_TYP**			C02	-
-	Number of standard event types ETP			DWORD	POWER ON
-					
-	10	28, 0, 0, 0, 0, 20, 20, 0, 0, 3...	0	51	1/1

Description:

```
Number of standard event types required in the ETP OPI block.
```

28400	**MM_ABSBLOCK**			EXP, C02	S7
-	activate block display w. absolute values			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	0	512	7/2

Description:

```
Value:

0:   Block display with absolute values deactivated

1:   Block display with absolute values activated;

    A display buffer with the following size is created:
    ($MC_MM_IPO_BUFFER_SIZE + $MC_MM_NUM_BLOCKS_IN_PREP)  *  256 bytes

>= 128:Block display with absolute values activated;

    A display buffer with the following size is created:
    ($MC_MM_IPO_BUFFER_SIZE + $MC_MM_NUM_BLOCKS_IN_PREP)  *  <value>
```

28402	**MM_ABSBLOCK_BUFFER_CONF**			EXP, C02	S7
-	Setting of upload buffer size			DWORD	POWER ON
-					
-	2	2, 4,2, 4,2, 4,2, 4,2, 4,2, 4,2, 4...	0	32000	7/2

Description:

```
Size of upload buffer:
$MC_MM_ABSBLOCK_BUFFER_CONF[0] : Number of blocks before current block
$MC_MM_ABSBLOCK_BUFFER_CONF[1] : Number of blocks after current block

The machine data is tested for the following upper / lower limits during star-
tup:
0 <= $MC_MM_ABSBLOCK_BUFFER_CONF[0] <= 8
0 <= $MC_MM_ABSBLOCK_BUFFER_CONF[1] <= ($MC_MM_IPO_BUFFER_SIZE +
$MC_MM_NUM_BLOCKS_IN_PREP)
When violating the limits, alarm 4152 is issued.
```

28450	**MM_TOOL_DATA_CHG_BUFF_SIZE**			-, C02, C06	-
-	Buffer for tool data changes (DRAM)			DWORD	POWER ON
-					
-	-	60,60,60,60,60,60,60,60,60,60,60,60,60,60 ...	0	2500	7/2

Description:

```
Number of entries in the buffer for the OPI change service for tool data.
Dynamic memory is used.
This buffer is created only if bit 2 or bit 3 is set in MD
$MN_TOOL_DATA_CHANGE_COUNTER.
```

28500	**MM_PREP_TASK_STACK_SIZE**			EXP, C02	S7
-	Stack size of preparation task (DRAM)			DWORD	POWER ON
-					
-	-	70,70,70,70,70,70,70,70,70,70,70,70,70,70 ...	45	100	0/0

Description:

```
Defines the stack size in kbytes for the preparation task. The stack is stored
in the dynamic memory.

Note:
    This machine data is assigned internally by the control and must not be
    altered by the user.
```

28520	**MM_MAX_AXISPOLY_PER_BLOCK**			C02	S7
-	maximal number of axial polynomials per block			DWORD	POWER ON
-					
-	-	3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3	1	5	7/2

Description:

```
Maximum number of axis polynomials which can be contained in a block.
In the standard case, each block only contains one polynomial per axis, i.e.
this data can immediately be set to one.
Currently, more polynomials are only needed for the new ADIS function with
G643.
In this case, this data must have a minimum value of three.
```

28530	MM_PATH_VELO_SEGMENTS			C02	K1
-	Number of memory elements for path velocity limitation			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	100	7/2

Description:

```
Number of memory elements available for limiting the path velocity and chan-
ging it in the block.
0   : Each block is limited by a maximum path velocity.
> 0 : If required, a profile of the permissible path velocity
    ; and its modification options is generated and monitored
    ; in the block.
    ; This results in a smoother axis velocity progression and
    ; a shorter travel time.
    ; $MC_MM_PATH_VELO_SEGMENTS defines the average available
    ; number of segments in the block.
    ; The necessary setting essentially depends
    ; on the requirements.

The following values are recommended:
3:  for G643, if only geometry axes are traversed
5:  for G643, if geometry and rotary axes are traversed
5:  for COMPCAD
5:  for dyn. transformation

A value that is too low this may lead to additional velocity limitations if an
insufficient number of blocks can be made available for interpolation.
$MC_MM_PATH_VELO_SEGMENTS additionally increases the memory requirement of
dyn. Look Ahead. Values higher than 5 are only practical in exceptional cases.

3 ... 5   :
    Recommended setting.
```

28535	MM_FEED_PROFILE_SEGMENTS			C02	-
-	Number of memory element for feed profiles			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	1	10	7/2

Description:

```
Number of memory elements available for feed profile per block.
The default value 1 is adequate for a programmable feed profile (FLIN, FCUB,
FPO()).
If compile cycle applications require more segments per block, this machine
data must be increased accordingly.
If, for example, a feed profile is to be activated in which there is decelera-
tion at both the beginning and the end of the block, 3 segments will be
required for the feed profile in the block, i.e. this MD must have value 3.
```

28540	MM_ARCLENGTH_SEGMENTS			C02	K1
-	Number of memory elements for arc length function representation			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	100	7/2

Description:

Number of memory elements available for the arc length function for parameterizing polynomials.If this machine data is equal to zero, a fixed interval division is used to represent the arc length function. In this case, the calculated function is only tangent-continuous. This can lead to discontinuities in the axis acceleration.
If the function G643 is used for smoothing and/or COMPCAD, this MD should be assigned a value of at least 10. In this case, the calculated function also has a constant curvature which results in a smoother progression of the path velocity as well as the axis velocities and accelerations.
Values substantially larger than 10 are only practical in exceptional cases.
Not only the value of $MC_MM_ARCLENGTH_SEGMENTS but also that of $MC_SPLINE_FEED_PRECISION are crucial for the accuracy.

28560	MM_SEARCH_RUN_RESTORE_MODE			C02	K1
-	Data restore after simulation			DWORD	POWER ON
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x00000001	7/2

Description:

Bit mask to restore data after abort of a simulated program execution. The following applies:
Bit 0: All frames in the data storage are restored.

28580	MM_ORIPATH_CONFIG			C02	-
-	Setting for ORIPATH path-relative orientation			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1	1/1

Description:

This MD is used to configure the behavior with ORIPATH, that is path-relative interpolation of the tool orientation. Furthermore, orientation smoothing is enabled with the G codes OSD or OST.
The following options are available:
0: The MD $MC_ORIPATH_MODE has no effect. G codes OSD and OST have no effect.
1: The "genuine" path-relative orientation intepolation can be activated with the MD $MC_ORIPATH_MODE = 1. The reference of the tool orientation to the path tangent and to the vector normal to the surface programmed with LEAD/TILT is retained throughout the block.
Note:
If ORIPATH is programmed for ORIPATH_MODE = 1 or OSD or OST without the MD ORIPATH_CONFIG = 1, alarm 10980 will be displayed.

28590	**MM_ORISON_BLOCKS**			C02	-
-	Setting for orientation smoothing			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	30	1/1

Description:

```
With this MD the function "Orientation smoothing with ORISON" is activated. If
value "Zero" is set for this data, no orientation smoothing will be possible.
The value of this machine data indicates over how many blocks this orienta-
tion is smoothed. A maximum of 30 blocks is possible. For most applications,
however, 10 blocks should suffice for smoothing.
Value 4 should be entered as a minimum.
Orientation smoothing over 4 blocks is possible.
If this MD is smaller than 4 and if G code ORISON is programmed, alarm 10982
will be displayed.
```

28600	**MM_NUM_WORKAREA_CS_GROUPS**			C02	-
-	Number of coordinate system-specific operating range limits			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	10	7/2

Description:

```
Number of data blocks in the channel that are created for coordinate system-
specific operating range limits.
It indicates the maximum value of the 1st index of system variable
$PC_WORKAREA_CS...[WALimNo, Ax]. It furthermore defines the number of the pro-
grammable G functions "WALCS1, WALCS2, ... WALCS10" as well as the maximum
value in system variable $AC_WORKAREA_PC_GROUP_NO".

= 0:Function "Monitoring of coordinate system-specific operating range limits"
cannot be activated.
```

1.5 Axis-specific machine data

Number	**Identifier**			Display filters	Reference
Unit	Name			Data type	Active
Attributes					
System	Dimension	Default value	Minimum value	Maximum value	Protection

Description:

```
Description
```

1.5.1 Configuration

30100	**CTRLOUT_SEGMENT_NR**			EXP, A01	G2
-	Setpoint assignment: bus segment number			BYTE	POWER ON
-					
-	1	1	1	5	7/2
710-6a2c	-	5	5	5	-1/-
720-6a2c	-	5	5	5	-1/-
730-6a2c	-	5	5	5	-1/-
710-31a10c	-	5	5	5	-1/-
720-31a10c	-	5	5	5	-1/-
730-31a10c	-	5	5	5	-1/-
840di-basic	-	5	5	5	-1/-
840di-universal	-	5	5	5	-1/-
840di-plus	-	5	5	5	-1/-

Description:

```
This MD is used to enter the number of the bus segment via which the output is
addressed.
0:  Local bus (for 802d MCPA)
1:  611D drive bus for SINUMERIK 840D/810D (1st DCM)
2:  reserved (previously local P bus)
3:  reserved (previously 611D bus, 2nd DCM)
4:  reserved (virtual buses)
5:  Profibus DP (e.g. SINUMERIK 840Di)
6:  reserved (same effect as 5)
```

30110	**CTRLOUT_MODULE_NR**			A01, A11, -	G2
-	Setpoint assignment: module number			BYTE	POWER ON
-					
-	1	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18...	1	31	7/2

Description:

The number of the module within a bus segment through which the output is addressed must be entered in the MD.

- For axes with 611D, the logical drive number (see MD 13010: DRIVE_LOGIC_NR[n]) must be entered here
- For axes on the PROFIBUS, the number of the drive assigned with MD DRIVE_LOGIC_ADDRESS must be entered here (CTRLOUT_MODULE_NR=n consequently points to DRIVE_LOGIC_ADDRESS[n])

30120	**CTRLOUT_NR**			EXP, A01, -	G2
-	Setpoint assignment: Setpoint output on drive submodule/module			BYTE	POWER ON
-					
-	1	1	1	3	2/2

Description:

Number of the output on a module, through which the setpoint output is addressed.
In SIMODRIVE 611D the value is always 1.

30130	**CTRLOUT_TYPE**			A01, A11	G2,S6
-	Output type of setpoint			BYTE	POWER ON
-					
-	1	0	0	3	7/2

Description:

The type of setpoint output is entered into the MD:
0: Simulation (no hardware required)
1: Standard (distinguished via hardware configuration)
2: reserved (previously stepper motor)
3: reserved (previously stepper motor)
4: reserved (previously virtual axis (up to SW 3), simulation, no hardware available
For SW 4 and higher, MD 30132 IS_VIRTUAL_AX must now be used instead of value 4.

30132	**IS_VIRTUAL_AX**			A01	M3
-	Axis is a virtual axis			BOOLEAN	POWER ON
CTEQ					
-	1	FALSE	-	-	7/2

Description:

```
Virtual axis. An axis that is also interpolated in the follow-up mode. (elec-
tronic transfer technology; virtual and real master value)
This MD is the successor of MD 30130: CTRLOUT_TYPE=4. Instead of MD 30130:
CTRLOUT_TYPE=4, MD 30130: CTRLOUT_TYPE=0 and IS_VIRTUAL_AX=1 are to be used.

Related to:
    MD 30130: CTRLOUT_TYPE
```

30134	**IS_UNIPOLAR_OUTPUT**			A01	G2
-	Setpoint output is unipolar			BYTE	POWER ON
-					
-	1	0	0	2	7/2

Description:

```
Unipolar output driver (for unipolar analog drive actuator):
Only positive set speeds are supplied to the drive, the sign of the set speed
is separately output in its own digital control signal.

Input value "0":
Bipolar output with pos./neg. set speed (this is the normal case)

Input value "1":
0. Digital bit = servo enable
1. Digital bit = neg. direction of travel

Input value "2": (linking of enable and direction of travel signals):
0. Digital bit = servo enable pos. direction of travel
1. Digital bit = servo enable neg. direction of travel
```

30200	**NUM_ENCS**			A01, A02, -	G2
-	Number of encoders			BYTE	POWER ON
-					
-	-	1	0	2	7/2

Description:

```
The number of encoders of the axis or spindle is to be entered in the MD for
actual position value sensing (the differentiation of direct/indirect measu-
ring system, i.e. the installation location of these encoders, is then speci-
fied, for example, via MD 31040: ENC_IS_DIRECT)
For simulation axes/spindles, NUM_ENCS > 0 must be specified for referencing.
```

30210	ENC_SEGMENT_NR			EXP, A01, A02	G2
-	Actual value assignment: bus segment number.			BYTE	POWER ON
-					
-	2	1, 1	1	5	7/2
710-6a2c	-	5, 5	5	5	-1/-
720-6a2c	-	5, 5	5	5	-1/-
730-6a2c	-	5, 5	5	5	-1/-
710-31a10c	-	5, 5	5	5	-1/-
720-31a10c	-	5, 5	5	5	-1/-
730-31a10c	-	5, 5	5	5	-1/-
840di-basic	-	5, 5	5	5	-1/-
840di-universal	-	5, 5	5	5	-1/-
840di-plus	-	5, 5	5	5	-1/-

Description:

```
Number of the bus segment, through which the encoder is addressed.
The bus segments are assigned to control systems SINUMERIK FM-NC or SINUMERIK
840/810D.
The bus segments are assigned to the control systems.
0:  reserved (previously local bus)
1:  611D drive bus for SINUMERIK 840D/810D (1st DCM)
2:  reserved (previously local P bus)
3:  reserved (previously 611D bus, 2nd DCM)
4:  reserved (virtual busses)
5:  PROFIBUS DP (for example SINUMERIK 840Di)
6:  reserved (same effect as 5)

Index [n] has the following coding [Encodernr.]: 0 or 1
```

30220	ENC_MODULE_NR			A01, A02, A11	G2
-	Actual value assignment: Drive number/measuring circuit number			BYTE	POWER ON
-					
-	2	1, 1,2, 2,3, 3,4, 4,5, 5,6, 6,7, 7...	1	31	7/2

Description:

```
Number of the module within a bus segment (MD: ENC_SEGMENT_NR[n]), through
which the encoder is addressed.
-   For axes with 611D, the logical drive number (see MD: DRIVE_LOGIC_NR[n]) must
    be entered here.
-   For axes on the PROFIBUS, the number of the drive assigned via MD:
    DRIVE_LOGIC_ADDRESS must be entered here (ENC_MODULE_NR=n points to
    DRIVE_LOGIC_ADDRESS[n])
The index[n] of the machine data has the following coding:
[Encodernr.]: 0 or 1

Related to:
    MD: CTRLOUT_MODULE_NR[n]
    (setpoint assignment: drive number/module number)
```

30230	**ENC_INPUT_NR**			A01, A02, A11, -	G2
-	Actual value assignm.: Input on drive module/meas. circuit board			BYTE	POWER ON
-					
-	2	1, 2	1	2	7/2

Description:

```
Number of the input on a module through which the encoder is addressed.
This determines through which input the actual position value is sensed:
for example with SIMODRIVE 611D = 1 or 2.

The index[n] of the machine data has the following coding:
[Encodernr.]: 0 or 1

If an input is selected, to which no encoder is connected, alarm 300008
"Measuring circuit not available on drive" is output.
```

30240	**ENC_TYPE**			A01, A02, A11, -	G2,R1
-	Encoder type of actual value sensing (actual position value).			BYTE	POWER ON
-					
-	2	0, 0	0	5	7/2

Description:

```
Encoder type:
0:  Simulation
1:  Raw signal generator (high resolution)
2:  Rectangular signal encoder (quadruplication of the pulse number per revolu-
tion)
3:  reserved (previously encoder for stepper motor)
4:  General absolute encoder in general (e.g. with EnDat interface)
5:  Special absolute encoder with SSI interface

Related to:
    SIMODRIVE-611D drive MD:
      1011ACTUAL_VALUE_CONFIG, bit 3
      1030 ACTUAL_VALUE_CONFIG_DIRECT, bit 3
```

30242	**ENC_IS_INDEPENDENT**			A02, A11, -	G2
-	Encoder is independent			BYTE	NEW CONF
-					
-	2	0, 0	0	3	7/2

Description:

```
If actual value corrections performed by the NC on the encoder selected for
position control are not to influence the actual value of any other encoder
defined in the same axis, then the position control encoder must be declared
to be "independent".
Actual value corrections include the following:
-   Modulo treatment,
-   Reference point approach,
-   Measuring system calibration,
-   PRESET
Example:
$MA_NUM_ENCS[ AX1 ] = 2
$MA_ENC_IS_INDEPENDENT[ 0, AX1 ] = 0
$MA_ENC_IS_INDEPENDENT[ 1, AX1 ] = 1
When the VDI interface has selected the first encoder for position control,
the above mentioned actual value corrections will be executed on this encoder
only.
When the VDI interface has selected the second encoder for position control,
the above mentioned actual value corrections will be executed on both enco-
ders.
The machine data is therefore only valid for encoders that have not been
selected by the VDI interface for positon control (passive encoders)!

For SW5 and higher, the scope of functions has been extended:
ENC_IS_INDEPENDENT = 2
The passive encoder is dependent. The active encoder changes the actual enco-
der value. In combination with MD35102 REFP_SYNC_ENCS = 1, the passive enco-
der is adjusted to the active encoder during reference point approach, but is
NOT referenced.
In reference mode MD34200 ENC_REFP_MODE = 3 (distance-coded reference marks),
the passive encoder is automatically referenced with the next traversing move-
ment after zero mark distance overtravel. This is done independently of the
current mode setting.
ENC_IS_INDEPENDENT = 3
In contrast to ENC_IS_INDEPENDENT = 1, modulo actual value corrections are
executed in the passive encoder of modulo rotary axes.
```

30244	**ENC_MEAS_TYPE**			A01, A02, A11	-
-	Encoder measurement type			BYTE	POWER ON
-					
-	2	1, 1	0	1	7/2

Description:

```
In combination with the NCK MD MEAS_TYPE=1 (decentralized measurement), this
MD can be used to set the type of the axial measuring function for drives.

Encoder measurement type:
0:  Encoder measurement type central (global) measurement
1:  Encoder measurement type decentral (local) measurement

MEAS_TYPE    ENC_MEAS_TYPE      Measuring sensor input used
   0                 0                        central
   0                 1                        central
   1                 0                        central
   1                 1                        decentralized
```

30250	**ACT_POS_ABS**			EXP, A02, A08	R1
-	Internal encoder position			DOUBLE	POWER ON
ODLD, -, -					
-	2	0.0, 0.0	-	-	7/2

Description:

```
In this MD, the actual position (mere hardware counter status without machine
reference) is stored (in internal format display).
At power ON (or activated encoder) it functions with:

-   Absolute encoders:
    for restoring the current position (in combination with the position (pos-
    sibly with several meanings) buffered in the encoder).
-   Incremental encoders:
    for actual value buffering via power OFF when the functionality is activa-
    ted     MD 34210: ENC_REFP_STATE > 0 (i.e. as reference point replacement).

Note:
    This MD is changed control-internal during traversing movements. Loading an
    MD data block that was saved earlier, can therefore destroy the encoder
    calibration of absolute encoders.
    We recommend for software conversions to remove the MD data block in the
    old software release prior to conversion and to reload it to the new soft-
    ware release without moving any axis in between. Protection level 1 should
    be set for SW 3.6; for SW 4 and higher, protection level 2 will suffice.
    The encoder calibration must be explicitely verified (controlled, calibra-
    ted) after software conversion.
```

30260	**ABS_INC_RATIO**			EXP, A01, A02	R1
-	Absolute encoder: Ratio of absolute to incremental resolution			DWORD	POWER ON
-					
-	2	4, 4	-	-	7/2

Description:

```
Absolute track in relation to the incremental signal.
This MD only applies for absolute encoders:

a.  SIMODRIVE 611D drives:
    With plausible 611D parameters (for example values unequal 0 of 611D and
    ratio of integral multiple of "4"), the value of this MD in combination
    with SIMODRIVE 611D is automatically calculated and updated from 611D para-
    meters (1005/1022 or 1007/1032; if the 611D values are plausible).
    Unplausible input values in the current MD are reset to default value "4".
    In addition, alarm 26002 is output in order to inform the user.

b.  PROFIBUS drives:
    Absolute information XIST2 related to incremental information XIST1.
    With plausible drive parameters (e.g. for SIMODRIVE 611U: P1042/P1043 or
    P1044/P1045) the value of this MD is automatically calculated and updated
    from drive parameters (if parameter read-out has not been deactivated by
    $MN_DRIVE_FUNCTION_MASK, bit2.

Unplausible drive parameters (e.g. multiplication of absolute track higher
than that of the incremental signal) are rejected and replaced by the value
entered in the current MD.
Unplausible input values in the current MD (e.g. value=0) are reset to the
default value. In addition, alarm 26025 or 26002 is output in order to inform
the user.
```

30270	**ENC_ABS_BUFFERING**			EXP, A01, A02	FBA,R1
-	Absolute encoder: Traversing range extension			BYTE	POWER ON
-					
-	2	0, 0	0	1	7/2

Description:

```
This MD defines in which way the absolute encoder position is buffered, and
whether a traversing range extension is active on software side (exceeding the
limits of the absolute value encoder area that can be displayed on the hard-
ware).

"0" = standard = traversing range extension (comp. ACT_POS_ABS) is active.
"1" = traversing range extension on software side is inactive.
When using an absolute linear scale, there will not be a traversing range
overflow for mechanical reasons. This MD is therefore only valid for rotary
absolute value encoders.
```

For rotary absolute value encoders, the traversing range that can be clearly displayed on encoder side, is stored in ENC_ABS_TURNS_MODULO. You can do without a traversing range extension without any problems (a hardware counter overflow that might be within the traversing range, is concealed in the software via shortest-path decision):

a. in linear axes or limited rotary axes, if the actual traversing range on load side is smaller than the traversing range on load side that corresponds to ENC_ABS_TURNS_MODULO.

b. in endlessly turning rotary axes (ROT_IS_MODULO = TRUE), if the absolute encoder is connected on load side (no gear to be considered) or if "without remainder" can be calculated:

Number of rotations on load side = ENC_ABS_TURNS_MODULO * gear ratio

(Example: ENC_ABS_TURNS_MODULO = 4096 encoder rotations, gear 25:32, i.e. number of rotations on load side = 4096*(25/32)=3200).
Notice:
If you do not meet the conditions under a. or b., you run the risk of getting a wrong absolute encoder position at next Power ON or encoder activation after parking without prewarning, in case the traversing range extension is not working. Therefore, the traversing range extension remains active in the standard version.

Related to:
$MA_ENC_TYPE
$MA_IS_ROT_AX
$MA_ROT_IS_MODULO
$MA_ACT_POS_ABS
$MA_ENC_ABS_TURNS_MODULO
$MA_REFP_MOVE_DIST_CORR

30300	**IS_ROT_AX**			A01, A06, A11, -	R2
-	Rotary axis / spindle			BOOLEAN	POWER ON
SCAL, CTEQ					
-	-	FALSE	-	-	7/2

Description:

1: Axis: The axis is defined as a "rotary axis".
- The special functions of the rotary axis are active or can be activated by means of additional machine data according to the type of machine required (see below).
- The unit of measurement is degrees.
- The units of the axis-specific machine and setting data are interpreted as follows with the standard control setting:
  - Positions in "degrees"
  - Velocitiesin "rev/minute"
  - Accelerationin "rev/second²"
  - Jerk limitationin "rev/second³"

Spindle:
The machine data should always be set to "1" for a spindle, otherwise alarm 4210 "Rotary axis declaration missing" is output.

0: The axis is defined as a "linear axis".

```
Special cases:
    For axis: Alarm 4200 if the axis is already defined as a geometry axis.
    For spindle: Alarm 4210

Related to:
    The following machine data are active only after activation of MD:
    IS_ROT_AX = "1":
    - MD: ROT_IS_MODULO"Modulo conversion for rotary axis"
    - MD: DISPLAY_IS_MODULO"Position display is modulo"
    - MD: INT_INCR_PER_DEG"Calculation precision for angular positions"
```

30310	**ROT_IS_MODULO**			A01, A06, A11, -	R2
-	Modulo conversion for rotary axis / spindle			BOOLEAN	POWER ON
CTEQ					
-	-	FALSE	-	-	7/2

Description:

```
1:  A modulo conversion is performed on the setpoints for the rotary axis. The
software limit switches and the working area limitations are inactive; the
traversing range is therefore unlimited in both directions. MD: IS_ROT_AX must
be set to "1"

0:  No modulo conversion

MD irrelevant for:
    MD: IS_ROT_AX = "0" (linear axes)

Related to:
    MD: DISPLAY_IS_MODULO
    "Position display is modulo 360°"
    MD: IS_ROT_AX  = 1
    "Rotary axis"
    MD: POS_LIMIT_MINUS
    "Software limit switch minus"
    MD: POS_LIMIT_PLUS
    "Software limit switch plus"
    SD: WORKAREA_LIMIT_MINUS
    "Working area limitation minus"
    SD: WORKAREA_LIMIT_PLUS
    "Working area limitation plus"
```

30320	DISPLAY_IS_MODULO			A01, A06, A11	R2
-	Modulo 360 degrees displayed for rotary axis or spindle.			BOOLEAN	POWER ON
CTEQ					
-	-	FALSE	-	-	7/2

Description:

```
1:  "Modulo 360° " position display is active:
    The position display of the rotary axis or spindle (for basic or machine
    coordinate system) is defined as "Modulo 360° ". In the case of a positive
    direction of rotation, the control resets the position display internally
    to 0.000° following each cycle of 359.999°. The display range is always
    positive and always between 0° and 359.999°.
0:  Absolute position display is active:
    In contrast to the modulo 360° display method, absolute positions are indi-
    cated by the absolute position display, e.g. +360° after 1 rotation and
    +720° after 2 rotations, etc. In this case, the display range is limited by
    the control in accordance with the linear axes.

MD irrelevant for:
    Linear axes MD: IS_ROT_AX = "0"

Related to:
    MD: IS_ROT_AX = 1 "Axis is rotary axis"
```

30330	MODULO_RANGE			EXP, A01, -	R2
degrees	Size of modulo range.			DOUBLE	RESET
CTEQ					
-	-	360.0	1.0	360000000.0	7/2

Description:

```
Defines the size of the modulo range. Default positions are accepted and dis-
played within this range. Useful modulo ranges are n * 360 degrees with n ele-
ment N. Other settings are equally possible in principle. Attention should be
paid to having a useful relationship between the positions in the NC and the
mechanics (ambiguity). Velocity definitions are not affected by settings in
this MD.
```

30340	MODULO_RANGE_START			EXP, A01	R2
degrees	Modulo range start position			DOUBLE	RESET
CTEQ					
-	-	0.0	-	-	7/2

Description:

```
Defines the start position for the modulo range.
Example:
Start =    0 degree -> modulo range           0 <->360 degrees
Start =  180 degrees -> modulo range   180 <->540 degrees
Start = -180 degrees -> modulo range  -180 <->180 degrees
```

30350	**SIMU_AX_VDI_OUTPUT**			A01, A06	G2
-	Axis signals output for simulation axis			BOOLEAN	POWER ON
CTEQ					
-	-	FALSE	-	-	7/2

Description:

```
This machine data defines whether axis-specific interface signals are output
to the PLC during simulation of an axis.

1:  The axis-specific interface signals of a simulated axis are output to the
PLC.
    In this way the user PLC program can be tested without the drives.
0:  The axis-specific interface signals of a simulated axis are not output to
the PLC.
    All axis-specific interface signals are set to "0".

MD irrelevant for:
    MD 30130: CTRLOUT_TYPE (output type of setpoint value) = 1
```

30450	**IS_CONCURRENT_POS_AX**			EXP, A01	P2
-	Default for reset: neutral/channel axis			BOOLEAN	RESET
CTEQ					
-	-	FALSE	-	-	7/2

Description:

```
For SW4.3 (not FM-NC) and higher:
If FALSE: On RESET, a neutral axis is reassigned to the NC program.
If TRUE:  On RESET, a neutral axis remains in the neutral axis state and an
axis assigned to the NC program becomes a neutral axis
```

30455	**MISC_FUNCTION_MASK**			A06, A10	R2
-	Axis functions			DWORD	RESET
CTEQ					
-	-	0x00	0	0x80	7/2

Description:

```
Bit 0 =0:
    Modulo rotary axis/spindle: Programmed positions must lie within the modulo
    range. Otherwise, an alarm is issued.
Bit 0 =1:
    When positions outside the modulo range are programmed, no alarm is issued.
    The position will be modulo-converted internally.
    Example: B-5 is equivalent to B355, POS[A]=730 is identical to POS[A]=10
    and SPOS=-360 behaves the same as SPOS=0 (modulo range 360 degrees)
Bit 1 =0:
    Determination of reference point position of rotary, distance-coded enco-
    ders analog (1:1) to the mechanical absolute position.
Bit 1 =1:
    Determination of reference point position of rotary, distance-coded enco-
    ders within the configured modulo range.
```

```
    For rotary axes with $MA_ROT_IS_MODULO=0 using rotary, distance-coded enco-
    ders $MA_ENC_REFP_MODE=3 the reference point position is determined depen-
    ding on $MA_MODULO_RANGE and $MA_MODULO_RANGE_START. It is automatically
    adapted to the motion limits of the modulo range. This bit is irrelevant
    for rotary axes with $MA_ROT_IS_MODULO=1, since the reference point posi-
    tion is always determined within the modulo range.

Bit 2 =0:
    Modulo rotary axis positioned at G90 with AC by default
Bit 2 =1:
    Modulo rotary axis positioned at G90 with DC by default (shortest path)

Bit 3 =0:
    With spindle/axis disable, $VA_IM,$VA_IM1,$VA_IM2 supply the setpoint value
Bit 3 =1:
    With spindle/axis disable, $VA_IM,$VA_IM1,$VA_IM2 supply the actual value

Bit 4 =0:
    Synchronous spindle link, following spindle: Cancelation of feedrate enable
    will decelerate link grouping.
Bit 4 =1:
    Following spindle: Feedrate enable only refers to the interpolation share
    of the overlaid motion (SPOS,..) and has no impact on the link.

Bit 5 = 0:
     Synchronous spindle link, following spindle: Position control, feedfor-
    ward control and parameter block are set independently of the leading
    spindle.
Bit 5 =1:
    Synchronous spindle link: The parameters of the following spindle are set
    as in the unlinked case.

Bit 6 =0:
    The programming of FA, OVRA, ACC and VELOLIMA acts separately for spindle
    and axis mode. The assignment is made by the programmed axis or spindle
    identifier.
Bit 6 =1:
    The programming of FA, OVRA, ACC and VELOLIMA acts in concert for spindle
    and axis mode irrespective of the programmed identifier.

Bit 7 = 0:
    Synchronous spindle, correct synchronism error: The correction value
    $AA_COUP_CORR[Sn] is continuously calculated as long as the VDI interface
    signal DB31,...DBX31.6 (Correct synchronism) is set and setpoint-related
    synchronism is present.
Bit 7 = 1:
    Synchronous spindle, correct synchronism error: The correction value
    $AA_COUP_CORR[Sn] is calculated only at the moment the VDI interface sig-
    nal DB31,..DBX31.6 (Correct synchronism) is set from 0 to 1.
```

30460	**BASE_FUNCTION_MASK**			A01	-
-	Axis functions			DWORD	POWER ON
CTEQ					
-	-	0x00	0	0xFF	7/2

Description:

```
Axis-specific functions can be set by means of this MD.

The MD is bit-coded; the following bits are assigned:

Bit 0 = 0:
    "Axis control" is not permissible.
Bit 0 = 1:
    "Axis control" is permissible (the axis moves in the speed mode, if the VDI
    signal "Axis control" is set).

Bit 1:
    Reserved for "Axis control".

Bit 2 = 0:
    Axis-specific diameter programming not permitted"
Bit 2 = 1:
    Axis-specific diameter programming permitted"

Bit 3:
    Reserved for "Axis control"

Bit 4 = 0:
    For control purposes, the axis can be used by NC and PLC.
Bit 4 = 1:
    The axis is exclusively controlled by the PLC.

Bit 5 = 0:
    The axis can be used by the NC and PLC.
Bit 5 = 1:
    The axis is a permanently assigned PLC axis. However, the axis can be
    jogged and referenced.
    Axis exchange between channels is not possible. The axis cannot be assig-
    ned to the NC program.

Bit 6 = 0:
    The channel-specific VDI interface signal DB21, ... DBX6.0 (feedforward
    disable) has an effect on the axis, even though it is a PLC-controlled
    axis.
Bit 6 = 1:
    The channel-specific VDI interface signal DB21, ... DBX6.0 (feedforward
    disable) will have no effect on the axis, if it is a PLC-controlled axis.
Bit 7 = 0:
    The channel-specific VDI interface signal DB21, ... DBX36.3 (all axes sta-
    tionary) is set independently of the axis, even though it is PLC-cont-
    rolled.
Bit 7 = 1:
    The channel-specific VDI interface signal DB21, ... DBX36.3 (all axes sta-
    tionary) will be set independently of the axis, if this axis is PLC-cont-
    rolled.
```

30465	**AXIS_LANG_SUB_MASK**			N01	-
-	Substitution of NC language commands			DWORD	POWER ON
-					
-	-	0	0	3	7/2

Description:

```
$MA_AXIS_LANG_SUB_MASK defines for the leading spindle(s) of a coupling (syn-
chronous spindle coupling, ELG, tangential tracking, coupled motion, master
value coupling, master/slave) which language constructs/functions are to be
substituted by the user program set by $MN_LANG_SUB_NAME / $MN_LANG_SUB_PATH
(default: /_N_CMA_DIR/_N_LANG_SUB_SPF).
The substitution is executed only if a coupling is active for the relevant
spindle and in the case of a gear stage change only if a gear stage change is
actually pending.

Bit 0 = 1:
    Automatic (M40) and direct (M41-M45) gear stage change
Bit 1 = 1:
    Spindle positioning with SPOS/SPOSA/M19
```

30500	**INDEX_AX_ASSIGN_POS_TAB**			A01, A10	T1
-	Axis is an indexing axis			BYTE	RESET
-					
-	-	0	0	3	7/2

Description:

```
The axis is declared as an indexing axis by assignment of indexing position
table 1 or 2.
 0: The axis is not declared as an indexing axis
 1: The axis is an indexing axis. The associated indexing positions are stored
in table 1 (MD: INDEX_AX_POS_TAB_1).
 2: The axis is an indexing axis. The associated indexing positions are stored
in table 2 (MD: INDEX_AX_POS_TAB_2).
 3: Equidistant indexing with SW 4.3 and higher (840D) and SW 2.3 and higher
(810D)
>3: Alarm 17090 "Value violates upper limit"

Special cases:
    Several axes can be assigned to an indexing position table on the condi-
    tion that all the axes are of the same type (linear axis, rotary axis,
    modulo 360° function). If they are not, alarm 4000 is output during power-
    up.
    Alarm 17500 "Axis is not an indexing axis"
    Alarm 17090 "Value violates upper limit"
```

```
Related to:
    MD: INDEX_AX_POS_TAB1 (indexing position table 1)
    MD: INDEX_AX_LENGTH_POS_TAB_1
    (no. of indexing positions used in table 1)
    MD: INDEX_AX_POS_TAB2 (indexing position table 2)
    MD: INDEX_AX_LENGTH_POS_TAB_2
    (no. of indexing positions used in table 2)
    For equidistant indexings with value 3:
    MD: INDEX_AX_NUMERATOR  Numerator
    MD: INDEX_AX_DENOMINATOR Denominator
    MD: INDEX_AX_OFFSET First indexing position
    MD: HIRTH_IS_ACTIVE    Hirth tooth system
```

30501	**INDEX_AX_NUMERATOR**			A01, A10	T1
mm, degrees	Indexing axis equidistant positions numerator			DOUBLE	RESET
-					
-	-	0.0	-	-	7/2

Description:

```
Defines the value of the numerator for calculating the distances between two
indexing positions when the positions are equidistant. Modulo axes ignore this
value and use $MA_MODULO_RANGE instead.
MD irrelevant for non-equidistant indexes in accordance with tables.

Related to:
    MD 30502: INDEX_AX_DENOMINATOR,
    MD 30503: INDEX_AX_OFFSET;
    MD 30500: INDEX_AX_ASSIGN_POS_TAB
```

30502	**INDEX_AX_DENOMINATOR**			A01, A10	T1
-	Indexing axis equidistant positions denominator			DWORD	RESET
-					
-	-	1	1	-	7/2

Description:

```
Defines the value of the denominator for calculating the distances between two
indexing positions when the positions are equidistant. For modulo axes it
therefore specifies the number of indexing positions.
MD irrelevant for non-equidistant indexes in accordance with tables.

Related to:
    MD 30501: INDEX_AX_NUMERATOR
    MD 30503: INDEX_AX_OFFSET
    MD 30500: INDEX_AX_ASSIGN_POS_TAB
```

30503	**INDEX_AX_OFFSET**			A01, A10	T1
mm, degrees	Indexing axis with equidistant positions first index position			DOUBLE	RESET
-					
-	-	0.0	-	-	7/2

Description:

```
Defines the position of the first indexing position from zero for an indexing
axis with equidistant positions.
MD irrelevant for non-equidistant indexes in accordance with tables.

Related to:
    MD 30501, 30502, 30500
```

30505	**HIRTH_IS_ACTIVE**			A01, A10	T1
-	Axis is an indexing axis with Hirth tooth system			BOOLEAN	RESET
CTEQ					
-	-	FALSE	-	-	7/2

Description:

```
Hirth tooth system is active when value 1 is set.

MD irrelevant is axis is not the indexing axis.

Related to:
    MD 30500, 30501, 30502, 30503
```

30550	**AXCONF_ASSIGN_MASTER_CHAN**			A01, A06, A10	K5
-	Initial setting of channel for change of axis			BYTE	POWER ON
-					
-	-	0	0	10	7/2

Description:

```
Definition of the channel to which the axis is assigned after Power ON.

Related to:
    MD: AXCONF_MACHAX_USED
```

30552	**AUTO_GET_TYPE**			EXP, A06, A10	S1,K5
-	Automatic GET for get axis			BYTE	POWER ON
-					
-	-	1	0	2	7/2

Description:

```
0 = No automatically created GET -> Alarm in response to incorrect program-
ming.
1 = GET is output when GET is generated automatically.
2 = GETD is output when GET is generated automatically.
```

30554	**AXCONF_ASSIGN_MASTER_NCU**			A01, A06, A10	B3
-	Initial setting which NCU creates setpoints for the axis			BYTE	POWER ON
-					
-	-	0	0	16	7/2

Description:

```
This machine data is evaluated only if the NCU is linked with other NCUs via
the NCU link communication.

Assignment of master NCU:
If a machine axis is activated via $MC_AXCONF_LOGIC_MACHAX_TAB in several NCUs
in an NCU cluster, then a MASTER NCU must be assigned to it. This NCU takes
over the setpoint creation for the axis after the runup. For axes which are
only activated in one NCU, the number of this NCU or 0 must be entered. Other
entries initiate a runup interrupt.
```

30560	**IS_LOCAL_LINK_AXIS**			EXP, A01	B3
-	Axis is a local link axis			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

```
An axis for which this MD is set to 1 is not addressed by the local NCU at
runup. The associated drive is put into operation.
The axis is traversed by another NCU. The evaluation is made only if link com-
munication exists.

Not relevant for:
    Systems without link modules

Related to:
    MM_NCU_LINK_MASK
```

30600	**FIX_POINT_POS**			A03, A10	K1
mm, degrees	Fixed-value positions of axis with G75			DOUBLE	POWER ON
-					
-	2	0.0, 0.0	-	-	7/2

Description:

```
The fixed-point positions (max. 2) for each axis which can be approached when
G75 is programmed are entered in these machine data.

References:
    /PA/, "Programming Guide: Fundamentals"
```

30800	**WORKAREA_CHECK_TYPE**			-	A2
-	Type of check of working area limitations.			BOOLEAN	NEW CONF
CTEQ					
-	-	FALSE	-	-	7/2

Description:

```
With this machine data you can specify whether only the working area limitati-
ons of traversing axes are to be checked (0)

or

whether the stationary axes in a traversing block are also to be checked  (1).
The value 0 corresponds to the behavior up to SW5.
```

1.5.2 Encoder matching

31000	**ENC_IS_LINEAR**			A02, A11, -	G2
-	Linear scale			BOOLEAN	POWER ON
-					
-	2	FALSE, FALSE	-	-	7/2

Description:

```
MD = 1: Encoder for position actual-value acquisition is linear (linear
scale).
MD = 0: Encoder for position actual-value acquisition is rotary.

The index [n] of the machine data has the following coding:
[encoder no.]: 0 or 1
```

31010	**ENC_GRID_POINT_DIST**			A02, A11, -	G2
mm	Division period for linear scales			DOUBLE	POWER ON
-					
-	2	0.01, 0.01	-	-	7/2

Description:

```
The distance between the reference marks on the linear scale is entered in
this MD.
The index [n] of the machine data has the following coding:
[encoder no.]: 0 or 1
```

31020	**ENC_RESOL**			A02, A11, -	G2
-	Encoder lines per revolution			DWORD	POWER ON
-					
-	2	2048, 2048	-	-	7/2

Description:

```
The number of encoder lines per encoder revolution are entered in this MD.
The index [n] of the machine data has the following coding:
[encoder no.]: 0 or 1
```

31025	**ENC_PULSE_MULT**			EXP, A01, A02	K4
-	Encoder multiplication (high-resolution)			DWORD	POWER ON
-					
-	2	2048, 2048	-	-	7/2

Description:

```
This MD describes the measuring system multiplication on PROFIBUS.
The standard value 2048 means: Changing by just one encoder line can be seen
in bit11 of the actual PROFIBUS value XIST1, that is, the actual encoder value
is multiplied by 2 to the power of 11= 2048.
```

31030	**LEADSCREW_PITCH**			A02, A11, -	G2
mm	Pitch of leadscrew			DOUBLE	POWER ON
-					
-	-	10.0	-	-	7/2

Description:

```
The ball screw lead must be entered in the MD (see data sheet: mm/rev or inch/
rev).

Special meaning for hydraulic linear drives:
If a hydraulic linear drive (HLA) is configured as rotary axis, it must be
specified in this MD, which drive feedrate in mm corresponds to a programmed
revolution (360 degrees).
```

31040	**ENC_IS_DIRECT**			A02, A11, -	G2
-	Direct measuring system (no compilation to load position)			BOOLEAN	POWER ON
-					
-	2	FALSE, FALSE	-	-	7/2

Description:

```
MD = 1:
    Encoder for actual position value sensing is attached directly (without
    intermediate gear unit) to the machine.
MD = 0:
    Encoder for actual position value sensing is attached to the motor (MD:
    DRIVE_AX_RATIO_NUMERA and DRIVE_AX_RATIO_DENOM are included in encoder
    valuation).

The index[n] of the machine data has the following coding:
[encoder no.]: 0 or 1

Special cases:
    Incorrect entry may cause faulty encoder resolution, as, for example,
    incorrect gear ratios are then calculated.
```

31044	**ENC_IS_DIRECT2**			A02, -	-
-	Encoder mounted on the additional gearbox			BOOLEAN	NEW CONF
-					
-	2	FALSE, FALSE	-	-	7/2

Description:

```
When using a load intermediate gearbox (for example for rotating tools, com-
pare $MA_DRIVE_AX_RATIO2_NUMERA and $MA_DRIVE_AX_RATIO2_DENOM), the encoder
installation location can be defined "on the output" of this load intermedi-
ate gearbox:

Encoder installation "on the output of the load intermediate gearbox" is con-
figured by $MA_ENC_IS_DIRECT=1 and $MA_ENC_IS_DIRECT2=1 at the same time.

Encoder installation "on the input of the load intermediate gearbox" is confi-
gured by $MA_ENC_IS_DIRECT=1 together with $MA_ENC_IS_DIRECT2=0.

A parameterization alarm will be output, if $MA_ENC_IS_DIRECT2=1 is set wit-
hout $MA_ENC_IS_DIRECT=1 (this combination has not been defined).
```

31050	**DRIVE_AX_RATIO_DENOM**			A02, A11, -	G2
-	Denominator load gearbox			DWORD	POWER ON
-					
-	6	1, 1, 1, 1, 1, 1	1	2147000000	7/2

Description:

```
The load gearbox denominator is entered in this MD.
The index [n] of the machine data has the following coding:
[control parameter set no.]: 0-5
```

31060	**DRIVE_AX_RATIO_NUMERA**			A02, A11, -	G2
-	Numerator load gearbox			DWORD	POWER ON
-					
-	6	1, 1, 1, 1, 1, 1	-2147000000	2147000000	7/2

Description:

```
The load gearbox numerator is entered in this MD.
The index [n] of the machine data has the following coding:
[control parameter set no.]: 0-5
```

31064	**DRIVE_AX_RATIO2_DENOM**			A02, -	-
-	Denominator additional gearbox			DWORD	NEW CONF
-					
-	-	1	1	2147000000	7/2

Description:

```
Intermediate gearbox denominator

The MD together with $MA_DRIVE_AX_RATIO2_NUMERA defines an intermediate gear-
box that acts as multiplier to the motor/load gearbox (described by
$MA_DRIVE_AX_RATIO_NUMERA and $MA_DRIVE_AX_RATIO_DENOM).

The load intermediate gearbox is inactive with default values 1:1.

Please consider $MA_ENC_IS_DIRECT2 for encoder installation.

When functionality Safety Integrated (see $MA_SAFE_FUNCTION_ENABLE) is active,
the intermediate gearbox can be used, if
-   the effectively active gear ratio from the motor to the tool is considered
    in the safety-relevant machine data and if
-   the safety-relevant secondary conditions are considered the gear ratios.
For more detailed information see the Safety Integrated Description of Func-
tions.
```

31066	**DRIVE_AX_RATIO2_NUMERA**			A02, -	-
-	Numerator additional gearbox			DWORD	NEW CONF
-					
-	-	1	-2147000000	2147000000	7/2

Description:

```
Intermediate gearbox numerator

Related to:
    MD 31064
```

31070	**DRIVE_ENC_RATIO_DENOM**			A02, A11, -	G2
-	Denominator measuring gearbox			DWORD	POWER ON
-					
-	2	1, 1	1	2147000000	7/2

Description:

```
The measuring gearbox denominator is entered in this MD.
The index [n] of the machine data has the following coding:
[encoder no.]: 0 or 1
```

31080	**DRIVE_ENC_RATIO_NUMERA**			A02, A11, -	G2
-	Numerator measuring gearbox			DWORD	POWER ON
-					
-	2	1, 1	1	2147000000	7/2

Description:

```
The measuring gearbox numerator is entered in this MD.
The index [n] of the machine data has the following coding:
[encoder no.]: 0 or 1
```

31090	**JOG_INCR_WEIGHT**			A01, A12	H1,G2
mm, degrees	Evaluation of an increment with INC/handwheel			DOUBLE	RESET
CTEQ					
-	2	0.001, 0.00254	-	-	7/2

Description:

```
The path of an increment which applies when an axis is traversed with the JOG
keys in incremental mode or with the handwheel is defined in this MD.
The path covered by the axis on each increment each time the traversing key is
pressed or for each handwheel position is defined by the following parameters:
-   MD: JOG_INCR_WEIGHT
    (weighting of an increment of a machine axis for INC/handwheel)
-   Selected increment size (INC1, ..., INCvar)
The possible increment stages are defined globally for all axes in the MD:
JOG_INCR_SIZE_TAB [n] and in SD: JOG_VAR_INCR_SIZE.
Entering a negative value reverses the direction of the traverse keys and the
handwheel rotation.

Related to:
    MD: JOG_INCR_SIZE_TAB
    SD: JOG_VAR_INCR_SIZE
```

31122	BERO_DELAY_TIME_PLUS			A02, A06	S1
s	BERO delay time Plus			DOUBLE	NEW CONF
-					
-	2	0.000110, 0.000110	-	-	7/2

Description:

```
The machine data in combination with the setting in MD 34200: ENC_REFP_MODE
(referencing mode) = 7 causes a signal runtime compensation in positive direc-
tion of movement at position determination with a BERO (zero mark).
The typical total delay time of the BERO message path for overtravel in posi-
tive direction of movement is entered.
The time includes:
-   the BERO edge delay time
-   the time for signal digitizing
-   the time for measured value editing, etc.
The periods of time depend on the hardware used. The default value is typical
for SIEMENS products. Adjustment by the customer is only required in exceptio-
nal cases.
Input of minimum value "0.0" deactivates the compensation (only active in com-
bination with MD 34200: ENC_REFP_MODE = 7).
The machine data is available for all encoders.

Related to:
    MD 34200: ENC_REFP_MODE (referencing mode)
    MD 34040: REFP_VELO_SEARCH_MARKER[n]
    (reference point creep velocity [Enc. no.])
```

31123	BERO_DELAY_TIME_MINUS			A02, A06	S1
s	BERO delay time minus			DOUBLE	NEW CONF
-					
-	2	0.000078, 0.000078	-	-	7/2

Description:

```
The machine data in combination with the setting in MD 34200: ENC_REFP_MODE
(referencing mode) = 7 causes a signal runtime compensation in negative direc-
tion of movement at position determination with a BERO (zero mark).
The typical total delay time of the BERO message path for overtravel in nega-
tive direction of movement is entered.
The time includes:
-   the BERO edge delay time
-   the time for signal digitizing
-   the time for measured value editing, etc.
The periods of time depend on the hardware used. The default value is typical
for SIEMENS products. Adjustment by the customer is only required in exceptio-
nal cases.

Input of minimum value "0.0" deactivates the compensation (only active in com-
bination with MD 34200: ENC_REFP_MODE = 7).
The machine data is available for all encoders.
Related to:
    MD 34200: ENC_REFP_MODE (referencing mode)
    MD 34040: REFP_VELO_SEARCH_MARKER[n]
    (creep velocity [Enc. no.])
```

31200	**SCALING_FACTOR_G70_G71**			EXP, A01	G2
-	Factor for converting values while G70/G71 is active			DOUBLE	POWER ON
CTEQ					
-	-	25.4	1.e-9	-	7/2

Description:

```
The conversion factor for inch/metric conversion by which the programmed geo-
metry of an axis (position, polynomial coefficients, radius for circular pro-
gramming,...) is multiplied when the programmed value for G code group G70/G71
differs from the initial setting value (set in MD: GCODE_RESET_VALUES[n]) is
entered in this MD.

The factor can be set for each axis individually so that pure positioning axes
are not dependent on G70/G71. The factors within the three geometry axes
should not be different.
The data influenced by G70/G71 are described in the Programming Guide.

Related to:
   MD: GCODE_RESET_VALUES[n] (G group initial setting).
```

31500	**AXIS_NUMBER_FOR_MONITORING**			A01	S6
-	Output setpoint of this axis for service purposes			DWORD	POWER ON
-					
-	1	0	0	31	7/2

Description:

```
Axis number
 0: No setpoint output for service purposes
>0: Machine axis index of the axis whose setpoint is to be output.
Service setpoint =(Setpoint[$MA_AXIS_NUMBER_FOR_MONITORING] -
$MA_OFFSETVALUE_FOR_MONITORING) * $MA_GAIN_FOR_MONITORING
The service setpoint is automatically limited to the maximum value of the D/A
converter.
```

31510	**OFFSETVALUE_FOR_MONITORING**			A01	S6
V	Offset voltage for service setpoint			DOUBLE	NEW CONF
-					
-	1	0.0	-10.0	10.0	7/2

Description:

```
Offset voltage for service setpoint
```

31520	**GAIN_FOR_MONITORING**			A01	S6
-	Gain for service setpoint			DOUBLE	NEW CONF
-					
-	1	1.0	-100.0	100.0	7/2

Description:

```
Gain for service setpoint
```

31600	**TRACE_VDI_AX**			EXP, N06	-
-	Trace-specification for axial VDI signals			BOOLEAN	POWER ON
NBUP					
-	-	FALSE	-	-	2/2

Description:

This machine data determines whether the axial VDI signals for this axis are recorded in the NCSC trace (according to MM_TRACE_VDI_SIGNAL).

1.5.3 Closed-loop control

32000	**MAX_AX_VELO**			A11, A04	G2
mm/min, rev/min	maximum axis velocity			DOUBLE	NEW CONF
CTEQ					
-	-	10000.	1.e-9	-	7/2

Description:

Maximum velocity at which the axis can permanently travel. The value limits both the positive and the negative axis velocity. The axis traverses at this velocity, if rapid traverse has been programmed.
Depending on the machine data $MA_IS_ROT_AX, the maximum rotary or linear axis velocity has to be entered.
In the machine data, the dynamic behavior of the machine and drive and the limit frequency of the actual value acquisition must be taken into account.

32010	**JOG_VELO_RAPID**			A11, A04, -	H1
mm/min, rev/min	Rapid traverse in jog mode			DOUBLE	RESET
CTEQ					
-	-	10000.	-	-	7/2

Description:

The axis velocity entered applies when the rapid traverse override key is operated in JOG mode and when the axial feedrate override is set to 100%.
The value entered must not exceed the maximum permissible axis velocity (machine data MAX_AX_VELO).
This machine data is not used for the programmed rapid traverse G00.

MD irrelevant for:
    Operating modes AUTOMATIC and MDI

Related to:
    MD: MAX_AX_VELO (maximum axis velocity)
    MD: JOG_REV_VELO_RAPID
    (revolutional feedrate for JOG with rapid traverse override)
    IS "Rapid traverse override" (DB21-28, DBX12.5 ff)
    IS "Feedrate override" (DB21-28, DBB4)

32020	**JOG_VELO**			A11, A04, -	H1
mm/min, rev/min	Jog axis velocity			DOUBLE	RESET
CTEQ					
-	-	2000.	-	-	7/2

Description:

```
The velocity entered applies to traversing in JOG mode when the axial fee-
drate override switch is on position 100%.
This velocity is only used when general setting data JOG_SET_VELO = 0 for
linear axes and linear feedrate is selected (MD: JOG_REV_IS_ACTIVE = 0) or SD:
JOG_ROT_AX_SET_VELO = 0 for rotary axes.

If this is the case, the axis velocity is active for
-   continuous jogging
-   incremental jogging (INC1, ... INCvar)
-   handwheel jogging

The value entered must not exceed the maximum permissible axis velocity
(machine data MAX_AX_VELO).
If DRF is active, the axis velocity for JOG must be reduced with MD:
HANDWH_VELO_OVERLAY_FACTOR.

Spindles in JOG mode:
This machine data can also be used to define the JOG mode speed for specific
spindles (if SD: JOG_SPIND_SET_VELO = 0). However, the speed can be modified
with the spindle override switch.

Related to:
    MD : MAX_AX_VELO
    (maximum axis velocity)
    MD: JOG_REV_VELO
    (revolutional feedrate for JOG)
    MD: HANDWH_VELO_OVERLAY_FACTOR
    (ratio JOG velocity to handwheel velocity (DRF))
    SD: JOG_SET_VELO
    (JOG velocity for G94)
    SD: JOG_ROT_AX_SET_VELO
    (JOG velocity for rotary axes)
    IS "Feedrate override" (DB21-28, DBB4)
```

32040	JOG_REV_VELO_RAPID			A11, A04	H1
mm/rev	Revolutional feedrate in JOG with rapid traverse override			DOUBLE	RESET
CTEQ					
-	-	2.5	-	-	7/2

Description:

```
The value entered defines the revolutional feedrate of the axis in JOG mode
with rapid traverse override referred to the revolutions of the master
spindle. This feedrate is active when SD: JOG_REV_IS_ACTIVE  =  1. (Revolutio-
nal feedrate active with JOG)

MD irrelevant for:
    SD: JOG_REV_IS_ACTIVE = "0"

Related to:
    SD: JOG_REV_IS_ACTIVE (revolutional feedrate for JOG active)
    MD: JOG_REV_VELO (revolutional feedrate with JOG)
```

32050	JOG_REV_VELO			A11, A04	H1
mm/rev	Revolutional feedrate in JOG			DOUBLE	RESET
CTEQ					
-	-	0.5	-	-	7/2

Description:

```
The value entered defines the revolutional feedrate of the axis in JOG mode
referred to the revolutions of the master spindle.
This feedrate is active when SD: Revolutional feedrate active with JOG,
JOG_REV_IS_ACTIVE  =  1.

MD irrelevant for:
    Linear feedrate; i.e. SD: JOG_REV_IS_ACTIVE  = 0

Related to:
    SD: JOG_REV_IS_ACTIVE
    (revolutional feedrate for JOG active)
    MD: JOG_REV_VELO_RAPID
    (JOG revolutional feedrate with rapid traverse override)
```

32060	**POS_AX_VELO**			A12, A04	P2
mm/min, rev/min	Initial setting for positioning axis velocity			DOUBLE	RESET
CTEQ					
-	-	10000.	-	-	7/2

Description:

Where a positioning axis is programmed in the part program without specifying the axis-specific feedrate, the feedrate entered in MD: POS_AX_VELO is automatically used. The feedrate from MD: POS_AX_VELO applies until an axis-specific feedrate is programmed in the part program for this positioning axis.

MD irrelevant for:
POS_AX_VELO is irrelevant for all axis types other than positioning axis.

Special cases:
If a ZERO velocity setting is entered in POS_AX_VELO, the positioning axis does not traverse if it is programmed without feed. If a velocity setting is entered in POS_AX_VELO that is higher than the maximum velocity of the axis (MD 32000: MAX_AX_VELO ZERO), the velocity is automatically restricted to the maximum rate.

32070	**CORR_VELO**			A04	H1,K2,W4
%	Axis velocity for override			DOUBLE	RESET
CTEQ					
-	-	50.0	-	-	7/2

Description:

Limitation of axis velocity for handwheel override, external zero offset, continuous dressing, distance control $AA_OFF via synchronized actions related to the JOG velocity
MD: JOG_VELO,
MD: JOG_VELO_RAPID,
MD: JOG_REV_VELO,
MD: JOG_REV_VELO_RAPID.

The maximum permissible velocity is the maximum velocity in MD: MAX_AX_VELO. Velocity is limited to this value.

The conversion into linear or rotary axis velocity is made according to MD: IS_ROT_AX.

32074	**FRAME_OR_CORRPOS_NOTALLOWED**			A01	H1,K2,W4
-	Frame or tool length compensation are not permissible			DWORD	POWER ON
CTEQ					
-	-	0	0	0xFFF	7/2

Description:

```
This machine data is used to define the effectiveness of the frames and tool
length compensations for indexing axes, PLC axes and command axes started from
synchronized actions.

Bit assignment:
Bit 0 = 0:
    Programmable zero offset (TRANS) allowed for indexing axis
Bit 0 = 1:
    Programmable zero offset (TRANS) forbidden for indexing axis
Bit 1 = 0:
    Scale modification (SCALE) allowed for indexing axis
Bit 1 = 1:
    Scale modification (SCALE) forbidden for indexing axis
Bit 2 = 0:
    Direction change (MIRROR) allowed for indexing axis
Bit 2 = 1:
    Direction change (MIRROR) forbidden for indexing axis
Bit 3 = 0:
    DRF offset allowed for axis
Bit 3 = 1:
    DRF offset forbidden for axis
Bit 4 = 0:
    External zero offset allowed for axis
Bit 4 = 1:
    External zero offset forbidden for axis
Bit 5 = 0:
    Online tool compensation allowed for axis
Bit 5 = 1:
    Online tool compensation forbidden for axis
Bit 6 = 0:
    Synchronized action offset allowed for axis
Bit 6 = 1:
    Synchronized action offset forbidden for axis
Bit 7 = 0:
    Compile cycles offset allowed for axis
Bit 7 = 1:
    Compile cycles offset forbidden for axis
Bit 8 = 0:
    Axial frames and tool length compensation are NOT considered for PLC axes
    (bit evaluation so for compatibility reasons)
Bit 8 = 1:
    Axial frames are considered for PLC axes, and the tool length compensation
    is considered for PLC axes which are geometry axes.
```

```
Bit 9 = 0:
    Axial frames are considered for command axes, and the tool length compensa-
    tion is considered for  command axes which are geometry axes.
Bit 9 = 1:
    Axial frames and tool length compensation are NOT considered for command
    axes
Bit 10 = 0:
    In JOG mode, too, traversing of a geometry axis as a PLC or command axis is
    NOT allowed with active rotation.
Bit 10 = 1:
    In JOG mode, traversing of a geometry axis as a PLC axis or command axis
    (static synchronized action ) is allowed with active rotation (ROT frame).
    Traversing must be terminated prior to returning to AUTOMATIC mode (neu-
    tral axis state), as otherwise alarm16908 would be output when the mode is
    changed.
Bit 11 = 0:
    In the 'Program interrupted' status, repositioning to the interrupt posi-
    tion  (AUTO - JOG) takes place when changing from JOG to AUTO.
Bit 11 = 1:
    Prerequisite: Bit 10 == 1 (PLC or command axis motion with active rotation
    in JOG mode).
    In the 'Program interrupted' status, the end point of the PLC or command
    axis motion is taken over when changing from JOG to AUTOMATIC and the geo-
    metry axes are positioned according to the rotation
```

32080	**HANDWH_MAX_INCR_SIZE**			A05, A10	H1
mm, degrees	Limitation of selected increment			DOUBLE	RESET
CTEQ					
-	-	0.0	-	-	7/2

Description:

```
> 0:Limitation of size of selected increment $MN_JOG_INCR_SIZE <Increment/VDI
signal>Ü or $SN_JOG_VAR_INCR_SIZE for the associated machine axis

 0: No limitation
```

32082	**HANDWH_MAX_INCR_VELO_SIZE**			A05, A10, A04	H1
mm/min, rev/min	Limitation for velocity override			DOUBLE	RESET
CTEQ					
-	-	500.0	-	-	7/2

Description:

```
For the velocity override of positioning axes:
 >0:Limitation of size of selected increment $MN_JOG_INCR_SIZEL<Increment/VDI
signal> 0 or $SN_JOG_VAR_INCR_SIZE for the associated machine axis

 0: No limitation
```

32084	HANDWH_STOP_COND			EXP, A10	H1
-	Effect of VDI signals on handwheel travel			DWORD	RESET
CTEQ					
-	-	0xFF	0	0x7FF	7/2

Description:

```
Definition of the behavior of the handwheel travel on axis-specific VDI inter-
face signals:

Bit = 0:
    Interruption or collection of the distances preset via the handwheel
Bit = 1:
    Abort of the traversing motion or no collection

Bit assignment:

Bit 0: Feedrate override
Bit 1: Spindle speed override
Bit 2: Feedrate stop/spindle stop
Bit 3: Clamping procedure running (= 0 no effect)
Bit 4: Servo enable
Bit 5: Pulse enable

For machine axis:

Bit 6 = 0
    For handwheel travel, the maximum possible velocity corresponds to the fee-
    drate set in MD 32020: JOG_VELO for the appropriate machine axis.
Bit 6 = 1
    For handwheel travel, the maximum possible velocity corresponds to the fee-
    drate set in MD 32000: MAX_AX_VELO for the appropriate machine axis.

Bit 7 = 0
    The override is active in handwheel travel.
Bit 7 = 1
    The override is always assumed to be 100% for handwheel travel regardless
    of how the override switch is set.
    Exception: The override 0% is always active.

Bit 8 = 0
    The override is active with DRF
Bit 8 = 1
    The override is always assumed to be 100% for DRF regardless of how the
    override switch is set.
    Exception: The override 0% is always active.
Bit 9 = 0
    For handwheel travel, the maximum possible velocity with revolutional fee-
    drate is
    - with the feedrate in the setting data $SN_JOG_REV_SET_VELO or
    - the feedrate in the machine data $MA_JOG_REV_VELO or
    - in the case of rapid traverse with $MA_JOG_REV_VELO_RAPID
     of the relevant machine axis calculated with the spindle or rotary axis
    feedrate.
```

```
Bit 9 = 1
    For handwheel travel, the maximum possible velocity is with the revolutio-
    nal feedrate in the machine data $MA_MAX_AX_VELO of the relevant machine
    axis. (see also bit 6)

Bit 10 = 0
    For overlaid motions, $AA_OVR is not active.
Bit 10 = 1
    For overlaid motions (DRF, $AA_OFF, external work offset, online tool off-
    set) the override $AA_OVR settable via synchronized actions is active.

Bit 11 = 0
    With the VDI interface signal "driveReady" (= 0) missing, paths defined by
    the handwheel are not collected, but a traversing request is displayed.
    Start of a continuous JOG motion in continuous mode
    ($SN_JOG_CONT_MODE_LEVELTRIGGRD 41050 = 0) or an incremental JOG motion in
    continuous mode ($MN_JOG_INC_MODE_LEVELTRIGGRD 11300 = 0) is displayed as a
    traversing request. With "driveReady" = 1, however, the tool is not tra-
    versed, but the procedure is aborted and must be started again.
Bit 11 = 1
    With the VDI interface "driveReady" missing, the paths defined by the hand-
    wheel are collected. Start of a continuous JOG motion in continuous mode
    ($SN_JOG_CONT_MODE_LEVELTRIGGRD 41050 = 0) or an incremental JOG motion in
    continuous mode ($MN_JOG_INC_MODE_LEVELTRIGGRD 11300 = 0) is displayed and
    saved as traversing request. With "driveReady" = 1 the traversing motion is
    started.                                        |
```

32090	**HANDWH_VELO_OVERLAY_FACTOR**			A10, A04	H1
-	Ratio of JOG velocity to handwheel velocity (DRF)			DOUBLE	RESET
CTEQ					
-	-	0.5	-	-	7/2

Description:

```
The velocity active with the handwheel in DRF can be reduced from the JOG
velocity with this machine data.
The following applies to linear axes for the velocity active with DRF:
    vDRF = SD:JOG_SET_VELO * MD:HANDWH_VELO_OVERLAY_FACTOR
    or when SD:JOG_SET_VELO  = 0:
    vDRF = MD:JOG_VELO * MD:HANDWH_VELO_OVERLAY_FACTOR
The velocity setting in SD: JOG_ROT_AX_SET_VELO applies for DRF on rotary axes
instead of the value in SD: JOG_SET_VELO.

MD irrelevant for:
    JOG handwheel

Related to:
    MD: JOG_VELO (JOG axis velocity)
    SD: JOG_SET_VELO (JOG velocity for G94)
    SD: JOG_AX_SET_VELO (JOG velocity for rotary axes)
```

32100	**AX_MOTION_DIR**			A07, A03, A11, -	G2
-	Traversing direction (not control direction)			DWORD	POWER ON
-					
-	-	1	-1	1	7/2

Description:

```
The direction of movement of the machine can be reversed with this MD.
The control direction is, however, not reversed, i.e. closed-loop control
remains stable.
MD  =  +1:  Normal direction
MD  =  -1:  Direction reversed
MD  =  0:  Normal direction
```

32110	**ENC_FEEDBACK_POL**			A07, A02, A11	G2
-	Sign actual value (control direction)			DWORD	POWER ON
-					
-	2	1, 1	-1	1	7/2

Description:

```
The evalution direction of the shaft encoder signals is entered into the MD.
  -1: Reversal of direction of movement
0, 1: No reversal of direction of movement
In case of reversal of the direction of movement, the control direction will
also be reversed, if the encoder is used for position control.

The index[n] of the machine data has the following coding:
[Encoder no.]: 0 or 1

Special cases:
    When an incorrect control direction is entered, the axis can run off.
    Depending on the setting of the corresponding limit values, one of the fol-
    lowing alarms is displayed:
    Alarm 25040 "Standstill monitoring"
    Alarm 25050 "Contour monitoring"
    Alarm 25060  "Speed setpoint limitation"
    If an uncontrolled setpoint leap occurs on connection of a drive, the cont-
    rol direction might be incorrect.
```

32200	POSCTRL_GAIN			A07, A11	G2
1000/min	Servo gain factor			DOUBLE	NEW CONF
CTEQ					
-	6	16.66666667, 16.66666667, 16.66666667, 16.66666667, 16.66666667...	0	2000.	7/2

Description:

```
Position controller gain, or servo gain factor.
The input/output unit for the user is [ (m/min)/mm].
I.e. POSCTRL_GAIN[n] = 1 corresponds to 1 mm following error at V = 1m/min.
The following machine data have default settings for adapting the standard
selected input/output unit to the internal unit [rev/s].

-   MD 10230: SCALING_FACTORS_USER_DEF[9] = 16.666667S
-   MD 10220: SCALING_USER_DEF_MASK = 0x200; (bit no 9 as hex value).

If the value "0" is entered the position controller is opened.
When entering the servo gain factor it is important to check that the gain
factor of the whole position control loop is still dependent on other parame-
ters of the controlled system. A distinction should be made between a "desi-
red servo gain factor " (MD: POSCTRL_GAIN) and an "actual servo gain factor"
(produced by the machine). Only when all the parameters of the control loop
are matched will these servo gain factors be the same.

These factors are:
-   Speed setpoint adjustment (MD 32260: RATED_VELO, MD 32250: RATED_OUTVAL)
-   Tacho compensation at speed encoder
-   Tacho generator on drive

Note:
    Axes which interpolate together and are to perform a machining, must eit-
    her have the same gain setting (i.e. have the same identical following
    error = 45° slope at the same velocity) or they must be matched via MD
    32910: DYN_MATCH_TIME.
    The actual servo gain factor can be checked by means of the following error
    (in the service display). However, note that the drift compensation must be
    checked first (in the case of SINUMERIK FM-NC).

The index [n] of the machine data has the following coding:
[control parameter set no.]: 0-5
```

32210	**POSCTRL_INTEGR_TIME**			A07	G2
s	Position controller integral time			DOUBLE	NEW CONF
-					
-	-	1.0	0	10000.0	7/2

Description:

```
Position controller integral action time for the integral component in s

The MD is only active if $MA_POSCTRL_INTEGR_ENABLE = TRUE.
A value of the MD less than 0.001 disables the integral component of the PI
controller. The controller is then a P controller which works with disabled
manipulated variable clamping (s.a. $MA_POSCTRL_CONFIG, bit0 = 1).
```

32220	**POSCTRL_INTEGR_ENABLE**			A07	G2
-	Enable integral component position controller			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

```
Enable of the integral component position controller; the position controller
is then a PI controller in which the manipulated variable clamping is disab-
led (s.a. $MA_POSCTRL_CONFIG, bit0 = 1).

Position overshoots may occur if the integral component is used. For this
reason, this functionality may only be used in special cases.
```

32230	**POSCTRL_CONFIG**			A07	-
-	Configuration of the position controller structure			BYTE	POWER ON
-					
-	-	0	0	17	7/2

Description:

```
Configuration of the position controller structure:
Bit0 = 1: Manipulated variable clamping inactive
Bit4 = 1: Accelerated exact stop signal active
```

32250	**RATED_OUTVAL**			A01, A11	G2
%	Rated output voltage			DOUBLE	NEW CONF
CTEQ					
-	1	80.0	-	-	7/2
710-6a2c	-	0.0	-	-	-/-
720-6a2c	-	0.0	-	-	-/-
730-6a2c	-	0.0	-	-	-/-
710-31a10c	-	0.0	-	-	-/-
720-31a10c	-	0.0	-	-	-/-
730-31a10c	-	0.0	-	-	-/-
840di-basic	-	0.0	-	-	-/-
840di-universal	-	0.0	-	-	-/-
840di-plus	-	0.0	-	-	-/-

Description:

```
a.)
Scaling of the manipulated variable with analog drives:
The value of the speed setpoint in percent is to be entered into the MD, rela-
ted to the maximum speed setpoint, at which the motor speed specified in MD:
RATED_VELO[n] is reached.

Related to:
    MD: RATED_OUTVAL[n] only makes sense in combination with MD: RATED_VELO[n].
Example:
1.  At a voltage of 5V, the drive reaches a speed of
    1875 rev/min ==> RATED_OUTVAL = 50%, RATED_VELO = 11250 [degrees/s]
2.  At a voltage of 8V, the drive reaches a speed of
    3000 rev/min ==> RATED_OUTVAL = 80%, RATED_VELO = 18000 [degrees/s]
3.  At a voltage of 1.5V, the drive reaches a speed of
    562.5 rev/min ==> RATED_OUTVAL = 15%, RATED_VELO = 3375 [degrees/s]

All three examples are possible for one and the same drive/converter. The
ratio of both values is decisive; in all three examples it is the same.

MD RATED_OUTVAL and MD RATED_VELO describe physical characteristics of conver-
ter and drive; they can therefore only be determined by means of measurement
or start-up instructions (converter, drive).

b.)
Scaling of the manipulated variable with digital PROFIBUS drives:
Default value "0" declares RATED_OUTVAL and RATED_VELO as invalid. Scaling of
the manipulated variable is automatically determined and adjusted from the
drive parameters instead (currently only applicable for SIMODRIVE 611U).
Otherwise (RATED_OUTVAL unequal to zero) scaling of the manipulated variable
is not determined from the drive (for example non-Siemens PROFIBUS drives),
but set via RATED_VELO und RATED_OUTVAL even for digital PROFIBUS drives. In
this case the following applies:

Scaling of the manipulated variable on the drive = RATED_VELO / RATED_OUTVAL

During simultaneous operation of analog drives and PROFIBUS drives the set-
tings for analog axes must be adjusted according to a.).
```

32260	**RATED_VELO**			A01, A11	G2
rev/min	Rated motor speed			DOUBLE	NEW CONF
CTEQ					
-	1	3000.0	-	-	7/2

Description:

```
Only applies when:
   MD: RATED_OUTVAL is set higher than 0.
The drive speed (scaled on the drive) must be entered into the MD that is rea-
ched with the speed setpoint in percent specified in MD: RATED_OUTVAL[n].

Related to:
   MD: RATED_VELO[n] only makes sense in combination with MD:RATED_OUTVAL[n].
```

32300	**MAX_AX_ACCEL**			A11, A04, -	B2
m/s², rev/s²	maximum axis acceleration			DOUBLE	NEW CONF
CTEQ					
-	5	1.0, 1.0, 1.0, 1.0, 1.0	1.0e-3	-	7/2

Description:

```
Acceleration, i.e. change in setpoint velocity, which is to act upon the axis
as a maximum. The value limits both the positive and negative axis accelera-
tion.
Depending on machine data $MA_IS_ROT_AX, the maximum angular or linear axis
acceleration must be entered.
If axes are interpolated linearly in a grouping, the grouping is limited in
such a way that no axis is overloaded. With regard to contour accuracy, the
control dynamic behavior has to be taken into account.
MD irrelevant for error states that lead to rapid stop.

Related to:
                    MD 32210: MAX_ACCEL_OVL_FACTOR
                    MD 32434: G00_ACCEL_FACTOR
                    MD 32433: SOFT_ACCEL_FACTOR
                    MD 20610: ADD_MOVE_ACCEL_RESERVE
                    MD 20602: CURV_EFFECT_ON_PATH_ACCEL
```

32301	**JOG_MAX_ACCEL**			A11, A04, -	-
m/s², rev/s²	Maximum axis acceleration in JOG mode			DOUBLE	NEW CONF
CTEQ					
-	-	0.0	-	-	0/0

Description:

```
The MD is effective only in JOG mode and corresponds with MD 32300:
$MA_MAX_AX_ACCEL[<axis>].
The value in $MA_JOG_MAX_ACCEL[<axis>] should be smaller than
$MA_MAX_AX_ACCEL[<axis>], otherwise the value in $MA_MAX_AX_ACCEL[<axis>] will
apply.
$MA_JOG_MAX_ACCEL[<axis>] is thus limited by $MA_MAX_AX_ACCEL[<axis>] as the
maximum value!
```

32310	**MAX_ACCEL_OVL_FACTOR**			A04	B1
-	Overload factor for axial velocity steps			DOUBLE	NEW CONF
CTEQ					
-	5	1.2, 1.2, 1.2, 1.2, 1.2	-	-	3/3

Description:

```
The overload factor limits the velocity jump of the machine axis on block
transition. The value entered refers to the value of MD 32300: MAX_AX_ACCEL
(axis acceleration) and states by how much the maximum acceleration for one
IPO cycle can be exceeded.

Related to:
    MD 32300: MAX_AX_ACCEL (axis acceleration)
    MD 10070: IPO_SYSCLOCK_TIME_RATIO (interpolator clock)

There is an entry for each dynamic G code group.
```

32320	**DYN_LIMIT_RESET_MASK**			A05, A06, A10, A04	-
-	Reset behavior of dynamic response limitation.			DWORD	RESET
CTEQ					
-	-	0	0	0x01	7/2

Description:

```
With MD $MA_DYN_LIMIT_RESET_MASK, the reset behavior of functions limiting the
dynamic response can be set.
The MD is bit-coded; currently only bit 0 (LSB) is assigned.

Bit 0 == 0:
    Channel reset/M30 resets the programmed ACC to 100%.  (compatibility: same
    response as  before)

Bit 0 == 1:
    Programmed ACC is maintained beyond channel reset/M30.
```

32400	**AX_JERK_ENABLE**			A07, A04, -	B2
-	Axial jerk limitation			BOOLEAN	NEW CONF
CTEQ					
-	-	FALSE	-	-	7/2

Description:

```
Enables the function of an axial jerk limitation.
The limitation is set via a time constant; it is always active.
The limitation works independently of the limitations "path-related maximum
jerk", "knee-shaped acceleration characteristic" and the axial jerk limita-
tion of the axes that are operated in JOG mode or positioning axis mode.

Related to:
    MD 32410: AX_JERK_TIME (time constant for axial jerk limitation)
```

32402	**AX_JERK_MODE**			A07, A04	B2,G2,B3
-	Filter type for axial jerk limitation			BYTE	POWER ON
CTEQ					
-	-	1	1	3	7/2

Description:

```
Filter type for axial jerk limitation:
1:  2nd order filter (like SW 1 through 4)
2:  Sliding-type averaging (SW 5 and higher)
3:  Bandstop filter (SW 6 and higher)

Type 2 requires more computing time, but causes less contour errors at the
same smoothing effect, or smoother movements at the same accuracy.
Type 2 is recommended; type 1 is set as default value for reasons of compati-
bility.
The maximum jerk is set via time constant MD 32410: AX_JERK_TIME.
Recommended values for type 1:
    min. 0.03 s; max. 0.06s.
Recommended values for type 2:
    min. 1 position control cycle; max. 16 position control cycles
    At a position control cycle of 2ms this corresponds to 0.002 s through
    0.032 s.
Type 3 requires setting of AX_JERK_TIME, AX_JERK_FREQ and AX_JERK_DAMP.
For parameterization of a mere bandstop filter we recommend to set
AX_JERK_TIME=0 which automatically sets "denominator frequency = numerator
frequency = blocking frequency = AX_JERK_FREQ".
However, with AX_JERK_TIME>0 a specific denominator frequency is set, which
makes it possible to implement a bandstop filter with amplitude increase for
frequencies beyond the blocking frequency.

MD 32402: AX_JERK_MODE is only active, if MD 32400: AX_JERK_ENABLE has been
set to 1.

Special cases, errors:
    The machine data must be same for all axes of an axis container.

Related to:
    MD 32400: AX_JERK_ENABLE
    MD 32410: AX_JERK_TIME
    as well as for type 3: AX_JERK_FREQ and AX_JERK_DAMP
```

32410	**AX_JERK_TIME**			A07, A04	B2
s	Time constant for axial jerk filter			DOUBLE	NEW CONF
-					
-	-	0.001	-	-	7/2

Description:

```
Time constant of the axial jerk filter which causes a smoother axis setpoint
characteristic. The jerk filter will only be active, if the time constant is
higher than a position control cycle.

Not active in case of errors that cause a change in follow-up mode (for
example EMERGENCY STOP99:

Special cases:
    Machine axes that are supposed to be interpolating with one another, must
    have the same effective jerk filtering (for example the same time constant
    for tapping without compensating chuck).

Related to:
    MD 32400: AX_JERK_ENABLE (axial jerk limitation)
```

32412	**AX_JERK_FREQ**			A07, A04	P6
-	Blocking frequency of axial jerk filter			DOUBLE	NEW CONF
-					
-	-	10.0	-	-	7/2

Description:

```
Blocking frequency of axial jerk filter bandstop MD is only active if
$MA_AX_JERK_MODE = 3
```

32414	**AX_JERK_DAMP**			A07, A04	P6
-	Damping of axial jerk filter			DOUBLE	NEW CONF
-					
-	-	0.0	-	-	7/2

Description:

```
Damping of axial jerk filter bandstop:
Input value 0 means complete blocking with $MA_AX_JERK_FREQ, input values >0
can attenuate the blocking effect.
MD is only active if $MA_AX_JERK_MODE = 3
```

32420	**JOG_AND_POS_JERK_ENABLE**			A04	B2
-	Default setting of axis jerk limitation			BOOLEAN	RESET
CTEQ					
-	-	FALSE	-	-	7/2

Description:

```
Enables the function of the axis-specific jerk limitation for the operating
modes JOG, REF and positioning axis mode.
1:  Axial jerk limitation for JOG mode and positioning axis mode
0:  No jerk limitation for JOG mode and positioning axis mode

The maximum jerk occurring is defined in  JOG_AND_POS_MAX_JERK.

Related to:
    MD 32430: JOG_AND_POS_MAX_JERK  (axial jerk)
```

32430	**JOG_AND_POS_MAX_JERK**			A04	B2
m/s³, rev/s³	Axial jerk			DOUBLE	RESET
CTEQ					
-	-	1000.0	1.e-9	-	7/2

Description:

```
The jerk limit value limits the rate of change of axis acceleration in the JOG
and REF modes and in positioning axis mode. The setting and time calculation
are made as for MD 20600: MAX_PATH_JERK (path-related maximum jerk).

MD irrelevant for:
    path interpolation and error states that lead to rapid stop.

Related to:
    MD 32420: JOG_AND_POS_JERK_ENABLE
    (initial setting of axial jerk limitation)
```

32431	**MAX_AX_JERK**			A04	B1
m/s³, rev/s³	maximum axial jerk for path movement			DOUBLE	NEW CONF
-					
-	5	1.e6, 1.e6, 1.e6, 1.e6, 1.e6	1.e-9	-	3/3

Description:

```
Maximum axial jerk for path movement

Entry for each dynamic G code group.
```

32432	PATH_TRANS_JERK_LIM			A04	B1
m/s³, rev/s³	maximum axial jerk at block transition in continuous-path mode			DOUBLE	NEW CONF
CTEQ					
-	5	1.e6, 1.e6, 1.e6, 1.e6, 1.e6	-	-	3/3

Description:

```
The control limits the jerk (acceleration jump) at a block transition between
contour sections of different curvature to the value set.

MD irrelevant for:
    Exact stop

Related to:
    Continuous-path mode, SOFT type of acceleration
```

32433	SOFT_ACCEL_FACTOR			A04, -	B1
-	Scaling of acceleration limitation with SOFT			DOUBLE	NEW CONF
-					
-	5	1., 1., 1., 1., 1.	1e-9	-	3/3

Description:

```
Scaling acceleration limitation with SOFT.
Relevant  axial acceleration limitation for SOFT =:
($MA_SOFT_ACCEL_FACTOR[..] * $MA_MAX_AX_ACCEL[..])

There is an entry for each dynamic G code group.
```

32434	G00_ACCEL_FACTOR			A04, -	B1
-	Scaling of acceleration limitation with G00.			DOUBLE	NEW CONF
-					
-	-	1.	1e-9	-	3/3

Description:

```
Scaling of acceleration limitation with G00.
Relevant  axial acceleration limitation for G00 =:
($MA_G00_ACCEL_FACTOR[..] * $MA_MAX_AX_ACCEL[..])
```

32435	G00_JERK_FACTOR			A04	B1
-	Scaling of jerk limitation with G00.			DOUBLE	NEW CONF
-					
-	-	1.	1e-9	-	3/3

Description:

```
Scaling of jerk limitation with G00.
Relevant  axial jerk limitation for G00 =:
($MA_G00_JERK_FACTOR[..] * $MA_MAX_AX_JERK[..])
```

32436	**JOG_MAX_JERK**			A04	-
m/s³, rev/s³	Maximum axial jerk during JOG motion			DOUBLE	NEW CONF
CTEQ					
-	-	0.0	-	-	0/0

Description:

```
The jerk limit value limits the change of axis acceleration in JOG mode only .

The behavior of the MD is analog to:
    MD 32430: JOG_AND_POS_MAX_JERK

It therefore also communicates with:
    MD 32420: JOG_AND_POS_JERK_ENABLE
    (default of the axial jerk limitation)
```

32440	**LOOKAH_FREQUENCY**			EXP, A04	B1
-	Smoothing frequency for Look Ahead			DOUBLE	NEW CONF
-					
-	-	10.	-	-	7/2

Description:

```
Acceleration procedures in continuous-path mode with Look Ahead which execute
with a higher frequency than that parameterized in this MD are smoothed as a
function of the parameterization in MD $MC_LOOKAH_SMOOTH_FACTOR.
It is always the minimum of all the axes participating in the path which is
determined.

If vibrations are aroused in the mechanics of this axis and if their fre-
quency is known, then this MD should be set to a lower value than this fre-
quency.
```

32450	**BACKLASH**			A09	K3
mm, degrees	Backlash			DOUBLE	NEW CONF
-					
-	2	0.0, 0.0	-	-	7/2

Description:

```
Backlash on reversal between positive and negative travel direction.
Input of the compensation value is
-   positive,  if the encoder is leading the machine part (normal situation)
-   negative, if the encoder is behind the machine part.
Backlash compensation is not active when 0 is entered.
Backlash compensation is always active after reference point approach in all
operating modes.
Special cases:
    For each measuring system, a specific backlash on reversal must be entered.

Related to:
    MD: NUM_ENC (number of measuring systems)
    MD: ENC_CHANGE_TOL
    (maximum tolerance at actual position value change)
```

32452	BACKLASH_FACTOR			A09	K3
-	Evaluation factor for backlash			DOUBLE	NEW CONF
-					
-	6	1.0, 1.0, 1.0, 1.0, 1.0, 1.0	0.01	100.0	7/2

Description:

```
Evaluation factor for backlash.
The machine data enables the backlash defined in MD 32450: BACKLASH to be
changed as a function of the parameter set, in order to  take a gear stage
dependent backlash into account, for example.

Related to:
    MD 32450: BACKLASH[n]
```

32460	TORQUE_OFFSET			A09	K3
%	Additional torque for electronic weight compensation			DOUBLE	NEW CONF
-					
-	1	0.0	-100.0	100.0	7/2

Description:

```
The additional torque for electronic counterweight is switched directly to the
current controller and becomes immediately effective when the current control-
ler is activated. This reduces a sag of vertical axes on servo enable set-
ting, especially if the reset time of the speed controller is high.

100% correspond to the nominal torque of the axis drive.

Definition of signs (prior to NCK.P6_48): A positive value would move the
drive in positive travel direction when the speed controller is switched off
(also see MD 32100: AX_MOTION_DIR).

If, for example, the positive travel direction goes upwards (axis is lifted),
a positive value will have to be entered for counterweight.
If the positive travel direction goes downwards, a negative value will be
required.
Only active for axes with SIMODRIVE 611D drives.

Special cases:
    See mutual effect with "Travel to fixed stop"
```

32490	FRICT_COMP_MODE			A09	K3
-	Type of friction compensation			BYTE	POWER ON
-					
-	1	1	0	2	7/2

Description:

```
0:  No friction compensation
1:  Friction compensation with constant injection value or adaptive characteri-
stic
2:  Friction compensation with learned characteristic via neural network
```

32500	**FRICT_COMP_ENABLE**			A09	K3
-	Friction compensation active			BOOLEAN	NEW CONF
-					
-	-	FALSE	-	-	7/2

Description:

```
1:  Friction compensation is enabled for this axis.
    Depending on the setting of MD 32490: FRICT_COMP_MODE, either "friction
    compensation with constant injected value" or "QEC with neural networks"
    becomes active.

    In the case of neural QEC, the machine data should first be set to "1" when
    a valid characteristic has been "learnt".
    During the learning stage, the compensation values are injected indepen-
    dently of the contents of this machine data.

0:  Friction compensation is not enabled for this axis.
    Thus, no friction compensation values are injected.

Related to:
    MD 32490: FRICT_COMP_MODE
    Friction compensation type
    MD 32510: FRICT_COMP_ADAPT_ENABLE
    Friction compensation adaptation active
    MD 32520: FRICT_COMP_CONST_MAX
    Maximum friction compensation value
    MD 32540: FRICT_COMP_TIME
    Friction compensation time constant
    MD 38010: MM_QEC_MAX_POINTS
    Number of interpolation points for QEC with neural networks
```

32510	**FRICT_COMP_ADAPT_ENABLE**			EXP, A09	K3
-	Adaptation friction compensation active			BOOLEAN	NEW CONF
-					
-	1	FALSE	-	-	7/2

Description:

```
1:  Friction compensation with amplitude adaptation is enabled for the axis.
With friction compensation, quadrant errors on circular contours can be com-
pensated.
    Often, the injection amplitude of the friction compensation value is not
    constant over the entire acceleration range. In this case, a smaller com-
    pensation value must be injected for optimum friction compensation for high
    accelerations than for small accelerations.
    The parameters of the adaptation curve must be determined and entered in
    the machine data.
0:  Friction compensation with amplitude adaptation is not enabled for the
axis.

MD irrelevant for:
    MD 32500: FRICT_COMP_ENABLE = 0
    MD 32490: FRICT_COMP_MODE = 2
```

```
Related to:
    MD 32500: FRICT_COMP_ENABLE
    Friction compensation active
    MD 32520: FRICT_COMP_CONST_MAX
    Maximum friction compensation value
    MD 32530: FRICT_COMP_CONST_MIN
    Minimum friction compensation value
    MD 32550: FRICT_COMP_ACCEL1
    Adaptation acceleration value 1
    MD 32560: FRICT_COMP_ACCEL2
    Adaptation acceleration value 2
    MD 32570: FRICT_COMP_ACCEL3
    Adaptation acceleration value 3
    MD 32540: FRICT_COMP_TIME
    Friction compensation time constant
```

32520	**FRICT_COMP_CONST_MAX**			EXP, A09	K3
mm/min, rev/min	Maximum friction compensation value			DOUBLE	NEW CONF
-					
-	1	0.0	-	-	7/2

Description:

```
With inactive adaption (MD32510=0), the maximum friction compensation is
injected all over the acceleration range.

With active adaption (MD32510=1), the maximum friction compensation is injec-
ted according to the adaptation curve.

In the 1st acceleration range (           a <  MD32550), the injection ampli-
tude = MD32520 * (a/MD32550)
In the 2nd acceleration range (MD32550 <= a <= MD32560), the injection ampli-
tude = MD32520
In the 3rd acceleration range (MD32560 <  a <  MD32570), the injection ampli-
tude = MD32520 * (1-(a-MD32560)/(MD32570-MD32560))
In the 4th acceleration range (MD32570 <= a           ), the injection ampli-
tude = MD32530

MD irrelevant for:
    MD 32500: FRICT_COMP_ENABLE = 0
    MD 32490: FRICT_COMP_MODE = 2 (neural QEC)

Related to:
    MD 32500: FRICT_COMP_ENABLE
    Friction compensation active
    MD 32510: FRICT_COMP_ADAPT_ENABLE
    Friction compensation adaptation active
    MD 32530: FRICT_COMP_CONST_MIN
    Minimum friction compensation value
    MD 32550: FRICT_COMP_ACCEL1
    Adaptation acceleration value 1
    MD 32560: FRICT_COMP_ACCEL2
    Adaptation acceleration value 2
    MD 32570: FRICT_COMP_ACCEL3
    Adaptation acceleration value 3
    MD 32540: FRICT_COMP_TIME
    Friction compensation time constant
```

32530	FRICT_COMP_CONST_MIN			EXP, A09	K3
mm/min, rev/min	Minimum friction compensation value			DOUBLE	NEW CONF
-					
-	1	0.0	-	-	7/2

Description:

```
The minimum friction compensation value is active only if "Friction compensa-
tion with adaptation" (MD32510=1) is active.
The amplitude of the friction compensation value is injected in the 4th acce-
leration range (MD32570 <= a).

MD irrelevant for:
    MD 32510: FRICT_COMP_ADAPT_ENABLE = 0
    MD 32490: FRICT_COMP_MODE = 2 (neural QEC)

Special cases:
    In special cases, the value for FRICT_COMP_CONST_MIN may even be higher
    than for MD 32520: FRICT_COMP_CONST_MAX.

Related to:
    MD 32500: FRICT_COMP_ENABLE
    Friction compensation active
    MD 32510: FRICT_COMP_ADAPT_ENABLE
    Friction compensation adaptation active
    MD 32520: FRICT_COMP_CONST_MAX
    Maximum friction compensation value
    MD 32550: FRICT_COMP_ACCEL1
    Adaptation acceleration value 1
    MD 32560: FRICT_COMP_ACCEL2
    Adaptation acceleration value 2
    MD 32570: FRICT_COMP_ACCEL3
    Adaptation acceleration value 3
    MD 32540: FRICT_COMP_TIME
    Friction compensation time constant
```

32540	FRICT_COMP_TIME			EXP, A09	K3
s	Friction compensation time constant			DOUBLE	NEW CONF
-					
-	1	0.015	-	-	7/2

Description:

```
The friction compensation value is injected via a DT1 filter.
The injection amplitude decays in accordance with the time constant.

MD irrelevant for:
    MD 32500: FRICT_COMP_ENABLE = 0

Related to:
    MD 32500:  FRICT_COMP_ENABLE
    Friction compensation active
    MD 32520:  FRICT_COMP_CONST_MAX
    Maximum friction compensation value
```

32550	FRICT_COMP_ACCEL1			EXP, A09	K3
m/s², rev/s²	Adaptation acceleration value 1			DOUBLE	NEW CONF
-					
-	1	0.0	-	-	7/2

Description:

```
The adaptation acceleration value is only required if "Friction compensation
with adaptation" (MD32510=1) is active.
The adaptation acceleration values 1 to 3 are interpolation points for defi-
ning the adaptation curve. The adaptation curve is subdivided into 4 sections
in which different friction compensation values apply.

For the 1st range (a < MD32550), the injection amplitude = a * MD32520/
MD32550

MD irrelevant for:
    MD 32510: FRICT_COMP_ADAPT_ENABLE = 0
    MD 32490: FRICT_COMP_MODE = 2

Related to:
    MD 32500: FRICT_COMP_ENABLE
    Friction compensation active
    MD 32510: FRICT_COMP_ADAPT_ENABLE
    Friction compensation adaptation active
    MD 32520: FRICT_COMP_CONST_MAX
    Maximum friction compensation value
    MD 32530: FRICT_COMP_CONST_MIN
    Minimum friction compensation value
    MD 32550: FRICT_COMP_ACCEL2
    Adaptation acceleration value 2
    MD 32570: FRICT_COMP_ACCEL3
    Adaptation acceleration value 3
    MD 32540: FRICT_COMP_TIME
    Friction compensation time constant
```

32560	FRICT_COMP_ACCEL2			EXP, A09	K3
m/s², rev/s²	Adaptation acceleration value 2			DOUBLE	NEW CONF
-					
-	1	0.0	-	-	7/2

Description:

```
The adaptation acceleration value is only required if "Friction compensation
with adaptation" (MD32510=1) is active.
The adaptation acceleration values 1 to 3 are interpolation points for defi-
ning the adaptation curve. The adaptation curve is subdivided into 4 sections
in which different friction compensation values apply.

In the 1st acceleration range (           a <  MD32550), the injection ampli-
tude = MD32520 * (a/MD32550)
In the 2nd acceleration range (MD32550 <= a <= MD32560), the injection ampli-
tude = MD32520
```

```
In the 3rd acceleration range (MD32560 <  a <  MD32570), the injection ampli-
tude = MD32520 * (1-(a-MD32560)/(MD32570-MD32560))
In the 4th acceleration range (MD32570 <= a           ), the injection ampli-
tude = MD32530

MD irrelevant for:
    MD 32510: FRICT_COMP_ADAPT_ENABLE = 0
    MD 32490: FRICT_COMP_MODE = 2

Related to:
    MD 32500: FRICT_COMP_ENABLE
    Friction compensation active
    MD 32510: FRICT_COMP_ADAPT_ENABLE
    Friction compensation adaptation active
    MD 32520: FRICT_COMP_CONST_MAX
    Maximum friction compensation value
    MD 32530: FRICT_COMP_CONST_MIN
    Minimum friction compensation value
    MD 32550: FRICT_COMP_ACCEL1
    Adaptation acceleration value 1
    MD 32570: FRICT_COMP_ACCEL3
    Adaptation acceleration value 3
    MD 32540: FRICT_COMP_TIME
    Friction compensation time constant
```

32570	**FRICT_COMP_ACCEL3**			EXP, A09	K3
m/s², rev/s²	Adaptation acceleration value 3			DOUBLE	NEW CONF
-					
-	1	0.0	-	-	7/2

Description:

```
The adaptation acceleration value is only required if "Friction compensation
with adaptation" (MD32510=1) is active.
The adaptation acceleration values 1 to 3 are interpolation points for defi-
ning the adaptation curve. The adaptation curve is subdivided into 4 sections
in which different friction compensation values apply.

In the 1st acceleration range (           a <  MD32550), the injection ampli-
tude = MD32520 * (a/MD32550)
In the 2nd acceleration range (MD32550 <= a <= MD32560), the injection ampli-
tude = MD32520
In the 3rd acceleration range (MD32560 <  a <  MD32570), the injection ampli-
tude = MD32520 * (1-(a-MD32560)/(MD32570-MD32560))
In the 4th acceleration range (MD32570 <= a           ), the injection ampli-
tude = MD32530

MD irrelevant for:
    MD 32510: FRICT_COMP_ADAPT_ENABLE = 0
    MD 32490: FRICT_COMP_MODE = 2
```

```
Related to:
    MD 32500: FRICT_COMP_ENABLE
    Friction compensation active
    MD 32510: FRICT_COMP_ADAPT_ENABLE
    Friction compensation adaptation active
    MD 32520: FRICT_COMP_CONST_MAX
    Maximum friction compensation value
    MD 32530: FRICT_COMP_CONST_MIN
    Minimum friction compensation value
    MD 32550: FRICT_COMP_ACCEL1
    Adaptation acceleration value 1
    MD 32570: FRICT_COMP_ACCEL2
    Adaptation acceleration value 2
    MD 32540: FRICT_COMP_TIME
    Friction compensation time constant
```

32580	**FRICT_COMP_INC_FACTOR**			A09	K3
%	Weighting factor of friction comp. value w/ short trav. movem.			DOUBLE	NEW CONF
-					
-	1	0.0	0	100.0	7/2

Description:

```
The optimum friction compensation value determined by the circularity test can
cause overcompensation of this axis if compensation is activated and axial
positioning movements are short.

In such cases, a better setting can be achieved by reducing the amplitude of
the friction compensation value and acts on all positioning blocks that are
made within an interpolation cycle of the control.

The factor that has to be entered can be determined empirically and can be
different from axis to axis because of the different friction conditions. The
input range is between 0 and 100% of the value determined by the circularity
test.

The default setting is 0; so that no compensation is performed for short tra-
versing movements.

Related to:
    MD 32500: FRICT_COMP_ENABLE  Friction compensation active
```

32610	**VELO_FFW_WEIGHT**			A07, A09	K3
-	Feedforward control factor f. velocity/speed feedforward control			DOUBLE	NEW CONF
-					
-	6	1.0, 1.0, 1.0, 1.0, 1.0, 1.0	-	-	7/2

Description:

Weighting factor for feedforward control. Is normally = 1.0 on digital drives, since these keep the setpoint speed exactly .
On analog drives, this factor can be used to compensate the gain error of the drive actuator, so that the actual speed becomes exactly equal to the setpoint speed (this reduces the following error with feedforward control).

On both drive types, the effect of the feedforward control can be continuously reduced with a factor of < 1.0, if the machine moves too abruptly and other measures (e.g. jerk limitation) are not to be used. This also reduces possibly existing overshoots; however, the error increases on curved contours, e.g. on a circle. With 0.0, you have a pure position controller without feedforward control.

Contour monitoring takes into account factors < 1.0.
In individual cases, it can, however, become necessary to increase MD CONTOUR_TOL.

32620	**FFW_MODE**			A07, A09	K3
-	Feedforward control mode			BYTE	RESET
-					
-	-	1	0	4	7/2
710-6a2c	-	3	-	-	-/-
720-6a2c	-	3	-	-	-/-
730-6a2c	-	3	-	-	-/-
710-31a10c	-	3	-	-	-/-
720-31a10c	-	3	-	-	-/-
730-31a10c	-	3	-	-	-/-
840di-basic	-	3	-	-	-/-
840di-universal	-	3	-	-	-/-
840di-plus	-	3	-	-	-/-

Description:

FFW_MODE defines the feedforward control mode to be applied on an axis-specific basis:
0 = No feedforward control
1 = Speed feedforward control with PT1 balancing
2 = Torque feedforward control (only for 840D) with PT1 balancing
3 = Speed feedforward control with Tt balancing
4 = Torque feedforward control (only for 840D) with Tt balancing

The high-level language instructions FFWON and FFWOF are used to activate and deactivate the feedforward control for specific channels on all axes.
To prevent the feedforward control from being affected by these instructions on individual axes, you can define that it is always activated or always deactivated in machine data FFW_ACTIVATION_MODE (see also FFW_ACTIVATION_MODE).
The torque feedforward control must be activated via the global option data $ON_FFW_MODE_MASK.

If a feedforward control mode is selected (speed or torque feedforward control), it can be programmed additionally in MD 32630: FFW_ACTIVATION_MODE whether the feedforward control can be activated or deactivated by the part program.
Torque feedforward control is an option that must be enabled.

Related to:
MD 32630: FFW_ACTIVATION_MODE
MD 32610: VELO_FFW_WEIGHT
MD 32650: AX_INERTIA

32630	**FFW_ACTIVATION_MODE**			A07, A09	K3,PA1
-	Activate feedforward control from program			BYTE	RESET
CTEQ					
-	-	1	-	-	7/2

Description:

With FFW_ACTIVATION_MODE you can define whether the feedforward control for this axis/spindle can be switched on and off by the part program.

0 = The feedforward control cannot be switched on or off by the high level elements FFWON or FFWOF.
For the axis/spindle the state specified with MD: FFW_MODE therefore always becomes effective.
1 = The feedforward control can be switched on or off by the part program with FFWON or FFWOF.
The default setting is specified with channel-specific MD 20150: GCODE_RESET_VALUES. This setting is valid, before the first NC block is executed.

The last valid state continues to be active even after Reset (and therefore also with JOG).
As the feedforward control is switched on or off by all axes of the channel with FFWON or FFWOF, MD:FFW_ACTIVATION_MODE should be set identical for interpolating axses.

Related to:
MD 32620: FFW_MODE
MD 20150: GCODE_RESET_VALUES

32640	STIFFNESS_CONTROL_ENABLE			A01, A07	K3,FBA
-	Dynamic stiffness control			BOOLEAN	NEW CONF
CTEQ					
-	1	FALSE	-	-	7/2

Description:

```
Activate dynamic stiffness control, if bit is set.
With active stiffness control, higher servo gain factors are possible (MD
32200: POSCTRL_GAIN).

Note on SIMODRIVE 611D:
    Due to the higher computational load in the SIMODRIVE 611D, the setting of
    the sampling cycles (current/drive module sampling time) should possibly be
    adjusted in the 611D. For a single-axis drive module, the standard setting
    (sampling time: 125 µs current, 125 µs speed controller) is sufficient; for
    double-axis modules, the speed controller should possibly be increased (to
    250 µs).
```

32642	STIFFNESS_CONTROL_CONFIG			A01, A07	K3,FBA
-	Dynamic stiffness control configuration (DSC)			BYTE	NEW CONF
CTEQ					
-	1	0	0	1	7/2

Description:

```
Configuration of dynamic stiffness control (DSC):

0:  DSC in drive works with indirect measuring system (standard case)
1:  DSC in drive works with direct measuring system

Note:
    Availability of this function depends on the drive used; it is not suppor-
    ted, for example, by SIMODRIVE 611D.

Note:
    When the dynamic stiffness control of SINAMICS (P1193 unequal to 0) is
    used, the value of this machine data must be set to 0.
```

32644	STIFFNESS_DELAY_TIME			A01, A07	K3,FBA
s	dynamic stiffness control: Delay			DOUBLE	POWER ON
CTEQ					
-	1	0.0	-0.02	0.02	7/2

Description:

```
Configuration of compensation dead time of the dynamic stiffness control (DSC)
with optimized DP cycle (e.g. SIMODRIVE 611U), unit: seconds
```

32650	**AX_INERTIA**			EXP, A07, A09	K3
kgm²	Inertia for torque feedforward control			DOUBLE	NEW CONF
-					
-	-	0.0	-	-	7/2

Description:

```
Axis inertia. Required for torque feedforward control.
```

32652	**AX_MASS**			EXP, A07, A09	K3
kg	Axis mass for torque feedforward control			DOUBLE	NEW CONF
-					
-	-	0.0	-	-	7/2

Description:

```
Mass of axis for torque feedforward control.
This MD is used instead of AX_INERTIA on linear drives (DRIVE_TYPE=3).
```

32700	**ENC_COMP_ENABLE**			A09	K3
-	Encoder/spindle error compensation.			BOOLEAN	NEW CONF
-					
-	2	FALSE, FALSE	-	-	7/2

Description:

```
1:  LEC (leadscrew error compensation) is activated for the measuring system.
    Leadscrew errors and measuring system errors can thus be compensated.
    The function is not enabled internally until the relevant measuring system
    has been referenced (IS: "Referenced/synchronized" = 1).

0:  LEC is not active for the axis/measuring system.

Related to:
    MD: MM_ENC_COMP_MAX_POINTS number of interpolation points with LEC
    IS "Referenced/synchronized 1"
    IS "Referenced/synchronized 2"
```

32710	**CEC_ENABLE**			A09	K3
-	Enable of sag compensation			BOOLEAN	NEW CONF
-					
-	-	FALSE	-	-	7/2

Description:

```
1:  Sag compensation is enabled for this axis.

Inter-axis machine geometry errors (e.g. sag and angularity errors) can be
compensated with sag compensation.

The function is not activated in the control until the following conditions
have been fulfilled:
-   Option "Interpolatory compensation" is set
-   Associated compensation tables have been loaded into the NC user memory and
    have been enabled (SD: CEC_TABLE_ENABLE[t] = 1)
-   The position measuring system required is referenced (IS "Referenced/synchro-
    nized" = 1).

0:  Sag compensation is not enabled for the compensation axis.

Related to:
    MD: MM_CEC_MAX_POINTS[t]
    Number of interpolation points for sag compensation
    SD: CEC_TABLE_ENABLE[t]
    Enable evaluation of sag compensation table t
    IS  "Referenced/synchronized 1 or 2"
    DB31-48, DBX60.4 or 60.5
```

32711	**CEC_SCALING_SYSTEM_METRIC**			A09	K3
-	Measuring system of sag compensation			BOOLEAN	NEW CONF
-					
-	-	TRUE	-	-	7/2

Description:

```
Compensation data exist in:
0:  inch system
1:  metric system
```

32720	CEC_MAX_SUM			A09	K3
mm, degrees	Maximum compensation value for sag compensation			DOUBLE	NEW CONF
-					
-	-	1.0	0	10.0	7/2

Description:

```
In sag compensation, the absolute value of the total compensation value (sum
of compensation values of all active compensation relations) is monitored axi-
ally with machine data value CEC_MAX_SUM.
If the determined total compensation value is larger than the maximum value,
alarm 20124 is triggered. Program processing is not interrupted. The compensa-
tion value output as the additional setpoint is limited to the maximum value.
MD irrelevant for:
-   MSEC
-   Backlash compensation
-   Temperature compensation
Related to:
    MD: CEC_ENABLE
    Enable sag compensation
    SD: CEC_TABLE_ENABLE[t]
    Enable evaluation of sag compensation table t
    IS "Referenced/synchronized 1 or 2"
    DB31-48, DBX60.4 or 60.5
```

32730	CEC_MAX_VELO			EXP, A09, A04	K3
%	Change in velocity at 1			DOUBLE	NEW CONF
-					
-	-	10.0	0	100.0	7/2

Description:

```
In sag compensation, modification of the total compensation value (sum of the
compensation values of all active compensation relations) is limited axially.
The maximum change value is defined in this machine data as a percentage of MD
32000: MAX_AX_VELO (maximum axis velocity).
If the change in the total compensation value is greater than the maximum
value, alarm 20125 is output. Program processing is however continued. The
path not covered because of the limitation is made up as soon as the compensa-
tion value is no longer subject to limitation.

MD irrelevant for:
-   MSEC
-   Backlash compensation
-   Temperature compensation

Related to:
    MD: CEC_ENABLE
    Enable sag compensation
    MD: MAX_AX_VELO
    Maximum axis velocity
    SD: CEC_TABLE_ENABLE[t]
    Enable evaluation of sag compensation table t
    IS "Referenced/synchronized 1 or 2"
    DB31-48, DBX60.4 or 60.5
```

32750	**TEMP_COMP_TYPE**			A09	K3,W1
-	Temperature compensation type			BYTE	POWER ON
CTEQ					
-	-	0	0	7	7/2

Description:

```
The type of temperature compensation applicable to the machine axis is activa-
ted in MD: TEMP_COMP_TYPE.
A distinction is made between the following types:

0:  No temperature compensation active
1:  Position-independent temperature compensation active
    (compensation value with SD: TEMP_COMP_ABS_VALUE)
2:  Position-dependent temperature compensation active
    (compensation value with SD: TEMP_COMP_SLOPE and SD:
    TEMP_COMP_REF_POSITION)
3:  Position-dependent and position-independent temperature compensation active
    (compensation values with SD acc. to type 1 and 2)
Temperature compensation is an option that must be enabled.

Related to:
    SD: TEMP_COMP_ABS_VALUE
    Position-dependent temperature compensation value
    SD: TEMP_COMP_REF_POSITION
    Reference point for position-dependent temperature compensation
    SD: TEMP_COMP_SLOPE
    Gradient for position-dependent temperature compensation
    MD: COMP_ADD_VELO_FACTOR
    Excessive velocity  due to compensation
```

32760	**COMP_ADD_VELO_FACTOR**			EXP, A09, A04	K3
-	Excessive velocity due to compensation			DOUBLE	POWER ON
CTEQ					
-	-	0.01	0.	0.10	7/2

Description:

```
The maximum distance that can be traversed because of temperature compensa-
tion in one IPO cycle can be limited by axial MD: COMP_ADD_VELO_FACTOR.
If the resulting temperature compensation value is above this maximum, it is
traversed over several IPO cycles. There is no alarm.
The maximum compensation value per IPO cycle is specified as a factor refer-
ring to the maximum axis velocity (MD: MAX_AX_VELO).
The maximum gradient of the temperature compensation tanbmax is also limited
with this machine data.
```

```
Example of calculation of the maximum gradient tanb(max):
1.  Calculation of the interpolator cycle time (see Description of Functions
Velocities, Setpoint/Actual-Value Systems, Cycle Times (G2))
    Interpolator cycle time = Basic system clock rate * factor for interpola-
    tion cycle
    Interpolator cycle time = MD: SYSCLOCK_CYCLE_TIME * MD:
    IPO_SYSCLOCK_TIME_RATIO
    Example:
    MD: SYSCLOCK_CYCLE_TIME = 0.004 [s]
    MD: IPO_SYSCLOCK_TIME_RATIO = 3
    -> Interpolator cycle time = 0.004 * 3 = 0.012 [s]
2.  Calculation of the maximum velocity increase resulting from a change made
to the temperature compensation parameter DvTmax
    DvTmax = MD: MAX_AX_VELO * MD: COMP_ADD_VELO_FACTOR

    Example:  MD: MAX_AX_VELO = 10 000 [mm/min ]

                      MD: COMP_ADD_VELO_FACTOR = 0.01
         -> DvTmax = 10 000 * 0.01 = 100 [mm/min]
3.  Calculation of the traverse distances per interpolator cycle

                                       0.012
     S1 (at vmax)      = 10 000 x  --------- = 2.0 [mm]
                                         60

                                        0.012
     ST (at DvTmax) =       100 x  --------- = 0.02 [mm]
                                          60
4.  Calculation of tanbmax
                          ST      0.02
             tanbmax  =  ----  = ------  = 0.01 (corresponds to value for
                          S1        2               COMP_ADD_VELO_FACTOR)
              -> bmax = arc tan 0.01 = 0.57 degrees
    With larger values of SD: TEMP_COMP_SLOPE, the maximum gradient (here 0.57
    degrees) for the position-dependent temperature compensation value is used
    internally. There is no alarm.

Note:
    Any additional excessive velocity resulting from temperature compensation
    must be taken into account when defining the limit value for velocity moni-
    toring (MD: AX_VELO_LIMIT).
MD irrelevant for:
    TEMP_COMP_TYPE = 0, sag compensation, LEC, backlash compensation
Related to:
    MD: TEMP_COMP_TYPE
    Temperature compensation type
    SD: TEMP_COMP_ABS_VALUE
    Position-independent temperature compensation value
    SD: TEMP_COMP_SLOPE
    Gradient for position-dependent temperature compensation
    MD: MAX_AX_VELO
    Maximum axis velocity
    MD: AX_VELO_LIMIT
    Threshold value for velocity monitoring
    MD: IPO_SYSCLOCK_TIME_RATIO
    Ratio basic system clock rate to IPO cycle
    MD: SYSCLOCK_CYCLE_TIME
    Basic system clock rate
```

32800	**EQUIV_CURRCTRL_TIME**			EXP, A07, A09	K3,G2
s	Equiv. time const. current control loop for feedforward control			DOUBLE	NEW CONF
-					
-	6	0.0005, 0.0005, 0.0005, 0.0005, 0.0005, 0.0005	-	-	7/2

Description:

```
This time constant must be equal to the equivalent time constant of the closed
current control loop.
It is used for parameterizing the torque feedforward control and for calcula-
ting the dynamic following error model (contour monitoring).
For a correctly set torque feedforward control, the equivalent time constant
of the current control loop must be determined exactly by measuring the step
response of the current control loop.
On SIMODRIVE 611D, the transient condition can be displayed by means of the
startup tool.

With $MA_FFW_MODE=4, closed-loop control free of following errors can be set
by means of negative values (overshoots during positioning might then pos-
sibly occur).
Delay values taken into account automatically by the software internally are
thus compensated again until the actually active minimum symmetrizing time "0"
is reached.
Any other negative input values have no further effect.
With $MA_FFW_MODE=2, negative input values are automatically converted to the
input value "0" internally, which means that they are not active in this case.

Related to:
    MD: FFW_MODE
    Type of feedfoward control
    MD: AX_INERTION
    Moment of inertia for speed feedforward control
    MD: CONTOUR_TOL
    Tolerance band contour monitoring
```

32810	**EQUIV_SPEEDCTRL_TIME**			A07, A09	K3,G2
s	Equiv. time constant speed control loop for feedforward control			DOUBLE	NEW CONF
-					
-	6	0.008, 0.008, 0.008, 0.008, 0.008, 0.008	-	-	7/2
710-6a2c	-	0.003, 0.003, 0.003, 0.003, 0.003...	-	-	-/-
720-6a2c	-	0.003, 0.003, 0.003, 0.003, 0.003...	-	-	-/-
730-6a2c	-	0.003, 0.003, 0.003, 0.003, 0.003...	-	-	-/-
710-31a10c	-	0.003, 0.003, 0.003, 0.003, 0.003...	-	-	-/-
720-31a10c	-	0.003, 0.003, 0.003, 0.003, 0.003...	-	-	-/-
730-31a10c	-	0.003, 0.003, 0.003, 0.003, 0.003...	-	-	-/-
840di-basic	-	0.003, 0.003, 0.003, 0.003, 0.003...	-	-	-/-
840di-universal	-	0.003, 0.003, 0.003, 0.003, 0.003...	-	-	-/-
840di-plus	-	0.003, 0.003, 0.003, 0.003, 0.003...	-	-	-/-

Description:

This time constant must be equal to the equivalent time constant of the closed current control loop.
It is used for parameterizing the speed feedforward control and for calculating the dynamic following error model (contour monitoring).
For a correctly set speed feedforward control, the equivalent time constant of the current control loop must be determined exactly by measuring the step response of the current control loop.
On SIMODRIVE 611D, the transient condition can be displayed by means of the startup tool.

With $MA_FFW_MODE=3, closed-loop control free of following errors can be set by means of negative values (overshoots during positioning might then possibly occur).
Delay values taken into account automatically by the software internally are thus compensated again until the actually active minimum symmetrizing time "0" is reached.
Any other negative input values have no further effect.
With $MA_FFW_MODE=1, negative input values are automatically converted to the input value "0" internally, which means that they are not active in this case.
Related to:

MD: FFW_MODE
Type of feedfoward control
MD: VELO_FFW_WEIGHT
Moment of inertia for speed feedforward control
MD: CONTOUR_TOL
Tolerance band contour monitoring

32900	**DYN_MATCH_ENABLE**			A07	G2
-	Dynamic response adaptation			BOOLEAN	NEW CONF
CTEQ					
-	-	FALSE	-	-	7/2

Description:

```
With dynamic response adaptation, axes with different servo gain factors can
be set to the same following error with MD: DYN_MATCH_TIME.
1:  Dynamic response adaptation active.
0:  Dynamic response adaptation inactive.

Related to:
    MD 32900: DYN_MATCH_TIME[n]
    (time constant of dyamic response adaptation)
```

32910	**DYN_MATCH_TIME**			A07	G2
s	Time constant of dynamic response adaptation			DOUBLE	NEW CONF
-					
-	6	0.0, 0.0, 0.0, 0.0, 0.0, 0.0	-	-	7/2

Description:

```
The time constant of the dynamic response adaptation of an axis has to be
entered in this MD.

Axes interpolating with each other but having different dynamic responses can
be adapted to the "slowest" control loop by means of this value.
The difference of the equivalent time constant of the "slowest" control loop
to the individual axis has to be entered here as the time constant of the
dynamic response adaptation.
The MD is only active if MD: DYN_MATCH_ENABLE = 1.

Related to:
    MD 32900: DYN_MATCH_ENABLE (dynamic response adaptation)
```

32920	**AC_FILTER_TIME**			A10	S5,FBSY
s	Smoothing filter time constant for adaptive control			DOUBLE	POWER ON
-					
-	-	0.0	-	-	7/2

Description:

```
With the main run variables $AA_LOAD, $AA_POWER, $AA_TORQUE and $AA_CURR, the
following drive actual values can be measured:
-   Drive utilization
-   Drive active power
-   Drive torque setpoint value
-   Current actual value of the axis or spindle
```

To compensate any peaks, the measured values can be smoothed with a PT1 filter. The filter time constant is defined via MD: AC_FILTER_TIME (filter smoothing time constant for adaptive control).

When measuring the drive torque setpoint value or the current actual value, the filter is active in addition to the filters available in the drive. The two filters are connected in series, if both strongly and slightly smoothed values are required in the system. The filter is switched off when a smoothing time of 0 seconds is entered.

32930	**POSCTRL_OUT_FILTER_ENABLE**			A07	G2
-	Activation of low-pass filter at position controller output			BOOLEAN	NEW CONF
CTEQ					
-	-	FALSE	-	-	7/2

Description:

Activation of low-pass filter at position controller output.
Activation of the low-pass filter is only enabled when the dynamic stiffness control is inactive MD32640=0.

32940	**POSCTRL_OUT_FILTER_TIME**			A07	G2
s	Time constant of low-pass filter at position controller output			DOUBLE	NEW CONF
-					
-	-	0.0	-	-	7/2

Description:

Time constant of low-pass filter at position controller output

32950	**POSCTRL_DAMPING**			EXP, A07	G2
%	Damping of the speed control circuit.			DOUBLE	NEW CONF
-					
-	-	0.0	-	-	7/2

Description:

Factor for additional attenuation of the speed control loop

Application:
Attenuation of an oscillating axis through additional activation of a rotational speed difference, which is determined from the difference of the two measuring systems.
One encoder must be connected directly, the other indirectly.

Explanation of normalization by means of SIMODRIVE 611D:
An input value of "100%" means: An additional torque is activated in accordance with drive MD 1725, if
- a positional deviation of 1mm exists on linear motors
- a load-side positional deviation of 360 degrees exists on rotary axes
- a positional deviation corresponding to $MA_LEADSCREW_PITCH (e.g. 10mm as a standard) exists on linear axes (rot. drive).

32990	**POSCTRL_DESVAL_DELAY_INFO**			EXP, A01, A07	B3
s	Actual setpoint position delay			DOUBLE	NEW CONF
READ					
-	3	0.0, 0.0, 0.0	-	-	7/0

Description:

```
This MD shows the additional setpoint value delay of the position controller
in the current controller structure. It is set automatically for NCU link with
different position controller cycles and can be changed via MD
$MN_POSCTRL_DESVAL_DELAY for the entire NCU.

In index 0, the value is displayed without feedforward control.
In index 1, the value is displayed with speed feedforward control.
In index 2, the value is displayed with torque feedforward control.

Related to:
    $MN_POSCTRL_DESVAL_DELAY
```

33000	**FIPO_TYPE**			EXP, A07	G2
-	Fine interpolator type			BYTE	POWER ON
CTEQ					
-	-	2	1	3	7/2

Description:

```
The type of the fine interpolator has to be entered in this MD:
1:  differential FIPO
2:  cubic FIPO
3:  cubic FIPO, optimized for operation with feedforward control
Calculation time required and contour quality increase with increasing type of
FIPO.
-   The default setting is the cubic FIPO.
-   If no feedforward control is used in the position control loop, the use of
    the differential FIPO reduces the calculation time while slightly increasing
    the contour error.
-   If the position control cycle and the interpolation cycle are identical, fine
    interpolation does not take place, i.e. the different types of fine interpo-
    lator do not have different effects.
```

33050	**LUBRICATION_DIST**			A03, A10	A2
mm, degrees	Traversing path for lubrication from PLC			DOUBLE	NEW CONF
-					
-	-	1.0e8	-	-	7/2

Description:

```
After the traversing path defined in the MD has been covered, the state of the
axial IS "Lubrication pulse" is inverted with which an automatic lubrication
device can be activated.
The traversing path is summated after Power on.
The "Lubrication pulse" can be used with axes and spindles.

Application example(s):
The machine bed lubrication can be carried out as a function of the relevant
traversed path.

Note:
    When 0 is entered, IS "Lubrication pulse" (DB31, ... DBX76.0) is set in
    every cycle.

Related to:
    IS "Lubrication pulse" (DB31, ... DBX76.0)
```

33060	**MAINTENANCE_DATA**			A10	-
-	Configuration of maintenance data recording			DWORD	RESET
-					
-	-	1	-	-	7/2

Description:

```
Configuration of axis maintenance data recording:
Bit 0:
    Recording the entire traversing path, entire traversing time and number of
    axis traversing procedures
Bit 1:
    Recording the entire traversing path, entire traversing time and number of
    traversing procedures at high axis speed
Bit 2:
    Recording the total sum of axis jerks, the time in which the axis is tra-
    versed with jerk, and the number of traversing procedures with jerk.
```

33100	**COMPRESS_POS_TOL**			A10	K1,PGA
mm, degrees	Maximum deviation during compression			DOUBLE	NEW CONF
CTEQ					
-	-	0.1	1.e-9	-	7/7

Description:

```
The value specifies the maximum permitted path deviation for each axis with
compression.
The larger the value, the more short blocks can be compressed into a long
block.
```

1.5.4 Reference point approach

34000	**REFP_CAM_IS_ACTIVE**			A03, A11	R1
-	Axis with reference point cam			BOOLEAN	RESET
-					
-	-	TRUE	-	-	7/2

Description:

```
1:  There is at least one reference point cam for this axis
0:  This axis does not have a reference point cam (e.g. rotary axis)
The referencing cycle starts immediately with phase 2 (see documentation)

Machine axes that have only one zero mark over the whole travel range or
rotary axes that have only one zero mark per revolution do not require an
additional reference cam that selects the zero mark (select REF_CAM_IS_ACTIVE
= 0).
The machine axis marked this way accelerates to the velocity specified in MD
34040: REFP_VELO_SEARCH_MARKER (reference point creep velocity) when the plus/
minus traversing key is pressed and synchronizes with the next zero mark.
```

34010	**REFP_CAM_DIR_IS_MINUS**			A03, A11	R1
-	Approach reference point in minus direction			BOOLEAN	RESET
-					
-	-	FALSE	-	-	7/2

Description:

```
0:  REF_CAM_DIR_IS_MINUS
    Reference point approach in plus direction

1:  REF_CAM_DIR_IS_MINUS
    Reference point approach in minus direction

For incremental measuring systems:
If the machine axis is positioned in front of the reference cam, it accelera-
tes, depending on the plus/minus traversing key pressed, to the velocity spe-
cified in MD 34020: REFP_VELO_SEARCH_CAM (reference point approach velocity)
in the direction specified in MD: REFP_CAM_DIR_IS_MINUS. If the wrong traver-
sing key is pressed, reference point approach is not started.

If the machine axis is positioned on the reference cam, it accelerates to the
velocity specified in MD 34020: REFP_VELO_SEARCH_CAM and travels in the direc-
tion opposite to that specified in MD: REFP_CAM_DIR_IS_MINUS.

For linear measuring systems with distance-coded reference marks:
If the machine axis has a reference cam (linear measuring systems with dis-
tance-coded reference marks do not necessarily require a reference cam) and
the machine axis is positioned on the reference cam, it accelerates, indepen-
dent of the plus/minus traversing key pressed, to the velocity specified in MD
34040: REFP_VELO_SEARCH_MARKER (reference point creep speed) in the direction
opposite to that specified in MD: REFP_CAM_DIR_IS_MINUS.
```

34020	REFP_VELO_SEARCH_CAM			A03, A11, A04	R1
mm/min, rev/min	Reference point approach velocity			DOUBLE	RESET
-					
-	-	5000.00	-	-	7/2

Description:

```
The reference point approach velocity is the velocity at which the machine
axis travels in the direction of the reference cam after the traversing key
has been pressed (phase 1). This value should be set at a magnitude large
enough for the axis to be stopped to 0 before it reaches a hardware limit
switch.

MD irrelevant for:
    Linear measuring systems with distance-coded reference marks
```

34030	REFP_MAX_CAM_DIST			A03, A11	R1
mm, degrees	Maximum distance to reference cam			DOUBLE	RESET
-					
-	-	10000.0	-	-	7/2

Description:

```
If the machine axis travels a maximum distance defined in MD:
REFP_MAX_CAM_DIST from the starting position in the direction of the refe-
rence cam, without reaching the reference cam (IS "Reference point approach
delay" (DB31, ... DBX12.7) is reset), the axis stops and alarm 20000 "Refe-
rence cam not reached" is output.

MD irrelevant for:
    Linear measuring systems with distance-coded reference marks
```

34040	REFP_VELO_SEARCH_MARKER			A03, A11, A04	R1
mm/min, rev/min	Creep velocity			DOUBLE	RESET
-					
-	2	300.00, 300.00	-	-	7/2

Description:

```
1)  For incremental measuring systems:
    This is the velocity at which the axis travels in the time between initial
    detection of the reference cam and synchronization with the first zero mark
    (phase 2).
    Traversing direction: Opposite to the direction specified for the cam
    search (MD 34010: REFP_CAM_DIR_IS_MINUS)
    If MD 34050: REFP_SEARCH_MARKER_REVERSE (direction reversal on reference
    cam) is enabled, the axis, in the case of synchronization to a rising refe-
    rence cam signal edge, travels to the cam at the velocity defined in MD
    34020: REFP_VELO_SEARCH_CAM.
```

```
2)  For linear measuring systems with distance-coded reference marks:
    The axis crosses the two reference marks at this velocity. The max. velo-
    city must be small enough that the time required to travel the smallest
    possible reference mark distance [(x(minimum)] on the linear measuring sys-
    tem is larger than one position controller cycle.
    The formula
                         Basic dist.                  Meas.length
    [x(minimum)] [mm] = ----------- * Grad.cycle - --------------
                              2                       Basic dist.

    with    Basic distance [multiple of graduation cycle]
              Graduation cycle [mm]
              Measuring length [mm]     yields:

                                 x(minimum) [mm]
        max. velocity [m/s] = ---------------------------------
                                 Position controller cycle  [ms]

    This limiting value consideration also applies to the other measuring sys-
    tems.
    Traversing direction:
-   as defined in MD: REFP_CAM_DIR_IS_MINUS;
-   if the axis is already positioned on the cam, the axis is traversed in the
    opposite direction
3)  Indirect measuring system with BERO on the load-side (preferred for spind-
les)
    At this velocity, the zero mark associated with the BERO is searched for
    (zero mark selection per VDI signal). The zero mark is accepted if the
    actual velocity lies within the tolerance range defined in MD 35150:
    SPIND_DES_VELO_TOL as deviation from the velocity specified in MD 34040:
    REFP_VELO_SEARCH_MARKER[n].
```

34050	**REFP_SEARCH_MARKER_REVERSE**			A03, A11	R1
-	Direction reversal to reference cam			BOOLEAN	RESET
-					
-	2	FALSE, FALSE	-	-	7/2

Description:

```
This MD can be used to set the direction of search for the zero mark:

REFP_SEARCH_MARKER_REVERSE = 0
Synchronization with falling reference cam signal edge
The machine axis accelerates to the velocity specified in MD 34040:
REFP_VELO_SEARCH_MARKER (reference point creep velocity) in the opposite
direction to that specified in MD 34010: REFP_CAM_DIR_IS_MINUS (reference
point approach in minus direction) .
When the axis leaves the reference cam (IS "Reference point approach delay"
(DB31, ... DBX12.7) is reset) the control is synchronized with the first zero
mark.
MD: REFP_SEARCH_MARKER_REVERSE = 1
Synchronization with rising reference cam signal edge
```

The machine axis accelerates to the velocity defined in MD 34020: REFP_VELO_SEARCH_CAM (reference point creep velocity) in the opposite direction to that specified in the MD: REFP_CAM_DIR_IS_MINUS. When the axis leaves the reference cam (IS "Reference point approach delay" is reset), the machine axis decelerates to a halt and accelerates in the opposite direction towards the reference cam at the velocity specified in MD: REFP_VELO_SEARCH_MARKER. When the reference cam is reached (IS "Reference point approach delay" (DB31, ... DBX12.7) is enabled) the control is synchronized with the first zero mark.

MD irrelevant for:
Linear measuring systems with distance-coded reference marks

34060	**REFP_MAX_MARKER_DIST**			A03, A11	R1
mm, degrees	maximum distance to reference mark			DOUBLE	RESET
-					
-	2	20.0, 20.0	-	-	7/2

Description:

For incremental measuring systems:
If, after leaving the reference cam (IS "Reference point approach delay" is reset), the machine axis travels a distance defined in MD: REFP_MAX_MARKER_DIST without detecting the zero mark, the axis stops and alarm 20002 "Zero mark missing" is output.

For linear measuring systems with distance-coded reference marks:
If the machine axis travels a distance defined in MD: REFP_MAX_MARKER_DIST from the starting position without crossing two zero marks, the axis stops and alarm 20004 "Reference mark missing" is output.

34070	**REFP_VELO_POS**			A03, A11, A04	R1
mm/min, rev/min	Reference point positioning velocity			DOUBLE	RESET
-					
-	-	10000.00	-	-	7/2

Description:

For incremental measuring systems:
The axis travels at this velocity between the time of synchronization with the first zero mark and arrival at the reference point.
For linear measuring systems with distance-coded reference marks:
The axis travels at this velocity between the time of synchronization (crossing two zero marks) and arrival at the target point.

34080	REFP_MOVE_DIST			A03, A11	R1
mm, degrees	Reference point distance			DOUBLE	NEW CONF
-					
-	2	-2.0, -2.0	-1e15	1e15	7/2

Description:

```
1. Standard measuring system (incremental with equidistant zero marks)
Reference point positioning movement: 3rd phase of the reference point
approach:
The axis traverses from the position at which the zero mark is detected with
the velocity REFP_AX_VELO_POS along the path REFP_MOVE_DIST +
REFP_MOVE_DIST_CORR (relative to the marker).
REFP_SET_POS is set as the current axis position at the target point.

2. Irrelevant for distance-coded measuring system.

Override switch and selection jog/continuous mode ( MD  JOG_INC_MODE_IS_CONT )
are active.
```

34090	REFP_MOVE_DIST_CORR			A03, A02, A08, A11	R1
mm, degrees	Reference point offset/absolute offset			DOUBLE	NEW CONF
-, -					
-	2	0.0, 0.0	-1e12	1e12	7/2

Description:

```
-   Incremental encoder with zero mark(s):
    After recognition of the zero mark, the axis is positioned away from the
    zero mark by the distance specified in MD 34080: REFP_MOVE_DIST +
    REFP_MOVE_DIST_CORR. After traversing this distance, the axis has reached
    the reference point. MD 34100: REFP_SET_POS is transferred into the actual
    value.
    During traversing by REFP_MOVE_DIST+REFP_MOVE_DIST_CORR, the override
    switch and MD : JOG_INC_MODE_IS_CONT (jog/continuous mode) are active

-   Distance-coded measuring system:
    REFP_MOVE_DIST_CORR acts as an absolute offset. It describes the offset
    between the machine zero and the first reference mark of the measuring sys-
    tem. Messsystems.

-   Absolute encoder:
    REFP_MOVE_DIST_CORR acts as an absolute offset.
    It describes the offset between the machine zero and the zero point of the
    absolute measuring system.
```

Note:
In conjunction with absolute encoders, this MD is modified by the control during calibration processes and modulo offset!
With rotary absolute encoders (on linear and rotary axes), the modification frequency also depends on the setting of MD34220 ENC_ABS_TURNS_MODULO.
Manual input or modification of this MD via the part program should therefore be followed by a Power ON Reset to activate the new value and to ensure that it will not be lost.

The following applies for NCU-LINK:
If a link axis uses an absolute encoder, every modification of MD34090 on the home NCU (servo physically available) is updated only locally and not beyond the limits of the NCU. The modification is therefore not visible for the link axis. Writing of MD34090 through the link axis is rejected with alarm 17070.

34092	**REFP_CAM_SHIFT**			A03, A11	R1
mm, degrees	electronic cam offset for incremental measuring systems			DOUBLE	RESET
-					
-	2	0.0, 0.0	-	-	7/2

Description:

Electronic cam offset for incremental measuring systems with equidistant zero marks.
When the reference cam signal occurs, the zero mark search does not start immediately but is delayed until after the distance from REFP_CAM_SHIFT.
This ensures the reproducibility of the zero mark search through a defined selection of a zero mark, even with temperature-dependent expansion of the reference cam.

Because the reference cam offset is calculated by the control in the interpolation cycle, the actual cam offset is at least REFP_CAM_SHIFT and at most REFP_CAM_SHIFT+(MD 34040: REFP_VELO_SEARCH_MARKER*interpolation cycle)

The reference cam offset is effective in the search direction of the zero mark.
The reference cam offset is only active if existing cam MD 34000: REFP_CAM_IS_ACTIVE=1.

34093	**REFP_CAM_MARKER_DIST**			A03, A11	R1
mm, degrees	Reference cam/reference mark distance			DOUBLE	POWER ON
-, READ					
-	2	0.0, 0.0	-	-	7/2

Description:

The value displayed corresponds to the distance between exiting the reference cam and the occurrence of the reference mark. If the values are too small, there is a risk of not being able to determine the reference point due to temperature reasons or varying operating times of the cam signal. The distance travelled may serve as a clue for setting the electronic reference cam offset.

This machine data is a display data and can therefore not be changed.

34100	REFP_SET_POS			A03, A11	R1
mm, degrees	Reference point value/target point for distance-coded system			DOUBLE	RESET
-					
-	4	0., 0., 0., 0.	-45000000	45000000	7/2

Description:

```
-   Incremental encoder with zero mark(s):
    The position value which is set as the current axis position after detec-
    tion of the zero mark and traversal of the distance REFP_MOVE_DIST +
    REFP_MOVE_DIST_CORR (relative to zero mark). The REFP_SET_POS for the refe-
    rence point number, which is set as the instant that the edge of the refe-
    rence cam signal (IS DB31, ....DBX2.4-2.7) rises, is set as the axis
    position.

-   Distance-coded measuring system:
    Target position which is approached when REFP_STOP_AT_ABS_MARKER is set to
    0 (FALSE) and two zero marks have been crossed.

-   Absolute encoder:
    REFP_SET_POS corresponds to the correct actual value at the calibration
    position.
    The reaction on the machine depends on the status of MD34210:
    ENC_REFP_STATE: When ENC_REFP_STATE = 1, the value of REFP_SET_POS is
    transferred as the absolute value.
    When ENC_REFP_STATE = 2 and REFP_STOP_AT_ABS_MARKER = 0 (FALSE), the axis
    approaches the target position stored in REFP_SET_POS.
    The value of REFP_SET_POS that has been set via (IS DB31, ....DBX2.4-2.7)
    is used.

Related to:
    IS "Reference point value 1 to 4" (DB31, ... DBX2.4 -2.7)
```

34102	REFP_SYNC_ENCS			A03, A02	R1
-	Calibration of measuring systems			BYTE	RESET
-					
-	-	0	0	1	7/2

Description:

```
Calibrating the measuring system to the reference measuring system can be
activated for all measuring systems of this axis with this machine data.
The calibration procedure is made during reference point approach or when
calibrated absolute encoders selected for the closed-loop control are swit-
ched on.

Values:
0:  No measuring system calibration, measuring systems must be referenced indi-
vidually
1:  Calibration of all measuring systems of the axis to the position of the
reference measuring system

In combination with MD30242 ENC_IS_INDEPENDENT = 2, the passive encoder is
calibrated to the active encoder but NOT referenced.
```

34104	**REFP_PERMITTED_IN_FOLLOWUP**			A03, A02	-
-	Enable referencing in follow-up mode			BOOLEAN	RESET
-					
-	-	FALSE	-	-	7/2

Description:

An axis can also be referenced in the follow-up mode under JOG+REF mode by means of an external motion.

34110	**REFP_CYCLE_NR**			A03	R1
-	Sequence of axes in channel-specific referencing			DWORD	POWER ON
-					
-	-	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18...	-1	31	7/2

Description:

```
MD: REFP_CYCLE_NR = 0 -----> axis-specific referencing
    Axis-specific referencing is started separately for each machine axis with
    the IS "Plus/minus travel keys" (DB31, ... DBX4.7 and 4.6).
    Up to 8 axes on the 840D and up to 5 axes on the FM-NC/810D can be refe-
    renced simultaneously.
    The following alternatives are provided for referencing the machine axes in
    a specific sequence:
-   The operator observes the correct sequence on startup.
-   The PLC checks the sequence on startup or defines the sequence itself.
-   The channel-specific referencing function is used.

MD: REFP_CYCLE_NR = 1 -----> channel-specific referencing
    Channel-specific referencing is started with the IS "Activate referencing"
    (DB21, ... DBX1.0). The control acknowledges a successful start with the IS
    "Referencing active" (DB21, ... DBX33.0). Each machine axis assigned to the
    channel can be referenced with channel-specific referencing (this is achie-
    ved internally on the control by simulating the plus/minus traversing
    keys). The axis-specific MD: REFP_CYCLE_NR can be used to define the
    sequence in which the machine axes are referenced:
    -1 means:
    The machine axis is not started by channel-specific referencing  and NC
    start is possible without referencing this axis.
    0 means:
    The machine axis is not started by channel-specific referencing and NC
    start is not possible without referencing this axis.
    1 means:
    The machine axis is started by channel-specific referencing.
    2 means:
    The machine axis is started by channel-specific referencing if all machine
    axes identified by a 1 in MD: REFP_CYCLE_NR are referenced.
    3 means:
    The machine axis is started by channel-specific referencing if all machine
    axes identified by a 2 in MD: REFP_CYCLE_NR are referenced.
    4 to 8 :
    As above for further machine axes.
```

Setting the channel-specific MD 20700: REF_NC_START_LOCK (NC start disable without reference point) to zero has the effect of entering -1 for all the axes of a channel.
MD irrelevant for:
    Axis-specific referencing
Related to:
    IS "Activate referencing" (DB21, ... DBX1.0)
    IS "Referencing active" (DB21, ... DBX33.0)

34120	**REFP_BERO_LOW_ACTIVE**			A02	M5
-	BERO polarity change			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2

Description:

With this MD, the electrical "polarity" of a BERO connected to the digital drive is indicated.

REFP_BERO_LOW_ACTIVE = 0 means:
Non-deflected state 0 V (low), deflected state 24 V (high)

REFP_BERO_LOW_ACTIVE = 1 means:
Non-deflected state 24 V (high), deflected state 0 V (low)

The polarity is evaluated in the referencing mode ENC_REFP_MODE = 5.
Note:
    The use of this MD is allowed only in conjunction with ENC_REFP_MODE = 5
    and the following SIMODRIVE 611 closed-loop control modules:
    Performance 1 control module (1 axis) 6SN1118R0DG2*-0AA1
    Performance 1 control module (2 axes) 6SN1118R0DH2*-0AA1
    Performance 2 control module (2 axes) 6SN1118R0DK23-0AA0

Related to:
    ENC_REFP_MODE

34200	**ENC_REFP_MODE**			A03, A02	R1
-	Referencing mode			BYTE	POWER ON
-					
-	2	1, 1	0	8	7/2

Description:

For referencing, the position measuring systems mounted can be set as follows via ENC_REFP_MODE:
-   ENC_REFP_MODE = 0
    If absolute encoder available: MD 34100: REFP_SET_POS is taken over
    Other encoders: Reference point approach not possible (SW2.2 and higher)
-   ENC_REFP_MODE = 1
    Referencing of incremental measuring systems:
    Incremental rotary measuring system
    Incremental linear measuring system (linear measuring system)
    Zero pulse on encoder track (not with absolute encoders)

- ENC_REF_MODE = 2 :
  BERO with 1-edge detection. Also possible with absolute encoder. After referencing, the absolute encoder is additionally marked as "calibrated".
- ENC_REFP_MODE = 3
  Referencing on linear measuring systems with distance-coded reference marks:
  Linear measuring system with distance-coded reference marks (Heidenhain)
- ENC_REF_MODE = 4 :
  BERO with 2-edge evaluation (relevant only for FM-NC)
  The positive and negative edges of the reference point are passed one after the other and the corresponding actual values recorded.
  The mean value generated thereof is the synchronization point.
  With the 2-edge evaluation, a possible drift or temperature-dependent expansion of the BERO can be compensated.
- ENC_REF_MODE = 5:
  When the BERO is passed, the zero mark search is started with the detection of the edge, and referencing to the next detected zero mark takes place.
- ENC_REFP_MODE = 6
  Measuring system calibration to an encoder already referenced (not NCU570) (SW3.2 and higher)
- ENC_REFP_MODE = 7
  BERO with configured approach velocity for axis and spindle applications (SW3.6 and higher) (MD 34040: REFP_VELO_SEARCH_MARKER[n] (reference point creep velocity [enc. no.].
- ENC_REFP_MODE = 8
  Referencing for linear measuring systems with distance-coded reference marks:
  Linear measuring system with distance-coded reference marks over 4 zero marks (increased safety).

When the BERO is crossed in mode 5, zero mark search is started with the recognition of the negative BERO edge and synchronization with the next zero mark in sequence takes place.

Mode 6 can be used as a direct measuring system in measuring system configurations with incremental encoders and as an indirect measuring system in configurations with absolute encoders. The absolute measuring system is then already referenced by the incremental encoder at the time of referencing,
The absolute position is taken over by the incremental encoder after traversing of the distance REFP_MOVE_DIST> of the measured backlash. Afterwards, the incremental encoder is referenced.
Caution:
This mode is available only with 611D drives!

34210	**ENC_REFP_STATE**			A07, A03, A02	R1
-	Adjustment status of absolute encoder			BYTE	SOFORT
-					
-	2	0, 0	0	2	7/4

Description:

```
-   Absolute encoder:
    This machine data contains the absolute encoder status
0:  Encoder is not calibrated
1:  Encoder calibration enabled (but not yet calibrated)
2:  Encoder is calibrated
    Default setting for new startup: Encoder is not calibrated.
-   Incremental encoder:
    This machine data contains the "Referenced status", which can be saved over
    Power On:
0:  Default setting: No automatic referencing
1:  Automatic referencing enabled, but encoder not yet referenced
2:  Encoder is referenced and at exact stop, automatic referencing active with
next encoder activation
    Default setting for new startup: No automatic referencing
```

34220	**ENC_ABS_TURNS_MODULO**			A03, A02	R2
-	Modulo range for rotary absolute encoder			DWORD	POWER ON
-					
-	2	4096, 4096	1	100000	7/2

Description:

```
Number of encoder revolutions, which a rotary absolute encoder can resolve
(cf. also maximum multiturn information of the absolute encoder, cf. encoder
data sheet or, for example SIMODRIVE 611D-MD 1021 or 1031).

The absolute position of a rotary axis is reduced to this resolvable range
when an absolute encoder is switched on:
That means that a MODULO transformation takes place, if the actual position
sensed is larger than the position permitted by MD ENC_ABS_TURNS_MODULO.
0 degree <= position <= n*360 degrees, (with n = ENC_ABS_TURNS_MODULO)

Note:
    With SW 2.2, the position is reduced to this range when the control/enco-
    der is switched on. With SW 3.6 and higher, half of this value represents
    the maximum permissible travel distance with the control swiched off / the
    encoder inactive.

Special cases:
    For SIMODRIVE 611D, only powers of two are permissible values ( 1, 2, 4, 8,
    16, ..., 4096).
If other values are entered, these are "rounded down" up to SW < 4.1 without
any further message. With SW 4.1 and higher, a rounded down value bcomes
visible in the machine data and is indicated by alarm 26025.

This MD is relevant only for rotary encoders (on linear and rotary axes).
```

Important recommendation:
The default value "1 encoder revolution" has been changed for SW 3.6 and higher to "4096". The new value is a more robust setting for the most frequently used encoder types.
When an encoder with a smaller multiturn information (encoder data sheet!) is used or when singleturn encoders are used, the value must be reduced accordingly. In either case, the value should be adjusted with multiturn absolute encoders to the maximum variable supported by the encoder, in order to be able to utilize the definite maximum travel range (Please observe: This value also influences the permissible position offset with the encoder inactive/Power Off).

Related to:
SIMODRIVE 611D-MD 1021, ENC_ABS_TURNS_MOTOR,
SIMODRIVE 611D-MD 1031, ENC_ABS_TURNS_DIRECT

34230	**ENC_SERIAL_NUMBER**			A02	R1
-	Encoder serial number			DWORD	POWER ON
-					
-	2	0, 0	-	-	7/2

Description:

The encoder serial number (from EnDat encoders) can be read out here.
"0" is supplied for encoders which do not have a serial number available.

Manipulating this MD normally causes an automatic absolute encoder maladjustment ($MA_ENC_REFP_MODE returns to "0").

34232	**EVERY_ENC_SERIAL_NUMBER**			A02	R1
-	Range of encoder serial number			BOOLEAN	POWER ON
-					
-	2	TRUE, TRUE	-	-	7/2

Description:

With this MD, the working range of MD $MA_ENC_SERIAL_NUMBER can be set on the SIMODRIVE 611D:

0 = Only valid encoder serial number are entered in the MD, i.e. when the drive supplies a "0" (which corresponds to invalid or unknown) the last valid encoder serial number is retained in the MD (e.g. for add-on axes that are not permanently connected to the machine).

1 = (default, upward compatible): The value supplied by the drive for the encoder serial number is taken over into the MD with every control runup. A validity check is not carried out.

Note for PROFIBUS drives:
As not every drive can supply the relevant parameters at all or in good time, the functionality is coded permanently corresponding to "0". A "1" setting is therefore ineffective on the PROFIBUS.

34300	**ENC_REFP_MARKER_DIST**			A03, A02	R1
mm, degrees	Basic distance of reference marks of distance-coded encoders.			DOUBLE	POWER ON
-					
-	2	10.0, 10.0	-	-	7/2

Description:

In addition to the incremental encoder track, a further encoder track is available with distance-coded measuring systems to determine the absolute encoder position. This encoder track has reference marks at defined different distances. The basic distance between the fixed reference marks (that are the reference marks which are always at the same distance to each other) can be taken from the data sheet and directly transferred to the machine data MD 34300.

With the basic distance between the fixed reference marks (MD 34300), the distance between two reference marks (MD 34310) and the number of encoder marks (MD 31020) on angular measuring systems or the graduation cycle (MD 31010) on linear measuring systems, the absolute encoder position can be determined already after crossing of two subsequent reference marks.

MD 34300 is also used for a plausibility check of reference mark distances.

Examples of application:

For example: Heidenhain LS186 C

MD 31010 = 0.02mm (graduation cycle)
MD 34300 = 20.00mm (basic distance between the reference marks)
MD 34310 = 0.02mm (distance between two reference marks corresponds to one graduation cycle). In addition to the incremental encoder track, a further encoder track is available with distance-coded measuring systems to determine the absolute encoder position. This encoder track has reference marks at defined different distances. The basic distance between the fixed reference marks (that are the reference marks which are always at the same distance to each other) can be taken from the data sheet and directly transferred to the machine data MD 34300.

34310	**ENC_MARKER_INC**			A03, A02	R1
mm, degrees	Interval between two reference marks for distance-coded scales			DOUBLE	RESET
-					
-	2	0.02, 0.02	-	-	7/2

Description:

The distances between two reference marks are defined variably, so that the position of the crossed reference marks can be determined accurately in linear measuring systems with distance-coded reference marks.
The difference between two reference mark distances is entered in MD: ENC_MARKER_INC.

MD irrelevant for:
    Incremental measuring systems

Special cases:
    On linear measuring systems with distance-coded reference marks supplied by Heidenhain, the interval between two reference marks is always equal to one graduation cycle.

34320	**ENC_INVERS**			A03, A02	G2,R1
-	Length measuring system inverse to axis movement.			BOOLEAN	RESET
-					
-	2	FALSE, FALSE	-	-	7/2

Description:

- MD has no meaning for an incremental measuring system

- In the case of a distance-coded measuring system:
When setting a reference point, the actual position (determined by the distance-coded reference marks) on the linear measuring system is assigned to an exact machine axis position (referred to the machine zero point). The absolute offset between the machine zero point and the position of the 1st reference mark on the linear measuring system must therefore be entered in MD 34090: REFP_MOVE_DIST_CORR (reference point/absolute offset). In addition, MD: ENC_INVERS must be used to set whether the linear measuring system is connected in the same or the opposite direction to the machine system.

MD irrelevant for:
    Incremental encoders without distance-coded reference marks.

34330	REFP_STOP_AT_ABS_MARKER			A03	R1
-	Distance-coded linear measuring system without target point			BOOLEAN	RESET
-					
-	2	TRUE, TRUE	-	-	7/2

Description:

```
-   Distance-coded measuring system:
REFP_STOP_AT_ABS_MARKER = 0:
At the end of the reference cycle, the position entered in MD 34100:
REFP_SET_POS is approached (normal case for phase 2).
REFP_STOP_AT_ABS_MARKER = 1:
The axis is braked after detection of the second reference mark (shortening of
phase 2)

-   Absolute encoder:
MD REFP_STOP_AT_ABS_MARKER defines the response of an axis with valid calibra-
tion identifier (MD 34210: ENC_REFP_STATE = 2) with G74 or when a traversing
key is actuated in JOG-REF:
REFP_STOP_AT_ABS_MARKER = 0:
Axis traverses to the position entered in MD: REFP_SET_POS
REFP_STOP_AT_ABS_MARKER = 1:
Axis does not traverse.

MD irrelevant for:
    Incremental encoders with zero mark (standard encoders)

Related to:
    MD 34100: REFP_SET_POS
    (reference point distance/target point for distance-coded system)
```

34990	ENC_ACTVAL_SMOOTH_TIME			A02	V1
s	Smoothing time constant for actual values.			DOUBLE	RESET
-					
-	2	0.0, 0.0	0.0	0.5	7/2

Description:

```
Using low-resolution encoders, a more continuous motion of coupled path or
axis motions can be achieved with smoothed actual values. The bigger the time
constant, the better the smoothing of actual values and the larger the over-
travel.

Smoothed actual values are used for:
-   Thread-cutting (G33, G34, G35)
-   Revolutional feedrate (G95, G96, G97, FPRAON)
-   Display of actual position and velocity, or speed respectively.
```

1.5.5 Spindles

35000	SPIND_ASSIGN_TO_MACHAX			A01, A06, A11	S1
-	Assignment of spindle to machine axis			BYTE	POWER ON
-					
-	-	0	0	20	7/2

Description:

```
Spindle definition. The spindle is defined when the spindle number has been
entered in this MD.
Example:
    If the corresponding axis is to be spindle 1, value "1" must be entered in
    this MD.
The spindle functions are possible only for modulo rotary axes. For this pur-
pose MD 30300: IS_ROT_AX and MD 30310: ROT_IS_MODULO must be set.
The axis functionality is maintained; transition to axis operation can be per-
formed with M70.
The spindle data are set gear stage-specific in parameter blocks 1..5; parame-
ter block 0 is used for axis operation (MD 35590: PARAMSET_CHANGE_ENABLE).
The smallest spindle number is 1, the highest number will depend on the num-
ber of axes in the channel.
If other spindle numbers shall be assigned, the function "spindle converter"
must be used.
With multi-channel systems, the same numbers can be assigned in all channels,
except for the spindles active in several channels (replacement axes/spindles
MD 30550: AXCONF_ASSIGN_MASTER_CHAN).
```

35010	GEAR_STEP_CHANGE_ENABLE			A06, A11	S1
-	Parameterize gear stage change			DWORD	RESET
CTEQ					
-	-	0x00	0	0x2B	7/2

Description:

```
Meaning of bit places:

Bit 0 = 0 and bit1 = 0:
    There is an invariable gear ratio between motor and load. The MD of the
    first gear stage are active. Gear stage change with M40 to M45 is not pos-
    sible.

Bit 0 = 1:
    Gear stage change at undefined change position. The gear can have up to 5
    gear stages, which can be selected with M40, M41 to M45. To support the
    gear stage change, the motor can carry out oscillating motions, which must
    be enabled by the PLC program.

Bit 1 = 1:
    Same meaning as for bit 0 = 1, however, the gear stage change is carried
    out at configured spindle position (SW 5.3 and higher). The change posi-
    tion is configured in MD 35011: "GEAR_STEP_CHANGE_POSITION". The position
    is approached at the current gear stage before the gear stage change. If
    this bit is set, bit 0 is not taken into account!
```

```
Bit 2: reserved

Bit 3 = 1:
    The gear stage change dialog between NCK and PLC is simulated. An NCK-
    internal acknowledgement is given. PLC signals for the change are output,
    checkback signals from the PLC are ignored because of the NCK-internal ack-
    nowledgement.

Bit 4: reserved

Bit 5 = 1:
    For tapping with G331/G332, the second gear stage data set is used. The bit
    must be set for the  master spindle used for tapping. Bit 0 or bit 1 must
    be set!

Corresponds with:
    MD 35090: NUM_GEAR_STEPS (number of gear stages 1st data set, see bit5)
    MD 35092: NUM_GEAR_STEPS2 (number of gear stages 2nd data set, see bit5)
    MD 35110: GEAR_STEP_MAX_VELO (max. speed for autom. gear stage change)
    MD 35112: GEAR_STEP_MAX_VELO2 (max. speed for autom. gear stage change 2nd
    data set, see bit 5)
    MD 35120: GEAR_STEP_MIN_VELO (min. speed for autom. gear stage change)
    MD 35122: GEAR_STEP_MIN_VELO2    (min. speed for autom. gear stage change
    2nd data set, see bit 5)
```

35012	**GEAR_STEP_CHANGE_POSITION**			A06, A11	S1
mm, degrees	Gear stage change position			DOUBLE	NEW CONF
CTEQ					
-	6	0.0, 0.0, 0.0, 0.0, 0.0, 0.0	-	-	7/2

Description:

```
Gear stage change position.
The value range must be within the configured modulo range.

Related to:
    MD 35010: GEAR_STEP_CHANGE_ENABLE, bit 1
    MD 30330: MODULO_RANGE
```

35014	**GEAR_STEP_USED_IN_AXISMODE**			A01, A06, A11	-
-	Gear stage for axis mode with M70			DWORD	NEW CONF
CTEQ					
-	-	0	0	5	7/2

Description:

```
With this MD, a gear stage can be defined which can be loaded into the axis
mode during the transition with M70. The parameter set zero used in axis mode
is to be optimized on this gear stage.

Significance of the values:

0:  There is no implicit gear stage change with M70.
    The current gear stage is retained.
```

1 ... 5:
There is a change into gear stage (1...5) during the execution of M70. During the transition into axis mode without M70, there is monitoring for this gear stage and alarm 22022 is issued if necessary. The condition for a gear stage change is the general release of the function in MD 35010 GEAR_STEP_CHANGE_ENABLE.

Secondary conditions:
When changing from axis mode into spindle mode, the configured gear stage continues to remain active. There is no automatic return to the last active gear stage in spindle mode.

35020	**SPIND_DEFAULT_MODE**			A06, A10	S1
-	Initial spindle setting			BYTE	RESET
CTEQ					
-	-	0	0	3	7/2

Description:

SPIND_DEFAULT_MODE activates the operating mode of the spindle at the time specified in MD 35030: SPIND_DEFAULT_ACT_MASK. The appropriate spindle operating modes can be selected with the following values:
0 Speed mode, position control deselected
1 Speed mode, position control activated
2 Positioning mode
3 Axis mode

Related to:
MD 35030: SPIND_DEFAULT_ACT_MASK (activate initial spindle setting)

35030	**SPIND_DEFAULT_ACT_MASK**			A06, A10	S1
-	Time at which initial spindle setting is effective			BYTE	RESET
CTEQ					
-	-	0x00	0	0x03	7/2

Description:

SPIND_DEFAULT_ACT_MASK specifies the time at which the operating mode defined in MD 35020: SPIND_DEFAULT_MODE becomes effective. The initial spindle setting can be assigned the following values at the following points in time:
0 POWER ON
1 POWER ON and NC program start
2 POWER ON and RESET (M2/M30)

Special cases:
If MD 35040: SPIND_ACTIVE_AFTER_RESET = 1, the following supplementary conditions are applicable:
- SPIND_DEFAULT_ACT_MASK should be set to 0
- If this is not possible, the spindle must be at standstill prior to activation.

Related to:
MD 35020: SPIND_DEFAULT_MODE (initial spindle setting)
MD 35040: SPIND_ACTIVE_AFTER_RESET (spindle active via reset)

35032	SPIND_FUNC_RESET_MODE			A06, A10	W4
-	Reset response of individual spindle functions			DWORD	POWER ON
CTEQ					
-	-	0x00	0	0x01	7/2

Description:

```
This data allows the "GWPS in every operating mode" function to be selected/
deselected.
SPIND_FUNC_RESET_MODE, bit 0 = 0 : "GWPS in every operating mode" is deselec-
ted
SPIND_FUNC_RESET_MODE, bit 0 = 1 : "GWPS in every operating mode" is selected
```

35035	SPIND_FUNCTION_MASK			A06, A10	S1
-	Spindle functions			DWORD	RESET
CTEQ					
-	-	0x510	-	-	7/2

Description:

```
This MD allows spindle-specific functions to be set.
The MD is bit-coded, the following bits are assigned:
Bit 0 = 1: With activated DryRun function for
           block programming (M40, M41 to M45), programming via FC18
           and synchronized actions, gear stage changes are suppressed.
Bit 1 = 1: With activated Program test function
           for block programming (M40, M41 to M45), programming via
           FC18 and synchronized actions, gear stage changes are suppressed.
Bit 2 = 1: Gear stage change for programmed gear stage will finally be carried
           out after deselection of DryRun or Program test functions with
REPOS.
Bit 3: reserved
Bit 4 = 1:
    The programmed speed is taken over into SD 43200 $SA_SPIND_S (incl. speed
    default settings via FC18 and synchronized actions).
    S programmings, that are not speed programmings, are not written into the
    SD. These include, for example, S value with constant cutting speed (G96,
    G961), S value with revolution-related dwell time (G4).
Bit 5 = 1:
    The content of SD 43200 $SA_SPIND_S acts as speed setpoint for JOG. If the
    content is zero, then other JOG speed default settings become active (s. SD
    41200 JOG_SPIND_SET_VELO).
Bit 6: reserved
Bit 7: reserved
Bit 8 = 1:
    The programmed cutting speed is taken over into SD 43202
    $SA_SPIND_CONSTCUT_S (incl. default settings via FC18 and synchronized
    actions). S programmings, that are no cutting speed programmings, are not
    written into the SD. These include, for example, S value beyond constant
    cutting speed (G96, G961), S value with revolution-related dwell time (G4).
Bit 9: reserved
```

```
Bit 10 = 0:
    SD 43206 $SA_SPIND_SPEED_TYPE is not changed by part program or channel
    settings,
       = 1:
    For the master spindle, the value of the 15th G group (type of feedrate) is
    taken over into SD 43206 $SA_SPIND_SPEED_TYPE. For all other spindles, the
    corresponding SD remains unchanged.

Bit 11: reserved
Bit 12 = 1:
    Spindle override is active for zero mark search for M19, SPOS and SPOSA
       = 0:
    Previous behavior (default)

Related to:
    SPIND_ACTIVE_AFTER_RESET
    SPIND_DEFAULT_MODE
    SPIND_S
```

35040	**SPIND_ACTIVE_AFTER_RESET**			A06, A10	S1
-	Own spindle RESET			BYTE	POWER ON
CTEQ					
-	-	0	0	2	7/2

Description:

```
SPIND_ACTIVE_AFTER_RESET defines the response of the spindle after reset
(DB21, ... DBX7.7) and program end (M2, M30).
It is only active in the spindle mode open-loop control mode. In positioning
mode or oscillation mode the spindle is always stopped.

SPIND_ACTIVE_AFTER_RESET = 0:
-   Spindle stops (with M2/M30 and channel and bag reset
-   Program is aborted

SPIND_ACTIVE_AFTER_RESET= 1:
-   Spindle does not stop
-   Program is aborted

SPIND_ACTIVE_AFTER_RESET= 2:
-   Spindle does not stop at the M function configured via MD $MN_NO_FCT_EOP (e.g.
    M32).
-   Spindle stops at channel or bag reset


The IS "Spindle reset" (DB31, ... DBX2.2) is always effective, independent of
SPIND_ACTIVE_AFTER_RESET.

Not relevant for:
-   spindle modes other than control mode.

Corresponds with:
    IS "Reset" (DB21, ... DBX7.7)
    IS "Spindle reset" (DB31, ... DBX2.2)
```

35090	NUM_GEAR_STEPS			A06, A10	S1
-	Number of gear stages			DWORD	RESET
-					
-	-	MAXNUM_GEAR_STEPS	1	5	2/2

Description:

```
Determination of the number of set gear stages (GS) of the first gear stage
data set. Starting with the first GS, the upper limit is defined. The machine
data beyond this GS upper limit are not used.

Corresponding MD:
    MD 35010: GEAR_STEP_CHANGE_ENABLE (gear stages available/functions)
    MD 35012: GEAR_STEP_CHANGE_POSITION (gear stage change position)
    MD 35014: GEAR_STEP_USED_IN_AXISMODE (gear stage for axis mode with M70)
    MD 35110: GEAR_STEP_MAX_VELO (max. speed for gear stage change)
    MD 35120: GEAR_STEP_MIN_VELO (min. speed for gear stage change)
    MD 35130 GEAR_STEP_MAX_VELO_LIMIT (max. speed of gear stage)
    MD 35140: GEAR_STEP_MIN_VELO_LIMIT (min. speed of gear stage)
    MD 35200: GEAR_STEP_SPEEDCTRL_ACCEL (acceleration in speed control mode)
    MD 35210: GEAR_STEP_POSCTRL_ACCEL (acceleration in position control mode)
    MD 35310: SPIND_POSIT_DELAY_TIME (positioning delay time)
    MD 35550: DRILL_VELO_LIMIT (maximum speeds for tapping)
    MD 35092: $MA_NUM_GEAR_STEPS2 (number of gear stages 2nd gear stage data
    set)
```

35092	NUM_GEAR_STEPS2			A06, A10	S1
-	Number of gear stages of 2nd gear stage data set			DWORD	RESET
-					
-	-	MAXNUM_GEAR_STEPS	1	5	2/2

Description:

```
Determination of the number of set gear stages (GS) of the second gear stage
data set. Starting with the first GS, the upper limit is defined. The machine
data beyond this GS upper limit are not used.
The number of gear stages of the first and second gear stage data set must not
be equal.

MD 35010: GEAR_STEP_CHANGE_ENABLE, bit 5 (on the master spindle) activates the
second gear stage data set for the function Tapping with G331/G332.

Corresponding MD:
    MD 35010: GEAR_STEP_CHANGE_ENABLE (gear stages available/functions)
    MD 35112: GEAR_STEP_MAX_VELO2 (2nd gear stage data set: max. speed for gear
    stage change)
    MD 35122: GEAR_STEP_MIN_VELO2 (2nd gear stage data set: min. speed for gear
    stage change)
    MD 35212: GEAR_STEP_POSCTRL_ACCEL2 (2nd gear stage data set: acceleration
    in position control mode)
```

35100	SPIND_VELO_LIMIT			A06, A11, A04	S1
rev/min	Maximum spindle speed			DOUBLE	POWER ON
CTEQ					
-	-	10000.0	1.0e-3	-	7/2

Description:

SPIND_VELO_LIMIT defines the maximum spindle speed, which the spindle (the spindle chuck with the workpiece or the tool) must not exceed. The NCK limits an excessive spindle setpoint speed to this value. If the maximum actual spindle speed is exceeded, even allowing for the spindle speed tolerance (MD 35150: SPIND_DES_VELO_TOL), there is a fault with the drive and the IS "Speed limit exceeded" (DB31, ... DBX83.0) is set. Alarm 22050 "Maximum speed reached" is also output and all axes and spindles on the channel are decelerated (provided the encoder is still functioning correctly).

```
Related to:
    MD 35150: SPIND_DES_VELO_TOL (spindle speed tolerance)
    IS "Speed limit exceeded" (DB31, ... DBX83.0)
    Alarm 22050 "Maximum speed reached"
```

35110	GEAR_STEP_MAX_VELO			A06, A11, A04	S1
rev/min	Maximum speed for gear stage change			DOUBLE	NEW CONF
CTEQ					
-	6	500., 500., 1000., 2000., 4000., 8000.	-	-	7/2

Description:

GEAR_STEP_MAX_VELO defines the maximum speed of the gear stage for automatic gear stage change (M40). The gear stages must be defined by GEAR_STEP_MAX_VELO and MD 35120: GEAR_STEP_MIN_VELO in a way that avoids gaps in the programmable spindle speed range between the gear stages.

```
Incorrect
    GEAR_STEP_MAX_VELO [gear stage1] =1000
    GEAR_STEP_MIN_VELO [gear stage2]  =1200
Correct
    GEAR_STEP_MAX_VELO [gear stage1] =1000
    GEAR_STEP_MIN_VELO [gear stage2]  =  950

Related to:
    MD 35010: GEAR_STEP_CHANGE_ENABLE
    (gear stage change is possible)
    MD 35120: GEAR_STEP_MIN_VELO
    (min. speed for gear stage change)
    MD 35140: GEAR_STEP_MIN_VELO_LIMIT
    (min. speed of gear stage)
    MD 35130: GEAR_STEP_MAX_VELO_LIMIT
    (max. speed of gear stage)
```

35112	GEAR_STEP_MAX_VELO2			A06, A11, A04	S1
rev/min	2nd data set: Maximum speed for gear stage change			DOUBLE	NEW CONF
CTEQ					
-	6	500., 500., 1000., 2000., 4000., 8000.	0	-	2/2

Description:

```
With GEAR_STEP_MAX_VELO2, the 2nd data set for the max. speeds (upper swit-
ching threshold) of the gear stages for the automatic gear stage change (M40)
is set. The gear stage must be defined via GEAR_STEP_MAX_VELO2 and MD 35122:
GEAR_STEP_MIN_VELO2 so that there are no gaps between the gear stages in the
programmable spindle speed range.

Examples:
incorrect:
    GEAR_STEP_MAX_VELO2 [gear stage 1] =1000
    GEAR_STEP_MIN_VELO2 [gear stage 2] =1200
correct:
    GEAR_STEP_MAX_VELO2 [gear stage 1] =1000
    GEAR_STEP_MIN_VELO2 [gear stage 2] =950

Activation of the 2nd gear stage data block for tapping with G331/G332 via MD
35010: GEAR_STEP_CHANGE_ENABLE bit 5 of the master spindle.

Corresponding with:
    MD 35140: GEAR_STEP_MIN_VELO_LIMIT (min.  speed of gear stage)
    MD 35130: GEAR_STEP_MAX_VELO_LIMIT (max. speed of gear stage)
```

35120	GEAR_STEP_MIN_VELO			A06, A11, A04	S1
rev/min	Minimum speed for gear stage change			DOUBLE	NEW CONF
CTEQ					
-	6	50., 50., 400., 800., 1500., 3000.	-	-	7/2

Description:

```
GEAR_STEP_MIN_VELO defines the minimum speed of the gear stage for the auto-
matic gear stage change (M40).
Refer to MD 35120: GEAR_STEP_MAX_VELO for more information.

Related to:
    MD 35110: GEAR_STEP_MAX_VELO
    (maximum speed for gear stage change)
    MD 35010: GEAR_STEP_CHANGE_ENABLE
    (gear stage change is possible)
    MD 35140: GEAR_STEP_MIN_VELO_LIMIT
    (minimum speed of gear stage)
    MD 35130: GEAR_STEP_MAX_VELO_LIMIT
    (maximum speed of gear stage)
```

35122	GEAR_STEP_MIN_VELO2			A06, A11, A04	S1
rev/min	2nd data set: Minimum speed for gear stage change			DOUBLE	NEW CONF
CTEQ					
-	6	50., 50., 400., 800., 1500., 3000.	0	-	2/2

Description:

```
In GEAR_STEP_MIN_VELO2 the 2nd data block of the minimum speeds (lower swit-
ching thresholds) of the gear stages for automatic gear stage change (M40) is
set. The gear stages must be defined with GEAR_STEP_MIN_VELO2 and MD 35112:
GEAR_STEP_MAX_VELO2 so that there are no gaps between the gear stages within
the programmable spindle speed range.

Examples:
incorrect:
    GEAR_STEP_MAX_VELO2 [gear stage 1] = 1000
    GEAR_STEP_MIN_VELO2 [gear stage 2] = 1200
correct:
    GEAR_STEP_MAX_VELO2 [gear stage 1] = 1000
    GEAR_STEP_MIN_VELO2 [gear stage 2] = 950

Activation of the 2nd gear stage data block for tapping with G331/G332 via MD
35010: GEAR_STEP_CHANGE_ENABLE bit 5 of the master spindle.

Corresponding with
    MD 35140: GEAR_STEP_MIN_VELO_LIMIT (min. speed of the gear stage)
    MD 35130: GEAR_STEP_MAX_VELO_LIMIT (max. speed of the gear stage)
```

35130	GEAR_STEP_MAX_VELO_LIMIT			A06, A11, A04	S1
rev/min	Maximum speed of gear stage			DOUBLE	NEW CONF
CTEQ					
-	6	500., 500., 1000., 2000., 4000., 8000.	1.0e-3	-	7/2

Description:

```
In GEAR_STEP_MAX_VELO_LIMIT the maximum speed of the gear stage is entered
with the position  control switched off.
This speed can never be exceeded in the active gear stage.
With the position control switched on, the behavior described in MD 35135
GEAR_STEP_PC_MAX_VELO_LIMIT applies.

Note:
-   If an S value is programmed that exceeds the max. speed of the active gear
    stage, the setpoint speed is limited to the max. speed of the gear stage (with
    gear stage selection - M41 to M45). Furthermore, the interface signal "Pro-
    grammed speed too high" will be set.
-   If an S value is programmed that exceeds the max. speed for gear stage change,
    a new gear stage will be set (with automatic gear stage selection - M40).
-   If an S value is programmed that exceeds the max. speed of the highest gear
    stage, the speed will be limited to the max. speed of the gear stage (with
    automatic gear stage selection - M40).
-   If an S value is programmed that does not have a suitable gear stage, no gear
    stage change will be triggered.
```

Related to:
MD 35010: GEAR_STEP_CHANGE_ENABLE (gear stage change possible)
MD 35110: GEAR_STEP_MAX_VELO (max. speed for gear stage change)
MD 35120: GEAR_STEP_MIN_VELO (min. speed for gear stage change)
MD 35135: GEAR_STEP_PC_MAX_VELO_LIMIT (min. speed of the gear stage with position control)
MD 35140: GEAR_STEP_MIN_VELO_LIMIT (min. speed of the gear stage)

35135	**GEAR_STEP_PC_MAX_VELO_LIMIT**			A06, A11, A04	S1
rev/min	Maximum speed of the gear stage with position control			DOUBLE	NEW CONF
CTEQ					
-	6	0., 0., 0., 0., 0., 0.	0	-	7/2

Description:

In GEAR_STEP_PC_MAX_VELO_LIMIT the maximum speed of the gear stage is set with the position control active.
If value 0 is set (default), 90% of the value from MD35130: GEAR_STEP_MAX_VELO_LIMIT (control margin) will become the max. speed of the gear stage with position control active. This limit speed is limited to a value that does not exceed MD 35130: GEAR_STEP_MAX_VELO_LIMIT and MD 35100: SPIND_VELO_LIMIT.
If an S value is programmed that exceeds the limit speed, the setpoint speed is limited to the limit speed. In this case, the VDI interface signal "Programmed speed too high" will be set.
Related to:
MD 35010: GEAR_STEP_CHANGE_ENABLE (gear stage change possible)
MD 35110: GEAR_STEP_MAX_VELO (max. speed for gear stage change)
MD 35120: GEAR_STEP_MIN_VELO (min. speed for gear stage change)
MD 35140: GEAR_STEP_MIN_VELO_LIMIT (min. speed of the gear stage)

35140	**GEAR_STEP_MIN_VELO_LIMIT**			A06, A11, A04	S1
rev/min	Minimum speed of gear stage			DOUBLE	NEW CONF
CTEQ					
-	6	5., 5., 10., 20., 40., 80.	-	-	7/2

Description:

GEAR_STEP_MIN_VELO_LIMIT defines the minimum speed for the gear stage. The speed cannot drop below this value, even if an S value is programmed that is too low.
The speed can only drop below this minimum value as a result of "Minimum/maximum speed of gear stage" signals/commands/states.
MD irrelevant for:
- Spindle oscillation mode
- Spindle positioning mode, axis mode

```
Related to:
    MD 35010: GEAR_STEP_CHANGE_ENABLE
    (gear stage change is possible)
    MD 35110: GEAR_STEP_MAX_VELO
    (maximum speed for gear stage change)
    MD 35120: GEAR_STEP_MIN_VELO
    (minimum speed for gear stage change)
    MD 35130: GEAR_STEP_MAX_VELO_LIMIT
    (maximum speed of gear stage)
```

35150	**SPIND_DES_VELO_TOL**			A03, A05, A06, A10, A04	S1
-	Spindle speed tolerance			DOUBLE	RESET
-					
-	-	0.1	0.0	1.0	7/2

Description:

```
In spindle control mode, the set speed (programmed speed x spindle offset,
allowing for limits) is compared with the actual speed.
-   If the actual speed deviates from the set speed by more than
    SPIND_DES_VELO_TOL, the IS "Spindle in setpoint range" (DB31, ... DBX83.5)
    is set to zero.
-   If the actual speed deviates from the set speed by more than
    SPIND_DES_VELO_TOL, the path feed is disabled (positioning axes continue tra-
    versing).
-   If the actual speed exceeds the maximum spindle speed (MD 35100:
    SPIND_VELO_LIMIT) by more than SPIND_DES_VELO_TOL the IS "Speed limit excee-
    ded" (DB31, ... DBX83.0) is enabled and alarm 22050 "Maximum speed reached"
    is output. All axes and spindles on the channel are decelerated.

MD irrelevant for:
-   Spindle oscillation mode
-   Spindle positioning mode

Related to:
    MD 35500: SPIND_ON_SPEED_AT_IPO_START
    (feed enable for spindle in setpoint range)
    MD 35100: SPIND_VELO_LIMIT
    (maximum spindle speed)
    IS "Spindle in setpoint range" (DB31, ... DBX83.5)
    IS "Speed limit exceeded" (DB31, ... DBX83.0)
    Alarm 22050 "Maximum speed reached"
```

35160	**SPIND_EXTERN_VELO_LIMIT**			A06, A04	S1
rev/min	Spindle speed limitation from PLC			DOUBLE	NEW CONF
CTEQ					
-	-	1000.0	1.0e-3	-	7/2

Description:

```
A limiting value for the spindle speed is entered in SPIND_EXTERN_VELO_UNIT,
which is taken into account exactly when the IS "Velocity/speed limitation"
(DB31, ... DBX3.6) is set.
The NCK limits a spindle speed which is too high to this value.
```

35200	**GEAR_STEP_SPEEDCTRL_ACCEL**			A06, A11, A04, -	S1
rev/s²	Acceleration in speed control mode			DOUBLE	NEW CONF
CTEQ					
-	6	30.0, 30.0, 25.0, 20.0, 15.0, 10.0	1.0e-3	-	7/2

Description:

```
If the spindle is in speed control mode, the acceleration is entered in
GEAR_STEP_SPEEDCTRL_ACCEL.
The spindle is in speed control mode with the function SPCOF.

Special cases:
    The acceleration in speed control mode (GEAR_STEP_SPEEDCTRL_ACCEL) can be
    set so that the electric current limit is reached.

Related to:
    MD 35210: GEAR_STEP_POSCTRL_ACCEL (acceleration in position control mode)
    MD 35220: ACCEL_REDUCTION_SPEED_POINT (speed limit for reduced accelera-
    tion)
```

35210	**GEAR_STEP_POSCTRL_ACCEL**			A06, A11, A04, -	S1
rev/s²	Acceleration in position control mode			DOUBLE	NEW CONF
CTEQ					
-	6	30.0, 30.0, 25.0, 20.0, 15.0, 10.0	1.0e-3	-	7/2

Description:

```
The acceleration in position control mode must be set so that the electric
current limit is not reached.

Related to:
    MD 35200: GEAR_STEP_SPEEDCTRL_ACCEL
    MD 35212: GEAR_STEP_POSCTRL_ACCEL2
```

35212	**GEAR_STEP_POSCTRL_ACCEL2**			A06, A11, A04, -	S1
rev/s²	2nd data set: Acceleration in position control mode			DOUBLE	NEW CONF
CTEQ					
-	6	30.0, 30.0, 25.0, 20.0, 15.0, 10.0	1.0e-3	-	2/2

Description:

```
Second gear stage data set for maximum acceleration capability of the gear
stages in position control mode.
The acceleration in position control mode must be set so that the current
limit is not reached.
Activation of the 2nd data set for tapping with G331/G332 via MD 35010
GEAR_STEP_CHANGE_ENABLE, bit 5 for the master spindle.
Related to:
    MD 35210: GEAR_STEP_POSCTRL_ACCEL
    MD 35200: GEAR_STEP_SPEEDCTRL_ACCEL
    MD 35220: ACCEL_REDUCTION_SPEED_POINT
```

35220	ACCEL_REDUCTION_SPEED_POINT			A06, A04	S1,S6,B2
-	Speed for reduced acceleration			DOUBLE	RESET
-					
-	-	1.0	0.0	1.0	7/2

Description:

This machine data defines the threshold speed/velocity for spindles/positioning axes from which the acceleration reduction is to start. The reference is the defined maximum speed/velocity. The starting point is a percentage of the maximum values.
Example: MD: ACCEL_REDUCTION_SPEED_POINT = 0.7, the maximum speed is 3000 rpm. Acceleration reduction begins with v_on = 2100 rpm, i.e. the maximum acceleration capacity is utilized in the speed range 0...2099.99 rpm. From 2100 rpm to the maximum speed, operation is with reduced acceleration.

Related to:
MD 32000: MAX_AX_VELO
(maximum axis velocity)
MD 35130: GEAR_STEP_MAX_VELO_LIMIT
(maximum gear stage speed)
MD 35230: ACCEL_REDUCTION_FACTOR
(reduced acceleration)

35230	ACCEL_REDUCTION_FACTOR			A06, A04	S1,S6,B2
-	Reduced acceleration			DOUBLE	RESET
CTEQ					
-	-	0.0	0.0	0.95	7/2

Description:

The machine data contains the factor by which the acceleration of the spindle/positioning axes is reduced with reference to the maximum speed/velocity. The acceleration is reduced by the factor between the threshold speed/velocity defined in MD: ACCEL_REDUCTION_SPEED_POINT and the maximum speed/velocity.

Example:
a= 10 rev/s², v_on = 2100 rpm, MD: ACCEL_REDUCTION_FACTOR = 0.3.
Acceleration and deceleration take place within the speed range 0...2099.99 rpm with an acceleration of 10 rev/s². From speed 2100 rpm up to the maximum speed, the acceleration is reduced from 10 rev/s² down to 7 rev/s².

MD irrelevant for:
Errors that lead to rapid stop.

Related to:
MD 32300: MAX_AX_ACCEL (axis acceleration)
MD 35200: GEAR_STEP_SPEEDCTRL_ACCEL
(acceleration in speed control mode)
MD 35210: GEAR_STEP_POSCTRL_ACCEL
(acceleration in position control mode)
MD 35242: ACCEL_REDUCTION_SPEED_POINT
(speed for reduced acceleration)

35240	ACCEL_TYPE_DRIVE			A04	S6
-	Acceleration curve DRIVE for axes ON/OFF			BOOLEAN	RESET
CTEQ					
-	-	FALSE	-	-	7/2

Description:

```
Basic setting of the acceleration response for single-axis movements (positio-
ning, oscillation, JOG):
FALSE: No acceleration reduction
TRUE:  Acceleration reduction active
MD is active only with JOG_AND_POS_JERK_ENABLE = FALSE.
For spindles (in spindle mode), the settings of MD 35220
ACCEL_REDUCTION_SPEED_POINT and 35230 ACCEL_REDUCTION_FACTOR are always
active.
```

35242	ACCEL_REDUCTION_TYPE			A04	S6
-	Type of acceleration reduction			BYTE	RESET
CTEQ					
-	-	1	0	2	7/2

Description:

```
Shape of acceleration reduction characteristic with DRIVE velocity control
0:  Constant
1:  Hyperbolic
2:  Linear
```

35300	SPIND_POSCTRL_VELO			A06, A04	S1
rev/min	Position control activation speed			DOUBLE	NEW CONF
CTEQ					
-	6	500.0, 500.0, 500.0, 500.0, 500.0, 500.0	-	-	7/2

Description:

```
When positioning a spindle that is not in position control mode from a high
speed, the position control is not activated until the spindle has reached or
falls below the velocity defined in MD: SPIND_POSCTRL_VELO.

The speed can be changed with FA[Sn] from the part program. Please refer to
the documentation:
 /FB1/ Function Manual, Basic Funtion; Spindles (S1), section "Spindle mode
'positioning operation'" for a description of the spindle behavior under
various supplementary conditions (positioning from rotation, positioning from
standstill).
Note:
    The active speed from SPIND_POSCTRL_VELO cannot exceed the max. speed set
    in GEAR_STEP_PC_MAX_VELO_LIMIT. If GEAR_STEP_PC_MAX_VELO_LIMIT = 0, the
    value is limited to 90% of GEAR_STEP_MAX_VELO_LIMIT.
Related to:
    MD 35350: SPIND_POSITIONING_DIR (direction of rotation during positioning
    from standstill, if no synchronization is available)
    MD 35100: SPIND_VELO_LIMIT (chuck speed)
```

35310	SPIND_POSIT_DELAY_TIME			A06, A04	S1
s	Positioning delay time			DOUBLE	NEW CONF
CTEQ					
-	6	0.0, 0.05, 0.1, 0.2, 0.4, 0.8	-	-	7/2

Description:

```
Positioning delay time
After reaching the positioning end (exact stop fine), there is a waiting time
equal to the time set in this MD. Selection of the position that matches the
currently set gear stage.

The delay time is activated for:
-   Gear stage change on defined spindle position. After reaching the position
    configured in MD 35011 GEAR_STEP_CHANGE_POSITION, there is a waiting period
    equal to the time specified here. After expiry of this time, the position
    control is switched off for an active direct measuring system and the inter-
    face signals DB31..,DBX82.3 "Change gear" and DB31..,DBX82.0..2 "Setpoint
    gear stage" are output.
-   Block search at output of an accumulated positioning block (SPOS, SPOSA,
    M19).
```

35350	SPIND_POSITIONING_DIR			A06	S1
-	Direction of rotation when positioning			BYTE	RESET
CTEQ					
-	-	3	3	4	7/2

Description:

```
When SPOS or SPOSA is programmed, the spindle is switched to position control
mode and accelerates with the acceleration defined in MD 35210:
GEAR_STEP_POSCTRL_ACCEL (acceleration in position control mode) if the spindle
is not synchronized. The direction of rotation is defined by MD 35350:
SPIND_POSITIONING_DIR (direction of rotation during positioning from stand-
still).
SPIND_POSITIONING_DIR = 3 ---> Clockwise direction of rotation
SPIND_POSITIONING_DIR = 4 ---> Counterclockwise direction of rotation

Related to:
    MD 35300: SPIND_POSCTRL_VELO (position control activation speed)
```

35400	**SPIND_OSCILL_DES_VELO**			A06, A04	S1
rev/min	Oscillation speed			DOUBLE	NEW CONF
CTEQ					
-	-	500.0	-	-	7/2

Description:

```
During oscillation, the IS "Oscillation speed" (DB31, ... DBX18.5) is used to
select a motor speed for the spindle motor. This motor speed is defined in MD:
SPIND_OSCILL_DES_VELO. The motor speed defined in this MD is independent of
the current gear stage. In the AUTOMATIC and MDI displays, the oscillation
speed is displayed in the "Spindle setpoint" window until the gear is changed.

MD irrelevant for:
    All spindle modes except oscillation mode

Special cases:
    The acceleration during oscillation (MD 35410: SPIND_OSCILL_ACCEL) is valid
    for the oscillation speed defined in this MD.

Related to:
    MD 35410: SPIND_OSCILL_ACCEL (acceleration during oscillation)
    IS "Oscillation via PLC" (DB31, ... DBX18.4)
    IS "Oscillation speed" (DB31, ... DBX18.5)
```

35410	**SPIND_OSCILL_ACCEL**			A06, A04, -	S1
rev/s²	Acceleration during oscillation			DOUBLE	NEW CONF
CTEQ					
-	-	16.0	1.0e-3	-	7/2

Description:

```
The acceleration specified here is only effective for the output of the oscil-
lation speed (MD 35400: SPIND_OSCILL_DES_VELO) to the spindle motor. The
oscillation speed is selected using the IS "Oscillation speed".

MD irrelevant for:
    All spindle modes except oscillation mode

Related to:
    MD 35400: SPIND_OSCILL_DES_VELO (oscillation speed)
    IS "Oscillation speed" (DB31, ... DBX18.5)
    IS "Oscillation via PLC" (DB31, ... DBX18.4)
```

35430	SPIND_OSCILL_START_DIR			A06	S1
-	Start direction during oscillation			BYTE	RESET
CTEQ					
-	-	0	0	4	7/2

Description:

```
With the IS "Oscillation speed", the spindle motor accelerates to the speed
specified in MD 35400: SPIND_OSCILL_DES_VELO.

The start direction is defined by SPIND_OSCILL_START_DIR if IS "Oscillation
via PLC" is not enabled.
SPIND_OSCILL_START_DIR = 0
    ---> Start direction same as the last direction of rotation
SPIND_OSCILL_START_DIR = 1
    ---> Start direction counter to the last direction of rotation
SPIND_OSCILL_START_DIR = 2
    ---> Start direction counter to the last direction of rotation
SPIND_OSCILL_START_DIR = 3 --->     Start direction is M3
SPIND_OSCILL_START_DIR = 4 --->     Start direction is M4

MD irrelevant for:
    All spindle modes except oscillation mode

Related to:
    MD 35400: SPIND_OSCILL_DES_VELO (oscillation speed)
    IS "Oscillation speed" (DB31, ... DBX18.5)
    IS "Oscillation via PLC" (DB31, ... DBX18.4)
```

35440	SPIND_OSCILL_TIME_CW			A06	S1
s	Oscillation time for M3 direction			DOUBLE	NEW CONF
CTEQ					
-	-	1.0	-	-	7/2

Description:

```
The oscillation time defined here is active in the M3 direction.

MD irrelevant for:
-   All spindle modes except oscillation mode
-   Oscillation via PLC (IS "Oscillation via PLC" (DB31, ... DBX18.4) enabled)

Related to:
    MD 35450: SPIND_OSCILL_TIME_CCW (oscillation time for M4 direction)
    MD 10070: IPO_SYSCLOCK_TIME_RATIO (interpolator cycle)
    IS "Oscillation speed" (DB31, ... DBX18.5)
    IS "Oscillation via PLC" (DB31, ... DBX18.4)
```

35450	SPIND_OSCILL_TIME_CCW			A06	S1
s	Oscillation time for M4 direction			DOUBLE	NEW CONF
CTEQ					
-	-	0.5	-	-	7/2

Description:

```
The oscillation time defined here is active in the M4 direction.

MD irrelevant for:
-   All spindle modes except oscillation mode
-   Oscillation via PLC (IS "Oscillation via PLC" (DB31, ... DBX18.4) enabled)

Related to:
    MD 35440: SPIND_OSCILL_TIME_CW (oscillation time for M3 direction)
    MD 10070: IPO_SYSCLOCK_TIME_RATIO (interpolator cycle)
    IS "Oscillation speed" (DB31, ... DBX18.5)
    IS "Oscillation by PLC" (DB31, ... DBX18.4)
```

35500	SPIND_ON_SPEED_AT_IPO_START			A03, A06, A10	S1
-	Feedrate enable for spindle in the set range			BYTE	RESET
CTEQ					
-	-	1	0	2	7/2

Description:

```
For SW 4.2 and higher:
Byte = 0:
    The path interpolation is not affected

Byte = 1:
    The path interpolation is not enabled (positioning axes continue traver-
    sing) until the spindle has reached the specified speed. The tolerance
    range can be set in MD 35150$MA_SPIND_DES_VELO_TOL. If a measuring system
    is active, then the actual speed is monitored, otherwise the set speed.
    Path axes traversing in continuous-path mode (G64) are not stopped.

Byte = 2:
    In addition to 1, traversing path axes are also stopped before machining
    begins, e.g. continuous-path mode (G64) and the change from rapid traverse
    (G0) to a machining block (G1, G2,..). The path is stopped at the last G0
    block and does not start traversing until the spindle is within the set
    speed range.
Restriction:
If the spindle is newly programmed by the PLC (FC18) or a synchronized action
"shortly" before the end of the last G0 block, then the path decelerates
taking the dynamic limitation into account. Because the spindle programming is
asynchronous, a traverse can be made into the machining block if necessary. If
the spindle has reached the setpoint speed range then machining starts from
this point.
Byte  = 3:
    No longer available for SW 5.3 and higher.
Related to:
    MD 35150: SPIND_DES_VELO_TOL (spindle speed tolerance)
    IS "Spindle in setpoint range" (DB31, ... DBX83.5)
```

35510	**SPIND_STOPPED_AT_IPO_START**			A03, A06, A10	S1
-	Feedrate enable for spindle stopped			BOOLEAN	RESET
CTEQ					
-	-	FALSE	-	-	7/2

Description:

When a spindle is stopped (M5), the path feed is disabled (positioning axes continue traversing) if MD: SPIND_STOPPED_AT_IPO_START is enabled and the spindle is in control mode.
When the spindle has come to a standstill (IS "Axis/spindle stationary" (DB31, ... DBX61.4) enabled), the path feed is enabled.

Related to:
MD 35500: SPIND_ON_SPEED_AT_IPO_START
(feed enable for spindle in setpoint range)

35550	**DRILL_VELO_LIMIT**			A06, A11, A04	-
rev/min	Maximum speeds for tapping			DOUBLE	NEW CONF
CTEQ					
-	6	10000., 10000., 10000., 10000., 10000., 10000.	1	-	7/2

Description:

Limit speed values for tapping without compensating chuck with G331/G332.
The maximum speed of the linear motor characteristic range (constant acceleration capacity) must be specified depending on the gear stage.

35590	**PARAMSET_CHANGE_ENABLE**			EXP, A05	A2
-	Parameter set can be changed			BYTE	POWER ON
CTEQ					
-	-	0	0	2	7/2

Description:

0: Parameter set changes cannot be controlled.
The first parameter set is always active. Exceptions: see below

1: The parameter set applied in the servo is specified via the VDI interface. Parameter sets 1 to 6 can be selected. Sets are selected by means of DB31 ff, DBB9, bits0..2 in the binary-coded value range 0...5. Values 6 and 7 select parameter set no. 6. Exceptions: see below.

For 0 and 1:
With G33, G34, G35, G331, G332, the number of the parameter set for the involved axes is ativated according to the master spindle gear stage, increased by one (corresponds to set of parameters number 2..6).
For spindles, parameter sets 2 to 6 are always active, depending on the set gear stage plus one.

Irrespective of these selections, the internal parameter set selection always has priority. This applies to spindles (no allowance for MD = 1), machine axes participating in tapping or thread cutting. The switchover response depends on whether the servo gain factor changes between the old and new parameter sets.

Secondary conditions:
Changing a parameter set at which the load gearbox factors differ between the active and the new parameter set, will result in a reset of the referenced signal, provided that the axis has an indirect measuring system.
If the load gearbox factors differ between the active and the new parameter set, while the axis position is unequal to zero and the position control is active, the parameter set cannot be changed and alarm 26050 for the correspon-ding axis is output. The problem must be resolved (change PLC control, etc.).
The axial machine data described below belong to the parameter set.
The parameter set contains the following axial machine data:

$MA_AX_VELO_LIMIT
$MA_POSCTRL_GAIN
$MA_EQUIV_CURRCTRL_TIME
$MA_EQUIV_SPEEDCTRL_TIME
$MA_DYN_MATCH_TIME
$MA_DRIVE_AX_RATIO_DENOM
$MA_DRIVE_AX_RATIO_NUMERA

Related to:

Interface signals DB31, ..., DBX9.0, 1 ,2 and DBX69.0, 1 ,2

References:

/FB/, H2, "Output of Auxiliary Functions to PLC"

1.5.6 Monitoring functions

36000	STOP_LIMIT_COARSE			A05	B1
mm, degrees	Exact stop coarse			DOUBLE	NEW CONF
-					
-	-	0.04	-	-	7/2

Description:

```
Treshold for exact stop coarse

An NC block is considered as terminated if the actual position of the path
axes is away from the setpoint position by the value entered for the exact
stop limit. If the actual position of a path axis is not within this limit,
the NC block is considered as not terminated and further part program execu-
tion is not possible. The magnitude of the value entered influences the tran-
sition to the next block. The larger the value, the earlier the block change
is initiated.
If the specified exact stop limit is not reached
-   the block is considered as not terminated,
-   further traversing of the axis is not possible,
-   alarm 25080 Positioning monitoring is output after expiry of the time speci-
    fied in MD: POSITIONING_TIME (monitoring time for exact stop fine),
-   the direction of movement +/- is indicated for the axis in the positioning
    display. The exact stop window is also evaluated for spindles in position
    control mode (SPCON instruction).

Special cases:
    MD: STOP_LIMIT_COARSE must not be set smaller than MD: STOP_LIMIT_FINE
    (exact stop fine). To achieve the identical block change behavior as with
    the "exact stop fine" criterion, the window of exact stop coarse may be
    identical to the band of exact stop fine. MD: STOP_LIMIT_COARSE must not be
    set equal to or larger than MD: STANDSTIL_POS_TOL (standstill tolerance).

Related to:
    MD 36020: POSITIONING_TIME (delay time, exact stop fine)
```

36010	STOP_LIMIT_FINE			A05	B1
mm, degrees	Exact stop fine			DOUBLE	NEW CONF
-					
-	-	0.01	-	-	7/2

Description:

```
Threshold for exact stop fine

See MD: STOP_LIMIT_COARSE (exact stop coarse)

Special cases:
    MD: STOP_LIMT_FINE must not be set larger than MD: STOP_LIMIT_COARSE (exact
    stop coarse).
    MD: STOP_LIMIT_FINE must not be set equal to or larger than MD:
    STANDSTILL_POS_TOL (standstill tolerance).
Related to:
    MD 36020: POSITIONING_TIME (delay time, exact stop fine)
```

36012	STOP_LIMIT_FACTOR			A05	B1
-	Factor for exact stop coarse/fine and standstill			DOUBLE	NEW CONF
-					
-	6	1.0, 1.0, 1.0, 1.0, 1.0, 1.0	0.001	1000.0	7/2

Description:

```
With this factor,
    MD 36000: STOP_LIMIT_COARSE,
    MD 36010: STOP_LIMIT_FINE,
    MD 36030: STANDSTILL_POS_TOL
can be newly assessed as a function of the parameter set. The relationship of
these three values to each other always remains the same.

Application examples:
Matching the positioning behavior if the mass relationships noticeably change
with a gear change, or if one wants to save on machine positioning time at the
cost of accuracy in various operating conditions.

Related to:
    MD 36000: STOP_LIMIT_COARSE,
    MD 36010: STOP_LIMIT_FINE,
    MD 36030: STANDSTILL_POS_TOL
```

36020	POSITIONING_TIME			A05	B1,A3
s	Delay time exact stop fine			DOUBLE	NEW CONF
-					
-	-	1.0	-	-	7/2

Description:

```
After termination of a positioning process, the time starts within which the
axis must reach the "exact stop fine".
The current following error is therefore continuously monitored for the limit
value MD 36010: STOP_LIMIT_FINE. In case of time-out, alarm 25080 "Positio-
ning monitoring" is output and the axis stopped. The MD should be selected
large enough to ensure that the monitoring function is not triggered under
normal operating conditions taking into account any settling times.

Related to:
    MD 36010: STOP_LIMIT_FINE (exact stop fine)
```

36030	STANDSTILL_POS_TOL			A05	A3
mm, degrees	Standstill tolerance			DOUBLE	NEW CONF
-					
-	-	0.2	-	-	7/2

Description:

This MD serves as a tolerance band for the following monitoring functions:

- After termination of a traversing block (position partial setpoint=0 at the end of the movement), the following error is monitored for reaching the limit value for STANDSTILL_POS_TOL (standstill tolerance) after the programmable STANDSTILL_DELAY_TIME (delay time, standstill monitoring).
- After termination of a positioning action (exact stop fine reached), positioning monitoring is replaced by standstill monitoring. The axis is monitored for moving more than indicated in MD: STANDSTILL_POS_TOL (standstill tolerance) from its position.

If the setpoint position is exceeded or undergone by the standstill tolerance, alarm 25040 "Standstill monitoring" is output and the axis stopped.

Special cases:
The standstill tolerance must be larger than the "exact stop limit coarse".

Related to:
MD 36040: STANDSTILL_DELAY_TIME (delay time, standstill monitoring)

36040	STANDSTILL_DELAY_TIME			A05	A3
s	Delay time for standstill monitoring			DOUBLE	NEW CONF
-					
-	-	0.4	-	-	7/2

Description:

See MD 36030: STANDSTILL_POS_TOL (standstill tolerance)

Related to:
MD 36030: STANDSTILL_POS_TOL (standstill tolerance)

36042	FOC_STANDSTILL_DELAY_TIME			A05	F1
s	Delay time for standstill monit. w/ active torque or force lim.			DOUBLE	NEW CONF
-					
-	-	0.4	-	-	7/2

Description:

Waiting time between the end of a movement and activation of standstill monitoring with active torque/force limitation.
If the configurable end of block criterion occurs within this time, then standstill monitoring is activated.

36050	CLAMP_POS_TOL			A05	A3
mm, degrees	Clamping tolerance			DOUBLE	NEW CONF
-					
-	-	0.5	-	-	7/2

Description:

```
With interface signal "Blocking action active" (DB31, ... DBX2.3), blocking
monitoring is activated. If the monitored axis is forced away from the set-
point position (exact stop limit) by more than the blocking tolerance, alarm
26000 "Blocking monitoring" is output and the axis stopped.
Threshold value for blocking tolerance (half width of window).
Special cases:
    The blocking tolerance must be larger than the "exact stop limit coarse".
Related to:
    IS "Blocking action active" (DB31, ... DBX2.3)
```

36052	STOP_ON_CLAMPING			A10	-
-	Special functions with clamped axis			BYTE	NEW CONF
CTEQ					
-	-	0	0	0x07	2/1

Description:

```
This MD defines how a blocked axis is taken into account.
Bit 0 =0:
    If a blocked axis is to be traversed again in continuous-path mode, it must
    be ensured via the part program that the path axes are stopped and that
    there is time for releasing the blockage.

Bit 0 =1:
    If a blocked axis is to be traversed again in continuous-path mode, the
    LookAhead function stops the path motion if required until the position
    controller is allowed to traverse the blocked axis again, i.e. until the
    controller enable is set again.

Bit 1 is relevant only if bit 0 is set:
Bit 1 =0:
    If a blocked axis is to be traversed again in continuous-path mode, the
    LookAhead function does not release the blockage.

Bit 1 =1:
    If a blocked axis is to be traversed again in continuous-path mode, a tra-
    versing command for the blocked axis is given in the preceding G0 blocks so
    that the PLC releases the axis blockage again.

Bit 2 =0:
    If an axis is to be blocked in continuous-path mode, it must be ensured in
    the part program that the path axes are stopped to make sure that there is
    time for setting the blockage.
Bit 2 =1:
    If an axis is to be blocked in continuous-path mode, the LookAhead func-
    tion stops the path motion prior to the next non-G0 block, if the axis has
    not yet been blocked by that time, i.e. the PLC has not yet set the fee-
    drate override to zero.
```

36060	**STANDSTILL_VELO_TOL**			A05, A04	A2
mm/min, rev/min	Threshold velocity/speed 'Axis/spindle in stop'			DOUBLE	NEW CONF
-					
-	-	5.00	-	-	7/2

Description:

This MD defines the standstill range for the axis velocity / spindle speed. If the current actual velocity of the axis or the actual speed of the spindle is smaller than the value entered in this MD, the interface signal "Axis/spindle stationary" is set.
To bring the axis/spindle to a standstill under control, the pulse enable should be not be removed until the axis/spindle is at a standstill. Otherwise the axis would coast down.
Related to:
    IS "Axis/spindle stationary" (DB31, ... DBX61.4)

36100	**POS_LIMIT_MINUS**			A03, A05, A11, -	A3
mm, degrees	1st software limit switch minus			DOUBLE	NEW CONF
CTEQ					
-	-	-1.0e8	-	-	7/2

Description:

Same meaning as 1st software limit switch plus, but the traversing range limitation is in the negative direction.

The MD becomes active after reference point approach if PLC interface signal "2nd software limit switch minus" is not set.

MD irrelevant:
    if axis is not referenced.

Related to:
    IS "2nd software limit switch minus" (DB31, ... DBX12.2)

The MD can be activated with SW release 5.3 newconf and later, i.e. a new setting of the MD via programming can be activated with NEWCONF.

36110	**POS_LIMIT_PLUS**			A03, A05, A11, -	A3
mm, degrees	1st software limit switch plus			DOUBLE	NEW CONF
CTEQ					
-	-	1.0e8	-	-	7/2

Description:

A software limit switch can be activated in addition to a hardware limit switch. The absolute position in the machine axis system of the positive range limit of each axis is entered.

The MD is active after reference point approach if IS "2nd software limit switch plus" has not been set.

MD irrelevant:
    if axis is not referenced.

Related to:
    IS "2nd software limit switch plus" (DB31, ... DBX12.3)

The MD can be activated with SW release 5.3 newconf and later, i.e. a new setting of the MD via programming can be activated with NEWCONF.

36120	**POS_LIMIT_MINUS2**			A03, A05, -	A3
mm, degrees	2nd software limit switch minus			DOUBLE	NEW CONF
CTEQ					
-	-	-1.0e8	-	-	7/2

Description:

Same meaning as 2nd software limit switch plus, but the traversing range limitation is in the negative direction.

Whether software limit switch 1 or 2 is to be active can be selected by the PLC via interface signal.

For example:
 DB31, DBB12
    Bit 2 = 0"1st software limit switch minus" active for 1st axis
    Bit 2 = 1"2nd software limit switch minus" active for 1st axis

MD irrelevant:
    if axis is not referenced.

Related to:
    IS "2nd software limit switch minus" (DB31, ... DBX12.2)

The MD can be activated with SW release 5.3 newconf and later, i.e. a new setting of the MD via programming can be activated with NEWCONF.

36130	**POS_LIMIT_PLUS2**			A03, A05, -	A3
mm, degrees	2nd software limit switch plus			DOUBLE	NEW CONF
CTEQ					
-	-	1.0e8	-	-	7/2

Description:

```
With this machine data, a 2nd software limit switch position in the positive
direction can be defined. An interface signal from the PLC can select which of
the two software limit switches 1 or 2 is to be active.

For example:
 DB31, DBB12
    Bit 3 = 0 "1st software limit switch plus" activefor 1st axis
    Bit 3 = 1 "2nd software limit switch plus" active for 1st axis

MD irrelevant:
    if axis is not referenced.

Related to:
    IS "2nd software limit switch plus" (DB31, ... DBX12.3)

The MD can be activated with SW release 5.3 newconf and later, i.e. a new set-
ting of the MD via programming can be activated with NEWCONF.
```

36200	**AX_VELO_LIMIT**			A05, A11, A04	A3,G2
mm/min, rev/min	Threshold value for velocity monitoring			DOUBLE	NEW CONF
CTEQ					
-	6	11500., 11500., 11500., 11500., 11500., 11500.	-	-	7/2

Description:

```
The threshold value for actual velocity monitoring is entered in this machine
data.
If the axis has at least one active encoder and if this encoder is below its
limit frequency, alarm 25030 "Actual velocity alarm limit" is triggered when
the treshold value is exceeded and the axis stopped.

Settings:
-   For axes, a value should be selected that is 10 to 15 % higher than that of
    MD: MAX_AX_VELO  (maximum axis velocity). With active temperature compensa-
    tion MD: TEMP_COMP_TYPE, the maximum axis velocity is increased by an addi-
    tional factor which is determined by MD: COMP_ADD_VELO_FACTOR (velocity
    overshoot through compensation). The following should therefore apply to the
    velocity monitoring threshold value:
    MD: AX_VELO_LIMIT[n] > MD: MAX_AX_VELO * (1.1 ... 1.15 + MD:
    COMP_ADD_VELO_FACTOR)
-   For spindles, a value should be selected for each gear stage that is 10 to
    15 % higher than that of MD: GEAR_STEP_MAX_VELO_LIMIT[n] (maximum speed of
    gear stage).
```

36210	**CTRLOUT_LIMIT**			EXP, A05	G2
%	Maximum speed setpoint			DOUBLE	NEW CONF
CTEQ					
-	1	110.0	0	200	7/2

Description:

This MD defines the maximum speed setpoint in percent. 100 % means maximum speed setpoint (10 V for analog interface, maximum speed for SIMODRIVE 611D (settable via 611D MD 1401: MOTOR_MAX_SPEED) or for PROFIBUS drives).
The maximum speed setpoint depends on possibly available setpoint limitations in the speed and current controller.
An alarm is output and the axis stopped when the limit is exceeded.
The limit is to be selected in such a way that the maximum velocity (rapid traverse) can be reached and an appropriate additional control margin is available.

36220	**CTRLOUT_LIMIT_TIME**			EXP, A05	A3
s	Delay time for speed setpoint monitoring			DOUBLE	NEW CONF
-					
-	1	0.0	-	-	7/2

Description:

This MD defines how long the speed setpoint may be within the limit CTRLOUT_LIMIT[n] (max. speed setpoint) until the monitoring function is triggered.
Monitoring (and with it also this machine data) is always active.
Reaching the limit renders the position control loop non-linear, which results in contour errors provided that the speed setpoint limited axis is participating in contour generation. That is why this MD has default value 0, i.e. the monitoring function responds as soon as the speed setpoint reaches the limit.

36300	**ENC_FREQ_LIMIT**			EXP, A02, A05, A06	A3
-	Encoder limit frequency			DOUBLE	POWER ON
-					
-	2	3.0e5, 3.0e5	-	-	7/2

Description:

This MD is used to enter the encoder frequency, which,
in general, is a manufacturer specification (type plate, documentation).

If the limit frequency of the encoder is higher than that of the measuring circuit module, the limit is internally reduced to the value of the measuring circuit module.

This does not apply to encoders on the PROFIBUS; here, the limit values of the measuring circuit module are slave-dependent, i.e. known only by the slave. Therefore, it is the user who is responsible for taking into account the limit frequency of the measuring circuit module.

Special case SIMODRIVE 611D:
When asynchronous motors are used in conjunction with digital main spindle drives, all encoders are evaluated by the NC (in contrast to the drive) up to their configured limit frequency. Already at the changeover speed MD1465, the drive itself changes from HSA mode to "encoderless" AM mode.
If the evaluation of the motor encoder through the NC is to be interrupted also at this drive-end-configured changeover speed, MD36300 must be assigned for this encoder with the changeover speed MD1465 converted into [Hz] as the default value.
Conversion formula: MD36300 = MD31020 * MD1465 / 60.0

36302	**ENC_FREQ_LIMIT_LOW**			EXP, A02, A05, A06	A3
%	Encoder limit frequency for new encoder synchronization.			DOUBLE	NEW CONF
-					
-	2	99.9, 99.9	0	100	7/2

Description:

Encoder frequency monitoring uses a hysteresis.
MD 36300: ENC_FREQ_LIMIT defines the encoder limit frequency. When this frequency is exceeded, the encoder is switched off. When the frequency defined in ENC_FREQ_LIMIT_LOW is undergone, the encoder is switched on again.

ENC_FREQ_LIMIT is entered directly in Hertz.
ENC_FREQ_LIMIT_LOW, however, is a fraction of ENC_FREQ_LIMIT in percent.
MA_ENC_FREQ_LIMIT_LOW is therefore already correctly preset for most of the encoders used.
Exception: In the case of absolute encoders with En-Dat interface, however, the limit frequency of the absolute track is considerably lower than the limit frequency of the incremental track. You can achieve that the encoder is not switched on again until the limit frequency of the absolute track is undergone and that it therefore does not reference until the absolute track allows it, by entering a small value in ENC_FREQ_LIMIT_LOW. For spindles, this referencing is carried out automatically.

Example EQN 1325:

Limit frequency of the electronics of the incremental track: 430 kHz
===> ENC_FREQ_LIMIT = 430 kHz

Limit frequency of the absolute track approx. 2000 encoder revs/min at 2048 increments/encoder rev., i.e. encoder frequency 2000/60 * 2048 Hz = 68 kHz
===> ENC_FREQ_LIMIT_LOW = 68/430 = 15 %

36310	**ENC_ZERO_MONITORING**			EXP, A02, A05	A3
-	Zero mark monitoring			DWORD	NEW CONF
-					
-	2	0, 0	-	-	7/2

Description:

```
This MD is used to activate zero mark monitoring.

 0: No zero mark monitoring

100:
    No zero mark monitoring and suppression of all encoder alarms (i.e. besi-
    des alarm 25020, alarms 25000, 25010, etc. are also completely suppressed)

>0: Incremental measuring systems:
    Number of detected zero mark errors at which monitoring is to be triggered
    (alarm output)

>0: Absolute measuring systems ($MA_ENC_TYPE=4):
    Permissible deviation in 1/2 coarse increments between the absolute and the
    incremental encoder track (one 1/2 coarse increment is sufficient).

Special case, only for SIMODRIVE 611D:
>0: Absolute SSI measuring systems ($MA_ENC_TYPE=5):
    With SSI encoders, there is no zero mark monitoring in the actual sense.
    However, there are encoder types with laser beam measurement, where an
    encoder error message can easily occur due to a beam interruption. To
    ensure that the control must not be switched off and on every time with
    such encoders, you can switch over to alarm 25010 (pollution of measuring
    system, reset alarm) instead of standard Power On alarm 25000 (i.e. zero
    mark monitoring is not possible with this MD on SSI encoders, but the MD is
    used for alarm reconfiguration in case of encoder errors).
Special case for Profibus:
>100:Weakened hardware error messages (encoder errors are not mapped on Powe-
rOn alarm 25000 (25001) but on reset alarm 25010 (25011); and zero mark moni-
toring is active (permiss. deviation must be set for Profibus in the drive,
*not* in the NC)
```

36400	**CONTOUR_TOL**			A05, A11	A3
mm, degrees	Tolerance band for contour monitoring			DOUBLE	NEW CONF
-					
-	-	1.0	-	-	7/2

Description:

```
Tolerance band for axial contour monitoring (dynamic following error monito-
ring).
The permissible deviation between the real and the modelled following error is
entered in this MD.
The input of the tolerance band is intended to avoid spurious tripping of the
dynamic following error monitoring through slight speed fluctuations, which
occur during normal closed-loop control operations (e.g. during first cut).
Following error modelling and thus the input of this MD depends on the posi-
tion control gain MD: POSCTRL_GAIN and, in the case of precontrol or simula-
tion, on the accuracy of the controlled system model MD: EQUIV_SPEEDCTRL_TIME
(equivalent time constant for precontrol of speed control loop), as well as on
the accelerations and velocities used.
```

36500	**ENC_CHANGE_TOL**			A02, A05	G2
mm, degrees	Tolerance at actual position value change.			DOUBLE	NEW CONF
-					
-	-	0.1	-	-	7/2

Description:

```
The permissible deviation between the actual values of the two measuring sys-
tems is entered in this MD.
This difference must not be exceeded when switching over the measuring system
used for closed-loop control, in order to avoid compensating processes that
are too strong. Otherwise, the error message 25100 "Axis %1 Switchover of
measuring system not possible" is generated and the switchover does not take
place.
MD irrelevant for:
    MD 30200: NUM_ENCS = 0 or 1.
```

36510	**ENC_DIFF_TOL**			A02, A05	G2
mm, degrees	Tolerance of measuring system synchronization			DOUBLE	NEW CONF
-					
-	-	0.0	-	-	7/2

Description:

```
Permissible deviation between the actual values of the two measuring systems.
This difference must not be exceeded during the cyclic comparison of the two
measuring systems used, as otherwise an error message would be generated.
The corresponding monitoring function is not active
-   with MD input value=0,
-   if 2 measuring systems are not active/available in the axis
-   or if the axis has not been referenced (at least act. closed-loop control
    meas. system).
With modulo axes, it is always the absolute value of the shortest/direct posi-
tion difference that is monitored.
```

36520	**DES_VELO_LIMIT**			A02, A05	DA
%	Threshold for setpoint velocity monitoring			DOUBLE	NEW CONF
-					
-	-	125.0	-	-	7/2

Description:

```
Maximum permissible setpoint velocity in percent of the maximum axis/spindle
velocity.
With $MA_DES_VELO_LIMIT, the position setpoint is monitored for abrupt chan-
ges. If the permissible limit value is exceeded, alarm 1016 error code 550010
is output.

With axes, this machine data refers to $MA_MAX_AX_VELO.
With spindles, the MD refers to the smaller one of the set velocities
$MA_GEAR_STEP_MAX_VELO_LIMIT of the current gear stage or
$MA_SPIND_VELO_LIMIT.
```

36600	**BRAKE_MODE_CHOICE**			EXP, A05	A3
-	Deceleration response on hardware limit switch			BYTE	POWER ON
CTEQ					
-	-	1	0	1	7/2

Description:

```
If a rising edge of the axis-specific hardware limit switch is detected while
the axis is traversing, the axis is braked immediately.

The type of braking is determined via this machine data:

Value = 0:
    Controlled braking along the acceleration ramp defined by MD: MAX_AX_ACCEL
    (axis acceleration).
Value = 1:
    Rapid braking (selection of setpoint = 0) with reduction of following
    error.

Related to:
    IS "Hardware limit switch plus or minus" (DB31, ... DBX12.1 or DBX12.0)
```

36610	**AX_EMERGENCY_STOP_TIME**			A05, -	A3
s	Maximum time for braking ramp in case of error.			DOUBLE	NEW CONF
-					
-	-	0.05	-	-	7/2

Description:

```
This MD is used to enter the time of the braking ramp in case of errors (e.g.
emergency stop) that a spindle requires to brake from maximum speed to stand-
still. From smaller velocities/speeds standstill is thus reached earlier with
the same lead/brake acceleration.
```

Mechanically robust axes are normally stopped abruptly with speed setpoint 0; in such cases, values in the lower ms range are appropriate (default setting). However, spindles often have to consider high moving masses or limited mechanical conditions (e.g. gear load capacity). A longer braking ramp through MD change will be required for this.

Notice:
- With interpolating axis/spindle links it is not guaranteed that the contour or link is respected during the braking operation.
- If the time of the braking ramp in case of errors is set too large, controller enable will be removed although the axis/spindle is still moving. Depending on the drive type used as well as the activation of the pulse enable, either an immediate stop with speed setpoint 0 would be initiated or the axis/spindle would coast down weakly. That is why the time in MD AX_EMERGENCY_STOP_TIME should be selected smaller than the time in MD 36620: SERVO_DISABLE_DELAY_TIME (cutout delay, controller enable), so that the braking ramp configured can be fully active throughout the entire braking operation.
- The braking ramp might be ineffective or not respected, if the active drive follows its own braking ramp logic (e.g. SINAMICS).

Related to:
MD 36620: SERVO_DISABLE_DELAY_TIME (cutout delay controller enable)
MD 36210: CTRLOUT_LIMIT (maximum speed setpoint)

36620	**SERVO_DISABLE_DELAY_TIME**			A05, -	A2
s	Cutout delay servo enable			DOUBLE	NEW CONF
-					
-	-	0.1	-	-	7/2

Description:

Maximum time delay for removal of "controller enable" after faults. The speed enable (controller enable) of the drive is removed within the control after the set delay time at the latest.

The delay time entered is active as a result of the following events:
- in case of errors that lead to immediate stopping of the axes
- if the IS "Controller enable" is removed by the PLC

As soon as the actual speed reaches the standstill range (MD 36060: STANDSTILL_VELO_ TOL) the "controller enable" for the drive is removed. The time should be set large enough to enable the axis / spindle to brake down to standstill from maximum traversing velocity or maximum speed. If the axis / spindle is stationary, the "controller enable" for the drive is removed immediately (i.e. the time defined in MD: SERVO_DISABLE_DELAY_TIME is terminated ahead of schedule).
Application example(s):
Speed control of the drive should be retained long enough to enable the axis / spindle to brake down to standstill from maximum traversing velocity or maximum speed.

```
Notice:
    If the cutout delay controller enable is set too small, controller enable
    will be removed although the axis/spindle is still moving. This axis/
    spindle then coasts down powerlessly (which might be reasonable with grin-
    ding wheels, for example); otherwise the time SERVO_DISABLE_DELAY_TIME
    should be set larger than the duration of the braking ramp in case of
    errors (MD: AX_EMERGENCY_STOP_TIME).

Related to:
    IS "Controller enable" (DB31, ... DBX2.1)
    MD: AX_EMERGENCY_STOP_TIME
```

36690	**AXIS_DIAGNOSIS**			EXP, A08	-
-	Internal data for test purposes			DWORD	POWER ON
NBUP					
-	-	0	-	-	0/0

Description:

```
Internal data for test purposes

0:      :Basic setting
Bit 0 (LSB) = 1 :For test case task.exp (for alarm SCAL_WARN_VEL)
Bit 1       = 1 :For test case brake test
-   ACT_POS_ABS for ENC-SIM on HOST
-   Additional error information in $VA_FXS_INFO
Bit 2       = 1 :For travel to fixed stop - preliminary
-   Allow rapid braking for linked axes
Bit 3       = 1 :For travel to fixed stop - preliminary
-   Consider inversion of direction when switching off rapid braking for linked
    axes
```

36700	**DRIFT_ENABLE**			EXP, A07, A09	K3
-	Automatic drift compensation			BOOLEAN	NEW CONF
-					
-	-	FALSE	-	-	1/1

Description:

```
With MD: DRIFT_ENABLE, the automatic drift compensation is activated.
1:  Automatic drift compensation active (only for position-controlled axes/
spindles).
    During automatic drift compensation, the control permanently calculates
    during axis standstill the additional drift value still required to ensure
    that the following error reaches value 0 (compensation criterion). The
    total drift value is therfore formed by the drift basic value
    (MD:DRIFT_VALUE) and the drift additional value.
0:  Automatic drift compensation not active.
    The drift value is formed only from the drift basic value (MD:
    DRIFT_VALUE).

MD irrelevant for:
    Non-position-controlled spindles
Related to:
    MD: DRIFT_LIMIT drift limit value for automatic drift compensation
    MD: DRIFT_VALUE drift basic value
```

36710	DRIFT_LIMIT			EXP, A07, A09	K3
%	Drift limit value for automatic drift compensation			DOUBLE	NEW CONF
-					
-	1	0.0	0	1.e9	1/1

Description:

```
With MD: DRIFT_LIMIT, the magnitude of the drift additional value calculated
during automatic drift compensation can be limited.
If the drift additional value exceeds the limit value entered in MD:
DRIFT_LIMIT, alarm 25070 "Drift value too large" is output and the drift addi-
tional value is limited to this value.

MD irrelevant for:
    MD: DRIFT_ENABLE = 0
```

36720	DRIFT_VALUE			EXP, A07, A09	K3
%	Basic drift value			DOUBLE	NEW CONF
-					
-	1	0.0	-	-	1/1

Description:

```
The value entered in MD: DRIFT_VALUE is always added as an offset to the mani-
pulated variable. While the automatic drift compensation is active only for
position-controlled axes, this machine data is always active.

Note: --> Digital drives have no drift!


The following rule applies for PROFIBUS:
The present MD can be used for "simple" drives on PROFIBUS systems, which face
drift problems. To avoid erroneous settings, this drift compensation only
becomes active on the Profibus if $MA_RATED_OUTVAL != 0 (i.e. the MD has no
effect for automatic interface adjustment between the NC and the drive).

Standardization: The input value refers to the interface standardization
according to
$MA_RATED_OUTVAL,
$MA_RATED_VELO as well as
$MA_CTRLOUT_LIMIT.

Note:
    If the DSC function ($MA_STIFFNESS_CONTROL_ENABLE=1) is used, drift compen-
    sation is not allowed to be active on the PROFIBUS; otherwise, unexpected
    speed oscillations will occur when DSC is enabled/disabled.
```

36730	DRIVE_SIGNAL_TRACKING			A10	S5
-	Acquisition of additional drive actual values			BYTE	POWER ON
-					
-	-	0	0	4	7/2

Description:

```
With MD: DRIVE_SIGNAL_TRACKING = 1, the acquisition of the following drive
actual values is activated:
-   $AA_LOAD   Drive load
-   $AA_POWER  Drive active power
-   $AA_TORQUE Drive torque setpoint
-   $AA_CURR   Smoothed current setpoint (q-axis current) of drive

Note:
    With SIMODRIVE 611D, the drive provides these values automatically. With
    PROFIBUS drives, however, it must be ensured that the values are also
    transmitted in the drive actual message frame (provide sufficient message
    frame length on the bus, assign the values to the message frame contents in
    the drive).

With MD: DRIVE_SIGNAL_TRACKING = 2, the acquisition of the following drive
actual values is activated (relevant/available only on PROFIBUS):
-   $VA_DP_ACT_TEL shows actual value message frame words
```

36750	AA_OFF_MODE			A10	FBSY
-	Effect of value assignment for axial override of synchr. action.			BYTE	POWER ON
CTEQ					
-	-	0	0	7	7/2

Description:

```
Mode setting for axial offset $AA_OFF

Bit 0: Effect of value assignment within a synchronized action
0:  Absolute value
1:  Incremental value (integrator)

Bit 1: Response of $AA_OFF on RESET
0:  $AA_OFF is deselected on RESET
1:  $AA_OFF is retained beyond RESET

Bit 2: $AA_OFF in JOG mode
0:  No superimposed motion due to $AA_OFF
1:  A superimposed motion due to $AA_OFF is interpolated
```

1.5.7 Safety Integrated

36901	**SAFE_FUNCTION_ENABLE**			A05, -	FBSI
-	Enable safety functions			DWORD	POWER ON
-					
-	-	0	0	0xFFFB	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
The safe operation functions can be enabled for an axis/spindle with this
data.
For each axis, only as many axes/spindles can be enabled for safe operation as
are enabled by the global option.
The more sub-functions are set, the more CPU time the safety functions need.

Bit  0: Enables safe velocity, safe operational stop
Bit  1: Enables safe limit switch
Bit  2: Reserved for functions with absolute references (such as SE/SN)
Bit  3: Enables actual value synchronization, 2 encoder system
Bit  4: Enables external ESR activation
Bit  5: Enables SG offset
Bit  6: Enables external stop requests
Bit  7: Enables cam synchronization
Bit  8: Enables safe cams, pair 1, cam +
Bit  9: Enables safe cams, pair 1, cam -
Bit 10: Enables safe cams, pair 2, cam +
Bit 11: Enables safe cams, pair 2, cam -
Bit 12: Enables safe cams, pair 3, cam +
Bit 13: Enables safe cams, pair 3, cam -
Bit 14: Enables safe cams, pair 4, cam +
Bit 15: Enables safe cams, pair 4, cam -

Special cases:
-   When one of the bits from bit 1 is set then bit 0 must also be set because
    the control switches to safe operational stop with STOP C, D, E (parameter
    alarm 27033 is displayed if there is an error).
-   If global option does not enable enough axes/spindles for safe operation then
    this data can be overwritten with the value 0 during power on.

Related to: Global option

References:            /FBSI/, SINUMERIK SAFETY INTEGRATED
```

36902	**SAFE_IS_ROT_AX**			A01, A05, A06, -	FBSI
-	Rotary axis			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
States whether the axis for safe operation is a rotary axis/spindle or a
linear axis.

0:  Linear axis
1:  Rotary axis/spindle

The value in this MD must be equal to that in MD $MA_IS_ROT_AX. A parameteri-
zation error is displayed if there is a difference.
```

36903	**SAFE_CAM_ENABLE**			A05, -	-
-	Function enable safe cams			DWORD	POWER ON
-					
-	-	0	0	0x3FFFFFFF	7/2
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Function enables of safe cams for "Safety Integrated".
Bit  0: Enables safe cams, pair 1, cam +
Bit  1: Enables safe cams, pair 1, cam -
Bit  2: Enables safe cams, pair 2, cam +
Bit  3: Enables safe cams, pair 2, cam -
Bit  4: Enables safe cams, pair 3, cam +
Bit  5: Enables safe cams, pair 3, cam -
Bit  6: Enables safe cams, pair 4, cam +
Bit  7: Enables safe cams, pair 4, cam -
Bit  8: Enables safe cams, pair 5, cam +
Bit  9: Enables safe cams, pair 5, cam -
Bit 10: Enables safe cams, pair 6, cam +
Bit 11: Enables safe cams, pair 6, cam -
Bit 12: Enables safe cams, pair 7, cam +
Bit 13: Enables safe cams, pair 7, cam -
Bit 14: Enables safe cams, pair 8, cam +
Bit 15: Enables safe cams, pair 8, cam -
```

```
Bit 16: Enables safe cams, pair 9, cam +
Bit 17: Enables safe cams, pair 9, cam -
Bit 18: Enables safe cams, pair 10, cam +
Bit 19: Enables safe cams, pair 10, cam -
Bit 20: Enables safe cams, pair 11, cam +
Bit 21: Enables safe cams, pair 11, cam -
Bit 22: Enables safe cams, pair 12, cam +
Bit 23: Enables safe cams, pair 12, cam -
Bit 24: Enables safe cams, pair 13, cam +
Bit 25: Enables safe cams, pair 13, cam -
Bit 26: Enables safe cams, pair 14, cam +
Bit 27: Enables safe cams, pair 14, cam -
Bit 28: Enables safe cams, pair 15, cam +
Bit 29: Enables safe cams, pair 15, cam -
```

36905	**SAFE_MODULO_RANGE**			A02, -	FBSI
degrees	Modulo value Safe cams			DOUBLE	POWER ON
-					
-	-	0.0	0.0	737280.0	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Actual value range in which the safe cams are calculated for rotary axes. The
axis must be a rotary axis ($MA_SAFE_IS_ROT_AX = 1).

0:  Modulo compensation after +/- 2048 revolutions (that is after 737,280
degrees)

>0: And multiples of 360 degrees: Modulo compensation after this value, for
example: value = 360 --> then the actual value range lies between 0 and
359.999 degrees. That is modulo compensation is made after each revolution.

Special cases:
-   If the value of this data is not 0 or a multiple of 360 degrees then a cor-
responding alarm is issued during power on.
-   The parameterized actual value ranges of the cam positions are also che-
cked during power on. A corresponding alarm is issued if there is a paramete-
rization error.
-   The actual value ranges set by $MA_SAFE_MODULO_RANGE and $MA_MODULO_RANGE
must be integers and divisible without a remainder.

Related to:
    MD 30330: $MA_MODULO_RANGE
    MD 36935: $MA_SAFE_CAM_POS_PLUS[n]
    MD 36937: $MA_SAFE_CAM_POS_MINUS[n]
```

36906	**SAFE_CTRLOUT_MODULE_NR**			A01, A05, -	-
-	SI drive assignment			BYTE	POWER ON
-					
-	-	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18...	1	31	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Index into the data field $MN_SAFE_DRIVE_LOGIC_ADDRESS for assigning the drive for the SI motion monitoring.
The drive assigned must be same as that selected via CTRLOUT_MODULE_NR and DRIVE_LOGIC_ADDRESS.

36907	**SAFE_DRIVE_PS_ADDRESS**			A01, A05, -	-
-	PROFIsafe address of the drive			DWORD	POWER ON
READ					
-	-	0	-	-	7/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

This NCK MD contains the PROFIsafe address of the drive asigned to this axis.
This MD is read out during the power on of the drive. This address must be unique across all axes.
This MD cannot be written, the PROFIsafe address must be parameterized in the drive.
The value of this MD is included in the calculation of MD $MA_SAFE_ACT_CHECKSUM[1].

36910	**SAFE_ENC_SEGMENT_NR**			EXP, A01, A02, A05, -	FBSI
-	Actual value assignment: type of drive			BYTE	POWER ON
-					
-	-	5	5	5	0/0
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Number of the bus segment over which the SI encoder is addressed.
0:  Local bus
1:  Drive bus 611D (1st DCM)
2:  MERKUR local P-bus
3:  Drive bus 611D (2nd DCM)
4:  Reserved (virtual buses)
5:  PROFIBUS DP

Safety functions are only possible with 611D or suitable PROFIBUS drives, see
also MD 30210
```

36911	**SAFE_ENC_MODULE_NR**			A01, A02, A05, -	FBSI
-	Actual value assignment: drive number/ measurement circuit number			BYTE	POWER ON
-					
-	-	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18...	1	31	7/2
710-6a2c	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	0	-1/-
720-6a2c	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	0	-1/-
730-6a2c	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	0	-1/-
710-31a10c	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	0	-1/-
720-31a10c	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	0	-1/-
730-31a10c	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	0	-1/-
840di-basic	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	0	-1/-
840di-universal	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	0	-1/-
840di-plus	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0...	0	0	-1/-

Description:

```
Module number within a segment by which the SI encoder is addressed.

The logical drive number of the drive assigned to the axis by
$MN_DRIVE_LOGIC_NR must be entered here.

In the standard case with a 2 encoder system, the encoder for Safety Integra-
ted is connected to the second encoder connection (lower input) of the same
drive submodule.

Special cases:
Any actual value input in the 611D grouping can be used as the NC-side measu-
ring system for the second encoder.
Related to:
    MD 36910: $MA_SAFE_ENC_SEGMENT_NR
    MD 36912: $MA_SAFE_ENC_INPUT_NR
    MD 13010: $MN_DRIVE_LOGIC_NR
```

36912	**SAFE_ENC_INPUT_NR**			A01, A02, A05, -	FBSI
-	Actual value assignm.: Input on drive module/meas. circuit board			BYTE	POWER ON
-					
-	-	1	1	3	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Number of the actual value input of a submodule over which the SI encoder is
addressed.

1:  SI encoder is connected to the upper input (motor encoder)
2:  SI encoder is connected to the lower input (2nd encoder)

In the standard case with a 2 encoder system, the encoder for Safety Integra-
ted is connected to the second encoder connection (lower input) of the same
drive submodule.

Special cases:
Any actual value input in the 611D grouping can be used as the NC-side measu-
ring system for the second encoder.

Related to:
    MD 36911: $MA_SAFE_ENC_MODULE_NR
```

36914	**SAFE_SINGLE_ENC**			A01, A02, A05, -	-
-	SI single-encoder system			BOOLEAN	POWER ON
-					
-	-	TRUE	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Identifier that SI is carried out with an encoder. This MD must be parameteri-
zed to 0 if different encoders are used for the Safety Integrated monitoring
functions in the NCK and in the drive.
```

36915	**SAFE_ENC_TYPE**			A01, A02, A05, -	FBSI
-	Encoder type			BYTE	POWER ON
-					
-	-	0	0	4	7/2
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Definition of the type of SI encoder connected.

0:  Simulation
1:  Raw signal generator (voltage, current, EXE, etc.)  -> high resolution
2:  Rectangular signal encoder (standard, quadruplication of increments)
3:  Encoder for stepper motor (only for MERKUR)
4:  EnDat absolute encoder
5:  SSI encoder (synchronous serial interface) only for Merkur, see also MD
30240


-   The coding of the value corresponds to the data $MA_ENC_TYPE.

Related to:
    MD 30240: $MA_ENC_TYPE
```

36916	**SAFE_ENC_IS_LINEAR**			A02, A05, -	FBSI
-	Linear scale			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Definition of whether a linear or a rotary encoder is connected.

0:  Rotary encoder is connected, its resolution is defined by
$MA_SAFE_ENC_RESOL, and converted by $MA_SAFE_ENC_GEAR_PITCH,
$MA_SAFE_ENC_GEAR_DENOM[n] and $MA_SAFE_ENC_GEAR_NUMERA[n] on the load side.
MD $MA_SAFE_ENC_GRID_POINT_DIST has no significance.
```

```
1:  Linear encoder is connected, its resolution is defined by
$MA_SAFE_ENC_GRID_POINT_DIST. MD $MA_SAFE_ENC_RESOL, $MA_SAFE_ENC_GEAR_PITCH,
$MA_SAFE_ENC_GEAR_DENOM[n] and $MA_SAFE_ENC_GEAR_NUMERA[n] have no signifi-
cance.

Related to:
With 0:
    $MA_SAFE_ENC_RESOL
    $MA_SAFE_ENC_GEAR_PITCH
    $MA_SAFE_ENC_GEAR_DENOM[n]
    $MA_SAFE_ENC_GEAR_NUMERA[n]

With 1:
    $MA_SAFE_ENC_GRID_POINT_DIST
```

36917	**SAFE_ENC_GRID_POINT_DIST**			A02, A05, -	FBSI
mm	Scale division for linear scale			DOUBLE	POWER ON
-					
-	-	0.01	0.00001	8	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Definition of the grid spacing of the linear scale used.

Not relevant for a rotary encoder.

36918	**SAFE_ENC_RESOL**			A02, A05, -	FBSI
-	Encoder lines per revolution			DWORD	POWER ON
-					
-	-	2048	1	100000	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Definition of the lines per revolution for a rotary encoder.

Not relevant for a linear encoder.

36919	**SAFE_ENC_PULSE_SHIFT**			A02, A05, -	-
-	Shift factor of encoder multiplication			BYTE	POWER ON
-					
-	-	11	2	18	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Slide factor of the multiplication factor (high-resolution) of the encoder used for the Safety Integrated monitoring functions in the NCK. The encoder value must be divided by 2 the number of times needed to get the number of encoder lines. A slide factor of 11 corresponds to an encoder multiplication factor of 2048. If the drive provides this information, this MD is automatically assigned internally after power on of the drive. If the value changes during this process, alarm 27036 is triggered.

36920	**SAFE_ENC_GEAR_PITCH**			A02, A05, -	FBSI
mm	Lead screw pitch			DOUBLE	POWER ON
-					
-	-	10.0	0.1	10000.	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Gear ratio between encoder and load for a linear axis with a rotary encoder.

36921	**SAFE_ENC_GEAR_DENOM**			A02, A05, -	FBSI
-	Denominator of gearbox encoder/load			DWORD	POWER ON
-					
-	8	1, 1, 1, 1, 1, 1, 1, 1	1	2147000000	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Numerator of the gearbox between encoder and load, that is the numerator of the fraction: number of encoder revolutions / number of load revolutions
n = 0, 1, ... , 7 stand for gear stages 1, 2, ... 8

The current value is selected via safety-relevant input signals (SGE).

Related to:
MD 36922: $MA_SAFE_ENC_GEAR_NUMERA[n]

36922	**SAFE_ENC_GEAR_NUMERA**			A02, A05, -	FBSI
-	Numerator of gearbox encoder/load			DWORD	POWER ON
-					
-	8	1, 1, 1, 1, 1, 1, 1, 1	1	2147000000	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Numerator of the gearbox between encoder and load, that is the numerator of
the fraction:

number of encoder revolutions / number of load revolutions
n = 0, 1, ... , 7 stand for gear stages 1, 2, ... 8

The current value is selected via safety-relevant input signals (SGE).

Related to:
    MD 36921: $MA_SAFE_ENC_GEAR_DENOM[n]
```

36923	**SAFE_INFO_ENC_RESOL**			A02, A05, -	-
mm, degrees	Safe encoder resolution			DOUBLE	POWER ON
READ					
-	8	0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0	-	-	7/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Display data: Resolution of the encoder used in the relevant gear stage for
the Safety Integrated monitoring functions. A single encoder system can moni-
tor safe positions with this accuracy. This MD is 0 if different encoders are
used in the drive and in the NCK for the Safety Integrated monitoring func-
tions.
```

36925	**SAFE_ENC_POLARITY**			A02, A05, -	FBSI
-	Direction reversal of actual value			DWORD	POWER ON
-					
-	-	1	-1	1	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
A direction reversal of the actual value can be set with this data.
-1: Direction reversal
0:  No direction reversal or
1:  No direction reversal
```

36926	SAFE_ENC_FREQ_LIMIT			A02, A05, -	FBSI
-	Encoder frequency limit for safe operation			DWORD	POWER ON
-					
-	-	300000	300000	420000	7/2
710-6a2c	-	500000	500000	500000	-1/-
720-6a2c	-	500000	500000	500000	-1/-
730-6a2c	-	500000	500000	500000	-1/-
710-31a10c	-	500000	500000	500000	-1/-
720-31a10c	-	500000	500000	500000	-1/-
730-31a10c	-	500000	500000	500000	-1/-
840di-basic	-	500000	500000	500000	-1/-
840di-universal	-	500000	500000	500000	-1/-
840di-plus	-	500000	500000	500000	-1/-

Description:

Encoder limit frequency above which amplitude monitoring is switched off.
A speed corresponding to this frequency must not be exceeded in safe operation with a 1-encoder system.

If this limit frequency is exceeded in safe operation (SBH or SG,), the drive is shut down by the stop response parameterized for active monitoring.
This frequency can be set to more than 300kHz only for performance-2 control units High Standard und High Performance.
Incorrect parameterizations are indicated by alarm 27033.

36927	SAFE_ENC_MOD_TYPE			A02, A05, -	-
-	Encoder evaluation type			BYTE	POWER ON
READ					
-	-	0	-	-	7/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Type of encoder evaluation used for Safety Integrated on this axis. This type is read out during power on by the encoder evaluation and compared with the last value stored here. This MD is then overwritten. The value of this MD is included in the calculation of MD $MA_SAFE_ACT_CHECKSUM[1].

36928	**SAFE_ENC_IDENT**			A02, A05, -	-
-	Encoder identification			DWORD	POWER ON
READ					
-	3	0, 0, 0	-	-	7/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Identification of the encoder evaluation used for Safety Integrated on this axis. This identification is read out during power on by the encoder evaluation and compared with the last value stored here. This MD is then overwritten. The value of this MD is included in the calculation of MD $MA_SAFE_ACT_CHECKSUM[1].

36930	**SAFE_STANDSTILL_TOL**			A05, -	FBSI
mm, degrees	Standstill tolerance			DOUBLE	POWER ON
-					
-	-	1.	0.	100.	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Definition of the tolerance for safe operational stop.

The control triggers alarm 27010 with STOP B if the difference between position limit value und position actual value is greater than this tolerance when safe operational stop is selected. The position limit value is the position actual value at the time safe operational stop was selected.

Related to:
MD 36956: $MA_SAFE_PULSE_DISABLE_DELAY

36931	SAFE_VELO_LIMIT			A05, A04, -	FBSI
mm/min, rev/min	Limit value for safe velocity			DOUBLE	POWER ON
-					
-	4	2000., 2000., 2000., 2000.	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Definition of the limit values for the safe velocities 1, 2, 3 and 4.

If SG1, SG2, SG3 or SG4 is selected and the current velocity exceeds this
limit value, the control triggers alarm 27011 with the stop response configu-
red in $MA_SAFE_VELO_STOP_MODE or $MA_SAFE_VELO_STOP_REACTION.

n = 0, 1, 2, 3 stand for the limit values of SG1, SG2, SG3, SG4

Special cases:
In a 1-encoder system with SBH/SG active, the velocity is monitored according
to the encoder frequency set in MD $MA_SAFE_ENC_FREQ_LIMIT. A corresponding
alarm is output if this is exceeded.

Related to:
    MD 36961: $MA_SAFE_VELO_STOP_MODE
    MD 36963: $MA_SAFE_VELO_STOP_REACTION
```

36932	SAFE_VELO_OVR_FACTOR			A05, -	FBSI
%	SG offset values			DOUBLE	POWER ON
-					
-	16	100.0, 100.0, 100.0, 100.0, 100.0, 100.0, 100.0, 100.0, 100.0...	1.0	100.0	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Overrides for the limit values of safe velocities 2 and 4 can be selected via
the SGEs, and the associated override value (percentage values) can be set
with this MD.
n = 0, 1, ... , 15 stand for overrides 0, 1, ... 15

Special cases:
-   The function "Override safe speed" is enabled by MD 36901
$MA_SAFE_FUNCTION_ENABLE.
-   This override is inactive for the limit values of velocities 1 and 3.
Related to:
    MD 36978: $MA_SAFE_OVR_INPUT[n]
    MD 36931: $MA_SAFE_VELO_LIMIT[n]
```

36933	SAFE_DES_VELO_LIMIT			A05, A04, -	FBSI
%	SG setpoint speed limit			DOUBLE	RESET
-					
-	-	0.0	0	100	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Weighting factor for determining the setpoint limit from the current actual speed limit. The active SG limit value is weighted with this factor and defined as the setpoint limit for the interpolator. Setpoint 0 is defined when SBH is selected.
An input of 100% limits the setpoint to the active SG stage
The setpoint speed limit is inactive with an input of 0%.

Special cases:
- In order to take the drive dynamics into account, multiple changes may have to be made to set this MD optimally. "Reset" is defined as the effectivity criterion to avoid making this procedure unnecesarily complicated.
- This data is not included in the cross-check with the drive.
- This data is not included in the axial check sum $MA_SAFE_ACT_CHECKSUM, as this is a 1-channel function.

36934	SAFE_POS_LIMIT_PLUS			A03, A05, -	FBSI
mm, degrees	Upper limit of safe end position			DOUBLE	POWER ON
-					
-	2	100000., 100000.	-2147000	2147000	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Definition of the upper limit value for safe end positions 1 and 2.

If SE1 or SE2 is selected and the current actual position is greater than this limit value, the control triggers alarm 27012 with the stop response configured in $MA_SAFE_POS_STOP_MODE and switches to SBH. Stop responses STOP B and A follow if SBH is violated.

n = 0, 1 stand for the upper limit values of SE1, SE2

Related to:
MD 36962: $MA_SAFE_POS_STOP_MODE
MD 36935: $MA_SAFE_POS_LIMIT_MINUS[n]
MD 36901: $MA_SAFE_FUNCTION_ENABLE

Special cases:
A parameterization error is displayed if a value is entered in MD:
$MA_SAFE_POS_LIMIT_PLUS[n] which is less than or equal to that in MD:
$MA_SAFE_POS_LIMIT_MINUS[n].

36935	**SAFE_POS_LIMIT_MINUS**			A03, A05, -	FBSI
mm, degrees	Lower limit of safe end position			DOUBLE	POWER ON
-					
-	2	-100000., -100000.	-2147000	2147000	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Definition of the lower limit value for safe end positions 1 and 2.

If SE1 or SE2 is selected and the current actual position is less than this
limit value, the control triggers alarm 27012 with the stop response configu-
red in  $MA_SAFE_POS_STOP_MODE and switches to SBH. Stop responses STOP B and
A follow if SBH is violated.

n = 0, 1 stand for the lower limit values of SE1, SE2

Related to:
    MD 36962: $MA_SAFE_POS_STOP_MODE
    MD 36934: $MA_SAFE_POS_LIMIT_PLUS[n]

Special cases:
A parameterization error is displayed if a value is entered in MD:
$MA_SAFE_POS_LIMIT_PLUS[n] which is less than or equal to that in MD:
$MA_SAFE_POS_LIMIT_MINUS[n].
```

36936	**SAFE_CAM_POS_PLUS**			A03, A05, -	FBSI
mm, degrees	Plus cam position for safe cams			DOUBLE	POWER ON
-					
-	4	10., 10., 10., 10.	-2147000	2147000	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Definition of the plus cam positions for safe cams SN1 +, SN2 +, SN3 + and SN4
+.

If, with activated safe cams, the actual position is greater than this value,
the corresponding safety-relevant output signal (SGA) is set to 1. If the
actual position falls below this value, the SGA is set to 0.

n = 0, 1, 2, 3 stand for plus cam positions of SN1 +, SN2 +, SN3 +, SN4 +

Related to:
    MD 36988: $MA_SAFE_CAM_PLUS_OUTPUT[n]
```

36937	**SAFE_CAM_POS_MINUS**			A03, A05, -	FBSI
mm, degrees	Minus cam position for safe cams			DOUBLE	POWER ON
-					
-	4	-10., -10., -10., -10.	-2147000	2147000	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Definition of the minus cam positions for safe cams SN1 -, SN2 -, SN3 - and SN4 -.

If, with activated safe cams, the actual position is greater than this value, the corresponding safety-relevant output signal (SGA) is set to 1. If the actual position falls below this value, the SGA is set to 0.

n = 0, 1, 2, 3 stand for minus cam positions of SN1 -, SN2 -, SN3 -, SN4 -

Related to:
MD 36989: $MA_SAFE_CAM_MINUS_OUTPUT[n]

36940	**SAFE_CAM_TOL**			A05, -	FBSI
mm, degrees	Tolerance for safe cams			DOUBLE	POWER ON
-					
-	-	0.1	0.001	10	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

As a result of differing encoder mounting positions and differing cycle and run times, the cam signals of the two monitoring channels never switch at exactly the same position or at exactly the same time.

This data defines the tolerance as a load-side path for all cams, within which the monitoring channels can have different signal states for the same cam without triggering alarm 27001.

Recommendation:
Enter a value equal to or slightly larger than that in MD 36942.

36942	SAFE_POS_TOL			A05, -	FBSI
mm, degrees	Tolerance actual value cross-check			DOUBLE	POWER ON
-					
-	-	0.1	0.001	360	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Because of varying installation locations for the encoder, backlash, torsion, lead screw error etc, the two actual positions acquired by NCK and drive at the same time can differ from one another.

The tolerance for the cross-check of the actual positions in the two monitoring channels is entered in this data.

Special cases:
- The prime consideration for defining this tolerance is the "finger protection" (ca. 10 mm).

- If this tolerance is exceeded, stop reaction STOP F ensues.

36944	SAFE_REFP_POS_TOL			A05, -	FBSI
mm, degrees	Tolerance actual value check (referencing)			DOUBLE	POWER ON
-					
-	-	0.01	0	36	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

This data defines the tolerance for checking the actual values after referencing (for an incremental encoder) or during power on (for an absolute encoder).
Referencing determines an absolute actual position of the axis. A second absolute actual position is derived from the last stored standstill position before the control was switched off and the path traversed since power on.
The control checks the actual values after referencing with these two absolute positions, the path traversed and this data.

The following influences must be taken into account when determining the tolerance values:
backlash, leadscrew error, compensations (max. compensation values with LEC, sag and temperature compensations), temperature errors, torsion (2-encoder system), gear tolerance in variable gears, coarser resolution (2-encoder system), oscillation distance with variable gears.

Special cases:
Given user agreement, if the two absolute actual positions differ by more than the value in this data, alarm 27001 is displayed with error code 1003, and renewed user agreement is required for referencing.

36946	**SAFE_VELO_X**			A05, -	FBSI
mm/min, rev/min	Velocity limit n_x			DOUBLE	POWER ON
-					
-	-	20.	0.	6000.	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the limit speed n_x for the SGA "n < nx".
The SGA "n < nx" is set if this speed limit is undershot.
```

36948	**SAFE_STOP_VELO_TOL**			A05, -	FBSI
mm/min, rev/min	Velocity tolerance for Safe braking ramp			DOUBLE	POWER ON
-					
-	-	300.	0.	120000.	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Tolerance of the actual velocity for the safe braking ramp (SBR).
The actual velocity is given this tolerance after the safe braking ramp has
been activated
by triggering a Stop B or C.
The actual velocity must not be greater than the limit defined thereby.
Otherwise a Stop A is triggered. This reveals an aceleration of the drive as
quickly as possible.
```

36949	**SAFE_SLIP_VELO_TOL**			A05, -	FBSI
mm/min, rev/min	Slip velocity tolerance			DOUBLE	POWER ON
-					
-	-	6.	0.	6000.	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Difference in velocity between the motor and load sides tolerated by a 2-enco-
der system, without the data cross-check between 611D and NCK signaling an
error.

MD 36949 is only evaluated if MD $MA_SAFE_FUNCTION_ENABLE_, bit3 is set.

Relating to:
    MD 1349: $MD_SAFE_SLIP_VELO_TOL
```

36950	**SAFE_MODE_SWITCH_TIME**			A05, -	FBSI
s	Tolerance time for SGE switchover			DOUBLE	POWER ON
-					
-	-	0.5	0	10.	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

SGE switchovers are not active simultaneously because the data transfer runtimes of the SGEs differ in the two monitoring channels. The data cross-check would report an error in this case.

This data defines the length of time after SGE switchovers during which the actual values and the monitoring results are not cross-checked (the machine data continue to be compared!). The selected monitoring continues to run uninterrupted in both monitoring channels.

A safe function becomes active in a monitoring channel as soon as the selection or switchover is detected in this channel.

The differing runtime is mainly determined by the PLC cycle time.

System-related minimum tolerance time: 2 x PLC cycle time (maximum cycle) + 1 x IPO cycle time.
The runtime differences must also be taken into account in the external circuit (e.g. relay switching times).

36951	**SAFE_VELO_SWITCH_DELAY**			A05, -	FBSI
s	Delay time for velocity changeover			DOUBLE	POWER ON
-					
-	-	0.1	0	600	7/2
710-6a2c	-	-	-	60	-/-
720-6a2c	-	-	-	60	-/-
730-6a2c	-	-	-	60	-/-
710-31a10c	-	-	-	60	-/-
720-31a10c	-	-	-	60	-/-
730-31a10c	-	-	-	60	-/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

A timer is started with this value when transferring from a higher to a lower safe speed or when selecting safe operational stop with safe speed active.
The parameterized value selected must be as low as possible.

The last selected speed limit value continues to be monitored while the timer is running. During this time, the axle/spindle can be decelerated, for example via the PLC user program, without the monitoring reporting an error and triggering a stop reaction.
Special cases:
1. The timer is aborted immediately on switching to a limit greater than or equal to the previously active SG limit.
2. The timer is aborted immediately on switching to "Non-safe operation" (SGE "Deselect SBH/SG=1).
3. The timer is retriggered (restarted) on switching to a limit less than the previously active SG limit or to SBH while the timer is running.

36952	**SAFE_STOP_SWITCH_TIME_C**			A05, -	FBSI
s	Transition time STOP C to safe standstill			DOUBLE	POWER ON
-					
-	-	0.1	0	600	7/2
710-6a2c	-	-	-	10	-/-
720-6a2c	-	-	-	10	-/-
730-6a2c	-	-	-	10	-/-
710-31a10c	-	-	-	10	-/-
720-31a10c	-	-	-	10	-/-
730-31a10c	-	-	-	10	-/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

This data defines the time after which a switch is made to safe operational stop when a STOP C has been triggered.
The parameterized value selected must be as low as possible.

Safe operational stop is monitored after this time has expired. STOP A or B is triggered if the axis/spindle could not be stopped.

36953	SAFE_STOP_SWITCH_TIME_D			A05, -	FBSI
s	Transition time STOP D to safe standstill			DOUBLE	POWER ON
-					
-	-	0.1	0	600	7/2
710-6a2c	-	-	-	60	-/-
720-6a2c	-	-	-	60	-/-
730-6a2c	-	-	-	60	-/-
710-31a10c	-	-	-	60	-/-
720-31a10c	-	-	-	60	-/-
730-31a10c	-	-	-	60	-/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

This data defines the time after which a switch is made to safe operational stop when a STOP D has been triggered.
The parameterized value selected must be as low as possible.

Safe operational stop is monitored after this time has expired. STOP B is triggered if the axis/spindle could not be stopped.

36954	SAFE_STOP_SWITCH_TIME_E			A05, -	FBSI
s	Transitional period STOP E to safe standstill			DOUBLE	POWER ON
-					
-	-	0.1	0	600	7/2
710-6a2c	-	-	-	60	-/-
720-6a2c	-	-	-	60	-/-
730-6a2c	-	-	-	60	-/-
710-31a10c	-	-	-	60	-/-
720-31a10c	-	-	-	60	-/-
730-31a10c	-	-	-	60	-/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Time period after which a switch over takes place from STOP E to safe operational stop.
The parameterized value selected must be as small as possible.

36955	SAFE_STOP_SWITCH_TIME_F			A05, -	FBSI
s	Transition time STOP F to STOP B			DOUBLE	POWER ON
-					
-	-	0.0	0	600	7/2
710-6a2c	-	-	-	60	-/-
720-6a2c	-	-	-	60	-/-
730-6a2c	-	-	-	60	-/-
710-31a10c	-	-	-	60	-/-
720-31a10c	-	-	-	60	-/-
730-31a10c	-	-	-	60	-/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Time period after which a switch over takes place from stop F to stop B with active monitoring functions.
The parameterized value selected must be as low as possible.
During this time, another deceleration reaction can be activated, e.g. by means of synchronized actions.

The switch over also takes place if a C/D/E stop occurs during this time.

36956	SAFE_PULSE_DISABLE_DELAY			A05, -	FBSI
s	Delay time for pulse suppression			DOUBLE	POWER ON
-					
-	-	0.1	0	600	7/2
710-6a2c	-	-	-	10	-/-
720-6a2c	-	-	-	10	-/-
730-6a2c	-	-	-	10	-/-
710-31a10c	-	-	-	10	-/-
720-31a10c	-	-	-	10	-/-
730-31a10c	-	-	-	10	-/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

On STOP B, deceleration is made with speed setpoint 0 at the current limit and changed to STOP A for pulse suppression after the delay time defined with this data.

The parameterized value selected must be as low as possible.
Special cases:
The pulse suppression is performed earlier than defined in this data if the condition for pulse suppression is present via MD 36960: $MA_SAFE_STANDSTILL_VELO_TOL or via MD 36620: $MA_SERVO_DISABLE_DELAY_TIME.
If the time is set in this data to ZERO, then on STOP B an immediate change is made to STOP A (immediate pulse suppression).
Relating to:
MD 36960: $MA_SAFE_STANDSTILL_VELO_TOL
MD 36620: $MA_SERVO_DISABLE_DELAY_TIME
MD 36060: $MA_STANDSTILL_VELO_TOL

36957	**SAFE_PULSE_DIS_CHECK_TIME**			A05, -	FBSI
s	Time for checking pulse suppression			DOUBLE	POWER ON
-					
-	-	0.1	0	10	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Definiiton of the time after which pulses have to be disabled after a request to disable pulses.

The time between deleting the SGA "Enable pulse" and detecting the disabling of pulses via the SGE "Status pulses disabled" must not exceed the value of this data.

Special cases:
STOP A is triggered if this time is exceeded.

36958	**SAFE_ACCEPTANCE_TST_TIMEOUT**			A05, -	FBSI
s	Time limit for acceptance test duration			DOUBLE	POWER ON
-					
-	-	40.0	5	100	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

On the NCK side, a time limit can be specified for the duration of an acceptance test.
The NCK terminates the test if an acceptance test lasts longer than the time defined in MD 36958.
The acceptance test status is set to zero on the NCK side. When the acceptance test status is reset, SI-power-ON-alarms are reset again from reset-acknowledgeable to power-ON-acknowledgeable on the NCK and drive sides.
The NCK clears alarm 27007 and the drive clears alarm 300952.
This MD is also used to limit the duration of an SE (safe limit position) acceptance test. After the programmed time has elapsed, the SE acceptance test is aborted and alarm 27008 deleted. The software limit positions then once again act as defined in the machine data.

36960	SAFE_STANDSTILL_VELO_TOL			A05, A04, -	FBSI
mm/min, rev/min	Creep speed for pulse suppression			DOUBLE	POWER ON
-					
-	-	0.0	0.0	6000.	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Speed below which the axle/spindle is regarded as being at a standstill and
the pulses are disabled with STOP B (through transition to STOP A).

Related to:
    MD 36956: $MA_SAFE_PULSE_DISABLE_DELAY
```

36961	SAFE_VELO_STOP_MODE			A05, -	FBSI
-	Stop reaction for safe velocity			BYTE	POWER ON
-					
-	-	5	0	14	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
The stop reaction defined in this data is triggered if the limit value for the
safe velocity 1, 2, 3 or 4
is exceeded.

= 0, 1, 2, 3 correspond to STOP A, B, C, D, common to each safe velocity stage
= 5 means that the stop reaction can be configured specifically for each safe
velocity in MD 36963.
The units digit defines the selection of the stop reaction when the safe velo-
city is exceeded.
The tens digit defines the behavior in the case of a drive bus failure if a
time greater than 0 is parameterized in $MN_SAFE_PULSE_DIS_TIME_BUSFAIL.

0:  Stop A
1:  Stop B
2:  Stop C
3:  Stop D
4:  Stop E
5:  SAFE_VELO_STOP_MODE invalid, stop reaction is parameterized via MD
SAFE_VELO_STOP_REACTION
10: Stop A, additionally, in the event of a drive bus failure, pulses are not
disabled immediately if safe velocity is active
```

```
11: Stop B, additionally, in the event of a drive bus failure, pulses are not
disabled immediately if safe velocity is active
12: Stop C, additionally, in the event of a drive bus failure, pulses are not
disabled immediately if safe velocity is active
13: Stop D, additionally, in the event of a drive bus failure, pulses are not
disabled immediately if safe velocity is active
14: Stop E, additionally, in the event of a drive bus failure, pulses are not
disabled immediately if safe velocity is active

Special cases:
-   If the value in this MD is 5, the stop reaction for each safe velocity stage
    is defined selectively in $MA_SAFE_VELO_STOP_REACTION.

Related to:
    MD 36931: $MA_SAFE_VELO_LIMIT[n]
    MD 36963: $MA_SAFE_VELO_STOP_REACTION[n]
```

36962	**SAFE_POS_STOP_MODE**			A05, -	FBSI
-	Stop reaction for safe end position			BYTE	POWER ON
-					
-	-	2	2	4	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
The stop reaction defined in this data is triggered if safe end position 1 or
2 is overrun.

2:  Stop C
3:  Stop D
4:  Stop E

Related to:
    MD 36934: $MA_SAFE_POS_LIMIT_PLUS[n]
    MD 36935: $MA_SAFE_POS_LIMIT_MINUS[n]
```

36963	**SAFE_VELO_STOP_REACTION**			A05, -	FBSI
-	Stop reaction for safe velocity			BYTE	POWER ON
-					
-	4	2, 2, 2, 2	0	14	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
The stop reaction defined in this data is triggered if the limit value for the
safe velocity 1, 2, 3 or 4 is exceeded.

= 0, 1, 2, 3 stand for SG1, SG2, SG3, SG4

The units digit defines the selection of the stop reaction for each specific
safe velocity when the safe velocity is exceeded.
The tens digit defines the behavior in the case of a drive bus failure for
each specific safe velocity if a time greater than 0 has been parameterized in
$MN_SAFE_PULSE_DIS_TIME_BUSFAIL.

Value    Meaning
 0: Stop A
 1: Stop B
 2: Stop C
 3: Stop D
 4: Stop E
10: Stop A, additionally, in the event of a drive bus failure, pulses are not
disabled immediately if this safe velocity stage is active
11: Stop B, additionally, in the event of a drive bus failure, pulses are not
disabled immediately if this safe velocity is active
12: Stop C, additionally, in the event of a drive bus failure, pulses are not
disabled immediately if this safe velocity is active
13: Stop D, additionally, in the event of a drive bus failure, pulses are not
disabled immediately if this safe velocity is active
14: Stop E, additionally, in the event of a drive bus failure, pulses are not
disabled immediately if this safe velocity is active

Special cases:
This MD is only active when MD 36961 and MD 1361 have the value 5.

Related to:
    MD 10089: $MN_SAFE_PULSE_DIS_TIME_BUSFAIL
    MD 36961: $MA_SAFE_VELO_STOP_MODE
```

36964	**SAFE_IPO_STOP_GROUP**			A01, A05, -	FBSI
-	Safety-integrated IPO-response grouping			BYTE	RESET
-					
-	-	0	0	1	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This MD is only active with Safety Integrated axes and spindles.
It influences the channel-wide IPO response distribution of Safety Integrated:

0 = Default: All other axes/spindles in the channel are informed of the IPO
stop response of this axis.

1 = For internal stops, the axes and machining spindles interpolating with the
axis in question are also influenced via the triggered safety alarms.
    Other axes/spindles in the channel, however, continue without disturbance.
    In the case of external stops (without an alarm) all other axes/spindles
    are not influenced by the safety axis/spindle stop. This allows, for
    example, the safe cancellation of the pulses of a spindle (using external
    Stop A) so that the spindle can be turned manually but still move the axes
    safely with monitoring.
    If the other axes/spindles stop together with the safety axis/spindle in
    certain machining situations, the user must implement this at his own
    responsibility using the PLC or synchronous action operations.
```

36965	**SAFE_PARK_ALARM_SUPPRESS**			A01, -	FBSI
-	Alarm suppression on parking axis			BOOLEAN	POWER ON
-					
-	-	FALSE	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This MD is only active for Safety Integrated axes/spindles.

0 = Default: Alarms 27000/300950 are displayed when parking is selected.
1 = Alarms 27000/300950 are not displayed when parking is selected. This is
necessary for axes that are disconnected on the encoder side (e.g. dressing
axes) during the machining process. The alarms are displayed when parking is
deselected again.
```

36966	SAFE_BRAKETEST_TORQUE			A05, A10, -	FBSI
%	Holding torque for brake test			DOUBLE	POWER ON
CTEQ					
-	-	5.0	0.0	800.0	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Specification of the torque and force for the functional test of the brake mechanism. The holding brake must be able to apply this torque without the axis starting to slip.

This MD must be at least 10% above the current torque when the brake test is selected, that is with the brake off. This ensures that the motor can brake the axis again if the brake is defective. If this is not the case, the brake test is aborted with alarm 20095. If the drive MD 1192 is not correctly parameterized and if bit 0 of MD $MA_SAFE_BRAKETEST_CONTROL is not set, the safety reserve required is increased to double the difference between the actual torque and the parameterization in MD 1192.
Specification of the torque and force for the functional test of the brake mechanism.

The holding brake must be able to apply this torque without the axis starting to slip.
The corresponding test function is enabled by MD $MA_FIXED_STOP_MODE bit 1.

This MD must be at least 10% above the current torque when the brake test is selected, (that is with the brake off). This ensures that the motor can brake the axis again if the brake is defective. If this is not the case, the brake test is aborted with alarm 20095.
If the drive MD 1192 is not correctly parameterized, the safety reserve required is increased to double the difference between the actual torque and the parameterization in MD 1192.

36967	SAFE_BRAKETEST_POS_TOL			A05, A10, -	FBSI
mm, degrees	Position tolerance for brake test			DOUBLE	POWER ON
CTEQ					
-	-	1.0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Maximum position tolerance for the functional test of the brake mechanics.
The functional test of the brake mechanics is aborted if the axis position deviates
by more than this tolerance from the position at selection of the brake test.

The corresponding test function is enabled by
MD $MA_FIXED_STOP_MODE bit 1.

36968	**SAFE_BRAKETEST_CONTROL**			A05, A10, -	-
-	Program check for the brake test			DWORD	POWER ON
CTEQ					
-	-	0	0	1	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Program check for the brake test.

Bit 0: Selection of the average value of the torque limit
= 0:Drive MD 1192 is used as the average value of the torque limit
= 1:The torque measured at the time of selection of the brake test is used as
the average value of the torque limit
```

36970	**SAFE_SVSS_DISABLE_INPUT**			A01, A05, -	FBSI
-	Input assignment SBH/SG deselection			DWORD	POWER ON
-					
-	-	0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the NCK input for selecting/deselectng the functions SBH and
SG.

Signal          Meaning
= 0 SG or SBH is selected
= 1 SG and SBH are deselected

Structure:

Special cases:
-   Entry of 0 means there is no existing assignment, the input remains fixed
at 0, SG and SBH cannot be deselected.
-   Entry of 80 00 00 00 means there is no existing assignment, the input
remains fixed at 1.

-   If a single output signal is placed on a terminal, the signal is processed
inverted if MD bit 31 is set.
-   If several output signals are placed on the same terminal, the signal con-
cerned is initially inverted if MD bit 31 is set.
    If MD bit 31 is set, the signal concerned is initially inverted. The (if
    applicable inverted) output signals are then AND-ed. The result is output
    on the terminal.
Related to:
    MD 10366: $MN_HW_ASSIGN_DIG_FASTIN
    MD 13010: $MN_DRIVE_LOGIC_NR
References:           /FB/, A4, Digital and Analog NCK I/Os
```

36971	SAFE_SS_DISABLE_INPUT			A01, A05, -	FBSI
-	Input assignment SBH deselection			DWORD	POWER ON
-					
-	-	0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Assignment of the NCK input for deselecting the function safe operational
stop.

Structure: See $MA_SAFE_SVSS_DISABLE_INPUT

Assignment of the terminal level for the safe functions if either safe velo-
city or safe operational stop  have been activated.

Signal           Meaning
= 0 Safe operational stop is selected
= 1 Safe operational stop is deselected (only if other functions have not trig-
gered a STOP C, D or E)
Special cases:
-   The signal is processed inverted if MD bit 31 is set.
-   This input is irrelevant if SG and SBH have been deselected (see
$MA_SAFE_SVSS_DISABLE_INPUT).
Related to:
    MD 36970: $MA_SAFE_SVSS_DISABLE_INPUT
```

36972	SAFE_VELO_SELECT_INPUT			A01, A05, -	FBSI
-	Input assignment SG selection			DWORD	POWER ON
-					
-	2	0, 0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the two inputs for selecting SG1, SG2, SG3 or SG4.
Structure: See $MA_SAFE_SVSS_DISABLE_INPUT

n = 1, 0 stand for bit 1, 0 for selecting SG1 to SG4

Assignment of the input bits to the safe velocities:

Bit 1            Bit 0              Selected SG
0                  0                    SG1
0                  1                    SG2
1                  0                    SG3
1                  1                    SG4
Special cases:
The signal is processed inverted if the MD bits 31 are set.
```

36973	SAFE_POS_SELECT_INPUT			A01, A05, -	FBSI
-	Input assignment SE selection			DWORD	POWER ON
-					
-	-	0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the input for selecting safe limit positions 1 or 2.

Structure see: $MA_SAFE_SVSS_DISABLE_INPUT

Signal       Meaning
= 0 SE1 is active
= 1 SE2 is active

Special cases:
The signal is processed inverted if MD bit 31 is set.

Related to:
    MD 36970: $MA_SAFE_SVSS_DISABLE_INPUT.
```

36974	SAFE_GEAR_SELECT_INPUT			A01, A05, -	FBSI
-	Input assignment speed ratio selection			DWORD	POWER ON
-					
-	3	0, 0, 0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Assignment of the input terminals for selecting the gear ratio (gear stage).

Structure: See $MA_SAFE_SVSS_DISABLE_INPUT

n = 2, 1, 0 stand for bit 2, 1, 0 for selecting gear stages 1 to 8

Bit 2               Bit 1              Bit 0            Active gear stage
0                     0                    0                   Stage 1
0                     0                    1                   Stage 2
0                     1                    0                   Stage 3
...                  ...                  ...                      ...
1                     1                    1                   Stage 8

Special cases:
The signals are processed inverted if the MD bits 31 are set.

Related to:
    MD 36970: $MA_SAFE_SVSS_DISABLE_INPUT
```

36975	**SAFE_STOP_REQUEST_INPUT**			A01, A05, -	FBSI
-	Input assignment test stop selection			DWORD	POWER ON
-					
-	-	0	-	-	7/2
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the input for selecting the test stop.

Structure see: $MA_SAFE_SVSS_DISABLE_INPUT

Signal       Meaning
= 0 test stop is inactive
= 1 test stop is executed

Special cases:
The signal is processed inverted if MD bit 31 is set.
```

36976	SAFE_PULSE_STATUS_INPUT			A01, A05, -	FBSI
-	Input assignment status pulses suppressed			DWORD	POWER ON
-					
-	-	0	-	-	7/2
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the input for reading back the disabling of pulses.

Structure see: $MA_SAFE_SVSS_DISABLE_INPUT

Signal       Meaning
= 0 Pulses are enabled
= 1 Pulses are disabled

Special cases:
-   The signal is processed inverted if MD bit 31 is set.
-   This MD need not be parameterized. With the default value 0, the status of
the disabling of pulses is determined internally. The old use of this MD with
the wiring of the terminals AS1/AS2 is still permissible.
```

36977	SAFE_EXT_STOP_INPUT			A01, A05, -	FBSI
-	Input assignment for external stop request			DWORD	POWER ON
-					
-	4	0, 0, 0, 0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the NCK inputs for selecting/deselecting the external brake
requests.

n = 0, 1, 2, 3 stand for the various braking modes

n = 0: Assignment for "Deselect external stop A" (SH, disabling of pulses)
n = 1: Assignment for "Deselect external stop C" (braking at the current
limit)
n = 2: Assignment for "Deselect external stop D" (path braking)
n = 3: Assignment for "Deselect external stop E" (ESR + path braking)
```

Structure: See $MA_SAFE_SVSS_DISABLE_INPUT

Special cases:
The signals are processed inverted if the MD bits 31 are set. The signal "Deselect external stop A" cannot be parameterized inverted. A parameter error is reported if there is an error.

36978	**SAFE_OVR_INPUT**			A01, A05, -	FBSI
-	Input assignment for SG override			DWORD	POWER ON
-					
-	4	0, 0, 0, 0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

Assignment of the NCK inputs for the override of the limit values of safe velocities 2 and 4.

Structure: See $MA_SAFE_SVSS_DISABLE_INPUT

n = 3, 2, 1, 0 stand for the override selection bits 3, 2, 1, 0

Assignment of the input bits to the SG override values:

```
Bit 3        Bit 2         Bit 1        Bit 0
    0            0             0            0    Override 0 is selected

    0            0             0            1    Override 1 is selected

to ...

    1            1             1            1    Override 15 is selected
```

The following machine data defines the override factor itself (percentage value):
MD 36932: $MA_SAFE_VELO_OVR_FACTOR[n]

Special cases:
- The function "Override safe velocity" is enabled by MD 36901 $MA_SAFE_FUNCTION_ENABLE.
- The signals are processed inverted if the MD bits 31 are set.

Related to:
MD 36932: $MA_SAFE_VELO_OVR_FACTOR[n]

36979	**SAFE_STOP_REQUEST_EXT_INPUT**			A01, A05, -	FBSI
-	Input assignment for test of external shutdown			DWORD	POWER ON
-					
-	-	0	-	-	7/2
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Assignment of the input terminal for selecting the test of the external switch
off.
This MD must be parameterized as soon as the internal pulse suppression is
used (bit 30 in $MA_SAFE_PULSE_ENABLE_OUTPUT=1)
Structure: see coding of input assignment
With each such machine data, a single input/output bit is assigned to a termi-
nal or a system variable. Otherwise the structure corresponds to machine data
36970 ff..
```

36980	**SAFE_SVSS_STATUS_OUTPUT**			A01, A05, -	FBSI
-	Output assignment SBH/SG active			DWORD	POWER ON
-					
-	-	0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Assignment of the output for reporting the status of the functions safe velo-
city and safe operational stop.

Signal          Meaning
= 0 SG and SBH are not active
= 1 SG or SBH is active

Special cases:
-   Entry of 0 means
    there is no existing assignment, the output is not affected.
-   Entry of 80 00 00 00 means there is no existing assignment, the output
remains fixed at 1.
```

```
-   If a single output signal is placed on a terminal, the
    the signal is processed inverted if MD bit 31 is set.
-   If several output signals are placed on the same terminal, then
    the signal concerned is initially inverted if MD bit 31 is set. The (if
    applicable inverted) output signals are then AND-ed. The result is output
    on the terminal.

Related to:
    MD 10368: $MN_HW_ASSIGN_DIG_FASTOUT
    MD 13010: $MN_DRIVE_LOGIC_NR

References:           /FB/, A4, Digital and Analog NCK I/Os
```

36981	**SAFE_SS_STATUS_OUTPUT**			A01, A05, -	FBSI
-	Output assignment SBH active			DWORD	POWER ON
-					
-	-	0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the output or the system variable for the message "SBH
active".

Structure see: $MA_SAFE_EXT_STOP_INPUT

Signal       Meaning
= 0 SBH is inactive
= 1 SBH is active

Special cases:
The signal is processed inverted if MD bit 31 is set.
```

36982	SAFE_VELO_STATUS_OUTPUT			A01, A05, -	FBSI
-	Output assignment for active SG selection			DWORD	POWER ON
-					
-	2	0, 0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the outputs or the system variables for the messages "SBH
active bit 0" and "SBH active bit 1".

Structure see: $MA_SAFE_EXT_STOP_INPUT

n = 1, 0              stand for SG active bits 1, 0

SG active
Bit 1  Bit 0  Meaning:
= 0    = 0    SG1 active if SBH/SG are active and SBH is not active
              SBH active if SBH/SG are active and SBH is active
= 1    = 0    SG2 active
= 0    = 1    SG3 active
= 1    = 1    SG4 active

Special cases:
The signal is processed inverted if MD bit 31 is set.
```

36984	SAFE_EXT_PULSE_ENAB_OUTPUT			A01, A05, -	FBSI
-	Output assignment enable for pulses external			DWORD	POWER ON
-					
-	-	0	-	-	7/2
710-6a2c	-	-	-	-	-1/-
720-6a2c	-	-	-	-	-1/-
730-6a2c	-	-	-	-	-1/-
710-31a10c	-	-	-	-	-1/-
720-31a10c	-	-	-	-	-1/-
730-31a10c	-	-	-	-	-1/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Assignment of the output terminal for the request "Enable pulses externally".
This MD must be parameterized as soon as the internal pulse suppression is
used (bit 30 in $MA_SAFE_PULSE_ENABLE_OUTPUT=1).
Structure: see coding of input assignment.
With each such machine data, a single input/output bit is assigned to a termi-
nal or a system variable. Otherwise the structure corresponds to machine data
36970 ff..
```

36985	**SAFE_VELO_X_STATUS_OUTPUT**			A01, A05, -	FBSI
-	Output assignment n < n_x			DWORD	POWER ON
-					
-	-	0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the output or the system variable for the message "n < nx".

Structure see: $MA_SAFE_SVSS_STATUS_OUTPUT

Signal       Meaning
= 0 Actual speed is greater than the limit speed in $MA_SAFE_VELO_X

= 1 Actual speed is less than or equal to the limit speed in $MA_SAFE_VELO_X

Related to:    $MA_SAFE_VELO_X

Special cases:
The signal is processed inverted if MD bit 31 is set.
```

36986	**SAFE_PULSE_ENABLE_OUTPUT**			A01, A05, -	FBSI
-	Output assignment enable pulses			DWORD	POWER ON
-					
-	-	0	0x0	0xFFFFFFFF	7/2
710-6a2c	-	-	-	0xCFFFFFFF	-1/-
720-6a2c	-	-	-	0xCFFFFFFF	-1/-
730-6a2c	-	-	-	0xCFFFFFFF	-1/-
710-31a10c	-	-	-	0xCFFFFFFF	-1/-
720-31a10c	-	-	-	0xCFFFFFFF	-1/-
730-31a10c	-	-	-	0xCFFFFFFF	-1/-
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the output for the request "Enable pulses".

Structure: See $MA_SAFE_SVSS_STATUS_OUTPUT

Signal  Meaning
= 0 Request to disable pulses
= 1 Request to enable pulses
```

Special cases:
- The signal is processed inverted if MD bit 31 is set.
- Bit 30 is given the following special meaning:
  If bit 30 is set to 1, the pulse are switched internally via the drive bus (only permissible with 611 digital performance module). In this case, the MDs for external pulse enable must be parameterized as an additional safe-guard if the internal pulse disable fails ($MA_SAFE_EXT_PULSE_ENAB_OUTPUT and $MA_SAFE_STOP_REQUEST_EXT_INPUT)

Possible combinations for the most significant bits (30, 31) in this MD:

Bit 31 Bit 30 MD value Meaning

0 0 0xxxxxxxH The SGA "Enable Pulses" is output to the parameterized interface (SPL or I/Os).

0 1 4xxxxxxxH The pulses are disabled internally via the drive bus. The SGA "Enable Pulses" contains the same information and is output inverted to the parameterized interface (SPL or I/O).

1 0 8xxxxxxxH The SGA "Enable Pulses" is output inverted to the parameterized interface.
1 1 CxxxxxxxH The pulses are disabled internally via the drive bus. The SGA "Enable Pulses" contains the same information and is output inverted to the parameterized interface.

36987	**SAFE_REFP_STATUS_OUTPUT**			A01, A05, -	FBSI
-	Output assignment axis safely referenced			DWORD	POWER ON
-					
-	-	0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

This data defines the output for the message "Axis safely referenced".

Structure see: $MA_SAFE_SVSS_STATUS_OUTPUT

Signal Meaning
= 0 Axis is not safely referenced (that is the safe limit monitoring is inactive!)
= 1 Axis is safely referenced

Special cases:
The signal is processed inverted if MD bit 31 is set.

36988	**SAFE_CAM_PLUS_OUTPUT**			A01, A05, -	FBSI
-	Output assignment SN1 + to SN4 +			DWORD	POWER ON
-					
-	4	0, 0, 0, 0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the outputs for the cam signals SN1 + to SN4 +.

Structure see: $MA_SAFE_SVSS_STATUS_OUTPUT

n = 0, 1, 2, 3 correspond to the assignments for plus cams SN1 +, SN2 +, SN3
+, SN4 +

Signal       Meaning
= 0 Axis is left of the cam (actual value < cam position)
= 1 Axis is right of the cam (actual value > cam position)

Special cases:
The signal is processed inverted if MD bit 31 is set.
```

36989	**SAFE_CAM_MINUS_OUTPUT**			A01, A05, -	FBSI
-	Output assignment SN1 - to SN4 -			DWORD	POWER ON
-					
-	4	0, 0, 0, 0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This data defines the outputs for the minus cams SN1 - to SN4 -.

Structure see: $MA_SAFE_SVSS_STATUS_OUTPUT

n = 0, 1, 2, 3 correspond to the assignments for minus cams SN1 -, SN2 -, SN3
-, SN4 -

Signal       Meaning
= 0 Axis is left of the cam (actual value < cam position)
= 1 Axis is right of the cam (actual value > cam position)

Special cases:
-   If a cam is negated and placed with another cam on an output, it is AND-ed
and a single cam signal is generated for range recognition.
```

36990	**SAFE_ACT_STOP_OUTPUT**			A01, A05, -	FBSI
-	Output assignment of active stop			DWORD	POWER ON
-					
-	4	0, 0, 0, 0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Assignment of the output terminals for displaying the currently active stop.
Index 0:  Assignment for "Stop A/B active"
Index 1:  Assignment for "Stop  C active"
Index 2:  Assignment for "Stop  D active"
Index 3:  Assignment for "Stop  E active"
```

36992	**SAFE_CROSSCHECK_CYCLE**			A01, A05, A08, -	FBSI
s	Display of axial cross-check cycle			DOUBLE	POWER ON
READ					
-	-	0.0	-	-	7/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Display data for safety functions: Effective axial cross-check cycle in
seconds.
The cycle derives from INFO_SAFETY_CYCLE_TIME and the number of data to be
cross-checked.
The axial value displayed depends on the associated drive module as the length
of cross-check lists varies between performance-1/standard-2 and performance-2
modules.
```

36993	**SAFE_CONFIG_CHANGE_DATE**			EXP, A07, A05, -	FBSI
-	Date/time of last change of SI-NCK MD			STRING	POWER ON
READ					
-	7	"", "", "", "", "", "", ""	-	-	7/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Display data for safety functions:
Date and time of the last configuration change to safety related NCK machine
data.
Changes to the axial MD SAFE_... are recorded.
```

36994	**SAFE_PREV_CONFIG**			EXP, A07, A05, -	FBSI
-	Data of previous safety configuration			DWORD	POWER ON
READ					
-	7	0, 0, 0, 0, 0, 0, 0	-	-	0/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
Intermediate buffer for storing previous safety configuration data
Index [0]: Status flag for change history
Index [1]: Previous value of function enable
Index [2]: Previous value of set checksum
Index [3]: Last value of function enable before standard data were loaded
Index [4]: Last value of set checksum before standard data were loaded.
```

36995	**SAFE_STANDSTILL_POS**			A07, A05, -	FBSI
-	Standstill position			DWORD	POWER ON
-					
-	-	0	-	-	0/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

```
This MD displays the current standstill position.

In order to be able to test the referencing of the axis for plausibility at
the next control Power ON, the current position of the axis is stored in non-
volatile memory in the following cases:
-   On selection of safe operational stop (SBH)
-   Cyclically, if SE/SN are activated

Special cases:
If the MD is changed manually, this will be detected at the next Power ON and
plausibility test. Another user agreement is required after referencing.
```

36997	**SAFE_ACKN**			A07, A05, -	FBSI
-	User acknowledge			DWORD	POWER ON
-					
-	-	0	-	-	7/2
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

This data displays the status of the user agreement.

The user agreement can be given or withdrawn by the user by means of a corresponding screen.

If the software detects internally that the reference to the machine has been lost, then it is "automatically" withdrawn (e.g. on changing gear or if the plausibility comparison with the stored standstill position fails during referencing).

Special cases:
If the MD is changed manually, then this will be detected at the next Power ON and plausibility test. Another user agreement is required after referencing.

36998	**SAFE_ACT_CHECKSUM**			EXP, A07, A05, -	FBSI
-	Actual checksum			DWORD	POWER ON
READ					
-	2	0, 0	-	-	7/0
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

The actual check sum calculated after POWER ON or on RESET is entered here over the current values of the safety relevant machine data.

36999	**SAFE_DES_CHECKSUM**			EXP, A07, A05, -	FBSI
-	Desired (expected) checksum			DWORD	POWER ON
-					
-	2	0, 0	-	-	7/1
840di-basic	-	-	-	-	-1/-
840di-universal	-	-	-	-	-1/-
840di-plus	-	-	-	-	-1/-

Description:

In this data, the set check sum stored at the last machine acceptance appears above the current values of the safety relevant machine data.

1.5.8 Travel to fixed stop

37000	**FIXED_STOP_MODE**			A10, -	F1
-	Travel to fixed stop mode			BYTE	POWER ON
CTEQ					
-	-	0	0	3	7/2

Description:

This machine data defines how the function "Travel to fixed stop" can be started.

0: Travel to fixed stop not available (option missing).
1: Travel to fixed stop can be started only from the NC program with command FXS[x]=1.
2: Control of function exclusively from PLC
3: NCK and PLC have equal priority (user ensures synchronization.)

37002	**FIXED_STOP_CONTROL**			A10	F1
-	Sequence control for travel to fixed stop			BYTE	POWER ON
-					
-	-	0	0	3	7/2

Description:

Sequence control for travel to fixed stop.

Bit 0: Behavior on pulse disable at fixed stop
= 0: Travel to fixed stop is canceled
= 1: Travel to fixed stop is interrupted, i.e. the drive is without power.

As soon as the pulse disable is canceled again, the drive continues with the limited torque.
The torque is applied in steps.

37010	**FIXED_STOP_TORQUE_DEF**			A10	F1
%	Default fixed stop clamping torque			DOUBLE	POWER ON
CTEQ					
-	-	5.0	0.0	100.0	7/2

Description:

The clamping torque in % of the maximum motor torque (in the case of FDD this corresponds to % of max. current setpoint) is set in this machine data.

The clamping torque becomes active as soon as the fixed stop is reached or IS "Acknowledge fixed stop reached" (DB31, ... DBX1.1) has been set.

The entered value is a default and is active only as long as
- no clamping torque has been programmed with command FXST[x]
- the clamping torque set in SD 43510: FIXED_STOP_TORQUE was not changed (after fixed stop has been reached).

In the case of "Travel to fixed stop" in an analog drive (611-A) and fixed clamping torque, the torque limit set in the drive should be the same as the limit entered in MD: FIXED_STOP_ANA_TORQUE.

Related to:
MD 37070: FIXED_STOP_ANA_TORQUE
(torque limit on approach to fixed stop for analog drives)
SD 43510: FIXED_STOP_TORQUE
(clamping torque for travel to fixed stop)

37012	**FIXED_STOP_TORQUE_RAMP_TIME**			A10	F1
s	Time period until reaching the changed torque limit			DOUBLE	NEW CONF
-					
-	-	0.0	-	-	7/2

Description:

Period in seconds until the changed torque limit is reached with function "Travel to fixed stop".
The value 0.0 deactivates the ramp function.
Default setting: 0 s

37014	**FIXED_STOP_TORQUE_FACTOR**			A10	F1
-	Adaption factor torque limit			DOUBLE	NEW CONF
-					
-	-	1.0	-	-	7/2

Description:

Interface factor torque limit.
With this factor, the torque limit of linked slave axes (MD 37250) can be weighted additionally.
Even with different motors, the torque limits can be kept equal in all linked axes.

37020	**FIXED_STOP_WINDOW_DEF**			A05, A10	F1
mm, degrees	Default fixed-stop monitoring window			DOUBLE	POWER ON
CTEQ					
-	-	1.0	-	-	7/2

Description:

This machine data is used to enter the default for the standstill monitoring window at fixed stop.
Fixed stop monitoring becomes active as soon as the fixed stop is reached, i.e. IS "Fixed stop reached" (DB31, ... DBX62.5) is set.
If the position at which the fixed stop is detected is left by more than the tolerance specified in MD: FIXED_STOP_WINDOW_DEF alarm 20093 "Fixed stop monitoring has responded" is output and the "FXS" function is deselcted.

The value entered is a default setting and is active only as long as
- no fixed stop monitoring window is programmed with command FXSW[x],
- the fixed stop monitoring window is not changed via SD 43520: FIXED_STOP_WINDOW (after reaching of fixed stop).

Related to:
SD 43520: FIXED_STOP_WINDOW (fixed stop monitoring window)

37030	**FIXED_STOP_THRESHOLD**			A10, -	F1
mm, degrees	Threshold for fixed stop detection			DOUBLE	NEW CONF
-					
-	-	2.0	-	-	7/2

Description:

Threshold value for fixed stop detection.
The contour deviation is checked for this threshold as a criterion for reaching the fixed stop. As a further condition for digital drives, reaching of the set torque limit is waited for.

This machine data is only active if MD: FIXED_STOP_BY_SENSOR = 0.
IS "Fixed stop reached" (DB31, ... DBX62.5) is set if the axial contour deviation exceeds the threshold value set in MD: FIXED_STOP_THRESHOLD.

MD irrelevant for:
MD 37040: FIXED_STOP_BY_SENSOR = 1

Related to:
IS "Fixed stop reached" (DB31, ... DBX62.5)

37040	**FIXED_STOP_BY_SENSOR**			A10	F1
-	Fixed stop detection by sensor			BYTE	SOFORT
CTEQ					
-	-	0	0	3	7/2

Description:

This machine data defines how the crtierion "Fixed stop reached" is determined.
A change of this machine data becomes active with the next selection of travel to fixed stop.

MD=0
The criterion "Fixed stop reached" is determined internally on the basis of the axial FIXED_STOP_THRESHOLD.
MD=1
The criterion "Fixed stop reached" is determined via an external sensor and signalled to the NC via IS "Sensor fixed stop" (DB31, ... DBX1.2).
MD=2
The criterion "Fixed stop reached" is accepted, if either contour monitoring (MD = 0) or the signal of the external sensor (MD = 1) has responded.

```
MD=3
    Triggering through movement analysis (only as an alternative to triggering
    via sensor)

Related to:
    MD 37030: FIXED_STOP_THRESHOLD
    (threshold for fixed stop detection)
    IS "Sensor fixed stop" (DB31, ... DBX1.2)
```

37050	**FIXED_STOP_ALARM_MASK**			A05, A10	F1
-	Enable of the fixed stop alarms			BYTE	NEW CONF
-					
-	-	1	0	15	7/2

Description:

```
This machine data defines whether the alarms
20091 "Fixed stop not reached",
20094 "Fixed stop aborted" and
25042 "FOC: Standstill monitoring" are output.

MD= 0
    Suppression of alarm 20091 "Fixed stop not reached"
MD= 2
    Suppression of alarms
    20091 "Fixed stop not reached" and
    20094 "Fixed stop aborted" (SW 4 and higher)
MD=3
    Suppression of alarm 20094 "Fixed stop aborted" (SW 4 and higher)
Add value 8
    Suppression of alarm 25042 "FOC: Standstill monitoring" (SW 7 and higher)

Independent of the setting of the alarm screen, errors during travel to fixed
stop can be read out from the status variable $AA_FXS.

Standard: 1 = Alarm 20091, 20094 and alarm 25042 are triggered
```

37052	FIXED_STOP_ALARM_REACTION			A05, A10	F1
-	Reaction with fixed stop alarms			BYTE	POWER ON
-					
-	-	0	-	-	7/1

Description:

```
Behavior of VDI signal "Mode group ready" in case of fixed stop alarms:
Bit value = 0: "Mode group ready" will be deleted (drives de-energized)
Bit value = 1: "Mode group ready" remains active

Bit0: Alarm 20090 Travel to fixed stop not possible
Bit1: Alarm 20091 Fixed stop not reached
Bit2: Alarm 20092 Travel to fixed stop still active
Bit3: Alarm 20093 Standstill monitoring at fixed stop has triggered
Bit4: Alarm 20094 Travel to fixed stop aborted

All other bits without meaning.

Standard: 0 = All alarms de-energize the drives
```

37060	FIXED_STOP_ACKN_MASK			A10	F1
-	Waiting for PLC acknowledgements during travel to fixed stop			BYTE	POWER ON
CTEQ					
-	-	0	0	3	7/2

Description:

```
This machine data defines whether or not the NC waits for acknowledgement mes-
sages from the PLC when the "Travel to fixed stop" function is active.

Bit 0 = 0
    Once the NC has transmitted IS "Activate travel to fixed stop" (DB31, ...
    DBX62.4) to the PLC, it starts the programmed traversing.

Bit 0 = 1
    After the NC has transferred IS "Activate travel to fixed stop" (DB31, ...
    DBX62.4) to the PLC, it waits for the PLC to acknowledge with IS "Enable
    travel to fixed stop" (DB31, ... DBX3.1) and then starts the programmed
    traversing.
    Bit 0 should be set to 1 for analog drives so that the motion is not star-
    ted before the PLC has limited the torque in the drive.

Bit 1 = 0
    Once the NC has transferred IS "Fixed stop reached" (DB31, ... DBX62.5) to
    the PLC, the program advances to the next block.

Bit 1 = 1
    After the NC has transferred IS "Fixed stop reached" (DB31, ... DBX62.5) to
    the PLC, it waits for the PLC to acknowledge with IS "Acknowledge fixed
    stop reached" (DB31, ... DBX1.1), outputs the programmed torque and then
    executes a block change.
```

```
    Bit 1 should be set for analog drives so that the PLC can switch the drive
    over to torque-controlled operation if a programmable clamping torque must
    be specified.
    With digital drives (611-D), the "Travel to fixed stop" function can be
    executed without any acknowledgements,
    thus allowing program run times to be reduced.

Related to:
    IS "Activate travel to fixed stop" (DB31, ... DBX62.4)
    IS "Enable travel to fixed stop" (DB31, ... DBX3.1)
    IS "Fixed stop reached" (DB31, ... DBX62.5)
    IS "Acknowledge fixed stop reached" (DB31, ... DBX1.1)
```

37070	**FIXED_STOP_ANA_TORQUE**			A10	F1
%	Torque limit when approaching the fixed stop for analog drives			DOUBLE	POWER ON
CTEQ					
-	-	5.0	0.0	100.0	7/2

Description:

```
This machine data defines an internal NC torque limit for analog drives. It is
specified as a percentage of the maximum drive torque (corresponds to % of
max. current setpoint with FDD).

This torque limit is active in the NC from the start of the motion (accelera-
tion torque) until the instant the fixed stop is reached.

The torque limit must have the same effect as the torque limit set in the
drive (611-A).

This torque limit is required to ensure that
-   there are no step changes in torque during switchover from speed-controlled
    to current-controlled or torque-controlled operation,
-   the acceleration is reduced to the correct value in the NC.

MD irrelevant for:
    SINUMERIK 840D with SIMODRIVE 611-D
```

37080	**FOC_ACTIVATION_MODE**			A10	F1
-	Initial setting of modal torque/force limitation			BYTE	POWER ON
-					
-	-	0	0	3	7/2

Description:

```
The initial setting of the modal torque/force limitation is set with this MD
after reset and PowerOn:

Bit 0: Response after PowerON
= 0 : FOCOF
= 1 : FOCON (modal)

Bit 1: Response after reset
= 0 : FOCOF
= 1 : FOCON (modal)

Default setting: FOCOF after reset and PowerOn
```

37100	**GANTRY_AXIS_TYPE**			A01, A10	G1
-	Gantry axis definition			BYTE	POWER ON
CTEQ					
-	-	0	0	33	7/2

Description:

```
General: decimal representation, with a b

a
    0:Leading axis
    1:Synchronized axis

b
    0: No gantry axis
    1: Axis in gantry grouping 1
    2: Axis in gantry grouping 2
    3: Axis in gantry grouping 3
    ...
    A max. of 8 gantry groupings is possible.

Examples:

    11: Axis is synchronized axis in gantry grouping 1
    2: Axis is leading axis in gantry grouping 2
    12: Axis is synchronized axis in gantry grouping 2
    3:Axis is leading axis in gantry grouping 3
    13:Axis is synchronized axis in gantry grouping 3
```

```
Special cases:
    Alarm 10650 "Incorrect gantry machine data" and 10651 "Gantry unit not
    defined" in the case of incorrect gantry axis definition.
Related to:
    MD 37110: GANTRY_POS_TOL_WARNING (gantry warning limit)
    MD 37120: GANTRY_POS_TOL_ERROR (gantry trip limit)
    MD 37130: GANTRY_POS_TOL_REF (gantry trip limit during referencing)
```

37110	**GANTRY_POS_TOL_WARNING**			A05, A10	G1
mm, degrees	Gantry warning limit			DOUBLE	RESET
-					
-	-	0.0	-	-	7/2

Description:

```
Value > 0

    With gantry axes, the difference between the position actual values of the
    leading and synchronized axes is constantly monitored.

    MD: GANTRY_POS_TOL_WARNING is used to define a limit value for the posi-
    tion actual value difference; when the limit is exceeded, warning 10652
    "Warning limit exceeded" is output. However, the gantry axes are not stop-
    ped internally in the control. The warning threshold must therefore be
    selected such that the machine can withstand the position actual value
    deviation between the gantry axes without sustaining mechanical damage.
    Furthermore, the IS "Gantry warning limit exceeded" (DB31-48, DBX101.3) to
    the PLC is set to "1". The PLC user program can thus initiate the neces-
    sary measures (e.g. program interruption at block end) when the warning
    limit is exceeded.

    As soon as the current position actual value difference has dropped below
    the warning limit again, the message is canceled and IS "Gantry warning
    limit exceeded" reset.

    Effect of gantry warning limit on gantry synchronization process:

    The position actual value difference between the leading and synchronized
    axes is determined during gantry synchronization. If the deviation is lower
    than the gantry warning limit, the synchronizing motion of the gantry axes
    is automatically started internally in the control.

    The synchronizing motion must otherwise be initiated via the PLC interface
    (IS "Start gantry synchronization process").

Value = 0

    Setting MD: GANTRY_POS_TOL_WARNING to 0 deactivates the monitoring for vio-
    lation of the warning limit.

    Gantry synchronization is not initiated internally in the control.

MD irrelevant for:
    SINUMERIK FM-NC; SINUMERIK 840D with NCU 571
```

```
Special cases:
    Alarm 10652 "Warning limit exceeded" in response to violation of gantry
    warning limit.
Related to:
    MD 37100: GANTRY_AXIS_TYPE Gantry axis definition
    MD 37120: GANTRY_POS_TOL_ERROR Gantry trip limit
    MD 37130: GANTRY_POS_TOL_REF
    Gantry trip limit during referencing
    IS "Gantry warning limit exceeded" (DB31-48, DBX101.3)
    IS "Start gantry synchronization" (DB31-48, DBX29.4)
```

37120	**GANTRY_POS_TOL_ERROR**			A05, A10	G1
mm, degrees	Gantry trip limit			DOUBLE	POWER ON
-					
-	-	0.0	-	-	7/2

Description:

```
With gantry axes, the difference between the position actual values of the
leading and synchronized axes is continuously monitored. The maximum permis-
sible deviation in position actual value between the synchronized axis and the
leading axis in the gantry axis grouping must be defined with MD:
GANTRY_POS_TOL_ERROR. Monitoring for violation of this limit value takes place
only if the gantry axis grouping is already synchronized (IS "Gantry grouping
is synchronized" = 1); otherwise the value set in MD 37130: GANTRY_POS_TOL_REF
is used.
When the limit value is exceeded, alarm 10653 "Error limit exceeded" is out-
put. The gantry axes are immediately stopped internally in the control to pre-
vent any damage to the machine.

In addition, IS "Gantry trip limit exceeded" to the PLC is set to "1".

MD irrelevant for:
    SINUMERIK FM-NC; SINUMERIK 840D with NCU 571

Special cases:
    Alarm 10653 "Error limit exceeded" in response to violation of gantry trip
    limit.

Related to:
    MD 37100: GANTRY_AXIS_TYPE Gantry axis definition
    MD 37110: GANTRY_POS_TOL_WARNING Gantry warning limit
    MD 37130: GANTRY_POS_TOL_REF
    Gantry trip limit during referencing
    IS "Gantry grouping is synchronized" (DB31-48, DBX101.5)
    IS "Gantry trip limit exceeded" (DB31-48, DBX101.2)
```

37130	**GANTRY_POS_TOL_REF**			A05, A10	G1
mm, degrees	Gantry trip limit during referencing			DOUBLE	POWER ON
-					
-	-	0.0	-	-	7/2

Description:

```
With gantry axes, the difference between the position actual values of the
leading and synchronized axes is continuously monitored. The maximum permis-
sible deviation in position actual values between the synchronized axis and
the leading axis that is monitored if the gantry axis grouping is not yet syn-
chronized (IS "Gantry grouping is synchronized" = "0") must be set in MD:
GANTRY_POS_TOL_REF.

When the limit value is exceeded, alarm 10653 "Error limit exceeded" is out-
put. The gantry axes are immediately stopped internally in the control to pre-
vent any damage to the machine.

In addition, IS "Gantry trip limit exceeded" to the PLC is set to "1".

MD irrelevant for:
    SINUMERIK FM-NC; SINUMERIK 840D with NCU 571

Special cases:
    Alarm 10653 "Error limit exceeded" in response to violation of gantry trip
    limit.

Related to:
    MD 37100: GANTRY_AXIS_TYPE Gantry axis definition
    MD 37110: GANTRY_POS_TOL_WARNING Gantry warning limit
    MD 37120: GANTRY_POS_TOL_ERROR Gantry trip limit
    IS "Gantry grouping is synchronized" (DB31-48, DBX101.5)
    IS "Gantry trip limit exceeded" (DB31-48, DBX101.2)
```

37135	**GANTRY_ACT_POS_TOL_ERROR**			A05, A10	-
mm, degrees	Current gantry trip limit			DOUBLE	RESET
-					
-	-	0.0	-	-	7/2

Description:

```
Actual value difference between master axis and slave axis in the case of
alarm 10653.
Leads to alarm 10657 after Power ON.
```

37140	**GANTRY_BREAK_UP**			EXP, A01, A10	G1
-	Invalidate gantry axis grouping			BOOLEAN	RESET
CTEQ					
-	-	FALSE	-	-	7/2

Description:

```
GANTRY_BREAK_UP = "0"
The forced coupling of the gantry axis grouping remains valid. Monitoring of
violation of the gantry warning or trip limit is active!

GANTRY_BREAK_UP = "1"
This invalidates the forced coupling of the gantry grouping, thus allowing all
gantry axes in this grouping to be traversed individually in manual mode. The
monitoring for violation of the gantry warning or trip limit is deactivated.
IS "Gantry grouping is synchronized" is set to "0".

Notice:
    In cases where the gantry axes are still mechanically coupled, the machine
    may sustain damage in this operating state when the leading or synchroni-
    zed axis is traversed!
The gantry axes cannot be referenced individually.

MD irrelevant for:
    SINUMERIK FM-NC; SINUMERIK 840D with NCU 571

Related to:
    MD 37100: GANTRY_AXIS_TYPE  Gantry axis definition
    MD 37110: GANTRY_POS_TOL_WARNING Gantry warning limit
    MD 37130: GANTRY_POS_TOL_REF
              Gantry trip limit during referencing
    IS "Gantry grouping is synchronized" (DB31-48, DBX101.5)
    IS "Gantry trip limit exceeded" (DB31-48, DBX101.2)
```

37150	**GANTRY_FUNCTION_MASK**			A10	-
-	Gantry functions			DWORD	RESET
-					
-	-	0x00	0	0x3	7/2

Description:

```
Special gantry functions are set with this MD.
The MD is bit-coded, the following bits are assigned:

Bit 0 == 0:
    Extended monitoring of the actual value difference is inactive.
    An offset between master and slave axes occurring in the tracking or
    BREAK_UP is not taken into account in the monitoring of the actual value
    difference.
    Alarm 10657 is not output if alarm 10563 occurs before Power OFF.

Bit 0 == 1:
    Extended monitoring of the actual value difference is active.
    An offset between master and slave axes occurring in the tracking or
    BREAK_UP is taken into account in the monitoring of the actual value diffe-
    rence.
    Prerequisite: The gantry grouping must be re-referenced or re-synchronized
    after starting of the control.
    Alarm 10657 is output if alarm 10563 occurs before Power OFF.

Bit 1 == 0:
    Zero mark search direction of the slave axis analogous to MD 34010
Bit 1 == 1:
    Zero mark search direction of the slave axis same as for master axis
```

37160	**LEAD_FUNCTION_MASK**			A10	-
-	Functions for master value coupling			DWORD	NEW CONF
CTEQ					
-	-	0x01	0	0x3	1/1

Description:

```
With this MD, special functions of master value coupling are set.
The MD is bit-coded, the following bits are assigned:

Bit 0 = 0:
    Dead time compensation is not active at actual value coupling.
Bit 0 = 1:
    Dead time compensation is active at actual value coupling.
    During actual value coupling, a systematic position offset is created bet-
    ween master and following axis. It is caused by the IPO/position control-
    ler dead time between the actual values of master axis and following axis.

    For SW 6.4 and higher, this position offset can be compensated by a linear
    extrapolation of the master value.
    Possible velocity fluctuations in the master axis may have an increased
    impact on the following axis.
    The bit must be set for the relevant master axis.
```

```
Bit 1 = 0:
    The spindle/axis disable of the axis will not become effective with the
    master value coupling active.
    The spindle/axis disable of the master axis becomes effective.
Bit 1 = 1:
    The spindle/axis disable is effective for this axis even with the master
    value coupling active.
    The bit must be set for the relevant following axis.
```

37200	**COUPLE_POS_TOL_COARSE**			A05, A10	S3
mm, degrees	Threshold value for 'Synchronism coarse'			DOUBLE	NEW CONF
-					
-	-	1.0	-	-	7/2

Description:

```
In synchronous mode, the positional difference between the leading and follo-
wing spindles is monitored (only DV and AV mode).

IS "Synchronism coarse" is set if the current positional difference is within
the tolerance band specified by the threshold value.

Furthermore, this threshold value represents the criterion for a block change
on activation of synchronous mode or on alteration of the transmission parame-
ters when the coupling is active in cases where "Synchronism coarse" is selec-
ted as the block change response condition (see channel-specific MD:
COUPLE_BLOCK_CHANGE_CTRL_1 or language instruction COUPDEF).

If the value "0" is input, IS "Synchronism coarse" is always set to "1" in DV
and AV mode.

Related to:
    Channel-specific MD: COUPLE_BLOCK_CHANGE_CTRL_1
    (block change response in synchronous spindle mode)
    IS "Synchronism coarse" (DB31-48, DBX98.1)
```

37210	COUPLE_POS_TOL_FINE			A05, A10	S3
mm, degrees	Threshold value for 'Synchronism fine'			DOUBLE	NEW CONF
-					
-	-	0.5	-	-	7/2

Description:

In synchronous mode, the positional difference between the leading and following spindles is monitored (only DV and AV mode).

IS "Synchronism fine" is set if the current positional difference is within the tolerance band specified by the threshold value.

Furthermore, this threshold value represents the criterion for a block change on activation of synchronous mode or on alteration of the transmission parameters when the coupling is active in cases where "Synchronism fine" is selected as the block change response condition (see channel-specific MD: COUPLE_BLOCK_CHANGE_CTRL_1 or language instruction COUPDEF).

If the value "0" is input, IS "Synchronism fine" is always set to "1" in DV and AV mode.

Related to:
Channel-specific MD: COUPLE_BLOCK_CHANGE_CTRL_1
(block change response in synchronous spindle mode)
IS "Synchronism fine" (DB31-48, DBX98.0)

37220	COUPLE_VELO_TOL_COARSE			A05, A10	S3
mm/min, rev/min	Velocity tolerance 'coarse'			DOUBLE	NEW CONF
-					
-	-	60.0	-	-	7/2

Description:

In synchronous mode, the velocity difference between the leading and following spindles is monitored (VV mode only).

IS "Synchronism coarse" is set if the current velocity difference is within the tolerance band specified by the threshold value.

Furthermore, this threshold value represents the criterion for a block change on activation of synchronous mode or on alteration of the transmission parameters when the coupling is active in cases where "Synchronism coarse" is selected as the block change response condition (see channel specific MD: COUPLE_BLOCK_CHANGE_CTRL_1 or language instruction COUPDEF).

If the value "0" is input, IS "Synchronism coarse" is always set to "1" in VV mode.

Related to:
Channel-specific MD: COUPLE_BLOCK_CHANGE_CTRL_1
(block change response in synchronous spindle mode)
IS "Synchronism coarse" (DB31-48, DBX98.1)

37230	COUPLE_VELO_TOL_FINE			A05, A10	S3
mm/min, rev/min	Velocity tolerance 'fine'			DOUBLE	NEW CONF
-					
-	-	30.0	-	-	7/2

Description:

In synchronous mode, the velocity difference between the leading and following spindles is monitored (VV mode only).

IS "Synchronism fine" is set if the current velocity difference is within the tolerance band specified by the threshold value.

Furthermore, this threshold value represents the criterion for a block change on activation of synchronous mode or on alteration of the transmission parameters when the coupling is active in cases where "Synchronism fine" is selected as the block change response condition (see channel-specific MD: COUPLE_BLOCK_CHANGE_CTRL_1 or language instruction COUPDEF).

If the value "0" is input, IS "Synchronism fine" is always set to "1" in VV mode.

Related to:
    Channel-specific MD: COUPLE_BLOCK_CHANGE_CTRL_1
    (block change response in synchronous spindle mode)
    IS "Synchronism fine" (DB31-48, DBX98.0)

37250	MS_ASSIGN_MASTER_SPEED_CMD			A10	TE3
-	Master axis number for speed setpoint coupling			DWORD	POWER ON
-					
-	-	0	0	31	7/2

Description:

A master/slave speed setpoint linkage is configured by indicating the machine axis number of the master axis belonging to this slave.

Related to:
    $MA_MS_ASSIGN_MASTER_TORQUE_CTR

37252	MS_ASSIGN_MASTER_TORQUE_CTR			A10	TE3
-	Master axis number for torque control			DWORD	POWER ON
-					
-	-	0	0	31	7/2

Description:

```
Torque control between the master and the slave axis is configured by indica-
ting the machine axis number of the master axis belonging to the slave.
By using the torque balance control, you can achieve a homogenous torque cont-
rol.
With default setting = 0, the same master axis is used for torque control as
for speed setpoint linkage $MA_MS_ASSIGN_MASTER_SPEED_CMD.

Related to:
    $MA_MS_ASSIGN_MASTER_SPEED_CMD
    $MA_MS_TORQUE_CTRL_MODE
    $MA_MS_TORQUE_CTRL_P_GAIN
    $MA_MS_TORQUE_CTRL_I_TIME
    $MA_MS_TORQUE_WEIGHT_SLAVE
```

37253	MS_FUNCTION_MASK			A10	-
-	Master/slave settings			DWORD	NEW CONF
-					
-	-	0x0	-	-	7/2

Description:

```
Parameterizing master/slave link

Bit 0 = 0:
    Scaling of MD 37256, MD 37260 is smaller by factor 1s/IPO cycle than
    described in the documentation.

Bit 0 = 1:
    Scaling of MD 37256, MD 37260 corresponds to documentation.
```

37254	MS_TORQUE_CTRL_MODE			A10	TE3
-	Torque compensatory controller interconnection			DWORD	SOFORT
-					
-	-	0	0	3	7/2

Description:

```
The output of the torque compensatory controller is connected to
0:  Master and slave axis
1:  Slave axis
2:  Master axis
3:  No axis
when the torque control is active.
Related to:
    $MA_MS_ASSIGN_MASTER_TORQUE_CTR
    $MA_MS_ASSIGN_MASTER_SPEED_CMD
    $MA_MS_TORQUE_CTRL_MODE
```

37255	MS_TORQUE_CTRL_ACTIVATION			A10	TE3
-	Torque compensatory controller activation			BYTE	NEW CONF
-					
-	-	0	0	1	7/2

Description:

```
The torque compensatory controller can be switched ON and OFF by means of
MD37254 or by means of the PLC (DB3x.DBX24.5).

In the case of the PLC, MD37254 is only used for configuring the interconnec-
tion of the torque compensatory controller.

0:  Switch ON/OFF via MD37254
1:  Switch ON/OFF via DB3x.DBX24.5
```

37256	MS_TORQUE_CTRL_P_GAIN			A10	TE3
%	Torque compensatory controller gain factor			DOUBLE	NEW CONF
-					
-	-	0.0	0.0	100.0	7/2

Description:

```
Gain factor of the torque compensatory controller

The gain factor is entered in percent as a ratio of the maximum axis velocity
of the slave axis on load side to the rated torque.
The maximum axis velocity is derived from MD 32000, the rated torque from the
product of drive machine data MD1725.

Related to:
    $MA_MS_TORQUE_CTRL_MODE
    $MA_MS_TORQUE_CTRL_I_TIME
    $MA_MAX_AX_VELO
```

37258	MS_TORQUE_CTRL_I_TIME			A10	TE3
s	Torque compensatory controller integral action time			DOUBLE	NEW CONF
-					
-	-	0.0	0.0	100.0	7/2

Description:

```
Integral time of torque compensatory controller
The integral time does not become active until the P gain factor is greater
than 0.

Related to:
    $MA_MS_TORQUE_CTRL_MODE
    $MA_MS_TORQUE_CTRL_P_GAIN
    $MA_MAX_AX_VELO
```

37260	**MS_MAX_CTRL_VELO**			A10	TE3
%	Torque compensatory controller limit			DOUBLE	NEW CONF
-					
-	-	100.0	0.0	100.0	7/2

Description:

```
Torque compensatory controller limitation
The speed setpoint value calculated by the torque compensatory controller is
limited.
The limit that can be entered as a percentage refers to $MA_MAX_AX_VELO of the
slave axis.

Related to:
    $MA_MS_TORQUE_CTRL_MODE
    $MA_MS_TORQUE_CTRL_P_GAIN
    $MA_MS_TORQUE_CTRL_I_TIME
    $MA_MAX_AX_VELO
```

37262	**MS_COUPLING_ALWAYS_ACTIVE**			A10	TE3
-	Permanent master/slave link			BYTE	NEW CONF
-					
-	-	0	0	1	7/2

Description:

```
Activation behavior of a master/slave link

0:  Temporary link
    The link is activated/deactivated via PLC interface signals and language
    commands.

1:  Permanent link
    This machine data activates the permanent link.
    PLC interface signals and language commands do not have any effect.

Related to:
    $MA_MS_ASSIGN_MASTER_TORQUE_CTR
    $MA_MS_ASSIGN_MASTER_SPEED_CMD
```

37263	**MS_SPIND_COUPLING_MODE**			A10	-
-	Link response of a spindle			BYTE	NEW CONF
-					
-	-	0	0	1	7/2

Description:

```
Link behavior of a speed-controlled spindle:

0:  Link is closed/released in standstill only.
1:  Link is closed/released already during motion.

The configuration is valid both for activation/deactivation via DB3x.DBX24.5
and for MASLON, MASLOF, MASLOFs, MASLDEL
```

37264	MS_TENSION_TORQUE			A10	TE3
%	Master/slave tension torque			DOUBLE	SOFORT
-					
-	-	0.0	-100.0	100.0	7/2

Description:

```
A constant tension torque as a percentage of the rated drive torque of the
slave axis can be entered between the master and the slave axis.

Related to:
    $MA_MS_ASSIGN_MASTER_TORQUE_CTR
    $MA_MS_TENSION_TORQ_FILTER_TIME
```

37266	MS_TENSION_TORQ_FILTER_TIME			A10	TE3
s	Filter time constant tension torque			DOUBLE	NEW CONF
-					
-	-	0.0	0.0	100.0	7/2

Description:

```
The tension torque between master and slave axis can be activated via a PT1
filter. Any change of $MA_MS_TENSION_TORQUE is then travelled out with the
time constant of the filter.
As default, the filter is inactive; any torque change becomes active unfilte-
red.

Related to:
    $MA_MS_TENSION_TORQUE
```

37268	MS_TORQUE_WEIGHT_SLAVE			A10	TE3
%	Torque weighting of slave axis			DOUBLE	NEW CONF
-					
-	-	50.0	1.0	100.0	7/2

Description:

```
The torque share that the slave axis contributes to the total torque can be
configured via the weighting. Different torque shares between the master and
slave axis can thus be implemented.

In the case of motors with the same rated torque, a 50% to 50% torque sharing
is suggested.
The torque share of the master axis results implicitly from 100% - MD37268.

Related to:
    $MA_MS_ASSIGN_MASTER_TORQUE_CTR
    $MA_MS_TENSION_TORQ_FILTER_TIME
```

37270	**MS_VELO_TOL_COARSE**			A10	TE3
%	Master/slave speed tolerance coarse			DOUBLE	NEW CONF
-					
-	-	5.0	-	-	7/2

Description:

```
Tolerance window, coarse, for the differential speed between the master and
the slave.
If the speed difference is within the tolerance window, the PLC interface sig-
nal DB3x.DBX96.4 is set.

The tolerance value is entered as a percentage of $MA_MAX_AX_VELO.
```

37272	**MS_VELO_TOL_FINE**			A10	TE3
%	Master/slave speed tolerance fine			DOUBLE	NEW CONF
-					
-	-	1.0	-	-	7/2

Description:

```
Tolerance window, fine, for the differential speed between the master and the
slave.
If the speed difference is within the tolerance window, the PLC interface sig-
nal DB3x.DBX96.3 is set.

The tolerance value is entered as a percentage of $MA_MAX_AX_VELO.
```

37274	**MS_MOTION_DIR_REVERSE**			A10	TE3
-	Inverting traversing direction slave axis			BYTE	NEW CONF
-					
-	-	0	0	1	7/2

Description:

```
Inverting the traversing direction of a slave axis in the linked status.
0:  Equidirectional to the master axis
1:  Inverse to the master axis
```

37400	**EPS_TLIFT_TANG_STEP**			A10	T3
mm, degrees	Tangent angle for corner recognition			DOUBLE	RESET
CTEQ					
-	-	5.0	-	-	7/2

Description:

```
If TLIFT has been programmed and the axis is tracked tangentially, a step of
the position setpoint larger than EPS_TLIFT_TANG_STEP causes an intermediate
block to be inserted. The intermediate block traverses the axis to the posi-
tion corresponding to the start tangent in the next block.
MD irrelevant if: TLIFT not activated
Related to:
    TLIFT instruction
```

37402	**TANG_OFFSET**			A10	T3
mm, degrees	Default angle for tangential correction			DOUBLE	RESET
CTEQ					
-	-	0.0	-	-	7/2

Description:

```
Default offset (angle), which the tracked axis forms with the tangent. The
angle acts in addition to the angle programmed in the TANGON block.

MD irrelevant if tangential tracking not active.

Related to:
    TANGON instruction
```

37500	**ESR_REACTION**			EXP, A01, A10, -	M3
-	Axial mode of "Extended Stop and Retract"			BYTE	NEW CONF
CTEQ					
-	-	0	0	22	7/2

Description:

```
Selection of the response to be triggered via system variable
"$AN_ESR_TRIGGER".
     0 = No response Reaktion (or only external response through synchronized
    action programming of rapid digital outputs).
    10 = Drive-autonomous generator axis
    11 = Drive-autonomous retraction axis
    12 = Drive-autonomous stopping axis
    13 = Drive-autonomous generator axis with NC-controlled stopping
    21 = NC-controlled retraction axis
    22 = NC-controlled stopping axis
Notes:
-   on 11 and 12: These are activated jointly in the drive - in the same way as
    with communication failure -  through broadcast to all drives.
-   on 22: Parameter assignment "22" is also used for configuration of the cor-
    responding drive-autonomous response in the case of communication failure or
    DC link undervoltage.
-   If the option data is missing, the MD is reset to "0".
```

37510	**AX_ESR_DELAY_TIME1**			EXP, A01, A10, -	-
s	Delay time ESR single axis			DOUBLE	NEW CONF
CTEQ					
-	-	0.0	-	-	7/2

Description:

```
If, for example, an alarm occurs, the deceleration time can be delayed by
means of this MD, e.g. to allow in case of gear hobbing the retraction from
the tooth gap first.
```

37511	**AX_ESR_DELAY_TIME2**			EXP, A01, A10, -	-
s	ESR time for interpolatory deceleration of single axis			DOUBLE	NEW CONF
CTEQ					
-	-	0.0	-	-	7/2

Description:

```
After expiry of time $MA_AX_ESR_DELAY_TIME1, the time for interpolatory bra-
king specified here ($MA_AX_ESR_DELAY_TIME2) is still remaining.

After expiry of time $MA_AX_ESR_DELAY_TIME2, rapid braking with subsequent
tracking is initiated.
```

37550	**EG_VEL_WARNING**			A05, A10	M3
%	Threshold value for velocity warning threshold.			DOUBLE	NEW CONF
-					
-	-	90.0	0	100	7/2

Description:

```
Threshold value for VDI signals

If, with active EG axis link, the maximum velocities stored in MD 32000:
$MA_MAX_AX_VELO have been reached for the current velocity of the axis by the
percentage set here, a warning (signal) for velocity is output.

Related to:
    MD 32000: MAX_AX_VELO
```

37560	**EG_ACC_TOL**			A05, A10	M3
%	Threshold value for 'Axis accelerating'			DOUBLE	NEW CONF
-					
-	-	25.0	-	-	7/2

Description:

```
Threshold value for VDI signal "Axis accelerates"
If, with active EU axis link, the maximum accelerations stored in MD 32300:
$MA_MAX_AX_ACCEL have been reached for the current acceleration of the axis by
the percentage set here, a warning (signal) for acceleration is output.

Korrespondiert mit:
    MD 32300: MAX_AX_ACCEL
```

37600	PROFIBUS_ACTVAL_LEAD_TIME			EXP, A01, A02	G3
s	Actual value acquisition time (Profibus Ti)			DOUBLE	POWER ON
-					
-	-	0.000125	0.0	0.032	0/0

Description:

```
Machine data for setting the actual value acceptance time (Ti) of the encoder
on the PROFIBUS.
Unit: seconds; therefore default is 125µs
(this is also the default which Step7 sets for a 611U).

NOTICE:
The actual Ti value is read directly from the PROFIBUS configuration or the
drive, if possible.
In this case, the machine data value is set to the read value and will only
serve for display purposes.
```

37602	PROFIBUS_OUTVAL_DELAY_TIME			EXP, A01, A02	G3
s	Setpoint delay time (Profibus To)			DOUBLE	POWER ON
-					
-	-	0.003	0.0	0.032	0/0

Description:

```
Machine data for setting the setpoint acceptance time (To) on the PROFIBUS.
Unit: seconds

NOTICE:
The actual To value is read directly from the PROFIBUS configuration or the
drive, if possible.
In this case, the value of the machine data is set to the read value and ser-
ves for display purposes only.
```

37610	PROFIBUS_CTRL_CONFIG			EXP, A01	K4
-	Profibus control bit configuration			BYTE	POWER ON
-					
-	-	0	0	2	7/2

Description:

```
Machine data for setting special PROFIBUS control word functionality:
0 =
    default = no change of standard behavior
1 =
    STW2, bits 0-1 are set depending on mode of operation/rapid traverse sup-
    pressing the setting of defaults for the VDI control bits "Parameter set
    bit0/1" from the PLC.
    Bits 0-1 get the following combinations depending on the mode of opera-
    tion, and controlled by NCK:
    00 = Default (after Power-On)
    01 = JOG (except for JOG-INC) or ((AUTOMATIC or MDI) and G0)
    10 = ((AUTOMATIC or MDI) and not G0), other
    11 = JOG-INC
```

```
2 =
    Combination of MD=0 (preset by VDI) and MD=1 (internally preset):
    MD=2 acts as MD=1, as long as there are no VDI control bits from the PLC,
    i.e. if the VDI control bits "Parameter set bit0/1" are both reset (0).
    MD=2 acts as MD=0, if the VDI control bits "Parameter set bit0/1" are set
    both or individually (!=0). In this case, the VDI control bits are trans-
    ferred directly to the drive (priority of VDI signals higher than that of
    internally created signals).
```

37620	**PROFIBUS_TORQUE_RED_RESOL**			EXP, A01	-
%	Resolution Profibus torque reduction			DOUBLE	NEW CONF
-					
-	-	1.0	0.005	10.0	7/2

Description:

```
Resolution of the torque reduction on the PROFIBUS (LSB significance)

The MD is only relevant for controls with PROFIBUS drives. For these cont-
rols, it defines the resolution of the cyclic interface data "Torque reduc-
tion value" (only exists for $MN_DRIVE_TELEGRAM_TYPE = 101 ff. or 201 ff.),
which is required for the "Travel to fixed stop" functionality.

The 1% default value corresponds to the original significance. The torque
limit is transferred on the PROFIBUS with increments of 1%; the value 100 in
the corresponding PROFIBUS data cell corresponds to full torque reduction
(i.e. without force).

By changing this MD to 0.005%, for example, the value can be entered in incre-
ments of 0.005%, i.e. the increments for the torque limit value become finer
by the factor 200.
For the limitation to the rated torque, the value 0 is transmitted in this
case; a complete torque reduction (i.e. without force) characterizes the
transmittable value 10000.
To avoid misadaptation, the setting value of the MD must be selected to match
the interpretation configured on the drive side or the firmly defined inter-
pretation of the torque reduction value.
```

37800	**OEM_AXIS_INFO**			A01, A11	-
-	OEM version information			STRING	POWER ON
-					
-	2	"", ""	-	-	7/2

Description:

```
A version information freely available to the user
(is indicated in the version screen)
```

1.5.9 Axis-specific memory settings

38000	MM_ENC_COMP_MAX_POINTS			A01, A09, A02	K3
-	Number of intermediate points for interpol. compensation (SRAM)			DWORD	POWER ON
-					
-	2	0, 0	0	5000	7/2

Description:

```
For leadscrew error compensation, the number of interpolation points required
per measuring system must be defined.
The required number can be calculated as follows using the defined parameters:
                            $AA_ENC_COMP_MAX - $AA_ENC_COMP_MIN
MD: MM_ENC_COMP_MAX_POINTS= ------------------------------------ + 1
                                       $AA_ENC_COMP_STEP

    $AA_ENC_COMP_MINInitial position (system variable)
    $AA_ENC_COMP_MAXEnd position (system variable)
    $AA_ENC_COMP_STEPDistance between interpolation points (system variable)

In selecting the number of interpolation points and/or the distances between
them, it is important to take account of the size of the resulting compensa-
tion table and the space required in the backed-up NC user memory (SRAM). 8
bytes are required per compensation value (interpolation point).
The index [n] has the following coding: [encoder no.]: 0 or 1

Special cases:                      Notice:
    After any change in MD: MM_ENC_COMP_MAX_POINTS, the non-volatile NC user
    memory is automatically re-allocated on system power-on.
    All data in the backed-up NC user memory are then lost (e.g. part pro-
    grams, tool offsets etc.). Alarm 6020 "Machine data changed - memory real-
    located" is signaled.
    If reallocation of the NC user memory fails because the total memory capa-
    city available is not sufficient, alarm 6000 "Memory allocation made with
    standard machine data" is signaled.
    In this case, the NC user memory division is allocated using the default
    values of the standard machine data.
References:
    /FB/, S7, "Memory Configuration"
    /DA/, "Diagnostics Guide"

Related to:
    MD: ENC_COMP_ENABLE[n]LEC active

References:
    /FB/, S7, "Memory Configuration"
```

38010	**MM_QEC_MAX_POINTS**			A01, A09	K3
-	Number of values for quadrant error compens. with neural network			DWORD	POWER ON
-					
-	1	0	0	1040	7/2

Description:

In quadrant error compensation with neural networks (QEC) the number of required compensation values must be entered for every axis to be compensated.

The required number can be calculated as follows using the defined parameters: MM_QEC_MAX_POINTS _ - ($AA_QEC_COARSE_STEPS + 1) * $AA_QEC_FINE_STEPS

$AA_QEC_COARSE_STEPS Coarse quantization of characteristic (system variable)
$AA_QEC_FINE_STEPS Fine quantization of characteristic (system variable)

For "direction-dependent" compensation the number must be greater than or equal to double the value of this product.

When selecting coarse or fine quantization, the resulting size of the compensation table and the memory required for it in the non-volatile user memory must be taken into account. 4 bytes are required for each compensation value. If the value 0 is entered, no memory is reserved for the table; i.e. the table does not exist and the function cannot therefore be activated.

Special cases: Caution!

If MD: MM_QEC_MAX_POINTS is altered, the non-volatile NC user memory is automatically re-allocated on system power-on. This deletes all the user data in the non-volatile user memory (e.g. drive and HMI machine data, code, tool offsets, part programs etc.).

Note:
Because the exact number of required interpolation points is not known during the first start-up of the function, a large number should be chosen initially. As soon as the characteristics are recorded and saved, the number can be reduced to the required size. After performing a power-on again, the saved characteristics can be reloaded.

References:
/FB/, S7, "Memory Configuration"

1.6 Setting data

Number	Identifier			Display filters	Reference
Unit	Name			Data type	Active
Attributes					
System	Dimension	Default value	Minimum value	Maximum value	Protection

Description:

Description

1.6.1 General setting data

41010	JOG_VAR_INCR_SIZE			-	H1
-	Size of the variable increment for JOG			DOUBLE	SOFORT
-					
-	-	0.	-	-	7/7

Description:

This setting data defines the number of increments when variable increment (INCvar) is selected. This increment size is traversed by the axis in JOG mode whenever the traverse key is pressed or the handwheel is turned one detent position and variable increment is selected (PLC interface signal "Active machine function: INC variable" for machine or geometry axes is set to 1). The defined increment size also applies to DRF.

Note:
Please note that the increment size is active for incremental jogging and handwheel jogging. So if a large increment value is entered and the hand-wheel is turned the axis might cover a large distance (depends on setting in MD: JOG_INCR_WEIGHT).

SD irrelevant for .....
JOG continuous

Related to ....
IS "Active machine function: INC variable" (DB21-28, DBX41.5 ff) or IS "Active machine function; INC variable" (DB31 - 48, DBX 69.5)
MD: JOG_INCR_WEIGHT (weighting of an increment for INC/handwheel)

41050	**JOG_CONT_MODE_LEVELTRIGGRD**			-	H1
-	Jog mode / continuous operation with continuous JOG			BOOLEAN	SOFORT
-					
-	-	TRUE	-	-	7/7

Description:

```
1:  Jog mode for JOG continuous
    In jog mode (default setting) the axis traverses as long as the traverse
    key is held down and an axis limitation has not been reached. When the key
    is released the axis is decelerated to zero speed and the movement is con-
    sidered complete.

0:  Continuous operation for JOG continuous
    In continuous operation the traverse movement is started with the first
    rising edge of the traverse key and continues to move even after the key is
    released. The axis can be stopped again by pressing the traverse key again
    (second rising edge).

SD irrelevant for ......
Incremental jogging (JOG INC)
Reference point approach (JOG REF)
```

41100	**JOG_REV_IS_ACTIVE**			-	-
-	JOG mode: (1) revolutional feedrate / (0) feedrate			BYTE	SOFORT
-					
-	-	14	-	-	7/7

Description:

```
Bit 0 = 0:
    The behavior depends on the following:
    - in the case of an axis/spindle:
    on the axial setting data $SA_ASSIGN_FEED_PER_REV_SOURCE
    - in the case of a geometry axis with an active frame with rotation:
    on the channel-specific setting data $SC_JOG_FEED_PER_REV_SOURCE
    - in the case of an orientation axis:
    on the channel-specific setting data $SC_JOG_FEED_PER_REV_SOURCE
Bit 0 = 1:
    A JOG motion with revolutional feedrate shall be traversed depending on the
    master spindle.
    The following must be considered:
    - If the master spindle is the spindle itself, it will be traversed wit-
    hout revolutional feedrate.
    - If the master spindle is in stop position and if the setting data is
    $SA_ASSIGN_FEED_PER_REV_SOURCE (with an axis/spindle) or
    $SC_JOG_FEED_PER_REV_SOURCE (with a geometry axis with an active frame with
    rotation, or with an orientation axis) = -3, traversing will be carried out
    without revolutional feedrate.
Bit 1 = 0:
    The axis/spindle, geometry axis or orientation axis will be traversed with
    revolutional feedrate even during rapid traverse (see bit 0 for selection).
```

```
Bit 1 = 1:
    The axis/spindle, geometry axis or orientation axis is always traversed
    without revolutional feedback during rapid traverse.

Bit 2 = 0:
    The axis/spindle, geometry axis or orientation axis is traversed with revo-
    lutional feedrate during JOG handwheel travel, too (see bit 0 for selec-
    tion).
Bit 2 = 1:
    The axis/spindle, geometry axis or orientation axis is always traversed
    without revolutional feedrate during JOG handwheel travel.

Bit 3 = 0:
    The axis/spindle is traversed with revolutional feedrate during DRF hand-
    wheel travel, too (see bit 0 for selection).
Bit 3 = 1:
    The axis/spindle is always traversed without revolutional feedrate during
    DRF handwheel travel.
```

41110	**JOG_SET_VELO**			-	H1
mm/min	Axis velocity in JOG			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Value not equal to 0:
The velocity value entered applies to linear axes traversed in JOG mode if
linear feedrate (G94) is active for the relevant axis (MD: JOG_REV_IS_ACTIVE =
0).
The axis velocity is active for
-   continuous jogging
-   incremental jogging (INC1, ... INCvar)
-   handwheel traversing.
The value entered is valid for all linear axes and must not exceed the maxi-
mum permissible axis velocity (MD: MAX_AX_VELO).
In the case of DRF, the velocity defined by SD: JOG_SET_VELO is reduced by
MD: HANDWH_VELO_OVERLAY_FACTOR.

Value = 0:
If 0 has been entered in the setting data, the active linear feedrate in JOG
mode is
MD: JOG_VELO "Jog axis velocity". Each axis can be given its own JOG velocity
with this MD (axial MD).

SD irrelevant for ......
-   Linear axes if SD: JOG_REV_IS_ACTIVE = 1
-   Rotary axes (SD: JOG_ROT_AX_SET_VELO is active here)

Application example(s)
The operator can thus define a JOG velocity for a specific application.
```

```
Related to ....
    Axial SD: JOG_REV_IS_ACTIVE (revolutional feedrate with JOG active)
    Axial MD: JOG_VELO (JOG axis velocity)
    Axial MD: MAX_AX_VELO (maximum axis velocity)
    Axial MD: HANDWH_VELO_OVERLAY_FACTOR (ratio of JOG velocity to handwheel
    velocity (DRF))
    SD: JOG_ROT_AX_SET_VELO (JOG speed with rotary axes)
```

41120	**JOG_REV_SET_VELO**			-	H1
mm/rev	Revolutional feedrate of axes in JOG mode			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Value not equal to 0:
The velocity value entered applies to axes traversed in JOG mode if revolutio-
nal feedrate (G95) is active for the relevant axis (MD: JOG_REV_IS_ACTIVE =
1). The axis velocity is active for
-   continuous jogging
-   incremental jogging (INC1, ... INCvar)
-   handwheel traversing. The value entered is valid for all axes and must not
    exceed the maximum permissible axis velocity (MD: MAX_AX_VELO).

Value = 0:
If 0 has been entered in the setting data, the active revolutional feedrate in
JOG mode is MD: JOG_REV_VELO "revolutional feedrate with JOG".
Each axis can be given its own revolutional feedrate with this MD (axial MD).

SD irrelevant for ......
-   For axes if SD: JOG_REV_IS_ACTIVE = 0

Application example(s)
The operator can define a JOG velocity for a particular application.

Related to ....
    Axial SD: JOG_REV_IS_ACTIVE (revolutional feedrate for JOG active)
    Axial MD: JOG_REV_VELO (revolutional feedrate with JOG)
    Axial MD: MAX_AX_VELO (maximum axis velocity)
```

41130	**JOG_ROT_AX_SET_VELO**			-	H1
rev/min	Axis velocity for rotary axes in JOG mode			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Value not equal to 0:
The velocity entered applies to rotary axes in JOG mode (in continuous mode,
in incremental mode, in traversing with handwheel). The value entered is com-
mon to all rotary axes and must not exceed the maximum permissible axis velo-
city (MD: MAX_AX_VELO).

With DRF, the velocity set with SD: JOG_ROT_AX_SET_VELO must be reduced by the
```

MD: HANDWH_VELO_OVERLAY_FACTOR.

Value equal to 0:
If the value 0 is entered in the setting data, the velocity that applies to rotary axes in JOG mode is the axial MD: JOG_VELO (jog axis velocity). In this way, it is possible to define a separate JOG velocity for each axis.

Application example(s)
The operator can define a JOG velocity for a particular application.

Related to ....
MD: JOG_VELO (JOG axis velocity)
MD: MAX_AX_VELO (maximum axis velocity)
MD: HANDWH_VELO_OVERLAY_FACTOR (ratio JOG velocity to handwheel velocity (DRF)

41200	**JOG_SPIND_SET_VELO**			-	H1
rev/min	Speed for spindle JOG mode			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

Value not equal to 0:
The speed entered applies to spindles in JOG mode if they are traversed manually by the "Plus or minus traversing keys" or the handwheel. The speed is active for
- continuous jogging
- incremental jogging (INC1, ... INCvar)
- handwheel traversing. The value entered is valid for all spindles and must not exceed the maximum permissible speed (MD: MAX_AX_VELO).

Value = 0:
If 0 has been entered in the setting data, MD: JOG_VELO (JOG axis velocity) acts as the JOG velocity. Each axis can thus be given its own JOG velocity with this MD (axial MD).
The maximum speeds of the active gear stage (MD: GEAR_STEP_VELO_LIMIT) are taken into account when traversing the spindle with JOG.

SD irrelevant for .....
Application example(s). The operator can thus define a JOG speed for the spindles for a specific application.

Related to ....
Axial MD: JOG_VELO (JOG axis velocity)
MD: GEAR_STEP_MAX_VELO_LIMIT (maximum speed of the gear range)

41300	**CEC_TABLE_ENABLE**			-	K3
-	Compensation table enable			BOOLEAN	SOFORT
-					
-	62	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/7

Description:

```
1:  The evaluation of the compensation table [t] is enabled.

    The compensation table is now included in the calculation of the compensa-
    tion value for the compensation axis.
    The compensation axis $AN_CEC_OUTPUT_AXIS can be taken from the table con-
    figuration.

    The effective total compensation value in the compensation axis can be
    adapted to the current machining by the targeted activation of tables (from
    NC part programm or PLC user program).

    The function does not become active until the following conditions have
    been fulfilled:
-   The option "Interpolatory compensation" is set
-   The associated compensation tables in the NC user memory have been loaded and
    enabled (SD: CEC_TABLE_ENABLE[t] = 1)
-   The current position measuring system is referenced (IS: "Referenced/Synchro-
    nized" =1).

0:  The evaluation of the sag compensation table [t] is not enabled.

Related to ....
    MD: MM_CEC_MAX_POINTS[t]    Number of  interpolation points with sag com-
    pensation
    SD: CEC_TABLE_ENABLE[t]     Evaluation of the sag compensation table t is
    enabled
    IS "Referenced/Synchronized 1"   DB31-48, DBX60.4
    IS "Referenced/Synchronized 2"   DB31-48, DBX60.5
```

41310	**CEC_TABLE_WEIGHT**			-	K3
-	Weighting factor compensation table			DOUBLE	SOFORT
-					
-	62	1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0...	-	-	7/7

Description:

The compensation value stored in the table [t] is multiplied by the weighting factor.
When selecting the weighting factor it should be ensured that the total compensation value in the compensation axis does not exceed the maximal value of (MD: CEC_MAX_SUM). With [t] = index of the compensation table (see MD: MM_CEC_MAX_POINTS)

If, for example, the weight of the tools used on the machine or the workpieces to be machined are too different and this affects the error curve by changing the amplitude, this can be corrected by changing the weighting factor. In the case of sag compensation, the weighting factor in the table can be changed for specific tools or workpieces from the PLC user program or the NC program by overwriting the setting data. However, different compensation tables are to be used if the course of the error curve is substantially changed by the different weights.

Related to ....
SD: CEC_TABLE_ENABLE[t] Evaluation of the sag compensation table t is enabled

MD: CEC_MAX_SUM Maximum compensation value for sag compensation

41500	**SW_CAM_MINUS_POS_TAB_1**			-	N3
mm/inch, degrees	Trigger points at falling cam 1-8			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

The cam positions of minus cams 1 - 8 are entered in this machine data.
The positions are entered in the machine coordinate system.

Index [n] of the setting data addresses the cam pair:
n = 0, 1, ... , 7 corresponds to cam pair 1, 2, ... , 8

When the set switching points are overtraveled in the positive axis direction, the associated "minus" cam signals in the PLC interface (and any applied fast output signals) switch from 1 to 0.

41501	**SW_CAM_PLUS_POS_TAB_1**			-	N3
mm/inch, degrees	Trigger points at rising cam edge 1-8			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
The cam positions of plus cams 1 - 8 are entered in this machine data.
The positions are entered in the machine coordinate system.

Index [n] of the setting data addresses the cam pair:
n = 0, 1, ... , 7 corresponds to cam pair 1, 2, ... , 8

When the set switching points are overtraveled in the positive axis direc-
tion, the associated "plus" cam signals in the PLC interface ( and any applied
fast output signals ) switch from 0 to 1.
```

41502	**SW_CAM_MINUS_POS_TAB_2**			-	N3
mm/inch, degrees	Trigger points at falling cam edge 9-16			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
The cam positions of minus cams 9-16 are entered in this machine data.
The positions are entered in the machine coordinate system.

Index [n] of the setting data addresses the cam pair:
n = 8, 9, ... , 15 corresponds to cam pair 9, 10, ... , 16

Switching points with falling edges of cams 9 - 16.
When the set switching points are overtraveled in the positive axis direc-
tion, the associated "minus" cam signals in the PLC interface ( and any
applied fast output signals ) switch from 1 to 0.
```

41503	**SW_CAM_PLUS_POS_TAB_2**			-	N3
mm/inch, degrees	Trigger points at rising cam edge 9-16			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
The cam positions of plus cams 9-16 are entered in this machine data.
The positions are entered in the machine coordinate system.

Index [n] of the setting data addresses the cam pair:
n = 8, 9, ... , 15 corresponds to cam pair 9, 10, ... , 16

Switching points with rising edges of cams 9 - 16.
When the set switching points are overtraveled in the positive axis direc-
tion, the associated "plus" cam signals in the PLC interface ( and any applied
fast output signals ) switch from 0 to 1.
```

41504	**SW_CAM_MINUS_POS_TAB_3**			-	N3
mm/inch, degrees	Trigger points at falling cam edge 17-24			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
The cam positions of minus cams 17 - 24 are entered in this machine data.
The positions are entered in the machine coordinate system.

Index [n] of the setting data addresses the cam pair:
n = 0, 1, ... , 7 corresponds to cam pair 17, 18, ... , 24

Switching points with falling edges of cams 17 - 24.
When the set switching points are overtraveled in the positive axis direc-
tion, the associated "minus" cam signals in the PLC interface ( and any
applied fast output signals ) switch from 1 to 0.
```

41505	**SW_CAM_PLUS_POS_TAB_3**			-	N3
mm/inch, degrees	Trigger points at rising cam edge 17-24			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
The cam positions of plus cams 17 - 24 are entered in this machine data.
The positions are entered in the machine coordinate system.

Index [n] of the setting data addresses the cam pair:
n = 0, 1, ... , 7 corresponds to cam pair 17, 18, ... , 24

Switching points with rising edges of cams 17 - 24
When the set switching points are overtraveled in the positive axis direc-
tion, the associated "plus" cam signals in the PLC interface ( and any applied
fast output signals ) switch from 0 to 1.
```

41506	**SW_CAM_MINUS_POS_TAB_4**			-	N3
mm/inch, degrees	Trigger points at falling cam edge 25-32			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
The cam positions of minus cams 25 - 32 are entered in this machine data.
The positions are entered in the machine coordinate system.

Index [n] of the setting data addresses the cam pair:
n = 8, 9, ... , 15 corresponds to cam pair 25, 26, ... , 32

Switching points with falling edges of cams 25 - 32.
When the set switching points are overtraveled in the positive axis direc-
tion, the associated "minus" cam signals in the PLC interface ( and any
applied fast output signals ) switch from 1 to 0.
```

41507	**SW_CAM_PLUS_POS_TAB_4**			-	N3
mm/inch, degrees	Trigger points at rising cam edge 25-32			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
The cam positions of plus cams 25 - 32 are entered in this machine data.
The positions are entered in the machine coordinate system.

Index [n] of the setting data addresses the cam pair:
n = 8, 9, ... , 15 corresponds to cam pair 25, 26, ... , 32

Switching points with rising edges of cams 25 - 32.
When the set switching points are overtraveled in the positive axis direc-
tion, the associated "plus" cam signals in the PLC interface ( and any applied
fast output signals ) switch from 0 to 1.
```

41520	**SW_CAM_MINUS_TIME_TAB_1**			-	N3
s	Rate time for '-' trigger points of cams 1-8			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
A lead or delay time can be assigned to each cam 1-8 in this setting data to
compensate for delay times.

The switching edge of the associated cam signal is advanced or delayed by the
time value entered.

Positive value:         Lead time
Negative value:         Delay time

Index [n] of the setting data addresses the cam pair:
n = 0, 1, ... , 7 corresponds to cam pair 1,  2, ... , 8

This setting data is added to MD: SW_CAM_MINUS_LEAD_TIME[n].

Related to ....
   MD: SW_CAM_MINUS_LEAD_TIME[n]  (lead or delay time on minus cams 1 - 16)
```

41521	**SW_CAM_PLUS_TIME_TAB_1**			-	N3
s	Rate time for '+' trigger points of cams 1-8			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
A lead or delay time can be assigned to each plus cam 1-8 in this setting data
to compensate for delay times.

The switching edge of the associated cam signal is advanced or delayed by the
time value entered.

Positive value:           Lead time
Negative value:           Delay time

Index [n] of the setting data addresses the cam pair:
n = 0, 1, ... , 7 corresponds to cam pair 1, 2, ... , 8

This setting data is added to MD: SW_CAM_PLUS_LEAD_TIME[n].

Related to ....
    MD: SW_CAM_PLUS_LEAD_TIME[n] (lead or delay time on plus cams 1 - 16)
```

41522	**SW_CAM_MINUS_TIME_TAB_2**			-	N3
s	Rate time for '-' trigger points of cams 9-16			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
A lead or delay time can be assigned to each minus cam 9 - 16 in this setting
data to compensate for delay times.

The switching edge of the associated cam signal is advanced or delayed by the
time value entered.

Positive value:        Lead time
Negative value:        Delay time

Index [n] of the setting data addresses the cam pair:
n = 8, 9, ... , 15 corresponds to cam pair 9, 10, ... , 16

This setting data is added to MD: SW_CAM_MINUS_LEAD_TIME[n+8].

Related to ....
    MD: SW_CAM_MINUS_LEAD_TIME[n] (lead or delay time on minus cams 1 - 16)
```

41523	**SW_CAM_PLUS_TIME_TAB_2**			-	N3
s	Rate time for '+' trigger points of cams 9-16			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
A lead or delay time can be assigned to each plus cam 9 - 16 in this setting
data to compensate for delay times.

The switching edge of the associated cam signal is advanced or delayed by the
time value entered.

Positive value:            Lead time
Negative value:            Delay time

Index [n] of the setting data addresses the cam pair:
n = 8, 9, ... , 15 corresponds to cam pair 9, 10, ... , 16

This setting data is added to MD: SW_CAM_PLUS_LEAD_TIME[n+8].

Related to ....
    MD: SW_CAM_PLUS_LEAD_TIME[n] (lead or delay time on plus cams 1 - 16)
```

41524	**SW_CAM_MINUS_TIME_TAB_3**			-	N3
s	Rate time for '-' trigger points of cams 17-24			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
A lead or delay time can be assigned to each minus cam 17-24 in this setting
data to compensate for delay times.

The switching edge of the associated cam signal is advanced or delayed by the
time value entered.

Positive value:         Lead time
Negative value:         Delay time

Index [n] of the setting data addresses the cam pair:
n = 0, 1, ... , 7 corresponds to cam pair 17, 18, ... , 24

This setting data is added to MD: SW_CAM_MINUS_LEAD_TIME[n].

Related to ....
    MD: SW_CAM_MINUS_LEAD_TIME[n]  (lead or delay time on minus cams 1 - 16)
```

41525	**SW_CAM_PLUS_TIME_TAB_3**			-	N3
s	Rate time for '+' trigger points of cams 17-24			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
A lead or delay time can be assigned to each plus cam 17-24 in this setting
data to compensate for delay times.

The switching edge of the associated cam signal is advanced or delayed by the
time value entered.

Positive value:             Lead time
Negative value:             Delay time

Index [n] of the setting data addresses the cam pair:
n = 0, 1, ... , 7 corresponds to cam pair 17, 18, ... , 24

This setting data is added to MD: SW_CAM_PLUS_LEAD_TIME[n].

Related to ....
    MD: SW_CAM_PLUS_LEAD_TIME[n] (lead or delay time on plus cams 1 - 16)
```

41526	**SW_CAM_MINUS_TIME_TAB_4**			-	N3
s	Rate time for '-' trigger points of cams 25-32			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
A lead or delay time can be assigned to each minus cam 25-32 in this setting
data to compensate for delay times.

The switching edge of the associated cam signal is advanced or delayed by the
time value entered.

Positive value:             Lead time
Negative value:             Delay time

Index [n] of the setting data addresses the cam pair:
n = 8, 9, ... , 15 corresponds to cam pair 25, 26, ... , 32

This setting data is added to MD: SW_CAM_MINUS_LEAD_TIME[n+8].

Related to ....
    MD: SW_CAM_MINUS_LEAD_TIME[n] (lead or delay time on minus cams 1 - 16)
```

41527	**SW_CAM_PLUS_TIME_TAB_4**			-	N3
s	Rate time for '+' trigger points of cams 25-32			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
A lead or delay time can be assigned to each plus cam 25 - 32 in this setting
data to com-pensate for delay times.

The switching edge of the associated cam signal is advanced or delayed by the
time value entered.

Positive value:         Lead time
Negative value:         Delay time

Index [n] of the setting data addresses the cam pair:
n = 8, 9, ... , 15 corresponds to cam pair 25, 26, ... , 32

This setting data is added to MD: SW_CAM_PLUS_LEAD_TIME[n+8].

Related to ....
    MD: SW_CAM_PLUS_LEAD_TIME[n] (lead or delay time on plus cams 1 - 16)
```

41600	**COMPAR_THRESHOLD_1**			-	A4
-	Threshold value of the 1st comparator			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
COMPAR_THRESHOLD_1[b] defines the threshold values for the individual input
bits [b] of comparator byte 1.

The output bit n of the 1st comparator is created by comparing the threshold
value n according to the comparison type defined in bit n of COMPAR_TYPE_1.

For example:
    COMPAR_ASSIGN_ANA_INPUT_1[2] = 4
    COMPAR_TRESHOLD_1[2]         = 5000.0
    COMPAR_TYPE_1                = 5
    The 3rd output bit of comparator 1 is set if the input value at AnalogIn 4
    is greater than or equal to 5 volts.

Index [b]: Bits 0 - 7

Related to ....
    MD 10530: COMPAR_ASSIGN_ANA_INPUT_1
    MD 10531: COMPAR_ASSIGN_ANA_INPUT_2
    MD 10540: COMPAR_TYPE_1 MD 10541: COMPAR_TYPE_2
```

41601	**COMPAR_THRESHOLD_2**			-	A4
-	Threshold value of the 2nd comparator			DOUBLE	SOFORT
-					
-	8	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/7

Description:

```
COMPAR_THRESHOLD_1[b] defines the threshold values for the individual input
bits [b] of comparator byte 1.
The output bit n of the 1st comparator is created by comparing the threshold
value n according to the comparison type defined in bit n of COMPAR_TYPE_2.


Index [b]: Bits 0 - 7

Related to ....
    MD 10530: COMPAR_ASSIGN_ANA_INPUT_1
    MD 10531: COMPAR_ASSIGN_ANA_INPUT_2
    MD 10540: COMPAR_TYPE_1
    MD 10541: COMPAR_TYPE_2
```

41700	**AXCT_SWWIDTH**			-	B3
-	Default rotation of axis container			DWORD	NEW CONF
CTDE					
-	16	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-32	32	7/7

Description:

```
The number of entries (slots) by which the entries in the axis container are
advanced on execution of the rotation. The value is interpreted modulo of the
actually existing entries. Negative values reverse the direction of rotation.

Related to the container rotation command, container axes.
This machine data is distribued via the NCU-link.

Contrary to the the definition for setting data, this SD is not immediately
active, but first with NEWCONF.
```

1.6.2 Channel-specific setting data

42000	**THREAD_START_ANGLE**			-	K1
degrees	Starting angle for thread			DOUBLE	SOFORT
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-	-	7/7

Description:

```
In the case of multiple thread cutting, the offset of the individual threads
can be programmed with the aid of this setting data.
This SD can be changed by the part program with the command SF.

Note:
    MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value writ-
    ten by the part program is transferred to the active file system on reset
    (that is the value is retained after reset.)
```

42010	**THREAD_RAMP_DISP**			-	V1
mm	Acceleration behavior of axis when thread cutting			DOUBLE	SOFORT
-					
-	2	-1., -1.,-1., -1.,-1., -1.,-1., -1....	-1.	999999.	7/7

Description:

```
The SD is active for thread cutting with G33 (G34, G35).
It features two elements that define the behavior of the thread axis during
runup (1st element) and during deceleration/smoothing (2nd element).
The values have the same properties for thread run-in and thread run-out:

<0:
    The thread axis is started/decelerated with configured acceleration. Jerk
    is according to the current programming of BRISK/SOFT. Behavior is compa-
    tible with MD 20650__THREAD_START_IS_HARD = FALSE used until now.

0:
    Starting/deceleration of the feed axis during thread cutting is stepped.
    Behavior is compatible with MD 20650__THREAD_START_IS_HARD = TRUE used
    until now.

>0:
    The maximum thread starting or deceleration path is specified. The speci-
    fied distance can lead to acceleration overload of the axis. The SD is
    written from the block when DITR (displacement thread ramp) is programmed.

Note:
    MD 10710: PROG_SD_RESET_SAVE_TAB can be be set so that the value written by
    the part program is transferred to the active file system on reset (that is
    the value is retained after reset.)
```

42100	**DRY_RUN_FEED**			-	V1
mm/min	Dry run feedrate			DOUBLE	SOFORT
-					
-	-	5000.,5000.,5000.,5000.,5000.,5000....	-	-	7/7

Description:

The feedrate for the active dry run is entered in this setting data. The setting data can be altered on the operator panel in the "Parameters" operating area.
The entered dry run feedrate is always interpreted as a linear feed (G94). If the dry run feedrate is activated via the PLC interface, the dry run feedrate is used as the path feed after a reset instead of the programmed feed. The programmed velocity is used for traversing if the programmed velocity is greater than the velocity stored here.

Application example(s)
Program testing

Related to ....
    IS "Activate dry run feedrate" (DB21, ... DBX0.6)
    IS "Dry run feedrate selected" (DB21, ... DBX24.6)

42101	**DRY_RUN_FEED_MODE**			-	V1
-	Mode for dry run velocity			BYTE	SOFORT
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	12	7/7

Description:

This MD can be used to set the method of operation of the dry run velocity specified by the setting data $SC_DRY_RUN_FEED.
The following values are possible:
0:
    The maximum of setting data $SC_DRY_RUN_FEED and the programmed velocity become active. This is the standard setting and corresponds to the behavior up to SW 5.
1:
    The minimum of setting data $SC_DRY_RUN_FEED and the programmed velocity become active.
2:
    The setting data $SC_DRY_RUN_FEED becomes active directly irrespective of the programmed velocity.
The values 3...9 are reserved for extensions.
10:
    As configuration 0 except thread cutting (G33, G34, G35) and tapping (G331, G332, G63). These functions are executed as programmed.
11:
    As configuration 1 except thread cutting (G33, G34, G35) and tapping (G331, G332, G63). These functions are executed as programmed.
12:
    As configuration 2 except thread cutting (G33, G34, G35) and tapping (G331, G332, G63). These functions are executed as programmed.

42110	**DEFAULT_FEED**			-	V1,FBFA
mm/min	Path feed default value			DOUBLE	SOFORT
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0., 0.,0.,0.,0.,0....	-	-	7/7

Description:

Default value for path feedrate, The setting data is evaluated when the part program starts taking into account the feedrate type active at this time (see $MC_GCODE_RESET_VALUES and $MC_EXTERN_GCODE_RESET_VALUES).

42120	**APPROACH_FEED**			-	-
mm/min	Path feedrate in approach blocks			DOUBLE	SOFORT
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0., 0.,0.,0.,0.,0....	-	-	7/7

Description:

Default value for path feedrate in approach blocks (after repos., block search, SERUPRO etc).

The contents of this settting data are only used when it is non-zero.

It is evaluated like an F word programmed for G94.

42122	**OVR_RAPID_FACTOR**			-	$MN_OVR_FACTOR_RAPID_TRA,$AC_OVR
%	Add. rapid traverse override can be specified through operation			DOUBLE	SOFORT
-					
-	-	100.,100.,100.,100., 100.,100.,100....	-	-	7/7

Description:

Additional channel-specific rapid traverse override in %. The value is calculated to the path depending on OPI variable enablOvrRapidFactor. The value multiplies the other rapid traverse overrides (rapid traverse override of the machine control panel, override default through synchronized actions $AC_OVR).

42125	**SERUPRO_SYNC_MASK**			-	-
-	Ssynchronization in approach blocks			DWORD	SOFORT
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

A synchronized approach can be set for the search type SERUPRO with the setting data SERUPRO_SYNC_MASK.
SERUPRO uses the function REPOS to move from the current machine position to the target block of the search. A synchronization of the channels can be forced between the reapproach block and the target block via SERUPRO_SYNC_MASK which would correspond to the use of wait markers.

Note:
The user cannot program wait markers between reapproach block and target block in a part program.
SERUPRO_SYNC_MASK activates this intermal wait marker, and defines for which other channels this channel is to wait.

Example for channel 3: $SC_SERUPRO_SYNC_MASK= 0x55
A new block is now inserted in the Serupro approach between the reapproach block and the target block, the function of which corresponds to the following programming: WAITM(101, 1,3,5,7), i.e. a wait mark synchronizes the channels 1, 3, 5 and 7.

The wait marks used internally cannot be explicitly programmed by the user.

NOTICE:
Similarly to the part program, the user can make the error of not setting the mark in a channel, so that the other channels naturally wait for ever!

Comment: The bit mask can contain a channel that does not exist (channel gaps) without a
deadlock occurring.
Example for channel 3: $SC_SERUPRO_SYNC_MASK= 0x55 and channel 5 do not exist, so WAITM(101, 1,3,7) is set.
Note: The block content corresponds to "WAITM(101, 1,3,5,7)", the user does not see this block content, he sees REPOSA!
Note:
  SERUPRO_SYNC_MASK is evaluated as soon as the part program command REPOSA is interpreted.
SERUPRO_SYNC_MASK can still be changed if SERUPRO is in the state "search target found".
If REPOSA has already been executed, a change to SERUPRO_SYNC_MASK can only become active if a new REPOS is set. This occurs, for example, by:
- Starting a new ASUB.
- STOP-JOG-AUTO-START
- STOP - select a new REPOS mode RMI/RMN/RME/RMB - START

```
Comment:
If one use the prog. event for search and if the NCK is at alarm 10208 then a
change of SERUPRO_SYNC_MASK is not active unless one sets a new REPOS.
SERUPRO_SYNC_MASK == 0   A block is NOT inserted.
Note:
    If the bit for the current channel is not set in $SC_SERUPRO_SYNC_MASK then
    a block is NOT inserted.
Example:
If $SC_SERUPRO_SYNC_MASK= 0xE is programmed in channel 1, then a block is NOT
inserted.
This assignment is reserved for a future function!
```

42140	**DEFAULT_SCALE_FACTOR_P**			-	FBFA
-	Default scaling factor for address P			DWORD	SOFORT
-					
-	-	1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	-	-	7/7

Description:

```
The value in this machine data is active if no scaling factor P has been pro-
grammed in the block.

Related to:
    WEIGHTING_FACTOR_FOR_SCALE
```

42150	**DEFAULT_ROT_FACTOR_R**			-	-
-	Default rotation factor for address R			DOUBLE	SOFORT
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-	-	7/7

Description:

```
The value in this machine data is active if no factor for rotation R is pro-
grammed in the block.
```

42160	**EXTERN_FIXED_FEEDRATE_F1_F9**			-	FBFA
-	Fixed feedrates F1 - F9			DOUBLE	SOFORT
-					
-	10	0., 0., 0., 0., 0., 0., 0., 0., 0., 0....	-	-	7/7

Description:

```
Fixed feedrate values for programming with F1 - F9. If the machine data
$MC_FEEDRATE_F1_F9_ON = TRUE is set with the programming of F1 - F9, the fee-
drate values are read from the setting data $SC_EXTERN_FIXED_FEEDRATE_F1_F9[0]
- $SC_EXTERN_FIXED_FEEDRATE_F1_F9[8], and activated as the machining feedrate.
The rapid traverse feedrate must be entered in
$SC_EXTERN_FIXED_FEEDRATE_F1_F9[0].
```

42162	**EXTERN_DOUBLE_TURRET_DIST**			-	FBFA
-	Double turret head tool distance			DOUBLE	SOFORT
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-	-	7/7

Description:

```
Distance between both tools of a double turret head.
The distance is activated using G68 as additive zero point offset if
$MN_EXTERN_DOUBLE_TURRET_ON is set to TRUE.
```

42200	**SINGLEBLOCK2_STOPRE**			-	BA
-	Activate SBL2 debug mode			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/7

Description:

```
Value = TRUE:
A preprocessing stop is made with every block if SBL2 (single block with stop
after every block) is active. This suppresses the premachining of part pro-
gram blocks. This variant of the SBL2 is not true-to-contour.
This means that a different contour characteristic might be generated as a
result of the preprocessing stop than without single block or with SBL1.

Application: Debug mode for testing part programs.
```

42300	**COUPLE_RATIO_1**			-	-
-	Speed ratio for synchr. spindle mode, numerator, denominator			DOUBLE	SOFORT
-					
-	2	1.0, 1.0,1.0, 1.0,1.0, 1.0,1.0, 1.0...	-1.0e8	1.0e8	7/7

Description:

```
This setting data defines the speed ratio parameters for the fixed coupling
configuration defined with the channel-specific MD: COUPLE_AXIS_1[n].

The linear correlation between the leading and following spindles is determi-
ned by the speed ratio k_Ü. This ratio is defined by two speed ratio parame-
ters in the form of a numerator [n=0] and a denominator [n=1]. This enables
the speed ratio to be defined very precisely.

k_Ü =  Speed ratio parameter of numerator / Speed ratio parameter of denomina-
tor = $SC_COUPLE_RATIO[0] / $SC_COUPLE_RATIO[1]
```

The speed ratio parameters can be altered in the NC part program with the language instruction COUPDEF provided that this is not locked by the channel-specific MD 21340: COUPLE_IS_WRITE_PROT_1.
However, the parameterized values of SD: $SC_COUPLE_RATIO_1 are not changed.
The calculation of k_Ü is initiated with POWER ON.
SD irrelevant for .....
User-defined coupling
Related to ....
SD: $SC_COUPLE_RATIO_1 currently has the same action as a machine data (e.g. active after POWER ON). The SD data are therefore displayed and input in the same way as channel-specific machine data.

42400	**PUNCH_DWELLTIME**			-	N4
s	Dwell time for punching and nibbling			DOUBLE	SOFORT
-					
-	-	1.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/7

Description:

This data sets the dwell time between reaching the position and triggering the stroke.
The set value is rounded to an integer multiple of the interpolation cycle.
(This means that the value set here can only differ slightly from that which is actually executed.)
Note:
MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be set so that the value written by the part program is transferred into the active file system on reset (i.e. the value is retained even after the reset).

42402	**NIBPUNCH_PRE_START_TIME**			-	N4
s	Delay time (punch/nibble) with G603			DOUBLE	SOFORT
-					
-	-	.02,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/7

Description:

This machine data has exactly the same effect as machine data NIBBLE_PRE_START_TIME. Its primary purpose is to allow the pre-start time to be altered from the NC program so that it can be adapted to different metal sheet sizes and thicknesses. However, the setting data is active only when the machine data has been set to zero.
Related to .... NIBBLE_PRESTART_TIME

42404	**MINTIME_BETWEEN_STROKES**			-	N4
s	Minimum time between 2 strokes in seconds			DOUBLE	SOFORT
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/7

Description:

Minimum time between 2 strokes in seconds

42440	**FRAME_OFFSET_INCR_PROG**			-	K2
-	Traversing from zero offset with incr. programming			BOOLEAN	SOFORT
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

```
0:  When incremental programming is used on an axis, only the programmed posi-
tion delta is traversed after a frame change. Zero offsets in FRAMES are only
traversed when an absolute position is specified.
1:  When incremental programming is used on an axis, changes to zero offsets
are traversed after a frame change (standard response up to software version
3).
Related to ....
    SD 42442: TOOL_OFFSET_INCR_PROG
```

42442	**TOOL_OFFSET_INCR_PROG**			-	W1
-	Traversing from zero offset with incr. programming			BOOLEAN	SOFORT
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

```
0:  When incremental programming is used on an axis, only the programmed posi-
tion delta is traversed after a frame change. Tool length offsets in FRAMES
are only traversed when an absolute position is specified.
1:   When incremental programming is used on an axis, changes to tool length
offsets are traversed after a tool change (standard response up to SW version
3).
Related to ....
    SD 42440: FRAME_OFFSET_INCR_PROG
```

42444	**TARGET_BLOCK_INCR_PROG**			-	BA
-	Set down mode after search run with calculation			BOOLEAN	SOFORT
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

```
If the first programming of an axis after "Search run with calculation to end
of block" is incremental, the incremental value is added as a function of SD
$SC_TARGET_BLOCK_INCR_PROG to the value accumulated up to the search target :
SD = TRUE: Incremental value is added to accumulated position
SD = FALSE: Incremental value is added to current actual value
The setting data is evaluated on NC start for output of the action blocks.
```

42450	**CONTPREC**			-	B1,K6
mm	Contour accuracy			DOUBLE	SOFORT
-					
-	-	0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1...	0.000001	999999.	7/7

Description:

Contour accuracy. This setting data can be used to define the accuracy to be maintained for the path of the geometry axes on curved contours. The lower the value and the lower the servogain factor of the geometry axes, the greater the reduction of path feed on curved contours.

Related to ....
    $MC_CPREC_WITH_FFW
    $SC_MINFEED

42460	**MINFEED**			-	B1,K6
mm/min	Minimum path feedrate for CPRECON			DOUBLE	SOFORT
-					
-	-	1.,1.,1.,1.,1.,1.,1.,1.,1.,1.,1.,1....	0.000001	999999.	7/7

Description:

Minimum path feedrate with the "Contour accuracy" function active. The feedrate is not limited to below this value, unless a lower F value has been programmed or the axis dynamics do not permit it.

Related to ....
    $MC_CPREC_WITH_FFW
    $SC_CONTPREC

42465	**SMOOTH_CONTUR_TOL**			-	B1
mm	maximum contour tolerance on smoothing			DOUBLE	SOFORT
-					
-	-	0.05,0.05,0.05,0.05,0.05,0.05,0.05,0.05...	0.000001	999999.	7/7

Description:

This setting data defines the maximum tolerance of smoothing for the contour.

Related to:
    $MC_SMOOTHING_MODE,
    $SC_SMOOTH_ORI_TOL

42466	**SMOOTH_ORI_TOL**			-	B1
degrees	Maximum deviation of tool orientation during smoothing.			DOUBLE	SOFORT
-					
-	-	0.05,0.05,0.05,0.05, 0.05,0.05,0.05...	0.000001	90.	7/7

Description:

```
This setting data defines the maximum tool orientation tolerance during smoo-
thing.
The data determines the maximum
angular displacement of the tool orientation.
This data only applies if an orientation tranformation
is active.

Related to:
    $MC_SMOOTHING_MODE,
    $SC_SMOOTH_CONTUR_TOL
```

42470	**CRIT_SPLINE_ANGLE**			-	W1,PGA
degrees	Corner limit angle for compressor			DOUBLE	SOFORT
-					
-	-	36.0,36.0,36.0,36.0, 36.0,36.0,36.0...	0.0	89.0	7/7

Description:

```
The setting data defines the limit angle from which the compressor COMPCAD
interprets a block transition as a corner. Practical values lie between 10 and
40 degrees. Values from 0 to 89 degrees inclusive are permitted.
The angle only serves as an approximate measure for corner detection. The com-
pressor can also classify flatter block transitions as corners and eliminate
larger angles as outliers on account of plausibility considerations.
```

42471	**MIN_CURV_RADIUS**			EXP, C09	-
mm	Minimum radius of curvature			DOUBLE	SOFORT
-					
-	-	3.0,3.0,3.0,3.0,3.0,3 .0,3.0,3.0,3.0...	-	-	7/7

Description:

```
The setting data defines a typical tool radius. It is only evaluated in com-
pressor COMPCAD. The lower the value, the greater the precision, but the slo-
wer the program execution.
```

42475	**COMPRESS_CONTUR_TOL**			-	F2,PGA
mm	maximum contour deviation with compressor			DOUBLE	SOFORT
-					
-	-	0.05,0.05,0.05,0.05, 0.05,0.05,0.05...	0.000001	999999.	7/7

Description:

This setting data defines the maximum contour tolerance in the compressor.

42476	**COMPRESS_ORI_TOL**			-	F2,PGA
degrees	Maximum deviation of tool orientation with compressor			DOUBLE	SOFORT
-					
-	-	0.05,0.05,0.05,0.05, 0.05,0.05,0.05...	0.000001	90.	7/7

Description:

This setting data defines the maximum tool orientation tolerance in the compressor. This data defines the maximum permissible angular displacement of the tool orientation.
This data is active only if an orientation transformation is active.

42477	**COMPRESS_ORI_ROT_TOL**			-	F2,PGA
degrees	Maximum deviation of tool rotation with compressor			DOUBLE	SOFORT
-					
-	-	0.05,0.05,0.05,0.05, 0.05,0.05,0.05...	0.000001	90.	7/7

Description:

This setting data defines the maximum tolerance in the compressor for turning the tool orientation. This data defines the maximum permissible angular displacement of the tool rotation.
This data is only active if an orientation transformation is active.
Turning the tool orientation is only possible with 6-axis machines.

42480	**STOP_CUTCOM_STOPRE**			-	W1
-	Alarm response with tool radius compensation and preproc. stop			BOOLEAN	SOFORT
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

If this setting data is TRUE, block execution is stopped by preprocessing stop and active tool radius compensation, and does not resume until after a user acknowledgement (START).
If it is FALSE, machining is not interrupted at such a program point.

42490	**CUTCOM_G40_STOPRE**			-	W1
-	Retraction behavior of tool radius compensation with prep. stop			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/7

Description:

```
FALSE:
If there is a preprocessing stop (either programmed or generated internally by
the control) before the deselection block (G40) when tool radius compensation
is active, then firstly the starting point of the deselection block is approa-
ched from the last end point before the preprocessing stop. The deselection
block itself is then executed, i.e. the deselection block is usually replaced
by two traversing blocks. Tool radius compensation is no longer active in
these blocks. The behavior is thus identical with that before the introduc-
tion of this setting data.
TRUE:
If there is a preprocessing stop (either programmed or generated internally by
the control) before the deselection block (G40) when tool radius compensation
is active, the end point of the deselection point is traversed in a straight
line from the last end point before the preprocessing stop.
```

42494	**CUTCOM_ACT_DEACT_CTRL**			-	W1
-	Approach & retraction behavior with 2-1/2D tool radius compens.			DWORD	SOFORT
-					
-	-	2222,2222,2222,2222,2222,2222,2222...	-	-	7/7

Description:

```
This setting data controls the approach and retraction behavior with tool
radius compensation if the activation or deactivation block does not contain
any traversing information. It is only evaluated with 2-1/2D TRC
(CUT2D or CUT2DF).
The decimal coding is as follows:
N N N N
|   |   |   |____  Approach behavior for tools with tool point direction
|   |   |          (turning tools)
|   |   |______ Approach behavior for tools without tool point direction
|   |            (milling tools)
|   |________  Retract behavior for tools with tool point direction
|              (turning tools)
|__________   Retract behavior for tools without tool point direction
             (milling tools)
```

If the position in question contains a 1, approach or retraction is always performed, even if G41/G42 or G40 stands alone in a block.
For example:

```
N100 x10 y0
N110 G41
N120 x20
```

If we assume a tool radius of 10mm in the above example, position x10y10 is approached in block N110.
If the position in question contains the value 2, the approach or retraction movement is only performed if at least one axis of the offset plane is programmed in the activation/deactivation block. To obtain the same results as the above example with this setting, the program must be altered as follows:

```
N100 x10 y0
N110 G41 x10
N120 x20
```

If axis information x10 is missing in block N110, activation of TRC is delayed by one block, i.e. the activation block would now be N120.
If the position in question contains a value other than 1 or 2, i.e. in particular the value 0, an approach or retraction movement is not performed in a block that does not contain any traversing information.
About the term "Tools with tool point direction":
These are tools with tool numbers between 400 and 599 (turning and grinding tools), whose tool point direction has a value between 1 and 8. Turning and grinding tools with tool point direction 0 or 9 or other undefined values are treated like milling tools.

Note:
If the value of this setting data is changed within a program, we recommend programming a preprocessing stop (stopre) before the description to avoid the new value being used in program sections before that point. The reverse case is not serious, i.e. if the setting data is written, subsequent NC blocks will definitely access the new value.

42496	**CUTCOM_CLSD_CONT**			-	-
-	Tool radius compensation behavior with closed contour			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/7

Description:

FALSE:
If two intersections are created on correction of the inner side of an (almost) closed contour consisting of two successive circle blocks or a circle and a linear block, the intersection that lies on the first part contour nearer to the block end will be selected as per the default behavior.
A contour will be considered as (almost) closed if the distance between the starting point of the first block and the end point of the second block is smaller than 10% of the active compensation radius, but not larger than 1000 path increments (corresponds to 1mm to 3 decimal places).

TRUE:
Under the same condition as described above, the intersection that lies on the first part contour nearer to block start is selected.

42500	**SD_MAX_PATH_ACCEL**			-	B2
m/s²	maximum path acceleration			DOUBLE	SOFORT
-					
-	-	10000.,10000.,10000.,10000.,10000....	1.0e-3	-	7/7

Description:

```
Setting data for additional limitation of (tangential) path acceleration

Related to ...
    MD 32300: MAX_AX_ACCEL
    SD 42502: IS_SD_MAX_PATH_ACCEL
```

42502	**IS_SD_MAX_PATH_ACCEL**			-	B2
-	Evaluate SD SC_SD_MAX_PATH_ACCEL			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/7

Description:

```
Setting data SD_MAX_PATH_ACCEL is included in the limit calculations if SD:
IS_SD_MAX_PATH_ACCEL=TRUE

Related to ...
    SD 42500: SD_MAX_PATH_ACCEL
```

42510	**SD_MAX_PATH_JERK**			-	B2
m/s³	maximum path-related jerk as setting data			DOUBLE	SOFORT
-					
-	-	100000.,100000.,100000.,100000.,100000....	1.e-9	-	7/7

Description:

```
As well as MD: MAX_PATH_JERK, the maximum path-related jerk can also limit the
jerk.


Related to ...
    MD 20600: MAX_PATH_JERK
    SD 42510: IS_SD_MAX_PATH_JERK
```

42512	**IS_SD_MAX_PATH_JERK**			-	B2
-	Evaluate SD SD_MAX_PATH_JERK			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/7

Description:

```
Setting data SD_MAX_PATH_JERK is included in the limit calculations if SD:
IS_SD_MAX_PATH_JERK=TRUE

Related to ...
    SD 42510: SD_MAX_PATH_JERK   (SD for additional limitation of (tangential)
    path jerk)
```

42520	**CORNER_SLOWDOWN_START**			-	-
mm	Start of feed reduction at G62.			DOUBLE	SOFORT
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-	-	7/7

Description:

```
Traverse path distance from which the feed is reduced before the corner with
G62.
```

42522	**CORNER_SLOWDOWN_END**			-	-
mm	End of feed reduction at G62.			DOUBLE	SOFORT
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-	-	7/7

Description:

```
Traverse path distance up to which the feed remains reduced after a corner
with G62.
```

42524	**CORNER_SLOWDOWN_OVR**			-	-
%	Feed override reduction at G62			DOUBLE	SOFORT
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0....	-	-	7/7

Description:

```
Override used to multiply the feed at the corner with G62.
```

42526	**CORNER_SLOWDOWN_CRIT**			-	-
degrees	Corner detection at G62			DOUBLE	SOFORT
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0., 0.,0.,0.,0.,0....	-	-	7/7

Description:

```
Angle from which a corner is taken into account when reducing the feed with
G62.
For example: CORNER_SLOWDOWN_CRIT = 90 means that all corners of 90 degrees or
a more acute angle are traversed slower with G62.
```

42528	**CUTCOM_DECEL_LIMIT**			-	-
-	Feed lowering on circles with tool radius compensation			DOUBLE	SOFORT
-					
-	-	0.,0.,0.,0.,0.,0.,0.,0., 0.,0.,0.,0.,0....	0.	1.	7/7

Description:

```
The setting data limits feed lowering of the tool center point on concave cir-
cle segments with tool radius compensation active and CFC or CFIN selected.
With CFC, the feed is defined at the contour. On concave circular arcs, feed
lowering of the tool center point is created by the ratio of the contour cur-
vature to the tool center point path curvature. The setting data is limiting
this effect, reducing backing off and overheating of the tool.
For contours with varying curvatures, a mid-range curvature is used.

0:  Provides the previous behavior: If the ratio between contour radius and
tool center point path radius is less than or equal to 0.01 the feed is
applied to the tool center point path. Less pronounced feed reductions are
executed.
>0: Feed lowering is limited to the programmed factor. At 0.01, this means that
the feed of the tool center point path is possibly only 1 percent of the pro-
grammed feed value.
1:  On concave contours, the tool center point feed equals the programmed feed
(the behavior then corresponds to CFTCP).
```

42600	**JOG_FEED_PER_REV_SOURCE**			-	V1
-	Control revolutional feedrate in JOG			DWORD	SOFORT
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-3	31	7/7

Description:

```
The revolutional feedrate in JOG mode for geometry axes on which a frame with
rotation acts.
0=  No revolutional feedrate is active.

>0=     Machine axis index of the rotary axis/spindle from which the revoluti-
onal feedrate is derived.

-1= The revolutional feedrate is derived from the master spindle of the chan-
nel in which the axis/spindle is active.
-2= The revolutional feedrate is derived from the axis with machine axis index
== 0.
-3= The revolutional feedrate is derived from the master spindle of the chan-
nel in which the axis/spindle is active. No revolutional feedrate is active if
the master spindle is at a standstill.

Related to ....
    SD 43300: ASSIGN_FEED_PER_REV_SOURCE  (revolutional feedrate for position
    axes/spindles)
```

42650	**CART_JOG_MODE**			-	H1
-	Coordinate system for Cartesian jog traverse			DWORD	SOFORT
-					
-	-	0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0...	0	0x0404	7/7

Description:

```
This SD can be used to set the reference coordinate system for Cartesian
manual travel, with bits 0 to 7 provided for selecting the coordinate system
for translation, bits 8 to 15 for selecting the reference system for orienta-
tion.

Cartesian manual travel will not be enabled if no bit is set or if just one
bit is set for translation or for orientation. This means that one bit must
always be set for translation and one for orientation. Cartesian manual tra-
vel will also not be enabled if more than one bit is set for translation or
orientation.
The meaning of the individual bits is defined as follows :
Bit  0 : Translation in Basic Coordinate System
Bit  1 : Translation in Workpiece Coordinate System
Bit  2 : Translation in Tool Coordinate System
Bit  3 : reserved
Bit  4 : reserved
Bit  5 : reserved
Bit  6 : reserved
Bit  7 : reserved
```

```
Bit  8 : Orientation in Basic Coordinate System
Bit  9 : Orientation in Workpiece Coordinate System
Bit 10 : Orientation in Tool Coordinate System
Bit 11 : reserved
Bit 12 : reserved
Bit 13 : reserved
Bit 14 : reserved
Bit 15 : reserved
```

42660	**ORI_JOG_MODE**			-	-
-	Definition of virtual kinematics for JOG			DWORD	SOFORT
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	5	7/7

Description:

This SD can be used to define virtual kinematics, which become active for the manual travel of orientations.
This setting data is evaluated only by the generic 5/6-axis transformation.
This data has no meaning for OEM transformations.
The following setting options are available:

0: The virtual kinematics are defined by the transformation.
1: Euler angles are traversed during jog, that is the 1st axis turns round the Z direction, the 2nd axis turns around the X direction and, if present, the 3rd axis turns aound the new Z direction.
2: RPY angles are traversed during jog with the turning sequence XYZ, that is the 1st axis turns around the x direction, the 2nd axis turns around the Y direction and, if present, the 3rd axis turns around the new Z direction.
3: RPY angles are traversed during jog with the turning sequence ZYX, that is the 1st axis turns around the Z direction, the 2nd axis turns around the Y direction and, if present, the 3rd axis turns around the new X direction.
4: The turning sequence of the rotary axes is set by means of MD $MC_ORIAX_TURN_TAB_1.
5: The turning sequence of the rotary axes is set by means of MD $MC_ORIAX_TURN_TAB_2.

42670	**ORIPATH_SMOOTH_DIST**			-	-
mm, degrees	Path for smoothing the orientation			DOUBLE	SOFORT
-					
-	-	0.05,0.05,0.05,0.05,0.05,0.05,0.05...	0.0	-	7/7

Description:

Displacement by which a jump in the tool orientation is smoothed with ORIPATH path-relative orientation interpolation. There is a deviation within this displacement from the relation of the orientation to the path tangent and the surface normal vector programmed with LEAD/TILT.
If zero is entered for this path length ($SC_ORIPATH_SMOOTH_DIST = 0.0), an intermediate block is inserted for smoothing the orientation. This means that the path motion remains at a stop in a corner and the orientation is then turned separately.

42672	**ORIPATH_SMOOTH_TOL**			-	-
degrees	Tolerance for smoothing the orientation			DOUBLE	SOFORT
-					
-	-	0.05,0.05,0.05,0.05, 0.05,0.05,0.05...	0.000001	-	7/7

Description:

Maximum angle (in degrees) for the deviation of the tool orientation with ORIPATH path-relative orientation interpolation. This angular tolerance is used for smoothing a "kink" in the orientation path.

42674	**ORI_SMOOTH_DIST**			-	-
mm, degrees	Path for orientation smoothing during smoothing			DOUBLE	SOFORT
-					
-	-	0.05,0.05,0.05,0.05, 0.05,0.05,0.05...	0.000001	-	7/7

Description:

Path through which a tool orientation bend is smoothed on a block transition with G code OSD.

42676	**ORI_SMOOTH_TOL**			-	-
degrees	Tolerance for orientation smoothing during smoothing			DOUBLE	SOFORT
-					
-	-	0.05,0.05,0.05,0.05, 0.05,0.05,0.05...	0.000001	-	7/7

Description:

Maximum angle (in degree) for the tool orientation deviation during orientation smoothing with G code OST with a bend in the orientation curve on block transitions.

42678	**ORISON_TOL**			-	-
degrees	Tolerance for smoothing the orientation			DOUBLE	SOFORT
-					
-	-	0.05,0.05,0.05,0.05, 0.05,0.05,0.05...	-	-	7/7

Description:

Maximum angle (in degree) for the tool orientation deviation during orientation smoothing with G code ORISON over several blocks.

42700	**EXT_PROG_PATH**			-	K1
-	Program path for external subroutine call EXTCALL			STRING	SOFORT
-					
-	-		-	-	7/7

Description:

The total path results from the string chaining of $SC_EXT_PROG_PATH + the programmed subprogram identifier.

42750	**ABSBLOCK_ENABLE**			-	K1
-	Enable base block display			BOOLEAN	SOFORT
-					
-	-	TRUE,TRUE,TRUE, TRUE,TRUE,TRUE, TRUE...	-	-	7/7

Description:

Value 0: Disable block display with absolute values (basic block display)
Value 1: Enable block display with absolute values (basic block display)

42800	**SPIND_ASSIGN_TAB**			-	S1
-	Spindle number converter.			BYTE	SOFORT
-					
-	21	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17...	0	21	7/7

Description:

The spindle converter converts the programmed (= logical) spindle number to the physical (= internal, configured) spindle number.
The index of the setting data (SD) corresponds to the programmed spindle number or the programmed address extension.
The SD contains the physical spindle which actually exists.

Special cases, errors, ...
Notes:
- The zero index (SPIND_ASSIGN_TAB[0]) is only used to display the master spindle selected in the channel and must not be overwritten.
- Changes to the spindle converter take effect immediately. It is therefore not advisable to change the spindle converter for spindles used in a part program from the MMC or PLC while a part program is running.
- After "delete SRAM", the numbers of the logical and physical spindles are identical.

42900	**MIRROR_TOOL_LENGTH**			-	W1
-	Sign change of tool length with mirror image machining			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/7

Description:

```
TRUE:
 If a frame with mirror image machining is active, the tool components
($TC_DP3[..., ...] to $TC_DP5[..., ...]) and the components of the base dimen-
sions
($TC_DP21[..., ...] to $TC_DP23[..., ...]) whose associated axes
are mirrored, are also mirrored, i.e. their sign is inverted. The wear values
are not mirrored. If the wear values are to be mirrored too, setting data
$SC_MIRROR_TOOL_WEAR must be set.

FALSE:
The sign for tool length components is unaffected by whether a frame with mir-
ror image machining is active.
```

42910	**MIRROR_TOOL_WEAR**			-	W1
-	Sign change of tool wear with mirror image machining			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/7

Description:

```
TRUE:
    If a frame with mirror image machining is activated, the signs of the wear
    values of the components in question are inverted. The wear values of the
    components that are not assigned to mirrored axes remain unchanged.

FALSE:
    The signs for wear values are unaffected by whether a frame with mirror
    image machining is active.
```

42920	**WEAR_SIGN_CUTPOS**			-	W1
-	Sign of tool wear depending on tool point direction			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/7

Description:

```
TRUE:
In the case of tools with a relevant tool point direction (turning and grin-
ding tools), the sign for wear of the tool length components depends on the
tool point direction.
The sign is inverted in the following cases (marked with an X):
Tool point direction    Length 1          Length 2
1
2                               X
3                               X                 X
4                                                 X
5
6
7                               X
8                                                 X
9
The sign for wear value of length 3 is not influenced by this setting data.
The setting data WEAR_SIGN acts in addition to this setting data.

FALSE:
The sign for wear of the tool length components is unaffected by the tool
point direction.
```

42930	**WEAR_SIGN**			-	W1
-	Sign of wear			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE,FALSE...	-	-	7/7

Description:

```
TRUE:
The sign for wear of the tool length components and the tool radius are inver-
ted, i.e. if a positive value in entered, the total dimension is decreased.

FALSE:
The sign for wear of the tool length components and the tool radius is not
inverted.
```

42935	**WEAR_TRANSFORM**			-	W1,W4
-	Transformations for tool components			DWORD	SOFORT
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

```
This setting data is bit-coded.
It determines which of the three wear components

wear
($TC_DP12 - $TC_DP14),

additive offsets fine ($TC_SCPx3 - $TC_SCPx5),

and additive offsets coarse ($TC_ECPx3 - $TC_ECPx5)

are subject to adapter transformation and transformation by an orientable tool
holder, if one of the two G codes TOWMCS or TOWWCS from G code group 56 is
active. If initial-setting G code TOWSTD is active, this setting data will not
become active.

Then, the following assignment is valid:
Bit 0 = TRUE: Do not apply transformations to $TC_DP12 - $TC_DP14.
Bit 1 = TRUE: Do not apply transformations to $TC_SCPx3 - $TC_SCPx5.
Bit 2 = TRUE: Do not apply transformations to $TC_ECPx3 - $TC_ECPx5.
The bits not mentioned here are (currently) not assigned.
```

42940	**TOOL_LENGTH_CONST**			-	W1
-	Change of tool length components with change of active plane			DWORD	SOFORT
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

```
If this setting data is not equal to 0, the assignment of tool length compon-
ents (length, wear, base dimensions) to geometry axes is not changed when the
machining plane (G17 - G19) is changed.
The assignment of tool length components to geometry axes can be derived from
the value of the setting data acc. to the following tables.
A distinction is made between turning and grinding tools (tool types 400 to
599)  and other tools (typically milling tools) in the assignment.
Representation of this information in tables assumes that geometry axes 1 to 3
are called X, Y and Z. For assignment of an offset to an axis, not the axis
identifier but the axis sequence is relevant.
```

Assignment for turning tools and grinding tools (tool types 400 to 599):

Content	Length 1	Length 2	Length 3
17	Y	X	Z
18*	X	Z	Y
19	Z	Y	X
-17	X	Y	Z
-18	Z	X	Y
-19	Y	Z	X

* Any value which is not 0 and is not one of the six values listed, is treated as value 18.
For values that are the same but with a different sign, assignment of length 3 is always the same, lengths 1 and 2 are reversed. Assignment for all tools which are neither turning nor grinding tools (tool types < 400 or > 599):

Content	Length 1	Length 2	Length 3
17*	Z	Y	X
18	Y	X	Z
19	X	Z	Y
-17	Z	X	Y
-18	Y	Z	X
-19	X	Y	Z

* Any value which is not 0 and is not one of the six values listed, is treated as value 17.
For values that are the same but with a different sign, assignment of length 1 is always the same, lengths 2 and 3 are reversed.

42950	TOOL_LENGTH_TYPE			-	W1
-	Assignment of tool length compensation independent of tool type			DWORD	SOFORT
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-	-	7/7

Description:

This setting data defines the assignment of the tool length components to the geometry axes independently of the tool type. It can assume any value between 0 and 2. Any other value is interpreted as 0.
Value
0: Assignment as standard. A distinction is made between turning and grinding tools (tool types 400 to 599) and other tools (milling tools).

1: The assignment of the tool length components is independent of the actual tool type, always as for milling tools.

2. The assignment of the tool length components is independent of the actual tool type, always as for turning tools.

The setting data also affects the wear values assigned to the length components.
If setting data SC_TOOL_LENGTH_CONST is set, the tables defined there access the table for milling and turning tools defined by SC_TOOL_LENGTH_TYPE irrespective of the actual tool type, if the value of the table is not equal to 0.

42960	**TOOL_TEMP_COMP**			-	W1
-	Temperature compensation for tool			DOUBLE	SOFORT
-					
-	3	0.0, 0.0, 0.0,0.0, 0.0, 0.0...	-	-	7/7

Description:

Temperature compensation value for the tool. The compensation value acts as vector according to the current rotation of the tool direction.
This setting data will only be evaluated, if temperature compensation has been activated for tools with MD 20390: $MC_TOOL_TEMP_COMP_ON.

Apart from that, the temperature compensation type must be set in bit 2 for the "Compensation in tool direction" MD 32750: TEP_COMP_TYPE.

The "Temperature compensation" is an option that has to be previously enabled.

42970	**TOFF_LIMIT**			-	F2
mm	Upper limit of correction value via $AA_TOFF			DOUBLE	SOFORT
-					
-	3	100000000.0, 100000000.0, 100000000.0...	-	-	7/7

Description:

Upper limit of the offset value which can be defined by means of synchronized actions via the $AA_TOFF system variable.

This limit value influences the absolutely effective amount of offset through $AA_TOFF.

Whether the offset value is within the limit range can be checked via the $AA_TOFF_LIMIT system variable.

42974	**TOCARR_FINE_CORRECTION**			C08	-
-	Fine offset TCARR ON / OFF			BOOLEAN	SOFORT
-					
-	-	FALSE,FALSE,FALSE,FALSE,FALSE, FALSE...	-	-	7/7

Description:

TRUE:
On activating an orientable tool holder, the fine offset values are considered.

FALSE:
On activating an orientable tool holder, the fine offset are not considered.

42980	**TOFRAME_MODE**			-	K2
-	Frame definition at TOFRAME, TOROT and PAROT			DWORD	SOFORT
-					
-	-	1000,1000,1000,1000,1000,1000,1000...	-	-	7/7

Description:

This setting data defines the direction of the X or Y axis in the case of frame definition by means of TOFRAME, TOROT or PAROT.
In the case of these frame definitions, the Z direction is uniquely defined, the rotation around the Z axis is free at first.
This free rotation can be defined by this setting data so that the newly defined frame deviates as little as possible from a previously active frame. In all cases in which the setting data is not zero, an active frame remains unchanged if the Z directions of the old and the new frame are the same.
0: The orientation of the coordinate system is determined by the value of the machine data X_AXIS_IN_OLD_X_Z_PLANE.

1: The new X direction is selected so that it lies in the X-Z plane of the old coordinate system. The angular difference between the old and new Y axes is minimal with this setting.

2: The new Y direction is selected so that it lies in the Y-Z plane of the old coordinate system. The angular difference between the old and new X axes is minimal with this setting.

3: The average of the two settings resulting from 1 and 2 is selected.

Addition of 100:
In the case of a plane change from G17 to G18 or G19, a tool matrix is generated, in which the new axis directions are parallel to the old directions. The axes are correspondingly swapped cyclically(standard transformation with plane changes). If the hundreds digit equals zero, a matrix is supplied in the cases of G18 and G19 which is derived from the unit matrix by simply rotating through 90 degrees around the X axis (G18) or through 90 degrees around the Y axis (G19). Thus in each case one axis is antiparallel to an initial axis. This setting is required to remain compatible with old software versions.

Addition of 1000:
The tool-frame is linked to any active basic frames and settable frames. The response is thus compatible with earlier software versions (before 5.3). If the thousands digit is not set, the tool frame is calculated so that any active basic frames and settable frames are taken into account.

Addition of 2000:
The tool frame is still correctly formed if the frames in the frame chain after the TOOLFRAME contain any values (rotations and translations). This mode is only possible if the system frame for the tool frame is present. The machine data X_AXIS_IN_OLD_X_Z_PLANE is no longer evaluated. All values in the units digit of this setting data that are not equal to 1 or 2 are handled as if the value was three. In particular, the behavior with 2000 is identical to that with 2003. TOFRAME sets the zero point of the workpiece coordinate system to the current position.

42984	**CUTDIRMOD**			C08	-
-	Modification of $P_AD[2] or $P_AD[11]			STRING	SOFORT
-					
-	-		-	-	7/7

Description:

States whether the tool point direction and cutting direction are to be modi-
fied on reading the corresponding system variables $P_AD[2] and $P_AD[11].
Modification is made by rotating the vector of the tool point direction or
cutting direction by a specific angle in the active machining plane (G17-G19).
The resulting output value is always the tool point direction or cutting
direction created by the rotation or to which the rotated value is closest.
the angle of rotation can be defined by one of the following six options:
1: The string is empty. The stated data are output unchanged.
2: The contents of the string is "P_TOTFRAME". The resulting rotation is
determined from the total frame.
3: The contents of the string is a valid frame name (e.g. $P_NCBFRAME[3]). The
resulting rotation is then calculated from this frame.
4: The contents of the string has the form "Frame1 : Frame2". The resulting
rotation is determined from the part frame chain that is created by chaining
all frames from Frame1 to Frame2 (in each case inclusive). Frame1 and Frame2
are valid frame names such as $P_PFRAME or $P_CHBFRAME[5]"
5: The contents of the frame is the valid name of a rotary axis (machine
axis). The resulting rotation is determined from the programmed end position
of this rotary axis. Additionally, an offset can be stated (in degrees, e.g.
"A+90).
6: The rotation is programmed explicitly (in degrees).

Optionally, the first character of the string can be written as sign (+ or -).
A plus sign will not have any effect on the angle calculation, but a minus
sign will invert the sign of the calculated angle.

42990	**MAX_BLOCKS_IN_IPOBUFFER**			-	K1
-	maximum number of blocks in IPO buffer			DWORD	SOFORT
-					
-	-	-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1...	-	-	7/7

Description:

This setting data can be used to delimit the maximum number of blocks in the
interpolation buffer by the maximum number specified in MD MM_IPO_BUFFER_SIZE.
A negative value means that no limitation of the number of blocks is active in
the interpolation buffer, and the number of blocks is determined solely by the
MD MM_IPO_BUFFER_SIZE (default setting).

42995	**CONE_ANGLE**			-	-
-	Taper angle			DOUBLE	SOFORT
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-90	90	7/7

Description:

This setting data writes the taper angle for taper turning. This setting data is written via the operator interface.

1.6.3 Axis-specific setting data

43100	**LEAD_TYPE**			-	M3
-	Defines what is used as master value			DWORD	RESET
CTEQ					
-	-	1	0	2	7/7

Description:

```
Defines which value is to be used as master value:

0: Actual value
1: Setpoint
2: Simulated master value
```

43102	**LEAD_OFFSET_IN_POS**			-	M3
-	Offset of master value if coupled to this axis			DOUBLE	RESET
-					
-	-	0.0	-	-	7/7

Description:

```
Offset of the master value before use on the coupling.

If this axis is a master value coupled following axis with CTABP as the curve
table and X as the master value, then its position setpoint is calculated from
LEAD_OFFSET_OUT_POS + LEAD_SCALE_OUT_POS * CTABP( LEAD_OFFSET_IN_POS +
LEAD_SCALE_IN_POS * X)

Related to ....
    SD 43104: LEAD_SCALE_IN_POS
    SD 43106: LEAD_OFFSET_OUT_POS
    SD 43108: LEAD_SCALE_OUT_POS
```

43104	**LEAD_SCALE_IN_POS**			-	M3
-	Scaling of master value if coupled to this axis			DOUBLE	RESET
-					
-	-	1.0	-	-	7/7

Description:

```
Scaling of the master value before use on the coupling.

If this axis is a master value coupled following axis with CTABP as the curve
table and X as the master value, then its position setpoint is calculated from
LEAD_OFFSET_OUT_POS + LEAD_SCALE_OUT_POS * CTABP( LEAD_OFFSET_IN_POS +
LEAD_SCALE_IN_POS * X)

Related to ....
    SD 43102: LEAD_OFFSET_IN_POS
    SD 43106: LEAD_OFFSET_OUT_POS
    SD 43108: LEAD_SCALE_OUT_POS
```

43106	**LEAD_OFFSET_OUT_POS**			-	M3
mm, degrees	Offset of the functional value of the curve table			DOUBLE	RESET
-					
-	-	0.0	-	-	7/7

Description:

```
Offset of the master value before use on the coupling.

If this axis is a master value coupled following axis with CTABP as the curve
table and X as the master value, then its position setpoint is calculated from
LEAD_OFFSET_OUT_POS + LEAD_SCALE_OUT_POS * CTABP( LEAD_OFFSET_IN_POS +
LEAD_SCALE_IN_POS * X)

Related to ....
    SD 43102: LEAD_OFFSET_IN_POS
    SD 43104: LEAD_SCALE_IN_POS
    SD 43108: LEAD_SCALE_OUT_POS
```

43108	**LEAD_SCALE_OUT_POS**			-	M3
-	Scaling of functional value of the curve table			DOUBLE	RESET
-					
-	-	1.0	-	-	7/7

Description:

```
Scaling of the function value before use of the curve table.

If this axis is a master value coupled following axis with CTABP as the curve
table and X as the master value, then its position setpoint is calculated from
LEAD_OFFSET_OUT_POS + LEAD_SCALE_OUT_POS * CTABP( LEAD_OFFSET_IN_POS +
LEAD_SCALE_IN_POS * X)

Related to ....
    SD 43102: LEAD_OFFSET_IN_POS
    SD 43104: LEAD_SCALE_IN_POS
    SD 43106: LEAD_OFFSET_OUT_POS
```

43120	**DEFAULT_SCALE_FACTOR_AXIS**			-	FBFA
-	Axial default scaling factor with G51 active			DWORD	SOFORT
-					
-	-	1	-	-	7/7

Description:

```
If no axial scaling factor I, J, or K is programmed in the G51 block,
DEFAULT_SCALEFACTOR_AXIS is active. The scaling factor is only active if MD
AXES_SCALE_ENABLE is set.

Related to:
    AXES_SCALE_ENABLE,
    WEIGHTING_FACTOR_FOR_SCALE
```

43200	**SPIND_S**			-	S1
rev/min	Speed for spindle start by VDI			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Spindle speed at spindle start by VDI interface signals DB31,...DBB30.1 and
DB31,...DBB30.2.

Example:  $SA_SPIND_S[S1] = 600
Spindle 1 is started at a speed of 600 rpm upon detection of the positive edge
of one of the above mentioned VDI starting signals.
Speed programming values are entered in the SD by setting bit 4=1 in MD 35035
SPIND_FUNCTION_MASK.
The SD becomes active in JOG as a default speed by setting bit 5=1 in MD 35035
SPIND_FUNCTION_MASK (exception: the value is zero).

Related to:
    SPIND_FUNCTION_MASK
```

43202	**SPIND_CONSTCUT_S**			-	S1
m/min	Const cut speed for spindle start by VDI			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Definition of the constant cutting speed for the master spindle.
The setting data is evaluated at spindle start by the VDI interface signals
DB31,...DBB30.1 and DB31,...DBB30.2.
Cutting speed programming values are entered in the SD by setting bit 8=1 in
MD 35035 SPIND_FUNCTION_MASK.

Related to:
    SPIND_FUNCTION_MASK
```

43206	**SPIND_SPEED_TYPE**			A06	-
-	Spindle speed type for spindle start through VDI			DWORD	SOFORT
-					
-	-	94	93	972	7/7

Description:

```
Definition of the spindle speed type for the master spindle.
The setting data is evaluated via the DBB30 interface at spindle start.
The range of values and the functionality correspond to the 15th G group "feed
type".
Permissible values are the G values: 93, 94, 95, 96, 961, 97, and 971.
With the stated values, a functional distinction has to be made between the
following variants:
```

==> 93, 94, 95, 97 and 971: The spindle is started at the speed in SD 43200 $SA_SPIND_S.

==> 96 und 961: The speed of the spindle is derived from the cutting speed of SD 43202 $SA_SPIND_CONSTCUT_S and the radius of the transverse axis.

The default value is 94 (corresponds to G94).
The default value becomes active if the SD is written with impermissible values.

43210	**SPIND_MIN_VELO_G25**			-	S1
rev/min	Programmed spindle speed limitation G25			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

A minimum spindle speed limit below which the spindle must not fall is entered in SPIND_MIN_VELO_G25. The NCK limits the set spindle speed to this value if it is too low.

The spindle speed may only fall below the minimum for the following:
- Spindle offset 0%
- M5
- S0
- IS "Spindle stop" (DB31, ... DBX8.3)
- IS "Cancel servo enable" (DB31, ... DBX2.1)
- IS "Reset" (DB21, ... DBX35.7)
- IS "Spindle reset" (DB31, ... DBX2.2)
- IS "Oscillation speed" (DB31, ... DBX18.5)
- Cancel S value

SD irrelevant for .....
    other spindle modes used in open-loop control mode (SPOS, M19, SPOSA)
Related to:
    MD 10710: PROG_SD_RESET_SAVE_TAB (from SW 5.3)

43220	**SPIND_MAX_VELO_G26**			-	S1
rev/min	Programmed spindle speed limitation G26			DOUBLE	SOFORT
-					
-	-	1000.0	-	-	7/7

Description:

A maximum spindle speed is entered in SPIND_MAX_VELO_G26, which the spindle must not exceed. The NCK limits an excessive spindle speed setpoint to this value.

SD irrelevant for .....
    all spindle modes except open-loop control mode.

Special cases, errors, ...
    The value in SD: SPIND_MIN_VELO_G26 can be altered by means of:

```
-   G26 S.... in the part program
-   Operator commands via HMI

The value in SPIND_MIN_VELO_G26 is retained after a reset or Power Off.

Related to ....
    SD 43210: SPIND_MIN_VELO_G25 (programmed spindle speed limit G25)
    SD 43230: SPIND_MAX_VELO_LIMS (programmed spindle speed limit G96/961)
    MD 10710: PROG_SD_RESET_SAVE_TAB
```

43230	**SPIND_MAX_VELO_LIMS**			-	S1
rev/min	Spindle speed limitation with G96			DOUBLE	SOFORT
-					
-	-	100.0	-	-	7/7

Description:

```
Limits the spindle speed with G96, G961, G97 to the stated maximum value
[degrees/second]. This setting data can be written from the block with LIMS.

Note:
    MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be set so that the value written by
    the part program is transferred into the active file system on reset (that
    is the value is retained after reset)

Related to ....
    SD 43220: SPIND_MAX_VELO_G26 (maximum spindle speed)
    SD 43210: SPIND_MIN_VELO_G25 (minimum spindle speed)
    MD 10710: PROG_SD_RESET_SAVE_TAB (from SW 5.3)
```

43240	**M19_SPOS**			-, A12	S1
degrees	Spindle position for spindle positioning with M19.			DOUBLE	SOFORT
-					
-	-	0.0	-10000000.0	10000000.0	7/7

Description:

```
Spindle position in [ DEGREES ] for spindle positioning with M19.
The position approach mode is defined in $SA_M19_SPOSMODE.

Default positions must lie in the range 0 <= pos < $MA_MODULO_RANGE.

Path defaults ($SA_M19_SPOSMODE = 2) can be positive or negative and are only
limited by the input format.
```

43250	**M19_SPOSMODE**			-, A12	S1
-	Spindle position approach mode for spindle positioning with M19.			DWORD	SOFORT
-					
-	-	0	0	5	7/7

Description:

```
Spindle position approach mode for spindle positioning with M19.

In which signify:
0:  DC    (default) approach position on the shortest path.
1:  AC    approach position normally.
2:  IC    approach incrementally (as path), sign gives the traversing direction
3:  DC    approach position on the shortest path.
4:  ACP   approach position from the positive direction.
5:  ACN   approach position from the negative direction.
```

43300	**ASSIGN_FEED_PER_REV_SOURCE**			-	V1,P2,S1
-	Revolutional feedrate for positioning axes/spindles			DWORD	SOFORT
CTEQ					
-	-	0	-3	31	7/7

Description:

```
0=  No revolutional feedrate is active.

>0= Machine axis index of the rotary axis/spindle, from which the revolutional
feedrate is derived.

-1= The revolutional feedrate is derived from the master spindle of the chan-
nel in which the axis/spindle is active
-2= The revolutional feedrate is derived from the axis with machine axis index
== 0 or the axis with an index in $MN_AXCONF_LOGIC_MACHAX_TAB == 0.
-3= The revolutional feedrate is derived from the master spindle of the chan-
nel in which the axis/spindle is active. No revolutional feedrate is active if
the master spindle is at a standstill.  Axis/spindle is active.

Related to ....
    SD 42600: JOG_FEED_PER_REV_SOURCE (revolutional feedrate for geometry axes
    on which a frame with rotation acts in JOG mode.)
```

43340	**EXTERN_REF_POSITION_G30_1**			-, A12	FBFA
-	Reference point position for G30.1			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Reference point position for G30.1.
This setting data will be evaluated in CYCLE328.
```

43350	**AA_OFF_LIMIT**			-	S5,FBSY
mm, degrees	Upper limit of offset value $AA_OFF with clearance control			DOUBLE	POWER ON
CTEQ					
-	-	100000000.0	-	-	7/7

Description:

```
The upper limit of the offset value, which can be defined by means of synchro-
nized actions via the variable $AA_OFF.
This limit value acts on the absolutely effective amount of offset by means of
$AA_OFF.

It is used for clearance control in laser machining:
The offset value is limited so that the laser head cannot get caught in the
plate recesses.
Whether the offset value lies within the limit range can be queried via sys-
tem variable $AA_OFF_LIMIT.
```

43400	**WORKAREA_PLUS_ENABLE**			-	A3
-	Working area limitation active in positive direction			BOOLEAN	SOFORT
CTEQ					
-	-	FALSE	-	-	7/7

Description:

```
1:  The working area limitation of the axis concerned is active in the posi-
tive direction.

0:  The working area limitation of the axis concerned is switched off in the
positive direction.

The setting data is parameterized via the operator panel in the operating area
"Parameters" by activating/deactivating the working area limitation.

SD irrelevant for ......
    G code: WALIMOF
```

43410	**WORKAREA_MINUS_ENABLE**			-	A3
-	Working area limitation active in the negative direction			BOOLEAN	SOFORT
CTEQ					
-	-	FALSE	-	-	7/7

Description:

```
1:  The working area limitation of the axis concerned is active in the nega-
tive direction.
0:  The working area limitation of the axis concerned is switched off in the
negative direction.
The setting data is parameterized via the operator panel in the operating area
"Parameters" by activating/deactivating the working area limitation.
SD irrelevant for ......
    G code: WALIMOF
```

43420	**WORKAREA_LIMIT_PLUS**			-	A3
mm, degrees	Working area limitation plus			DOUBLE	SOFORT
-					
-	-	1.0e+8	-	-	7/7

Description:

```
The working area as defined in the basic coordinate system in the positive
direction of the axis concerned can be limited with axial working area limita-
tion.
The setting data can be changed on the operator panel in the operating area
"Parameters".
The positive working area limitation can be changed in the program with G26.

SD irrelevant for ......
    G code: WALIMOF

Related to ....
    SD 43400: WORKAREA_PLUS_ENABLE
```

43430	**WORKAREA_LIMIT_MINUS**			-	A3
mm, degrees	Working area limitation minus			DOUBLE	SOFORT
-					
-	-	-1.0e+8	-	-	7/7

Description:

```
The working area as defined in the basic coordinate system in the negative
direction of the axis concerned can be limited with axial working area limita-
tion.
The setting data can be changed on the operator panel in the operating area
"Parameters".
The negative working area limitation can be changed in the program with G25.

SD irrelevant for ......
    G code: WALIMOF

Related to ....
    SD 43410: WORKAREA_MINUS_ENABLE
```

43500	**FIXED_STOP_SWITCH**			-	F1
-	Selection of travel to fixed stop			BYTE	SOFORT
-					
-	-	0	0	1	7/7

Description:

The "Travel to fixed stop" function to be selected and deselected with this setting data.

SD=0 Deselect "Travel to fixed stop"
SD=1 Select "Travel to fixed stop"

The setting data can only be overwritten by the part program with the command FXS[x]=1/0 when software version 2.x is installed.

The status of the setting data is indicated on the operator panel in the "Parameters" area.

43510	**FIXED_STOP_TORQUE**			-	F1
%	Fixed stop clamping torque			DOUBLE	SOFORT
-					
-	-	5.0	0.0	800.0	7/7

Description:

The clamping torque is entered in this setting data as a % of the maximum motor torque (corresponds to % of max. current value with FDD).

The setting data is active only if the fixed stop has been reached.

The fixed stop is considered reached when,
- with MD: FIXED_STOP_ACKN_MASK, bit 1 = 0 (no acknowledgment required) IS "Fixed stop reached" (DB31, ... DBX62.5) is set by the NC
- with MD: FIXED_STOP_ACKN_MASK, bit 1 = 1 (acknowledgment required) IS "Fixed stop reached" (DB31, ... DBX62.5) is set by the NC and acknowledged by IS "Acknowledge fixed stop reached" (DB31, ... DBX1.1)

The status of the setting data is indicated on the operator panel in the "Parameters" area.

The FXST[x] command effects a block-synchronous change to this setting data. It can also be changed by the user or via the PLC. The value is otherwise transferred from MD: FIXED_STOP_TORQUE_DEF to the setting data when "Travel to fixed stop" is active.

Related to ....
MD 37010: FIXED_STOP_TORQUE_DEF (default setting for clamping torque)

43520	**FIXED_STOP_WINDOW**			-	F1
mm, degrees	Fixed stop monitoring window			DOUBLE	SOFORT
-					
-	-	1.0	-	-	7/7

Description:

The fixed stop monitoring window is entered in this setting data.

The setting data is active only if the fixed stop has been reached.

The fixed stop is considered reached when,
- with MD: FIXED_STOP_ACKN_MASK, bit 1 = 0 (no acknowledgment required) IS "Fixed stop reached" (DB31, ... DBX62.5) is set by the NC
- with MD: FIXED_STOP_ACKN_MASK, bit 1 = 1 (acknowledgment required) IS "Fixed stop reached" (DB31, ... DBX62.5) is set by the NC and acknowledged by IS "Acknowledge fixed stop reached" (DB31, ... DBX1.1)

If the position at which the fixed stop was detected leaves the tolerance band by more than the amount specified in SD 43520: FIXED_STOP_WINDOW, then alarm 20093 "Fixed stop monitoring has responded" is output and the "FXS" function deselected.

The status of the setting data is indicated on the operator panel in the "Parameters" area.

The FXSW[x] command effects a block-synchronous change to this setting data. It can also be changed by the user or via the PLC.

The value is otherwise transferred from MD: FIXED_STOP_WINDOW_DEF to the setting data when "Travel to fixed stop" is active.

Related to ....
MD 37020: FIXED_STOP_WINDOW_DEF (default setting for fixed stop monitoring window)

43600	**IPOBRAKE_BLOCK_EXCHANGE**			A06, A10	K1
%	Block change criterion 'braking ramp'			DOUBLE	SOFORT
-					
-	-	0.0	0	100.0	7/7

Description:

Specifies the application time at single axis interpolation for the block change criterion braking ramp: At 100%, the block change criterion is fulfilled at the time of application of the braking ramp. At 0%, the block change criterion is identical with IPOENDA.

Note:
MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be set so that the value written by the part program is transferred into the active file system on reset (i.e. the value is retained even after reset).

43610	**ADISPOSA_VALUE**			A06, A10	P2
mm, degrees	Tolerance window 'braking ramp'			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
In case of single-axis interpolation, this value defines the size of the tole-
rance window which the axis must have reached in order to enable a block
change in case of the block-change criterion 'braking ramp with tolerance win-
dow valid' and when reaching the corresponding  % value of the braking ramp
($SA_IPOBRAKE_BLOCK_EXCHANGE).

Note:
By means of the MD 10710 $MN_PROG_SD_RESET_SAVE_TAB,  the user can specify
that the value written by the part program is transferred into the active file
system in case of a reset (i.e. the value is retained even after the reset).
```

43700	**OSCILL_REVERSE_POS1**			-	P5
mm, degrees	Oscillation reversal point 1			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Position of the oscillating axis at reversal point 1.

Note:
    MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value writ-
    ten by the part program is transferred to the active file system on reset
    (that is the value is retained after RESET.)

Application example(s)
NC language:      OSP1[Axis]=Position

Related to ....
    OSCILL_REVERSE_POS2
```

43710	**OSCILL_REVERSE_POS2**			-	P5
mm, degrees	Oscillation reversal point 2			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Position of the oscillating axis at reversal point 2.
Note:
    MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value writ-
    ten by the part program is transferred to the active file system on reset
    (that is the value is retained after reset.)
Application example(s)
NC language:      OSP2[Axis]=Position
Related to ....
    OSCILL_REVERSE_POS1
```

43720	**OSCILL_DWELL_TIME1**			-	P5
s	Hold time at oscillation reversal point 1			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Hold time of the oscillating axis at reversal point 1.

Note:
    MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value writ-
    ten by the part program is transferred to the active file system on reset
    (that is the value is retained after RESET.)

Application example(s)
    NC language:      OST1[Axis]=Position

Related to ....
    OSCILL_DWELL_TIME2
```

43730	**OSCILL_DWELL_TIME2**			-	P5
s	Hold time at oscillation reversal point 2			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Hold time of the oscillating axis at reversal point 2.

Note:
    MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value writ-
    ten by the part program is transferred to the active file system on reset
    (that is the value is retained after RESET.)

Application example(s)
    NC language:      OST2[Axis]=Position

Related to ....
    OSCILL_DWELL_TIME1
```

43740	**OSCILL_VELO**			-	P5
mm/min, rev/min	Feedrate of reciprocating axis			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Feed rate of the oscillating axis
Note:
    MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value writ-
    ten by the part program is transferred to the active file system on reset
    (that is the value is retained after RESET.)
Application example(s)
    NC language:      FA[Axis]=F value
```

43750	**OSCILL_NUM_SPARK_CYCLES**			-	P5
-	Number of spark-out strokes			DWORD	SOFORT
-					
-	-	0	-	-	7/7

Description:

```
Number of sparking-out strokes performed after ending the oscillating movement

Application example(s)
    NC language:      OSNSC[Axis]=Stroke number

Note:
    MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value writ-
    ten by the part program is transferred to the active file system on reset
    (that is the value is retained after reset.)
```

43760	**OSCILL_END_POS**			-	P5
mm, degrees	End position of the reciprocating axis			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Position the oscillating axis travels to after ending the sparking-out stro-
kes.

Note:
MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value written by
the part program is transferred to the active file system on reset (that is
the value is retained after reset.)

Application example(s)
    NC language:      OSE[Axis]=Position
```

43770	**OSCILL_CTRL_MASK**			-	P5
-	Oscillation sequence control mask			DWORD	SOFORT
-					
-	-	0	-	-	7/7

Description:

```
Bit mask:
Bit no.       | Meaning in OSCILL_CTRL_MASK
-----------------------------------------------------------------------------
0(LSB)-1     | 0: Stop at the next reversal point if the
             |    oscillating movement is switched off
             |
             | 1: Stop at reversal point 1 if the
             |    oscillating movement is switched off
             | 2: Stop at reversal point 2 if the
             |    oscillating movement is switched of
             | 3: Do not approach a reversal point when the oscillating move-
ment is switched off
             |    if no sparking-out strokes are programmed
-----------------------------------------------------------------------------
2            | 1: Approach end position after sparking out
-----------------------------------------------------------------------------
3            | 1: If the oscillating movement is aborted by delete distance-
to-go,
             |    then the sparking-out strokes are to be executed afterwards
             |    and the end position approached if necessary
-----------------------------------------------------------------------------
4            | 1: If the oscillating movement is aborted by delete distance-
to-go,
             |    then the corresponding reversal point
             |    is approached on switch off
-----------------------------------------------------------------------------
5            | 1: Changed feedrate does not become active until the next
reversal point
-----------------------------------------------------------------------------
6            | 1: Path override is active if the feed rate is 0,
             |    otherwise speed override is active
-----------------------------------------------------------------------------
7            | 1: In the case of rotary axes DC (shortest path)
-----------------------------------------------------------------------------
8            | 1: Execute sparking-out stroke as single stroke not as double
stroke
-----------------------------------------------------------------------------
9            | 1: On starting, first approach the starting position, see
             |    $SA_OSCILL_START_POS
-----------------------------------------------------------------------------

Application example(s)
NC language:       OSCTRL[Axis]=(setting options, reset options)
```

43780	**OSCILL_IS_ACTIVE**			-	P5
-	Activate oscillation movement			BOOLEAN	SOFORT
-					
-	-	FALSE	-	-	7/7

Description:

```
Switching the oscillating movement on and off

Note:
    MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value writ-
    ten by the part program is transferred to the active file system on reset
    (that is the value is retained after reset.)

Application example(s)
    NC language:      OS[Axis]=1, OS[Axis]=0
```

43790	**OSCILL_START_POS**			-	-
mm, degrees	Start position of reciprocating axis			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
Position approached by the oscillating axis at the start of oscillation if
this is set in $SA_OSCILL_CTRL_MASK.

Note:
    MD 10710 $MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value writ-
    ten by the part program is transferred to the active file system on reset
    (that is the value is retained after reset.)
```

43900	**TEMP_COMP_ABS_VALUE**			-	K3
-	Position-independent temperature compensation value			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
The position-independent temperature compensation value is defined by SD:
TEMP_COMP_ABS_VALUE.
This value is to be defined by the PLC (user program) as a function of the
current temperature.
The machine axis traverses this additional compensation value as soon as the
position-independent temperature compensation has been activated (MD:
TEMP_COMP_TYPE = 1 or 3).

SD irrelevant for ......
    MD: TEMP_COMP_TYPE = 0 or 2

Related to ....
    MD: TEMP_COMP_TYPE             Temperature compensation type
    MD: COMP_ADD_VELO_FACTOR       Velocity overshoot caused by compensation
```

43910	**TEMP_COMP_SLOPE**			-	K3
-	Lead angle for position-dependent temperature compensation			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
In the case of position-dependent temperature compensation, the error curve
characteristic of the temperature-dependent actual-value deviation can often
be approximated by a straight line. This straight line is defined by a refe-
rence point P_0 and a lead tanß.
SD: TEMP_COMP_SLOPE defines the lead tanß. This lead can be changed by the PLC
user program as a function of the current temperature.
The axis traverses additionally the compensation value calculated for the cur-
rent actual position as soon as the position-dependent temperature compensa-
tion becomes active (MD: TEMP_COMP_TYPE = 2 or 3).
MD: COMP_ADD_VELO_FACTOR limits the maximum lead angle tanß_max of the error
curve. This maximum lead angle cannot be exceeded.

SD irrelevant for ......
    MD: TEMP_COMP_TYPE = 0 or 1

Special cases, errors, ......
    When TEMP_COMP_SLOPE is greater than tanß_max , the lead tanß_max is used
    to calculate the position-dependent temperature compensation value inter-
    nally. No alarm is output.

Related to ....
    MD: TEMP_COMP_TYPE                        Temperature compensation type

    SD: TEMP_COMP_REF_POSITION     Reference position for position-dependent
    temperature compensation

    MD: COMP_ADD_VELO_FACTOR       Velocity overshoot caused by compensation
```

43920	**TEMP_COMP_REF_POSITION**			-	K3
-	Ref. position of position-dependent temperature compensation			DOUBLE	SOFORT
-					
-	-	0.0	-	-	7/7

Description:

```
In the case of position-dependent temperature compensation, the error curve
characteristic of the temperature-dependent actual-value deviation can often
be approximated by a straight line. This straight line is defined by a refe-
rence point P_0 and a lead tanß.
SD: TEMP_COMP_REF_POSITION defines the position of the reference point P_0.
This reference position can be changed by the PLC user program as a function
of the current temperature.
```

```
The axis traverses additionally the compensation value calculated for the cur-
rent actual position as soon as the position-dependent temperature compensa-
tion becomes active (MD: TEMP_COMP_TYPE = 2 or 3).

SD irrelevant for ......
    MD: TEMP_COMP_TYPE = 0 or 1

Related to ....
    MD: TEMP_COMP_TYPE            Temperature compensation type
    SD: TEMP_COMP_SLOPE           Lead angle for position-dependent tempera-
    ture compensation
```

1.7 Machine data compile cycles

Number	Identifier			Display filters	Reference
Unit	Name			Data type	Active
Attributes					
System	Dimension	Default value	Minimum value	Maximum value	Protection

Description:

```
Description
```

1.7.1 Channel-specific machine data compile cycles

62500	CLC_AXNO			-	-
-	Axis assignment for clearance control			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	-2	maximale Achszahl im Kanal	7/2

Description:

```
0: Deactivates the clearance control

x with x> 0:
Activates the 1D clearance control for the channel axis with the axis number
indicated under x. This axis must not be a modulo rotary axis.

x with x < 0: Activates the 3D clearance control.
Activation of the 3D clearance control requires configuration of at least one
of the two possible 5-axis transformations in the channel.

-   -1: With x = -1 the first 5-axis transformation (16 <=transformer type <=149)
    configured with $MC_TRAFO_TYPE_x in the 1st channel is selected for clearance
    control.
-   -2: With x = -2 the second 5-axis transformation configured in the 1st channel
    is selected.

The overlaid motion acts on the axes configured as linear axes in the first
three elements of $MC_TRAFO_AXES_IN_x of the selected transformation.

Configuration of 3- and 4-axis transformations is permissible (2D clearance
control).
```

Restriction:
- Only one of the linear axes involved in clearance control must be configured as master axis of a gantry grouping.
- No axis of the clearance control must be configured as slave axis of a gantry grouping.
- Erroneous configurations are rejected after power ON with CLC alarm 75000.

62502	**CLC_ANALOG_IN**			-	-
-	Analog input for clearance control			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1	1	8	7/2

Description:

The machine data defines the number of the analog input that is used for the clearance sensor.

Differing from the functions realized in the interpolator (synchronized actions) the input of the clearance control cannot be influenced via PLC interface DB10 DBW148ff.

62504	**CLC_SENSOR_TOUCHED_INPUT**			-	-
-	Assignment of an input bit for the signal			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0	-40	40	7/2

Description:

This machine data defines the digital input that is used for collision monitoring.

Requirements:
- The clearance sensor has a "sensor collision" signal.
- The numbering of the digital inputs corresponds to the numbering of the corresponding system variables: $A_IN[x], with x = number of the digital input.
- Example: 3rd input on the 2nd input byte: $MC_CLC_SENSOR_TOUCHED_INPUT = 11 ; 3 + 1 * 8

Negative values result in the corresponding input signal being used internally inverted (fail-safe).

See section 2.4, page 3/TE1/2-14 for sensor collision monitoring.

62505	**CLC_SENSOR_LOWER_LIMIT**			-	-
-	Lower motion limit of the clearance control			DOUBLE	RESET
-					
-	mm / inch	-5.0,-10.0,0,0,0,0,0,0	-x.x	0.0	7/2

Description:

```
This machine data consists of 2 field elements:
-   CLC_SENSOR_LOWER_LIMIT[0]
With the first field element the lower limit for the deviation from the sen-
sor-controlled machine position from the programmed position is set.
As soon as the limit is reached, the following PLC signal is set and CLC alarm
75020 is displayed:
    - DB21 DBB37.4
-   CLC_SENSOR_LOWER_LIMIT[1]
The second field element limits the value of the maximum
lower limit that can be programmed.
```

62506	**CLC_SENSOR_UPPER_LIMIT**			-	-
-	Upper motion limit of the clearance control			DOUBLE	RESET
-					
-	mm / inch	10.0,40.0,0,0,0,0,0,0	0.0	+x.x	7/2

Description:

```
This machine data consists of 2 field elements:
-   CLC_SENSOR_UPPER_LIMIT[0]
With the first field element the upper limit for the deviation from the sen-
sor-controlled machine position from the programmed position is set.
As soon as the limit is reached, the following PLC signal is set and CLC alarm
75021 is displayed:
    - DB21 DBB37.5
-   CLC_SENSOR_UPPER_LIMIT[1]
The second field element limits the value of the maximum upper limit that can
be programmed.
```

62508	**CLC_SPECIAL_FEATURE_MASK**			-	-
-	Special functions + CLC modes			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
Bit 0 and bit 1:
Alarm reaction on reaching the CLC motion limits: This machine data configu-
res the alarm reaction on reaching the motion limits set with MD62505 and
MD62506 or programmed with CLC_LIM .

Bit 0 = 0:
    Alarm 75020 does not stop program execution. The alarm can be acknowledged
    by pressing the Cancel key.
Bit 0 = 1
    Alarm 75020 stops program execution at the lower limit. The alarm can only
    be acknowledged with reset.
Bit 1 = 0
    Alarm 75021 does not stop program execution. The alarm can be acknowledged
    by pressing the Cancel key.
Bit 1 = 1
    Alarm 75021 stops program execution at the upper limit. The alarm can only
    be acknowledged with reset.


Bit 4:
Operation as online tool length compensation in orientation direction

Bit 4 = 0
    Clearance control works as usual.
Bit 4 = 1
    Unlike the clearance control the analog input does not specify a velocity,
    but directly an offset position instead. In this case, the ordinate of the
    selected sensor characteristic $MC_CLC_SENSOR_VELO_TABLE_x is interpreted
    in mm or inch instead of in mm/min (inch/min).

    This operating mode can be used for testing purposes and for
implementing a 3D tool length compensation. The analog value is
thereby not read in in position controller cycle, but in IPO cycle.
In this operating mode, a normal influence or definition of the analog
values by the PLC is possible via DB10 DBW148ff.
The input used must have been activated through the following
machine data: MD10300 $MN_FASTIO_ANA_NUM_INPUTS


Bit 5:
Mode for rapid retraction in position controller cycle
```

```
Bit 5 = 0:
    Clearance control works as usual.
Bit 5 = 1:
    The analog input is inactive. If the digital input configured with MD62504
    is activated (inverted, if required), a retraction motion will start in the
    same position controller cycle that corresponds to an analog signal speci-
    fication of +10V during operation as "Online tool length compensation" (see
    bit 4).
The digital input signal that starts the retraction movement cannot be influ-
enced by the PLC. In addition to the reaction in the position controller, the
input "sensor collision" and the subsequent stop of the path motion is handled
in the interpolator. This signal branch can be influenced by the PLC through
default signals DB10 DBB0ff.


Bit 8:
Mode for alarm output when the lower motion limit is reached.

Bit 8 = 0:
    Alarm 75020 is displayed.
Bit 8 = 1:
    Alarm 75020 will not be displayed, if the alarm reaction after
reaching of the CLC movement limits (bit 0) was configured without program
execution stop: bit 0 = 0


Bit 9:
Mode for alarm display when the upper motion limit is reached.

Bit 9 = 0:
    Alarm 75021 is displayed.
Bit 9 = 1:
    Alarm 75021 will not be displayed, if the alarm reaction on reaching the
    CLC motion limits (bit 0) was configured without program execution stop:
    bit 1 = 0


Bit 14:
Synchronization of the start position with single-axis clearance control.

Bit 14 = 0:
    If the clearance control has been configured for one axis only (MD62500),
    the current actual position of the next part program block on clearance
    control power OFF with CLC(0) is synchronized for this axis only.

Bit 14 = 1:
    If the clearance control has been configured for one axis only (MD62500),
    the current actual positions of the next part program block on clearance
    control power OFF with CLC(0) are synchronized for all axes.
This setting is required only for those applications for which a single-axis
clearance control is used together with a 3/4/5-axis transformation (e.g. pipe
cutting with rotating workpiece) and when an axis
 jump in the CLC axis or alarm: "Channel %1 Axis %2 System error 550010" occur
at the first traversing block after CLC (0).
```

62510	**CLC_SENSOR_VOLTAGE_TABLE_1**			-	-
-	Coordinate voltage interpol. pts. sensor characteristic 1			DWORD	RESET
-					
-	Volt	- 10.0,10.0,0.0,0.0,0.0,0.0,0.0,0.0	-10.0	+10.0	7/2

Description:

```
This machine data defines the voltage values of sensor characteristic 1. The
corresponding velocity value must be entered under the same index i of this
machine data:
MD62511 $MC_CLC_SENSOR_VELO_TABLE_1[i]

For the simplest case it will suffice to define the characteristic via two
interpolation points as a symmetrical straight through the zero point:

Example:
-   $MC_CLC_SENSOR_VOLTAGE_TABLE_1[ 0 ] = -10.0; Volt
-   $MC_CLC_SENSOR_VOLTAGE_TABLE_1[ 1 ] = 10.0; Volt
-   $MC_CLC_SENSOR_VELO_TABLE_1[ 0 ] = 500.0; mm/min
-   $MC_CLC_SENSOR_VELO_TABLE_1[ 1 ] = -500.0; mm/min

For all field elements of the machine data not used in the example
value 0.0 must be set.

If the defined sensor characteristic creates an incorrect control direction,
i.e. after power ON of the clearance control the sensor "flees" from the work-
piece, the control direction can be corrected either by  reversing the pola-
rity of the sensor signal at the I/O module, or by changing the sign in front
of the voltage values in the machine data.

Notes on how to define the sensor characteristic:
-   A point with velocity value 0 must not stand at the end of the table.
-   The characteristic must be monotonic, i.e. the velocity values above the vol-
    tage must either only rise or only fall.
-   The characteristic must not have any jumps in the velocity sequence, i.e. it
    is not permissible to define different velocities for the same voltage value.
-   The characteristic must have at least two interpolation points.
-   Do not enter more than 5 interpolation points (3 for 840D prior to SW 5.3)
    with positive or with negative velocity.
-   Characteristics that do not go directly throught the zero point may influence
    the clearance normalization set on the clearance sensor.
```

62511	**CLC_SENSOR_VELO_TABLE_1**			-	-
-	Coordinate velocity interpol. pts. sensor characteristic 1			DWORD	RESET
-					
-	mm / min	2000.0,-2000.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/2

Description:

This machine data defines the velocity values of sensor characteristic 1. The corresponding voltage value must be entered under the same index i of the machine data:
MD62510 $MC_CLC_SENSOR_VOLTAGE_TABLE_1[i]
Additional information on how to define the characteristic is available in the description of machine data MD62510.

62512	**CLC_SENSOR_VOLTAGE_TABLE_2**			-	-
-	Coordinate voltage interpol. pts. sensor characteristic 2			DWORD	RESET
-					
-	Volt	-10.0,10.0,0.0,0.0,0.0,0.0,0.0,0.0	-10.0	+10.0	7/2

Description:

This machine data defines the voltage values of sensor characteristic 2.

Additional information on how to define the characteristic is available in the description of machine data MD62510.

62513	**CLC_SENSOR_VELO_TABLE_2**			-	-
-	Coordinate velocity interpol. pts. sensor characteristic 2			DWORD	RESET
-					
-	mm / min	2000.0,-2000.0,0.0,0.0,0.0,0.0,0.0,0.0...	-	-	7/2

Description:

This machine data defines the voltage values of sensor characteristic 2.

Additional information on how to define the characteristic is available in the description of machine data MD62510.

62516	**CLC_SENSOR_VELO_LIMIT**			-	-
-	Velocity of the clearance control motion			DWORD	RESET
-					
-	Prozent	100.0,100.0,100.0,100.0,100.0,100.0...	0.0	100.0	7/2

Description:

```
1D clearance control
This machine data defines the maximum traversing velocity of the overlaid con-
trol motion as a percentage value of the max. residual axis velocity from the
maximum value of the next clearance-controlled axis:
-   MD32000 $MA_MAX_AX_VELO[x]

2D/3D clearance control
With 2D or 3D clearance control the maximum velocity of the slowest clearance-
controlled axis multiplied with the root of 2 or with the root of 3 is used as
reference value.
```

62517	**CLC_SENSOR_ACCEL_LIMIT**			-	-
-	Acceleration of the clearance control movement			DWORD	RESET
-					
-	Prozent	100.0,100.0,100.0,100.0,100.0,100.0...	0.0	100.0	7/2

Description:

```
1D clearance control
This machine data defines the maximum acceleration of the
overlaid control motion as a percentage value of the max. residual
axis velocity from the maximum value of the next
clearance-controlled axis:
-   MD32300 $MA_MAX_AX_ACCEL[x]

2D/3D clearance control
With 2D or 3D clearance control the maximum velocity of the slowest clearance-
controlled axis multiplied with the root of 2 or with the root of 3 is used as
reference value.
```

62520	**CLC_SENSOR_STOP_POS_TOL**			-	-
-	Pos.tolerance for status report "Clearance control standstill"			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0,0	-2	maximale Achszahl im Kanal	7/2

Description:

```
With the clearance control active and in order to achieve the exact stop con-
dition (G601/G602), not only the axis involved in the programmed traversing
motion, but also the clearance-controlled axes must have reached their exact
stop conditions.
The exact stop condition of the clearance control is defined via a
position window and a dwell time:

-   MD62520 $MC_CLC_SENSOR_STOP_POS_TOL
-   MD62521 $MC_CLC_SENSOR_STOP_DWELL_TIME

If the clearance control or the clearance-controlled axes are within the posi-
tion tolerance during the parameterized dwell time, the exact stop condition
of the clearance control is fulfilled.

Setting notes:
If the clearance control should not be able to keep the parameterized posi-
tion window for the corresponding dwell time, the following alarm will be dis-
played in certain situations:

-   Alarm "1011 Channel Channel number System error 140002"

In order to avoid the alarm or in case the alarm occurred, the following
measures must be taken:
1. Switch on the clearance control with the typical machining clearance bet-
ween the clearance sensor and a small metal sheet.
2. Tap on the metal sheet so that the laser head performs visible adjustment
motions. After these adjustment movements are completed, do not touch the
metal sheet again.
3. If the interface signal "flickers" after the tapping or after release of
the process gas:
    - DB31, ... DBX60.7 (position reached with fine exact stop)
... ,the following machine data will have to be adjusted:
    - MD36010 $MA_STOP_LIMIT_FINE (increase)
    - MD62520 $MC_CLC_SENSOR_STOP_POS_TOL(increase)
    - MD62521 $MC_CLC_SENSOR_STOP_DWELL_TIME (shorten)

The changes to the machine data will become active only after NCK-POWER ON-
RESET. The clearance control therefore may have to be switched on again after
NC start.
```

62521	**CLC_SENSOR_STOP_DWELL_TIME**			-	-
-	Delay standstill clearance control			DWORD	RESET
-					
-	s	0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1	0.0	-	7/2

Description:

This machine data defines the dwell time for reaching the exact stop conditi-
ons of the clearance control.
The corresponding position tolerance must be entered in machine data:
- MD62520 $MC_CLC_SENSOR_STOP_POS_TOL

Additional information on the exact stop condition of the clearance control is
available in the description of machine data MD62520.

Related to:
The set dwell time must not be longer than the maximum delay for reaching the
exact stop condition parameterized in the following machine data:
- MD36020 $MA_POSITIONING_TIME
.

62522	**CLC_OFFSET_ASSIGN_ANAOUT**			-	-
-	Change the setpoint clearance of the overlaid sensor signal			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0	-8	+8	7/2

Description:

This machine data defines the analog output, the output value of which is sub-
tracted from the input voltage of the clearance sensor.
The numbering of the analog output corresponds to the numbering of the rele-
vant system variables: $A_OUTA[x], with x = number of the analog output.
The analog output can be used through variable $A_OUTA[n] both block-synchro-
nous from a part program or asynchronous via a synchronized action.

62523	**CLC_LOCK_DIR_ASSIGN_DIGOUT**			-	-
-	Assignment digital output interlocking CLC motion			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0,0,0	-40	+40	7/2

Description:

```
This machine data consists of 2 field elements:
-   CLC_LOCK_DIR_ASSIGN_DIGOUT[0]
The first field element defines the digital output through which the negative
motion direction of the clearance control can be locked.
-   CLC_LOCK_DIR_ASSIGN_DIGOUT[1]
The second field element defines the digital output through which the posi-
tive motion direction of the clearance control can be locked.

Entering the negative output number will invert the evaluation of the swit-
ching signal.

Example:
Digital output 1 ($A_OUT[1]) shall lock the negative motion direction; digi-
tal output 2 ($A_OUT[2]) shall lock the positive motion direction:
-   MD62523 $MC_CLC_LOCK_DIR_ASSIGN_DIGOUT[0] = 1
-   MD62523 $MC_CLC_LOCK_DIR_ASSIGN_DIGOUT[1] = 2

With the corresponding system variables interlocking of the relevant motion
direction can be switched on or off either block-synchronous in the part pro-
gram or asynchronous via synchronized actions.
-   Interlock of the negative motion direction ON/OFF
$A_OUT[1] = 1 / 0
-   Interlock of the positive motion direction ON/OFF
$A_OUT[2] = 1 / 0

Switching signal inversion
-   MD62523 $MA_CLC_LOCK_DIR_ASSIGN_DIGOUT[0] = -1
-   Interlock of the negative motion direction ON/OFF
$A_OUT[1] = 0 / 1
```

62524	**CLC_ACTIVE_AFTER_RESET**			-	-
-	Clearance control active after RESET			BOOLEAN	NEW CONF
-					
-	-	0,0,0,0,0,0,0,0	-	-	7/2

Description:

```
1D clearance control
This machine data parameterizes the RESET behavior (program end RESET or NC
RESET) of the 1D clearance control.
-   CLC_ACTIVE_AFTER_RESET = 0
After RESET the clearance control is switched off analog to the part program
command CLC(0).
-   CLC_ACTIVE_AFTER_RESET = 1
After RESET the cleance control maintains its current status.
3D clearance control
This machine data does not effective with a 3D clearance control. The
clearance control will in this case always be switched off after RESET.
```

62525	**CLC_SENSOR_FILTER_TIME**			-	-
-	Time constant of PT1 sensor filtering			DWORD	RESET
-					
-	s	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	0.0	-	7/2

Description:

This machine data parameterizes the time constant for the PT1 filter of the clearance control (corresponds to an RC element).
With the PT1 filter, the higher-frequency noise components in the input signal of the clearance control can be diminished.

The filter's effect can be observed through the function-specific display data (see section 2.7, page 3/TE1/2-33).

A value of zero switches the filter off completely.

Note:
Any additional time constant in the control loop reduces the max. achievable control loop dynamics.

62528	**CLC_PROG_ORI_AX_MASK**			-	-
-	Axis screen of the direction axes			DOUBLE	-
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.000	99999.0	7/2

Description:

Each bit of the axis screen refers to the channel axis[n+1] depending on its bit index n. Only exactly 3 bits can be set according to the three direction axes of the compensation vector. The bits are evaluated in ascending order.

The first channel axis parameterized like that corresponds to the X coordinate of the compensation vector. The second channel axis to the Y coordinate, and so on.

62529	**CLC_PROG_ORI_MAX_ANGLE**			-	-
-	Limit angle			DOUBLE	-
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.000	99999.0	7/2

Description:

Permissible limit angle between tool orientation and CLC direction

62530	**CLC_PROG_ORI_ANGLE_AC_PARAM**			-	-
-	Index of the display variables f. the current differential angle			DOUBLE	-
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.000	99999.0	7/2

Description:

```
Index n of system variable $AC_PARAM[n] in which the current differential
angle between tool orientation and CLC direction is output.
```

62560	**FASTON_NUM_DIG_OUTPUT**			-	-
-	Configuration of the switching output			BYTE	POWER ON
-					
-	-	0,0,0,0,0,0,0,0,0,0,0,0,0	0	4	7/2

Description:

```
This machine data indicates the number of the onboard output (1...4) assigned
to the switching signal.

Output of the switching signal is deactivated with 0.
```

62561	**FASTON_OUT_DELAY_MICRO_SEC**			-	-
-	Still missing			DOUBLE	-
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.000	99999.0	7/2

Description:

```
Still missing
```

62571	**RESU_RING_BUFFER_SIZE**			-	-
-	Ring buffer size (block buffer)			DWORD	POWER ON
-					
-	-	1000,1000,1000,1000,1000,1000,1000,1000...	10	1000000	7/2

Description:

```
The block buffer includes the geometrical information for the part program.
The value entered in the machine data corresponds to the number of loggable
part program blocks (with 32 byte / part program block). The block buffer size
corresponds to the number of retrace-capable blocks.
```

62572	**RESU_SHARE_OF_CC_HEAP_MEM**			-	-
-	RESU share of the parameterized heap memory			DOUBLE	-
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.000	99999.0	7/2

Description:

```
The heap memory size available for all compile cycles is parameterized by
general machine data:
-   MD28105 $MC_MM_NUM_CC_HEAP_MEM

The RESU machine data can limit the max. heap memory share available for RESU.
```

62573	**RESU_INFO_SA_VAR_INDEX**			-	-
-	Indices of the synchronized action variables used			DWORD	POWER ON
-					
-	-	-1,-1,-1,-1,-1,-1,-1,-1	-1	10000	7/2

Description:

```
Reserved. This machine data must not be used.
```

62574	**RESU_SPECIAL_FEATURE_MASK**			-	-
-	Additional RESU characteristics			DOUBLE	-
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.000	99999.0	7/2

Description:

```
Bit 0
Reserved. Must not be used.

Bit 1

Bit 1 = 0:(default) (recommended setting)
    RESU main program CC_RESU.MPF is created in the dynamic memory area of the
    NC (DRAM).
Bit 1 = 1:
    RESU main program CC_RESU.MPF is created in the battery-buffered part pro-
    gram memory (SRAM).

Bit 2
Bit 2 = 0:(default)
    The following RESU-specific subroutines are created as user cycles:
    - CC_RESU_INI.SPF
    - CC_RESU_END.SPF
    - CC_RESU_BS_ASUP.SPF
    - CC_RESU_ASUP.SPF
Bit 2 = 1:(recommended setting)
    The RESU-specific subroutines (see above) are created as OEM cycles.
```

```
Bit 3

Bit 3 = 0: (default)
    No effect (see under bit 3 = 1).
Bit 3 = 1: (recommended setting, if bit 2 = 1)
    If the RESU-specific subroutines (see above) are created as OEM cycles, and
    if during NC start RESU-specific subroutines are nevertheless available as
    user cycles, these will be cancelled without prior checkback.
```

62575	**RESU_SPECIAL_FEATURE_MASK_2**			-	-
-	Additional RESU properties			DOUBLE	-
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.000	99999.0	7/2

Description:

```
Bit 0

Bit 0 = 0: (default) (recommended settings)
    For continued machining, a block search with contour calculation beginning
    at the part program start is used.
Bit 0 = 1:
    In order to accelerate that machining is continued, 2 different block
    search types are used:
-   From part program start to the last main block: block search without calcu-
    lation
-   From the last main block to the current part program block: block search with
    contour calculation
```

62580	**RESU_WORKING_PLANE**			-	-
-	Working plane			DWORD	RESET
-					
-	-	1000,1000,1000,1000,1000,1000,1000...	1	3	7/2

Description:

```
This machine data determine the working plane of RESU. It should be assigned
the  value:
1 :  for G17 ( first and second geometry axis) working plane
2 :  for G18 ( first and third geometry axis) working plane
3 :  for G19 ( second and third geometry axis) working plane
```

62600	**TRAFO6_KINCLASS**			-	-
-	Kinematics class			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1	1	2	7/2

Description:

```
The following kinematics classes can be indicated:
-   Standard transformation: 1
-   Special transformation: 2
```

62601	**TRAFO6_AXES_TYPE**			-	-
-	Axis type for transformation [axis no.]: 0...5			DWORD	POWER ON
-					
-	-	1,1,1,3,3,3	1	4	7/2

Description:

```
This machine data identifies the axis type used in the transformation.

The following axis types can be indicated:
-   Linear axis: 1
-   Rotary axis: 3 (4)
```

62602	**TRAFO6_SPECIAL_KIN**			-	-
-	Special kinematics type			DOUBLE	POWER ON
-					
-	-	1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0	-	-	7/2

Description:

```
This machine data identifies the type of special kinematics.

The following special kinematics are available:
-   5-axis articulated arm with coupling of axis 2 to axis 3: 1
-   2-axis SCARA with forced coupling to tool: 3
-   3-axis SCARA with degrees of freedom X, Y, A: 4
-   2-axis articulated arm with coupling of axis 1 to axis 2: 5
-   4-axis SCARA with coupling of axis 1 to axis 2: 7
```

62603	**TRAFO6_MAIN_AXES**			-	-
-	Basic axis identification			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1	1	12	7/2

Description:

```
This machine data identifies the type of basic axis assignment. Normally, the
first 3 axes are the basic axes.

The following basic axis assignments are included:
-   SS (gantry): 1
-   CC (SCARA): 2
-   NR (articulated arm): 3
-   SC (SCARA): 4
-   RR (articulated arm): 5
-   CS (SCARA): 6
-   NN (articulated arm): 7
```

62604	**TRAFO6_WRIST_AXES**			-	-
-	Identification of the hand axes			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1	1	6	7/2

Description:

This machine data identifies the robot hand type. Normally, axes 4 to 6 are the robot hand.

The following hand types are included:
- No hand: 1
- Central hand: 2
- Beveled hand with elbow: 6

62605	**TRAFO6_NUM_AXES**			-	-
-	Number of transformed axes			DWORD	POWER ON
-					
-	-	3,3,3,3,3,3	2	5	7/2

Description:

This machine data identifies the number of axes involved in the transformation.

Package 2.3 (810D) or 4.3 (840D) support kinematics with a max. of 5 axes.

62606	**TRAFO6_A4PAR**			-	-
-	Axis 4 parallel / antiparallel to the last basic axis			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0	2	5	7/2

Description:

This machine data identifies whether the 4th axis is parallel / antiparallel to the last rotary basic axis.

This machine data only applies for kinematics with more than 3 axes.
- Axis 4 is parallel / antiparallel: 1
- Axis 4 is not parallel: 0

62607	**TRAFO6_MAIN_LENGTH_AB**			-	-
-	Basic axis length A and B, n = 0...1			DOUBLE	POWER ON
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

This machine data identifies the basic axis lengths A and B. These lengths are particularly defined for each basic axis type.
- n = 0: basic axis length A
- n = 1: basic axis length B

62608	**TRAFO6_TX3P3_POS**			-	-
-	Attachment of the hand (position share), n = 0...2			DOUBLE	POWER ON
-					
-	mm	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
This machine data identifies the position share of frame TX3P3 connecting the
basic axes with the hand.
-   Index 0: X component
-   Index 1: Y component
-   Index 2: Z component
```

62609	**TRAFO6_TX3P3_RPY**			-	-
-	Attachment of the hand (rotation share), n = 0...2			DOUBLE	POWER ON
-					
-	Grad	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
This machine data identifies the orientation share of frame TX3P3 connecting
the basic axes with the hand.
-   Index 0: rotation with RPY angle A
-   Index 1: rotation with RPY angle B
-   Index 2: rotation with RPY angle C
```

62610	**TRAFO6_TFLWP_POS**			-	-
-	Frame between hand pt. and flange coordinate system, n = 0...2			DOUBLE	POWER ON
-					
-	mm	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
This machine data identifies the position share of frame TFLWP that connects
-   Index 0: X component
-   Index 1: Y component
-   Index 2: Z component
```

62611	**TRAFO6_TFLWP_RPY**			-	-
-	Frame between hand point and flange coordinate system, n = 0...2			DOUBLE	POWER ON
-					
-	Grad	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
This machine data identifies the orientation share of frame
TX3P3 that connects
-   Index 0: rotation with RPY angle A
-   Index 1: rotation with RPY angle B
-   Index 2: rotation with RPY angle C
```

62612	**TRAFO6_TIRORO_POS**			-	-
-	Frame between foot pt. and int. coordinate system, n = 0...2			DOUBLE	POWER ON
-					
-	mm	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
This machine data identifies the position share of frame TIRORO that connects
-   Index 0: X component
-   Index 1: Y component
-   Index 2: Z component
```

62613	**TRAFO6_TIRORO_RPY**			-	-
-	Frame between foot pt. and int. coordinate system, n = 0...2			DOUBLE	POWER ON
-					
-	Grad	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
This machine data identifies the orientation share of frame TIRORO that con-
nects
-   Index 0: rotation with RPY angle A
-   Index 1: rotation with RPY angle B
-   Index 2: rotation with RPY angle C
```

62614	**TRAFO6_DHPAR4_5A**			-	-
-	Parameter A for configuration of the hand, n = 0...1			DOUBLE	POWER ON
-					
-	mm	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
This machine data identifies length a.
-   n = 0: transition axis 4 to 5
-   n = 1: transition axis 5 to 6
```

62615	**TRAFO6_DHPAR4_5D**			-	-
-	Parameter D for configuration of the hand, n = 0...1			DOUBLE	POWER ON
-					
-	mm	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
This machine data identifies length d.
-   n = 0: transition axis 4 to 5
-   n = 1: transition axis 5 to 6
```

62616	**TRAFO6_DHPAR4_4ALPHA**			-	-
-	Parameter ALPHA for configuration of the hand, n = 0...1			DOUBLE	POWER ON
-					
-	Grad	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
This machine data identifies angle a.
-   n = 0: transition axis 4 to 5
-   n = 1: transition axis 5 to 6
```

62617	**TRAFO6_MAMES**			-	-
-	Offset of math. to mech. zero point [axis no.]: 0...5			DOUBLE	POWER ON
-					
-	Grad	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
This machine data can specify an adjustment of the zero point for a rotary
axis to the mathematical zero point specified by the transformation.
```

62618	**TRAFO6_AXES_DIR**			-	-
-	Adjustm. of the phys. and math. dir. of rot. [axis no.]: 0...5			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1	-1	1	7/2

Description:

```
This machine data can adjust the mathematical and physical direction of rota-
tion
of the axes.
-   +1: same direction of rotation
-   -1: different direction of rotation
```

62619	**TRAFO6_DIS_WRP**			-	-
-	Medium distance between hand point and singularity			DOUBLE	POWER ON
-					
-	mm	10.0,10.0,10.0,10.0, 10.0,10.0	-	-	7/2

Description:

```
Through this machine data a limit value for the distance between the hand
point and the singularity can be entered.

Inactive!
```

62620	**TRAFO6_AXIS_SEQ**			-	-
-	Axis reorganization			DOUBLE	POWER ON
-					
-	mm	1,2,3,4,5,6	1	6	7/2

Description:

```
This machine data can reverse the order of the axes in order to transfer a
kinematic system into a standard kinematic system.
```

62621	**TRAFO6_SPIN_ON**			-	-
-	Triangular or acme-screw spindles available			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0	0	1	7/2

Description:

```
This machine data identifies whether triangular spindles or acme connections
are available.
-   0: not available
-   1: available

This function is currently not supported.

MD62621 must be set to 0. Machine data MD62622 through MD62628 are thus inac-
tive!
```

62622	**TRAFO6_SPIND_AXIS**			-	-
-	Axis on which the triangular spindle has an effect, n = 0...2			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0	0	5	7/2

Description:

```
This machine data identifies for which axis a triangular spindle is active. A
maximum of 3 triangular spindles may be available.
-   n = 0: 1st triangular axis
-   n = 1: 2nd triangular axis
-   n = 2: 3rd triangular axis
```

62623	**TRAFO6_SPINDLE_RAD_G**			-	-
-	Radius G for triangular axis, n = 0...2			DOUBLE	POWER ON
-					
-	mm	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
This machine data identifies radius G for the n-th triangular spindle.
```

62624	**TRAFO6_SPINDLE_RAD_H**			-	-
-	Radius H for triangular axis, n = 0...2			DOUBLE	POWER ON
-					
-	mm	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
This machine data identifies radius H for the n-th triangular spindle.
```

62625	**TRAFO6_SPINDLE_SIGN**			-	-
-	Sign for triangular spindle, n = 0...2			DWORD	POWER ON
-					
-	-	1,1,1,1,1,1,1,1	-1	1	7/2

Description:

```
This machine data identifies the sign for the adjustment of the direction of
rotation for the n-th triangular spindle.
```

62626	**TRAFO6_SPINDLE_BETA**			-	-
-	Angular offset for triangular spindles, n = 0...2			DOUBLE	POWER ON
-					
-	Grad	0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

This machine data identifies offset angle b for adjustment of the zero point for the n-th triangular spindle.

62627	**TRAFO6_TRP_SPIND_AXIS**			-	-
-	Axes driven by acme spindle, n = 0...1			DWORD	POWER ON
-					
-	-	0,0,0,0,0,0	0	5	7/2

Description:

This machine data identifies which axes are driven by an acme connection.
- n = 0: axis driven by an acme
- n = 1: coupling axis

62628	**TRAFO6_TRP_SPIND_LEN**			-	-
-	Acme length, n = 0...3			DOUBLE	-
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0...	0.000	99999.0	7/2

Description:

This machine data specifies the lengths of the acme connection.

62629	**TRAFO6_VELCP**			-	-
-	Cartesian velocity [no.]: 0...2			DOUBLE	SOFORT
-					
-	mm/min	10000.00,10000.00,10000.00,10000.00...	-	-	7/2

Description:

This machine data can specify a velocity for the Cartesian directions of traversing blocks with G0.
- n = 0: velocity in X direction
- n = 1: velocity in Y direction
- n = 2: velocity in Z direction

62630	**TRAFO6_ACCCP**			-	-
-	Cartesian accelerations [no.]: 0...2			DOUBLE	SOFORT
-					
-	m/s2	2.0,2.0,2.0,2.0,2.0,2.0	-	-	7/2

Description:

```
This machine data can specify an acceleration for the Cartesian directions of
traversing blocks with G0.
-   n = 0: velocity in X direction
-   n = 1: velocity in Y direction
-   n = 2: velocity in Z direction
```

62631	**TRAFO6_VELORI**			-	-
-	Orientation angle velocities [no.]: 0...2			DOUBLE	SOFORT
-					
-	Umdr./min	10.0,10.0,10.0,10.0,10.0,10.0	-	-	7/2

Description:

```
This machine data can specify a velocity for the orientation angles of traver-
sing blocks with G0.
-   n = 0: velocity angle A
-   n = 1: velocity angle B
-   n = 2: velocity angle C
```

62632	**TRAFO6_ACCORI**			-	-
-	Orientation angle accelerations [no.]: 0...2			DOUBLE	SOFORT
-					
-	Grad/s2	1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0	-	-	7/2

Description:

```
This machine data can specify an acceleration for the orientation angles of
traversing blocks with G0.
-   n = 0: velocity angle A
-   n = 1: velocity angle B
-   n = 2: velocity angle C
```

62633	**TRAFO6_REDVELJOG**			-	-
-	Reduction factor velocity in JOG [no.]: 0...2			DOUBLE	SOFORT
-					
-	%	10.0,10.0,10.0,10.0,10.0,10.0	-	-	7/2

Description:

```
Inactive!
```

1.7.2 Axis-specific machine data compile cycles

63540	**CC_MASTER_AXIS**			-	-
-	Indicates the corresponding CC_Master axis for a CC_Slave axis			DWORD	RESET
-					
-	-	0,0,0,0,0,0,0,0	0	8	7/2

Description:

```
With a value (n) higher than 0 the axis is a CC_Slave axis. The machine data
indicates the corresponding CC_Master axis. The machine axis number is ente-
red here.
The machine axis and axis name can be found in the channel-specific machine
data.
-   MD20070 $MC_AXCONF_MACHAX_USED[n-1]
-   MD20080 $MC_CHANAX_NAME_TAB[n-1]

Notice:
CC_Master and CC_Slave must have the same axis type (linear or rotary axis).
CC_Master and CC_Slave must not be a spindle.
CC_Master and CC_Slave must not be replacement axes.
If the axes are dynamically different, it is recommended to make the weaker
axis the CC_Master axis.

The machine data may be changed only when the coupling has been
switched off.
```

63541	**CC_POSITION_TOL**			-	-
-	Monitoring window (only applies to a CC_Slave axis)			DOUBLE	RESET
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	0	99999999.999	7/2

Description:

```
Monitoring window. (Only applies to a CC_Slave axis)
The difference of the actual values between the CC_Master and CC_Slave
must always range within this window. Otherwise an alarm will be
displayed.

The following applies:
d   = | actual [CC_Master ] - (actual[CC_Slave] + offset) | d <= MD63541
Offset= position difference between CC_Master and CC_Slave when switching on
the coupling.

Monitoring is switched off with value 0.
```

63542	**CC_PROTEC_MASTER**			-	-
-	Indicates the corresponding PMaster axis for a PSlave axis			DOUBLE	-
-					
-	-	0.0	0.000	99999.0	7/2

Description:

```
With a value (n) higher than 0 the axis is a PSlave axis. The machine data
indicates the corresponding PMaster axis.

The machine axis and the axis name can be found in the channel-specific
machine data:
-   MD20070 $MC_AXCONF_MACHAX_USED[n-1]
-   MD20080 $MC_CHANAX_NAME_TAB[n-1]

Notice:
PMaster and PSlave must have the same axis type (linear or rotary axis).
```

63543	**CC_PROTEC_OPTIONS**			-	-
-	Still missing			DOUBLE	-
-					
-	-	0.0	0.000	99999.0	7/2

Description:

```
Bit 0 - bit 3 for PMaster and PSlave

Bit 0 = 1
    Retraction in PLUS
Bit 1 = 1
    Factor 1.2 for max. braking acceleration
Bit 2 = 1
    Monitoring can be activated even without a referenced axis
Bit 3 = 1
    Reverse the direction of retraction, if the axis is the master axis


Bit 4 - bit 7 only for PSlave

Bit 4 = 1
    Monitoring always active (otherwise ON/OFF via PLC)
Bit 5
    Reserve
Bit6
    Reserve
Bit 7
    Display active protection in DBx, DBX66.0
```

63544	**CC_COLLISION_WIN**			-	-
-	Collision protection window			DOUBLE	RESET
-					
-	-	1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0	-	-	7/2

Description:

```
Minimum distance between this (PSlave) axis and the specified PMaster axis.
With a value smaller than 0, the monitoring function cannot be activated. The
value for the PSlave axis is used only.
```

63545	**CC_OFFSET_MASTER**			-	-
-	Monitoring window (only applies to a CC_Slave axis)			DOUBLE	RESET
-					
-	-	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	-	-	7/2

Description:

```
Work offset between PSlave and PMaster.
The value for the PSlave axis is used only.
```

SINAMICS-Parameter 2

Note

A detailed description of the SINAMICS parameters is provided in the following publication:

LH1, SINAMICS_S Parameter Manual

An overview together with a brief description of the SINAMICS parameters is provided in the following publication:

LIS1, Parameter Manual 1

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Suggestions and/or Corrections

Siemens AG A&D MC MS P. O. Box 3180 D-91050 Erlangen Federal Republic of Germany Fax +49 (0) 9131 98 - 63315[Documentation] mailto:docu.motioncontrol@siemens.com	Suggestions Corrections for Publication/Manual SINUMERIK 840D sl, 840Di sl Detailed Maschine Data Description (AMDsl) Manufacturer/Service documentation
From Name: Company/Dept. Address :_____ Telephone : _____ / _____ Telefax : _____ / _____ email : _____	Order No.: - 11/2006 Edition Should you come across any printing errors when reading this publication, please notify us on this sheet. Suggestions for improvements are also welcome.

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