



Installing, starting up, and operating the AXC F 1152, AXC F 2152 and AXC F 3152 controllers

User manual

User manual

Installing, starting up, and operating the AXC F 1152, AXC F 2152 and AXC F 3152 controllers

UM EN AXC F X152, Revision 08

2020-09-30

This user manual is valid for:

Designation	As of version (HW)	As of version (FW)	Order No.
AXC F 1152	03	2020.0 LTS	1151412
AXC F 2152	03	2020.0 LTS	2404267
AXC F 3152	01	2020.3	1069208



Before starting up the controller, observe the following:

- Make sure you always operate the controller with the latest firmware version.

The current firmware version can be downloaded at:

- AXC F 1152: phoenixcontact.net/product/1151412
- AXC F 2152: phoenixcontact.net/product/2404267
- AXC F 3152: phoenixcontact.net/product/1069208

- Observe the change notes regarding the firmware version.
- If necessary, update the firmware.

For information on running firmware updates, refer to “[Web-based management \(WBM\)](#)” on [page 81](#) and [Section A 3](#).

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1 For your safety

Read this user manual carefully and keep it for future reference.

1.1 Identification of warning notes



This symbol indicates hazards that could lead to personal injury.

There are three signal words indicating the severity of a potential injury.

DANGER

Indicates a hazard with a high risk level. If this hazardous situation is not avoided, it will result in death or serious injury.

WARNING

Indicates a hazard with a medium risk level. If this hazardous situation is not avoided, it could result in death or serious injury.

CAUTION

Indicates a hazard with a low risk level. If this hazardous situation is not avoided, it could result in minor or moderate injury.



This symbol together with the **NOTE** signal word warns the reader of actions that might cause property damage or a malfunction.



Here you will find additional information or detailed sources of information.

1.2 Qualification of users

The use of products described in this user manual is oriented exclusively to:

- Electrically skilled persons or persons instructed by them. The users must be familiar with the relevant safety concepts of automation technology as well as applicable standards and other regulations.
- Qualified application programmers and software engineers. The users must be familiar with the relevant safety concepts of automation technology as well as applicable standards and other regulations.

1.3 Field of application of the product

1.3.1 Intended use

The AXC F 1152 and AXC F 2152 controllers are modular small-scale controllers. The AXC F 3152 is a modular controller that can be used for smaller and medium-sized applications. The devices comply with the IP20 protection class and are designed for use in closed control cabinets or control boxes (terminal boxes) with an IP54 degree of protection or higher.

The devices are designed for use in industrial environments.

1.4 Product changes

Modifications to the device hardware are not permitted.

Incorrect operation or modifications to the devices can endanger your safety or damage the devices. Do not repair the devices yourself. If a device is defective, please contact Phoenix Contact.

1.5 Safety notes

Observe the country-specific installation, safety, and accident prevention regulations.



NOTE: Property damage due to impermissible stress

The IP20 degree of protection (IEC 60529/EN 60529) requires that the device is used in a clean and dry environment. If you use the device in an environment that is outside of the specified limits, this may cause damage to the device.

- Do not subject the device to mechanical and/or thermal loads that exceed the specified limits.



NOTE: Electrostatic discharge

The device contains components that can be damaged or destroyed by electrostatic discharge. When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) in accordance with EN 61340-5-1 and IEC 61340-5-1.



NOTE: Device failure due to foreign objects in device

Foreign objects in the device can lead to malfunctions or even device failure.

- Ensure that no foreign objects find their way into the device (e.g., into the vents).



NOTE: Device failure if operated outside the permitted ambient temperature range

Operating the device in ambient temperatures that are not within the permitted range may lead to malfunctions or even device failure.

- Ensure that the device is operated within the permitted ambient temperature range, see [Section 14.3](#) and [Section 14.4](#).

**NOTE: Device failure due to vibrations and shock levels above the permitted specifications during operation**

If the device is subjected to vibrations and shock levels above the permitted specifications during operation, this may lead to malfunctions or even device failure.

- Ensure that the permitted specifications for vibrations and shocks are adhered to when operating the device, see [Section 14.3](#) and [Section 14.4](#).

**NOTE: Device defect due to polarity reversal**

Polarity reversal puts a strain on the electronics and can damage the device.

- To protect the device, avoid reversing the poles of the 24 V supply.

**Please note:**

The service interface currently has no function.

The service interface is intended for connecting a PC. The service interface is not intended for connecting other peripheral devices.

1.6 Security in the network

**NOTE: Risk of unauthorized network access**

Connecting devices to a network via Ethernet always entails the risk of unauthorized access to the network.

Therefore, please check your application for the option of deactivating active communication channels (e.g., FTP, DCP, HTTP, HTTPS, etc.), or setting passwords to prevent third parties from accessing the controller without authorization and modifying the system.

Due to its communication interfaces, the controller should not be used in safety-critical applications unless additional security appliances are used.

Please take additional protective measures in accordance with the IT security requirements and the standards applicable to your application (e.g., virtual networks (VPN) for remote maintenance access, firewalls, etc.) for protection against unauthorized network access.

On first request, you shall release Phoenix Contact and the companies associated with Phoenix Contact GmbH & Co. KG, Flachsmarktstraße 8, 32825 Blomberg, Germany in accordance with §§ 15 ff AktG (German Stock Corporation Act), hereinafter collectively referred to as “Phoenix Contact”, from all third-party claims made due to improper use.

For the protection of networks for remote maintenance via VPN, Phoenix Contact offers the mGuard product range of security appliances, a description of which you will find in the latest Phoenix Contact catalog (phoenixcontact.net/products).

Additional measures for protection against unauthorized network access are listed in the AH EN INDUSTRIAL SECURITY application note. The application note can be downloaded at phoenixcontact.net/product/2404267.

1.7 UL warning notes

Valid for AXC F 1152 and AXC F 2152

If the device is not used in the specified manner, the protection provided by the device may be impaired.

SELV - Limited energy according UL/IEC/EN 61010-1 or NEC Class 2

1.8 Notes on using the AXC F 2152 controller in potentially explosive areas



Please note:

From 2020 on, the AXC F 2152 is available with approval for potentially explosive areas. In this case, the approval is printed on the device.

- Before using the device in a potentially explosive area, make sure that your device has the required approval.

The indicators and certificate numbers of the available approvals are printed on the device:

-  II 3 G Ex ec IIC T4 Gc
- TÜV 19 ATEX 8356 X
- IECEx TUR 19.0031X

Approval in accordance with ATEX directive 2014/34/EU and IECEx scheme



WARNING: Explosion hazard

- Please make sure that the following notes and instructions are observed.

The category 3 device is designed for installation in zone 2 potentially explosive areas.

The device satisfies the requirements of EN/IEC 60079-0 and EN/IEC 60079-7.

Installation, operation, and maintenance must only be carried out by qualified electricians.

The IP20 degree of protection (IEC 60529/EN 60529) of the device is intended for use in a clean and dry environment. Do not subject the device to mechanical and/or thermal loads that exceed the specified limits.

The device must be stopped and immediately removed from the Ex area if it is damaged, was subjected to an impermissible load, stored incorrectly or if it malfunctions.

The device is not designed for use in atmospheres with a danger of dust explosions.

This device must be installed in an area that is no longer classified as pollution degree 2 in accordance with IEC 60664-1.

If this device is used in a zone 2 environment, it must be installed in a housing that at least meets the requirements of IP54 degree of protection in accordance with IEC 60079-7 or another degree of protection in accordance with IEC 60079-0, section 1.

- Follow the installation instructions as described.

- When installing and operating the device, observe the applicable regulations and safety directives (including national safety directives), as well as general technical regulations. The safety-relevant data is included in this packing slip, the user manual and on the certificates (manufacturer's declaration, additional approvals where applicable). All documents can be downloaded at phoenixcontact.net/product/2404267.
- Observe the specified conditions for use in potentially explosive areas. Also observe the requirements of EN 60079-14.
- Opening or modifying the device is prohibited. Do not repair the device yourself, but replace it with an equivalent device. Repairs may only be carried out by the manufacturer. The manufacturer is not liable for damage resulting from non-compliance.
- The following work is only permitted in potentially explosive areas when the power is disconnected:
 - Snapping the device onto the DIN rail
 - Removing the device from the DIN rail
 - Connection and disconnection of cables
 - Inserting and removing the SD card
- Connect the DIN rail to protective earth ground.
- The switches of the device that can be accessed may only be actuated when the power supply to the device is disconnected or when it has been ensured that there is no potentially explosive atmosphere present.
- For safe operation, lockable plug connections must have a functional interlock (e.g., locking clip, screw connection, etc.). Insert the interlock. Repair any damaged connectors immediately.
- For safe operation with the plug-in parameterization memory (SD card), it must be completely plugged in and snapped into place.
- For safe operation, all interfaces at the device must be used or covered.
- Please note the following derating values:

Table 1-1 Temperature derating of the AXC F 2152 depending on the altitude

Altitude (above sea level)	Maximum ambient temperature (supply via bus base module)
Up to 2000 m	55°C
2000 m ... 3000 m	49°C

2 Transport, storage, and unpacking

2.1 Transport

The device is delivered in cardboard packaging.

- Only transport the device to its destination in its original packaging.
- Observe the instructions on how to handle the package, as well as the moisture, shock, tilt, and temperature indicators on the packaging.
- Observe the humidity specifications and the temperature range specified for transport (see [Section 14.3](#) and [Section 14.4](#)).
- Protect the surfaces as necessary to prevent damage.
- When transporting the equipment or storing it temporarily, make sure that the surfaces are protected from the elements and any external influences, and that they are kept dry and clean.

2.2 Storage

The storage location must meet the following requirements:

- Dry
- Protected from unauthorized access
- Protected from harmful environmental influences such as UV light
- Temperature range: -40°C ... +85°C
- Air pressure: 58 kPa ... 106 kPa (up to 4500 m above sea level)
- Permissible humidity: 5% ... 95% (in accordance with DIN EN 61131-2)

2.3 Unpacking

The controller is supplied in packaging, together with a packing slip with installation instructions.

- Read the complete packing slip carefully before unpacking the controller.

**NOTE: Electrostatic discharge**

The device contains components that can be damaged or destroyed by electrostatic discharge. When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) in accordance with EN 61340-5-1 and IEC 61340-5-1.

**NOTE: Property damage due to noncompliance with ESD notes**

If the ESD notes are not observed during unpacking and packaging, the device may become damaged.

- Observe the ESD notes during unpacking and packaging.

Checking the delivery

- Check the delivery for transport damage.

Damaged packaging is an indicator of potential damage to the device that may have occurred during transport. This could result in a malfunction.

- Submit claims for any transport damage immediately, and inform Phoenix Contact or your supplier as well as the shipping company without delay.
- Enclose photos clearly documenting the damage to the packaging and/or delivery together with your claim.
- Immediately upon delivery, refer to the delivery note to ensure that the delivery is complete.

**Scope of supply for
AXC F 1152 and
AXC F 2152**

- Controller AXC F 1152 or AXC F 2152
- AXL BS BK bus base module
- AXL CN S/UL supply connector

**Scope of supply for
AXC F 3152**

- AXC F 3152 controller
- AXC BS L 30 bus base module
- AXL CN S/UL supply connector

3 Description of the controllers

3.1 General description of the controllers

The AXC F 1152 and AXC F 2152 controllers are modular small-scale controllers. The AXC F 3152 is a modular controller with an integrated Ethernet and Axioline F local bus connection.

The controllers consist of an electronics module (1) and a bus base module (2).

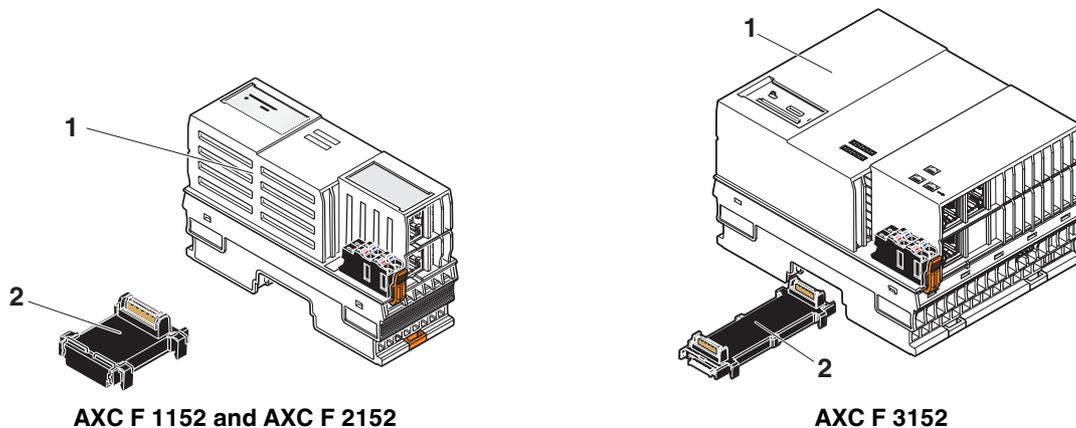


Figure 3-1 Components of the controller

Axioline F station

An Axioline F station is created by connecting Axioline F modules to the controller. The Axioline F local bus (referred to as local bus in this document) is implemented by arranging bus base modules side by side.

Inline station

As an alternative to an Axioline F station, you can create a PLCnext Inline station using the controller. To do so, you need the AXC F IL ADAPT Inline adapter terminal (Order No. 1020304). You can directly align the Inline modules to the Inline adapter terminal.

Programming

The controllers can be configured and programmed in accordance with IEC 61131 using the PLCnext Engineer automation software.

In addition or as an alternative to the programming languages specified in IEC 61131-3, you can also use the C++ or MATLAB® Simulink® programming languages. The individual programs or program parts can be programmed in any development environment (e.g., Eclipse, Microsoft® Visual Studio®, etc.). These programs or program parts must then be imported into PLCnext Engineer as a library.

Integrated Ethernet interfaces

The AXC F 1152 and AXC F 2152 controllers feature two switched Ethernet interfaces for TCP/IP / UDP/IP communication within the Ethernet network.

The AXC F 3152 controller features three independent Ethernet interfaces for TCP/IP / UDP/IP communication within the Ethernet network.

PROFINET controller/device functionality

The PROFINET protocol can be used via the Ethernet interfaces of the controllers. In this case, the controller can be used as a PROFINET controller or PROFINET device, depending on the configuration.



For additional information on how to integrate your controller as a PROFINET controller or device, please refer to the PLCnext Engineer online help.

Axioline F local bus

There is an interface to the Axioline F local bus on the bottom of the controller. Bus base modules are used to carry the communications voltage and the bus signals from the controller through the Axioline F station. A bus base module is supplied with the controllers.

Up to 63 Axioline F modules can be connected to the controllers. The modules are connected to the right of the controller. The maximum number of modules that can be operated depends on the current consumption of the modules. The total current consumption of all devices connected to the controller must not exceed the maximum current that the controller supplies for the local bus.



NOTE: Electronics may be damaged when overloaded

Observe the current consumption of each device when configuring an Axioline F station. The current consumption is specified in each module-specific data sheet and may vary. The possible number of devices that can be connected depends on the structure of the Axioline F station.

Left-alignment of Axioline F extension modules

- You can connect **one** Axioline F extension module to the left of the **AXC F 2152** using the AXC BS L 2 bus base module.



Please note:

The AXC BS L 2 bus base module is not supplied with the AXC F 2152. For the ordering data for the bus base module, please refer to [Section “Ordering data” on page 91](#).

- You can connect one AXC F XT IB Axioline F extension module to the left of the **AXC F 3152** using the supplied AXC BS L 30 bus base module. Connection of the left-alignable AXC F XT ETH 1TX Ethernet interface is not supported yet.
- Axioline F extension modules **cannot** be aligned to the left of the **AXC F 1152**.

The following left-alignable Axioline F extension modules are currently available:

- AXC F XT ETH 1TX (Order No. 2403115):
Left-alignable Ethernet interface
- AXC F XT IB (Order No. 2403018):
Left-alignable INTERBUS master for the connection of up to 255 INTERBUS remote bus devices



For the INTERBUS master, please note:

The left-alignable AXC F XT IB INTERBUS master and the AXC F IL ADAPT Inline adapter terminal **cannot** be used simultaneously.

**Axioline F/
system and firmware**

For system-specific information on the Axioline F system, please refer to the PLCnext Engineer online help and the “Axioline F: System and installation” (UM EN AXL F SYS INST) and “Axioline F: Diagnostic registers and error messages” (UM EN AXL F SYS DIAG) user manuals.
The user manuals can be downloaded at phoenixcontact.net/product/2404267.

**MRP (only AXC F 1152 and
AXC F 2152)**

The MRP (Media Redundancy Protocol) can be used via the Ethernet interfaces of the controller. The controller supports the MRP client function, which can be enabled or disabled via an engineering tool (e.g., PLCnext Engineer). This function is disabled in delivery state. If the function is enabled, it remains enabled after the supply voltage is switched off and on. If the controller has been reset to the delivery state, the MRP client function will also be disabled again. In a ring with Media Redundancy Protocol, maximum switch-over times of up to 200 ms can be expected.

**Parameterization
memory/SD card**

The controllers have an internal parameterization memory. This memory can be used to store programs and configurations which belong to your project, e.g., the visualization project. If the internal parameterization memory is not large enough for your application, the controllers can be operated using an SD card. The SD card is optional and not required to operate the controllers.



The SD card is not included in the scope of delivery of the controller.

- Only use an SD card provided by Phoenix Contact (see [Section “Ordering data” on page 91](#)).



NOTE: Damage to the SD card after formatting

The SD card is already formatted (ext4 format) and is intended for use with Phoenix Contact controllers of the PLCnext Control product family. If you format the SD card, certain information on the SD card that is required for use with Phoenix Contact devices will be lost. After formatting, you can no longer use the SD card to operate the controller.

- Ensure that the SD card is not formatted.

**Data buffering/backup in
the event of voltage
failures**

In the event of a supply voltage failure, the AXC F 3152 saves control data, e.g., retain data and log files, on the inserted parameterization memory (SD card).

The device firmware recognizes the voltage failure. The retain data (variables of the controller that are marked as “Retain” in the PLCnext Engineer project) and log files are automatically backed up on the parameterization memory.



NOTE: Startup of the AXC F 3152 not ensured

For proper startup of the device, the supply voltage may be switched on at the earliest 30 seconds after the diagnostic and status indicators go out.

Visualization

You can create visualizations for the controller using the HMI integrated in PLCnext Engineer.

Real-time clock

In the event that the supply voltage fails, the real-time clock integrated in the controllers is buffered, see [Section “Ordering data and technical data” on page 91](#).

**Function extensions using
PLCnext apps**

You can easily extend the scope of functions of the controllers using apps from the PLCnext Store.
Visit the PLCnext Store at plcnextstore.com.

3.2 Licensing information regarding open-source software

The controllers work with a Linux operating system.

License information for the individual Linux packages can be found in the file system of the controller under:

`/usr/share/common-licenses`



Information on the directory structure of the file system can be found in [Section 3.4](#).

Alternatively, you can also call up the license information via the web-based management system of the controller, see [Section 9](#).

Notes on LGPL software libraries

All open-source software used in the product is subject to the respective license terms that are not affected by the Phoenix Contact Software License Terms (SLT) for the product. In particular, the license holder can change the respective open-source software in accordance with the applicable license terms. If the license holder wishes to change an LGPL software library contained in this product, reverse engineering is permitted for debugging such modifications.

Notes on OpenSSL

This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. (<http://www.openssl.org/>).

This product includes cryptographic software written by Eric Young (eay@cryptsoft.com).

3.3 Requesting the source code

The controllers contain software components that are licensed by the rights holder as free software or open-source software under the GNU General Public License.

You can request the source code of these software components in the form of a CD or DVD-ROM for a processing fee of 50 euros within three years after delivery of the controller. To do so, contact the Phoenix Contact After Sales Service in writing at the following address:

PHOENIX CONTACT GmbH & Co. KG
After Sales Service
Flachmarktstraße 8
32825 Blomberg
GERMANY

Subject: "Source Code AXC F 1152", "Source Code AXC F 2152", or "Source Code AXC F 3152"

3.4 Directory structure of the file system

The controllers work with a Linux operating system. You can access the controller via SFTP or via SSH and view the directories and files on the file system (on the internal parameterization memory and on the optional SD card) and modify them as necessary.



Information on the directory structure of the file system can be found at the [PLCnext Technology Info Center](#).

3.5 Using SFTP to access the file system

The file system (on the internal parameterization memory and on the SD card of the controller) is accessed via the SFTP protocol. An SFTP client software is required for this (e.g., WinSCP).

Access to the file system via SFTP requires authentication with a user name and password.



Please note:

Authentication with a user name and password is **always** required for SFTP access and cannot be deactivated.

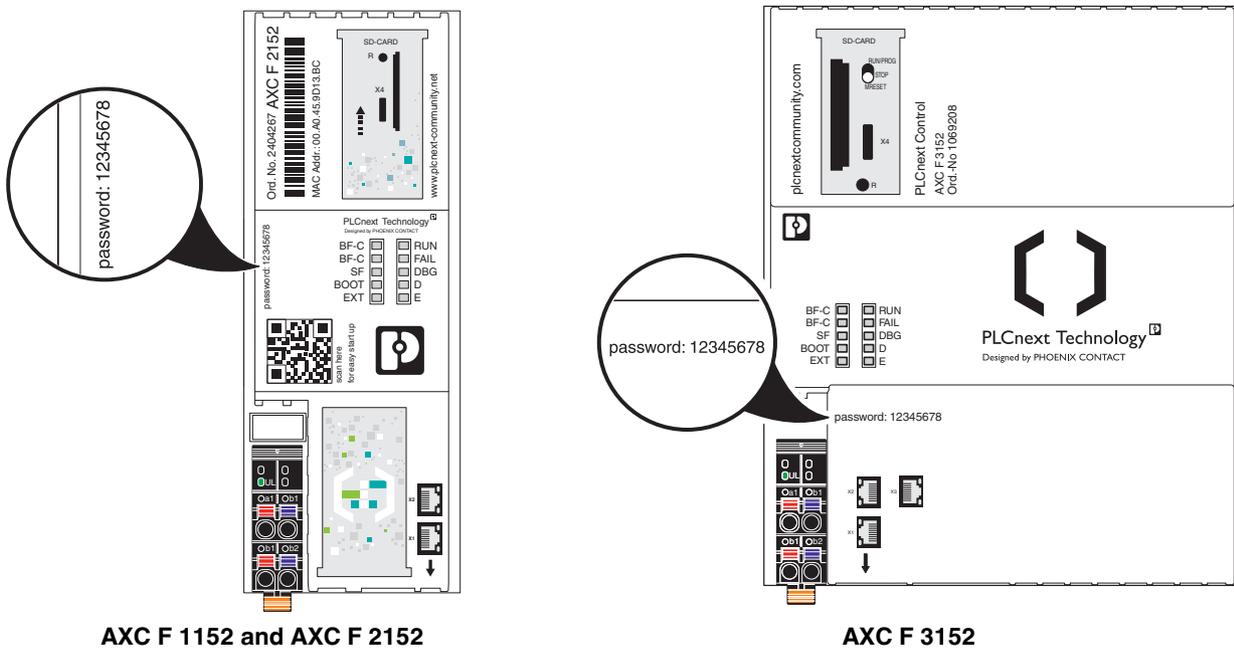
Only users with administrator rights can access the file system.

You can create additional users with administrator rights in the web-based management system of the controller. For additional information, please refer to the [PLCnext Technology Info Center](#).

In the delivery state, the following access data with administrator rights is preset:

User name: admin

Password: printed on the controller (see Figure 3-2).



AXC F 1152 and AXC F 2152

AXC F 3152

Figure 3-2 Administrator password on the controller

3.6 Firewall



The firewall of the controller is deactivated by default.

Recommended:

- Activate the firewall.

For information on the firewall, please refer to the [PLCnext Technology Info Center](#).

3.7 Possible fields of application of the controller

3.7.1 The controller as a distributed controller of an Axioline F station

The controller can be used as a distributed controller of an Axioline F station that is connected to an Ethernet system. A maximum of 63 devices (Axioline F modules) can be connected to the controller. The maximum number of alignable devices depends on the current consumption of the devices. The total current consumption of all devices aligned on the controller must not exceed the maximum current that the controller supplies for the local bus (1 A at an ambient temperature $\leq 55^{\circ}\text{C}$). If the current consumption exceeds the maximum current, use the AXL F PWR 1H power module.

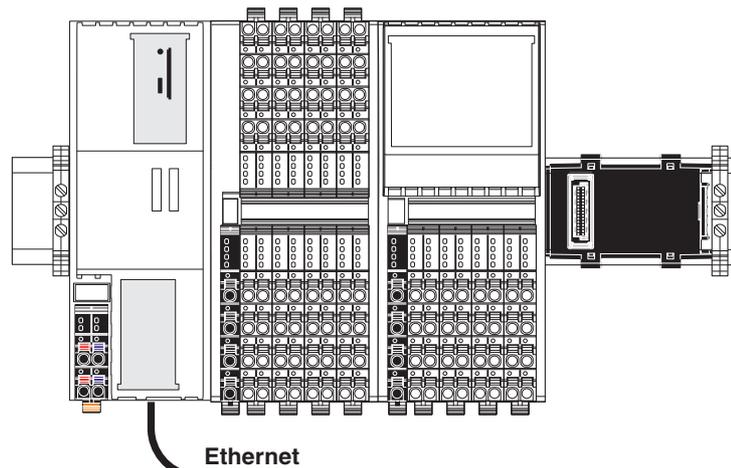


Figure 3-3 Example: Axioline F station with AXCF 2152 controller

3.7.2 The controller as a PROFINET controller in a PROFINET network

Figure 3-4 shows the example of the AXC F 3152 controller as a PROFINET controller in a PROFINET network.

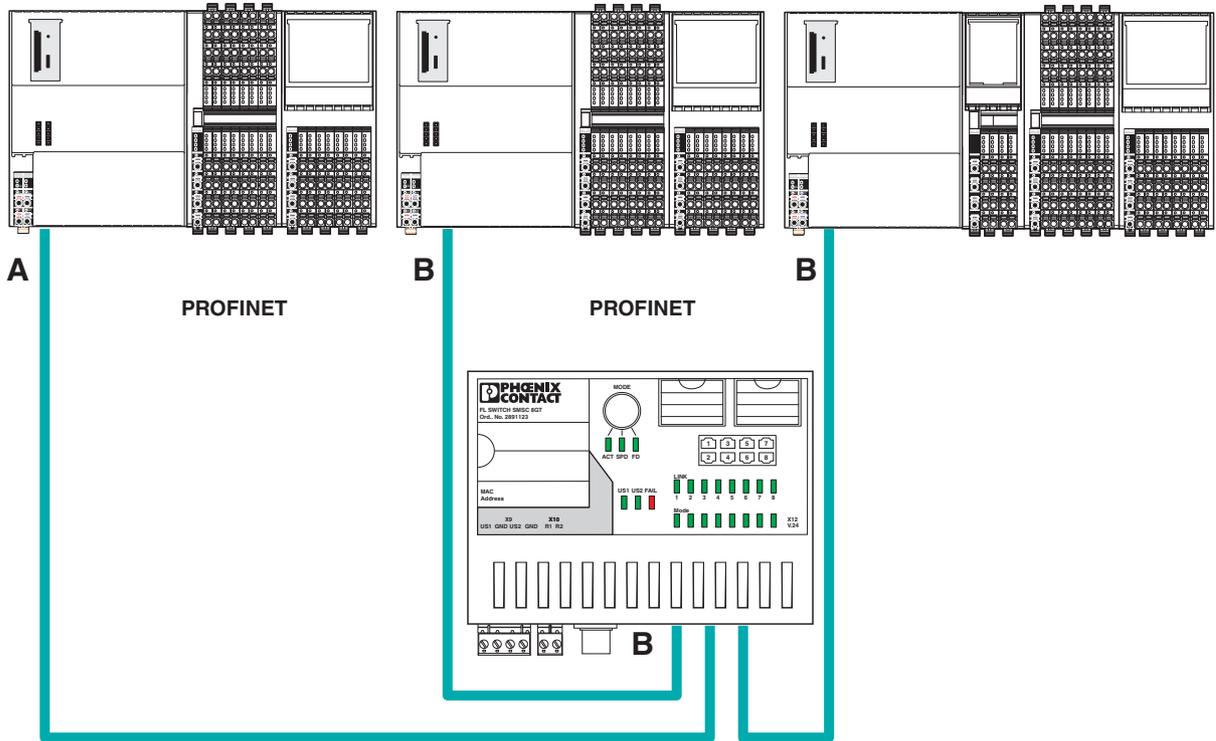


Figure 3-4 Example: AXC F 3152 controller as PROFINET controller

Key:

- A** PROFINET controller (AXC F 1152, AXC F 2152 or AXC F 3152)
- B** PROFINET device and switch (in the example: controller with connected Axioline F I/O modules)



For additional information on how to integrate the controller as a PROFINET controller into a PROFINET network, please refer to the PLCnext Engineer online help.

3.7.3 The controller as a PROFINET device in a PROFINET network

Figure 3-5 shows the example of the controller as a PROFINET device in a PROFINET network.

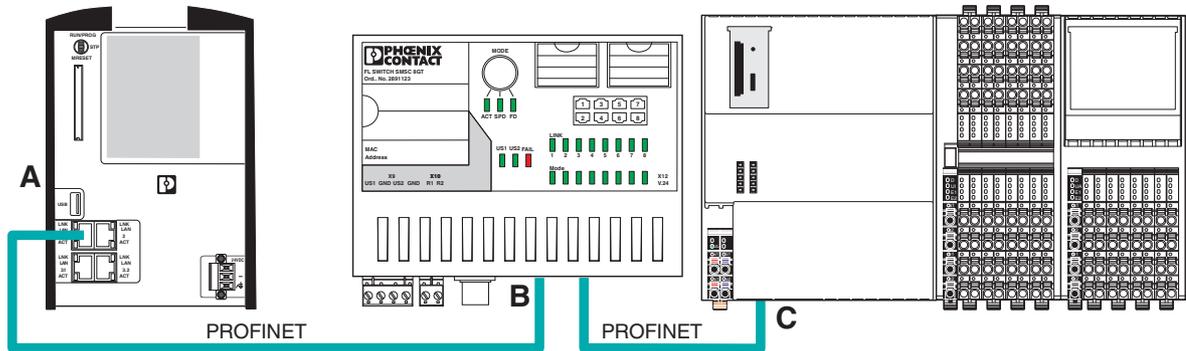


Figure 3-5 Example: AXC F 3152 controller as PROFINET device

Key:

- A** PROFINET controller (in the example: RFC 4072S)
- B** Managed switch (in the example: FL SWITCH SMCS ...)
- C** PROFINET device (AXC F 1152, AXC F 2152 or AXC F 3152)



For additional information on how to integrate the controller as a PROFINET device into a PROFINET network, please refer to the PLCnext Engineer online help.

3.8 Components of the controller

3.8.1 Connection and operating elements

AXC F 1152 and AXC F 2152

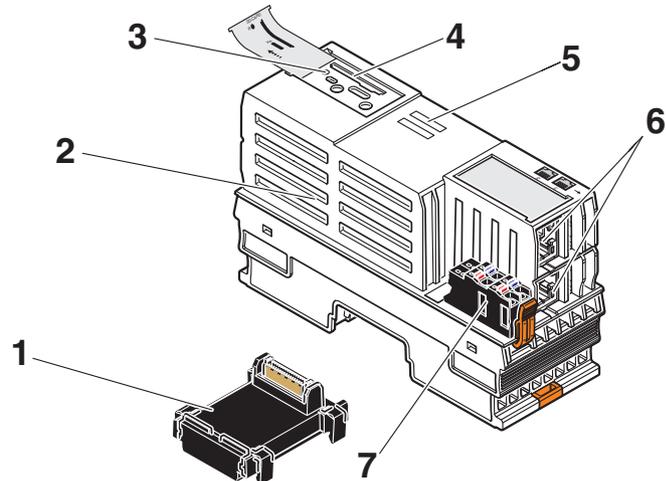


Figure 3-6 Connection and operating elements of the AXC F 1152 and AXC F 2152 controllers

The controller consists of the following components:

- 1 Bus base module
- 2 Electronics module
- 3 Reset button
- 4 SD card holder



The SD card is optional and not supplied as standard with the controller.
Please refer to the ordering data in [Section "Ordering data" on page 91](#).

- 5 Diagnostic and status indicators
- 6 Ethernet interfaces (X1, X2)
- 7 Supply connector (connector for connecting the supply voltage (communications voltage U_L))

AXC F 3152

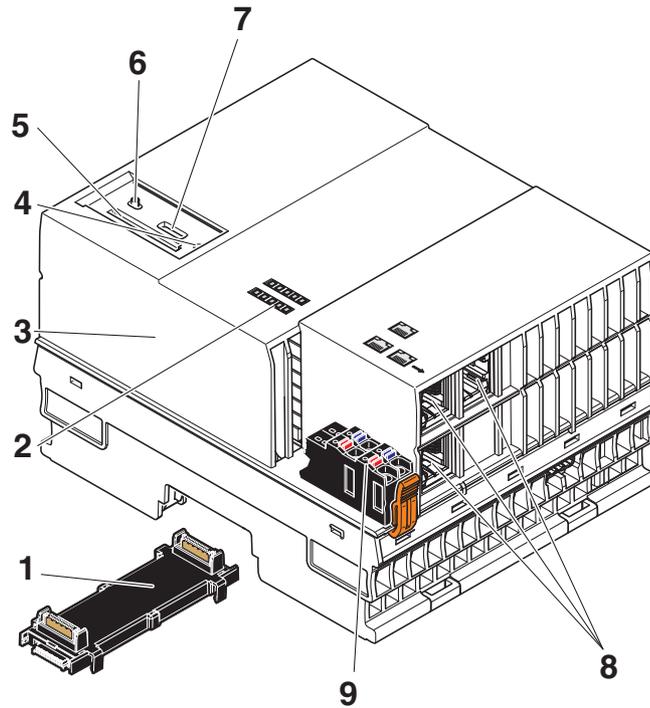


Figure 3-7 Connection and operating elements of the AXC F 3152 controller

The controller consists of the following components:

- 1 Bus base module
- 2 Diagnostic and status indicators
- 3 Electronics module
- 4 Reset button
- 5 SD card holder

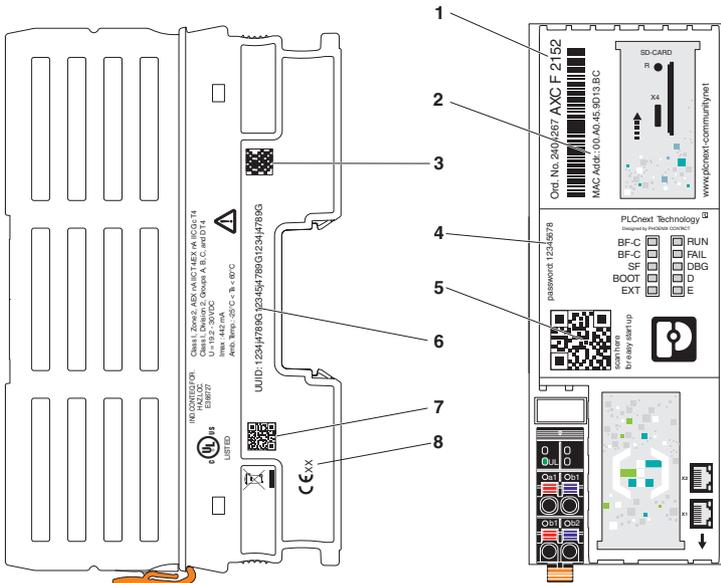


The SD card is optional and not supplied as standard with the controller.
Please refer to the ordering data in [Section "Ordering data" on page 91](#).

- 6 Mode selector switch
- 7 Service interface (X4)
- 8 Ethernet interfaces (X1, X2, X3)
- 9 Supply connector (connector for connecting the supply voltage (communications voltage U_L))

3.8.2 Printing

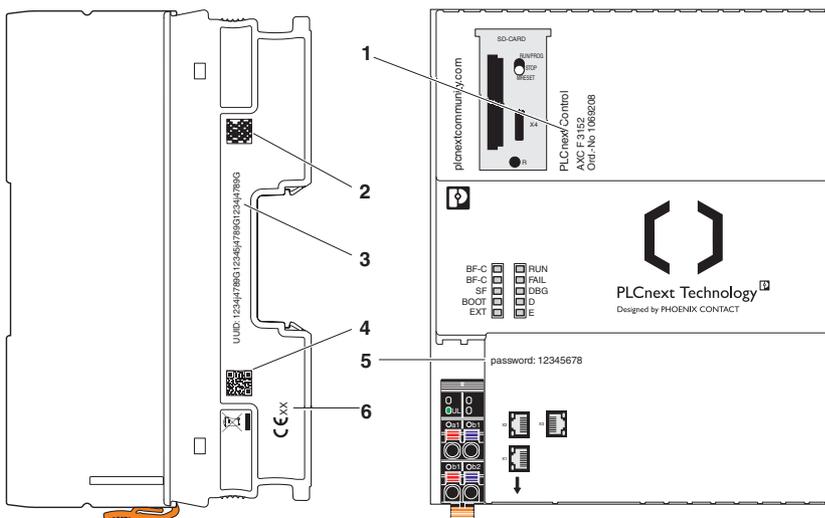
AXC F 1152 and AXC F 2152 controller printing



- 1 Order number and order designation
- 2 MAC address
- 3 QR code for UUID
- 4 Administrator password
- 5 QR code for connecting to the PLCnext Community
- 6 UUID for connecting to PROFICLOUD
- 7 QR code for administrator password
- 8 Year of manufacture

Figure 3-8 AXC F 1152 and AXC F 2152 controller printing

AXC F 3152 controller printing



- 1 Order number and order designation
- 2 QR code for UUID
- 3 UUID for connecting to PROFICLOUD
- 4 QR code for administrator password
- 5 Administrator password
- 6 Year of manufacture

Figure 3-9 AXC F 3152 controller printing

Administrator password

You need the administrator password (in combination with the “admin” user name) for initial access to:

- The controller file system
- Certain functions in PLCnext Engineer
- The PLCnext Engineer HMI
- Web-based management (WBM)
- The OPC UA server of the controller

**Recommended:**

- Only use the administrator password for initial access.
- Once you have gained access successfully, change the administrator password to prevent unauthorized administrator access (see [Section 9](#)).

QR code for connecting to the PLCnext Community

You can access the PLCnext Community directly via the QR code.

In the PLCnext Community, you will find:

- Information on PLCnext Technology
- Information on PLCnext Engineer
- Information on programming the controller with C++
- Operating instructions
- Tutorials
- Example projects
- FAQs

3.9 Diagnostic and status indicators

The diagnostic and status indicators are used for quick local error diagnostics.

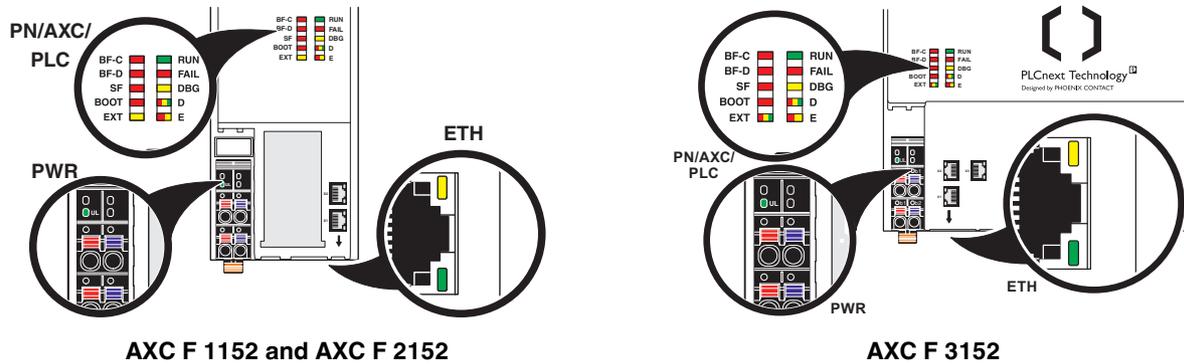


Figure 3-10 Diagnostic and status indicators

Table 3-1 Controller diagnostic and status indicators

Designation	Color	Meaning	State	Description
PN: PROFINET controller/device function				
BF-C	Red/yel-low	Status of PROFINET communication/communication error	Controller as PROFINET controller	
			Off	The controller has established an active communication connection to each configured PROFINET device.
			Red on	No link status on the Ethernet interfaces and/or no 100 Mbit transmission and/or no full duplex mode.
			Flashing red (1 Hz)	Link status present, at least one configured PROFINET device does not have a communication connection.
BF-D	Red/yel-low	Status of PROFINET communication/communication error	Controller as PROFINET device	
			Off	A PROFINET controller has established an active communication connection to the controller (PROFINET device).
			On	No PROFINET communication (no link status at the Ethernet interfaces)
			Flashing (1 Hz)	Link status present, no communication connection to the PROFINET controller
SF	Red	Group error (PROFINET)	Off	PROFINET diagnostics not present
			On	PROFINET diagnostics present

Table 3-1 Controller diagnostic and status indicators

Designation	Color	Meaning	State	Description
PLC: Controller diagnostics				
RUN	Green	Controller RUN status	Off	PLCnext runtime system is not ready for operation.
			Flashing (0.5 Hz)	PLCnext runtime system successfully initialized. The controller is in the READY/STOP state; application program is not being processed.
			Flashing (2 Hz)	Controller has been reset to the default status (see Section "Reset button" on page 31).
			Flashing (2 Hz)	System watchdog was triggered. FAIL flashes red with same frequency.
			On	PLCnext runtime system successfully initialized and an application program is running. The controller is in the RUN state.
FAIL	Red	Failure	On	A runtime error has occurred in the application program of the PLCnext runtime system.
			Off	No runtime error has occurred in the application program of the PLCnext runtime system.
			Flashing (2 Hz)	System watchdog was triggered. RUN flashes green at the same frequency.
DBG	Yellow	Debug mode (troubleshooting)	On	The PLCnext runtime system/controller is in debug mode, i.e., debug mode has been activated in PLCnext Engineer (breakpoint(s) set). The status of the RUN LED is not affected.
BOOT	Red	Device firmware loading status	On	Device firmware is faulty.
			Flashing (2 Hz)	Device firmware is being loaded (boot process).
			Off	Device firmware running.

Table 3-1 Controller diagnostic and status indicators

Designation	Color	Meaning	State	Description
AXC: Axioline F diagnostics				
D	Red/yellow/green	Axioline F: diagnostics for local bus communication	Green on	Run: The Axioline F station is ready for operation; communication within the Axioline F station is OK. All data is valid. No malfunction occurred.
			Flashing green	Active: The Axioline F station is ready for operation; communication within the Axioline F station is OK. The data is not valid. There is no valid data available from the controller. No malfunction occurred on the device.
			Yellow on	Ready: The Axioline F station is ready for operation; no data is being exchanged.
			Flashing yellow	Access from Startup+ in I/O check mode
			Flashing yellow/red	Local bus error during active I/O check
			Flashing red	Local bus error during startup Possible causes: <ul style="list-style-type: none"> - Configuration cannot be generated, information is missing from a device - Chip version of a device is <V 1.1 - Desired configuration and actual configuration differ - No local bus device connected - The maximum number of local bus devices has been exceeded.
			Red on	Bus error in RUN state The Axioline F station is ready for operation but has lost connection to at least one local bus device. Possible causes: <ul style="list-style-type: none"> - Communication error - Local bus device has been removed or configured local bus device is missing - Reset at a local bus device - Serious device error at a local bus device (local bus device can no longer be reached)
Off	Power down: Local bus device is in (power) reset			
E	Yellow/red	Error/warning	Yellow on	I/O warning at a local bus device
			Red on	I/O error at a local bus device

Table 3-1 Controller diagnostic and status indicators

Designation	Color	Meaning	State	Description
EXT	Red	Left alignment	On	Error at extension module Possible error causes: <ul style="list-style-type: none"> – Extension module is not supported. – Extension module is not mounted correctly or is defective. – Extension module was disconnected from power during operation or has been removed.
	Green		On	Extension module operating without errors.
PWR: Supply voltage (communications voltage U_L)				
UL	Green	U_{Logic}	Off	24 V communications voltage feed-in not present or too low
			On	24 V communications voltage feed-in present
ETH: Ethernet interfaces				
	Green	Link status	Off	Connection not established successfully
			On	Connection established successfully (link): The controller is able to contact another network device.
	Yellow	Activity status	Off	Data transmission not active
			On/flashing	Data transmission active (activity): The Ethernet interface is sending or receiving data.

**Please note:**

On the AXC F 1152, the EXT LED is without function as Axioline F extension modules cannot be aligned to the left.

**Special case: firmware update**

During a firmware update, the RUN LED first flashes, and then stops. Upon a successful controller restart, the RUN LED lights up again permanently. Information on firmware updates can be found in [Section "Replacing the HTTPS certificate" on page 102](#).

**Special cases: SD card**

- **Unauthorized removal of the SD card during operation:**
If the SD card is removed during operation, all LEDs except the D and E LEDs begin to flash red (1 Hz).
 - **Invalid SD card license:**
If the SD card is invalid, all LEDs except the D and E LEDs begin to flash red (1 Hz).
- Information on operating the controller with an SD card can be found in [Section "SD card \(optional\)" on page 33](#).

3.10 Mode selector switch (AXC F 3152)

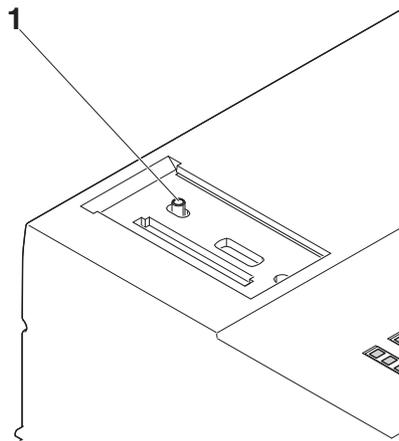


Figure 3-11 Mode selector switch on the AXC F 3152 controller

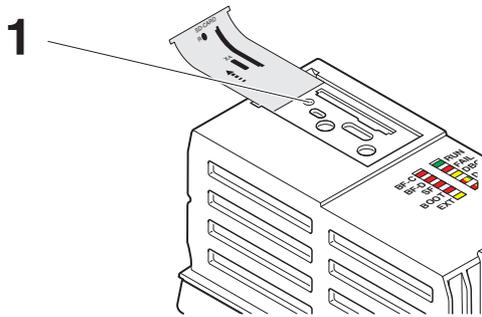
The mode selector switch is used to define the operating state of the controller.

The RUN/PROG and STOP positions have a latching function and the MRESET position has a pushbutton function. After releasing the switch in the MRESET position, it returns to the STOP position.

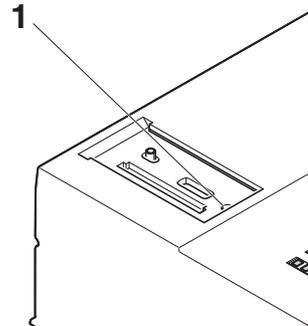
Table 3-2 Controller operating modes

Operating mode	Explanation
RUN/PROG	<p>The controller is in the RUN state. The application is processed.</p> <p>The PLCnext Engineer software can be used for program and configuration modifications as well as for the online monitoring function.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> The application is not processed if a controller error has occurred or if the application has been stopped by PLCnext Engineer.</p> </div>
STOP	<p>The controller is in the STOP state. Application processing has been stopped.</p>
MRESET	<p>The retain data and the application program in the controller RAM are deleted.</p> <p>To delete the retain data and the application program, proceed as follows:</p> <ul style="list-style-type: none"> • Hold the mode selector switch in the MRESET position for three seconds. • Release the mode selector switch for less than three seconds. • Hold the mode selector switch in the MRESET position for three seconds.

3.11 Reset button



AXC F 1152 and AXC F 2152



AXC F 3152

Figure 3-12 Reset button (1)

The reset button on the controller can only be operated with a pointed object, such as a pin, and is therefore protected against accidental activation.

If the reset button is actuated during operation for ≥ 2 s, the controller is restarted.

The reset button can also be used to reset the controller to the default settings. Here, a distinction is made between two types of default settings:

- Type 1:
All application-specific data is deleted.
- Type 2:
The controller is reset to the delivery state.



Please note the following when using PROFICLOUD:

Upon reset to default setting type 1 or 2, the controller can no longer be reached by PROFICLOUD. To continue using the controller in PROFICLOUD, proceed as follows:

- Delete the controller from PROFICLOUD, as described in the “Startup and operation of hardware and software components of the PROFICLOUD” user manual.
- Then reregister the controller in PROFICLOUD and add it as a PROFICLOUD device, as described in [Section “Transferring variable values to PROFICLOUD” on page 64](#).

Default setting type 1

Resetting the controller to default setting type 1 deletes all settings that you have configured. These include, for example:

- The PLCnext Engineer project, including all applications that have been programmed in accordance with IEC 61131-3
- All applications that were programmed using high-level languages
- The configured bus configuration
- The network configuration of the controller
- Changes and extensions that you have made to the operating system or to the firmware

To reset the controller to default setting type 1, proceed as follows:

- Switch off the supply voltage of the controller.
- After the LEDs have gone out, press the reset button.
- Hold the reset button down and switch the supply voltage on.

The RUN and FAIL LEDs light up.

- Release the reset button.

The controller is reset to default setting type 1.

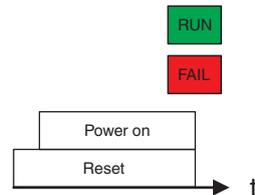


Figure 3-13 Sequence when resetting to default setting type 1, and LED indicators

Default setting type 2

Resetting to default setting type 2 resets the controller to the delivery state. This deletes all settings that you have configured.



Please note:

The operating system and all firmware components of the controller are reset to the delivery state.

To reset the controller to default setting type 2, proceed as follows:

- Switch off the supply voltage of the controller.
- After the LEDs have gone out, press the reset button.
- Hold the reset button down and switch the supply voltage on.

The RUN and FAIL LEDs light up.

- Press and hold the Reset button down (approx. 30 s) until all LEDs (except the E and D LEDs) light up.
- Release the reset button.

The controller is reset to default setting type 2.

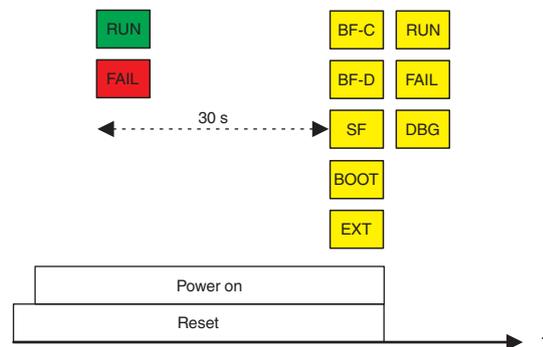


Figure 3-14 Sequence when resetting to default setting type 2, and LED indicators

3.12 Parameterization memory



NOTE: Damage of the internal parameterization memory due to high data traffic

Frequent write accesses in applications with high data traffic can cause long-term damage to the internal parameterization memory of the controller (e.g. DataLogger applications). This leads to a device defect.

Use an external SD card as storage medium for applications with high data traffic. Phoenix Contact recommends the SD cards SD FLASH 8GB PLCnext Memory, order no. 1061701 or SD FLASH 2GB PLCnext Memory order no. 1043501.

The controllers have an internal parameterization memory. Alternatively, a pluggable parameterization memory in the form of an SD card can be used, see [Section 3.13](#).

The programs and configurations (e.g., controller IP address) belonging to your PLCnext Engineer project are stored in the parameterization memory. In addition, application-specific data can also be stored in the parameterization memory.

If you make changes to Linux operating system files on the internal parameterization memory, the Linux operating system generates an overlay file system from the changed files and directories. If you operate the controller with an SD card, the overlay file system is generated on the SD card.

On the internal controller parameterization memory, the following data quantities are available for user-specific data and the overlay file system:

- 512 Mbyte on the AXC F 1152 and AXC F 2152 controllers
- 1 GB on the AXC F 3152 controller

3.13 SD card (optional)

If the internal parameterization memory is not large enough for your application, the controller can be operated using an SD card. The SD card is optional and not required to operate the controller.

If you operate the controller with an SD card, all application-specific data (e.g., the PLCnext Engineer project) is stored there.



The SD card will be recognized during the initialization phase of the controller. If you insert the SD card during operation, the SD card will not be recognized.

- Make sure that the SD card has been inserted before switching on the controller, in order to enable the controller to use it.
- Insert and remove the SD card only when the controller supply voltage is disconnected.
Refer to [Section “Diagnostic and status indicators” on page 26](#) for the LED blink codes in the event of unauthorized removal of the SD card during operation.
- Only use an SD card provided by Phoenix Contact, see [Section “Ordering data” on page 91](#).



Please note:

You can activate or deactivate support of the SD card via the WBM of the controller, see [Section 9](#).

Recommended:

- Deactivate the support of the SD card if you run the controller without SD card.

You thereby avoid the risk of data theft and manipulation.

Data buffering/backup in the event of voltage failures

In the event of a supply voltage failure, the AXC F 3152 saves control data, e.g., retain data and log files, on the inserted parameterization memory (SD card).

The device firmware recognizes the voltage failure. The retain data (variables of the controller that are marked as “Retain” in the PLCnext Engineer project) and log files are automatically backed up on the parameterization memory.



NOTE: Startup of the AXC F 3152 not ensured

For proper startup of the device, the supply voltage may be switched on at the earliest 30 seconds after the diagnostic and status indicators go out.

Change: Operation without SD card → Operation with SD card

When changing from operation without SD card to operation with SD card, note the following:

If there already is an overlay file system on the internal parameterization memory, it will be copied to the SD card.

If there already is an overlay file system on the SD card, the controller will access it. The overlay file system on the internal parameterization memory will be deleted.

Furthermore, all application-specific data will be deleted from the internal parameterization memory. PLCnext Engineer projects and IP configurations stored on the parameterization memory are no longer available. The controller accesses the data stored on the SD card.



NOTE: Data loss due to removing the SD card

If you remove the SD card during operation, data will be lost.

- Do not remove the SD card during operation.



NOTE: Damage to the SD card after formatting

The SD card is already formatted (ext4 format) and is intended for use with Phoenix Contact controllers of the PLCnext Control product family. If you format the SD card, certain information on the SD card that is required for use with Phoenix Contact devices will be lost. After formatting, you can no longer use the SD card to operate the controller.

- Ensure that the SD card is not formatted.
- If you want to delete the overlay file system from the SD card:
Reset the controller to default setting type 1.



The SD card will be recognized during the initialization phase of the controller. If you insert the SD card during operation, the SD card will not be recognized.

- Make sure that the SD card has been inserted before switching on the controller, in order to enable the controller to use it.
- Insert and remove the SD card only when the controller supply voltage is disconnected. Refer to [Section “Diagnostic and status indicators” on page 26](#) for the LED blink codes in the event of unauthorized removal of the SD card during operation.
- Only use an SD card provided by Phoenix Contact, see [Section “Ordering data” on page 91](#).



Please note:

The SD card can be read with a conventional SD card reader at any time. Sensitive data on the SD card can be read if you do not physically protect the SD card against unauthorized access.

- Ensure that unauthorized persons do not have access to the SD card.

Change: Operation with SD card → Operation without SD card

If you want to switch from operation with SD card to operation without SD card, please note the following:

If there is an overlay file system on the SD card, there will be an empty overlay file system on the internal parameterization memory after the SD card has been removed and the controller rebooted. The contents of the overlay file system on the SD card will not be transferred to the internal parameterization memory of the controller.

Neither will the application-specific data on the SD card be transferred to the internal parameterization memory of the controller.

3.14 Internal basic circuit diagram

AXC F 1152 and AXC F 2152

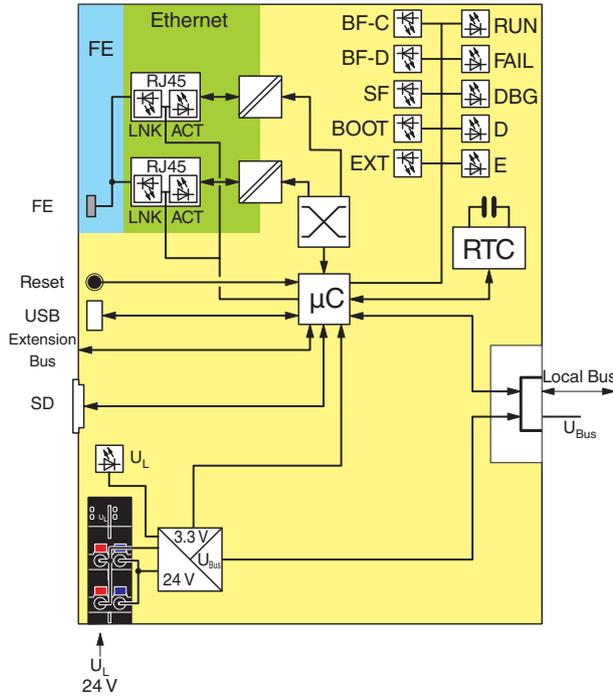


Figure 3-15 Internal basic circuit diagram for AXC F 1152 and AXC F 2152

Key:

	Microprocessor		Transmitter
	Service interface		LED
	Reset button		Real-time clock
	RJ45 interface		Power supply unit
	Functional ground connection		Ethernet switch
	SD card holder		Axioline F local bus
Extension bus	Left-aligned Axioline F extension modules (AXC F 2152 only)		

The colored areas in the basic circuit diagram represent electrically isolated areas:

- Logic
- Ethernet interface
- Functional ground

AXC F 3152

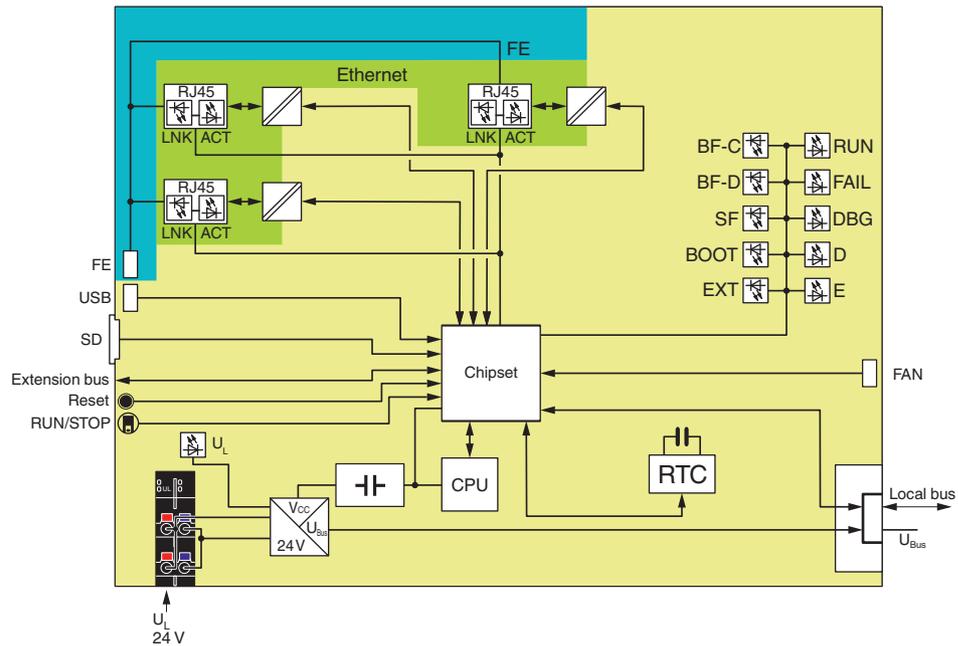
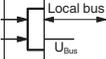


Figure 3-16 Internal basic circuit diagram AXC F 3152

Key:

	UPS		Mode selector switch
USB	Service interface		Transmitter
Reset	Reset button		LED
	RJ45 interface		Real-time clock
FE	Functional ground connection		Power supply unit
SD	SD card holder		Chipset
Extension bus	Left-aligned Axioline F extension modules		Axioline F local bus
CPU	Processor	FAN	Fan connection

The colored areas in the basic circuit diagram represent electrically isolated areas:

-  Logic
-  Ethernet interface
-  Functional ground

3.15 Communication paths

The following communication paths are available on the controllers:

AXC F 1152 and AXC F 2152

- (1) 2 x Ethernet X1/X2: 10/100 BASE-T(X) (switched internally)
- (2) Service interface No function at present

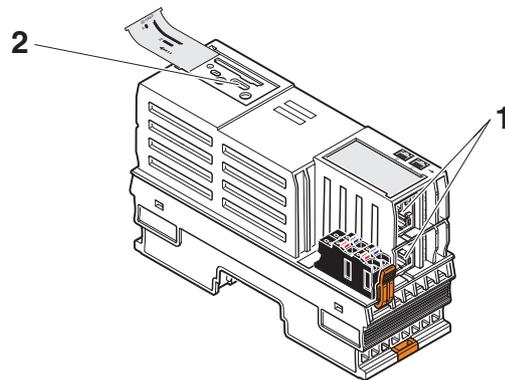


Figure 3-17 Communication paths: (1) Ethernet, (2) service interface

AXC F 3152

- (1) 3 x Ethernet X1/X2/X3: 10/100/1000 BASE-T(X)
X2: PROFINET controller interface
X3: PROFINET device interface
- (2) Service interface No function at present

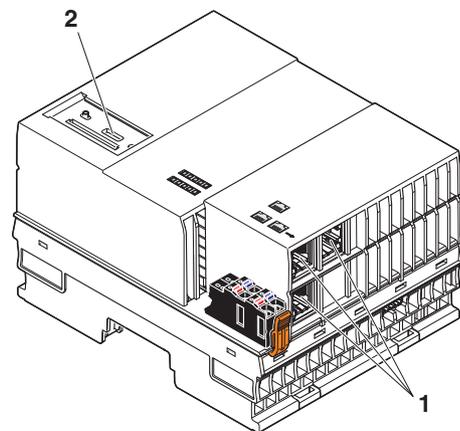


Figure 3-18 Communication paths: (1) Ethernet, (2) service interface

3.15.1 Ethernet

The Ethernet network is connected via RJ45 sockets.



- Use an Ethernet cable that complies with at least CAT5 of IEEE 802.3.
- Observe the bending radii of the Ethernet cables used.

3.16 Supply connector

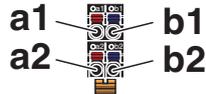


Figure 3-19 Terminal points for the supply voltage (communications voltage U_L)

Terminal point assignment

Table 3-3 Terminal point assignment of the supply connector

Terminal point	Color	Assignment
a1, a2	Red	24 V DC (U_L)
b1, b2	Blue	GND

Key:

- U_L Communications voltage feed-in (bridged internally)
 GND Supply voltage reference potential (bridged internally)

3.17 Bus base module

AXC F 1152 and AXC F 2152

AXL BS BK bus base module

Bus base modules carry the communications voltage and the bus signals from the controller through the Axioline F station (local bus). The AXL BS BK bus base module is supplied with the AXC F 1152 and AXC F 2152 controllers.

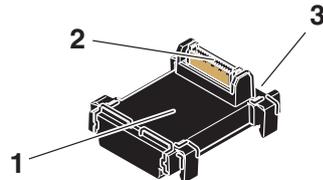


Figure 3-20 Structure of the AXL BS BK bus base module

- 1 Bus base module
- 2 Connection of the local bus to the controller
- 3 Connection to the bus base module of the local bus

AXC BS L 2 bus base module (AXC F 2152 only)

For an Axioline F extension module to be aligned to the left, the AXC F 2152 requires the AXC BS L 2 bus base module. The bus base module is not supplied with the controller. Please refer to the ordering data in [Section "Ordering data" on page 91](#).

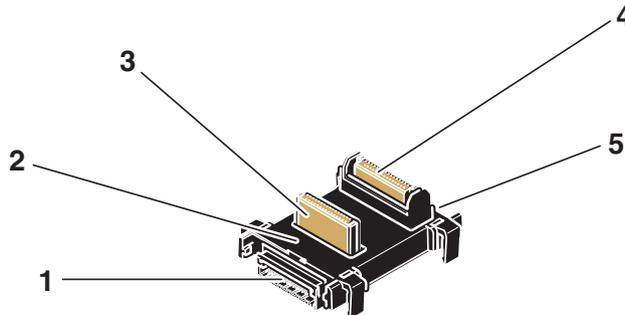


Figure 3-21 Structure of the AXC BS L 2 bus base module

- 1 Connection to the bus base module of a left-alignable Axioline F extension module
- 2 Bus base module
- 3 Connection of the extension bus to the controller
- 4 Connection of the local bus to the controller
- 5 Connection to the bus base module of the local bus

AXC F 3152**AXC BS L 30 bus base module**

Bus base modules carry the communications voltage and the bus signals from the controller through the Axioline F station (local bus). The AXC BS L 30 bus base module is supplied with the AXC F 3152 controller.

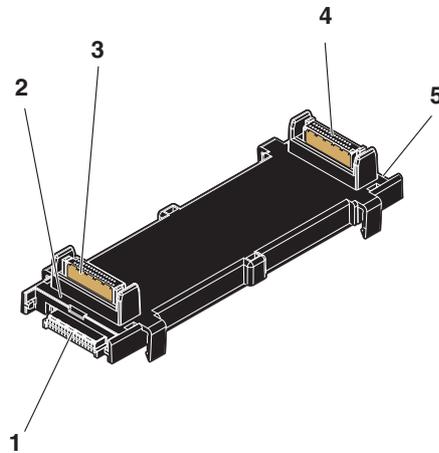


Figure 3-22 Structure of the AXC BS L 30 bus base module

- 1 Connection to the bus base module of a left-alignable Axioline F extension module
- 2 Bus base module
- 3 Connection of the extension bus to the controller
- 4 Connection of the local bus to the controller
- 5 Connection to the bus base module of the local bus

4 Mounting hardware



For basic information on the Axioline F system and its installation, particularly mounting/removing Axioline F modules, please refer to the UM EN AXL F SYS INST user manual (“Axioline F: system and installation”).

4.1 Safety notes



NOTE: Electrostatic discharge

The device contains components that can be damaged or destroyed by electrostatic discharge. When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) in accordance with EN 61340-5-1 and IEC 61340-5-1.



NOTE: Damage to electronics due to inadequate external protection – no safe fuse tripping in the event of a fault

The electronics in the device will be damaged if external fuse protection is inadequate.

- Protect the supply voltage externally in accordance with the connected load (number of Axioline F devices/amount of logic current consumption for each device).
- Ensure that the external fuse trips reliably in the event of a fault.



NOTE: Damage to the contacts when tilting

Tilting the modules can damage the contacts.

- Place the modules onto the DIN rail **vertically** (see [Figure 4-1](#)).



Please note:

During any work on the Axioline F station, the controller or a module, switch off the power supply to the Axioline F station and make sure the supply voltage is protected against unauthorized reactivation.



The controller is automatically grounded (FE) when it is snapped onto a grounded DIN rail.

There are two FE springs on the back of the controller that make contact with the DIN rail when the controller is placed on the DIN rail.

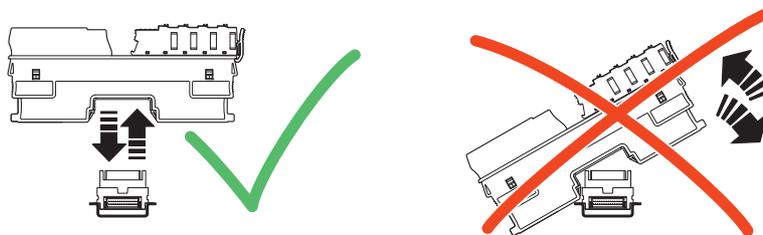


Figure 4-1 Placing the module **vertically**

4.2 Basic information

Mounting location The controller meets the requirements for the IP20 degree of protection. Due to its compact design, the controller can be installed in standard terminal boxes.

Mounting/DIN rail The controller is mounted on a 35 mm standard DIN rail without any tools using the bus base module. It is mounted perpendicular to the DIN rail. The local bus is created automatically when the bus base modules of the controller and Axioline F devices are installed next to one another.



Observe the notes on securing the DIN rail and fastening elements as well as the notes on mounting distances in the UM EN AXL F SYS INST user manual.

Supply connector The controller has a supply connector for connecting the power supply. The connector is fitted with spring-cage terminal blocks. When using suitable conductors, the conductors can be connected by means of direct connection technology (Push-in technology).



For additional information, please refer to [Section 5.1.2](#).

FE connection There are two FE springs (metal contacts) on the bottom of the controller which establish the connection to functional ground when the controller is snapped onto a grounded DIN rail.

End brackets Mount end brackets on both sides of the Axioline F station. The end brackets ensure that the Axioline F station is correctly mounted. End brackets secure the station on both sides and keep it from moving from side to side on the DIN rail. Phoenix Contact recommends the following end brackets:

Table 4-1 Recommended end brackets

Mounting position	Ambient conditions	End bracket
Horizontal; A in Figure 4-2 on page 44 :	Normal	CLIPFIX 35, CLIPFIX 35-5
	High shock and vibration load	E/AL-NS 35
Other; B in Figure 4-2 on page 44	Normal	E/AL-NS 35
	High shock and vibration load	

Mounting position

As standard, mount the controller in a horizontal position on the DIN rail provided for that purpose (A in [Figure 4-2](#)).

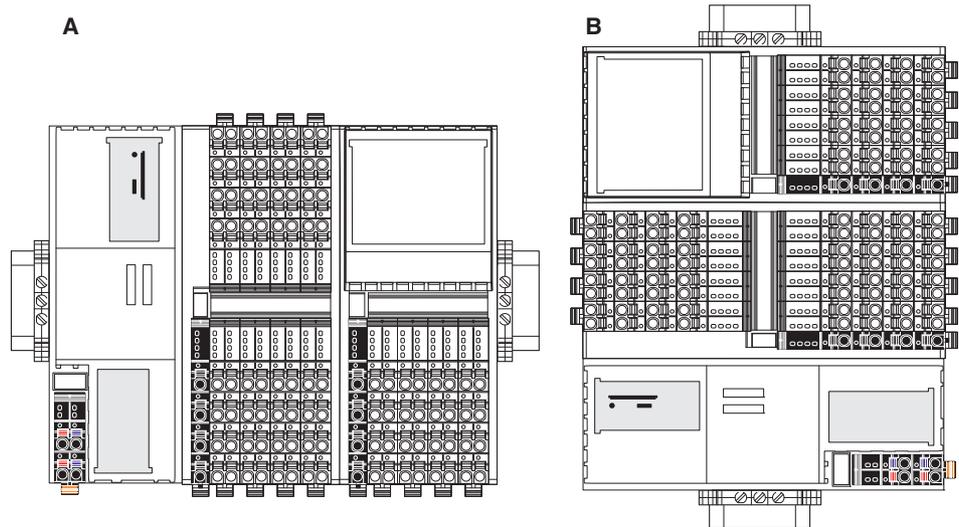


Figure 4-2 Example: AXC F 2152 in horizontal (A) and vertical (B) installation position

Note the ambient temperatures and any other special features (e.g., derating) specified in the device/module-specific documentation for the Axioline F devices.

4.3 Structure of an Axioline F station

Figure 4-3 shows an example structure of an Axioline F station with the AXC F 2152:

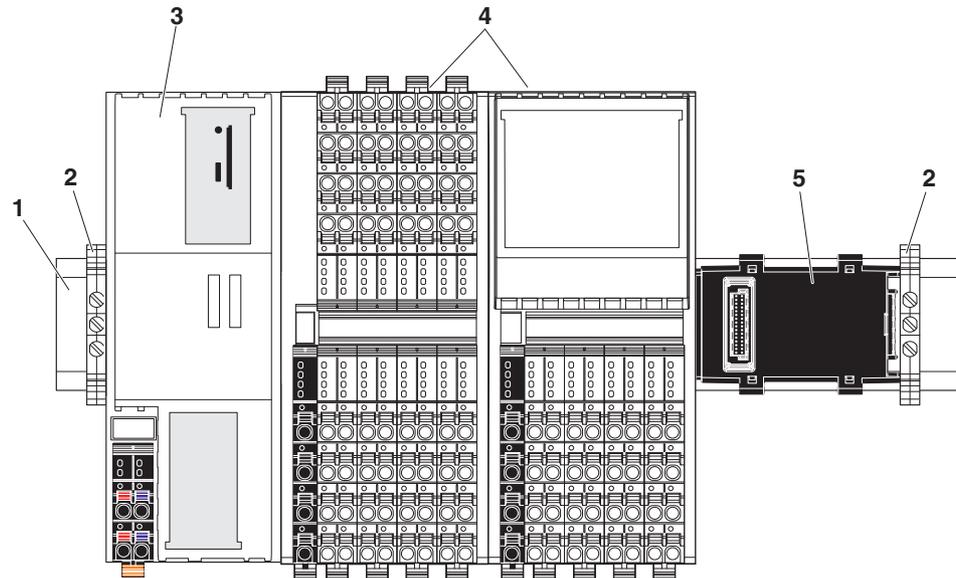


Figure 4-3 Example: Structure of an Axioline F station with the AXC F 2152

Key:

- 1 DIN rail
- 2 End bracket (e.g., CLIPFIX 35-5; Order No. 3022276)
- 3 Controller
- 4 I/O modules (Axioline F devices) corresponding to the application
- 5 Bus base module

An Axioline F station is set up by mounting the individual components side by side. No tools are required. Mounting the components side by side automatically creates potential and bus signal connections between the individual components of the Axioline F station.

Left-alignment of Axioline F extension modules

- You can connect **one** Axioline F extension module to the left of the **AXC F 2152** using the AXC BS L 2 bus base module.



Please note:

The AXC BS L 2 bus base module is **not** supplied with the AXC F 2152. For the bus base module ordering data, please refer to [Section "Ordering data" on page 91](#).

- You can connect one AXC F XT IB Axioline F extension module to the left of the **AXC F 3152** using the supplied AXC BS L 30 bus base module. Connection of the left-alignable AXC F XT ETH 1TX Ethernet interface is not supported yet.
- Axioline F extension modules cannot be aligned to the left of the **AXC F 1152**.

The following left-alignable Axioline F extension modules are currently available:

- **AXC F XT ETH 1TX** (Order No. 2403115):
Left-alignable Ethernet interface
- **AXC F XT IB** (Order No. 2403018):
Left-alignable INTERBUS master for the connection of up to 255 INTERBUS remote bus devices

Figure 4-4 shows an example structure of an Axioline F station with the AXC F 3152 controller and the left-aligned Axioline F AXC F XT IB extension module:

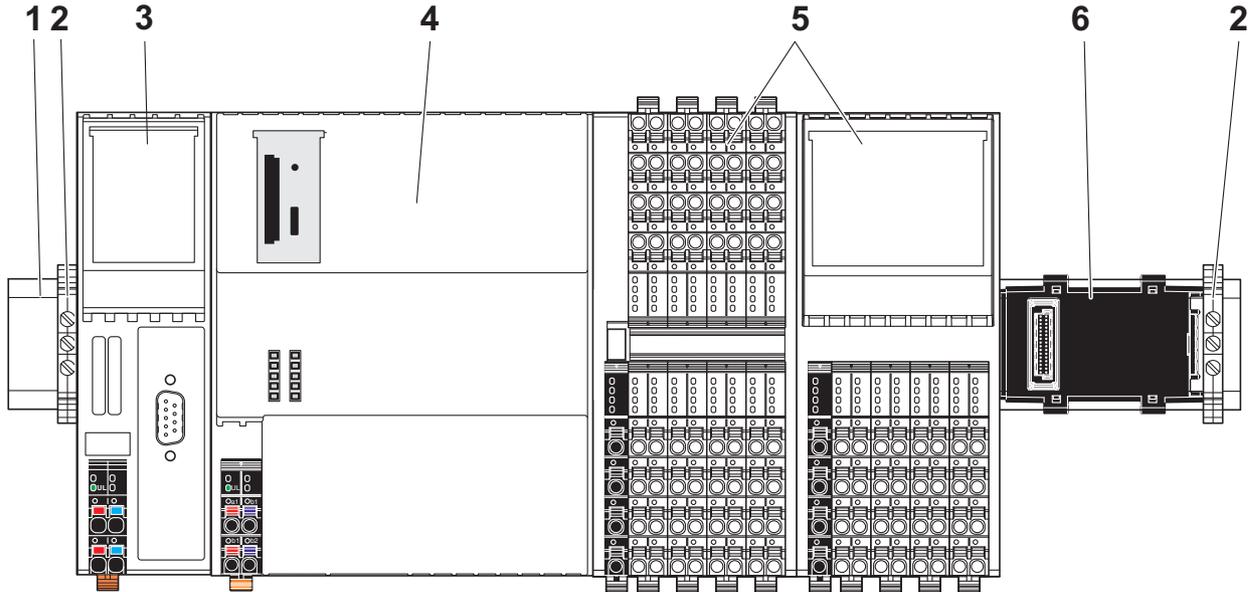


Figure 4-4 Example: Axioline F station with AXC F 3152 and left-aligned Axioline F extension module

Key:

- 1 DIN rail
- 2 End bracket (e.g., CLIPFIX 35-5; Order No. 3022276)
- 3 Left-alignable Axioline F AXC F XT IB extension module
- 4 AXC F 3152 controller
- 5 I/O modules (Axioline F devices) corresponding to the application
- 6 Bus base module

4.4 Structure of a PLCnext Inline station

As an alternative to an Axioline F station, you can create a PLCnext Inline station using the controller. To do so, you need the AXC F IL ADAPT Inline adapter terminal (Order No. 1020304). You can directly align the Inline modules to the Inline adapter terminal.

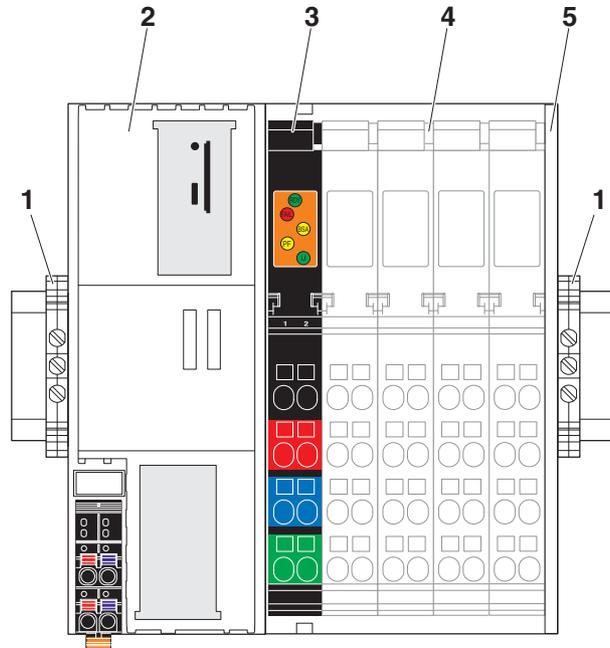


Figure 4-5 Example: Structure of a PLCnext Inline station with the AXC F 2152

- 1 End bracket (e.g., CLIPFIX 35-5, Order No. 3022276)
- 2 Controller
- 3 Inline adapter terminal
- 4 Inline terminals corresponding to the application
- 5 End plate (snapped onto the DIN rail as station end)



For mounting information, please refer to the packing slip and the data sheet for the Inline adapter terminal. The documents can be downloaded at phoenixcontact.net/product/1020304.



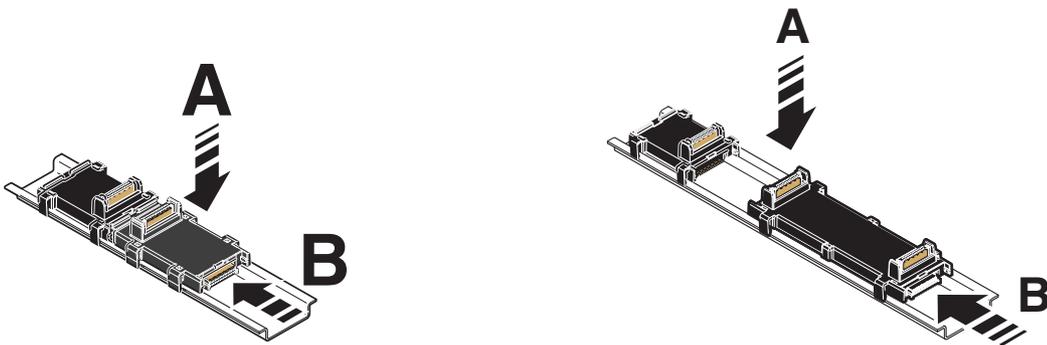
Various function blocks are available in PLCnext Engineer for INTERBUS configuration and communication.
 For more detailed information, please refer to the PLCnext Engineer online help.
 For more detailed information on PCP and INTERBUS services, please refer to the following user manuals: "Peripherals Communication Protocol (PCP)" (IBS SYS PCP G4 UM E), "Firmware Services and Error Messages" (IBS SYS FW G4 UM E), and "For diagnostics in Generation 4 controller boards" (IBS SYS DIAG DSC UM E).
 The documents can be downloaded at phoenixcontact.net/product/1020304.

4.5 Mounting the controller

- Disconnect the Axioline F station from the power supply.
- Mount the left end bracket on the Axioline F station.

Mounting bus base modules

- First install the bus base module for the controller and then all bus base modules necessary for the Axioline F station on the DIN rail (A in Figure 4-6).
- Push each subsequent bus base module into the connection of the previous bus base module (B in Figure 4-6).



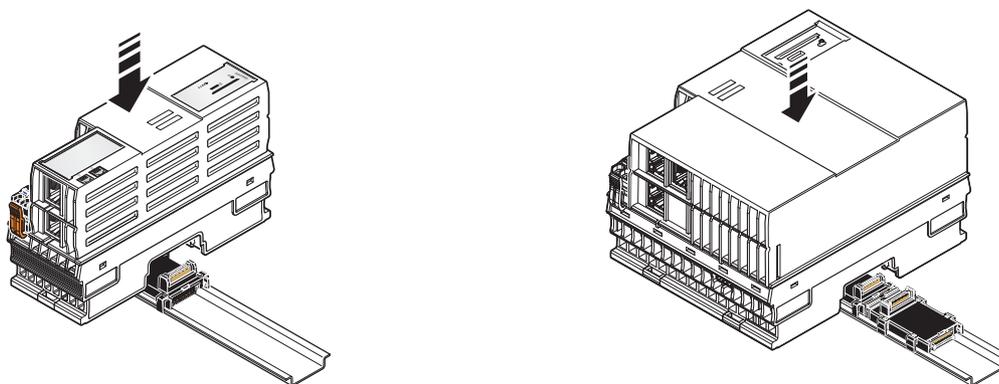
AXC F 1152 and AXC F 2152

AXC F 3152

Figure 4-6 Mounting the bus base modules

Snapping the controller into place

- Push the controller vertically onto the first bus base module until it snaps into place with a click.
- Make sure that the device plug for the bus base connection is situated above the corresponding socket on the bus base module.



AXC F 1152 and AXC F 2152

AXC F 3152

Figure 4-7 Snapping the controller into place

4.6 Inserting the SD card



NOTE: Damage to the SD card after formatting

The SD card is already formatted (ext4 format) and is intended for use with Phoenix Contact controllers of the PLCnext Control product family. If you format the SD card, certain information on the SD card that is required for use with Phoenix Contact devices will be lost. After formatting, you can no longer use the SD card to operate the controller.

- Ensure that the SD card is not formatted.
- If you want to delete the overlay file system from the SD card:
Reset the controller to default setting type 1.



The SD card will be recognized during the initialization phase of the controller. If you insert the SD card during operation, the SD card will not be recognized.

- Make sure that the SD card has been inserted before switching on the controller, in order to enable the controller to use it.
- Insert and remove the SD card only when the controller supply voltage is disconnected.
Refer to [Section “Diagnostic and status indicators” on page 26](#) for the LED blink codes in the event of unauthorized removal of the SD card during operation.
- Only use an SD card provided by Phoenix Contact, see [Section “Ordering data” on page 91](#).



The SD card is optional and not supplied as standard with the controller.
Please refer to the ordering data in [Section “Ordering data” on page 91](#).

- Disconnect the Axioline F station from the power supply.

The controller has an SD card holder with push/push technology.

- On the AXC F 1152 and AXC F 2152, remove the upper marking field of the controller (item 1 in [Figure 4-8](#)).

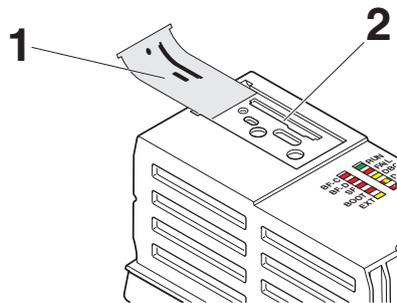


Figure 4-8 Removing the upper marking field of the AXC F 1152 and AXC F 2152

- Gently push the SD card into the SD card holder until it engages with a click in the SD card holder (see [Figure 4-9](#), “Click”).

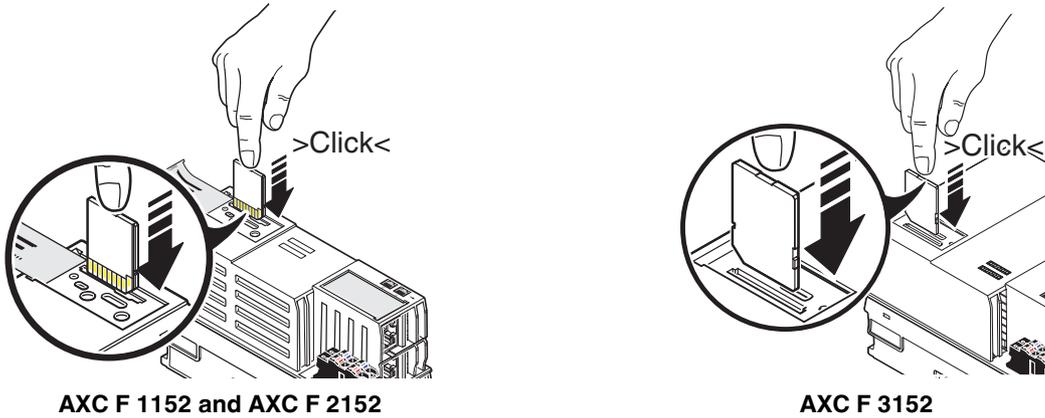


Figure 4-9 Inserting the SD card

4.7 Mounting a left-alignable Axioline F extension module

- Mount the left-alignable Axioline F extension module as described in the module-specific packing slip and module-specific data sheet.



For additional information on the number and order of left-alignable Axioline F extension modules, refer to [page 45](#).

4.8 Mounting the AXC F IL ADAPT Inline adapter terminal

- Mount the Inline adapter terminal as described in the module-specific packing slip and module-specific data sheet.

5 Connecting and wiring hardware

5.1 Supply voltage

5.1.1 Sizing of the power supply

- Choose a power supply unit that is suitable for the currents in your application. The selection depends on the bus configuration and the resulting maximum currents.



WARNING: Loss of electrical safety when using unsuitable power supplies

The controllers are designed exclusively for operation with protective extra-low voltage (PELV) in accordance with EN 60204-1. Only PELV in accordance with the listed standard may be used for the supply.

The following applies to the network (PROFINET) and the I/O devices used in it:

Only use power supply units that meet EN 61204, with safe isolation and PELV in accordance with EN 50178 or EN 61010-2-201. These prevent short circuits between primary and secondary sides.



A power supply without a fall-back characteristic curve must be used for the correct operation of the controller (see Figure 5-2).

When the controller is switched on, an increased inrush current occurs briefly. When it is switched on, the controller behaves like a capacitive load.

Some electronically controlled power supplies have a fall-back characteristic curve (see Figure 5-1). They are not suitable for operation with capacitive loads.

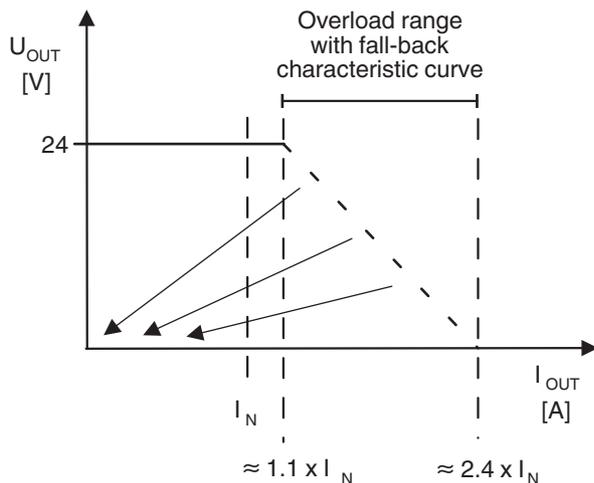


Figure 5-1 Overload range **with** fall-back characteristic curve

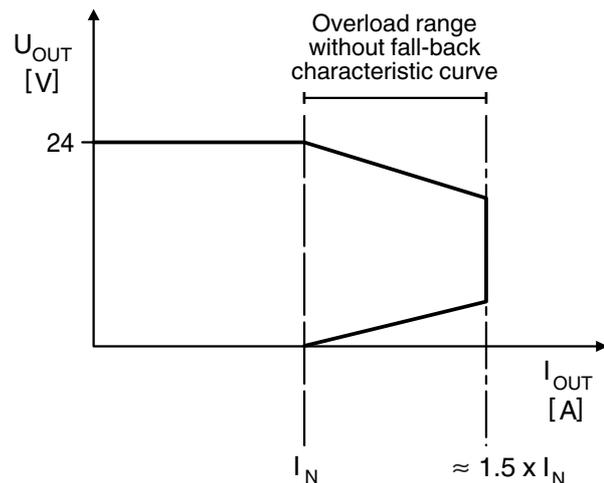


Figure 5-2 Overload range **without** fall-back characteristic curve

5.1.2 Connecting the power supply

Observe the notes in [Section 3.16](#) when assembling the connector for the supply voltage.

- Strip 8 mm off the cable. If necessary, fit a ferrule to the cable.



When using ferrules:

- Use ferrules in accordance with the specifications in the UM EN AXL F SYS INST user manual.
- Make sure that the ferrules are crimped correctly.

Rigid conductor/ferrule

- Insert the conductor into the terminal point. It is clamped into place automatically.



Figure 5-3 Connecting a rigid conductor

Flexible conductor

- Open the spring by pressing on the spring lever with a screwdriver (A in [Figure 5-4](#)).
- Insert the conductor into the terminal point (B in [Figure 5-4](#)).
- Remove the screwdriver to secure the conductor (recommended: bladed screwdriver, blade width 2.5 mm (e.g., SZS 0,4 x 2,5 VDE, Order No. 1205037)

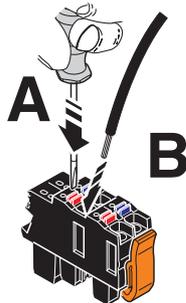
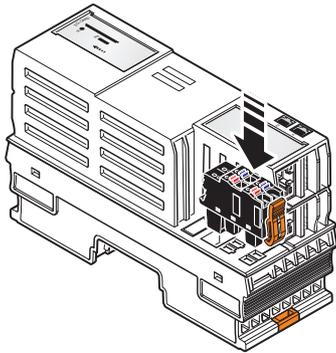


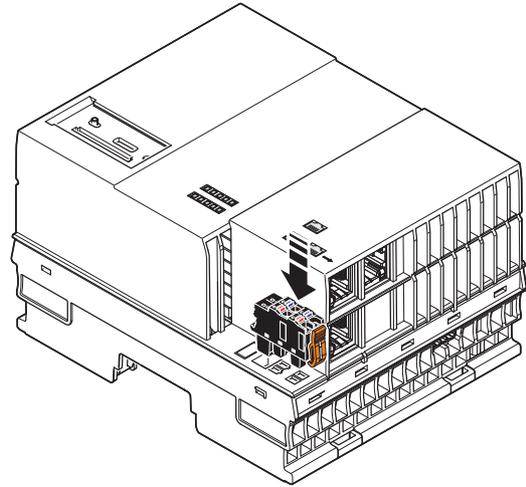
Figure 5-4 Connecting a flexible conductor

Connecting the supply connector

- Place the supply connector vertically into its position and press down firmly. Make sure that the locking latch snaps into place.



AXC F 1152 and AXC F 2152



AXC F 3152

Figure 5-5 Connecting the supply connector

Supply the controller via external 24 V DC sources. The permissible voltage range is 19.2 V DC to 30 V DC (ripple included).



Only use power supplies that are suitable for operation with capacitive loads (increased inrush current) (see [Section 5.1.1](#)).

1. Connect the power supplies to the supply connector as shown in [Figure 5-3](#) and in [Figure 5-4](#). Note the information in [Section 3.16](#).
2. Switch on the power supplies.

The controller is now fully initialized.

If the LEDs do not light up or start flashing, there is a serious fault in the controller. In this case, please contact Phoenix Contact.



Please note the following when using left-alignable Axioline F extension modules:
The supply voltage of the controller and the left-alignable Axioline F extension modules must be fed in via a **shared** power supply unit.

- Connect the supply voltage as described in the module-specific data sheet.

5.2 Connecting Ethernet

- Connect the Ethernet network to the RJ45 jack.

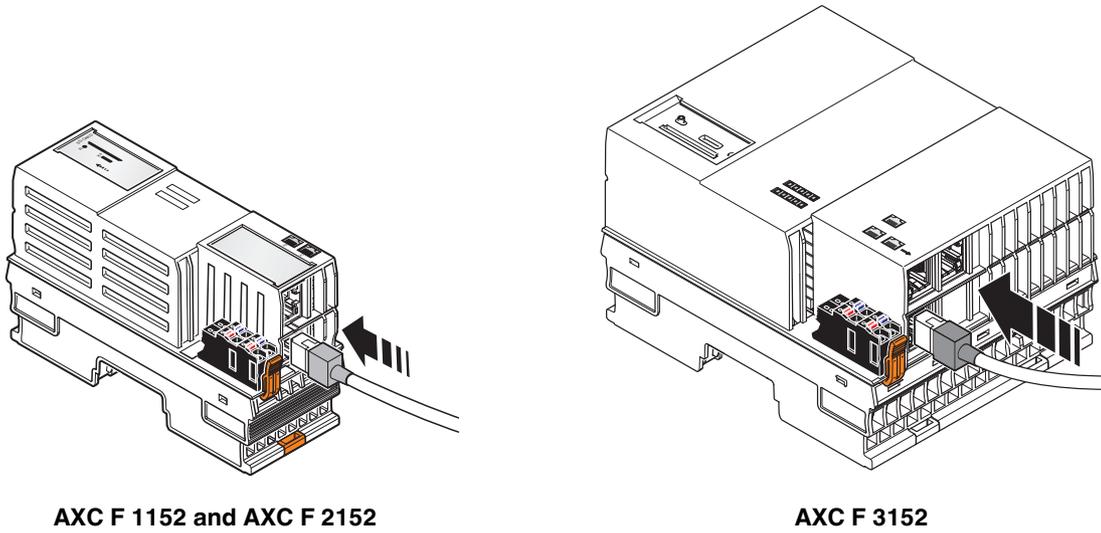


Figure 5-6 Connecting Ethernet

6 Startup

The PLCnext Engineer software is required for starting up the controllers.



In addition, the following topics are available in the [PLCnext Technology Info Center](#):

- Configuring Axioline F modules
- Configuring Inline modules
- Adding left-alignable Axioline F extension modules to the bus configuration
- Configuring PROFINET devices
- Programming according to IEC 61131-3
- Instantiating of programs
- Assigning process data
- Specifying the refresh interval for Axioline F I/O data
- Transferring a project to the controller
- Creating a PLCnext Engineer HMI application

6.1 Installing PLCnext Engineer

The software can be downloaded at phoenixcontact.net/product/1046008.

- Download the software onto your PC.
- Double-click the *.exe file to start installation.
- Follow the instructions in the installation wizard.

Make sure you install a version of the PLCnext Engineer software that is suitable for your controller:

Controller	PLCnext Engineer version
AXC F 1152	≥2020.0
AXC F 2152	≥2020.0
AXC F 3152	≥2020.3

6.2 User interface

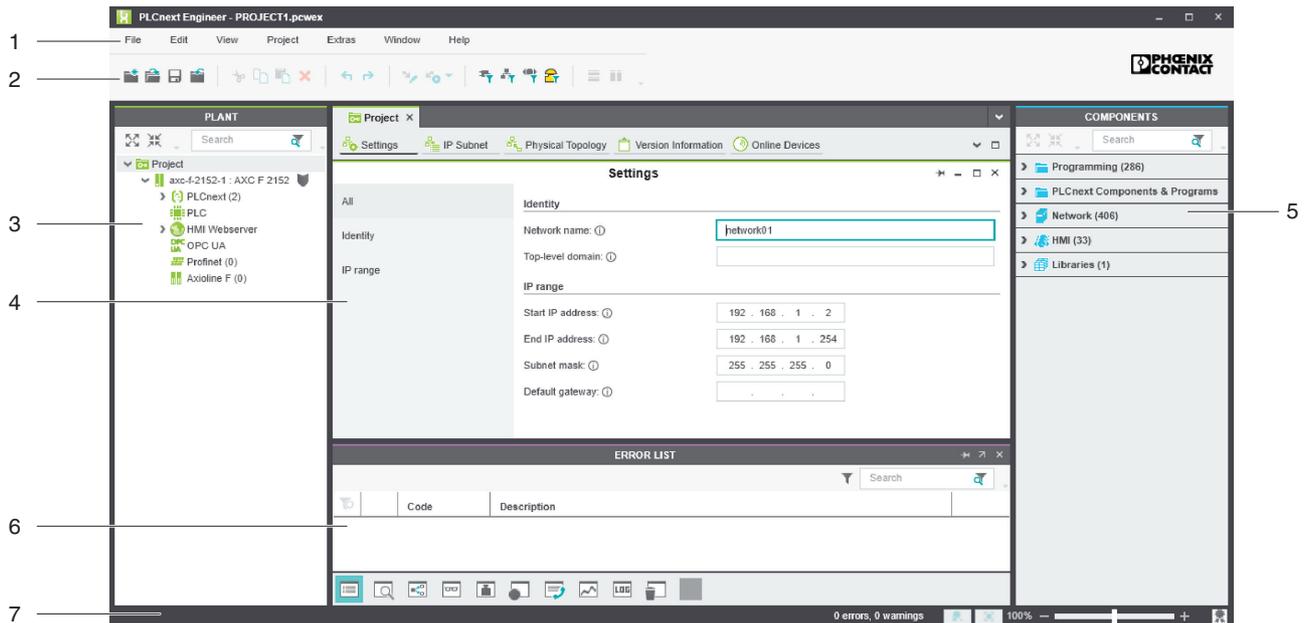


Figure 6-1 PLCnext Engineer user interface

1. Menu bar
2. Tool bar
3. “PLANT” area
4. Editors area
5. “COMPONENTS” area
6. Cross-functional area
7. Status bar

“PLANT” area

All of the physical and logical components of your application are mapped in the form of a hierarchical tree structure in the “PLANT” area.

Editors area

Double-clicking on a node in the “PLANT” area or an element in the “COMPONENTS” area opens the associated editor group in the Editors area. Editor groups are always displayed in the center of the user interface. The color of the editor group indicates whether it is an instance editor (green; opened from the “PLANT” area) or a type editor (blue; opened from the “COMPONENTS” area). Each editor group contains several editors that can be opened and closed via buttons in the editor group.

“COMPONENTS” area

The “COMPONENTS” area contains all of the components available for the project. The components can be divided into the following types based on their function:

- Developing program code (“Data Types”, “Programs”, and “Functions & Function Blocks”)
- Displaying all devices available for the “PLANT” area and adding them via GSDML or FDCML (“Devices”)
- Editing HMI pages (“HMI”)

- Adding libraries such as firmware libraries, IEC user libraries or libraries provided by Phoenix Contact (“References”)

Cross-functional area

The cross-functional area contains functions that extend across the entire project.

- **ERROR LIST:**
Shows all errors, warnings, and messages for the current project.
- **GLOBAL FIND AND REPLACE:**
Finds and replaces strings in the project.
- **CROSS REFERENCES:**
Displays all cross-references within the project, for example, the use and declaration of all variable types or HMI tags.
- **WATCH WINDOWS:**
Debug tool; shows the current values of the added variables in online mode.
- **BREAKPOINTS:**
Debug tool for setting and resetting breakpoints when debugging within the application.
- **CALL STACKS:**
Debug tool that shows the order for calling up when executing the code and that contains commands for debugging with breakpoints.
- **LOGIC ANALYSIS:**
Records and visualizes variable values at runtime.
- **LOGGING:**
Shows all errors, warnings, and messages. A distinction is made between “online” (messages regarding the runtime environment, as well as errors and warnings that concern online communication) and “engineering” (messages regarding software events, e.g., GSDML and FDCML files; not project-related).
- **RECYCLE BIN:**
Elements that have recently been deleted from the “PLANT” or “COMPONENTS” areas are moved to the recycle bin. Deleted elements can be restored from here, if needed.

6.3 Creating a new project

- Open PLCnext Engineer.
- On the start page, click on a project template, e.g., “Empty AXC F 2152 v00 / 2020.0.0 project”.

The project template for an empty AXC F 2152 project opens.

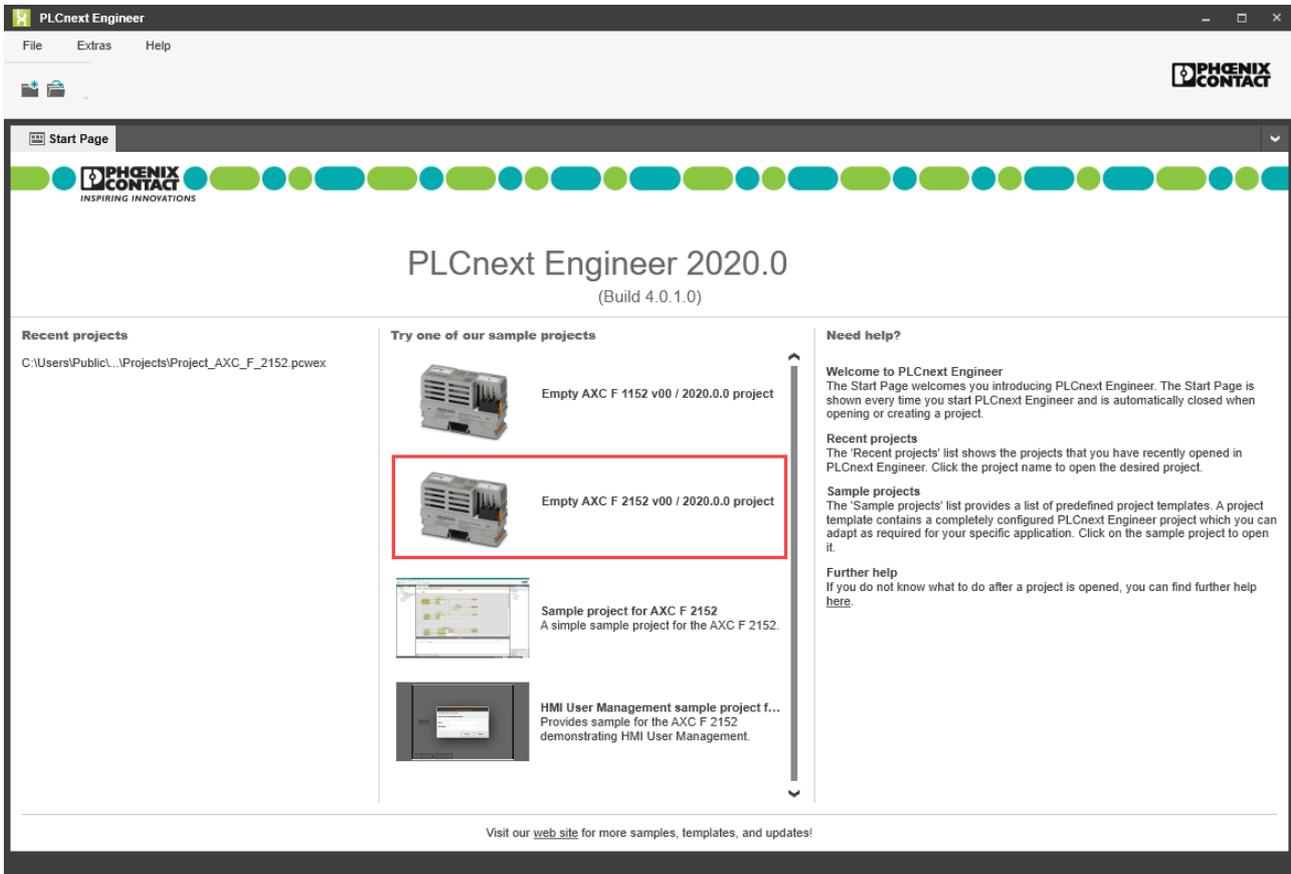


Figure 6-2 Start page, “Empty AXC F 2152 v.00 / 2020.0.0 project” project template

- Open the “File, Save Project As...” menu.
- Enter a unique and meaningful name for the project.
- Click on “Save”.

6.4 Configuring the IP settings

6.4.1 Setting the IP address range

- Double-click the “Project (x)” node in the “PLANT” area.

The “Project” editor group opens.

- Select the “Settings” editor.
- Set the desired IP address range and the subnet mask for the project.

The screenshot shows a software interface with a top navigation bar containing 'Project', 'Settings', 'IP Subnet', 'Physical Topology', 'Version Information', and 'Online Devices'. Below this is a 'Settings' window with a sidebar on the left containing 'All', 'Identity', and 'IP range'. The main area is titled 'Settings' and has a sub-section 'Identity' with fields for 'Network name' (containing 'network01') and 'Top-level domain'. Below this is the 'IP range' section, which is highlighted with a red box. It contains four fields: 'Start IP address' (192 . 168 . 1 . 2), 'End IP address' (192 . 168 . 1 . 254), 'Subnet mask' (255 . 255 . 255 . 0), and 'Default gateway' (empty).

Identity	
Network name: ⓘ	network01
Top-level domain: ⓘ	
IP range	
Start IP address: ⓘ	192 . 168 . 1 . 2
End IP address: ⓘ	192 . 168 . 1 . 254
Subnet mask: ⓘ	255 . 255 . 255 . 0
Default gateway: ⓘ	. . .

Figure 6-3 Setting the IP address range

6.4.2 Setting the IP address

- Double-click the controller node in the “PLANT” area.

The controller editor group opens.

- Select the “Settings” editor.
- Select the “Ethernet” view.

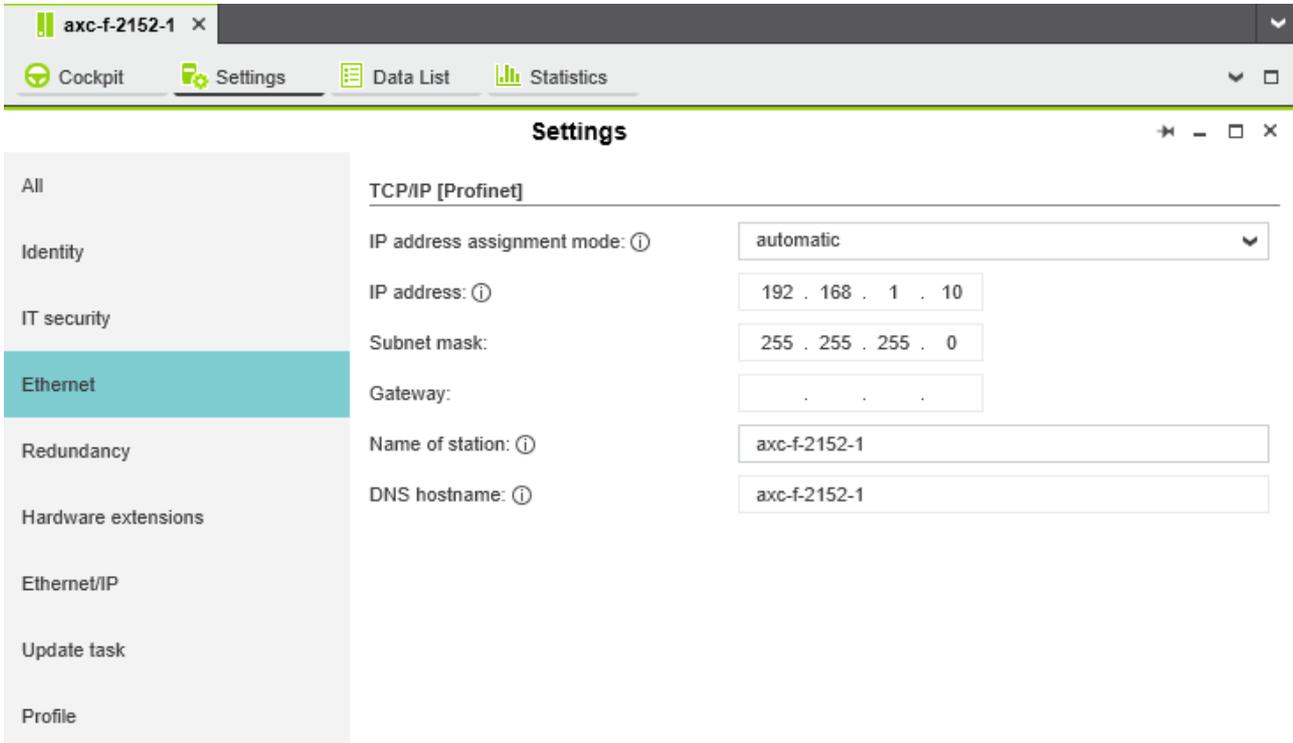


Figure 6-4 Setting the IP address

The IP address of the controller can be set automatically or manually. The IP address is assigned to the controller when you have connected PLCnext Engineer to the controller, see [Section 6.5](#).

Setting the IP address automatically

- From the “IP address assignment mode” drop-down list, select “automatic”.

PLCnext Engineer automatically assigns an IP address to the controller from the set IP address range (see [Section 6.4.1, “Setting the IP address range”](#)) as soon as a connection to the controller is established (see [Section 6.5](#)).

Setting the IP address manually

- From the “IP address assignment mode” drop-down list, select “manual”.
- Enter the IP address, subnet mask, and gateway in the respective input fields.

PLCnext Engineer assigns the manually set IP address to the controller as soon as a connection to the controller is established (see [Section 6.5](#)).



If you are using an SD card, the IP address will be stored there. In the event of a device replacement, the IP address will then be adopted by the new controller when the SD card is inserted.

6.5 Connecting to the controller

To be able to transfer a project to the controller, you must first connect PLCnext Engineer to the controller. To do this, proceed as follows:

- Double-click the “Project (x)” node in the “PLANT” area.

The “Project” editor group opens.

- Select the “Online Devices” editor.
- Select the appropriate network card from the drop-down list.



Figure 6-5 Selecting the network card



You can show and hide more detailed information by clicking on the arrows next to “Name of station (Project)” and “Name of station (Online)” (see [Figure 6-5](#)).

- Click on the button to search the network for connected devices.

You can see the configured devices under “Name of station (Project)”.

You can see the devices that have been found online in the network (online devices) under “Name of station (Online)”.

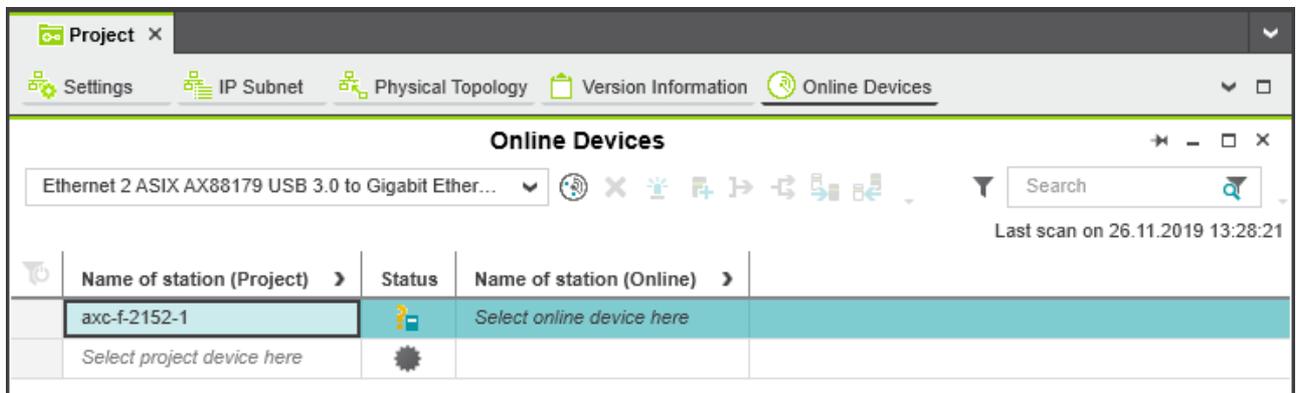


Figure 6-6 Assigning online devices

If you select the device (“Select online device here”) under “Name of station (Online)”, the controller found in the network (the online device) receives the IP settings of the configured controller.

If you select the device (“Select project device here”) under “Name of station (Project)”, the configured controller receives the IP settings of the online device found in the network.

- Select the desired device.

The configured controller has now been assigned to an online device.



If the IP address of an online device found in the network already matches the IP address of the configured controller, the online device is automatically assigned to the configured controller. In this case, you do not need to select the desired device for the assignment.

The icon in the “Status” column indicates that the assignment was successful.



Figure 6-7 Successful assignment of the configured controller to an online device

Once the configured controller has been assigned to an online device, you can connect PLCnext Engineer to the controller:

- Double-click the controller node in the “PLANT” area.

The controller editor group opens.

- Select the “Cockpit” editor.
- Click on the button to connect PLCnext Engineer to the controller.

The “SECURE DEVICE LOGIN” dialog opens.

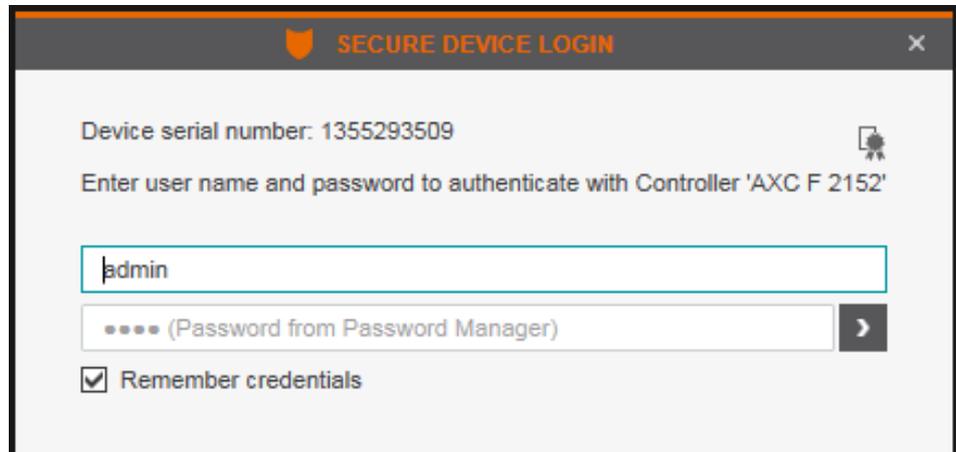


Figure 6-8 “SECURE DEVICE LOGIN” dialog

- Enter your user name and your password.

In the delivery state, the following access data with administrator rights is preset:

User name: admin

Password: printed on the controller (see [Figure 3-8](#) and [Figure 3-9](#)).

The  icon next to the controller node in the “PLANT” area indicates that connection was successful.

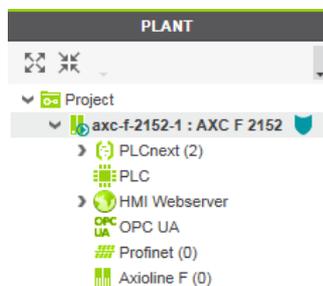


Figure 6-9 Successful connection to the controller



For additional information, please refer to the PLCnext Technology Info Center and the PLCnext Engineer online help.

7 Transferring variable values to PROFICLOUD

In PLCnext Engineer, you can define variables whose values are to be transferred as metrics to PROFICLOUD. The variable values are stored in PROFICLOUD. The metrics can be represented graphically using the open platform Grafana.



Instructions are available in the [PLCnext Technology Info Center](#). They include the following topics:

- Creating variables as OUT ports in PLCnext Engineer
- Configuring PROFICLOUD
- Enabling the PROFICLOUD connection of the controller
- Viewing the metrics overview of a PROFICLOUD device
- Displaying the metrics graphically in Grafana

8 System variables and status information

8.1 General information

This section describes the system variables that are available for the controller.

The controller has a register set that is used for diagnostics and easy control of the controller and the Axioline F local bus.

The diagnostic data is stored in the diagnostic status register and the diagnostic parameter register. These registers are available to the application program as system variables (system flags, global variables).

8.2 Data structures

Some system variables of the controller are organized as data structures. The data structure for this type of system variable contains further system variables.

In the Init Value Configuration of PLCnext Engineer, you can see which specific system variables belong to a system variable that is organized as a data structure.

To open the Init Value Configuration for a system variable organized as a data structure, proceed as follows:

- Double-click on the “PLC” node in the “PLANT” area.

The “/ PLC” controller editor group opens.

- Select the “Data List” editor.



Alternatively, you can open the “Data List” editor via the controller node in the “PLANT” area.

- Open the “System Variables” section.
- In the “Variable (PLC)” column, click on the arrow to display additional information.

The data type of the system variable is displayed in the “Type” column of the additional information.

- Select the row for the system variable organized as a data structure whose associated system variables you would like to view.
To do this, click on the first column in the row for the system variable organized as a data structure.
- Click on the  button to open the Init Value Configuration for the system variable organized as a data structure.

The Init Value Configuration for the selected system variable organized as a data structure opens below the “Data List” editor.

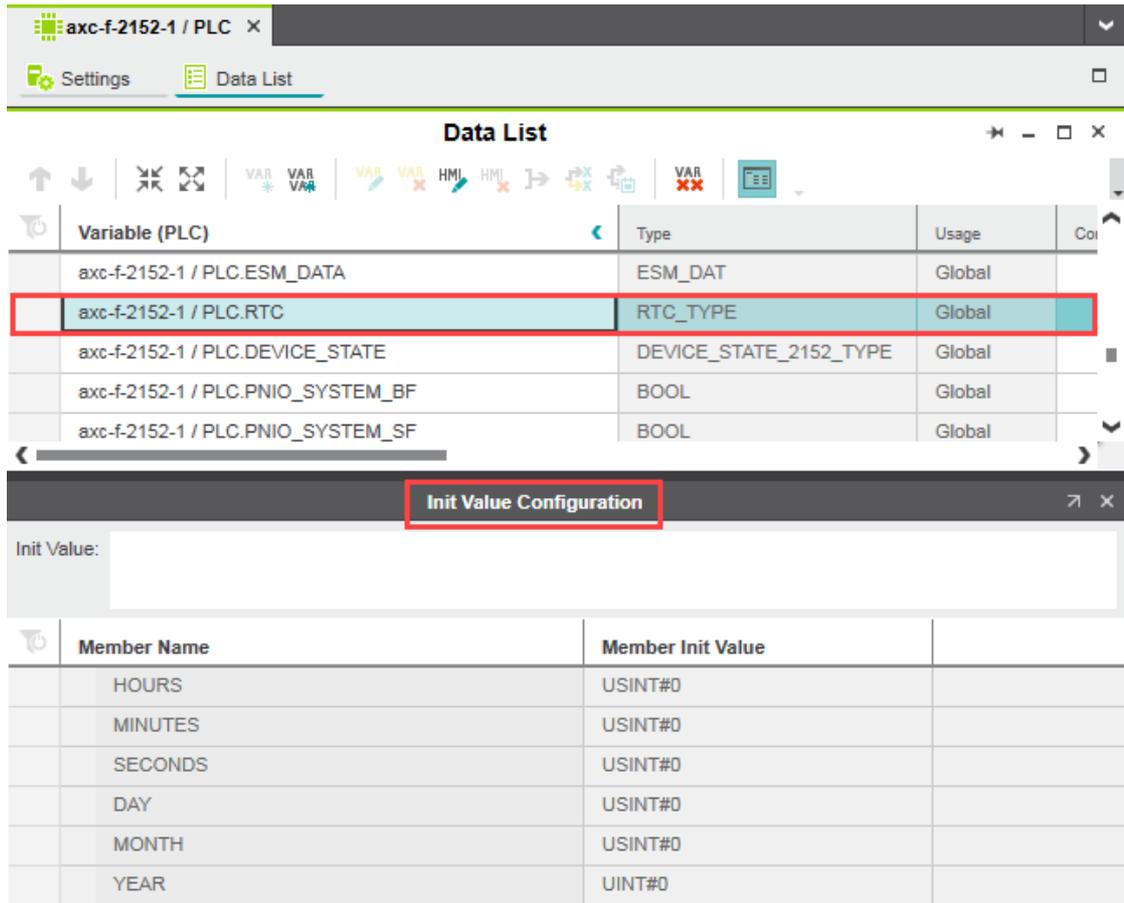


Figure 8-1 Example of AXC F 2152: Init Value Configuration for the RTC system variable organized as a data structure (RTC_TYPE data type)

The “Member Name” column in the Init Value Configuration displays all the system variables contained in the system variable which is organized as a data structure.

8.3 System time

The RTC system variable is a system variable organized as a data structure. The RTC system variable can be used to retrieve information on the system time of the device's internal real-time clock.

Table 8-1 RTC system variable (RTC_TYPE data structure) and the system variables it contains

System variable	Type	Description
RTC	RTC_TYPE	Data structure
HOURS	USINT	System time (hours)
MINUTES	USINT	System time (minutes)
SECONDS	USINT	System time (seconds)
DAY	USINT	System time (day)
MONTH	USINT	System time (month)
YEAR	UINT	System time (year)

8.4 Power supplies

Table 8-2 Power supply system variables

System variable	Type	Description
POWER_SUPPLY_MAIN_OK	BOOL	The 24 V main power supply is OK.
UPS_BATTERY_OK	BOOL	Full capacity of the energy storage for the undervoltage buffering

8.5 TCP_SOCKET, UDP_SOCKET, and TLS_SOCKET function blocks

You can use the TCP_SOCKET and UDP_SOCKET function blocks to open and close the IP sockets that are used for IP communication via TCP (Transmission Control Protocol) or via UDP (User Datagram Protocol).

You can use the TLS_SOCKET function block to open and close IP sockets that are used for secure IP communication via TLS (Transport Layer Security).

You can retrieve the number of opened IP sockets using the following system variables:

Table 8-3 System variables for the TCP_SOCKET, UDP_SOCKET, and TLS_SOCKET function blocks

System variable	Type	Description
IP_ACTIVE_SOCKETS	UINT	Number of IP sockets opened using the TCP_SOCKET and UDP_SOCKET function blocks
TLS_ACTIVE_SOCKETS	UINT	Number of IP sockets opened using the TLS_SOCKET function block

8.6 Device status

The DEVICE_STATE system variable is a system variable organized as a data structure. The DEVICE_STATE system variable can be used to retrieve various information on the device status of the controller.

Table 8-4 DEVICE_STATE system variable (DEVICE_STATE_X152_TYPE data structure) and the system variables it contains

System variable	Type	Description
DEVICE_STATE	DEVICE_STATE_X152_TYPE	Data structure
BOARD_TEMPERATURE	SINT	Temperature inside the housing (in °C)
reserved1	BOOL	Reserved
reserved2	USINT	Reserved
CPU_LOAD_ALL_CORES	USINT	Average current utilization of all processor cores (in %)
CPU_LOAD_PER_CORE	CPU_LOAD_PER_CORE_ARRAY	Information on the utilization per processor core
[1]	USINT	Current utilization of processor core 1 (in %)
[2]	USINT	Current utilization of processor core 2 (in %)

8.7 Partition

The USER_PARTITION system variable is organized as data structure. The USER_PARTITION system variable can be used to retrieve various information and memory statistics about the user partition (overlay file systems). The partition can be located on an external SD card or on the internal memory. This memory is organized in blocks. A block has a constant, fixed size and a file always occupies one or more blocks. A certain number of blocks is reserved in the Linux system for the root user. These reserved blocks are only available for the root user and ensure that the root user is able to act even if the memory is occupied (e.g. for log output).

Tabelle 8-5 USER_PARTITION system variable (PARTITION_INFO data structure) and the system variables it contains

System variable	Type	Description
USER_PARTITION	PARTITION_INFO	Data structure
MEM_TOTAL	ULINT	Total memory of the partition in bytes (including reserved blocks)
MEM_FREE	ULINT	Free, available memory in bytes (without reserved blocks)
MEM_USED	ULINT	Occupied memory in bytes (including reserved blocks)
MEM_USAGE	USINT	Used memory in % (without reserved blocks)

8.8 Task handling

Programs and program parts are treated as tasks in PLCnext Engineer. Individual tasks are coordinated and processed in the Execution and Synchronization Manager (ESM). The ESM_DATA system variable can be used to retrieve information on the task handling of the ESM. The ESM_DATA system variable is a system variable organized as a data structure.

Table 8-6 ESM_DATA system variable (ESM_DAT data structure) and the system variables it contains

System variable	Type	Description
ESM_DATA	ESM_DAT	Data structure
ESM_COUNT	USINT	Number of ESMs (one ESM per processor core)
ESM_INFOS	ESM_INFO_ARRAY	Information on ESMs [1 ... 2] ¹
[1] ... [2]	ESM_INFO	
TASK_COUNT	UINT	Number of tasks that have been configured for the ESM
TICK_COUNT	UDINT	Always 0
TICK_INTERVAL	UDINT	Always 0
TASK_INFOS	TASK_INFO_ARRAY	Information on tasks [1 ... 16] ²
[1] ... [16]	TASK_INFO	
INTERVAL ³	LINT	For cyclic tasks: time interval in μs For acyclic tasks: 0
PRIORITY ³	INT	Priority of task
WATCHDOG ³	LINT	Watchdog time in μs (0 = no watchdog) Watchdog time that you define for the sum of execution duration and delay time. If the watchdog time is exceeded, the watchdog will trigger.
LAST_EXEC_DURATION	LINT	Execution duration of the task in the previous cycle in μs (including interruptions by higher priority tasks)
MIN_EXEC_DURATION	LINT	Minimum execution duration of the task in μs (including interruptions by higher priority tasks)
MAX_EXEC_DURATION	LINT	Maximum execution duration of the task in μs (including interruptions by higher priority tasks)
LAST_ACTIVATION_DELAY	LINT	Delay time of the task in the previous cycle in μs (delay occurs if higher priority tasks are pending at the time of task activation)
MIN_ACTIVATION_DELAY	LINT	Minimum delay time of the task in μs (delay occurs if higher priority tasks are pending at the time of task activation)

Table 8-6 ESM_DATA system variable (ESM_DAT data structure) and the system variables it contains

System variable	Type	Description
MAX_ACTIVATION_DELAY	LINT	Maximum delay time of the task in μ s (delay occurs if higher priority tasks are pending at the time of task activation)
EXEC_TIME_THRESHOLD ³	LINT	Threshold value that you can define for the sum of execution duration and delay time.
EXEC_TIME_THRESHOLD_CNT	UDINT	If the defined threshold value EXEC_TIME_THRESHOLD is exceeded, the value of the EXEC_TIME_THRESHOLD_CNT variable is incremented.
NAME ³	STRING	Task name
EXCEPTION_COUNT	USINT	Number of exceptions
EXCEPTION_INFOS	ESM_EXCEPTION_INFO_ARRAY	Information on exceptions [1 ... 2]
[1] ... [2]	ESM_EXCEPTION_INFO	
TYPE_ID	UDINT	ID of the exception
SUB_TYPE	STRING512	Type of exception
SUB_TYPE_ID	UDINT	ID of the task in which the exception occurred
TASK_NAME	STRING	Name of the task in which the exception occurred
PROGRAM_NAME	STRING512	Name of the program instance in which the exception occurred
INFORMATION	STRING512	Information on the exception that occurred

¹ The AX C F 1152 supports only ESM1.

² The AX C F 1152 supports only 8 tasks.

³ You can set the system variable in the PLCnext Engineer software ("Tasks and Events" editor).

8.9 Client connections to a PLCnext Engineer HMI web server

A PLCnext Engineer HMI application is executed on a PLCnext Engineer HMI server. There are two system variables for handling client connections to a PLCnext Engineer HMI web server:

- HMI_STATUS
- HMI_CONTROL

8.9.1 HMI_STATUS system variable

The HMI_STATUS system variable can be used to retrieve information on the client connections to a PLCnext Engineer HMI web server.

The HMI_STATUS system variable is a system variable organized as a data structure.

Table 8-7 HMI_STATUS system variable (HMI_STATUS_TYPE data structure) and the system variables it contains

System variable	Type	Description
HMI_STATUS	HMI_STATUS_TYPE	Data structure
CLIENT_COUNT	UINT	Number of currently existing client connections to the HMI web server
CLIENTS	HMI_STATUS_ARRAY	Information on existing client connections
[1] ... [256]	HMI_STATUS_STRUCT	Client connections 1 ... 256
SESSION_ID	STRING	Session ID of the client connection
STATION_ID	STRING	Station ID of the client
LAST_REQ	LINT	Time of the last request from the client to the controller
IP_ADDRESS	IP_ADDRESS_ARRAY	IP address of the client
[0] ... [3]	BYTE	IP address in hexadecimal format (Example: [C0].[A8].[01].[64] ⇒ 192.168.1.100)

8.9.2 HMI_CONTROL system variable

The HMI_CONTROL system variable can be used to disconnect a client from a PLCnext Engineer HMI web server.

The HMI_CONTROL system variable is a system variable organized as a data structure.

Table 8-8 HMI_CONTROL system variable (HMI_CONTROL_TYPE data structure) and the system variables it contains

System variable	Type	Description
HMI_CONTROL	HMI_CONTROL_TYPE	Data structure
CLIENTS	HMI_CONTROL_ARRAY	Information on existing client connections
[1] ... [256]	HMI_CONTROL_STRUCT	Client connections 1 ... 256
DISABLE	BOOL	<ul style="list-style-type: none"> Set this bit to 1 to disconnect the selected client from the PLCnext Engineer HMI web server.

8.10 Axioline F: Diagnostic status register

Information on the operating state of the Axioline F local bus is stored in the diagnostic status register. A specific Axioline F local bus state is assigned to each bit in the diagnostic status register.

The following system variables can be used to read the diagnostic status register information.

Table 8-9 System variables of the diagnostic status register

System variable	Type	Description
AXIO_DIAG_STATUS_REG_HI	BYTE	Diagnostic status register (high byte)
AXIO_DIAG_STATUS_REG_LOW	BYTE	Diagnostic status register (low byte)
AXIO_DIAG_STATUS_REG_PF	BOOL	Peripheral fault
AXIO_DIAG_STATUS_REG_PW	BOOL	I/O warning
AXIO_DIAG_STATUS_REG_BUS	BOOL	Bus error
AXIO_DIAG_STATUS_REG_RUN	BOOL	Data transmission is active
AXIO_DIAG_STATUS_REG_ACT	BOOL	Selected configuration is ready for operation
AXIO_DIAG_STATUS_REG_RDY	BOOL	The Axioline F local bus is ready for operation
AXIO_DIAG_STATUS_REG_SYSFAIL	BOOL	The Axioline F local bus switches to the SYSFAIL state when the controller is in the STOP state or there is no program present on it.

8.11 Axioline F: diagnostic parameter register

The diagnostic parameter register provides additional information on the error indicated in the diagnostic status register. The error code is stored in the diagnostic parameter register, and the error location is stored in the extended diagnostic parameter register. The error location is stored as a slot number. This starts at 1 and corresponds to the sequential number of the Axioline F modules that are installed one after another.



Special case: If an interface error cannot be located, the value 128 is displayed in the diagnostic parameter register (bit 7 is set).

The diagnostic parameter register is rewritten whenever a malfunction occurs. If no malfunction has been detected, the diagnostic parameter register contains the value 0.

Table 8-10 System variables of the diagnostic parameter register

System variable	Type	Description
AXIO_DIAG_PARAM_REG_HI	BYTE	Diagnostic parameter register (high byte)
AXIO_DIAG_PARAM_REG_LOW	BYTE	Diagnostic parameter register (low byte)
AXIO_DIAG_PARAM_2_REG_HI	BYTE	Extended diagnostic parameter register (high byte)
AXIO_DIAG_PARAM_2_REG_LOW	BYTE	Extended diagnostic parameter register (low byte)

8.12 PROFINET system variables

Table 8-11 lists the PROFINET system variables of the integrated PROFINET controller functionality.

Table 8-11 PROFINET system variables (PROFINET controller functionality)

System variable	Type	Description
PNIO_SYSTEM_BF	BOOL	No connection to a configured PROFINET device An error has occurred in the PROFINET network, i.e., a connection could not be established to at least one configured PROFINET device. This value is not set if the “Control BF” parameter was set to FALSE for a PROFINET device. The PROFINET device has therefore been excluded from connection monitoring.
PNIO_SYSTEM_SF	BOOL	Diagnostic alarm on a configured PROFINET device At least one PROFINET device is indicating a system error (diagnostic alarm or maintenance alarm). The error priority can be determined from the PNIO_DIAG_AVAILABLE, PNIO_MAINTENANCE_DEMANDED, and PNIO_MAINTENANCE_REQUIRED variables.
PNIO_MAINTENANCE_DEMANDED	BOOL	Maintenance demand At least one PROFINET device is indicating the “maintenance demand” alarm (high-priority maintenance alarm) with an active connection. The PROFINET device can be identified using the RALRM diagnostic block.
PNIO_MAINTENANCE_REQUIRED	BOOL	Maintenance required At least one PROFINET device is indicating the “maintenance requirement” alarm (low-priority maintenance alarm) with an active connection. The PROFINET device can be identified using the RALRM diagnostic block.
PNIO_FORCE_FAILSAFE	BOOL	All PROFINET devices are prompted to set their configured substitute values. If required, the system variable can be written/set from the program.
PNIO_CONFIG_STATUS	WORD	Configuration status of the PROFINET controller
PNIO_CONFIG_STATUS_READY	BOOL	This variable is set if the PROFINET controller has been initialized correctly. No desired configuration has been loaded by PLCnext Engineer yet.

Table 8-11 PROFINET system variables (PROFINET controller functionality)

System variable	Type	Description
PNIO_CONFIG_STATUS_ACTIVE	BOOL	This variable is set if the desired configuration for the PROFINET controller has been loaded. In this state, the PROFINET controller attempts to cyclically establish a connection to all devices in the desired configuration (under the PROFINET icon).
PNIO_CONFIG_STATUS_CFG_FAULT	BOOL	The desired PROFINET controller configuration has not been applied due to a serious error. In this case, please contact Phoenix Contact.
PNIO_FORCE_PRIMARY	BOOL	Function blocks use this variable for applicative redundancy to specify the SRL role of the PROFINET controller.

Table 8-12 lists the PROFINET system variables for the integrated PROFINET device functionality.

Table 8-12 PROFINET system variables (PROFINET device functionality)

System variable	Type	Description
PND_S1_PLC_RUN	BOOL	Status of the higher-level PROFINET controller Information indicating whether the higher-level PROFINET controller is active. The value is TRUE if the higher-level PROFINET controller is in the RUN state (program is being processed). The display only applies when there is an existing PROFINET connection (PND_S1_VALID_DATA_CYCLE).
PND_S1_VALID_DATA_CYCLE	BOOL	The higher-level PROFINET controller has established the connection. Information indicating whether a connection exists and cyclic data is being exchanged between the PROFINET controller and PROFINET device (AXC F 1152 or AXC F 2152), and whether the last frame received contained valid data.
PND_S1_OUTPUT_STATUS_GOOD	BOOL	IOP status of the higher-level PROFINET controller Information indicating whether the input process data (PND_S1_INPUTS) was received by the PROFINET device with the "valid" status. The value is TRUE if the output data of the higher-level PROFINET controller is valid (provider status).
PND_S1_INPUT_STATUS_GOOD	BOOL	IOC status of the higher-level PROFINET controller
PND_S1_DATA_LENGTH	WORD	Process data length that was configured for the PROFINET device
PND_S1_OUTPUTS	PND_IO_512	Output process data Memory area for output process data that the PROFINET device sends to the higher-level PROFINET controller

Table 8-12 PROFINET system variables (PROFINET device functionality)

System variable	Type	Description
PND_S1_INPUTS	PND_IO_512	Input process data Memory area for input process data that the PROFINET device receives from the higher-level PROFINET controller
PND_IO_DRIVEN_BYPLC	INT	Applicative system redundancy – number of the PROFINET controller currently connected to the PROFINET device. Specifies the higher-level PROFINET controller from which the data in the PROFINET device originates. 0: No PROFINET controller 1: PROFINET controller A 2: PROFINET controller B

8.13 INTERBUS: master diagnostic status register

Information on the operating state of the INTERBUS master is stored in the diagnostic status register. A specific INTERBUS master state is assigned to each bit in the diagnostic status register.

The following system variables can be used to read the diagnostic status register information.

Table 8-13 System variables of the master diagnostic status register

System variable	Type	Description
IB_DIAG_STATUS_REG_HI	BYTE	Master diagnostic status register, high byte
IB_DIAG_STATUS_REG_LOW	BYTE	Master diagnostic status register, low byte
IB_DIAG_STATUS_REG_SYSFAIL	BOOL	“System failure” error message
IB_DIAG_STATUS_REG_WARN	BOOL	Defined warning time exceeded
IB_DIAG_STATUS_REG_QUAL	BOOL	Defined error density exceeded
IB_DIAG_STATUS_REG_USER	BOOL	User error/parameterization error
IB_DIAG_STATUS_REG_PF	BOOL	Peripheral fault
IB_DIAG_STATUS_REG_BUS	BOOL	Bus error
IB_DIAG_STATUS_REG_CTRL	BOOL	INTERBUS master/hardware fault
IB_DIAG_STATUS_REG_DTC	BOOL	Diagnostic routine is active
IB_DIAG_STATUS_REG_RUN	BOOL	Data transmission is active
IB_DIAG_STATUS_REG_ACT	BOOL	Selected configuration is ready for operation
IB_DIAG_STATUS_REG_RDY	BOOL	The INTERBUS master is ready for operation

8.14 INTERBUS: master diagnostic parameter register

The diagnostic parameter register provides additional information on an error indicated in the master diagnostic status register (see [Section 8.13](#)).

The following information is stored in the master diagnostic parameter register:

- Error location
- Error code

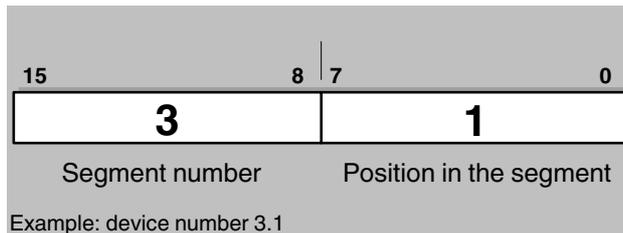


Figure 8-2 Error location in the master diagnostic parameter register

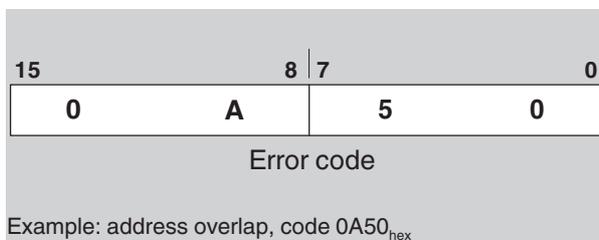


Figure 8-3 Error code in the master diagnostic parameter register



Special case:

If an INTERBUS local bus error cannot be located, the value 128 is indicated in the master diagnostic parameter register (i.e., bit 7 is set).

Table 8-14 Example for error code 0A050_{hex}

Error code	Type	Description and remedy
0A50 _{hex}	USER	Error when assigning a process data item. Input or output address assigned more than once. Remedy: <ul style="list-style-type: none"> • Always assign just one process data item to each input/output address. Add_Error_Info: PDRL index of the incorrect PDRL entry

The master diagnostic parameter register is rewritten whenever a malfunction occurs. If no malfunction has been detected, the master diagnostic parameter register contains the value 0.

Table 8-15 System variables of the master diagnostic parameter register

System variable	Type	Description
IB_DIAG_PARAM_REG_HI	BYTE	Master diagnostic parameter register, high byte
IB_DIAG_PARAM_REG_LOW	BYTE	Master diagnostic parameter register, low byte
IB_DIAG_PARAM_2_REG_HI	BYTE	Extended master diagnostic parameter register, high byte
IB_DIAG_PARAM_2_REG_LOW	BYTE	Extended master diagnostic parameter register, low byte

9 Web-based management (WBM)

In the web-based management (WBM) system, you can access static and dynamic controller information and modify certain controller settings. The WBM can be called up via any of the controller's Ethernet interfaces.



For a description of the web-based management, refer to the [PLCnext Technology Info Center](#).

10 Removing hardware



For basic information on the Axioline F system and its installation, particularly mounting/removing Axioline F modules, please refer to the UM EN AXL F SYS INST user manual (“Axioline F: system and installation”).

10.1 Safety notes



NOTE: Electrostatic discharge

The device contains components that can be damaged or destroyed by electrostatic discharge. When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) in accordance with EN 61340-5-1 and IEC 61340-5-1.



NOTE: Damage to electronics due to inadequate external protection – no safe fuse tripping in the event of a fault

The electronics in the device will be damaged if external fuse protection is inadequate.

- Protect the supply voltage externally in accordance with the connected load (number of Axioline F devices/amount of logic current consumption for each device).
- Ensure that the external fuse trips reliably in the event of a fault.



NOTE: Damage to the contacts when tilting

Tilting the modules can damage the contacts.

- Remove the modules **vertically** from the DIN rail.



Please note:

- During any work on the Axioline F station, the controller or a module, switch off the power supply to the Axioline F station and make sure the supply voltage is protected against unauthorized reactivation.

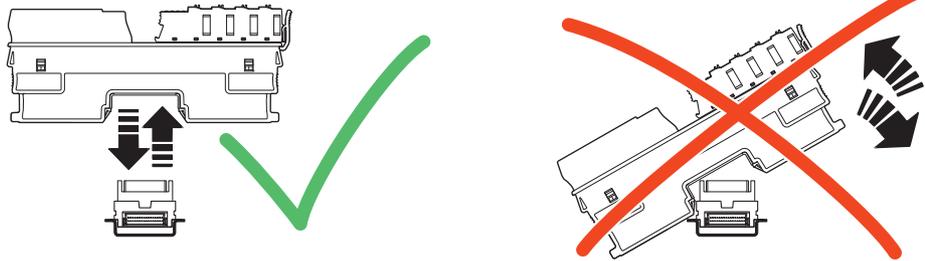


Figure 10-1 Removing the module **vertically**

10.2 Removing cables

- Disconnect the Axioline F station from the power supply.

The cables should only be removed from the supply connector if you wish to change the terminal point assignment or no longer wish to use the supply connector.

- Open the spring by pressing on the spring lever with a screwdriver (A in [Figure 10-2](#)).
- Remove the cable (B in [Figure 10-2](#)).

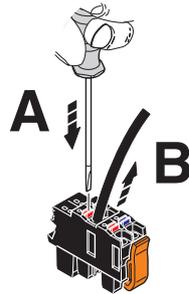
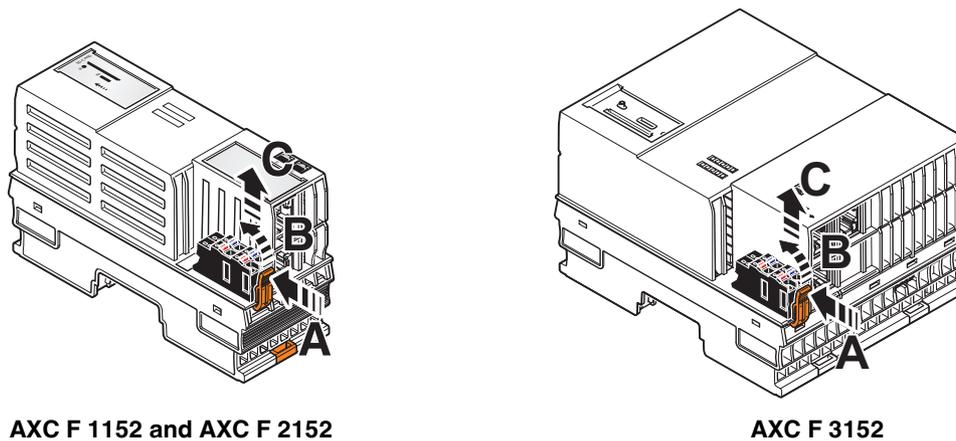


Figure 10-2 Removing the cable

10.3 Removing the connector

Removing the supply connector

- Release the locking latch (A in [Figure 10-3](#)), tilt the connector upwards slightly (B in [Figure 10-3](#)), and remove it from the controller (C in [Figure 10-3](#)).



AXC F 1152 and AXC F 2152

AXC F 3152

Figure 10-3 Removing the supply connector

Removing the Ethernet connector

- Release the RJ45 connector by pressing on the snap-in latch and remove the connector.

10.4 Removing the SD card

- Lightly push the SD card far enough into the SD card holder until the snap-in mechanism releases the SD card and partially ejects the SD card from the SD card holder.
- Remove the SD card.

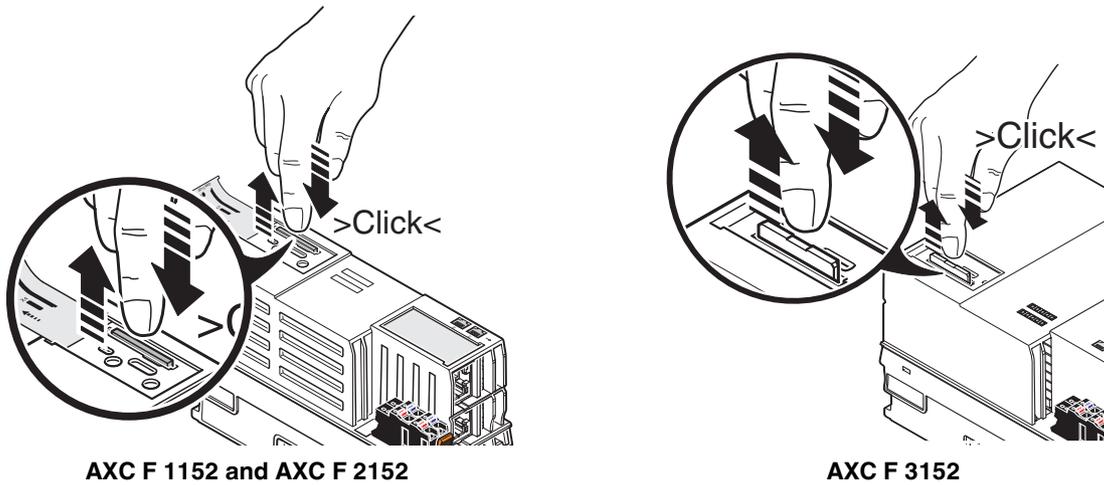


Figure 10-4 Removing the SD card

10.5 Removing the controller

- Insert a suitable tool (e.g., bladed screwdriver) into the upper and lower snap-in mechanisms (base latches) of the controller one after the other and release the controller (A in Figure 10-5).

The base latches are locked in place in the open position.

- Remove the controller keeping it perpendicular to the DIN rail (B in Figure 10-5).

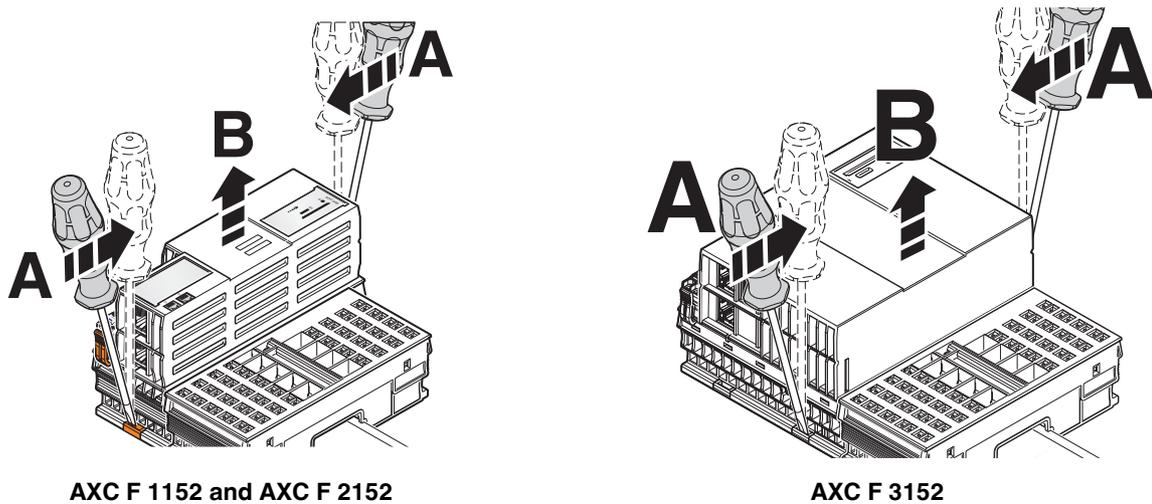


Figure 10-5 Removing the controller

10.6 Removing a left-alignable Axioline F extension module

- Remove the left-alignable Axioline F extension module as described in the module-specific packing slip.

10.7 Removing the AXC F IL ADAPT Inline adapter terminal

- Remove the Inline adapter terminal as described in the module-specific packing slip.

11 Device replacement, device defects, and repairs

11.1 Device replacement

The controller can be replaced, if necessary.

If you want to replace a controller in an Axioline F station, follow the steps described in [Section 10, “Removing hardware”](#) and [Section 4, “Mounting hardware”](#).

- Disconnect the Axioline F station from the power supply.
- Remove the SD card of the controller to be replaced.
- Replace the controller in your application with an identical controller (same order number).

**Please note:**

If the new controller firmware is of a later version than the firmware of the controller to be replaced, you may have to recompile the project in the PLCnext Engineer software and/or in the integrated development environment. This procedure is only necessary for certain firmware versions. For additional information, please refer to the “Change notes for the controller” application note.

The application note can be downloaded at phoenixcontact.net/product/2404267.

- To adopt the settings stored on the SD card, insert the SD card into the new controller.
- Once the controller is replaced, restore all the necessary connections.

In case you operate the controller with PROFICLOUD connection:

- Delete the controller from PROFICLOUD, as described in the “Startup and operation of hardware and software components of the PROFICLOUD” user manual.
- Then reregister the controller in PROFICLOUD and add it as a PROFICLOUD device, as described in [Section “Transferring variable values to PROFICLOUD” on page 64](#).

11.2 Device defects and repair

Repairs may only be carried out by Phoenix Contact.

- Send defective devices back to Phoenix Contact for repair or to receive a replacement device.
- We strongly recommend using the original packaging to return the product.
- Include a note in the packaging indicating that the contents are returned goods.
- If the original packaging is no longer available, observe the following points:
 - Observe the humidity specifications and the temperature range specified for transport (see [Section 14.3](#)).
 - If necessary, use dehumidifying agents.
 - Use suitable ESD packaging to protect components that are sensitive to electrostatic discharge.
 - Secure any loose parts.
 - Make sure that the packaging you select is large enough and that the material used is sufficiently thick.
 - Only use plastic bubble wrap sheets as wadding.
 - Attach warnings to the transport packaging so that they are clearly visible.
 - Please ensure that the delivery note is placed inside the package if the package is to be shipped domestically. However, if the package is being shipped internationally, the delivery note must be placed inside a delivery note pocket and attached to the outside so that it is clearly visible.

12 Maintenance, decommissioning, and disposal

12.1 Maintenance

The controller is maintenance-free.

12.2 Decommissioning and disposal

Controller disposal

- Do not dispose of the device with household waste; it should instead be disposed of in accordance with the currently applicable national regulations.

Packaging disposal

- Dispose of packaging materials that are no longer needed (cardboard packaging, paper, bubble wrap sheets, etc.) with household waste in accordance with the currently applicable national regulations.

SD card disposal

Sensitive data is stored on the SD card. This data can even be restored after reformatting the SD card. To ensure that your data does not fall into unauthorized hands, you should physically destroy the SD card before disposal.

- Physically destroy the SD card, e.g., by cutting up the SD card.
- Dispose of the irreparably damaged SD card in accordance with the applicable national regulations.

13 Troubleshooting and frequently asked questions (FAQs)



Information on troubleshooting and answers to frequently asked questions (FAQs) can be found in the PLCnext Community at plcnext-community.net.

14 Ordering data and technical data

14.1 Ordering data

Description	Type	Order No.	Pcs./Pkt.
PLCnext Control for the direct control of Axioline F I/Os. With two Ethernet interfaces. Complete with connector and bus base module.	AXC F 1152	1151412	1
PLCnext Control for the direct control of Axioline F I/Os. With two Ethernet interfaces. Complete with connector and bus base module.	AXC F 2152	2404267	1
PLCnext Control for the direct control of Axioline F I/Os. With three independent Ethernet interfaces. Complete with connector and bus base module.	AXC F 3152	1069208	1
Accessories	Type	Order No.	Pcs./Pkt.
Engineering software platform for Phoenix Contact automation controllers. PLCnext Engineer is IEC 61131-3-compliant and its functionality can be extended using add-ins. (Software)	PLCnext Engineer	1046008	1
Program and configuration memory for storing the application programs and other files in the file system of the PLC, pluggable, 8 GB. (Memory)	SD FLASH 8GB PLCNEXT MEMORY	1061701	1
Program and configuration memory for storing the application programs and other files in the file system of the PLC, pluggable, 2 GB. (Memory)	SD FLASH 2GB PLCNEXT MEMORY	1043501	1
Right-alignable Inline adapter terminal (INTERBUS master) for one PLCnext Control device for setting up a PLCnext Technology Inline station	AXC F IL ADAPT	1020304	1
Left-alignable Ethernet interface, for connection to a compatible modular controller from the PLCnext Control range.	AXC F XT ETH 1TX	2403115	1
Left-alignable INTERBUS master, for the connection of INTERBUS remote bus components to a compatible modular controller from the PLCnext Control range.	AXC F XT IB	2403018	1
Axioline F, power module for the communications power U_{BUS} , max. 4 A, degree of protection: IP20, including bus base module and Axioline F connector	AXL F PWR 1H	2688297	1
Bus base module for left-aligning the AXC F 2xxx controllers	AXC BS L 2	1064312	1
Connecting cable, for connecting the controller to a PC from USB C to USB C (cable/conductor)	CAB-USB C/ USB C/1,8M	1021809	1
Connecting cable, for connecting the controller to a PC from USB A to USB C (cable/conductor)	CAB-USB A/ USB C/1,8M	2404677	1

Replacement items	Type	Order No.	Pcs./Pkt.
Axioline F bus base module for housing type BK (replacement product for AXC F 1152 and AXC F 2152)	AXL BS BK	2701422	5
Axioline F bus base module (replacement product for AXC F 3152)	AXC BS L 30	1138006	1

14.2 Overview of documentation



Information on troubleshooting and answers to frequently asked questions (FAQs) can be found in the PLCnext Community at plcnext-community.net.

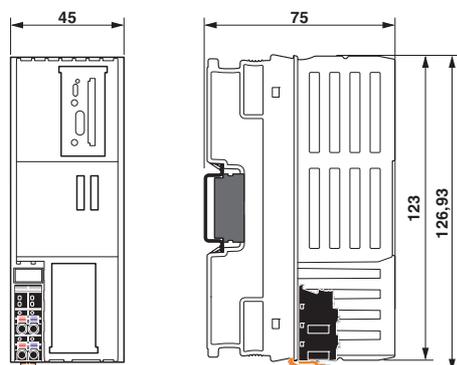


Comprehensive documentation on PLCnext Technology is available in the [PLCnext Technology Info Center](#).

Documentation	Type	Order No.	Pcs./Pkt.
User manual, English: Axioline F: System and installation	UM EN AXL F SYS INST	-	-
User manual, English, Axioline F: Diagnostic registers and error messages	UM EN AXL F SYS DIAG	-	-
Data sheet, English, PLCnext Technology, right-alignable Inline adapter terminal (INTERBUS master)	DB EN AXC F IL ADAPT	-	-
Data sheet, English, Axioline F, left-alignable INTERBUS master	DB EN AXC F XT IB	-	-
Data sheet, English, Axioline F, left-alignable Ethernet inter- face	DB EN AXC F XT ETH 1TX	-	-
Application note, English, measures to protect network- capable devices with Ethernet connection against unau- thorized access	AH EN INDUSTRIAL SECURITY	-	-
User manual, English, for diagnostics on Generation 4 controller boards	IBS SYS DIAG DSC UM E	2747280	1
User manual, English, for firmware messages of Genera- tion 4 controller boards, only available as a download.	IBS SYS FW G4 UM E	2745130	1
User manual, English, for the Peripherals Communication Protocol (PCP), only available as a download.	IBS SYS PCP G4 UM E	2745114	1

14.3 Technical data of the AXC F 1152 and AXC F 2152

Dimensions (nominal sizes in mm)



Width	45 mm
Height	126.93 mm
Depth	75 mm
Note on dimensions	The depth applies when a TH 35-7.5 DIN rail is used (in accordance with EN 60715).

General data

Color	Gray
Weight	215 g
Design	Axioline
Mounting method	DIN rail mounting
Operating system	Linux
RAM	512 MByte DDR3 SDRAM
Real-time clock	Yes

Ambient conditions

Ambient temperature (operation)	-25°C ... 60°C up to 2000 m above sea level (note derating) -25°C ... 55°C up to 3000 m above sea level (note derating) ≤55°C (with max. 1 A on U _{BUS}) >55°C ... 60°C (only in conjunction with an Axioline F power module AXL F PWR 1H (Order No. 2688297))
Ambient temperature (storage/transport)	-40°C ... 85°C
Permissible humidity (operation)	5% ... 95% (in accordance with DIN EN 61131-2)
Permissible humidity (storage/transport)	5% ... 95% (in accordance with DIN EN 61131-2)
Air pressure (operation)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Air pressure (storage/transport)	58 kPa ... 106 kPa (up to 4500 m above sea level)
Degree of protection	IP20
Protection class	III, IEC 61140, EN 61140, VDE 0140-1
Vibration (operation)	5g

AXC F X152

Ambient conditions

Vibration (storage/transport)	5g
Shock	30g, 11 ms period, half-sine shock pulse, in accordance with IEC 60068-2-27
Shock (operation)	10g (bump endurance test in accordance with DIN EN 60068-2-27)

Processor

Processor	ARM [®] Cortex [®] -A9 AXC F 2152: 2x 800 MHz AXC F 1152: 1x 800 MHz
-----------	--

Connection data

Designation	Axioline F connector
Connection method	Push-in connection
Conductor cross section rigid/flexible	0.2 mm ² ... 1.5 mm ²
Conductor cross section [AWG]	24 ... 16
Stripping length	8 mm

Axioline F local bus interface

Number of interfaces	1
Connection method	Bus base module
Transmission speed	100 Mbps
Electrical isolation	No
Number of supported devices	Max. 63

Ethernet interface

Number of interfaces	2
Connection method	RJ45 jack
Note on the connection method	Auto-negotiation and auto-crossing
Bus system	RJ45
Number of channels	2
Transmission speed	10/100 Mbps (full duplex)
Transmission length	100 m, max.
Transmission physics	Ethernet in RJ45 twisted pair

System limits

Amount of process data	8192 bits, maximum (per station) 4096 bits, maximum (input) 4096 bits, maximum (output)
------------------------	---

System limits

Number of supported devices	Max. 63 (per station)
Number of local bus devices that can be connected	Max. 63 (observe current consumption)

**NOTE: Electronics may be damaged if overloaded**

Note the logical current consumption of each device when configuring an Axioline F station. This is specified in every module-specific data sheet. The current consumption can differ depending on the individual module. The permissible number of devices that can be connected therefore depends on the specific station structure.

PROFINET

Device function	PROFINET controller, PROFINET device
-----------------	--------------------------------------

Number of supported devices

AXC F 1152	Max. 16 (on PROFINET controller)
AXC F 2152	Max. 64 (on PROFINET controller)

Specification	Version 2.3
---------------	-------------

Conformance class	A
-------------------	---

Update rate

AXC F 1152	Min. 1 ms (4 devices) Min. 4 ms (16 devices)
AXC F 2152	Min. 1 ms (4 devices) Min. 16 ms (64 devices)

Number of slots	1
-----------------	---

Vendor ID	00B0 _{hex}
-----------	---------------------

Device ID

AXC F 1152	0169 _{hex}
AXC F 2152	0142 _{hex}

Communications voltage U_L feed-in (the supply of the Axioline F local bus U_{Bus} is generated from U_L)

Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, ripple included)
Current consumption	Typ. 200 mA (with no I/Os and $U_L = 24$ V) Max. 442 mA (with 1 A at U_{Bus} for the I/Os and $U_L = 24$ V)
Power consumption	Typ. 4.8 W (with no I/Os) Max. 10.6 W (with 1 A load at U_{Bus} for the I/Os)
Surge protection for supply voltage	Electronic
Polarity reversal protection for supply voltage	Electronic

**NOTE: Electronics may be damaged if overloaded**

Provide external protection for the 24 V U_L range. If you use a fuse, the power supply unit must be capable of supplying four times the nominal current of the fuse. This ensures that the fuse trips reliably in the event of a fault.

Axioline F local bus supply (U_{Bus})

Supply voltage	5 V DC (via bus base module)
Power supply	1 A

Real-time clock

Real-time clock accuracy	1.73 s/day = 20 ppm at 25°C
Power reserve	240 h

Error messages to the higher-level controller or computer system

None

Programming

Programming tool	PLCnext Engineer (≥2020.0) Eclipse MATLAB® Simulink®
Supported programming languages	Programming in accordance with IEC 61131-3 C++ C# Java Manufacturer-specific

IEC 61131 runtime system

Module classification	PLCnext Control for direct control of Axioline F I/Os
Type of application	Distributed control technology
Application interface	OPC UA
Number of data blocks	Depends on mass storage
Number of control tasks	
AXC F 1152	8
AXC F 2152	32 (16 per processor core)
Cycle time	
AXC F 1152	5 ms (for cyclic task)
AXC F 2152	1 ms (for cyclic task)
Program memory	8 MBytes
Retentive mass storage	48 kB (NVRAM)
Mass storage	16 MBytes
Parameterization memory	Min. 4 MB (depending on storage medium)

Conformance with EMC directive 2014/30/EU

Immunity test in accordance with EN 61000-6-2

Electrostatic discharge (ESD) EN 61000-4-2/IEC 61000-4-2	Criterion B, 6 kV contact discharge, 8 kV air discharge
Electromagnetic fields EN 61000-4-3 / IEC 61000-4-3	Criterion A, field strength: 10 V/m
Fast transients (burst) EN 61000-4-4/ IEC 61000-4-4	Criterion B, 2 kV
Transient overvoltage (surge) EN 61000-4-5/IEC 61000-4-5	Criterion B; DC supply lines: ±0.5 kV/±0.5 kV (symmetrical/asymmetrical), fieldbus cable shielding: ±1 kV
Conducted disturbance variables EN 61000-4-6/ IEC 61000-4-6	Criterion A, test voltage 10 V

Noise emission test in accordance with EN 61000-6-3 Class B

Approvals

For the current approvals, please visit phoenixcontact.net/products.

UL: Additional information

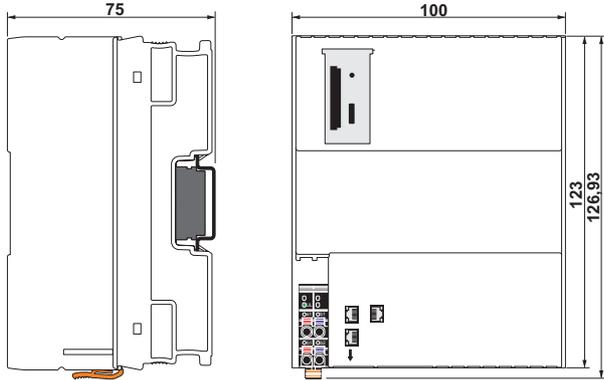
Overvoltage category	2
Pollution degree	2
Operating mode	Indoor use
Minimum temperature rating and size of the cables to be connected to the field wiring terminals	Min. 75°C and 24 ... 16 AWG



- All types are intended to be used in final safety enclosure, which shall conform with requirements for protection against the spread of fire and shall have adequate rigidity acc. to UL 61010-1 & UL 61010-2-201.
- If the device is used in not specified manner, the protection provided by the device may be impaired.
- The supply source and ext. circuits intended to be connected to this device shall be galv. separated from mains supply or hazardous live voltage by reinforced or double insulation and meet the requirements of SELV circuit of UL/IEC 61010-2-201 and clause 9.4 Limited energy circuit of UL/IEC 61010-1 or NEC Class 2.

14.4 AXC F 3152 technical data

Dimensions (nominal sizes in mm)



Width	100 mm
Height	126.93 mm
Depth	75 mm
Note on dimensions	The depth applies when a TH 35-7.5 DIN rail is used (in accordance with EN 60715).

General data

Color	Gray
Weight	498 g
Design	Axioline
Mounting method	DIN rail mounting
Operating system	Linux
RAM	2048 Mbytes
Real-time clock	Yes

Ambient conditions

Ambient temperature (operation)	-25°C ... 60°C up to 2000 m above sea level (note derating) -25°C ... 55°C up to 3000 m above sea level (note derating) ≤55°C (with max. 1 A on U _{BUS}) >55°C ... 60°C (only in conjunction with an Axioline F power module AXL F PWR 1H (Order No. 2688297))
Ambient temperature (storage/transport)	-40°C ... 85°C
Permissible humidity (operation)	5% ... 95% (in accordance with DIN EN 61131-2)
Permissible humidity (storage/transport)	5% ... 95% (in accordance with DIN EN 61131-2)
Air pressure (operation)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Air pressure (storage/transport)	58 kPa ... 106 kPa (up to 4500 m above sea level)
Degree of protection	IP20
Protection class	III (IEC 61140, EN 61140, VDE 0140-1)
Vibration (operation)	5g

Ambient conditions

Vibration (storage/transport)	5g
Shock	30g, 11 ms period, half-sine shock pulse, in accordance with IEC 60068-2-27
Shock (operation)	10g (bump endurance test in accordance with DIN EN 60068-2-27)

Connection data

Designation	Axioline F connector
Connection method	Push-in connection
Conductor cross section rigid/flexible	0.2 mm ² ... 1.5 mm ²
Conductor cross section [AWG]	24 ... 16
Stripping length	8 mm

Processor

Processor	Intel® Atom™ x5-E3930 1.3 GHz Dual Core
-----------	---

Axioline F local bus interface

Number of interfaces	1
Connection method	Bus base module
Transmission speed	100 Mbps
Electrical isolation	No
Number of supported devices	Max. 63

Ethernet interface

Number of interfaces	3
Connection method	RJ45 jack
Note on the connection method	Auto-negotiation and auto-crossing
Bus system	RJ45
Transmission speed	10/100/1000 Mbps
Transmission length	100 m, max.
Transmission physics	Ethernet in RJ45 twisted pair

System limits

Number of supported devices	Max. 63 (per station)
Number of local bus devices that can be connected	Max. 63 (observe current consumption)

**NOTE: Electronics may be damaged if overloaded**

Note the logical current consumption of each device when configuring an Axioline F station. This is specified in every module-specific data sheet. The current consumption can differ depending on the individual module. The permissible number of devices that can be connected therefore depends on the specific station structure.

PROFINET

Device function	PROFINET controller, PROFINET device
Number of supported devices	Max. 128 (on PROFINET controller)
Specification	Version 2.3

PROFINET

Conformance class	A
Update rate	Min. 1 ms (32 devices) Min. 4 ms (128 devices)
Number of slots	1
Device ID	0158 _{hex}

Communications voltage U_L feed-in (the supply of the Axioline F local bus U_{BUS} is generated from U_L)

Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC
Current consumption	Typ. 260 mA (with no I/Os and $U_L = 24$ V) Typ. 504 mA (with 1 A at U_{BUS} for the I/Os and $U_L = 24$ V)
Power consumption	Typ. 6.24 W (with no I/Os) Typ. 12.1 W (with 1 A at U_{BUS} for the I/Os and $U_L = 24$ V)
Surge protection for supply voltage	Electronic
Polarity reversal protection for supply voltage	Electronic



NOTE: Electronics may be damaged if overloaded

Provide external protection for the 24 V U_L range. If you use a fuse, the power supply unit must be capable of supplying four times the nominal current of the fuse. This ensures that the fuse trips reliably in the event of a fault.

Axioline F local bus supply (U_{BUS})

Supply voltage	5 V DC (via bus base module)
Power supply	1 A

Real-time clock

Real-time clock accuracy	0.7 s/day = 8 ppm at 25°C
Power reserve	14 days at 25°C

Error messages to the higher-level controller or computer system

None

Programming

Programming tool	PLCnext Engineer (≥2020.3) Eclipse MATLAB® Simulink®
Supported programming languages	Programming in accordance with IEC 61131-3 C++ C# Java Manufacturer-specific

IEC 61131 runtime system

Module classification	PLCnext Control for direct control of Axioline F I/Os
Type of application	Distributed control technology
Application interface	OPC UA
Number of data blocks	Depends on mass storage
Cycle time	500 µs (for cyclic task)
Program memory	16 MBytes
Retentive mass storage	1 MByte
Mass storage	32 MBytes
Parameterization memory	Min. 4 MB (depending on storage medium)

Conformance with EMC Directive 2014/30/EU

Immunity test in accordance with EN 61000-6-2

Electrostatic discharge (ESD) EN 61000-4-2/IEC 61000-4-2	Criterion B, 6 kV contact discharge, 8 kV air discharge
Electromagnetic fields EN 61000-4-3 / IEC 61000-4-3	Criterion A, field strength: 10 V/m
Fast transients (burst) EN 61000-4-4/ IEC 61000-4-4	Criterion B, 2 kV
Transient overvoltage (surge) EN 61000-4-5/IEC 61000-4-5	Criterion B; DC supply lines: ±0.5 kV/±0.5 kV (symmetrical/asymmetrical), fieldbus cable shielding: ±1 kV
Conducted disturbance variables EN 61000-4-6/ IEC 61000-4-6	Criterion A, test voltage 10 V

Noise emission test according to EN 61000-6-3 Class B

Approvals

For the current approvals, please visit phoenixcontact.net/products.

A Appendix

A 1 Updating the firmware via the shell



For information on the firmware update via the shell, please refer to the [PLCnext Technology Info Center](#).

A 2 Shell commands for controlling the firmware



For information on controlling the firmware (start, stop, restart) via shell commands, please refer to the [PLCnext Technology Info Center](#).

A 3 Replacing the HTTPS certificate

You can replace the HTTPS certificate currently used for the controller with a third-party certificate. The HTTPS certificate comprises two files: https_cert.pem and https_key.pem.

To replace the files on the controller, proceed as follows:

- Open the SFTP client software (e.g., WinSCP).
- If necessary:
Enter the IP address of the controller in the “Computer name” input field.
- Log in as an administrator.

In the delivery state, the following access data is set:

User name: admin

Password: printed on the controller.

- Open the /opt/plcnext/Security/Certificates/https directory.

The two files https_cert.pem and https_key.pem are located in this directory.

- Replace the two files with the third-party certificate files.



Please note:

The third-party certificate files must have the same designation as the original files.

- If necessary, rename the third-party certificate files to https_cert.pem and https_key.pem.

A 4 Use of the AXC F 2152 controller under extreme ambient conditions

The AXC F 2152 controller has been tested successfully over 250 temperature change cycles in accordance with IEC 61131-2 in the range from -40°C to $+70^{\circ}\text{C}$.

The following conditions were observed:

- The Axioline F devices for all connecting cables were connected with a minimum conductor cross section of 0.5 mm^2
- The Axioline F station was assembled on a wall-mounted horizontal DIN rail
- Fans were used to ensure continuous movement of air in the control cabinet
- The Axioline F station was not exposed to vibration or shock
- The Axioline F station was operated with a maximum of 24.5 V (ensured by using regulated power supply units)

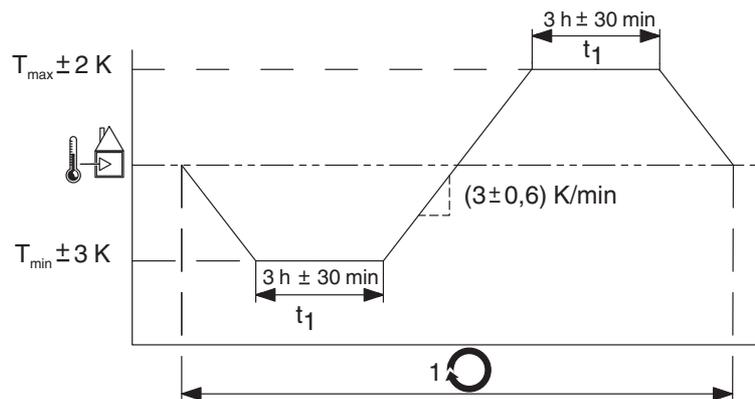


Figure 14-1 Temperature change cycle



Temperature in the control cabinet/ambient temperature



Cycle

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