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

User manual

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

UM EN AXC F X152, Revision 13 2025-01-21

This user manual is valid for:

Designation	As of version (HW)	As of version (FW)	Item no.
AXC F 1152	05	2020.0 LTS	1151412
AXC F 2152	05	2020.0 LTS	2404267
AXC F 3152	03	2023.0 LTS	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.com/product/1151412
- AXC F 2152: phoenixcontact.com/product/2404267
- AXC F 3152: phoenixcontact.com/product/1069208

- Observe the change notes regarding the firmware version.
- If necessary, update the firmware.
  For information on running firmware updates, refer to section „Web-based management (WBM)“ auf Seite 74 and section „Updating the firmware“ auf Seite 103.

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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.

The symbol indicates potential security risks in devices, solutions or services from Phoenix Contact. These can be IT and network security risks in industry automation, for example.

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 degree of protection 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.

1.3.2 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.

1.4 Trademarks

- Linux® is a registered trademark of Linus Torvalds in the USA and other countries.
- Visual Studio® is a registered trademark of Microsoft Corporation.
- MATLAB® and Simulink® are registered trademarks of The MathWorks, Inc.
- OPC UA® is a registered trademark of the OPC Foundation.
- EtherNet/IP™ is a trademark of ODVA, Inc.
- Python® is a registered trademark of the Python Software Foundation.
- Eclipse® is a registered trademark of the Eclipse Foundation.
- IO-Link® is a registered trademark of the PROFIBUS Nutzerorganisation e.V., Germany.
- Arm® und Cortex® are registered trademarks of Arm Limited (or its subsidiaries or affiliates) in the United States and other countries.
- Intel®, the Intel®-Logo and Intel Atom® are trademarks of Intel Corporation or its subsidiaries.

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, “Ordering data and technical data”.

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, “Ordering data and technical data”.

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.

NOTE: Unauthorized physical access

There is a danger of the device being tampered with through unauthorized physical access.

- Protect the device and the aligned modules against unauthorized physical access. Use a lockable control cabinet, for example.

1.6 Security in the network

NOTE: Network security jeopardized by unauthorized access
Connecting devices to a network entails the danger of unauthorized access to the network.

Observe the following safety notes:

- If possible, deactivate unused communication channels.
- Use secure passwords reflecting the complexity and service life recommended in the latest guidelines.
- Only allow authorized persons to access the device. Limit the number of authorized persons to the necessary minimum.
- Always install the latest firmware version. The firmware can be downloaded via the item (phoenixcontact.com/products).
- Observe the IT security requirements and the standards applicable to your application. Take the necessary protective measures. These may include, for example, virtual networks for remote maintenance access or a firewall.
- In security-critical applications, always use the device with an additional security appliance.

  Phoenix Contact offers security appliances in the mGuard product range. The mGuard routers connect various networks for the remote maintenance and protection of the local network and protect these networks against cyberattacks.
- You must take defense-in-depth strategies into consideration when planning networks.

Additional measures for protection against unauthorized network access can be found in the “INDUSTRIAL SECURITY” application note. The application note can be downloaded via the item (phoenixcontact.com/products).
German: AH DE INDUSTRIAL SECURITY, 107913
English: AH EN INDUSTRIAL SECURITY, 107913

If a security vulnerability exists for products, solutions, or services from Phoenix Contact, it will be published on the PSIRT (Product Security Incident Response Team) website: phoenixcontact.com/psirt

1.7 UL notes

1.7.1 AXC F 1152 and AXC F 2152

UL Ordinary Location

- If the device is not used in the specified manner, the protection provided by the device may be impaired.
- The device has to be installed in the final safety enclosure, which has adequate rigidity according to UL 61010-1, UL 61010-2-201 and meets the requirements with respect to spread of fire.
- The external circuits intended to be connected to this device shall be galvanically separated from the mains supply or hazardous live voltage by reinforced or double insulation and meet the requirements of SELV/PELV (Class III) circuits of UL/CSA/IEC 61010-1, UL/CSA/IEC 61010-2-201.

UL Hazardous Location (nur AXC F 2152)

- Ambient temperature: -25 °C < T_{amb} < 60 °C
- This device must be installed in a tool only accessible enclosure certified for use in Class I, Zone 2, minimum, and rated IP54, minimum, in accordance with UL/CSA 60079-0 when used in a Class I, Zone 2 environment.
- This device must be installed within an area of not more than pollution degree 2, as defined in IEC 60664-1.
- Electrical Ratings:
  U_L = 24 V DC (19.2 V DC ... 30 V DC) / I_{max} = 442 mA

1.7.2 AXC F 3152

UL Ordinary Location

CAUTION:
- The external circuits intended to be connected to this device shall be galvanically separated from the mains supply or hazardous live voltage by reinforced or double insulation and meet the requirements of SELV/PELV (Class III) circuits of UL/CSA/IEC 61010-1, UL/CSA/IEC 61010-2-201.
- The device has to be installed in the final safety enclosure, which has adequate rigidity according to UL 61010-1, UL 61010-2-201 and meets the requirements with respect to spread of fire.

To install the device in accordance with UL/CSA/IEC standard, the following notes must be observed.

- If the device is not used in the specified manner, the protection provided by the device may be impaired.
- Mount and install the device in such a way that the disconnecting device can be operated without restriction.
- Minimum temperature rating and size of the cables to be connected to the field wiring terminals: min. 80°C and 24 ... 16 AWG
- Use copper conductors only.

1.8 AXC F 2152: Installation in potentially explosive area

WARNING: Explosion hazard

- Before using the device in a potentially explosive area, make sure that your device has the required approval.
  The approvals are printed on the device.

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 the following standards:
  EN/IEC 60079-0 und EN/IEC 60079-7
  For detailed information, refer to the declarations of conformity enclosed with the device. For the latest version, go to the item page at
  www.phoenixcontact.com/product/2404267.

– Installation, operation, and maintenance may only be carried out by qualified electricians. Follow the installation instructions as described. When installing and operating the device, the applicable regulations and safety directives (including national safety directives), as well as general technical regulations, must be observed. The safety data is listed in this document and in the certificates.

– Observe the specified conditions for use in potentially explosive areas! Also observe the requirements of EN/IEC 60079-14.

– The device must not be opened or modified. Do not repair the device yourself, replace it with an equivalent device. Repairs may only be carried out by the manufacturer. The manufacturer is not liable for damage resulting from violation.

– The IP20 protection (IEC 60529/EN 60529) of the device is intended for use in a clean and dry environment. The device must not be subject to mechanical strain and/or thermal loads, which exceed the limits described.

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

– In potentially explosive areas, only connect and disconnect cables and plug-in connections (e.g., connector, bus base module, SD card, etc.) when the power is disconnected.

Special conditions

– The device must be installed in a housing (switch or distributor box) that satisfies the requirements of EN/IEC 60079-0, EN/IEC 60079-7, GB 3836.1-2010 and has at least IP54 degree of protection (EN/IEC 60529).
– Use the device in an environment that does not exceed pollution degree 2 in accordance with EN/IEC 60664-1, GB/T 16935.1.
– Connect the DIN rail to the protective earth ground.
– 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, all interfaces on the device must be used or covered.

Areas with a danger of dust explosions

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

Ambient temperature range

-25 °C ... 55 °C (AXC F 2152)
-25 °C ... 60 °C (AXC F 2152 with AXL F PWR 1H module)

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

Altitude (above sea level)	Maximum ambient temperature AXC F 2152	Maximum ambient temperature AXC F 2152 + AXL F PWR 1H
Up to 2000 m	55°C	60°C
2000 m ... 3000 m	49°C	54°C
3000 m ... 4000 m	44°C	48°C
4000 m ... 5000 m	38°C	42°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, “Ordering data and technical data”).
- 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.
- Immediately upon delivery, refer to the delivery note to ensure that the delivery is complete.
- Check whether the security seals are attached to the device in the intended places and are intact, see “Security seal” in Section 3.8.2.
  Damaged security seals indicate that the housing of the device has been opened without authorization.
- Complain about devices with damaged security seals immediately and inform Phoenix Contact without delay.

General information about complaints

- Enclose photos clearly documenting the damage to the packaging and/or delivery together with your claim.

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

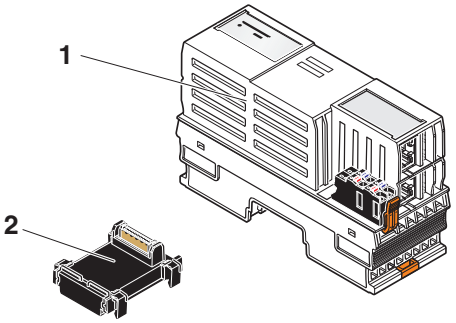
3 Description of the controllers

3.1 General description of the controllers

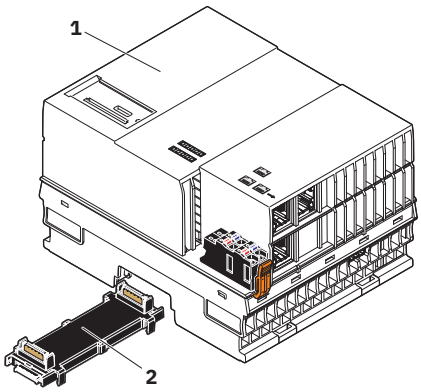
The AXC F 1152 and AXC F 2152 controllers are modular small-scale controllers. The AXC F 3152 is a modular controller with an integrated Ethernet and Axioline F local bus connection.

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

Figure 3-1 Components of the controller



AXC F 1152 and AXC F 2152



AXC F 3152

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 an Inline station using the controller. To do so, you need the AXC F IL ADAPT Inline adapter terminal (Item No. 1020304). You can directly align the Inline modules to the Inline adapter terminal.

IoT device and RTU

The main application area of the controller is industrial automation.
Due to its open system architecture, it is also used as an IoT device or remote terminal unit (RTU).

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

In principle, you can extend the controllers by connecting Axioline F modules on the right. Furthermore, you can also add hardware functions to the left of the controller AXC F 2152 and AXC F 3152 devices.

The following left-alignable modules (extension modules) are currently available:

Available at the time this user manual was created:

–	2403115	AXC F XT ETH 1TX	Left-alignable Ethernet interface
–	2403018	AXC F XT IB	Left-alignable INTERBUS master
–	1139999	AXC F XT EXP	Left-alignable PCIe extension interface
–	1091657	AXC F XT PB	Left-alignable PROFIBUS master
–	1159811	AXC F XT SPLC 1000	Left-alignable safety-related Axioline F controller of performance class 1000
–	1259849	AXC F XT ML 1000	Left-alignable module with machine learning function
–	1160157	AXC F XT SPLC 3000	Left-alignable safety-related Axioline F controller of performance class 3000

Note the following special characteristics:

Table 3-1 Special characteristics of the left-alignable extension modules in combination with the controllers

Characteristic	AXC F 2152	AXC F 3152
Bus base module		
– Connection of an AXC F XT ... to the controller	Replace the bus base module of the controller with the bus base module AXC BS L 2, Item No. 1064312.	Remove the cap on the left-hand side on the bus base module of the controller.
– Connection of an AXC F XT ... to an AXC F XT ...	To align an additional AXC F XT ... module to the left on an AXC F XT ..., remove the cap on the bus base module of the preceding module.	
Extendibility		
– Direct on the controller (without AXC F XT EXP)	1 AXC F XT ... module	2 AXC F XT ... modules
– When using an AXC F XT EXP	4 AXC F XT ... modules	5 AXC F XT ... modules
	Sequence: Module 1: AXC F XT EXP Modules 2 ... 4: Any*	Sequence: Module 1: Any* Module 2: AXC F XT EXP Modules 3 ... 5: Any*
***Restrictions**		
– General	All left-alignable modules may only be connected once.	
– AXC F XT IB	If you use the module AXC F XT IB to the left, do not use an AXC F IL ADAPT in the Axioline F local bus, and vice versa.	
– AXC F XT ML 1000	With the AXC F XT ML 1000 left-alignable machine learning module, you can only extend a controller of the type AXC F 3152.	

The LED EXT on the controller signals that left-alignable extension modules are being used. The displays have the following meaning:

Designation	Color	Meaning	State	Description
EXT	Red	Left alignment	On	Error at extension module Possible error causes: – 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.

Please note for mounting and supplying with power:

- Mount all the modules required before supplying power to the Axioline F station. Modules to which power is only supplied following the controller boot process are not detected or may result in a malfunction.
- Feed the supply voltage for the left-alignable modules and the controller used via a common power supply unit. This ensures that the devices have the same reference potential.
- Fuse the power supply unit appropriately for the current consumption of the installation system.
- Do not reverse the supply voltage connection. The GND potential of the controller and the left-aligned extension modules are connected together via the bus base. Reversing the polarity will lead to an immediate short circuit.
- To ensure that the left-alignable extension modules are detected correctly, proceed as follows:
  - Switch on the power to the left-alignable extension modules before switching on the power to controller
    or
  - Switch on the power to the left-alignable modules and to the controller simultaneously.

Always observe:
- The information in Section “Connecting and wiring hardware” on page 58.
- The information in the documentation for the modules used, particularly if you are using left-alignable safety-related Axioline F controllers.

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.com/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.

Flash memory/SD card

The controllers have an internal flash memory. This memory can be used to store programs and configurations which belong to your project, e.g., the visualization project. If the internal flash 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 and technical data” on page 83).

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 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 SD card.

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 83.

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
Flachsmarktstraße 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 flash 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 Info Center.

3.5 Using SFTP to access the file system

The file system (on the internal flash 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.

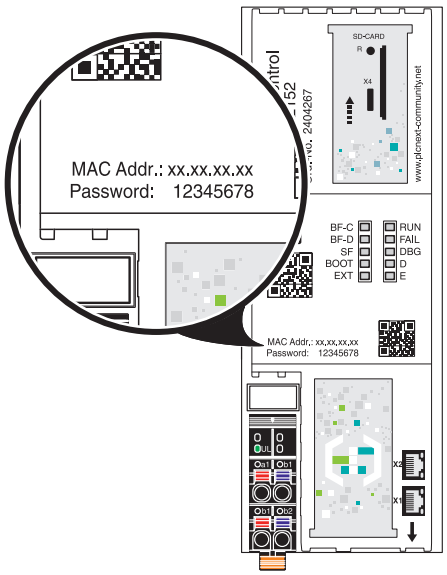
Only users with administrator rights can access the file system.

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 Info Center.

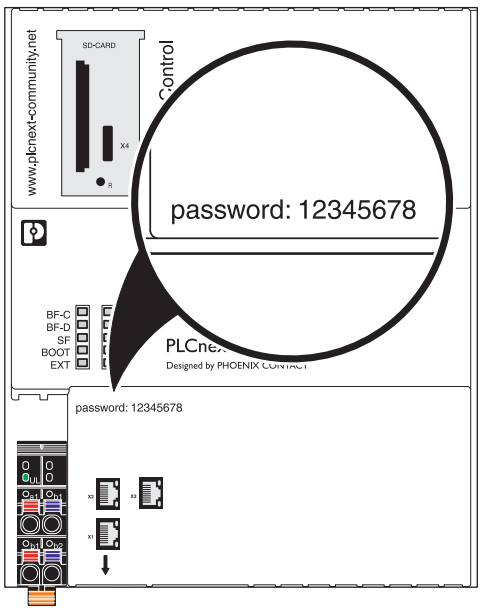
In the delivery state, the following access data with administrator rights is preset:

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

Figure 3-2 Administrator password on the controller



AXC F 1152 and AXC F 2152



AXC F 3152

3.6 Firewall

The firewall of the controller is deactivated by default.

Recommended:

- Activate the firewall.

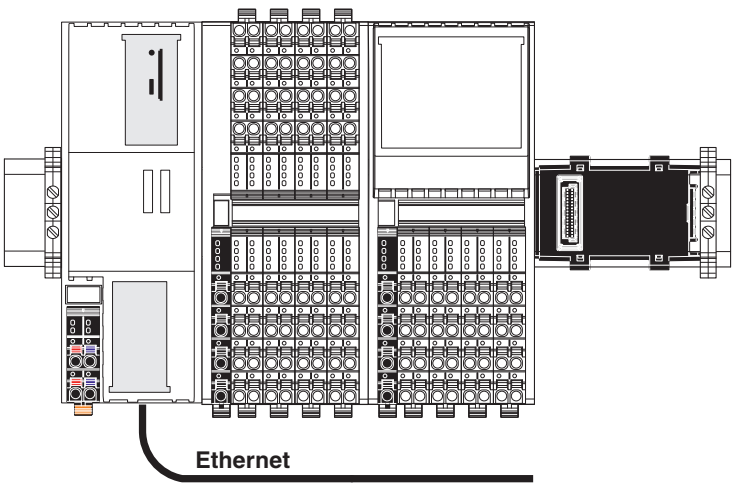
For information on the firewall, please refer to the PLCnext Info Center.

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 ≤55°C). If the current consumption exceeds the maximum current, use the AXL F PWR 1H power module.

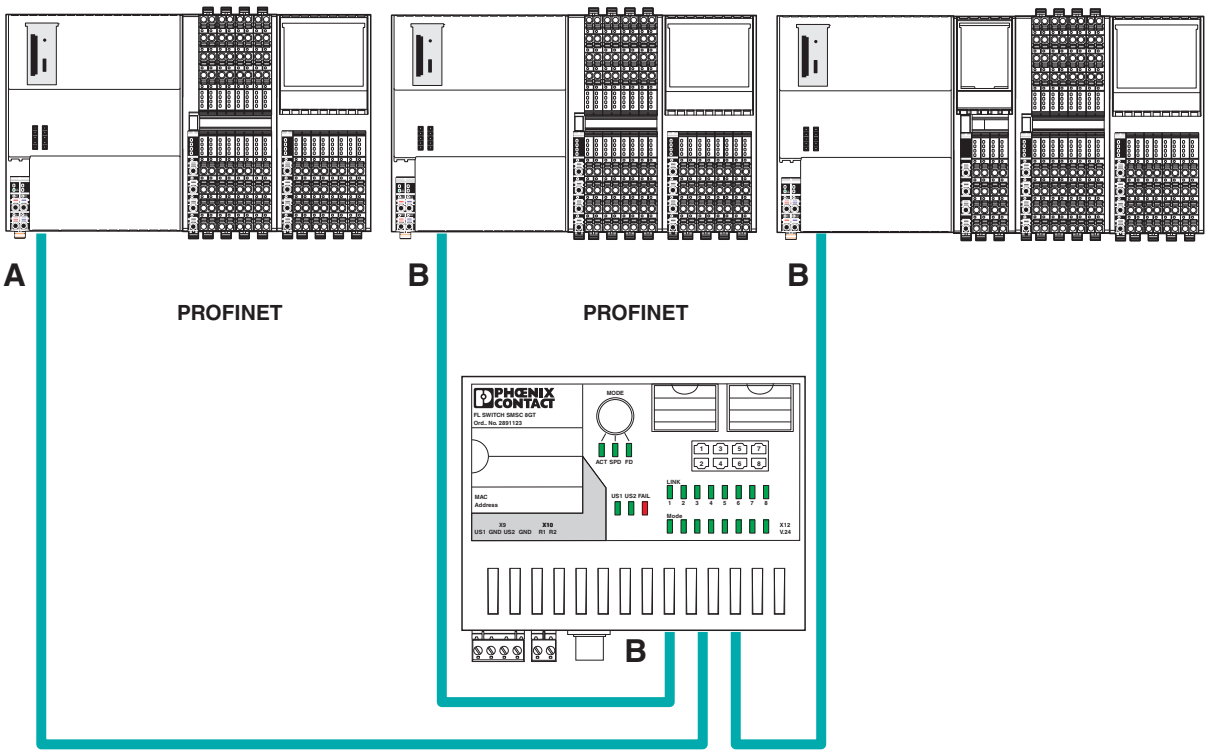
Figure 3-3 Example: Axioline F station with AXC F 2152 controller



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 PROFINETcontroller



Key:

A PROFINET controller (AXC F 1152, AXC F 2152 or AXC F 3152)

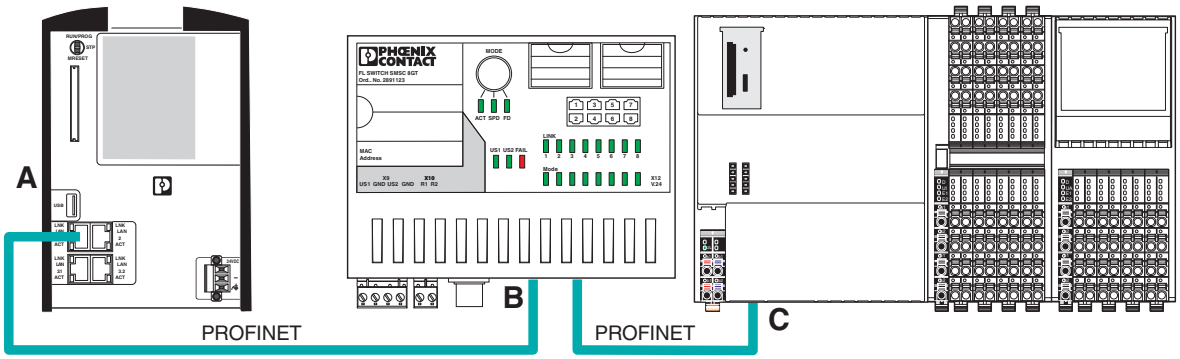
B PROFINET device and switch (in the example: controller with connected Axioline F I/O modules)

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)

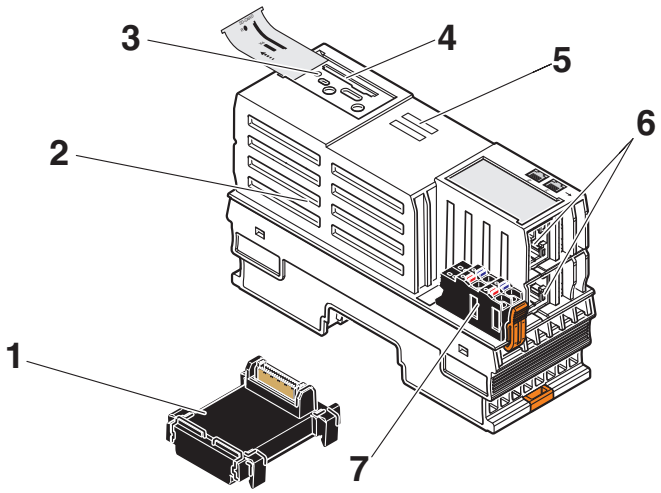
For additional information on how to integrate the controller as a PROFINET device into a PROFINET network, please refer to the PLCnext Engineer online help.

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 and technical data” on page 83.

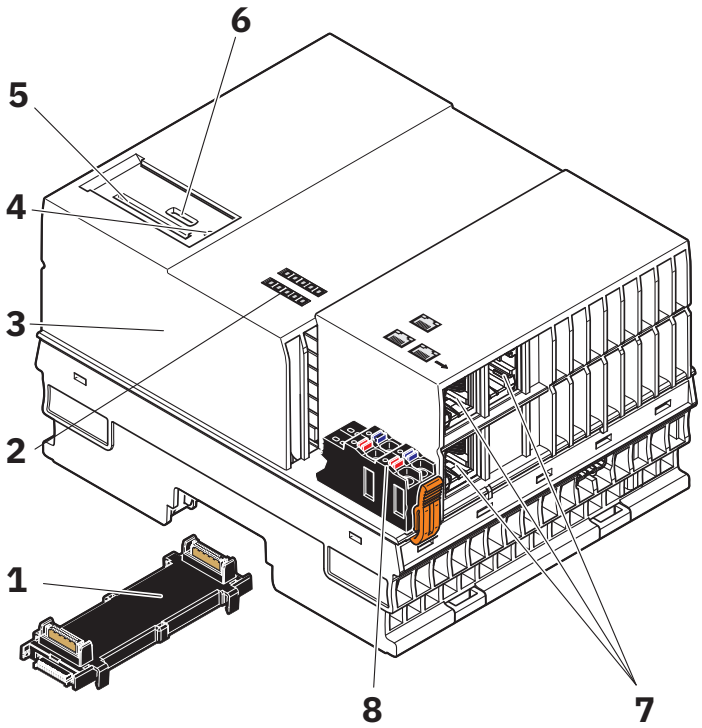
5 Diagnostic and status indicators

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 and technical data” on page 83.

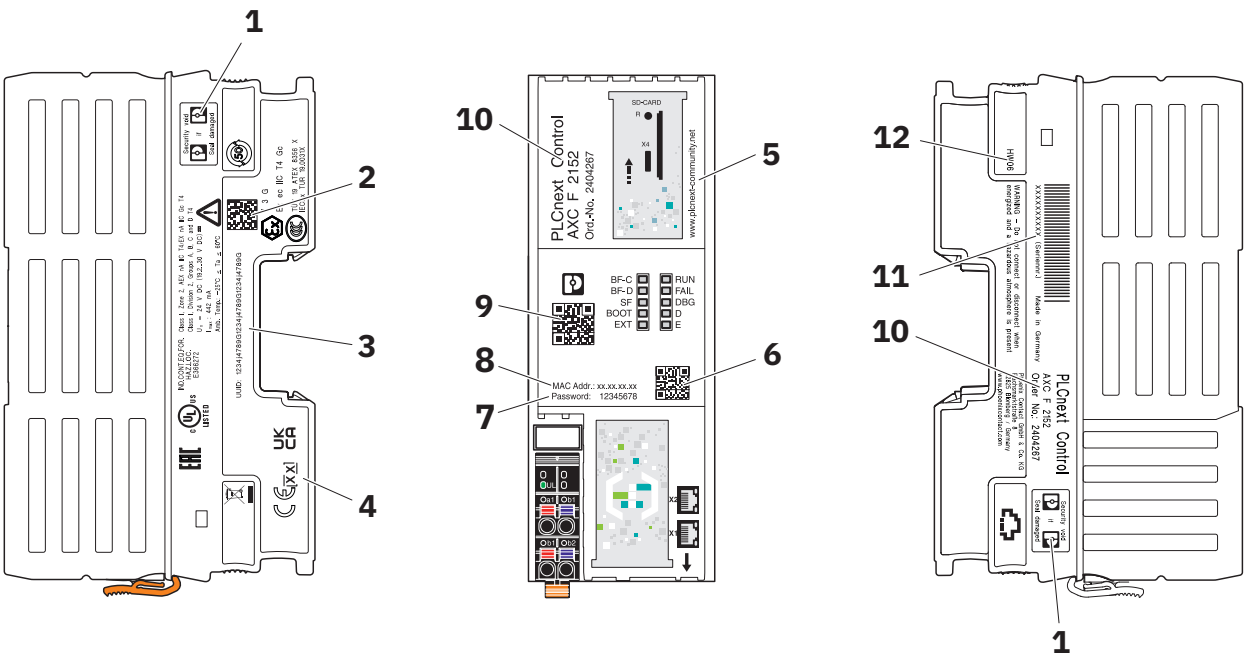
6 Service interface (X4)
7 Ethernet interfaces (X1, X2, X3)
8 Supply connector (connector for connecting the supply voltage (communications voltage U_L))

From hardware version 04, the controller is supplied without a mode selector switch.

3.8.2 Printing

AXC F 1152 and AXC F 2152 controller printing

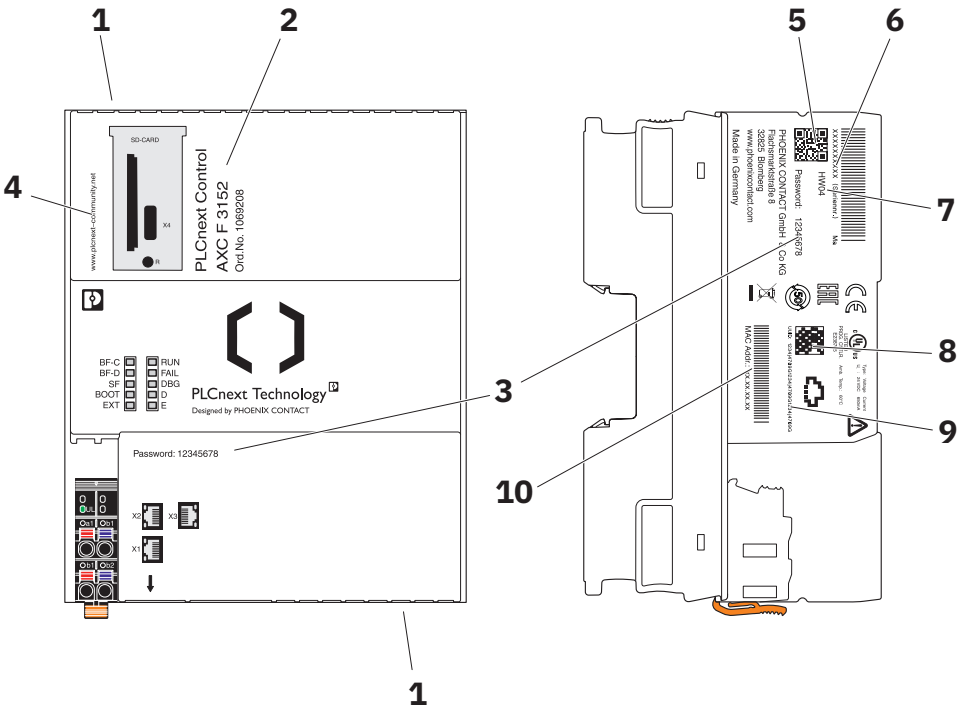
Figure 3-8 AXC F 1152 and AXC F 2152 controller printing



1 Security seal
2 2D code: UUID for the connection to Proficloud
3 UUID for the connection to Proficloud
4 Year of manufacture
5 Link to PLCnext Community
6 QR code: administrator password
7 Administrator password
8 MAC address
9 QR code: Link to the product page on the Phoenix Contact website
10 Item number and designation
11 Serial number
12 Hardware version

AXC F 3152 controller printing

Figure 3-9 AXC F 3152 controller printing



1 Security seal
2 Item number and designation
3 Administrator password
4 Link to PLCnext Community
5 QR code: administrator password
6 Serial number
7 Hardware version
8 2D code: UUID for the connection to Proficloud
9 UUID for the connection to Proficloud
10 MAC address

Security seal

Controllers with firmware versions > 2023.0.x LTS are certified in accordance with IEC 62443-4-1 (Full ML3 Process Profile) and IEC 62443-4-2. Further information on the supported functions (security levels 1 ... 3) can be found in the PLCnext Security Info Center.

NOTE: Tampering with the device by unauthorized opening of the housing
To detect unauthorized opening of the housing and to prevent tampering with the device, two security seals are attached to the housing of the device.

- Check that both security seals are in place and undamaged.
- Do not continue to use devices with damaged security seals.

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

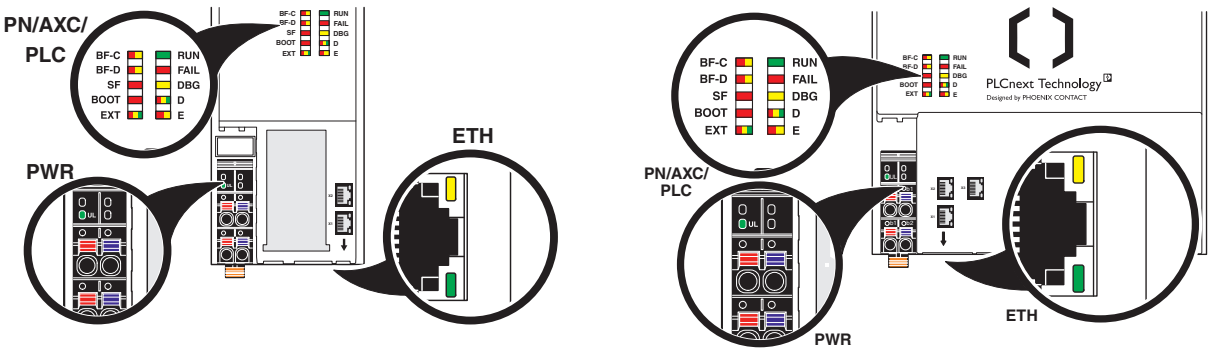
You can access the PLCnext Community directly via the QR code.
In the PLCnext Community, you will find:

– 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



AXC F 1152 and AXC F 2152 AXC F 3152

Table 3-2 Controller diagnostic and status indicators

Designation	Color	Meaning	State	Description
PN: PROFINET controller/device function				
BF-C	Red/ yellow	Status of PROFINET communication/ communication error	**Controller as PROFINET controller**	
			Off	The controller has established an active communication connection to each configured PROFINET device. Or: No PROFINETdevices are configured.
			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.
			Flashing yellow (0.5 Hz)	PROFINET device identification (DCP Signal Service) has been activated.
BF-D	Red/ yellow	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).
			Red on	No PROFINET communication (no link status at the Ethernet interfaces)
			Flashing red (1 Hz)	Link status present, no communication connection to the PROFINET controller
			Flashing yellow (0.5 Hz)	PROFINET device identification (DCP Signal Service) has been activated.

Table 3-2 Controller diagnostic and status indicators

Designation	Color	Meaning	State	Description
SF	Red	Group error (PROFINET)	Off	PROFINET diagnostics not present
			On	PROFINET diagnostics present
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. No application program is executed. The controller is in the STOP state.
			Flashing (2 Hz)	System watchdog was triggered. **FAIL** flashes red with same frequency.
			On	PLCnext runtime system successfully initialized. An application program is executed or the controller is running at idle. 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 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 3-2 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 red	Local bus error during startup Possible causes: – 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: – 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)
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 3-2 Controller diagnostic and status indicators

Designation	Color	Meaning	State	Description
EXT	Red/ yellow/ green	Left alignment	Off	No extension module available
			Red on	Error at extension module Possible error causes: – 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.
			Yellow on	Test of the extension module during the boot procedure
			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 103.

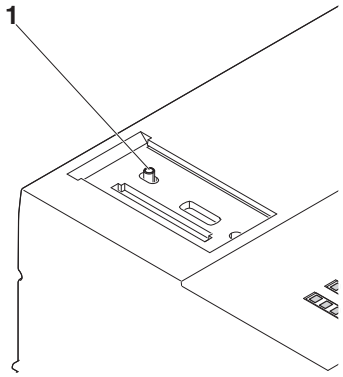
Special cases: SD card
In the following cases, all LEDs except the D and E LEDs begin to flash red (1 Hz):
– Unauthorized removal of the SD card during operation
– Invalid SD card license
– SD card with write protection enabled
– For SD cards of the type SD FLASH 32GB PLCNEXT MEMORY LIC: the firmware version on the controller is < 2022.0 LTS
– the (unencrypted) SD card in the slot cannot be read

Information on operating the controller with an SD card can be found in Section “SD card (optional)” on page 38.

3.10 Mode selector switch (AXC F 3152)

From hardware version 04, the controller is supplied without a mode selector switch.

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.

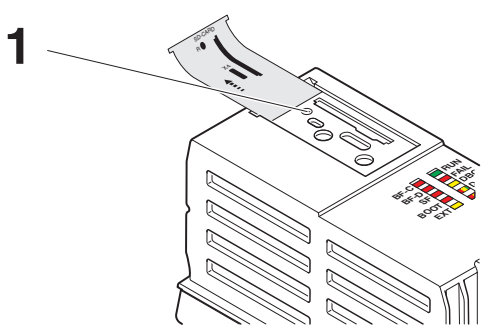
The RUN/PROG and STOP positions have a latching function and the MRESET position has a pushbutton function. After releasing the switch in the MRESET position, it returns to the STOP position.

Table 3-3 Controller operating modes

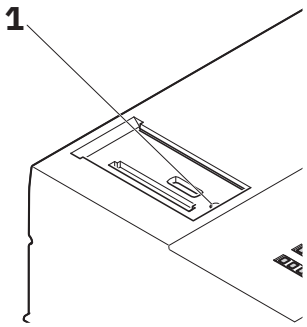
Operating mode	Explanation
RUN/PROG	The controller is in the RUN state. The application program is executed or the controller is running at idle. The PLCnext Engineer software can be used for program and configuration modifications as well as for the online monitoring function. The application program is not executed if a controller error has occurred or if the application program has been stopped by PLCnext Engineer.
STOP	The controller is in the STOP state. The application program is not executed.
MRESET	The retain data and the application program in the controller RAM are deleted. To delete the retain data and the application program, proceed as follows: • 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

Figure 3-12 Reset button (1)



AXC F 1152 and AXC F 2152



AXC F 3152

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.
- Reregister the controller in Proficloud and add it as a Proficloud device.

You can find information on this on the Internet at proficloud.io.

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:

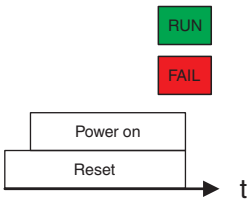
- Switch off the supply voltage of the controller.
- After the LEDs have gone out, press the reset button.
- Hold the reset button down and switch the supply voltage on.

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:

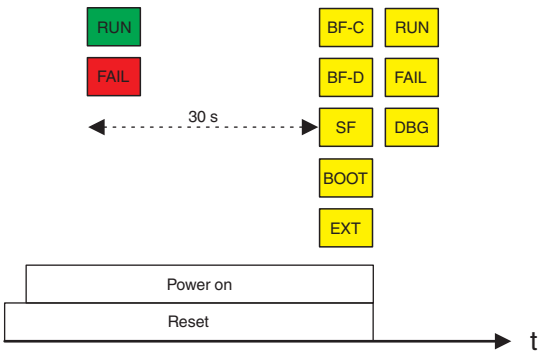
- Switch off the supply voltage of the controller.
- After the LEDs have gone out, press the reset button.
- Hold the reset button down and switch the supply voltage on.

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 Flash memory

NOTE: Damage of the internal flash memory due to high data traffic
Frequent write accesses in applications with high data traffic can cause long-term damage to the internal flash 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, Item No. 1061701 or SD FLASH 2GB PLCnext Memory, Item No. 1043501.

The controllers have an internal flash memory. Alternatively, a pluggable 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 flash memory. In addition, application-specific data can also be stored in the flash memory.

If you make changes to Linux® operating system files on the internal flash 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 flash 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 flash 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 31 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 and technical data” on page 83.

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.

When using SD cards of the type SD FLASH ... MEMORY LIC ...:
From firmware version 2024.0 LTS, you can encrypt the SD cards.
Further information can be found in the PLCnext Info Center. PLCnext Info Center.

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 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 SD card.

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 flash 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 flash memory will be deleted.

Furthermore, all application-specific data will be deleted from the internal flash memory. PLCnext Engineer projects and IP configurations stored on the flash 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 31 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 and technical data” on page 83.

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:

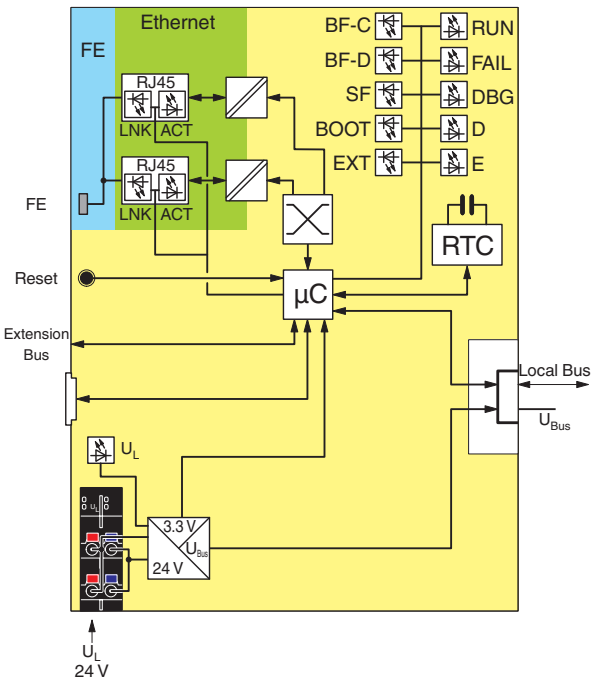
If there is an overlay file system on the SD card, there will be an empty overlay file system on the internal flash memory after the SD card has been removed and the controller re-booted. The contents of the overlay file system on the SD card will not be transferred to the internal flash memory of the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

Neither will the application-specific data on the SD card be transferred to the internal flash 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:

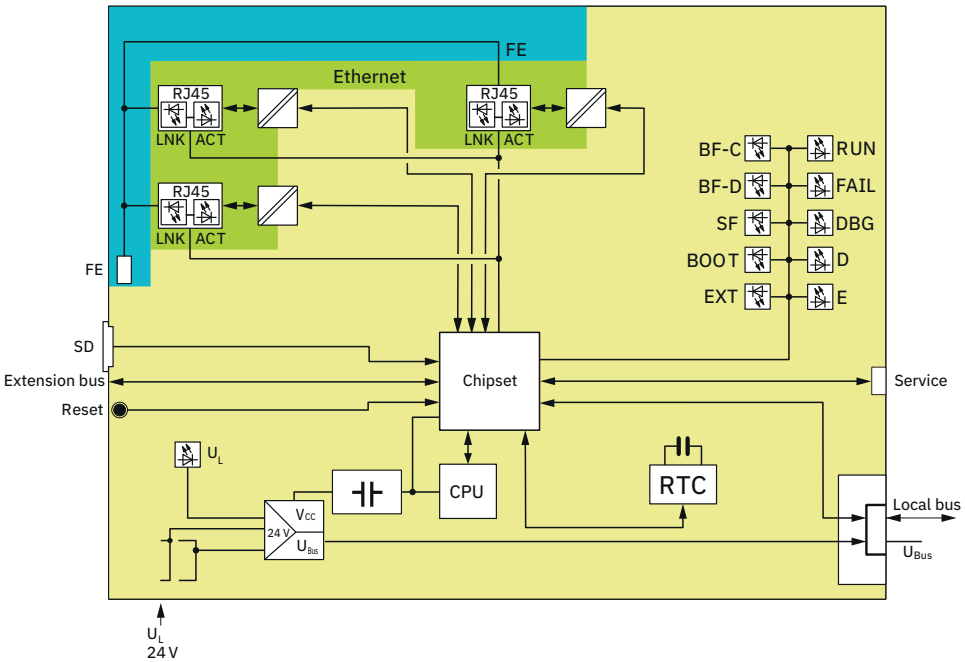
µC	Microprocessor		Transmitter
	Reset button		LED
RJ45 LNK ACT	RJ45 interface	RTC	Real-time clock
	Functional ground connection	3.3 V / 24 V / U_{Bus}	Power supply unit
	SD card holder		Ethernet switch
Extension bus	Left-aligned Axioline F extension modules (AXC F 2152 only)	Local bus / U_{Bus}	Axioline F local bus

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		Transmitter
Reset	Reset button		LED
RJ45 LNK ACT	RJ45 interface	RTC	Real-time clock
FE	Functional ground connection	3.3 V / 24 V / U_{Bus}	Power supply unit
SD	SD card holder	Chipset	Chipset
Extension bus	Left-aligned Axioline F extension modules	Service	Service interface
CPU	Processor	Local bus / U_{Bus}	Axioline F local bus

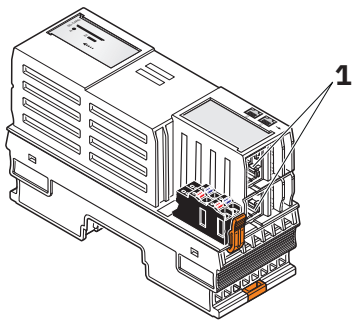
The colored areas in the basic circuit diagram represent electrically isolated areas:

- Logic
- Ethernet interface
- Functional ground

3.15 Interfaces

3.15.1 AXC F 1152 and AXC F 2152

Figure 3-17 Ethernet interfaces (1)



Ethernet interfaces

2 x Ethernet: X1/X2: 10/100 BASE-T(X) (switched internally)

Name	Interface	Default IP address
X1/X2	Ethernet interface (PROFINET)	192.168.1.10
Ethernet interface extension module AXC F XT ETH 1TX		192.168.2.10

The default IP addresses are also set after a reset to default setting type 2.

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.

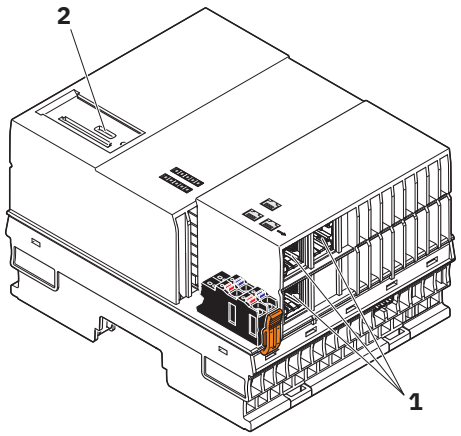
3.15.2 AXC F 3152

Ethernet interfaces

3 x Ethernet: X1/X2/X3: 10/100/1000 BASE-T(X)

Name	Interface	Default IP address
X1	Ethernet interface	192.168.1.10
X2	PROFINET controller interface	192.168.2.10
X3	PROFINET device interface	192.168.3.10
Ethernet interface extension module AXC F XT ETH 1TX		192.168.4.10

Figure 3-18 Ethernet interfaces (1), service interface (2)



The default IP addresses are also set after a reset to default setting type 2.

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.

Service interface

The service interface is supported from hardware version 04.

For service purposes, you can connect a PC to the service interface (USB-C interface). In this case, the service interface is used as an Ethernet interface (with activated or deactivated security profile, default IP address: 128.0.0.1/30).
Use as a USB host interface is not possible.

NOTE: Damage to the USB interfaces
In PCs, the USB interfaces are usually not electrically isolated from the rest of the hardware. This does not cause any problems for USB devices that do not have their own reference ground. However, if you connect grounded devices (e.g., the AXC F 3152), ground loops with undesired compensating currents may occur. These compensating currents can impair data transmission and, in extreme cases, destroy the USB interfaces.
Recommended:

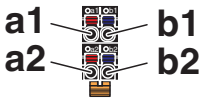
- Connect the service interface of the AXC F 3152 to your PC in such a way that it is electrically isolated.
- To do this, use a USB isolator.

- Connect the service interface of the controller with a suitable cable to a free USB port on our PC.

The procedure for commissioning the service interface can be found in the PLCnext Info Center.

3.16 Supply connector

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



Terminal point assignment

Table 3-4 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)

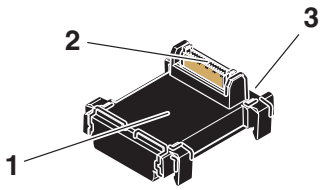
3.17 Bus base module

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

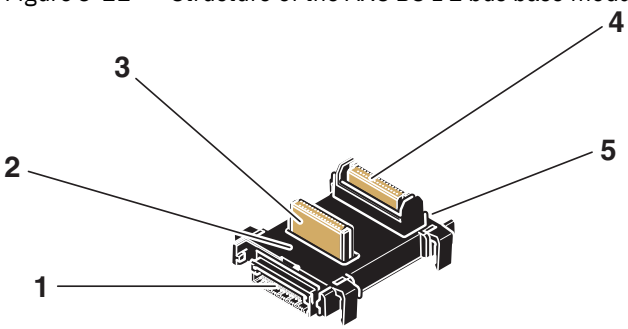


1 Bus base module
2 Connection of the local bus to the controller
3 Connection to the bus base module of the local bus

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 and technical data” on page 83.

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



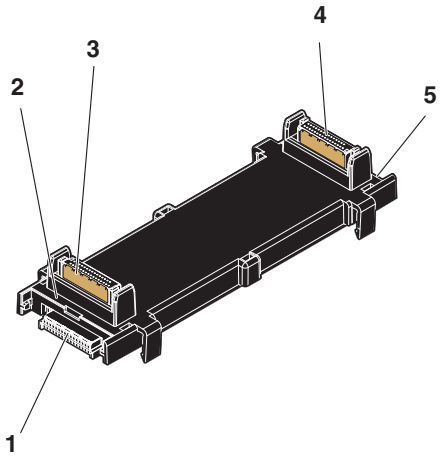
1 Connection to the bus base module of a left-alignable Axioline F extension module
2 Bus base module
3 Connection of the extension bus to the controller
4 Connection of the local bus to the controller
5 Connection to the bus base module of the local bus

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.

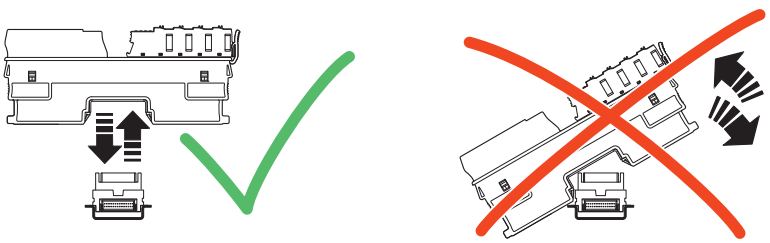
NOTE: Damage to the contacts when tilting
Tilting the modules can damage the contacts.

- 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:

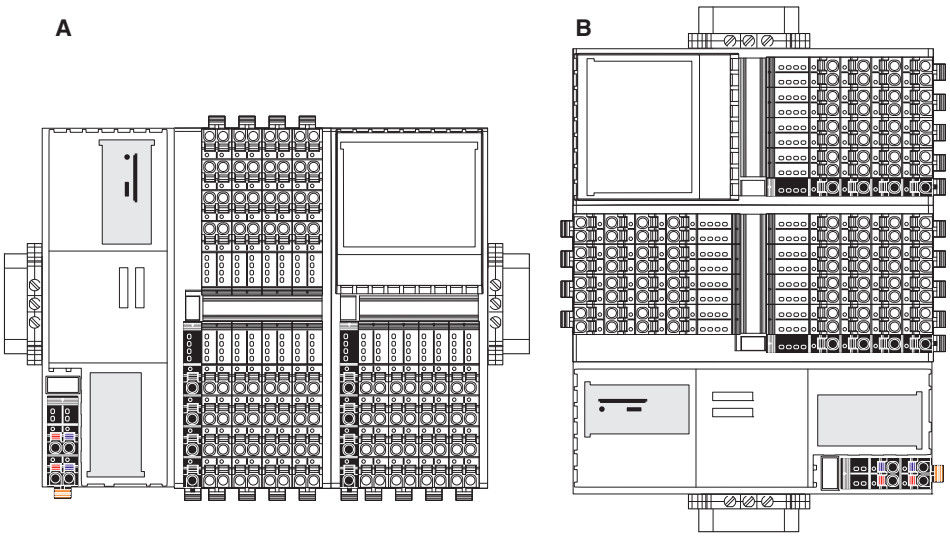
Table 4-1 Recommended end brackets

Mounting position	Ambient conditions	End bracket
Horizontal; A in Figure 4-2 on page 51:	Normal	CLIPFIX 35, CLIPFIX 35-5
	High shock and vibration load	E/AL-NS 35
Other; B in Figure 4-2 on page 51	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

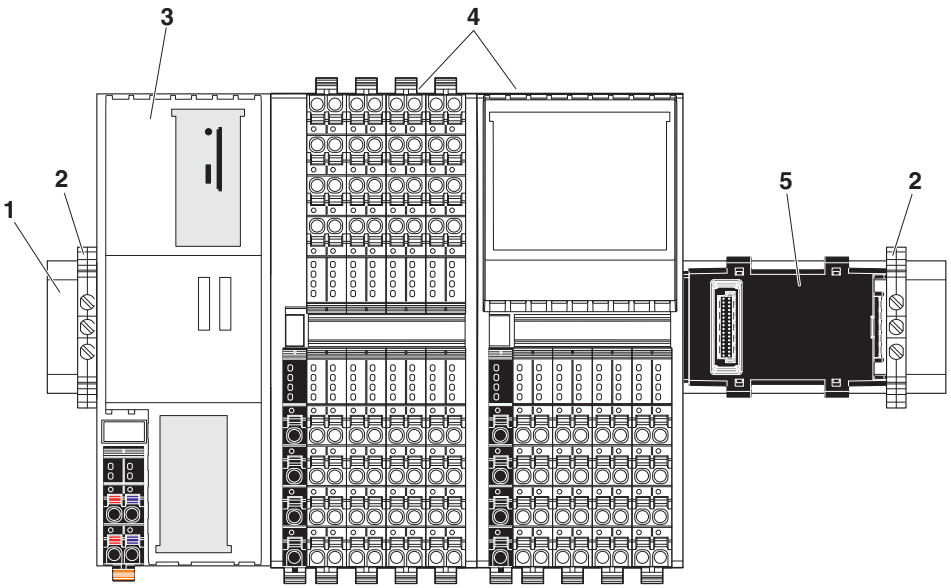


Note the ambient temperatures and any other special features (e.g., derating) specified in the device/module-specific documentation for the Axioline F devices.

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; Item No. 3022276)

3 Controller

4 I/O modules (Axioline F devices) corresponding to the application

5 Bus base module

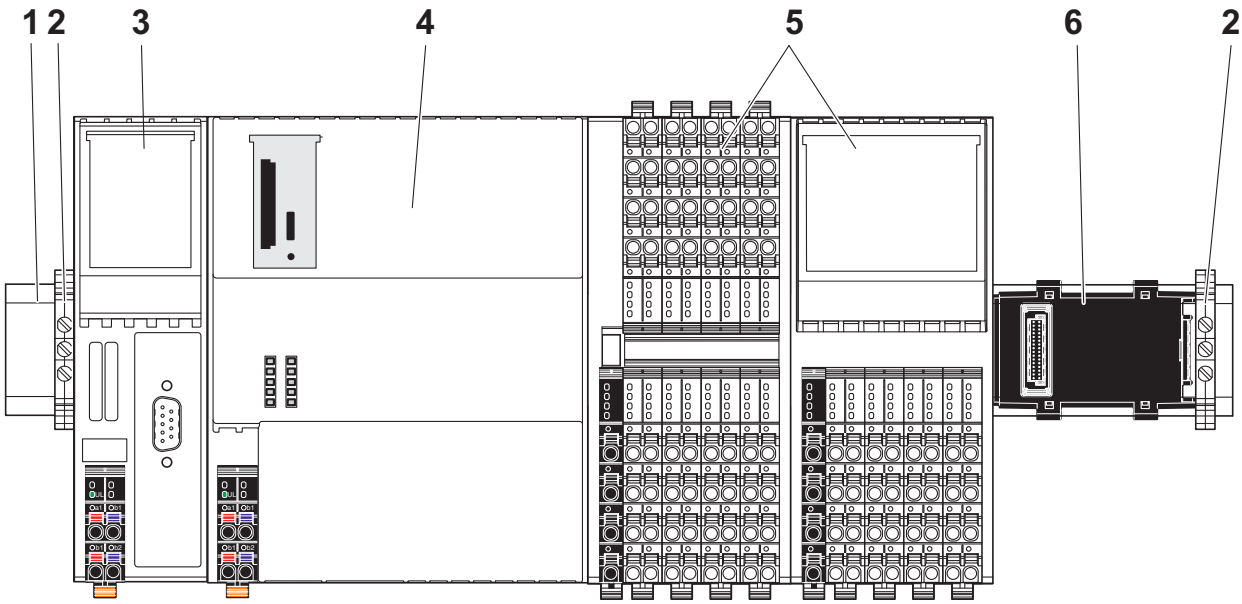
An Axioline F station is set up by mounting the individual components side by side. No tools are required. Mounting the components side by side automatically creates potential and bus signal connections between the individual components of the Axioline F station.

Left-alignment of Axioline F extension modules

For additional information on the number and order of left-alignable Axioline F extension modules, refer to page 17.

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; Item No. 3022276)

3 Left-alignable Axioline F AXC F XT IB extension module

4 AXC F 3152 controller

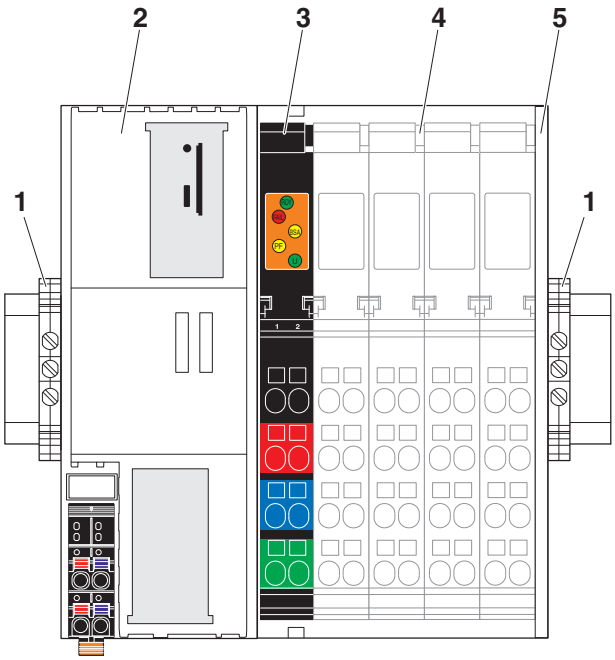
5 I/O modules (Axioline F devices) corresponding to the application

6 Bus base module

4.4 Structure of an Inline station

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

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



1 End bracket (e.g., CLIPFIX 35-5, Item 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.com/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.com/product/1020304.

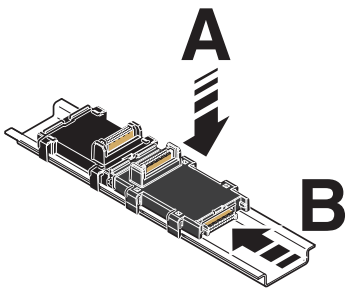
4.5 Mounting the controller

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

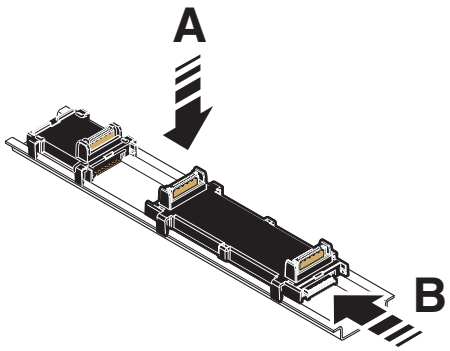
Mounting bus base modules

- 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).

Figure 4-6 Mounting the bus base modules



AXC F 1152 and AXC F 2152

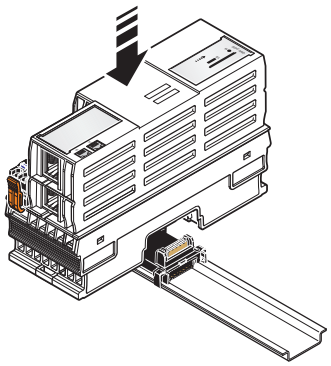


AXC F 3152

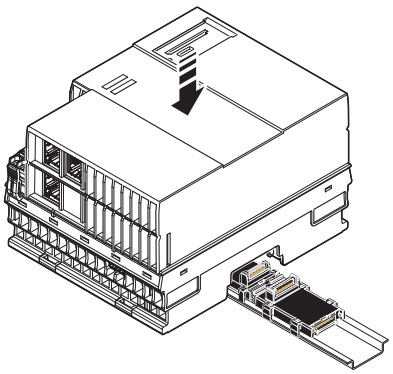
Snapping the controller into place

- 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.

Figure 4-7 Snapping the controller into place



AXC F 1152 and AXC F 2152



AXC F 3152

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 31 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 and technical data” on page 83.

The SD card is optional and not supplied as standard with the controller.

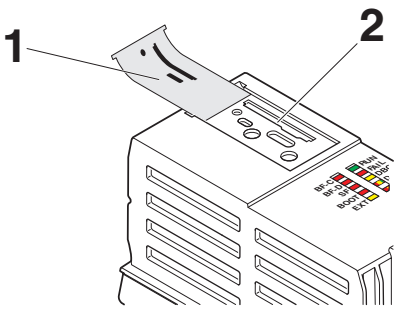
Please refer to the ordering data in Section “Ordering data and technical data” on page 83.

- Disconnect the Axioline F station from the power supply.

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

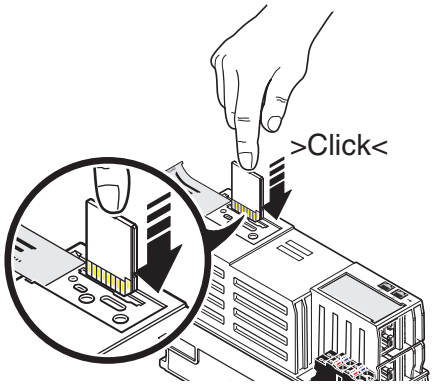
- On the AXC F 1152 and AXC F 2152, remove the upper marking field of the controller (item 1 in Figure 4-8).

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

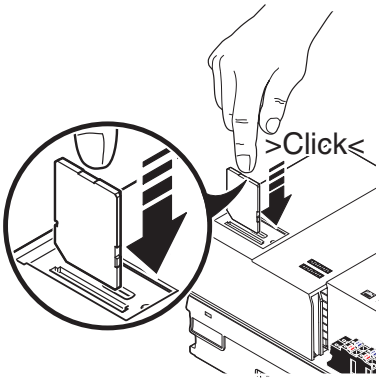


- Gently push the SD card into the SD card holder until it engages with a click in the SD card holder (see Figure 4-9, “Click”).

Figure 4-9 Inserting the SD card



AXC F 1152 and AXC F 2152



AXC F 3152

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 17.

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
The controller is designed exclusively for operation with safety extra-low voltage or protective extra-low voltage (**SELV/PELV**). If you operate the controller with another power supply, the loss of electrical safety can result in device damage or personal injury.

- Only use a power supply with double or reinforced insulation in accordance with IEC 61010-2-201 and EN 61010-2-201.
  This ensures safe isolation and prevents a short circuit between the primary and secondary circuits.

WARNING: Loss of functional safety
For use in systems with **functional safety** components, note the following:
The controller may only be operated with a power supply with protective extra-low voltage (**PELV**). If you operate the controller with another power supply, the loss of functional safety can result in device damage or personal injury.

- Only use power supplies with protective extra-low voltage (PELV) in accordance with IEC 60204-1 and EN 60204-1.
- Observe the product-specific user documentation for the devices used.

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

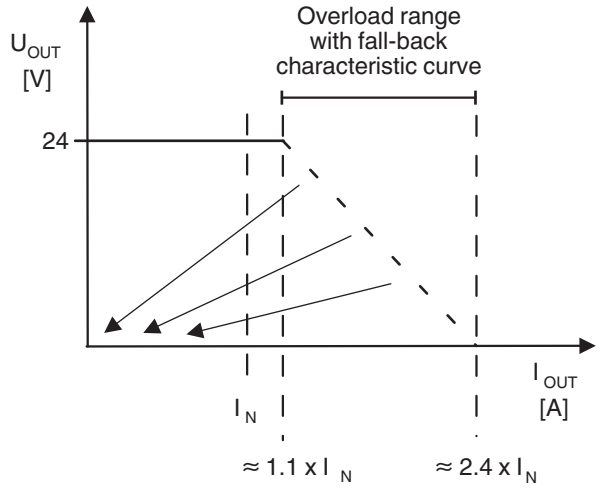
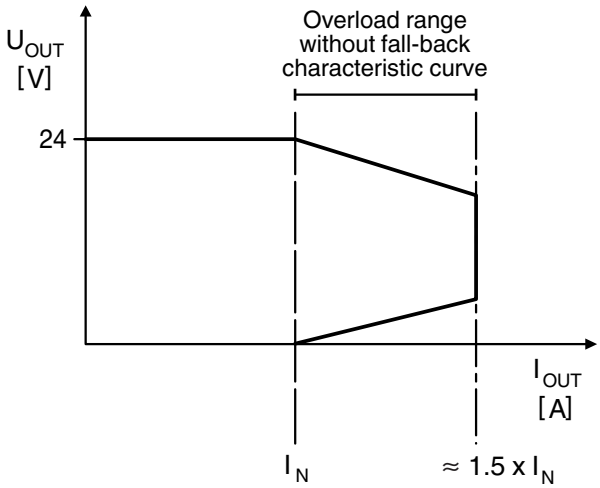


Figure 5-2 Overload range **without** fall-back characteristic curve



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.

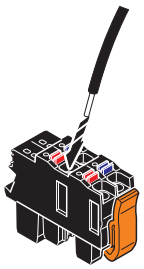
When using ferrules:

- 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.

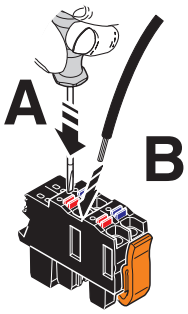
Figure 5-3 Connecting a rigid conductor



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, Item No. 1205037)

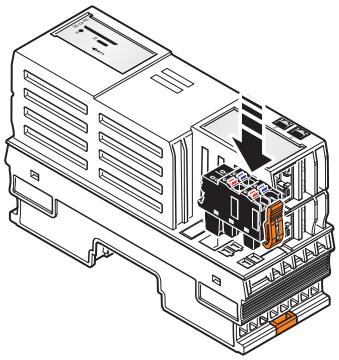
Figure 5-4 Connecting a flexible conductor



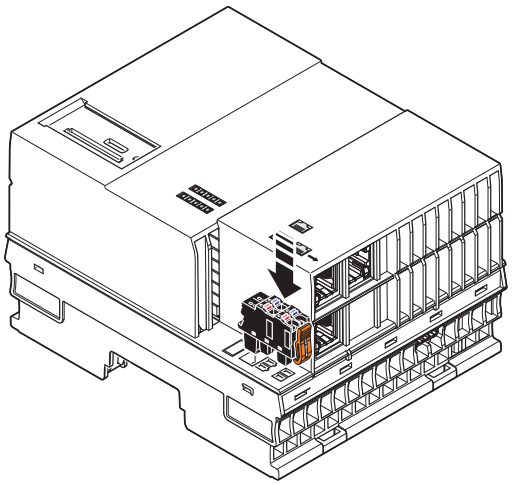
Connecting the supply connector

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

Figure 5-5 Connecting the supply connector



AXC F 1152 and AXC F 2152



AXC F 3152

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.

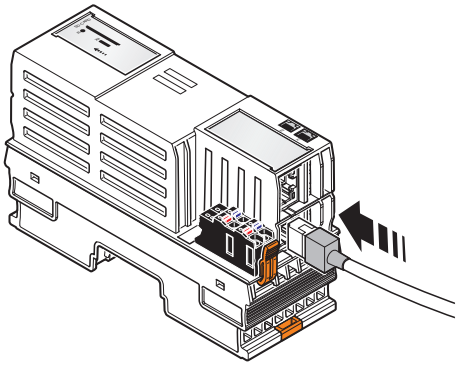
Please note the following when using left-alignable Axioline F extension modules:
The supply voltage of the controller and the left-alignable Axioline F extension modules must be fed in via **a shared** power supply unit.

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

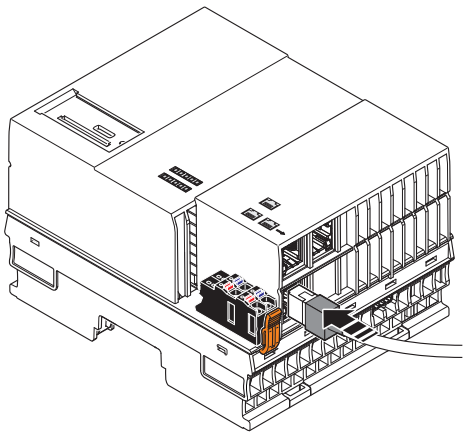
5.2 Connecting Ethernet

- Connect the Ethernet network to the RJ45 jack.

Figure 5-6 Connecting Ethernet



AXC F 1152 and AXC F 2152



AXC F 3152

6 Startup

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

In addition, the following topics are available in the PLCnext 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.com/product/1046008.

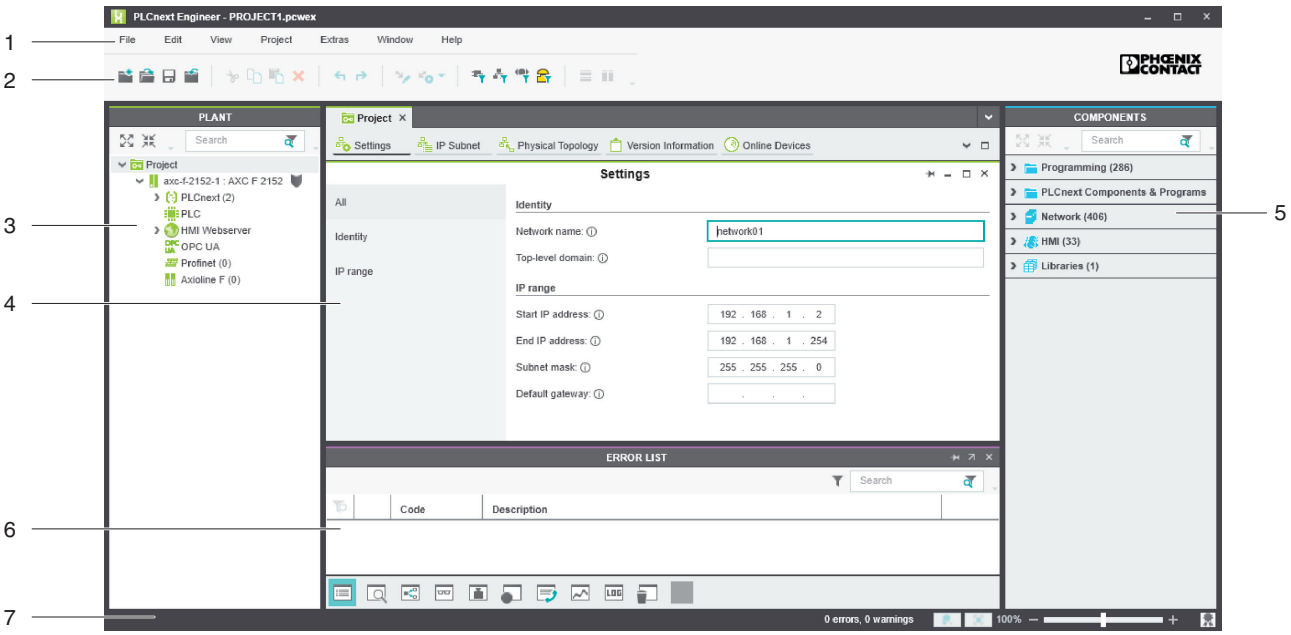
- Download the software onto your PC.
- Double-click the *.exe file to start installation.
- Follow the instructions in the installation wizard.

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.

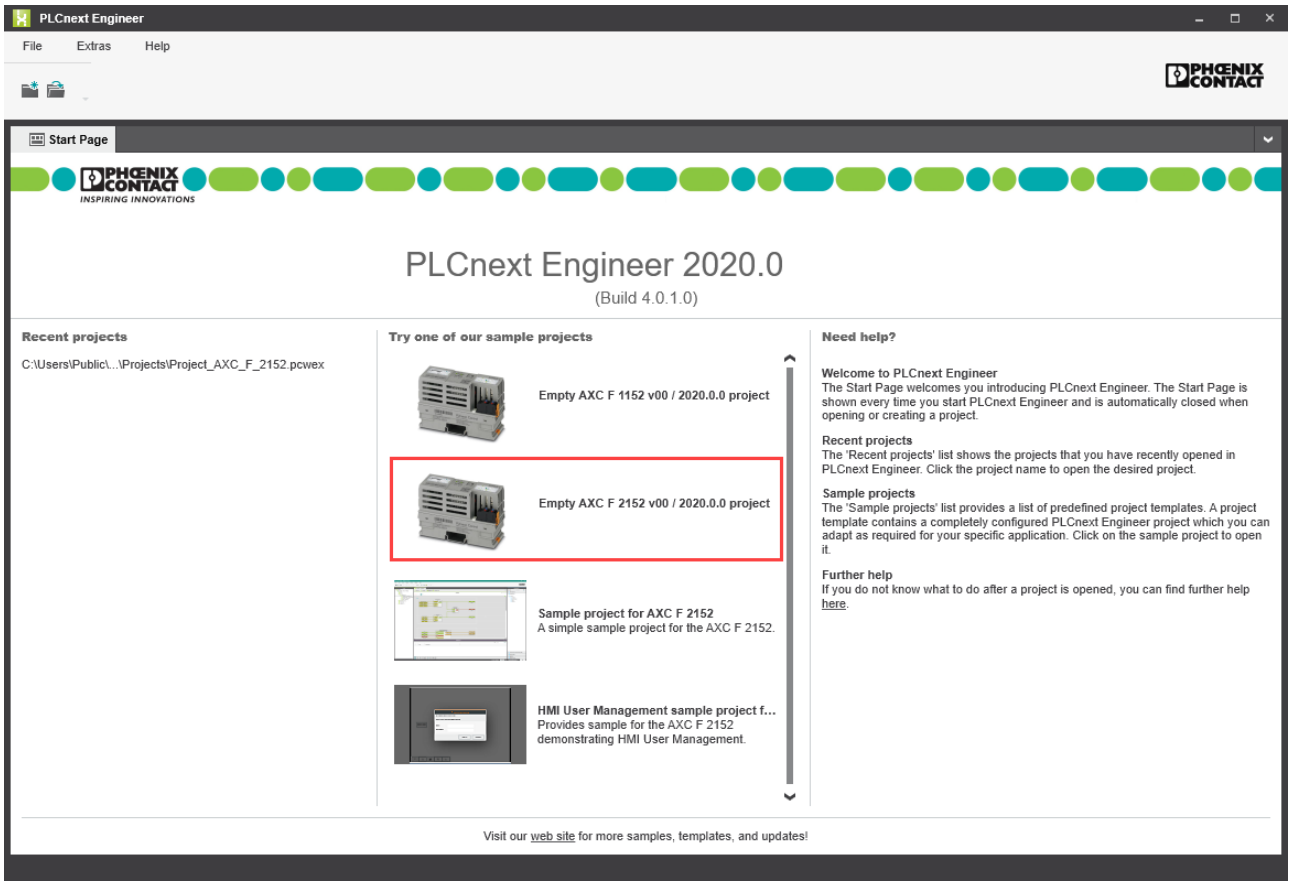
- ERROR LIST:
  Shows all errors, warnings, and messages for the current project.
- GLOBAL FIND AND REPLACE:
  Finds and replaces strings in the project.
- CROSS REFERENCES:
  Displays all cross-references within the project, for example, the use and declaration of all variable types or HMI tags.
- WATCH 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

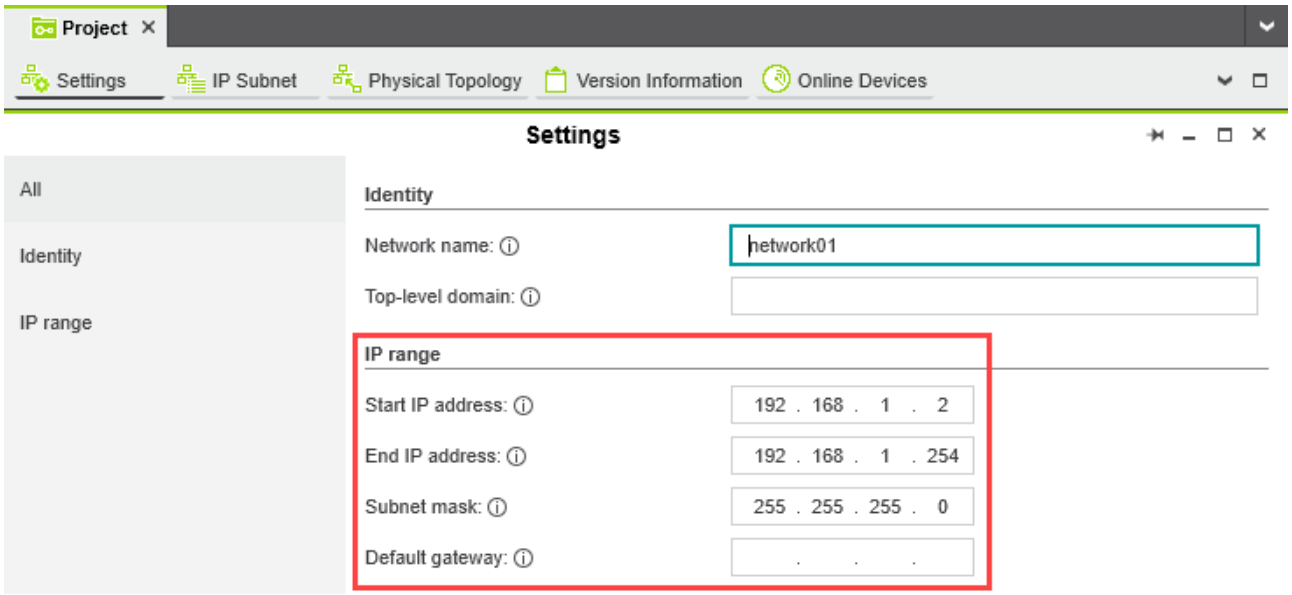
6.4.1 Setting the IP address range

- 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.

Figure 6-3 Setting the IP address range



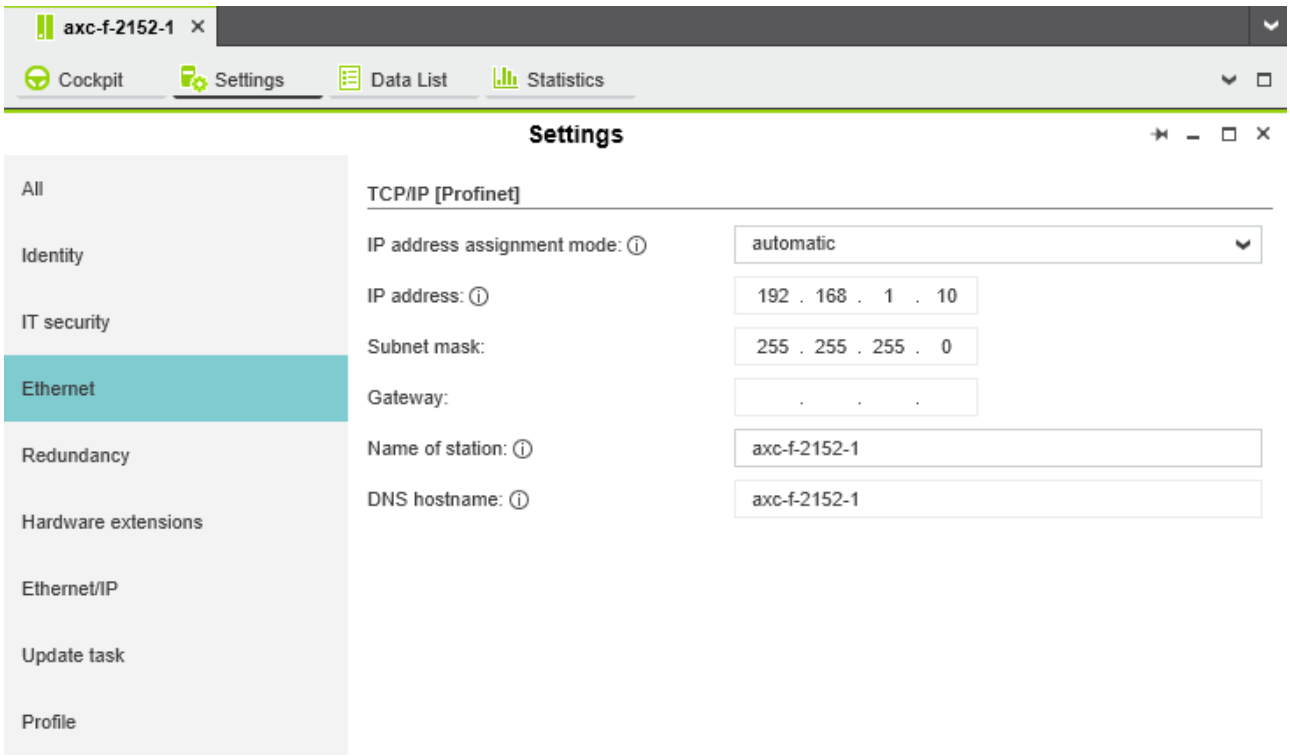
6.4.2 Setting the IP address

- 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

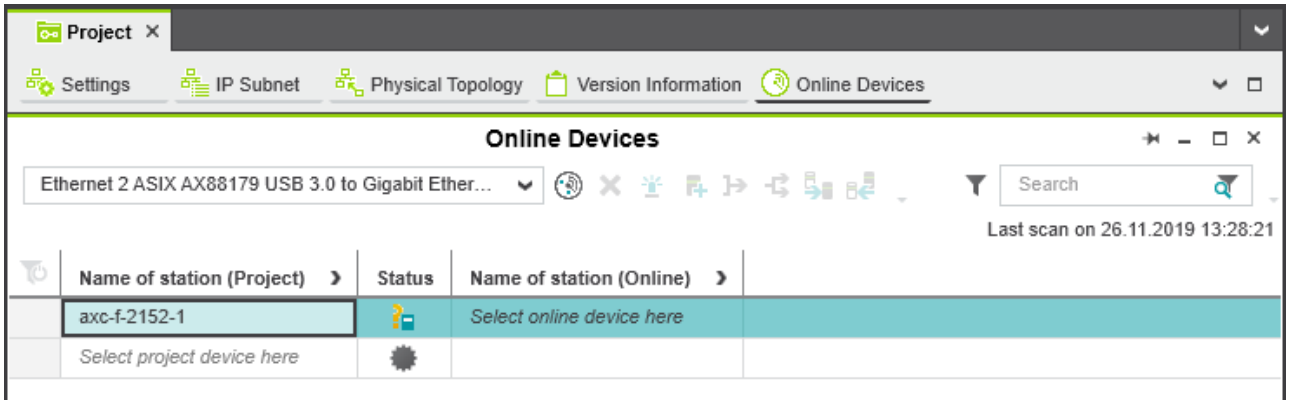
You can show and hide more detailed information by clicking on the arrows next to “Name of station (Project)” and “Name of station (Online)” (see Figure 6-5).

- 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.

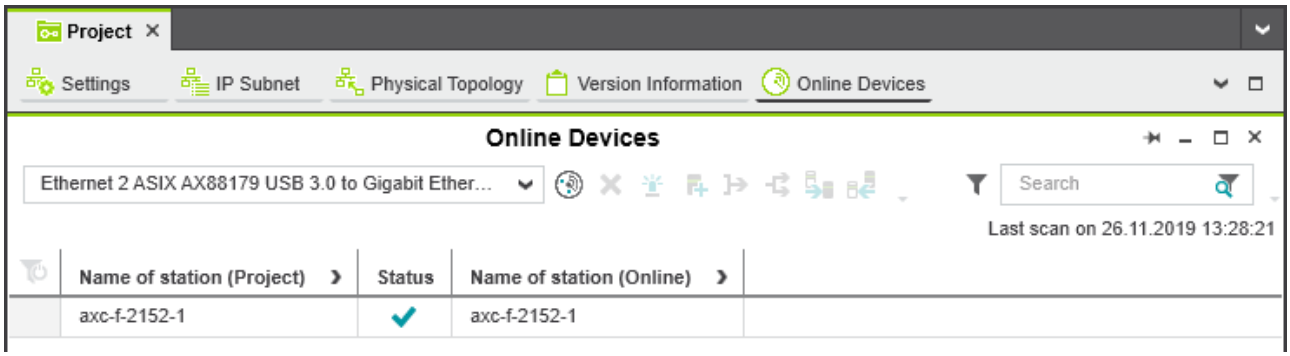
- Select the desired device.

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:

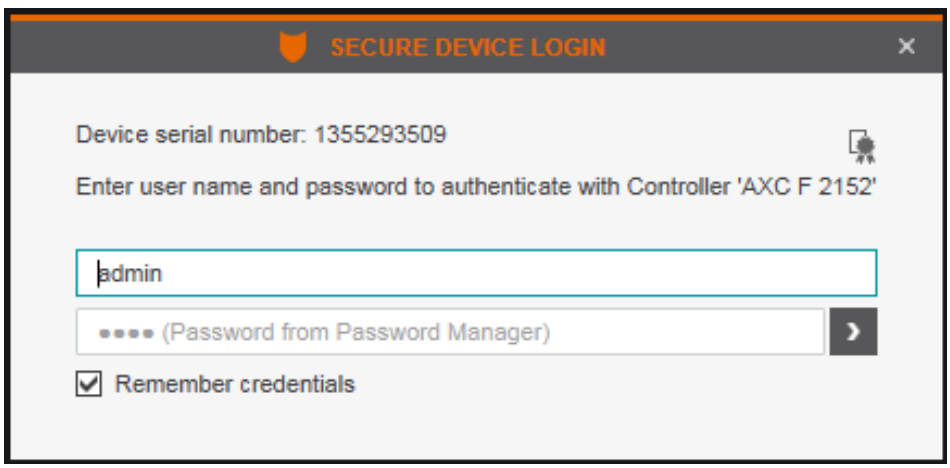
- Double-click the controller node in the “PLANT” area.

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



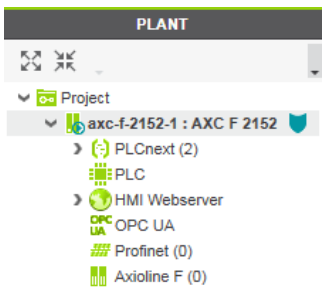
- Enter your user name and your password.

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

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

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 Info Center and the PLCnext Engineer online help.

7 PROFICLOUD.IO

The Proficloud offers an easy way of managing remote PLCnext devices. The main functions are:

- Device Management Service:
  - Showing a device overview with exact geolocation of all connected devices
  - Showing the status of all connected devices
  - Showing key information for all connected devices
  - Reporting logs from the connected devices
  - Checking for firmware updates and updating connected devices
- Time-series data service:
  - Storing variable values in the Proficloud

You can find more information about the Proficloud in the PLCnext Info Center.

8 System variables and status information

A detailed description of the system variables available for the controllers can be found in the PLCnext Info Center.

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).

In the PLCnext Info Center you will find detailed descriptions of the system variables of the following areas:

- System time
- Power supplies
- TCP_SOCKET, UDP_SOCKET, and TLS_SOCKET function blocks
- Device status
- Partition
- Task handling
- HMI status and control
- Axioline F: Diagnostic status and diagnostic parameter register
- PROFINET system variables
- INTERBUS: master diagnostic status and parameter register

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 Info Center. There you will find information on the following topics:

- Information, e.g. general data and network configuration
- Diagnostics, e.g. network, PROFINET, notifications, local bus
- Configuration, e.g. Proficloud services, web and system services, network
- Security, e.g. user authentication, certificates, LDAP, firewall, SD cards
- Administration, e.g. firmware update, licenses, apps

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

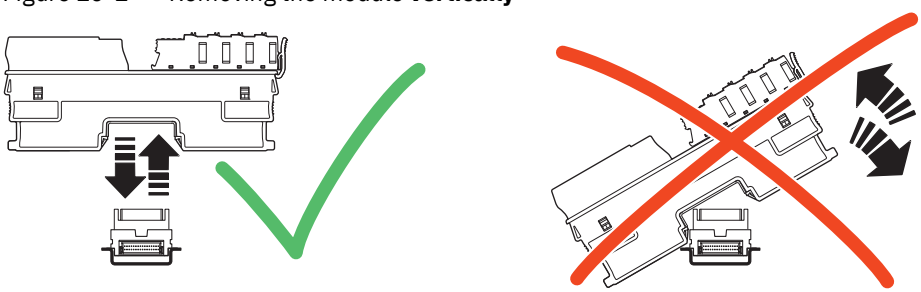
Tilting the modules can damage the contacts.

- 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**



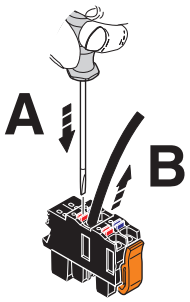
10.2 Removing cables

- 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

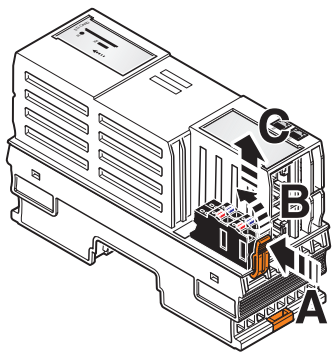


10.3 Removing the connector

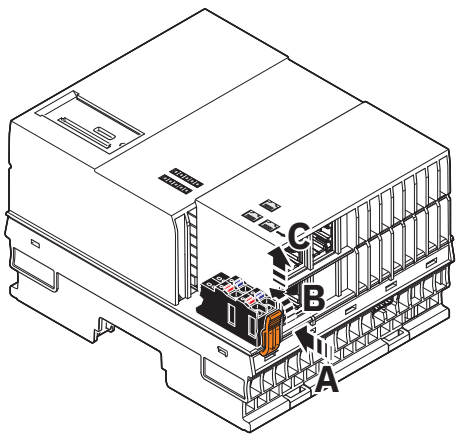
Removing the supply connector

- 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).

Figure 10-3 Removing the supply connector



AXC F 1152 and AXC F 2152



AXC F 3152

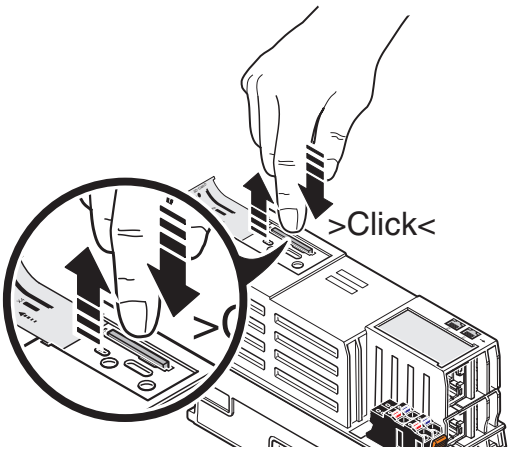
Removing the Ethernet connector

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

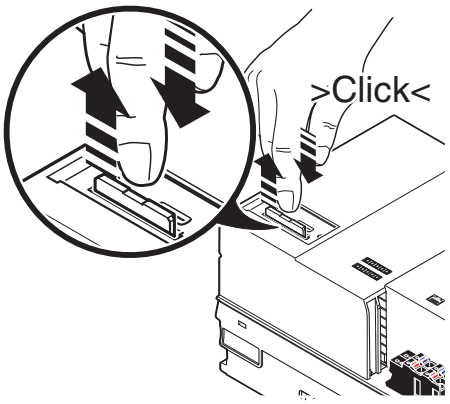
10.4 Removing the SD card

- 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



AXC F 1152 and AXC F 2152



AXC F 3152

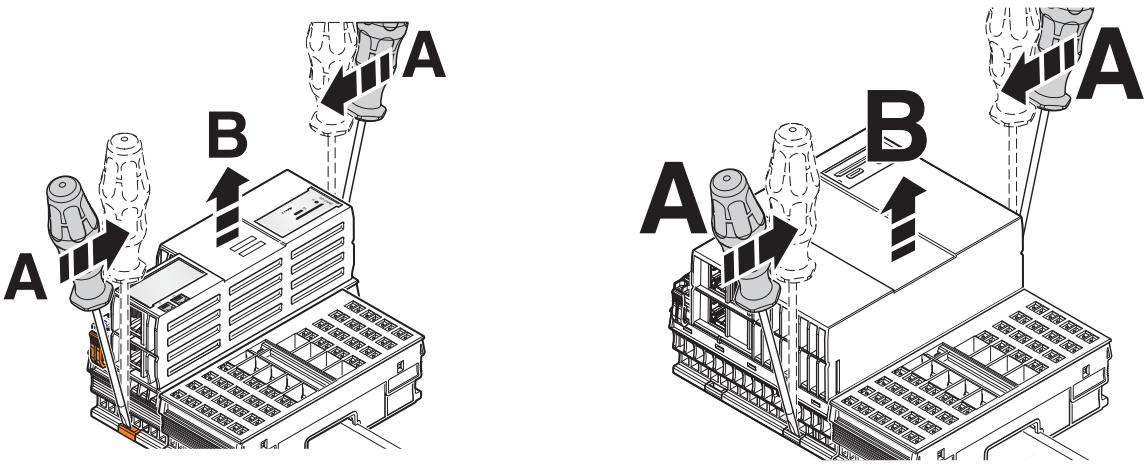
10.5 Removing the controller

- 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



AXC F 1152 and AXC F 2152 **AXC F 3152**

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 item 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.com/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.
- Reregister the controller in Proficloud and add it as a Proficloud device.

You can find information on this on the Internet at proficloud.io.

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).
  - 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

The symbol with the crossed-out trash can indicates that this item must be collected and disposed of separately from other waste. Phoenix Contact or public collection sites will take the item back for free disposal. For information on the available disposal options, visit phoenixcontact.com. Delete personal data before returning the item.

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:

- Cut the card into pieces
  or
  shred the card using a suitable document shredder (e.g., particle size ≤ 30 mm^2 in accordance with EN 15713).
- 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 AXC F 1152

14.1.1 Ordering data

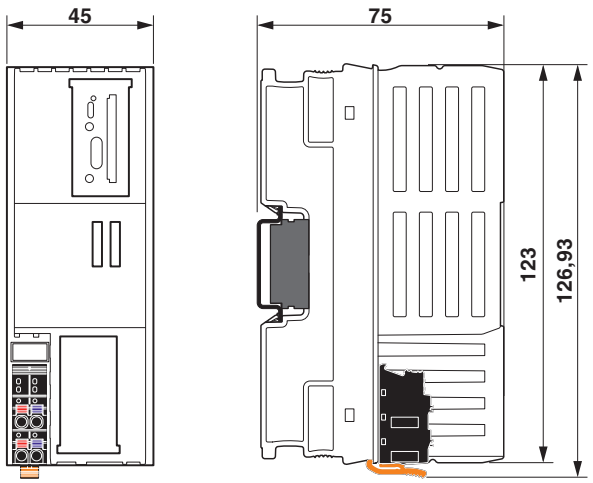
Description	Type	Item no.	Pcs./Pkt.
PLCnext Control for the direct control of Axioline F I/Os. With two Ethernet interfaces. Complete with connector and bus base module.	AXC F 1152	1151412	1

Accessories	
For accessories, go to:	www.phoenixcontact.com/product/1151412

Documentation	
For further documentation, go to:	www.phoenixcontact.com/product/1151412

14.1.2 Technical data

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	Housing: traffic grey A (RAL 7042)
Weight	223 g (with connector and bus base module)
Type	modular
Mounting type	DIN rail mounting
Module classification	PLCnext Control for direct control of Axioline F I/Os.
Application type	distributed control technology

Features	
Industrial cybersecurity	yes
Safety function	no
Redundancy function	no
Diagnostics display	no
Web server	yes
External memory	yes
Optical interface	no
Realtime clock	yes

System properties	
Operating system	Yocto/Linux®
Processor	Arm®Cortex®-A9, 1x 800 MHz
Trusted Platform Module	TPM 1.2
RAM	512 Mbyte DDR3 SDRAM
Flash memory	512 Mbyte (internal flash memory) SD card from Phoenix Contact (for external flash memory, see accessories)
Application interface	OPC UA®

Ambient conditions	
Ambient temperature (operation)	-25 °C … 60 °C up to 2000 m above mean sea level (observe derating) -25 °C … 55 °C up to 3000 m above mean sea level (observe 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 (Item no. 2688297))
Ambient temperature (storage/transport)	-40 °C … 85 °C
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 mean sea level)
Permissible humidity (operation)	5 % … 95 % (according to DIN EN 61131-2)
Permissible humidity (storage/transport)	5 % … 95 % (according to DIN EN 61131-2)
Degree of protection	IP20 (Manufacturers declaration, not evaluated by UL)
Protection class	III (IEC 61140, EN 61140, VDE 0140-1)
Overvoltage category	II

Ambient conditions	
Vibration (operation)	5g (in accordance with EN 60068-2-6/IEC 60068-2-6)
Shock (operation)	30g (in accordance with EN 60068-2-27/IEC 60068-2-27)
Continuous shock (operation)	10g (in accordance with EN 60068-2-27/IEC 60068-2-27)

Connection data: Axioline F connector	
Connection method	Push-in connection
Conductor cross section, rigid	0.2 mm² … 1.5 mm²
Conductor cross section, flexible	0.2 mm² … 1.5 mm²
Conductor cross section [AWG]	24 … 16
Stripping length	8 mm

Interface Axioline F local bus	
Connection method	Bus base module
Number of interfaces	1
Transmission speed	100 Mbps
Electrical isolation	No
Number of supported devices	max. 63

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

System limits	
Amount of process data	max. 1482 Byte (per station (total input and output data)) max. 1024 Byte (Axioline F local bus (input)) max. 1024 Byte (Axioline F local bus (output))
Number of supported devices	max. 63 (per station)
Number of local bus devices that can be connected	max. 63 (observe current consumption)
Number of IO-Link masters	max. 8 (recommended)

NOTE: Electronics may be damaged when overloaded

Observe the logic current consumption of each device when configuring an Axioline F station. It 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. 16 (at PROFINET controller)
Conformance Class	A

PROFINET	
Update rate	min. 1 ms (4 devices) min. 4 ms (16 devices)
Number of slots	1
Vendor ID	$00B0_{hex}$
Device ID	0169_{hex}
Process data width	64 Byte ... 512 Byte (PROFINET device)
Supported functions	MRP, FSU (PROFINET controller), MRP (PROFINET device)

Further specifications in relation to the firmware version used can be found in the PLCnext Info Center at the following address:
https://www.plcnext.help/te/Features_and_roadmaps/PLCnext_Technology_features.htm

Communications power 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, including ripple (± 5 %))
Current consumption	typ. 200 mA (without I/Os and U_L = 24 V) max. 442 mA (with 1 A at U_{Bus} for the I/Os)
Power consumption	typ. 4.8 W (without I/Os) max. 10.6 W (with 1 A at U_{Bus} for the I/Os)
Surge protection	electronic
Reverse polarity protection	electronic

NOTE: Electronics may be damaged when overloaded

Provide external fuses for the 24 V U_L area. If you are using an external fuse, the power supply unit must be able to supply four times the nominal current of the fuse. This ensures that it trips in the event of an error.

Axioline F local bus supply (U_{Bus})	
Supply voltage	5 V DC (via bus base module)
Power supply unit	1 A

Power dissipation	
Maximum power dissipation for nominal condition	5.6 W (5.6 W = 10.6 W - 5.0 W)

Realtime clock	
Accuracy realtime clock	typ. 10 ppm, max. 20 ppm at 25°C
Power reserve	120 h (at 25 °C, from hardware version 07 240 h (at25 °C, to hardware version 06)

Programming Data	
Register length (master)	1482 Byte

Programming	
Programming tool	PLCnext Engineer Eclipse® Visual Studio® MATLAB®/ Simulink®
Programming languages supported	Symbolic flowchart (SFC) Ladder diagram (LD) Function block diagram (FBD) Structured text (ST) C++ C# Java Python® Simulink®

IEC 61131 runtime system	
Number of data blocks	depending on data storage
Number of control tasks	8
Cycle Time	5 ms (for cyclical task)
Program memory	8 Mbyte
Data storage system	12 Mbyte
Retentive data storage	48 kByte (NVRAM)

Supported protocols	
Protocol	HTTP HTTPS PROFINET Modbus/TCP (via corresponding library) Modbus/RTU (via corresponding library) EtherNet/IP™ (Adapter) CANopen® (via corresponding library) DALI (via corresponding library) DALI-2 (via corresponding app) HART (via corresponding app) IO-Link® (via corresponding app) MQTT (via corresponding app) OPC UA® Server OPC UA® Client (via corresponding app) DHCP (via corresponding app) SFTP SMTP (via corresponding app) SNTP (via corresponding app) SNMP (via corresponding app) DNS (via corresponding app) DNP3 (via corresponding app) IEC 60870-5-1 (via corresponding library) IEC 60870-5-104 (via corresponding library) IPsec syslog

Conformance with EMC Directive 2014/30/EU	
Immunity test in accordance with EN IEC 61000-6-2	
Electrostatic discharge (ESD) IEC 61000-4-2	Criterion B, ±6 kV contact discharge, ±8 kV air discharge
Electromagnetic fields IEC 61000-4-3	Criterion A, Field intensity: 10 V/m
Fast transients (burst) IEC 61000-4-4	Criterion B, ±2 kV
Transient overvoltage (surge) IEC 61000-4-5	Criterion B; DC supply lines: ±0.5 kV/±1.0 kV (symmetrical/asymmetrical), fieldbus cable shielding: ±1.0 kV
Conducted interference IEC 61000-4-6	Criterion A, Test voltage 10 V
Noise emission test in accordance with EN IEC 61000-6-4	Class A

NOTE: radio interference

This is a Class A item of equipment. When using the equipment in residential areas, it may cause radio interference. In this case, the operator may be required to implement appropriate measures and to pay the resulting costs.

Approvals	
For the current approvals, go to:	www.phoenixcontact.com/product/1151412
UL, USA/Canada (E238705)	cULus
Industrial Cyber Security (IITS2 029429 0027)	Industrial IT Security, IACS Component IEC 62443-4-1:2018 IEC 62443-4-2:2019 PPP 15003B:2021 (IEC 62443-4-1: Full ML3 Process Profile) Configuration: Security Profile active

Manufacturer's declarations	
For the current manufacturer’s declarations, go to:	www.phoenixcontact.com/product/1151412

14.2 AXC F 2152

14.2.1 Ordering data

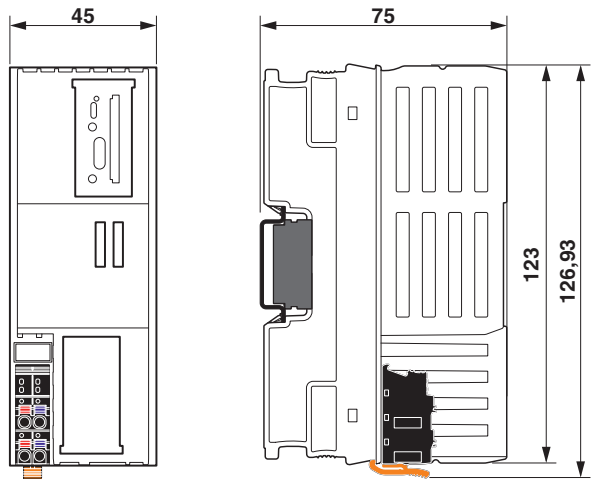
Description	Type	Item no.	Pcs./Pkt.
PLCnext Control for the direct control of Axioline F I/Os. With two Ethernet interfaces. Complete with connector and bus base module.	AXC F 2152	2404267	1

Accessories	
For accessories, go to:	www.phoenixcontact.com/product/2404267

Documentation	
For further documentation, go to:	www.phoenixcontact.com/product/2404267

14.2.2 Technical data

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	Housing: traffic grey A (RAL 7042)
Weight	223 g (with connector and bus base module)
Type	modular
Mounting type	DIN rail mounting
Module classification	PLCnext Control for direct control of Axioline F I/Os.
Application type	distributed control technology

Features	
Industrial cybersecurity	yes
Safety function	no (Functional safety is provided with the left-alignable AXC F XT SPLC 1000 or AXC F XT SPLC 3000 extension modules.)
Redundancy function	yes (applicative system redundancy)
Diagnostics display	no
Web server	yes
External memory	yes
Optical interface	no
Realtime clock	yes

System properties	
Operating system	Yocto/Linux®
Processor	Arm®Cortex®-A9, 2x 800 MHz
Trusted Platform Module	TPM 1.2
RAM	512 Mbyte DDR3 SDRAM
Flash memory	512 Mbyte (internal flash memory) SD card from Phoenix Contact (for external flash memory, see accessories)
Application interface	OPC UA®

Ambient conditions	
Ambient temperature (operation)	-25 °C … 60 °C up to 2000 m above mean sea level (observe derating) -25 °C … 55 °C up to 3000 m above mean sea level (observe 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 (Item no. 2688297)) -40 °C … 70 °C (Extended, see Section “Tested successfully: use under extreme ambient conditions” in the user manual)
Ambient temperature (storage/transport)	-40 °C … 85 °C
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 mean sea level)
Permissible humidity (operation)	5 % … 95 % (according to DIN EN 61131-2)
Permissible humidity (storage/transport)	5 % … 95 % (according to DIN EN 61131-2)

Ambient conditions	
Degree of protection	IP20 (Manufacturers declaration, not evaluated by UL)
Protection class	III (IEC 61140, EN 61140, VDE 0140-1)
Overvoltage category	II
Pollution degree	2
Vibration (operation)	5g (in accordance with EN 60068-2-6/IEC 60068-2-6)
Shock (operation)	30g (in accordance with EN 60068-2-27/IEC 60068-2-27)
Continuous shock (operation)	10g (in accordance with EN 60068-2-27/IEC 60068-2-27)

Connection data: Axioline F connector	
Connection method	Push-in connection
Conductor cross section, rigid	0.2 mm² ... 1.5 mm²
Conductor cross section, flexible	0.2 mm² ... 1.5 mm²
Conductor cross section [AWG]	24 ... 16
Stripping length	8 mm

Interface Axioline F local bus	
Connection method	Bus base module
Number of interfaces	1
Transmission speed	100 Mbps
Electrical isolation	No
Number of supported devices	max. 63

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

System limits	
Amount of process data	max. 1482 Byte (per station (total input and output data)) max. 1024 Byte (Axioline F local bus (input)) max. 1024 Byte (Axioline F local bus (output))
Number of supported devices	max. 63 (per station)
Number of local bus devices that can be connected	max. 63 (observe current consumption)
Number of IO-Link masters	max. 8 (recommended)

NOTE: Electronics may be damaged when overloaded

Observe the logic current consumption of each device when configuring an Axioline F station. It 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. 64 (at PROFINET controller)
Conformance Class	B
Update rate	min. 1 ms (4 devices) min. 16 ms (64 devices)
Number of slots	1
Vendor ID	$00B0_{hex}$
Device ID	0142_{hex}
Process data width	64 Byte ... 512 Byte (PROFINET device)
Supported functions	MRP, FSU (PROFINET controller), MRP (PROFINET device)

Further specifications in relation to the firmware version used can be found in the PLCnext Info Center at the following address:
https://www.plcnext.help/te/Features_and_roadmaps/PLCnext_Technology_features.htm

Communications power 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, including ripple (± 5 %))
Current consumption	typ. 200 mA (without I/Os and U_L = 24 V) max. 442 mA (with 1 A at U_{Bus} for the I/Os)
Power consumption	typ. 4.8 W (without I/Os) max. 10.6 W (with 1 A at U_{Bus} for the I/Os)
Surge protection	electronic
Reverse polarity protection	electronic

NOTE: Electronics may be damaged when overloaded

Provide external fuses for the 24 V U_L area. If you are using an external fuse, the power supply unit must be able to supply four times the nominal current of the fuse. This ensures that it trips in the event of an error.

Axioline F local bus supply (U_{Bus})	
Supply voltage	5 V DC (via bus base module)
Power supply unit	1 A

Power dissipation	
Maximum power dissipation for nominal condition	5.6 W (5.6 W = 10.6 W - 5.0 W)

Realtime clock	
Accuracy realtime clock	typ. 10 ppm, max. 20 ppm at 25°C
Power reserve	120 h (at 25 °C, from hardware version 07 240 h (at25 °C, to hardware version 06)

Programming Data	
Register length (master)	1482 Byte

Programming	
Programming tool	PLCnext Engineer Eclipse® Visual Studio® MATLAB®/ Simulink®
Programming languages supported	Symbolic flowchart (SFC) Ladder diagram (LD) Function block diagram (FBD) Structured text (ST) C++ C# Java Python® Simulink®

IEC 61131 runtime system	
Number of data blocks	depending on data storage
Number of control tasks	32 (16 per processor core)
Cycle Time	1 ms (for cyclical task)
Program memory	8 Mbyte
Data storage system	12 Mbyte
Retentive data storage	48 kByte (NVRAM)

Supported protocols	
Protocol	HTTP HTTPS PROFINET INTERBUS Modbus/TCP (via corresponding library) Modbus/RTU (via corresponding library) EtherNet/IP™ (Adapter) CANopen® (via corresponding library) DALI (via corresponding library) DALI-2 (via corresponding app) HART (via corresponding app) IO-Link® (via corresponding app) PROFIBUS MQTT (via corresponding app) OPC UA® Server OPC UA® Client (via corresponding app) DHCP (via corresponding app) SFTP SMTP (via corresponding app) SNTP (via corresponding app) SNMP (via corresponding app) DNS (via corresponding app) DNP3 (via corresponding app) IEC 60870-5-1 (via corresponding library) IEC 60870-5-104 (via corresponding library) IPsec syslog

Conformance with EMC Directive 2014/30/EU	
Immunity test in accordance with EN IEC 61000-6-2	
Electrostatic discharge (ESD) IEC 61000-4-2	Criterion B, ±6 kV contact discharge, ±8 kV air discharge
Electromagnetic fields IEC 61000-4-3	Criterion A, Field intensity: 10 V/m
Fast transients (burst) IEC 61000-4-4	Criterion B, ±2 kV
Transient overvoltage (surge) IEC 61000-4-5	Criterion B; DC supply lines: ±0.5 kV/±1.0 kV (symmetrical/asymmetrical), fieldbus cable shielding: ±1.0 kV
Conducted interference IEC 61000-4-6	Criterion A, Test voltage 10 V
Noise emission test in accordance with EN IEC 61000-6-4	Class A

NOTE: radio interference

This is a Class A item of equipment. When using the equipment in residential areas, it may cause radio interference. In this case, the operator may be required to implement appropriate measures and to pay the resulting costs.

Approvals	
For the current approvals, go to:	www.phoenixcontact.com/product/2404267
ATEX (TÜV 19 ATEX 8356 X)	Ⓔx II 3 G Ex ec IIC T4 Gc EN IEC 60079-0, EN IEC 60079-7
IECEx (IECEx TUR 19.0031X)	Ex ec IIC T4 Gc IEC 60079-0 Ed. 7, IEC 60079-7 Ed. 5.1
CCC / China-Ex (㊣, 2021122304114448)	Ex ec IIC T4 Gc GB/T 3836.1-2021, GB/T 3836.3-2021
UL Ex, USA / Canada (E366272)	Class I, Zone 2, AEx nA IIC T4 Class I, Div. 2, Groups A, B, C, D Ex nA IIC Gc T4 UL 60079-0, Ed. 6 / CSA C22.2 NO. 60079-0, Ed. 3 UL 60079-15, Ed. 4 / CSA C22.2 NO. 60079-15
UL, USA/Canada (E238705)	cULus
Corrosive gas test	ISA S71.04.2013 G3 Harsh Group A, DIN EN 60068-2-60:2016-06 Method 4
Industrial Cyber Security (IITS2 029429 0027)	Industrial IT Security, IACS Component IEC 62443-4-1:2018 IEC 62443-4-2:2019 PPP 15003B:2021 (IEC 62443-4-1: Full ML3 Process Profile) Configuration: Security Profile active

Manufacturer's declarations	
For the current manufacturer’s declarations, go to:	www.phoenixcontact.com/product/2404267

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.

14.3 AXC F 3152

14.3.1 Ordering data

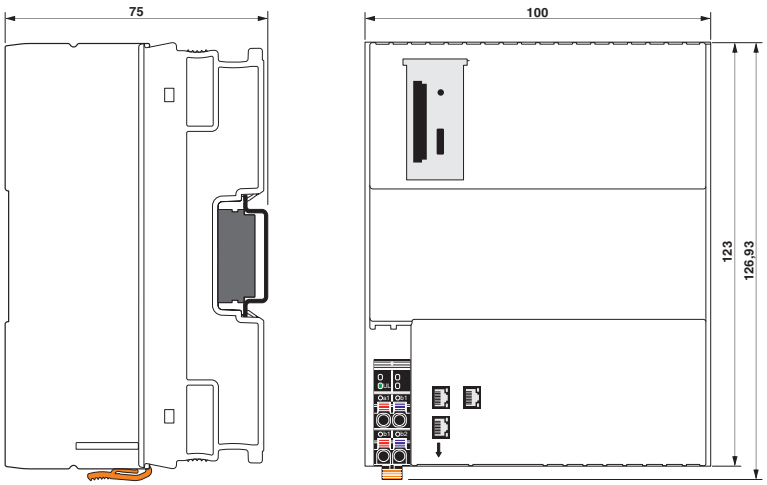
Description	Type	Item no.	Pcs./Pkt.
PLCnext Control for the direct control of Axioline F I/Os. With three independent Ethernet interfaces. Complete with connector and bus base module.	AXC F 3152	1069208	1

Accessories	
For accessories, go to:	www.phoenixcontact.com/product/1069208

Documentation	
For further documentation, go to:	www.phoenixcontact.com/product/1069208

14.3.2 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	Housing: traffic grey A (RAL 7042)
Weight	498 g (with connector and bus base module)
Type	modular
Mounting type	DIN rail mounting
Module classification	PLCnext Control for direct control of Axioline F I/Os.
Application type	distributed control technology

Features	
Industrial cybersecurity	yes
Safety function	no (Functional safety is provided with the left-alignable AXC F XT SPLC 1000 or AXC F XT SPLC 3000 extension modules.)
Redundancy function	yes (applicative system redundancy)
Diagnostics display	no
Web server	yes
External memory	yes
Optical interface	no
Realtime clock	yes

System properties	
Operating system	Yocto/Linux®
Processor	Intel®Atom® x5-E3930, 2x 1.3 GHz
Trusted Platform Module	TPM 1.2 TPM 2.0
RAM	2048 Mbyte
Flash memory	1 GByte (internal flash memory) SD card from Phoenix Contact (for external flash memory, see accessories)
Application interface	OPC UA®

Ambient conditions	
Ambient temperature (operation)	-25 °C … 60 °C up to 2000 m above mean sea level (observe derating) -25 °C … 55 °C up to 3000 m above mean sea level (observe 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 (Item no. 2688297)) -40 °C … 70 °C (Extended, see Section “Tested successfully: use under extreme ambient conditions” in the user manual)
Ambient temperature (storage/transport)	-40 °C … 85 °C
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 mean sea level)
Permissible humidity (operation)	5 % … 95 % (according to DIN EN 61131-2)

Ambient conditions	
Permissible humidity (storage/transport)	5 % ... 95 % (according to DIN EN 61131-2)
Degree of protection	IP20 (Manufacturers declaration, not evaluated by UL)
Protection class	III (IEC 61140, EN 61140, VDE 0140-1)
Overvoltage category	II
Pollution degree	2
Vibration (operation)	5g (in accordance with EN 60068-2-6/IEC 60068-2-6)
Shock (operation)	30g (in accordance with EN 60068-2-27/IEC 60068-2-27)
Continuous shock (operation)	10g (in accordance with EN 60068-2-27/IEC 60068-2-27)

Connection data: Axioline F connector	
Connection method	Push-in connection
Conductor cross section, rigid	0.2 mm² ... 1.5 mm²
Conductor cross section, flexible	0.2 mm² ... 1.5 mm²
Conductor cross section [AWG]	24 ... 16
Stripping length	8 mm

Interface Axioline F local bus	
Connection method	Bus base module
Number of interfaces	1
Transmission speed	100 Mbps
Electrical isolation	No
Number of supported devices	max. 63

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

Interface Service	
Bus system	USB
Connection method	USB type C
Note on the connection method	Only device interface
Number of interfaces	1
Electrical isolation	No

System limits	
Amount of process data	max. 1482 Byte (per station (total input and output data)) max. 1024 Byte (Axioline F local bus (input)) max. 1024 Byte (Axioline F local bus (output))
Number of supported devices	max. 63 (per station)
Number of local bus devices that can be connected	max. 63 (observe current consumption)
Number of IO-Link masters	max. 8 (recommended)

NOTE: Electronics may be damaged when overloaded

Observe the logic current consumption of each device when configuring an Axioline F station. It 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 (at PROFINET controller)
Conformance Class	B
Update rate	min. 1 ms (32 participants) min. 2 ms (64 devices) min. 4 ms (128 participants)
Number of slots	1
Vendor ID	$00B0_{hex}$
Device ID	0158_{hex}
Process data width	64 Byte ... 512 Byte (PROFINET device)
Supported functions	FSU (PROFINET controller)

Further specifications in relation to the firmware version used can be found in the PLCnext Info Center at the following address:
https://www.plcnext.help/te/Features_and_roadmaps/PLCnext_Technology_features.htm

Communications power 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, including ripple (± 5 %))
Current consumption	typ. 260 mA (without I/Os and U_L = 24 V) max. 650 mA (with 1 A at U_{Bus} for the I/Os)
Power consumption	typ. 6.24 W (without I/Os) max. 13.3 W (with 1 A at U_{Bus} for the I/Os)
Surge protection	electronic
Reverse polarity protection	electronic

NOTE: Electronics may be damaged when overloaded

Provide external fuses for the 24 V U_L area. If you are using an external fuse, the power supply unit must be able to supply four times the nominal current of the fuse. This ensures that it trips in the event of an error.

Axioline F local bus supply (U_{Bus})	
Supply voltage	5 V DC (via bus base module)
Power supply unit	1 A
Power dissipation	
Maximum power dissipation for nominal condition	8.3 W (8.3 W = 13.3 W - 5.0 W)
Realtime clock	
Accuracy realtime clock	0.7 s/day = 8 ppm at 25 °C
Power reserve	240 h (at 25 °C)
Programming Data	
Register length (master)	1482 Byte
Programming	
Programming tool	PLCnext Engineer Eclipse® Visual Studio® MATLAB®/ Simulink®
Programming languages supported	Symbolic flowchart (SFC) Ladder diagram (LD) Function block diagram (FBD) Structured text (ST) C++ C# Java Python® Simulink®
IEC 61131 runtime system	
Number of data blocks	depending on data storage
Number of control tasks	32 (16 per processor core)
Cycle Time	500 µs (for cyclical task)
Program memory	12 Mbyte
Data storage system	32 Mbyte
Retentive data storage	1 Mbyte

Supported protocols	
Protocol	HTTP HTTPS PROFINET INTERBUS Modbus/TCP (via corresponding library) Modbus/RTU (via corresponding library) EtherNet/IP™ (Adapter) CANopen® (via corresponding library) DALI (via corresponding library) DALI-2 (via corresponding app) HART (via corresponding app) IO-Link® (via corresponding app) PROFIBUS MQTT (via corresponding app) OPC UA® Server OPC UA® Client (via corresponding app) DHCP (via corresponding app) SFTP SMTP (via corresponding app) SNTP (via corresponding app) SNMP (via corresponding app) DNS (via corresponding app) DNP3 (via corresponding app) IEC 60870-5-1 (via corresponding library) IEC 60870-5-104 (via corresponding library) IPsec syslog

Conformance with EMC Directive 2014/30/EU	
Immunity test in accordance with EN IEC 61000-6-2	
Electrostatic discharge (ESD) IEC 61000-4-2	Criterion B, ±6 kV contact discharge, ±8 kV air discharge
Electromagnetic fields IEC 61000-4-3	Criterion A, Field intensity: 10 V/m
Fast transients (burst) IEC 61000-4-4	Criterion B, ±2 kV
Transient overvoltage (surge) IEC 61000-4-5	Criterion B; DC supply lines: ±0.5 kV/±1.0 kV (symmetrical/asymmetrical), fieldbus cable shielding: ±1.0 kV
Conducted interference IEC 61000-4-6	Criterion A, Test voltage 10 V
Noise emission test in accordance with EN IEC 61000-6-4	Class A

NOTE: radio interference

This is a Class A item of equipment. When using the equipment in residential areas, it may cause radio interference. In this case, the operator may be required to implement appropriate measures and to pay the resulting costs.

Approvals	
For the current approvals, go to:	www.phoenixcontact.com/product/1069208
UL, USA/Canada (E238705)	cULus
Corrosive gas test	ISA S71.04.2013 G3 Harsh Group A, DIN EN 60068-2-60:2016-06 Method 4
Industrial Cyber Security (IITS2 029429 0027)	Industrial IT Security, IACS Component IEC 62443-4-1:2018 IEC 62443-4-2:2019 PPP 15003B:2021 (IEC 62443-4-1: Full ML3 Process Profile) Configuration: Security Profile active

Manufacturer's declarations	
For the current manufacturer’s declarations, go to:	www.phoenixcontact.com/product/1069208

A Appendix

A 1 Updating the firmware

For information on updating the firmware, please refer to the PLCnext Info Center.
– Firmware update via the shell
– Firmware update via the web-based management

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 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.

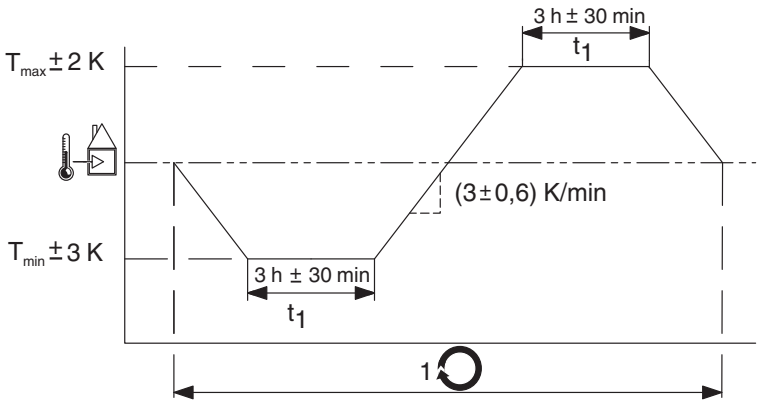
A 4 Tested successfully: Use under extreme ambient conditions

WARNING:
In the following applications, the controllers are only approved for use in the temperature range from -25 °C to 60 °C:
- Applications with UL approval
- Use in zone 2 potentially explosive areas

The AXC F 2152 and AXC F 3152 controllers have been tested successfully over 250 temperature change cycles in accordance with IEC 61131-2 in the range from -40 °C to +70 °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 mm²
- 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 A-1 Temperature change cycle



Temperature in the control cabinet/ambient temperature

Cycle

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