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Axioline F: system and installation

User manual

PHOENIX CONTACT
INSPIRING INNOVATIONS

User manual

Axioline F: system and installation

2017-02-22

Bezeichnung: UM EN AXL F SYS INST

Revision: 06

Artikel-Nr.: —

This user manual is valid for:

All modules of the Axioline F product group without bus-specific special features.

Please observe the following notes

User group of this manual

The use of products described in this manual is oriented exclusively to qualified electricians or persons instructed by them, who are familiar with applicable standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.

Explanation of symbols used and signal words

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety measures that follow this symbol to avoid possible injury or death.

There are three different categories of personal injury that are indicated with a signal word.

DANGER This indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

This symbol together with the signal word **NOTE** and the accompanying text alert the reader to a situation which may cause damage or malfunction to the device, hardware/software, or surrounding property.

This symbol and the accompanying text provide the reader with additional information or refer to detailed sources of information.

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Table of contents

1 Documentation landscape of Axioline F

1.1 Available documents

The documentation for the Axioline F product group is modular, providing you with the optimum information to meet your requirements, for example, for installation or startup with software.

In the following table, the term module describes the controller, bus coupler, and I/O module.

Table 1-1 Axioline F documentation

Document	Contents
System: Information on the Axioline F system	
User manual “Axioline F: System and installation” UM EN AXL F SYS INST (this manual)	This manual is the generic system manual for Axioline F. It describes the system and everything about Axioline F module mounting and wiring regardless of a higher-level network.
User manual “Axioline F: Diagnostic registers, and error messages” UM EN AXL F SYS DIAG	The user manual lists all error message for the system and provides remedial measures.
Module: Basic information on a specific module	
Package slips	A package slip is provided with the module upon delivery. It contains key information for the electrical installation of a module or group of modules. These include, for example: – Short description – Safety notes – Mounting/removal – Terminal point assignment
User manuals for the safety modules and controller	The user manual for each safety module or controller contains the complete information needed for use. These include at the very least: – Description – Mounting/removal and power supply – Startup under PC Worx and – Technical data and ordering data

Table 1-1 Axioline F documentation [...]

Document	Contents
Module-specific data sheets	The data sheet for each module contains the complete information needed for use. These include at the very least: – Function description – Accessories – Technical data – Pin assignment/terminal point assignment – Local diagnostics and status indicators and – Connection examples
Additional: Information on a specific module	
Additional user manuals	The additional user manuals either describe: – A bus coupler connected to a network or – A specific module Each manual only describes the relevant module and/or bus-specific special features. Being a generic manual, the “UM EN AXL F SYS INST” user manual also applies.
Quick start guides	Quick start guides are available for various topics. A quick start guide describes the startup of a system or a module step by step using an example.
Application notes	Application notes provide additional information about special topics.
Up-to-date pdf	
Generate PDF	By clicking the “Generate product PDF” button on the Internet, you can call up up-to-date information on the product (see Section “Documentation on the Internet” on page 11). These include at the very least: – Short description – Technical data – Drawings – Approvals

1.2 Documentation on the Internet

This documentation can be downloaded at phoenixcontact.net/products. Here you will find information on each product. During your search, take into account the difference between “Generate product PDF” and “Download”.

Generate product PDF

Click the “Generate product PDF” button to receive up-to-date selected information. It provides a **short overview** of the module.
The generated PDF file contains the essential product information. If you require further information, you can use the “Downloads” tab.

Downloads

Under the “Downloads” tab, you can access the **complete** documentation and all other downloads related to a module.
Module-specific documentation can be found in the download area for the corresponding module.
Comprehensive documentation can be found in the download area for the corresponding bus coupler.

1.3 Purpose of this user manual

This user manual informs you about the Axioline F system. It describes the system and everything about Axioline F module mounting and wiring regardless of a higher-level network.

2 The Axioline F product group

2.1 What is Axioline F?

Axioline F is a modular I/O system for the control cabinet. Open to all Ethernet-based communication protocols, Axioline F offers maximum flexibility. In addition, Axioline F is fast as regards response times and installation, robust in terms of its design and mechanics, and at the same time very easy to operate.

It is used for the transmission of process signals to a higher-level controller. Various networks are supported.

2.2 Features

Axioline F is fast

Axioline F features shortest response times and fast synchronous signal processing. This reduces cycle times and helps to increase the machine output and productivity. In addition, the control quality and as a result the product quality increases thanks to the fast signal processing feature.

Axioline F is as fast as parallel cabling, so the speed for data transmission is determined by the higher-level network.

– Synchronous to the higher-level network (depends on the bus coupler)
– Local bus cycle time in the µs range
– Fast I/O update times
– Fast and efficient station set-up

Axioline F is robust

Axioline F features a particularly robust mechanical design. The high electromagnetic compatibility, noise immunity, and low emissions ensure problem-free use in the industrial environment and beyond.

The XC modules, including controllers, bus couplers, and I/O modules, give you an extended temperature range. The coated modules open up even more applications.

– Vibration and shock resistant
– High noise immunity even in electromagnetically strongly contaminated environments
– Future-proof – thanks to reduced radiation it can even be used after reducing limit values
– Wide temperature range
– Coated modules withstand even the harshest environments
– All important approvals for marine automation

Axioline F is easy

Extremely user friendly. Thanks to the push-in connection technology, you can wire efficiently without tools – solid conductors or conductors with ferrules can be inserted directly into the terminal. The color coding of the contact points enables fast and intuitive wiring – this saves installation time and therefore also costs.

In addition, intelligent marking systems from Phoenix Contact simplify the individual I/O system marking.

Clear wiring: the design supports cabling from above and below. Module replacement is particularly fast with existing wiring.

Other properties

- High channel density
- Voltage ranges: 24 V DC (protective extra low voltage) and up to 220 V DC/230 V AC (low voltage)
- Transmission speed in the local bus: 100 Mbps
- Communication to the higher-level system via an Ethernet-based protocol (e.g., PROFINET, Sercos, EtherCAT®, Modbus/TCP)
- Very good diagnostic properties for the Axioline F system and application

2.3 Structure of an Axioline F station

An Axioline F station consists of individual modules that are snapped onto a DIN rail.
A controller or a bus coupler forms the head of the station. I/O modules are mounted next to it.
Bus base modules are used for the connection of the individual modules to one another and to the station head. The bus base modules are snapped onto the DIN rail side by side and thus form the Axioline F local bus.

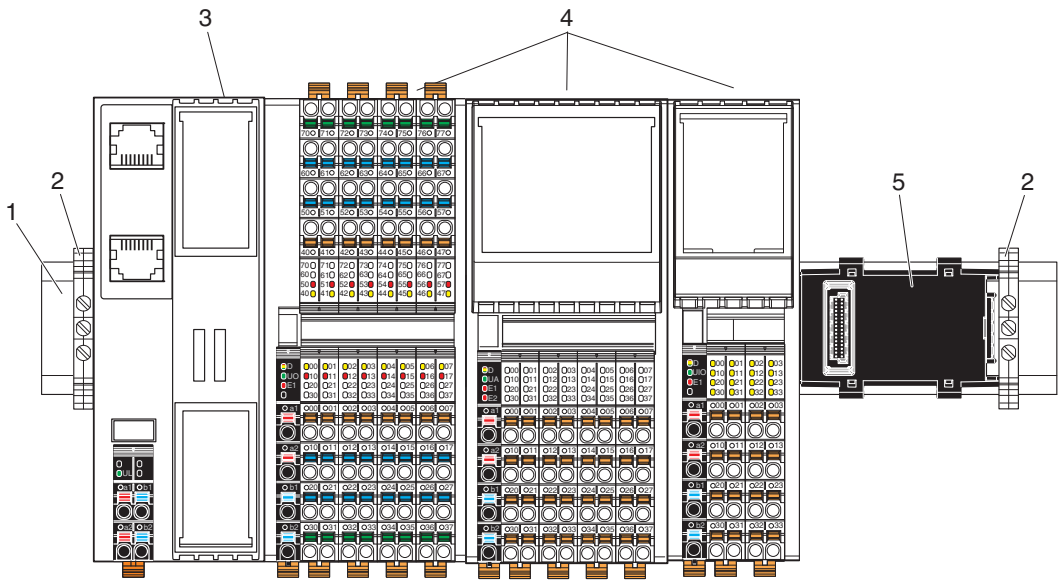

Figure 2-1 Example of an Axioline F station

1 DIN rail
2 End bracket (for securing the station; see “End brackets” on page 51)
3 Bus head (bus coupler or controller)
4 I/O modules
5 Bus base module

For detailed information about the function, properties, wiring, and parameterization, please refer to the module-specific documentation.

2.4 Product description

Modules with various functions are available within the Axioline F product group.

The Axioline F modules consist of an electronic module, one or several connectors, and a bus base module.

The electronics module can be changed without having to remove a wire from the connector.

The bus base modules are snapped onto the DIN rail side by side and thus form the Axioline F local bus that connects the modules to one another.

The Axioline F local bus is subsequently referred to as the local bus.

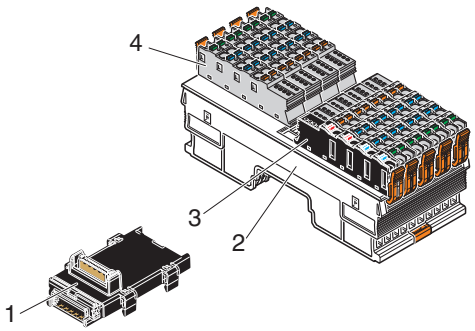

Figure 2-2 Components of an Axioline F I/O module

Key:

1 Bus base module
2 Electronics module
3 Connector for connecting the supply voltage
4 I/O connector

Versions

Modules are available for the following automation tasks:

– Controller
– Bus couplers to integrate the Axioline F station into various networks (PROFINET, Sercos, PROFIBUS, etc.).
– Input and output modules for digital and analog signals
– Modules for temperature recording
– Module for open and closed-loop control, and position detection
– Modules for communication
– ...

This product range is growing continuously.

Voltage ranges

Axioline F modules are available for the protective extra low voltage (PELV) range and the low voltage range. You can use low voltage and extra low voltage modules directly next to each other within an Axioline F station.

Table 2-1 Voltage ranges for Axioline F

Voltage range	Product groups	Nominal voltage used	Permissible voltage range	Examples
PELV	Low-level signal modules	24 V DC	19.2 V DC ... 30 V DC	AXL F DI16/4 2F
Low voltage	Low voltage modules	110 V DC/ 220 V DC	-300 V DC ... +300 V DC	AXL F DI8/2 110/220DC 2F
		220 V DC 230 V AC	-300 V DC ... 300 V DC 24 V AC ... 230 V AC (50 Hz ... 60 Hz)	AXL F DOR4/2 AC/220DC 1F
		230 V AC	12 V AC ... 253 V AC (50 Hz ... 60 Hz)	AXL F DO4/3 AC 1F

The instructions given in this user manual and in the module-specific documentation must be followed during installation and startup.

Particularly observe:

Section “Safety notes for mounting/removal” on page 47.

Mounting location

The Axioline F modules meet IP20 protection and can be used in closed control cabinets or in control boxes (terminal boxes) with IP54 protection according to EN 60529 or higher.

The compact structure means that the Axioline F modules can be installed in standard terminal boxes. Please observe the mounting distances when selecting the housing (see Section “Mounting distances” on page 62).

Mounting

Each Axioline F module consists of a bus base module and an electronics module. Snap the bus base modules onto the DIN rail without the need for tools and arrange the modules side by side. The local bus is created automatically when the bus base modules are installed next to one another.

Then, snap the electronics modules onto the DIN rail over the bus base modules.

See Section “Mounting and removing modules” on page 47.

Removal

Only a standard tool is necessary for removing the electronics module (e.g., a bladed screwdriver with a blade width of 2.5 mm).

See Section “Mounting and removing modules” on page 47.

Bus connection (network)

The Axioline F station is integrated in the network using a controller or a bus coupler.

Axioline F local bus

There is an interface to the Axioline F local bus on the bottom of the modules. Bus base modules are used to carry the communications power and the bus signals from the controller or bus coupler through the Axioline F station. The bus base module is supplied as standard with each module.

Please note the special feature of the bus couplers:
For bus couplers with the designation AXL BK ...., the bus coupler is integrated.
For bus couplers with the designation AXL F BK..., a separate bus base module is supplied in the scope of delivery.

The maximum number of Axioline F modules within a station is 63. The actual number of modules within an Axioline F station may be limited by the supplied logic current, the current consumption of the connected modules, and the system limits of the controller or bus coupler. See Section “Maximum number of modules” on page 52.

Connector

The Axioline F modules have connectors for connecting to the power supply and the I/O. The connectors have spring-cage terminal blocks. Suitable wires can be connected with push-in technology (see Section “Conductor cross sections and stripping/insertion lengths” on page 66).

Connecting the supply voltage

The communications power for the Axioline F station is supplied at the controller or bus coupler. The I/O voltage for the module is supplied separately to each I/O module (see Section “Connecting the power supplies” on page 72).

I/O connection

Sensors or actuators are connected with connectors using 1, 2, 3 or 4-wire technology (see Section “Connecting sensors and actuators” on page 77).

Depending on the module, the sensor/actuator cables are connected in one direction (at the bottom) or in two directions (at the top and at the bottom).

FE connection

At the bottom of each module there is at least one FE spring (metal contact) creating a functional earth ground connection when the module is snapped onto a grounded DIN rail.

Programming interface, service interface

The AXC 305x controllers are provided with a programming interface, and the AXC 105x controllers and the bus couplers are provided with a service interface. This interface is a type B micro USB socket. In addition to providing the network interface, it enables communication with the controller or bus coupler from a PC.

AXL BK ... bus couplers (not AXL F BK ...) do not have a micro USB socket but an IFS adapter interface. Please observe the information in the corresponding data sheet in this case.

Startup+

For information on Startup+, please refer to Section 10, “Software support” and the corresponding documentation.

Web-based management

By means of the web-based management integrated into the controllers and some bus couplers, you have the option to display static and dynamic information of the controller using a standard browser. The status and diagnostic functions can be clearly displayed on a graphical user interface by means of read access via a device network connection.
In addition, specific controller/bus coupler properties can be configured via web-based management.

Diagnostics

The Axioline F system provides comprehensive diagnostics:

- Remote diagnostics
- Process diagnostics (e.g., cycle time monitoring)
- Communication diagnostics
- Module diagnostics (status of the Axioline F module)
- I/O diagnostics (status of sensors/actuators)

For the diagnostic options of a specific module, please refer to the module-specific data sheets.

Reset button

The reset button provided on the controllers and bus couplers can only be operated with a pointed object (e.g., a pen) and is therefore protected against accidental activation.

If the reset button is actuated during operation, the controller or bus coupler is restarted.

Using the reset button, the controller or bus coupler can also be reset to the default settings.

For more detailed information on the reset button, please refer to the module-specific documentation.

Parameterization memory (controller)

The controllers have an integrated parameterization memory. Alternatively, it is possible to use a plug-in parameterization memory in the form of an SD card or USB stick.

For more detailed information on the parameterization memory, please refer to the user manual for the controller used.

2.5 Intended use

Axioline F controllers, Axioline F bus couplers, and Axioline F I/O modules should only be used according to the instructions in the module-specific documentation and this user manual (see Section “Technical data” on page 107). Phoenix Contact accepts no liability if the modules are used for anything other than their designated use.

2.6 Approvals

For the latest approvals for a module, please visit phoenixcontact.net/products.

Observe any notes and restrictions for the approvals in the module-specific package slip or in the module-specific documentation.

Search for approvals of a product

When searching for the approvals of a specific product, please proceed as follows:

- Enter the order designation, a part of it, or the order number in the search window.

Figure 2-3 Searching for order number 2688310

- Select the product.
- Switch to the “Approvals” tab.

The current approvals of the product are listed.

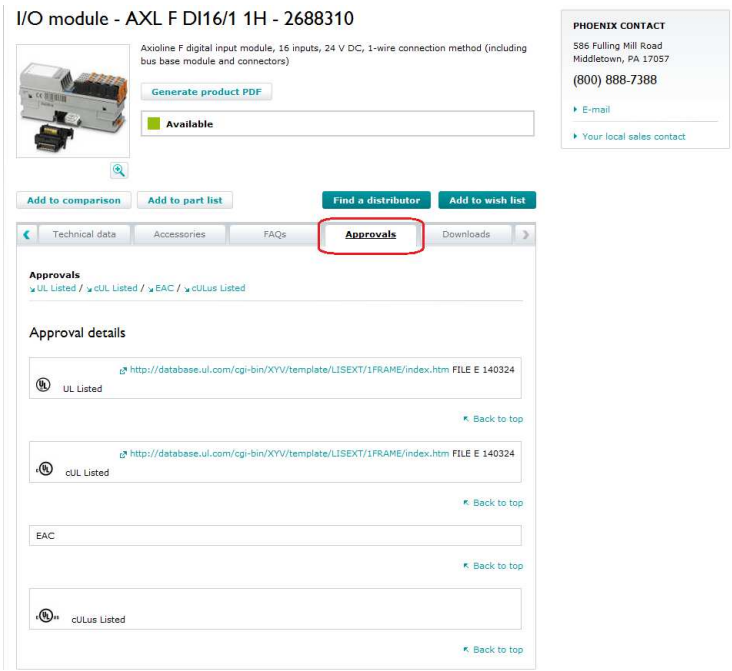

Figure 2-4 Current approvals of product 2688310

Search for all products that have a specific approval

When searching for products that have a specific approval, e.g., GL or ATEX-approved products, please proceed as follows:

- Enter AXL F, for example, in the search window.

Figure 2-5 Searching for AXL F

- UL approvals are listed directly; for other approvals, open “Approvals, More Options”.
- Activate the checkbox of the required approval and confirm the selection with “Submit”.

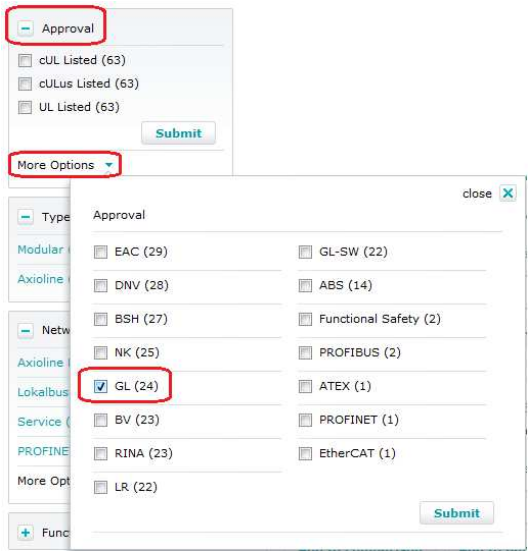

Figure 2-6 Selecting GL approval

This results in a list of all modules that have the selected approval.

3 Axioline F modules at a glance

3.1 Axioline F order designation

The order designation helps you to identify the function of a module.

Previous designation:

	Product group	Function	System	Number of inputs or outputs	Conductor connection	Extension
Examples:	AXL	BK	PN			
	AXL	DI		16	/4	-ME
	AXL	RTD		8		

New designation:

	Product group	Function and number of inputs of outputs	Conductor connection	Function extension	Housing
Examples:	AXL F	BK		PB	
	AXL F	DI16	/1	HS	1H
	AXL F	DI16	/4		2F
	AXL F	AI4		I	1H
	AXL F	DO8	/2	2A	1H
	AXL F	PSDO8	/3		1F
	AXL F	DO4	/3	AC	1F
	AXL F	DOR4	/2	AC/220DC	1F
	AXL F	DI8	/2	110/220DC	1F

Table 3-1 Structure of the order designations

Product group	AXL	Axioline F (previous designation)
	AXL F	Axioline F (new designation)
Function	BK	Bus coupler AXL BK ... : BK housing AXL F BK ... : F-BK housing
	DI	Digital input
	DO	Digital output
	DOR	Relay output
	SDI	Safe digital input
	SDO	Safe digital output
	P(SDI, SDO)	PROFIsafe
	AI	Analog Input
	AO	Analog output
	RTD	Analog input for the connection of resistance temperature detectors
	UTH	Analog input for the connection of thermocouple sensors
	CNT	Counter
	INC	Incremental encoder input
	SSI	SSI interface for absolute encoders
	RS UNI	Communication module for serial data transmission via RS-232 or via RS-485/422
	PWR	Supply
Number of inputs or outputs	1 ... 64	1 channel ... 64 channels
Function extension **(for bus couplers (BK): bus system/network)**	PN	PROFINET
	S3	Sercos
	PB	PROFIBUS DP
	EC	EtherCAT®
	ETH	Ethernet (Modbus/TCP)
	EIP	EtherNet/IP™

Table 3-1 Structure of the order designations [...]

Function extension (for other modules)	HS	High speed
	XC	Extreme ambient conditions
	S	Speed
	I	Current
	U	Voltage
	2A	2 A outputs
	FLK	FLK connection
	AC	Low voltage range AC (nominal output voltage 230 V AC)
	AC/220DC	Low voltage range AC and DC (nominal output voltage 230 V AC, 220 V DC)
	110/220DC	Low voltage range DC (Nominal voltage 110 V DC, 220 V DC)
Connection technology (for digital modules only)	/4	4-wire technology
	/3	3-wire technology
	/2	2-wire technology
	/1	1-wire technology
Housing	1F	1 terminal field, F housing (wide housing), cable outlet at the bottom
	2F	2 terminal fields, F housing (wide housing), cable outlets at the bottom and top
	1H	1 terminal field, H housing (narrow housing), cable outlet at the bottom
	2H	2 terminal fields, H housing (narrow housing), cable outlets at the bottom and top
Extension (only for previous designation)	ME	Module electronics (without bus base module and without connector) - as a replacement item

The standard modules are supplied with bus base module and Axioline F connectors. The connectors are mounted to the electronics module, and the bus base module is supplied as a separate part.

Bus base modules are also available as replacement items.
Please refer to the download area for the module at phoenixcontact.net/products to see whether a module-specific connector set is available as a replacement item.