AXL F DI16/1 1H

Axioline F, digital input module, digital inputs: 16, 24 V DC, connection technology: 1-conductor



Data sheet
8184_en_04

© Phoenix Contact 2025-08-11

1 Description

The module is designed for use within an Axioline F station.
It is used to acquire digital signals.
You can adjust the filter times of the inputs to increase noise immunity.
Filter times of 100 µs enable you to implement a counter function with a maximum input frequency of 5 kHz in the application.

Features

- 16 digital inputs in accordance with EN 61131-2 type 1 and type 3
- 24 V DC, 2.4 mA
- Connection of sensors in 1-conductor technology
- Minimum update time of < 100 µs
- Filter times can be adjusted in three increments: < 100 µs, 1000 µs or 3000 µs
- Maximum input frequency: 5 kHz
- Device rating plate stored

Valid as of hardware revision 02, firmware revision 1.00.

The deviating behavior of the modules with an earlier hardware revision is documented in the corresponding points.

Observe these notes

This data sheet is only valid in association with the UM EN AXL F SYS INST user manual.

Make sure you always use the latest documentation.
It can be downloaded at: phoenixcontact.com/product/2688310

2 Table of contents

1 Description 1
2 Table of contents 2
3 Ordering data 3
4 Technical data 3
5 Internal circuit diagram 6
6 For your safety 7
6.1 Intended use 7
6.2 Qualification of users 7
6.3 Electrical safety 7
6.4 Installation 7
6.5 UL note 7
7 Terminal point assignment 8
8 Connection example 8
9 Local diagnostic and status indicators 9
10 Process data 10
11 Parameter, diagnostics and information (PDI) 11
11.1 PDI objects 11
11.2 Retentive storage 11
12 Standard objects 12
12.1 Objects for identification (device rating plate) 12
12.2 Miscellaneous standard objects 14
12.3 Diagnostics state (0018hex: DiagState) 14
12.4 Handling diagnostic messages (0019hex: ResetDiag) 15
13 Application objects 16
14 Device descriptions 16

3 Ordering data

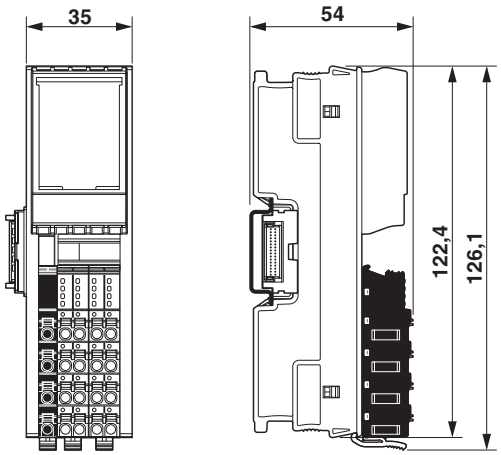
Description	Type	Item no.	Pcs./Pkt.
Axioline F, Digital input module, Digital inputs: 16, 24 V DC, connection technology: 1-conductor, transmission speed in the local bus: 100 Mbps, degree of protection: IP20, including bus base module and Axioline F connectors	AXL F DI16/1 1H	2688310	1

Documentation	Type	Item no.	Pcs./Pkt.
User manual, English, Axioline F: System and installation	UM EN AXL F SYS INST	-	-
User manual, English, Axioline F: Diagnostic registers, and error messages	UM EN AXL F SYS DIAG	-	-

Additional ordering data	
For additional ordering data (accessories), go to:	www.phoenixcontact.com/product/2688310

4 Technical data

Dimensions (nominal sizes in mm)



Width	35 mm
Height	126.1 mm
Depth	54 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	133 g (with connectors and bus base module)
Ambient temperature (operation)	-25 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Permissible humidity (operation)	5 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	5 % ... 95 % (non-condensing)
Air pressure (operation)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Air pressure (storage/transport)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Degree of protection	IP20
Protection class	III (IEC 61140, EN 61140, VDE 0140-1)
Overvoltage category	II (IEC 60664-1, EN 60664-1)
Degree of pollution	2 (IEC 60664-1, EN 60664-1)
Mounting type	DIN rail mounting
Mounting position	any (no temperature derating)

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

Please observe the information provided on conductor cross-sections in the “Axioline F: system and installation” user manual.

Interface: Axioline F local bus	
Number of interfaces	2
Connection method	Bus base module
Transmission speed	100 Mbps

Axioline F local bus supply (U_{Bus})	
Supply voltage	5 V DC (via bus base module)
Current consumption	max. 120 mA (up to HW 01) max. 60 mA (from HW 02)

Supply for digital input modules (U_I)	
Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption	max. 30 mA
Surge protection	electronic (35 V, 0.5 s)
Reverse polarity protection	parallel diode; with external 5 A fuse (only for commissioning)

Supply for digital input modules (U_I)	
Protection	max. 8 A (polarity reversal protection up to 5 A)

NOTE: Damage to the electronics

Provide external protection for the module to ensure reverse polarity protection. If you use a fuse, the power supply unit must be capable of supplying four times the nominal current of the fuse. This ensures that the fuse trips reliably in the event of a fault.

When using the module for the first time, protect it with a 5 A fuse. When all modules in the system are correctly connected, the 5 A fuse can be replaced with an 8 A fuse. After that, you can load the module up to 8 A.

Loads over 8 A are not permitted.

Power dissipation	
Maximum power dissipation for nominal condition	2.25 W

Digital inputs	
Number of inputs	16
Connection method	Push-in connection
Connection technology	1-conductor
Description of the input	EN 61131-2 types 1 and 3
Nominal input voltage	24 V DC
Nominal input current	2.4 mA
Current flow	linear until nominal current is reached, then constantly approx. 2.4 mA
Input voltage range "0" signal	-3 V DC ... 5 V DC
Input voltage range "1" signal	11 V DC ... 30 V DC
Input filter time	3000 µs (Default), 1000 µs, < 100 µs
Process data update	< 100 µs
Polarity reversal protection of the inputs	parallel diode (30 V, 5 s)

Input and output address area	
Input address area	2 Byte
Output address area	0 Byte

Configuration and parameter data in a PROFIBUS system	
Required parameter data	3 Byte
Required configuration data	6 Byte

Electrical isolation/isolation of the voltage areas	
Test section	**Test voltage**
5 V supply of the local bus (U_{Bus}) / 24 V supply (I/Os)	500 V AC, 50 Hz, 1 min
5 V supply of the local bus (U_{Bus}) / functional ground	500 V AC, 50 Hz, 1 min
24 V supply (I/O) / functional ground	500 V AC, 50 Hz, 1 min

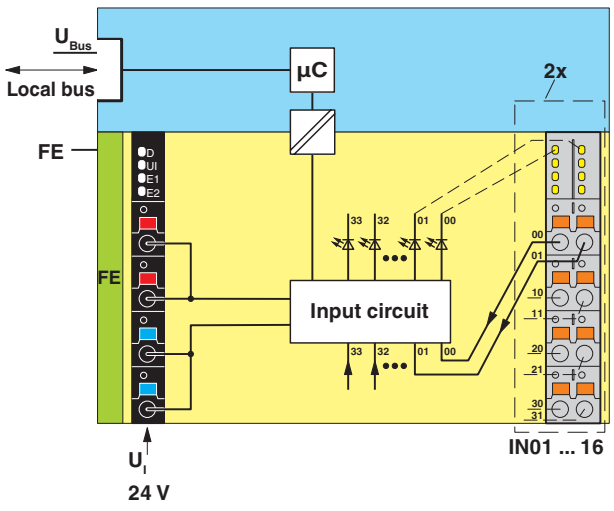
Mechanical tests	
Vibration resistance in accordance with EN 60068-2-6/IEC 60068-2-6	5g
Shock in accordance with EN 60068-2-27/IEC 60068-2-27	30g
Continuous shock in accordance with EN 60068-2-27/IEC 60068-2-27	10g

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)
Conducted interference IEC 61000-4-6	Criterion A, Test voltage 10 V
Noise emission test in accordance with EN IEC 61000-6-3	Class B

Approvals and manufacturer's declarations	
The latest documents can be found at:	www.phoenixcontact.com/product/2688310

5 Internal circuit diagram

Figure 1 Internal wiring of the terminal points



Key:

Local bus	Axioline F local bus (hereinafter referred to as local bus)
FE	Functional ground
µC	Microcontroller
	Electrical isolation
Input circuit	Input circuit
	LED
	Electrically isolated areas

6 For your safety

6.1 Intended use

Use the Axioline F modules exclusively in accordance with the specifications in the accompanying data sheet and the “Axioline F: System and Installation” user manual.

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

6.2 Qualification of users

The use of products described in this data sheet 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.

6.3 Electrical safety

WARNING: loss of electrical safety

If used incorrectly, device safety may be impaired.

The instructions given in this data sheet as well as the UM EN AXL F SYS INST user manual must be observed during installation, startup, and operation.

6.4 Installation

Only install the Axioline F modules in a control cabinet or junction box.

NOTE: Fire hazard

– The device must be installed in the final protective housing, which provides sufficient resistance to mechanical strain and protection against the spreading of fire in accordance with the standards UL/IEC/EN 61010-1 and UL/IEC/EN 61010-2-201.

– The supply and 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/EN 61010-1, UL/CSA/IEC/EN 61010-2-201.

NOTE: Damage to contacts or malfunction

Physical overloads can result in damage to the terminal points.

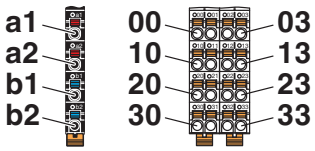
- Relieve strain in the connected cables.

6.5 UL note

– Use copper conductors only.

7 Terminal point assignment

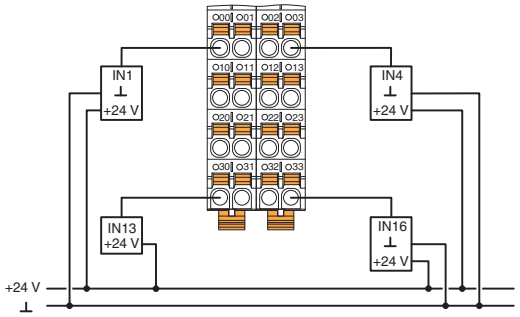
Figure 2 Terminal point assignment



Terminal point	Color	Assignment	
Supply voltage input			
a1, a2	Red	24 V DC (U_I)	Supply for digital input modules (bridged internally)
b1, b2	Blue	GND	Reference potential of the supply voltage (bridged internally)
Digital inputs			
00 ... 03	Orange	IN01 ... IN04	Digital inputs 1 ... 4
10 ... 13	Orange	IN05 ... IN08	Digital inputs 5 ... 8
20 ... 23	Orange	IN09 ... IN12	Digital inputs 9 ... 12
30 ... 33	Orange	IN13 ... IN16	Digital inputs 13 ... 16

8 Connection example

Figure 3 Example of a connection of sensors when using external busbars

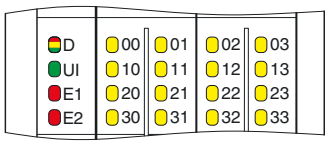


Ensure that GND of the sensors and GND for U_I have the same potential.

9 Local diagnostic and status indicators

As of hardware revision 02

Figure 4 Local diagnostic and status indicators



Designation	Color	Meaning	State	Description
D	Red/ yellow /green	Diagnostics of local bus communication		
		Run	Green on	The device is ready for operation, communication within the station is OK. All data is valid. An error has not occurred.
		Active	Flashing green	The device is ready to operate, communication within the station is OK. The data is **not** valid. The controller or higher-level network is not delivering valid data. There is no error on the module.
		Device application not active	Flashing green/ yellow	The device is ready for operation, communication within the station is OK. Output data **cannot** be outputted and/or input data **cannot** be read. There is a fault on the periphery side of the module.
		Ready	Yellow on	The device is ready for operation but did not detect a valid cycle after power-up.
		Connected	Flashing yellow	The device is not (yet) part of the active configuration.
		Reset	Red on	The device is ready for operation but has lost the connection to the bus head.
		Not connected	Red flashing	The device is ready for operation but there is no connection to the previously existing device.
		Power down	Off	Device is in (power) reset.
UI	Green	U_{Input}	On	Supply for digital input modules (U_I) is present.
			Off	Supply for digital input modules (U_I) is not present.
E1	Red	Supply voltage error	On	Feed-in for digital input modules (U_I) is faulty.
			Off	Feed-in for digital input modules (U_I) is OK.
E2	Red	Internal device error	On	There is an internal device error.
			Off	There is no internal device error.
00 ... 03, 10 ... 13, 20 ... 23, 30 ... 33	Yellow	Status of the inputs	On	Input is set.
			Off	Input is not set.

Deviating behavior up to hardware revision 01

The LEDs E1 and E2 are not present.

10 Process data

The process data is mapped in Motorola format (Big Endian).

IN process data

Byte	0							
Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Signal	IN08	IN07	IN06	IN05	IN04	IN03	IN02	IN01
Terminal point	13	12	11	10	03	02	01	00

Byte	1							
Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Signal	IN16	IN15	IN14	IN13	IN12	IN11	IN10	IN09
Terminal point	33	32	31	30	23	22	21	20

11 Parameter, diagnostics and information (PDI)

11.1 PDI objects

The module has PDI objects. They are used to map parameters, diagnostic data, and information about the module. The PDI objects can be read and/or written acyclically.

You can find out how to access the PDI objects in the documentation for the bus coupler or the controller used.

The PDI objects created in the module are described in the following sections.

You will find an explanation of the data types in the user manual UM EN AXL F SYS INST.

The following applies to all tables below:

Abbreviation	Meaning
Length in bytes	Maximum length of the elements in bytes
R	Read
W	Write
[x]	Number of elements in an array or record

Each visible string is terminated with a null terminator (00_{hex}). The length of a visible-string-type element is therefore at least one byte larger than the number of user data items.
If the number of user data items plus null terminator is smaller than the specified length of the element, the visible string will be populated with a null character (00_{hex}).

You will find detailed information on the PDI objects in the user manual UM EN AXL F SYS INST.

11.2 Retentive storage

The module has retentively (non-volatilely) and volatilely stored parameters.

Retentively stored parameters retain their values even after the module voltage is reset.

For writeable parameters, the following tables indicate whether they are stored retentively or volatilely.

A write operation to the module memory is only triggered if the value of at least one retentive parameter has been changed.

Due to the storage technology used, parameters that are stored retentively only allow a certain number of write access operations (typ. 100,000 to 1,000,000 times). **They are not suitable for being changed cyclically.**

NOTE: Damage to the Flash memory during cyclic write access

The flash memory is only designed for a limited number of write access operations.

- Make sure that write access operations are not performed too often and, in particular, are not performed cyclically.
- Note this behavior when programming function blocks.
- For systems with initial parameterization (e.g., PROFINET), avoid parameterization from the application program.

12 Standard objects

12.1 Objects for identification (device rating plate)

You can only access these objects via subindex 00, i.e., you access the entire object in each case.
If an object contains several elements, the content is listed in the table in a structured way, e.g. hardware version divided into date and version.

As of hardware revision 02

Index (hex)	Object name	Data type	Length in bytes	Rights	Meaning	Contents
Manufacturer						
0001	VendorName	Visible String	32	R	Vendor name	Phoenix Contact
0002	VendorID	Visible String	7	R	Vendor ID	00A045
0003	VendorText	Visible String	58	R	Vendor text	Components and systems for industrial automation
0012	VendorURL	Visible String	58	R	Vendor URL	www.phoenixcontact.com
Module - general						
0004	DeviceFamily	Visible String	16	R	Device family	I/O digital IN
0006	ProductFamily	Visible String	32	R	Product family	AXL F
000E	CommProfile	Visible String	4	R	Communication profile	633
000F	DeviceProfile	Visible String	5	R	Device profile	0010
0011	ProfileVersion	Record [2] of Visible Strings	32	R	Profile version	2011-12-07; Basic - Profile V2.0
0017	Language	Record [2] of Visible Strings	14	R	Language	en-us; English
Module - special						
0005	Capabilities	Octet string	8	R	Capabilities	Nothing
0007	ProductName	Visible String	32	R	Product name	AXL F DI16/1 1H
0008	SerialNo	Visible String	22	R	Serial number	e. g., 1234512345
0009	ProductText	Visible String	58	R	Product text	16 digital inputs, adjustable filter
000A	OrderNumber	Visible String	32	R	Item No.	2688310
000B	HardwareVersion	Record [2] of Visible Strings	22	R	Hardware version	e. g., 2011-02-04; 00
000C	FirmwareVersion	Record [2] of Visible Strings	22	R	Firmware version	e.g., 2017-12-31; 1.00
000D	PChVersion	Record [2] of Visible Strings	17	R	PDI version	e. g., 2010-06-21; V1.00
0037	DeviceType	Octet string	8	R	Device type	00 80 00 02 00 00 00 $D6_{hex}$
003A	VersionCount	Array [4] of UINT16	8	R	Version counter	e. g., 0007 0001 0001 0001_{hex}

Index (hex)	Object name	Data type	Length in bytes	Rights	Meaning	Contents
Use of the device						
These parameters are stored retentively. They are retained when the voltage is reset.						
0014	Location	Visible String	58	R/W	Location	Can be completed by the user.
0015	EquipmentIdent	Visible String	58	R/W	Equipment identifier	Can be completed by the user.
0016	ApplDeviceAddr	UINT16	2	R/W	Application-specific device address	Can be completed by the user.

Deviating behavior up to hardware revision 01

Index (hex)	Object name	Data type	Length in bytes	Rights	Meaning	Contents
Manufacturer						
0001	VendorName	Visible String	16	R	Vendor name	Phoenix Contact
0003	VendorText	Visible String	49	R	Vendor text	Components and systems for industrial automation
0012	VendorURL	Visible String	30	R	Vendor URL	http://www.phoenixcontact.com
Module - general						
0006	ProductFamily	Visible String	33	R	Product family	Axioline - High speed I/O system
0011	ProfileVersion	Record [2] of Visible Strings	30	R	Profile version	2011-12-07; Basis - Profil V2.0
Module - special						
0007	ProductName	Visible String	16	R	Product name	AXL F DI16/1 1H
0008	SerialNo	Visible String	11	R	Serial number	e. g., 1234512345
0009	ProductText	Visible String	37	R	Product text	16 digital inputs, adjustable filter
000A	OrderNumber	Visible String	8	R	Item No.	2688310
000B	HardwareVersion	Record [2] of Visible Strings	14	R	Hardware version	e. g., 2011-02-04; 00
000C	FirmwareVersion	Record [2] of Visible Strings	14	R	Firmware version	0000-00-00; --
003A	VersionCount	Array [4] of UINT16	8	R	Version counter	e.g., 0007 0001 0000 0000_{hex}

12.2 Miscellaneous standard objects

Index (hex)	Object name	Data type	Length in bytes	Rights	Meaning/contents	Retentive storage	
Diagnostics objects							
0018	DiagState	Record [6]	58	R	Diagnostic state		*
0019	ResetDiag	UINT8	1	R/W	Handling diagnostic messages	No	*
Objects for process data management							
0025	PDIN	Octet string	4	R	Input process data The structure corresponds to the representation in the "Process data" section.		

The objects identified with * in the last column are described in more detail in the following sections.

The description of the other objects is to be found in the user manual UM EN AXL F SYS INST.

12.3 Diagnostics state (0018_{hex}: DiagState)

This object is used for a structured message of an error.

Read off all information via subindex 00 to receive all information on an error number. Access to individual elements of the object is not permitted.

As of hardware revision 02

0018_{hex}: Diagnostics state (read)					
Subindex/ element	**Data type**	**Length in bytes**	**Meaning**	**Contents**	
0	Record	58	Diagnostic state	Current diagnostic state of the device in short form	
1	UINT16	2	Error number	0 ... 65535_{dec}	
2	UINT8	1	Priority	00_{hex}	No error
				01_{hex}	Error
				02_{hex}	Warning
				81_{hex}	Error removed
				82_{hex}	Warning eliminated
3	UINT8	1	Channel/group/module	00_{hex}	No error
				FF_{hex}	Entire device
4	UINT16	2	Error code	See table below	
5	UINT8	1	Additional information	00_{hex}	
6	Visible String	51	Text	See table below	

The message with priority 81_{hex} or 82_{hex} is a one-off, internal message to the bus coupler. The bus coupler transfers this error message to the error mechanisms of the higher-level system.

Once the cause of the fault has been removed, the message is automatically reset.

Error and status of the local diagnostics and status indicators

Subindex	2	3	4	6				
Error	**Priority**	**Chan-nel/ group/ module**	**Error code**	**Text**	**LED**			
	hex	**hex**	**hex**		**D**	**UI**	**E1**	**E2**
No error	00	00	0000	Status OK	◐	●	○	○
Failure of the supply for digital input modules (U_I)	01	FF	3412	Missing I/O supply UI, terminal point a1/a2, b1/b2	☼	○	●	○
Undervoltage of the supply for digital input modules (U_I)	01	FF	3455	Missing I/O supply UI, terminal point a1/a2, b1/b2	☼	○	●	○

LED	○	Off
	●	On
	◐	Green on
	☼	Flashing green/yellow

Deviating behavior up to hardware revision 01

The LEDs E1 and E2 are not present.

The error codes are identical to those in hardware revision 02.

Error text is not specified.

12.4 Handling diagnostic messages (0019_{hex}: ResetDiag)

You can use this object to specify how the module should handle diagnostic messages.

0019_{hex}: Handling diagnostic messages (read, write)				
Subindex	**Data type**	**Length in bytes**	**Code (hex)**	**Meaning/contents**
0	UINT8	1	00	Permit all diagnostic messages (default)
			02	Delete all diagnostic messages that are still pending
			06	Delete all diagnostic messages and do not permit new ones
			Other	Reserved

13 Application objects

Index (hex)	Object name	Data type	Length in bytes	Rights	Meaning/contents	Retentive storage
FF8F	Input_Filter	UINT8	1	R/W	Filter time	Yes

Filter time ($FF8F_{hex}$: Input_Filter)

You parameterize the filter time of the module with this object.

Value range	
Value (hex)	**Filter time**
00	**3000 µs (default)**
01	1000 µs
02	< 100 µs

14 Device descriptions

The device is described in the device description files.
The device descriptions for controllers from Phoenix Contact are included in PC Worx and PLCnext Engineer, as well as in the corresponding service packs.
The device description files for other systems are available for download at www.phoenixcontact.com/products in the download area of the bus coupler installed.