

# AXL F DI16/4 2F

**Axioline F digital input module, 16 inputs,  
24 V DC, 2, 3 or 4-wire connection method**

Data sheet  
7987\_en\_04

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## 1 Description

The module is designed for use within an Axioline F station.

It is used to acquire digital signals.

The filter times of the inputs can be set to increase noise immunity.

Filter times of 100  $\mu$ s allow the user to implement a counter function with a maximum input frequency of 5 kHz in the application.

### Features

- 16 digital inputs according to EN 61131-2 type 1 and type 3
- 24 V DC, 2.4 mA
- Connection of sensors in 2, 3, and 4-wire technology
- Minimum update time < 100  $\mu$ s
- Filter times can be set in two increments: < 100  $\mu$ s or 500  $\mu$ s
- Maximum input frequency: 5 kHz
- Maximum permissible load current per sensor: 2 A
- Maximal permissible load current of the module: 4 A (2 A for each group of 8 inputs)
- Device type label stored
- Diagnostic and status indicators



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 from the product at [phoenixcontact.net/products](http://phoenixcontact.net/products).

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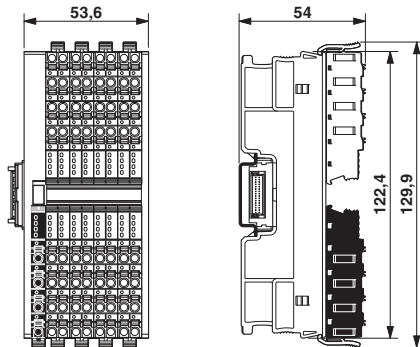
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### 3 Ordering data

Description	Type	Order No.	Pcs./Pkt.
Axioline F digital input module, 16 inputs, 24 V DC, 2, 3 or 4-wire connection method (including bus base module and connectors)	AXL F DI16/4 2F	2688022	1
Accessories	Type	Order No.	Pcs./Pkt.
Axioline F bus base module for housing type F (Replacement item)	AXL F BS F	2688129	5
Axioline F connector set (for e.g., AXL F DI16/4 2F) (Replacement item)	AXL CNS 8L-ORBG/D/UI/E1/E2	2700980	1
Zack marker strip for Axioline F (device labeling), in 2 x 20.3 mm pitch, unprinted, 25-section, for individual labeling with B-STIFT 0.8, X-PEN, or CMS-P1-PLOTTER (Marking)	ZB 20,3 AXL UNPRINTED	0829579	25
Zack marker strip, flat, in 10 mm pitch, unprinted, 10-section, for individual labeling with M-PEN 0,8, X-PEN, or CMS-P1-PLOTTER (Marking)	ZBF 10/5,8 AXL UNPRINTED	0829580	50
Documentation	Type	Order No.	Pcs./Pkt.
User manual, English, Axioline F: System and installation	UM EN AXL F SYS INST	-	-
User manual, English, Axioline F: Diagnostic registers, and error messages	UM EN AXL F SYS DIAG	-	-

### 4 Technical data

#### Dimensions (nominal sizes in mm)



Width	53.6 mm
Height	129.9 mm
Depth	54 mm
Note on dimensions	The depth is valid when a TH 35-7.5 DIN rail is used (according to EN 60715).

#### General data

Color	traffic grey A RAL 7042
Weight	231 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)

### General data

Degree of protection	IP20
Protection class	III, IEC 61140, EN 61140, VDE 0140-1
Mounting position	Any (no temperature derating)

### Connection data

Designation	Axioline F connector
Connection method	Push-in connection
Conductor cross section solid / stranded	0.2 mm <sup>2</sup> ... 1.5 mm <sup>2</sup> / 0.2 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>
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

Connection method	Bus base module
Transmission speed	100 MBit/s

### Communications power

Communications power $U_{Bus}$	5 V DC (via bus base module)
Current consumption from $U_{Bus}$	max. 120 mA
Power consumption at $U_{Bus}$	max. 600 mW

### I/O supply

Supply of digital input modules $U_i$	24 V DC
Maximum permissible voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption from $U_i$	max. 4 A (2 A or each group of 8 inputs)
Power consumption at $U_i$	typ. 240 mW (Without sensors), max. 120.8 W (Of which 800 mW with internal losses)
Surge protection of the supply voltage	Electronic (35 V, 0.5 s)
Polarity reversal protection of the supply voltage	Parallel diode; with external 5 A fuse (for startup only)
Protection	max. 8 A (polarity reversal protection up to 5 A)



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



#### NOTE: Damage to the electronics

Provide the module with an external fuse to protect it against polarity reversal. The power supply unit must be able to supply four times the nominal current of the external fuse, to ensure that it trips in the event of an error.

### Digital inputs

Number of inputs	16
Connection method	Push-in connection
Connection method	2, 3, 4-wire
Description of the input	EN 61131-2 types 1 and 3
Nominal input voltage	24 V DC
Nominal input current	2.4 mA
Sensor current per channel	max. 2 A
Total sensor current	max. 2 A (per group)
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

### Digital inputs

Input filter time	500 µs (default), < 100 µs
Polarity reversal protection of the inputs	Electronic
Short-circuit protection for the sensor supply	Electronic, per group
Overload protection for the sensor supply	Electronic, per group

### Configuration and parameter data in a PROFIBUS system

Required parameter data	3 Byte
Need for configuration data	6 Byte

### Error messages to the higher level control or computer system

I/O supply failure	Yes
Overload of group 1	Yes
Overload of group 2	Yes

### Electrical isolation/isolation of the voltage areas

Test section	Test voltage
5 V communications power (logic), 24 V supply (I/O)	500 V AC, 50 Hz, 1 min
5 V supply (logic)/functional earth ground	500 V AC, 50 Hz, 1 min
24 V supply (I/O) / functional earth ground	500 V AC, 50 Hz, 1 min

### Mechanical tests

Vibration resistance in acc. with EN 60068-2-6/IEC 60068-2-6	5g
Shock in acc. with EN 60068-2-27/IEC 60068-2-27	30g
Continuous shock according to EN 60068-2-27/IEC 60068-2-27	10g

### Conformance with EMC Directive 2004/108/EC

#### Noise immunity test in accordance with EN 61000-6-2

Electrostatic discharge (ESD) EN 61000-4-2/IEC 61000-4-2	Criterion B; 6 kV contact discharge, 8 kV air discharge
Electromagnetic fields EN 61000-4-3/IEC 61000-4-3	Criterion A; Field intensity: 10 V/m
Fast transients (burst) EN 61000-4-4/IEC 61000-4-4	Criterion B, 2 kV
Transient surge voltage (surge) EN 61000-4-5/IEC 61000-4-5	Criterion B; DC supply lines: ±0.5 kV/±0.5 kV (symmetrical/asymmetrical)
Conducted interference EN 61000-4-6/IEC 61000-4-6	Criterion A; Test voltage 10 V

#### Noise emission test according to EN 61000-6-3

Radio interference properties EN 55022	Class B
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### Approvals

For the latest approvals, please visit [phoenixcontact.net/products](http://phoenixcontact.net/products).

### 5 Internal circuit diagram

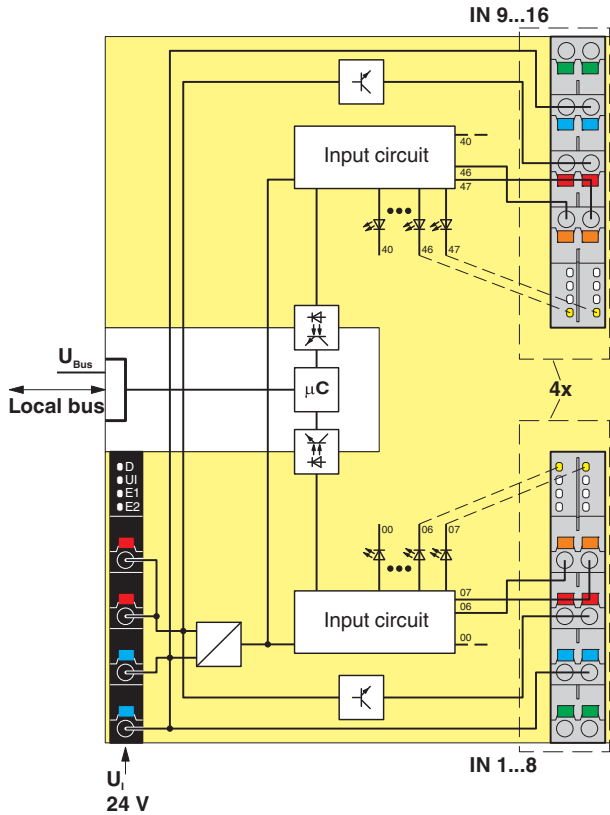


Figure 1 Internal wiring of the terminal points

Key:

- Local bus      Axioline F local bus (hereinafter referred to as local bus)
- Microcontroller
- Transistor
- Optocoupler
- LED
- Power supply unit
- Electrically isolated areas
- Input circuit      Input circuit

### 6 Terminal point assignment

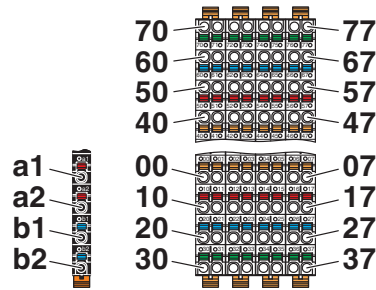


Figure 2 Terminal point assignment

Terminal point	Color	Assignment	
<b>Supply voltage input</b>			
a1, a2	Red	24 V DC (U <sub>I</sub> )	Supply for digital input modules (internally jumpered)
b1, b2	Blue	GND	Reference potential of the supply voltage (internally jumpered)
<b>Digital inputs</b>			
00 ... 07	Orange	IN1 ... IN8	Digital inputs 1 ... 8
40 ... 47	Orange	IN9 ... IN16	Digital inputs 9 ... 16
10 ... 17, 50 ... 57	Red	24 V DC (U <sub>S</sub> )	Sensor supply
20 ... 27, 60 ... 67	Blue	GND	Reference potential for all channels
30 ... 37, 70 ... 77	Green	FE	Functional earth ground (FE)

### 7 Connection example

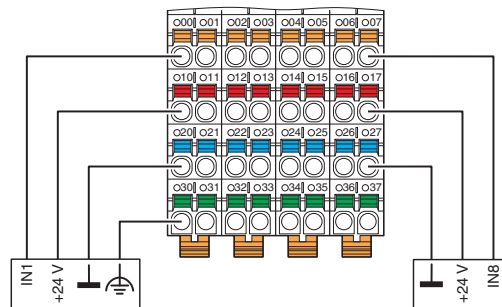
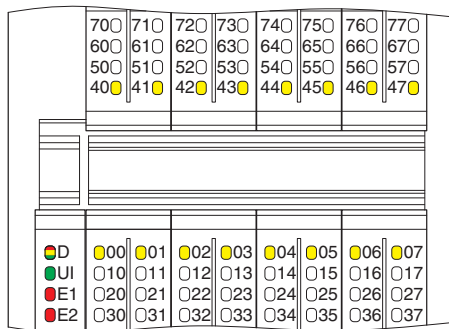


Figure 3 Connection using 4 and 3-wire technology

## 8 Local status and diagnostic indicators



E1 and E2 LEDs: Inputs 1 to 8 form group 1, inputs 9 to 16 form group 2. If an error occurs on at least one of the inputs of a group, this will be indicated with the corresponding LED.

Figure 4 Local status and diagnostic 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. There are no faults.
		Active	Green flashing	The device is ready for operation, communication within the station is OK. The data is <b>not</b> valid. Valid data from the controller/higher-level network not available. There is no fault in the module.
		Device application not active	Flashing green/yellow	The device is ready for operation, communication within the station is OK. Output data <b>cannot</b> be outputted and/or input data <b>cannot</b> 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-on.
		Connected	Yellow flashing	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	Flashing red	The device is ready for operation but there is no connection to the previously existing device.
Power down	OFF	Device in (power) reset.		
UI	Green	U <sub>Input</sub>	ON	Supply for digital input modules is present.
			OFF	Supply for digital input modules is not present.
E1	Red	I/O error in group 1	ON	Breakdown or overload/short-circuit of the sensor supply of group 1.
			OFF	No I/O error.
E2	Red	I/O error in group 2	ON	Breakdown or overload/short-circuit of the sensor supply of group 2.
			OFF	No I/O error.
00 ... 07, 40 ... 47	Yellow	Status of the inputs	ON	Input is set.
			OFF	Input is not set.

## 9 Process data

I/O data is mapped in the Motorola format.

### IN process data

Byte	0							
Bit	7	6	5	4	3	2	1	0
Channel	8	7	6	5	4	3	2	1
Terminal point	07	06	05	04	03	02	01	00

Byte	1							
Bit	7	6	5	4	3	2	1	0
Channel	16	15	14	13	12	11	10	9
Terminal point	47	46	45	44	43	42	41	40

## 10 Parameter, diagnostics and information (PDI)

Parameter and diagnostic data as well as other information is transmitted via the PDI channel of the Axioline F station.

The standard and application objects stored in the module are described in the following section.

The following applies to all tables below:

Please refer to the UM EN AXL F SYS INST for an explanation of the object codes and data types.

Abbreviation	Meaning
A	Number of elements
L	Length of the elements
R	Read
W	Write



Every visible string is terminated with a zero terminator (00<sub>hex</sub>). The length of a visible string element is therefore one byte larger than the amount of user data.



For detailed information on PDI and the objects, please refer to the UM EN AXL F SYS INST user manual.



## 11 Standard objects

### 11.1 Objects for identification (device rating plate)

Index (hex)	Object name	Object type	Data type	A	L	Rights	Meaning	Contents
<b>Manufacturer</b>								
0001	VendorName	Var	Visible String	1	16	R	Vendor name	Phoenix Contact
0002	VendorID	Var	Visible String	1	7	R	Vendor ID	00A045
0003	VendorText	Var	Visible String	1	49	R	Vendor text	Components and systems for industrial automation
0012	VendorURL	Var	Visible String	1	30	R	Vendor URL	http://www.phoenix-contact.com
<b>Module - general</b>								
0004	DeviceFamily	Var	Visible String	1	15	R	Device family	I/O digital IN
0006	ProductFamily	Var	Visible String	1	33	R	Product family	Axioline - High speed I/O system
000E	CommProfile	Var	Visible String	1	4	R	Communication profile	633
000F	DeviceProfile	Var	Visible String	1	5	R	Device profile	0010
0011	ProfileVersion	Record	Visible String	2	11; 20	R	Profile version	2011-12-07; Basis - Profil V2.0
003A	VersionCount	Array	Unsigned 16	4	4 * 2	R	Version counter	0006 0001 0000 0000 <sub>hex</sub>
<b>Module - special</b>								
0005	Capabilities	Array	Visible String	1	8	R	Features	Nothing
0007	ProductName	Var	Visible String	1	16	R	Product name	AXL F DI16/4 2F
0008	SerialNo	Var	Visible String	1	11	R	Serial number	xxxxxxxx (e. g., 1234512345)
0009	ProductText	Var	Visible String	1	37	R	Product text	16 digital inputs, adjustable filter
000A	OrderNumber	Var	Visible String	1	8	R	Order No.	2688022
000B	HardwareVersion	Record	Visible String	2	11; 3	R	Hardware version	e. g., 2011-02-04; 00
000C	FirmwareVersion	Record	Visible String	2	11; 3	R	Firmware version	0000-00-00; --
000D	PChVersion	Record	Visible String	2	11; 6	R	Parameter channel version	2010-01-08; V1.00
0037	DeviceType	Var	Octet string	1	8	R	Module identification	00 80 00 02 00 00 00 D0 <sub>hex</sub>
<b>Use of the device</b>								
0014	Location	Var	Visible String	1	59	R/W	Location	Can be filled out by the user.
0015	EquipmentIdent	Var	Visible String	1	59	R/W	Equipment identifier	Can be filled out by the user.
0016	ApplDeviceAddr	Var	Unsigned 16	1	2	R/W	Application device address	Can be filled out by the user.

11.2 Object for multilingual capacity

Index (hex)	Object name	Object type	Data type	A	L	Rights	Meaning	Contents
0017	Language	Record	Visible String	2	6; 8	R	Language	en-us; English

11.3 Diagnostics objects

Index (hex)	Object name	Object type	Data type	A	L	Rights	Assignment/content
0018	DiagState	Record		6	2; 1; 1; 2; 1; 1	R	Diagnostic state

Diagnostics state (0018<sub>hex</sub>: DiagState)

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

0018 <sub>hex</sub> : DiagState (Read)					
Subindex	Data type	Length in bytes	Meaning	Contents	
0	Record	8	Diagnostic state	Complete diagnostics information	
1	Unsigned 16	2	Error number	0 ... 65535 <sub>dez</sub>	
2	Unsigned 8	1	Priority	00 <sub>hex</sub>	No error
				01 <sub>hex</sub>	Error
				02 <sub>hex</sub>	Warning
				81 <sub>hex</sub>	Error removed
				82 <sub>hex</sub>	Warning eliminated
3	Unsigned 8	1	Channel/group/module	00 <sub>hex</sub>	No error
				01 <sub>hex</sub>	Group 1 (inputs 1 to 8)
				02 <sub>hex</sub>	Group 2 (inputs 9 to 16)
				FF <sub>hex</sub>	entire device
4	Unsigned 16	2	Error code	See table below	
5	Unsigned 8	1	More follows	00 <sub>hex</sub>	
6	Visible String	1	Text	00 <sub>hex</sub>	



The message with the priority 81<sub>hex</sub> or 82<sub>hex</sub> is a one-time internal message to the bus coupler that is implemented onto the error mechanisms of the higher-level system by the bus coupler.

Error and status of the local status and diagnostics indicators

Subindex	2	3	4				
Error	Priority	Channel/group/module	Error code	LED			
	hex	hex	hex	D	UI	E1	E2
No error	00	00	0000	Green ON	ON	OFF	OFF
I/O supply failure	01	FF	3412	Flashing green/yellow	OFF	OFF	OFF
Sensor supply overload for inputs 1 to 8 (group 1)	01	01	2211	Green ON	ON	ON	OFF
Sensor supply overload for inputs 9 to 16 (group 2)	01	02	2211	Green ON	ON	OFF	ON



After all errors have been eliminated, it is automatically reset.

#### 11.4 Objects for process data management

Index (hex)	Object name	Object type	Data type	A	L	Rights	Assignment
0025	PDIN	Var	Octet string	1	2	R	Input process data
003B	PDIN_Descr	Array of Records		3	8; 2; 2	R	Description of the IN process data
003C	PDOOUT_Descr	Array of Records		3	8; 2; 2	R	Description of the output process data

The objects 003B<sub>hex</sub> and 003C<sub>hex</sub> are only applicable to tools.

#### IN process data (0025<sub>hex</sub>: PDIN)

You can read the IN process data of the module with this object.

The structure corresponds to the representation in the "Process data" section.

0025 <sub>hex</sub> : PDIN (Read)			
Subindex	Data type	Length in bytes	Meaning
0	Octet string	2	Input process data

## 12 Application objects

Index (hex)	Object name	Object type	Data type	A	L	Rights	Assignment
FF8F	Input_Filter	Var	Unsigned 8	1	1	R/W	Filter time

### Filter time (FF8F<sub>hex</sub>: Input\_Filter)

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

FF8F <sub>hex</sub> : Input_Filter (read, write)				
Subindex	Data type	Length in bytes	Contents	
0	Var	1	00 <sub>hex</sub> (Default)	500 µs
			01 <sub>hex</sub>	< 100 µs

## 13 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 the corresponding service packs.

The device description files for other systems are available for download at [phoenixcontact.net/products](http://phoenixcontact.net/products) in the download area of the bus coupler used.