AXL F DI16/1 HS 1H

Axioline F digital input module, 16 inputs, high speed, 24 V DC, single-conductor connection technology

Data sheet
8610_en_01

1 Description

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

It is used to acquire digital signals.

The internal update time of < 5 µs enables a practical counter function to be implemented with the module. The maximum counting input frequency is 100 kHz.

Features

- 16 digital inputs according to EN 61131-2 type 1 and type 3
- 24 V DC, 2.4 mA
- Connection of sensors in 1-wire technology
- Minimum update time < 5 µs, bus-synchronous
- Maximum input frequency: 100 kHz
- Device type label stored
- Diagnostic and status indicators

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

Make sure you always use the latest documentation.
It can be downloaded from the product at phoenixcontact.net/products.

2 Table of contents

3 Ordering data

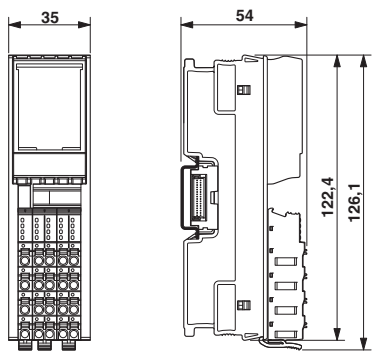
Description	Type	Order No.	Pcs. / Pkt.
Axioline digital input module, 16 inputs, high speed, 24 V DC, 1-wire connection technology (including bus base module and connectors)	AXL F DI16/1 HS 1H	2701722	1

Accessories	Type	Order No.	Pcs. / Pkt.
Axioline F bus base module for housing type H (Replacement item)	AXL F BS H	2700992	5
Axioline plug set (e.g., for AXL DI 16/1) (Replacement item)	AXL CNS 2L-O/D/UI/E1/E2	2700985	1
Zack marker strip for Axioline (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	-	-

4 Technical data

Dimensions (nominal sizes in mm)



Width	35 mm
Height	126.1 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	gray
Weight	133 g
Ambient temperature (operation)	-25 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Permissible humidity (operation)	5 % ... 95 % (according to DIN EN 61131-2)
Permissible humidity (storage/transport)	5 % ... 95 % (according to DIN EN 61131-2)
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

Connection data

Name	Axioline plug
Connection method	Spring-cage connection with direct plug-in method
Conductor cross section solid / stranded	0.2 mm² ... 1.5 mm²
Conductor cross section [AWG]	24 ... 16

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	20 mA
Power consumption at U_I	typ. 380 mW, max. 480 mW
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	Direct plug-in method
Connection method	1-wire
Description of the input	EN 61131-2 types 1 and 3
Nominal input voltage	24 V DC
Input voltage range	-3 V DC ... 30 V DC
Nominal input current	2.3 mA
Current flow	Linear until nominal current is reached, then constantly approximately 2.3 mA
Input voltage range "0" signal	-3 V DC ... 8.4 V DC
Input voltage range "1" signal	9.4 V ... 30 V DC
Input filter time	< 5 µs
Process data update	< 5 µs (bus-synchronous)
Polarity reversal protection of the inputs	Parallel diode (30 V, 5 s)

The minimum update time of the module can only be fully utilized if the station is configured accordingly, as the runtime of the local bus depends on the number of connected Axioline F modules (see also Axioline system manual).

PROFIBUS telegram data

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

Electrical isolation/isolation of the voltage areas	
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	5 g
Shock in acc. with EN 60068-2-27/IEC 60068-2-27	25 g, 11 ms period, half-sine shock pulse
Continuous shock according to EN 60068-2-27/IEC 60068-2-27	10 g

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

Approvals

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

5 Internal circuit diagram

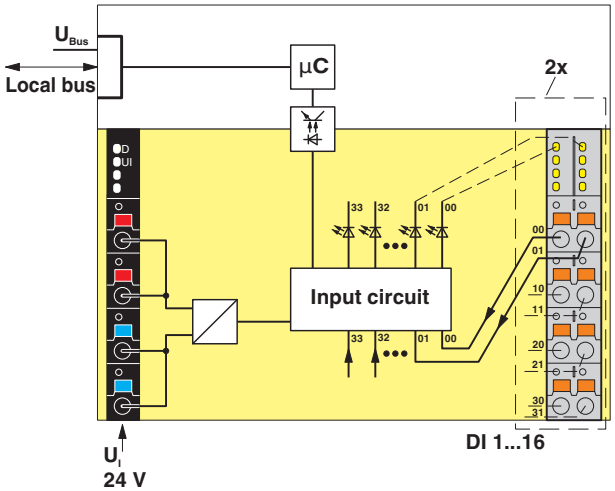


Figure 1 Internal wiring of the terminal points

Key:

µC	Microprocessor
	Optocoupler
	LED
	Power supply unit
	Electrically isolated area
Input circuit	Input circuit
Local bus	Axioline F local bus (hereinafter referred to as local bus)

6 Terminal point assignment

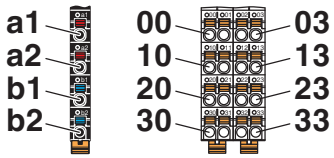


Figure 2 Terminal point assignment

Terminal point	Color	Assignment	
Supply voltage input			
a1, a2	Red	24 V DC (U_I)	Digital input module supply (internally jumpered)
b1, b2	Blue	GND	Reference potential of the supply voltage (internally jumpered)
Digital inputs			
00 ... 03	Orange	IN1 ... IN4	Digital inputs 1 ... 4
10 ... 13	Orange	IN5 ... IN8	Digital inputs 5 ... 8
20 ... 23	Orange	IN9 ... IN12	Digital inputs 9 ... 12
30 ... 33	Orange	IN13 ... IN16	Digital inputs 13 ... 16

7 Connection example

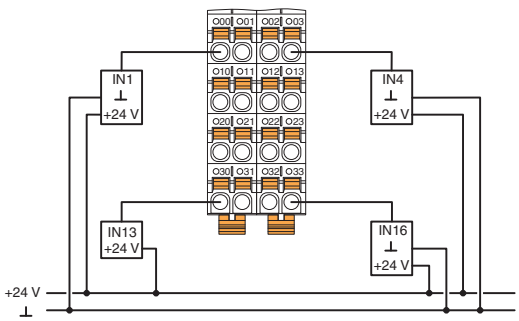


Figure 3 Example of a connection of sensors when using external busbars

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

8 Local status and diagnostic indicators

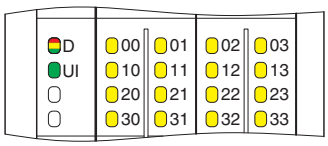


Figure 4 Local status and diagnostic indicators

Designation	Color	Meaning	State	Description
D	Red/yellow/green	Diagnostics of local bus communication		
		Power down	OFF	Device in (power) reset.
		Not connected	Red flashing	Device operating, but there is no connection to previous device.
		Reset	Red ON	Application reset Device operating, but there is still a connection to the previous device, the application is reset.
		Ready	Yellow ON	Device operating, there is still a connection to the previous device, but the device has not yet detected a valid cycle after power on.
		Connected	Yellow flashing	Valid data cycles have been detected, but the device is (not) yet part of the current configuration.
		Device application not active	Green/yellow alternating	Valid data cycles are being detected. The master application set the output data to valid, however, the slave application has not set the input data to valid as yet.
		Active	Green flashing	Device operating, communications within the station is OK. The master application does not read the input data. (The connection to the controller has not yet been established, for example.)
		Run	Green ON	Valid data cycles are being detected. All data is valid
UI	Green	U_{Input}	ON	Supply of digital input modules present.
			OFF	Supply of digital input modules not present.
00 ... 03, 10 ... 13, 20 ... 23, 30 ... 33	Yellow	Status of the inputs	ON	Input is set.
			OFF	Input is not set.

For more information on the meaning of local diagnostic and status indicators, please refer to the UM EN AXL SYS INST user manual.

9 Process data

The I/O data is displayed in S7-compatible format.

Byte	Byte 0 (high byte)							
Bit	7	6	5	4	3	2	1	0
Channel	8	7	6	5	4	3	2	1
Terminal point	13	12	11	10	03	02	01	00

Byte	Byte 1 (low byte)							
Bit	7	6	5	4	3	2	1	0
Channel	16	15	14	13	12	11	10	9
Terminal point	33	32	31	30	23	22	21	20

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.

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

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

Please refer to the basic profile for comprehensive information.

The following applies to all tables below:

Please refer to the UM EN AXL SYS INST or the basic profile 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_{hex}). The length of a visible string element is therefore one byte larger than the amount of user data.

11 Standard objects

11.1 Objects for identification (device rating plate)

Index (hex)	Object name	Object type	Data type	A	L	Rights	Meaning	Contents
Manufacturer								
0001	VendorName	Var	Visible String	1	16	R	Manufacturer name	Phoenix Contact
0002	VendorID	Var	Visible String	1	7	R	Manufacturer identification	00A045
0003	VendorText	Var	Visible String	1	49	R	Comment on the manufacturer	Components and systems for industrial automation
0012	VendorURL	Var	Visible String	1	30	R	URL of the manufacturer	http:// phoenixcontact.com
Module - general								
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; 22	R	Device profile version	2009-10-22; Basic - Profile V1.12
003A	VersionCount	Array	Unsigned 16	4	4 * 2	R	Version counter	0007 0001 0000 0000_{hex}
Module - special								
0005	Capabilities	Array	Visible String	1	8	R	Properties	SyncI_0
0007	ProductName	Var	Visible String	1	19	R	Product designation	AXL F DI16/1 HS 1H
0008	SerialNo	Var	Visible String	1	11	R	Serial number	xxxxxxxxxx (e. g., 1234512345)
0009	ProductText	Var	Visible String	1	18	R	Product text	16 digital inputs
000A	OrderNumber	Var	Visible String	1	8	R	Order No.	2701722
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; 20	R	Parameter channel version	2011-12-07; Basic Profile V2.0
0037	DeviceType	Var	Octet string	1	8	R	Module identification	00 80 00 02 00 00 00 DB_{hex}
Use of the device								
0014	Location	Var	Visible String	1	59	R/W	Installation 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	User-defined device number	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	Diagnostics state; see below

Diagnostics state (0018_{hex}: DiagState)

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

0018_{hex}: 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_{dec}	
2	Unsigned 8	1	Priority	00_{hex}	No error
				01_{hex}	Error
				02_{hex}	Warning
				81_{hex}	Error removed
				82_{hex}	Warning eliminated
3	Unsigned 8	1	Group	00_{hex}	No error
				FF_{hex}	Entire device
4	Unsigned 16	2	Error code	See table below	
5	Unsigned 8	1	More information follows	00_{hex} (not supported)	
6	Visible String	1	Text	00_{hex} (not supported)	

Error code and status of the local status and diagnostics indicators

Error code	Error	Priority	Group	D LED	UI LED
0000_{hex}	No error	00_{hex}	00_{hex}	Green ON	ON
3412_{hex}	I/O supply failure	01_{hex}	FF_{hex}	Flashing green/yellow	OFF

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	PDOUT_Descr	Array of Records		3	8; 2; 2	R	Description of the output process data

The objects $003B_{hex}$ and $003C_{hex}$ are only applicable to tools.

IN process data (0025_{hex}: 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_{hex}: PDIN (Read)			
Subindex	**Data type**	**Length in bytes**	**Meaning**
0	Octet string	2	Input process data

12 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/download in the download area of the bus coupler used.