AXL F DO16/1 1H

Axioline F digital output module, 16 outputs, 24 V DC, 500 mA, 1-wire connection method

Data sheet
8186_en_03

1 Description

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

It is used to output digital signals.

The outputs are short-circuit and overload-protected .

Features

- 16 digital outputs
- 24 V DC, 500 mA
- Connection of actuators in 1-wire technology
- Minimum update time < 100 µs
- 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.

2 Table of contents

3 Ordering data

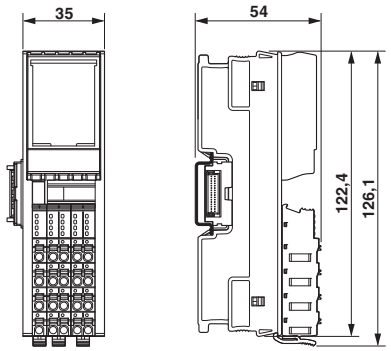
Description	Type	Order No.	Pcs./Pkt.
Axioline F digital output module, 16 outputs, 24 V DC, 500 mA, 1-wire connection method (including bus base module and connector connectors)	AXL F DO16/1 1H	2688349	1

Accessories	Type	Order No.	Pcs./Pkt.
Axioline F bus base module for housing type H (Replacement item)	AXL F BS H	2700992	5
Axioline F connector set (for e.g., AXL F DO16/1 1H) (Replacement item)	AXL CNS 2L-O/D/UO/E1	2700986	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
Insert label, Roll, white, unlabeled, can be labeled with: THERMOMARK ROLL, THERMOMARK ROLL X1, THERMOMARK X, THERMOMARK S1.1, Mounting type: snapped into marker carrier, Lettering field: 35 x 28 mm (Marking)	EMT (35X28)R	0801602	1

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	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	traffic grey A RAL 7042
Weight	134 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
Mounting position	Any (no temperature derating)

Connection data

Designation	Axioline F connector
Connection method	Push-in connection
Conductor cross section solid / stranded	0.2 mm² ... 1.5 mm² / 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

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 output modules U_O	24 V DC
Maximum permissible voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption from U_O	8 A (external fuse)
Power consumption at U_O	typ. 320 mW (without actuators), max. 240 W (Of which 560 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.

Loads over 8 A are not permitted.

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 outputs	
Number of outputs	16
Connection method	Push-in connection
Connection method	1-wire
Nominal output voltage	24 V DC
Maximum output current per channel	500 mA
Maximum output current per device	8 A (external fuse)
Nominal load, ohmic	max. 12 W (48 Ω; with nominal voltage)
Nominal load, inductive	max. 12 VA (1.2 H; 48 Ω; with nominal voltage)
Nominal load, lamp	max. 12 W (at nominal voltage)
Signal delay	max. 100 µs (when switched on) max. 100 µs (when switched off; with at least 50 mA load current)
Switching frequency	max. 10000 per second (with at least 50 mA load current)
Switching frequency	max. 1 per second (with inductive load)
Switching frequency	max. 16 per second (with nominal lamp load)
Load min.	10 kΩ
Energy consumption	see diagram
Limitation of the voltage induced on circuit interruption	-25.8 V ... -15 V
Output voltage when switched off	max. 1 V
Output current when switched off	max. 300 µA
Behavior with overload	Shutdown with automatic restart
Behavior with inductive overload	Output can be destroyed
Reverse voltage resistance to short pulses	Limited protection up to 0.5 A for 1 s

NOTE: Damage to the electronics

If there is a faulty external voltage (reverse voltage) at one of the outputs, the output may be destroyed. This may cause unintentional setting of further outputs.

Overcurrent shut-down	as of 0.7 A
Output current with ground connection interrupt when switched off	< 1 mA
Short-circuit protection, overload protection of the outputs	Electronic

Configuration and parameter data in a PROFIBUS system	
Required parameter data	1 Byte
Need for configuration data	6 Byte

Error messages to the higher level control or computer system	
I/O supply failure	configurable
Short-circuit / overload of the digital outputs	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

Approvals

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

5 Maximum outputs power consumption when inductive loads are switched off

NOTE: Damage to the electronics

Restrict freewheeling voltage to a maximum of -17 V when using an external freewheeling circuit! The external freewheeling circuit does not function in the case of higher negative voltages.

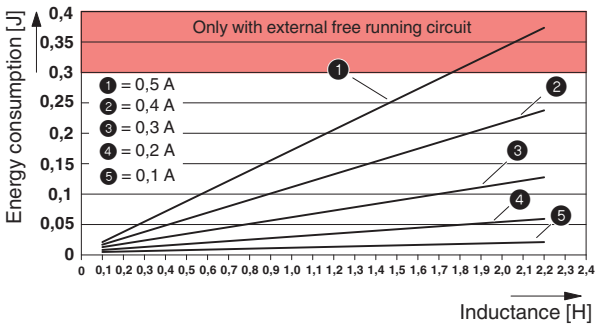


Figure 1 Maximum outputs power consumption when inductive loads are switched off

The specifications in the diagram refer to a maximum switching frequency of 1 Hz.

The diagram shows the maximum power that can be fed back for every switch-off operation in the respective output groups (outputs 1 to 4, 5 to 8, 9 to 12, 13 to 16) when an inductive load is switched off without an external freewheel. The current data refers to the ohmic DC voltage component of the inductive load.

6 Internal circuit diagram

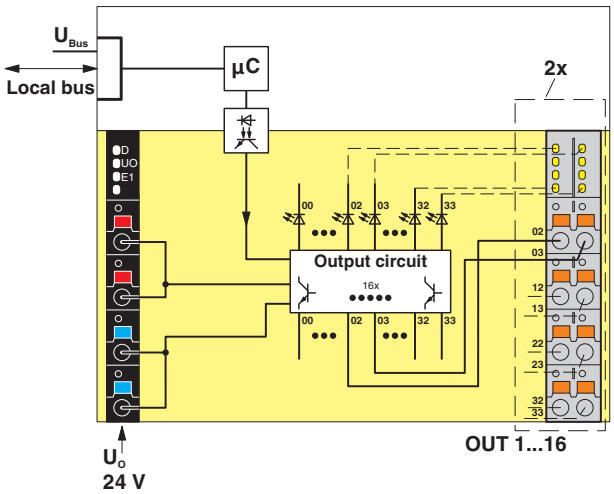


Figure 2 Internal wiring of the terminal points

Key:

Local bus	Axioline F local bus (hereinafter referred to as local bus)
µC	Microcontroller
	Optocoupler
	LED
	Electrically isolated areas
Output circuit	Output configuration

7 Terminal point assignment

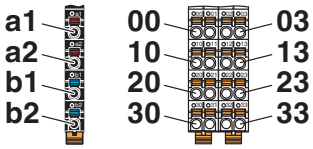


Figure 3 Terminal point assignment

Terminal point	Color	Assignment	
Supply voltage input			
a1, a2	Red	24 V DC (U_O)	Supply for digital output modules (internally jumpered)
b1, b2	Blue	GND	Reference potential of the supply voltage (internally jumpered)
Digital outputs			
00 ... 03	Orange	OUT1 ... OUT4	Digital outputs 1 ... 4
10 ... 13	Orange	OUT5 ... OUT8	Digital outputs 5 ... 8
20 ... 23	Orange	OUT9 ... OUT12	Digital outputs 9 ... 12
30 ... 33	Orange	OUT13 ... OUT16	Digital outputs 13 ... 16

8 Connection example

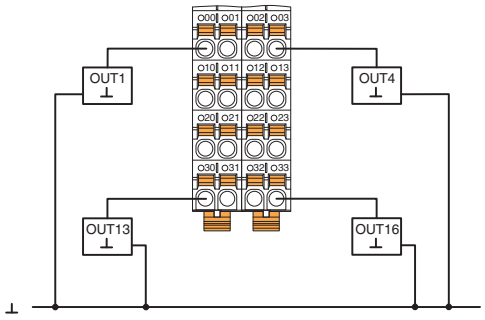


Figure 4 Connection with 1-wire technology

Make sure that the GND of the actuators and the GND for U_O have the same potential!

9 Local status and diagnostic indicators

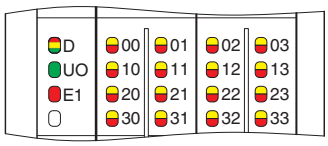


Figure 5 Local status and diagnostic indicators

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 **not** 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 **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-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	Red flashing	The device is ready for operation but there is no connection to the previously existing device.
		Power down	OFF	Device in (power) reset.
U_O	Green	U_{Output}	ON	Supply for digital output modules present.
			OFF	Supply for digital output modules is not present.
E1	Red	Peripheral fault	ON	Breakdown or overload/short-circuit of an output.
			OFF	No I/O error.
00 ... 03, 10 ... 13, 20 ... 23, 30 ... 33	Red/ yellow	Diagnostics / Status of the outputs	Red ON	Short-circuit/overload of the output.
			Yellow ON	Output is set.
			OFF	No error, output is not set.

10 Process data

OUT process data

I/O data is mapped in the Motorola format.

Byte	0							
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	1							
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

11 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 in bytes
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.

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

12 Standard objects

12.1 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	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
Module - general								
0004	DeviceFamily	Var	Visible String	1	16	R	Device family	I/O digital OUT
0006	ProductFamily	Var	Visible String	1	6	R	Product family	AXL F
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	e.g., 0007 0001 0000 0000_{hex}
Module - special								
0005	Capabilities	Array	Visible String	1	8	R	Features	Nothing
0007	ProductName	Var	Visible String	1	16	R	Product name	AXL F DO16/1 1H
0008	SerialNo	Var	Visible String	1	11	R	Serial number	xxxxxxxxxx (e. g., 1234512345)
0009	ProductText	Var	Visible String	1	19	R	Product text	16 digital outputs
000A	OrderNumber	Var	Visible String	1	8	R	Order No.	2688349
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 40 00 02 00 00 00 $D7_{hex}$
Use of the device								
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.

12.2 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

12.3 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_{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_{dez}	
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	Channel/group/module	00_{hex}	No error
				FF_{hex}	entire device
4	Unsigned 16	2	Error code	See table below	
5	Unsigned 8	1	More follows	00_{hex}	
6	Visible String	1	Text	00_{hex}	

The message with the priority 81_{hex} or 82_{hex} 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.

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

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	U_O	E1	xx
No error	00	00	0000	Green ON	ON	OFF	OFF
Short-circuit/overload of an output	02	FF	2344	Green ON	ON	Red ON	Red ON
Actuator supply not present	01	FF	3422	flashing green or green/yellow	OFF	OFF	OFF

xx LED	Diagnostics of the output
xx	00 ... 03, 10 ... 13, 20 ... 23, 30 ... 33

The behavior of LED D during an "Actuator supply not present" error depends on whether you have switched error reporting via the $FF8F_{hex}$ object on or off.

Parameterization in $FF8F_{hex}$	D LED
Do not report error to the controller	green
Report error to the controller	Flashing green/yellow

12.4 Objects for process data management

Index (hex)	Object name	Object type	Data type	A	L	Rights	Assignment
0026	PDOUT	Var	Octet string	1	2	R	Output 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.

OUT process data (0026_{hex}: PDOUT)

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

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

0026_{hex}: PDOUT (Read)			
Subindex	Data type	Length in bytes	Meaning
0	Octet string	2	Output process data

13 Application objects

Index (hex)	Object name	Object type	Data type	A	L	Rights	Assignment
FF8D	PD Output Substitute Configuration	Var	Unsigned 8	1	1	R/W	Substitute value behavior
FF8F	DiagOut	Var	Unsigned 8	1	1	R/W	Message “Actuator supply not present”

In the case of valid parameters, the parameterization is stored in the module permanently.

13.1 Substitute value behavior ($FF8D_{hex}$: PD Output Substitute Configuration)

With this object, you parameterize the behavior of the module so that an application reset can be detected if necessary.

$FF8D_{hex}$: PD Output Substitute Configuration (Read, write)				
Subindex	**Data type**	**Length in bytes**	**Contents**	
0	Var	1	00_{hex} (Default)	"0" output to all output bits
			01_{hex}	Hold last value

13.2 Message “Actuator supply not present” ($FF8F_{hex}$: DiagOut)

With this object, you parameterize whether the “Actuator supply missing” error is reported to the controller or not.

If you parameterize the module so that the error is not reported to the controller, the corresponding indicator in LED D (flashing green/yellow) is suppressed and the LED lights up green.

$FF8F_{hex}$: DiagOut (Read, write)				
Subindex	**Data type**	**Length in bytes**	**Contents**	
0	Var	1	00_{hex} (Default)	Do not report error to the controller
			01_{hex}	Report error to the controller

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 the corresponding service packs.
The device description files for other systems are available for download at phoenixcontact.net/products in the download area of the bus coupler used.