AXL F DO8/2 2A 1H

Axioline F digital output module, 8 outputs, 24 V DC, 2 A, 2-wire connection technology

Data sheet
8238_en_04

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

- 8 digital outputs
- 24 V DC, 2 A
- Connection of actuators in 2-wire technology
- Minimum update time of < 150 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

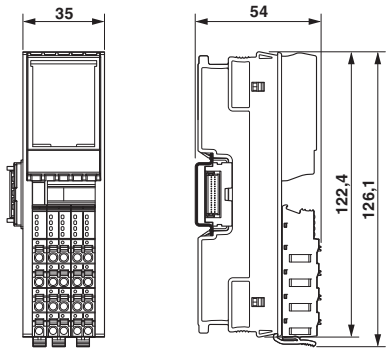
Description	Type	Order No.	Pcs./Pkt.
Axioline F, Digital output, Digital outputs: 8, 24 V DC, 2 A, Connection method: 2-wire, Transmission speed in the local bus 100 MBit/s, Degree of protection IP20, including bus base module and Axioline F connectors	AXL F DO8/2 2A 1H	2688381	1

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 DO8/2 2A 1H) (Replacement item)	AXL CNS 2L-OBOB/D/UO/E1	2700987	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	136 g (with connectors and bus base module)
Ambient temperature (operation)	-25 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C

General data

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	0.5 mm² ... 1.5 mm² / 0.5 mm² ... 1.5 mm²
Conductor cross section [AWG]	20 ... 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. 150 mA
Power consumption at U_{Bus}	max. 750 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	max. 16 A (Provide external protection; if the total current of 8 A is exceeded, connect the supply at the power connector parallel via both terminal points.)
Power consumption at U_O	typ. 260 mW (without actuators), max. 480 W (Of which 625 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. 16 A (polarity reversal protection up to 5 A)

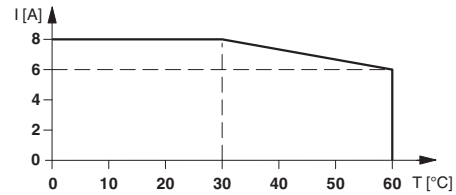
When using the module for the first time, protect it with a 5 A fuse. When all modules in the system are correctly connected, the 5 A fuse can be replaced by a 16 A fuse. You can now load the module up to 16 A. Observe the derating.
Loads over 16 A are not permitted.

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	8
Connection method	Push-in connection
Connection method	2-wire
Nominal output voltage	24 V DC
Maximum output current per channel	2 A
Maximum output current per device	16 A (external fuse)

Digital outputs

Nominal load, ohmic	max. 48 W (12 Ω, at nominal load)
Nominal load, inductive	max. 48 VA (1.2 H, 12 Ω, at nominal load)
Nominal load, lamp	max. 48 W (at nominal voltage)
Signal delay	max. 150 µs (when switched on) max. 150 µs (When switched off; with at least 100 mA load current)
Switching frequency	max. 3000 per second (with ohmic load)
Switching frequency	max. 1 per second (with inductive load)
Switching frequency	max. 4 per second (with nominal lamp load)
Load min.	10 kΩ
Energy consumption	see diagram
Derating	For channel groups 1 ... 4 and 5 ... 8: 8 A to 30°C, then dropping linearly to 6 A at 60°C
Derating diagram for channel groups 1 ... 4 and 5 ... 8	
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 2.8 A
Output current with ground connection interrupt when switched off	< 1 mA
Short-circuit protection, overload protection of the outputs	Electronic
Derating	For channel groups 1 ... 4 and 5 ... 8: 8 A to 30°C, then dropping linearly to 6 A at 60°C

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

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 2014/30/EU

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 overvoltage (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

100 % simultaneity

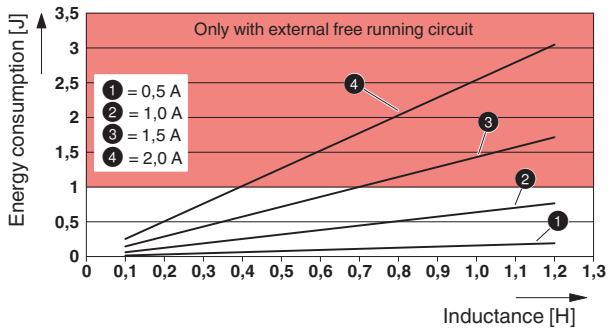


Figure 1 Maximum energy consumption of the outputs when switching off inductive loads with 100 % simultaneity

50 % simultaneity

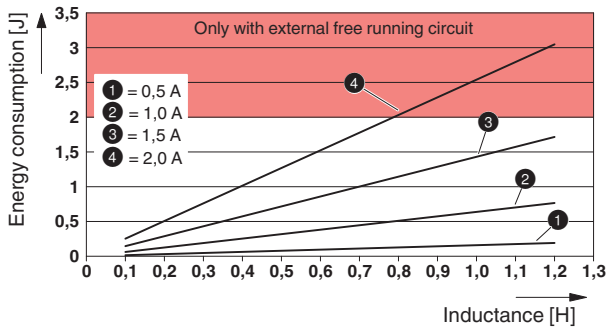


Figure 2 Maximum energy consumption of the outputs when switching off inductive loads with 50 % simultaneity

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

The diagrams show the maximum amount of energy that may be fed back into the corresponding output groups (outputs 1 to 4, 5 to 8) for each switch-off procedure when switching off an inductive load without external freewheeling circuit.

The current data refers to the ohmic DC voltage component of the inductive load.

6 Internal circuit diagram

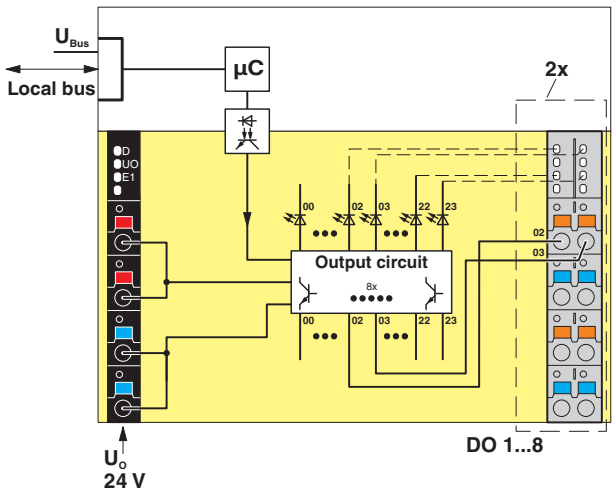


Figure 3 Internal wiring of the terminal points

Key:

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

7 Terminal point assignment

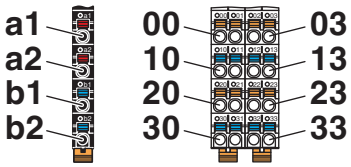


Figure 4 Terminal point assignment

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	Blue	GND	Reference potential for all channels
20 ... 23	Orange	OUT5 ... OUT8	Digital outputs 5 ... 8
30 ... 33	Blue	GND	Reference potential for all channels

8 Connection example

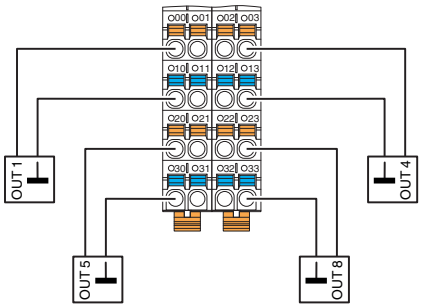


Figure 5 Connection with 2-wire technology

9 Local diagnostic and status indicators

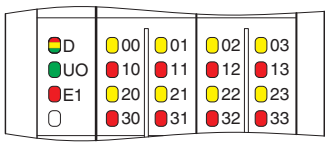


Figure 6 Local diagnostic and status indicators

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	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-up.
		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 is 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, 20 ... 23	Yellow	Output status	ON	Output is set.
			OFF	Output is not set.
10 ... 13, 30 ... 33	Red	Diagnostics of the output	ON	Short-circuit/overload of the output.
			OFF	No short-circuit/overload of the output.

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	23	22	21	20	03	02	01	00

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
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	23	R	Vendor URL	www.phoenixcontact.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	18	R	Product name	AXL F DO8/2 2A 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	8 digital outputs
000A	OrderNumber	Var	Visible String	1	8	R	Order No.	2688381
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 01 00 00 00 $D5_{hex}$
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 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.

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

Error and status of the local diagnostics and status 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, 20 ... 23

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.