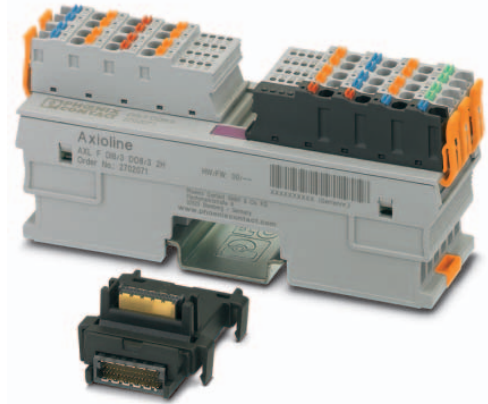# AXL F DI8/3 DO8/3 2H

Axioline F digital input and output module, 8 inputs, 24 V DC, 8 outputs, 24 V DC, 500 mA, 2-, 3-conductor connection technology

Data sheet
105869_en_02

1 Description

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

It is used to acquire and output digital signals.

The filter times of the inputs can be set to increase noise immunity.
Filter times of 100 µs allow the user to implement a counter function with a maximum input frequency of 5 kHz in the application.

The outputs are short-circuit and overload-protected .

Input features

– 8 digital inputs according to EN 61131-2 type 1 and type 3
– 24 V DC, 2.4 mA
– Connection of 2 or 3-wire sensors
– Filter times can be set in three increments: < 100 µs, 1000 µs or 3000 µs
– Maximum input frequency: 5 kHz

Output features

– 8 digital outputs
– 24 V DC, 500 mA
– Connection of actuators in 2 and 3-wire technology

Features of Axioline F

– Minimum update time < 100 µs
– Device type label stored
– Diagnostic and status indicators

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

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

PHŒNIX CONTACT

INSPIRING INNOVATIONS

2 Table of contents

3 Ordering data

Description	Type	Order No.	Pcs. / Pkt.
Axioline F digital input and output module, 8 inputs, 24 V DC, 8 outputs, 24 V DC, 500 mA, 2-, 3-conductor connection technology (including bus base module and connectors)	AXL F DI8/3 DO8/3 2H	2702071	1

Accessories	Type	Order No.	Pcs. / Pkt.
Axioline F bus base module for housing type H (Replacement item)	AXL F BS H	2700992	5
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)
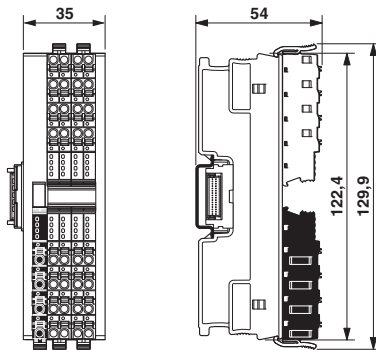
Width	35 mm
Height	129.9 mm
Depth	54 mm
Note on dimensions	The depth is valid when a TH 35-7.5 DIN rail is used (according to EN 60715).

General data

Color	traffic grey A RAL 7042
Weight	159 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 technology
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

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

Digital input and output module supply U_{IO}	24 V DC
Maximum permissible voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption from U_{IO}	max. 6 A (external fuse)
Power consumption at U_{IO}	typ. 288 mW (without actuators), max. 180 W (of which 1.24 W 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)

> **i** 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 inputs

Number of inputs	8
Connection method	Push-in technology
Connection method	2, 3-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
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
Polarity reversal protection of the inputs	Electronic
Short-circuit protection for the sensor supply	Electronic
Overload protection for the sensor supply	Electronic

Digital outputs

Number of outputs	8
Connection method	Push-in technology
Connection method	2, 3-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)
Signal delay	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	3 Byte
Need for configuration data	7 Byte

Error messages to the higher level control or computer system

I/O supply failure	Yes
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

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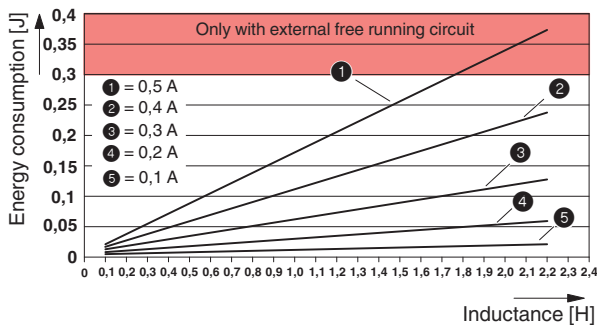
Figure 1   Maximum outputs power consumption when inductive loads are switched off

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

The diagram shows the maximum amount of energy that may be fed back into the outputs 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
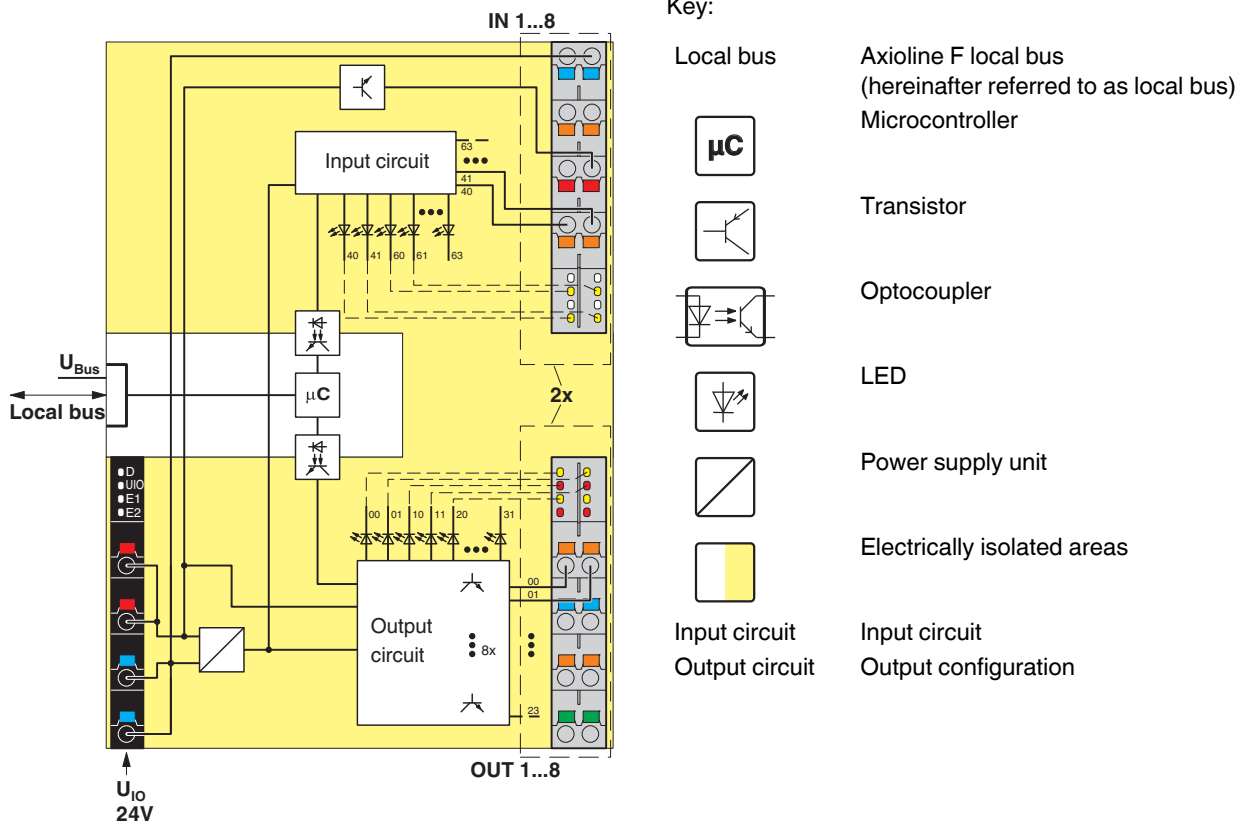
Figure 2   Internal wiring of the terminal points

Key:

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

7 Terminal point assignment
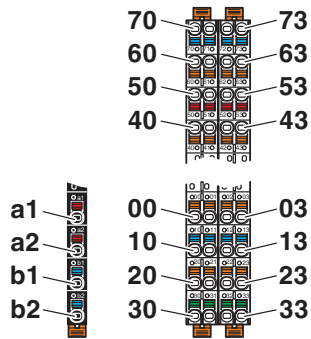
Figure 3   Terminal point assignment

Terminal point	Color	Assignment	
Supply voltage input			
a1, a2	Red	24 V DC (U_{IO})	Supply to digital input and output modules (internally jumpered)
b1, b2	Blue	GND	Reference potential of the supply voltage (internally jumpered)
Digital inputs			
40 ... 43	Orange	IN1 ... IN4	Digital inputs 1 ... 4
50 ... 53	Red	24 V DC (U_S)	Sensor supply
60 ... 63	Orange	IN5 ... IN8	Digital inputs 5 ... 8
70 ... 73	Blue	GND	Reference potential for all channels
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	Green	FE	Functional earth ground (FE)

8 Connection example
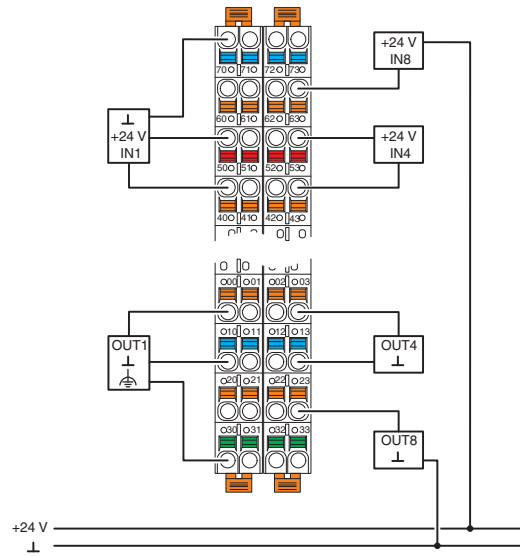
Figure 4   Example of connection of sensors and actuators

> ℹ️ Please note that TWIN ferrules are not permitted in the Axioline F system.
> A maximum of four sensors and actuators can be wired on the module with 2 or 3-wire technology. If you wish to use more inputs or outputs, connect them via external busbars by means of single-wire technology.
>
> Ensure that GND of the sensors and actuators and GND for U_{IO} have the same potential.
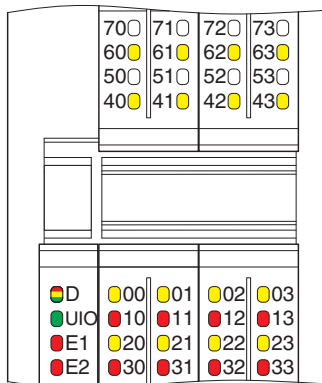
9 Local status and diagnostic indicators

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.
UIO	Green	$U_{input/output}$	ON	Supply for digital input and output modules is available.
			OFF	Supply for digital input and output modules is not available.
E1	Red	Sensor supply I/O error	ON	Failure or overload/short circuit of the sensor supply.
			OFF	No I/O error
E2	Red	Output I/O error	ON	Breakdown or overload/short-circuit of an output.
			OFF	No I/O error
00 ... 03	Yellow	Status of outputs 1 ... 4	ON	Output is set.
			OFF	Output is not set.

Designation	Color	Meaning	State	Description
10 ... 13	Red	Diagnostics of outputs 1 ... 4	ON	Short-circuit/overload of the output.
			OFF	No short-circuit/overload of the output.
20 ... 23	Yellow	Status of outputs 5 8	ON	Output is set.
			OFF	Output is not set.
30 ... 33	Red	Diagnostics of outputs 5 ... 8	ON	Short-circuit/overload of the output.
			OFF	No short-circuit/overload of the output.
40 ... 43	Yellow	Status of inputs 1 ... 4	ON	Input is active.
			OFF	Input is inactive.
60 ... 63	Yellow	Status of inputs 5 ... 8	ON	Input is active.
			OFF	Input is inactive.

10 Process data

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

Input process data								
Byte	0							
Bit	7	6	5	4	3	2	1	0
Channel	8	7	6	5	4	3	2	1
Terminal point	63	62	61	60	43	42	41	40

Output process data								
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

> **i** 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.

> **i** 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	19	R	Device family	I/O digital IN-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; Basic Profile 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	21	R	Product name	AXL F DI8/3 DO8/3 2H
0008	SerialNo	Var	Visible String	1	11	R	Serial number	xxxxxxxxxx (e. g., 1234512345)
0009	ProductText	Var	Visible String	1	55	R	Product text	8 digital inputs, adjustable filter, 8 digital outputs
000A	OrderNumber	Var	Visible String	1	8	R	Order No.	2702071
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 C0 00 01 00 00 0D 02$_{hex}$
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$_{hex}$	Error at at least one channel
				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$_{hex}$	

i 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.

i 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	dec	D	UIO	E1	E2
No error	00	00	0000	0	Green ON	ON	OFF	OFF
I/O supply failure	01	FF	3400	13312	Flashing green/ yellow	OFF	OFF	OFF
Short-circuit/overload of an output	02	00	2344	9028	Green ON	ON	OFF	ON
Sensor supply overload.	01	00	2345	9029	Green ON	ON	ON	OFF

12.4 Objects for process data management

Index (hex)	Object name	Object type	Data type	A	L	Rights	Assignment
0025	PDIN	Var	Octet string	1	1	R	Input process data
0026	PDOUT	Var	Octet string	1	1	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.

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	1	Input process data

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	1	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	Input_Filter	Var	Unsigned 8	1	1	R/W	Filter time

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 Filter time (FF8F$_{hex}$: Input_Filter)

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

FF8F$_{hex}$: Input_Filter (read, write)				
Subindex	Data type	Length in bytes	Contents	
0	Var	1	00$_{hex}$ (Default)	3000 µs
			01$_{hex}$	1000 µs
			02$_{hex}$	< 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 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.