

# AXL F AI2 AO2 1H

## Axioline F analog input and output module, 2 inputs, 2 outputs

Data sheet  
106048\_en\_02

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### 1 Description

The module is designed for use within an Axioline F station. It is used to acquire and output analog voltage and current signals.

#### Input features

- 2 analog differential input channels
- Connection of sensors in 2-wire technology
- Current ranges: 0 mA ... 20 mA, 4 mA ... 20 mA, ±20 mA
- Voltage ranges: 0 V ... 10 V, ±10 V, 0 V ... 5 V, ±5 V

#### Output features

- 2 analog outputs
- Connection of actuators in 2-wire technology
- Current ranges: 0 mA ... 20 mA, 4 mA ... 20 mA, ±20 mA
- Voltage ranges: 0 V ... 10 V, ±10 V, 0 V ... 5 V, ±5 V

#### General features

- Process data update < 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](http://phoenixcontact.net/products).

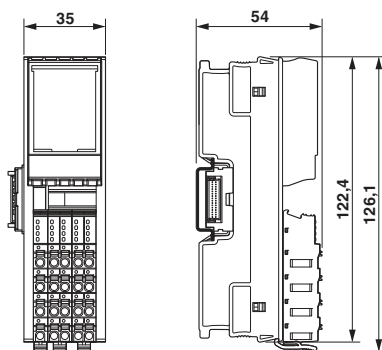
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### 3 Ordering data

Description	Type	Order No.	Pcs./Pkt.
Axioline F analog input and output module, 2 inputs, 2 outputs, 0 - 10 V, ±10 V, 0 - 5 V, ±5 V, 0 - 20 mA, 4 - 20 mA, ±20 mA, 2-conductor connection technology (including bus base module and connectors)	AXL F AI2 AO2 1H	2702072	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 shield connection set (contains 2 busbar holders and 2 SK 5 shield connection clamps)	AXL SHIELD SET	2700518	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	200 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	0.2 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 $U_{BUS}$	typ. 120 mA, max. 150 mA
Power consumption at $U_{BUS}$	typ. 0.6 W, max. 0.75 W

### I/O supply

Supply for analog modules $U_A$	24 V DC
Maximum permissible voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption from $U_A$	typ. 40 mA max. 80 mA
Power consumption at $U_A$	typ. 0.96 W, max. 1.92 W
Surge protection	Electronic (35 V, 0.5 s)
Protection against polarity reversal	Polarity protection diode
Transient protection	Suppressor diode

### Total power consumption of the module

Power consumption	typ. 1.56 W (at $U_{BUS}$ and $U_A$ ), max. 2.67 W (at $U_{BUS}$ and $U_A$ )
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### Analog inputs

Number of inputs	max. 2 (Differential inputs, voltage or current can be chosen separately)
Connection method	Push-in connection
Connection method	2-wire (shielded)
Resolution A/D	16 bit
A/D conversion time	2 $\mu$ s
Limit frequency (3 dB)	30 Hz, 12 kHz
Measured value representation	16 bits (15 bits + sign bit)
Data formats	IB IL, S7-compatible, standardized representation
Process data update	150 $\mu$ s

### Analog inputs

Input filter	30 Hz, 12 kHz and mean-value generation (can be parameterized)
Precision	0.1 % (of measuring range final value for active mean-value generation and 30 Hz filter)
Transient protection of inputs	Suppressor diode

### Differential inputs, voltage

Number of inputs	2
Voltage input signal	0 V ... 5 V, -5 V ... 5 V, 0 V ... 10 V, -10 V ... 10 V
Input resistance of voltage input	268 k $\Omega$ (typical)
Open circuit response	Goes to 0 V
Common mode voltage range signal - ground	-50 V DC ... 50 V DC
Overload protection	$\pm$ 30 V DC, maximum

### Differential inputs, current

Number of inputs	2
Current input signal	0 mA ... 20 mA, 4 mA ... 20 mA, -20 mA ... 20 mA
Input resistance current input	104 $\Omega$ (typical)
Open circuit response	Going to 0 mA; open-circuit detection from 4 mA ... 20 mA
Overload protection	No; $\pm$ 5.2 V DC, maximum, $I_{max} = 50$ mA

### Analog outputs

Number of outputs	2
Connection method	Push-in connection
Connection method	2-wire (shielded, twisted pair)
D/A resolution	16 bit
Representation of output values	16 bits (15 bits + sign)
Data formats	IB IL, S7-compatible, standardized representation
Process data update	150 $\mu$ s
Short-circuit and overload protection	Electronic
Transient protection	Suppressor diode

### Analog outputs, Current

Current output signal	0 mA ... 20 mA, 4 mA ... 20 mA, -20 mA ... 20 mA
Load/output load current output	$\leq$ 500 $\Omega$
Precision	typ. 0.1 % (of output range final value)

### Analog outputs, Voltage

Voltage output signal	0 V ... 5 V, -5 V ... 5 V, 0 V ... 10 V, -10 V ... 10 V
Load/output load voltage output	$>$ 2 k $\Omega$
Precision	typ. 0.1 % (of output range final value)

### Configuration and parameter data in a PROFIBUS system

Required parameter data	11 Byte
Need for configuration data	7 Byte

### 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)/analog inputs and outputs	500 V AC, 50 Hz, 1 min
5 V supply (logic)/functional earth ground	500 V AC, 50 Hz, 1 min

**Electrical isolation/isolation of the voltage areas**

Test section	Test voltage
24 V supply (I/O)/analog inputs and outputs	500 V AC, 50 Hz, 1 min
24 V supply (I/O) / functional earth ground	500 V AC, 50 Hz, 1 min
Analog inputs and outputs/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; supply lines DC: $\pm 0.5$ kV/ $\pm 0.5$ kV (symmetrical/asymmetrical); $\pm 1$ kV to shielded I/O cables
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 Tolerance data

The following applies for tolerance values:

### Analog inputs:

The data is valid for nominal operation ( $U_A = 24\text{ V}$ ) in the default parameterization (unless documented otherwise).

Default parameterization: filter with 30 Hz, 16-sample mean value, IB IL format.

### Analog outputs:

The data is valid irrespective of the parameterization.

Tolerances at $T_A = 25^\circ\text{C}$				
	Absolute		Relative	
	Typ.	Max.	Typ.	Max.
<b>Analog inputs</b>				
0 mA ... 20 mA, 4 mA ... 20 mA, $\pm 20\text{ mA}$	$\pm 20\ \mu\text{A}$	$\pm 60\ \mu\text{A}$	$\pm 0.10\%$	$\pm 0.30\%$
0 V ... 5 V, $\pm 5\text{ V}$ , 0 V ... 10 V, $\pm 10\text{ V}$	$\pm 10\text{ mV}$	$\pm 30\text{ mV}$	$\pm 0.10\%$	$\pm 0.30\%$
<b>Analog outputs</b>				
0 mA ... 20 mA, 4 mA ... 20 mA, $\pm 20\text{ mA}$	$\pm 20\ \mu\text{A}$	$\pm 60\ \mu\text{A}$	$\pm 0.10\%$	$\pm 0.30\%$
0 V ... 5 V, $\pm 5\text{ V}$ , 0 V ... 10 V, $\pm 10\text{ V}$	$\pm 10\text{ mV}$	$\pm 30\text{ mV}$	$\pm 0.10\%$	$\pm 0.30\%$

300  $\mu\text{s}$  update time, 12 kHz filter, without mean-value generation

Tolerances at $T_A = 25^\circ\text{C}$				
	Absolute		Relative	
	Typ.	Max.	Typ.	Max.
<b>Analog inputs</b>				
0 mA ... 20 mA, 4 mA ... 20 mA, $\pm 20\text{ mA}$	$\pm 100\ \mu\text{A}$	$\pm 160\ \mu\text{A}$	$\pm 0.5\%$	$\pm 0.8\%$
0 V ... 5 V, $\pm 5\text{ V}$ , 0 V ... 10 V, $\pm 10\text{ V}$	$\pm 50\text{ mV}$	$\pm 80\text{ mV}$	$\pm 0.5\%$	$\pm 0.8\%$

Typical data contains offset error, gain error, and linearity error in the respective default setting.

All tolerances indicated as a percentage are related to the positive measuring range final value.

Please also observe the values for temperature drift and the tolerances under influences of electromagnetic interferences.

Tolerance and temperature response at $T_A = -25^\circ\text{C}$ to $+60^\circ\text{C}$		
	Drift	
	Typical	Maximum
<b>Analog inputs</b>		
0 mA ... 20 mA, 4 mA ... 20 mA, $\pm 20\text{ mA}$	$\pm 45\text{ ppm/K}$	$\pm 65\text{ ppm/K}$
0 V ... 5 V, $\pm 5\text{ V}$ , 0 V ... 10 V, $\pm 10\text{ V}$	$\pm 40\text{ ppm/K}$	$\pm 55\text{ ppm/K}$
<b>Analog outputs</b>		
0 mA ... 20 mA, 4 mA ... 20 mA, $\pm 20\text{ mA}$	$\pm 65\text{ ppm/K}$	$\pm 80\text{ ppm/K}$
0 V ... 5 V, $\pm 5\text{ V}$ , 0 V ... 10 V, $\pm 10\text{ V}$	$\pm 30\text{ ppm/K}$	$\pm 40\text{ ppm/K}$

The drift values refer to the relevant measuring range final value.

### Tolerances influenced by electromagnetic interference

Electromagnetic fields	EN 61000-4-3/ IEC 61000-4-3	$< \pm 0.3\%$
Fast transients (burst)	EN 61000-4-4/ IEC 61000-4-4	$< \pm 1.2\%$
Conducted interference	EN 61000-4-6/ IEC 61000-4-6	$< \pm 1.0\%$

Additional tolerances may occur due to the influence of high-frequency electromagnetic interference caused by wireless transmission systems in the near vicinity. The values specified refer to nominal operation in the event of direct interference to components without additional shielding such as a steel cabinet, etc.

The above mentioned tolerances can be reduced by providing further shielding measures for the I/O module (e.g., use of a shielded control box/control cabinet, etc.).

## 6 Signal rise times

### Voltage step 0 V ... 10 V (typical values)

Load	Time for 0 % ... 99 %
$R_L = 2 \text{ k}\Omega$	7.5 $\mu\text{s}$
$R_L = 2 \text{ k}\Omega \parallel C_L = 10 \text{ nF}$	15 $\mu\text{s}$
$R_L = 2 \text{ k}\Omega \parallel C_L = 220 \text{ nF}$	140 $\mu\text{s}$
$R_L = 2 \text{ k}\Omega + L_L = 3.3 \text{ mH}$	20 $\mu\text{s}$

### Current step 0 mA ... 20 mA (typical values)

Load	Time for 0 % ... 99 %
$R_L = 500 \Omega$	20 $\mu\text{s}$
$R_L = 500 \Omega \parallel C_L = 10 \text{ nF}$	20 $\mu\text{s}$
$R_L = 500 \Omega \parallel C_L = 220 \text{ nF}$	240 $\mu\text{s}$
$R_L = 500 \Omega + L_L = 3.3 \text{ mH}$	90 $\mu\text{s}$

### Key to the tables

$R_L$	Ohmic load
$C_L$	Capacitive load
$L_L$	Inductive load
$\parallel$	Parallel connection
+	Serial connection



## 7 Internal circuit diagram

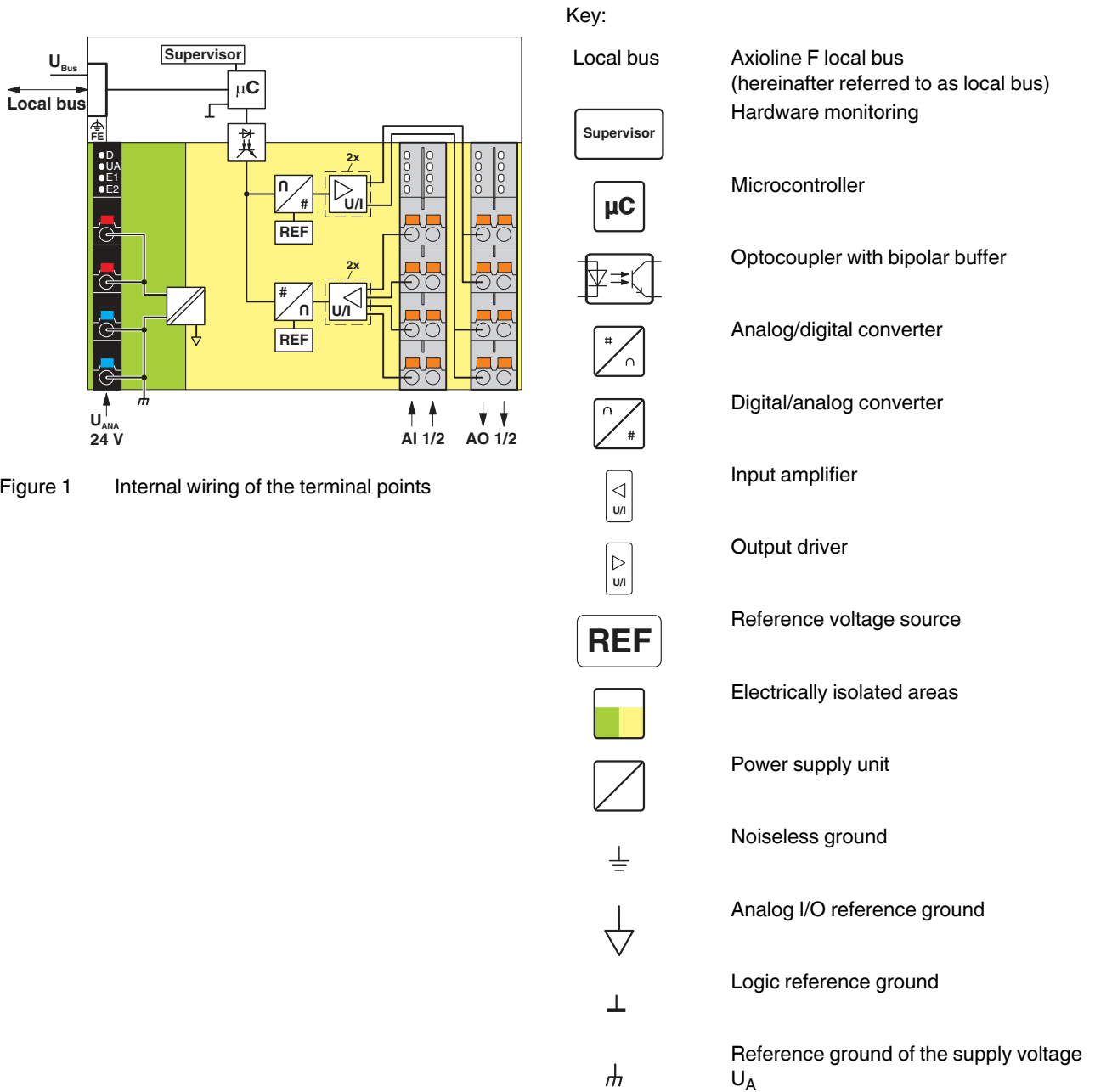


Figure 1 Internal wiring of the terminal points

## 8 Terminal point assignment

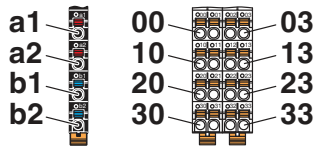


Figure 2 Terminal point assignment

Terminal point	Color	Assignment	
<b>Supply voltage input</b>			
a1, a2	Red	24 V DC ( $U_A$ )	Supply for analog modules (bridged internally)
b1, b2	Blue	GND	Reference potential of the supply voltage (internally jumpered)
<b>Analog inputs</b>			
00, 01	Orange	$U1+$ , $U2+$	Positive voltage connection for channel 1 and 2
10, 11	Orange	$U1-$ , $U2-$	Negative voltage connection for channel 1 and 2
20, 21	Orange	$I1+$ , $I2+$	Positive current connection for channel 1 and 2
30, 31	Orange	$I1-$ , $I2-$	Negative current connection for channel 1 and 2
<b>Analog outputs</b>			
02, 03	Orange	$U1$ , $U2$	Voltage connection for channel 1 and 2
12, 13	Orange	$I1$ , $I2$	Current connection for channel 1 and 2
22, 23	Orange	GND	Reference potential for all AO channels
32, 33	Orange	GND	

## 9 Connection examples

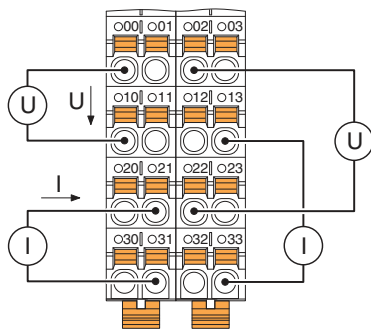


Figure 3 Connection for measuring voltage and current as well as voltage and current output

### 9.1 Analog inputs

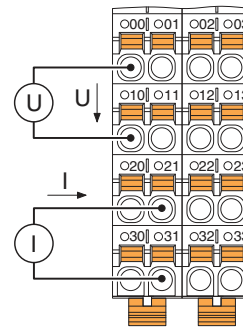


Figure 4 Connection for voltage and current measurement

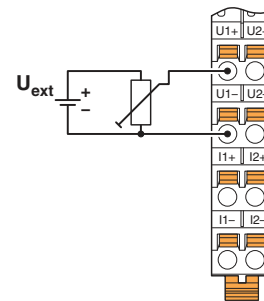


Figure 5 Connection of potentiometric position sensors

The values of potentiometric position sensors can be acquired with voltage measurement. Supply the potentiometer via an external power supply unit ( $U_{ext} = 10\text{ V}$ ).

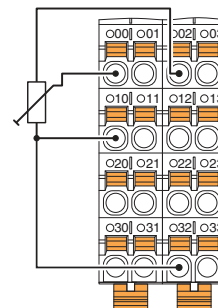


Figure 6 Connection of potentiometers for detecting the position (OUT1 channel is used for supplying the potentiometer)

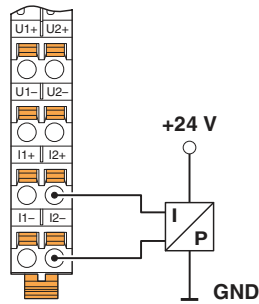


Figure 7 Passive pressure sensor at a differential current input

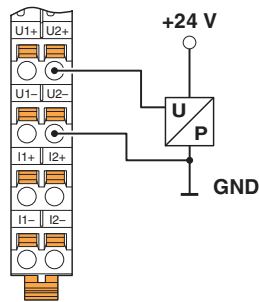


Figure 8 Differential voltage input with active 3-wire transmitter

## 9.2 Analog outputs

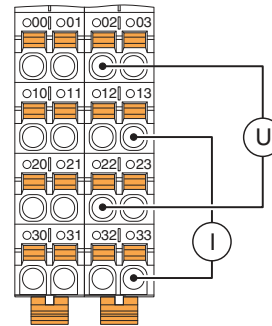


Figure 9 Connection for voltage and current output

## 10 Connection notes



**NOTE: Damage to the electronics/measuring errors**

Always connect the analog actuators using shielded twisted-pair cables.

Unshielded cables may lead to values outside the specified tolerance limits in environments subject to heavy noise.

Connect the cable shield to functional earth immediately after the cables enter the control cabinet.

If there is no closed control cabinet, connect the shield to a shield bus.

Use the AXL SHIELD SET Axioline shield connection set for an optimized connection directly in front of the module.



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

## 11 Local status and diagnostic indicators



Channel errors are errors that can be associated with a channel.  
Periphery errors are errors that affect the entire module.

Figure 10 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	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.
UA	Green	U <sub>Analog</sub>	ON	Supply for analog modules U <sub>A</sub> present.
			OFF	Supply for analog modules U <sub>A</sub> not present.
E1	Red	Supply voltage error	ON	Supply for analog modules U <sub>A</sub> is faulty.
			OFF	Supply for analog modules U <sub>A</sub> is OK.
E2	Red	Error	ON	I/O or channel error has occurred.
			OFF	No error

Error code and status of the E1 and E2 LEDs

Error	E1 LED	E2 LED
No error	OFF	OFF
Underrange	OFF	ON
Overrange	OFF	ON
Open circuit	OFF	ON
Faulty supply voltage	ON	ON
Parameter table invalid	OFF	ON
Device error	OFF	ON
Flash format error	OFF	ON



The error that can actually be reported depends on the measuring range. For additional information please refer to the tables with significant measured values in various formats.

## 12 Process data

The module uses two words of IN process data and two words of OUT process data.

The measured values are transmitted to the controller board or the computer using process data input words IN1 and IN2.

The output values are transmitted from the controller board or the computer to the module using process data output words OUT1 and OUT2.

Output value OUT1	Output value OUT2
-------------------	-------------------

Measured value IN1	Measured value IN2
--------------------	--------------------

Each channel is mapped to a word.

The output values and measured values are depicted in IB IL, S7-compatible or standardized representation format. For all formats, the measured value is displayed in 16-bit format. The data type is Integer 16 from a technical programming point of view.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Analog value															

In IB IL and standardized representation format, a diagnostic code is mapped to the input data in the event of an error:

Code (hex)	Cause
8001	Measuring range exceeded (overrange)
8002	Open circuit
8004	Measured value invalid/no valid measured value available
8010	Parameter table invalid
8020	Faulty supply voltage
8040	Device faulty
8080	Below measuring range (underrange)

### 13 Significant values in various formats

#### 13.1 Significant values in IB IL format



The measured values and output values are identical for input and output data, except in the event of overrange or underrange. Therefore, in these special cases, the values for the inputs and outputs are specified in the tables.

I/O data		0 V ... 10 V	± 10 V	0 V ... 5 V	± 5 V	0 mA ... 20 mA	± 20 mA	4 mA ... 20 mA
hex	dec	V	V	V	V	mA	mA	mA
8001	Overrange (output)	+10.837	+10.837	+5.419	+5.419	+21.6764	+21.6764	+21.3397
8001	Overrange (input)	> +10.837	> +10.837	> +5.419	> +5.419	> +21.6764	> +21.6764	> +21.3397
7FFF ... 7F01		+10.837	+10.837	+5.419	+5.419	+21.6764	+21.6764	+21.3397
7F00	32512	+10.837	+10.837	+5.419	+5.419	+21.6764	+21.6764	+21.3397
7530	30000	+10.0	+10.0	+5.0	+5.0	+20.0	+20.0	+20.0
3A98	15000	+5.0	+5.0	+2.5	+2.5	+10.0	+10.0	+12.0
0001	1	+333.33 μV	+333.33 μV	+166.67 μV	+166.67 μV	+0.6667 μA	+0.6667 μA	+4.0005333
0000	0	0	0	0	0	0	0	+4.0
FFFF	-1	0	-333.33 μV	0	-166.67 μV	0	-0.6667 μA	+4.0
C568	-15000	0	-5.0	0	-2.5	0	-10.0	+4.0
8AD0	-30000	0	-10.0	0	-5.0	0	-20.0	+4.0
8100	-32512	0	-10.837	0	-5.419	0	-21.6764	+4.0
80FF ... 8000*	(Output)	Hold last value	Hold last value	Hold last value	Hold last value	Hold last value	Hold last value	Hold last value
8080	Under-range (output)	0	-10.837	0	-5.419	0	-21.6764	Hold last value
8080	Under-range (input)	0	< -10.837	0	< -5.419	0	< -21.6764	

\* without 8001, 8080

The maximum output value or measured value is 7F00<sub>hex</sub>.

Depending on the output range or measuring range, the minimum output value or measured value is 0000<sub>hex</sub> or 8100<sub>hex</sub>.

13.2 Significant values in S7-compatible format

I/O data		0 V ... 10 V	± 10 V	0 V ... 5 V	± 5 V	0 mA ... 20 mA	± 20 mA
hex	dec	V	V	V	V	mA	mA
7FFF ... 7F00	Overrange	0	0	0	0	0	0
7EFF	32511	+11.7589	+11.7589	+5.8800	+5.8800	+23.5150	+23.5150
6C00	27648	+10.0	+10.0	+5.0	+5.0	+20.0	+20.0
5100	20736	+7.5	+7.5	+3.75	+3.75	+15.0	+15.0
0001	1	+361.69 µV	+361.69 µV	+180.845 µV	+180.845 µV	+0.7234 µA	+0.7234 µA
0000	0	0	0	0	0	0	0
FFFF	-1	0	-361.69 µV	0	-180.845 µV	0	-0.7234 µA
9400	-27648	0	-10.0	0	-5.0	0	-20.0
8100	-32512	0	-11.7589	0	-5.8800	0	-23.5157
80FF ... 8000	Underrange	0	0	0	0	0	0

Output data		4 mA ... 20 mA
hex	dec	mA
7FFF ... 7F00	Overrange	0
7EFF	32511	+22.8100
6C00	27648	+20.0
5100	20736	+16.0
0001	1	+4.000578
0000	0	+4.0
FFFF	-1	+3.99942
F940	-1728	+3.0
E501	-6911	0.578 µA
E500	-6912	0
8100	-32512	0
80FF ... 8000	Underrange	0

Input data		4 mA ... 20 mA
hex	dec	mA
7EFF	32511	+22.8100
6C00	27648	+20.0
5100	20736	+16.0
0001	1	+4.000578
0000	0	+4.0
FFFF	-1	+3.99942
F940	-1728	+3.0
8000	Open circuit	<1.1852

The maximum output value or measured value is 7EFF<sub>hex</sub>.

Depending on the output range or measuring range, the minimum output value or measured value is 0000<sub>hex</sub> or 8100<sub>hex</sub>.

13.3 Significant values in standardized representation format



The measured values and output values are identical for input and output data, except in the event of overrange or underrange. Therefore, in these special cases, the values for the inputs and outputs are specified in the tables.

I/O data		0 V ... 10 V	± 10 V	0 V ... 5 V	± 5 V	0 mA ... 20 mA	± 20 mA	4 mA ... 20 mA
hex	dec	V	V	V	V	mA	mA	mA
8001	Overrange (output)	+10.837	+10.837	+5.419	+5.419	+21.674	+21.674	+21.339
8001	Overrange (input)	> +10.837	> +10.837	> +5.419	> +5.419	> +21.674	> +21.674	> +21.339
54AA	21674					+21.674	+21.674	
4E20	20000					+20.0	+20.0	
43BB	17339							21.339
2A55	10837	+10.837	+10.837					
2710	10000	+10.0	+10.0			+10.0	+10.0	+14.0
152B	5419			+5.419	+5.419			
1388	5000	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0	+9.0
0001	1	+0.001	+0.001	+0.001	+0.001	+0.001	+0.001	+4.001
0000	0	0	0	0	0	0	0	+4.0 ... +3.2
FFFF	-1		-0.001		-0.001		-0.001	
EC78	-5000		-5.0		-5.0		-5.0	
EAD5	-5419				-5.419			
D8F0	-10000		-10.0				-10.0	
D5AB	-10837		-10.837					
B1E0	-20000						-20.0	
AB56	-21674		-21.674					
8080	Under-range (output)		-10.837		-5.419		-21.674	
8080	Under-range (input)	< -10.837		< -5.419		< -21.674		

Depending on the output range or measuring range, the maximum output value or measured value is 54AA<sub>hex</sub>, 43BB<sub>hex</sub> or 152B<sub>hex</sub>.

Depending on the output range or measuring range, the minimum output value or measured value is EAD5<sub>hex</sub>, D5AB<sub>hex</sub> or AB56<sub>hex</sub>.



### 13.4 Calculation of the measured value from the process data input value

The following examples explain the calculation of the measured value from the process data input value for the measuring range 4 mA to 20 mA.

PD IW = Process data input word = input data

#### IB IL format

Resolution =  $(20 \text{ mA} - 4 \text{ mA}) / 30000 = 0.0005333$

Measured value = PD-EW x 0.0005333 mA + 4 mA

#### Example 1

PD IW                       $493F_{\text{hex}} = 18751_{\text{dec}}$   
 Value x resolution       $18751 \times 0.000533 \text{ mA} = 10 \text{ mA}$   
 + 4 mA                       $10 \text{ mA} + 4 \text{ mA} = 14 \text{ mA}$   
 Measured value           $14 \text{ mA}$

#### S7-compatible format

Resolution =  $(20 \text{ mA} - 4 \text{ mA}) / 27648 = 0.0005787$

Measured value = PD IW x 0.0005787 mA + 4 mA

#### Example 1

PD IW                       $6C00_{\text{hex}} = 27648_{\text{dec}}$   
 Value x resolution       $27648 \times 0.0005787 \text{ mA} = 16 \text{ mA}$   
 + 4 mA                       $16 \text{ mA} + 4 \text{ mA} = 20 \text{ mA}$   
 Measured value           $20 \text{ mA}$

#### Example 2

PD IW                       $F940_{\text{hex}} \rightarrow FFFF_{\text{hex}} - F940_{\text{hex}} + 1 = -1728_{\text{dec}}$   
 Value x resolution       $-1728 \times 0.0005787 \text{ mA} = -1 \text{ mA}$   
 + 4 mA                       $-1 \text{ mA} + 4 \text{ mA} = 3 \text{ mA}$   
 Measured value           $3 \text{ mA}$

## 14 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<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.

## 15 Standard objects

### 15.1 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	20	R	Device family	I/O analog 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; Basis - Profil V2.0
003A	VersionCount	Array	Unsigned 16	4	4 * 2	R	Version counter	e. g., 0007 0001 0001 0001 <sub>hex</sub>
<b>Module - special</b>								
0005	Capabilities	Var	Visible String	1	8	R	Features	Energ_0
0007	ProductName	Var	Visible String	1	17	R	Product name	AXL F AI2 AO2 1H
0008	SerialNo	Var	Visible String	1	11	R	Serial number	xxxxxxxx (e. g., 1234512345)
0009	ProductText	Var	Visible String	1	36	R	Product text	2 input and 2 output analog channels
000A	OrderNumber	Var	Visible String	1	8	R	Order No.	2702072
000B	HardwareVersion	Record	Visible String	2	11; 3	R	Hardware version	e. g., 2010-06-21; 01
000C	FirmwareVersion	Record	Visible String	2	11; 6	R	Firmware version	e. g., 2010-06-21; V1.10
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 30 00 08 00 00 00 A9 <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.

### 15.2 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

### 15.3 Object descriptions

Index (hex)	Object name	Object type	Data type	A	L	Rights	Meaning
0038	ObjDescrReq	Record		2	3	Read, write	Object description request
0039	ObjDescr	Record		16	See subindices	Read	Object description



These objects are only important for tools and are therefore not described in more detail here.  
Please refer to the basic profile for comprehensive information.

15.4 Diagnostics objects

Index (hex)	Object name	Object type	Data type	A	L	Rights	Assignment
0018	DiagState	Record		6	2; 1; 1; 2; 1; 14	R	Diagnostic state
0019	ResetDiag	Var	Unsigned 8	1	1	W	Reset diagnostics

15.4.1 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	21	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>	Channel 1
				:	:
				04 <sub>hex</sub>	Channel 4
				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	14	Text (14 characters)	See table below	



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	6					
Error	Priority	Channel/ group/ module	Error code	Text	Process data	LED			
	hex	hex	hex			D	UA	E1	E2
No error	00	00	0000	Status OK	xxxx	Green ON	ON	OFF	OFF
Short-circuit	01	03 ... 04	2130	Short-circuit	--	Green ON	ON	OFF	ON
Supply voltage faulty (supply for analog modules U <sub>A</sub> )	01	FF	5160	Supply fail	8020	Flashing green/yellow	OFF	ON	ON
Device error	01	FF	6301	CS FLASH	8040	Green ON	ON	OFF	ON
Flash format error	01	FF	6302	FO FLASH	8040	Green ON	ON	OFF	ON
Parameter table invalid	01	FF	6320	Invalid para	8010	Green ON	ON	OFF	ON
Open circuit	01	01 ... 04	7710	Open circuit	8002	Green ON	ON	OFF	ON
Overrange	02	01 ... 02	8910	Overrange	8001	Green ON	ON	OFF	ON
Underrange	02	01 ... 02	8920	Underrange	8080	Green ON	ON	OFF	ON

### Special notes for the analog outputs

In the event of errors at the outputs, no process data codes are written to the input data, only a message is generated via the DiagState object.

The following two error messages are supported:

Open circuit: current output, but open terminal blocks

Short circuit: voltage output, but short circuit between the terminal points

An open circuit or short circuit is only indicated when the process data value of the channel is > 512<sub>dec</sub>, corresponding to 1.7% of the output range final value.

#### 15.4.2 Reset diagnostic messages (0019<sub>hex</sub>: ResetDiag)

You can delete the diagnostics memory and acknowledge the diagnostic messages with this object.

0019 <sub>hex</sub> : ResetDiag (Write)					
Subindex	Data type	Length in bytes	Meaning	Contents	
0	Unsigned 8	1	Reset diagnostics	00 <sub>hex</sub>	All diagnostic messages approved
				02 <sub>hex</sub>	Deletes and acknowledges all pending diagnostic messages that have not been read out
				06 <sub>hex</sub>	Deletes and acknowledges all the diagnostic messages, resets the error counter, and allows no further diagnostic messages
				Other	Reserved

15.5 Objects for process data management

Index (hex)	Object name	Object type	Data type	A	L	Rights	Assignment
0024	ResetCode	Array	Unsigned 16	2	2	R/W	Substitute value behavior when process data is missing
0025	PDIN	Var	Octet string	1	4	R	Input process data
0026	PDOUT	Var	Octet string	1	4	R/W	Output process data
0027	GetExRight	Simple variable	Unsigned 8	1	1	R/W (access-protected)	Get exclusive process data write rights
002F	PDOUT_Subst	Array	Unsigned 16	2	2	R/W	Substitute value for the OUT process data
003B	PDIN_Descr	Record		6	12	R	Description of the IN process data
003C	PDOUT_Descr	Record		6	12	R	Description of the output process data



Objects 003B<sub>hex</sub> and 003C<sub>hex</sub> are only applicable to tools and are therefore not described in more detail here.  
Please refer to the basic profile for comprehensive information.

15.5.1 Substitute value behavior when process data is missing (0024<sub>hex</sub>: ResetCode)

With this object, you parameterize the behavior of the module in the event that process data is missing.

After resetting, the module works with the last permanently stored data. Upon delivery, the module works with the default data (default settings).

0024 <sub>hex</sub> : BusResetCode (Read, write)					
Subindex	Data type	Length in bytes	Meaning	Contents	Default value
0	Array	2 * 2	Substitute value behavior when process data is missing		

Element	Data type	Length in bytes	Meaning	Contents	Default value
1	Unsigned 16	2	Behavior of channel OUT1	0000 ... 0003 <sub>hex</sub>	0002 <sub>hex</sub>
2	Unsigned 16	2	Behavior of channel OUT2	0000 ... 0003 <sub>hex</sub>	0002 <sub>hex</sub>

Value range:

Code (hex)	Behavior
0000	Output of zero values (0 V/0 mA/4 mA) at output
0001	Output of final values (10 V/5 V/20 mA) at output
0002	Hold last value
0003	Transfer the substitute values from the "Replace output process data" (002F <sub>hex</sub> ) object

**Behavior of the outputs when the supply voltage fails**

U <sub>A</sub>	U <sub>Bus</sub>	Behavior of the outputs
Available	Available	Nominal operation or see object 0024 <sub>hex</sub>
Missing	Available	Outputs to 0 V/0 mA
Available	Missing	Hold the last values (as with object 0024 <sub>hex</sub> , code 0002)

**Special features**

- You can only access this object via subindex 0, i. e., you access the entire object.
- In the case of valid parameters, the object is stored permanently.
- After resetting, the module works with the last permanently stored data. Upon delivery, the module works with the default data (default settings).

For error message, see object 0080<sub>hex</sub>.

**15.5.2 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	4	Input process data

**15.5.3 OUT process data (0026<sub>hex</sub>: PDOUT)**

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

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

0026 <sub>hex</sub> : PDOUT (Read)			
Subindex	Data type	Length in bytes	Meaning
0	Octet string	4	Output process data

There are 2 bytes available for each channel, starting with channel 1.

Observe the notes in the section "Writing the analog values via the PDI channel".

**15.5.4 Request exclusive write access (0027<sub>hex</sub>: GetExRight)**

This object allows you to determine which channel (process data channel or PDI channel) gets the rights for writing the outputs.

0027 <sub>hex</sub> : GetExRight (read, write)					
Subindex	Data type	Length in bytes	Meaning	Contents	
0	Simple variable	1	Get exclusive process data write rights	00 <sub>hex</sub>	Rights for writing output data over the PD channel (process data channel)
				01 <sub>hex</sub>	Rights for writing output data via the PDI channel

All other values are invalid and will be acknowledged with an error.



**Please note the following for your process:**  
 The parameterization in object 0027<sub>hex</sub> "Rights for writing the output data via the PDI channel" overwrites the OUT process data transmitted via the process data channel with the values from object 0026<sub>hex</sub> PDOOUT. From now, the OUT process data can only be changed using the PDI object. Changes on the process data channel will have no effect. If the value from the process data channel is to be used again, write access must be changed to "Rights for writing the output data via the PD channel (process data channel)" via the GetExRight object. After a power reset, the values transmitted via the process data channel are always valid.



**15.5.5 Substitute value for the OUT process data (002F<sub>hex</sub>: PDOUT\_Subst)**

This object is used to parameterize the substitute values that are to be output at the analog outputs in the event that process data is missing. The condition is that option 0003 is selected in the “Substitute value behavior when process data is missing” object (0024<sub>hex</sub>).

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

After resetting, the module works with the last permanently stored data. Upon delivery, the module works with the default data (default settings).

002F <sub>hex</sub> : PDOUT_Subst (Read, write)			
Subindex	Data type	Length in bytes	Meaning
0	Array of Unsigned 16	2 * 2	Replace output process data

There are 2 bytes available for each channel, starting with channel 1.

The values are used in the parameterized format.

**Example:**

Channel 1: 1 V, channel 2: 2 V, IB IL format  
 0B B8 17 70

**Special features**

- You can only access this object via subindex 0, i. e., you access the entire object.
- In the case of valid parameters, the object is stored permanently.
- The parameterized values are compared with the selected output range. If the substitute value does not correspond to the output range, an error message is issued.

For error message, see object 0080<sub>hex</sub>.

15.6 Objects for device management

Index (hex)	Object name	Object type	Data type	A	L	Rights	Meaning
001D	Password	Simple variable	Octet string	1	9	W	Password
0029	ParamSetWrite-Control	Byte	Unsigned 8	1	1	R/W	Parameter set write control
002A	ConflictDictionary	Record		N	12	R	Conflict dictionary
002D	ResetParam	Simple variable	Unsigned 8	1	1	R/W	Reset parameterization
002E	Checksum	Simple variable	Unsigned 32	1	4	R	Checksum

15.6.1 Password (001D<sub>hex</sub>: Password)

This object can be used to enable protected module functions, e.g., for the GetExRight object.

001D <sub>hex</sub> : password (Write)			
Subindex	Data type	Length in bytes	Meaning
0	Simple variable	9	Password

15.6.2 Parameter record write control (0029<sub>hex</sub>: ParamSetWriteControl)

This object is used to control block parameterization.

0029 <sub>hex</sub> : ParameterSetWriteControl (read/write)				
Subindex	Data type	Length in bytes	Meaning	
0	Unsigned 8	1	Parameter record write control	
			00 <sub>hex</sub>	Termination of block parameterization
			01 <sub>hex</sub>	Initiation of block parameterization

Block parameterization serves to enable the joint transfer of interdependent parameters.

If you attempt to parameterize dependent parameters individually, this may result in the error message “Dependency of other parameter not taken into consideration”. Block parameterization should be used in this case.

The plausibility check for the parameterization data is disabled during block parameterization, the data is only stored temporarily. However, the data length and subindex are checked.

The plausibility check is only performed when block parameterization is terminated with data item 00<sub>hex</sub>.

If the check was completed with no errors, the temporarily stored parameterization data is applied and stored in the Flash memory.

If errors were detected in the temporarily stored parameterization data, the service is acknowledged negatively with 08, 00, 0040<sub>hex</sub>.

The exact cause of the error can be read in object 002A<sub>hex</sub>. The error codes are indicated by object 0080<sub>hex</sub>.

Not all startup objects have to be written.

To use block parameterization without tools, proceed in the following sequence:

- Initiate block parameterization by writing the value 01<sub>hex</sub> to object 0029<sub>hex</sub>.
- Write the parameter table (ParaTable) to object 0080<sub>hex</sub>.
- Schreiben Sie das Ersatzwertverhalten beim Ausbleiben von Prozessdaten (ResetCode) auf Objekt 0024<sub>hex</sub>.
- Write the substitute value for the OUT process data in the event of an error (PDOOUT\_Subst) to object 002F<sub>hex</sub>.
- Terminate block parameterization by writing the value 00<sub>hex</sub> to object 0029<sub>hex</sub>.

**15.6.3 Conflict dictionary (002A<sub>hex</sub>: ConflictDictionary)**

This object contains the indices and error messages (additional code) for the parameters involved in the conflict.

002A <sub>hex</sub> : ConflictDictionary (Read)			
Subindex	Data type	Length in bytes	Meaning
0		12	Conflict dictionary

Meaning	Length in bytes	Example	
Subslot	1	00	No subslot
Index	2	00 2F	PDOOUT_Subst
Subindex	1	02	Substitute value for OUT2
Parameter number	2	0001	
Error code and class	2	0080	
Additional error code	4	0000 0240	Substitute value for OUT2 outside the limit values

**15.6.4 Reset parameterization (002D<sub>hex</sub>: ResetParam)**

This object is used to reset the module to the default settings.

To reset the module value 01<sub>hex</sub> must be transferred during write access. Any other values are not permissible and will be acknowledged with an error.

Then the default settings of the channels are loaded and all the user-set parameters are reset.

**15.6.5 Checksum (002E<sub>hex</sub>: Checksum)**

The data of the startup objects is verified with this CRC32 checksum.

Checksum for the default setting:        6B F7 35 CF<sub>hex</sub>

## 16 Application objects

Index (hex)	Object name	Object type	Data type	A	L	Rights	Assignment
0080	ParaTable	Array	Unsigned 16	6	6 * 2	R/W	Parameter table
0082	Measured Value Float	Array	Record	2	2 * 6	R	Measured values in the extended float format
0083	PD Min	Array	Integer 16	2	2 * 2	R	Minimum process data value
0084	PD Max	Array	Integer 16	2	2 * 2	R	Maximum process data value
00F1	StartupObjects	Var	Octet string	1	11	R	Startup objects

### 16.1 Parameter table (0080<sub>hex</sub>: ParaTable)

Parameterize the module using this object.

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

After resetting, the module works with the last permanently stored data. Upon delivery, the module works with the default data (default settings).

0080 <sub>hex</sub> : ParaTable (read, write)				
Subindex	Data type	Length in bytes	Meaning	Default value
0	Array of Unsigned 16	6 * 2	Read/write all elements	See subindices
1	Unsigned 16	2	Parameterization of channel IN1	0000 <sub>hex</sub>
2	Unsigned 16	2	Parameterization of channel IN2	0000 <sub>hex</sub>
3	Unsigned 16	2	Parameterization of channel OUT1	0000 <sub>hex</sub>
4	Unsigned 16	2	Parameterization of channel OUT2	0000 <sub>hex</sub>
5	Unsigned 16	2	Data format	0000 <sub>hex</sub>
6	Unsigned 16	2	Reserved	0000 <sub>hex</sub>

### Parameterization of channel IN1/2, OUT1/2

#### Parameterization word

Parameterization of the analog inputs															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	Filter	0	0	Mean-value	0	0	0	0	0	0	0	0	Measuring range

Parameterization of the analog outputs															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Output range

Filter	Code (bin)	Code (hex)
30 Hz (default)	0	0
12 kHz	1	1

Measuring/output range	Code (bin)	Code (hex)
0 V ... 10 V (default)	0000	0
-10 V ... +10 V	0001	1
0 V ... 5 V	0010	2
-5 V ... +5 V	0011	3
0 mA ... 20 mA	0100	4
-20 mA ... +20 mA	0101	5
4 mA ... 20 mA	0110	6
Channel inactive	1111	F
Reserved	Other	

Mean-value	Code (bin)	Code (hex)
16-sample (default)	00	0
No mean-value	01	1
4-sample	10	2
32-sample	11	3

**Data format**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	Data format	0	0	0	0	0	0	0	0	0

Data format	Code (bin)	Code (hex)
IB IL (default setting)	00	0
Reserved	01	1
S7-compatible	10	2
Standardized representation	11	3



Set all reserved bits to 0.

The validity of the values parameterized in object 0080<sub>hex</sub> (ParaTable) is checked.

If everything is OK, the specifications for object 0024<sub>hex</sub> (ResetCode) and object 002F<sub>hex</sub> (PDOOut-Subst) are checked as these depend on the output range and format.

If errors are detected, they are indicated with additional error code xx40<sub>hex</sub> (collision with other values).

In the case of an invalid parameterization value, a negative write conformation with the error message 08, 00, xx30<sub>hex</sub> is generated.

The low byte of the additional error code is 30<sub>hex</sub> (value is out of range), the high byte contains the number of the element in question.

Example: ParaTable is completely filled with data (subindex 0) and the entry for channel 2 is invalid.

In this case the error message is 8, 0 with additional error code 0230<sub>hex</sub>.

In the case of valid parameters, ParaTable is stored permanently.

Die gespeicherten Daten werden mit einer Prüfsumme gesichert. Nach Spannungszuschalten wird die ParaTable zusammen mit den Ersatzwerten (Objekt 002F<sub>hex</sub>) und dem Wert für das Verhalten beim Ausbleiben von Prozessdaten (Objekt 0024<sub>hex</sub>) aus dem Flash geladen.

**Error messages:**

Parameterization error	Code (hex)	Additional code (hex)	Meaning	Corrective
Object 0080 <sub>hex</sub> , subindex = 0, length ≠ 12 bytes	0605	0000	Inconsistent object attributes	Check the call.
Object 0080 <sub>hex</sub> , subindex ≠ 0, length ≠ 2 bytes	0605	0000	Inconsistent object attributes	
The element contains an invalid value	0800	xx30	A reserved bit was set or a reserved code was used during parameterization xx: number of the element in question 30: value is out of range	Check the parameterization.
The ResetCode for channel xx is set to 0003 <sub>hex</sub> and the substitute value is outside the process data limit values	0800	xx40	Collision with other values	
	0800	0540	Channel OUT1, substitute value > positive limit value	
	0800	1540	Channel OUT1, substitute value < negative limit value	
	0800	2540	Channel OUT2, substitute value > positive limit value	
	0800	3540	Channel OUT2, substitute value < negative limit value	

**16.2 Measured value in extended float format (0082<sub>hex</sub>: Measured Value Float)**

You can read the IN process data in IB IL or S7-compatible format with the 0025<sub>hex</sub> object.

The 0082<sub>hex</sub> object is also available.

This object provides the measured value in the highest internal accuracy of the terminal in the float format.

0082 <sub>hex</sub> : Measured Value Float (Read)			
Subindex	Data type	Length in bytes	Meaning
0	Array of Records	2 * 6	Read all elements
1	Record	6	Measured value IN1
2	Record	6	Measured value IN2

**Measured values IN1 and IN2**

Element	Data type	Length in bytes	Meaning
1	Float 32	4	Measured value in float format according to IEEE 754
2	Unsigned 8	1	Status
3	Unsigned 8	1	Unit

Structure of the float format according to IEEE 754 in the bit representation:

VEEE EEEE	EMMM MMMM	MMMM MMMM	MMMM MMMM
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- V 1 sign bit, 0: positive, 1: negative
- E 8 bits exponent with offset 7F<sub>hex</sub>
- M 23 bits mantissa

Some example values for conversion from floating point to hexadecimal representation:

Floating point	Hexadecimal representation
1.0	3F 80 00 00
10.0	41 20 00 00
1.03965528	3F 85 13 6D
- 1.0	BF 80 00 00

**Extended Float Format**

Extended Float Format is a specially defined format. It consists of the measured value in float format, a status, and a unit.

Status is necessary because the float format defines no patterns providing information on the status of the numerical value.

The status corresponds to the LSB of the diagnostic code in IB IL format (e.g., overrange: status = 01, diagnostic code = 8001<sub>hex</sub>). If status = 0, the measured value is valid.

Unit	Code
Milliampere (mA)	39 (27 <sub>hex</sub> )
Volt (V)	58 (3A <sub>hex</sub> )

Status	Code
Measured value is valid	00 <sub>hex</sub>
Measured value is invalid	Other

**16.3 Minimum process data value  
(0083<sub>hex</sub>: PD Min)**

Object 0083<sub>hex</sub> can be used to read the minimum IN process data values.

The values are initialized after each parameterization. The highest value is assigned for the minimum process data value.

PD Min = 7FFF 7FFF<sub>hex</sub>

On every analog conversion, the PD Min value is compared with the current measured values and overwritten if necessary.

0083 <sub>hex</sub> : PD Min (Read)			
Subindex	Data type	Length in bytes	Meaning
0	Array of Integer 16	2 * 2	Read all elements
1	Integer 16	2	Minimum process data value channel IN1
2	Integer 16	2	Minimum process data value channel IN2

**16.4 Maximum process data value  
(0084<sub>hex</sub>: PD Max)**

Object 0084<sub>hex</sub> can be used to read the maximum IN process data values.

The values are initialized after each parameterization. The lowest value is assigned for the maximum process data value.

PD Max = 8000 8000<sub>hex</sub>

On every analog conversion, the PD Max value is compared with the current measured values and overwritten if necessary.

0084 <sub>hex</sub> : PD Max (Read)			
Subindex	Data type	Length in bytes	Meaning
0	Array of Integer 16	2 * 2	Read all elements
1	Integer 16	2	Maximum process data value channel IN1
2	Integer 16	2	Maximum process data value channel IN2

**17 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.