AXL F AI2 AO2 1H

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

Data sheet
106048_en_05

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.

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
- 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
- Process data update < 150 µs
- Device rating plate stored

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 at: phoenixcontact.net/product/2702072

2 Table of contents

3 Ordering data

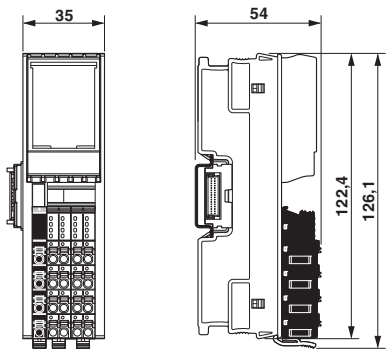
Description	Type	Order No.	Pcs./Pkt.
Axioline F, analog I/O module, analog inputs: 2, 0 V ... 5 V, -5 V ... 5 V, 0 V ... 10 V, -10 V ... 10 V, 0 mA ... 20 mA, 4 mA ... 20 mA, -20 mA ... 20 mA, connection method: 2-wire, analog outputs: 2, 0 V ... 5 V, -5 V ... 5 V, 0 V ... 10 V, -10 V ... 10 V, 0 mA ... 20 mA, 4 mA ... 20 mA, -20 mA ... 20 mA, connection method: 2-wire, transmission speed in the local bus: 100 Mbps, degree of protection: IP20, including bus base module and Axioline F 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 shield bus 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 ROLLMASTER 300/600, THERMOMARK X1.2, THERMOMARK ROLL X1, THERMOMARK ROLL 2.0, THERMOMARK ROLL, mounting type: snapped into marker carrier, lettering field size: 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
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: Axioline F connector	
Connection method	Push-in connection
Conductor cross section solid / stranded	0.2 mm² ... 1.5 mm² / 0.2 mm² ... 1.5 mm²
Conductor cross section [AWG]	24 ... 16
Stripping length	8 mm

Please observe the information provided on conductor cross sections in the “Axioline F: system and installation” user manual.

Interface: Axioline F local bus	
Number	2
Connection method	Bus base module
Transmission speed	100 Mbps
Axioline F local bus supply (U_{Bus})	
Supply voltage	5 V DC (via bus base module)
Current consumption	typ. 120 mA max. 150 mA
Power consumption	typ. 0.6 W max. 0.75 W
Supply for analog modules (U_A)	
Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption	min. 30 mA (internal current consumption, no load, output 0 V) typ. 40 mA max. 60 mA (2 voltage channels, output 10 V, load 2 kΩ) max. 80 mA (2 current channels, output 24 mA, load 500 Ω)
Power consumption	typ. 0.96 W max. 1.92 W
Surge protection of the supply voltage	electronic (35 V, 0.5 s)
Polarity reversal protection of the supply voltage	Polarity protection diode
Transient protection supply voltage	Suppressor diode
Power consumption	
Power consumption	typ. 1.56 W (at U_{Bus} and U_A) max. 2.67 W (at U_{Bus} and U_A)
Analog inputs	
Number of inputs	2
Description of the input	Differential inputs, voltage or current can be chosen separately
Connection method	Push-in connection
Connection technology	2-wire, shielded, twisted pair
Current input signal	0 mA ... 20 mA, 4 mA ... 20 mA, -20 mA ... 20 mA
Voltage input signal	0 V ... 5 V, -5 V ... 5 V, 0 V ... 10 V, -10 V ... 10 V
Resolution A/D	16 bits
A/D conversion time	2 µs
Measured value representation	16 bits (15 bits + sign bit)
Data formats	IB IL, S7-compatible, standardized representation
Process data update	150 µs
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)
Input resistance of voltage input	268 kΩ (typical)
Input resistance current input	104 Ω (typical)

Analog inputs	
Limit frequency (3 dB)	30 Hz 12 kHz
Open circuit response	goes to 0 V, 0 mA; open-circuit detection for 4 mA ... 20 mA
Common mode voltage range	-50 V DC ... 50 V DC
Transient protection of inputs	Suppressor diode
Overload protection of the current inputs	No; ±5.2 V DC, maximum, I_{max} = 50 mA
Overload protection of the voltage inputs	±30 V DC, maximum

Analog outputs	
Number of outputs	2
Connection method	Push-in connection
Connection technology	2-wire, shielded, twisted pair
Current output signal	0 mA ... 20 mA, 4 mA ... 20 mA, -20 mA ... 20 mA
Voltage output signal	0 V ... 5 V, -5 V ... 5 V, 0 V ... 10 V, -10 V ... 10 V
D/A resolution	16 bits
Representation of output values	16 bits (15 bits + sign)
Data formats	IB IL, S7-compatible, standardized representation
Process data update	150 µs
Load/output load current output	≤ 500 Ω
Load/output load voltage output	≥ 2 kΩ
Precision	typ. 0.1 % (of output range final value)
Short-circuit and overload protection	electronic
Transient protection	Suppressor diode

Input and output address area	
Input address area	4 Byte
Output address area	4 Byte

Configuration and parameter data in a PROFIBUS system	
Required parameter data	11 Byte
Required 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.
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 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, supply lines DC: ±0.5 kV/±0.5 kV (symmetrical/ asymmetrical), ±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	Class B

Approvals

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

5 Tolerance data

The following applies for tolerance values:

Analog inputs:

The data is valid for nominal operation (U_A = 24 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°C				
	Absolute		Relative	
	Typ.	Max.	Typ.	Max.
Analog inputs				
0 mA ... 20 mA, 4 mA ... 20 mA, ±20 mA	±20 µA	±60 µA	±0.10%	±0.30%
0 V ... 5 V, ±5 V, 0 V ... 10 V, ±10 V	±10 mV	±30 mV	±0.10%	±0.30%
Analog outputs				
0 mA ... 20 mA, 4 mA ... 20 mA, ±20 mA	±20 µA	±60 µA	±0.10%	±0.30%
0 V ... 5 V, ±5 V, 0 V ... 10 V, ±10 V	±10 mV	±30 mV	±0.10%	±0.30%

300 µs update time, 12 kHz filter, 32-sample mean value

Tolerances at T_A = +25°C				
	Absolute		Relative	
	Typ.	Max.	Typ.	Max.
Analog inputs				
0 mA ... 20 mA, 4 mA ... 20 mA, ±20 mA	±100 µA	±160 µA	±0.5%	±0.8%
0 V ... 5 V, ±5 V, 0 V ... 10 V, ±10 V	±50 mV	±80 mV	±0.5%	±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 °C ... +60 °C		
	Drift	
	Typical	Maximum
Analog inputs		
0 mA ... 20 mA, 4 mA ... 20 mA, ±20 mA	±45 ppm/K	±65 ppm/K
0 V ... 5 V, ±5 V, 0 V ... 10 V, ±10 V	±40 ppm/K	±55 ppm/K
Analog outputs		
0 mA ... 20 mA, 4 mA ... 20 mA, ±20 mA	±65 ppm/K	±80 ppm/K
0 V ... 5 V, ±5 V, 0 V ... 10 V, ±10 V	±30 ppm/K	±40 ppm/K

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

Additional tolerances influenced by electromagnetic interference		
Electromagnetic fields	EN 61000-4-3/ IEC 61000-4-3	< ±0.3 %
Fast transients (burst)	EN 61000-4-4/ IEC 61000-4-4	< ±1.2 %
Conducted interference	EN 61000-4-6/ IEC 61000-4-6	< ±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 kΩ	7.5 µs
R_L = 2 kΩ II C_L = 10 nF	15 µs
R_L = 2 kΩ II C_L = 220 nF	140 µs
R_L = 2 kΩ + L_L = 3.3 mH	20 µs

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

Load	Time for 0 % ... 99 %
R_L = 500 Ω	20 µs
R_L = 500 Ω II C_L = 10 nF	20 µs
R_L = 500 Ω II C_L = 220 nF	240 µs
R_L = 500 Ω + L_L = 3.3 mH	90 µs

Key to the tables

R_L	Ohmic load
C_L	Capacitive load
L_L	Inductive load
II	Parallel connection
+	Serial connection

7 Internal circuit diagram

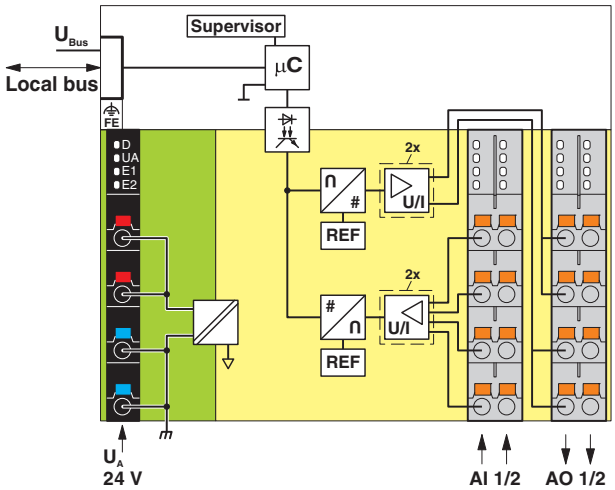


Figure 1 Internal wiring of the terminal points

Key:

Local bus	Axioline F local bus (hereinafter referred to as local bus)
Supervisor	Hardware monitoring
µC	Microcontroller
	Optocoupler with bipolar buffer
	Power supply unit with electrical isolation
	Analog/digital converter
	Digital/analog converter
U/I	Input amplifier for current (I) or voltage (U)
U/I	Output driver
REF	Reference voltage source
	Noiseless ground
	Analog I/O reference ground
	Logic reference ground
	Reference ground of the supply voltage U_A
	Electrically isolated areas

8 Terminal point assignment

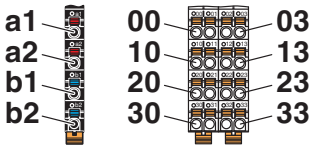


Figure 2 Terminal point assignment

Terminal point	Color	Assignment	
Supply voltage input			
a1, a2	Red	24 V DC (U_A)	Analog module feed-in (bridged internally)
b1, b2	Blue	GND	Reference potential of the supply voltage (bridged internally)
Analog inputs			**IN01, IN02**
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
Analog outputs			**OUT01, OUT02**
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

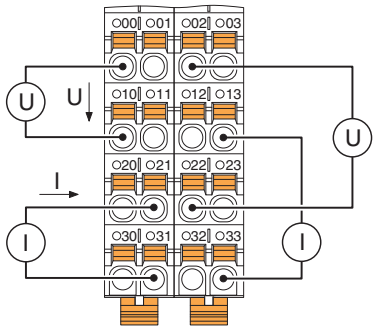


Figure 3 Connection for measuring voltage and current as well as voltage and current output

9.1 Analog inputs

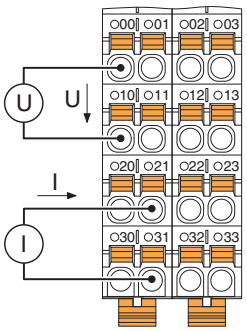


Figure 4 Connection for voltage and current measurement

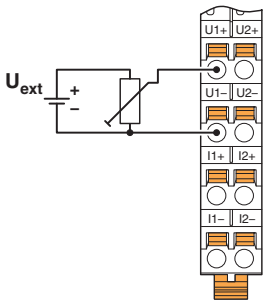


Figure 5 Connection of potentiometric position sensors

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

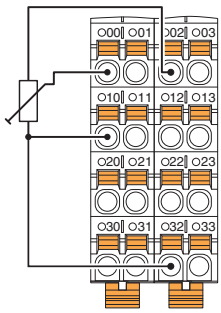


Figure 6 Connection of positiometers for detecting the position (OUT01 channel is used for supplying the positiometer)

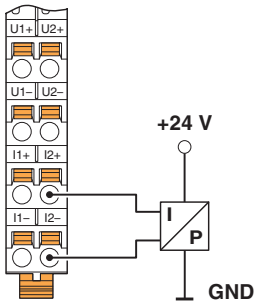


Figure 7 Passive pressure sensor at a differential current input

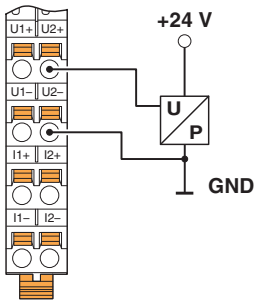


Figure 8 Differential voltage input with active 3-wire transmitter

9.2 Analog outputs

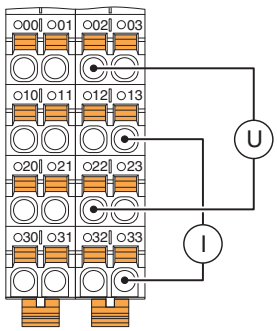


Figure 9 Connection for voltage and current output

10 Connection notes

NOTE: Damage to the electronics/ measuring errors

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

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

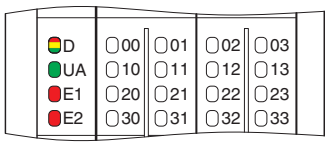
Connect the cable shield to functional earth immediately after the cables enter the control cabinet.

If a closed control cabinet is not available, 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 F SYS INST user manual.

11 Local diagnostic and status indicators



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

Figure 10 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. No valid data provided by the controller/ higher-level network. There is no error on the module.
		Device application not active	Green/yellow flashing	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	Red flashing	The device is ready for operation but there is no connection to the previously existing device.
		Power down	Off	Device is in (power) reset.
UA	Green	U_{Analog}	On	Supply for analog modules (U_A) present.
			Off	Supply for analog modules (U_A) not present.
E1	Red	Supply voltage error	On	Supply for analog modules (U_A) is faulty.
			Off	Supply for analog modules (U_A) 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
Supply voltage faulty (supply for analog modules (U_A))	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.

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

The process data is mapped in Motorola format (Big Endian).

Output word	0	1
Assignment	Output value OUT01	Output value OUT02
Signal	OUT01	OUT02
Terminal point (signal)	OUT01_U: 02, OUT01_I: 12	OUT02_U: 03, OUT02_I: 13
Terminal point (GND)	22, 23, 32, 33	

Input word	0	1
Assignment	Measured value IN01	Measured value IN02
Signal	IN01	IN02
Terminal point (signal)	IN01_U: 00, IN01_I: 20	IN02_U: 01, IN02_I: 21
Terminal point (-)	U1-: 10, I1-: 30	U2-: 11, I2-: 31

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 or no valid measured value available
8010	Parameter table invalid
8020	Supply voltage faulty (supply for analog modules (U_A))
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 ... +3.2
FFFF	-1		-333.33 µV		-166.67 µV		-0.6667 µA	
FED3	-301			-100 mV				
FDA7	-601	-200 mV						
C568	-15000		-5.0		-2.5		-10.0	
8AD0	-30000		-10.0		-5.0		-20.0	
8100	-32512		-10.837		-5.419		-21.6764	
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)	-200 mV	-10.837	-100 mV	-5.419		-21.6764	Hold last value
8080	Under-range (input)	< -200 mV	< -10.837	< -100 mV	< -5.419	< -0.44	< -21.6764	
8002	Open circuit							< +3.2

* Without 8001, 8002, 8080

The maximum output value or measured value is $7F00_{hex}$.

Depending on the output range or measuring range, the minimum output value or measured value is 0000_{hex} or 8100_{hex}.

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		-361.69 µV		-180.845 µV		-0.7234 µA
FDBC	-580			-105 mV			
FDAE	-594	-215 mV					
9400	-27648		-10.0		-5.0		-20.0
8100	-32512		-11.7589		-5.8800		-23.5157
80FF ... 8000	Underrange	< -215 mV	< -11.7589	< -105 mV	< -5.88	< -0.44	< -23.5157

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 $7EFF_{hex}$.

Depending on the output range or measuring range, the minimum output value or measured value is 0000_{hex} or 8100_{hex}.

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	
FF9C	-100			-100 mV				
FF38	-200	-200 mV						
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	
8080	Under-range (output)		-10.837		-5.419		-21.674	
8080	Under-range (input)	< -200 mV	< -10.837	< -100 mV	< -5.419	< -0.44	< -21.674	
8002	Open circuit							< +3.2

Depending on the output range or measuring range, the maximum output value or measured value is $54AA_{hex}$, $43BB_{hex}$ or $152B_{hex}$.

Depending on the output range or measuring range, the minimum output value or measured value is $EAD5_{hex}$, $D5AB_{hex}$ or $AB56_{hex}$.

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 mA - 4 mA) / 30000 = 0.0005333

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

Example 1

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

S7-compatible format

Resolution = (20 mA - 4 mA) / 27648 = 0.0005787

Measured value = PD IW x 0.0005787 mA + 4 mA

Example 1

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

Example 2

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

14 Parameter, diagnostics and information (PDI)

Parameter and diagnostic data as well as other information is transmitted as objects 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 data types.

Abbreviation	Meaning
A	Number of elements
L	Length of the elements in bytes
R	Read
W	Write

Each visible string is terminated with a null terminator (00_{hex}). The length of a visible-string-type element is therefore at least one byte larger than the number of user data items.
If the number of user data items plus null terminator is smaller than the specified length of the element, the visible string will be populated with a null character (00_{hex}).

For detailed information on PDI 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	Data type	A	L	Rights	Meaning	Contents
Manufacturer							
0001	VendorName	Visible String	1	16	R	Vendor name	Phoenix Contact
0002	VendorID	Visible String	1	7	R	Vendor ID	00A045
0003	VendorText	Visible String	1	49	R	Vendor text	Components and systems for industrial automation
0012	VendorURL	Visible String	1	23	R	Vendor URL	www.phoenixcontact.com
Module - general							
0004	DeviceFamily	Visible String	1	20	R	Device family	I/O analog IN / OUT
0006	ProductFamily	Visible String	1	6	R	Product family	AXL F
000E	CommProfile	Visible String	1	4	R	Communication profile	633
000F	DeviceProfile	Visible String	1	5	R	Device profile	0010
0011	ProfileVersion	Record of Visible Strings	2	11; 21	R	Profile version	2011-12-07; Basic - Profile V2.0
0017	Language	Record of Visible Strings	2	6; 8	R	Language	en-us; English
Module - special							
0005	Capabilities	Visible String	1	8	R	Capabilities	Energ_0
0007	ProductName	Visible String	1	17	R	Product name	AXL F AI2 AO2 1H
0008	SerialNo	Visible String	1	11	R	Serial number	e. g., 1234512345
0009	ProductText	Visible String	1	37	R	Product text	2 input and 2 output analog channels
000A	OrderNumber	Visible String	1	8	R	Order No.	2702072
000B	HardwareVersion	Record of Visible Strings	2	11; 3	R	Hardware version	e. g., 2010-06-21; 01
000C	FirmwareVersion	Record of Visible Strings	2	11; 6	R	Firmware version	e. g., 2010-06-21; V1.10
000D	PChVersion	Record of Visible Strings	2	11; 6	R	PDI version	2010-01-08; V1.00
0037	DeviceType	Octet string	1	8	R	Device type	00 30 00 08 00 00 00 $A9_{hex}$
003A	VersionCount	Array of UINT16	4	4 * 2	R	Version counter	e. g., 0007 0001 0001 0001_{hex}
Use of the device							
0014	Location	Visible String	1	59	R/W	Location	Can be completed by the user.
0015	EquipmentIdent	Visible String	1	59	R/W	Equipment identifier	Can be completed by the user.
0016	ApplDeviceAddr	UINT16	1	2	R/W	Application device address	Can be completed by the user.

15.2 Miscellaneous standard objects

Index (hex)	Object name	Data type	A	L	Rights	Meaning/contents	
Object descriptions							
0038	ObjDescrReq	Record	2	3	R/W	Object description request	
0039	ObjDescr	Record			R	Object description	
Diagnostics objects							
0018	DiagState	Record	6	2; 1; 1; 2; 1; 14	R	Diagnostic state	*
0019	ResetDiag	UINT8	1	1	R/W	Reset diagnostic mesages	*
Objects for process data management							
0024	ResetCode	Array of UINT16	2	2 * 2	R/W	Substitute value behavior during bus reset (PDOUT)	*
0025	PDIN	Octet string	1	4	R	Input process data	*
0026	PDOUT	Octet string	1	4	R	Output process data	*
0027	GetExRight	UINT8	1	1	R/W	Get exclusive process data write rights	*
002F	PDOUT_Subst	Array of UINT16	2	2	R/W	Substitute value for the OUT 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	
Objects for device management							
001D	Password	Octet string	1	9	W	Password	*
0029	ParamSetWrite-Control	UINT8	1	1	R/W	Parameter set write control	*
002A	ConflictDictionary	UINT8	1	12	R	Conflict dictionary	*
002D	ResetParam	UINT8	1	1	R/W	Reset parameterization	*
002E	CheckSum	Unsigned 32	1	4	R	Checksum	*

The objects marked in the last column with an * are described in more detail in the next sections.

The description of the other objects is to be found in the user manual UM EN AXL F SYS INST.

The objects 0038_{hex}, 0039_{hex}, $003B_{hex}$ and $003C_{hex}$ are only applicable to tools.

15.3 Diagnostics objects

15.3.1 Diagnostics state (0018_{hex}: DiagState)

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

0018_{hex}: Diagnostics state (read)					
Subindex	**Data type**	**Length in bytes**	**Meaning**	**Contents**	
0	Record	21	Diagnostic state	Complete diagnostics information	
1	UINT16	2	Error number	0 ... 65535_{dec}	
2	UINT8	1	Priority	00_{hex}	No error
				01_{hex}	Error
				02_{hex}	Warning
				81_{hex}	Error removed
				82_{hex}	Warning eliminated
3	UINT8	1	Channel/group/module	00_{hex}	No error
				01_{hex}	Channel 1
				:	:
				04_{hex}	Channel 4
				FF_{hex}	Entire device
4	UINT16	2	Error code	See table below	
5	UINT8	1	More follows	00_{hex}	
6	Visible String	14	Text	See table below	

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.

Error and status of the local diagnostics and status 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	◐	●	○	○
Short-circuit	01	03 ... 04	2130	Short-circuit	--	◐	●	○	●
Supply voltage faulty (supply for analog modules (U_A))	01	FF	5160	Supply fail	8020	◐	○	●	●
Device error	01	FF	6301	CS FLASH	8040	◐	●	○	●
Flash format error	01	FF	6302	FO FLASH	8040	◐	●	○	●
Parameter table invalid	01	FF	6320	Invalid para	8010	◐	●	○	●
Open circuit	01	01 ... 04	7710	Open circuit	8002	◐	●	○	●
Overrange	02	01 ... 02	8910	Overrange	8001	◐	●	○	●
Underrange	02	01 ... 02	8920	Underrange	8080	◐	●	○	●

○ Off ◐ Green on

● On ◐ Green/yellow flashing

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_{dec}, corresponding to 1.7% of the output range final value.

15.3.2 Reset diagnostic mesages (0019_{hex}: ResetDiag)

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

0019_{hex}: Reset diagnostic mesages (read, write)				
Subindex	**Data type**	**Length in bytes**	**Code (hex)**	**Meaning**
0	UINT8	1	00	Permit all diagnostic messages
			02	Delete and acknowledge all diagnostic messages that are still pending
			06	Delete and acknowledge all diagnostic messages, reset the error counter, and do not permit new diagnostic messages
			Other	Reserved

15.4 Objects for process data management

15.4.1 Substitute value behavior during bus reset (PDOUT) (0024_{hex}: 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_{hex}: substitute value behavior during bus reset (PDOUT) (read, write)			
Subindex	**Data type**	**Length in bytes**	**Meaning**
0	Array	2 * 2	Substitute value behavior during bus reset (PDOUT)

Element	Data type	Length in bytes	Meaning	Contents	Default value
1	UINT16	2	Behavior of channel OUT01	0000 ... 0003_{hex}	0002_{hex}
2	UINT16	2	Behavior of channel OUT02	0000 ... 0003_{hex}	0002_{hex}

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" ($002F_{hex}$) object

Behavior of the outputs when the supply voltage fails

U_A	U_{Bus}	Behavior of the outputs
Available	Available	Nominal operation or see object 0024_{hex}
Missing	Available	Outputs to 0 V/0 mA
Available	Missing	Hold the last values (as with object 0024_{hex}, 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_{hex}.

15.4.2 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}: IN process data (read)			
Subindex	**Data type**	**Length in bytes**	**Meaning**
0	Octet string	4	Input process data

15.4.3 OUT process data (0026_{hex}: 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_{hex}: OUT process data (read, write)			
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".

15.4.4 Request exclusive write access (0027_{hex}: GetExRight)

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

0027_{hex}: Request exclusive write access (read, write)					
Subindex	**Data type**	**Length in bytes**	**Meaning**	**Contents**	
0	Simple variable	1	Get exclusive process data write rights	00_{hex}	Rights for writing output data over the PD channel (process data channel)
				01_{hex}	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_{hex} “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_{hex} PDOUT. 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.

15.4.5 Substitute value for the OUT process data ($002F_{hex}$: 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_{hex}).

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).

$002F_{hex}$: Substitute value for the OUT process data (read, write)			
Subindex	**Data type**	**Length in bytes**	**Meaning**
0	Array of UINT16	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_{hex}.

15.5 Objects for device management

15.5.1 Password ($001D_{hex}$: Password)

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

$001D_{hex}$: Password (Write)			
Subindex	**Data type**	**Length in bytes**	**Meaning**
0	Simple variable	9	Password

15.5.2 Parameter record write control (0029_{hex}: ParamSetWriteControl)

This object is used to control block parameterization.

0029_{hex}: Parameter record write control (read/write)				
Subindex	**Data type**	**Length in bytes**	**Meaning/contents**	
0	UINT8	1	00_{hex}	Termination of block parameterization
			01_{hex}	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_{hex}.

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.
The exact cause of the error can be read in object $002A_{hex}$. The error codes are indicated by object 0080_{hex}.

Not all startup objects have to be written.

The following actions are carried out when the parameter contents are modified:

Write control changes from 00_{hex} to 01_{hex}: initiation of block parameterization

– Block parameterization is initiated
– Conflict dictionary is reset

Write control changes from 01_{hex} to 00_{hex}: termination of block parameterization

– Block parameterization is terminated
– Individual parameterization is active
– Parameterization is checked for compatibility

  Parameters are compatible:
  - The parameter contents are accepted.
  - Write access to the write control parameter is acknowledged positively.

  Parameters are not compatible:
  - The old contents of all the parameters required for block parameterization remain in effect.
  - The conflict dictionary is updated.
  - Write access to the write control parameter is acknowledged negatively.

Error code in the event of negative acknowledgment:

Code (hex)	Additional Code (hex)	Meaning	Corrective
0800 or 0801	0030	Parameter value has left the value range.	Check the parameterization.
	0040	Dependent values were not taken into consideration.	

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

- Initiate block parameterization by writing the value 01_{hex} to object 0029_{hex}.
- Write the parameter table (ParaTable) to object 0080_{hex}.
- Write the substitute value behavior when process data is missing (ResetCode) to object 0024_{hex}.
- Write the substitute value for the OUT process data in the event of an error (PDOUT_Subst) to object $002F_{hex}$.
- Terminate block parameterization by writing the value 00_{hex} to object 0029_{hex}.

15.5.3 Conflict dictionary (002A$_{hex}$: ConflictDictionary)

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

002A$_{hex}$: Conflict dictionary (read)			
Subindex	**Data type**	**Length in bytes**	**Meaning/contents**
0		12	Conflict dictionary

Meaning	Length in bytes	Example	
Subslot	1	00	No subslot
Index	2	00 2F	PDOUT_Subst
Subindex	1	02	Substitute value for OUT02
Parameter number	2	0001	
Error code and class	2	0080	
Additional error code	4	0000 0240	Substitute value for OUT02 outside the limit values

15.5.4 Reset parameterization (002D$_{hex}$: ResetParam)

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

To reset the module value 01_{hex} 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.

15.5.5 Checksum (002E$_{hex}$: CheckSum)

The data of the startup objects is verified with this checksum. The checksum only changes if an object relevant for startup has been changed. The checksum is therefore suitable for comparing the parameterization.

16 Application objects

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

Index (hex)	Object name	Data type	A	L	Rights	Meaning/contents
0080	ParaTable	Array of UINT16	6	6 * 2	R/W	Parameter table
0082	Measured Value Float	Array of Records	2	2 * 6	R	Measured values in the extended float format
0083	PD Min	Array of UINT16	2	2 * 2	R	Minimum process data value
0084	PD Max	Array of UINT16	2	2 * 2	R	Maximum process data value
00F1	StartupObjects	Octet string	1	11	R	Startup objects

16.1 Parameter table (0080_{hex}: 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_{hex}: Parameter table (read, write)				
Subindex	**Data type**	**Length in bytes**	**Meaning**	**Default value**
0	Array of UINT16	6 * 2	Read/write all elements	See subindices
1	UINT16	2	Parameterization of channel IN01	0000_{hex}
2	UINT16	2	Parameterization of channel IN02	0000_{hex}
3	UINT16	2	Parameterization of channel OUT01	0000_{hex}
4	UINT16	2	Parameterization of channel OUT02	0000_{hex}
5	UINT16	2	Data format	0000_{hex}
6	UINT16	2	Reserved	0000_{hex}

Parameterization of channel IN01/02, OUT01/02

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	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	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
Reserved	0111 ... 1110	7 ... E
Channel inactive	1111	F

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

Data format	Code (bin)	Code (hex)
IB IL (default)	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_{hex} (ParaTable) is checked.
If everything is OK, the specifications for object 0024_{hex} (ResetCode) and object $002F_{hex}$ (PDOut_Subst) are checked as these depend on the output range and format.

If errors are detected, they are indicated with additional error code $xx40_{hex}$ (collision with other values).

In the case of an invalid parameterization value, a negative write conformation with the error message 08, 00, $xx30_{hex}$ is generated.
The low byte of the additional error code is 30_{hex} (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_{hex}.

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

The stored data is verified with a checksum. After powering up, ParaTable, together with the substitute values (object $002F_{hex}$) and the value for the behavior when process data is missing (object 0024_{hex}) are loaded from the Flash memory.

Error messages:

Parameterization error	Code (hex)	Additional Code (hex)	Meaning	Corrective
Object 0080_{hex}, subindex = 0, length ≠ 12 bytes	0605	0000	Inconsistent object attributes	Check the call.
Object 0080_{hex}, 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_{hex} and the substitute value is outside the process data limit values	0800	xx40	Collision with other values	
	0800	0540	Channel OUT01, substitute value > positive limit value	
	0800	1540	Channel OUT01, substitute value < negative limit value	
	0800	2540	Channel OUT02, substitute value > positive limit value	
	0800	3540	Channel OUT02, substitute value < negative limit value	

16.2 Measured value in extended float format (0082_{hex}: Measured Value Float)

You can read the IN process data in IB IL or S7-compatible format with the 0025_{hex} object.

The 0082_{hex} object is also available.

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

0082_{hex}: Measured value in extended float format (read)			
Subindex	**Data type**	**Length in bytes**	**Meaning**
0	Array of Records	2 * 6	Read all elements
1	Record	6	Measured value IN01
2	Record	6	Measured value IN02

Measured values IN01 and IN02

Element	Data type	Length in bytes	Meaning
1	Float 32	4	Measured value in float format according to IEEE 754
2	UINT8	1	Status
3	UINT8	1	Unit

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

VEEE EEEE	EMMM MMMM	MMMM MMMM	MMMM MMMM

V 1 sign bit, 0: positive, 1: negative

E 8 bits exponent with offset $7F_{hex}$

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_{hex}). If status = 0, the measured value is valid.

Unit	Code
Milliampere (mA)	39 (27_{hex})
Volt (V)	58 ($3A_{hex}$)

Status	Code
Measured value is valid	00_{hex}
Measured value is invalid	Other

16.3 Minimum process data value (0083_{hex}: PD Min)

Object 0083_{hex} 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 $7FFF_{hex}$

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

0083_{hex}: Minimum process data value (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 IN01
2	Integer 16	2	Minimum process data value channel IN02

16.4 Maximum process data value (0084_{hex}: PD Max)

Object 0084_{hex} 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_{hex}

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

0084_{hex}: Maximum process data value (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 IN01
2	Integer 16	2	Maximum process data value channel IN02

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 PLCnext Engineer, as well as in 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 installed.