AXL E PB IOL8 DI4 M12 6P



Axioline E PROFIBUS IO-Link master, plastic housing, 8 IO-Link ports, 4 inputs, 24 V DC, M12 connector

Data sheet
8439_en_16

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1 Description

The Axioline E PROFIBUS IO-Link master is designed for use within a PROFIBUS network.
It enables the operation of up to eight IO-Link sensors/actuators and is also used to acquire digital signals.

PROFIBUS features

- Connection to PROFIBUS DP using M12 connectors (B-coded)
- DP/V1 for Class 1 and Class 2 masters
- Data transmission speed of 9.6 kbps up to 12 Mbps (automatic detection)
- Rotary encoding switches for setting the PROFIBUS address
- Supported PROFIBUS addresses 0 to 126
- PROFIBUS features: Sync mode, Freeze mode, I & M functions
- Device description using GSD file

IO-Link features

- Connection of 8 IO-Link devices
  - 4 IO-Link A ports with additional digital input
  - 4 IO-Link B ports with additional power supply
- Connection of IO-Link ports using M12 connectors (A-coded, 5-pos.)
- Parameter data storage on the IO-Link master
- Parameterizable process data width
- Support of the IOL_CALL function block
- IO-Link specification V1.1.2

General features

- Diagnostic and status indicators
- Short-circuit and overload protection of the sensor supply
- IP65/67 degree of protection

Observe these notes

This data sheet is only valid in association with the corresponding documentation.
Make sure you always use the latest documentation.
It can be downloaded via the product at phoenixcontact.com/products.

The IO-Link master does not support IODD interpretation for the parameterization of connected IO-Link devices. Use the supported function blocks to parameterize connected IO-Link devices.

2 Table of contents

1 Description 1
2 Table of contents 2
3 Ordering data 3
4 Technical data 4
5 Internal circuit diagram 9
6 Pin assignment 10
6.1 PROFIBUS and power supply connection 10
6.2 PROFIBUS pin assignment 10
6.3 Pin assignment of the power supply US/UA 10
6.4 Connecting IO Link Ports and inputs 11
6.5 Pin assignment of the IO-Link ports and inputs 11
7 Connection example 12
8 Connection notes 12
9 Configuration via rotary encoding switch 13
10 Local status and diagnostic indicators 14
10.1 Indicators for bus and power supply 14
10.2 Displaying the IO-Link ports and inputs 15

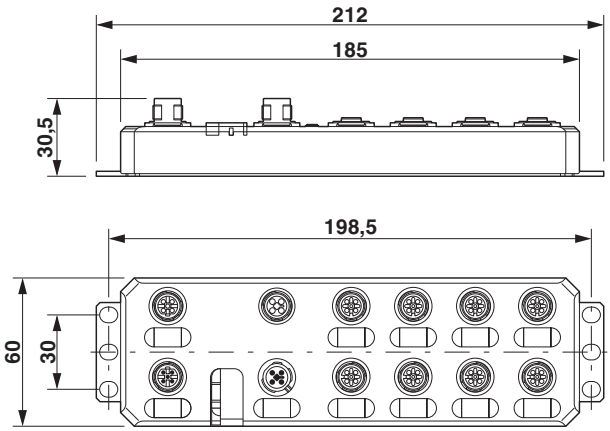
3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
Axioline E, PROFIBUS DP, M12 connector, IO-Link ports Class A: 4, connection method: M12 connector, connection technology: 3-conductor, IO-Link ports Class B: 4, connection method: M12 connector, connection technology: 3-conductor, Digital inputs at pin 2 for class A ports: 4, 24 V DC, connection technology: 3-conductor, Plastic housing, degree of protection: IP65/IP67	AXL E PB IOL8 DI4 M12 6P	2701503	1

Additional ordering data	
For additional ordering data (accessories), go to:	www.phoenixcontact.com/product/2701503

4 Technical data

Dimensions (nominal sizes in mm)	



Width	60 mm
Height	185 mm
Depth	30.5 mm
Note on dimensions	The height is 212 mm including fixing clips.

General data	
Housing material	Pocan®
Color	anthracite
Weight	480 g
Ambient temperature (operation)	-25 °C … 60 °C

CAUTION: Risk of burns

If the device is used at an ambient temperature above 50°C, the contact temperature of metal surfaces can exceed 70°C.

Ambient temperature (storage/transport)	-25 °C … 85 °C
Permissible humidity (operation)	5 % … 95 %
Permissible humidity (storage/transport)	5 % … 95 %
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	IP65/IP67
Protection class	III (IEC 61140, EN 61140, VDE 0140-1)

Connection data	
Connection method	M12 connector

Interface: PROFIBUS DP	
Number	2
Connection method	M12 connector (B-coded)
Number of positions	5
Transmission speed	9.6 kbps ... 12 Mbps (Automatic baud rate detection)
Transmission physics	PROFIBUS-DP-compliant copper cable
PROFIBUS DP	
Equipment type	PROFIBUS slave
PROFIBUS protocols	DP V1
Supply of module electronics and sensors (U_S)	
Connection method	M12 connector (T-coded)
Number of positions	4
Supply voltage	24 V DC
Supply voltage range	19.5 V DC ... 31.2 V DC (including all tolerances, including ripple)
Current consumption	typ. 170 mA ±15 % (at 24 V DC) max. 12 A
Supply of actuators (U_A)	
Connection method	M12 connector (T-coded)
Number of positions	4
Supply voltage	24 V DC
Supply voltage range	18 V DC ... 31.2 V DC (including all tolerances, including ripple)
Current consumption	typ. 30 mA ±15 % (at 24 V DC) max. 12 A
IO-Link ports: Class A	
Number of ports	4
Connection method	M12 connector
Connection technology	3-conductor
Cycle Time	min. 2 ms (MasterCycleTime: PDInput* + PDOutput* + OnReqData* < = 17 Bytes, COM3; * see "IO-Link Interface and System Specification V1.1.2")
IO-Link ports: Class B	
Number of ports	4
Connection method	M12 connector
Connection technology	3-conductor
Cycle Time	min. 2 ms (MasterCycleTime: PDInput* + PDOutput* + OnReqData* < = 17 Bytes, COM3; * see "IO-Link Interface and System Specification V1.1.2")

IO-Link port supply L+	
Nominal voltage for I/O supply	24 V DC
Nominal current for every IO-Link port	max. 150 mA (at C/Q (pin 4), maximum of 1.6 A over all 8 IO-Link C/Q and L+ cables) max. 200 mA (at L+/L- (pin 1 and pin 3), during startup, up to 1.6 A for short periods) max. 2 A (at U_A (IO-Link B ports, pin 2 and pin 5))
Overload protection	yes
Permissible cable length	< 20 m (to the sensor)

IO-Link ports in digital input (DI) mode	
Number of inputs	max. 8 (EN 61131-2 type 1)
Connection method	M12 connector, X01 ... X04 have double occupancy
Connection technology	3-conductor
Nominal input voltage	24 V DC
Nominal input current	typ. 3 mA
Sensor current per channel	max. 200 mA (from L+/L-)
Total sensor current	max. 1.6 A (from L+/L-)
Input voltage range "0" signal	-0.3 V DC ... 5 V DC
Input voltage range "1" signal	15 V DC ... 30 V DC
Input filter time	< 1000 µs
Input frequency	0.5 kHz
Overload protection	yes
Short-circuit protection for the sensor supply	yes

IO-Link ports in digital output (DO) mode	
Number of outputs	max. 8
Connection method	M12 connector, X01 ... X04 have double occupancy
Connection technology	3-conductor
Nominal output voltage	24 V DC
Maximum output current per channel	150 mA
Maximum output current per module	1.2 A
Nominal load, ohmic	3.6 W (160 Ω, at nominal load)
Nominal load, inductive	3.6 VA (0.8 H, 160 Ω, at nominal load)
Signal delay	max. 150 µs (when switched on) max. 200 µs (when switched off)
Switching rate	1 per second, maximum (at nominal inductive load) 5500 per second, maximum (at nominal ohmic load)
Behavior with overload	Shutdown with automatic restart
Overload protection	yes
Short-circuit protection	yes
Limitation of the voltage induced on circuit interruption	-15 V DC
Output voltage when switched off	max. 1 V
Output current when switched off	max. 300 µA

Digital inputs at pin 2 for class A ports	
Number of inputs	4
Connection method	M12 connector, X01 ... X04 have double occupancy
Connection technology	3-conductor
Description of the input	IEC 61131-2 type 1
Nominal input voltage	24 V DC
Nominal input current	typ. 3 mA
Sensor current per channel	max. 200 mA (from L+/L-)
Total sensor current	max. 1.6 A (from L+/L-)
Input voltage range "0" signal	-0.3 V DC ... 5 V DC
Input voltage range "1" signal	15 V DC ... 30 V DC
Input filter time	< 1000 µs
Input frequency	0.5 kHz
Overload protection, short-circuit protection of sensor supply	yes

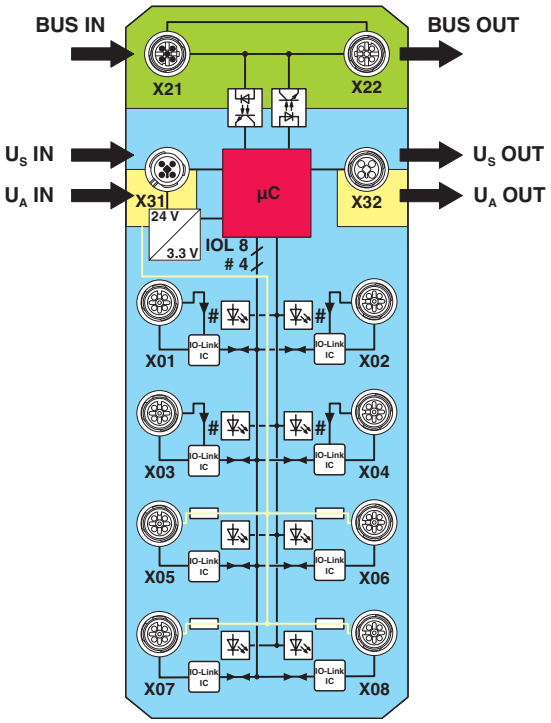
Configuration data	
ID number	0E57
Input address area	min. 2 Byte max. 162 Byte (Dependent on configuration)
Output address area	min. 2 Byte max. 162 Byte (Dependent on configuration)

Electrical isolation/isolation of the voltage areas	
Test section	**Test voltage**
24 V supply (communications power and sensor supply, IO-Link ports)/bus connection	500 V AC, 50 Hz, 1 min.
24 V supply (communications power and sensor supply, IO-Link ports)/FE	500 V AC, 50 Hz, 1 min.
Bus connection / FE	500 V AC, 50 Hz, 1 min.
24 V supply (actuator supply)/24 V supply (communications power and sensor supply, IO-Link ports)	500 V AC, 50 Hz, 1 min.
24 V supply (actuator supply)/bus connection	500 V AC, 50 Hz, 1 min.
24 V supply (actuator supply)/FE	500 V AC, 50 Hz, 1 min.

Mechanical tests	
Vibration resistance in accordance with EN 60068-2-6/IEC 60068-2-6	5g
Shock in accordance with EN 60068-2-27/IEC 60068-2-27	30g, 11 ms period, half-sine shock pulse
Continuous shock in accordance with EN 60068-2-27/IEC 60068-2-27	10g
Conformance with EMC Directive 2014/30/EU	
Immunity test in accordance with EN IEC 61000-6-2	
Electrostatic discharge (ESD) IEC 61000-4-2	Criterion B, ±6 kV contact discharge, ±8 kV air discharge
Electromagnetic fields IEC 61000-4-3	Criterion A, Field intensity: 10 V/m
Fast transients (burst) IEC 61000-4-4	Criterion B, ±2 kV
Transient overvoltage (surge) IEC 61000-4-5	Criterion B, DC supply lines: ±0.5 kV/±0.5 kV (symmetrical/asymmetrical)
Conducted interference IEC 61000-4-6	Criterion A, Test voltage 10 V
Noise emission test in accordance with EN IEC 61000-6-4	Class A
Approvals	
For the current approvals, go to:	www.phoenixcontact.com/product/2701503
Manufacturer's declarations	
For the current manufacturer’s declarations, go to:	www.phoenixcontact.com/product/2701503

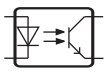
5 Internal circuit diagram

Figure 1 Internal wiring of connections



Key:

Green area:	Network
Blue area:	U_S
Yellow area:	U_A


Optocoupler


Power supply unit with electrical isolation



Microcontroller


Digital input



IO-Link circuit

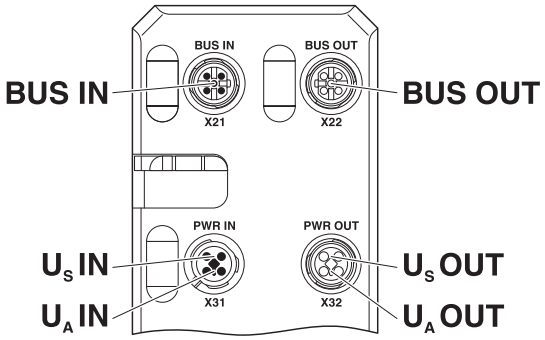

LED


Fuse

6 Pin assignment

6.1 PROFIBUS and power supply connection

Figure 2 Connections for PROFIBUS and power supply



Designation	Meaning
BUS IN (X21)	PROFIBUS IN
BUS OUT (X22)	PROFIBUS OUT
U_S IN (X31)	Power supply IN (logic and sensors)
U_A IN (X31)	Power supply IN (actuators)
U_S OUT (X32)	Power supply OUT for additional devices
U_A OUT (X32)	Power supply OUT for additional devices

Ground the IO-Link master via the mounting screws.

The shield is connected to FE in the IO-Link master.

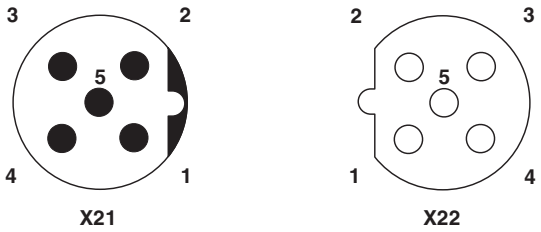
The thread is used for additional shielding.

Make sure that power supply U_A and power supply U_S are supplied by two independent, electrically isolated power supply units.

6.2 PROFIBUS pin assignment

The bus is connected via two B-coded M12 plug-in plugs. The incoming bus (IN) is a plug and the outgoing bus (OUT) is a socket.

Figure 3 PROFIBUS pin assignment, B-coded

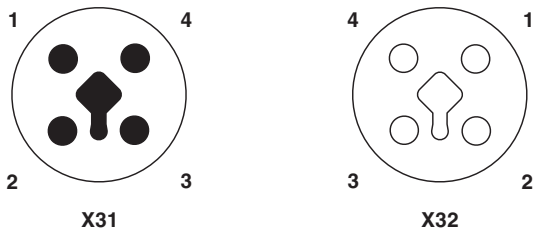


Pin	Signal	Specification	Description
1	VP	V	5 V termination resistor
2	RxD / TxD-N (A)	A, RS-485, PD	Inverted bus cable
3	DGND	V	0 V
4	RxD / TxD-P (B)	B, RS-485, PU	Non-inverted bus cable
5	Not used	-	-

A	=	A line
B	=	B cable
RS-485	=	RS-485 level, bidirectional
V	=	Power supply
PU	=	Pullup
PD	=	Pulldown

6.3 Pin assignment of the power supply U_S/U_A

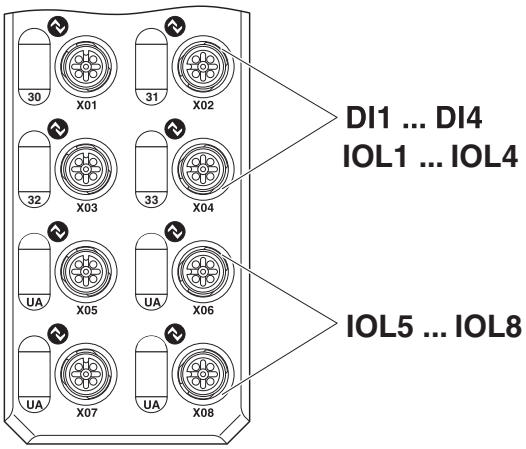
Figure 4 Pin assignment of the power supply, T-coded



Pin	IN	OUT	Conductor colors
1	+24 V DC (U_S)	+24 V DC (U_S)	Brown
2	GND (U_A)	GND (U_A)	White
3	GND (U_S)	GND (U_S)	Blue
4	+24 V DC (U_A)	+24 V DC (U_A)	Black

6.4 Connecting IO Link Ports and inputs

Figure 5 IO-Link port and digital input connections



Designation	Meaning
DI1 ... DI4 (X01 ... X04)	Inputs 1 ... 4 (pin 2)
IOL 1 ... 4 (X01 ... X04)	IO-Link A ports
IOL 5 ... 8 (X05 ... X08)	IO-Link B ports

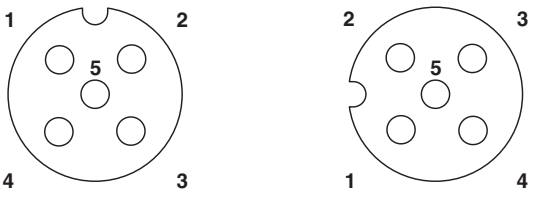
IO-Link A port
The IO-Link A port is assigned an additional hard-wired DI (digital input) at pin 2.

IO-Link B port
The IO-Link B port has an additional supply voltage via pin 2 and pin 5. This port is suitable for connecting devices that have a higher current consumption. There are max. 2 A nominal current provided.

Operating modes
The C/Q cable (pin 4) can be configured independently of the other pins. The IO-Link ports can be operated in the following operating modes:
- DI (behaves like a digital input)
- DO (behaves like a digital output)
- DI with IO-Link
- IO-Link

6.5 Pin assignment of the IO-Link ports and inputs

Figure 6 IO-Link ports pin assignment, A-coded



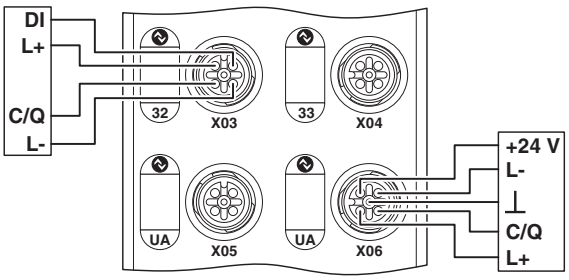
Pin	IO-Link A ports (X01 ... X04)	IO-Link B ports (X05 ... X08)
1	24 V DC (L+)	24 V DC (L+)
2	DI	24 V DC (U_A)
3	GND (L-)	GND (L-)
4	C/Q, IO-Link data transmission channel	C/Q, IO-Link data transmission channel
5	Not used	GND (U_A)

NOTE: Damage to sensors
When connecting an IO-Link class A sensor to an IO-Link B port, make sure that a voltage is present at pin 2 and pin 5. Do not connect these to the sensor.
Use a three-core cable between the port and sensor, e.g., cable type SAC-3P-M12MS/.../... (Item No. 1696662).

Nominal current at L+/L-
Pin 1 and Pin 3 provide a nominal current of 200 mA, maximum. Higher currents are briefly permitted during startup. The current is then limited electronically.

7 Connection example

Figure 7 Typical connection of IO Link devices (IO-Link A ports, X03) and (IO-Link B ports, X06)



8 Connection notes

NOTE: Data corruption or loss

Implement the FE connection using mounting screws, in order to ensure immunity to interference.

NOTE: device damage

In order to guarantee IP65/IP67 degree of protection, fit unused sockets with protective caps.

NOTE: Damage to the electronics

Only supply the IO-Link master and the IO-Link devices with the voltage U_S and U_A provided at the terminal points.

NOTE: Damage to the electronics

In order to prevent damage to the IO-Link master, observe the correct polarity of the supply voltages U_S and U_A.

NOTE: Malfunction

When connecting the IO-Link devices, observe the assignment of the connections.

Fix the IO-Link master to a level surface or to a profile. Do not use the IO-Link master to bridge gaps, in order to prevent forces being transmitted via the IO-Link master.

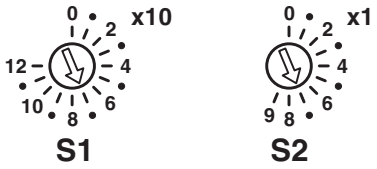
Use standard M5 screws with toothed lock washer and self-locking nuts. Observe the maximum torque of the screws.

9 Configuration via rotary encoding switch

You can assign the address and configure other functions using the rotary encoding switches.

After changing the switch position, restart the IO-Link master, as the change to the switch position does not take effect during operation.

Figure 8 PROFIBUS rotary encoding switch



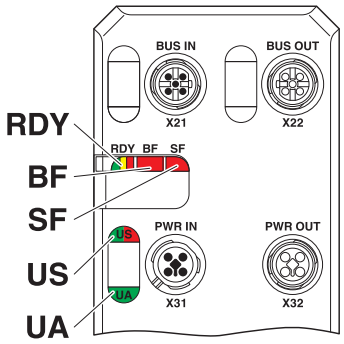
S1	S2	Code	Function
0	0	00	Reserved
0 ... 12	1 ... 5	01 ... 125	Manual address assignment
12	6	126	Setting the slave address (set slave address command)
12	7	127	Reserved
12	8	128	Reserved
12	9	129	Reserved

A new address value is only applied upon power up of the IO-Link master.

10 Local status and diagnostic indicators

10.1 Indicators for bus and power supply

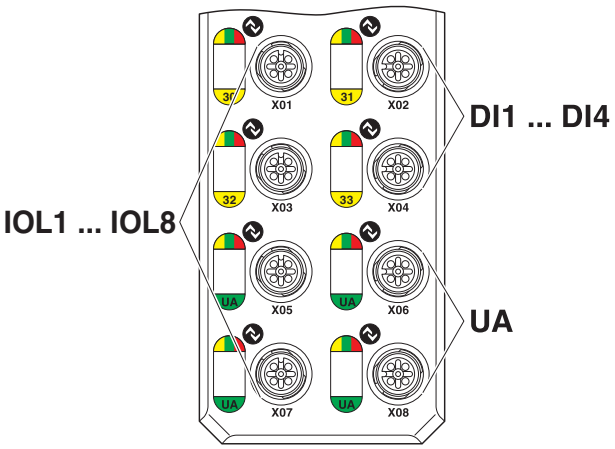
Figure 9 LEDs for bus and power supply



Designation	Color	Meaning	State	Description
RDY	Green/ yellow/ red	**R**ea**dy**	Green on	The IO-Link master is ready to operate.
			Flashing yellow	Firmware update is being performed.
			Flashing green/ yellow	Over- or undervoltage at U_S
				The temperature of the IO-Link master is in the critical range.
				Failure of the actuator supply U_A
				And red US LED: sensor supply overload
			Red on	Rotary encoding switches are set to an invalid/reserved position.
			Off	The IO-Link master is not ready to operate.
BF	Red	**B**us **F**ault	Red on	No communication on PROFIBUS
				The IO-Link master is starting up.
				The IO-Link master does not detect a baud rate.
			Red flashing	The IO-Link master has not been configured by the PROFIBUS master.
				IO-Link master configuration does not match.
				Invalid parameter data received from the PROFIBUS master.
				Invalid bus address
				The IO-Link master is in the clear or stop state.
			Off	No error
SF	Red	Group error	Red on	Device-specific diagnostics present, e.g., short circuit at the I/O devices.
				Hardware is faulty.
				IO-Link master data or parameter data does not match.
			Off	No error
US	Green/ red	**U_S**ensors	Green on	Logic/sensor supply is sufficient.
			Off	Logic/sensor supply not available or insufficient.
			Red on	Sensor voltage overload
UA	Green	**U_A**ctuators	On	Actuator supply available.
			Off	Actuator supply not available.

10.2 Displaying the IO-Link ports and inputs

Figure 10 Displaying the IO-Link port and inputs



Designation	Color	Meaning	State	Description
IO-Link LED	Green/ yellow/ red	Status of the IO-Link ports (X01 ... X08)	Green on	In IO-Link operating mode: IO-Link communication present.
			Flashing green	In IO-Link operating mode: no IO-Link communication.
			Yellow on	In DI or DO operating mode: the digital input or output is set.
			Red on	In IO-Link mode: IO-Link communication error
			Red on	In IO-Link mode: overload of the L+/L- cable
			Red on	In DI or DO mode: overload of the L+/L- cable
			Red on	Overload of the C/Q cable
			Off	In DI or DO mode: the digital input or output is not set.
30 ... 33	Yellow	Status of the digital inputs	On	Input is set.
			Off	Input is not set.
UA	Green/ red	Actuator supply for X05 ... X08	Green on	Actuator supply available.
			Off	Actuator supply not available.
			Red on	Short circuit between pin 2 and pin 5

The numbering of the LEDs is as follows: the first number specifies the byte, the second number specifies the bit.