

IndraControl S67E IO-Link master for Sercos, 24 V DC

R911379704
Edition 01

Data sheet S67E-S3-IOL8-DI4-M12-6P

8 IO-Link ports
4 digital inputs
M12 fast connection technology
Plastic housing

07/2019



1 Description

The IndraControl S67E device is designed for use within a Sercos® network. It enables the operation of up to eight IO-Link sensors/actuators and is also used to acquire digital signals.

Sercos features

- Connection to Sercos network using M12 connectors (D-coded)
- Implementation according to Sercos Profile Version V1.3.1/V1.3.2 with the following functionalities:
 - Hot plug, Diagnostic trace, Sercos IPS, Fast startup, I/O profile, Firmware update
- Maximum number of cyclic data: 272 bytes (IN and OUT)
- Sercos address assignment either via the IDN S-0-1040 or via rotary coding switches
- Minimum cycle time of 1 ms
- Device description by means of SDDML

IO-Link features

- Connection of eight 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.)
- Parameterizable process data width
- IO-Link specification v1.1
- Access to all IO-Link parameters according to Sercos specification
- IO-Link update time and data storage behavior port granular adjustable
- Minimum cycle time of 2 ms

General features

- Diagnostic and status indicators
- Short-circuit and overload protection of the sensor supply
- Integrated web server for web-based management
- IP65/67 degree of protection

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3 Ordering data

Description	Type	MNR	Pcs./Pkt.
IndraControl S67E IO-Link master for Sercos, 24 V DC	S67E-S3-IOL8-DI4-M12-6P	R911174437	1
Documentation	Type	MNR	Pcs./Pkt.
IndraControl S67E: system and installation	DOK-CONTRL-S67E*SYSINS-APRS-EN-P	R911379700	1
Network-specific properties of the S67E IO-Link Master for Sercos	DOK-CONTRL-S67E*S3*IOL-APRS-EN-P	R911386382	1



This data sheet is only valid in association with the application descriptions for the IndraControl S67E system, material numbers R911386382 and R911379700.



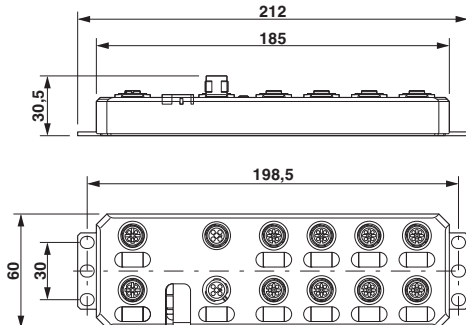
Make sure you always use the latest documentation.
It can be downloaded under www.boschrexroth.com/electrics.
You will always find the current SDDML-files here.

Additional ordering data

For additional ordering data (accessories), please refer to the product catalog at www.boschrexroth.com/electrics.

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 may exceed 70°C.

Ambient temperature (storage/transport)	-25 °C ... 85 °C
Permissible humidity (operation)	5 % ... 95 %

General data

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
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Interface: Sercos

Number	2
Designation connection point	Copper cable
Connection method	M12 connectors, D-coded
Number of positions	4
Transmission speed	100 Mbps (with autonegotiation)



Sercos and IO-Link run independently and exchange data via a buffer. This ensures that the IO-Link connection does not slow down the Sercos network..

Sercos

Equipment type	Sercos slave
Device profile	FSP_IO
Sercos protocols	Sercos, S/IP
Additional protocols	HTTP, TFTP, FTP
Specification	Sercos specification 1.1.2

Supply: 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. 180 mA ±15 % (at 24 V DC) max. 12 A

Supply: 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. 28 mA ±15 % (at 24 V DC) max. 12 A

IO-Link ports: Class A

Number of ports	4
Connection method	M12 fast connection technology
Connection technology	3-wire
MasterCycleTime	min. 2 ms (PDInput* + PDOOutput* + OnReqData* ≤ 17 byte, COM3) * see "IO-Link Interface and System Specification V1.1.2"

IO-Link ports: Class B

Number of ports	4
Connection method	M12 fast connection technology
Connection technology	3-wire
MasterCycleTime	min. 2 ms (PDInput* + PDOOutput* + OnReqData* < = 17 byte, COM3) * see "IO-Link Interface and System Specification V1.1.2"

IO-Link

Nominal voltage for I/O supply	24 V DC
Nominal current for every IO-Link port	150 mA at IO-Link / IN1 (pin 4), max. 1.6 A across all 8 IO-Link / IN1 cables and 24 V cables) 200 mA at 24 V (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 conductor length to the sensor	< 20 m

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-wire
Nominal input voltage	24 V DC
Nominal input current	typ. 3 mA
Sensor current per channel	max. 200 mA
Total sensor current	max. 1.6 A
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-wire
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)
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

IO-Link ports in digital output (DO) mode

Behavior with overload	Shutdown with automatic restart
Overload protection	yes
Short-circuit protection	yes

Digital inputs at pin 2 for type A ports

Number of inputs	4 (EN 61131-2 type 1)
Connection method	M12 connector, X01 ... X04 have double occupancy
Connection technology	3-wire
Nominal input voltage	24 V DC
Nominal input current	typ. 3 mA
Sensor current per channel	max. 200 mA (from 24 V, pin 1 and pin 3)
Total sensor current	max. 1.6 A (from 24 V, pin 1 and pin 3)
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

Electrical isolation/isolation of the voltage areas

Test section	Test voltage
24 V supply (communications power and sensor supply, IO-Link ports)/bus connection (Ethernet 1)	500 V AC, 50 Hz, 1 min.
24 V supply (communications power and sensor supply, IO-Link ports)/bus connection (Ethernet 2)	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 (Ethernet 1)/FE	500 V AC, 50 Hz, 1 min.
Bus connection (Ethernet 2)/FE	500 V AC, 50 Hz, 1 min.
Bus connection (Ethernet 1)/bus connection (Ethernet 2)	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 (Ethernet 1)	500 V AC, 50 Hz, 1 min.
24 V supply (actuator supply)/bus connection (Ethernet 2)	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 acc. with EN 60068-2-6/IEC 60068-2-6	5g
Shock in acc. with EN 60068-2-27/IEC 60068-2-27	30g, 11 ms period, half-sine shock pulse
Continuous shock in acc. with 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

Conformance with EMC Directive 2014/30/EU

Transient overvoltage (surge) EN 61000-4-5/IEC 61000-4-5	Criterion B, DC supply lines: $\pm 0.5 \text{ kV}/\pm 0.5 \text{ kV}$ (symmetrical/asymmetrical)
Conducted interference EN 61000-4-6/IEC 61000-4-6	Criterion A; Test voltage 10 V
Noise emission test as per EN 61000-6-4	Class A

Approvals

For the latest approvals, please visit www.boschrexroth.com/electrics.

5 Internal circuit diagram

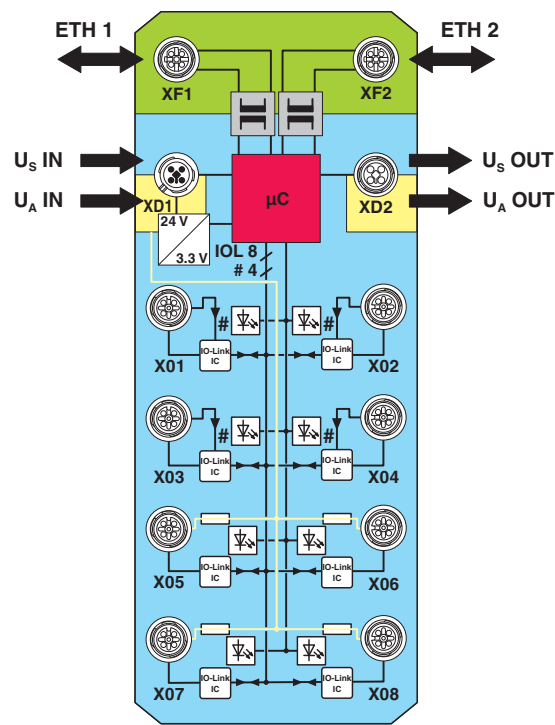


Fig. 1 Internal wiring of connections

Key:

- | | |
|--------------|---------|
| Green area: | Network |
| Blue area: | U_S |
| Yellow area: | U_A |
-
- | | |
|--|---|
|  | Transmitter with electrical isolation |
|  | Power supply unit with electrical isolation |
|  | Microcontroller |
|  | Digital input |
|  | IO-Link circuit |
|  | LED |
|  | Fuse |

6 Pin assignment

6.1 Sercos and power supply connection

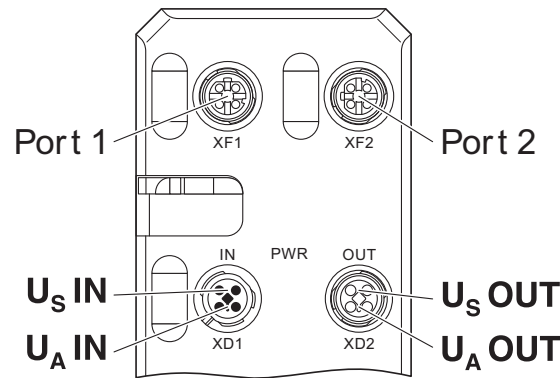


Fig. 2 Connections for Sercos and power supply

Designation	Meaning
Port 1 (XF1)	Ethernet port 1
Port 2 (XF2)	Ethernet port 2
U _S IN (XD1)	Power supply IN (logic and sensors)
U _A IN (XD1)	Power supply IN (actuators)
U _S OUT (XD2)	Power supply OUT for additional devices
U _A OUT (XD2)	Power supply OUT for additional devices



Ground the device by means of the mounting screws.

6.2 Sercos pin assignment

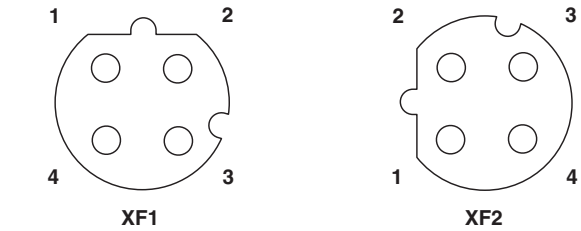


Fig. 3 Pin assignment, D-coded

Pin	Ethernet port 1 (XF1)	Ethernet port 2 (XF2)
1	TX+	TX+
2	RX+	RX+
3	TX-	TX-
4	RX-	RX-



The shield is connected to FE in the device.



The thread is used for additional shielding.

6.3 Pin assignment of the power supply U_S/U_A

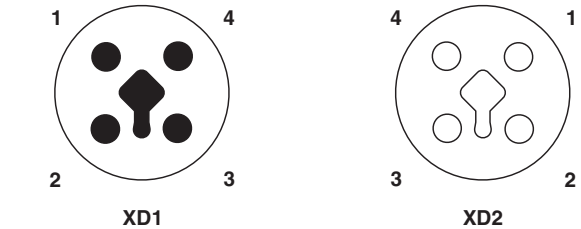


Fig. 4 Pin assignment of the power supply, T-coded

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

NOTICE **Damage to the electronics**
Make sure that power supply U_A and power supply U_S are supplied by two independent, electrically isolated power supply units.

6.4 Connecting IO Link Ports and inputs

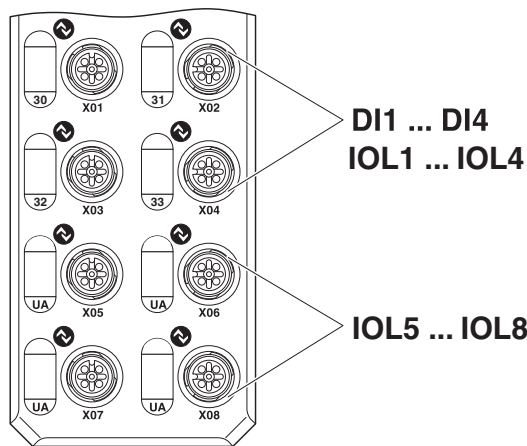


Fig. 5 IO-Link port and digital input connections

Designation	Meaning
IO-Link 1 ... 8 (X01 ... X08)	IO-Link ports 1 ... 8
IN1 ... IN4 (X01 ... X04)	Digital inputs 1 ... 4



IO-Link A port

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

IO-Link B port

The IO-Link B port has an additional supply voltage via pins 2 and 5. This port is suitable for connecting devices with a higher current consumption. A maximum 2 A nominal current is provided.

Operating modes

The IO-Link / IN1 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 as a digital input)
- - DO (behaves as a digital output)
- - DI with IO-Link
- - IO-Link

6.5 Pin assignment of the IO-Link ports and inputs

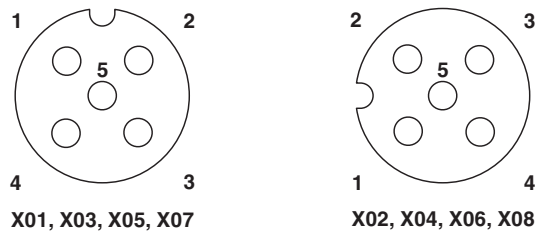


Fig. 6 IO-Link ports pin assignment, A-coded

Pin	IO-Link A ports (X01 ... X04)	IO-Link B ports (X05 ... X08)
1	+24 V	+24 V
2	IN2	AUX 24 V
3	0 V	GND
4	IO-Link / IN1	IO-Link / IN1
5	Not used	AUX 0 V

NOTICE Damage to the electronics

When connecting an IO-Link type 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.



Nominal current at 24 V

Pins 1 and 3 provide a maximum nominal current of 200 mA. Higher currents are permitted briefly during startup. The current is then limited electronically.

7 Connection example

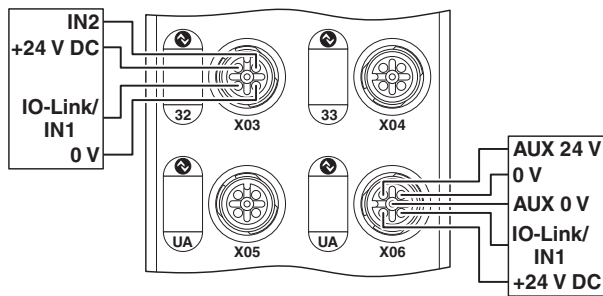


Fig. 7 Typical connection of IO Link devices
(IO-Link A ports, X03) and
(IO-Link B ports, X06)

8 Connection notes

NOTICE Data loss

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

NOTICE Damage to the electronics

To ensure IP65/67 degree of protection, cover unused sockets with protective caps.

NOTICE 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.

NOTICE Damage to the electronics

Observe the correct polarity of the supply voltages U_S and U_A in order to prevent damage to the device.

NOTICE Malfunction

When connecting the IO-Link devices, observe the assignment of the connections to the Sercos input data.



Secure the device to a level surface or to a profile. Do not use this device to bridge gaps, in order to prevent forces being transmitted via the device.



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 configure the address assignment and other functions using rotary encoding switches.

After modifying the switch position, restart the device, as the modification to the switch position does not take effect during operation.

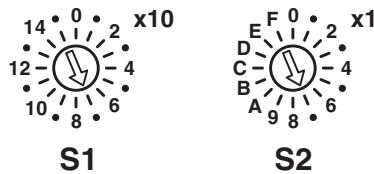


Fig. 8 Rotary encoding switch

The code results from the sum of $S1 \times 10$ plus $S2 \times 1$. The image shows the code and therefore Sercos address 77 ($7 \times 10 + 7$).

S1	S2	Code	Function
0	0	00	Remote address assignment (default) via the Sercos master (see IDN S-0-1040)
0 ... 15	0 ... 09	01 ... 159	Manual address assignment
0	F	0F	Resetting to the default settings
Other			Reserved

9.1 Manual address assignment

Switch position 01 ... 159

The devices are automatically assigned addresses by the Sercos master via remote address assignment as standard.

Set the Sercos address manually with this switch position. Remote address assignment, e.g., via an engineering tool, is deactivated.

9.2 Resetting to the default settings

Switch position 0F

All settings are reset to the delivery state.



The device is ready for operation after powering up, as soon as the RDY LED lights up green. A connection to the device however cannot be established in this switch position. As soon as the RDY LED lights up green, a new switch position can be selected on the rotary encoding switch and the device can be restarted.

9.3 Reserved/invalid switch position

The device starts with the previous settings, e.g., with the settings that were valid before the device was restarted.

10 Local status and diagnostic indicators

10.1 Indicators for Ethernet ports and power supply

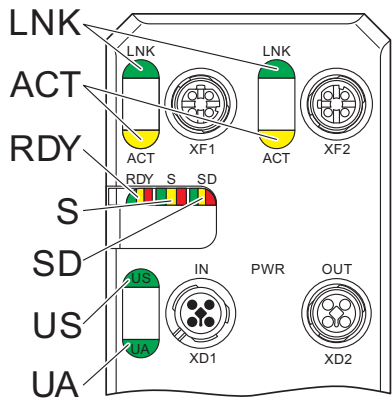


Fig. 9 Indicators for Ethernet ports and power supply

Designation	Color	Meaning	State	Description
LNK 1/2	Green	Link	Green on	Connection is present at port 1/2.
			OFF	Connection is not present at port 1/2.
ACT 1/2	Yellow	Activity	Yellow on	Data transmission is present at port 1/2.
			OFF	Data transmission is not present at port 1/2.
RDY	Green/ yellow/ red	Ready	Green on	Device is ready for operation
			Yellow flashing	Firmware update is being performed.
			Flashing green/ yellow	Over- or undervoltage at U_S
				Temperature of the device is in the critical area.
				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	Device is not ready for operation.

Designation	Color	Meaning	State	Description
S	Green/ orange/ red	Sercos	Flashing orange (2 Hz)	Identification (bit 15 in device control (C-Dev)), used for address assignment and configuration errors.
			Orange on	CP0
			Flashing orange/green	CP1: 250 ms green, 2750 ms orange
			Flashing orange/green	CP2: 250 ms green, 250 ms orange, 250 ms green, 2250 ms orange
			Flashing orange/green	CP3: 250 ms green, 250 ms orange, 250 ms green, 250 ms orange, 250 ms green, 1750 ms orange
			Green on	CP4
			Green flashing	Loop back activated
			Flashing red/orange	User error
			Flashing red/green	MST loss
			Red on	Communication error
			Flashing red (2 Hz)	Watchdog error
			OFF	NRT mode; no Sercos communication
SD	Green/ orange/ red	Sub Device	Green on	Sub device is on the operation level (OL)
			Orange on	Sub device is on the parameterization level (PL)
			Red on	Error in the sub device (C1D)
			OFF	Sub device is not active.
US	Green/ red	U _{Sensors}	Green on	Communications power/sensor voltage is present.
			OFF	Communications power/sensor voltage is not present or too low.
			Red on	Sensor voltage overload
UA	Green	U _{Actuators}	On	Actuator voltage is present.
			OFF	Actuator voltage is not present.

10.2 Displaying the IO-Link ports and inputs

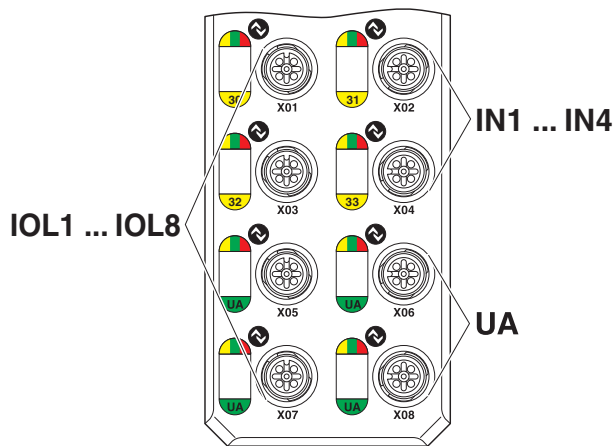


Fig. 10 Displaying the IO-Link port and inputs

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.
			Green flashing	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 operating mode: overload 24 V, pin 1 and pin 3
			Red on	In DI or DO operating mode: overload 24 V, pin 1 and pin 3
			Red on	Overload of the IO-Link (C/Q) cable, pin 4
			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 voltage is present.
			OFF	Actuator voltage is not present.
			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.

Further information on the Sercos data model is to be found in the application description "Network-specific features of the IO-Link master for Sercos".