GB

Operating instructions
IO-Link input / output module (IP 69K)
AL2527

11638939 / 00 11 / 2024

Contents

1 Preliminary note . . . 3
1.1 Symbols used . . . 3
2 Safety instructions . . . 4
3 Intended use . . . 5
4 Function . . . 6
4.1 IO-Link . . . 6
4.1.1 Response when the IO-Link communication is interrupted . . . 6
4.2 Electrical isolation of the voltage supply . . . 6
4.3 Parameter setting . . . 7
4.4 Inputs / outputs . . . 7
4.5 Voltage supply . . . 7
4.5.1 Supply voltage US . . . 7
4.5.2 Supply voltage UA . . . 7
4.5.3 Behaviour in case of undervoltage . . . 7
4.5.4 Limit values, protection against excessive current . . . 7
4.5.5 Derating . . . 7
4.6 Digital input filters . . . 9
4.6.1 Debouncing . . . 9
4.6.2 Hold . . . 10
4.6.3 Inverting . . . 11
4.6.4 Combination of different input filters . . . 12
5 Installation . . . 13
6 Electrical connection . . . 14
6.1 Connecting the device . . . 14
6.1.1 IO-Link connection . . . 14
6.1.2 Mounting the connector . . . 14
6.1.2.1 Maximum cable length . . . 15
7 Operating and display elements . . . 16
7.1 LEDs . . . 16
8 Maintenance, repair and disposal . . . 17

1 Preliminary note

You will find instructions, technical data, approvals and further information using the QR code on the unit / packaging or at documentation.ifm.com.

1.1 Symbols used

✓	Requirement
▶	Instructions
▷	Reaction, result
[...]	Designation of keys, buttons or indications
→	Cross-reference
!	Important note Non-compliance may result in malfunction or interference.
i	Information Supplementary note

2 Safety instructions

- The unit described is a subcomponent for integration into a system.
  - The system architect is responsible for the safety of the system.
  - The system architect undertakes to perform a risk assessment and to create documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the architect of the system.
- Read this document before setting up the product and keep it during the entire service life.
- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.
- Only use the product for its intended purpose (→ Intended use).
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, operation and maintenance of the product must be carried out by qualified personnel authorised by the machine operator.
- Protect units and cables against damage.
- Store the product in its original packaging.

3 Intended use

The device is suited for use in the food and beverage industry (use of cleaning agents under high pressure and at high temperatures).

The device has 8 ports that can be used as follows:

- Digital input
- Digital output

4 Function

After power on, the unit is in the RUN mode (normal operating mode).

4.1 IO-Link

This unit has an IO-Link communication interface which enables direct access to process and diagnostic data. In addition it is possible to set the parameters of the unit while it is in operation. Operation of the unit via the IO-Link interface requires an IO-Link master.

With a PC, suitable IO-Link software and an IO-Link adapter cable, communication is possible while the system is not in operation.

The IODDs necessary for the configuration of the unit, detailed information about process data structure, diagnostic information, parameter addresses and the necessary information about the required IO-Link hardware and software can be found at www.ifm.com.

4.1.1 Response when the IO-Link communication is interrupted

The parameter [Output state COM lost / PD invalid] (index 15000) is used to set how the outputs are to respond when the IO-Link communication is interrupted. For every output it can be defined separately if it:

- 0: [OFF] is to be switched off
- 1: [ON] is to be switched on
- 2: [KEEP LAST] is to keep the last state

Parameter	Index	Subindex	Value	Incre-ments	Factory setting
Output COM lost / PD Invalid X1.0 - 1	15000	1	0 [OFF], 1 [ON], 2 [KEEP LAST]	1	0
Output COM lost / PD Invalid X1.0 - 2		2			
Output COM lost / PD Invalid X1.1 - 1		3			
Output COM lost / PD Invalid X1.1 - 2		4			
Output COM lost / PD Invalid X1.2 - 1		5			
Output COM lost / PD Invalid X1.2 – 2		6			
Output COM lost / PD Invalid X1.3 - 1		7			
Output COM lost / PD Invalid X1.3 - 2		8			
Output COM lost / PD Invalid X1.4 – 1		9			
Output COM lost / PD Invalid X1.4 - 2		10			
Output COM lost / PD Invalid X1.5 - 1		11			
Output COM lost / PD Invalid X1.5 - 2		12			
Output COM lost / PD Invalid X1.6 - 1		13			
Output COM lost / PD Invalid X1.6 - 2		14			
Output COM lost / PD Invalid X1.7 - 1		15			
Output COM lost / PD Invalid X1.7 - 2		16			

Subindex access: true

4.2 Electrical isolation of the voltage supply

The voltage supply of the ports (UA) is electrically isolated from the voltage supply of the IO-Link master (US).

An electrical connection between US and UA eliminates the electrical isolation. This can lead to increased interference in the IO-Link communication.

4.3 Parameter setting

IO Device Description (IODD) with all parameters and process data of the unit can be found at documentation.ifm.com.

4.4 Inputs / outputs

The device has 8 ports (X1.0...X1.7).

Each port has 2 digital inputs/digital outputs.

4.5 Voltage supply

4.5.1 Supply voltage US

The supply voltage US supplies the IO-Link interface.

Switching off US interrupts the power supply for IO-Link communication.

4.5.2 Supply voltage UA

The voltage UA supplies the outputs and sensors of ports X1.0...X1.7.

4.5.3 Behaviour in case of undervoltage

If the voltage supply of the outputs (UA) falls below 16 V, all outputs switch off.

4.5.4 Limit values, protection against excessive current

	AL2527
Total current	16 A
Power supply for sensors (pin1)	800 mA
Max. total current per port group	8 A
Max. current per port	2 A

The total current is limited to 16 A. Each individual port has a current limitation of 2 A. If the current of one port is too high, the device switches off the overloaded port until the current is within the permissible range again.

4.5.5 Derating

Observe the derating of the current carrying capacity as a function of the ambient temperature as follows:

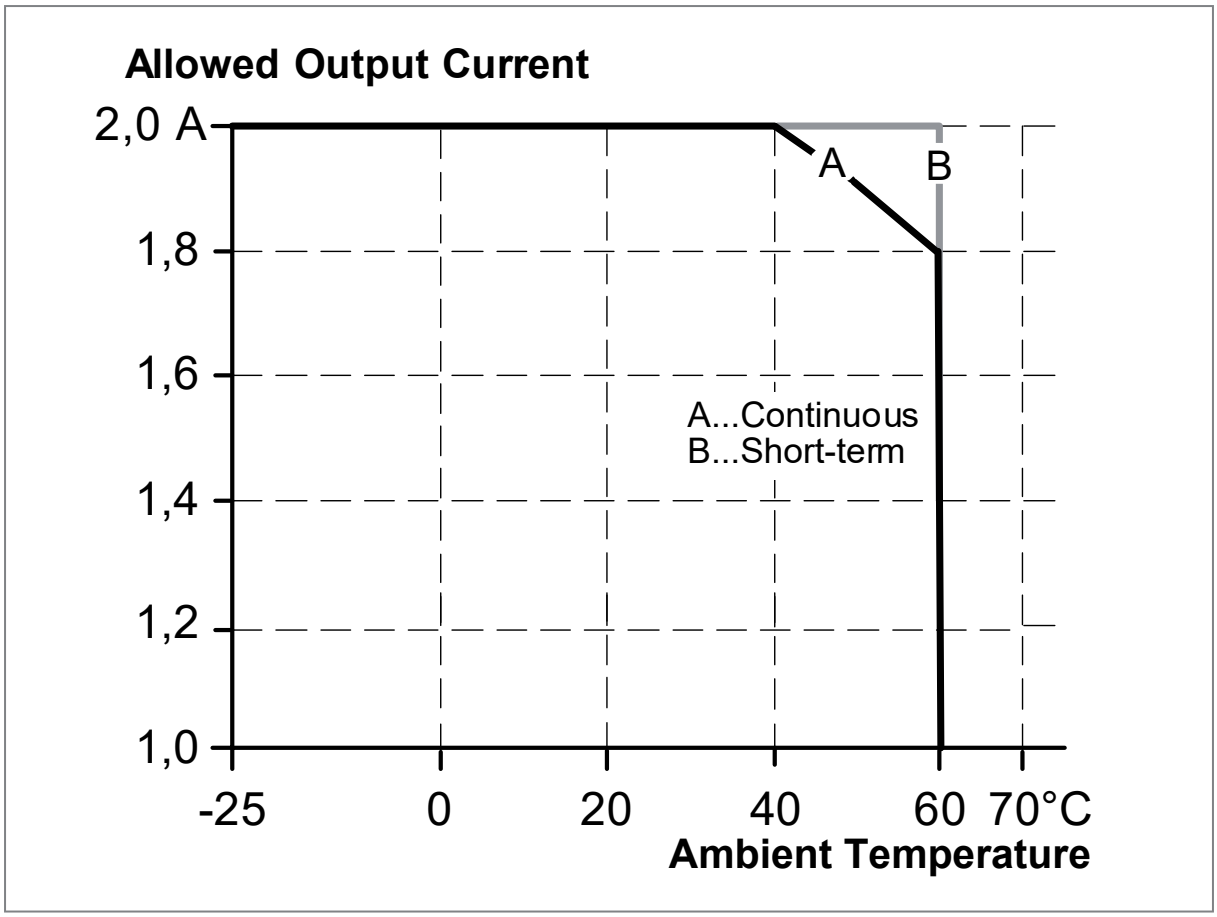


Fig. 1: Max. current per port

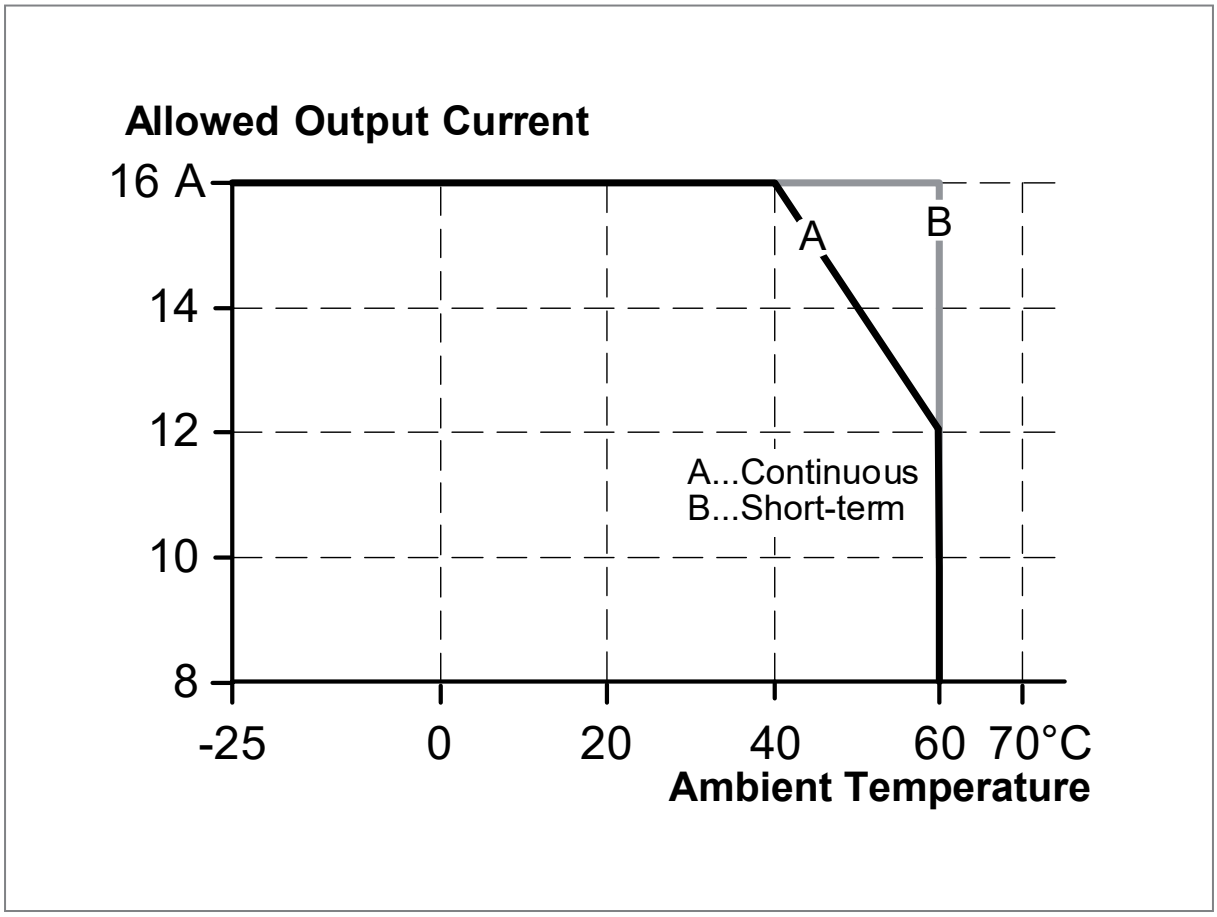
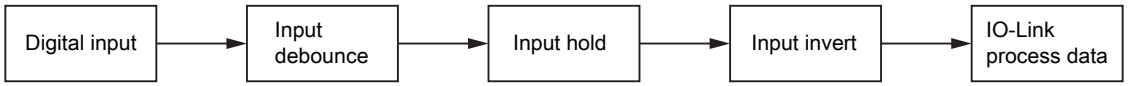


Fig. 2: Total current

4.6 Digital input filters

The input signals can be changed via different filters before they are passed on via IO-Link. The following filters are available and are applied to the input signal in this order:

1. Debounce
2. Hold
3. Inverting



Each of these filters can be configured separately via IO-Link. More information is available in the IODD at documentation.ifm.com.

The device detects signals of a length of min. 2 ms. Shorter signals are not detected.

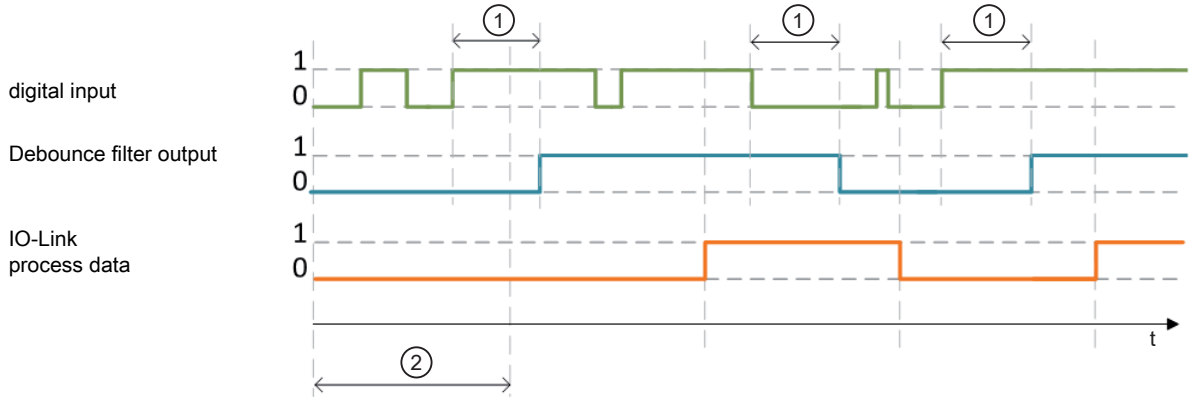
Periodic signals are only detected reliably if the signal period is at least twice as long as the cycle time.

The precision of the digital input filters is ± 1 ms.

4.6.1 Debouncing

The input debouncing filter suppresses noise signals caused by mechanical switches, contacts or relays. The filter provides the input signals at the filter output with a delay (debounce time). All signals shorter than the set debounce time are ignored by the filter.

Time diagram debounce filter:



1: Debounce time
2: Cycle time

Parameter	Index	Subindex	Value (ms)	Increments	Factory setting
Input Debounce time X1.0 - 1	15100	1	0 – 50	1	0
Input Debounce time X1.0 - 2		2			
Input Debounce time X1.1 - 1		3			
Input Debounce time X1.1 - 2		4			
Input Debounce time X1.2 - 1		5			
Input Debounce time X1.2 – 2		6			
Input Debounce time X1.3 - 1		7			
Input Debounce time X1.3 - 2		8			
Input Debounce time X1.4 – 1		9			

Parameter	Index	Subindex	Value (ms)	Increments	Factory setting
Input Debounce time X1.4 - 2	15100	10	0 – 50	1	0
Input Debounce time X1.5 - 1		11			
Input Debounce time X1.5 - 2		12			
Input Debounce time X1.6 - 1		13			
Input Debounce time X1.6 - 2		14			
Input Debounce time X1.7 - 1		15			
Input Debounce time X1.7 - 2		16			

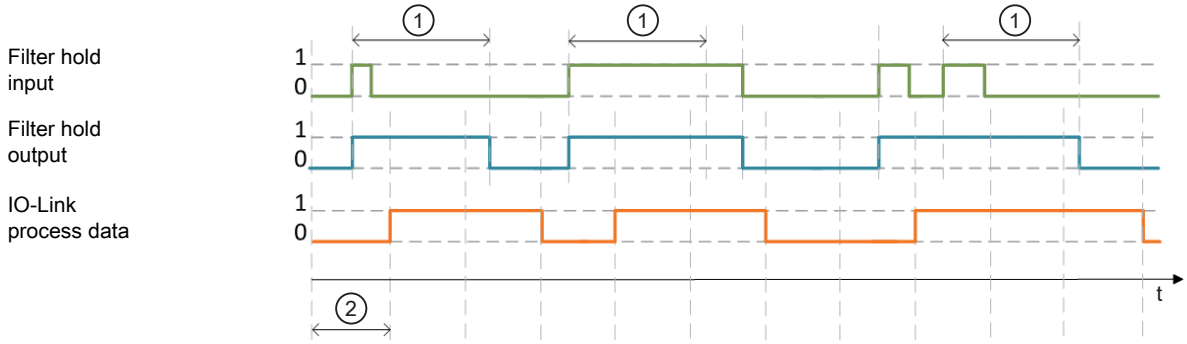
Subindex access: true

4.6.2 Hold

This filter stretches short input pulses. The filter is configured via the following parameters:

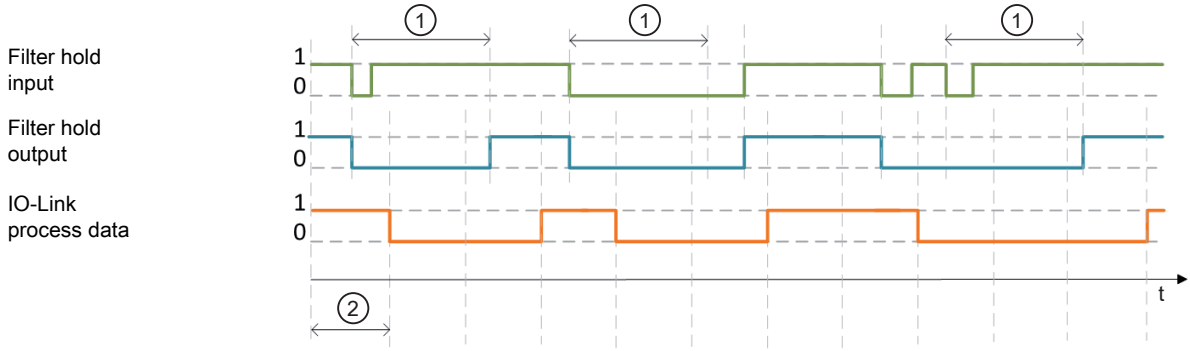
- Hold time: pulse duration to which short pulses are to be stretched. Pulses that are present for a longer time than the hold time are not stretched.
- Hold status: input level to be stretched (HIGH or LOW)

Time diagram hold filter with hold status HIGH:



1: Hold time
2: Cycle time

Time diagram for hold filter with hold status LOW:



1: Hold time
2: Cycle time

Input signals shorter than the cycle time are not reliably transmitted. To ensure a correct signal transmission via IO-Link the hold filter must be used.

Parameter	Index	Subindex	Value (ms)	Increments	Factory setting
Input hold time X1.0 - 1	15101	1	0 – 100	1	0
Input hold time X1.0 - 2		2			
Input hold time X1.1 - 1		3			
Input hold time X1.1 - 2		4			

Parameter	Index	Subindex	Value (ms)	Increments	Factory setting
Input hold time X1.2 - 1	15101	5	0 – 100	1	0
Input hold time X1.2 – 2		6			
Input hold time X1.3 - 1		7			
Input hold time X1.3 - 2		8			
Input hold time X1.4 – 1		9			
Input hold time X1.4 - 2		10			
Input hold time X1.5 - 1		11			
Input hold time X1.5 - 2		12			
Input hold time X1.6 - 1		13			
Input hold time X1.6 - 2		14			
Input hold time X1.7 - 1		15			
Input hold time X1.7 - 2		16			

Subindex access: true

Parameter	Index	Subindex	Value	Increments	Factory setting
Input hold state X1.0 - 1	15102	1	0 [LOW], 1 [HIGH]	-	1
Input hold state X1.0 - 2		2			
Input hold state X1.1 - 1		3			
Input hold state X1.1 - 2		4			
Input hold state X1.2 - 1		5			
Input hold state X1.2 – 2		6			
Input hold state X1.3 - 1		7			
Input hold state X1.3 - 2		8			
Input hold state X1.4 – 1		9			
Input hold state X1.4 - 2		10			
Input hold state X1.5 - 1		11			
Input hold state X1.5 - 2		12			
Input hold state X1.6 - 1		13			
Input hold state X1.6 - 2		14			
Input hold state X1.7 - 1		15			
Input hold state X1.7 - 2		16			

Subindex access: true

4.6.3 Inverting

This filter inverts incoming input signals.

Parameter	Index	Subindex	Value	Increments	Factory setting
Input invert X1.0 - 1	15103	1	0 [NO], 1 [YES]	-	0
Input invert X1.0 – 2		2			
Input invert X1.1 - 1		3			
Input invert X1.1 - 2		4			
Input invert X1.2 - 1		5			
Input invert X1.2 – 2		6			
Input invert X1.3 - 1		7			
Input invert X1.3 - 2		8			

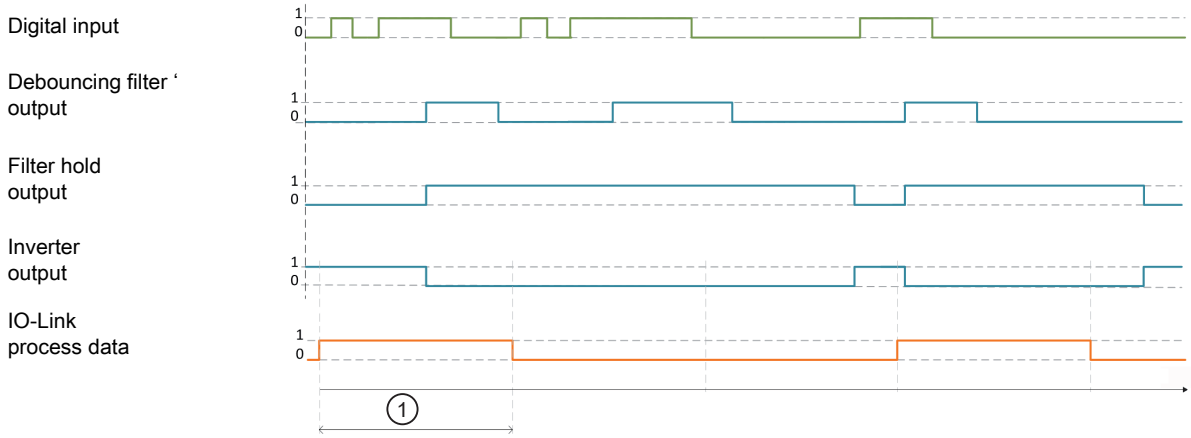
Parameter	Index	Subindex	Value	Increments	Factory setting
Input invert X1.4 – 1	15103	9	0 [NO], 1 [YES]	-	0
Input invert X1.4 - 2		10			
Input invert X1.5 - 1		11			
Input invert X1.5 - 2		12			
Input invert X1.6 - 1		13			
Input invert X1.6 - 2		14			
Input invert X1.7 - 1		15			
Input invert X1.7 - 2		16			

Subindex access: true

4.6.4 Combination of different input filters

The different input filters can be combined.

In the following example all 3 filters are used:



1: Cycle time

5 Installation

▶ Disconnect the power of the machine before installation.

▶ For installation choose a flat mounting surface.

▶ Fasten the module onto the mounting surface using M5 mounting screws and washers. Tightening torque 1.8 Nm.

6 Electrical connection

The unit must be connected by a qualified electrician.

Observe the national and international regulations for the installation of electrical equipment.

Voltage supply according to SELV, PELV.

Do not apply external voltage to the outputs.

The device has digital type 3 inputs. Connected devices must be suitable for these inputs.

- ▶ Protect the UA voltage supply according to the maximum load and the ambient temperature (maximum 16 A).
  The characteristics of the fuse must correspond to the application.
- ▶ Use only UL-certified cables (CYJV or PVVA) with suitable data to connect the device.

6.1 Connecting the device

- ▶ Disconnect power.
- ▶ Connect the unit as follows:

M12 plug, A-coded, IO-Link (X1)

1: L+ (US)
2: not used
3: L- (US)
4: IO-Link

M12 connector, L-coded, voltage supply U_{AUX} (X31)

1: not used
2: L- (UA)
3: not used
4: L+ (UA)
5: FE

M12 socket, A-coded, ports (X1.0...X1.7)

1: L+ (UA)
2: I/O2
3: L- (UA)
4: I/O1
5: FE

6.1.1 IO-Link connection

The IO-Link port must be connected according to the IO-Link specification.

6.1.2 Mounting the connector

The threaded connections in the device correspond to the M12 standard. To ensure compliance with the specified protection rating, only cables that comply with this standard may be used. In the case of self-assembled cables, the system manufacturer is responsible for the protection rating.

- ▶ Use connectors with gold-plated contacts.
- ▶ During installation, place the connectors vertically so that the coupling nut will not damage the thread.
- ▶ Observe the coding of the connectors during installation.

If connector in the device:

▶ Tighten the cable sockets according to the torque specifications indicated by the cable vendor. Maximum permissible tightening torque: 0.8 Nm

If sockets in the device:

▶ Tighten the cable plug using 1.0 ± 0.1 Nm.

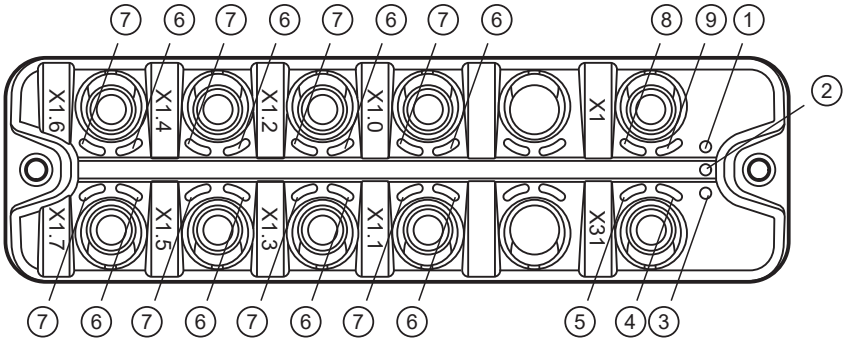
▶ Cover unused connections with protective covers. Tightening torque: 0.6...0.8 Nm

▶ Provide all outgoing cables with suitable strain relief after a maximum of 200 mm. Observe the minimum bending radius of the cables (→ information from the cable manufacturer).

6.1.2.1 Maximum cable length

- Without IO-Link communication: 30 m on each side
- With IO-Link communication: 20 m on the master side

7 Operating and display elements



1:	LED INT	Internal error
2:	LED 1	Port group 1 error
3:	LED 2	Port group 2 error
4:	LED UA	Supply voltage ports
5:	-	Not used
6:	LED I/O2	Status input/output I/O2
7:	LED I/O1	Status input/output I/O1
8:	LED	IO-Link communication
9:	LED US	Supply voltage

7.1 LEDs

LED	Colour	Input/output function	Status	Designation
INT	red		On	Internal error
			Off	No internal error Device in operating mode
1	red		On	Short circuit in port group 1 or undervoltage UA
			Off	No error in port group 1 Device in operating mode
2	red		On	Short circuit in port group 2 or undervoltage UA
			Off	No error in port group 2 Device in operating mode
US	Green		On	Voltage supply ≥ 18 V
			Off	Voltage supply < 16 V
UA	Green		On	Voltage supply ≥ 18 V
			Off	Voltage supply < 16 V
	Green		On	IO-Link communication active
			Off	IO-Link communication not active
I/O1, I/O2	Yellow	Digital input	On	Input signal High
			Off	Input signal Low
			Flashing	Short circuit
		Digital output	On	Output signal High
			Off	Output signal Low
			Flashing	Short circuit

8 Maintenance, repair and disposal

The unit is maintenance-free.

- ▶ Contact ifm in case of malfunction.
- ▶ Do not open the housing as the unit does not contain any components which can be maintained by the user. The unit must only be repaired by the manufacturer.
- ▶ Clean the device using a dry cloth.
- ▶ Dispose of the unit in accordance with the national environmental regulations.