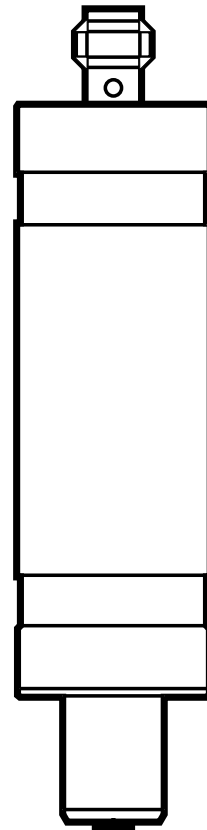


Operating instructions
IO-Link repeater
E30444

UK

11517929 / 00 03 / 2023




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1 Preliminary note

1.1 Symbols used

- ▶ Instruction
- > Reaction, result
- [...] Designation of keys, buttons or indications
- Cross-reference

 Important note
Non-compliance may result in malfunction or interference.

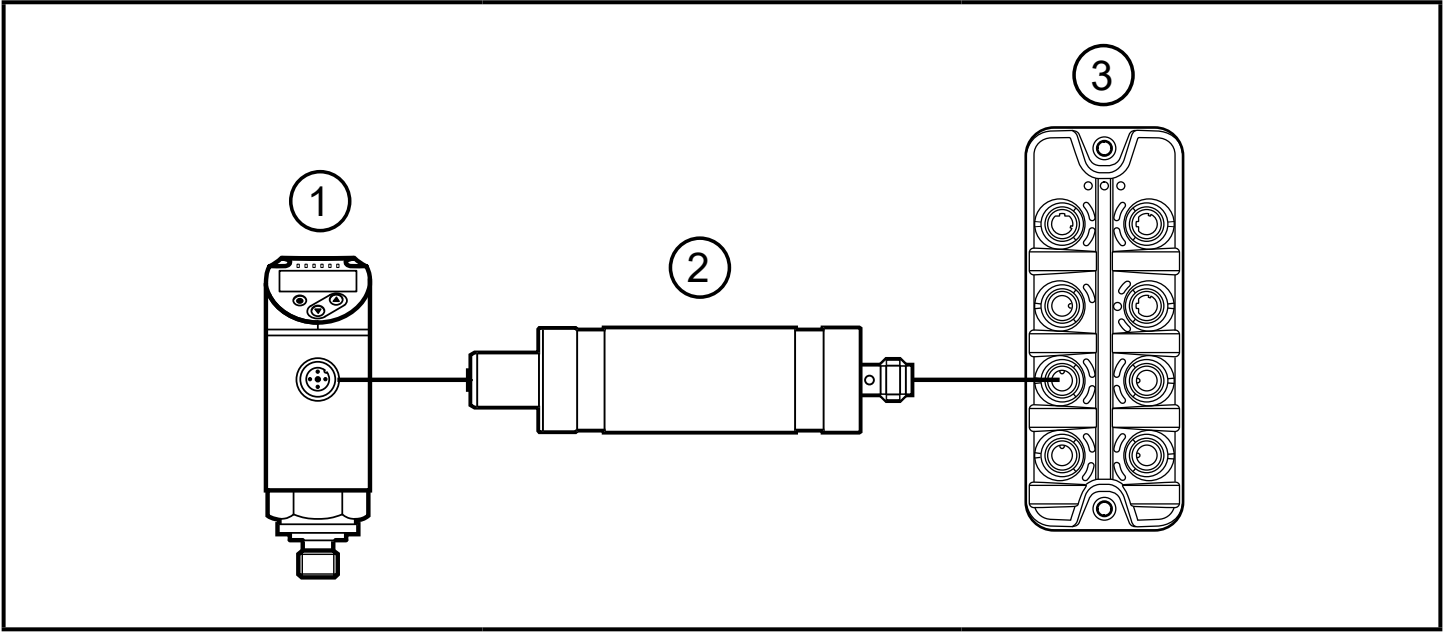
 Information
Supplementary note.

2 Safety instructions

- The device described is a subcomponent for integration into a system.
 - The manufacturer is responsible for the safety of the system.
 - The system manufacturer undertakes to perform a risk assessment and to create a 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 manufacturer 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 (→ Functions and features).
- Only use the product for permissible media (→ Technical data).
- 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, programming, configuration, operation and maintenance of the product must be carried out by personnel qualified and authorised for the respective activity.
- Protect units and cables against damage.

3 Functions and features

The IO-Link repeater is used to extend the range of IO-Link devices. The maximum cable length of IO-Link devices is 20 m. With IO-Link repeaters the cable length can be increased to max. 240 m.



Example of a system integration

1: IO-Link device

2: IO-Link repeater

3: IO-Link master



Ground the unit to protect it against transient overvoltages (→ 5).

3.1 Application area

The device is suitable for use in the food industry.

3.1.1 Restriction of the application area

- Each repeater increases the communication delay time by up to 1 s (depends on the device).
- The process data is delayed by up to 1 cycle per repeater (→ 7.2).
- Acyclic data is delayed by up to 2 cycles per repeater (→ 7.2).
- No SIO mode*) on pin 4 (→ 6) possible (only IO-Link communication).
*) SIO mode = standard input-output mode (conventional switching mode)

4 Maximum cable length and number of repeaters



The max. extension of the cable length depends on the baud rate used, the max. current consumption of the connected IO-Link device and the connection cables used.

4.1 Cross section and maximum cable length

With a defined cable length (max. 240 m) and known current consumption of the device, the required cross section can be determined by means of the following formula:

$$A_{\min} = (I_{\max} + 45) \times L \times k$$

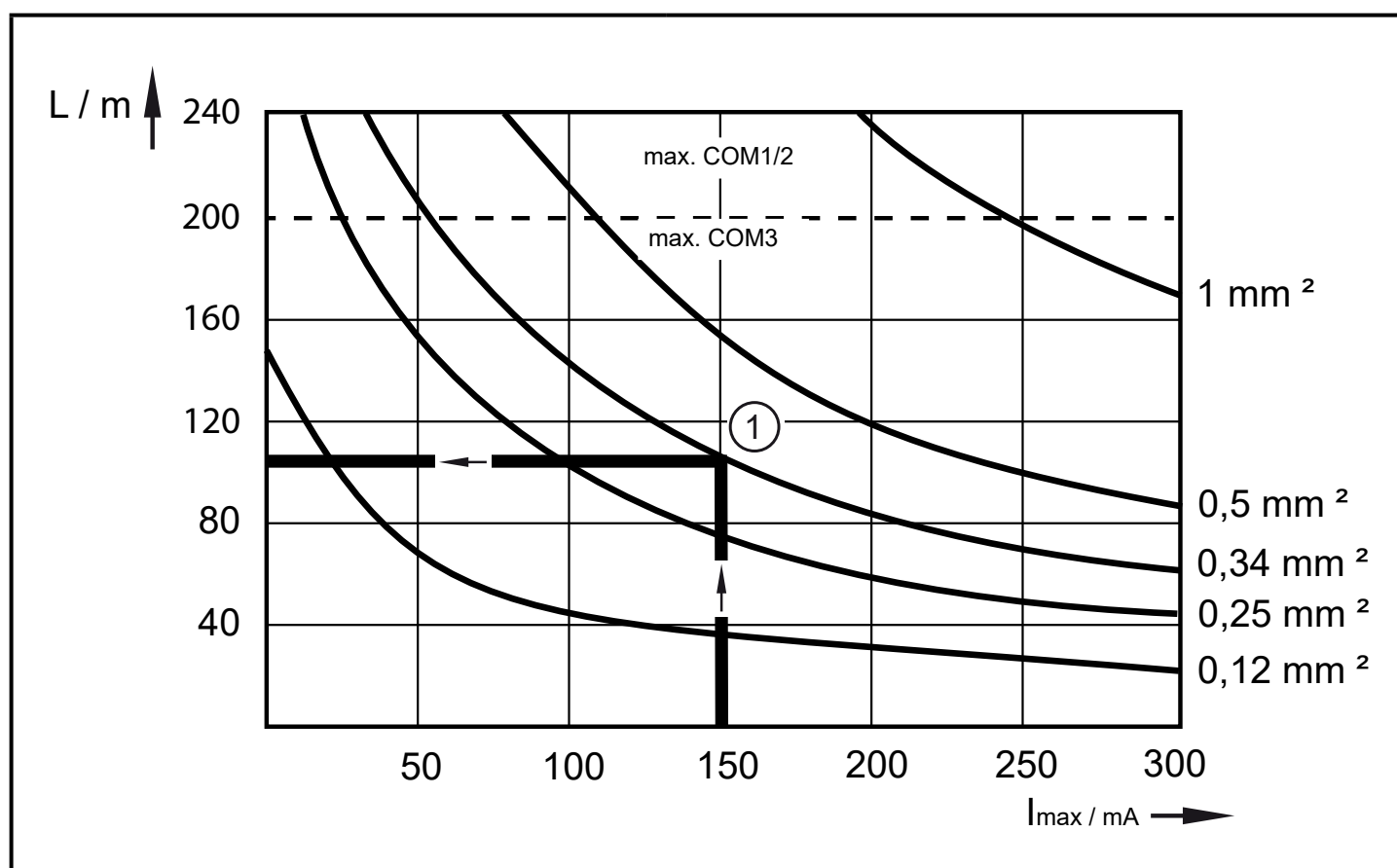
A_{\min} : required minimum cross section in mm^2

I_{\max} : maximum current consumption in mA

L: required cable length in m (max. 240 m)

k: constant with $17.24 \times 10^{-6} \text{ mm}^2 / (\text{mA} \times \text{m})$, applies to copper wires

With a defined cross section and known current consumption of the IO-Link device, the maximum cable length can be determined by means of the following diagram:



L: Maximum cable length

I_{\max} : current consumption of the IO-Link device

(1): Example:

With $I_{\max} = 150 \text{ mA}$, the max. cable length is 100 m with 0.34 mm^2

- Determine the cross section of the wiring used and select the respective graph in the diagram.

- ▶ Determine the current consumption of the device used and (starting from the horizontal axis of the diagram) vertically determine the related point on the selected graph.
- ▶ Read the corresponding maximum cable length L horizontally (starting from the point determined on the graph) on the vertical axis of the diagram.
- ▶ Required number of repeaters and maximum possible partial distances: (→ 4.2).



If the required cable length is shorter than the maximum cable length determined according to the diagram the required cable length is decisive for dimensioning the repeaters.

4.2 Installation instructions and dimensioning of the repeaters



In addition to the required cable length the required number of repeaters and the maximum partial distances also depend on the baud rate used (COM1/2 or COM3).

With COM3, a range of max. 200 m is possible (→ Fig. 6).

- ▶ Do the dimensioning according to the following figures by means of the baud rate used (COM1/2 or COM3) and the required cable length.

4.2.1 COM1 (4.8 kBaud) and COM2 (38.4 kBaud)

Cable length	Dimensioning, maximum partial distances in m
Fig. 1 20...40 m	
Fig. 2 40...140 m	
Fig. 3 140...240 m	

D: IO-Link device

R: IO-Link repeater

I: IO-Link master

4.2.2 COM3 (230 kBaud)

Cable length	Dimensioning, maximum partial distances in m
Fig. 4 20...40 m	
Fig. 5 40...120 m	
Fig. 6 120...200 m	

D: IO-Link device

R: IO-Link repeater

M: IO-Link master

- Example:

The maximum cable length determined in (→ 4.1) is 50 m. The actually needed cable length, however, is only 40 m. The baud rate is COM2.

According to fig. 1, 1 repeater is required.

The partial distances are: 20 m + 20 m = 40 m

- Example:

The maximum cable length determined in (→ 4.1) is 150 m. The actually needed cable length, however, is only 100 m. The baud rate is COM3.

According to fig. 5, 2 repeaters are required.

The partial distances (from left to right) are chosen as follows:

20 m + 60 m + 20 m = 100 m

- Example:

A maximum cable length of 140 m results from (→ 4.1) due to a current consumption of the device of 100 mA and the intended cross section of 0.34 mm². The actually needed cable length, however, is 170 m. As baud rate COM3 is to be used.

Solution A: Instead of the 0.34 mm² cross section used so far, a cross section of 0.5 mm² is intended. This results in a maximum cable length of 200 m.

According to fig. 6, 3 repeaters are required.

The partial distances (from left to right) are chosen as follows:

20 m + 70 m + 60 m + 20 m = 170 m




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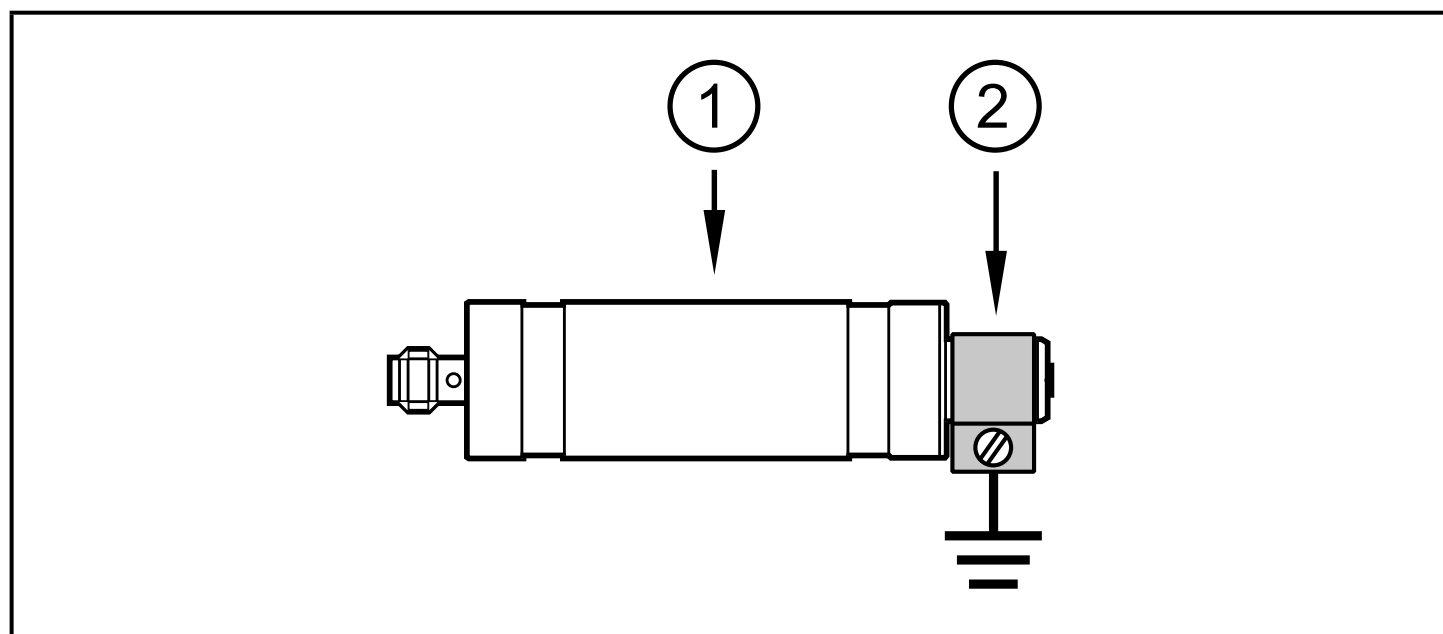
Solution B: A required minimum cross section of 0.42 mm² (→ 4.1). The next higher available cross section of 0.5 mm² is chosen. The partial distances chosen are the same as in solution A.

Advantage over solution A: Cables with a lower cross section can be used (stock-keeping, costs, laying efforts).

5 Installation

5.1 Installation location / environment

-  Ground the unit using the provided grounding terminal. Use a short piece of cable with a minimum core cross-section of 1.5 mm².
-  The cable lengths indicated in (→ 4) only apply if the units are properly grounded.
-  The grounding and the protective circuitry integrated in the unit both offer protection against transient overvoltages.



1: IO-Link repeater

2: Grounding terminal + grounding

- Mount the device so that it is accessible. In case of concealed installation, mark the installation location in an appropriate way to ensure it can be found.
- Avoid heat build-up or impermissible heating of the device. Observe the maximum ambient temperature (→ Technical data)
- Observe the protection rating (→ Technical data)


5.2 Installation procedure


For installation various clamps, mounting kits and connection cables are available (→ Accessories).


- ▶ Mount the device at a suitable location.

The distance between the IO-Link device/IO-Link master and IO-Link repeater may be max. 20 m. The other distances (→ 4).

- ▶ Connect the device with a suitable cable.

 Depending on the type of IO-Link device (port class A or B) use 4-pole or 5-pole connection cables.

 Sensors usually come with a 4-pole connector and actuators with a 5-pole connector.

 Use cables with sufficient cross section. The required cross section results from the cable length needed (→ 4.1).

- ▶ Lay the cables and connect to an IO-Link device, IO-Link repeater(s) and an IO-Link master (→ 6).

6 Electrical connection



The unit must be connected by a qualified electrician.

The national and international regulations for the installation of electrical equipment must be adhered to.

Voltage supply according to SELV, PELV.



Ground the unit to protect it against transient overvoltages (→ 5).

► Disconnect power.

► Connect the unit as follows:

Core colours			
BK	black		
BN	brown		
BU	blue		
WH	white		
GY	grey		
On the device side (1):	On the master side (3):	Pin connection	
		1: L+ (connected through)	
		2: no function (connected through)	
		3: L- (connected through)	
		4: IO-Link	
		5: no function (connected through)	



All pins (except for pin 4) are connected through in the IO-Link repeater, but not electrically isolated from the other electronics (internal supply of the repeater, surge protection).

Pin 4 is used for the regeneration of the IO-Link signal. The repeater function is bidirectional (for the sake of clarity only one direction is indicated in the symbol).

7 Operation

► Check whether the unit operates correctly.

7.1 Operation and diagnostics display

Description	LED
Supply voltage too low	OFF
Device fault, communication error	flashes red at 1 Hz
No IO-Link detected	flashes green at 1 Hz
IO-Link device detected and successful connection to the IO-Link device.	double flash (2 x briefly, green)
Successful connection to the device and master. IO-Link repeater function active	green

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7.2 Delay times

Cyclic data (process data, value status):

The time to transmit cyclic data may be extended by up to 1 cycle per repeater.

- 0 repeater: 1 cycle
- 1 repeater: up to 2 cycles
- 2 repeaters: up to 3 cycles
- 3 repeaters: up to 4 cycles

Acyclic data (e.g. parameter data, diagnostic data):

The time to transmit acyclic data may be extended by up to 2 cycles per repeater.

- 0 repeater: 1 cycle
- 1 repeater: up to 3 cycles
- 2 repeaters: up to 5 cycles
- 3 repeaters: up to 7 cycles



The cycle time is the time span between two data requests of the IO-Link master.

8 Technical data and scale drawing

Technical data and scale drawing at www.ifm.com

9 Maintenance, repair and disposal

- ▶ It is not possible to repair the unit.
- ▶ After use dispose of the unit in an environmentally friendly way in accordance with the applicable national regulations.
- ▶ In case of returns ensure that the unit is free from dangerous and toxic substances.

More information at www.ifm.com