Your Global Automation Partner

TURCK

BI...-M...-2APS8X2-H1141
Inductive Safety Sensor

Safety Manual - Translation

Content

1 About this Manual

1.1 Target groups

These instructions are aimed at qualified personal and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Explanation of symbols used

The following symbols are used in these instructions:

	**DANGER** DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.
	**WARNING** WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided.
	**CAUTION** CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.
	**NOTICE** NOTICE indicates a situation which may lead to property damage if not avoided.
	**NOTE** NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.
▶	**CALL TO ACTION** This symbol denotes actions that the user must carry out.
⇨	**RESULTS OF ACTION** This symbol denotes relevant results of actions.

1.3 Other documents

Besides this document the following material can be found on the Internet at www.turck.com:

- Data sheet
- TÜV certificate
- Type examination certificate
- EU Declaration of Conformity

1.4 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to techdoc@turck.com.

1.5 Document history

Output	Description	Date
1.0	First edition	10.02.2020
2.0	Addendum to chap. 5.1 and 5.3	01.04.2021

The German version shall be considered the definitive document. Every care was taken in the production of the translations of this document. If there is any uncertainty in its interpretation, refer to the German version of the safety manual or contact Turck directly.

NOTE
In all cases use the latest version of this safety manual. Check whether a newer version is available.

2 Notes on the Product

2.1 Scope

This safety manual applies to the following inductive safety sensors:

- BI4-M12-2APS8X2-H1141
- BI8-M18-2APS8X2-H1141
- BI12-M30-2APS8X2-H1141

2.2 Scope of delivery

- Inductive safety sensor
- 2 × fastening nuts
- Safety instructions

2.3 Legal requirements

- 2014/30/EU (electromagnetic compatibility)
- 2011/65/EU (RoHS directive)
- 2006/42/EU (Machinery Directive)

2.4 Turck service

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database under **www.turck.com** contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats.

The contact details of Turck subsidiaries worldwide can be found on p. [▷ 31].

3 Safety Information

3.1 General safety notes

This chapter contains general safety information about the safety sensor. Further safety information is provided in the respective chapters to cover the specific situations in which the product may be used.

WARNING
Hazard due to lack of effectiveness of the protective device
In the case of non-compliance, it is possible that the dangerous state of the machine may not be stopped or not stopped in a timely manner.

- ▶ Please read this document carefully and make sure that you understand the content fully before working with the device.
- ▶ Follow all safety notes in this document.

NOTE
The adhesive strip above the LED displays must not be removed in order to achieve the specified enclosure rating.

3.2 Intended use

The inductive safety sensor is activated by actuating elements (metal objects) without making contact. The safety sensor is suitable for the following applications:

- Safe position and area determination of metal objects

The safety sensor is used for protecting people.

The safety sensor must only be used within the limits of the prescribed and specified technical data and operating conditions at all times.

The devices may only be used as described in these instructions. Any other use is not in accordance with the intended use. Turck accepts no liability for any resulting damage.

3.3 Improper use

The safety sensor is not suitable for the following applications, among others:

- Environments with increased levels of ionizing radiation
- Applications in which the safety sensor is exposed to chemicals, for example cleaning in food processing.
- Outdoors (only suitable for weather-protected areas of application, Class C according to IEC 60654-1)

3.4 Requirements for the qualification of personnel

The safety sensor must be configured, mounted, connected, commissioned, and serviced by qualified safety personnel only.

Project planning

For project planning, a person is considered competent when he/she has expertise and experience in the selection and use of protective devices on machines and is familiar with the relevant technical rules and national work safety regulations.

Mechanical mounting, electrical installation, and commissioning

For the task, a person is considered qualified when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine to be able to assess whether it is in an operationally safe state.

Operation and maintenance

For operation and maintenance, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine and has been instructed by the machine operator in its operation.

4 Product Description

4.1 Structure and function

Description of operation

The safety sensor is activated by actuating elements (metal objects) without making contact.

If an actuating element is situated between the active sensor surface and assured switch-on distance S_{ao}, safety outputs (OSSDs) are safe in the ON state. If an actuating element is situated outside assured safe switch-off distance S_{ar}, safety outputs (OSSDs) are in the OFF state.

The machine or its control must safely analyze the signals (for example using a safe control or safety relays) and stop the dangerous state.

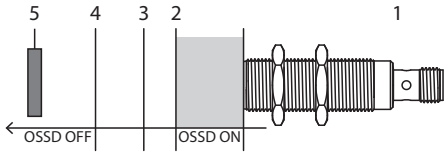

Fig. 1: Device overview

1	Safety sensor
2	Assured switch-on distance S_{ao}
3	Sensing range S_n (switch-on distance under laboratory conditions)
4	Assured switch off distance S_{ar}
5	Actuating element

Assured switch on distance (S_{ao})

Distance from the active sensor surface within which the presence of the actuating element can be safely detected.

The assured switch-on distance is the important value for safe applications.

Sensing range (S_n)

Is detected under laboratory conditions.

Typical sensing range of the safety sensor. The sensing range can change with the shape and material of the actuating element. Manufacturing tolerances as well as external influences such as temperature or supply voltage are not considered.

Assured switch off distance (S_{ar})

Distance from the active sensor surface outside of which the presence of the actuating element is reliably detected.

4.2 Product characteristics

4.2.1 Protective functions

WARNING
Loss of cross-circuit monitoring when output load at the OSSDs is too high
Loss of safety function
- ▶ The safety sensor must always be operated within the limits of the prescribed and specified technical data.

The safety sensor is available for the following internal protective functions:

- Short-circuit protection at all outputs
- Cross-circuit monitoring at the OSSDs
- Overload protection at the OSSDs
- Supply voltage reverse polarity protection

4.2.2 Status indicators

LEDs on the device

The safety sensor signals the operational status via an LED.

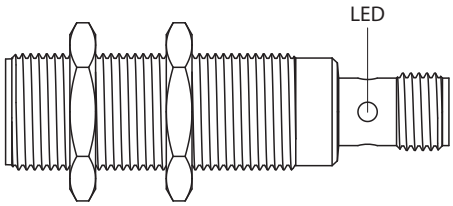

Fig. 2: LED

Item	Name	Color	Purpose
1	STATE	Green/Red	Signals when an object is detected.

5 Engineering

5.1 Manufacturer of the machine

DANGER
Failure to comply with manufacturer's obligations
Hazard due to lack of effectiveness of the protective device

- Carry out a risk assessment before using the safety sensor.
- Do not tamper with, open, or modify the components of the safety sensor.
- Do not repair defective devices – they must be replaced instead.
- Make sure that switch-on commands which bring about a dangerous state of the machine are not enabled until the protective device is closed.
- Ensure that a stop command is triggered if the actuating element is no longer detected (e.g. when the protective device is opened during a hazardous machine status).
- The safety sensors must not be circumvented (contacts bypassed), rotated away, removed, or rendered ineffective in any other way. Put measures in place to reduce possibilities for circumvention.
- Ensure that the safety sensor can only be actuated by the prescribed damping element.

5.2 Operating entity of the machine

DANGER
Failure to observe operator obligations
Hazard due to lack of effectiveness of the protective device

- Changes to the machine and changes to the mechanical mounting of the safety switch necessitate a new risk assessment. The results of this risk assessment may require the entity operating the machine to meet the obligations of a manufacturer.
- Apart from the procedures described in this document, the components of the safety switch must not be opened or modified.
- Do not carry out any repair work on components. Improper repair of the safety switch can lead to a loss of the protective function.

5.3 Design

Important notes

DANGER
Bypassing the safety device
Hazard due to lack of effectiveness of the safety device

- ▶ Use at least one of the following measures to prevent any incentives to manipulate the inductive safety sensor:
  - ▶ Install the safety sensor out of reach.
  - ▶ Cover the safety sensor with obstacles or a screen.
  - ▶ Install the safety sensor in a hidden position.
  - ▶ If possible do not install the safety sensor with the active face of the sensor pointing upward.
- ▶ Ensure that the safety sensor can only be actuated by the prescribed damping element.

DANGER
Damage to the safety sensor through mechanical stress
Loss of the safety function

- ▶ Protect the safety sensor from mechanical stress such as from impact or permanent contact pressure, e.g. by means of an additional mechanical limit.

Mounting location

Select the mounting location so that the safety sensor is protected from impact and mechanical pressure. If necessary fit an additional mechanical limit.

Measures to prevent accidental actuation

The safety sensor can be actuated by any objects made from metal, e.g. metal shavings, doors or moving machine elements. Design measures must be implemented to ensure the safety sensor is only actuated by the intended damping element.

Clearance

If several safety sensors are mounted on the machine, these must be mounted with a minimum distance between each other.

Orientation

The safety sensor can be mounted with any orientation. If the safety sensor is mounted with the face of the sensor pointing upwards, the risk of unintended actuation by loose metal objects (e.g. metal shavings) or manipulation of the safety sensor is increased.

Flush mounting

The devices can be mounted flush with the mounting environment. The active face of the sensor forms a plane with the surrounding material.

5.3.1 Determining the sensing ranges

Sensing ranges S_{ao}, S_{ar} and S_n depend on the material and form of the actuating element. The specified values assume the following prerequisites:

- Length and width of the actuating element: Diameter of the active sensor surface
- Material thickness: 1 mm
- Material of the actuating element: Structural steel (Fe 360)
- Ambient temperature: 25 °C

If the actuating element consists of another material, the specified values for S_{ao}, S_{ar} and S_n must be multiplied with the respective correction factor (values of sensing ranges [▶ 25]).

Correction factor for sensing ranges S_{ao}, S_{ar} and S_n

Material	Correction factor
Mu-metal	1.2
Molded metal	1.1
Structural steel (Fe 360)	1.0
Rust-free steel (V2A, 304)	0.8
Aluminum	0.45
Copper	0.3
Brass	0.4

Example calculation

For a copper actuating element, the safe switch-off distance changes as follows:

$S_{ar/copper} = S_{ar} \times 0.3$

5.4 Integration in the electrical control

Switch on commands that initiate a hazardous machine state must only become effective if the safety sensor detects a damping element. If the machine is in a hazardous state, a Stop command must be triggered if a suitable object is not detected. The signal is evaluated according to the safety concept, e.g. with a safety relay or with a safety controller.

The connected controller and all devices responsible for safety must comply with the required performance level and the required category (e.g. to EN ISO 13849-1:2015, and SIL according to DIN EN 62061:2016, DIN EN 61511:2019).

5.4.1 Course of the OSSD test over time

The safety interlock tests the OSSDs for self diagnostics at regular intervals. For this the safety interlock of each OSSD switches momentarily to the OFF state and checks whether the channel is de-energized in this time.

Ensure that the controller of the machine does not respond to this test pulse and the machine does not switch off.

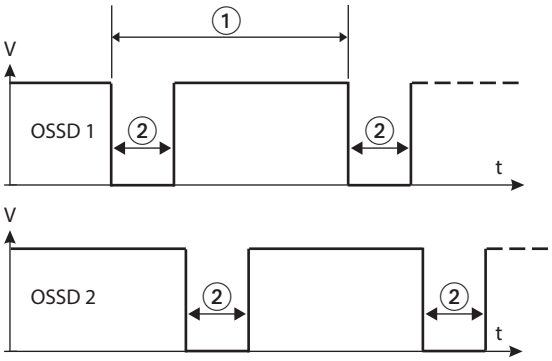

Fig. 3: Time characteristic of the OSSD tests

Legend number	Description	Value
1	Test pulse interval	Normally every 20 ms
2	Test pulse width	300 µs

5.5 Thorough check concept

The safety sensor must be tested by appropriately qualified safety personnel during commissioning, after modifications, and at regular intervals; see “Requirements for the thorough check during commissioning and in certain situations“ [▷ 16].

Regular thorough checks serve to investigate the effectiveness of the safety sensor and discover defects resulting from modifications or external influences (such as damage or manipulation).

The manufacturer and operating entity must define the type and frequency of the thorough checks on the machine on the basis of the application conditions and the risk assessment. The process of defining the thorough checks must be documented in a traceable manner.

5.5.1 Requirements for the thorough check during commissioning and in certain situations

The protective device and its application must be thoroughly checked in the following situations:

- Before commissioning
- After changes to the configuration or the safety function
- After changes to the mounting, the alignment, or the electrical connection
- After exceptional events, such as after a manipulation has been detected, after modification of the machine, or after replacing components

The thorough check ensures the following:

- All relevant regulations are complied with and the protective device is active for all of the machine's operating modes.
- The documentation corresponds to the state of the machine, including the protective device

The thorough checks must be carried out by qualified safety personnel or specially qualified and authorized personnel and must be documented in a traceable manner.

- ▶ Check whether the protective device of the machine is effective in all operating modes in which the machine can be set.
- ▶ Make sure that operating personnel have been instructed in the function of the protective device before starting work on the machine. The operating entity has overall responsibility for the instruction, which must be carried out by qualified personnel.

5.5.2 Minimum requirements for regular thorough checks

The following tests must be carried out at least once a year:

- Test of basic protection function of the safety sensor
- Testing of the assured release and operating distances S_{ar} and S_{ao}
- Check of the sensor housing for damage
- Check of the sensor cables for damage
- Check of the safety sensor for signs of misuse or manipulation

6 Installing

Important notes

DANGER
The switching behavior of the safety sensor will be affected if it is not mounted as specified.
The safety sensor may possibly not switch as intended.

- For flush mounting, only use safety sensors that are designed for flush mounting.
- For non-flush mounting, the switching distances may vary depending on the exact distance and the metal used for mounting. Check the proper operation of the sensor before commissioning.

Procedure

- Observe the max. tightening torque (12 Nm) for installation.

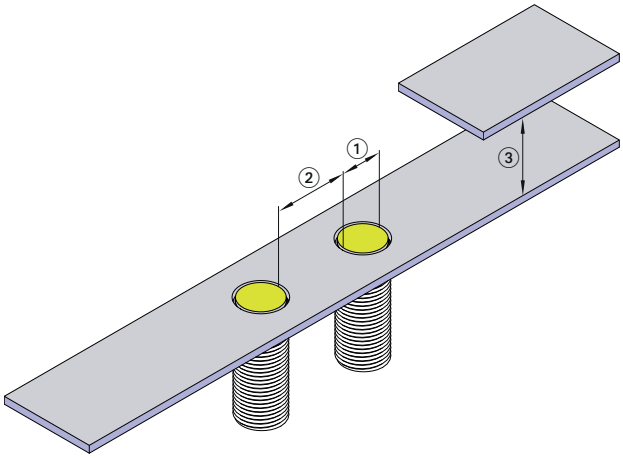

Fig. 4: Clearances for flush mounting

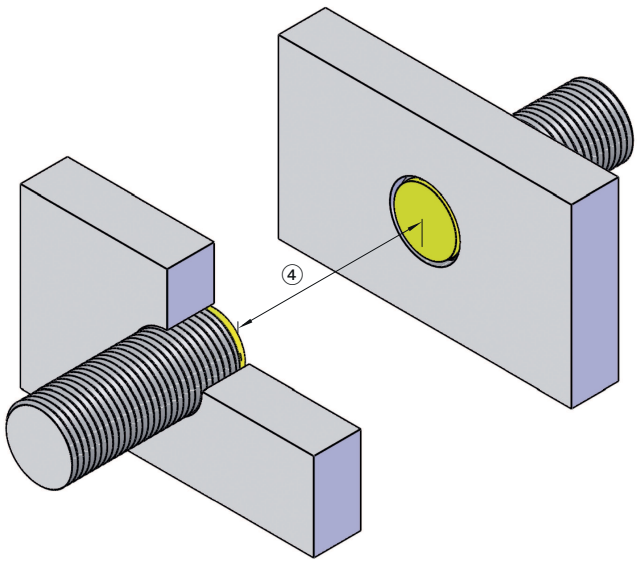

Fig. 5: Clearance with two opposite safety sensors

Dimensions for flush mounting in mm

Variant	1 Diameter of the safety sensor (D)	2 Minimum clearance to neighboring safety sensor	3 Minimum clearance above the active sensor face	4 Minimum clearance to opposite safety sensor
BI4-M12-2APS8X2-H1141	12	> 24	> 12	> 32
BI8-M18-2APS8X2-H1141	18	> 36	> 24	> 64
BI12-M30-2APS8X2-H1141	30	> 60	> 36	> 96
General Formulas	–	2 × D	> 3 × S_n	> 8 × S_n

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7 Electrical Installation

7.1 Safety

Overview

You can integrate the safety sensor directly into the machine control system via the safety outputs (OSSDs). The OSSDs signal the ON state with the signal level HIGH (non-isolated). The OFF state is indicated by the LOW signal level. Downstream control elements must evaluate the output signals of the protective device in such a way that the hazardous state of the machine is safely terminated. The signal is evaluated according to the safety concept, e.g. with a safety relay or with a safety controller.

Important notes

DANGER
Danger due to electrical voltage
Danger due to unexpected startup of the machine

- ▶ Ensure that the machine is and remains in a de-energized state during the electrical installation.
- ▶ Ensure that the hazardous state of the machine is and remains switched off during the electrical installation.
- ▶ Ensure that the outputs of the safety sensor have no effect on the machine during the electrical installation.

DANGER
Risk of ineffectiveness of safety device
The hazardous state may possibly not be terminated if this is not observed.

- ▶ Always ensure the separate connection of the two OSSDs. The two OSSDs must not be connected to each other.
- ▶ Connect OSSDs in such a way that the machine controller processes both signals separately.

Separate connection of OSSD1 and OSSD2

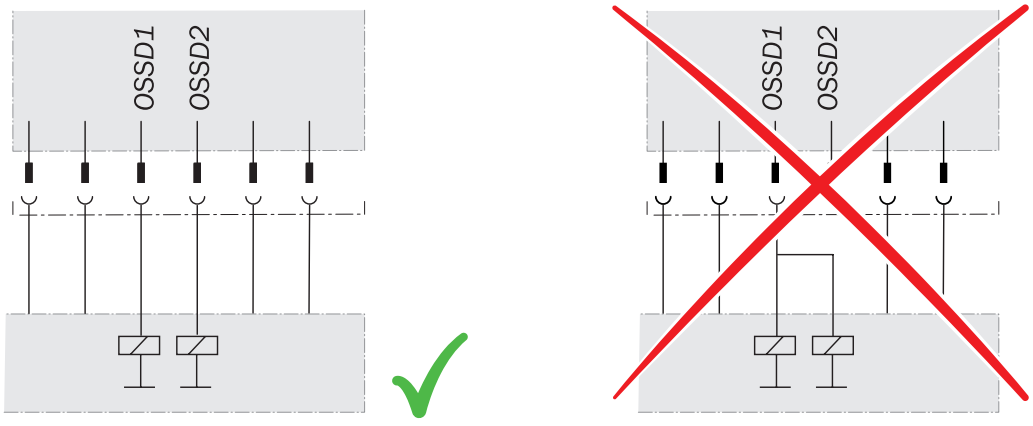

Fig. 6: Dual channel and separate connection of OSSD1 and OSSD2

Avoid a potential difference between load and protective device

If you connect loads to the OSSDs (switching outputs) that switch even when they are driven with negative voltage (e.g. electromechanical contactor without polarity reversal protection diode), you must connect the 0 V connections of these loads and those of the associated protective device individually and directly to the same 0 V terminal strip. This is the only way to ensure that, in the event of a fault, no potential difference is possible between the 0 V connections of the loads and those of the associated protective device.

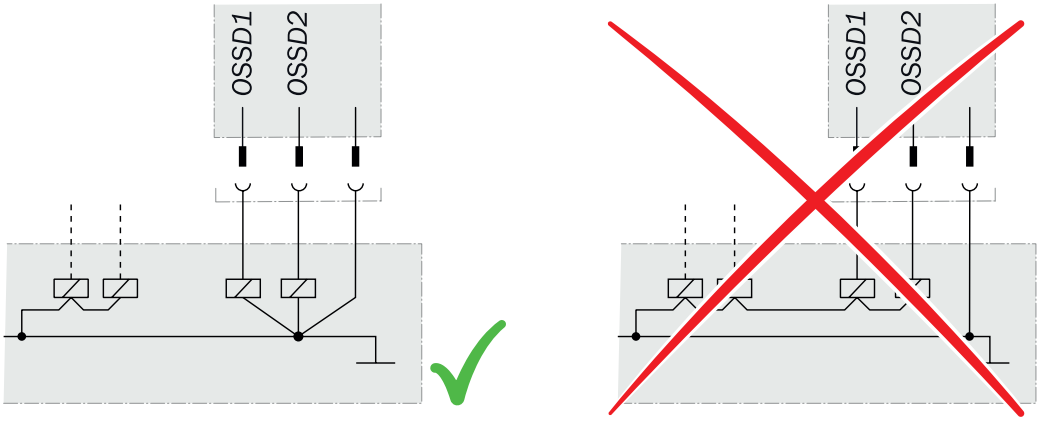

Fig. 7: No potential difference between load and protective device

7.2 Notes on cULus

Important notes

DANGER
Risk of burns due to hot housing

- ▶ Take measures to ensure that the safety sensor cannot be touched during operation.

The following additional conditions must be met for the application and use according to the requirements of UL 60947-5-2:

- Power supply must comply with class 2 in accordance with UL 508
- Power supply U_v protected with 1 A fuse

7.3 System connection (M12, 4-pin)

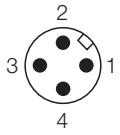

Fig. 8: System connection pin assignment (male connector)

Device connection pin assignment (male connector, M12, 4-pin, A-coded)

Pin	Wire color [1]	Designation	Description
1	Brown	+24 V DC	Voltage supply 24 VDC
2	White	OSSD1	Output OSSD1
3	Blue	0 V	Voltage supply 0 VDC
4	Black	OSSD2	Output OSSD2

[1] Applies to the extension cables recommended as accessories.

- ▶ Pay attention to seal tightness of the plug connector.

8 Commissioning

8.1 Safety

DANGER
Hazard due to lack of effectiveness of the protective device
In the case of non-compliance, it is possible that the dangerous state of the machine may not be stopped or not stopped in a timely manner.

- ▶ Before commissioning the machine, have it checked and released by qualified safety personnel.
- ▶ Make sure that the time for the safety requirement (closing the protective device again) is longer than the response time.

8.2 Switching on

Approach

- ▶ Verify that the actuating element is not located within the assured switch-off distance.
- ▶ Switch on the supply voltage.

As soon as the supply voltage is applied, the safety sensor initializes automatically. When the STATE LED permanently lights up red, the safety sensor is ready for operation.

LED displays and OSSD status during commissioning

STATE LED	OSSDs	Device state
Green/Red flashing	OFF state	Safety sensor initializes.
Red	OFF state	The safety sensor is switched on. Actuating object is not detected.
Green	ON state	The safety sensor is switched on. Actuating object is detected.

8.3 Adjustment

Distance adjustment

- ▶ Adjust the distance between the safety sensor and damping element so that the damping object is reliably detected within the assured operating distance S_{ao} (STATE LED permanently green).

Additional information

NOTE
The distance can be adjusted by screwing and unscrewing the safety sensor.

9 Troubleshooting

9.1 Safety

DANGER
Hazard due to lack of effectiveness of the protective device
In the case of non-compliance, it is possible that the dangerous state of the machine may not be stopped or not stopped in a timely manner.

- ▶ Immediately shut the machine down if the behavior of the machine cannot be clearly identified.
- ▶ If a machine fault cannot be definitively determined or safely rectified, immediately shut the machine down.
- ▶ Secure the machine so that it cannot switch on unintentionally.

NOTE
Additional information on troubleshooting can be found at the responsible Turck subsidiary.

9.2 Fault indicators

STATE LED			
Green	**Red**	**Possible cause**	**Remedy**
Off	Off	No power supply	▶ Apply supply voltage.
Off	Flashing (4 Hz)	Internal error	▶ Switch the power supply off and on. ▶ If the error occurs again afterwards, the sensor is faulty. Replace the sensor.
		Supply voltage too high or too low	▶ Check supply voltage.
Off	Flashing (1 Hz)	External fault	▶ Check wiring for cross-connections and short circuits. ▶ Switch the power supply off and on. ▶ If the error occurs again afterwards, the sensor is faulty. Replace the sensor.

10 Maintenance

10.1 Cleaning

NOTICE

- Do not use aggressive cleaning agents (such as isopropanol or spirit).
- Do not use any substances that hinder the wetting properties of lacquers.
- We recommend anti-static cleaning agents.

11 Disposal

The devices must be disposed of correctly and must not be included in general household garbage.

12 Technical Data

12.1 Data sheet

Safety-related variables

Safety-related parameters	
Performance level	PL d (EN ISO 13849-1:2015)
Category	Category 2 (EN ISO 13849-1:2015)
Safety integrity level	SIL 2 (IEC 61508)
SIL claim limit	SILCL 2 (IEC 62061)
PFHd (probability of a dangerous failure per hour)	
For operating altitudes ≤ 1000 m above sea level	6×10^{-8} at 40 °C
For operating altitudes 1001 ... 2000 m above sea level	7×10^{-8} at 40 °C
For operating altitudes 2001 ... 3000 m above sea level	7×10^{-8} at 40 °C
SFF	92.38 %
$MTTF_d$	2269 years
DC	84.94 %
TM (service time)	20 years (EN ISO 13849–1:2015)
Design	Type 3 (ISO 14119)
Safe state in the event of failure	At least one safety-related semiconductor output (OSSD) is in the OFF state.

NOTE
If the ambient temperature is higher, the failure probabilities from the FMEDA must be adjusted: For an average temperature of 60 °C, the failure probabilities are multiplied by an empirical factor of 2.5.

Features

Features	
Assured operating distance S_{ao} [1]	
BI4-M12-2APS8X2-H1141	3.2 mm
BI8-M18-2APS8X2-H1141	6.5 mm
BI12-M30-2APS8X2-H1141	9.6 mm
Assured release distance S_{ar} [1]	
BI4-M12-2APS8X2-H1141	6 mm
BI8-M18-2APS8X2-H1141	12 mm
BI12-M30-2APS8X2-H1141	18 mm
Switching distance S_n [1]	
BI4-M12-2APS8X2-H1141	4 mm
BI8-M18-2APS8X2-H1141	8 mm
BI12-M30-2APS8X2-H1141	12 mm
Operating frequency	≤ 100 Hz

[1] Values given apply to steel (Fe 360). For other materials a correction factor must be applied, see below.

Correction factors for switching distances S_{ao}, S_{ar} and S_n

Material	Correction factor
Mu metal	1.2
Cast iron	1.1
700 t construction steel (Fe 360)	1.0
Stainless steel (V2A, 304)	0.8
Aluminum	0.45
Copper	0.3
Brass	0.4

Interfaces

Interfaces	System connection
BI4-M12-2APS8X2-H1141	M12 male connector, 4-pin
BI8-M18-2APS8X2-H1141	M12 male connector, 4-pin
BI12-M30-2APS8X2-H1141	M12 male connector, 4-pin

Electrical data

Electrical data	
Protection class	III (EN 61140/IEC 61140)
Supply voltage U_V	DC 24 V (19.2 V DC … 28.8 V DC)
Ripple	± 10 % [1]
Rated insulation voltage U_i	28.8 V
Voltage drop (of supply voltage)	≤ 3 V [2]
Pollution degree	3 (external, according to EN 60947-1)
Rated impulse withstand voltage U_{imp}	1500 V
Utilization category (IEC 60947-5-1)	DC-12: 24 V/20 mA
Device protection	1 A
Current consumption at 24 V	< 20 mA
Hysteresis	≤ 15 % of S_n
Reproducibility	2 %
Switch-on time (after applying the supply voltage) [3]	< 1 s
Response time (removal from the operating distance)	< 1 ms
Release time (reaction time when approaching the operating distance)	
BI4-M12-2APS8X2-H1141	< 1 ms
BI8-M18-2APS8X2-H1141	< 1.5 ms
BI12-M30-2APS8X2-H1141	< 5 ms
Risk time [4]	< 20 ms
[1] Within the limits of UV	
[2] At 50 mA on any OSSD channel	
[3] After switching on the supply voltage, the OSSDs are in the OFF state during the delay before startup.	
[4] The risk time is the fault detection time for internal or external faults. External faults affect the OSSDs (short circuit to an OSSD or cross-circuit between the two OSSDs). At least one of the two OSSDs is safely switched off within the risk period.	

Mechanical data

Mechanical data	
Dimensions	See "Dimensional drawings", [▶ 29]
Material	
Housing	Brass, nickel-plated
Sensor face	Polyamide (PA)
Line	PVC
Fixing nut	Brass alloy
Tightening torque for mounting	
Tightening torque	12 Nm
Weight	See "Weight table", [▶ 28]

Outputs

Outputs	
Switching outputs	2 PNP semiconductors
Switch voltage	
ON state	19.2 V DC … 28.8 V DC
OFF state	0 V DC … 2 V DC
Switch current	
ON state	≤ 50 mA
OFF state	< 500 µA
Load capacitance	80 nF
Short-circuit protection	Yes
Reverse polarity protection	Yes
Test pulse width	300 µs

Environmental data

Environmental data	
Type of protection	IP 67 (IEC 60529) [1]
Operating ambient temperature	–25 °C … +70 °C
Temperature change rate	≤ 1 °K/min
Storage temperature	–25 °C … +70 °C
Site of installation (IEC 60654-1)	Class C; Weather protected location
Operating height	≤ 3000 m above sea level
Relative humidity	50 % at 70 °C (IEC 60947-5-2)
Vibration resistance	1 mm/10 Hz … 55 Hz (IEC 60947-5-2)
Shock resistance	Acc. to IEC 60947-5-2
EMC	Acc. to IEC 60947-5-2, IEC 60947-5-3 and IEC 61000-6-7
Minimum distance between two safety sensors	See “Installing”, [▶ 17]

[1] To achieve the specified protection class, the adhesive strip above the LED indications must not be removed.

12.2 Weight table

Type	Weight in g
BI4-M12-2APS8X2-H1141	18
BI8-M18-2APS8X2-H1141	42
BI12-M30-2APS8X2-H1141	102

12.3 Dimensional drawings

BI4-M12-2APS8X2-H1141

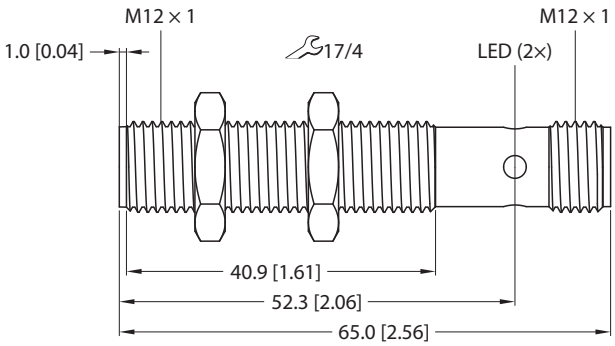

Fig. 9: Dimensional drawing BI4-M12-2APS8X2-H1141

BI8-M18-2APS8X2-H1141

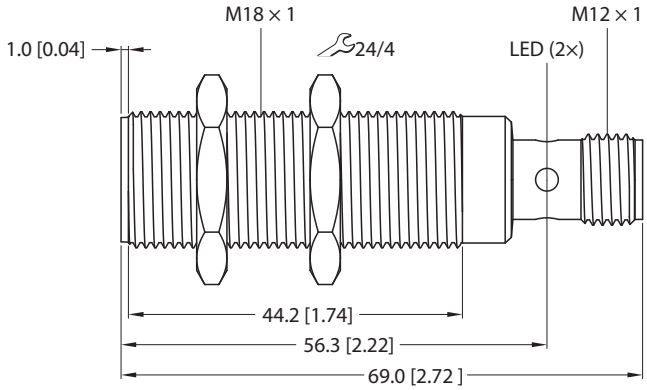

Fig. 10: Dimensional drawing BI8-M18-2APS8X2-H1141

BI12-M30-2APS8X2-H1141

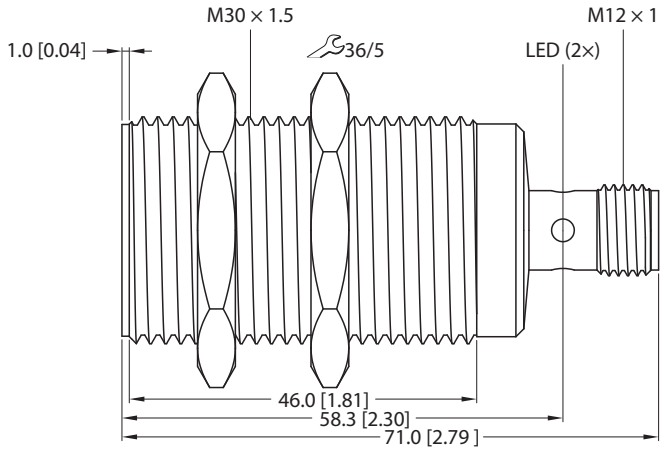

Fig. 11: Dimensional drawing BI12-M30-2APS8X2-H1141

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