OPERATING INSTRUCTIONS

STR1

Safety switches

SICK
Sensor Intelligence.

Described product

STR1

Manufacturer

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Legal information

Original document

This document is an original document of SICK AG.

Contents

1 About this document

1.1 Function of this document

These operating instructions contain the information needed during the life cycle of the safety switch.

They must be made available to all people who work with the safety switch.

1.2 Scope

Product

This document applies to the following products:

- Product code: STR1

Document identification

Document part number:

- This document: 8018754
- Available language versions of this document: 8018074

You can find the current version of all documents at www.sick.com.

1.3 Target groups of these operating instructions

Some chapters of these operating instructions are intended for certain target groups. However, the entire operating instructions are relevant for intended use of the product.

Table 1: Target groups and selected chapters of these operating instructions

Target group	Chapters of these operating instructions
Project developers (planners, developers, designers)	"Project planning", page 12 "Technical data", page 36
Installers	"Mounting", page 21
Electricians	"Electrical installation", page 24
Safety experts (such as CE authorized representatives, compliance officers, people who test and approve the application)	"Project planning", page 12 "Commissioning", page 29 "Technical data", page 36
Operators	"Troubleshooting", page 31
Maintenance personnel	"Maintenance", page 34 "Troubleshooting", page 31

1.4 Additional information

www.sick.com

The following information is available on the Internet:

- Data sheets and application examples
- CAD data and dimensional drawings
- Certificates (e.g. EU declaration of conformity)
- Guide for Safe Machinery Six steps to a safe machine

1.5 Symbols and document conventions

The following symbols and conventions are used in this document:

Safety notes and other notes

DANGER
Indicates a situation presenting imminent danger, which will lead to death or serious injuries if not prevented.

WARNING
Indicates a situation presenting possible danger, which may lead to death or serious injuries if not prevented.

CAUTION
Indicates a situation presenting possible danger, which may lead to moderate or minor injuries if not prevented.

NOTICE
Indicates a situation presenting possible danger, which may lead to property damage if not prevented.

NOTE
Indicates useful tips and recommendations.

Instructions to action

▸ The arrow denotes instructions to action.

1. The sequence of instructions for action is numbered.
2. Follow the order in which the numbered instructions are given.

✓ The check mark denotes the result of an instruction.

LED symbols

These symbols indicate the status of an LED:

○ The LED is off.
☀ The LED is flashing.
● The LED is illuminated continuously.

2 Safety information

2.1 General safety notes

This chapter contains general safety information about the safety switch.

Further information about specific product use situations can be found in the relevant chapters.

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.

▸ 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.

2.2 Intended use

The safety switch is a transponder safety switch that is switched in a non-contact manner by means of actuators, and is suitable for the following applications:

- Movable physical guards
- Safe position monitoring

The product may be used in safety functions.

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

Incorrect use, improper modification or manipulation of the product will invalidate any warranty from SICK; in addition, any responsibility and liability of SICK for damage and secondary damage caused by this is excluded.

The safety switch is **not** suitable for certain ambient conditions, including:

- Radioactivity (with the exception of natural radioactivity)
- Vacuum or high pressure
- High UV exposure
- In the vicinity of low-frequency RFIDs
- In the vicinity of magnetic fields

The following can impair the function of the safety switch:

- Metal subsurfaces or metal in the immediate vicinity (see "Design", page 12)
- Flying metal chips

2.3 Requirements for the qualification of personnel

The safety switch must be planned in, mounted, connected, commissioned, and serv- iced 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.

3 Product description

3.1 Setup and function

The safety switch consists of two components:

- **Sensor**
  The sensor is mounted on the fixed part of the protective device.
- **Actuator (transponder)**
  The actuator is mounted on the moving part of the protective device.

When the guard is closed, the actuator is moved towards the sensor. The sensor detects the code of the actuator when it reaches the switch-on distance. If the sensor detects a valid actuator, the sensor sets the OSSD 1 and OSSD 2 safety outputs (semiconductor outlets) to HIGH.

When the protective device is opened, the actuator is moved out of the sensor’s response range. The sensor sets the OSSD 1 and OSSD 2 safety outputs to Low.

3.2 Product characteristics

3.2.1 Product variants

Overview

The safety switch is delivered in different variants. You will find an overview of important distinguishing features of the variants in the following.

Coding

The safety switch is available with the following codings:

- **Universally coded**
  All actuators are accepted. No teach-in is required.
- **Uniquely coded**
  An actuator must be taught in during commissioning. Up to 8 actuators may be taught in one after the other. Only the most recently taught-in actuator is valid. Previously taught-in actuators can no longer be used.
- **Permanently coded**
  An actuator must be taught in during commissioning. Teach-in only needs to be performed once. It is not possible to teach in any further actuators.

Design of the actuator

The actuator is available in the following designs:

- Standard
- Compact
- Flat
- Mini

Safe series connection

The safety switch is available with the following options for safe series connection:

- Safe series connection via T-connectors
- Safe series connection via Flexi Loop
- Safe series connection in the control cabinet

Connection type

The safety switch is available with the following connections:

- Open cable ends, 5-wire
- Open cable ends, 7-wire

- M8 male connector, 8-pin
- M12 male connector, 5-pin
- M12 male connector, 8-pin

Length of cable

Some variants are available with different lengths of cable:

- 0.2 m
- 0.3 m
- 0.5 m
- 3 m
- 10 m

Complementary information

You can find a complete overview of variants on the SICK homepage: www.sick.com/STR1

3.2.2 Active sensor surfaces

The sensor has 3 active sensor surfaces:

- Front: black surface
- 2 x sides: yellow surface with long black edge

3.2.3 Fault detection

Any faults that occur, including internal device faults, are detected at the latest with the next request (as soon as a safety output switches to HIGH). The safety switch then switches to safe state. If a fault is detected, the safety circuit is switched off and the STATE and DIAG LEDs show the error (see table 18).

3.2.4 Safe series connection

Overview

Several safety switches can be connected in series in a safe series connection. The connected devices act like a single device. The type of safe series connection depends on the safety switch variant selected.

The following options are available:

- Safe series connection with Flexi Loop (with diagnostics)
  In a series connection with Flexi Loop, the safety switches are connected to Flexi Loop nodes. Each Flexi Loop node evaluates a safety switch and sends the information to the Flexi Soft safety controller.
- Safe series connection with T-connector (without diagnostics)
  In a series connection with T-connectors, several safety switches are connected via T-connectors and connected to the safe evaluation unit.
- Safe series connection in control cabinet (with diagnostics)
  In a series connection in the control cabinet, the safety switches are led to the control cabinet individually. The OSSDs of the safety switches are connected in series there and evaluated by the evaluation unit. The Aux outputs can be individually connected to the programmable logic controller (PLC).

Further topics

- "Safe series connection", page 16
- "Safe series connection with T-connector (without diagnostics)", page 18
- "Safe series connection in control cabinet (with diagnostics)", page 19

3.2.5 State indicators

The STATE light emitting diode (red/green) and the DIAG light emitting diode (yellow) signal the operational state of the safety switch.

Complete overview of the light emitting diode states and their meanings: see "Diagnostic LEDs", page 31.

3.2.6 Protective functions

The safety switch has the following internal protective functions:

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

4 Project planning

4.1 Manufacturer of the machine

The manufacturer of the machinery must carry out a risk assessment and apply appropriate protective measures. Further protective measures may be required in addition to the safety switch.

The device must not be tampered with or changed, except for the procedures described in this document.

The device must only be repaired by the device manufacturer or by someone authorized by the device manufacturer. Improper repair can result in the device not providing correct protection.

If several devices are connected in series (safe series connection) and the simplified process according to EN ISO 13849 is used to determine the performance level (PL), the PL may be reduced.

4.2 Operator of the machine

Changes to the electrical integration of the device in the machine controller and changes to the mechanical mounting of the device 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.

The device must not be tampered with or changed, except for the procedures described in this document.

The device must only be repaired by the device manufacturer or by someone authorized by the device manufacturer. Improper repair can result in the device not providing correct protection.

4.3 Design

DANGER
Bypassing the protective device

Hazard due to lack of effectiveness of the protective device

- Prevent incentives to manipulate the safety switch by taking at least one of the following measures:
  - Only for universally coded variants: Cover the sensor and the actuator with additional equipment or protect them against access.
  - If possible use permanent mounting methods for actuators (e.g., glue, safety screws, or rivets).

Mounting location

- When the protective device is closed, the sensor and actuator must be located opposite each other at assured switch-on distance S_{ao} or closer (see "Sensing ranges", page 40).
- Select a mounting location that allows the sensor and actuator to be accessed for maintenance work and protects them against damage.
- If possible, mount the sensor and actuator on non-ferrous subsurfaces and at a distance from metallic parts in order to avoid affecting the sensing range. If this is not possible, the effect on the safe switch on distance S_{ao} and the safe switch off distance S_{ar} must be checked.

- Make sure that there is no possibility of hazards arising when the protective device is opened, even if the actuator has not yet reached the safe switch off distance S_{ar}.
- If the actuator approaches the sensor in parallel, maintain the minimum distances (see "Sensing ranges", page 40).
- If necessary, attach an additional stop for the moving protective device.

Distance

If multiple safety switches are mounted on the machine, they must be mounted with a minimum distance in relation to one another; see "Mounting", page 21.

Alignment

Sensors and actuators can be aligned differently to one another, see "Mounting", page 21, see "Sensing ranges", page 40. The actuators can point to the front or be rotated by 90° to the front sensor surface or a side sensor surface.

Approach direction

The actuator can approach the sensor differently:

- Direct approach
  The direction of movement of the actuator is vertical to one of the 3 active sensor surfaces. No minimum distance must be maintained.
- Parallel approach
  The direction of movement of the actuator is parallel to the long side of the sensor. A minimum distance must be maintained (see "Sensing ranges", page 40).
  Due to the principle, the response range of the sensor has side lobes. If the minimum distance is not maintained, the OSSDs switch to the ON state before the correct position is reached. SICK recommends doing without parallel approach if you cannot maintain a minimum distance.

4.3.1 Different sensing ranges

Different sensing ranges

- Assured switch-on distance S_{ao}
  If the actuator approaches the sensor and reaches the assured switch-on distance, the OSSDs safely switch to the ON state.

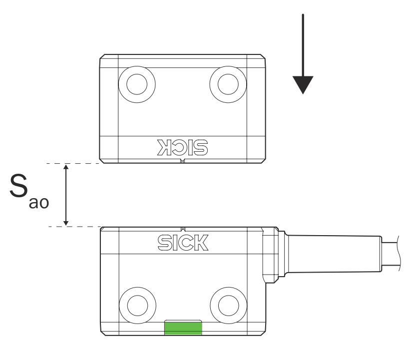


Figure 1: Assured switch-on distance S_{ao}

- Assured switch off distance S_{ar}
  If the actuator is removed from the sensor and the assured switch-off distance is reached, the OSSDs safely switch to the OFF state.

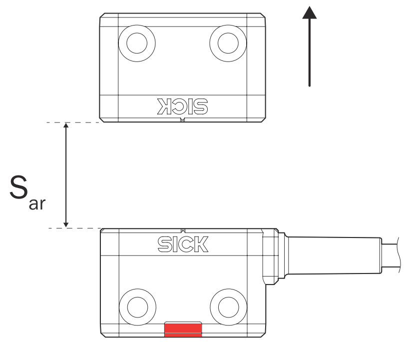


Figure 2: Assured switch off distance S_{ar}

- Typical switch-on distance
  If the actuator approaches the sensor, the OSSDs typically switch to the ON state before the actuator reaches assured switch-on distance S_{ao}. The typical switch-on distance depends on the ambient conditions.

The exact values of the sensing ranges depend on different factors.

Further topics

- "Sensing ranges", page 40

4.4 Integration in the electrical control system

You need to take the following into consideration when integrating the safety switch into the electrical control system.

Requirement for use

- The safety locking device must not be bypassed by electrical means, e.g. by bridging the contacts. You may need to take measures to prevent this.
- The connected controller and all devices responsible for safety must comply with the required performance level and the required category (for example according to ISO 13849-1).
- The overall concept of the control system in which the device is integrated must be validated in accordance with ISO 13849-2.
- The inputs of a connected evaluation unit must be positive-switching (PNP) inputs because the two outputs of the safety switch supply a level of the supply voltage in the switched-ON state.

4.4.1 Course of the OSSD test over time

The device tests the OSSDs for self-diagnosis at regular intervals. To do this, the device switches each OSSD briefly to the OFF state and checks whether this channel is voltage-free during this time.

Make sure that the machine’s control does not react to these test pulses and the machine does not switch off.

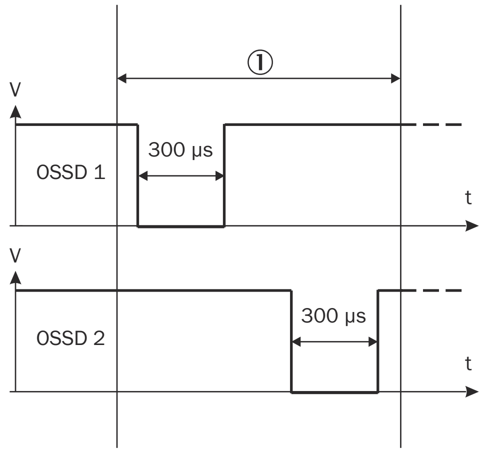


Figure 3: Course of the OSSD test over time

① Usually every 40 ms.

The interval is dynamic and can be smaller than 40 ms.

4.4.2 Application diagnostic output

The signal of the application diagnostic output (AUX) depends on various factors. This is not a safety output.

Table 2: Switching behavior of application diagnostic output

Actuator in response range	The device is in error state	Signal status a In1 and In2	OSSDs	Application diagnostic output
Yes	No	High	High	Low
Yes	Yes	High/Low	Low	High
Yes	No	Low	Low	Low
No	Yes/No	High/Low	Low	High

Certain variants of the safety switch have a different switching behavior.

Table 3: Switching behavior of application diagnostic output only STR1-SAXM0AC8S01

Actuator in response range	The device is in error state	Signal status a In1 and In2	OSSDs	Application diagnostic output
Yes	No	High	High	High
Yes	Yes	High/Low	Low	Low
Yes	No	Low	Low	Low
No	Yes/No	High/Low	Low	Low

Table 4: Switching behavior of application diagnostic output STR1-SAXM0AC8S02, STR1-SACM0PR5 and STR1-SACM0PR8 only

Actuator in response range	The device is in error state	Signal status a In1 and In2	OSSDs	Application diagnostic output
Yes	No	High	High	High
Yes	Yes	High/Low	Low	Low
Yes	No	Low	Low	High
No	Yes/No	High/Low	Low	Low

4.4.3 Safe series connection

Overview

Several safety switches can be connected in series in a safe series connection. The connected devices act like a single device. The type of safe series connection depends on the safety switch variant selected.

The following options are available:

- Safe series connection with Flexi Loop (with diagnostics)
  In a series connection with Flexi Loop, the safety switches are connected to Flexi Loop nodes. Each Flexi Loop node evaluates a safety switch and sends the information to the Flexi Soft safety controller.
- Safe series connection with T-connector (without diagnostics)
  In a series connection with T-connectors, several safety switches are connected via T-connectors and connected to the safe evaluation unit.
- Safe series connection in control cabinet (with diagnostics)
  In a series connection in the control cabinet, the safety switches are led to the control cabinet individually. The OSSDs of the safety switches are connected in series there and evaluated by the evaluation unit. The Aux outputs can be individually connected to the programmable logic controller (PLC).

Safe series connection with T-connectors or in the control cabinet

Do not use more than 30 safety switches in a series connection.

The maximum number of safety switches depends on the following factors:

- Applied supply voltage
- Length of cables used
- Wire cross-section of cables used

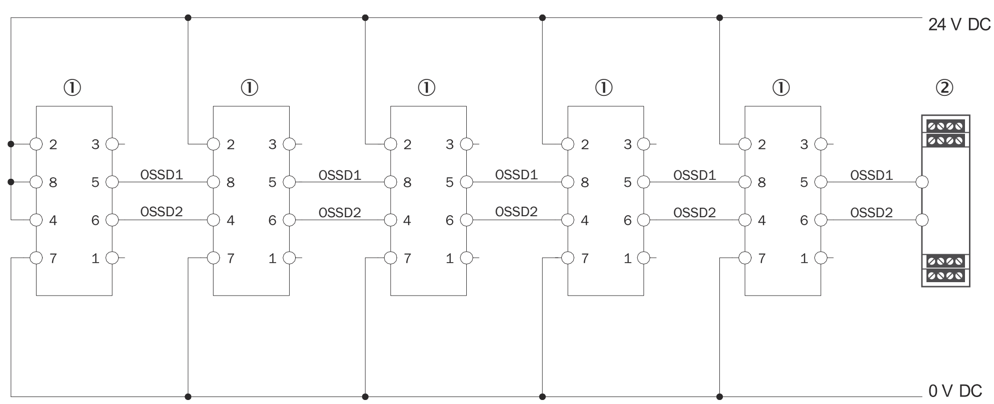


Figure 4: Switching with 5 safety switches connected in series

① Safety switch

② Safe evaluation unit

The voltage drop in the series connection must be checked so that the defined minimum voltage is still applied to the last safety switch.

For connection cables with a length of 2 m and a wire cross-section of 0.25 mm², the maximum number of safety switches in connected in series depends on the voltage as follows:

Table 5: Maximum number of safety switches in a series connection depends on the voltage

Voltage	Connection cables, uniform for the entire series connection	Input voltage at 30th safety switch	Maximum number of safety switches in series connection
24 V	Length: 2 m Wire cross-section of $0.25\ mm^2$	17.8 V	24
26.8 V		19.2 V	30

Complementary information

The number of safety switches in a series connection influences the response time of the system (see "Response times in a safe series connection", page 40).

Further topics

- "Safe series connection with Flexi Loop (with diagnostics)", page 17
- "Safe series connection with T-connector (without diagnostics)", page 18
- "Safe series connection in control cabinet (with diagnostics)", page 19

4.4.3.1 Safe series connection with Flexi Loop (with diagnostics)

Prerequisites

- Safety switch with male connector, M12, 5-pin
  or
- Safety switch with male connector, M12, 8-pin

Construction

The safe series connection can be created using Flexi Loop nodes.

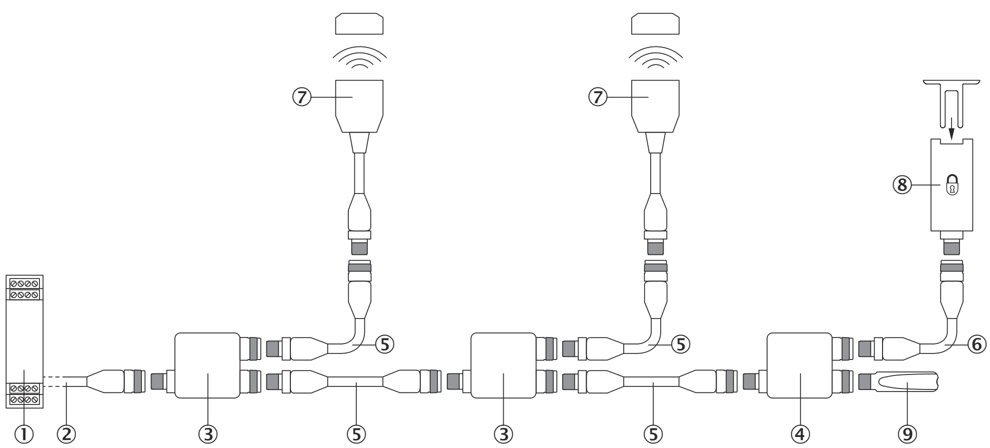


Figure 5: Safe series connection with Flexi Loop nodes

① Flexi Soft safety controller
② Connecting cable with female connector, M12, 5-pin
③ FLN-OSSD1000105 Flexi Loop node
④ FLN-EMSS1100108 Flexi Loop node
⑤ Connection cable with male connector, M12, 5-pin and female connector, M12, 5-pin
⑥ Connection cable with male connector, M12, 8-pin and female connector, M12, 8-pin
⑦ STR1 safety switch
⑧ Safety locking device
⑨ FLT-TERM00001 Flexi Loop terminating element

Further topics

- "Device connection (M12, 5-pin)", page 25

4.4.3.2 Safe series connection with T-connector (without diagnostics)

Important information

DANGER
Bypassing the protective device

The dangerous state may not be stopped in the event of non-compliance.

If a safe series connection is created with T-connectors, the connecting cable must be mounted so that individual T-connectors (and therefore a safety switch) cannot be easily jumpered.

NOTE
If safety switches are connected in series via T-connectors, the application diagnostic output cannot be evaluated.

NOTE
If the series connection is not made using special T-connectors and end connectors, ensure that inputs In 1 and In 2 are connected to constant 24 V DC at the first safety switch of the series connection.

Prerequisites

- Safety switch with male connector, M12, 8-pin

Construction

The safe series connection can be implemented using special T-connectors and an end connector.

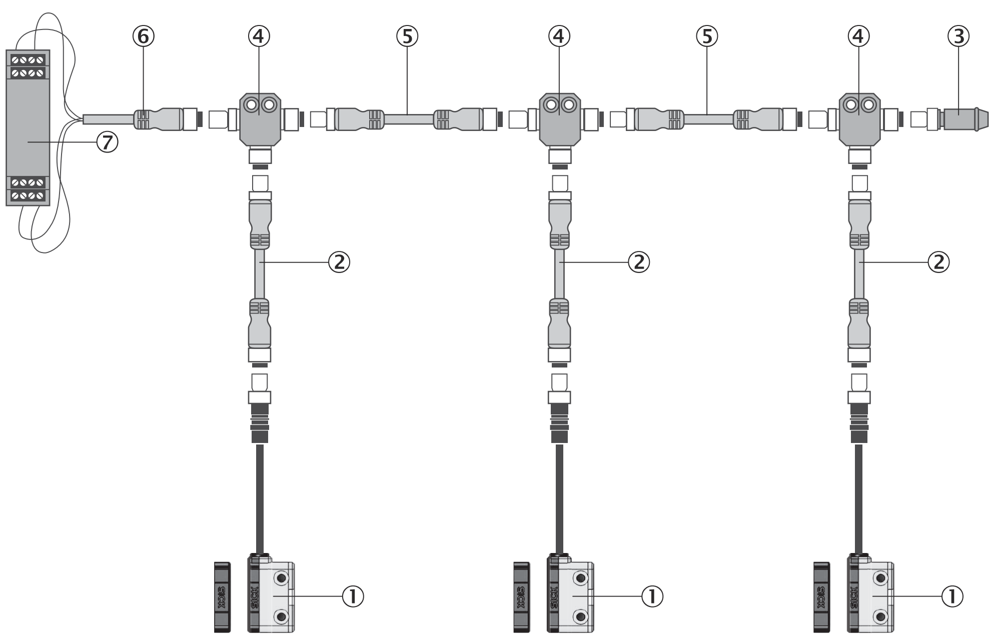


Figure 6: Safe series connection using T-connectors

①	STR1 safety switch
②	M12 connection cable, 8-pin
③	End connector
④	T-piece
⑤	M12 connection cable, 4-pin
⑥	M12 connecting cable, 4-pin

⑦ Safe evaluation unit

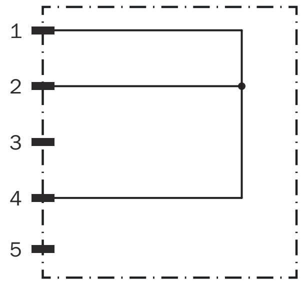


Figure 7: Internal circuitry: end connector for safe series connection

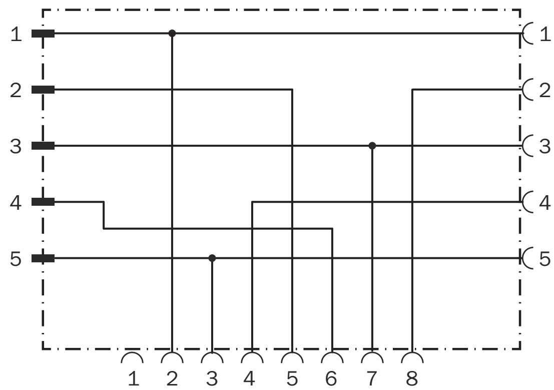


Figure 8: Internal circuitry: T-connector for safe series connection

Further topics

- "Connection of a safe series connection with T-connectors", page 28

4.4.3.3 Safe series connection in control cabinet (with diagnostics)

Prerequisites

- Safety switch with cable, 7-wire
- Safety switch with cable with male connector, M12, 8-pin

Construction

The safety switches are led individually to the control cabinet. The OSSDs of the safety switches are connected in series there and evaluated by the evaluation unit. The Aux outputs are individually connected to the programmable logic controller (PLC).

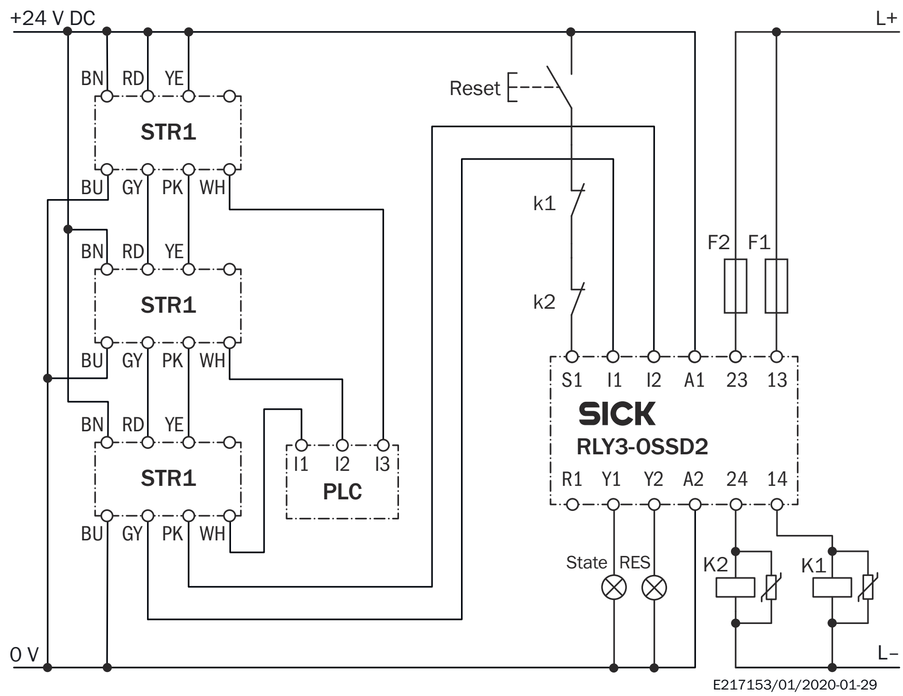


Figure 9: 3 safety switches in series connection on safety relay

4.5 Thorough check concept

The safety switch 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", page 30.

Regular thorough checks serve to investigate the effectiveness of the safety switch 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.

4.5.1 Minimum requirements for regular thorough checks

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

- Thorough check of the principal protective function of the safety switch
- Thorough check of assured sensing ranges S_{ar} and S_{ao}
- Thorough check for damage on the switch housing
- Thorough check for damage on the switch cables
- Thorough check for signs of misuse or manipulation on the safety switch

5 Mounting

5.1 Safety

DANGER
Hazard due to unexpected starting of the machine

Death or severe injury

- Make sure that the dangerous state of the machine is and remains switched off.

DANGER
Bypassing the protective device

Hazard due to lack of effectiveness of the protective device

- Prevent incentives to manipulate the safety switch by taking at least one of the following measures:
  - Universally coded variant only: Attach safety switches with a cover or with shielding, or ensure they are out of reach.
  - If possible, use non-detachable mounting methods for actuators (such as welding, gluing, non-removable screws, or rivets).

NOTICE
Incorrect mounting and unsuitable ambient conditions may damage the safety switch.

- Arrange the sensor and actuator in a way that prevents damage from foreseeable external influences.
- Do not use the sensor and actuator as a stop.
- The holder and mounting method for the sensor and actuator must be stable enough to ensure that correct operation can take place.
- Always use reliable mounting elements that can only be removed using tools.
- If misalignment results in an opening on the physical guard, this must not impair the protection that is provided.

5.2 Unpacking

- Check the components for completeness and the integrity of all parts, see "Scope of delivery", page 45.
- Please contact your respective SICK subsidiary should you have any complaints.

5.3 Mounting

Selecting the mounting location

If the machine documentation does not specify the mounting location, select one carefully:

- When the protective device is closed, the sensor and actuator must be located opposite each other at assured switch-on distance S_{ao} or closer (see "Sensing ranges", page 40).
- Select a mounting location that allows the sensor and actuator to be accessed for maintenance work and protects them against damage.
- If possible, mount the sensor and actuator on non-ferrous subsurfaces and at a distance from metallic parts in order to avoid affecting the sensing range. If this is not possible, the effect on the safe switch on distance S_{ao} and the safe switch off distance S_{ar} must be checked.

- Make sure that there is no possibility of hazards arising when the protective device is opened, even if the actuator has not yet reached the safe switch off distance S_{ar}.
- If the actuator approaches the sensor in parallel, maintain the minimum distances (see "Sensing ranges", page 40).
- If necessary, attach an additional stop for the moving protective device.

Mounting the sensor

1. Mount the sensor on the fixed part of the protective device.
2. Take account of the tightening torque for the fixing screws: 1 Nm

Mounting the actuator

1. Align actuator using the marking nib on the sensor.

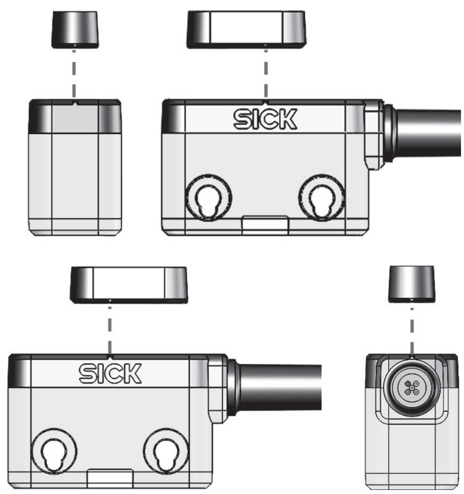


Figure 10: Aligning the actuator on the sensor

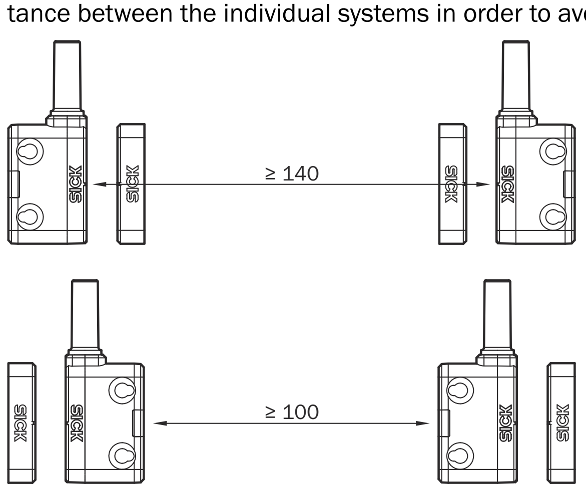
2. Screw on actuator, then observe tightening torque.

Table 6: Actuator tightening torque

Actuator	Standard	Compact	Flat	Mini
Tightening tor-que	1 Nm	1 Nm	1 Nm	0.7 Nm

Mounting multiple safety switches

1. When mounting multiple safety switches, adhere to the specified minimum dis-tance between the individual systems in order to avoid mutual interference.



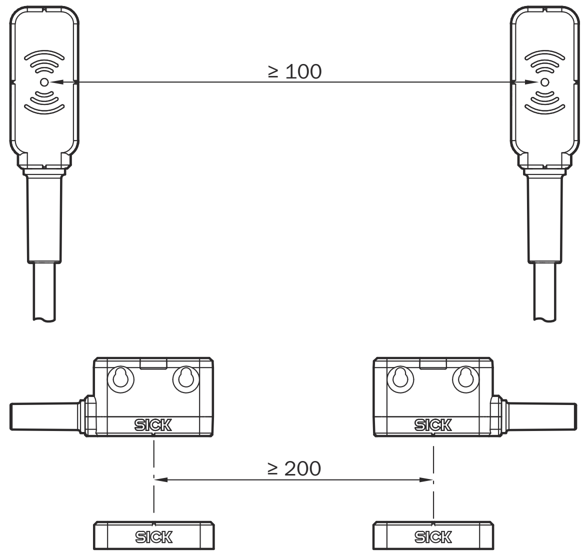


Figure 11: Minimum distances relative to the alignment of the safety switches

All dimensions in mm.

6 Electrical installation

6.1 Safety

Overview

You can directly integrate the safety switch into the machine controller via the safety outputs (OSSDs). The OSSDs indicate the ON state with the HIGH signal level (non-isolated). The OFF state is indicated with the LOW signal level.

Downstream control elements must evaluate the output signals of the protective device in such a way that the dangerous state of the machine is safely ended. Depending on the safety concept, the signal is analyzed by, e.g., safety relays or a safety controller.

Important information

DANGER
Hazard due to electrical voltage

Hazard due to unexpected starting of the machine

- Make sure that the machine is and remains disconnected from the power supply during the electrical installation.
- Make sure that the dangerous state of the machine is and remains switched off during electrical installation.
- Make sure that the outputs of the safety switch have no effect on the machine during electrical installation.

DANGER
Hazard due to lack of effectiveness of the protective device

The dangerous state may not be stopped in the event of non-compliance.

- Always connect the two OSSDs separately. The two OSSDs must not be connected to each other.
- Connect the OSSDs such that the machine controller processes both signals separately.

Isolated connection of OSSD1 and OSSD2

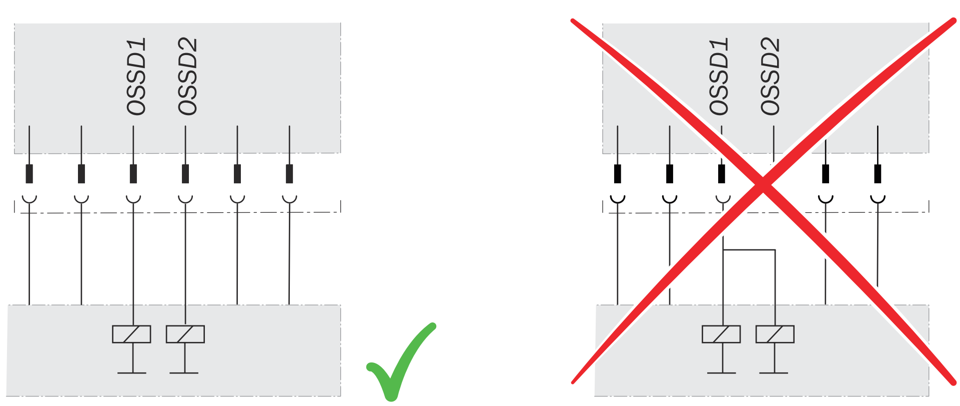


Figure 12: Dual-channel and isolated connection of OSSD1 and OSSD2

Avoiding any potential difference between load and protective device

If you connect loads to the output signal switching devices (switching outputs) that then also switch if controlled with negative voltage (e.g., electro-mechanical contactor without reverse polarity protection diode), you must connect the 0 V connections of these loads and those of the corresponding protective device separately and also directly to the same 0 V terminal strip. In the event of a fault, this is the only way to ensure that there can be no potential difference between the 0 V connections of the loads and those of the corresponding protective device.

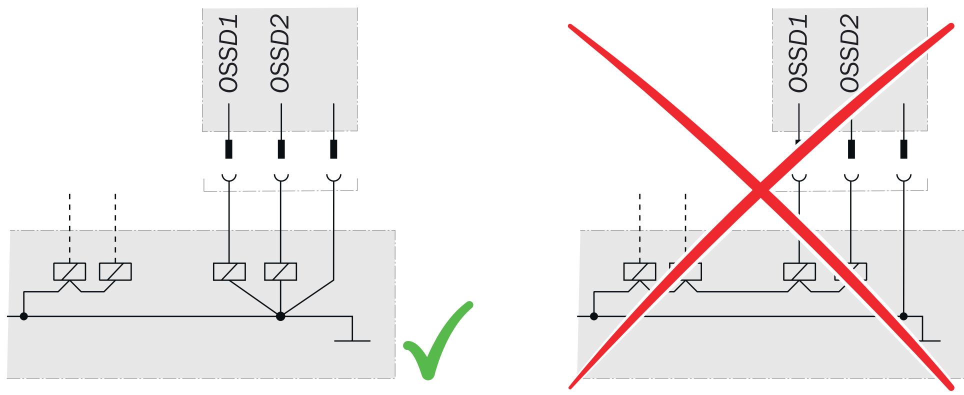


Figure 13: No potential difference between load and protective device

6.2 Notes on cULus

The following conditions must also be fulfilled in order to use and apply the equipment in accordance with UL 508 requirements:

- The voltage supply must conform to Class 2 according to UL 508.
- Connections In 1 and In 2 must conform to Class 2 according to UL 508.
- The required fuse protection for each device is 1 A. In a safe series connection, a suitable device fuse protection must be calculated.

6.3 Device connection (M12, 5-pin)

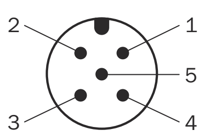


Figure 14: Device connection (male connector, M12, 5-pin, A-coded)

Table 7: Device connection pin assignment (male connector, M12, 5-pin, A-coded)

Pin	Wire color [1]	Designation	Description
1	Brown	+24 V DC	24 V DC voltage supply
2	White	OSSD 1	Output OSSD 1
3	Blue	0 V	0 V DC voltage supply
4	Black	OSSD 2	Output OSSD 2
5	Gray	Aux	Application diagnostic output (not safe)

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

▶ Ensure the plug connector is tightly connected.

6.4 Device connection (M12, 8-pin)

Variants except for STR1-SAXM0AC8S01 and STR1-SAXM0AC8S02

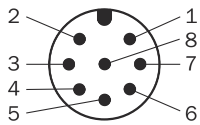


Figure 15: Device connection (male connector, M12, 8-pin, A-coded)

Table 8: Device connection pin assignment (male connector, M12, 8-pin, A-coded)

Pin	Wire color [1)]	Designation	Description
1	White	Aux	Application diagnostic output (not safe)
2	Brown	+24 V DC	Voltage supply 24 V DC
3	Green	n. c.	Not connected
4	Yellow	In 2	Enable input OSSD 2 [2)]
5	Gray	OSSD 1	OSSD 1 output
6	Pink	OSSD 2	OSSD 2 output
7	Blue	0 V	Voltage supply 0 V DC
8	Red	In 1	Enable input OSSD 1 [2)]

1) Applies to the connecting cables recommended as accessories.
2) When using an individual safety switch or in a series connection with T-connector, apply 24 V DC on the first safety switch (see "Safe series connection with T-connector (without diagnostics)", page 18).

Only for variants STR1-SAXM0AC8S01 and STR1-SAXM0AC8S02

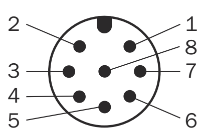


Figure 16: Device connection (male connector, M12, 8-pin, A-coded)

Table 9: Device connection pin assignment (male connector, M12, 8-pin, A-coded)

Pin	Wire color [1)]	Designation	Description
1	White	+24 V DC	Voltage supply 24 V DC
2	Brown	In 1	Enable input OSSD 1 [2)]
3	Green	0 V	Voltage supply 0 V DC
4	Yellow	OSSD 1	OSSD 1 output
5	Gray	Aux	Application diagnostic output (not safe)
6	Pink	In 2	Enable input OSSD 2 [2)]
7	Blue	OSSD 2	OSSD 2 output
8	Red	n. c.	Not connected

1) Applies to the connecting cables recommended as accessories.
2) When using an individual safety switch or in a series connection with T-connector, apply 24 V DC on the first safety switch (see "Safe series connection with T-connector (without diagnostics)", page 18).

Only for STR1-SACM0PR8 variants

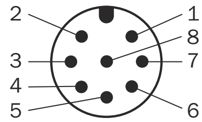


Figure 17: Device connection (male connector, M8, 8-pin, A-coded)

Table 10: Device connection pin assignment (male connector, M8, 8-pin, A-coded)

Pin	Wire color [1]	Designation	Description
1	White	In 2	Enable input OSSD 2 [2]
2	Brown	+24 V DC	Voltage supply 24 V DC
3	Green	OSSD 1	OSSD 1 output
4	Yellow	OSSD 2	OSSD 2 output
5	Gray	AUX	Application diagnostic output not safe
6	Pink	In 1	Enable input OSSD 1 [2]
7	Blue	0 V	Voltage supply 0 V DC
8	Red	n. c.	Not connected

1) Applies to the connecting cables recommended as accessories.
2) When using an individual safety switch or in a series connection with T-connector, apply 24 V DC on the first safety switch (see "Safe series connection with T-connector (without diagnostics)", page 18).

6.5 Device connection (M8, 8-pin)

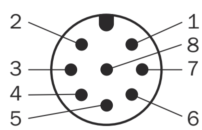


Figure 18: Device connection (male connector, M8, 8-pin, A-coded)

Table 11: Device connection pin assignment (male connector, M8, 8-pin, A-coded)

Pin	Wire color [1]	Designation	Description
1	White	In 2	Enable input OSSD 2 [2]
2	Brown	+24 V DC	Voltage supply 24 V DC
3	Green	OSSD 1	OSSD 1 output
4	Yellow	OSSD 2	OSSD 2 output
5	Gray	AUX	Application diagnostic output not safe
6	Pink	In 1	Enable input OSSD 1 [2]
7	Blue	0 V	Voltage supply 0 V DC
8	Red	n. c.	Not connected

1) Applies to the connecting cables recommended as accessories.
2) When using an individual safety switch or in a series connection with T-connector, apply 24 V DC on the first safety switch (see "Safe series connection with T-connector (without diagnostics)", page 18).

6.6 Device connection (loose cable, 5-wire)

Table 12: Device connection cable assignment

Wire color	Designation	Description
Brown	+24 V DC	24 V DC voltage supply

Wire color	Designation	Description
White	OSSD 1	Output OSSD 1
Blue	0 V	0 V DC voltage supply
Black	OSSD 2	Output OSSD 2
Gray	Aux	Application diagnostic output (not safe)

6.7 Device connection (loose cable, 7-wire)

Table 13: Device connection cable assignment

Wire color	Designation	Description
White	Aux	Application diagnostic output (not safe)
Brown	+24 V DC	Voltage supply 24 V DC
Yellow	In 2	Enable input OSSD 2
Gray	OSSD 1	OSSD 1 output
Blue	0 V	Voltage supply 0 V DC
Pink	OSSD 2	OSSD 2 output
Red	In 1	Enable input OSSD 1

6.8 Connection of a safe series connection with T-connectors

The 5-pin male connector of the last T-connector upstream of the safe evaluation unit is the interface between the safety switches connected in series and the safe evaluation unit.

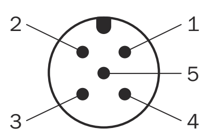


Figure 19: Connection of the T-connector (M12, 5-pin, A-coded, male connector)

Table 14: Device connection of T-connector (male connector, M12, 5-pin, A-coded)

Pin	Wire color [1]	Designation	Description
1	Brown	+24 V DC	Voltage supply 24 V DC
2	White	OSSD 1	OSSD 1 output
3	Blue	0 V	Voltage supply 0 V DC
4	Black	OSSD 2	OSSD 2 output
5	Gray	n.a.	Not connected

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

7 Commissioning

7.1 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.

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

7.2 Switching on

The device initializes after switching on. During this process, the OSSDs are switched off and the light emitting diodes light up alternately in the color sequence green, red, and yellow. For unique coded and permanently coded safety switches only: If any actuators have already been taught in, the STATE light emitting diode will flash once after initialization for each taught-in actuator.

7.3 Teach-in

DANGER
Bypassing the protective device

The dangerous state may not be stopped in the event of non-compliance.

- ▶ Document teaching-in of an actuator.
- ▶ During regular thorough checks, make sure that the taught-in actuator is still being used.

Variant for universally coded actuators

No teach-in is required.

Variant for unique coded actuators

An actuator must be taught in during commissioning. Up to 8 actuators may be taught in one after the other. Only the most recently taught-in actuator is valid. Previously taught-in actuators cannot be taught in again.

Variant for permanently coded actuators

An actuator must be taught in during commissioning. It is not possible to teach in any further actuators.

Teaching in an actuator

1. Open the physical guard.
2. Connect the safety switch to the voltage supply (see "Electrical installation", page 24).

✓ The start sequence is performed. The LEDs light up alternately in the color sequence green, red, and yellow.

3. Close the physical guard.

✓ When the guard is closed and the actuator has reached the appropriate position, the safety switch will automatically start the teach-in sequence. The LEDs will display the individual steps.

Table 15: Displays for teach-in sequences

STATE light emitting diode (red/green)	DIAG light emitting diode (yellow)	Step
☀ green	☀ yellow	Actuator is being taught in
☀ green	● yellow	Actuator has been taught in

4. Within 5 minutes of successfully teaching in the actuator, connect and restore the voltage supply for the safety switch.

✓ Once the taught-in actuator is in the response range, both OSSDs switch to the ON state and the STATE light emitting diode lights up green.

7.4 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 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 machine operator has overall responsibility for the instruction, which must be carried out by qualified personnel.

8 Troubleshooting

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.

- 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.

DANGER
Hazard due to unexpected starting of the machine

- When any work is taking place, use the protective device to secure the machine or to ensure that the machine is not switched on unintentionally.

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.

- Do not carry out any repairs on the device components.
- Do not modify or manipulate device components.
- Apart from during the procedures described in this document, the device components must not be opened.

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

8.2 Diagnostic LEDs

8.2.1 Switching on

Table 16: LED displays during initialization

STATE light emitting diode (red/green)	DIAG light emitting diode (yellow)	Duration
● green	○	500 ms
● red	○	500 ms
○	● yellow	500 ms
☀ green [1]	○	

[1] For unique coded and permanently coded safety switches only: If any actuators have already been taught in, the STATE light emitting diode will flash once after initialization for each taught-in actuator.

8.2.2 State display

Table 17: Status indications during normal operation

STATE light emitting diode (red/green)	DIAG light emitting diode (yellow)	Meaning
○	○	No voltage supply
● red	○	No valid actuator is in the response range. OSSD pair is in the OFF state.
● green	○	Actuator is in the response range. OSSD pair is in the ON state.
● Green	☼ Yellow	Actuator is in the response range, but is close to the assured release distance S_{ar}.[1]
● red	☼ Yellow	• Signal to the In 1 and In 2 OSSD inputs invalid or not available. No valid actuator in response range OSSD pair in OFF state • Actuator is outside the response range, but is close to the assured operating distance S_{ao}.[1]
● Red	● Yellow	Signal to the In 1 and In 2 OSSD inputs invalid or not available. Valid actuator in response range OSSD pair in OFF state

[1] Only applies for safety switches whose serial numbers begin with number series 2020**** or higher. The serial number is displayed on the safety switch over the data matrix code.

8.2.3 Fault displays

Table 18: Fault displays

STATE light emitting diode (red/green)	DIAG light emitting diode (yellow)	Possible cause	Corrective measure
○	○	No voltage supply	Check voltage supply. If the light emitting diodes do not light up even if a voltage supply is present, replace the safety switch.
☼ red	☼ yellow	External fault	• Check OSSD 1 and OSSD 2 for short-circuit downstream of 0 V or 24 V DC, or between one another • Check cabling for damage. There must be a dual-channel configuration. • If the error occurs again, the sensor is defective. Replace sensor.
☼ red	○	Internal fault	• Isolate the faulty sensor and check it separately • Check wiring for cross-circuits and short-circuits. • Switch the voltage supply off and on. • If the fault still occurs after this, the sensor is defective. Replace sensor.

8.2.4 Fault indicators for a safe series connection with T-connectors or in the control cabinet

If an error occurs in a device in a series connection, the affected device displays the error and switches off the OSSDs (STATE LED flashes red). All downstream devices switch off their OSSDs (LED STATE flashes red, LED DIAG flashes yellow).

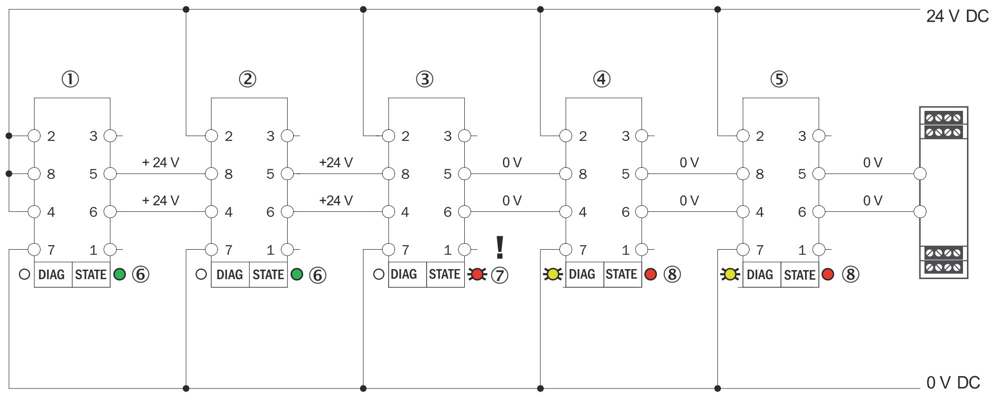


Figure 20: Fault indicators for safety switches in series connection In the example: Internal error on safety switch 3

① – ⑤ Safety switch
⑥ LED STATE lights up green
⑦ LED STATE flashes red
⑧ LED STATE flashes red, LED DIAG flashes yellow

What to do with safety switches switched in series:

- Isolate the faulty sensor and check it separately.
- Check wiring for cross-circuits and short-circuits.
- Switch the voltage supply off and on. If the fault still occurs after this, the sensor is defective. Replace sensor.

8.2.5 Fault displays during teach-in

Table 19: Fault displays during teach-in

STATE light emitting diode (red/green)	DIAG LED (yellow)	Cause
red/green	yellow	The maximum number of actuators has been taught in. It is not possible to carry out another teach-in process.
red/green	● yellow	An actuator that has already been taught in needs to be taught in again. This is not possible.
red/green	○	Teach-in sequence failed. Teach in the actuator again. Possible fault: • Actuator removed from response range too early. • Voltage supply not isolated in a timely manner.

Fault displays are repeated until the equipment is reset.

▶ To perform a reset, disconnect the voltage supply for at least 3 s.

9 Maintenance

9.1 Cleaning

NOTICE

- Do not use aggressive cleaning agents (such as isopropanol or spirit).
- Do not use any paint wetting impairment substances.
- We recommend anti-static cleaning agents.

NOTICE

The safety switch cables can be damaged by cleaning with high pressure or strong water jets.

- Safety switches cables must not be directly exposed to high pressure or strong water jets during cleaning.

9.2 Regular thorough check

The safety switch must be thoroughly checked regularly. The type and frequency of thorough checks are defined by the manufacturer and the operating entity of the machine; see "Thorough check concept", page 20

Regular thorough checks serve to investigate the effectiveness of the safety switch and detect any ineffectiveness due to modifications or external influences (such as damage or manipulation).

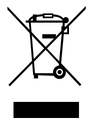
1. Carry out the thorough checks according to the instructions from the manufacturer and the operating entity of the machine.

10 Decommissioning

10.1 Disposal

Approach

- Always dispose of unusable devices in accordance with national waste disposal regulations.



Complementary information

SICK will be glad to help you dispose of these devices on request.

11 Technical data

11.1 Technical data

Table 20: Features

Features	
Safe switch on distance S_{ao} (IEC 60947 5-3)	see "Sensing ranges", page 40
Assured switch-off distance S_{ar} (IEC 60947 5-3)	see "Sensing ranges", page 40
Max. actuation frequency	0.5 Hz
Safe series connection	≤ 30 safety switches

Table 21: Safety-related parameters

Safety-related parameters	
Performance level	PL e (EN ISO 13849-1)
Category	4 (EN ISO 13849)
Safety integrity level	SIL 3 (EN 61508)
PFH_D (mean probability of one dangerous failure per hour)	5.1×10^{-9} at 40 °C and sea level 14×10^{-9} at 40 °C and 2,000 m above sea level
T_M (mission time)	20 years (EN ISO 13849–1)
Response time (removal from response range) [1]	Single device: ≤ 40 ms Safe series connection: see "Response times in a safe series connection", page 40
Release time (response time when approaching response range) [2]	Single device: ≤ 100 ms Safe series connection: see "Response times in a safe series connection", page 40
Risk time [3][4]	Single device: ≤ 100 ms Safe series connection: see "Response times in a safe series connection", page 40
Length of cable [5]	≤ 200 m
Minimum distance between 2 safety switches	Depending on alignment see "Mounting", page 21
Type	Type 4 (EN ISO 14119)
Coding level	
Universally coded	Low coding level (EN ISO 14119)
Uniquely coded	High coding level (EN ISO 14119)
Permanently coded	High coding level (EN ISO 14119)
Safe status when a fault occurs	At least one safety-related semiconductor output (OSSD) is in the OFF state.

1) Response time for moving the OSSDs into the OFF state when the actuator is removed from the response area or when the OSSD input signals go into the OFF state.

2) Response time for moving the OSSDs into the ON state when the actuator is detected by the sensor and the OSSD input signals are in the ON state.

3) At least one of the two OSSD outputs is safely switched off during the response time.

4) The risk time is the time needed to detect internal and external faults. External errors affect the OSSDs (short-circuit to an OSSD and cross-circuit between the two OSSDs). At least one of the two OSSDs is safely switched off during the risk time.

5) Length of cable and wire cross-section change the voltage drop depending on the output current (R_{max} = 14.5 Ω).

Table 22: Interfaces

Interfaces	
System connection	
Voltage supply Local inputs and outputs	Male connector, M12, 5-pin, A-coded (common male connector for voltage supply and outputs) Male connector, M12, 8 pin, A-coded (common male connector for voltage supply and inputs and outputs) or Male connector, M8, 8-pin, A-coded (common male connector for voltage supply and outputs) Flying leads
Length of cable	0.2 m 0.3 m 0.5 m 3 m 10 m

Table 23: Electrical data

Electrical data	
OSSD pairs	1
Rated impulse withstand voltage U_{imp}	1,500 V
Contamination rating	3 (external, according to EN 60947-1)
Power-up delay (after supply voltage applied) [1)]	2.5 s
Supply voltage U_V	DC 24 V (19.2 V ... 28.8 V)
Rated insulation voltage Ui	DC 32 V
Utilization category (IEC 60947-5-1)	DC-12: 24 V / 20 mA
Load capacity	400 nF (at OSSD1 and OSSD2) 2 µF (at Out Aux)
External fuse protection (supply voltage)	0.6 A ... 2 A 1 A for UL-compliant applications
Current consumption (without load)	50 mA
Protection class	III (EN 61140 / IEC 61140)

1) Once the supply voltage has been switched on, the OSSDs and the application diagnostic output are in the OFF state during the time delay before availability. The specified time applies to one sensor; in a series connection, 0.1 s must be added per sensor. An additional 0.5 s per taught-in actuator must be added for uniquely coded and permanently coded sensors.

Table 24: Mechanical data

Mechanical data	
Dimensions (W x H x D)	
Safety switches	40 mm x 18 mm x 26 mm
Actuator dimensional drawing	see "Dimensional drawings", page 39
Housing material of the sensor	Vistal®
Housing material of the actuator	Vistal®
Cable material	PVC/PUR
Wire material	Copper
Coupling nut material	Nickel plated zinc die cast
Cable diameter	5.5 mm
Wire cross-section	0.12 mm^2
Bend radius (for fixed installation)	> 8 × cable diameter

Mechanical data	
Bend radius (for flexible use)	> 12 × cable diameter
Weight	
Safety switches “Standard” actuator “Compact” actuator “Flat” actuator “Mini” actuator	63 g … 436 g (depending on variant) 26 g 13 g 13 g 6 g

Table 25: Inputs

Inputs	
Rated voltage	DC 24 V (19.2 V … 28.8 V)
Switching current	
ON state OFF state	≤ 5 mA 0 mA
Switching voltage	
ON state OFF state	21 V DC … 24 V DC ≤ 2 V DC

Table 26: Outputs

Outputs	
2 OSSDs (OSSD1 and OSSD2)	2 x PNP, max. 100 mA (without load), short-circuit protected and overload protected
Application diagnostic output (Aux)	50 mA max, short-circuit protected
Switching current	
ON state OFF state	≤ 100 mA < 500 µA
Switching voltage	
ON state OFF state	21 V DC … 24 V DC 0 V DC … 2 V DC

Table 27: Ambient data

Ambient data	
Enclosure rating	IP67 (IEC 60529) IPX9K (ISO 20653) [1]
Ambient operating temperature	–30 °C … +70 °C [2]
Storage temperature	–30 °C … +70 °C
Vibration resistance	1 mm / 10 Hz … 55 Hz (IEC 60068-2-6)
Shock resistance	30 g, 11 ms (IEC 60068-2-27)
EMC	In accordance with IEC/EN 61326-3-1, IEC/EN 60947-5-2, IEC/EN 60947-5-3 and EN 300330 V2.1.1

1) The cables of the safety switches must not be exposed to high pressure or strong water jets during cleaning.

2) Only applies for safety switches whose serial numbers begin with number series 1825**** or higher. For safety switches whose serial numbers deviate from this, an ambient operating temperature of -10 °C … +70 °C applies.
The serial number is displayed on the safety switch over the data matrix code.

11.2 Dimensional drawings

Sensor

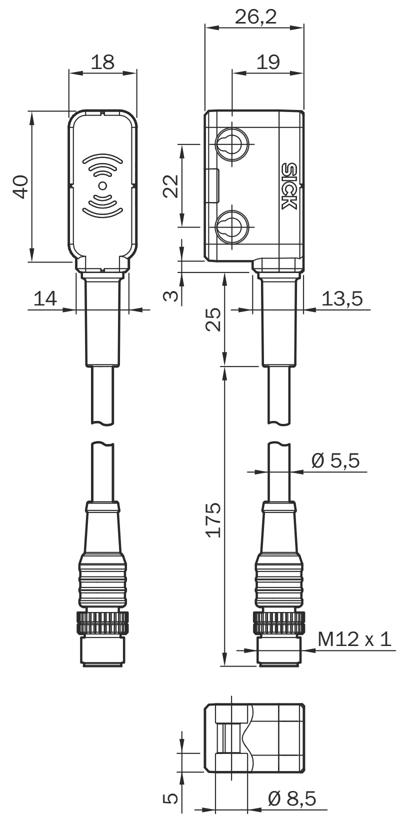


Figure 21: Dimensional drawing for STR1 sensor with M12 male connector

All dimensions in mm.

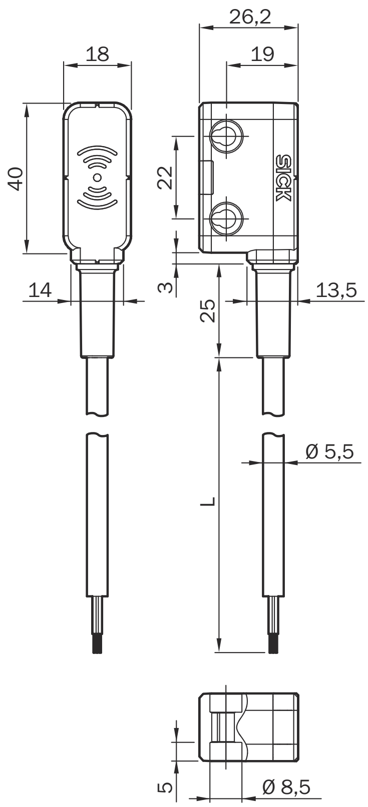


Figure 22: Dimensional drawing for STR1 sensor with flying leads

All dimensions in mm.

Actuator

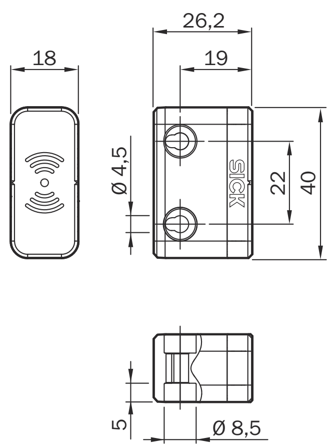


Figure 23: Dimensional drawing of “Standard” STR1 actuator

All dimensions in mm.

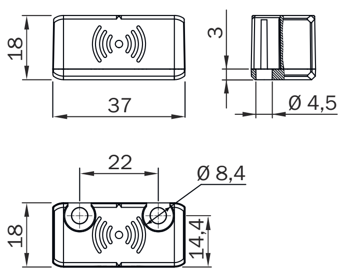


Figure 24: Dimensional drawing of “Compact” STR1 actuator

All dimensions in mm.

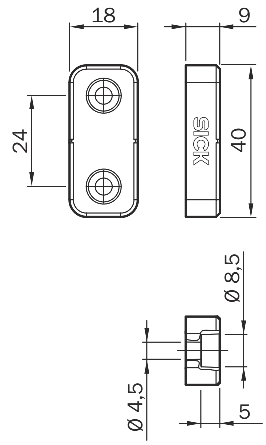


Figure 25: Dimensional drawing of "Flat" STR1 actuator

All dimensions in mm.

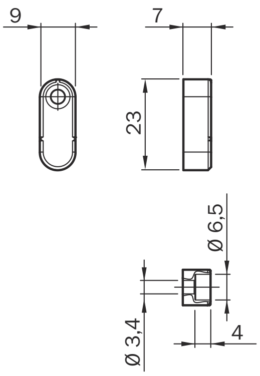


Figure 26: Dimensional drawing of "Mini" STR1 actuator

All dimensions in mm.

11.3 Response times in a safe series connection

Response time (removal of actuator from response range)

Response time for series connection: 40 ms × number of safety switches

Enable time (actuator approaching response range)

Release time for series connection: 100 ms × number of safety switches

Risk time (error detection time for external faults)

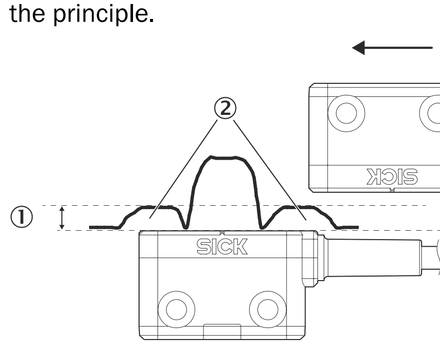
Risk time for series connection: 100 ms +40 ms * (number of safety switches –1)

11.4 Sensing ranges

Important information

NOTE

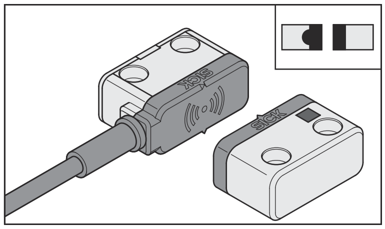
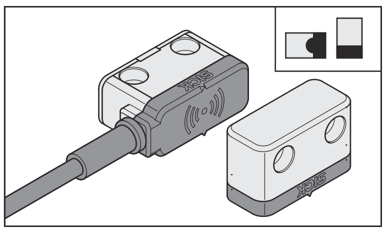
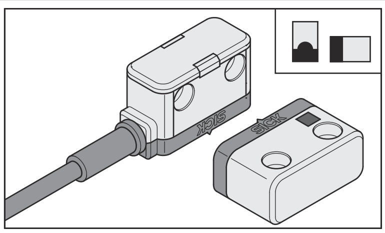
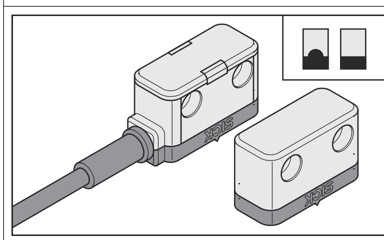
- The values specified in this chapter only apply for a deviation of 0 mm between the sensor and actuator (marking nibs on sensor and actuator).
- If the sensor approaches the actuator in parallel, a minimum distance between the sensor and actuator must be maintained due to the side lobes required due to the principle.



① Minimum distance with parallel approach
② Side lobes

Sensing ranges for “Standard” actuator

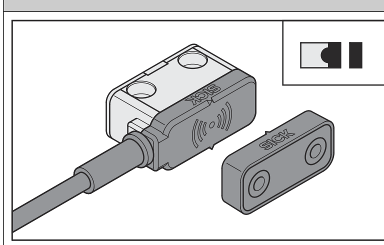
Table 28: Sensing ranges for “Standard” actuator

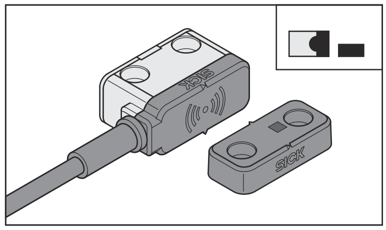
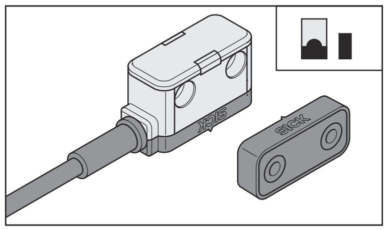
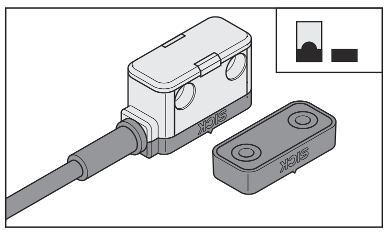
Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch off distance S_{ar}	Minimum distance with parallel approach
	≤ 10 mm	≥ 25 mm	6 mm
	≤ 10 mm	≥ 25 mm	6 mm
	≤ 3 mm ≤ 6 mm 1)	≥ 15 mm	–
	≤ 3 mm ≤ 6 mm 1)	≥ 15 mm	–

1) Only applies in limited temperature range of –10 °C ... +70 °C. Devices with serial number 1824*** or lower only support the limited temperature range. The serial number is displayed on the safety switch over the data matrix code.

Sensing ranges for “Flat” actuator

Table 29: Sensing ranges for “Flat” actuator

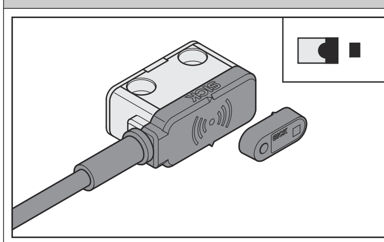
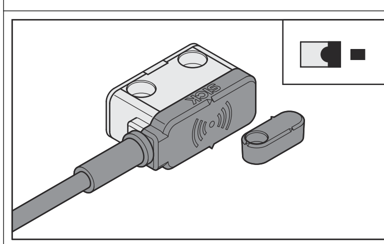
Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch off distance S_{ar}	Minimum distance with parallel approach
	≤ 10 mm ≤ 14 mm 1)	≥ 28 mm	10 mm

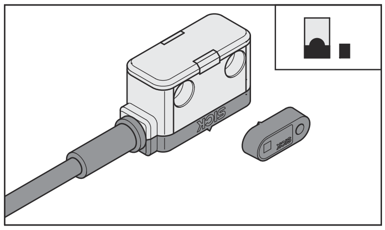
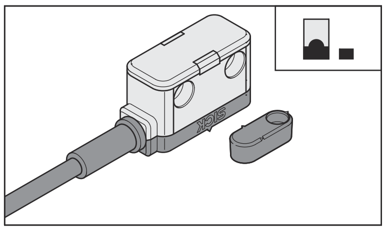
Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch off distance S_{ar}	Minimum distance with parallel approach
	≤ 4 mm ≤ 6 mm 1)	≥ 28 mm	5 mm
	≤ 3 mm ≤ 9 mm 1)	≥ 20 mm	4 mm
	Not possible		

1) Only applies in limited temperature range of –10 °C ... +70 °C. Devices with serial number 1824*** or lower only support the limited temperature range. The serial number is displayed on the safety switch over the data matrix code.

Sensing ranges for “Mini” actuator

Table 30: Sensing ranges for “Mini” actuator

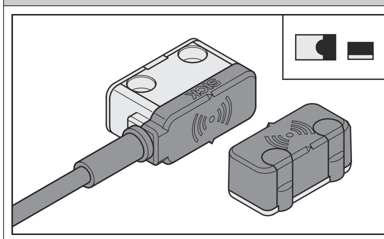
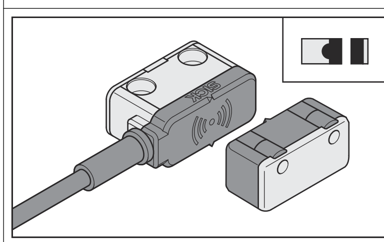
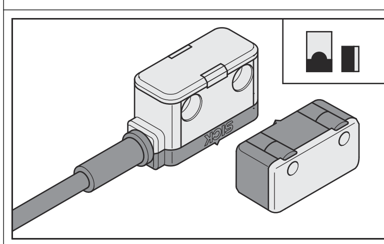
Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch off distance S_{ar}	Minimum distance with parallel approach
	≤ 10 mm ≤ 14 mm 1)	≥ 28 mm	10 mm
	≤ 10 mm ≤ 14 mm 1)	≥ 28 mm	10 mm

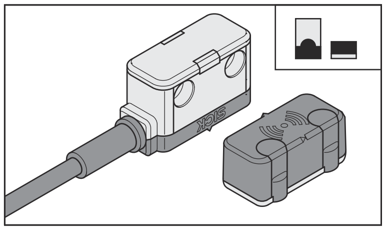
Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch off distance S_{ar}	Minimum distance with parallel approach
	≤ 4 mm ≤ 9 mm [1]	≥ 20 mm	4 mm
	≤ 4 mm ≤ 9 mm [1]	≥ 20 mm	4 mm

1) Only applies in limited temperature range of –10 °C ... +70 °C. Devices with serial number 1824*** or lower only support the limited temperature range. The serial number is displayed on the safety switch over the data matrix code.

Sensing ranges for “Compact” actuator

Table 31: Sensing ranges for “Compact” actuator

Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch off distance S_{ar}	Minimum distance with parallel approach
	≤ 10 mm	≥ 25 mm	5 mm
	≤ 10 mm	≥ 25 mm	5 mm
	≤ 3 mm	≥ 25 mm	–

Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch off distance S_{ar}	Minimum distance with parallel approach
	≤ 2 mm	≥ 25 mm	–

12 Ordering information

12.1 Scope of delivery

- Sensor
- Actuator
- Protective cap for secure sensor mounting
- Protective cap for secure actuator mounting (no protective caps for “mini” design) (In scope of delivery from production date 2227)
- Safety note
- Operating instructions for download: www.sick.com

12.2 Ordering information and accessories

Ordering information

You can order the safety switch and the spare parts of the safety switch on the SICK homepage. Please note that the part number on the sensor is not a part number that can be ordered. You can enter the printed part number on the SICK homepage and select the respective variant from the suggested products.

www.sick.com/STR1

Accessories

Suitable accessories are available at www.sick.com. All suitable accessories are listed on the Accessories tab of the product page.

13 Annex

13.1 Conformities and certificates

You can obtain declarations of conformity, certificates, and the current operating instructions for the product at www.sick.com. To do so, enter the product part number in the search field (part number: see the entry in the “P/N” or “Ident. no.” field on the type label).

13.1.1 EU declaration of conformity

Excerpt

The undersigned, representing the manufacturer, herewith declares that the product is in conformity with the provisions of the following EU directive(s) (including all applicable amendments), and that the standards and/or technical specifications stated in the EU declaration of conformity have been used as a basis for this.

- ROHS DIRECTIVE 2011/65/EU
- MACHINERY DIRECTIVE 2006/42/EC
- RE DIRECTIVE 2014/53/EU

13.1.2 UK declaration of conformity

Excerpt

The undersigned, representing the following manufacturer herewith declares that this declaration of conformity is issued under the sole responsibility of the manufacturer. The product of this declaration is in conformity with the provisions of the following relevant UK Statutory Instruments (including all applicable amendments), and the respective standards and/or technical specifications have been used as a basis.

- Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
- Supply of Machinery (Safety) Regulations 2008
- Radio Equipment Regulations 2017

13.1.3 FCC and IC radio approval

- FCC ID: 2AHDRSTR1
- IC: 21147STR1

The device fulfills the EMC requirements for use in the USA and Canada, in accordance with the following extracts from the relevant approvals:

FCC § 15.19

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- this device must accept any interference received, including interference that may cause undesired operation.

FCC §15.21 (warning statement)

[Any] changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

IC

This device complies with Industry Canada’s licence-exempt RSSs. Operation is subject to the following two conditions:

- This device may not cause interference; and
- This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d’Industrie Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes :

- l’appareil ne doit pas produire de brouillage;
- l’utilisateur de l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.

14 List of figures

15 List of tables

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