OPERATING INSTRUCTIONS

safeIDS

Safety switch

SICK
Sensor Intelligence.

Described product

safeIDS

Manufacturer

SICK AG
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Germany

Legal information

Original document

This document is an original document of SICK AG.

Contents

1 About this document

1.1 Information on the operating instructions

Read these operating instructions carefully before starting any work in order to familiarize yourself with the product and its functions.

The operating instructions are an integral part of the product and should remain accessible to the personnel at all times. When handing this product over to a third party, include these operating instructions.

These operating instructions do not provide information on the handling and safe operation of the machine or system in which the product is integrated. Information on this can be found in the operating instructions for the machine or system.

1.2 Target group

This document is intended for persons who project plan, install, commission, operate and maintain the product.

1.3 Further information

You can find the product page with further information via the SICK Product ID:
pid.sick.com/{P/N}/{S/N}
(see "Product identification via the SICK product ID", page 9).

The following information is available depending on the product:

- This document in all available language versions
- Data sheets
- Other publications
- CAD files and dimensional drawings
- Certificates (e.g., declaration of conformity)
- Software
- Accessories

1.4 Symbols and document conventions

Warnings 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
Highlights useful tips and recommendations as well as information for efficient and trouble-free operation.

Instructions to action

► The arrow denotes instructions to action.

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

✓ The tick denotes the results of an action.

2 Safety information

2.1 General safety notes

Integrating the product

DANGER
The product can not offer the expected protection if it is integrated incorrectly.

- ► Plan the integration of the product in accordance with the machine requirements (project planning).
- ► Implement the integration of the product in accordance with the project planning.

Mounting and electrical installation

DANGER
Death or severe injury due to electrical voltage and/or an unexpected startup of the machine

- ► Make sure that the machine is (and remains) disconnected from the voltage supply during mounting and electrical installation.
- ► Make sure that the dangerous state of the machine is and remains switched off.

Repairs and modifications

DANGER
Improper work on the product

A modified product may not offer the expected protection if it is integrated incorrectly.

- ► Apart from the procedures described in this document, do not repair, open, manipulate or otherwise modify the product.

2.2 Intended use

The safety switch is an IO-Link safety device that makes it possible to safely read out actuator IDs. To operate the safety switch, it must be connected to an IO-Link Safety Masterport of a certified IO-Link Safety Master. The safety switch is suitable for the following applications:

- Safe position identification
- Safe case differentiation, e.g. for selecting tools for robot applications

The product may be used in safety functions.

The product is only suitable for use in industrial environments.

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

2.3 Improper use

Impermissible ambient conditions

- Outdoor areas
- Precipitation
- Inadequate protection against moisture and contamination
- Publicly accessible areas
- Explosion-hazardous area

- Corrosive environment
- Increased radioactivity
- Vacuum or pressure
- Direct UV radiation (sunlight)
- In the vicinity of low-frequency RFID devices
- In the vicinity of magnetic fields

Ambient conditions that can impair the safety switch

- Metal subsurface or metal in direct proximity (see "Mounting location", page 13)
- Passing metal chips

2.4 Qualification of personnel

Any work on the product may only be carried out by personnel qualified and authorized to do so.

Qualified personnel are able to perform tasks assigned to them and can independently recognize and avoid any potential hazards. This requires, for example:

- technical training
- experience
- knowledge of the applicable regulations and standards

3 Product description

3.1 Scope of delivery

- Safety switch
- Safety note
- Operating instructions for download: www.sick.com

3.2 Product identification

3.2.1 Product identification via the SICK product ID

SICK product ID

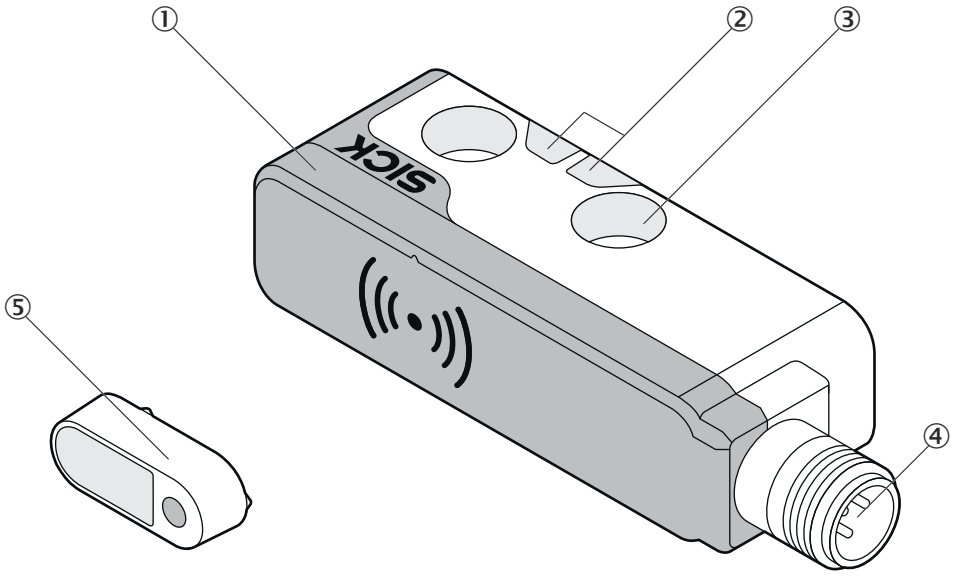
The SICK product ID uniquely identifies the product. It also serves as the address of the web page with information on the product.

The SICK product ID comprises the host name pid.sick.com, the part number (P/N), and the serial number (S/N), each separated by a forward slash.

The SICK product ID is displayed as text and QR code on the type label and/or on the packaging.

Figure 1: SICK product ID

3.3 Overview of the product



① Safety switch
② Display elements (LEDs)
③ Mounting holes
④ Connection
⑤ Actuator

3.4 Product characteristics

3.4.1 Design and function

Design

The safety switch consists of two components:

- **Sensor**
- **Actuator (RFID)**
  The actuator is mounted on an object or at a certain position.

Function

If the actuator is guided to the sensor, the sensor can evaluate the actuator ID. The actuator ID is transmitted safely to an IO-Link Safety Master via IO-Link Safety.

A safe signal is also generated when a valid actuator is detected.

3.4.2 Protective functions

The safety switch has the following internal protective functions:

- Short-circuit protection at all outputs
- Supply voltage reverse polarity protection

3.4.3 Pre-configured safety switch

The safety switch is operational at delivery and does not require any further configuration. No configuration software or special tool is therefore included, as is typically the case for devices with IO-Link Safety.

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 product.

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

The product must not be repaired. Defective products must be replaced.

4.2 Operating entity of the machine

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

After each change to the configuration, it is necessary to check whether the protective measure provides the necessary protection. The person making the change is responsible for ensuring that the protection measure provides the necessary protection.

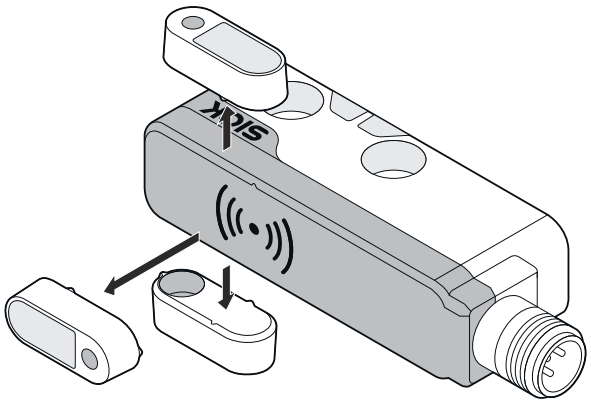
The product must not be tampered with or changed, except for the procedures described in this document.

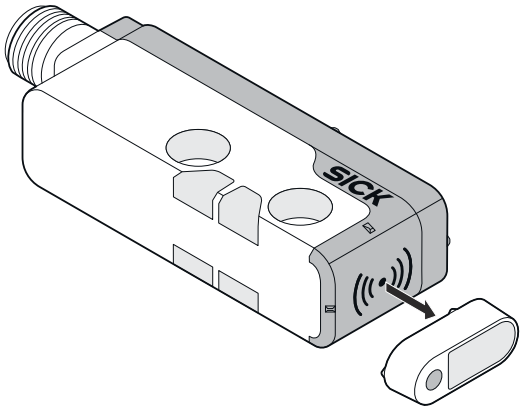
The product must not be repaired. Defective products must be replaced.

4.3 Design

4.3.1 Active sensor surfaces

The sensor has active sensor surfaces on which the actuator can be detected. The variant selected determines on which side the sensor has active sensor surfaces.

Actuation direction with 3 active sensor surfaces: • Top • Left • Right	 *Figure 2: Variant with 3 active sensor surfaces*

Actuation direction with 1 active sensor surface: • Frontal	 *Figure 3: Variant with 1 active sensor surface*

4.3.2 Features of the actuator

Overview

The actuators are available in different designs. The design effects the sensing ranges.

The sensor can read actuators from the STR1 product family in addition to the actuators from the safeIDS product family.

Actuator SE1-AM**

The actuators belong to the safeIDS product family. The following IDs can be read out:

- Standard ID
  - Uniquely coded 16 bit ID
  - High coding according to ISO 14119
  - Must be evaluated individually to be used.
- Short ID
  - Number from 1 ... 16
  - Medium coding according to ISO 14119
  - Laser marking on actuator

The actuators are available in the following designs:

- Mini

Actuator STR1-XA*

The actuators belong to the STR1 product family. The following IDs can be read out:

- Standard ID
  - Uniquely coded 24 bit ID
  - High coding according to ISO 14119
  - Must be read out individually to be used.

The actuators are available in the following designs:

- Standard
- Compact
- Flat
- Mini

4.3.3 Mounting location

WARNING
Bypassing the protective device
Hazard due to lack of effectiveness of the protective device

► Make manipulating the safety switch more difficult. If possible, use permanent mounting methods for actuators (e.g., glue, safety screws, or rivets).

- During actuation, the sensor and actuator must be located opposite each other at assured switch-on distance S_{ao} or closer (see "Sensing ranges", page 32).
- Select the mounting location so that the sensor and actuator are accessible for maintenance work and are protected against damage.
- Mount the sensor and actuator on a non-ferrous surface and at a distance from metal parts if possible in order to avoid influencing the sensing range. If this is not possible, the influence on the assured switch-on distance S_{ao} and the assured switch-off distance S_{ar} must be checked. If the actuator approaches the sensor in parallel, maintain the minimum distances.

4.3.4 Distance

When several safety switches are mounted on the machine, they must be mounted at a minimum distance to one another see "Mounting", page 17.

4.3.5 Alignment

Sensors and actuators can be aligned differently to one another, see "Mounting", page 17, see "Sensing ranges", page 32. The actuators can point to the front or be rotated by 90° to an active sensor surface.

4.3.6 Approach direction

The actuator can approach the sensor differently:

- Direct approach
  The direction of movement of the actuator is vertical to one of the 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 32).
  Due to the principle, the response range of the sensor has side lobes. If the minimum distance is not maintained, the safety switch switches before the correct position is reached. SICK recommends doing without parallel approach if you cannot maintain a minimum distance.

4.3.7 Different sensing ranges

Overview

The assured switch-on distance S_{ao} and the assured switch off distance S_{ar} can be used to determine the position of the sensor and actuator for different operational statuses when planning the application.

- Assured switch-on distance S_{ao}:
  When the distance between the sensor and actuator is ≤ S_{ao}, the actuator is reliably detected.
- Assured switch-off distance S_{ar}:
  When the distance between the sensor and actuator is > S_{ar}, the actuator is reliably not detected.

Different sensing ranges

- Assured switch-on distance S_{ao}
  If the actuator approaches the sensor and reaches the assured switch-on distance, the sensor reacts as follows:
  - Status variable in the SPDU telegram changes to: 0x0000 0000 0x0001 0000
    (For actuators of type STR1-XA*: 0x0000 0000 0x0001 0010)
  - Output of the actuator ID in the TagID variable in the SPDU telegram
  - If applicable, output of the short ID in the ShortID variable in the SPDU telegram
  - STATE LED lights up green while the DIAG LED is switched off.

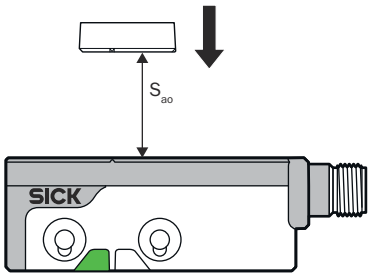


Figure 4: Assured switch-on distance S_{ao}

- Assured switch-off distance S_{ar}
  If the actuator is removed from the sensor and reaches the assured switch-off distance, the sensor reacts as follows:
  - Status variable in the SPDU telegram changes to: 0x0000 0000 0x0000 1110
  - Output of 0x0000 in the TagID variable in the SPDU telegram
  - Output of 0x00 in the ShortID variable in the SPDU telegram
  - STATE LED lights up red while the DIAG LED is switched off.

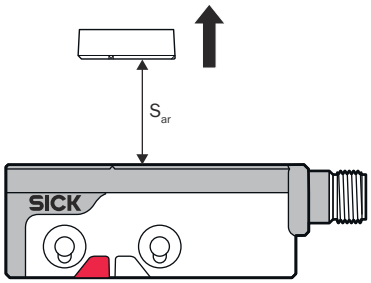


Figure 5: Assured switch-off distance S_{ar}

- Before reaching assured switch-on distance S_{ao}
  If the actuator approaches the sensor, the Status variable shows that it is in the boundary area of the switch-on distance before the actuator reaches assured switch-on distance S_{ao}. The typical switch-on distance depends on the ambient conditions.
  - Status variable in the SPDU telegram changes to: 0x0000 0000 0x0001 1000
    (For actuators of type STR1-XA*: 0x0001 1010)
  - Diag LED lights up yellow.

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

Complementary information

In the range between S_{ao} and S_{ar}, interferences with the surrounding materials can arise. This can lead to the sensor switching multiple times between the output states. If this leads to problems, the output state should only be evaluated when the distance between the sensor and actuator is certain to be less than S_{ao} or certain to be greater than S_{ar}.

Further topics

- "Sensing ranges", page 32
- "IO-Link Safety interface and process data description", page 15

4.4 Integration in the electrical control system

4.4.1 Type of higher-level control system

The product is connected to an IO-Link Safety Master (FS Master).

4.5 Integration into the network

4.5.1 IO-Link Safety interface and process data description

Overview

General

- IO-Link Safety Version: 1.1.3
- COM rate: Com2
- Feature level: a (no OSSDe support)

SPDUin content (from sensor to master)

FS-PDin	PortNum	Status&DCnt	CRC Signature
Safe sensor output data	FS Master port number, inverted	Status and error indication and inverted 3-bit counter	Checksum of FS-PDin, PortNum and Status&DCnt
8 bytes	1 byte	1 byte	4 bytes

FS-PDin content (Functional Safety Protocol)

- Status: 2 bytes
- TagID: 4 bytes
- ShortID: 2 bytes

Structure of FS-PDin

Byte offset	48		16				0	
Byte	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Variable	Status		TagID				ShortID	
Data type	IntegerT(16)		IntegerT(32)				IntegerT(16)	
Subindex	1		2				3	

Variable: Status

Bit / Byte	7	6	5	4	3	2	1	0
0	0x00							

Bit / Byte	7	6	5	4	3	2	1	0
1	0 = Reserved	00 = Reserved		01 = Actuator not detected		11 = Standard, no actuator detected		0
				10 = Actuator detected		00 = Pre-programmed actuator type SE1-AM**		
				11 = Actuator at the edge of the detection zone		01 = Actuator type STR1-XA**		
						10 = Reserved		

4.6 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 22.

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.

4.6.1 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 Mounting

Important information

NOTICE

- Arrange the safety switch and actuator so that damage due to unintentional outside influences is prevented.
- Check for environmental influences before using the device, e.g., UV radiation or corrosion. Mount with protection if necessary.

Prerequisites

- Project planning is completed.
- Assembly is carried out according to the project planning.
- Dangerous condition of the machine is and remains switched off during mounting.
- Do not use a safety switch and actuator as a stop.
- Use only reliable mounting elements that can only be removed with tools.

Mounting the sensor

1. Mount the sensor.
   Minimum requirement for mounting screws
   - Quantity: 2
   - Size: M4 × 18 (or longer)
   - Strength class: Class 8.8 or higher (stainless steel screws: A2-70 or higher).
   - Tightening torque: 1 Nm
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.

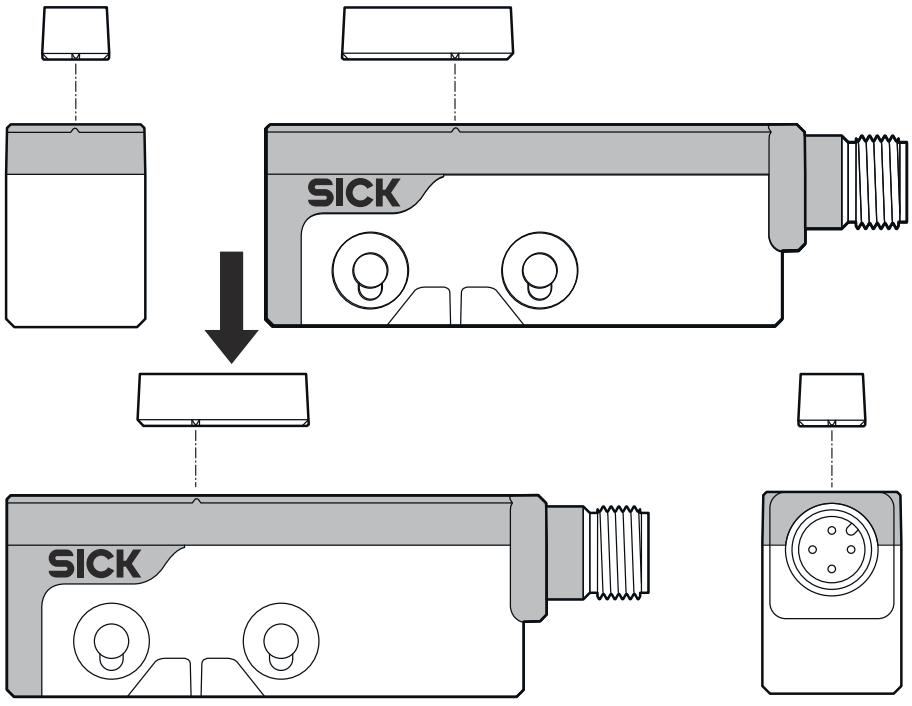


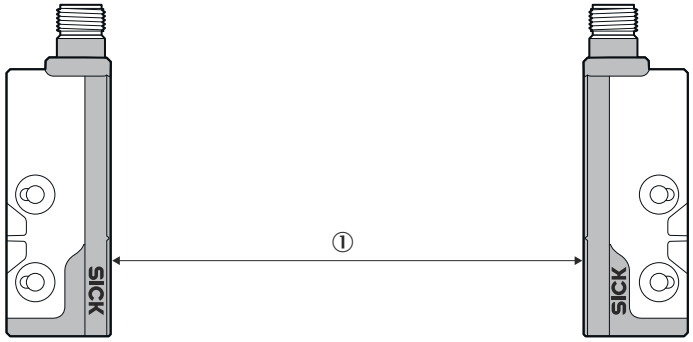
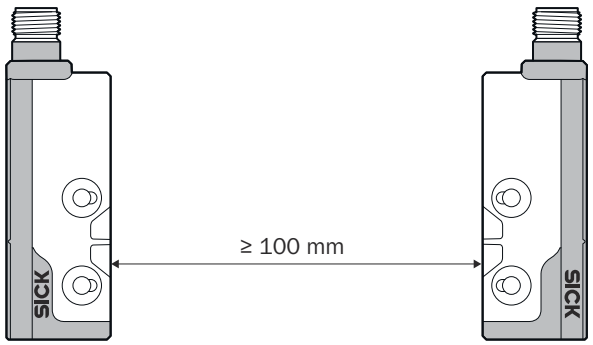
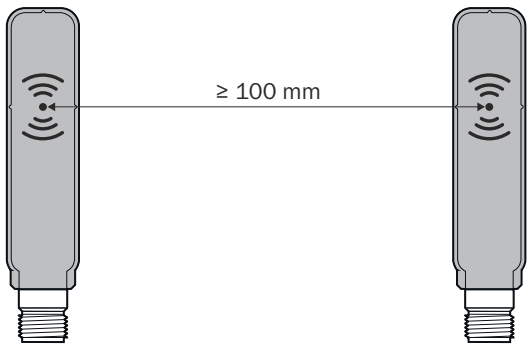
Figure 6: Align actuator to sensor (example for actuator on top sensor surface)

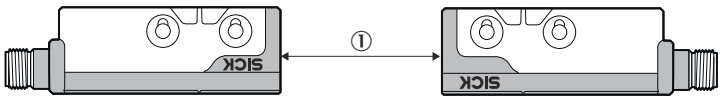
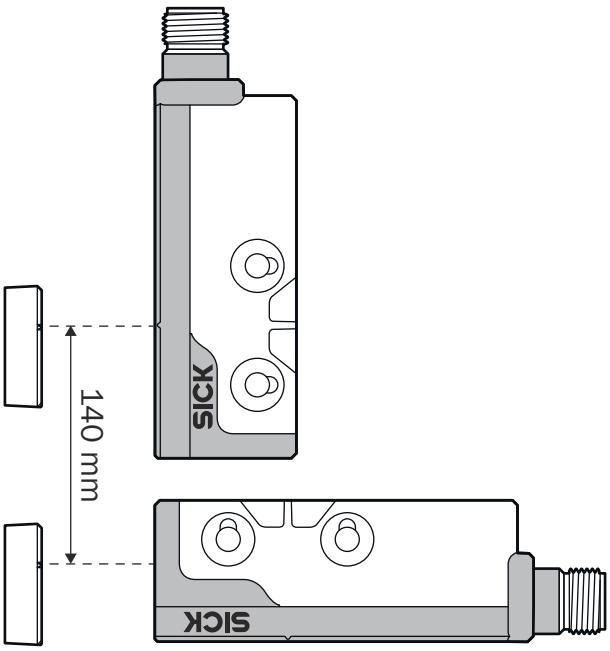
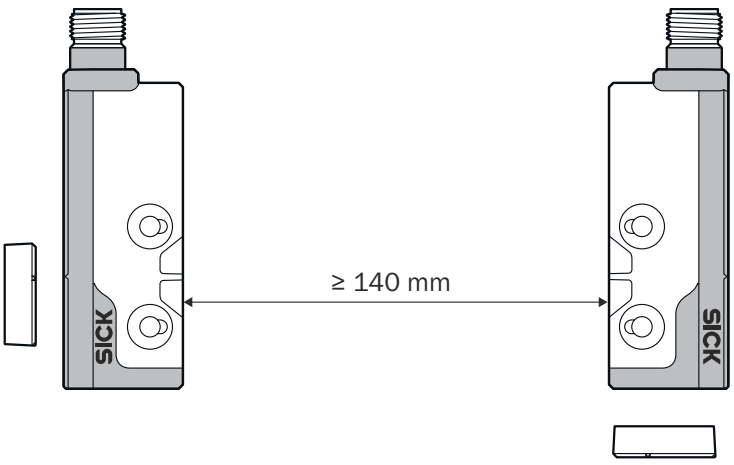
2. Screw on the actuator. Max. tightening torque 0.7 Nm

Mounting several safety switches

1. When several safety switches are mounted, the prescribed minimum distance between the individual systems must be adhered to in order to avoid mutual interference.

Table 1: Mounting distances

Identically designed variants	Minimum distance
Yes	 *Figure 7: Mounting distance 1* ① • SE1-ST1A20 variant: ≥ 200 mm • SE1-SS1A20 variant: ≥ 100 mm
Yes	 *Figure 8: Mounting distance 2*
Yes	 *Figure 9: Mounting distance 3*

Identically designed variants	Minimum distance
Yes	 *Figure 10: Mounting distance 4* ① • SE1-ST1A20 ≥ 200 mm • SE1-SS1A20 ≥ 140 mm
No	 *Figure 11: Mounting distance 5*
No	 *Figure 12: Mounting distance 6*

Further topics

- see "Mounting location", page 13
- see "Different sensing ranges", page 13

6 Electrical installation

6.1 Device connection (M12, 4-pin)

Prerequisites

- Mounting is completed.
- Electrical installation is carried out according to the project planning.
- Dangerous condition of the machine is and remains off during the electrical installation.
- Outputs of the device have no effect on the machine during electrical installation.

Device connection (M12, 4-pin)

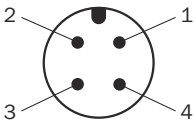


Figure 13: Device connection (male connector M12, 4-pin, A-coded)

Table 2: Pin assignment for device connection (male connector, M12, 4-pin, A-coded)

Pin	Wire color [1)]	Designation	Description
1	Brown	+24 V DC	Voltage supply 24 V DC
2	White	N/C	Not connected
3	Blue	0 V	Voltage supply 0 V DC
4	Black	Q/C/IOL-S	IO-Link network connection

1) Applies to the connecting cables recommended as accessories.

7 Commissioning

7.1 Switching on

Procedure

1. Connect sensor to IO-Link Safety Master.
2. Apply supply voltage to IO-Link Safety Master.

✓ The sensor initializes after it is switched on. It then sends a ready pulse to the IO-Link Safety Master. The master responds with a wake-up pulse. The sensor then starts communication.

3. Generate safety-relevant protocol parameters using the IO-Link Safety Master and its configuration software (FS Master Tool).
4. Transfer the safety-relevant protocol parameters to the sensor.
5. Briefly interrupt the voltage supply of the sensor using the IO-Link Safety Master.

✓ The sensor is restarting.

✓ The sensor starts directly in the safe communication mode.

Complementary information

If the sensor has already been put into operation, steps see step 3 to see step 5 are skipped.

7.2 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 accurately reflects the state/condition 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 is available from your SICK subsidiary.

8.2 Display elements

LEDs

The STATE (red/green) and DIAG (yellow/red) LEDs indicate the operational status of the safety switch.

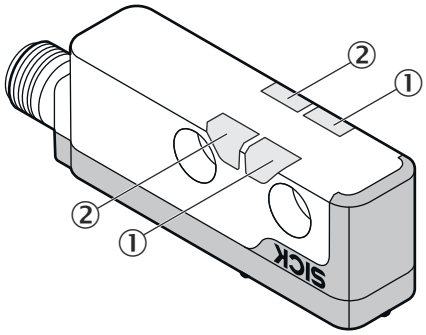


Figure 14: Display elements

① STATE

② DIAG

Table 3: Status LEDs

Item	Name	Color
①	STATE	Red/green
②	DIAG	Yellow/red

Further topics

- "Switching on", page 22

8.2.1 Status indicators

Table 4: Status indicators

Operational status of the sensor	Description	STATE LED (red/green)	DIAG LED (yellow/red)
Switched off	No voltage supply	○	○
Initialization	Step 1	Red	○
	Step 2	Green	○
	Step 3	○	Yellow
	Step 4	○	Red
Before safe operational status		Green	Red

Operational status of the sensor	Description	STATE LED (red/green)	DIAG LED (yellow/red)
Safe operational status	Valid actuator in assured switch-on distance S_{ao}	● Green	○
	Valid actuator in the area between assured switch-on distance S_{ao} and assured switch-off distance S_{ar}	Not defined	● Yellow
	No valid actuator in detection zone	● Red	○
	Internal or external error see "Correct error", page 25	☼ Red	☼ Red
	Error message from IO-Link Master	Not defined	● Red

○ LED off. ☼ LED flashes. ● LED illuminates.

8.3 Correct error

Overview

The error status is communicated in two ways:

- LED display (STATE and DIAG flash red)
- SDset bit (bit 2 in the Status&DCnt byte in SPDUin) = 1 (see "IO-Link Safety interface and process data description", page 15)

Procedure

Communication via IO-Link Safety possible

1. Read out the device status from the service data (index dec 36 / hex 0x24, 1 byte).
   Service data values
   - 0 = OK
   - 1 = Maintenance required
   - 2 = Operation outside the specifications
   - 3 = Functional check
   - 4 = Error status
2. When Device Status = 2
   Use the indices for temperature and electrical voltage to determine the error cause (see table 5). The values must be within the operating parameters (see "Technical data", page 29).
3. When Device Status = 4
   Read out the error history to determine the error cause (see table 5). Then contact SICK Support and have the error history data on hand.

Table 5: Indices for troubleshooting

Data	Index	
	dec	hex
Temperature	dec 153 and 154	hex 0x99 and 0x9A
Electrical voltage	dec 155 and 156	hex 0x9B and 0x9C
Error history	dec 601 ... 620	hex 0x259 ... 0x26C

No communication via IO-Link Safety possible

1. Restart sensor (remove and reapply the voltage supply).
2. If the error persists, contact SICK Support.

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.

9.2 Regular thorough check

The safety switch must be checked regularly. The type and frequency of thorough checks is defined by the machine manufacturer and operating entity, see "Thorough check concept", page 16.

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

Procedure

► 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 6: Features

Features	
Assured switch-on distance S_{ao} (IEC 60947 5-3)	see "Sensing ranges", page 32
Assured switch-off distance S_{ar} (IEC 60947 5-3)	see "Sensing ranges", page 32
Max. actuation frequency	0.5 Hz

Table 7: 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 a dangerous failure per hour)	0.301×10^{-9} at 40 °C and sea level 0.418×10^{-9} at 40 °C and 3,000 m above sea level
T_M (mission time)	20 years (EN ISO 13849–1)
Response time (removal from response range) [1] IO-Link Safety specification: WCDT	≤ 100 ms
Release time (response time when approaching response range) [2]	≤ 100 ms
Risk time [3] IO-Link Safety specification: OFDT	≤ 100 ms
Length of cable [4]	≤ 20 m
Minimum distance between 2 safety switches	Depends on the alignment and variant see "Mounting", page 17
Type	Type 4 (EN ISO 14119)
Coding level depends on the evaluation of the data and actuator type	
Evaluation of the actuator detection from the Status variable (byte 1, bits 3 and 4)	Low coding level (EN ISO 14119)
Evaluation of the Short-ID variable (byte 6 ... 7) when using numbered actuators	Medium coding level (EN ISO 14119)
Evaluation of the Tag-ID variable (byte 2 ... 5)	High coding level (EN ISO 14119)
Safe status when an error occurs	Error display via bit 2 (SDset) in the Status&DCnt byte in SPDUin

1) Response time between removing the actuator from the response range and sending the “No valid actuator in response range” status in the “Status” byte by means of SPDUin.
2) Response time between detection of the actuator and sending the “Valid actuator in response range” status in the “Status” byte by means of SPDUin.
3) The risk time is the time needed to detect internal and external errors. External errors affect the voltage supply or the IO-Link Safety communication interface. Within the risk time, the error is indicated via the SDset bit in SPDUin or communication is switched off.
4) Cable specification according to IO-Link safety specs. V 1.1.3.

Table 8: Interfaces

Interfaces	
Communication	FS-PD (Functional Safety Protocol Data)

Interfaces	
IO-Link Safety Version	1.1.3
COM rate	Com2
Feature level	a (no OSSDe support)

Table 9: Electrical data

Electrical data	
Degree of contamination	3 (external, according to EN 60947-1)
Power-up time (after supply voltage applied)	≤ 5 s
Supply voltage U_V	DC 24 V (18 V ... 30 V)
Rated insulation voltage Ui	DC 32 V
Utilization category (IEC 60947-5-1)	DC-12: 24 V / 20 mA
Current consumption (without load)	35 mA
Protection class	III (EN 61140 / IEC 61140)

Table 10: Mechanical data

Mechanical data	
Dimensions (W x H x D)	
Safety switch	84 mm x 18 mm x 26 mm
Actuator dimensional drawing	see "Dimensional drawings", page 31
Housing material of the sensor	Vistal®
Housing material of the actuator	Vistal®
Weight	
Safety switch “Mini” actuator	44 g 6 g

Table 11: Ambient data

Ambient data	
Enclosure rating	IP67 (IEC 60529) IPX9K (ISO 20653)
Ambient operating temperature	–10 °C ... +70 °C
Storage temperature	–25 °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)
Electromagnetic compatibility (EMC)	In accordance with IEC/EN 61000-6-2, IEC/EN 61000-6-7, EN 62131-9 and EN 61139-2

11.2 Dimensional drawings

Sensor

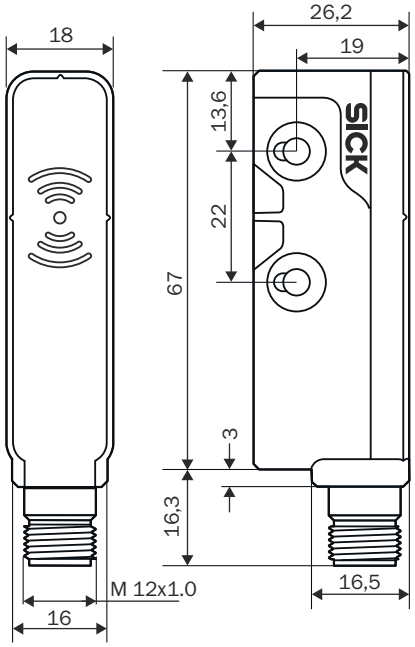


Figure 15: Sensor dimensional drawing

Actuator

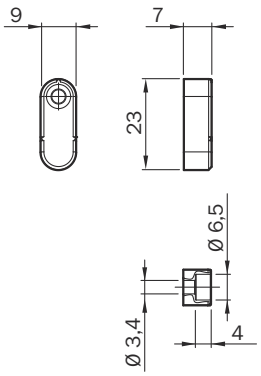


Figure 16: Dimensional drawing of “Mini” safeIDS actuator

All dimensions in mm.

11.3 Sensing ranges

Important information

NOTE

- The values specified in this section 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.

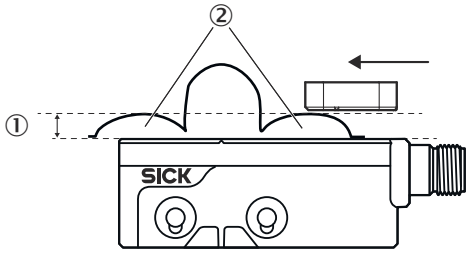


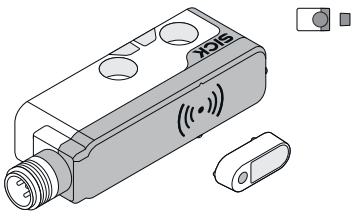
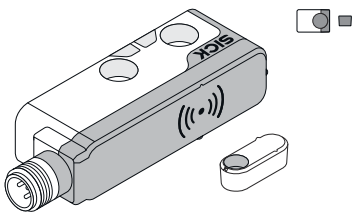
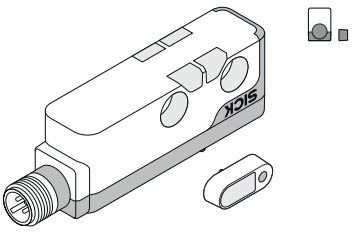
Figure 17: Minimum distance with parallel approach

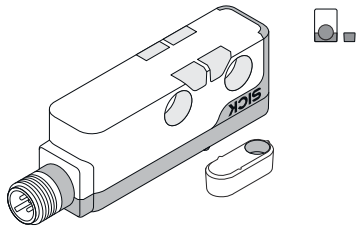
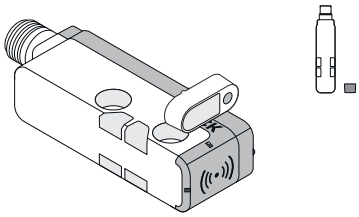
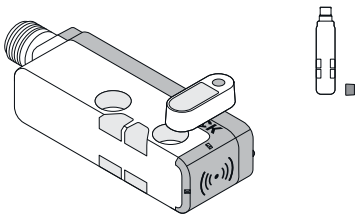
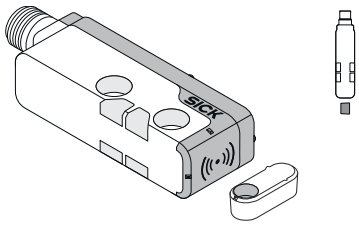
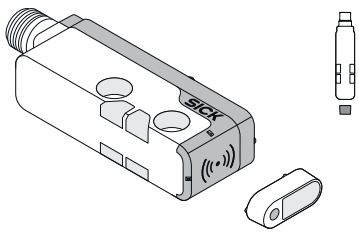
① Minimum distance with parallel approach

② Side lobes

Sensing ranges with actuator type SE1-AM**

Table 12: Sensing ranges for "Mini" actuator

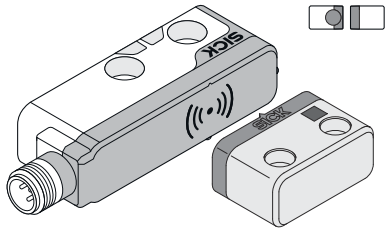
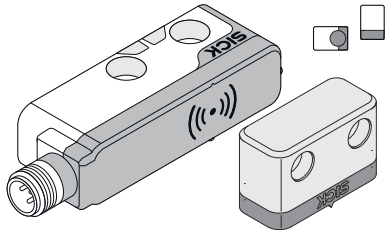
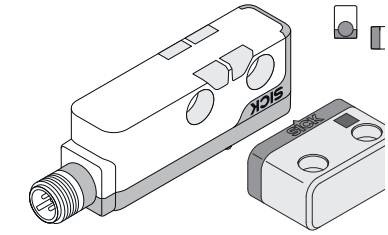
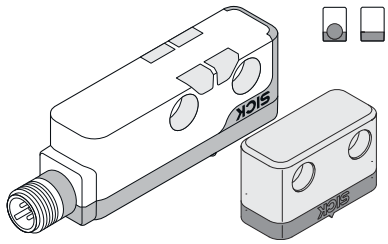
Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch-off distance S_{ar}	Minimum distance with parallel approach
Variant with 3 active sensor surfaces			
	10 mm	35 mm	4 mm
	10 mm	35 mm	4 mm
	4 mm	35 mm	0 mm

Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch-off distance S_{ar}	Minimum distance with parallel approach
	4 mm	35 mm	0 mm
Variant with 1 active sensor surface			
	4 mm	30 mm	0 mm
	4 m	30 mm	0 mm
	7 mm	30 mm	2 mm
	7 mm	30 mm	2 mm

Sensing ranges with actuator type STR1-XA*

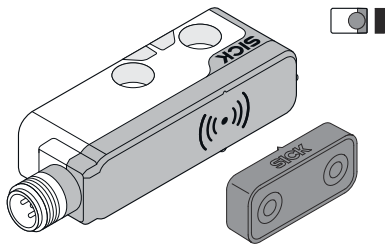
Table 13: Sensing ranges for "Standard" actuator

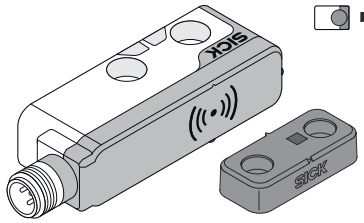
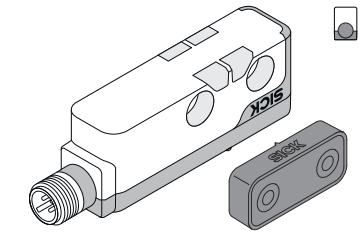
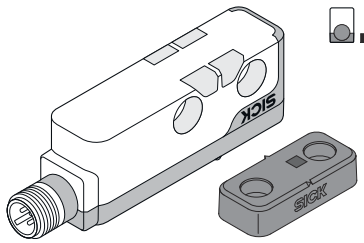
Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch-off distance S_{ar}	Minimum distance with parallel approach
Variant with 3 active sensor surfaces			

Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch-off distance S_{ar}	Minimum distance with parallel approach
	7 mm	30 mm	4 mm
	7 mm	30 mm	4 mm
	4 m	25 mm	0 mm
	4 mm	25 mm	0 mm

Sensing ranges for “Flat” actuator

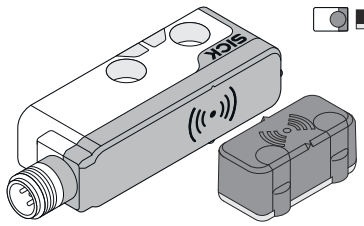
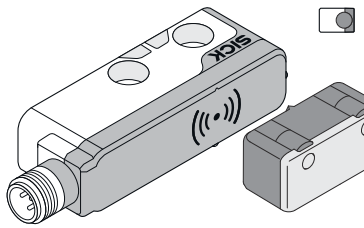
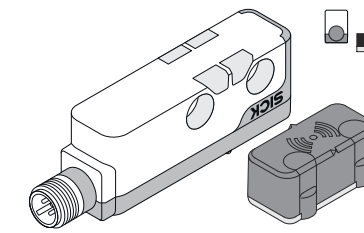
Table 14: Sensing ranges for “Flat” actuator

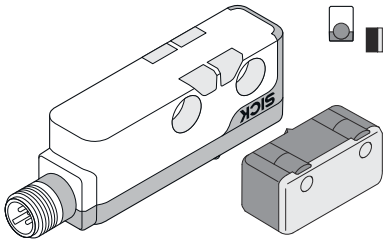
Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch-off distance S_{ar}	Minimum distance with parallel approach
Variant with 3 active sensor surfaces			
	8 mm	28 mm	4 mm

Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch-off distance S_{ar}	Minimum distance with parallel approach
	8 mm	28 mm	4 mm
	4 mm	28 mm	0 mm
	Not possible		

Sensing ranges for “Compact” actuator

Table 15: 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
Variant with 3 active sensor surfaces			
	7 mm	30 mm	4 mm
	7 mm	30 mm	4 mm
	3 mm	30 mm	0 mm

Alignment of sensor and actuator	Assured switch-on distance S_{ao}	Assured switch-off distance S_{ar}	Minimum distance with parallel approach
	3 mm	30 mm	0 mm

12 Ordering information

12.1 Ordering information

Table 16: Ordering information for safety switch

Active sensor surfaces	Type	Part number
3	SE1-ST1A20	1132196
1	SE1-SS1A20	1132197

Table 17: Ordering information for pre-numbered “Mini” design actuator

Short ID	Type	Part number
01	SE1-AM01	1132271
02	SE1-AM02	1132272
03	SE1-AM03	1132273
04	SE1-AM04	1132274
05	SE1-AM05	1132275
06	SE1-AM06	1132276
07	SE1-AM07	1132277
08	SE1-AM08	1132278
09	SE1-AM09	1132279
10	SE1-AM10	1132280
11	SE1-AM11	1132281
12	SE1-AM12	1132282
13	SE1-AM13	1132283
14	SE1-AM14	1132284
15	SE1-AM15	1132285
16	SE1-AM16	1132286

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.

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.

13.2 FCC and IC radio approval

- FCC ID: 2AHDRSE1
- IC: 21147SE1

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.

8028533/2024-05-13/en

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