

IN4000 Standard

Safety switches



Described product

IN4000 Standard

Manufacturer

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Original document

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1 About this document

1.1 Purpose of this document

These operating instructions provide technical personnel of the machine manufacturer or machine operator with instructions regarding the safe mounting, parameterization, electrical installation, commissioning, operation and thorough check of the inductive safety switch.

These operating instructions do not provide information on operating the machine in which a safety switch is integrated. For information about this, refer to the operating instructions of the specific machine.

1.2 Target group

These operating instructions are intended for planning engineers, developers, and operating entities of plants and systems that are to be protected by one or more inductive safety switches. They are also intended for people who integrate the safety switch into a machine, or perform the initial commissioning or inspection.

1.3 Information depth

These operating instructions contain information about the inductive safety switch on the following topics:

- Mounting,
- Electrical installation,
- Hardware commissioning,
- Fault diagnosis and troubleshooting,
- Part numbers,
- Conformity and approval.

Please note that technical skills not covered by this document are also required when planning and using SICK protective devices.

The official and legal regulations for operating the inductive safety switch must always be complied with.

General information on the topic of safety technology can be found in the “Guide for Safe Machinery”.



NOTE

Please also refer to the website at: www.sick.com

There you will find:

- example applications
- a list of frequently asked questions

1.4 Scope

Product

This document applies to the following products:

- Product code: IN4000 Standard

Document identification

Document part number:

- This document: 8027276
- Available language versions of this document: 8010934

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

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 On safety

This section concerns your own safety and the safety of the system operator.

- ▶ Please read this section carefully before you begin working with the IN4000 Standard series of inductive safety switches, or the machine protected by these safety switches in conjunction with the corresponding protective devices.

National and international legal regulations apply to the use/installation of the IN4000 Standard series of safety switches as well as to their commissioning and recurring technical inspections, in particular

- the Machinery Directive,
- the EMC Directive,
- the Work Equipment Directive,
- the safety regulations, and
- the accident prevention regulations and work safety regulations.

2.1 Qualified safety personnel

The safety switches must only be installed and commissioned by qualified safety personnel. A person is considered qualified safety personnel if he/she

- has taken part in adequate technical training

and

- has been instructed by the machine operator in machine operation and the applicable safety guidelines

and

- can access these operating instructions.

2.2 Applications of the safety switches

The IN4000 Standard series of safety switches are inductive safety proximity switches that are actuated by metal in a non-contact manner. The safe state is the de-energized state.

The IN4000 Standard series of safety switches and the corresponding machine or system controller can be used, for example, to protect movable physical guards in such a way that:

- the dangerous state of the machine or system can only be switched on when the protective devices are closed.
- a stop command is triggered if a protective device is opened while the machine is running.

For the controller, this means that:

- switch-on commands that result in dangerous states may only be activated when the protective devices are in the protective position,

and

- dangerous states must be ended before the protective devices are moved out of the protective position.

Before using the safety switches, a risk assessment must be carried out on the machine.

Intended use also includes compliance with the relevant requirements for installation and operation.

The safety switches must be subjected to periodic technical inspections (see "Periodic technical inspections", page 22).

2.3 Intended use

The IN4000 Standard series of safety switches may only be used as described in section "Applications of the safety switches". The safety switches may only be installed by qualified safety personnel and may only be used on the machine on which they were installed and commissioned for the first time by qualified safety personnel in accordance with these operating instructions.

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.

If used in any other way or if alterations are made to the devices – including in the context of mounting and installation – any warranty claims directed to SICK AG will be rendered void.

2.4 Reasonably foreseeable misuse

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

- In the vicinity of chemical and biological media (solid, liquid, gaseous)
- In environments with increased levels of ionizing radiation

2.5 General safety notes and protective measures

The safety switch performs a personal protection function. Improper installation or manipulation can lead to serious personal injuries.

The safety switch complies with the following safety requirements:

- SIL3 according to IEC 61 508,
- SILCL3 according to EN 62 061,
- Performance Level e according to EN ISO 13 849-1 (depending on application).

Change information

- **For devices up to CW24 2018, the following applies:**
PFH_D 1.33×10^{-9} /Category 4 (EN ISO 13 849-1)
- **For devices on or after CW25 2018, the following applies :**
PFH_D 1.0×10^{-8} /Category 3 (EN ISO 13 849-1)
- ▶ Please check whether the device meets the safety requirements of your application.

Note regarding the classification of the device according to EN 60 947–5-2:

- The IN40-D0101K safety switch complies with I1C40SP2M or I2C40SP2M classification, depending on the installation method.
- The IN40-D0303K safety switch complies with the I2A18SP2M classification.
- The IN40-D0202K safety switch complies with the I2A30SP2M classification.
- The IN40-D0304K safety switch complies with the I1A18SP2M classification.

**WARNING**

Safety switches must not be circumvented, rotated away, removed, or rendered ineffective in any other way. Their contacts must not be bridged.

The inductive safety switches respond to metallic objects. Other metallic objects that are not intended to trigger the safety function must not be placed on the sensing face of the safety switches under any circumstances. Appropriate measures must therefore be taken to prevent this.

Please observe the installation measures according to EN ISO 14 119.

Damaged devices must be replaced.

3 Product description

3.1 IN4000 Standard Series safety switches

The IN4000 Standard series of safety switches are based on the same principle of operation, but differ in their design, installation method, response ranges, and classification.

The IN40-D0101K safety switch has a cuboid housing with an alignable active sensor face. It can also be installed flush or flush on one side, except in steel.

The IN40-D0303K and IN40-D0202K safety switches are enclosed in a cylindrical housing and are not suitable for flush or one-sided flush installation.

The IN40-D0304K safety switch is enclosed in a cylindrical housing and is suitable for flush installation.

3.2 Features and principle of operation

The IN4000 Standard series of safety switches are typically used for safe position detection, as is the case, for example, when monitoring a movable protective device. The sensor detects the presence of metal. In order to meet the requirements against easy manipulation, the switching range of the sensor is monitored in time and space.

Its status can be read directly on the sensor or the protective device by means of LEDs. Errors, such as a coil break, short-circuit or wire break are detected by the self-monitoring function of the sensor.

The safety switch can be connected directly to a safe PLC or to a SICK safety controller, e.g., Flexi Classic or Flexi Soft.

The IN4000 Standard series of safety switches can be cascaded (see ["Series connection of inductive safety switches"](#), page 21).

Information on connection can also be found in the operating instructions of the safety controller used (e.g., Flexi Classic or Flexi Soft).

3.3 Enable zone and assured switch-off distance

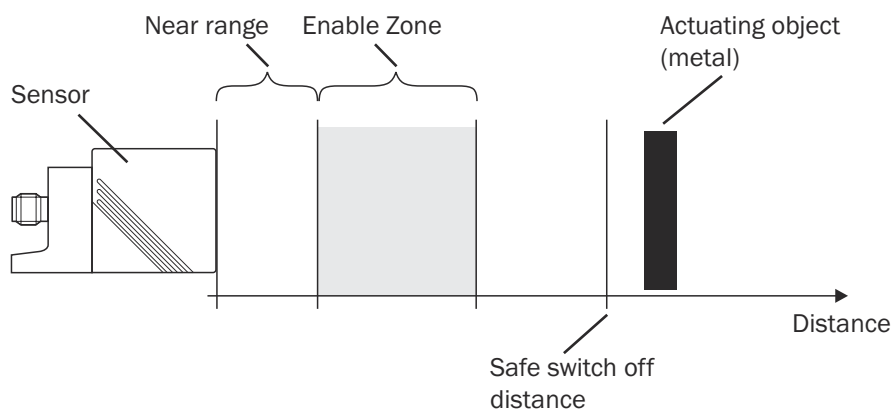


Figure 1: Schematic illustration of the zones

The output of the safety switch is only enabled in the event of actuation within the enable zone. Outside the enable zone, i.e., also in the close range, the output remains switched off.

After actuation in the close range, either the supply voltage must be interrupted or the actuator must be brought into the assured switch-off distance for more than 2 s before it can be enabled again.

The enable zone depends on the type of safety switch and the material and shape of the actuator. Using other actuators (material, shape) results in a different enable zone.

Typically, the following enable zone is achieved at an ambient temperature of 20 °C with non-flush installation of the safety switch using a standard plate according to EN 60 947-5-2 (45 × 45 × 1 mm³ for IN40-D0101K and IN40-D0202K or 24 × 24 × 1 mm³ for IN40D03..) and with different materials:

Table 1: Enable zone and assured switch-off distance IN40D0101K

Material	Enable zone		Assured switch-off distance
	Lower boundary	Upper boundary	
FE360 steel	≥ 10.0 mm	≤ 15.0 mm	30 mm
1.4302 stainless steel (V2A)	7.5 mm	13.2 mm	
AlMg 3G22	2.0 mm	5.8 mm	
Al 99 %	1.4 mm	5.0 mm	
CuZn 37	2.3 mm	6.2 mm	
Cu	0.8 mm	4.3 mm	

Table 2: Enable zone and assured switch-off distance IN40D0202K

Material	Enable zone		Assured switch-off distance
	Lower boundary	Upper boundary	
FE360 steel	≥ 6.0 mm	≤ 12.0 mm	30 mm
1.4302 stainless steel (V2A)	3.7 mm	8.4 mm	
AlMg 3G22	1.0 mm	4.7 mm	
CuZn 37	1.2 mm	5.1 mm	

Table 3: Enable zone and assured switch-off distance IN40D0303K

Material	Enable zone		Assured switch-off distance
	Lower boundary	Upper boundary	
FE360 steel	≥ 3.0 mm	≤ 6.0 mm	15 mm
1.4302 stainless steel (V2A)	1.7 mm	4.3 mm	
AlMg 3G22	0.5 mm	2.2 mm	
CuZn 37	0.5 mm	2.5 mm	

Table 4: Enable zone and assured switch-off distance IN40D0304K

Material	Enable zone		Assured switch-off distance
	Lower boundary	Upper boundary	
FE360 steel	≥ 1.0 mm	≤ 4.0 mm	10 mm
1.4302 stainless steel (V2A)	0.4 mm	2.7 mm	
AlMg 3G22	0 mm	1.4 mm	
CuZn 37	0 mm	1.5 mm	
Cu	0 mm	0.8 mm	

3.4 LED indicators

The safety switches have two LEDs that indicate the status of the supply voltage and the operational status.

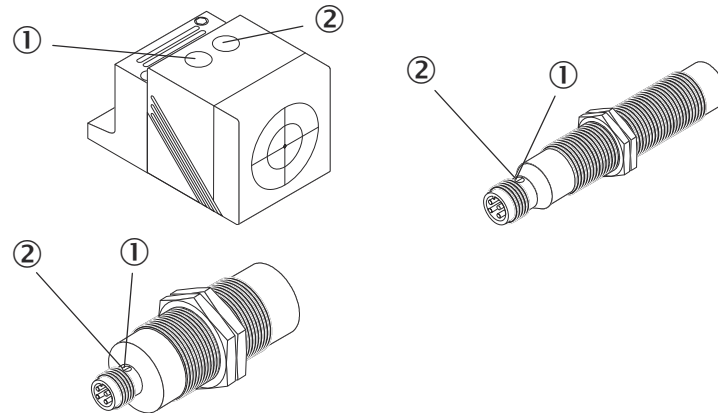


Figure 2: LED displays for voltage supply and operational status

- ① Power LED, green
- ② Signal LED, yellow

3.4.1 Displays in operating mode

The yellow signal LED lights up immediately or after a time delay, depending on the duration of the preceding de-actuation, when an actuator enters the enable zone.



NOTE

Regardless of the behavior of the yellow LED, the output always switches within the normal response times without any additional delay.

- If the actuator is in the enable range when the supply voltage is switched on, the yellow signal LED switches after a time delay of 5 s.
- If the actuator was ≥ 2 s away from the sensor at the assured switch-off distance and is then brought back into the enable zone, the yellow signal LED switches after a delay of 3 s.
- If the actuator was < 2 s away from the sensor at the assured switch-off distance and is then brought back into the enable zone, the yellow signal LED switches without a time delay.
- If the actuator is brought to the assured switch-off distance from the sensor, the yellow signal LED switches off without delay.
- If the actuator is brought into the close range, the yellow signal LED switches off after a delay of 2 s.

Further topics

- ["Enable zone and assured switch-off distance", page 10](#)
- ["Data sheet", page 27](#)

3.4.2 Displays in adjustment mode

- In adjustment mode, the yellow signal LED flashes when the actuator is outside the enable zone.
- In adjustment mode, the yellow signal LED goes out when the actuator is within the enable zone or in the assured switch-off range.



NOTE

In adjustment mode, the output remains in the safe state.

Display	Meaning	Sensor signals
○ Yellow ○ Green	No supply voltage	
○ Yellow ● Green	Undervoltage	
○ Yellow ● Green	Overtoltage	
○ Yellow ● Green	Output switched off (safe state); actuator outside the enable zone (operating mode) or actuator within the enable zone (adjustment mode)	
● Yellow ● Green	Output activated; actuator within the enable zone (operating mode)	
● Yellow ● Green	Output switched off (safe state); actuator outside the enable zone (adjustment mode)	
● Yellow ○ Green	Error. For troubleshooting Perform de-actuation/actuation Switch the supply voltage off and then on again Replace device Check wiring/connections and ensure they are in the proper condi- tion Check the downstream electronics (safety controller or PLC) and ensure they are in the proper condition	

- "Adjustment", page 21

3.5 Signal behavior

The safety switch must be operated at its TE input with a clock that meets the following conditions:

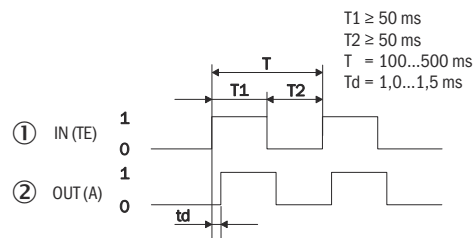


Figure 3: PSDI mode of the safety switches

- ① PSDI input
- ② PSDI output

The electrical input characteristics are compatible with the output characteristics according to EN 61 131-2 (0.1 A nominal current and 24 V nominal voltage):

Table 5: Input characteristics

Logical "1"	≥ 11 V, < 30 V	Input current 3 mA
Logical "0"	≤ 5 V	Off-state current: 1 mA

Permissible test pulse width	1.0 ms	
------------------------------	--------	--

If the actuator is in the enable zone and no sensor error is present, the clock input signal is passed on to the output after a delay time of t_d . The output characteristics are compatible with the input characteristics according to EN 61 131-2 type 1 or 2:

Table 6: Output characteristics

Logical "1"	$\geq 15\text{ V}$ $\geq 11\text{ V}$	2 ... 15 mA 15 ... 30 mA Output impedance, typ: 27 Ohm
Logical "0"	$\leq 5\text{ V}$	Off-state current: 0 mA Pull-down current, typ: IN40-D0101K: 50 mA IN40-D03..: 30 mA IN40-D0202K: 30 mA

If the actuator is outside the enable zone, the output is switched off (logical "0"; safe state).

Any deviation from the timing sequence, including continuous logical "1", represents an error.



WARNING

Cross-circuits are detected by the safety switch and lead to an error message (constant logical "1"). The pull-down current of the clock generator must not exceed 30 mA because the safety switch can no longer handle this current. An error message is then no longer possible.

3.6 Response times of the safety switch

Table 7: Response times of the safety switches

Response time to safety request (removal from the enable zone)	20 ms ¹
Response time when approaching the close range zone (non-safety-relevant zone) (see figure 3)	$\leq T$
Response time when approaching the enable zone (enable time)	Typ. 100 ms $\leq 200\text{ ms}^2$
Signal delay when cascading sensors (per sensor)	$\leq 2\text{ ms}$
Time delay before availability when TE is activated (per sensor)	Typ. 40 ms max. 100 ms
Error response time for safety-relevant errors (see figure 3)	$\leq T$
Permissible dwell time at close range	Approx. 2 s
Delay time for activation of the adjustment mode (see "Adjustment", page 21)	Approx. 5 s
Dwell time in de-actuated state ($\geq 30\text{ mm}$) for return to operating mode see "Adjustment", page 21	Approx. 2 s

¹ Within this time the output will be switched off (Logical "0")

² From this time onwards, the clock input signal is forwarded to the output with a time delay.

3.7 Manipulation prevention



WARNING

The inductive safety switches respond to metallic objects, e.g. the frame of a safety door. Other metallic objects that are not intended to trigger the safety function must not be placed near the sensing face of the safety switches under any circumstances. Appropriate measures must therefore be taken to prevent this.

The safety switch is protected against simple circumvention by the following switching behavior:

- When slowly bringing a metallic object into the enable zone, the output is triggered immediately, but is only indicated by the signal LED after a time delay of approx. 3 s. As a result, the object is usually in the close range zone before the signal LED lights up. The technical regulations relating to restarting the system must be observed.
- If this object remains in the close range zone for longer than approx. 2 s, the output is completely blocked and is no longer enable if actuation occurs in the enable zone. If the object remains in the close range zone for longer than approx. 5 s, adjustment mode is activated [see "Adjustment", page 21](#).

The enable zone can be unlocked either

- by de-actuation (> 30 mm) for a period of more than 2 s

or

- by interrupting the voltage [see "Adjustment", page 21](#).

4 Mounting

**WARNING**

The safety system must only be mounted by authorized qualified personnel.

Select the mounting location and the mounting position of the safety switch in such a way that

- the safety switch is difficult to access for operating personnel when the protective device is open,
- thorough checking and replacement of the safety switch is possible.

**WARNING**

Circumvention of the inductive safety switch in a simple way or unintentional actuation must be prevented by suitable installation measures in accordance with EN ISO 14 119.

**DANGER**

Damage to the safety switch due to mechanical stress
Loss of the safety function

- ▶ Protect the safety switch from mechanical stress such as impacts or permanent contact pressure, for example by means of an additional stop.

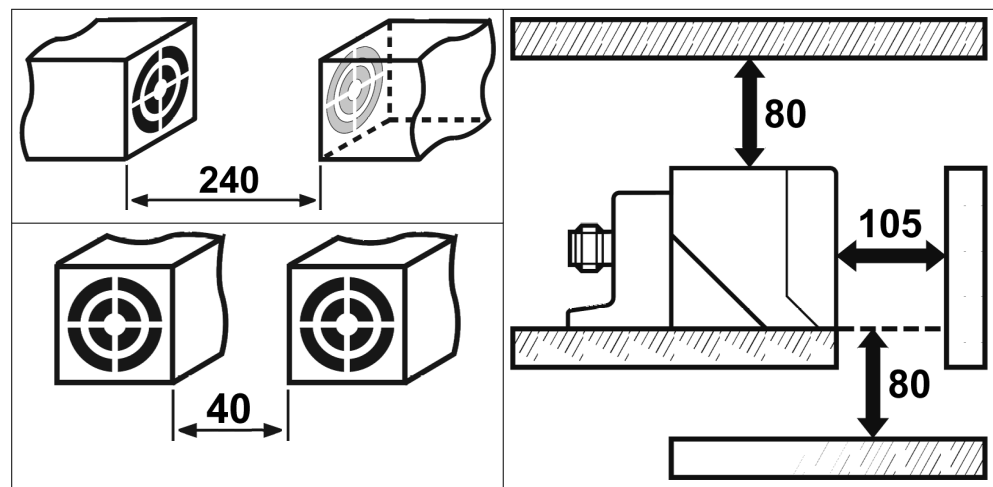
4.1 Mounting the IN40-D0101K safety switch

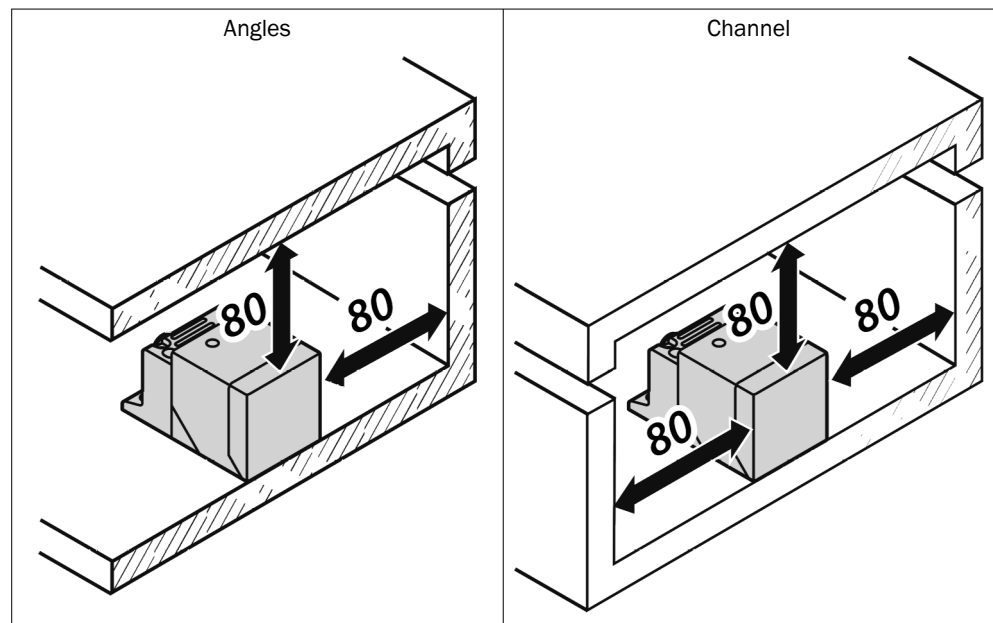
**WARNING**

The IN40-D0101K safety switch must not be flush mounted in steel.

- The IN40-D0101K safety switch can be installed flush or non-flush in copper, aluminum and brass; this results in the classification I1C40SP2 according to EN 60 947-5-2.
- The IN40-D0101K safety switch must not be installed flush in steel; this results in classification I2C40SP2 according to EN 60 947-5-2.
- Note the assured switch-off distance and enable zone (see figure 1, page 10).
- The minimum distances for adjacent and opposite sensors, and the minimum distances to fixed system components and walls shown in the following figure must be maintained.

Table 8: Minimum distances when mounting the IN40-D0101K safety switch





- The IN40-D0101K safety switch must be mounted so that the sensing face of the sensor is oriented towards the moving part of the protective device (door or the like). The sensing face can be aligned if necessary.

The safety switch is supplied pre-mounted on a mounting bracket. The mounting bracket does not need to be removed to align the sensing face of the sensor.

Align the sensing face of the safety switch so that it is oriented towards the moving part of the protective device (door or the like) after mounting; do the following if necessary

- unscrew the hexagon socket screw on the sensor bracket and pull the sensor off the bracket (see figure 4 a-b),
- loosen the two screws at the lower corner of the sensor housing and rotate the active sensor face into the correct position (see figure 4 c-d),
- screw the sensor housing back on and remount the sensor on the sensor bracket (see figure 4 e-f).

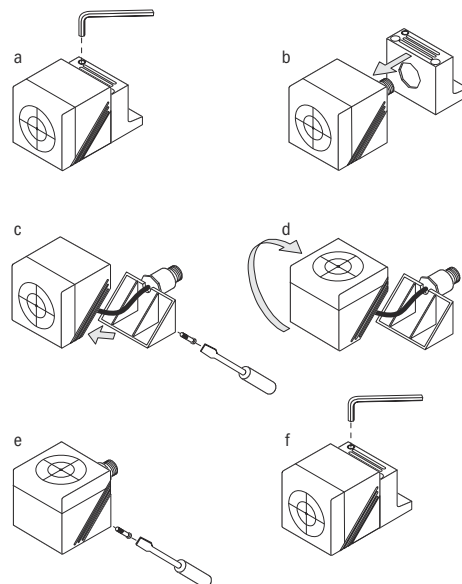


Figure 4: Alignment of the active sensor face of the IN40-D0101K safety switch

- Fasten the safety switch as securely as possible at the selected mounting location and position using the mounting bracket. Tighten the non-loosening screws to 1.0 Nm.

4.2 Mounting the IN40-D03.. and IN40-D0202K safety switches



WARNING

The IN40-D0303K and IN40-D0202K safety switches must not be mounted flush.

- The IN40-D0303K safety switch must not be installed flush; this results in classification I2A18SP2M according to EN 60 947-5-2.
- The IN40-D0202K safety switch must not be installed flush; this results in classification I2A30SP2M according to EN 60 947-5-2.
- The IN40-D0304K safety switch can be installed flush; this results in classification I1A18SP2M according to EN 60 947-5-2.
- Note the assured switch-off distance and enable zone (see table 2, table 3 respectively table 4).
- The minimum distances for adjacent and opposite sensors, and the minimum distances to fixed system components and walls shown in the following figures must be maintained.

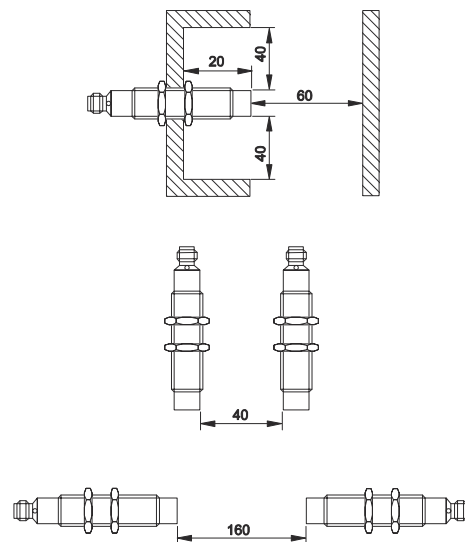


Figure 5: Minimum distances when mounting the IN40-D0303K safety switch

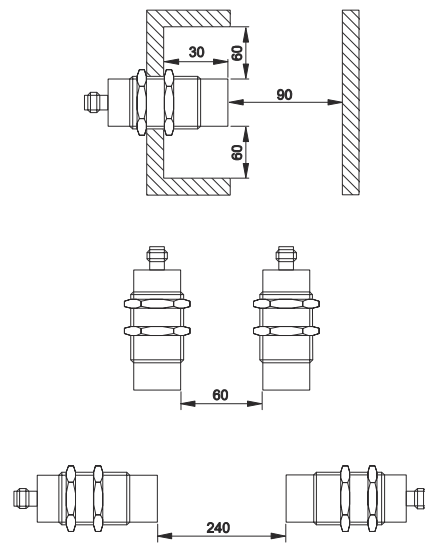


Figure 6: Minimum distances when mounting the IN40-D0202K safety switch

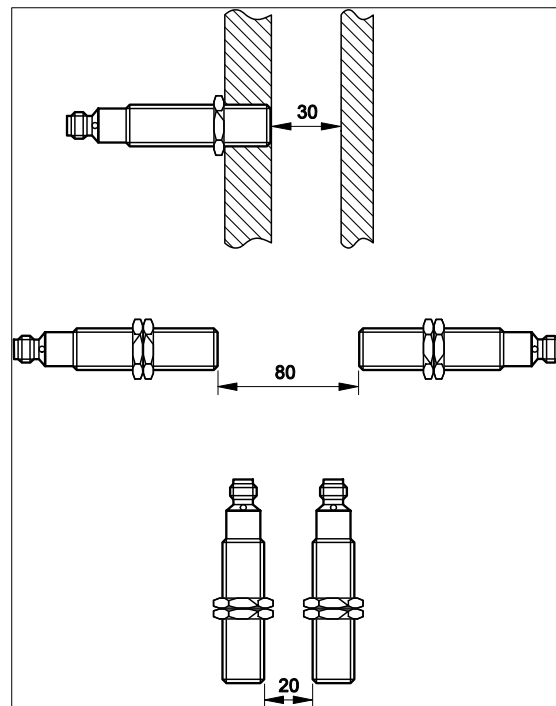


Figure 7: Minimum distances when mounting the IN40-D0304K safety switch

- Fasten the safety switch as securely as possible at the selected mounting location and position using the mounting nuts.

5 Connection and adjustment

5.1 Electrical connection

The supply voltage (L+...L-) must be connected between pin 1 and pin 3 of the male connector. The nominal voltage is 24 V DC. This voltage is allowed to fluctuate between 19.2 V and 30 V with a residual ripple of 5 % in accordance with EN 61 131-2.



WARNING

The supply voltage must comply with SELV according to EN 60 950-1.

To deploy and use the device in accordance with cULus requirements, the supply voltage must be provided by a secondary fuse-protected transformer. A safe industrial power supply unit with overvoltage protection must be used. In the event of an error, 60 V DC must not be exceeded.

For cuboid sensors, the following applies:

overcurrent protection		
Cable diameter for control current circuit		Maximum load on the protective device
AWG	(mm ²)	Ampere
26	(0.13)	1
24	(0.20)	2
22	(0.32)	3
20	(0.52)	5
18	(0.82)	7
16	(1.3)	10

For cylindrical sensors, one of the following requirements must be met:

- max. 5 A for voltages from 0 ... 20 Vrms (0 ... 28.3 Vp)
- 100/Vp for voltages from 20 ... 30 Vrms (28.3 ... 42.4 Vp)

5.2 Series connection of inductive safety switches

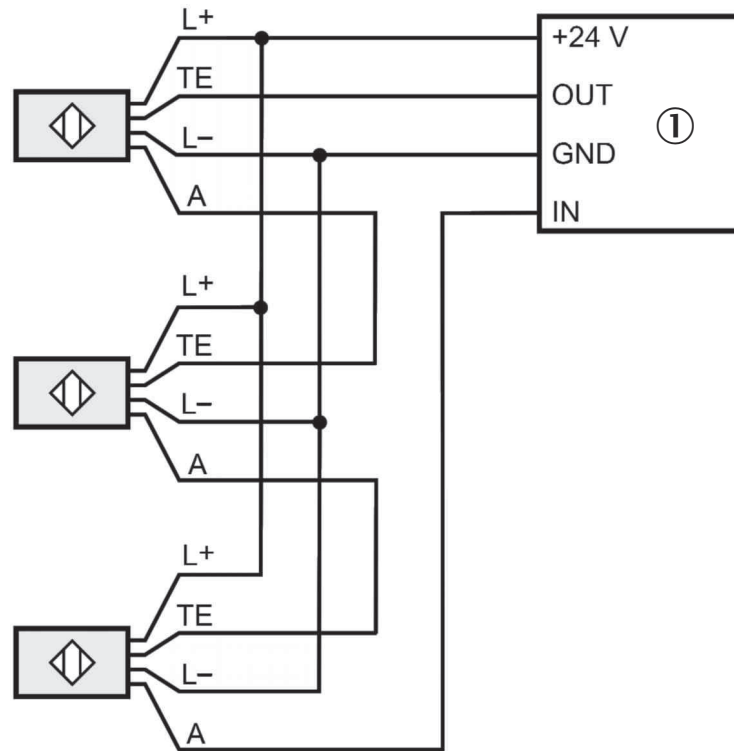


Figure 8: Series connection of inductive safety switches

① Safety controller

Between 2 and 10 inductive safety switches can be connected in series. IN40A2121N Y-distributors can be used for this purpose (see "Accessories", page 30).

5.3 Adjustment

To determine a suitable mounting position, the sensor can be put into an adjustment mode.

1. Hold a metallic object for about 5 s in the close range (see "Enable zone and assured switch-off distance", page 10) of the sensor; when the yellow signal LED flashes, the sensor is in adjustment mode.



NOTE

In adjustment mode, the output remains in the safe state.

2. To determine the enable zone, move the actuator in front of the sensor; the yellow signal LED goes out when the actuator is in the enable zone.
3. Securely mount the sensor and actuator in the position found.
4. Switch off the adjustment mode again by interrupting the voltage or de-actuating the sensor for more than 2 s.

6 Commissioning and operation



WARNING

Prior to initial commissioning, qualified safety personnel must thoroughly check and document the safety functions of the machine or system.

After each modification and after maintenance and repair work, the entire protective device must be tested for effectiveness by qualified safety personnel.

6.1 Checks before initial commissioning

1. Check adherence to the mounting requirements (see "Mounting", page 16).
2. Perform an electrical function check of the sensor in conjunction with a safety controller or a safe PLC.

6.1.1 Checking the start function

The check must be performed separately for each protective device.

1. Switch off the machine or system.
 2. Protective device open.
 3. Start the machine or system; if the safety function of the protective device is working, the machine or system must not start.
-



WARNING

If the machine or system starts nevertheless, check again that the mounting requirements have been adhered to and all electrical connections are of the correct type, and establish the functional readiness of the safety system.

6.2 Periodic technical inspections

No maintenance is required. Regular thorough checks are required to ensure proper and lasting function.

6.2.1 Daily check

Every day or before the start of a shift, the operating personnel must check the safety switch for the following:

- fault-free operation
- no recognizable manipulation

6.2.2 Inspections by qualified safety personnel

The inspection by qualified safety personnel must be carried out regularly in accordance with the nationally applicable regulations and at the intervals specified therein. If any changes are made to the machine or someone tampers with the protective device after initial commissioning, this will ensure that any such issues are detected.

6.3 Response to errors

**WARNING**

Cease operation if the cause of the malfunction has not been clearly identified!

- ▶ Immediately put the machine out of operation if you cannot clearly identify the error and if you cannot safely remedy the problem.
 - ▶ Do not repair the safety switch.
 - ▶ Replace defective devices before recommissioning the machine.
-

**WARNING**

Behavior in case of rectifiable errors:

- ▶ If rectifiable errors occur, resolve these errors immediately (see "[Displays in adjustment mode](#)", page 12).
-

SICK support

If you cannot correct an error using the information in this section, please contact your local SICK office (see the back of these operating instructions).

7 Troubleshooting

7.1 Safety



WARNING

Risk of ineffectiveness of the protective device

Persons and parts of the body to be protected are not recognized in case of non-observance.

- ▶ Immediately put the machine out of operation if the behavior of the machine cannot be clearly identified.
- ▶ Immediately put the machine out of operation if you cannot clearly identify or allocate the error and if you cannot safely remedy the error.
- ▶ Secure the machine such that it cannot be switched on unintentionally.



NOTE

If you cannot remedy the error with the help of the information provided in this section, please contact your SICK subsidiary.

In the event of an error, the type of error is indicated by the LED display on the sender or receiver.

7.2 Troubleshooting

Table 9: LED indicators

Problem	Possible cause	Fix the error
No LED display	No supply voltage	▶ Switch on the voltage supply.
<ul style="list-style-type: none"> • "Power" LED does not flash. • Sensor does not switch. 	<ul style="list-style-type: none"> • Undervoltage • Overvoltage 	▶ Check the supply voltage (see "Data sheet", page 27).
<ul style="list-style-type: none"> • "Power" LED is off. • "Signal" LED flashes. 	Internal or external error	<ul style="list-style-type: none"> ▶ Perform a de-actuation and actuation ▶ Switch the voltage supply off and on again ▶ Check the connections and their wiring ▶ Eliminate any cross-circuits. ▶ Check the connected components, e.g., the PLC. ▶ Replace the device.

Further topics

- [see "LED indicators", page 12](#)

7.3 Safe status when an error occurs

When an error occurs that leads to the loss of the safety function, the safety switch assumes a defined, safe state. The safety switch remains in this state until the error or the cause of the error has been rectified.

Possible errors that can lead to loss of the safety function are:

- Safety-related internal errors
- Invalid input signal conditions
- Loss of the supply voltage
- Loss of the guaranteed detection capability

8 Maintenance

8.1 Maintenance

When operating properly, no maintenance or servicing measures are required.

9 Decommissioning

9.1 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.

10 Technical data

10.1 Data sheet

Table 10: IN4000 Standard

Parameter	Value		
	Minimum	Typical	Maximum
Safety integrity level	SIL3 (IEC 61 508)		
SIL claim limit	SILCL3 (EN 62 061)		
Category	Category 3 (EN ISO 13 849-1)		
Performance level	PL e (EN ISO 13 849-1)		
PFH _D (mean probability of a dangerous failure per hour) (40 °C)	1.0 × 10 ⁻⁸		
Type	Type 3 (EN ISO 14 119)		
Actuator coding level	Uncoded (EN ISO 14 119)		
Housing material			
IN40-D0101K IN40-D0303K IN40-D0202K IN40-D0304K	PPE, zinc die cast PBT, V4A PEEK, V4A PBT, specially coated brass		
Impact resistance according to EN 60 439-6			
IN40-D0101K IN40D03.. IN40-D0202K	IK06 IK04 IK04		
Enclosure rating according to IEC 60 529			
IN40-D0101K IN40D03.. IN40-D0202K	IP67 IP68/IP69K IP68/IP69K		
Protection class	III		
Connection	M12 plug connection, gold-plated contacts		
Ambient conditions			
Operation site	Class C according to EN 60 654-1 Weather-protected location of use		
Temperature change rate	0.5 K/min		
Ionizing radiation	Not allowed		
T _M (mission time)	EN ISO 13 849-1; depending on the ambient conditions: see the following lines		
Operating temperature T _M = 10 years			
IN40-D0101K IN40-D0202K IN40-D0303K IN40-D0304K	-25 °C 0 °C -25 °C -25 °C		+70 °C +70 °C +70 °C +70 °C
Operating temperature T _M = 20 years			
IN40-D0...	+10 °C		+40 °C
Relative humidity			
T _M = 10 years T _M = 20 years	5 % 5 %		95 % 70 %
Absolute air humidity	1 g/m ³		25 g/m ³
Air pressure	80 kPa		106 kPa

Parameter	Value		
	Minimum	Typical	Maximum
Solar radiation	500 W/m ²		
Condensation	Yes		
Rain, snow, hail	Yes		
Ice formation	Yes		
Salt spray	No		
Application			
Operating mode	Continuous operation (maintenance-free)		
Electrical data			
Supply voltage	24 V DC (19.2 ... 30 V DC)		
Rated insulation voltage	30 V		
Short-circuit protection	Clacked		
Current consumption	< 15 mA		
EMC/vibration resistance/shock resistance	EN 60 947-5-3		
Operating data			
Response range/enable zone			
IN40-D0101K	10 mm		15 mm
IN40-D0303K	3 mm		6 mm
IN40-D0202K	6 mm		12 mm
IN40-D0304K	1 mm		4 mm
Assured switch-off distance			
IN40-D0101K	30 mm		
IN40-D0303K	15 mm		
IN40-D0202K	30 mm		
IN40-D0304K	10 mm		
Response times			
Response time for safety request	< 20 ms		
Response time for enable	< 200 ms, typ. 100 ms		

10.2 Pin assignment

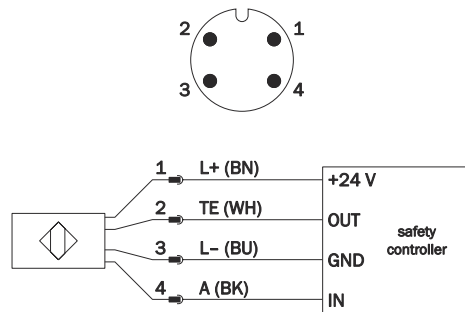


Figure 9: Pin assignment and connection diagram

Table 11: Pin assignment of the safety switches

PIN	Wire color	Function
1	BN (brown)	L+ (24 V)
2	WH (white)	Clock input TE

PIN	Wire color	Function
3	BU (blue)	L- (GND)
4	BK (black)	Output A

10.3 Dimensional drawings

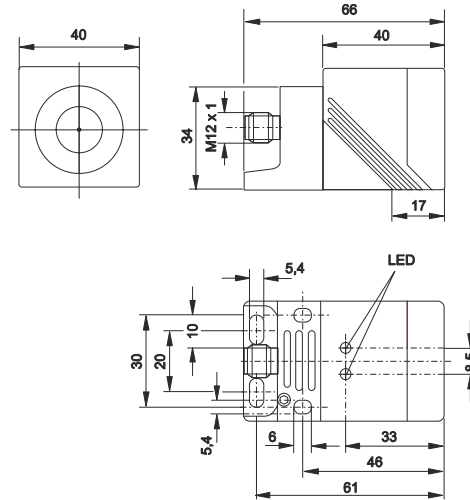


Figure 10: Dimensional drawing for the IN40-D0101K safety switch (mm)

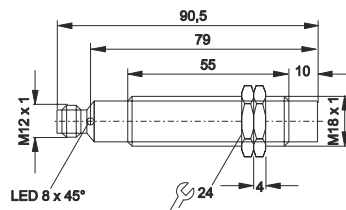


Figure 11: Dimensional drawing for the IN40-D0303K safety switch (mm)

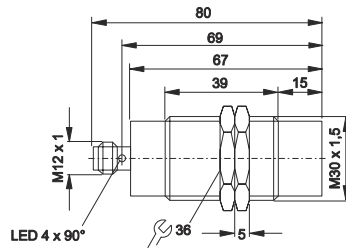


Figure 12: Dimensional drawing for the IN40-D0202K safety switch (mm)

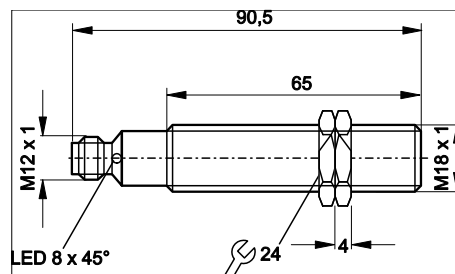


Figure 13: Dimensional drawing for the IN40-D0304K safety switch (mm)

11 Ordering information

11.1 Devices

Description	Type	Part number
Safety switch in cubic design	IN40-D0101K	6027389
Safety switch in cylindrical design M30	IN40-D0202K	6027392
Safety switch in cylindrical design M18	IN40-D0303K	6027391
Safety switch in cylindrical design M18 and flush mounted	IN40-D0304K	6037684

11.2 Accessories

Description	Type	Part number
Y-distribution connection for series connection	IN40-A2121N	5315025
Connecting cable 5 m, straight male connector	YF2A14-050VB3XLEAX	2096235
Connecting cable 10 m, straight male connector	YF2A14-100VB3XLEAX	2096236
Connecting cable 15 m, straight male connector	YF2A14-150VB3XLEAX	2096237
Connecting cable 20 m, straight male connector	YF2A14-200VB3XLEAX	2096238

12 Annex

12.1 Conformities and certificates

You can obtain declarations of conformity, certificates and the current documentation 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).

12.1.1 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
- EMC DIRECTIVE 2014/30/EU
- MACHINERY DIRECTIVE 2006/42/EC

12.1.2 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
- Electromagnetic Compatibility Regulations 2016
- Supply of Machinery (Safety) Regulations 2008

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