

ES21

Safety switch



Described product

ES21

Manufacturer

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Original document

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1 About this document

These operating instructions are original operating instructions.

2 On safety

Read these operating instructions carefully and keep them in a safe place.

The operating instructions are to be provided to the person who is installing the emergency stop pushbutton.



DANGER

- ▶ Always note and follow the warnings below!
 - Before starting the installation, electrically isolate system and device!
 - Emergency stop pushbuttons provide a personnel protection function. Incorrect installation or manipulation can result in serious injuries!
 - Emergency stop pushbuttons are not allowed to be bypassed, removed or rendered ineffective in any other manner!
 - The switching process is only allowed to be triggered by suitable pushbuttons that are securely fastened to the switching element!
 - Use suitable connections for the switching element!
 - Incorrect installation or tampering can result in damage to the machine and workpiece!
 - The emergency stop function is not allowed to be used as a replacement for protective measures or other safety functions, instead it should be designed as an additional protective measure.
 - The emergency stop function is not allowed to degrade the effectiveness of protective devices or other devices with safety functions.
 - Based on a risk analysis, the designer must ensure that the emergency stop achieves the required level of safety (SIL, SILCL or PL) in combination with control system.
 - For emergency stop pushbuttons with key release, the key must only ever be inserted when it is actually being used for unlocking.

2.1 Area of use

National and international legal specifications apply to the installation and use of the emergency stop pushbutton, to its commissioning, and to recurring technical inspections, in particular:

- The Machinery Directive
- The Low Voltage Directive
- The safety regulations
- The work safety regulations and safety regulations

The manufacturer and user of the machine on which the protective devices are used are responsible for liaising with the relevant authorities about all applicable safety regulations/rules and for ensuring compliance with these.

Intended use also includes regular monitoring of the protective device by qualified safety personnel.

The product may be used in safety functions.

2.2 Qualified personnel

The emergency stop pushbutton may be mounted, put into operation, checked, maintained, or used only by qualified safety personnel.

A person who satisfies all the following conditions is deemed properly qualified:

- Appropriate technical training
- Instruction of the machine operator in machine operation and the applicable safety guidelines
- Access to these operating instructions

3 Product description

3.1 Items supplied

- built-in version:
 - Complete set with pushbutton including switching element in one package or
 - Pushbutton or switching element separately
- surface-mounted version: complete set with pre-assembled pushbutton in a housing with latching switching element

3.2 Structure and function

The emergency stop pushbutton consists of a pushbutton and a switching element with up to five functions.

The emergency stop pushbuttons are available as a built-in version and a surface-mounted version with housing.

The switching elements are actuated by the pushbutton. To maintain safety when the switching element drops out from the pushbutton, the switching elements of the built-in version are equipped with so-called self-monitoring. It opens a contact when the switching element is disconnected from the pushbutton. The self-monitoring function thereby detects an error and triggers the emergency stop function.

4 Mounting and electrical installation

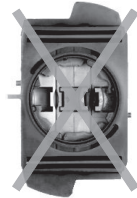


DANGER

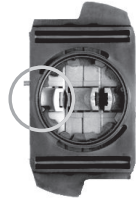
Pay attention to the correct assembly of the switching elements!

The switching elements are correctly fitted from the factory.

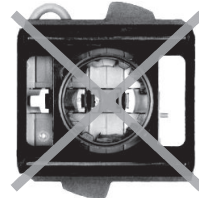
- ▶ If you re-assemble the switching elements, make sure that all actuating pins are actuated by the pushbutton!
-



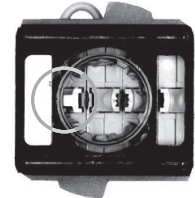
⚠ Incorrect mounting



Correct mounting



⚠ Incorrect mounting



Correct mounting

4.1 Mounting and connecting built-in version

Approach

1. Drill mounting holes in the mounting plate (see figure 3, page 18; use the correct dimensional drawing for the design).
2. Make sure the surface is smooth to ensure tightness.
3. Insert pushbutton through the mounting hole and fasten lock nut (max. torque 2.5 Nm).
4. Fit switching element and turn one eighth of a turn clockwise. The switching element engages.
5. In the case of illuminated pushbuttons, the male connector must also be guided through the small drill hole in the mounting plate (see figure 3, page 18, right dimensional drawing) and connected to switching element X1/X2.
6. Check whether the contacts for the self-monitoring are closed with the switching element engaged if the pushbutton is not actuated.
7. Connect connecting cable to the terminal strip. Pay attention to permissible electrical and mechanical data (see "Technical specifications", page 16).



NOTE

On the usage of illuminable pushbuttons, a maximum of 230 V AC is allowed to be connected to the switching elements.

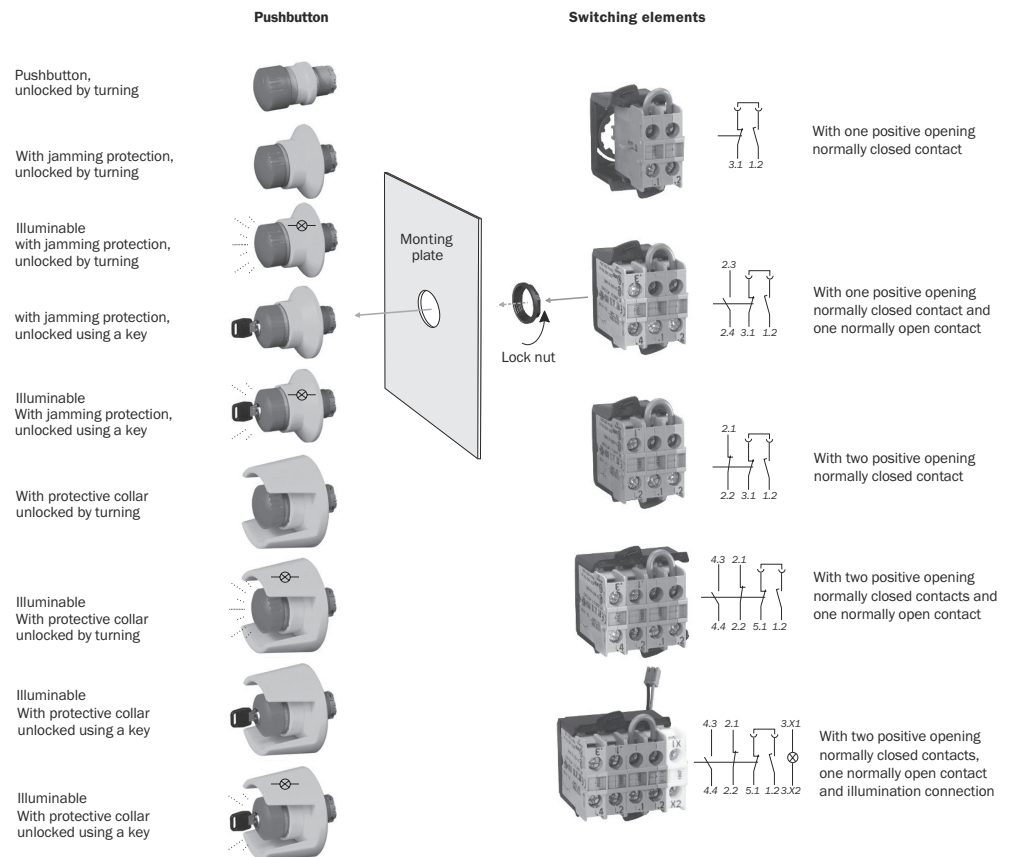


Figure 1: Pushbuttons and switching elements of the built-in version and their mounting

4.2 Mounting and connecting the surface-mounted version



DANGER

Make sure that the emergency stop pushbutton is easily accessible!

Mount the emergency stop pushbutton such that it can be reached easily. This statement applies in particular for emergency stop pushbuttons with a high protective collar!

1. Mount the lower part of the housing or the base of the housing on a flat surface. The mounting holes in the floor of the housing have a diameter of 4.2 mm with a distance of 59 × 39 mm between the holes (see figure 6, page 19). These dimensions can also be found on the base of the housing.
2. Lay the connecting cable through one of the two M20 cable entries.
3. Connect the connecting cables to the terminal strips. During this process pay attention to the permissible electrical and mechanical data (see "Technical specifications", page 16). Make sure the switching elements installed in the housing are correctly connected so that the insulated housing requirements relating to clearance and creepage lines can be adhered to when the equipment is used correctly.
4. Close the housing. During this process make sure that the housing is correctly sealed (all screws tightened firmly ...).

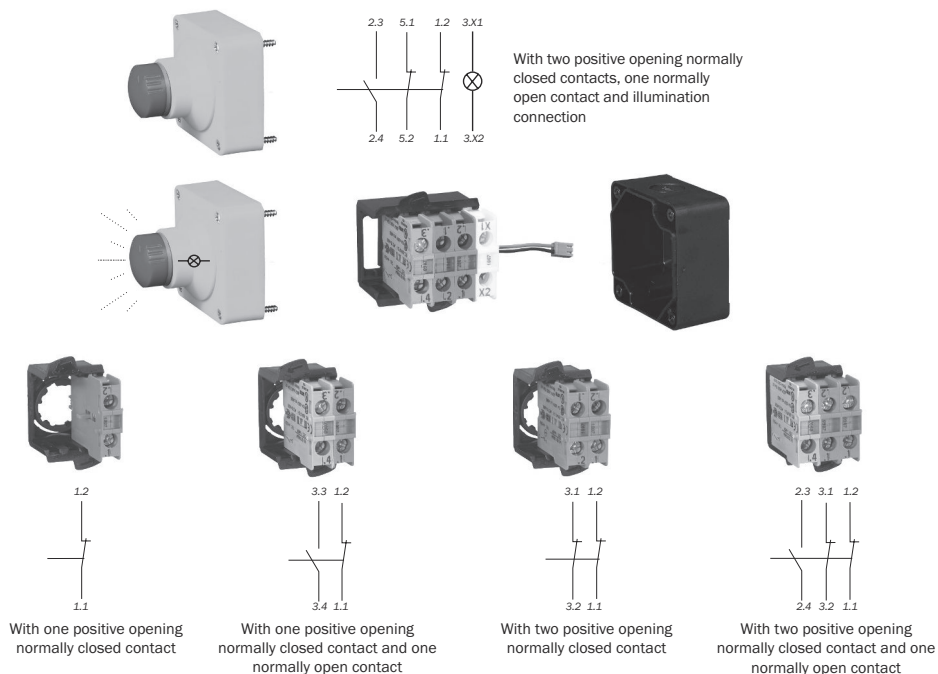


Figure 2: Pushbuttons and switching elements for the surface-mounted version and their mounting

5 Checks before initial commissioning

Mechanical function check-out

- The emergency stop pushbutton is fastened so that it cannot be turned.
- The nut is tightened so that no gap is detectable in the longitudinal direction.
- The pushbutton engages when actuated.

Electrical function check-out

1. Start the machine.
 2. Actuate the pushbutton.
-



DANGER

Check that the machine stops!

- ▶ Check whether the machine stops when the emergency stop pushbutton is actuated.
-

6 Recurring technical checks

Do regular monitoring to ensure smooth and permanent function. The inspection interval must be determined by the machine designer using the risk assessment. However, we recommend having the emergency stop pushbutton triggered at least once a year by the responsible safety representative for test purposes and checking for proper function:

- Mechanical and electrical function test, [see "Checks before initial commissioning", page 11](#)
- Safe mounting of components
- No manipulation and damage detectable
- Cable entry tightness
- No loose cable connections

7 Response to malfunctions

**DANGER**

In the event of mechanical overload or external exertion of force, the emergency stop pushbutton can be damaged and the function impaired.

- ▶ Perform a function test in this case, see ["Checks before initial commissioning"](#), page 11.
-

8 Deinstallation



DANGER

▶ Disconnect the system and device from the mains before beginning disassembly!

9 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.

10 Technical specifications

Pushbuttons

Table 1: Pushbuttons ES21-A*****

Housing material	Plastic
Enclosure rating Without illumination With LED illumination	IP65 (IEC 60529) IP54 (IEC 60529)
Ambient operating temperature Without illumination With LED illumination	-30 ... +70 °C -30 ... +55 °C
Storage temperature	-50 ... +85 °C
Switching operations	> 50000
Max. torque	2,5 Nm
Installation diameter	22,3 mm

Complete sets

Table 2: Complete sets ES21-S*****

Housing material	Plastic
Enclosure rating Without illumination With LED illumination	IP65 (IEC 60529) IP54 (IEC 60529)
Protection class	II
Ambient operating temperature	-25 ... +60 °C
Storage temperature	-25 ... +85 °C
Switching elements Positive opening normally closed contacts/normally open contacts	Depending on type 1/0, 1/1, 2/0, 2/1
Cable entry	2 × M20
B _{10D} -value	250000 Switching operations
Mechanical life (at +20 °C)	50000
Electrical data	see table 3, page 17

Switching elements

Table 3: Switching elements ES21-C***0*

Protection class	II
Ambient operating temperature	
Without illumination	-30 ... +85 °C
With LED illumination	-30 ... +65 °C
Storage temperature	-50 ... +85 °C
Switching principle for switching elements	Slow action switching element
Usage category	AC-15/DC-13 (EN 60947-5-1)
Rated current (voltage)	3 A (250 V DC) 2 A (24 V DC)
Overvoltage category	III
Degree of contamination	3
Rated impulse withstand voltage U_{imp}	4,0 kV (Contact Element)
Rated insulation voltage U_i	600 V
Connector technology (contacts)	Screw connection
Minimum switching voltage	5 V
Minimum switching current	1 mA
Max. wire cross-section	2,5 mm ²
Thermal continuous current I_{th}	16 A
Max. contact resistance	20 mΩ
Max. bounce time	10 ms
Min. positive opening travel	3 mm
B_{10D} -Wert	250000 Switching operations
Mechanical life	1 × 10 ⁶ Switching operations
Electrical service life (at rated load)	1 × 10 ⁶ Switching operations
Contact material	AgNi
Actuating travel	6 mm

Switching element with illumination connection

Table 4: Switching element with illumination connection ES21-C***1*

Electrical data	see table 3, page 17
Protection class	II
Max. wire cross-section	2,5 mm ²
Connector technology	Screw connection
Storage temperature	-50 ... +85 °C
Operating voltage	12 ... 30 V AC/DC
Operating current	8 ... 44 mA
LED service life	100000 h (T = 25 °C, I = 20 mA) 70000 h (T = 55 °C, I = 20 mA)
Connecting wire 10 cm, crimped BKL plug connector, crimped BKL plug connector	0,25 mm ²
Connection	X1: anode X2: cathode

11 Dimensional drawings

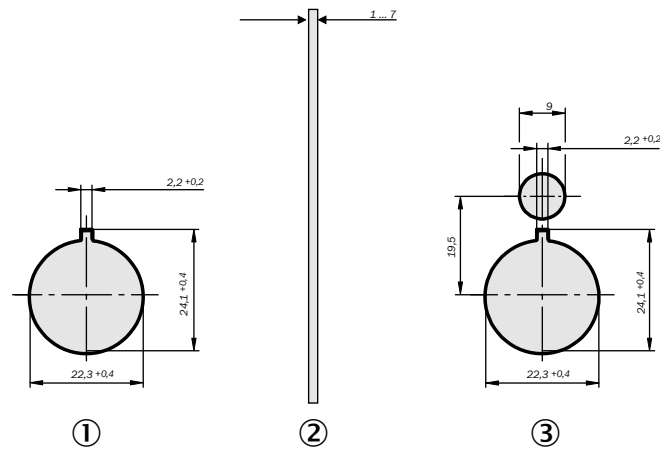


Figure 3: Dimensional drawings of the mounting holes for the built-in versions (mm)

- ① Type without illumination
- ② Mounting Plate
- ③ Design with illumination

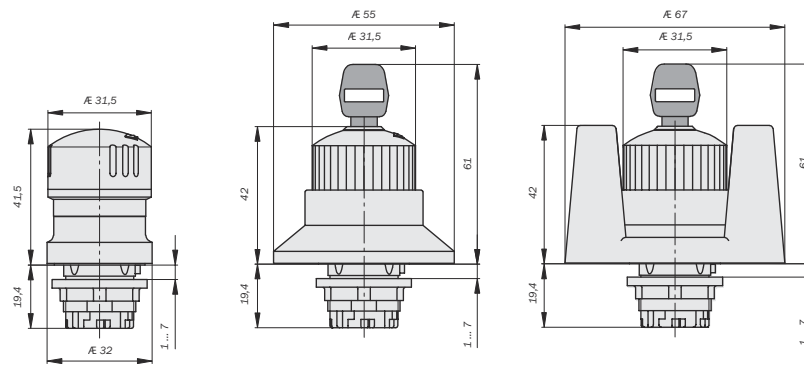


Figure 4: Dimensional drawings of the pushbuttons (mm)

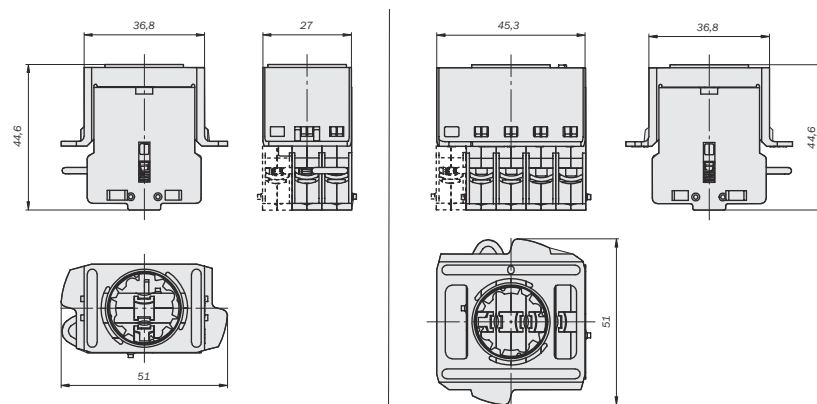


Figure 5: Dimensional drawings of the switching elements (mm)

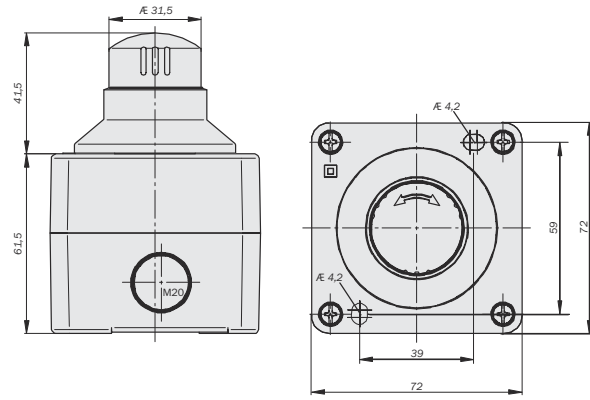


Figure 6: Dimensional drawings of the surface-mounted version (mm)

12 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).

12.1 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

12.2 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

13 Ordering information

Pushbuttons

Table 5: Pushbuttons

Artikel	Type code	Part number
Unlocked by turning	(ES21-AT1110)	5321156
With jamming protection, unlocked by turning	(ES21-AT1120)	5321157
Illuminable, with jamming protection, unlocked by turning	(ES21-AT1130)	5321158
With jamming protection, unlocked using a key	(ES21-AK1120)	5321163
Illuminable, with jamming protection, unlocked using a key	(ES21-AK1130)	5321164
With protective collar, unlocked by turning	(ES21-AT1140)	5321165
Illuminable, with protective collar, unlocked by turning	(ES21-AT1150)	5321166
With protective collar, unlocked using a key	(ES21-AK1140)	5321167
Illuminable, with protective collar, unlocked using a key	(ES21-AK1150)	5321168

Switching elements

Table 6: Switching elements

Part	Type code	Part number
1 positive opening normally closed contact with contact module for selfmonitoring	ES21-CG1001)	6036139
2 positive opening normally closed contacts with contact module for selfmonitoring	ES21-CG2001	6036140
1 positive opening normally closed contact + 1 normally open contact with contact module for self-monitoring	ES21-CG1101	6036141
2 positive opening normally closed contacts + 1 normally open contact with contact module for self-monitoring, with illumination	ES21-CH2111	6036143
2 positive opening normally closed contacts + 1 normally open contact with contact module for self-monitoring	ES21-CH2101	6036144
3 positive opening normally closed contacts with contact module for selfmonitoring	ES21-CH3001	6035721

Complete sets

Table 7: Complete sets

Part	Type code	Part number
Housing with pushbutton fitted, with jamming protection, unlocked by turning, incl. switching element with 1 positive opening normally closed contact	ES21-SA10C1	6036145
As above, incl. switching element with 1 positive opening normally closed contact + 1 normally open contact	ES21-SA10D1	6036146
As above, incl. switching element with 2 positive opening normally closed contacts	ES21-SA10E1	6036147

Part	Type code	Part number
As above, incl. switching element with 2 positive opening normally closed contacts + 1 normally open contact	ES21-SA10F1	6036148
Housing with pushbutton fitted, illuminable, with jamming protection, unlocked by turning, incl. switching element with 2 positive opening normally closed contacts + 1 normally open contact + illumination connection	ES21-SA11H1	6036751
As above, with protective collar	ES21-SA12H1	6037464
Built-in version, comprising: Pushbutton with jamming protection, unlocked by turning, and switching element with 2 positive opening normally closed contacts + 1 normally open contact with contact module for self-monitoring	ES21-SB10G1	6036492
Built-in version, comprising: Pushbutton with jamming protection, unlocked by turning, and switching element with 2 positive opening normally closed contact	ES21-SB10E1	6041507

Spare parts/accessories

Table 8: Spare parts/accessories

Part	Type code	Part number
Housing with installation opening 22 mm	ES21-XS001	5321175
Mounting key for pushbuttons	ES21-XA100	5321538
Spare key for pushbuttons with key unlocking	ES21-XA200	5321539
M20 cable gland	-	5309164

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