

the sensor people

S20 Safety Switches



GB 2008/12 607260
We reserve the right to
make technical changes

SAFE IMPLEMENTATION AND OPERATION

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1 About this document

1.1 Other applicable documents

The information on the S20 Safety Switch is divided into two documents. Document "Application information" contains only the most important safety notices.

- ✎ For the safe implementation, testing and operation, download document "Safe implementation and operation of the S20" from <http://www.leuze.com/s20> or request it from service.schuetzen@leuze.de or tel. +49 8141 5350-111.

Table 1.1: Documents on the S20 Safety Switch

Purpose and target group	Title	Source
Detailed information for all users	Safe implementation and operation (this document)	On the Internet, download from: http://www.leuze.com/s20
Basic information for technicians and machine operators	Application information	Print document part no. 607234 included in the delivery contents of the product

1.2 Used symbols and signal words

Table 1.2: Warning symbols and signal words




	Symbol for dangers
NOTICE	Signal word for property damage Indicates dangers that may result in property damage if the measures for danger avoidance are not followed.
CAUTION	Signal word for minor injury Indicates dangers that may result in minor injury if the measures for danger avoidance are not followed.
WARNING	Signal word for severe injury Indicates dangers that may result in severe or fatal injury if the measures for danger avoidance are not followed.
DANGER	Signal word for life-threatening danger Indicates dangers that will result in severe or fatal injury if the measures for danger avoidance are not followed.

Table 1.3: Other symbols

	Symbol for tips Text passages with this symbol provide you with further information.
	Symbols for action steps Text passages with this symbol instruct you to perform actions.

2 Safety

Before using the Safety Switch, a risk evaluation must be performed according to valid standards (e.g. EN ISO 12100-1, EN ISO 13849-1, EN ISO 14121). For mounting, operating and testing, document "Safe implementation and operation of the S20" as well as all applicable national and international standards, regulations, rules and directives must be observed (e.g. machinery directive, low-voltage directive, work-equipment directive, safety regulations, accident-prevention regulations, EN 1088, EN ISO 13849-1, EN 60204-1, EN 954-1). Observe and print out relevant and supplied documents and distribute to the affected personnel.

↳ Before beginning work with the Safety Switch, completely read and understand the documents applicable to the respective task.

The following standards apply for the risk evaluation at the protective device prior to using the Safety Switch:

- EN ISO 14121, Safety of machinery, risk evaluation
- EN ISO 12100-1, Safety of machinery
- EN ISO 13849-1, Safety-related parts of control systems

The realizable category of the integration in control circuits according to EN ISO 13849-1 and EN 954-1 is dependent on the used contact block and wiring.

In particular, the following national and international legal regulations apply for the start-up, technical inspections and work with Safety Switch:

- Machinery directive 2006/42/EC
- Low voltage directive 2006/95/EC
- Use of work equipment directive 89/655 EEC
- Safety regulations
- Accident-prevention regulations and safety rules

2.1 Proper use

To ensure proper personnel protection, the Safety Switch must be mounted, connected and started-up by trained personnel. It must be in perfect condition and inspected regularly. The switching process must only be triggered by an actuator approved for this Safety Switch that is connected to the moveable guard in a non-detachable and tamperproof manner.

The rules and regulations for protection and safety at work and the recognised safety-related rules and regulations must be observed. These include:

- EN 1088, Interlocking devices associated with guards
- EN ISO 13849-1, Safety-related parts of control systems
- EN 60204-1, Electrical equipment of machines

S20 Safety Switches must be connected in such a way that a dangerous state can only be activated while the protective device is closed and so that the dangerous state stops upon opening of the protective device. It must not be used if the point of operation can be accessed during the lag time before the dangerous state has ended.

Connection conditions:

- the dangerous state can only be activated while the protective device is closed
- opening the protective device while the machine is running triggers a STOP command and ends the dangerous state

Furthermore, the S20 Safety Switch must **not** be used under the following conditions:

- high concentration of dust particles in the surrounding area
- rapidly changing ambient temperature (leads to condensation)
- in the event of strong physical shocks
- in explosive or easily flammable atmospheres
- the mounting locations are not sufficiently stable
- the safety of multiple persons is dependent on the function of this Safety Switch (e.g. nuclear power plants, trains, aircraft, motor vehicles, incinerators, medical devices)



For machines with longer slowdowns, a Safety Locking Device must be used.

Handling the Safety Switch:

- ↳ Observe the permissible environmental conditions for storage and operation (see chapter 14 "Technical data").
- ↳ Immediately replace damaged Safety Switch according to these instructions (see chapter 6 "Mounting").
- ↳ Use cable gland, insulation materials and connecting wires of the appropriate protection rating.
- ↳ Protect the Safety Switch from penetrating foreign bodies (e.g. shavings, sand and blasting agent).
- ↳ Before performing painting work, cover the actuation slot, actuator and name plate.
- ↳ Immediately clean any contamination from the Safety Switch that impacts function according to these instructions.
- ↳ Make no structural changes to the Safety Switch.

2.2 Competent personnel

Prerequisites for competent personnel:

- suitable technical training
- knows the rules and regulations for occupational safety, safety at work and safety technology and can assess the safety of the machine
- knows the instructions for the Safety Switch and the machine
- was instructed by the responsible individuals on the mounting and operation of the machine and of the Safety Switch

2.3 Responsibility for safety

Manufacturer and operator of the machine must ensure that the machine and implemented Safety Switch function properly and that all affected persons are adequately informed and trained.

The type and content of all imparted information must not lead to unsafe actions by users.

The manufacturer of the machine is responsible for:

- safe machine construction
- safe implementation of the Safety Switch
- imparting all relevant information to the operator
- adhering to all regulations and directives for the safe starting-up of the machine

The operator of the machine is responsible for:

- instructing the operating personnel
- maintaining the safe operation of the machine
- adhering to all regulations and directives for occupational safety and safety at work
- regular testing by competent personnel

2.4 Exemption of liability

Leuze electronic GmbH + Co. KG is not liable in the following cases:

- Safety Switch is not used as intended
- safety notices are not adhered to
- mounting and electrical connection are not properly performed
- proper function is not tested (see chapter 9 "Testing")
- changes to the Safety Switch

3 Device description

The Safety Switch of the S20 series is an electro-mechanical switching device in a housing made of glass-fibre-reinforced and non-combustible plastic; the device satisfies protection rating IP 67. The standard design facilitates easy replacement. By means of the funnel-shaped insertion opening, the actuator self-centres, even if the door is slightly misadjusted.



- 1 Deflection head
- 2 Dust cover
- 3 Insertion opening for actuator
- 4 Housing cover
- 5 Name plate (connection data, production code and year of manufacture)

Table 3.1: S20 Safety Switch

Article	Part No.	Description
S20-P3C1-M20-FH	63000 100	2 NC, 1 cable entry
S20-P1C1-M20-FH	63000 101	1 NC + 1 NO, 1 cable entry
S20-P1C3-M20-LH	63000 102	1 NC + 1 NO, 3 cable entries

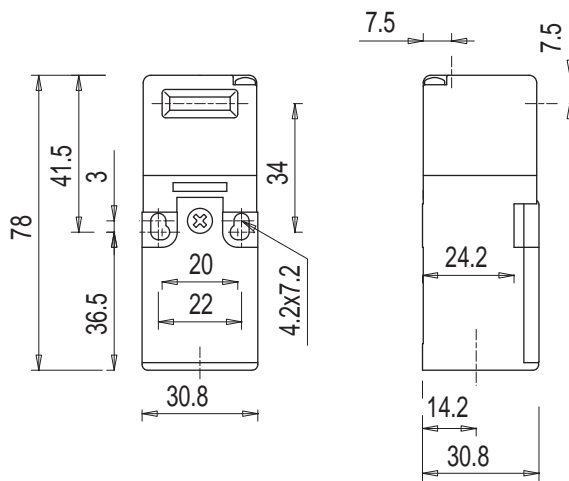


Figure 3.1: Dimensions S20-P3C1-M20-FH and S20-P1C1-M20-FH in mm

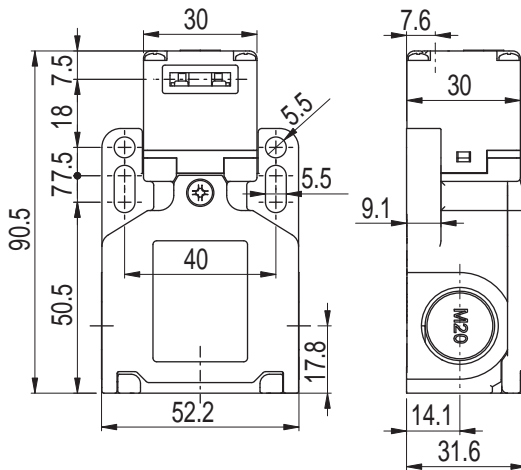


Figure 3.2: Dimensions S20-P1C3-M20-LH in mm

The deflection head can be turned in 90° increments and set to 5 approach directions. A selection of different actuators ensures that the Safety Switch can be mounted in any position.

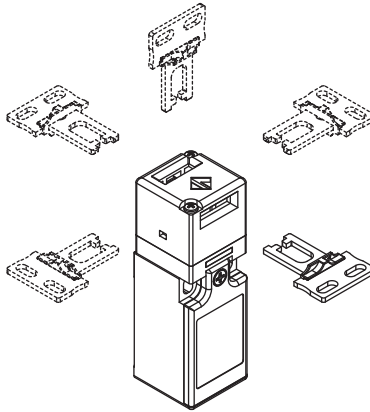


Figure 3.3: Approach directions

4 Functions

The Safety Switch signals to the safety switching device whether the protective device is closed. Moving the actuator in closes the safety contacts; moving the actuator out forces the safety contacts to open (e.g. upon opening of the protective device). As a result, the machine can only be switched on if the protective device is closed.

5 Applications

The Safety Switch can be used for e.g. the following protective devices:

- turning or swivelling moveable guards
- laterally moveable protective gratings or sliding gates
- protective flaps

6 Mounting

WARNING

Serious accidents may result if the Safety Switch is not mounted properly!

The protective function of the Safety Switch is only ensured if appropriately and professionally mounted for the respective, intended area of application.

- ↪ Mounting may only be performed by competent personnel.
- ↪ Observe standards, regulations and these instructions.
- ↪ Protect the housing and deflection head from materials penetrating the enclosure (environmental conditions see chapter 14 "Technical data").
- ↪ Test to ensure proper function.

6.1 Adjusting the deflection head

- ↪ Loosen the 2 screws on the deflection head.



- ↪ Lift the deflection head and turn in the desired approach direction.



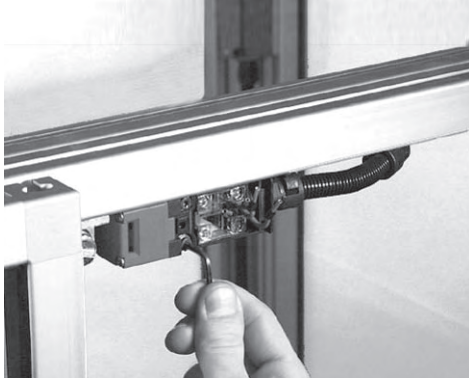
- ↪ Tighten the 2 screws on the deflection head with 0.7–0.9Nm.
- ↪ Close unused opening with the dust cover.

6.2 Mounting the Safety Switch

Prerequisites for mounting:

- deflection head has been set
 - fully assembled
- ↪ Select the mounting location so that the following conditions are satisfied:
 - Safety Switch and actuator can be well matched to one another mechanically and can be permanently mounted
 - accessible to qualified personnel for testing and replacement
 - difficult to access by operating personnel while the protective device is open

↪ Position washers and screw down Safety Switch with 2–3Nm.



6.3 Mounting the actuator

NOTICE

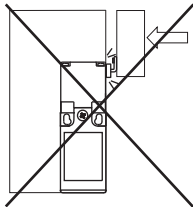
The Safety Switch may be damaged if mounted improperly!

- ↪ Use separate mechanical limit stop for the moving part of the protective device.
- ↪ Align actuator so that it does not hit or rub against the edges of the insertion opening.

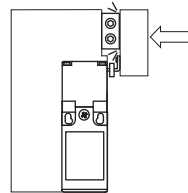
Prerequisites for proper function:

- actuator is not deformed or damaged
 - actuator is suitable for the Safety Switch
- Proper function is ensured only with original accessories (see chapter 13 "Accessories").

Wrong

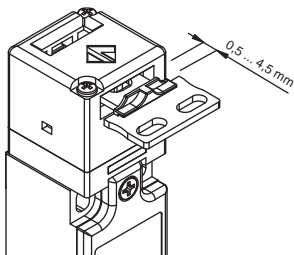


Correct



↪ Align actuator.


Play for the actuator in the closed state: 0.5–4.5 mm.




↪ Secure actuator with rivets or tamperproof screws so that it cannot be detached.



7 Electrical connection

 WARNING
Serious accidents may result if the electrical connection is faulty!
↳ Electrical connection may only be performed by competent personnel.

7.1 Connecting the contact block

 DANGER
Risk of death by electric shock!
↳ Interrupt the voltage supply to the Safety Switch.

Prerequisites for the electrical connection:

- temperature stability of the cable insulation material must be greater than the maximum temperature of the housing (see chapter 14 "Technical data")
- cable gland with appropriate protection rating
- maximum current load is observed (see chapter 14 "Technical data")

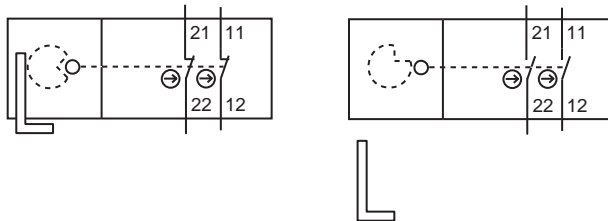


Figure 7.1: Contact block 2 NC (S20-P3C1-M20-FH)

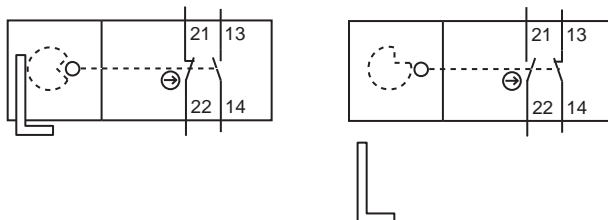


Figure 7.2: Contact block 1 NC + 1 NO (S20-P1C1-M20-FH, S20-P1C3-M20-LH)

- ↪ Unscrew the housing cover.
- ↪ Connect the contact block according to the circuit diagram.

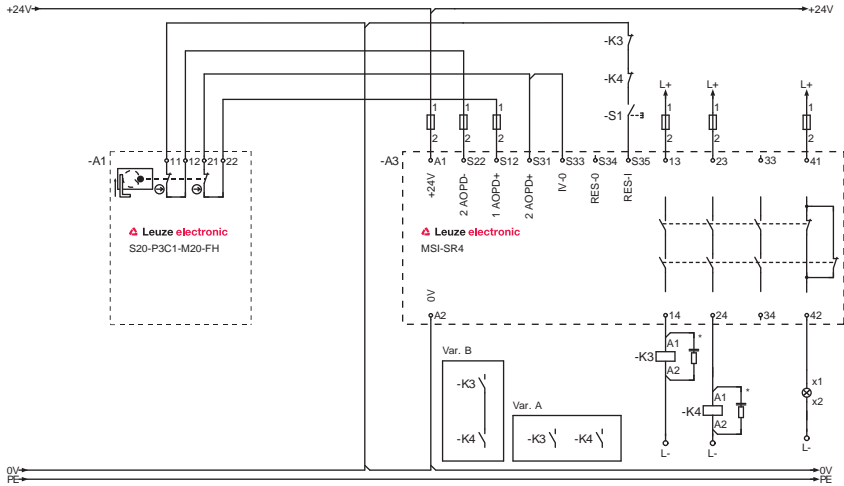


Figure 7.3: Connection example S20-P3C1-M20-FH

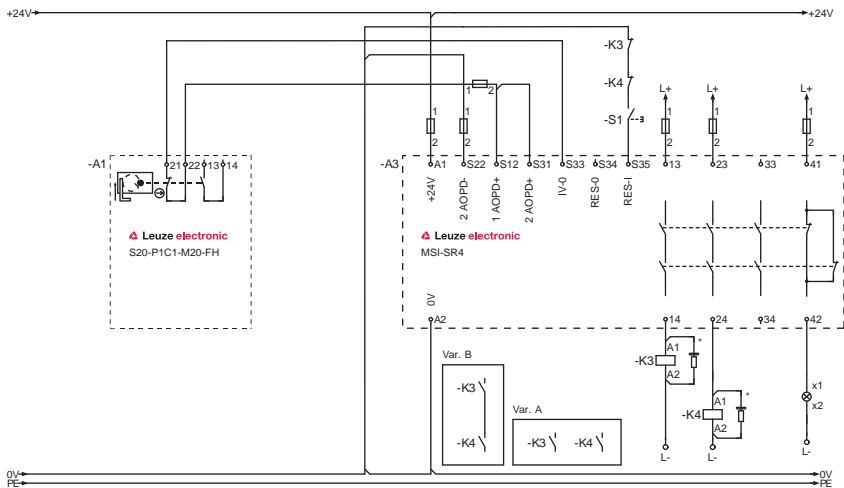


Figure 7.4: Connection example S20-P1C1-M20-FH

- ↪ Tighten cable terminal screws with 0.6–0.8Nm.



- ↪ Tighten the housing cover with 0.7–0.9Nm.



8 Setting the device into service

Prerequisites:

- Safety Switch is mounted and connected according to these instructions
- operating personnel have been trained in the correct use

↳ Test the function of the Safety Switch (see chapter 9 "Testing").

The Safety Switch is then ready for use.

9 Testing

S20 Safety Switches are maintenance free. Nevertheless, they must be replaced after maximum 1,000,000 switching cycles.

↳ Always replace the entire Safety Switch including actuator.

↳ For the testing intervals, observe nationally applicable regulations.

↳ Document all tests in a comprehensible manner.

9.1 To be performed prior to the initial start-up by competent personnel

↳ Check whether the Safety Switch is operated according to its specified environmental conditions (see chapter 14 "Technical data").

↳ Test to ensure proper mechanical and electrical function (see chapter 9.2).

9.2 To be performed periodically by competent personnel

Mechanical function

↳ Stop the dangerous state and open the protective device.

↳ Check that the components are securely fastened.

↳ Test the cable entry for leaks.

↳ Check Safety Switch and actuator for damage, deposits, deformation and wear.

↳ Test several times whether the actuator can be easily moved into the Safety Switch.

Electrical function**WARNING**

Severe injuries may result if tests are not performed properly!

☞ Make certain that there are no persons in the danger zone.

- ☞ Stop the dangerous state and open the protective device.
- ☞ Make certain that the machine cannot be started while the protective device is open.
- ☞ Close the protective device and start the machine.
- ☞ Test several times whether the machine stops upon opening of the protective device.
- ☞ Test whether the dangerous state ends before the point of operation can be reached.

9.3 To be performed daily by the operating personnel**WARNING**

Severe injuries may result if tests are not performed properly!

☞ Make certain that there are no persons in the danger zone.

- ☞ Stop the dangerous state and open the protective device.
- ☞ Check the Safety Switch and actuator for damage or tampering.
- ☞ Make certain that the machine cannot be started while the protective device is open.
- ☞ Close the protective device and start the machine.
- ☞ Test whether the machine stops upon opening of the protective device.

10 Cleaning

There must be no soiling (e.g. shavings and dust) present, especially in the deflection head of the Safety Switch.

Prerequisites for cleaning:

- protective device is opened and machine is switched off
- voltage supply to the Safety Switch is interrupted

↳ Regularly clean the Safety Switch with the protective device open (e.g. with a vacuum cleaner).

11 Disposing

↳ The nationally valid regulations for electro-mechanical components are to be observed when disposing.

12 Service and support

Contact data:

Leuze electronic GmbH + Co. KG
Liebigstraße 4
D-82256 Fürstenfeldbruck
Phone: +49 8141 5350-111

13 Accessories

Table 13.1: Actuators of the AC-AN series for the S20 Safety Switch

Article	Part No.	Description
AC-AN-S	63000 700	Straight
AC-AN-A	63000 701	Angled
AC-AN-F4	63000 702	Straight, flexible in 4 directions
AC-AN-F2J2	63000 703	Straight, flexible in 2 directions, alignable in 2 directions
AC-AN-SL	63000 704	Straight, long
AC-AN-AL	63000 705	Angled, long
AC-AN-F1J2	63000 706	Straight, flexible in 1 direction, alignable in 2 directions
AC-AN-ASH	63000 707	Angled, short

14 Technical data

Table 14.1: General

Switch type	Interlock device without guard interlocking in accordance with EN 1088
Actuator, external	AC-AN series: straight, angled, resilient, alignable
Approach actuation directions	1 x above, 4 x side (90°)
Approach speed	min. 1 mm/s, max. 0.5m/s
Actuation force (extraction)	10N
Actuating path with forced separation	min. 9.0mm (S20-P3C1-M20-FH) min. 7.2mm (S20-P1C1-M20-FH, S20-P1C3-M20-LH)
Mechanical life time according to IEC 60947-5-1	1,000,000switching cycles
Actuation frequency in accordance with IEC 60947-5-1	max. 3600 per hour
Life time according to EN ISO 13849-1	on request
Number of cycles until the dangerous failure (B10d) in accordance with EN 61810-2 with DC1 (ohmic load) with AC1 (ohmic load) with DC13 (inductive load) with AC15 (inductive load) low load (20% rated load)	on request
Usage category in accordance with EN 60947-5-1	AC 15: (Ue / Ie) 250V / 6A 400V / 4A 500V / 1A DC 13: (Ue / Ie) 24V / 6A 125V / 1.1A 250V / 0.4A
Dimensions (dimensional drawings)	see chapter 3 "Device description"

Table 14.2: Safety

Protection rating	IP 67
Contact protection	Protective insulation O
Recoil tolerance	4.5mm
Contact allocation	S20-P3C1-M20-FH: 2 NC S20-P1C1-M20-FH: 1 NC + 1 NO S20-P1C3-M20-LH: 1 NC + 1 NO
Contact material	silver alloy
Switching principle	slow-action contact
Opening of contact	positive-forced
Rated insulation voltage	500VAC, 600VDC
Conventional thermal current	max. 10A
Short-circuit protection according to IEC 60269-1	10A, 500V, type aM

Table 14.3: Housing

Housing material	fiberglass-reinforced, thermo-plastic plastic, self-extinguishing
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Table 14.4: Connection

Number of cable entries	1 (S20-P3C1-M20-FH, S20-P1C1-M20-FH) 3 (S20-P1C3-M20-LH)
Type of cable entry	M20 x 1.5
Conductor cross-section (stranded)	1 x 0.5mm ² to 2 x 2.5mm ²

Table 14.5: Environment

Temperature range, operation	-25 ... +80°C
Degree of contamination, external, according to EN 60947-1	3

15 EC Declaration of Conformity


Leuze electronic GmbH + Co. KG
Liebigstraße 4
D-82256 Fürstenfeldbruck

We hereby declare that the S20 Safety Switch (see name plate for part no.) in the form in which it is marketed by us conforms with the relevant safety and health requirements of the listed EC directives ¹ (including all changes) and that the listed standards ¹ were used in its design and construction.

Fürstenfeldbruck, 15 September 2008



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