SIEMENS

Industrial Controls

Detecting devices SIRIUS 3SE5 / 3SF1 position switches and 3SE66 / 3SE67 magnetically operated switches

Configuration Manual

05/2021
NEB334869902000/RS-AD/005

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Table of contents

Introduction

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1.1 Purpose of this documentation

This manual describes the many possible uses of SIRIUS detection devices for monitoring motion sequences or protective devices.

General information will be provided about the principal of operation, selection, and installation of mechanical position switches and safety switches to enable their reliable operation.

1.2 Target group

This documentation contains information for the following target groups:

- Decision makers
- Technologists
- Project planning engineers
- Commissioning engineers

1.3 Required knowledge

Zum Verständnis dieser Dokumentation sind allgemeine Grundkenntnisse auf folgenden Gebieten erforderlich:

- Low-voltage controls and distribution
- Digital circuit logic
- Automation technology
- AS-Interface
- Safety technology

1.4 Siemens Industry Online Support

Information and service

At Siemens Industry Online Support you can obtain up-to-date information from our global support database quickly and simply. To accompany our products and systems, we offer a wealth of information and services that provide support in every phase of the lifecycle of your machine or plant – from planning and implementation and commissioning, right through to maintenance and modernization:

- Product support
- Application examples
- Services
- Forum
- mySupport

Link: Siemens Industry Online Support (https://support.industry.siemens.com/cs/de/en)

Product support

Here you will find all the information and comprehensive know-how for your product:

- **FAQs**
  Our replies to frequently asked questions.
- **Manuals/operating instructions**
  Read online or download, available as PDF or individually configurable.
- **Certificates**
  Clearly sorted according to approving authority, type and country.
- **Characteristics**
  For support in planning and configuring your system.
- **Product announcements**
  The latest information and news concerning our products.
- **Downloads**
  Here you will find updates, service packs, HSPs and much more for your product.
- **Application examples**
  Function blocks, background and system descriptions, performance statements, demonstration systems, and application examples, clearly explained and represented.
- **Technical data**
  Technical product data for support in planning and implementing your project.

Link: Product support (https://support.industry.siemens.com/cs/ww/en/ps)

mySupport

With "mySupport", your personal work area, you get the very best out of your Industry Online Support experience. Everything enables you to find the right information - every time.

The following functions are now available:

- **Personal messages**
  Your personal mailbox for exchanging information and managing your contacts
- **Requests**
  Use our online form for specific solution suggestions, or send your technical request direct to a specialist in Technical Support
- **Notifications**
  Make sure you always have the latest information - individually tailored to your needs
- **Filter**
  Simple management and re-use of your filter settings from Product Support and the Technical Forum
- **Favorites / Tags**
  Create your own "knowledge base" by assigning "Favorites" and "Tags" to documents – simple and efficient
- **Entries last viewed**
  Clear history of the entries you have most recently viewed
- **Documentation**
  Configure and compile individual documentation concepts from different manuals – quickly and without complications
- **Personal data**
  Change personal data and contact information here
- **CAx data**
  Simple access to thousands of items of CAx data such as 3D models, 2D dimension drawings, EPLAN macros and much more

1.5 Latest information

Selection data and ordering data

You can find additional information about detection devices on the Internet in the Industry Mall.

Here, you have access to

- Catalogs/brochures (http://www.siemens.com/industrial-controls/catalogs)
- Online configuration (http://www.siemens.com/sirius/configurators)

1.6 Siemens Industry Online Support app

Siemens Industry Online Support app

The Siemens Industry Online Support app provides you access to all the device-specific information available on the Siemens Industry Online Support portal for a particular article number, such as operating instructions, manuals, data sheets, FAQs etc.

The Siemens Industry Online Support app is available for Android and iOS:

Android

iOS

1.7 Support Request

Use the Support Request online form to send your question directly to Technical Support:

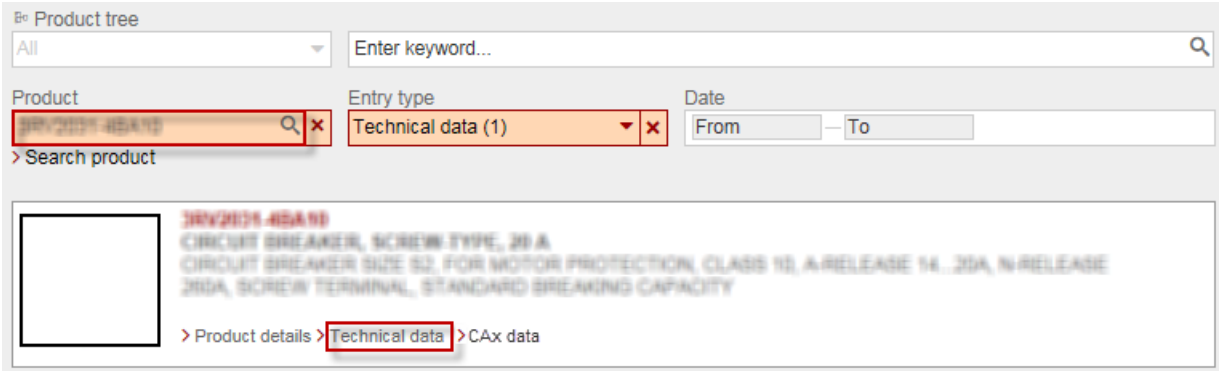
Support Request:	Internet (https://support.industry.siemens.com/My/ww/en/requests)

1.8 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/16403/td).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.



1.9 Overview tables

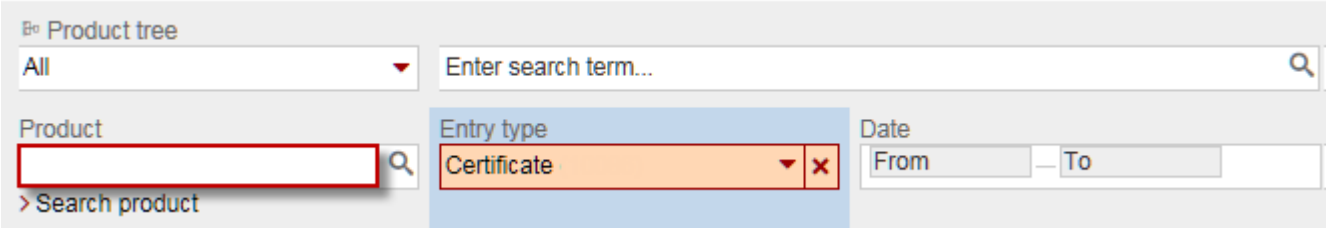
Overview tables technical data

You will find overview tables with technical data in the "Product information" tab in our online ordering system (https://mall.industry.siemens.com/mall/en/WW/Catalog/Products/10026725?tree=CatalogTree).

1.10 Certificates

You can find all certificates for the product in Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Make a selection in the "Document type" > "Certificate" field.
2. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
3. All valid certificates for the chosen device are displayed in the bottom area of the page.



Safety notes

2

2.1 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit
https://www.siemens.com/industrialsecurity.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under
https://www.siemens.com/industrialsecurity.

2.2 Recycling and disposal

For environmentally friendly recycling and disposal of your old device, please contact a company certified for the disposal of old electrical and/or electronic devices and dispose of the device in accordance with the regulations in your country.

Important note

The products described here were developed to perform safety-oriented functions as part of an overall installation or machine. A complete safety-oriented system generally features sensors, evaluation units, signaling units, and reliable shutdown concepts. It is the responsibility of the manufacturer to ensure that a system or machine is functioning properly as a whole. Siemens AG, its regional offices, and associated companies (hereinafter referred to as "Siemens") cannot guarantee all the properties of an overall installation or machine that has not been designed by Siemens. Nor can Siemens assume liability for recommendations that appear or are implied in the following description. No new guarantee, warranty, or liability claims beyond the scope of the Siemens general terms of supply are to be derived or inferred from the following description.

⚠ DANGER

Hazardous voltage. Will cause death or serious injury.

Electric shock.

Non-metallic enclosures do not provide grounding between conduit unions. Proper grounding between conduit unions must be established by using grounding bushings and jumper wires.

⚠ WARNING

Possible inaccurate signal.

Personal injury or property damage can occur.

If the original actuator is not used, this may result in a defect on the module and the switch may no longer be able to lock or unlock.

Only use the designated actuator for the appropriate safety switch.

NOTICE

The functionality of the switch cannot be ensured in the event of incorrect installation.

Incorrect installation will destroy the actuator head.

Install the position switch and actuator in such a way that the actuator can move into the actuator head without large lateral forces. Do not use position switches as an endstop.

General description 3

3.1 Application areas

Mechanical position switches are used to detect (end) positions of moving machine and plant parts. Mechanical safety switches are used to protect personnel and machinery in manufacturing and processing lines.

The following are typical application areas for position switches:

- Protective devices
- Manufacturing and assembly lines
- Packaging systems and luggage sorting systems
- Elevators and conveyor systems
- Automatically controlled machines and robots

No matter what the requirements, SIRIUS position switches can be used in practically any situation in day-to-day industrial operations. The following features make this possible:

- Modular structure
- Uniform structure
- Structure with many different variants available
- Wide variety of actuators

Standardized designs and functions make it easy to select the appropriate switch and ensure simple, efficient storage, installation, and wiring.

Together with fail-safe evaluation units, such as 3SK1, 3SK2, ASIsafe and SIMATIC or SINUMERIK units, you can achieve a performance level of up to PL e according to ISO 13849 or SIL3 according to IEC 62061 / IEC 61508.

Position switches are actuated by bars, cams, endstops, cam disks, etc. and provide control commands for the following sequences:

- Sequence of the switch program
- Manufacturing sequence
- Processing sequence

A variety of device series with different contact versions are available for carrying out various control tasks.

- Position switches in open-type design (Page 49)
- Position switches in compact design (Page 55)
- Mechanical position switches (modular system) (Page 66) with plastic enclosure/with metal enclosure
- 3SE22 mechanical safety switches with separate actuation (Page 129)
- 3SE5 mechanical safety switches with separate actuator and without tumbler (Page 137)

- 3SE5 mechanical safety switches with separate actuation with tumbler (Page 154)
- 3SF1 mechanical safety switches for AS-Interface (Page 177)
- Hinge switches (Page 205)
- Magnetically operated switches (Page 215)

A variety of actuators are available for the various approach and actuation situations to enable an optimum solution. The different enclosure designs enable the most favorable conditions for installing and removing devices and the ideal electrical cable entry. The 3SE5 position switches guarantee operational reliability of controls by virtue of their design, materials, and manufacture.

3.2 Determination of failure rate

Using the B10 value, the failure rate of a position switch is calculated according to the following formula:

$\lambda = 0.1 * c / B10$

$\lambda_D = 0.1 * c / B10_d$

$PFH_D = \lambda_D * 1\ h$

λ = Total failure rate of a position switch

λ_D = Failure rate of dangerous failures

c = Switching operations per hour

B10 = Number of operating cycles after which 10% of the devices have failed

$B10_d$ = Number of operating cycles after which 10% of the devices have failed with dangerous effect

PFH_D = Probability of a dangerous failure per hour

$B10_d$ = B10 / Proportion of dangerous failures

SN 31920 standard

The B10 value for devices subject to wear is expressed in the number of switching cycles. This is the number of switching cycles at which during a lifetime test, 10% of the test objects have failed (or: number of operating cycles after which 10% of the devices have failed).

Note

Refer to the relevant data sheet (see Technical data in Siemens Industry Online Support (Page 17)) for the number of switching cycles (B10 value).

Calculation example

A protective door is monitored by a position switch with a separate actuator. The protective door is opened 4 times an hour.

The total failure rate of the position switch is:
$\lambda = 0.1 * C / B10$ [failures / h] $\lambda = 0.1 * 4 / 1000000 = 4 * 10^{-7}$ [failures / h]

The dangerous failure rate is calculated as:
λ_D = 20% of $\lambda = 0.2 * 4 \times 10^{-7}$ [failures / h]
$\lambda_D = 8 * 10^{-8}$ [failures / h]

3.3 Overview of position switches in open-type and compact design

Position switch	**Open-type design**	**Compact design with connector**		**Compact design with molded cable**	
	3SE5250	**3SE5413-.....-1EB1**	**3SE5423-.....-1EB1**	**3SE5413-.....-1EA.**	**3SE5423-.....-1EA.**
					
Enclosure					
Plastic	✓	—			
Metal	—	✓			
Dimensions (W x H x D) in mm					
	30 x 48.5 x 20	30 x 50 x 16	40 x 50 x 16	30 x 50 x 16	40 x 50 x 16
Degree of protection	IP10 or IP20 (conductor connected and clamping screw tightened)	IP67			
Standards	IEC 60947-5-1				
Mounting and operating points according to standard	EN 50047	EN 50047	EN 50041	EN 50047	EN 50041
Contact blocks					
2 slow-action contacts	1 NO + 1 NC	—			
2 snap-action contacts	1 NO + 1 NC	1 NO + 1 NC			
2 snap-action contacts, short stroke	1 NO + 1 NC	—			
2 snap-action contacts with 2 x 2 mm contact spacing	1 NO + 1 NC	—			
3 slow-action contacts	2 NO + 1 NC 1 NO + 2 NC	—			
3 slow-action contacts with make-before-break	1 NO + 2 NC				
3 snap-action contacts	1 NO + 2 NC	—			
Technical data					
Actuating speed v	0.1 mm/s to 1.5 m/s (snap-action contact) 0.4 mm/s to 1.5 m/s (slow-action contact)	0.05 mm/s to 2 m/s			
Ambient temperature	-25 °C to +85 °C				

Position switch	Open-type design	Compact design with connector		Compact design with molded cable	
	3SE5250	3SE5413-.....-1EB1	3SE5423-.....-1EB1	3SE5413-.....-1EA.	3SE5423-.....-1EA.
Connections					
M12 connector, 5-pin	—	✓		—	
Molded cable, 5-pin	—	—		✓	
Actuator					
Rounded plunger	✓	✓			
Roller plunger	—	✓			
Twist lever	—	✓			

✓ Available for delivery — Not available

3SE54... complete units in compact design	Enclosure width mm
• 2 snap-action contacts 1 NO + 1 NC	
• Degree of protection IP67	
• with connecting cable or M12 plug connector	
Rounded plunger	
• Standard mounting	
- with 2 m cable 5 x 0.75 mm²	30 40
- with 5 m cable 5 x 0.75 mm²	30
- with M12 plug connector	30 40
• with M12x1 central fixing	
- with 2 m cable 5 x 0.75 mm²	30 40
• with external seal	
- with 2 m cable 5 x 0.75 mm²	30 40
Roller plunger	
• Standard mounting	
- with 2 m cable 5 x 0.75 mm²	30 40
- with 5 m cable 5 x 0.75 mm²	30
- with M12 plug connector	30 40
• with M12 x 1 central fixing	
- with 2 m cable 5 x 0.75 mm²	30 40
• Actuator head rotated 90°	
- with 2 m cable 5 x 0.75 mm²	30 40

3SE54... complete units in compact design	**Enclosure width mm**
Twist lever	
• Standard mounting	
- with 2 m cable 5 x 0.75 mm^2	30 40
- with 5 m cable 5 x 0.75 mm^2	30
- with M12 plug connector	30 40

3.4 Overview of mechanical position switches

	Mechanical position switches in modular design						XL enclosure
	3SE523.	3SE521.	3SE524.	3SE511.	3SE513.	3SE512.	3SE516.
							
Enclosure							
Plastic	✓	—	✓	—	✓	—	—
Metal	—	✓	—	✓	—	✓	✓
Dimensions (W x H x D) in mm							
	31 x 68 x 33		50 x 53 x 33	40 x 78 x 38		56 x 78 x 38	56 x 100 x 27
Degree of protection	IP65	IP66/67	IP66/67	IP66/67		IP66/67	IP66/67
Standards	IEC 60947-5-1						
Mounting and operating points according to standard	EN 50047		EN 50047	EN 50041		EN 50041	EN 50041
Contact blocks	1			1			2
Slow-action contacts	1 NO + 1 NC			1 NO + 1 NC			2x (1 NO + 1 NC)
Snap-action contacts	1 NO + 1 NC			1 NO + 1 NC			2x (1 NO + 1 NC)
Snap-action contacts, short-stroke	1 NO + 1 NC			1 NO + 1 NC			—
Snap-action contacts with 2 x 2 mm operating distance	1 NO + 1 NC			1 NO + 1 NC			—
Slow-action contacts	1 NO + 2 NC 2 NO + 1 NC			1 NO + 2 NC 2 NO + 1 NC			—
Snap-action contacts	1 NO + 2 NC			1 NO + 2 NC			—
Slow-action contacts with make-before-break	1 NO + 2 NC			1 NO + 2 NC			2x (1 NO + 2 NC)
Slow-action contacts with make-before-break and slow-action contacts	—			—			1x (1 NO + 2 NC) 1x (1 NO + 1 NC)
LED display	✓			✓			—
Increased anti-corrosion protection	✓			✓			✓

✓ Available for delivery — Not available

	Mechanical position switches in modular design						**XL enclosure**
	3SE523.	**3SE521.**	**3SE524.**	**3SE511.**	**3SE513.**	**3SE512.**	**3SE516.**
Connections							
Cable entry	1 x (M20 x 1.5)		2 x (M20 x 1.5)	1 x (M20 x 1.5)		3 x (M20 x 1.5)	3 x (M20 x 1.5)
M12 connector, 4-, 5-, or 8-pin	✓		✓	✓		✓	—
Connector, 6-pin + PE	—		—	✓		✓	—
Actuator							
Plain plunger	—	✓	—	✓			✓
Rounded plunger	✓			✓			✓
Roller plunger	✓			✓			✓
Roller lever	✓			✓			✓
Angular roller lever	✓			✓			✓
Spring rod	✓			✓			✓
Twist lever	✓			✓			✓
Adjustable-length twist lever and rod lever	✓			✓			✓
Fork lever	✓			✓			✓

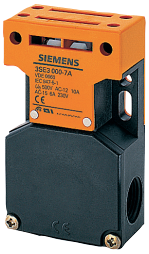
✓ Available for delivery — Not available

3.5 Overview of safety switches with separate actuation

	Safety switches with separate actuation				Safety switches with tumbler
	3SE5212-..V40 3SE5232-..V40	**3SE5242-..V40**	**3SE5112-..V10 3SE5132-..V20**	**3SE5122-..V10**	**3SE5322-.S... 3SE5312-.S...**
					
Enclosure					
Plastic (1)	✓	✓	✓	—	✓
Metal (2)	✓	—	✓	✓	✓
Dimensions (W x H x D) in mm					
	31 x 68 x 33	50 x 53 x 33	40 x 78 x 38	56 x 78 x 38	54 x 185 x 44
Degree of protection	(1) IP65 (2) IP66/67	(1) IP66/67	(2) IP66/67		(1)(2) IP66/67
Standards	IEC 60947-5-1, ISO 13849-1, IEC 62061 / IEC 61508, ISO 14119				
Mounting according to standard	EN 50047		EN 50041		ISO 14119
2 slow-action contacts	1 NO + 1 NC				—
3 slow-action contacts	1 NO + 2 NC				—
6 slow-action contacts	—				2 x (1 NO + 2 NC)
LED display	✓				✓
Rated insulation voltage U_i	400 V				250 V
Conventional thermal current I_{the}	6 A				6 A
Cable routing	1 x (M20 x 1.5)	2 x (M20 x 1.5)	1 x (M20 x 1.5)	3 x (M20 x 1.5)	3 x (M20 x 1.5)
M12 connector, 4- / 5- / 8-pin	✓				—
Connector, 6-pin + PE	—	✓	—	✓	—
Separate actuation	✓				✓

✓ Available for delivery — Not available

3.6 Overview of 3SE22 safety switches with separate actuation

Molded-plastic enclosures in special width of 52 mm, lateral and front-end actuation	**3SE2243-0XX.0**	**3SE2257-6XX.0**	**3SE2243-0XX.8**
			
With M20 x 1.5 connecting thread	✓	✓	—
With M16 x 1.5 connecting thread	—	—	✓
Slow-action contacts	1 NO + 2 NC	1 NC	1 NO + 2 NC
Holding force 5 N	3SE2243-0XX40	3SE2257-6XX40	—
Holding force 30 N	3SE2243-0XX	3SE2257-6XX	3SE2243-0XX18
With automatic ejection	3SE2243-0XX30	—	—
Degree of protection	IP67	IP67	IP67
Stroke	6 mm	6 mm	6 mm

✓ Available for delivery — Not available

Note

Notes on actuator

Safety switches can only be used in combination with an appropriate actuator. The actuator must be ordered separately.

3.7 Overview of the mechanical safety switches with separate actuation for AS-Interface

	Mechanical safety switches with separate actuation				Safety switches with tumbler
	3SF1214 3SF1234	**3SF1244**	**3SF1114**	**3SF1124**	**3SF13.4**
					
Enclosure					
Plastic (1)	✓	✓	—	—	✓
Metal (2)	✓	—	✓	✓	✓
Dimensions (W x H x D) in mm					
	31 x 68 x 33	50 x 53 x 33	40 x 78 x 38	56 x 78 x 38	54 x 85 x 44
Degree of protection	IP65	IP66/67	IP66/67	IP66/67	IP66/67
Standards	IEC 60947-5-1, ISO 13849-1, IEC 62061 / IEC 61508, ISO 14119				
Mounting according to standard	EN 50047	EN 50047	EN 50041	EN 50041	ISO 14119
2 slow-action contacts	1 NO + 1 NC	1 NO + 1 NC	1 NO + 1 NC	1 NO + 1 NC	—
3 slow-action contacts	1 NO + 2 NC	1 NO + 2 NC	1 NO + 2 NC	1 NO + 2 NC	—
6 slow-action contacts	—	—	—	—	2 x (1 NO + 2 NC)
Rated insulation voltage U_i	400 V	400 V	400 V	400 V	250 V
Conventional thermal current I_{the}	6 A	6 A	6 A	6 A	6 A
Cable routing	1 x (M20 x 1.5)	2 x (M20 x 1.5)	1 x (M20 x 1.5)	3 x (M20 x 1.5)	3 x (M20 x 1.5)
M12 connector, 4-pin	✓	✓	✓	✓	—
AS-Interface	✓	✓	✓	✓	✓
Separate actuation	✓	✓	✓	✓	✓

✓ Available for delivery — Not available

3.8 Overview of hinge switches

	Hinge switches			
	3SE5232-0.U2.	**3SE5212-0.U2.**	**3SE5112-0.U2.**	**3SE5132-0.U2.**
				
Enclosure				
Plastic	✓	—	—	✓
Metal	—	✓	✓	—
Dimensions (W x H x D) in mm	31 x 68 x 33	31 x 68 x 33	40 x 78 x 38	40 x 78 x 38
Degree of protection	IP65	IP66/67	IP66/67	IP66/67
Standards	IEC 60947-5-1			
Mounting and operating points according to standard	EN 50047	EN 50047	EN 50041	EN 50041
2 snap-action contacts	1 NO + 1 NC	1 NO + 1 NC	1 NO + 1 NC	1 NO + 1 NC
3 snap-action contacts	1 NO + 2 NC	1 NO + 2 NC	1 NO + 2 NC	1 NO + 2 NC
Increased anti-corrosion protection	✓	✓	✓	✓
Rated insulation voltage U_i	400 V	400 V	400 V	400 V
Cable routing	1 x (M20 x 1.5)	1 x (M20 x 1.5)	1 x (M20 x 1.5)	1 x (M20 x 1.5)
With hollow or solid shaft	✓	✓	✓	✓

✓ Available for delivery — Not available

Plastic enclosures with integrated hinge	**3SE2283-0GA.3**	**3SE2283-6GA.3**	**3SE2283-0GA44**	**3SE2283-6GA44**
				
Aluminum hinge	✓	✓	—	—
High-grade steel hinge	—	—	✓	✓
Slow-action contacts	1 NO + 2 NC	3 NC	1 NO + 2 NC	3 NC
4 °actuating angle	3SE2283-0GA43	3SE2283-6GA43	3SE2283-0GA44	3SE2283-6GA44
8 °actuating angle	3SE2283-0GA53	3SE2283-6GA53	—	—

Plastic enclosures with integrated hinge	**3SE2283-0GA.3**	**3SE2283-6GA.3**	**3SE2283-0GA44**	**3SE2283-6GA44**
Rated insulation voltage U_i	250 V	250 V	250 V	250 V
Degree of protection	IP65	IP65	IP65	IP65
Cable entry	2 x (M20 x 1.5)	2 x (M20 x 1.5)	2 x (M20 x 1.5)	2 x (M20 x 1.5)

✓ Available for delivery — Not available

3.9 Overview of magnetically operated switches

3.9.1 3SE66/3SE67 non-contact magnetically operated safety switches

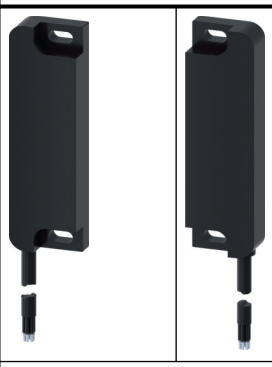
	3SE6704-1BA	3SE6605-1BA	3SE6704-2BA	3SE660.-2BA	3SE6704-3BA	3SE6605-3BA
						
	Switching magnet (co-ded)	Contact block	Switching magnet (co-ded)	Contact block	Switching magnet (co-ded)	Contact block
Size (mm)	M30	M30	25 x 88	25 x 88	25 x 33	25 x 33
Contacts	—	1 NO + 1 NC 2 NC	—	1 NO + 1 NC 2 NC	—	1 NO + 1 NC 1 NO + 2 NC
With 3 m cable	—	3SE6605-1BA	—	3SE6605-2BA 3SE6604-2BA 3SE6606-2BA04	—	3SE6605-3BA
With 5 m cable	—	—	—	3SE6605-2BA05	—	3SE6605-3BA05
With 10 m cable	—	—	—	3SE6605-2BA10 3SE6604-2BA10	—	3SE6605-3BA10
With 15 m cable	—	—	—	—	—	3SE6605-3BA15
With 25 m cable	—	3SE6605-1BA25	—		—	3SE6605-3BA25
With M8 plug, 4-pole	—	—	—	3SE6605-2BA01 3SE6604-2BA01	—	—
With M12 plug, 4-pole	—	3SE6605-1BA02	—	—	—	—

✓ Available for delivery — Not available

	Enclosures, plastic					
	3SE66.6-3CA01		3SE66.7-3CA01		3SE66.7-3CA04	
						
With 8 mm plug, 6-pole	✓		✓		—	
With cable	—		—		✓	

	Enclosures, plastic		
	3SE66.6-3CA01	**3SE66.7-3CA01**	**3SE66.7-3CA04**
Door hinge right	3SE6626-3CA01	3SE6627-3CA01	3SE6627-3CA04
Door hinge left	3SE6616-3CA01	3SE6617-3CA01	3SE6617-3CA04
Dimensions (W x H x D) in mm	26 x 36 x 13	26 x 36 x 13	26 x 36 x 13
Degree of protection	IP67	IP67	IP67
Approvals	UL / CSA	UL / CSA	UL / CSA
Safety contacts	1 NO + 1 NC	2 NC	2 NC
Signaling contacts	1 NC	1 NC	1 NC

✓ Available for delivery — Not available

	Enclosures, plastic		
	3SE66.7-2CA01	**3SE66.4-4CA01**	**3SE66.7-2CA04**
			
With 8 mm plug, 6-pole	✓	—	—
with LED and M8 connector, 4-pin	—	✓	—
With cable	—	—	✓
Door hinge right	3SE6627-2CA01	3SE6624-4CA01	3SE6627-2CA04
Door hinge left	3SE6617-2CA01	3SE6614-4CA01	3SE6617-2CA04
Dimensions (W x H x D) in mm	25 x 88 x 13	25 x 88 x 13	25 x 88 x 13
Degree of protection	IP67	IP67	IP67
Approvals	UL / CSA	UL / CSA	UL / CSA
Safety contacts	2 NC	2 NC	2 NC
Signaling contacts	1 NC	—	1 NC

✓ Available for delivery — Not available

Contact blocks	**3SE6714-3CA**	**3SE6724-3CA**	**3SE6714-2CA**	**3SE6724-2CA**
				
Offset by 90 degrees	—	✓	—	✓
Suitable for 3SE6626-3CA01 3SE6627-3CA01 3SE6616-3CA01 3SE6617-3CA01 3SE6617-3CA04 3SE6627-3CA04	✓	✓	—	—
Suitable for 3SE6627-2CA01 3SE6617-2CA01 3SE6624-4CA01 3SE6614-4CA01 3SE6627-2CA04 3SE6617-2CA04	—	—	✓	✓

✓ Available for delivery — Not available

3.10 Features of position switches

3.10.1 Basic function

Mechanical position switches and mechanical safety switches for safety-related applications ensure safe interruption of a circuit when required. For example, actuators are safely switched off by actuating the position switch, thereby preventing injuries to persons and damage to machines. The mechanical position switches and mechanical safety switches implement the safe shutdown without any action on the part of the machine control system, e.g., PLC.

3.10.2 Electromechanical sensors

Due to certain mechanical advantages, position switches are used in automatic control systems and in many other applications under a variety of service conditions.

They transmit information to the control system on the following:

- Presence/absence of objects
- Running-past of an object
- Position of an object
- End position of an object
- Status of protective doors

Electrical features

- Electrically isolated auxiliary switch
- Very high switching capacity when switching low currents and, depending on the version, a high level of fail-safe operation
- High short-circuit strength in combination with the assigned backup fuse
- Absolute protection against electromagnetic interference
- High operating voltage permitted

Mechanical features

- Depending on the actuator head selected, either a positively-driven (positive opening operation ⊕) or non-positive actuation of the normally closed auxiliary switch is possible.
- High level of resistance in industrial environment (tests according to standardized and special ambient conditions)
- Operating point repeatability up to 0.05 mm

3.10.3 Contact element variance

Variants: 1 NO +1 NC, 1 NO + 2 NC, 2 NO + 1 NC, make-before-break

The 3-pin contact block increases the safety through redundant switch-off and additional signaling. Additional available space is not required compared to 2-pin contact blocks.

Snap-action contacts

- Simultaneous switching of all contacts irrespective of the actuating speed
- Operating point independent of actuating speed v_{min} = 0.1 mm/s
- Hysteresis is approximately 30% to 40% of the operating travel

The hysteresis describes the difference between the operating point and reset point in the case of snap-action contacts. This difference results from the different geometric positions of the snap-action mechanism during the switch and reset operations.

Snap-action contacts, short-stroke

Improved precision through reduced actuator travel.

Snap-action contacts 2 x 2 mm

Operating distance for elevator industry.

Slow-action contacts

- Travel difference (current-free pause or make-before-break) between normally open contact and normally closed contact.
- The normally closed contact always opens first before the normally open contact closes.
- The operating time is dependent on the actuating speed
  Actuating speed v_{min} = 0.4 mm/s. The operating speed is identical or proportional to the actuating speed.
- Operating point dependent on contact erosion/aging
- No hysteresis
- The operating point and the reset point are generally always the same because the contact mechanism is actuated linearly by the actuator head.

Slow-action contact with make-before-break

This variant is used to introduce a second function to a sequential control system.

One of the two normally closed contacts opens first.

The second normally closed contact only opens once the normally open contact is closed.

Gold-plated contacts

Used for applications with low currents, low switching frequency, corrosive vapors/ atmospheres.

Contact reliability

The new contact blocks guarantee a very high level of contact reliability. This is also the case when the devices are required to switch low currents and voltages, such as 1 mA at 5 V DC.

Positive opening operation ⊕

The contacts with normally closed function are opened reliably by means of a positively-driven actuating plunger mechanism. This is referred to as a positive opening operation.

IEC 60947-5-1 and DIN EN 60947-5-1 require positive opening of normally closed contacts for operator protection and stipulate use of the marking ⊕.

Positive opening travel

A manufacturer-specified minimum travel that ensures that all main contacts are in open position when the operator control element is in the position corresponding to the open position of the switching device.

Positive opening position switches with slow-action function, snap-action function, and slow-action function with make-before-break

On actuation, the positive opening normally closed contact opens and reaches its positive opening point in a defined manner. On reset (closing of protective device), the contact closes at the same point (no hysteresis) in the case of slow-action contacts.

Note the information regarding operating travel and actuator travel.

The installation of switches must ensure their complete mechanical actuation such that the positive opening ⊕ is achieved.

Position switches with snap-action contacting are recommended in the case of a very slow actuating speed and for applications in which the contacts are to switch with almost no delay. If the snap-action contact block fails, the positive opening operation is initiated by a deflection mechanism.

Operating distances are largely standardized, and thus it is possible to compare competitors within the usual tolerances.

Recognition features for safety switches

The yellow covers on switches with separate actuation with and without tumbler, hinge switches, and AS-Interface indicate that the switch is a safety switch.

For mechanical position switches with positive opening operation ⊕, you can replace the turquoise cover with a yellow cover to enable visual recognition of the position switch as a safety switch.

Overtravel

The overtravel enables additional actuator travel of 3 mm without damaging the contact block. The overtravel provides a certain extra travel by means of an additional spring. Positive opening is assured.

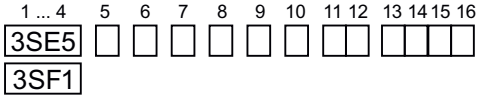
Membranes

Two kinds of integrated membranes are available for selection for all enclosure variants:

- Chlorinated rubber membrane for normal applications to protect against dust and moisture
- Silicone membrane for high operational reliability at low temperatures (down to -40 °C) and in aggressive environments

3.10.4 Article No. scheme

The article number of a position switch follows the following scheme:



Digit		Digit	
3SE5 1 ... 4	Mechanical position switch Mechanical safety switch	8	LED display
3SF1 1 ... 4	Mechanical safety switch for AS-Interface	9	Contact variants 1 contact block, except 3SE516 2 contact blocks, 3SE516 only
5	0 = Spare parts / modules 1 = Design according to EN 50041 2 = Design according to EN 50047 3 = Separate actuator with tumbler 4 = Compact design 5 = Design according to EN 50047 Compact	10	Actuator type
6	Enclosure design	11 - 12	Actuator variants
7	Device connection	13 - 16	Various variant descriptions

3.10.5 Selection of 3SE position switches

Position switches are used to detect the position of moving machine parts, doors, objects, etc. and to convert the position to electrical signals, which are then processed in control systems.

Position switches are differentiated as follows:

- Position switches **without** separate actuation
- Position switches **with** separate actuation

The position switches without separate actuation are available in four variants. They differ in their dimensions, technical data, and possible uses.

Enclosure	Enclosure width	Degree of protection
Plastic, open-type	30 mm	IP10 (3-pin) IP20 (2-pin) (conductor connected and clamping screw tightened)
Plastic	31 mm	IP65
	40 mm/50 mm	IP66/IP67
Metal	31 mm	IP66/IP67
	40 mm	
	56 mm/56 mm XL	
Compact design, metal	30 mm	IP67
	40 mm	

Note

3SE5000-0.A00 or 3SE5060-0.A00 contact blocks without enclosure have the IP00 degree of protection. 3SE5050-0.A00 contact blocks without enclosure have the IP20 degree of protection.

The position switches with separate actuation are differentiated as follows:

Enclosure	Enclosure width	Degree of protection
Position switches with separate actuator **without** tumbler		
Plastic	31 mm	IP65
	40 mm/50 mm	IP66/IP67
Metal	31 mm, 40 mm, 56 mm	IP66/IP67
Position switches with separate actuator **with** tumbler		
Plastic/metal	54 mm	IP66/IP67

The actuator is triple coded to prevent it from being manipulated easily.

Note

The dimensions and drilling dimensions of the 30 mm, 31 mm, and 50 mm-wide enclosures are according to EN 50047.

The dimensions and drilling dimensions of the 40 mm and 56 mm-wide enclosures are according to EN 50041.

3.10.6 Online configuration

3.10.6.1 Use of the online configurator

The online Configurator (http://www.siemens.com/industrial-controls/configurators) enables you to select and order the appropriate position switch as well as generate a complete set of product documentation:

- Product data sheet
- Dimension drawings
- Operating travel diagram
- CAD data in 2-D and 3-D model images
- Ordering data
- Product photo

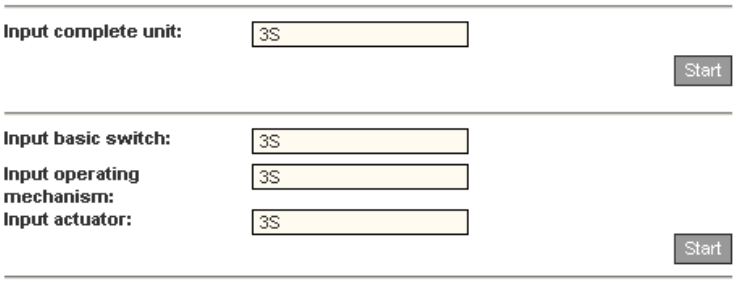
The configurator allows you to select which position switch out of the comprehensive product range best suits the requirements of each application.

3.10.6.2 Application of the online configurator

Configuration via direct entry

To configure a position switch, proceed as follows:

1. Open the overview page of Configurators (http://www.siemens.com/industrial-controls/configurators)
2. In the drop-down list box "Select a configurator", select "3SE5/3SF1 Position Switches".
3. If you already know the article number for a device and you only need a data sheet or the CAD data for this device, you can enter the article number in the corresponding fields under "Input complete unit", "Input basic switch", "Input operating mechanism", or "Input actuator".



"Input complete unit:"

Note

Direct entry

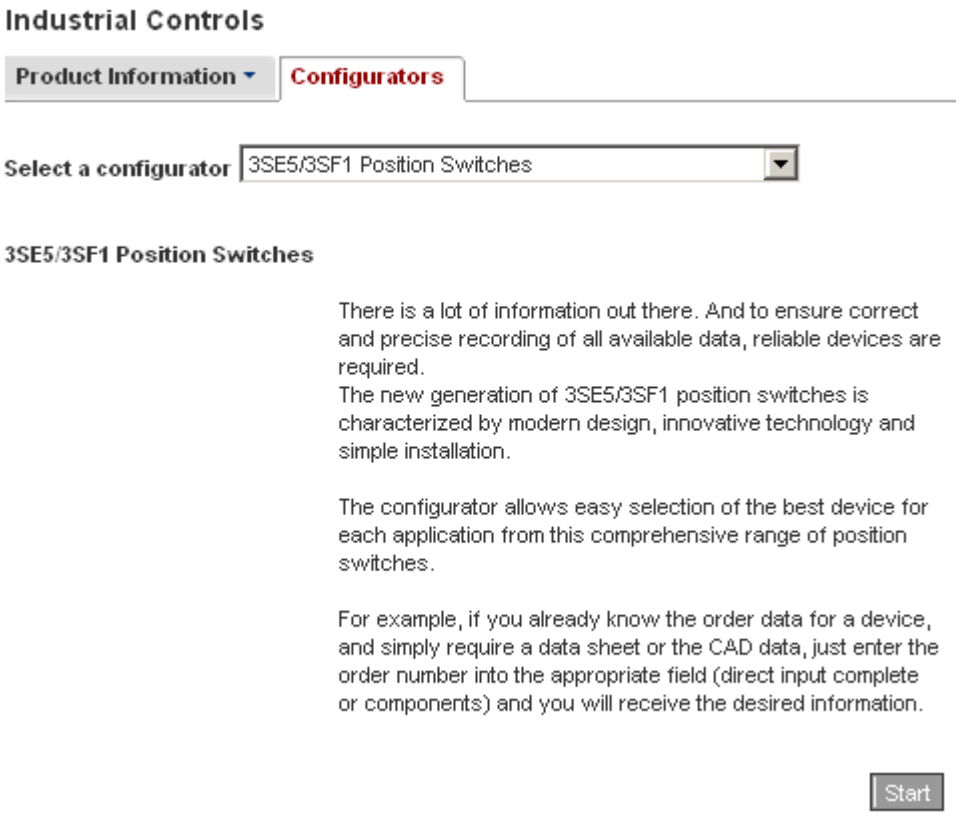
For safety switches with separate actuator with or without tumbler, you can enter **only** the basic switch directly with the article number. The actuator must be selected in the selection menu.

Configuration via selection

To configure a position switch, proceed as follows:

1. Open the overview page of Configurators (http://www.siemens.com/industrial-controls/configurators)
2. In the drop-down list box "Select a configurator", select "3SE5/3SF1 Position Switches".

3. Click "Start".



4. Select the device type (e.g. mechanical position switch) and other characteristics.
5. Select "Position Switch > Configuration of Switches".
6. Select the desired features.

7. Once you have specified all values, a CAD preview is generated.

Position Switch

Part list | Result | Documents | CAD

Print | Export as Excel

Name	Order number	Properties
Position Switch		**Device type:** Standard position switch **AS-i connection:** without AS-i **Special requirements:** Without
Configuration of Switches		**Enclosure:** Plastic 31 mm EN 50047 **Device connection:** M12 connector **Pin configuration:** M12 connector, 5-pole: PIN1= terminal21, PIN2=22, PIN3=13, PIN4=14, PIN5=ground LED **LED Display:** 24 V DC **Contacts:** Slow-action contacts 1NO/1NC **Contact material:** Silver alloy **Type of operating mechanism:** Roller plunger **Operating mechanism material:** Metal **Actuator design:** Stainless steel roller EN 50041, form C **Designs:** 2 LEDs 24 V DC, yellow + green, with M12 connector 5-pole PIN assignment: 1NC/1NO: PIN1=21,PIN2=22,PIN3=13,PIN4=14,PIN5= ground LED, LED green to 13, LED yellow to 14
Basic Switch	3SE5234-1BC05-1AF3	
Operating mechanism	3SE5000-0AD02	

8. To finish the configuration, click the "Display technical data & order" button.
9. Following configuration, you have the following options:
   - "Part list" tab - Shows a listing of your selection, which you can display and print out automatically on an Excel spreadsheet for documentation purposes.
   - "Result" tab - Shows your selection.
   - "Documents" tab - Here, you can download and print the product data sheet in PDF format.
   - "CAD" tab - Shows the CAD representation of the selection as a surface model, wire frame model, or 3-D applet and enables you to download the bitmap, dimension drawing, or 3-D model.

Ordering

After the configuration is complete, it is possible to order the switch directly in the online Catalog and Ordering System.

- Click the "Next" button to go to the ordering dialog where you can place your selection in the shopping cart.
  Here, you can also generate an Excel spreadsheet containing the ordering data and/or print the displayed list.

Note

Registration

To place an order, you must have logged into Siemens Industry Mall www.siemens.com/industrial-controls/mall (http://www.siemens.com/industrymall) beforehand.

Position switches and safety switches

4

4.1 Position switches in open-type design

The position switches in open-type design with degree of protection IP10 (3 contact blocks) or IP20 (2 contact blocks) are designed for the following:

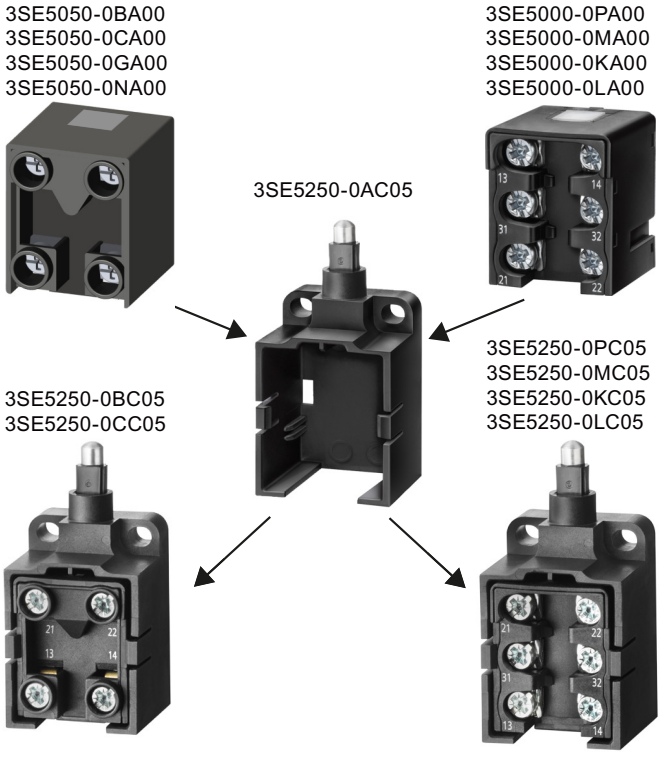
- Use as auxiliary switches in cabinets
- Larger enclosures
- Locations not influenced by dust and moisture

Their compact design makes these switches particularly suitable for use in confined conditions. The fixing dimensions and operating points are according to EN 50047. The switches are equipped with two or three contacts:

- Snap-action contact
- Slow-action contact
- Slow-action contact with make-before-break

NOTICE
Achieving degree of protection IP20 for 3SE5250-0BC05 and 3SE5250-0CC05
You will only achieve IP20 protection if you connect the conductors and tighten the clamping screws with a torque of between 0.8 and 1 Nm.

The travel is 6 mm. The empty enclosure can be equipped with any of the contact block variants.



⚠ WARNING

Risk of injury or death.

Use only the contact block with article number 3SE5050-0.A00 as a 2-pin open-type position switch.

The 2-pin contact blocks with article numbers 3SE5000-0.A00 and 3SE5060-0.A00 must not be used as open-type position switches.

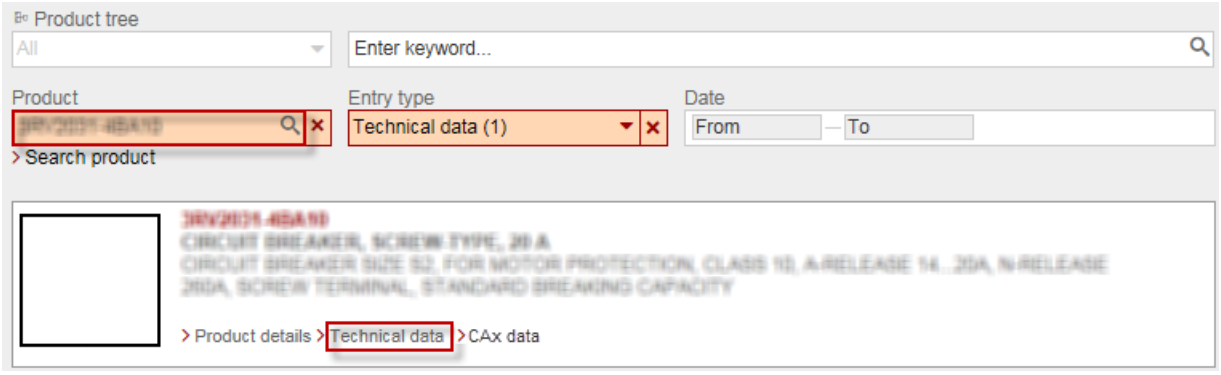
4.1.1 Technical specifications

4.1.1.1 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.

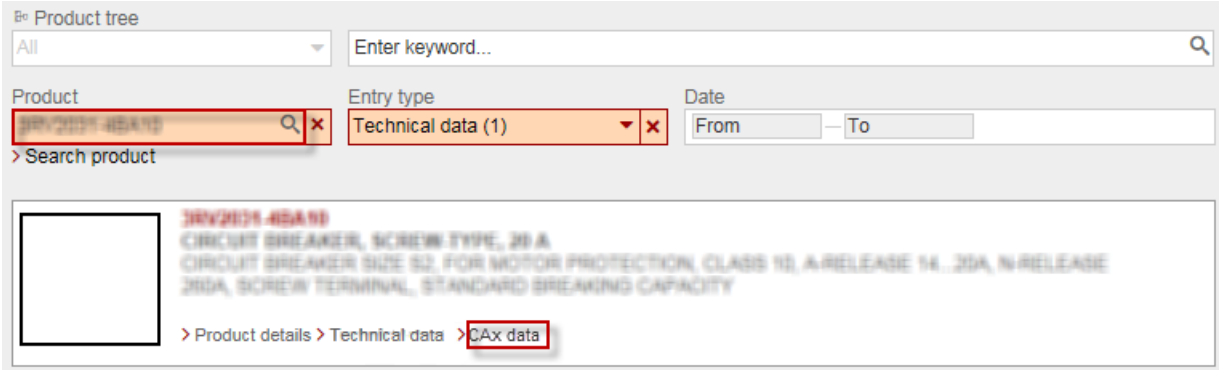


4.1.2 Dimension drawings and operating travel diagrams

4.1.2.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

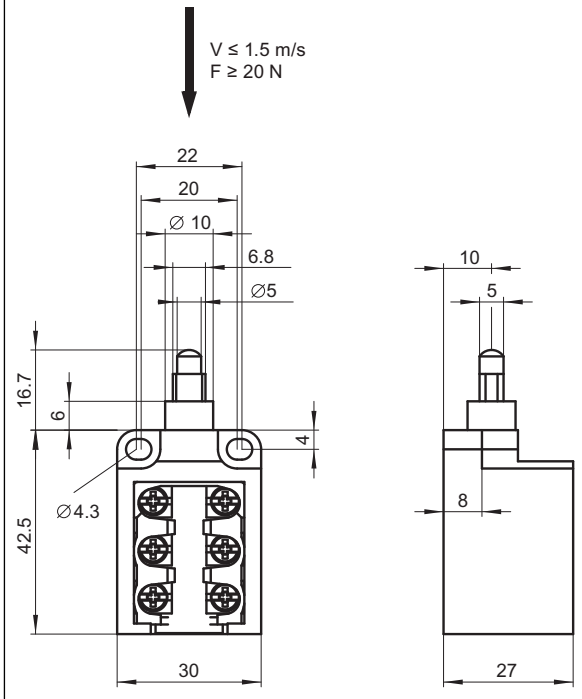
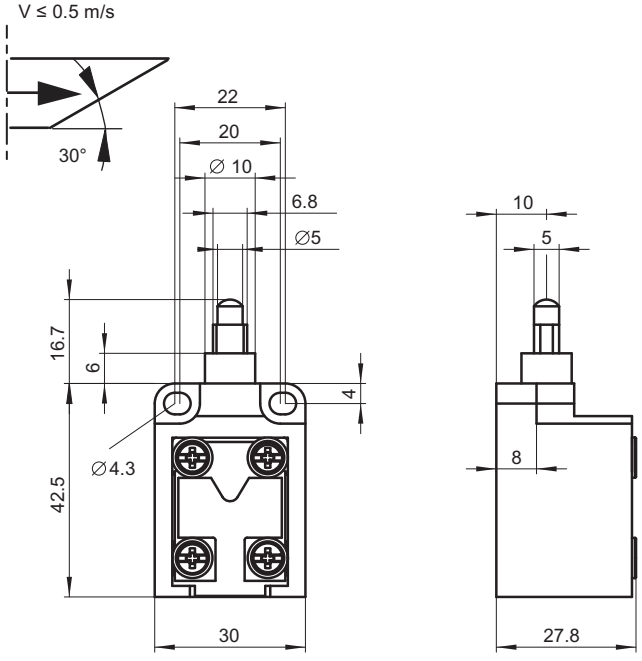
1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "CAx data link.

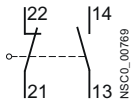
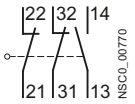
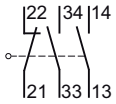
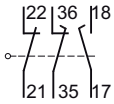
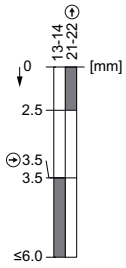
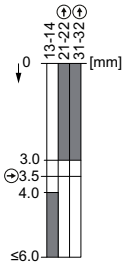
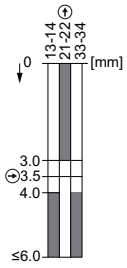
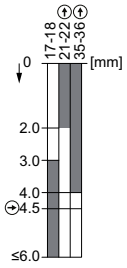


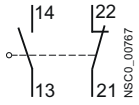
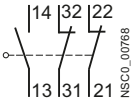
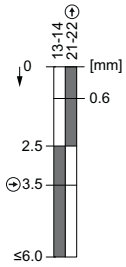
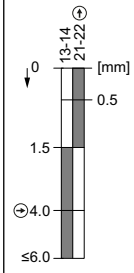
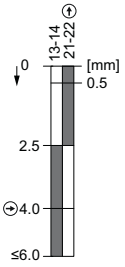
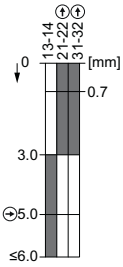
4.1.2.2 Extract from the technical specifications

Note

The information in the extract from the technical specifications is not subject to the change service. For current values, refer to Technical Data Sheet.

3SE5250-0PC05 **3SE5250-0MC05** **3SE5250-0KC05** **3SE5250-0LC05**	**3SE5250-0BC05** **3SE5250-0CC05**
	
v ≤ 1.5 m/s (maximum actuating speed) F ≥ 9 N (minimum force demand in actuation direction)	v ≤ 1.5 m/s (maximum actuating speed)

Slow-action contacts			**With make-before-break**
1 NO + 1 NC	1 NO + 2 NC	2 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 12	Code number 21	Code number 12
Actuation in travel direction			
3SE5250-0BC05	3SE5250-0KC05	3SE5250-0PC05	3SE5250-0MC05
			

Snap-action contacts			
1 NO + 1 NC			1 NO + 2 NC
			
Code number 11			Code number 12
Actuation in travel direction			
3SE5250-0CC05	3SE5250-0AC05 + 3SE5050-0NA00 [1]	3SE5250-0AC05 + 3SE5050-0GA00 [1]	3SE5250-0LC05
	 Short stroke	 Operating distance 2 x 2 mm	
[1] Empty enclosure and contact blocks must be ordered separately.			

⊕ Positive opening operation according to EN 60947-5-1
→ Direction of actuation
Contact element closed

▭	Contact element open
≤	Maximum actuator travel

4.2 Position switches in compact design

Enclosure sizes

The 3SE54 position switches in compact design are available as complete units in two enclosure sizes:

- Enclosure series 3SE5413 conforms to EU standards and has a 30 mm-wide enclosure. The fastening holes are spaced 20 mm apart.
- The enclosure series 3SE5423 conforms to requirements of the U.S. market and has a 40 mm-wide enclosure. The fastening holes are spaced 25 mm apart.

Position switches with molded cable or connector have the following advantages:

- Compact design (small enclosure sizes)
- Metal enclosure
- Simple multi-switch configuration
- Degree of protection IP67
- Large selection of actuators

Applications

- Lifting means
- Door monitoring (e.g., on trains)
- Construction machinery
- Elevators
- Mechanical equipment

Terminals

Devices are offered with

- 2 m cable (3SE54.-1EA2)
- 5 m cable (3SE54.-1EA5)
- Variants with M12 connector (3SE54.-1EB1)

Switch variants with molded cable or connector - 30 mm enclosure width

Excerpt from the catalog

3SE5413


-0CC20-1EA.


-0CC21-1EA.


-0CC22-1EA.


-0CD20-1EA.


-0CD20-1EB1
-0CD23-1EB1


-0CN20-1EA.
-0CP20-1EA2


-0CQ20-1EA2

Switch variants with molded cable or connector - 40 mm enclosure width

Excerpt from the catalog

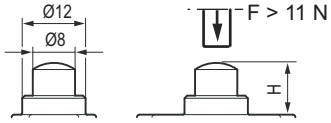
3SE5423

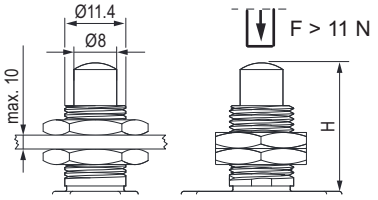

-0CC20-1EA.

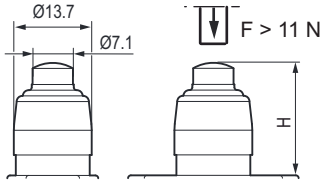

-0CD20-1EB1

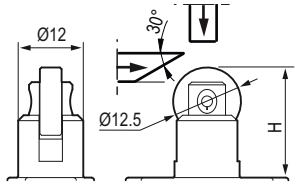

-0CD21-1EA2

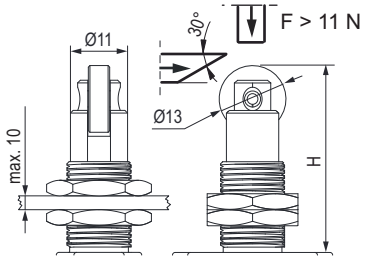
4.2.1 Actuator heads for position switches in compact design with molded cable

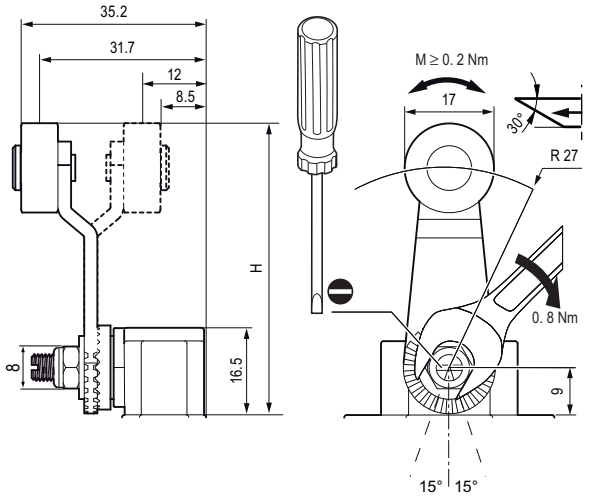
	3SE5413-0CC20-....	**3SE5423-0CC20-....**
H	9.8 mm	7.5 mm
		

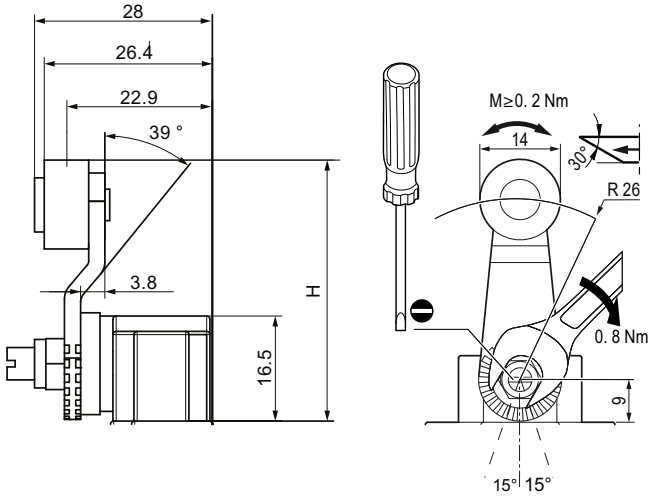
	3SE5413-0CC21-....	**3SE5423-0CC21-....**
H	24 mm	24 mm
		

	3SE5413-0CC22-....	**3SE5423-0CC22-....**
H	19.8 mm	16.7 mm
		

	3SE5413-0CD20-....	**3SE5423-0CD20-....**
	3SE5413-0CD23-....	**3SE5423-0CD23-....**
H	20.3 mm	20.3 mm
		

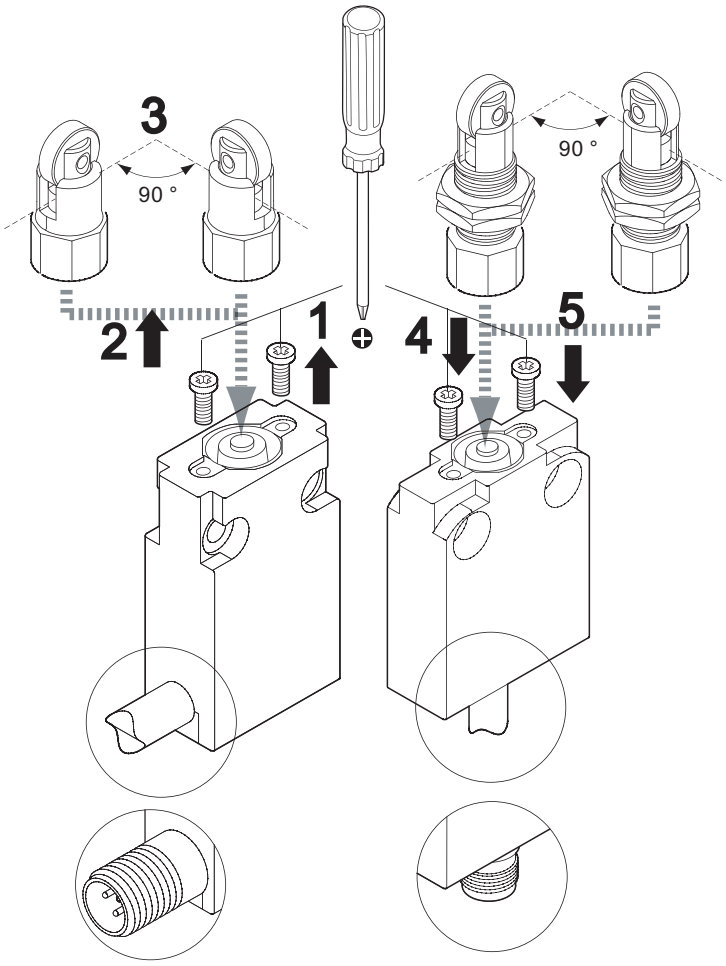
	3SE5413-0CD21-....	3SE5423-0CD21-....
H	35 mm	35 mm
		

	3SE5413-0CN20-....	3SE5423-0CN20-....
H	44 mm	44 mm
		

	3SE5413-0CP20-....
H	41 mm
	

4.2.2 Mounting the actuator head

Rotating the actuator head



1. Use a cross-tip screwdriver to remove the two fixing screws of the drive head on the upper side of the enclosure.
2. Pull the drive head up and out of the enclosure.
3. Turn the drive head by 90 degrees.
4. Insert the drive head in the enclosure.
5. Fasten the drive head with the two fixing screws.

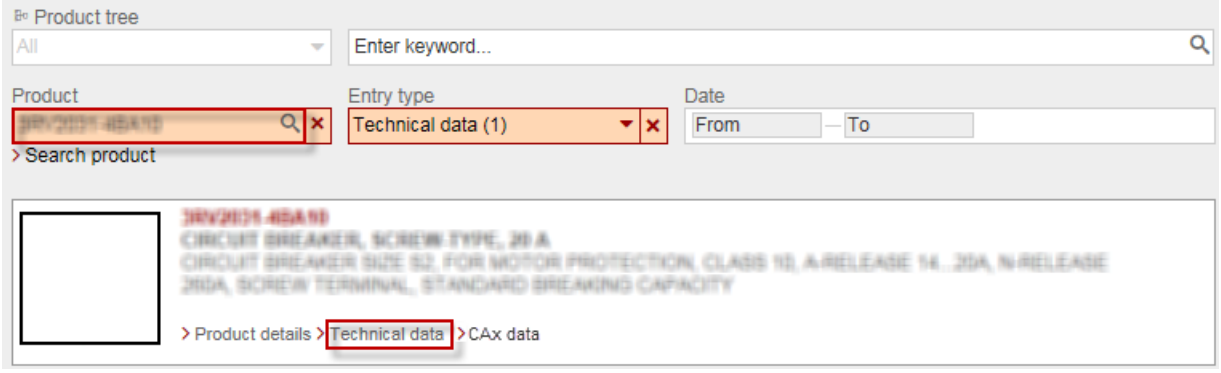
4.2.3 Technical specifications

4.2.3.1 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.

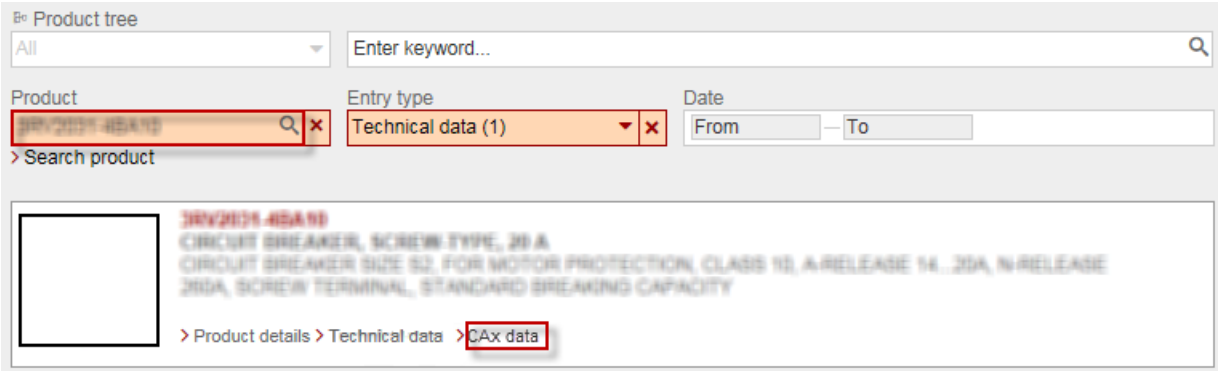


4.2.4 Dimension drawings and operating travel diagrams

4.2.4.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "CAx data link.

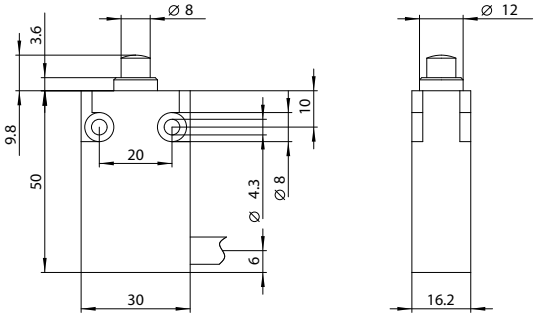


4.2.4.2 Extract from the technical specifications

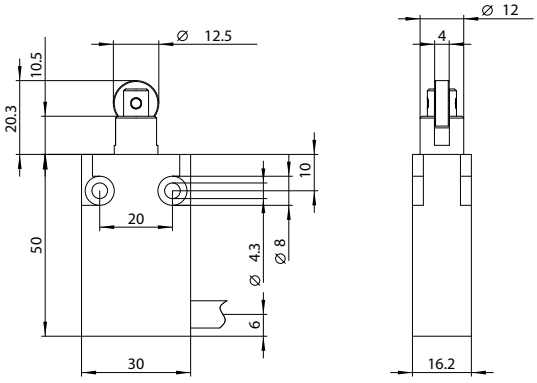
Note

The information in the extract from the technical specifications is not subject to the change service. For current values, refer to Technical Data Sheet.

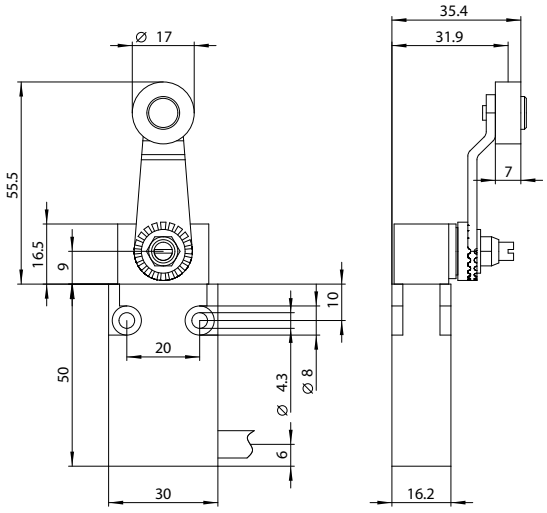
3SE5413-0CC20-1EA2



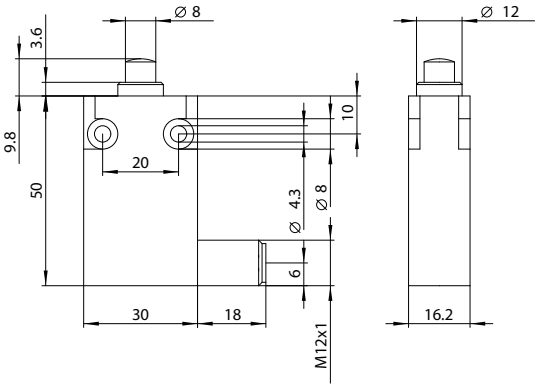
3SE5413-0CD20-1EA2



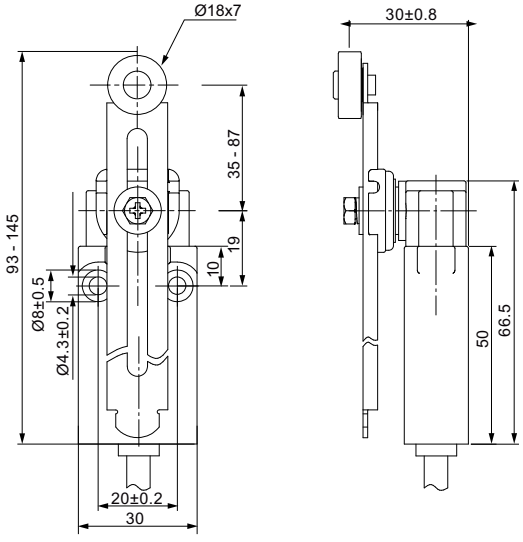
3SE5413-0CN20-1EA2



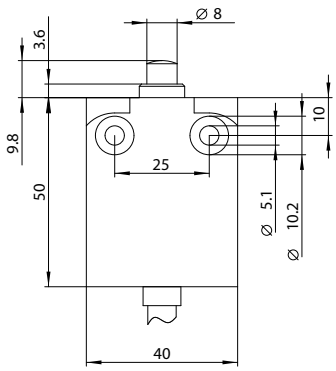
3SE5413-0CC20-1EB1



3SE5413-0CQ20-1EA2



3SE5423-0CC20-1EA2



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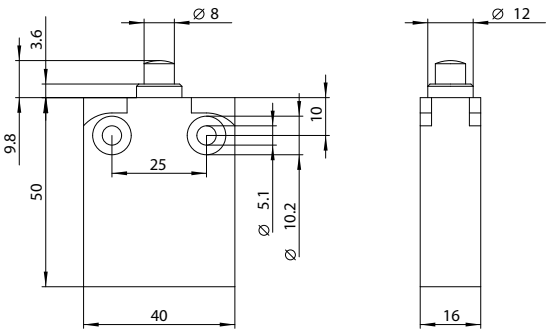
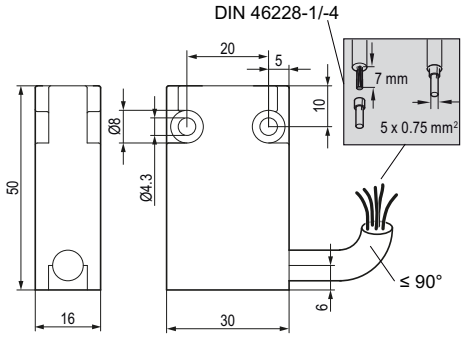


3SE5413-.....-1EA.



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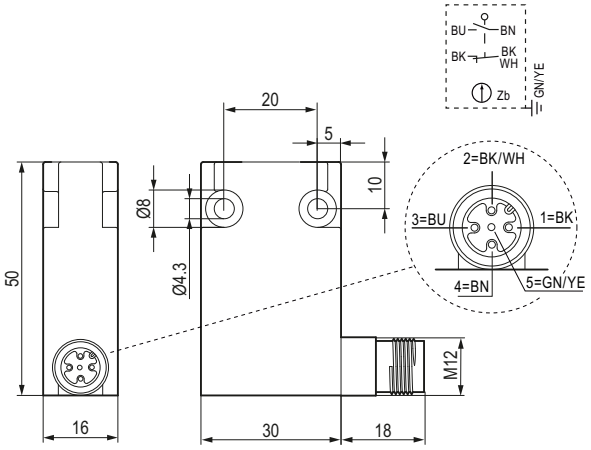
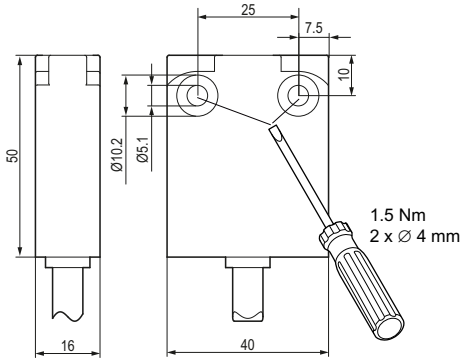


BK = black, BU = blue, BN = brown, WH = white, YE = yellow, GN = green

3SE5423-.....-1EA.



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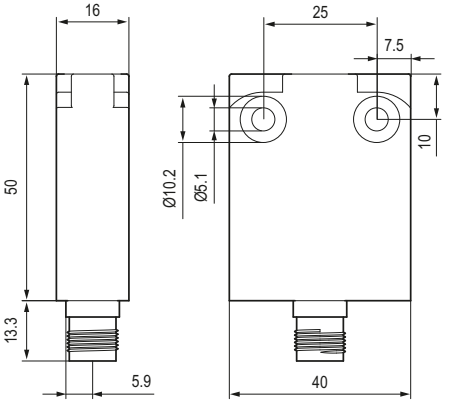
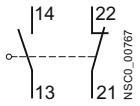
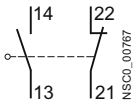
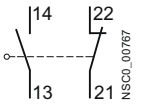
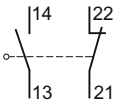
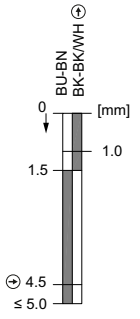
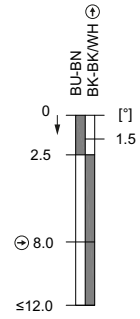
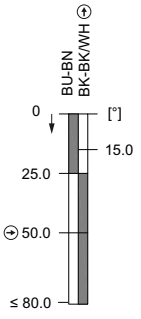
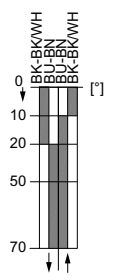


Compact design 3SE54.3-0CC2.

Snap-action contacts			
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11
Actuation in travel direction			
3SE54.3-0CC2.	3SE54.3-0CD2.	3SE54.3-0CN2.	3SE5413-0CQ20 -1EA2
			

⊕ Positive opening operation according to EN 60947-5-1
→ Direction of actuation
Contact element closed
Contact element open
≤ Maximum actuator travel

BK = black	BU = blue	BN = brown
WH = white	YE = yellow	GN = green

4.3 Mechanical position switches (modular system)

Modular system

The 3SE5 series is a modular system, consisting of the basic switch in various sizes and an actuator, which must be ordered separately. The modular switch design allows the user to choose the appropriate solution from a wide selection of options and to assemble it himself.

Figure 4-1 Examples of possible selections in the modular system

4.3.1 Plastic enclosure

The enclosure for these position switches is made of glass fiber-reinforced, flame-resistant plastic that is resistant to shock, impact, and drill oils. The cover is fastened with a captive screw. The cable entry features one M20 x 1.5 thread.

Note

In the case of position switches with integrated contact block, the bottom of the enclosure contains drill holes that enable mounting with M4 cylinder head screws.

Operating points, enclosure dimensions, and mounting dimensions for the 3SE52.. position switches, together with the respective actuators, conform to DIN EN 50047. The "Protective insulation" protective measure is achieved through the use of the plastic enclosure, thereby making connection of a protective conductor unnecessary. The enclosure is protected against ingress of dust and water jets from any direction. The contact pieces are pressed into the bottom of the enclosure (integrated) or a contact block is inserted inside an enclosure (replaceable). When the cover is open, the contact chamber is additionally covered to protect against ingress of foreign objects. The contact pieces are visible. Contact version 1 NO + 1 NC, 1 NO + 2 NC, and 2 NO + 1 NC.

The position switches are supplied with snap-action contacts, slow-action contacts, and slow-action contacts with make-before-break.

Enclosure widths 31 mm, 40 mm, and 50 mm are available.

3SE5232-.....

3SE5132-.....

3SE5242-.....

In addition, different actuator variants are available. These can be attached to the rounded plunger (basic switch), which is affixed to the position switch enclosure (basic version). All actuators can be subsequently mounted onto the position switch enclosure or replaced with other actuator variants.

4.3.2 Metal enclosure

The position switch with metal enclosure consists of the three parts: basic enclosure, contact block, and actuator. The contact blocks are inserted inside the enclosure.

All contact blocks have a black plastic enclosure that holds the fixed contact pieces and the SIGUT terminals (captive screws).

The contact blocks can be used in standard enclosures with 2 or 3 contacts.

3SE5212-.....

3SE5112-.....

3SE5122-.....

3SE5162-.....

The enclosures, together with the corresponding actuators, conform to the standard position switches according to DIN EN 50041 or DIN EN 50047. The metal enclosures are corrosion-resistant and insensitive to impact, shock, and hot swarf.

The 40 mm wide enclosures satisfy degree of protection IP66/IP67 (complete touch protection/ protection against harmful water in case of immersion). The standard enclosure is equipped with a choice of two diagonally arranged round holes or oblong holes for mounting purposes. The wide enclosure has oblong holes arranged on the left and right sides of the actuator. These enable an adjustment of the operating point during installation, if this adjustment cannot be made by means of the actuating element.

The 56 mm wide enclosure is provided with three threaded holes and the 31 mm and 40 mm wide enclosures with an M20 x 1.5 threaded hole for cable entry. The wide enclosure has more connection options because it also has a larger connection compartment.

The enclosure has a terminal for the protective conductor connection.

4.3.3 Complete units

Frequently requested position switch variants in standard enclosures are offered as complete units.

Note

Variants for -40 °C

Variants for operating temperatures down to -40 °C can be ordered with the qualifier -1AJ. (shock and vibration test according to railway standard EN 61373) or -1AY. (without rail standard). These switches are characterized by their use of special sealing materials as well as low-temperature greases.

Note

Variants with device plug

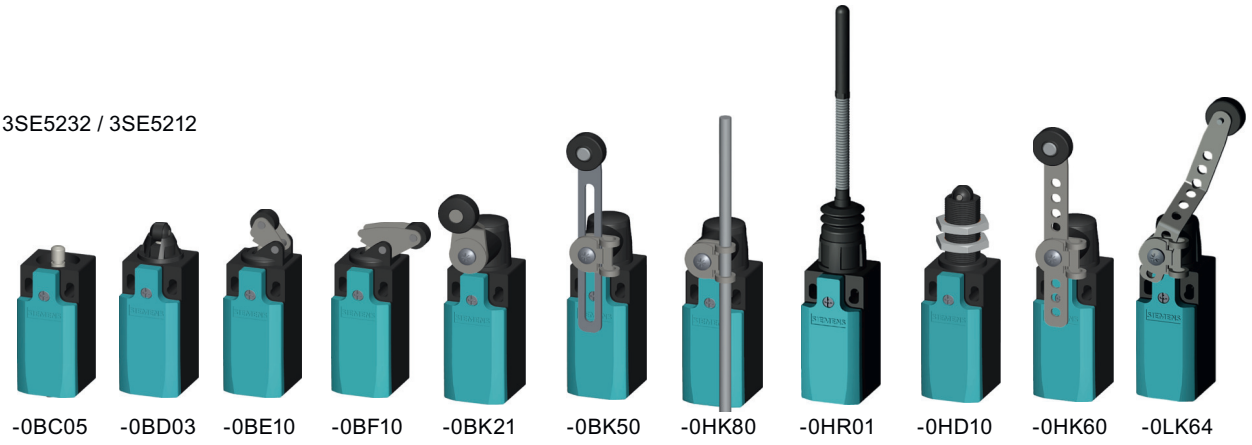
Variants with a fitted M12, 4-pole, 5-pole or 8-pole plug can be ordered under the article number 3SE5..4-....-1A... (e.g. 3SE5114-0CA00-1AC5). For the wide enclosures, plugs are available as accessories for user assembly.

Metal enclosures with 6-pole + PE device plugs can be ordered under the article number 3SE5..5-....-1A... (e.g. 3SE5114-0CA00-1AD0).

Enclosure width 31 mm - plastic/metal

Excerpt from the catalog

3SE5232 / 3SE5212



-0BC05 -0BD03 -0BE10 -0BF10 -0BK21 -0BK50 -0HK80 -0HR01 -0HD10 -0HK60 -0LK64

Enclosure width 40 mm - plastic/metal

Excerpt from the catalog

3SE5132 / 3SE5112

-0BB01 -0BC02 -0BD02 -0BE01 -0BF01 -0BH01 -0BH50 -0CH80 -0CR01 -0CJ60

Enclosure width 50 mm - plastic

Excerpt from the catalog

3SE5242

-0BC05 -0BD03 -0BE10 -0BF10 -0BK21 -0BK50 -0HK60 -0HK80 -0HR01 -0HD10

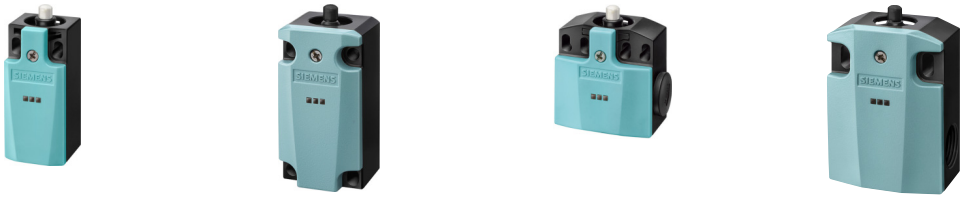
Enclosure width 56 mm - metal

Excerpt from the catalog

XL enclosure 56 mm - metal

Excerpt from the catalog

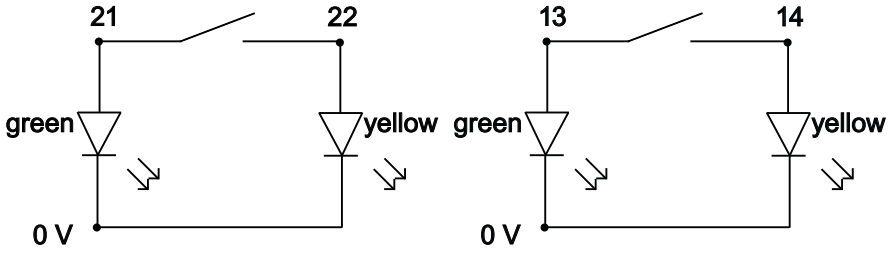
4.3.4 Optional LED displays



All enclosure variants (except XL enclosure) can be supplied with an LED display.

LED connection

Operating diagram 24 V DC
230 V AC



Slow action Snap-action

LED display

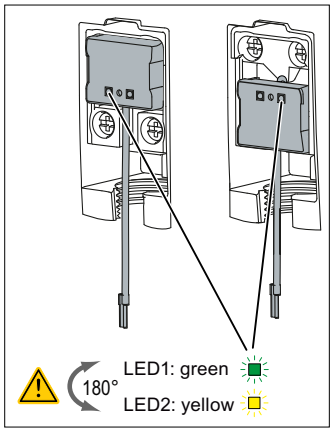
2 LEDs on the front panel indicate the switch position of the protective device.

LED status	No voltage	Voltage applied	Contact closed
	□		
	LED off	LED lit green	LED lit yellow

Note

Modified LED function in case of rotation of LED module

Note that if the LEDs are rotated 180°, their function is modified. Safety contacts (NC) must not be queried by means of LEDs. The free cable (mass / ground) must be connected.



Green LED NO contact closed, NC contact open
Yellow LED NO contact open, NC contact closed

Figure 4-2 LED element rotated 180°

4.3.5 Enclosure

Enclosure cover

- The standard color of the enclosure covers with and without LED display is turquoise.
- These can be replaced with yellow covers with and without LED displays, which are available for all enclosure sizes (except XL enclosure).

- All LED enclosure covers are available for both plastic and metal enclosures.

Enclosure sizes

The 3SE5 switches are available for delivery in eight different enclosure sizes:

- Position switches in open-type design, IP20 or IP10
- Position switches in compact design
- Plastic enclosure/metal enclosure according to EN 50047, 31 mm wide, 1 cable entry, IP65/IP66/IP67
- Plastic enclosure, 50 mm wide, 2 cable entries, IP66/IP67
- Plastic enclosure/metal enclosure according to EN 50041, 40 mm wide, 1 cable entry, IP66/IP67
- Metal enclosure, 56 mm wide and XL enclosure, 3 cable entries, IP66/IP67

Enclosure versions

With the enclosures, you can choose a basic switch from a wide range of options:

- With integrated contact block for 31 mm plastic switches, or with replaceable contact blocks including two or three contacts, available as slow-action contacts, snap-action contacts, and slow-action contacts with make-before-break
- With optional LED display
- With assembled M12 plug connector, 4-pin, 5-pin, or 8-pin (available as an accessory for self-assembly)
- With assembled plug connector 6-pin + PE for metal enclosures (available as an accessory for self-assembly)
- With increased anti-corrosion protection

- Variants for operating temperatures down to -40 °C can be ordered with the qualifier -1AJ. (shock and vibration test according to rail standard EN 61373) or -1AY. (without rail standard). These switches are characterized by their use of special sealing materials as well as low-temperature greases.
- AS-Interface version with integrated ASIsafe electronics for the modular enclosure types (see Chapter 3SF1 mechanical safety switches for AS-Interface (Page 177))

Actuator variants

The following actuator variants are available for delivery:

- Plain plunger
- Rounded plunger
- Roller plunger
- Roller lever
- Angular roller lever
- Spring rod
- Twist lever
- Adjustable-length twist lever with or without pre-drilled holes
- Rod lever
- Fork lever

The actuator rollers are available in different materials and, in the case of twist levers, in different diameters.

4.3.6 Actuators and their actuation

There are currently 10 different actuator solutions available to satisfy a wide range of approach requirements.

These are distinguished by the following:

- The permissible type and direction of approach
- The actuating speed
- The actuating element design
- The favorable material pairing

All position switches operate independently of their position.

The same values apply with respect to the service life and switching frequency as for the contact block. All actuators are available for all enclosure sizes (3SE51, 3SE52). If the case of lateral actuation, the approach angle and trailing angle of the actuating element must be the same. The position switch must not be used as a mechanical endstop of a moving machine part under any circumstances. The actuators with central fixing M18 x 1 enable fast assembly and simple adjustment.

Possible uses

All actuators can be used for safety switches.

Exceptions:

- Spring rod
- Rod lever
- Adjustable-length twist lever with oblong hole without latching

The following actuator types are available:

- Plastic actuators for enclosure widths 31 mm and 50 mm according to EN 50047/40 mm according to EN 50041.
- Metal actuators for enclosure widths 40 mm and 56 mm according to EN 50041.
- All actuator heads can be rotated in 22.5 ° increments.

The actuator types have the same functionality, but different applications (see Application examples (Page 241))

4.3.6.1 Plain plunger/rounded plunger

3SE5000-0AB01
Plain plunger

3SE5000-0AC02
Rounded plunger

3SE5000-	0AB01	0AC02	0AC02-1AJ0	0AC03	0AC03-1AJ0
For position switch	3SE51/52	3SE51/52	3SE51	3SE5132	3SE5132
According to standard	EN 50041	EN 50041	EN 50041	EN 50041	EN 50041
Actuator head	Plastic	Metal	Metal	Plastic	Plastic
Stainless steel plunger	✓	✓	✓	—	—
Plastic plunger	—	—	—	✓	✓
Approach direction	In travel direction	In travel direction	In travel direction	In travel direction	In travel direction
Approach velocity v_{max}	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s
Overtravel	—	3 mm	3 mm	—	—
Special features	—	—	Functional at -40 °C	—	Functional at -40 °C

Note

Some rounded plungers have a 3 mm overtravel and thus a longer actuator travel than other actuators.

Actuation in the travel direction has a positive effect on the service life because neither lateral forces nor additional friction occurs in this case.

4.3.6.2 Roller plunger

3SE5000-0AD02

3SE5000-0AD03 / 3SE5000-0AD04

3SE5000-	0AD02	0AD03	0AD04	0AD05	0AD06
For position switch	3SE51/52	3SE51/52	3SE51/52	3SE5132	3SE5132
According to standard	EN 50041	EN 50047	EN 50047	EN 50041	EN 50041
Actuator head	Metal	Plastic	Plastic	Plastic	Plastic
Stainless steel roller	✓	—	✓	—	✓
Plastic roller	—	✓	—	✓	—
Roller ∅	13 mm	10 mm	10 mm	13 mm	13 mm
Approach direction with switching bar	Perpendicular to the travel axis	Perpendicular to the travel axis	Perpendicular to the travel axis	Perpendicular to the travel axis	Perpendicular to the travel axis
Approach velocity v_{max}	1 m/s	1 m/s	1 m/s	1 m/s	1 m/s
Overtravel	3 mm	—	—	—	—
Special features				Functional at -40 °C (0AD05-1AJ0 only)	

The roller plunger is recommended in the case of lateral actuation and a relatively long overtravel distance.

Note

Some roller plungers have a 3 mm overtravel and thus a longer actuator travel than other actuators.

4.3.6.3 Roller plunger for central fixing

3SE5000-0AD10 / 3SE5000-0AD11

- Rapid installation
- Easy adjustment

3SE5000-	**0AD10**	**0AD11**
For position switch	3SE51/52	3SE51/52
According to standard	EN 50047	EN 50047
Actuator head	Plastic	Plastic
Stainless steel roller	—	✓
Plastic roller	✓	—
Roller ⌀	10 mm	10 mm
Approach direction	Perpendicular to the travel axis	Perpendicular to the travel axis
Approach velocity v_{max}	1 m/s	1 m/s
Special features	• With thread M18 x 1 • Minimum actuation force in actuation direction 18 N	

4.3.6.4 Roller lever

3SE5000-0AE1.

3SE5000-0AE0.

3SE5000-	0AE10 / 0AE01	0AE11 / 0AE02	0AE12 / 0AE03	0AE13 / 0AE04	0AE05
For position switch	3SE51/52	3SE51/52	3SE51/52	3SE51/52	3SE5132
According to standard	EN 50047 / EN 50041	EN 50047 / EN 50041	EN 50047 / EN 50041	EN 50047 / EN 50041	EN 50041
Actuator head	Plastic/metal				Plastic
Stainless steel lever	—	—	✓	✓	—
Metal lever	✓	✓	—	—	✓
Stainless steel roller	—	✓	—	✓	—
Plastic roller	✓	—	✓	—	✓
Roller ∅	13 mm / 22 mm	13 mm / 22 mm	13 mm / 22 mm	13 mm / 22 mm	22 mm
Approach direction only from	Right	Right	Right	Right	Right
Approach velocity v_{max}	1 m/s	2.5 m/s	1 m/s	2.5 m/s	1 m/s

Because the actuator is equipped with a plastic or stainless steel roller, it is especially well-suited for actuating elements made of finely-ground steel in the form of cams, bars, or cam discs without additional lubrication.

The roller levers are distinguished by a very long mechanical service life.

4.3.6.5 Angular roller lever

3SE5000-0AF1.

3SE5000-0AF0.

3SE5000-	0AF01 / 0AF10	0AF02 / 0AF11	0AF03 / 0AF12	0AF04 / 0AF13	0AF05
For position switch	3SE51/52	3SE51/52	3SE51/52	3SE51/52	3SE5132
According to standard	EN 50047 / EN 50041	EN 50047 / EN 50041	EN 50047 / EN 50041	EN 50047 / EN 50041	EN 50041
Actuator head	Plastic/metal				Plastic
Metal lever	✓	✓	—	—	✓
Stainless steel lever	—	—	✓	✓	—
Plastic roller	✓	—	✓	—	✓
Stainless steel roller	—	✓	—	✓	—
Roller ∅	22 mm / 13 mm	22 mm / 13 mm	22 mm / 13 mm	22 mm / 13 mm	22 mm
Approach direction only from	Below	Below	Below	Below	Below
Approach velocity v_{max}	1 m/s	2.5 m/s	1 m/s	2.5 m/s	1 m/s

Because the actuator is equipped with a plastic or stainless steel roller, it is especially well-suited for actuating elements made of finely-ground steel in the form of cams, bars, or cam discs without additional lubrication.

The angular roller levers are distinguished by a very long mechanical service life.

4.3.6.6 Spring rod

3SE5000-0AR01

⚠ WARNING

Risk of injury or death.

Spring rod actuators must not be used for safety circuits.

Note

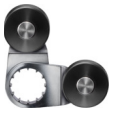
The spring rod is only suitable for switches with snap-action contacts.

3SE5000-	0AR01	0AR02	0AR03	0AR04
For position switch	3SE51/52	3SE51/52	3SE51/52	3SE51/52
According to standard	—	—	—	—
Actuator head	Plastic	Plastic	Plastic	Plastic
Stainless steel plunger	—	✓	—	—
Plastic plunger	✓	—	✓	✓
Plunger length	50 mm	50 mm	10 mm	50 mm
Spring length	50 mm	50 mm	23.5 mm	150 mm
Total length	142.5 mm	142.5 mm	76 mm	242.5 mm
Approach direction	From all directions	From all directions	From all directions	From all directions
Approach velocity v_{max}	1 m/s	1 m/s	1 m/s	1 m/s
Special features	• Only suitable for switches with snap-action contacts • No positive opening operation			

The spring rod is suitable for applications in which the direction of actuation changes constantly.

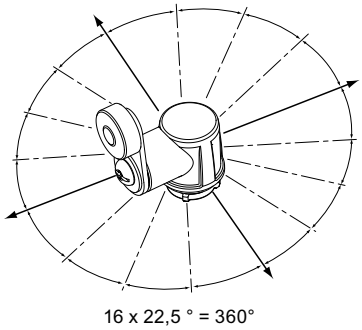
4.3.6.7 Part-turn actuators with lever

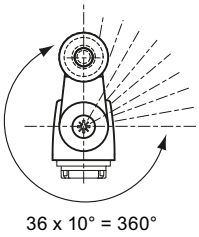
Because they are available in many different variations, position switches with twist lever and rod lever are all-purpose switches. They are less sensitive to environmental influences than other actuators (for example, oils run past on the side). The arrangement of actuator and shaft seal make twist levers and rod levers especially insensitive to heavy exposure to dirt, grinding dust, or coarse-grained material.

Actuator heads	3SE5000-0AK00 3SE5000-0AH00			
+	+	+	+	+
	 (No positive opening operation)		 (No positive opening operation)	
3SE5000-0AA0./1./2./3.	3SE5000-0AA5.	3SE5000-0AA6.	3SE5000-0AA8.	3SE5000-0AT0.
Twist lever	Twist lever, adjustable-length	Twist lever, adjustable-length, with pre-drilled holes	Rod lever	Fork lever

All actuators can be subsequently mounted onto the position switch enclosure or replaced with other actuator variants. In addition, they can be offset in 16x 22.5 ° increments.

The part-turn actuators offer right, left, or right/left direction of operation by default and can be offset from 10° to 10° on the actuator shaft.





Note

Conversion of actuator head possible.

The actuator head can be converted to right-operating and/or left-operating (see Changing the actuator head (Page 96)).

Special features:

- Different materials of
  - Metal
  - Plastic
  - Stainless steel (important for anti-corrosion protection)
- Different rollers made of
  - Plastic
  - Metal
  - Stainless steel
  - Rubber
- Different roller diameters
- Rollers with ball bearing
- Various lever lengths
- High approach velocity (v = 1.5 m/s)
- Many possible approaches
- Insensitive to
  - Oil
  - Grinding dust
  - Dirt
  - Coarse-grained material
- 10 ° offset of part-turn actuators possible

4.3.6.8 Twist lever

3SE5000-0AA2./3. - Straight lever

3SE5000-0AA0./1. - Offset lever

3SE5000-	0AA01 / 0AA15 / 0AA24	0AA21	0AA03 / 0AA23	0AA05 / 0AA25	0AA07	0AA24 / 0AA26
For position switch	3SE51 / 3SE51 / 3SE51/52	3SE52	3SE51 / 3SE52	3SE51 / 3SE52	3SE51	3SE51/52
According to standard	EN 50041	EN 50047	EN 50041 / EN 50047	EN 50041 / EN 50047	EN 50041	EN 50041
Metal lever	✓	✓	✓	✓	✓	✓
Stainless steel lever	—	—	—	—	—	—
Lever length	27 mm / 35 mm / 30 mm	21 mm	27 mm / 21 mm	27 mm / 21 mm	27 mm	30 mm
Plastic roller	✓	✓	—	✓	✓	✓
Stainless steel roller	—	—	—	—	—	—
Ball bearing roller	—	—	✓	—	—	—
Rubber roller	—	—	—	—	—	—
Roller ∅	19 mm	19 mm	19 mm	30 mm	50 mm	19 mm/ 30 mm
Approach direction	From left and right					
Approach velocity v_{max}	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s
Special features	3SE5000-0AA01 -1AJ0 functional at -40 °C	3SE5000-0AA21-1AJ0 functional at -40 °C	—	—	3SE5000-0AA 31-1AJ0 functional at -40 °C	Roller can be mounted inversely (180°)

3SE5000-	0AA08	0AA02 / 0AA22	0AA11	0AA12 / 0AA31 / 0AA32	0AA04
For position switch	3SE51	3SE51 / 3SE52	3SE51	3SE51 / 3SE52 / 3SE52	3SE51
According to standard	EN 50041	EN 50041 / EN 50047	EN 50041	EN 50041 / EN 50047 / EN 50047	EN 50041
Metal lever	✓	✓	—	—	✓
Stainless steel lever	—	—	✓	✓	—
Lever length	27 mm	27 mm / 21 mm	27 mm	27 mm / 21 mm / 21 mm	27 mm
Plastic roller	—	—	✓	—	2x
Stainless steel roller	—	✓	—	✓	—

3SE5000-	**0AA08**	**0AA02 / 0AA22**	**0AA11**	**0AA12 / 0AA31 / 0AA32**	**0AA04**
Ball bearing roller	—	—	—	—	—
Rubber roller	✓	—	—	—	—
Roller ∅	50 mm	19 mm	19 mm	19 mm	19 mm
Approach direction	From left and right				
Approach velocity v_{max}	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s
Special features	—	—	3SE5000-0AA11-1 AJ0 functional at -40 °C	—	—

Twist lever (maximum approach angle = maximum trailing angle)

4.3.6.9 Adjustable-length twist lever with oblong hole

Because they are available in many different variations, position switches with adjustable-length twist levers are all-purpose switches. They are less sensitive to environmental influences than other actuators (for example, oils run past on the side). The arrangement of actuator and shaft seal make twist levers especially insensitive to heavy exposure to dirt, grinding dust, or coarse-grained material.

3SE5000-0AA5.

3SE5000-	0AA50	0AA51	0AA52	0AA53	0AA55	0AA56	0AA57	0AA58
For position switch	3SE51/52							
According to standard	EN 50047 / EN 50041							
Stainless steel lever	—	—	✓	✓	—	—	—	—
Metal lever	✓	✓	—	—	✓	✓	✓	✓
Lever length	100 mm	100 mm	100 mm	100 mm	100 mm	146 mm	100 mm	100 mm
Stainless steel roller	—	✓	—	✓	—	—	—	—
Plastic roller	✓	—	✓	—	✓	✓	✓	—
Rubber roller	—	—	—	—	—	—	—	✓
Roller ∅	19 mm	19 mm	19 mm	19 mm	30 mm	22 mm	50 mm	50 mm
Approach direction from	left and right							
Approach velocity v_{max}	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s
Special features	—	—	With stainless steel clamp	With stainless steel clamp	—	—	—	—

⚠ CAUTION

Switch function can be impaired.

The actuators with adjustable-length twist lever without pre-drilled holes are not suitable for safety circuits.

The adjustable-length twist lever is intended for cases where an actuating element with approach angle and trailing angle is not possible for technological reasons (e.g., packages, bottles, etc.).

4.3.6.10 Adjustable-length twist lever with pre-drilled holes

Because they are available in many different variations, position switches with adjustable-length twist levers are all-purpose switches. They are less sensitive to environmental influences than other actuators (for example, oils run past on the side). The arrangement of actuator and shaft seal make twist levers especially insensitive to heavy exposure to dirt, grinding dust, or coarse-grained material.

3SE5000-0AA6.

3SE5000-	**0AA60**	**0AA61**	**0AA62 / 0AA64**	**0AA63**	**0AA67**	**0AA68**
For position switch	3SE51/52	3SE51/52	3SE51/52	3SE51/52	3SE51/52	3SE51/52
According to standard	EN 50047 / EN 50041					
Stainless steel lever	—	—	✓	✓	—	—
Metal lever	✓	✓	—	—	✓	✓
Lever length	100 mm	100 mm	100 mm	100 mm	100 mm	100 mm
Stainless steel roller	—	✓	—	✓	—	—
Plastic roller	✓	—	✓	—	✓	—
Rubber roller	—	—	—	—	—	✓
Roller ∅	19 mm	19 mm	19 mm	19 mm	50 mm	50 mm
Approach direction from	left and right					
Approach velocity v_{max}	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s
Special features	3SE5000-0AA60-1AJ0 functional at -40 °C	—	3SE5000-0AA62-1AJ0 functional at -40 °C	With stainless steel clamp	—	—
	—	—	3SE5000-0AA62 with stainless steel clamp	—	—	—

The adjustable-length twist lever is intended for cases where an actuating element with approach angle and trailing angle is not possible for technological reasons (e.g., packages, bottles, etc.).

4.3.6.11 Rod lever

Because they are available in many different variations, position switches with rod levers are all-purpose switches. They are less sensitive to environmental influences than other actuators (for example, oils run past on the side). The arrangement of actuator and shaft seal make rod levers especially insensitive to heavy exposure to dirt, grinding dust, or coarse-grained material.

3SE5000-0AA80

3SE5000-0AA81

3SE5000-0AA82

3SE5000-	**0AA80**	**0AA81**	**0AA82**	**0AA83**
For position switch	3SE51 / 3SE52	3SE51 / 3SE52	3SE51 / 3SE52	3SE51 / 3SE52
According to standard	EN 50041 / EN 50047	EN 50041 / EN 50047	EN 50041 / EN 50047	EN 50041 / EN 50047
Aluminum rod	✓	—	—	—
Plastic rod	—	—	✓	✓
Spring rod	—	✓	—	—
Length	200 mm	200 mm	200 mm	330 mm
Rod ∅	6 mm	6 mm	6 mm	6 mm
Approach direction from	left and right	left and right	left and right	left and right
Approach velocity v_{max}	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s
Special features	With clamp	With clamp	With clamp	With clamp

CAUTION

Switch function can be impaired.

The actuator with rod lever is not suitable for safety circuits.

The rod lever is intended for cases where an actuating element with approach angle and trailing angle is not possible for technological reasons (e.g., packages, bottles, etc.).

4.3.6.12 Fork lever

3SE5000-0AT0.

3SE5000-	0AT01	0AT02	0AT03	0AT04
For position switch	3SE51	3SE51	3SE51	3SE51
For actuator head	3SE5000-0AT10	3SE5000-0AT10	3SE5000-0AT10	3SE5000-0AT10
According to standard	EN 50041	EN 50041	EN 50041	EN 50041
2 x metal lever	✓	✓	—	—
2 x stainless steel lever	—	—	✓	✓
Plastic roller	✓	—	—	✓
Stainless steel roller	—	✓	✓	—
Roller ∅	19 mm	19 mm	19 mm	19 mm
Approach direction from	left and right			
Approach velocity v_{max}	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s
Special features	• Can be operated in two directions • Latching actuator • For reciprocating movements			

Note

The fork lever latches after actuation and must be reset.

4.3.7 Combinations

Any enclosure can be combined with any available actuator.

The following contact blocks can be interchanged:

	2-pin	**3-pin**	**3-pin with make-before-break**
• With snap-action function	1 NO + 1 NC	1 NO + 2 NC	—
• With slow-action function	1 NO + 1 NC	1 NO + 2 NC 2 NO + 1 NC	—
• With slow-action function with make-before-break	—	—	1 NO + 2 NC

Contact blocks

- Slow-action contacts (1 NO + 1 NC), (1 NO + 2 NC), (2 NO + 1 NC)
- Slow-action contacts with make-before-break
- Snap-action contacts (1 NO + 1 NC), + (1 NO + 2 NC)
  - 2 x 2 mm operating distance (1 NO + 1 NC)
  - Short stroke (1 NO + 1 NC)
    The short-stroke element (1 NO + 1 NC) improves the switching accuracy through a reduced actuator travel.
  - Hard-gold-plated contacts (used for applications with low currents, low switching frequency, corrosive vapors)

Covers

The covers can be replaced.

Cover colors

The standard cover color is turquoise.

Yellow covers are also available in order to make the safety switch stand out visually.

Plastic enclosures can only be used with plastic covers and metal enclosures only with metal covers.

4.3.8 Connection

4.3.8.1 Contact blocks

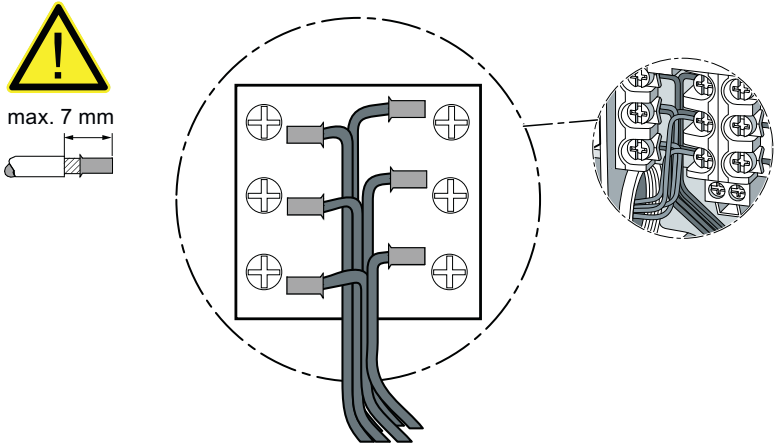
Replaceable 2-pin and 3-pin contact blocks for all enclosure sizes.

The 3-pin contact block (1 normally open contact + 2 normally closed contacts or 2 normally open contacts + 1 normally closed contact) in three contact versions (snap-action, slow-action, and slow-action with make-before-break) is available for all enclosure types. It offers additional safety through redundant switch-off (2 normally closed contacts) with simultaneous signaling (1 normally open contact). It requires the same installation space as the 2-pin contact block.

Connection with stranded and finely stranded cable

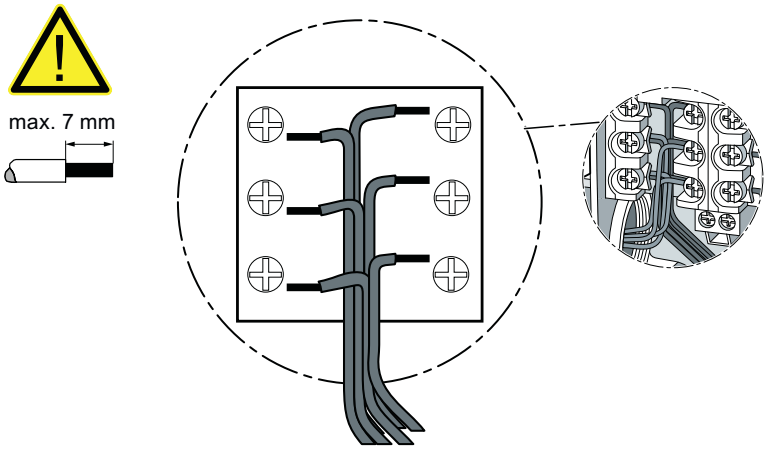
⚠ CAUTION
There is a risk of injury if no end sleeve is used. For stranded and finely stranded cables, use end sleeves to prevent splicing open of connecting wires when inserting them in terminals. Pay attention to the notes on ferrules in DIN 46 228, Part 1.

NOTICE
Incorrect wire stripping causes a risk of short-circuits. The stripped length must not exceed 7 mm.



Connection with solid cable

NOTICE
Incorrect wire stripping causes a risk of short-circuits.
The stripped length must not exceed 7 mm when connecting with solid cable.



4.3.8.2 Quick-connect system

The quick-connect system is used with the 31 mm-wide plastic enclosure.

These position switches have an option for easy and fast wiring. The connecting cable is first connected to the contact block terminals and then routed through a slot in the cable gland opening.

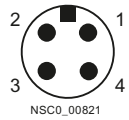
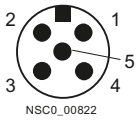
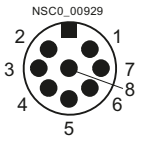
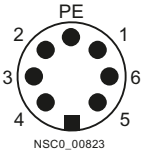
4.3.8.3 Plug connection

There are various connectors for the device connection:

- Connector M12, 4-pin, plastic
- Connector M12, 5-pin, plastic, with or without protective conductor
- Connector, 6-pin + PE, plastic
- Connector M12, 8-pin, plastic

Some of these are available as complete switch variants and some as accessories (Page 124).

4.3.8.4 Device connector: pin assignment

Plug connector M12, 4-pin	**Plug connector M12, 5-pin**
3SY3127	3SY3128 (protective conductor to Pin 5) 3SX5100-1SS51 (protective conductor to Pin 3) 3SX5100-1SS05 (without protective conductor)
	
Plug connector M12, 8-pin	**Plug connector, 6-pin + PE** DIN 43651 standard (EN 175201-804)
3SX5100-1SS08	3SY3131
	

3SE5..4-.....-	**1AC4**	**1AC5**	**1AE0**	**1AE1**	**1AE2 / 1AE3**	**1AF3**	**1AF3**	**1AD4**
Plug connector M12, 4-, 5-, or 8-pin	3SY3127	3SY3128	3SY3127	3SY3128	3SX5100-1SS51	3SY3128 (snap action)	3SY3128 (slow action)	3SX5100-1SS08 (snap action)
Contacts	1 NO + 1 NC	1 NO + 1 NC	2 NC	2 NC	2 NC	1 NO + 1 NC	1 NO + 1 NC	1 NO + 2 NC
LED	—	—	—	—	—	2 LED	2 LED	2 LED
Pin 1	21	21	21	21	21	21	21	21
Pin 2	22	22	22	22	31	22	22	22
Pin 3	13	13	31	31	— / PE	13 / LED GN	14 / LED GN	13 / LED GN
Pin 4	14	14	32	32	22	14 / LED YE	13 / LED YE	14 / LED YE
Pin 5	—	PE	—	PE	32	Ground LED	Ground LED	31
Pin 6	—	—	—	—	—	—	—	32
Pin 7	—	—	—	—	—	—	—	Ground LED
Pin 8	—	—	—	—	—	—	—	PE
PE	—	—	—	—	—	—	—	—

GN = green
YE = yellow

3SE5..5-.....-	**1AD0**	**1AD1**	**1AD2**	**1AF2**	**1AF2**
Plug connector, 6-pin + PE	3SY3131	3SY3131	3SY3131 (snap action)	3SY3131 (snap action)	3SY3131 (slow action)
Contacts	1 NO + 1 NC	1 NO + 2 NC	1 NO + 2 NC	1 NO + 1 NC	1 NO + 1 NC
LED	—	—	2 LED	2 LED	2 LED

3SE5..5-.....-	1AD0	1AD1	1AD2	1AF2	1AF2
Pin 1	21	21	21	21	21
Pin 2	22	22	22	22	22
Pin 3	13	13	31	13 / LED GN	14 / LED GN
Pin 4	14	14	32	14 / LED YE	13 / LED YE
Pin 5	—	31	13 / LED GN	—	—
Pin 6	—	32	Ground LED	Ground LED	Ground LED
PE	✓	✓	✓	✓	✓

GN = green

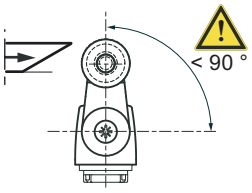
YE = yellow

✓ = connected

4.3.9 Notes on installation

4.3.9.1 Installation instructions for twist levers

Installation of twist levers



Note

Maximum actuating angle of 90 degrees.

Please note when installing a twist lever that the maximum permitted actuating angle is 90 degrees.

4.3.9.2 Changing the actuator head

The actuators can be interchanged.

Possible changes to the method of actuation

- Every actuator can be replaced with any other actuator variant.
- Every actuator can be offset by 22.5° (depending on the actuator adjustment and the enclosure type).
- The twist lever can be offset from 10° to 10° on the actuator shaft, and can be repositioned 180°.

Procedure for changing the direction of operation and replacing the actuator head

1. Unscrew the enclosure cover (1).
2. Slide the locking plate (2) to the right.

   Note

   The spring is preloaded and may be lost when changing the actuator head. If this happens the switch will no longer function in the case of part-turn actuators. Keep a firm hold on the actuator head while removing it.

3. Remove the actuator head (3).
4. Insert the new actuator head (3) until it reaches the endstop.
5. Slide the locking plate (2) to the left.
6. Screw on the enclosure cover (1).
   - **Part-turn actuator 3SE5000-0AH00 / 3SE5000-0AK00 / 3SE5000-0AH00-1AJ0 / 3SE5000-0AK00-1AJ0** is left- and right-operating (factory configuration) (4.1)
   - **Adjusting the actuator head to be left-operating or right-operating only**
     Actuating plunger (4) rotated 90° to the left = left-operating (4.2).
     Actuating plunger (4) rotated 90° to the right = right-operating (4.3).

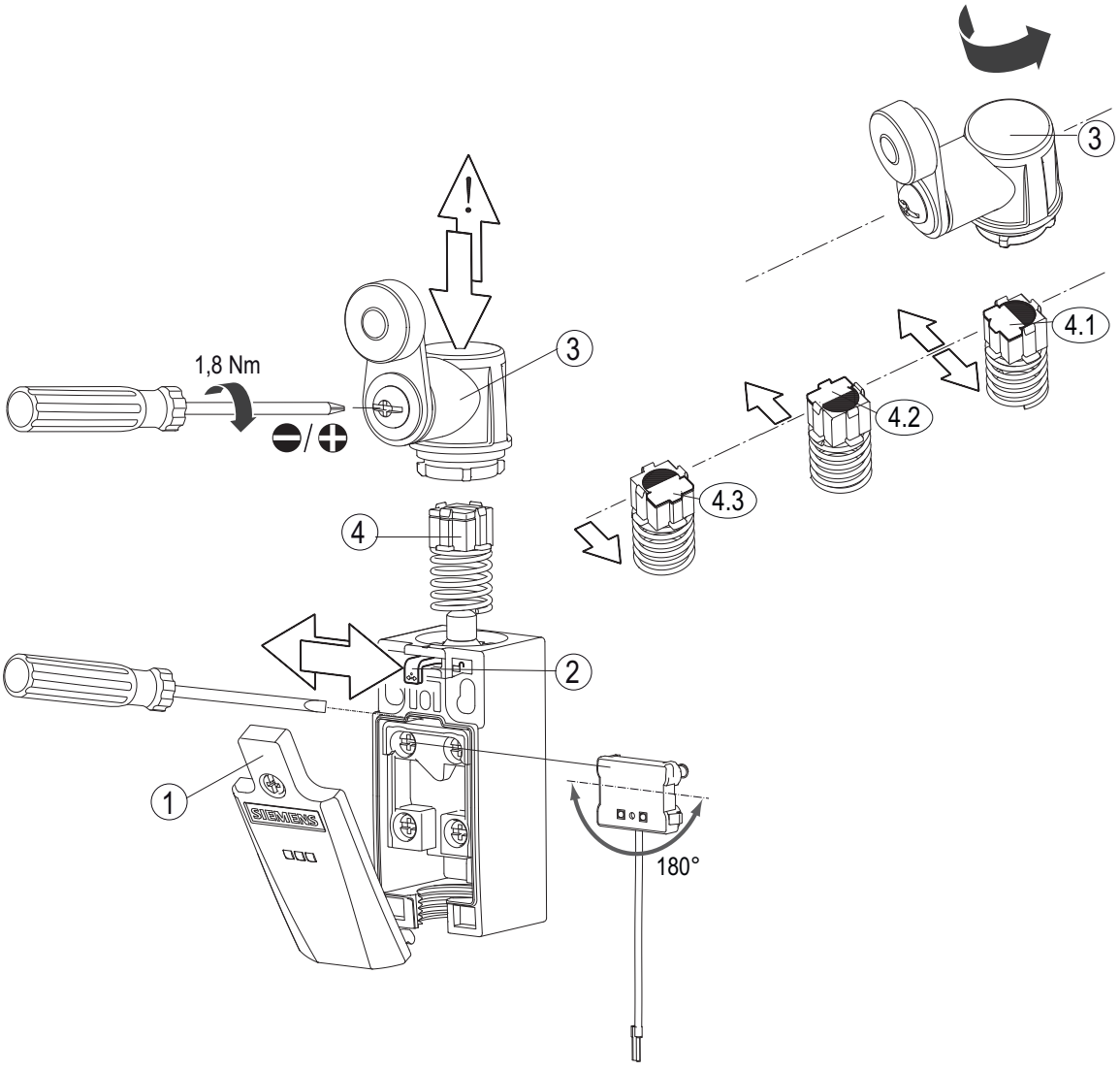


Figure 4-3 Changing the actuator head (example: part-turn actuator)

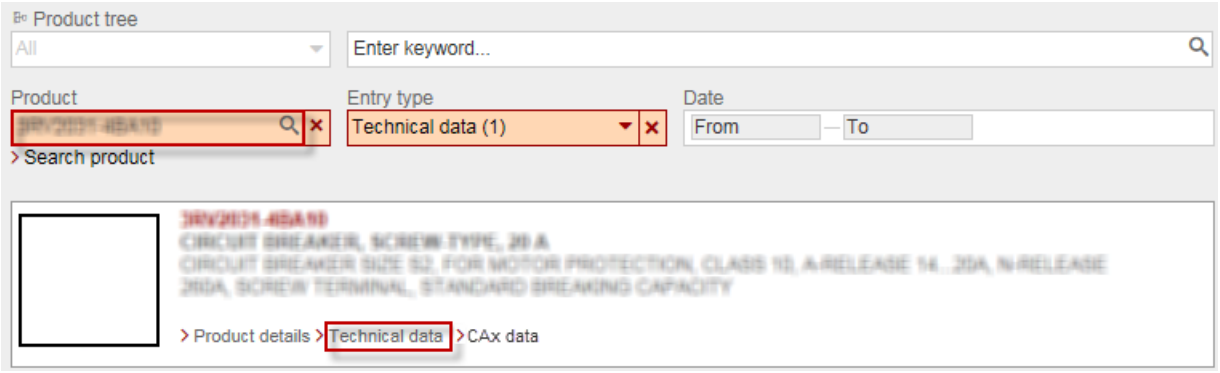
4.3.10 Technical specifications

4.3.10.1 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.

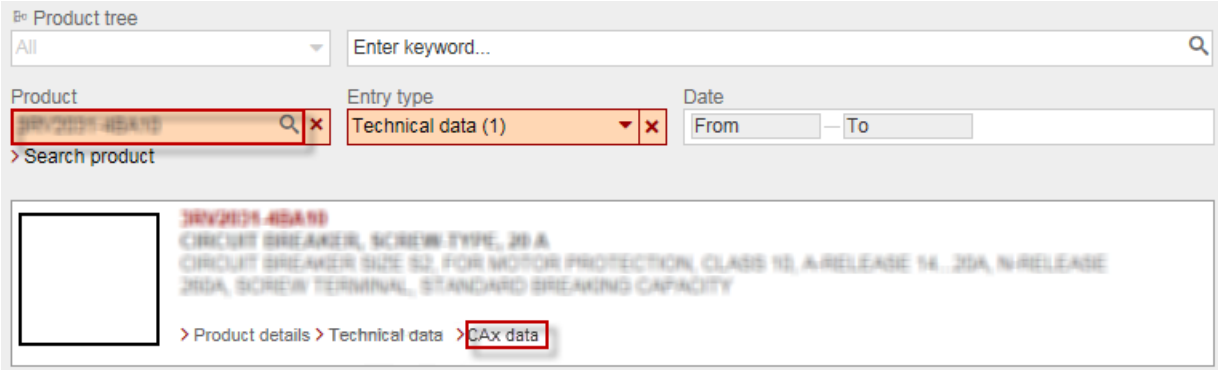


4.3.11 Dimension drawings and operating travel diagrams

4.3.11.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "CAx data link.

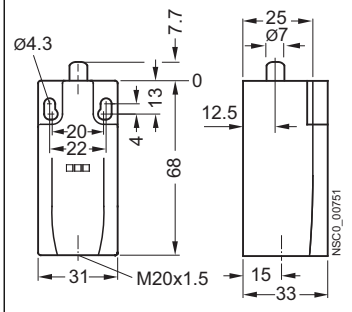
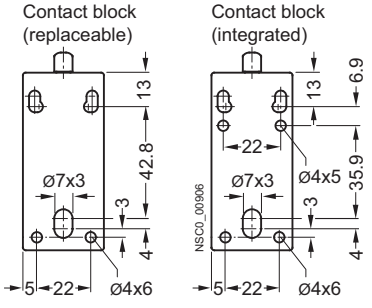
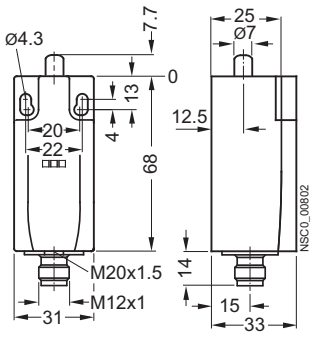
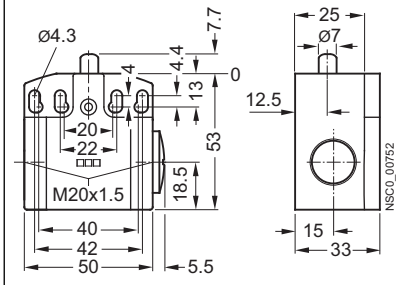
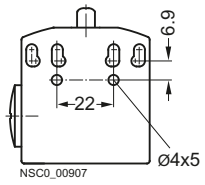
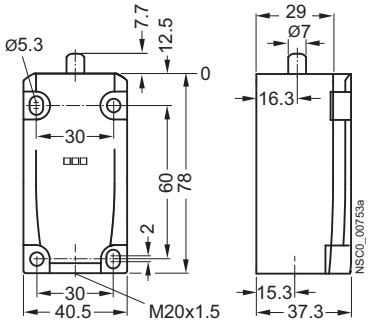
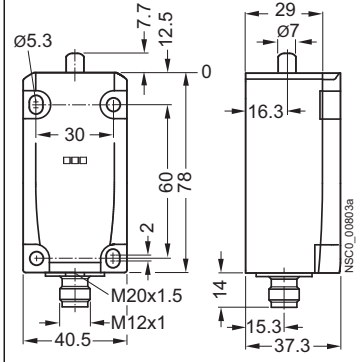
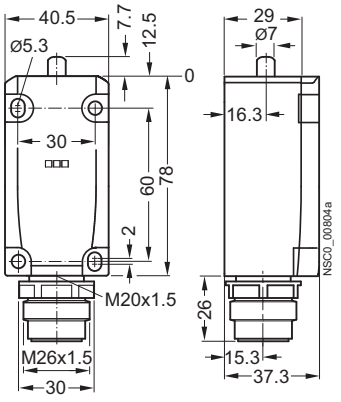
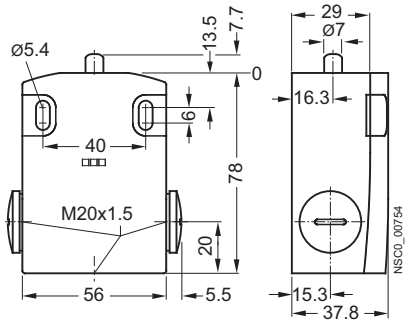


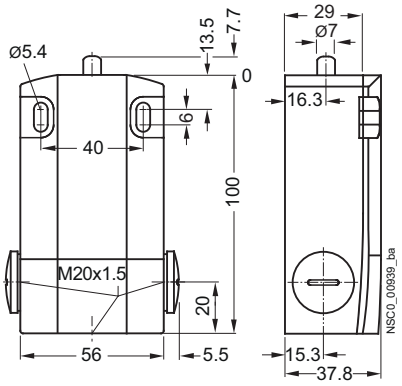
4.3.11.2 Extract from the technical specifications

Note

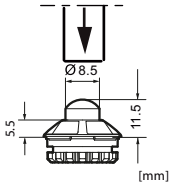
The information in the extract from the technical specifications is not subject to the change service. For current values, refer to Technical Data Sheet.

Basic switch

Enclosure width 31 mm, EN 50047, with connecting thread M20 × 1.5 3SE5232 / 3SE5212	Enclosure width 31 mm, EN 50047, Rear panel with mounting holes 3SE5232/212	Enclosure width 31 mm, EN 50047, with plug connector M12 3SE5234/214
		
Enclosure width 50 mm, with 2x connecting thread M20 × 1.5 3SE5242	Enclosure width 50 mm, rear panel with mounting holes 3SE5242	Enclosure width 40 mm, EN 50041, with connecting thread M20 × 1.5 3SE5112/132
		
Enclosure width 40 mm, EN 50041, with plug connector M12 3SE5114/134	Enclosure width 40 mm, EN 50041, with plug connector 6-pin + PE 3SE5115	Enclosure width 56 mm, with 3x connecting thread M20 × 1.5 3SE5122
		

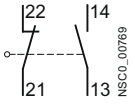
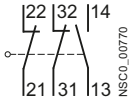
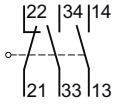
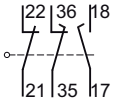
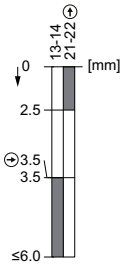
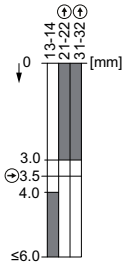
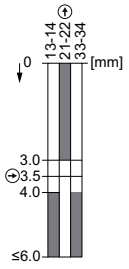
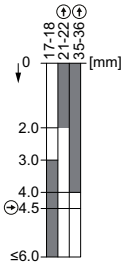
XL enclosure, enclosure width 56 mm, with 3x connecting thread M20 × 1.5 3SE5162	
	The XL enclosure can only be combined with the following actuator heads: • 3SE5000-..B.. • 3SE5000-..C.. • 3SE5000-..D.. • 3SE5000-..E.. • 3SE5000-..F.. • 3SE5000-..H..

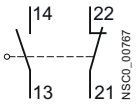
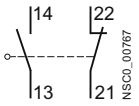
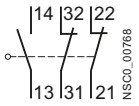
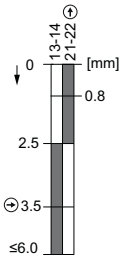
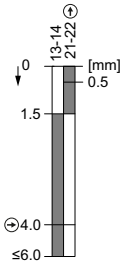
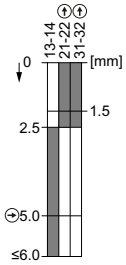
Plain plunger 3SE5000-0AB01



v ≤ 1.5 m/s (maximum actuating speed)

F ≥ 20 N (minimum force demand in actuation direction)

Slow-action contacts			**With make-before-break**
1 NO + 1 NC	1 NO + 2 NC	2 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 12	Code number 21	Code number 12
Actuation in travel direction			
3SE5...-0BB01	3SE5...-0KB01	3SE51..-0PB01	3SE51..-0MB01 [1]
			
[1] Cannot be ordered as complete unit			

Snap-action contacts		
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Actuation in travel direction		
3SE5...-0CB01 3SE5...-0GB01 [1) 2)] 3SE5...-0HB01 [1)]  	3SE52..-0NB01 [1)]  Short stroke	3SE5...-0LB01 
[1)] Cannot be ordered as complete unit [2)] Operating distance 2 x 2 mm		

⊕ Positive opening operation according to EN 60947-5-1

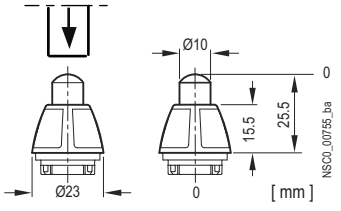
→ Direction of actuation

Contact element closed

Contact element open

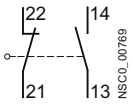
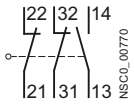
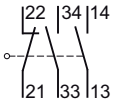
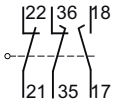
≤ Maximum actuator travel

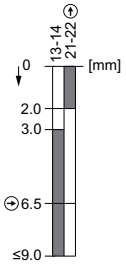
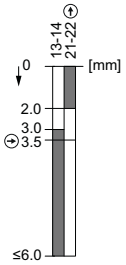
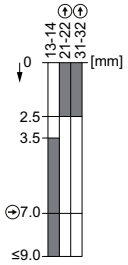
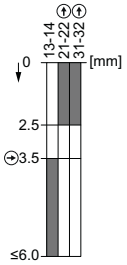
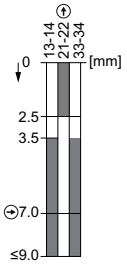
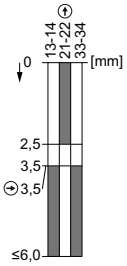
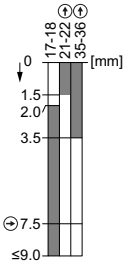
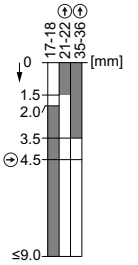
Rounded plunger 3SE5000-0AC02 / -0AC03



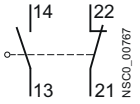
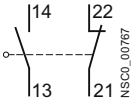
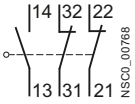
v ≤ 1.5 m/s (maximum actuating speed)

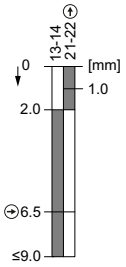
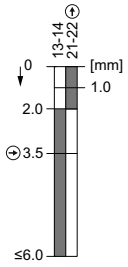
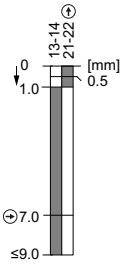
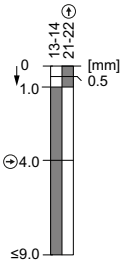
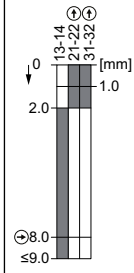
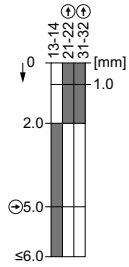
F ≥ 20 N (minimum force demand in actuation direction)

Slow-action contacts			**With make-before-break**
1 NO + 1 NC	1 NO + 2 NC	2 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 12	Code number 21	Code number 12
Actuation in travel direction			
3SE51..			

-0BC02	-0BC03	-0KC02	-0KC03	-0PC02	-0PC03	-0MC02 [1]	-0MC03 [1]
							

[1] Cannot be ordered as complete unit

Snap-action contacts		
1 NO + 1 NC	1 NO + 1 NC	1 NO + 2 NC
		
Code number 11	Code number 11	Code number 12
Actuation in travel direction		
3SE51..		

-0CC02	-0CC03	-0NC02 [1]	-0NC03 [1]	-0LC02	-0LC03
		 Short stroke	 Short stroke		

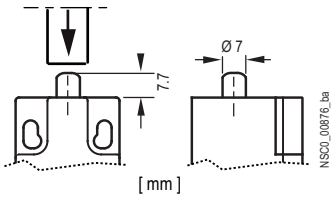
[1] Cannot be ordered as complete unit

⊕ Positive opening operation according to EN 60947-5-1

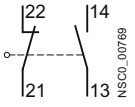
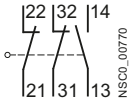
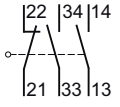
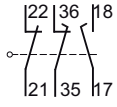
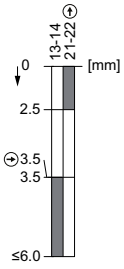
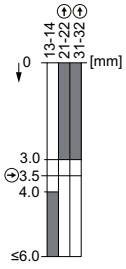
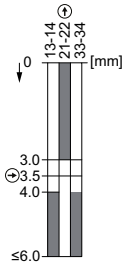
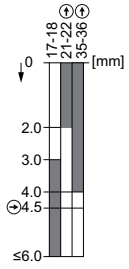
→ Direction of actuation

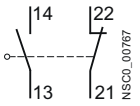
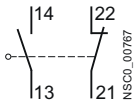
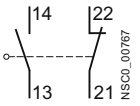
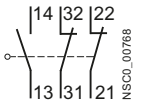
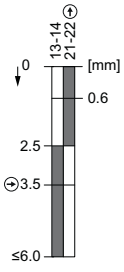
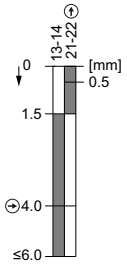
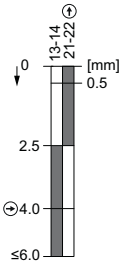
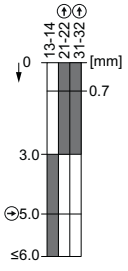
Contact element closed
Contact element open
≤ Maximum actuator travel

Rounded plunger EN 50047 3SE52..-..C05



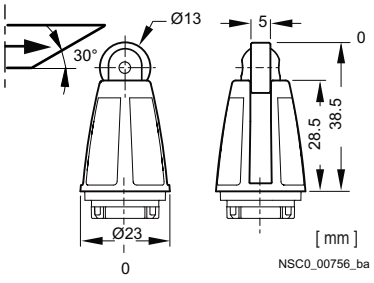
v ≤ 1.5 m/s (maximum actuating speed)
F ≥ 20 N (minimum force demand in actuation direction)

Slow-action contacts			**With make-before-break**
1 NO + 1 NC	1 NO + 2 NC	2 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 12	Code number 21	Code number 12
Actuation in travel direction			
3SE52..-.BC05	3SE52..-.KC05	3SE52..-.PC05	3SE52..-.MC05
			

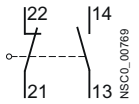
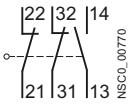
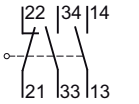
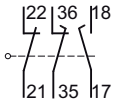
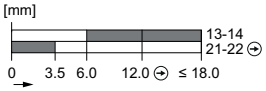
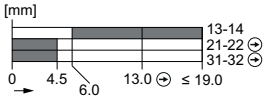
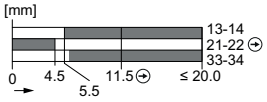
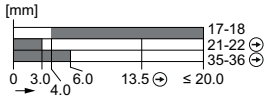
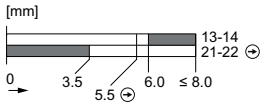
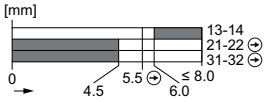
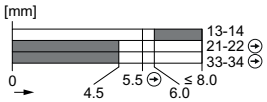
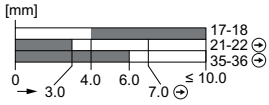
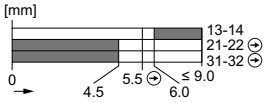
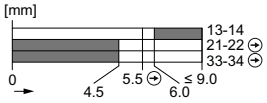
Snap-action contacts			
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Actuation in travel direction			
3SE52..-.CC05 3SE52..-.HC05  	3SE52..-.FC05  Short stroke integrated	3SE52..-.GC05  Operating distance 2 x 2 mm	3SE52..-.LC05 

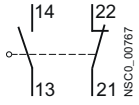
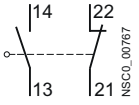
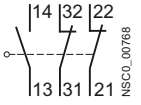
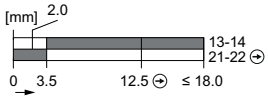
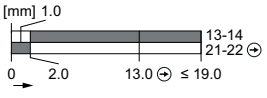
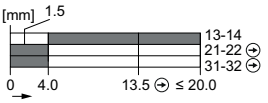
⊕ Positive opening operation according to EN 60947-5-1
→ Direction of actuation
▭ Contact element closed
▭ Contact element open
≤ Maximum actuator travel

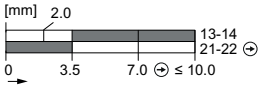
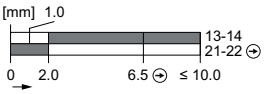
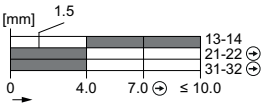
Roller plunger 3SE5000-0AD02 / -0AD05 / -0AD06



v ≤ 1 m/s (maximum actuating speed)
F ≥ 20 N (minimum force demand in actuation direction)

Slow-action contacts			**With make-before-break**
1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12	2 NO + 1 NC  Code number 21	1 NO + 2 NC  Code number 12
Lateral actuation			
3SE51..-0BD02  	3SE51..-0KD02  	3SE51..-0PD02 [1]  	3SE51..-0MD02 [1] 
3SE51..-0BD05 3SE51..-0BD06 [1]  	3SE51..-0KD05  	3SE51..-0PD05 3SE51..-0PD06 [1]  	3SE51..-0MD05/06 [1] 
	3SE51..-0KD06 [1]  	3SE51..-0PD06 [1]  	
[1] Cannot be ordered as complete unit			

Snap-action contacts		
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Lateral actuation		
3SE51..-0CD02  	3SE51..-0ND02 [1]  Short stroke	3SE51..-0LD02 

Snap-action contacts		
3SE51..-0CD05 3SE51..-0CD06 [1)]	3SE51..-0ND05/06 [1)]	3SE51..-0LD05 3SE51..-0LD06 [1)]
	 Short stroke	
[1)] Cannot be ordered as complete unit		

⊕ Positive opening operation according to EN 60947-5-1

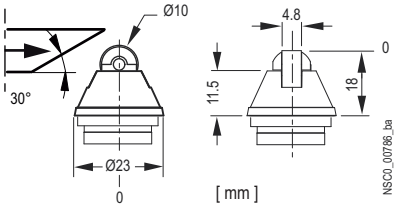
→ Direction of actuation

Contact element closed

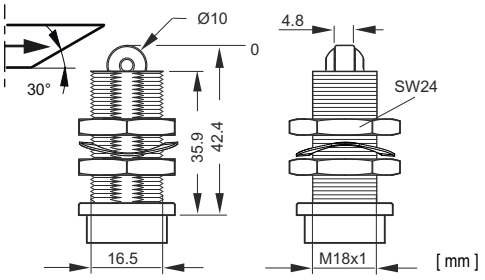
Contact element open

Roller plunger

3SE5000-0AD03 / 3SE5000-0AD04
Type C

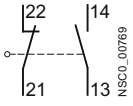
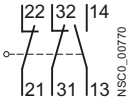
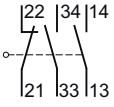
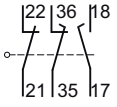
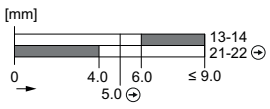
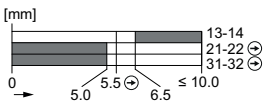
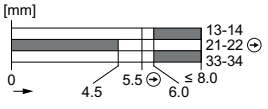
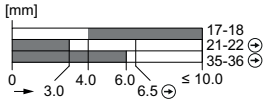


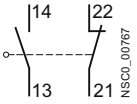
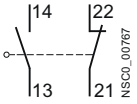
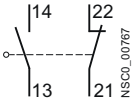
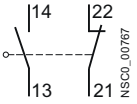
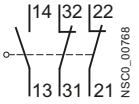
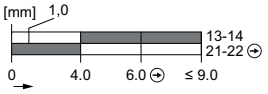
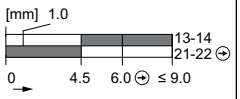
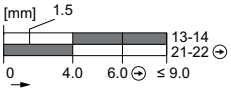
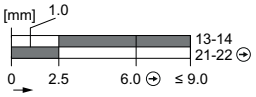
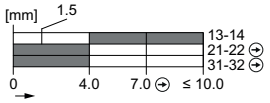
3SE5000-0AD10 / 3SE5000-0AD11
Central fixing



v ≤ 1 m/s (maximum actuating speed)

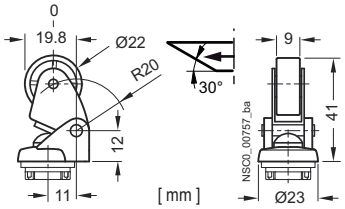
F ≥ 20 N (minimum force demand in actuation direction)

Slow-action contacts			**With make-before-break**
1 NO + 1 NC	1 NO + 2 NC	2 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 12	Code number 21	Code number 12
Lateral actuation			
3SE52..-0BD03 3SE52..-0BD04/10/11 [1)]	3SE52..-0KD03/10 3SE52..-0KD04/11 [1)]	3SE52..-0PD.. [1)]	3SE52..-0MD.. [1)]
			
[1)] Cannot be ordered as complete unit			

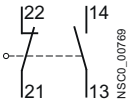
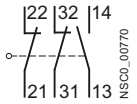
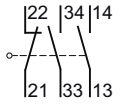
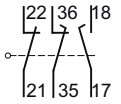
Snap-action contacts				
1 NO + 1 NC	1 NO + 1 NC	1 NO + 1 NC	1 NO + 1 NC	1 NO + 2 NC
				
Code number 11	Code number 11	Code number 11	Code number 11	Code number 12
Lateral actuation				
3SE52..-0CD03/04/10 3SE52..-0CD11 [1]	3SE52..-0GD.. [1]	3SE52..-0HD03/10 3SE52..-0HD04/11 [1]	3SE52..-0FD03 3SE52..-.FD04/10/11 [1]	3SE52..-0LD03 3SE52..-0LD04/10/11 [1]
	 Operating distance 2 x 2 mm		 Short stroke integrated	
[1] Cannot be ordered as complete unit				

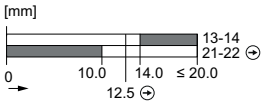
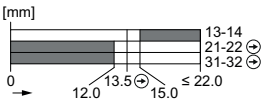
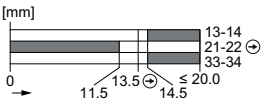
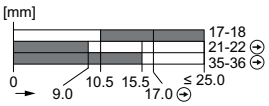
⊕ Positive opening operation according to EN 60947-5-1
→ Direction of actuation
Contact element closed
Contact element open
≤ Maximum actuator travel

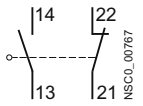
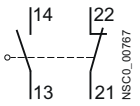
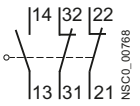
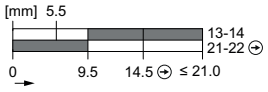
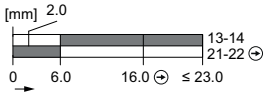
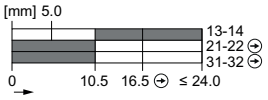
Roller lever 3SE5000-0AE0.



v ≤ 2.5 m/s (maximum actuating speed)
F ≥ 10 N (minimum force demand in actuation direction)

Slow-action contacts			**With make-before-break**
1 NO + 1 NC	1 NO + 2 NC	2 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 12	Code number 21	Code number 12
Lateral actuation			

Slow-action contacts			**With make-before-break**
3SE51..-0BE01/05 3SE51..-0BE02/03/04 [1] 	3SE51..-0KE0. 	3SE51..-0PE0. 	3SE51..-0ME0. [1] 
[1] Cannot be ordered as complete unit			

Snap-action contacts		
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Lateral actuation		
3SE51..-0CE01/02/03/05 3SE51..-0CE04 [1] 	3SE51..-0NE0. [1]  Short stroke	3SE51..-0LE01/05 3SE51..-0LE02/03/04 [1] 
[1] Cannot be ordered as complete unit		

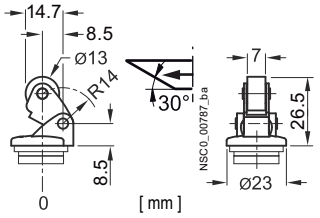
⊕ Positive opening operation according to EN 60947-5-1

→ Direction of actuation

Contact element closed

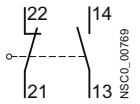
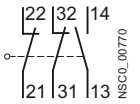
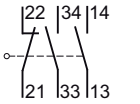
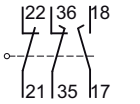
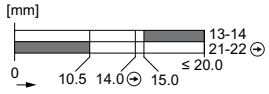
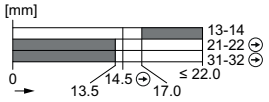
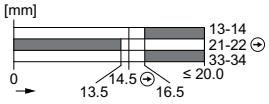
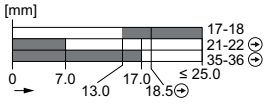
Contact element open

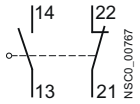
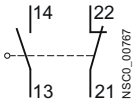
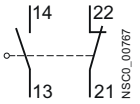
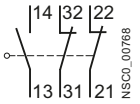
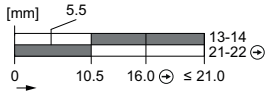
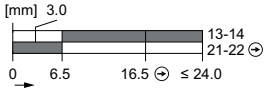
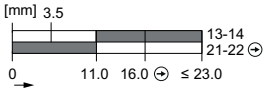
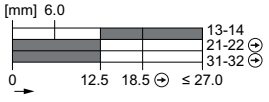
Roller lever 3SE5000-0AE1.



v ≤ 1 m/s (maximum actuating speed)

F ≥ 10 N (minimum force demand in actuation direction)

Slow-action contacts			**With make-before-break**
1 NO + 1 NC	1 NO + 2 NC	2 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 12	Code number 21	Code number 12
Lateral actuation			
3SE52..-0BE10 3SE52..-0BE11/12/13 [1]	3SE52..-0KE10 3SE52..-0KE11/12/13 [1]	3SE52..-0PE1. [1]	3SE52..-0ME1. [1]
			
[1] Cannot be ordered as complete unit			

Snap-action contacts			
1 NO + 1 NC	1 NO + 1 NC	1 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 11	Code number 11	Code number 12
Lateral actuation			
3SE52..-0CE10/12 3SE52..-0CE11/13 [1] 3SE52..-0HE10/12 3SE52..-0HE11/13 [1]	3SE52..-0FE1. [1]	3SE52..-0GE1. [1]	3SE52..-0LE10/12 3SE52..-0LE11/13 [1]
	 Short stroke integrated	 Operating distance 2 x 2 mm	
[1] Cannot be ordered as complete unit			

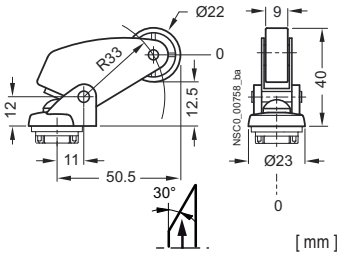
⊕ Positive opening operation according to EN 60947-5-1

→ Direction of actuation

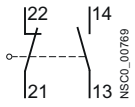
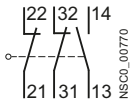
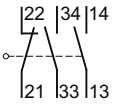
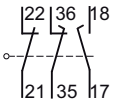
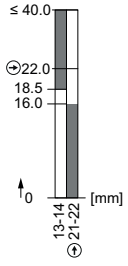
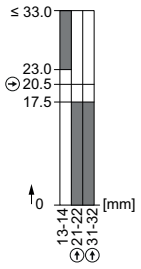
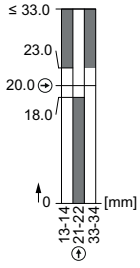
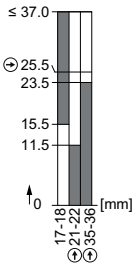
Contact element closed

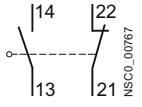
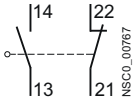
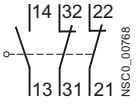
Contact element open

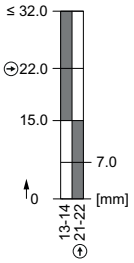
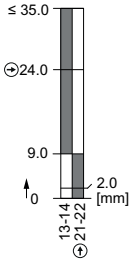
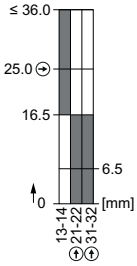
Angular roller lever 3SE5000-0AF0.



v ≤ 2.5 m/s (maximum actuating speed)
F ≥ 10 N (minimum force demand in actuation direction)

Slow-action contacts			**With make-before-break**
1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12	2 NO + 1 NC  Code number 21	1 NO + 2 NC  Code number 12
Actuation in travel direction			
3SE51..-0BF01/05 3SE51..-0BF02/03/04 [1]  	3SE51..-0KF0. [1]  	3SE51..-0PF01 3SE51..-0PF02/03/04/05 [1]  	3SE51..-0MF0. [1] 
[1] Cannot be ordered as complete unit			

Snap-action contacts		
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Actuation in travel direction		

Snap-action contacts		
3SE51..-0CF01/03/05 3SE51..-0CF02/04 [1]	3SE51..-0NF0. [1]	3SE51..-0LF01/05 3SE51..-0LF02/03/04 [1]
	 Short stroke	
[1] Cannot be ordered as complete unit		

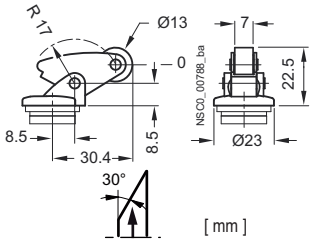
⊕ Positive opening operation according to EN 60947-5-1

→ Direction of actuation

Contact element closed

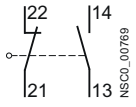
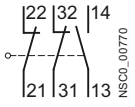
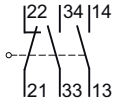
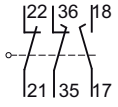
Contact element open

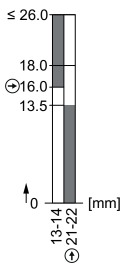
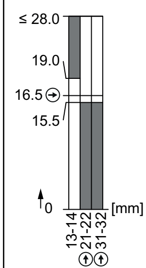
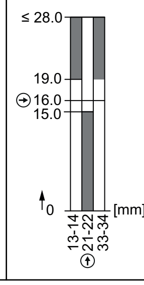
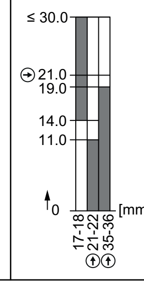
Angular roller lever 3SE5000-0AF1.

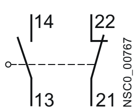
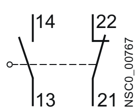
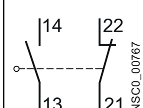
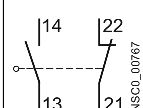
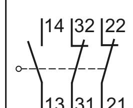
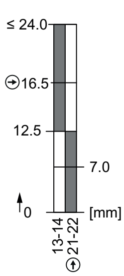
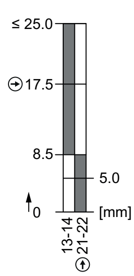
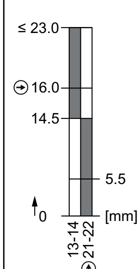
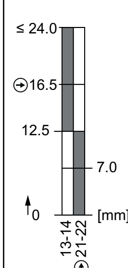
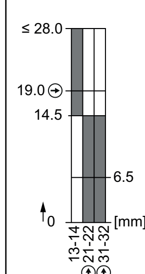


v ≤ 1 m/s (maximum actuating speed)

F ≥ 10 N (minimum force demand in actuation direction)

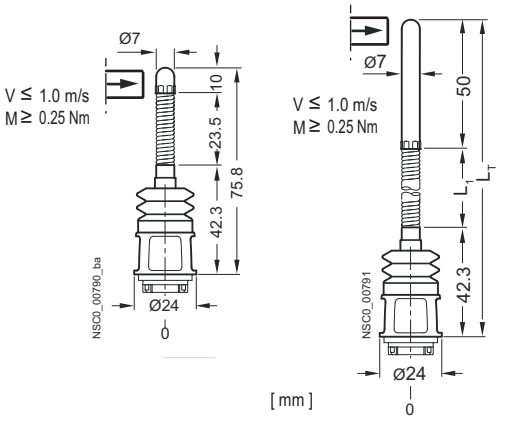
Slow-action contacts			**With make-before-break**
1 NO + 1 NC	1 NO + 2 NC	2 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 12	Code number 21	Code number 12
Actuation in travel direction			

Slow-action contacts			**With make-before-break**
3SE52..-0BF10 3SE52..-0BF11/12/13 [1] 	3SE52..-0KF10 3SE52..-0KF11/12/13 [1] 	3SE52..-0PF10/11/12/13 [1] 	3SE52..-0MF1. [1] 
[1] Cannot be ordered as complete unit			

Snap-action contacts				
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Actuation in travel direction				
3SE52..-0CF10 3SE52..-0CF11/12/13 [1] 	3SE52..-0FF1. [1]  Short stroke integra-ted	3SE52..-0GF1. [1]  Operating distance 2 x 2 mm	3SE52..-0HF10 3SE52..-0HF11/12/13 [1] 	3SE52..-0LF10 3SE52..-0LF11/12/13 [1] 
[1] Cannot be ordered as complete unit				

(→)	Positive opening operation according to EN 60947-5-1
→	Direction of actuation
(grey box)	Contact element closed
(white box)	Contact element open

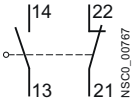
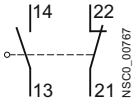
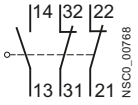
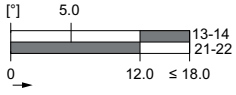
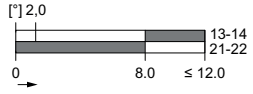
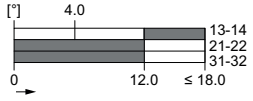
Spring rod 3SE5000-0AR0.

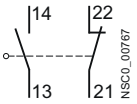
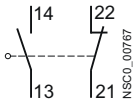
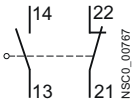
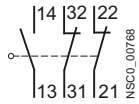


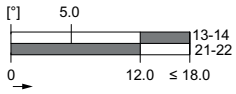
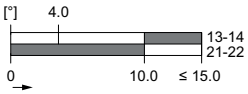
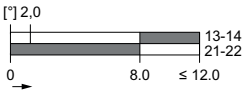
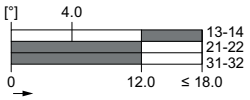
	L_1	L_T	[mm]
3SE5...-..R01/R02	50	142.3	
3SE5...-..R03	23.5	75.8	
3SE5...-..R04	150	242.3	

v ≤ 1 m/s (maximum actuating speed)
F ≥ 9 N (minimum force demand in actuation direction)
M ≥ 0.25 Nm (minimum torque in actuation direction)
No positive opening operation

The spring rods can only be used with snap-action contacts.

Snap-action contacts		
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Deflection of spring rod		
3SE51..-0CR01 3SE51..-0CR02/03/04 [1]  	3SE51..-0NR0. [1]  	3SE51..-0LR0. 3SE51..-0LR02/03/04 [1] 
[1] Cannot be ordered as complete unit		

Snap-action contacts			
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Deflection of spring rod			

Snap-action contacts			
3SE52..-0CR0. 3SE52..-0GR0. [1] 3SE52..-0HR0. 	3SE52..-0FR0. [1]  Short stroke integrated	3SE52..-0NR0. [1]  Short stroke	3SE52..-0LR0. 
[1] Cannot be ordered as complete unit			

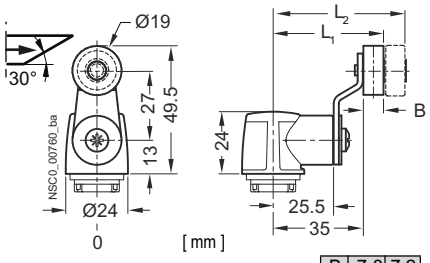
→ Direction of actuation

Contact element closed

Contact element open

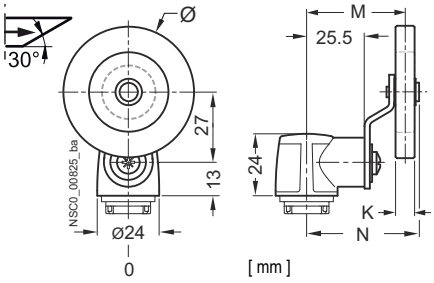
Twist lever

3SE5000-0AH00
+ 3SE5000-0AA01 / 02 / 03 / 04 / 11 / 12



B	7.8	7.2
L_1	43	—
L_2	—	51

3SE5000-0AH00
+ 3SE5000-0AA05 / 06 / 07 / 08

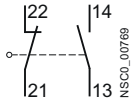
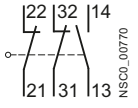
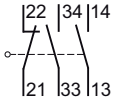
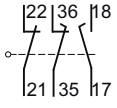


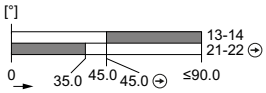
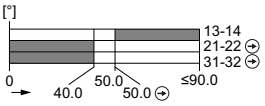
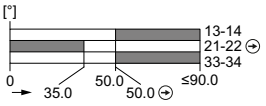
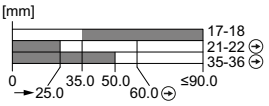
∅	30	35	50	50
K	7.2	4.5	7.2	8.6
M	39	37.5	39	40
N	44.5	43	44.5	46

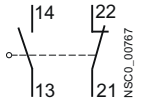
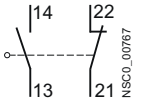
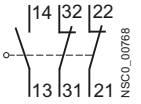
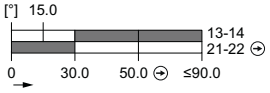
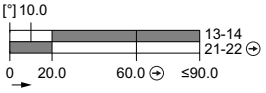
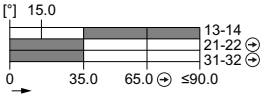
v ≤ 1.5 m/s (maximum actuating speed)

M ≥ 0.25 Nm (minimum torque in actuation direction)

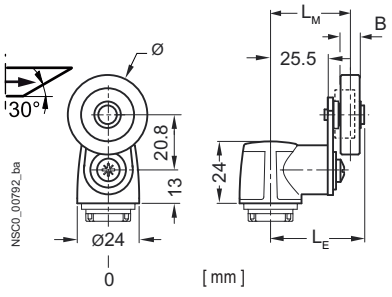
Lever adjustable in increments of 10°, maximum deflection 90°

Slow-action contacts			**With make-before-break**
1 NO + 1 NC	1 NO + 2 NC	2 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 12	Code number 21	Code number 12
Deflection in direction of rotation			

Slow-action contacts			**With make-before-break**
3SE51..-0BH.. 3SE51..-0BJ.. 	3SE51..-0KH.. 3SE51..-0KJ.. 	3SE51..-0PH.. 3SE51..-0PJ.. 	3SE51..-0MH.. [1] 3SE51..-0MJ.. [1] 
[1] Cannot be ordered as complete unit			

Snap-action contacts		
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Deflection in direction of rotation		
3SE51..-0CH.. 3SE51..-0CJ.. 	3SE51..-0NH.. [1] 3SE51..-0NJ.. [1]  Short stroke	3SE51..-0LH.. 3SE51..-0LJ.. 
[1] Cannot be ordered as complete unit		

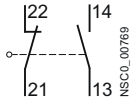
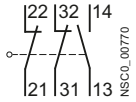
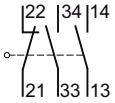
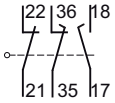
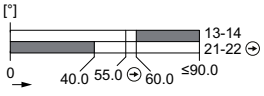
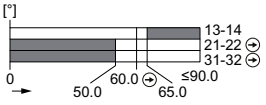
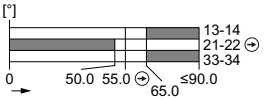
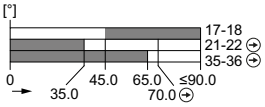
Twist lever 3SE5000-0AK00 / 3SE5000-0AA2. / 3.

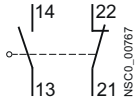
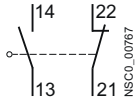
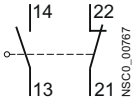
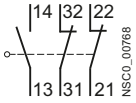
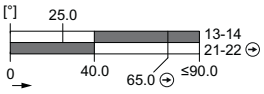
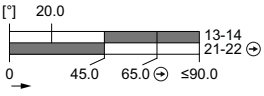
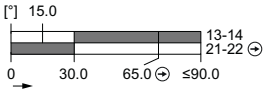
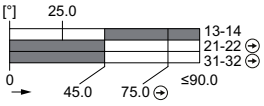


Ø	19	30
B	7.8	7.2
L_M	29.5	31.6
L_E	33.8	37.2

v ≤ 1.5 m/s (maximum actuating speed)

M = 0.25 Nm (minimum torque in actuation direction)

Slow-action contacts			**With make-before-break**
1 NO + 1 NC	1 NO + 2 NC	2 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 12	Code number 21	Code number 12
Deflection in direction of rotation			
3SE52..-0BK2. 3SE52..-0BK3. [1]	3SE52..-0KK2. 3SE52..-0KK3. [1]	3SE52..-0PK2. [1] 3SE52..-0PK3. [1]	3SE52..-0MK2. [1] 3SE52..-0MK3. [1]
			
[1] Cannot be ordered as complete unit			

Snap-action contacts			
1 NO + 1 NC	1 NO + 1 NC	1 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 11	Code number 11	Code number 12
Deflection in direction of rotation			
3SE52..-0CK2. 3SE52..-0HK2.	3SE52..-0GK2. [1] 3SE52..-0GK3. [1]	3SE52..-0FK2. [1] 3SE52..-0FK3. [1]	3SE52..-0LK2. 3SE52..-0LK3. [1]
	 Operating distance 2 x 2 mm	 Short stroke integrated	
[1] Cannot be ordered as complete unit			

⊕ Positive opening operation according to EN 60947-5-1

→ Direction of actuation

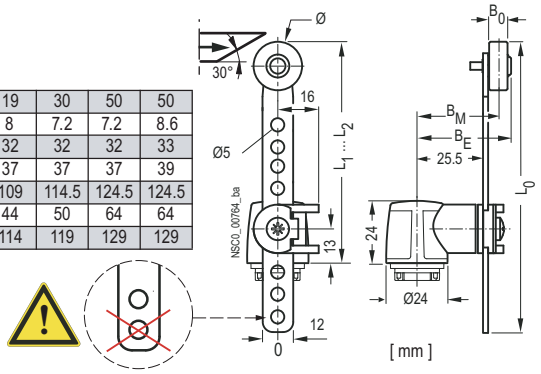
Contact element closed

Contact element open

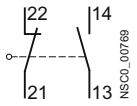
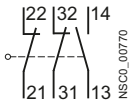
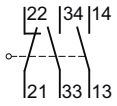
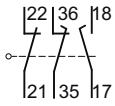
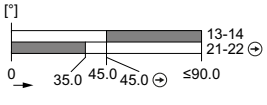
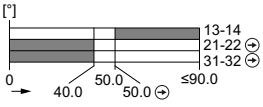
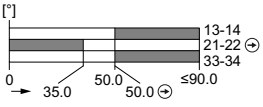
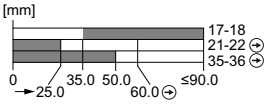
≤ Maximum actuator travel

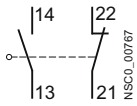
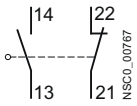
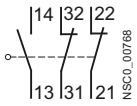
Adjustable-length twist lever with pre-drilled holes 3SE5000-0AH00 + 3SE5000-0AA6.

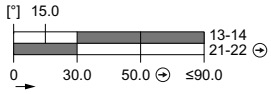
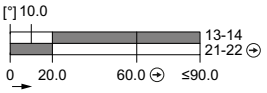
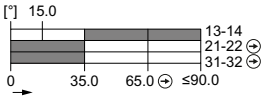
∅	19	30	50	50
B_0	8	7.2	7.2	8.6
B_M	32	32	32	33
B_E	37	37	37	39
L_0	109	114.5	124.5	124.5
L_1	44	50	64	64
L_2	114	119	129	129



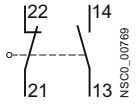
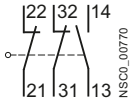
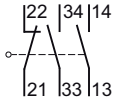
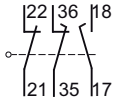
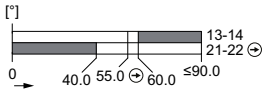
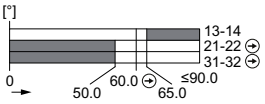
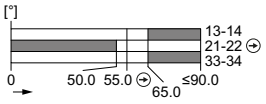
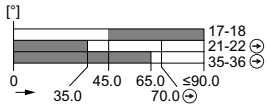
$v_{(met)} \leq 1.5$ m/s (maximum actuating speed)
$v_{(plast)} \leq 1.0$ m/s (maximum actuating speed)
$M \geq 0.25$ Nm (minimum torque in actuation direction)
Note: Do not use the bottommost drill hole.

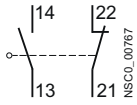
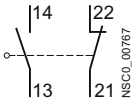
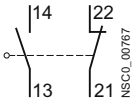
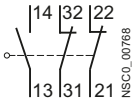
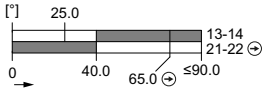
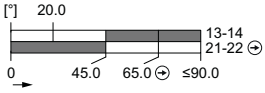
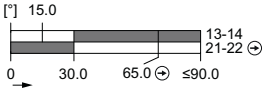
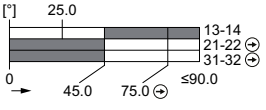
Slow-action contacts			**With make-before-break**
1 NO + 1 NC	1 NO + 2 NC	2 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 12	Code number 21	Code number 12
Deflection in direction of rotation			
3SE51..-0BH6. 3SE51..-0BJ6. [1]	3SE51..-0KH6. [1] 3SE51..-0KJ6. [1]	3SE51..-0PH6. [1] 3SE51..-0PJ6. [1]	3SE51..-0MH6. [1] 3SE51..-0MJ6. [1]
			
[1] Cannot be ordered as complete unit			

Snap-action contacts		
1 NO + 1 NC	1 NO + 1 NC	1 NO + 2 NC
		
Code number 11	Code number 11	Code number 12
Deflection in direction of rotation		

Snap-action contacts		
3SE51..-0CH6. 3SE51..-0CJ6. 	3SE51..-0NH6. [1] 3SE51..-0NJ6. [1]  Short stroke	3SE51..-0LH6. 3SE51..-0LJ6. 
[1] Cannot be ordered as complete unit		

Adjustable-length twist lever with pre-drilled holes 3SE50000AK00 + 3SE5000-0AA6.

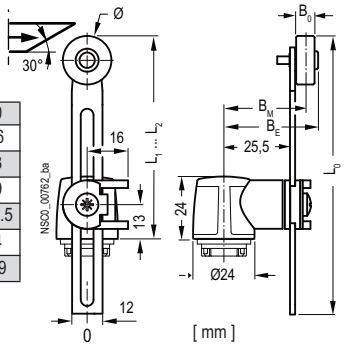
Slow-action contacts			**With make-before-break**
1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12	2 NO + 1 NC  Code number 21	1 NO + 2 NC  Code number 12
Deflection in direction of rotation			
3SE52..-0BK6. [1] 	3SE52..-0KK6. 	3SE52..-0PK6. [1] 	3SE52..-0MK6. [1] 
[1] Cannot be ordered as complete unit			

Snap-action contacts			
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Deflection in direction of rotation			
3SE52..-0CK6. 3SE52..-0HK6. 	3SE52..-0GK6. [1]  Operating distance 2 x 2 mm	3SE52..-0FK6. [1] 3SE52..-0NK6. [1]  Short stroke	3SE52..-0LK6. 
[1] Cannot be ordered as complete unit			

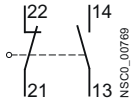
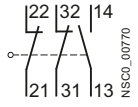
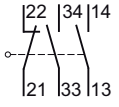
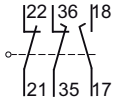
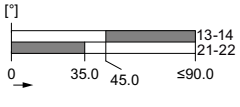
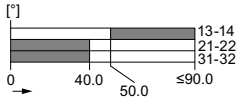
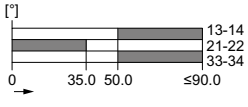
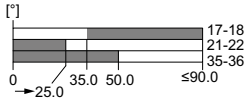
⊕ Positive opening operation according to EN 60947-5-1
→ Direction of actuation
Contact element closed
Contact element open
≤ Maximum actuator travel

Adjustable-length twist lever with oblong hole 3SE5000-0AH00 + 3SE5000-0AA5.

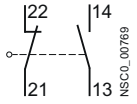
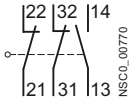
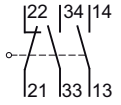
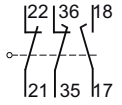
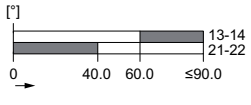
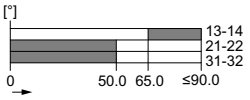
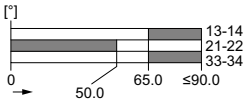
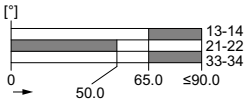
∅	19	30	50	50
B_0	8	7.2	7.2	8.6
B_M	32	32	32	33
B_E	37	37	37	39
L_0	109	114.5	124.5	124.5
L_1	44	50	64	64
L_2	114	119	129	129

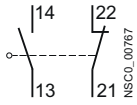
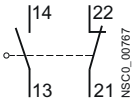
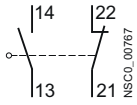
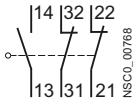
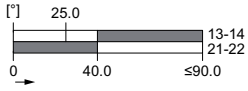
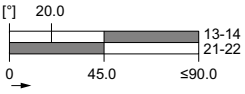
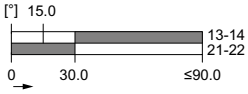
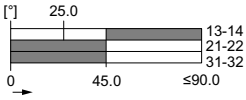


$v_{(met)} \leq 1.5$ m/s (maximum actuating speed)
$v_{(plast)} \leq 1.0$ m/s (maximum actuating speed)
M ≥ 0.25 Nm (minimum torque in actuation direction)
Lever adjustable in increments of 10°, maximum deflection 90°
No positive opening operation

Slow-action contacts			**With make-before-break**
1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12	2 NO + 1 NC  Code number 21	1 NO + 2 NC  Code number 12
Deflection in direction of rotation			
3SE51..-0BH5. 3SE51..-0BJ5. [1]  	3SE51..-0KH5. [1] 3SE51..-0KJ5. [1]  	3SE51..-0PH5. [1] 3SE51..-0PJ5. [1]  	3SE51..-0MH5. [1] 3SE51..-0MJ5. [1] 
[1] Cannot be ordered as complete unit			

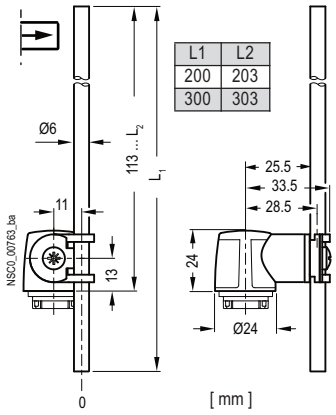
Adjustable-length twist lever with oblong hole 3SE5000-0AK00 + 3SE5000-0AA5.

Slow-action contacts			**With make-before-break**
1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12	2 NO + 1 NC  Code number 21	1 NO + 2 NC  Code number 12
Deflection in direction of rotation			
3SE52..-0BK5.  	3SE51..-0KK5.  	3SE51..-0PK5. [1]  	3SE51..-0MK5. [1] 
[1] Cannot be ordered as complete unit			

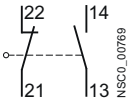
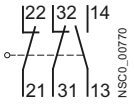
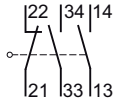
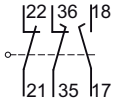
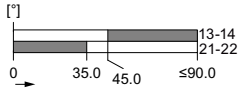
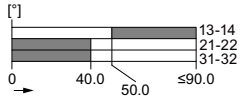
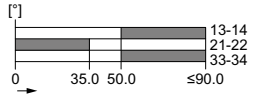
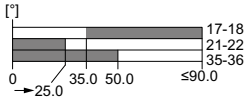
Snap-action contacts			
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Deflection in direction of rotation			
3SE52..-0CK5. 3SE52..-0HK5.  	3SE52..-0GK5. [1]  Operating distance 2 x 2 mm	3SE52..-0FK5. [1] 3SE52..-0NK5. [1]  Short stroke	3SE52..-0LK5. 
[1] Cannot be ordered as complete unit			

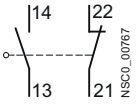
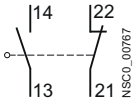
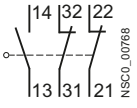
→ Direction of actuation
Contact element closed
Contact element open
≤ Maximum actuator travel

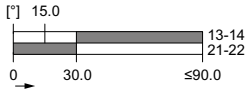
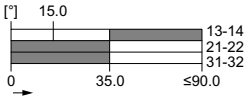
Rod lever made of plastic 3SE5000-0AH00 + 3SE5000-0AA80/82



$v_{(plast)} \leq 1.0$ m/s (maximum actuating speed)
M ≥ 0.25 Nm (minimum torque in actuation direction)
Lever adjustable in increments of 10°, maximum deflection 90°
No positive opening operation

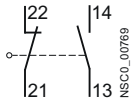
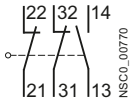
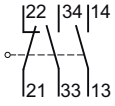
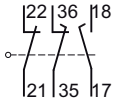
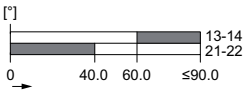
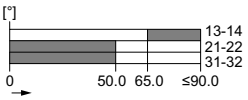
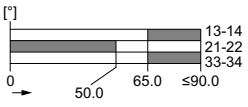
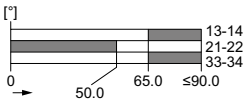
Slow-action contacts			**With make-before-break**
1 NO + 1 NC	1 NO + 2 NC	2 NO + 1 NC	1 NO + 2 NC
			
Code number 11	Code number 12	Code number 21	Code number 12
Deflection in direction of rotation			
3SE51..-0BH8. [1] 3SE51..-0BJ8. [1]	3SE51..-0KH8. [1] 3SE51..-0KJ8. [1]	3SE51..-0PH8. [1] 3SE51..-0PJ8. [1]	3SE51..-0MH8. [1] 3SE51..-0MJ8. [1]
			
[1] Cannot be ordered as complete unit			

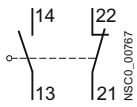
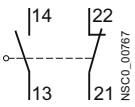
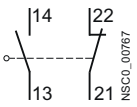
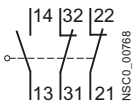
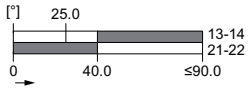
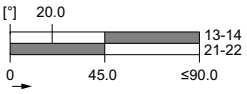
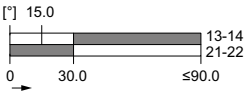
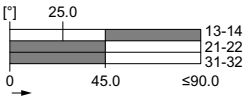
Snap-action contacts		
1 NO + 1 NC	1 NO + 1 NC	1 NO + 2 NC
		
Code number 11	Code number 11	Code number 12
Deflection in direction of rotation		

Snap-action contacts		
3SE51..-0CH8. 3SE51..-0CJ8. 	3SE51..-0NH8. [1] 3SE51..-0NJ8. [1]  Short stroke	3SE51..-0LH8. 3SE51..-0LJ8. [1] 
[1] Cannot be ordered as complete unit		

Rod lever made of metal 3SE5000-0AK00 + 3SE5000-0AA80/82

$v_{(met)} \leq 1.5$ m/s (maximum actuating speed)

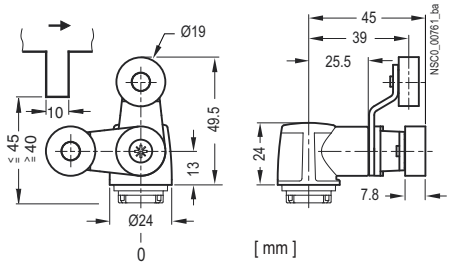
Slow-action contacts			**With make-before-break**
1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12	2 NO + 1 NC  Code number 21	1 NO + 2 NC  Code number 12
Deflection in direction of rotation			
3SE52..-0BK8. [1] 	3SE52..-0KK8. [1] 	3SE52..-0PK8. [1] 	3SE52..-0MK8. [1] 
[1] Cannot be ordered as complete unit			

Snap-action contacts			
1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Deflection in direction of rotation			
3SE52..-0CK8. [1] 3SE52..-0HK8. 	3SE52..-0GK8. [1]  Operating distance 2 x 2 mm	3SE52..-0FK8. [1]  Short stroke integrated	3SE52..-0LK8. 
[1] Cannot be ordered as complete unit			

→ Direction of actuation
Contact element closed
Contact element open
≤ Maximum actuator travel

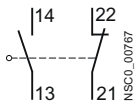
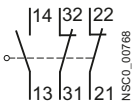
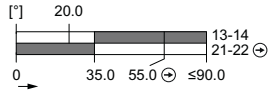
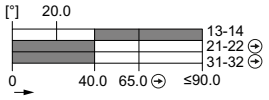
Fork lever

3SE5000-0AT1. + 3SE5000-0AT0.



v ≤ 1.5 m/s (maximum actuating speed)
M ≥ 0.25 Nm (minimum torque in actuation direction)
Lever adjustable in increments of 10°, maximum deflection 90°

The fork levers can only be used with snap-action contacts.

Snap-action contacts	
1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
Deflection in direction of rotation	
3SE51..-0CT1.  	3SE51..-0LT1. [1] 
[1] Cannot be ordered as complete unit	

⊕ Positive opening operation according to EN 60947-5-1
→ Direction of actuation
Contact element closed
Contact element open
≤ Maximum actuator travel

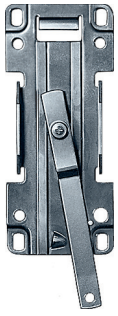
4.3.12 Accessories and spare parts

To enable fast replacement of highly-utilized devices with standard enclosure, e.g., in automatic manufacturing lines, a quick-release device and plug connector are offered.

4.3.12.1 Quick-release device for enclosure width 40 mm

3SY3110 - Intermediate plate with screws

3SY3027 - Base plate with locking lever



4.3.12.2 Plug-in connections for connecting thread M20 x 1.5

3SY3131 - Plug connector (6-pin + PE), for M20 x 1.5

For maximum 250 V, 10 A
with connecting cable 0.75 mm², plastic, degree of protection IP65, ambient temperature -40 to +90 °C

3SY3127 - Plug connector (4-pin), M12 for M20 × 1.5

For maximum 250 V, 4 A, U_{imp} = 2500 V

With 4 connecting cables 0.25 mm², plastic, degree of protection IP67, ambient temperature -40 to +85 °C

3SY3128 - Plug connector (5-pin), M12 for M20 × 1.5

For maximum 125 V, 4 A, U_{imp} = 1500 V, PIN 5 = PE
with 5 connecting cables 0.25 mm², plastic, degree of protection IP67, ambient temperature -40 to +85 °C

3SX5100-1SS51 - Plug connector (5-pin), M12, for M20 x 1.5

For maximum 60 V, 1.5 A, U_{imp} = 800 V, PIN 3 = PE

With 5 connecting cables 0.25 mm², degree of protection IP67, ambient temperature 25 to +85 °C

Connectors for SIMATIC

Suitable for wiring sensors to be connected to all compact block I/O modules in the SIMATIC ET 200eco PN, ET 200eco PN-F and ET 200AL series.

3SX5100-1SS05 - Plug connector (5-pin), M12, for M20 x 1.5

For max. 60 V, 1.5 A, U_{imp}= 800 V, without protective conductor

With 5 connecting cables 0.25 mm^2, degree of protection IP67, ambient temperature 25 to +85 °C

3SX5100-1SS08 - Plug connector (8-pin), M12 for M20 × 1.5

For maximum 30 V, 2 A, U_{imp} = 800 V
with 8 connecting cables 0.25 mm^2, plastic, degree of protection IP67,
ambient temperature -40 to +85 °C

3SX5601-3SB54 - Connecting cable with M12 socket, 4-pin, 5 m long with free cable end

For connection for position switch, with M12 connector

3SX5601-3SB55 - Connecting cable with M12 socket, 5-pin, 5 m long with free cable end

For connection for position switch, wired with M12 connector

4.3.12.3 Cable gland

The following cable gland can be used:

Cable gland M20 x 1.5

Plastic
3SX9926 (IP67) / 3SX5601-1A (IP69)

NOTICE
Use a seal. The seal that comes with the cable gland must be used.

4.3.12.4 Adapters

For NPT ½" thread, a cable entry adapter (M20 x 1.5 to NPT ½") made of metal or plastic according to , , and is available.

Metal
3SX9917

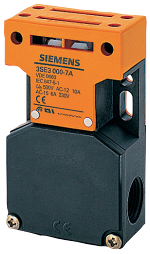
Plastic
3SX9918

4.3.12.5 Protective cover made of plastic

3SE5000-0AC30

Optional accessory for 3SE5 for rounded plunger according to EN 50047

4.4 3SE22 mechanical safety switches with separate actuation



Application areas of 3SE2257 and 3SE2243 safety switches

3SE2257 and 3SE2243 safety switches are used on protective grilles, covers and doors that have to be closed to warrant the required operational safety.

Note

Notes on actuator

Safety switches can only be used in combination with an appropriate actuator. The actuator must be ordered separately.

4.4.1 Actuator for 3SE22 safety switches with separate actuation

3SE22 safety switches can be supplied without actuators. The following actuators are available:

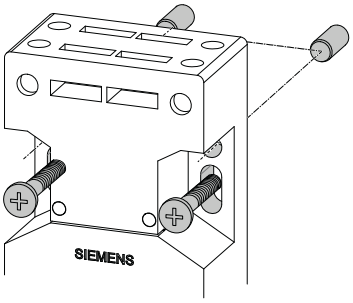
Actuators for 3SE22 safety switches

3SX3218	3SX3228	3SX3256	3SX3217	3SX3234
				
Standard actuator	Universal radius actuator	Radius actuator	Separate actuator with ball locating	Actuator
r_{rmin} = 150 mm, length 28 mm	r_{rmin} = 45 mm, length 34 mm	Radius adjustable, length 34 mm	Force adjustable up to max. 100 N by 2 screws, length 28 mm	with dust protection and slit cover, length 34 mm

4.4.2 Mounting instructions for 3SE22 safety switches with separate actuation

Please observe the following mounting instructions when installing 3SE2243 / 3SE2257 position switches:

Mounting with fixing bolts



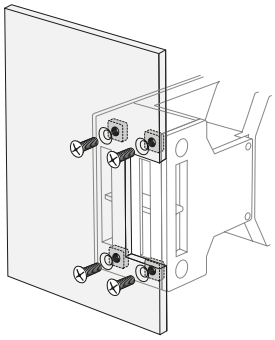
To avoid shifting on approach from above, optional fixing bolts can be used for precise adjustment.

When the device is replaced, an exact position is kept to and readjustment is not necessary.

The switch must be additionally fastened with two screws.

Front plate mounting

The 3SE22 safety switch with separate actuation can be mounted on a front plate with four screws.



Actuator

Note

Use appropriate measures (one-way screws, bonding, boring of screw heads, rivets) to secure the actuator permanently and prevent it being moved.

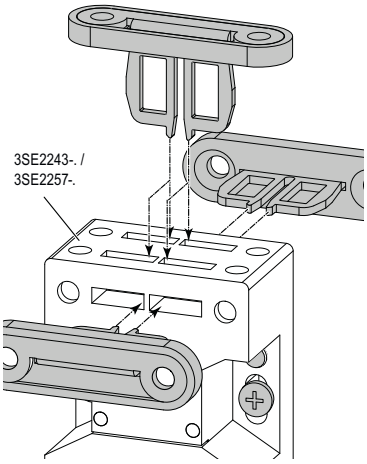


Figure 4-4 Possible approach directions of actuators

Radius actuator

Lateral (a) and vertical (b) presetting are possible for the radius actuator.

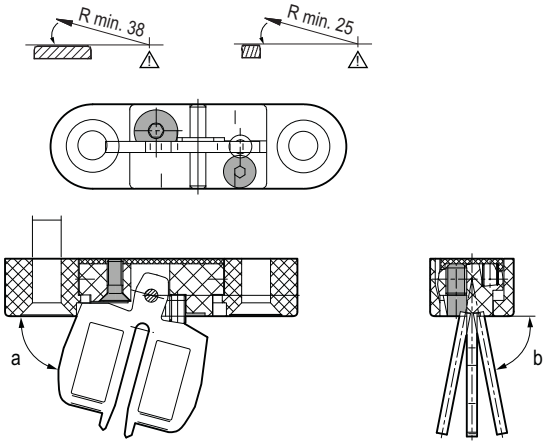


Figure 4-5 Default settings for the radius actuator

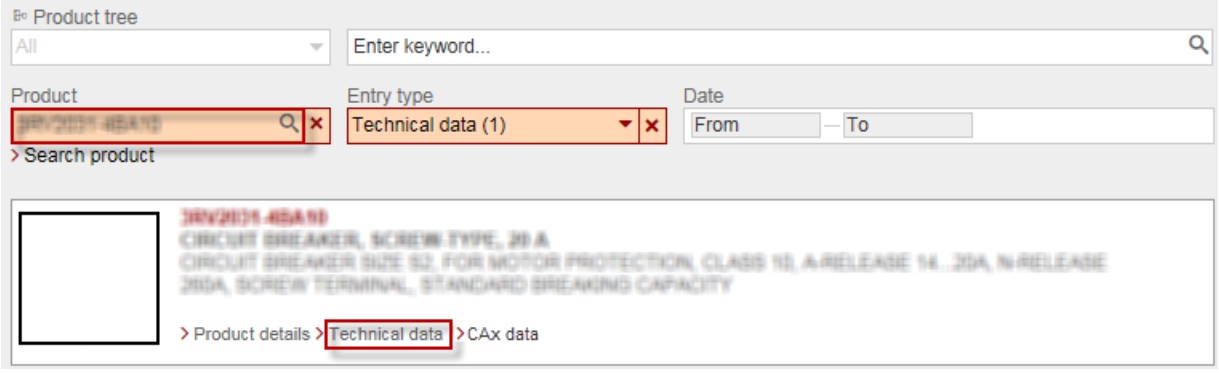
4.4.3 Technical data

4.4.3.1 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.

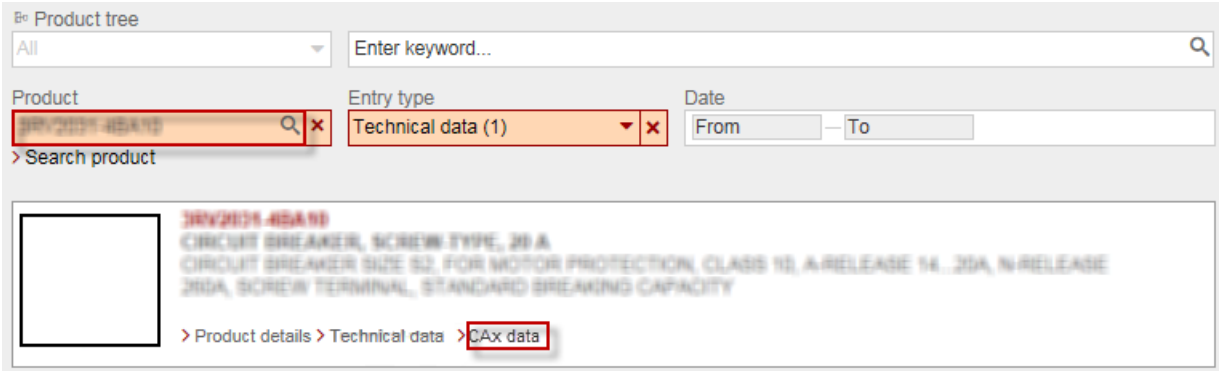


4.4.4 Dimension drawings and operating travel diagrams

4.4.4.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "CAx data link.



4.4.4.2 Extract from the technical specifications

3SE22 safety switches with separate actuation

Note

The information in the extract from the technical specifications is not subject to the change service. For current values, refer to Technical Data Sheet.

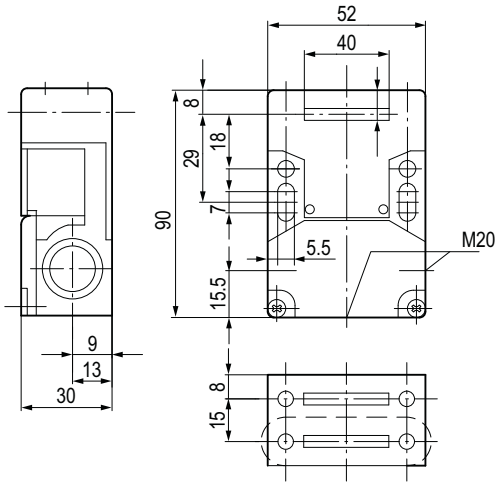


Figure 4-6 3SE2243 safety position switch with separate actuator with lateral and front actuation

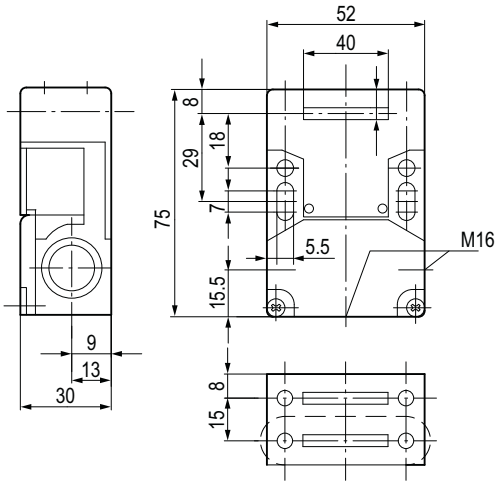


Figure 4-7 3SE2257 safety position switch with separate actuator with lateral and front actuation

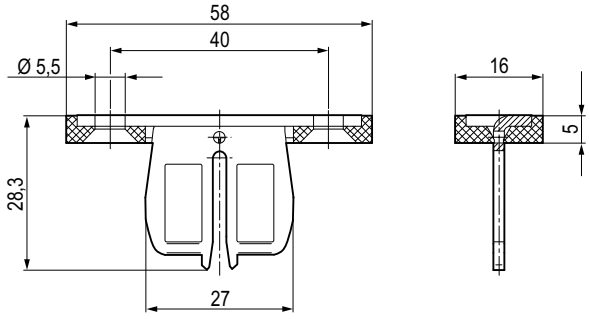


Figure 4-8 3SX3218 standard actuator

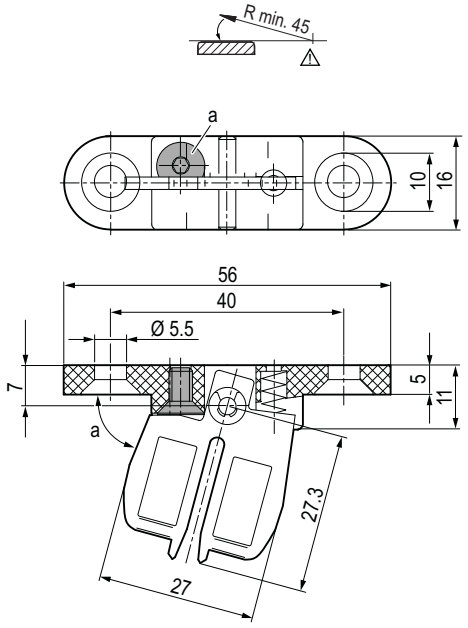


Figure 4-9 3SX3256 radius actuator, radius adjustable

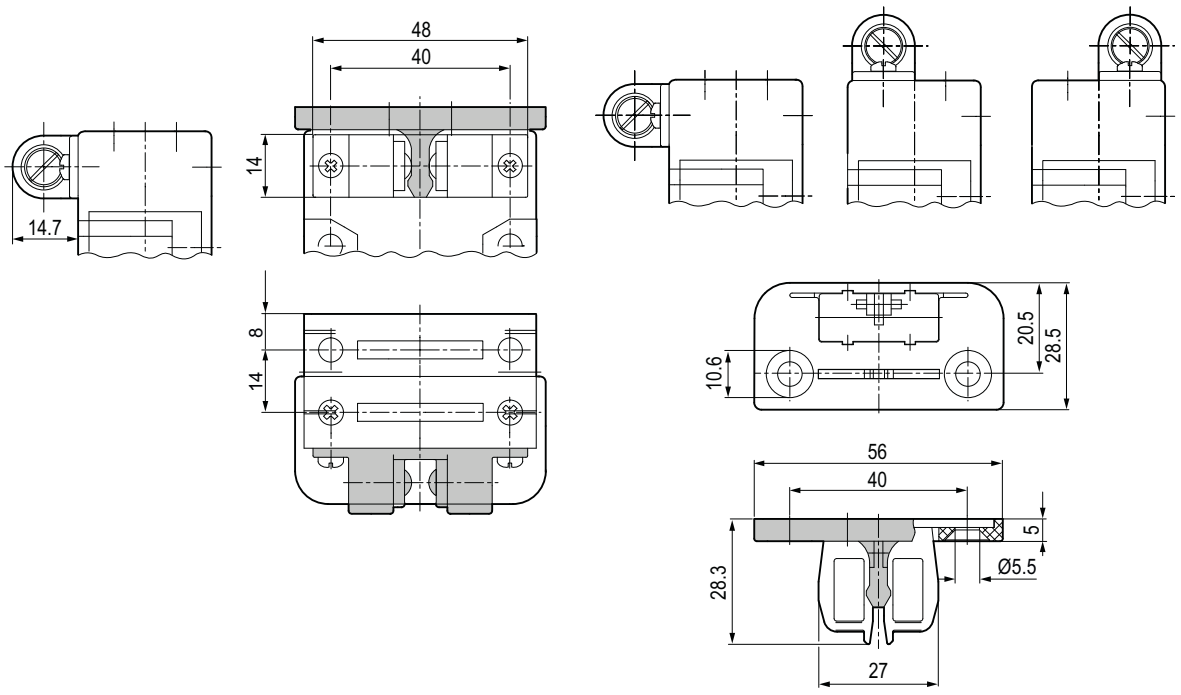


Figure 4-10 3SX3217 separate actuator with ball locating

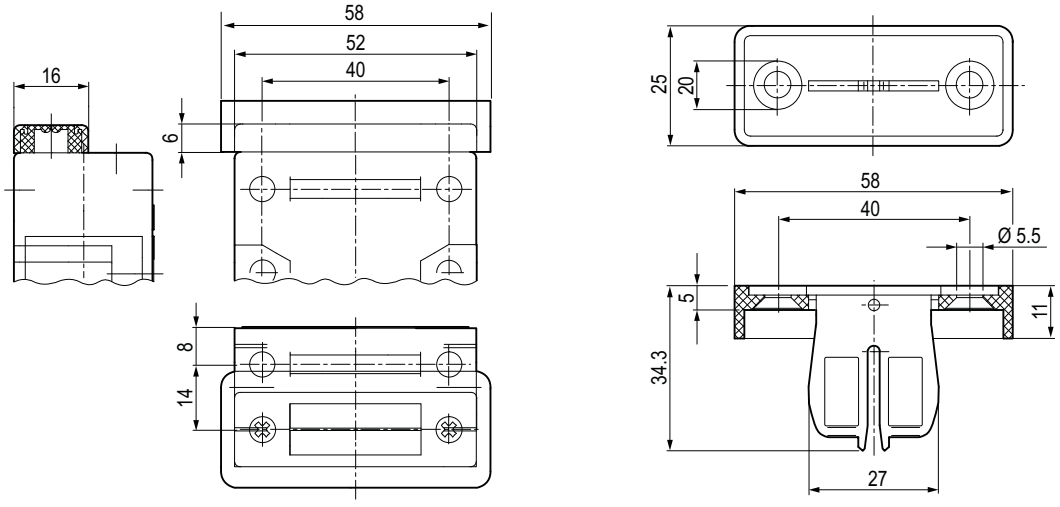


Figure 4-11 3SX3234 separate actuator with dust protection and slit covers

Figure 4-12 3SE2257-6XX

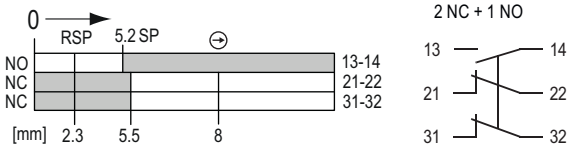


Figure 4-13 3SE2243-0XX

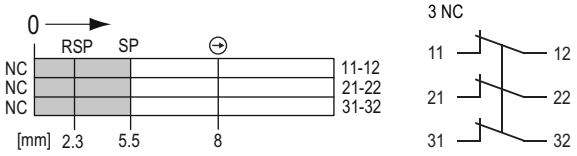


Figure 4-14 3SE2243-6XX

NC	NC contact
NO	NO contact
⊕	Positive opening operation
SP	Switching point
RSP	Switching-back point
▭	Contact element closed
▭	Contact element open

4.5 3SE5 mechanical safety switches with separate actuator and without tumbler

The mechanical safety switches with separate actuator without tumbler are used for applications where the position of doors, covers, or protective grilles must be monitored for safety reasons.

The 3SE5...-..V.. position switches with separate actuator have the same enclosure as the 3SE5 mechanical position switches (modular system).

Note

Notes on actuator

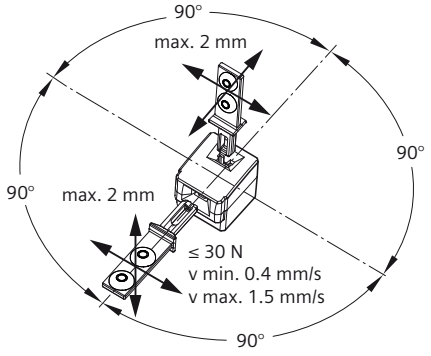
Safety switches can only be used in combination with an appropriate actuator. The actuator must be ordered separately.

You will find additional information on applications in Chapter Application example of safety switch without tumbler (Page 261).

Versions for operating temperatures down to -40 °C can be ordered with the qualifiers -1AJ0, -1AJ1 (shock and vibration test in accordance with rail standard EN 61373) or -1AY0 (e.g. 3SE5232-0LE10-1AY0). For more information, see Chapter Extreme temperatures (Page 290).

4.5.1 Actuator head and actuators

- The actuator head is included in the scope of delivery.
- For actuation from four directions, it can be offset by 4 × 90° (applies only to position switches with separate actuator).
- The switches can also be approached from above.
- The actuator is not included in the scope of delivery of the position switches and must be ordered separately.
- You can choose from several variants made of die-cast zinc or stainless steel, depending on the application.
- The actuator is coded. This prevents simple tampering by hand or with tools.

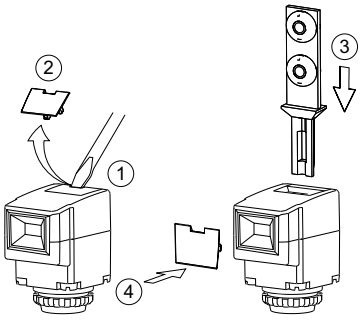


Axial and lateral actuation (4 × 90°)

Minimum force requirement in direction of actuation 30 N (when withdrawing)

Actuation from above

In the delivery state there is a protective cover on top of the actuator head. If you would like to insert the actuator from above, proceed as follows:

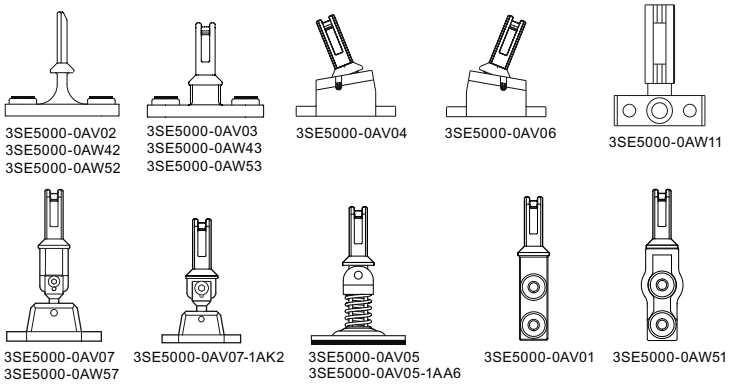


1. / 2. Remove the protective cover on the actuator head using a flat screwdriver.

3. Insert the actuator from above into the actuator head.

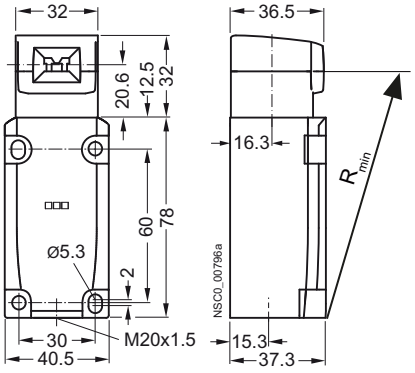
4. Fit the protective cover on the front of the actuator head.

4.5.2 Actuator variants for safety switches with separate actuation without tumbler



4.5.3 Combinations with actuators

Minimum actuation radius without tumbler



Article number of actuator	R_{min}[mm]
3SE5000-0AV01	400
3SE5000-0AV02	400
3SE5000-0AV03	400
3SE5000-0AW11	400
3SE5000-0AW42	400
3SE5000-0AW43	400
3SE5000-0AW51	400
3SE5000-0AW52	400
3SE5000-0AW53	400
3SE5000-0AV04	400
3SE5000-0AV05	150
3SE5000-0AV05-1AA6	150
3SE5000-0AV06	400

Minimum actuation radius without tumbler	
3SE5000-0AV07 3SE5000-0AW57	150
3SE5000-0AV07-1AK2	150

4.5.4 Actuator assembly

The actuators for safety switches with separate actuator with or without tumbler are identical. The 3SE5000-0AW11 plastic actuator is an exception to this. This can only be used for versions without a tumbler.

NOTICE
Risk of property damage. **The position switch can be damaged.** To maintain the level of safety, the actuators are permitted to be used only in combination with the associated safety switch. The actuators must be ordered separately. Assemble the position switch and actuator in such a way that the actuator can move into the actuator head within the insertion tolerances < 2 mm (see Actuator head and actuators (Page 137)).

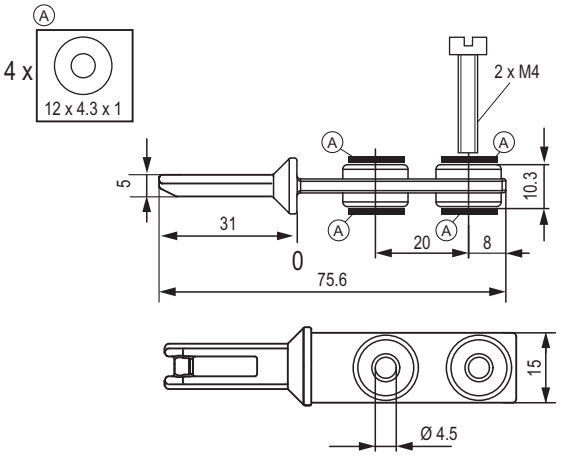
Note

Extreme environmental conditions

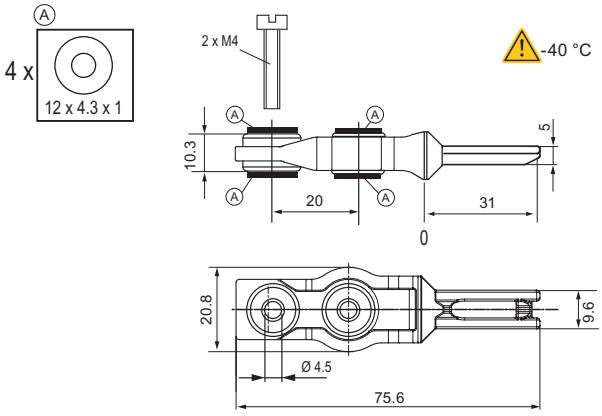
The variant made of stainless steel (3SE5000-0AW..) is recommended for extreme environmental conditions and increased break resistance.

Standard actuator

3SE5000-0AV01



3SE5000-0AW51 (stainless steel)

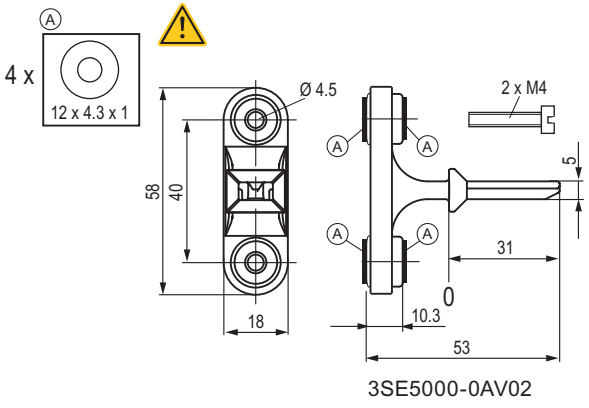


The 3SE5000-0AW51 stainless steel version has optimized geometry and is suitable for extreme environmental conditions down to -40 °C.

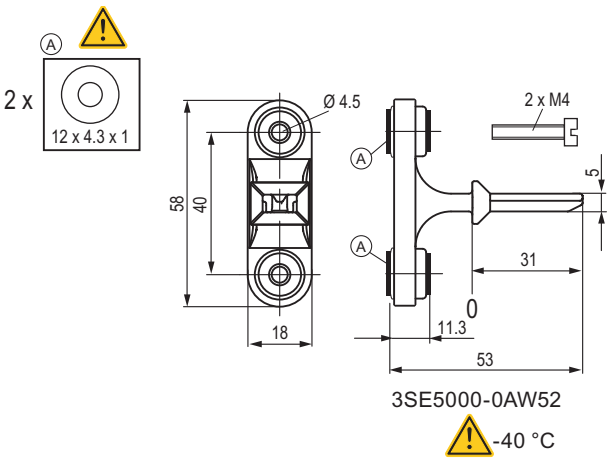
NOTICE
Risk of damage to the actuator and switch. When mounting the actuator, use the four washers included on the upper and lower sides of the rubber sleeves. Never remove the barrels that are located inside the rubber sleeves.

Actuators with vertical and horizontal mounting

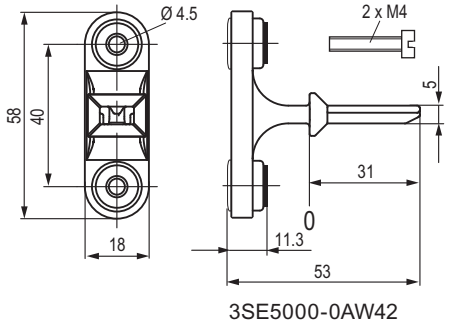
Actuator with vertical mounting 3SE5000-0AV02



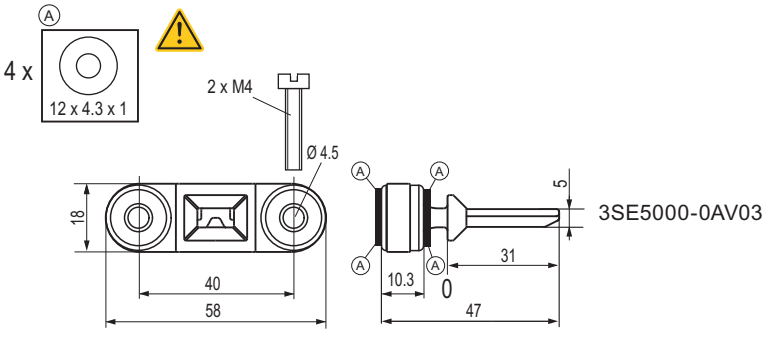
3SE5000-0AW52 (stainless steel)



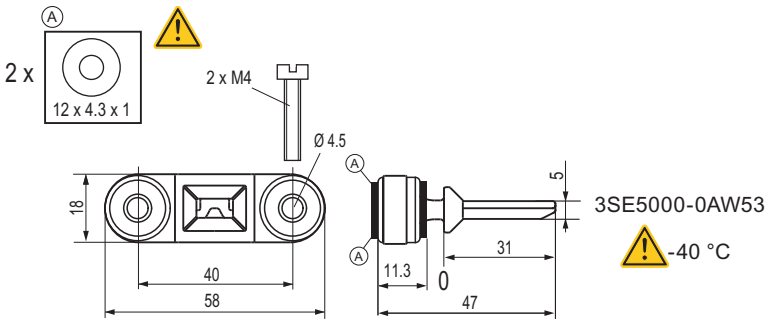
Actuator with vertical mounting with stainless steel flanged sockets 3SE5000-0AW42



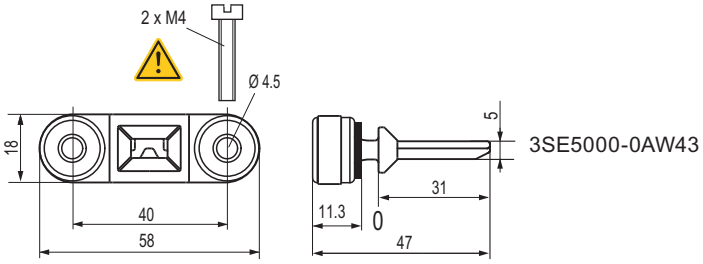
Actuator with horizontal mounting 3SE5000-0AV03



3SE5000-0AW53 (stainless steel)

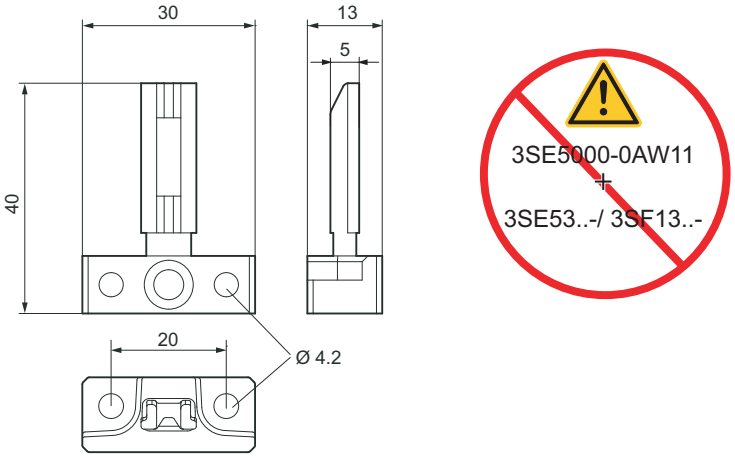


Actuator with horizontal mounting with stainless steel flanged sockets 3SE5000-0AW43



NOTICE
Risk of damage to the actuator and switch.
No washers need to be used for the actuators with flanged sockets.
Never remove the integrated flanged sockets.

Plastic standard actuators 3SE5000-0AW11



⚠ WARNING

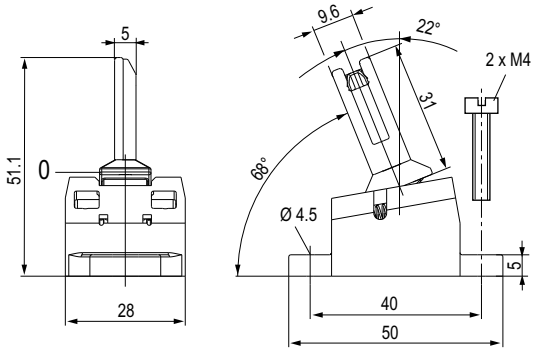
Improper use may cause a risk of death.

Do not use the 3SE5000-0AW11 actuator for the following safety position switches with tumbler: 3SE5322-..... / 3SE5312-.... and 3SF1324-.... / 3SF1314-....

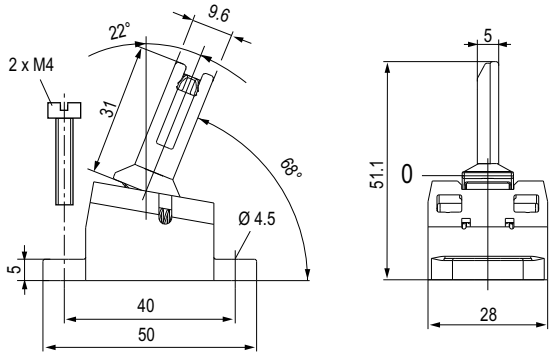
Radius actuator

The position switches with radius actuator are especially well-suited for rotatable protective devices. The movable operating key enables the switch to approach even in the case of small actuating radii. Damage to the switch and actuator as a result of imprecise approaching is avoided.

- **Approach from left** 3SE5000-0AV04



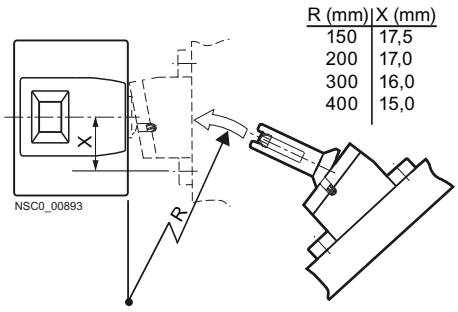
- **Approach from right** 3SE5000-0AV06



Note

Observe settings.

Observe the radii (R) and suitable distances (X) from the following table.



Radius actuator

Setting the radius actuator

1. Release the actuator's screws.
2. Insert the actuator at the required angle.
3. Fix the actuator in place by tightening the screw.

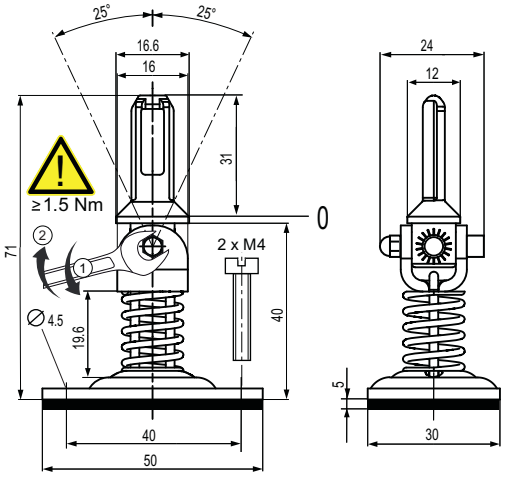
Note

Pay attention to the torque.

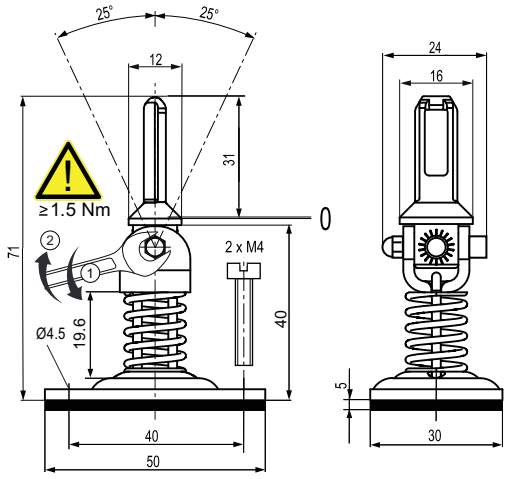
When setting the actuation angle, you must tighten the fixing screw to at least 1.5 Nm.

Universal radius actuator

3SE5000-0AV05

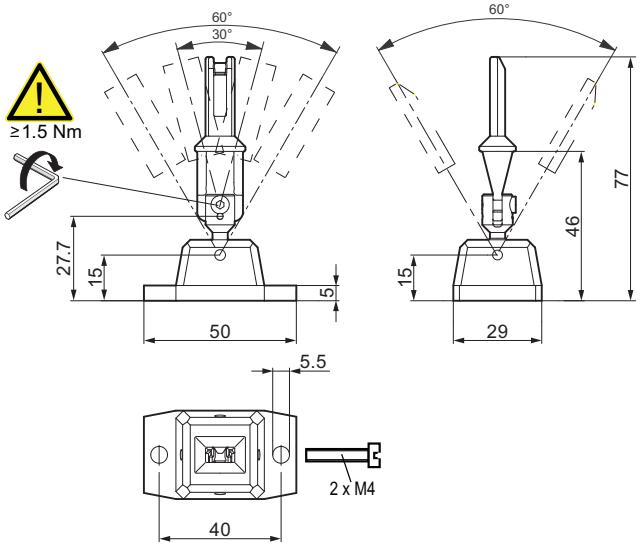


3SE5000-0AV05-1AA6

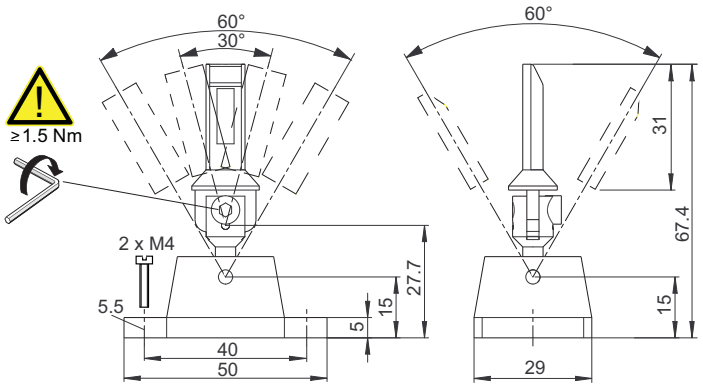


Heavy Duty 3SE5000-0AV07

3SE5000-0AW57 (stainless steel)



Heavy Duty 3SE5000-0AV07-1AK2



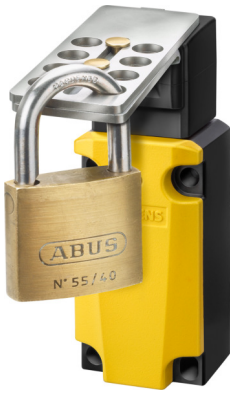
4.5.5 Accessories for safety switches with separate actuation

The accessories for safety switches with separate actuator with and without tumbler are identical.

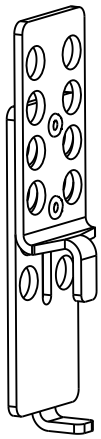
Lock insert 3SE5000-0AV08-1AA3

To ensure safety of several persons in the work zone (prevention of unauthorized commissioning), a stainless steel lock insert that accommodates up to eight padlocks is offered.

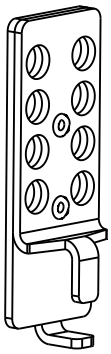
The lock is not included in the scope of delivery.



Lock insert with padlock



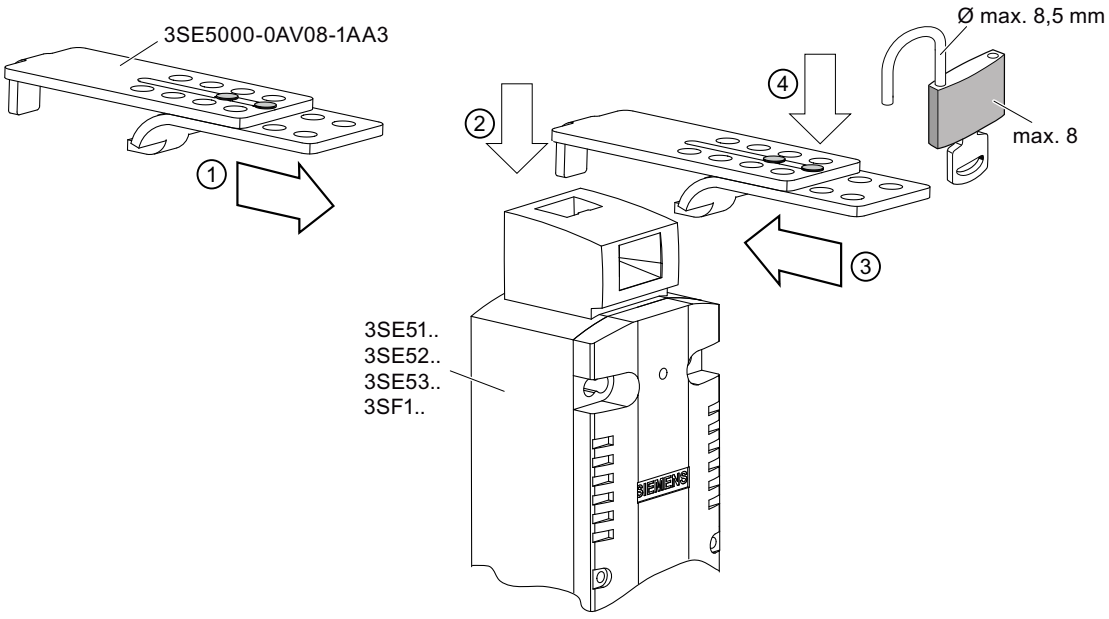
Lock insert, open



Lock insert, closed

Installing a lock insert

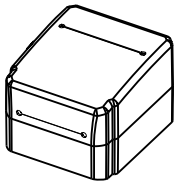
The 3SE5000-0AV08-1AA3 stainless steel lock insert prevents unauthorized commissioning of the position switch.



1. Pull the lock insert apart as far as the endstop.
2. Place the lock insert on the actuator head.
3. Push the locking plate into the actuator head as far as the stop.
4. Secure the position with a lock (1 to 8 locks).

Dust cap 3SE5000-0AV08-1AA2

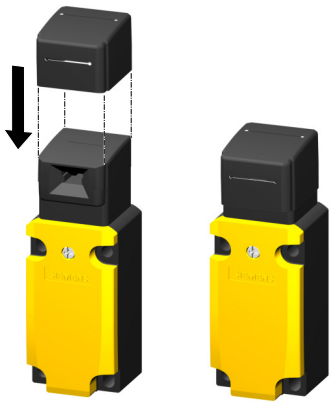
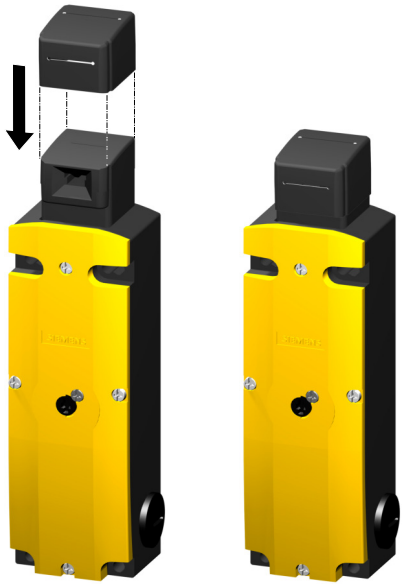
For use in dusty environments, a protective cap is offered that protects the actuator entries of the actuator head from dirt.



Note

Proper attachment of dust cap.

Make sure when attaching the dust cap that its slots are located at the top and front of the actuator head.

3SE5112-0QV10	3SE5312-0SD11
	

Note

You can use the dust cap for enclosure widths of 40 mm and 56 mm.

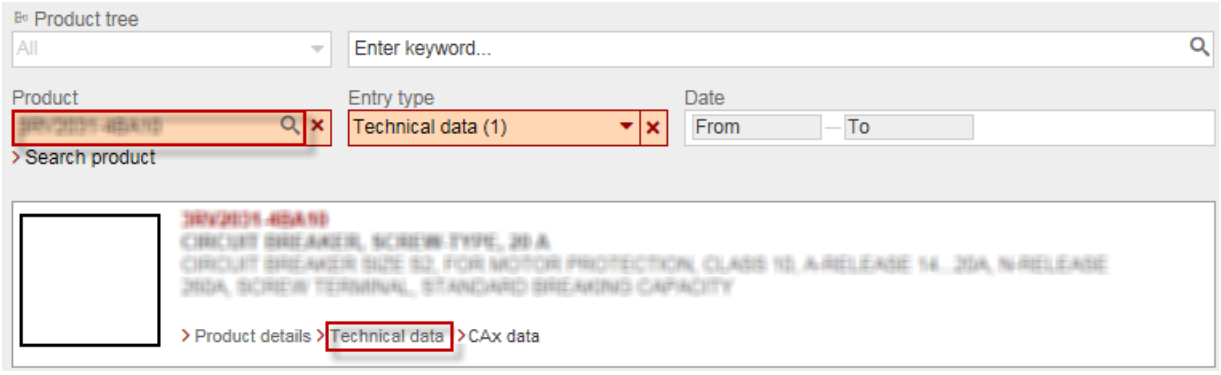
4.5.6 Technical data

4.5.6.1 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.

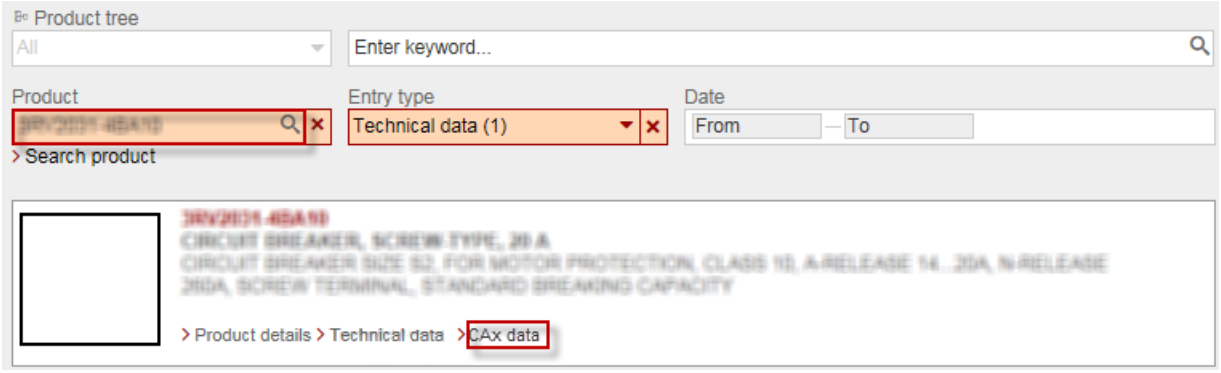


4.5.7 Dimension drawings and operating travel diagrams

4.5.7.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "CAx data link.



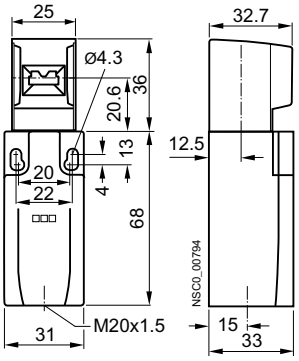
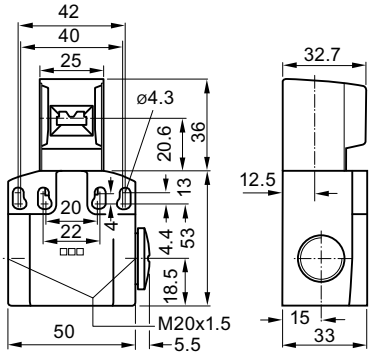
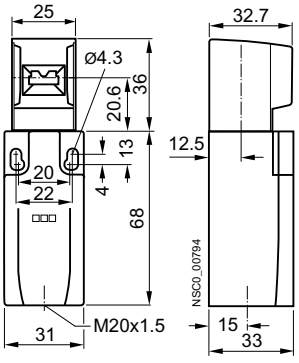
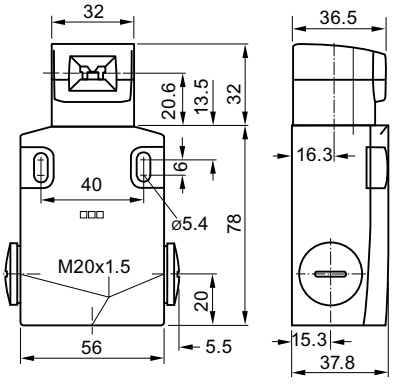
4.5.7.2 Extract from the technical specifications

Dimension drawings

Note

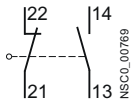
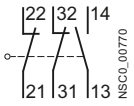
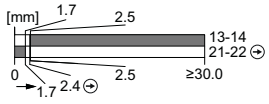
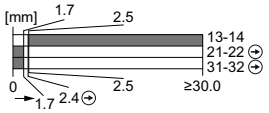
The information in the extract from the technical specifications is not subject to the change service. For current values, refer to Technical Data Sheet.

3SE5 mechanical safety switches with separate actuation - complete units

Enclosure according to EN 50047	
Enclosure width 31 mm 3SE523.-.QV40, 3SE523.-.RV40 (plastic) 3SE521.-.QV40, 3SE521.-.RV40 (metal)	Enclosure width 50 mm 3SE524.-.QV40, 3SE524.-.RV40 (plastic)
	
Enclosure acc. to EN 50041	
Enclosure width 40 mm 3SE511.-.QV10, 3SE511.-.RV10 (metal) 3SE5132-0QV20 (plastic)	Enclosure width 56 mm 3SE512.-.QV10, 3SE512.-.RV10 (metal)
	

Operating travel diagrams

The operating travel diagrams for position switches with separate actuator with and without tumbler are identical.

Slow-action contacts	
1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
With lateral/axial actuation	
3SE5...-.RV..  	3SE5...-.QV.. 

⊕ Positive opening operation according to EN 60947-5-1
→ Direction of actuation
▭ Contact element closed
▭ Contact element open
≥ Minimum actuator travel
Actuator in actuator head = Normally closed contact is closed

4.6 3SE5 mechanical safety switches with separate actuation with tumbler

Safety switches with separate actuator and additional electromagnetic tumbler are used when the shutdown of machines calls for closed protective doors. For example, this is the case when protecting the work zone of a robot system.

An integrated auxiliary magnet keeps the protective door locked until a specific signal is received. The actuator cannot be withdrawn with a pulling force of up to 2600 N for metal variants and up to 1300 N for plastic variants. A safety locking mechanism also ensures that the normally closed contacts of the magnet are never closed while the door is open. The switch can be released manually using an auxiliary release mechanism if, for example, access is required following a power failure or during installation.

Properties

- Integrated tumbler with 24 V, 115 V, or 230 V coil voltage
- Standard equipment with 6 switching contacts
  (actuator 1 NO + 2 NC; solenoid 1 NO + 2 NC)
- Separate evaluation of the magnet position and the protective door position
- Optical signaling devices enable reliable status monitoring

Safety switches with tumbler are special safety-related devices that prevent accidental or intentional opening of protective doors, protective grilles, or other covers as long as dangerous conditions exist, e.g., follow-on motions of shut-down machines.

Safety switches with tumbler consist of a switch part with electromechanical tumbler and a mechanical actuator, which must be ordered separately. These rugged protective devices provide the greatest possible safety for humans and machines. The safety switches with tumbler are offered with a plastic or metal enclosure.

Dimensions (W × H × D)

- 3SE53: 54 mm × 185 mm × 43.5 mm

Versions for operating temperatures down to -40 °C can be ordered with the qualifiers -1AJ0, -1AJ1 (shock and vibration test in accordance with rail standard EN 61373) or -1AY0 (e.g. 3SE5232-0LE10-1AY0). For more information, see Chapter Extreme temperatures (Page 290).

Safety function according to ISO 14119

In accordance with ISO 14119, the safety switches with tumbler are type 2 devices with a low coding level. The position switch can only be switched with the associated triple-coded actuator.

Safety function A: interlock

Position monitoring for a guard on a machine. The mechanical actuator is mounted on the guard. When the guard is opened, the mechanical actuator is pulled out of the safety switch and the safety contacts of the actuator contact block (11-12 and 21-22) are positively opened. These safety contacts are monitored in the subsequent controller or evaluation unit. Simple overruling by hand or auxiliary devices is impossible.

Safety function B: tumbler

The guard is held shut during a hazardous machine function. During this time, the actuator cannot be removed from the safety switch until the controller has issued the enabling signal (to operate the magnet). The position of the tumbler is monitored via the contacts of the magnet contact block (41-42, 51-52, 63-64). The position of the tumbler's contacts should be fed back to the controller, where they should be compared with the magnet's control signal for plausibility.

Protection from manipulation

Mechanical safety switches with separate actuator offer "Protection against easy bypassing". Actuation with a simple tool (e.g., screwdriver) and other aids (e.g., wires, pencils, adhesive tape) is not possible.

Exception

Removal of components of the safety switch or separate actuator, as well as jumpering of the switching contacts, is regarded as a deliberate action and not as "easy bypassing".

Coding

The separate actuator is triple-coded and acts like a key. Once an actuator and switch are functionally joined together (protective device closed), a machine or plant can begin operation. When the protective device is opened, a positively-locking, positive-opening operation of the normally closed contacts becomes operative. The switching contact remains positively opened until the actuator is inserted again. Additional expenses for, e.g., an approach rod or switching cam, as is necessary for conventional position switches, as well as shielding measures for tamper protection, do not apply in the case of the switches. Installing the switch on the machine at a location that is as concealed and inaccessible as possible provides additional protection against manipulation.

⚠ **WARNING**
Improper use may cause a risk of death.
You must not use the 3SE5000-0AW11 actuator for safety switches with tumbler.

The actuator head is included in the scope of delivery. It can be offset by 4 × 90 ° to allow actuation from four directions. The 3SE53 switches can also be approached from above.

The actuator is not included in the scope of delivery of the position switches and must be ordered separately. There are 14 variants to choose from, depending on the application.

Actuation data:

- Maximum actuating speed v_{max} = 1.5 m/s
- Minimum actuating speed v_{min} = 0.4 mm/s
- Minimum force in direction of actuation F_{min} = 30 N

Operation

Safety switches with tumbler can only be switched with the associated triple-coded actuator. This prevents simple tampering by hand or with tools.

The normally closed contact is positively opened and the normally open contact is closed by pulling the actuator.

Insertion guides

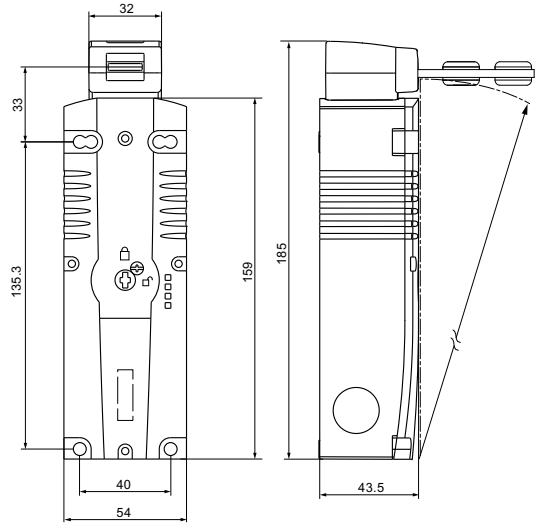
For large doors, insertion funnels/guides for positioning of switches must be used.

4.6.1 Actuator head and actuators

See Chapter Actuator head and actuators (Page 137).

4.6.2 Combinations with actuators

Minimum actuation radius with tumbler



Article number of actuator	R_{min} [mm]
3SE5000-0AV01	400
3SE5000-0AV02	400
3SE5000-0AV03	400
3SE5000-0AW42	400
3SE5000-0AW43	400
3SE5000-0AW51	400
3SE5000-0AW52	400
3SE5000-0AW53	400
3SE5000-0AV04	400
3SE5000-0AV05	150
3SE5000-0AV05-1AA6	150
3SE5000-0AV06	400
3SE5000-0AV07 3SE5000-0AW57	150
3SE5000-0AV07-1AK2	150

4.6.3 Actuator

The actuators for safety switches with separate actuator with or without tumbler are identical. The 3SE5000-0AW11 plastic actuator is an exception to this. This can only be used for versions without a tumbler.

For more information, see Chapter Actuator assembly (Page 141).

Contact block

The safety switches with tumbler have two contact blocks, each with two positive-opening normally closed contacts and one normally open contact (terminal markings according to EN 50013).

Note

The safety switches with tumbler have one contact block each for the following:

- Monitoring the actuator or position of the protective door
- Monitoring the position of the magnet

The mechanical design of the switch corresponds to the requirements of the fail-safe principle according to ISO 14119.

4.6.4 Interlock types

There are two versions for interlocking the actuator:

- **Spring-locked** (closed-circuit principle): Actuator inserted and mechanically interlocked. Actuator is released by applying voltage to the magnet or, in the case of voltage drop, by means of a manual or key-operated auxiliary release mechanism (version-dependent). Release variants:
  - Auxiliary release
  - Key-operated release
  - Emergency release
  - Escape release
- **Solenoid-locked** (open-circuit principle): Actuator released. Actuator is interlocked by applying voltage to the magnet. Actuator is released by switching off the voltage applied to the magnet.

Note

Risk analysis

Tumblers based on the open-circuit principle may only be used if the application's risk analysis shows that use of closed-circuit current variants is not possible. An identical safety level must be established by suitable measures.

Interlock variants

See Interlock variants for 3SE5 safety switches with separate actuation with tumbler (Page 159)

4.6.5 Interlock variants for 3SE5 safety switches with separate actuation with tumbler

For emergency situations or for setup mode, the spring-locked switch is equipped with an auxiliary release. The following variants are available as options (3SE5 only):

- An escape release, or
- An emergency release

Auxiliary release

3SE53.2-0SD2.

Note

The auxiliary release may only be used when the tumbler fails.

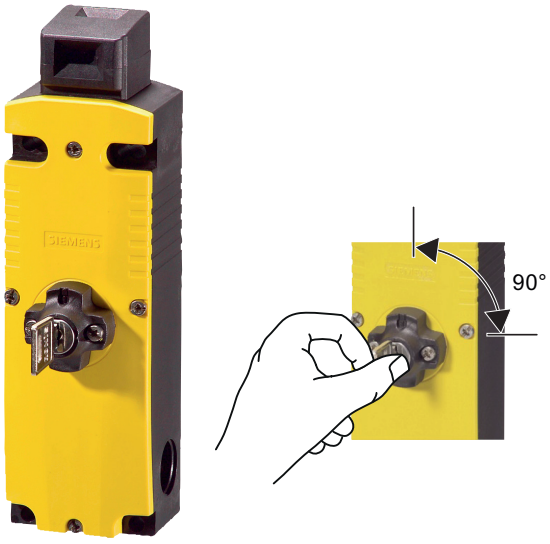
DANGER

Risk of death. Possibility of unauthorized use.

The switch can be manipulated.

Seal the access point of the auxiliary release following installation.

Auxiliary release with lock

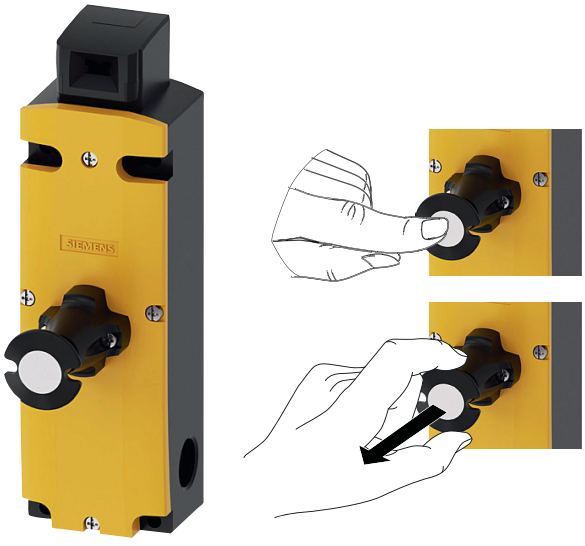


3SE53.2-0SE2.

Rotation of the key of the key-operated auxiliary release by an authorized person releases the tumbler. The actuator is released for withdrawal.

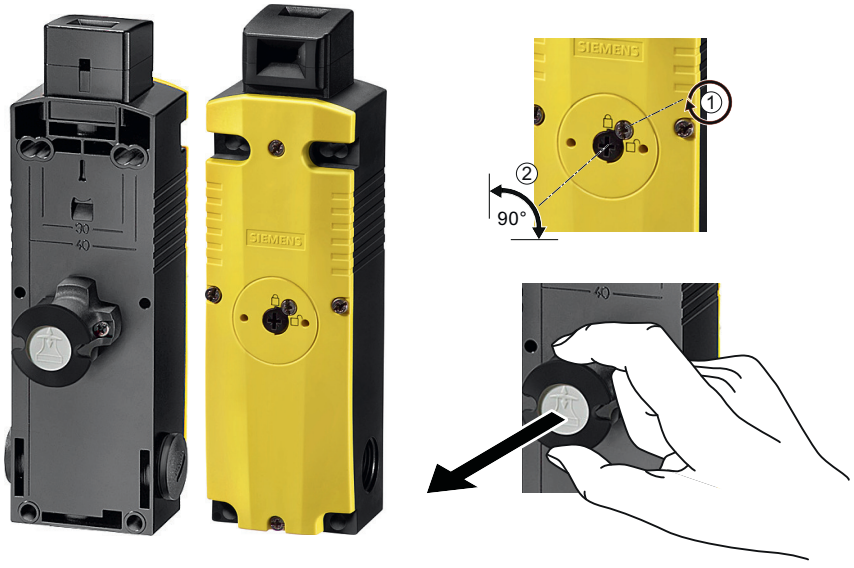
Eliminate the dangerous situation. An authorized person resets the device to operating mode by turning the key (clockwise). The key can be withdrawn.

Front escape release



3SE53.2-0SF2.

Rear escape release and front auxiliary release

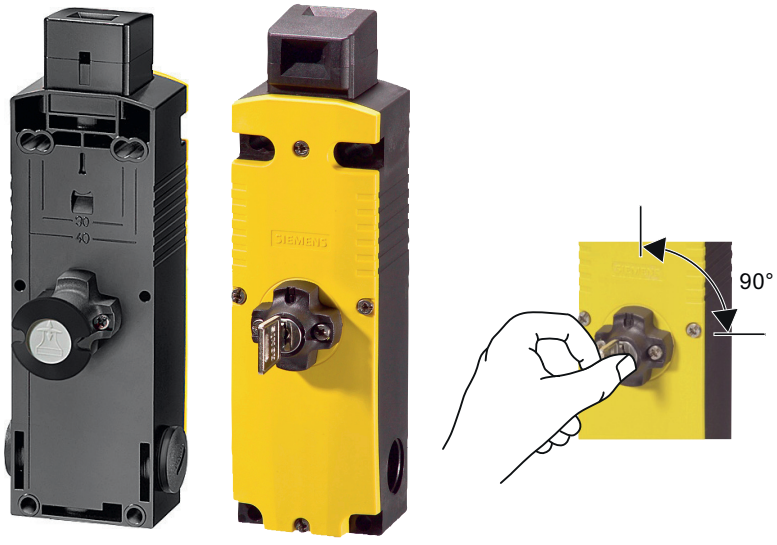


3SE53.2-0SG2.

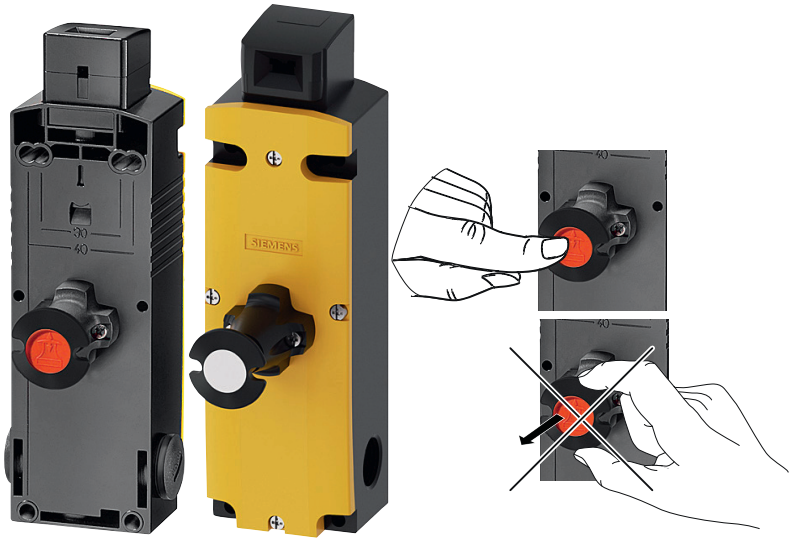
The escape release is intended for use cases in which the possibility for escape or rescue of persons is required. Its purpose is to release the safety interlock without an auxiliary tool in dangerous situations.

A deliberate action on the device is required to cancel the block and restore the ready-to-operate condition.

Escape release at rear, auxiliary releases with lock at front



Emergency release at rear, escape release at front



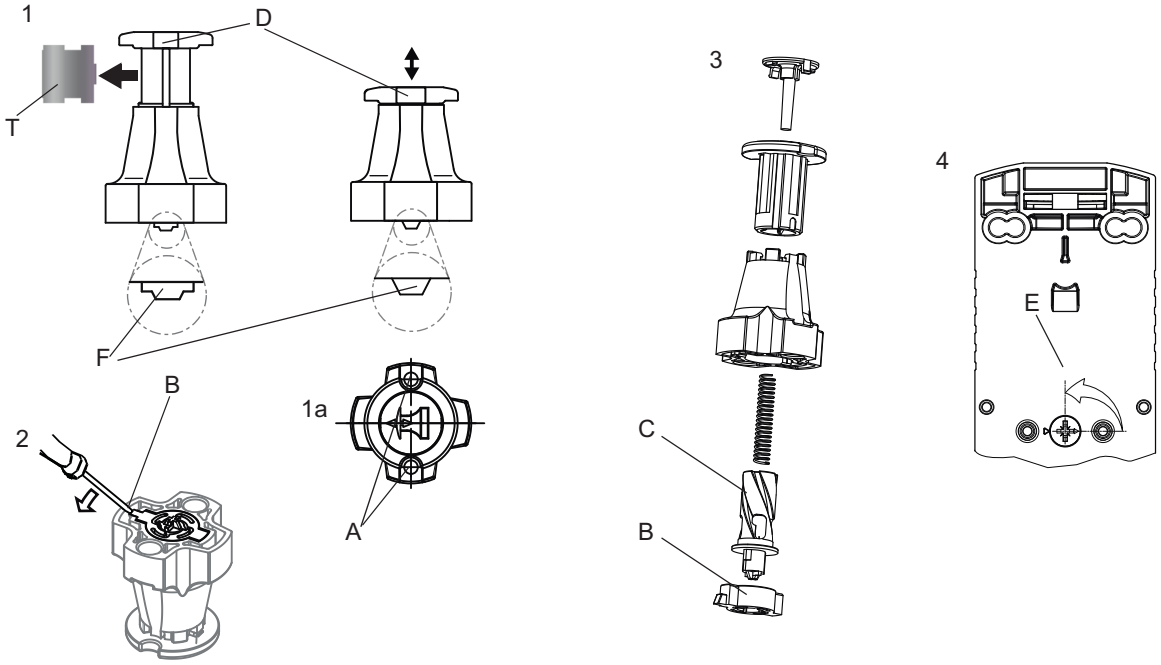
3SE5322-0SL21, 3SE5322-0SL21-1AJ0 (for -40 °C)

Manual activation of the emergency pushbutton by any person in the danger zone releases the tumbler. The actuator is released for withdrawal.

Safety switches equipped with the escape release option must be installed within the danger zone. The escape release may only be operated to allow a person to exit the danger zone in the event of a system failure.

Emergency release

The emergency release enables someone in an emergency situation to manually release a position switch with tumbler and thus to open a protective device without tools from the access side (of the hazardous area). The transport lock (T, Fig. 1) must be removed before commissioning! Pressing the emergency release (red pushbutton D, Fig. 1) causes mechanical release of the tumbler and opens the NC contacts (closes the NO contacts) for monitoring the interlock.



Note

Resetting the emergency release

Only authorized persons may reset the emergency release.

It is imperative to adhere to the following work steps and resetting must be done according to the mounting position (Fig. 3):

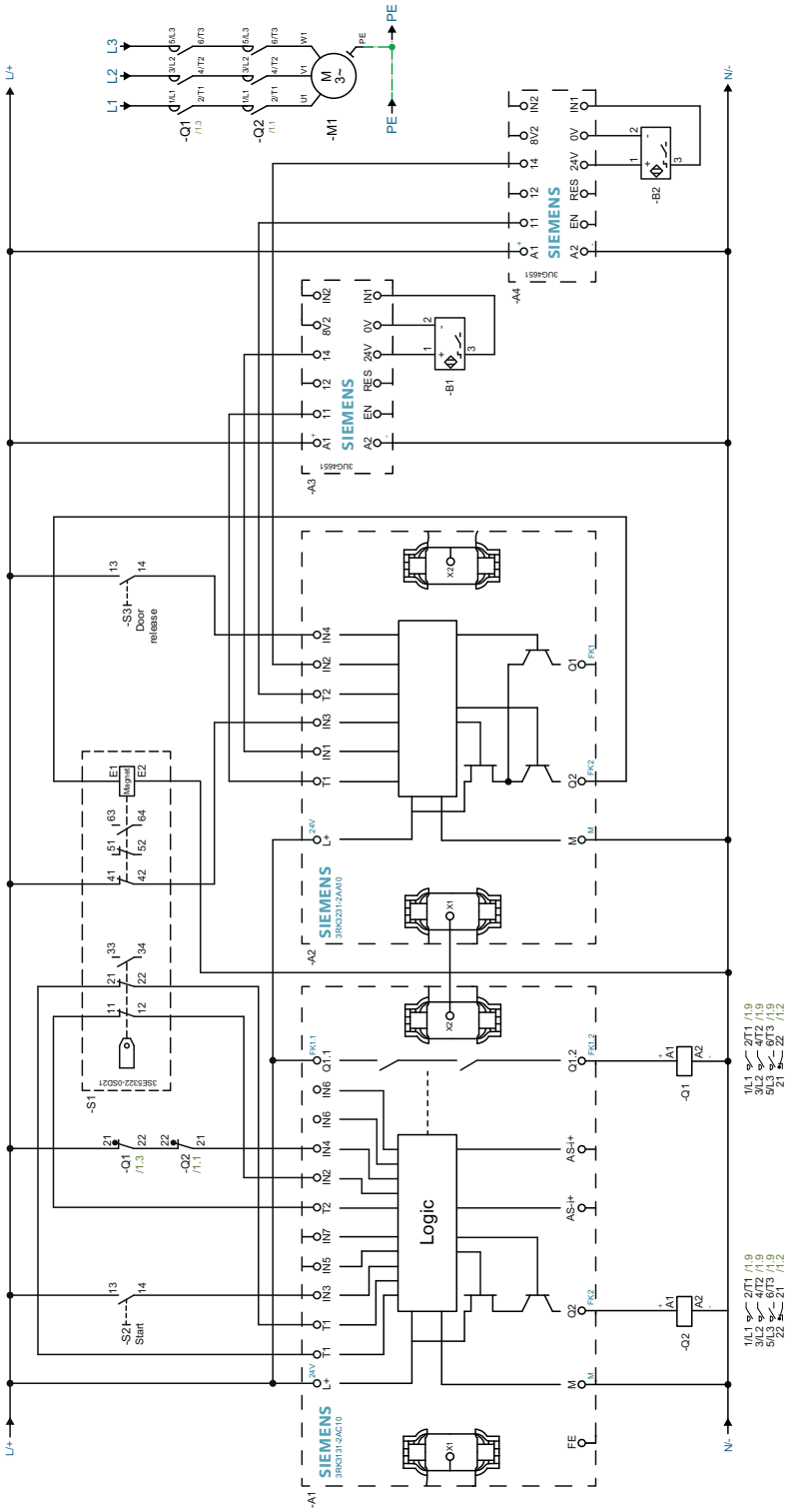
1. Release the screws (A) (Fig. 1a).
2. NOTICE: Turn the release (E) on the position switch (Fig. 4) by 90° to the left (reset).
3. Lever out the locking ring (B) (Fig. 2).
4. Press the plunger (C) into the emergency release (Fig. 3) and turn it to the right (90°). The plunger is released (do not pull it out fully).
5. Pull out the pushbutton (D) completely up to the endstop (Fig. 1).
6. Push the plunger (C) back in again and press in the locking ring (B) down to the endstop (Fig. 2).
7. NOTICE: Note the key position (F).
8. Screw on the emergency release again.

4.6.6 Typical circuit diagram with evaluation unit in accordance with SIL2

Note

The control signal of the tumbler must be checked for consistency (cross-check of the tumbler contact block and the control signal for solenoid operation).

The tumbler contact block can only switch to the "locked" state if the actuator is plugged in.


L+
M-
L1
L2
L3
PE
-Q1
-Q2
-M1
-A4
-B2
-A3
-B1
-S3
Door release
-S1
-S2
Start
-A2
-A1
Logic
-Q1
-Q2

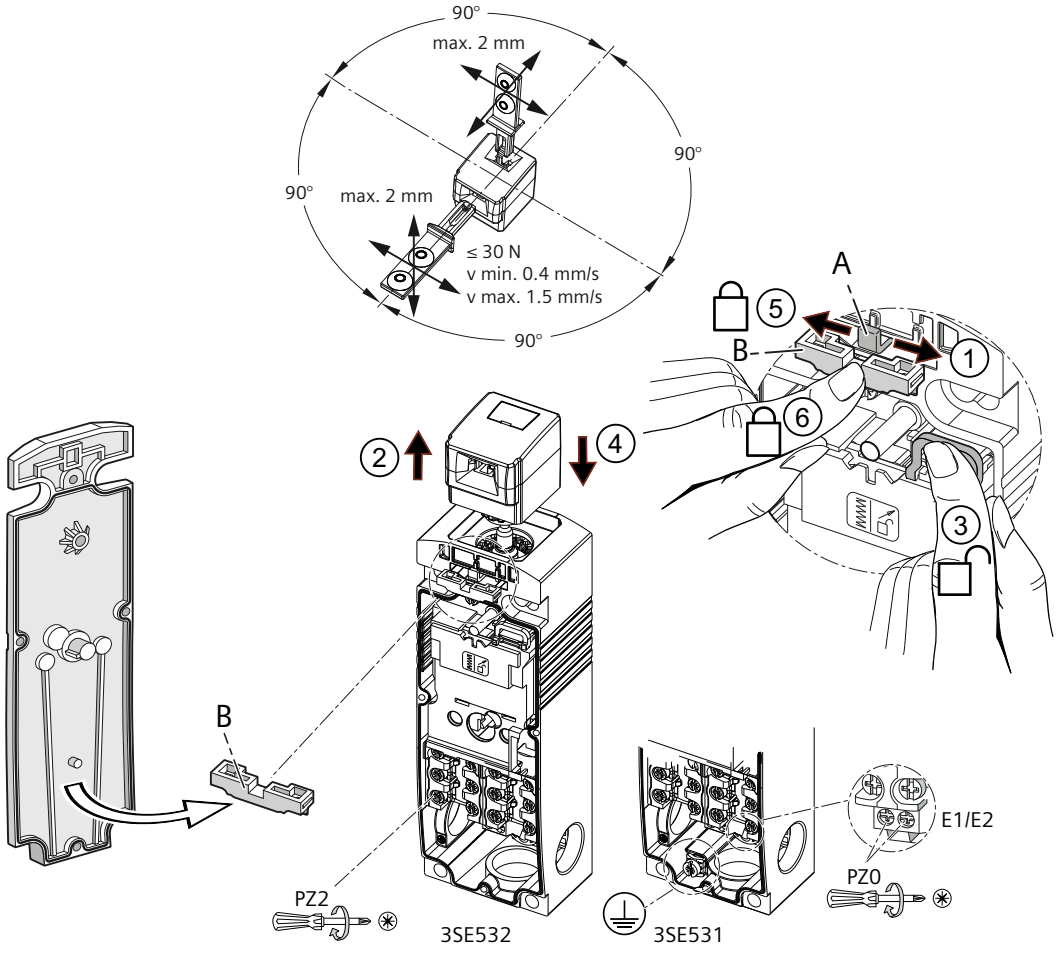
4.6.7 Installing and securing the actuator head

Installing/removing the actuator head

Note

Please observe misalignment!

Any misalignment when inserting the actuator must be less than 2 mm. The actuator head can be rotated in 90-degree steps.



1. Release the actuator head by sliding the locking plate **(A)** to the right.
2. Pull the actuator head out upwards.
3. Press the auxiliary release lever.
4. Reinsert the actuator head.

5. Lock the actuator head back into place by sliding the locking plate to the left into the middle position. The actuator head is locked in place.
6. To secure the locking plate , push in the filler **(B)** (mounted on the inside of the cover) while the actuator head is locked in place. This secures the closed locking plate **(A)** against unauthorized opening. The actuator head can no longer be rotated.

Note

Do not use the position switch as an endstop, as this may influence the way it functions.

4.6.8 Notes on installation

Safety switch with tumbler

⚠ WARNING

Repair and maintenance

The components of existing tumbler systems, such as switches, actuator heads or actuators, may not be replaced individually. To maintain the safety level, the whole tumbler system, consisting of the switch, actuator head and actuator, must always be replaced in its entirety.

Note

Notes on interlocking devices in accordance with the ISO 14119 standard

Observe the following notes on tamper protection from the ISO 14119 standard:

Interlocking devices must be selected and/or installed so as to minimize defeat possibilities in a reasonably foreseeable way.

Measures for minimizing defeat possibilities of interlocking devices

a) Prevent accessibility to the elements of the interlocking device

b) Prevent substitute actuation of the interlocking device by means of easily available objects

c) Prevent disassembly or position changing of elements of the interlocking device by means of non-removable fasteners (e.g. by welding, bonding, disposable screws, rivets, etc.)

d) Prevent circumvention

⚠ WARNING

Use of grounding bushings and jumper wires

Non-metallic enclosures do not provide an electrical connection between conduit unions. Proper grounding between metallic conduit unions must be established by using grounding bushings and jumper wires.

Protection against damage

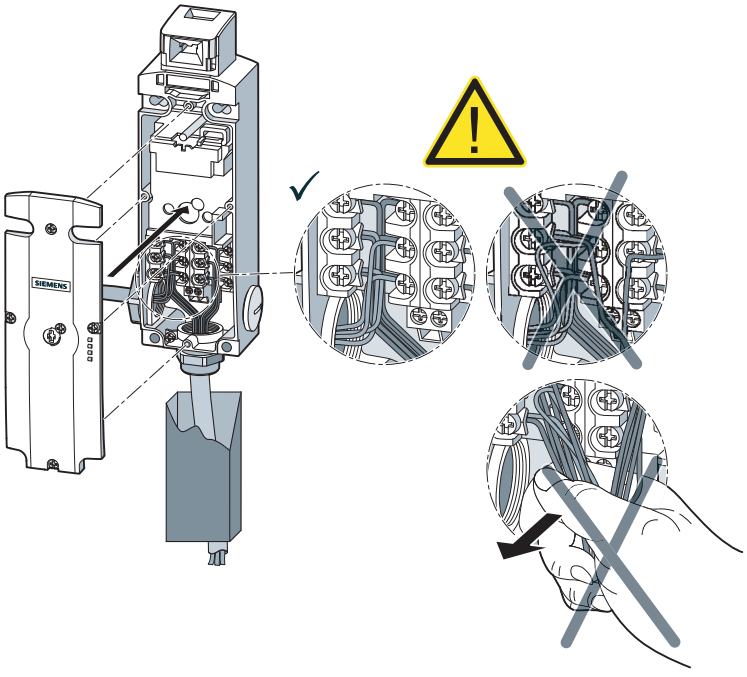
WARNING

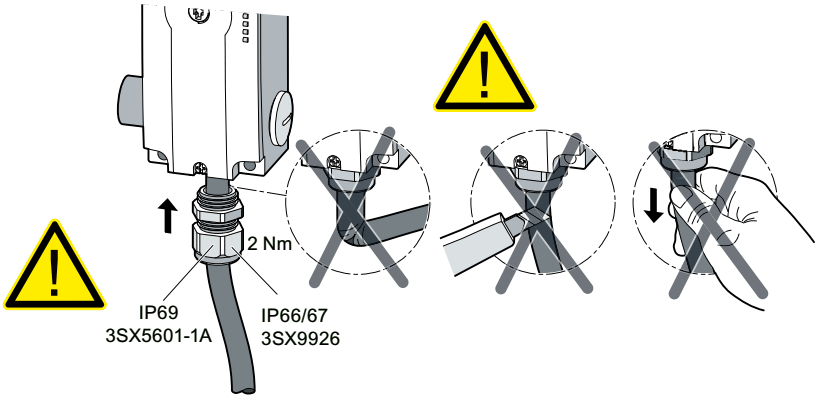
Protection against damage

Protect the routed cables against unintentional damage, in order to avoid discontinuities or cross-circuits in the signal path or in the voltage supply of the solenoid.

Route the connecting cable in a cable duct, for example.

Do not pull on the wiring or connecting cable in order to avoid damage.





Checking and cleaning

Note

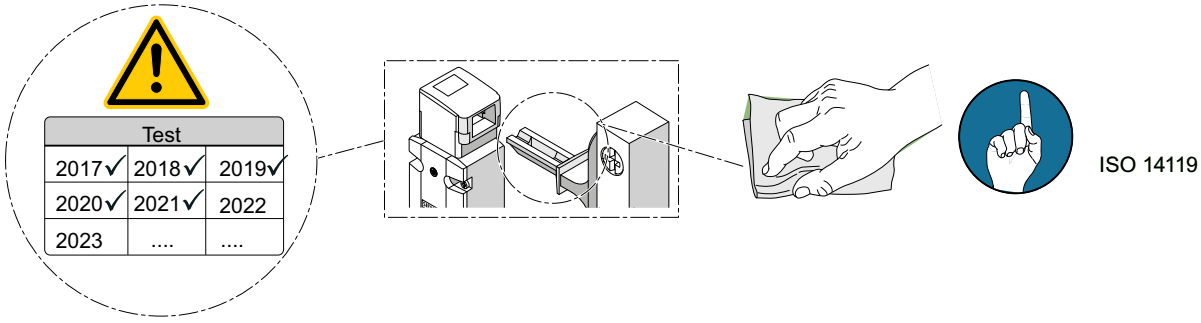
Regularly check correct functioning.

Check correct functioning of the switch once a year.

Note

Observe the following note from the ISO 14119 standard:

Consideration of environmental conditions (e.g. hygiene, temperature, dust, humidity, etc.)
Dirt must be regularly cleaned from the switch.



Insertion tolerances

⚠ WARNING

Use actuators only with the associated safety switch

To maintain the level of safety, the actuators should only be purchased and used in combination with the associated safety switch. Assemble the position switch and actuator in such a way that the actuator can move into the actuator head within the insertion tolerance. Do not use position switches as an endstop.

NOTICE

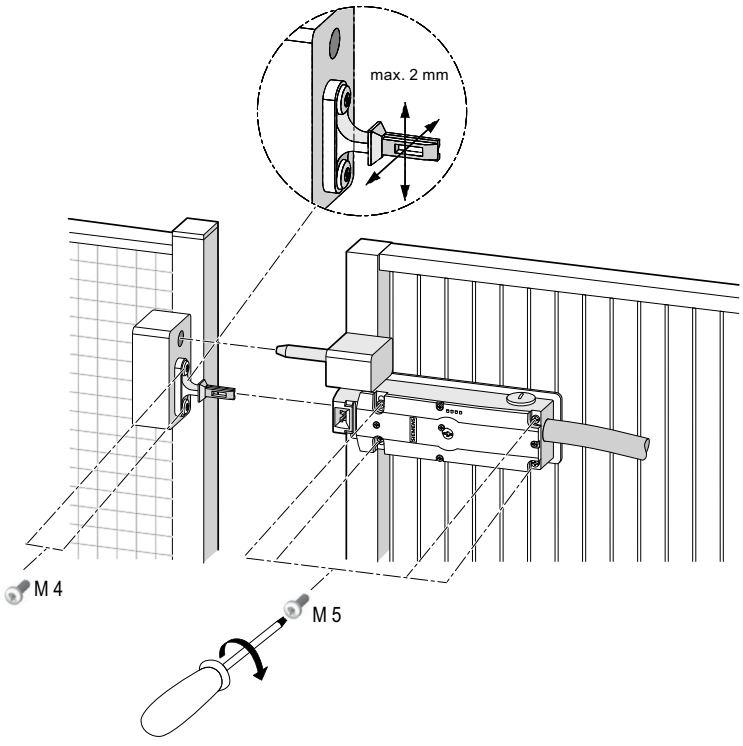
Risk of property damage. Observe the offset of the actuator.

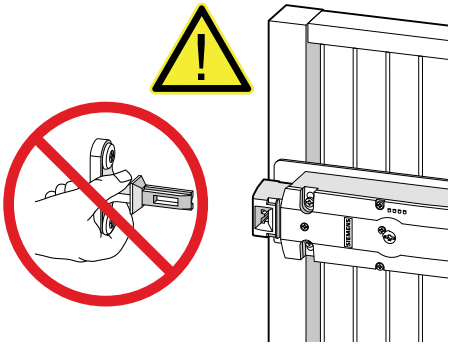
The actuator may have a maximum offset of 2 mm.

NOTICE

Risk of property damage. Heavy doors

A guide must be created for the actuator if doors are heavy.





Mechanical safety switches with tumbler and LED display

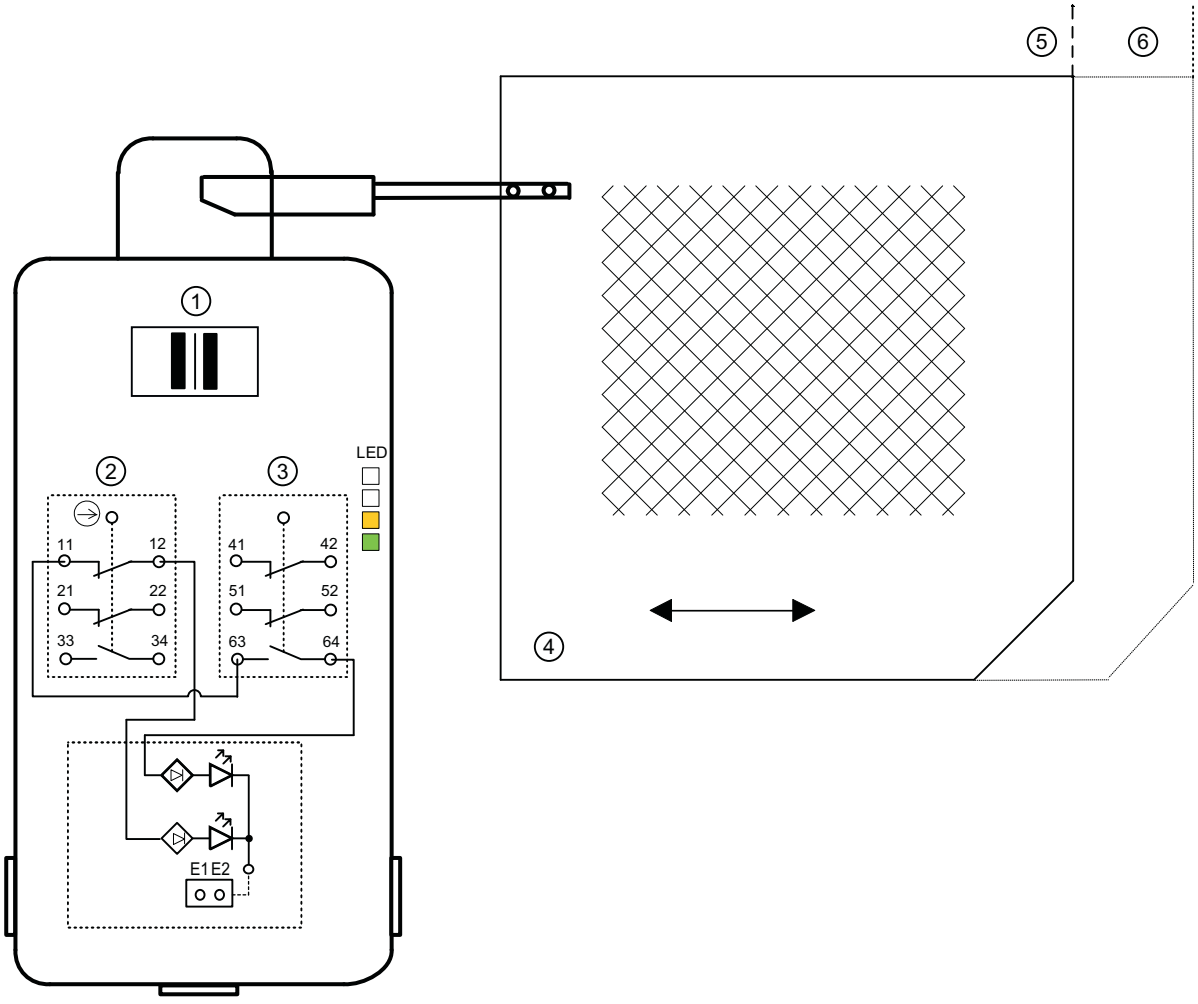
The safety switches with tumbler are available with an optional LED display.
2 LEDs on the front panel indicate the switch position of the interlock and the protective device.

Note

Connection - Internal wiring

- Stranded wires (red, green and yellow) are factory-wired.
- The voltage for LED actuation must be connected on site to terminal 11.
- LED ground is wired internally to E2.

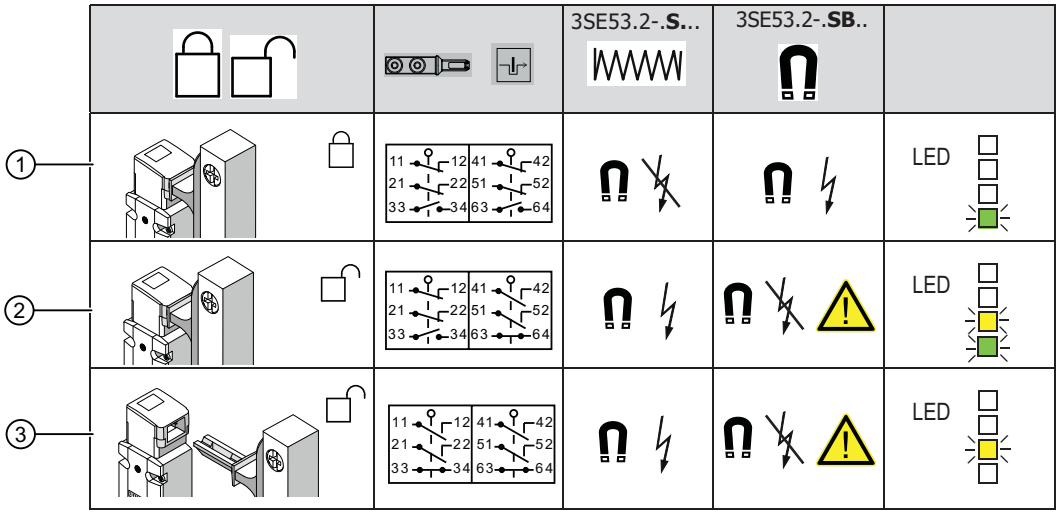
NOTICE
Risk of property damage. The voltage of the LEDs at the monitored contacts must match the operating voltage of the magnet (same potential).



① Magnet
② Actuator monitoring
③ Magnet monitoring
④ Protective door
⑤ Protective door closed
⑥ Protective door open

Meaning of switch positions and LED indications

The switches have a display with four LEDs:



		Switch position	Switch with spring lock (closed-circuit principle)	Switch with solenoid lock (open-circuit principle)	LED display
①	The actuator is inserted. The protective device is interlocked.	11/12, 21/22, 41/42, 51/52 closed; 33/34, 63/64 open	Magnet not energized.	Magnet energized.	LED 1 = off LED 2 = off LED 3 = off LED 4 = lit green
②	The actuator is inserted. The protective device is not interlocked.	11/12, 21/22, 63/64 closed; 41/42, 51/52, 33/34 open	Magnet energized.	Magnet not energized.	LED 1 = off LED 2 = off LED 3 = lit yellow LED 4 = lit green
③	The actuator is withdrawn. The protective device is not interlocked.	33/34, 63/64 closed; 11/12, 21/22, 41/42, 51/52 open	Magnet energized.	Magnet not energized.	LED 1 = off LED 2 = off LED 3 = lit yellow LED 4 = off

WARNING

Releasing the solenoid-locked switch

The tumbler of the solenoid-locked switches is released by deactivating the current. Do not use these switches if there is a hazard due to releasing in the event of voltage failure. Carry out a risk analysis with regard to the safety level.

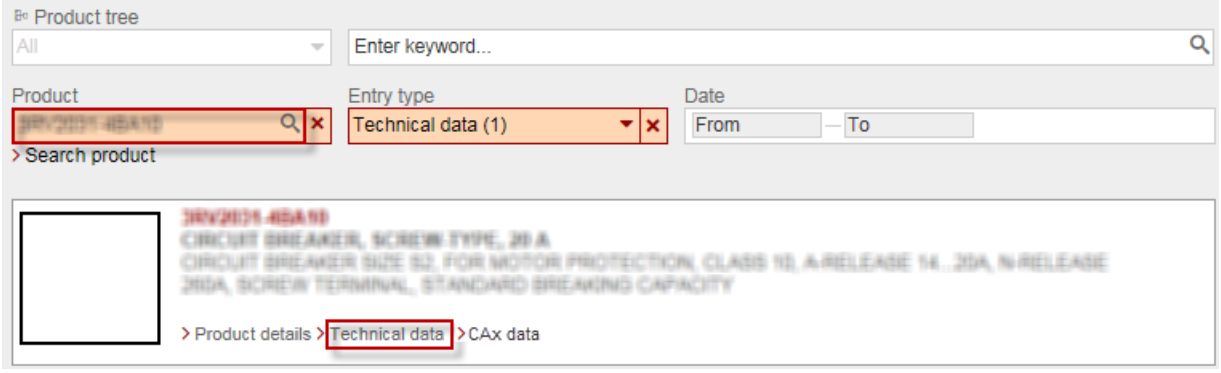
4.6.9 Technical specifications

4.6.9.1 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.



4.6.10 Maximum achievable Performance Level / SIL

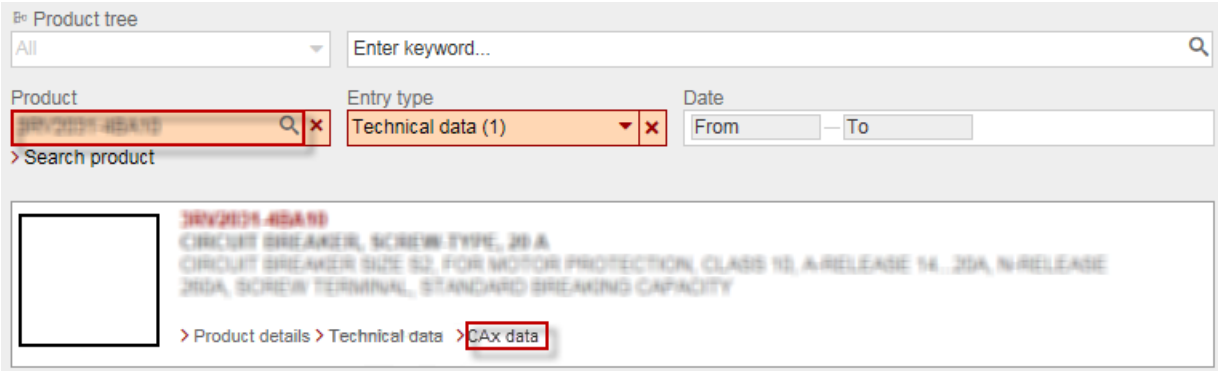
Function	Performance Level / SIL with one safety switch
Interlock / actuator monitored (or process protection)	Max. PLe / SIL 3
Tumbler monitored (for personnel protection)	Max. PLd / SIL 2

4.6.11 Dimension drawings

4.6.11.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "CAx data link.

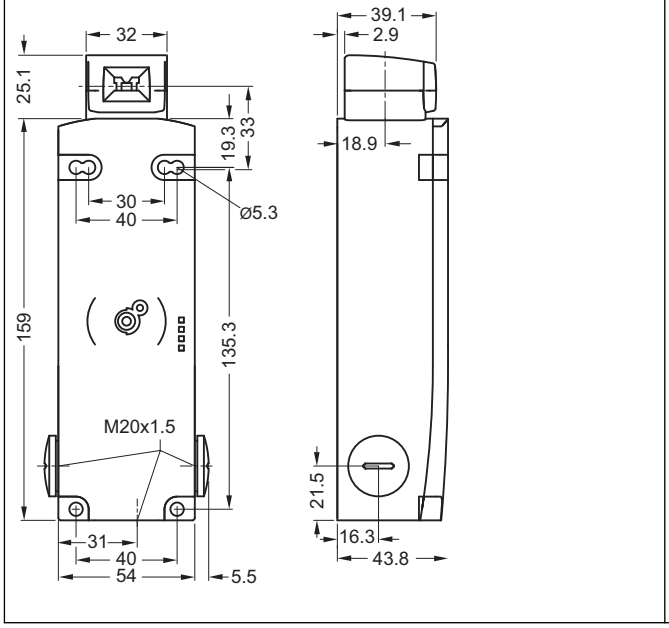
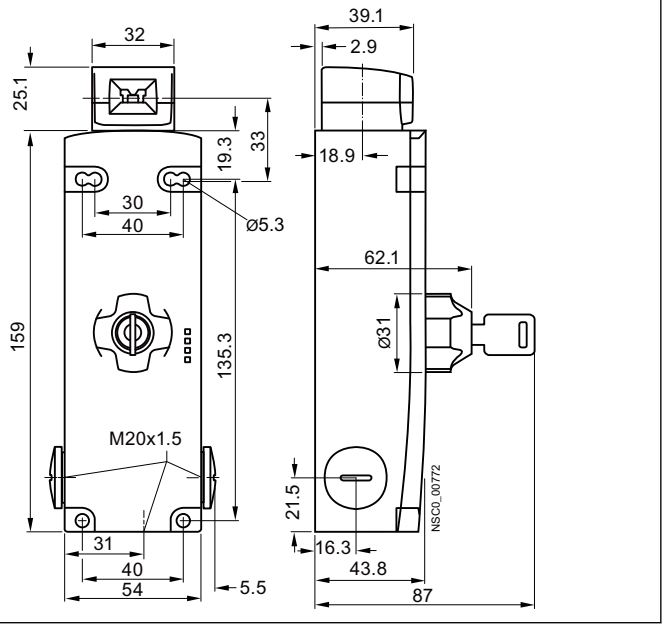


4.6.11.2 Extract from the technical specifications

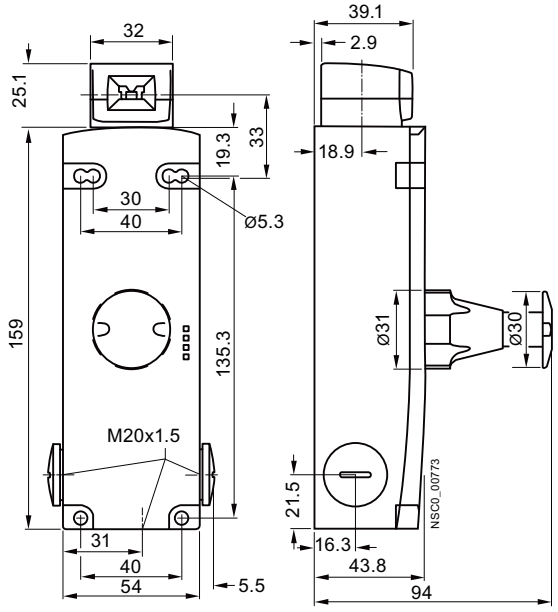
Note

The information in the extract from the technical specifications is not subject to the change service. For current values, refer to Technical Data Sheet.

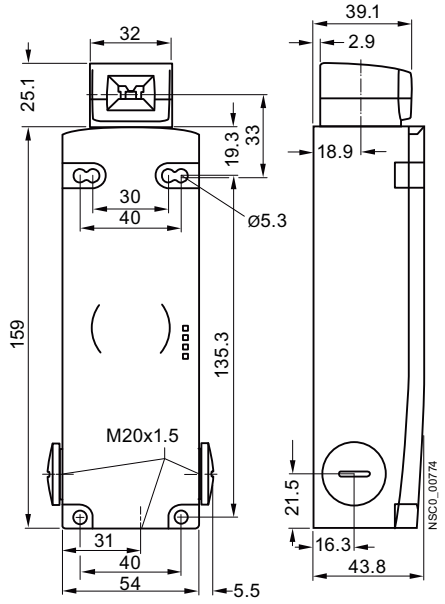
Mechanical safety switches with tumbler

Spring-locked, with front auxiliary release 3SE5322-.SD2., 3SE5312-.SD1.	Spring-locked, with auxiliary release with lock 3SE5322-.SE2., 3SE5312-.SE1.
	

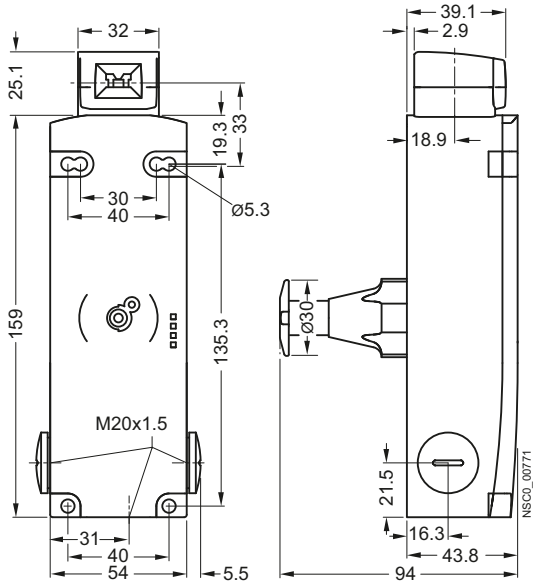
Spring-locked, with escape release at front
3SE5322-.SF2., 3SE5312-.SF1.



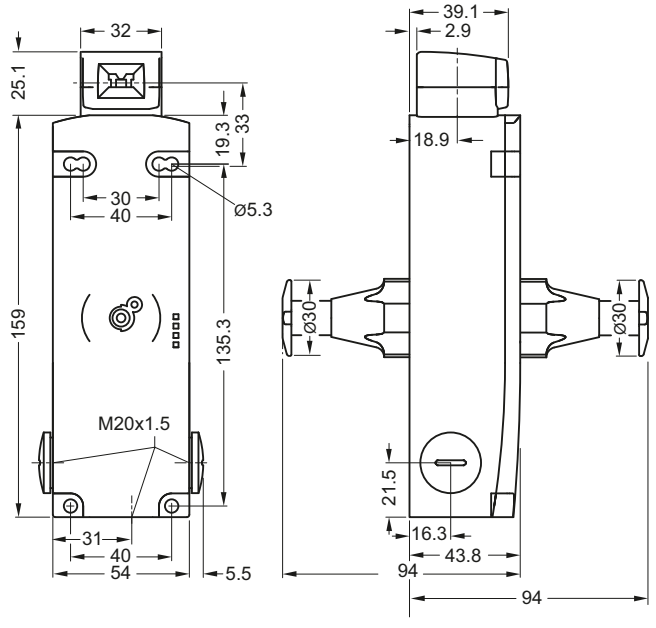
Solenoid-locked
3SE5322-.SB2, 3SE5312-.SB1.



Escape release at rear, auxiliary release at front
3SE5322-.SG2., 3SE5312-.SG2.
Emergency release at rear, auxiliary release at front
3SE5322-.SJ2., 3SE5312-.SJ2.



Front escape release and rear emergency release
3SE5322-.SL2., 3SE5312-.SL2.



Note

The plastic enclosures have knock-outs behind the connecting thread; therefore, blind caps are not included in the scope of delivery.

3SF1 mechanical safety switches for AS-Interface

5

SIRIUS detection devices are ideally suited as the basis for networked systems within a plant.

The individual components can be integrated into the AS-Interface system.

They are fully compatible according to IEC 62026-2 with the well-known AS-Interface components, e.g., master, slaves, power supply unit, etc., and can be connected to the same yellow AS-Interface cable. We supply all components for configuring a safe AS-Interface network.

- The following range of 3SE5 position switches is available with integrated ASIsafe electronics as 3SF1 position switches:
  - Mechanical position switch with modular configuration
  - Mechanical safety switches with separate actuator
  - Mechanical safety switches with tumbler
- The connection to the AS-Interface cable is made via an M12 connector
- The position switch and the safety switch with separate actuator, including the LEDs, are supplied directly from the AS-i cable. No additional 24 V supply is required.
- The safety switch with tumbler, including the magnetic coil and LEDs, is supplied directly from the AS-Interface cable. The maximum current consumption of the magnet is 170 mA. No additional 24 V supply is required.

5.1 Overview of mechanical position switch with modular configuration

The SIRIUS 3SF1 mechanical safety switches with safety-related communication can be directly connected via the AS-Interface bus system. Wiring of the safety functions is no longer required.

The ASIsafe electronics are integrated within the switch enclosure in 3SF1 safety switches.

Figure 5-1 Examples of possible selections in the modular system

5.2 Connection

5.2.1 Contact blocks

The contact blocks are pre-wired and connected to the inputs of the ASIsafe electronics.

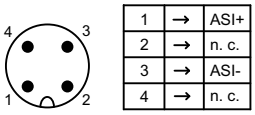
5.2.2 Plug connection

The connection to the AS-Interface cable is made using a 4-pin M12 plug connector (plastic version) to the yellow AS-Interface bus cable (the low current consumption, max. 170 mA, of the magnet means that an additional auxiliary power feed is not necessary).

The 50 mm and 56 mm-wide enclosures also have an M12 socket for connecting a second position switch. As a result, a PLe according to ISO 13849-1 or SIL2/SIL3 according to IEC 61508 can be achieved.

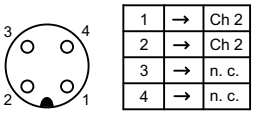
5.2.3 Pin assignment

Plug connector M12, 4-pin



1 ASI+
2 Not used
3 ASI-
4 Not used

M12 socket, 4-pin
for the connection of a second (optional) position switch



1 Connection for second NC contact, e.g. 21 (connected to Channel 2, F-IN2)
2 Connection for second NC contact, e.g. 22 (connected to Channel 2, F-IN2)
3 Not assigned
4 Not used

5.3 Mounting instructions for mechanical position switch with modular configuration

The safety switches of the 3SF11.4 and 3SF12.4 series are configured as a modular system, consisting of the basic enclosure in different variants and an actuator, which must be ordered separately. The modular switch design allows the end user to choose the appropriate solution from a wide selection of options and to assemble it himself. The 3SF1 safety switches have the same enclosure as the 3SE5 mechanical position switches.

5.3.1 Changing the actuator head

Procedure for changing the direction of operation and replacing the actuator head

1. Unscrew the enclosure cover (1).
2. Slide the locking plate (2) to the right.

   Note

   The spring is preloaded and may be lost when changing the actuator head. If this happens the switch will no longer function in the case of part-turn actuators. Keep a firm hold on the actuator head while removing it.

3. Remove the actuator head (3).
4. Insert the new actuator head (3) until it reaches the endstop.
5. Slide the locking plate (2) to the left.
6. Screw on the enclosure cover (1).
   - **Part-turn actuator 3SE5000-0AH00 / 3SE5000-0AK00 / 3SE5000-0AH00-1AJ0 / 3SE5000-0AK00-1AJ0** is left- and right-operating (factory configuration) (4.a)
   - **Adjusting the actuator head to be left-operating or right-operating only**
     Actuating plunger (4) rotated 90 ° to the left = left-operating (4.b).
     Actuating plunger (4) rotated 90 ° to the right = right-operating (4.c).

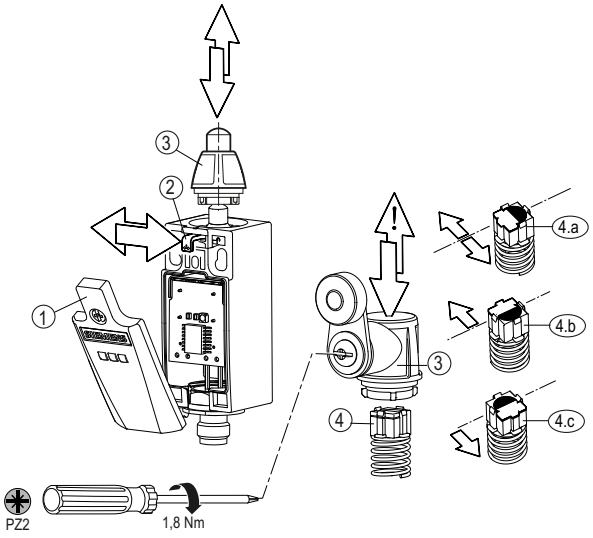


Figure 5-2 Changing the actuator head (example: part-turn actuator)

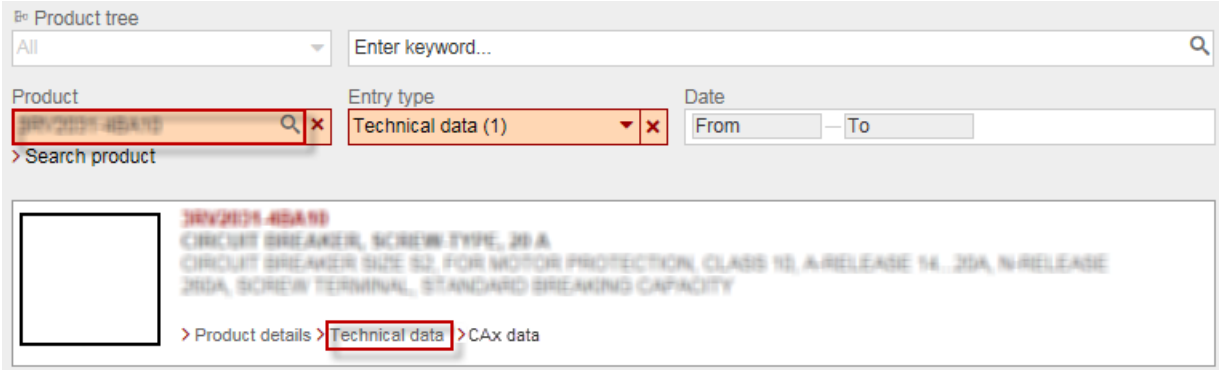
5.4 Technical specifications

5.4.1 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.



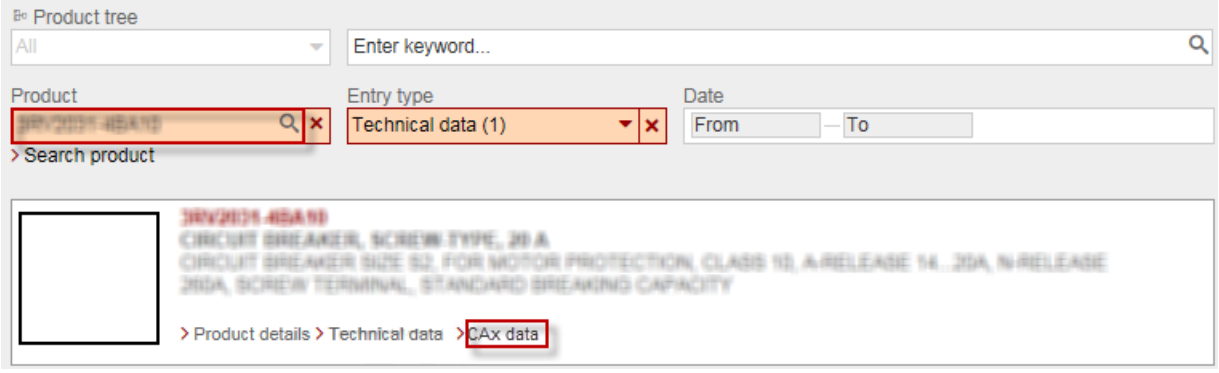
Data according to AS-Interface Specification	3SF11 / 3SF12
I/O configuration	7 / B
ID1 code/ID2 code (hex)	F / F

5.5 Dimension drawings

5.5.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "CAx data link.

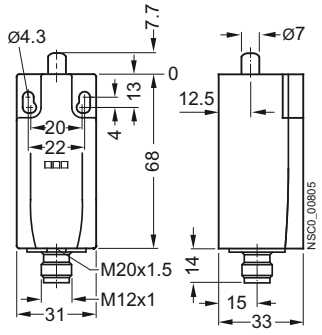


5.5.2 Extract from the technical specifications

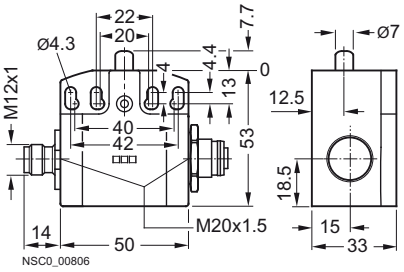
5.5.2.1 Safety switches for AS-Interface

Basic switches (without actuator)

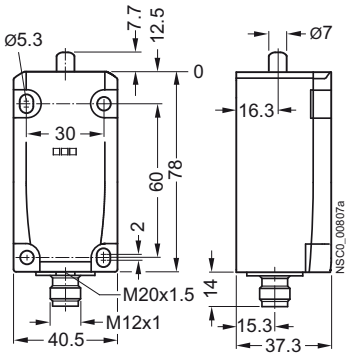
Enclosure width 31 mm, EN 50047
3SF1234



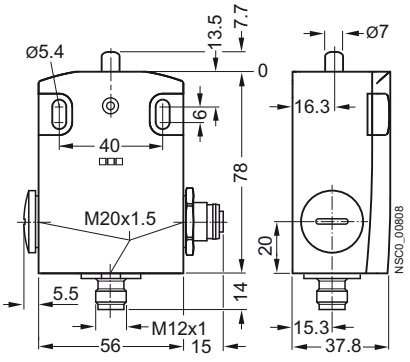
Enclosure width 50 mm
3SF1244



Enclosure width 40 mm, EN 50041
3SF1114



Enclosure width 56 mm
3SF1124



You will find further information under:

Actuators and their actuation (Page 74)

3SE22 mechanical safety switches with separate actuation (Page 129)

5.6 Safety switches for AS-Interface with separate actuation without tumbler

5.6.1 Overview

The 3SF1 safety switches with safety-related communication are directly connected via the AS-Interface bus system. As a result, the safety functions are no longer conventionally wired.

The ASIsafe electronics are integrated within the switch enclosure in 3SF1 safety switches.

3SF1234-1QV40-1BA1
3SF1214-1QV40-1BA1

3SF1244-1QV40-1BA2

3SF1114-1QV10-1BA1

3SF1124-1QV10-1BA2

Figure 5-3 3SF1 safety switches for AS-Interface with separate actuator

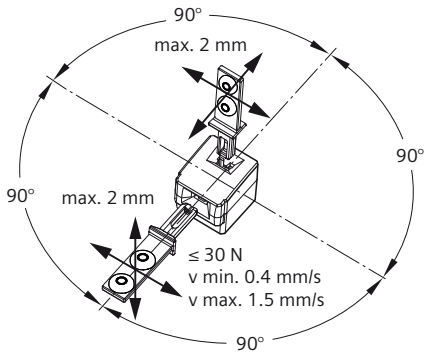
The 3SF1 safety switches with separate actuator have the same enclosure as 3SE5 mechanical position switches.

5.6.2 Actuator head and actuators

- The actuator head is included in the scope of delivery.
- For actuation from four directions, it can be offset by 4 × 90° (applies only to position switches with separate actuator).
- The switches can also be approached from above.

5.6.3 Actuator

- The actuator is not included in the scope of delivery of the position switches and must be ordered separately.
- You can choose from several variants made of die-cast zinc or stainless steel, depending on the application.
- The actuator is coded. This prevents simple tampering by hand or with tools.

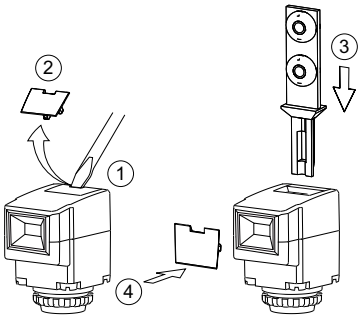


Axial and lateral actuation (4 × 90°)

Minimum force requirement in direction of actuation 30 N (when withdrawing)

Actuation from above

In the delivery state there is a protective cover on top of the actuator head. If you would like to insert the actuator from above, proceed as follows:

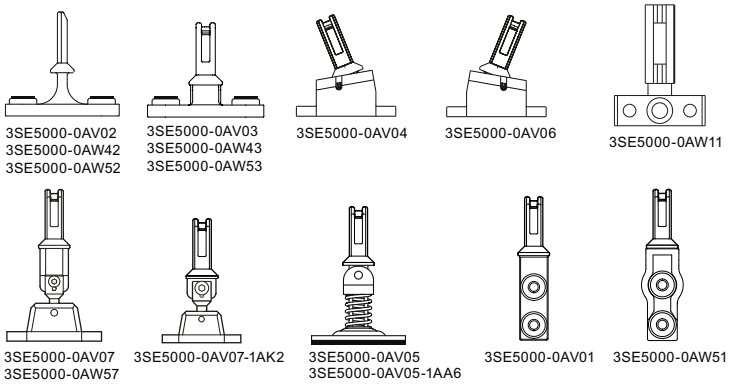


1. / 2. Remove the protective cover on the actuator head using a flat screwdriver.

3. Insert the actuator from above into the actuator head.

4. Fit the protective cover on the front of the actuator head.

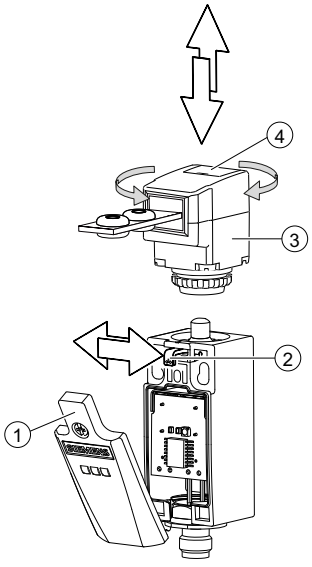
5.6.4 Actuator variants for safety switches with separate actuation without tumbler



5.6.5 Installation of AS-Interface with separate actuator without tumbler

Pay attention to the mounting instructions in the chapter Mechanical safety switches with tumbler (Page 167).

Installing/removing the actuator head



1. Unscrew the enclosure cover (1).
2. Slide the locking plate (2) to the right.

Note

The spring is preloaded and may be lost when changing the actuator head. If this happens the switch will no longer function in the case of part-turn actuators. Keep a firm hold on the actuator head while removing it.

3. Remove the actuator head (3).
4. Insert the new actuator head (3) until it reaches the endstop.
5. Slide the locking plate (2) to the left. Lock the actuator head back into place by sliding the locking plate (2) to the left into the middle position. The actuator head is locked in place.
6. Screw on the enclosure cover (1).

5.6.6 Radius actuator

Actuation radius for safety switches with separate actuation without tumbler

For values concerning the minimum actuation radius, refer to Combinations with actuators (Page 139).

5.6.7 Lock insert and dust cap accessories

The accessories for safety switches with separate actuator with and without tumbler are identical. For further information, see Accessories for safety switches with separate actuation (Page 148).

Lock insert

A high-grade steel lock insert for attaching up to eight padlocks is available for even more safety.

Dust cap

For use in dusty environments, a dust cap is offered for the 3SF1...-..V10 safety switch that protects the actuator entry of the actuator head from dirt.

5.6.8 LED display 3SF11 / 3SF12

Status display of the LEDs in the error-free operating state

The switches have a display with three LEDs; in the error-free operating state LED1 (F-IN1) and LED 2 (F-IN2) are yellow, while LED 3 (AS-i /Fault) is green.

Status display in the error-free operating state		
LED 1 F-IN1	LED 2 F-IN2	LED 3 AS-i/Fault
 Yellow	 Yellow	 Green

Status display of the LED 3 AS-i/Fault			
No voltage	Connection OK	Connection error	AS-i address = 0
			
Off	Green	Red	Yellow/red

5.6.9 Technical specifications

5.6.9.1 Technical data for safety switches for AS-Interface with separate actuation

Technical specifications in Siemens Industry Online Support

You can find technical specifications on the product on the Internet (see Technical data in Siemens Industry Online Support (Page 183)).

5.6.10 Dimension drawings

5.6.10.1 CAx data for safety switches for AS-Interface with separate actuation

CAx data in Siemens Industry Online Support

You can find CAx data on the product on the Internet (see CAx data (Page 184)).

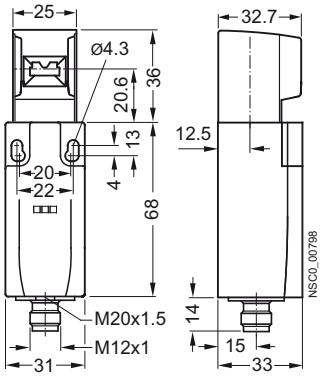
5.6.10.2 Extract from the technical specifications

Safety switches for AS-Interface with separate actuation

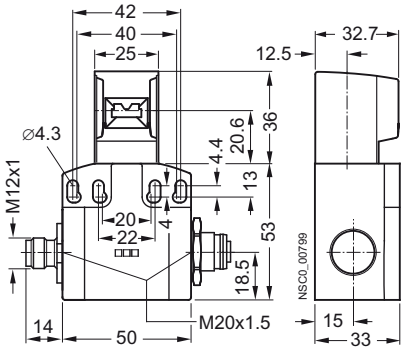
Note

The information in the extract from the technical specifications is not subject to the change service. For current values, refer to Technical Data Sheet.

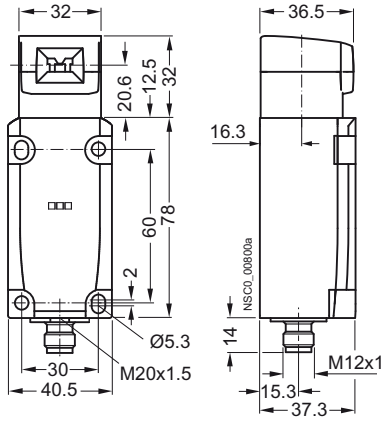
Enclosure width 31 mm, EN 50047
3SF1234-..V..



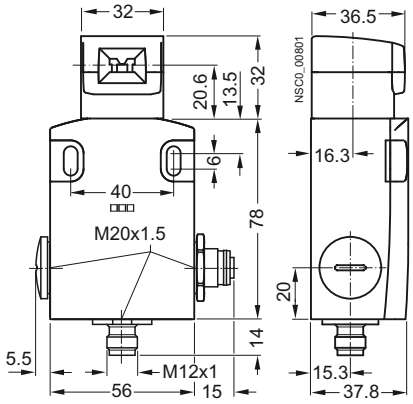
Enclosure width 50 mm
3SF1244-..V..



Enclosure width 40 mm, EN 50041
3SF1114-..V..



Enclosure width 56 mm
3SF1124-..V..



5.7 Safety switches for AS-Interface with separate actuation with tumbler

5.7.1 Overview

The mechanical safety switches for AS-Interface with tumbler are special safety-related devices that prevent accidental or intentional opening of protective doors, protective grilles, or other covers as long as dangerous conditions exist, e.g., follow-on motions of shut-down machines.

The 3SF1 safety switches with safety-related communication can be directly connected via the AS-Interface bus system. As a result, the safety functions no longer have to be conventionally wired.

The ASIsafe electronics are integrated within the switch enclosure in 3SF1 safety switches.

Figure 5-4 3SF13 safety switches with tumbler and with integrated ASIsafe electronics

Note

Position switch with high degree of protection IP69

Position switches with article number 3SF1324-1S.21-1BK4 fulfil degree of protection IP69.

5.7.2 Maximum achievable Performance Level / SIL

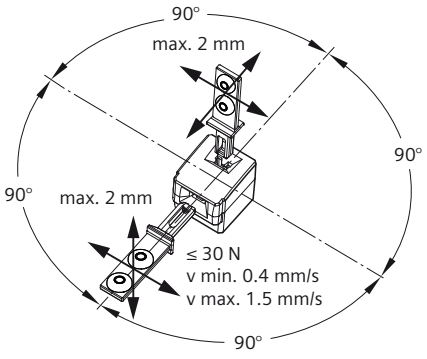
Function	Performance Level / SIL with one safety switch
Interlock / actuator monitored (or process protection)	Max. PLe / SIL 3
Tumbler monitored (for personnel protection)	Max. PLd / SIL 2

5.7.3 Actuator head and actuators

- The actuator head is included in the scope of delivery.
- For actuation from four directions, it can be offset by 4 × 90° (applies only to position switches with separate actuator).
- The switches can also be approached from above.

5.7.4 Actuator

- The actuator is not included in the scope of delivery of the position switches and must be ordered separately.
- You can choose from several variants made of die-cast zinc or stainless steel, depending on the application.
- The actuator is coded. This prevents simple tampering by hand or with tools.

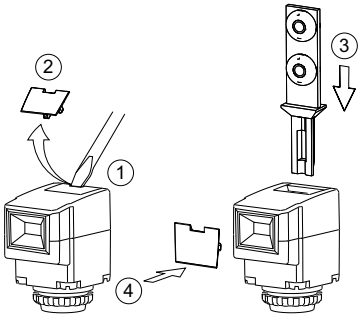


Axial and lateral actuation (4 × 90°)

Minimum force requirement in direction of actuation 30 N (when withdrawing)

Actuation from above

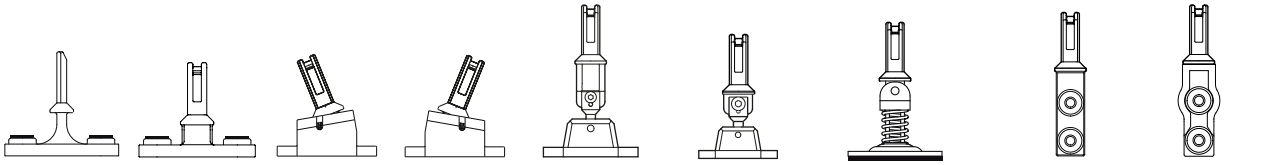
In the delivery state there is a protective cover on top of the actuator head. If you would like to insert the actuator from above, proceed as follows:



1. / 2. Remove the protective cover on the actuator head using a flat screwdriver.

3. Insert the actuator from above into the actuator head.
4. Fit the protective cover on the front of the actuator head.

5.7.5 Actuator variants for safety switches with separate actuation with tumbler



3SE5000-0AV02
3SE5000-0AW42
3SE5000-0AW52

3SE5000-0AV03
3SE5000-0AW43
3SE5000-0AW53

3SE5000-0AV04

3SE5000-0AV06

3SE5000-0AV07
3SE5000-0AW57

3SE5000-0AV07-1AK2

3SE5000-0AV05
3SE5000-0AV05-1AA6

3SE5000-0AV01

3SE5000-0AW51

5.7.6 Mounting

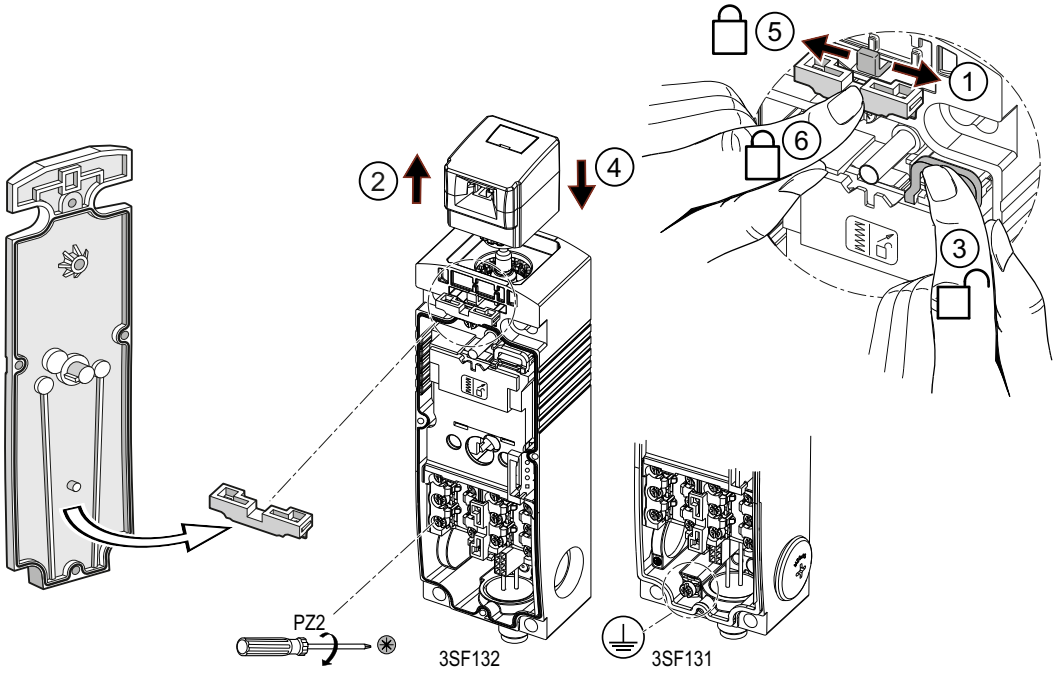
Pay attention to the mounting instructions in chapter Mechanical safety switches with tumbler > Notes on installation (Page 167).

Installing/removing the actuator head

Note

Observe the offset!

Any misalignment when inserting the actuator must be less than 2 mm. The actuator head can be rotated in 90-degree steps.



1. Release the actuator head by sliding the locking plate **(A)** to the right.
2. Pull the actuator head out upwards.
3. Press the auxiliary release lever.
4. Reinsert the actuator head.
5. Lock the actuator head back into place by sliding the locking plate to the left into the middle position. The actuator head is locked in place.
6. To secure the locking plate , push in the filler **(B)** (mounted on the inside of the cover) while the actuator head is locked in place. This secures the closed locking plate **(A)** against unauthorized opening. The actuator head can no longer be rotated.

Note

Do not use the position switch as an endstop, as this may influence the way it functions.

5.7.7 Lock insert and dust cap accessories

The accessories for safety switches with separate actuator with and without tumbler are identical. For further information, see Accessories for safety switches with separate actuation (Page 148).

Lock insert

A high-grade steel lock insert for attaching up to eight padlocks is available for even more safety.

Dust cap

For use in dusty environments, a dust cap is offered for the 3SF1...-..V10 safety switch that protects the actuator entry of the actuator head from dirt.

5.7.8 3SF13..-....-1BA1

The protective door is closed when the machine is running. The actuator is located in the safety switch and is interlocked there. The positive-opening contacts of the safety switch are closed in this state. An 8 x 4 bit code table is transferred via the closed contacts (channel 1 - actuator monitoring; channel 2 - magnet monitoring) and is passed from the AS-Interface module to the AS-i bus cable. The safety monitor connected to the AS-i bus cable evaluates the transferred code table. For maintenance purposes, there is a need to manually intervene behind the protective grille. The operator switches off the machine for this purpose. The user must ensure that the protective grille can only be opened after the machine has come to a standstill. It is not possible to restart the machine until the protective door is closed and the actuator is interlocked. The contacts used for monitoring the protective door are connected with positive locking by the actuator such that the position of the protective door is detected immediately. The contacts used for monitoring the blocking means are connected with positive locking to the blocking element such that a failure of the tumbler device is detected by the safety monitor. An integrated protection against incorrect closing prevents the blocking element from being in the blocking position even though the actuator is still outside the safety switch.

With the monitoring of channel 1 (actuator) and channel 2 (magnet) of position switches 3SF13..-....-1BA1, PL d according to ISO 13849-1 and SIL2 according to IEC 61508 are achieved for the corresponding operation. The PFH_D value of the entire loop according to IEC 61508 must be calculated by the user. The PFH_D value of the position switch can be calculated from failure rate λ_D. Calculation of the failure rate is described in Chapter Determination of failure rate (Page 25).

- Channel 1: 1-channel actuator monitoring
- Channel 2: 1-channel tumbler safety function

SIL 1/PL c with setting in the AS-Interface Monitor:

2-channel conditionally dependent:

- Feedback from magnet available
- Reclosing condition: Door must not be opened

SIL 2/PL d with setting in the AS-Interface Monitor:

2-channel dependent:

- Feedback from magnet available
- Reclosing condition: Door must be opened

5.7.9 3SF13..-....-1BA4

The protective door is closed when the machine is running. The actuator is located in the safety switch and is interlocked there. The positive-opening contacts of the position switch are closed in this state. An 8 x 4 bit code table is transferred via the closed contacts (channel 1: 2-channel actuator monitoring; channel 2: 1-channel magnet monitoring) and is passed from the AS-Interface module to the AS-i bus cable. The "Safety at Work" evaluation unit, such as an ASIsafe 3RK1 safety monitor, which is connected to the AS-i bus cable, evaluates the transferred code table. For maintenance purposes, there is a need to manually intervene behind the protective door. The operator switches off the machine for this purpose. The user must ensure that the protective door can only be opened after the machine has come to a standstill. It is not possible to restart the machine until the protective door is closed and the actuator is interlocked. The contacts used for monitoring the protective door are connected with positive locking by the actuator such that the position of the protective door is detected immediately. The contacts used for monitoring the blocking means are connected with positive locking to the blocking element such that a failure of the tumbler device is detected, e.g., by an ASIsafe 3RK1 safety monitor. An integrated protection against incorrect closing prevents the blocking element from being in the blocking position even though the actuator is still outside the safety switch.

With the channel monitoring (channel 1: 2-channel actuator monitoring; channel 2: 1-channel magnet monitoring) of position switches 3SF13..-....-1BA4, PL d according to ISO 13849-1 and SIL2 according to IEC 61508 are achieved for the corresponding operation. The PFH_D value of the entire loop according to IEC 61508 must be calculated by the user. The PFH_D value of the position switch can be calculated from failure rate λ_D. Calculation of the failure rate is described in Chapter Determination of failure rate (Page 25).

- Channel 1: 2-channel actuator monitoring
- Channel 2: 1-channel tumbler safety function

Category 2/SIL 2/PL d when set in the AS-Interface Monitor:

2-channel conditionally dependent:

- Feedback from magnet available
- Reclosing condition: Door must not be opened

Note

Note on 3SF13..-1B.4

Due to combination of two-channel querying of the actuator (position monitoring of the guard) with one-channel querying of monitoring of the blocking means, in the event of corresponding operation performance level d in compliance with EN ISO 13849-1 or SIL 2 / IEC 61508 is also achieved in the "conditionally dependent" mode of operation for the "interlock" safety function.

The PFD value of the entire loop must be calculated by the user.

The PFD value of the tumbler is listed in the technical data.

5.7.10 Direct connection of safety monitor SIL 2 /PL d

- Spring-locked safety switch with tumbler
- Direct connection to AS-Interface
- Unsafe release
- The position switch transfers the information of the two actuator contacts on a transfer channel because the discrepancy of the actuator contacts is already evaluated in the switch. The second transfer channel is therefore available for the magnet monitoring (for the standard process evaluation).

Configuring

Protective door monitoring with ASIMON monitoring block, type "conditionally dependent":

SIL2 according to IEC 62061 or PL d according to ISO 13849-1

The safety monitor monitors the actuator and the magnet ("conditionally dependent" monitoring). When you activate the "Independent In -1" parameter, you can release the protective door without having to open it afterwards.

The standard output integrated in the position switch is used to release the protective door.

5.7.11 Interlock types

There are two versions for interlocking the actuator:

- **Spring-locked** (closed-circuit principle): Actuator inserted and mechanically interlocked. Actuator is released by applying voltage to the magnet or, in the case of voltage drop, by means of a manual or key-operated auxiliary release mechanism (version-dependent). Release variants:
  - Auxiliary release
  - Key-operated release
  - Emergency release
  - Escape release
- **Solenoid-locked** (open-circuit principle): Actuator released. Actuator is interlocked by applying voltage to the magnet. Actuator is released by switching off the voltage applied to the magnet.

Note

Risk analysis

Tumblers based on the open-circuit principle may only be used if the application's risk analysis shows that use of closed-circuit current variants is not possible. An identical safety level must be established by suitable measures.

Interlock variants

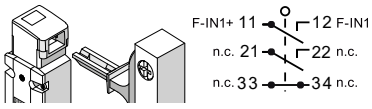
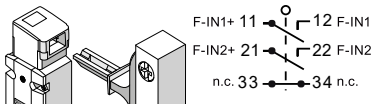
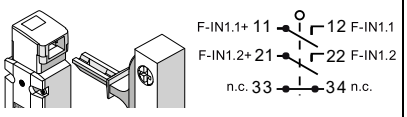
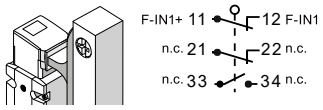
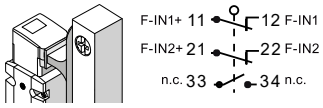
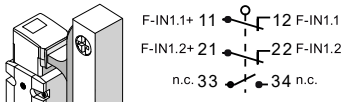
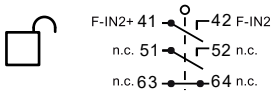
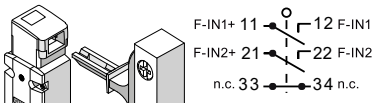
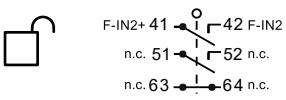
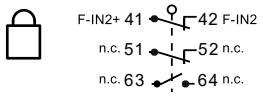
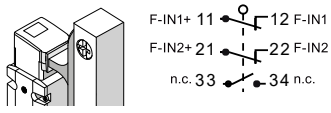
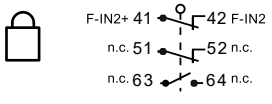
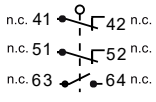
See Interlock variants for 3SE5 safety switches with separate actuation with tumbler (Page 159)

5.7.12 LED display safety position switch for AS-Interface with separate actuation with tumbler

Meaning of switch positions and LED indications

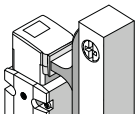
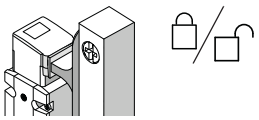
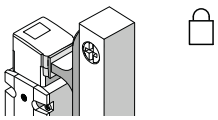
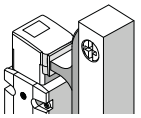
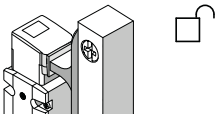
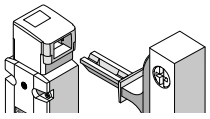
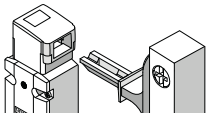
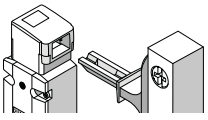
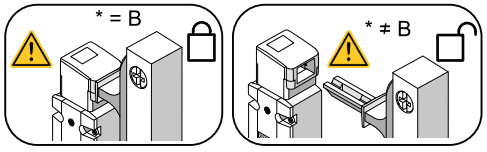
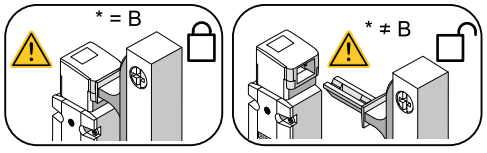
The switches have a display with four LEDs:

	Status display (operating status)			
	LED 1 AS-i	LED 2 Fault	LED 3 F-IN1	LED 4 F-IN2
AS-i 1 FAULT 2 F-IN1 3 F-IN2 4	 Green	 Red	 Yellow	 Yellow

AS-i safety input			
	3SF13..-.....-...1	3SF13..-.....-...3	3SF13..-.....-...4
F-DI = F-IN1 & F-IN2			
F-IN1	Door position	Door position	Door position
	F-IN1 = 0: open  LED F-IN1 ☐ 3 Off	F-IN1 = 0: open  LED F-IN1 ☐ 3 Off	F-IN1 = 0: open  LED F-IN1 ☐ 3 Off
	F-IN1 = 1: closed  LED F-IN1 ■ 3 Yellow	F-IN1 = 1: closed  LED F-IN1 ■ 3 Yellow	F-IN1 = 1: closed  LED F-IN1 ■ 3 Yellow
F-IN2	Interlocking status	Door position	Interlocking status
	F-IN2 = 0: unlocked  LED F-IN2 ☐ 4 Off	F-IN2 = 0: open  LED F-IN2 ☐ 4 Off	F-IN2 = 0: unlocked  LED F-IN2 ☐ 4 Off
	F-IN2 = 1: interlocked  LED F-IN2 ■ 4 Yellow	F-IN2 = 1: closed  LED F-IN2 ■ 4 Yellow	F-IN2 = 1: interlocked  LED F-IN2 ■ 4 Yellow
		Interlocking status 	

AS-i standard output				
3SF13..-..*..-.... (* ≠ B)	DQ 0	Solenoid control	0 = off	1 = active
3SF13..-..B..-....	DQ 0	Solenoid control	0 = off	1 = active

n.c. = not connected Not assigned

	3SF13..-..*..-...1	3SF13..-..*..-...3	3SF13..-..*..-...4
LED	AS-i Status	AS-i Status	AS-i Status
AS-i 1 green FAULT 2 off F-IN1 3 yellow F-IN2 4 yellow	closed + locked  * ≠ B: DQ 0 = 0 (off) * = B: DQ 0 = 1 (active)	closed (locked / unlocked)  * ≠ B: DQ 0 = 0 / 1 (off / active) * = B: DQ 0 = 1 / 0 (active / off)	closed + locked  * ≠ B: DQ 0 = 0 (off) * = B: DQ 0 = 1 (active)
AS-i 1 green FAULT 2 off F-IN1 3 yellow F-IN2 4 off	closed + unlocked  * ≠ B: DQ 0 = 1 (active) * = B: DQ 0 = 0 (off)	FAULT Discrepancy	closed + unlocked  * ≠ B: DQ 0 = 1 (active) * = B: DQ 0 = 0 (off)
AS-i 1 green FAULT 2 off F-IN1 3 off F-IN2 4 off	open  * ≠ B: DQ 0 = irrelevant * = B: DQ 0 = irrelevant	open  * ≠ B: DQ 0 = irrelevant * = B: DQ 0 = irrelevant	open  * ≠ B: DQ 0 = irrelevant * = B: DQ 0 = irrelevant
AS-i 1 green FAULT 2 red F-IN1 3 off F-IN2 4 off	FAULT AS-i communication error F-IN1 = 0 / F-IN2 = 0 		
AS-i green flashing FAULT 2 red F-IN1 3 off F-IN2 4 off	FAULT AS-i address = 0 F-IN1 = 0 / F-IN2 = 0 		

Article numbers for safety switches with separate actuation with tumbler

Type of interlock	Article number
Spring-locked	3SF13.4-1SD.. / 3SF13.4-1SE../ 3SF13.4-1SF.. / 3SF13.4-1SG.. / 3SF1314-1SH.. / 3SF13.4-1SJ..
Solenoid-locked	3SF1314-.SB..

WARNING

Releasing the solenoid-locked switch

The tumbler of the solenoid-locked switches is released by deactivating the current. Do not use these switches if there is a hazard due to releasing in the event of voltage failure. Carry out a risk analysis with regard to the safety level.

5.7.13 Connection with tumbler

The connection to the yellow AS-Interface bus cable is made using a 4-pin M12 plug connector (the low current consumption, max. 170 mA, of the magnet means that an additional auxiliary power feed is not necessary).

1	→	ASI+
2	→	n. c.
3	→	ASI-
4	→	n. c. *

* n. c. = not connected Not connected

5.7.14 Technical specifications

Technical specifications in Siemens Industry Online Support

You can find technical specifications on the product on the Internet (see Technical data in Siemens Industry Online Support (Page 183)).

5.7.15 Dimension drawings

5.7.15.1 CAx data for safety switches for AS-Interface with separate actuation with tumbler

CAx data in Siemens Industry Online Support

You can find CAx data on the product on the Internet (see CAx data (Page 184)).

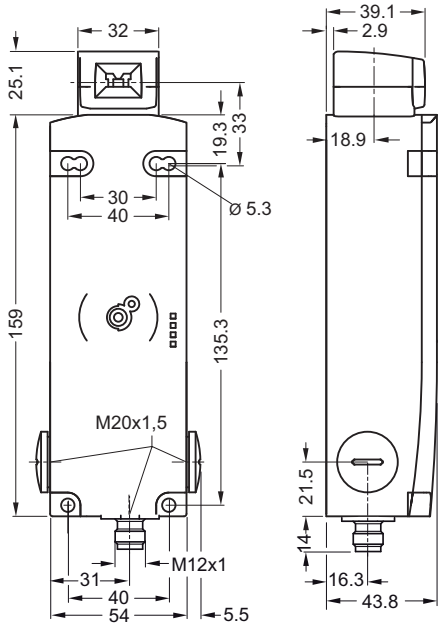
5.7.15.2 Extract from the technical specifications

Safety switches for AS-Interface with separate actuation with tumbler

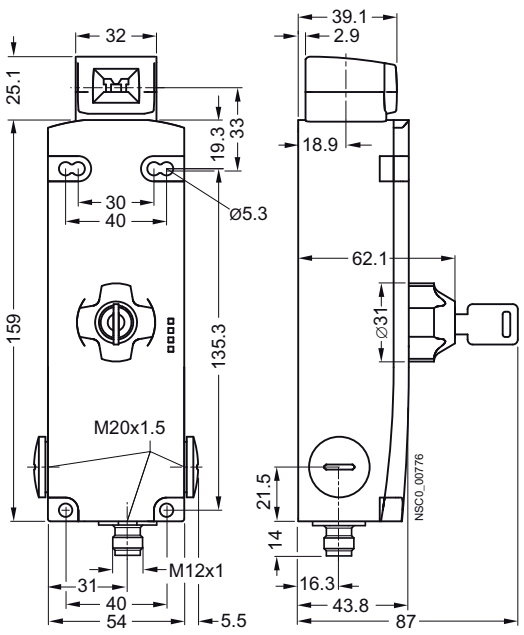
Note

The information in the extract from the technical specifications is not subject to the change service. For current values, refer to Technical Data Sheet.

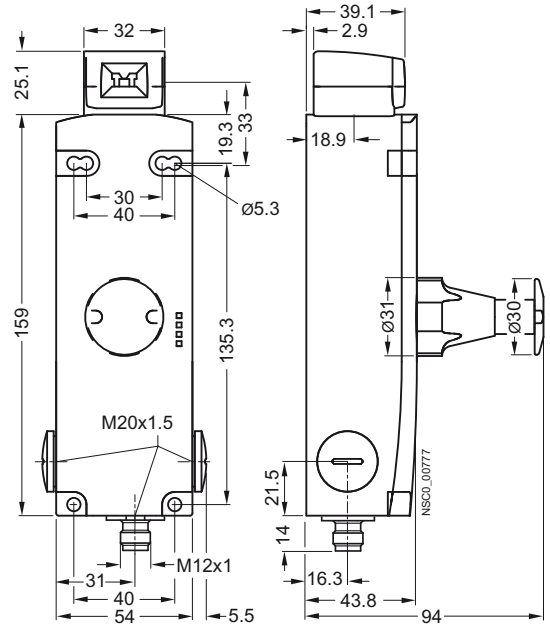
Spring-locked, with front auxiliary release
3SF1324-.SD1., 3SF1314-.SD1.



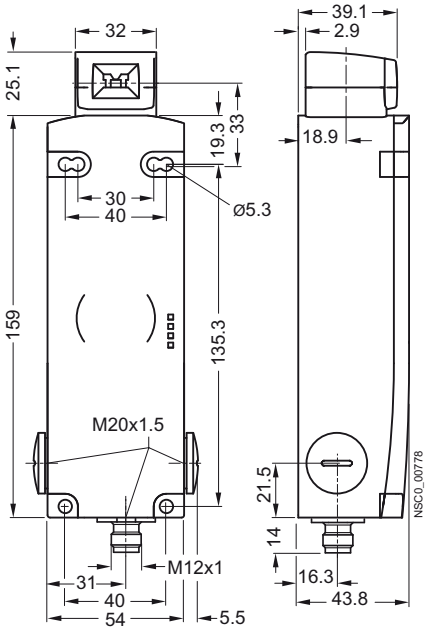
Spring-locked, with auxiliary release with lock
3SF1324-.SE1., 3SF1314-.SE1.



Spring-locked, with escape release at front
3SF1324-.SF1., 3SF1314-.SF1.

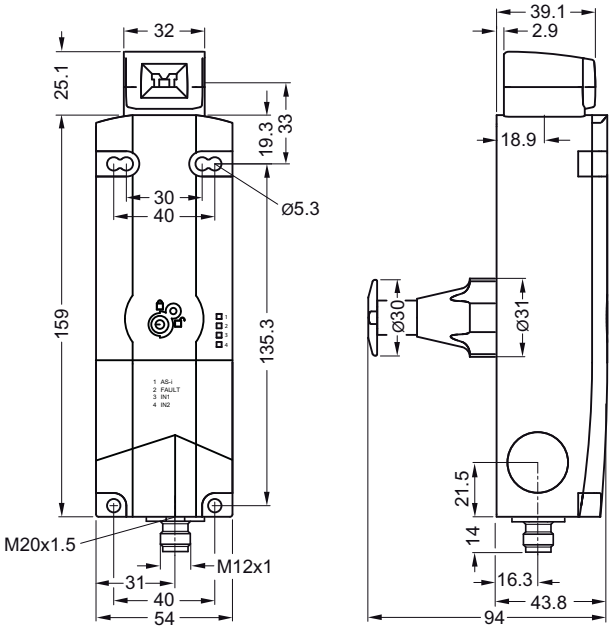


Solenoid-locked
3SF1324-.SB1., 3SF1314-.SB1



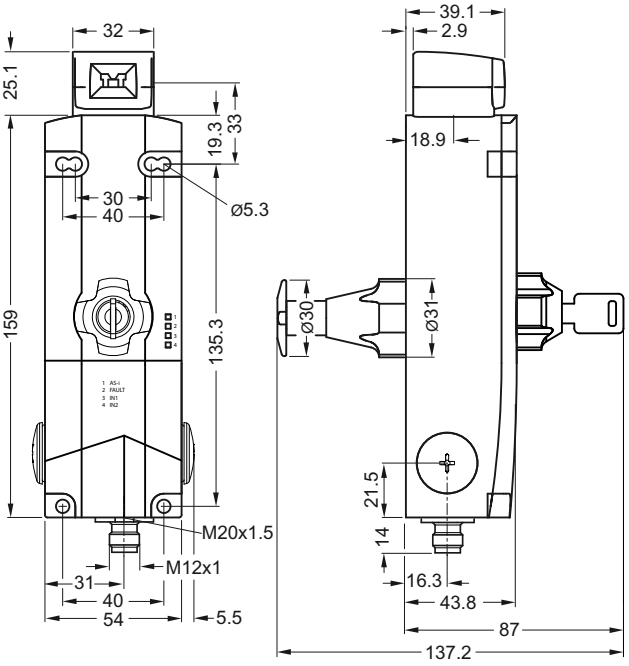
Spring-locked, front auxiliary release,
escape release at rear

3SF1324-1SG21-1BA4, 3SF1324-1SG21-1BK4,
3SF1324-1SG21-1BA1, 3SF1324-1SG11-1BA1



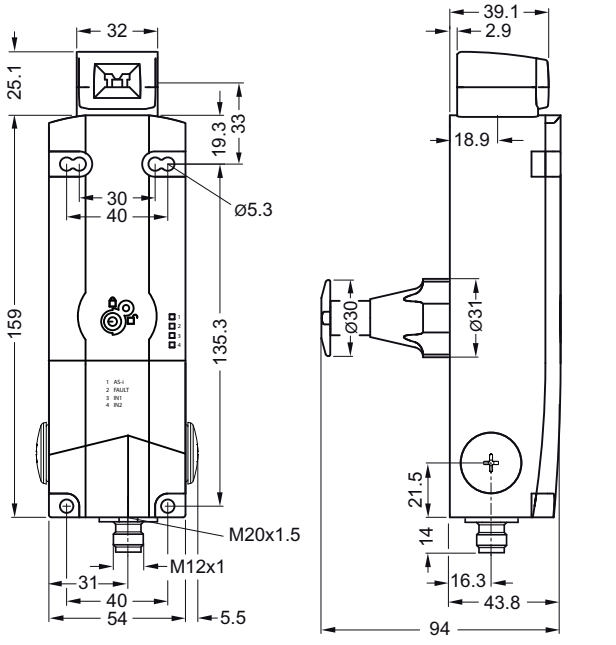
Spring-locked, front auxiliary release with lock, escape release at rear

3SF1314-1SH11-1BA1



Spring-locked, emergency release at rear,
auxiliary release at front

3SF1314-1SJ11-1BA1, 3SF1324-1SJ21-1BA1



You can find further information at: Combinations with actuators (Page 139)

Hinge switches

6

3SE5232-0.U21

3SE5232-0.U22

3SE5132-0LU21

3SE5132-0LU22

3SE2283

Application areas and features

- Used for hinged protective devices, such as doors or flaps, for which the position must be monitored for safety reasons.
- The 3SE5 hinge switches have snap-action contacts with an actuating angle of 10° and enable shutdown and signaling without delay at a small opening angle.

The 3SE5 hinge switches have the same enclosure as mechanical position switches (modular system).

The 3SE2283 hinge switches with built-in hinge are particularly suitable for use in doors and flaps of machines.

Benefits

- Fixed and positively-locking connections between the switch and protective door hinge directly at the pivot point of the protective device provide maximum protection from tampering and manipulation.
- Hinge switches in a standard enclosure according to EN 50047 and EN 50041 provide a small actuating angle of only 10°.
- The snap-action contacts enable simultaneous shutdown and signaling.
- 3SE2283 variants with a small operating angle of 4° or 8°.
- Protection against personal injury provided by positively driven NC contacts according to IEC 60947-5-1

WARNING
Damage or wear. Functioning of the hinge switch may be detrimentally affected if this is not observed. The complete switch must be replaced in the event of damage or wear. Replacement of individual parts or modules is not permitted.

Enclosure sizes

The 3SE5 hinge switches are available as complete units in two enclosure sizes:

- Metal enclosure/plastic enclosure according to EN 50047, 31 mm wide, 1 cable entry
- Metal enclosure/plastic enclosure according to EN 50041, 40 mm wide, 1 cable entry

Enclosure versions

With the enclosures, you can choose from a variety of basic switches:

- Available with two-pole contact blocks, designed as snap-action contacts only.
- Available with three-pole contact blocks, designed as snap-action contacts only.

Actuator

The hinge switches are intended for mounting on hinges. The actuator head is included in the scope of delivery. There are two variants:

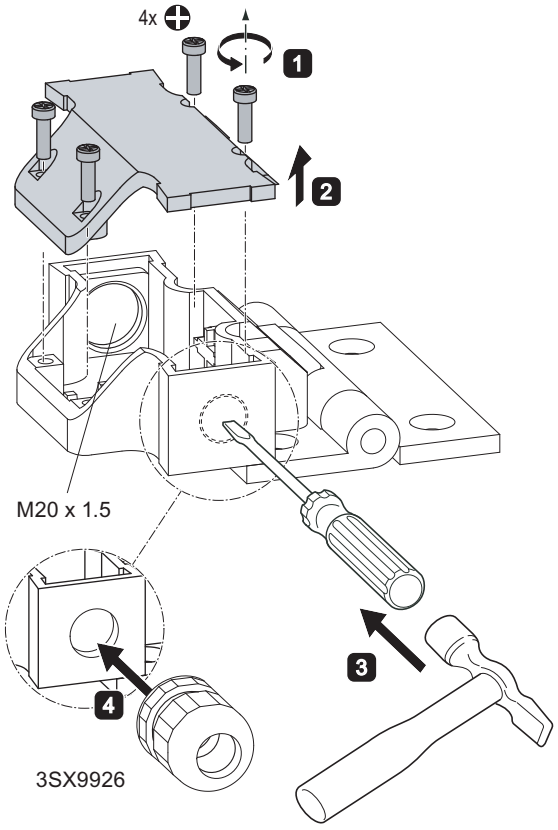
- Actuator with hollow shaft, inside diameter 8 mm, outside diameter 12 mm
- Actuator with solid shaft, diameter 10 mm

6.1 Mounting instructions for 3SE2283 hinge switches

1. / 2. Unscrew the cover of the plastic enclosure.

3. Use a hammer and a screwdriver to remove the pre-punched opening from the plastic enclosure of the hinge switch.

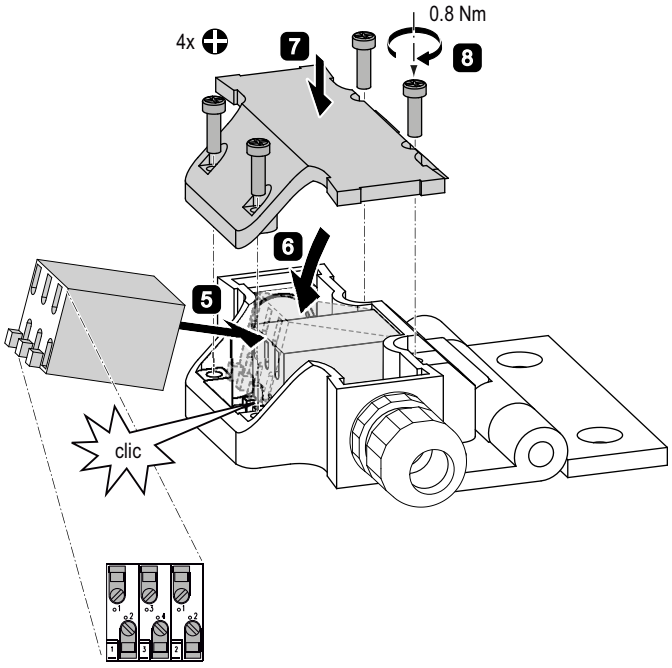
4. Screw the cable gland 3SX9926 onto the opening in the enclosure.



5. / 6. As illustrated, snap the contact block into the enclosure.

7. Fit the cover of the enclosure.

8. Fasten the cover of the enclosure with 4 cross-recessed screws.



⚠ WARNING

Damage or wear. Functioning of the hinge switch may be detrimentally affected if this is not observed.

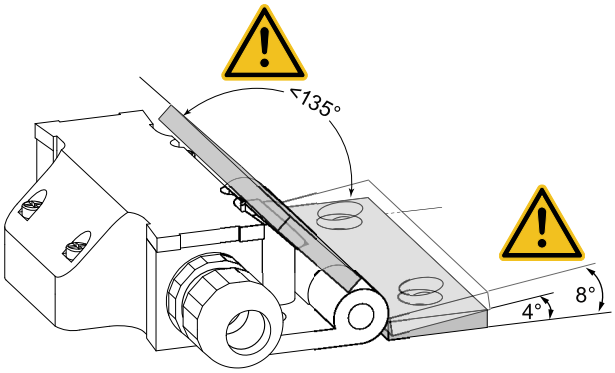
The complete switch must be replaced in the event of damage or wear. Replacement of individual parts or modules is not permitted.

Mounting instructions

NOTICE

Observe the operating angle.

On installation, make sure that the hinge of the hinge switch has an operating angle of 4 ° to 8 °.



4°	8°
3SE2283-0GA43	3SE2283-0GA53
3SE2283-6GA43	3SE2283-6GA53

Make sure of positive locking

1. The hinge switch of the 40 mm wide enclosure is secured with four M5 screws. Make sure that at least one of these screws is a safety screw (one-way screw) to meet the requirements of EN 1088 or ISO 14119. Ensure that there is a screw retainer.
2. The hollow shaft (external diameter 12 mm, internal diameter 8 mm) of the hinge switch has three fixing options:
   - An M3 drill hole underneath
   - A 2.9 mm drill hole at in the center at the rear
   - A 2.9 mm drill hole at on the left at the front
3. Positively-locking fastening is absolutely essential.
4. It is the customer's responsibility to ensure a positively-locking fastening. The following versions are possible:
   - Drill a hole in the shaft opposite the M3 hole and connect the shaft and hollow shaft positively with an M3 screw.
   - Drill a hole in the shaft opposite one or both 2.9 mm holes and connect the shaft and hollow shaft positively with a conical pin.
   - Drill through one or both 2.9 mm holes and connect the shaft and hollow shaft positively with a pin.

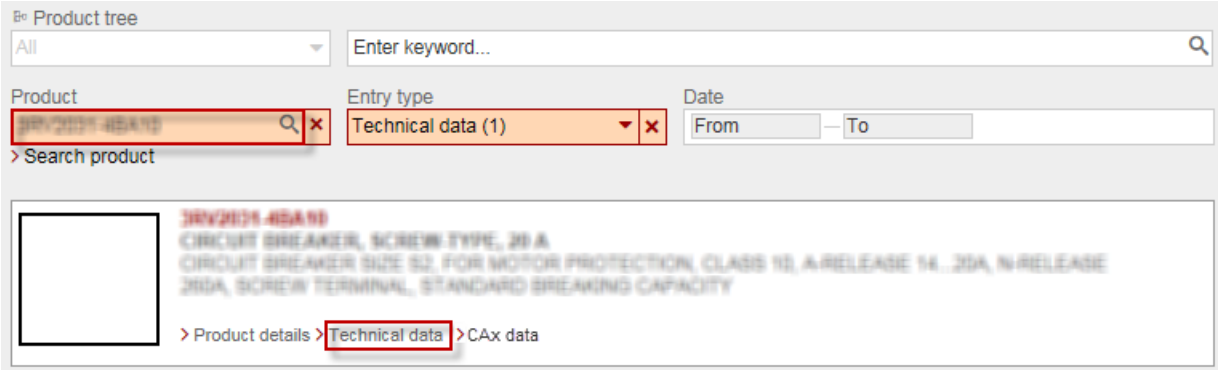
6.2 Technical specifications

6.2.1 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.

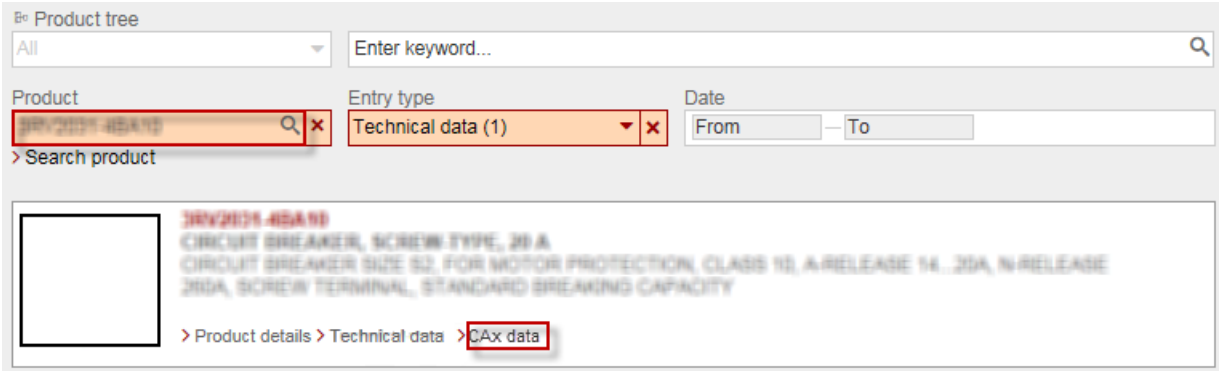


6.3 Dimension drawings and operating travel diagrams

6.3.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "CAx data link.

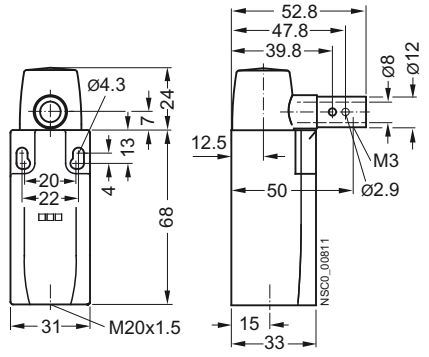
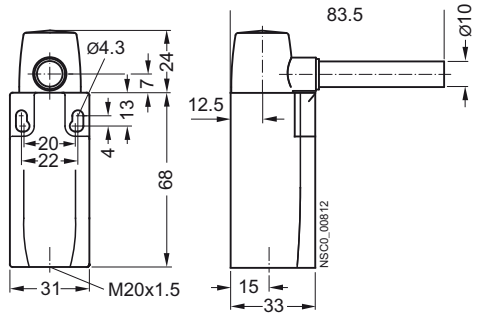
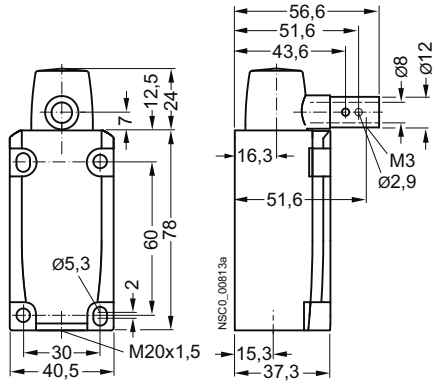
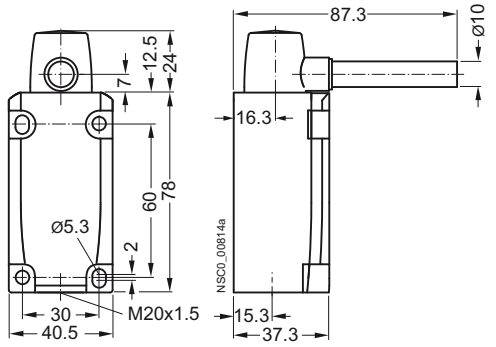


6.3.2 Extract from the technical specifications

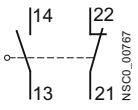
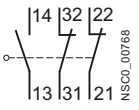
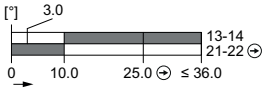
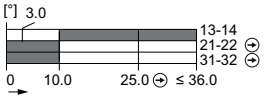
Note

The information in the extract from the technical specifications is not subject to the change service. For current values, refer to Technical Data Sheet.

Dimension drawings for 3SE5 hinge switches

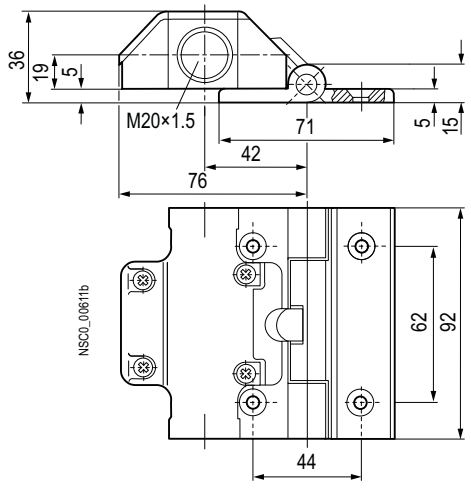
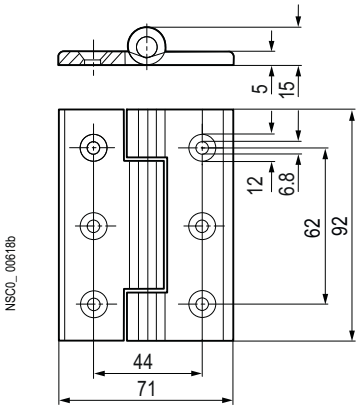
Enclosure width 31 mm with hollow shaft 3SE5212-0.U21 3SE5232-0.U21	Enclosure width 31 mm with solid shaft 3SE5212-0.U22 3SE5232-0.U22
	
Enclosure width 40 mm with hollow shaft 3SE5112-0.U21 3SE5132-0.U21	Enclosure width 40 mm with solid shaft 3SE5122-0.U22 3SE5132-0.U22
	

Operating travel diagrams for 3SE5 hinge switches

Snap-action contacts	
1 NO + 1 NC  Code number 11	1 NO + 2 NC  Code number 12
3SE5...-0HU2. 	3SE5..-0LU2. 

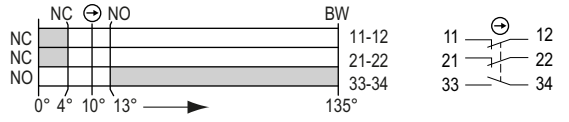
⊕ Positive opening operation according to EN 60947-5-1
→ Direction of actuation
Contact element closed
Contact element open

Dimension drawings for 3SE2 hinge switches

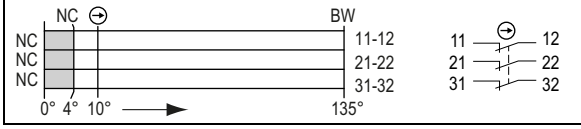
Hinge switch, molded-plastic enclosure with hinge 3SE2283-.GA4 /-.GA5.	Additional hinge for 40 mm profile for hinge switch 3SX3225 / 3SX3231
	

Operating travel diagrams for 3SE2283

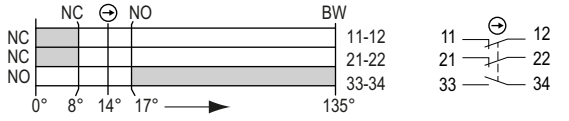
3SE2283-0GA43



3SE2283-6GA43



3SE2283-0GA53



3SE2283-6GA53

NC NC contact

NO NO contact

⊕ Positive opening operation according to EN 60947-5-1

BW Actuator travel

Contact element closed

Contact element open

Magnetically operated switches

7

A magnetically operated switch comprises a coded switching magnet and a contact block (sensor unit). Evaluation requires a safety relay or connection to a bus system.

A magnetic monitoring system comprises one or more magnetically operated switches and an evaluation unit, e. g. a safety switching device (3SK) (see Chapter Evaluation of the sensors with safety relays (Page 284))

7.1 3SE660/3SE670 non-contact magnetically operated safety switches

Application areas and features

- On movable protective guards (hoods, hinge switches, doors, etc.)
- The closed design with IP67 degree of protection is particularly suitable therefore for areas exposed to contamination, cleaning or disinfecting.
- When magnetically operated switches with 1 NO + 1 NC / 2 NC contact blocks are used, the safety relays provide a high level of protection against manipulation and can be installed in safety circuits up to SIL 3 according to ISO 13849-1.

7.1.1 Mounting position for 3SE66 magnetically operated switches

Adjustment

Only 3SE67 coded magnets can be used to operate the 3SE66 contact blocks.

Note

Function check

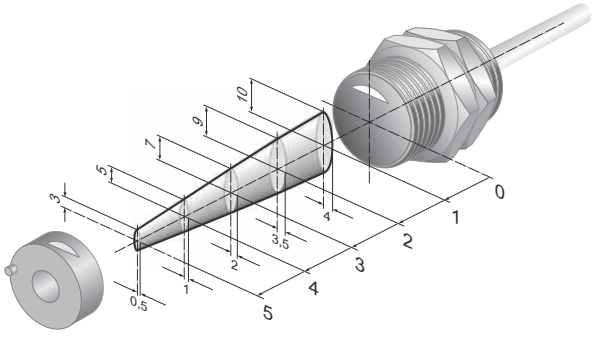
Please always check proper operation of the magnetic monitoring system with the connected monitoring unit.

Use the specified diagrams to perform adjustment. When the center marking of the magnet is within the depicted basic setting zone, the connected monitoring unit will provide an enable

signal. The specified operating distances refer to switches and magnets mounted opposite. In principle, other arrangements are possible, but they may lead to different operating distances.

NOTICE
Keep to the mounting distance. When fitting two systems, pay attention to a mounting distance of at least 50 mm.

Round contact block, 3SE6605-1BA / 3SE6605-1BA02

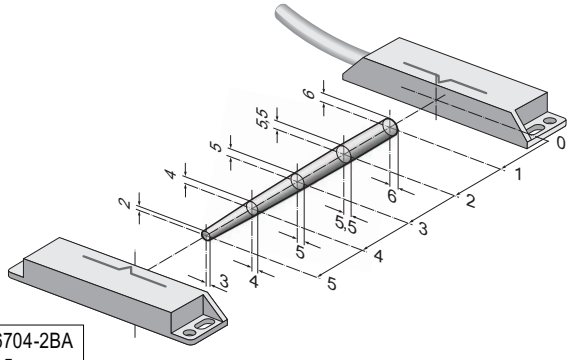


s_{ao} = 5 mm
s_{ar} = 15 mm

s_{ao} = safe operating distance ON

s_{ar} = safe operating distance OFF

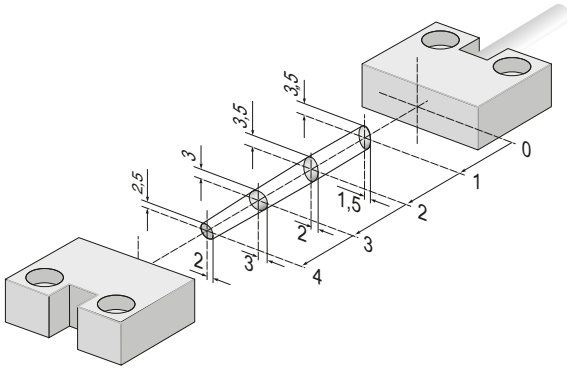
Rectangular contact block, 25 x 88 mm, 3SE6604-2BA. / 3SE6605-2BA. / 3SE6606-2BA04



3SE6704-2BA
s_{ao} = 5 mm
s_{ar} = 15 mm

3SE6701-2BA
s_{ao} = 8 mm
s_{ar} = 18 mm

Rectangular contact block, 25 x 33 mm, 3SE6605-3BA.



s_{ao} = 4 mm
s_{ar} = 14 mm

s_{ao} = safe operating distance ON

s_{ar} = safe operating distance OFF

Note

EN 60947-5-3

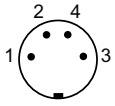
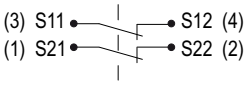
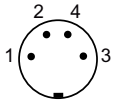
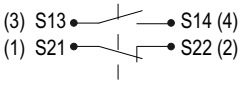
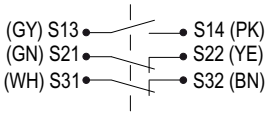
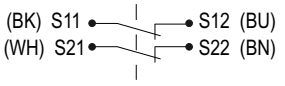
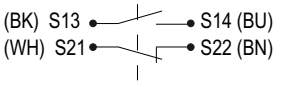
The EN 60947-5-3 standard is fulfilled only by a complete system comprising the contact block, the coded switching magnet, the monitoring unit (electronics; e.g. 3SK) or AS-i Safe and SIMATIC S7300F.

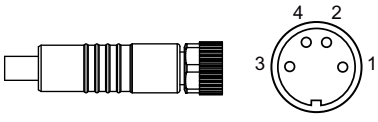
Note

Lateral actuation

Lateral actuation of the safety sensor (sliding door) via the longitudinal side of the safety sensor is allowed only from the direction opposite the cable outlet.

7.1.2 3SE660 pin assignments

3SE6604-2BA01 Magnetically operated switch, rectangular contact block, 25 x 88 mm	**M8 connector, -pin (2 NC)** 	
3SE6605-1BA02 Magnetically operated switch, round M30 contact block, M12 connector **3SE6605-2BA01** Magnetically operated switch, rectangular contact block, 25 x 88 mm, M8 connector	**M8/M12 connector 4-pin (1 NO + 1 NC)** 	
3SE6606-2BA04 Magnetically operated switch, rectangular contact block, 25 x 88 mm	**with connecting cable (1 NO + 2 NC)** 	
3SE6604-2BA / 3SE6604-2BA10 Magnetically operated switch, rectangular contact block, 25 x 88 mm	**with connecting cable (2 NC)** 	
3SE6605-1BA Magnetically operated switch, round M30 contact block **3SE6605-2BA / 3SE6605-2BA10** Magnetically operated switch, rectangular contact block, 25 x 88 mm **3SE6605-3BA / 3SE6605-3BA05 / 3SE6605-3BA10** Magnetically operated switch, rectangular contact block 25 x 33 mm	**with connecting cable (1 NO + 1 NC)** 	

Socket with connecting cable 3SX5601-3GA05	**1**	**2**	**3**	**4**
	BN	WH	BU	BK

GY = gray
GN = green
WH = white
BK = black

PK = pink
YE = yellow
BN = brown
BU = blue

S11/12, S21/22 = safety contact
S31/32 = signaling contact

7.1.3 Notes on installation

Installation

By laying the cables between the magnetically-operated switch and the evaluation unit in a manner that protects them against short-circuit, the occurrence of a cross-circuit fault can be excluded.

Note the following for installation of the magnetically-operated switch:

- When using the magnetically-operated switches on the following Siemens evaluation units, no protected laying of cables or fuse protection is required:
  - 3SK112 Advanced safety relays as well as 3SK122 input expansions
  - 3SK2 safety relays
  - 3RK3 Modular Safety System MSS
- If none of the evaluation units listed above is used, the cables between the magnetically-operated switch and the evaluation unit must be laid such that they are short-circuit and cross-circuit-proof in order to prevent contact welding in the event of a cross circuit.
- If the protected laying of cables is not possible, then every channel in the sensor circuit must be protected:
  - G fuse links: 0.25 A 250 V/AC very-fast-acting (FF) 5 x 20 mm for Standard 3SE66 magnetically-operated switches.
  - Magnetically operated switches with LED display (3SE66..-4....) are not able to be used in this case due to the reduced operating current.
  - Use the fuse terminal with plug-in connection 8WH6000-1GG08, with cover 8WH9003-1GA00, or the fuse terminal with screw connection 8WA1011-1SF12 to secure the fuse on a DIN rail.

Regular technical tests

Perform regular checks to ensure fault-free and reliable operation.

Test the safe functioning of the protective equipment in the following cases:

- after every commissioning operation
- every time a component is replaced
- after an extended period of non-operation or standstill
- after every fault

Test the safe function of the protective equipment at suitable intervals, such as during maintenance activities. Refer to the ISO 14119 standard for examples of possible intervals.

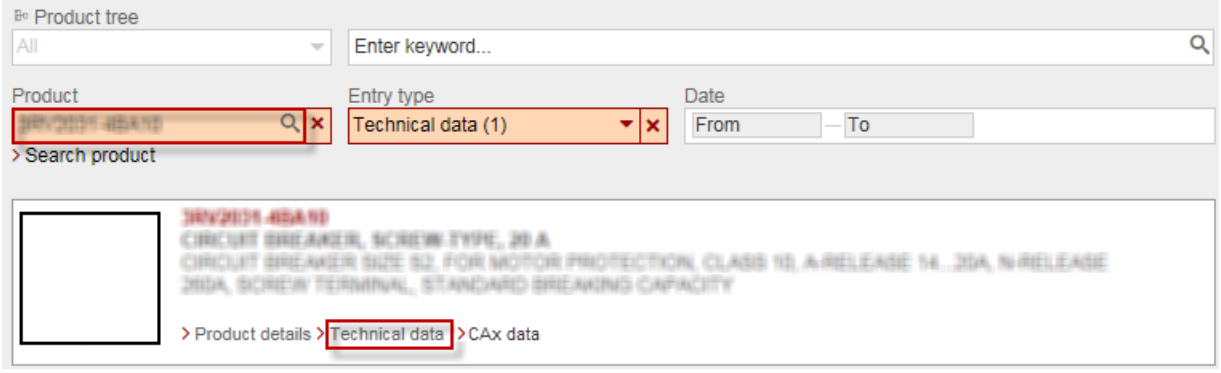
7.1.4 Technical specifications

7.1.4.1 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.

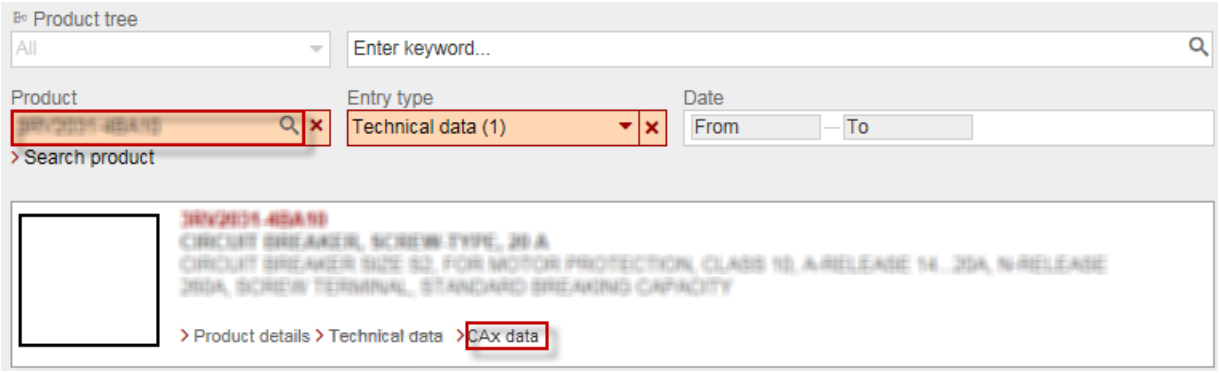


7.1.5 Dimension drawings

7.1.5.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "CAx data link.

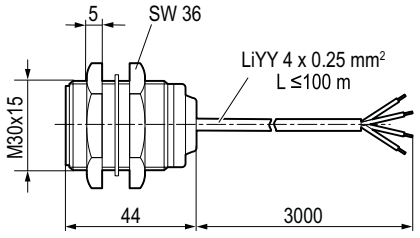


7.1.5.2 Extract from the technical specifications

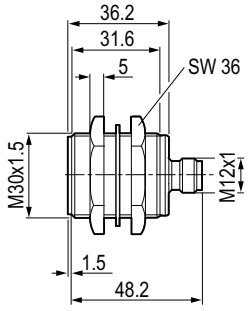
Note

The information in the extract from the technical specifications is not subject to the change service. For current values, refer to Technical Data Sheet.

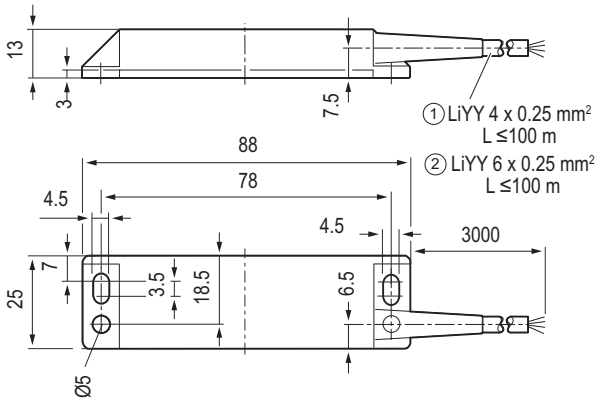
Round contact block with cable, 3SE6605-1BA



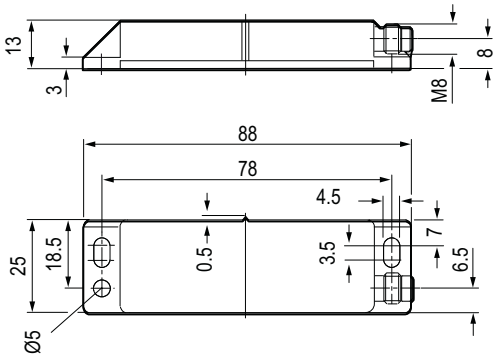
Round contact block with M12 plug, 3SE6605-1BA02



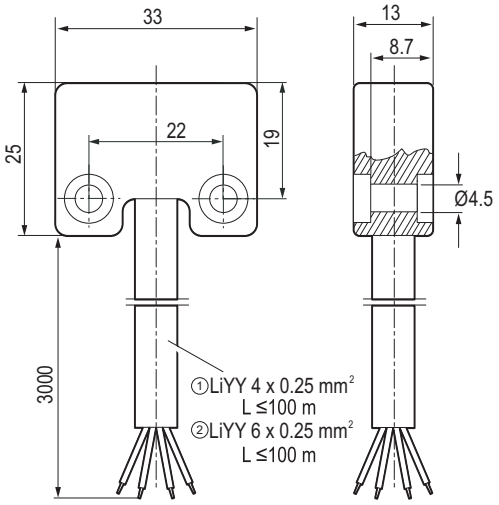
Rectangular contact block, 25 x 88 mm, with cable, 3SE6604-2BA / 3SE6605-2BA, 3SE6604-2BA10 / 3SE6605-2BA10, 3SE6605-2BA05, 3SE6606-2BA04



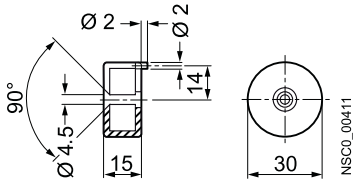
Rectangular contact block, 25 x 88 mm, with M12 plug, 3SE6604-2BA01 / 3SE6605-2BA01



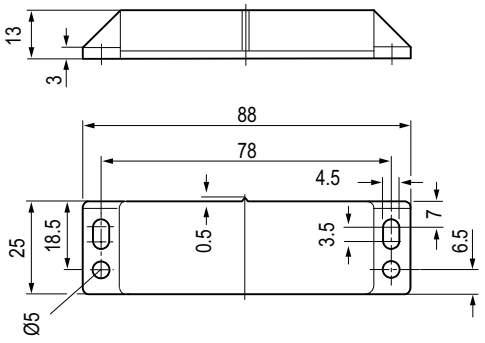
Rectangular contact block, 25 x 33 mm, with cable, 3SE6605-3BA..



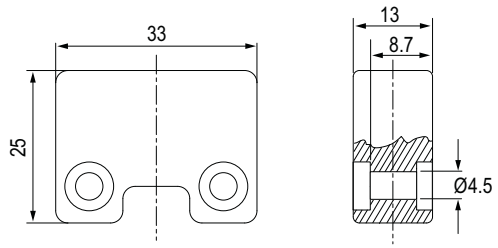
Round switching magnet, 3SE6704-1BA



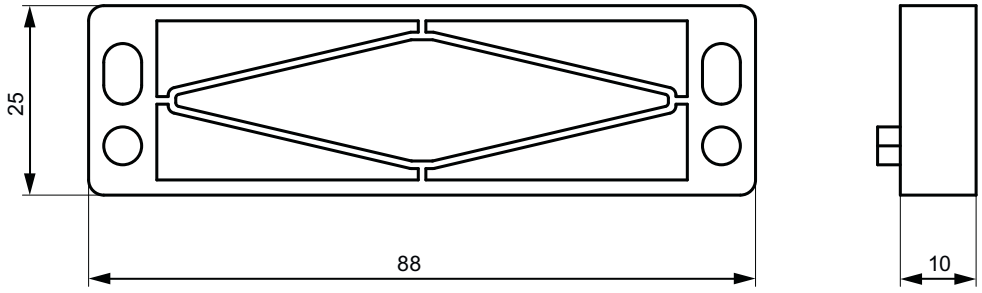
Rectangular switching magnet, 3SE6704-2BA



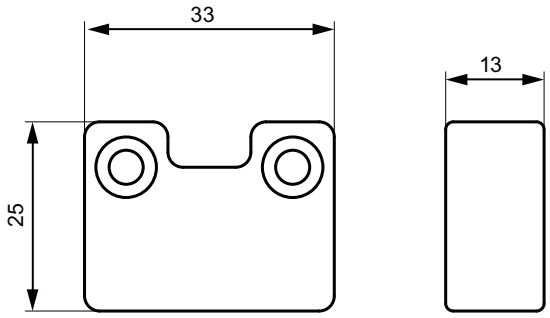
Rectangular switching magnet, 3SE6704-3BA



Spacer accessory, 3SX3260

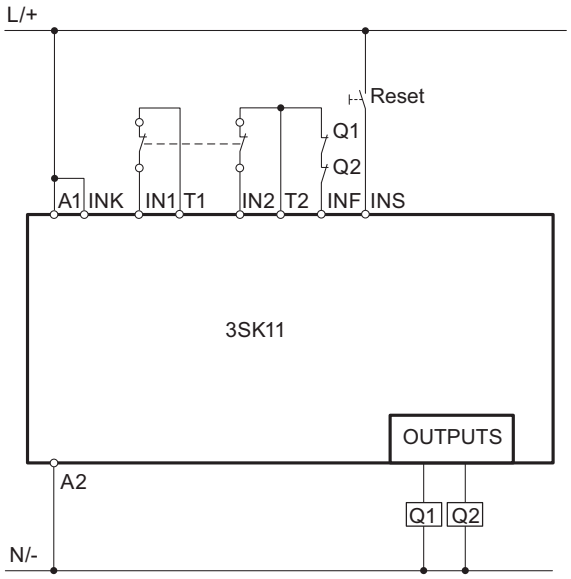


Spacer accessory, 3SX3261



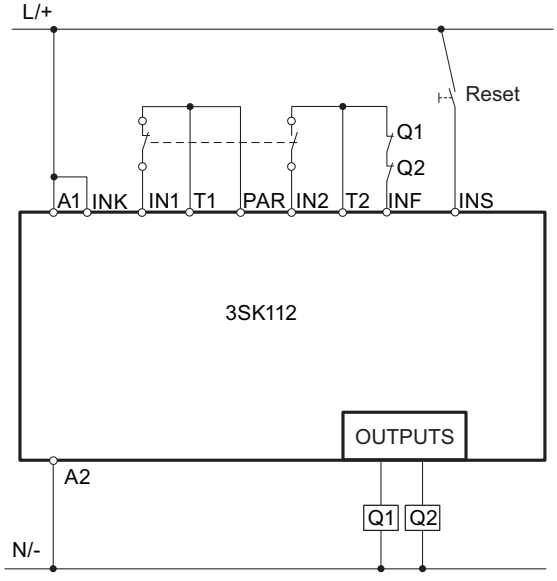
7.1.6 Example circuits

Example circuit 3SE6604 with SIRIUS 3SK11 safety relay



Achievable safety level: PLe (DIN EN ISO 13849-1), SIL3 (EN 62061)

Example circuit 3SE6605 / 3SE6606 with SIRIUS 3SK112 safety relay



Achievable safety level: PLe (DIN EN ISO 13849-1), SIL3 (EN 62061)

7.2 Non-contact magnetically operated safety switches 3SE661/3SE662 + 3SE671/3SE672

Application areas and features

- The 3SE66 safety sensors for use in safety circuits serve to monitor the positions of movable protective devices in compliance with ISO 14119 and IEC 60947-5-3.
- Only 3SE67 actuators may be used to operate the 3SE66 safety sensors.
- The closed design with IP67 degree of protection is particularly suitable therefore for areas exposed to contamination, cleaning or disinfecting.
- When magnetically operated switches with 1 NO + 1 NC (+ 1 NC = signaling contact) / 2 NC (+ 1 NC = signaling contact) contact blocks are used, the 3SK safety relays provide a high level of protection against manipulation and can be installed in safety circuits up to SIL 3 according to EN ISO 13849-1.

Note

The safety sensors are used in applications in which the hazardous state is ended without delay when the protective device is opened.

Note

LED status display

In the version with the LED display, the LED lights up when the protective door is closed.

7.2.1 Door hinge

Select the appropriate magnetically operated switch for a right or left door hinge.

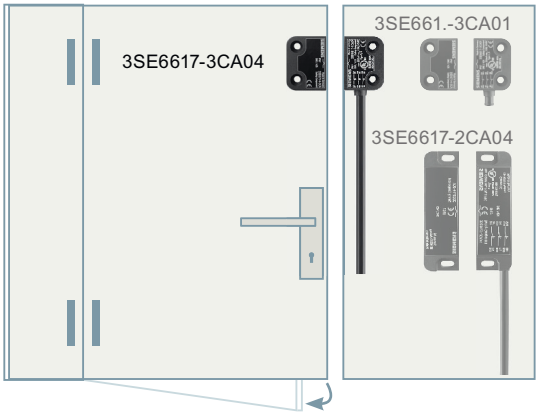


Figure 7-1 Door hinge left

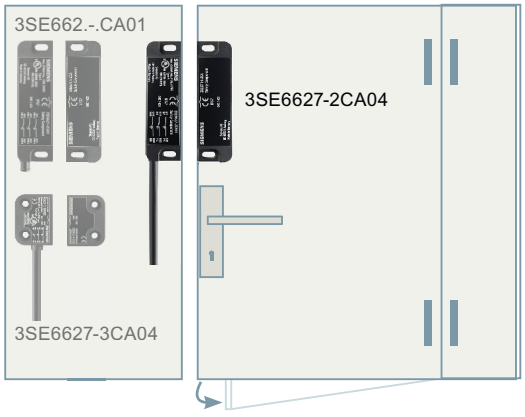
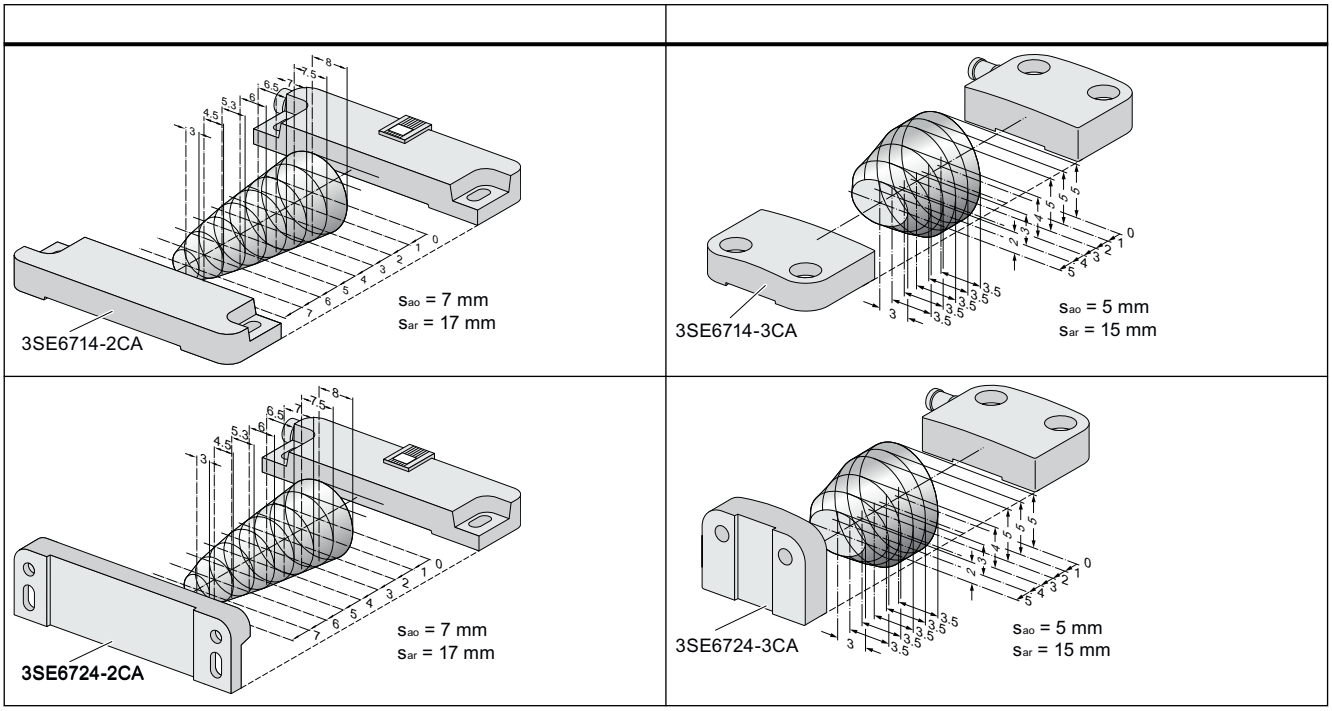


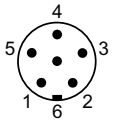
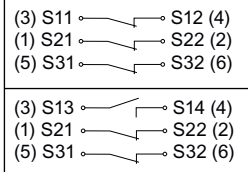
Figure 7-2 Door hinge right

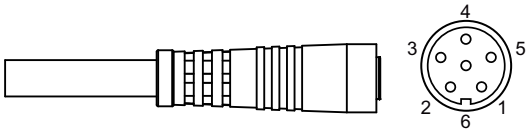
7.2.2 Mounting position



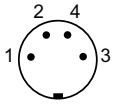
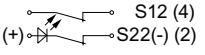
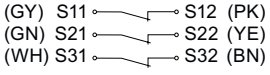
7.2.3 Pin assignments

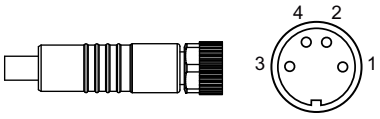
Color coding of cores

Magnetically operated switch	Connector ⌀ 8 mm, latching connection, 6-pin	
3SE6617-2CA01 / 3SE6627-2CA01 Magnetically operated switch, rectangular contact block, 25 x 88 mm **3SE6617-3CA01 / 3SE6627-3CA01** Magnetically operated switch, rectangular contact block 26 x 36 mm		

Socket with connecting cable 3SX5601-4GA05	1	2	3	4	5	6
	BN	WH	GN	YE	GY	BU

GY = gray	PK = pink	S11/12, S21/22 = safety contact
GN = green	YE = yellow	S13/14, S31/32 = signaling contact
WH = white	BN = brown	

Magnetically operated switch	M8 connector, 4-pin	
3SE6614-4CA01 / 3SE6624-4CA01 Magnetically operated switch, rectangular contact block, 25 x 88 mm		
	with cable	
3SE6617-2CA04 / 3SE6627-2CA04 Magnetically operated switch, rectangular contact block, 25 x 88 mm **3SE6617-3CA04 / 3SE6627-3CA04** Magnetically operated switch, rectangular contact block 26 x 36 mm		

Socket with connecting cable 3SX5601-3GA05	1	2	3	4
	BN	WH	BU	BK

BU = blue BK = black S11/12, S21/22 = safety contact
WH = white BN = brown S31/32 = signaling contact

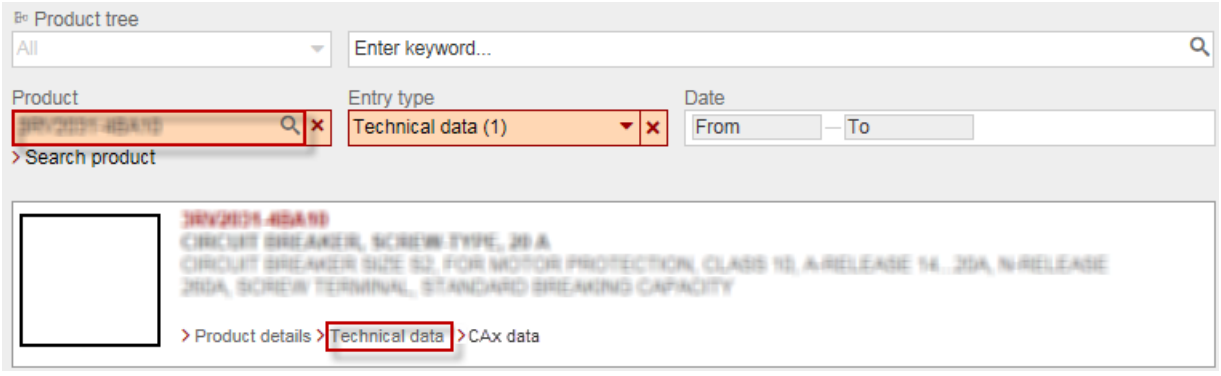
7.2.4 Technical specifications

7.2.4.1 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.

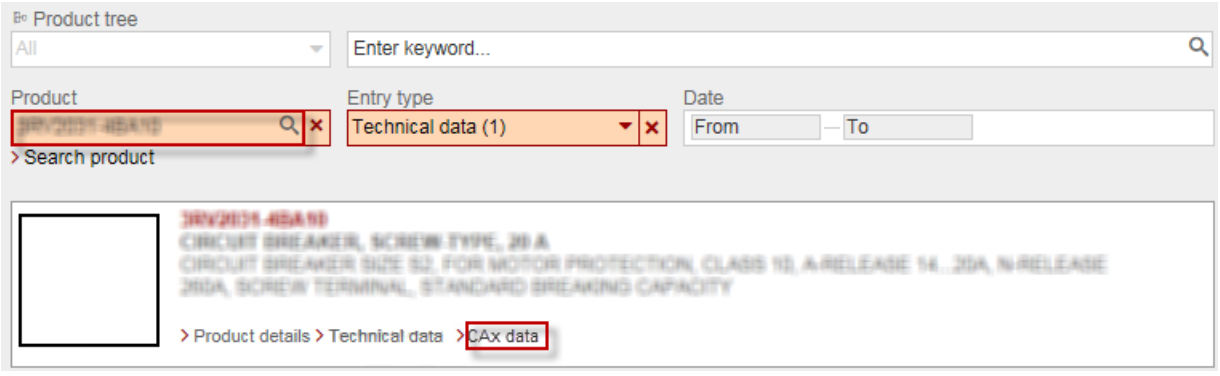


7.2.5 Dimension drawings

7.2.5.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "CAx data link.

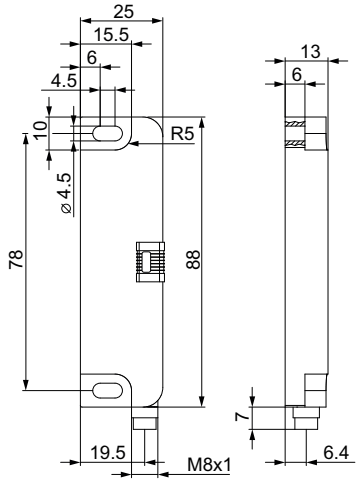
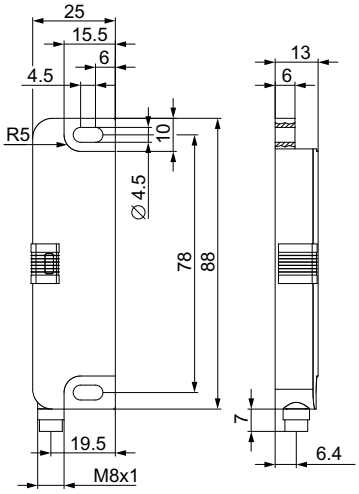
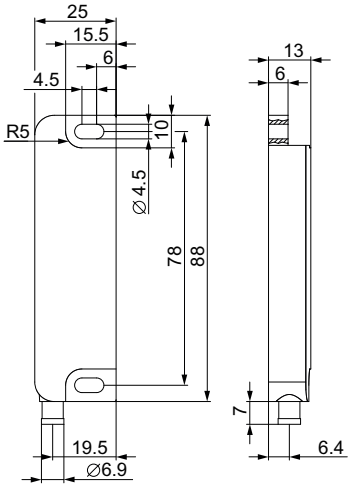


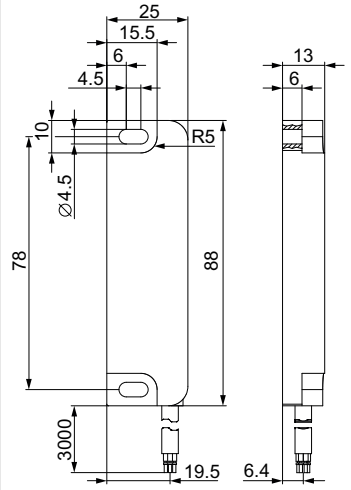
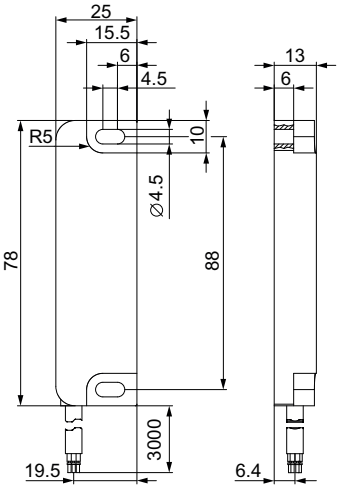
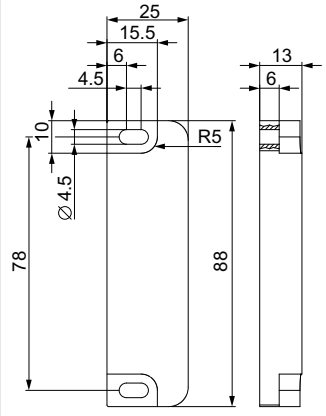
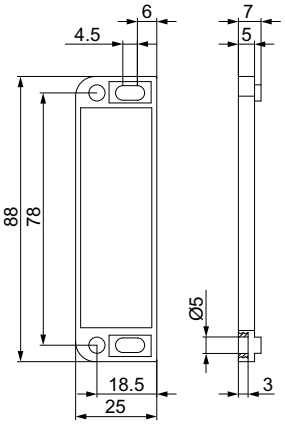
7.2.5.2 Extract from the technical specifications

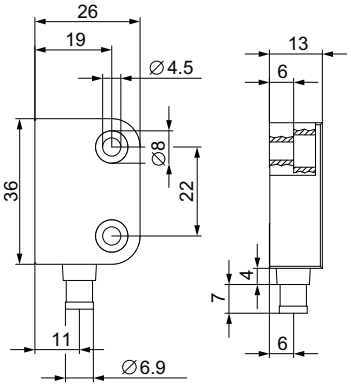
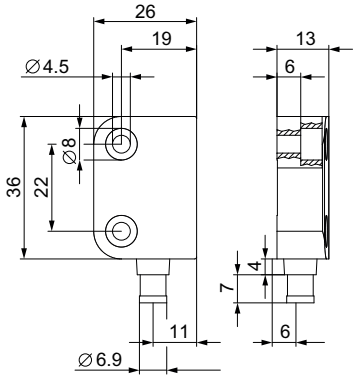
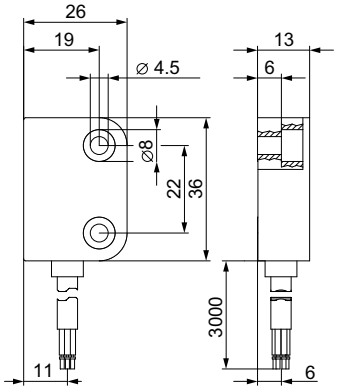
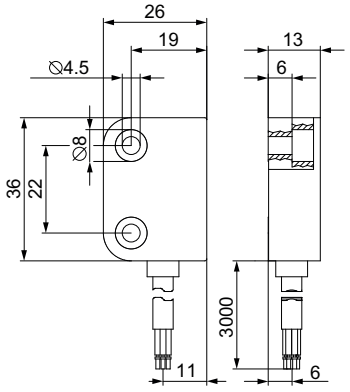
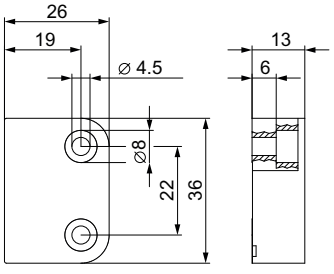
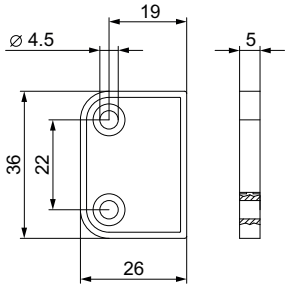
Dimension drawings

Note

The information in the extract from the technical specifications is not subject to the change service. For current values, refer to Technical Data Sheet.

Contact blocks and switching magnets, 25 x 88 mm	
 Contact block 3SE6614-4CA01, door hinge left	 Contact block 3SE6624-4CA01, door hinge right
	 Contact block 3SE6627-2CA01, door hinge right

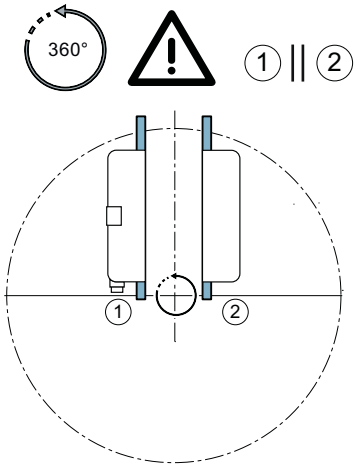
Contact blocks and switching magnets, 25 x 88 mm	
 Contact block 3SE6617-2CA04, door hinge left	 Contact block 3SE6627-2CA04, door hinge right
 Switching magnet 3SE6714-2CA, position with contact block in one mounting plane	 Spacer 3SX5600-2GA02

Contact blocks and switching magnets, 26 x 36 mm	
 Contact block 3SE6617-3CA01, door hinge left	 Contact block 3SE6626-3CA01, door hinge right
 Contact block 3SE6617-3CA04, door hinge left	 Contact block 3SE6627-3CA04, door hinge right
 Switching magnet 3SE6714-3CA, position with contact block in one mounting plane	 Spacer 3SX5600-2GA01

7.3 Notes on installation

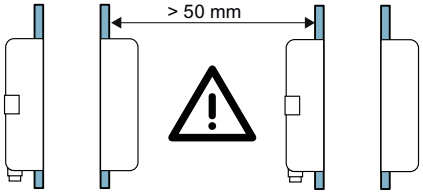
Installation position

Any installation position is possible, but the actuation surfaces must be parallel with one another.



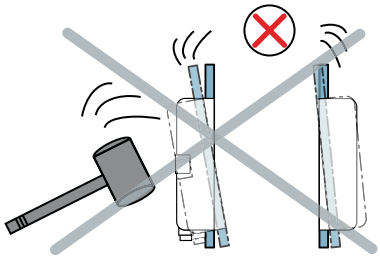
Mounting distance

The mounting distance between two systems is at least 50 mm.



Ambient conditions

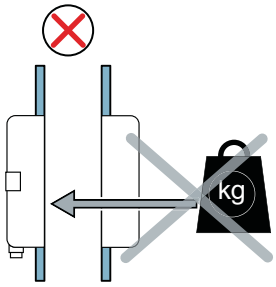
Do not subject the safety sensor and the actuator to extreme vibrations and impacts.



Be sure to keep the safety sensor and the actuator free from iron swarf.

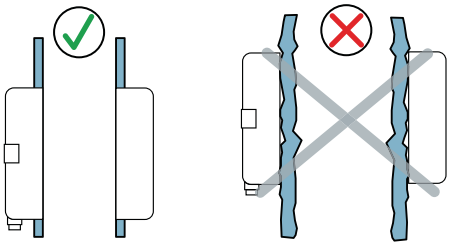
Installation

Do not use the safety sensor and the actuator as endstops.



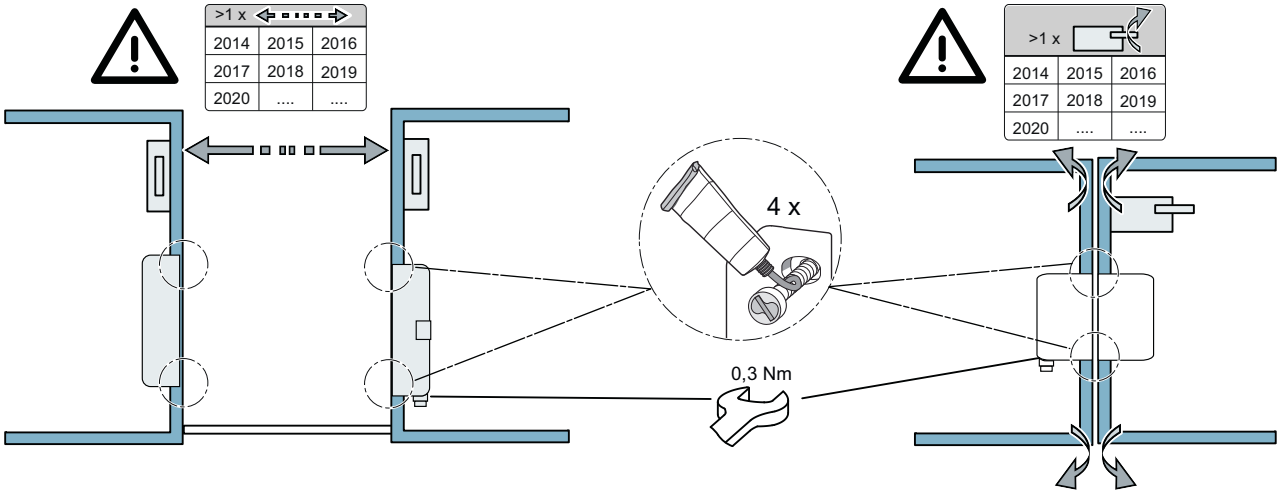
Mounting and checking

The safety sensor may only be mounted onto flat surfaces because distortion can otherwise occur that is capable of destroying the sensor or changing the minimum distances.



The safety sensor and the actuator must be mounted inseparably on the protective device.

Check the operating capability of the safety sensor and the actuator once a year.

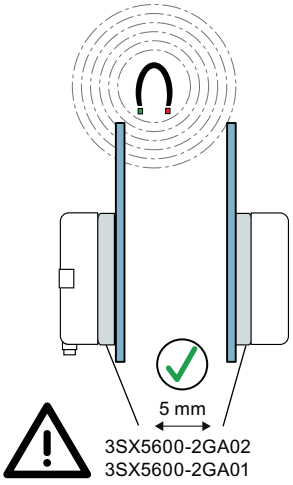


Magnetic influences

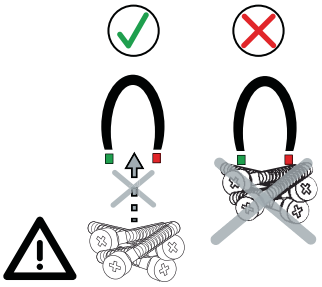
Note

The safety sensor and the actuator must not be fitted in strong magnetic fields in order to ensure their proper function.

If the safety sensor and the actuator are to be fitted on magnetic material, a 5 mm thick non-magnetic adapter or the original spacer must be used.



Use non-magnetic screws for mounting only.



7.4 Magnetically operated switch - monitoring unit combination

Monitoring units		Magnetically operated switches (contact block + switching magnet)			Achievable SIL (IEC 61508, IEC 62061) Performance Level (EN ISO 13849-1)
		1 NO + 1 NC 3SE6605-.BA.. 1 NO + 1 NC (+ 1 NC signaling contact) 3SE6704-.BA	2 NC 3SE6604-2BA.. 1 NO + 2 NC 3SE6606-2BA04 3SE6704-2BA	--	
		1 NO + 1 NC (+ 1 NC signaling contact) 3SE6616-3CA01 3SE6626-3CA01 3SE6714-3CA 3SE6724-3CA	2 NC; 2 NC (+ 1 NC signaling contact) 3SE6614-4CA01 3SE6624-4CA01 3SE6617-2CA01 3SE6627-2CA01 3SE6617-2CA04 3SE6627-2CA04 3SE6714-2CA 3SE6724-2CA	2 NC (+ 1 NC signaling contact) 3SE6617-3CA01 3SE6627-3CA01 3SE6617-3CA04 3SE6627-3CA04 3SE6714-3CA 3SE6724-3CA	
Relay outputs					
SIRIUS safety relays	3SK1111 / 3SK1121	-- / ✓	✓	✓	SIL 3/PL e
Solid-state output					
SIRIUS safety relays	3SK1112 / 3SK1122	-- / ✓	✓	✓	SIL 3/PL e
	3SK2112 / 3SK2122	✓	✓	✓	SIL 3/PL e
ASIsafe compact safety modules	3RK1205 / 3RK1405	--	✓	✓	SIL 3/PL e
Modular Safety System (MSS)	3RK3	✓	✓	✓	SIL 3/PL e
SIMATIC S7-1200F or SIMATIC S7-1500F	F-DI 16 x 24 V DC	✓	✓	✓	SIL 3/PL e
SIMATIC ET 200SP PROFIsafe	4/8 F-DI, 24 V DC	✓	✓	✓	SIL 3/PL e
SIMATIC ET 200eco	4/8 F-DI, 24 V DC	✓	✓	✓	SIL 3/PL e
SIMATIC ET 200pro	8/16 F-DI, 24 V DC, 4/8 F-DI / 4 F-DO 2 A, 24 V DC, F-Switch	✓	✓	✓	SIL 3/PL e

✓ Suitable magnetically operated switch

-- Not available

Application examples

8

8.1 Notes on installation

NOTICE
Risk of property damage. **Failure to observe this caution may result in damage to the switch.** • Make sure that the actuating element of any actuator with a roller can approach in such a way that no lateral forces occur. The actuating element should be moved on the roller in a flat manner. • The actuating element must be configured according to its purpose so that the position switch is not subjected to unnecessary stress on actuation.

Instructions based on practical experience

Position switches, especially open-type position switches, must be mounted on a flat base in order not to exert any bending moment on the plastic enclosure when screwing into place.

NOTICE
Risk of property damage. The installation location of position switches and their electrical connecting cables must be at least 400 mm above the floor or the platform where maintenance and repair personnel work.

Make sure that the following actions can be performed easily and safely:

- Fastening
- Connecting
- Setting up
- Testing during the operating sequence

Note the following installation instructions:

- Position switches should be accessible without having to dismantle mechanical parts (except for protective grilles, maintenance doors).
- Make sure there is sufficient room for setting up and connecting.
- Seal the cable entry in such a way that liquids (splash water, drill emulsion, etc.) cannot penetrate the enclosure interior.
- Mount the position switch in such a way that chips, coarse dirt, oils, and coolants do not impair the function.

- Make sure that position switches can be easily tested during the operating sequence.
- Use a suitable cover or appropriate positioning to prevent chips from damaging or blocking the position switch.
- Take steps to prevent an inadvertent actuation by operating personnel.
- Ensure sufficient covers as a protection against inadvertent actuation as a result of normal movements of operating personnel.
- Take steps to rule out the possibility of mechanical damage during transport of the position switch.
- Avoid bending the connecting cable. If bending of the connecting cable cannot be avoided, the bending radius should not be less than 80 mm.

Ensure the following:

- Positive locking on a significant portion of the actuator travel of the position switch up until positive opening ⊕.
- Configuration of the switch as a switch with positive-opening operation and fail-safe signal processing.
- Adjustment of the actuating travel to conform to the positive opening operation travel according to manufacturer specifications.
- Actuation of the total positive-opening operation travel before intervention in the danger zone is possible.
- Positively-locking mounting (position can be rotated and offset) of the switch and final controlling element (cam disk, control rod), use of oblong hole mounting only with additional fixing means.
- Securing of the mounting elements of the switch and final controlling element (cam disk, control rod) against self-loosening.
- Sufficient mechanical strength of the support elements and functional elements for the switch.
- Protection against overtravel.
- Protection against external damage.
- Adaptation of the cable entry to the required degree of protection of the switch.
- Accessibility for maintenance and functional testing.
- Assurance that easy bypassing of the protective function is not possible.

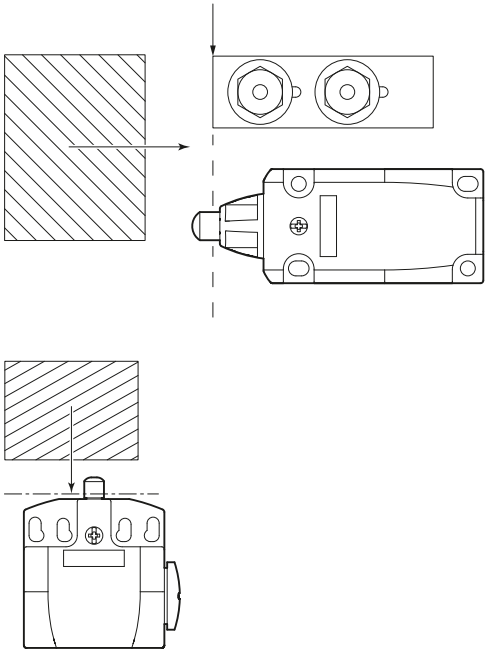
8.1.1 Protection against damage during approach and overtravel

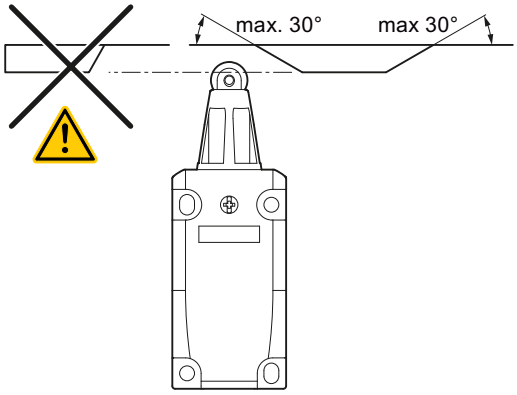
NOTICE
Risk of property damage. **Do not use position switches as a mechanical endstop.** Place the position switches in such a position that they are not damaged during approach and overtravel. For this reason, it is not permissible to use them as a mechanical stop. Choose a height for the control rod or cam that is less than the total travel in the switch, so that no mechanical loading of the switch or its mounting occurs.

EN 60204-1 stipulates:

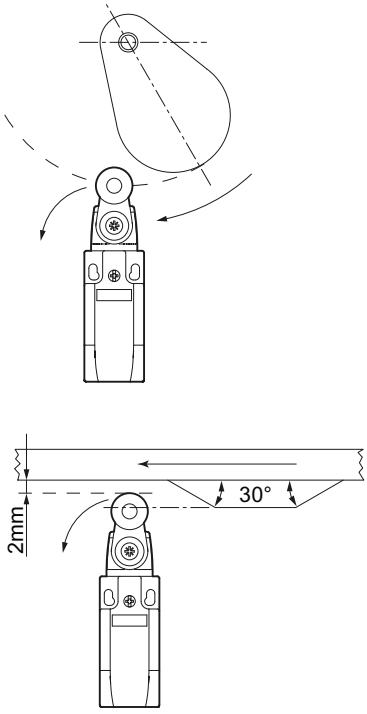
Position switches must be positioned in such a way that they are not damaged in the case of overtravel. They must be positioned in such a way that they are protected against inadvertent actuation.

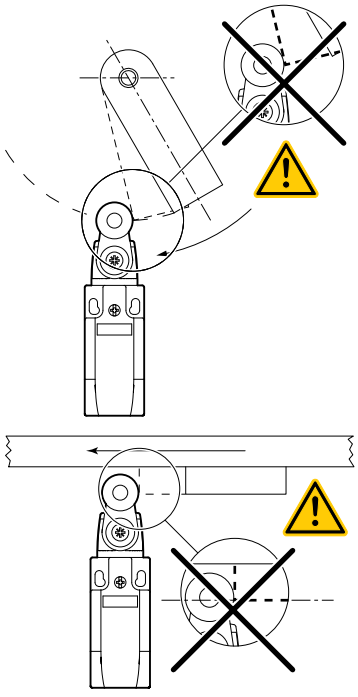
Installation instructions for rounded and roller plungers

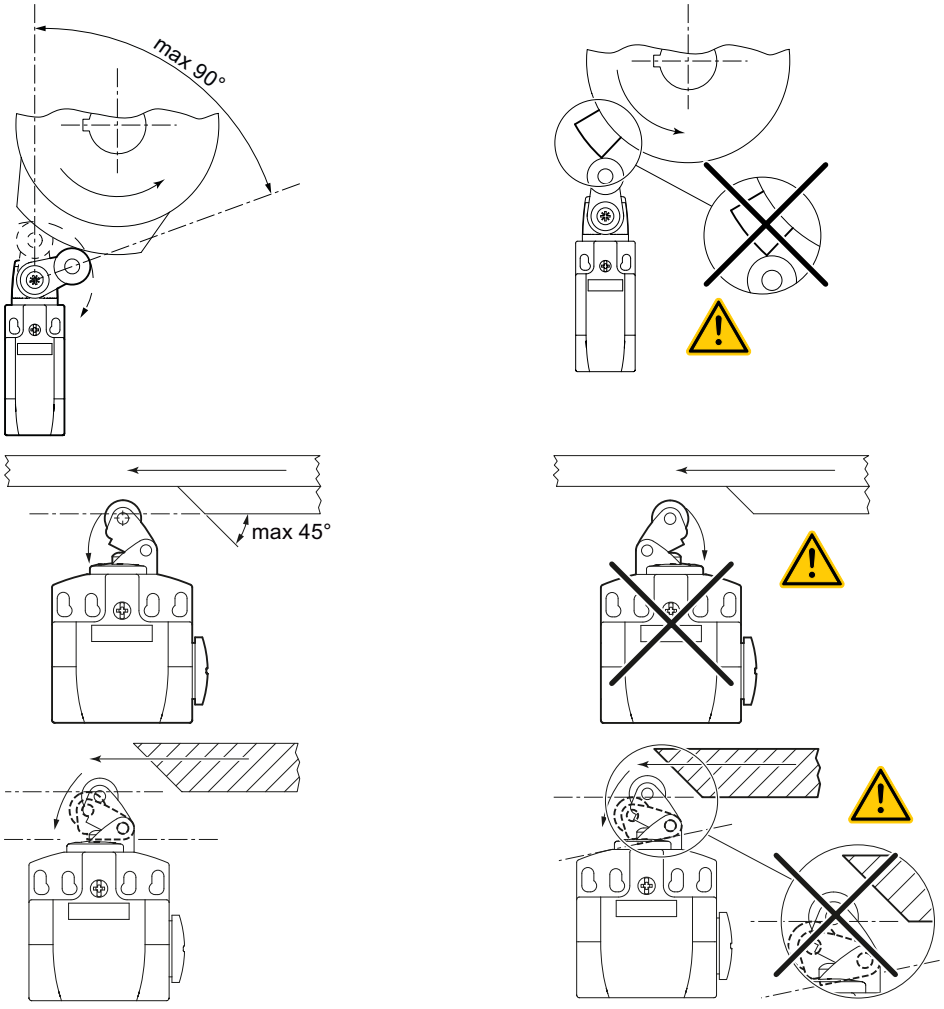




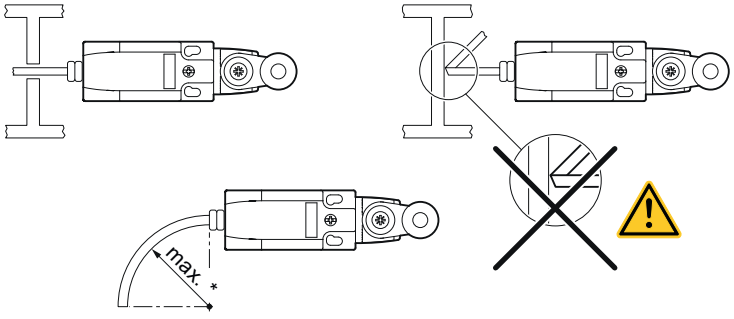
Installation instructions for position switches with roller lever, angular roller lever, twist lever, and rod lever





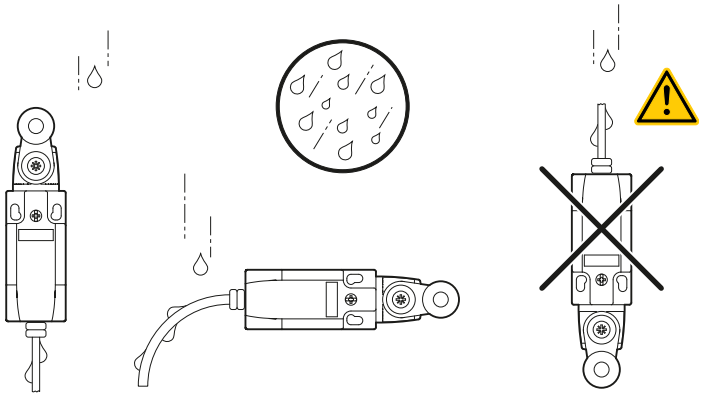


Installation instructions for position switches with cable



* Radius according to cable specification

Installation instructions when moisture is present



8.1.2 Cable entry

Note

Proper use of cable entries.

Use a cable entry with gasket, e.g. accessory 3SX9926, to avoid a reduction in the degree of protection according to IEC 60529 (VDE 0470-1). If a cable entry is not required, fit it with a threaded dummy cap. The protective ground connection is located in the metal enclosure. Required torque: 1.1 Nm.

NOTICE
Risk of property damage. In case of damage or wear, the complete switch must be replaced. The replacement of individual parts or modules is not permitted.

NOTICE
Risk of property damage. Avoid bending the connecting cable. If bending of the connecting cable cannot be avoided, the bending radius should not be less than 80 mm.

8.1.3 Securing against change of position (fixing)

To secure position switches with a safety function against a change of position, **positively locked** techniques must be employed upon installation between the enclosure and mounting surface. The following options are available:

- Secure the position switch using the round holes.
- When the oblong holes are used for mounting, dowel pins or stops must also be used.

8.1.4 Quick-release device for enclosure width 40 mm

1. Mount the intermediate plate (b) on the position switch (a).
2. Install the base plate (c) at the installation location.
3. Fit the position switch and use the locking lever (d) to interlock it.

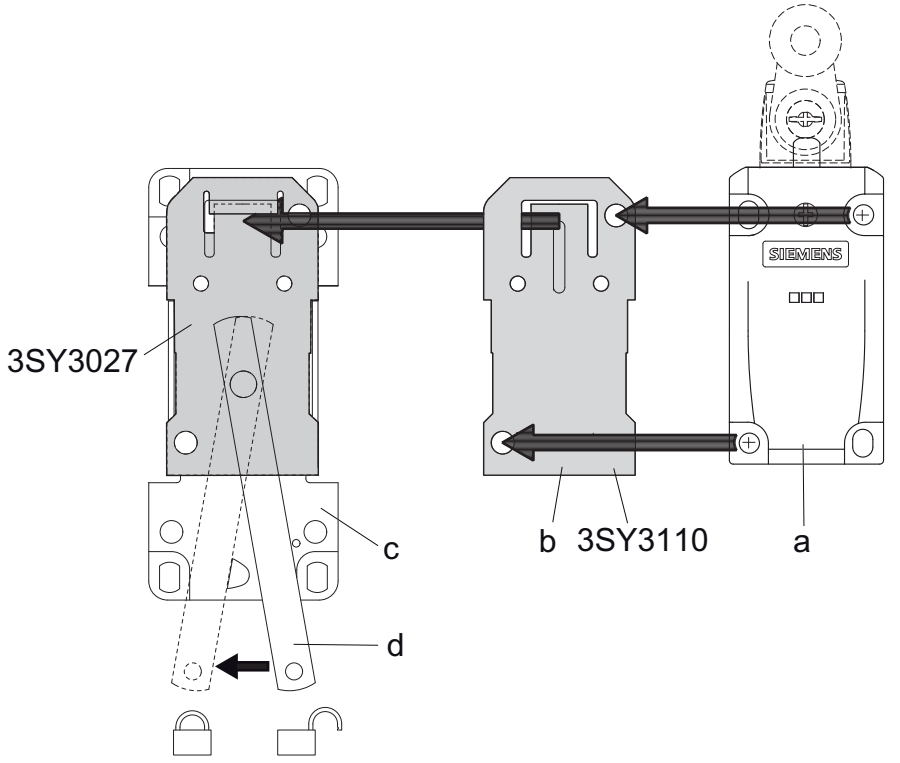
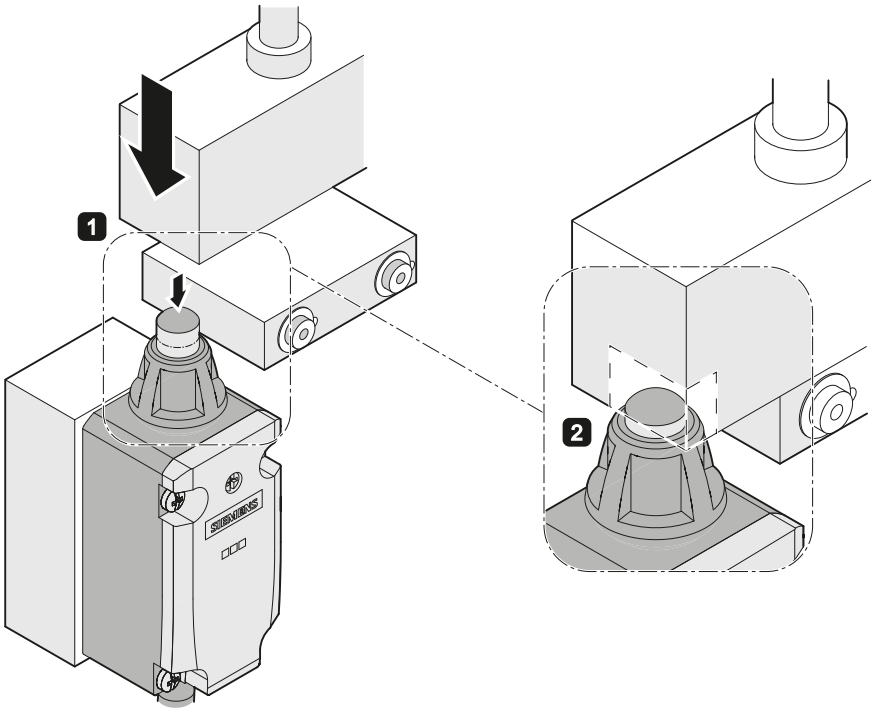


Figure 8-1 Quick-release device

8.2 Application example - Rounded plunger

Possible application of a mechanical position switch with rounded plunger



Application examples

Door monitoring

Endstop monitoring

Notes on installation

- Approach possible in travel direction only
- Rounded plungers and roller plungers have an overtravel and thus a longer actuator travel than other actuators.

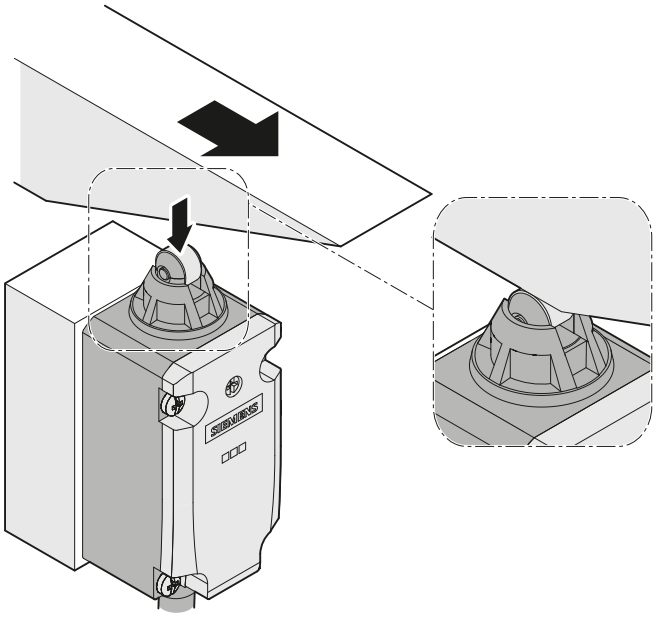
Variants

Rounded plunger made of plastic

Rounded plunger made of metal

8.3 Application example - Roller plunger

Possible application of a mechanical position switch with roller plunger



Application examples

- Conveyor belts
- Assembly lines
- Sliding doors

Notes on installation

- Approach possible in travel direction
- Approach with switching bar perpendicular to the travel axis
- Rounded plungers and roller plungers have an overtravel and thus a longer actuator travel than other actuators.
- The roller plunger is recommended in the case of lateral actuation and a relatively long overtravel distance.

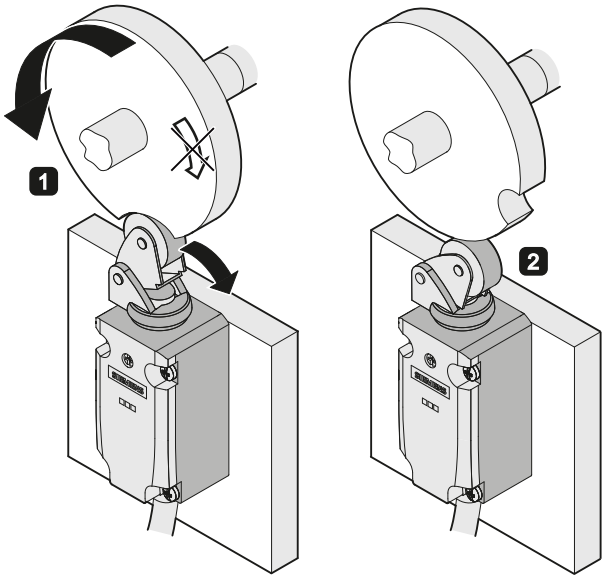
Variants

Roller plunger with plastic roller

Roller plunger with stainless steel roller for frequent overtravel

8.4 Application example - Roller lever

Possible application of a mechanical position switch with roller lever



Application examples

Cam disks

Notes on installation

- Especially suitable for actuating elements made of finely-ground steel in the form of cams, bars, or cam disks without additional lubrication.
- Approach angle = trailing angle, maximum 30 °
- Each actuator can be offset by 90 °.

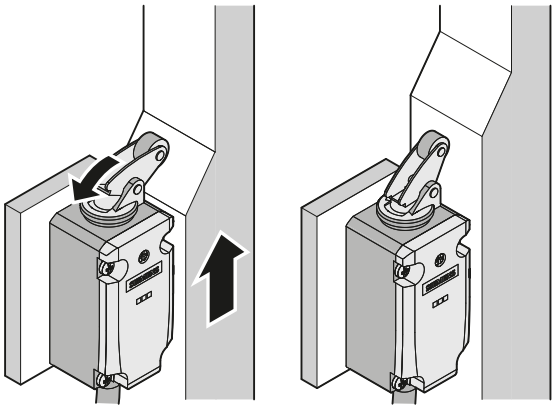
Variants

Roller lever (Page 79) made of metal or stainless steel with plastic roller

Roller lever made of metal or stainless steel with stainless steel roller for frequent overtravel

8.5 Application example - Angular roller lever

Possible application of a mechanical position switch with angular roller lever



Application examples

- Installation in confined space conditions

Notes on installation

- Especially suitable for actuating elements made of finely-ground steel in the form of cams, bars, or cam disks without additional lubrication.
- High approach velocity v_{max} = 2.5 m/s
- Different approach angles (a = 30 °) or trailing angles (g = 45 °)

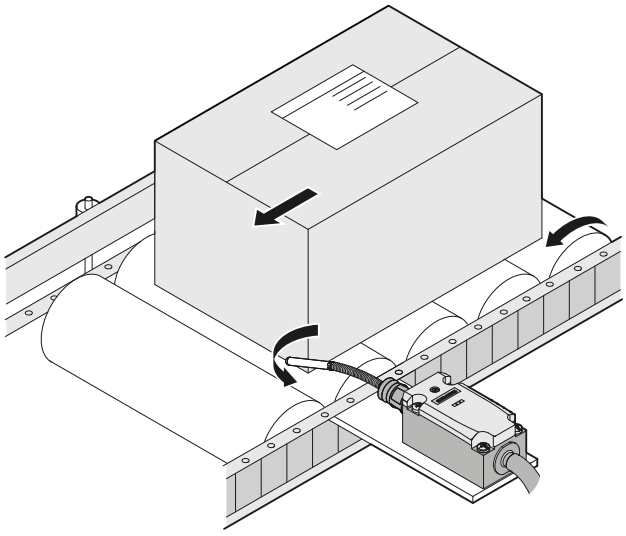
Variants

Angular roller lever made of metal or stainless steel with plastic roller

Angular roller lever made of metal or stainless steel with metal roller

8.6 Application example - Spring rod

Possible application of a mechanical position switch with spring rod



Application examples

Package conveyor systems

Notes on installation

- Approach from all directions
- With varying actuation direction
- With approach by angular objects (e.g., packages)
- With undefined actuation

Variants

Spring rod in various lengths with metal plunger

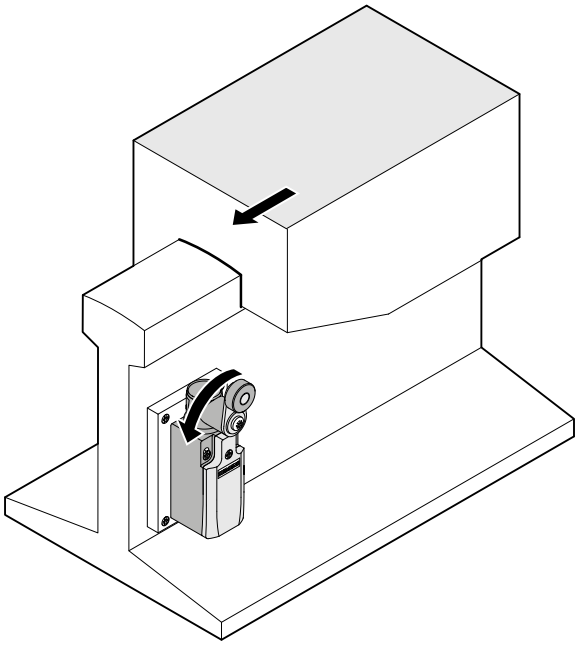
Spring rod in various lengths with plastic plunger

Note

The position switch with spring rod application is only suitable for switches with snap-action contacts.

8.7 Application example - Twist lever

Possible application of a mechanical position switch with twist lever



Application examples

- Conveyor belts
- Assembly lines
- Door monitoring

Notes on installation

- For high approach velocity (v = 1.5 m/s)
- Many possible approaches
- Insensitive to oil, grinding dust, dirt, coarse-grained material
- In the case of twist levers, the maximum approach angle is equal to the maximum trailing angle
- 10 ° offset of twist levers possible
- Right, left, or right/left direction of operation can be selected in the default configuration

Variants

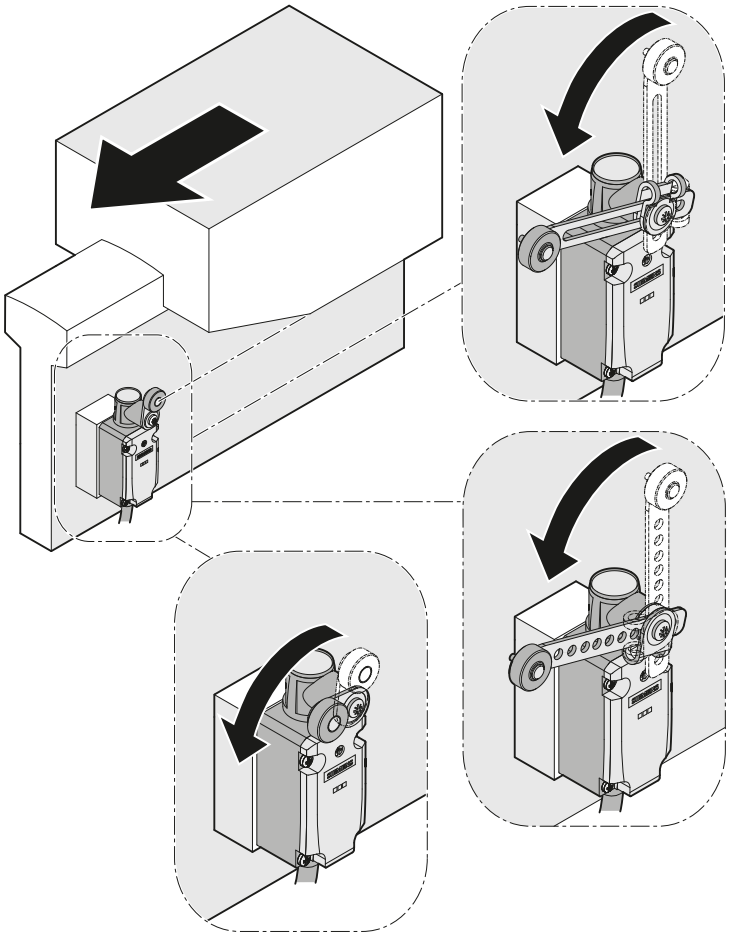
Twist lever with plastic roller

Twist lever with metal roller

Twist lever with ball bearing

8.8 Application example: adjustable-length twist lever

Possible application of a mechanical position switch with adjustable length twist lever



NOTICE
Risk of property damage.
To avoid property damage, do not use the last drill hole.

Application examples

- With varying approach height distances
- Conveyor belts, assembly lines
- If an actuating element with approach and trailing angles is not possible for technological reasons, e.g., bottles, packages

Notes on installation

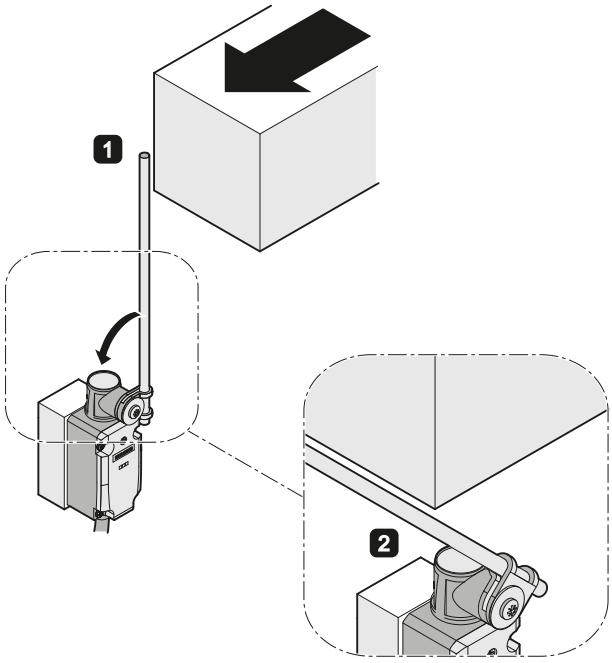
- Many possible approaches
- Insensitive to oil, grinding dust, dirt, coarse-grained material
- In the case of twist levers, the maximum approach angle is equal to the maximum trailing angle
- 10 ° offset of twist levers possible
- Right, left, or right/left direction of operation can be selected in the default configuration

Variants

- Metal lever with pre-drilled holes with plastic roller
- Adjustable-length metal lever with
  - Plastic roller
  - Stainless steel roller
- Adjustable-length twist lever with pre-drilled holes
  - Made of stainless steel
  - Made of metal
- Adjustable-length twist lever with oblong hole
  - Made of stainless steel
  - Made of metal

8.9 Application example: adjustable-length rod lever

Possible application of a mechanical position switch with adjustable-length rod lever



Application examples

- With approach heights of varying distances, e.g. conveyor belts, assembly lines
- When the distance between position switch and actuating element is greater for technological reasons

Notes on installation

- Many possible approaches
- Insensitive to oil, grinding dust, dirt, coarse-grained material
- If an actuating element with approach angle and trailing angle is not possible
- Infinitely adjustable

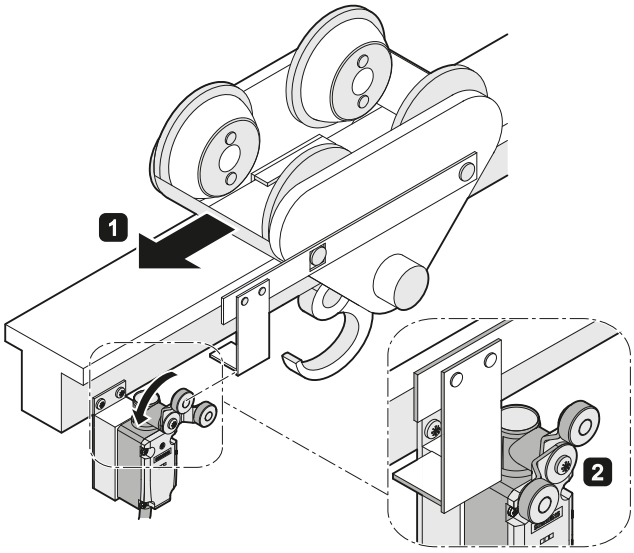
Variants

Rod lever with plastic rod

Rod lever with aluminum rod

8.10 Application example - Fork lever

Possible application of a mechanical position switch with fork lever



Application examples

- Cranes
- Crane trolleys

Notes on installation

- For reciprocating movements
- Can be operated in two directions
- Latching actuator

NOTICE
Risk of property damage.
The fork lever latches after actuation and must be reset.

Note

The actuator is not suitable for safety circuits.

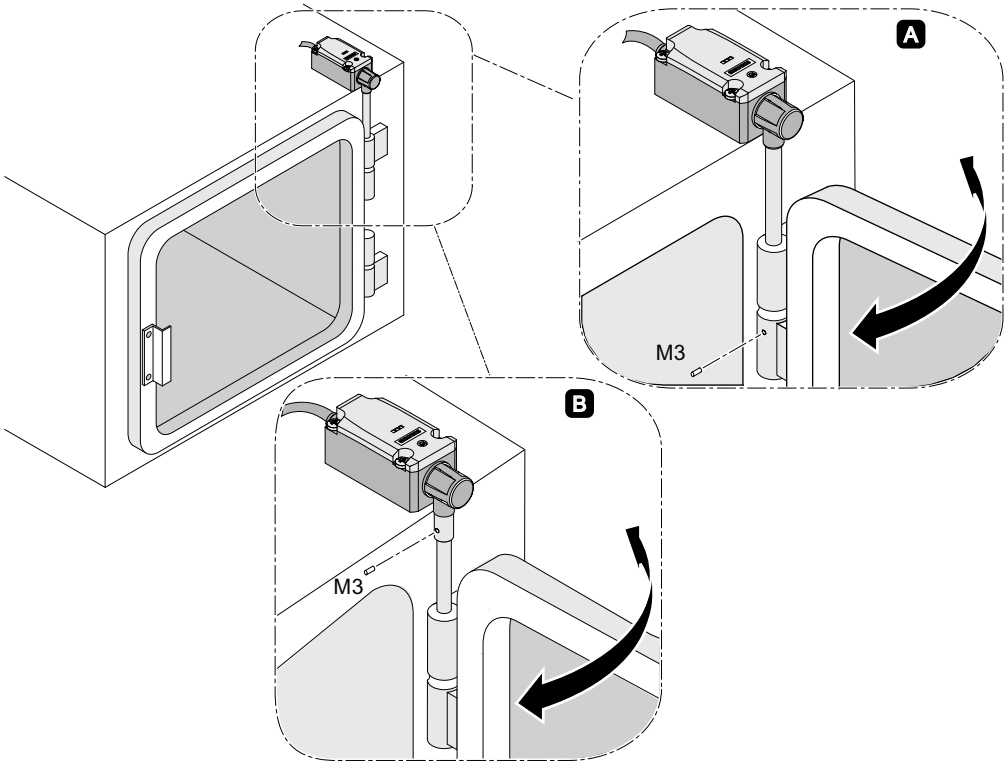
Variants

Fork lever (Page 89) made of stainless steel or metal with plastic roller

Fork lever made of stainless steel or metal with metal roller

8.11 Application example - Hinge switch

Possible application of a hinge switch



Application examples

- Hinged doors
- For monitoring of hinged doors and flaps, with a fixed positively-locking connection between the switch and door hinge.

Notes on installation

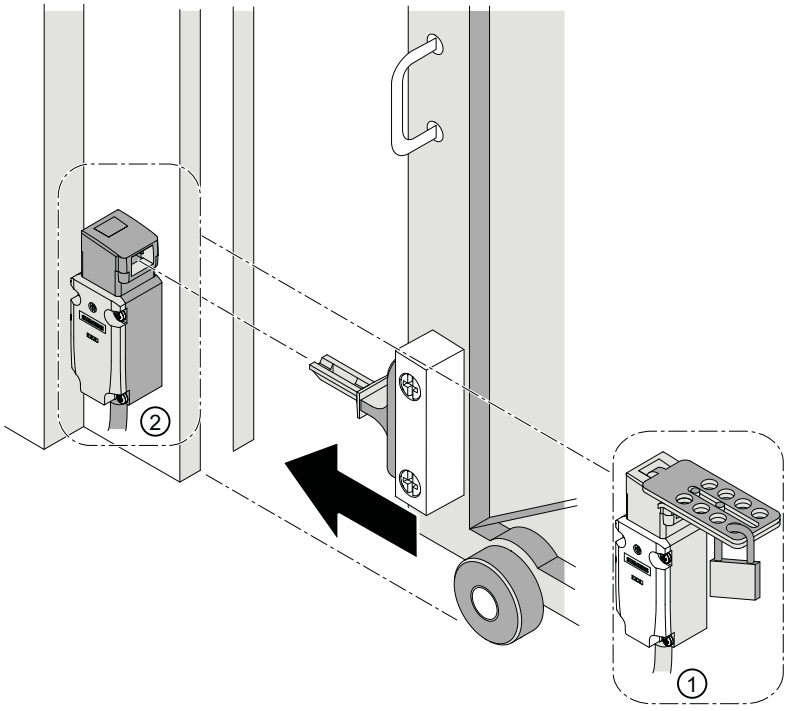
- For inserting into a hinge (solid shaft 3SE5112-0LU.)
- For inserting into a hinge pin (hollow shaft 3SE5232)
- Tamper proof
- Direct connection to the ASi network with a very low current load of ≤ 40 mA
- Default: 2 x 3 contacts
- Fixing by means of M3 pin in existing drill hole

Variants

A	Actuator with solid shaft, diameter 10 mm
B	Actuator with hollow shaft, inside diameter 8 mm, outside diameter 12 mm

8.12 Application example of safety switch without tumbler

Possible application of a mechanical safety switch without tumbler



(1) With locking device: e.g., for protection against inadvertent actuation

(2) Without tumbler: e.g., for monitoring of protective doors

Application examples

- Rolling gates
- Position monitoring of doors, covers, or protective grilles (without tumbler)
- Additional interlock requirement, e.g., in the work zone of a robot system

Notes on installation

Note

For precise positioning of safety switches with separate actuator in the case of large, heavy protective doors, an insertion guide should be used.

- The safety switch can only be switched with the associated triple-coded actuator.
- The switch can be actuated on the face side and laterally.

NOTICE
Risk of property damage. Do not use the safety switch as an endstop, as this may cause damage to the switch.

Variants

Safety switch with separate actuator without tumbler (Page 129)
Safety switch with separate actuator with tumbler (Page 154)

- Spring-locked
  - Auxiliary release
  - Key-operated release
  - Emergency release
  - Escape release
- Solenoid-locked
- Front escape release
- Rear escape release and front auxiliary release
- Rear emergency release and front auxiliary release

8.13 Application example: attachment system for hinged doors

Possible application for 3SE5 safety switch in combination with Brühl safety door

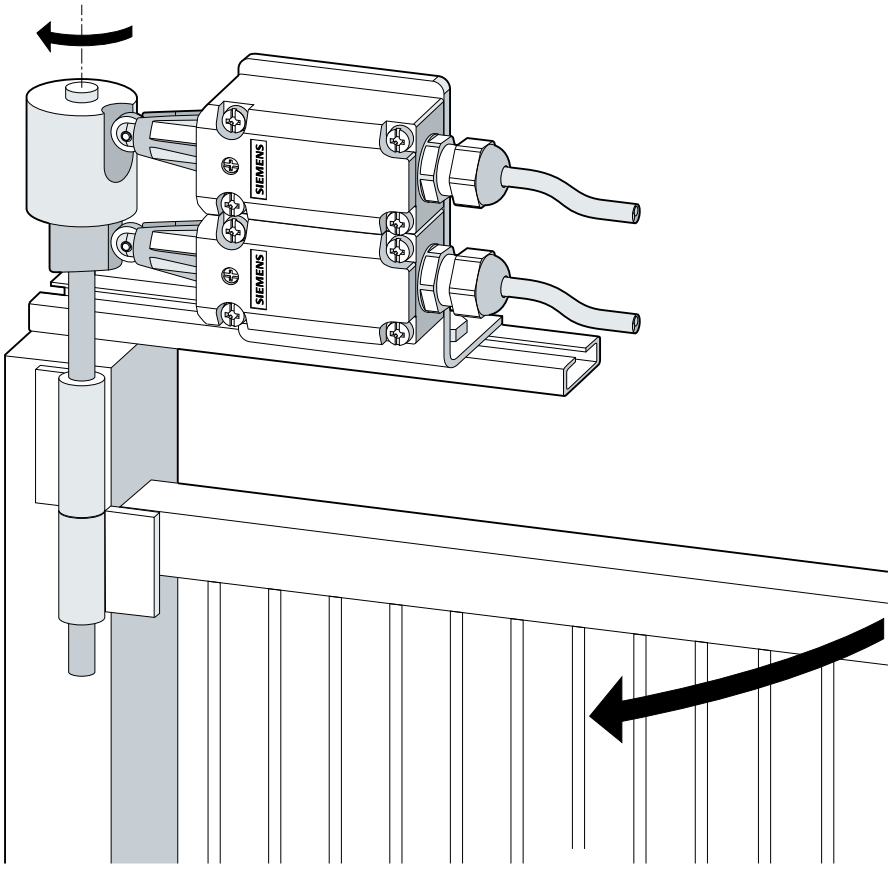


Figure 8-2 Example: Two 3SE5 position switches on Brühl hinged doors with mounting accessories

Application examples

- Protective fence systems

Variants

- Brühl can supply a suitable safety switch or suitable mounting bracket for every application.
- Thanks to the modular design of the position switch, the actuator head can be replaced. For example, the roller plunger can be replaced by other variants such as roller levers.

8.14 Application example: attachment system for sliding doors

Possible application of 3SE5 position switch with twist lever on sliding doors

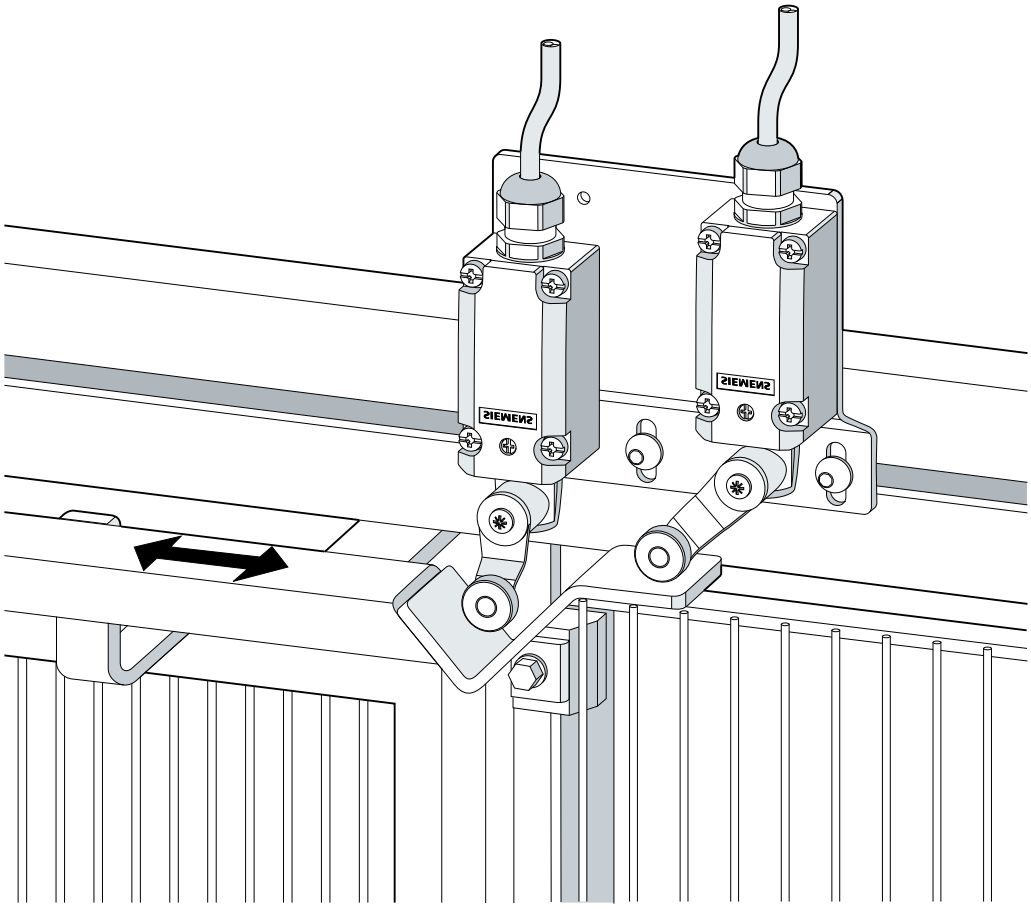


Figure 8-3 Example: Two 3SE5 position switches with twist levers on Brühl hinged doors with mounting accessories

Application example

Monitoring of sliding doors

8.15 Application example of a magnetically-operated switch

NOTICE
Install the sensor and actuator at the same height. Ensure that you install the sensor and actuator at the same height so as to not affect the correct functioning of the magnetically operated switch.

Magnetic monitoring system 3SE66..-.CA0. - sliding door

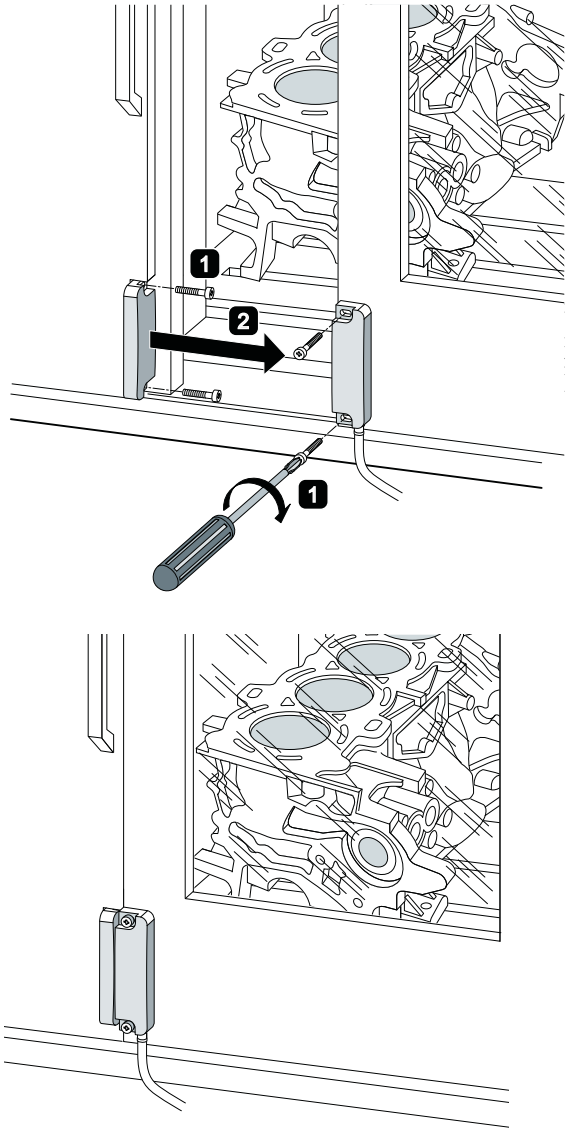


Figure 8-4 Non-contact, magnetically operated safety switch 3SE66/3SE67, rectangular, large format 25 x 88 mm - monitoring of sliding doors

Magnetic monitoring system 3SE66..-.CA0. - swivel door

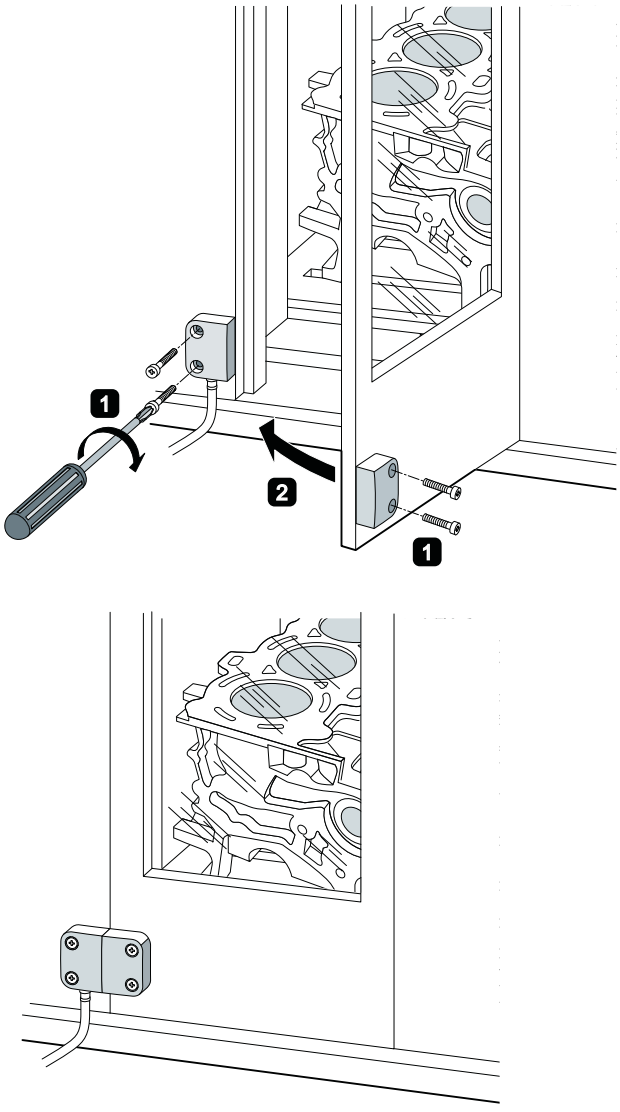


Figure 8-5 Non-contact, magnetically operated safety switch 3SE66/3SE67, rectangular, small format 26 x 36 mm - monitoring of hinged doors

Non-contact magnetically-operated safety switches 3SE66..-.BA

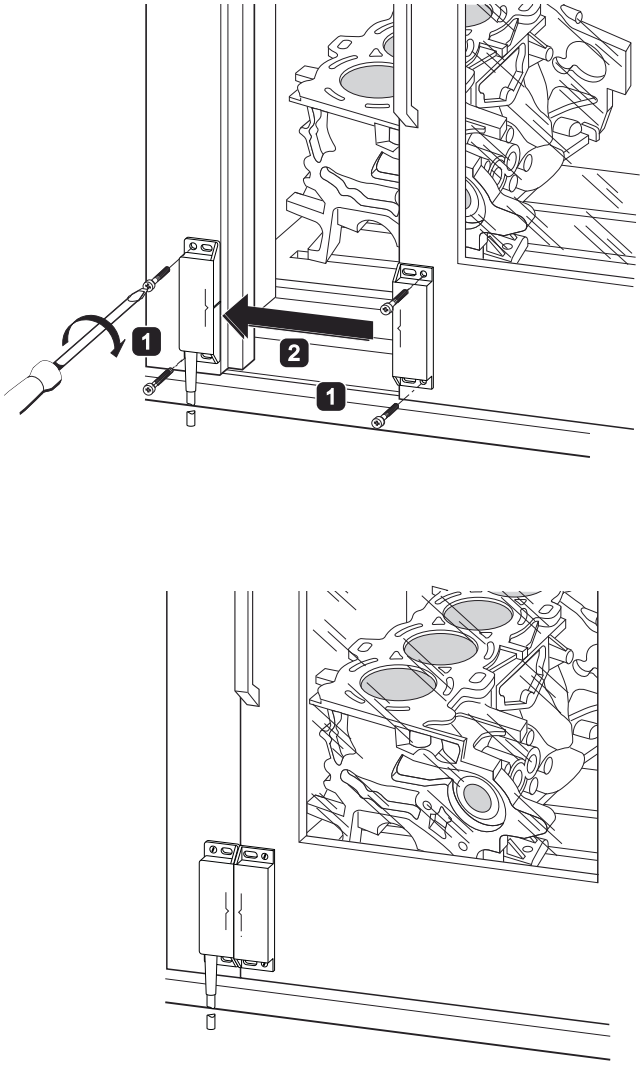


Figure 8-6 3SE66/67, rectangular, large format 25 x 88 mm - monitoring of sliding doors

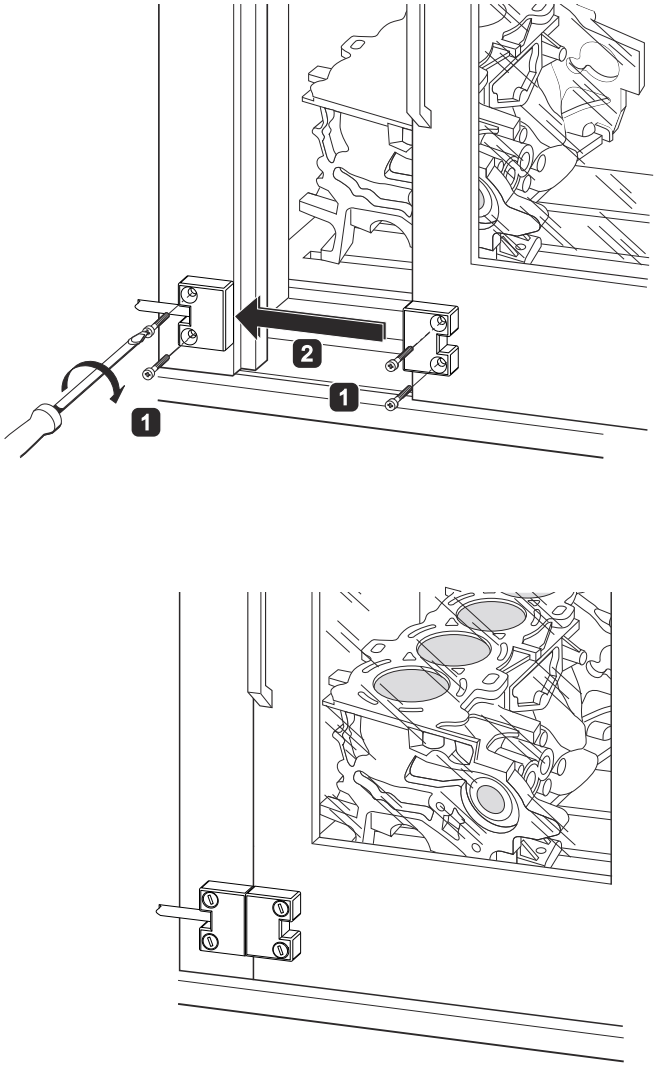


Figure 8-7 3SE66/67, rectangular, small format 25 x 33 mm - monitoring of sliding doors

Application examples

- The magnetically-operated switch for use in safety circuits serves to monitor the positions of moving protective devices (covers, flaps or doors).
- Especially suitable for cramped conditions
- The magnetically-operated switches are used in applications in which the hazardous state is ended without delay when the protective device is opened.

8.16 Application example of safety switch with tumbler

Possible application of a mechanical safety switch with tumbler

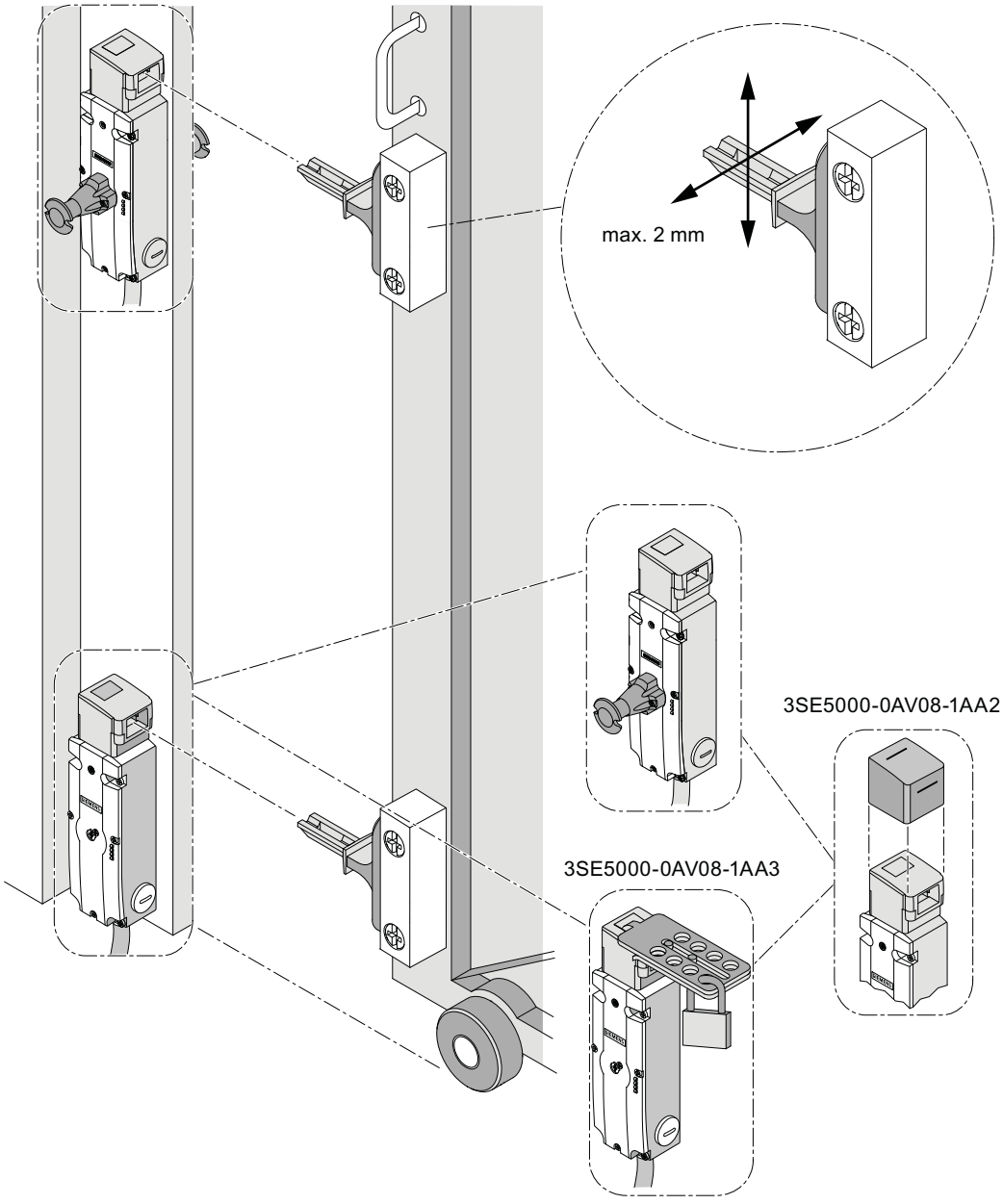
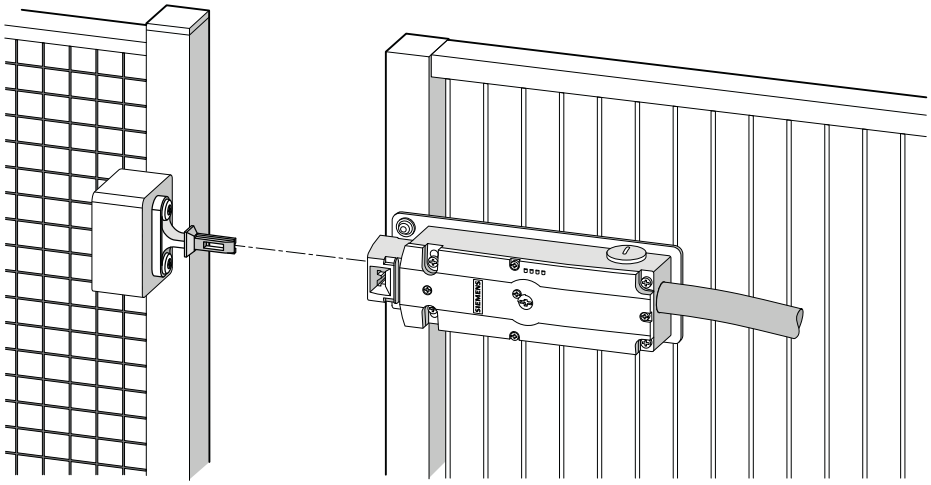


Figure 8-8 Example using standard actuator 3SE5000-0AV02

Note

Observe the offset of the actuator.

The actuator may have a maximum offset of 2 mm.



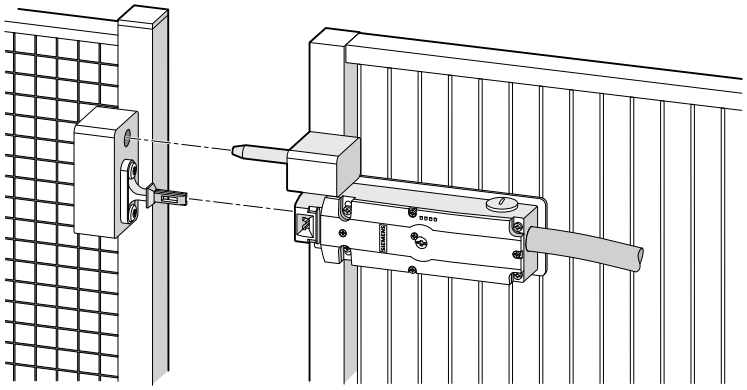
Note

Do not use the door as an endstop.

Note

Heavy doors

A guide must be created for the actuator if doors are heavy.



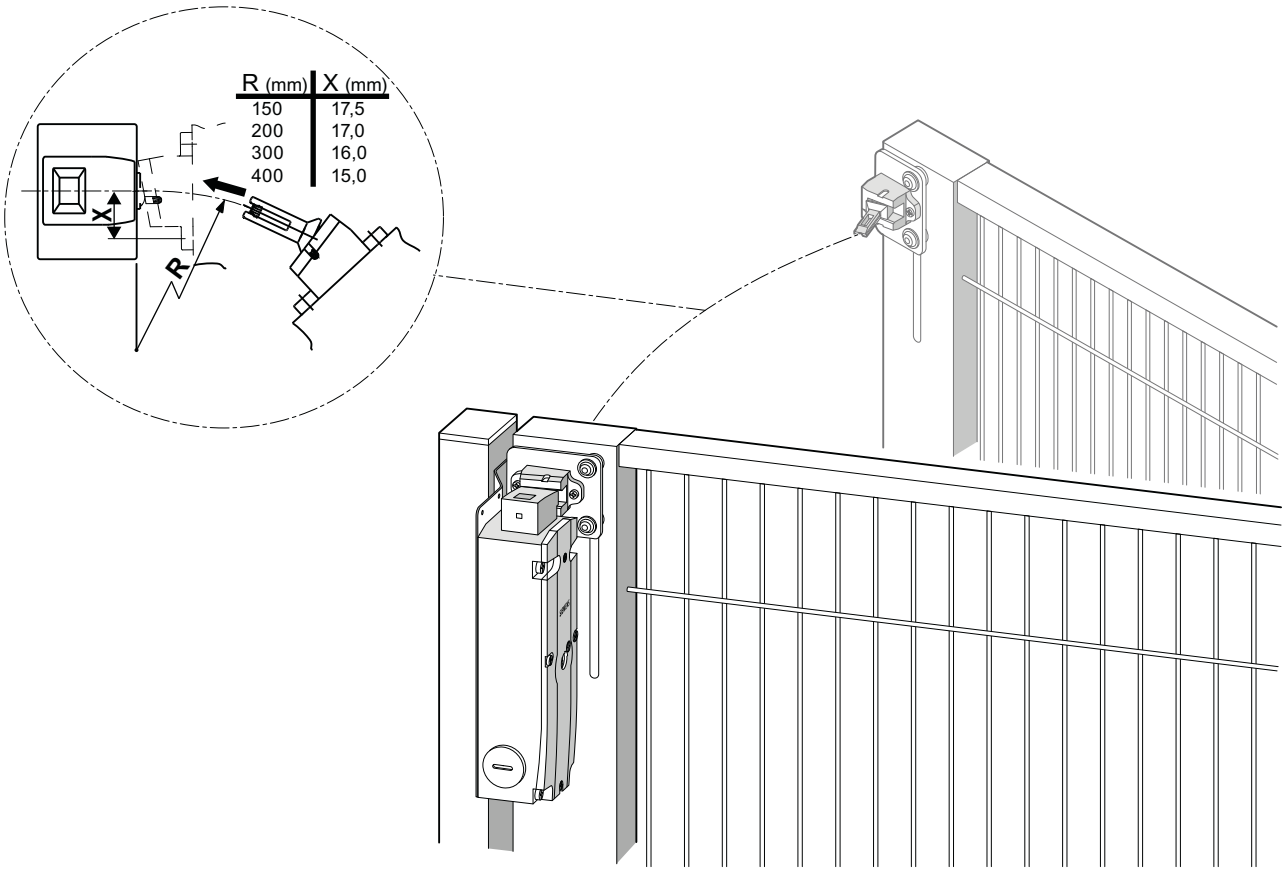


Figure 8-9 Example using radius actuator

Application examples

- Protection of a work zone (with tumbler)
- Shutting down of machines requires that safety doors are closed (with tumbler)

8.17 Options for protective door monitoring

Reliable protective door monitoring is one of the most common safety requirements that has to be provided for machines: Hazardous machine movements must be reliably brought to a standstill when a protective door is opened. In combination with SIRIUS 3SK safety relays, the following solutions are available for every safety application in compliance with ISO 14119:

- mechanical protective door monitoring with standard and safety position switches
- non-contact protective door monitoring with magnetically operated switches
- RFID safety switches for ultimate protection against tampering

System description / application example

The protective door is closed when the machine is running. The actuator is located in the safety switch and is interlocked there. In this case, the enable path of the evaluation unit is closed and the enable path of the contactor control unit is open. For maintenance purposes, there is a need to manually intervene behind the protective grille. The operator switches off the machine for this purpose.

This opens the enable path of the evaluation unit and shuts down the performance level of the machine. Because dangerous machine movement does not cease immediately, the safety switch must not enable the actuator until the follow-on movement of the machine ends. This is ensured by a suitable contactor control unit, such as a standstill monitor or a delay module.

When the protective door is open, the safety contacts (positive-opening normally closed contact ⊖) prevent the machine from restarting. The additional normally open contacts can be used as signaling contacts. These functions are not used for safety purposes but rather for machine availability.

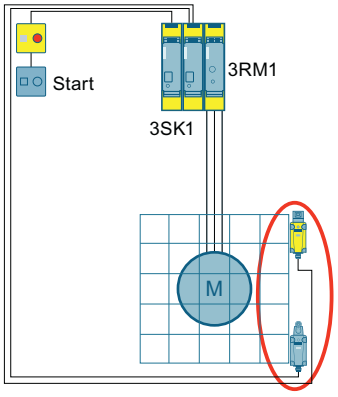
With suitable evaluation units, the normally open contacts can also be incorporated in the safety circuit as an additional check.

The contacts used for monitoring are connected with positive locking by the actuator such that the position of the protective door is detected immediately.

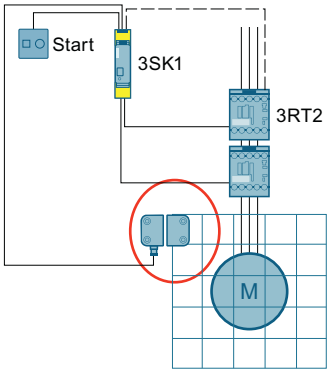
The contacts used for monitoring the blocking means are connected with positive locking to the blocking element such that a failure of the tumbler device is detected by the safety-related control system. An integrated protection against incorrect closing prevents the blocking element from being in the blocking position even though the actuator is still outside the safety switch. Thus, the contacts used for monitoring the blocking can also be used to monitor the protective device. When integrated into suitable safety concepts, the ability to perform reciprocal monitoring of contacts enables implementation of safety-related control systems with Performance Level d according to ISO 13849-1 and SIL 2 according to IEC 62061.

Options for protective door monitoring, tamper-proof, up to SIL3 / PL e

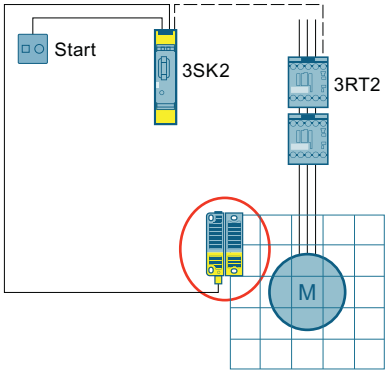
1. Mechanical protective door monitoring with 3RM1 electronic motor starter



2. Non-contact protective door monitoring with 3SE66/67 magnetically operated switch



3. Non-contact protective door monitoring with 3SE63 RFID safety switch



For further information on the RFID safety switches, refer to Configuration Manual for safety switches - RFID (https://support.industry.siemens.com/cs/ww/en/view/52233535)

8.18 Monitoring the position of the protective door and tumbler function

A SIRIUS 3SF13 safety switch is used for monitoring the position of the protective door. This safety switch detects the position of the protective door by means of a separate actuator, which travels into the safety switch when the protective door closes.

The SIRIUS 3SF13 safety switch also contains an integrated tumbler, which can keep the protective door closed during operation and thus prevent entry into the danger zone. An actuator mounted on the protective door moves into the positively-locked position switch with tumbler. The SIRIUS 3SF13 safety switch with tumbler used here has a spring lock. This means that door is held shut in the de-energized state and the door is unlocked by applying a voltage.

Operating principle:

If the door is closed and no voltage is applied, a locking mechanism moves into the separate actuator, which prevents the door from being opened. If a voltage is applied, the locking mechanism is drawn out of the separate actuator by a solenoid, which unlocks the tumbler.

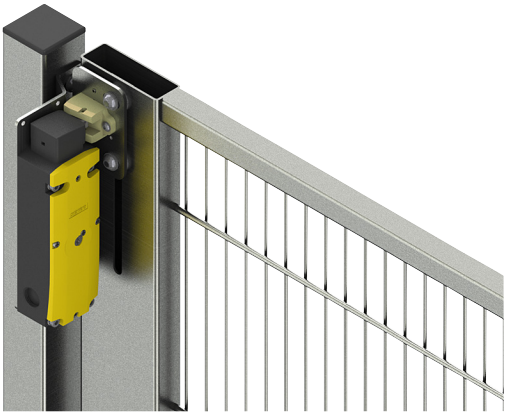


Figure 8-10 Safety switch with tumbler

The SIRIUS 3SF13 safety switches are equipped with mechanical protection against incorrect locking. This ensures that the door or locking mechanism can only be locked if the door is closed.

The SIRIUS 3SF13 safety switch has an integrated AS-i slave, in contrast to the 3SE53 safety switch.

Two contacts are evaluated internally in order to reach the required (SIL 2 or PL d) safety level. If one of the contacts is defective, opening of the protective door is still detected by the second contact. Failure of a contact is detected by a discrepancy monitor, which prevents a renewed switch on until the fault has been rectified.

There are basically three different combinations for forwarding the contacts of the AS-i safety switch with tumbler as ASIsafe channel 1 and 2 to the controller for evaluation:

3SF13 version	ASIsafe channel 1	ASIsafe channel 2
3SF13..-1BA1	1st normally closed contact of actuator	Normally closed contact of solenoid
3SF13..-1BA3	1st normally closed contact of actuator	2nd normally closed contact of actuator
3SF13..-1BA4	1st and 2nd normally closed contacts of actuator	Normally closed contact of solenoid

Version 3SF13..-1BA3

In the 3SF13..-1BA3 version, both ASIsafe channels are provided with a normally closed actuator contact. The signaling contact of the solenoid for the tumbler is not taken into account. Therefore the user program cannot be used to evaluate whether the door is actually locked, and so the maximum achievable safety level of the "Protective door tumbler" safety function is limited to SIL 1 or PL c and diagnostics are not possible. The 3SF13..-1BA3 version must be parameterized in the TIA Portal as 1oo2 (equivalent). The discrepancy time must be adapted to the conditions where the safety switch is installed. The default setting of the discrepancy time (500 ms) is normally suitable for this safety switch.

Version 3SF13..-1BA1

In contrast to the 3SF13..-1BA3 version, the signaling contact (normally closed contact) of the solenoid is evaluated as the second ASIsafe channel in the 3SF13..-1BA1 version. Consequently, the user program can be used to evaluate whether the door is actually locked, and so the maximum achievable safety level of the "Protective door tumbler" safety function is SIL 2 or PL d and diagnostics are possible. However this means that the two ASIsafe channels run asynchronously, resulting in the following requirement on the machine operator:
Each time unlocking the door is requested, the door also has to be opened. In the parameter assignment of the safety switch, a 1oo2 evaluation (equivalent) must be set with the "Discrepancy time unlimited" option, whereby the F-CM AS-i Safety module expects a zero crossing of both ASIsafe channels before reclosing becomes possible. Therefore, in the case of a door release request without subsequent door opening, the F-CPU would prevent a hot restart of the machine.

Version 3SF13..-1BA4

In the 3SF13..-1BA4 version, for the first ASIsafe channel both normally closed contacts of the actuator are already linked in the switch and automatically evaluated for discrepancy. Therefore, for this version it must be ensured that the discrepancy analysis is deactivated (1oo1 evaluation) in the configuration of the AS-i slave in the TIA Portal. The signaling contact (normally closed contact) of the solenoid is evaluated as the second ASIsafe channel. Consequently, the user program can be used to evaluate whether the door is actually locked, and so the maximum achievable safety level of the "Protective door tumbler" safety function is SIL 2 or PL d and diagnostics are possible. The 3SF13..-1BA4 version of the 3SF13 safety switch thus offers the advantage that with a door release request the door does not then have to be opened immediately. Nevertheless, malfunctioning of the tumbler solenoid can still be diagnosed by evaluating the signaling contact.

For this reason, a 3SF13..-1BA4 version of the 3SF13 safety switch is used in the application example described here.

See the figure below:

- 1st normally closed contact of actuator (state: door closed): 11 / 12
- 2nd normally closed contact of actuator (state: door closed): 21 / 22
- Normally closed contact / signaling contact of the solenoid (state: tumbler active): 41 / 42
- Control of the solenoid (state: door release inactive): E1 / E2

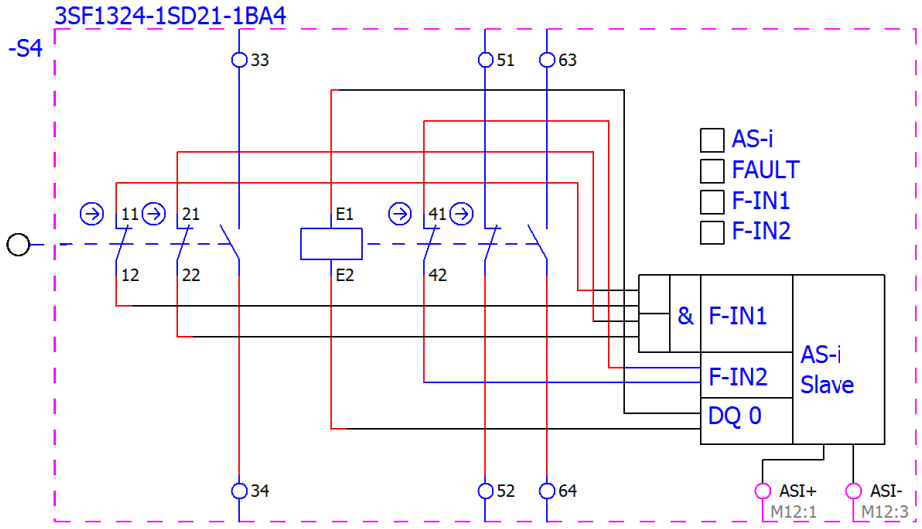


Figure 8-11 3SF1324-1SD21-1BA4 internal circuit diagram

8.19 Application example with protective door with 3SF13 safety switch AS-Interface

Protective doors are frequently used to fence off danger zones. These are monitored for position and, if necessary, the area from which the hazard emanates is switched off. If the machine continues to present a hazard for a certain period even after shutdown, access can be prevented by means of a tumbler. An emergency stop command device is additionally monitored for shutting down the machine in an emergency. CM AS-i Master and F-CM AS-i Safety are used to connect to the fail-safe controller.

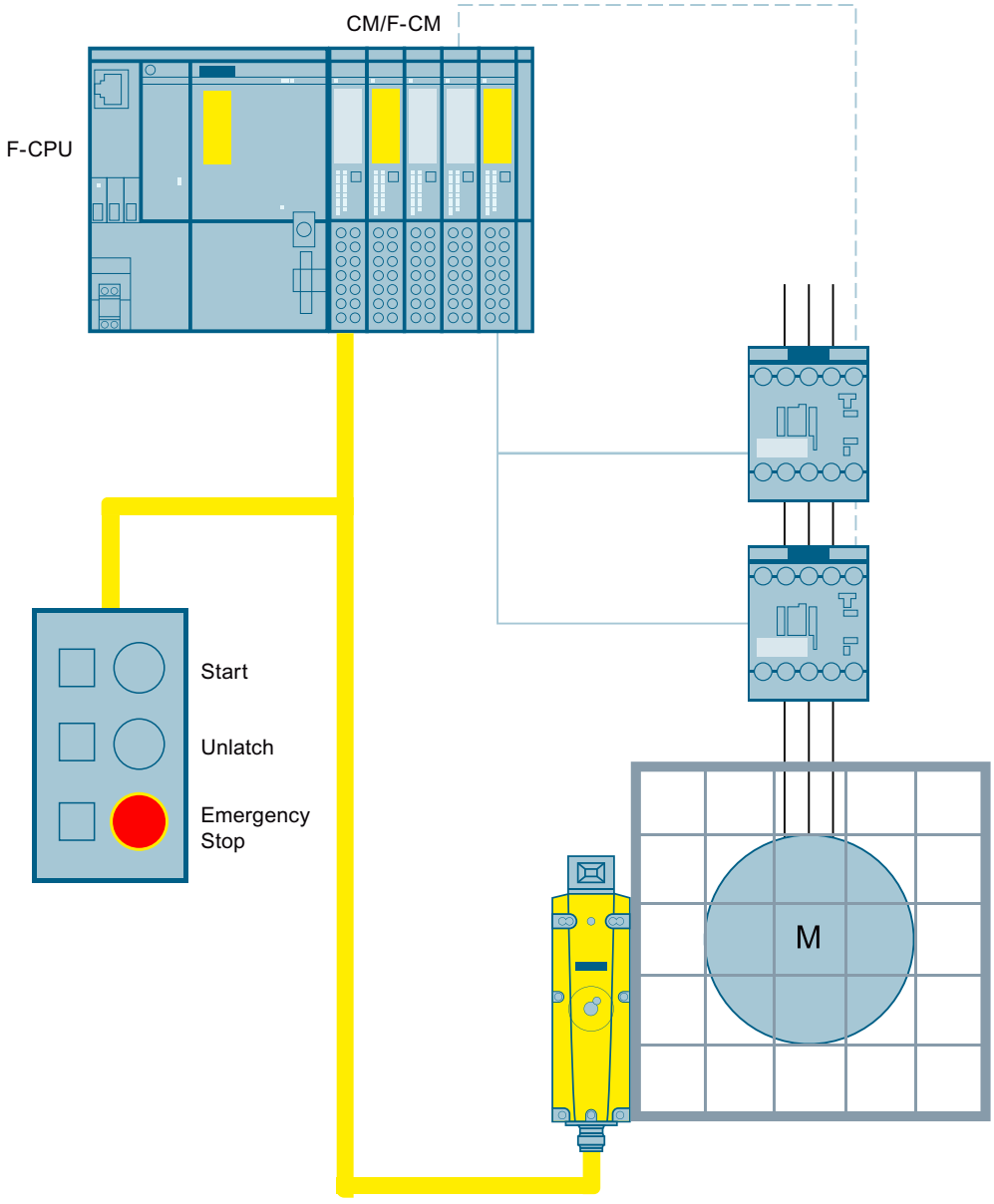


Figure 8-12 Circuit diagram example

The fail-safe controller monitors the emergency stop command device and the safety switch on two channels. Both devices have an integrated AS-i slave and are thereby connected to the AS-

Interface. The two signals are transmitted to the fail-safe controller using the combination of CM AS-i Master and F-CM AS-i Safety (ET 200SP station modules).

The protective door position is monitored by a safety switch. In addition, the door is locked by means of a tumbler integrated in the safety switch. When the command to release the door is issued by means of a toggle switch, safety switch-off of the power contactors takes place via the fail-safe controller. On expiry of a set time, the tumbler is unlocked and access to the machine is enabled.

After the door has been closed and locked again, and the feedback circuit of the power contactors is closed, the Start button can be used to switch on again. When the emergency stop command device is actuated, the fail-safe controller also switches off the power contactors in a safety-related way. If the emergency stop command device is reset and the feedback circuit is closed, the Start button can be used to switch on again. Start pushbuttons and toggle switches are also read in via the AS-Interface.

The "Stopping in an emergency" safety function is designed up to SIL 3 or PL e.

The "Protective door monitoring" and "Protective door tumbler" safety functions are designed up to SIL 2 or PL d.

Safety function	Description	Requirement
SF1	If the emergency stop command device is actuated, the machine is shut down safely.	SIL 3 or PL e
SF2	If the protective door is opened, the machine is shut down safely.	SIL 2 or PL d
SF3	The protective door is kept closed until the machine has come to a standstill.	SIL 2 or PL d

Note

Taking account of fault exclusions, the use of only one safety switch with or without tumbler is permissible up to SIL 2 or PL d. Further information is contained in the PDF under the following link "concerning the use of safety switches up to SIL 2 or PL d".

You can find further information on ASIsafe circuit examples in the Function Manual ASIsafe circuits for safety technology with AS-Interface safety monitor and DP/AS-i F-Link.

See also

Safety Integrated Application Manual (https://support.industry.siemens.com/cs/ww/de/view/24509484/en)

8.20 Emergency stop and protective door monitoring via ET 200eco PN-F, IP67

Application

Protective doors are frequently used to fence off danger zones. These are monitored for position and, if necessary, the area from which the hazard emanates is switched off. An emergency stop command device is additionally monitored for shutting down the machine in an emergency. To record these two safety functions in the IP67 environment a fail-safe version of an ET 200eco PN is used.

Design

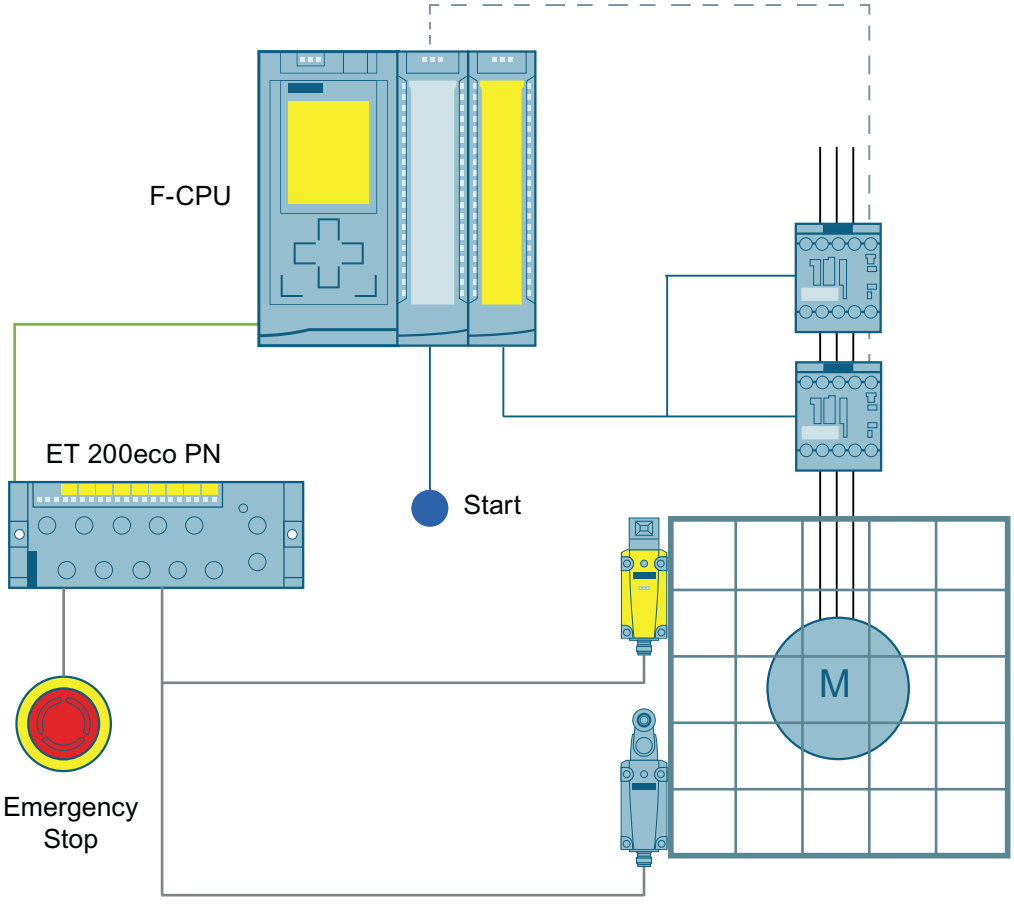


Figure 8-13 Emergency stop shutdown and protective door monitoring up to SIL 3 or PL e via ET 200eco PN and F-CPU

Operating principle

The emergency stop command device is directly connected to a fail-safe input socket (F-DI) of the ET 200eco PN by means of an M12 cable. The two position switches are joined by means of a special M12 Y-cable and likewise connected directly to an individual F-DI of the ET 200eco PN. The fail-safe controller (F-CPU) monitors the two safety switches as well as the emergency stop command device on two channels. When the emergency stop command device is actuated or the protective door is opened, the fail-safe controller switches the power contactors off in a safety-related way. If the door is closed, the emergency stop command device is unlatched and the feedback circuit is closed, the Start button can be used to switch on again.

Safety-oriented components

Emergency stop command device	Safety switch		Distributed I/O IP67
			
3SU1 https://www.siemens.com/sirius-act	2 x 3SE5 https://www.siemens.com/sirius-command		ET 200eco PN https://www.siemens.de/simatic-safety

Fail-safe controller	Contactor
	
S7 F-PLC https://www.siemens.de/simatic-safety	2 x 3RT20 https://www.siemens.de/sirius-schalten

see also

Circuit diagram, TIA Portal project and SET calculation (http://support.automation.siemens.com/WW/view/en/109747647)

Modular safety engineering for safety-related sensors and actuators using M12 technology

SIRIUS sensors and SIMATIC ET 200eco PN-F

All SIMATIC I/O modules with IP65 and IP67 protection and with 5-pin sockets have a specific pin assignment.

To prevent confusion between sensors and the consequences, the pin assignments of the following components must be the same:

- Modules
- Connecting cable
- Sensor

The 3SE5.-1AE. position switches, ready-wired with M12 5-pin connectors, have the same pin assignment as all SIMATIC ET 200 I/O modules in the field.

The connection is carried out quickly and clearly using appropriate connecting cables.

The 3SU1 emergency stop enclosure can also be supplied with an M12 5-pin connector.

The ET 200eco PN is deployed primarily where use is required directly on the machine with limited space requirements and a high level of ruggedness.

Other sensors that can be connected to the ET 200eco PN

Non-contact safety switch

- RFID 3SE63
- 3SE66/67 solenoid
- The 3SE53 safety switches with tumbler and the 3SU1 illuminated emergency stop enclosure, as well as the 3SU1 enclosure with emergency stop and a command point, can be connected to the fail-safe SIMATIC field modules using a special Y-cable.

Applications

- Mechanical engineering
- Automotive industry
- Tool changing machines

8.21 Other applications

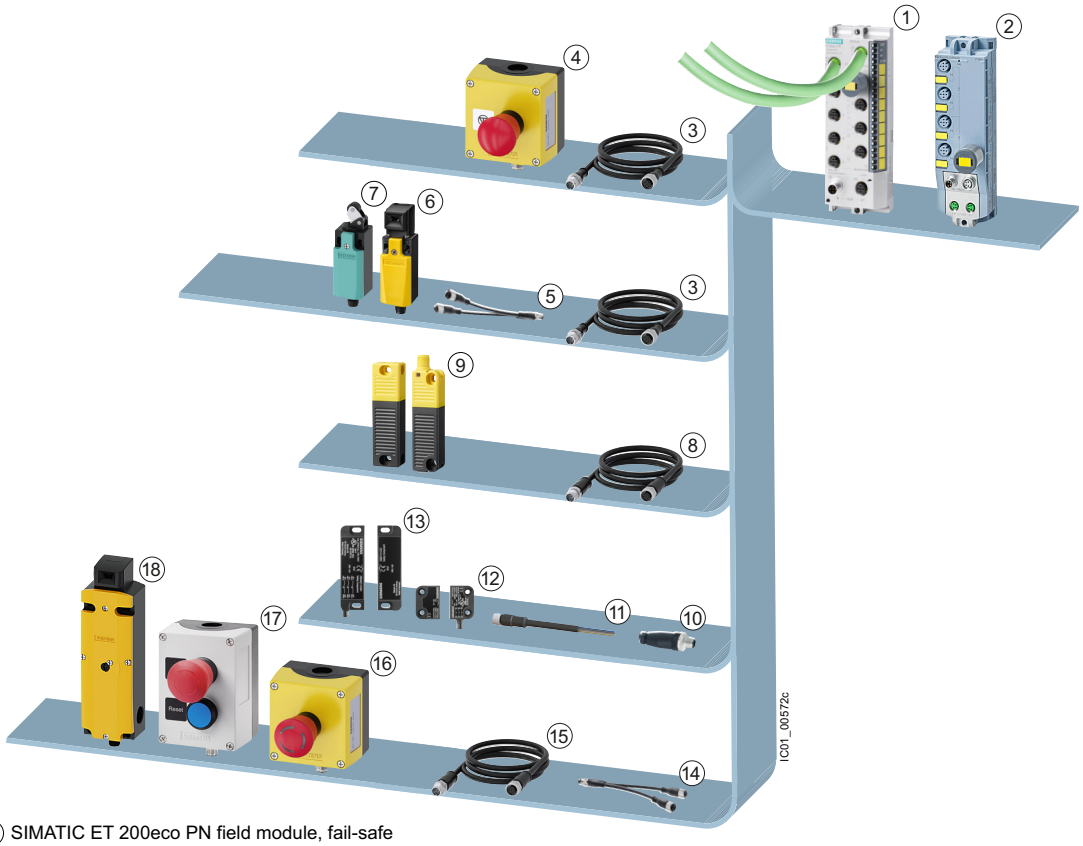
For further examples of applications refer to the Manual SIRIUS Safety Integrated (https://support.industry.siemens.com/cs/ww/en/view/81366718).

8.22 Connection options with SIMATIC ET200eco PN

The SIRIUS sensors can be connected in the field via the fail-safe field module of the SIMATIC ET 200eco and via the field module of the SIMATIC ET 200AL.

The field modules achieve IP65/67 degree of protection in cabinet-free design mounted directly on the machine.

The signals are forwarded to the higher-level controller via PROFINET/PROFIsafe either by means of a direct connection (SIMATIC ET 200eco) or, in the case of SIMATIC ET 200AL, via an interface module.



① SIMATIC ET 200eco PN field module, fail-safe 6ES7146-6FF00-0AB0

② SIMATIC ET 200AL field module, fail-safe 6ES7146-5FF00-0AB0

③ Connection cables, 5-pole, 3SX5601-3SV15

④ SIRIUS ACT enclosure, EMERGENCY STOP, with M12 plug, 5-pole, 3SU1801-0NH00-4NB2

⑤ Y-cable, 5-pole to 2 x 5-pole, 6ES7194-6KB00-0XA0

⑥ Safety switch with separate actuator, without tumbler, with M12 plug, 5-pole, 3SE5114/3SE5234

⑦ Position switch, with M12 plug, 5-pole, 3SE5114/3SE5234

⑧ Adapter cable, with M12 socket, 8-pole and M12 plug, 5-pole, 3SX5601-3SV00-1AK3

⑨ Non-contact RFID safety switches, 8-pole, 3SE63

⑩ M12 plug, 5-pole, 3RK1902-4BA00-5AA0

⑪ Connecting cable with open end, 6-pole or 4-pole, 3SX5601-.GA05

⑫ Magnetically operated switches, 6-pole, 3SE66/67

⑬ Magnetically operated switches, 4-pole, 3SE66/67

⑭ Y-cable, 8-pole to 2 x 5-pole, 6ES7194-6KC00-0XA0

⑮ Connection cable, 8-pole, 3SX5601-3SV18

⑯ SIRIUS ACT enclosure, EMERGENCY STOP, illuminated, with M12 plug, 8-pole, 3SU1801-0NV00-4SA2

⑰ SIRIUS ACT enclosure, EMERGENCY STOP and pushbutton, with M12 plug, 8-pole, 3SU1802-0NE00-4SB1

⑱ Safety switch with tumbler, with M12 plug, 8-pole, 3SE5324

You will find selection and ordering data in the Catalog IC10 (www.siemens.com/ic10).

8.23 Evaluation of the sensors with safety relays

Note

It is possible to use different types of safety relays.

You can use SIRIUS 3SK safety relays to evaluate sensors. For further information and variants, refer to the SIRIUS 3SK1 safety relays Equipment Manual (https://support.industry.siemens.com/cs/ww/de/view/67585885) and the SIRIUS 3SK2 safety relays Equipment Manual (https://support.industry.siemens.com/cs/ww/en/view/109444336).

Monitoring units		Number of encoders	Enabling/signaling circuits	Article No.
 3SK1111-1AB30	**3SK1 safety relays, Standard or Advanced basic units**			
	with 24 V DC relay output	1	3 NO/1 NC	3SK1111-1AB30
		6[1)]	3 NO/1 NC	3SK1121-1AB40
	with 24 V DC semiconductor output	1	2x F-DQ/1 QM	3SK1112-1BB40
 3SK2112-1AA10	**3SK2 safety relays, basic units**			
	with 24 V DC semiconductor output	4	2x F-DQ/1 QM	3SK2112-1AA10
		8	4 x F-DQ/2 QM	3SK2122-1AA10

[1)] Only when up to 5 3SK1220 expansion units are used

8.24 Achievable safety level in combination with safety relays

Position and door monitoring with SIRIUS 3SE5 mechanical safety switches including positive opening

The following table lists the maximum achievable safety level of a safety relay in combination with a position switch:

		Compact switches 3SE54	Standard position switches 3SE51/52	Hinge switches 3SE51/52	Safety switches with separate actuator 3SE51/52	Safety switches with optional tumbler function 3SE53
Number of position switches		1	1	1	1	1
+	**Safety relay (e.g. 3SK) with**					
= Max. achievable safety level	Monitoring 1 x NC contact	**SIL 1/PL c**				
	Monitoring 2 x NC contacts or 1 x NC contact 1 x NO contact	**SIL 1/PL c**		**SIL 2/PL d**		

The following table lists the maximum achievable safety level of a safety relay in combination with two position switches:

		Compact switches 3SE54	Standard position switches 3SE51/52	Hinge switches 3SE51/52	Safety switches with separate actuator 3SE51/52	3SE53 safety switches with optional tumbler function
Number of position switches		2	2	2	2	2
+	**Safety relay (e.g. 3SK) +**					
= Max. achievable safety level	3SE51/52 standard position switches	**SIL 3/PL e**				
	3SE51/52 safety switches hinge switches					
	3SE51/52 safety switches with separate actuator					
	3SE53 safety switches with optional tumbler function					

Safe protective door tumbler with safety switches and separate 3SE5 actuator with positive opening

The following table lists the maximum achievable safety level of a safety relay in combination with one or two position switches:

		Safety switches with tumbler	
Number of safety switches		1	2
+	**safety relay (e.g. 3SK2) +**		
= Max. achievable safety level		**SIL 2/PL d**	**SIL 3/PL e**

Position monitoring with 3SE6 magnetically operated switches

The following table lists the maximum achievable safety level of a safety relay in combination with a magnetically operated switch:

		3SE66/3SE67 magnetically operated switches	
Magnetically operated switch		1 NO + 1 NC	2 NC
+	**safety relay (e.g. 3SK)**		
= Max. achievable safety level		**SIL 3/PL e**	

Application examples

Application examples for using the switches with SIRIUS safety relays can be found in the SIRIUS Safety Integrated Application Manual (https://support.industry.siemens.com/cs/ww/en/view/81366718).

8.25 Special environmental requirements

8.25.1 Icing

Position switches must be mounted and, if necessary, protected in such a way that damage resulting from foreseeable influences is avoided.

- The interface and actuating element must be positioned so as to avoid condensation, water accumulation, or icing.
- Choose actuators that are less prone to icing (rotary instead of linear), such as a rod lever or twist lever.
- All basic designs without actuator are ideal since the plunger guide is sealed only by means of an external chlorinated rubber membrane.
- See also Humidity and wet conditions (Page 287)

8.25.2 UV radiation

The actuator interface of the complete 3SE5 series is sealed with a UV-resistant chlorinated rubber membrane.

Note

For purposes of long-term stability, make sure to mount the position switches in such a way that seals and plastics are protected against direct and extreme UV radiation.

8.25.3 Humidity and wet conditions

8.25.3.1 Condensation

Moisture in sealed enclosure

While enclosures tested according to IP standard are impervious to liquids, they are not gas-tight. Therefore, moisture can penetrate the enclosure in spite of degree of protection IP66 and IP67.

Wetness

Wetness refers to water in liquid state, e.g., rain.

Humidity

Humidity is water in gaseous state, e.g., micro-aerosols or water vapor.

Enclosures according to IP standards are impervious to liquids, but they are not permanently gas-tight. Therefore, while rain cannot penetrate the enclosure, water vapor can. If an underpressure is created in the enclosure, humid air can be drawn in. Underpressure or overpressure conditions form very quickly when an enclosure is used under open-air weather conditions. This moisture can no longer escape from the enclosure, where it accumulates and condenses.

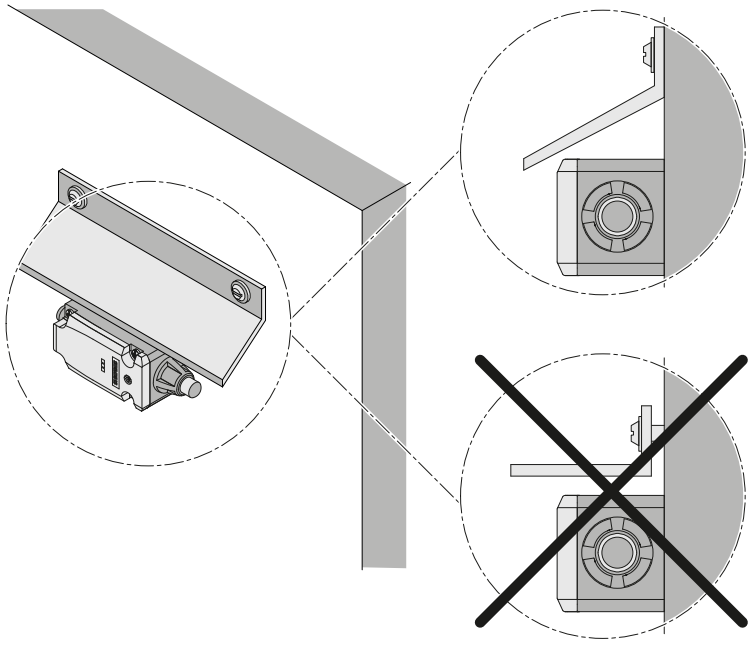
Result

Short-circuit and corrosion

The more often the enclosure is exposed to temperature change cycles, the more moisture is transported into the enclosure. This is due to the fact that each temperature cycle places a constant load on the seals, whose function may be impaired due to abrasion and stress cracks.

Remedy, measures

- Separate protective cover over enclosure, protective canopy



NOTICE
Risk of property damage Ensure the following when installing protective canopies: • The interface and actuating element must be positioned so as to avoid water accumulation. • The protective canopy must be adequately sealed. • The protective canopy must have an adequate projection and slope.

8.25.3.2 Water jet

Protection against water jets

- The switches have degree of protection IP65 or IP66 and are therefore protected against water jets. When high-pressure cleaners are used frequently, protection must be provided for the installation (e.g., in the case of cleaning operations in the food and beverage industry).
- The interface and actuating element must be positioned so as to avoid water accumulation.

8.25.3.3 Immersing

Switches with degree of protection IP67 can be immersed for 1 hour in water up to 1 m deep. In this case, attention must be paid that the threaded caps (cable gland) fit tightly.

8.25.4 Dust, dirt, oil

Note

Avoidance of dirt.

Ensure that the switch is attached in such a way that accumulation of dirt in the interface is avoided.

8.25.5 Cleaning agent, chemical environment

NOTICE
Risk of property damage. **Cleaning agents can make devices sticky.** Ensure that the switch is attached in such a way that accumulation of cleaning agents in the interface is avoided. This can cause linear guides (e.g., rounded plunger, roller plunger) to become sticky. Extremely aggressive cleaning agents can attack and damage seals.

8.25.6 Extreme temperatures

Versions down to -40 ℃

Versions for operating temperatures down to -40 °C can be ordered with the qualifiers -1AJ0, -1AJ1 (shock and vibration test in accordance with rail standard EN 61373) or -1AY0 (e.g. 3SE5232-0LE10-1AY0). These switches are characterized by their use of special sealing materials as well as low-temperature greases.

Application

- In external areas, e.g., for crane systems, train applications, etc.

Installation in cooling systems

When the switches are installed in or on cooling systems, increased condensation may occur. When the doors are opened, warm, moist air flowing in condenses and can cause icing on the switches.

Recommendation

Mount the switch outside the cooling chamber or install with a cover (see Section Icing (Page 287)).

Appendix

A

A.1 Standards and approvals

A.1.1 Standards for mechanical position switches

SIRIUS position switches are developed and manufactured according to product standard DIN EN / IEC 60947-5-1. The SIRIUS position switches also meet the requirements of DIN EN 50041 and DIN EN 50047 and thus help you to comply with the specifications when designing your machines.

All modules/devices marked with the positive-opening symbol can be used in safety circuits.

DIN EN / IEC 60204-1:

This part of IEC 60204 contains requirements and recommendations for electrical equipment of machines, in order to:

– promote the safety of persons and property

– maintain correct functioning

– simplify service and maintenance

For example, mechanically actuated position switches (travel sensors used for safety purposes must be provided with a positive-opening normally-closed contact).

DIN EN / IEC 60947-5-1

This standard applies to control devices and contact blocks intended for controlling, signaling, interlocking, and so on, of switching devices and switchgear, especially position switches, e.g., auxiliary switches actuated by a machine part or a mechanism.

Requirements for the design and behavior of the auxiliary switches are described.

ISO 14119

This standard defines guidelines for the design and selection of interlocking devices associated with guards. It describes tamper-proofing and designs of interlocking devices.

A.1.2 General information regarding dimensions and characteristic values for position switches

These standards describe the mountings and operating points of position switches.

DIN EN 50041 - Control switches; position switches 42.5 x 80

This standard applies to certain position switches with automatically resetting actuator elements for industrial application, whose standard dimensions and required characteristic values for use are specified in the following.

The electrical values must conform to DIN EN / IEC 60947-5-1.

This standard includes the following 6 types:

- With twist lever (type A)
- With rounded plunger (type B)
- With roller plunger (type C)
- With rod lever (type D)
- Lateral actuator with rounded plunger (type F)
- Lateral actuator with rounded plunger (type G)

The devices are designed with snap-action or slow-action function.

DIN EN 50047 - Control switches; position switches 30 x 55

This standard applies to certain position switches with automatically resetting actuator elements for industrial application, whose standard dimensions and required characteristic values for use are specified in the following.

The electrical values must conform to DIN EN / IEC 60947-5-1.

This standard includes the following 4 types:

- With twist lever (type A)
- With rounded plunger (type B)
- With roller plunger (type C)
- With roller lever (type E)

The devices are designed with snap-action or slow-action function.

A.2 Description of the degrees of protection

Degree of protection

The protection of position switches against ingress of solid foreign objects and liquids must be appropriate, taking into consideration the external influences under which the switch is operated (e.g., dust, coolant, and metal chips).

Examples of minimum degrees of protection

General industrial applications	IP32, IP43, and IP54
Building site areas	IP54
Enclosure that is cleaned with low-pressure water jet	IP55
Enclosure that guarantees protection against fine dust.	IP65

IPX5, IPX6, and IPX7 do not mean that an interlocking device may be sprayed, e.g., with a hose or high-pressure cleaning unit. Additional protective measures must be taken in this case.

A marking in which the second digit is "7" or "8" (e.g., IP67) does not necessarily mean that the requirements for degrees of protection in which the second digit is "5" or "6" (e.g., IP65) are met.

Excerpt from DIN EN 60529 "IP degrees of protection; protection against contact, foreign objects, and water for electrical equipment"

First code number	Degrees of protection (protection against contact and solid foreign objects)
5	Ingress of dust is not totally prevented, but dust must not be allowed to enter in such quantities that satisfactory operation of the device or safety is impaired.
6	No ingress of dust
Second code number	**Degrees of protection (water protection)**
4	Water splashing onto the enclosure from any direction must not have a harmful effect.
5	A jet of water directed at the enclosure from any direction must not have a harmful effect.
6	A strong jet of water directed at the enclosure from any direction must not have a harmful effect.
7	Water must not enter in an amount that causes harmful effects if the enclosure is submerged in water temporarily under standardized pressure and time conditions.

Components of the IP code and their meaning

Component:	Digits or letters	Meaning for protection of **equipment**:	Meaning for protection of **persons**:
Code letters	IP	—	—

First code number		Ingress of solid foreign bodies	Access to dangerous parts with
	0	(Not protected)	(Not protected)
	1	≥ 50 mm diameter	Back of hand
	2	≥ 12.5 mm diameter	Finger
	3	≥ 2.5 mm diameter	Tool
	4	≥ 1.0 mm diameter	Wire
	5	Dust protected	Wire
	6	Dust-tight	Wire
		Ingress of water with harmful effects	
Second code number	0	(Not protected)	—
	1	Protected against vertical dripping water	
	2	Protected against dripping water (15° inclination)	
	3	Protected against spray water	
	4	Protected against splash water	
	5	Protected against jet-water	
	6	Protected against intense jet-water	
	7	Protected against the effects of temporary immersion in water	
	8	Protected against the effects of continuous immersion in water	
	9	Protected against high pressure and high jet-water temperatures	

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