SIEMENS

# Industrial Controls

## Safety Engineering

### SIRIUS 3SK1 Safety Relays

Manual

Edition 04/2013

Answers for industry.

SIEMENS

# Industrial Controls

# Safety engineering 3SK1 safety relays

Manual


Introduction 1

Product-specific safety information 2

Product overview for 3SK1 3

Safety systems - General information 4

3SK1 devices 5

System configuration 6

Circuit diagrams 7

Mounting 8

Connection 9

Configuration / operation 10

Commissioning 11

Display and diagnostics 12

Technical data 13

Dimension drawings 14

Accessories 15

Appendix A



04/2013

A5E02526190021A/RS-AA/01

## 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

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

### 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.

Siemens AG
Industry Sector
Postfach 48 48
90026 NÜRNBERG
GERMANY

Order number: 3ZX1012-0SK11-0AC0
℗ 04/2013 Technical data subject to change

Copyright © Siemens AG 2013.
All rights reserved

# Table of contents


**1 Introduction ..... 11**

1.1 User responsibility for system design and function ..... 11
1.2 Required basic knowledge ..... 11
1.3 Validity range ..... 11
1.4 Definitions ..... 11
1.5 DataMatrix code ..... 12
1.6 Correction sheet ..... 13

**2 Product-specific safety information ..... 15**

2.1 General safety notes ..... 15
2.2 Safety information for hazardous areas ..... 17
2.3 Intended use ..... 17
2.4 Current information about operational safety ..... 18
2.5 Declaration of conformity ..... 18

**3 Product overview for 3SK1 ..... 19**

3.1 Overview ..... 19
3.2 Overview of components and accessory parts ..... 22
3.3 Functional scope of the 3SK1 basic units ..... 23
3.4 Introduction ..... 24
3.5 3SK1 system ..... 25
3.5.1 Standard ..... 25
3.5.1.1 Typical system configuration ..... 25
3.5.2 Advanced ..... 26
3.5.2.1 Typical system configuration ..... 26

**4 Safety systems - General information ..... 29**

4.1 What is safety? ..... 29
4.2 Safety function ..... 29
4.3 Basic terminology ..... 31
4.3.1 Redundancy/single-channel and two-channel ..... 31
4.3.2 Cross-circuit detection ..... 32
4.3.3 Enabling circuit ..... 32
4.3.4 Signaling circuit ..... 33
4.3.5 Feedback circuit ..... 33
4.3.6 Stop categories ..... 33
4.3.7 Automatic start ..... 34
4.3.8 Manual start ..... 34

4.3.9 Monitored start ... 35
4.3.10 Two-hand operation/synchronism ... 36
4.3.11 Cascading ... 36
4.3.12 Startup testing ... 37
4.3.13 Connection of actuators ... 37
4.3.14 Series connection of sensors ... 40

**5 3SK1 devices ... 43**

5.1 3SK1 standard ... 43
5.1.1 General information ... 43
5.1.2 Applications ... 43
5.1.3 3SK1111 Standard basic unit instantaneous (with relay outputs) ... 44
5.1.3.1 General information ... 44
5.1.3.2 Function description ... 44
5.1.3.3 Design ... 45
5.1.3.4 Terminal assignment ... 46
5.1.3.5 Inputs ... 46
5.1.3.6 Outputs ... 47
5.1.3.7 Display of the operating state ... 47
5.1.3.8 Function setting ... 47
5.1.4 3SK1112 Standard basic unit instantaneous (with solid-state outputs) ... 50
5.1.4.1 General information ... 50
5.1.4.2 Function description ... 50
5.1.4.3 Design ... 51
5.1.4.4 Terminal assignment ... 52
5.1.4.5 Inputs ... 52
5.1.4.6 Outputs ... 53
5.1.4.7 Display of the operating state ... 53
5.1.4.8 Function setting ... 54

5.2 3SK1 Advanced ... 56
5.2.1 General information ... 56
5.2.2 Applications ... 56
5.2.3 General device features ... 57
5.2.4 Function description ... 57
5.2.5 Functions ... 58
5.2.6 3SK1121 Advanced basic unit instantaneous (with relay outputs) ... 60
5.2.6.1 Device features ... 60
5.2.6.2 Function description ... 60
5.2.6.3 Design ... 61
5.2.6.4 Terminal assignment ... 62
5.2.7 3SK1121 Advanced basic unit time-delayed (with relay outputs) ... 63
5.2.7.1 Device features ... 63
5.2.7.2 Design ... 64
5.2.7.3 Terminal assignment ... 65
5.2.8 3SK1122 Advanced basic unit instantaneous (with solid-state outputs) ... 67
5.2.8.1 Device features ... 67
5.2.8.2 Design ... 68
5.2.8.3 Terminal assignment ... 69
5.2.9 3SK1122 Advanced basic unit time-delayed (with solid-state outputs) ... 71
5.2.9.1 Device features ... 71
5.2.9.2 Design ... 72
5.2.9.3 Terminal assignment ... 73

5.2.10 3SK1120 Advanced basic unit instantaneous (with solid-state outputs) ..... 75
5.2.10.1 Device features ..... 75
5.2.10.2 Design ..... 76
5.2.10.3 Terminal assignment ..... 77

5.3 3SK1 output expansions ..... 78
5.3.1 Applications ..... 78
5.3.2 Function description ..... 78
5.3.3 Display of the operating state ..... 79
5.3.4 Function setting ..... 79
5.3.5 Output expansion 3SK1211 ..... 80
5.3.5.1 Device features ..... 80
5.3.5.2 Design of 3SK1211-.B..0 ..... 81
5.3.5.3 Design of 3SK1211-.BB40 ..... 82
5.3.5.4 Terminal assignment ..... 83
5.3.6 Output expansion 3SK1213 ..... 84
5.3.6.1 Device features ..... 84
5.3.6.2 Design of 3SK1213-.AB40 ..... 85
5.3.6.3 Design of 3SK1213-.A.20 ..... 86
5.3.6.4 Terminal assignment ..... 86

5.4 3SK1 input expansions ..... 87
5.4.1 Input expansion 3SK1220 ..... 87
5.4.1.1 Device features ..... 87
5.4.1.2 Applications ..... 87
5.4.1.3 Design ..... 88
5.4.1.4 Terminal assignment ..... 88
5.4.1.5 Display of the operating state ..... 89
5.4.1.6 Function setting ..... 89
5.4.2 Power supply 3SK1230 ..... 91
5.4.2.1 Device features ..... 91
5.4.2.2 Applications ..... 91
5.4.2.3 Design ..... 92
5.4.2.4 Terminal assignment ..... 93
5.4.2.5 Display of the operating state ..... 93

**6 System configuration ..... 95**

6.1 General information ..... 95
6.1.1 General notes on the Standard system ..... 95
6.1.2 General information on the Advanced system ..... 95
6.1.3 Maximum system configuration ..... 96

6.2 3ZY12 device connector ..... 98
6.2.1 Device features ..... 98
6.2.2 Applications ..... 100

6.3 System configuration rules ..... 100

**7 Circuit diagrams ..... 103**

7.1 Internal circuit diagrams ..... 103
7.1.1 Internal circuit diagrams for 3SK1 Standard basic units ..... 103
7.1.2 Internal circuit diagrams for 3SK1 Advanced basic units ..... 105
7.1.3 Internal circuit diagrams for expansion units ..... 108

7.2 Typical circuits ..... 111

7.2.1 Sensor wiring ... 111
7.2.2 Typical circuits ... 113
**8 Mounting ... 123**
8.1 Warning notices ... 123
8.2 Terminal coding ... 124
8.3 Mounting the devices on a level surface ... 125
8.4 Disassembling devices from a level surface ... 127
8.5 Mounting the 22.5 mm/17.5 mm device on a standard mounting rail ... 129
8.6 Mounting the 90 mm devices on a standard mounting rail ... 130
8.7 Removing devices from a standard mounting rail ... 131
8.8 Mounting 22.5 mm/17.5 mm devices with device connectors on a standard mounting rail ... 132
8.9 Removing 22.5 mm/17.5 mm devices with device connectors from a standard mounting rail ... 135
8.10 Mounting 90 mm devices with device connectors on a standard mounting rail ... 138
8.11 Removing 90 mm devices with device connectors from a standard mounting rail ... 141
8.12 Mounting 22.5 mm/17.5 mm devices with device connectors on the wall ... 144
8.13 Removing 22.5 mm/17.5 mm devices with device connectors from the wall ... 148
8.14 Mounting 90 mm devices with device connectors on the wall ... 151
8.15 Removing 90 mm devices with device connectors from wall ... 155
8.16 Mounting the sealable cover ... 158
**9 Connection ... 159**
9.1 22.5 mm/17.5 mm devices ... 159
9.1.1 Terminal assignment ... 159
9.1.2 Connection data for terminals ... 161
9.1.3 Connecting the screw-type terminals ... 162
9.1.4 Disconnecting the screw-type terminals ... 163
9.1.5 Connecting the push-in terminals ... 164
9.1.6 Disconnecting the push-in terminals ... 166
9.1.7 Attaching the terminals ... 167
9.1.8 Disconnecting ... 168
9.2 Devices 90 mm ... 170
9.2.1 Opening the terminal cover ... 170
9.2.2 Connection data for terminals ... 171
9.2.3 Connecting terminals ... 172
9.2.4 Mounting terminals ... 174
9.2.5 Disconnecting ... 175
9.3 Device replacement ... 177
**10 Configuration / operation ... 179**
10.1 Procedure for configuration ... 179
10.2 Explanation of the device's functions ... 180

10.3 Modes ..... 183
10.4 Response times ..... 184
10.4.1 Response times ..... 184
**11 Commissioning ..... 185**
**12 Display and diagnostics ..... 187**
12.1 LED display ..... 187
12.2 Power-up ..... 189
12.3 Error statuses ..... 189
12.4 Diagnostics ..... 189
**13 Technical data ..... 193**
13.1 General technical data ..... 193
13.2 Basic units ..... 197
13.2.1 Standard ..... 197
13.2.1.1 Technical data for 3SK1111 Standard relay basic unit ..... 197
13.2.1.2 Technical data for 3SK1112 Standard solid-state basic unit ..... 202
13.2.2 Advanced ..... 206
13.2.2.1 Technical data for 3SK1120 Advanced solid-state basic unit ..... 206
13.2.2.2 Technical data for 3SK1121 Advanced relay instantaneous basic unit ..... 210
13.2.2.3 Technical data for 3SK1121 Advanced relay time-delayed basic unit ..... 214
13.2.2.4 Technical data for 3SK1122 Advanced solid-state instantaneous basic unit ..... 219
13.2.2.5 Technical data for 3SK1122 Advanced solid-state time-delayed basic unit ..... 223
13.3 Expansion modules ..... 228
13.3.1 Output expansions ..... 228
13.3.1.1 Technical data for output expansion 3SK1211 ..... 228
13.3.1.2 Technical data for output expansion 3SK1213 ..... 233
13.3.2 Input expansions ..... 237
13.3.2.1 Technical data for input expansion 3SK1220 ..... 237
13.3.2.2 Technical data for power supply unit 3SK1230 ..... 241
**14 Dimension drawings ..... 243**
14.1 Dimension drawings for 3SK1 devices ..... 243
14.2 Dimension drawings for 3SK1 device connector ..... 251
**15 Accessories ..... 257**
**A Appendix ..... 259**
A.1 Correction sheet ..... 259

# Introduction 1

## 1.1 User responsibility for system design and function

The products described here were developed to perform safety-related functions as part of an overall installation or machine.

A complete, safety-related system is generally equipped with sensors, evaluation units, and signaling units, and uses reliable shutdown concepts.

It is the responsibility of the manufacturer of a system or machine to ensure that the product functions properly.
Siemens AG, its regional offices, and associated companies (hereinafter referred to as "Siemens") cannot guarantee all the properties of an entire plant, system 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.

## 1.2 Required basic knowledge

A general knowledge of the following areas is needed in order to understand this manual:

- Low-voltage switchgear
- Digital circuit logic
- Automation systems
- Safety systems

## 1.3 Validity range

The manual is valid for these safety relays SIRIUS 3SK1. It describes the components that are valid at the time of publication.

SIEMENS reserves the right of including a Product Information for each new component, and for each component of a later version.

## 1.4 Definitions

"3SK1" always applies to all variants of the SIRIUS 3SK1 safety relays.

# 1.5 DataMatrix code

A DataMatrix code is lasered onto the lower terminal cover of all 3SK1-series safety relays.

DataMatrix codes are standardized in ISO/IEC 16022. The DataMatrix codes on Siemens devices use ECC200 coding for powerful error correction.

The following device information is encoded in the DataMatrix codes as a bit stream:

- MLFB
- Serial number
- MAC address, if applicable

This information is stored in the following format in the DataMatrix code:

| | | | |
|---|---|---|---|
| 1P | MLFB | + | S serial number<br>(+ 23S MAC address) |
| Data identifier | Net content | Separator | |

**Note**

The information content is displayed without spaces.

This machine-readable information simplifies and accelerates handling of the respective devices.
As well as fast access to the serial numbers of the respective devices for unique identification, the DataMatrix codes simplify communication with Siemens Technical Support.

The DataMatrix codes enable in particular extremely fast and convenient access to all the device-specific information available on an MLFB in the SIEMENS Service&Support Portal, such as operating instructions, manuals, data sheets, FAQs, etc..
We offer the SIEMENS Industry Support App free for this purpose. This can be used on commercially available smartphones and tablet PCs.
The SIEMENS Industry Support App is available for iOS and Android-based terminal devices and can be accessed via the following links:

Link for Android

Link for iOS

## 1.6 Correction sheet

The appendix to this manual contains a correction sheet for evaluation and feedback. Please use it to record your suggestions for improvements, additions and corrections, and return the sheet to us. This will help us to improve the next edition of the manual.
Thank you.

# Product-specific safety information 2

## 2.1 General safety notes

**Note**

**Recycling and disposal**

Dispose of existing packing material in accordance with applicable regulations or recycle it.

The 3SK1 safety relays are able to be recycled thanks to a low-pollutant manufacturing process. For environmentally-friendly recycling and disposal of your electronic waste, please contact a company certified for the disposal of electronic waste.

**Note**

**SILCL 3 to IEC 62061:2005 / PL e to ISO 13849-1:2008**

The 3SK1 safety relays are designed in such a way as to allow implementation of applications up to SILCL 3 in accordance with IEC 62061 and PL e/Kat. 4 in accordance with EN ISO 13849-1.

**Note**

**Safe state**

The basis of the safety function is the definition of the safe state. In the case of safety relays, this is the "OFF state", i.e. an open contact for sensors or shutdown of the actuators.

**⚠ WARNING**

**Protection against electrically conductive contamination!**

The devices must be protected against conductive contamination while taking account of the ambient conditions. One way you can do this is to install the devices in a control cabinet with the appropriate degree of protection.

**⚠ WARNING**

**Safe functional extra-low voltage**

The 3SK1 safety relays with a supply voltage of 24 V DC must be operated with safe functional extra-low voltage (SELV, PELV). This means these modules must only be subjected to a voltage of Um even in the event of a fault. The following applies for these 3SK1 safety relays: **Um < 60.0 V**.
You can find more detailed information about safe functional extra low voltage in the data sheets of the power supplies to be used.

**CAUTION**

**Protection against electrostatic charge**

When handling and installing the 3SK1 safety relays, ensure that the components are protected from being electrostatically charged. Changes to the system configuration and wiring are only permissible while the supply voltage is switched off.
Connection of 3SK1 safety relays is only permissible when the power supply units (PELV and SELV) are switched off.

**CAUTION**

**Noise immunity / grounding**

The following must be grounded in accordance with the regulations to ensure noise immunity of the 3SK1 safety relays:

- PELV / SELV power supply units (please also note the documentation for the respective power supply unit in this regard).

**Note**

**Operational faults and malfunctions in communication**

If the EMC Directive 2004/108/EC is not complied with when plants and devices are installed, communication breaks may occur.

**Note**

Cover the 3ZY12 device connector on the left-hand side using the cover supplied with the device termination connector.

**WARNING**

3SK1..1 and 3SK1..3 (devices with outputs using contacts):

In continuous operation, the key safety values apply in the case of a function test interval (state change of the outputs) ≤ 1 year.

3SK1..2 (devices with solid-state outputs):

In continuous operation, the key safety values apply in the case of a function test interval (state change of the outputs) ≤ 1 year.

**Note**

**Annual function test**

- Actuate the connected sensors.
- Check their effect on the safety relay and the downstream actuators.
- Activate the safety relay via the connected sensors.
- Check their effect on the safety relay and the downstream actuators.
- Defective devices must be replaced.

## 2.2 Safety information for hazardous areas

**⚠ WARNING**

**Hazardous Voltage.**

**Can Cause Death, Serious Injury, or Property Damage.**

**Installation of the 3SK1 safety relays in hazardous areas**

The components of the 3SK1 are **not** suitable for installation in hazardous areas.
Please contact your ATEX specialist.

## 2.3 Intended use

**⚠ WARNING**

**Hazardous Voltage.**

**Can Cause Death, Serious Injury, or Property Damage.**

**Proper use of hardware products**

This equipment is only allowed to be used for the applications described in the catalog and in the technical description, and only in conjunction with non-Siemens equipment and components recommended by Siemens.

Correct transport, storage, installation and assembly, as well as careful operation and maintenance, are required to ensure that the product operates safely and without faults.

EU note: Commissioning is absolutely prohibited until it has been ensured that the machine in which the component described here is to be installed complies with the stipulations of the Directive 2006/42/EC.

## 2.4 Current information about operational safety

### Important note for maintaining operational safety of your system

**⚠ WARNING**

**Hazardous Voltage**

**Can Cause Death, Serious Injury, or Property Damage.**

**Please take note of our latest information**

Systems with safety-related characteristics are subject to special operational safety requirements on the part of the operator. The supplier is also obliged to comply with special product monitoring measures. For this reason, we publish a special newsletter containing information on product developments and features that are (or could be) relevant to operation of safety-related systems. By subscribing to the appropriate newsletter, you will ensure that you are always up-to-date and able to make changes to your system, when necessary:

SIEMENS newsletter ()

Sign on to the following newsletter under "Products & Solutions":

- Control Components and System Engineering News
- Safety Integrated Newsletter

## 2.5 Declaration of conformity

The manufacturer declares that the safety components of the SIRIUS 3SK1 series in the designs marketed by us comply with the applicable basic safety and health requirements of the EC Directives* stated (including amendments) and that the stated standards* were applied in their design and construction.

* You can download the complete EC Declaration of Conformity as a PDF.

# Product overview for 3SK1

# 3

## 3.1 Overview

### Overview of 3SK1 safety relays

The following tables provide an overview of the 3SK1 safety relays.

### 3SK1 Standard basic units

| Designation | Voltages | MLFB |
|---|---|---|
| Basic unit 3SK1 Standard instantaneous (with relay outputs) | 24 V AC/DC | 3SK1111-xAB30 |
| | 110 ... 240 V AC/DC | 3SK1111-xAW20 |
| Basic unit 3SK1 Standard instantaneous (with solid-state outputs) | 24 V DC | 3SK1112-xBB40 |

x = 1: screw terminals; x = 2: push-in terminals

### 3SK1 Advanced basic units

| Designation | Voltages | MLFB |
|---|---|---|
| Basic unit 3SK1 Advanced instantaneous (with relay outputs) | 24 V DC | 3SK1121-xAB40 |
| Basic unit 3SK1 Advanced time-delayed (with relay outputs) | 24 V DC | 3SK1121-xCB4y |
| Basic unit 3SK1 Advanced instantaneous (with solid-state outputs) | 24 V DC | 3SK1122-xAB40 |
| Basic unit 3SK1 Advanced time-delayed (with solid-state outputs) | 24 V DC | 3SK1122-xCB4y |
| Basic unit 3SK1 Advanced 17.5 mm instantaneous (with solid-state outputs) | 24 V DC | 3SK1120-xAB40 |

x = 1: screw terminals; x = 2: push-in terminals
y = 1: 0.05 ... 3 s; y = 2: 0.5 ... 30 s; y = 4: 5 ... 300 s

## Expansion units

| Designation | Voltages | MLFB |
|---|---|---|
| Output expansion 3SK1211 | 24 V AC | 3SK1211-xBB00 |
| | 24 V DC | 3SK1211-xBB40 |
| | 110 ... 240 V AC/DC | 3SK1211-xBW20 |
| Output expansion 3SK1213 | 24 V DC | 3SK1213-xAB40 |
| | 115 V AC | 3SK1213-xAJ20 |
| | 240 V AC | 3SK1213-xAL20 |
| Input expansion 3SK1220 | 24 V DC | 3SK1220-xAB40 |
| Power supply 3SK1230 | 110 ... 240 V AC/DC | 3SK1230-xAW20 |

x = 1: screw terminals; x = 2: push-in terminals

## Overview of the enabling circuits

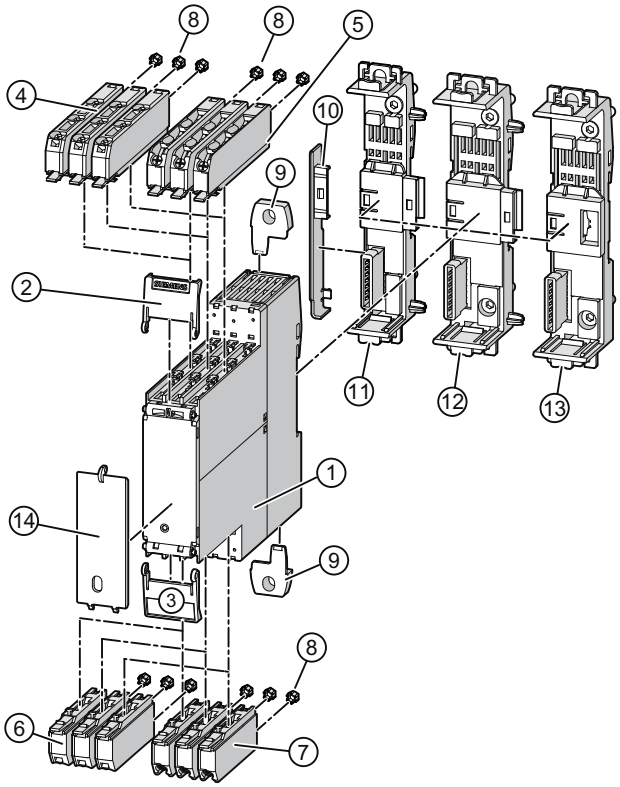
| Type and number of enabling circuits | | | | | | |
|---|---|---|---|---|---|---|
| | Relay | | Solid-state | | Signaling circuits | Device connectors |
| Advanced | Instantaneous | Delayed | Instantaneous | Delayed | | |
| 3SK1121-xAB40 | 3 | - | - | - | 1 | ✓ |
| 3SK1121-xCB4x | 2 | 2 | - | - | - | ✓ |
| 3SK1122-xAB40 | - | - | 3 | - | 1 | ✓ |
| 3SK1122-xCB4x | - | - | 2 | 2 | - | ✓ |
| 3SK1120-xAB40 | - | - | 1 | - | - | ✓ |
| **Standard** | | | | | | |
| 3SK1111-xAxx0 | 3 | - | - | - | 1 | - |
| 3SK1112-xBB40 | - | - | 2 | - | 1 | - |
| **Output expansions** | | | | | | |
| 4RO | | | | | | |
| 3SK1211 | 4 | | - | - | 1 | ✓ (for 24 V DC) |
| 3RO | | | | | | |
| 3SK1213 | 3 | - | - | - | 1 | ✓ (for 24 V DC) |

## Online configurator

To assist you with configuration, the "SIRIUS 3SK1 safety relay configurator" is at your disposal on the Internet (www.siemens.com/industrial-controls/configurators). You can select and order the correct safety relays here and generate the complete product documentation:

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

## 3.2 Overview of components and accessory parts




① 3SK1 safety relay (basic unit/expansion unit)
② Top cover flap
③ Bottom cover flap
④ Terminals, 3-pole, push-in, 1 x 2.5 mm²
⑤ Terminals, 3-pole, screw-type, 1 x 2.5 mm²
⑥ Terminals, 2-pole, push-in, 1 x 2.5 mm²
⑦ Terminals, 2-pole, screw-type, 1 x 2.5 mm²
⑧ Coding pins
⑨ Push-in lugs for wall mounting
⑩ Cover
⑪ Device connector, type 1, 17.5 mm
⑫ Device connector, type 1, 22.5 mm
⑬ Device termination connector, type 1, 22.5 mm
⑭ Sealable cover

## 3.3 Functional scope of the 3SK1 basic units

| Function | 3SK1 Standard | | 3SK1 Advanced | |
|---|---|---|---|---|
| | Type of enabling circuits | | | |
| | Relay | Solid-state | Relay | Solid-state |
| **Sensors** | | | | |
| Mechanical sensors | ✓ | ✓ | ✓ | ✓ |
| Non-floating sensors | ✓ | ✓ | ✓ | ✓ |
| Antivalent sensors | Not possible | Not possible | ✓ | ✓ |
| Sensor number can be increased | Not possible | Cascading only | ✓ | ✓ |
| **Parameters** | | | | |
| Type of start (autostart/monitored start) | ✓ | ✓ | ✓ | ✓ |
| Sensor connection 2x single-channel / 1x two-channel | Using wiring | ✓ | ✓ | ✓ |
| Cross-circuit detection OFF / ON | Using wiring | ✓ | ✓ | ✓ |
| Start-up test OFF / ON | No start-up test | ✓ | ✓ | ✓ |
| Monitoring of two-hand control units | No | No | ✓ | ✓ |
| **Enabling circuits** | | | | |
| Instantaneous | ✓ | ✓ | ✓ | ✓ |
| Time-delayed | None | None | ✓ | ✓ |
| Expandable with relay enabling circuits | Using wiring | Using wiring | ✓ | ✓ |
| Device connector | Cannot be used | Cannot be used | ✓ | ✓ |
| **Rated control supply voltage** | | | | |
| 24 V DC | ✓ | ✓ | ✓ | ✓ |
| 110 ... 240 V AC/DC | ✓ | Not possible | ✓[1)] | ✓[1)] |

[1)] Possible using 3SK1230 power supply and device connector

# 3.4 Introduction

SIRIUS 3SK1 safety relays are mainly used in autonomous safety applications that are not connected to a safety-related bus system. Here they are used to evaluate sensors and ensure safety-related shutdown when required. They also check and monitor the sensors, actuators, and the safety-related functions of the safety relay.

## Applications

Depending on the version of the device and the external connection of sensors and actuators, applications up to SIL CL 3 in accordance with IEC 62061, SIL 3 in accordance with IEC 61508 and PL e (Cat. 4) in accordance with ISO 13849-1 can be implemented.

- Monitoring the switch position of the sensors
- Monitoring of the sensor lines
- Monitoring of correct functioning of the safety relay
- Monitoring of the actuators
- Safety-related shutdown in case of hazards

# 3.5 3SK1 system

## 3.5.1 Standard

### 3.5.1.1 Typical system configuration

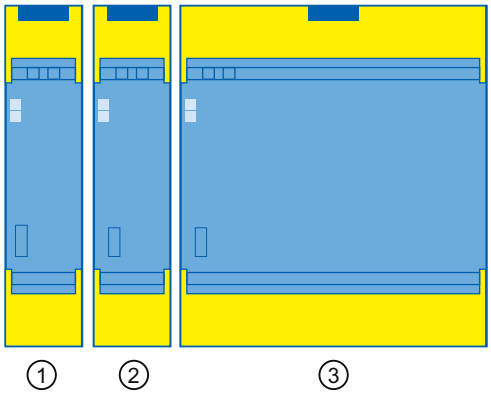
#### System configuration for 3SK1 Standard

A 3SK1 Standard system can comprise the following devices:

- Basic units (one basic unit per system)
  - Basic unit 3SK1111 Standard relay instantaneous (see also 3SK1111 Standard basic unit instantaneous (with relay outputs) (Page 44) )
  - Basic unit 3SK1112 Standard solid-state instantaneous (see also 3SK1112 Standard basic unit instantaneous (with solid-state outputs) (Page 50) )
- Output expansions
  - Output expansion 3SK1211 (see also Output expansion 3SK1211 (Page 80) )
  - Output expansion 3SK1213 (see also Output expansion 3SK1213 (Page 84) )

The devices are connected using wiring.

Typical 3SK1 Standard system configuration




① Basic unit 3SK1 Standard
② Output expansion 3SK1211
③ Output expansion 3SK1213

## 3.5.2 Advanced

### 3.5.2.1 Typical system configuration

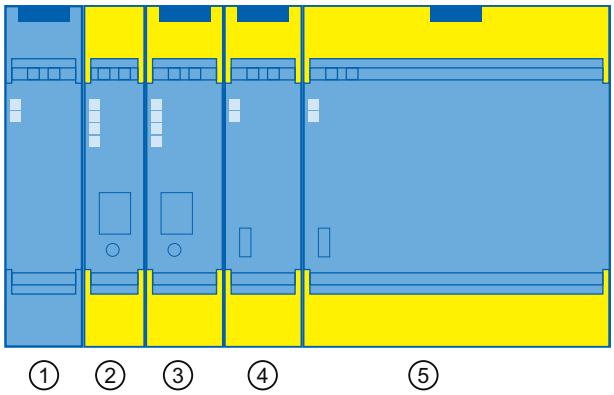
#### System configuration for 3SK1 Advanced

A 3SK1 Advanced system can comprise the following devices:

- Basic units (one basic unit per system)
  - Basic unit 3SK1121 Advanced relay instantaneous (see also 3SK1121 Advanced basic unit instantaneous (with relay outputs) (Page 60) )
  - Basic unit 3SK1121 Advanced relay time-delayed (see also 3SK1121 Advanced basic unit time-delayed (with relay outputs) (Page 63) )
  - Basic unit 3SK1122 Advanced solid-state instantaneous (see also 3SK1122 Advanced basic unit instantaneous (with solid-state outputs) (Page 67) )
  - Basic unit 3SK1122 Advanced solid-state time-delayed (see also 3SK1122 Advanced basic unit time-delayed (with solid-state outputs) (Page 71) )
  - Basic unit 3SK1120 Advanced 17.5 mm solid-state instantaneous (see also 3SK1120 Advanced basic unit instantaneous (with solid-state outputs) (Page 75) )
- Input expansions
  - Power supply 3SK1230 (see also Power supply 3SK1230 (Page 91) )
  - Input expansion 3SK1220(see also Input expansion 3SK1220 (Page 87) )
- Output expansions
  - Output expansion 3SK1211 (see also Output expansion 3SK1211 (Page 80) )
  - Output expansion 3SK1213 (see also Output expansion 3SK1213 (Page 84) )
- Device connector (optional) (see also 3ZY12 device connector (Page 98) )

The devices are connected by means of device connectors or wiring.

Typical 3SK1 Advanced system configuration




① Power supply 3SK1230
② Input expansion 3SK1220
③ Basic unit 3SK1 Advanced
④ Output expansion 3SK1211
⑤ Output expansion 3SK1213

# Safety systems - General information

# 4

## 4.1 What is safety?

Safety defines a state in which the risk of damage is reduced to a tolerable level, or which can be regarded as risk-free. Following on from this definition, functional safety concerns persons, machines and the environment.

The objective of safety systems is to reduce the risk for humans and machines that is posed by a use case to an acceptable level. The first step is, therefore, to identify the risk of a use case. In order to make a reliable assessment regarding the application, each individual function of a machine or plant must be analyzed for potential hazards.

For further information, refer to the brochure "Safety of machines and plants" which is available here as a download: Functional safety (http://wwwsiemens.com/safety).

## 4.2 Safety function

A safety function describes the reaction of a machine/plant to the occurrence of a specific event (e.g. opening of a protective door). Execution of the safety function(s) is carried out by a safety-related control system. This usually comprises three subsystems, **detecting**, **evaluating** and reacting.

**Detecting** (sensors):

- Detection of a safety requirement,
  e.g.: EMERGENCY STOP or a sensor for monitoring a hazardous area (light array, laser scanner, etc.) is operated.

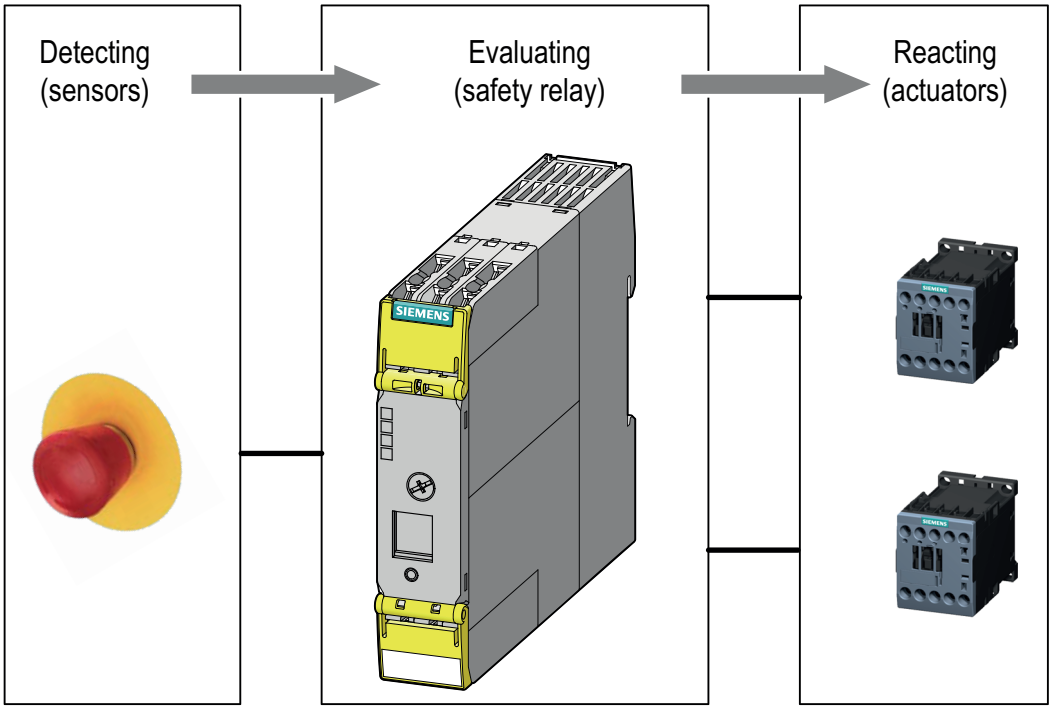
**Evaluating** (safety relay):

- Detection of a safety requirement and the safe initiation of the reaction (e.g. switching off the enabling circuits).
- Monitoring the correct operation of sensors and actuators
- Initiating a reaction upon detection of faults

For the 3SK1 products described in this manual, this concerns evaluation units for safety functions.

**Reacting** (actuators):

- Switching off the hazard by means of downstream actuators.



# 4.3 Basic terminology

## 4.3.1 Redundancy/single-channel and two-channel

### Redundancy

With redundancy, more than one component is implemented for the same function, so a faulty function of a component is performed instead by the other component(s).

A redundant configuration reduces the probability of a function failing due to a single defective component. This requirement is essential for achieving SILCL 3 in accordance with IEC 62061, SIL 3 in accordance with IEC 61508 and PL e (Cat. 4) in accordance with ISO 13849-1 (also necessary for SIL 2 / PL d under certain circumstances).

The simplest form of redundancy is **two-channel redundancy.**

If a circuit fails, two-channel redundancy ensures that the safety function is maintained.

In a redundant system configuration, the subsystems for detecting and reacting must also be implemented with two-channel redundancy.

**Note**

All SIRIUS Safety devices that comply with SILCL 3 in accordance with IEC 62061, SIL 3 in accordance with IEC 61508 and PL e (Cat. 4) in accordance with DIN EN ISO 13849-1 are redundantly configured with regard to the internal logic as well as with regard to the output circuits.

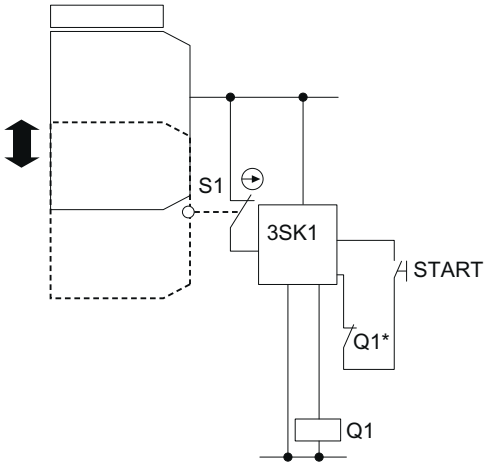



Figure 4-1 Single-channel sensor connection

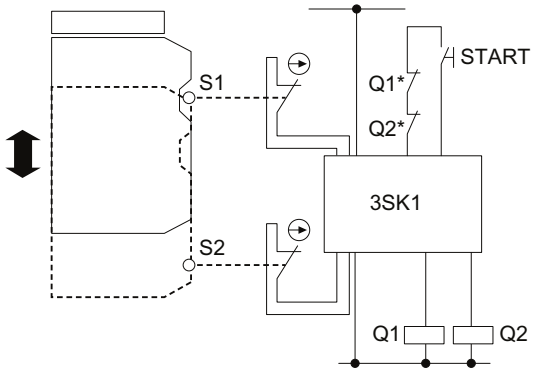



Figure 4-2 Two-channel sensor connection

* = positively-driven auxiliary contacts/mirror contacts

## 4.3.2 Cross-circuit detection

Cross-circuit detection is a diagnostic function of a safety relay that detects short-circuits and cross-circuits between the input channels (sensor circuits) during two-channel sensing or reading. A cross-circuit can be caused, for example, by a cable casing being squashed. In devices without cross-circuit detection, this can mean that a two-channel EMERGENCY STOP circuit does not trip even though only one NC contact is faulty (secondary error).

With 3SK1 devices, a cross-circuit is detected in the sensor circuits by means of signals with different clock pulses. If the clocked signals overlap, the device detects a cross-circuit. With 3SK1 basic units, cross-circuit detection can be deactivated to allow electronic sensors to be evaluated (that monitor themselves as well as the cable to the evaluation unit.

## 4.3.3 Enabling circuit

An enabling circuit provides a safety-related output signal. From an external viewpoint, enabling circuits usually act as NO contacts (however, in terms of functionality, safety-oriented opening is always the most important aspect).

An individual enabling circuit that is redundantly configured internally in the safety relay can be used for SIL 3 / PL e.

*Note: Enabling current paths can also be used for signaling purposes.*

3SK1 safety relays are only equipped with enabling circuits with NO functionality. This means that when the safety function is triggered, or a fault is detected, the enabling circuits will always transfer to the safe state (NO contact open).

### 4.3.4 Signaling circuit

A current signaling path provides a safety-related output signal. Signaling circuits can be implemented with either NC or NO contact functionality.

With 3SK1 relays, the signaling circuits are always implemented as NC circuits. This means that when the safety function is triggered, or a fault is detected, the signaling circuits will always close.

### 4.3.5 Feedback circuit

A feedback circuit is used to monitor controlled actuators (e.g. relays or load contactors) with positively driven contacts or mirror contacts. The enabling circuits can only be activated with the feedback circuit closed.

**Note**

When 3SK1 expansion units are used on 3ZY1 device connectors with 3SK1 Advanced basic units, it is not necessary to incorporate the expansion modules in the feedback circuit wiring. This is implemented internally via the device connector.

### 4.3.6 Stop categories

#### Stop category 0

Non-controlled shutdown by immediately switching off the power to the machine's drive elements.

#### Stop category 1

Controlled stopping where the energy feed is interrupted with a time delay, or is only interrupted once standstill has been reached.

**Note**

The time-delayed shutdown of enabling circuits in accordance with Stop category 1 is not guaranteed under all operating states.

In the case of some internal device faults, and when disconnecting the supply voltage, these enabling circuits are switched off **instantaneously**.

### 4.3.7 Automatic start

For an automatic start, the device is started without manual confirmation, but only after the input image has been checked and a positive test of the safety relay has been conducted. This function is also known as dynamic operation and is not permissible for EMERGENCY STOP devices. Safety devices for prohibited danger zones (e.g. position switches, light arrays, safety shutdown mats) can use the automatic start function if this does not pose any risk.

**Note**

An automatic start is not permitted for EMERGENCY STOP devices.

### 4.3.8 Manual start

For a manual start, the device is started by operating the START button, but only after the input image has been checked and a positive test of the safety relay has been conducted. On a manual start, the START button is not monitored for correct operation, a positive edge of the START button is sufficient for starting.

**Note**

The "Manual start" function is only available with the 3SK1111 safety relays (slide switch at Autostart position).

**Note**

Manual start is not permitted for EMERGENCY STOP devices.

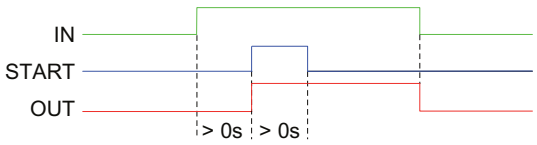



Figure 4-3 Start function "Manual start"

### 4.3.9 Monitored start

For a monitored start, the device is started by operating the START button, but only after the input image has been checked and a positive test of the safety relay has been conducted.

Contrary to the manual start, the monitored start evaluates a **signal change** of the START button. This means that the START button cannot be bypassed (misuse). For PL e (ISO 13849-1) as well as SIL 3 (IEC 62061), the monitored start must be used in the case of EMERGENCY STOP. For other safety sensors/functions, the necessity for a monitored start command depends on the risk assesment.

If the START button is operated for more than 2 seconds, the 3SK1 basic unit detects a wiring short-circuit in the START button and switches to the fault state (Device = green; SF = flashing red; Out = flashing yellow; IN = off)

**Note**

In the delivery state of the 3SK1 safety relays, the start type is set to "Monitored start".

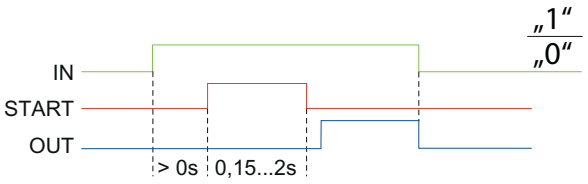



Figure 4-4 Start function "Monitored start"

### 4.3.10 Two-hand operation/synchronism

Synchronous sensor operation is a special form of simultaneity of sensors.

In this case, it is not sufficient for sensor contacts 1 and 2 to be switched to the closed state at different times, they must be closed within 0.5 seconds.

Synchronism of sensors is required, in particular, in the case of two-hand operation of presses. This ensures that the presses only become active when the sensors are operated simultaneously with both hands. This minimizes the risk of the operator getting a hand in the press.

**Note**

In the delivery state of 3SK1 safety relays, monitoring of time synchronism is deactivated. Time synchronism can be activated using the following adjustable parameter for 3SK11 Advanced and 3SK122 Advanced:

- Jumper T1/PAR (NO/NC evaluation)
- Dip switches (1) Autostart
- Dip switches (3) 2 x single-channel

**Note**

The 3SK1 Advanced safety relays support exclusively two-hand control units with two NO contacts.

### 4.3.11 Cascading

Cascading of safety relays is used for tripping safety relays in series.

Several safety functions can then be logically connected to a shared shutdown path. Several enabling circuits can be created for selective shutdown of drive elements.

The connection between the individual modules must be arranged on one side only, because cascading from the last relay to the first one would create a loop which would prevent starting.

Cascading is implemented within a control cabinet in a single-channel configuration; this is even permissible with SIL 3 / PL e, because cable routing within a control cabinet is protected against short-circuits and short-circuiting to P potential (fault exclusion in accordance with ISO 13849-2).

The 3SK1 Advanced device series offers an extremely convenient solution for cascading. Input expansions can be easily connected to the evaluation unit by means of device connectors.

### 4.3.12 Startup testing

The sensor or protection equipment must be opened and closed again after the supply voltage is restored before the enables for the 3SK1 safety relay can be switched through.

Startup testing ensures that any errors in the sensors are detected (again), because safety relays lose their ability to store errors at zero voltage.

Unauthorized manipulation of the protection equipment can also be detected through startup testing.

The plant operator decides whether startup testing should be performed (risk assessment). No general statements apply.

**Note**

In the delivery state of 3SK1 safety relays, startup testing is deactivated.

### 4.3.13 Connection of actuators

**Note**

To achieve the Performance Level / Safety Integrity Level given in the following examples, the actuators shown must be monitored in the feedback circuit of the corresponding safety relay.

**Note**

For capacitive and inductive loads, we recommend an adequate protective circuit. In this way, electromagnetic interference can be suppressed and contact service life increased.

You can find more information in the SIRIUS Innovations - SIRIUS 3RT2 Contactors/Contactor Assemblies manual (http://support.automation.siemens.com/WW/view/en/60306557)

### Actuator wiring up to PL c / Cat. 2 in accordance with ISO 13849-1 or SILCL 1 in accordance with IEC 62061

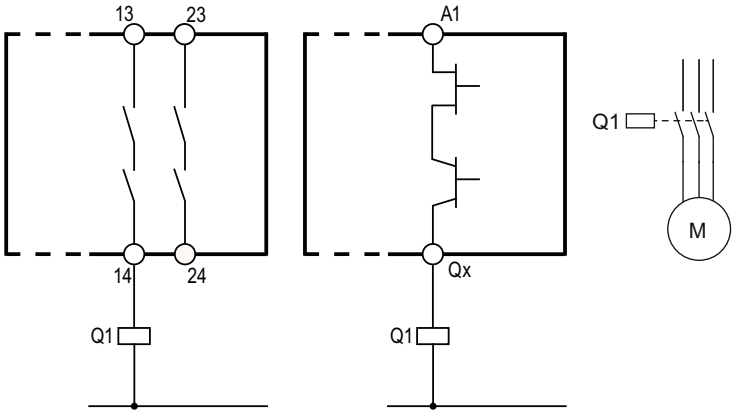



Figure 4-5 PL c / Cat. 2 in accordance with ISO 13849-1 or SILCL 1 in accordance with IEC 62061

### Actuator wiring up to PL e / Cat. 4 in accordance with ISO 13849-1 or SILCL 3 in accordance with IEC 62061

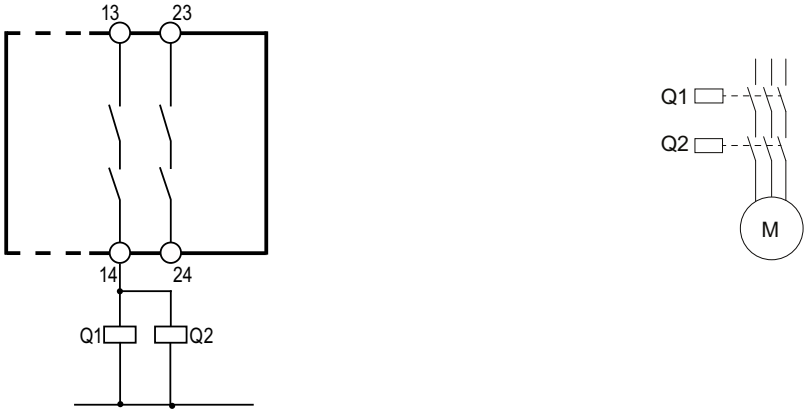



Figure 4-6 PL e / Cat. 4 in accordance with ISO 13849-1 or SILCL 3 in accordance with IEC 62061

**⚠ WARNING**

PL e / Cat. 4 in accordance with ISO 13849-1 or SILCL 3 in accordance with IEC 62061 can only be achieved with 3SK1111-…and 3SK1121-… and cross-circuit-proof/short-circuit to P-proof laying of the control cables from the relay output (e.g. 14) to the control relays/contactors (Q1 and Q2) (e.g. as a separately sheathed cable or in its own cable duct).

**Note**

In the case of 3SK1..2 (devices with solid-state outputs) it is not possible to achieve PL d/e / Cat. 3/4 in accordance with ISO 13849-1 or SILCL 2/3 in accordance with IEC 62061 with the wiring shown above.

## Actuator wiring up to PL e / Cat. 4 in accordance with ISO 13849-1 or SILCL 3 in accordance with IEC 62061

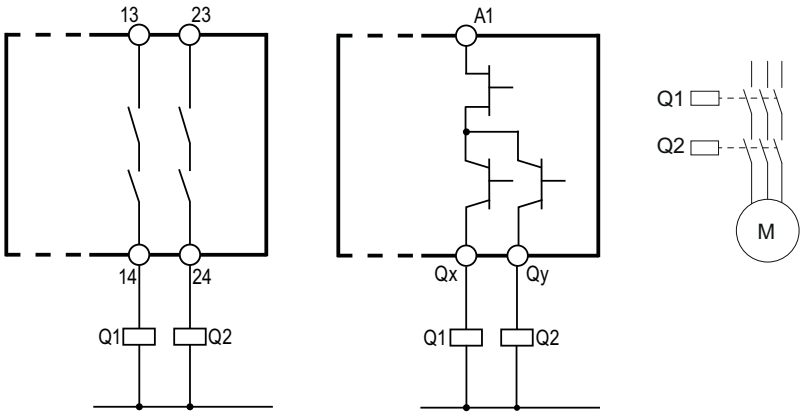



Figure 4-7 PL e / Cat. 4 in accordance with ISO 13849-1 or SILCL 3 in accordance with IEC 62061

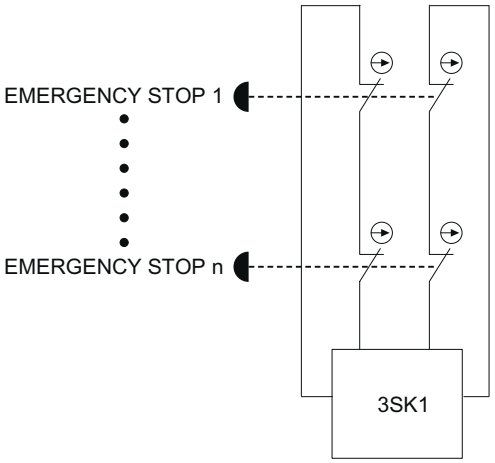
**WARNING**

For 3SK1..2 (devices with solid-state outputs): In continuous operation, the key safety values apply in the case of a function test interval (state change of the outputs) ≤ 1 year.

## 4.3.14 Series connection of sensors

### Series connection of EMERGENCY STOP command devices

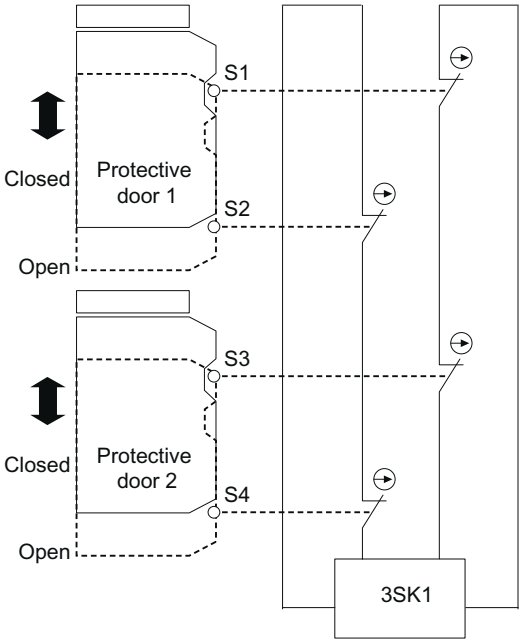
It is possible to connect EMERGENCY STOP command elements in series up to the highest safety level (SILCL 3 in accordance with IEC 62061, SIL 3 in accordance with IEC 61508 and PL e (Cat. 4) in accordance with ISO 13849-1), because it is assumed that only one EMERGENCY STOP is operated at a time. This ensures that errors and defects can be detected.



## Series connection of position switches

In general, position switches may be connected in series if measures ensure that several protective doors are not regularly opened simultaneously (otherwise a fault cannot be detected).

For safety level SILCL3 in accordance with IEC 62061, SIL3 in accordance with IEC 61508, and PL e (Cat. 4) in accordance with ISO 13849-1, however, they must **never** be connected in series, because every hazardous error must be detected (independently of the operating personnel).



# 3SK1 devices

# 5

## 5.1 3SK1 standard

### 5.1.1 General information

The safety relays of the Standard series can be configured as stand-alone devices or as an expansion solution with conventional wiring technology.

**The focus of the Standard series is on:**

- Single devices for simple safety applications
- Output-side expansion by means of expansion units and external wiring
- No expansion on the input side

### 5.1.2 Applications

The safety relay can be used in EMERGENCY OFF/EMERGENCY STOP devices in accordance with ISO 13850 and in safety circuits in accordance with VDE 0113-1 and/or DIN EN 60204-1. Depending on the external circuit, it is possible to achieve SILCL 3 in accordance with IEC 62061, SIL 3 in accordance with IEC 61508 and PL e (Cat. 4) in accordance with ISO 13849-1.

**Application examples**

- EMERGENCY OFF / EMERGENCY STOP monitoring.
- Monitoring of protective doors with electromechanical position switches, solid-state position switches, or solenoid switches.
- Monitoring of contact-free protection equipment, e.g. light arrays/light barriers, or laser scanners.

## 5.1.3 3SK1111 Standard basic unit instantaneous (with relay outputs)

### 5.1.3.1 General information

**MLFB:**

| | |
|---|---|
| 3SK1111-*AB30 | 24 V AC/DC |
| 3SK1111-*AW20 | 110 ... 240 V AC / DC<br>(wide-range supply) |

(*) 1: = screw-type terminal; 2: = push-in terminal

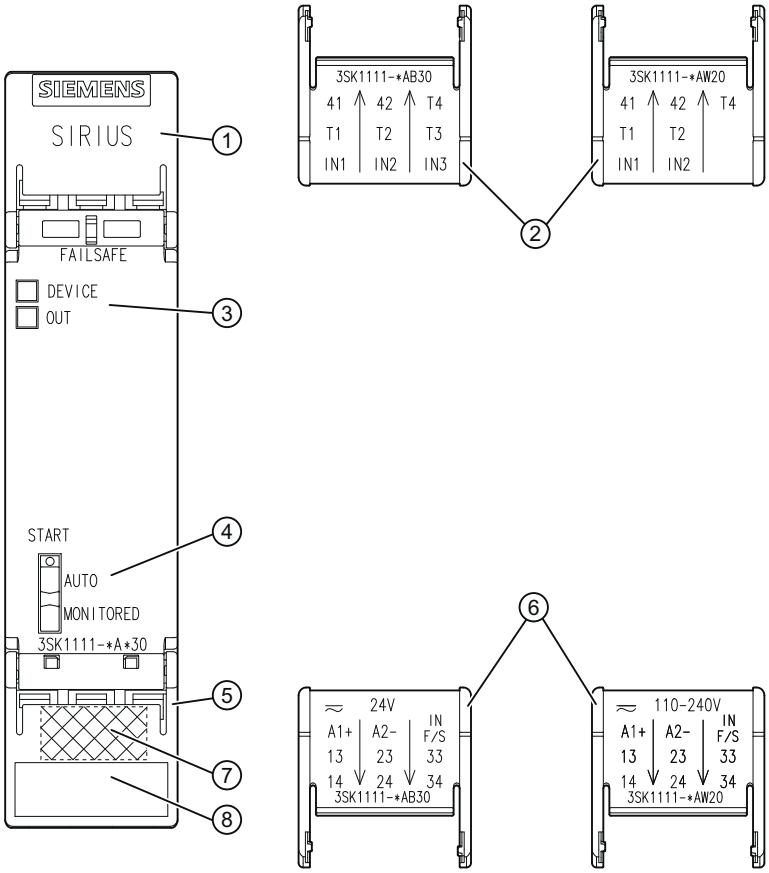
**Device features:**

- 2 sensor inputs (channels 1 and 2)
- 1 input for feedback circuit and START button
- 3 enabling circuits (safety-related circuits, NO contacts)
- 1 signaling circuit (non-safety-related circuit, NC contact)
- 2 LEDs for displaying the operating states
- Slide switch for function setting
- Single-channel or two-channel connection
- Cross-circuit detection between sensor channels 1 and 2
- Enclosure width 22.5 mm
- Removable terminals

### 5.1.3.2 Function description

The device is a two-channel safety relay for EMERGENCY OFF and EMERGENCY STOP equipment in accordance with EN 60204-1.
The 3SK1111 Standard basic unit is equipped with a positively-driven relay and monitors itself during every ON/OFF cycle.
The safety relay has three enabling circuits (safety-related circuits) as NO circuits and a signaling circuit (non-safety-related circuit, NC contact).
On the front of the device there is a slide switch for function setting and two LEDs for displaying the operating states.

### 5.1.3.3 Design




① Top cover flap
② Top cover flap; internal inscription
③ Display LEDs
④ Slide switch
⑤ Bottom cover flap
⑥ Bottom cover flap; internal inscription
⑦ DataMatrix code
⑧ Device identification label

### 5.1.3.4 Terminal assignment

| Terminal | Explanation |
|---|---|
| A1 | L+ |
| A2 | N- |
| IN1 | Sensor channel 1 |
| IN2 | Sensor channel 2 |
| IN3 | Non-floating sensor evaluation [1] |
| INF/S | Feedback circuit/START button |
| T1 | Test output 1 (for IN1) |
| T2 | Test output 2 (for IN2) |
| T3 | Test output 3 (for IN3) [1] |
| T4 | Test output 4 (for INF/S) |
| 13 - 14<br>23 - 24<br>33 - 34 | Enabling circuits (NO, relay contact) |
| 41 - 42 | Signaling circuits (NC, relay contact) |
| Floating: | Sensors T1 / IN1 and T2 / IN2<br>jumper T3/IN3 |
| Non-floating | SensorsIN1 and IN3[1]<br>jumper T2/ IN2 |

[1] For 24 V AC/DC variant only

### 5.1.3.5 Inputs

The device has three or four inputs for safe signal processing: IN1, IN2 or IN3 (24 V floating devices only), INF/S:

Inputs IN1 and IN2 can only be operated in two-channel mode with cross-circuit detection. Single-channel activation is only possible via the supply voltage connection (A1). In this case, circuits T1/IN1, T2/IN2 and T3/IN3 (24 V devices only) must be jumpered.

Sensor input INF/S is used to monitor a START button and/or external feedback circuits. When a START button is implemented and external feedback circuits are monitored, the floating contacts must be connected in series between T4 and INF/S.

## Voltage variant 24 V:

#### Connecting floating sensors:

When floating sensors are used, for two-channel sensor connection, sensor inputs T1/IN1 and T2/IN2 must be used and T3/IN3 must additionally be jumpered.

#### Connecting non-floating sensors:

With non-floating sensors, cross-circuit detection must be deactivated.
This is implemented by the following pin assignment on the 3SK1111-.AB30:

IN1 and IN3 must be used as the input terminal for the two-channel non-floating sensor. In addition, T2/IN2 must be jumpered.

### Voltage variant 110 V ... 240 V AC/DC:

Only **floating sensors** can be connected to the device version 3SK1111-.AW20.

Connection of the two-channel sensor takes place via T1/IN1 and T2/IN2.

## 5.1.3.6 Outputs

The safety relay has the following outputs:

- Safety-related outputs (enabling circuits, relays), NO contacts: 13/14, 23/24, 33/34
- Non-safety-related outputs (enabling circuit; relays), NC contacts: 41/42

## 5.1.3.7 Display of the operating state

### Display of the operating state

Two LEDs and a slide switch indicate the operating state and functioning of the device:

- DEVICE
- OUT

### LED displays

| LED | | Operation | | | |
|---|---|---|---|---|---|
| DEVICE | OUT | Line supply | Sensor | START button | Enabling circuit |
| Green | Green | ON | Not pressed | Pressed | Closed |
| Green | OFF | | Pressed | Not pressed | Open |
| Green | OFF | | Not pressed | Not pressed | Open |
| | | Error | | | |
| OFF | OFF | Cross-circuit or no power supply | | | Open |

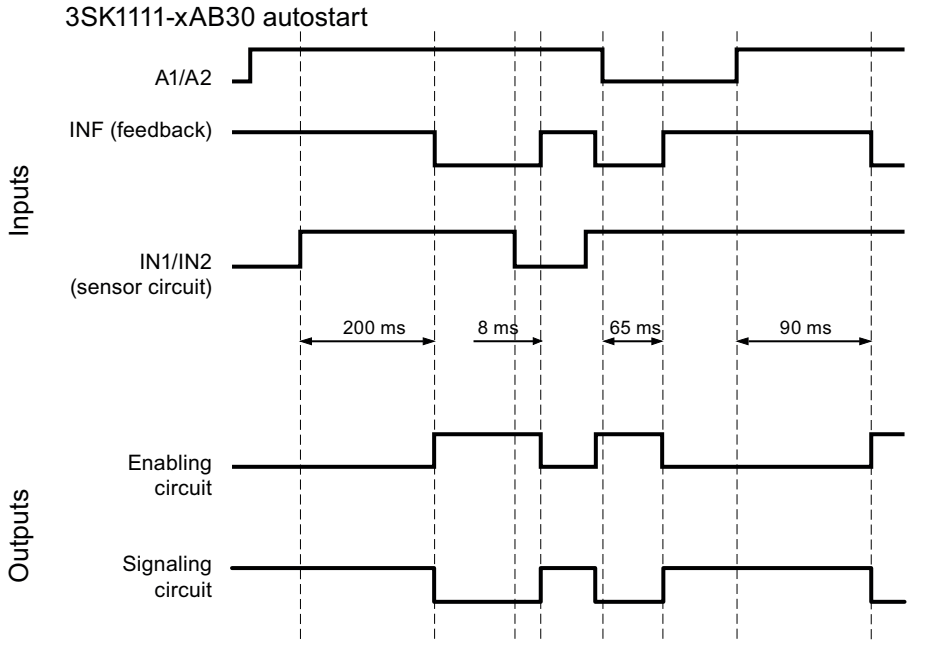
## 5.1.3.8 Function setting

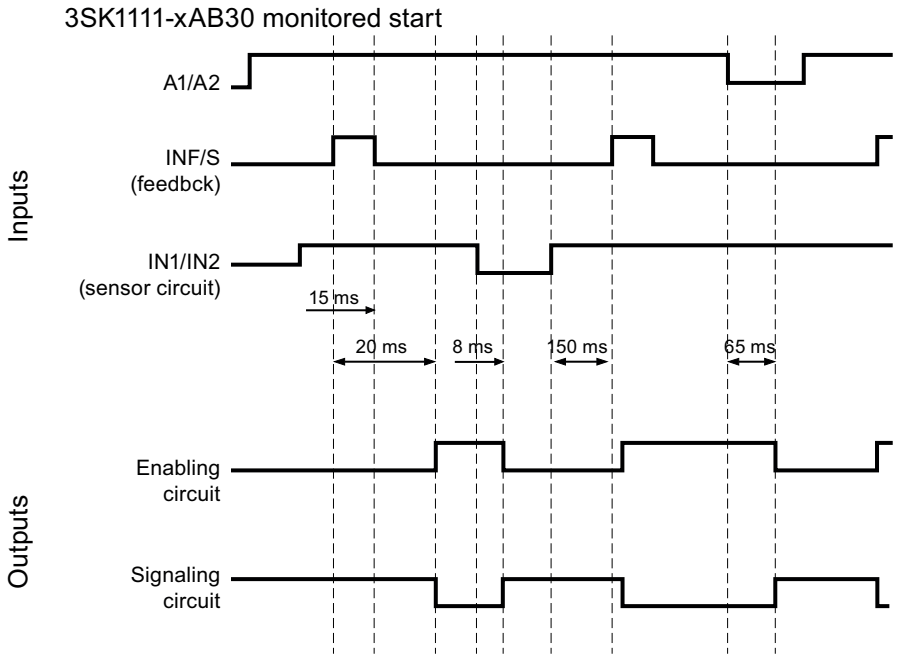
### Setting the functions

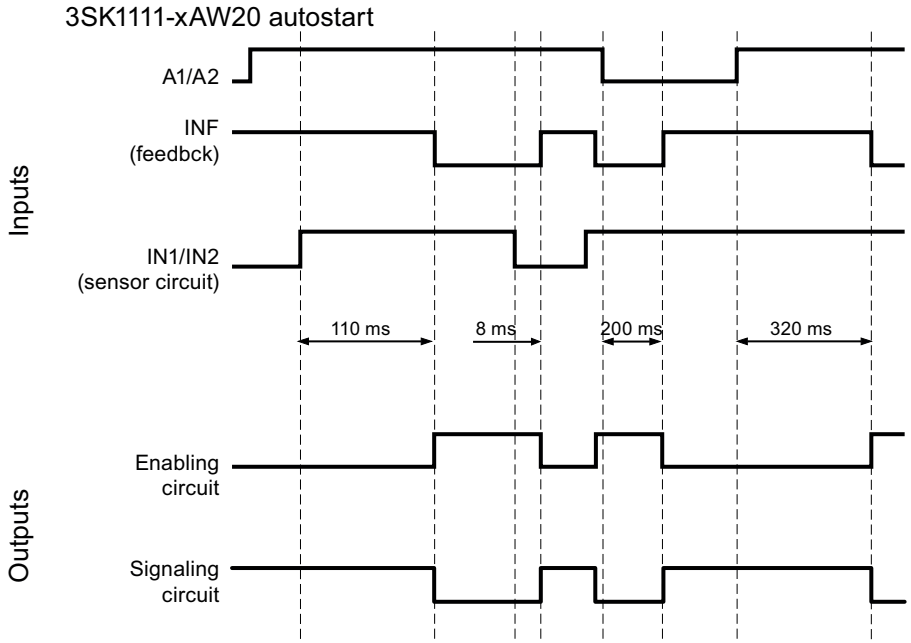
| Slide switch | | |
|---|---|---|
| Start<br>AUTO<br>MONITORED | AUTO | Autostart |
| | MONITORED | Monitored start |

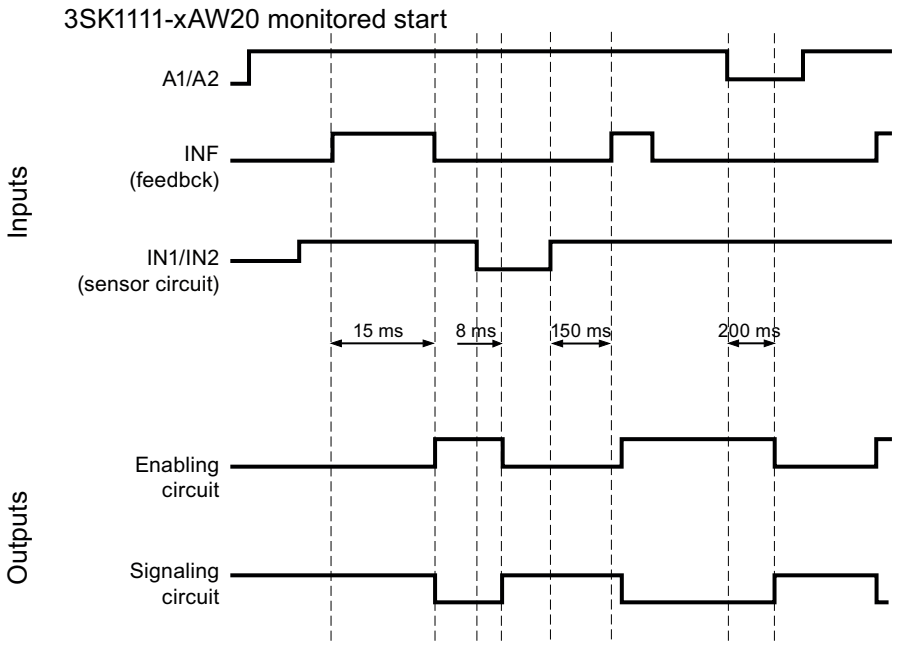
In the delivery state, the slide switch is at the bottom (monitored start).

## State diagrams 3SK1111




3SK1111-xAW20 autostart
Inputs
A1/A2
INF
(feedbck)
IN1/IN2
(sensor circuit)
110 ms
8 ms
200 ms
320 ms
Outputs
Enabling
circuit
Signaling
circuit


3SK1111-xAW20 monitored start
Inputs
A1/A2
INF
(feedbck)
IN1/IN2
(sensor circuit)
15 ms
8 ms
150 ms
200 ms
Outputs
Enabling
circuit
Signaling
circuit

## 5.1.4 3SK1112 Standard basic unit instantaneous (with solid-state outputs)

### 5.1.4.1 General information

**MLFB:**

| | |
|---|---|
| 3SK1112-*BB40 | 24 V DC |

(*) 1: = screw-type terminal; 2: = push-in terminal

**Device features:**

- 4-way DIP switch for function setting (parameterization)
- SET/RESET button
- 4 LEDs for status and function display
- 2 sensor inputs (channels 1 and 2)
- 1 input (cascading circuit)
- 1 input (START pushbutton circuit)
- 1 input (feedback circuit)
- 2 test outputs
- 2 safe solid-state outputs
- 1 solid-state signaling circuit
- Enclosure width 22.5 mm
- Removable terminals

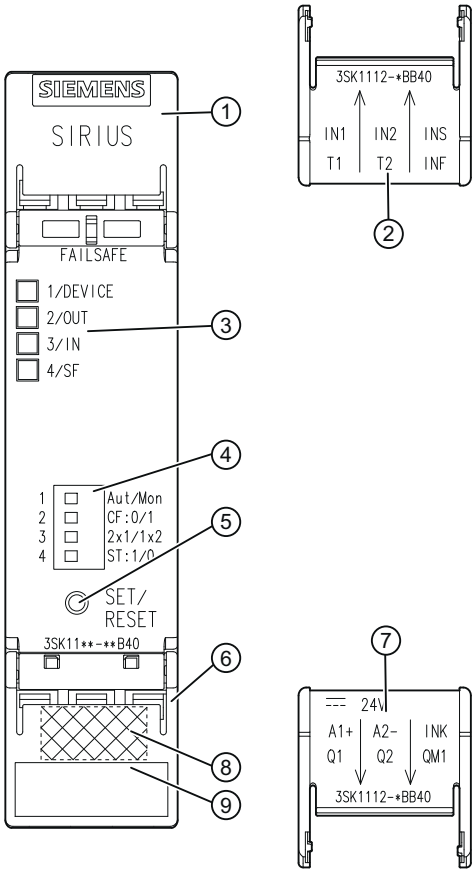
**⚠ WARNING**

In continuous operation for PL e / Cat. 4 in accordance with ISO 13849-1 or SILCL 3 in accordance with IEC 62061, the key safety values apply in the case of a function test interval (state change of the outputs) ≤ 1 year.

### 5.1.4.2 Function description

The 3SK1112 safety relay has two safety-related solid-state safe outputs and one non-safety-related signaling circuit.
On the front of the device there is a 4-way DIP switch for function setting and 4 LEDs for status and function display.
The SET/RESET button is used to load function settings and to restart the device (reset).
On commissioning, the device runs through a self-test. This checks that the internal electronics and firmware are functioning correctly. All internal safety-critical parts of the circuit are cyclically monitored for faults during operation.

### 5.1.4.3 Design




① Top cover flap
② Top cover flap; internal inscription
③ Display LEDs
④ DIP switch
⑤ SET/RESET button
⑥ Bottom cover flap
⑦ Bottom cover flap; internal inscription
⑧ DataMatrix code
⑨ Device identification label

### 5.1.4.4 Terminal assignment

| Terminal | Explanation |
|---|---|
| A1 | + |
| A2 | - |
| IN1 | Sensor channel 1 |
| IN2 | Sensor channel 2 |
| INS | START pushbutton circuit |
| INF | Feedback circuit |
| INK | Cascading circuit |
| T1 | Test output 1 (for IN1) |
| T2 | Test output 2 (for IN2, INF) |
| Q1 | Safe output 1 (switching to P potential, 24 V DC solid-state) |
| Q2 | Safe output 2 (switching to P potential, 24 V DC solid-state) |
| QM1 | Signaling circuit 1 (switching to P potential, 24 V DC solid-state) |

### 5.1.4.5 Inputs

The device has five inputs for safe signal processing: IN1, IN2, INS, INF, INK:

- IN1: sensor input channel 1
- IN2: sensor input channel 2
- INS: START pushbutton circuit (start after rising and falling edge)
- INF: Feedback circuit (checked for being closed: before switching on)
- INK: Cascading circuit (cascading input / normal switching duty
- The cascading circuit is AND-connected with the sensor inputs IN1 and IN2 .
- ON-button circuit and cascading circuit are activated with a static +24 V DC signal.
- With cross-circuit detection activated, the following inputs are checked for cross-circuits: IN1/T1, IN2/T2. The supply is taken in this case from test outputs T1 and T2. INF/T2 is only checked for a short-circuit to P potential.
- If "without cross-circuit detection" is set on the device, inputs IN1 and IN2 are not checked for cross-circuits. Inputs IN1 and IN2 must not be supplied via T1/T2 here, otherwise a fault will be generated via input INF. It is therefore essential that inputs IN1 and IN2 are supplied via an external + 24 V DC current source from which the device is also supplied.

**Note**

**Observe the following special points during commissioning of the 3SK1112 safety relay:**

The cascading input must be jumpered if it is not to be used.

Monitoring of the feedback circuits is not optional.

### 5.1.4.6 Outputs

The safety relay has the following outputs:

- Q1, Q2: safety-related solid-state outputs with dynamic monitoring, switching to P potential
- QM1: non-safety-related solid-state signaling circuit, switching to P potential

The safe outputs and the safety-related signaling circuit are short-circuit proof.

### 5.1.4.7 Display of the operating state

#### Display of the operating state

Four LEDs and one DIP switch indicate the operating state and functioning of the device:

- (1) DEVICE
- (2) OUT
- (3) IN
- (4) SF

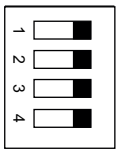
The four LEDs show the following:

- Operating mode: Diagnostics
- Configuration mode: DIP setting

For an explanation of the operating state display, see Section Display and diagnostics (Page 187)

### 5.1.4.8 Function setting

Table 5- 1 **DIP switch**

| Switch position: left | Schematic | DIP switch No. | Switch position: right |
|---|---|---|---|
| Autostart |  | 1 | Monitored start |
| Cross-circuit detection deactivated | | 2 | Cross-circuit detection activated |
| 2 x single-channel sensor connection | | 3 | 1 x two-channel sensor connection |
| Start-up test ON | | 4 | Start-up test OFF |



In the delivery state, all the DIP switches are in switch position: right.

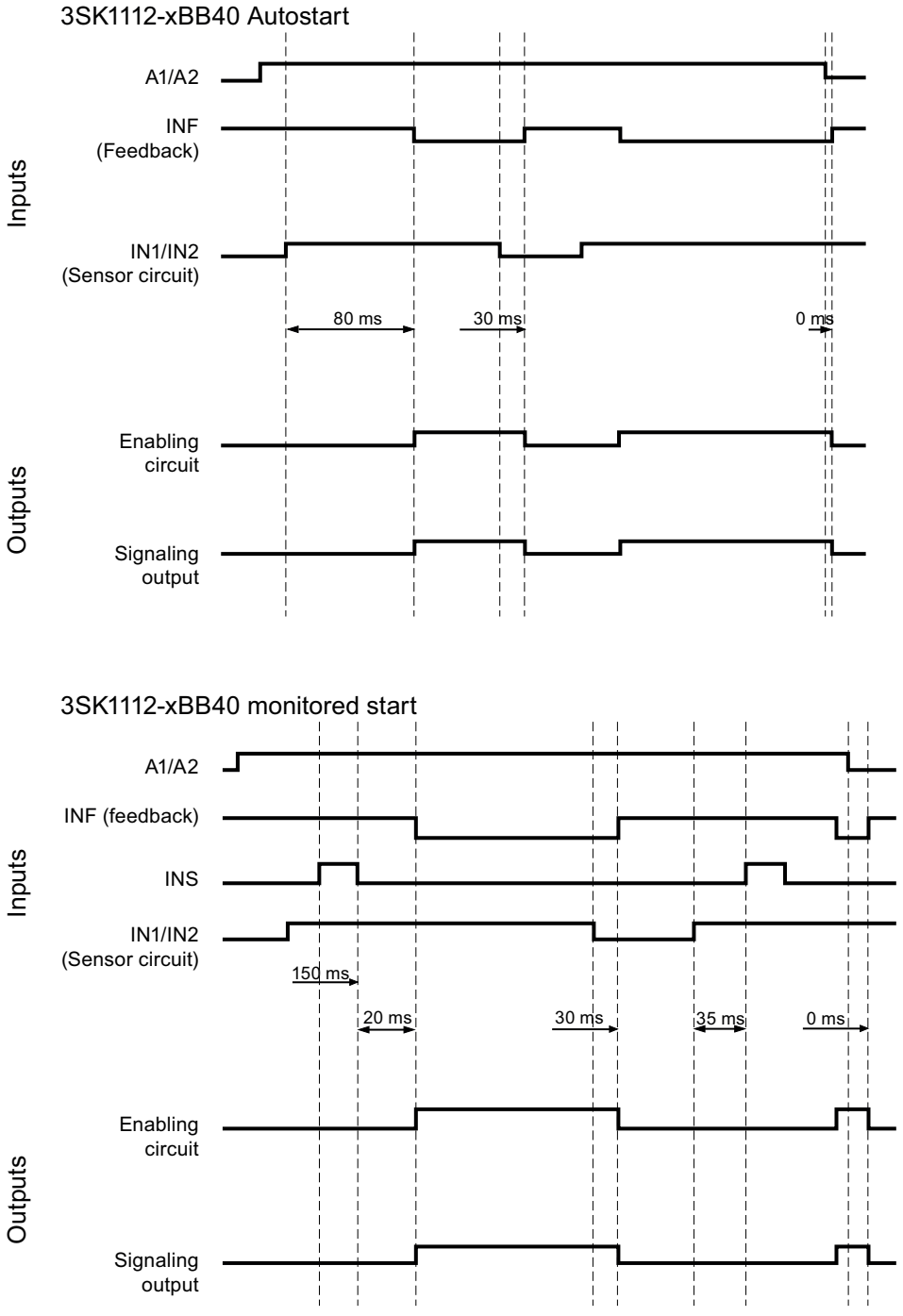
Table 5- 2 **SET/RESET button**

| Function of the SET/RESET button | Status of the indicating LEDs | Function |
|---|---|---|
| SET | "DEVICE" LED flashing yellow | • **Press key for about 1 s**<br>The parameterization is loaded |
| RESET | "DEVICE" LED red | • **Press key for about 1 s**<br>=> The device restarts without the supply voltage having to be switched off |
| | "DEVICE" LED flashing green yellow | |
| | "SF" LED red | |

**Note**

The SET/RESET pushbutton only triggers a reset for the device on which the button is pressed.

## State diagrams 3SK1112



# 5.2 3SK1 Advanced

## 5.2.1 General information

The safety relays of the Advanced device series comprise basic devices and input and output expansions. The Advanced devices can be connected by means of a 3ZY12 device connector.
When configuring the system, it must be ensured that input expansions are always mounted on the left, and output expansions (3SK121) on the right of the basic unit. For control supply voltages of 110 ... 240 V AC/DC, the Advanced device series can be supplied with the necessary 24 V DC voltage from the 3SK1230 power supply (which must be positioned on the extreme left in the system).

### The focus of the Advanced relay series is on:

- Single devices that can be flexibly parameterized
- Expandability using 3ZY12 device connector on both input and output side
- Basic units with time-delayed enabling circuits / outputs

## 5.2.2 Applications

- EMERGENCY OFF / EMERGENCY STOP monitoring.
- Monitoring of protective doors with electromechanical position switches, solid-state position switches, or solenoid switches.
- Monitoring of contact-free protection equipment, e.g. light arrays/light barriers, or laser scanners.

The 3SK1 Advanced safety relays can be used in EMERGENCY OFF and EMERGENCY STOP devices in accordance with ISO 60204-1 and in safety circuits in accordance with VDE 0113-1 and / or DIN EN 60204-1, e.g. in circuits in which controlled shutdown, STOP Category 1 is necessary. Depending on the external circuit, it is possible to achieve SILCL 3 in accordance with IEC 62061, SIL 3 in accordance with IEC 61508 and PL e (Cat. 4) in accordance with ISO 13849-1.

## 5.2.3 General device features

### Device properties:

- 4-way DIP switch for function setting (parameterization)
- SET/RESET button
- 4 LEDs for status and function display
- 2 sensor inputs (channels 1 and 2)
- 1 input (cascading circuit)
- 1 input (START pushbutton circuit)
- NO contact/NC contact evaluation via external jumper
- Connection interface
- Removable terminals

## 5.2.4 Function description

On the front of the 3SK1 Advanced basic units, there is a 4-way DIP switch for function setting and 4 LEDs for status and function display. A SET/RESET button can be used to load function settings and to perform a device restart (reset). On commissioning, the devices runs a self-test in which the internal electronics and firmware are checked for correct functioning. All internal parts of the circuit are cyclically monitored for faults during operation. The semiconductor outputs run through a dark test for up to 2 ms (dynamically) to verify their correct function. The safety relays can be expanded using 3ZY device connectors with input and output expansions.

**Basic unit 3SK1 Advanced time-delayed only:**

These basic units have two time-delayed and two instantaneous enabling circuits as NO circuits or outputs switching to P potential.

### Display of the operating state

Four LEDs and one DIP switch indicate the operating state and functioning of the device:

- (1) DEVICE
- (2) OUT
- (3) IN
- (4) SF

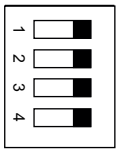
The four LEDs show the following:

- Operating mode: Diagnostics
- Configuration mode: DIP setting

For an explanation of the operating state display, see Section Display and diagnostics (Page 187)

## 5.2.5 Functions

Table 5- 3 **DIP switch**

| Switch position: left | Schematic | DIP switch No. | Switch position: right |
|---|---|---|---|
| Autostart |  | 1 | Monitored start |
| Cross-circuit detection deactivated | | 2 | Cross-circuit detection activated |
| 2 x single-channel sensor connection | | 3 | 1 x two-channel sensor connection |
| Start-up test ON | | 4 | Start-up test OFF |



In the delivery state, all the DIP switches are in switch position: right.

### Terminal parameterization:

Jumper on terminals T1/PAR = NO/NC evaluation

Table 5- 4 **SET/RESET button**

| Function of the SET/RESET button | Status of the indicating LEDs | Function |
|---|---|---|
| SET | "DEVICE" LED flashing yellow | • **Press key for about 1 s**<br>The parameterization is loaded |
| RESET | "DEVICE" LED red | • **Press key for about 1 s**<br>=> The device restarts without the supply voltage having to be switched off |
| | "DEVICE" LED flashing green yellow | |
| | "SF" LED red | |

**Note**

The SET/RESET pushbutton only triggers a reset for the device on which the button is pressed.

### Potentiometer for time setting

Potentiometer for infinite time setting of the time-delayed enabling circuits on the Advanced basic units (with time-delayed enabling circuits).

- 3SK112.-.CB41 setting range: 0.05 ... 3 s
- 3SK112.-.CB42 setting range: 0.5 ... 30 s
- 3SK112.-.CB44 setting range: 5 ... 300 s

**Note**

The delay time ends when the voltage is disconnected. The time-delayed contacts change switch position.

### Parameterizing "without cross-circuit detection":

If "without cross-circuit detection" is set on the device, inputs IN1 and IN2 are not checked for cross-circuits. Inputs IN1 and IN2 then no longer have to be supplied from clock outputs T1 or T2, but can also be supplied from a + 24 V DC signal, for example, from the same current source from which the device is supplied.

The clock outputs are never switched off, because they are also required for the PAR and INF inputs.

**Note**

**Observe the following during commissioning of the 3SK1 Advanced safety relays:**

The cascading input must be jumpered if it is not to be used.

Monitoring of the feedback circuits is not optional.

## 5.2.6 3SK1121 Advanced basic unit instantaneous (with relay outputs)

### 5.2.6.1 Device features

**MLFB:**

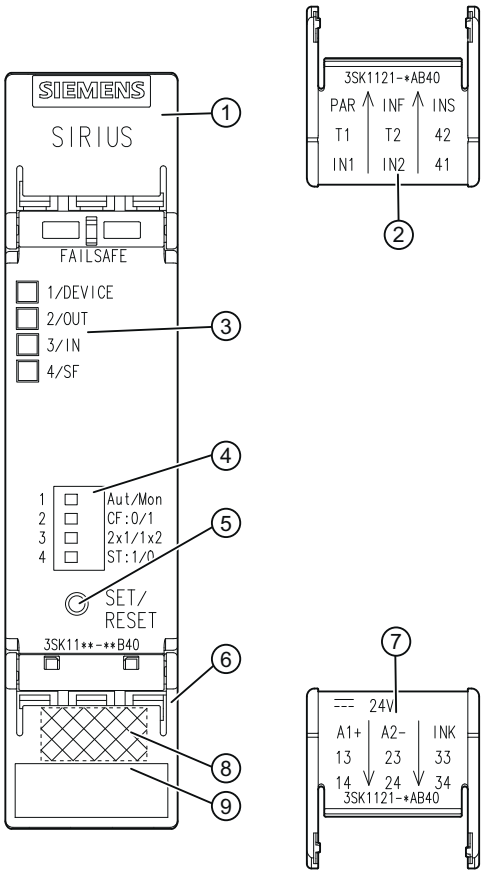
| | |
|---|---|
| 3SK1121-xAB40 | 24 V DC |

(x) 1 = screw-type terminal; 2 = push-in terminal

### 5.2.6.2 Function description

The 3SK1121 Advanced basic unit has three safety-related relay enabling circuits and one non-safety-related signaling circuit.

### 5.2.6.3 Design

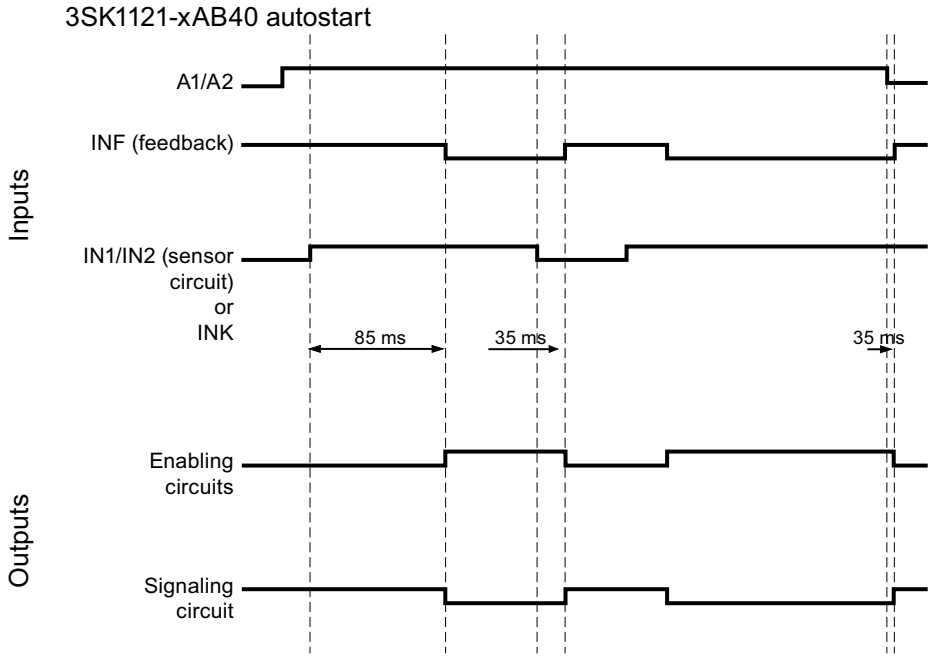



① Top cover flap
② Top cover flap; internal inscription
③ Display LEDs
④ DIP switch
⑤ SET/RESET button
⑥ Bottom cover flap
⑦ Bottom cover flap; internal inscription
⑧ DataMatrix code
⑨ Device identification label

### 5.2.6.4 Terminal assignment

| Terminal | Explanation |
|---|---|
| A1 | + |
| A2 | - |
| IN1 | Sensor channel 1 |
| IN2 | Sensor channel 2 |
| PAR | NO contact/NC contact evaluation |
| INS | START pushbutton circuit |
| INF | Feedback circuit |
| INK | Cascading circuit |
| T1 | Test output 1 (for IN1, PAR) |
| T2 | Test output 2 (for IN2, INF) |
| 13 - 14<br>23 - 24<br>33 - 34 | Enabling circuits (NO, relay contact) |
| 41 - 42 | Signaling circuits (NC, relay contact) |

**State diagram 3SK1121**



## 5.2.7 3SK1121 Advanced basic unit time-delayed (with relay outputs)

### 5.2.7.1 Device features

**MLFB:**

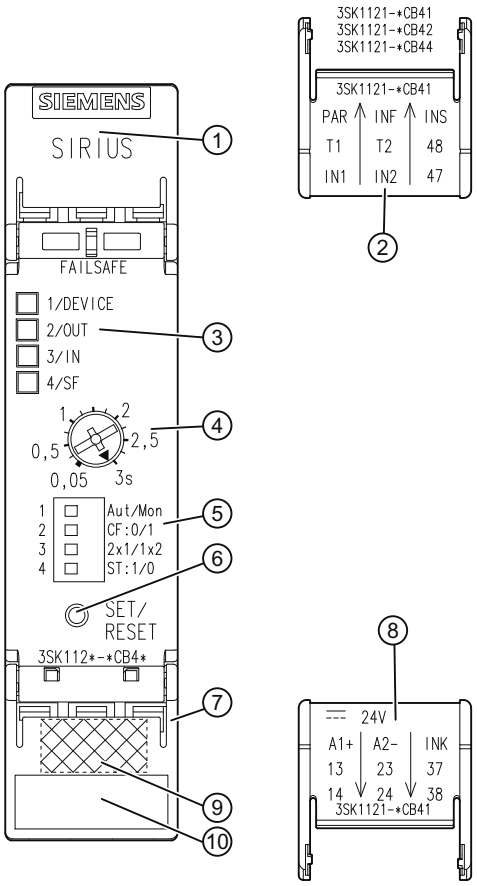
| | |
|---|---|
| 3SK1121-xCB4y | 24 V DC |

(x) 1 = screw-type terminal; 2 = push-in terminal
(y) time delay 1 = 0.05 ... 3 s; 2 = 0.5 ... 30 s; 4 = 5 ... 300 s

**Additional / alternative device characteristics**

- 2 instantaneous enabling circuits (safety-related circuits, NO contacts)
- 2 time-delayed enabling circuits (safety-related circuits, NO contacts)
- Potentiometer for setting the delay time
- Time function: With OFF-delay

### 5.2.7.2 Design

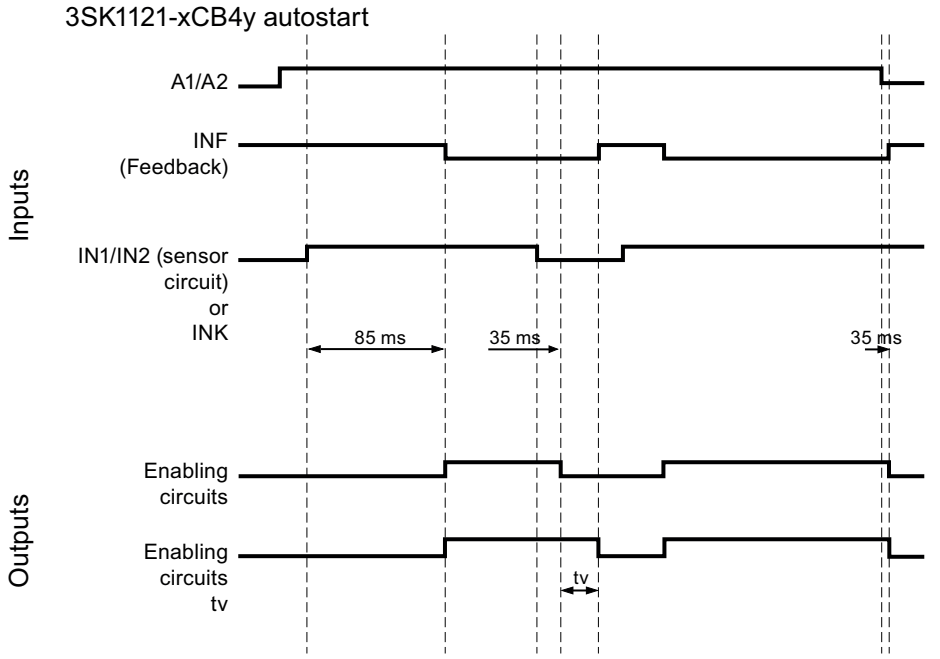


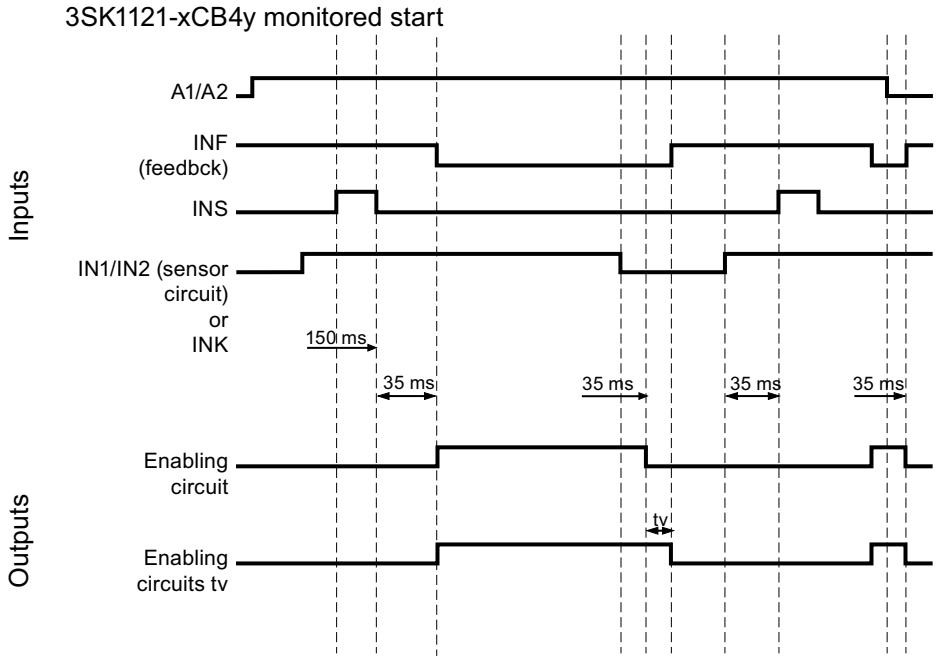

① Top cover flap
② Top cover flap; internal inscription
③ Display LEDs
④ Potentiometer for setting the delay time
⑤ DIP switch
⑥ SET/RESET button
⑦ Bottom cover flap
⑧ Bottom cover flap; internal inscription
⑨ DataMatrix code
⑩ Device identification label

### 5.2.7.3 Terminal assignment

| Terminal | Explanation |
|---|---|
| A1 | + |
| A2 | - |
| IN1 | Sensor channel 1 |
| IN2 | Sensor channel 2 |
| PAR | NO contact/NC contact evaluation |
| INS | START pushbutton circuit |
| INF | Feedback circuit |
| INK | Cascading circuit |
| T1 | Test output 1 (for IN1, PAR) |
| T2 | Test output 2 (for IN2, INF) |
| 13 - 14 | Instantaneous enabling circuit 1 (NO, relay contact) |
| 23 - 24 | Instantaneous enabling circuit 2 (NO, relay contact) |
| 37 - 38 | Time delayed enabling circuit 1 (NO, relay contact) |
| 47 - 48 | Time delayed enabling circuit 2 (NO, relay contact) |

## State diagrams 3SK1121-xCB4y



## 5.2.8 3SK1122 Advanced basic unit instantaneous (with solid-state outputs)

### 5.2.8.1 Device features

**MLFB:**

| | |
|---|---|
| 3SK1122-xAB40 | 24 V DC |

(x) 1 = screw-type terminal; 2 = push-in terminal

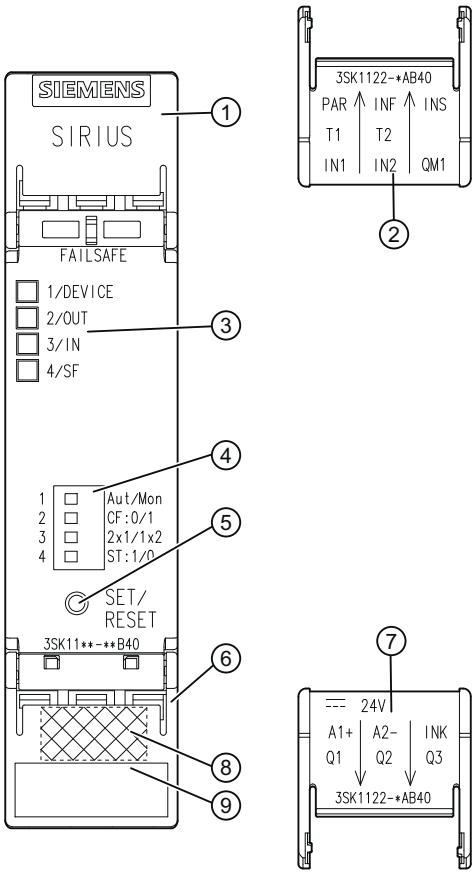
**Additional or alternative device features**

- 3 safety-related solid-state outputs
- 1 solid-state signaling circuit

**⚠ WARNING**

In continuous operation for PL e / Cat. 4 in accordance with ISO 13849-1 or SILCL 3 in accordance with IEC 62061, the key safety values apply in the case of a function test interval (state change of the outputs) ≤ 1 year.

### 5.2.8.2 Design

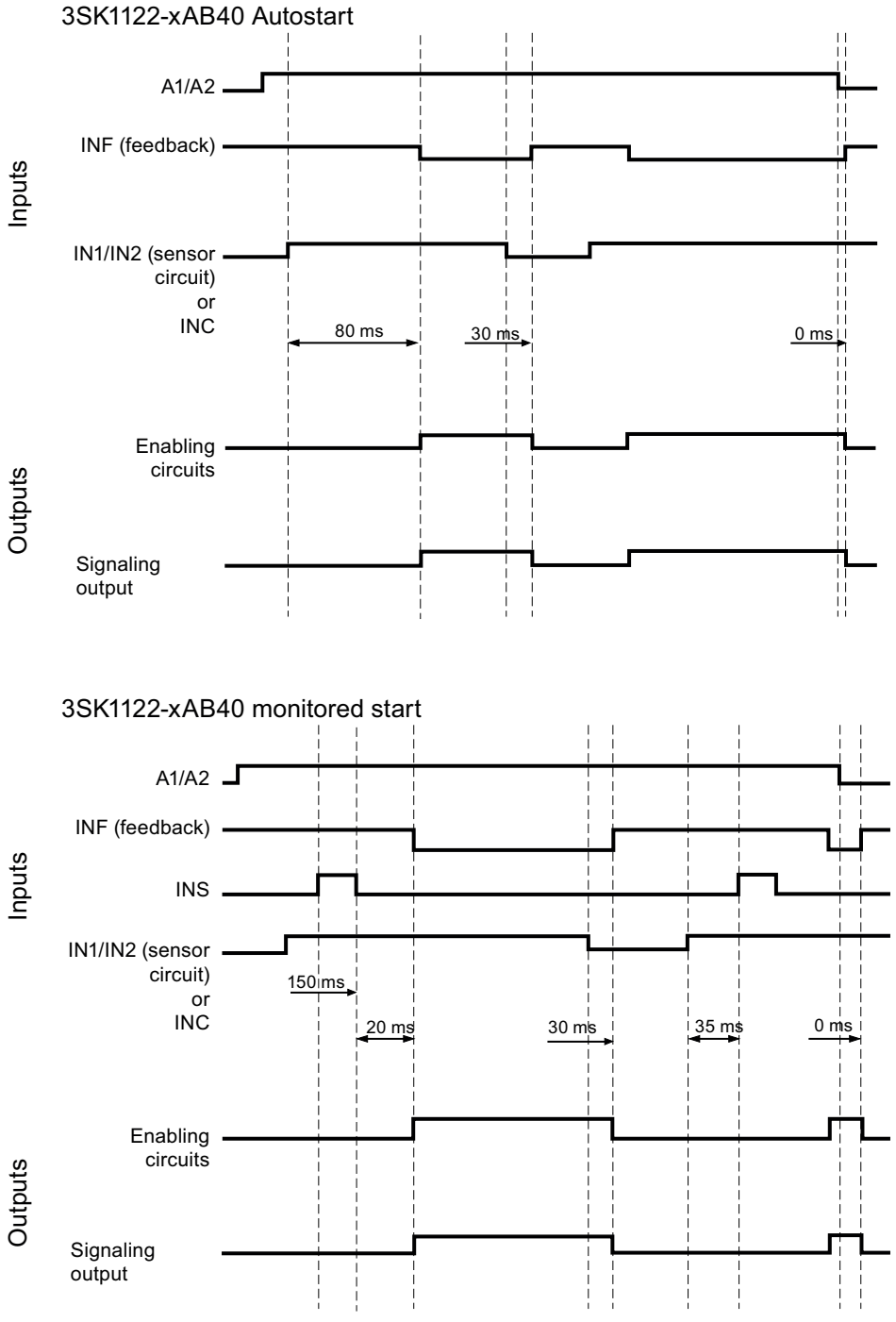



① Top cover flap
② Top cover flap; internal inscription
③ Display LEDs
④ DIP switch
⑤ SET/RESET button
⑥ Bottom cover flap
⑦ Bottom cover flap; internal inscription
⑧ DataMatrix code
⑨ Device identification label

### 5.2.8.3 Terminal assignment

| Terminal | Explanation |
|---|---|
| A1 | + |
| A2 | - |
| IN1 | Sensor channel 1 |
| IN2 | Sensor channel 2 |
| PAR | NO contact/NC contact evaluation |
| INS | START pushbutton circuit |
| INF | Feedback circuit |
| INK | Cascading circuit |
| T1 | Test output 1 (for IN1, PAR) |
| T2 | Test output 2 (for IN2, INF) |
| Q1 | Safety-related output 1 (switching to P potential, 24 V DC solid-state) |
| Q2 | Safety-related output 2 (switching to P potential, 24 V DC solid-state) |
| Q3 | Safety-related output 3 (switching to P potential, 24 V DC solid-state) |
| QM1 | Signaling circuit 1 (switching to P potential, 24 V DC solid-state) |

## State diagrams 3SK1122-xAB40



## 5.2.9 3SK1122 Advanced basic unit time-delayed (with solid-state outputs)

### 5.2.9.1 Device features

**MLFB:**

| | |
|---|---|
| 3SK1122-xCB4y | 24 V DC |

(x) 1 = screw-type terminal; 2 = push-in terminal
(y) time delay 1 = 0.05 ... 3 s; 2 = 0.5 ... 30 s; 4 = 5 ... 300 s

**Additional / alternative device characteristics**

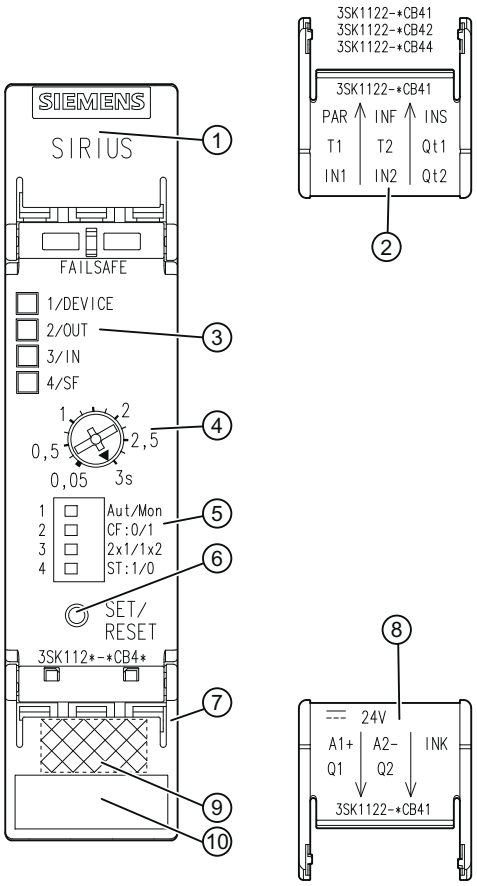
- 2 instantaneous solid-state outputs
- 2 time-delayed solid-state outputs
- Potentiometer for setting the delay time
- Time function: With OFF-delay

**⚠ WARNING**

**Continuous operation**

In continuous operation for PL e / Cat. 4 in accordance with ISO 13849-1 or SILCL 3 in accordance with IEC 62061, the key safety values apply in the case of a function test interval (state change of the outputs) ≤ 1 year.

### 5.2.9.2 Design

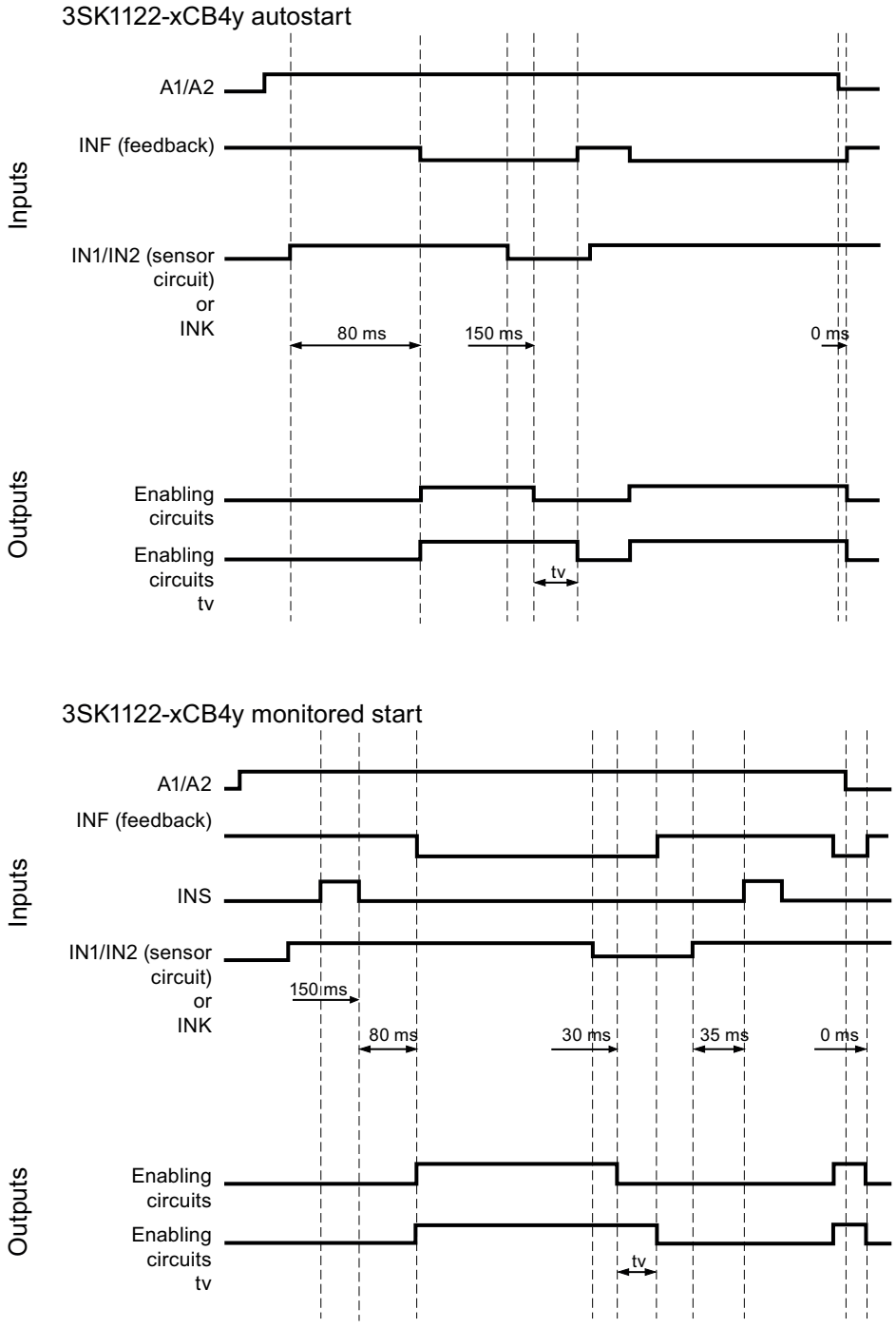



① Top cover flap
② Top cover flap; internal inscription
③ Display LEDs
④ Potentiometer for setting the delay time
⑤ DIP switch
⑥ SET/RESET button
⑦ Bottom cover flap
⑧ Bottom cover flap; internal inscription
⑨ DataMatrix code
⑩ Device identification label

### 5.2.9.3 Terminal assignment

| Terminal | Explanation |
|---|---|
| A1 | + |
| A2 | - |
| IN1 | Sensor channel 1 |
| IN2 | Sensor channel 2 |
| PAR | NO contact/NC contact evaluation |
| INS | START pushbutton circuit |
| INF | Feedback circuit |
| INK | Cascading circuit / normal switching duty |
| T1 | Test output 1 (for IN1, PAR) |
| T2 | Test output 2 (for IN2, INF) |
| Q1 | Instantaneous safety-related output 1 (switching to P potential, 24 V DC solid-state) |
| Q2 | Instantaneous safety-related output 2 (switching to P potential, 24 V DC solid-state) |
| Qt1 | Time-delayed safety-related output 1 (switching to P potential, 24 V DC solid-state) |
| Qt2 | Time-delayed safety-related output 2 (switching to P potential, 24 V DC solid-state) |

## State diagrams 3SK1122-xCB4y



## 5.2.10 3SK1120 Advanced basic unit instantaneous (with solid-state outputs)

### 5.2.10.1 Device features

**MLFB:**

| | |
|---|---|
| 3SK1120-xAB40 | 24 V DC |

(x) 1 = screw-type terminal; 2 = push-in terminal

**Additional or alternative device features**

- 1 safety-related solid-state output
- The following design variants are possible for the 3SK1120 Advanced basic unit:
  - Operation without using device connectors

**⚠ WARNING**

**Operation without using device connectors**

In operation without using device connectors, up to PL c / Cat. 2 in accordance with ISO 13849-1 or SILCL 2 in accordance with IEC 62061 can be achieved.

  - Operation using device connectors

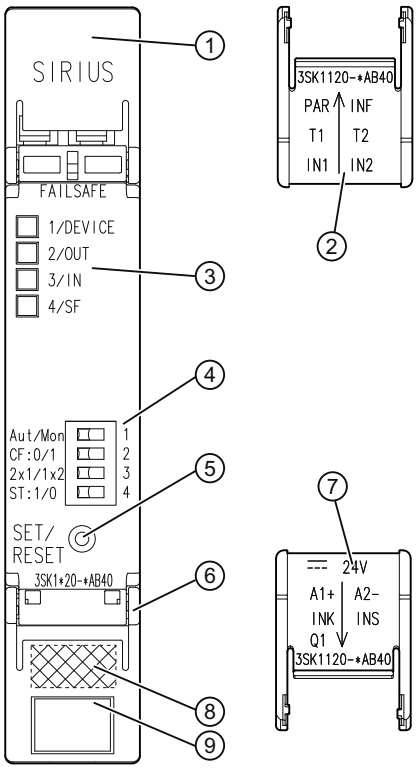
**Note**

In operation using device connectors and using at least one output expansion (3SK1211, 3SK1213), up to PL e / Cat. 4 in accordance with ISO 13849-1 or SILCL 3 in accordance with IEC 62061 can be achieved.

**⚠ WARNING**

In continuous operation for PL e / Cat. 4 in accordance with ISO 13849-1 or SILCL 3 in accordance with IEC 62061, the key safety values apply in the case of a function test interval (state change of the outputs) ≤ 1 year.

### 5.2.10.2 Design




① Top cover flap
② Top cover flap; internal inscription
③ Display LEDs
④ DIP switch
⑤ SET/RESET button
⑥ Bottom cover flap
⑦ Bottom cover flap; internal inscription
⑧ DataMatrix code
⑨ Device identification label

### 5.2.10.3 Terminal assignment

| Terminal | Explanation |
|---|---|
| A1 | + |
| A2 | - |
| IN1 | Sensor channel 1 |
| IN2 | Sensor channel 2 |
| PAR | NO contact/NC contact evaluation |
| INS | START pushbutton circuit |
| INF | Feedback circuit |
| INK | Cascading circuit |
| T1 | Test output 1 (for IN1, PAR) |
| T2 | Test output 2 (for IN2, INF) |
| Q1 | Safety-related output 1 (switching to P potential, 24 V DC solid-state) |

# 5.3 3SK1 output expansions

## 5.3.1 Applications

The 3SK1 output expansions are used to expand the enabling circuits. The maximum achievable Performance Level PL / Cat. in accordance with ISO 13849-1, SILCL in accordance with IEC 62061, SIL in accordance with IEC 61508 corresponds to the Performance Level PL and SIL of the basic unit when the external wiring (connection between basic unit and output expansion) is configured as fail-safe (e.g. basic unit and output expansion are connected using 3ZY12device connector ).
The output expansions can be activated via the supply voltage (A1/A2) or using 3ZYdevice connectors[1].

[1] For 24 V DC variant only

**Note**

**Use of the output expansions on device connectors 3ZY**

You can switch between instantaneous or delayed control of the basic unit using the slide switch of the output expansion (see also the chapter "System configuration rules (Page 100)").

**Note**

**Using the output expansions with conventional wiring**

The slide switch has **no** function here.

If you require outputs of Stop category 1 with the output expansion, terminals A1/A2 of the output expansion must be connected to outputs 38 or 48, and on the 3SK1 basic units they must be connected with relay outputs or Q1t/Q2t.

## 5.3.2 Function description

The operating state of the 3SK1 output expansions is displayed on the DEVICE LED.

The output expansions 3SK1211(4RO) have four safety-related enabling circuits as NO circuits, and the output expansions 3SK1213 (3RO) have three. They each have one positively-driven NC circuit. The output expansions can be activated via any enabling circuit / output of the basic unit via (A1). The NC circuit 51/52 of 3SK1211 (4RO) or 41/42 of 3SK1213 (3RO) is used for monitoring the output expansions.

In the 24 V DC variants, the expansion units can be activated and evaluated via the 3ZY device connectors.

## 5.3.3 Display of the operating state

### Display of the operating state

The operating state and functioning of the device are indicated by an LED:

- (1) DEVICE

### Operating states

| LED | State | Meaning |
|---|---|---|
| DEVICE | Control supply voltage | Enabling circuits |
| OFF | OFF | Open |
| Green | ON | Closed |

## 5.3.4 Function setting

### Setting the activation (slide switch only for 24 V variants)

The interface input for activating the output expansion can be selected using a slide switch on the front of the device.

| Slide switch | Interface input |
|---|---|
| Top | Outputs switch with time delay (as in basic unit) |
| Bottom | Outputs switch instantaneously |

When using an instantaneous basic unit, the slide switch must be in the instantaneous position (bottom).

## 5.3.5 Output expansion 3SK1211

### 5.3.5.1 Device features

**MLFB:**

| | |
|---|---|
| 3SK1211-xBB00 | 24 V AC |
| 3SK1211-xBB40 | 24 V DC |
| 3SK1211-xBW20 | 110 ... 240 V AC / DC (wide-range supply) |

(x) 1 = screw-type terminal; 2 = push-in terminal

**Supply:**

**24 V AC:**

- Activation via 24 V transformer is possible

**24 V DC:**

- An SELV / PELV power supply must be used for the infeed

**110 ... 240 V AC/DC:**

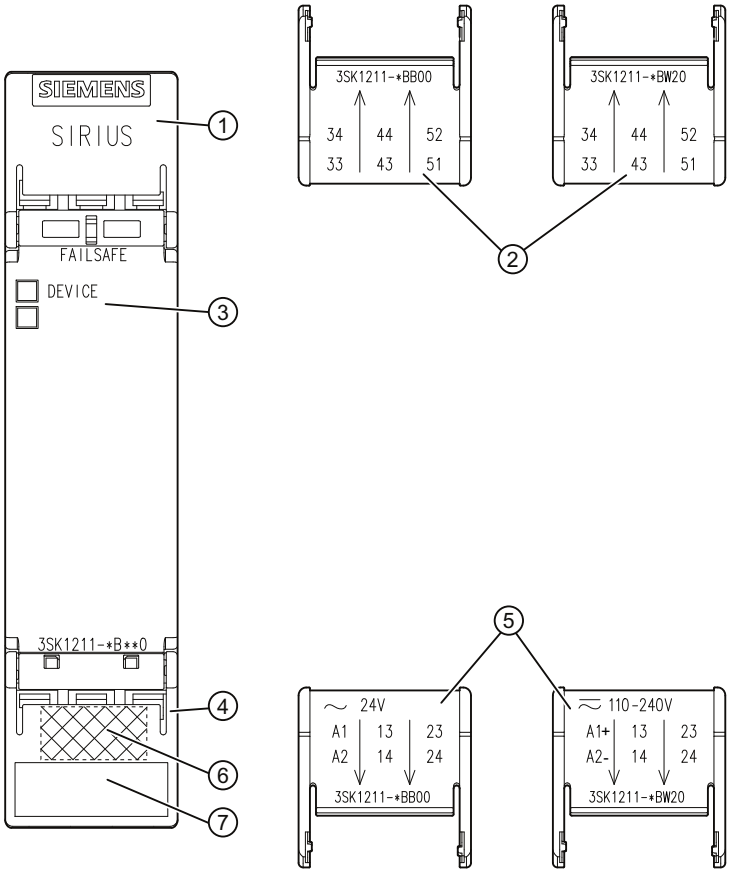
- Direct line supply connection L/N

**Device properties:**

- Slide switch for selecting the activation type (time-delayed / instantaneous)*
- 1 LED for status display
- 4 enabling circuits (safe circuits, NO contacts)
- 1 NC circuit as feedback contact for output expansion 3SK1211 to the up-circuit basic unit
- 3ZY device connectors*
- Enclosure width 22.5 mm
- Removable terminals

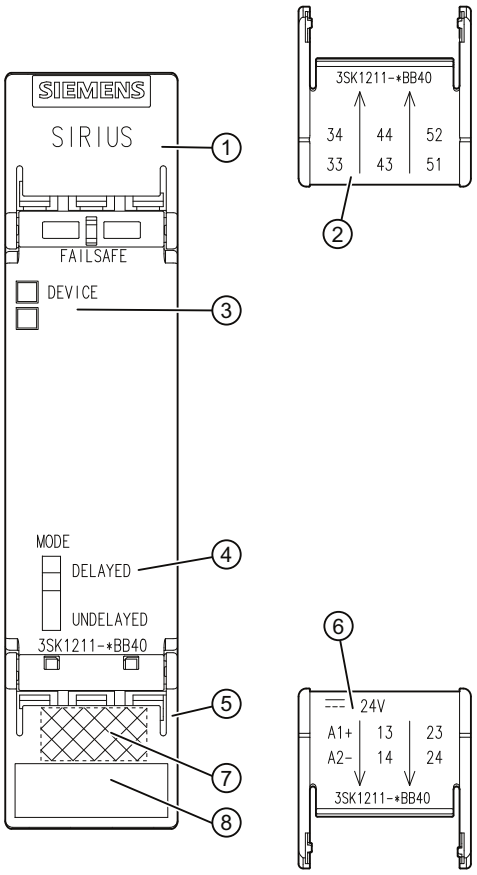
* For 24 V DC variant only

### 5.3.5.2 Design of 3SK1211-.B..0




① Top cover flap
② Top cover flap; internal inscription
③ Display LEDs
④ Bottom cover flap
⑤ Bottom cover flap; internal inscription
⑥ DataMatrix code
⑦ Device identification label

### 5.3.5.3 Design of 3SK1211-.BB40




① Top cover flap
② Top cover flap; internal inscription
③ Display LEDs
④ Slide switch
⑤ Bottom cover flap
⑥ Bottom cover flap; internal inscription
⑦ DataMatrix code
⑧ Device identification label

### 5.3.5.4 Terminal assignment

| Terminal | Explanation |
|---|---|
| A1 | + (L+ for 3SK1211-.BW20) |
| A2 | - (N- for 3SK1211-.BW20) |
| 13 - 14 | Enabling circuit 1 (NO, relay contact) |
| 23 - 24 | Enabling circuit 2 (NO, relay contact) |
| 33 - 34 | Enabling circuit 3 (NO, relay contact) |
| 43 - 44 | Enabling circuit 4 (NO, relay contact) |
| 51 - 52 | NC circuit as feedback contact (NC, relay contact) |

## 5.3.6 Output expansion 3SK1213

### 5.3.6.1 Device features

#### MLFB:

| | |
|---|---|
| 3SK1213-xAB40 | 24 V DC |
| 3SK1213-xAJ20 | 115 V AC |
| 3SK1213-xAL20 | 230 V AC |

(x) 1 = screw-type terminal; 2 = spring-loaded terminal

#### Supply:

**24 V DC:**

- An SELV / PELV power supply must be used for the infeed

**115 V AC and 230 V AC**

- Direct line supply connection L/N

#### Device properties:

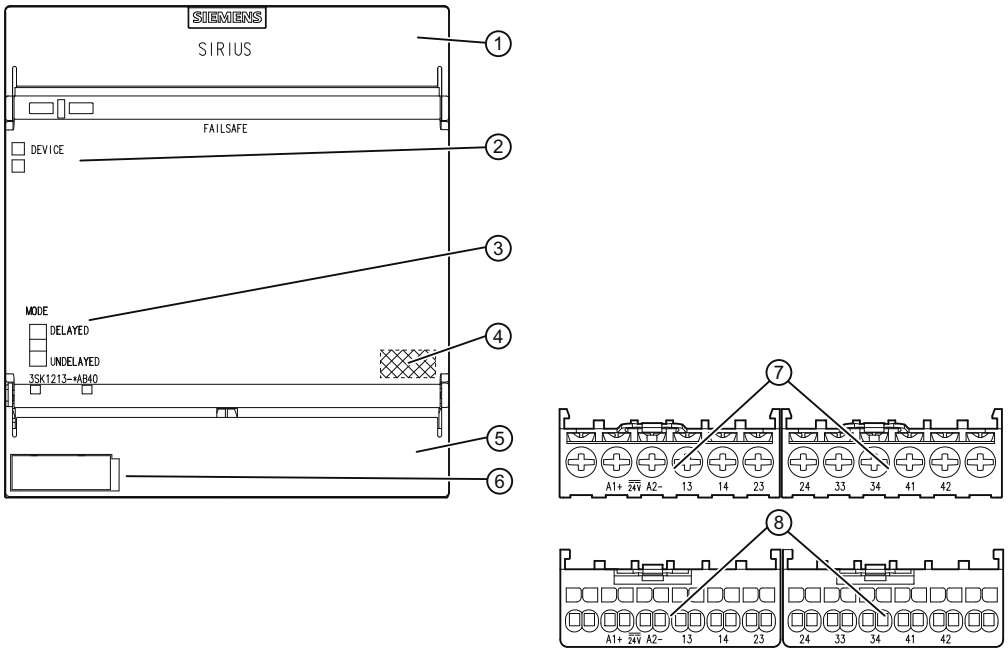
- Slide switch for selecting the activation type (time-delayed / instantaneous)*
- 1 LED for status display
- 3 enabling circuits (safe circuits, NO contacts)
- 1 NC circuit as feedback contact for output expansion 3SK1213 for the up-circuit basic unit
- 3ZY device connectors*
- Enclosure width 90 mm
- Removable terminals

* For 24 V DC variant only

#### When using 3ZY device connectors

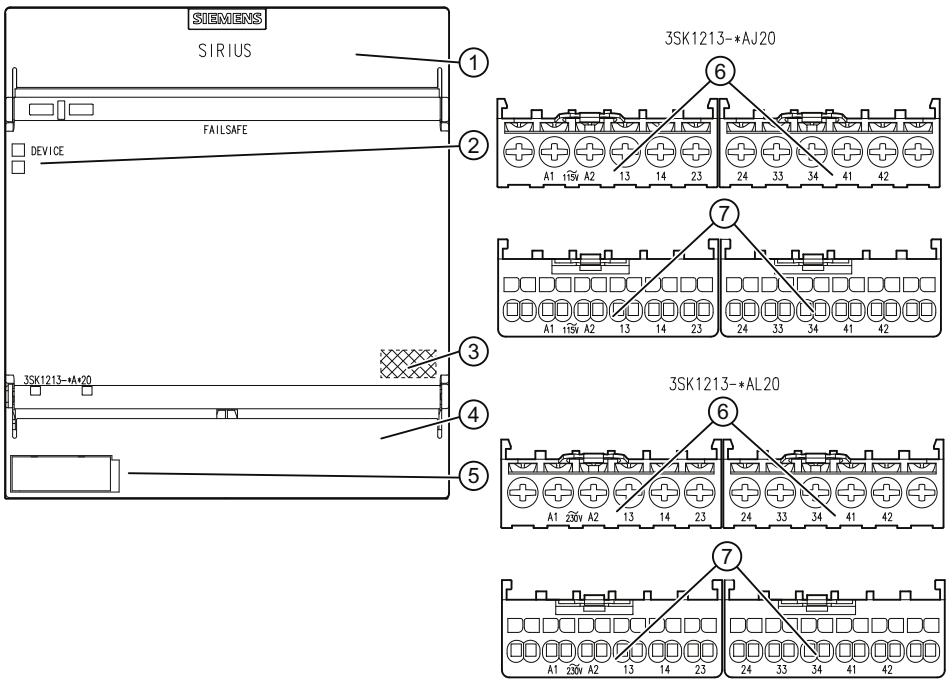
The output expansion 3SK1213 must always be terminated with a device termination connector, type 2, set for enclosures > 45 mm (3ZY1212-0FA01). Expansion on the right-hand side is then no longer possible.

### 5.3.6.2 Design of 3SK1213-.AB40




① Top cover flap
② Display LEDs
③ Slide switch
④ DataMatrix code
⑤ Bottom cover flap
⑥ Device identification label
⑦ Screw-type terminals
⑧ Spring-loaded terminals

### 5.3.6.3 Design of 3SK1213-.A.20




① Top cover flap
② Display LEDs
③ DataMatrix code
④ Bottom cover flap
⑤ Device identification label
⑥ Screw-type terminals
⑦ Spring-loaded terminals

### 5.3.6.4 Terminal assignment

| Terminal | Description |
|---|---|
| A1 | + |
| A2 | - |
| 13 - 14 | Enabling circuit 1 (NO, relay contact) |
| 23 - 24 | Enabling circuit 2 (NO, relay contact) |
| 33 - 34 | Enabling circuit 3 (NO, relay contact) |
| 41 - 42 | NC circuit as feedback contact (NC, relay contact) |

# 5.4 3SK1 input expansions

## 5.4.1 Input expansion 3SK1220

### 5.4.1.1 Device features

**MLFB:**

| | |
|---|---|
| 3SK1220-xAB40 | 24 V DC |

(x) 1 = screw-type terminal; 2 = push-in terminal

**Device properties:**

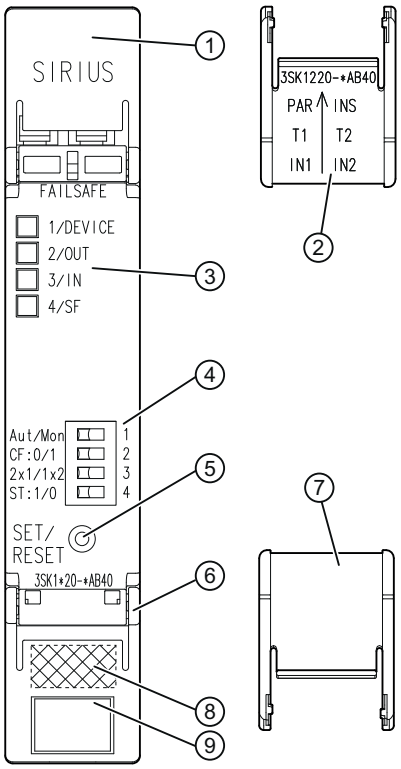
- 4-way DIP switch for function setting (parameterization)
- NO contact/NC contact evaluation via external jumper
- SET/RESET button
- 4 LEDs for status and function display
- 1 input (ON button circuit)
- 2 test outputs
- Enclosure width 17.5 mm
- Removable terminals
- Mounting exclusively on 3ZY12 device connectors

### 5.4.1.2 Applications

The number of sensor inputs for a basic unit can be expanded using input expansions. Input expansions must always be mounted to the left of a basic unit.

The input expansion 3SK1220 is certified to SIL 3 / PL e.
The SILCL / PL achieved by the overall system depends on the external connection of sensors and actuators.
The input expansion 3SK1220 is supplied via the 3ZY12 device connectors.

### 5.4.1.3 Design




① Top cover flap
② Top cover flap; internal inscription
③ Display LEDs
④ DIP switch
⑤ SET/RESET button
⑥ Bottom cover flap
⑦ Bottom cover flap; internal inscription
⑧ DataMatrix code
⑨ Device identification label

### 5.4.1.4 Terminal assignment

| Terminal | Explanation |
|---|---|
| IN1 | Sensor channel 1 |
| IN2 | Sensor channel 2 |
| PAR | NO contact/NC contact evaluation |
| INS | ON button circuit |
| T1 | Test output 1 (for IN1, PAR) |
| T2 | Test output 2 (for IN2, INF) |

#### 5.4.1.5 Display of the operating state

### Display of the operating state

You can find additional information on this under "Advanced" in the Chapter Function description (Page 57).

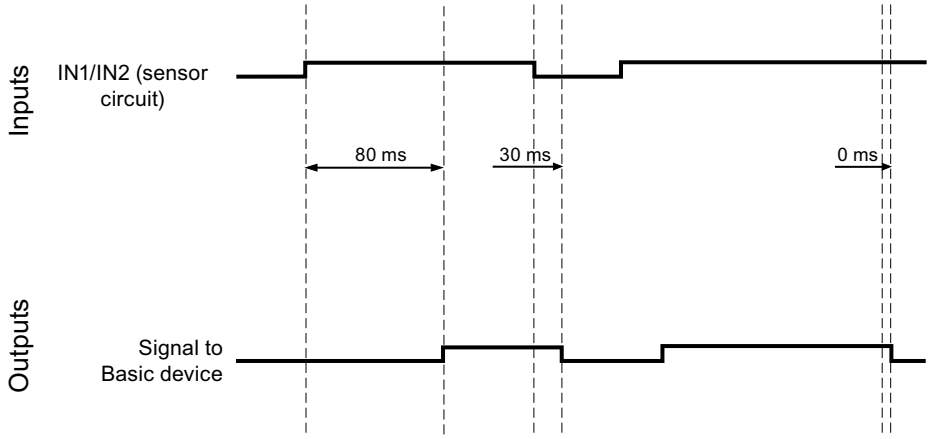
#### 5.4.1.6 Function setting

### DIP switch settings

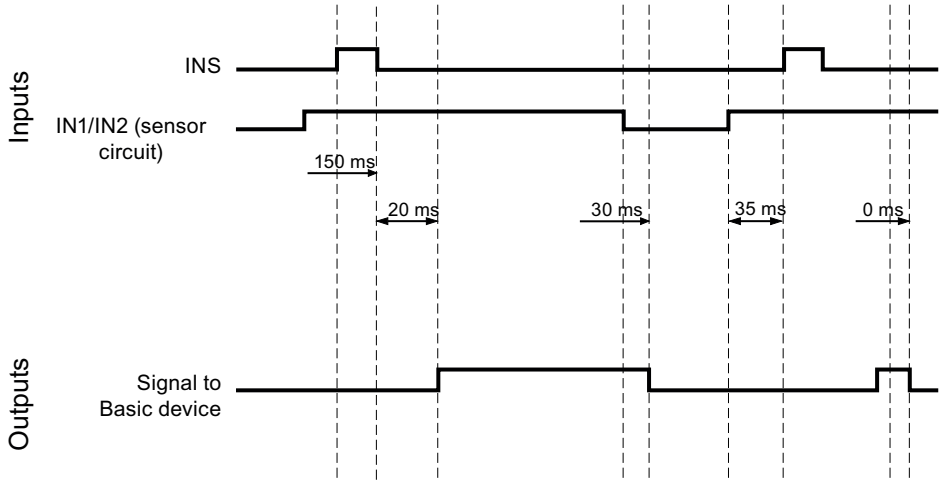
You can find additional information on this under "Advanced" in the Chapter Functions (Page 58).

## State diagrams 3SK1220

3SK1220 Autostart




3SK1220 monitored start



## 5.4.2 Power supply 3SK1230

### 5.4.2.1 Device features

**MLFB:**

| | |
|---|---|
| 3SK1230-xAW20 | 110 ... 240 V AC/DC |

(x) 1 = screw-type terminal; 2 = push-in terminal

**Device properties:**

- Wide-range input: 110 ... 240 V AC/DC
- Rated output voltage: 24 V DC
- Rated output current: 0.6 A
- 1 LED for status display
- Connection interface
- Enclosure width 22.5 mm
- Removable terminals

**Note**

Due to the output current of the power supply 3SK1230 (= 0.6 A), the use of 3SK1 basic units with solid-state **outputs** is only possible to a limited extent. The output current of all semiconductor outputs can be **up to 0.4 A** here (depending on the system configuration).

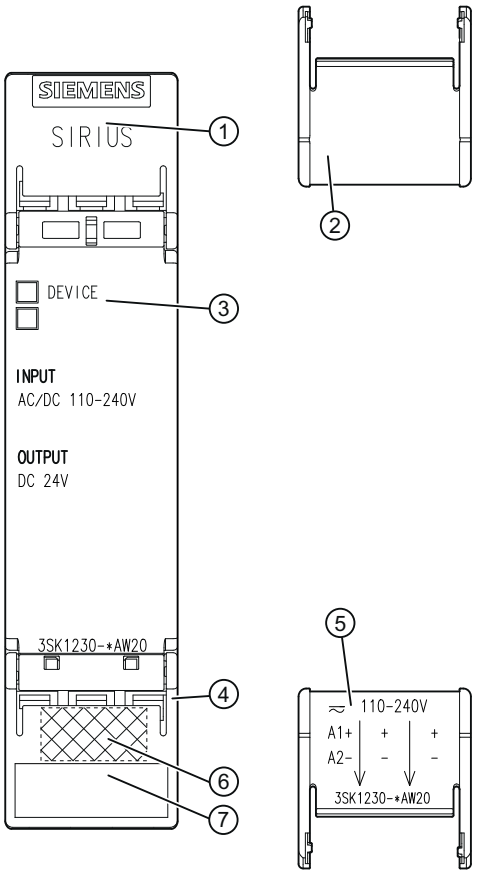
### 5.4.2.2 Applications

The power supply 3SK1230 generates a stabilized output voltage of 24 V DC from 110 ... 240 V AC/DC. The 3SK1230 power supply can supply the 3SK1 Advanced device series with 24 V DC via 3ZY device connectors or via the +/– output terminals.

The START pushbutton input "INS" of the 3SK1 device series must be supplied from the 3SK1230 power supply.

| NOTICE |
|---|
| Two power supplies in parallel are not permissible! Only one 3SK1230 is permitted per system configuration. |

### 5.4.2.3 Design




① Top cover flap
② Top cover flap; internal inscription
③ Display LEDs
④ Bottom cover flap
⑤ Bottom cover flap; internal inscription
⑥ DataMatrix code
⑦ Device identification label

### 5.4.2.4 Terminal assignment

| Terminal | Explanation |
|---|---|
| A1 | L+ |
| A2 | N- |
| + | +24 V DC |
| + | +24 V DC |
| - | - Mass |
| - | - Mass |

### 5.4.2.5 Display of the operating state

#### Display of the operating state

The operating state and functioning of the device are indicated by an LED:

- (1) DEVICE

#### Operating states

| LED | State | Meaning |
|---|---|---|
| DEVICE | Green | Output voltage OK |
| | Flashing | Overload |
| | OFF | No voltage |

# System configuration

# 6

## 6.1 General information

### 6.1.1 General notes on the Standard system

- Expanding enabling circuits using external wiring.
- Output expansions must be activated via a safe enabling circuit/output of the basic unit.
- The NC circuit (51/52 for 3SK1211; 41/42 for 3SK1213) of the output expansion must be looped into the feedback circuit (T2/INF) of the basic unit.

### 6.1.2 General information on the Advanced system

- Expandable using 3ZY12 device connector on both input and output side.
- The output expansions are activated and the feedback circuit is evaluated via the connection interface.
- When using the Advanced device series with output expansion on the device connector described, all enabling and signaling circuits of the basic unit and output expansion can be used as required.
- The input expansions, as well as the output expansions mounted on the 3ZY12 device connector, are supplied with voltage via the 3ZY12 device connector. The supply voltage is only connected once on the basic unit (24 V DC) or the 3SK1230 power supply (110 ... 240 V AC/DC).

## 6.1.3 Maximum system configuration

### Changes to the system configuration

Changes to the system configuration in safety mode always result in a device error. Restarting, by disconnecting and reconnecting the operating voltage (Power OFF/ON), is a mandatory requirement.

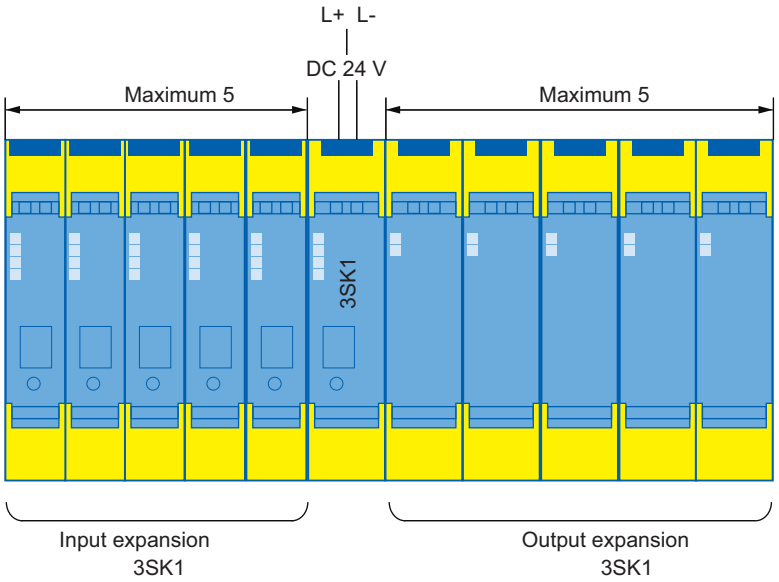
### Maximum system configuration when supplying with 24 V DC on the basic unit

**WARNING**

**Only one 3SK1 basic unit is permitted per system**

The safety function is not guaranteed when more than one basic unit is used.

Connection of 24 V DC to the basic unit:
up to 5 expansions are permitted to the left of the basic unit and 5 expansions are permitted on the right.



## Maximum system configuration when supplying with 24 V DC using the 3SK1230 power supply

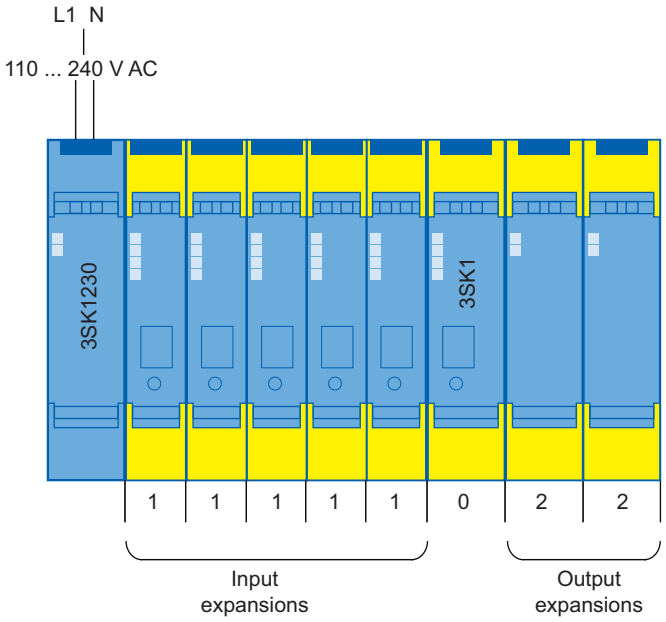
When using the 3SK1230 power supply, the maximum system configuration can be calculated as follows:
Up to 10 "system units" can be connected to a 3SK1230 power supply.
Individual devices occupy a different number of system units.

**Note**

With this configuration too, up to 5 expansions are permitted to the left of the basic unit and 5 expansions are permitted on the right.

| Device | System unit |
|---|---|
| Input expansion 3SK1220 | 1 |
| Power supply 3SK1230 | 0 |
| Basic units 3SK1 | 0 |
| Output expansion 3SK1211 | 2 |
| Output expansion 3SK1213 | 2 |

Example 1x 3SK1230 power supply; 5 x 3SK1220 input expansion; 1 x 3SK1 basic unit; 2 x 3SK121 output expansion



# 6.2 3ZY12 device connector

## 6.2.1 Device features

### MLFB:

| MLFB | Type of device connector |
|---|---|
| 3ZY1212-1BA00 | Device connector, type 1, 17.5 mm |
| 3ZY1212-2BA00 | Device connector, type 1, 22.5 mm |
| 3ZY1212-2DA00 | Device termination connector, type 1, 22.5 mm |
| 3ZY1212-2EA00 | Device connector, type 2, 22.5 mm |
| 3ZY1212-2FA00 | Device termination connector, type 2, 22.5 mm |
| 3ZY1212-0FA01 | Device termination connector, type 2, set for enclosures > 45 mm |

### Use of device connectors

- A device connector is always required when a basic unit is expanded using input or output expansions.
- A device termination connector is always required in the system for the last module on the right.

The following device connectors are required for the various enclosure widths of the Advanced device series:

| Devices | Device connector, type 1, 17.5 mm<br>3ZY1212-1BA00 | Device connector, type 1, 22.5 mm<br>3ZY1212-2BA00 | Device termination connector, type 1, 22.5 mm<br>3ZY1212-2DA00 |
|---|---|---|---|
| **Basic units 3SK1 Advanced** | | | |
| 3SK1121 | - | x | x |
| 3SK1122 | - | x | x |
| 3SK1120 | x | - | - |
| **Output expansions 3SK1** | | | |
| 3SK1211 (4RO) | - | x | x |
| 3SK1213 (3RO) | - | - | - |
| **Input expansions 3SK1** | | | |
| 3SK1220 | x | - | - |
| Power supply 3SK1230 | - | x | - |

| Devices | Device connector, type 2, 22.5 mm<br>3ZY1212-2EA00 | Device termination connector, type 2, 22.5 mm<br>3ZY1212-2FA00 | Device termination connector, type 2 set for enclosures > 45 mm<br>3ZY1212-0FA01 |
|---|---|---|---|
| **Basic units 3SK1 Advanced** | | | |
| 3SK1121 | - | - | - |
| 3SK1122 | - | - | - |
| 3SK1120 | - | - | - |
| **Output expansions 3SK1** | | | |
| 3SK1211 (4RO) | - | - | - |
| 3SK1213 (3RO) | - | - | x |
| **Input expansions 3SK1** | | | |
| 3SK1220 | - | - | - |
| Power supply 3SK1230 | - | - | - |

**Note**

If a basic unit is expanded on the right-hand side, the final output expansion must be terminated with a device termination connector of type 1 (basic unit, output expansion 3SK1211)) or device termination connector of type 2 (output expansion 3SK1213).

If a basic unit is only expanded on the left-hand side, a device termination connector of type 1 must be mounted below the basic unit.

### 6.2.2 Applications

The Advanced basic unit can be expanded on the input and output side using device connectors (connecting plugs) without any additional wiring outlay. When configuring the system, it is important to ensure that input expansions are connected on the left and output expansions on the right of a basic unit.

## 6.3 System configuration rules

- Input expansions and the 3SK1230 power supply must always be connected on the left of the basic unit and output expansions on the right.
- The 3SK1230 power supply must always be plugged into the system on the extreme left.
- If a 3SK1230 power supply is used, no additional, external 24 V DC voltage is permitted to be connected to a basic unit.
- If an input expansion is detected on the left when the device powers up, this will be loaded into the device configuration. The cascading input image is then activated in safety mode and ANDed with the sensor states.
- An input expansion evaluates the sensor states and generates an enable signal for the basic unit depending on the start condition. The enable signal is then acquired by an input expansion on the right-hand side, or acquired by the basic unit and ANDed with its sensor statuses.
- Device termination connector type 1:
  - Below basic unit: the switch of the device termination connector must be open, i.e. in position 2 at the bottom.
  - Below 3SK1211 output expansion: the switch of the device termination connector must be closed, i.e. in position 1 at top.
- The 3ZY12 device connector used below the final device must be fitted with a cover on the left side (supplied with the device termination connectors).
- If an output expansion is detected on the right when the device powers up, this will be loaded into the device configuration. The internal feedback circuit of the contact extension is evaluated and checked.
- An Advanced basic unit controls the output expansions via the 3ZY12 device connector.
- If an output expansion is used, a device termination connector of type 1 must ALWAYS be used under the final device on the right (for 3SK1211) with the switch setting: "1" (switch upwards), or type 2 (for 3SK1213)
- If the 3SK1213 output expansion is used in the system, this must always be the final station in the system (on the right) and must be fitted with a 3ZY1212-0FA01 device termination connector. Only one 3SK1213 output expansion can be used in a system with a device connector.
- The output expansion (instantaneous) is activated via a safety-related channel.
- The output expansion (time-delayed) is activated via a safety-related channel.
- If a basic unit is operated as a stand-alone device, no device connector or device termination connector is necessary.

- If an output expansion is not detected on powering up, the internal feedback circuit will not be evaluated.
- In the case of a change to the device configuration during operation, error mode is activated immediately. A restart can only take place via a Power OFF/ON.
  All other configuration changes during operation are indicated by LED (DEVICE LED flashes green/yellow).

## See also

Accessories (Page 257)

## Configuration notes for using device connectors

Device connectors 3ZY12 can only be used with devices of the Advanced device series.

Further configuration notes:

| NOTICE |
| --- |
| **Only one 3SK1 Advanced basic unit is permitted per system**<br>The safety function is not guaranteed when more than one basic unit is used. |

| NOTICE |
| --- |
| **Supply voltage must only be fed in on the basic unit**<br>The supply voltage of 24 V DC must only be fed in on the basic unit, otherwise the safety function is bypassed. |

### Power supply

- When device connectors are used, only one 3SK1230 power supply is permitted per system.
- The 3SK1230 power supply must always be located on the extreme left.
- If the 3SK1230 power supply is used, an additional (external) 24 V DC connection is not permitted (this also applies for the cascading input, as well as for non-floating sensors).

### 24 V DC power supply

- It is only permitted to connect a voltage of 24 V DC to the terminals on the basic unit.
- It is not permitted to supply 24 V DC to an expansion component.

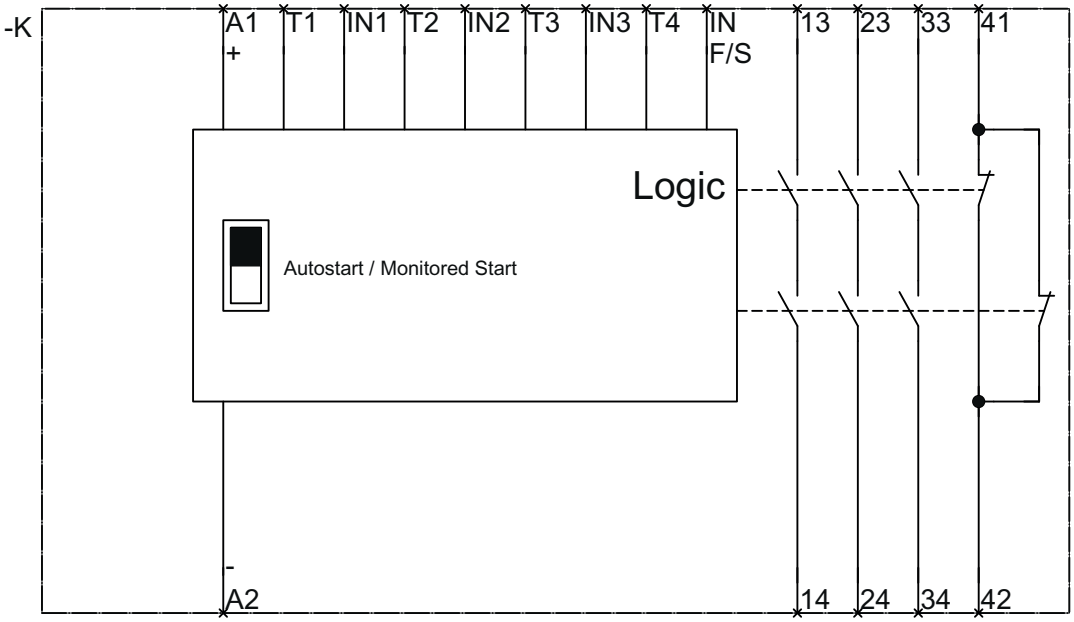
# Circuit diagrams

7

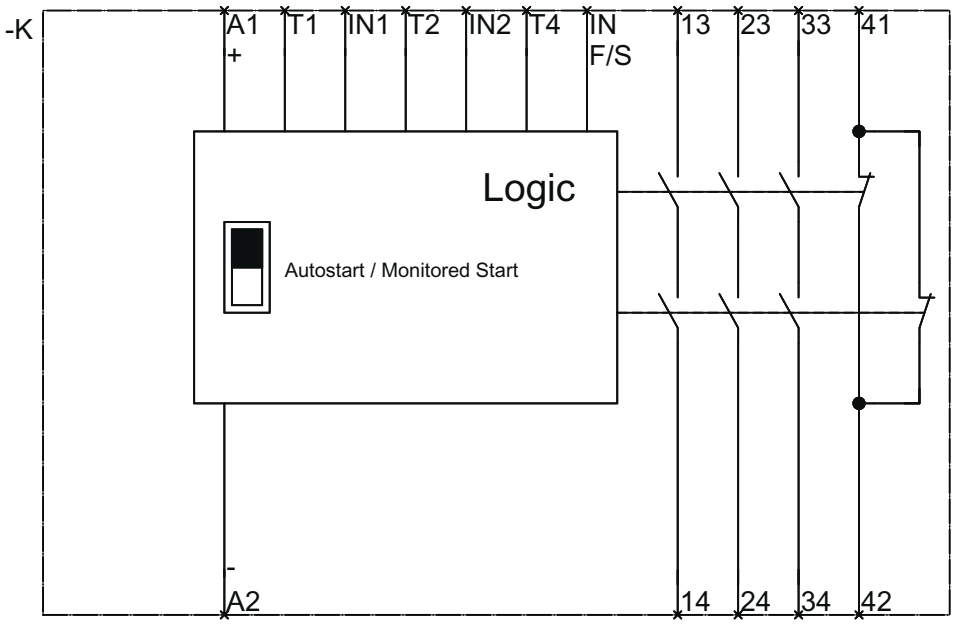
## 7.1 Internal circuit diagrams

### 7.1.1 Internal circuit diagrams for 3SK1 Standard basic units

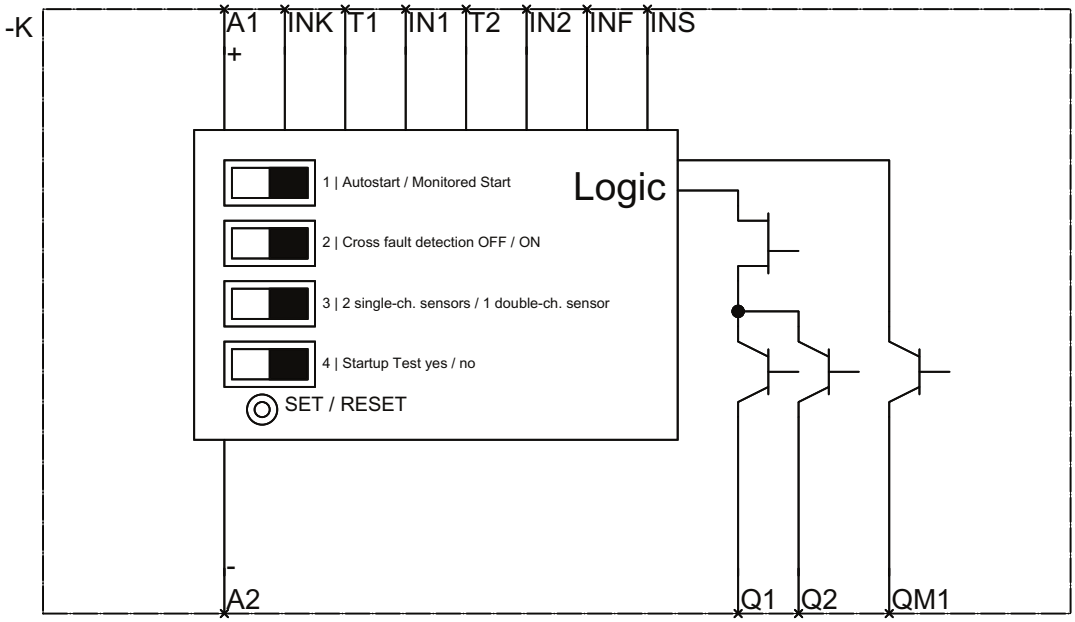
**Basic unit 3SK1111-.AB30 Standard relay instantaneous (24 V)**



## Basic unit 3SK1111-.AW20 Standard relay instantaneous (110 - 240 V)

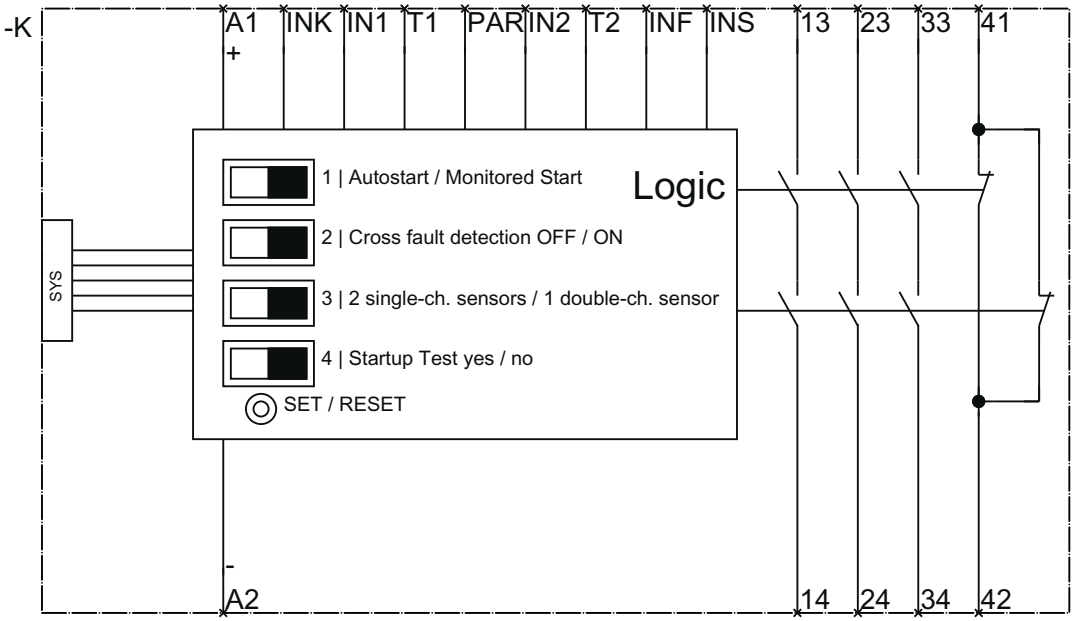



## Basic unit 3SK1112-.BB40 Standard solid-state

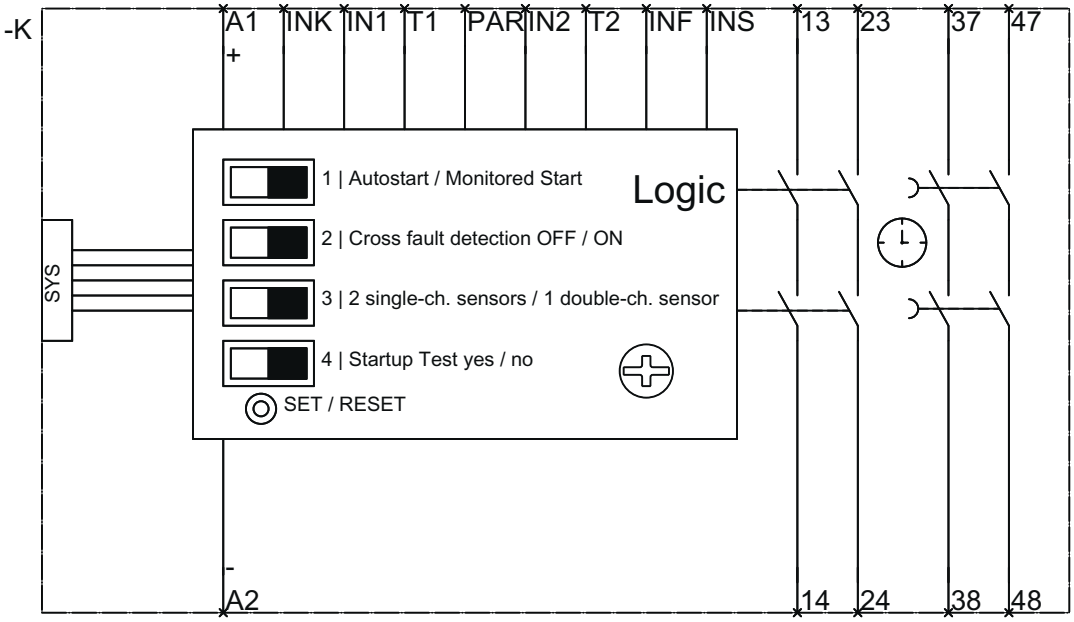


## 7.1.2 Internal circuit diagrams for 3SK1 Advanced basic units

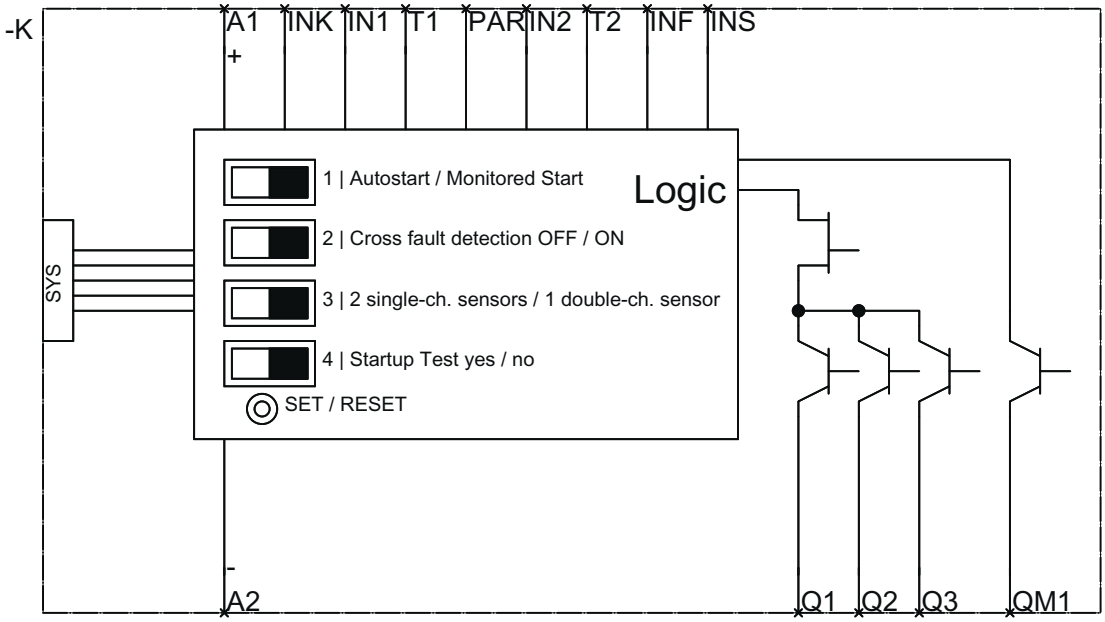
### Basic unit 3SK1121-.AB40 Advanced relay instantaneous



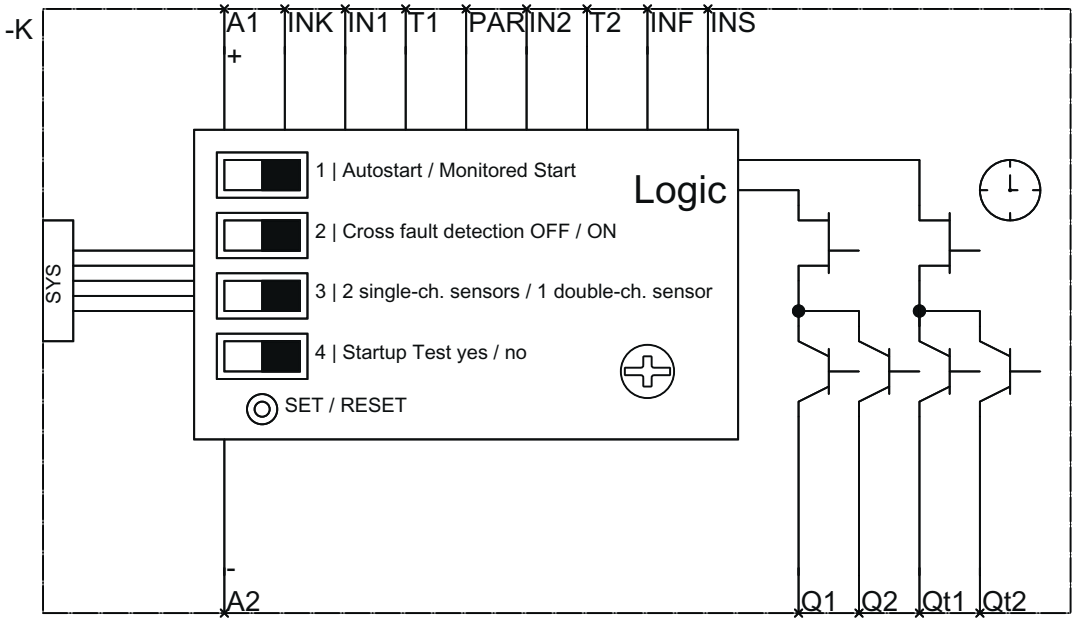

### Basic unit 3SK1121-.CB4. Advanced relay time-delayed



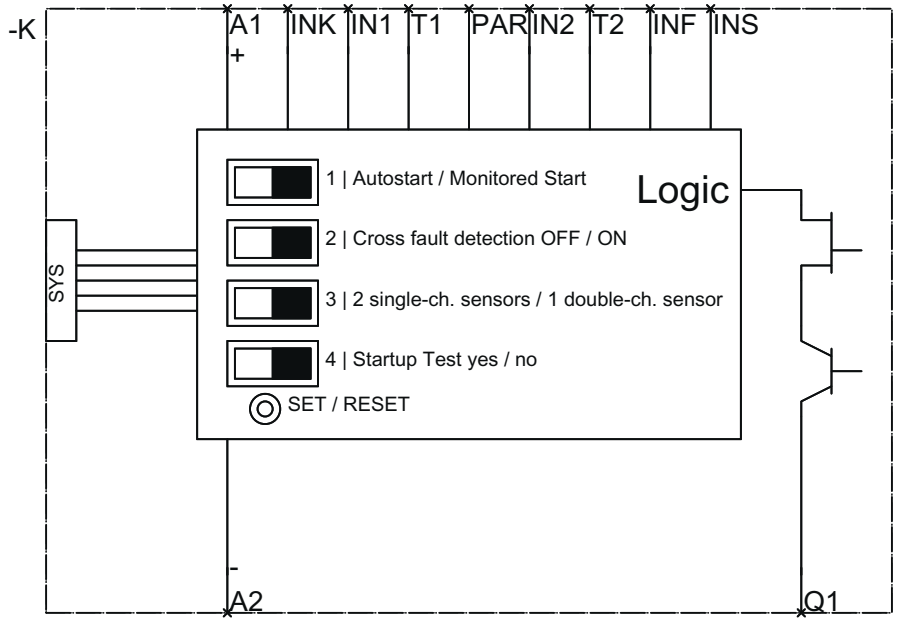
## Basic unit 3SK1122-.AB40 Advanced solid-state instantaneous




## Basic unit 3SK1122-.CB4. Advanced solid-state time-delayed

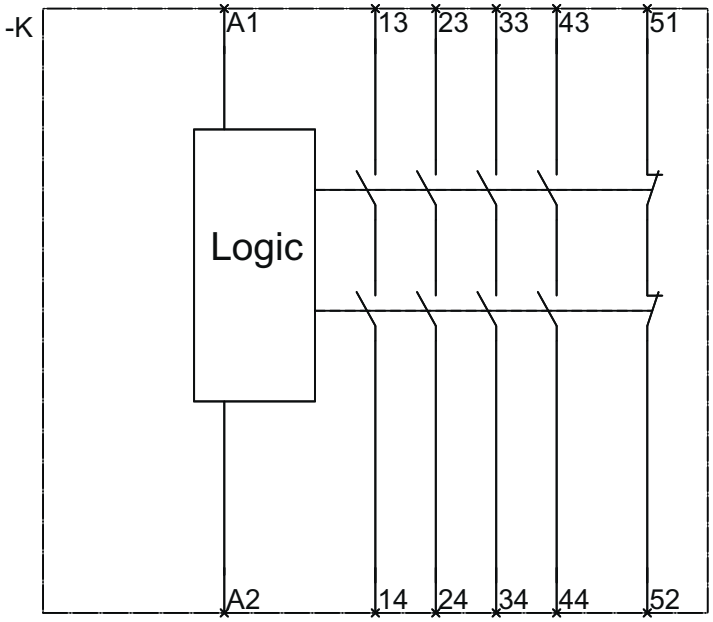


## Basic unit 3SK1120-.AB40 Advanced 17.5 mm solid-state instantaneous

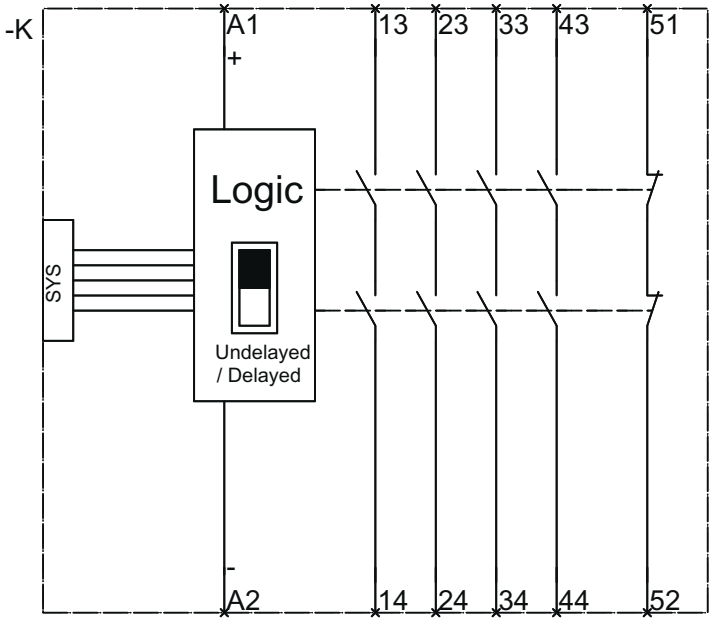


## 7.1.3 Internal circuit diagrams for expansion units

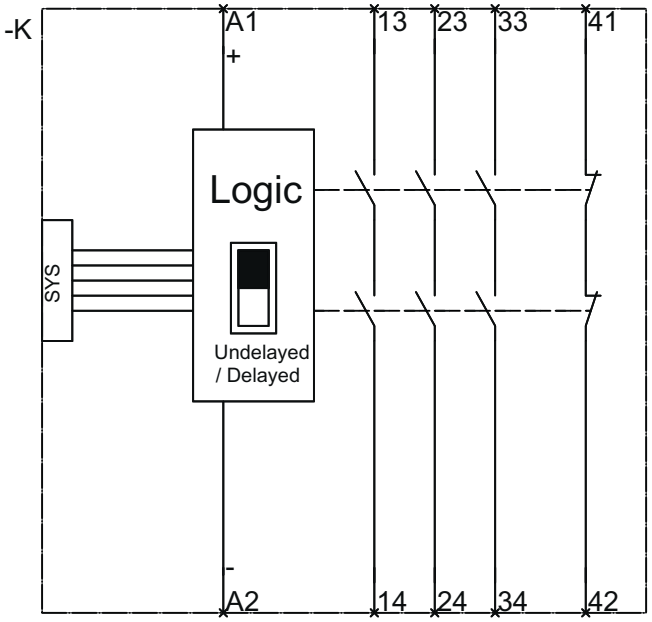
### Output expansion 3SK1211 (110 - 240 V)



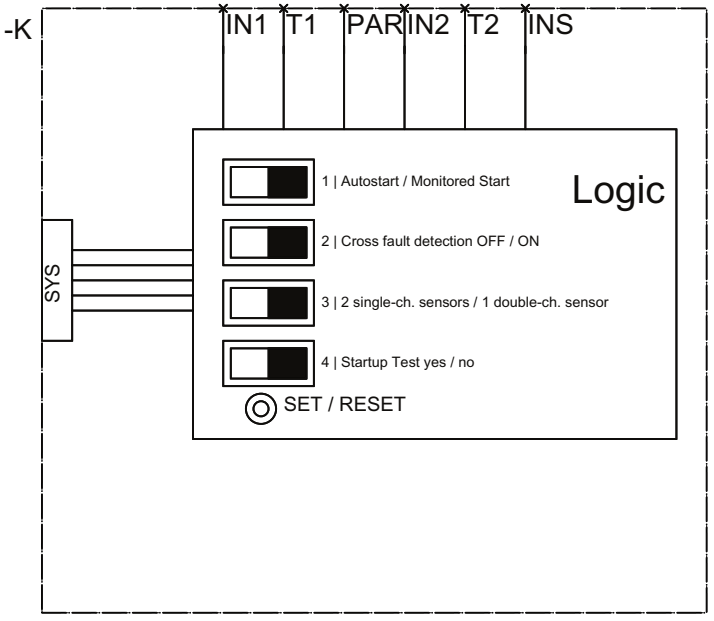

### Output expansion 3SK1211 (24 V DC)



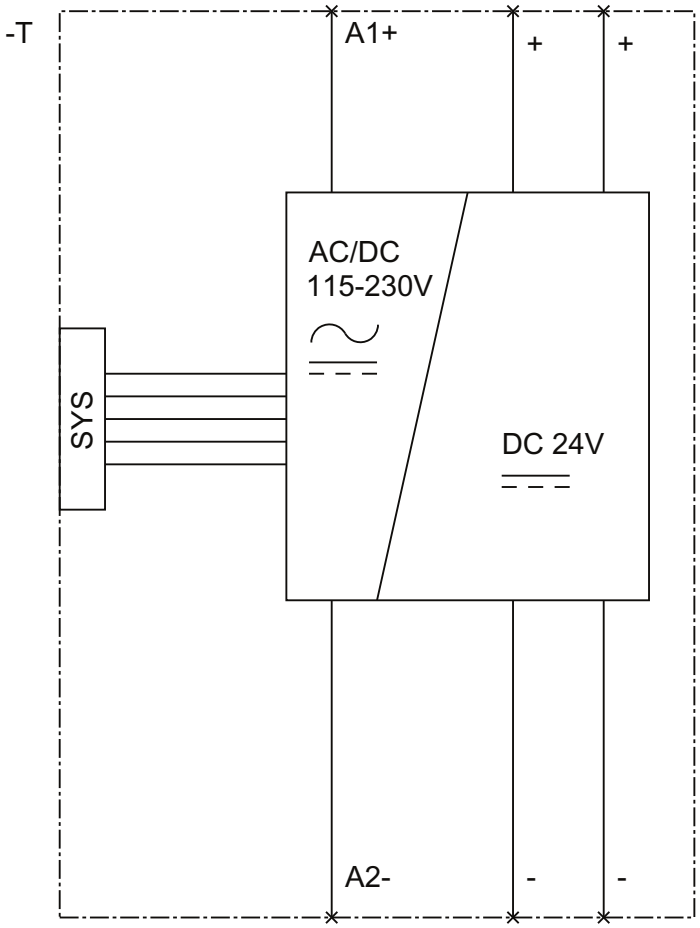
## Output expansion 3SK1213




## Input expansion 3SK1220



## Power supply 3SK1230



# 7.2 Typical circuits

## 7.2.1 Sensor wiring

### Parameter definitions depending on the sensor wiring

| Slide switch | | Description | Typical circuit |
|---|---|---|---|
| AUTO | MONITORED | | Basic unit 3SK1 Standard relay |
| | X | EMERGENCY STOP, single-channel, with monitored start | 1 and 2 |
| X | | EMERGENCY STOP, single-channel, with autostart | 3 and 4 |
| | X | Two-channel, with cross-circuit detection, with monitored start | 5 |
| X | | Two-channel, with cross-circuit detection, with autostart | 6 |
| X | | Sensors with solid-state outputs, without cross-circuit detection, with autostart | 7 |

| DIP switch | | | | Description | Typical circuit |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | | Basic units 3SK1 Standard / Advanced |
| right | right | right | — | 1 x two-channel, with cross-circuit detection, with monitored start | 8 |
| left | right | right | — | 1 x two-channel, with cross-circuit detection with autostart | 9 |
| right | left | right | — | Electronic sensor, without cross-circuit detection, with monitored start | 10 |
| left | left | right | — | Electronic sensor, without cross-circuit detection, with autostart | 11 |
| right | left | left | — | 2 x single-channel, without cross-circuit detection, with monitored start | 12 |
| left | left | left | — | 2x single-channel, without cross-circuit detection, with autostart | 13 |

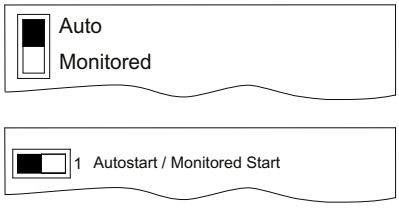
— = Not relevant

| DIP switch | | | | Description | Typical circuit |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | | Basic units 3SK1 Advanced |
| right | right | right | — | 1NC/1NO sensor, with cross-circuit detection, with monitored start | 14 |
| left | right | right | — | 1NC/1NO sensor, with cross-circuit detection, with autostart | 15 |
| left | right | right | — | Two-hand operation, with cross-circuit detection, with autostart | 16 |

— = Not relevant

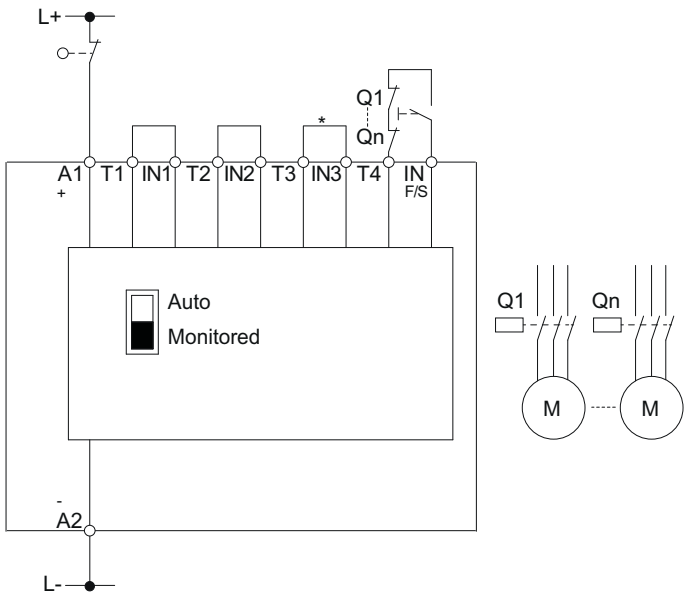
## 7.2.2 Typical circuits

The black fields show the positions of the switches. Here, "Autostart" in each case.




### Typical circuits for basic unit 3SK1111 Standard relay

Table 7- 1 Typical circuit 1:
Single-channel, with monitored start



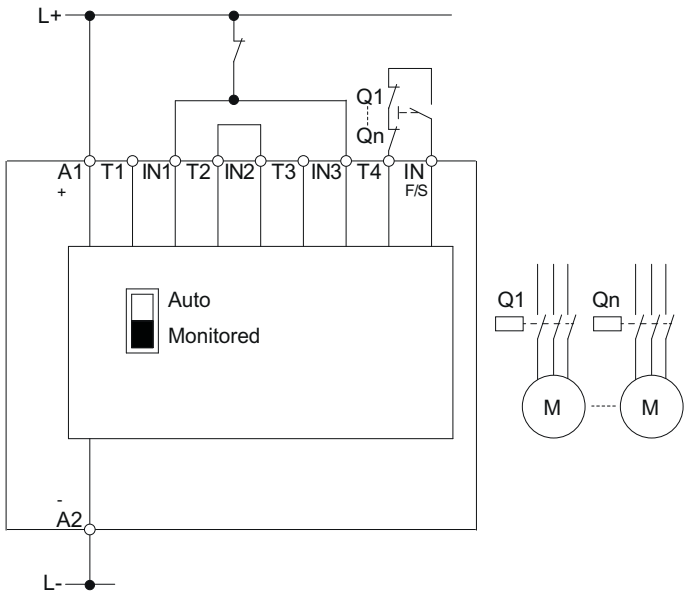

* For 3SK1111-.AB30 basic unit only

- Monitored start
- 3SK1111 Standard relay
- Sensor: 1 NC contact

| Slide switch | |
|---|---|
| **Auto** | **Monitored** |
| — | ON<br>bottom |

| | |
|---|---|
| Up to PL in accordance with ISO 13849-1 | c |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | 1 |

Table 7- 2 Typical circuit 2:
Single-channel, with monitored start

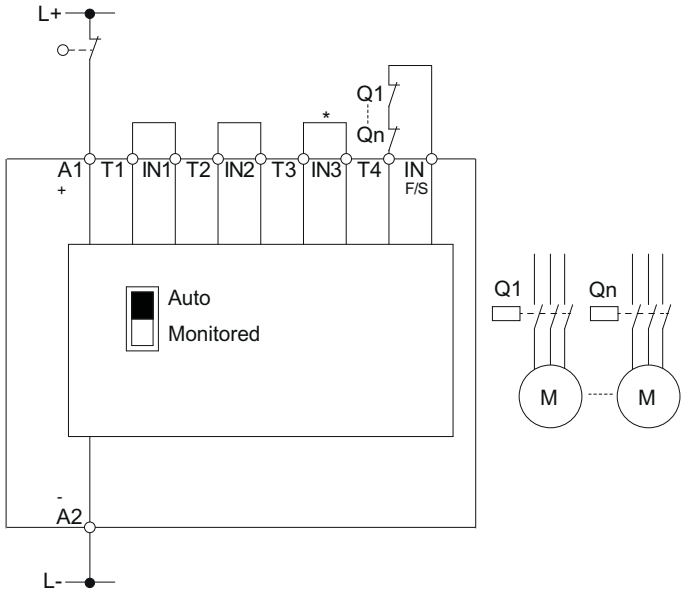



- Monitored start
- 3SK1111 Standard relay
- Sensor: 1 NC contact

| Slide switch | |
|---|---|
| **Auto** | **Monitored** |
| — | ON<br>bottom |

| | |
|---|---|
| Up to PL in accordance with ISO 13849-1 | c |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | 1 |

Table 7- 3 Typical circuit 3:
single-channel, with autostart



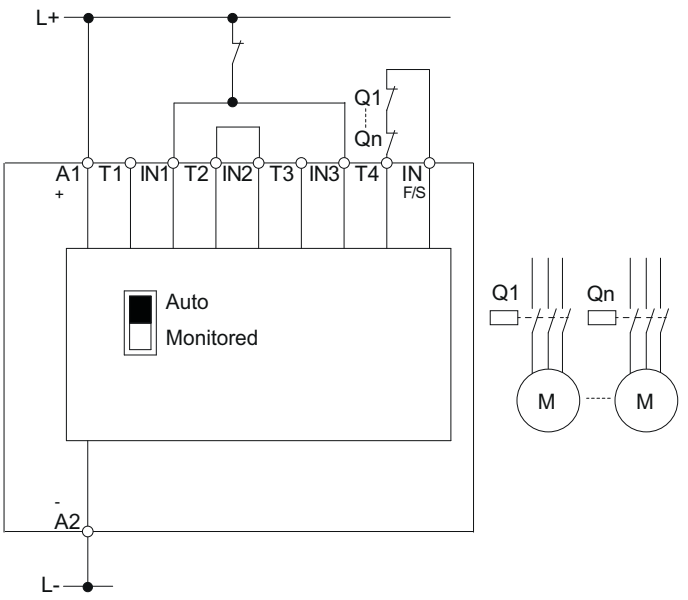

* For 3SK1111-.AB30 basic unit only

- Autostart
- 3SK1111 Standard relay
- Sensor: 1 NC contact

| Slide switch | |
|---|---|
| **Auto** | **Monitored** |
| ON<br>top | — |

| | |
|---|---|
| Up to PL in accordance with ISO 13849-1 | c |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | 1 |

Table 7- 4 Typical circuit 4:
single-channel, with autostart

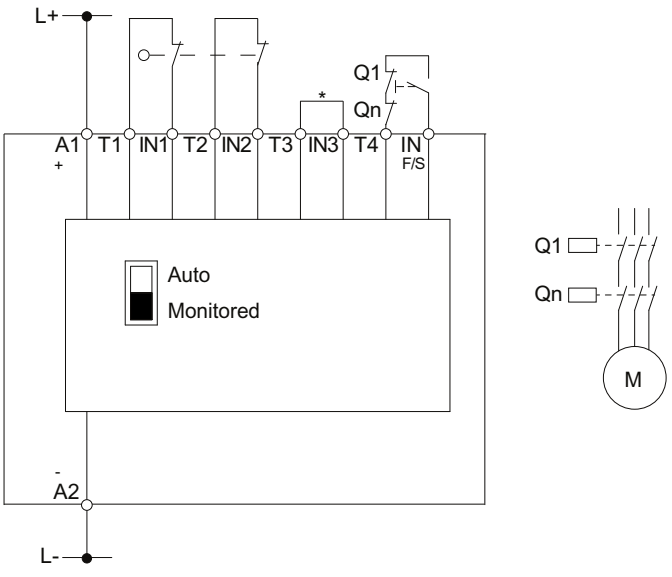



- Autostart
- 3SK1111 Standard relay
- Sensor: 1 NC contact

| Slide switch | |
|---|---|
| **Auto** | **Monitored** |
| ON<br>top | — |

| | |
|---|---|
| Up to PL in accordance with ISO 13849-1 | c |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | 1 |

Table 7- 5 Typical circuit 5:
EMERGENCY STOP two-channel, with cross-circuit detection, with monitored start



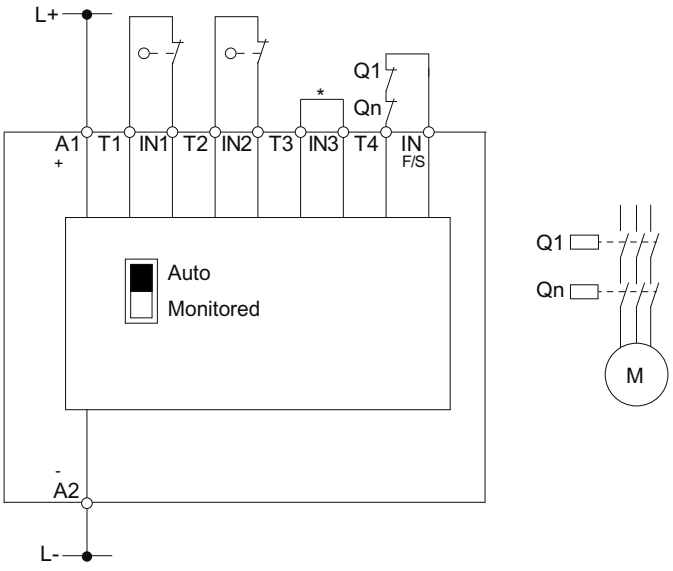

* For 3SK1111-.AB30 basic unit only

- Monitored start
- With cross-circuit detection
- Sensor: 2 NC contacts
- 3SK1111 Standard relay

| Slide switch | |
|---|---|
| **Auto** | **Monitored** |
| — | ON<br>bottom |

| | |
|---|---|
| Up to PL in accordance with ISO 13849-1 | e |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | 3 |

Table 7- 6 Typical circuit 6:
Two-channel, with cross-circuit detection, with autostart



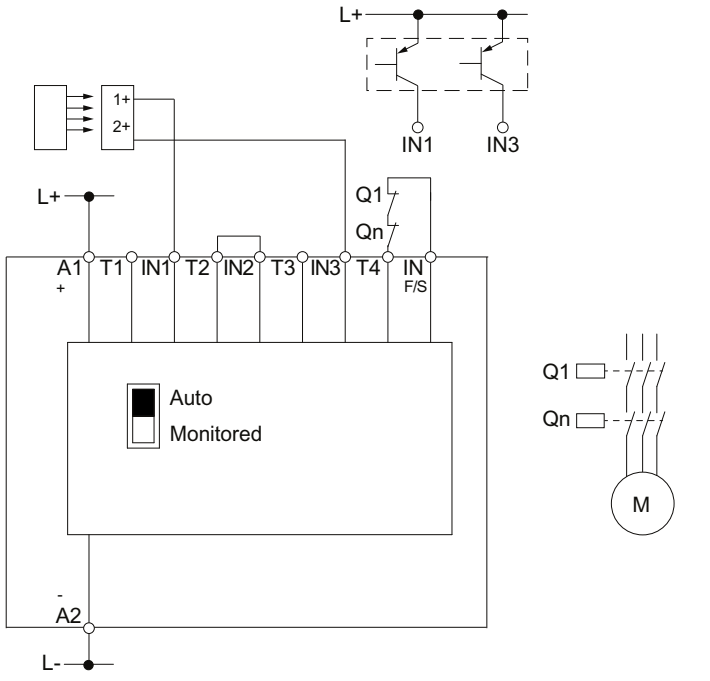

* For 3SK1111-.AB30 basic unit only

- Autostart
- With cross-circuit detection
- Sensor: 2 NC contacts
- 3SK1111 Standard relay

| Slide switch | |
|---|---|
| **Auto** | **Monitored** |
| ON<br>top | — |

| | |
|---|---|
| Up to PL in accordance with ISO 13849-1 | e |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | 3 |

Table 7- 7 Typical circuit 7:
Sensors with solid-state outputs, without cross-circuit detection, with autostart




- Autostart
- Without cross-circuit detection
- Sensor: 2-channel non-floating
- 3SK1111 Standard relay

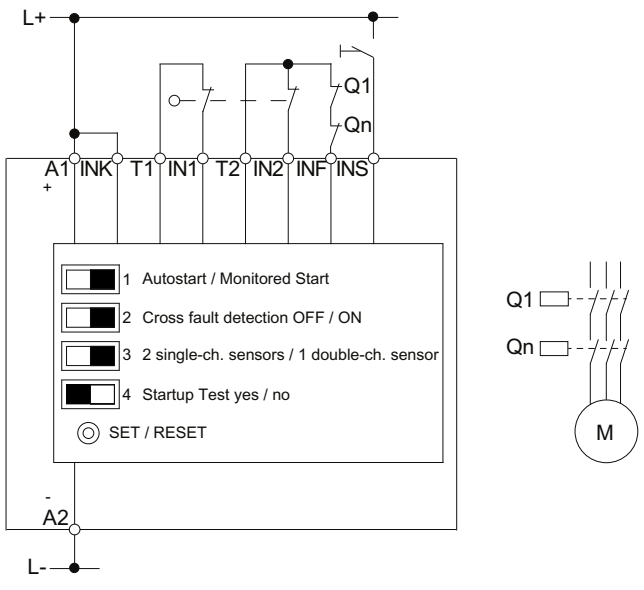
Slide switch

| Auto | Monitored |
|---|---|
| ON<br>top | — |

| | |
|---|---|
| Up to PL in accordance with ISO 13849-1 | e |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | 3 |

## Typical circuits for 3SK1 Standard solid-state basic units or 3SK1 Advancedbasic units

Table 7- 8 Typical circuit 8: EMERGENCY STOP two-channel, with cross-circuit detection, with monitored start



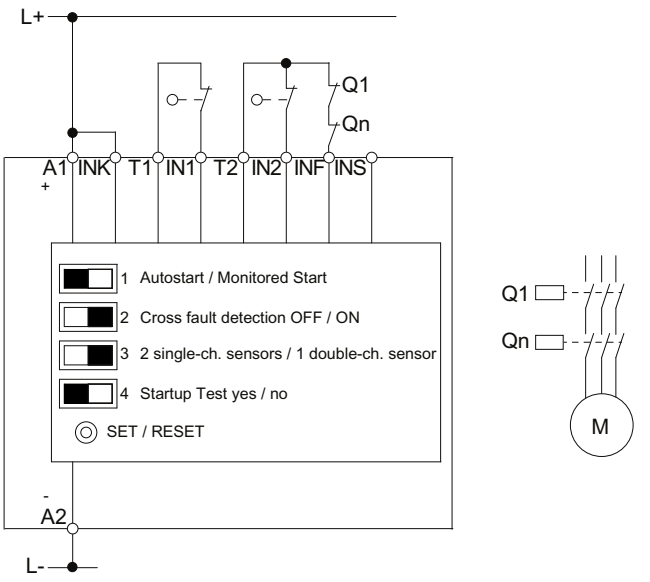

- Monitored start
- With cross-circuit detection
- 1 x two-channel
- Sensor: 2 NC contacts
- 3SK1112 Standard solid-state and 3SK112 / 3SK122 Advanced

DIP switch

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| ON<br>right | ON<br>right | ON<br>right | — |

| | |
|---|---|
| Up to PL in accordance with ISO 13849-1 | e |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | 3 |

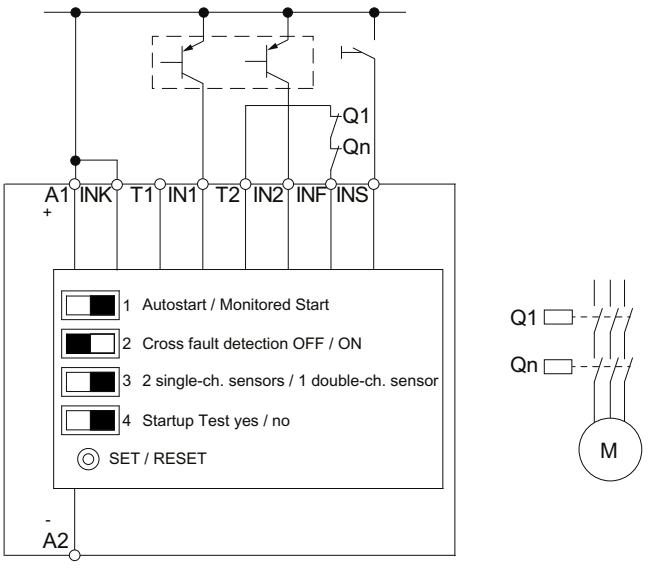
Table 7- 9 Typical circuit 9: Two-channel, with cross-circuit detection, with autostart




- Autostart
- With cross-circuit detection
- 1 x two-channel
- Sensor: 2 NC contacts
- 3SK1112 Standard solid-state and 3SK112 / 3SK122 Advanced

| DIP switch | | | |
|---|---|---|---|
| **1** | **2** | **3** | **4** |
| OFF<br>left | ON<br>right | ON<br>right | — |
| Up to PL in accordance with ISO 13849-1 | | | e |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | | | 3 |

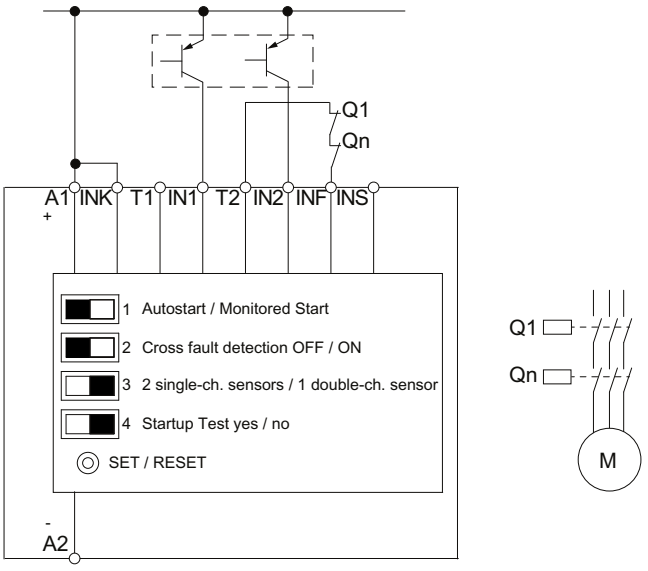
Table 7- 10 Typical circuit 10:
Electronic sensor, 2-channel, without cross-circuit detection, with monitored start




- Monitored start
- Without cross-circuit detection
- 1 x two-channel
- Sensor: 2-channel non-floating
- 3SK1112 Standard solid-state and 3SK112 Advanced

| DIP switch | | | |
|---|---|---|---|
| **1** | **2** | **3** | **4** |
| ON<br>right | OFF<br>left | ON<br>right | — |
| Up to PL in accordance with ISO 13849-1 | | | e |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | | | 3 |

Table 7- 11 Typical circuit 11:
Electronic sensor, two-channel, without cross-circuit detection, with autostart




- Autostart
- Without cross-circuit detection
- 1 x two-channel
- Sensor: 2-channel non-floating
- 3SK1112 Standard solid-state and 3SK112 Advanced

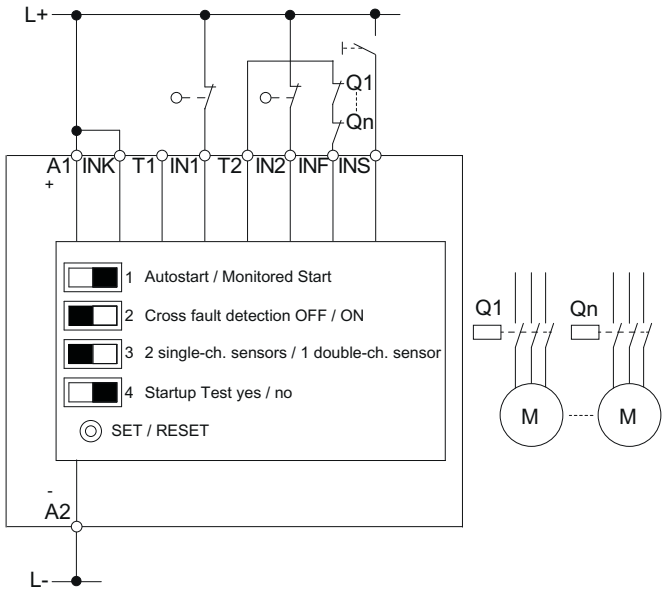
| DIP switch | | | |
|---|---|---|---|
| **1** | **2** | **3** | **4** |
| OFF<br>left | OFF<br>left | ON<br>right | — |
| Up to PL in accordance with ISO 13849-1 | | | e |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | | | 3 |

**Note**

**Single-channel connection**

If only one single-channel sensor is used, the other sensor circuit must be jumpered.

Table 7- 12 Typical circuit 12: 2 x single-channel, without cross-circuit detection, with monitored start



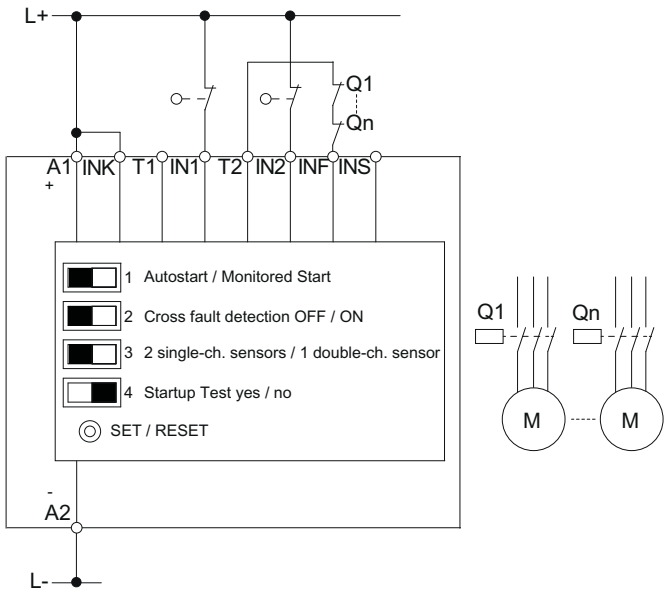

- Monitored start
- Without cross-circuit detection
- 2 x single-channel
- Sensor: two single-channel NC sensors
- 3SK1112 Standard solid-state and 3SK112 Advanced

DIP switch

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| ON<br>right | OFF<br>left | OFF<br>left | — |

| | |
|---|---|
| Up to PL in accordance with ISO 13849-1 | c |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | 1 |

Table 7- 13 Typical circuit 13: 2x single-channel, without cross-circuit detection, with autostart




- Autostart
- Without cross-circuit detection
- 2 x single-channel
- Sensor: two single-channel NC contacts
- 3SK1112 Standard solid-state and 3SK112 Advanced

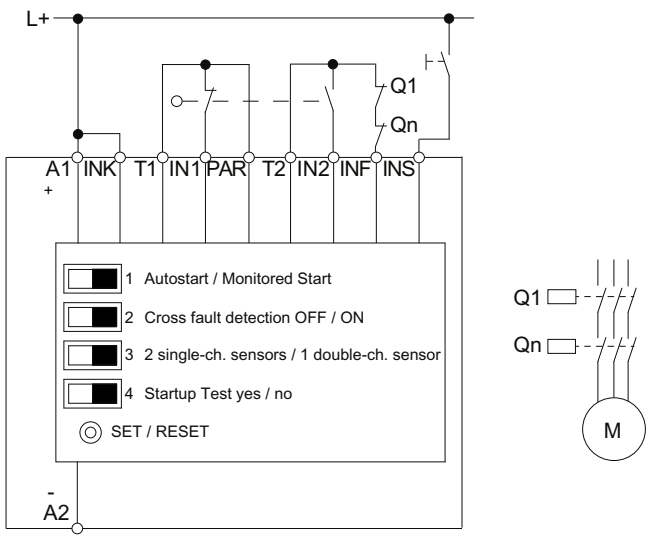
DIP switch

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| OFF<br>left | OFF<br>left | OFF<br>left | — |

| | |
|---|---|
| Up to PL in accordance with ISO 13849-1 | c |
| Up to Safety Integrity Level (SILCL) to IEC 62061 | 1 |

## Typical circuits for 3SK1 Advanced basic units only

Table 7- 14 Typical circuit 14:
1NC/1NO sensor, with cross-circuit detection, with monitored start



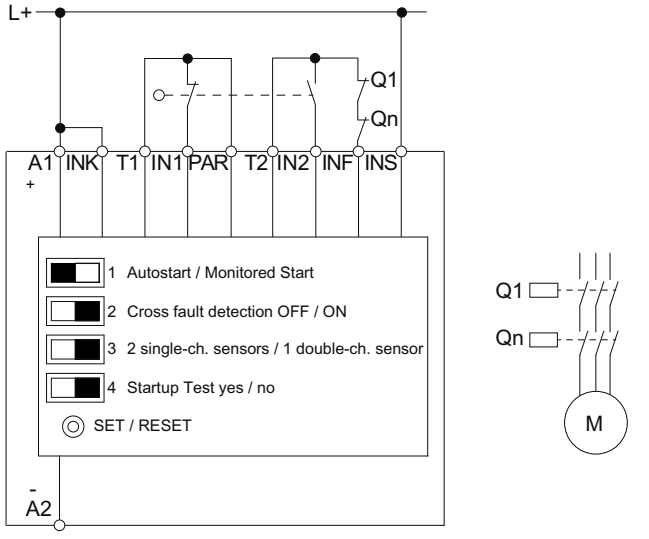

- Monitored start
- With cross-circuit detection
- 1 x two-channel
- Jumper T1/PAR for NC/NO evaluation
- Sensor: NC/NO sensor
- 3SK112 Advanced

DIP switch

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| ON<br>right | ON<br>right | ON<br>right | — |

| | |
|---|---|
| Up to PL in accordance with ISO 13849-1 | e |
| Up to Safety Integrity Level (SILCL) to IEC 61508 | 3 |

Table 7- 15 Typical circuit 15:
1NC/1NO sensor, with cross-circuit detection, with autostart



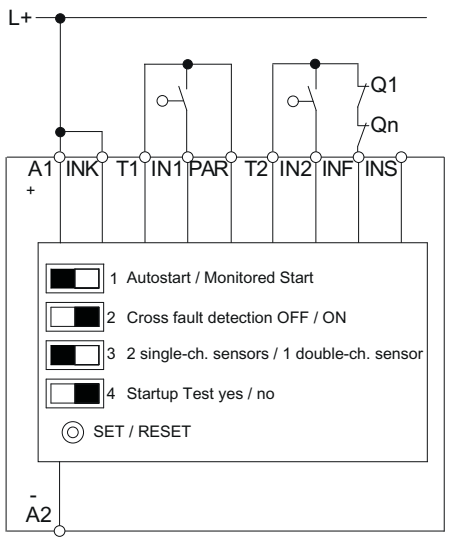

- Autostart
- With cross-circuit detection
- 1 x two-channel
- Jumper T1/PAR for NC/NO evaluation
- Sensor: NC/NO sensor
- 3SK112 Advanced

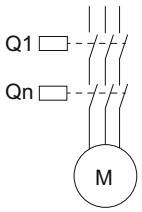
DIP switch

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| OFF<br>left | ON<br>right | ON<br>right | — |

| | |
|---|---|
| PL in accordance with ISO 13849-1 | e |
| Safety Integrity Level (SILCL) to IEC 61508 | 3 |

Table 7- 16 Typical circuit 16:
Two-hand operation, with cross-circuit detection, with autostart




- Autostart
- With cross-circuit detection
- 2 x single-channel
- Jumper T1/PAR for NC/NO evaluation
- Sensor: Two-hand NO/NO sensor
- 3SK112 Advanced

| DIP switch | | | |
|---|---|---|---|
| **1** | **2** | **3** | **4** |
| OFF<br>left | ON<br>right | OFF<br>left | — |
| PL in accordance with ISO 13849-1 | | | e |
| Safety Integrity Level (SILCL) to IEC 61508 | | | 3 |

For more information on two-hand operation, please refer to the chapter Two-hand operation/synchronism (Page 36).

# Mounting

# 8

## 8.1 Warning notices

### Warning notices before installation, wiring, and commissioning

| ⚠ WARNING |
| --- |
| Hazardous voltage! Can cause electric shock and burns. Turn off and lock out all power supplying this device before working on this device. |

## 8.2 Terminal coding

You can provide the terminals with coding pins (3ZY1440-1AA00). This helps you to avoid errors when replacing the terminals.

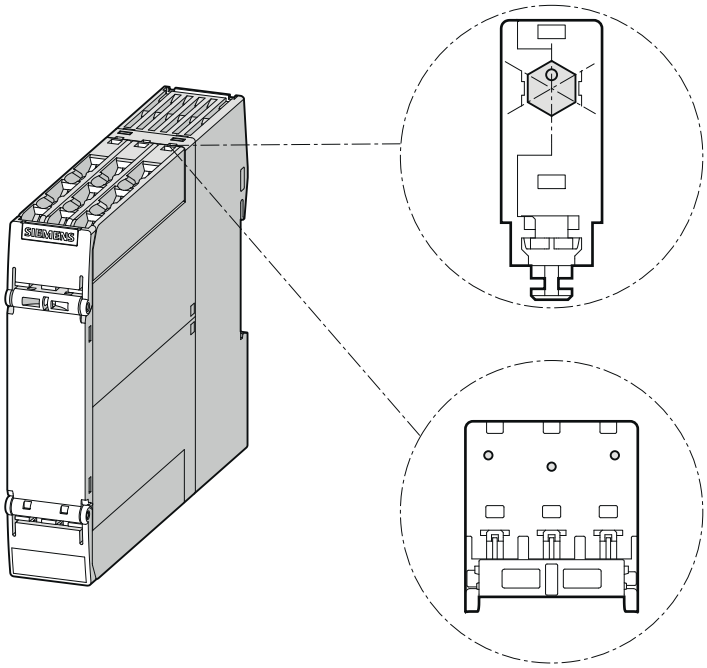


Figure 8-1 Module with coding pins

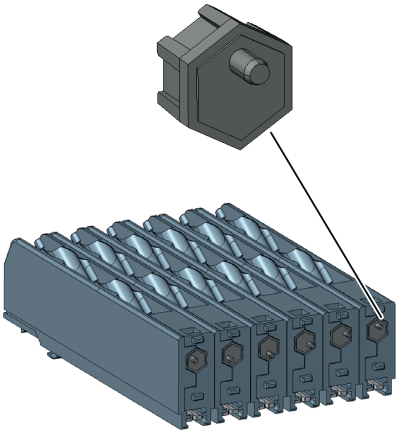


Figure 8-2 Stud position rotated by 60° in each case

# 8.3 Mounting the devices on a level surface

## Requirements

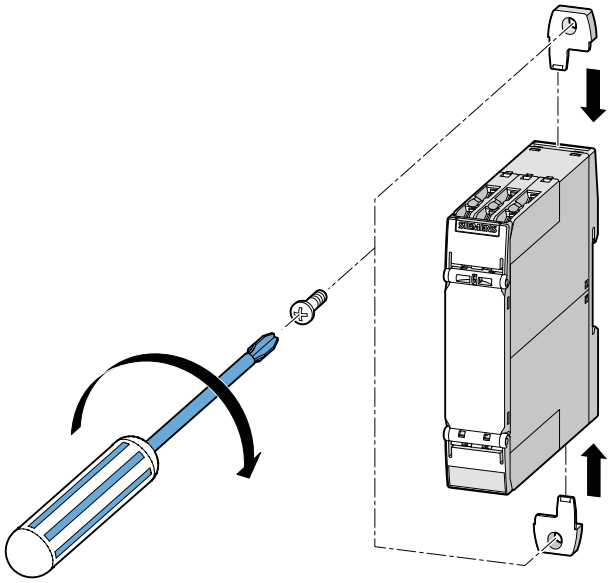
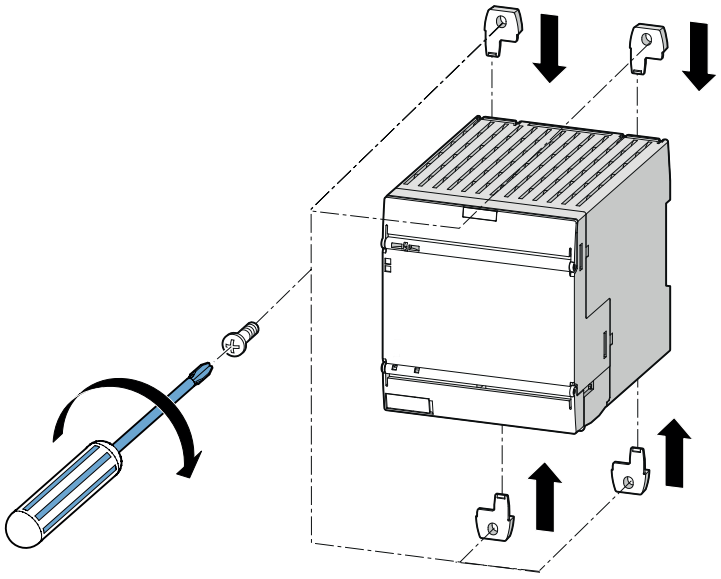
Please note the following requirements for mounting on a level surface:

- Please observe the information about the mounting position in the chapter "General technical data (Page 193)".
- Two properly executed drill holes with thread or plug on the level surface.

  For details of the distances between the drilled holes, please refer to the relevant dimension drawings in the chapter "Dimension drawings for 3SK1 devices (Page 243)".
- Two screws (17.5 mm or 22.5 mm devices)/or four screws (90 mm devices) to fit the holes M4 x 12 in accordance with DIN 784.
- Two plastic securing brackets.

  Please refer to the accessories list for the relevant order number in the chapter "Accessories (Page 257)".

## Procedure

| Step | Instructions | Figure |
|---|---|---|
| 1 | Insert the securing brackets into the openings provided on the device until they engage. |  17.5 mm and 22.5 mm devices  90 mm device |
| 2 | Hold the device up to the surface prepared for screw fastening. | |
| 3 | Insert the screws through the oblong holes in the securing brackets. | |
| 4 | Screw the device onto the level surface so that it is secure.<br>Tightening torque: 1 Nm | |

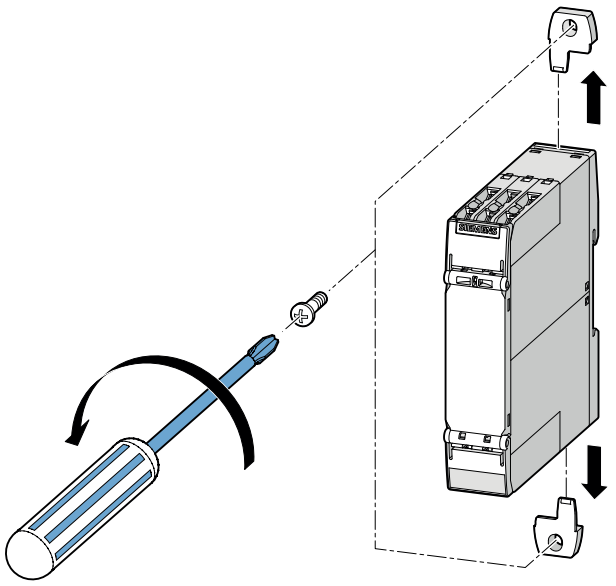
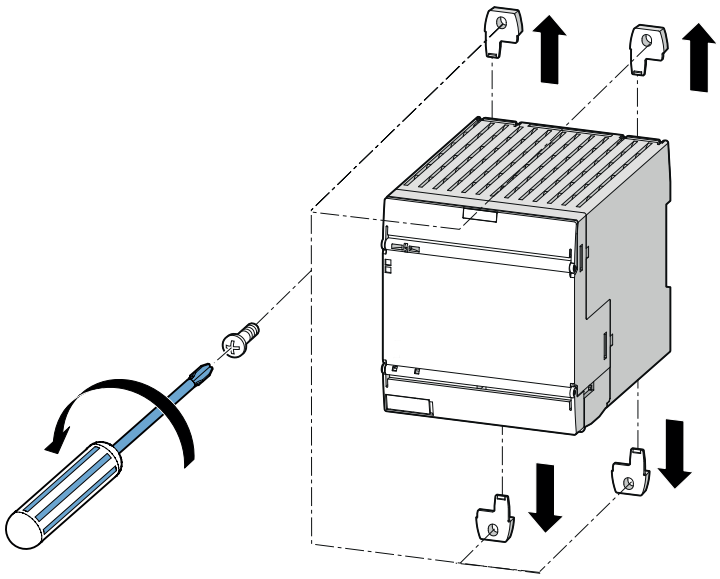
## 8.4 Disassembling devices from a level surface

| ⚠ WARNING |
| --- |
| **Hazardous Voltage** |
| **Can Cause Death, Serious Injury, or Property Damage.** |
| Before starting work, therefore, disconnect the system and devices from the power supply. |

### Requirements

- The terminals have been removed or disconnected.

## Procedure

| Step | Instructions | Figure |
|---|---|---|
| 1 | Hold the device firmly. |  Disassembling 17.5 mm and 22.5 mm devices  Disassembling 90 mm devices |
| 2 | Unscrew the cap screws. | |
| 3 | Lift the device from the level surface. | |
| 4 | Remove the securing brackets from the device. | |

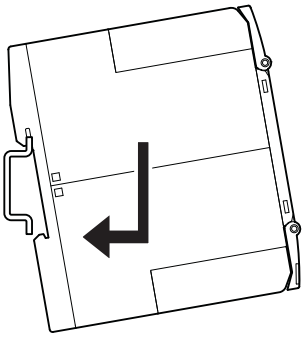
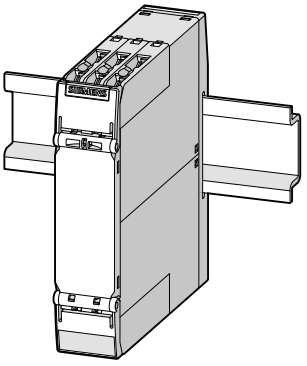
# 8.5 Mounting the 22.5 mm/17.5 mm device on a standard mounting rail

## Requirements

- A horizontal 35-mm wide mounting rail in accordance with DIN EN 60715 has been properly secured at the installation location.
- Please observe the information about the mounting position in the chapter "General technical data (Page 193)".

## Procedure

The figures show 22.5 mm devices. The 17.5 mm devices are mounted correspondingly.

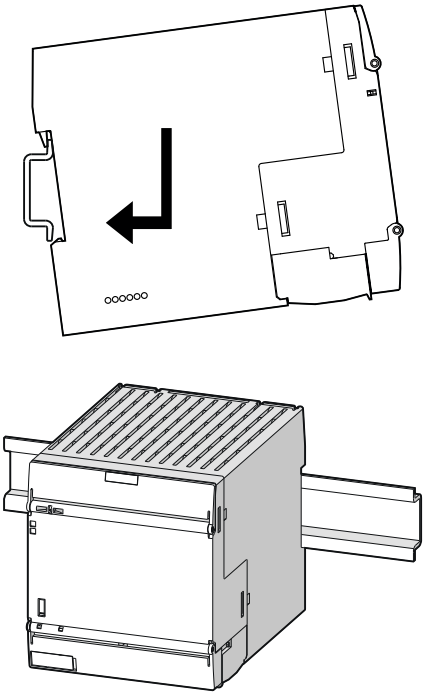
| Step | Instructions | Figure |
|---|---|---|
| 1 | Hang the back of the device onto the upper edge of the standard mounting rail |  |
| 2 | Press the lower half of the device against the rail until the device engages |  |

# 8.6 Mounting the 90 mm devices on a standard mounting rail

## Requirements

- A horizontal 35-mm wide mounting rail in accordance with DIN EN 60715 has been properly secured at the installation location.
- Please observe the information about the mounting position in the chapter "General technical data (Page 193)".

## Procedure

| Step | Instructions | Figure |
|---|---|---|
| 1 | Hang the back of the device onto the upper edge of the standard mounting rail |  |
| 2 | Press the lower half of the device against the rail until the device engages | |

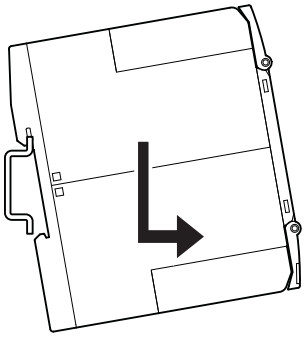
# 8.7 Removing devices from a standard mounting rail

| ⚠ WARNING |
| --- |
| **Hazardous Voltage**<br>**Can Cause Death, Serious Injury, or Property Damage.**<br>Before starting work, therefore, disconnect the system and devices from the power supply. |

## Requirements

- The terminals have been removed or disconnected.

## Procedure

| Step | Instructions | Figure |
| --- | --- | --- |
| 1 | Press the device downwards. |  |
| 2 | Pull the lower half of the device away from the standard mounting rail. | |
| 3 | Lift the device from the upper edge of the standard mounting rail. | |

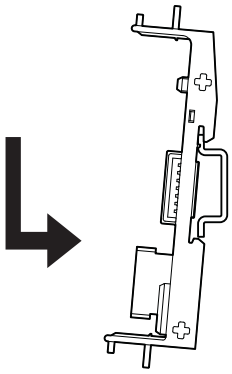
# 8.8 Mounting 22.5 mm/17.5 mm devices with device connectors on a standard mounting rail

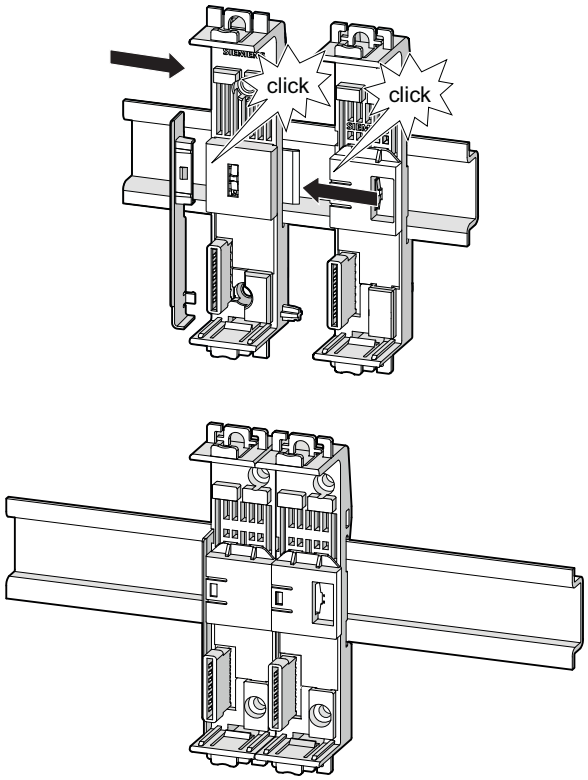
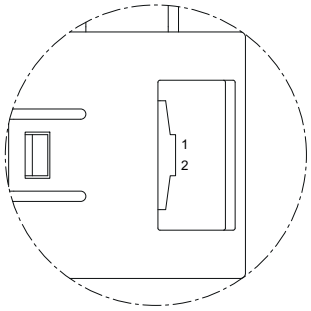
## Requirements

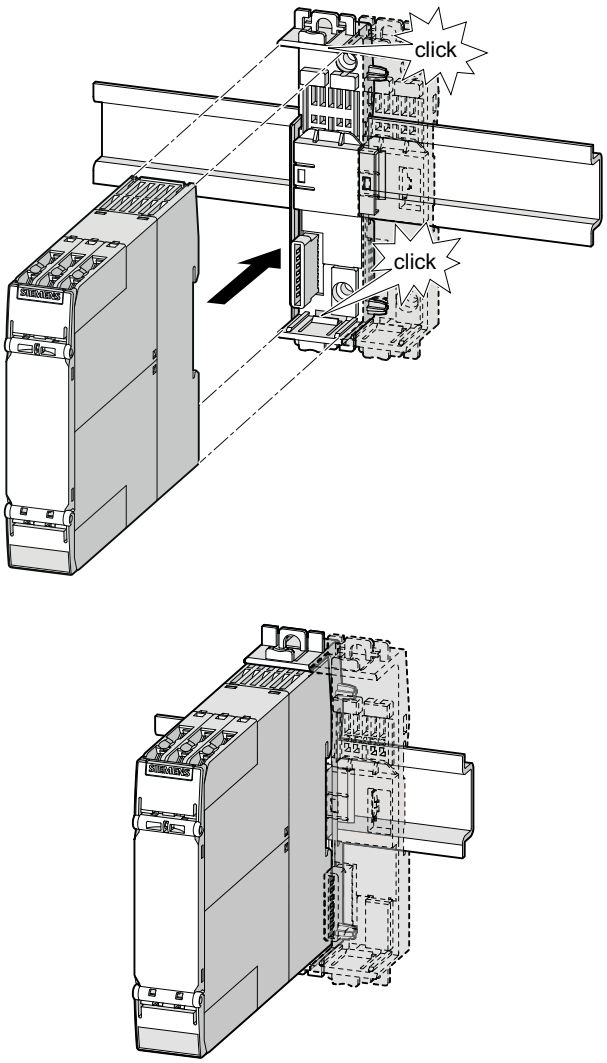
- A horizontal 35-mm wide mounting rail in accordance with DIN EN 60715 has been properly secured at the installation location.
- Please observe the information about the mounting position in the chapter "General technical data (Page 193)".

## Procedure

The figures show 22.5 mm devices. The 17.5 mm devices are mounted correspondingly.

| Step | Instructions | Figure |
|---|---|---|
| 1 | Place the back of the device connector on the upper edge of the standard mounting rail. |  |
| 2 | Press the lower half of the device connector against the standard mounting rail until the connector engages. | |
| 3 | Repeat the procedure with all the required device connectors. | |

| Step | Instructions | Figure |
|---|---|---|
| 4 | Push the device connectors together until they engage. |  |
| 5 | Mount the cover on the left of the first device connector. The cover is included in the scope of supply of the device terminator. | |
| 6 | Set the slide switches in the device termination connector (Type 1) to the following positions<br>• Below 3SK1 basic unit: position 2 (bottom; i.e. open)<br>• Below output expansion 3SK1211 position 1 (top; i.e. closed) |  |

| Step | Instructions | Figure |
|---|---|---|
| 7 | Mount the device on the device connector |  |
| 8 | Mount all the devices required for the system configuration in accordance with the respective installation guidelines on the device connectors | |

## 8.9 Removing 22.5 mm/17.5 mm devices with device connectors from a standard mounting rail

**⚠ WARNING**

**Hazardous Voltage**
**Can Cause Death, Serious Injury, or Property Damage.**

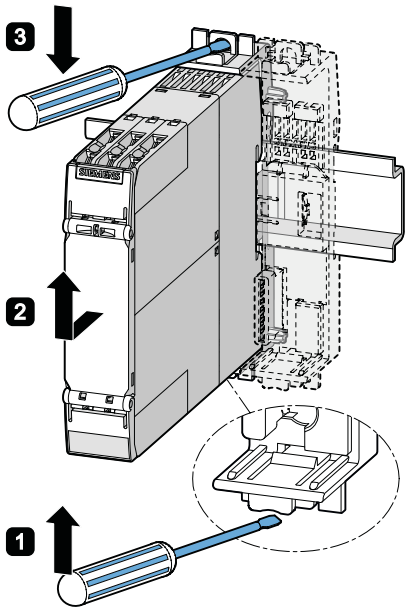
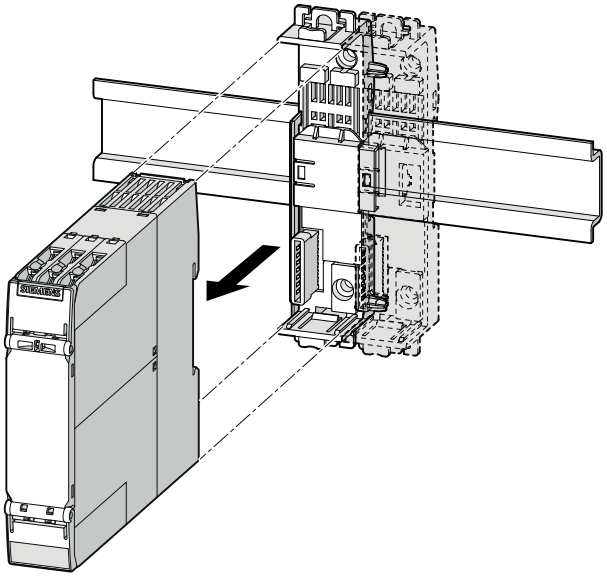
Before starting work, therefore, disconnect the system and devices from the power supply.

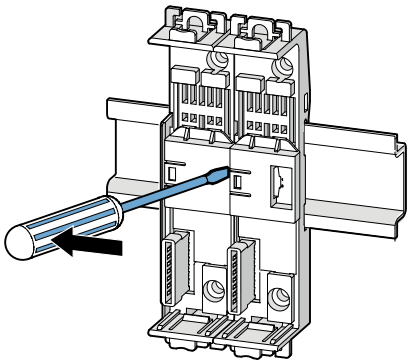
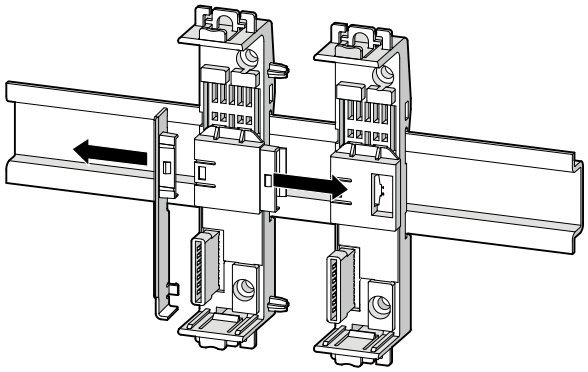
### Requirements

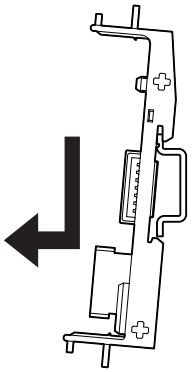
- The terminals have been removed or disconnected.

## Procedure

The figures show 22.5 mm devices. The 17.5 mm devices are removed correspondingly.

| Step | Instructions | Figure |
|---|---|---|
| 1 | Unlock the device using a screwdriver. |  |
| 2 | Pull the lower half of the device away from the device connector. | |
| 3 | Unlock the device using a screwdriver. | |
| 4 | Pull the device away from the device connector. |  |

| Step | Instructions | Figure |
|---|---|---|
| 5 | Separate the device connectors using a screwdriver |  |
| 6 | Remove the cover |  |

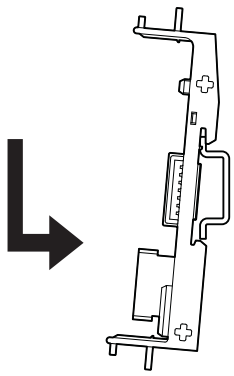
| Step | Instructions | Figure |
|---|---|---|
| 7 | Press the device connector downwards |  |
| 8 | Pull the lower half of the device connector away from the standard mounting rail | |
| 9 | Lift the device connector from the upper edge of the standard mounting rail | |

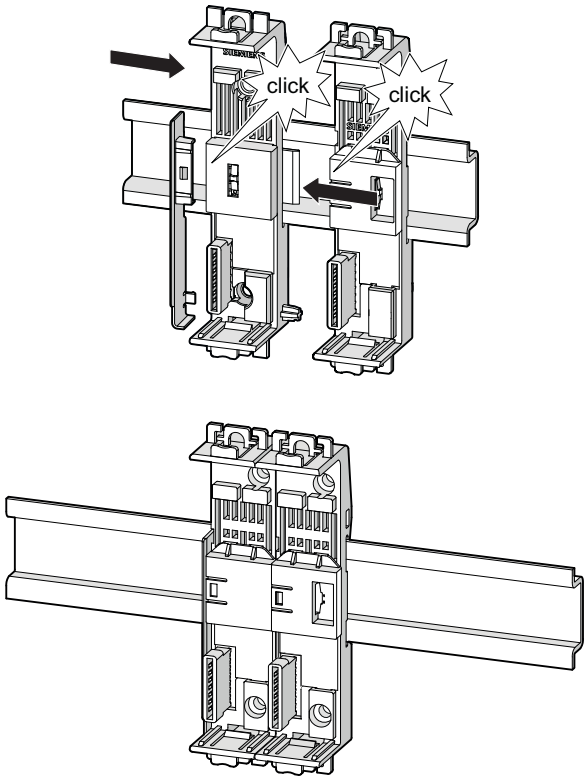
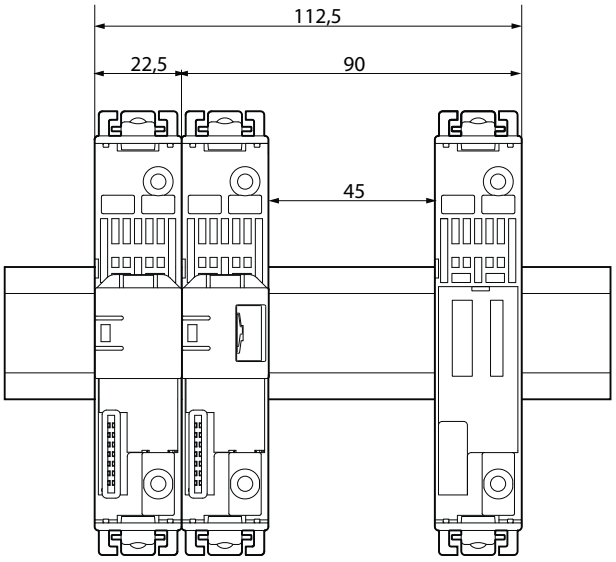
# 8.10 Mounting 90 mm devices with device connectors on a standard mounting rail

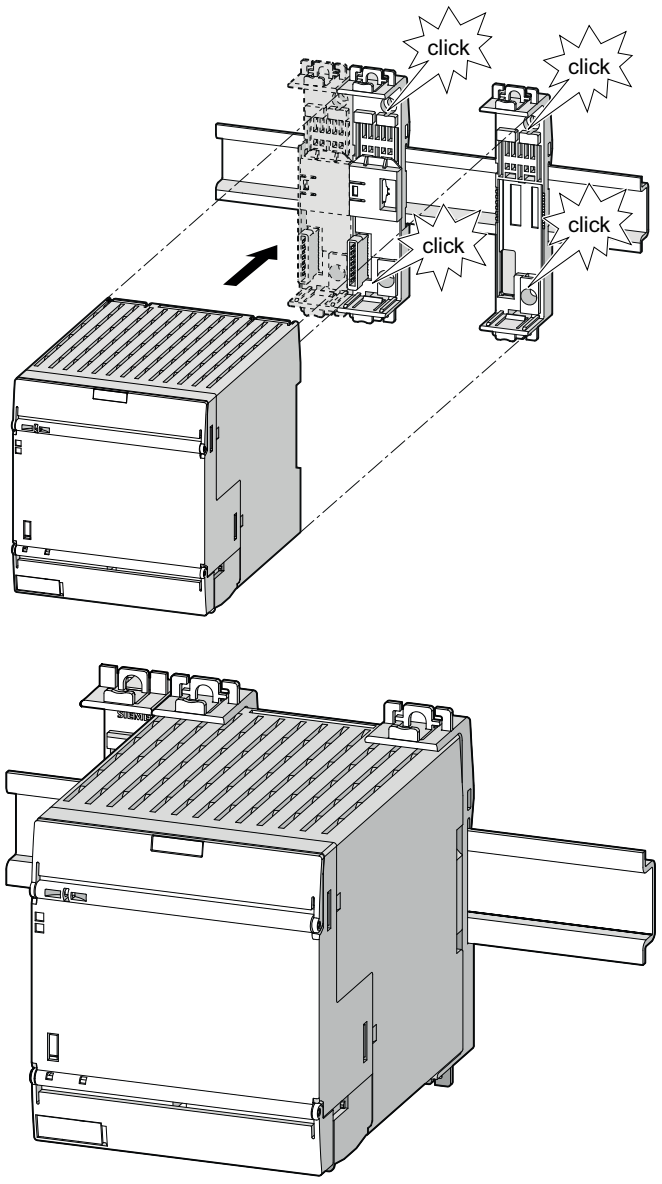
## Requirements

- A horizontal 35-mm wide mounting rail in accordance with DIN EN 60715 has been properly secured at the installation location.
- Please observe the information about the mounting position in the chapter "General technical data (Page 193)".
- Use device connectors type 2 for enclosures > 45 mm.
- Please observe the obligatory mounting rules in Section: "System configuration rules (Page 100)".

## Procedure

| Step | Instructions | Figure |
|---|---|---|
| 1 | Hang the back of the device connector onto the upper edge of the standard mounting rail |  |
| 2 | Press the lower half of the device connector against the standard mounting rail until the connector engages | |
| 3 | Repeat the process with all the device connectors required | |

| Step | Instructions | Figure |
|---|---|---|
| 4 | Push the device connectors together until they engage. |  |
| 5 | Mount the cover on the left of the first device connector piece and the device connectors supplied in the set for enclosures of 45 mm upwards (right-hand side) | |
| 6 | Note the clearances required for the 90 mm devices |  |

| Step | Instructions | Figure |
|---|---|---|
| 7 | Mount output expansion 3SK1213 on the device connectors |  |
| 8 | Mount all the devices required for the system configuration in accordance with the respective installation guidelines on the device connectors | |

## 8.11 Removing 90 mm devices with device connectors from a standard mounting rail

**WARNING**

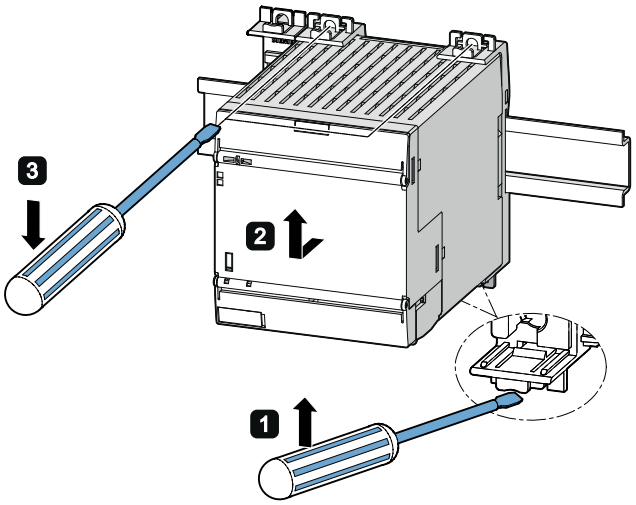
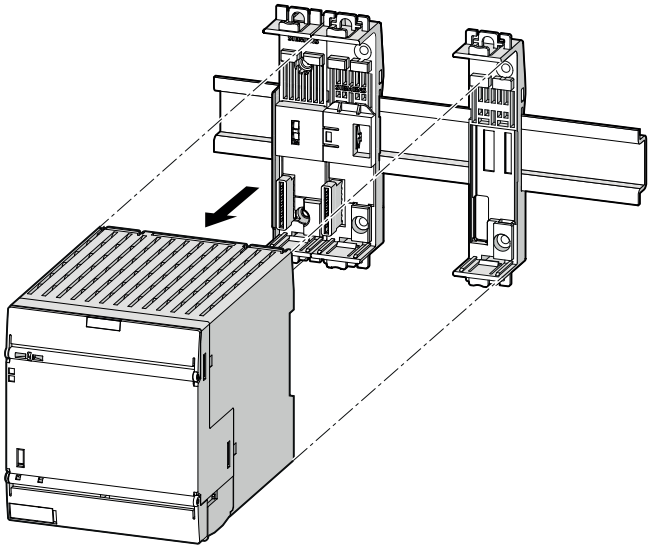
**Hazardous Voltage**
**Can Cause Death, Serious Injury, or Property Damage.**

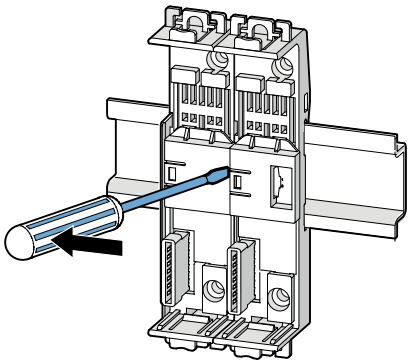
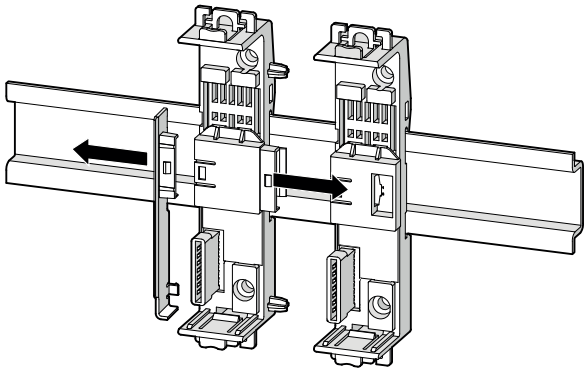
Before starting work, therefore, disconnect the system and devices from the power supply.

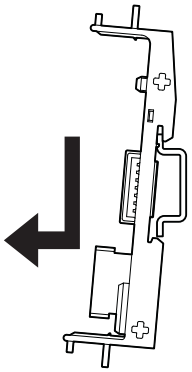
### Requirements

- The terminals have been removed or disconnected.

## Procedure

| Step | Instructions | Figure |
|---|---|---|
| 1 | Unlock the device using a screwdriver |  |
| 2 | Pull the lower half of the device away from the device connector. | |
| 3 | Unlock the device using a screwdriver | |
| 4 | Pull the device away from the device connector |  |

| Step | Instructions | Figure |
|---|---|---|
| 5 | Separate the device connectors using a screwdriver |  |
| 6 | Remove the termination piece. |  |

| Step | Instructions | Figure |
|---|---|---|
| 7 | Press the device connector downwards |  |
| 8 | Pull the lower half of the device connector away from the standard mounting rail | |
| 9 | Lift the device connector from the upper edge of the standard mounting rail | |

# 8.12 Mounting 22.5 mm/17.5 mm devices with device connectors on the wall

## Requirements

Please note the following requirements for mounting on a level surface:

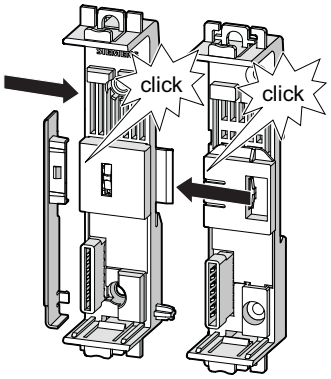
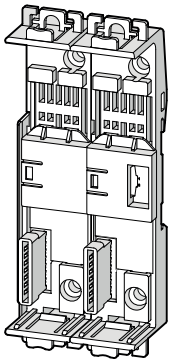
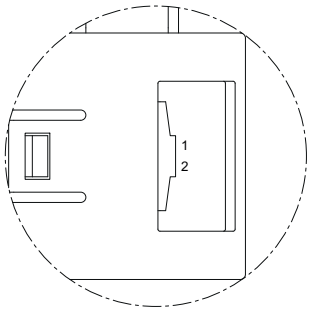
- Please observe the information about the mounting position in the chapter "General technical data (Page 193)".
- Two properly executed drill holes (per device connector) with thread or plug on the level surface.

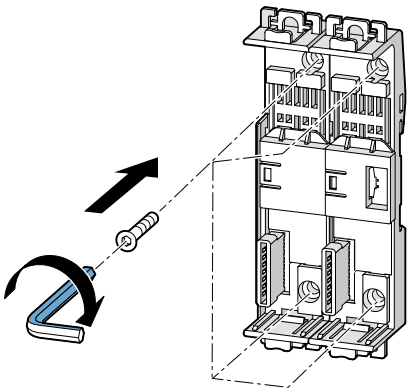
  For details of the distances between the drilled holes, please refer to the relevant dimension drawings in the chapter "Dimension drawings 3SK1 device connectors (Page 251)".
- Two screws (per device connector) to fit the holes M4 x12 in accordance with DIN 784.
- Device connector

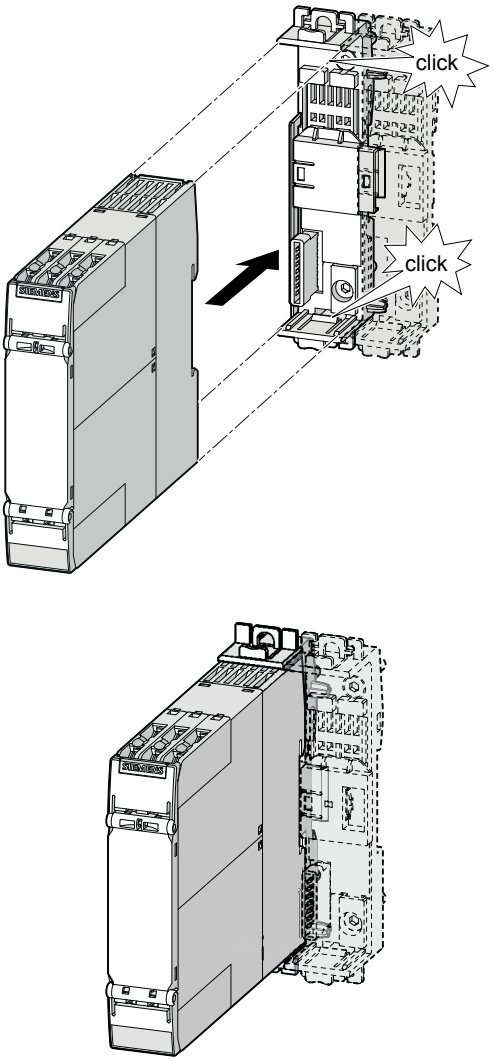
  Please refer to the accessories list for the relevant order number in the chapter "Accessories (Page 257)".

## Procedure for mounting on a level surface

The figures show 22.5 mm devices. The 17.5 mm devices are mounted correspondingly.

| Step | Instructions | Figure |
|---|---|---|
| 1 | Push the device connectors together until they engage |   |
| 2 | Mount the cover on the left of the first device connector. The cover is included in the scope of supply of the device termination connector | |
| 3 | Set the slide switches in the device termination connector (Type 1) to the following positions<br>• Below 3SK1 basic unit: position 2 (bottom; i.e. open)<br>• Below output expansion 3SK1211 position 1 (top; i.e. closed) |  |

| Step | Instructions | Figure |
|---|---|---|
| 4 | Hold the device connector on the level surface prepared for screw fastening. |  |
| 5 | Insert each screw through the relevant holes in the device connectors. | |
| 6 | Screw the device connector to the level surface so that it is secure.<br>Tightening torques:<br>• Top: < 0.1 Nm<br>• Bottom: 1 Nm | |

| Step | Instructions | Figure |
|---|---|---|
| 7 | Mount the device on the device connector |  |
| 8 | Mount all the devices required for the system configuration in accordance with the respective installation guidelines on the device connectors | |

# 8.13 Removing 22.5 mm/17.5 mm devices with device connectors from the wall

**⚠ WARNING**

**Hazardous Voltage**
**Can Cause Death, Serious Injury, or Property Damage.**

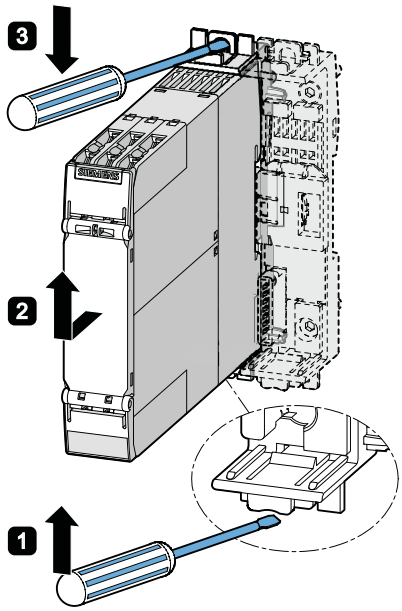
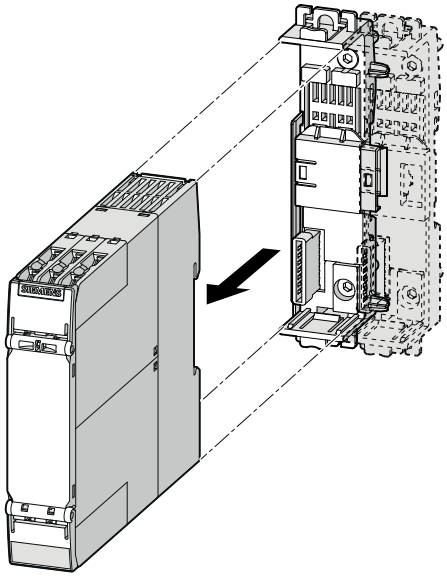
Before starting work, therefore, disconnect the system and devices from the power supply.

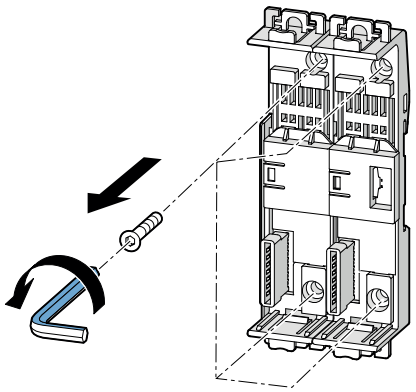
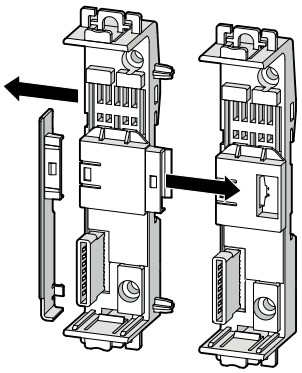
## Requirements

- The terminals have been removed or disconnected.

## Procedure

The figures show 22.5 mm devices. The 17.5 mm devices are removed correspondingly.

| Step | Instructions | Figure |
|---|---|---|
| 1 | Unlock the device (below) using a screwdriver |  |
| 2 | Pull the lower half of the device away from the device connector | |
| 3 | Unlock the device (above) using a screwdriver | |
| 4 | Pull the device away from the device connector |  |

| Step | Instructions | Figure |
|---|---|---|
| 5 | Release the screws |  |
| 6 | Separate the device connectors using a screwdriver | |
| 7 | Remove the cover |  |

## 8.14 Mounting 90 mm devices with device connectors on the wall

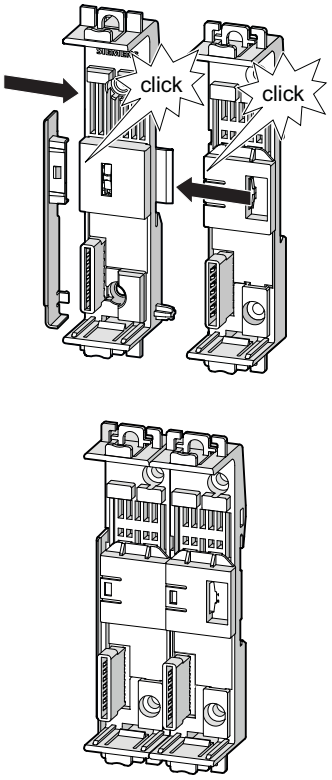
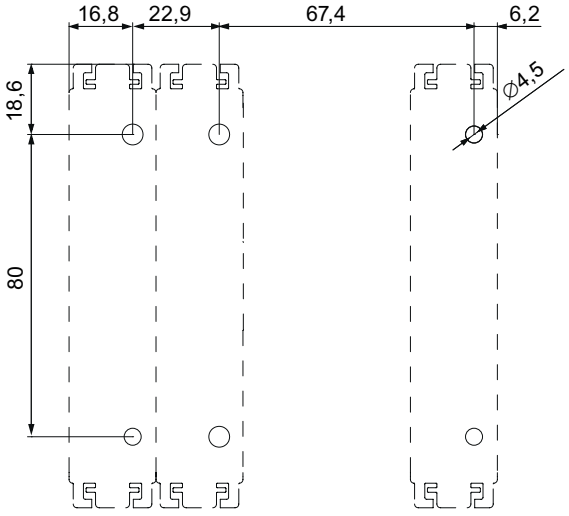
### Requirements

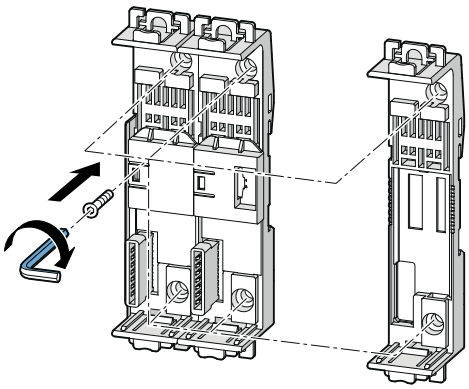
Please note the following requirements for mounting on a level surface:

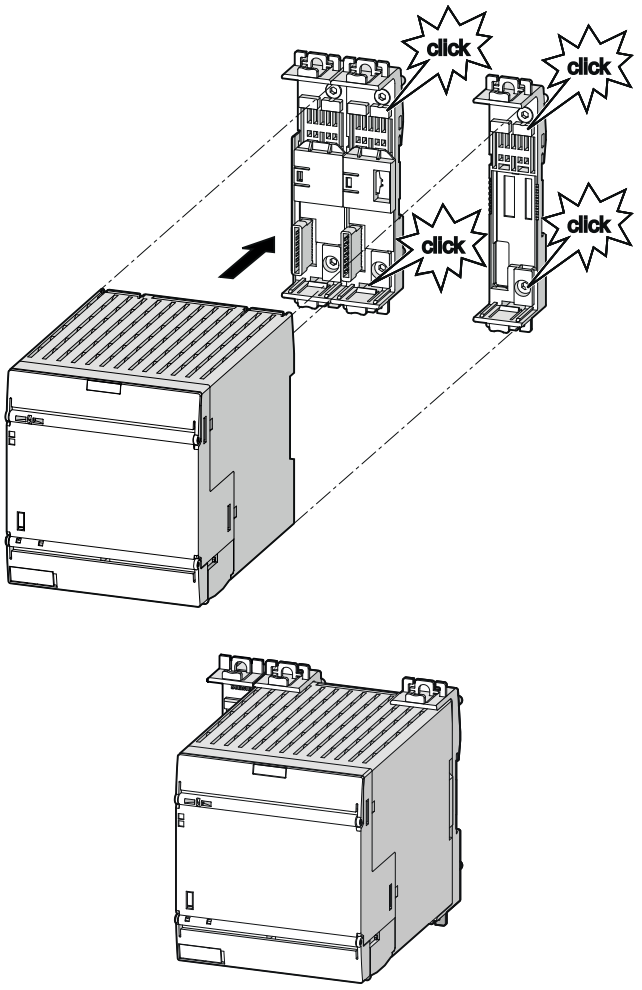
- Please observe the information about the mounting position in the chapter "General technical data (Page 193)".
- Please note the spacing of the drilled holes in the chapter "Dimension drawings for 3SK1 devices (Page 243)" and "Dimension drawings 3SK1 device connectors (Page 251)".
- Two properly executed drill holes with thread or plug on the level surface (per device connector)
- Two screws (per device connector) to fit the holes M4 x12 in accordance with DIN 784
- Device connector

  Please refer to the accessories list for the relevant order number in the chapter "Accessories (Page 257)".

## Procedure

| Step | Instructions | Figure |
|---|---|---|
| 1 | Push the device connectors together until they engage |  |
| 2 | Mount the cover on the left of the first device connector | |
| 3 | Note the clearances required for the 90 mm devices<br>Mount the device connector supplied in the set for enclosures of 45 mm upwards (right-hand side)<br>Tightening torques:<br>• Top: < 0.1 Nm<br>• Bottom: 1 Nm |  |

| Step | Instructions | Figure |
|---|---|---|
| 4 | Hold the device connector on the level surface prepared for screw fastening. |  |
| 5 | Insert each screw through the relevant holes in the device connectors. | |
| 6 | Screw the device connector to the level surface so that it is secure. | |

| Step | Instructions | Figure |
|---|---|---|
| 7 | Mount output expansion 3SK1213 on the device connectors |  |
| 8 | Mount all the devices required for the system configuration in accordance with the respective installation guidelines on the device connectors | |

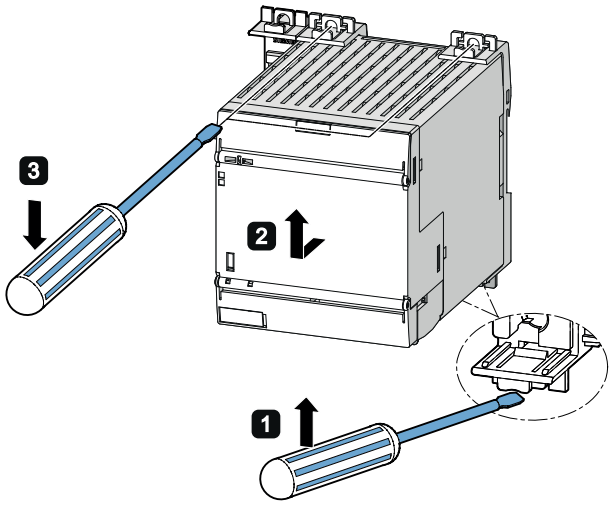
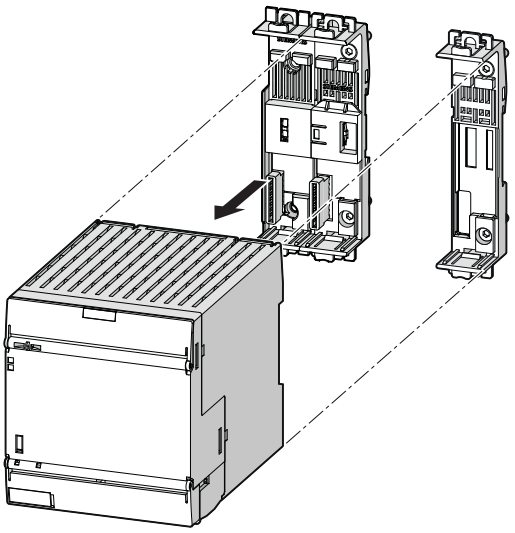
## 8.15 Removing 90 mm devices with device connectors from wall

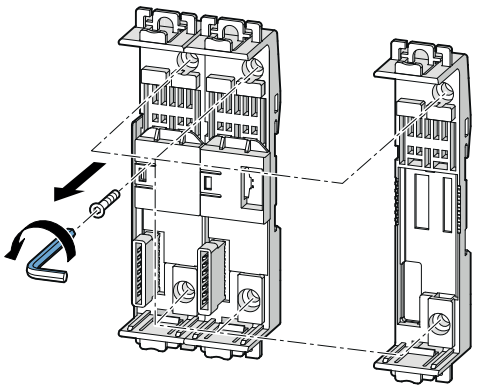
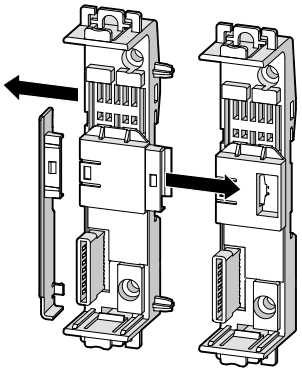
| ⚠ WARNING |
| --- |
| **Hazardous Voltage**<br>**Can Cause Death, Serious Injury, or Property Damage.**<br>Before starting work, therefore, disconnect the system and devices from the power supply. |

### Requirements

- The terminals have been removed or disconnected.

## Procedure

| Step | Instructions | Figure |
|---|---|---|
| 1 | Unlock the device (bottom) using a screwdriver |  |
| 2 | Pull the lower half of the device away from the device connector | |
| 3 | Unlock the device (top) using a screwdriver | |
| 4 | Pull the device away from the device connector |  |

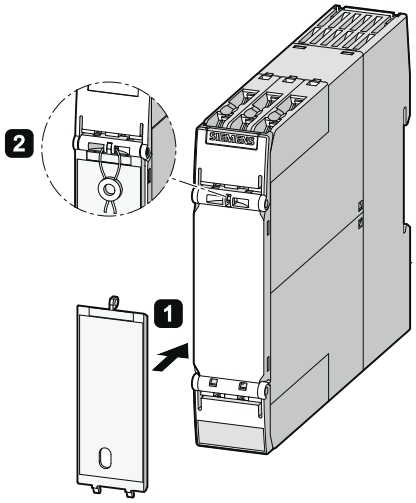
| Step | Instructions | Figure |
|---|---|---|
| 5 | Release the screws |  |
| 6 | Separate the device connectors |  |
| 7 | Remove the cover | |

# 8.16 Mounting the sealable cover

The sealable cover (3ZY1321-1AA00 for 17.5 mm devices, 3ZY1321-2AA00 for 22.5 mm devices) can be used to secure the DIP switches (and, if present, the rotary switches for setting the delay time) of the safety relays against unauthorized or unintended readjustment.

As an alternative, Siemens also offers a sealable membrane (3TK2820-0AA00) for securing the safety relays. The sealable membrane is fixed to the front of the safety relay and secures the DIP switches and the buttons (and rotary switches) against unintentional readjustment.

## Mounting the sealable cover

| Step | Instructions | Figure |
|---|---|---|
| 1 | Attach the hooks on the cover to the openings on the device and fold the cover up |  |
| 2 | Seal the cover to secure it against unauthorized removal. Sealing wire diameter, max.: 2 mm | |

# Connection

# 9

## 9.1 22.5 mm/17.5 mm devices

### 9.1.1 Terminal assignment

#### Location of the connections

The inside faces of the terminal covers are labeled with the designations of the relevant terminals. The position of the label corresponds to the position of the respective terminal.

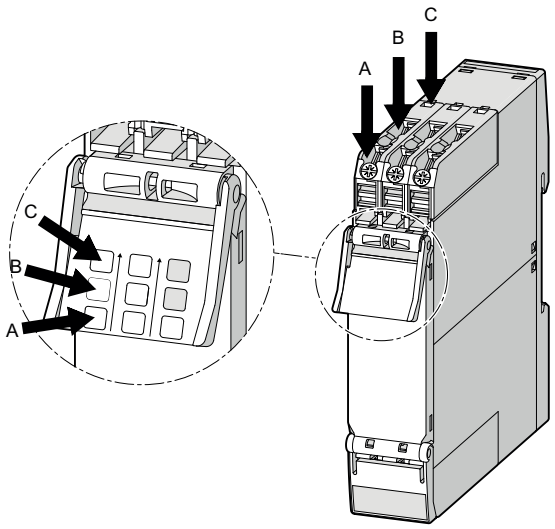



Figure 9-1 Upper terminal cover

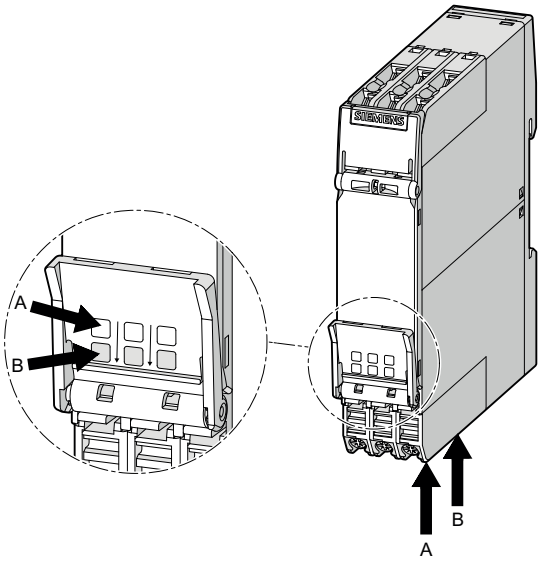
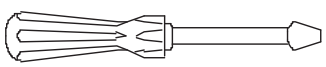
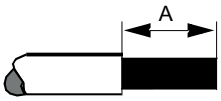
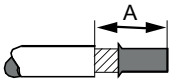
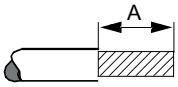



Figure 9-2 Lower terminal cover

## 9.1.2 Connection data for terminals

| | Specification and value in the case of removable terminals with screw-type terminals | Specification and value in the case of removable terminals with Push-In terminals |
|---|---|---|
| Screwdriver  | Cross-tip screwdriver<br>Size: PZ 1x80 (⌀ 4.5 mm)<br>Torque: 0.6 to 0.8 Nm | Screwdriver (3RA2908-1A)<br>Size: 3 mm for operating the springs<br>DIN 5264-A; 0.5 x 3 |
| Rigid cable   | A = 10 mm<br>1 x 0.5 ... 2.5 mm²<br>2 x 1.0 ... 1.5 mm² | A = 10 mm<br>1 x 0.5 ... 1.5 mm²<br>2 x 0.5 ... 1.5 mm² |
| Flexible conductor with end sleeve   | A = 10 mm<br>1 x 0.5 ... 2.5 mm²<br>2 x 0.5 ... 1.0 mm² | A = 10 mm<br>1 x 0.5 ... 1.0 mm²<br>2 x 0.5 ... 1.0 mm² |
| Flexible cable   | Not permissible | 1 x 0.5 ... 1.5 mm²<br>2 x 0.5 ... 1.5 mm² |
| AWG | 1 x 20 to 14<br>2 x 18 to 16 | 1 x 20 to 16<br>2 x 20 to 16 |

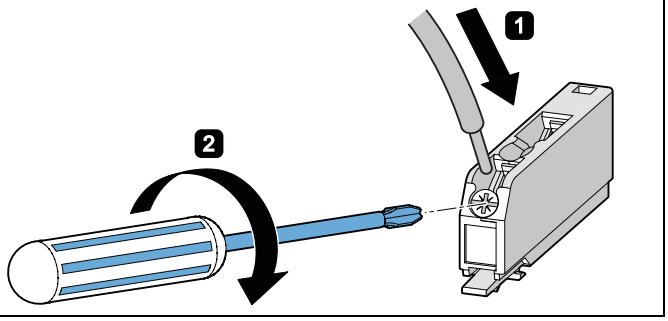
## 9.1.3 Connecting the screw-type terminals

| ⚠ WARNING |
| --- |
| **Hazardous Voltage**<br>**Can Cause Death, Serious Injury, or Property Damage.**<br>Before starting work, therefore, disconnect the system and devices from the power supply. |

### Requirements

- Cross-tip screwdriver size PZ 1 x 80.
- For suitable connection cross-sections of the cables, see the chapter "Connection data for terminals (Page 161)".

### Procedure

| Step | Instructions | Figure |
| --- | --- | --- |
| 1 | Insert the relevant cable into square on the screw-type terminal until it engages. |  |
| 2 | Hold the cable in the screw-type terminal. | |
| 3 | Tighten the screw with a torque of 0.8 to 1.2 N. | |
| 4 | Pull on the cable to ensure it is screwed tight. | |

## 9.1.4 Disconnecting the screw-type terminals

**⚠ WARNING**

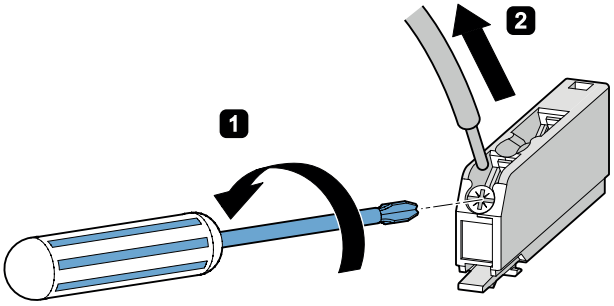
**Hazardous Voltage**
**Can Cause Death, Serious Injury, or Property Damage.**

Before starting work, therefore, disconnect the system and devices from the power supply.

### Requirements

- Cross-tip screwdriver size PZ 1 x 80

### Procedure

| Step | Instructions | Figure |
|---|---|---|
| 1 | Unscrew the screw of the screw-type terminal. |  |
| 2 | Remove the cable from the unscrewed screw-type terminal. | |

## 9.1.5 Connecting the push-in terminals

**⚠ WARNING**

**Hazardous Voltage**
**Can Cause Death, Serious Injury, or Property Damage.**

Before starting work, therefore, disconnect the system and devices from the power supply.

Push-in connections are a form of spring-loaded terminals allowing wiring without tools for rigid conductors or conductors equipped with end sleeves.

For wiring finely-stranded or stranded conductors without end sleeves on push-in connections, a screwdriver is required.

### Requirements

- 0.5 x 3 mm screwdriver DIN 5264 (for finely-stranded conductors only).
- For suitable connection cross-sections of the cables, see the chapter "Connection data for terminals (Page 161)".

### Procedure

Table 9- 1 Rigid conductors or conductors equipped with end sleeves

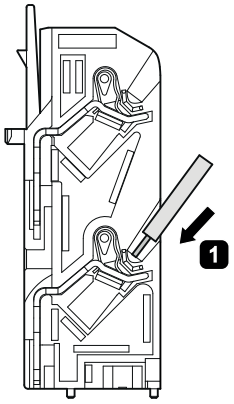
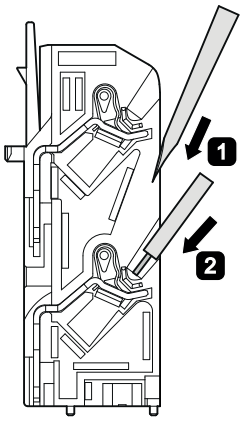
| Step | Instructions | Figure |
|---|---|---|
| 1 | Insert the cable into the oval opening as far as it will go. |  |
| 2 | Pull on the cable to ensure it is tight. | |

Table 9- 2 Finely-stranded conductors

| Step | Instructions | Figure |
|---|---|---|
| 1 | Insert the screwdriver in the rectangular opening to open the terminal (oval opening). |  |
| 2 | Insert the cable as far as it will go into the oval opening and remove the screwdriver. | |
| 3 | Pull on the cable to ensure it is tight. | |

## 9.1.6 Disconnecting the push-in terminals

**WARNING**

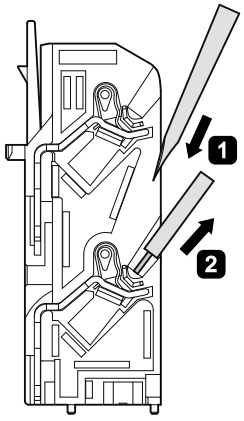
**Hazardous Voltage**
**Can Cause Death, Serious Injury, or Property Damage.**

Before starting work, therefore, disconnect the system and devices from the power supply.

### Requirements

- Screwdriver DIN 5264 of the size 0.5 x 3 mm

### Procedure

| Step | Instructions | Figure |
|---|---|---|
| 1 | Insert the flat-head screwdriver into the rectangular opening of the spring-loaded terminal until it engages. |  |
| 2 | Remove the cable from the oval opening. | |
| 3 | Remove the screwdriver. | |

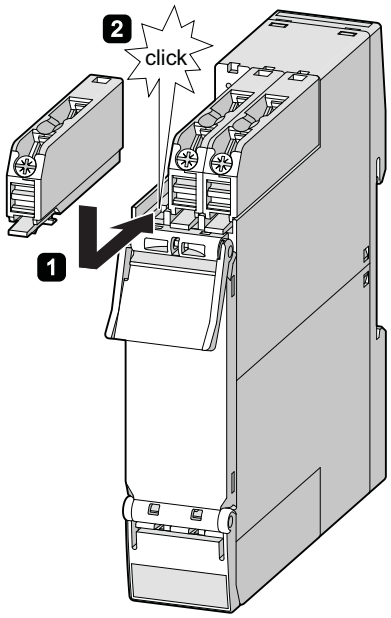
## 9.1.7 Attaching the terminals

| ⚠ WARNING |
| --- |
| **Hazardous Voltage**<br>**Can Cause Death, Serious Injury, or Property Damage.**<br>Before starting work, therefore, disconnect the system and devices from the power supply. |

### Requirements

You must have removed the terminal blocks, for the purpose of replacing a device, for example.

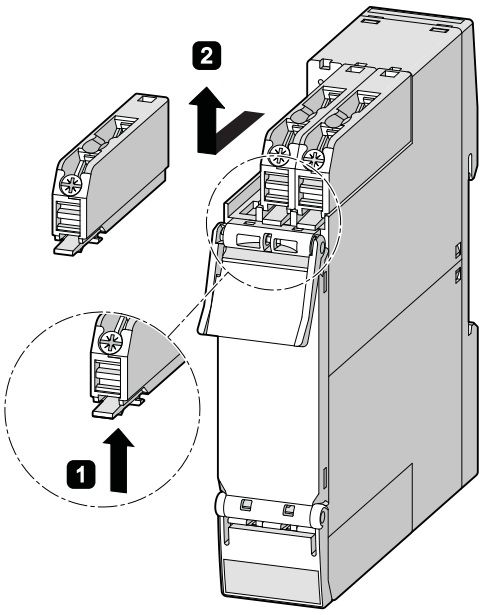
### Procedure when plugging in the terminal blocks

| Step | Instructions | Figure |
| --- | --- | --- |
| 1 | Insert the removable terminal block into the guide rail of the device. |  |
| 2 | Slide the removable terminal block back until it audibly engages. | |

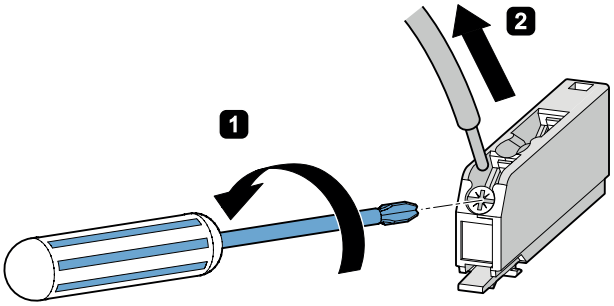
## 9.1.8 Disconnecting

| ⚠ WARNING |
| --- |
| **Hazardous Voltage** |
| Can Cause Death, Serious Injury, or Property Damage. |
| Before starting work, therefore, disconnect the system and devices from the power supply. |

### Removing terminal blocks from the device

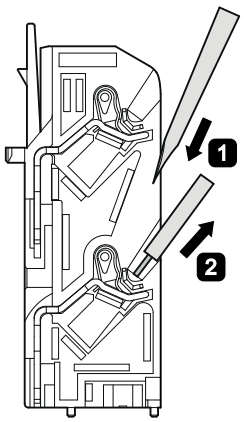
| Step | Instructions | Figure |
| --- | --- | --- |
| 1 | Press the clip of the terminal block upwards. |  |
| 2 | Pull the terminal block out to the front. | |
| 3 | Lift the terminal block out of the guide rail of the device. | |

## Screw terminals: Disconnecting the conductor

| Step | Instructions | Figure |
|---|---|---|
| 1 | Unscrew the screw of the screw-type terminal. |  |
| 2 | Remove the cable from the unscrewed screw-type terminal. | |



## Push-in terminals: Disconnecting the conductor

| Step | Instructions | Figure |
|---|---|---|
| 1 | Insert the flat-head screwdriver into the square opening of the push-in terminal until it engages. Please observe a 10° horizontal angular deviation of the screwdriver to the oval opening. |  |
| 2 | Remove the cable from the oval opening. | |
| 3 | Remove the screwdriver. | |

# 9.2 Devices 90 mm

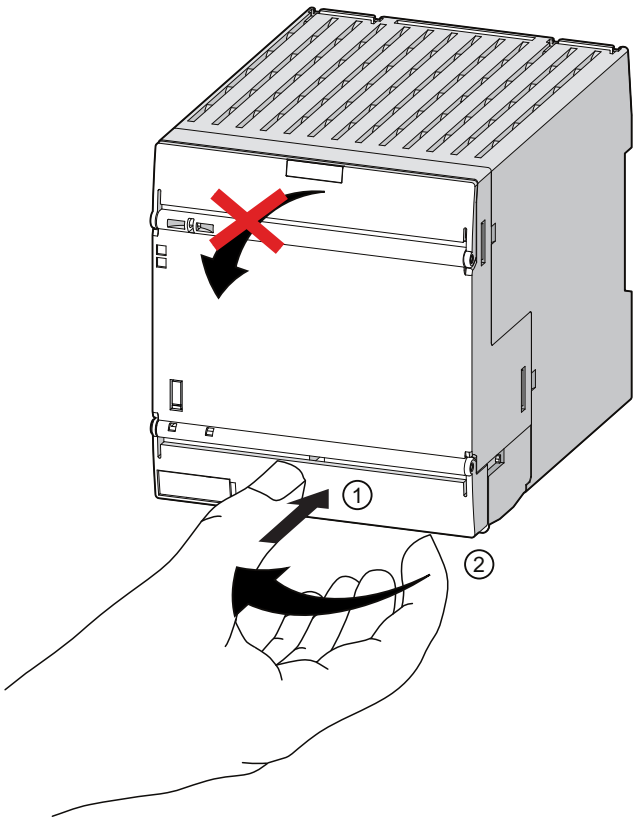
## 9.2.1 Opening the terminal cover

| ⚠ WARNING |
| --- |
| **Hazardous Voltage** |
| **Can Cause Death, Serious Injury, or Property Damage.** |
| Before starting work, therefore, disconnect the system and devices from the power supply. |

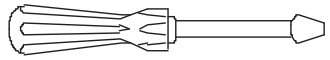
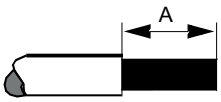
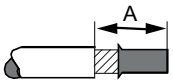
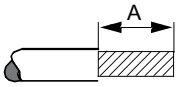
### Positions of the terminals and opening the terminal cover

Ther removable terminals are located under the **lower** terminal cover.

To open the terminal cover, press on it in the middle ① and lift it up ②.



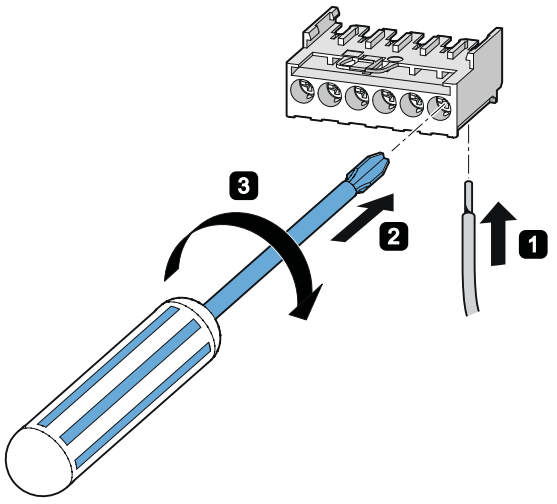
## 9.2.2 Connection data for terminals

| | Screwdriver for removable terminals with screw-type terminals | Screwdriver for removable terminals with spring-loaded terminals |
|---|---|---|
| Screwdriver  | Cross-tip screwdriver<br>Size: PZ 1 (⌀ 4 mm)<br>Torque: 0.8 to 1.2 Nm | Screwdriver<br>Size: 0 or 1 (width to 3 mm) for raising the terminal springs<br>DIN 5264-A; 0.5 x 3 |
| Rigid cable   | A = 10 mm<br>1 x 0.5 ... 4.0 mm$^2$<br>2 x 0.5 ... 2.5 mm$^2$ | A = 10 mm<br>1 x 0.5 ... 1.5 mm²<br>2 x 0.5 ... 1.5 mm² |
| Flexible cable with end sleeve/cable lug   | A = 10 mm<br>1 x 0.5 ... 2.5 mm²<br>2 x 0.5 ... 1.5 mm² | A = 10 mm<br>1 x 0.5 ... 1.5 mm²<br>2 x 0.5 ... 1.5 mm² |
| Flexible cable   | Not permissible | A = 10 mm<br>1 x 0.5 ... 1.5 mm²<br>2 x 0.5 ... 1.5 mm² |
| AWG | 1 x 20 to 12<br>2 x 18 to 14 | 1 x 20 to 16<br>2 x 20 to 16 |

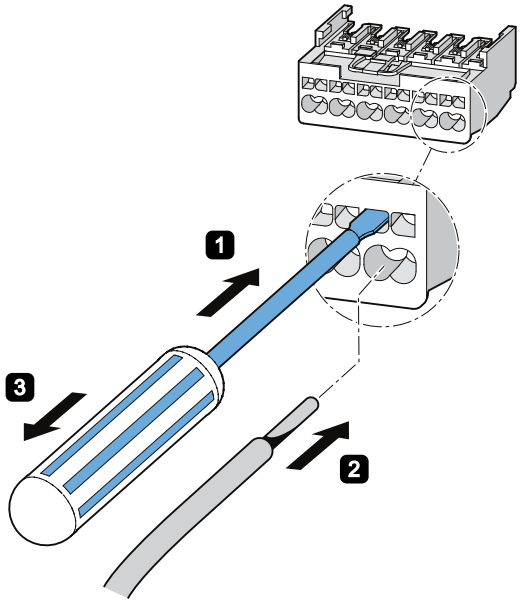
## 9.2.3 Connecting terminals

| WARNING |
| --- |
| **Hazardous Voltage**<br>**Can Cause Death, Serious Injury, or Property Damage.**<br>Before starting work, therefore, disconnect the system and devices from the power supply. |

### Procedure for screw-type terminal blocks

| Step | Instructions | Figure |
| --- | --- | --- |
| 1 | Insert the relevant cable into square on the screw-type terminal until it engages. |  |
| 2 | Hold the cable in the screw-type terminal. | |
| 3 | Tighten the screw of the terminal in which the cable is inserted. | |
| 4 | Pull on the cable to ensure it is screwed tight. | |

## Procedure for spring-loaded terminal blocks

| Step | Instructions | Figure |
|---|---|---|
| 1 | To release the clamping springs, insert the flat-head screwdriver as far as it will go into the square opening of the spring-loaded terminal. Please observe a 10° horizontal angular deviation of the screwdriver to the oval opening. |  |
| 2 | Insert the cable into the oval opening as far as it will go. | |
| 3 | Hold the cable in the spring-loaded terminal. | |
| 4 | Remove the screwdriver. | |
| 5 | Pull on the cable to ensure it is tight. | |

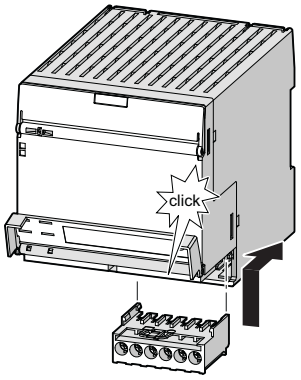
## 9.2.4 Mounting terminals

| ⚠ WARNING |
| --- |
| **Hazardous Voltage** |
| **Can Cause Death, Serious Injury, or Property Damage.** |
| Before starting work, therefore, disconnect the system and devices from the power supply. |

### Requirements

You must have removed the terminal blocks, for the purpose of replacing a device, for example.

### Procedure for mounting terminal blocks

| Step | Instructions | Figure |
| --- | --- | --- |
| 1 | Insert the removable terminal block into the guide rail of the device. |  |
| 2 | Slide the removable terminal block back until it audibly engages. | |
| 3 | Check that the clip of the removable terminal block closes flush with the front panel. | |

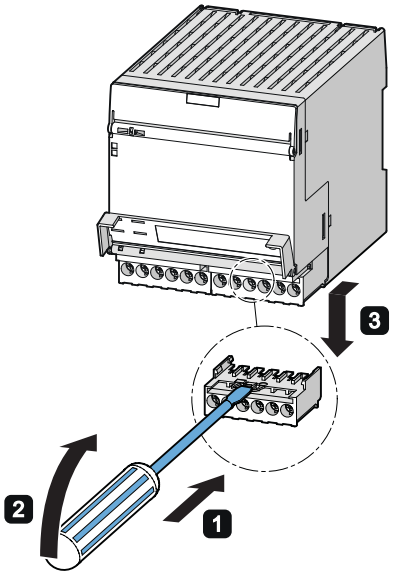
## 9.2.5 Disconnecting

**WARNING**

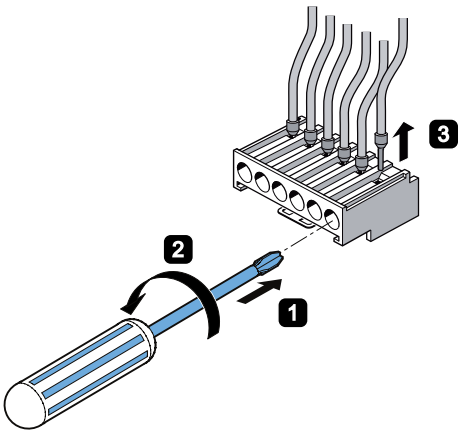
**Hazardous Voltage**
**Can Cause Death, Serious Injury, or Property Damage.**

Before starting work, therefore, disconnect the system and devices from the power supply.

### Removing terminals from the device

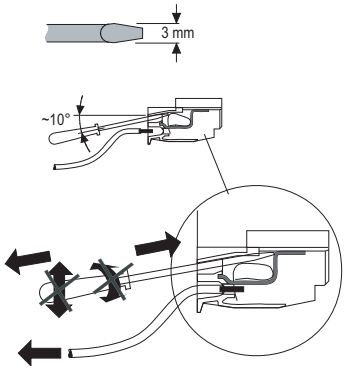
| Step | Instructions | Figure |
|---|---|---|
| 1 | Insert a flat-head screwdriver between the clip of the terminals and the front panel. |  |
| 2 | Pull the terminals out to the front. | |
| 3 | Lift the terminals out of the guide rail of the device. | |

## Disconnecting screw-type terminals

| Step | Instructions | Figure |
|---|---|---|
| 1 | Insert the screwdriver into the screw-type terminal. |  |
| 2 | Unscrew the screw of the screw-type terminal. | |
| 3 | Remove the cable from the unscrewed screw-type terminal. | |



## Disconnecting spring-loaded terminals

| Step | Instructions | Figure |
|---|---|---|
| 1 | Insert the flat-head screwdriver into the rectangular opening of the spring-loaded terminal until it engages. Please observe a 10° horizontal angular deviation of the screwdriver to the oval opening. |  |
| 2 | Remove the cable from the oval opening. | |
| 3 | Remove the screwdriver. | |

# 9.3 Device replacement

**⚠ WARNING**

**Hazardous Voltage**
**Can Cause Death, Serious Injury, or Property Damage.**

Before starting work, therefore, disconnect the system and devices from the power supply.

When replacing a device, you do not need to re-wire it. The terminal blocks can be disconnected from the defective device and then connected to the new device.

You can provide the terminal blocks with coding pins. These are to help you avoid errors when replacing the terminal blocks (see the chapter "Terminal coding (Page 124)" for more details).

## Replacing the module

**⚠ WARNING**

**Hazardous Voltage**
**Can Cause Death, Serious Injury, or Property Damage.**
**Carry out function test of the plant**

To ensure the safety of the system, a full functional test must be conducted and a successful result obtained after a device has been replaced.

**Note**

Only replace a defective device with a device of an identical order number.

1. Disconnect the defective device at the terminals.
   - Chapter for 22.5 mm devices Disconnecting (Page 168)
   - Chapter for 90 mm devices Disconnecting (Page 175)
2. Deinstall the defective device.
   - Chapter "Removing devices from a standard mounting rail (Page 131)"
   - Chapter "Removing 22.5 mm/17.5 mm devices with device connectors from a standard mounting rail (Page 135)"
   - Chapter "Removing 90 mm devices with device connectors from a standard mounting rail (Page 141)"

3. Mount the new device
   - Chapter "Mounting the devices on a level surface (Page 125)"
   - Chapter "Mounting the 22.5 mm/17.5 mm device on a standard mounting rail (Page 129)"
   - Chapter "Mounting the 90 mm devices on a standard mounting rail (Page 130)"
   - Chapter "Mounting 22.5 mm/17.5 mm devices with device connectors on the wall (Page 144)"
   - Chapter "Mounting 90 mm devices with device connectors on the wall (Page 151)"
4. Connect the defective device at the terminals
   - Chapter for 22.5 mm devices "Connecting the screw-type terminals (Page 162)", "Connecting the push-in terminals (Page 164)" and "Attaching the terminals (Page 167)"
   - Chapter for 90 mm devices "Connecting terminals (Page 172)" and "Mounting terminals (Page 174)"

After applying the supply voltage, the new 3SK1 basic unit checks whether the hardware configuration matches the device configuration.

If there are no deviations, the system re-enters safety mode.

# Configuration / operation 10

## 10.1 Procedure for configuration

**General information:**

- It is only possible to change the configuration (DIP switch, NC/NO evaluation, potentiometer, input and output expansion) in configuration mode. Modifications during operation are not accepted.
- A configuration change (DIP switch, NC/NO evaluation, potentiometer) is indicated in safety mode by the "DEVICE" LED flashing green/yellow, but does not change the device function.
- In safety mode, if a change in the system configuration (input and output expansion) is detected, the device switches to error mode ("DEVICE" LED and "SF" LED red). A restart is only possible using Power OFF/ON.

### Procedure for configuring a basic unit

1. Set the configuration (DIP, PAR, potentiometer, input expansion, output expansion) in accordance with the desired function.
2. Connect the power supply.
3. If the device detects a modified configuration, it remains in configuration mode (LEDs flash) during power up.
4. Confirm the new configuration by operating the SET/RESET pushbutton for more than 1s.
5. The configuration has been accepted and the device changes to safety mode.

---

**Note**

**Configuration and setting the delay time**

A change to the configuration must only ever be carried out when the system is disconnected from the power.

In safety mode, an adjustment to the potentiometer does not result in a change to the parameterized delay time.
A change to the potentiometer setting made during operation is not accepted and is indicated in safety mode by a yellow/green flashing "DEVICE" LED. The device can be restarted by performing a RESET (pressing the SET/RESET button) or by disconnecting and reconnecting the supply voltage. Following a restart, the device remains in safety configuration mode during power up (all enabling circuits are shut down) until the new delay time is accepted by pressing the SET/RESET button.

---

# 10.2 Explanation of the device's functions

## Explanation of the device's functions (DIP switches)

| DIP switch | Parameter | Function |
|---|---|---|
| 1 | Start type | • **Autostart:** The enabling circuits are switched to the active position as soon as the switch-on condition is satisfied at the sensor inputs IN1, IN2, INF and 1. The START button connection terminal INS is not queried.<br>• **Monitored start:** The enabling circuits are switched to the active position as soon as the switch-on condition is met at the sensor inputs IN1, IN2, INF and 1 and the START button at the terminal INS is actuated (start with the falling edge). |
| 2 | Cross-circuit detection | Cross-circuit detection is only possible with floating sensors. The sensors must be switched between T1 - IN1 and T2 – IN2 for this purpose. On terminals IN1 and PAR (if used), the device expects the test signal of terminal T1; and on terminals IN2 and INF , it expects the test signal of T2 . The device detects a sensor fault if the signal at terminals IN1, PAR or IN2, INF does not agree with test signals T1, T2.<br>Cross-circuit detection must be deactivated if electronic sensors such as light arrays or laser scanners are connected. The 3SK1 now no longer monitors the sensor inputs for cross-circuit detection. Usually, the outputs of safety sensors (OSSD) are already monitored for cross-circuits in the sensor.<br>Devices with PAR terminals expect the test signal T2 at the parameterization input. A 24 V signal at the PAR or INF terminals results in a fault (cross-circuit at the input). |
| 3 | Type of connection | • **1 sensor with 2 contacts** (1 x 2-channel) (NC/NC).<br>It is expected here that both contacts were open simultaneously.<br>With the additional connection of T1 to PAR, this DIP parameterization applies for ONE 2-channel sensor with NC/NO contacts.<br>• **2 sensors with one contact each** (2x single-channel) (NC/NC).<br>It is expected that both sensors are ANDed. Simultaneity is not monitored. |
| 4 | Startup testing | After a power failure, startup testing requires that the sensors at IN1 and IN2are actuated once by the system operator. |

## Function of the cascading input (terminal INK)

1. **Safe combination of safety relays**
   In this application, a higher-level safety relay switches off the 3SK1 safety relay via the cascading input via a safe output.
   Example:
   an EMERGENCY STOP circuit is to deactivate the entire installation as a higher-level circuit.
   Several function groups (e.g., protective doors) that disconnect locally can be operated as subordinate units.

   **⚠ WARNING**

   **Application / safety relay safety level**

   The safety level (PL/SIL) of the application corresponds to the lowest safety level of a subsystem of the application when errors are excluded (protected wiring of the control cable).

2. **Additional safety sensor circuit**
   The cascading input INK is ANDed with sensor inputs IN1, IN2 .
   PL c in accordance with ISO 13849-1, or SIL1 in accordance with IEC 62061 can be achieved if the cascading input is wired with single-channel (positive opening) safety sensors (supply via A1 / +24 V (identical potential to A1)) and if the connecting cable is laid in a protected fashion. The start function for the cascading input INK corresponds to the start response of sensor inputs IN1 and IN2 (autostart or monitored start).
   The cascading input INK can be triggered with floating or solid-state contact blocks (switching to P potential). Floating contact blocks must be connected between A1 / +24 V (identical potential to A1) and the cascading input.

3. **Normal switching duty**
   The cascading input INK can also be used for normal switching duty (not safe). The cascading input INK can be activated in this case with floating contact blocks or with solid-state contact blocks (switching to P potential).
   Floating contact blocks can be connected between A1 / +24 V and INK .
   It is important to note that the start function of cascading input INK corresponds to the start function of sensor inputsIN1, IN2 .

**When using a 3SK1 safety relay with instantaneous and time-delayed contacts, the two following safety notes must always be observed:**

| NOTICE |
| --- |
| **In the event of external faults such as:**<br>• Cross-circuit fault<br>• Short circuit to ground<br>• Current-source short circuit<br>and to access the configuration mode for copying a delay time after a reset, the following device behavior must always be taken into account:<br>The outputs of stop category 0 switch instantaneously, while the outputs of stop category 1 have a time delay.<br>The sequence cannot be interrupted.<br>Exception: Switching off the power supply. |

| NOTICE |
| --- |
| If the safe state is restored during the time delay, (e.g. the protective door is closed) and the START button is actuated, the enabling circuits switch to the active position immediately after the delay time has elapsed. The actuation of the START button is saved. |

| NOTICE |
| --- |
| **Observe the following in the case of protective doors with tumblers:**<br>If the voltage Us is disconnected on devices with time-delayed outputs between switching the instantaneous outputs and the time-delayed outputs, the delay time expires when the voltage Us is restored, and the time-delayed contacts change their switch positions. |

## 10.3 Modes

The 3SK1 safety relays have four main operating modes:

- Power-up
- Configuration mode
- Safety mode
- Error mode

### Power-up

On powering up (up to 7 seconds), the 3SK1 safety relay runs through a complete function test.

### Configuration mode

A saved configuration can only be modified in configuration mode.

The configuration must only ever be modified after disconnecting the power supply.

If the device detects a configuration change during the restart (DIP, PAR, potentiometer, input expansion, output expansion), it does not change automatically to safety mode after power up, but instead remains in configuration mode.
In configuration mode, the LEDs (yellow) whose DIP switch position is ON (right) flash; all other parameter settings are not explicitly indicated.

The configuration is accepted by pressing the SET/RESET button for approximately 1s.

In configuration mode, the device is in the safe state. No monitoring functions are active.

**Note**

A configuration change made during operation is not accepted, and in safety mode, this is indicated by a yellow/green flashing "DEVICE" LED. The device can be restarted by performing a RESET (pressing the SET/RESET button) or by disconnecting and reconnecting the supply voltage.

### Safety mode (DEVICE LED: green)

In safety mode, all monitoring functions are active in accordance with the set configuration.

**Note**

Parameterized startup testing is indicated by a green flashing "DEVICE" LED. Only when this has been successfully executed does the "DEVICE" LED show a green light.

### Error mode

Error mode is indicated by a red "DEVICE" LED or by a red "SF" LED. In error mode, the device **ALWAYS** changes to the safe state.

## 10.4 Response times

### 10.4.1 Response times

### Verification of response times in the case of safety circuits

When safety equipment is commissioned, steps must be taken to verify that a safety-related output will switch off within a maximum permissible response time if the input signal changes at the relevant input.

To provide this verification, you must determine the total response time of the application you have configured.

**Note**

Note that the calculation of the response time affects the level of safety and governs the overall design of the system.

You can find the response data of the safety relays in the technical data of the respective devices in the chapter Technical data (Page 193).

# Commissioning

# 11

**Note**

Since commissioning of the 3SK1 safety relays is an important, safety-related step, it must be carried out by qualified personnel.

**⚠ WARNING**

**Hazardous Voltage**

**Can Cause Death, Serious Injury, or Property Damage.**
**Carry out function test of the plant.**

To ensure the safety of the system, a full functional test of the system must be conducted after commissioning, and a successful result obtained.

## Commissioning the 3SK1safety relays

The 3SK1 safety relays are commissioned by applying the operating voltage.

After the supply voltage has been applied, all LEDs show a green light for about 1 s (lamp test). The LEDs then go out for approx. 0.5 s. The configuration of the device is then displayed on the configuration LEDs for approx. 3 s.

If a valid configuration is set and the potentiometer setting has been left unchanged, the device is now ready for operation and is in safety mode.

If no configuration change (DIP, PAR, potentiometer, input expansion, output expansion) has been detected, the device changes automatically to safety mode and is ready for operation. However, if the device detects a deviation of the set parameters from the saved configuration, it remains in safe configuration mode until the new configuration is accepted by pressing the SET/RESET button.

**Note**

**Observe the following during commissioning:**

The cascading input must be jumpered ( 24 V DC) if it is not to be used.

Monitoring of the feedback circuits is not optional.

# Display and diagnostics

# 12

## 12.1 LED display

The LED indications of the Advanced safety relays are shown in the tables below. You can find the LED indications of the Standard safety relays in the chapter "Display of the operating state (Page 47)".

| LED | Display | Explanation |
|---|---|---|
| (1) DEVICE | OFF* | No voltage, group error<br>Configuration mode DIP (1) position: **left** |
| | Green | Device is ready for operation<br>Power-up: hardware test |
| | Green flashing | Missing startup testing<br>Short-circuit on the SET/RESET button |
| | Yellow | Power-up DIP (1) position: **right** |
| | Yellow flashing | Configuration mode DIP (1) position: **right** |
| | Green/yellow flashing | Configuration changed |
| | Red | Device error |
| (2) OUT | OFF* | Output inactive<br>Configuration mode DIP (2) position: **left** |
| | Green | Output active<br>Power-up: hardware test |
| | Green flashing | Feedback circuit error<br>Short-circuit on the SET/RESET button |
| | Yellow | Power-up DIP (2) position: **right** |
| | Yellow flashing | Configuration mode DIP (2) position: right<br>START button pressed too long |
| | Green/yellow flashing | Instantaneous outputs inactive, delayed outputs active |

| LED | Display | Explanation |
|---|---|---|
| (3) IN | OFF* | Start conditions not fulfilled<br>Configuration mode DIP (3) position: **left** |
| | Green | Start conditions fulfilled<br>Power-up: hardware test |
| | Green flashing | • For 1x2-channel: Simultaneity of sensors not fulfilled<br>• For two-hand operation: time monitoring violated<br>• For monitored start: START button not yet pressed<br>Short-circuit on the SET/RESET button |
| | Yellow | Power-up DIP (3) position: **right** |
| | Yellow flashing | Short-circuit of T1/T2 to ground or 24 V<br>With input expansion: missing enabling signal of input expansion<br>Group error: Cross-circuit at input<br>Configuration mode DIP (3) position: **right** |
| | Flickering yellow | Configuration mode: Special configuration, two-hand operation |
| | Flickering red | Configuration mode: impermissible configuration |
| (4) SF | OFF* | No group error<br>Configuration mode DIP (4) position: **left** |
| | Green | Power-up: hardware test |
| | Green flashing | Short-circuit on the SET/RESET button |
| | Yellow | Power-up DIP (4) position: **right** |
| | Yellow flashing | Configuration mode DIP (4) position: **right** |
| | Red | Group error (e.g. cross-circuit at input, short-circuit to P, device configuration changed) |
| | Red flashing | Error message (e.g. short-circuit T1/T2, violation of simultaneity, violation of time monitoring two-hand operation, feedback circuit error, START-button pressed too long) |

* LED flashes briefly in configuration mode due to lamp test

## 12.2 Power-up

### Display mode during power-up / parameterization in configuration mode

| LED | Display | Explanation |
|---|---|---|
| (1) DEVICE | Yellow or yellow flashing | Monitored start |
| | Off | Autostart |
| (2) OUT | Yellow or yellow flashing | Cross-circuit detection ON |
| | Off | Cross-circuit detection off |
| (3) IN | Yellow or yellow flashing | 1 x two-channel |
| | Flickering yellow | Configuration mode: Special configuration, two-hand operation |
| | Flickering red | Configuration mode: impermissible configuration |
| | Off | 2 x single-channel |
| (4) SF | Yellow or yellow flashing | Startup testing off |
| | Off | Startup testing ON |

## 12.3 Error statuses

| LED | Display | Explanation |
|---|---|---|
| (1) DEVICE | Red | Device error |
| (4) SF | Red | Group error |
| | Red flashing | Fault message |

## 12.4 Diagnostics

### Power-up

| Explanation | DEVICE | OUT | IN | SF |
|---|---|---|---|---|
| Hardware test<br>(Note: input expansions remain in this state until acknowledged by the device on the right-hand side) | Green | Green | Green | Green |
| The SET/RESET button is stuck, or has been pressed too long. The device remains in this state until the button is released again. | Green flashing | Green flashing | Green flashing | Green flashing |
| Display of DIP switch configuration | If the DIP switch position is at ON (right), the relevant LED shows a yellow light | | | |

## Configuration

| Explanation | DEVICE | OUT | IN | SF |
|---|---|---|---|---|
| Indication of a modified configuration | If the DIP switch position is at ON (right), the relevant LED flashes yellow | | | |
| Special configuration, two-hand operation (NC/NO, autostart, 2x1-channel) | Off | If the DIP switch position is at ON (right), the relevant LED flashes yellow | Flickering yellow | If the DIP switch position is at ON (right), the relevant LED flashes yellow |
| Impermissible configuration (NC/NO, monitored start, 2x1-channel) | Yellow flashing | If the DIP switch position is at ON (right), the relevant LED flashes yellow | Flickering red | If the DIP switch position is at ON (right), the relevant LED flashes yellow |
| All DIP switches are at OFF (left) | All LEDs light up briefly (yellow) at intervals | | | |

## Safety mode

| Explanation | DEVICE | OUT | IN | SF |
|---|---|---|---|---|
| No startup testing | Green flashing | Off | Off | Off |
| Device ready for operation, all outputs OFF | Green | Off | Off | Off |
| Device ready for operation, all outputs ON | Green | Green | Green | Off |
| Device ready for operation, instantaneous outputs OFF, time-delayed outputs ON | Green | Green/yellow flashing | Off | Off |
| For monitored start: START button not yet pressed | Green | Off | Green flashing | Off |
| With input expansion: missing enabling signal of input expansion | Green | Off | Yellow flashing | Off |
| Configuration has been changed (PAR, DIP switch, potentiometer) | Green/yellow flashing | — [1)] | — [1)] | — [1)] |
| For 1x2-channel: Simultaneity violated,<br>For two-hand operation: time monitoring violated | Green | Off | Green flashing | Red flashing |
| Short-circuit test clock output T1 or T2 | Green[2)] | Off | Yellow flashing | Red flashing |
| For monitored start: START button was pressed too long or has a short-circuit | Green | Yellow flashing | Off | Red flashing |
| Feedback circuit error | Green | Green flashing | Green | Red flashing |

1) Dependent on device status

2) Green flashing DEVICE LED: No startup testing

## Error mode

| Explanation | DEVICE | OUT | IN | SF |
|---|---|---|---|---|
| Device fault (restart possible by pressing the SET/RESET button) | Red | Off[3)] | Off[3)] | Off[3)] |
| Group error (restart possible by pressing the SET/RESET button) | Off[3)] | Off[3)] | Off[3)] | Red |
| Group error, cross-circuit at the input (restart possible by pressing the SET/RESET button) | Off[3)] | Off[3)] | Flashing yellow[3)] | Red |
| System stop (restart possible by disconnecting and re-connecting the operating voltage) | Red | Off[3)] | Off[3)] | Red |

3) On time-delayed devices, the LED flashes green/yellow provided the time-delayed outputs are still switched on

# Technical data

# 13

## 13.1 General technical data

Technical data valid for all 3SK1 products in this manual.

| | | |
|---|---|---|
| **Product brand name** | | SIRIUS |
| **Product designation** | | Safety relay |
| **Version of the product** | | for EMERGENCY STOP and protective doors |
| **IP degree of protection of the enclosure** | | IP20 |
| **Touch protection against electric shock** | | Safe from finger-touch |
| **Ambient temperature**<br>• **during storage**<br>• **during operation** | °C | <br>-40 ... +80<br>-25 ... +60 |
| **Air pressure**<br>Comply with the instructions given for the respective device<br>• **according to SN 31205** | hPa | 900 ... 1060 |
| **Relative air humidity**<br>• **During operation without condensation** | % | 10 ... 95 |
| **Maximum operating altitude above MSL** | m | 2000 |
| **Vibration resistance according to IEC 60068-2-6** | | 5 ... 500 Hz: 0.75 mm |
| **Degree of pollution** | | 3 |
| **Overvoltage category** | | III |
| **Distance to be maintained at the side with side-by-side mounting** | mm | 0 |
| **Distance to be maintained at the side from grounded parts** | mm | 5 |
| **$DC_{avg}$**<br>average diagnostics coverage level | | > 99 % |
| **$MTTF_d$**<br>Mean Time To dangerous Failure | | > 30 years |
| **Item designation**<br>In accordance with DIN 40719, expanded in accordance with IEC 204-2 and IEC 750 | | - |
| **Item designation**<br>in accordance with DIN EN 61346-2 | | F |
| **Hardware failure tolerance**<br>in accordance with IEC 61508 | | 1 |

| | | | |
|---|---|---|---|
| **Mounting position** | | Any (except 3SK1213)<br>3SK1213: +/- 22.5° lateral inclination | |
| **Type of fixing** | | Snap-on mounting<br>Comply with the instructions given for the respective device | |
| **Type of electrical connection** | | 3SK....-1....<br>screw-type | 3SK....-2....<br>push-in connection |
| **Maintenance** | | The 3SK1 safety relays are maintenance-free | |
| **Certificate of suitability**<br>• **TÜV approval**<br>• **UL certification**<br>• **CSA approval** | | Yes (except 3SK1230)<br>Yes<br>Yes | |

### Electrical service life (B10 values) of the 3SK1 safety relays

**Note**

When using the devices to equip furnaces to DIN EN 50156-1, the load (utilization category) listed below must not be exceeded.

Electrical service life ≥ 250000 operating cycles at:

| Utilization category | 3SK111; 3SK1121; 3SK1211 | 3SK1213 |
|---|---|---|
| AC-1, 240 V | 1.5 A | 10.0 A |
| AC-15, 240 V | 0.2 A | 10.0 A |
| DC-13, 24 V | 2.0 A | 3.0 A |

### $B10_d$ values for the 3SK1 safety relays

Device versions:

3SK1121-.AB40
3SK1111-.AB30
3SK1111-.AW20
3SK1211-.BB40
3SK1211-.BB00
3SK1211-.BW20

| Utilization category | Ue (V) | Ie (A) | $B10_d$ value (operating cycles) |
|---|---|---|---|
| AC-1 | 240 | 5 | 500000 |
| | | 4 | 860000 |
| | | 2 | 1300000 |
| AC-15 | 240 | 4 | 300000 |
| | | 3 | 850000 |
| | | 1 | 1100000 |
| DC-13 | 24 | 5 | 300000 |
| | | 2 | 2000000 |
| | | 1 | 7000000 |

Device version:
3SK1121-.CB4.

| Utilization category | Ue (V) | Ie (A) | $B10_d$ value (operating cycles) |
|---|---|---|---|
| AC-1 | 240 | 5 | 500000 |
| | | 4 | 600000 |
| | | 2 | 1000000 |
| AC-15 | 240 | 3 | 400000 |
| | | 0.1 | 10000000 |
| DC-13 | 24 | 3 | 450000 |
| | | 1 | 2000000 |

Device versions:
3SK1213-.AB40
3SK1213-.AJ20
3SK1213-.AL20

| Utilization category | Ue (V) | Ie (A) | $B10_d$ value (operating cycles) |
|---|---|---|---|
| AC-1 | 240 | 10 | 1370000 |
| AC-15 | 240 | 10 | 1370000 |
| DC-13 | 24 | 6 | 1370000 |

### PFHD and PFDavg values of the 3SK1 safety relays

The table below shows the values of the:

- Average frequency of a hazardous failure of the safety function per hour **(PFH)** at a high demand rate in accordance with IEC 61508.
- Average probability of failure of the safety function upon demand **(PFDavg)** at a low demand rate in accordance with IEC 61508.

| Safety relay | PFH [1/h] less than | PFDavg less than |
|---|---|---|
| 3SK1111-.AB30 | 1.7 $E^{-09}$ | 1.0 $E^{-06}$ |
| 3SK1111-.AW20 | 1.5 $E^{-09}$ | 1.0 $E^{-06}$ |
| 3SK1112-.BB40 | 1.0 $E^{-09}$ | 7.0 $E^{-06}$ |
| 3SK1121-.AB40 | 2.5 $E^{-09}$ | 7.0 $E^{-06}$ |
| 3SK1121-.CB41 | 3.7 $E^{-09}$ | 7.0 $E^{-06}$ |
| 3SK1121-.CB42 | 3.7 $E^{-09}$ | 7.0 $E^{-06}$ |
| 3SK1121-.CB44 | 3.7 $E^{-09}$ | 7.0 $E^{-06}$ |
| 3SK1122-.AB40 | 1.3 $E^{-09}$ | 7.0 $E^{-06}$ |
| 3SK1122-.CB41 | 1.5 $E^{-09}$ | 7.0 $E^{-06}$ |
| 3SK1122-.CB42 | 1.5 $E^{-09}$ | 7.0 $E^{-06}$ |
| 3SK1122-.CB44 | 1.5 $E^{-09}$ | 7.0 $E^{-06}$ |
| 3SK1120-.AB40 | 1.3 $E^{-09}$ | 7.0 $E^{-06}$ |
| 3SK1211-.BB40 | 1.7 $E^{-09}$ | 1.0 $E^{-06}$ |
| 3SK1211-.BB00 | 1.7 $E^{-09}$ | 1.0 $E^{-06}$ |
| 3SK1211-.BW20 | 1.7 $E^{-09}$ | 1.0 $E^{-06}$ |
| 3SK1213-.AB40 | 1.0 $E^{-09}$ | 1.0 $E^{-06}$ |
| 3SK1213-.AJ20 | 1.0 $E^{-09}$ | 1.0 $E^{-06}$ |
| 3SK1213-.AL20 | 1.0 $E^{-09}$ | 1.0 $E^{-06}$ |
| 3SK1220-.AB40 | 1.0 $E^{-09}$ | 7.0 $E^{-06}$ |

You will find further technical data in the "Technical Data" chapters of each product and in the "Dimension Drawings" chapter.

# 13.2 Basic units

## 13.2.1 Standard

### 13.2.1.1 Technical data for 3SK1111 Standard relay basic unit

| | | 3SK1111-.AB.. | 3SK1111-.AW.. |
|---|---|---|---|
| **Insulation voltage rated value** | V | 300 | |
| **Resistance against shock** | | 10g / 11 ms | |
| **Number of sensor inputs 1-channel or 2-channel** | | 1 | |
| **Design of the cascading** | | none | |
| **Type of the safety-related wiring of the inputs** | | single-channel and two-channel | |
| **Product feature transverse contact-secure** | | Yes | |
| **Safety Integrity Level (SIL)** | | | |
| • according to IEC 61508 | | SIL3 | |
| • for delayed release circuit according to IEC 61508 | | — | |
| **Performance Level (PL)** | | | |
| • according to ISO 13849-1 | | e | |
| • for delayed release circuit according to ISO 13849-1 | | — | |
| **Category according to ISO 13849-1** | | 4 | |
| **T1 value for proof test interval or service life according to IEC 61508** | a | 20 | |
| **Safety device type according to IEC 61508-2** | | Type A | |

| | | 3SK1111-.AB.. | 3SK1111-.AW.. |
|---|---|---|---|
| **Number of outputs** | | | |
| • as contact-affected switching element | | | |
| – as NC contact for reporting function delayed switching | | 0 | |
| – as NC contact for reporting function instantaneous switching | | 1 | |
| – as NC contact safety-related delayed switching | | 0 | |
| – as NC contact safety-related instantaneous switching | | 0 | |
| – as NO contact for reporting function delayed switching | | 0 | |
| – as NO contact for reporting function instantaneous switching | | 0 | |
| – as NO contact safety-related delayed switching | | — | |
| – as NO contact safety-related instantaneous switching | | 3 | |
| • as contact-less semiconductor switching element for reporting function delayed switching | | — | |
| • as contact-less semiconductor switching element for reporting function non-delayed | | 0 | |
| • as contact-less semiconductor switching element safety-related delayed switching | | 0 | |
| • as contact-less semiconductor switching element safety-related non-delayed | | 0 | |
| **Stop category according to DIN EN 60204-1** | | 0 | |
| **Design of the input** | | | |
| • cascading-input/functional switching | | No | |
| • feedback input | | Yes | |
| • start input | | Yes | |
| **Design of the electrical connection jumper socket** | | No | |
| **Operating cycles maximum** | 1/h | 360 | |
| **Switching capacity current of the semiconductor outputs at DC-13 at 24 V** | A | — | |

| | | 3SK1111-.AB.. | 3SK1111-.AW.. |
|---|---|---|---|
| **Switching capacity current of the NO contacts of the relay outputs** | | | |
| • at DC-13 | | | |
| – at 24 V | A | 5 | |
| – at 115 V | A | 0.2 | |
| – at 230 V | A | 0.1 | |
| • at AC-15 | | | |
| – at 115 V | A | 4 | |
| – at 230 V | A | 4 | |
| **Switching capacity current of the NC contacts of the relay outputs** | | | |
| • at DC-13 | | | |
| – at 24 V | A | 1 | |
| – at 115 V | A | 0.2 | |
| – at 230 V | A | 0.1 | |
| • at AC-15 | | | |
| – at 115 V | A | 1.5 | |
| – at 230 V | A | 1.5 | |
| **Thermal current of the contact-affected switching element maximum** | A | 5 | |
| **Total current maximum** | A | 12 | |
| **Mechanical operating cycles as operating time typical** | | 10 000 000 | |
| **Max. permissible voltage for safe isolation between electronic evaluation device and enabling circuit according to EN 60947-1** | V | — | |
| **Design of the fuse link for short-circuit protection of the NO contacts of the relay outputs required** | | gL/gG: 6A or circuit breaker type A: 3A or circuit breaker type B: 2A or circuit breaker type C: 1A | |
| **Cable length between sensor and electronic evaluation device with Cu 1.5 mm² and 150 nF/km maximum** | m | 2 000 | |

| | | 3SK1111-.AB.. | 3SK1111-.AW.. |
|---|---|---|---|
| **Make time** | | | |
| • with automatic start | | | |
| – typical | s | 0.2 | 0.11 |
| – for DC maximum | s | 0.32 | 0.13 |
| – for AC maximum | s | 0.32 | 0.13 |
| – after mains power cut | | | |
| – typical | s | 0.2 | 0.11 |
| – maximum | s | 0.32 | 0.13 |
| • with monitored start | | | |
| – typical | s | 0.015 | |
| – maximum | s | 0.02 | 0.015 |
| **Backslide delay time** | | | |
| • after opening of the safety circuits typical | s | 0.01 | |
| • at mains power cut | | | |
| – typical | s | 0.065 | 0.2 |
| – maximum | s | 0.075 | 0.3 |
| **Adjustable backslide delay time** | | | |
| • after opening of the safety circuits | s | — | |
| **Recovery time** | | | |
| • after opening of the safety circuits typical | s | 0.01 | |
| • after mains power cut typical | s | 0.09 | 0.32 |
| **Pulse duration** | | | |
| • of the sensor input minimum | s | 0.15 | |
| • of the ON pushbutton input minimum | s | 0.015 | |
| • of the cascading-entrance minimum | s | — | |
| **Type of voltage of the controlled supply voltage** | | AC/DC | |
| **Control supply voltage frequency** | | | |
| • 1 rated value | Hz | 50 | |
| • 2 rated value | Hz | 60 | |

| | | 3SK1111-.AB.. | 3SK1111-.AW.. |
|---|---|---|---|
| **Control supply voltage** | | | |
| • for DC rated value | V | 24 | — |
| – minimum | V | — | 110 |
| – maximum | V | — | 240 |
| • at 50 Hz at AC rated value | V | 24 | — |
| – minimum | V | — | 110 |
| – maximum | V | — | 240 |
| • at 60 Hz at AC rated value | V | 24 | — |
| – minimum | V | — | 110 |
| – maximum | V | — | 240 |
| **operating range factor control supply voltage rated value of the magnet coil** | | | |
| • at 50 Hz for AC | | 0.85 | |
| | | 1.1 | |
| • at 60 Hz for AC | | 0.85 | |
| | | 1.1 | |
| • for DC | | 0.85 | |
| | | 1.2 | 1.1 |
| **Active power loss typical** | W | 2 | 2.5 |
| **Contact reliability of the auxiliary contacts** | | — | |
| **Product function parameterizable** | | Sensor floating / sensor non-floating, monitored start / autostart | Sensor floating / monitored start / autostart |
| **Suitability for use device connector 3ZY12** | | No | |
| **Suitability for interaction pressing control** | | No | |
| **Suitability for use** | | | |
| • safety cut-out switch | | Yes | |
| • monitoring of floating sensors | | Yes | |
| • monitoring of non-floating sensors | | Yes | No |
| • magnetically operated switches monitoring | | Yes | No |
| • safety-related circuits | | Yes | |

### 13.2.1.2 Technical data for 3SK1112 Standard solid-state basic unit

| | | 3SK1112-.BB.. |
|---|---|---|
| **Insulation voltage rated value** | V | 50 |
| **Resistance against shock** | | 10g / 11 ms |
| **Number of sensor inputs 1-channel or 2-channel** | | 1 |
| **Design of the cascading** | | yes |
| **Type of the safety-related wiring of the inputs** | | single-channel and two-channel |
| **Product feature transverse contact-secure** | | Yes |
| **Safety Integrity Level (SIL)** | | |
| • according to IEC 61508 | | SIL3 |
| • for delayed release circuit according to IEC 61508 | | — |
| **Performance Level (PL)** | | |
| • according to ISO 13849-1 | | e |
| • for delayed release circuit according to ISO 13849-1 | | — |
| **Category according to ISO 13849-1** | | 4 |
| **T1 value for proof test interval or service life according to IEC 61508** | a | 20 |
| **Safety device type according to IEC 61508-2** | | Type B |
| **Number of outputs** | | |
| • as contact-affected switching element | | |
| – as NC contact for reporting function instantaneous switching | | 0 |
| – as NO contact for reporting function instantaneous switching | | 0 |
| – as NC contact for reporting function delayed switching | | 0 |
| – as NO contact for reporting function delayed switching | | 0 |
| – as NC contact safety-related instantaneous switching | | 0 |
| – as NO contact safety-related instantaneous switching | | — |
| – as NC contact safety-related delayed switching | | 0 |
| – as NO contact safety-related delayed switching | | — |
| • as contact-less semiconductor switching element | | |
| – safety-related | | |
| – delayed switching | | 0 |
| – non-delayed | | 2 |
| – for reporting function | | |
| – delayed switching | | — |
| – non-delayed | | 1 |
| **Stop category according to DIN EN 60204-1** | | 0 |

| | | 3SK1112-.BB.. |
|---|---|---|
| **Design of the input** | | |
| • cascading-input/functional switching | | Yes |
| • feedback input | | Yes |
| • start input | | Yes |
| **Design of the electrical connection jumper socket** | | No |
| **Operating cycles maximum** | 1/h | 2 000 |
| **Switching capacity current of the semiconductor outputs at DC-13 at 24 V** | A | 2 |
| **Switching capacity current of the NO contacts of the relay outputs** | | |
| • at DC-13 | | |
| – at 24 V | A | — |
| – at 115 V | A | — |
| – at 230 V | A | — |
| • at AC-15 | | |
| – at 115 V | A | — |
| – at 230 V | A | — |
| **Switching capacity current of the NC contacts of the relay outputs** | | |
| • at DC-13 | | |
| – at 24 V | A | — |
| – at 115 V | A | — |
| – at 230 V | A | — |
| • at AC-15 | | |
| – at 115 V | A | — |
| – at 230 V | A | — |
| **Thermal current of the contact-affected switching element maximum** | A | — |
| **Total current maximum** | A | — |
| **Mechanical operating cycles as operating time typical** | | — |
| **Max. permissible voltage for safe isolation between electronic evaluation device and enabling circuit according to EN 60947-1** | V | — |
| **Design of the fuse link for short-circuit protection of the NO contacts of the relay outputs required** | | not required |
| **Cable length between sensor and electronic evaluation device with Cu 1.5 mm² and 150 nF/km maximum** | m | 1 000 |

| | | 3SK1112-.BB.. |
|---|---|---|
| **Make time** | | |
| • with automatic start | | |
| – typical | s | — |
| – for DC maximum | s | 0.085 |
| – for AC maximum | s | — |
| – after mains power cut | | |
| – typical | s | 6.5 |
| – maximum | s | 6.5 |
| • with monitored start | | |
| – typical | s | — |
| – maximum | s | 0.085 |
| **Backslide delay time** | | |
| • after opening of the safety circuits typical | s | 0.04 |
| • at mains power cut | | |
| – typical | s | 0 |
| – maximum | s | 0 |
| **Adjustable backslide delay time** | | |
| • after opening of the safety circuits | s | —<br>— |
| **Recovery time** | | |
| • after opening of the safety circuits typical | s | 0.03 |
| • after mains power cut typical | s | 6.5 |
| **Pulse duration** | | |
| • of the sensor input minimum | s | 0.06 |
| • of the ON pushbutton input minimum | s | 0.15 |
| • of the cascading-entrance minimum | s | — |
| **Type of voltage of the controlled supply voltage** | | DC |
| **Control supply voltage frequency** | | |
| • 1 rated value | Hz | — |
| • 2 rated value | Hz | — |

| | | 3SK1112-.BB.. |
|---|---|---|
| **Control supply voltage** | | |
| • for DC rated value | V | 24 |
| – minimum | V | — |
| – maximum | V | — |
| • at 50 Hz at AC rated value | V | — |
| – minimum | V | — |
| – maximum | V | — |
| • at 60 Hz at AC rated value | V | — |
| – minimum | V | — |
| – maximum | V | — |
| **Operating range factor control supply voltage rated value of the magnet coil** | | |
| • at 50 Hz for AC | | — |
| | | — |
| • at 60 Hz for AC | | — |
| | | — |
| • for DC | | 0.8 |
| | | 1.2 |
| **Active power loss typical** | W | 2 |
| **Contact reliability of the auxiliary contacts** | | — |
| **Product function parameterizable** | | Sensor floating / sensor non-floating, monitored start / autostart, 1-channel / 2-channel sensor connection, cross-circuit detection, startup testing |
| **Suitability for use device connector 3ZY12** | | No |
| **Suitability for interaction pressing control** | | No |
| **Suitability for use** | | |
| • safety cut-out switch | | Yes |
| • monitoring of floating sensors | | Yes |
| • monitoring of non-floating sensors | | Yes |
| • magnetically operated switches monitoring | | Yes |
| • safety-related circuits | | Yes |

## 13.2.2 Advanced

### 13.2.2.1 Technical data for 3SK1120 Advanced solid-state basic unit

| | | 3SK1120-.AB.. |
|---|---|---|
| **Insulation voltage rated value** | V | 50 |
| **Resistance against shock** | | 10g / 11 ms |
| **Number of sensor inputs 1-channel or 2-channel** | | 1 |
| **Design of the cascading** | | yes |
| **Type of the safety-related wiring of the inputs** | | single-channel and two-channel |
| **Product feature transverse contact-secure** | | Yes |
| **Safety Integrity Level (SIL)** | | |
| • according to IEC 61508 | | SIL3 |
| • for delayed release circuit according to IEC 61508 | | — |
| **Performance Level (PL)** | | |
| • according to ISO 13849-1 | | e |
| • for delayed release circuit according to ISO 13849-1 | | — |
| **Category according to ISO 13849-1** | | 4 |
| **T1 value for proof test interval or service life according to IEC 61508** | a | 20 |
| **Safety device type according to IEC 61508-2** | | Type B |
| **Number of outputs as contact-affected switching element as NO contact safety-related** | | |
| • as contact-affected switching element | | |
| – as NC contact for reporting function instantaneous switching | | 0 |
| – as NO contact for reporting function instantaneous switching | | 0 |
| – as NC contact for reporting function delayed switching | | 0 |
| – as NO contact for reporting function delayed switching | | 0 |
| – as NC contact safety-related instantaneous switching | | 0 |
| – as NO contact safety-related instantaneous switching | | — |
| – as NC contact safety-related delayed switching | | 0 |
| – as NO contact safety-related delayed switching | | — |
| • as contact-less semiconductor switching element | | |
| – safety-related | | |
| – delayed switching | | 0 |
| – non-delayed | | 1 |
| – for reporting function | | |
| – delayed switching | | — |
| – non-delayed | | 0 |

| | | 3SK1120-.AB.. |
|---|---|---|
| **Stop category according to DIN EN 60204-1** | | 0 |
| **Design of the input** | | |
| • cascading-input/functional switching | | Yes |
| • feedback input | | Yes |
| • start input | | Yes |
| **Design of the electrical connection jumper socket** | | No |
| **Operating cycles maximum** | 1/h | 2 000 |
| **Switching capacity current of the semiconductor outputs at DC-13 at 24 V** | A | 0.5 |
| **Switching capacity current of the NO contacts of the relay outputs** | | |
| • at DC-13 | | |
| – at 24 V | A | — |
| – at 115 V | A | — |
| – at 230 V | A | — |
| • at AC-15 | | |
| – at 115 V | A | — |
| – at 230 V | A | — |
| **Switching capacity current of the NC contacts of the relay outputs** | | |
| • at DC-13 | | |
| – at 24 V | A | — |
| – at 115 V | A | — |
| – at 230 V | A | — |
| • at AC-15 | | |
| – at 115 V | A | — |
| – at 230 V | A | — |
| **Thermal current of the contact-affected switching element maximum** | A | — |
| **Total current maximum** | A | — |
| **Mechanical operating cycles as operating time typical** | | — |
| **Max. permissible voltage for safe isolation between electronic evaluation device and enabling circuit according to EN 60947-1** | V | — |
| **Design of the fuse link for short-circuit protection of the NO contacts of the relay outputs required** | | not required |
| **Cable length between sensor and electronic evaluation device with Cu 1.5 mm² and 150 nF/km maximum** | m | 1 000 |

| | | 3SK1120-.AB.. |
|---|---|---|
| **Make time** | | |
| • with automatic start | | |
| – typical | s | — |
| – for DC maximum | s | 0.085 |
| – for AC maximum | s | — |
| – after mains power cut | | |
| – typical | s | 6.5 |
| – maximum | s | 6.5 |
| • with monitored start | | |
| – typical | s | — |
| – maximum | s | 0.085 |
| **Backslide delay time** | | |
| • after opening of the safety circuits typical | s | 0.04 |
| • at mains power cut | | |
| – typical | s | 0 |
| – maximum | s | 0 |
| **Adjustable backslide delay time** | | |
| • after opening of the safety circuits | s | —<br>— |
| **Recovery time** | | |
| • after opening of the safety circuits typical | s | 0.03 |
| • after mains power cut typical | s | 6.5 |
| **Pulse duration** | | |
| • of the sensor input minimum | s | 0.06 |
| • of the ON pushbutton input minimum | s | 0.15 |
| • of the cascading-entrance minimum | s | — |
| **Type of voltage of the controlled supply voltage** | | DC |
| **Control supply voltage frequency** | | |
| • 1 rated value | Hz | — |
| • 2 rated value | Hz | — |

| | | 3SK1120-.AB.. |
|---|---|---|
| **Control supply voltage** | | |
| • for DC rated value | V | 24 |
| – minimum | V | — |
| – maximum | V | — |
| • at 50 Hz at AC rated value | V | — |
| – minimum | V | — |
| – maximum | V | — |
| • at 60 Hz at AC rated value | V | — |
| – minimum | V | — |
| – maximum | V | — |
| **Operating range factor control supply voltage rated value of the magnet coil** | | |
| • at 50 Hz for AC | | — |
| | | — |
| • at 60 Hz for AC | | — |
| | | — |
| • for DC | | 0.8 |
| | | 1.2 |
| **Active power loss typical** | W | 2 |
| **Contact reliability of the auxiliary contacts** | | — |
| **Product function parameterizable** | | Sensor floating / sensor non-floating, monitored start / autostart, 1-channel / 2-channel sensor connection, cross-circuit detection, startup testing, antivalent sensors, 2-hand switches |
| **Suitability for use device connector 3ZY12** | | Yes |
| **Suitability for interaction pressing control** | | No |
| **Suitability for use** | | |
| • safety cut-out switch | | Yes |
| • monitoring of floating sensors | | Yes |
| • monitoring of non-floating sensors | | Yes |
| • magnetically operated switches monitoring | | Yes |
| • safety-related circuits | | Yes |

### 13.2.2.2 Technical data for 3SK1121 Advanced relay instantaneous basic unit

| | | 3SK1121-.AB.. |
|---|---|---|
| **Insulation voltage rated value** | V | 300 |
| **Resistance against shock** | | 10g / 11 ms |
| **Number of sensor inputs 1-channel or 2-channel** | | 1 |
| **Design of the cascading** | | yes |
| **Type of the safety-related wiring of the inputs** | | single-channel and two-channel |
| **Product feature transverse contact-secure** | | Yes |
| **Safety Integrity Level (SIL)** | | |
| • according to IEC 61508 | | SIL3 |
| • for delayed release circuit according to IEC 61508 | | — |
| **Performance Level (PL)** | | |
| • according to ISO 13849-1 | | e |
| • for delayed release circuit according to ISO 13849-1 | | — |
| **Category according to ISO 13849-1** | | 4 |
| **T1 value for proof test interval or service life according to IEC 61508** | a | 20 |
| **Safety device type according to IEC 61508-2** | | Type B |
| **Number of outputs** | | |
| • as contact-affected switching element | | |
| – as NC contact for reporting function instantaneous switching | | 1 |
| – as NO contact for reporting function instantaneous switching | | 0 |
| – as NC contact for reporting function delayed switching | | 0 |
| – as NO contact for reporting function delayed switching | | 0 |
| – as NC contact safety-related instantaneous switching | | 0 |
| – as NO contact safety-related instantaneous switching | | 3 |
| – as NC contact safety-related delayed switching | | 0 |
| – as NO contact safety-related delayed switching | | — |
| • as contact-less semiconductor switching element | | |
| – safety-related | | |
| – delayed switching | | 0 |
| – non-delayed | | 0 |
| – for reporting function | | |
| – delayed switching | | — |
| – non-delayed | | 0 |
| **Stop category according to DIN EN 60204-1** | | 0 |

| | | 3SK1121-.AB.. |
|---|---|---|
| **Design of the input** | | |
| • cascading-input/functional switching | | Yes |
| • feedback input | | Yes |
| • start input | | Yes |
| **Design of the electrical connection jumper socket** | | No |
| **Operating cycles maximum** | 1/h | 360 |
| **Switching capacity current of the semiconductor outputs at DC-13 at 24 V** | A | — |
| **Switching capacity current of the NO contacts of the relay outputs** | | |
| • at DC-13 | | |
| – at 24 V | A | 5 |
| – at 115 V | A | 0.2 |
| – at 230 V | A | 0.1 |
| • at AC-15 | | |
| – at 115 V | A | 4 |
| – at 230 V | A | 4 |
| **Switching capacity current of the NC contacts of the relay outputs** | | |
| • at DC-13 | | |
| – at 24 V | A | 1 |
| – at 115 V | A | 0.2 |
| – at 230 V | A | 0.1 |
| • at AC-15 | | |
| – at 115 V | A | 1.5 |
| – at 230 V | A | 1.5 |
| **Thermal current of the contact-affected switching element maximum** | A | 5 |
| **Total current maximum** | A | 12 |
| **Mechanical operating cycles as operating time typical** | | 10 000 000 |
| **Max. permissible voltage for safe isolation between electronic evaluation device and enabling circuit according to EN 60947-1** | V | — |
| **Design of the fuse link for short-circuit protection of the NO contacts of the relay outputs required** | | gL/gG: 6A or circuit breaker type A: 3A or circuit breaker type B: 2A or circuit breaker type C: 1A |
| **Cable length between sensor and electronic evaluation device with Cu 1.5 mm² and 150 nF/km maximum** | m | 1 000 |

| | | 3SK1121-.AB.. |
|---|---|---|
| **Make time** | | |
| • with automatic start | | |
| – typical | s | — |
| – for DC maximum | s | 0.11 |
| – for AC maximum | s | — |
| – after mains power cut | | |
| – typical | s | 6.5 |
| – maximum | s | 6.5 |
| • with monitored start | | |
| – typical | s | — |
| – maximum | s | 0.11 |
| **Backslide delay time** | | |
| • after opening of the safety circuits typical | s | 0.04 |
| • at mains power cut | | |
| – typical | s | 0.03 |
| – maximum | s | 0.05 |
| **Adjustable backslide delay time** | | |
| • after opening of the safety circuits | s | —<br>— |
| **Recovery time** | | |
| • after opening of the safety circuits typical | s | 0.03 |
| • after mains power cut typical | s | 6.5 |
| **Pulse duration** | | |
| • of the sensor input minimum | s | 0.075 |
| • of the ON pushbutton input minimum | s | 0.15 |
| • of the cascading-entrance minimum | s | — |
| **Type of voltage of the controlled supply voltage** | | DC |
| **Control supply voltage frequency** | | |
| • 1 rated value | Hz | — |
| • 2 rated value | Hz | — |

| | | 3SK1121-.AB.. |
|---|---|---|
| **Control supply voltage** | | |
| • for DC rated value | V | 24 |
| – minimum | V | — |
| – maximum | V | — |
| • at 50 Hz at AC rated value | V | — |
| – minimum | V | — |
| – maximum | V | — |
| • at 60 Hz at AC rated value | V | — |
| – minimum | V | — |
| – maximum | V | — |
| **operating range factor control supply voltage rated value of the magnet coil** | | |
| • at 50 Hz for AC | | — |
| | | — |
| • at 60 Hz for AC | | — |
| | | — |
| • for DC | | 0.8 |
| | | 1.2 |
| **Active power loss typical** | W | 2 |
| **Contact reliability of the auxiliary contacts** | | — |
| **Product function parameterizable** | | Sensor floating / sensor non-floating, monitored start / autostart, 1-channel / 2-channel sensor connection, cross-circuit detection, startup testing, antivalent sensors, 2-hand switches |
| **Suitability for use device connector 3ZY12** | | Yes |
| **Suitability for interaction pressing control** | | No |
| **Suitability for use** | | |
| • safety cut-out switch | | Yes |
| • monitoring of floating sensors | | Yes |
| • monitoring of non-floating sensors | | Yes |
| • magnetically operated switches monitoring | | Yes |
| • safety-related circuits | | Yes |

### 13.2.2.3 Technical data for 3SK1121 Advanced relay time-delayed basic unit

| | | 3SK1121-.CB.1 | 3SK1121-.CB.2 | 3SK1121-.CB.4 |
|---|---|---|---|---|
| **Insulation voltage rated value** | V | 300 | | |
| **Resistance against shock** | | 10g / 11 ms | | |
| **Number of sensor inputs 1-channel or 2-channel** | | 1 | | |
| **Design of the cascading** | | yes | | |
| **Type of the safety-related wiring of the inputs** | | single-channel and two-channel | | |
| **Product feature transverse contact-secure** | | Yes | | |
| **Safety Integrity Level (SIL)** | | | | |
| • according to IEC 61508 | | SIL3 | | |
| • for delayed release circuit according to IEC 61508 | | SIL3 | | |
| **Performance Level (PL)** | | | | |
| • according to ISO 13849-1 | | e | | |
| • for delayed release circuit according to ISO 13849-1 | | e | | |
| **Category according to ISO 13849-1** | | 4 | | |
| **T1 value for proof test interval or service life according to IEC 61508** | a | 20 | | |
| **Safety device type according to IEC 61508-2** | | Type B | | |

| | | 3SK1121-.CB.1 | 3SK1121-.CB.2 | 3SK1121-.CB.4 |
|---|---|---|---|---|
| **Number of outputs as contact-affected switching element as NO contact safety-related** | | | | |
| • as contact-affected switching element | | | | |
| – as NC contact for reporting function instantaneous switching | | 0 | | |
| – as NO contact for reporting function instantaneous switching | | 0 | | |
| – as NC contact for reporting function delayed switching | | 0 | | |
| – as NO contact for reporting function delayed switching | | 0 | | |
| – as NC contact safety-related instantaneous switching | | 0 | | |
| – as NO contact safety-related instantaneous switching | | 2 | | |
| – as NC contact safety-related delayed switching | | 0 | | |
| – as NO contact safety-related delayed switching | | 2 | | |
| • as contact-less semiconductor switching element | | | | |
| – safety-related | | | | |
| – delayed switching | | 0 | | |
| – non-delayed | | 0 | | |
| – for reporting function | | | | |
| – delayed switching | | — | | |
| – non-delayed | | 0 | | |
| **Stop category according to DIN EN 60204-1** | | 0 / 1 | | |
| **Design of the input** | | | | |
| • cascading-input/functional switching | | Yes | | |
| • feedback input | | Yes | | |
| • start input | | Yes | | |
| **Design of the electrical connection jumper socket** | | No | | |
| **Operating cycles maximum** | 1/h | 360 | | |

| | | 3SK1121-.CB.1 | 3SK1121-.CB.2 | 3SK1121-.CB.4 |
|---|---|---|---|---|
| **Switching capacity current of the semiconductor outputs at DC-13 at 24 V** | A | — | | |
| **Switching capacity current of the NO contacts of the relay outputs** | | | | |
| • at DC-13 | | | | |
| – at 24 V | A | 3 | | |
| – at 115 V | A | 0.2 | | |
| – at 230 V | A | 0.1 | | |
| • at AC-15 | | | | |
| – at 115 V | A | 3 | | |
| – at 230 V | A | 3 | | |
| **Switching capacity current of the NC contacts of the relay outputs** | | | | |
| • at DC-13 | | | | |
| – at 24 V | A | — | | |
| – at 115 V | A | — | | |
| – at 230 V | A | — | | |
| • at AC-15 | | | | |
| – at 115 V | A | — | | |
| – at 230 V | A | — | | |
| **Thermal current of the contact-affected switching element maximum** | A | 5 | | |
| **Total current maximum** | A | 12 | | |
| **Mechanical operating cycles as operating time typical** | | 10 000 000 | | |
| **Max. permissible voltage for safe isolation between electronic evaluation device and enabling circuit according to EN 60947-1** | V | — | | |
| **Design of the fuse link for short-circuit protection of the NO contacts of the relay outputs required** | | gL/gG: 6A or circuit breaker type A: 3A or circuit breaker type B: 2A or circuit breaker type C: 1A | | |
| **Cable length between sensor and electronic evaluation device with Cu 1.5 mm² and 150 nF/km maximum** | m | 1 000 | | |

| | | 3SK1121-.CB.1 | 3SK1121-.CB.2 | 3SK1121-.CB.4 |
|---|---|---|---|---|
| **Make time** | | | | |
| • with automatic start | | | | |
| – typical | s | — | | |
| – for DC maximum | s | 0.11 | | |
| – for AC maximum | s | — | | |
| – after mains power cut | | | | |
| – typical | s | 6.5 | | |
| – maximum | s | 6.5 | | |
| • with monitored start | | | | |
| – typical | s | — | | |
| – maximum | s | 0.11 | | |
| **Backslide delay time** | | | | |
| • after opening of the safety circuits typical | s | 0.04 | | |
| • at mains power cut | | | | |
| – typical | s | 0.03 | | |
| – maximum | s | 0.04 | | |
| **Adjustable backslide delay time** | | | | |
| • after opening of the safety circuits | s | 0.05<br>3 | 0.5<br>30 | 5<br>300 |
| **Recovery time** | | | | |
| • after opening of the safety circuits typical | s | 0.03 | | |
| • after mains power cut typical | s | 6.5 | | |
| **Pulse duration** | | | | |
| • of the sensor input minimum | s | 0.075 | | |
| • of the ON pushbutton input minimum | s | 0.15 | | |
| • of the cascading-entrance minimum | s | — | | |
| **Type of voltage of the controlled supply voltage** | | DC | | |
| **Control supply voltage frequency** | | | | |
| • 1 rated value | Hz | — | | |
| • 2 rated value | Hz | — | | |

| | | 3SK1121-.CB.1 | 3SK1121-.CB.2 | 3SK1121-.CB.4 |
|---|---|---|---|---|
| **Control supply voltage** | | | | |
| • for DC rated value | V | 24 | | |
| – minimum | V | — | | |
| – maximum | V | — | | |
| • at 50 Hz at AC rated value | V | — | | |
| – minimum | V | — | | |
| – maximum | V | — | | |
| • at 60 Hz at AC rated value | V | — | | |
| – minimum | V | — | | |
| – maximum | V | — | | |
| **Operating range factor control supply voltage rated value of the magnet coil** | | | | |
| • at 50 Hz for AC | | — | | |
| | | — | | |
| • at 60 Hz for AC | | — | | |
| | | — | | |
| • for DC | | 0.8 | | |
| | | 1.2 | | |
| **Active power loss typical** | W | 2.5 | | |
| **Contact reliability of the auxiliary contacts** | | — | | |
| **Product function parameterizable** | | Sensor floating / sensor non-floating, monitored start / autostart, 1-channel / 2-channel sensor connection, cross-circuit detection, startup testing, antivalent sensors, 2-hand switches, time delay | | |
| **Suitability for use device connector 3ZY12** | | Yes | | |
| **Suitability for interaction pressing control** | | No | | |
| **Suitability for use** | | | | |
| • safety cut-out switch | | Yes | | |
| • monitoring of floating sensors | | Yes | | |
| • monitoring of non-floating sensors | | Yes | | |
| • magnetically operated switches monitoring | | Yes | | |
| • safety-related circuits | | Yes | | |

### 13.2.2.4 Technical data for 3SK1122 Advanced solid-state instantaneous basic unit

| | | 3SK1122-.AB.. |
|---|---|---|
| **Insulation voltage rated value** | V | 50 |
| **Resistance against shock** | | 10g / 11 ms |
| **Number of sensor inputs 1-channel or 2-channel** | | 1 |
| **Design of the cascading** | | yes |
| **Type of the safety-related wiring of the inputs** | | single-channel and two-channel |
| **Product feature transverse contact-secure** | | Yes |
| **Safety Integrity Level (SIL)** | | |
| • according to IEC 61508 | | SIL3 |
| • for delayed release circuit according to IEC 61508 | | — |
| **Performance Level (PL)** | | |
| • according to ISO 13849-1 | | e |
| • for delayed release circuit according to ISO 13849-1 | | — |
| **Category according to ISO 13849-1** | | 4 |
| **T1 value for proof test interval or service life according to IEC 61508** | a | 20 |
| **Safety device type according to IEC 61508-2** | | Type B |
| **Number of outputs** | | |
| • as contact-affected switching element | | |
| – as NC contact for reporting function instantaneous switching | | 0 |
| – as NO contact for reporting function instantaneous switching | | 0 |
| – as NC contact for reporting function delayed switching | | 0 |
| – as NO contact for reporting function delayed switching | | 0 |
| – as NC contact safety-related instantaneous switching | | 0 |
| – as NO contact safety-related instantaneous switching | | — |
| – as NC contact safety-related delayed switching | | 0 |
| – as NO contact safety-related delayed switching | | — |
| • as contact-less semiconductor switching element | | |
| – safety-related | | |
| – delayed switching | | 0 |
| – non-delayed | | 3 |
| – for reporting function | | |
| – delayed switching | | — |
| – non-delayed | | 1 |
| **Stop category according to DIN EN 60204-1** | | 0 |

| | | 3SK1122-.AB.. |
|---|---|---|
| **Design of the input** | | |
| • cascading-input/functional switching | | Yes |
| • feedback input | | Yes |
| • start input | | Yes |
| **Design of the electrical connection jumper socket** | | No |
| **Operating cycles maximum** | 1/h | 2 000 |
| **Switching capacity current of the semiconductor outputs at DC-13 at 24 V** | A | 2 |
| **Switching capacity current of the NO contacts of the relay outputs** | | |
| • at DC-13 | | |
| – at 24 V | A | — |
| – at 115 V | A | — |
| – at 230 V | A | — |
| • at AC-15 | | |
| – at 115 V | A | — |
| – at 230 V | A | — |
| **Switching capacity current of the NC contacts of the relay outputs** | | |
| • at DC-13 | | |
| – at 24 V | A | — |
| – at 115 V | A | — |
| – at 230 V | A | — |
| • at AC-15 | | |
| – at 115 V | A | — |
| – at 230 V | A | — |
| **Thermal current of the contact-affected switching element maximum** | A | — |
| **Total current maximum** | A | — |
| **Mechanical operating cycles as operating time typical** | | — |
| **Max. permissible voltage for safe isolation between electronic evaluation device and enabling circuit according to EN 60947-1** | V | — |
| **Design of the fuse link for short-circuit protection of the NO contacts of the relay outputs required** | | not required |
| **Cable length between sensor and electronic evaluation device with Cu 1.5 mm² and 150 nF/km maximum** | m | 1 000 |

| | | 3SK1122-.AB.. |
|---|---|---|
| **Make time** | | |
| • with automatic start | | |
| – typical | s | — |
| – for DC maximum | s | 0.085 |
| – for AC maximum | s | — |
| – after mains power cut | | |
| – typical | s | 6.5 |
| – maximum | s | 6.5 |
| • with monitored start | | |
| – typical | s | — |
| – maximum | s | 0.085 |
| **Backslide delay time** | | |
| • after opening of the safety circuits typical | s | 0.04 |
| • at mains power cut | | |
| – typical | s | 0 |
| – maximum | s | 0 |
| **Adjustable backslide delay time** | | |
| • after opening of the safety circuits | s | —<br>— |
| **Recovery time** | | |
| • after opening of the safety circuits typical | s | 0.03 |
| • after mains power cut typical | s | 6.5 |
| **Pulse duration** | | |
| • of the sensor input minimum | s | 0.06 |
| • of the ON pushbutton input minimum | s | 0.15 |
| • of the cascading-entrance minimum | s | — |
| **Type of voltage of the controlled supply voltage** | | DC |
| **Control supply voltage frequency** | | |
| • 1 rated value | Hz | — |
| • 2 rated value | Hz | — |

| | | 3SK1122-.AB.. |
|---|---|---|
| **Control supply voltage** | | |
| • for DC rated value | V | 24 |
| – minimum | V | — |
| – maximum | V | — |
| • at 50 Hz at AC rated value | V | — |
| – minimum | V | — |
| – maximum | V | — |
| • at 60 Hz at AC rated value | V | — |
| – minimum | V | — |
| – maximum | V | — |
| **Operating range factor control supply voltage rated value of the magnet coil** | | |
| • at 50 Hz for AC | | — |
| | | — |
| • at 60 Hz for AC | | — |
| | | — |
| • for DC | | 0.8 |
| | | 1.2 |
| **Active power loss typical** | W | 2 |
| **Contact reliability of the auxiliary contacts** | | — |
| **Product function parameterizable** | | Sensor floating / sensor non-floating, monitored start / autostart, 1-channel / 2-channel sensor connection, cross-circuit detection, startup testing, antivalent sensors, 2-hand switches |
| **Suitability for use device connector 3ZY12** | | Yes |
| **Suitability for interaction pressing control** | | No |
| **Suitability for use** | | |
| • safety cut-out switch | | Yes |
| • monitoring of floating sensors | | Yes |
| • monitoring of non-floating sensors | | Yes |
| • magnetically operated switches monitoring | | Yes |
| • safety-related circuits | | Yes |

### 13.2.2.5 Technical data for 3SK1122 Advanced solid-state time-delayed basic unit

| | | 3SK1122-.CB.1 | 3SK1122-.CB.2 | 3SK1122-.CB.4 |
|---|---|---|---|---|
| **Insulation voltage rated value** | V | 50 | | |
| **Resistance against shock** | | 10g / 11 ms | | |
| **Number of sensor inputs 1-channel or 2-channel** | | 1 | | |
| **Design of the cascading** | | yes | | |
| **Type of the safety-related wiring of the inputs** | | single-channel and two-channel | | |
| **Product feature transverse contact-secure** | | Yes | | |
| **Safety Integrity Level (SIL)** | | | | |
| • according to IEC 61508 | | SIL3 | | |
| • for delayed release circuit according to IEC 61508 | | SIL3 | | |
| **Performance Level (PL)** | | | | |
| • according to ISO 13849-1 | | e | | |
| • for delayed release circuit according to ISO 13849-1 | | e | | |
| **Category according to ISO 13849-1** | | 4 | | |
| **T1 value for proof test interval or service life according to IEC 61508** | a | 20 | | |
| **Safety device type according to IEC 61508-2** | | Type B | | |

| | | 3SK1122-.CB.1 | 3SK1122-.CB.2 | 3SK1122-.CB.4 |
|---|---|---|---|---|
| **Number of outputs** | | | | |
| • as contact-affected switching element | | | | |
| – as NC contact for reporting function instantaneous switching | | 0 | | |
| – as NO contact for reporting function instantaneous switching | | 0 | | |
| – as NC contact for reporting function delayed switching | | 0 | | |
| – as NO contact for reporting function delayed switching | | 0 | | |
| – as NC contact safety-related instantaneous switching | | 0 | | |
| – as NO contact safety-related instantaneous switching | | — | | |
| – as NC contact safety-related delayed switching | | 0 | | |
| – as NO contact safety-related delayed switching | | — | | |
| • as contact-less semiconductor switching element | | | | |
| – safety-related | | | | |
| – delayed switching | | 2 | | |
| – non-delayed | | 2 | | |
| – for reporting function | | | | |
| – delayed switching | | — | | |
| – non-delayed | | 0 | | |
| **Stop category according to DIN EN 60204-1** | | 0 / 1 | | |
| **Design of the input** | | | | |
| • cascading-input/functional switching | | Yes | | |
| • feedback input | | Yes | | |
| • start input | | Yes | | |
| **Design of the electrical connection jumper socket** | | No | | |
| **Operating cycles maximum** | 1/h | 2 000 | | |
| **Switching capacity current of the semiconductor outputs at DC-13 at 24 V** | A | 2 | | |

| | | 3SK1122-.CB.1 | 3SK1122-.CB.2 | 3SK1122-.CB.4 |
|---|---|---|---|---|
| **Switching capacity current of the NO contacts of the relay outputs** | | | | |
| • at DC-13 | | | | |
| – at 24 V | A | — | | |
| – at 115 V | A | — | | |
| – at 230 V | A | — | | |
| • at AC-15 | | | | |
| – at 115 V | A | — | | |
| – at 230 V | A | — | | |
| **Switching capacity current of the NC contacts of the relay outputs** | | | | |
| • at DC-13 | | | | |
| – at 24 V | A | — | | |
| – at 115 V | A | — | | |
| – at 230 V | A | — | | |
| • at AC-15 | | | | |
| – at 115 V | A | — | | |
| – at 230 V | A | — | | |
| **Thermal current of the contact-affected switching element maximum** | A | — | | |
| **Total current maximum** | A | — | | |
| **Mechanical operating cycles as operating time typical** | | — | | |
| **Max. permissible voltage for safe isolation between electronic evaluation device and enabling circuit according to EN 60947-1** | V | — | | |
| **Design of the fuse link for short-circuit protection of the NO contacts of the relay outputs required** | | not required | | |
| **Cable length between sensor and electronic evaluation device with Cu 1.5 mm² and 150 nF/km maximum** | m | 1 000 | | |

| | | 3SK1122-.CB.1 | 3SK1122-.CB.2 | 3SK1122-.CB.4 |
|---|---|---|---|---|
| **Make time** | | | | |
| • with automatic start | | | | |
| – typical | s | — | | |
| – for DC maximum | s | 0.085 | | |
| – for AC maximum | s | — | | |
| – after mains power cut | | | | |
| – typical | s | 6.5 | | |
| – maximum | s | 6.5 | | |
| • with monitored start | | | | |
| – typical | s | — | | |
| – maximum | s | 0.085 | | |
| **Backslide delay time** | | | | |
| • after opening of the safety circuits typical | s | 0.04 | | |
| • at mains power cut | | | | |
| – typical | s | 0 | | |
| – maximum | s | 0 | | |
| **Adjustable backslide delay time** | | | | |
| • after opening of the safety circuits | s | 0.05<br>3 | 0.5<br>30 | 5<br>300 |
| **Recovery time** | | | | |
| • after opening of the safety circuits typical | s | 0.03 | | |
| • after mains power cut typical | s | 6.5 | | |
| **Pulse duration** | | | | |
| • of the sensor input minimum | s | 0.06 | | |
| • of the ON pushbutton input minimum | s | 0.15 | | |
| • of the cascading-entrance minimum | s | — | | |
| **Type of voltage of the controlled supply voltage** | | DC | | |
| **Control supply voltage frequency** | | | | |
| • 1 rated value | Hz | — | | |
| • 2 rated value | Hz | — | | |

| | | 3SK1122-.CB.1 | 3SK1122-.CB.2 | 3SK1122-.CB.4 |
|---|---|---|---|---|
| **Control supply voltage** | | | | |
| • for DC rated value | V | 24 | | |
| – minimum | V | — | | |
| – maximum | V | — | | |
| • at 50 Hz at AC rated value | V | — | | |
| – minimum | V | — | | |
| – maximum | V | — | | |
| • at 60 Hz at AC rated value | V | — | | |
| – minimum | V | — | | |
| – maximum | V | — | | |
| **Operating range factor control supply voltage rated value of the magnet coil** | | | | |
| • at 50 Hz for AC | | — | | |
| | | — | | |
| • at 60 Hz for AC | | — | | |
| | | — | | |
| • for DC | | 0.8 | | |
| | | 1.2 | | |
| **Active power loss typical** | W | 2 | | |
| **Contact reliability of the auxiliary contacts** | | — | | |
| **Product function parameterizable** | | Sensor floating / sensor non-floating, monitored start / autostart, 1-channel / 2-channel sensor connection, cross-circuit detection, startup testing, antivalent sensors, 2-hand switches, time delay | | |
| **Suitability for use device connector 3ZY12** | | Yes | | |
| **Suitability for interaction pressing control** | | No | | |
| **Suitability for use** | | | | |
| • safety cut-out switch | | Yes | | |
| • monitoring of floating sensors | | Yes | | |
| • monitoring of non-floating sensors | | Yes | | |
| • magnetically operated switches monitoring | | Yes | | |
| • safety-related circuits | | Yes | | |

# 13.3 Expansion modules

## 13.3.1 Output expansions

### 13.3.1.1 Technical data for output expansion 3SK1211

| | | 3SK1211-.BB0. | 3SK1211-.BB4. | 3SK1211-.BW2. |
|---|---|---|---|---|
| Insulation voltage rated value | V | 300 | | |
| Resistance against shock | | 10g / 11 ms | | |
| Number of sensor inputs 1-channel or 2-channel | | — | | |
| Type of the safety-related wiring of the inputs | | — | | |
| Product feature transverse contact-secure | | — | | |
| Safety Integrity Level (SIL) according to IEC 61508 | | SIL3 | | |
| SIL claim limit (for a subsystem) according to EN 62061 | | 3 | | |
| Performance level (PL) according to ISO 13849-1 | | e | | |
| Category according to ISO 13849-1 | | 4 | | |
| T1 value for proof test interval or service life according to IEC 61508 | a | 20 | | |
| Safety device type according to IEC 61508-2 | | Type A | | |

| | | 3SK1211-.BB0. | 3SK1211-.BB4. | 3SK1211-.BW2. |
|---|---|---|---|---|
| **Number of outputs as contact-affected switching element** | | | | |
| • as NC contact for reporting function instantaneous switching | | 0 | | |
| • as NO contact for reporting function instantaneous switching | | 0 | | |
| • as NC contact for reporting function delayed switching | | 0 | | |
| • as NO contact for reporting function delayed switching | | 0 | | |
| • as NC contact safety-related instantaneous switching | | 0 | | |
| • as NO contact safety-related instantaneous switching | | 4 | | |
| • as NC contact safety-related delayed switching | | 0 | | |
| • as NO contact safety-related delayed switching | | 0 | | |
| **Stop category according to DIN EN 60204-1** | | 0 | | |
| **Design of the input start input** | | — | | |
| **Design of the electrical connection jumper socket** | | No | | |
| **Operating cycles maximum** | 1/h | 360 | | |

| | | 3SK1211-.BB0. | 3SK1211-.BB4. | 3SK1211-.BW2. |
|---|---|---|---|---|
| **Switching capacity current** | | | | |
| • of the NO contacts of the relay outputs | | | | |
| – at DC-13 | | | | |
| – at 24 V | A | 5 | | |
| – at 115 V | A | 0.2 | | |
| – at 230 V | A | 0.1 | | |
| – at AC-15 | | | | |
| – at 115 V | A | 4 | | |
| – at 230 V | A | 4 | | |
| • of the NC contacts of the relay outputs | | | | |
| – at DC-13 | | | | |
| – at 24 V | A | — | | |
| – at 115 V | A | — | | |
| – at 230 V | A | — | | |
| – at AC-15 | | | | |
| – at 115 V | A | — | | |
| – at 230 V | A | — | | |
| **Thermal current of the contact-affected switching element maximum** | A | 5 | | |
| **Total current maximum** | A | 12 | | |
| **Mechanical operating cycles as operating time typical** | | 10 000 000 | | |
| **Max. permissible voltage for safe isolation between electronic evaluation device and enabling circuit according to EN 60947-1** | V | — | | |
| **Design of the fuse link for short-circuit protection of the NO contacts of the relay outputs required** | | gL/gG: 6A or circuit breaker type A: 3A or circuit breaker type B: 2A or circuit breaker type C: 1A | | |
| **Cable length between sensor and electronic evaluation device with Cu 1.5 mm² and 150 nF/km maximum** | m | — | | |

| | | 3SK1211-.BB0. | 3SK1211-.BB4. | 3SK1211-.BW2. |
|---|---|---|---|---|
| **Make time** | | | | |
| • with automatic start | | | | |
| – typical | s | 0.025 | 0.015 | 0.035 |
| – for DC maximum | s | — | 0.03 | — |
| – for AC maximum | s | 0.04 | — | 0.035 |
| – after mains power cut | | | | |
| – typical | s | 0.025 | 0.015 | 0.035 |
| – maximum | s | 0.04 | 0.03 | 0.035 |
| • with monitored start | | | | |
| – maximum | s | — | | |
| – typical | s | — | | |
| **Backslide delay time** | | | | |
| • after opening of the safety circuits typical | s | — | | |
| • at mains power cut | | | | |
| – typical | s | 0.045 | 0.01 | 0.2 |
| – maximum | s | 0.05 | 0.015 | 0.3 |
| **Adjustable backslide delay time after opening of the safety circuits** | | | | |
| • initial value | s | — | | |
| • final value | s | — | | |
| **Recovery time** | | | | |
| • after opening of the safety circuits typical | s | — | | |
| • after mains power cut typical | s | 0.06 | 0.015 | 0.32 |
| **Pulse duration** | | | | |
| • of the sensor input minimum | s | — | | |
| • of the ON pushbutton input minimum | s | — | | |
| • of the cascading-entrance minimum | s | — | | |
| **Type of voltage of the controlled supply voltage** | | AC | DC | AC/DC |
| **Control supply voltage frequency** | | | | |
| • 1 rated value | Hz | 50 | — | 50 |
| • 2 rated value | Hz | 60 | — | 60 |

| | | 3SK1211-.BB0. | 3SK1211-.BB4. | 3SK1211-.BW2. |
|---|---|---|---|---|
| **Control supply voltage** | | | | |
| • for DC rated value | V | — | 24 | — |
| – minimum | V | — | | 110 |
| – maximum | V | — | | 240 |
| • at 50 Hz at AC rated value | V | 24 | — | |
| – minimum | V | — | | 110 |
| – maximum | V | — | | 240 |
| • at 60 Hz at AC rated value | V | 24 | — | |
| – minimum | V | — | | 110 |
| – maximum | V | — | | 240 |
| **Operating range factor control supply voltage rated value of the magnet coil** | | | | |
| • at 50 Hz for AC | | 0.85 | — | 0.85 |
| | | 1.1 | — | 1.1 |
| • at 60 Hz for AC | | 0.85 | — | 0.85 |
| | | 1.1 | — | 1.1 |
| • for DC | | — | 0.8 | 0.85 |
| | | — | 1.2 | 1.1 |
| **Active power loss typical** | W | 2.5 | | 2 |
| **Contact reliability of the auxiliary contacts** | | — | | |
| **Product function parameterizable** | | — | undelayed/delayed (only with system connector) | — |
| **Suitability for interaction pressing control** | | — | | |
| **Suitability for use device connector 3ZY12** | | No | Yes | No |
| **Suitability for use** | | | | |
| • monitoring of floating sensors | | — | | |
| • monitoring of non-floating sensors | | — | | |
| • safety cut-out switch | | — | | |
| • magnetically operated switches monitoring | | — | | |
| • safety-related circuits | | Yes | | |

### 13.3.1.2 Technical data for output expansion 3SK1213

| | | 3SK1213-.AB.. | 3SK1213-.AJ.. | 3SK1213-.AL.. |
|---|---|---|---|---|
| Insulation voltage rated value | V | 300 | | |
| Resistance against shock | | 5 g / 10 ms | | |
| Number of sensor inputs 1-channel or 2-channel | | — | | |
| Type of the safety-related wiring of the inputs | | — | | |
| Product feature transverse contact-secure | | — | | |
| Safety Integrity Level (SIL) according to IEC 61508 | | SIL3 | | |
| SIL claim limit (for a subsystem) according to EN 62061 | | 3 | | |
| Performance level (PL) according to ISO 13849-1 | | e | | |
| Category according to ISO 13849-1 | | 4 | | |
| T1 value for proof test interval or service life according to IEC 61508 | a | 20 | | |
| Safety device type according to IEC 61508-2 | | Type A | | |
| Number of outputs as contact-affected switching element | | | | |
| • as NC contact for reporting function instantaneous switching | | 0 | | |
| • as NO contact for reporting function instantaneous switching | | 0 | | |
| • as NC contact for reporting function delayed switching | | 0 | | |
| • as NO contact for reporting function delayed switching | | 0 | | |
| • as NC contact safety-related instantaneous switching | | 0 | | |
| • as NO contact safety-related instantaneous switching | | 3 | | |
| • as NC contact safety-related delayed switching | | 0 | | |
| • as NO contact safety-related delayed switching | | 0 | | |
| Stop category according to DIN EN 60204-1 | | 0 | | |
| Design of the input start input | | — | | |
| Design of the electrical connection jumper socket | | No | | |

| | | 3SK1213-.AB.. | 3SK1213-.AJ.. | 3SK1213-.AL.. |
|---|---|---|---|---|
| **Operating cycles maximum** | 1/h | 360 | | |
| **Switching capacity current** | | | | |
| • of the NO contacts of the relay outputs | | | | |
| – at DC-13 | | | | |
| – at 24 V | A | 6 | | |
| – at 115 V | A | 1.1 | | |
| – at 230 V | A | 0.55 | | |
| – at AC-15 | | | | |
| – at 115 V | A | 10 | | |
| – at 230 V | A | 10 | | |
| • of the NC contacts of the relay outputs | | | | |
| – at DC-13 | | | | |
| – at 24 V | A | — | | |
| – at 115 V | A | — | | |
| – at 230 V | A | — | | |
| – at AC-15 | | | | |
| – at 115 V | A | — | | |
| – at 230 V | A | — | | |
| **Thermal current of the contact-affected switching element maximum** | A | 10 | | |
| **Total current maximum** | A | — | | |
| **Mechanical operating cycles as operating time typical** | | 10 000 000 | | |
| **Max. permissible voltage for safe isolation between electronic evaluation device and enabling circuit according to EN 60947-1** | V | 300 | | |
| **Design of the fuse link for short-circuit protection of the NO contacts of the relay outputs required** | | gL/gG: 16 A or MCB type A: 6 A or MCB type B: 4 A or MCB type C: 4 A | | |
| **Cable length between sensor and electronic evaluation device with Cu 1.5 mm² and 150 nF/km maximum** | m | — | | |

| | | 3SK1213-.AB.. | 3SK1213-.AJ.. | 3SK1213-.AL.. |
|---|---|---|---|---|
| **Make time** | | | | |
| • with automatic start | | | | |
| – typical | s | 0.05 | 0.01 | |
| – for DC maximum | s | 0.07 | — | |
| – for AC maximum | s | — | 0.015 | |
| – after mains power cut | | | | |
| – typical | s | 0.05 | 0.01 | |
| – maximum | s | 0.07 | 0.015 | |
| • with monitored start | | | | |
| – maximum | s | — | | |
| – typical | s | — | | |
| **Backslide delay time** | | | | |
| • after opening of the safety circuits typical | s | — | | |
| • at mains power cut | | | | |
| – typical | ms | 20 | 15 | |
| – maximum | ms | 20 | 15 | |
| **Adjustable backslide delay time after opening of the safety circuits** | | | | |
| • initial value | s | — | | |
| • final value | s | — | | |
| **Recovery time** | | | | |
| • after opening of the safety circuits typical | s | — | | |
| • after mains power cut typical | s | 0 | | |
| **Pulse duration** | | | | |
| • of the sensor input minimum | s | — | | |
| • of the ON pushbutton input minimum | s | — | | |
| • of the cascading-entrance minimum | s | — | | |
| **Type of voltage of the controlled supply voltage** | | DC | AC | |
| **Control supply voltage frequency** | | | | |
| • 1 rated value | Hz | — | 50 | |
| • 2 rated value | Hz | — | 60 | |

| | | 3SK1213-.AB.. | 3SK1213-.AJ.. | 3SK1213-.AL.. |
|---|---|---|---|---|
| **Control supply voltage** | | | | |
| • for DC rated value | V | 24 | — | |
| – minimum | V | — | | |
| – maximum | V | — | | |
| • at 50 Hz at AC rated value | V | — | 115 | 230 |
| – minimum | V | — | | |
| – maximum | V | — | | |
| • at 60 Hz at AC rated value | V | — | 115 | 230 |
| – minimum | V | — | | |
| – maximum | V | — | | |
| **Operating range factor control supply voltage rated value of the magnet coil** | | | | |
| • at 50 Hz for AC | | — | 0.85 | |
| | | — | 1.1 | |
| • at 60 Hz for AC | | — | 0.85 | |
| | | — | 1.1 | |
| • for DC | | 0.8 | — | |
| | | 1.2 | — | |
| **Active power loss typical** | W | 5.5 | 4 | 3.5 |
| **Contact reliability of the auxiliary contacts** | | — | | |
| **Product function parameterizable** | | undelayed/delayed (only with system connector) | — | |
| **Suitability for interaction pressing control** | | — | | |
| **Suitability for use device connector 3ZY12** | | Yes | No | |
| **Suitability for use** | | | | |
| • monitoring of floating sensors | | — | | |
| • monitoring of non-floating sensors | | — | | |
| • safety cut-out switch | | — | | |
| • magnetically operated switches monitoring | | — | | |
| • safety-related circuits | | Yes | | |

## 13.3.2 Input expansions

### 13.3.2.1 Technical data for input expansion 3SK1220

| | | 3SK1220-..... |
|---|---|---|
| **Insulation voltage rated value** | V | 50 |
| **Resistance against shock** | | 10g / 11 ms |
| **Number of sensor inputs 1-channel or 2-channel** | | 1 |
| **Type of the safety-related wiring of the inputs** | | single-channel and two-channel |
| **Product feature transverse contact-secure** | | Yes |
| **Safety Integrity Level (SIL) according to IEC 61508** | | SIL3 |
| **SIL claim limit (for a subsystem) according to EN 62061** | | 3 |
| **Performance level (PL) according to ISO 13849-1** | | e |
| **Category according to ISO 13849-1** | | 4 |
| **T1 value for proof test interval or service life according to IEC 61508** | a | 20 |
| **Safety device type according to IEC 61508-2** | | Type B |
| **Number of outputs as contact-affected switching element** | | |
| • as NC contact for reporting function instantaneous switching | | 0 |
| • as NO contact for reporting function instantaneous switching | | 0 |
| • as NC contact for reporting function delayed switching | | 0 |
| • as NO contact for reporting function delayed switching | | 0 |
| • as NC contact safety-related instantaneous switching | | 0 |
| • as NO contact safety-related instantaneous switching | | 0 |
| • as NC contact safety-related delayed switching | | 0 |
| • as NO contact safety-related delayed switching | | 0 |
| **Stop category according to DIN EN 60204-1** | | 0 |
| **Design of the input start input** | | Yes |
| **Design of the electrical connection jumper socket** | | No |
| **Operating cycles maximum** | 1/h | — |

| | | 3SK1220-..... |
|---|---|---|
| **Switching capacity current** | | |
| • of the NO contacts of the relay outputs | | |
| – at DC-13 | | |
| – at 24 V | A | — |
| – at 115 V | A | — |
| – at 230 V | A | — |
| – at AC-15 | | |
| – at 115 V | A | — |
| – at 230 V | A | — |
| • of the NC contacts of the relay outputs | | |
| – at DC-13 | | |
| – at 24 V | A | — |
| – at 115 V | A | — |
| – at 230 V | A | — |
| – at AC-15 | | |
| – at 115 V | A | — |
| – at 230 V | A | — |
| **Thermal current of the contact-affected switching element maximum** | A | — |
| **Total current maximum** | A | — |
| **Mechanical operating cycles as operating time typical** | | — |
| **Max. permissible voltage for safe isolation between electronic evaluation device and enabling circuit according to EN 60947-1** | V | — |
| **Design of the fuse link for short-circuit protection of the NO contacts of the relay outputs required** | | — |
| **Cable length between sensor and electronic evaluation device with Cu 1.5 mm² and 150 nF/km maximum** | m | 1 000 |
| **Make time** | | |
| • with automatic start | | |
| – typical | s | 0.06 |
| – for DC maximum | s | 0.06 |
| – for AC maximum | s | — |
| – after mains power cut | | |
| – typical | s | 6.5 |
| – maximum | s | 6.5 |
| • with monitored start | | |
| – maximum | s | 0.06 |
| – typical | s | 0.06 |

| | | 3SK1220-..... |
|---|---|---|
| **Backslide delay time** | | |
| • after opening of the safety circuits typical | s | 0.04 |
| • at mains power cut | | |
| – typical | s | — |
| – maximum | s | — |
| **Adjustable backslide delay time after opening of the safety circuits** | | |
| • initial value | s | — |
| • final value | s | — |
| **Recovery time** | | |
| • after opening of the safety circuits typical | s | 0.03 |
| • after mains power cut typical | s | — |
| **Pulse duration** | | |
| • of the sensor input minimum | s | 0.06 |
| • of the ON pushbutton input minimum | s | 0.15 |
| • of the cascading-entrance minimum | s | — |
| **Type of voltage of the controlled supply voltage** | | DC |
| **Control supply voltage frequency** | | |
| • 1 rated value | Hz | — |
| • 2 rated value | Hz | — |
| **Control supply voltage** | | |
| • for DC rated value | V | 24 |
| – minimum | V | — |
| – maximum | V | — |
| • at 50 Hz at AC rated value | V | — |
| – minimum | V | — |
| – maximum | V | — |
| • at 60 Hz at AC rated value | V | — |
| – minimum | V | — |
| – maximum | V | — |
| **Operating range factor control supply voltage rated value of the magnet coil** | | |
| • at 50 Hz for AC | | — |
| | | — |
| • at 60 Hz for AC | | — |
| | | — |
| • for DC | | 0.8 |
| | | 1.2 |
| **Active power loss typical** | W | 1.2 |

| | 3SK1220-..... |
|---|---|
| **Contact reliability of the auxiliary contacts** | — |
| **Product function parameterizable** | Sensor floating / sensor non-floating, monitored start / autostart, 1-channel / 2-channel sensor connection, cross-circuit detection, startup testing, antivalent sensors, 2-hand switches |
| **Suitability for interaction pressing control** | No |
| **Suitability for use device connector 3ZY12** | Yes |
| **Suitability for use** | |
| • monitoring of floating sensors | Yes |
| • monitoring of non-floating sensors | Yes |
| • safety cut-out switch | Yes |
| • magnetically operated switches monitoring | Yes |
| • safety-related circuits | Yes |

### 13.3.2.2 Technical data for power supply unit 3SK1230

| Bestell-Nr. | | 3SK1230-1AW20 | 3SK1230-2AW20 |
|---|---|---|---|
| Type of current supply | | 24 V / 0,6 A | |
| Type of display for normal operation | | Green LED for 24 V OK | |
| Overvoltage class | | Installation category III | |
| Characteristic feature of the output short-circuit protected | | Yes | |
| Product feature Bridging of channels | | No | |
| Output voltage for DC nominal value | V | 24 | |
| Output current nominal range ultimate value | A | 0.6 | |
| Resistive loss | W | 17 | |
| Design of the short-circuit protection | | automatically start-up | |
| Operating range factor control supply voltage rated value | | | |
| • at 50 Hz for AC | | | |
| – initial value | | 0.85 | |
| – final value | | 1.1 | |
| • at 60 Hz for AC | | | |
| – initial value | | 0.85 | |
| – final value | | 1.1 | |
| • for DC | | | |
| – initial value | | 0.85 | |
| – final value | | 1.1 | |
| Control supply voltage | | | |
| • at 50 Hz at AC rated value | | | |
| – maximum | V | 240 | |
| – minimum | V | 110 | |
| • at 60 Hz at AC rated value | | | |
| – maximum | V | 240 | |
| – minimum | V | 110 | |
| • for DC rated value | | | |
| – maximum | V | 240 | |
| – minimum | V | 110 | |
| Resistance against shock | | 10g / 11 ms | |
| Verification of suitability | | | |
| • TÜV (German technical inspectorate) certificate | | No | |
| • UL-registration | | Yes | |

# Dimension drawings

# 14

## 14.1 Dimension drawings for 3SK1 devices

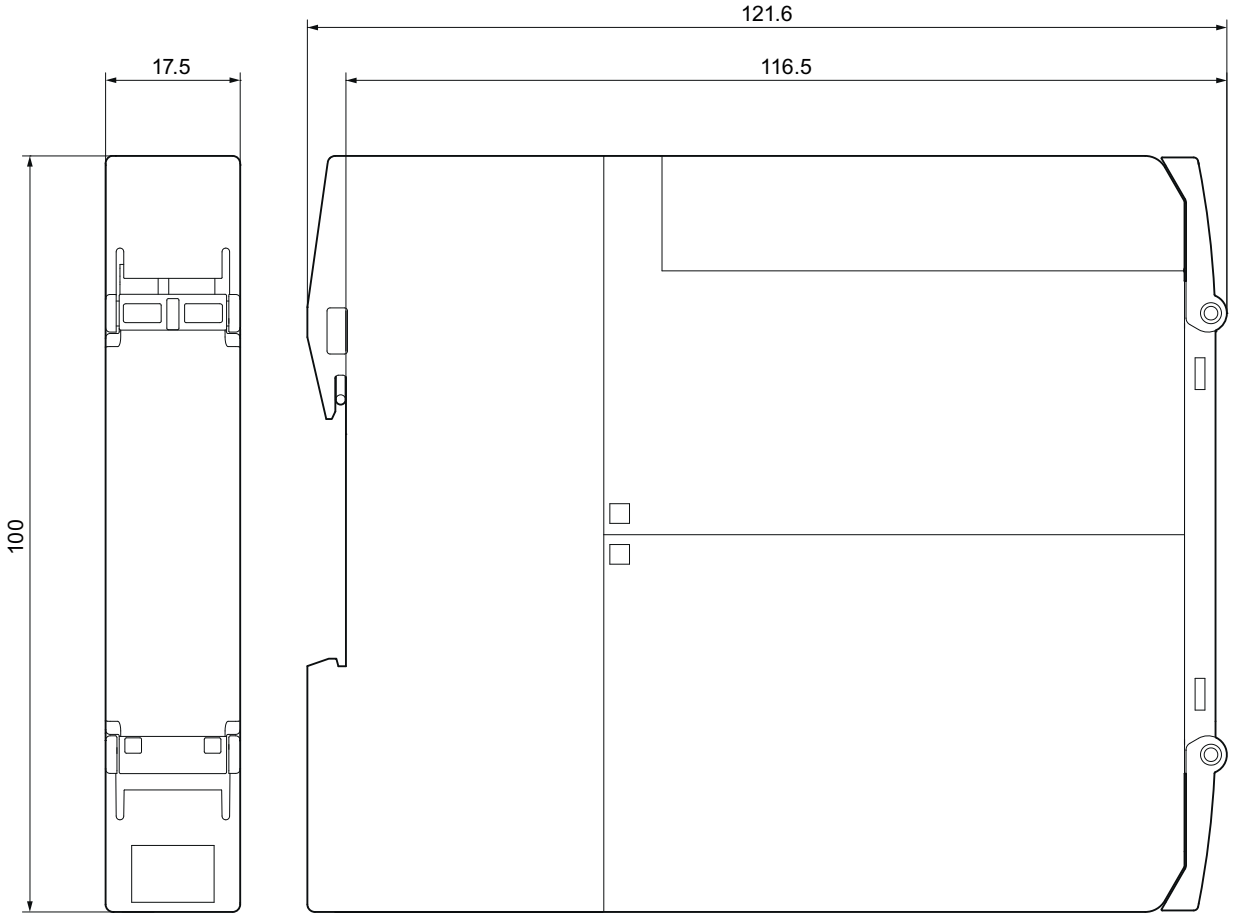



Figure 14-1 Enclosure 17.5 mm for safety relays:
3SK1120-….. ; 3SK1220-…..

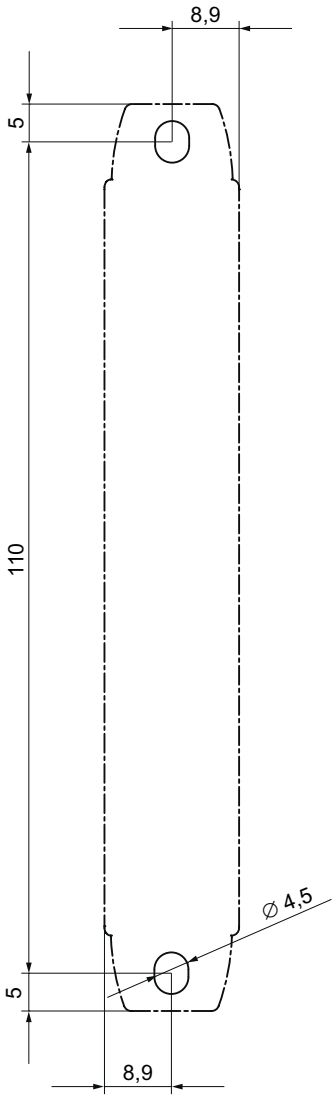



Figure 14-2 Drilling diagram, enclosure 17.5 mm

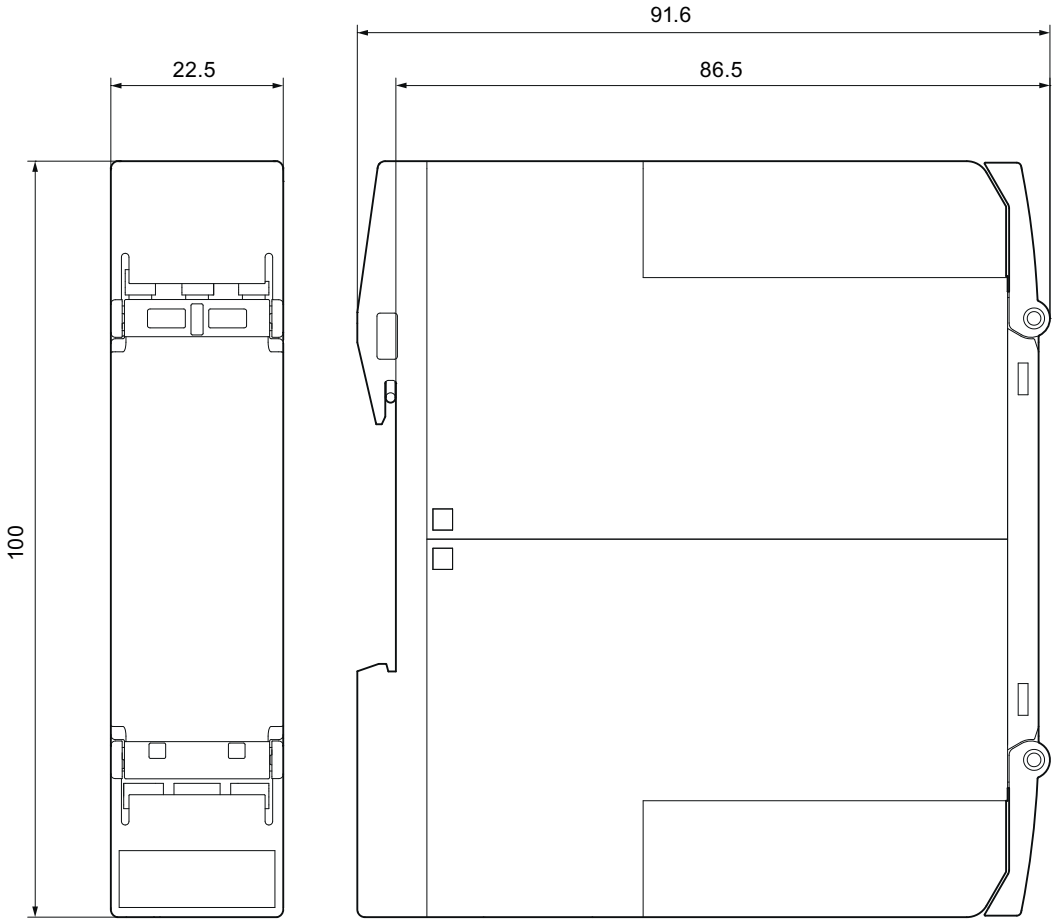



Figure 14-3 Enclosure 22.5 mm (short) for safety relays: 3SK1112-…..

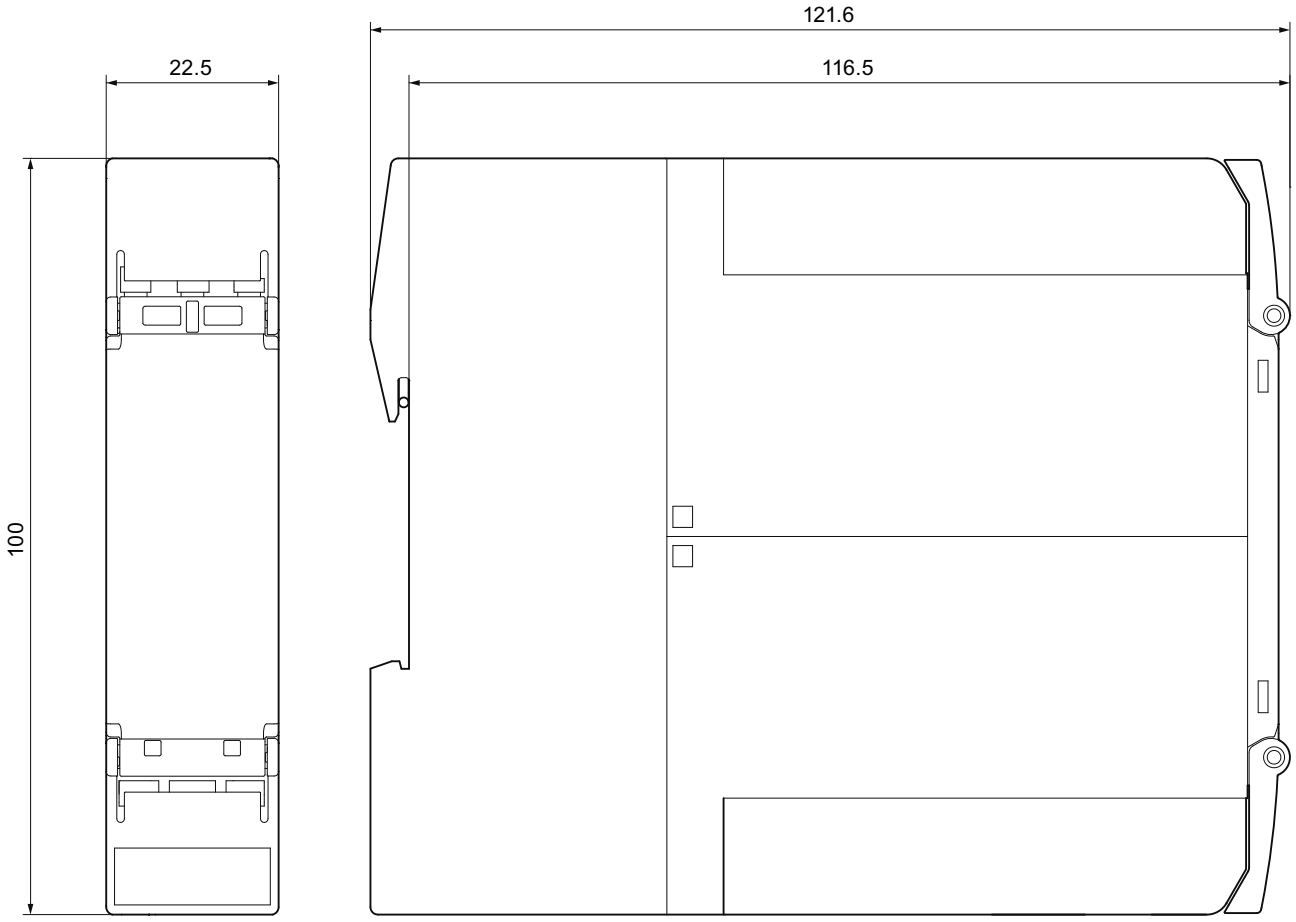



Figure 14-4 Enclosure 22.5 mm (long) for safety relays:
3SK1111-….. ; 3SK1121-….. ; 3SK1122-….. ; 3SK1211-….. ; 3SK1230-…..

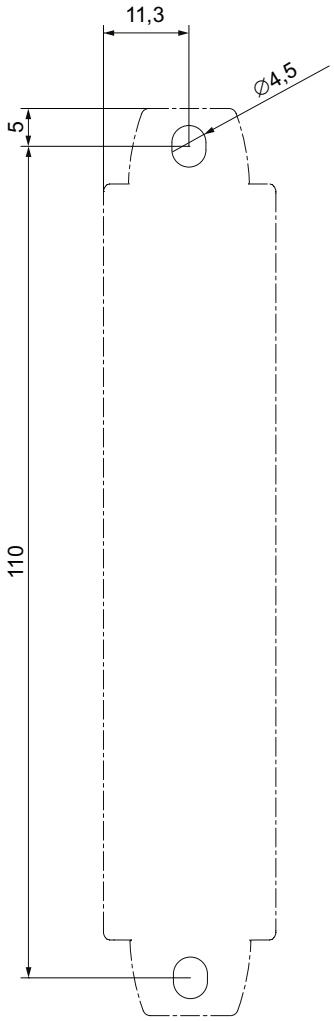



Figure 14-5 Drilling diagram, enclosure 22.5 mm

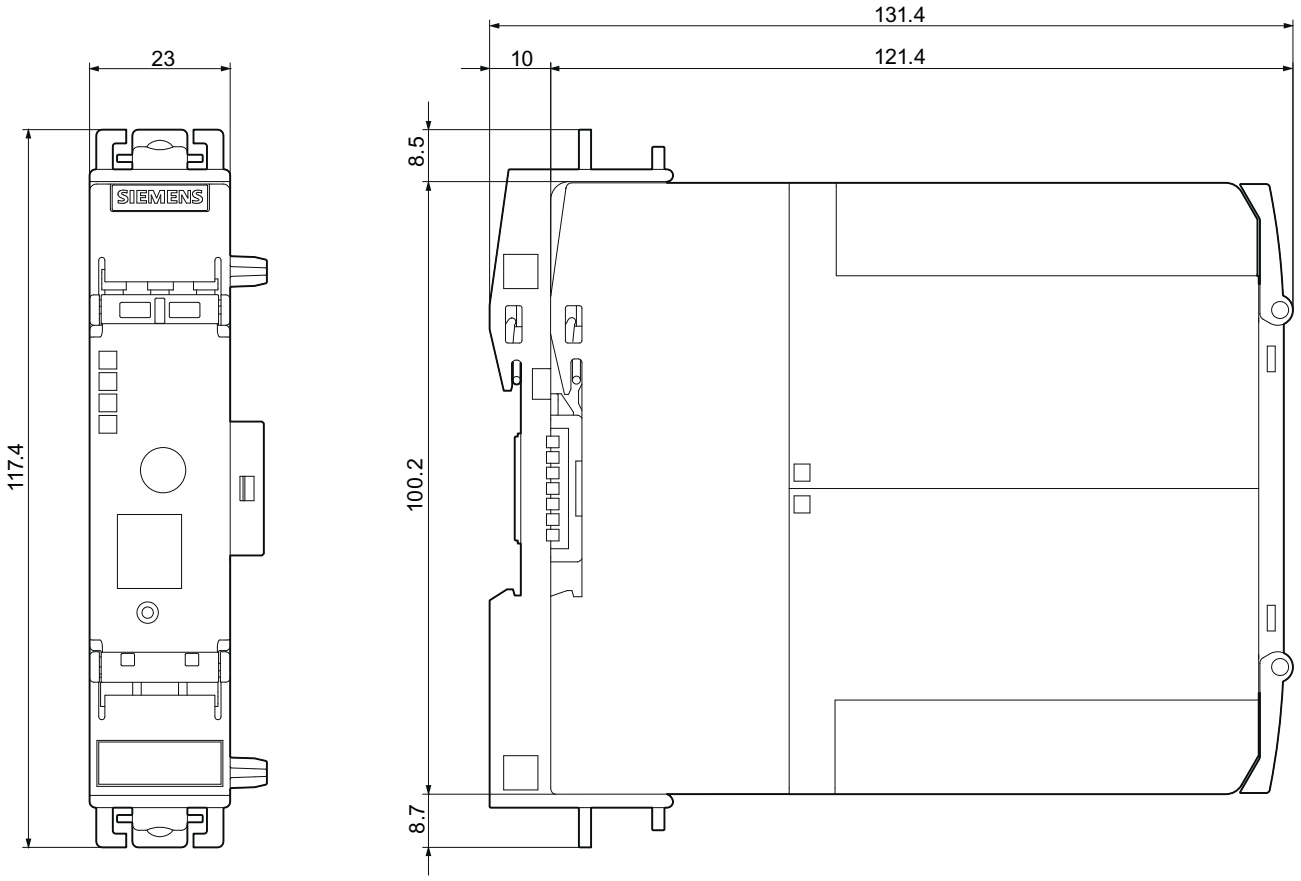



Figure 14-6 Dimension drawing 3SK1 device on device connector

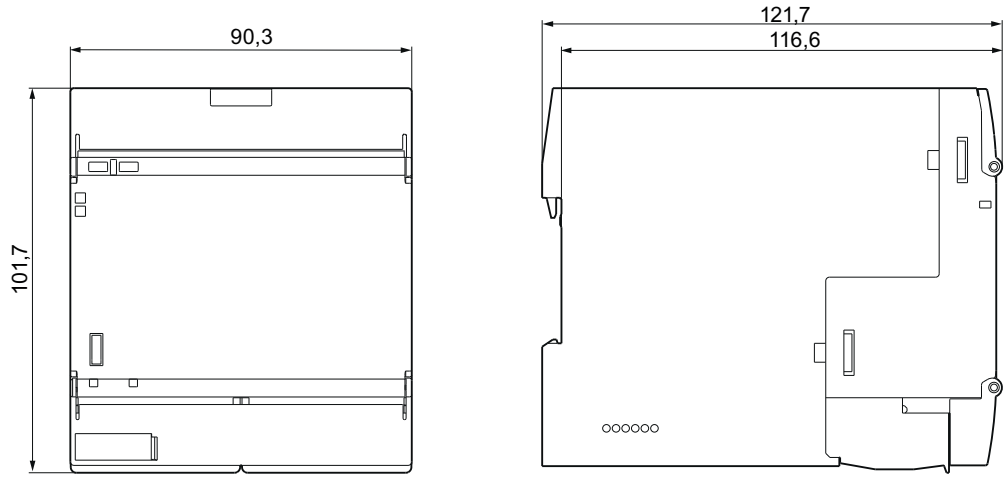



Figure 14-7 Enclosure 90 mm for safety relays: 3SK1213-…..

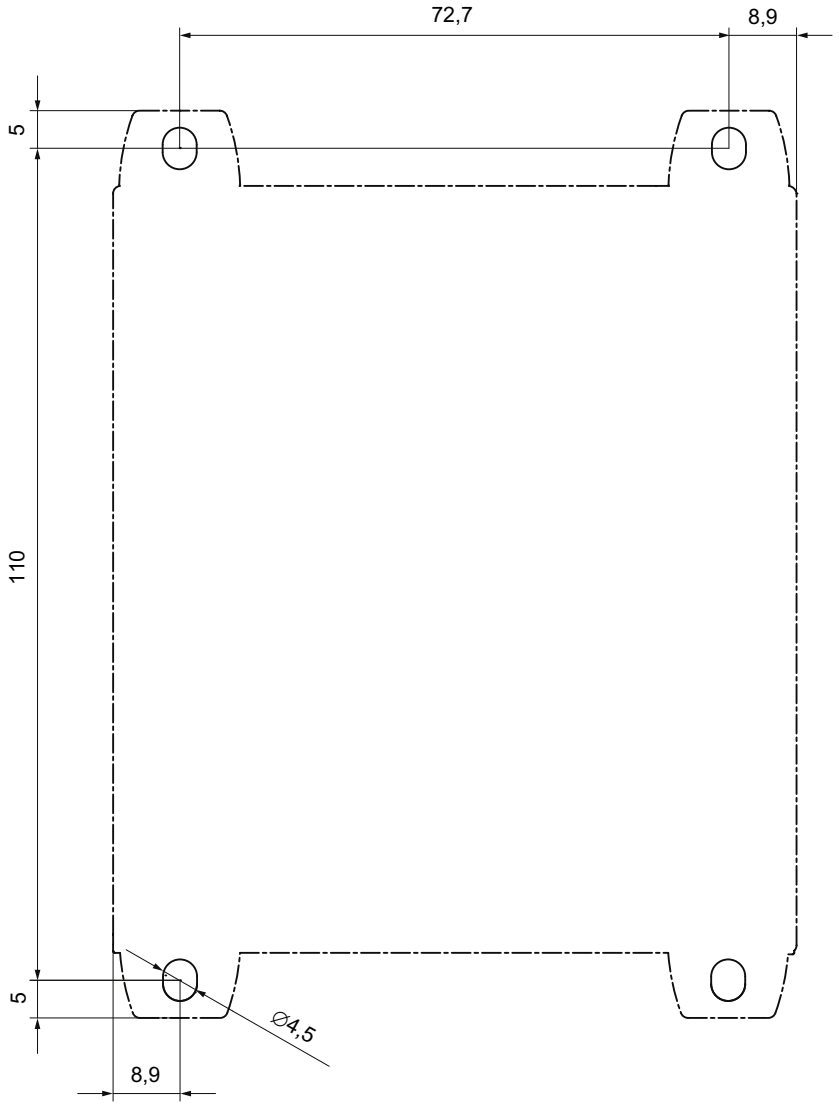



Figure 14-8 Drilling diagram, enclosure 90 mm

## 14.2 Dimension drawings for 3SK1 device connector

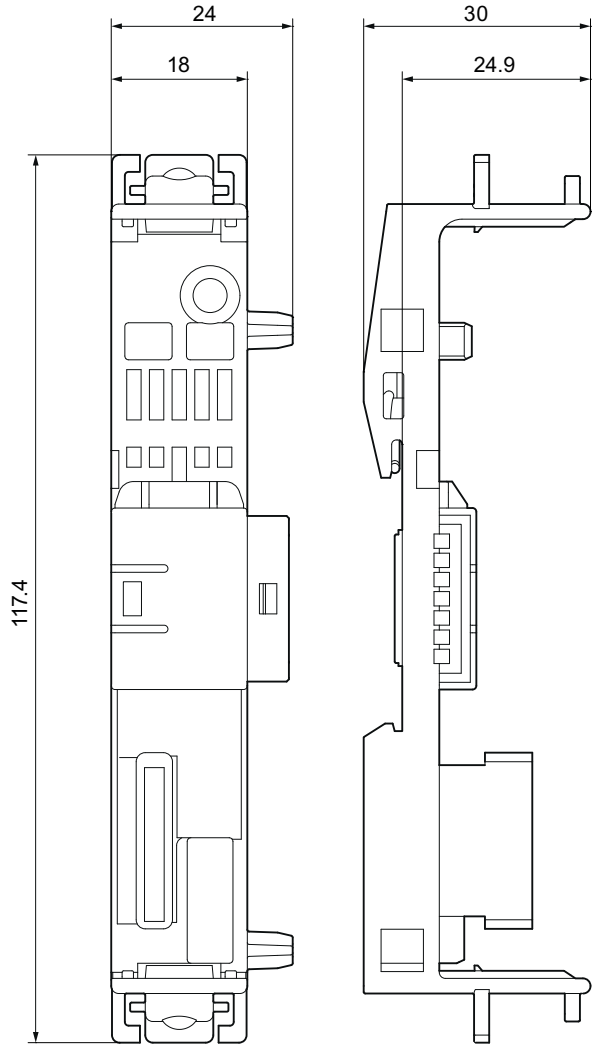



Figure 14-9 Device connector 17.5 mm

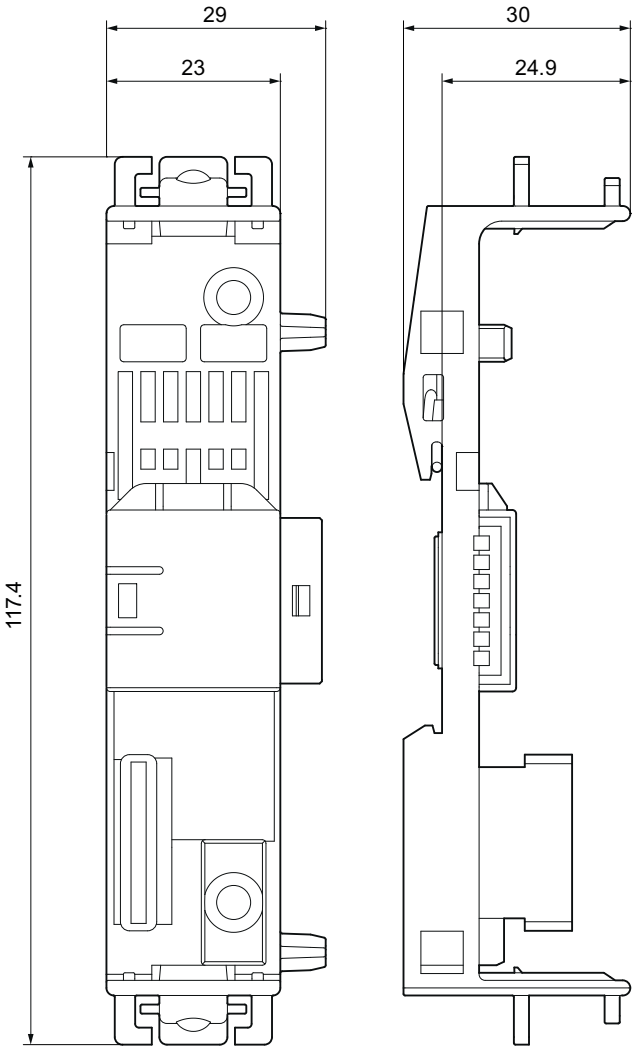



Figure 14-10 Device connector, type 1, 22.5 mm

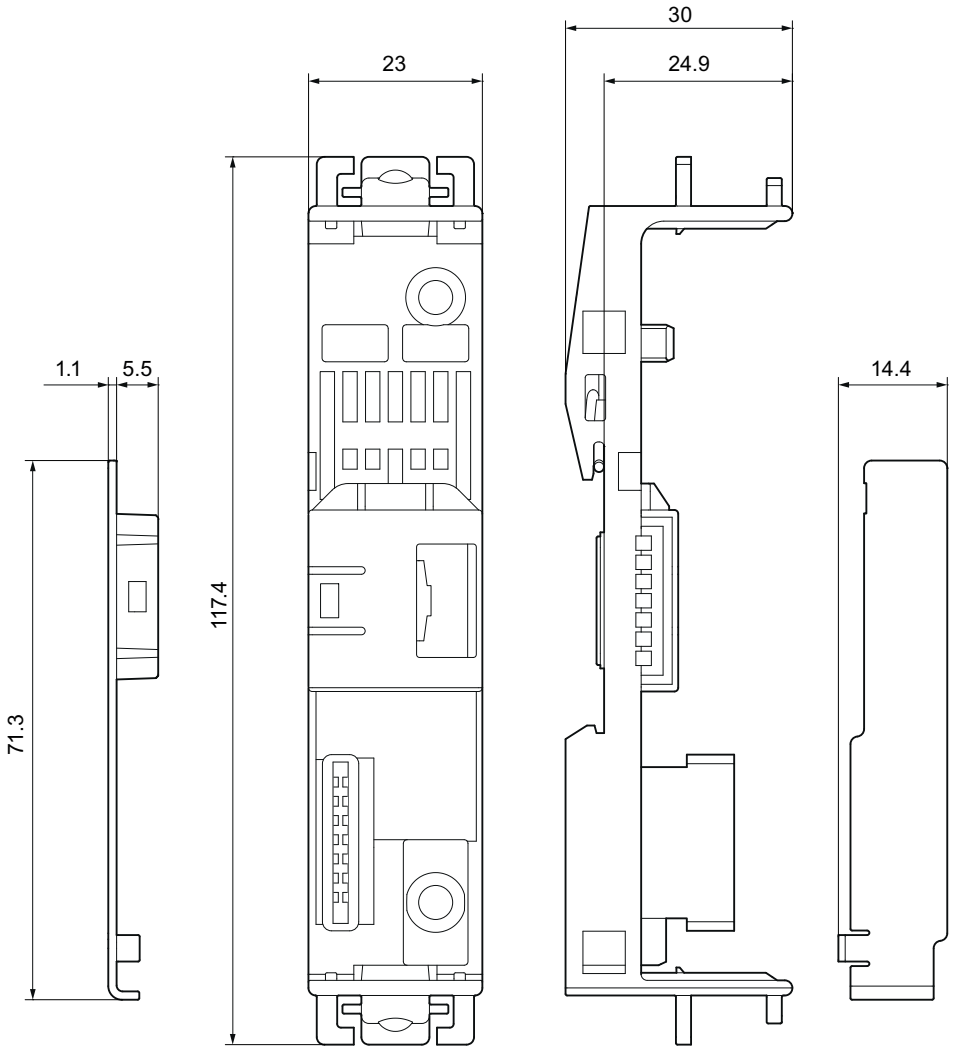



Figure 14-11 Device termination connector, type 1, 22.5 mm

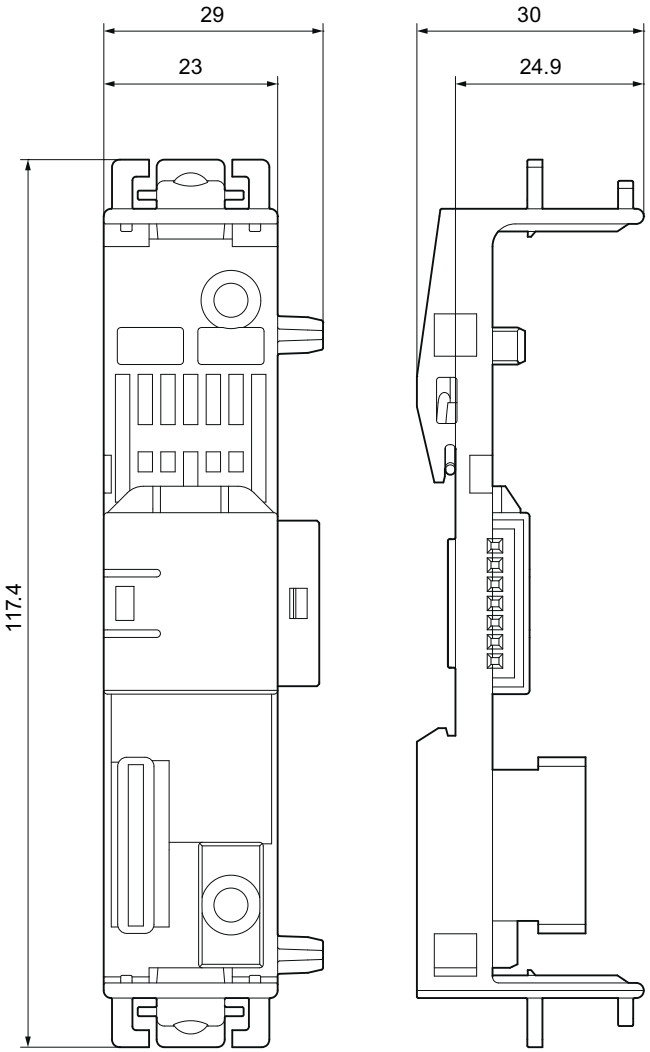



Figure 14-12 Device connector, type 2, 22.5 mm

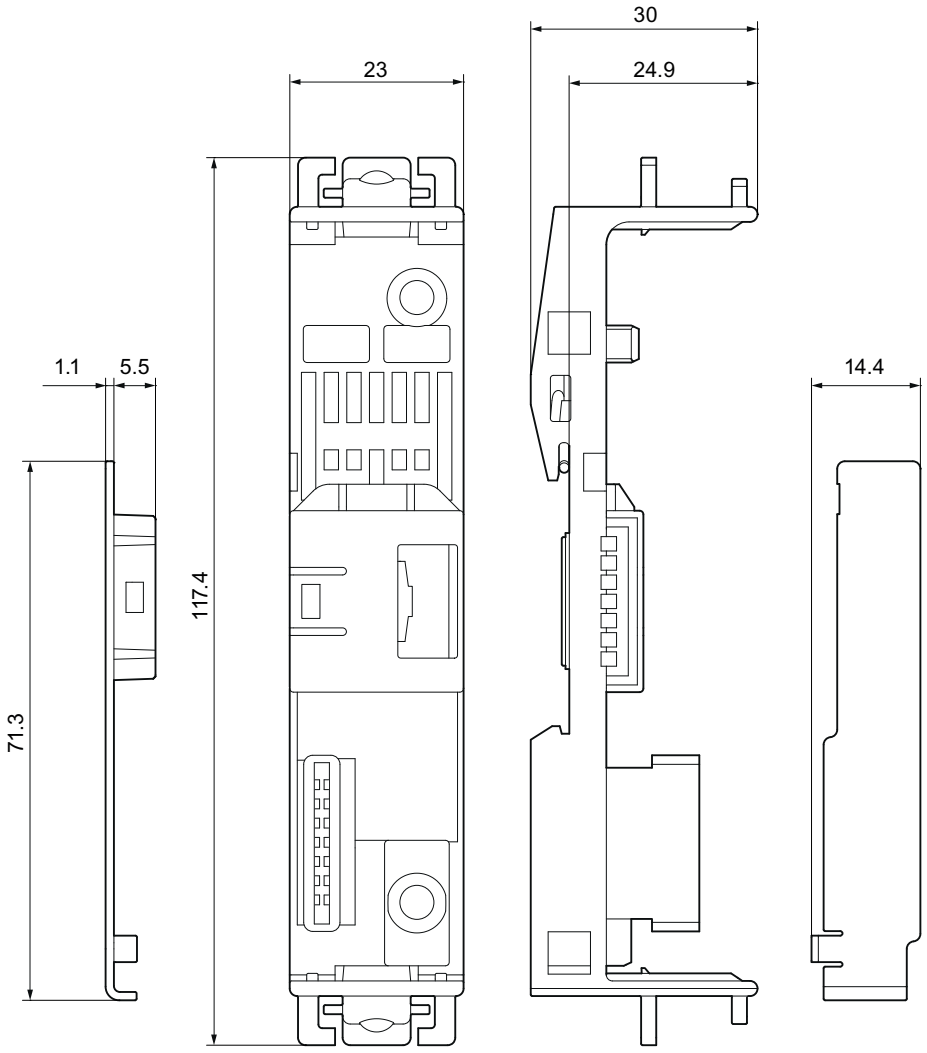



Figure 14-13 Device termination connector, type 2, 22.5 mm

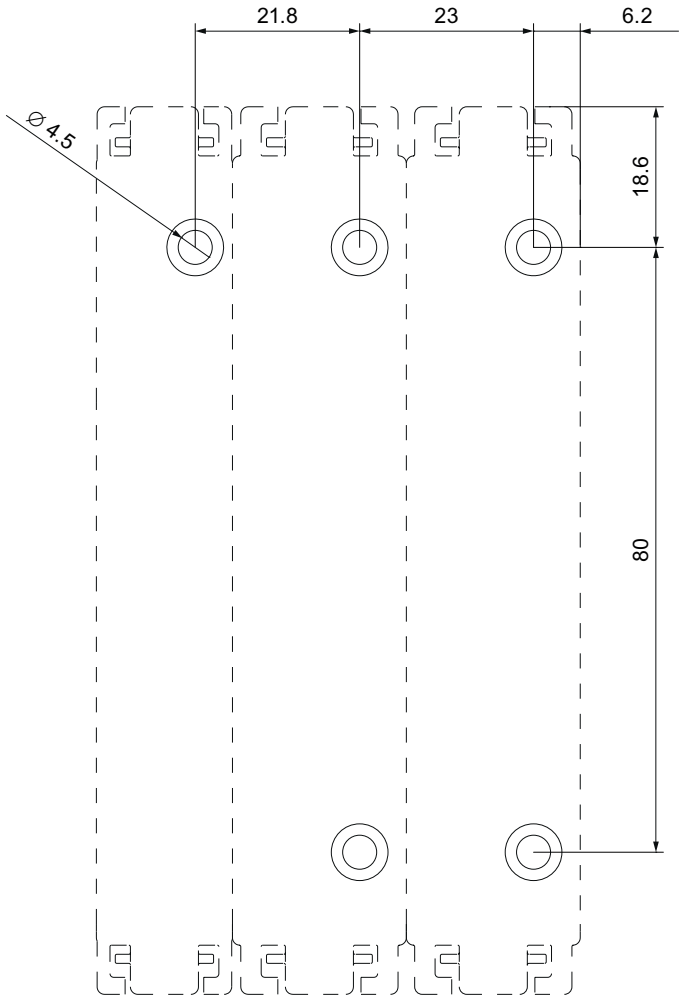



Figure 14-14 Drilling plan for 17.5 mm and 22.5 mm device connectors

# Accessories

# 15

The following accessories are available for the 3SK1 devices.

| Designation | MLFB |
|---|---|
| SIRIUS terminal, 2-pole, screw-type, 1 x 2.5 mm² | 3ZY1121-1BA00 |
| SIRIUS terminal, 3-pole, screw-type, 1 x 2.5 mm² | 3ZY1131-1BA00 |
| SIRIUS terminal, 2-pole, push-in, 1 x 2.5 mm² | 3ZY1121-2BA00 |
| SIRIUS terminal, 3-pole, push-in, 1 x 2.5 mm² | 3ZY1131-2BA00 |
| SIRIUS device connector, type 1, 17.5 mm | 3ZY1212-1BA00 |
| SIRIUS device connector, type 1, 22.5 mm | 3ZY1212-2BA00 |
| SIRIUS device termination connector, type 1, 22.5 mm | 3ZY1212-2DA00 |
| SIRIUS device connector, type 2, 22.5 mm | 3ZY1212-2EA00 |
| SIRIUS device termination connector, type 2, 22.5 mm | 3ZY1212-2FA00 |
| SIRIUS device termination connector, type 2, set for enclosures of 45 mm upwards | 3ZY1212-0FA01 |
| SIRIUS push-in lugs for wall mounting (contents: 12 units) | 3ZY1311-0AA00 |
| SIRIUS sealable cover 17.5 mm | 3ZY1321-1AA00 |
| SIRIUS sealable cover 22.5 mm | 3ZY1321-2AA00 |
| Coding pins for SIRIUS terminals | 3ZY1440-1AA00 |
| Sealable membrane 22.5 mm<br>1 pack = 12 membranes | 3TK2820-0AA00 |
| SIRIUS device identification label<br>17 sheets of 48 labels; large 10 x 7 mm | 3RT2900-1SB10 |
| SIRIUS device identification label<br>17 sheets of 20 labels; large 20 x 7 mm | 3RT2900-1SB20 |
| SIRIUS device identification label<br>10 sheets of 306 adhesive labels; large 19 x 6 mm | 3RT2900-1SB60 |

# Appendix

# A

## A.1 Correction sheet

Have you noticed any errors while reading this manual? If so, please use this form to tell us about them. We welcome comments and suggestions for improvement.

**Fax response**

| | |
|---|---|
| | **From (please complete):** |
| **To** | Name |
| **SIEMENS AG** | |
| **I IA CE MK&ST 3** | Company/Department |
| **92220 Amberg / Germany** | Address |

Fax: +49 (0)9621-80-3337

**Manual title:**

Table A- 1 Errors, comments, and suggestions for improvements

| |
|---|
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |

## Service & Support

Download catalogs and information material:
**www.siemens.com/sirius/infomaterial**

Newsletter - always up to date:
**www.siemens.com/sirius/newsletter**

E-Business in the Industry Mall:
**www.siemens.com/sirius/mall**

Online-Support:
**www.siemens.com/sirius/support**

Contact for all technical information:
**Technical Assistance**
**Tel.: +49 (911) 895-5900**
**e-mail: technical-assistance@siemens.com**
**www.siemens.com/sirius/technical-assistance**

Siemens AG
Industry Sector
Postfach 23 55
90713 FUERTH
GERMANY

Subject to change without prior notice
Order No.: 3ZX1012-0SK11-0AC0

© Siemens AG 2013

Industrial
Controls
SIRIUS

**www.siemens.com/automation**