

## Correct use

Safety switches series TK are interlocking devices with a guard locking pin.

Safety switches TK do not have a prevention of inadvertent locking position (faulty closure protection). This must be implemented separately.

In combination with a movable guard and the machine control, this safety component prevents the guard from being opened while a dangerous machine function is being performed.

The position of the guard must be monitored for this purpose, e.g. with another safety switch.

This means:

- ▶ Starting commands that cause a dangerous machine function must become active only when the guard is closed and locked.
- ▶ The guard locking must not be unlocked until the dangerous machine function has ended.
- ▶ Closing and locking a guard must not cause automatic starting of a dangerous machine function. A separate start command must be issued. For exceptions, refer to EN ISO 12100 or relevant C-standards.

Devices from this series are also suitable for process protection.

Before the device is used, a risk assessment must be performed on the machine, e.g. in accordance with the following standards:

- ▶ EN ISO 13849-1
- ▶ EN ISO 12100
- ▶ IEC 62061

Correct use includes observing the relevant requirements for installation and operation, particularly based on the following standards:

- ▶ EN ISO 13849-1
- ▶ EN ISO 14119
- ▶ EN 60204-1

### Important!

- ▶ The user is responsible for the proper integration of the device into a safe overall system. For this purpose, the overall system must be validated, e.g. in accordance with EN ISO 13849-2.
- ▶ If the simplified method according to section 6.3 of EN ISO 13849-1:2015 is used for determining the Performance Level (PL), the PL might be reduced if several devices are connected in series.
- ▶ Logical series connection of safe contacts is possible up to PL d in certain circumstances. More information about this is available in ISO TR 24119.
- ▶ If a product data sheet is included with the product, the information on the data sheet applies in case of discrepancies with the operating instructions.

## Safety precautions

### ⚠ WARNING

Danger to life due to improper installation or due to bypassing (tampering). Safety components fulfill a personnel protection function.

- ▶ Safety components must not be bypassed, turned away, removed or otherwise rendered ineffective. On this topic pay attention in particular to the measures for reducing the possibility of bypassing according to EN ISO 14119:2013, section 7.
- ▶ Prevent bypassing by means of replacement keys. For this purpose, restrict access to keys for releases.
- ▶ Mounting, electrical connection and setup only by authorized personnel possessing special knowledge about handling safety components.

### ⚠ CAUTION

Danger due to high housing temperature at ambient temperatures above 40 °C.

- ▶ Protect switch against touching by personnel or contact with inflammable material.

## Function

The safety switch permits the locking of movable guards.

The guard locking pin is extended on the activation of the guard locking. Guard locking is achieved by the insertion of the guard locking pin into a recess on the safety door frame, for example (see Fig. 1).

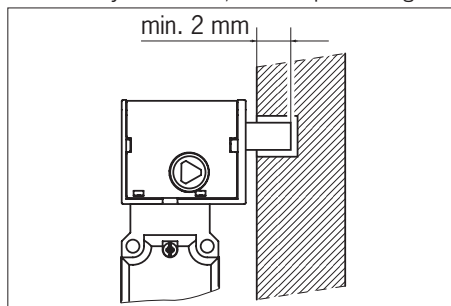



Fig. 1: Locked safety switch TK

The safety switch is designed so that fault exclusions for internal faults in accordance with EN ISO 13849-2:2013, Table A4, can be assumed.

## Guard locking monitoring

All versions feature at least one safe contact for monitoring guard locking. The contacts  are opened when guard locking is released.

## Version TK1

(Guard locking actuated by spring force and released by power-ON)

- ▶ Activating guard locking: close guard, disconnect voltage from the solenoid
- ▶ Releasing guard locking: apply voltage to the solenoid

The spring-operated guard locking functions in accordance with the closed-circuit current principle. If the voltage is interrupted at the solenoid, the guard locking remains active and the guard cannot be opened directly.

If the guard is open when the power supply is interrupted and is then closed, guard locking is activated. This can lead to persons being locked in unintentionally.

## Version TK2

(Guard locking actuated by power-ON and released by spring force)

### Important!

Use as guard locking for personnel protection is possible only in special cases, after strict assessment of the accident risk (see EN ISO 14119:2013, section 5.7.1)!

- ▶ Activating guard locking: apply voltage to the solenoid
- ▶ Releasing guard locking: disconnect voltage from the solenoid

The magnetically actuated guard locking operates in accordance with the open-circuit current principle. If the voltage at the solenoid is interrupted, the guard locking is released and the guard can be opened directly!

## Switching states

The detailed switching states for your switch can be found in Fig. 2. All available switching elements are described there.

### Guard not locked

TK1 and TK2:  
The safety contacts  are open.

### Guard locked

TK1 and TK2:  
The safety contacts  are closed.


## Manual release

Some situations require the guard locking to be released manually (e.g. malfunctions or an emergency). A function test should be performed after release.

More information on this topic can be found in the standard EN ISO 14119:2013, section 5.7.5.1. The device can feature the following release functions:

### Auxiliary release with triangular wedge

In the event of malfunctions, the guard locking can be released with the auxiliary release irrespective of the state of the solenoid (see Figure 3).

The contacts  are opened when the auxiliary release is actuated. A stop command must be generated with these contacts.

- ▶ Insert triangular key into the release on the switch head and turn against the locking direction.
- ➔ Guard locking is released.


### Important!

The guard locking auxiliary release does not possess a resetting device in accordance with EN ISO 14119. Additional measures at the control system level are required to achieve this.


## Contact separation

### Important!

The guard locking pin must not be under tensile stress during manual release.

If there are malfunctions, the contacts  can be opened with contact separation. A stop command must be generated with these contacts.

### Actuating contact separation

1. Unscrew locking screw.
  2. Using a screwdriver, turn the contact separation to  in the direction of the arrow.
- ➔ The contacts are opened.

### Important!

- ▶ The guard locking is not unlocked!
- ▶ After use, reset the contact separation and screw in and seal the locking screw (e.g. with sealing lacquer).

Mounting

NOTICE

- Device damage due to improper mounting and unsuitable ambient conditions
- ▶ Safety switches must not be used as an end stop.
  - ▶ Observe EN ISO 14119:2013, sections 5.2 and 5.3, for information about fastening the safety switch.
  - ▶ Observe EN ISO 14119:2013, section 7, for information about reducing the possibilities for bypassing an interlocking device.
  - ▶ Protect the switch head against damage, as well as penetrating foreign objects such as swarf, sand and blasting shot, etc.
  - ▶ The actuating head is not allowed to be turned.
  - ▶ The specified IP degree of protection is applicable only if the housing screws, cable entries and plug connectors are properly tightened. Observe the tightening torques.
  - ▶ The guard locking pin must be inserted by at least 2 mm (see Fig. 1).
  - ▶ Mount the safety switch positively. The switch must be fastened using four screws (M5) on the switch's head. The specified locking force applies only to this type of attachment.

Electrical connection

⚠ WARNING

- Loss of the safety function due to incorrect connection.
- ▶ Use only safe contacts (⊕) and (⊖) for safety functions.
  - ▶ When choosing the insulation material and wire for the connections, pay attention to the required temperature resistance and the max. mechanical load!
  - ▶ Strip the insulation from the ends of the individual wires over a length of 6±1 mm to ensure a reliable contact.

Use of the safety switch as guard locking for personnel protection

At least one contact (⊖) must be used. It signals the guard locking state (for terminal assignment, see Fig. 2).

Use of the safety switch as guard locking for process protection

At least one contact (⊕) must be used. Contacts with the (⊖) symbol can also be used (for terminal assignment, see Fig. 2).

The following information applies to devices with plug connector:

- ▶ Check that the plug connector is sealed.

The following information applies to devices with cable entry:

1. Use a suitable tool to open the desired insertion opening.
2. Fit the cable gland with the appropriate degree of protection.
3. Connect and tighten the terminals with 0.5 Nm (for terminal assignment, see Fig. 2).
4. Check that the cable entry is sealed.
5. Close the switch cover and screw in place (tightening torque 0.8 Nm).

Function test

⚠ WARNING

- Fatal injury due to faults during the function test.
- ▶ Before carrying out the function test, make sure that there are no persons in the danger zone.
  - ▶ Observe the valid accident prevention regulations.

Check the device for correct function after installation and after every fault.

Proceed as follows:

Mechanical function test

The guard locking pin must move easily to the locked position. For checking, close the guard several times and extend and retract guard locking pin.

Electrical function test

1. Switch on operating voltage.
2. Close all guards and activate guard locking.
  - ➔ The machine must not start automatically.
  - ➔ It must not be possible to open the guard.
3. Start the machine function.
  - ➔ It must not be possible to release guard locking as long as the dangerous machine function is active.
4. Stop the machine function and release guard locking.
  - ➔ The guard must remain locked until there is no longer any risk of injury (e.g. due to movements with overtravel).
  - ➔ It must not be possible to start the machine function as long as guard locking is released.

Repeat steps 2–4 for each guard.

Inspection and service

⚠ WARNING

Danger of severe injuries due to the loss of the safety function.

- ▶ If damage or wear is found, the complete switch must be replaced. Replacement of individual parts or assemblies is not permitted.
- ▶ Check the device for proper function at regular intervals and after every fault. For information about possible time intervals, refer to EN ISO 14119:2013, section 8.2.
- ▶ Do not grease guard locking pin.

Inspection of the following is necessary to ensure trouble-free long-term operation:

- ▶ correct switching function
- ▶ secure mounting of all components
- ▶ damage, heavy contamination, dirt and wear
- ▶ sealing of cable entry
- ▶ loose cable connections or plug connectors.

Info: The year of manufacture can be seen in the bottom, right corner of the type label.

Exclusion of liability and warranty

In case of failure to comply with the conditions for correct use stated above, or if the safety regulations are not followed, or if any servicing is not performed as required, liability will be excluded and the warranty void.

Notes about cULus

The following information applies to devices with cable entry:

For use and applications as per the requirements of cULus, a copper wire for the temperature range 60/75 °C is to be used.

The following information applies to devices with plug connector:

For use and applications as per the requirements of cULus, a Class 2 power supply according to UL1310 must be used. Connecting cables for safety switches installed at the place of use must be separated from all moving and permanently installed cables and un-insulated active elements of other parts of the system that operate at a voltage of over 150 V. A constant clearance of 50.8 mm must be maintained. This does not apply if the moving cables are equipped with suitable insulation materials that possess an identical or higher dielectric strength compared to the other relevant parts of the system.

EU declaration of conformity

The declaration of conformity is part of the operating instructions, and it is included as a separate sheet with the unit.

The EU declaration of conformity can also be found at: www.euchner.com

Service

If servicing is required, please contact:

EUCHNER GmbH + Co. KG  
Kohlhammerstraße 16  
70771 Leinfelden-Echterdingen

Service telephone:  
+49 711 7597-500

E-mail:  
support@euchner.de

Internet:  
www.euchner.com

Technical data

| Parameter   | Value   |
|---|---|
| Housing material  | Reinforced thermoplastic  |
| Degree of protection TK... (cable entry)                            | IP67  |
| TK...SM8 (plug connector SM8)                                       | IP67  |
| TK...SR11 (plug connector SR11)                                     | IP65  |
| Mechanical life   | 1 x 10 <sup>6</sup> operating cycles  |
| Ambient temperature   | -20 ... +55 °C  |
| Degree of contamination (external, acc. to EN 60947-1)              | 3 (industrial)  |
| Installation orientation  | Any   |
| Locking force (in case of head mounting)                            | 5,000 N   |
| Actuation frequency   | 1,200/h   |
| Switching principle   | Slow-action switching contact   |
| Contact material  | Silver alloy, gold flashed  |
| Connection TK...  | Cable entry M20 x 1.5   |
| TK...SM8  | Plug connector SM8, 8-pin   |
| TK...SR11   | Plug connector SR11, 11-pin+PE  |
| Conductor cross-section (flexible/rigid)                            | 0.34 ... 1.5 mm <sup>2</sup>  |
| Conditional short-circuit current                                   | 100 A   |
| Switching voltage, min., at 10 mA                                   | 12 V  |
| Switching current, min., at 24 V                                    | 1 mA  |
| Short circuit protection (control circuit fuse) acc. to IEC 60269-1 |   |
| TK.../TK...SR11   | 4 A gG  |
| TK...SM8  | 1 A gG  |
| Conventional thermal current I <sub>th</sub>                        |   |
| TK.../TK...SR11   | 4 A   |
| TK...SM8  | 1 A   |
| Solenoid operating voltage/solenoid power consumption               |   |
| TK...024  | AC/DC 24 V (+10%/-15%) 8 W  |
| TK...048  | AC/DC 48 V (+10%/-15%) 8 W  |
| TK...110  | AC 110 V (+10%/-15%) 10 W   |
| TK...230  | AC 230 V (+10%/-15%) 11 W   |
| Duty cycle  | 100%  |
| Utilization category acc. to EN 60947-5-1                           | TK... TK...SR11 TK...SM8  |
| AC-15   | 4 A 230 V 4 A 50 V 1 A 24 V   |
| DC-13   | 4 A 24 V 4 A 24 V 1 A 24 V  |
| Rated insulation voltage  | U <sub>i</sub> = 250 V U <sub>i</sub> = 50 V U <sub>i</sub> = 30 V            |
| Rated impulse withstand voltage                                     | U <sub>imp</sub> = 2.5 kV U <sub>imp</sub> = 1.5 kV U <sub>imp</sub> = 1.5 kV |
| <b>Reliability values acc. to EN ISO 13849-1</b>                    |   |
| B <sub>100</sub> at DC-13 100 mA/24 V                               | 2 x 10 <sup>6</sup>   |

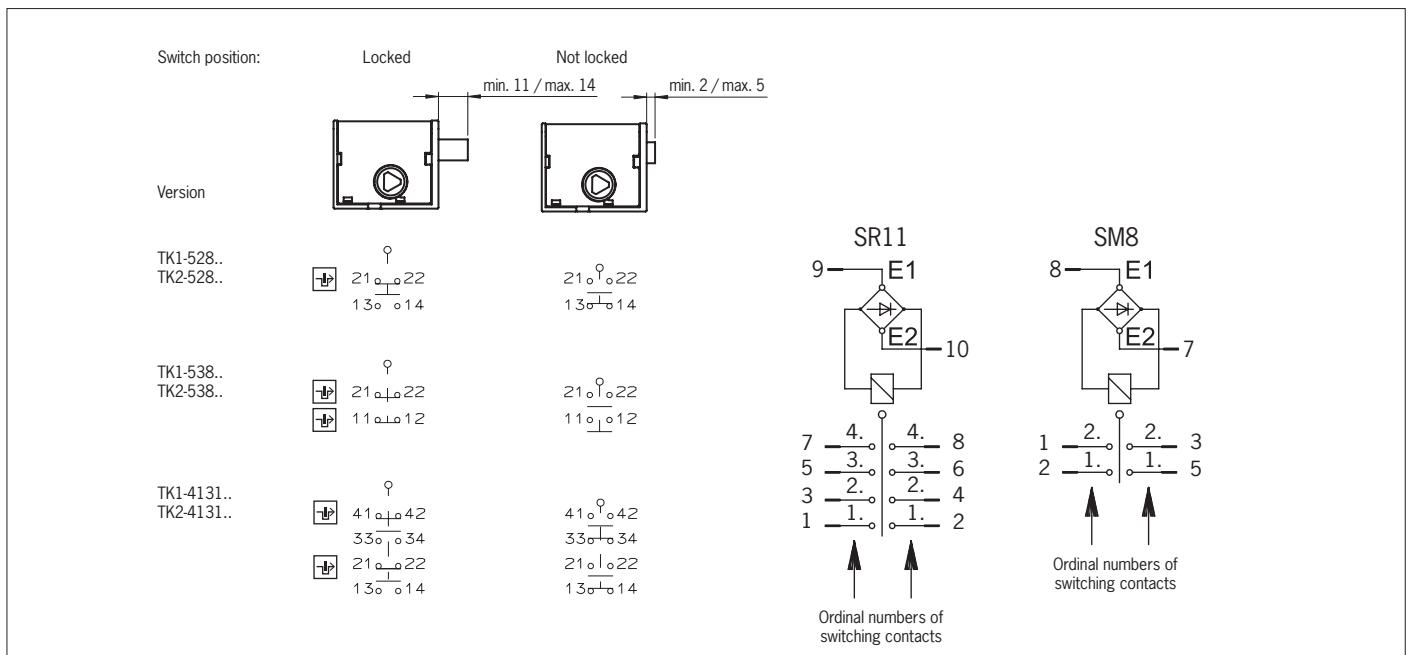


Fig. 2: Switching elements and switching functions

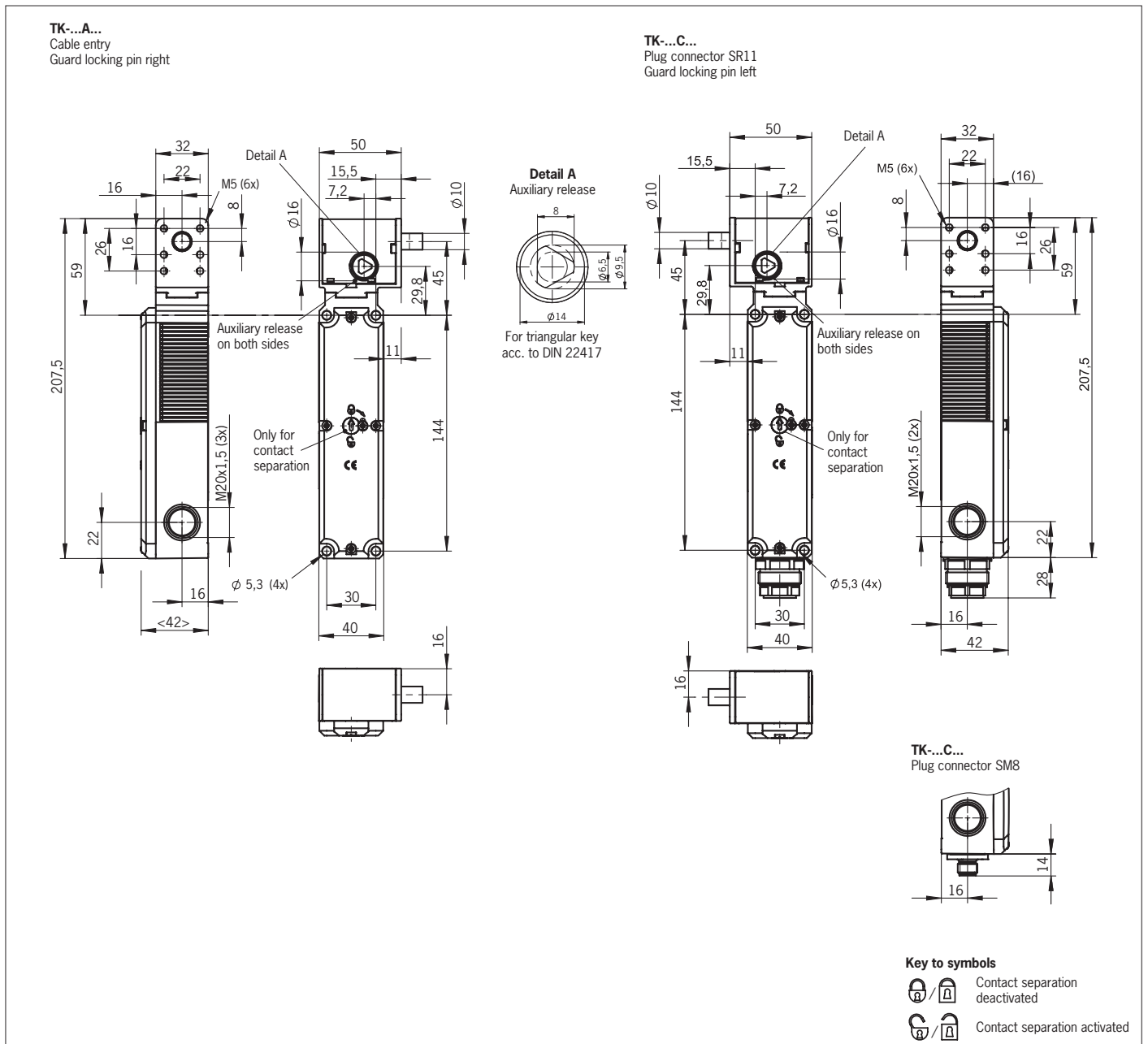


Fig. 3: Dimension drawing