Correct use

Safety switches series TX are interlocking devices with guard locking solenoid (type 2). The actuator has a low coding level. 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.

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 released 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 perform 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.
- The switching operation must be triggered only by actuators designated for this purpose.
- Prevent bypassing by means of replacement actuators. For this purpose, restrict access to actuators and to keys for releases, for example.
- Mounting, electrical connection and setup only by authorized personnel possessing special knowledge about handling safety components.

Function

The safety switch permits the locking of movable guards.

In the switch head, there is a rotating cam that is blocked/released by the guard locking pin.

The guard locking pin is moved on the insertion/removal of the actuator and on the activation/release of the guard locking. During this process the switching contacts are actuated.

If the cam is blocked (guard locking active), the actuator cannot be pulled out of the switch head. For design reasons, guard locking can be activated only when the guard is closed (prevention of inadvertent locking position (faulty closure protection)).

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 lock monitoring

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

Door monitoring contact

All versions additionally feature at least one door monitoring contact. Depending on the switching element, the door monitoring contacts can be either positively driven (contacts ⊖) or not positively driven.

The door monitoring contacts are actuated when the guard is opened.

Versions TX1 and TX3

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

- Activating guard locking: close guard; no voltage at the solenoid
- Releasing guard locking

  TX1 and **TX3...110**: apply voltage to the solenoid
  TX3...024: apply control voltage with solenoid voltage present

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 TX2

(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 open

The safety contacts ⊖ and ⊣↱ are open.

Guard closed and not locked

The safety contacts ⊖ are closed. The safety contacts ⊣↱ are open.

Guard closed and locked

The safety contacts ⊖ and ⊣↱ are closed.

Selection of the actuator

NOTICE

Damage to the device due to unsuitable actuator. Make sure to select the correct actuator (see table in Fig. 4).

Additionally pay attention to the door radius and the mounting options (see Fig. 5).

The following versions are available:

- *Standard* actuator with 1 mm insertion depth.
- *Overtravel* actuator with 8 mm insertion depth.

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

In the event of malfunctions, the guard locking can be released with the auxiliary release irrespective of the state of the solenoid.

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

Actuating auxiliary release

1. Unscrew locking screw.
2. Using a screwdriver, turn the auxiliary release to 🔓 in the direction of the arrow.

➡ Guard locking is released.

Important!

- The actuator must not be under tensile stress during manual release.
- After use, reset the auxiliary release and screw in and seal the locking screw (with sealing lacquer, for example).

Auxiliary key release

Function as for auxiliary release.

Important!

- The actuator must not be under tensile stress during manual release.

Escape release

This permits opening of a locked guard from the danger zone without tools.

Important!

- It must be possible to actuate the escape release manually from inside the protected area without tools.
- It must not be possible to reach the escape release from the outside.
- The actuator must not be under tensile stress during manual release.
- The escape release meets the requirements of Category B according to EN ISO 13849-1:2015.

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

Emergency release

This permits opening of a locked guard from outside the danger zone without tools.

Important!

- It must be possible to operate the emergency release manually from outside the protected area without tools.
- The emergency release must possess a marking indicating that it may be used only in an emergency.
- The actuator must not be under tensile stress during manual release.
- The release function meets all other requirements from EN ISO 14119.
- The emergency release meets the requirements of Category B according to EN ISO 13849-1:2015.

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

Mounting

NOTICE

Device damage due to improper mounting and unsuitable ambient conditions

- Safety switches and actuators must not be used as an end stop.
- Observe EN ISO 14119:2013, sections 5.2 and 5.3, for information about mounting the safety switch and the actuator.
- 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 specified IP degree of protection is applicable only if the housing screws, cable entries and plug connectors are properly tightened. Observe the tightening torques.

Changing the actuating direction

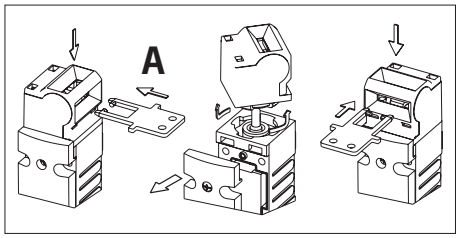

Fig. 1: Changing the actuating direction

1. Unscrew and open switch cover.
2. Remove actuating head from the switch by turning and refit in the required position (bayonet fastening).
3. Fit locking pins supplied for protection against twisting.
4. Close the switch cover and screw in position.
5. Cover the unused actuating slot with the enclosed slot covers.

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 wires 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 $6^{\pm 1}$ 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 1.5 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 actuator must slide easily into the actuating head. Close the guard several times to check the function. The function of any manual releases (except for the auxiliary release) must also be tested.

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 and actuator assembly 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.

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 c UL us

The following information applies to devices with cable entry:

For use and application as per the requirements of c UL us a rigid copper wire for the temperature range 60/75 °C must be used.

The following information applies to devices with plug connector:

This device is intended to be used and applied with a Class 2 power source in accordance with UL1310. 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 device.

The original 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
Germany

Service telephone:
+49 711 7597-500

E-mail:
support@euchner.de

Internet:
www.euchner.com

Technical data

Parameter	Value
Housing material	Die-cast alloy, cathodically dipped
Degree of protection Cable entry Plug connector	 IP67 IP65
Mechanical life	1x10⁶ operating cycles
Ambient temperature TX.../TX...BH10/TX...BH12 TX...RC18	 -20 ... +80 °C -20 ... +70 °C
Degree of contamination (external, acc. to EN 60947-1)	3 (industrial)
Installation orientation	Any
Approach speed, max.	20 m/min
Extraction force (not locked)	35 N
Retention force TX1/TX2 TX3	 20 N 50 N
Actuating force, max.	35 N
Actuation frequency	1,200/h
Switching principle	Slow-action switching contact
Contact material	Silver alloy, gold flashed
Connection TX... TX...BH10 TX...BH12 TX...RC18	 Cable entry M20x1.5 Plug connector BH10, 9-pin+PE Plug connector BH12, 11-pin+PE Plug connector RC18, 18-pin+PE
Conductor cross-section rigid/flexible	0.34 ... 1.5 mm²
Connection type to switching element	Screw terminals
Connection type to printed circuit board	Cage-pull clamps
Rated insulation voltage TX... TX...BH10, TX...BH12, TX...RC18	 Ui = 250 V Ui = 50 V
Rated impulse withstand voltage TX... TX...BH10, TX...BH12, TX...RC18	 U_{imp} = 2.5 kV U_{imp} = 1.5 kV
Conditional short-circuit current	100 A
Switching voltage, min., at 10 mA	12 V
Utilization category acc. to IEC 60947-5-1 TX... TX...BH10, TX...BH12, TX...RC18	 AC-15 4 A 230 V / DC-13 4 A 24 V AC-15 4 A 50 V / DC-13 4 A 24 V
Switching current, min., at 24 V	1 mA
Short circuit protection (control circuit fuse) acc. to IEC 60269-1	4 A gG
Convent. thermal current I_{th}	4 A
Solenoid operating voltage U_B/ solenoid power consumption (TX3...024: I_B = 2 A for T_{IMP} = 250 ms)	AC/DC 24 V (+10%/-15%) 8 W AC 110 V (+10%/-15%) 10 W AC 230 V (+10%/-15%) 11 W
Duty cycle	100%
Switching frequency, max. for TX3	45 min⁻¹
Control voltage U_S for TX3...024	AC/DC 24 V
Locking force F_{max}	F_S = 1,700 N
Locking force F_{Zh} acc. to EN ISO 14119	$(F_{Zh} = \frac{F_{max}}{1.3})$ = 1,300 N
Reliability values acc. to EN ISO 13849-1	
B_{10D} at DC-13 100 mA/24 V	6 x 10⁶

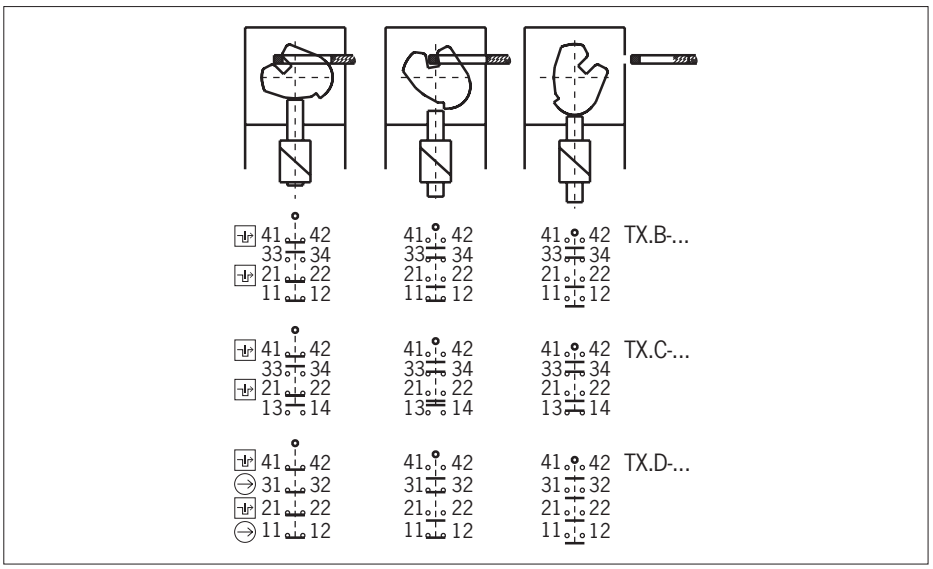

Fig. 2: Switching elements and switching functions

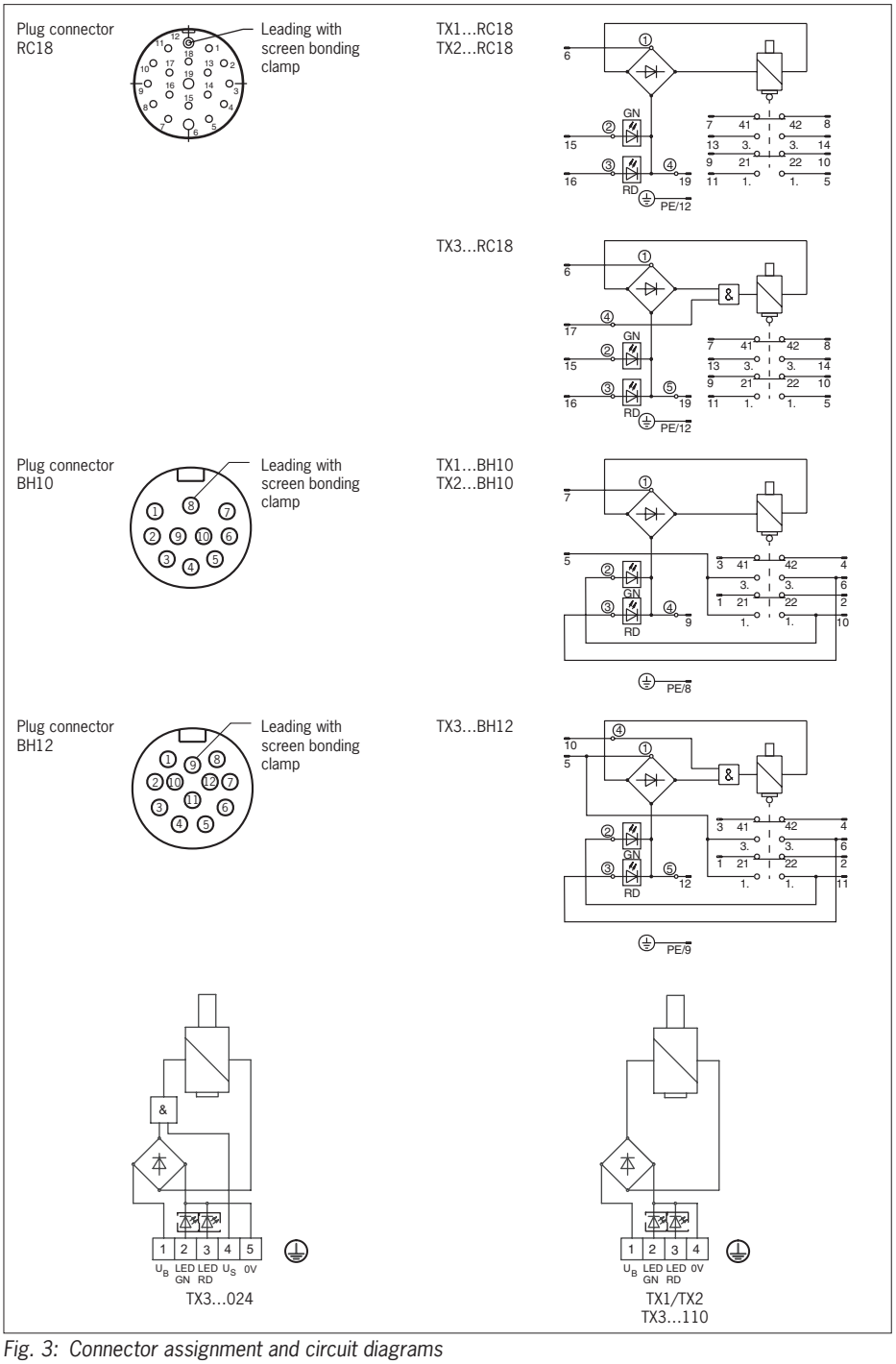

Fig. 3: Connector assignment and circuit diagrams

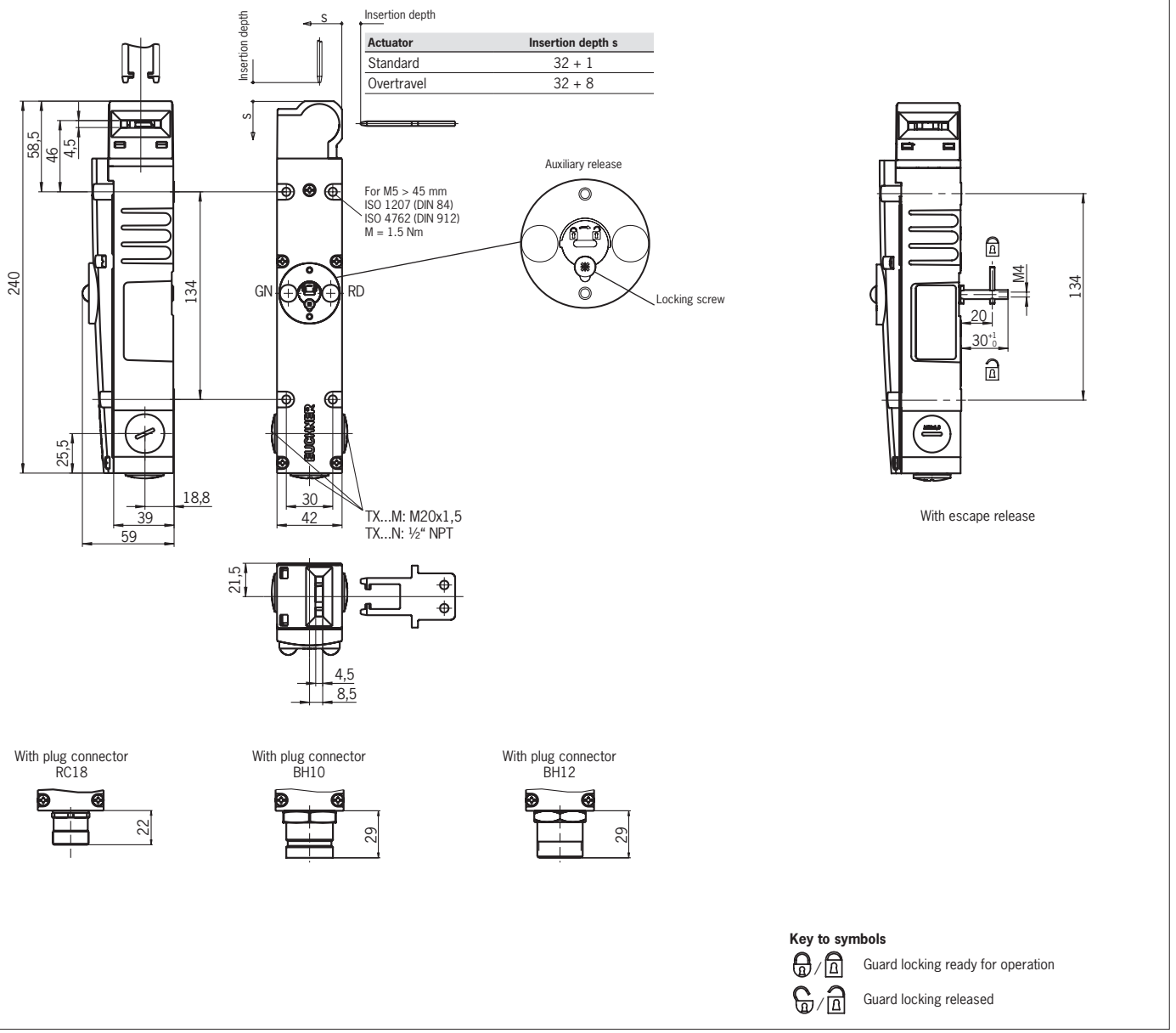

Fig. 4: Dimension drawing TX...

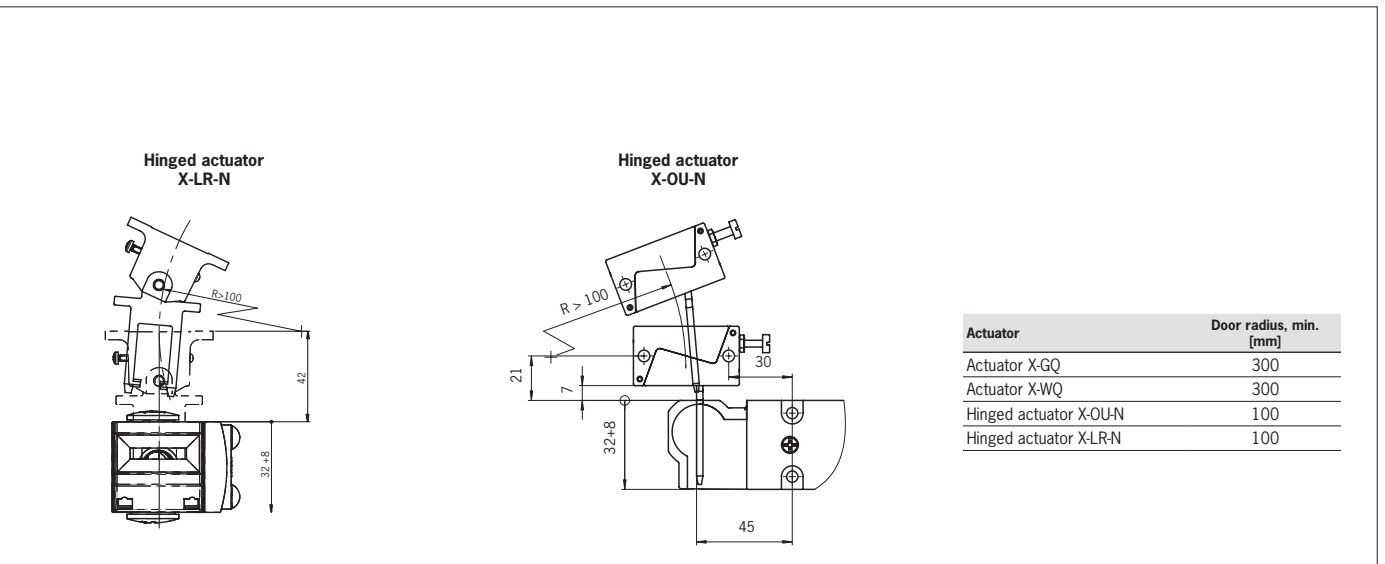

Fig. 5: Minimum door radii