With electronic enabling circuits

Design

The solid-state safety relays can be used in EMERGENCY-STOP devices to EN 418 and in safety circuits to EN 60204-1 (11.98), for example, for moving covers and protective doors. Depending on the device type and the external circuit, the maximum category that can be achieved is Category 4 of EN 954-1 or SIL 3 according to IEC 61508.

Mounting

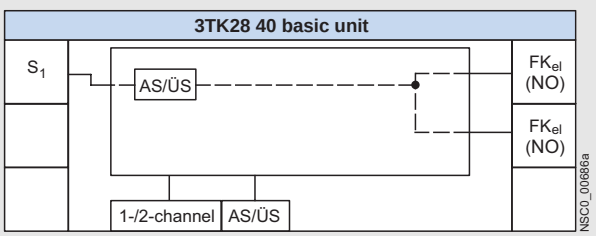
For snap-on mounting on 35 mm standard mounting rail according to EN 60715. Screw mounting is also possible for the devices by means of 2 additional 3RP19 03 push-in lugs.

Function

Basic units

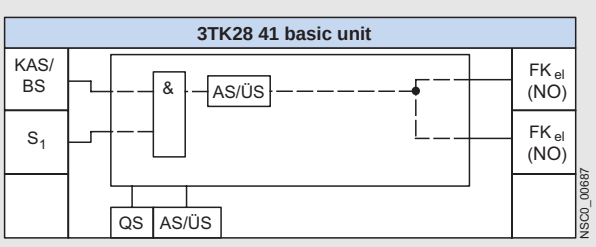
3TK28 40

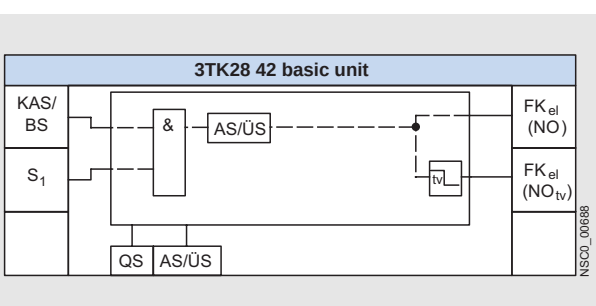
The 3TK28 40 has one sensor input S1 and two solid-state enabling circuits. If the signal is no longer applied to the sensor input, the enabling circuits are disconnected immediately.



3TK28 41 and 3TK28 42

The 3TK28 41 and 3TK28 42 each has one sensor input S1 and one cascading input KAS/BS as well as two solid-state enabling circuits (2 x instantaneous or 1 x instantaneous and 1 x with delay). If the signal is no longer applied to either of the two inputs, the enabling circuits are isolated immediately or according to the set delay time. Autostart or monitored start can be selected in the parameterization.





Legend

Sensor interface

KAS/BS:	Cascading input or normal switching duty. Normal switching duty: Connection of a PLC output for example. The enabling circuits and hence the connected loads can then be operated by the machine control. The safety function is on a higher level.
S_x:	Sensor input

Safety logic

AS/ÜS:	Automatic or monitored start depending on the parameterization
tv	Time delay, OFF-delay

Parameters

AS/ÜS:	Automatic or monitored start depending on the parameterization
QS:	With or without crossover monitoring
1-/2-channel:	One-channel / two-channel sensor connection

Actuator interface

FK_{el}:	Enabling circuit, solid-state (non-floating)
NO:	NO contact
NO_{tv}:	NO contact, time-delayed

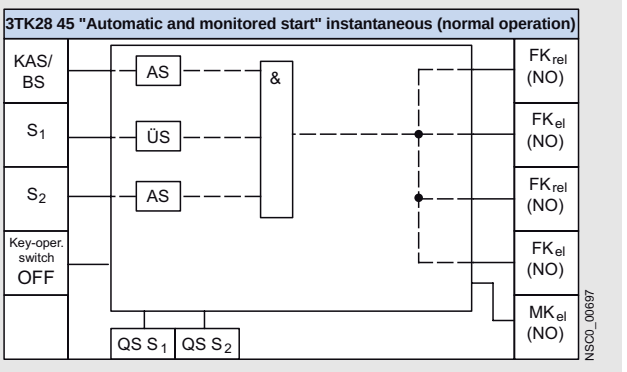
Multi-function units

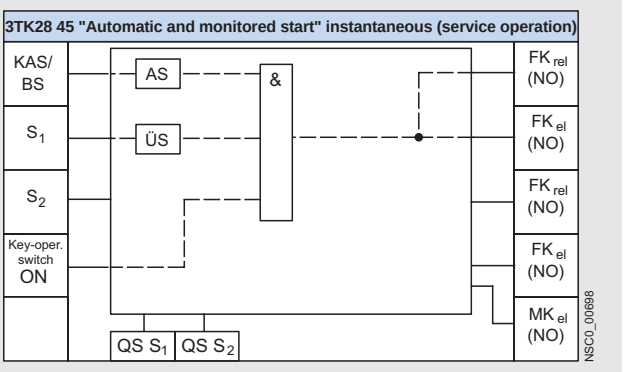
3TK28 45-.HB.. "Monitored start and autostart"

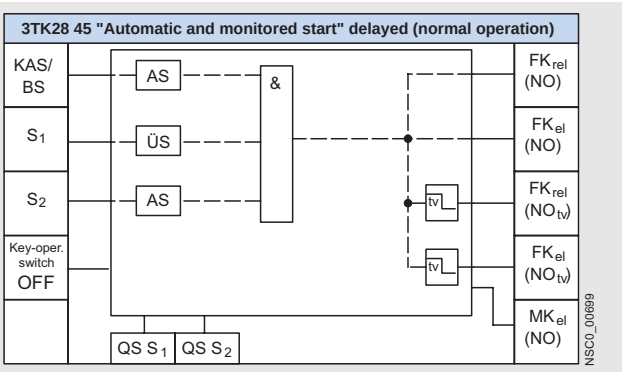
The 3TK28 45-.HB.. has two sensor inputs (S_1 with monitored start, S_2 with autostart), a cascading input (KAS/BS with autostart) and a changeover input (key-operated switch). On the output side are two relay enabling circuits, two solid-state enabling circuits and a solid-state signaling output.

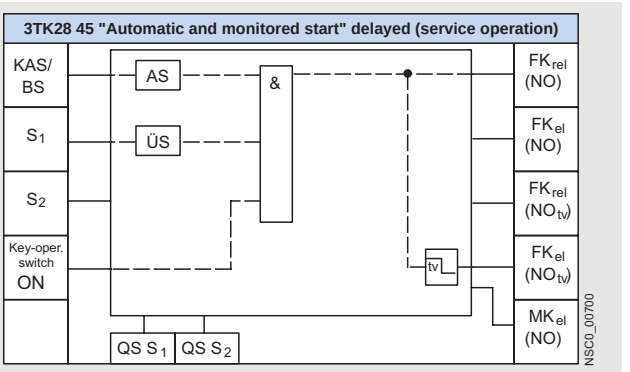
Normal operation
In normal operation (key-operated switch "OFF"), all enabling circuits are activated. All inputs are "AND"-interconnected and act simultaneously on all enabling circuits, some time-delayed.

Service operation
In service operation (key-operated switch "ON"), only two of the four enabling circuits are activated. In this case the sensor input S_2 (e.g. protective door) has no function. The hazard area can be entered because the hazardous movement is switched off by means of the two inactive enabling circuits. The sensor input S_1 and the cascading input KAS/BS still act on the active enabling circuits.









Legend

Sensor interface

KAS/BS: Cascading input or normal switching duty.
Normal switching duty: Connection of a PLC output for example. The enabling circuits and hence the connected loads can then be operated by the machine control.
The safety function is on a higher level.

S_x: Sensor input

Key-operated switch: Bridging of the sensor connected to S_2 (normal/service operation)

Safety logic

AS: Automatic start Device starts automatically once the enabling conditions are fulfilled. If a START button is integrated in the feedback circuit, a manual start is also possible (up to Category 3 according to EN 954-1).

ÜS: Monitored start. Device does not start until after the enabling conditions are fulfilled and a start signal is issued.

tv: Time delay, OFF-delay

Parameters

QS: With or without crossover monitoring

Actuator interface

FK_{el}: Enabling circuit, solid-state (non-floating)
FK_{rel}: Enabling circuit, relay contact (floating)
MK_{el}: Signaling circuit, solid-state (non-floating)
NO: NO contact
NO_{tv}: NO contact, time-delayed

With electronic enabling circuits

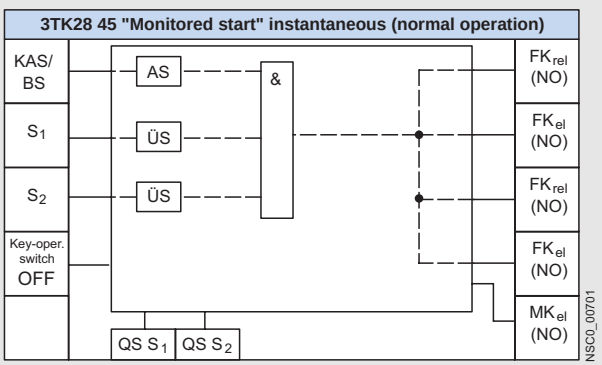
3TK28 45-.DB.. "Monitored start"

The 3TK28 45-.DB.. has two sensor inputs (S_1, S_2 with monitored start), a cascading input (KAS/BS with autostart) and a changeover input (key-operated switch). On the output side are two relay enabling circuits, two solid-state enabling circuits and a solid-state signaling output.

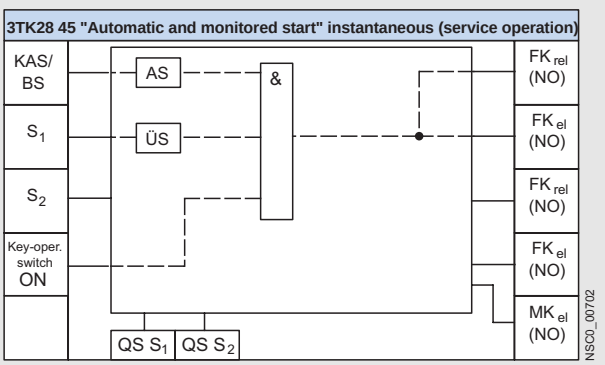
Normal operation
In normal operation (key-operated switch "OFF"), all enabling circuits are activated. All inputs are "AND"-interconnected and act simultaneously on all enabling circuits, some time-delayed.

Service operation
In service operation (key-operated switch "ON"), only two of the four enabling circuits are activated. In this case the sensor input S_2 (e.g. protective door) has no function. The hazard area can be entered because the hazardous movement is switched off by means of the two inactive enabling circuits. The sensor input S_1 and the cascading input KAS/BS still act on the active enabling circuits.

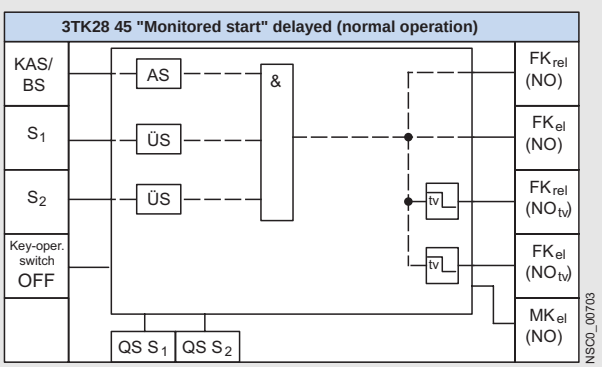
3TK28 45 "Monitored start" instantaneous (normal operation)



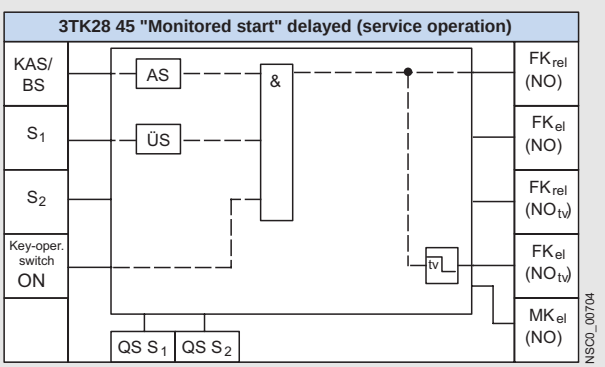
3TK28 45 "Automatic and monitored start" instantaneous (service operation)



3TK28 45 "Monitored start" delayed (normal operation)



3TK28 45 "Monitored start" delayed (service operation)



Legend

Sensor interface

KAS/BS: Cascading input or normal switching duty..
Normal switching duty: Connection of a PLC output for example. The enabling circuits and hence the connected loads can then be operated by the machine control.
The safety function is on a higher level.

S_x: Sensor input

Key-operated switch: Bridging of the sensor connected to S_2 (normal/service operation)

Safety logic

AS: Automatic start Device starts automatically once the enabling conditions are fulfilled. If a START button is integrated in the feedback circuit, a manual start is also possible (up to Category 3 according to EN 954-1).

ÜS: Monitored start. Device does not start until after the enabling conditions are fulfilled and a start signal is issued.

tv Time delay, OFF-delay

Parameters

QS: With or without crossover monitoring

Actuator interface

FK_{el}: Enabling circuit, solid-state (non-floating)
FK_{rel}: Enabling circuit, relay contact (floating)
MK_{el}: Signaling circuit, solid-state (non-floating)
NO: NO contact
NO_{tv}: NO contact, time-delayed

3TK28 45-.EB.. "OK button"

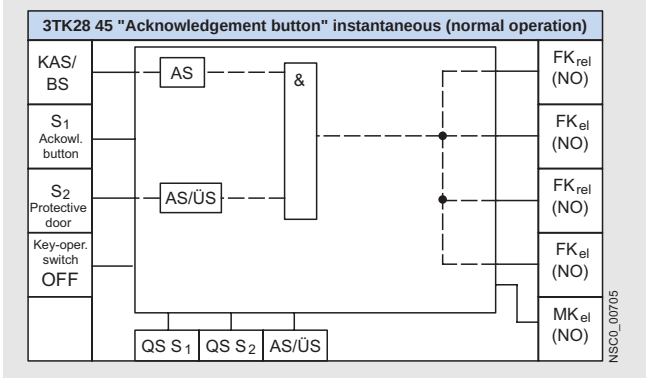
The 3TK28 45-.EB.. has two sensor inputs (S_1 OK button with autostart, S_2 with selectable monitored start or automatic start), a cascading input (KAS/BS with autostart) and a changeover input (key-operated switch). On the output side are two relay enabling circuits, two solid-state enabling circuits and a solid-state signaling output.

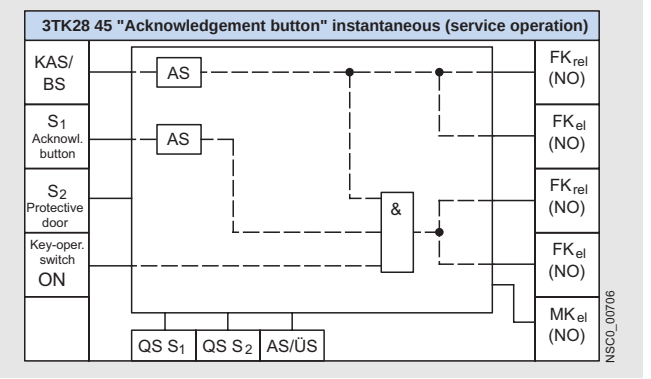
Normal operation

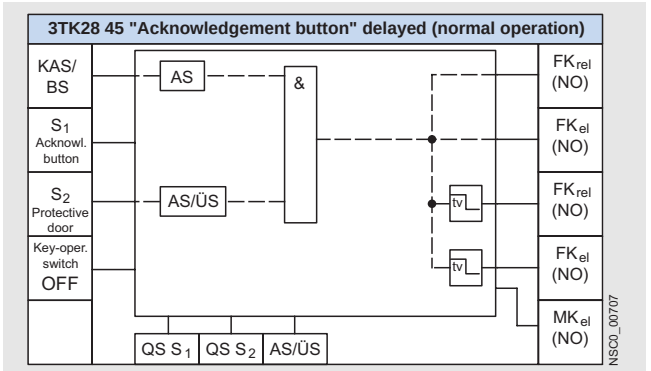
In normal operation (key-operated switch "OFF"), all enabling circuits are activated. The cascading input KAS/BS and the protective door input S_2 are "AND"-interconnected and act simultaneously on all enabling circuits, some time-delayed. The input S_1 for the OK button has no function here. Opening the protective door or a missing signal at the cascading input KAS/BS will deactivate all enabling circuits.

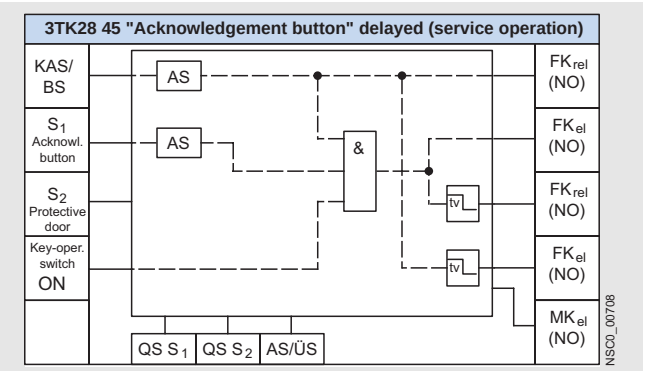
Service operation

In service operation (key-operated switch "ON"), only two of the four enabling circuits are activated. In this case the sensor input S_2 (e.g. protective door) has no function. The hazard area can be entered because the hazardous movement is switched off by means of the two inactive enabling circuits. Using the OK button at sensor input S_1, the hazardous movement can be started in spite of an open protective door.









Legend

Sensor interface

KAS/BS: Cascading input or normal switching duty..
Normal switching duty: Connection of a PLC output for example. The enabling circuits and hence the connected loads can then be operated by the machine control.
The safety function is on a higher level.

S_x: Sensor input

Key-operated switch: Bridging of the sensor connected to S_2 (normal/service operation)

Safety logic

AS: Automatic start Device starts automatically once the enabling conditions are fulfilled. If a START button is integrated in the feedback circuit, a manual start is also possible (up to Category 3 according to EN 954-1).

AS/ÜS: Automatic or monitored start depending on the parameterization

tv: Time delay, OFF-delay

Parameters

QS: With or without crossover monitoring
AS/ÜS: Automatic or monitored start depending on the parameterization

Actuator interface

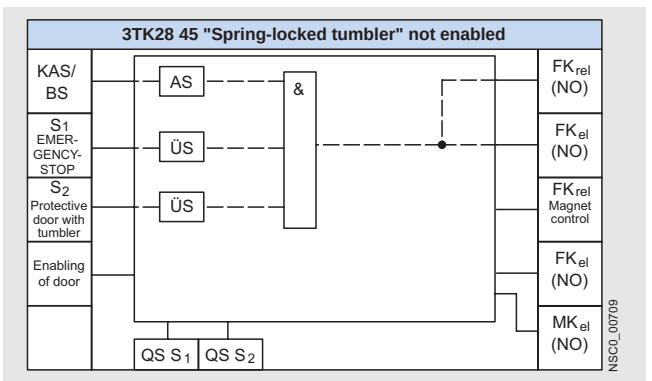
FK_{el}: Enabling circuit, solid-state (non-floating)
FK_{rel}: Enabling circuit, relay contact (floating)
MK_{el}: Signaling circuit, solid-state (non-floating)
NO: NO contact

With electronic enabling circuits

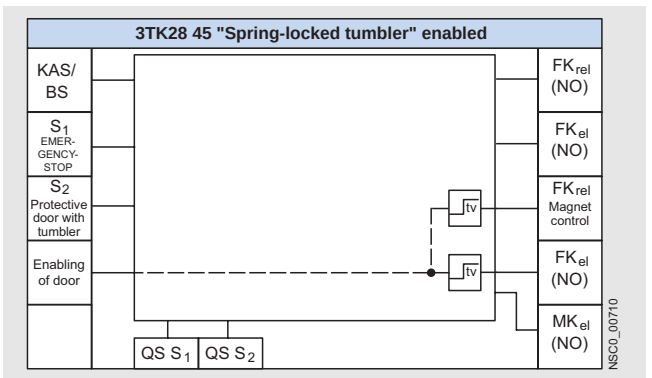
3TK28 45-.FB.. "Spring-locked tumbler"

The 3TK28 45-.FB.. has two sensor inputs (S_1: EMERGENCY-STOP with monitored start, S_2: protective door with tumbler and monitored start), a cascading input (KAS/BS with autostart) and a door-enabling input. On the output side are a relay enabling circuit, two solid-state enabling circuits, a relay magnet control output and a solid-state signaling output.

Not enabled
If the protective door is not enabled, it cannot be opened. If the signal is no longer applied to the inputs S_1 or KAS/BS, the enabling circuit is deactivated.



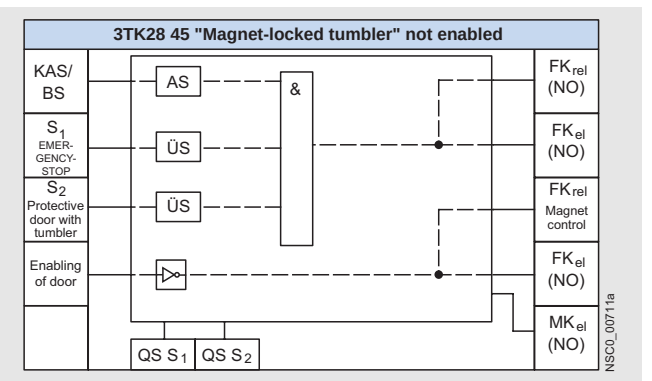
Enabled
With a signal at the door enabling input, the magnet control output and the second solid-state enabling circuit are activated after the delay time has elapsed. The protective door is thus enabled.



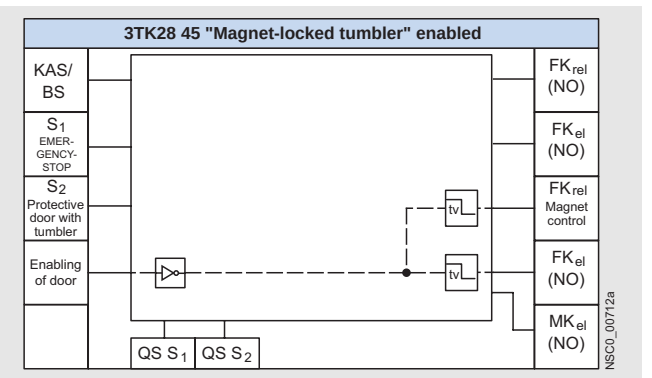
3TK28 45-.GB.. "Magnet-locked tumbler"

The 3TK28 45-.GB.. has two sensor inputs (S_1: EMERGENCY-STOP with monitored start, S_2: protective door with tumbler and monitored start), a cascading input (KAS/BS with autostart) and a door-enabling input. On the output side are a relay enabling circuit, two solid-state enabling circuits, a relay magnet control output and a solid-state signaling output.

Not enabled
If the protective door is not enabled, it cannot be opened. If the signal is no longer applied to the inputs S_1 or KAS/BS, the enabling circuit is deactivated.



Enabled
With a signal at the door enabling input, the magnet control output and the second solid-state enabling circuit are deactivated after the delay time has elapsed. The protective door is thus enabled.



Legend

Sensor interface

KAS/BS: Cascading input or normal switching duty..
Normal switching duty: Connection of a PLC output for example. The enabling circuits and hence the connected loads can then be operated by the machine control.
The safety function is on a higher level.
S_x: Sensor input
Door enabling: Isolating the lock on the protective door

Safety logic

AS: Automatic start Device starts automatically once the enabling conditions are fulfilled. If a START button is integrated in the feedback circuit, a manual start is also possible (up to Category 3 according to EN 954-1).
ÜS: Monitored start. Device does not start until after the enabling conditions are fulfilled and a start signal is issued.

tv Time delay, OFF-delay

tv Time delay, ON-delay

Parameters

QS: With or without crossover monitoring

Actuator interface

FK_{el}: Enabling circuit, solid-state (non-floating)
FK_{rel}: Enabling circuit, relay contact (floating)
MK_{el}: Signaling circuit, solid-state (non-floating)
NO: NO contact