Safety Modules

PRODUCT CATALOG

SALZ
AUTOMATION

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Further information on the SALZ Automation product range can be found at: www.salz-automation.com | Published in 09/2021. Subject to changes.

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Introduction

SALZ Automation, with its headquarters in Germany and China, serves customers all over the world with practice-oriented solutions for automated machines and systems. All partners in the steadily growing network are selected according to strict standards to maintain the high safety, quality and sustainability standards of the “SALZ” brand. You will experience this high standard in every facet of our product lines: Power Supplies, Safety Modules and Industrial Ethernet Switches.

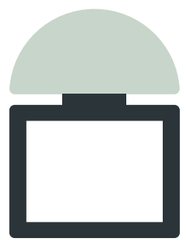
This catalog gives you an overview of our TÜV-certified functional safety modules. The compact safety switching modules with up to seven contact sets monitor the function of connected safety sensors and the wiring, and as power amplifiers they safely switch off connected contactors or drives in industrial automation.

To implement such safety-related applications in mechanical engineering and in the process industry, SALZ Automation offers various safety relays, safe coupling relays and expansion modules. From emergency stop and protective door monitoring to two-hand applications, all of our safety modules meet the requirements of the relevant standards and are tested and certified by independent testing institutes such as TÜV Rheinland.

Applications

Our series of safety modules protects man and machine. By monitoring the functions and the wiring of connected safety sensors, and by safely switching off connected contactors or drives.

MONITORING OF E-STOP

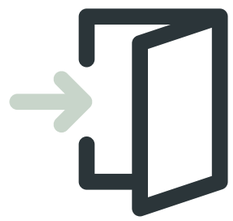


MANUAL OR AUTOMATIC START

TRANSPONDER

TWO-HAND PUSH BUTTONS

SAFETY GATES



LIGHT CURTAINS

Type	Application	Input Channels	Start	Safe Output Contacts	Safe Output Delayed	Auxiliary	SIL CL	PL	Width in mm	Packaging Size
SAFE-ESTOP	Monitoring of E-stop, safety gates, light curtains	1/2	manual/ automatic	3		1	3	e	22.5	1
SAFE-ESTOP 50	Monitoring of E-stop, safety gates, light curtains	1/2	manual/ automatic	3		1	3	e	22.5	50
SAFE-DELAY	Monitoring of E-stop, safety gates, light curtains, off-delay timer up to 30 seconds	1/2	manual/ automatic	2	2		3	e	22.5	1
SAFE-SIL	SIL coupling relay and contact expansion module	1	automatic	3		1	3	e	22.5	1
SAFE-MULTI	Monitoring of E-stop, safety gates, light curtains	1/2	manual/ automatic	7		4	3	e	45	1
SAFE-TWO-HAND	Two-hand monitoring, Type IIIC	1/2	automatic	2			3	e	22.5	1

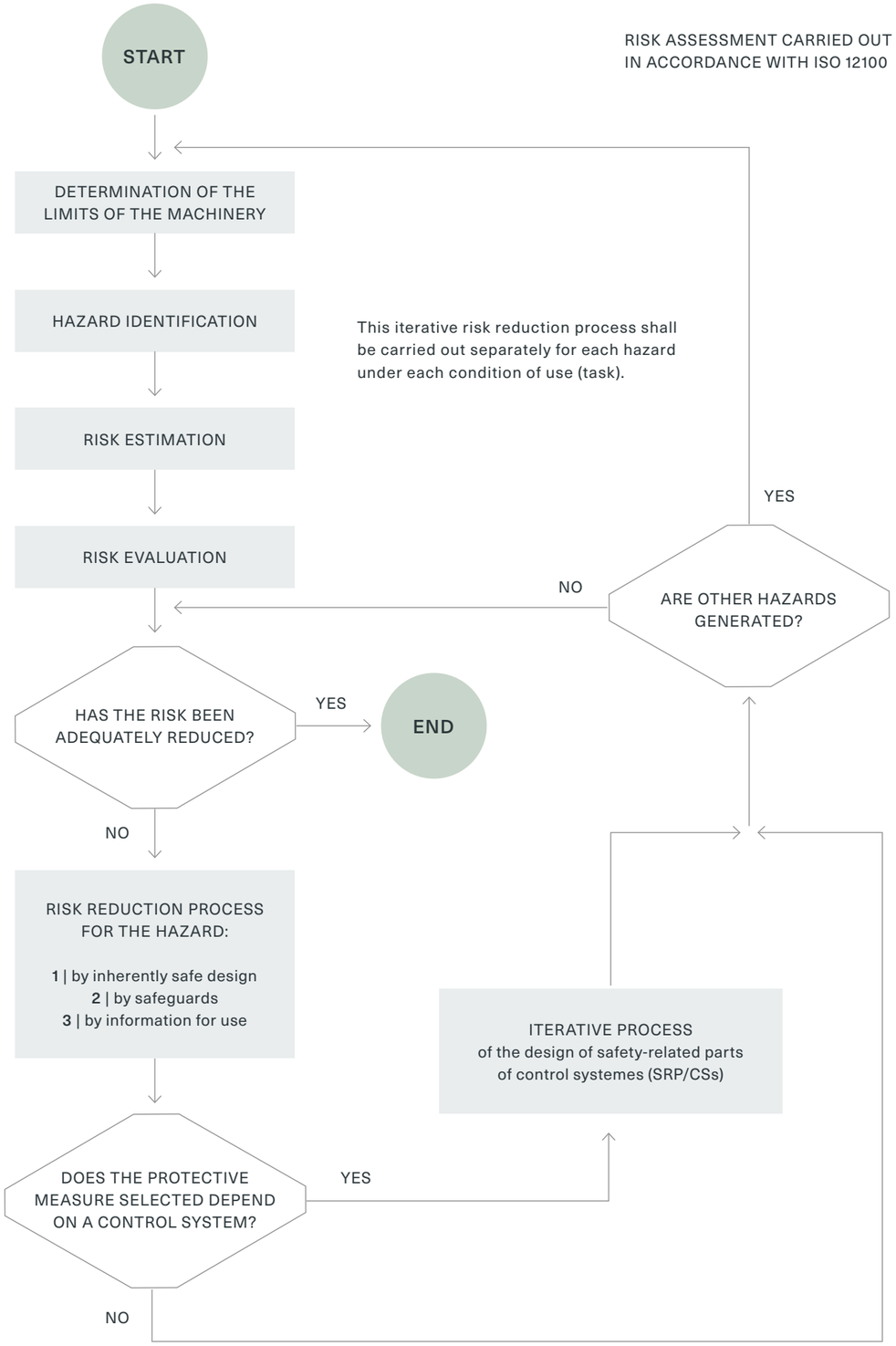
Machine Safety

ACCORDING TO MACHINERY DIRECTIVE 2006/42/EC

CE

SALZ AUTOMATION

ITERATIVE RISK REDUCTION PROCESS



I. Risk assessment without risk reduction measures

- Determine safety and health protection requirements
- Perform risk assessment according to Machinery Directive Annex I and EN ISO 12100
- Verify risk assessment (depending on process)
- Include information/notes in operating instructions

II. Procedure for risk reduction according to Machinery Directive Annex I

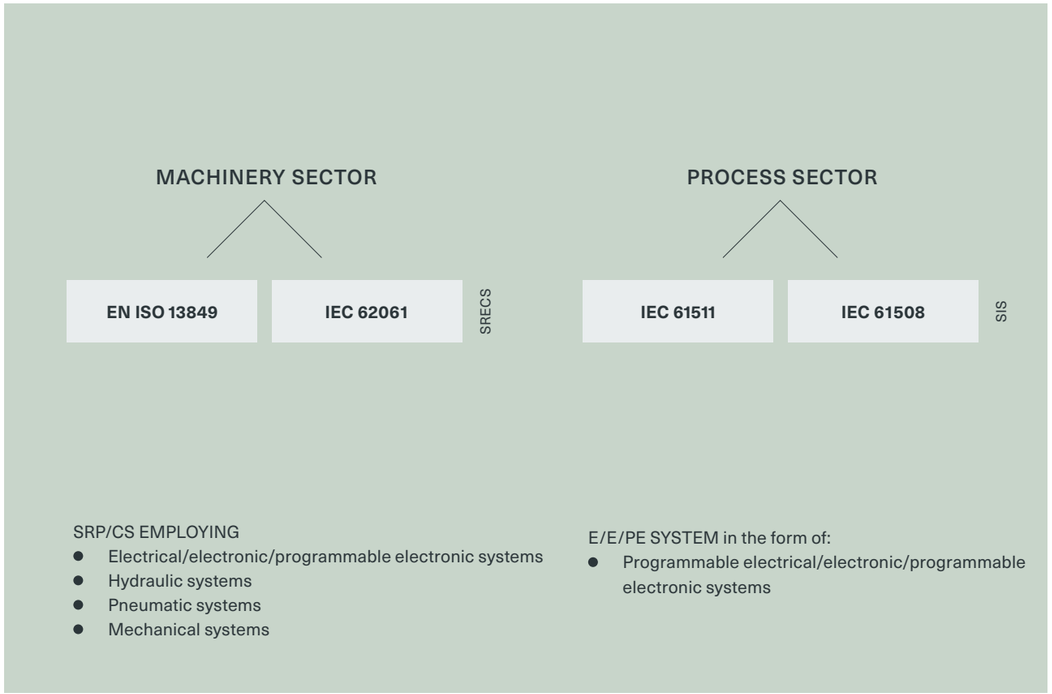
- Constructive measures
- Technical measures
- Indicative measures (documentation)

III. Implementation of the mechanical design

1. Safety design
2. Documentation:
   a. Specifications
   b. Design plans
   c. Static and strength calculations
   d. ...
3. Construction and manufacturing
4. Verification of implementation
5. Validation of the safety-related measures

IV. Implementation of the technical measures for functional safety according to EN ISO 13849

In addition to EN ISO 13849, there are other related general standards for functional safety. As shown in the figure, these standards are the IEC 61508 series and the IEC 62061 industry standard for the machinery industry. Both are limited to the electrical industry, programmable electronic systems and devices.

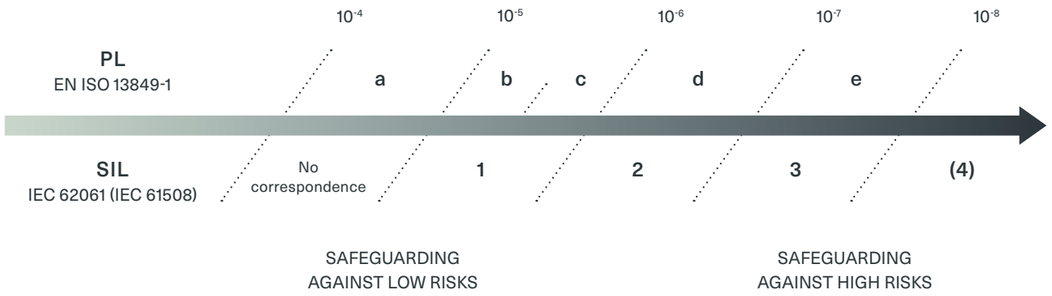


A class gadget involving “Safety Integrity Levels” (SILs) is about out in IEC 61508 and IEC 62061. The SILs function signs of the extent of protection-associated reliability. The related values are goal failure measures, every comprising a decade. IEC 61508 distinguishes distinct packages of safety functions:

- Safety functions in low demand mode (max. frequency of demands once per year)
- Safety functions in high demand mode or continuous mode

The Safety Integrity Level (SIL) representing the probability of a dangerous failure per hour this is related to Performance Level (PL):

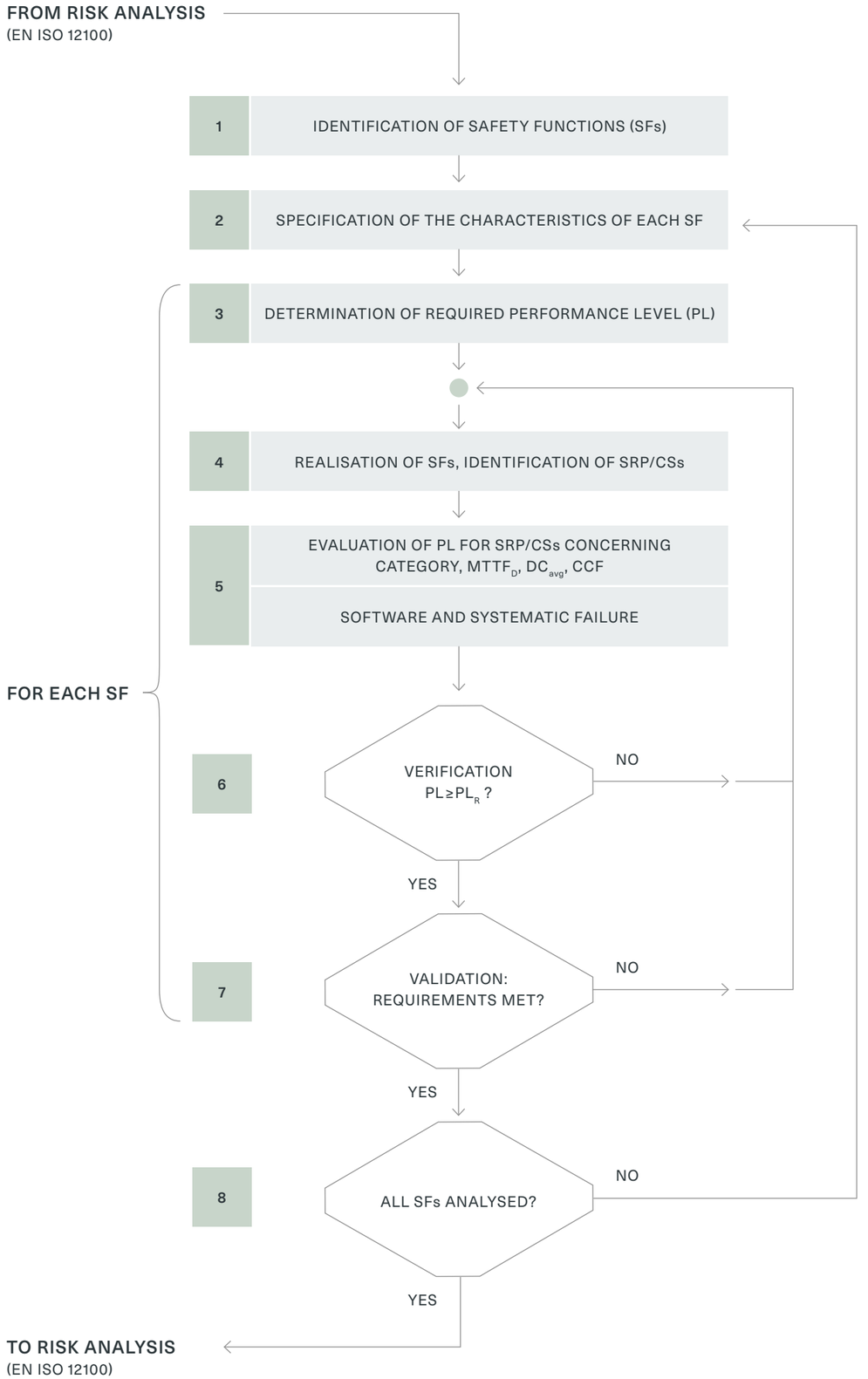
PROBABILITY OF A DANGEROUS FAILURE PER HOUR (PFH_D)



PERFORMANCE LEVEL (PL)	AVERAGE PROBABILITY OF A DANGEROUS FAILURE PER HOUR (PFH_D) in h^{-1}
a	≥ 10^{-5} to < 10^{-4}
b	≥ $3 \cdot 10^{-6}$ to < 10^{-5}
c	≥ 10^{-6} to < $3 \cdot 10^{-6}$
d	≥ 10^{-7} to < 10^{-6}
e	≥ 10^{-8} to < 10^{-7}

THE ITERATIVE PROCESS FOR THE DESIGN OF SAFETY RELATED PARTS OF CONTROL SYSTEMS:

SF = Safety Function
PL = Performance Level
PLr = Required Performance Level
SRP/CS = Safety-Related Part of a Control System
MTTFD = Mean Time to Dangerous Failure
DCavg = Average Diagnostic Coverage
CCF = Common Cause Failure

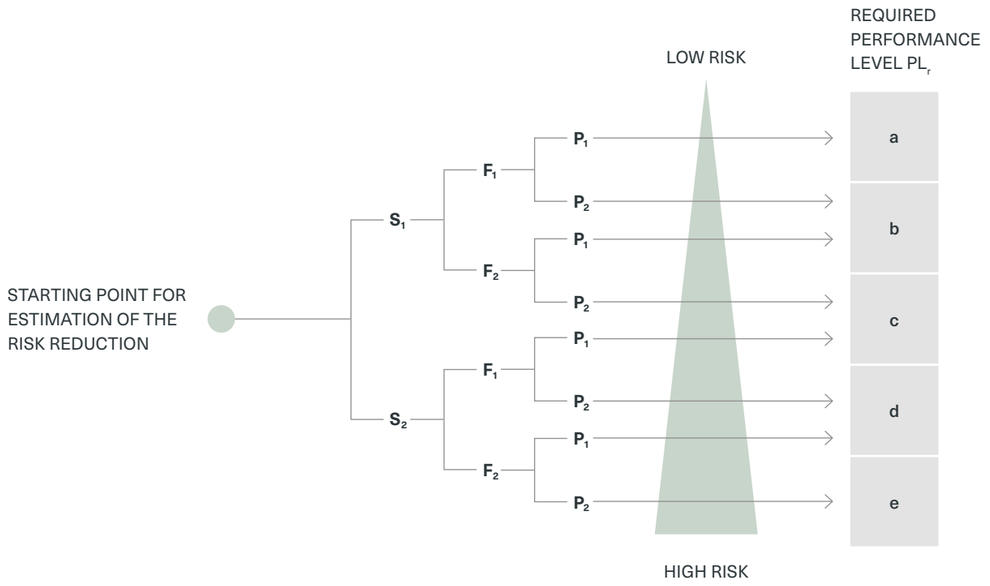


EN ISO 13849-1 SAFETY FUNCTIONS

Safety-related stop function, initiated by a safeguard	Response to tripping of a protective device with STO (Safe torque off), SS1 (Safe stop 1) or SS2 (Safe stop 2)
Manual reset function	Acknowledgement when areas behind the protective device are vacated
Start/restart function	Permissible only with interlocking guards with start function to EN ISO 12100
Local control function	Control of machine movements from a location within the hazard zone
Local control function	Temporary deactivation of safeguards, e.g., during material transport
Hold-to-run equipment (inching switch)	Machine movements controlled from a position within the hazard zone, e.g., during setup
Enabling function	Machine movements controlled from a position within the hazard zone, e.g., during setup
Prevention of unexpected start-up	Manual operator intervention in hazard zones
Escape and rescue of trapped persons	Separation of rollers
Isolation and energy dissipation function	Opening of a hydraulic valve for pressure release
Control modes and operating mode selection	Activation of safety functions by an operating mode selector switch
Function for stopping in an emergency	Response to actuation of an emergency-stop device with STO (Safe torque off) or SS1 (Safe stop 1)

RISK GRAPH

The diagram in Annex A of the standard EN ISO 13849-1 leads directly to the required Performance Level PL_r for each safety function. Further examples of determining of the PLr can be found in Annex A of the standard.



S – severity of injury
F – frequency of and/or duration of exposure to hazard
P – possibility of avoiding the hazard or of limiting the harm

S1/S2 | Severity of injury

Generally, the severity of injury (parameter S) in a hazard zone will be found to vary widely. For the requirements upon the control system, however, only the following distinction is relevant:

S1 – SLIGHT (NORMALLY REVERSIBLE INJURY)
S2 – SERIOUS (NORMALLY IRREVERSIBLE INJURY OR DEATH)

The usual consequences of accidents and the normal healing processes must be considered for determining between S1 and S2.

F1/F2 | Frequency of and/or exposure to the hazard (parameter F)

The frequency of and/or exposure to the hazard are evaluated as:

F1 – SELDOM TO LESS OFTEN, AND/OR EXPOSURE TIME IS SHORT
F2 – FREQUENT TO CONTINUOUS, AND/OR EXPOSURE TIME IS LONG

Consideration is therefore given both to the number of interventions in the danger zone within a period and to the duration of presence within it. The standard assists decision-making by stating that where operator interventions occur more frequently than once every 15 minutes, F2 should be selected. In all other cases, F1 is the correct choice, provided the duration of hazard exposure does not exceed 1/20 of the total operation time of the machine. During evaluation, an average value should be considered for the duration of the hazard exposure in relation to the overall time for which a machine is in use.

For a manually charged metalworking press whose operator must reach cyclically between the dies of the press, F2 is clearly the appropriate choice. Conversely, for a machining center that is set up once each year and then operates automatically, F1 will doubtless be selected. For evaluation of the frequency and duration of exposure to the hazard, cases in which the same person or different persons are exposed must be treated in the same way.

P | Possibility of avoiding the hazard P1 and P2 (parameter P)

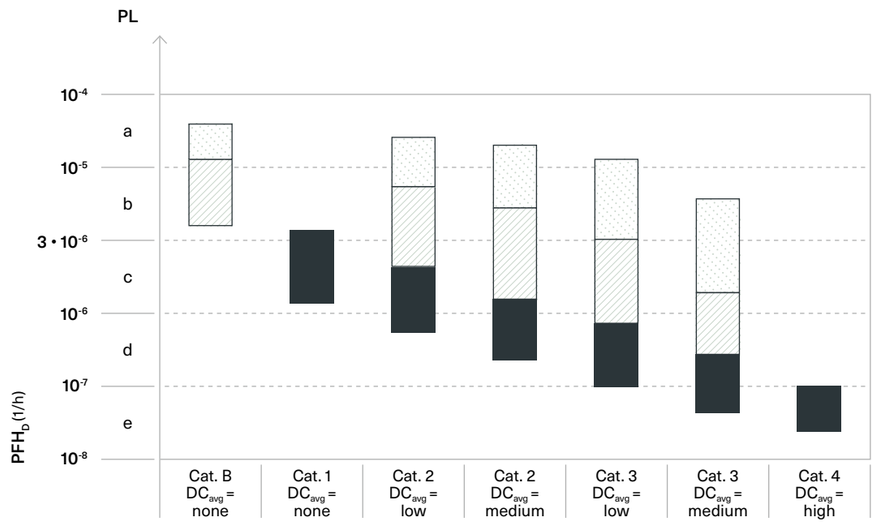
At this point, an evaluation must be made of whether recognition and avoidance of a hazardous situation is:

P1 – POSSIBLE UNDER SPECIFIC CONDITIONS
P2 – SCARCELY POSSIBLE

Aspects relevant to definition of this parameter include the physical characteristics of a machine, the qualifications of the operator, and their possible reaction. If, for example, the machine must be set up whilst running at limited speed, the parameter P1 will be the correct choice at the low acceleration values for setup: with the slow emergence of the hazards and given sufficient freedom of movement, the operator will be able to move out of the hazard zone. Conversely, P2 must be selected when higher speeds may rapidly be reached, and the operator has no realistic chance of evading an accident. During this evaluation, consideration should be given only to hazard limitation by physically possible means, and not to limitation by control components, since the latter could fail in the event of a fault. For example, rollers moving in the direction of the operator's hand cannot entrap it under fault-free conditions. In the event of a control-system fault, however, the direction of rotation could be reversed, and under worst-case conditions, the hand would be drawn in.

SIMPLIFIED DETERMINING OF THE PL BY BAR CHART

Bar chart for simplified determining of the PL from the Category (including measures against CCF), the DCavg and the MTTF:



Legend

PFH_D Average probability of dangerous failure per hour
PL Performance Level

$MTTF_D$ of each channel = low
$MTTF_D$ of each channel = medium
$MTTF_D$ of each channel = high

MTTFD | Mean time to dangerous failure

The reliability of the individual components from which the control system is constructed makes a decisive contribution to its overall reliability. The MTTFD (mean time to dangerous failure) is thus also considered in the PL as a reliability value. It is clear that “failure” in this context refers to component defects that result in the implemented function not or no longer being performed.

$MTTF_D$ FOR EACH CHANNEL

DESCRIPTION	RANGE
Not suitable	0 years ≤ $MTTF_D$ < 3 years
Low	3 years ≤ $MTTF_D$ < 10 years
Medium	10 years ≤ $MTTF_D$ < 30 years
High	30 years ≤ $MTTF_D$ < 100 years
Permissible only in Category 4	100 years ≤ $MTTF_D$ < 2.500 years

DC | Diagnostic coverage of test and monitoring measures

A further variable with a major influence upon the PL is the (self-)test and monitoring measures in SRP/CS. Effective tests for example permit some compensation to be made for poor reliability of the components. The quality of the tests is measured in EN ISO 13849-1 by the diagnostic coverage (DC). The DC is defined as the proportion of detected dangerous failures among all conceivable dangerous failures. The reference quantity may be a component, a block, or the entire SRP/CS. In the last of these cases, the DC is the average diagnostic coverage DCavg, which has an important function in the simplified quantification of the PL by means of the bar chart method.

DIAGNOSTIC COVERAGE (DC)

DESCRIPTION	RANGE
None	DC < 60 %
Low	60 % ≤ DC < 90 %
Medium	90 % ≤ DC < 99 %
High	99 % ≤ DC

CCF | Measures against common cause failure

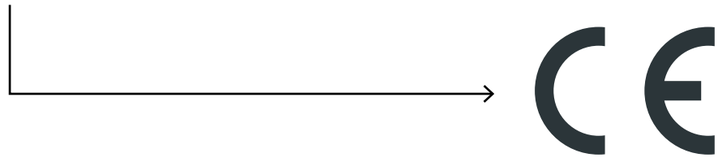
The final parameter relevant to the simplified quantification of the probability of failure concerns common cause failures (CCF). Such failures are related dangerous failures, for example in both channels of a redundant SRP/CS, that are attributable to a common cause. Examples include unfavorable environmental conditions or overloads that were not adequately addressed during design of the control system. Should the channels not be adequately separated, dangerous secondary faults may occur that render the intended single-fault tolerance ineffective. The quantitative relevance of these effects in a specific system is difficult to estimate (refer also to Annex F).

V. Implementation of the indicative measures and the further documents

1. Operating instructions
2. Declaration of incorporation for incomplete machines, which have been incorporated into information signs and pictograms the machine
3. Personal protective equipment

VI. Other directives, if applicable (EMC Directive, ATEX Directive, Pressure Equipment Directive)

VII. Conformity procedures for machinery according to Article 12 of the Machinery Directive



Product Specifications

Types

Our high-quality safety relays are designed for the machine building and process industry. They all meet the requirements for the respective standards and are certified up to SIL 3/PL e by independent testing institutes.

SAFE-ESTOP

P. 18

SAFE-DELAY

Off-delay up to 30 seconds

P. 24

SAFE-SIL

Safe coupling or extension module

P. 30

SAFE-MULTI

P. 36

SAFE-TWO-HAND

P. 42

SIL 3

Download full product information via the QR code next to the products.

SAFE-ESTOP

Download
Datasheet

SAFE-ESTOP is an all-purpose emergency stop device with three safe relay contacts for safe monitoring of one or two channel sensors, certified by TÜV Rheinland. Further applications for the SAFE-ESTOP include single or dual channel emergency stop circuits and guard monitoring on machines and plants according to EN ISO 13849-1, EN 62061 and EN 61508.

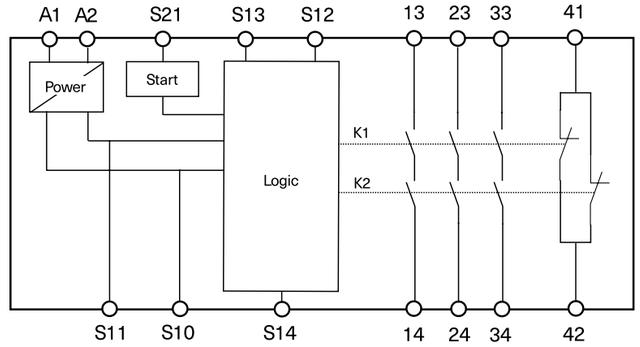
SAFE-ESTOP

Functional Safety Module | E-Stop monitoring up to SIL 3

Features

- 3 non-delayed safety contacts
- 1 non-delayed auxiliary contact
- Connection of:
  - Emergency stop buttons
  - Mechanical safety switches
  - Non-contact safety switches
  - Safety components with OSSD outputs
- Control: single or dual channel
- Feedback loop for external contactors or extension modules
- Cyclical monitoring of the output contacts
- LED indicator for power and status
- Automatic or manual start
- Short-circuit monitoring and ground fault monitoring
- Up to PL e, SILCL 3, category 4 (EN ISO 13849-1, EN 62061, EN 61508)

Function



The safety relay SAFE-ESTOP is designed for monitoring of safety circuits according to EN 60204-1, stop category 0 and can be used in safety-related applications up to safety category 4, PL e (EN ISO 13849-1) SILCL 3 (EN 62061, EN 61508).

ORDER DETAILS

Brand	SALZ Automation
Product Name	SAFE-ESTOP
Function	E-stop monitoring module with 3 N/O, 1 N/C up to SIL 3
Product SKU/Order No.	SA-SAFE-ES-01-00 (1 pc) | SA-SAFE-ES-50-00 (50 pcs)

TÜVRheinland CERTIFIED
Product Safety
Functional Safety
www.tuv.com
ID 0000000000

Operation Instructions

Applications

Depending on the application or the result of the risk assessment according to EN ISO 13849-1, the device must be wired as shown in Fig. 1 to Fig. 10.

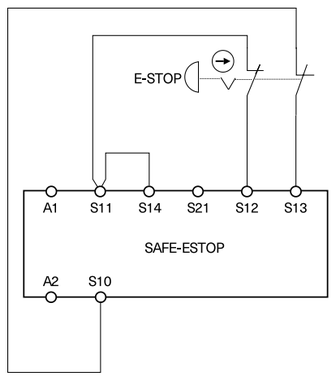


Fig. 1: Dual channel emergency stop with short circuit and ground fault monitoring (category 4, up to PL e/SIL 3)

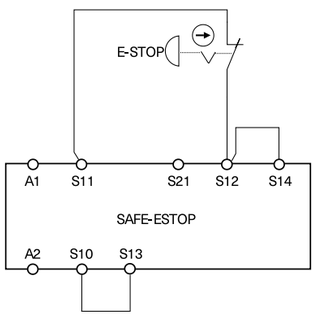


Fig. 2: Dual channel emergency stop with ground fault monitoring (category 3, up to PL d/SIL 2)

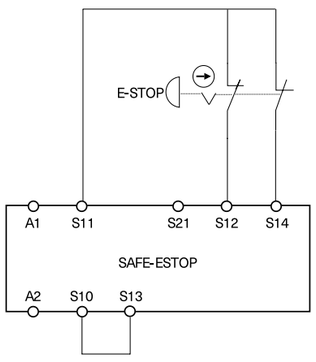


Fig. 3: Single channel emergency stop with ground fault monitoring (category 1, up to PL c/SIL 1)

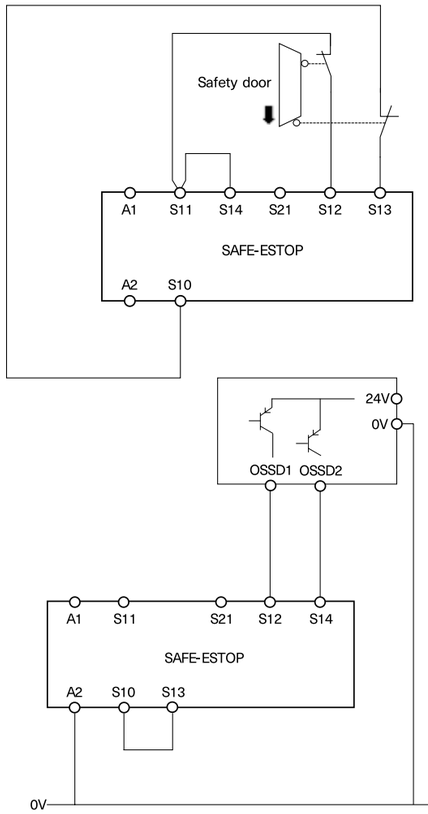


Fig. 4: Dual channel safety guard monitoring with short circuit and ground fault monitoring. (category 4, up to PL e/SIL 3)

Fig. 5: Two channel emergency stop with PNP outputs/OSSD outputs with its own short circuit monitoring. (category 4, up to PL e/SIL 3)

PREREQUISITE: Signal generator meets requirements for PL e/SIL 3

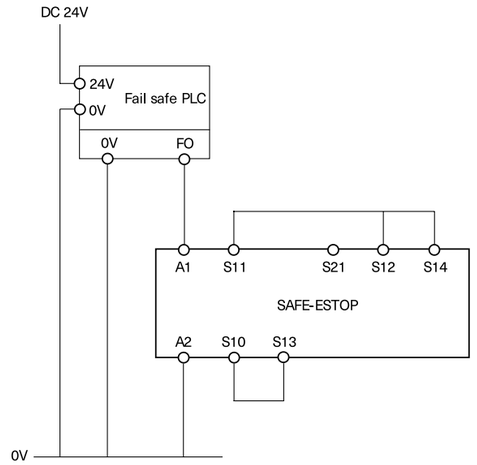


Fig. 6: Connecting to a safety PLC (category 4, up to PL e/SIL 3)

PREREQUISITE: Safe PLC output meets the required safety level and short circuit between PLC output and SAFE-ESTOP can be excluded (e.g. wiring inside an electrical installation space – see EN ISO 13849-2; Tab D4).

⚠ ATTENTION: Loss of functional safety!

For the applications according Fig. 5 and Fig. 6 the following is to be noted:

- Make sure that the ground potential of the signal generator and the SAFE-ESTOP is the same.
- It must be ensured that any switch-on pulses (light test) sent by the signal generator do not lead to a short activation of the safety relay and should therefore basically be deactivated.

Start Behaviour

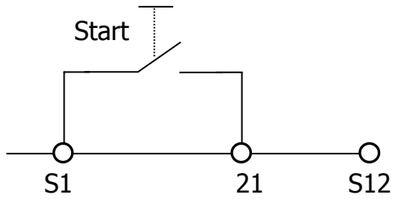


Fig. 7: Monitored manual start. It is monitored that the start button has been opened before the safety switch is closed.

PREREQUISITE: Power supply may not be interrupted.

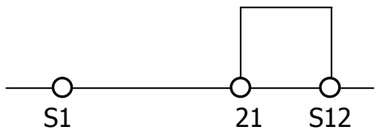


Fig. 8: Automatic start. Maximum allowable delay when closing the safety switches at S12 and S13/S14:

S12 before S13/S14: 200 ms
S13/S14 before S12: no limit

⚠ **WARNING:** Safety contacts will be activated immediately at power ON.

Feedback Loop

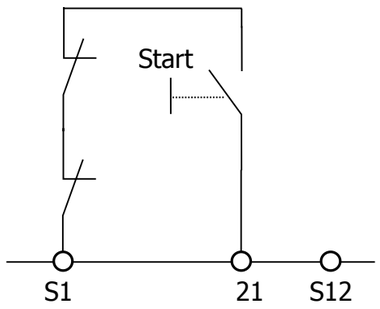


Fig. 9: Feedback loop for monitored manual start. The feedback loop monitors contactors or the expansion modules.

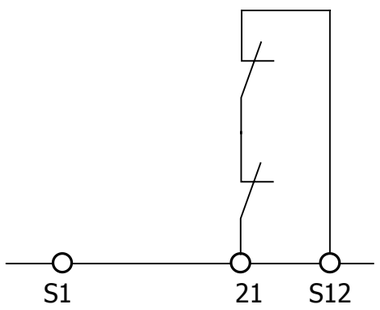


Fig. 10: Feedback loop for automatic start. The feedback loop monitors contactors or the expansion modules.

Technical Data

In compliance with	EN 60204-1; EN ISO 13849-1; IEC 62061; IEC 61508 Parts 1-2 and 4-7
Operating voltage	DC 24 V +/- 10 %
Power consumption	2.6 W
Inrush current	5 A (approx. 250 µs)
Pulse suppression (A1/S12/S14) Switch-off pulse/dark test Switch-on pulse/light test	max. 3 ms (pulse width)/500 ms (pulse rate) max. 1 ms (pulse width)/500 ms (pulse rate) **Note:** It must be ensured that any switch-on pulses (light test) sent by the signal generator do not lead to a short activation of the safety relay and should therefore basically be deactivated.
Safe contact configuration	3 non-delayed safety contacts (NO)
Auxiliary contacts	1 non-delayed auxiliary contact (NC)
Max. switching voltage	AC 250 V
Contact rating of safety contacts (13-14, 23-24, 33-34) 6 switching cycles/min	AC: 250 V, 2000 VA, 8 A for resistive load 250 V, 3 A for AC-15
	DC: 30 V, 240 W, 8 A for resistive load 24 V, 3 A for DC-13
Thermal current Ith	Max. 5 A per contact (see total current limit curve)
Contact rating of auxiliary contact	AC: 250 V, 500 VA, 2 A for resistive load DC: 30 V, 60 W, 2 A for resistive load
Minimum contact load	5 V, 10 mA
External fuses	10 A gG (NO); 6 A gG (NC)
Max. switch-on delay	< 50 ms
Max. switch-off delay	Via A1: < 40 ms; Via S12 or S13/S14 < 20 ms
Recovery time	< 500 ms
Wire width	0.14 - 2.5 mm^2
Tightening moment (Min./Max.)	0.5 Nm/0.6 Nm
Contact material	$AgSnO_2$
Service Life	mech. approx. 1×10^7
Rated impulse withstand voltage	2.5 kV (control voltage/contacts)
Dielectric strength	4 kV (DIN VDE 0110-1)
Rated insulation voltage	250 V
Degree of pollution/Overvoltage category	2/3 (DIN VDE 0110-0)
Protection	IP20
Temperature range Ambient	-15 °C to +55 °C
Temperature range Storage	-15 °C to +85 °C
Max. altitude	≤ 2000 m (above sea level)
Weight approx.	150 g
Mounting DIN rail according to EN 60715	TH35

SAFE-DELAY

Download
Datasheet

SAFE-DELAY is an all-purpose emergency stop device that combines non-time-delayed and time-delayed contacts. This permits dangerous components of a system to be switched off quickly and safely in an emergency situation. At the same time, other circuits can continue to be supplied with voltage for up to 30 seconds to allow a tool to be moved to its idle position or to brake following parts, for example. The safety module provides two safe relay contacts without any delay and two safe relay contacts with a time-off delay up to 30 seconds. Further applications for the SAFE-DELAY include single or dual channel emergency stop circuits and guard monitoring on machines and plants according to EN ISO 13849-1 and EN 62061.

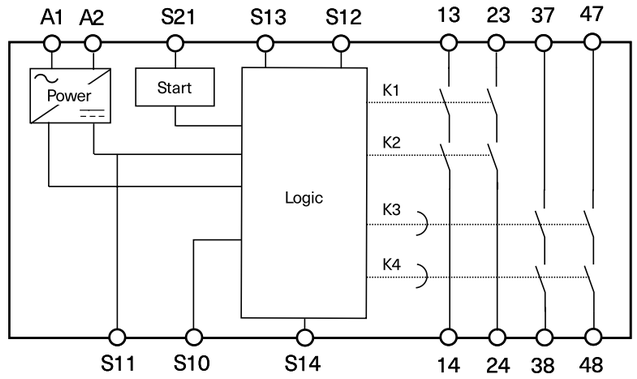
SAFE-DELAY

Functional Safety Module | E-Stop monitoring up to SIL 3 with time-off delayed contacts

Features

- 2 non-delayed safety contacts
- 2 time-off delayed contacts
- Continuously adjustable time delay (1 to 30 s)
- Connection of:
  - Emergency stop buttons
  - Mechanical safety switches
  - Non-contact safety switches
  - Safety components with OSSD outputs
- Control: single or dual channel feedback loop for external contactors or extension modules
- Cyclical monitoring of the output contacts LED indicator for power and status
- Automatic or manual start
- Short-circuit monitoring and ground fault monitoring
- Up to PL e, SILCL 3, category 4 (EN ISO 13849-1, EN 62061)

Function



ORDER DETAILS

Brand	SALZ Automation
Product Name	SAFE-DELAY
Function	E-stop monitoring module SIL 3 with time-off delay 30 sec.
Product SKU/Order No.	SA-SAFE-DL-01-00 | 1 pc

Product Safety
Functional
Safety
www.tuv.com
ID 0600000000

Operation Instructions

Applications

Depending on the application or the result of the risk assessment according to EN ISO 13849-1, the device must be wired as shown in Fig. 1 to Fig. 9. Non delayed contacts 13/14, 23/24 can be used up to category 4, PL e, time-off delayed safety contacts 37/38, 47/48 up to category 3, PL e.

⚠ **WARNING:** In order to activate earth fault monitoring, the PE must be connected only to the power supply unit in accordance with EN 60204-1.

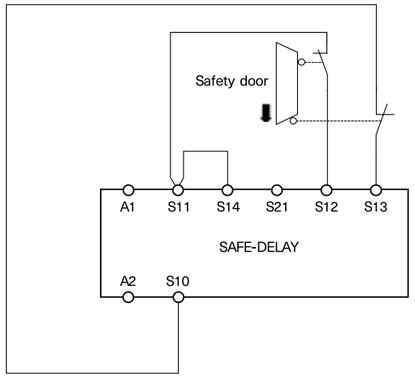


Fig. 1 : Dual channel emergency stop with short circuit and ground fault monitoring. (category 4, up to PL e/SIL 3)

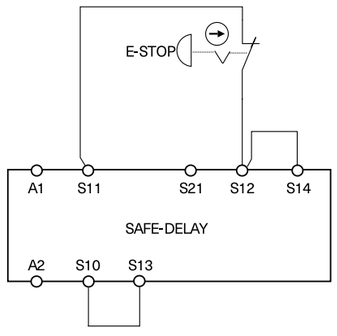


Fig. 2: Dual channel emergency stop with ground fault monitoring. (category 3, up to PL d/SIL 2)

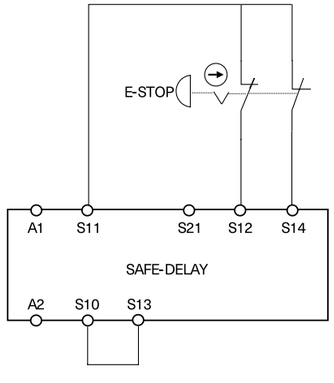


Fig. 3: Single channel emergency stop with ground fault monitoring. (category 1, up to PL c/SIL 1)

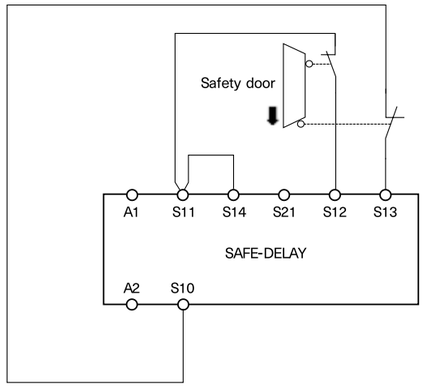


Fig. 4: Dual channel safety guard monitoring with short circuit and ground fault monitoring. (category 4, up to PL e/SIL 3)

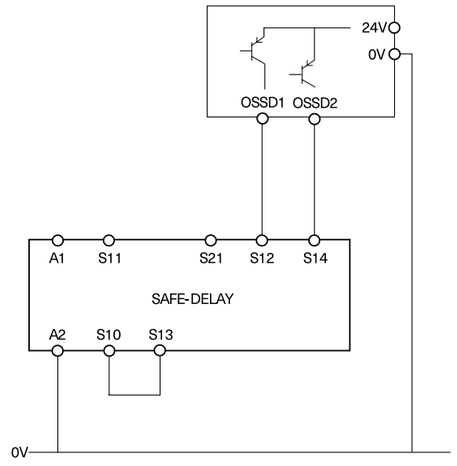


Fig. 5: Two channel emergency stop with PNP outputs/OSSD outputs with its own short circuit monitoring. (category 4, up to PL e/SIL 3)

⚠ **ATTENTION: Loss of functional safety!**

For the application according Fig. 5 the following is to be noted:

- Make sure that the ground potential of the signal generator and the SAFE-DELAY is the same.
- It must be ensured that any switch-on pulses (light test) sent by the signal generator do not lead to a short activation of the safety relay and should therefore basically be deactivated.

Start Behaviour

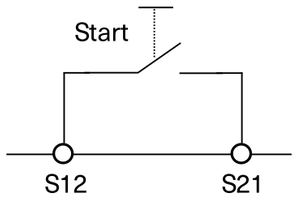


Fig. 6: Manual start.

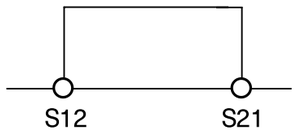


Fig. 7: Automatic start. Maximum allowable delay when closing the safety switches at S12 and S13:

S12 before S13: 300 ms
S13 before S12: no limit

⚠ **WARNING:** Safety contacts will be activated immediately at power ON.

Feedback Loop

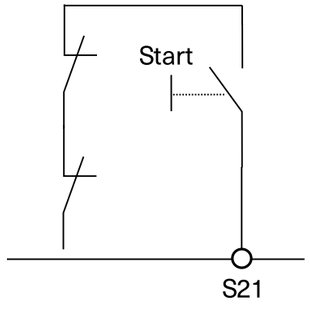


Fig. 8: Feedback loop for monitored manual start. The feedback loop monitors contactors or the expansion modules.

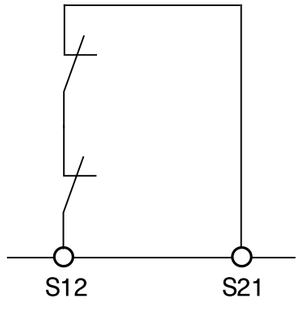


Fig. 9: Feedback loop for automatic start. The feedback loop monitors contactors or the expansion modules.

Technical Data

In compliance with	EN 60204-1; EN ISO 13849-1; IEC 62061
Operating voltage	AC/DC 24 V +/- 10 %
Power consumption	AC 5.3 VA/DC 4.7 W
Rated supply frequency	50 - 60 Hz
Control voltage at S11	DC 24 V
Control current	typical 190 mA
Safety contacts non-delayed	2 NO
Safety contacts delayed	2 NO
Max. switching voltage	AC 250 V
Contact rating of safety contacts 6 switching cycles/min	AC: 250 V, 2000 VA, 8 A for resistive load 250 V, 3 A for AC-15
	DC: 40 V, 320 W, 8 A for resistive load 24 V, 3 A for DC-13
Max. total current through all contacts	15 A I more than one device is closely spaced under load, the max. total current at the ambient temperature of T=20 °C: 9 A; at T=30 °C: 3 A; at T=40 °C =1 A. Otherwise a distance of 5 mm between two devices is necessary.
Minimum contact load	5 V, 10 mA
External fuses	10 A gG
Max. switch-on delay	< 30 ms
Switch-off delay (adjustable)	30 ms to 30 sec.
Recovery time	< 500 ms
Max. length of control line	1000 m at 0.75 mm^2
Wire width	0.14 - 2.5 mm^2
Tightening moment (Min./Max.)	0.5 Nm/0.6 Nm
Contact material	$AgSnO_2$
Service Life	mech. approx. 1 x 10^7
Test voltage	2.5 kV (control voltage/contacts)
Rated impulse withstand voltage, leakage path/air gap	4 kV (DIN VDE 0110-1)
Rated insulation voltage	250 V
Degree of pollution/Overvoltage category	2/3 (DIN VDE 0110-0)
Protection	IP20
Temperature range Ambient	-15 °C to +40 °C
Temperature range Storage	-15 °C to +85 °C
Max. altitude	≤ 2000 m (above sea level)
Weight approx.	250 g
Mounting DIN rail according to EN 60715	TH35

SAFE-SIL

Download
Datasheet

SAFE-SIL is an all-purpose safe coupling device with three safe relay contacts for safe switching, certified by TÜV Rheinland. The SAFE-SIL couples safe signals of pulsed PLC outputs to the field for galvanic isolation and power adjustment or it can be used as contact extension for a basic device. No feedback circuit necessary. It is designed according EN ISO 13849-1, EN 62061 and EN 61508.

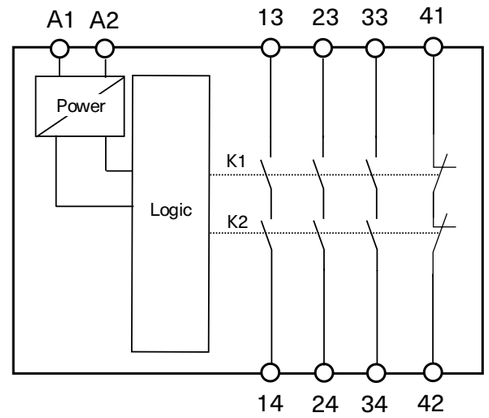
SAFE-SIL

Functional Safety Module | Safe coupling relay up to SIL 3

Features

- 3 non-delayed safety contacts
- 1 non-delayed auxiliary contact
- Coupling of safe signals for galvanic isolation and power adjustment
- LED indicator for status
- Self-monitoring
- Automatic start
- Up to PL e, SILCL 3, category 4 (EN ISO 13849-1, EN 62061, EN 61508)

Function



ORDER DETAILS

Brand	SALZ Automation
Product Name	SAFE-SIL
Function	Safe coupling relay with 3 N/O and 1 N/C up to SIL 3
Product SKU/Order No.	SA-SAFE-SL-01-00 (1 pc) | SA-SAFE-SL-50-00 (50 pcs)

TÜVRheinland CERTIFIED
Product Safety
Functional Safety
www.tuv.com
ID 0600000000

Operation Instructions

Applications

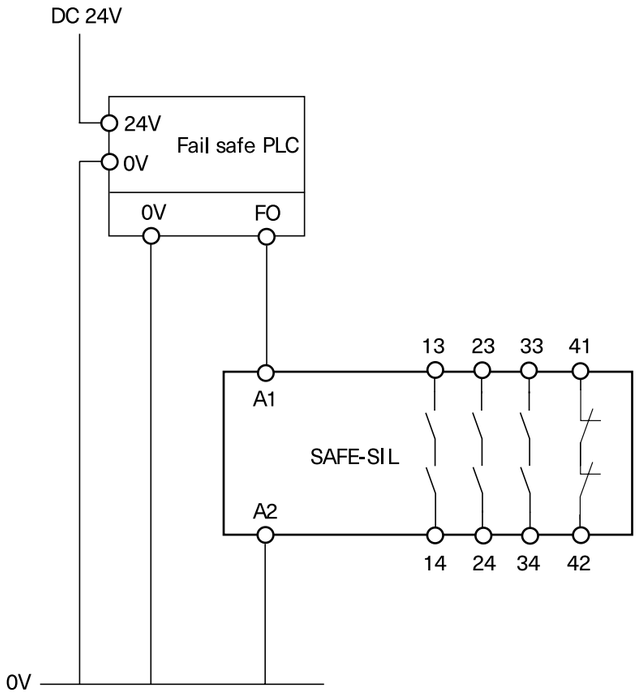


Fig. 1: SAFE-SIL as Coupling Relay for fail safe PLC output

Single channel control with fail safe PLC output. (Category 4, up to PL e/SILCL 3, if the safety output meets PL e/SILCL 3 and short circuits in line between the safety output and A1 of the SAFE-SIL can be ruled out - see Advice)

⚠ **CAUTION:** Safety contacts will be activated immediately by switching on the control line. Make sure that A2 is the correct reference potential to the switching voltage A1.

⚠ **ADVICE:** According to ISO 13849-2 the wiring has to be in a short-circuit-proof control cabinet with a minimum degree of protection of IP54. For example EN ISO 13849-2, table D4 - Cables within an electrical installation space in accordance with EN 60204-1.

A feedback loop for monitoring the SAFE-SIL is not necessary. However, if a feedback loop is necessary for the application, this can be achieved by wiring the feedback to the auxiliary contact 41-42.

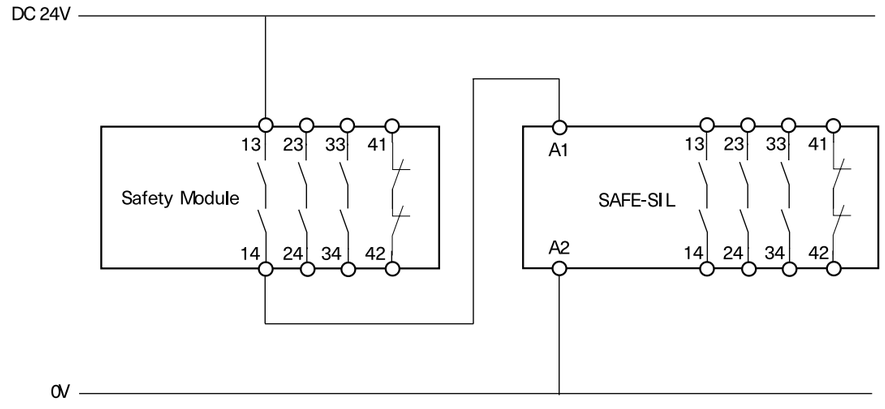


Fig. 2: SAFE-SIL as Expansion Module - Control with safe relay contacts

Wiring as contact extension of a basic device (Category 4, up to PL e/SILCL 3, if the safety output meets PL e/SILCL 3 and short circuits in line between the safety output and A1 of the SAFE-SIL can be ruled out - see Advice)

⚠ **CAUTION:** Safety contacts will be activated immediately by switching on the basic device.

⚠ **ADVICE:** According to EN ISO 13849-2 the wiring has to be in a short-circuit-proof control cabinet with a minimum degree of protection of IP54. For example, EN ISO 13849-2, table D4-Cables within an electrical installation space in accordance with EN 60204-1.

A feedback loop for monitoring the SAFE-SIL is not necessary. However, if a feedback loop is necessary for the application, this can be achieved by wiring the feedback to the auxiliary contact 41-42 (see Fig.6 or Fig. 7).

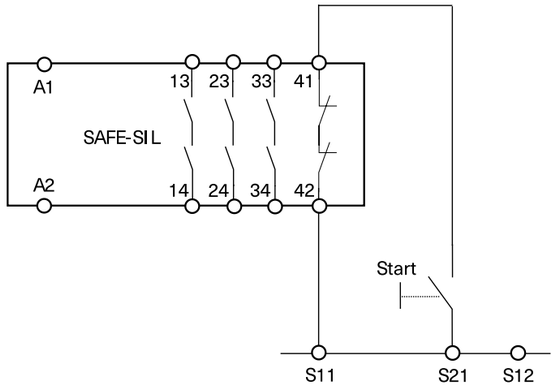


Fig. 3: SAFE SIL as Expansion Module - Feedback loop using a manual, monitored start.

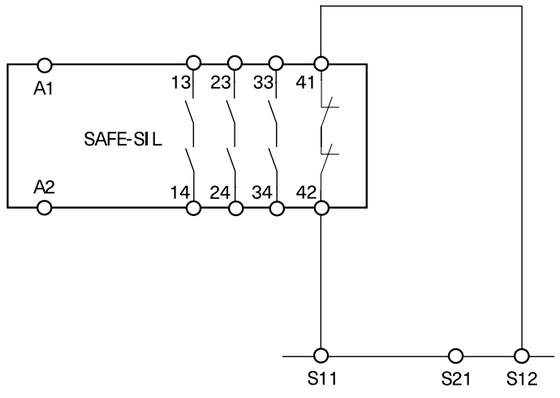


Fig. 4: SAFE SIL as Expansion Module - Feedback loop, automatic start.

Technical Data

In compliance with	EN 60204-1; DIN EN ISO 13849-1; EN 62061; EN 50156-1 EN 746-2; IEC 61508 Parts 1-2 and 4-7; IEC 61511-1
Operating voltage	DC 24 V +/- 10 %
Power consumption	Typ. 2 W
Safety contacts	3 N/O
Auxiliary contacts	1 N/C
Max. switching voltage	AC 250 V
Contact rating of safety contacts (13-14, 23-24, 33-34) 6 switching cycles/ min	AC: 250 V, 2000 VA, 8 A for resistive load 250 V, 5 A for AC-15
	DC: 30 V, 240 W, 8 A for resistive load 24 V, 4 A for DC-13
Max. total current through all 3 contacts	15 A (13-14, 23-24, 33-34)
Contact rating of auxiliary contact	AC: 250 V, 500 VA, 2 A for resistive load DC: 30 V, 60 W, 2 A for resistive load
Minimum contact load	5 V, 10 mA
External fuses	10 A gG (NO)
Contact rating of auxiliary contact	AC: 250 V, 500 VA, 2 A for resistive load DC: 30 V, 60 W, 2 A for resistive load
Minimum contact load	5 V, 10 mA
External fuses	10 A gG (NO); 6 A gG (NC) 6 A gG for applications acc. to EN 50156-1 and EN 746-2 (See EN 50156-1; Chapter 10.5.5.3.4)
Max. switch-on delay	< 30 ms
Max. switch-off delay	< 60 ms
Recovery time	< 500 ms
Max. line resistance at nominal voltage	50 Ω
Wire width	0.14 - 2.5 mm2
Tightening moment (Min./Max.)	0.5 Nm/0.6 Nm
Contact material	$AgSnO_2$
Service Life	mech. approx. 1×10^7
Rated impulse withstand voltage	2.5 kV (control voltage/contacts)
Dielectric strength (EN 60664-1)	6 kV between relays safety loops, control lines and internal logic
Rated insulation voltage	250 V
Degree of pollution/Overvoltage category	2/3 (EN 60664-1)
Protection	IP20
Temperature range Ambient	-15 °C to +55 °C
Temperature range Storage	-15 °C to +85 °C
Max. altitude	≤ 2000 m (above sea level)
Weight approx.	150 g
Mounting DIN rail according to EN 60715	TH35

SAFE-MULTI

Download
Datasheet

SAFE-MULTI is an all-purpose emergency stop device with seven safe relay contacts for safe monitoring of one or two channel sensors, certified by TÜV Rheinland. Further applications for the SAFE-MULTI include single or dual channel emergency stop circuits and guard monitoring on machines and plants according to EN ISO 13849-1, EN 62061 and EN 61508.

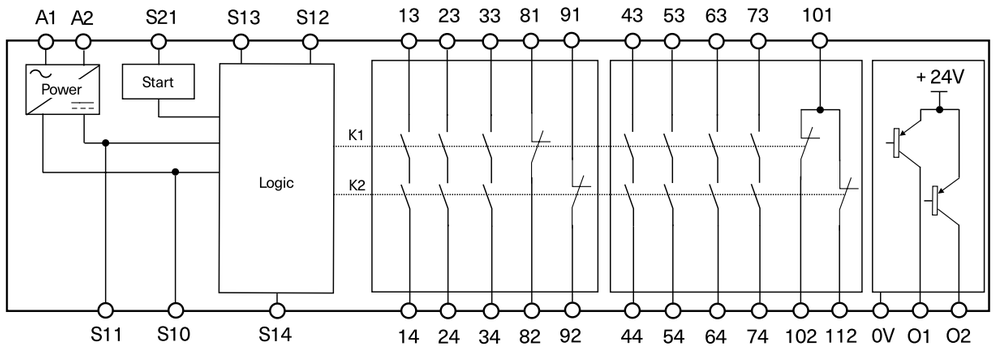
SAFE-MULTI

Functional Safety Module | E-Stop monitoring up to SIL 3

Features

- 7 non-delayed safety contacts
- 4 auxiliary relay and 2 auxiliary semiconductor outputs
- Connection of:
  - Emergency stop buttons
  - Mechanical safety switches
  - Non-contact safety switches
  - Safety components with OSSD outputs
- Control: single or dual channel
- Feedback loop for external contactors or extension modules
- Cyclical monitoring of the output contacts
- LED indicator for power and status
- Automatic or manual start
- Short-circuit monitoring and ground fault monitoring
- Up to PL e, SILCL 3, category 4 (EN ISO 13849-1, EN 62061, EN 61508)

Function



ORDER DETAILS

Brand	SALZ Automation
Product Name	SAFE-MULTI
Function	E-stop monitoring module with 7 N/O, 4 N/C, 2 PNP, up to SIL 3
Product SKU/Order No.	SA-SAFE-MU-01-00 | 1 pc

TÜVRheinland CERTIFIED
Product Safety
Functional Safety
www.tuv.com
ID 0600000000

Operation Instructions

Applications

Depending on the application or the result of the risk assessment according to EN ISO 13849-1, the device must be wired as shown in Fig. 5 to Fig. 16.

⚠ **WARNING:** In order to activate earth fault monitoring, the PE must be connected only to the power supply unit in accordance with EN60204-1.

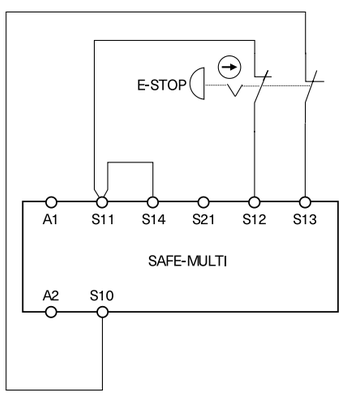


Fig. 1: Dual channel emergency stop with short circuit and ground fault monitoring. (category 4, up to PL e/SIL 3)

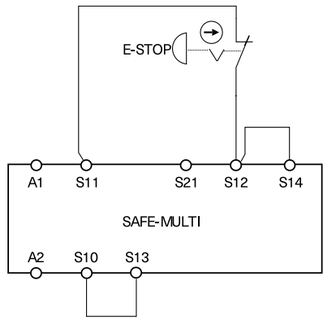


Fig. 2: Dual channel emergency stop with ground fault monitoring. (category 3, up to PL d/SIL 2)

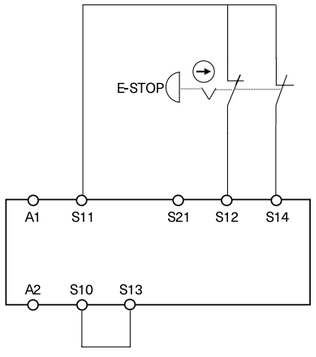


Fig. 3: Single channel emergency stop with ground fault monitoring. (category 1, up to PL c/SIL 1)

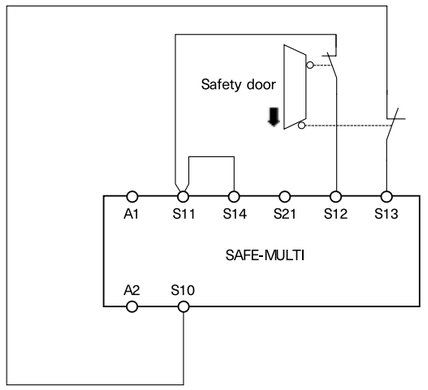


Fig. 4: Dual channel safety guard monitoring with short circuit and ground fault monitoring. (category 4, up to PL e/SIL 3)

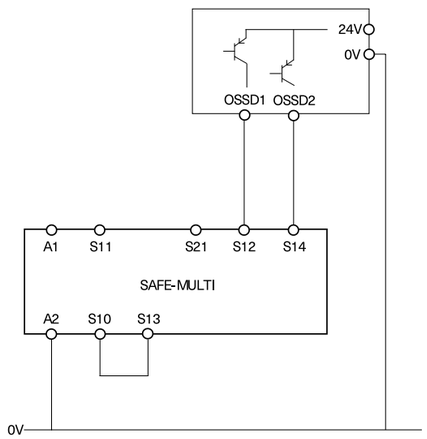


Fig. 5: Two channel emergency stop with PNP outputs/OSSD outputs with its own short circuit monitoring. (category 4, up to PL e/SIL 3)

PREREQUISITE: Signal generator meet requirements for PL e/SIL 3

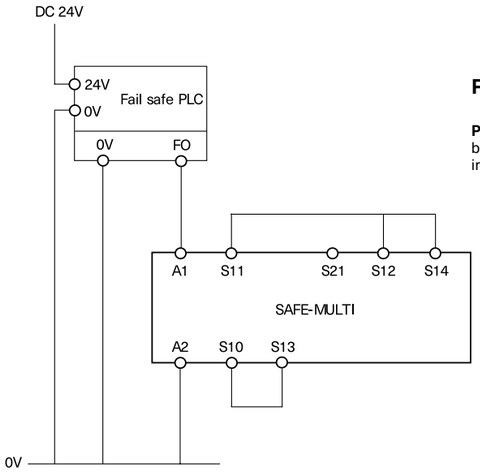


Fig. 6: Connecting to a safety PLC (category 4, up to PL e/SIL 3)

PREREQUISITE: Safe PLC output meets the required safety level and short circuit between PLC output and SAFE-ESTOP can be excluded (e.g. wiring inside an electrical installation space - see EN ISO 13849-2; Tab D4).

⚠ **ATTENTION: Loss of functional safety!**

For the applications according Fig. 8 and Fig. 9 the following is to be noted:

- Make sure that the ground potential of the signal generator and the MULTI is the same.
- It must be ensured that any switch-on pulses (light test) sent by the signal generator do not lead to a short activation of the safety relay and should therefore basically be deactivated.

Start Behaviour

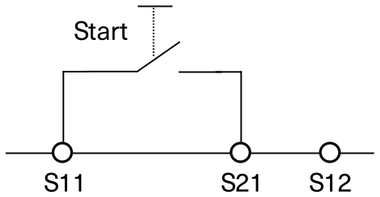


Fig. 7: Monitored manual start. It is monitored that the start button has been opened before the safety switch is closed.

PREREQUISITE: Power supply may not be interrupted.

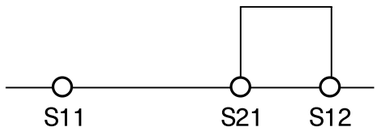


Fig. 8: Automatic start. Maximum allowable delay when closing the safety switches at S12 and S13/S14:

S12 before S13/S14: 300ms
S13/S14 before S12: no limit

⚠ **WARNING:** Safety contacts will be activated immediately at power ON.

Feedback Loop

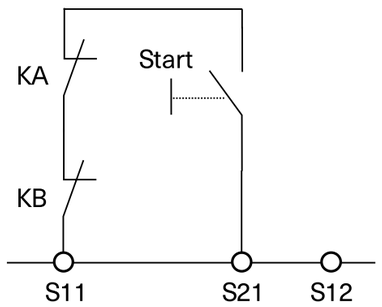


Fig. 9: Feedback loop for monitored manual start. The feedback loop monitors contactors or the expansion modules.

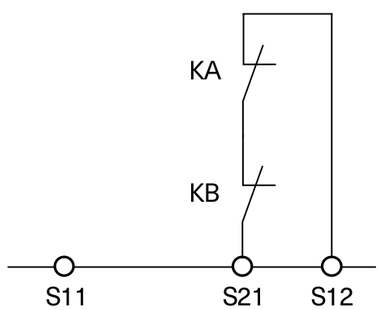


Fig. 10: Feedback loop for automatic start. The feedback loop monitors contactors or the expansion modules.

Technical Data

In compliance with	EN 60204-1; EN ISO 13849-1; IEC 62061
Operating voltage	AC/DC 24 V +/- 10 %
Power consumption	AC 8.5 VA/DC 4.5 W
Rated supply frequency	50 - 60 Hz
Safety contacts	7 non-delayed safety contacts (NO)
Auxiliary contacts	4 non-delayed auxiliary contact (NC)
Auxiliary transistor outputs (O1, O2)	DC 24 V/30 mA, over current protected
Max. switching voltage	AC 250 V
Contact rating of safety contacts (13-14, ..., 73-74) 6 switching cycles/ min	AC: 250 V, 2000 VA, 8 A for resistive load 250 V, 3 A for AC-15
	DC: 30 V, 240 W, 8 A for resistive load 24 V, 3 A for DC-13
Max. total current through all 7 contacts up to Ta=40 °C:	35 A with 10 mm spacing between the devices 20 A no spacing between the devices
Contact rating of auxiliary contact	AC: 250 V, 2000 VA, 8 A for resistive load DC: 40 V, 320 W, 8 A for resistive load
Minimum contact load	5 V, 10 mA
External fuses	10 A gG (NO); 6 A gG (NC)
Max. switch-on delay	< 30 ms
Max. switch-off delay	Via S12 or S13/S14 < 20 ms
Recovery time	< 500 ms
Max. length of control line	2x 1000 m at 1.5 mm^2, 2x 500 m at 0.75 mm^2
Wire width	0.14 - 2.5 mm^2
Tightening moment (Min./Max.)	0.5 Nm/0.6 Nm
Contact material	$AgSnO_2$
Service Life	mech. approx. 1 x 10^7
Rated impulse withstand voltage, leakage path/air gap	4 kV (DIN VDE 0110-1)
Rated insulation voltage	250 V
Degree of pollution/Overvoltage category	2/3 (DIN VDE 0110-0)
Protection	IP20
Temperature range Ambient	-15 °C to +40 °C
Temperature range Storage	-15 °C to +85 °C
Max. altitude	≤ 2000 m (above sea level)
Weight approx.	350 g
Mounting DIN rail according to EN 60715	TH35

SAFE-TWO-HAND

Download
Datasheet

The SAFE-TWO-HAND safety relay is an extremely compact, universal safety two-hand control unit. It complies with EN ISO 13851, Type IIIC, and is intended for use in safety circuits that are designed in accordance with EN 60204-1, e.g., on presses, punches and bending tools. Due to the internal error monitoring, the two-hand safety relay can be used for all applications up to the highest safety category 4 and PL e according to EN ISO 13849-1, SILCL 3 according to EN 62061 or Type III C according to EN ISO 13851.

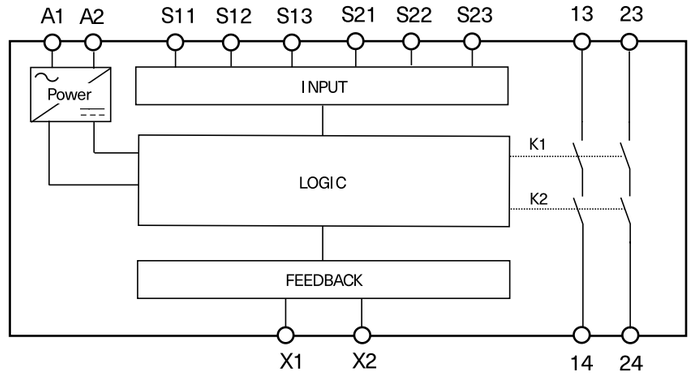
SAFE-TWO-HAND

Functional Safety Module | Safe two-hand control unit up to SIL 3

Features

- 2 non-delayed safety contacts
- Cyclical monitoring of the output contacts
- Connection of two-hand push buttons
- Feedback loop for external contactors or extension modules
- LED indicator for status
- Short-circuit monitoring and ground fault monitoring
- Up to PL e, SILCL 3, category 4, Type IIIC (EN ISO 13849-1, EN 62061, EN ISO 13851)

Function



ORDER DETAILS

Brand	SALZ Automation
Product Name	SAFE-TWO-HAND
Function	Safe two-hand control unit up to SIL 3 and TYPE IIIC
Product SKU/Order No.	SA-SAFE-TH-01-00 | 1 pc

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Operation Instructions

Applications

The arrangement of the two-hand buttons must be designed in accordance with the standards EN ISO 13851 and DIN EN ISO 13855 such that accidental actuation or simple bypassing of the safety function is excluded.

The SAFE-TWO-HAND unit is provided for the connection of two-hand push-buttons, with one normally open or one normally colsed contact.

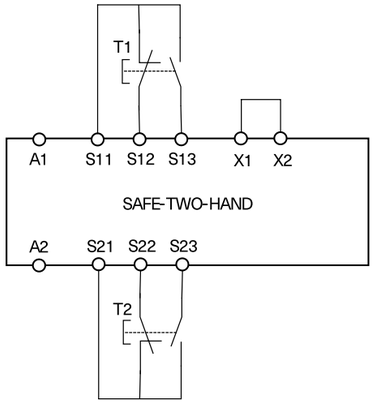

Fig. 1: Wiring of two-hand push buttons according to Type IIIC

Feedback Loop

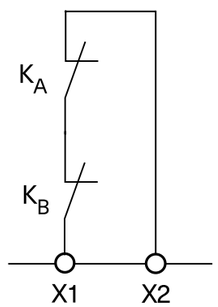

Fig. 2: Feedback loop for automatic start. The feedback loop monitors contactors or the expansion modules.

Technical Data

In compliance with	EN ISO 13851, EN 60204-1, EN ISO 13849-1, EN 62061
Operating voltage	AC/DC 24 V +/- 10 %
Power consumption	AC 3.5 VA/DC 1.5 W
Rated supply frequency	50 - 60 Hz
Control voltage at S11 and S22	DC 24V
Control current	typical 2 x 40 mA
Safety contacts non-delayed	2 NO
Max. switching voltage	AC 250 V
Contact rating of safety contacts 6 switching cycles/min	AC: 250 V, 1500 VA, 6 A for resistive load 250 V, 3 A for AC-15
	DC: 24 V, 144 W, 6 A for resistive load 24 V, 3 A for DC-13
Max. total current through all contacts	12 A
Minimum contact load	5 V, 10 mA
External fuses	10 A gG
Release time for the safety relays after release of a button	< 20 ms
Response delay after actuation of the buttons	< 20 ms
Synchronization time	0.5 s
Max. length of control line	1000 m at 0.75 mm^2
Wire width	0.14 - 2.5 mm^2
Tightening moment (Min./Max.)	0.5 Nm/0.6 Nm
Contact material	$AgSnO_2$
Service Life	mech. approx. 1 x 10^7
Test voltage	2.5 kV (control voltage/contacts)
Rated impulse withstand voltage, leakage path/air gap	4 kV (DIN VDE 0110-1)
Rated insulation voltage	250 V
Degree of pollution/Overvoltage category	2/3 (DIN VDE 0110-0)
Protection	IP20
Temperature range Ambient	-15 °C to +60 °C (max. +40 °C for AC use)
Temperature range Storage	-15 °C to +85 °C
Max. altitude	≤ 2000 m (above sea level)
Weight approx.	190 g
Mounting DIN rail according to EN 60715	TH35

Product Portfolio

We offer you the right products to make your machines competitive:

TÜV-Certified Functional Safety Modules

Functional Safety not only makes automation solutions more reliable, it also increases the availability of machines. This is because the safety modules enable a safe response to critical situations in a production process without having to stop the machines completely.

With our full-featured safety relays manufactured in Germany, you can implement conventional safety-related applications such as the monitoring of emergency stop circuits.

Industrial Power Supplies

Power supplies are among the essential components in the automation landscape. They may need to change the voltage up or down, convert the power to DC, or regulate the power for a smoother output voltage.

These functions will help you choose which power supply you need for your needs. Our three product families differ in performance, functionality and design. The power supplies are optimally adapted to the requirements of various industries, such as mechanical and plant engineering, building automation, shipbuilding or process technology.

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Industrial Ethernet is the most important communication standard in industrial automation. It uses a transparent, universal TCP/IP protocol. Indus Ethernet switches form the basis for high-performance communication networks by distributing data across all levels in a targeted and reliable manner.

Our Industrial Ethernet switches come in a metal housing for use in harsh industrial environments. In addition to robustness and reliability, we have placed great emphasis on the high-quality design of our products. Choose between fully managed, lite managed and unmanaged switches depending on the features you need. All switches have an integrated QoS (Quality of Service) for operation in PROFINET applications.

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We look forward to realizing your ideas with you.

solution@salz-automation.com

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SALZ AUTOMATION

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Precision in production and high-quality, TÜV-certified products are our top priorities. We do this using German-made and carefully selected modules from expert suppliers. In the end, you will only receive the product quality that we are fully convinced of.

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We are challengers and push the limits of automation.

We know how complex automation with high demands on functional safety works. In our case, however, this does not lead to complex solutions. We make use of the possibilities of Industry 4.0 and translate them into customer-friendly products and systems that focus on the essentials and have high utility value.

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