MINOS SD1E

Product Information



Safety Relay MINOS SD1E

1. Features

- Use up to PL e, Cat. 4, SILCL 3
- Certified for operation in furnaces and vessels according to EN 50156-1 / EN 746-2
- Stop Category 0 according to EN 60204-1
- 1 two-channel safe input
- 1 safe relay contact
- 1 auxiliary output (PNP)
- Automatic or monitored manual start selectable at the device
- 6.8 mm width
- Extensive monitoring via front LED‘s

2. Function

Config-Switches S1 and S2:

At the back of the device are two slide-switches (S1 and S2) to configure the SD1E. The following functions can be configured:

With the Config-Switch **S1**, the function of the safety circuit at I1 / I2 can be configured. According to your application a cross circuit monitoring can be enabled or disabled (see Fig. 1).

With the Config-Switch **S2**, the function of the start input at S21 can be configured. An automatic start or an monitored, manual start can be set.

For this, turn the SD1E until the printed configuration table (see Fig. 1) is facing up and the opening at the back of the device is visible. Two slide switches can be seen, which you can slide to the left or right side depending on the desired configuration (see Fig. 1).

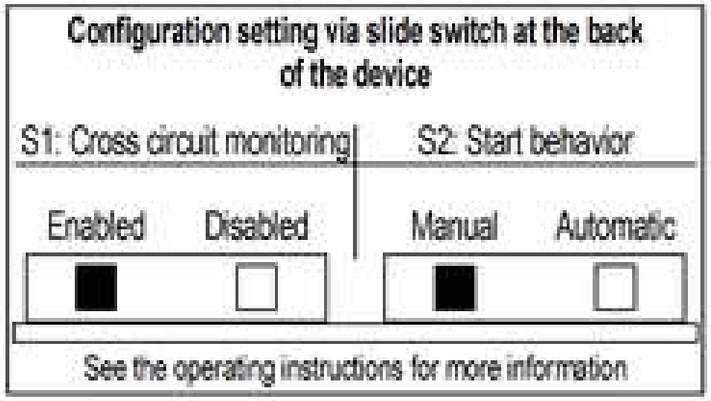


Fig. 1 Configuration table SD1E

For example:

For a two channel application with cross circuit monitoring and automatic start the Config-Switches must be set as follwos:

Config-Switch **S1**: Left (Enabled)

Config-Switch **S2**: Right (Automatic)

Safety circuit I1 / I2:

The safety circuit is designed to be used as single or dual channel via I1 and I2 depending on the wiring and the position of the Config-switch S1 (see chapter 12 “Commissioning”)

Start input S21:

A monitored manual start or an automatic start is provided via the terminal S21. The start function can be set via the Config-Switch S2 on the back of the device. (see chapter 12; “Commissioning”).

Safe relay contact 13-14:

Considering the start behaviour, the safe relay contact switches on at the time the safety circuit closes. Opening the safety circuit results in an immediate shutdown (safe condition).

Auxiliary output C1:

The PNP-semiconductor output switches invertedly to the safe relay contact and may not be used as safe output.

Behaviour in case of a fault:

It is ensured that one single fault does not lead to loss of the safety function and that every fault is detected latest when the system is switched off and switched on again through cyclic self-monitoring.

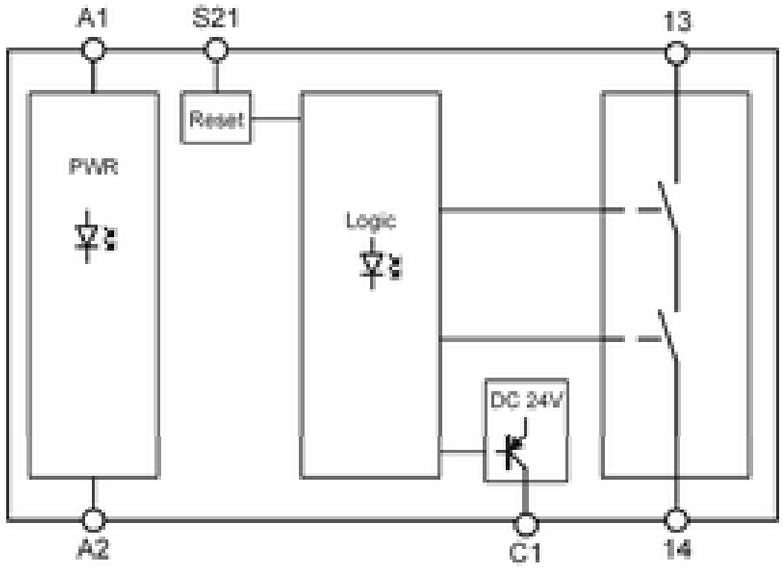


Fig. 2 Block diagram SD1E

3. Application examples

Application example 1:

SD1E for two-channel emergency stop monitoring with short circuit monitoring and monitored manual start up to PL e / SIL 3.

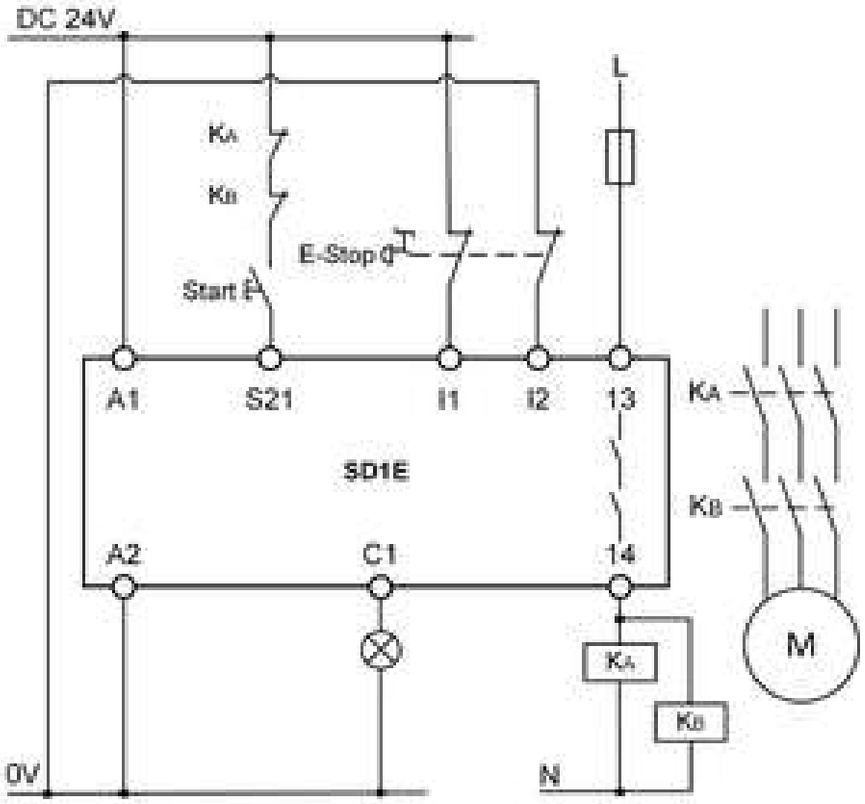


Fig. 3 Two-channel emergency-stop monitoring with cross circuit monitoring

Note: Config-Switches are set as follows:
S1: Enabled / **S2**: Manual
(see chapter 7. “Function”)

Application example 2:

SD1E for single-channel emergency stop monitoring with automatic start up to PL c / SIL 1.

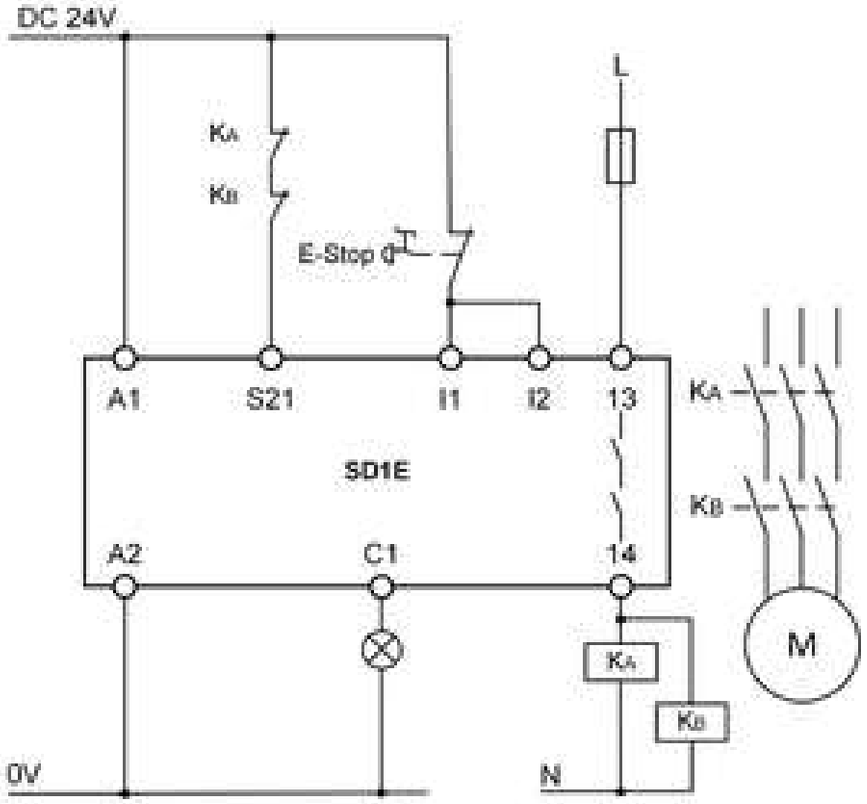


Fig. 4 Single-channel emergency stop monitoring with auto-start

Note: Config-Switches are set as follows:
S1: Disabled / **S2**: Automatic
(see chapter 7. “Function”)

Application example 3:

SD1E for two-channel monitoring of a non-contact safety device with short circuit monitoring and automatic start up to PL e / SIL 3.

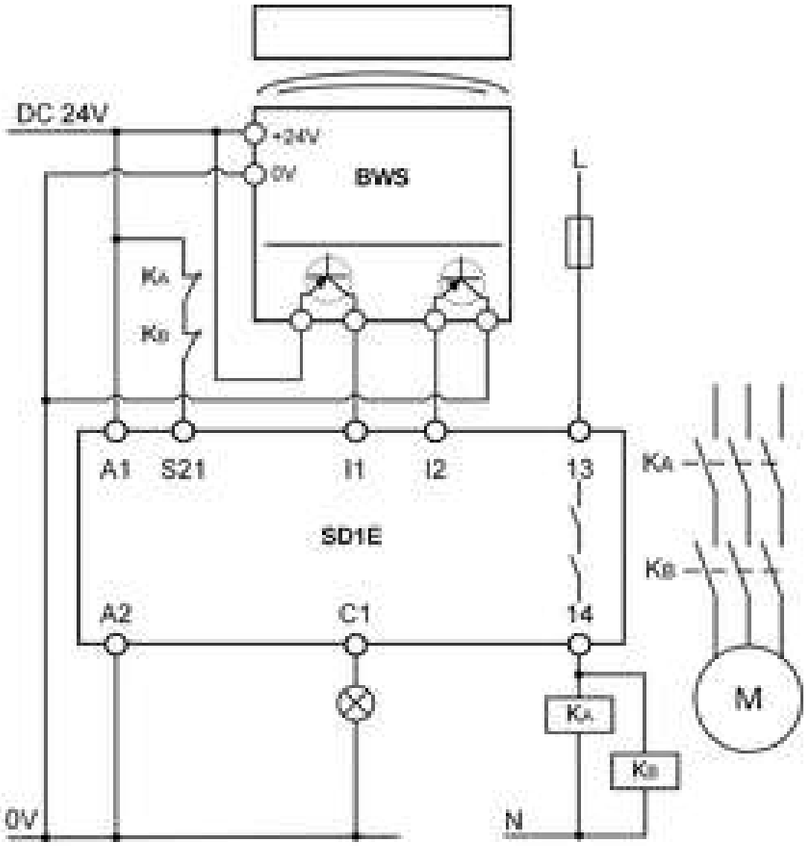


Fig. 5 Dual channel safety door monitoring with BWS

Note: Config-Switches are set as follows:
S1: Enabled / **S2**: Automatic
(see chapter 7. “Function”)

Application example 4:

SD1E for dual channel safety door monitoring with manual start up to PL e / SIL 3.

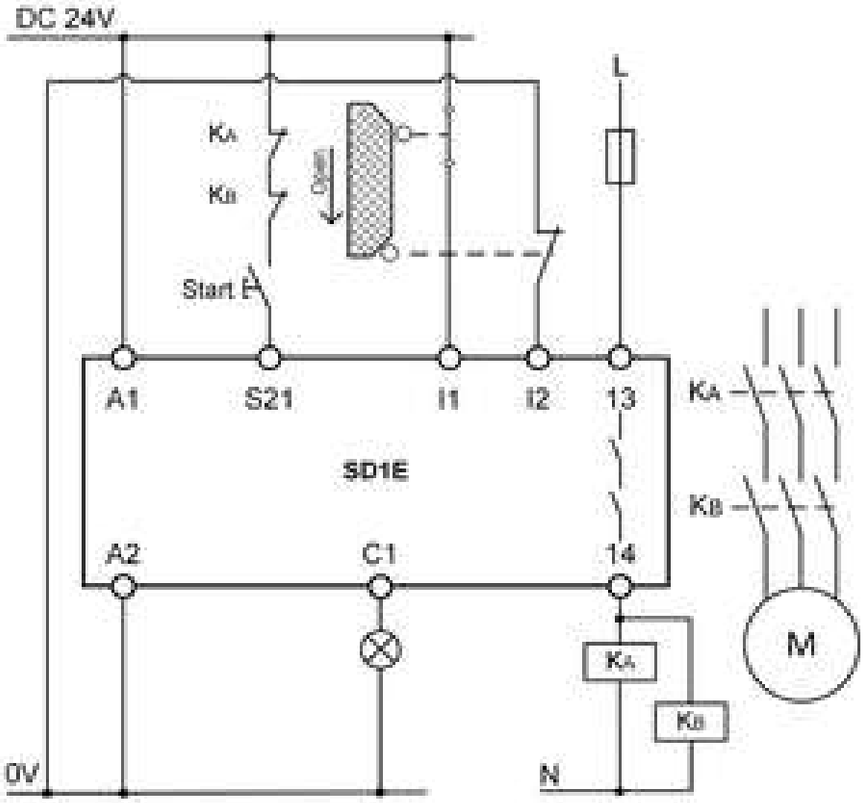


Fig. 6 Dual channel safety door monitoring

Note: Config-Switches are set as follows:
S1: Enabled / **S2**: Manual
(see chapter 7. “Function”)

Legend for all application examples:

E-Stop: Emergency stop button

Start: Start button

KA/KB: Positively driven contactors;
Monitoring via feedback circuit

BWS: Non-contact safety switch,
Light curtains etc.

PL and SIL: According to EN ISO 13849-1 and IEC 62061 / IEC 61508.

Specified safety level, considering a fault exclusion in the wiring between SD1E and the connected contactors KA and KB. See details in chapter 15 "Wiring / Applications - Safe relay contact"

4. Terminal assignment and LED display



A1: Power supply + DC 24 V

A2: Power Supply 0 V

S21: Control line start

I1: Control line safety circuit 1

SD1E: Variant label

Label - Upper terminal block

Label - Lower terminal block

Monitoring LEDs: UB, I1, I2, K1/2 (see monitoring table)

I2: Control line safety circuit 2

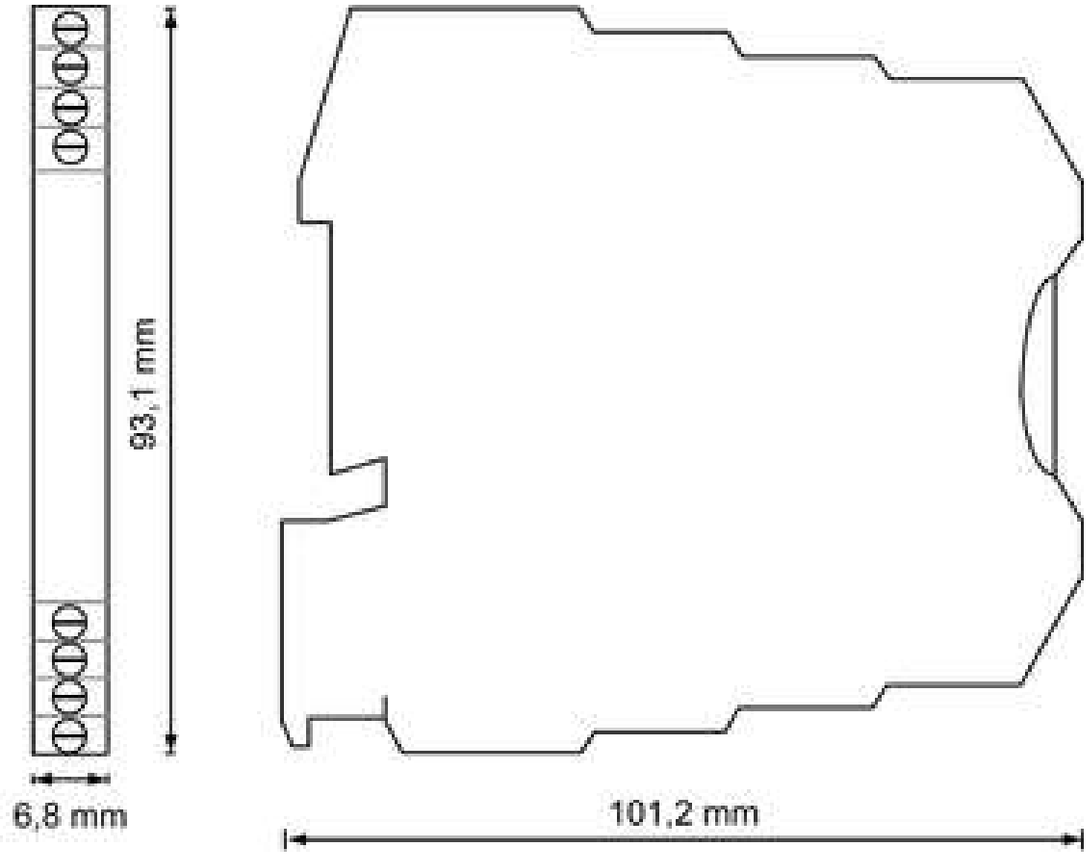
13: Safe Relay Contact

14: Safe Relay Contact

C1: Auxilliary Output

Fig. 7 Front view SD1E

5. Dimensions



6. Safety parameters

ATTENTION!

According to CNB / M / 11.050, a request for the safety function is recommended at the following intervals:

- Once a month for applications up to PL e with Cat. 3 respectively Cat. 4 or SIL CL3, SIL 3 with HFT = 1
- Once a year for applications up to PL d with Cat. 3 or SIL CL 2, SIL 2 with HFT = 1

The following table shows the safety parameters for the SD1E according EN ISO 13849-1 and IEC 61508 for High-Demand and Low-Demand.

Safety parameters according to EN ISO 13849-1

Conditions:
AC-15: 5 A; Max. 10.000 Switching-Cycles / Year
DC-13: 4 A; Max. 15.000 Switching-Cycles / Year

Max. duration of use [Years]	20
Category	4
PL	e
PFHd [1/h]	1.2E-08

Safety parameters according to IEC 61508 - High-Demand - Request Rate < 1 year

Conditions:
AC-15: 5 A; Max. 10.000 Switching-Cycles / Year
DC-13: 4 A; Max. 15.000 Switching-Cycles / Year

Max. duration of use [Years]	20
Proof-Test-Intervall [Years]	20
PFH [1/h]	1.2E-10
SIL	3

Safety parameters according to IEC 61508 - Low-Demand - Request Rate ≥ 1 year

Conditions:
AC-15: 5 A
DC-13: 4 A

Max. duration of use [Years]	20
Proof-Test-Intervall [Years]	9
PFD_{AVG}	9.87E-05
SIL	3

7. Technical data

Standards	
Meets the following standards	EN ISO 13849-1; IEC 62061; IEC 61508; EN 50156-1; EN 746-2IEC 61511-1; EN 60204-1
Electrical data	
Operating voltage	U_B: DC 24 V ± 10 %
Power consumption at U_B = 24 V	1.5 W
Filter time at A1 (Voltagedips at U_B)	3 ms
Safe dual-channel input I1 / I2	
Input current at high level	max. 16 mA
Galvanic isolation	no
Low level	0 V to 5 V
High level	21.6 V to 26.4 V
Pulse suppression - Signal to 0V Dark-Test (Pulse to 0 V) Light-Test (Pulse to U_B)	 Max. 5 ms Max. 1 ms Note: It must be ensured that any switch-on pulses (light test) sent by the signal generator (e.g. PLC) do not lead to a short activation of the safety relay and should therefore basically be deactivated.
Start input / feedback circuit S21	
Input current at high level	Max. 7 mA
Galvanic isolation	no
Low level	0 V to 5 V
High level	21.6 V to 26.4 V

Safe relay contact 13-14	
Structure	Redundant relay contact
Max. Contact rating (6 switching cycles/ min)	AC-15: 5 A, AC 230 V DC-13: 4 A, DC 24 V See chapter 21 “Derating”
Min. switching voltage / current	AC/DC 12 V / 3 mA
Min. switching power	60 mW
External fuses	6 A gG Factor 0.6 for applications acc. to EN 50156-1, chapter 10.5.5.3.4
Mech. Service life	approx. $1x10^7$ cycles
Contact material	$AgSnO_2$
Auxiliary output C1	
Structure	PNP output, single channel
Maximum switching capacity	100 mA
Galvanic isolation	no
Short-circuit-proof	yes
Output voltage at "1" (max. load) / "0"	U_B - 2 V / 0 V
Timings	
Time till module is ready for operation after power-on	< 50 ms
Max. switch-on delay	< 20 ms
Off-delay Requested via the safety circuit or Pwr-Off	< 20 ms
Recovery time after shutdown via request through the safety circuit or Pwr-Off	< 50 ms

Environmental data	
Ambient temperature	-15 °C to 55 °C - See chapter 21 “Derating”
Storage temperature	-15 °C to 80 °C
Humidity rating	93 % relative humidity at + 40 °C, non-condensing
Vibration / Shocks	10 Hz to 150 Hz, 2g / 15 g
EMC	in accordance with EN 61326-3-1
Maximum altitude	≤ 2000 m (Above sea level9
General data	
Clearance and creepage distances in accordance with EN 60664-1	According EN 60664-1
Overvoltage category	III (in accordance with DIN VDE 0110-1)
Pollution degree	2 (in accordance with DIN VDE 0110-1)
Rated insulation voltage	50 V (For SELV/PELV circuit) 250 V (Between relay circuit and SELV/PELV circuit)
Rated surge voltage strength	800 V - Basic insulation for SELV/PELV circuit 6 kV - Safe insulation, reinforced insulation between relay circuit and SELV/PELV circuit
Degree of protection	IP20
Minimum degree of protection of installation space	IP54
Mounting	DIN rail
Installation position	vertical, horizontal
Dimensions (W x H x D)	6.8 x 93.1 x 102.5 mm
Weight	50 g (module without packaging)
Housing material	PBT, blue
Cross section of conductor - Rigid / flexible - AWG min/max	 0.2 mm² to 2.5 mm² 16/14
Insulation stripping length	12 mm
Tightening moment	0.5 Nm to 0.6 Nm

8. Derating

Maximum current at safe relay contact 13-14 depending at on the ambient temperature.

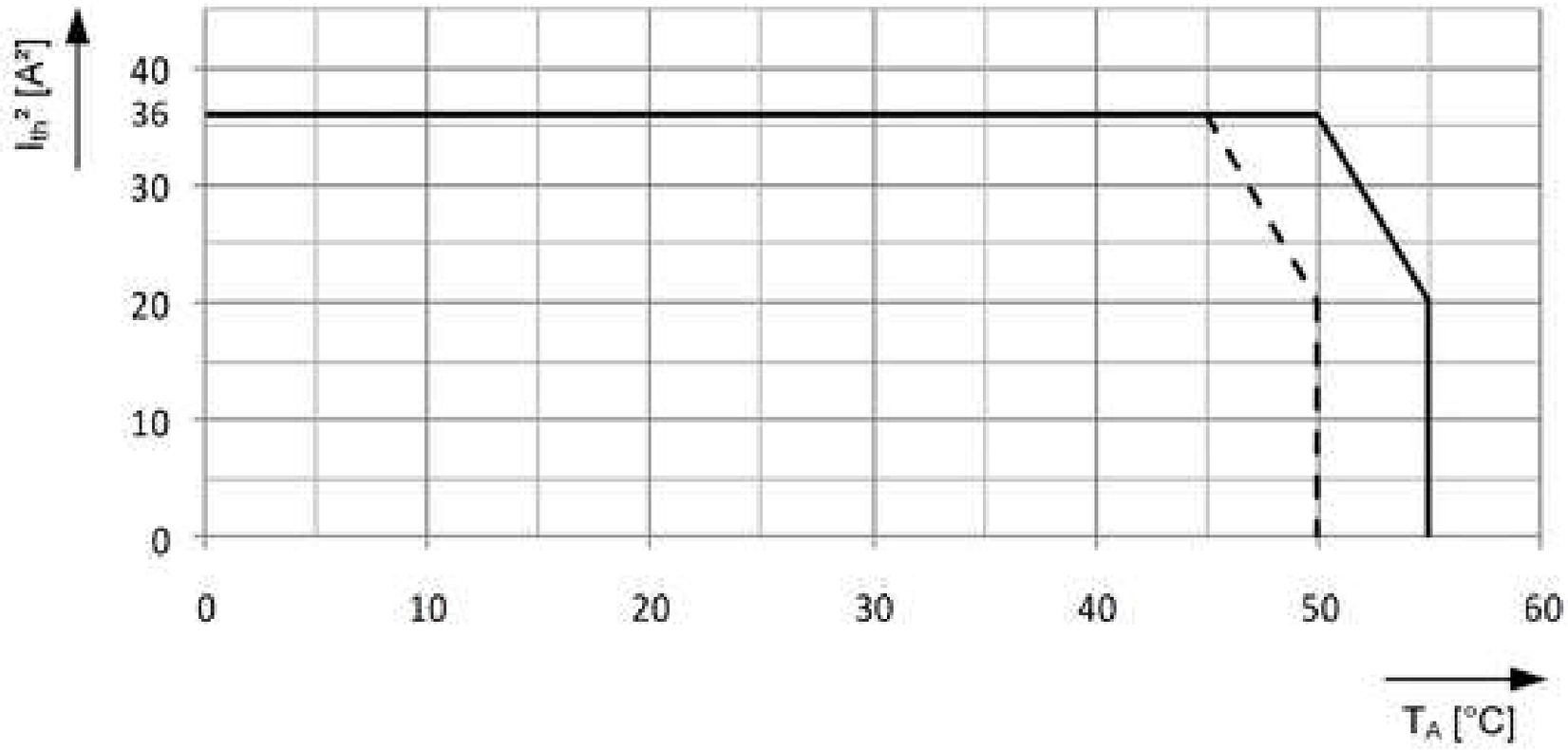


Fig. 8 Derating curve

——— U_B = DC 24 V and 0 mm clearance to adjacent devices with same load

– – – – U_B = DC 26,4 V and 0 mm clearance to adjacent devices with same load

9. Variants / Order No.

Order No.	Type	Application
472841	SD1E	Emergency Stop relay for the connection of safety sensors, e.g. light-curtains, safety (RFID) switches, emergency stop buttons, safety rope switches, interlock switches

10. Service

For service requirements, contact
H. Zander GmbH & Co. KG
Am Gut Wolf 15
52070 Aachen
Germany

Service line

+49 241 910 501-0

E-mail

info@zander-aachen.de

Internet

www.zander-aachen.de