

# Реле безопасной связи MINOS SD1K

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# MINOS SD1K

## Product Information



Safe Coupling Relay MINOS SD1K

## 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 safe relay contact
- 1 auxiliary output (PNP)
- Feedback circuit
- 6.8 mm width
- Extensive monitoring via front LED's

## 2. Function

### Feedback Circuit S21

If a feedback loop is necessary, e.g. for the monitoring of contactors, it has to be wired via terminal S21. See details in chapter 15 "Wiring / Applications - Feedback Circuit SD1K.

### Safe relay contact 13-14

By applying the control line at A1/A2, the safe relay contact will close immediately. Turning of the power supply leads to an open relay contact.

### Auxiliary output C1

The auxiliary output C1 switches inverted to the safe relay contacts.

Hint:

The auxiliary contact can be used for the failure monitoring of the SD1K. A non switching of the relay contacts with present control line will be detected.

### 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.

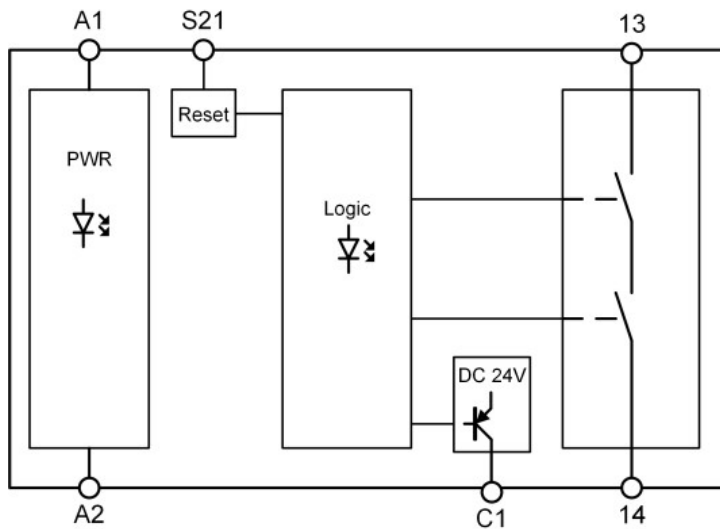


Fig. 1 Block diagram SD1K

### 3. Application example

#### Application example

SD1K as contact reinforcement and test pulse filtering for safe PLC output up to PL e/ SILCL 3

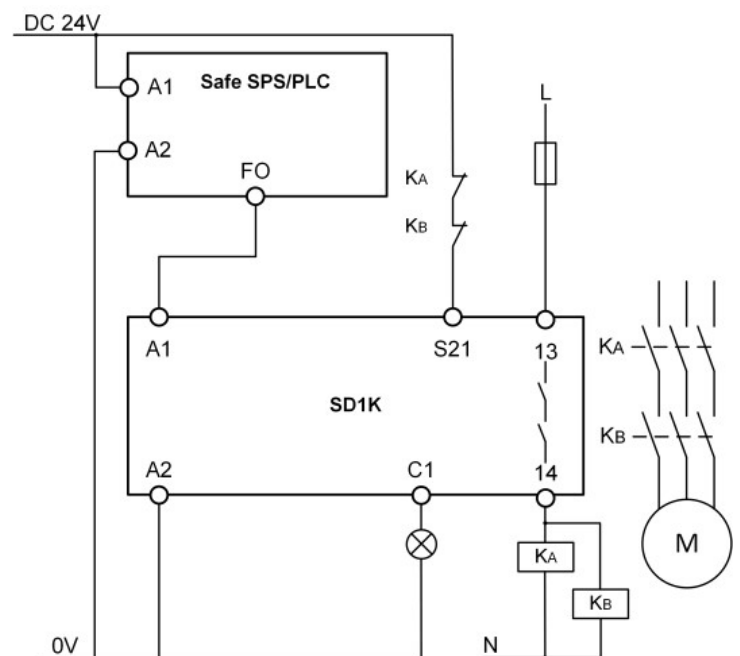


Fig. 2 Contact reinforcement and test pulse filtering for safe PLC outputs

**Prerequisite:** Safe PLC output meets the required safety level and short circuit between PLC output and SD1K can be excluded (e.g. wiring inside an electrical installation space - see EN ISO 13849-2:2013:02, Tab D4 / D5).

### Legend

KA/KB: Positively driven contactors;

Monitoring via feedback circuit

PL and SILCL: According to EN ISO 13849-1 and IEC 62061.

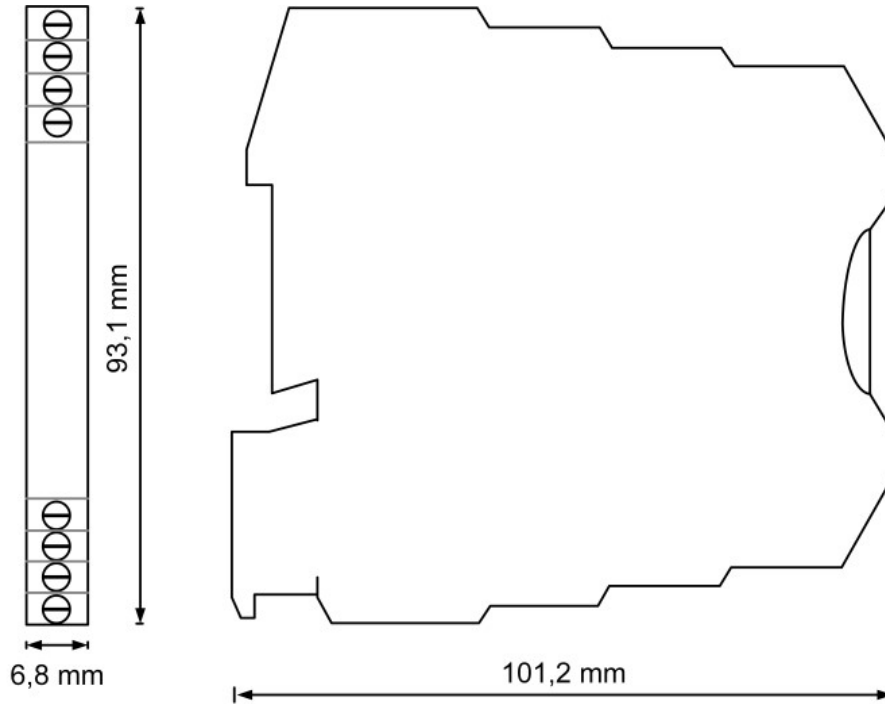
Specified safety level, considering a fault exclusion in the wiring between SD1K and the connected contactors KA and KB. See details in chapter 15 "Wiring / Applications - Safe relay contact":

#### 4. Terminal assignment and LED display

|                                                                                           |                                                  |                               |
|-------------------------------------------------------------------------------------------|--------------------------------------------------|-------------------------------|
|          | A1:                                              | Control Line + DC 24 V        |
|          | A2:                                              | Control Line 0 V              |
|          | S21:                                             | Control line feedback circuit |
|          | N.C.:                                            | Not Connected - No function   |
| SD1K<br> | SD1K:                                            | Variant label                 |
| A1 ↑<br>A2<br>S21<br>N.C.                                                                 | Label - Upper terminal block                     |                               |
| N.C.<br>13<br>14<br>C1 ↓                                                                  | Label - Lower terminal block                     |                               |
| UB     | Monitoring LEDs: UB, K1/2 (see monitoring table) |                               |
| K1/2   |                                                  |                               |
|        | N.C.:                                            | Not Connected - No function   |
|        | 13:                                              | Safe Relay Contact            |
|        | 14:                                              | Safe Relay Contact            |
|        | C1:                                              | Auxilliary Output             |

Fig. 4 Front View SD1K

## 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 or 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 different wirings of the safety circuit according to chapter 15 "Wiring / Applications".

### 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 <sub>AVG</sub>           | 9.87E-05 |
| SIL                          | 3        |

## 7. Technical data

### Standards

|                               |                                                                                      |
|-------------------------------|--------------------------------------------------------------------------------------|
| Meets the following standards | EN ISO 13849-1; IEC 62061; IEC 61508;<br>EN 50156-1; EN 746-2IEC 61511-1; EN 60204-1 |
|-------------------------------|--------------------------------------------------------------------------------------|

### Electrical data

|                                   |                                                                                                                                                                                                      |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating voltage                 | $U_B$ : DC 24 V $\pm$ 10 %                                                                                                                                                                           |
| Power consumption at $U_B$ = 24 V | 1.5 W                                                                                                                                                                                                |
| Filter time at A1, $U_B$ = 2kV    |                                                                                                                                                                                                      |
| Dark test pulse                   | Max. 2 ms pulse width at 200 ms pulse rate                                                                                                                                                           |
| Light test pulse                  | Max. 1 ms pulse width at 200 ms pulse rate                                                                                                                                                           |
|                                   | Note:<br>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. |

### 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 to 26.4 V |

### Safe relay contact 13-14

|                                                  |                                                                                            |
|--------------------------------------------------|--------------------------------------------------------------------------------------------|
| Structure                                        | Redundant relay contact                                                                    |
| Max. Contact rating<br>(6 switching cycles/ min) | AC-15: 5 A, AC 230 V<br>DC-13: 4 A, DC 24 V<br>See derating characteristics in chapter 21. |
| Min. switching voltage / current                 | AC/DC 12 V / 3 mA                                                                          |
| Min. switching power                             | 60 mW                                                                                      |
| External fuses                                   | 6 A gG<br>Factor 0.6 for applications acc. to EN 50156-1,<br>chapter 10.5.5.3.4            |
| Mech. Service life                               | approx. $1 \times 10^7$ cycles                                                             |
| Contact material                                 | AgSnO <sub>2</sub>                                                                         |

### 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 <sub>B</sub> - 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                                              | < 20 ms |
| Recovery time                                          | < 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 level)                        |

## General data

|                                                                   |                                                                                                                                                |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Clearance and creepage distances<br>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)<br>250 V (Between relay circuit and SELV/PELV circuit)                                                            |
| Rated surge voltage strength                                      | 800 V - Basic insulation for SELV/PELV circuit<br>6 kV - Safe insulation, reinforced insulation between<br>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                                                | 0.2 mm <sup>2</sup> to 2.5 mm <sup>2</sup>                                                                                                     |
| - AWG min/max                                                     | 16/14                                                                                                                                          |

## 8. Derating

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

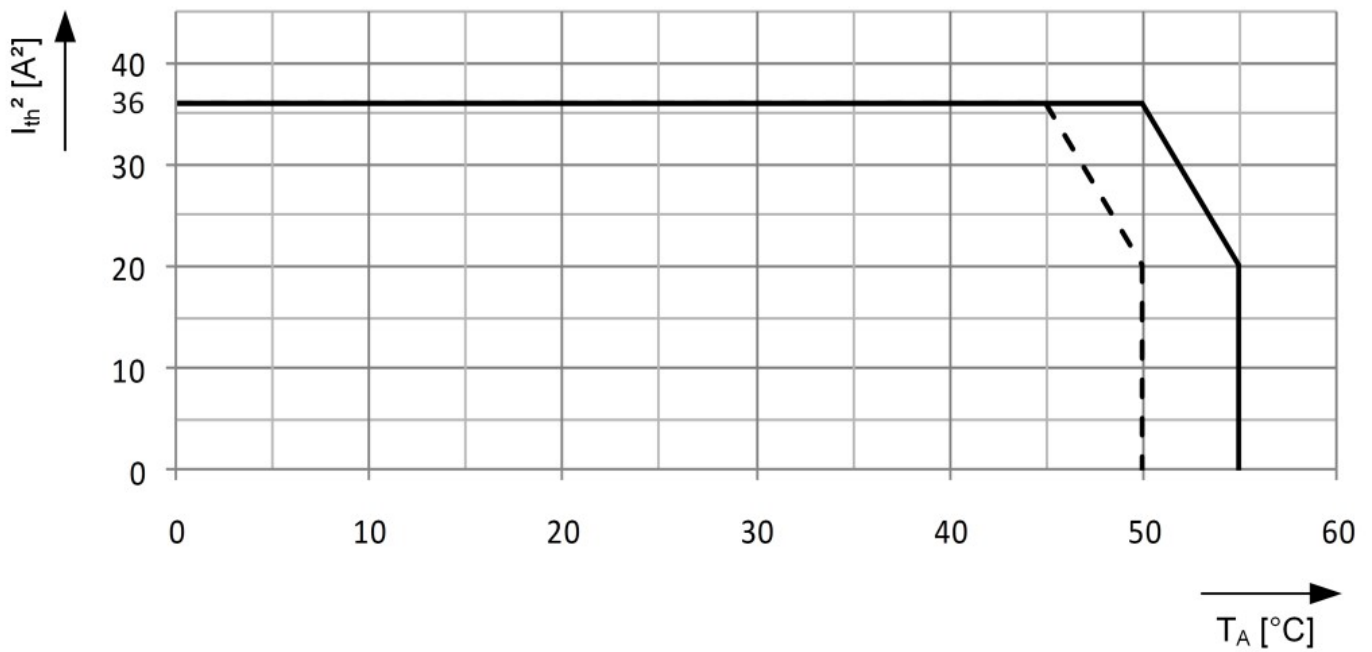


Fig. 5 Derating curve

- $U_B = DC 24 V$  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.

#### MINOS SD1K

| Order No. | Type | Application                                                                             |
|-----------|------|-----------------------------------------------------------------------------------------|
| 472851    | SD1K | Safe couple relays for galvanic separated contact reinforcement at machines and plants. |

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