### SNO 4003 K plus

Safety relay for emergency stop and guard door applications

- SILCL2 in accordance with EN 62061
- PL d, Category 3 in accordance with EN ISO 13849-1
- Stop category 0 in accordance with DIN EN 60204-1
- Manual or automatic start
- With cross circuit detection of the reset inputs
- Feedback circuit for external contactor monitoring
- 3 enable circuits, NO positively guided, 1 signal generator current circuit
- Input debouncing
- Error message by SUPPLY-LED

### Equipment and functional description

The unit is a single-channel safety switch unit that is self-monitoring in every ON-OFF cycle, for emergency stop devices as per EN 60204-1, which is fitted with a positively guided relay. Switching (input circuit A1) is carried out by the supply voltage. The unit has the two reset inputs Y2 (automatic reset) or Y3 (manually monitored reset). The two relays K1 and K2 are controlled after actuating the reset button (on Y1-Y3) or automatically (bridge Y1-Y2). The release current circuits are closed after this switch-on phase and the signal current circuit is opened. If the electrical connections between terminal A1 and the supply voltage are interrupted, the release current circuits are opened and the signal current circuit is closed.

The LED SUPPLY (green) shows the presence of the supply voltage. The LED K1, K2 (green) shows the status of the release current circuits. Setting up an emergency stop device according to stop category 0 is possible (EN 60204-1). The unit corresponds to category 3 for safety-relevant parts of control systems (EN ISO 13 849-1).

### Areas of application for the unit

The safety relay SNO 4003K plus can be used
- in accordance with EN 62061 to SILCL2
- in accordance with EN ISO 13 849-1 to PL d and Category 3

The actual performance level achieved and the safety category as per EN ISO 13 849-1 depends on external switching, execution of the wiring, selection of command generator and its setup on the machine.

Tactile safety sensors are connected to the safety relay (e.g. safety switch, emergency stop switch). The switching outputs of the safety relay can be used to safely switch off the associated actuators on the machine or installation.

### Intended use

The SNO 4003K plus is a safety switch unit. It must only be used as part of the protection devices on machines for the purpose of personal, material and machine protection.

It may only be used by competent persons and only on the machine it has been fitted and commissioned by a competent person in accordance with the operating instructions. In the event of any other use and in the event of modifications to the unit - even in the framework of fitting and installation - any claim under warranty against Schleicher Electronic GmbH & Co. KG becomes invalid.

- The user must carry out a risk assessment in accordance with DIN EN ISO 12100.
- On this basis you must carry out validation of the entire installation/machine in accordance with the applicable standards.
- The quoted performance level (PL) is only reached if an average number of switching cycles per year is not exceeded, depending on the loading of the unit (EN ISO 13849-1 Table C.1) and the specific application (EN ISO 13849-1, C.2.4 and Table K.1). Using an assumed B10d value for maximum load 400,000 we get, for example, a maximum cycle number of 400,000 / (0.1 x 30) = 133,333 switching cycles/year.

### Competent persons

The safety relay SNO 4003K plus may only be fitted, installed, commissioned and tested by competent persons. A competent person is someone who

- has had an appropriate technical education and
- has been instructed by the machine operator on operation and the applicable safety guidelines and
- has access to the operating instructions of the safety relay SNO 4003K plus, and has read and duly noted its content.
Display elements

<table>
<thead>
<tr>
<th>LED display</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1,K2 (green)</td>
<td>Current circuit K1/K2 switched</td>
</tr>
<tr>
<td>SUPPLY (green)</td>
<td>Supply voltage is present</td>
</tr>
<tr>
<td>SUPPLY 2x flashing</td>
<td>Cross-circuit Y2 to Y3 on Y1</td>
</tr>
<tr>
<td>SUPPLY 3x flashing</td>
<td>Reset error</td>
</tr>
<tr>
<td>SUPPLY 6x flashing</td>
<td>Over-voltage only on U, 24 V DC</td>
</tr>
<tr>
<td>SUPPLY flickers</td>
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<td>SUPPLY aus</td>
<td>No voltage, under-voltage</td>
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Additional description see behavior in the event of a fault

Terminal allocation

<table>
<thead>
<tr>
<th>Allocation</th>
<th>Description</th>
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<tbody>
<tr>
<td>A1</td>
<td>Supply voltage U+/L1</td>
</tr>
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<td>Supply voltage GND/N</td>
</tr>
<tr>
<td>Y1 – Y2</td>
<td>Manual reset</td>
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<td>Y1 – Y3</td>
<td>Release current circuit 1</td>
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<tr>
<td>13 – 14</td>
<td>Release current circuit 2</td>
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<tr>
<td>23 – 24</td>
<td>Release current circuit 3</td>
</tr>
<tr>
<td>33 – 34</td>
<td>Signal current circuit (not safe)</td>
</tr>
<tr>
<td>41 – 42</td>
<td></td>
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</table>

Input switching

**Single channel operation:**
The safety sensor is connected between U+/ and A1

**Two-channel operation:**
One safety sensor is connected between U+/ and A1, the second between GND and A2.

**Reset**
- Manual reset:
  Wire the reset button with NO contact between contacts Y1 and Y3 (monitored reset). The reset button must be installed outside the danger area in such a way that it cannot be actuated from the danger area. In addition, the user must have a complete overview of the danger area when actuating.

- **Automatic reset:**
  Connect a wire bridge between Y1–Y2.

**Contactor monitoring:**
Contactor monitoring only becomes active in reset. Connecting the NC contacts of the switched gate in series with the reset circuit effects static contactor monitoring.

Function test

**Function test with manual reset**
If the safety sensor is not actuated (e.g., emergency stop not pushed) and the supply voltage is present, the unit is ready (LED SUPPLY lights up). After actuating the reset button, the release current circuits close or the signal current circuit opens (LED K1, K2 lights up). Actuating the sensor opens the release current circuits and closes the signal current circuit (LED K1,K2 and LED SUPPLY off).

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Electrical installation

**Make the installation free from voltage!**

- **Only on 24 V DC units:**
The supply voltage must comply with the regulations for small voltages with safe isolation (SELV, PELV) in accordance with EN 60664 and EN 50178.
- **Design the insulation of the input lines for the highest voltage!**
The insulation of the input lines of the supply circuit (A1/A2) and the components connected to Y1 to Y3 must be designed for the highest voltage that may occur in the unit.
- **Operate signal and input current circuits in the same voltage range.**
- **With AC power supply and single channel switching, the maximum line length in the safety current circuit must be observed (see instructions concerning line length and technical data).**
- **All connected command generators and subsequent control systems, together with wiring and routing must comply with the stipulated category, (e.g. protected routing, individual sleeve line with screening etc.).**
- In order to protect the safety outputs and to increase service life, the external loads must be fitted with varistors and RC elements. When doing so, remember that this will increase the response times, depending on the type of protection switching.
- The safety outputs and the contactor monitor (EDM) must be wired within the switchgear cabinet.
- To duplicate the enable circuits you can use the extension units from the SNE range or external contactors with positively guided contacts.
- To prevent the contacts on the fitted relays from welding together, you must select an over-current protection device or a short-circuit protector (operating class g5) according to the appropriate utilization category and integrate this in the release current circuit.

Notes

- Operating the unit outside the specification can lead to functional errors or destruction of the unit.
- The units are equipped with an overload protection (in the event of a short-circuit). After elimination of the cause of the fault, the unit will be ready for operation after approx. 1.5 seconds.
- The control output Y1 is to be used exclusively for connecting command generators as per the instruction manual and not for connecting external consumers, such as lamps, relays or contactors.

Commissioning and regular testing

**No commissioning without testing by a competent person!**

Before commissioning the installation where you are fitting a safety relay SNO-4003K plus for the first time, this must be checked by a competent person and released, with documentation of this action.

**Check the danger area**
Before commissioning you must ensure that there is nobody in the danger area. Check the danger area and secure the area against access by persons. Observe the relevant laws and local regulations.

Regular testing of the protection equipment by competent persons

- Test the installation in accordance with the applicable national regulations at the intervals quoted therein. This is to show any changes to the machine or manipulation of the protection equipment since initial commissioning.
- Each safety application must be tested at the time intervals that you have stipulated. The effectiveness of the protection equipment must be checked by competent and appointed persons.
- If changes have been made to the machine or the protection equipment or if the safety relay has been replaced or repaired, you should test the installation again.

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Display elements

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Function diagram SNO 4003K plus manual start with start-up block

A1, SUPPLY LED
Y3
K1/K2, K1/K2 LED
13/14, 23/24, 33/34
41/42

- \( t_{\text{R1}} \) = response time
- \( t_{\text{R2}} \) = maximum switch-on time
- \( t_{\text{R3}} \) = readiness time
- \( t_{\text{R4}} \) = minimum switch-on time
- \( t_{\text{R5}} \) = fallback time
- \( t_{\text{R6}} \) = time required to be ready for operation again

Function diagram SNO 4003K plus automatic start

A1, SUPPLY LED
Y2
K1/K2, K1/K2 LED
13/14, 23/24, 33/34
41/42

- \( t_{\text{R1}} \) = response time
- \( t_{\text{R2}} \) = fallback time
- \( t_{\text{R3}} \) = time required to be ready for operation again

Notes concerning line length

Max. line length of the input circuit with alternating voltage

Caution!
The values for max. line capacity \( C_L \) must always be maintained, otherwise the unit can react in a faulty manner.

Line data
- Cross-section: 1.5 mm²
- Capacity: 150 nF/km
- Resistance: 28 Ω/km
- Temperature: \(+25\ °\text{C}\)

Ring line
- Alternating current line not routed in parallel, max. length \( l_r \): 1 km

Stub
- Max. length of stub \( l_s \) and max. line capacity \( C_L \) depending on supply voltage \( U_B \):

<table>
<thead>
<tr>
<th>( U_B )</th>
<th>( l_s )</th>
<th>( C_L )</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 V</td>
<td>250 m</td>
<td>37.5 nF</td>
</tr>
<tr>
<td>230 V</td>
<td>50 m</td>
<td>7.5 nF</td>
</tr>
</tbody>
</table>

Application examples

Emergency stop application, single channel, manual start with reset button monitoring
The single channel emergency stop application already fulfills the stop category 0 in accordance with EN 60204-1 and the category 2 in accordance with EN ISO 13849. The emergency stop sensor circuit is not redundant. Short-circuits to ground are detected in the emergency stop sensor circuit.

Supply voltage DC 24 V

Guard door application, twin channel, automatic start
The twin channel emergency stop application already fulfills the requirements of stop category 0 in accordance with EN 60204-1 and the category 3 in accordance with EN ISO 13849. The guard door circuit is not redundant. Short-circuits to ground are detected in the guard door circuit.

Supply voltage AC 230 V
Assembly

1. Hook the relay onto the top-hat rail.
2. Snap the relay onto the top-hat rail using slight pressure in the direction of the arrow.

Disassembly

3. Push the relay down in the direction of the arrow.
4. When the relay is pushed down, release it from the retainer in the direction of the arrow and remove it from the top-hat rail.

Dimensions SNO 4003K plus

<table>
<thead>
<tr>
<th>Dimensions SNO 4003K-A/-C plus</th>
</tr>
</thead>
</table>

Behavior in the event of a fault

No operation in the event of unclear malfunction!

The machine must be taken out of service if you cannot find a cause for a fault and safely rectify it.

- Observe the LED SUPPLY, the flashing code indicates possible causes of faults.
- Reset fault (LED flashes 3x): faulty initiation of the reset input (too long, at start already). If the fault has been rectified, the SUPPLY LED lights up permanently. After valid reset, release of circuits follows.
- Cross short (LED flashes 2x): cross short detection Y2 to Y3 takes place with reset request on Y1. Switch off power to the unit, rectify cross short. With correct wiring, circuits are released in accordance with the reset condition.
- Only 24 V DC unit:
  - over-voltage (LED flashes 6x): switch off power to the unit, check the supply voltage. With permissible operating voltage, circuits are released in accordance with the reset condition.
  - Under-voltage (LED off): check the supply voltage. With permissible operating voltage, circuits are released in accordance with the reset condition.
  - Internal fault (LED flickers): the unit is defective and must be replaced.

Complete function test after fault rectification!

Carry out a complete function test after rectification of a fault.

Also, please observe the information provided by your professional association

DC switch-off capacity

Overview of devices / Part numbers

<table>
<thead>
<tr>
<th>Type</th>
<th>Rated voltage</th>
<th>Terminals</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNO 4003K</td>
<td>DC 24 V</td>
<td>screw terminals, fixed</td>
<td>R1.188.0409.1</td>
</tr>
<tr>
<td></td>
<td>AC 115-120 V</td>
<td>screw terminals, fixed</td>
<td>R1.188.0899.1</td>
</tr>
<tr>
<td></td>
<td>50-60 Hz</td>
<td>screw terminals, fixed</td>
<td>R1.188.0899.1</td>
</tr>
<tr>
<td>SNO 4003K-A</td>
<td>DC 24 V</td>
<td>screw terminals, pluggable</td>
<td>R1.188.0509.1</td>
</tr>
<tr>
<td></td>
<td>AC 115-120 V</td>
<td>screw terminals, pluggable</td>
<td>R1.188.0909.1</td>
</tr>
<tr>
<td></td>
<td>50-60 Hz</td>
<td>screw terminals, pluggable</td>
<td>R1.188.0919.1</td>
</tr>
<tr>
<td>SNO 4003K-C</td>
<td>DC 24 V</td>
<td>spring terminals, pluggable</td>
<td>R1.188.1999.0</td>
</tr>
</tbody>
</table>
STOP CATEGORY

TM (PFHd)

I = 1 A

DC 1 W

AC 2.1 W / 3 VA

Nominal voltage U_n

Nominal frequency

Operating voltage range

Fusing for control circuit supply

Control circuit

Output (Y1)

Rated output voltage (Y1 on Y2, Y3)

Idle running voltage (only AC units)

Short-circuit resistant / current limiting

Inputs (Y2, Y3)

Input voltage range (only on DC units)

Rated current / peak current (reset inputs Y2, Y3)

Times at UN

Response time t_{sa} (reset input Y2)

Response time t_{sb} (reset input Y3)

Switch-on duration t_{on}, t_{on} (reset input Y3)

Readiness time Y3 t_{b}

Reavailability time t_{w}

Reavailability time t_{w} in the event of a fault

Fallback time t_{b} (K1, K2)

Output circuit (13/14, 23/24, 33/34 NO and 41/42 NC)

Relay contacts

Release current circuits (NO), safety-relevant

Signal generator circuits (NC) not safety-relevant

Nominal switching voltage U_n

Max. steady current I_n per current path

Max. total current of all circuits

Use category as per DIN EN 60947-5-1

Contact fusing, gG or

Line protection switch characteristic B or C

General Data

Contact protection

Rated surge voltage

Over-voltage category

Rated voltage

Test voltage U_{test} (50 Hz)

Protection rating housing/terminals as per DIN EN 60529

Ambient/storage temperature

Weight

Terminal and connection data

Single wire/fine wire

Stripped length

Fine wire with core ferule as per DIN 46228

Maximum tightening torque

Connection cross-sections for UL and CSA applications

Max. tightening torque for UL and CSA applications

General system data

Safety integration level

Safe Failure Fraction (SFF)

Hardware fault tolerance (HFT)

Category

Performance Level

DCAVG

MTTFd

B_{U50} - value (relay)

AC-15, 230 V, I = 5 A

DC-13, 24 V, I = 2 A

I = 1 A

300 x 10^7 switching cycles

2 x 10^8 switching cycles

7 x 10^8 switching cycles

≥ 2 x 10^7

20 years (EN ISO 13849)

0 (EN 60204-1)