Safety switching device
Emergency stop and safety gate monitor SNO 4003K

safety

Base device for single-channel emergency stop and safety gate monitoring

- Stop category 0 according to EN 60204-1
- Applications up to safety category 2 according to EN 954-1
- Safety category of the device: 4 according to EN 954-1
- Manual or automatic start
- 3 enabling current paths, 1 signaling current path
- Feedback loop for monitoring external contactors

Applications

- Protection of people and machinery
- For immediate interruption of the power supply – stop category 0
- Monitoring of emergency stop applications
- Monitoring of safety gates
- Protective measures in sections of the safety system

Function

The device is a single-channel switching device for emergency stop applications with self-monitoring on each ON-OFF cycle. It complies with EN 60204-1 and is equipped with positively driven relays.
The device has two reset inputs Y2 (without reset monitoring) or Y3 (with reset monitoring). The relays K1 and K2 are actuated either after the reset button (on Y1-Y3) has been pressed or automatically (bridge Y1-Y2). They become self-locking through their own contacts, if there is an electrical connection between terminal A1 and the supply voltage (emergency stop button, position switches). After this switch-on phase the enabling current paths are closed and the signaling current path is open. If the electrical connections between terminal A1 and the supply voltage are interrupted, the enabling current paths open and the signaling current path closes.
The energized state (self-locking) of the two channels is indicated by a green LED K1, K2. The second green LED indicates that supply voltage has been applied. The set-up of an emergency stop facility after stop category 0 (EN 60204-1) is possible. The device corresponds to category 4 for safety-related parts of controls (EN 954-1).

Notes

Proper use

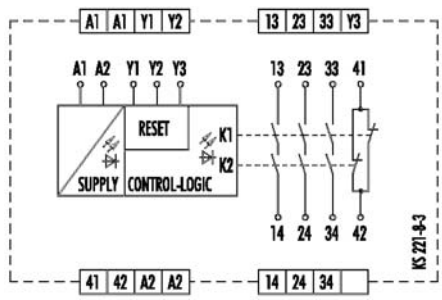
The device is available for monitoring transducers (such as emergency stop buttons or position switches) that are components of protective equipment on machines and are used for the purpose of protecting people, material and machines.

- The safety category according to EN 954-1 depends on the external circuitry, the choice of control devices and their placement on the machine.
- Expansion devices or external contactors with positively driven contacts can be used to multiply the enabling current paths.
- The device and the contacts must be protected at max. 8 A.
- The emergency stop circuit must be closed before the reset button is activated.
- For connecting magnetic switches with reed contacts or sensors with semiconductor outputs the peak input current must be considered (see “Technical data”).
- The devices must be installed in a control cabinet with a protection degree of at least IP 54.
- With AC supply and single-channel circuitry the maximum cable length for the safety circuit of the transducers must be considered (see the notes on cable lengths and “Technical data”).

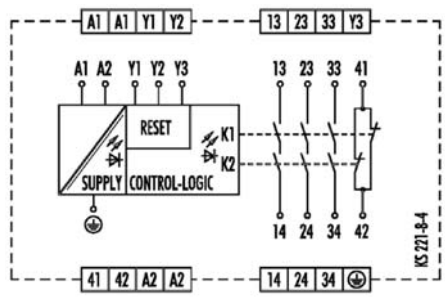
Please also note the information provided by your trade association.

Circuit diagram

SNO 4003K / K-A — **AC / DC 24 V**



SNO 4003K / K-A — **AC 115-120 V / AC 230 V**



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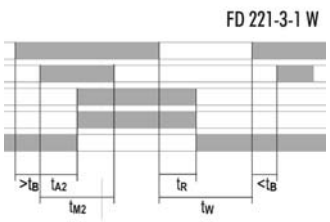
Function diagram

SNO 4003K

Manual start (restart inhibit) with reset button monitoring (installation 2)



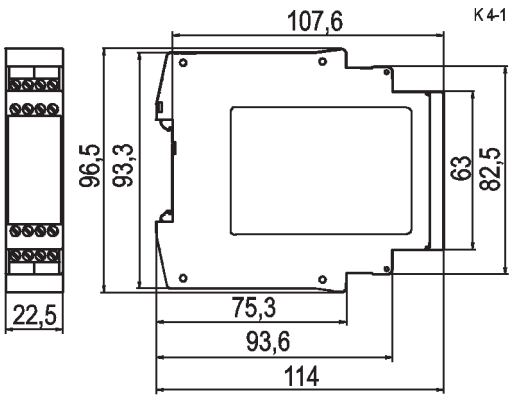
A1, LED SUPPLY
Y3
K1/K2, LED K1/K2
13/14, 23/24, 33/34
41/42
t_B = stand-by time
t_{A2} = response time
t_{M2} = minimum ON time
t_R = release time
t_W = recovery time

Automatic start (installation 1)

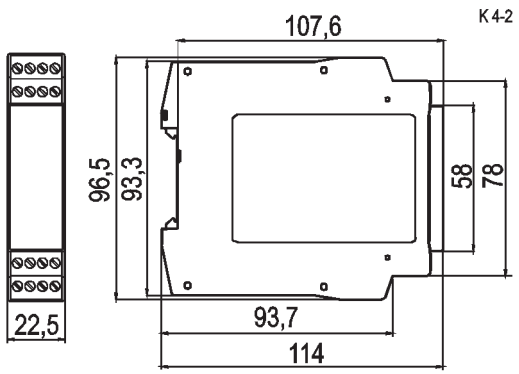
A1, LED SUPPLY
Y3
K1/K2, LED K1/K2
13/14, 23/24, 33/34
41/42
t_{A1} = response time
t_{M1} = minimum ON time
t_R = release time
t_W = recovery time

Dimension diagram

SNO 4003K



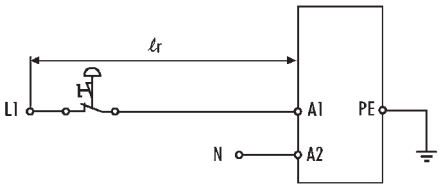
SNO 4003K-A



Notes on the cable length

Max. cable length of the input circuit with AC voltage

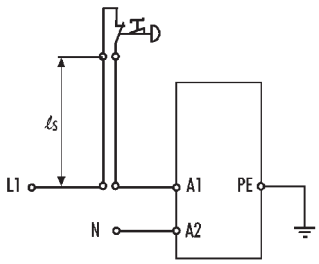
Cable data	
Cross section	1.5 mm²
Capacity	150 nF/km
Resistance	28 Ω/km
Temperature	+25 °C
Circular line	Alternating current (AC) cable not laid out in parallel, max. length l_r: 1 km



Tap line

max. length of tap line l_s and max. line capacity C_L depending on supply voltage U_B:

U_B	115 V	230 V
C_L	37.5 nF	7.5 nF
l_s	250 m	50 m



Notice:
The max. line capacity C_L must not be exceeded, otherwise the device may respond incorrectly.

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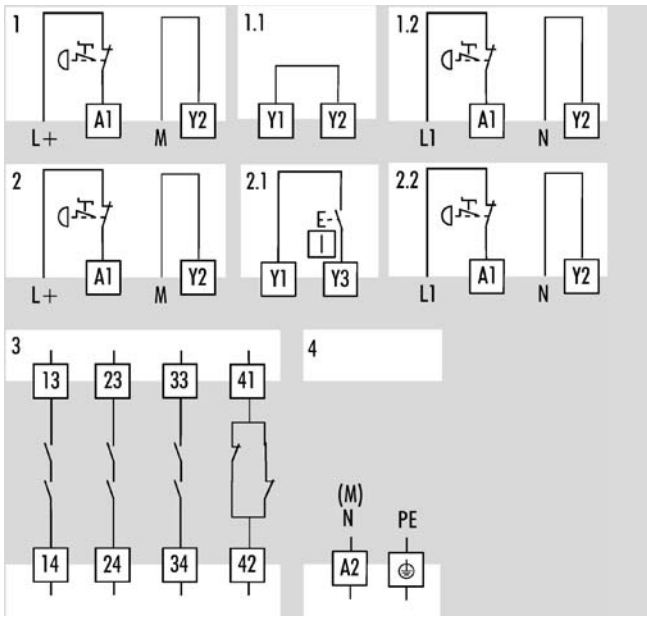
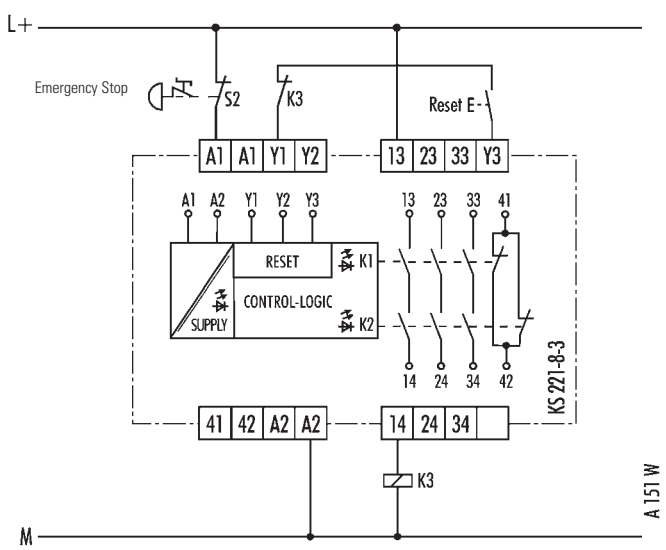
safety

Installation



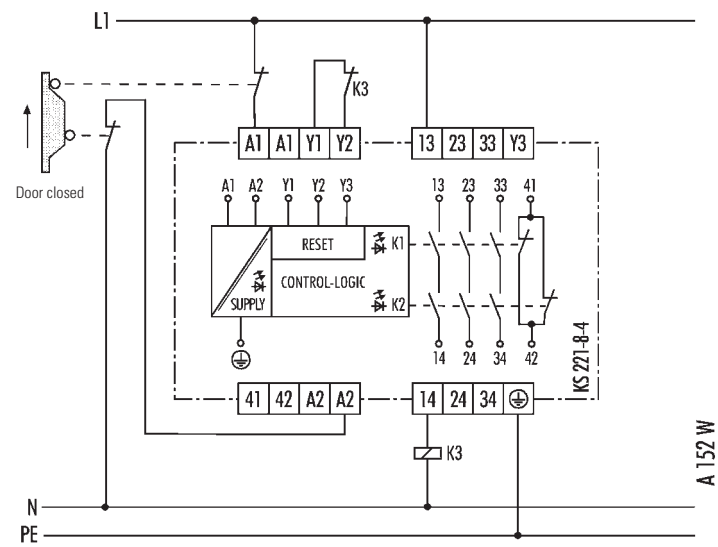
	Please consult the circuit diagram during installation.
1	**Emergency stop** single-channel
1.1	automatic reset
1.2	with AC supply and parallel wiring
2	**Emergency stop** single-channel
2.1	manual reset
2.2	with AC supply and parallel wiring
3	**3 enabling current paths (NO contact)** **1 signaling current path (NC contact)**
4	**Rated voltage of the device** Ground for AC devices only



Application example

Emergency stop application, single channel, manual start with reset button monitoring

The single-channel emergency stop application complies with the requirements of stop category 0 according to EN 60204-1 and safety category 2 according to EN 954-1. The circuit of the emergency stop button is not redundant. Ground faults in the emergency stop button circuit are detected. Supply voltage DC 24 V.



Application example

Safety gate application, single channel, automatic start

The single-channel safety gate application complies with the requirements of stop category 0 according To EN 60204-1 and control category 2 according to EN 954-1. The circuit of the safety gate is redundant. Ground faults in the safety gate circuit are detected. Supply voltage AC 230 V.

Overview of devices / Part numbers

Type	Rated voltage		Terminals	Part no.	Std. Pack
SNO 4003K	AC/DC 24 V	50 – 60 Hz	Terminal block, rising cage termination	R1.188.0400.1	1
	AC 115 – 120 V	50 – 60 Hz	Terminal block, rising cage termination	R1.188.0880.1	1
	AC 230 V	50 – 60 Hz	Terminal block, rising cage termination	R1.188.0890.1	1
SNO 4003K-A	AC/DC 24 V	50 – 60 Hz	Pluggable connector, rising cage termination	R1.188.0500.1	1
	AC 115 – 120 V	50 – 60 Hz	Pluggable connector, rising cage termination	R1.188.0900.1	1
	AC 230 V	50 – 60 Hz	Pluggable connector, rising cage termination	R1.188.0910.1	1

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Safety

Technical data	SNO 4003K		
Function according to EN 60204-1	Emergency stop relay		
Function display	2 LEDs green		
Function diagram	FD 221-3-1 W, FD 221-3-2 W		
Power supply circuit			
Devices with rated voltage AC/DC 24 V	min.	typ.	max.
Operating voltage range	AC/DC 20.4 V	AC/DC 24 V	AC/DC 26.4 V
Residual ripple			2.4 V_{SS}
Rated consumption DC	–	1.3 W	1.6 W
Rated consumption AC	–	1.8 W/3.2 VA	2.2 W/3.9 VA
Rated frequency AC	50 Hz	–	60 Hz
Input inrush current (A1)	–	–	1.7 A
Rated short-circuit current	–	1400 mA	–
Response time / recovery time		2 s/3 s	
Fuse for control circuit supply	PTC thermistor		
Electrical isolation supply circuit – control circuit	no		
Devices with rated voltage AC 115-120 V / AC 230 V			
Operating voltage range U_N = AC 115-120 V	AC 93.5 V	AC 115-120 V	AC 132 V
Operating voltage range U_N = AC 230 V	AC 195 V	AC 230 V	AC 253 V
Rated consumption	–	2.0 W/2.3 VA	2.4 W/2.8 VA
Rated frequency AC	50 Hz	–	60 Hz
Wire length to the safe transducer	(wires installed in parallel; see the notes on the wire lengths)		
Fuse for control circuit supply	Short-circuit proof transformer		
Electrical isolation supply circuit – control circuit	yes		
Control circuit			
Conductor resistance in Y1-Y2 or Y1-Y3 (at U_N dep. on supply voltage)	–	–	70 Ω
Rated output voltage to the supply of input Y2	–	DC 24 V	–
Open circuit voltage	–	–	DC 40 V
Rated current / peak current (inputs Y2, Y3)	–	–	90 mA/1500 mA
Release time t_R (K1, K2)	–	60 ms	80 ms
Response time t_{A1} (devices with rated current AC 115-120 V/AC 230 V)	–	180 ms	300 ms
Response time t_{A1} (devices with rated voltage AC/DC 24 V)	–	40 ms	60 ms
Response time t_{A2}	–	40 ms	60 ms
Minimum ON time t_{M1} (Y2)	t_{A1}	–	–
Minimum ON time t_{M2} (Y3)	t_{A2}	–	–
Recovery time t_W	–	–	200 ms
Stand-by time t_B	–	–	300 ms
Output circuit			
Contact assignment	3 enabling current paths with positively driven contacts (NO), 1 signaling current path (NC)		
Rated switching voltage U_n	AC/DC 230 V		
Max. continuous current I_n per current path, NO / NC	8 A/5 A		
Max. total current of all current paths for devices with rated voltage AC/DC 24 V	12 A		
Max. total current of all current paths for devices with rated voltage AC 115-120 V/AC 230 V	8 A		
Application category according to EN 60947-5-1 360 h^{-1}	AC-15: U_e 230 V, I_e 4 A / DC-13: U_e 24 V, I_e 4 A		
Application category according to EN 60947-5-1 3600 h^{-1}	AC-15: U_e 230 V, I_e 3 A / DC-13: U_e 24 V, I_e 2.5 A		
Short-circuit protection max. fuse	6 A class gG or circuit breaker with trigger characteristic B or C		
Short-circuit protection, fuse	max. 8 A		
Mechanical life	10 x 10^6 switching operations		
General data			
Creepage distances and clearances between the circuits	according to EN 60664-1 depending on device version; see "Electrical isolation, supply circuit"		
Overvoltage category	III		
Rated impulse voltage	4 kV		
Rated voltage	AC 300 V		
Test AC voltage	2 kV		
Degree of pollution of the device: inside / outside	2/3		
Protection degree according to DIN EN 60529 (housing / terminals)	IP 40/IP 20		
Ambient temperature / storage temperature	-25 – +55 °C/-25 – +75 °C		
Dimension diagram	K 4-1 (screw terminals / K 4-2 (pluggable terminals)		
Wire ranges fine-stranded / solid	2 x 0.14 – 0.75 mm^2/1 x 0.14 – 2.5 mm^2		
or fine-stranded with ferrules	1 x 0.25 – 2.5 mm^2/2 x 0.25 – 0.5 mm^2		
Permissible torque	0.5 – 0.6 Nm		
Weight for devices with rated voltage AC/DC 24 V	0.20 kg		
Weight for devices with rated voltage AC 115-120 V/AC 230 V	0.25 kg		
Approvals			