Safety switching device
Emergency stop and safety gate monitors SNO 4063K/SNO 4063KM/SNO 4063KR

Base devices for single-channel or two-channel emergency stop, safety gate, safety mat/strip and light curtain monitoring

- Stop category 0 according to EN 60204-1
- Applications up to safety category 4 according to EN 954-1
- Safety category of the devices: 4 according to EN 954-1
- Manual or automatic start
- Cross monitoring
- Single-channel and two-channel control
- 3 enabling current paths (NO contact, positively driven); feedback loop for monitoring external contactors
- Supply voltage reset with SNO 4063KR (without start inhibit)

Applications

- Emergency stop, safety gate, safety mat and light curtain applications
- For processing signals from the output signal switching devices (OSSD) of a light curtain according to DIN EN 61496-1
- For connecting to a safety mat according to DIN EN 1760-1

Function

SNO 4063K

The device is a two-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.

Basic function

After supply voltage has been applied to terminals A1/A2 and the safety inputs closed, operating of the reset button closes the enabling current paths (manual start). When the safety inputs are opened/de-energized the enabling current paths will open.

Operating modes / system functions

- **Single or two-channel control** With single-channel control both safety channels CH1 and CH2 are connected in parallel; with two-channel control they are switched separately.
- **Without cross monitoring** Both safety channels are switched to the positive potential (S12 and S31 to S11).
- **With cross monitoring** Safety channel CH1 is switched to the positive potential (S11 to S12), and safety channel CH2 to the negative potential (S21 to S22).
- **Manual start** When the safety inputs are closed, a button is used to open reset input S34 (triggering with falling edge) or to close reset input S35 (triggering with rising edge).
- **Automatic start** Reset input S35 is connected to S33. The device starts with the rising edge of the signal on safety input S12.
- **Start inhibit** After supply voltage has been applied and the safety inputs closed, the enabling paths will not close. Starting is only possible after the reset button has been operated. For start inhibit the reset inputs have to be controlled with the button, as with manual start mode.
- **Restart inhibit** No restart after the safety inputs have been opened and closed. Restarting is only possible after the reset button has been operated. For restart inhibit the reset inputs have to be activated with the button, as in manual start mode.
- **Semiconductor compatible** OSSD (output signal switching devices) signals from a light curtain or other safety sensors with semiconductor outputs can be processed. Test pulses $< t_{TP}$ do not influence the device functions. Test pulses $> t_{TP}$ can lock the device.
- **Synchrocheck** With two-channel control both safety channels are monitored against one another with the synchronous time t_S. Safety channel CH1 must close before CH2 and bridge S33/S35 must be connected. If CH2 closes before CH1, the synchronous time is $t_S = \infty$.

SNO 4063KM

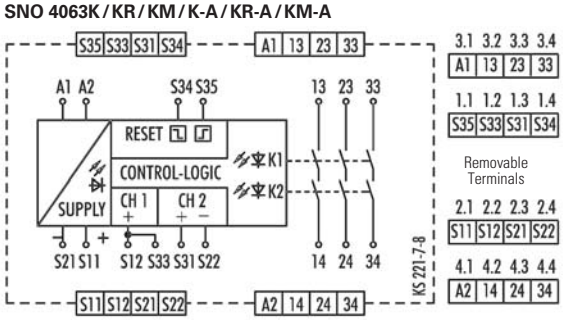
The function of this device corresponds to that of the SNO 4063K **without synchrocheck.** The device is suitable for connecting to light curtains for Si category 4 and to short-circuit forming 4-wire safety mats, switching strips or switching edges (without monitoring resistance).

- **Safety mats** The device must be operated with two channels and cross monitoring. If there is resistance < 50 Ω / channel and a short circuit between the channels (S11/S12 and S21/S22) the enabling paths open and the SUPPLY LED flashes.
- **Light curtain for Si category 4** The device will be operated with two channels and without cross monitoring, if the light curtain connected to the OSSD detects a shunt fault on its own.
- **Input debouncing** Input debouncing prevents fast consecutive switching of the enabling current paths when the safety inputs are opened for less than t_{ASP}. Safety inputs opened for longer than t_{ASP} lead to opening of the enabling current paths after t_R. Restarting is blocked for time t_{SP}.

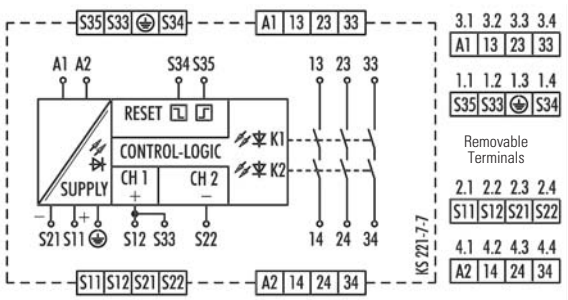
For applications with tactile operating modes (rapid ON-OFF cycles, for example at manual supply) we recommend the use of SNO 4063KM.

Circuit diagram

SNO 4063K / KR / KM / K-A / KR-A / KM-A **AC / DC 24 V**



SNO 4063K / KR / K-A / KR-A **AC 115 – 120 V / AC 230 V**



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Function (continued)

SNO 4063KR

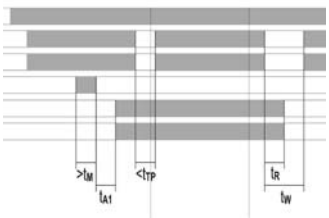
The function of this device corresponds to that of the SNO 4063K without start inhibit. After supply voltage has been applied and the safety inputs are closed, the enabling current paths will close, regardless whether started automatically or manually. The device can be used for automatic start after power on (for example, compressor systems or water treatment with wide-area emergency stop circuits).

Function diagram

SNO 4063K

Manual start with start inhibit (installations 1 and 3)

FD 221-5-1 W



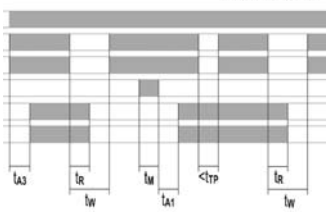
A1/A2
S12
S31/S22
S34
K1, K2
13/14, 23/24, 33/34

t_M = minimum ON time, t_{A1} = response time
t_{TP} = test pulse time, t_R = release time
t_W = recovery time

SNO 4063KR

Manual start without start inhibit (installations 1 and 3)

FD 221-5-2 W



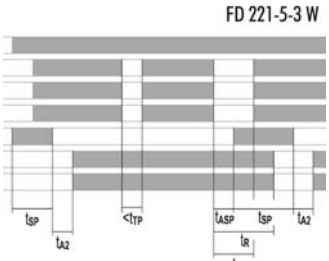
A1/A2
S12
S31/S22
S34
K1, K2
13/14, 23/24, 33/34

t_M = minimum ON time, t_{A1} = response time
t_{TP} = test pulse time, t_R = release time
t_W = recovery time

SNO 4063KM

Automatic start without start inhibit (installations 4 and 5)

FD 221-5-3 W



A1/A2
S12
S31/S22
S35
Disable (internal)
K1, K2
13/14, 23/24, 33/34

t_{SP} = disable time, t_{A2} = response time
t_{TP} = Test pulse time, t_{ASP} = response time of the disable
t_R = release time, t_W = recovery time

Notes

Proper use

The devices are safety switching devices. They must only be used as components of safety equipment on machines for the purpose of protecting persons, material and machines.

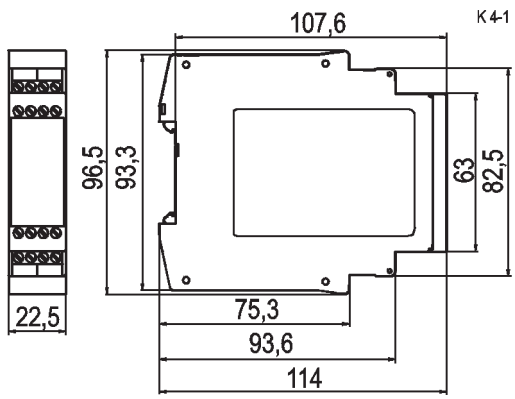
- The safety category according to EN 954-1 depends on the external circuitry, the choice of control devices and their placement on the machine.
- The indicated times must be observed when the device is operated, otherwise the device could lock. Locking can be released by properly opening the safety inputs.
- SNE 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 with max. 6 A utilization category gG or through circuit breakers with trigger characteristic B or C.
- The devices are equipped with overload protection (for short circuit). After the cause of the malfunction has been removed, the device is operational again after approx. 3 s.
- Control output S11 is exclusively for connecting control devices as defined in the operating instructions and not for connecting external devices such as lamps, relays or contactors.
- The devices must be installed in a control cabinet with a protection degree of at least IP 54.

Please also note the information provided by your trade association.

Dimension diagram

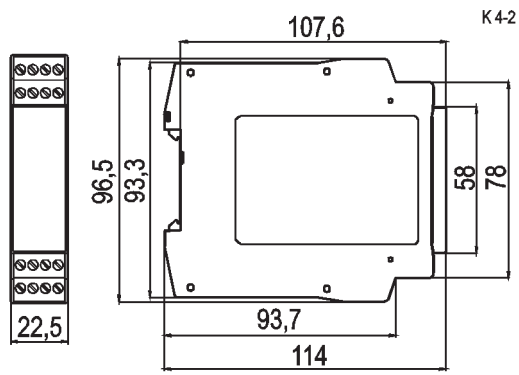
SNO 4063K / SNO 4063KR / SNO 4063KM

K 4-1



SNO 4063K-A / SNO 4063KR-A / SNO 4063KM-A

K 4-2



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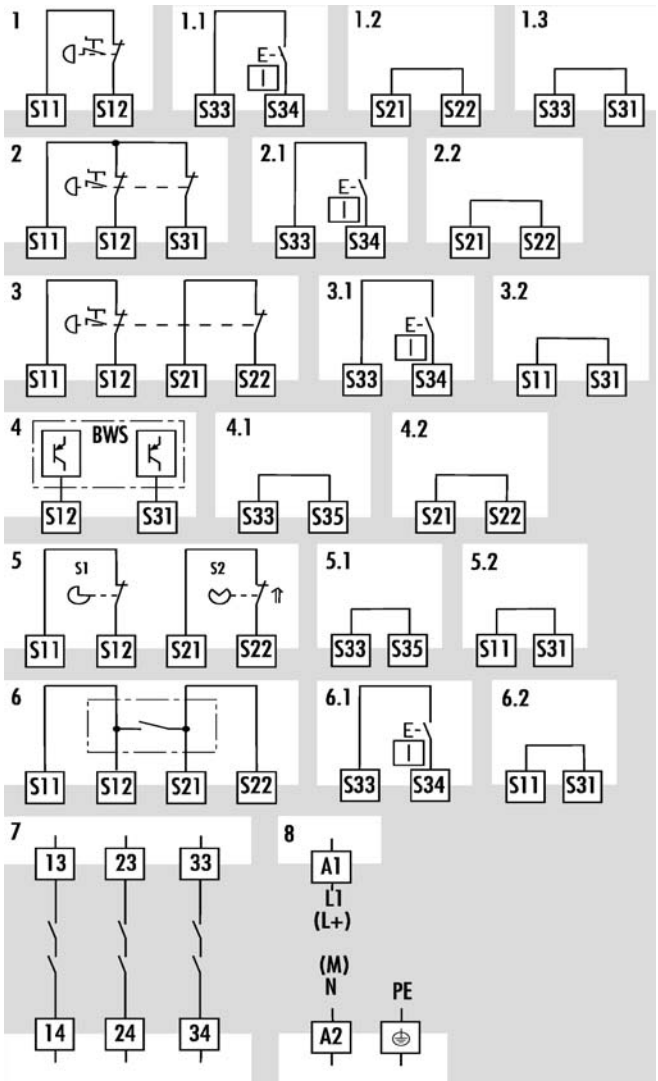
Installation



	Please consult the circuit diagram during installation.
1	**Emergency stop button** single-channel, manual start (for DC devices)
1.1	Reset button
1.2	Bridge
1.3	Bridge
2	**Emergency stop button** two-channel, manual start, without cross monitoring (for DC devices)
2.1	Reset button
2.2	Bridge
3	**Emergency stop button** two-channel, manual start, with cross monitoring
3.1	Reset button
3.2	Bridge (for DC devices)
4	**OSSD control** two-channel, automatic start, without cross monitoring (for DC devices)
4.1	Bridge
4.2	Bridge
5	**Safety gate** two-channel, automatic start, with cross monitoring
5.1	Bridge
5.2	Bridge (for DC devices)
6	**Safety mat (SNO 4063KM)** two-channel, manual start, with cross monitoring Safety mat shown as not actuated
6.1	Reset button
6.2	Bridge
7	**Enabling current paths** 3 NO contacts, positively driven
8	**Supply voltage** Ground for AC devices only

Safety switching device
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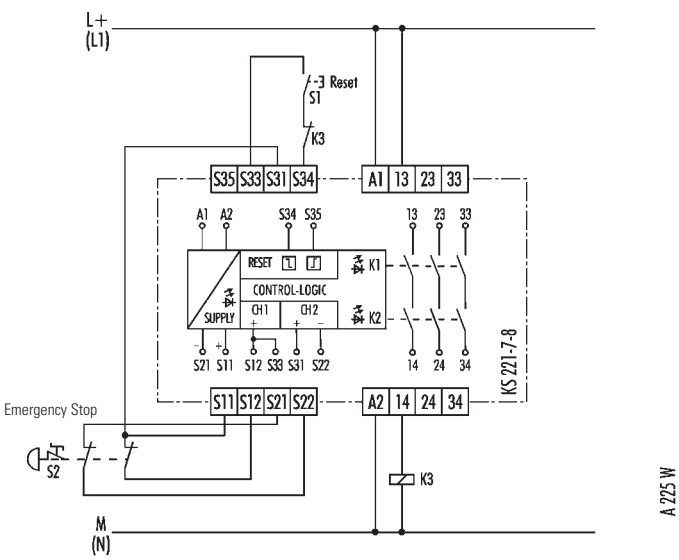

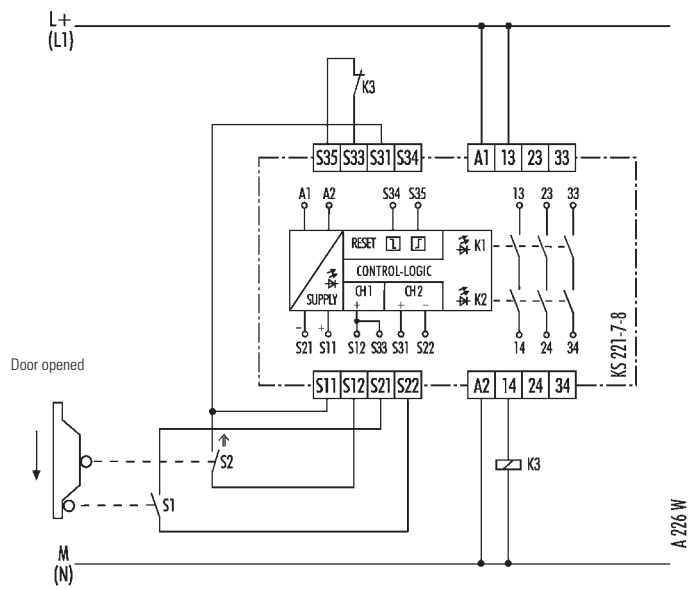

Application example

Two-channel emergency stop application with cross monitoring and manual start

The two-channel emergency stop application switches off the device even if one of the two contacts of emergency stop button does not open. If an error occurs (for example when the emergency stop contact connected to terminal S12 does not open), the second (redundant) contact S22 will activate safety circuit. The enabling current paths 13/14 and 23/24 and 33/34 open. After unlocking of the emergency stop button, the reset button must be operated (manual start) to reactivate the device. The SNO 4063KR works with supply voltage reset. When supply voltage is applied and the emergency stop circuit is closed, the enabling current paths close. In case of a short circuit in the lines leading to the emergency stop button, the voltage applied to S11, S21 is short-circuited (cross monitoring). The relays K1, K2 switch back into the OFF position and the electronic fuse is triggered. If a line short circuit occurs in the reset button after the device has been activated, this will be recognized by the cyclical self test when reactivating the device. This will inhibit the enabling current paths from closing again.

Application example

Two-channel safety gate application with cross monitoring and automatic start

Channel 1 (S12) and channel 2 (S22) monitor the position of the safety gate (shown open here). If channel 1 is actuated before channel 2 during closing, a synchrocheck is performed with t_s approx. 0.5 s. Actuation of channel 2 before channel 1 switches off the synchrocheck ($t_s = \infty$). If the safety gate is opened, the device switches off and the enabling current paths 13/14, 23/24, 33/34 are opened. If the safety gate is closed again, the NC contact K3 (automatic start) will activate the device again.

Overview of devices / Part numbers

Type	Rated voltage		Terminals	Part no.	Std. Pack
SNO 4063K	DC 12 V		Terminal block, rising cage termination	R1.188.1110.0	1
	AC/DC 24 V	50 – 60 Hz	Terminal block, rising cage termination	R1.188.0960.0	1
	AC 115 – 120 V	50 – 60 Hz	Terminal block, rising cage termination	R1.188.0970.0	1
	AC 230 V	50 – 60 Hz	Terminal block, rising cage termination	R1.188.0980.0	1
SNO 4063K-A	DC 12 V		Pluggable connector, rising cage termination	R1.188.1120.0	1
	AC/DC 24 V	50 – 60 Hz	Pluggable connector, rising cage termination	R1.188.0990.0	1
	AC 115 – 120 V	50 – 60 Hz	Pluggable connector, rising cage termination	R1.188.1000.0	1
	AC 230 V	50 – 60 Hz	Pluggable connector, rising cage termination	R1.188.1010.0	1
SNO 4063KM	AC/DC 24 V	50 – 60 Hz	Terminal block, rising cage termination	R1.188.1270.0	1
SNO 4063KM-A	AC/DC 24 V	50 – 60 Hz	Pluggable connector, rising cage termination	R1.188.1280.0	1
SNO 4063KR	DC 12 V		Terminal block, rising cage termination	R1.188.1160.0	1
	AC/DC 24 V	50 – 60 Hz	Terminal block, rising cage termination	R1.188.1130.0	1
	AC 115 – 120 V	50 – 60 Hz	Terminal block, rising cage termination	R1.188.1140.0	1
	AC 230 V	50 – 60 Hz	Terminal block, rising cage termination	R1.188.1150.0	1
SNO 4063KR-A	DC 12 V		Pluggable connector, rising cage termination	R1.188.1200.0	1
	AC/DC 24 V	50 – 60 Hz	Pluggable connector, rising cage termination	R1.188.1170.0	1
	AC 115 – 120 V	50 – 60 Hz	Pluggable connector, rising cage termination	R1.188.1180.0	1
	AC 230 V	50 – 60 Hz	Pluggable connector, rising cage termination	R1.188.1190.0	1

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Technical data		SNO 4063K / SNO 4063KR	SNO 4063KM
Function according to EN 60204-1		Emergency stop relay	
Function display		3 LEDs green	
Function diagram		FD 221-5-1 W, FD 221-5-2 W, FD 221-5-3 W	
Power supply circuit			
Rated voltage U_N		DC 12 V, AC/DC 24 V, AC 115 - 120 V, AC 230 V	AC/DC 24 V
Rated consumption DC		2.0 W	2.1 W
Rated consumption AC		2.4 W/4.4 VA	2.5 W/4.6 VA
Residual ripple		$2.4\ V_{ss}$	
Rated frequency		50 – 60 Hz	
Operating voltage range		$0.85 – 1.1 \times U_N$	
Fuse for control circuit supply		short-circuit resistant	
Control circuit			
Outputs (S11, S21)			
Rated output voltage (S11 to S21)		DC 22 V	
Open circuit voltage (only AC devices)		< 40 V	
Output current		100 mA	
Short circuit protection / current limitation		yes/–	yes/250 mA
Inputs (S12 / S33, S31 / S22, S34, S35)			
Input voltage range (only for DC devices)		DC 17.4 V to DC 26.4 V	
Rated current / peak current (safety inputs S12/S33, S31/S22)		40 mA/100 mA	
Rated current / peak current (reset inputs S34, S35)		5 mA/50 mA	
Times			
Permissible test pulse time t_{TP}/test frequency		≤ 1000 µs/≤ $10\ s^{-1}$	
Response time t_{A1} (reset input S34)		20 ms – 40 ms	
Response time t_{A2} (reset input S35)		200 ms – 600 ms	20 ms – 80 ms
Response time t_{A3} (only SNO 4063KR)		100 ms – 400 ms	
Minimum ON time t_M (reset inputs S34, S35)		> 80 ms	
Locking time t_{SP}		–	70 ms – 130 ms
Response time of the lock t_{ASP}		–	> 7 ms
Recovery time t_W		≥ 100 ms	
Release time t_R (K1, K2) with emergency stop		< 25 ms	
Synchronous time t_S		ca. 200 ms	–
Output circuit			
Enabling paths			
Contact assignment		3 NO contacts, positively driven	
Rated switching voltage U_n		AC 230 V/DC 300 V	
Max. continuous current I_n per current path		6 A	
Max. total current of all current paths	DC 12 V, AC/DC 24 V	12 A	
	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 AC, I_e 4 A / DC-13: U_e 24 V DC, I_e 4 A	
	3600 h^{-1}	AC-15: U_e 230 V AC, I_e 3 A / DC-13: U_e 24 V DC, I_e 2.5 A	
Short-circuit protection, max. fuse insert		6 A class gG or circuit breaker with trigger characteristic B or C	
Mechanical life		10×10^6 switching cycles	
General data			
Creepage distances and clearances between the circuits		according to EN 60664-1	
Rated impulse voltage		4 kV	
Overvoltage category		III	
Degree of pollution of the device: inside / outside		2/3	
Rated voltage		AC 300 V	
Test voltage U_{eff} 50 Hz		2 kV	
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		$2 \times 0.14 – 0.75\ mm^2 / 1 \times 0.14 – 2.5\ mm^2$	
or fine-stranded with ferrules		$1 \times 0.25 – 2.5\ mm^2 / 2 \times 0.25 – 0.5\ mm^2$	
Permissible tightening torque		0.5 – 0.6 Nm	
for UL and CSA applications	Wire ranges	AWG 18-16 only use Cu wires	
	Max. tightening torques	0.79 in-lbs	
Weight		0.21 kg (DC device) / 0.25 kg (AC device)	
Approvals			