SCHLEICHER

Relays and Automation Systems

NEW

Safety Relays provide High Safety in the Most Compact Housings

Applications for the new Series 4000:

Emergency-Stops

Two-Hand Controls

Safety Mats/Safety Bumpers

Contact Expansions with/without Time Delay

Safety Gates

Valve Position

Extract from Catalog 2E, Chapter1

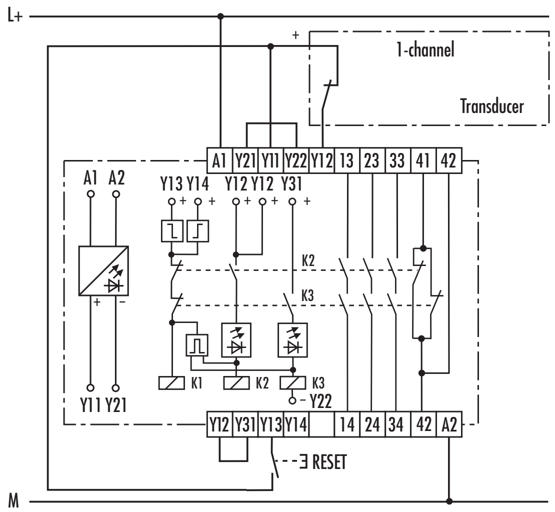
Transducer Activation

A safety switching circuit consists of :
transducer + safety switching device + actuator.

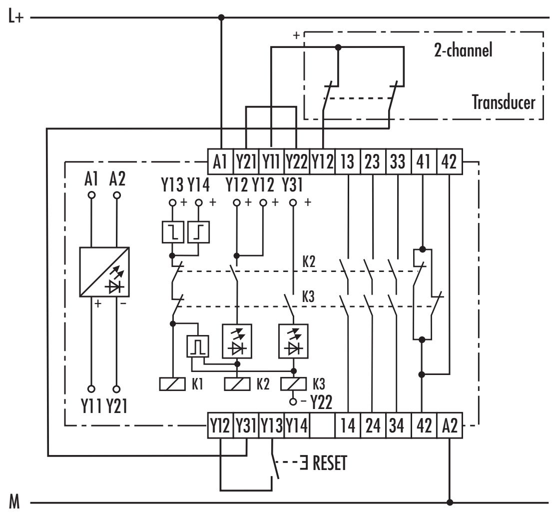
Different kind of transducers can be connected to safety switching devices. The type of connection can be single channel, dual channel or dual channel with cross monitoring feature depending from the basic unit used. The Safety Category acc. to EN 954-1 depends from the use of the safety switching devices and the kind of connection between the transducer and the safety switching device.

The lowest degree reached by one of the parts of this chain defines the highest degree of the Safety Category in the whole, i.e. a wrong kind of connection can lower the Safety Category even if the device has been choosen correctly. The following pictures show different examples of connections between transducers and safety switching devices.

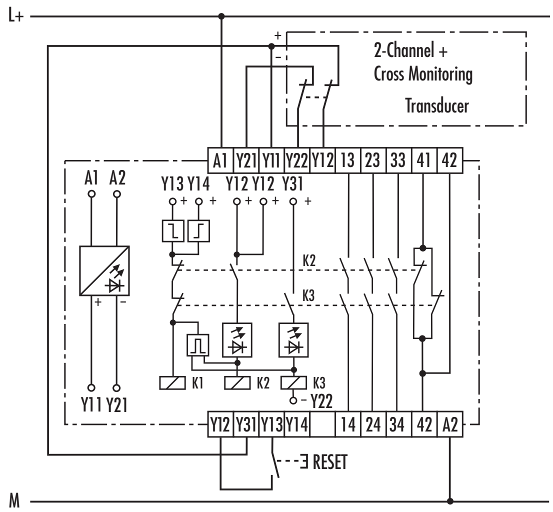
Single Channel Connection



Dual Channel Connection



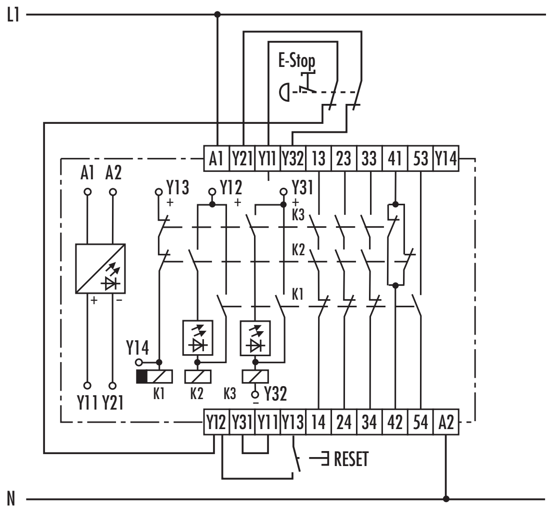
Dual Channel With Cross Monitoring Connection



Subject to changes

Advantages of the Cross Monitoring

Application example with consideration of faults: Dual channel E-Stop control circuit (with cross monitoring) with SNO 2002-230.



Type of Fault	Effect
Short circuit of terminals Y11 or Y12 or Y31 to A2 (ground fault).	Instant fault detection, opening of the enabling current paths.
Short circuit of terminal Y13 to A2 (ground fault).	Fault detection in the context of cyclic self monitoring *, the device cannot be restarted.
Short circuit of terminals Y21 or Y32 to A2 (ground fault).	Instant fault de tection. Opening of the enabling current paths.
Short circuit of terminal Y11 to Y12 or Short circuit of terminal Y21 to Y32.	Fault detection in the context of cyclic self monitoring *, the device cannot be restarted.
Short circuit of terminals Y11 or Y12 or Y31 to Y13.	No fault detection.
Short circuit of terminals Y11 or Y12 to Y21 or Y32 (bridge fault).	Instant fault detection, opening of the enabling current paths.
Interruption between terminal Y11 and Y12 or interruption between terminal Y21 and Y32.	Instant fault detection, opening of the enabling current paths.
Interruption between terminal Y12 and Y13.	Fault detection in the context of cyclic self monitoring *, the device cannot be restarted.

* Cyclic self monitoring: fault detection when the safety switching device is started again after the E-Stop button has been activated.

Causes of damage to the control lines during operation are e.g. pinching, high temperatures, shavings, acids, etc. These effects can cause shunts or ground shorts on the feed lines of the E-Stop momentary contact switch. The circuit of the emergency-stop relay with cross monitoring can sense these effects.

Cross monitoring pre-supposes the following conditions:

1. Emergency-stop alarm via two normally closed contacts with two-channell (separate) wiring
2. The two current paths (channels) are operated with a different voltage potential.

Line Lengths

In installations with a large spatial extent, long line paths to the E-Stop momentary contact switch are the rule.
For the SNO safety switching devices, the line resistance of the E-Stop control circuit may be a maximum of 70 Ω. This value corresponds to a copper line with a cross section of 2 x 1,5 mm^2, 2,5 km. long (a two-strand 1,5 mm^2 copper line has a DC resistance of 28 Ω/km at 25 °C).

Electronic Fusing

The SNO safety switching devices for AC have a short-circuit-proof transformer acc. to DIN VDE 0551, which also functions as a fuse. In the case of short circuits on the control lines, the secondary voltage of the transformer collapses, and the switching relays immediately return to their de-energized state. The enabling current paths open. After the cause of the trouble has been eliminated, the device is again ready to operate (as long as the rated volatge is maintained), and it again assumes its original state, depending on its original conditions.

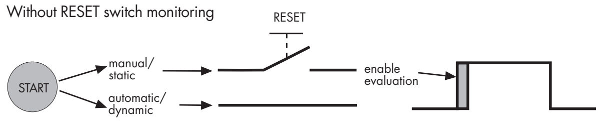
The SNO safety switching devices for DC have a PTC thermistor with a positive temperature coefficient as fuse. In the case of short circuits on the control lines, the control voltage collapses, and the internal switching relays immediately return to their de-energized state. The enabling current paths open. After its response time the PTC limits the short-circuit current to a value that is not hazardous to the relay. After the cause of the trouble has been eliminated, the device is again ready to operate after the recovery time has elapsed (if the operating voltage tolerance is maintained). It assumes its original state, depending on the initial conditions.

The supply circuit and its protective equipment must be dimensioned for the maximum short circuit current $I_{Kmax.}$.

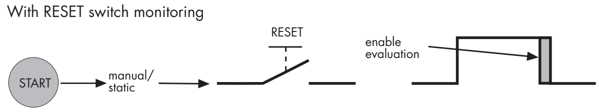
Monitoring of the RESET Switch

When the RESET switch is monitored, the device is enabled only with the falling edge of the switch signal. This means that with this function, the device can be operated only manually (statically). The RESET switch must always be activated for starting. An automatic (dynamic) start by shunting the RESET key is not possible. Devices without monitoring of the RESET switch are suited for dynamic operation (automatic start). The RESET switch can be shunted. This function becomes important in the area of protective gate applications.

Without RESET switch monitoring



With RESET switch monitoring



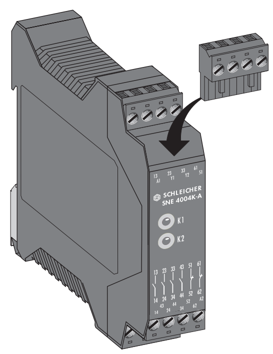
Time back-up

Devices with time back-up have the following effect: If the supply voltage (A1/A2) fails, the supply voltage of relays K1 and K2 is maintained until the selected off-delay time t_{R1} has elapsed. The relays K1 and K2 switch into their de-energized position only after it has elapsed. Devices with time back-up can be delivered only with the adjustment range 0 to 3 s.
With devices without time back-up, failure of the supply voltage (A1/A2) causes the relays K1 and K2 to switch off with the off-delay time t_{R2}.
The relays K1 and K2 switch into their de-energized position.

Selection guide of safety switching devices

Application	SNO 4003 K	SNO 4062 K	SNO 4062 KM	SNE 4004 K	SNE 4004 KV	SNT 4053 K	SNT 4453 K	SNZ 4052 K
Emergency - Stop application	●	●	●					
Protective equipment with separation function	●	●	●			●	●	
Valve position/protective gate						●	●	
Safety bumpers/safety mats application			●					
Two-hand control								●
Basic unit	●	●	●			●	●	●
Expansion unit (contact expansion)				●#	●#			
1 channel E - Stop	●	●	●					
2 channel E - Stop	●	●	●					
2 channel E - Stop with cross monitoring		●	●			●	●	●
Activation via signalling element with semiconductor output			●			●	●	
Off - delayed enabling current paths						●		
Reset switch monitoring		●	●					
Start - up test						●	●	
Restart inhibit	●	●	●					
Feedback loop for monitoring external contactors	●	●	●			●	●	●
Forced guided contacts								
Safety contacts	3	2	2	4		3	3	2
Off - delayed contacts					4			
Control contacts	1	1	1	2*		1	1	1
OFF - delayed control contacts					2*			
Feedback contact				1**				
OFF - delayed feedback contact					1**			
Maximum rated current I_n per contact A	6					* = 2; ** = 0,1		
Maximum total current for all contacts A	12							
Rated voltage U_N V AC/DC	24							
Housing width in mm	22,5							
Page no. of the partial catalog	5	8	8	11	11	14	17	20

Only in connection with a basic unit.
The Safety and Stop Category of the expansion unit can be at most that of the basic unit.



SNx 40xx K-A

Removable Terminals:

- Available for all safety relays in the 4000 Series
- Quick module exchange because of Removable Terminals
- Same electrical specifications as screw terminals models
- Removable Terminals are coded to prevent mistakes
- Wiring is quicker, flexible and safer

Emergency-Stop-Relay

Basic unit
Complies with EN 60204 – 1 and EN 954 – 1
Single channel E-Stop circuit is possible
3 NO safety contacts, 1 NC control contact

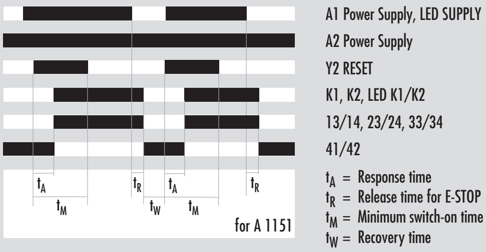
SNO 4003 K	EN 60204 - 1	For Stop Category	0
	EN 954 - 1	Safety Category	3

SNO 4003 K

Function Diagram

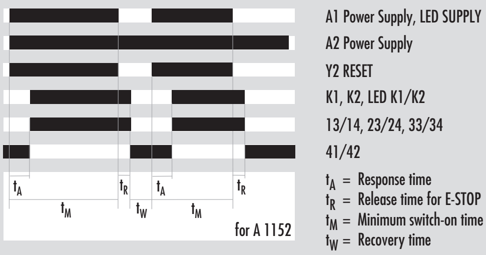
FD 0221-15-1 W1

SNO 4003 K, SNO 4003 K-A



t_A = Response time
t_R = Release time for E-STOP
t_M = Minimum switch-on time
t_W = Recovery time

FD 0221-15-2 W1

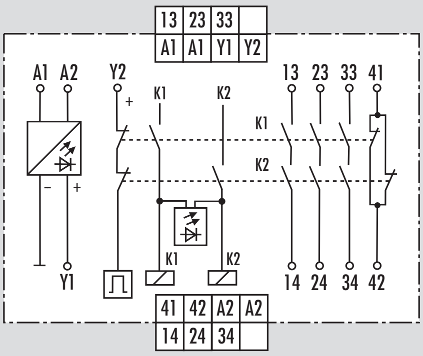


t_A = Response time
t_R = Release time for E-STOP
t_M = Minimum switch-on time
t_W = Recovery time

Connection Diagram

KS 0221-15 W1

SNO 4003 K, SNO 4003 K-A



For Example

Protection of persons and machines

- For immediate interruption of the power supply = Stop Category 0
- Monitoring of E-Stop applications
- Monitoring of protective screens
- Protective measures in safety subdomains

Function

SNO 4003 K
Upon application of the supply voltage at terminal A2 and at terminal A1 through the not-actuated E-Stop switch or protective gate contact, the lock-out preventing closing is effective. The actuation of the RESET key connected to terminals Y1/Y2 activates the control logic. This triggers the relays K1 and K2. The latter become self locking through their own contacts after the response time t_A . At the same time, the relay contacts of K1 and K2 de-activate the control logic.
After this switch-on phase, the three enabling current paths, which are intended for the output, are closed (terminal connections 13/14, 23/24, 33/34) and the control contact is opened (terminal connections 41/42). Two LEDs provide a display, and these LEDs are associated with the safety channels K1/K2 and the supply voltage.
If the E-stop switch or the position switch is opened, the current leads for the K1 and K2 relays are interrupted. The enabling current paths at the output are opened and the control contact is closed.

According to the particular application (e.g. protective gate monitoring) it is possible to have an automatic start shunting terminals Y1/Y2.

SNO 4003 K-A
The function corresponds to the one of the SNO 4003 K. Devices with the – A identification in their model reference are equipped with four removable terminals (see Dimension Diagram K 2 - 2). This feature allows a quick installing/removing operation. The terminal locations are coded and not interchangeable.

Notes

- To multiply the enabling current paths, the expansion units or external contactive elements with positively driven contacts can be used.
- The circuit design for the feedback loop depends on the required safety level.

Approvals

ET 97284

Ordering Example

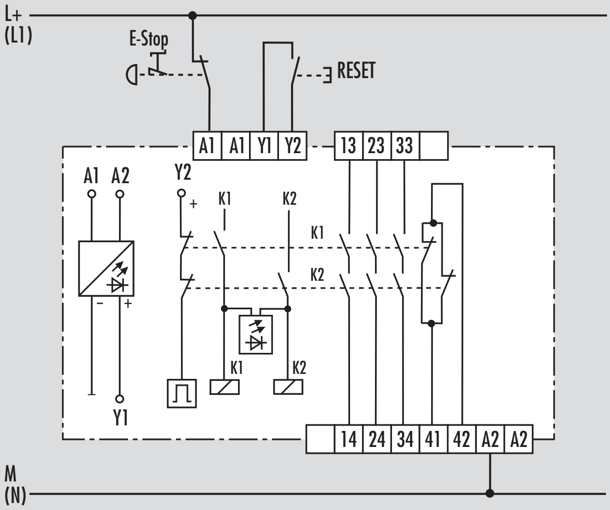
SNO 4003 K	24 V AC/DC
Type	Rated Voltage

SNO 4003 K SNO 4003 K-A

Application Example

A 1151

Single Channel Emergency-Stop Application with Manual Start

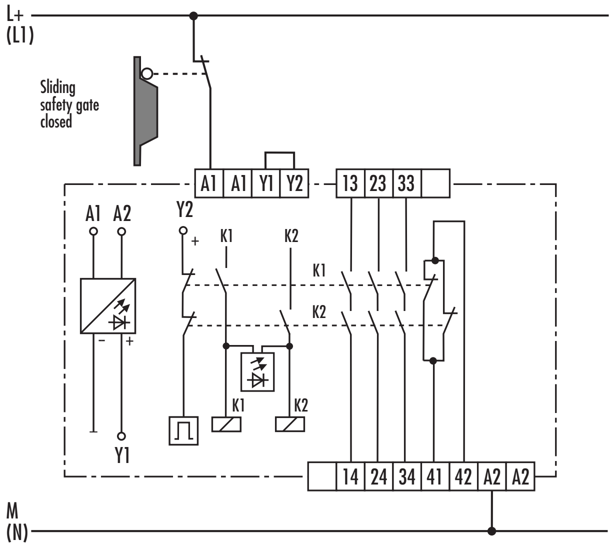


The single channel E-Stop circuit complies with the requirements of the Stop-Category 0 acc. to EN 60204-1 and the Safety Category 2 acc. to EN 954-1. However the circuit of the E-Stop momentary contact is not redundant. Ground faults in the E-Stop circuit are immediately detected.

Application Example

A 1152

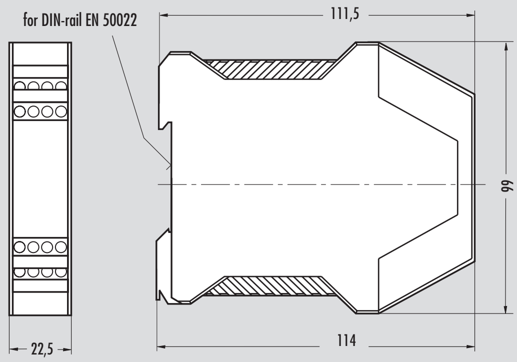
Single Channel Protective Gate Application with Automatic Start



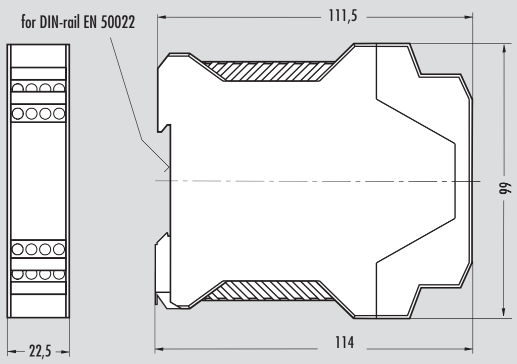
The single channel protective gate application complies with the requirements of the Stop-Category 0 acc. to EN 60204-1 and the Safety Category 2 acc. to EN 954-1. However the circuit of the protective gate is not redundant. Ground faults in the protective gate contact are immediately detected.

Dimension Diagram

K 2-1



K 2-2



Technical Data

	Unit	SNO 4003 K / SNO 4003 K-A
FUNCTION According to EN 60204-1		Emergency-Stop Relay
Function Display		2 LED, green
Function Diagram		FD 0221-15-1 and -2 W1
POWER SUPPLY DATA		
Rated Voltage U_N	V AC/DC	**24**
Rated Consumption at 50 Hz and Un (AC)	VA	2,4
Rated Consumption at 50 Hz and U_N (AC)	W	1,4
Rated Consumption at Un (DC)	W	1,3
Residual Ripple	V_{ss}	2,4
Rated Frequency	Hz	50 to 60
Operating Voltage Range		0,85 to 1,1 x U_N
CONTROL CIRCUIT only for supplying the control inputs		
Line Resistance between Y1/Y2 (at U_N)	Ω	≤ 70
Control Output Y1 with respect to A2:		
Rated Output Voltage	V DC	24
Rated Current	mA	40
Rated Short-Circuit Current I_K max.	mA	1400
Fuse		AC/DC: PTC-Resistance
Response Time	s	2
Recovery Time	s	3
Control Input Y2:		
Rated Current Input	mA	40
Response Time t_A K1, K2	ms	50
Recovery Time t_R K1, K2	ms	40
Minimum Swith-ON Time t_M for Y2	ms	50
Recovery Time t_W	ms	≤ 50
OUTPUT CIRCUIT		
Contact Equipment:		3 N.O. Safety Contact 1 N.C. Control Contact
Contact Type		Forced Contact
Contact Material		Ag-Alloy; Gold-Plated
Switching Voltage U_n	V AC/DC	230/230
Maximum Continuous Current per Contact	A	6
Total of All Contact Currents	A	12
Application Category According to EN 60947–5–1:1991		AC–15: U_e 230 V AC, I_e 6 A (3600 Switch./h) DC–13: U_e 24 V DC, I_e 6 A (360 Switch./h) DC–13: U_e 24 V DC, I_e 3 A (3600 Switch./h)
Short-Circuit Protection, Max. Fuse Element Class gG	A	6
Permissible Switching Frequency	Switching Cycles/h	3600
Mechanical Lifetime	Switching Cycles	10×10^6
GENERAL DATA		
Creepage and Clearance Distances Between Circuits According to DIN VDE 0110-1:04.97:Rated Withstand Voltage	kV	4
Over-Voltage Category		III
Contamination Level		3 Outside,2 Inside
Design Voltage	V	300
Test Voltage U_{eff} 50 Hz acc. to DIN VDE 0110-1, Table A.1	kV	2,21
Protection Class Housing/Terminals acc. to DIN VDE 0470 Sec. 1:11.92		IP 40/IP 20
Radiated Noise		EN 50081–1:03.93, –2:03.94
Noise Immunity		EN 50082–2:1995
Ambient Temperature, Working Range	°C	– 25 to + 55
Dimension Diagram: SNO 4003 K; SNO 4003 K-A		K 2-1/K2-2
Terminal Diagram		KS 0221-15 W1
Max. wire cross section (flexible/single core)	mm^2	1 x 2,5 or 2 x 0,5/1 x 2,5 or 2 x 0,75
Weight	kg	0,2
Approvals		BG, CSA, UL
GENERAL TECHNICAL SPECIFICATIONS		Page i.11 Catalog 2

Emergency-Stop-Relay

Basic unit
Complies with EN 60204 – 1 and EN 954 – 1
Single or dual channel E-Stop circuit is possible
2 NO safety contacts, 1 NC control contact
Additional monitoring of the RESET switch (anti tie-down)

SNO 4062 K	EN 60204 - 1	For Stop Category	0
SNO 4062 KM	EN 954 - 1	Safety Category	4

SNO 4062 K

SNO 4062 KM

SNO 4062 K-A

SNO 4062 KM-A

For Example

- Protection of persons and machines
- For immediate interruption of the power supply = Stop Category 0
- Monitoring of E-Stop applications
- Monitoring of protective screens
- Evaluation of safety strips applications (SNO 4062 KM)

Function

SNO 4062 K

After the supply voltage is applied to terminals A1/A2, and if the E-Stop momentary contact switch is not activated, the control logic is energized with the RESET switch. This triggers the internal relays K1 and K2. The latter become self locking through their own contacts. After this switch-on phase, the two enabling current paths, which are intended for the output, are closed (terminal connections 13/14, 23/24) and the control contact is opened (terminal connections 31/32). Three LEDs provide a display, and these LEDs are associated with the safety channels K1,K2 and the supply voltage. If the E-stop switch is activated, the current leads for the K1 and K2 relays are interrupted. The enabling current paths at the output are opened and the control contact is closed.
With a two-channel connection of the E-Stop switch and cross monitoring wiring of the E-Stop circuit, it is possible to monitor the presence of a short circuit between the connected cables (cross monitoring) and ground faults. An internal electronic circuit protects the emergency-stop relay from damages. After eliminating the fault the item will return into operation after about 3 s.
RESET key monitoring.
The SNO 4062 K, SNO 4062 KM are equipped with the monitoring feature for the RESET key. The device can be enabled with the falling edge (RESET released) or rising edge (RESET closed) of the signal (terminals S34 or S35). For the specific use in the emergency stop applications with manual START the RESET key must be connected to terminals S33/S34. The device is enabled only with a falling edge of the signal in the RESET key. In order to start the RESET key has to be closed and released. For those applications with protective gates where an automatic RESET must be performed, it is necessary to jumper terminals S35 with S12. The device will react at the rising edge of the signal.
Simultaneity check (Application Example A1155).
The use of safety limit switches for single or dual channel circuit in the protective gate application depends from the required safety level.
The SNO 4062 K features a dual channel control and in addition a simultaneity check of the limit switches on request. Precondition for a simultaneity check $t_G \approx 0{,}5$ s is the position of the limit switches. The limit switches must be positioned so that channel 1 (terminals S33/S12) has to close before channel 2 (terminals S21/S22) does. If channel 2 closes before channel 1 the simultaneity time $t_G = \infty$.

SNO 4062 KM

Its function corresponds to the one of the SNO 4062 K.
As additional feature it is possible to connect all safety contact mats, safety contact strips or safety contact edges with 4-wire-technology (without monitoring resistance). The safety contact mats, strips and edges operate causing a short circuit between two wires. In case the value of the internal wire resistance in the safety mat , strip or bumper is < 50 Ω per channel and there is a presence of a short circuit between the channels (terminals S11/S12 and S21/S22) the item will be completely shut down. This is possible because the item is designed with the cross monitoring feature which requires a dual channel control circuit.

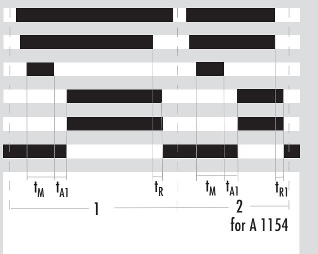
SNO 4062 K-A und SNO 4062 KM-A

Their function correspond to the ones of the SNO 4062 K and SNO 4062 KM. Devices with the – A identification in their model reference are equipped with four removable terminals (see Dimension Diagram K 2 - 2). This feature allows a quick installing/removing operation. The terminal locations are coded and not interchangeable.

Function Diagram

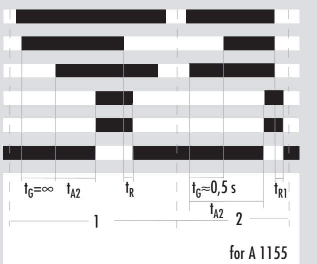
FD 0221-17-1 W1

SNO 4062 K, SNO 4062 KM, SNO 4062 K-A, SNO 4062 KM-A



A1/A2 Power Supply, LED SUPPLY
S12/S22 E-STOP
S34 RESET(with RESET switch monitoring)
K1, LED K1
K2, 13/14, 23/24, LED K2
31/32
t_{A1} = Response time (S34)
t_R = Release time for E-STOP (S12/S22)
t_{R1} = Release time for E-STOP (A1/A2)
t_M = Minimum switch-on time
1 = E-STOP via S12, S22
2 = E-STOP via A1/A2

FD 0221-17-2 W1

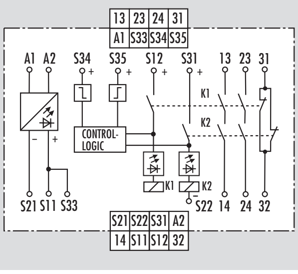


A1/A2 Power Supply, LED SUPPLY
S22
S12
K1, LED K1
K2, 13/14, 23/24, LED K2
31/32
t_{A2} = Response time (S35)
t_R = Release time for E-STOP (S12/S22)
t_{R1} = Release time for E-STOP (A1/A2)
t_G = Simultaneity check
1 = E-STOP via S12, S22
2 = E-STOP via A1/A2

Connection Diagram

KS 0221-17-1 W1

SNO 4062 K, SNO 4062 KM, SNO 4062 K-A, SNO 4062 KM-A



SNO 4062 KM-A **SNO 4062 KM** **SNO 4062 K-A** **SNO 4062 K**

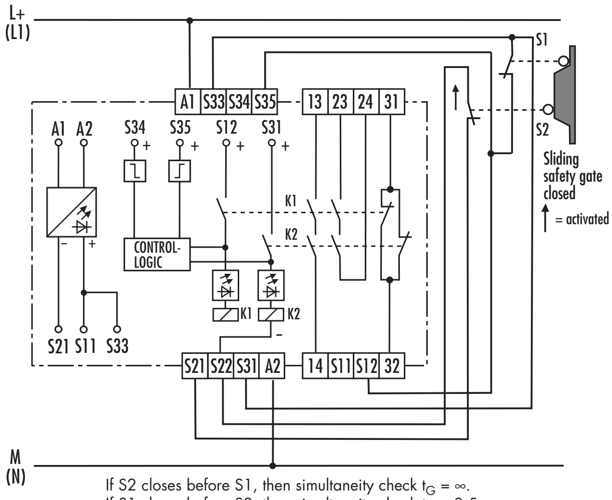
Notes

- To multiply the enabling current paths, the expansion units or external contactive elements with positively driven contacts can be used.
- The circuit design for the feedback loop depends on the required safety level.

Application Example

A 1155

Two-Channel Protective Gate Application with Cross Monitoring and Automatic Start



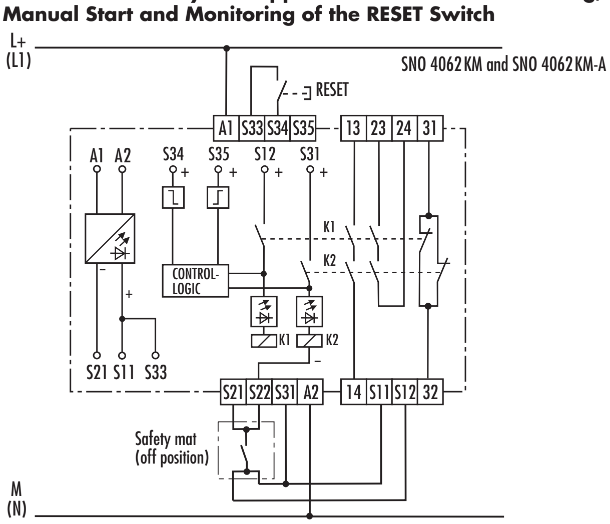
If S2 closes before S1, then simultaneity check $t_G = \infty$.
If S1 closes before S2, then simultaneity check $t_G \approx 0{,}5$ s.

Channel 1 (S12) and channel 2 (S22) monitor the position of the sliding protective gate. The automatic START through terminal S35 activates the SNO 4062 K/SNO 4062 KM. If the sliding protective gate opens, K1 and K2 switch back to their off position (enable current paths 13/14, 23/24 are opened). If the protective gate is closed again, the automatic START at S35 activates the device again.

Application Example

A 1156

Two-Channel Safety Mat Application with Cross Monitoring, Manual Start and Monitoring of the RESET Switch

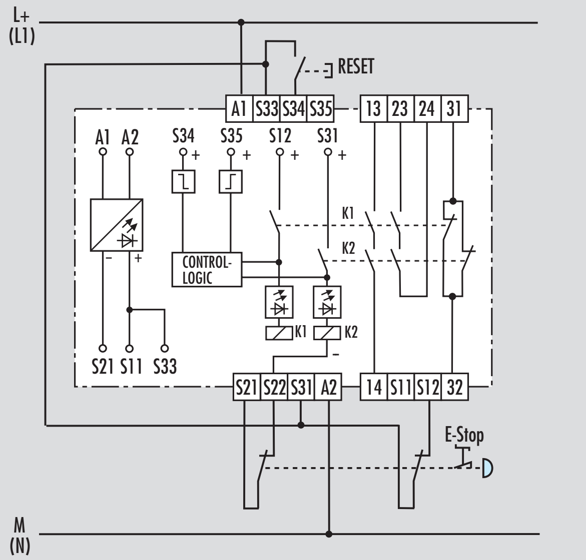


The safety mat connected to terminals S21, S22 and S11, S12 is checked with help of the cross monitoring feature.If the safety mat is not actuated (i.e. no one is stepping on it) the SNO 4062 KM can be activated with the RESET switch. The enable current paths 13/14, 23/24 close and the control contact 31/32 opens. If a person steps on to the safety mat, a short circuit is generated that causes the immediate release of the K1 and K2 relays. The enabling current paths open and the control contact closes.

Application Example

A 1154

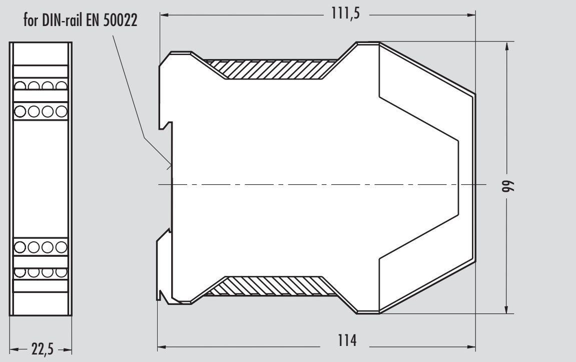
Two-Channel Emergency-Stop Application with Cross Monitoring, Manual Start and Monitoring of the RESET Switch



The two-channel E-Stop application switches off the device even if one of the two contacts in the E-Stop pushbutton does not open. If a fault occurs (i.e. the E-Stop contact connected to terminal S12 does not open), the second (redundant) contact activates the safety circuit. The enabling current paths 13/14 and 23/24 open. In case of a short circuit in the lines leading to the E-Stop pushbutton, the internal supply voltage at S11, S21 is short circuited (cross monitoring). The relays K1, K2 switch back to their off position and the electronic protective fuse is triggered. If a line short circuit occurs in the RESET switch after the device has been activated, it will be recognized by the cyclical self-test when reactivating the device. This will inhibit the enabling current paths (output safety contacts) to close again.

Dimension Diagram

K 2-1



Approvals

ET 98002 SNO 4062 K
ET 98011 SNO 4062 KM

Ordering Example

SNO 4062 K	24 V AC/DC
SNO 4062 KM	24 V AC
SNO 4062 KM	24 V DC
SNO 4062 K-A	24 V AC/DC
SNO 4062 KM-A	24 V AC
SNO 4062 KM-A	24 V DC
Type	Rated Voltage

TECHNICAL DATA

TECHNICAL DATA	Unit	SNO 4062 K / SNO 4062 K-A	SNO 4062 KM / SNO 4062 KM-A
FUNCTION According to EN 60204-1		Emergency-Stop Relay	Emergency-Stop Relay
Function Display		3 LED, green	3 LED, green
Function Diagram		FD 0221-17-1 and -2 W1	FD 0221-17-1 and -2 W1
POWER SUPPLY DATA			
Rated Voltage U_N	V AC/DC	**24**	
Rated Voltage U_N	V AC		**24**
Rated Voltage U_N	V DC		**24**
Rated Consumption at 50 Hz and Un (AC)	VA	3,5	4,0
Rated Consumption at 50 Hz and U_N (AC)	W	2,1	2,7
Rated Consumption at Un (DC)	W	1,5	2,7
Residual Ripple	V_{ss}	2,4	2,4
Rated Frequency	Hz	50 to 60	50 to 60
Operating Voltage Range		0,85 to 1,1 x U_N	0,85 to 1,1 x U_N
CONTROL CIRCUIT only for supplying the control inputs			
Line Resistance between S33 and S12/S21 or S21 and S22 (at U_N)	Ω	≤ 70	≤ 70
Safety Mat Resistance between S11 and S12/S31 or S21 and S22 for SNO 4062 KM (at U_N)	Ω	≤ 50	≤ 50
Control Outputs S33 and S11 for SNO 4062 K with respect to S21:			
Rated Output Voltage	V DC	≤ 24	≤ 24
Rated Current	mA	50	50
Rated Short-Circuit Current I_K max. (Short-circuit S33 and S11 to A2)	mA	2200	–
Fuse		PTC-Resistance	Electronic Fuse
Response Time	ms	2000	5
Recovery Time	ms	3000	5
Control Outputs S33 and S11 for SNO 4062 KM with respect to S21:			
Rated Output Voltage	V DC	–	20
Rated Current	mA	–	50
Rated Short-Circuit Current I_K max.	mA	–	100
Control Inputs S12, S31, S22:			
Rated Current Input S12	mA	30	30
Rated Current Input S31, S22	mA	20	20
Response Time t_{A1} K1, K2	ms	80	80
Response Time t_{A2} K1, K2	ms	600	600
Recovery Time t_R/t_{R1} K1, K2	ms	40/100	40/100
Minimum Swith-ON Time t_M for S34, S35	ms	50	50
Recovery Time t_W	ms	500	500
OUTPUT CIRCUIT			
Contact Equipment:		2 N.O. Safety Contact 1 N.C. Control Contact	2 N.O. Safety Contact 1 N.C. Control Contact
Contact Type		Forced Contact	Forced Contact
Contact Material		Ag-Alloy; Gold-Plated	Ag-Alloy; Gold-Plated
Switching Voltage U_n	V AC/DC	230/230	230/230
Maximum Rated Current I_n per Contact	A	6	6
Maximum Total Current for all Contacts	A	12	12
Application Category According to EN 60947–5–1:1991		AC–15: U_e 230 V AC, I_e 6 A * DC–13: U_e 24 V DC, I_e 6 A ** DC–13: U_e 24 V DC, I_e 3 A * * 3600 Switch./h ** 360 Switch./h	AC–15: U_e 230 V AC, I_e 6 A * DC–13: U_e 24 V DC, I_e 6 A ** DC–13: U_e 24 V DC, I_e 3 A * * 3600 Switch./h ** 360 Switch./h
Short-Circuit Protection, Max. Fuse Element Class gG	A	6	6
Permissible Switching Frequency	Switching Cycles/h	3600	3600
Mechanical Lifetime	Switching Cycles	10 x 10^6	10 x 10^6
GENERAL DATA			
Creepage and Clearance Distances Between Circuits According to DIN VDE 0110-1:04.97:Rated Withstand Voltage	kV	4	4
Over-Voltage Category		III	III
Contamination Level		3 Outside, 2 Inside	3 Outside, 2 Inside
Design Voltage	V AC	300	300
Test Voltage U_{eff} 50 Hz acc. to DIN VDE 0110-1, Table A.1	kV	2,21	2,21
Protection Class Housing/Terminals acc. to DIN VDE 0470 Sec. 1:11.92		IP 40/IP 20	IP 40/IP 20
Radiated Noise		EN 50081–1:03.93, –2:03.94	EN 50081–1:03.93, –2:03.94
Noise Immunity		EN 50082–2:1995	EN 50082–2:1995
Ambient Temperature, Working Range	°C	– 25 to + 55	– 25 to + 55
Dimensional diagram: SNO 4062 K; SNO 4062 KM/SNO 4062 K-A; SNO 4062 KM-A		K 2-1/K 2-2	K 2-1/K 2-2
Terminal Diagram		KS 0221-17-1 W1	KS 0221-17-2 W1
Weight	kg	0,2	0,2
Approvals		BG, CSA, UL	BG, CSA, UL
GENERAL TECHNICAL SPECIFICATIONS		Page i.11 Catalog 2	Page i.11 Catalog 2

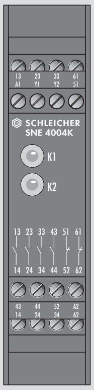
Emergency-Stop Relay

Expansion unit
Complies with EN 60204 - 1 and EN 954 - 1
Single or dual channel E - Stop circuit are possible
4 NO safety contacts, 2 NC control contacts and 1 NC fleeting contact
SNE 4004 KV with fixed OFF - delay time and time back - up

SNE 4004 K	EN 60204 - 1	For Stop Category	*
SNE 4004 KV	EN 954 - 1	Safety Category	*

*) see notes

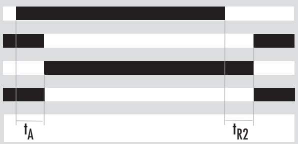
SNE 4004 K
SNE 4004 KV
SNE 4004 K-A
SNE 4004 KV-A



Function Diagram

FD 0221-19 W1

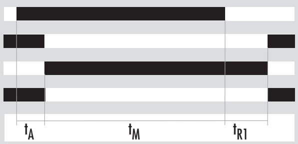
SNE 4004 K, SNE 4004 K-A



A1/A2 Power Supply
Y1, Y2 Feedback circuit
13/14, 23/24, 33/34, 43/44 LED K1, LED K2
51/52, 61/62
t_A = Response time
t_{R2} = Release time

SNE 4004 KV, SNE 4004 KV-A

FD 0221-19 W2

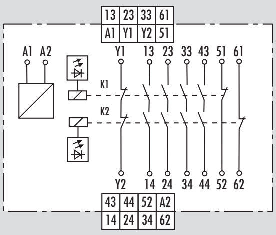


A1/A2 Power Supply
Y1, Y2 Feedback circuit
17/18, 27/28, 37/38, 47/48 LED K1, LED K2
55/56, 65/66
t_A = Response time
t_M = Minimum switch-on time
t_{R1} = Off-delay time

Connection Diagram

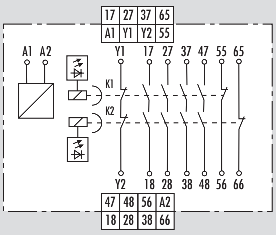
SNE 4004 K
SNE 4004 K-A

KS 0360-1



SNE 4004 KV
SNE 4004 KV-A

KS 0361-1



For Example

- Multiplying the enable current paths of a basic units
- Contact expansion in safety systems
- Safety switching devices (see Notes)

Function

SNE 4004 K
The supply voltage for the SNE expansion unit is lead by one of the output enabling current paths of the basic unit connected to it. After the supply voltage has been applied, the relays K1 and K2 switch into their operating position. After this switch - on phase the four safety output contacts 13/14, 23/24, 33/34, 43/44 (SNE 4004 K) or 17/18, 27/28, 37/38, 47/48 (SNE 4004 KV) close and the feedback contact Y1/ Y2 opens. The status of relays K1 and K2 is indicated by two LEDs. If the E - Stop button is pressed the enabling current paths of the basic unit open and the relays K1 and K2 of the SNE 4004 K are de - energized. The safety output contacts open and the feedback contact closes. The feedback contact Y1/ Y2 prevents the re - activation of the basic unit in case the relay K1 or K2 should not be de - energized. The device can comply with Stop Category 0 or 1 according to the basic unit connected.

SNE 4004 KV
The function corresponds to the one of the SNE 4004 K. The SNE 4004 KV is available with four fixed OFF - delay times t_{R1}: 0,5 s; 1 s; 2 s and 3 s. The item has a time back - up, so that in case of failure of the external power supply (A1/A2) the internal relays K1 and K2 stay energized until the OFF - delay time t_{R1} has elapsed. It cannot be deleted prematurely. Upon timing - out the relays K1 and K2 go back into their off - position. The OFF - delay times > 0 s correspond to Stop Category 1.

SNE 4004 K-A and SNE 4004 KV-A
The function corresponds to the one of the SNE 4004 K or SNE 4004 KV. Devices with the – A identification in their model reference are equipped with four removable terminals (see Dimension Diagram K 2 - 2). This feature allows a quick installing/removing operation. The terminal locations are coded and not interchangeable.

Notes

- The expansion units SNE can be connected to one or two safety contacts of the basic unit according to the safety level requested.
- The SNE units can be combined with all basic safety switching devices. The feedback circuit Y1/Y2 of the SNE unit has to be connected to the RESET button or to the feedback circuit of the basic unit.
- The actual Safety and Stop Category of the SNE units always depends from the corresponding category reached by the connected basic unit. The Safety and Stop Category of the expansion unit can only reach the max. Safety and Stop Category of the basic unit.
- As a safety switching device in stand-alone operation, it corresponds to Safety Category 3 according to EN 954-1

Please take note of the information provided by your professional association!

Approvals

ET 98109

Ordering Example

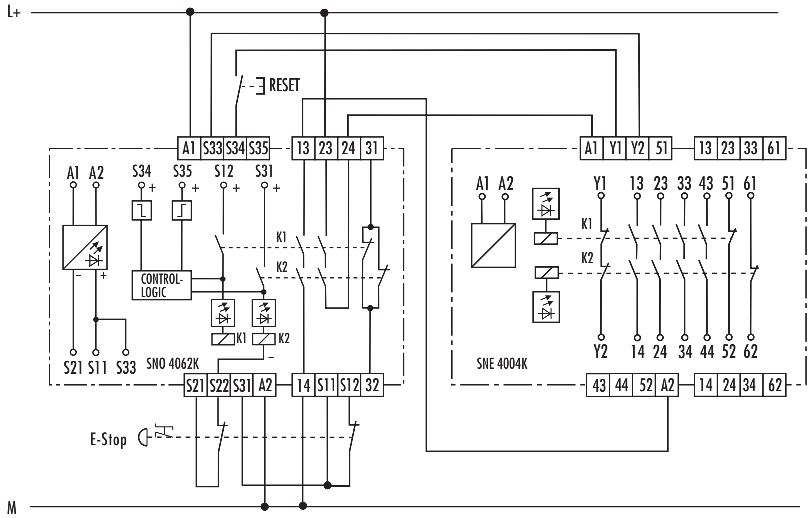
SNE 4004 K		24 V AC/DC
SNE 4004 KV - A	3 s	24 V DC
Type	OFF - Delay Time	Rated Voltage

SNE 4004 K | SNE 4004 K-A | SNE 4004 KV | SNE 4004 KV-A

Application Example

A 1157

Two - Channel Emergency - Stop Application (Cross Monitoring) with Monitoring of the RESET Switch and Contact Expansion. Basic Unit SNO 4062 K with Expansion SNE 4004 K.

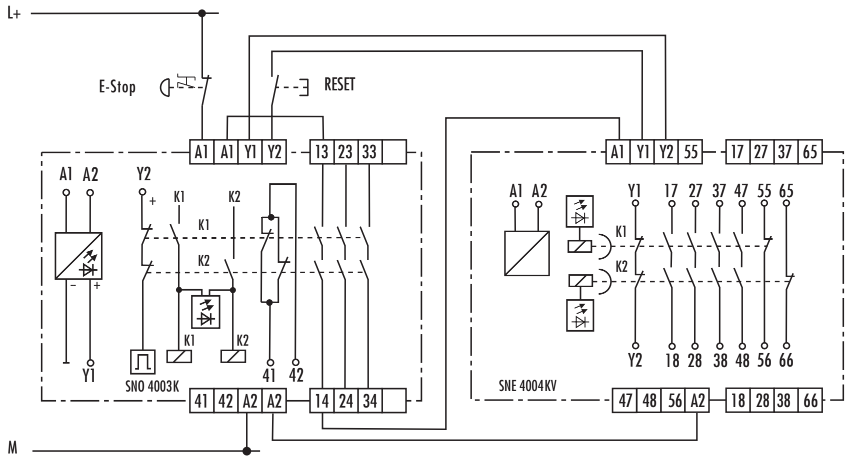


The dual channel emergency - stop application with expansion unit switches off even if one of both contacts of the E - Stop does not open. If a fault occurs (e.g. the E - Stop contact connected to S12 does not open), the safety circuit is opened through the second redundant contact S22. The enabling current paths 13/14 and 23/24 open. In case the lines leading to the E-Stop switch are short circuited the voltage supply at S11, S21 is short circuited (cross monitoring). An internal electronic protective circuit is activated and switches back the K1, K2 relays into their off - position. The items have a single RESET switch. A line short through the RESET switch, which has occured after the units have been activated, is detected by means of the cyclic self-test with a new starting process, and the enabling current paths are prevented from switching through. It is possible to perform a new START after an emergency stop only if all relays are back to their off - position.

Application Example

A 1158

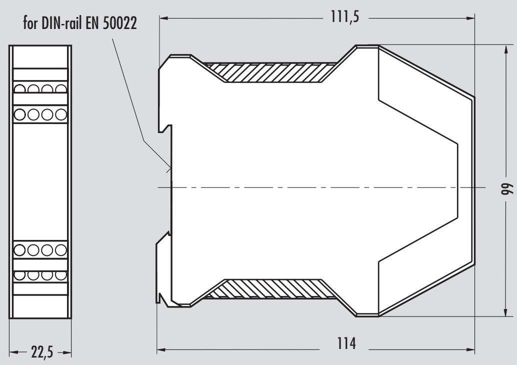
Single - Channel Emergency - Stop Application with Contact Expansion. Basic Unit SNO 4003 K with Expansion SNE 4004 K.



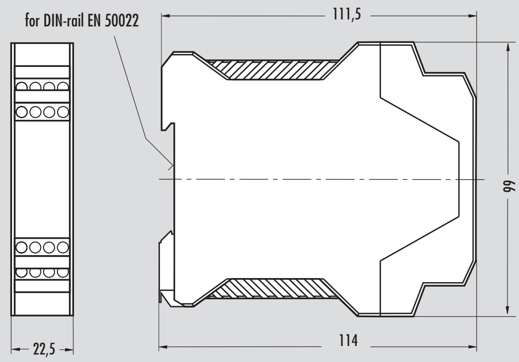
If the number of the enabling current paths of a basic unit, e.g. SNO 4003 K, are not sufficient or it is necessary an off - delay time for the enabling current paths, the SNE 4004 KV can be used for expansion.
The expansion switching relays K1 und K2 are triggered via one of the enabling current paths of the basic unit.
The basic unit is triggered with the "RESET" command through the feedback loop of the expansion unit.

Dimension Diagram

K 2-1



K 2-2



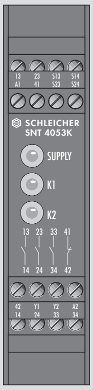
TECHNICAL DATA		SNE 4004 K	SNE 4004 KV
FUNCTION According to EN 60204-1		Emergency-Stop Expansion Relay	Emergency-Stop Expansion Relay
Function Display		2 LED, green	2 LED, green
Function Diagram		FD 0221-19 W1	FD 0221-19 W2
POWER SUPPLY DATA			
Rated Voltage U_N	V AC/DC	**24**	
Rated Voltage U_N	DC		**24**
Rated Consumption at 50 Hz and Un (AC)	VA	2,7	–
Rated Consumption at 50 Hz and U_N (AC)	W	1,5	–
Rated Consumption at Un (DC)	W	1,0	1,0
Residual Ripple	V_{ss}	2,4	2,4
Rated Frequency	Hz	50 to 60	–
Operating Voltage Range		0,85 to 1,1 x U_N	0,85 to 1,1 x U_N
Response Time t_A K1, K2	ms	25	25
Recovery Time t_{R2} (SNE 4004 K) K1, K2	ms	15	–
TIME CIRCUIT (SNE 4004 KV)			
Time Setting/No. of Time Ranges		–	fixed/1
Available OFF-Delay Times t_{R1}:	s	–	0,5; 1; 2; 3
Min. Switch-ON Time t_M	ms	–	75
Influence of the Supply Voltage	%/% Δ U_N	–	0,5
Influence of the Ambient temperature	% / K	–	0,4
Average of the Error	% + ± 10 ms	–	± 20
Dispersion	% + ± 10 ms	–	± 2
OUTPUT CIRCUIT			
Contact Equipment:		4 NO Safety Contacts, 2 NC Control Contacts, 1 NC Feedback Contact	4 NO Safety Contacts OFF-Delayed, 2 NC Control Contacts OFF-Delayed, 1 NC Feedback Contact OFF-Delayed
Contact Type		Forced Contact	Forced Contact
Contact Material		Ag-Alloy; Gold-Plated	Ag-Alloy; Gold-Plated
Switching Voltage U_n	V AC/DC	230/230	230/230
Switching Voltage U_n, Feedback Circuit Y1, Y2	V DC	24	24
Maximum Rated Current I_n per N.O.	A	6	6
Maximum Rated Current I_n per N.C.	A	2	2
Maximum Rated Current I_n, Feedback Circuit Y1, Y2	A	0,1	0,1
Maximum Total Current for all Contacts	A	12	12
Application Category According to EN 60947-5-1:1991		AC–15: U_e 230 V AC, I_e 6 A * DC–13: U_e 24 V DC, I_e 6 A ** DC–13: U_e 24 V DC, I_e 3 A * * 3600 Switch/h ** 360 Switch/h	AC–15: U_e 230 V AC, I_e 6 A * DC–13: U_e 24 V DC, I_e 6 A ** DC–13: U_e 24 V DC, I_e 3 A * * 3600 Switch/h ** 360 Switch/h
Short-Circuit Protection, Max. Fuse Element Class gG	A	6	6
Permissible Switching Frequency	Switching Cycles/h	3600	3600
Mechanical Lifetime	Switching Cycles	10 x 10^6	10 x 10^6
GENERAL DATA			
Creepage and Clearance Distances Between Circuits According to DIN VDE 0110-1:04.97: Rated Withstand Voltage	kV	4	4
Over-Voltage Category		III	III
Contamination Level		3 Outside, 2 Inside	3 Outside, 2 Inside
Design Voltage	V	300	300
Test Voltage U_{eff} 50 Hz acc. to DIN VDE 0110-1, Table A.1	kV	2,21	2,21
Protection Class Housing/Terminals acc. to DIN VDE 0470 Sec. 1:11.92		IP 40/IP 20	IP 40/IP 20
Radiated Noise		EN 50081–1:03.93, –2:03.94	EN 50081–1:03.93, –2:03.94
Noise Immunity		EN 50082–2:1995	EN 50082–2:1995
Ambient Temperature, Working Range	°C	– 25 to + 55	– 25 to + 55
Dimension Diagram: SNE 4004 K; SNE 4004 KV/SNE 4004 K-A; SNE 4004 KV-A		K 2-1/K 2-2	K 2-1/K 2-2
Terminal Diagram		KS 0360-1	KS 0361-1
Max. wire cross section (flexible/single core)	mm^2	1 x 2,5 or 2 x 0,5/1 x 2,5 or 2 x 0,75	1 x 2,5 or 2 x 0,5/1 x 2,5 or 2 x 0,75
Weight	kg	0,2	0,2
Approvals		BG, CSA, UL	BG, CSA, UL
GENERAL TECHNICAL SPECIFICATIONS		Page i.11 Catalog 2	Page i.11 Catalog 2

Protective Gate Monitor

Basic unit complies with EN 60204 - 1 and EN 954 - 1
Simultaneity check
3 NO safety contacts, 1 NC control contact
Meets the requirements of the EN 201 and EN 422 Type II, with sensors it meets the requirements of DIN VDE 0660-209 and EN 64496-1
Dual channel E-Stop control through 2 NO contacts or semiconductors, with cross monitoring

SNT 4053 K	EN 60204 - 1	For Stop Category	0
	EN 954 - 1	Safety Category	4

SNT 4053 K SNT 4053 K-A



For Example

- Protection of persons and machines
- For immediate interruption of the power supply = Stop Category 0
- Monitoring hazardous areas
- Monitoring on protective equipment with a separation function

Function

SNT 4053 K
The protective gate monitor SNT 4053 K is used to monitor switching elements on protective installations and to generate a safety output signal (enable). Depending on the type of construction, the protective installation can be defined as: protective gate, protective door, housing, cover, enclosure, shield etc.. The SNT 4053 K meets the requirements of the EN 201 and EN 422 Type I + II. Sensors and a safety switching device (analyzing unit) form the safety circuit for "non-contacting position switches with safety functions"in accordance with DIN VDE 0660 Part 209 and EN 64496-1.

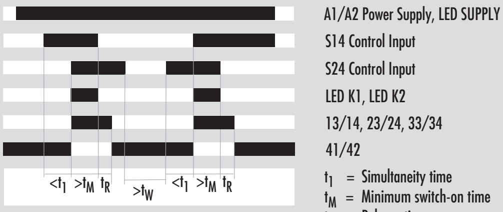
After the supply voltage has been applied to terminals A1/A2 the starting inhibiting circuit prevents an unintentional start-up of the protective gate monitor. The device can be enabled after the start - up test has been performed, i. e. by manually activating the protective installation (in the case of closed installation, by opening and closing, or in the case of opened installation, by opening). With this operation the simultaneous activation of both switching elements (e.g. positioning limit switches, magnetic switches, proximity switches) is thus tested. The device recognizes self - acting failures within the switching elements and their connected wires. If the test is passed the device is only enabled when the protective installation is closed as well as the feedback circuit. If a malfunction occurs in the external contactors connected to the unit, the feedback circuit at terminals Y1/Y2 can prevent the SNT 4053 K to be enabled. Contacts or semiconductor contacts can be used in the control input circuit. Dual channel control input circuit at terminals S14 and S24 with cross monitoring is available. The device performs a cyclic self - test with each signal change at these terminals. If a fault is detected, no new enable takes place. The device has a simultaneity check of the connected switching elements. The connected switching elements must generate a signal sequence within the simultaneity time t_1. If the time t_1 is exceeded the device cannot be enabled. The change of signal is monitored each time the protective installation is closed: i.e. the position of the connected switching elements is monitored. Thereof it is possible to recognize any manipulation and failure in the safety circuit. The green LED SUPPLY displays the presence of the external power supply, the green LED K1 the activation of both switching elements and the green LED K3 the passing of the simultaneity check.

SNT 4053 K-A
Its function corresponds to the one of the SNT 4053 K. Devices with the – A identification in their model reference are equipped with four removable terminals (see Dimension Diagram K 2 - 2). This feature allows a quick installing/removing operation. The terminal locations are coded and not interchangeable.

Function Diagram

FD 0221-20 W1

SNT 4053 K, SNT 4053 K-A

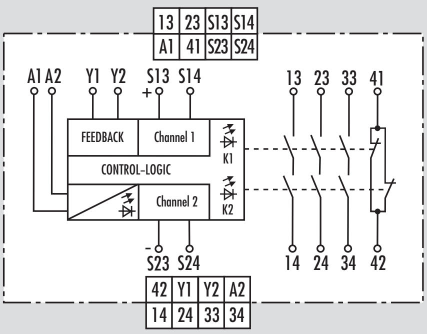


t_1 = Simultaneity time
t_M = Minimum switch-on time
t_R = Release time
t_W = Recovery time

Connection Diagram

SNT 4053 K, SNT 4053 K-A

KS 0357-1



Approvals

ET 98181

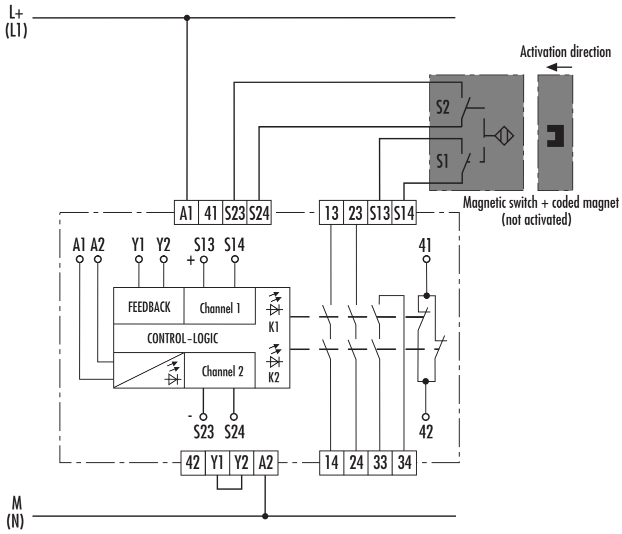
Ordering Example

SNT 4053 K	24 V AC/DC
SNT 4053 K-A	24 V AC/DC
Type	Rated Voltage

Application Example

A 1159

Two - Channel Protective Gate Monitoring with Coded Magnetic Switch (2 NO contacts) and Automatic Start (with cross monitoring)

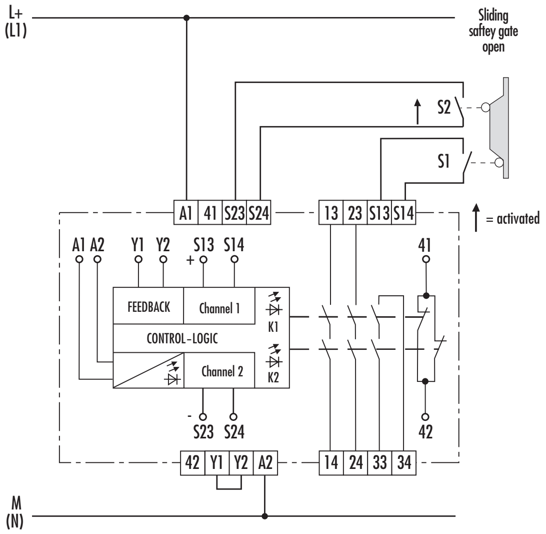


The position of the protective gate is checked by means of the cross monitoring feature via the two channels S13/S14 and S23/S24. After the supply voltage has been applied, the starting inhibiting circuit prevents an unintentional start-up of the protective gate monitor. For the start-up test, the protective gate must be opened and closed once, so that the enable current paths 13/14, 23/24, 33/34 will close and the control contact 41/42 will open. The feedback loop Y1/Y2 must be closed for this, and the two normally open contacts of the magnetic switch must yield a perfect signal sequence within the simultaneity time t1. If the protective gate is opened, K1 and K2 switch into their de-energized position (enable current paths open and control contact closes). If the protective gate is closed again, the device is activated again through the automatic start. If the leads to the magnetic switch are short circuited, then the voltage applied to S13/S14 or S23/S24 is short circuited (cross monitoring). The control voltage collapses, and the relays K1, K2 immediately switch back to their initial position. A new start is not possible until the bridge-fault has been removed, the recovery time of the electronic fuse has elapsed, and the subsequent start-up test has been performed.

Application Example

A 1160

Two - Channel Protective Gate Monitoring with Mechanical Position Switches (2 NO contacts) and Automatic Start (with cross monitoring).

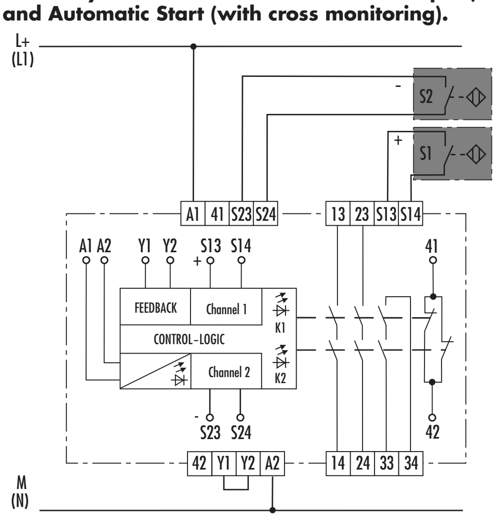


Function as in Application Example A 1159

Application Example

A 1161

Two - Channel Protective Gate Monitoring with Two - Conductor Proximity Sensors with Semiconductor Output (2 NO contacts) and Automatic Start (with cross monitoring).

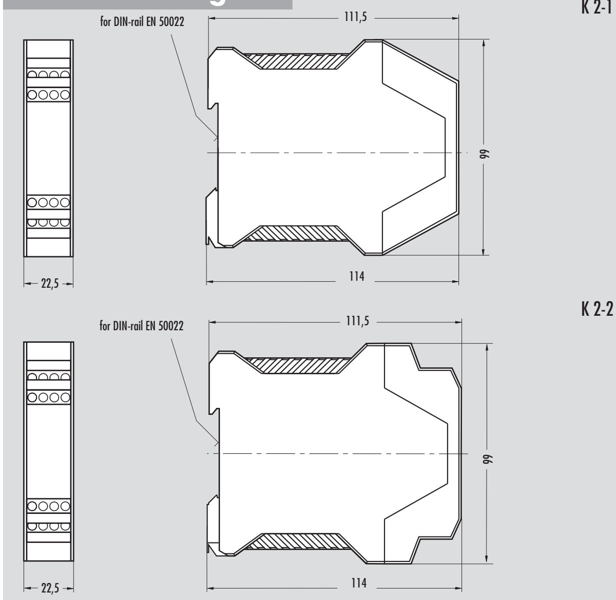


Function as in Application Example A 1159

Notes

- Switching elements with semiconductor outputs in 2-, 3-, or 4-conductor designs can be used (no NAMUR sensors).
- Safety category 4 can be achieved only if the switching elements also correspond to these requirements.
- To multiply the enable current paths, expansion units or external contactors with positively driven contacts can be used.

Dimension Diagram



TECHNICAL DATA

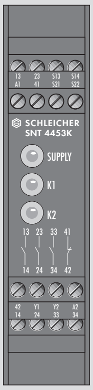
TECHNICAL DATA	Unit	SNT 4053 K / SNT 4053 K-A
FUNCTION According to EN 60204-1		Protective Gate Monitor
Function Display		3 LED, green
Function Diagram		FD 0221-20 W1
POWER SUPPLY DATA		
Rated Voltage U_N	V AC/DC	**24**
Rated Consumption at 50 Hz and Un (AC)	VA	3,8
Rated Consumption at 50 Hz and U_N (AC)	W	2,4
Rated Consumption at Un (DC)	W	2,0
Residual Ripple	V_{ss}	2,4
Rated Frequency	Hz	50 to 60
Operating Voltage Range		0,85 to 1,1 x U_N
CONTROL CIRCUIT only for Supplying the Control Inputs		
DC Isolation Between the Supply Circuit and the Control Circuit		no
Line Resistance in Y1/Y2, S13/S14 and S23/S24 (at U_N)	Ω	≤ 70
Control Outputs Y1, S13, S23:		
Rated Output Voltage	V DC	≤ 24
Rated Current Y1/S13, S23	mA	20/12
Rated Short-Circuit Current I_K max.	mA	1100
Fuse		AC/DC: PTC-Resistance
Response Time	s	2
Recovery Time	s	3
Control Inputs Y2, S14, S24:		
Rated Current Input Y2/S14, S24	mA	20/12
Minimum Swith-ON Time t_M an S14, S24	ms	100
Simultaneity Time t_1 für S14, S24	s	1,5
Release Time t_R	ms	20
Recovery Time t_W	ms	200
When the Control Inputs S14 and S24 Are Driven with a Semiconductor Output, the Following Data Should Be Noted:		
Rated Output Voltage	V DC	10 to 30
Rated Current	mA	> 5
Voltage Drop	V	≤ 5
Residual Current	mA	≤ 1,5
Idling Current (for 3- and 4-Wire Switching Elements)	mA	< 40
OUTPUT CIRCUIT		
Contact Equipment:		3 N.O. Safety Contact 1 N.C. Control Contact
Contact Type		Forced Contact
Contact Material		Ag-Alloy; Gold-Plated
Switching Voltage U_n	V AC/DC	230/230
Maximum Rated Current I_n per Contact	A	6
Maximum Total Current for all Contacts	A	12
Application Category According to EN 60947-5-1:1991		AC–15: U_e 230 V AC, I_e 6 A * DC–13: U_e 24 V DC, I_e 6 A ** DC–13: U_e 24 V DC, I_e 3 A * * 3600 Switch/h ** 360 Switch/h
Short-Circuit Protection, Max. Fuse Element Class gG	A	6
Permissible Switching Frequency	Switching Cycles/h	3600
Mechanical Lifetime	Switching Cycles	10 x 10^6
GENERAL DATA		
Creepage and Clearance Distances Between Circuits According to DIN VDE 0110-1:04.97: Rated Withstand Voltage	kV	4
Over-Voltage Category		III
Contamination Level		3 Outside,2 Inside
Design Voltage	V	300
Test Voltage U_{eff} 50 Hz acc. to DIN VDE 0110-1, Table A.1	kV	2,21
Protection Class Housing/Terminals acc. to DIN VDE 0470 Sec. 1:11.92		IP 40/IP 20
Radiated Noise/Noise Immunity		EN 50081–1:03.93, –2:03.94 EN 50082–2:1995
Ambient Temperature, Working Range	°C	– 25 bis + 55
Dimension Diagram: SNT 4053 K/SNT 4053 K-A		K 2-1/K 2-2
Terminal Diagram		KS 0357-1
Max. wire cross section (flexible/single core)	mm^2	1 x 2,5 or 2 x 0,5/1 x 2,5 or 2 x 0,75
Weight	kg	0,21
Approvals		BG, CSA, UL
GENERAL TECHNICAL SPECIFICATIONS		Page i.11 Catalog 2

Valve Position / Protective Gate Monitor

Basic unit complies with EN 60204-1 and EN 954-1
Simultaneity check
3 NO safety contacts, 1 NC control contact
Meets the requirements of the EN 201 and EN 422 Type II, with sensors it meets the requirements of DIN VDE 0660-209 and EN 64496-1
Dual channel control through 1 NC contact and 1 NO contact, as contacts or semiconductors, with cross monitoring

SNT 4453 K	EN 60204-1	For Stop Category	0
	EN 954-1	Safety Category	4

SNT 4453 K   SNT 4453 K-A



For Example

- Protection of persons and machines
- For immediate interruption of the power supply = Stop Category 0
- Monitoring hazardous areas
- Monitoring on protective equipment with a separation function

Function

SNT 4453 K
The valve position monitor/protective gate monitor SNT 4453 K is used to monitor switching elements on valves or protective installations and to generate a safety output signal (enable). Depending on the type of construction, the protective installation can be defined as: protective gate, protective door, housing, cover, enclosure, shield etc.. The SNT 4453 K meets the requirements of the EN 201 and EN 422 Type I + II. Sensors and a safety switching device (analyzing unit) form the safety circuit for "non-contacting position switches with safety functions"in accordance with DIN VDE 0660 Part 209 and EN 64496-1.

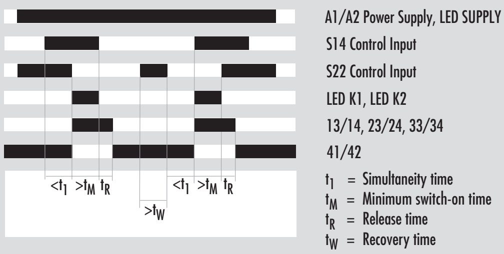
After the supply voltage has been applied to terminals A1/A2 the starting inhibiting circuit prevents an unintentional start-up of the valve position monitor/ protective gate monitor. The device can be enabled after the start-up test has been performed, i.e. by activating the valve or manually activating the protective installation (in the case of closed installation, by opening and closing, or in the case of opened installation, by opening).With this operation the simultaneous activation of both switching elements (e.g. positioning limit switches, magnetic switches, proximity switches) is thus tested. The device recognizes self-acting failures within the switching elements and their connected wires. If the test is passed the device is only enabled when the valve is closed or the protective installation is closed as well as the feedback circuit. If a malfunction occurs in the external contactors connected to the item. The feedback loop at terminals Y1/Y2 can prevent the SNT 4453 K from being enabled, if interference is present at external contactors. Contacts or semiconductor contacts can be used in the control input circuit. Dual channel control input circuit at terminals S14 and S22 with cross monitoring is available. The device performs a cyclic self-test with each signal change at these terminals. If a fault is detected, no new enable takes place. The device has a simultaneity check of the connected switching elements. The connected switching elements must generate a signal sequence within the simultaneity time t_1. If the time t_1 is exceeded the device cannot be enabled. The change of the signal is monitored each time the valve or the protective installation is closed: i.e. the position of the connected switching elements is monitored. Thereof it is possible to recognize any manipulation and failure in the safety circuit. The green LED SUPPLY displays the presence of the external power supply, the green LED K1 the activation of both switching elements and the green LED K3 the passing of the simultaneity check.

SNT 4453 K-A
The function corresponds to the one of the SNT 4453 K. Devices with the – A identification in their model reference are equipped with four removable terminals (see Dimension Diagram K 2 - 2). This feature allows a quick installing/removing operation. The terminal locations are coded and not interchangeable.

Function Diagram

FD 0221-21 W1

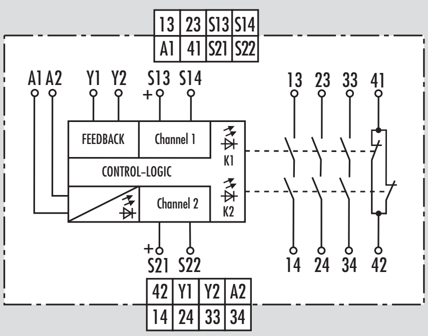
SNT 4453 K, SNT 4453 K-A



Connection Diagram

SNT 4453 K, SNT 4453 K-A

KS 0358-1



Approvals

ET 98181

Ordering Example

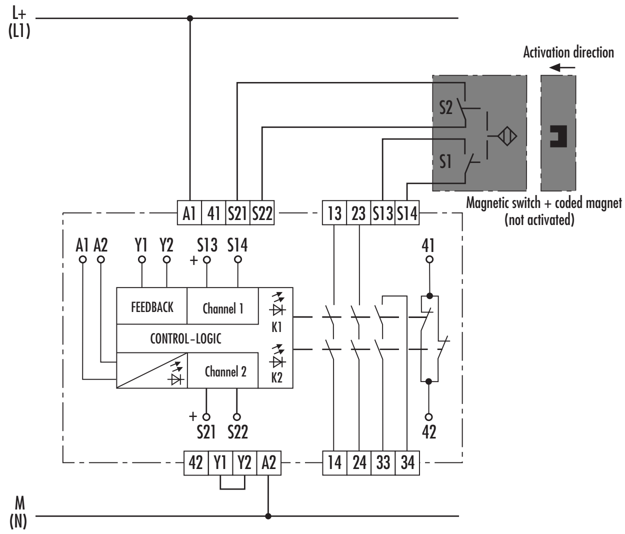
SNT 4453 K	24 V AC/DC
SNT 4453 K-A	24 V AC/DC
Type	Rated Voltage

SNT 4453 K   SNT 4453 K-A

Application Example

A 1164

Two - Channel Protective Gate Monitoring with Coded Magnetic Switch (1 NO + 1 NC contacts) and Automatic Start (with cross monitoring)

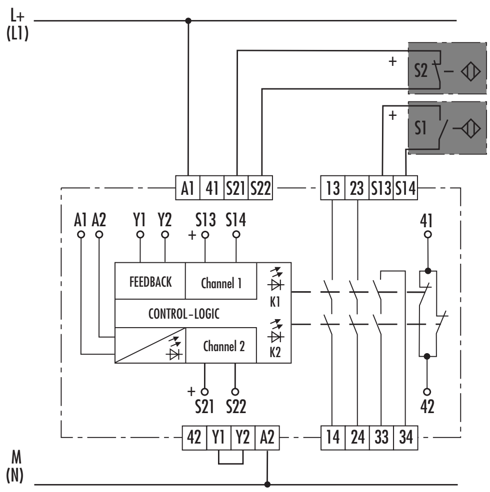


The position of the protective gate is checked by means of the cross monitoring feature via the two channels S13/S14 and S21/S22. After the supply voltage has been applied, the starting inhibiting circuit prevents an unintentional start - up of the protective gate monitor. For the start - up test, the protective gate must be opened and closed once, so that the enable current paths 13/14, 23/24, 33/34 will close and the control contact 41/42 will open. The feedback loop Y1/Y2 must be closed for this, and the two normally open contacts of the magnetic switch must yield a perfect signal sequence within the simultaneity time t1. If the protective gate is opened, K1 and K2 switch into their de - energized position (enable current paths open and control contact closes). If the protective gate is closed again, the device is activated again through the automatic start. If the leads to the magnetic switch are short circuited, then the voltage applied to S13/S14 or S21/S22 is short circuited (cross monitoring). The control voltage collapses, and the relays K1, K2 immediately switch back to their initial position. A new start is not possible until the bridge - fault has been removed, the recovery time of the electronic fuse has elapsed, and the subsequent start - up test has been performed.

Application Example

A 1163

Two - Channel Protective Gate Monitoring with Two - Conductor Proximity Sensors with Semiconductor Output (1 NO + 1 NC contacts) and Automatic Start (with cross monitoring)

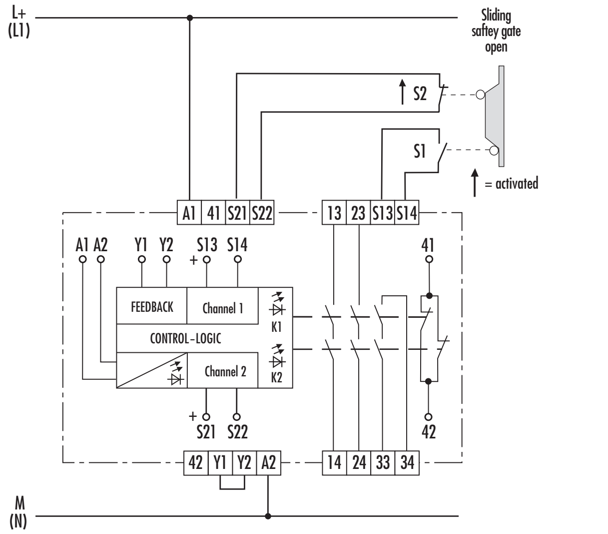


Function as in Application Example A 1164

Application Example

A 1162

Two - Channel Protective Gate Monitoring with Mechanical Position Switches (1 NO + 1 NC contacts) and Automatic Start (with c ross monitoring)

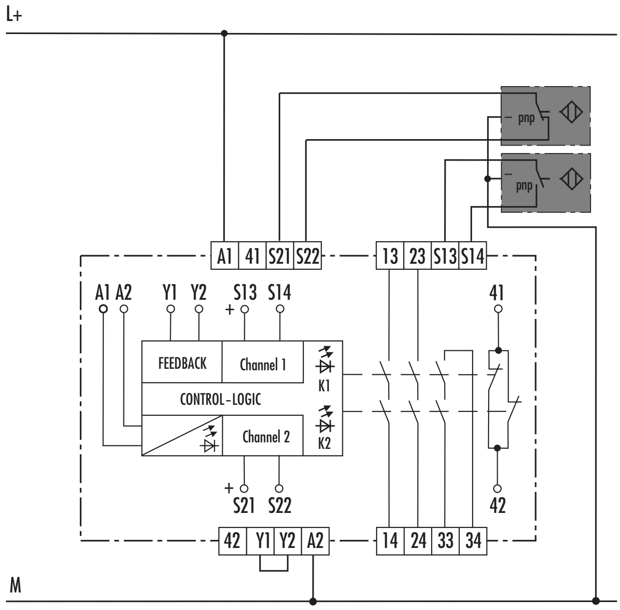


Function as in Application Example A 1164

Application Example

A 3057

Two - Channel Protective Gate Monitoring with Three - Conductor Proximity Sensors (1 NO + 1 NC contacts) and Automatic Start (with c ross monitoring)

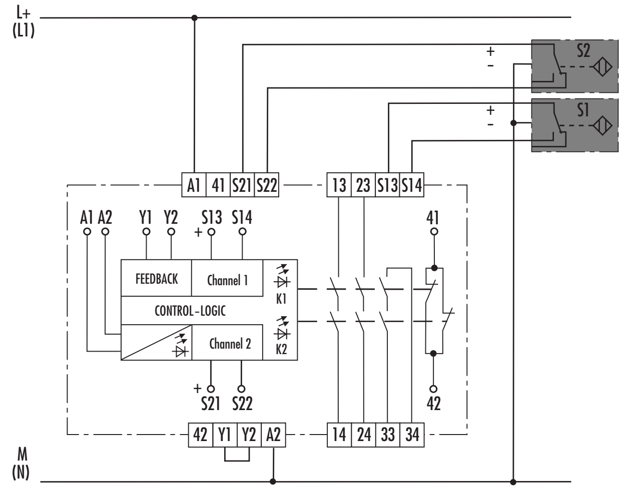


Function as in Application Example A 1164

Application Example

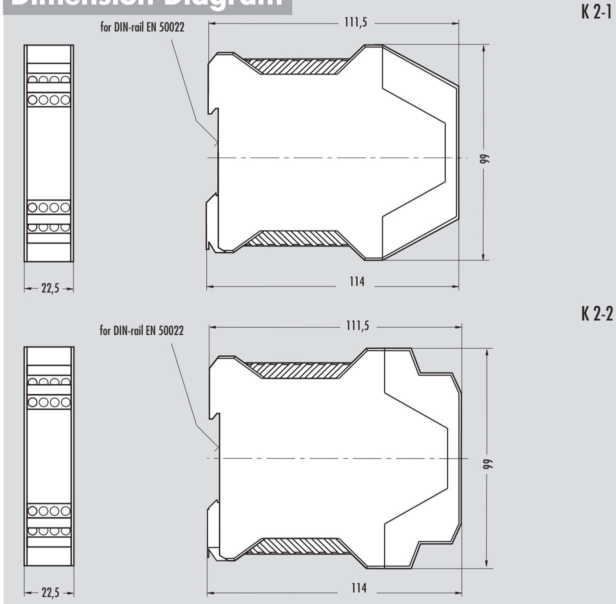
A 1166

Two - Channel Protective Gate Monitoring with Four - Conductor Proximity Sensors (1 NO + 1 NC contacts) and Automatic Start (with c ross monitoring)



Function as in Application Example A 1164

Dimension Diagram



Notes

- Switching elements with semiconductor outputs in 2 -, 3 -, or 4 - conductor designs can be used (no NAMUR sensors).
- Safety category 4 can be achieved only if the switching elements also correspond to these requirements.
- To multiply the enable current paths, expansion units or external contactors with positively driven contacts can be used.

TECHNICAL DATA

		SNT 4453 K / SNT 4453 K-A
FUNCTION According to EN 60204-1		Valve position/Protective Gate Monitor
Function Display		3 LED, green
Function Diagram		FD 0221-21 W1
POWER SUPPLY DATA		
Rated Voltage U_N	V AC/DC	**24**
Rated Consumption at 50 Hz and Un (AC)	VA	3,7
Rated Consumption at 50 Hz and U_N (AC)	W	2,3
Rated Consumption at Un (DC)	W	1,8
Residual Ripple	V_{ss}	2,4
Rated Frequency	Hz	50 to 60
Operating Voltage Range		0,85 to 1,1 x U_N
CONTROL CIRCUIT only for Supplying the Control Inputs		
DC Isolation Between the Supply Circuit and the Control Circuit		no
Line Resistance in Y1/Y2, S13/S14 and S21/S22 (at U_N)	Ω	≤ 70
Control Outputs Y1, S13, S23:		
Rated Output Voltage	V DC	≤ 24
Rated Current Y1/S13, S23	mA	20/12
Rated Short-Circuit Current I_K max.	mA	1100
Fuse		AC/DC: PTC-Resistance
Response Time	s	2
Recovery Time	s	3
Control Inputs Y2, S14, S22:		
Rated Current Input Y2/S14, S22	mA	20/12
Minimum Swith-ON Time t_M an S14, S22	ms	100
Simultaneity Time t_1 für S14, S22	s	300
Release Time t_R	ms	20
Recovery Time t_W	ms	200
When the Control Inputs S14 and S22 Are Driven with a Semiconductor Output, the Following Data Should Be Noted:		
Rated Output Voltage	V DC	10 to 30
Rated Current	mA	> 5
Voltage Drop	V	≤ 5
Residual Current	mA	≤ 1,5
Idling Current (for 3- and 4-Wire Switching Elements)	mA	< 40
OUTPUT CIRCUIT		
Contact Equipment:		3 N.O. Safety Contact 1 N.C. Control Contact
Contact Type		Forced Contact
Contact Material		Ag-Alloy; Gold-Plated
Switching Voltage U_n	V AC/DC	230/230
Maximum Rated Current I_n per Contact	A	6
Maximum Total Current for all Contacts	A	12
Application Category According to EN 60947-5-1:1991		AC–15: U_e 230 V AC, I_e 6 A * DC–13: U_e 24 V DC, I_e 6 A ** DC–13: U_e 24 V DC, I_e 3 A * * 3600 Switch/h ** 360 Switch/h
Short-Circuit Protection, Max. Fuse Element Class gG	A	6
Permissible Switching Frequency	Switching Cycles/h	3600
Mechanical Lifetime	Switching Cycles	10 x 10^6
GENERAL DATA		
Creepage and Clearance Distances Between Circuits According to DIN VDE 0110-1:04.97: Rated Withstand Voltage	kV	4
Over-Voltage Category		III
Contamination Level		3 Outside,2 Inside
Design Voltage	V	300
Test Voltage U_{eff} 50 Hz acc. to DIN VDE 0110-1, Table A.1	kV	2,21
Protection Class Housing/Terminals acc. to DIN VDE 0470 Sec. 1:11.92		IP 40/IP 20
Radiated Noise/Noise Immunity		EN 50081–1:03.93, –2:03.94 EN 50082–2:1995
Ambient Temperature, Working Range	°C	– 25 to + 55
Dimension Diagram: SNT 4453 K/SNT 4453 K-A		K 2-1/K 2-2
Terminal Diagram		KS 0358-1
Max. wire cross section (flexible/single core)	mm^2	1 x 2,5 or 2 x 0,5/1 x 2,5 or 2 x 0,75
Weight	kg	0,21
Approvals		BG, CSA, UL
GENERAL TECHNICAL SPECIFICATIONS		Page i.11 Catalog 2

Two - Hand Relay

Basic Unit
Functional Properties to EN 574 Typ III C, EN 60204 - 1 and EN 954 - 1
Two - Channel Control for each Channel
For Two - Hand and Protective Gate Applications
Simultaneity Check ≤ 0,5 s
2 NO safety contacts, 1 NC control contact

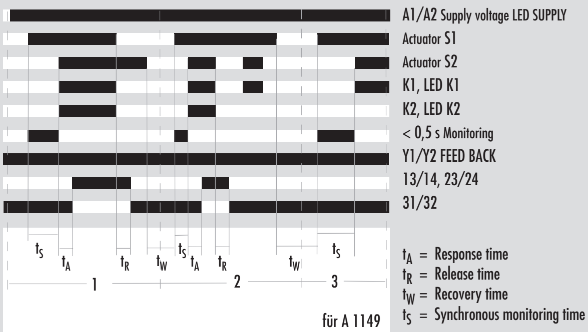
SNZ 4052 K	EN 60204 - 1	For Stop Category	0
SNZ 4052 K - A	EN 954 - 1	Safety Category	4
	EN 547	Requirements	Typ III C

SNZ 4052 K SNZ 4052 K-A

Function Diagram

FD 0221-18-1 W1

SNZ 4052 K, SNZ 4052 K-A

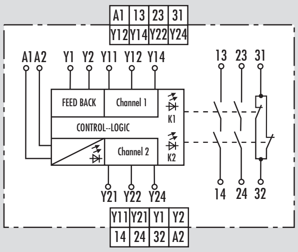


1 Enable in case of synchronous activation.
2 Enable in case of synchronous activation. If one of the actuator is released the unit is immediately desabled. The unit can be enabled again only after both actuators have been released.
3 The unit is not enabled because of no synchronous activation.

Connection Diagram

KS 0221-18 W1

SNZ 4052 K, SNZ 4052 K-A



For Example

- Protection of the operating personnel against injuries during hazardous motions
- For immediate interruption of the power supply = Stop Category 0
- Monitoring of two - hand applications
- Monitoring of protective screens
- Protection of persons and machines

Function

SNZ 4052 K
The SNZ 4052 K complies with the EN 574 Type III C requirements. The safety behavior of the SNZ 4052 K is designed according to the performance level for safety category 4 (EN 954 - 1). Machines whose operation requires repeated motion of the hands into the hazardous zone may be operated with this relay.
The relay SNZ 4052 K is single-fault safe and has self-monitoring. Synchronous activation within 0,5 s of both actuators (two-hand momentary-contact or protective gate switches) is monitored. Each of the two two-hand momentary-contact switches is connected to the relay with a normally open contact and a normally closed contact. The technical design of the input circuit provides cross and ground-fault monitoring. The output function is designed to be positively driven with two normally open contacts as enabling contacts, and with one normally closed contact as control contact. After the supply voltage is applied to terminals A1/A2 and with closed feedback circuit (terminals Y1/Y2), the enable current paths are opened by activating simultaneously the actuators (S1 and S2). Both momentary contact switches must be activated synchronously within 0,5 s for the output contacts to be enabled. If only one of the two hand switches is released during the hazardous closure motion, the two-hand relay is immediately de-excited. The enabling current paths open. The relay can be restarted only after both actuator elements have returned to their initial position (e.g. the two-hand momentary contact switches have been released) and the feedback circuit is closed again. The feedback circuit should only be opened again after both actuators are activated. Otherwise the relay stays in its off-position. The current status of the relay is indicated by three LEDs: application of the supply voltage with LED SUPPLY, activation of both actuators with LED K1 and with LED K 2 in addition in case of synchronous activation.

SNZ 4052 K-A
The function corresponds to the one of the SNZ 4052 K. Devices with the – A identification in their model reference are equipped with four removable terminals (see Dimension Diagram K 2 - 2). This feature allows a quick installing/removing operation. The terminal locations are coded and not interchangeable.

Notes

- To multiply the enabling current paths, the expansion units or external contactive elements with positively driven contacts can be used..
- The safety category according to EN 954 - 1 also depends from the external circuit, the choice of the control station and is location on the machine.

Approvals

ET 98044
EG - Baumuster - Prüfbescheinigung

Order Example

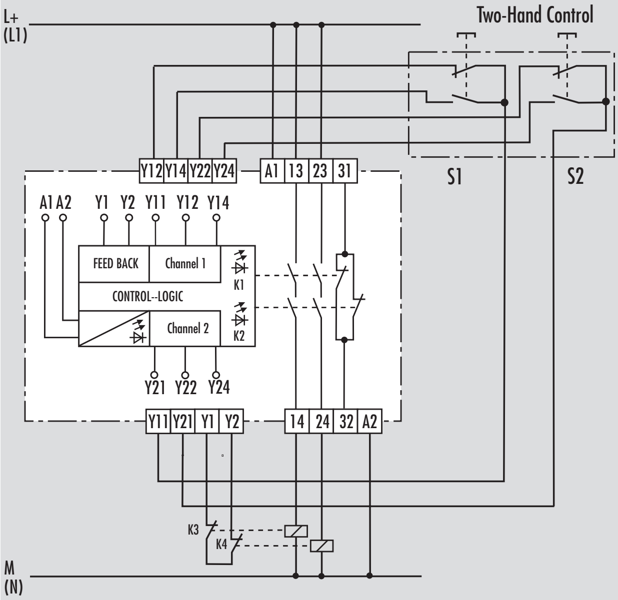
SNZ 4052 K	24 V AC/DC
SNZ 4052 K-A	24 V AC/DC
Type	Rated Voltage

SNZ 4052 K SNZ 4052 K-A

Application Example

A 1149

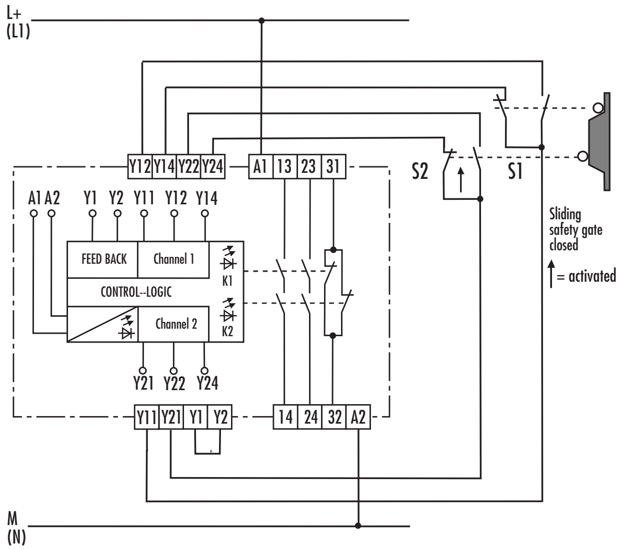
Two-Hand Control acc. to Type III C for Safety Category 4 with external Contact Expansion



Application Example

A 1150

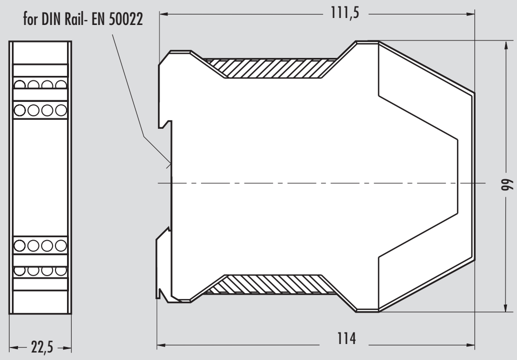
Two-Channel Protective Gate Application with Cross Monitoring and Automatic Start



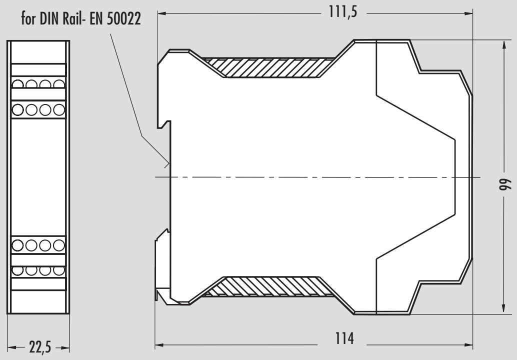
Channel 1 (Y11) and channel 2 (Y21) monitor the position of the sliding protective gate. The SNZ 4052 K is activated with an automatic START. If the sliding protective gate opens, the two-hand relay switches back to their off position (enable current paths 13/14, 23/24 are opened). If the protective gate is closed again, the automatic START activates the two-hand relay again.

Dimension Diagram

K 2-1



K 2-2



Technical Data

Technical Data		SNZ 4052 K / SNZ 4052 K-A
FUNCTION According to EN 60204-1		Two-Hand-Relay
Function Display		3 LED, green
Function Diagram		FD 0221-18-1 W1
POWER SUPPLY DATA		
Rated Voltage U_N	V AC/DC	**24**
Rated Consumption at 50 Hz and Un (AC)	VA	2,7
Rated Consumption at 50 Hz and U_N (AC)	W	1,6
Rated Consumption at Un (DC)	W	1,5
Residual Ripple	V_{ss}	2,4
Rated Frequency	Hz	50 to 60
Operating Voltage Range		0,85 to 1,1 x U_N
CONTROL CIRCUIT only for supplying the control inputs		
Line Resistance between Y1/Y2, Y11/Y12/Y14 and Y21/Y22/Y24 (at U_N)	Ω	≤ 70
Control Outputs Y12/Y14 bzw. Y22/Y24 and Y1:		
Rated Output Voltage	V DC	24
Rated Current	mA	60
Rated Short-Circuit Current I_K max.	mA	1000
Fuse		AC/DC: PTC-Resistance
Response Time	s	2
Recovery Time	s	3
Control Inputs Y11, Y21, Y2:		
Rated Current Input	mA	60
Response Time t_A K1, K2	ms	40
Recovery Time t_R	ms	< 50
Simultaneity check t_S	ms	≤ 500
Recovery Time t_W	ms	≤ 250
OUTPUT CIRCUIT		
Contact Equipment:		2 N.O. Safety Contact 1 N.C. Control Contact
Contact Type		Forced Contact
Contact Material		Ag-Alloy; Gold-Plated
Switching Voltage U_n	V AC/DC	230/230
Maximum Continuous Current per Contact	A	6
Total of All Contact Currents	A	12
Application Category According to EN 60947–5–1:1991		AC–15: U_e 230 V AC, I_e 6 A (3600 Sch/h) DC–13: U_e 24 V DC, I_e 6 A (360 Sch/h) DC–13: U_e 24 V DC, I_e 3 A (3600 Sch/h)
Short-Circuit Protection, Max. Fuse Element Class gG	A	6
Permissible Switching Frequency	Switching Cycles/h	3600
Mechanical Lifetime	Switching Cycles	10 x 10^6
GENERAL DATA		
Creepage and Clearance Distances Between Circuits According to DIN VDE 0110-1:04.97:Rated Withstand Voltage	kV	4
Over-Voltage Category		III
Contamination Level		3 Outside, 2 Inside
Design Voltage	V	300
Test Voltage U_{eff} 50 Hz acc. to DIN VDE 0110-1, Table A.1	kV	2,21
Protection Class Housing/Terminals acc. to DIN VDE 0470 Sec. 1:11.92		IP 40/IP 20
Radiated Noise		EN 50081–1:03.93, –2:03.94
Noise Immunity		EN 50082–2:1995
Ambient Temperature, Working Range	°C	– 25 to + 55
Dimensional diagram: SNO 4052 K/SNO 4052 K-A		K 2-1/K2-2
Terminal Diagram		KS 0221-18 W1
Max. wire cross section (flexible/single core)	mm^2	1 x 2,5 or 2 x 0,5/1 x 2,5 or 2 x 0,75
Weight	kg	0,2
Approvals		EG, CSA, UL
GENERAL TECHNICAL SPECIFICATIONS		Page i.11 Catalog 2

Relays and Automation Systems

Schleicher GmbH & Co. Relais - Werke KG
Pichelswerderstraße 3 - 5, D - 13597 Berlin
Telefon (030) 3 30 05 - 0, Telefax (030) 33 00 53 40
Internet http://www.schleicher - de.com
Email: relay - division@schleicher - de.com

DE084GB12983 · Printed in Germany