

SRK MULTI SAFETY RELAY MODULE

Installation, use and maintenance guide



SAFETY RELAY SRK MULTI SAFETY RELAY MODULE

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OVERVIEW

The SRK MULTI safety relay module main features are the following:

- Different safety functions selectable via rotary switch:
 - Safety barrier with fail safe outputs
 - Dual channel emergency stop button
 - Gate monitoring applications
 - Two-hand control
 - Type 2 safety photocells
- Restart manual or automatic selectable
- 2 N.O. outputs with guided contact safety relays
- 1 system monitor PNP output
- 1 external contactors feedback input
- 1 System test input (for Type 2 light curtains)

OPERATING MODES

By means of the rotary switch on the relay frontal panel it is possible to select between different operating modes:

Rotary switch position	Operating mode selected	Operating mode description
P	Programming	Programming mode start
1	1A	OSSD double input, automatic restart mode
2	1C	OSSD double input, monitored restart mode
3	2A	Gate monitoring/Emergency stop function, automatic restart mode
4	2M	Gate monitoring/Emergency stop function, manual restart mode (not monitored)
5	2C	Gate monitoring/Emergency stop function, monitored restart mode
6	3A	Two-hands control, automatic restart mode, two N.O. contacts
7	3C	Two-hands control, automatic restart mode, changeover contact
8	4A	Type 2 photocells control, automatic restart mode
9	4C	Type 2 photocells control, monitored restart mode

Table 1 - Operating Modes

PROGRAMMING THE SAFETY RELAY

SRK MULTI provides a rotary switch for its mode of operation selection on the front panel. The programming sequence is the following:

STEP	OPERATION
1	Set the rotary switch to configuration position P
2	Switch on the power supply of the device
	The LED IN1 is flashing green (the device is waiting the programming)
3	Adjust the rotary switch to the needed position (refer to Table 1 - Operating Modes)
	During the rotation the LED IN2/FAIL lapse green by every step
4	Wait 5 seconds until LED IN1 flashes three times (memorization) and remains on
5	Turn OFF the power (the device is now ready to work)



Figure 1

OPERATING MODES

With **automatic restart modes**, the outputs of the safety relay follow the status of the input.

With **monitored restart modes**, the outputs of the safety relay are activated only if the safety relay inputs (terminals 7 & 8) are both active and after sending the RESTART signal to the relay using the push-button or by means of a specific command on the RESTART input (terminal 4).

The RESTART command is active with a voltage of 24VDC.

The minimum duration of the command is 100 ms.

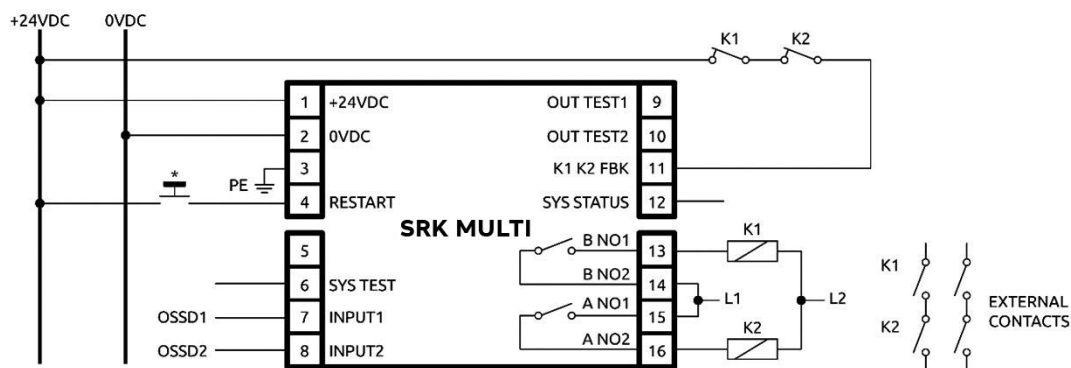
With **manual restart mode (2M)**, the outputs of the safety relay are activated only if the safety relay inputs (terminals 7, 8) are both active and after sending the RESTART signal to the relay using the push-button or by means of a specific command on the RESTART input (terminal 4) (*please refer to "The RESTART command" section*).

The RESTART command is active with a voltage of 24VDC.

- In manual restart mode (2M), with the RESTART signal permanently connected to 24VDC the safety relay works in automatic restart mode.
- Use in monitored restart mode (start/restart interlock activated) is mandatory in case the safety device controls an access protecting a danger zone and once a person has passed through the opening, he/she may remain in the danger zone without being detected (use as trip device according to EN 61496). Failure to comply with this rule may result in very serious risks for the persons exposed.

OPERATING MODE EXAMPLES

OPERATING MODES 1A, 1C



* not necessary if set in automatic operation mode (1A)

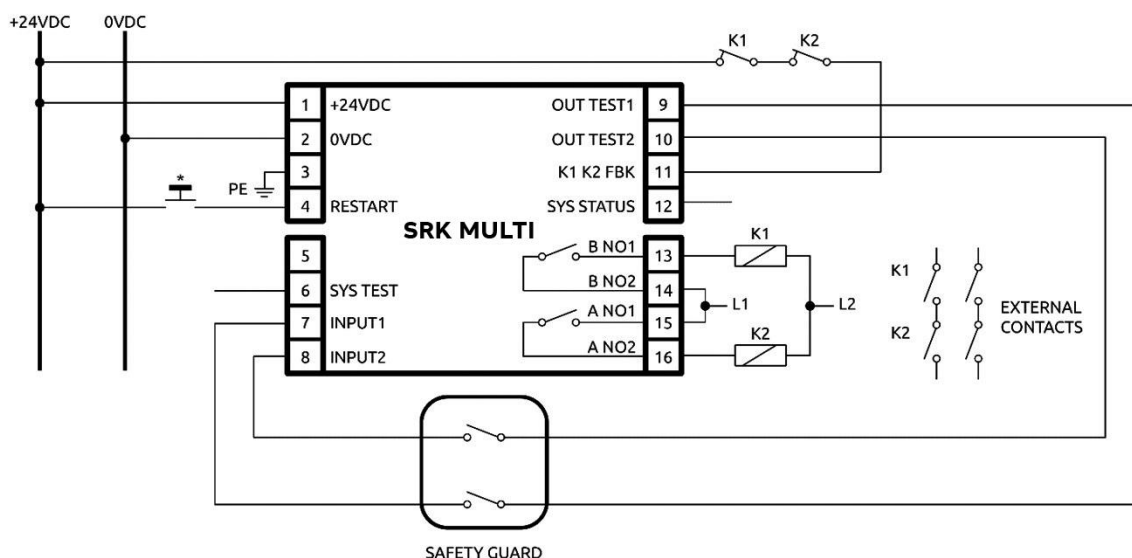
Figure 2

In these operating modes (1A, 1C) it is possible to monitor two semiconductor safety outputs (OSSD1, OSSD2) coming from ESPE (light curtains, laser scanner, etc) or other equipment with OSSD output pair (inductive safety sensor, RFID safety sensor, etc).

The selection between automatic or monitored restart mode is made by the rotary switch (1A or 1C) while the EDM control is selected with appropriate wiring.

- Without EDM it is mandatory to connect terminal 11 to terminal 12 (e.g. in Figure 9).

OPERATING MODES 2A, 2M, 2C



* not necessary if set in automatic operation mode (2A)

Figure 3

In these operating modes (2A, 2M, 2C) it is possible to monitor two inputs coming from safety gate, safety guard or similar (two channels electromechanical safety switch).

Short circuit between the two channels or between the channels and 24VDC are detected by means of the OUT TEST1, OUT TEST2 signals generated by the safety relay.

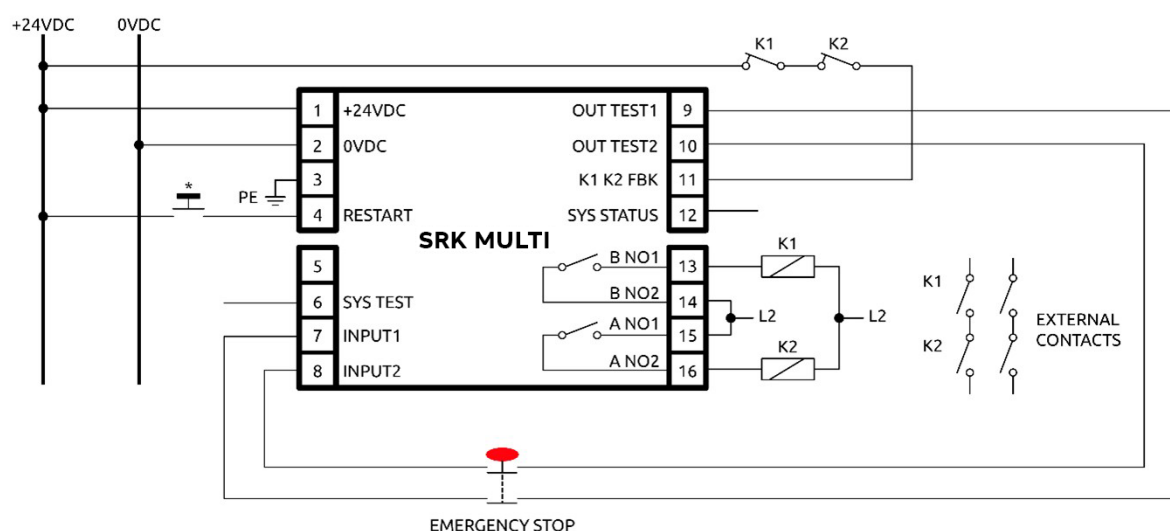
Between the two channels a simultaneity check is performed (within 1 sec).

- ➔ If the simultaneity is not respected, the system remains in OFF with an alternate flashing of the LEDs IN1 - IN2/FAIL. To reactivate the outputs, it is necessary to re-open and close INPUT1 and INPUT2 (respecting the simultaneity).

The selection between automatic, monitored, or manual restart mode is made by the rotary switch (2A, 2M or 2C) while the EDM control is selected with appropriate wiring.

- ⚡ Without EDM it is mandatory to connect terminal 11 to terminal 12 (e.g. in Figure 9).

- ➔ Same operating modes must be used to monitor emergency stop actuators.



* not necessary if set in automatic operation mode (2A)

Figure 4

OPERATING MODE 3A, 3C

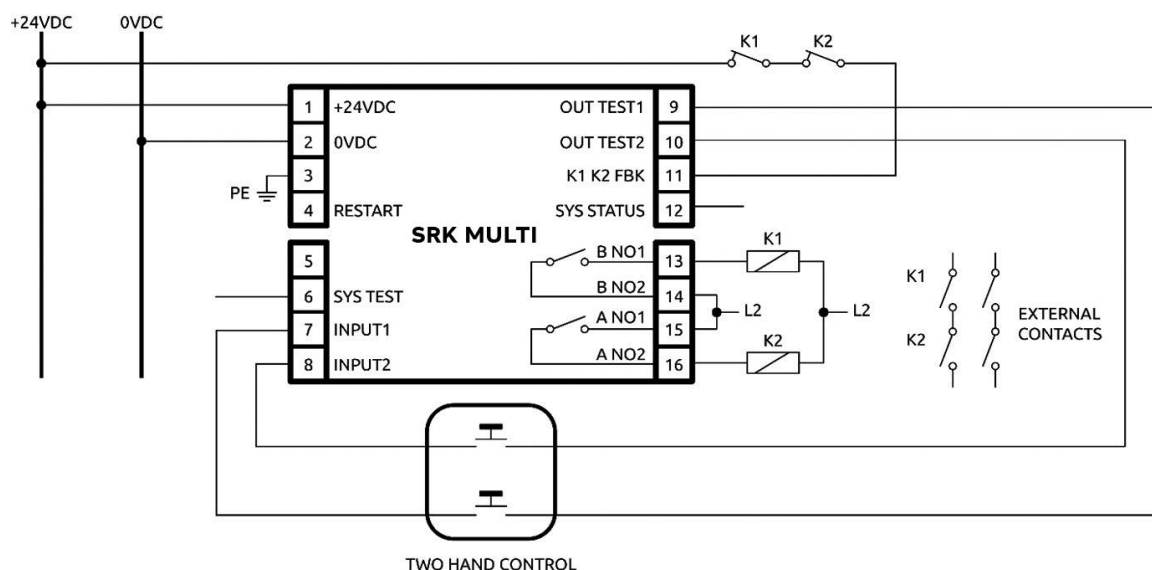


Figure 5 – Mode 3A

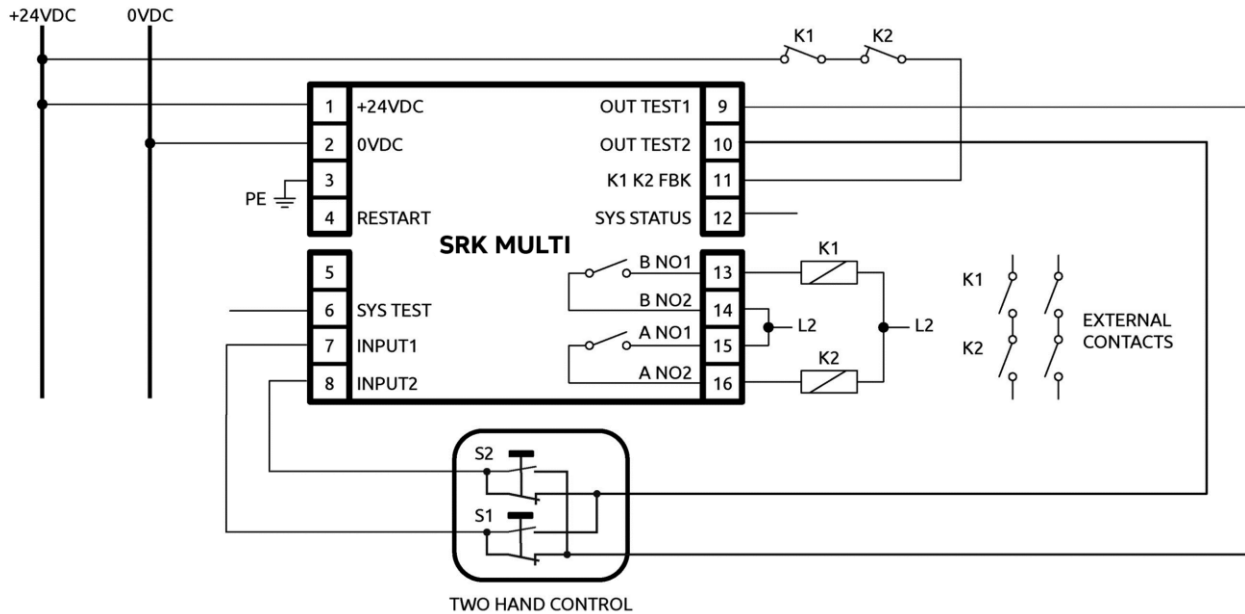


Figure 6 – Mode 3C

In these operating modes (3A, 3C) it is possible to perform a two-hands-control function.

Short circuit between the two channels or between the channels and 24VDC are detected by means of the OUT TEST1, OUT TEST2 signals generated by the safety relay.

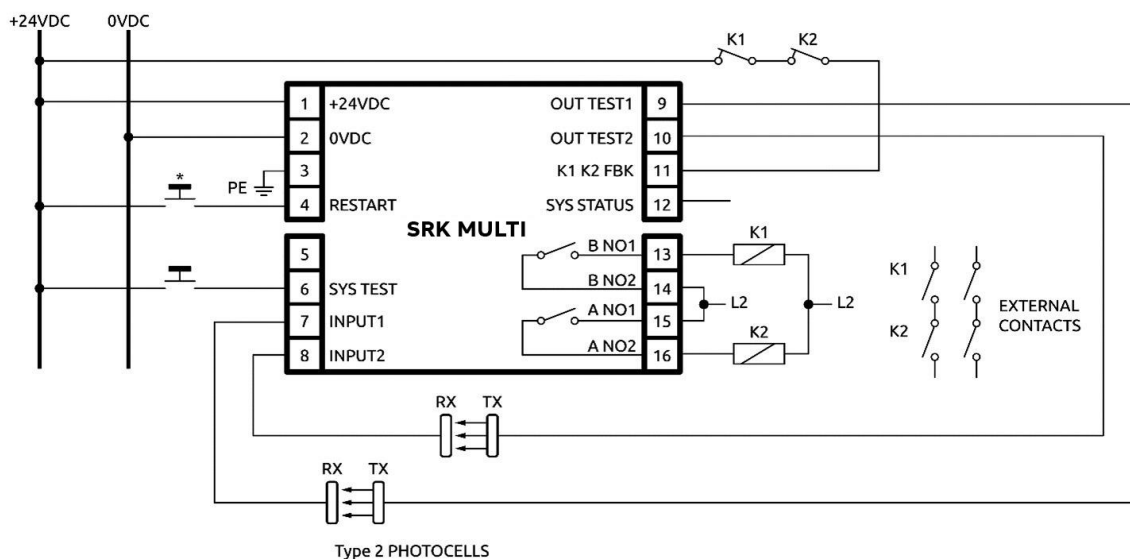
Between the two channels a simultaneity check is performed (within 500 msec).

The selection of the operating mode is made by the rotary switch (3A, 3C) while the EDM control is selected with appropriate wiring.

 Without EDM it is mandatory to connect terminal 11 to terminal 12 (e.g. in Figure 9).

- ➔ Please note that the two-hands-control contacts can be:
- in mode 3A a double NO contact (according to EN 574 - IIIA)
 - in mode 3C a changeover contact (according to EN 574 - IIIC)



OPERATING MODES 4A, 4C



* not necessary if set in automatic operation mode (4A)


Figure 7

In these operating modes (4A, 4C) it is possible to monitor Type 2 photocells (from 1 to 4).

-  Connecting SRK MULTI to Type 2 photocell(s) the safety levels of the system will reduce to SIL 1, SILCL 1, PL c, Cat. 2, Type 2.
-  Perform an in-depth risk analysis to determine the appropriate safety level for your specific application, based on all the applicable standards.

(Refer to the “NEW SAFETY PARAMETERS FOR TYPE 2 BARRIERS AND MANDATORY LABELLING” section).

The selection between automatic or monitored restart mode is made by the rotary switch (4A, 4C) while the EDM control is selected with appropriate wiring.

-  Without EDM it is mandatory to connect terminal 11 to terminal 12 (e.g. in Figure 9).

A SYS TEST input is available to perform a complete test of the system.

NEW SAFETY PARAMETERS FOR TYPE 2 BARRIERS AND MANDATORY LABELLING

- ➔ With the publication of Edition 3 of the harmonized EN 61496-1 standard it is no longer possible to use a Type 2 safety light barrier for safety functions assessed as SIL 2 / PL d.
- ➔ If a safety level of SIL 2 / PL d (or higher) is required and it is nevertheless intended to use a safety light barrier, then it will be necessary to use a Type 4 safety light barrier.
- ➔ This regulatory requirement derives from the fact that the reduction of risk that can be obtained via a photoelectric safety barrier is not only a function of the safety level of its electronic parts but is also determined by its systematic capabilities (for example: environmental influences, EMC, optical performance, and detection principle).
- ➔ The systematic capability of a Type 2 photoelectric barrier may in fact not be sufficient to ensure adequate risk reduction for SIL 2 / PL d applications.
- ➔ The standard also establishes that the labelling of Type 2 safety barriers must indicate such limitation to SIL 1 / PL c.
- ➔ The PFHd values declared for the electronic control part of the device, on the other hand, are not limited and therefore it is possible to use the PFHd value provided by the manufacturer of the device in the global assessment of the safety function, even if it exceeds the SIL 1 / PL c range.






ELECTRICAL CONNECTIONS



Figure 8

SRK MULTI is provided with terminal blocks for the electrical connections.
The unit provides 16 terminals.

➔ Terminal tightening torque: 5 to 7 lb-in
(0,6 to 0,7 Nm).

-  Install SRK MULTI in an enclosure with a protection class of at least IP54.
-  Connect the safety relay module when it is not powered.
-  The supply voltage to the units must be $24 \pm 20\%$ VDC; PELV (in compliance with the standard EN 60204-1 (Chapter 6.4)).
-  Do not use the SRK MULTI to supply external devices.
-  The same ground connection (0VDC) must be used for all system components.

INSTRUCTIONS CONCERNING CONNECTION CABLES

- ➔ Wire size range: AWG 12 to 30, (solid/stranded) (UL).
- ➔ Use 60/75°C copper (Cu) conductor only.
- ➔ We recommend the use of separate power supplies for the safety controller and for other electrical power equipment (electric motors, inverters, frequency converters) or other sources of disturbance.
- ➔ Cables used for connections longer than 50m must have a cross-section of at least 1mm² (AWG16).

PINOUT

TERMINAL	SIGNAL NAME	TYPE OF SIGNAL	DESCRIPTION
1	24VDC	-	Power supply 24VDC
2	0VDC	-	Power supply 0VDC
3	PE	-	Ground connection
4	RESTART	Input	Restart command
5	-	-	-
6	SYS TEST	Input	Test for Type 2 photocell application
7	INPUT1	Input	Safety Input 1
8	INPUT2	Input	Safety Input 2
9	OUT TEST1	Output	Test output 1 for mechanical switch
10	OUT TEST2	Output	Test output 2 for mechanical switch
11	K1 K2 FBK	Input	Feedback external contactors K1K2
12	SYS STATUS	Output	Output status
13	B NO1	Output	Safety relay B, contact 1 (N.O.)
14	B NO2	Output	Safety relay B, contact 2 (N.O.)
15	A NO1	Output	Safety relay A, contact 1 (N.O.)
16	A NO2	Output	Safety relay A, contact 2 (N.O.)

Table 2

CHECKLIST AFTER INSTALLATION

The SRK MULTI safety relay Module is able to detect in real time the faults.

To support proper operation of the system perform the following checks at start up and at least every year:

OPERATION / CONTROL	COMPLETE
1. Verify the correct fixing of SRK MULTI to the Omega rail.	<input type="checkbox"/>
2. Verify that all the cables are correctly inserted and the terminal blocks well screwed.	<input type="checkbox"/>
3. Verify the positioning of all the sensors connected to SRK MULTI.	<input type="checkbox"/>
4. Verify that all the LEDs (indicators) light on correctly.	<input type="checkbox"/>
5. Verify that all the external indicators (lamps) work properly.	<input type="checkbox"/>
6. Operate a complete System Test.	<input type="checkbox"/>

Table 3

- ➔ The System Test is mandatory only if a Type 2 device is connected upstream to SRK MULTI safety relay (e.g., photocell, safety barrier, etc).
- ➔ The SYS TEST command must be sent to SRK MULTI connecting terminal 6 to the 24VDC for a time $t > 40 \text{ msec}$ and remains operative as long as the terminal 6 is connected to 24VDC.

INPUT AND OUTPUT

THE RESTART COMMAND

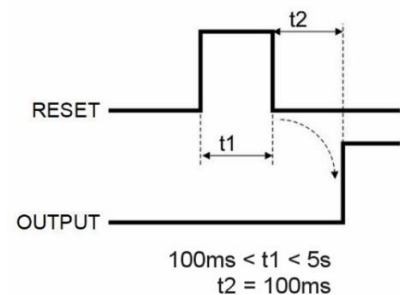
The RESTART command allows SRK MULTI to manage Manual operation.

- ⚡ The RESTART command must be installed outside the danger area in a position where the danger area and the entire work area concerned are clearly visible.
- ⚡ It must not be possible to reach the control from inside the danger area.

RESTART in monitored restart modes

In monitored restart modes, the outputs of the safety relay are activated only if the safety relay inputs (terminals 7, 8) are both active and after sending the RESTART signal to the relay using the push-button or by means of a specific command on the RESTART input (terminal 4).

- ➔ The RESTART command must be sent to SRK MULTI connecting terminal 4 to the 24VDC, respecting the behaviour of the timing beside.
- ➔ The contact used for the RESTART command must be able to switch a voltage of 24VDC and a current of 10mA (guaranteeing a closing time $> 100 \text{ ms}$).
- ➔ The whole SYSTEM RESET TIME is obtained adding the reset time of external contactors K1K2 to the reset time of SRK MULTI.



K1K2 FEEDBACK INPUT

Using the K1 and K2 auxiliary safety contactors with guided contact safety type, it is necessary to connect the +24VDC to the **K1 K2 FBK** through the series of the K1-1 and K2-1 N.C. control contacts.

- ➔ The control of the correct switching of K1 and K2 is performed with a delay of 300ms.

- ⚡ If required by the application, the response time of the external contactors must be verified by an additional device.
- ⚡ When the K1-1 and K2-1 N.C. control contacts are not used (or no control is provided) it is mandatory to connect the terminal 11 (K1K2 FBK) to terminal 12 (SYS STATUS). *Following an example of 1A/1C mode wiring diagram without EDM (Figure 9)*

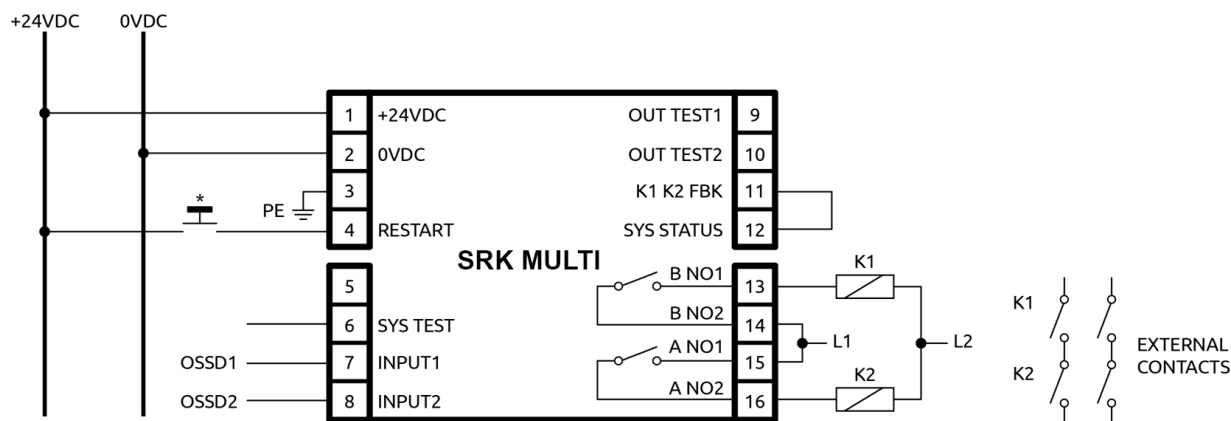


Figure 9

SYSTEM STATUS OUTPUT

The SYSTEM STATUS output reports exactly the output safety relays condition:

- When the output relays are opened, the SYSTEM STATUS reports 0VDC.
- When the output relays are closed, the SYSTEM STATUS reports +24VDC.

CHARACTERISTICS OF THE OUTPUT CIRCUIT

For the output circuit, the safety relay module uses two guided contact safety relays.

These relays are rated by the manufacturer for voltage and current values above those indicated in the technical data; however, to enable correct insulation and to significantly reduce potential damage or premature aging, protect each output line with an appropriate fuse (depending on the load). Check that load characteristics comply with the indications given in the table below.

Minimum switching voltage	18 VDC
Minimum switching current	20 mA
Maximum switching voltage	250 VAC
Maximum switching current	6A(AC) / 6A(DC)

USE OF K1 AND K2 AUXILIARY CONTACT ELEMENTS.

For loads with higher voltage and current characteristics than those indicated in the table above, use of auxiliary external relays or contactors suitable for the load to be controlled is recommended.

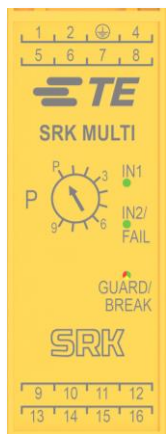
- The K1 and K2 auxiliary contactors or relays must be of the guided contact safety type.
- Referring to the table below, pay particular attention to the configuration of the control contacts on terminal 11 and that of the contacts of use.

	Auxiliary Relay K1	Auxiliary Relay K2
Control contacts	K1-1 normally closed	K2-1 normally closed
Use contacts	K1-2 normally open	K2-2 normally open

- Control contacts K1-1 and K2-1 (terminal 11) must be able to switch a current of 10mA and a voltage of 24VDC.

STATUS INDICATORS

NORMAL OPERATION



LED	COLOR	STATUS/COLOR	CONDITION
IN1	Green	ON	Input1 ON
		OFF	Input1 OFF
IN2/ FAIL	Red Green	RED	Fault detected
		GREEN	Input2 ON
		OFF	Input2 OFF
GUARD/ BREAK	Green Red Yellow	RED	Output relays opened
		RED blinking	The number of blinks show the type of FAIL (only with red FAIL LED ON)
		GREEN	Output relays closed
		YELLOW	Input ON, Output OFF and waiting for Restart
IN1/IN2	Green	Blinking alternately	Wrong simultaneity check detected

Table 4

- ➔ The max Simultaneity check value will be:
 - Mode 3A, 3C: **500 msec**
 - Mode 2A, 2M, 2C: **1 sec**
- ➔ Please refer to the "OPERATING MODE EXAMPLES" section for a detailed explanation of the simultaneity check.
- ➔ Please refer to the "FAULT DIAGNOSIS" section for a detailed explanation of the detected fault.

FAULT DIAGNOSIS



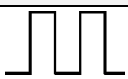





LED			MEANING
IN1	IN2/FAIL	GUARD/BREAK (RED LED pulses)	
OFF	RED	 (2 pulses)	▪ Possible fault of Microcontroller board
OFF	RED	 (3 pulses)	▪ Internal relays fault
OFF	RED	 (4 pulses)	▪ K1K2 external relays fault
OFF	RED	 (5 pulses)	▪ User configuration failure
OFF	RED	 (6 pulses)	▪ User configuration changed without system restart
OFF	RED	 (7 pulses)	▪ Possible overload or ▪ SYSTEM STATUS connection error

Table 5

TECHNICAL DATA

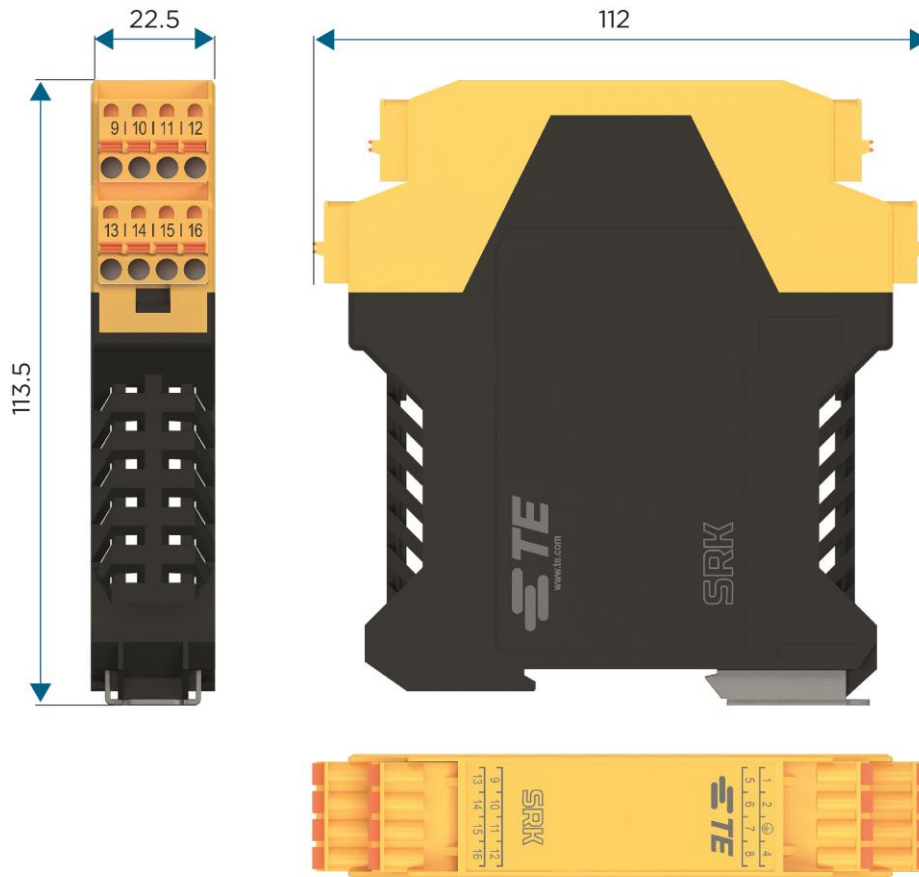
SAFETY DATA	VALUE	STANDARD
Safety level	Type 4	EN 61496-1: 2020
	SIL 3	EN 61508: 2010
	SILCL 3	EN 62061: 2005 / A2: 2015
	Cat.4	EN ISO 13849-1: 2015
Performance level	PLe	EN ISO 13849-1: 2015
PFHd	5,06E-09	EN 61508: 2010
MTTFd (Refer to next table)		EN ISO 13849-1: 2015
DCavg	99 %	
Device lifetime	20 years	
Certifications	cULus, TÜV	

Load	B10d	Number of Commutations	PFHd *	DCavg #	MTTFd # (years)	PL #	CCF #
2A@230Vac	400.000	1 every 30s	1,73E-07	99,00%	25,13	d	80%
		1 every min	8,89E-08	99,00%	46,92	e	80%
		1 every hour	6,45E-09	98,98%	318,27	e	80%
		1 every day	5,14E-09	98,97%	350,48	e	80%
0,5A@24VDC	200.000	1 every 30s	3,41E-07	99,00%	13,03	d	80%
		1 every min	1,73E-07	99,00%	25,13	d	80%
		1 every hour	7,85E-09	98,98%	289,86	e	80%
		1 every day	5,23E-09	98,97%	348,13	e	80%

* EN 61508:2010, EN 62061:2005/A2:2015; # EN ISO 13849-1: 2015

ELECTRICAL PARAMETERS	VALUE
Power supply	24 ± 20% VDC; PELV
Rated impulse between PELV and relay contacts	6 kV
Power requirement	3W max
Protection	Overload protected STATUS output
INPUT DATA	VALUE
Inputs number/data (type 3)	4 / according to standard EN61131-2, type 3
Input current	Typical 4.3mA
Input voltage	0VDC to 30VDC
Inputs number/data (type 2)	1 / according to standard EN61131-2, type 2
Input current	Typical 10mA
Input voltage	0VDC to 30VDC
Number of EDM input	1 N.C. contact
EDM Response time	300ms
System Test Input	100mA@24VDC; (t>40 msec)
OUTPUT DATA	VALUE
System Status Output	100mA@24VDC
Number of safety output	2 N.O. contacts
Type	Relays with forced guided contacts
Max switching voltage	250VAC , 125 VDC, Overvoltage Category III
Max switching current	6A (AC), 6A (DC)
Max switching power	1500VA, 180W (85W if load voltage >30Vdc)
Max Response time	20ms
Mechanical service life	10 x 10E6
Electrical service life AC1 at 360 switchings/h	> 10E5
CONNECTIONS / OPERATION	VALUE
Operating modes	Automatic, Monitored or Manual selectable via rotary switch
Connections	16 Terminal blocks with protection against reversal of polarity
Status indicators	LED: Input status – Output status – Fail
Max. length of connections	100m
Operating temperature	-30 to 55°C
Max surrounding air temperature	55°C
Storage temperature	-30 to 70°C
Relative humidity	10%...95%
Maximum operating altitude	2000m
Vibration resistance (CEI EN 60068-2-6:2009)	+/- 1.5 mm 9 to 200 Hz
Bump resistance (CEI EN 60068-2-27:2012)	15 g (6 ms half-sine)
ENCLOSURE DATA	VALUE
Description	Electronic housing 16 pole, with locking latch mounting
Enclosure protection rating	IP 20
Terminal block protection rating	IP 2X
Fastening	Fast attachment to rail according to CEI EN 60715
Dimensions (h x w x d)	99mm x 22,5mm x 113,5mm
Weight	150g

DIMENSIONS (mm)



(All dimensions are expressed in mm)

Figure 10

INDICATIONS AND INFORMATION FOR ENVIRONMENTAL PROTECTION

Dispose of the product in an eco-compatible manner and in accordance with national legislation.



For Countries in the European Union:

Pursuant to the Directive no. 2012/19/EU on waste electrical and electronic equipment (WEEE).

The crossed out wheeled-bin symbol on the equipment or its packaging means that when the product reaches the end of its useful life it must be collected separately from other waste.

Proper separate collection of the discarded equipment for later environment-friendly recycling, processing, and disposal, helps to avoid negative impact on the environment and health and encourages re-use and recycling of the materials the equipment is made of.

In each individual Member State of the European Union this product is required to be disposed of in accordance with Directive 2012/19/EU as implemented in the Member State where the product is disposed of.

For further information please contact TE or your local dealer.

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Manual

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