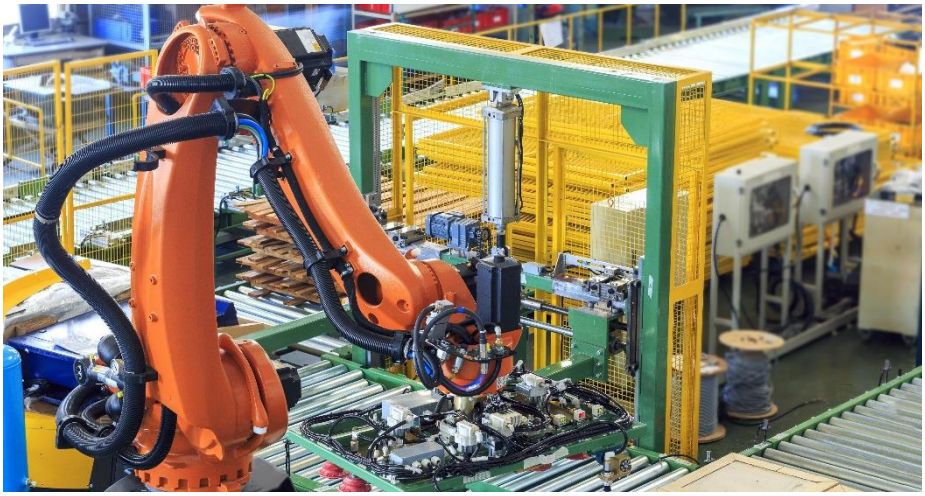
SRK4-2NO SAFETY RELAY MODULE

Installation, use and maintenance guide



SAFETY RELAY
SRK4-2NO
INSTALLATION USE AND MAINTENANCE

TABLE OF CONTENTS

This symbol indicates an important personal safety warning. Failure to comply with the warning may result in very high risk for exposed personnel.

➔ This symbol indicates an important warning.

OVERVIEW

The SRK4-2NO Safety Relay module, connected to an EN 61496 – 1/2 certified type 4 safety light curtain and equipped with two auto-controlled PNP type solid-state outputs, is a type 4 ESPE (Electro-sensitive Protective Equipment).

The other characteristics indicated above remaining constant, if the light curtain is type 2, the entire ESPE will be type 2.

The SRK4-2NO main features are the following:

- Inputs for the connection of safety barrier with fail safe outputs
- Restart manual or automatic selectable
- 2 N.O. outputs with guided contact safety relays
- 1 System Status PNP output
- 1 external contactors feedback input (EDM)

The safety module also helps ensure that:

- The output lines are open if the connected device is in OFF status;
- The output lines are enabled only with correct response times;
- In manual mode, maintenance of the RESTART contact closed is not interpreted as AUTO mode.

For safe use of the SRK4-2NO module, it is essential to read and understand the contents of this handbook.

Failure to comply with the prescriptions indicated in this handbook may result in very high risks for the operating personnel of the machine protected.

OPERATING MODES DESCRIPTION

OPERATING MODES SELECTION		
TERMINAL 5	**TERMINAL 6**	**OPERATION**
0 Vdc	+24 Vdc	Automatic
+24 Vdc	0 Vdc	Manual
0 Vdc	0 Vdc	Non-permissible conditions
+24 Vdc	+24 Vdc	

Table 1

AUTOMATIC MODE

In this operating mode, the outputs of the safety module follow the status of the barrier:

- with the protected area free (outputs of the barrier active), the relay outputs of the unit are active.
- with the protected area occupied (outputs of the barrier de-activated), the relay outputs of the safety module are de-activated.

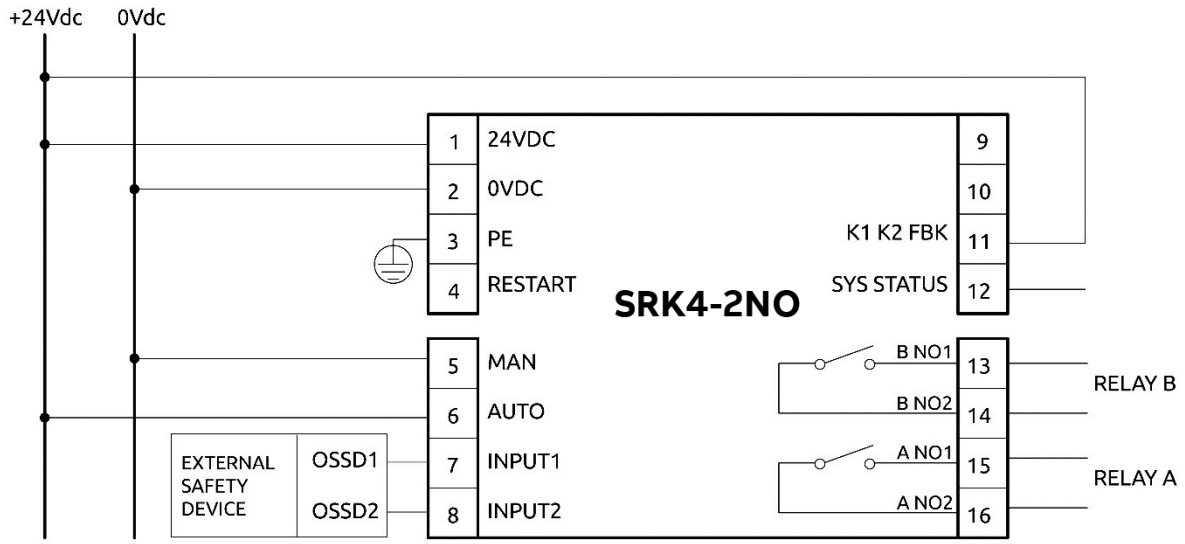


Figure 1 – Automatic operation without K1 K2 relays

Use in manual 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.

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 (K1 K2 FBK) to terminal 24VDC.

MANUAL MODE

In this operating mode, the outputs of the safety relay are activated only if the protected area is free and after sending the RESTART signal to the unit using the push-button or by means of a specific command on the RESTART input (terminal 4).

➔ Refer to the “THE RESTART COMMAND” at page 9 for a more detailed description of the command.

➔ Once the protected area has been occupied, the output relays are de-activated.

➔ The sequence described on “THE RESTART COMMAND” section must be repeated in order to re-activate the outputs relay.

Check correct functioning of the entire safety system (safety relay + barrier) following each re-installation. In particular, if the original operating mode was Manual, check that the unit has been reconfigured in this mode.

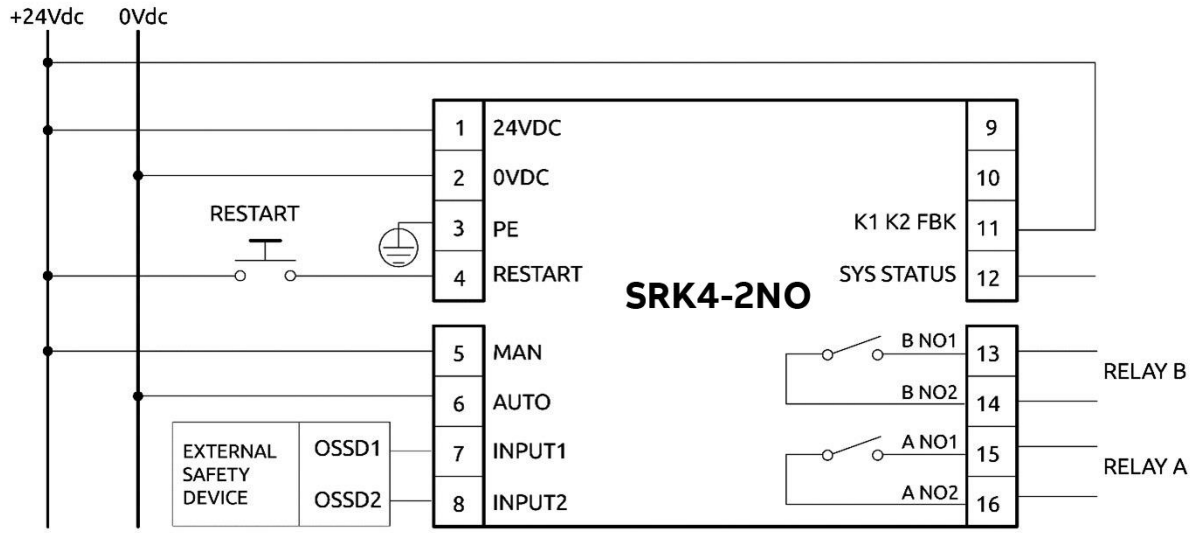


Figure 2 – Manual operation without K1 K2 relays

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 (K1 K2 FBK) to terminal 24VDC.

CONNECTION OF EXTERNAL CONTACTORS K1 AND K2

Control of external contactors K1 K2 can be activated in both operating modes. If this control must be used, the series of normally closed contacts of the external contactors must be connected to terminal 11 of the safety relay (figures 3 and 4).

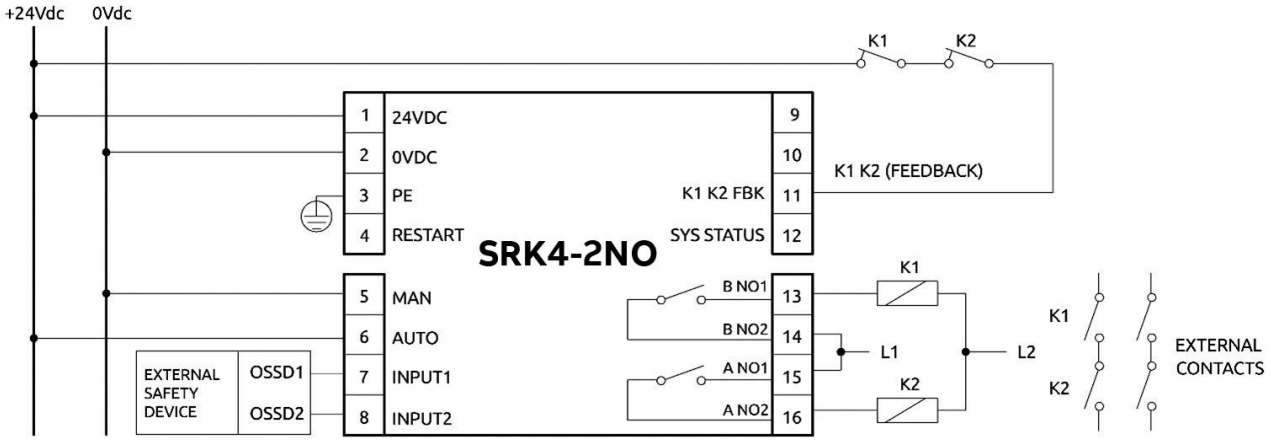


Figure 3 – Automatic operation with K1 K2 relays

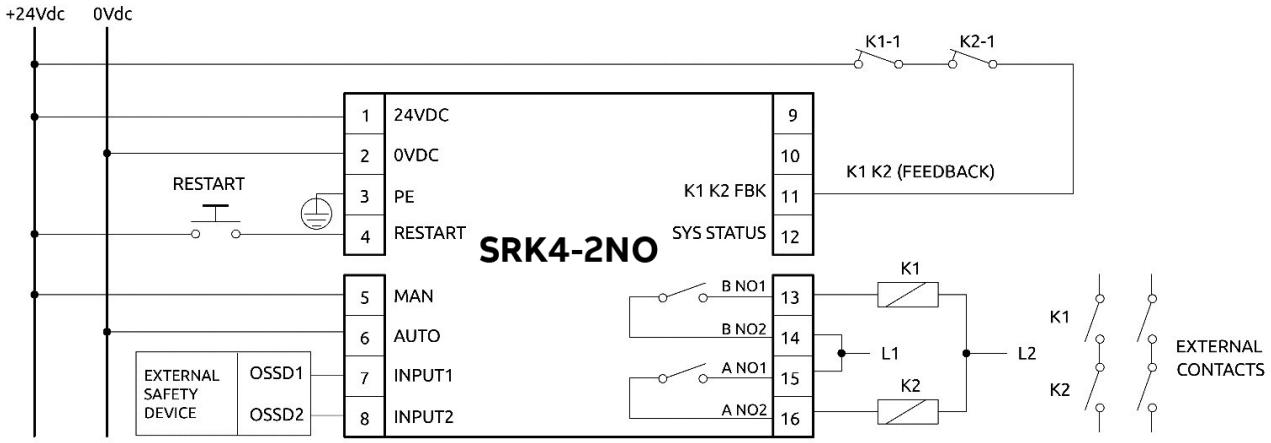


Figure 4 – Manual operation with K1 K2 relays

ELECTRICAL CONNECTIONS

Figure 5

SRK4-2NO 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 the SRK4-2NO safety relay in an environment with a protection rating of at least IP54.
- The supply voltage must be 24 ± 20% VDC; PELV (in compliance with the standard EN 60204-1 (Chapter 6.4)).
- During the installation of the SRK4-2NO safety relay be sure to avoid short circuits between the contacts 7 and 8.
- Connect the safety relay module when it is not powered.
- Do not use the SRK4-2NO 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 1mm^2 (AWG16).

PINOUT

TERMINAL NUMBER	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	**MAN**	Input	Manual/Automatic Configuration
6	**AUTO**	Input	
7	**INPUT1**	Input	Safety Input 1
8	**INPUT2**	Input	Safety Input 2
9	**-**	-	-
10	**-**	-	-
11	**K1 K2 FBK**	Input	Feedback external contactors K1 K2
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 SRK4-2NO 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 SRK4-2NO to the Omega rail.	❒
2. Verify that all the cables are correctly inserted and the terminal blocks well screwed.	❒
3. Verify that all the LEDs (indicators) light on correctly.	❒
4. Verify the correct positioning of the barrier connected to SRK4-2NO.	❒
5. Verify that all the external indicators (lamps) work properly.	❒

INPUT AND OUTPUT

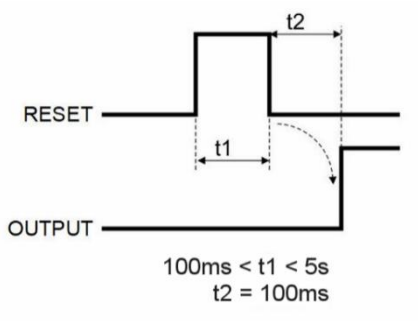
THE RESTART COMMAND

The RESTART command allows SRK4-2NO to manage Manual operation.

➔ The RESTART command must be sent to SRK4-2NO 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 t1: **5s>t1>100ms**).

➔ The whole SYSTEM RESET TIME is obtained adding the reset time of external contactors K1 K2 to the reset time of SRK4-2NO.



- This data is particularly important in the case of automatic management of the RESTART command sending, for example using a PLC.
- In the case of manual activation, a normally open external button can be used, temporary closing of which generates the RESTART command.

✸ 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.

SYSTEM STATUS OUTPUT

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

- 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. (See K1 K2 FEEDBACK input (EDM), page 10).

	Relay K1	**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 20mA and a voltage of 24VDC.
- To increase the electrical life of internal relays A and B, it is advisable to use anti-disturbance devices which must be connected across the coils of K1 and K2.

K1 K2 FEEDBACK INPUT (EDM)

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 (K1 K2 FEEDBACK) to terminal 24VDC.

STATUS INDICATORS / FAULT DIAGNOSIS

NORMAL OPERATION

LED	COLOR	STATUS	CONDITION
IN	*Green*	**ON**	Barrier free
		OFF	Barrier intercepted
FAIL	*Red*	**ON**	Fault detected *
		OFF	Correct operation
GUARD BREAK	*Green/ Red/ Yellow*	**RED**	Output relays opened
		RED blinking	The number of blinkings shows the kind of FAIL (only with FAIL is ON) *
		GREEN	Output relays closed
		YELLOW	Barrier free - Output relays opened (module waiting for RESTART only in manual mode)

* REFER TO THE "FAULT DIAGNOSIS" SECTION TO HAVE A DETAILED EXPLANATION OF THE POSSIBLE FAULT

Table 3

FAULT DIAGNOSIS

LED		GUARD/BREAK RED/GREEN (pulses red LED)	MEANING
IN GREEN	**FAIL RED**		
OFF	**ON**	*(2 pulses)*	▪ Internal fault
OFF	**ON**	*(3 pulses)*	▪ Internal relays fault
OFF	**ON**	*(4 pulses)*	▪ K1 K2 external relays fault
OFF	**ON**	*(5 pulses)*	▪ User configuration failure ▪ INPUT1/2 BARR consistency check failed (<20ms) Check connected barrier outputs
OFF	**ON**	*(6 pulses)*	▪ User configuration changed without system restart: ▪ Switch off and restart the module to solve the problem. ▪ At the switch on verify the new user configuration.
OFF	**ON**	*(7 pulses)*	▪ Possible overload or ▪ SYSTEM STATUS connection error

Table 4

If it is not possible to clearly identify the malfunction and to remedy it, stop the machine and contact TE Connectivity (TE).

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	4,82E-09	EN 61508: 2010
MTTFd (Refer to next table)		EN ISO 13849-1: 2015
DCavg	99 %	
Device lifetime	20 years	
Certifications	cULus, TÜV	

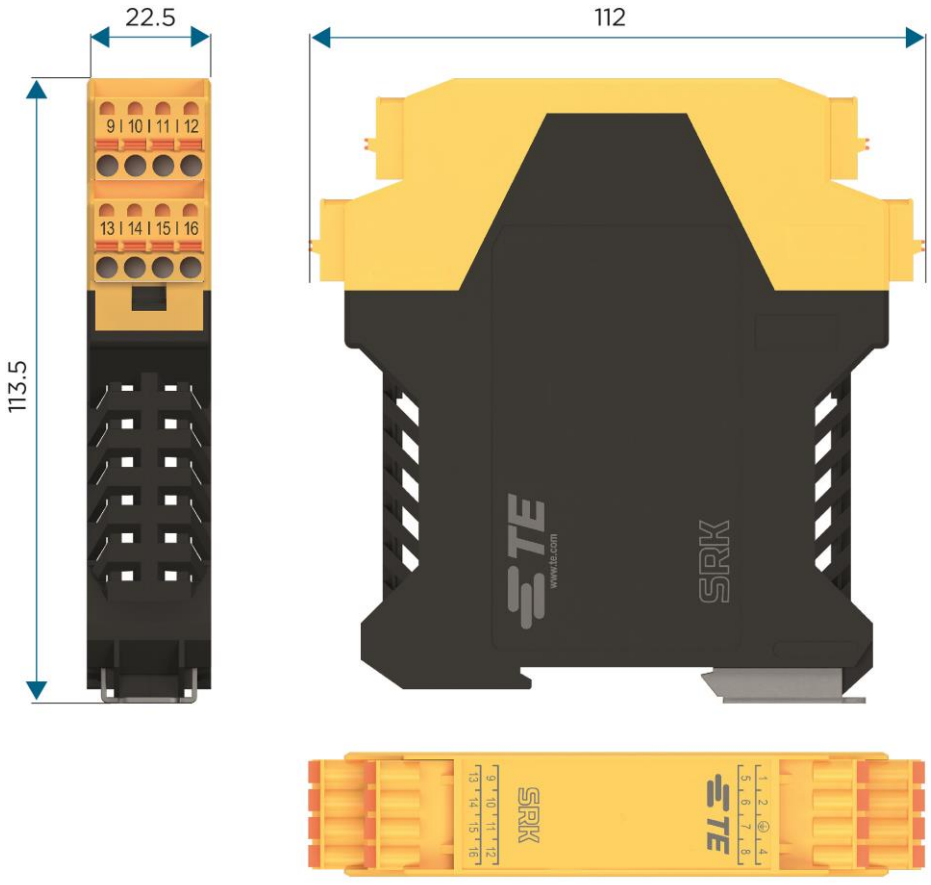
Load	B10d	Number of Commutations	PFHd *	DCavg #	MTTFd # (years)	PL #	CCF #
2A@230Vac	400.000	1 every 30s	1,73E-07	99,00%	25,26	d	80%
		1 every min	8,87E-08	99,00%	47,39	e	80%
		1 every hour	6,22E-09	98,98%	341,25	e	80%
		1 every day	4,91E-09	98,97%	378,55	e	80%
0,5A@24VDC	200.000	1 every 30s	3,41E-07	99,00%	13,06	d	80%
		1 every min	1,73E-07	99,00%	25,26	d	80%
		1 every hour	7,61E-09	98,98%	308,79	e	80%
		1 every day	4,99E-09	98,97%	375,81	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**
Number of connectable barriers	24 ± 20% VDC
Inputs number/data (type 3)	5 / 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
Number of EDM input	1 N.C. contact
EDM Response time	300ms
OUTPUT DATA	**VALUE**
System Status Output number/ value	1 / 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	
Operating modes	Automatic, Monitored or Manual selectable
Connections	16 Terminal block with protection against reversal of polarity
Status indicators	LED: Input – Output Status – Fail
Operating modes	Manual or Automatic, selectable from terminal block
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% to 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 (6ms 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)

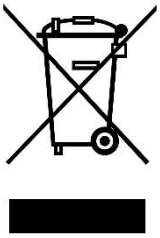


(All dimensions are expressed in mm)

Figure 6

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 wheelie-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.

CONNECT WITH US

We make it easy to connect with our experts and are ready to provide the support you need.
Visit **www.te.com/support** to chat with a Product Information Specialist.

te.com

SRK4-2NO_SAFETY_BARRIER_manual_EN 12/23

Manual

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