



# Technical description of non isolated safety protection



## More protection / less concern

Psm4 / A31 non isolated safety protection device is related to personal safety. Please read the operation manual carefully before use! The instruction manual is an important document to guide users to correctly install and use the non isolated safety protection device. Agents, dealers and machine tool manufacturers must deliver the instruction manual to users with the optical safety protection device!

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# catalogue

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Note: please read the product information in this technical description carefully. It contains important contents related to product operation, safety and maintenance. Please keep this technical description for future reference.

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## 1. Product introduction of non isolated safety protection system

Nonisolated safety protection system is used to detect people standing or stepping on in a specific area. In industrial application, it is a safety protection device of automatic equipment, which meets the highest safety protection requirements. The nonisolated safety protection system can detect whether there are people in the laid area within a specific time to prevent personal injury and danger caused by the movement of the machine.

Provide necessary safety protection for personnel working in hazardous areas.

The nonisolated safety protection system has the following advantages:

1) The sensing safety carpet has high trigger sensitivity and can provide safety protection for people weighing more than 30kg.

2) The laying area of safety carpet is flexible, and safety carpets of different sizes or shapes can be provided according to user requirements.

3) Different types of safety carpets can be selected according to different working conditions and use environment. The correct use of nonisolated safety protection system depends on the following elements:

- Determination of working conditions of installation area.
- Correct selection of laying area size.
- Correct installation method.

## 2. Unit matching of non isolated safety protection system

The nonisolated safety protection system is composed of a safety carpet in a protection area and a matching safety relay. A protection area can be a safety carpet or multiple safety carpet series areas. One area can be connected in series at most

5 to 6 safety carpets. The total area of the protection area shall not be greater than 3 to 4 square meters.

### 3. Technical description of non isolated safety protection device components

- This product is normally open without resistance. It needs resistance. Please contact our factory before customization.
- There are four core wires (black, white, red and yellow), in which black and white are a group of normally open and closed quantities, which will be connected under the action of external force (people step on it), so as to transmit signals to the controller or relay to control the machine. Red and yellow are also a group of normally open and closed values (white and yellow can also be used as a group, black and red as a group). The white and red lines are connected without external force (a group of normally closed points), and so are the black and yellow lines (the normally closed point is only for detection, can not be used as normally closed carpet, and has no function of normally closed carpet. Using this function needs to cooperate with A31 safety relay).
- This product is a pressure touch switch, which needs to be used with controller or relay.
- When fixing the frame, pay attention to the flat ground and fix it at four corners (if any).
- This product is not suitable for use in water. If it is used in this environment, please communicate with our factory in advance.

### 4. Product selection and technical standards

#### 1) Product introduction

Sensing safety carpet	Psm4type
Adaptive detection range	Detect the presence of operators and items
Recommended occasions	It is applicable to the safety protection of mixed areas of people and small vehicles
Service environment requirements	It is suitable for indoor and outdoor use, and the ambient temperature range is - 10 °C - + 60 °C
Safety carpet thickness	14 millimeter
Surface protective material	NBR rubber
Surface pattern and color	Copper coin, pattern anti-skid surface (black, yellow, red)
Edge banding form	Aluminum edge sealing
Applicable industry	Light and heavy industrial occasions such as paper industry, electronic industry, automobile welding production line, forging production line, general industrial application and automatic palletizer
Ordering instructions	Provide the size of safety carpet and the size or pattern of safety protection area

## 2) System technical standards

size	It can be specially made according to requirements, with length of 200mm-1000mm and width of 200mm-2000mm
Underpressure	Dynamic 500kg, solid 700kg
Surface material	Rubber(red / yellow / Black optional)
Control level	Shared with controller to reach level 3
Degree of protection	IP65
ambient temperature	-10 °C to 60 °C
thickness	14mm
Trigger force	Adult 30kg
Cable length	3M and 5M optional
response time	Less than 30ms
weight	About 30kg / sq.m
Chemical resistance	Less than 30ms
Material ability	commonly
service life	100 Ten thousand times
waterproof	commonly
Anti mineral acid	commonly
Anti organic acid	commonly
Anti alcohol	commonly
Anti ethanol	commonly
Corrosion protection	commonly
Anti petroleum solvent	commonly
Anti bio oil solvent	commonly
type of output	No (normally open)
Maximum voltage	DC24V

## 3) General product specifications

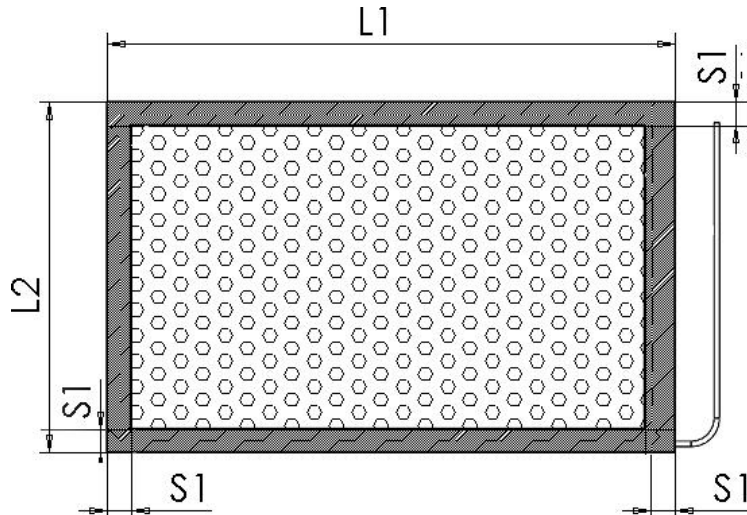
Product model	width	length	type of output	Entry cable
PSM4-250*500	250mm	500mm	NO	4core
PSM4-500*500	500mm	500mm	NO	4core
PSM4-500*1000	500mm	1000mm	NO	4core
PSM4-750*1000	750mm	1000mm	NO	4core
PSM4-1000*1000	1000mm	1000mm	NO	4core
PSM4-1100*1800	1100mm	1800mm	NO	4core

## 4) Special shaped customization

Users can customize the special-shaped design according to the drawings or dimensions, and consult our factory for details.

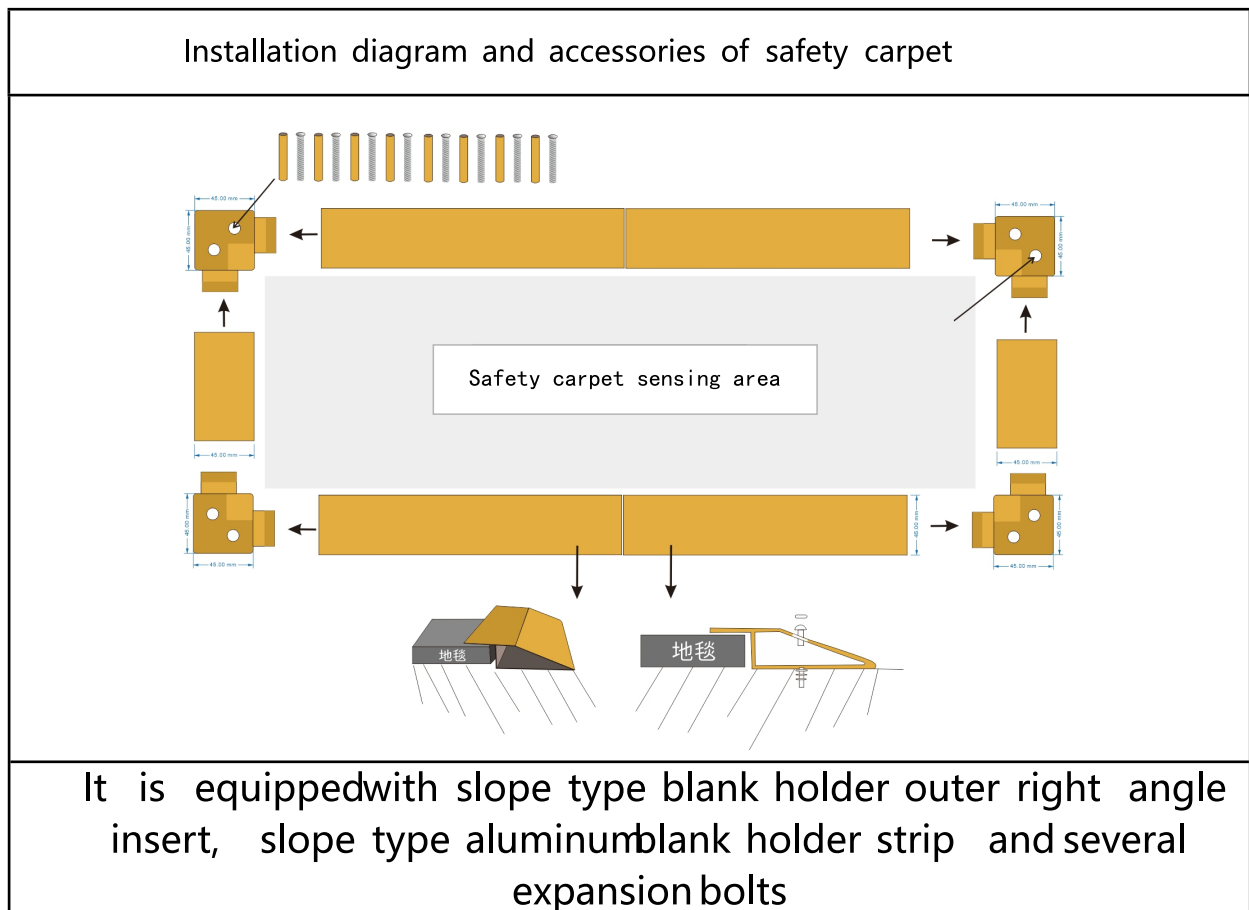
## 5. Safety carpet product features

### 1) Effective size and edge non sensing area



- Effective area of standard safety carpet:  $L1 \times L2 \square 1.5 \text{ m}^2$  . For the protection area more than  $1.5 \text{ m}^2$ , it is recommended to adopt the assembly method of multiple safety carpets.
- The cable defaults to one corner, and the standard outgoing line is 3M.
- The edge of the safety carpet package is a non sensing area, and the edge non sensing area does not have sensing function.  $S1 \approx 45 \text{ mm}$
- Note: when multiple safety carpets are assembled into one assembled safety carpet, only the edge of non outgoing line can be spliced with the adjacent safety carpet.

### 2) Safety carpet installation accessories



Note: non standard custom installation accessories are not listed in this table.

## 6. System installation

### Installation of safety carpet

Please follow the steps below to install the safety carpet

- 1) Unpacking: take out the safety carpet and installation accessories, check whether the contents of the package are consistent with the package list provided, and check whether the safety carpet is intact.
- 2) Preparation of installation site: the installation site shall be flat, and the installation ground shall not have holes with a diameter of more than 20mm or changes in the height of the ground. Any defect in the ground will lead to the loss of the safety function of the safety carpet.
- 3) Remove dirt particles from the installation floor and ensure that the surface is dry.
  - a. Drill holes on the installation foundation surface according to the position of the installation hole on the aluminum blank holder, and clean the dust on the aluminum blank holder, the foundation surface and the drilling hole (with a vacuum cleaner), otherwise the dust from the drilling will cause unevenness under the safety pad and aluminum sealing edge.
  - b. Lay and wire the safety carpet used in series in each area, and connect the signal cable to the safety relay in the control cabinet.
- 4) Connect the safety carpet and safety relay to the control system of the machine according to the system configuration.

Note: the cable is only used for signal output. The cable must not be dragged for positioning during the installation of safety carpet.

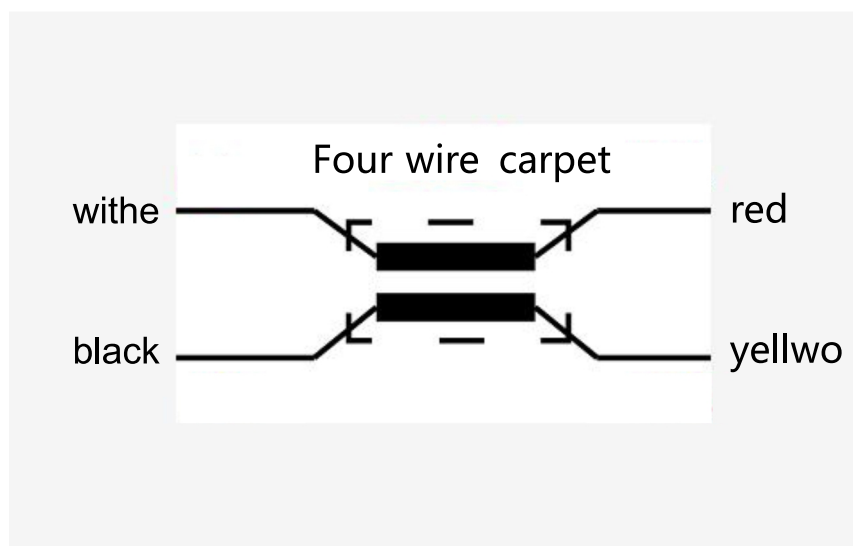
- 5) According to the working conditions and the type of safety carpet, different types of safety carpet adopt different installation accessories.

## 7. Wiring instructions

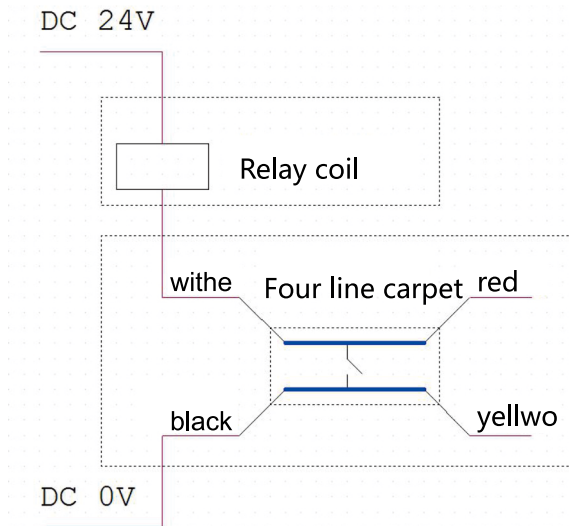
Note: This product must not be in direct contact with the power supply. It needs the auxiliary use of relay or controller.

The maximum voltage is DC24V

### Four wire carpet circuit diagram



1) Relay coil wiring diagram- this diagram is not a safe circuit and should be used with caution



This figure is a non safety circuit, use with caution!

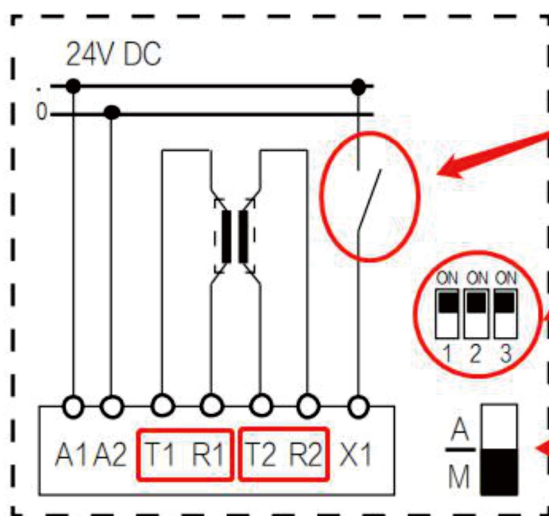
2) Wiring diagram of safety relay  
Safety relay model: Tner-A31

A1: connect +24V± 10% (20V~26V)  
A2: connect 0V

Automatic reset: turn the toggle switch to A

Manual reset: turn the toggle switch to M

Safety relay connection:



Safety reset switch

The function selection is standard four wire touchline

Automatic and manual reset selection



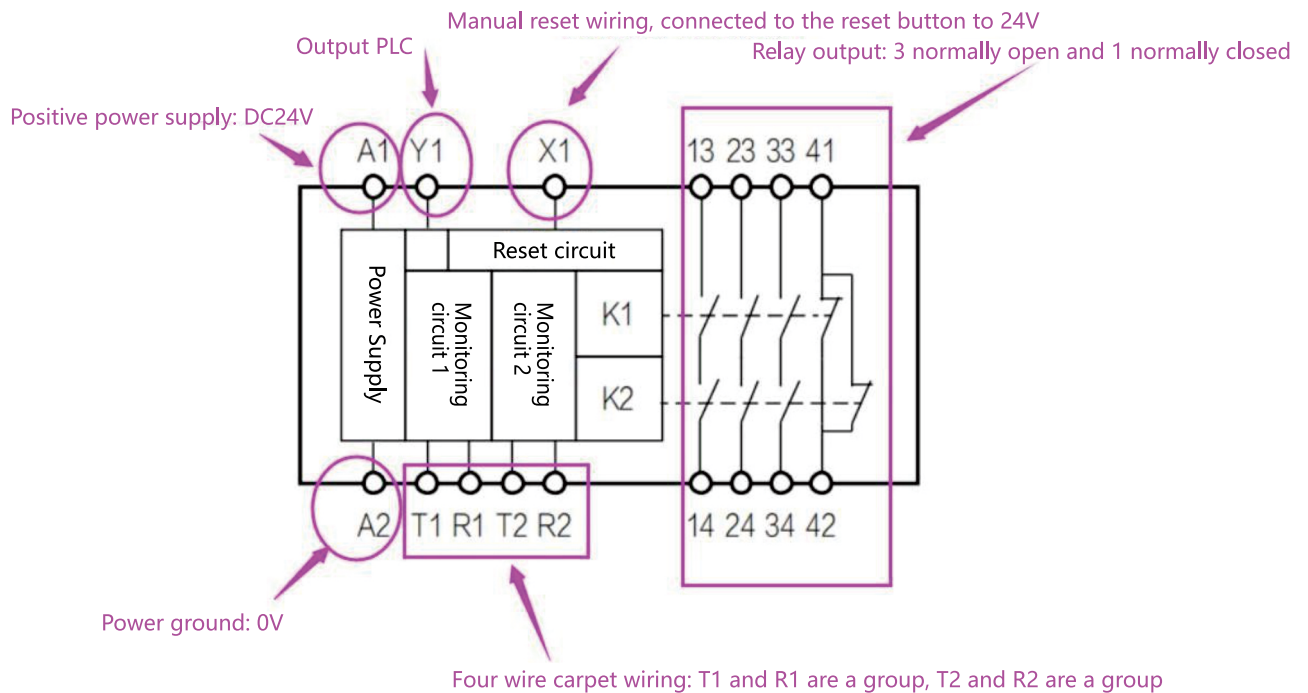
6. Double channel 4-wire touchline / carpet safety input manual reset

White and red are a group, connected to T1 or R1  
Black and yellow are a group, connected to T2 or R2



Red line and white line: connected to T1 and R1, regardless of order  
 Black line and yellow line: connected to T2 and R2, regardless of order  
 Or: red line and white line: connect T2 and R2, regardless of order  
 Black line and yellow line: connected to T1 and R1, regardless of order

## Safety relay system module diagram




This product has the function of testing: whether the wiring of the four wire touch edge is correct and whether the wiring is falsely connected. If the wiring is wrong or the line is falsely disconnected, the safety relay will actively respond to the safety function.

## Function description of safety relay terminal

A1	Power supply positive (24VDC)	A1 and A2 as power supply
A2	Negative pole of power supply (0V)	
T1	Channel 1 signal output	Type I signal source
R1	Channel 1 safety input	Accept type I signal input, with short circuit, open circuit detection and mutual inspection of channel 2
T2	Channel 2 signal output	Type II signal source
R2	Channel 2 safety input	Accept type II signal input, with short circuit, open circuit detection and channel 1 mutual inspection automatic reset: when the input conditions are met, the unit is activated immediately
X1	Reset input (manual reset or automatic reset can be configured)	Manual reset: the input conditions are met, and the reset circuit is then manually closed. After release, the unit is activated
Y1	Transistor signal output	Output status signal indication, which can be input as PLC signal or connected to external indicator
13/14	Normally open instantaneous safety contact	The unit can be externally connected with tner-ts31 unit on the contact to increase the number of contacts
23/24		
33/34		
41/42	Normally closed instantaneous safety contact	It can be used as external signal lamp or control other devices

## Technical parameters of safety relay

Power Supply	
Power supply	24V DC
Voltage tolerance	+10%/-20%
power waste	2.9w
output	
Relay safety output	3NO+1NC
Transistor signal output	<500mA 24VDC
Relay contact capacity	
AC-1	6A/250VAC/1500VA
AC-15	4A/240VAC
DC-1	6A/24VDC/150W
DC-13	4A/24VDC
Maximum switching capacity	12A (distributed on all safety output contacts)
contact resistance	<100mΩ
Minimum load	10 mA / 5V
Contact material	AgSnO <sub>2</sub> +0.2μmAu
General parameters	
Output fuse (external)	5A GL/GG
Release response time	< 30ms (from input to output),
Input component end detection resistance (tentacle / carpet)	1KΩ ~ 10KΩ
Electrical life	80000 lbs
class of pollution	two
working temperature	-25 ° C to 85 ° C
Working humidity	35% - 85% (exposed)
Impulse withstand voltage	2.5kV
Degree of protection	External IP30, sub IP20, IP54 pushed forward
Storage temperature	-40 ° C to 105 ° C
Shell material	Flame retardant PA66
Installation mode	Mark and subtract 35mmdin guide / spring clip
size	114.5mm x 100.5mm x 22.5mm
weight	172g
Connection parameters	
Available cross section range of rigid conductor	0.5~2.5mm <sup>2</sup>
Available cross section range of flexible conductor	0.5~2.5mm <sup>2</sup>
Minimum conductor cross section	AWG 24
Maximum conductor cross section	AWG 12
Strip length	8 mm
Minimum tightening torque	0.5 Nm
Maximum tightening torque,	0.6 Nm
Standard application	
accord with	EN 60947-1:2007/A2:2014
	EN 60947-5-1:2004/A1:2009
	EN ISO 13849-1:2015
	EN 62061:2005+A2:2015
	

### 8. Design essentials and configuration of non isolated safety protection system

## 1) Design essentials of nonisolated safety protection system

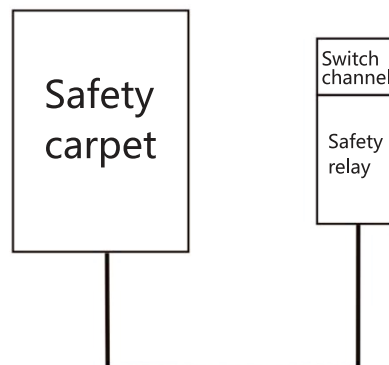
The non isolated safety protection system requires that when a person or protected object enters the protected area, the system shall immediately send a command to stop the machine in the area. The machine can not start working again until the operator sends a command after the person or protected object confirms to leave the protected area. According to the requirements, the design essentials are:

- The principle of full coverage shall be realized in the safety protection area to avoid personal safety accidents due to personnel in the dangerous area.
- The safety relay must use manual reset mode, and automatic reset can be used under special circumstances.
- The manual reset button must be installed in the non hazardous area to ensure the system reset after personnel leave the hazardous area.

## 2) Configuration of nonisolated safety protection system

According to the area to be protected, it can be the safety protection area of a single safety carpet, or multiple safety carpets can be connected in series into a protection area. The following combination schemes can be selected according to the actual installation conditions and requirements:

- Nonisolated safety protection of single safety carpet



- Non isolated safety protection assembled by multiple safety carpets

This combination is generally used in sensing output mode, single area and multi piece safety carpet assembly. A maximum of 5 to 6 safety carpets for this splicing method. The total area of the protection area shall not be greater than 3 to 4 square meters

Multiple carpets are used in series, and each carpet has four core wires (black, white, red and yellow)

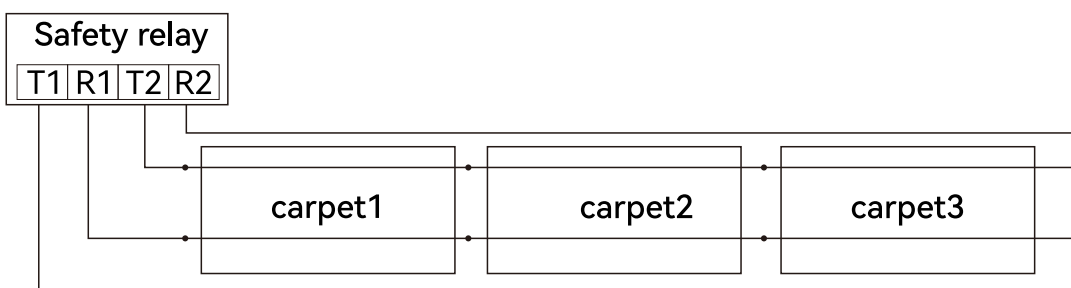
White and red are one way, connected to T1 and R1

Black and yellow are one way, connected to T2 and R2

perhaps

White and red are one way, connected to T2 and R2

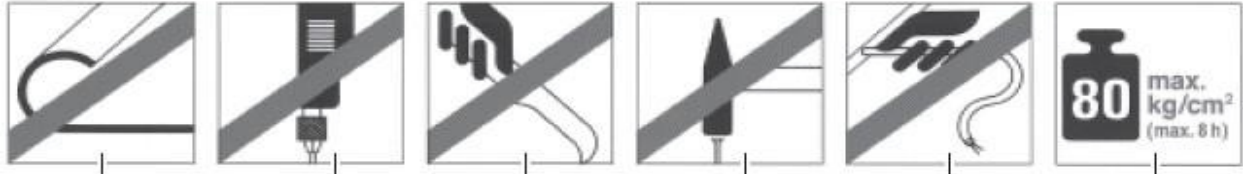
Black and yellow are one way, connected to T1 and R1



## 9. matters needing attention

### 1) Storage and installation precautions

The following actions will cause damage to the safety carpet



1 2 3 4 5 6

1. The safety carpet shall not be curled during use, installation and handling.
- 2 do not drill holes or cut the safety carpet.
3. The safety carpet cannot be cut
- 4 do not hammer the safety carpet or drive nails (screws) on the safety carpet.
- 5 do not drag the cable, move or handle the safety carpet
6. Do not place the overload on the safety carpet for a long time.  
The maximum bearing capacity is  $80 \text{ kg / cm}^2$  ( 8 hours)

### 2) Precautions for use

- Be sure to select safety carpet and safety relay with safety function certification.
- When connected to PLC, it needs to be grounded according to the use requirements.
- Please regularly check whether the system works normally to ensure its safety function.
- Please replace the safety carpet beyond its service life in time.
- Please replace the safety carpet with damaged surface protective layer in time.