





Protection technical description

Safety mat

PSM4/ PSM6/PSM11

PRODUCT MANUAL







Catalogue

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Note: Please read the product information in this technical note carefully. It contains important content about the operation, safety, and maintenance of the product. Please keep this technical note for subsequent reference

If there are any technical improvements to the product, they will be included in the new version of the electronic manual (the cardboard will not be changed in a timely manner) and will not be notified separately.

If there are any changes to the appearance, color, or accessories of the product, the actual product shall prevail.



1.Product introduction of non-isolated safety protection system

Non-isolated security systems are used to detect people standing or stepping on a specific area. In industrial applications, it is a safety protection device for automatic equipment, which meets the highest safety protection requirements. The non-isolated safety protection system can detect whether there are people in the paved area within a certain period of time, and prevent the personnel in the area from being injured and dangerous due to the movement of the machine. Provide necessary safety protection for personnel working in hazardous areas.

1.1 The non-isolated safety protection system has the following advantages:

- 1.1.1 The sensor-type safety mat has high trigger sensitivity and can provide safety protection for people who weigh more than 30 meters.
- 1.1.2 The laying area of the safety mat is flexible, and different sizes or shapes of safety mats can be provided according to user requirements.
- 1.1.3 Different types of safety mats can be selected according to different working conditions and usage environments.

1.2 Proper use of non-isolated security systems depends on the following elements:

- 1.2.1 Determination of the working conditions of the installation area.
- 1.2.2 Correct selection of the size of the laying area.
- 1.2.3 Correct installation method.

2. Design essentials of non-isolated safety protection system

The non-isolated safety protection system requires that when a person or a protected object enters the protection area, the system should immediately issue an instruction to stop the machines in the area, until the person or the protected object confirms to leave the protected area, and the operator will operate The machine can start working again only when the human gives the command. According to this requirement, the design essentials are:

- 2.1 The security protection area should implement the principle of full coverage to avoid personal safety accidents caused by personnel in the dangerous area.
- 2.2 The safety relay must use the manual reset mode, and the automatic reset can be used in special cases.
- 2.3 The manual reset button must be installed in the non-hazardous area to ensure that the system resets after the person leaves the hazardous area.

3. Unit matching of non-isolated safety protection system

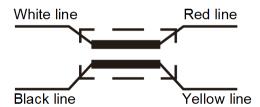
The non-isolation safety protection system is composed of a safety mat in a protection area and a matching safety relay. A protective area can be a safety mat or a series of safety mats.

A maximum of 5 to 6 safety mats can be connected in series in one area; the total area of the protected area should not be larger than 4 to 5 square meters.

4. Technical parameters of non-isolated safety guard device components

4.1. Principles of technology

Internal electrical circuit diagrams



- This product is a pressure touch switch. It needs to be used with a controller or a safety relay. It cannot be directly connected to the power supply, which will burn the mat.
- When using the frame to fix, pay attention to the ground level, and the fixing position is at four corners.
- This product is not suitable for use in water, if you use it in such an environment, please communicate with us in advance

4.2. Product selection and technical standards

4.2.1Model specification

PSM4- <u>A</u> * <u>B</u> - <u>C D E F - G - H</u>

型号说明

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>	<u>H</u>
Model	Width	Length	Number of splices	Description of size	Color/material configuration	Resistor configuration	Cable length	Controller
PSM4 (default)	L2:Safety pad width	L1: safety pad length	1: Not writing	A: After installing the outer frame	B: Black rubber surface (default)	K: 4-core cable (default)	3m: Standard configuration. Not writing (default)	SRC: safety relay
PSM6	i 1 1 1		2: Splice 2 pieces	F: Net carpet size, additional frame required	Y: Yellow PVC (pattern)	KF: 2 sets of 2 cores	6m: 6 meters cable	
PSM11			3: Splice 3 pieces	P: Net carpet size,	H: Red PVC (pattern)	R: With terminal resistor (8.2KΩ)	8m: 8 meters cable	
1		 	4: Splice 4 pieces	S: Customized type	1			

For example:

PSM4-1000*500-ABK-SRC

Technical parameters - 14mm thick hard mat, total size including outer frame installation is 1000*500 (mm), length and width each add 90mm (excluding 15mm stuck in the mat), clean mat is 910*410 (mm), black rubber surface, K-type 4-core cable, 3 meters; equipped with a safety relay

PSM4-2000*1000-2FHR-8m-SRC

Technical parameters - 14mm thick hard mat, two clear mats with dimensions of 1000*1000 assembled into 2000*1000 (mm), with outer frame, 2090*1090 (mm) after installing the outer frame, red PVC material, terminals with resistors, 2-core cable, 8 meters, equipped with a safety relay

PSM6-500*300-PBK-6m-SRC



4.2.2 Common use specifications of products

Product model	Width Net mat size	Length Net mat size	Overall dimensions of mat and frame	Color material	Output type	Outline way	Controller
PSM4-490*590-ABK-SRC	400mm	500mm	490*590	14mm Black NBR	2NO (Passive NO)	4 cores/2 cores (external resistance)	SRC106
PSM4-590*590-ABK-SRC	500mm	500mm	590*590	14mm Black NBR	2NO (Passive NO)	4 cores/2 cores (external resistance)	SRC106
PSM4-590*840-ABK-SRC	500mm	1000mm	590*840	14mm Black NBR	2NO (Passive NO)	4 cores/2 cores (external resistance)	SRC106
PSM4-590*1090-ABK-SRC	750mm	1000mm	590*1090	14mm Black NBR	2NO (Passive NO)	4 cores/2 cores (external resistance)	SRC106
PSM4-840*1090-ABK-SRC	1000mm	1000mm	840*1090	14mm Black NBR	2NO (Passive NO)	4 cores/2 cores (external resistance)	SRC106
PSM4-1090*1090-ABK-SRC	1000mm	1500mm	1090*1090	14mm Black NBR	2NO (Passive NO)	4 cores/2 cores (external resistance)	SRC106

4.2.3 Ordering Instructions - Provide the size of the safety mat (including the total installation size of the frame); provide the size of pattern of the safety protection area, which can be customized in special shapes. Please ask our salesperson for details.

4.2.4 System technical standards

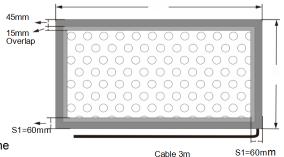
			Sensory sa	fety mat		
Adapt to detection range	It is suitable	for inspection	personnel in gen	neral working conditions and cannot withstand vehicle crushing and heavy object impact.		
Recommended use		5	Suitable for safety	protection in perso	onnel operating areas;	
occasions	PSM4 - regul	ar model, the h			d durable, and is suitable for one side larger than	
				default is PSM4 with		
					dable, suitable for small sizes; ght restricted for narrow locations;	
Applicable industries		, electronics in	dustry, automobi	le welding production	on lines, forging production lines, general industrial pht and heavy industrial applications	
Dimensions (net mat)		vidth range: 20 ength range: 20	0mm-1000mm 0mm-2000mm	Surface Material-PSM4	PSM4-rubber (black particles for anti-skid) or PVC (red and yellow patterns for anti-skid);	
Edge sealing form	Yellow aluminum edge sealing			Surface material-PSM6, PSM11	Hard sole	
Maximum allowable load (8 hours)	≤ 400N/cm2			Mechanical life PSM4	>1, 000,000	
Maximum humidity (23 degrees)	95% (condensation)			Mechanical life PSM6	>800,000	
Ambient temperature (usage environment)	-5℃ to 55℃	(no icing or co	ondensation)	Mechanical life PSM11	>700,000	
Ambient temperature (storage environment)		-10℃ to 60℃		Cable	4-core*0.32² shielded cable, 3M standard (can be customized and lengthened)	
Triggering force	PSM4-Adult 30KG	PSM6/1	1-Adult 20KG	Output type	2NO(passive normally open)	
Protection level	IP65			Series connection	Series connection of less than 5/6 blocks is allowed (or no more than 4-5 square meters)	
Thickness	PSM4- 14mm			Controller maximum voltage	DC24V (using 0V control)	
Response time	<30ms			Switching current\voltage	Max.100mA \5V	
Weight	About 20kg/m²			Allowed single block area	1.5m²	
Conform to Standard application	······································					

In general, safety mat surface coverings have excellent resistance to acids, alkalis, and salts. Long-term exposure to hot acid, hot alkali, concentrated acid and alkali, and organic salts will damage the surface covering. Good resistance to aliphatic solvents, relatively poor resistance to aromatic and chloride solvents, poor resistance to ketones and most ester solvents. CAUTION: Combinations of chemicals can have unpredictable effects. In this case testing is recommended. If necessary, If necessary, you can apply to our factory for a small material sample to undergo a 48-hour immersion test. If it is deformed, it is not suitable for this environment.

4.3. Product size description and installation

4.3.1 Effective size and edge non-sensing area

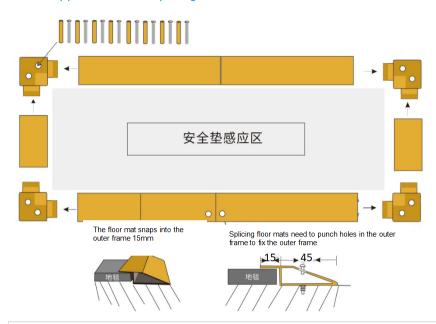
- The area of the standard safety mat is: L1×L2≤1.5m². For protected areas > 1.5 m²,
- It is recommended to use multiple pieces of safety mats to assemble.
- The outer frame will block the mat 15mm (overlapping area); the product is made of rubber micro-elastic material, with a tolerance of ±6mm
- > The package frame (S1) of the safety mat is a non-sensing area, and the edge non-sensing area does not have the sensing function.
- S1 (aluminum frame) =60 mm



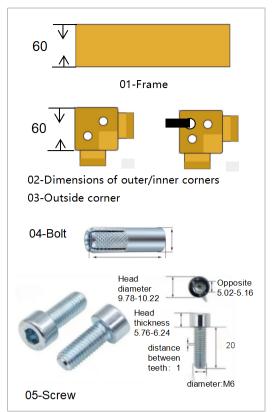


- Calculation method: Framed mat installation size = (net mat length + 90mm) * (net mat width + 90mm)
- The effective sensing size of framed mat = (total length including frame 120mm) * (total width including frame -
- > 120mm)
- The cable defaults to one corner, and the standard outlet is 3 meters.

4.3.2 Appearance and splicing instructions **Unit: mm**



Accessory size



Standard configura equipped with slope edge outside right Angle plug, slope aluminum edge length and expansion bolts

Standard installation: the frame card into the mat, the four outer corners card into the outer frame, in order to fix the mat, the cable outlet in the outer corners of the three holes

Non-standard installation: splicing type super-long frame, fix the frame and floor with expansion screws to fix the mat, as shown

4.3.3 Notes before installation

A.Open the packaging:

Remove the safety mat and installation accessories, check that the contents of the package comply with the packaging list provided, and check that the safety mat is intact.

B.Prepare the installation site:

The installation site shall be flat, and the installation ground shall not have holes exceeding 20mm in diameter or the height of the ground. Any defect in the ground can cause the loss of the safety function of the safety mat.

C.Remove mounting ground dirt particles to ensure the surface is dry.

- a. Drilling on the installation foundation surface according to the position of the aluminum press edge mounting hole to clean the dust on the aluminum press edge, the foundation surface and inside the drilling hole (with a vacuum cleaner), otherwise the drilling dust will cause uneven formation under the safety pad and the aluminum seal edge.
- b. Line and wire up the safety mats used in series in each area separately, and connect the signal cables to the safety relay in the control cabinet.

D.Connect the safety mat to the safety relay to the machine's control system according to the system configuration.

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

Low-voltage cables and high-voltage cables need to keep a safe distance. If there is interference on site, the shielding layer of the cable can be connected to 0V/ground wire

E.According to the working conditions and choose the type of safety mats, different types of safety mats use different installation accessories.

5. Controller wiring instructions

Note: This product must not be in direct contact with the power supply, and requires the auxiliary use of safety relays or other switch mode relays.

The safety mat sensor and the safety relay (SRC106) produced by our company form a safety mat system, which has disconnection detection.

5.1 Instructions for safety relay wiring

This product has its own detection: whether the four-wire mat and the two-wire mat with resistance are correctly wired, and whether the wiring is virtual connection. If the wiring is incorrect, or the line is broken, the safety relay will actively respond to the safety function.



Cyndar safety relay model: SRC106

Safe forced disconnect relay output

Three open transient safety contacts (3NO)

One normally closed transient safety contact (1NC)

Automatic reset switch

The automatic / manual reset switch can be configured

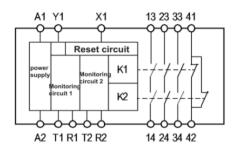
Safety features

Redundant circuits and with a self-monitoring function

In the event of a component failure, the safety function is still valid

The safety contacts are automatically tested to be correctly disconnected and closed during each openclosed cycle

System module diagram





5.1.1 Function description of wiring terminals

A1	Power supply cathode (24VDC)	A1, A2 shall serve as power sources				
A2	Power supply negative electrode (0V)	711, 712 Shall serve as power sources				
T1	Channel 1 Signal Output	Type I signal source				
R1	Channel 1 is a secure input	Accept type I signal input, with short circuit, open circuit detection and channel 2 mutual inspection				
T2	Channel 2 Signal Output	Type II signal source				
R2	Channel 2 is a secure input	Accept type II signal input, with short circuit, open circuit detection and channel 1 inspection				
X 1	Reset input (manual reset or automatic reset can be configured) Automatic reset to DC24V, manually reset button	Automatic reset: If the input conditions meet, the unit is activated immediately Manual reset: the input condition is met, and the reset loop is then closed manually. After release, the unit is activated				
Y1	Transistor signal output	The output state signal indication can be input as a PLC signal or connected to the external indicator lamp(Cannot be used to control device work or stop)				
13/14	NO instantaneous safety contact (mat trigger output NO)					
23/24	tingger output NO)	The unit can connect the SRC106 units externally to the contact point to increase the number of contacts				
33/34		number of contacts				
41/42	NC instantaneous safety contact (mat trigger output NC)	Can be used as external signal lights or other control devices				

5.1.2 LED and reset lever instructions

ED Status				
	∎Steady on ★☆			
Function	State	Power LED	Enter LED	Output LED
Resistive	Input connection disconnection/connection exception		★☆	
2-wire edge/mat	The edge/mat is held down			★☆
	Edge/mat connected correctly/not reset			
	Edge/mat connected correctly/reset		•	
	Fystem error	★☆		
	Input connection broken (not supported for detection)		*☆	
	input connection exception			★☆
	The edge/mat is held down			★☆
Non-resistive 2-wire edge/mat	Edge/mat connected correctly/not reset		★ ☆	
cuge/mat	Edge/mat connected correctly/reset			
	System error	★☆		
	Input connection disconnection/connection exception		★ ☆	
	The edge/mat is held down		•	★☆
4 wire edge/mat	Edge/mat connected correctly/not reset			
	Edge/mat connected correctly/reset			
	System error	★☆		
	Output interference/input water ingress		★☆	★ ☆

System failure, please check whether the side dial and front toggle switch (automatic reset and manual reset wiring are different) are correct. If correct, please provide a separate DC24V power supply to the safety relay.

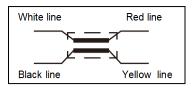
Reset lever operation

	State	Illustrate
Reset lever	Α	Can be configured as an automatic reset function (X1 must be shorted with the positive pole of the power supply)
	М	It can only be configured as a manual reset function (X1 is connected to the positive pole of the power supply through the reset button, refer to the connection illustration)



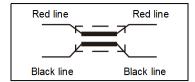
5.1.3 Safety relay wiring diagram

Safety floor mat sensor can choose four-core (**K-type**) wiring mode or with resistance (**4-core-K-type or 4-core-KF-type/2-core-R-type**)) wiring mode. Before wiring, judge whether the mat is K-type or R-type. Choose automatic reset or manual reset wiring



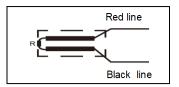
K Type

Internal circuit diagram, 2 sets of passive normally open points



KF Type

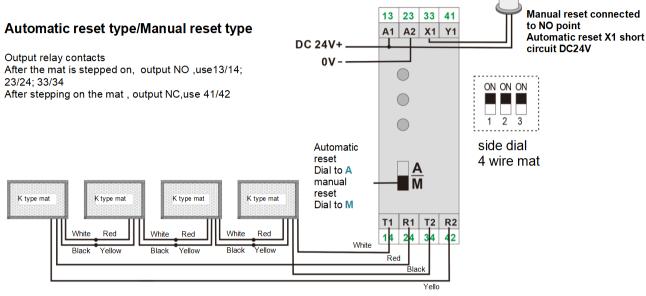
Internal circuit diagram, 2 sets of passive normally open points Outgoing lines from both ends



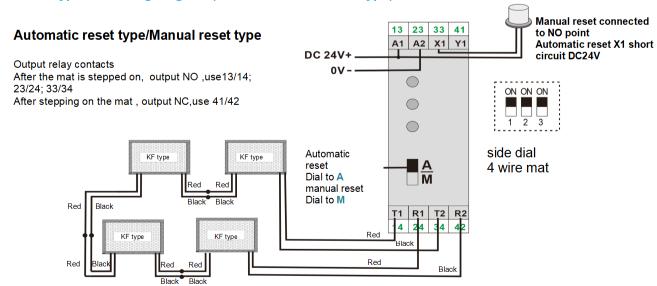
R Type

Internal circuit diagram, 1 set of passive normally open point built-in resistors

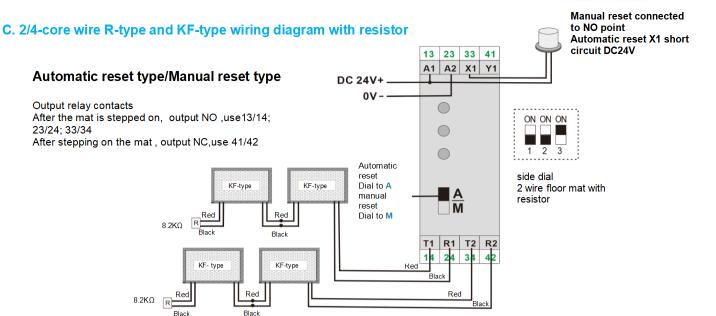
A. 4-wire K-type mat wiring diagram (conventional standard type)

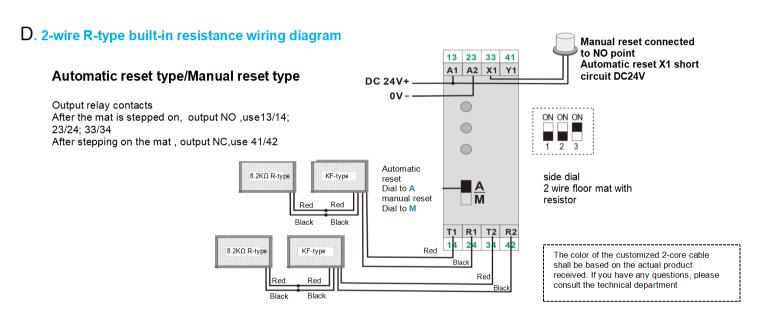


A. 4-wire KF-type mat wiring diagram (conventional standard type)







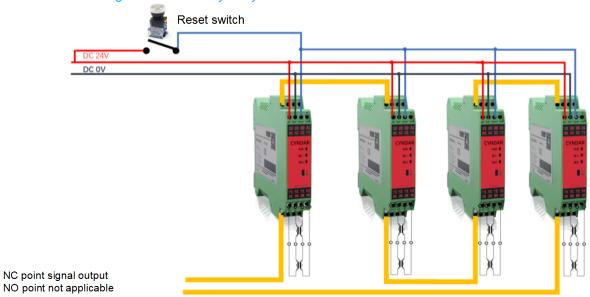


5.1.4. Safety relay parameters source 24V DC Power Supply Voltage Voltage tolerance +10%/-20% 2.9W power dissipation output Relay safety output 3NO+1NC Transistor signal output <500mA 24VDC Relay contact capacity AC-1 6A/250VAC/1500VA AC-15 4A/240VAC DC-1 6A/24VDC/150W DC-13 4A/24VDC 12A (assigned to all security output contacts) Maximum switching capacity <100mΩ contact resistance 10mA/5V Minimum load Touch material AgSnO2 + 0.2µmAu Conventional parameters



	SAFETY SENSOR EXPERT
Output Fuses (external)	5A gL/gG
Release response time	<30m s (from input to output),
Check the resistance at the tail end of the input component (Touch edge / mat)	1kΩ~10kΩ
Electrical life	That was done 80,000 times
class of pollution	2
working temperature	-25℃~85℃
Working humidity	35% -85% (unfrozen or condensation)
impulse withstand voltage	2.5kV
levels of protection	Housing IP30, terminal IP20, is recommended for the cabinet or housing IP54
Storage temperature	-40℃~105℃
Case material	Flame-retardant PA66
way to install	Standard 35mmDIN guide rail / spring buckle
size	114.5mm×100.5mm×22.5mm
weight	172g
Connection parameter	
Rigid conductor has a usable cross-section range	0.5~2.5mm²
Flexible conductors have an available cross-section range	0.5~2.5mm²
Minimum conductor cross-section	AWG 24
Maximum conductor cross-section	AWG 12
The strip length	8mm
Minimum fastening torque	0.5 Nm
Maximum fastening torque	0.6 Nm
Standard application	
	EN 60947-1:2007/A2:2014
	EN 60947-5-1:2004/A1:2009
	EN ISO 13849-1:2015
Conform	EN 62061:2005+A2:2015
	ϵ

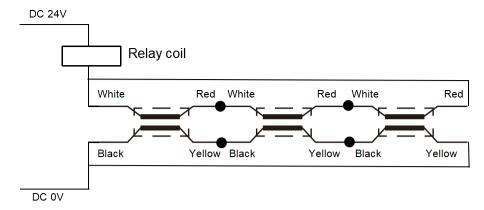
5.1.5. Series wiring method of safety relay





5.2 Relay coil wiring diagram - this diagram is not a safe circuit wiring method

(The mat is a passive NO open contact output and cannot be directly connected to the power supply)

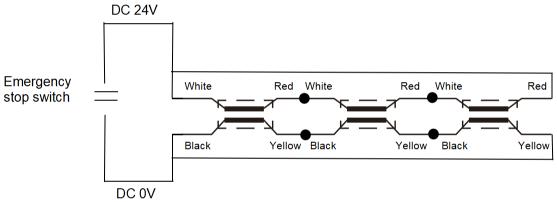


Wiring instructions: the intermediate relay uses DC 24V

- The white wire and the red wire are connected in parallel, and connected to the negative pole of the intermediate relay
- The black wire and the yellow wire are connected in parallel, connected to DC 0V
- The positive pole of the intermediate relay is connected to DC24V

5.3 PLC wiring - this picture is not a safe circuit wiring method

(The mat is a passive NO open contact output and cannot be directly connected to the power supply)



Wiring instructions: according to the emergency stop connection method

- White wire and red wire are connected in parallel, connected to PLC common terminal (0V)
- The black wire and the yellow wire are connected in parallel and connected to the PLC input terminal

6. Safety and precautions

6.1. Please read the operating instructions included with this product carefully before installing and using the safety mat system.



safety output failure can cause serious personal injury. Do not connect the load beyond the rating to the safe output. Loss of safety function required may cause serious personal injury. Do not use safety mats that have logical errors and may cause the activation of the monitored equipment. Instead, the logic function is normal to make the safety output equipped with OFF safety mat in dangerous situations.

Loss of the required safety functions may cause serious personal injury. Because safety mats do not support the child detection function, so do not use it

When using the safety mat for entrance detection, determine the safe distance from the mat to entering the dangerous area according to the following instructions, otherwise the machine

The device will not stop until the person reaches the dangerous area, resulting in a personal injury accident

Minimum safe distance calculation

In the safety protection design, stop time, operator movement speed, safety distance, and crossing and operation of safety devices must be particularly considered. Proper dimensions and safety must ensure that the operator does not reach the nearest hazard point before the machine is completely stopped. The EN ISO0 13855 standard (mechanical safety, limb proximity speed) provides a formula for calculating the safe distance.

The ENISO 13855 calculation formula is used for the

S=KX(T1+T2)+(1200-0,4H)

S Minimum safe distance (mm), calculating the distance from the hazard area to the detection line or detection surface.

K constant mm / s. the invasion speed of a human or object (1600 mm/s).



H Distance through the reference plane (e. g. floor) (safety pad is generally 0mm) in mm.

The maximum response time of the T1 safety device is the time from the sensitive element (safety pad) to the safety protection has output the opposite state.

The response time of the T2 machine, that is, the downtime required to eliminate the danger after the safety device has output the conversion signal.

So the safe distance can roughly be calculated as follows

S=1600mm/s X(T1+T2)+1200mm

Example: The safety distance must be calculated by making the response time of the machine 142.5ms and the response time of the safety device 45ms.

Safety mat is tiled over the ground.

S=1600 mm/s×(0.045s+0.1425s)+1200 mm

S=1600 mm/sx(0,1875s)+1200 mm

S=300 mm+1200 mm

S=1500 mm

The concept of the entire control system, the integration of security components, must be validated by the relevant standards.

6.2. Use precautions

Ensure the safety mat is combined with safety controllers of the SRC106 series.

6.2.1. Please be careful

- A. Do not drop the safety mat to the ground or subject it to excessive vibration or mechanical shock, otherwise it may cause damage to the safety mat or malfunction.
- B. Do not apply load to a certain position of the safety mat for a long time, otherwise it may cause damage to the safety mat.
- C. Do not immerse the safety mat in water or use it in occasions where water splashes frequently.
- D. Before installation, please place the safety mat vertically (straightly) to prevent load on the safety mat.
- E. The product should be protected from solvents such as alcohol, thinner, trichloroethane or gasoline. Such solvents will damage the markings on the safety mat and cause deterioration of related parts

6.2.2. Storage conditions for safety mats

- A. Do not store safety mats in the following situations.
- B. Subject to direct sunlight.
- C. The ambient temperature is outside the range of -37~66°C.
- D. Contains corrosive or flammable gases.
- E. Vibration or mechanical shock exceeds the rated value.
- F. Splashed by oil and chemicals.
- G. Environment containing dust, salt or metal powder

6.3.other

This product is a Class A product (industrial grade product). If this product is used in a civilian setting, it may cause radio interference. in this case. Please take appropriate measures.



Technical support: WhatsApp+86-18922155361 WeChat:+86-18922155361

CYNDAR

GZ Cyndar Co., LTD.

Address: No. 3, Qingxu Street, Tianhe District, Guangzhou .510650 China Tel: 86-20-83717854, Email: sale1@cyndar.net Https://:www.gzcyndar.com