LNTECH®

SF SERIES SAFETY LIGHT CURTAIN

INSTALLATION AND USAGE MANUAL

Please read this document carefully and thoroughly before installation and operation, because the correct and optimum use of this product is important for the personal safety. Please give the user this document with the safety light curtain if you are an agent, a dealer or a machine manufacturer which forms a complete set, because this document is important to guide the user correctly to install and operate.

Foreword

Thanks for choosing LNTECH safety light curtain, this operating instruction manual is designed to address the technical personnel of the machine manufacturer or the machine operator in regards to safe mounting, wiring, commissioning, operation and maintenance of the safety light curtain.

The safety light curtain (herein after called "light curtain") is electro-sensitive protective equipment (ESPE); it is also named " opto-electronic sensor".

It is mainly used in antomotive manufacturing,packaging and other automation fields, prevent staff entering the danger zone and being injured.

The light curtain only protects the rectangular region of the light curtain. If it is installed improperly, either operation is not according to the instruction manual and the correlation security working rule, or the protected device have faults, or other possible causes, it is unable to exert the protective function.

Therefore, before install and operate the protector, please read carefully and understand fully related items in the instruction manual, in particular apprehend about the items stressed as "Warning", "Attention" and so on.

In operating, please understand correctly and fully the operating performance about the protector, operate strictly according to the requests proposed in the instruction manual, stipulate the relevant security working rule.

The contents of this instruction manual are explained by Shandong Laien Optic-electronic Technology Limited Company, if you have any unclear items, please contact us.

Prohibitions:

On the content, it will be modified because of the improved device or other reasons in the future. Please understand without notification in advance.

This manual is prepared professionally, but there is still something imperfect. If you have found the unclear contents, wrong pages or missing pages, etc, please contact the nearest distributor.

Contents

Contents

1 Important Information

1.1 Overview

This manual contains instruction, operation, installation, wiring, maintenance and troubleshooting of the SF series production.

This manual don't offer the instruction of the machine installed with the SF series.The instruction of related machine operation may refer to the instruction of machinery manufacture.

1.2 The Composition of This Manual

This manual contains following chapters:

- Important information contains emphasis information,the makeup of this manual,control dependability information,certificate,directive and so on.
- Basic introduction contains the usage,features, working schematic drawing and terminology,technical parameter data and specification of the SF series safety light curtain.
- Attentions for installation of the light curtain must be noticed contains calculating determination of placement position and attentions for neighboring placement.
- The function of SF series parts and shell size.
- Wiring drawings for NPN/PNP output,the wiring of safety relay with light curtain and so on.
- Ajustment
- Check and maintenance
- Troubleshooting

1.3 Application scope

The instruction is only applicable to SF series safety light curtain. For other series, please refer to the corresponding instruction

This instruction is only provided to the R&D person and operator of SF series light curtain, also to the person who are in charge of the protector's maintenance.

1.4 EU Directives Verification

Directives	No.
Machinery Directive	2006/42/EC
Low Voltage Directive	2014/35/EU
EMC Directive	2014/30/EU

1.5 EU Standards Verification

The installation and usage of the SF series must comply with applicable EU standards(not all list)

Directives	No.
EN ISO 13849-1	Safety of machinery -- Safety-related parts of control systems -- Part 1: General principles for design
EN 61496-1	Machinery safety-Electro-sensitive protective equipment-Part 1:General requirements and tests
EN 61496-2	Machinery safety-Electro-sensitive protective equipment-Part 2:Active opto-electronic protective devices
EN 60204-1	Machinery safety - Machinery electrical equipment
EN ISO 12100-1	Safety of machinery. Basic concepts,general principles for design. Part 1:Basic terminology,methodology Incorporates Amendment
EN ISO 12100-2	Safety of machinery - Basic concepts, general principles for design
EN ISO 14121-1	Safety of machinery - Risk assessment - Part 1: Principles
IEC 61508-1…-7	Functional safety of electrical/electronic/programmable electronic safety-related systems
EN 62061	IEC 62061: Safety of machinery - Functional safety of electrical, electronic and programmable control systems
EN ISO 13855	Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body
EN ISO 13857	Safety of machinery -- Safety distances to prevent hazard zones being reached by upper and lower limbs

1.6 GB Standards Verification

The SF series must comply with the following GB standards

Directives	No.
GB 5226.1-2008	Machinery safety - Machinery electrical equipment
GB/T 16855-1-2008	Safety of machinery -- Safety-related parts of control systems -- Part 1: General principles for design
GB/T 19436-1-2013	Machinery safety-Electro-sensitive protective equipment-Part 1:General requirements and tests
GB/T 19436-2-2013	Machinery safety-Electro-sensitive protective equipment-Part 2:Active opto-electronic protective devices
GB/T 15706-2012	Safety of machinery - Basic concepts, general principles for design - Risk assessment and risk reduction
GB/T 20438-1…-7-2006	Functional safety of electrical/electronic/programmable electronic safety-related systems

1.7 Terminology

Emitter

The emitter consists of emitter units; it can emit the modulated light signal.

Sensor

The sensor consists of emitter units and (or) receiver units. It can emit and (or) accept the modulated light and form light curtain with a reflector (or through reflector/mirror). Output a light passing signal or light intercepting signal to controller. In order to be advantageous for the description, sometimes also refers to the emitter and (or) the receiver.

Reflector

The reflector used to reflect the modulated light from emitter units to receiver units.

Mirror

The mirror used to change the light direction of transmission from emitter units to receiver units, to form multi-sides protection light curtain.

Signal cable

The signal cable used to connect the emitter, receiver and the controller, or connect the sensor and controller.

Light curtain device

All the components that the sensor and the reflector of the reflection type, the emitter and the receiver of the direct protection type and the reflector, the emitter and the receiver of the multi-sides protection type, produce the light curtain.

Light beam

The emitter unit sends out the infrared light, forms a bunch of parallel light after passing optics part.

Beam center line

It is the middle line of the light beam.

Light intercepting

It is the output state of thelight curtainwhen the light curtain is intercepted.

Light axis pitch

The distance of optical axis between the neighboring two bunches of light, uses to express the light beam density of light curtain, the optical axis spacing is smaller, and the light beam is more crowded.

Detection precision

The light curtains' ability to detect the size of test piece, it means when the light curtain is shaded anywhere, active opto-electronic protective device can have induction function and when the device keeps off state, it needs the diameter value of the smallest test piece.

Protective range

Thelight curtaincan protect length scope.

Light beam number

It is quantity of the light beams that sending out from emitter, the same as the quantity of the emitter units in the emitter.

Light passing

It is the output state of the light curtain when the light curtain is not intercepted.

1.8 Safety Instruction

⚠ Warning

Safety light curtain is only taken as a kind of protection measure, can't completely rely on this for security!
For example,when switch off the power to machines or danger area, the light curtain can't prevent the workpieces being ejected, dropped, radiated, also can't detect the transparant objects.
According to the site situation sometimes need take other mechanical protection measures apart from safety light curtain

Please follow the below procedures to ensure of proper and safety application.
The GB/ISO regulations and directives are applicable to the installation,operation,and periodic tech checkouts, specially as below:

- Machinery directives
- Machinery application directives
- Work safety stipulations/safety rules
- Other relative health and safety stipulations

The machine manufacturer and operator of the safety light curtain, are liable to get and abide by all applicable safety stipulations and directives.
Any configuration change to the protector will lower the protection level, so must check the protector works well or not after the change.
The test must be carried out by the qualified safety person or the person who has speciall skills and obtained the authorization, must keep the written record of test for tracing with ease.
The operator who runs the guarded machines installed with SF series safety light curtain must ensure of reading the manual at all times, and must be guided by the qualified person to read the manual!

2 Basic Introduction

2.1 External Dimension

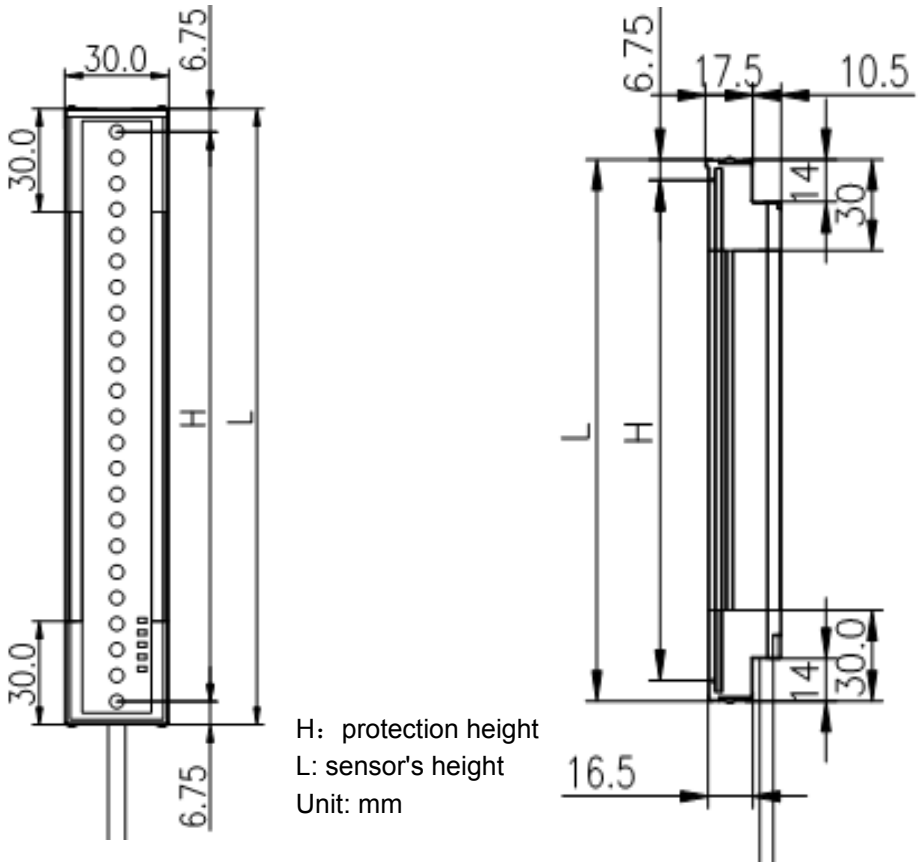


Fig.2-1 SF series sensor's dimension

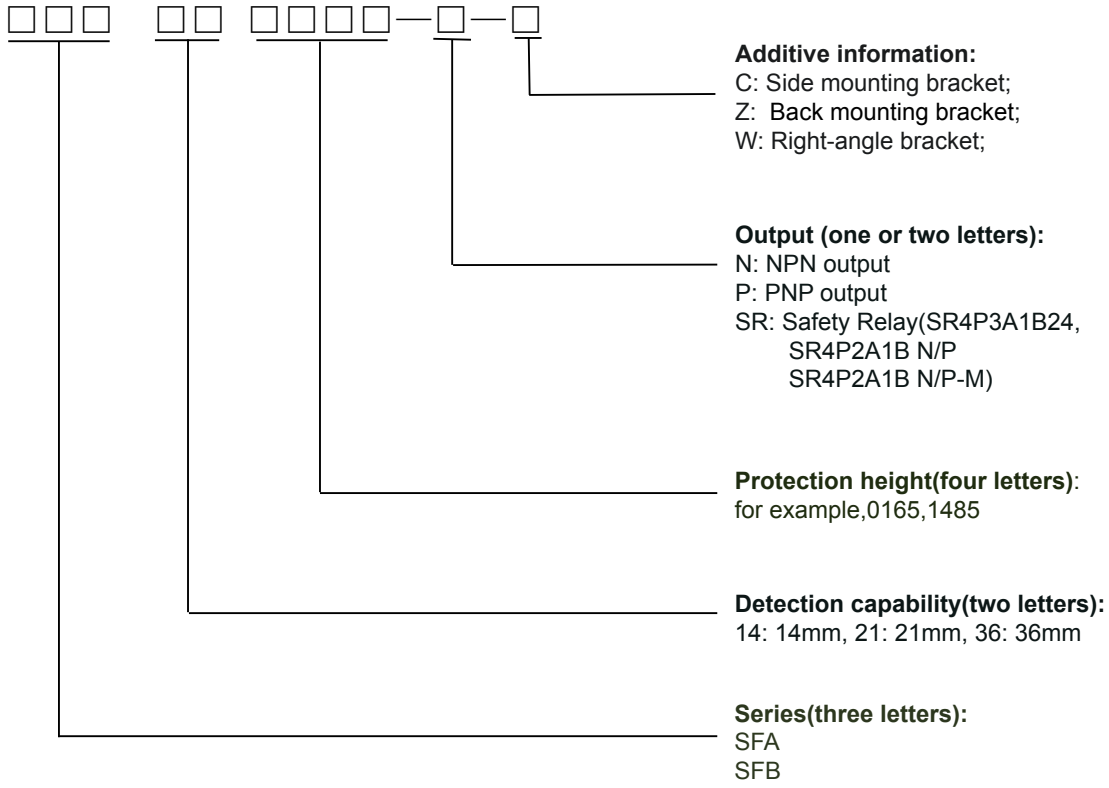
No blind zone design: SF series safety light curtain protection height is almost the same as the sensor's height, can extremely extend the protection area
Slim and compact profile: metal housing with black end covers, elegant apprearance
Protection height: the height depends on the constructure height, please see form 2.1.
Protection width: width of the area protected by the size of the light path between the sender and receiver, and shall not exceed the maximum rated width of the protection area.
Protection level: IP65

2.2 Specifications

The specifications of the light curtain includes five parts ,the first part denotes the series; the second part denotes the detection capability(resolution); the third part denotes protection height; the fourth part denotes the output way; the fifth part denotes other information.The third,fourth and fifth parts separately by “--“.

For example:

SFA140165 - P - W SF series, the detection precision is 14mm, the protection height is 165mm, PNP output and right-angle bracket.



Form 2.1 Specification Table

Light axis pitch14mm			Light axis pitch 21mm		
Spc	Beams	L	Spc	Beams	L
SFA140165	23	179	SFA210165	12	179
SFA140225	31	239	SFA210225	16	239
SFA140285	39	299	SFA210285	20	299
SFA140345	47	359	SFA210345	24	359
SFA140405	55	419	SFA210405	28	419
SFA140465	63	479	SFA210465	32	479
SFA140525	71	539	SFA210525	36	539
SFA140585	79	599	SFA210585	40	599
SFA140645	87	659	SFA210645	44	659
SFA140705	95	719	SFA210705	48	719
SFA140765	103	779	SFA210765	52	779
SFA140825	111	839	SFA210825	56	839

SFA140885	119	899	SFA210885	60	899
SFA140945	127	959	SFA210945	64	959
SFA141005	135	1019	SFA211005	68	1019
SFA141065	143	1079	SFA211065	72	1079
SFA141125	151	1139	SFA211125	76	1139
SFA141185	159	1199	SFA211185	80	1199
SFA141245	167	1259	SFA211245	84	1259
SFA141305	175	1319	SFA211305	88	1319
SFA141365	183	1379	SFA211365	92	1379
SFA141425	191	1439	SFA211425	96	1439
SFA141485	199	1499	SFA211485	100	1499

2.3 Relations between detection precision and light axis pitch

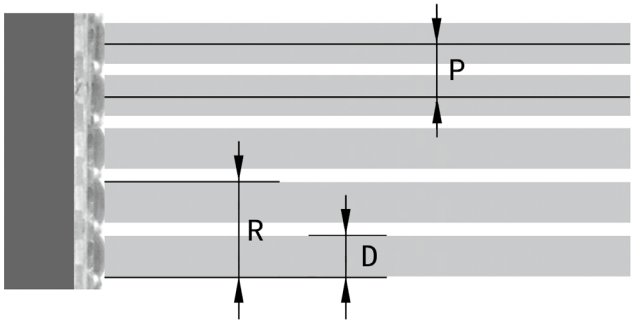
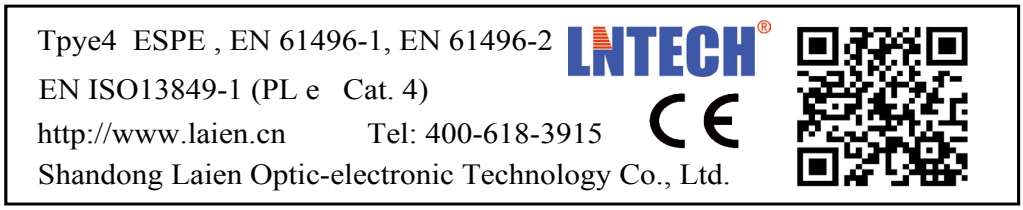


Figure 2-1 Relations between detection precision and light axis pitch

- P: light axis pitch, R: detection precision, D: len's dia.; R=P+D
- Detection precision(resolution):14mm, 21mm
- Different resolution for protection type Form 2.2

Resolution	Len's dia.	Light axis pitch	Remark
14mm	6.5mm	7.5mm	finger protection
21mm	6.5mm	15mm	hands protection

2.4 Technical label



Type	SFA140225	Protection Distance	4000mm	ResponseTime	≤20ms
No	F16071003	Protection Height	225mm	Power Supply	DC12-24V（≤3W）
Data	2016-07	Detection Capability	14mm	Ambient temperature	-10ºC~55ºC
Sealing	IP65	Output	NPN	Output switching capacity	200mA/DC24V

Type	SFA140225	Protection Distance	4000mm	ResponseTime	≤20ms
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Data	2016-07	Detection Capability	14mm	Ambient temperature	-10ºC~55ºC
Sealing	IP65	Output	PNP×2	Output switching capacity	200mA/DC24V

Uniqueness: every safety light curtain with the sole number, can find the basic information with the number.

Benchmark: the important parameters of safety light curtain is marked on the technical label.

Applicability: the parameters in the label is only applicable to SF series safety light curtain, except the models the other information is not changed.

3.Introduction

3.1 Technical Parameters

Performance characteristics		
Protective range		SFA:0-4000mm, SFA:0-8000mm
Protective height		H=(beams-1)×light axis pitch
Detection precision		14mm, 21mm
Light axis pitch		7.5mm,15mm
Light source		Infrared light, 940nm
Acceptance angle of light		Max.2.5°
DC		99%
MTTFd		200a
Light immunity		10000Lux（incident angle≥5°）
Safety level		EN ISO 13849-1：Cat.4
Category		EN 61496-1/EN 61496-2：Type4
Performance level		EN ISO 13849-1：Ple
Electrical properties		
Operating power		DC12V-DC24V
Power consumption		<3W(without load)
Control output		Dual transistor output（PNP or NPN）、load current 200mA,residual voltage below 1.4V
Auxiliary output		Single transistor output(NPN),load current 200mA,residual voltage bellow1.4V
Response time		＜10ms(beam number<=39), <20m (beam number<=87)
Status indicator	Emitter	light passing(green light "ON"),light intercepting(red light "OFF")
	Receiver	light passing(green light "ON"),light intercepting(red light "OFF"),Auxiliary indicator light(yellow light “AL1”, yellow light " AL2", yellow light "AL3")
Noise immunity		IEC61000-4-4：level Ⅲ/IEC61000-4-2：level Ⅲ
Insulating resistance		＞100MΩ
Dielectric strength		AC1500V，60s
Physical characteristics		
Ambient temperature		-10℃～55℃
Humidity		20℃,RH≤85%
Vibration		Frequency range: 10 to 55 Hz Sweep rate: 1 octave/min Amplitude: 0.35 ± 0.05 mm. Number of sweeps: 20 for each of three mutually perpendicular axes
Sealing		IP65
Shell material		Sensor: Aluminium alloy; Light filter: Polycarbonate(PC)

3.2 Characteristics

- **Comply with type 4**
- **No blind zone design, slim and compact profile**
- **Simple mounting and wiring**
- **Good anti-interference to the surrounding lights and electromagnetic**
- **Good anti-vibration,water-proof and dust-proof performance**
- **The running,connection,faults states indication and auxiliary alignment**
- **NPN*2 or PNP*2 output with pulse-inversion**
- **EDM,auxiliary output function(option)**
- **Fixed and floating muting function(option)**

3.3 Working Diagram

The light curtain consists of emitter,receiver,signal cables, it forms infrared light curtain, detects the signal of passing or intercepting, transmits the the signal of passing or intercepting light through the signal cable

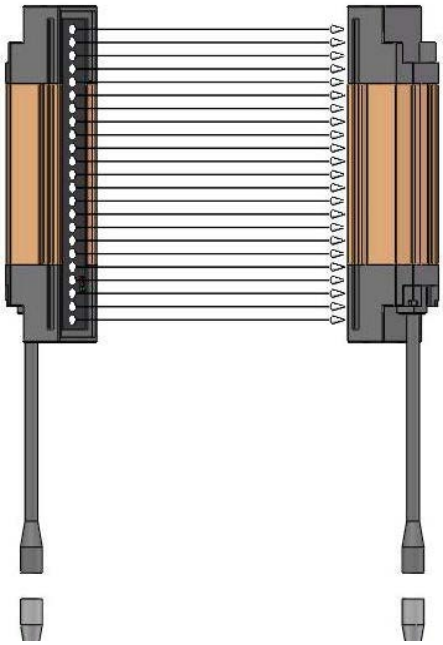

Fig.3-1

Operation principle: safeyt light curtain is composed of emitter, receiver, signal cables, send out the infrared light to form the light curtain and detect the passing, interception state, the relative signal is transmitted by signal cable.

Protection Level: IP65.

Easy to tell the emitter and receiver as there is the specific label marked on the light curtain, can reduce the failure rate caused by identify errors in the installation and maintenance.

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3.4 Aplication Sample

Safety light curtain is widely used in many industries and plays an important role in security, many of them are developed into automed factories by using the light curtain.

The SF series safety light curtain is mainly applied to industry automation, electronics industry etc. which features double redundancy and self-check function, comply with EN 61496-1 and EN 61496-2, Type 4 that ensure the protection function will be kept even single fault or cumulative failure.

- Finger and hands protection
- Protection against hazardous area
- Enter the protection

【finger and hand protection】

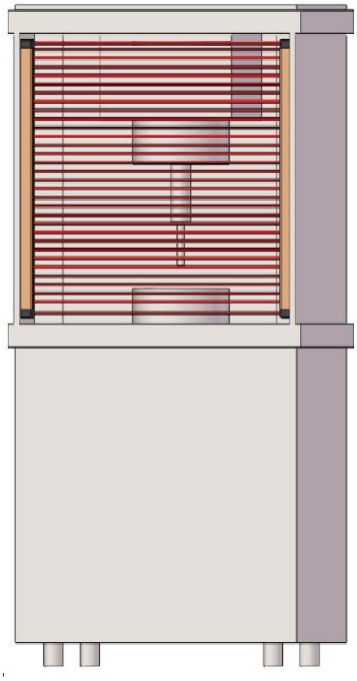


Fig.3-2 dangerous points protection

【dangerous area protection】

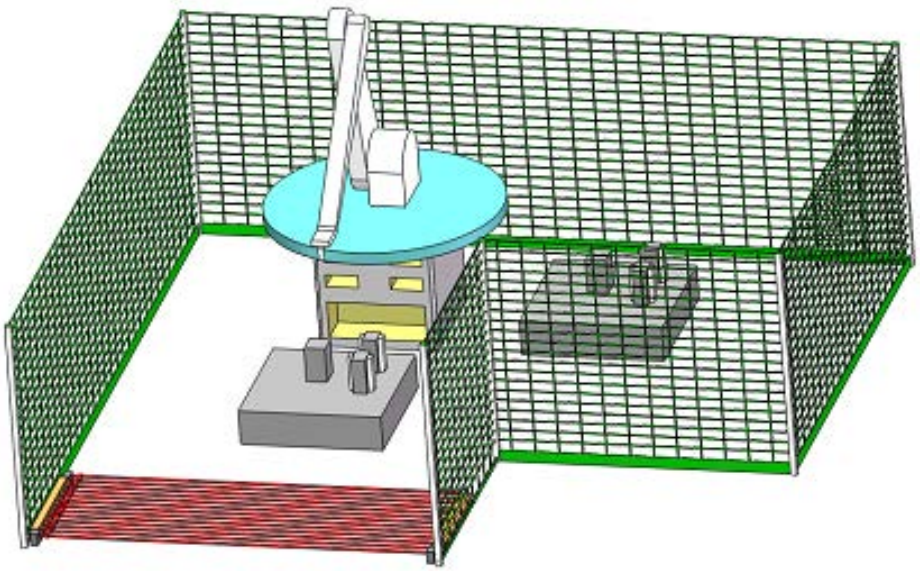


Fig.3-3 dangerous area protection

【access protection】

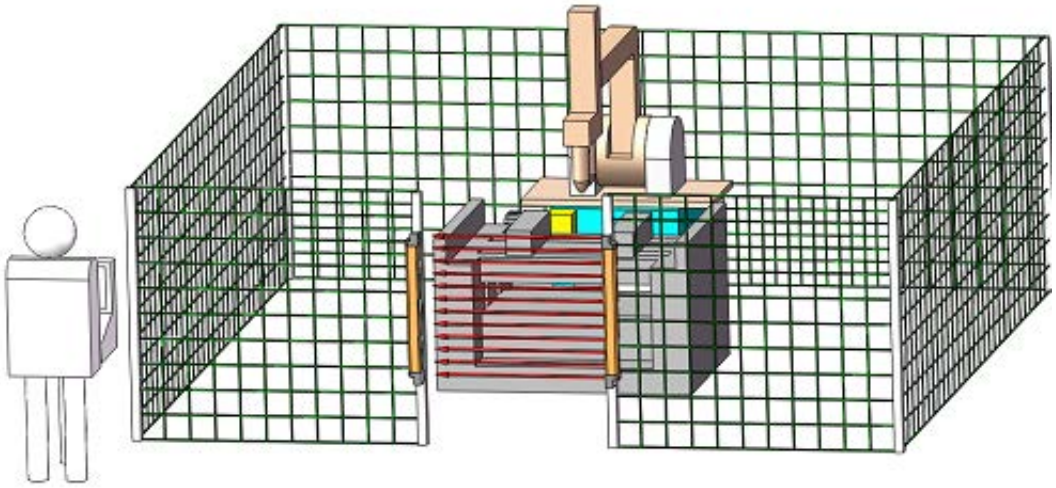


Fig.3-4 dangerous enterance protection

3.5 Application Condition

As the protection device need meet below requirements to properly run the SF series safety light curtain:

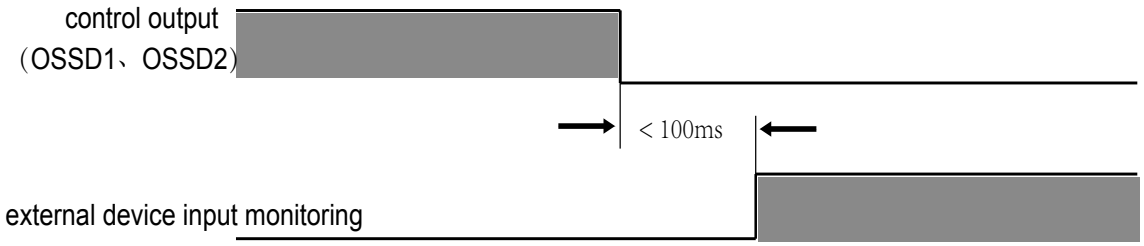
- The machine protected must be electrical controlled
- Ensure the machines state can be changed (the danger state to safety state) at all times
- Ensure the light curtain can detect the objects passing when mount the emitter and receiver
- Must abide by the local stipulation and rules for the application.

4.Functions configuration

4.1 EDM

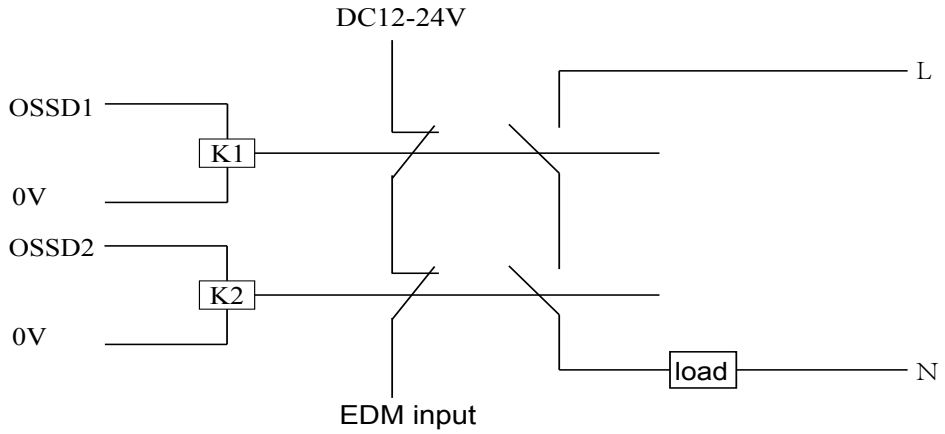
EDM: a means by which a safety device (such as a safety light curtain) actively monitors the state (or status) of external devices that may be controlled by the safety device. A lockout of the safety device will result if an unsafe state is detected in the external device. External device (s) may include, but are not limited to: MPCEs, captive contact relays/contactors, and safety modules.
The captive contact relays connected with the emitter monitor if improper voltage is detected,enter the lock status when failure occurs, but relays delay exceed the setting time, take it as a fualt.
In 0.1s after control output switched ON to OFF, if the N/C contact is not closed, and there is no proper power detected in the monitoring input cable of extal relay, take it as a fualt and enter the lock status.

【asynchronous time】



As the above diagram, light passing state turns to light blocking, safety output is off, meanwhile the relay will react in 100ms. The light curtain will come into the lockout condition when either of realy can't response to the stats change in 100ms.
If the EDM is in lockout condition but there is no problem with the function,should check the relay if works normally or not, also can replace the relay in turn to check.

【EDM wiring】



e.g. for PNP output, OSSD1 and OSSD2 are two safety outputs, K1 and K2 are relays. EDM input is connected with power + through the relays N/C contacts in series, relays N/O contacts in series to connect with safety control circuit.

! Warning

If the EDM fault's lockout,must remove the fault and can't restore the machine with the EDM closed, otherwise, which will lead to the danger and injury

4.2 Auxiliary Output

⚠ Warning

◆the output is only used for sending signal,not safety output,can't control the machine protected
◆If don't need the output, please insulate the black cable end in emitter

There is one signal auxiliary output in the emitter(black cable), the safety light curtain can send out specific status signal through the output.
The auxiliary output is not safety NPN output,can be used with relay or alertor.
--See wring fig.7-2 in P30 for auxiliary output.
--See wring fig.7-1 in P30 for no auxiliary output.

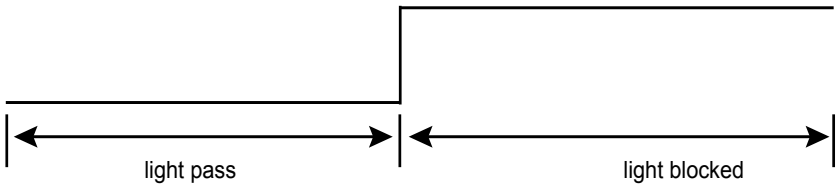
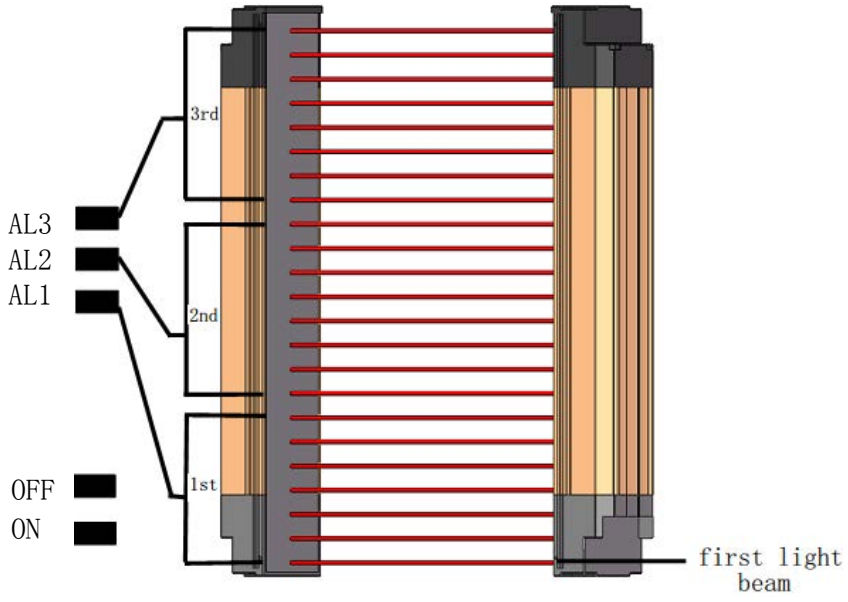


Fig.4-1 output waveform

4.3 Auxiliary Alignment

See Fig.4-2, if improper alignment, the yellow indicator(AL1, AL2, AL3) will give the auxiliary alignment instruction, and the light beams are devided to 3 segments, take the 1st beam as aligning baseline,when this is not aligned, AL1,AL2,AL3 indicator is not ON, otherwise, the LED indicators will be on one by one,after all beams aligned,the green indicator is on.meanwhile the auxiliary indicator(AL1,AL2,AL3)show the light intensity.



Light beams in three segments

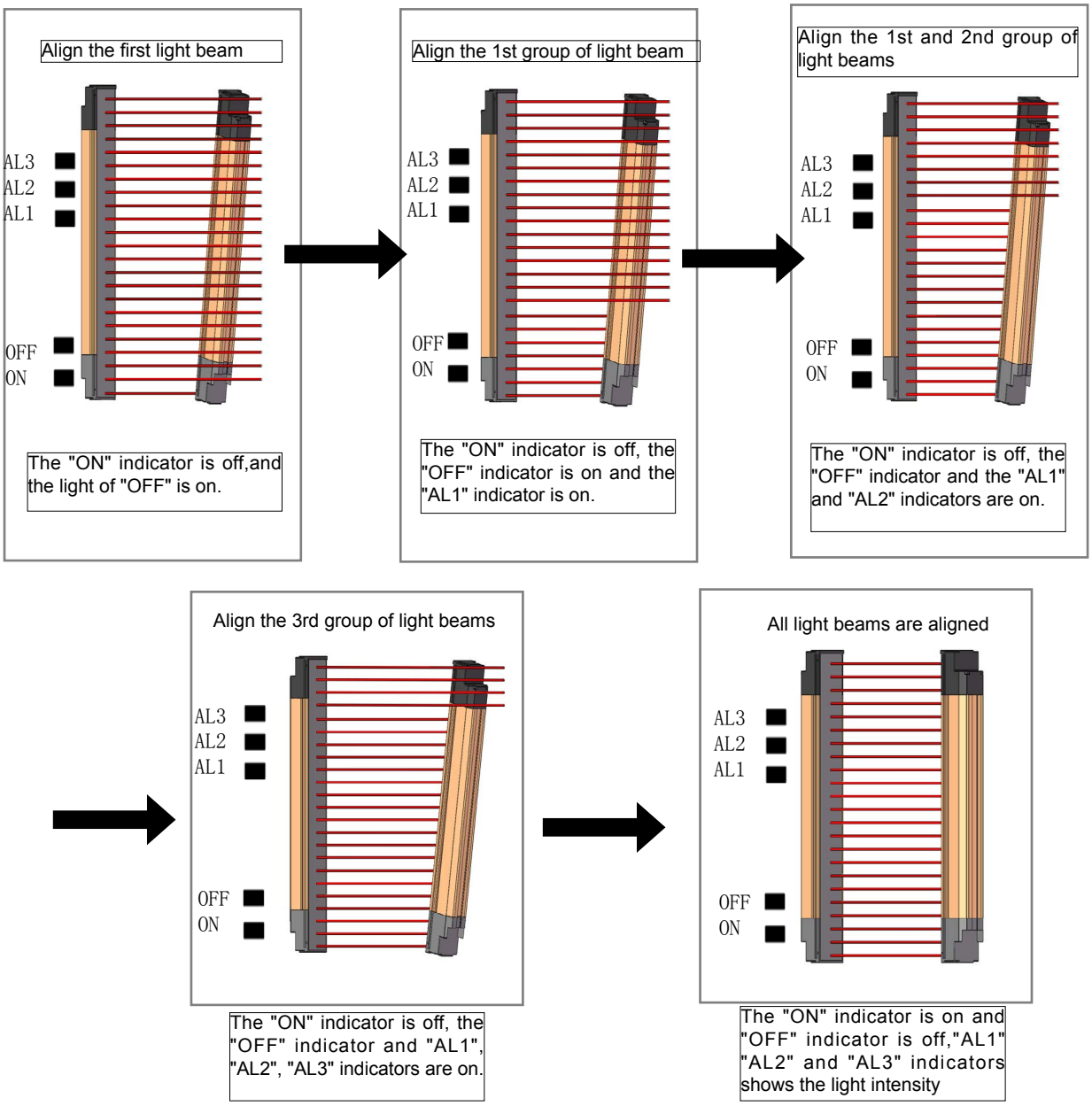


Fig. 4-3 Schematic diagram of auxiliary alignment

4.4 Alignment Intensity

After properly align,yellow indicators(AL1,AL2,AL3) display the alignment strength, by adjust emitter, receiver position and angle,there will has visually light changes in indicators, the amount of "on" indicators means the alignment intensity, 4 level in all,all yellow light is on,strongest alignment,otherwise,weakest.

5.Installation

This chapter will give the procedures of SF series installtaion
1. Calculate the safety distance according to application environment
2. Determine the installation way, there are 3 Kinds of bracket for SF series include: side mounting, back mounting, right-angle bracket, you can choose the right bracket for your application：

! Attention

◆ The installation,connecton,debugging and maintenance should be carried out by the trained person and skilled workers
◆It's the invalide claims on guarantee under the condition that use this for any other application or changes to the protector(during assembly and installation as well)

5.1 Safety Distance

The safety distance is the minimum distance that must be maintained between the light curtain and the dangerous parts of the machine, so that the machine can be stopped before a human body or an object can reach the dangerous parts .
In order to guarantee the operator's personal safety, the light curtain's installment position must meet the requirements of the safety distance, otherwise a possible accident may occur.

5.1.1 The Formula 1

Regarding the press which the slide can stop in the optional position, its safety distance Ds computational method is given by the formula 1.

Ds = KT + C ..... Formula 1

In the formula:
Ds---Safety distance, the unit is millimeter (mm);
K---Intrusion velocity of operator’s body or object, the unit is millimeter per second (mm/s);
T---Total response time of equipment, the unit is second (s);
C---Additional distance, the unit is millimeter (mm).
Before installation, please unpack the package box and checkup packing component according to the packing detailed list;
During installation, please shut off power supply to avoid electric shock.

5.1.2 K Value Determination

When the light curtain is installed in a horizontal position, taken as 1600mm/s for calculation.
When the light curtain is installed in a vertical position, and the safety distance is no longer than 500mm, taken as 2000mm/s; if the safety distance is longer than 500mm, then taken as 1600mm/s for calculation.

5.1.3 T Value Determination

The total response time of equipment T includes two parts, response time of the protector and maximum halting time of the equipment.
The response time of the protector is given by the supplier.
The maximum halting time of the equipment needs to be measured.

5.1.4 C Value Determination

Additional distance C is determined according to the distance that the operator’s hands enter the light curtain and extend to hazard point by certain speed, until the protector is able to achieve protection condition.
When the press is not used the self-lock (start - restart locking) function by the protector, according to its examination precision, when calculating safety distance, should use the Table 5-1 stipulations at least.

Fig.5.1

Resolution/mm	C/mm	start the stroke by the device
≤14	0	Yes
＞14≤20	80	
＞20≤30	130	
＞30≤40	240	No
＞40	850	

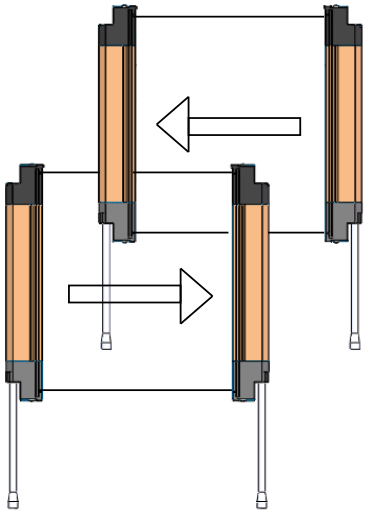
For example, maybe need different calculation depends on the application envrionment
The machine stop time = 300ms
Response time after beam intercepted = 20ms
Resolution = 14 mm，C=0
T = 300 ms + 20 ms = 320 ms = 0.32 s
S = 2000 × 0.32 = 640 mm
S > 500 mm， so：
S = 1600 × 0.32 = 512 mm

⚠ Warning

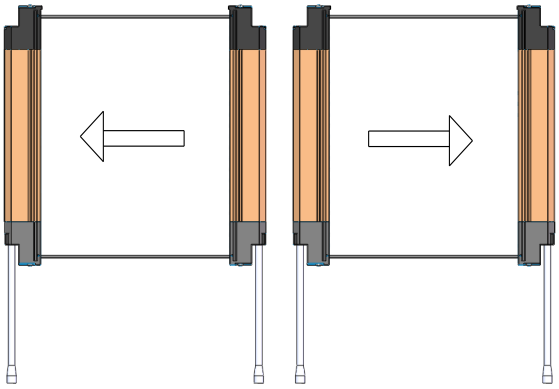
◆Safety distance is one of necessary conditions, must calculate the distance correctly
◆Must ensure the min. distance from light curtain area between sender and receiver to danger zone more than safety distance
◆Safety distance exceeds 400mm, need take other safeguard measures as auxiliary protection

5.2 Installation of multiple safety light curtains

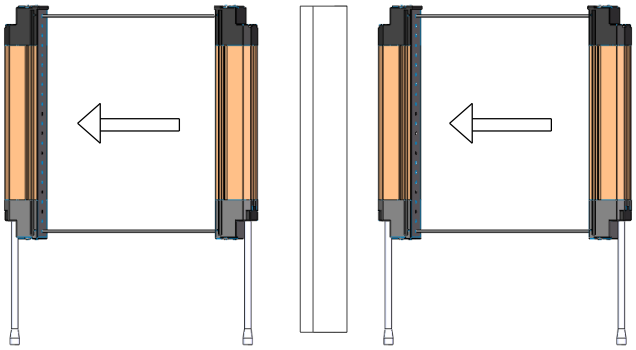
Two or more light curtains are installed one close to another, which will be interefered mutually. In order to avoid the interference, it should place the light curtain at right postion as below demonstration.



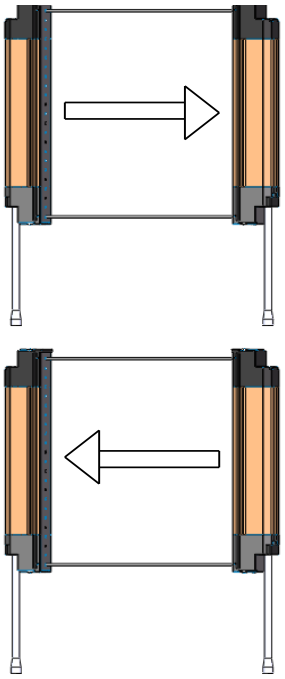
1, in horizontal plane



2, in horizontal plane



3, seperated by board



4, light curtains stacked

Figure 5-1 Installation of mutiple sensors

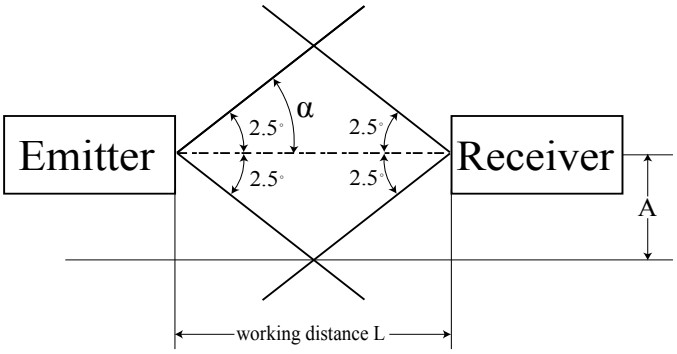
! Warning

A. The mutual interference between the light curtains can cause the protection function failure

B. Need take correct placement method to eliminate the interference

5.3 Near reflective surfaces

Avoid the light curtain near a reflective surface, like the metal plate, the floor, the ceiling, the workpiece, the walls, the partition board, the glass plate and so on, the distance from light curtain placement position to the reflective surface is farther than value A (m), value A can be calculated by the formula in form, or be consulted from the coordinates chart.



Protection range L	Permitted distance A
0.3 to 3m	0.16m
>3m	L × tan2.5°=L×0.052

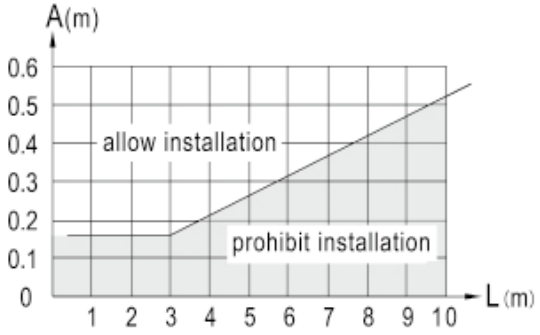


Figure 3-4 Reflective surface

! Warning

A. The reflective surfaces can affect the sensing area, the protection function may fail and could result in serious injury
B. The placement position of the sensor must be as far as possible away from the reflective objects, or cover up the reflective objects to eliminates the disturbance around the light curtain

5.4 Installation

There are 3 kinds of installation ways: side installation bracket, back installation bracket and right-angle bracket, specific desgin to increase the mounting flexibility, while reducing the mounting time almost can meet the installation requirements.

【back mounting bracket】

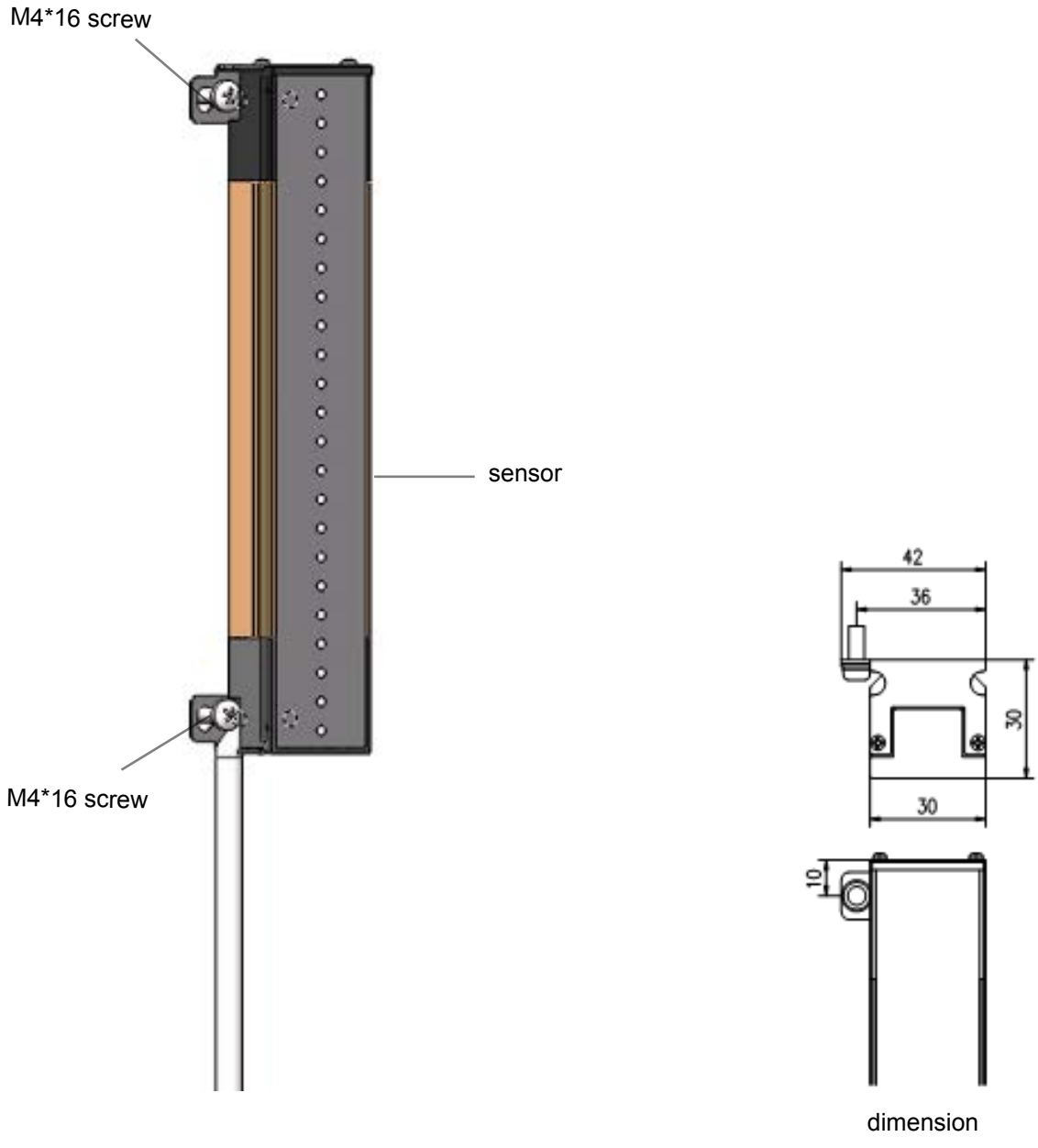
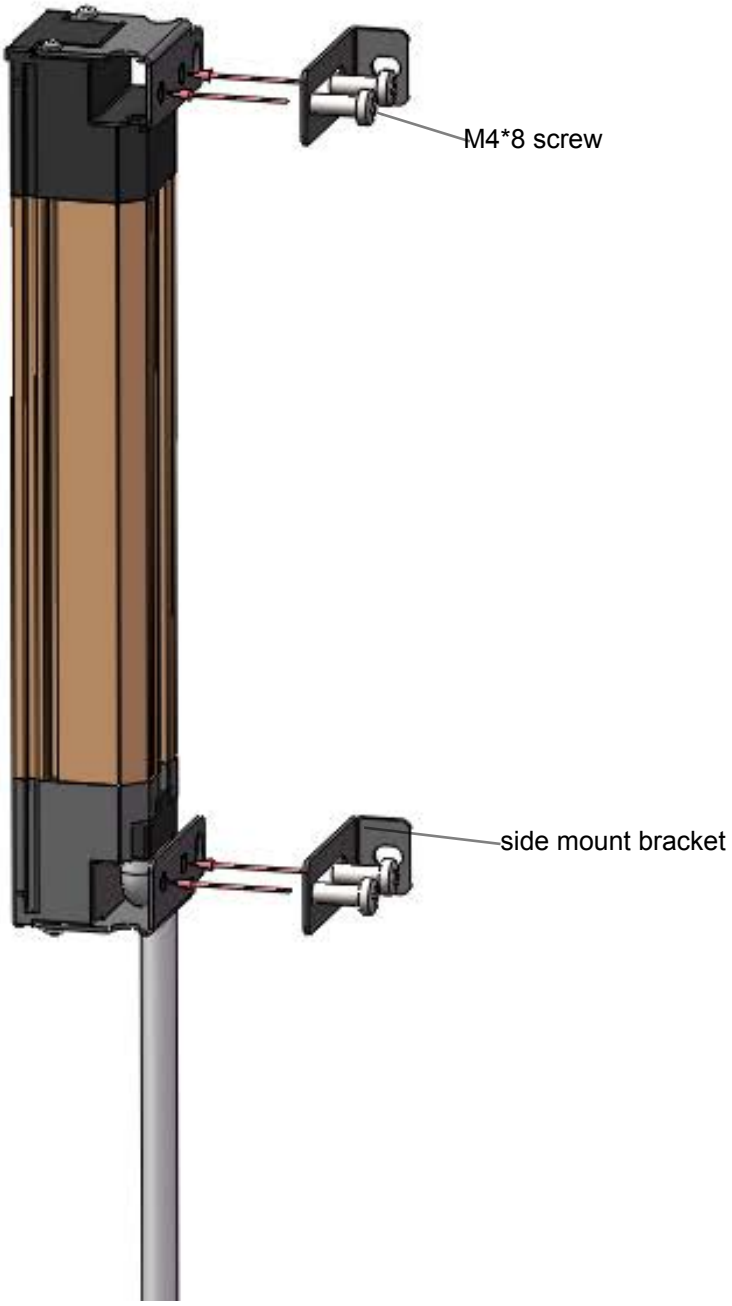


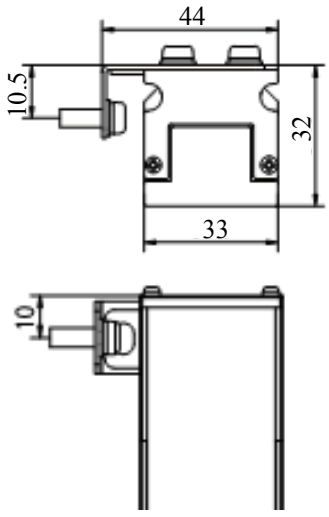
Fig.5-3 back mounting bracket

Back mounting procedure:

The bracket has been already mounted on the sensor before leave factory, only need use the M4*16 screw to fix the sensor to the mouting position.

【side mounting bracket】





side mounting dimension

1st step:
Use M4*8 screw to fix the backet to SFA sensor

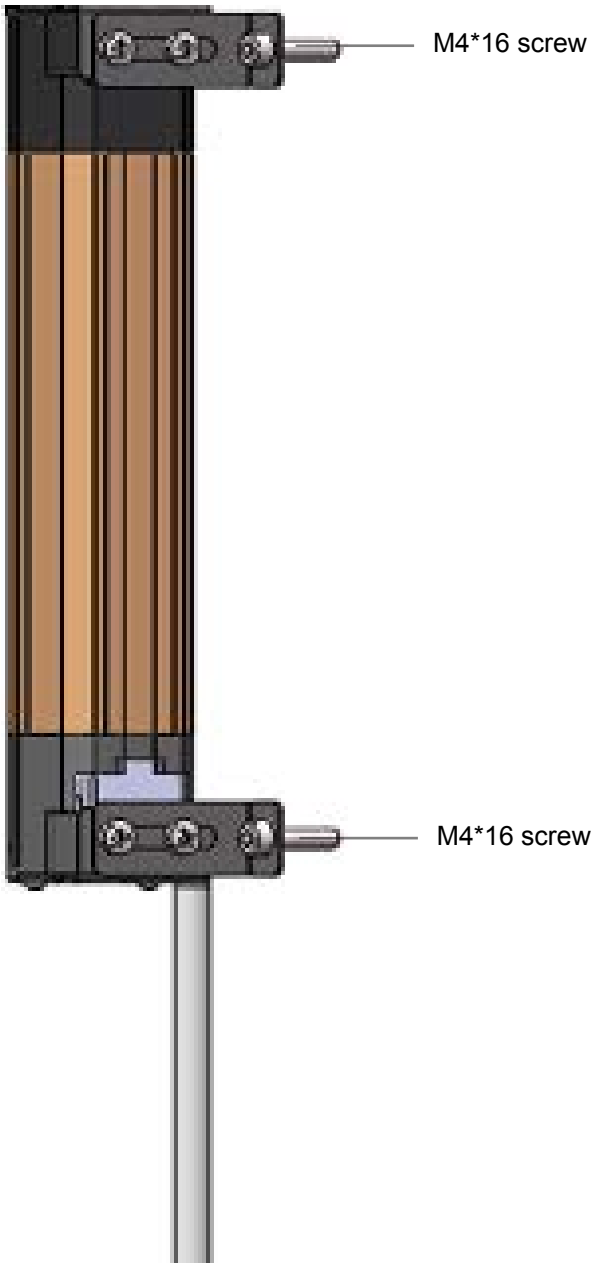


Fig.5-4 side mounting bracket

2nd step:
confirm the mounting position,and drill the hole,use M4*16 screw to fix the sensor

【right-angle bracket】

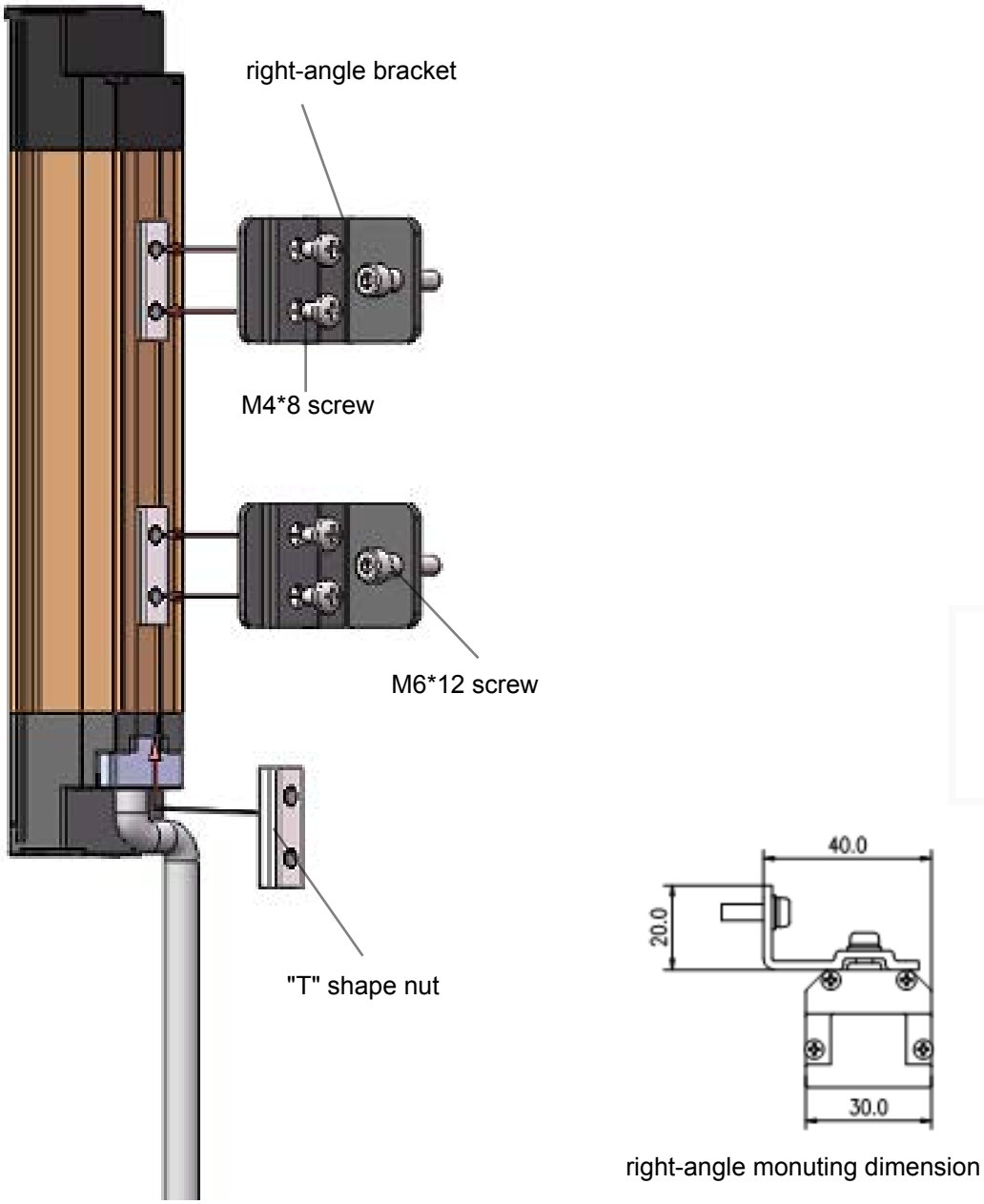


Fig.5-5 right-angle bracket installation

I**nstallation steps:**

1st: mount the "T" shape nut into the sensor as per the drawing,each sensor with 2 "T" nuts
2nd: connect the right-angle bracket(2 pcs) with the "T" nut in the sensor
3nd: drill the hole at the mounting position, then use M4*16 screw fix the sensor into the hole.

5.5 Installation tools

Electric drill,bit(Φ4.2,Φ5.0,Φ6.8,Φ10)
Screw tap(Size:M6)
Crosshead and A"screwdriver
Sechskant-Schraubendreher(Size:5mm,6mm)
long flat nose pliers and so on

- Need Φ5.0 drill and M6 screw tap to mount right-angle bracket;
- Need Φ10 drill bit for wiring hole.

6.Components

SF series safety light curtain is composed of emitter and receiver, the emitter sends out infrared light direct to the receiver to generate the light curtain.
SF protection range: 0～4000mm

6.1 Main parts

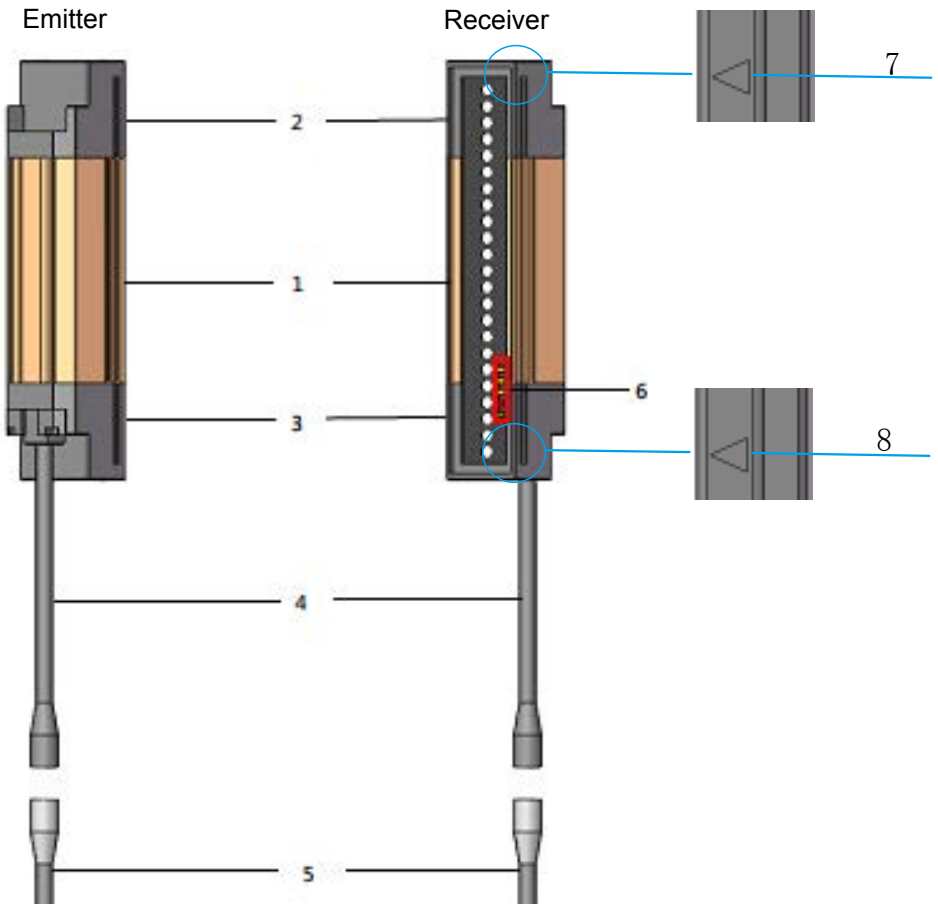


Fig.6-1 main parts

1. Sensor shell
2. Light beams
3.The under cover
4.SFA connecting cables
5.SFA extension cables
6.Signal indicator
7.Sign of the first light beam
8.Sign of the last light beam

6.2 Emitter Indicators

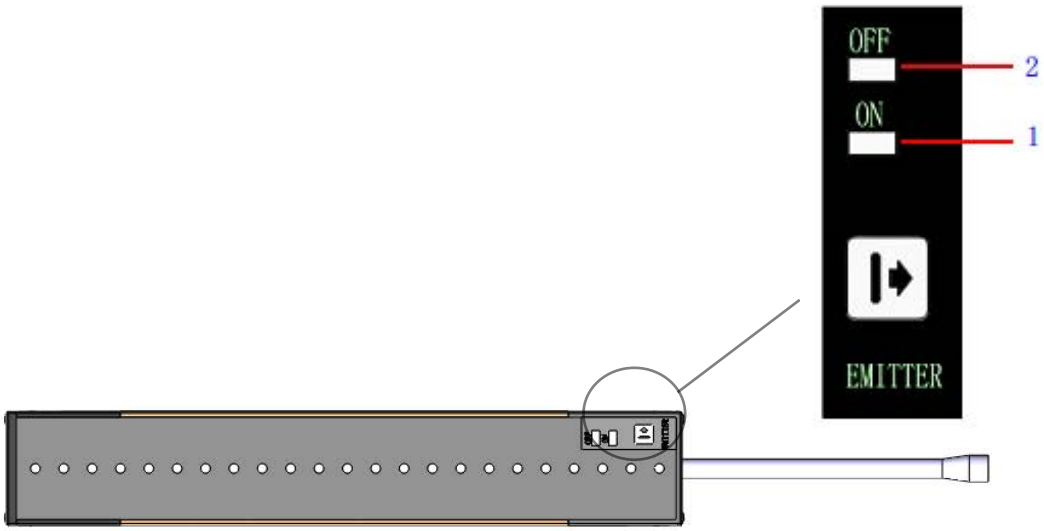


Fig.6-2 emitter indicators

Two indicators:

1.green light:ON

2.red light: OFF

Status indications

Component	Green indicator	Red indicator	Status description
Emitter	on	off	Light psssing.
	off	on	Light intercepted.
	off	flash	Fault state.sensor wiring fault
	on	flash	Fault state.Internal self-test fault
	flash	flash	Fault state.EDM abnormal function.

6.3 Receiver Indicators

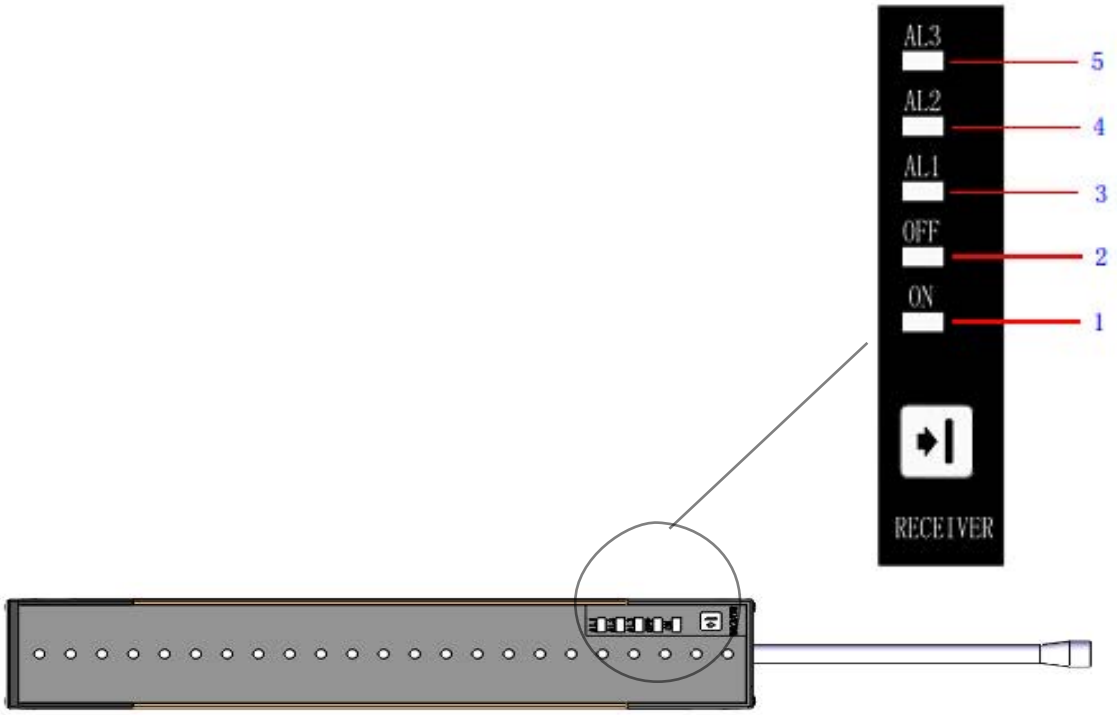


Fig.6-3 receiver indicators

Five indicators:

1.Green light:ON

2.Red light: OFF

3.Yellow light: AL1

4.Yellow light: AL2

5.Yellow light: AL3

Status indication

Component	Green	Red	Yellow AL1	Yellow AL2	Yellow AL3	Status Description
Receiver	on	off	Auxiliary indicator, indicating the intensity of light.			Light psssing;Yellow lights are on,light intensity is strongest;Yellow lights are off,light intensity is weakest.
	off	on	Auxiliary indicator, indicating the position of the light beams blocked			Light interceped.L1,L2,L3 are off the first beams is shading;L1 is on,some of the top 1/3 beams are shading;L1,L2 are on,some of the middle 1/3 beams are shading;L1,L2,L3 are on,some of the after 1/3 beams are shading
	off	flash	flash	off	off	Fault state.the first or second output wiring fault.
	off	flash	others			Fault state. internal circuit fault

7 Wiring

Warning

- Before wiring,must switch off the guarded machine and wiring as per the diagram properly
- Any change is prohibited in the circuit
- The user has the responsibility to ensure that all local, state, and national laws, rules, codes, or regulations relating to the wring. If the wiring is not followed properly, the device cannot provide the protection for which it was designed.

Remark: the wiring to the guarded machine by Qualified Persons, in accordance with this manual and applicable safety regulations.

The power device need meet below requirements:

1) local verified power device

2) comply with EMS directs(for CE certification)

3) comply with low-volt directives,output power below 100VA

4) output holding time >20ms

5) when electric surge occur,need usd SPD

6) In line with CLASS 2 (comply with UL/cUL)

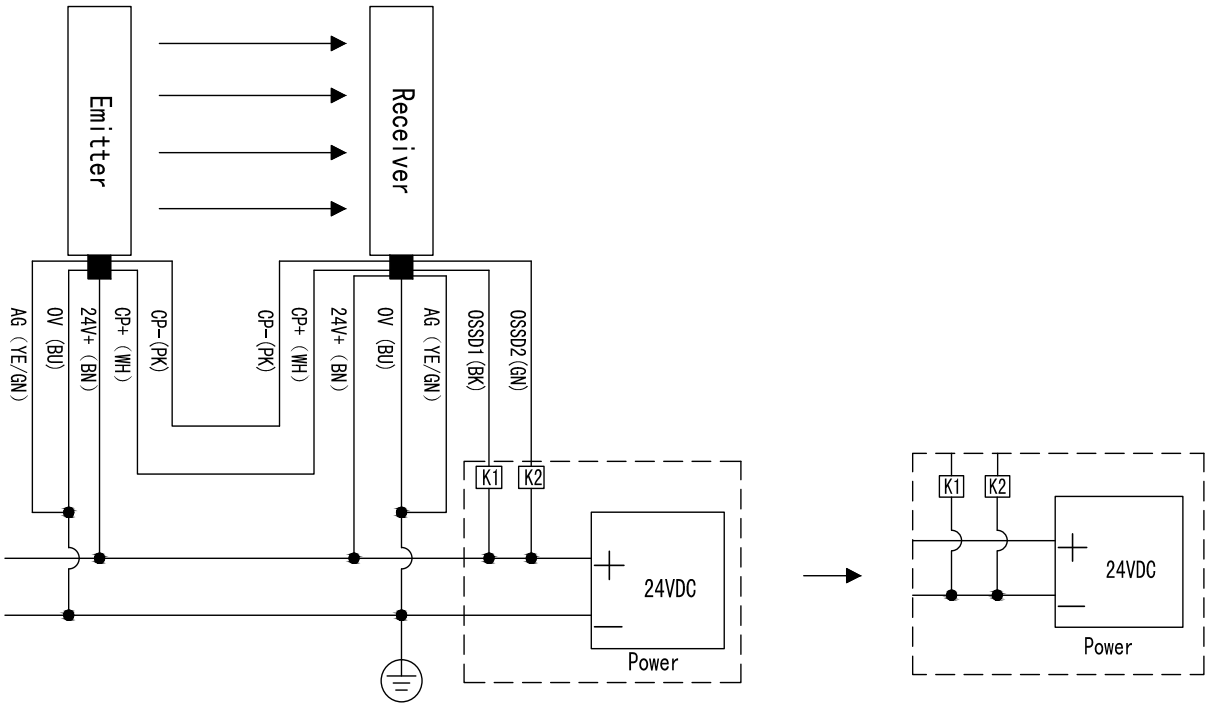
<SUPPLYMENTARY> As IEC 60536 regulation that the power device with double insulation or reinforced insulation distance.

Comply with low-volt directives and output power<100VA

7.1 I/O Wiring

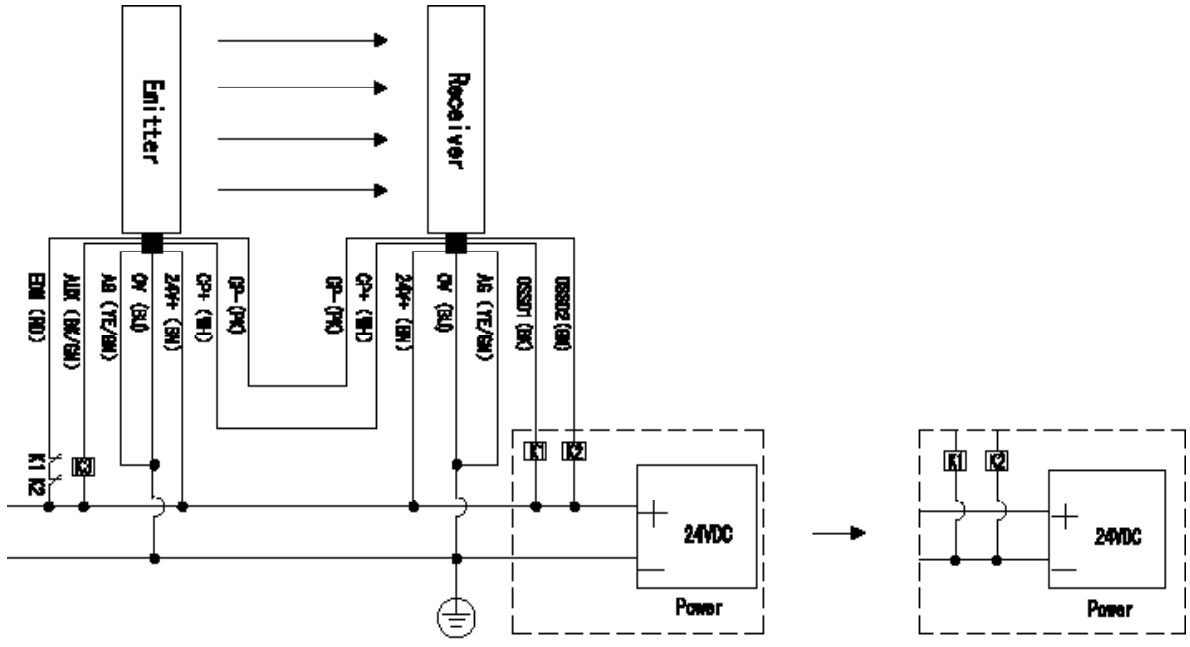
Warning

1.If don't use EDM function,please short the red and black-green cable in emitter
2.Must insulate the unuse cable ends
3.Should take into account pulse-inversion effect to PLC
4.Fig.7-1,7-2 K1,K2 and K3,Fig.7-5,7-6,7-7,7-8,7-9 K3 and K4 is the external device, should take the forced guide safety relay or magnetic contact



SFA-NPN SFA-PNP

Fig.7-1 I/O wiring



SFA-NPN SFA-PNP

Fig.7-2 EDM function wiring

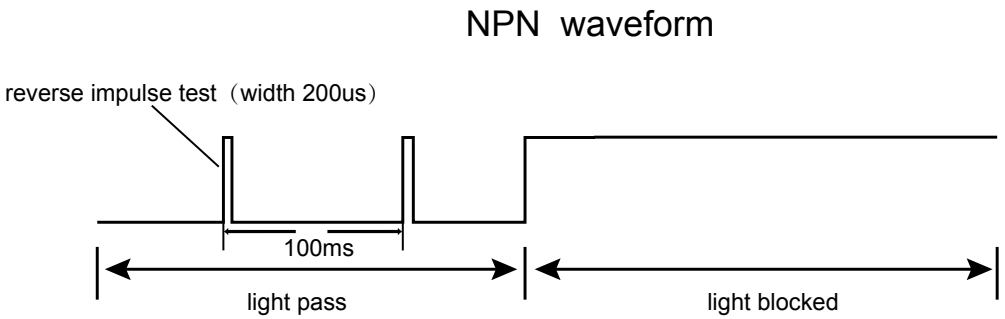


Fig.7-3 NPN output waveform

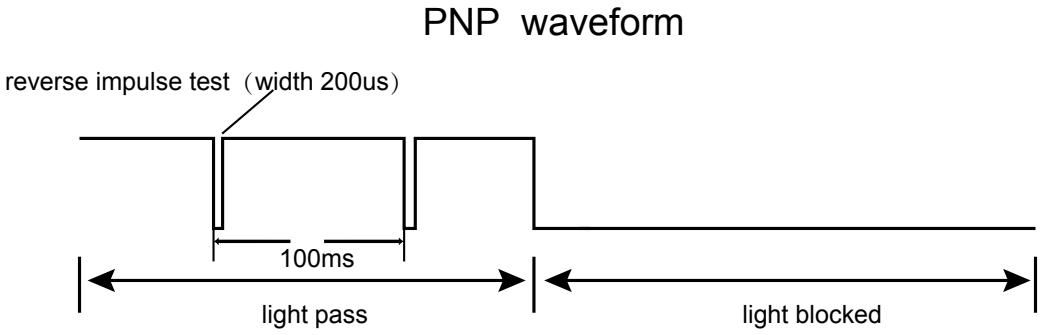
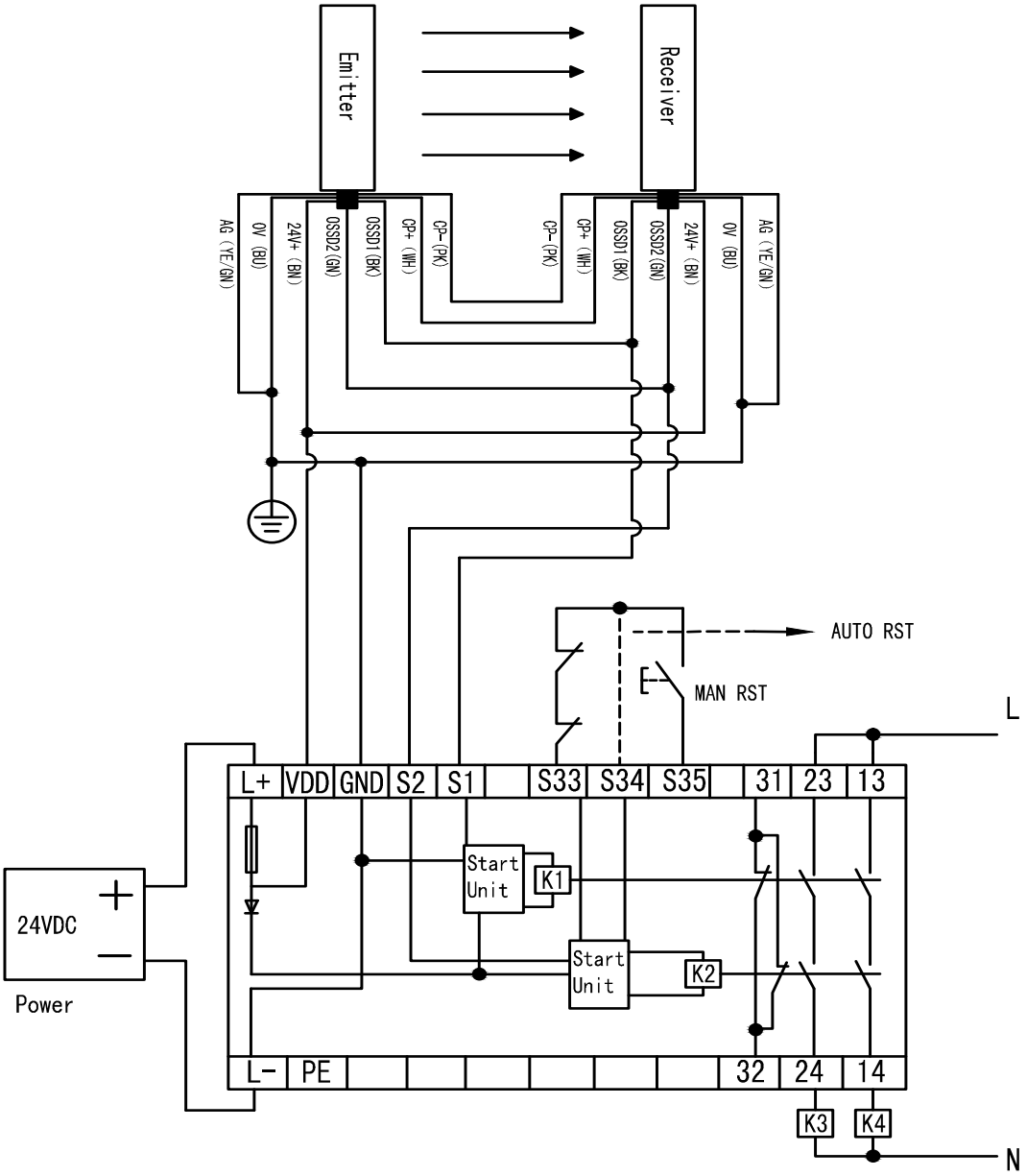


Fig.7-4 PNP output waveform

7.2 Wiring with safety relay SR4P2A1B24N/P



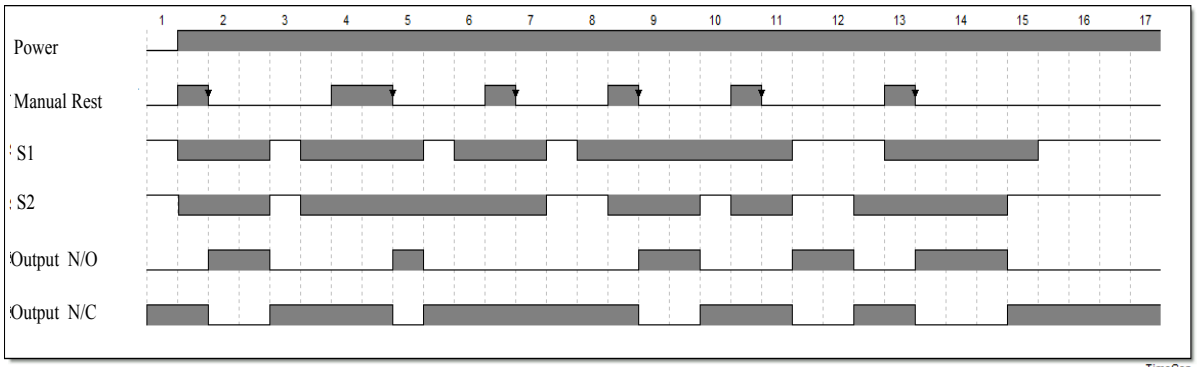
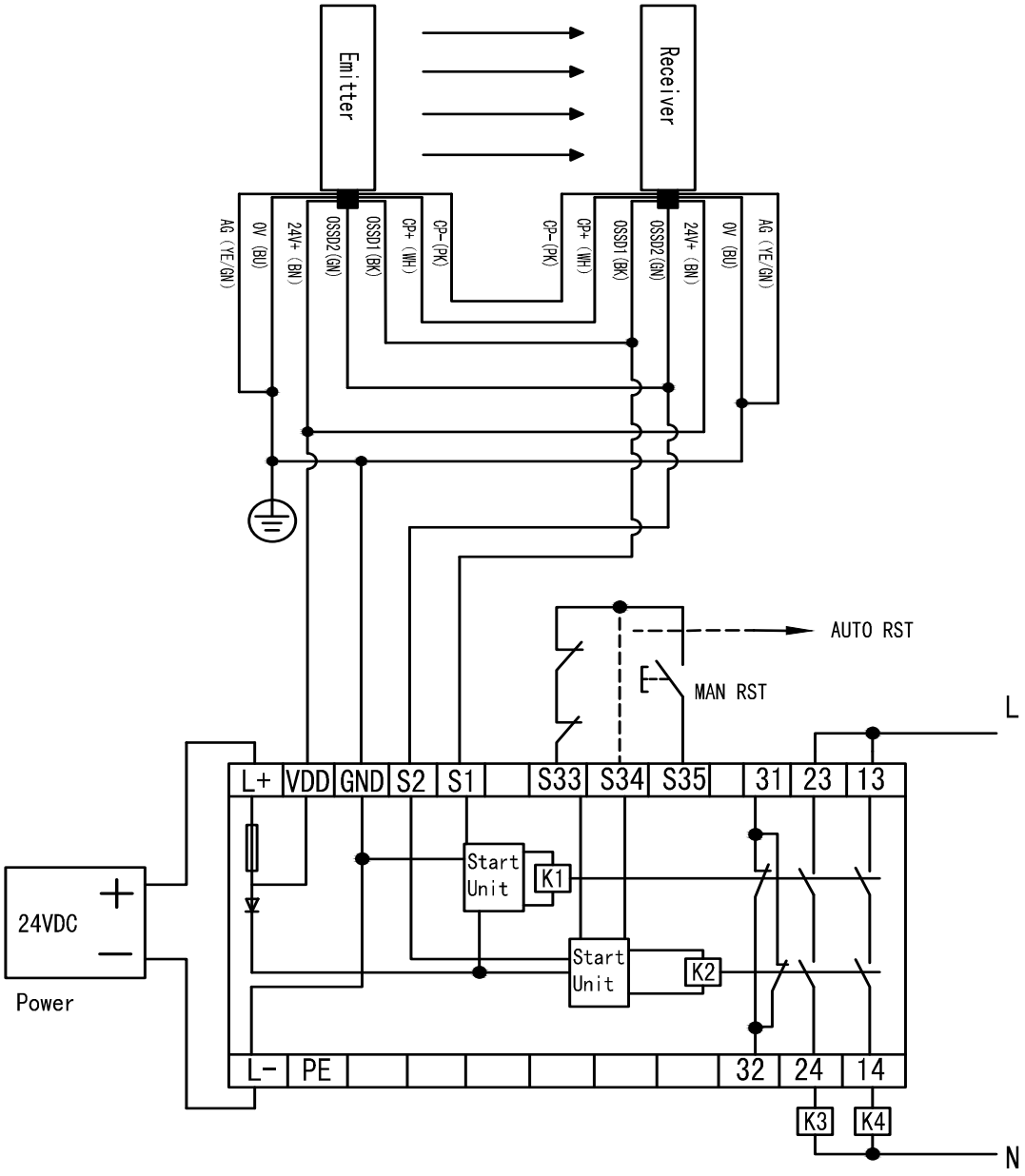


Fig.7-5 SR4P2A1B24N output waveform and time graphic



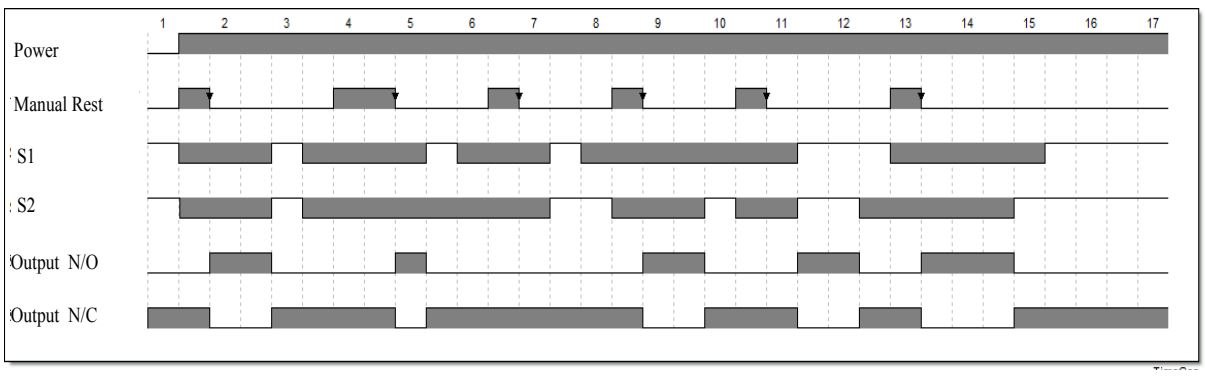
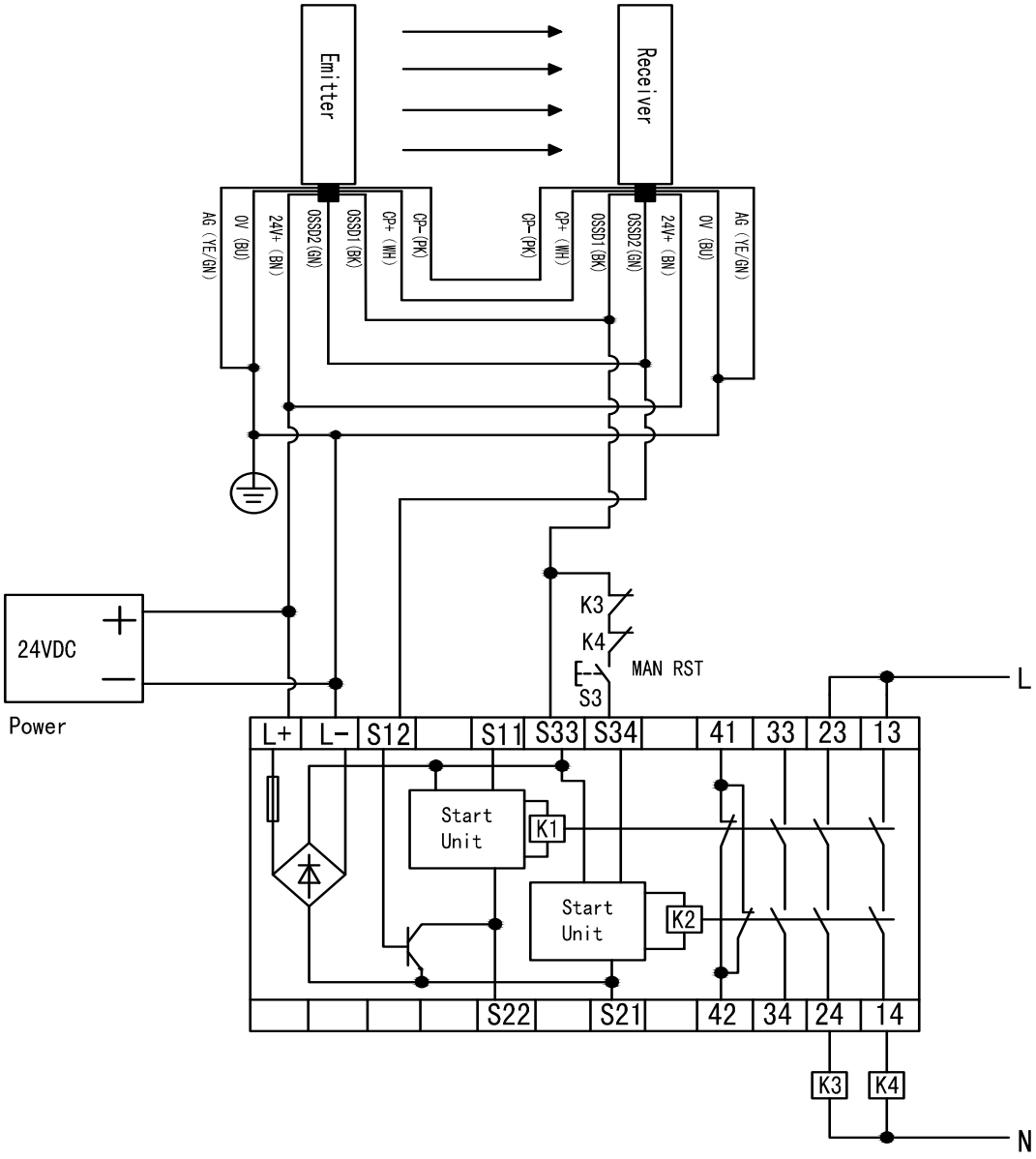


Fig.7-6 SR4P2A1B24P output waveform and time graphic

7.2 Wiring with safety relay SR4P3A1B24



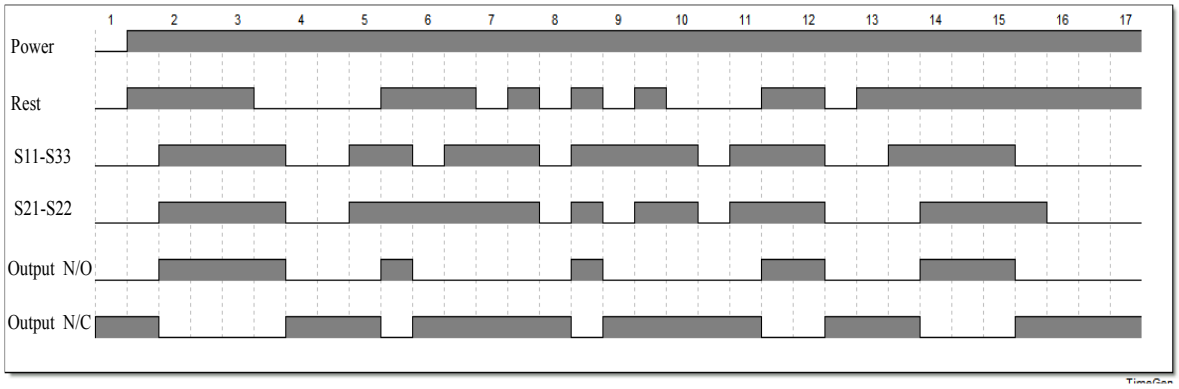
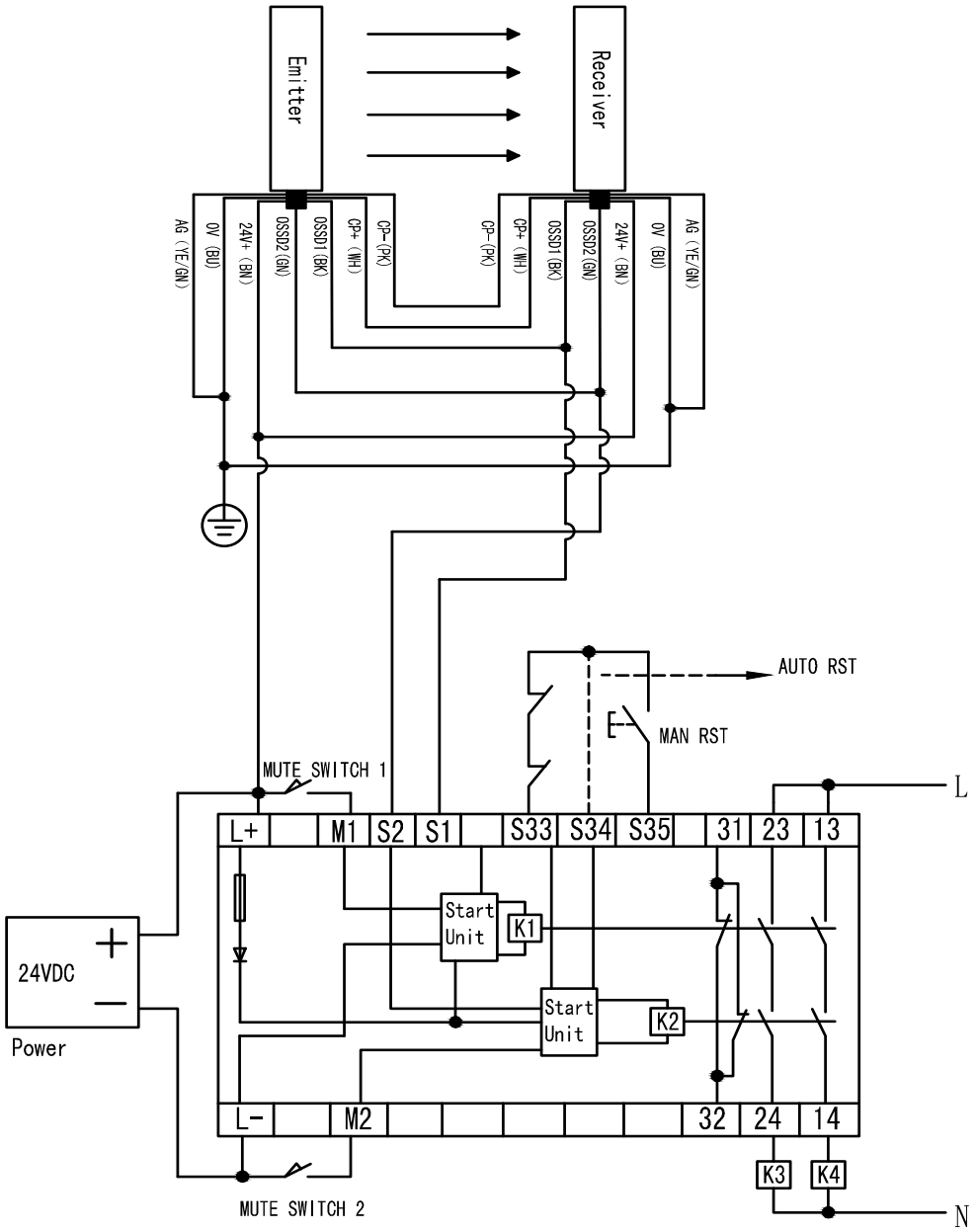


Fig.7-7 SR4P3A1B24 output waveform and time graphic

7.4 Wiring with safety relay SR4P2A1B24N-M



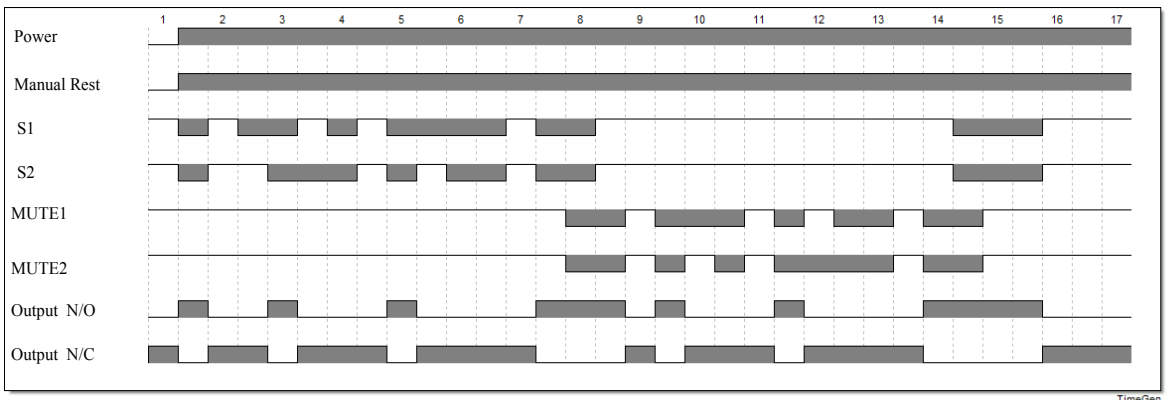
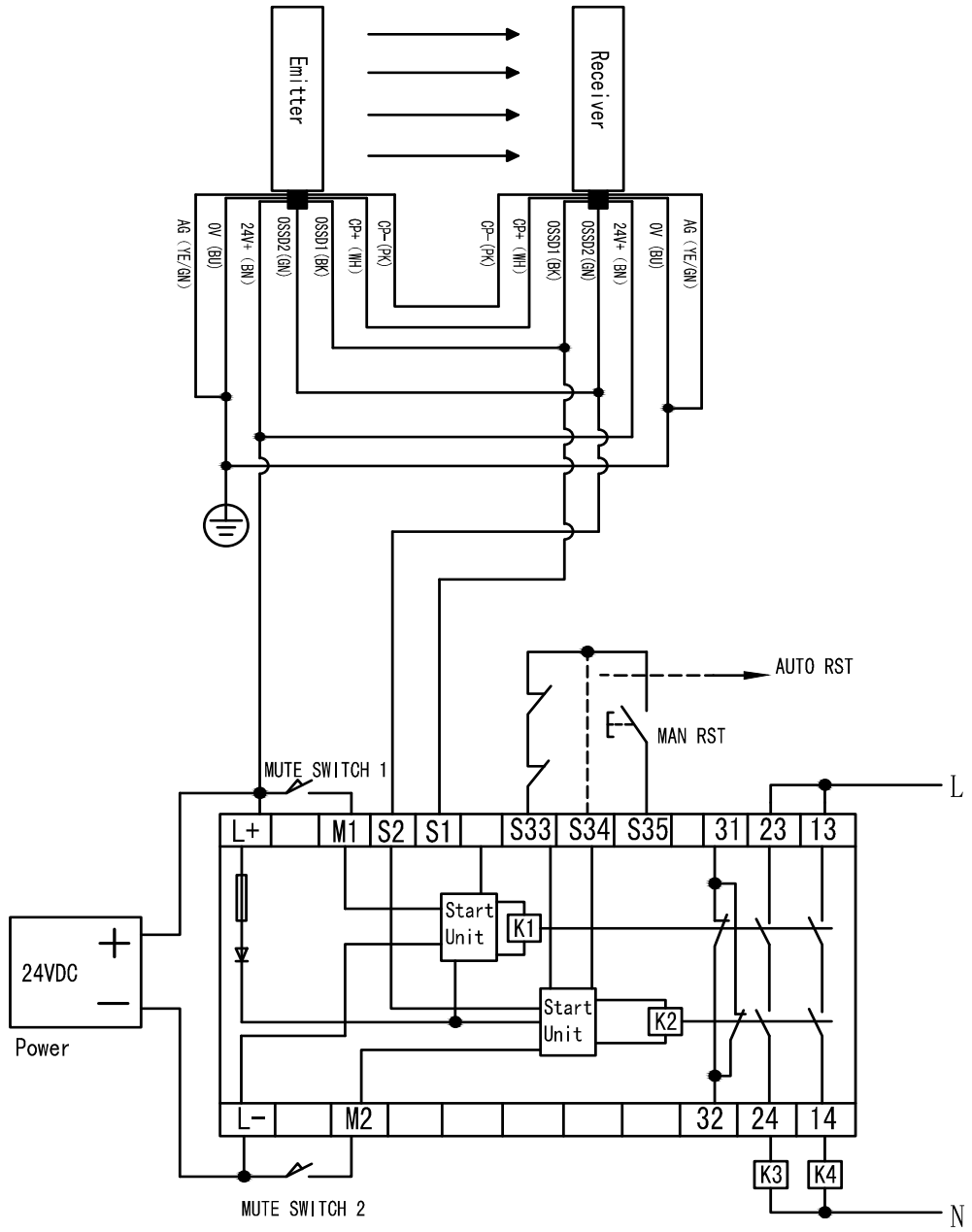


Fig.7-8 SR4P2A1B2N-M output waveform and time graphic



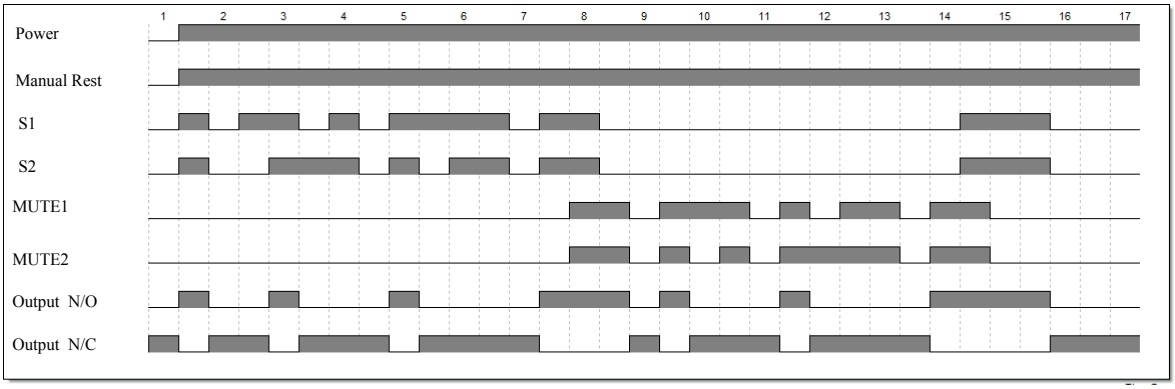
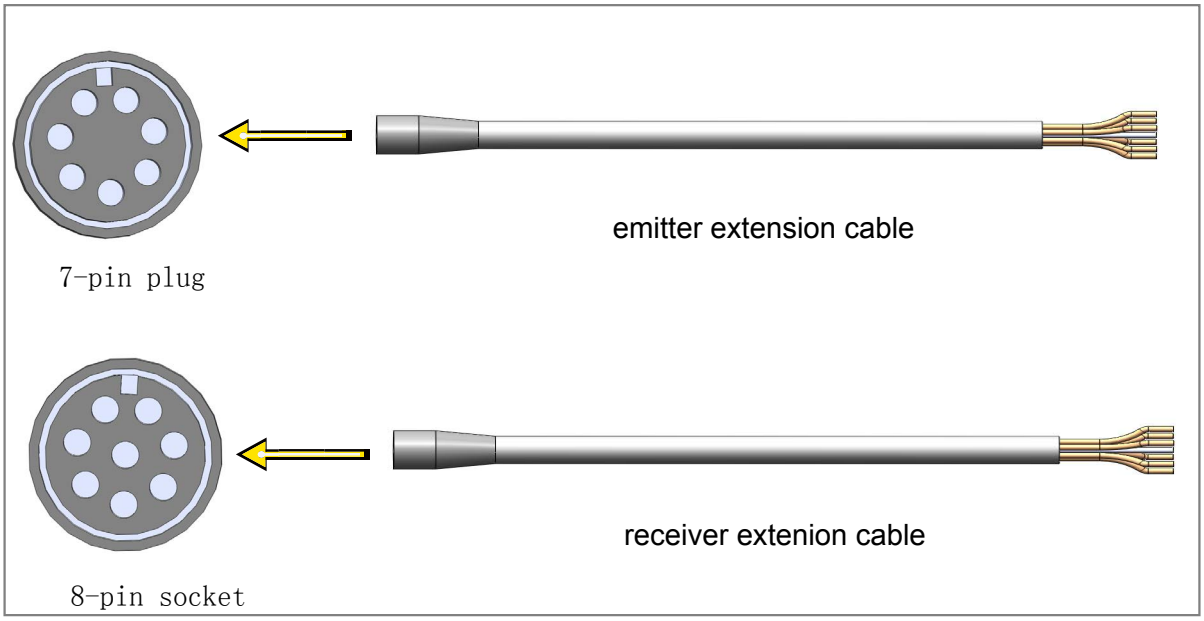


Fig.7-9 SR4P2A1B2P-M output waveform and time graphic

7.5 Signal Cable



6-corn signal cable for emitter and receiver,cable color marks：

Part	Pins No.	Color	Discription	Remarkt
Emitter	1	Blue	0V	GND
	2	Brown	DC 12V-24V	VCC
	3	Pink	CP-	Synchronous cable
	4	White	CP+	Synchronous cable
	5	Black/Green	OSSD3	Auxiliary output
	6	Red	EDM	External contacts monitoring
	7	Yellow/Green	AG	Auxiliary grounding
Receiver	1	Blue	0V	GND
	2	Brown	DC 12V-24V	VCC
	3	Pink	CP-	Synchronous cable
	4	White	CP+	Synchronous cable
	5	Green	OSSD2	NPN/PNP output
	6	Black	OSSD1	NPN/PNP output
	7	Yellow/Green	AG	Auxiliary grounding

7.6 Wiring cautions

Keep the OSSD1 and OSSD2 apart, can't connect them together, otherwise which leads to the failure of protection function, make sure of the signals processed separately.

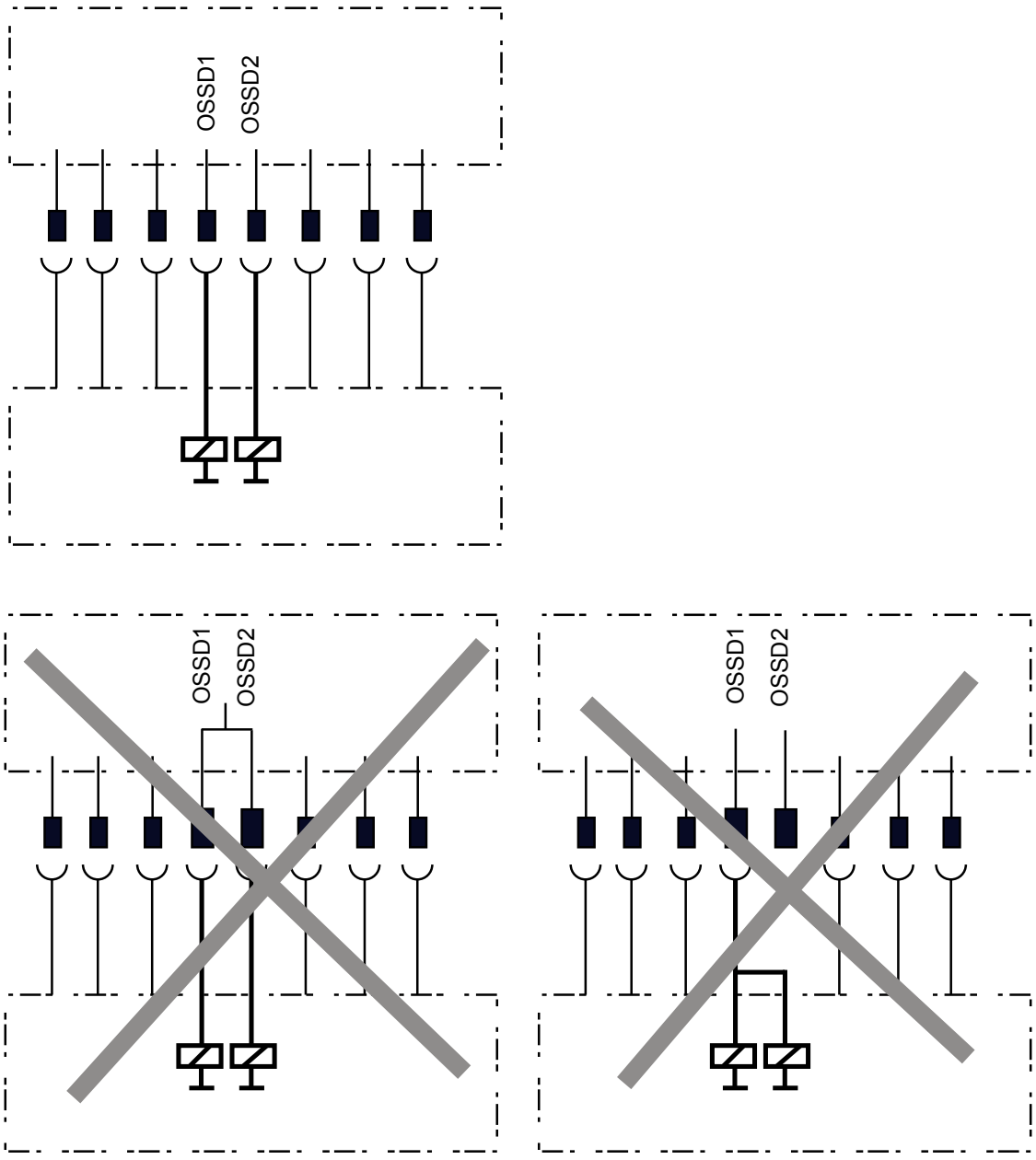


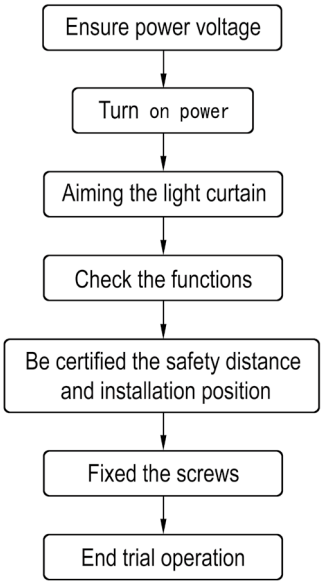
Fig.7-10 Wiring caurtions

8 Debugging

8.1 Debugging

⚠ Attention

Check carefully the wiring to ensure that all connections are correct after installation, then power-up and debug.



1. Check power voltage
   Ensure the power voltage conforming to that in technical label, the range is less than ±15%.
2. Power on
3. Alignment
   Adjust the position and angle of the emitter and receiver, until the green light on in the receiver and emitter
4. Check
   Block every light beam with test bar to confirm light curtain running well,
   Intercepting, the red indicator"OFF"is on, green indicator"ON" is off
   Passing, the green indicator"ON"is on, red indicator"OFF" is off
5. Ensure safety distance and mounting postion
6. fix the screw
7, debugging finish

8.2 Trial operation

Operation test of entire system is to ensure safety after finishing check and before normal operation. Intercept light curtain and observe indicators if they display as the form 8.2.1.

form 8.2.1

Light curtain	Indicators of emitter		Indicators of receiver		
	Green	Red	Green	Red	Yellow(AL1 ,A L2 ,A L3)
Light passing	¤	●	¤	●	indication of light intensity
Light intercepted	●	¤	●	¤	indication of light intensity

"¤" means ON，"●" means OFF

Block the light curtain, the guarded equipment should immediately stop or send alarm.

9 Operation, Check and Maintenance

9.1 Attention

A. Before operation, check the light curtain to ensure it can control the equipment normally.
B. Do not change the position of light curtain
C. When changed the protected device,the position of light curtain should be adjusted by qualified person
D. When a malfunction happened, only professional technicians are allowed to repair.
E. Before replacing or installing light curtain and transmitting wires cables, power to light curtain should be switched off, it is operated only by professional technicians.
F. If the light curtain runs abnormally, please stop immediately

9.2 Check and Maintenance

It's neccessary to keep eriodical check and maintenance. not only it's important to the operator's safety, but can prelong the safety light shelflife, do that follow form 9.1.

form 9.1

Item	Contents	Measures	Check cycle
Check	Check light curtain housing	check and confirm clean, not broken	Before operation
	Interception test(check every light beam)	Block the light beam one by one ; check if indication state is normal	Before operation
	Protection function test	block light curtain, protected device should stop immediately	Before operatino
	Check screws	Confirmation of all screws tightly fixed	Six months
	Check wiring	Confirmation of all screws tightly fixed, and good connection	Six months
Maintenance	Light curtain housing	Clean with soft cotton yarn soaked water or detergent, prohibit cleaning with organic solvent	Implement based on conditions
	Filter replacement	If filter is broken, replace it immediately. Unpack the end cover of sensor, pull out the broken filter, insert the new one, and then fix the end cover	Implement based on conditions
	Fix and replace screws	Fix loosen screws tightly, replace the damaged ones	Implement based on conditions

10 Troubleshooting

10.1 Lockout conditions and recovery procedures

Form 10.1 Faults reasons and solutions

Phenomenon	Reason	Solution
The light curtain does not work, all indicators are off	No power	Inspect the power source and the wiring, provide the correct power
	connect wrong power supply	Correct wiring, the recovery insurance can restore
The light curtain works intermittently, indicators flicker.	the wiring of control cable is not good	Check the controller wiring
	the light curtain is not aimed correctly	Adjust the light curtain and good alignment
The light curtain indicators displaying normally, but the protected device can not run normally.	The output of light curtain is wrong or output cable fell off	Connect newly or return to factory
	Protected device has electrical fault.	Examine the protected device .
Red indicator of emitter flashes and green indicator is off	Sensor wiring fault	the communication failure in pink and white cable, check if the receiver connected or not
Red indicator of emitter flashes, green indicator is on or red and green indicator all flash	Internal self-test failure	return to factory
Emitter's red and green indicators flash	sensor's wiring failure or inner circuit fault	Check the auxiliary output wiring or return to factory
Red indicator of receiver flashes and other indicators are off	OSSD1 output fault	Check the wiring of receiver output or return to factory
Red indicator of receiver flashes and yewllo indicator (AL1) flashes, AL2,AL3 are ON	OSSD2 output fault	Check the wiring of receiver output or return to factory

Red indicator of receiver flashes means the sensor's fault, consult our technicians to remove the faults or return to factory

11 Accessories

11.1 standard configuration

NO.	Item	Qty.	Remarks
1	emitter	1pc	
2	receiver	1pc	
3	emitter extension cable	1pc	be customized
4	receiver extension cable	1pc	be customized

brackets for selection

5	back mounting bracket	hexagon screw M4*16	4pcs	
6	side mounting bracket	bracekt	4pcs	
		hexagon screw M4*16	4pcs	
		M4*8 cross head screw	8pcs	
7	right-angle bracket	bracket	4pcs	
		hexagon screw M6*12	4pcs	
		M4*8 cross head screw	8pcs	
		SFA-T nut	4pcs	

Controllers for selection

8	safety relay	SR4P3A1B24	1pc	
9	safety relay	SR4P2A1B24N	1pc	
10	safety relay	SR4P2A1B24P	1pc	
11	safety relay	SR4P2A1B24N-M	1pc	
12	safety relay	SR4P2A1B24P-M	1pc	

can order the fittings seperately as per your application

! Attention

- All products have been tested before delivery by qualified person
- Please carefully check the packing list correct after receipt of the goods

LNTECH®

SHANDONG LAIEN OPTIC-ELECTRONIC TECHNOLOGY CO., LTD.
Shanbo Road, High-tech Zone, Jining, Shandong, 271000, China
Tel: 086-537-3169707/3169808
Fax: 086-537-3166661
Http: //www.laien.cn
E-mail: ln100@163.com

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