3SG Series Safety Light Curtains

BEBK

Milont Technology Co.,Ltd

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Catalogue

1、Safety Notice

- This safety light curtain can only be installed, inspected and maintained by professionals.

- Before use, understand the necessary procedures and requirements for installation, operation and maintenance. Users should establish a safety operation system and effectively implement it.

- The safe output OSSD must meet the following conditions: it must not be short-circuited with the power supply and must not exceed the rated value. It is strictly prohibited to connect two or more OSSD together.

- When installing, if an extension is required, the shield must be effectively connected. Incorrect wiring may cause the grating to fail to work properly.

- When installing, the accessory package provided by our company must be used. For specific details, please refer to the warning labels in the accessory package.

- When installing safety light curtains, please stay as far away from reflective objects as possible, or cover or block them to eliminate interference. For instance, reduce the smoothness of the reflective objects or apply frosted materials to ensure safety.

2、Product Description

The 3SG series safety light curtains are designed with independent dual-loop output mode, featuring self-check function of output circuits and over current protection function.

We use unique optical lens design, enabling the maximum distance of photoelectric sensor reflection to reach over 30 meters.

The working voltage of the safety light curtains is DC 10V - 30V, with a wide voltage supply range. The output is in the form of transistor, which can be directly

connected and used with PLC or relays.

The housing use double-sided sliding slot installation design, facilitating the diverse installation of the safety light curtains.

- The beam range is maximum reaching up to 30M.
- Use dual-loop self-check output design,High safety and reliability.
- It has strong anti-electromagnetic interference capability.
- The aluminum alloy shell structure design has good seismic resistance.
- It adopts line synchronization technology and has strong anti-light interference ability.
- It is suitable for installation and use in various environments.

3、Technical Specification （Grating technical parameter list）

Working Power Supply	DC10V-30V		
Rate of work	＜5W		
Beam pitch	20mm	40mm	
Resolution ratio	30mm	50mm	
Number of optical axes	4、6、8……80	4、6、8……80	
Protection Height	H : (protection height) N: number of optical axes H=（N-1）X Beam pitch		
Field Emission Lamp	940NM		
Response Time	response time =（N x 0.1ms）+ 0.4ms （N:number of optical axes）		
Safety Output（OSSD）	PNP transistor output: Load current ≤200mA, residual voltage ≤1V (excluding voltage drop caused by cable extension), leakage current ≤1mA NPN transistor output: Load current ≤200mA, residual voltage ≤1V (excluding voltage drop caused by cable extension), leakage current ≤1mA		
Protection circuit	Power over voltage protection, reverse polarity protection and output over current protection		
Beam distance	0.02m-30m		
Anti-light interference	10,000Lux（angle of incidence I＞5°）		
Grating Mode	Radiative convective		
Synchronization mode	line synchronization		
Shell material	Aluminium alloy		
Protection grade	IP65		
Sectional dimension	35*50mm		
Resistance to shock	Frequency: 10Hz-55Hz, amplitude: 0.35±0.05mm, 20 times each in the X, Y and Z directions		
Operate temp	-10℃-55℃（No condensation）		
Store temp	-30℃-70℃（No condensation ）		
Operating humidity	When the temperature is 20℃, the relative humidity of the air is less than 85%		

4、Specification and Model description

For Example：

BEBK-3SG- 04/06/08.....80 -10/20/40/-H1/L1-N/P-C/C1-C-30MM

BEBE-3SG:series safety light curtain

Number Of Optical Axes: 04、06、08、10.....80

Beam Pitch：10mm、20mm、40mm

installing support : H1:Install from top to bottom , L1: Install from left to right

Output methods : N :NPN output, P: PNP output

Scanning methods: C: Parallel scan, C1: Cross scan

Sensing mode: C: Normally closed

Protection height :30MM

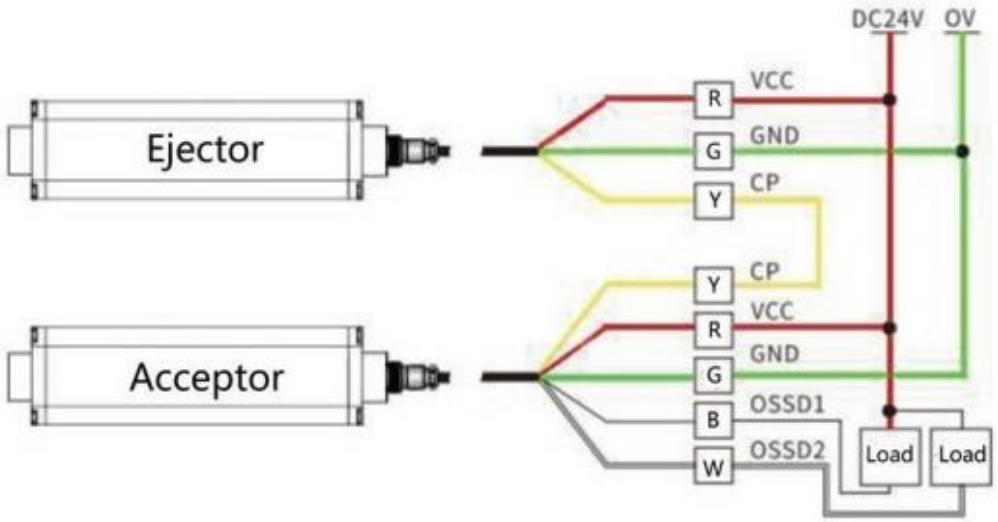
5、The working status of the safety light curtain

Output Mode	Grating state	Ejector indicator light	Acceptor indicator light		Output the OSSD status of the signal (Grating power supply =DC24V)
		green light	green light	red light	
NPN is normally closed	nonopaque	¤	¤	●	DC0V
	diaphragmation	¤	●	¤	Open（hang in the air）
PNP is normally closed	nonopaque	¤	¤	●	DC24V
	diaphragmation	¤	●	¤	Open（hang in the air）

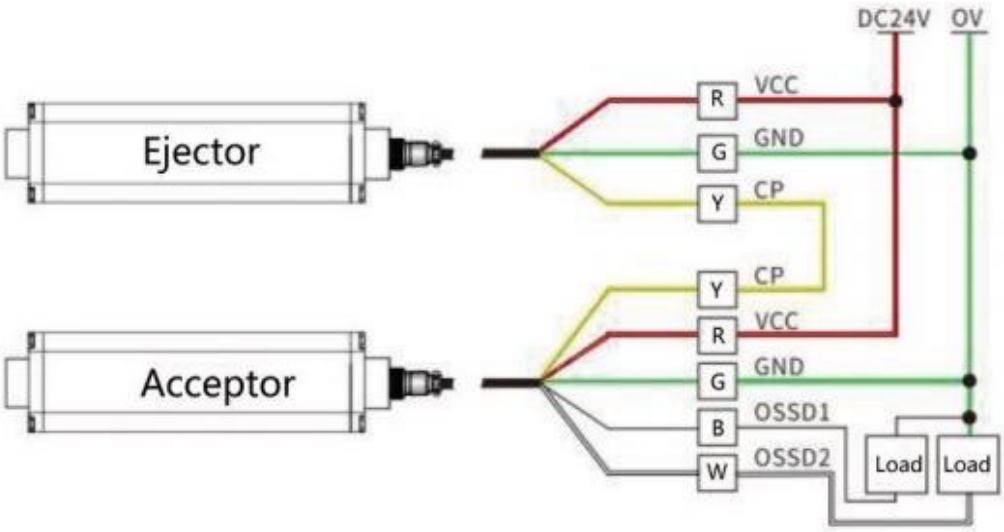
Marke：¤ The indicator light is on ● The indicator light goes out OSSD: OSSD1 OrOSSD2

Warning: It is strictly prohibited to use normally open grating in safety protection environments ;
Otherwise, the grating will not be able to work.

6、Wiring of safety light curtains



NPN wiring diagram



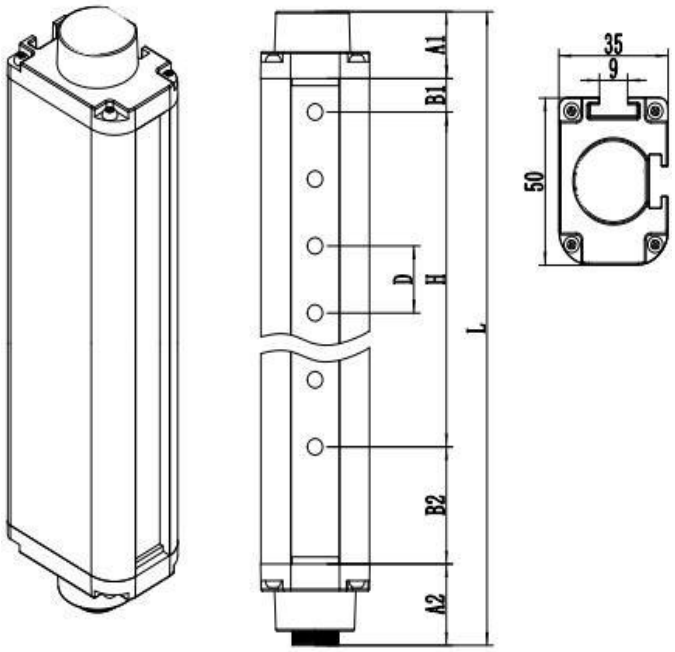
PNP wiring diagram

The color and function of the transmission line connecting the grating

Shown in the following table:

Cable	Pin	clolour	Function	wiring instructions
Ejector	1	red	VCC positive pole	DC 24V positive pole
	2	yellow	CP Synchronous signal line	CP synchronization line connection
	3	green	GND negative pole	DC 0V negative pole
Accpetor	1	red	VCC positive pole	DC 24V positive pole
	2	yellow	CP Synchronous signal line	CP synchronization line connection
	3	black	OSSD1 signal 1 output	Connect to system control port 1
	4	white	OSSD2 signal 2 output	Connect to system control port 2
	5	green	GND negative pole	DC 0V negative pole

7、Structural dimension drawing of safety light curtains



A1: 20mm A2：25mm

B1: Upper blind spot

B2： lower blind spot

D：Beam pitch

Grating protection height H =（Number of optical axes -1）x Beam pitch

Total height of the grating L = The total length of the product

8、Installation of safety light curtains

The safety distance and installation height are two essential factors for ensuring the safety of the safety grating and achieving protection.

The safety distance must be accurately calculated, and the installation position of the grating must comply with the requirements of the safety distance and installation height; otherwise, there is still a possibility of an accident occurring.

8.1 **Calculation of safe distance**

The safety distance refers to the minimum distance between the safety sensor and the dangerous point.

To ensure that the equipment can immediately enter the stop state when a person or object enters the dangerous area, a safety distances (as shown in Figure 8-1) should be set between the dangerous area and the safety sensor.

The safety distance varies depending on different national standards and equipment characteristics. During installation, the safety distance must be set in accordance with relevant standards; otherwise, there is still a possibility of an accident occurring.

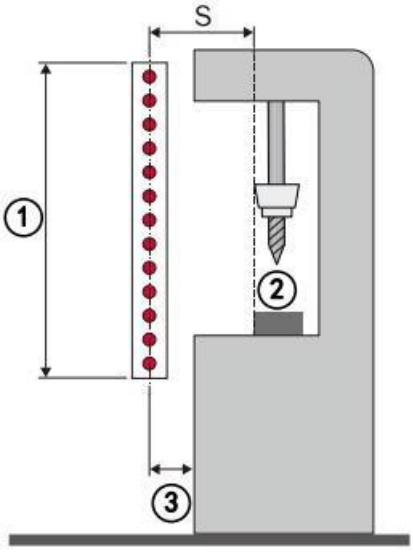


Figure 8-1

① protection height ② dangerous point ③ safety zone

1、For a press where the slider can brake and stop at any position during the stroke, the safety distance is calculated by referring to formula (1)

$$= \times + 8 \times (- 14)$$ Formula (1）

2、For a press where the slider can not brake and stop at any position during the stroke, the safety distance is calculated by referring to formula (2)

$$= \times + 8 \times (- 14)$$ Formula（ 2 ）

S : Safe distance, measured in millimeters (mm)；

K: The speed at which a human body or a certain part intrudes into the effective area of the grating, measured in millimeters per second (mm/s);

T: The total braking time of the equipment system, measured in seconds (s)；

Ts: The time from when the hand leaves the grating (i.e., the allowable start slider) to when the press slider reaches the bottom dead center (i.e., the slider's bottom stroke time), measured in seconds (s);

The Ts value should be calculated or actually determined by referring to Formula (3) below.

D: The resolution of the safety light curtain,measured in millimeters (mm)

Determination of the K value

When the safety light curtain is installed horizontally , 1600mm/s should be used

When the safety light curtain is installed vertically, if the safety distance does not exceed

500mm, 2000mm/s should be used.

When the safety distance is greater than 500mm, 1600mm/s should be used

Determination of the T value

The total braking time T = the response time of the safety light curtain + the downtime of the machine

The response time of the safety light curtain is provided by the supplier of the safety light curtain

The downtime of the machine needs to be measured in practice

Determination of the Ts value

The calculation of Ts : = (1/2 + 1/) × Formula (3)

N: The number of engagement slots of the clutch;

Tn: The time it takes for the crankshaft to complete one rotation, measured in seconds (s)

Calculation Step

Calculate **S** using the following formula:

First, K = 2000mm/s， = 2000mm/ × + 8 × (− 14mm)

Such as the calculation result ≤500mm，Then this value is taken as the minimum safe distance

Such as the calculation result >500mm，Then it needs to be recalculated **S**：

Second, K = 1600mm/s， = 1600mm/ × + 8 × (− 14mm)

Such as the calculation result > 500mm，Then this value is taken as the minimum safe distance

Such as the calculation result ≤ 500mm，Then 500mm is the minimum safe distance

Examples:

Assumption: Machine downtime =290ms;

The response time of the grating =30ms;

The resolution of the grating =20mm; Then:

= 290m + 30m = 320m = 0.32；

= 2000mm/ × 0.32 + 8 × (20mm − 14mm) = 688mm；

> 500mm，So proceed to the next step；

= 1600mm/ × 0.32 + 8 × (20mm − 14mm) = 560mm

Therefore, for example, the minimum safety distance of the grating here is 560mm.

The safety distance is one of the necessary conditions for ensuring the protective function of the safety grating. It must be accurately calculated. During installation, the safety distance must be ensured.

When installing, it is necessary to ensure that the minimum distance from the grating plane to the dangerous point is greater than the safety distance. If the selected safety distance is too small, the dangerous state of the machine will not be able to be terminated in time.

When the safety distance exceeds 400mm, other auxiliary protective measures are necessary.

8.2 Consider the situation where you reach above the equipment

According to ISO13855, the possibility of bypassing electrical sensitive protective equipment is not allowed.

If it is necessary to enter the hazardous area when reaching (touching) from above the vertical protection area, it is essential to ensure the minimum distance between the height of the protection area and the electrical sensitive protective equipment.

This can be determined by comparing the calculated values based on feasible detections of limbs or body parts with those obtained through touch. Use the larger value obtained through this comparison.

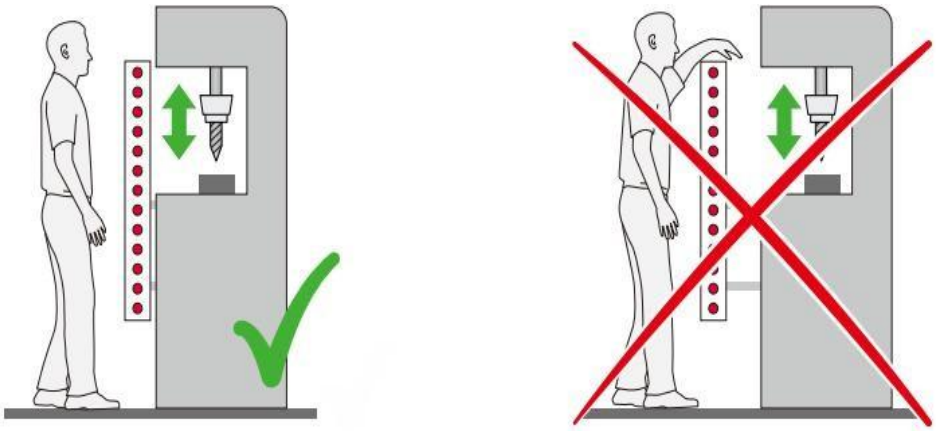


Figure 8-2 Schematic diagram

8.3 Determination of installation height

The installation height refers to the position of the safety light curtain relative to the upper and lower die openings of the equipment.

That is, under the premise of ensuring the safety distance, the lowest beam of the light curtain must not be higher than the lower edge of the lower die opening, and the highest beam must not be lower than the upper edge of the upper die opening.

In other practical application scenarios where there are no relevant safety standards, it is necessary to ensure the isolation of the operator from the dangerous area.

When the horizontal distance between the light curtain plane and the front end of the die opening exceeds 400mm, an auxiliary light curtain or guardrail should be installed to prevent the operator's body from entering the inner side of the light curtain plane,as shown in Figure 8-3.

When the 400mm requirement is not met, safety measures such as auxiliary light curtains or guardrails can also be taken.

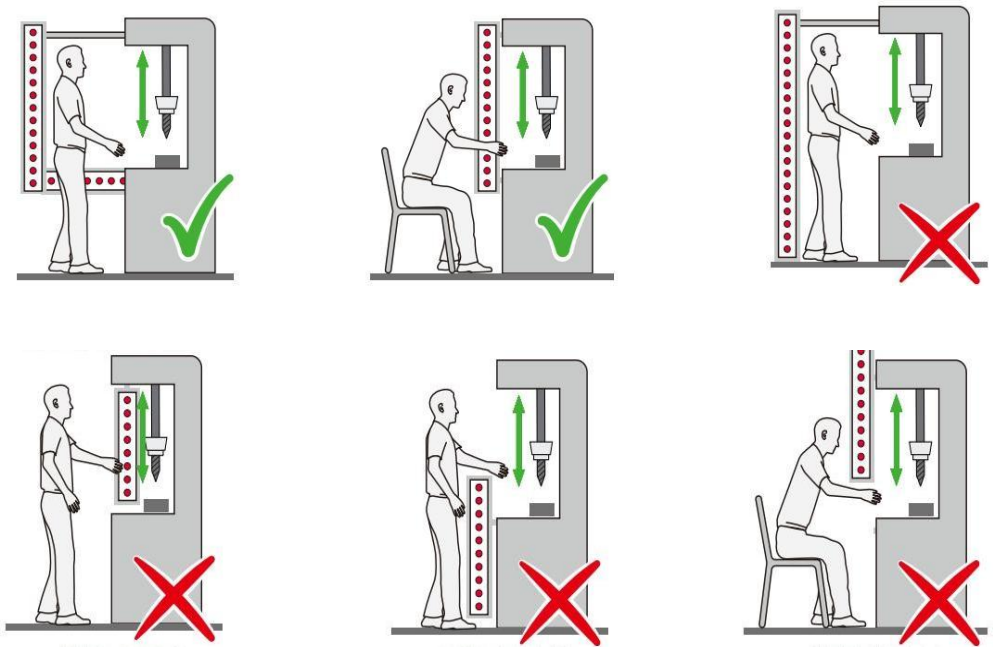


Figure 8-3 Schematic diagram

Warning：

1/ During use, if the mold is replaced, it is necessary to re-adjust the safety distance and installation position in accordance with the requirements of 8.1 and 8.3 mentioned above.

2/ If there is any slippage phenomenon in the machine tool, it must be promptly repaired and adjusted.Otherwise, even if the installation position of the photoelectric protection device is correct, safety cannot be guaranteed (the photoelectric protection device can only control the electrical control part and cannot prevent accidents such as slippage and breakage).

3/ When the safety distance exceeds 400mm, other auxiliary protective measures are necessary.

4/ The installation height position is one of the necessary conditions for ensuring the protective function of the safety grating. During installation, it is essential to ensure the accuracy of the height position.

5/ When installing the safety grating, please ensure that the possibility of bypassing the safety grating from below, above, and behind, as well as the movement of the safety grating, is excluded.

6/ The safety grating can only be installed on the equipment that meets the requirements, and the width of the protected area will not change when the safety grating is working.

8.4 **Precautions for adjacent installations**

1/ When two or more grating devices are installed in adjacent positions, mutual interference is likely to occur between the devices, as shown in Figure 8-4.

2/ For example, the infrared rays emitted by the transmitting unit of system ① may affect the receiving unit of system ②. This may interfere with the protective function of system ②, meaning that the operators are in danger. Therefore, it is necessary to refer to Figure 8-5 for installation.

3/ That is, without a light-blocking barrier, adjacent grating devices should not be installed on the same side; otherwise, the emitted light from the transmitter is likely to shine on the adjacent receiver.

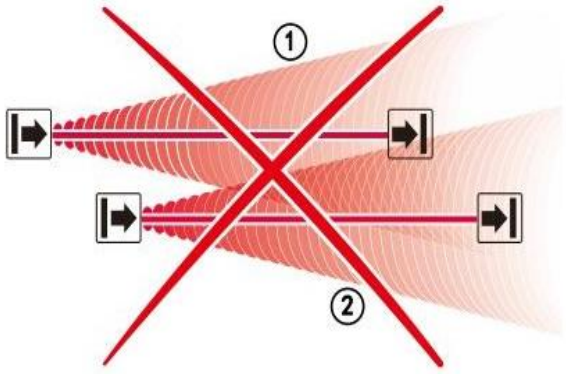


Figure 8-4

Schematic diagram to avoid mutual interference between System ① and ②

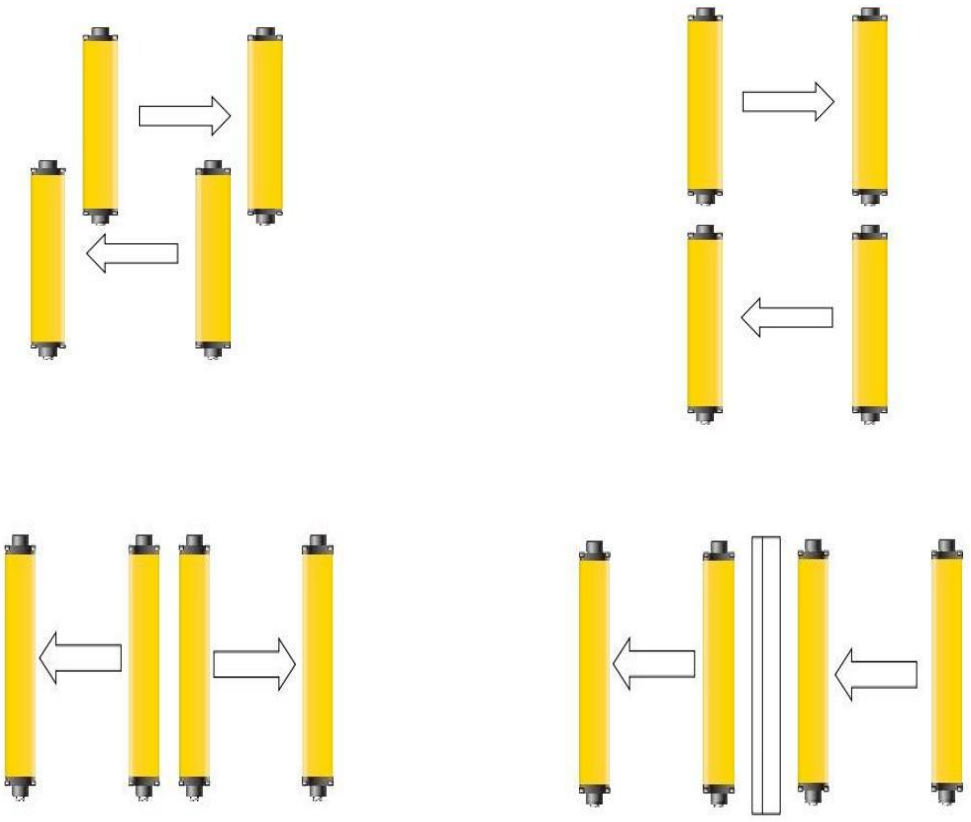


Figure 8-5
Safety Light Curtain - Anti-interference Installation Diagram

1/ The mutual interference between gratings will cause them to lose their normal functions and fail to provide protection.

2/ Please adopt the correct installation method based on the specific situation to eliminate the interference between the optical grating devices and ensure safety.

3/ The transmission line interfaces of the transmitter and receiver must point in the same direction. That is, the receiver cannot be installed 180° opposite to the transmitter.

8.5 When there are reflectors, determine the installation correct position of the safety light curtain

If there are smooth reflective surfaces around the grating device, such as metal plates, floors, ceilings, work pieces, covers, partitions, glass plates, etc., the installation position of the grating should be at least A meters away from the reflective surface (where A can be calculated using the formula in the table or found from the coordinate graph)

As shown in Figure 8-6, a cone has an aperture angle **α**, which is formed between the optical axis and the light beam located at the edge of the optical cone. Here, **α** is the aperture angle of the light beam, L is the distance between the emitter and the receiver, and L is less than the farthest collimation distance of the grating

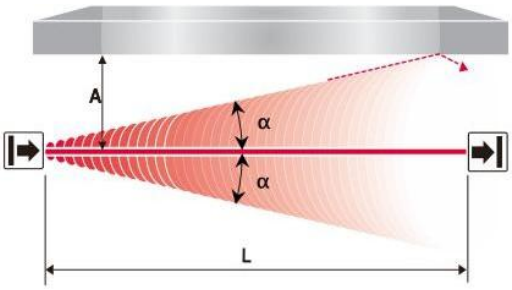
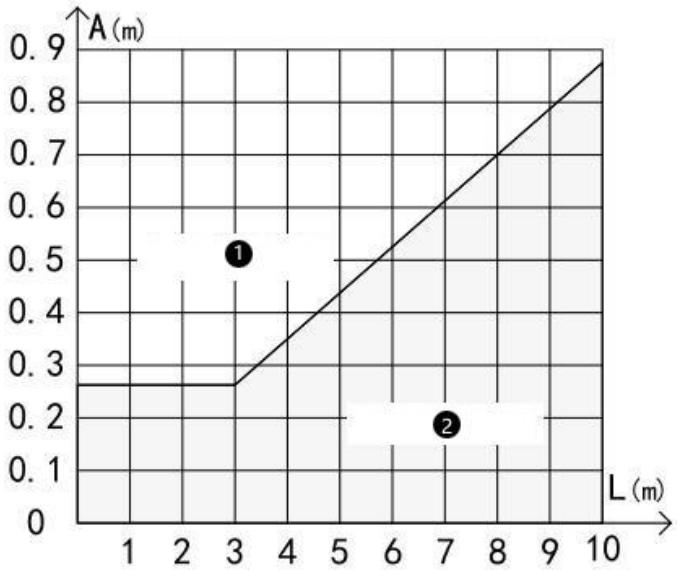


Figure 8-6

Schematic diagram of reflector interference

protective length L（m）	installation distance A（m）
0.3m-3m	0.262 m

3m above	× α α = × 0.0875(α = 5°)



① Permitted installation range ② Forbidden installation range

Figure 8-7: diagram of the installation position where the reflector affects the grating

Warning :

1/ The smooth reflective surfaces or scattering media of the surrounding objects will change the propagation direction of the light emitted by the security grating, causing the protective personnel or body parts to be bypassed and thus not be detected, resulting in the security grating losing its normal function and failing to provide protection. (Scattering media include dust, fog, smoke, etc.)

2/ When installing the security grating, please try to stay away from the reflective objects or cover and block them to eliminate interference. For example, reduce the smoothness of the reflective objects or apply a frosted material to ensure safety.

9、 Install Type

9.1 Installation method of H1 upper and lower installation brackets

The installation steps are as follows :

1/ Based on the calculated safe distance and height position, determine the installation location of the grating on the equipment.（When installed on the bed wall of the equipment, drilling and tapping are required. During the positioning of the drilling, it is necessary to ensure that the transmitter and receiver can be installed in parallel and aligned after installation）

2/ The grating is respectively assembled with the M6 slider and the upper and lower mounting brackets through M6*8 hexagon socket screws

3/ Install the upper and lower mounting brackets on the equipment bed wall or the bracket profile using M6*16 hexagon socket screws and M6 flat washers and spring washers

4/ Adjust the position of the grating to make it parallel and aligned, and tighten the installation screws appropriately

5/ Connect the cables and turn on the machine. After installation and debugging, tighten all the installations

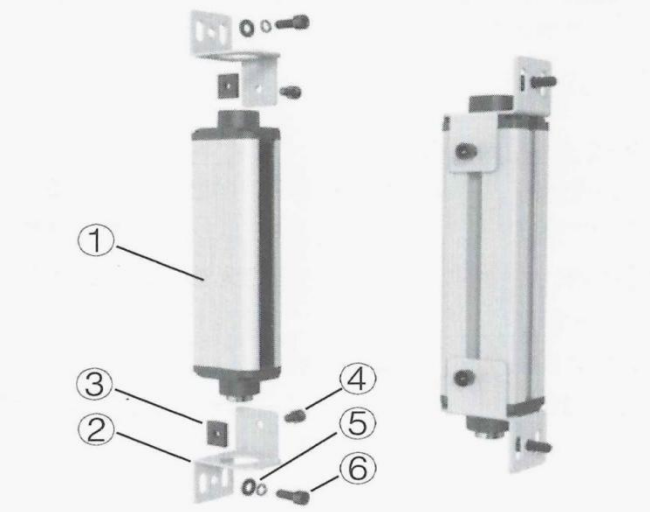


Figure 9-1
Installation method of H1 upper and lower installation brackets

Grating Installation Accessories：

① Ejector or Acceptor ② H1support 4 pcs ③ M6/ sliders4pcs

④ M6*8/ head cap screw 4 pcs ⑤ M6/ spacer 8pcs

⑥ M6*16 /head cap screw 4 pcs

10、 Debugging and maintenance of safety light curtains

10.1 Debugging of safety light curtains

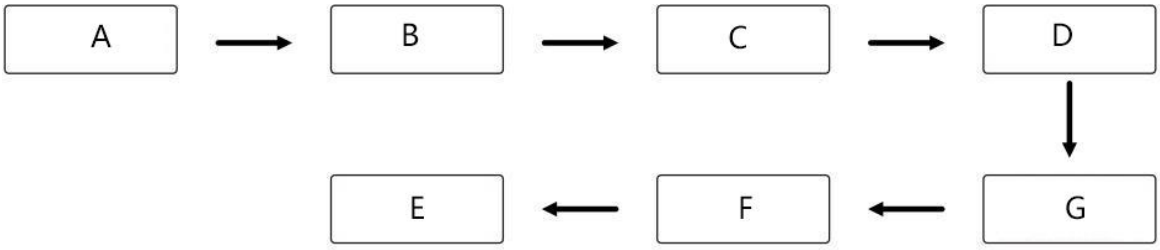


Figure 10-1 Debugging flowchart

A/ Confirm the power supply

Use a Multimeter to confirm the power supply and voltage. The fluctuation range should not exceed ±20%.

B/ Connect and power on

Disconnect the power supply, correctly connect the grating cable to the power supply according to the wiring diagram, and can power on .

C / Beam-Focusing

According to the on-site environment, adjust the position and Angle of the transmitter and receiver to ensure that the receiver's green light is on (under normal light alignment, the receiver's indicator light remains constantly green).

D/ Confirm the safety distance and installation position

Ensure that the safety light curtains can effectively play their protective role.

G / Verify

Use the detection rod to block each beam of light to confirm that the safety grating is in a normal state; check the indicator lights of the receiver.

When blocking the light, the red light indicator is on and the green light indicator is off; when the light is turned on, the green light indicator is on and the red light indicator is off.

when blocking the light, confirm whether the equipment has stopped running normally or triggered an alarm.

F / Holding Screw

Fix the installation position of the safety light curtain to ensure its reliable operation.

E / Debugging completed

1、Before installation, it is necessary to check whether the installation environment meets the product's usage environment. After the wiring is completed, a detailed inspection should be carried out to ensure the correct wiring and to verify.

2、Only after this can the power be connected for debugging. The connection screws on the cable plug need to be tightened with the socket of the grating to prevent the cable plug from falling off.

3、During installation, pay attention to using the screws from our company's accessory package correctly to avoid damaging the shell with the screws and causing short circuits and other situations.

11、 Maintenance and Troubleshooting

11.1 Matters Attention

1/ When disassembling, assembling or repairing photoelectric protection devices and cables, the power supply should be turned off first and operated by professionals.

2/ Before each use, it is necessary to check whether the photoelectric protection device controls the equipment normally.

3/ The position of the protective light grating must not be changed at will during use.

4/ After changing the mold or fixture, the safety distance and installation position of the protective light curtain must be adjusted by the dedicated personnel.

5/ During use, do not allow work pieces, tools, waste materials, etc. to collide with the photoelectric protection device and its plugs, cables, etc.

11.2 Inspection and maintenance

Check item	Method	Check cycle
Inspection of the optical surface of grating	Confirm that all light-transmitting surfaces are clean and undamaged	Check before starting the work
Shading confirmation (one beam block light test)	Using shading keep out each beam, view lamp state is normal	Check before starting the work
Grating output detection	Confirm safety grating when the object shelter effective control equipment downtime alarm device (or equipment)	Check before starting the work
Inspection of fasteners	Check and confirm that all fasteners are firmly connected	Each shift
Inspection of the terminal blocks	Make sure the screws are not loose and the wires are in good contact	Each shift
Cleaning of the optical surface of the grating	Regular cleaning on the surface of a grating, ensure that the optical surface clean and neat (do not use organic solvents to wipe)	
Fastening of fasteners	Tighten the loose screws	

Figure11-2
Grating inspection maintenance table