SDKELI®

CE

KS06 Active Opto-electronic Protective Device

OPERATION MANUAL

(2019·01)

◇ KS06 Active Opto-electronic Protective Device is for use where personnel protection is required, please read this manual carefully before Installation and Utilization.

◇ The operation manual is an important document to guide users to install and use the Active Opto-electronic Protective Device correctly. Agents, dealers and machine factories have the obligation to hand over this manual along with the devices to customers.

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Preface

Thank you for choosing "*SDKELI*" Active Opto-electronic Protective Device!

KS06 Active Opto-electronic Protective Device, it is mainly applied to forging industry assorting punching equipment to protect operators.

This device provides only protection over the rectangular area between emitter and receiver. If its installation is not positioned correctly or the operation is not carried on under the instructions or relative security operational provisions, or there is a fault in the actuating mechanism of machine tool, the device will fail to protect well. Carefully read this manual in entirety, paying particular attention to the content marked with "WARNING", "NOTICE" before installing the device. In the course of use, please understand the working function of AOPD correctly, operate strictly in accordance with the instructions or relative security operational provisions.

This manual introduces only the application of AOPD on the press, when this type of AOPD is applied under other occasions, this manual is for reference.

Our company owns the final right to interpret this manual, if you have any doubt in reading or using this manual, please contact us or access http://www.sdkeli.com.

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UNIT 1 BASIC INSTRUCTION

I APPLICATION SCOPE

I.1 AOPD can be applied to all kinds of press machines, such as punch press, straight press, hydraulic press, forging press, filming press, molding press, injection molding machine, powder metallurgy molding press, shear machine, bending machine, paper cutter and so on, to protect personal security of the operator.

I.2 For presses on which the slider can stop at any point in one stroke, it can achieve the full–trip protection; and it can also achieve the protection from 30° to 180° in one stroke, assorting with the cam switch.

I.3 For presses on which the slider can not stop at any point in one stroke, AOPD can only achieve top stop protection at the end of the last stroke that is when the last stroke has already finished, but the next stroke is not activated yet, the next stroke will not start if the light curtain is on the shading state.

I.4 Area protection can be achieved for industrial robot, injection molding machine, packaging equipment, automation equipment and wielding production lines which are regarded as dangerous zone.

I.5 AOPD can also be used for detection and prevention of burglary.

II FEATURES

II.1 Varies of product features and specifications

Divided by operating range: A series–0 to 3m, B series–0 to 6m, C series–0 to 12m, D series–8m to 20m, E series–0 to 40m (0 to 40m for 4 to 16 beams, 0 to 30m for 18 to 40 beams).

Divided by detection capability: 18mm (10mm beam spacing), 28mm (20mm beam spacing), 38mm (30mm beam spacing), 48mm (40mm beam spacing).

Divided by protective height:110mm to 710mm for detection capability of 18mm; 100mm to 1420mm for detection capability of 28mm; 150mm to 2130mm for detection capability of 38mm; 120mm to 2840mm for detection capability of 48mm.

KS06 cascaded AOPD can be configured by four sets of light curtains with one controller and the total quantity of its beams can reach up to 288. Detection zone realize its diversification under KS06 cascaded AOPD, such as “serial setting”, “L–type setting” and “U–type setting”.

Divided by output mode: Relay output with CPS II controller, CQ2 controller or CQ3 controller; transistor output with JKIII interface or KS06G safety light curtain with no controller.

In addition, special products can be made according to customer’s requirements.

II.2 Sound self–test function

When AOPD fails, it is ensuring the machine automatically stop running.

The external physical damage, breakdown voltage or wrong wiring will lead the control signal circuit to failure. On the above condition, the device may fail to detect the malfunction of control because of the limitation in self–test. So designation, installation and wring must be carried out strictly in terms of this manual.

II.3 Start–restart interlock function can be set up (only when used with CPSⅡ/CQ2/CQ3)

If any light beam of the light curtain is shaded, the press slider stops running at once; even if the light curtain resumes light–passing state, the press slider still keeps stopping and manual reset is necessary to resume the running of press slider.

The start–restart interlock function is not set in the standard configuration.

If the start–restart interlock function is needed, the customer should propose a request when placing the order for AOPD.

Application of Interlock Function

For presses on which the slider can not stop at any point in one stroke, if the way of feeding material is automatic, the interlock function should be applied just in case; if the way of feeding material is manual, it is necessary to apply interlock function.

The AOPD with interlock function, it is commonly fixed with reset button or reset switch down–lead. Please refer to "OPERATION" in chapter "OPERATION, CHECK AND MAINTENANCE" to see how to use it.

II.4 High capacity of resisting disturbance

The system possesses high capacity of resisting disturbance against electromagnetic signal, strobe light, jointing arc light and surrounding light source etc.

II.5 Easy beam–focusing

Scientific and skillful designed optical system realizes high alignment accuracy.

II.6 Good vibration resistance

II.7 Convenient and diversified installation

We can provide the regular installation forms such as common side mounting, ZC mounting, pipe mounting, double–arm mounting, T–groove mounting, scatter shield mounting or magnetic attachment mounting. We can also offer special support to meet the requirement of customer.

II.8 Long performance life and high reliability.

Output relay is replaceable after reaching the end of its performance life.

III DESIGNATION

In order to protect the operator from injury, all the presses should be equipped with AOPD.

III.1 For presses on which the slider can stop at any point in one stroke, AOPD can be directly used in conjunction with the press.

III.2 For presses on which the slider can not stop at any point in one stroke, if the coupling union power of clutch is electromagnetic force or gas, fluid power, AOPD can be directly used in conjunction with the press; if the coupling union power of clutch is manpower, AOPD can not be used in conjunction with the press before it is transformed into electromagnetic force or gas, fluid power.

III.3 KS06A AOPD is applied to the machine of which the protective length is less than 3m; KS06B is applied to the machine of which the protective length is less than 6m; KS06C is applied to the machine of which the protective length is less than 12m; KS06D is applied to the machine of which the protective length ranging from 8m to 20m; KS06E is applied to the machine of which the protective length ranging from 0 to 40m; KS06 cascaded AOPD is applied to machines with more than one protective area (not more than 4).

III.4 ***The protective height of the selected light curtain should not be less than which specified by the relevant safety standards around the user's location to ensure that the operator is isolated from the danger zone.***

III.5 Controller can be selected in accordance with the accessibility requirements, choosing CPSII controller, CQ2 or CQ3 controller; for the machine controlled by level signal (NPN or PNP), such as PLC system, JKIII interface should be selected as the controller or use the KS06G safety light curtain. Customer should select JKIII or KS06G according to sheet1.5, sheet1.6 and sheet4.1 when ordering. We suggest that the customer not use the work mode that the transistor turns on when the light curtain is on shading state. **CQ2 or CQ3 should be given priority to be selected because it can be installed inside of the electrical cabinet to avoid physical damage. If CPSⅡ has to be selected, it must be installed nearest by the electrical cabinet and protective measurements should be adopted. Meanwhile special person must examine it carefully before each duty.**

While use the KS06G, the cable for receiver must be protected well, to avoid failure to danger.

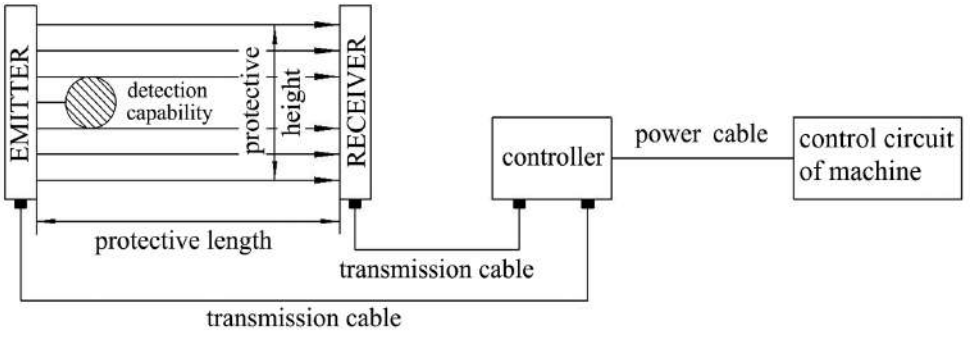
III.6 The AOPD with the detection capability of 18mm is applied to the short safety distance occasions to protect the finger or larger part of body from injury; the AOPD with the detection capability of 28mm is applied to the moderate safety distance occasions to protect the palm or larger part of body from injury; the AOPD with the detection capability of 38mm and 48mm is applied to even longer safety distance occasions to protect the arm or larger part of body from injury.

For machines with more than one protective area (not more than 4), KS06 cascaded AOPD can be used. Light curtains for every protective area of the cascaded AOPD are chosen according to requirements of III.3, III.4 and III.6.

III.7 When user has no special request, we will supply the power cable and transmission cable with standard length (Refer to P9 to P10).

IV PRINCIPLE AND STRUCTURE

IV.1 Schematic illustration of working principle



Note: Controller and power cable are not needed for KS06G safety light curtain.

Fig1.1 Working principle

IV.2 Build–up unit

IV.2.1 Control devices

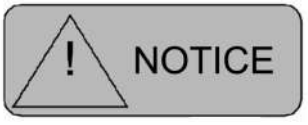
Controller supplies power for emitter and receiver; processes signals transmitted from receiver; sends out signal through output signal switching device(OSSD), controlling the forced stroke stop circuit or alarm circuit of machine.

Controller is an indispensable process to test the signal from receiver or test the output signal sent by itself. It is an important part to make up a safety, reliable and sound functional protective system.

Controller will offer more sufficient self–test function, it is suggested that the AOPD should be equipped with controller when used. Our company will not be responsible for the body injury resulted by the failure of control under the condition without using controller.

Controller is divided into four types, namely CPSII controller(CPSII for short), CQ2 controller(CQ2 for short), CQ3 controller (CQ3 for short) and JKIII interface (JKIII for short).

For CPSII, CQ2 and CQ3, relays are used as the output signal switching device; for JKIII and KS06G safety light curtain (KS06G for short), transistor is used as the output signal switching device. The output terminals of output signal switching device are connected to the control system of the machine. When there is no opaque object between the light curtain or the size of object is smaller than detection capability, that is the light curtain is on the unblocked state, the output signal is ON, and the slide on the press can move freely. When the light is blocked, the output signal turns to the OFF state, and the slide on the press can not move at this moment.



CPSII and CQ2 provide two groups of relay–contacts as output, "OSSD1" and "OSSD2" stand for normally open (NO) contacts while "OSSD3" and "OSSD4" stand for normally closed (NC) contacts.
CQ3 provides 3 NO contacts (OSSD1, OSSD2, OSSD3), and 1 NC contact (SSD).
Make sure to distinguish NO contacts from NC contacts clearly before wiring.

IV.2.1.1 CPSII controller

It is placed outside the external part of machine control unit, commonly mounted on the machine bed support. Its operating state is shown in sheet1.1.

CPSII can be divided to single–side protection and double–side protection.

The single–side protection controller is configured with one AOPD, to protect one area.

The double–side protection controller is configured with two AOPDs, to protect two areas.

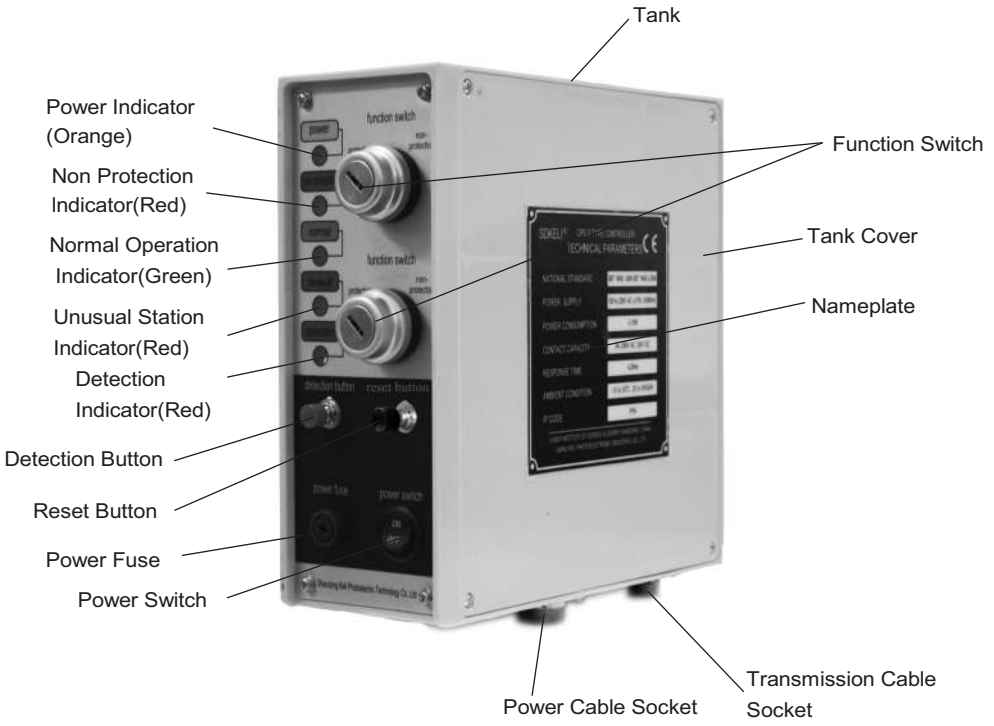


Fig1.2.A CPSII controller–single–side protection

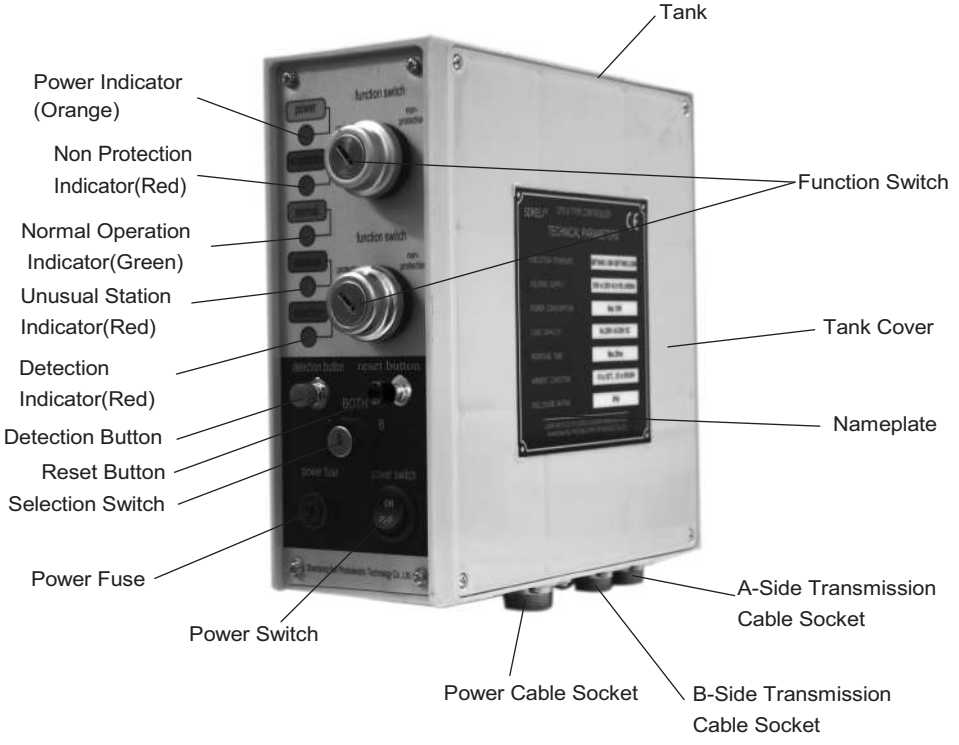


Fig1.2.B CPSII controller–double–side protection

Sheet1.1 The operating state of CPSII

Power switch	Function switch	Power indicator (Orange)	Non–protection indicator (Red)	Normal operation indicator(Green)		Unusual station indicator(Red)		Operating state of AOPD
				Un-blocked	Blocked	Un-blocked	Blocked	
ON	Protection	ON	OFF	ON	OFF	OFF	ON	Protection
	Non–protection	ON	ON	OFF	OFF	OFF	OFF	Non–protection
OFF	Protection	OFF	OFF	OFF	OFF	OFF	OFF	Protection
	Non–protection	OFF	OFF	OFF	OFF	OFF	OFF	Protection

When the power switch being turned on, press the detection button or contact adhesion of relay occurs, the detection indicator (Red) is on.

Selection switch: Selection switch is set on the panel of double–side protection controller to set detection zone.

When the switch is pointed to "A", the relevant light curtain is activated and "B" side light curtain is bypassed.

When the switch is pointed to "B", the relevant light curtain is activated and "A" side light curtain is bypassed.

When the switch is pointed to "Both", both of light curtains are activated at the same time.

When the AOPD is on non protection, other safety preventive measures need to be adopted!

IV.2.1.2 CQ2 type controller

It is placed inside the electrical cabinet of machine. Its operating state is shown in sheet1.2.

Power Cable Plug

Transmission Cable Plug

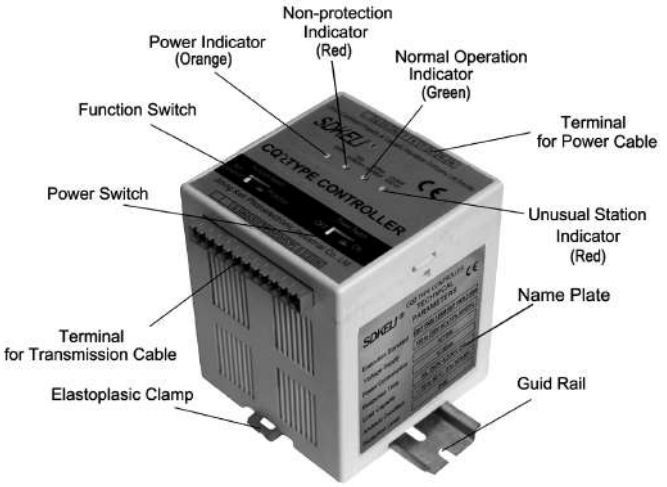


Fig1.3 CQ2 controller

Sheet1.2 The operating state of CQ2

Power switch	Function switch	Power indicator (Orange)	Non–protection indicator (Red)	Normal operation indicator (Green)		Unusual station indicator(Red)		Operating state of AOPD
				Unblocked	Blocked	Unblocked	Blocked	
ON	Protection	ON	OFF	ON	OFF	OFF	ON	Protection
	Non–protection	ON	ON	OFF	OFF	OFF	OFF	Non–protection
OFF	Protection	OFF	OFF	OFF	OFF	OFF	OFF	Protection
	Non–protection	OFF	OFF	OFF	OFF	OFF	OFF	Protection

When AOPD is on non–protection status, other safety measures need to be adopted!

IV.2.1.3 CQ3 type controller

CQ3 can protect the machine mandatorily while powers on. It has no power switch and function switch. Its operating state is shown in sheet1.3.

Sheet1.3 The operating state of CQ3

Power supply	State of light curtain	Indicator			Output signal			
		Power indicator (Orange)	Normal operation indicator (Green)	Unusual station indicator (Red)	OSSD1	OSSD2	OSSD3	SSD
OFF	Any	OFF	OFF	OFF	OFF	OFF	OFF	ON
ON	Blocked	ON	OFF	ON	OFF	OFF	OFF	ON
ON	Unblocked	ON	ON	OFF	ON	ON	ON	OFF

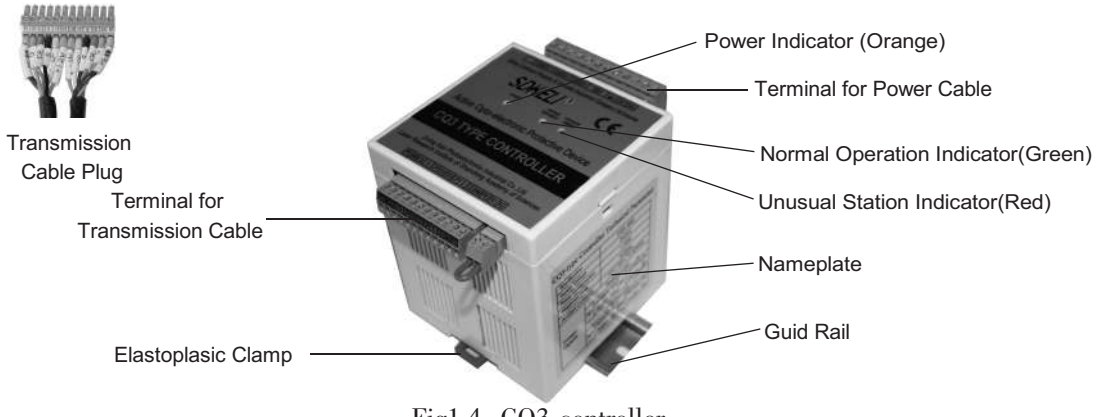


Fig1.4 CQ3 controller

IV.2.1.4 JKIII interface

It is placed inside the electrical cabinet of machine. Its operating state is shown as follows.

● Power indicator (Red): if the power is on, the indicator is on;

● Driving signal indicator(Green): if the transistor turns on, the indicator is on.

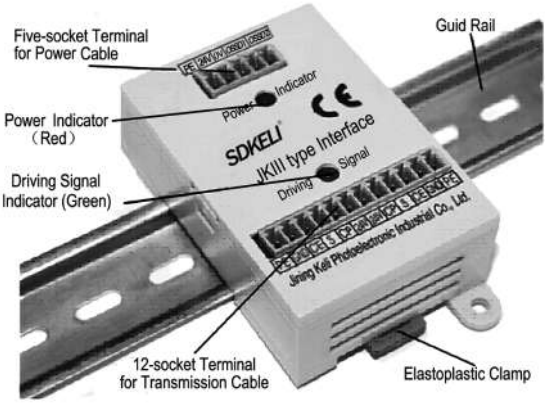


Fig1.5 JKIII interface

Declaration about output state:

The way that the transistor turns on when the light curtain is on unblocked state is the safe mode.

The way that the transistor turns on when the light curtain is on blocked state is the non–safe mode. Under this way, being disconnecting or poor contacting of any junction in the circuit will cause control failure.

Non–safe mode is not supposed to be selected by customer! If customer insists using this mode, our company will not be responsible for control failure resulted by wiring.

IV.2.2 Light curtain

Light curtain is composed of emitter and receiver, it is the execute unit of the AOPD.

Emitter is a complex of luminous units, its function is to emit optical signal.

Receiver is a complex of light–receiving units, its function is to process optical signals from emitter and send signals reflecting the sate of light curtain to the controller or the controlled machine.

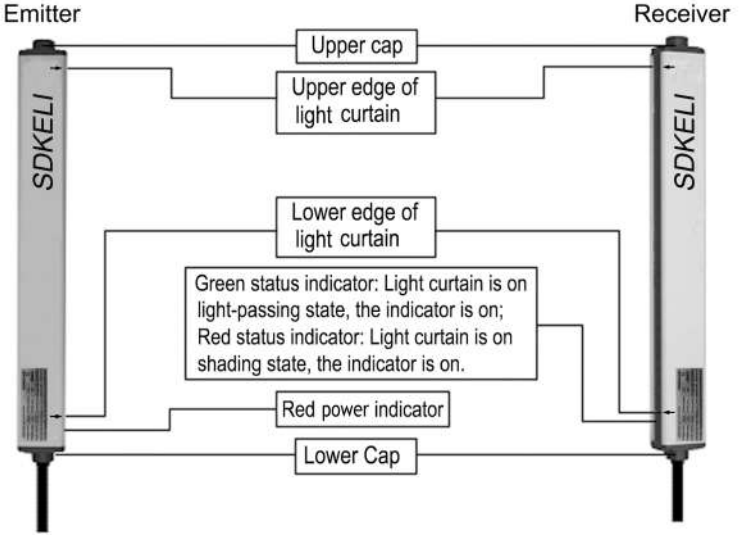


Fig1.6 Light curtain

IV.2.3 Transmission cable

The transmission cable is utilized for transmitting signals between emitter/receiver and controller.

Sheet1.4 The standard length of double–end transmission cable (Unit: m)

Series No.	A	B	C	D	E
Single–side protection	2 & 4	2 & 8	3 & 14	Custom–made	
Double–side protection	2 & 4	2 & 8	3 & 14		
	3 & 8	4 & 10	6 & 17		

Sheet1.5 The standard length of single–end transmission cable (Unit: m)

A	B	C	D	E
2 & 4 (3 & 5 for protective height which is larger than 200mm)	3 & 8	3 & 14	Custom–made	

Transmission cable for cascaded AOPD/cascaded safety light curtain needs to be customized when ordering.

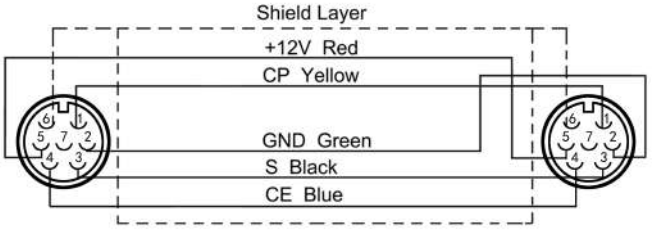


Fig1.7.A Double–end transmission cable for KS06 AOPD

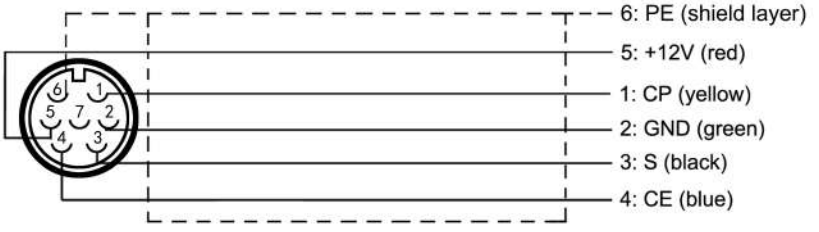


Fig1.7.B Single–end transmission cable for KS06 AOPD

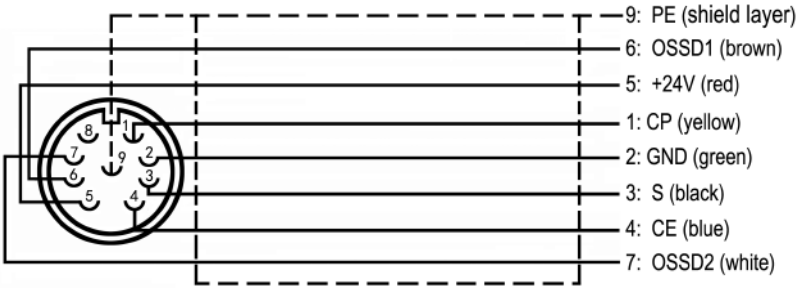


Fig1.7.C Transmission cable for cascaded safety light curtain

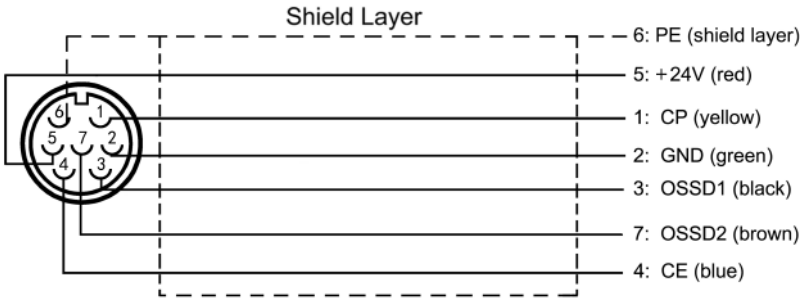


Fig1.7.D Transmission cable for KS06G

IV.2.4 Power cable

The power cable connects AOPD with power supply, transmitting signal sent from controller to electric equipment of machine and other controlled systems. The connection points are shown in Fig1.8.

The standard length of power cable: 2.5m for CPSII, 1.5m for CQ2/JKIII.

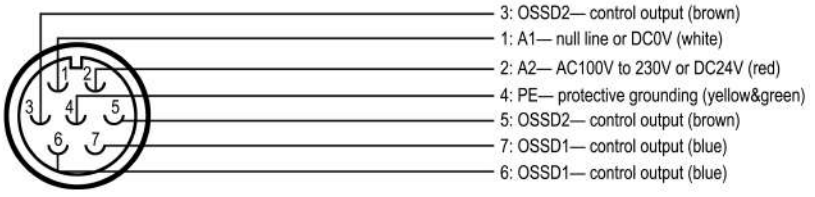


Fig1.8.A Power cable for CPSII

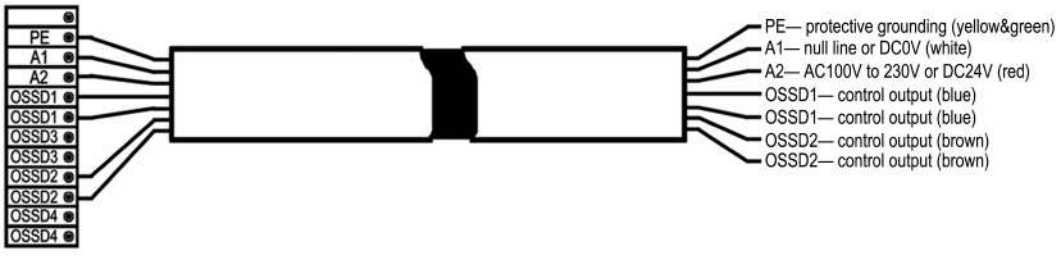


Fig1.8.B Power cable for CQ2

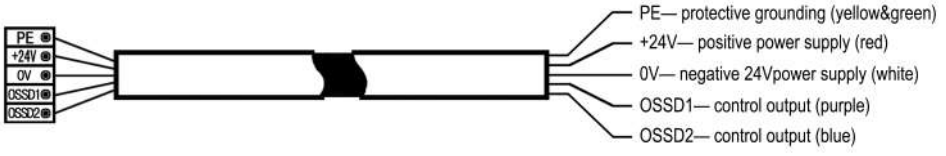
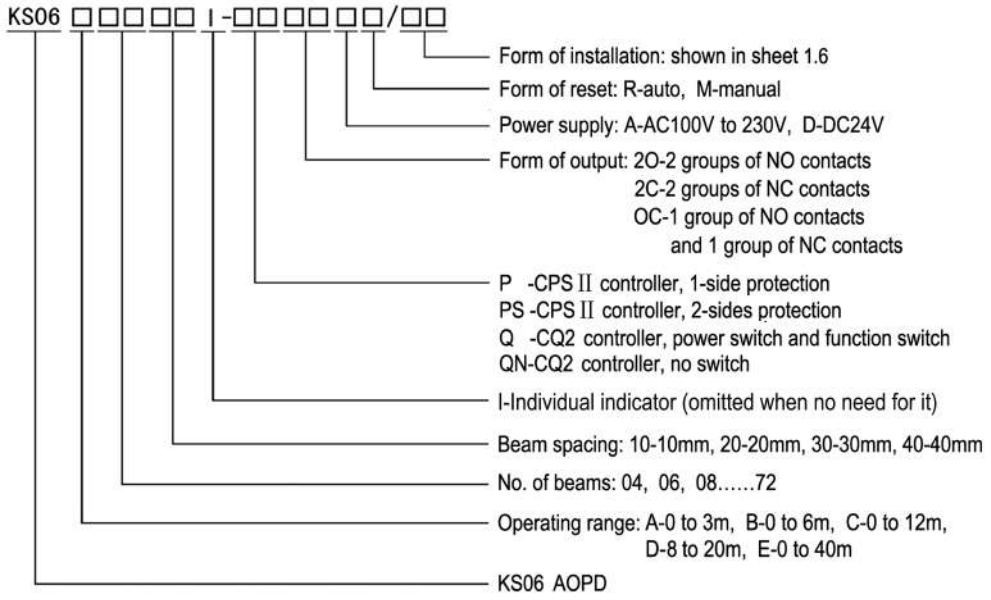


Fig1.8.C Power cable for JKIII

The customer should make special order if the standard transmission cable or power cable does not meet the actual requirements.

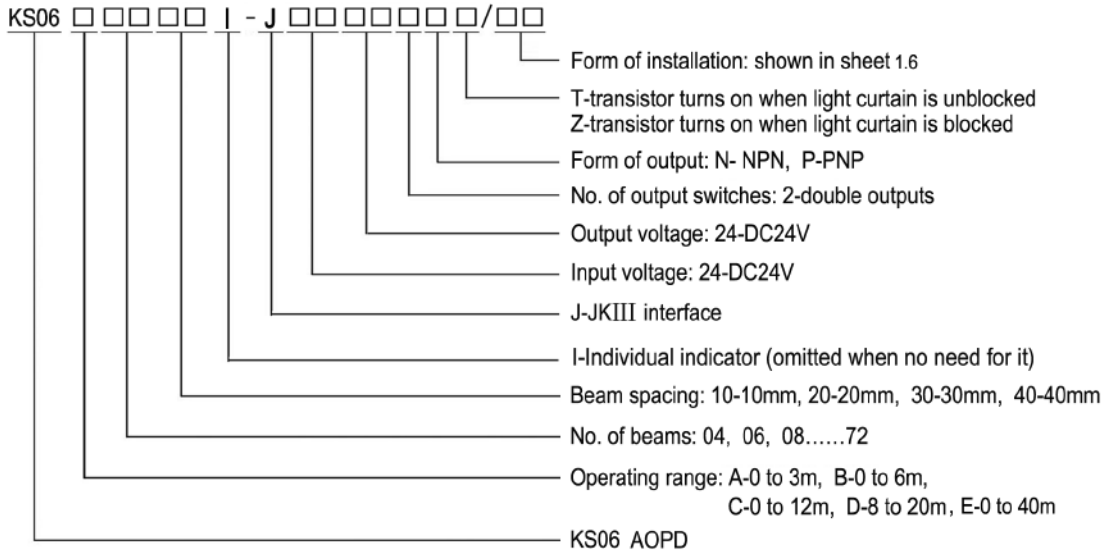
V INSTRUCTION OF SPECIFICATION

The entire machine specification of AOPD with the relay contact output is as follows:



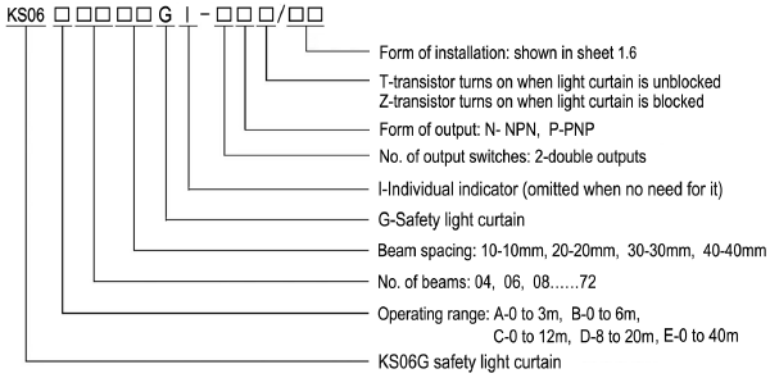
Note: The maximum quantity of beams for E type is 40 and the beam spacing for E type is only 40mm. The maximum operating range is 40m when the quantity of beams is from 4 to 16 and 30m for the quantity of beams is from 18 to 40.

The entire machine specification of AOPD with JKIII is as follows:



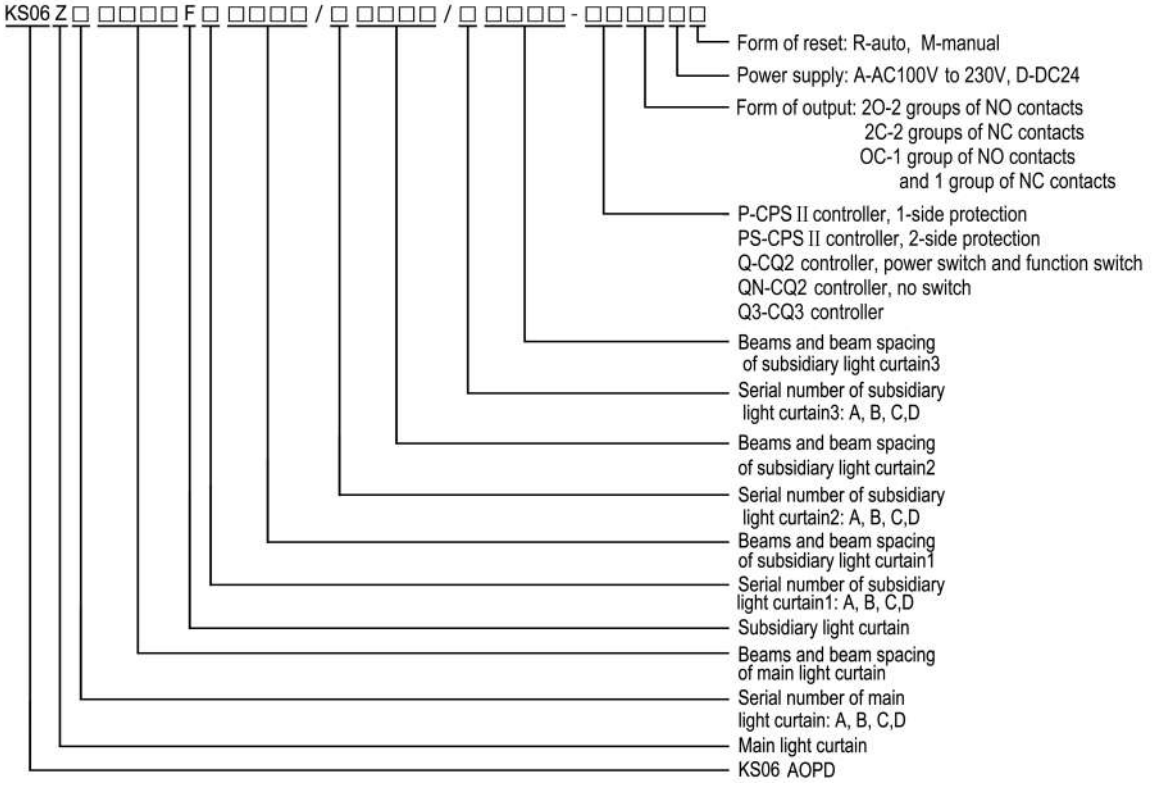
Note: The maximum quantity of beams for E type is 40 and the beam spacing for E type is only 40mm. The maximum operating range is 40m when the quantity of beams is from 4 to 16 and 30m for the quantity of beams is from 18 to 40.

The entire machine specification of KS06G is as follows:



Note: The maximum quantity of beams for E type is 40 and the beam spacing for E type is only 40mm. The maximum operating range is 40m when the quantity of beams is from 4 to 16 and 30m for the quantity of beams is from 18 to 40.

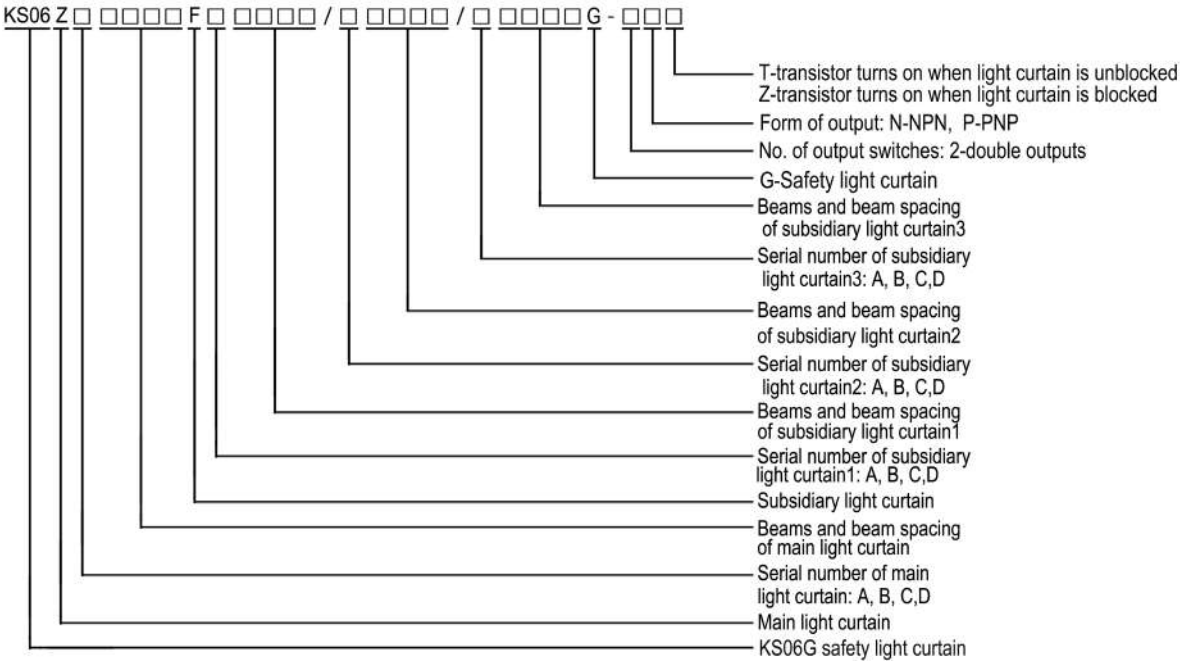
The entire machine specification of cascaded AOPD is as follows:



Note 1: The output form for CQ3 controller is only 3 NO and 1 NC contacts and the power supply is only DC24V. Identifications of them are both omitted. When 4 sets of light curtains are cascaded or the total quantity of light beams is more than 144 for cascaded light curtain, the power consumption of should be selected 30W, the others can be selected 15W, please use 30 or 15 at the end of entire machine specification to show the power consumption.

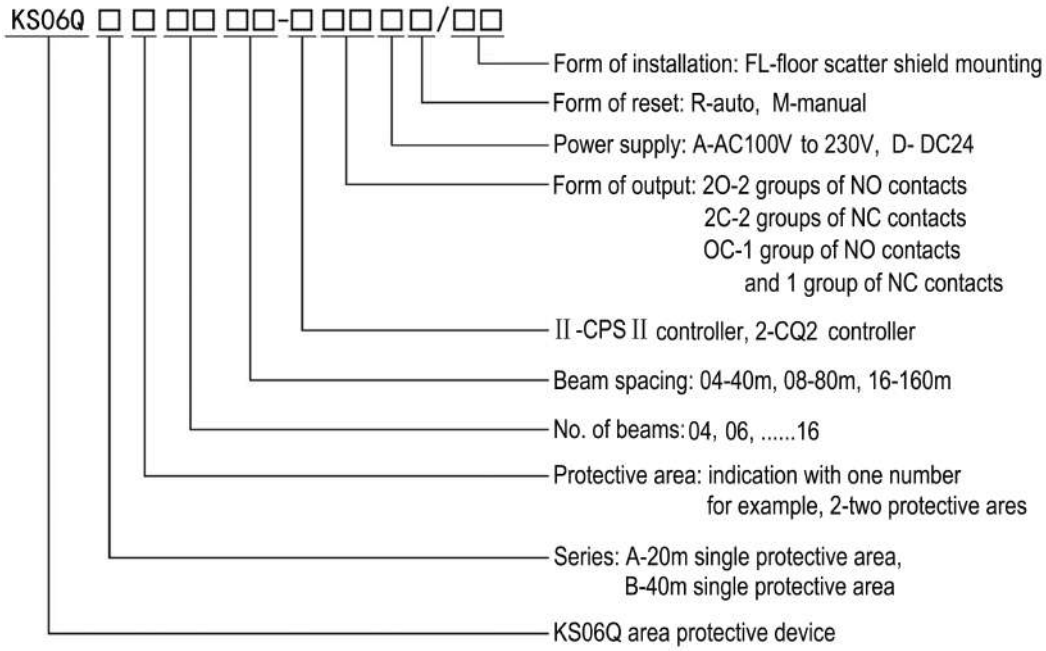
Note2: The entire machine specification of cascaded AOPD does not contain installation bracket part, please specify the installation bracket when ordering.

The entire machine specification of G cascaded safety light curtain is as follows:

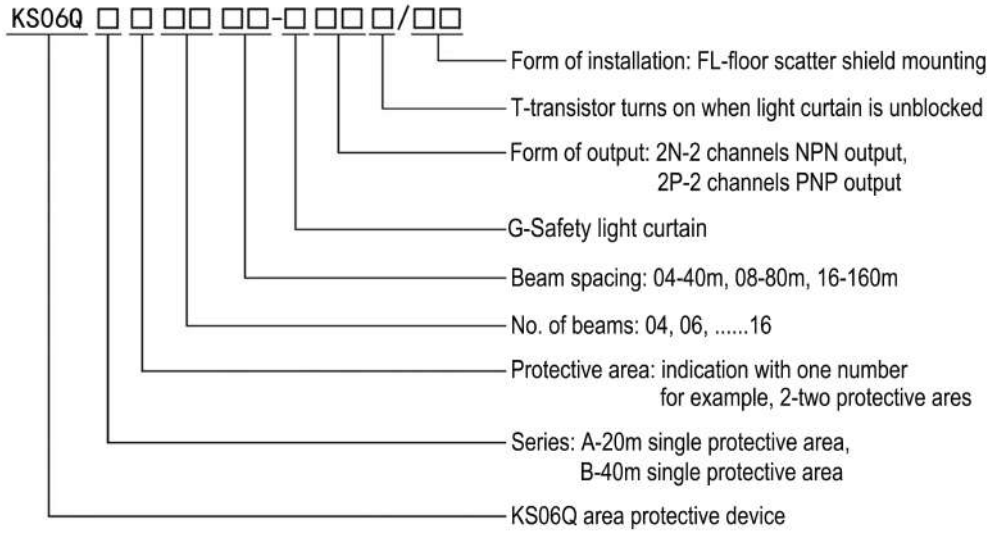


Note: The entire machine specification of cascaded AOPD does not contain installation bracket, please specify the installation bracket when ordering.

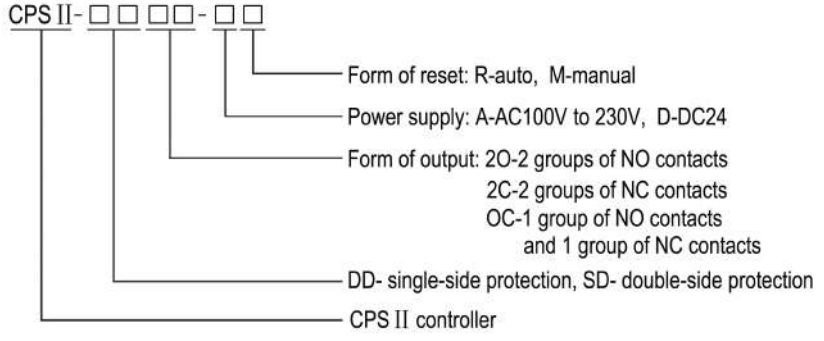
The entire machine specification of KS06Q area protective device with the relay contact output is as follows:



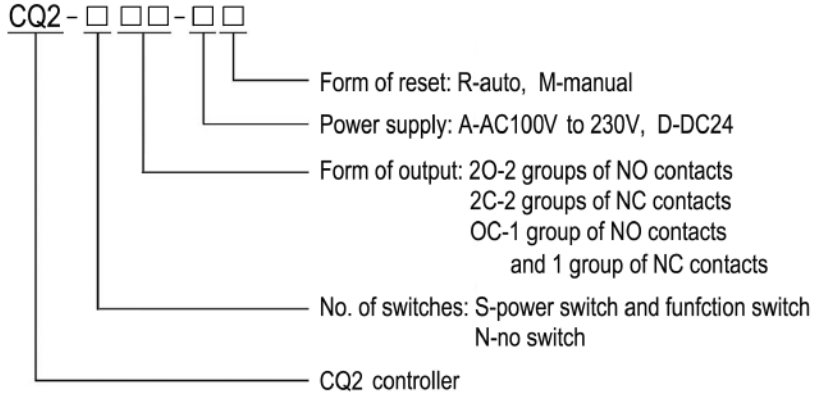
The entire machine specification of KS06Q area protective device with the transistor output is as follows:



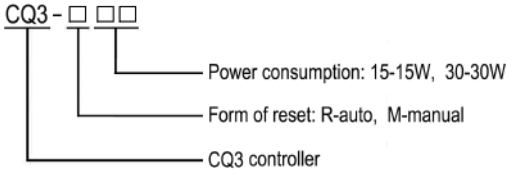
The specification of CPSII controller is as follows:



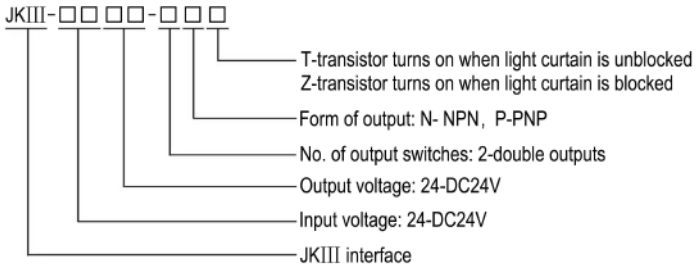
The specification of CQ2 is as follows:



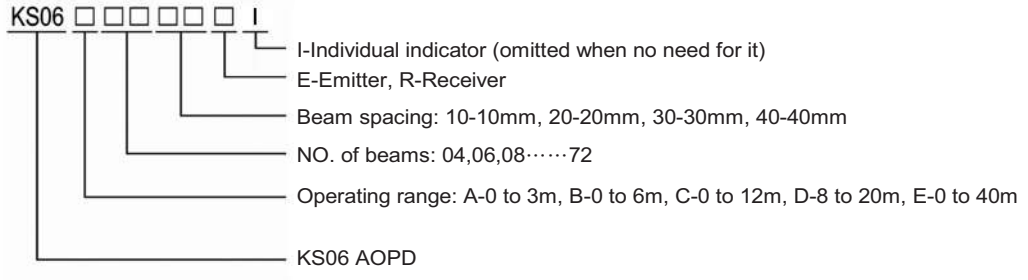
The specification of CQ3 is as follows:



The specification of JKIII is as follows:

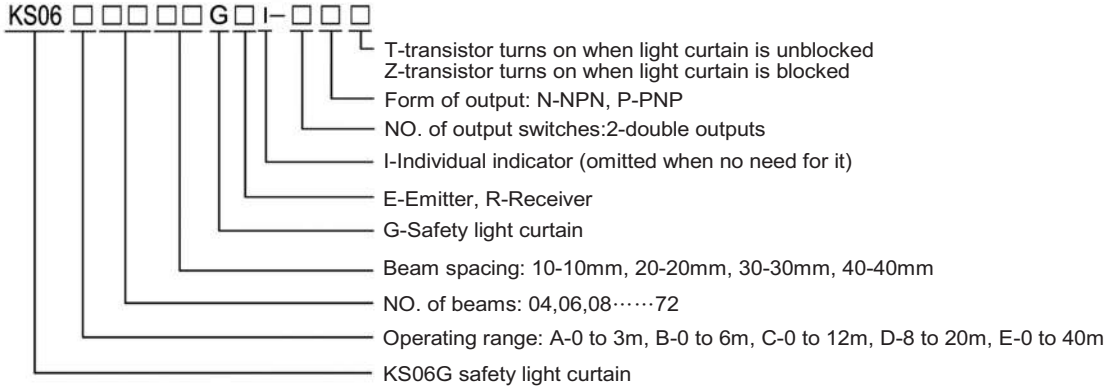


The specification for emitter/receiver of KS06 AOPD is as follows:



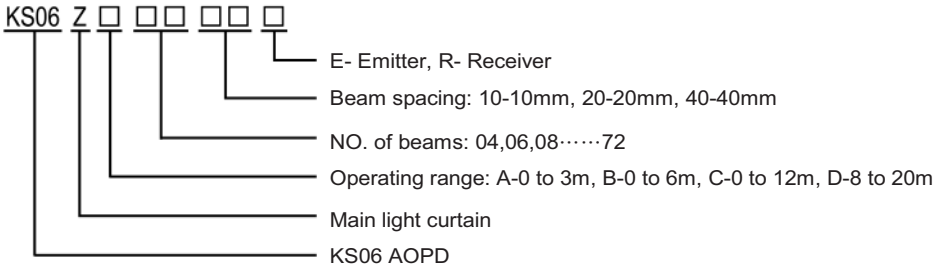
Note: The maximum quantity of beams for E type is 40 and the beam spacing for E type is only 40mm. The maximum operating range is 40m when the quantity of beams is from 4 to 16 and 30m for the quantity of beams is from 18 to 40.

The specification for emitter/receiver of KS06G is as follows:

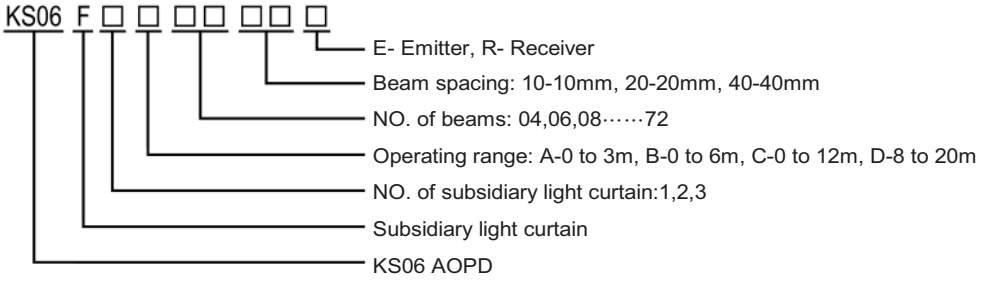


Note: The maximum quantity of beams for E type is 40 and the beam spacing for E type is only 40mm. The maximum operating range is 40m when the quantity of beams is from 4 to 16 and 30m for the quantity of beams is from 18 to 40.

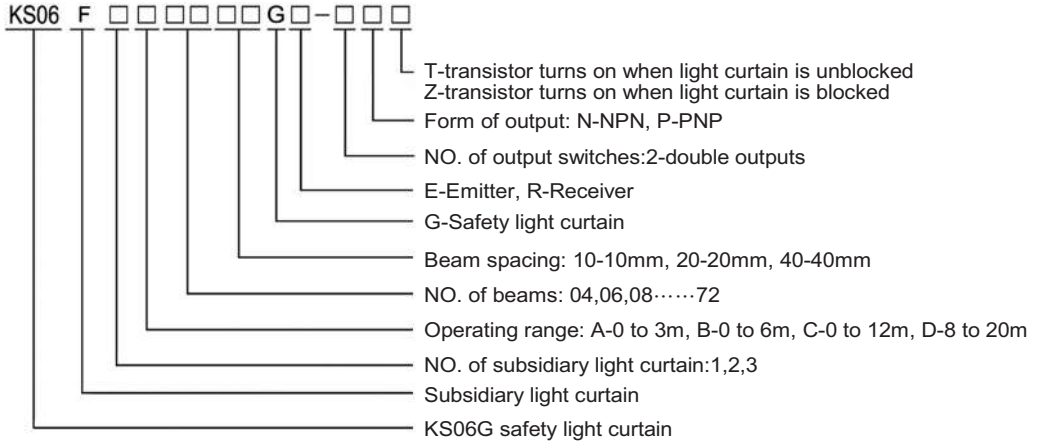
The specification for emitter/receiver of cascaded main light curtain is as follows:



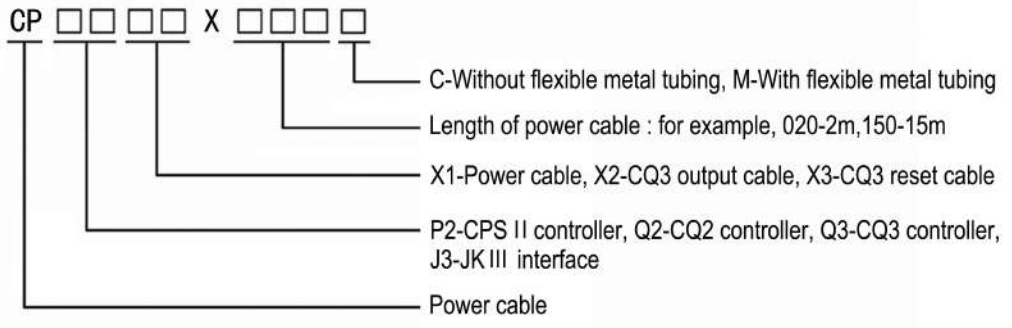
The specification for emitter/receiver of cascaded subsidiary light curtain is as follows:



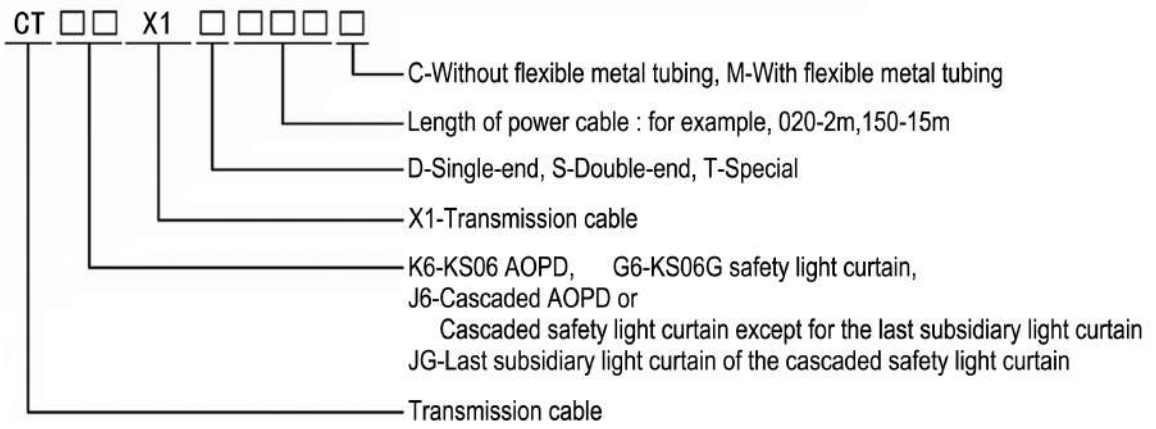
The specification for emitter/receiver of the last cascaded subsidiary light curtain is as follows:



The specification of power cable is as follows:



The specification of transmission cable is as follows:



Sheet1.6 Code of bracket installation

NO.	Form	Code	Remark
1	Common side mounting	PC	P32
2	ZC mounting	ZC	P34
3	Pipe mounting	GC	P35
4	Double-arm side mounting-with reducer	SCJ	P37
5	Double-arm side mounting- T-groove	SCT	P38
6	T-groove mounting	TC	P40
7	Scatter shield side mounting	FC	P42
8	Scatter shield front mounting	FZ	P42
9	Scatter shield pipe mounting	GF	P43
10	Scatter shield double-arm mounting	SF	P44
11	Magnatic attachment mounting	CX	P46
12	Scatter shield column mounting	FL	P48
13	Scatter shield magnet front mounting	CFZ	These installation forms are not illustrated in this operation manual, please contact us for more details before you want to use them.
14	Scatter shield magnet side mounting	CFC	
15	Double-bracket arm mounting	G1	
16	Plate support with magnet mounting	BC	
17	Plate support with bolt mounting	BL	
18	Others forms of bracket	XX	The form of bracket should be rasied in the contact by customer and the code of it will be made by us.

Note: Inconsideration of long working distance of KS06E series, installation brackets with large regulating variable may be selected, such as, FL, GC, GF, other installations are not recommended.

VI TECHNICAL PARAMETERS

Sheet1.7 Technical parameters of CPSII/CQ2/CQ3

Power supply	AC100V to 230V±15%, 50/60Hz	DC24V±10%
Temperature	Operating: –10℃ to 55℃	Storage: –40℃ to 70℃
Humidity	Operating: 35% to 85%RH	Storage: 35% to 95%RH
Output	Relay contact output	
Output contact capacity	CPSII/CQ2: 5A, AC250V/DC30V (Resistive load)	CQ3: 10A, AC250V/DC30V (Resistive load)
Power consumption	<15W	Cascaded≤30W(CQ3)
Response time	≤20ms	
Insulating resistance	>100MΩ	
Dielectric strength	AC1500V, no arcing and flashover in 60s	
Performance life of relay	$\geqslant 10^6$ times	
IP code	CPSII: IP54	CQ2/CQ3: IP20

Note: CQ3 only works under DC24V power supply

Sheet1.8 Technical parameters of JKIII

Power supply		DC24V
Output voltage		DC24V
Output	JKIII□□□□–2NT	NPN transistor direct–current output when light curtain is unblocked
	JKIII□□□□–2PT	PNP transistor direct–current output when light curtain is unblocked
	JKIII□□□□–2NZ	NPN transistor direct–current output when light curtain is blocked
	JKIII□□□□–2PZ	PNP transistor direct–current output when light curtain is blocked
Output current		≤300mA
Power isolation form		DC–DC
Output isolation form		Optically coupled isolation
IP code		IP20

Sheet1.9 Technical parameters of KS06G/KS06 AOPD

<table>
<tr><td colspan="2">Executed standards</td><td colspan="6">GB4584–2007; GB/T19436.1 (Type 4); GB/T19436.2 (Type 4)
IEC 61496–1(Type 4),IEC 61496–2(Type 4)</td></tr>
<tr><td colspan="2">Beam spacing(mm)</td><td>10</td><td>20</td><td>30</td><td colspan="3">40</td></tr>
<tr><td colspan="2">Detection capability(mm)</td><td>18</td><td>28</td><td>38</td><td colspan="3">48</td></tr>
<tr><td colspan="2">No. of beams</td><td>12,16…72</td><td>6,8…72</td><td>6,8…72</td><td>4,6…72</td><td>4,6…16</td><td>18,20…40</td></tr>
<tr><td colspan="2">Operating range(m)</td><td colspan="4">KS06A: 0 to 3m,KS06B: 0 to 6m,
KS06C: 0 to 12m,KS06D: 8 to 20m</td><td>KS06E:
0 to 40m</td><td>KS06E:
0 to 30m</td></tr>
<tr><td colspan="2">Protective height</td><td colspan="6">Refer to sheet 1.11</td></tr>
<tr><td colspan="2">Effective aperture angle(EAA)</td><td colspan="6">Within ±2.5° for the emitter and receiver at a detection distance of at least 3m according to IEC 61496–2</td></tr>
<tr><td colspan="2">Temperature</td><td colspan="3">Operating:–10℃ to 55℃</td><td colspan="3">Storage:–40℃ to 70℃</td></tr>
<tr><td colspan="2">Humidity</td><td colspan="3">Operating:35% to 85%RH</td><td colspan="3">Storage:35% to 95%RH</td></tr>
<tr><td rowspan="2">Resistance to light interference</td><td>Incandescent lamp</td><td colspan="6">3000 Lux (max.)</td></tr>
<tr><td>Fluorescent lamp</td><td colspan="6">3000 Lux (max.)</td></tr>
<tr><td colspan="2">IP code</td><td colspan="6">IP65</td></tr>
<tr><td rowspan="2">Power supply</td><td>KS06</td><td colspan="6">DC12V±10%</td></tr>
<tr><td>KS06G</td><td colspan="6">DC24V±10%</td></tr>
<tr><td rowspan="2">Current consumption (no load)</td><td>Emitter</td><td colspan="6">300mA (max.)</td></tr>
<tr><td>Receiver</td><td colspan="6">100mA (max.)</td></tr>
<tr><td rowspan="2">Response time</td><td>KS06</td><td colspan="6">≤20ms (entire machine)</td></tr>
<tr><td>KS06G</td><td colspan="6">≤20ms</td></tr>
<tr><td rowspan="2">Output characteristic</td><td rowspan="2">KS06G</td><td>PNP</td><td colspan="5">PNP transistor outputs×2 (OSSD is in ON–state when light curtain is unblocked), load current 300mA max, Residual voltage 4V max. (except for voltage drop due to cable extension)</td></tr>
<tr><td>NPN</td><td colspan="5">NPN transistor outputs×2 (OSSD is in ON–state when light curtain is unblocked), load current 300mA max, Residual voltage 3.5V max (except for voltage drop due to cable extension)</td></tr>
</table>

Sheet1.10 Technical parameters of KS06Q area protective device

Safety level	Type 4 (IEC61496)			
Series	KS06QA KS06QB			
Power supply	AC100V~230V±15%,50/60Hz or DC24V±10%			
Power consumption	<15W			
Response time	≤20ms			
Output	KS06Q: Relay contact output			
	KS06QG: PNP or NPN transistor output			
Beam spacing*	40mm	80mm	160mm	320mm
No. of beams	4,6,8…16	4,6,8…16	4,5,6,7,8	3,4,5
Protective range	KS06QA:Single-area:20m; Two-areas:14m; Three-areas:10m; Four-areas:8m KS06QB:Single-area:40m; Two-areas:30m;Three-areas:20m; Four-areas:16m			
Controller used with	KS06Q: CPSⅡ/CQ2/CSRMC			
	KS06QG: No separate control unit is required or used with CSRMB to output relay passive contact signal			
Operating temperature	-10℃ to 55℃,			
Operating humidity	35%RH to 85%RH			
IP code	IP65			
Shock resistance	10g, 16 ms duration, 1000±10 bumps for each axis (applies to all 3 axes)			
Vibration resistance	10Hz to 55Hz frequency range, 1 octave/min. sweep rate, 0.35mm±0.05 amplitude, 20 sweeps per axis (applies to all 3 axes)			

*:For KS06A and KS06B, the beam spacing can be customized: 40 × N (N is an integer)

Sheet1.11 Dimensions of H, J and L for KS06 AOPD/KS06G safety light curtain, unit:mm

No. of Beams	Detection capability 18mm			Detection capability 28mm			Detection capability 38mm			Detection capability 48mm		
	H	J	L	H	J	L	H	J	L	H	J	L
4										120	239	500
6				100 *	199	500	150	239	500	200	319	500
8				140	239	500	210	299	500	280	399	750
10				180	279	500	270	359	750	360	479	750
12	110*	199	500	220	319	500	330	419	750	440	559	1000
14				260	359	750	390	479	750	520	639	1000
16	150	239	500	300	399	750	450	539	750	600	719	1000
18				340	439	750	510	599	1000	680	799	1000
20	190	279	500	380	479	750	570	659	1000	760	879	1200
22				420	519	750	630	719	1000	840	959	1200
24	230	319	500	460	559	1000	690	779	1000	920	1039	1500
26				500	599	1000	750	839	1200	1000	1119	1500
28	270	359	750	540	639	1000	810	899	1200	1080	1199	1500
30				580	679	1000	870	959	1200	1160	1279	1500
32	310	399	750	620	719	1000	930	1019	1500	1240	1359	1750
34				660	759	1000	990	1079	1500	1320	1439	1750
36	350	439	750	700	799	1000	1050	1139	1500	1400	1519	1750
38				740	839	1200	1110	1199	1500	1480	1599	2000
40	390	479	750	780	879	1200	1170	1259	1500	1560	1679	2000
42				820	919	1200	1230	1319	1750	1640	1759	2000
44	430	519	750	860	959	1200	1290	1379	1750	1720	1839	
46				900	999	1200	1350	1439	1750	1800	1919	
48	470	559	1000	940	1039	1500	1410	1499	1750	1880	1999	
50				980	1079	1500	1470	1559	2000	1960	2079	
52	510	599	1000	1020	1119	1500	1530	1619	2000	2040	2159	
54				1060	1159	1500	1590	1679	2000	2120	2239	
56	550	639	1000	1100	1199	1500	1650	1739	2000	2200	2319	
58				1140	1239	1500	1710	1799	2000	2280	2399	
60	590	679	1000	1180	1279	1500	1770	1859		2360	2479	
62				1220	1319	1750	1830	1919		2440	2559	
64	630	719	1000	1260	1359	1750	1890	1979		2520	2639	
66				1300	1399	1750	1950	2039		2600	2719	
68	670	759	1000	1340	1439	1750	2010	2099		2680	2799	
70				1380	1479	1750	2070	2159		2760	2879	
72	710	799	1000	1420	1519	1750	2130	2219		2840	2959	

H—protective height, J—length of emitter/receiver, L—length of steel pipe/double-arm pipe

* represents this protective height can not be provided by KS06G safety light curtain.

The maximum quantity of beams for E type is 40 and the beam spacing for E type is only 40mm.

The length L of double-arm pipe does not exceed 1.5m.

Sheet1.12 Dimensions of H, J1 J2 and L for cascaded AOPD, unit: mm

No. of Beams	Detection capability 18 mm				Detection capability 28 mm				Detection capability 48 mm			
	H	J1	J2	L	H	J1	J2	L	H	J1	J2	L
4									120 *	239	249	500
6									200 *	319	329	500
8					140 *	239	249	500	280	399	409	750
10									360	479	489	750
12					220 *	319	329	500	440	559	569	1000
14									520	639	649	1000
16	150 *	239	259	500	300	399	409	750	600	719	729	1000
18									680	799	809	1000
20	190 *	279	299	500	380	479	489	750	760	879	889	1200
22									840	959	969	1200
24	230 *	319	339	500	460	559	569	1000	920	1039	1049	1500
26									1000	1119	1129	1500
28	270	359	379	750	540	639	649	1000	1080	1199	1209	1500
30									1160	1279	1289	1500
32	310	399	419	750	620	719	729	1000	1240	1359	1369	1750
34									1320	1439	1449	1750
36	350	439	459	750	700	799	809	1000	1400	1519	1529	1750
38									1480	1599	1609	2000
40	390	479	499	750	780	879	889	1200	1560	1679	1689	2000
42									1640	1759	1769	2000
44	430	519	539	750	860	959	969	1200	1720	1839	1849	
46									1800	1919	1929	
48	470	559	579	1000	940	1039	1049	1500	1880	1999	2009	
50									1960	2079	2089	
52	510	599	619	1000	1020	1119	1129	1500	2040	2159	2169	
54									2120	2239	2249	
56	550	639	659	1000	1100	1199	1209	1500	2200	2319	2329	
58									2280	2399	2409	
60	590	679	699	1000	1180	1279	1289	1500	2360	2479	2489	
62									2440	2559	2569	
64	630	719	739	1000	1260	1359	1369	1750	2520	2639	2649	
66									2600	2719	2729	
68	670	759	779	1000	1340	1439	1449	1750				
70												
72	710	799	819	1000	1420	1519	1529	1750				

H—protective height, J1—length of main light curtain, J2—length of subsidiary light curtain,

L—length of steel pipe/double-arm pipe

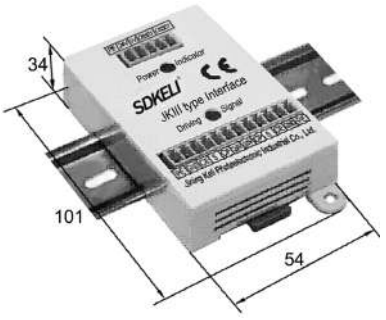
* represents this protective height can not be provided by the subsidiary light curtain3 of the G cascaded safety light curtain.

The length L of double-arm pipe does not exceed 1.5m.

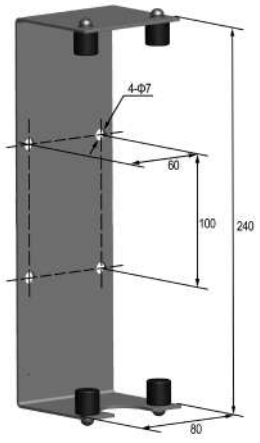
VII DIMENSIONS OF MAJOR PARTS

CPSII controller

CQ2/CQ3 controller

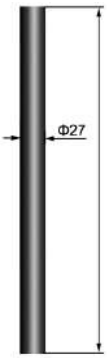


JKIII interface

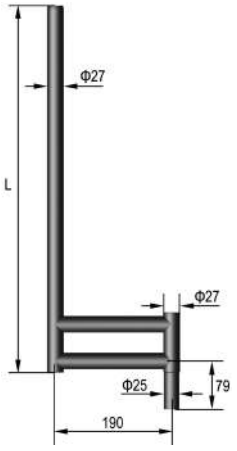


Controller support

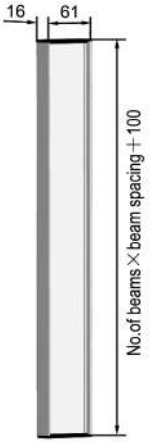
Emitter/Receiver



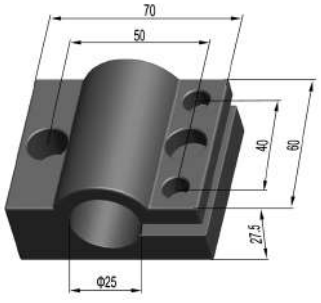
Steel pipe



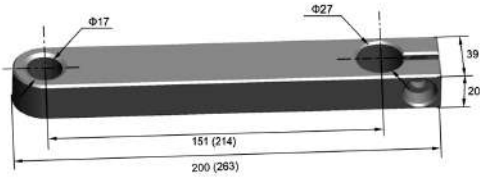
Double–arm pipe



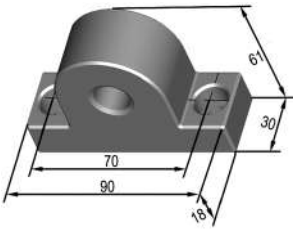
Viewfinder



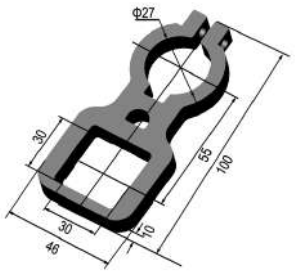
Support seat



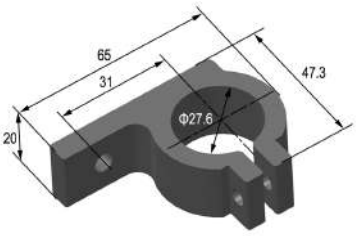
Bracket arm



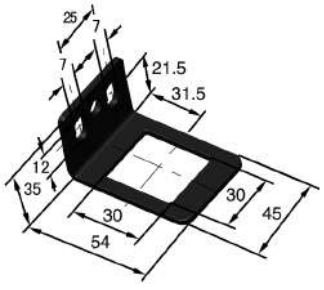
Bracket seat



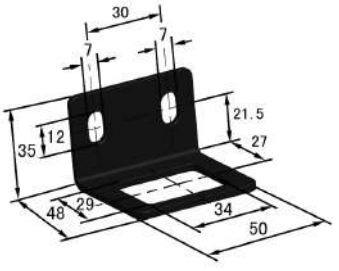
KS pipe–mounting fixing clamp



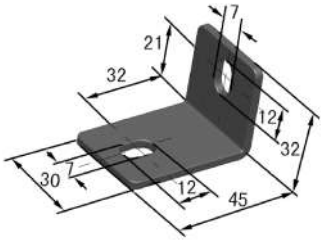
Q–clamp



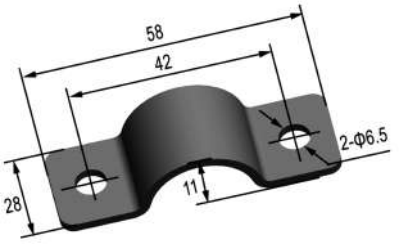
ZC–mounting bracket



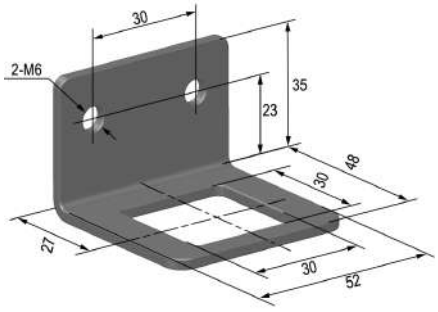
KS common side–mounting bracket



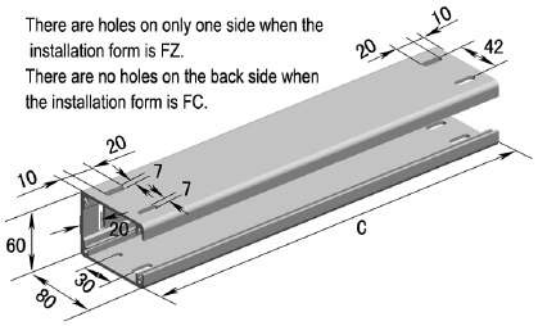
L–bracket



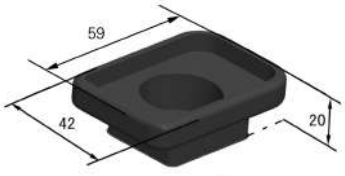
Ω–clamp



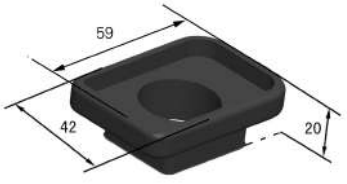
KS shield–mounting bracket



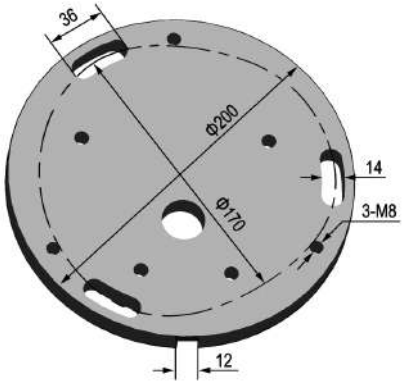
KS scatter shield (C is shown on P45)



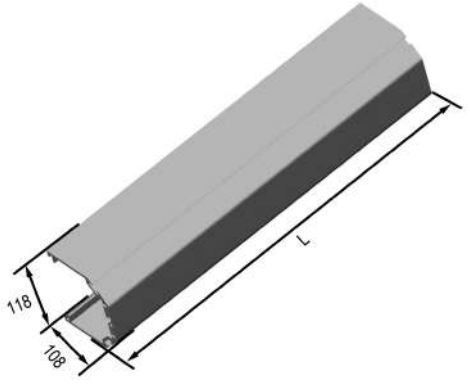
KS06 upper vibration–reducer



KS06 lower vibration–reducer



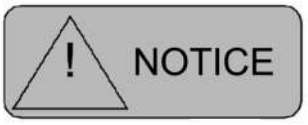
Floor column base



Floor scatter shield

Fig1.9 Detail drawing of major parts

UNIT 2 INSTALLATION



As soon as you receive our goods, please open the packaging box, check the items inside the box according to packing list;
Before installation, shut down the power supply to exclude possibility of danger.

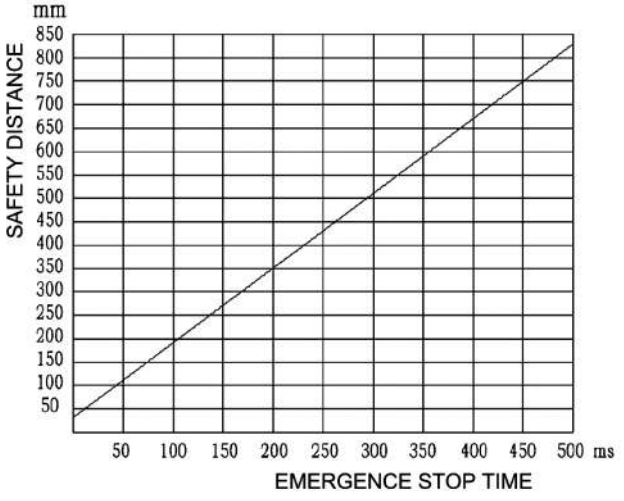
I INSTALLATION SITE

The installation site contains two factors, that is safety distance and relative altitude height.

To ensure personal safety, the installation site of AOPD must meet the requirement for safety distance and relative altitude position. Otherwise, the accident may occur.

I.1 Safety distance

The safety distance is the minimum distance that must be set between the light curtain of AOPD and the margin of mould orifice to stop the hazardous part before a person or object reaches it. Its algorithmic method should be defined according to the brake mode of the machine or refer to sheet 2.1.



Sheet2.1 Calculation sheet for safety distance

- For presses on which the slider can stop at any point in one stroke, the safety distance can be worked out according to formula (1).

$$S = KT + C \qquad (1)$$

Where:

S — Safety distance(in mm)from the light curtain sensing field to the danger zone

K — Velocity (in mm/s) of movement into the danger zone

T — Total response time (in s) of the system, including the response time of the AOPD (informed by the supplier) and the braking time of the press (should be measured by actual time).

C — Additional safety distance (in mm)

● For presses on which the slider can not stop at any point in one stroke, the safety distance can be worked out according to formula (2).

$$S = KTs + C \qquad (2)$$

Where:

S — Safety distance(in mm)from the light curtain sensing field to the danger zone

K — Velocity (in mm/s) of movement into the danger zone

C — Additional safety distance (in mm)

Ts — Time (in s) from the press slider starts from the upper dead point to the press slider arrives at the lower dead point, name the stroke down time of press slider. Ts can be calculated according to formula (3) or measured by actual time.

$$Ts = (1/2 + 1/N)Tn \qquad (3)$$

Where:

N — Number of stoats of clutch

Tn — Time (in s) needed for crankshaft to make a cycle

The value of K:

● To adopt parallel approach of installation, the value of K uses 1600.

● To adopt vertical approach of installation, the value of K uses 2000 if S≤500mm, the value of K uses 1600 if S>500mm.

The value of C:

● The value of C should be set by the maximal length of the arm which put into the light curtain sensing field but not cause the AOPD to response.

● The value of C should be set according to the detection capability, shown in the following table.

Detection capability(mm)	C(mm)
≤14	0
>14 to 20	80
>20 to 30	130
>30 to 40	240
>40	850

Make sure to secure the safety distance between the light curtain of AOPD and the margin of mould orifice, otherwise the machine may not stop before a person reaches the hazardous part, leading to serious injury.

I.2 Relative altitude height

Relative altitude height refers to the upper and lower position of light curtain relative to the die orifice of machine. Namely in the premise of ensuring the safety distance, the lowest light beam of light curtain should not be higher than the lower edge of lower die orifice, and the highest light beam of light curtain should not be lower than the upper edge of upper die orifice, as shown in Fig2.1.1. This is related to the selection of the protective height of light curtain.

The protective height of the selected light curtain should not be less than which specified by the relevant safety standards around the user's location.

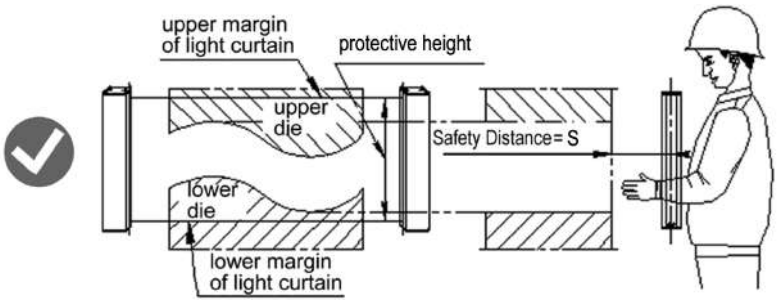


Fig2.1.1 The correct position of installation site

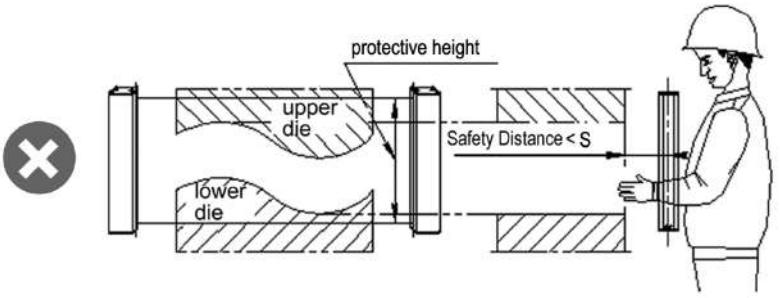


Fig2.1.2 Incorrect position of installation site—light curtain is too close to die orifice.

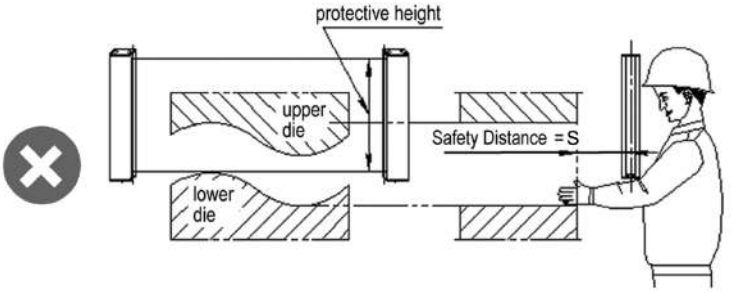


Fig2.1.3 Incorrect position of installation site
—light curtain is a little higher, the hand can stretch into it under the lowest beam.

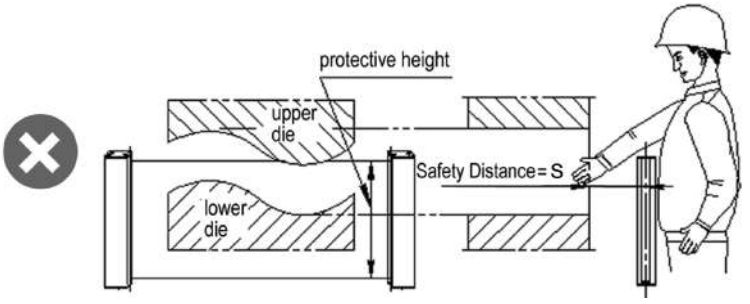


Fig2.1.4 Incorrect position of installation site
—light curtain is a little lower, the hand can stretch into it upside the highest beam.

WARNING

- **The relative altitude height is one of necessary conditions for achieving the protection function of AOPD, the relative altitude height must be ensured while installing AOPD.**
- **If the brake staff of press slider is in faults, it must be checked and repaired in time. Otherwise, safety can not be ensured even if the installation site is correct.**
- **If the die is changed in the course of using AOPD, the safety distance and relative altitude height must be readjusted according to the two requirements above.**

I.3 Installation of KS06 cascaded AOPD

Safety distance and relative altitude height of every protective area must be set according to I.1 and I.2 strictly.

The main light curtain is placed forefront of the subsidiary light curtains, and then place the subsidiary light curtains in proper order. Subsidiary light curtain1 is connected with the main light curtain directly.

The end with indicators of the subsidiary light curtain is connected with the next subsidiary light curtain or the controller.

The serial No. of the emitter and receiver of the subsidiary light curtain must be corresponded strictly.

The AOPD can be installed of "serial setting", "L–type setting" and "U–type setting" or be installed with no relevance.

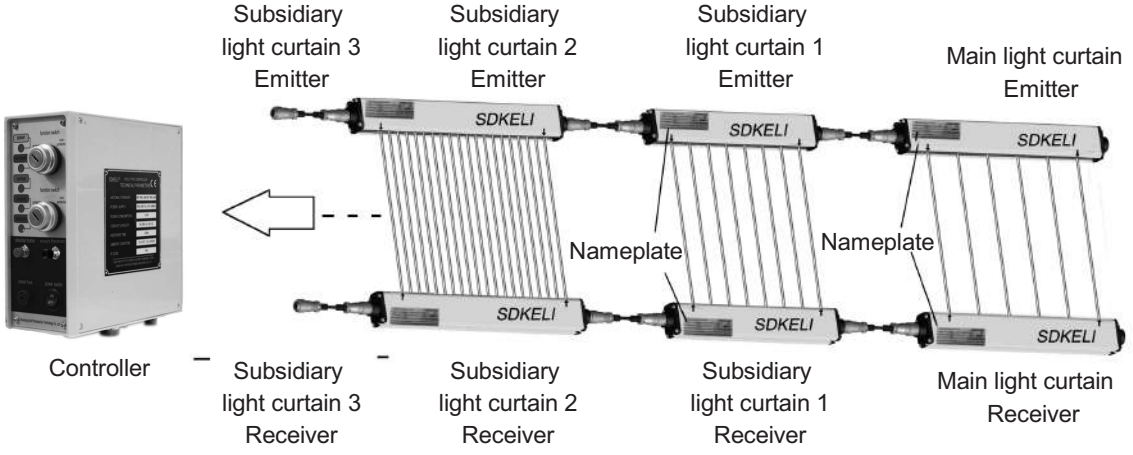


Fig2.1.5 Typically installation of KS06 cascaded AOPD

I.4 Auxiliary protective equipment

If the distance between light curtain and outside of die orifice is over 400mm, auxiliary protective equipment should be installed to prevent operator from entering the danger zone, it is shown in Fig2.1.6. If this distance is no more than 400mm, auxiliary protective equipment may also be adopted.

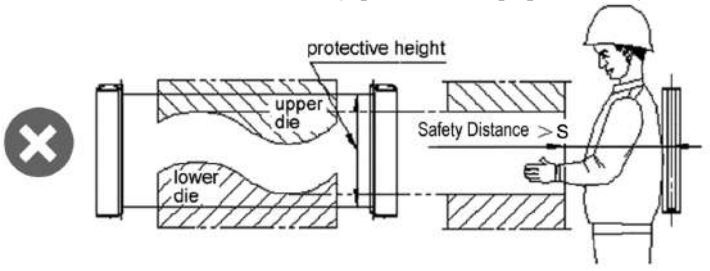


Fig2.1.6 Incorrect position of installation site
–light curtain is too far from die orifice, operators could enter danger zone.

II INSTALLATION TOOL

Electric drill,
Taps (specification: M5/M6/M8),
Knife–ended screwdriver,
8# adjustable wrench,
Aiguilles (specification: Φ4.2/Φ5.2/Φ6.7/Φ10),
Cross–ended screwdriver,
Inner–hexagon wrench (specification: 5#/6#),
Long flat nose pliers.

- To install KS type common front/side mounting bracket for emitter/receiver and controller support: Φ5.2 aiguille and M6 tap;
- To install the bracket seat for pipe mounting or the support seat for double–arm mounting: Φ6.7 aiguille and M8 tap;
- To install CQ2/CQ3 and JKⅢ: Φ4.2 aiguille;
- To drill the cable–passing hole of transmission cable and power cable: Φ10 aiguille.

III INSTALLATION OF CONTROL DEVICE

III.1 Installation of CPSⅡ controller

CPSⅡ is installed on the bed support of machine through controller support, the procedures are as follows:

1. Select proper position according to the external dimensions of the controller.
2. According to the mounting dimensions of controller support, fix the support well, as shown in Fig2.2.
3. Install the controller on the support through shock absorber and its bowl, the procedures are as follows:
   - Take off two shock absorbers from the upper part of the support, and then put them into the shock absorber bowl of the upper part of controller.
   - Aim the shock absorber bowl of the lower part of the controller at the shock absorbers of the lower part the support, and then assemble the shock absorber and its bowl. Push forward the controller into its support; make the tapped holes of shock absorbers to be aimed at the holes of the upper part of the support.
   - Tighten the M5×10 cross recessed screws to fix firmly the two shock absorbers to the upper part of the support.

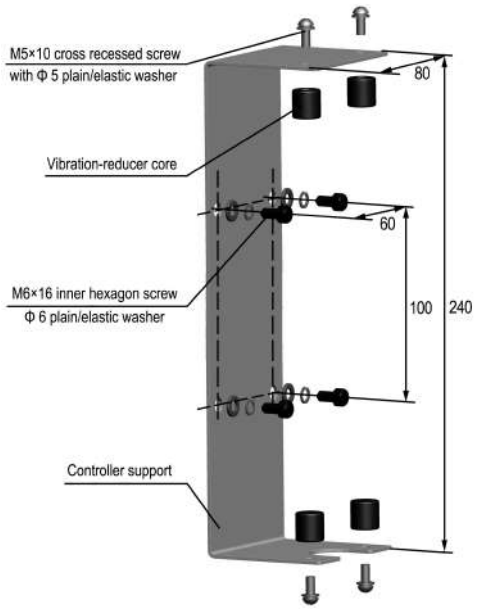


Fig2.2 Controller support

III.2 Installation of CQ2/CQ3 controller

CQ2/CQ3 is directly fixed onto the 35mm guide rail inside the control unit of machine, as shown in Fig2.3.

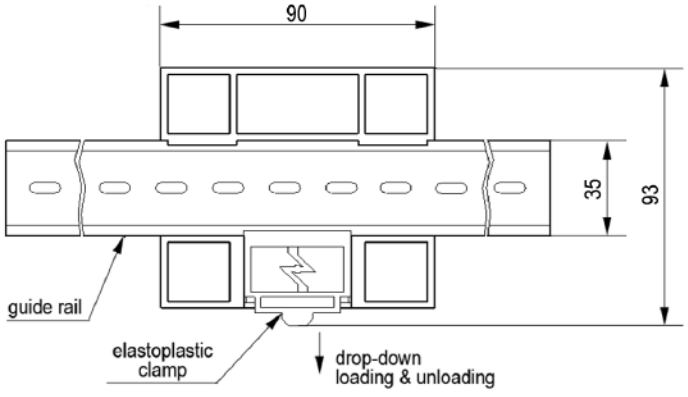


Fig2.3 CQ2/CQ3 controller

III.3 Installation of JKIII interface

JKIII can be installed into the electrical cabinet by 35mm guide rail or M4 screws, as shown in Fig2.4.

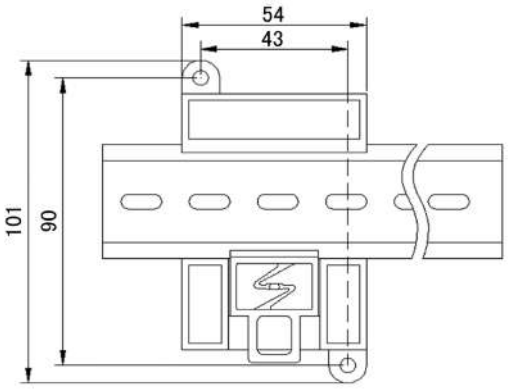


Fig2.4 JKIII interface

IV INSTALLATION OF LIGHT CURTAIN

Before installation, safety distance and relative altitude height must be calculated and defined correctly.

IV.1 Common side mounting (PC)

The way, to install emitter and receiver through KS common side–mounting bracket directly on bed piece, is generally applied to straight side press of support construction. The form of installation is shown in Fig2.5.

1. In the premise of ensuring the safety distance, select proper installation position on the machine bed piece, drill and tap according to dimensions shown in Fig2.5.C. Attention must be given in locating the drilling hole to ensure that the emitter and receiver is parallel and aligned after being installed.
2. Fit KS06 upper vibration–reducer and KS06 lower vibration–reducer in the mounting hole of common side–mounting bracket, according to the assembly direction with the emitter and receiver.
3. Fix KS common side–mounting bracket located below onto the machine bed piece through M6×16 inner hexagon screws.
4. Mount the Emitter/Receiver with vibration–reducer on the KS common side–mounting bracket fixed on the machine bed, and then mount the other KS common side–mounting bracket with the upper vibration–reducer on the Emitter/Receiver. Fix the upper KS common side–mounting bracket through M6×16 inner hexagon screws.
5. Adjust the position of emitter and receiver, make them parallel, corresponding, aligned.
6. Fasten all mounting screws after start–up test.

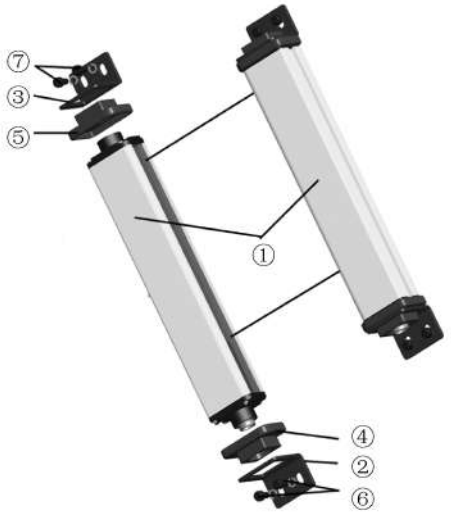


Fig2.5 Common side mounting (PC)

Sheet2.2 Formula of Dimension A, B and H

Dimension	Specifications	Formula
A	KS06□-□□10	A=H+131
	KS06□-□□20	A=H+141
	KS06□-□□30	A=H+131
	KS06□-□□40	A=H+161
B	KS06□-□□10	B=H+104
	KS06□-□□20	B=H+114
	KS06□-□□30	B=H+104
	KS06□-□□40	B=H+134

H–protective height

①Emitter/Receiver
②③KS common side–mounting bracket
④KS06 lower vibration–reducer
⑤KS06 upper vibration–reducer
⑥⑦M6×16 inner hexagon screw, Φ6 elastic/plain washer

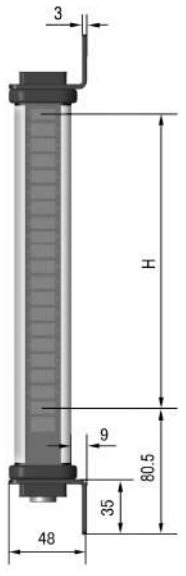


Fig2.5.A

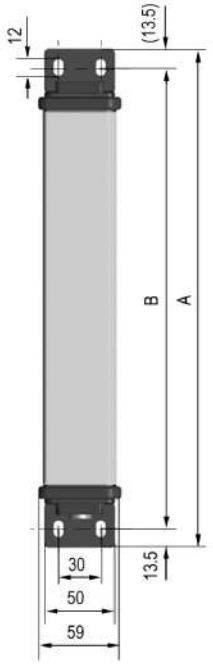


Fig2.5.B

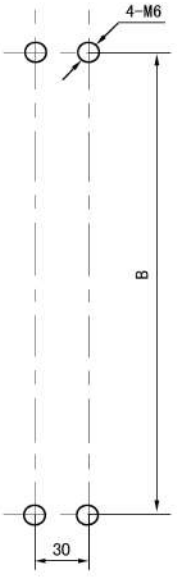
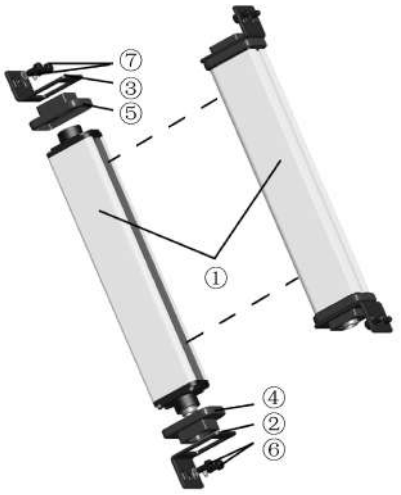


Fig2.5.C

IV.2 ZC mounting (ZC)

The way, to install emitter and receiver through ZC–mounting bracket directly on bed piece, is generally applied to straight side press of support construction. The form of installation is shown in Fig2.6.



Sheet2.3 Formula of Dimension A, B and H

Dimension	Specifications	Formula
A	KS06□-□□10	A=H+131
	KS06□-□□20	A=H+141
	KS06□-□□30	A=H+131
	KS06□-□□40	A=H+161
B	KS06□-□□10	B=H+104
	KS06□-□□20	B=H+114
	KS06□-□□30	B=H+104
	KS06□-□□40	B=H+134

H–protective height

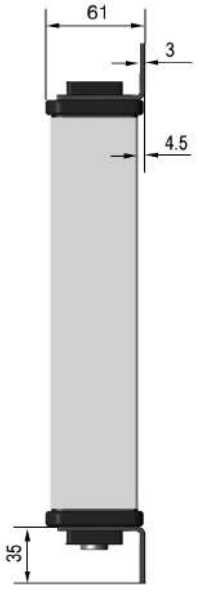
Fig2.6 ZC mounting (ZC)

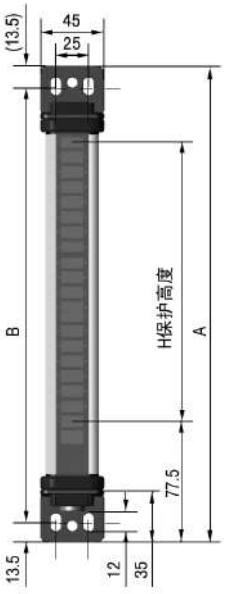
①Emitter/Receiver ②③ZC–mounting bracket

④KS06 lower vibration–reducer ⑤KS06 upper vibration–reducer

⑥⑦M6×16 inner hexagon screw, Φ6 plain /elastic washer

1. In the premise of ensuring the safety distance, select proper installation position on the machine bed piece, drill and tap according to dimensions shown in Fig2.6.C. Attention must be given in locating the drilling hole to ensure that the emitter and receiver are parallel and aligned after being installed.
2. Fit KS06 upper vibration–reducer and KS06 lower vibration–reducer in the mounting hole of ZC–mounting bracket, according to the assembly direction with the emitter and receiver.
3. Fix ZC–mounting bracket located below onto the machine bed piece through M6×16 inner hexagon screws.
4. Mount the Emitter/Receiver with vibration–reducer on the ZC–mounting bracket fixed on the machine bed, and then mount the other ZC–mounting bracket with the upper vibration–reducer on the Emitter/Receiver. Fix the upper ZC–mounting bracket through M6×16 inner hexagon screws.
5. Adjust the position of emitter and receiver, make them parallel, corresponding, aligned.
6. Fasten all installed screws after start–up test.





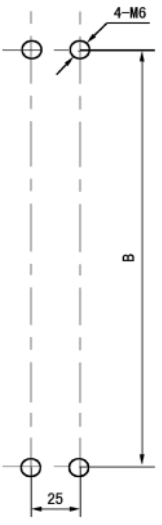


Fig2.6.A Fig2.6.B Fig2.6.C

IV.3 Pipe mounting (GC)

Emitter/Receiver is fixed on the machine through an adjustable pipe–mounting support. This way is generally applied to open press and four column hydraulic press. The form of installation is shown in Fig2.7.

1. Install the adjustable pipe–mounting support
   - Select proper position from two sides of machine, drill and tap according to dimensions shown in Fig2.7.A. Fix the bracket seat onto the machine bed piece by two M8×20 inner hexagon screws.
   - Fix the bracket arm on the bracket seat by one M16×45 hexagon screw.
   - Insert steel pipe into the round hole of bracket arm, adjust it to a proper height, tight properly the M8×25 inner hexagon screw.
2. Install the two KS pipe–mounting fixing clamps on the steel pipe, adjust the lower clamp to a proper position, tight properly the M5×25 inner hexagon screw, as shown in Fig2.7.C.
3. Fit Emitter/Receiver, KS06 upper vibration–reducer and KS06 lower vibration–reducer together, and make sure that the KS06 lower vibration–reducer is on the side of the Emitter/Receiver with multi-pin connector for transmission cable.
4. Mount the Emitter/Receiver with vibration–reducer on the KS pipe–mounting fixing clamps fixed on the pipe–mounting support. Fix the KS pipe–mounting fixing clamps through M5×25 inner hexagon screws.
5. Adjust the position of emitter and receiver, make them parallel, corresponding, aligned.
6. Fasten all installed screws after start–up test.

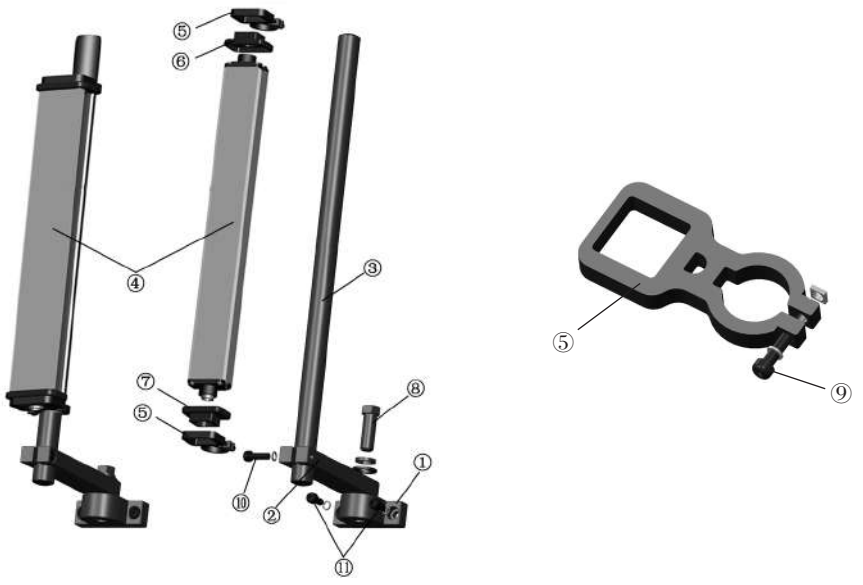


Fig2.7 Pipe mounting (GC)

①Bracket seat ②Bracket arm ③Steel pipe ④Emitter/Receiver
⑤KS pipe–mounting fixing clamp ⑥KS06 upper vibration–reducer ⑦KS06 lower vibration–reducer
⑧M16×45 hexagon screw, Φ16 plain/elastic washer
⑨M5×25 inner hexagon screw, Φ5 elastic washer, M5 square nut
⑩M8×25 inner hexagon screw, Φ8 elastic washer ⑪M8×20 inner hexagon screw, Φ8 elastic washer

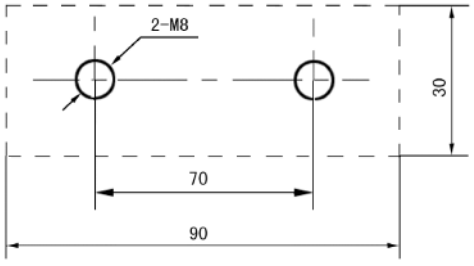


Fig2.7.A

Fig2.7.B adjustable in the range of 180°

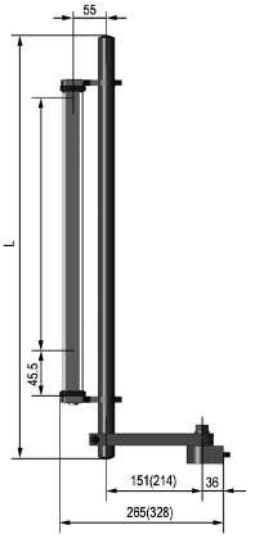


Fig2.7.C

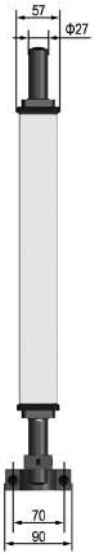


Fig2.7.D

IV.4 Double–arm side mounting

Emitter/Receiver is fixed on the machine tool through an adjustable double–arm–mounting support. This way is generally applied to open press and four column hydraulic press. The form of installation is shown in Fig2.8 and Fig2.9.

IV.4.1 Double–arm side mounting——with reducer (SCJ)

1. According to the safety distance and relative altitude height calculated in advance, select proper position from two sides of machine tool, drill and tap according to dimensions shown in Fig2.8.A. Fix the support seat onto the machine bed piece by two M8×25 inner hexagon screws.
2. Insert double–arm pipe into the round hole of support seat, adjust it to be worktable of machine tool, tight properly the two M8×25 inner hexagon screws by 6# inner hexagon wrench.
3. Put KS06 upper vibration–reducer and KS06 lower vibration–reducer in the mounting hole of KS pipe–mounting fixing clamp according to the assembly direction with the emitter and receiver.
4. Install the two KS pipe–mounting fixing clamps on the double–arm pipe, tight properly the M5×25 inner hexagon screw.
5. Put the Emitter/Receiver in the assembly grooves of upper vibration–reducer and lower vibration–reducer fixed on the double–arm pipe. Fix KS pipe–mounting fixing clamps through M5×25 inner hexagon screws.
6. Adjust the position of emitter and receiver, including safety distance, relative altitude height and feathering angle, make them parallel, corresponding, aligned.
7. Fasten all mounting screws after start–up test.

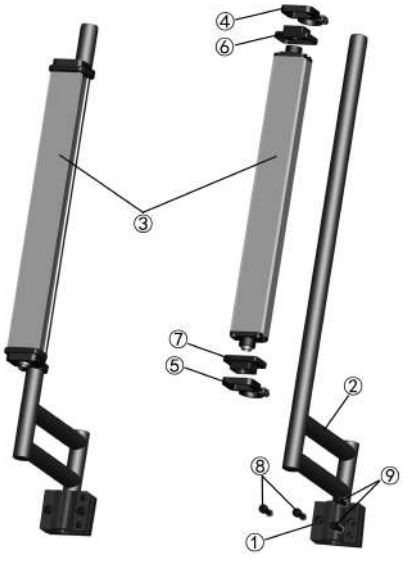


Fig2.8 Double–arm side mounting——with reducer(SCJ)

①Support
②Double–arm pipe
③Emitter/Receiver
④⑤KS pipe–mounting fixing clamp
⑥KS06 upper vibration–reducer
⑦KS06 lower vibration–reducer
⑧⑨ M8×25 inner hexagon screw, Φ8 elastic washer
⑩M5×25 inner hexagon screw, Φ5 elastic washer, M5 square nut

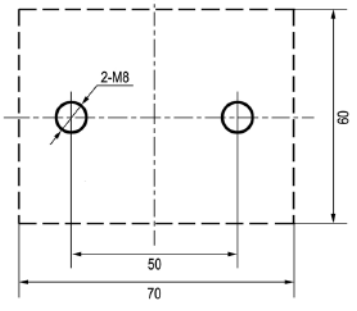


Fig2.8.A

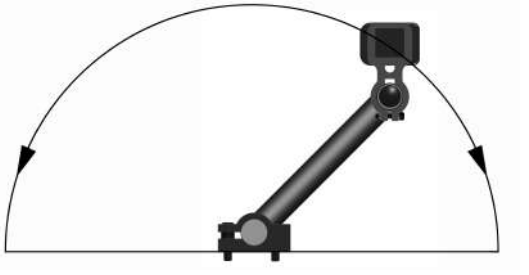


Fig2.8.B adjustable in the range of 180°

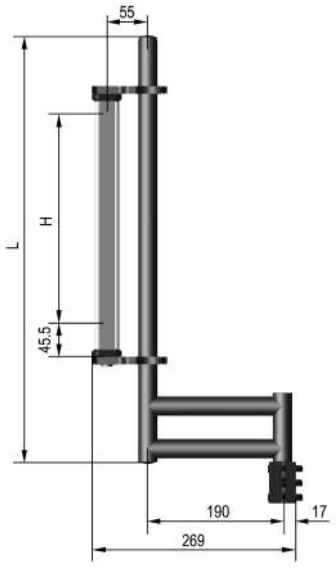
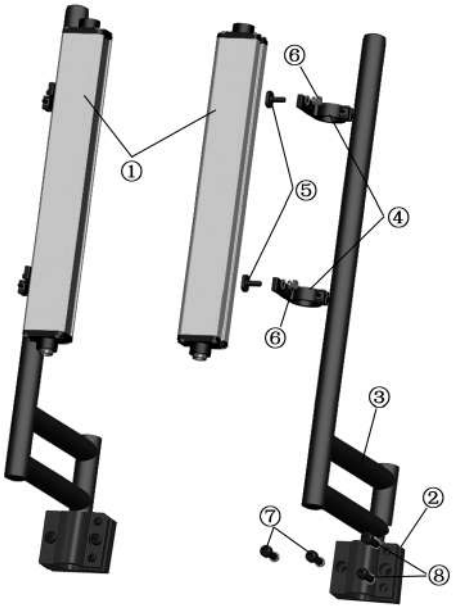


Fig2.8.C

Fig2.8.D

IV.4.2 Double–arm side mounting——T–groove (SCT)

1. According to the safety distance and relative altitude height calculated in advance, select proper position from two sides of machine tool, drill and tap according to dimensions shown in Fig2.8.A. Fix the support seat onto the machine bed piece by two M8×25 inner hexagon screws.
2. Insert double–arm pipe into the round hole of support seat, adjust it to be worktable of machine tool, tight properly the two M8×25 inner hexagon screws.
3. Fix the Q–clamp onto the emitter and receiver through T–nuts and M6×12 inner hexagon screw。
4. Fix the emitter on the double–arm pipe through Q–clamp, adjust the height of emitter to the requirements of the position, tight properly the tightening screws on the Q–clamp.
5. Fix the receiver on the double–arm pipe through Q–clamp, adjust the height of the receiver with the emitter at the same height, tight properly the tightening screws on the Q–clamp.
6. Adjust the position of emitter and receiver, including safety distance, relative altitude height and feathering angle, make them parallel, corresponding, aligned.
7. Fasten all mounting screws after start–up test.



①Emitter/Receiver ②Support
③Double-arm pipe ④Q-clamp ⑤T-bolt
⑥M6 hexagon nut, Φ6 elastic/plain washer
⑦⑧M8×25 inner hexagon screw, Φ8 elastic washer
⑨M5×25 inner hexagon screw, Φ5 elastic washer, M5 square nut

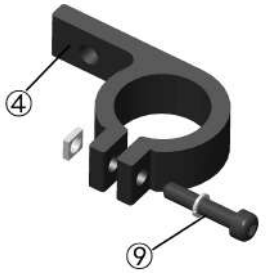


Fig2.9 Double-arm side mounting——T-groove(SCT)

Fig2.9.A adjustable in the range of 180°

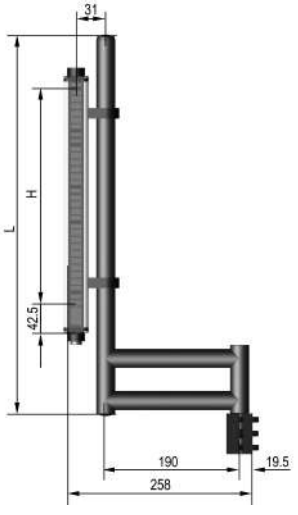


Fig2.9.B

Fig2.9.C

IV.5 T–groove mounting (TC)

Emitter/receiver contains T–groove itself, when the space is too limited to adopt the three installation forms mentioned above, T–groove installation is another solution for consideration. Fix Emitter/Receiver on machine bed by T–bolts and L–brackets. The form of installation is showing in Fig2.9. The procedures are as follows:

1. Select proper installation position on the machine bed piece, drill and tap as shown in Fig2.9.C.
2. Fix the L–bracket onto the machine bed piece by one M6×16 inner hexagon screw.
3. Tightly fix the emitter and receiver onto the L–bracket by T–bolts and M6 hexagon nuts.
4. Adjust the position of emitter and receiver, make them parallel, corresponding and aligned.
5. Fasten all mounting screws after start–up test.

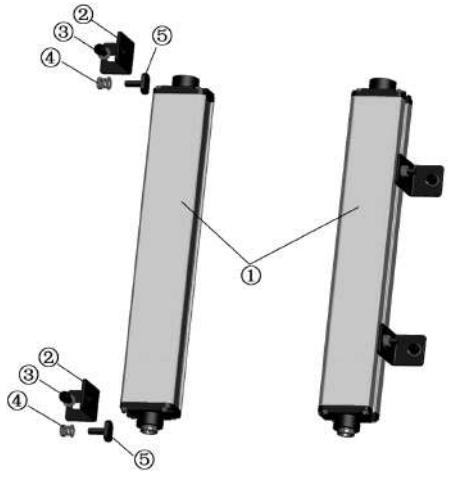


Fig2.10 T–groove mounting (TC)

①Emitter/Receiver
②L–bracket
③M6×16 inner hexagon screw, Φ6 elastic/plain washer
④M6 hexagon nut, Φ6 elastic/plain washer
⑤T–bolt

Sheet2.4 Formula of Dimension D, F and H

Dimension	Specifications	Formula
D	KS06□-□□10	D=H+55
	KS06□-□□20	D=H+65
	KS06□-□□30	D=H+55
	KS06□-□□40	D=H+85
F	D/2≤F<D	

H–protective height

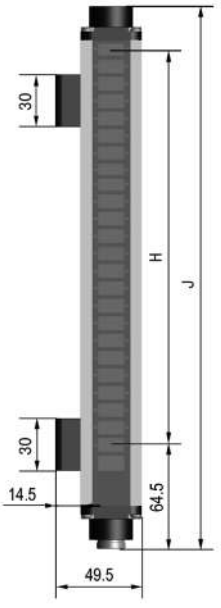


Fig2.10.A

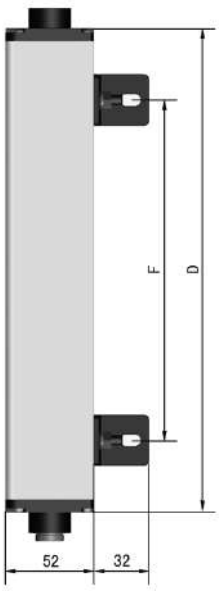


Fig2.10.B

Fig2.10.C

IV.6 Scatter shield installation

To avoid and reduce the loss of Emitter/Receiver caused by collision and impact in the course of use, installing scatter shield is a way to protect Emitter/Receiver.

There are four main forms to install scatter shield, namely scatter shield side mounting, scatter shield front mounting, scatter shield pipe mounting and scatter shield double–arm mounting.

The procedures are as follows:

A. Fix emitter and receiver onto the scatter shield by side–mounting bracket of scatter shield, KS06 upper vibration–reducer and KS06 lower vibration–reducer.

B. Fix the scatter shield onto the support

- For scatter shield side mounting, first, select proper installation position on the machine bed piece; second, drill and tap as shown in Fig2.11.B; third, fix the scatter shield onto the machine bed piece by four M6×16 inner hexagon screws. Refer to Fig2.11.
- For scatter shield front mounting, first, select proper installation position on the machine bed piece; second, drill and tap as shown in Fig2.21.B; third, fix the shield onto the machine bed piece by two M6×16 inner hexagon screws. Refer to Fig2.12.
- For scatter shield pipe mounting, first, fit the pipe–mounting support well; second, fix Ω–clamps on the scatter shild by gaskets and M6×35 inner hexagon screws; third, fix the scatter shield on the steel pipe by tightening the screws. Refer to Fig2.13.
- For scatter shield double–arm mounting, first, fit the double–arm mounting support well; second, fix Ω–clamps on the scatter shild by gaskets and M6×35 inner hexagon screws; third, fix the scatter shield on the steel pipe by tightening the screws. Refer to Fig2.14.

C. Adjust the position of emitter and receiver, make them parallel, corresponding, aligned.

D. Fasten all installed screws after start–up test.

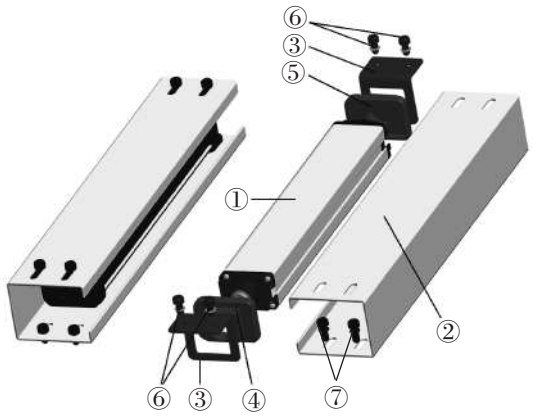


Fig2.11 Scatter shield side mounting (FC)

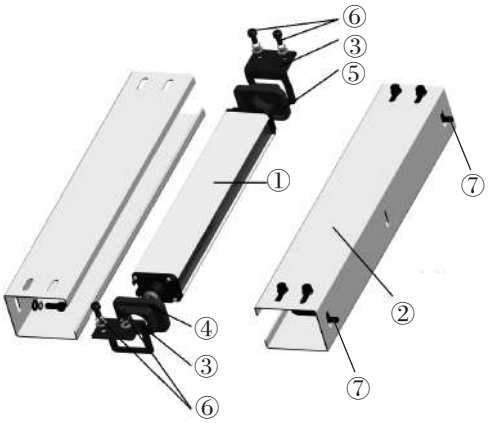


Fig2.12 Scatter shield front mounting (FZ)

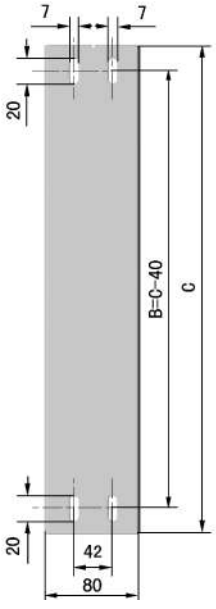


Fig2.11.A

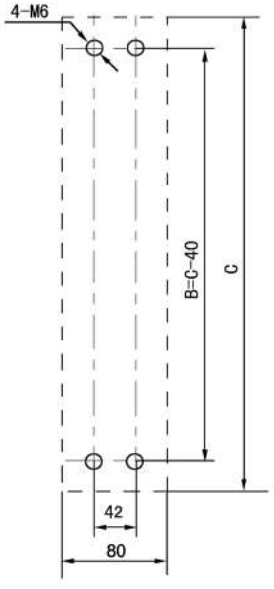


Fig2.11.B

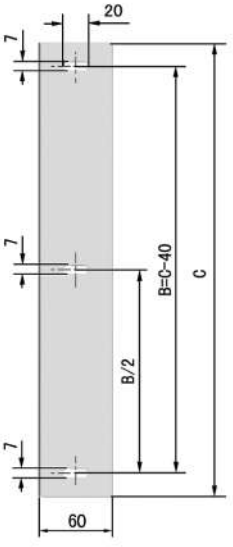


Fig2.12.A

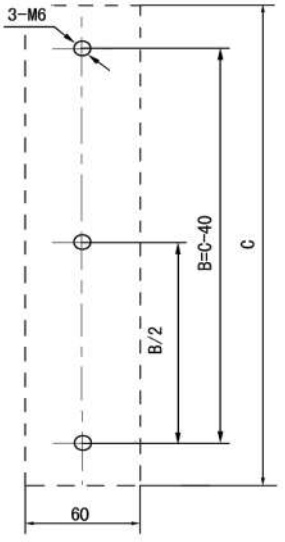


Fig2.12.B

①Emitter/Receiver ②Scatter Shield ③KS shield–mounting bracket
④KS06 lower vibration–reducer ⑤KS06 upper vibration–reducer
⑥M6×12inner hexagon screw, Φ6 elastic/plain washer
⑦M6×16inner hexagon screw, Φ6 elastic/plain washer

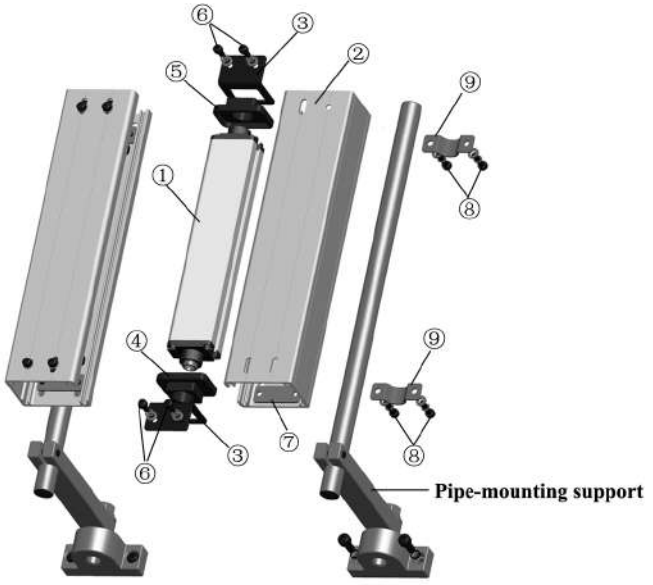


Fig2.13 Scatter shield pipe mounting (GF)

Fig2.13.A

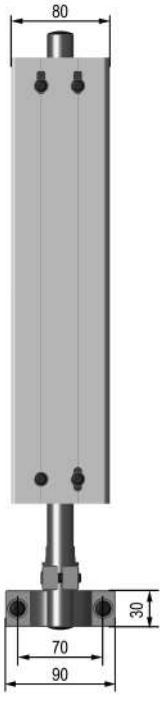


Fig2.13.B

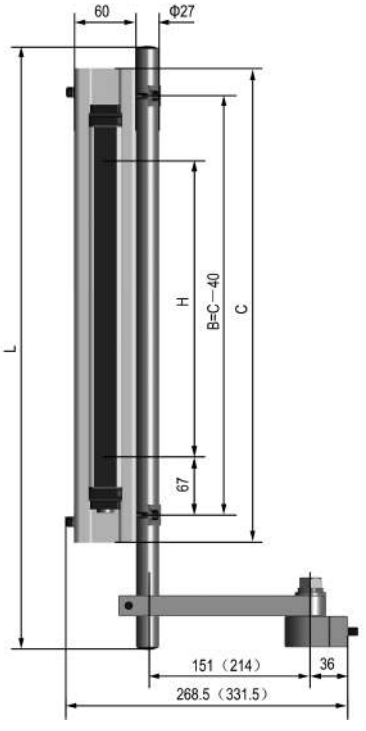


Fig2.13.C

①Emitter/Receiver
②Scatter Shield
③KS shield–mounting bracket
④KS06 lower vibration–reducer
⑤KS06 upper vibration–reducer
⑥M6×12 inner hexagon screw, Φ6 elastic/plain washer
⑦Gasket
⑧M6×35 inner hexagon screw, Φ6 elastic washer
⑨Ω–clamp

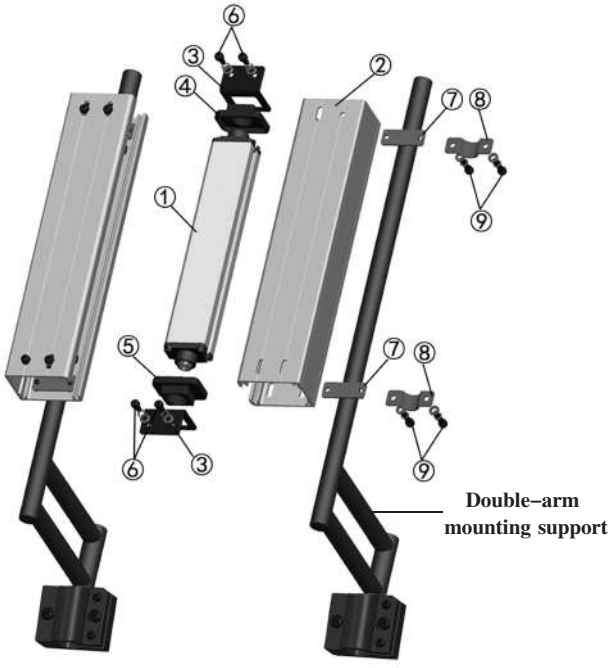


Fig 2.14 Scatter shield double–arm mounting (SF)

Fig 2.14.A

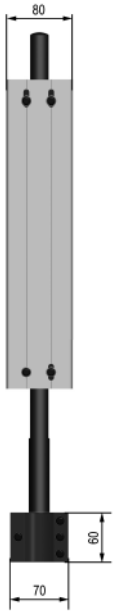


Fig 2.14.B

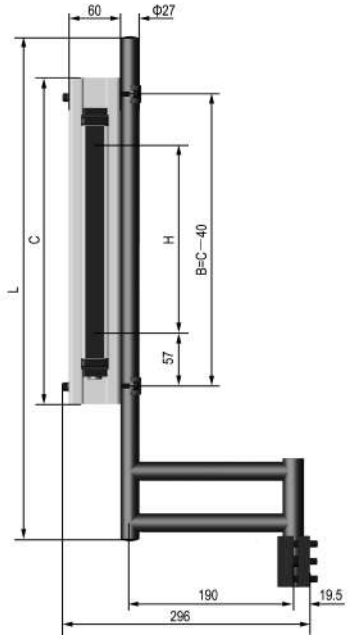


Fig 2.14.C

①Emitter/Receiver ②Scatter Shield ③KS shield–mounting bracket ④KS06 upper vibration–reducer
⑤KS06 lower vibration–reducer ⑥M6×12 inner hexagon screw, Φ6 elastic/plain washer
⑦Gasket ⑧Ω–clamp ⑨M6×35 inner hexagon screw, Φ6 elastic washer

Sheet2.5 Length of scatter shield

No.	Specification	C	Specification	C	Specification	C	Specification	C
1							0440	300
2			0620	260	0630	300	0640	380
3			0820	300	0830	360	0840	460
4			1020	340	1030	420	1040	540
5	1210	260	1220	380	1230	480	1240	620
6			1420	420	1430	540	1440	700
7	1610	300	1620	460	1630	600	1640	780
8			1820	500	1830	660	1840	860
9	2010	340	2020	540	2030	720	2040	940
10			2220	580	2230	780	2240	1020
11	2410	380	2420	620	2430	840	2440	1100
12			2620	660	2630	900	2640	1180
13	2810	420	2820	700	2830	960	2840	1260
14			3020	740	3030	1020	3040	1340
15	3210	460	3220	780	3230	1080	3240	1420
16			3420	820	3430	1140	3440	1500
17	3610	500	3620	860	3630	1200	3640	1580
18			3820	900	3830	1260	3840	1660
19	4010	540	4020	940	4030	1320	4040	1740
20			4220	980	4230	1380	4240	1820
21	4410	580	4420	1020	4430	1440	4440	1900
22			4620	1060	4630	1500	4640	1980
23	4810	620	4820	1100	4830	1560	4840	2060
24			5020	1140	5030	1620	5040	2140
25	5210	660	5220	1180	5230	1680	5240	2220
26			5420	1220	5430	1740	5440	2300
27	5610	700	5620	1260	5630	1800	5640	2380
28			5820	1300	5830	1860	5840	2460
29	6010	740	6020	1340	6030	1920	6040	2540
30			6220	1380	6230	1980	6240	2620
31	6410	780	6420	1420	6430	2040	6440	2700
32			6620	1460	6630	2100	6640	2780
33	6810	820	6820	1500	6830	2160	6840	2860
34			7020	1540	7030	2220	7040	2940
35	7210	860	7220	1580	7230	2280	7240	

Note: Scatter shield for subsidiary light curtain with beam spacing of 10mm should be added for 10mm.

IV.7 Magnetic attachment mounting (CX)

This way is generally applied to side straight press of bracket construction, the installation is convenient. The form of installation is shown in Fig2.14.

Refer to Fig2.14.A select proper position on the bed piece, and absorb emitter and receiver onto the bed piece.

Emitter and receiver should be parallel, corresponding, aligned. If the bed piece of machine is not flat, a steel of 6 to 10mm width could be attached to the bed piece of machine.

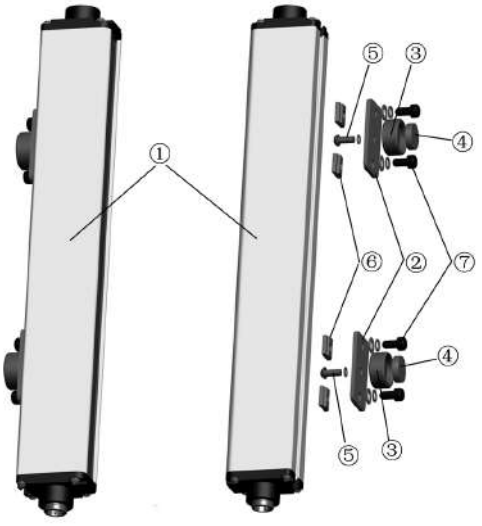


Fig 2.14 Magnetic attachment mounting (CX)

Sheet2.6 Formula of Dimension D, G and H

Dimension	Specifications	Formula
D	KS06□-□□10	D=H+55
	KS06□-□□20	D=H+65
	KS06□-□□30	D=H+55
	KS06□-□□40	D=H+85
F	D/2	

H–protective height

①Emitter/Receiver ②KS magnet–seat plate
③KS magnet–seat
④KS permanent magnet
⑤M5×12 cross semicircle head screws, Φ5 elastic washer
⑥T–nut
⑦M6×12 inner hexagon screw, Φ6 elastic/plain washer

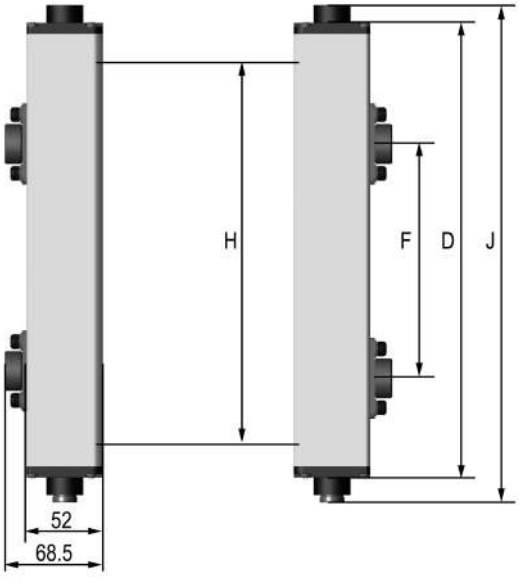


Fig 2.14.A

To adopt this form of installation, it is necessary to have dedicated staff responsible for the safety management; the installation positions of AOPD must meet the requirements for safety distance and relative altitude height.

V AREA PROTECTION INSTALLATION

Fig2.16 shows the installation form for three-side area protection.

There is different form of installation for different area.

It can be designed according to the special requirement.

Refer to Fig2.16 and Fig2.16 for detailed installation.

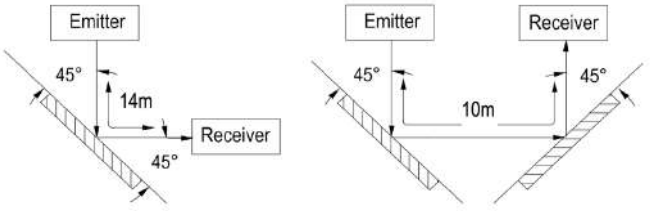


Fig2.15 Schematic drawing of beam-focusing

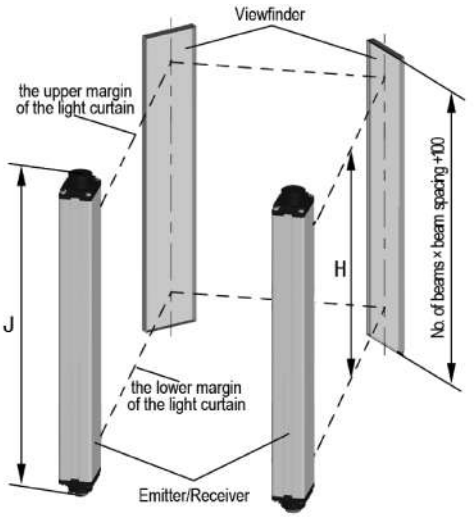


Fig2.16 Schematic drawing of installation

VI KS06Q AREA PROTECTION INSTALLATION

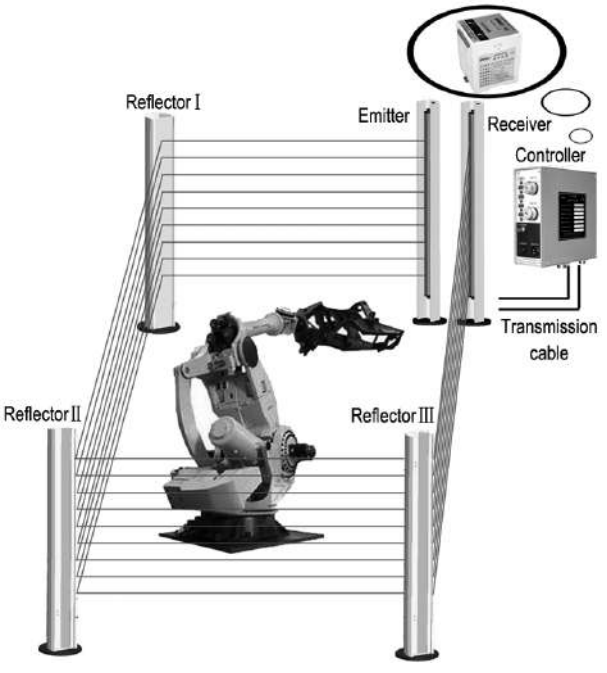
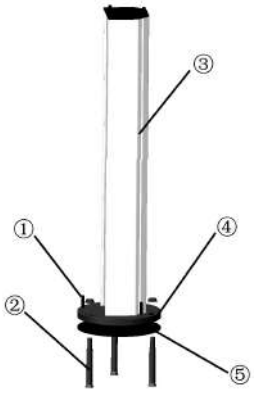


Fig2.17 Schematic drawing of installation



① M8×30 inner hexagon cone end set screw
② M12×120 expansion bolt
③ Floor scatter shield (assembled with the sensor and the floor column cover plate)
④ Floor column base
⑤ Floor column base plate

Fig2.17.A Scatter shield column mounting (FL)

1. Use M6 × 20 inner hexagon screws to fix the Floor scatter shield ③ to the Floor column base ④ and tighten the screws.
2. Select the appropriate location, use M12×120 expansion bolt ② to fix Floor column base ④ and Floor column base plate ⑤ to the ground, adjust the direction of the floor bracket and pre-tighten the expansion bolts.
3. Adjust M8×30 inner hexagon cone end set screws ① to make the bubble in the center of the gradienter on the column base.
4. Adjust the Reflector I to make its reflecting surface to the transmission surface of the emitter at an angle of 45 °, then adjust the Reflector II and Reflector III in turn, to make the reflecting surface of Reflector II perpendicular to the reflecting surface of Reflector I and to make the reflecting surface of Reflector III perpendicular to the reflecting surface of Reflector II.
5. Power on light debugging. With the aid of the collimation device, adjust the Emitter, Reflector I, Reflector II, Reflector III and Receiver initially positioned, to make the collimated light beam emitted by the collimation device being reflected by the three reflectors on the transmission surface of the receiver .
6. Adjust the floor bracket assembled with the receiver until all individual indicators on the receiver turn off and keep the floor bracket in this position, then adjust it lightly to stabilize the light-passing state.
7. Tighten the expansion screws completely.

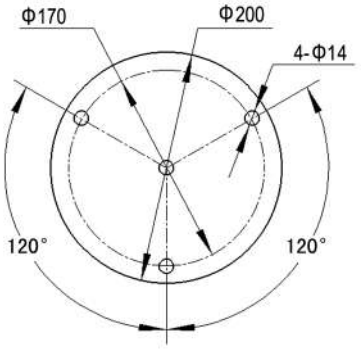


Fig2.17.B

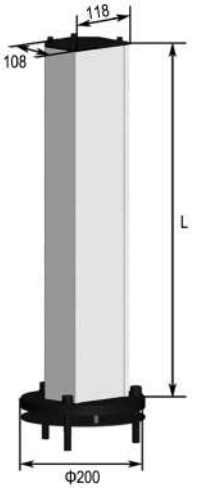


Fig2.17.C

UNIT 3 WIRING

NOTICE

- **Make sure to carry out the wiring in the power supply off condition and the wiring is performed according to the wiring diagram strictly.**
- **Properly perform the wiring after confirming the signal names of all terminals.**
- **PE is the earth wire of AOPD, it must be connected well to the earth.**
- **OSSD is forbidden to connect into AC380V circuit.**

I WIRING ABOUT CPSII CONTROLLER

CPSII provides switch mode power input and two forms of protection, namely single-side protection and double-side protection. The function of each core is defined in the wiring diagram which is on the back of the controller.

I.1 Wiring about power cable

Power cable between controller and the electric equipment of machine is 7-core cable, in which the terminal of controller is connected by 7-core socket connector.

At the time of wiring, connect to AC100 to 230V power supply according to the numerical values marked on the nameplate, or connect to DC24V power supply.

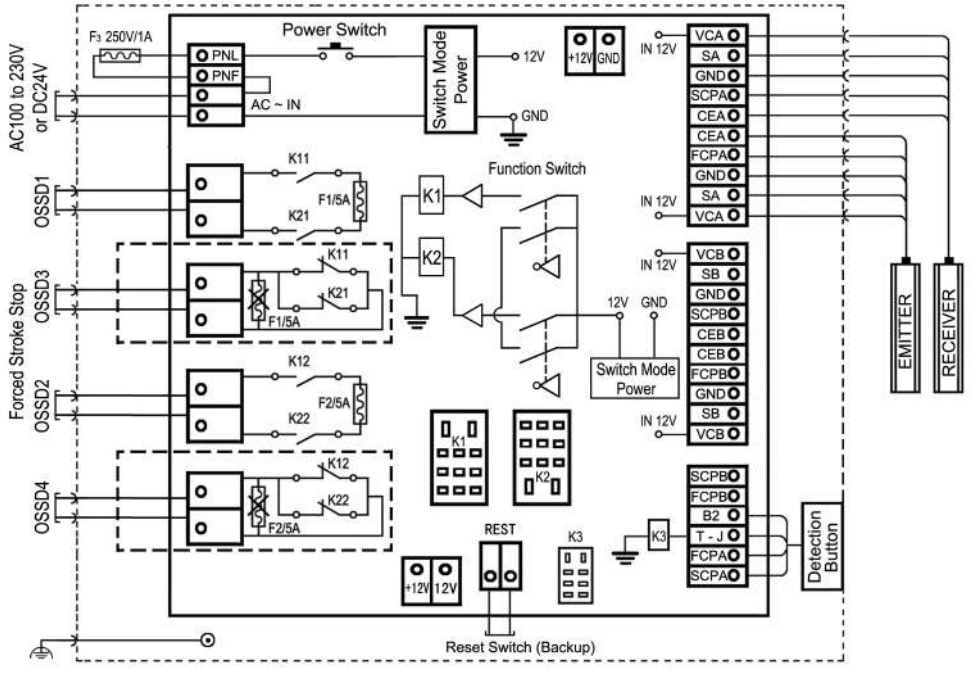


Fig3.1.A Single-side protection controller

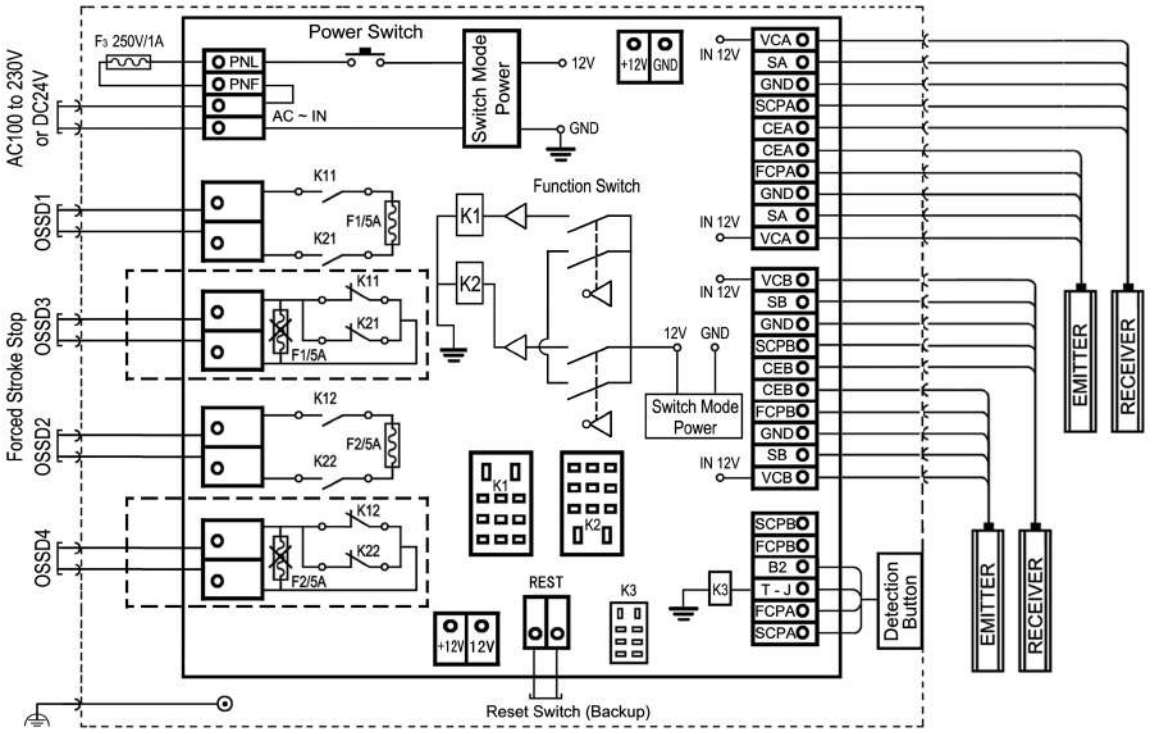


Fig3.1.B Double-side protection controller

I.2 Wiring about OSSD

The control lines marked with "OSSD1" and "OSSD2" are output signal switch contacts of the AOPD. They are connected to the stop control loop of machine stroke. There are two forms of connection when wiring, separately according to Fig3.2.A and Fig3.2.B.

In the Fig3.2.A, both couples of output contacts are connected to the same stop control loop of machine stroke in series. This form of wiring can protect the operator more effectively.

In the Fig3.2.B, different couple of output contacts is connected to the different stop control loop of machine stroke. This form of wiring can control two actions of machine at the same time.

Fig3.2.A Connect to the same conrtol loop

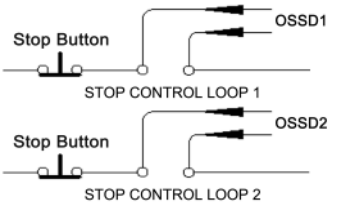


Fig3.2.B Connect to different conrtol loops

Sheet3.1 State of OSSD outputs

State of light curtain	Indicators of receiver		Indicators of controller		OSSD outputs
	Green status indicator	Red status indicator	Normal operation indicator	Unusual station indicator	
Unblocked	ON	OFF	ON	OFF	ON
Blocked	OFF	ON	OFF	ON	OFF

The declaration of using NC contacts

The customer should make special order if they want to use NC contacts to control the machine.

If the NC contacts must be used for special purpose, it is ensured that NC contacts must be connected reliably with the stop control loop of machine stroke. The measures of maintaning should be carried out besides control function of AOPD being checked routinely by the operators. The condition of all the contact junctions with NC contacts must be checked monthly to ensure that they are connected reliably. Our company will not be responsible for the accident caused by improper wiring of NC contacts.

In general, NC contacts should not be used as the control contact for safe purpose!
Our company will not be responsible for control failure resulted by poor contact or disconnection of the circuit.
Other safety measurements must be adopted when NC contacts have to be connected into the circuit.

I.3 Realization of muting function

1. If the muting function is realized by machine itself, no additional wiring is needed;
2. If the muting function is realized with the help of AOPD, connect one pair of normal open contact points of cam switch with NO contacts in–parallel, as shown in Fig3.3.

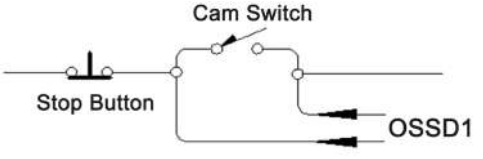


Fig3.3 The muting function is realized by OSSD

To avoid an accident, the cam switch must be adjusted to the accurate angle!

I.4 Wiring about CPSII controller and Emitter/Receiver

The transmission cables between CPSII and emitter/receiver are both 5–core shielded cables; the two terminals of transmission cable are all connected by 7–core multipin connectors. As for single–side protection, two transmission cables can be plugged at will. As for double–side protection, emitter/receiver from one side must be plugged into 7–core sockets of the same side (A or B), as shown in Fig3.4.

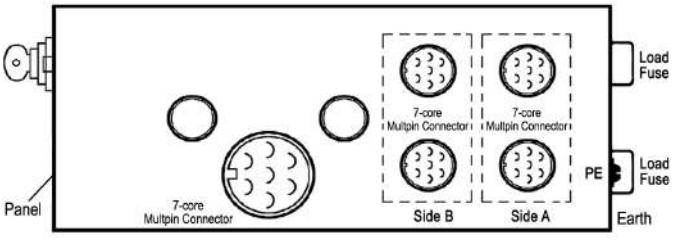


Fig3.4 Wiring illustration of CPSII controller

Special tool is needed to take out the fuse because of the embedded knob in the socket. Operators must not change the fuse when unauthorized!

NOTICE

If transmission cable or power cable is tightened, the connector may be broken by shock of the cable. The cable at the end of connector should be relaxed properly after wiring. Refer to Fig3.11.

II WIRING ABOUT CQ2 CONTROLLER

CQ2 provides switch mode power input.

II.1 Wiring about Power cable

The power cable between controller and the electric equipment of machine is 7–core cable, in which the terminal of controller is connected by 12–core connection terminals.

At the time of wiring, connect to AC100 to 230V or DC24V power supply according to the numerical values marked on the nameplate.

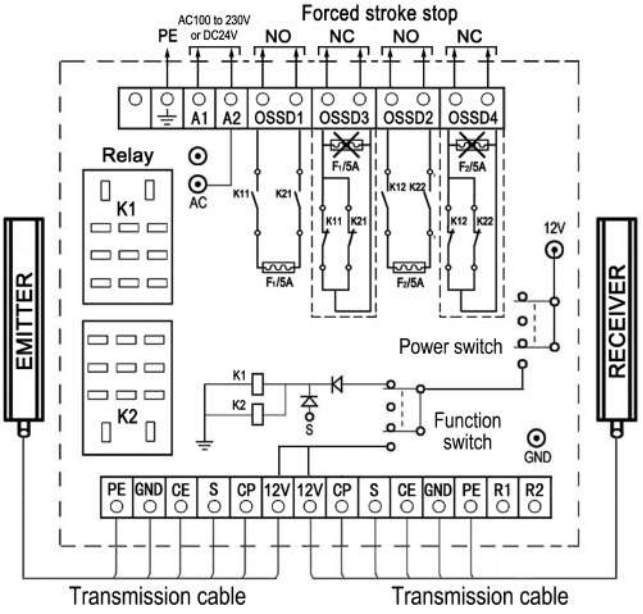


Fig3.5 CQ2 controller

II.2 Wiring about OSSD

The connection of OSSD, refer to the connection form of CPSII.

II.3 In general, NC contacts should not be used as the control contact for safe purpose! If NC contacts are needed, take out the overload fuse F1/5A first.

II.4 Realization of muting function

The realization of muting function, refer to the connection form of CPSII.

II.5 Wiring about CQ2 controller and Emitter/Receiver

The transmission cables between CQ2 and emitter/receiver are both 5–core shielded cables. Transmission cable and CQ2 are connected by 14–core terminal, and transmission cable and emitter/receiver are connected by 7–core multipin connectors.

At the time of wiring, connect the terminals of transmission cable with the correspondingly terminals of CQ2 according to the wire markings, fasten the compression–joint screw, and then connect the transmission cable with the emitter and receiver.

NOTICE

If transmission cable or power cable is tightened, the connector may be broken by shock of the cable. The cable at the end of connector should be relaxed properly after wiring. Refer to Fig3.11.

Ⅲ WIRING ABOUT CQ3 CONTROLLER

1. Connect the 3–core power cable with the power supply according to the terminal label. CQ3 only works under DC24V, so don't connect it to high voltage and notice the electrode.

2. Usually, CQ3 doesn't configure with control output cable, users can prepare it by selves. While in full–load, equivalent single–core aluminum cable of which the diameter is not smaller than 2mm^2 is proposed to connect with the OSSDs.

3. Wiring about OSSD1, OSSD2, OSSD3 and the machine refers to wiring about OSSD1, OSSD2 of CPSII; Wiring about SSD and the machine refers to wiring about OSSD3, OSSD4 of CPSII.

4. Wiring about CQ3 and the emitter/receiver and the notice refers to which of CQ2.

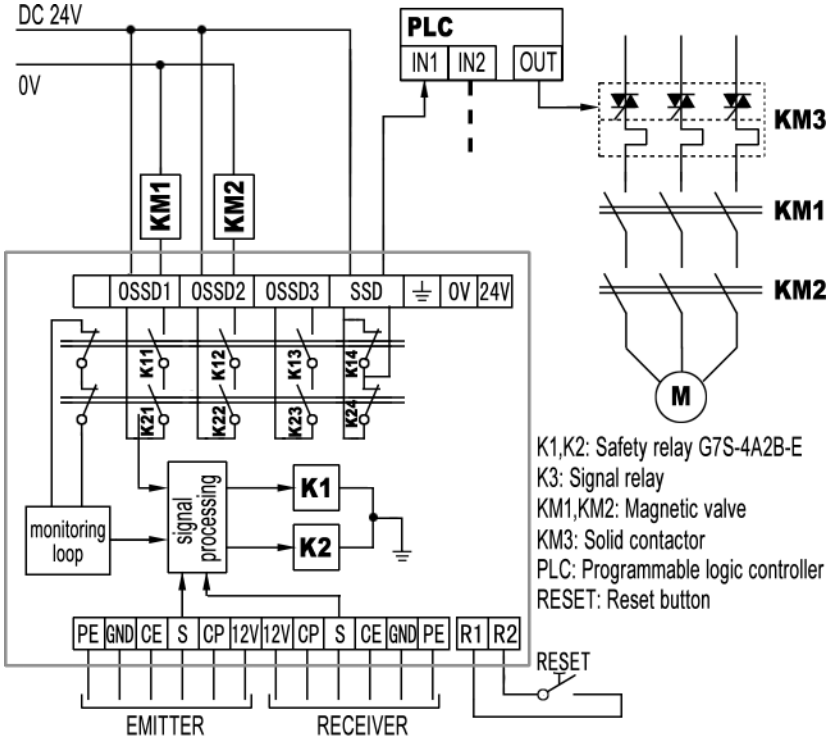


Fig3.6 Wiring about CQ3 controller

NOTICE

If transmission cable or power cable is tightened, the connector may be broken by shock of the cable. The cable at the end of connector should be relaxed properly after wiring. Refer to Fig3.11.

Ⅳ WIRING ABOUT JKIII INTERFACE

The input power voltage of JKIII is commonly DC24V.

Ⅳ.1 Wiring about power cable

JKIII is connected to the power cable by a 5–core cable, the terminal of JKIII is 5–core terminal. The wiring refers to Fig3.7.

● +24V is the power supply input terminal, the power supply should be coupled in according to the marked value.

● 0V is the common terminal of power supply and the output signal.

● OSSD1 and OSSD2 are two terminals of output control signal, should be connected to the stop control loop of machine stroke.

● PE is the terminal of the protective earthing terminal.

Ⅳ.2 Wiring about JKIII interface and Emitter/Receiver

The transmission cable between JKIII and emitter/receiver are both 5–core shielded cables. Transmission cable and JKIII are connected by 12–core terminal, while transmission cable and emitter/receiver are connected by 7–core multipin connectors.

At the time of wiring, connect transmission cable with the terminals of JKIII according to the wire markings, fasten the compression–joint screw, and then connect the transmission cable with the emitter and receiver.

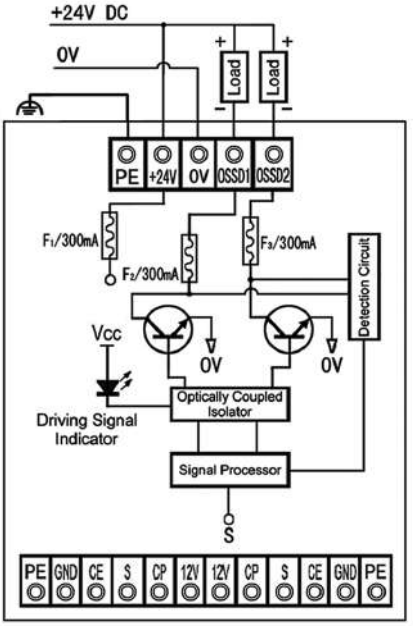


Fig3.7.A NPN output

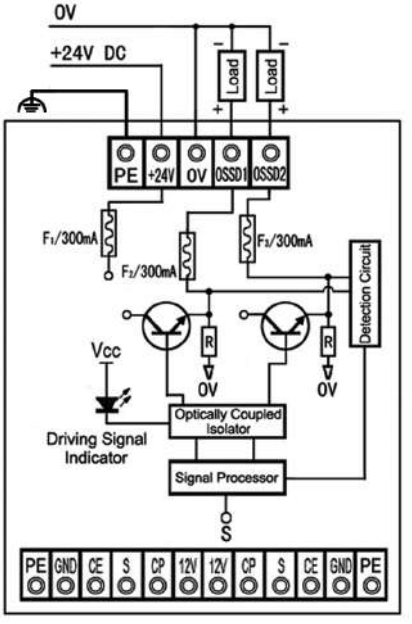


Fig3.7.B PNP output

NOTICE

If transmission cable or power cable is tightened, the connector may be broken by shock of the cable. The cable at the end of connector should be relaxed properly after wiring. Refer to Fig3.11.

V WIRING ABOUT KS06G SAFETY LIGHT CURTAIN

Power supply of KS06G is DC24V, it can output transistor control signal directly. Wiring about the NPN and PNP output are shown in the following figure.

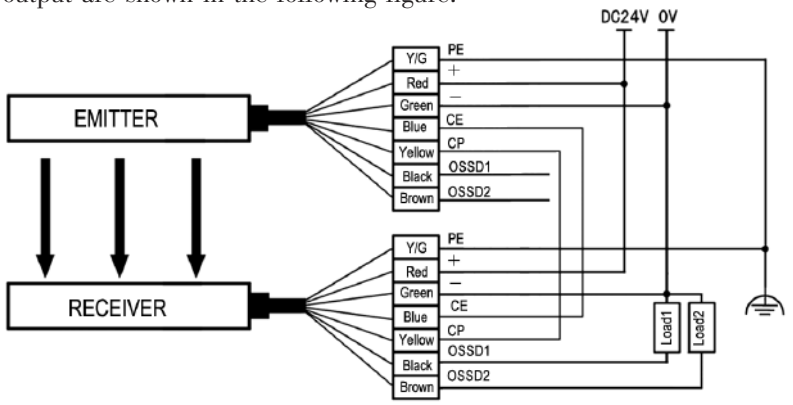


Fig3.8.A PNP output

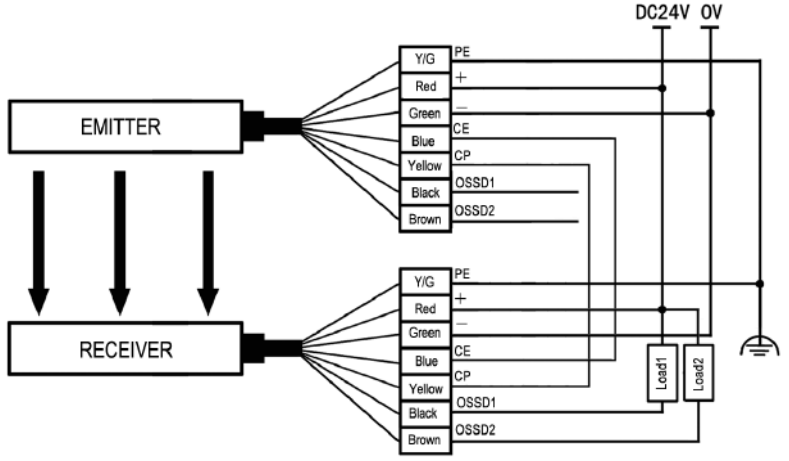


Fig3.8.B NPN output

VI WIRING ABOUT KS06G CASCADED SAFETY LIGHT CURTAIN

KS06G cascaded safety light curtain is powered by DC24V power supply, and can output the transistor control signal directly. It can provide PNP output and NPN output, wiring diagrams are as shown below, in which the control signal lines OSSD1 and OSSD2 of the receiver should not be connected.

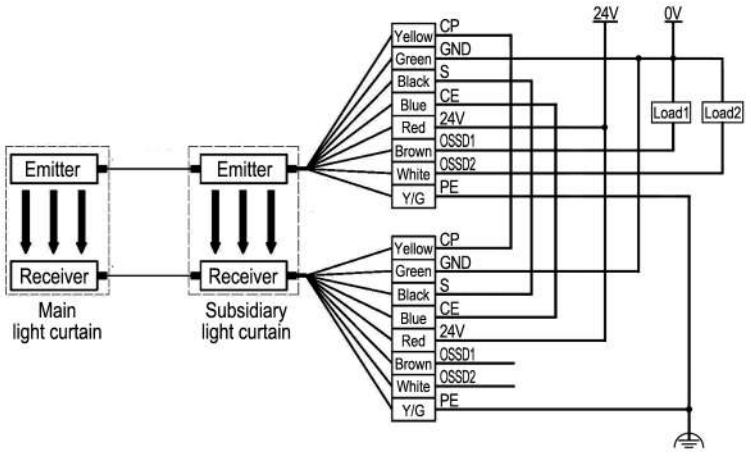


Fig3.9.A PNP output

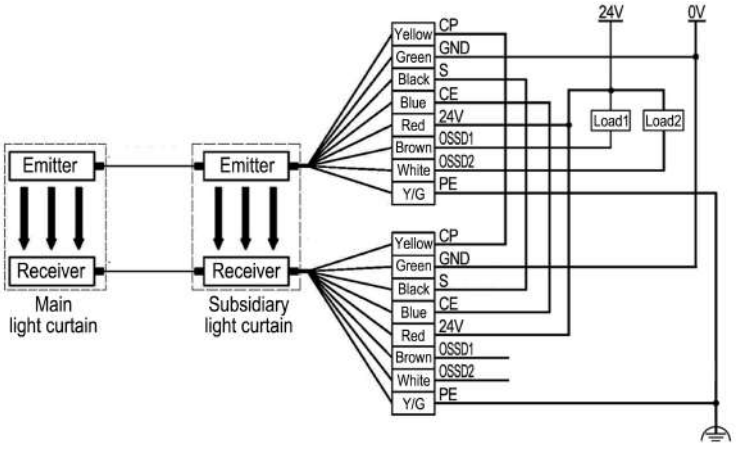


Fig3.9.B NPN output

Ⅶ ASSEMBLY ABOUT CONNECTOR

According to Fig3.10:

● At the time of assembly, use the plug for insertion, the plug key tallies the groove, jogs the end of plug, then fasten the cage nut clockwise.

● At the time of disassembly, loosen the cage nut anticlockwise, and then pull the plug out.

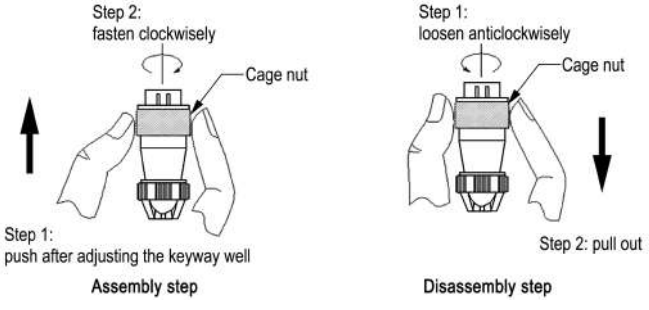


Fig3.10 Illustration of assembly and disassembly department

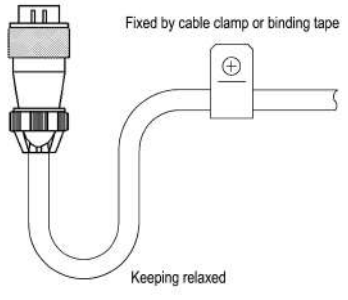


Fig3.11 Method of fixing cables

UNIT 4 DEBUGGING

After wiring, make a detailed check according to nameplate markings and operation manual to ensure that all the connections are correct; the power supply can be switched on for debugging after the verification of wiring.

I DEBUGGING

I.1 Turn off the power switch, and then energize the machine (all the indicators are off). Check the power voltage with multimeter, the value must be in line with the voltage marked on the nameplate (voltage fluctuation range must not exceed ±10%).

I.2 Energizing

For CPSII and CQ2, turn on the power switch, the orange power indicator is on;

For JKIII, program the machine control system, such as PLC system. The red power indicator is on.

I.3 Beam alignment

First, trun on the power switch and turn the function switch to the protection side. Then adjust the positions of emitter and receiver, make them parallel, corresponding, aligned, until the red status indicator of receiver is off, the green status indicator of receiver is on, it means the light curtain is unblocked.

For KS06E, turn on the collimator switch on the emitter, then adjust the positions of emitter and receiver with the help of the collimating beam.

I.4 Test

Shade the light curtain beam by beam. On the receiver, the red status indicator is on, and the green status indicator is off. On the controller, the green normal operation indicator is off; the red unusual station indicator is on;

When the light curtain is unblocked, on the receiver, the red status indicator is off, the green status indicator is on. On the controller, the green normal operation indicator is on, the red unusual station indicator is off, and AOPD is ON state.

For AOPD with JKIII and KS06G, the normal output state is shown in the Sheet 4.1.

I.5 Ensure that the safety distance and relative altitude height are both correct.

I.6 Fasten firmly all the installed screws on AOPD.

Sheet4.1 Operating state of JKIII and KS06G

Specification	State of light curtain	State of indicator		State of transistor	State of OSSD
		Power (red)	Driving signal (green)*		
JKIII -2424-2NT& KS06□□□□□ G2NT/□□	Unblocked	ON	ON	ON	300mA, DC0V to 4V
	Blocked	ON	OFF	OFF	OPEN (DC20V to 24V, drain current＜2mA)
JKIII -2424-2NZ& KS06□□□□□ G2NZ/□□	Unblocked	ON	OFF	OFF	OPEN (DC20V to 24V, drain current＜2mA)
	Blocked	ON	ON	ON	300mA, DC0V to 4V
JKIII -2424-2PT& KS06□□□□□ G2PT/□□	Unblocked	ON	ON	ON	300mA, DC20V to 24V
	Blocked	ON	OFF	OFF	OPEN (DC0V to 4V, resistance to ground 10K)
JKIII -2424-2PZ& KS06□□□□□ G2PZ/□□	Unblocked	ON	OFF	OFF	OPEN (DC0V to 4V, resistance to ground 10K)
	Blocked	ON	ON	ON	300mA, DC20V to 24V

*Green indicator of KS06G only indicates the light curtain is unblocked.

II ANGLE ADJUSTMENT OF MUTING FUNCTION

If muting function needs to be realized, the angle of cam can be adjusted according to the situation shown in Fig4.1 on the premise of safety. In the case that muting function is realized with the help of AOPD, the state of muting function is shown in Sheet4.2.

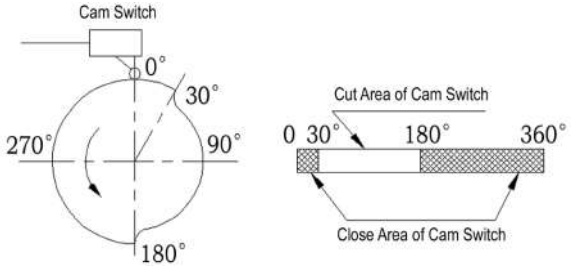


Fig4.1 Structure & functional mode of cam switch

WARNING **The adjustment of cam angle determins the non-protection area of machine, it matters the safety of operator, please be careful!**

Sheet4.2 State of muting function

State of cam switch	State of light curtain	Indicator of receiver		Indicator of controller		State of stop control loop
		Green	Red	Normal operation	Unusual station	
Closing	Unblocked	ON	OFF	ON	OFF	Closing
	Blocked	OFF	ON	OFF	ON	Closing
Opening	Unblocked	ON	OFF	ON	OFF	Closing
	Blocked	OFF	ON	OFF	ON	Opening

III COMMISSIONING

After debugging, commissioning should be carried out to ensure the AOPD is absolutely risk-free in operation.

III.1 Shade the light beams of light curtain, observe indicators of AOPD, and check if the conversion of indicators is in line with status in sheet 4.2.

III.2 For presses on which the slider can stop at any position in one stroke, in the protection interval—for the machine with muting function, the cam switch of muting function is in opening status from 30° to 180° of stroke down—shade the light curtain, the slider will stop at once.

- **For presses on which the slide can stop at any point in one stroke, the braking must not have any failure!**
- **If the braking is at fault, the machine must be repaired!**
- **If the braking of machine is at fault, the safety of AOPD is at risk!**

For presses which can only realize upper dead point protection, when the slider is at the upper dead point, shade the light curtain, the next stoke is not able to start up.

- **As for presses which can only realize upper dead point protection, the machine can not have the clutch failure!**
- **If the clutch of machine has failure, the machine must be repaired!**
- **If the clutch of machine has failure, the safety of AOPD is at risk!**

III.3 When the slider is at the lower dead point, shade the light curtain, the slider should be able to return.

If Ⅲ.1, Ⅲ.2, Ⅲ.3 above are all met, the debugging of AOPD is successful, and it can be put into use.

UNIT 5 OPERATION, CHECK AND MAINTENANCE

I OPERATION

- To ensure safe production, management system and operating instruction about how to use AOPD must be worked out in all aspects and carried out strictly.
- Before operating the machine, check whether the AOPD control function to the machine is normal, as shown in "COMMISSIONING", UNIT 4 DEBUGGING.
- Before operating the machine, check the self–test function of AOPD, press the detection button, the red detection indicator is on, the machine is not able to run, indicating that the self–test function of AOPD is normal. To return to normal operation state, the controller must be re–energized after cutting its power.
- For safe purpose, the key of function switch of CPSⅡ must be kept by special staff.
- **The position of light curtain should not be changed at will.**
- **The safety distance and relative altitude height of AOPD must be adjusted by special staff after changing the die. Refer to "INSTALLATION SITE", UNIT 2 INSTALLATION.**
- When fault of AOPD occurred, it should be repaired by professional staff.
- When the AOPD and the transmission cables are being disassembled, at first cut the power, this must be operated by professional staff.
- The performance life for relay inside the controller is 10^6 times, it should be changed when it reaches its performance life. If the misty opacity occurred inside the relay, the relay must be changed. Refer to "CHECK AND MAINTENANCE" in this chapter.
- **When the AOPD is not in use, for CPSII, turn on the power switch and turn the two function switchs to the non–protection side; for CQ2, turn on the power switch and turn the function switch to the non–protection side.**

When the AOPD is not in use, other safety prevention measures should be adopted.

- During the use, prevent the AOPD from collision caused by work piece, tool, scrap.
- If the AOPD is equipped with reset button, after light shading, the machine slider couldn't run or start up again until the AOPD is reset by pressing the reset button.

Hot line wiring for power cable is forbidden!

II CHECK AND MAINTENANCE

The check and maintenance of AOPD is very important in ensuring the safety of punching operation, the AOPD must be checked and maintained regularly to give full play to its function. Refer to Sheet5.1 for detailed requirement of check and maintenance.

Sheet5.1 Check and maintenance

Projects	Details	Methods	Period
Check	The check of filter plate or viewfinder	Make sure the light-passing surface or reflective surface is clean and unbroken	Before operating
	Light-shading confirmation beam by beam	Shade each beam of the light curtain; observe the indicators of receiver and controller, especially the relative beam indicator.	
	The check of effective protection scope	As for the machine with the muting function realized by the cam switch, shade the light curtain during 30° to 180° of the cam switch trip, the slider of machine will stop at once.	
	The check of fasteners	Fasten all the screws.	Six months
	The check of connection terminals	Make sure the cage nuts are not loosened, the lead contact is all right	
	The check of relay	Make sure the installation of relay is solid, the contact is all right, the movement is normal; observe the relay to make sure there is no misty opacity phenomena inside it	
Maintenance	The replacement of relay	It must be fixed firmly after the replacement	Misty opacity occurred inside the relay or the performance life has reached 10^6 times
	The cleaning of viewfinder surface	Clean it with a clean and soft cotton yarn bedewed with alcohol (organic solvent is banned from using)	Carry on according to the operational situation
	The replacement of viewfinder	If it is broken, it should be replaced at once	
	The cleaning of filter plate	Clean it with a clean and soft cotton yarn bedewed with alcohol (organic solvent is banned from using)	
	The replacement of filter plate	If it is broken, it should be replaced at once	
	Tightening and replacement of fasteners	Fasten the loosened fasteners, fasteners with the broken sliding-filament must be replaced at once	
Apart from regular checks, it is necessary to check AOPD before each operation			

Hot line wiring for power cable is forbidden!

UNIT 6 TROUBLESHOOTING OF SIMPLE FAULT

I DISTINGUISHING OF AOPD AND MACHINE

Sheet6.1

Phenomena of fault	Cause	Solution
AOPD can not work, all the indicators are off	No supply voltage	Couple in correct power supply
	Controller fault	Refer to sheet6.2
AOPD works intermittently, the conversion of indicator is abnormal	Low supply voltage or there is bad contact in the circuit	Couple in correct power supply or correct bad contact
	Bad beam focusing for AOPD or critical beam focusing	Readjust the position of emitter, receiver to make beam focusing all right
The conversion of indicator is normal, press is not able to work	The connection between OSSD output signal cable terminals and electric part of machine cut or incorrect	Check and repair the electric circuit of machine connected with OSSD, make the connection correct
	Output signal cable opens circuit	Repair or replace the output signal cable
	Electric fault of machine	Check and repair electric circuit of machine
	Controller fault	Refer to sheet6.2
The conversion of indicator is normal, shade the light curtain, the press doses not stop	The electric circuit of machine connected with OSSD shorts circuit	Check and repair the electric circuit of machine connected with OSSD
	Output signal cable shorts circuit	Replace it and its connector
	The circuit of cam switch for muting function is short circuit	Check and repair the circuit of cam switch for muting function
	The braking of machine is at fault.	Check the machine
The conversion of indicator is normal, shade the light curtain, the press doses not stop at once	The adjustment of cam switch for muting function is incorrect	Check the machine or adjust the cam switch to the correct angle
	The clutch of machine is at fault	Check the machine
Turn the function switch to the non-protection side, press is not able to work	The electric circuit of machine connected with OSSD is broken	Check and repair the electric circuit of machine connected with OSSD, make the connection correct
	Output signal cable opens circuit	Repair or replace the output signal cable
	The loop of electric stroke for machine disconnects	Check and repair electric circuit of machine
	Controller fault	Refer to sheet6.2
Turn the function switch to the protection side, press is not able to work; turn the unction switch to the non-protection side, press works normally	Controller fault	Refer to sheet6.2
	Emitter or receiver fault	Refer to sheet6.3

All the phenomenon shown in the above sheet takes place when the power switch is turned on.

II TROUBLESHOOTING OF CONTROLLER

Sheet6.2

Phenomena of fault		Cause	Solution
The AOPD does not work, all the indicators are off		No supply voltage	Couple in correct power supply
		The power fuse blowing out	Replace the power fuse with a new one of the same specification, 5×20/1A
		Power cable fault or bad contact for socket connector	Check and repair power cable and socket connector
		Power switch broken or bad contact for connector, or relevant circuits broken	Replace the key switch, or check and repair connector and relevant circuit
		The switch mode power is broken	Check the connection of circuit and socket connector, replace the switch mode power if the wiring is correct
The conversion of indicator is normal, press is not able to wok		The fuse F1 fusing	Replace the power fuse with a new one of the same specification, 5×20/5A
		The circuit between OSSD breaks.	Check and repair the circuit and wiring of OSSD
		The contact point of relay is ageing or broken	Replace the relay with the same specification one
		Electric fault of machine	Check and repair the circuit and wiring of OSSD, if the wiring is correct, please check and repair the electric circuit of machine
Turn the function switch to the non-protection side, press is not able to work		For CPSII, function switch is broken or related circuit fault	Check the circuit of function switch, if there is no fault, replace the controller
		For CQ2, function switch or relay fault, the load fuse blowing out	Check the load fuse or relay, if there is no fault, replace the controller
The power indicator and unusual station indicator are on; the normal operation indicator is off.	The green status indicator of receiver is off	Emitter or receiver fault	Refer to sheet6.3
		Wiring fault of transmission cables or transmission cable fault	Check and repair the transmission cable, if it's broken, replace it
	The green status indicator of receiver is on	S signal line of transmission cable loose contact	Check the connection for S signal line
		The relay fault	Replace the relay with the same specification one
		The controller fault	Replace the controller with the same specification one
The red detection indicator is on		Contact adhesion for one relay	Replace the two relays with the same specification ones

All the phenomenon shown in the above sheet takes place when the power switch is turned on.

III TROUBLESHOOTING OF EMITTER/RECEIVER

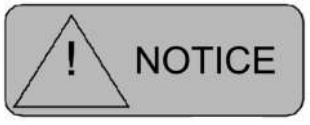
Sheet6.3

Phenomena of failure	Cause	Solution
All the indicators in emitter or receiver are off	Transmission cable failure	Check and repair transmission cable and the wiring
	Emitter or receiver failure	Replace emitter or receiver with the same specification one
On the receiver, the red status indicator is on., and the green status indicator is off.	Bad beam focusing	Make the beam focusing well
	The filter plate surface of emitter or receiver is dirty.	Wipe it with a clean, soft cotton yarn
	Emitter or receiver failure	Replace emitter or receiver with the same specification one

IV TROUBLESHOOTING OF JKIII INTERFACE

Sheet6.4

Phenomena of fault	Cause	Solution
All indicators are off	No power supply	Check power supply and its wiring
	JKIII fault	Replace the interface with the same specification one
The red power indicator is on, conversion of driving signal indicator is abnormal	Emitter or receiver fault	Refer to Sheet6.3
	Bad beam focusing	Make the beam focusing well
	Transmission cable fault or wiring fault	Check and repair transmission cable
	JKIII fault	Replace the interface with the same specification one
The conversion of all indicators is normal, no output signal.	JKIII fault	Replace the interface with the same specification one
	Power cable fault or wiring fault	Check and repair power cable



If you can not remedy the fault with the help of information provided in this chapter, please contact machine factory or the local "*SDKELI*" representative directly.