SDKELI®

CT6 Safety Light Curtain

（Type 4）

Operation Manual

(2026.07)



TÜVRheinland® CERTIFIED
Type Approved
Safety
Regular Production
Surveillance
www.tuv.com
ID 1111320241

TÜVRheinland C US

CE RoHS

Jining KeLi Photoelectronic Industrial Co., Ltd.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

CONTENT

Ⅰ. Legislation and standards ..... - 1 -
Ⅱ. User instructions ..... - 1 -
Ⅲ. Precautions on safety ..... - 3 -
Ⅳ. Precautions for safe use ..... - 3 -
Ⅴ. Meaning of symbols ..... - 4 -
Section1 Product description ..... - 5 -
1.1. System components ..... - 5 -
1.2. Specifications ..... - 6 -
1.2.1. System specification ..... - 6 -
1.2.2. Emitter / receiver specification ..... - 6 -
1.2.3. Transmission cable specification ..... - 6 -
1.3. Transmission cables ..... - 8 -
1.4. Applications ..... - 10 -
1.5. Appearance ..... - 11 -
1.6. Technical parameters ..... - 13 -
1.7. Parameter table ..... - 16 -
1.8. Dimensions of major parts ..... - 20 -
Section2 Function introduction ..... - 22 -
2.1. Input / Output interface circuit ..... - 22 -
2.2. Function declaration ..... - 23 -
2.2.1 Self-test function ..... - 23 -
2.2.2 External device monitoring（EDM） ..... - 24 -
2.2.3 Auxiliary output (unsafe) ..... - 25 -
2.2.4 Automatic reset function ..... - 25 -
Section3 Installation and wiring ..... - 31 -
3.1. Installation requirements ..... - 31 -
3.1.1 Detection zone and installation method ..... - 31 -
3.1.2 Safety distance ..... - 33 -
3.1.3 Distance from reflective surfaces ..... - 36 -
3.1.4 Mutual interference prevention ..... - 36 -
3.2. Installation ..... - 38 -
3.2.1 Installation method ..... - 38 -
3.3. Wiring ..... - 45 -
3.3.1 Precautions ..... - 45 -
3.3.2 Power supply ..... - 45 -
3.3.3 Wiring steps ..... - 46 -
3.3.4 Wiring of the emitter’s cable and the emitter ..... - 46 -
3.3.5 Wiring of the receiver’s cable and the receiver ..... - 46 -
3.3.6. G type, line synchronization mode ..... - 47 -
3.3.7. G type, optical synchronization mode, Optical communication coding 1 ..... - 47 -
3.3.8. G type, optical synchronization mode, Optical communication coding 2 ..... - 48 -
3.3.9. M type, line synchronization mode ..... - 48 -
3.3.10. M type, optical synchronization mode, Optical communication coding 1 ..... - 49 -
3.3.11. M type, optical synchronization mode, Optical communication coding 2 ..... - 49 -
Section4 Check and debugging ..... - 50 -
4.1. Installation condition check ..... - 50 -
4.2. Wiring check before power is turned on ..... - 50 -
4.3. Operation check while the machine is stopped ..... - 51 -
4.4. Checking that hazardous parts stop while the machine operates ..... - 51 -
Section5 Maintenance ..... - 52 -
5.1. Inspection at startup and when changing operators ..... - 52 -
5.2. Inspection for the guarded machine ..... - 52 -
5.3. Items to inspect every 6 months or when machine settings are changed ..... - 52 -
Section6 Troubleshooting ..... - 54 -
6.1. Fault state ..... - 54 -

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6.2. Fault of brake system of the machine ..... - 55 -
Section7 Version ..... - 56 -

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Ⅰ. Legislation and standards

(1) CT6 safety light curtain complies with the following legislations and standards:

- EU legislations
  Machinery Directive 2006/42/EC
  EMC Directive 2014/30/EU
- European Standards
  EN 61496-1 (Type 4 ESPE)
  EN 61496-2(Type 4 AOPD)
  EN ISO 13849-1 (Category 4、PL e)
  EN 61326-1:2013
  EN 62061
- International Standards
  IEC 61496-1 (Type 4 ESPE),
  IEC 61496-2 (Type 4 AOPD)
  IEC 61326-1
  ISO 13855
  IEC 62061
  IEC 61508 （SIL 3）

(2) CT6 light curtain received the following approvals from TÜV:

- EC Type-Examination in accordance with the EU Machinery Directive
  Type 4 ESPE (IEC 61496-1)
  Type 4 AOPD (IEC 61496-2)
- EMC Competent Body Certificate
- TÜV type approval
  Type 4 ESPE (EN IEC 61496-1)
  Type 4 AOPD (EN IEC 61496-2)
  Category 4（EN ISO 13849-1/-2）
  PL e（EN ISO 13849-1/-2）

(3) CT6 light curtain is designed according to the standards listed below :

- EN/IEC 61010-1
- EN 60204-1
- EN 60529
- 2014/35/EU (Low voltage directive)

Ⅱ. User instructions

Read this manual thoroughly and confirm the product from the appearance before installing, operating and maintaining CT6 light curtain. Please contact us if you have any questions or comments.

(1) Quality Assurance

The quality guarantee period of CT6 light curtain is 12 months.

KELI makes no warranty or representation, express or implied, regarding non-infringement, merchantability, or fitness for particular purpose of the products. Any

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

buyer or user acknowledges that the buyer or user alone has determined that the products will suitably meet the requirements of their intended use. KELI disclaims all other warranty, express or implied.

(2) Limitations of Liability

KELI shall not be responsible for special, indirect, or consequential damages, loss of profits or commercial loss in any way connected with the products, whether such claim is based on contract, warranty, negligence, or strict liability.

In no event shall responsibility of KELI for any act exceed the individual price of the product on which liability is asserted.

In no event shall KELI be responsible for warranty, repair, or other claims regarding the products unless KELI's analysis confirms that the products were properly handled, stored, installed, and maintained and not subject to contamination, abuse, misuse, or inappropriate modification or repair.

(3) Precautions for Use

If you do not use the product specifications as specified in this manual, or modify the product without authorization, the company will not guarantee the function and performance of the product.

At the customer's request, KELI will provide applicable third party certification documents. But the third party certification documents are not sufficient to fully explain the applicability of CT6 light curtain to the product, machine or system.

The following are some examples of applications for which particular attention must be given.

Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.

Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipments, amusement machines, vehicles, and installations subject to separate industry or government regulations.

Systems, machines, and equipments that could present a risk to life or property.

Please learn about all application restrictions for CT6 light curtain.

Never use CT6 light curtain in applications that may pose a serious risk to life or property and can not guarantee the security of the entire system.

After the product is scrapped, it should be disposed of as industrial waste. When disposing of it, be sure to follow the requirements and rules, regulations, and laws of industrial wastes in the country or region where the product is located.

(4) Performance

Performance data given in this document is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of KELI's test conditions, and the users must correlate it to actual application requirements.

(5) Change in Specifications

Product specifications and accessories may be changed at any time based on improvements and other reasons.

When the product's rating, performance, or structure changes, the product's specifications will change accordingly. For the change of product specifications, our company will not notify, if in doubt, please contact us.

(6) Errors and Omissions

The contents of the manual have been made as accurate and complete as possible, but

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

there is no guarantee that there are no errors or omissions in this manual.The information mentioned in the specification is provided for reference only and may be replaced by updates.The Company shall not be responsible for any errors or omissions that may have occurred in this specification.

(7) Copyright and Copy Permission

This document shall not be copied for sales or promotions without permission.

This document is protected by copyright and is intended solely for use in conjunction with CT6 light curtain. Please notify us before copying or reproducing this document in any manner, for any other purpose. If copying or transmitting this document to another, please copy or transmit it in its entirety.

Ⅲ. Precautions on safety

The following special information may appear at any place in the manual or on CT6 light curtain, as a warning of potential risk or promotion of special attention to information about clarifying or simplifying certain procedures.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

! WARNING
WARNING indicates an actual or potential risk or health hazard. They are designed to help you to prevent accidents. Read carefully and follow the warnings!

! CAUTION
CAUTION indicates the key information which, if not avoided, can result in expected legal dispute, or equipment damage. Read carefully and follow the cautions!

Ⅳ. Precautions for safe use

Make sure to observe the following precautions that are necessary for ensuring safe use of the product.

(1) Thoroughly read this manual and understand the installation procedures, operation check procedures, and maintenance procedures before using the product.

(2) CT6 light curtain should only be installed, checked, and maintained by a qualified person.

(3) A qualified person is defined as “a person or persons who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training and experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work” .

(4) OSSDs must satisfy the following conditions:

Not short-circuited with 24V.

Not short-circuited with active signal.

OSSDs output should not exceed the rating.

(5) Do not drop the product.

(6) Dispose of the product in accordance with the relevant rules and regulations of the country or area where the product is used.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Ⅴ. Meaning of symbols



Symbol of emitter in this operation manual



Symbol of receiver in this operation manual

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Section1 Product description

1.1. System components

CT6 safety light curtain is composed of an emitter, a receiver and two transmission cables, as shown in Figure 1.1. The system works with 24V DC power supply, and supplies two channels of transistor output（PNP ）, EDM function, one channel of auxiliary output (unsafe), and state indicating function. The detection range is 2m,5m,8m and 15m. The detection capability is 14mm, 30mm and 46mm. The detection height is 232mm to 2872mm with the extension accuracy of 40mm, refer to 1.7.

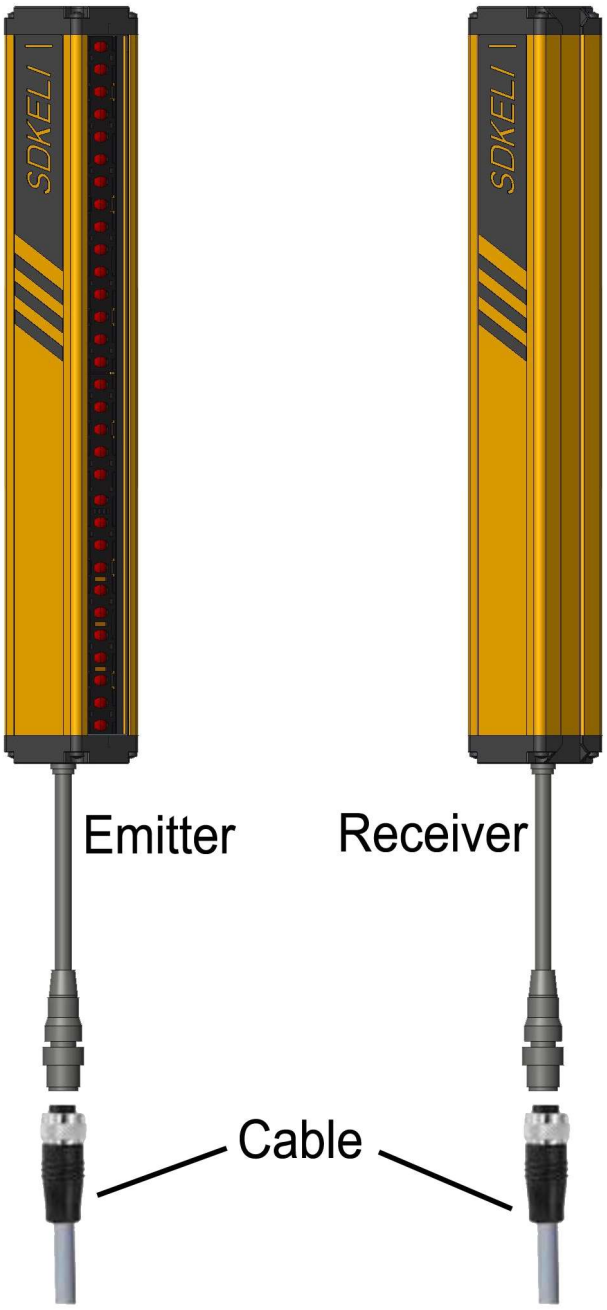
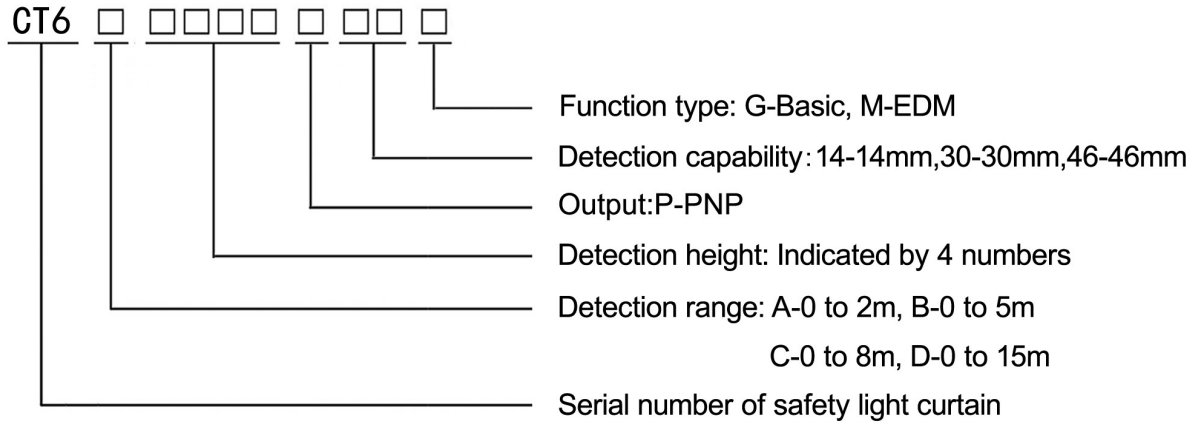


Fig 1.1 Composition of CT6 System

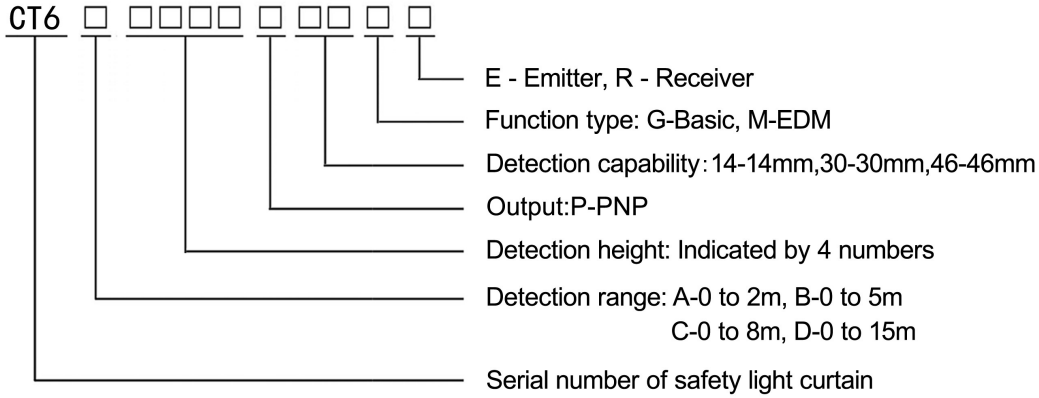
LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.2. Specifications

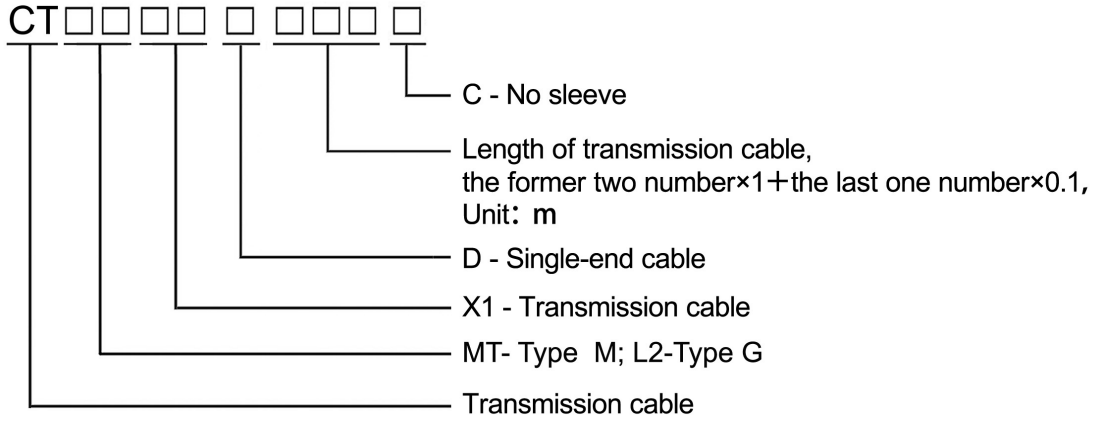
1.2.1. System specification



1.2.2. Emitter / receiver specification



1.2.3. Transmission cable specification



LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Table 1.2 Code of bracket installation

NO.	Form	Code
1	ZC mounting	ZC
2	Pipe mounting	GC
3	Double-arm side mounting- T-groove	SCT
4	T-groove mounting	TC
5	Scatter shield ZC mounting	FZC
6	Scatter shield pipe mounting	GF
7	Scatter shield double-arm mounting	SF
8	Magnatic attachment mounting	CX
9	Formal installation of magnetic protective cover	CFZ
10	Side-mounted magnetic protective cover	CFC
11	Double-bracket arm mounting	G1
12	Plate support with magnet mounting	ZBC
13	Plate support with bolt mounting	ZBL

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.3. Transmission cables

Type M transmission cable adopts oil-resistant PVC jacketed 8-core shielded cable; Type G transmission cable adopts oil-resistant PVC jacketed 6-core shielded cable. One end is an 8-core M12-hole type plug-in connected to the sensor. The other end of each core is stripped from the wire and then connected to the device.Standard cable lengths: 3m, 5m, 10m, 20m.

Connections of the transmission cables are shown in Fig 1.3.

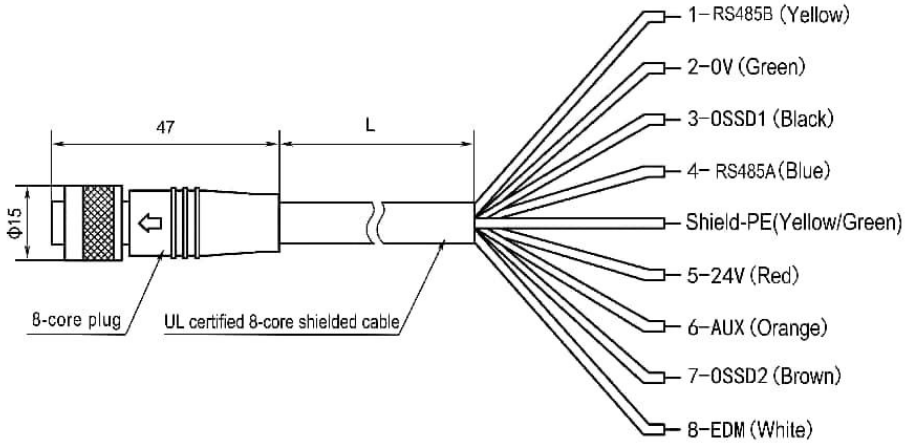


Fig 1.3.1 Schematic Diagram of Connection Points of the type M transmission cables Transmission Cable

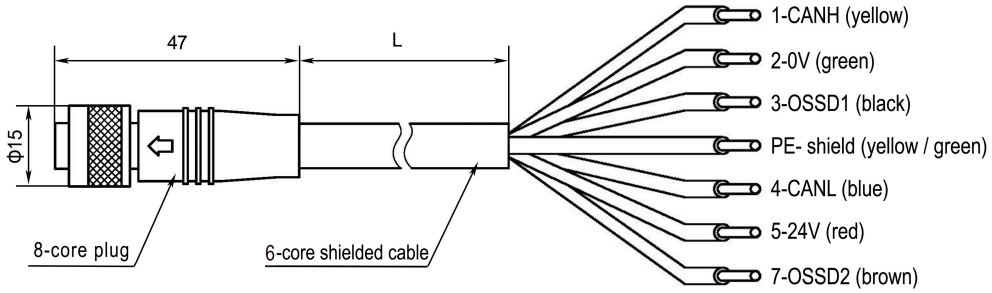


Fig 1.3.2 Schematic Diagram of Connection Points of the type G transmission cables Transmission Cable

If the standard transmission cable can not meet the requirements of the use, the extension cable can be used to increase the length of transmission cable. Extension cable is the 8-core shield cable, with the hole seat at one end and the pin seat at the other end. The standard length of extension cable is 5m, 10m and 20m. Cable specifications are shown in Table 1.3:

Table 1.3 List of Specifications for CT6 Safety light curtain Cables

Model	Name	Specifications	Unit	Single/double terminal	length
Type M	M12-8×24AWG transmission cable – single terminal 3 m	CTMTX1D030C	Pcs	single	3m
	M12-8×24AWG transmission cable – single terminal 5 m	CTMTX1D050C	Pcs	single	5m
	M12-8×24AWG transmission cable – single terminal 10 m	CTMTX1D100C	Pcs	single	10m

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

	M12-8×24AWG transmission cable – single terminal 20 m	CTMTX1D200C	Pcs	single	20m
	Transmission Cable Extension Line - Dual Terminal 5 m	CTC4X2S050C	Pcs	double	5m
	Transmission Cable Extension Line - Dual Terminal 10 m	CTC4X2S100C	Pcs	double	10m
	Transmission Cable Extension Line - Dual Terminal 20 m	CTC4X2S200C	Pcs	double	20m
Type G	LCSII transmission cable – single terminal 3 m	CTL2X1D030C	Pcs	single	3m
	LCSII transmission cable – single terminal 5 m	CTL2X1D050C	Pcs	single	5m
	LCSII transmission cable – single terminal 10 m	CTL2X1D100C	Pcs	single	10m
	LCSII transmission cable – single terminal 20 m	CTL2X1D200C	Pcs	single	20m
	Transmission Cable Extension Line - Dual Terminal 5 m	CT6MX3S050C	Pcs	double	5m
	Transmission Cable Extension Line - Dual Terminal 10 m	CT6MX3S100C	Pcs	double	10m
	Transmission Cable Extension Line - Dual Terminal 20 m	CT6MX3S200C	Pcs	double	20m

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.4. Applications

To be protected by CT6 safety light curtain, the detected object must meet the following conditions:

(1) CT6 light curtain can only detect objects which intrude into the detection zone. Detection zone is the rectangular area between the emitter and the receiver, formed by protective height and operating range.

(2) CT6 light curtain cannot detect transparent and/or translucent objects.

(3) The size of the guarded object must not be less than the detection capability. Detection capability is the sensing function parameter limit specified by the supplier that will cause actuation of the system. The detection capability of CT6 light curtain is 14mm, 30mm and 46mm.

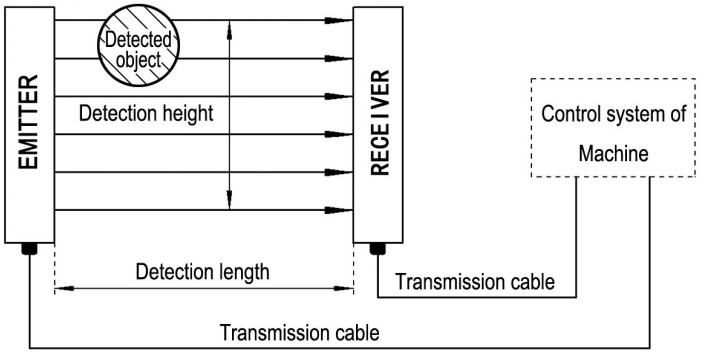


Fig 1.4 Operation schematic diagram

When using CT6 safety light curtain, the following requirements must be observed:

- The guarded machine must be able to stop any where in its cycle, and can only achieve the upper dead point protection for rigid equipment.
- The guarded machine must not present a hazard from flying parts.
- The guarded machine must have a consistent stopping time and adequate control mechanisms.
- All applicable governmental and local rules, codes, and regulations must be satisfied. This is the user's and employer's responsibility.
- All safety-related machine control elements must be designed so that an alarm in the control logic or failure of the control circuit does not lead to failure to danger.
- Do not use radio equipment such as cellular phones, walkie-talkies, or transceivers near CT6 light curtain.
- Do not use CT6 light curtain in the following types of environments:
  Areas with heavy smoke, particulate matter, and corrosives;
  Areas exposed to intense interference light, such as direct sunlight;
  Areas with high humidity where condensation is likely to occur;
  Areas exposed to vibration or shock levels higher than in the specification provisions;
  Areas where the product may come into contact with water;
  Areas where the product may get wet with oil that can solve adhesive;
  Environments where flammable or explosive gases are present.

! WARNING

Install a protective structure so that the hazardous part of a machine can only be reached by passing through the sensor's detection zone.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.5. Appearance

CT6 safety light curtain is composed of emitter and receiver, as shown in Fig 1.5.

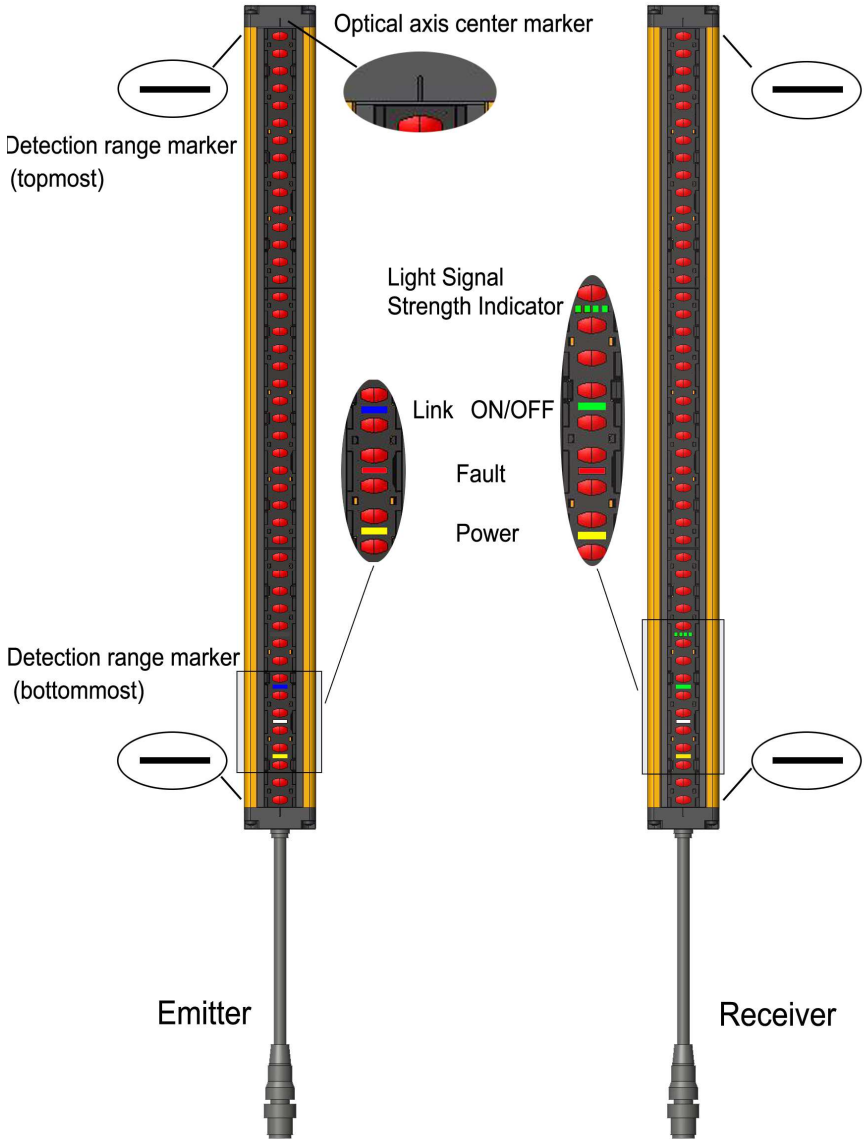


Fig 1.5 Appearance Information of CT6 Safety light curtain

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Table 1.5 List of indicator light information description

Light curtain	LED indicator	Color	Description
Emitter	POWER	Yellow	Power light, turns on while the power of emitter is on.
	LINK	Blue	Link light, turns on while there is communication between emitter and receiver（line synchronization）.
	FAULT	Red	Fault light, turns on when the system self-test and the emitter is in fault state or the communication is wrong.
Receiver	POWER	Yellow	Power light, turns on while the power is on.
	ON	Green	On light, turns on when the OSSDs output ON-state. The guarded machine works.
	OFF	Red	Off light, turns on when the OSSDs output OFF-state and the guarded machine can't work.
	FAULT	Red	Fault light, The indicator light is always on When Receiver fault and communication fault； The indicator light is flashes When the wiring error and external light interference； Wiring errors include EDM and OSSD wiring errors.
	Light intensity indication	Green	On light, turns on when the OSSDs output ON-state.Indicates the light intensity state

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.6. Technical parameters

Executed standards	EN 61496-1 (Type 4 ESPE) EN 61496-2 (Type 4 AOPD) EN ISO 13849-1(Category 4、PL e) EN 61326-1 IEC 61496-1 (Type 4 ESPE) IEC 61496-2 (Type 4 AOPD) IEC 61326-1 ISO 13855 EN/IEC 62061 IEC 61508 (SIL 3)		
Related standards	2014/35/EU (Low Voltage Directive) EN/IEC 61010-1 EN 60204-1		
Safety class			
Safety level	Type 4 Category 4 PL e SIL3		
DCavg	99%		
CCF	100		
$MTTF_D$ /PFH_D	See 1.7 Parameter table		
SC	3		
Optical characteristics			
Detection capability (Opaque objects)	14mm	30mm	46mm
Operating range	Type A: 0 to 2m;Type B: 0 to 5m;Type D: 0 to 8m; Type E: 0 to 15m		
Protection height	232 to 2872mm (Refer to 1.7)		
Effective aperture angle (EAA)	Within ±2.5° for the emitter and receiver at a detection distance of at least 3m according to IEC61496-2		
Light source	Infrared LED (850nm wavelength)		
Environment			
Ambient temperature	Operation	-10℃ to 55℃ (non-condensing)	
	Storage	-30 ℃to 70℃	
Ambient humidity	Operation	35% RH to 85%RH	
	Storage	35% RH to 95%RH	
Resistance to light interference	Incandescent lamp	3000 Lux	
	Fluorescent lamp	3000 Lux	

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

	Sunlight	10000 Lux
Homologous optical interference	There shall be no failure to danger of CT6 by light interference from the emitting elements of an AOPD of identical design.	
Enclosure rating		IP65/IP67
Vibration resistance		IEC 61496-1: 5 to 150Hz frequency range, 1g, 3.5mm, 10 sweeps per axis
Shock resistance		IEC61496-1: 15g, 6 ms duration, 100 bumps for each axis (applies to all 3 axes)
Sensor size		J×33×38mm（J: Emitter/Receiver length）
Materials	Enclosure	Extruded aluminum
	End caps	Black nylon, glass reinforced
	Optical window	Type A/B-light grey polycarbonate; Type C/D-clear polycarbonate
	Transmission cable	RVVP
Electrical characteristics		
Supply voltage		24V DC±20% (ripple p-p5% max.)
Current consumption (no load)	Emitter	＜200 mA
	Receiver	＜200 mA
Response time		6 ms～147 ms (Refer to 1.7)
Synchronously way		Compatible with optical synchronization and line synchronization
Safety outputs（OSSD） PNP		PNP transistor outputs×2, In ON-state, the load current ≤ 300mA, the output voltage ≥ Vcc-2V In OFF-state, the leakage current ⩽ 1mA, the residual voltage ⩽ 1V(excluding the effect of wire extension) Capacitive load: 0.9 uF,Inductive load: 2H.
Startup waiting time		＜2s
Test function		Self-test (After power ON, and during operation)
Protection circuit		Overvoltage and overcurrent protection Output short-circuit protection
Mutual interference prevention function		Interference light avoidance algorithm,In optical synchronization, adjacent machine use different optical communication codes
Auxiliary function		
Auxiliary output (AUX)	Unsafe output, one channel of PNP output, opposites to the OSSDs Shading state: output current≤300mA, output voltage≥Vcc-2V Light passing state: output current＜2mA , output voltage＜2V	

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

External device monitoring (EDM)	EDM is used to monitor the NC contact of the external relay or contactor The input voltage in ON state: 0V to 7V or open circuit The input voltage in OFF state: 9V to 24V
Manual reset function	In the EDM circuit, a set of normally open contacts are connected in series to realize the manual reset function， When using the manual reset function: in the OFF state, after the light curtain resumes light, press the reset button, and the light curtain outputs the ON state; in the OFF state, before the reset button is pressed, the receiver fault light flashes.
Upper computer configuration	The light curtain communicates with the upper computer through the 485 communication line and is capable of achieving fixed shielding, floating shielding, and multiple shading start-up reset functions
Cascading function	Four sets of light curtains are cascaded. The conventional light curtains achieve the cascading function by adding expansion modules
Accessories	
Accessories	operation manual, installation accessories, manufacturer certificate, packing list

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.7. Parameter table

H : Protective height, J :Length of light curtain，L : Length of steel pipe，C : Shield length(Unit：mm)
Detection capability 14mm

Specification	No. of beams	H	Dimensions 33×38×J	L	C	Response time (ms)	$MTTF_D$ (Year)	PFH_D (1/h)	MTTF (Year)
CT6□0232P14△	30	232	260	500	330	＜15	364	6.44E-09	43
CT6□0272P14△	35	272	300	750	370	＜17	332	7.04E-09	42
CT6□0312P14△	40	312	340	750	410	＜19	305	7.76E-09	41
CT6□0352P14△	45	352	380	750	450	＜21	282	8.67E-09	40
CT6□0392P14△	50	392	420	750	490	＜23	263	8.67E-09	39
CT6□0432P14△	55	432	460	750	530	＜25	246	9.81E-09	38
CT6□0472P14△	60	472	500	750	570	＜27	231	1.08E-08	37
CT6□0512P14△	65	512	540	1000	610	＜29	218	1.08E-08	36
CT6□0552P14△	70	552	580	1000	650	＜31	206	1.19E-08	36
CT6□0592P14△	75	592	620	1000	690	＜33	195	1.19E-08	35
CT6□0632P14△	80	632	660	1000	730	＜35	186	1.33E-08	34
CT6□0672P14△	85	672	700	1000	770	＜37	177	1.33E-08	33
CT6□0712P14△	90	712	740	1000	810	＜39	169	1.50E-08	33
CT6□0752P14△	95	752	780	1000	850	＜41	162	1.50E-08	32
CT6□0792P14△	100	792	820	1200	890	＜43	155	1.61E-08	32
CT6□0832P14△	105	832	860	1200	930	＜45	149	1.61E-08	31
CT6□0872P14△	110	872	900	1200	970	＜47	143	1.61E-08	30
CT6□0912P14△	115	912	940	1200	1010	＜49	138	1.87E-08	30
CT6□0952P14△	120	952	980	1200	1050	＜51	133	1.87E-08	29
CT6□0992P14△	125	992	1020	1500	1090	＜53	129	1.87E-08	29
CT6□1032P14△	130	1032	1060	1500	1130	＜55	124	2.03E-08	28
CT6□1072P14△	135	1072	1100	1500	1170	＜57	120	2.03E-08	28
CT6□1112P14△	140	1112	1140	1500	1210	＜59	117	2.03E-08	27
CT6□1152P14△	145	1152	1180	1500	1250	＜61	113	2.23E-08	27
CT6□1192P14△	150	1192	1220	1500	1290	＜63	110	2.23E-08	27
CT6□1232P14△	155	1232	1260	1500	1330	＜65	107	2.23E-08	26
CT6□1272P14△	160	1272	1300	1750	1370	＜67	104	2.47E-08	26
CT6□1312P14△	165	1312	1340	1750	1410	＜69	101	2.47E-08	25
CT6□1352P14△	170	1352	1380	1750	1450	＜71	98	2.47E-08	25
CT6□1392P14△	175	1392	1420	1750	1490	＜73	96	2.47E-08	25
CT6□1432P14△	180	1432	1460	1750	1530	＜75	94	2.74E-08	24
CT6□1472P14△	185	1472	1500	1750	1570	＜77	91	2.74E-08	24
CT6□1512P14△	190	1512	1540	2000	1610	＜79	89	2.74E-08	24

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

CT6□1552P14△	195	1552	1580	2000	1650	＜81	87	3.08E-08	23
CT6□1592P14△	200	1592	1620	2000	1690	＜83	85	3.08E-08	23
CT6□1632P14△	205	1632	1660	2000	1730	＜85	83	3.08E-08	23
CT6□1672P14△	210	1672	1700	2000	1770	＜87	81	3.08E-08	22
CT6□1792P14△	225	1792	1820		1890	＜93	80	3.08E-08	22
CT6□1912P14△	240	1912	1940		2010	＜99	78	3.41E-08	22
CT6□2032P14△	255	2032	2060		2130	＜105	76	3.41E-08	21
CT6□2152P14△	270	2152	2180		2250	＜111	68	3.80E-08	20
CT6□2272P14△	285	2272	2300		2370	＜117	61	4.22E-08	19
CT6□2392P14△	300	2392	2420		2490	＜123	56	4.73E-08	17
CT6□2512P14△	315	2512	2540		2610	＜129	47	5.76E-08	15
CT6□2632P14△	330	2632	2660		2730	＜135	45	6.37E-08	15
CT6□2752P14△	345	2752	2780		2850	＜141	42	7.11E-08	15
CT6□2872P14△	360	2872	2900		2970	＜147	39	7.11E-08	14

Detection capability 30mm

Specification	No. of beams	H	Dimensions 33×38×J	L	C	Response time (ms)	$MTTF_D$ (Year)	PFH_D (1/h)	MTTF (Year)
CT6□0232P30△	11	232	260	500	330	＜8	439	5.38E-09	44
CT6□0272P30△	13	272	300	750	370	＜9	420	5.38E-09	44
CT6□0312P30△	15	312	340	750	410	＜9	411	5.38E-09	44
CT6□0352P30△	16	352	380	750	450	＜10	394	5.94E-09	43
CT6□0392P30△	18	392	420	750	490	＜11	378	5.94E-09	42
CT6□0432P30△	20	432	460	750	530	＜11	364	6.44E-09	42
CT6□0472P30△	21	472	500	750	570	＜12	357	6.44E-09	42
CT6□0512P30△	23	512	540	1000	610	＜13	344	6.44E-09	41
CT6□0552P30△	25	552	580	1000	650	＜13	332	7.04E-09	41
CT6□0592P30△	26	592	620	1000	690	＜14	326	7.04E-09	41
CT6□0632P30△	28	632	660	1000	730	＜15	315	7.04E-09	40
CT6□0672P30△	30	672	700	1000	770	＜15	305	7.76E-09	39
CT6□0712P30△	31	712	740	1000	810	＜16	300	7.76E-09	39
CT6□0752P30△	33	752	780	1000	850	＜17	291	7.76E-09	39
CT6□0792P30△	35	792	820	1200	890	＜17	282	8.67E-09	38
CT6□0832P30△	36	832	860	1200	930	＜18	278	8.67E-09	38
CT6□0872P30△	38	872	900	1200	970	＜19	270	8.67E-09	37
CT6□0912P30△	40	912	940	1200	1010	＜19	263	8.67E-09	37
CT6□0952P30△	41	952	980	1200	1050	＜20	259	9.81E-09	37
CT6□0992P30△	43	992	1020	1500	1090	＜21	252	9.81E-09	36

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

CT6□1032P30△	45	1032	1060	1500	1130	＜21	246	9.81E-09	36
CT6□1072P30△	46	1072	1100	1500	1170	＜22	243	9.81E-09	36
CT6□1112P30△	48	1112	1140	1500	1210	＜23	237	9.81E-09	35
CT6□1152P30△	50	1152	1180	1500	1250	＜23	231	1.08E-08	35
CT6□1192P30△	51	1192	1220	1500	1290	＜24	228	1.08E-08	35
CT6□1232P30△	53	1232	1260	1500	1330	＜25	223	1.08E-08	34
CT6□1272P30△	55	1272	1300	1750	1370	＜25	218	1.08E-08	34
CT6□1312P30△	56	1312	1340	1750	1410	＜26	215	1.08E-08	34
CT6□1352P30△	58	1352	1380	1750	1450	＜27	210	1.19E-08	33
CT6□1392P30△	60	1392	1420	1750	1490	＜27	206	1.19E-08	33
CT6□1432P30△	61	1432	1460	1750	1530	＜28	203	1.19E-08	33
CT6□1472P30△	63	1472	1500	1750	1570	＜29	199	1.19E-08	33
CT6□1512P30△	65	1512	1540	2000	1610	＜29	195	1.19E-08	32
CT6□1552P30△	66	1552	1580	2000	1650	＜30	193	1.19E-08	32
CT6□1592P30△	68	1592	1620	2000	1690	＜31	189	1.33E-08	32
CT6□1632P30△	70	1632	1660	2000	1730	＜31	186	1.33E-08	32
CT6□1672P30△	71	1672	1700	2000	1770	＜32	184	1.33E-08	31
CT6□1792P30△	76	1792	1820		1890	＜34	180	1.33E-08	31
CT6□1912P30△	81	1912	1940		2010	＜36	177	1.33E-08	31
CT6□2032P30△	86	2032	2060		2130	＜38	175	1.50E-08	31
CT6□2152P30△	91	2152	2180		2250	＜40	160	1.50E-08	29
CT6□2272P30△	96	2272	2300		2370	＜42	148	1.61E-08	28
CT6□2392P30△	101	2392	2420		2490	＜44	137	1.87E-08	27
CT6□2512P30△	106	2512	2540		2610	＜46	120	2.03E-08	25
CT6□2632P30△	111	2632	2660		2730	＜48	109	2.47E-08	23
CT6□2752P30△	116	2752	2780		2850	＜50	100	2.47E-08	21
CT6□2872P30△	121	2872	2900		2970	＜52	91	2.74E-08	20

Detection capability 46mm

Specification	No. of beams	H	Dimensions 33×38×J	L	C	Response time (ms)	$MTTF_D$ (Year)	PFH_D (1/h)	MTTF (Year)
CT6□0232P46△	7	232	260	500	330	＜6	461	4.91E-09	45
CT6□0272P46△	8	272	300	750	370	＜7	450	4.91E-09	44
CT6□0312P46△	9	312	340	750	410	＜7	439	5.38E-09	44
CT6□0352P46△	10	352	380	750	450	＜7	429	5.38E-09	44
CT6□0392P46△	11	392	420	750	490	＜8	420	5.38E-09	43
CT6□0432P46△	12	432	460	750	530	＜8	411	5.38E-09	43
CT6□0472P46△	13	472	500	750	570	＜9	402	5.94E-09	43

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

CT6□0512P46△	14	512	540	1000	610	＜9	394	5.94E-09	42
CT6□0552P46△	15	552	580	1000	650	＜9	386	5.94E-09	42
CT6□0592P46△	16	592	620	1000	690	＜10	378	6.44E-09	42
CT6□0632P46△	17	632	660	1000	730	＜10	371	6.44E-09	41
CT6□0672P46△	18	672	700	1000	770	＜11	364	6.44E-09	41
CT6□0712P46△	19	712	740	1000	810	＜11	357	6.44E-09	41
CT6□0752P46△	20	752	780	1000	850	＜11	350	6.44E-09	40
CT6□0792P46△	21	792	820	1200	890	＜12	344	7.04E-09	40
CT6□0832P46△	22	832	860	1200	930	＜12	338	7.04E-09	40
CT6□0872P46△	23	872	900	1200	970	＜13	332	7.04E-09	39
CT6□0912P46△	24	912	940	1200	1010	＜13	326	7.04E-09	39
CT6□0952P46△	25	952	980	1200	1050	＜13	321	7.04E-09	39
CT6□0992P46△	26	992	1020	1500	1090	＜14	315	7.76E-09	38
CT6□1032P46△	27	1032	1060	1500	1130	＜14	310	7.76E-09	38
CT6□1072P46△	28	1072	1100	1500	1170	＜15	305	7.76E-09	38
CT6□1112P46△	29	1112	1140	1500	1210	＜15	300	7.76E-09	38
CT6□1152P46△	30	1152	1180	1500	1250	＜15	296	7.76E-09	37
CT6□1192P46△	31	1192	1220	1500	1290	＜16	291	7.76E-09	37
CT6□1232P46△	32	1232	1260	1500	1330	＜16	287	7.76E-09	37
CT6□1272P46△	33	1272	1300	1750	1370	＜17	282	8.67E-09	37
CT6□1312P46△	34	1312	1340	1750	1410	＜17	278	8.67E-09	36
CT6□1352P46△	35	1352	1380	1750	1450	＜17	274	8.67E-09	36
CT6□1392P46△	36	1392	1420	1750	1490	＜18	270	8.67E-09	36
CT6□1432P46△	37	1432	1460	1750	1530	＜18	266	8.67E-09	36
CT6□1472P46△	38	1472	1500	1750	1570	＜19	263	8.67E-09	35
CT6□1512P46△	39	1512	1540	2000	1610	＜19	259	9.81E-09	35
CT6□1552P46△	40	1552	1580	2000	1650	＜19	256	9.81E-09	35
CT6□1592P46△	41	1592	1620	2000	1690	＜20	252	9.81E-09	34
CT6□1632P46△	42	1632	1660	2000	1730	＜20	249	9.81E-09	34
CT6□1672P46△	43	1672	1700	2000	1770	＜21	246	9.81E-09	34
CT6□1792P46△	46	1792	1820		1890	＜22	243	9.81E-09	34
CT6□1912P46△	49	1912	1940		2010	＜23	240	9.81E-09	34
CT6□2032P46△	52	2032	2060		2130	＜24	237	1.08E-08	34
CT6□2152P46△	55	2152	2180		2250	＜25	220	1.08E-08	32
CT6□2272P46△	58	2272	2300		2370	＜27	206	1.19E-08	31
CT6□2392P46△	61	2392	2420		2490	＜28	193	1.19E-08	30
CT6□2512P46△	64	2512	2540		2610	＜29	172	1.50E-08	28

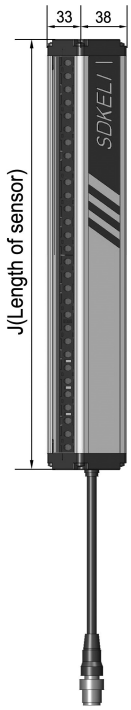
LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

CT6□2632P46△	67	2632	2660		2730	＜30	161	1.50E-08	27
CT6□2752P46△	70	2752	2780		2850	＜31	150	1.61E-08	26
CT6□2872P46△	73	2872	2900		2970	＜33	139	1.87E-08	26

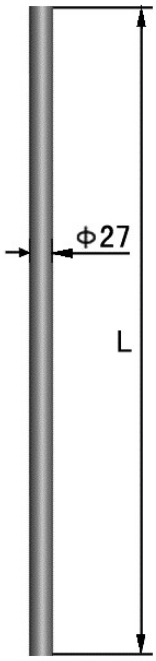
Note：① “□” stands for “A” ,“B”,“C” or “D” ,“△” stands for “G” or “M” (Refer to 1.2).

② The length of double arm steel pipe shall not exceed 1.5m.

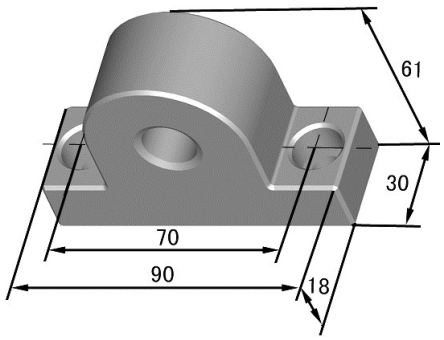
1.8. Dimensions of major parts



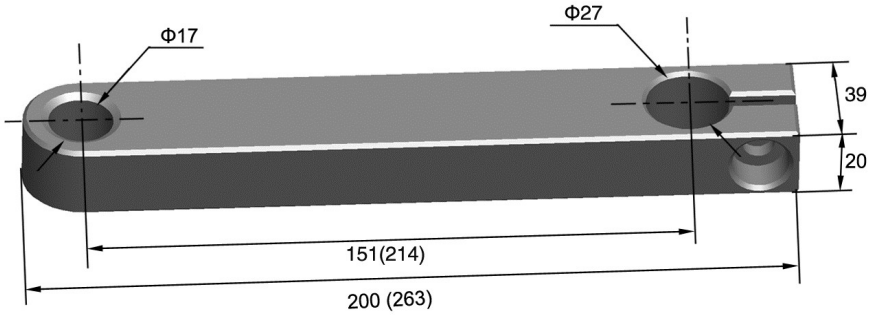
Emitter/Receiver



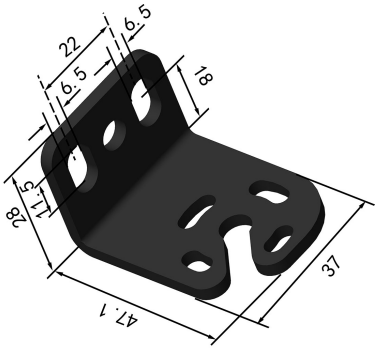
Steel pipe



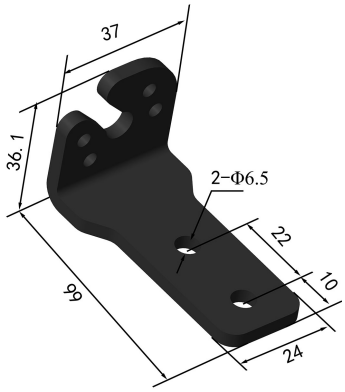
Bracket seat



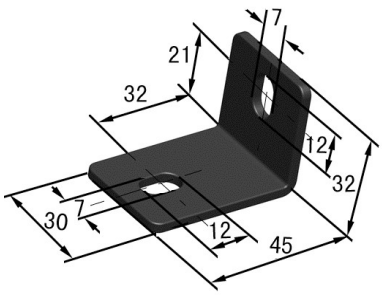
Bracket arm



Mounting Bracket

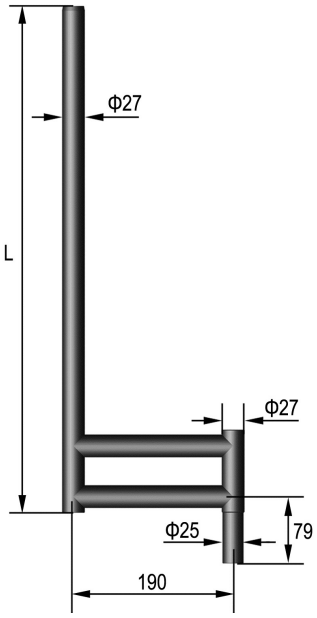


Rotating Bracket

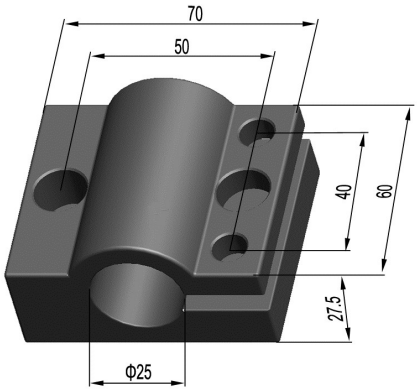


L-shaped Bent Plate Bracket

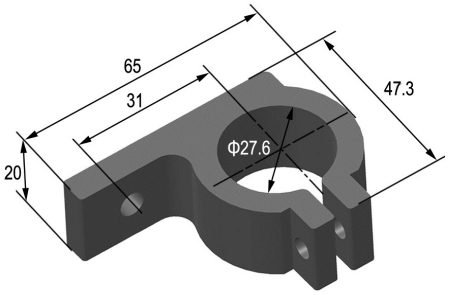
LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000



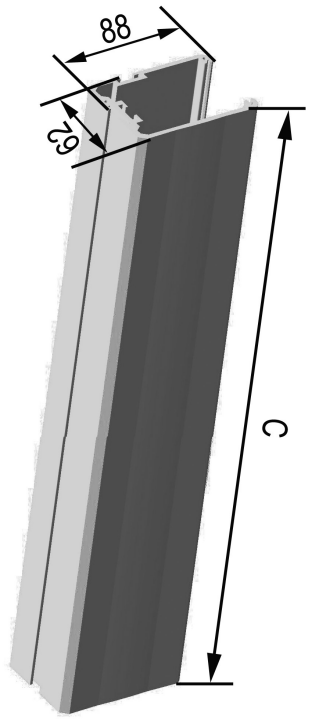
Double-arm pipe



Support seat



Q-clamp



Protection cover

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Section2 Function introduction

2.1. Input / Output interface circuit

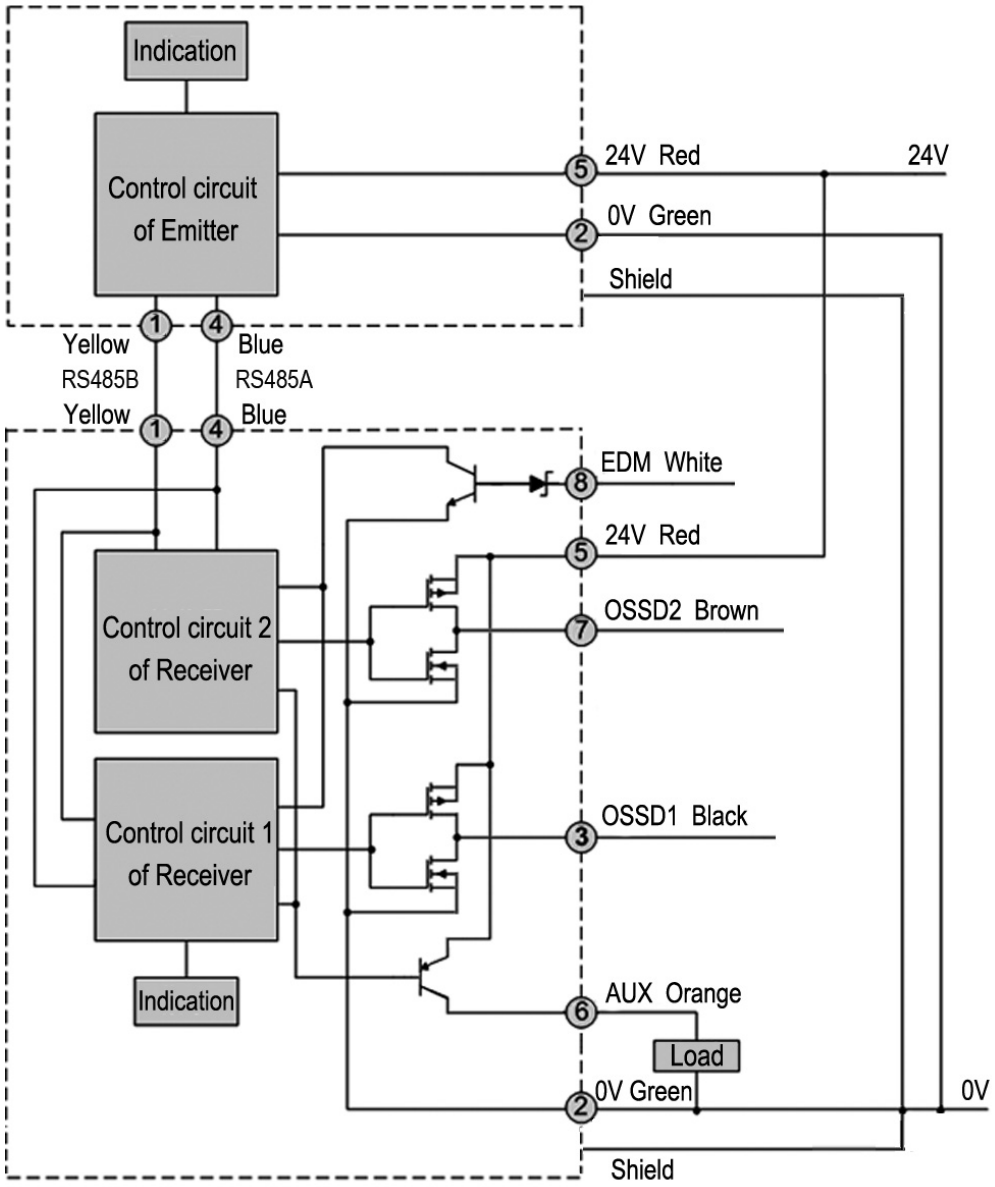


Fig 2.1 Input and Output Interface Circuit Diagram

Table 2.1 Signal and wiring introduction:

Signal label	Meaning of signal	Wiring
Red	Anode of input 24V DC	Connect with anode of input 24V DC
Green	Cathode of input 24V DC	Connect with cathode of input 24V DC
Yellow	The 485 communication interface between emitter and receiver	Link 485B respectively between emitter and receiver, Hanging during optical synchronization

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Blue	The 485 communication interface between emitter and receiver	Link 485A respectively between emitter and receiver, Hanging during optical synchronization
White	Input interface of monitoring of external device	Connect with the NC contact of the external relay and then connect the relay with anode of 24V.
Orange	Auxiliary output interface	Unsafe output, not allowed to be used as safety function.
Black	Controlling output interface	Safe output interface, supplies one channels of safety output
Brown	Controlling output interface	Safe output interface, supplies one channels of safety output

Note 1: The digits in the circle are the core-numbers of the connector.

2.2. Function declaration

2.2.1 Self-test function

The CT6 performs the self-test when power is turned ON (within 1 second) to check the function and wiring. Also, it regularly performs the self-test (within the response time) while operating, to avoid to output failure to danger signal.



If an error is found in the self-test, the CT6 enters lockout state, keeps the OSSDs in OFF-state, and indicates the error at the same time. After the error is removed, only though re-power can release the lockout state .

1) Self-Test Details

   The self-test detects the types of errors described below.

   Emitter

   - Broken or short-circuited cable
   - Communication failure
   - Internal circuit failure

   Receiver

   - Abnormal external power supply voltage
   - OSSDs wiring failure
   - EDM wiring failure
   - Communication failure
   - External light influence
   - Internal circuit failure

2) Safety output detect

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- While CT6 light curtain is in light-passing state, OSSDs outputs ON-state signal with periodical OFF-state signal, as shown in Fig 2.2.1. When OSSDs output circuit failure or be shorted with other interface signals, the detect signal varies, and feedback wrong state, the system turns into lockout state, the fault indicator flicker output, after the fault resolved, the system automatically steps out of the fault state.

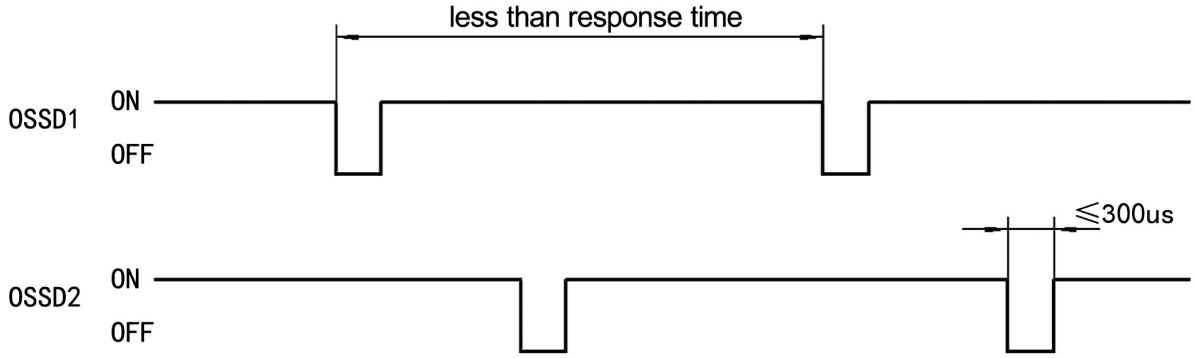


Fig 2.2.1 Security Output Detection Diagram

3) Light influence detect
   - While external influence light is detected, the system turns into light-shaded state and the fault indicator flicker output, after the fault resolved, the system automatically steps out of the fault state.
4) Light influence detect
   - When the communication wiring between the emitter and the receiver is wrong or the optical synchronization is not successfully established, the fault indicator flicker output, after the fault resolved, the system automatically steps out of the fault state.
5) Internal circuit detection
   - When the internal signal of the system is incorrect, it enters the lockout-state.

2.2.2 External device monitoring（EDM）

! WARNING

Prohibit short circuit between EDM and AUX, while using EDM function. Otherwise, the EDM function can't work.

The EDM function is used to monitor the faulty state of the relay(or contactor) that controls the dangerous parts of the machine, such as adhesion.

The receiver judges the operating state of the external device by monitoring the voltage of the EDM signal interface. When the EDM signal fails, the CT6 enters into lockout-state, after the fault resolved, the fault indicator flicker output, and the system automatically steps out of the fault state.

For example, after OSSD enters the OFF state of 500ms from ON, the normally closed contacts of external devices are not closed, the specified voltage is not input into the EDM signal interface, and the receiver is judged as external equipment failure and steps into lockout-state.

To ensure the safety of EDM functions, you need to use a safety relay with mandatory guidance or a contactor .

1) Function realization

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

When using the EDM function, the external voltage signal(9V to 24V) is input to the EDM signal interface through the normally closed contacts of the monitored device.

If the EDM function is not needed, short circuit EDM and AUX, refer to 3.3 about the wiring.

2) Timing Chart

After the power is on, the CT6 reads the EDM interface signal. When the state of the safe output signal changes, the state of the EDM input signal does not change within 500 ms, and CT6 enters into lockout-state, as shown in Fig 2.2.2

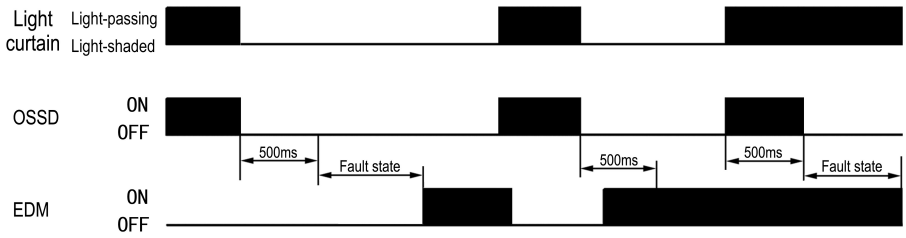


Fig 2.2.2 Timing Chart

2.2.3 Auxiliary output (unsafe)

! WARNING

- AUX can't be used for safety-control circuit. Failure to do so may result in serious injury.
- The load capacity of AUX is not larger than 200mA; failure to do so may result in fault of CT6.

When EDM is not used, AUX provide the input signal of EDM for CT6. It can also be used as a state monitoring signal for CT6, which can drive relays, indicator PLCs, etc..

The timing chart is shown in Fig 2.2.3.

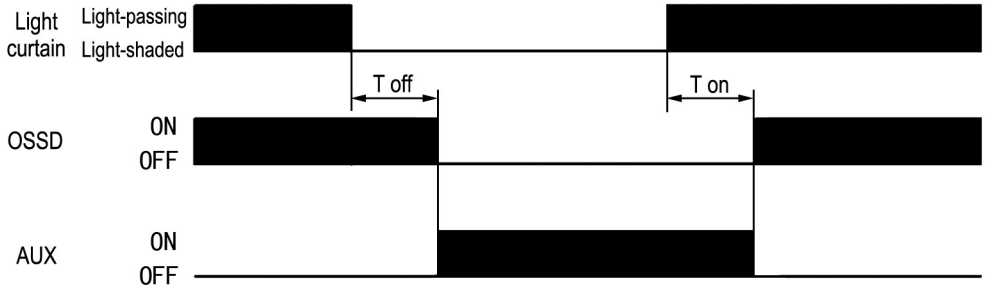


Fig 2.2.3 Timing Chart

T off：Response time for OSSD from ON to OFF, refer to 1.7 about the details.

T on：Response time for OSSD from OFF to ON, ≥80ms.

2.2.4 Automatic reset function

After the light-blocking object is removed, OSSDs automatically outputs the ON status

2.2.5 Cascading function

The CT6 safety light curtain can achieve a series connection of four sets of light curtains. Through the "serial setting" with increased detection height, the "L-shaped setting" and "U-shaped setting" with multi-faceted protection, it simplifies the installation and wiring space while saving costs for users.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

The cascade light curtain is connected through an expansion module. The cascade position of the main and secondary light curtains is identified based on the dip position of the expansion module. The output mode is consistent with that of the safety light curtain, providing two PNP outputs.

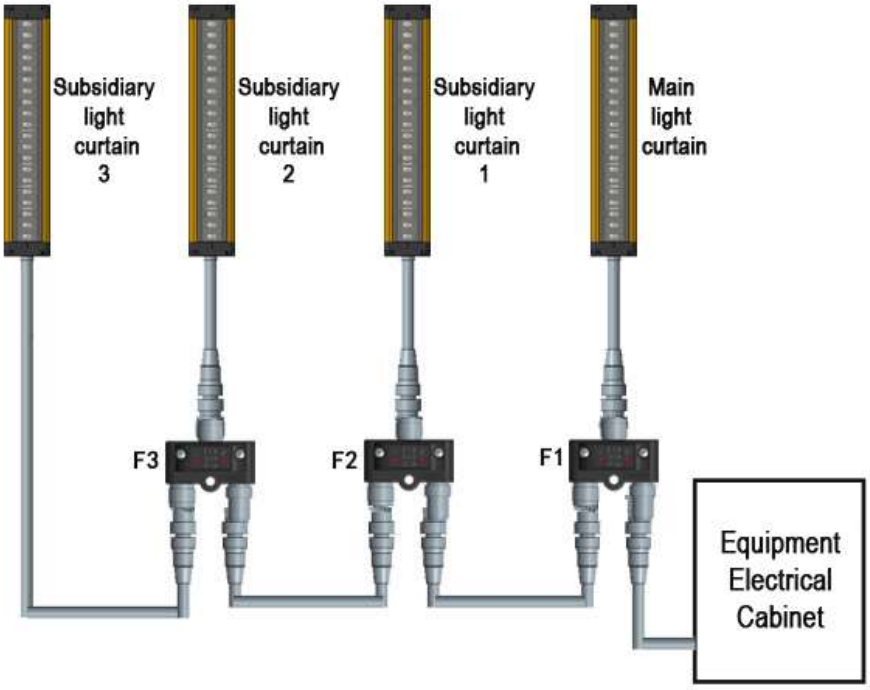


Fig 2.2.4 Cascade Schematic Diagram

When using the cascade module, please operate in accordance with the following steps:

1.Properly connect the module to the safety light curtain and fasten the sensor connector tightly.

2.Use a Phillips-head screwdriver (PH1 type is preferred) to unscrew the two M2.5 screws on the sealing cover of the cascade module.

3.Remove the upper cover.Note: The screws and the sealing cover adopt a non-loosening structure. The upper cover can be removed directly once the screws are fully unscrewed from the module body (as shown in Figure 2.3.5).

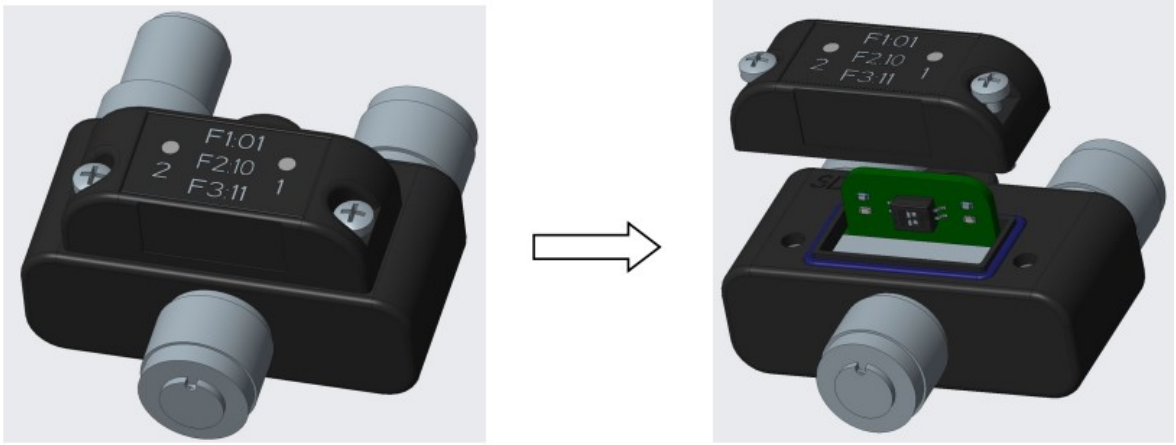


Fig 2.2.5 Sealing Cover Removal Diagram

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

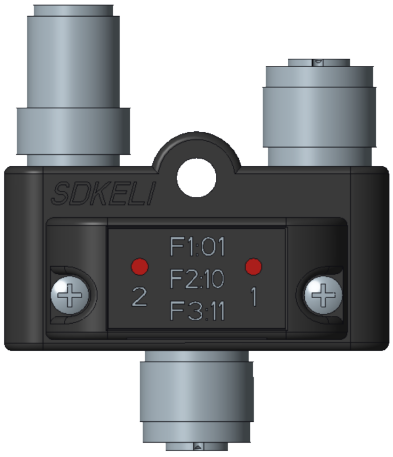


Fig 2.2.6 Panel Diagram

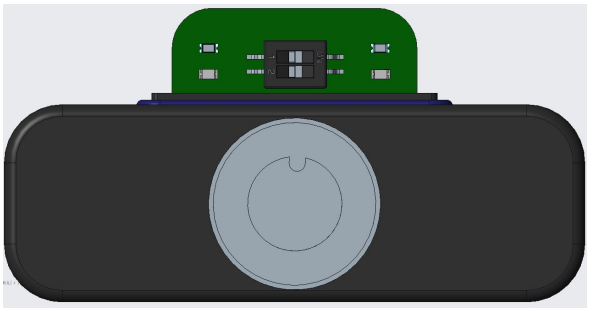


Fig 2.2.7 DIP Switch Diagram

Mapping Table of light curtain Position & Expansion Module DIP Switch：

F1:01	Subsidiary light curtain 1	Only DIP Switch 1 is set to ON; Indicator Light 2 is off, Indicator Light 1 is on.
F2:10	Subsidiary light curtain 2	Only DIP Switch 2 is set to ON; Indicator Light 2 is on, Indicator Light 1 is off.
F3:11	Subsidiary light curtain 3	Both DIP Switch 1 and 2 are set to ON; both Indicator Light 1 and 2 are on.

Note: The expansion module is factory-configured. Please refer to the label on the side of the expansion module.

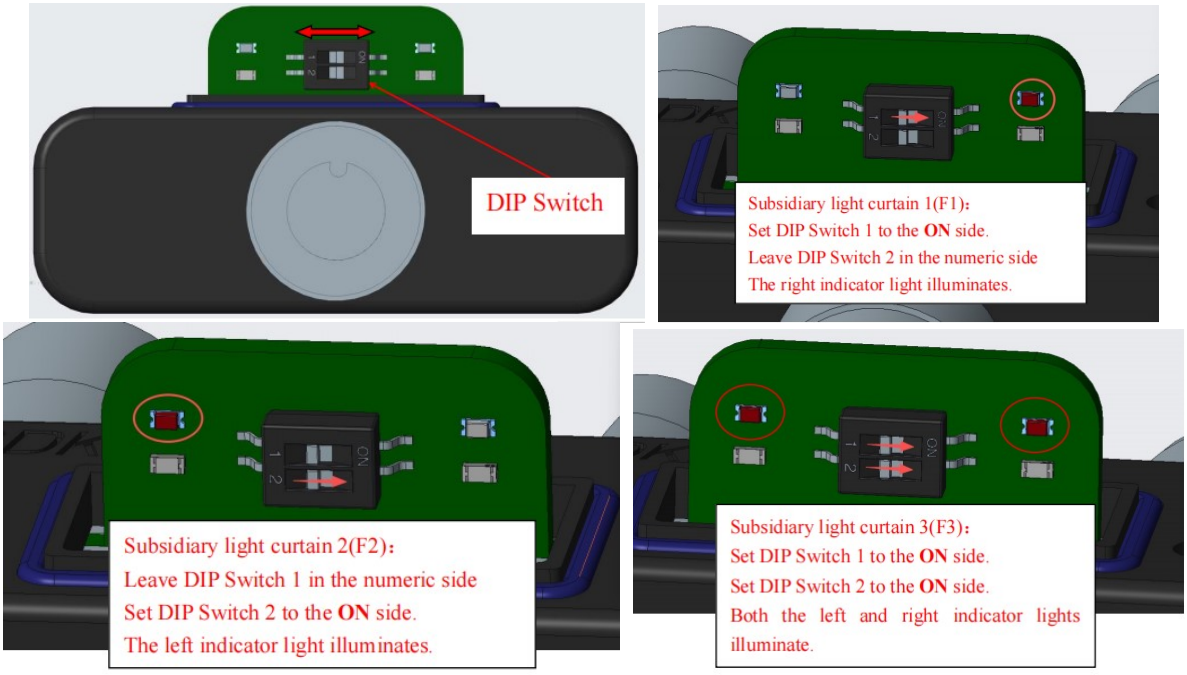


Fig 2.2.7 DIP Switch Operation Diagram

Finally, after completing the setup, refit the sealing cover of the cascading module and tighten the screws, then power on the device.

During operation, if you need to increase the number of cascaded units, follow the steps below:

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.Install a new slave safety light curtain and expansion module behind the last-stage safety light curtain.

2.Configure the expansion module.

3.Power the device off and on again after configuration; the settings will take effect immediately.

During operation, if you need to reduce the number of cascaded units (e.g., changing from 4 cascaded units to 3), follow the steps below:

1.Remove the last-stage safety light curtain and its corresponding expansion module.

2.Perform the following reset operations on the master safety light curtain:

(1) After disconnecting the black wire (or brown wire) in the transmission cables of the main safety light curtain emitter and receiver from the control circuit, short- circuit this wire to the 24V power supply..

(2) Power on the device, keep it powered for 2 seconds, then power it off.

(3) Disconnect the black wire (or brown wire) from the 24V power supply.

(4) Power the device on again; the safety light curtain will resume normal operation.

2.2.6 Host Computer Configuration Function

Communication with the host computer through an RS485 communication cable enables functions including fixed blanking and floating blanking.

Configuration Tools: Laptop computer (Windows 10/Windows 11 operating system), configuration software (Configure Tool V1.0.exe), and USB-to-RS485 converter module.

The configuration process is as follows:

(1) Hardware Wiring

Connect the blue wire (RS485A) of the CT6 safety light curtain to the RS485A port of the USB-to-RS485 converter module; connect the yellow wire (RS485B) of the CT6 safety light curtain to the RS485B port of the USB-to-RS485 converter module.

(2) Connection Establishment

After completing the hardware connection, launch the Configure Tool configuration software and follow the steps below to establish a connection.

First, select the corresponding serial port number and click the Open Serial Port button. Then select the correct device model and click the Establish Connection button. Upon successful connection, a "Connection Successful" prompt will appear in the lower-left corner of the software's status bar. The configuration interface is shown in Figure 2.3.9.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

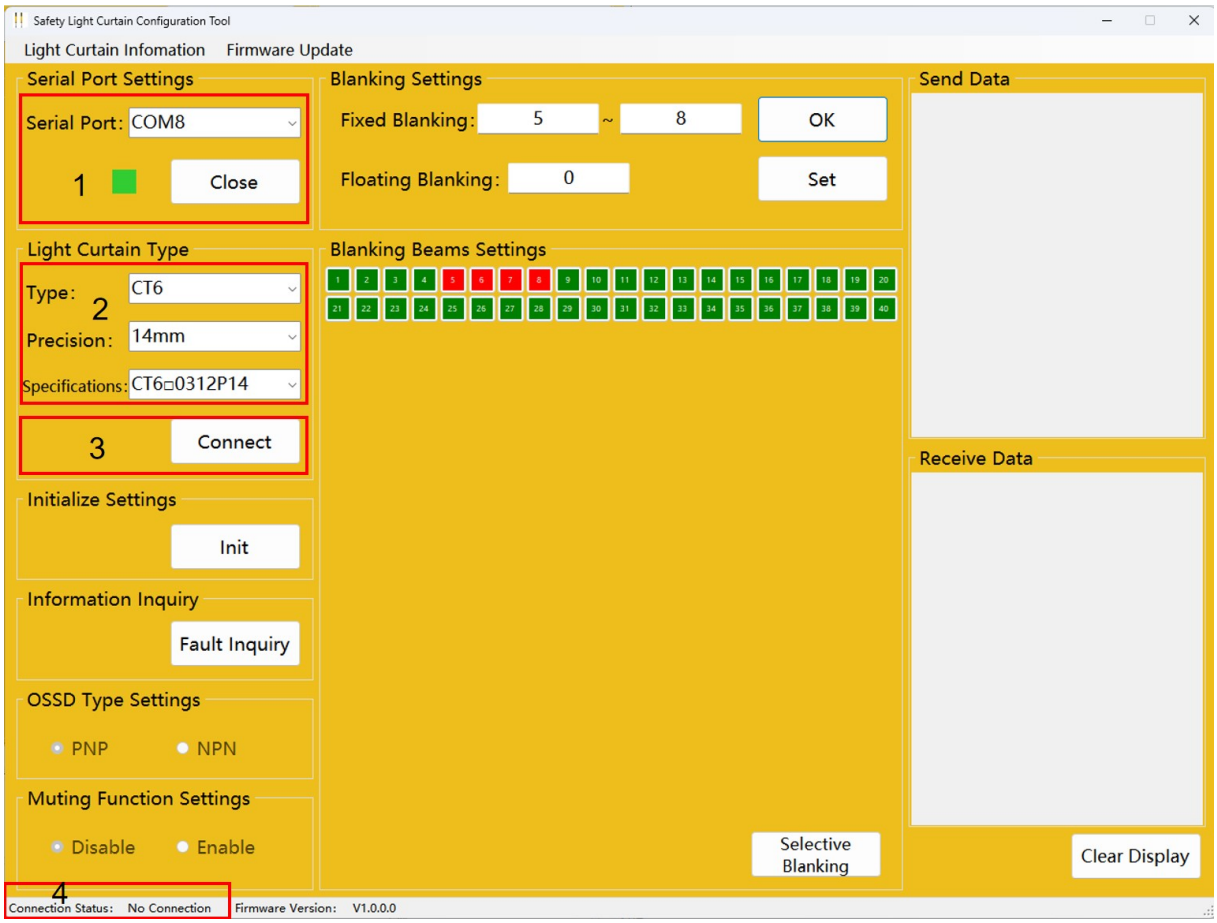


Figure 2.3.9 Host Computer Configuration Software Interface

(3) Function Configuration

- Initial Configuration

Click the Initial Configuration button and monitor the data transmission area and data reception area on the right. A valid data response indicates a successful configuration, and the safety light curtain will be restored to its factory default settings.

- Fixed Blanking Setting

In the blanking configuration function area, enter the start beam position and end beam position to be blanked, then click the OK button. The background color of the corresponding pre-blanked beam button in the blanked beam selection area will turn red. After confirming that the number of blanked beams is correct, click the Blanking Specified Beams button and monitor the data transmission and reception areas on the right. A valid data response indicates a successful configuration.

- Floating Blanking Setting

In the blanking configuration function area, enter the number of floating blanking channels, then click the Set Floating Blanking button and monitor the data transmission and reception areas on the right. A valid data response indicates a successful configuration.

- Information Query Function

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Click the Fault Query button in the information query function area and monitor the data transmission and reception areas on the right. A valid data response indicates that the fault information has been successfully queried.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Section3 Installation and wiring

Please read the warnings carefully before installing, to avoid faulty installation which may cause personal injury.

3.1. Installation requirements

! WARNING

- Make sure that the machine is OFF while installing, failure to do so may resulting in serious injury.
- Do not use this sensor for machines that cannot be stopped by electrical control. For example, do not use it for a pressing machine that uses a full-rotation clutch. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.
- Install the sensor system so that it is not affected by the reflective surface, otherwise, may affect the normal detecting function, resulting in serious injury.
- Do not use CT6 in flammable and explosive environment, otherwise, it may cause explosion.
- Make sure that foreign material such as water, oil, or dust does not enter the CT6 or the connector while the cap is removed.
- When using a wireless device such as a mobile phone or a radio transceiver near the product, make sure to check that the product is not affected by electromagnetic waves generated by the wireless device and that it can work normally.
- If this product is used in an air medium with heavy smoke or fine particles or a corrosive chemical, it may result in a decline in product quality.
- The CT6 cannot protect a person from an object flying from a hazardous zone. Install protective cover(s) or fence(s).

3.1.1 Detection zone and installation method

! WARNING

- Install a protective structure so that the hazardous part of a machine can only be reached by passing through the sensor's detection zone. Install the sensors so that part of the person is always present in the detection zone when working in a machine's hazardous zones.
- If a person is able to step into the hazardous zone of a machine and remain behind the CT6's detection zone, take some other measures to prevent the machine from being restarted. Failure to do so may result in serious injury.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Do not use the sensor system with mirrors in a retro-reflective configuration as shown in Fig3.1.1.1. Doing so may hinder the normal detection.

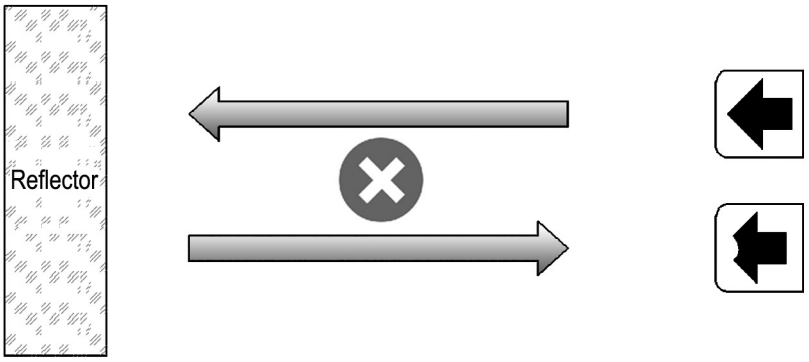


Fig 3.1.1.1 Reflector Constitutes a Schematic Diagram of the Transmitting System.

Correct installation

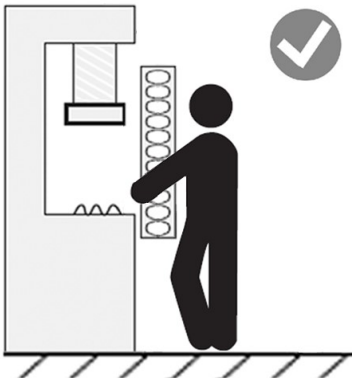


Fig 3.1.1.2 The hazardous zone of a machine can be reached only by passing through the sensor's detection zone.

Incorrect installation

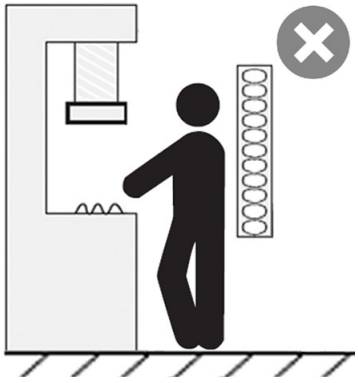


Fig 3.1.1.3 The operator is between the sensor's detection zone and the hazardous zone of a machine.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

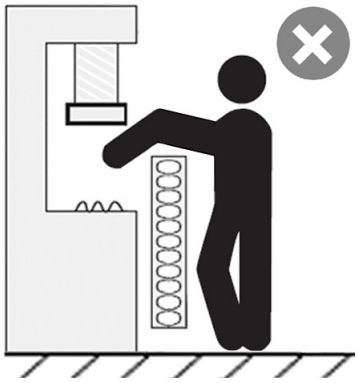


Fig 3.1.1.4 The operator can reach the hazardous zone of a machine through the upper zone to the sensor's detection zone(the ESPE is too low).



Fig 3.1.1.5 The operator can reach the hazardous zone of a machine through the lower zone to the sensor's detection zone(the ESPE is too high).

3.1.2 Safety distance

! WARNING

Make sure to secure the safety distance (S) between the CT6 and the hazardous part. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.

! CAUTION

The response time of a machine is the time period from when the machine receives a stop signal to when the machine's hazardous part stops. Measure the response time on the actual system. Also, periodically check that the response time of the machine has not changed.

The safety distance is the distance that must be set between the CT6 and a machine's hazardous part to stop the hazardous part before a person or object reaches it (as shown in Fig 3.1.2). The safety distance varies according to the standards of each country and the individual specifications of each machine. Always refer to the relevant standards.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

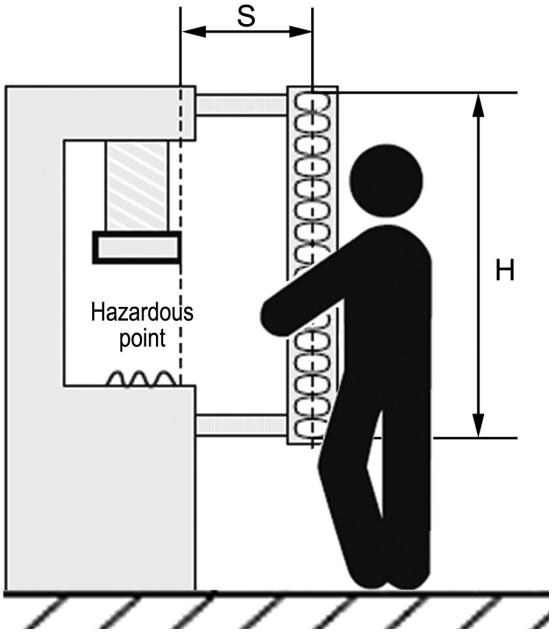


Fig 3.1.2 Safety Distance Diagram

Calculate the safety distance according to International Standard ISO 13855-2002 (European standard EN 999) (Reference)

If a person approaches the detection zone of the CT6 perpendicularly

S = K × T ＋ C . . . Formula (1)

•S: Safety distance

•K: Approach speed to the detection zone

•T: Total response time of the machine and CT6

•C: Additional distance calculated by the detection capability of CT6

(1) System that has detection capability of 40mm or less

Use K = 2,000mm/s and C = 8 x (d - 14mm) in formula (1)

for the calculation.

S = 2,000mm/s×(Tm＋Ts)＋8 × (d － 14mm)

• S = Safety distance (mm)

• Tm = Machine's response time (s)

• Ts = Response time of CT6 from ON to OFF (s)

• d = Detection capability of CT6(mm)

[Calculation example]

Tm = 0.29s, Ts = 0.02s, d= 14mm:

S= 2,000mm/s×(0.29s＋0.02s) ＋8 × (14mm － 14mm)

= 620mm . . . Formula (2)

If the result < 100mm, use S = 100mm.

If the result exceeds 500mm, use the following expression where K = 1,600mm/s.

S= 1,600mm/s × (Tm ＋ Ts) ＋ 8×(d － 14mm) . . . Formula (3)

So S= 496mm

If the result of this formula (3) < 500mm, use S = 500mm.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

(2) A system with larger detection capability than 40mm

Calculate by using Equation (1) with K = 1,600mm/s and C = 850mm:

S = 1,600mm/s × (Tm ＋ Ts) ＋ 850 . . . Formula (4)

• S = Safety distance(mm)

• Tm = Response time of the machine(s)

• Ts = CT6's response time from ON to OFF (s)

[Example]

Tm = 0.29s，Ts = 0.02s:

S = 1,600mm/s × (0.29s ＋ 0.02s) ＋ 850mm

= 1346mm

Calculate the safety distance according to American standard ANSI B11.19 (reference)

If a person approaches the detection zone of the F3SJ perpendicularly, calculate the safety distance as

shown below.

S = K × (Ts ＋ Tc ＋ Tr ＋ Tbm) ＋ Dpf

•S: Safety distance

•K: Approach speed to the detection zone(the value recommended by OSHA standard is 1,600mm/s)

Approach speed K is not specified in the ANSI B.11.19 standard. To determine the value of K to apply,

consider all factors, including the operator's physical ability.

•Ts = Machine's stopping time (s)

•Tr = Response time of CT6 from ON to OFF (s)

•Tc =Machine control circuit's maximum response time required to activate its brake (s)

•Tbm = Additional time (s)

If a machine has a brake monitor, "Tbm= Brake monitor setting time - (Ts + Tc)". If it has no brake

monitor, we recommend using 20% or more of (Ts + Tc) as additional time.

•Dpf = Additional distance

According to ANSI's formula, Dpf is calculated as shown below:

Dpf = 3.4 × (d － 7.0): Where d is the detection capability of CT6（unit: mm）

[Calculation example]]

K = 1,600mm/s, Ts + Tc = 0.07s, brake monitor setting time = 0.1s,

Tr = 0.02s, d = 14mm:

Tbm = 0.1 － 0.07 = 0.03s

Dpf = 3.4 × (14 － 7.0) = 23.8mm

S = 1,600 × (0.07 ＋ 0.02 ＋ 0.03) ＋ 23.8 = 215.8mm

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.1.3 Distance from reflective surfaces

WARNING

Install the sensor system so that it is not affected by reflective surfaces. Failure to do so may hinder the normal detection, resulting in serious injury.

Install the sensor system at distance D or further from highly reflective surfaces such as metallic walls, floors, ceilings, or workpieces, as shown in Fig 3.1.3.

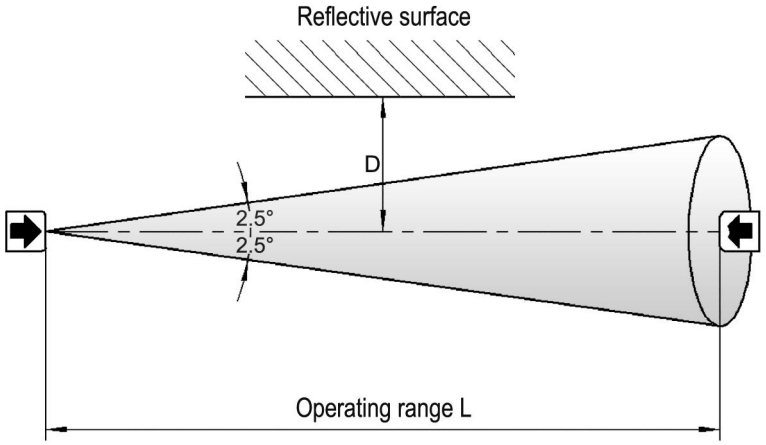


Fig 3.1.3 Reflector Distance Diagram

Distance between an emitter and a receiver (operating range L)	Allowable installation distance D
0 to 3m	0.13m
＞3m	L×tan2.5 ° = L×0.044 (m)

3.1.4 Mutual interference prevention

If several safety light curtains operate in close proximity to each other, the sender beams of one system may interfere with the receiver of another system, as shown in figure A.1. This can disrupt the protective function of the system. This would mean that the operator is at risk. You must avoid such mounting scenarios or take appropriate measures, e.g. by reversing the transmission direction of a system (figure A.2) or by mounting non reflective sight protection walls (figure A.3).

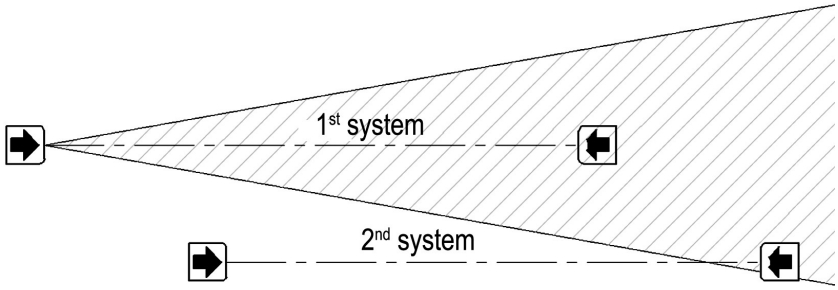


Figure A.1 Unwanted influencing of a 2nd system.
The receiver of the 2nd system is affected by the beams of the 1st

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

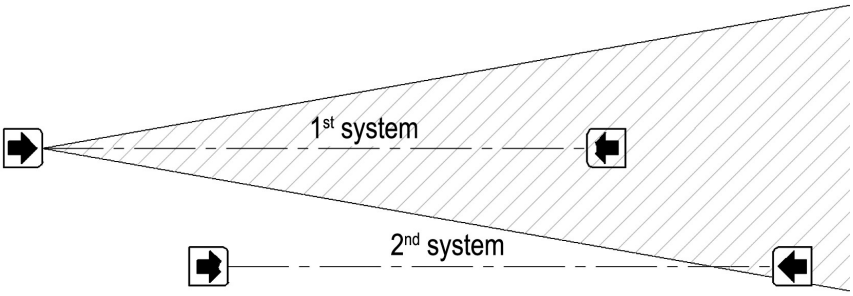


Figure A.2 Reversing the transmission direction of systems in close proximity.
The emitter of the 2nd system is not affected by the beams of the 1st system.

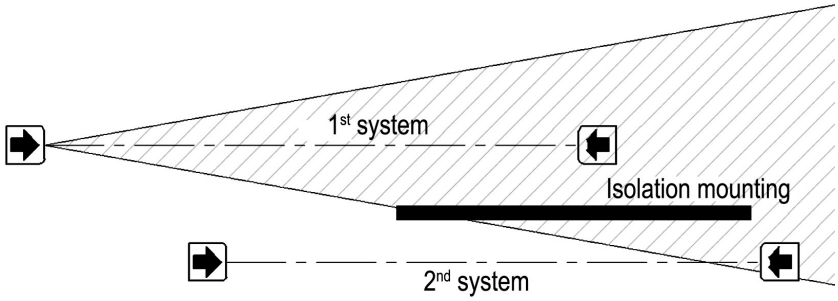


Figure A.3 Mounting non reflective sight protection wall
The emitter of the 2nd system is not affected by the beams of the 1st system.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

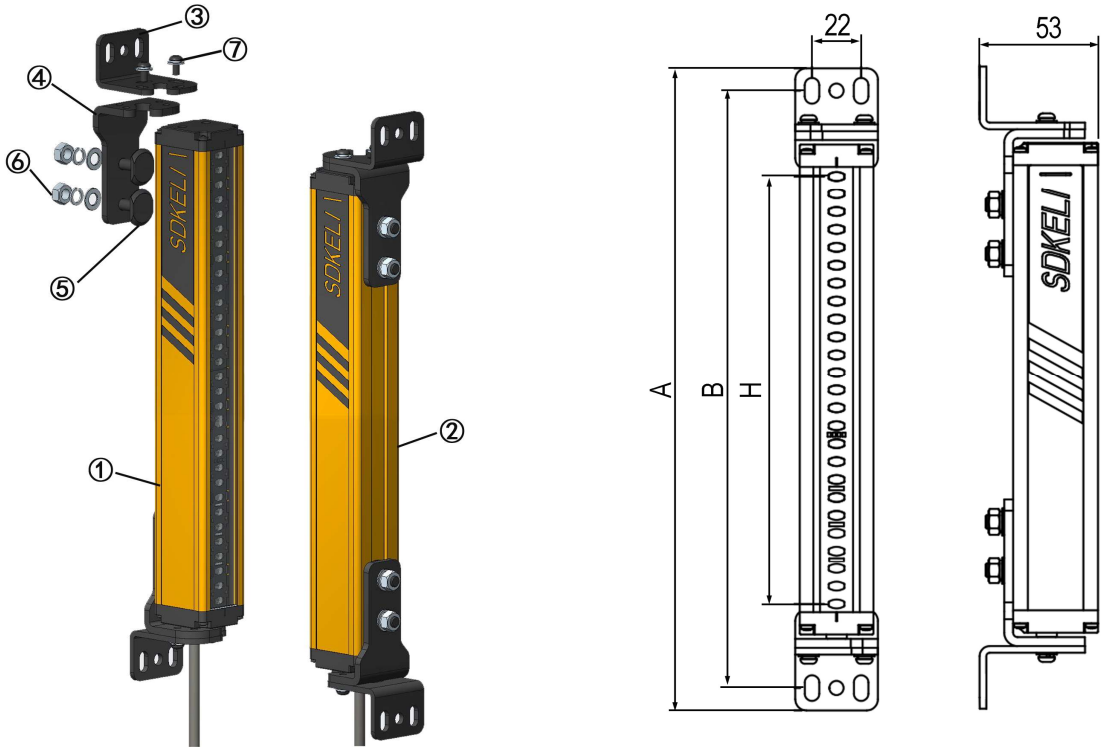
3.2. Installation

WARNING

- Install the emitter and receiver in parallel.
- Install the emitter and receiver so that their vertical direction should match.
- If the vibration of the work environment exceeds the specified value, other measures should be taken to reduce the vibration.
- Installation should strictly abide by the provisions of the safe distance. Refer to 3.1.2 about calculation of actual safety distance.
- The installation of CT6 should make sure that the hazardous part of a machine can not be reached by passing through the upper, lower and back side of the detection zone. And the installation position can not be changed after installed.
- Install a protective structure so that the hazardous part of a machine can only be reached by passing through the sensor's detection zone. Install the sensors so that part of the person is always present in the detection zone when working in a machine's hazardous zones. Failure to do so may result in serious injury.
- Make sure that the CT6 is securely mounted and its cables and connectors are properly connected.

3.2.1 Installation method

ZC mounting (ZC)——Common front mounting

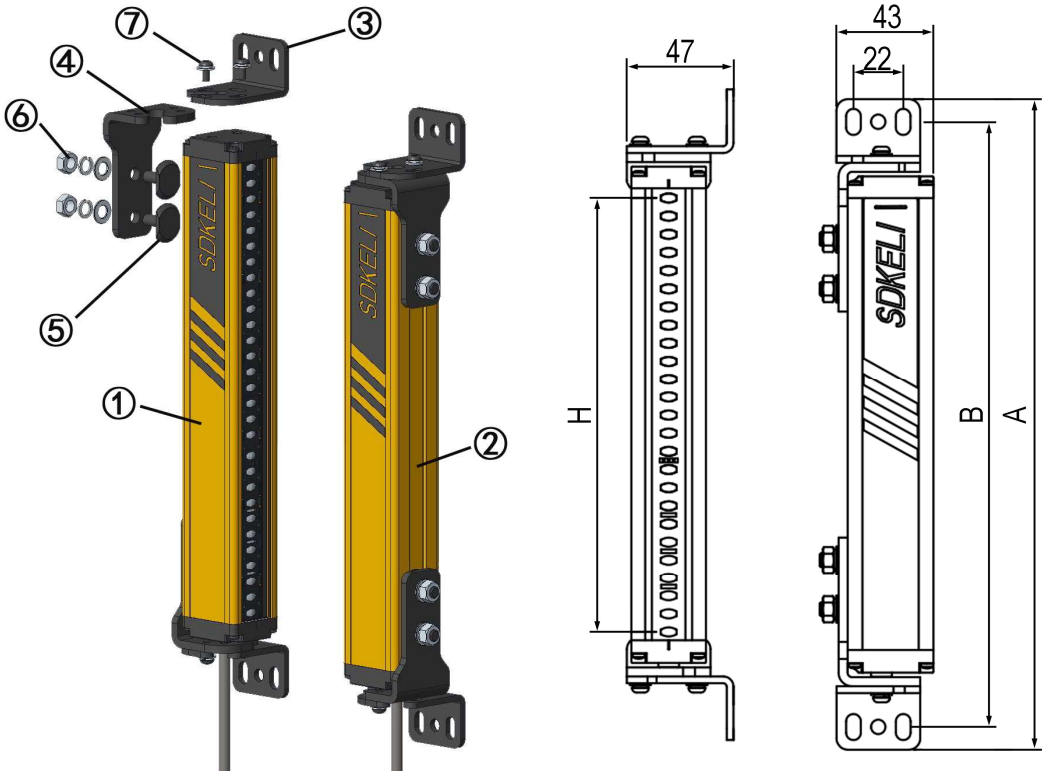


Common front mounting Dimensions

Fig 3.2.1.1 Common Front Mounting Diagram(ZC)

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

ZC mounting (ZC)——Common side mounting



Common side mounting Dimensions

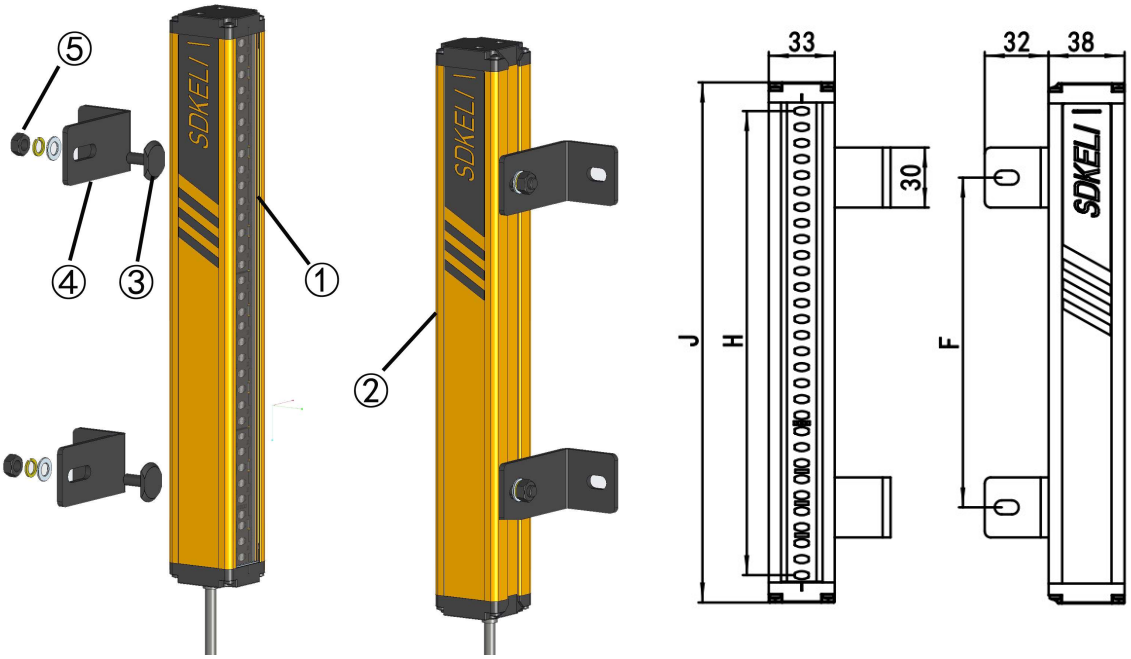
Fig 3.2.1.2 Common Side Mounting Diagram(ZC)

①Emitter ②Receiver ③Mounting brackets ④Rotating bracket ⑤T-bolt
⑥M6 hexagon nut with spring flat washer ⑦M4×8 socket head cap screws

H	Protective height (Refer to 1.7 Parameter table）
A	H＋92mm(Min.)
B	H＋72mm(Min.)

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

T-groove mounting (TC)



T-groove side mounting method Dimensions

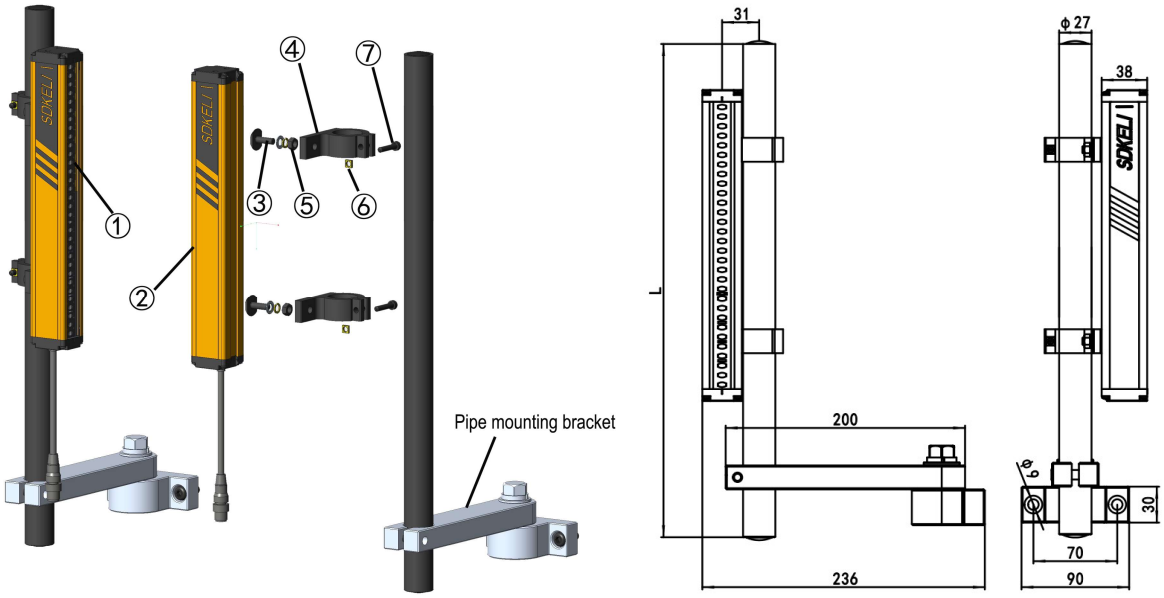
Fig 3.2.1.3 T-groove side mounting diagram(TC)

①Emitter ②Receiver ③T-bolt ④L-bend bracket
⑤M6 hexagon nut with spring flat washer

H	Protective height(Refer to 1.7 Parameter table）
J	Sensor length(Refer to 1.7 Parameter table）
F	J/2＜F＜J

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Pipe mounting (GC)

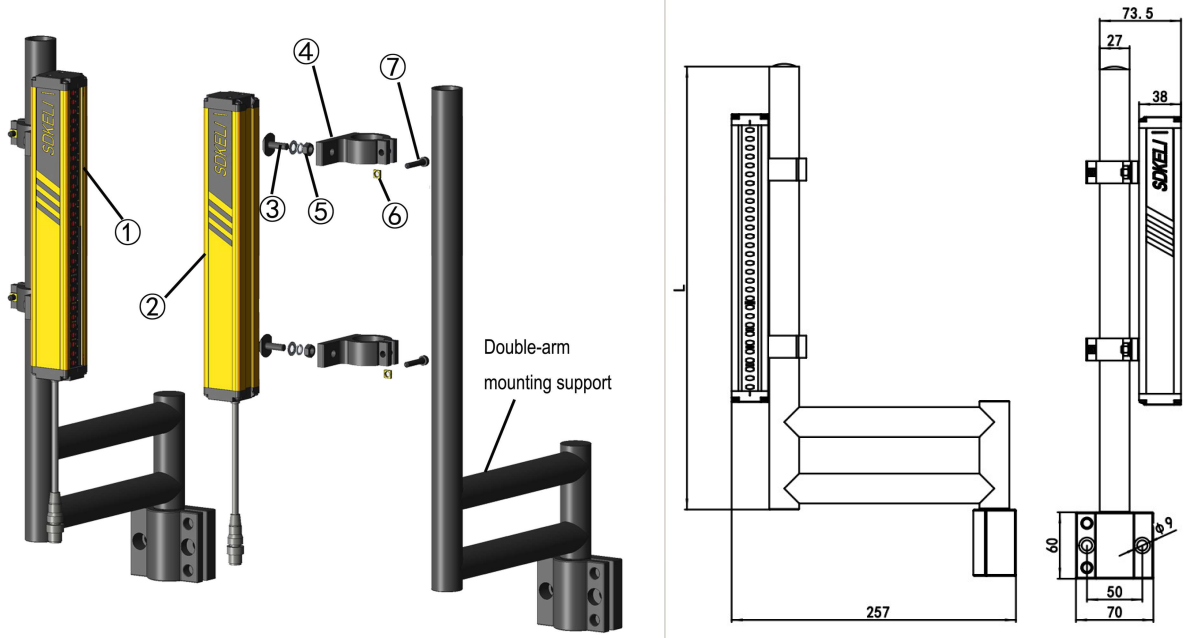


Pipe mounting method Dimensions

Fig3.2.1.4 Pipe mounting and Installation Diagram(GC)

①Emitter ②Receiver ③T-bolt ④Q-Pipe clamp ⑤M6 hexagon nut with spring flat washer ⑥M5 square nut ⑦M5×25 hexagon socket head cap screw with spring washer

Double-arm side mounting——T-groove (SCT)



Double-arm side mounting Dimensions

Fig3.2.1.5 Double-arm side mounting——T-groove(SCT)

①Emitter ②Receiver ③T-bolt ④Q-Pipe clamp ⑤M6 hexagon nut with spring flat washer ⑥M5 square nut ⑦M5×25 hexagon socket head cap screw with spring washer

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Scatter shield ZC mounting (FZC)

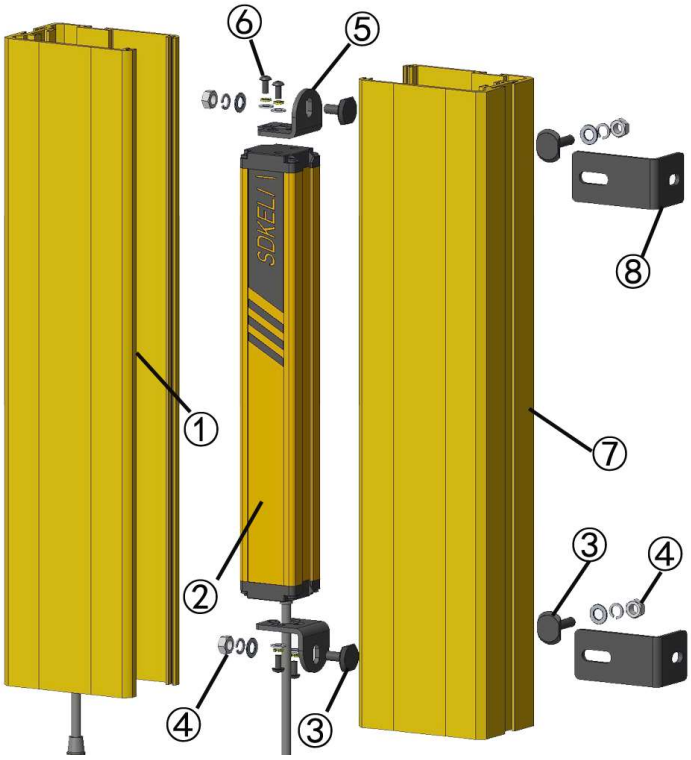


Fig 3.2.1.6 Scatter shield front mounting diagram

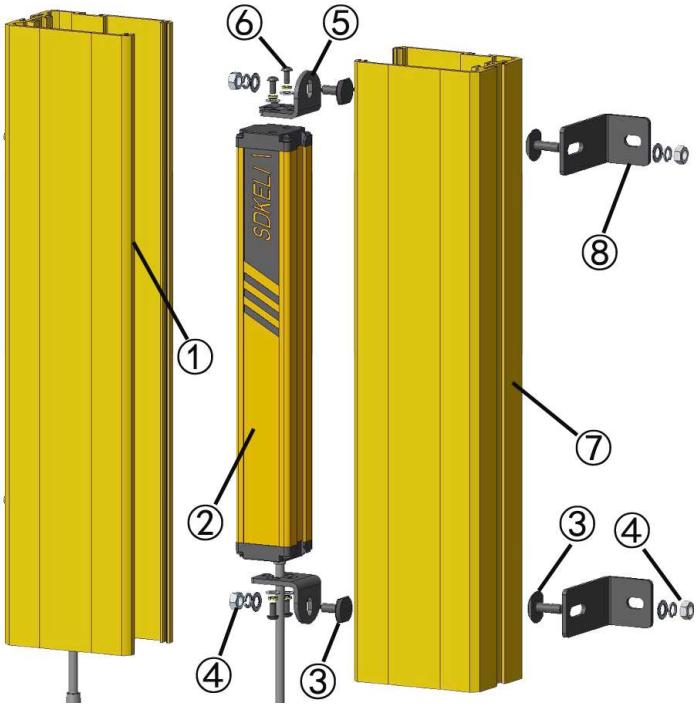


Fig 3.2.1.7 Scatter shield side mounting diagram

①Emitter ②Receiver ③T-bolt ④M6 hexagon nut with spring flat washer ⑤Mounting brackets ⑥M4×8 socket head cap screws ⑦Protection cover ⑧L-bend bracket

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Scatter shield pipe mounting(GF)

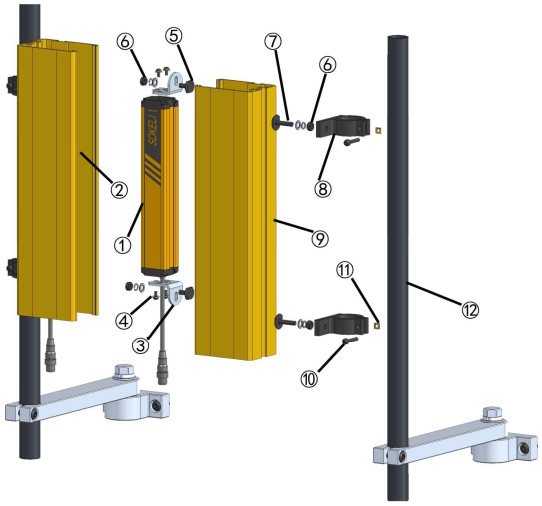


Fig 3.2.1.8 Scatter shield pipe mounting diagram(GF)

①Emitter ②Receiver ③Mounting brackets ④M4×8 socket head cap screws ⑤T-bolt（M6×14.5） ⑥M6 hexagon nut with spring flat washer ⑦T-bolt（M6×24） ⑧Q-clamp ⑥M5×25 socket head cap screws⑨Scatter Shield ⑩M5×25 hexagon socket head cap screw with spring washer ⑪M5 square nut ⑫Pipe mounting bracket

Scatter shield double-arm mounting (SF)

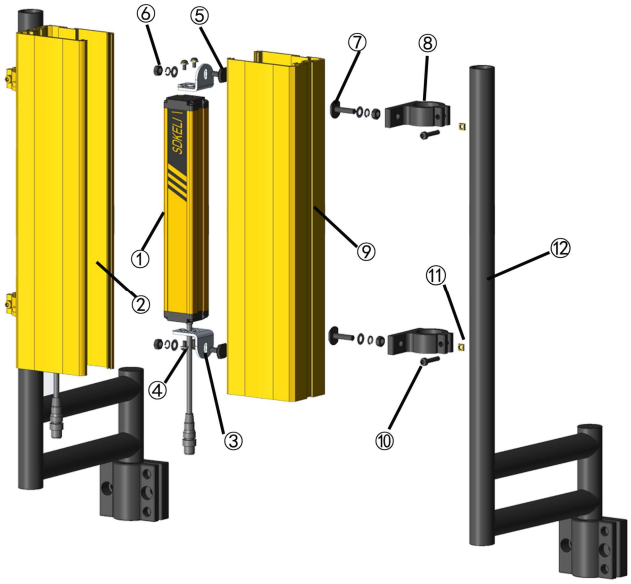


Fig3.2.1.9 Scatter shield double-arm mounting (SF)

①Emitter ②Receiver ③Mounting brackets ④M4×8 socket head cap screws ⑤T-bolt（M6×14.5） ⑥M6 hexagon nut with spring flat washer ⑦T-bolt（M6×24） ⑧Q-clamp ⑥M5×25 socket head cap screws⑨Scatter Shield ⑩M5×25 hexagon socket head cap screw with spring washer ⑪M5 square nut ⑪M5 square nut ⑫double-arm mounting bracket

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

※Warm prompt:

All of the above mounting methods (Except for pipe mounting bracket side mounting) need M6×16 inner hexagon screws (with Φ6 elastic/plain washers) to fix the brackets to the guarded machine.For side mounting of the pipe mounting bracket, M8 × 20 hexagon socket head screws (with spring washer) are required to fix the mounting bracket on the machine wall.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.3. Wiring

3.3.1 Precautions

WARNING

- Wiring when the power of CT6 is turned OFF
- Double or reinforced insulation must be applied between the input/output interface and dangerous voltage, otherwise may lead to electric shock.
- It is strictly forbidden to short-circuit between OSSDs and the power supply.
- The two OSSDs must be used together; otherwise it may reduce the safety of the system.
- Do not connect each line of CT6 to a DC power supply higher than 24V+20%. Also, do not connect to an AC power supply. Failure to do so may result in electric shock.
- The power supply of CT6 should not be higher than 24V±20%, otherwise it may affect the stability of the light curtain.
- While uses EDM function, short circuit between EDM and AUX is forbidden, otherwise, the EDM function is invalid.
- When replacing cable connectors with other types of connectors, connectors with IP67 or higher protection level should be used.
- Properly perform the wiring after confirming the signal names of all the terminals.
- Be sure to route the CT6 cable separate from high-potential power lines or through an exclusive conduit.
- Be sure to follow the relevant electrical codes, regulations, rules, and laws of the country or region where the product is used when wiring electrical wiring.

CAUTION

The emitter and the receiver should be powered on at the same time!
Floating signal wires must be individually insulated!
Optical communication code is selected via RS485A wiring; a power cycle is required when switching the optical communication code!

3.3.2 Power supply

WARNING

For CT6 light curtain, the DC power supply unit must satisfy all of the following conditions.

In order to ensure that the CT6 fulfills requirements of IEC 61496-1, the DC power supply must fulfill all of the following requirements:

- Must be within the rated power voltage (24V DC ± 20%)
- Fulfill requirements of load current
- Must comply with EMC directives (industrial environment)
- Double or reinforced insulation must be applied between the primary and secondary circuits
- Output holding time must be 20ms or longer when the supply voltage fluctuates or drops

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- The output current is bigger than 1A, with automatic recovery of overcurrent protection characteristics
- The power supply must have output overvoltage and overcurrent protection function
- Overcurrent protection is realized by the resettable fuse (PPTC) inside of the CT6 light curtain, external power supply must have overcurrent protection function to prevent input current to be greater than 1.5A
- Must comply with laws and regulations, regarding EMC and electrical equipment safety, of the country or region where the CT6 is used (Ex: In EU, the power supply must comply with the EMC Directive and the Low Voltage Directive.)

3.3.3 Wiring steps

! WARNING

When extending the communication line with a cable other than the dedicated cable, use a cable with the same or superior specifications, and don't make it exceed the specified maximum length, failure to do so may affect the stability of CT6.

Wiring steps:

1) Connect the emitter's cable to the emitter (8 core)
2) Connect the receiver's cable to the receiver (8 core)
3) Wiring according to the basis of the functional requirements.

3.3.4 Wiring of the emitter's cable and the emitter

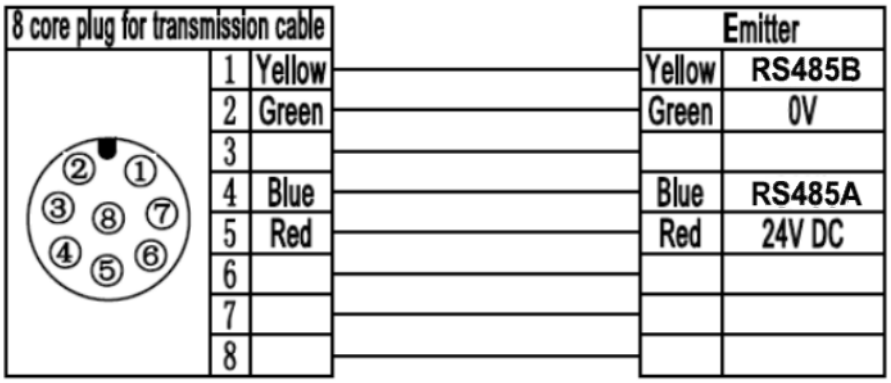


Fig 3.3.4 Wiring Diagram of the Emitter's Cable and the Emitter

3.3.5 Wiring of the receiver's cable and the receiver

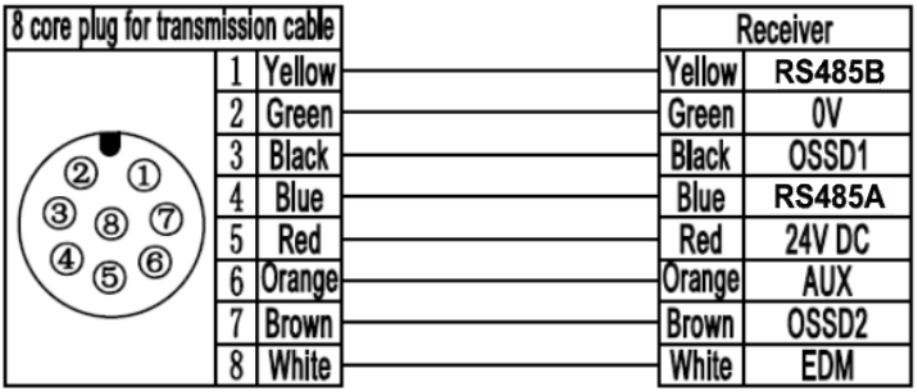
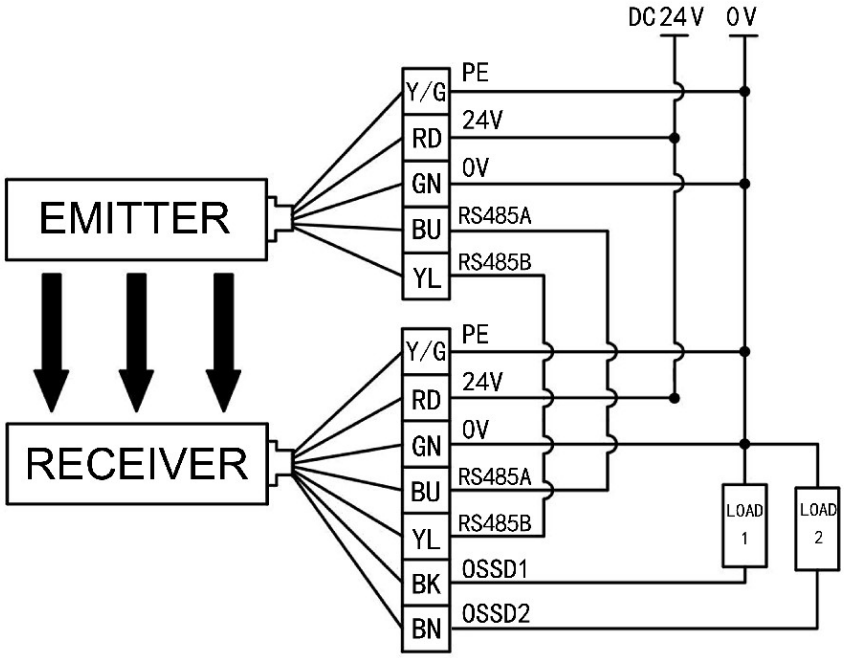


Fig 3.3.5 Wiring Diagram of the Receiver's Cable and the Receiver

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.3.6. G type, line synchronization mode

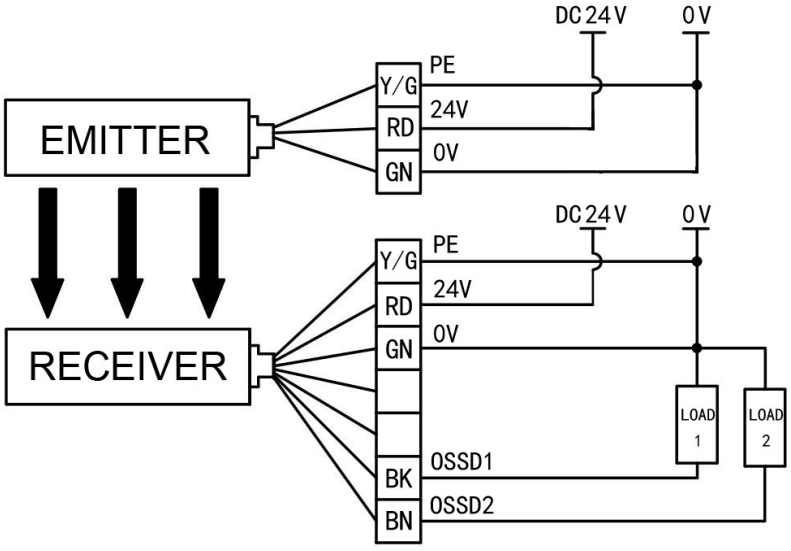


Load 1, load 2: relay or other equipment to control dangerous parts of the machine;

Load 3: Load or PLC (for monitoring). When load 3 is not used, CT6 light curtain can work normally.

3.3.7. G type, optical synchronization mode, Optical communication coding 1

When the EDM function is not used, the EDM and AUX signals need to be short-circuited. The wiring method is as shown below.

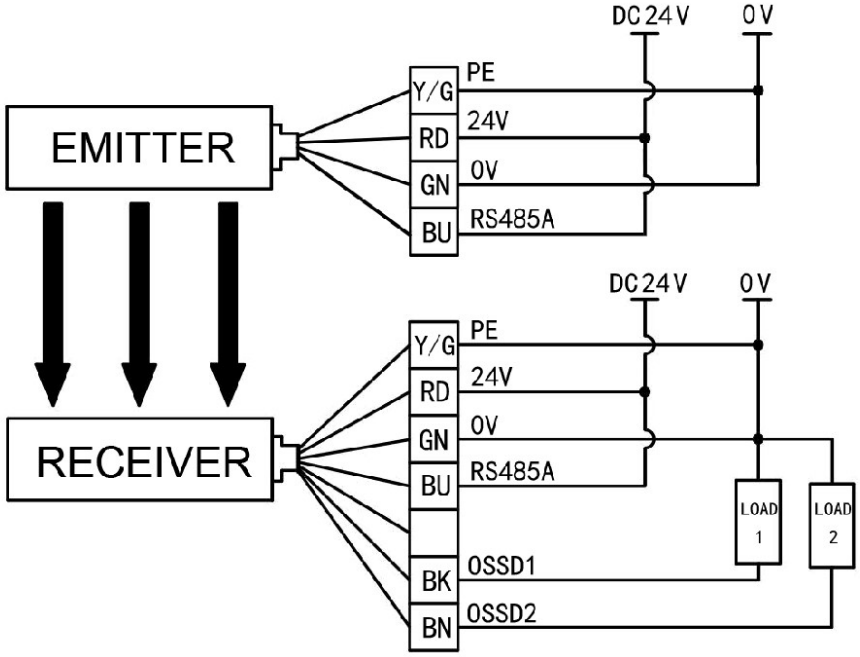


Load 1, load 2: relay or other equipment to control dangerous parts of the machine;

Load 3: Load or PLC (for monitoring). When load 3 is not used, CT6 light curtain can work normally.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

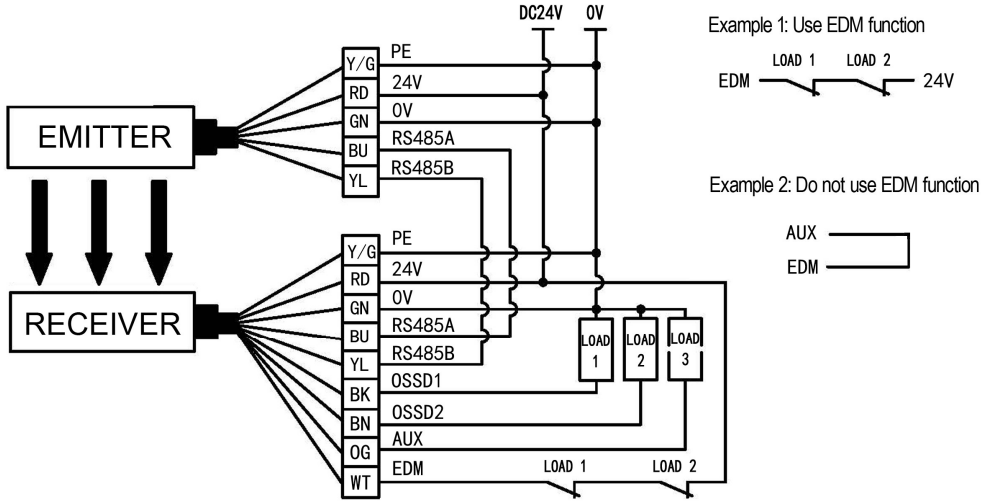
3.3.8. G type, optical synchronization mode, Optical communication coding 2



Load 1, load 2: relay or other equipment to control dangerous parts of the machine;

Load 3: Load or PLC (for monitoring). When load 3 is not used, CT6 can work normally.

3.3.9. M type, line synchronization mode

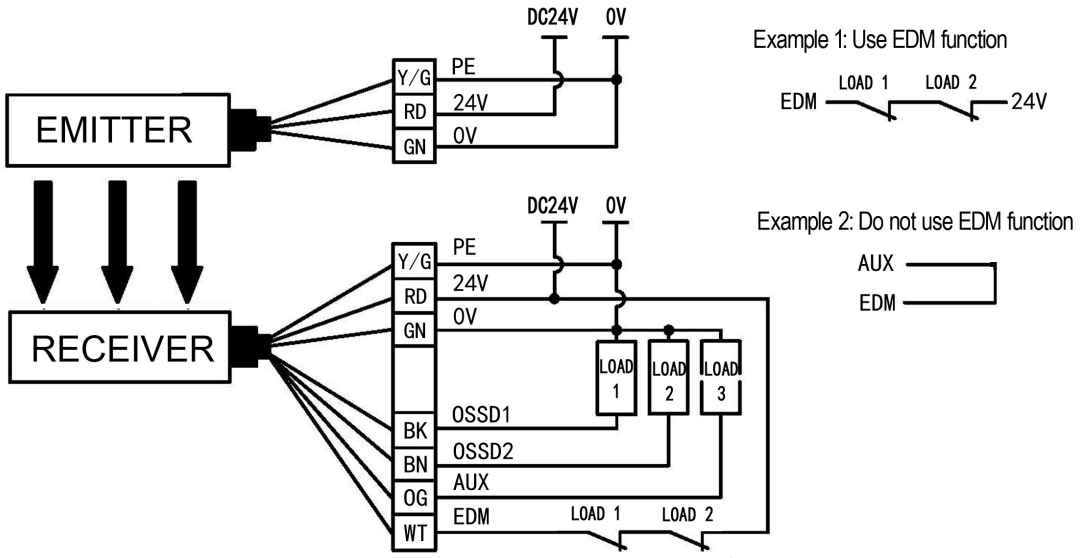


Load 1, load 2: relay or other equipment to control dangerous parts of the machine;

Load 3: Load or PLC (for monitoring). When load 3 is not used, CT6 light curtain can work normally.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

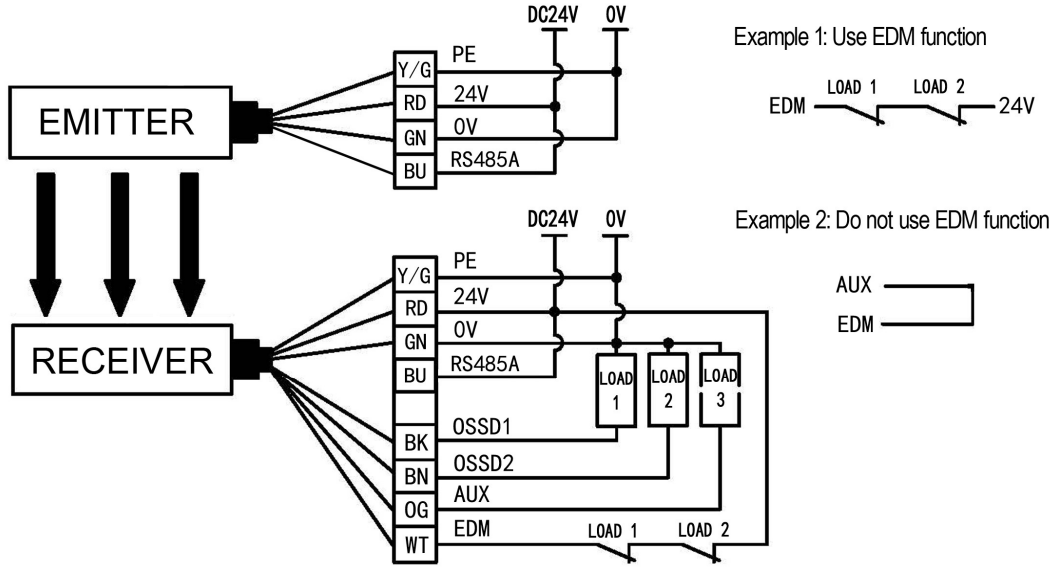
3.3.10. M type, optical synchronization mode, Optical communication coding 1



Load 1, load 2: relay or other equipment to control dangerous parts of the machine;

Load 3: Load or PLC (for monitoring). When load 3 is not used, CT6 light curtain can work normally;

3.3.11. M type, optical synchronization mode, Optical communication coding 2



Load 1, load 2: relay or other equipment to control dangerous parts of the machine;

Load 3: Load or PLC (for monitoring). When load 3 is not used, CT6 light curtain can work normally;

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Section4 Check and debugging

WARNING

Make sure to test the operation of CT6 after installation to verify that CT6 operates as intended. Make sure to stop the machine until the test is complete. Unintended function settings may cause a person to go undetected, resulting in serious injury.

After installation, the highest level administrator must use the following checklist to verify the operation, placing a check mark in each of the boxes.

4.1. Installation condition check

☐ The machine itself does not prevent the operation of safety functions such as stopping.

☐ The hazardous part of a machine cannot be reached without passing through the detection zone of CT6.

☐ CT6 can always detect a worker who is working in the hazardous zone.

☐ Safety distance has been calculated. Calculated distance: S =____mm.

☐ The actual distance is equal to or greater than the calculated distance. Actual distance =__ mm.

☐ Reflective objects are not installed in prohibited zones.

☐ It can't be used in flammable or explosive atmosphere.

4.2. Wiring check before power is turned on

☐ Power supply unit must be dedicated to CT6. It must have tolerance against total rated current of devices if it is connected to multiple devices.

☐ The power supply unit is a 24V DC unit that conforms to the EMC Directive, Low-voltage Directive, and output holding specifications.

☐ The power supply polarity is not connected in reverse.

☐ Emitter/receiver cables are properly connected to the respective emitters/receivers, and the signal cables are connected correctly.

☐ Double insulation or reinforced insulation is used between I/O lines and the hazard potential (dangerous power supplies, etc.).

☐ Loads are not connected to the 24V DC line.

☐ OSSDs are not short-circuited to 24V DC line.

☐ All lines are not connected to dangerous power source.

☐ Specification of emitter and receiver must be the same.

☐ When 2 or more sets of CT6 are used, mutual interference prevention measures are taken.

☐ AUX can not be used as safety output.

☐ Power supply's 0V and the shielding layer must be grounded.

☐ Use transmission cables prepared by KELI, and the length of the cables can't exceed the specified value.

☐ Neither connectors nor terminals can be loose.

☐ Cables must not be bent, cracked, or damaged. The cables in the connector end should be relaxed to avoid damaging the connectors.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4.3. Operation check while the machine is stopped

☐ The diameter is consistent with the detection capability of CT6.

When the test rod enters into the detection zone, CT6 light curtain retains light-shaded state; after the test rode leaves the detection zone, the light curtain turns into light-passing state.

Move the test rod slowly through the protective field to be tested, as shown in figure ①, the red OFF-state indicator on the receiver is on.

Then move the test piece along the edges of the protective field, as shown in figure ②, the red OFF-state indicator on the receiver is on. Remove the test piece, the green ON-state indicator on the receiver is on.

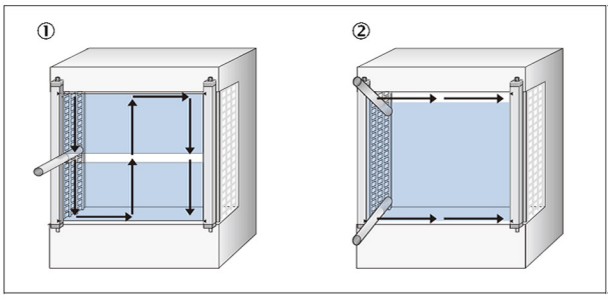


Fig 4.3 Schematic Diagram of the Test Method of the Test Piece in the Detection Area

☐ When use EDM function, if CT6 light curtain is in light-shaded state and the input of the external device is OFF, the system turns into lockout state.

4.4. Checking that hazardous parts stop while the machine operates

☐ The hazardous parts stop immediately when a test piece is inserted into the detection zone at 3 positions: "directly in front of the emitter", "directly in front of the receiver", and "between the emitter and receiver". (Use the appropriate test piece.)

☐ The hazardous parts remain stopped as long as the test piece is in the detection zone.

☐ The hazardous parts stop when the power of CT6 is turned OFF.

☐ The actual response time of the whole machine is equal to or less than the calculated value.

! WARNING

- For presses on which the slide can stop at any point in one stroke, the braking must not have any failure!
- For presses which can only realize upper dead point protection, the machine tool can not have the clutch failure!
- If the braking is at fault, the guarded machine must be repaired!
- If the braking of guarded machine is at fault, the CT6 can not protect the operator.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Section5 Maintenance

WARNING

- Perform daily and 6-month inspection for CT6. Otherwise, the system may fail to work properly, resulting in serious injury.
- Do not try to disassemble, repair, or modify this product. Doing so may cause the safety functions to stop working properly.

CAUTION

Hot plugging for the connectors of CT6 is forbidden!

To ensure safety, keep a record of the inspection results. When the user is a different person from those who installed or designed the system, he/she must be properly trained for maintenance.

5.1. Inspection at startup and when changing operators

☐ There is no approach route other than through the detection zone of CT6.

☐ Part of the operator's body always remains in the detection zone of CT6 when working around the machine's hazardous part.

☐ The actual safety distance is equal to or greater than the calculated value.

☐ Reflective objects are not installed in prohibited zones.

☐ There must be no dirt on nor damage to the optical surface.

☐ The test piece is not deformed, fulfills requirements of the detection capability.

☐ When the power of CT6 is turned ON while nothing is in the detection zone, it must output light-passing state in 1s.

☐ The light curtain retains light-shaded state while the test piece is moved around in the detection zone according to 4.3.

☐ When use EDM function, if CT6 light curtain is in light-shaded state and the input of the external device is OFF, the system turns into lockout state.

5.2. Inspection for the guarded machine

☐ The hazardous parts are movable when nothing is in the detection zone.

☐ The hazardous parts stop immediately when a test piece is inserted into the detection zone.

☐ The hazardous parts remain stopped as long as the test piece is in the detection zone.

☐ The hazardous parts stop when the power of the CT6 is turned OFF while nothing is in the detection zone.

☐ The machine itself does not prevent the operation of safety functions such as stopping.

5.3. Items to inspect every 6 months or when machine settings are changed

In addition to inspection items in 4.1 and 4.2, following items must also be verified.

☐ The outputs of CT6 and the machine are properly wired.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

☐ The total number of times that the control relays/contactors have switched is significantly lower than their design lives.

☐ There is no interference light.

☐ Power supply's 0V must be grounded.

☐ The cables must not be bent, cracked, nor damaged.

☐ CT6 is fixed fasten, no loose.

☐ The changing of machine setting affects the safety of the control system.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Section6 Troubleshooting

WARNING

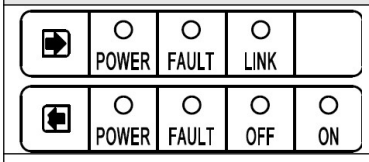
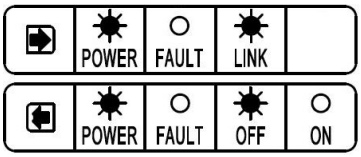
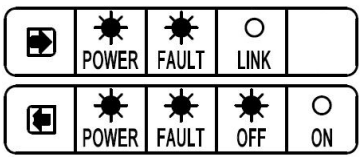
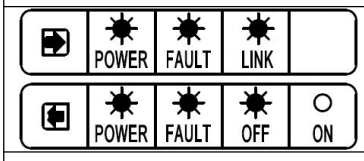
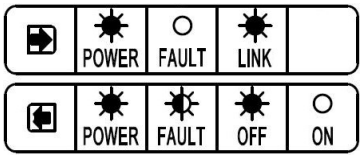
Do not try to disassemble, repair, or modify this product. Otherwise may cause the safety functions to stop working properly.

CAUTION

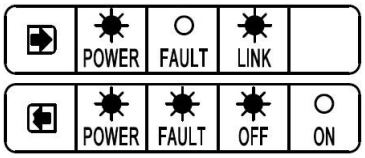
While in operation, the power supply's 0V and the shielding layer must be grounded!

6.1. Fault state

If an error is detected, the CT6 enters lockout state, keeps the OSSDs in OFF-state. When the OSSDs, EDM signal lines are wired incorrectly or the receiver detects optical interference, the receiver's fault indicator flashes. When other faults are detected, the red fault indicator is always on. For faults caused by incorrect wiring, after the fault is removed, the system automatically removes the fault state.

Phenomenon	Cause	Result	Solution
	No working power	OSSD1 and OSSD2 are turned off.	Check and repair the electric circuit or replace the power supply
	Bad for light	OSSD1 and OSSD2 are turned off.	Restart the machine
	Dirty surface	OSSD1 and OSSD2 are turned off.	Clean the surface
	Emitter or Receiver fault	OSSD1 and OSSD2 are turned off.	Replace the emitter or Receiver with a same specification one
	Communication fault	OSSD1 and OSSD2 are turned off.	Check and repair the electric circuit or replace the power supply
	Emitter fault	OSSD1 and OSSD2 are turned off.	Replace the emitter or Receiver with a same specification one
	Emitter fault	OSSD1 and OSSD2 are turned off.	Replace the emitter with a same specification one
	Check that there is interference light in the detection zone	OSSD1 and OSSD2 are turned off.	Eliminate interference source
	Short circuit between OSSD and other signals	OSSD1 and OSSD2 are turned off.	Check and repair the electric circuit
	When use EDM function, the response time of the external device delay	OSSD1 and OSSD2 are turned off.	Replace the external device

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

	or failure.		
	Fault of the receiver	OSSD1 and OSSD2 are turned off.	Replace the receiver with a same specification one
	Check that there is interference light in the detection zone	OSSD1 and OSSD2 are turned off.	Eliminate interference source
	Supply voltage drops below the specified value or lack of supply current	OSSD1 and OSSD2 are turned off.	Replace the power supply
	Fault of the receiver	OSSD1 and OSSD2 are turned off.	Replace the receiver with a same specification one

☀ : ON ○ : OFF ☀ FLASH

6.2. Fault of brake system of the machine

Phenomenon	Cause	Solution
The CT6 type safety light bar indicator is normal and the device does not work.	The electric circuit of guarded machine connected with OSSD short circuit or wrong connected	Check and repair the electric circuit of guarded machine connected with OSSD
	Electric failure of guarded machine	Check and repair electric circuit of guarded machine
The CT6 type safety light indicator is converted to normal, the safety light curtain is blocked, and the equipment cannot be stopped.	Electric failure of guarded machine	Check and repair electric circuit of guarded machine
	The braking of guarded machine is at fault.	Check the guarded machine
The CT6 safety light barrier indicator is switched to normal, the safety light curtain is blocked, and the device cannot stop immediately.	The clutch of guarded machine is at fault	Check the guarded machine

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Section7 Version

Version	Date	Modification
V1.0	2025-07	

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Special dealers within the EC

Please visit the company website：
www.sdkeli.com

TEL: 86-537 2168110 **FAX: 86-537 2331667**
WEB: *www.sdkeli.com* **Service Tel: 400 666 0416**
ADD: Building E2, Laser Research Institute Park, No. 46 Haichuan Road, High-tech Zone, Jining City, Shandong Province 272000, P.R. China

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000