Embedded AmplifierPhoto Sensors

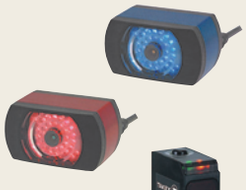
- ASG Series
- UM2 Series
- GN Series
- UM Series
- Mini-G Series
- VS Series
- GA Series
- Middle-G Series
- NT Series
- CX Series
- DLZ Series
- GM Series
- LD-M/LD-S Series
- LD Series
- PF Series
- GA/NES Series
- NAL Series
- NE-DC Series
- NEF Series
- PU/AS Series

Embedded AmplifierPhoto Sensors

List of models

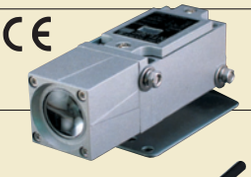
Type	Series	Appearance / Shape (typical example)	Detection method	Model	Detecting distance		See page
Glass detection	ASG		Diffuse-reflective type	ASG-S20R	20mm		170
			Limited reflection type	ASG-Z15R	3～15mm		
Ultra Miniature	UM2		Through-beam type	UM2-T15DT	150mm		172
				UM2-T15DTV			
				UM2-T50DT	500mm		
				UM2-T50DTV			
				UM2-T50DS			
				UM2-T50DSV			
			Limited reflection type	UM2-Z3SV	5～30mm		
				UM2-Z3DSV			
Compact/for built-in use	GN		Through-beam type	GN-T10RS	10m		178
				GN-T10RS-J			
			Polarization reflector type	GN-M2RS	0.03～1.3m		
				GN-M2RS-J			
			Diffuse-reflective type	GN-R40RS	400mm		
				GN-R40RS-J			
Ultra Miniature	UM		Through-beam type	UM-T15DT	150mm		184
				UM-T15DTV			
				UM-T50DT	500mm		
				UM-T50DTV			
				UM-T50DS			
				UM-T50DSV			
				UM-T100DT	1m		
				UM-T100DS			
			Diffuse-reflective type	UM-R3T	2～30mm		
				UM-R3TV			
				UM-R5T	2～50mm		
				UM-R5TV			
			Limited reflection type	UM-Z3SV	5～30mm		

List of models

Type	Series	Appearance / Shape (typical example)	Detection method	Model	Detecting distance		See page
Side-on	UM		Through-beam type	UM-T50DNS	500mm		188
				UM-T50DNSV			
				UM-T50NS			
				UM-T50NSV			
Ultra compact/for embedded use	Mini-G		Through-beam type	GT1SN	1m		190
				GT1N			
				GT3N	7m		
				GT3RSN	10m		
				GT7SN	7m		
			Reflective type	GSM2RSN	0.01～2m		
			Diffuse-reflective type	GS5SN	70mm		
				GS5N			
				GS20RSN	400mm		
				GS20RN	300mm		
				GS20SN	300mm		
				GS20N	200mm		
			Limited reflection type	GSZ3SN	1～40mm		
				GSZ3RSN	3～30mm		
Compound-eye	VS		Diffuse-reflective type	VS-S20R	80～200mm		196
				VS-S20B			
				VS-S50RNF	100～500mm		
				VS-S50BNF			
Self-teaching	GA		Polarization reflector type	GA-M3R	3m		202
			Diffuse-reflective type	GA-S05R	500mm		

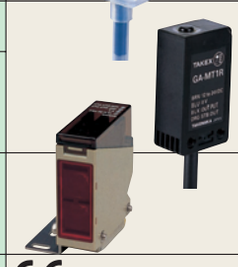
Embedded AmplifierPhoto Sensors

List of models

Type	Series	Appearance / Shape (typical example)	Detection method	Model	Detecting distance		See page
Compact/for embedded use	Middle-G		Through-beam type	GT5RSN	7m		210
				GT5RSN-J			
				GT5RN			
				GT5RN-J			
			Polarization reflector type	GMR2RSN	0.3～1.5m		
				GMR2RSN-J			
				GMR2RN			
				GMR2RN-J			
			Diffuse-reflective type	GSR05RSN	500mm		
				GSR05RSN-J			
				GSR05RN			
				GSR05RN-J			
			Limited reflection type	GSZ5RS	20～50mm		
				GSZ5RS-J			
				GSZ5R			
				GSZ5R-J			
Die-cast	NT		Through-beam type	NT30F	30m		216
Cylindrical	CX		Through-beam type	CXT8	3m		220
			Polarization reflector type	CX-M2RD	2m		
			Diffuse-reflective type	CX-R01	100mm		
				CX-R03V	300mm		

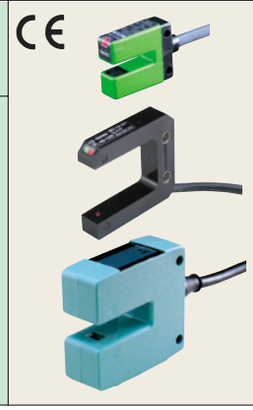
Embedded AmplifierPhoto Sensors

List of models

Type	Series	Appearance / Shape (typical example)	Detection method	Model	Detecting distance		See page
PCB detection	DLZ		Limited reflection type	DLZ-S30(D)	10～30㎜		224
PCB detection	GM		Limited reflection type	GM-S/Z	50㎜		226
Red laser	LD-M LD-S		Polarization reflector type	LD-M10R	3～15m		228
Red laser	LD-M LD-S		Diffuse-reflective type	LD-S20R	80～300㎜		228
Red laser	LD		Through-beam type	LD-T20R	20m		234
Red laser	LD		Through-beam type	LD-T20R-C1	20m		234
Red laser	LD		Reflective type mark sensor	LD-S33R	200～400㎜		234
Resistance chemicals	PF		Through-beam type	PF-T3DS(S)	3m		240
Resistance chemicals	PF		Diffuse-reflective type	PF-R03S(DS)	300㎜		240
Transparent objects	GA		Reflector type	GA-MT1R	1m		244
Transparent objects	NES		Polarization reflector type	NES-MT1	0.2～1m		248
Transparent objects	NES		Polarization reflector type	NES-MT1D	0.2～1m		248
Polarization	NAL		Polarization reflector type	NAL-M10RTC	0.5～10m		250
For logistics facilities	NE-DC		Through-beam type	NE-T10RD-DC	10m		254
For logistics facilities	NE-DC		Through-beam type	NE-T30D-DC	30m		254
For logistics facilities	NE-DC		Polarization reflector type	NE-M5RD-DC	0.03～5m		254
For logistics facilities	NE-DC		Diffuse-reflective type	NE-R10-DC	1m		254
For logistics facilities	NEF		Through-beam type	NEF-T10RD	10m		258
For logistics facilities	NEF		Polarization reflector type	NEF-M5RD	0.03～5m		258
For logistics facilities	NEF		Diffuse-reflective type	NEF-R50	1m		258

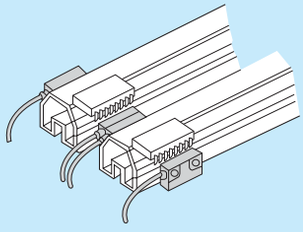
Embedded AmplifierPhoto Sensors

List of models

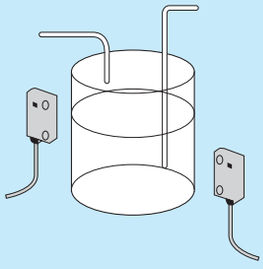
Type	Series	Appearance / Shape (typical example)	Detection method	Model	Detecting distance		See page
U-shaped (address sensor)	PU		Through-beam type (U-shaped)	**PU5**	5mm fixed		260
				PU10	10mm fixed		
	AS			**AS-U20**	19mm		
				AS-U20D			
				AS-U25	25mm fixed		
				AS-U25D			
				AS-U30	30mm fixed		
				AS-U30D			

Applications

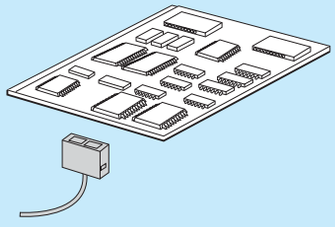
- Detection of ICs in transparent package



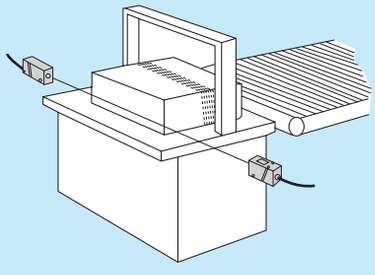
- Checking amount of remaining resist liquid



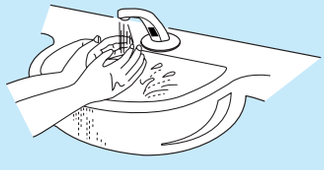
- Detection of pc boards on insertion machine



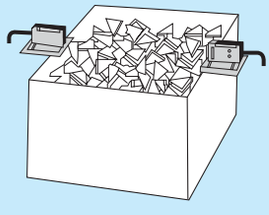
- Detection of arrival of corrugated boards



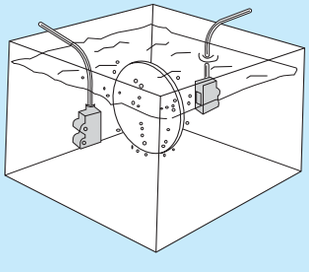
- Sensor for automatic faucet



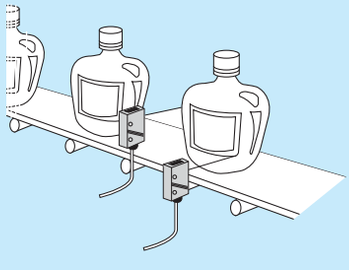
- Detection of press cuttings overfill



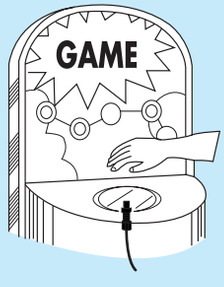
- Detection of wafer in cleaning tank



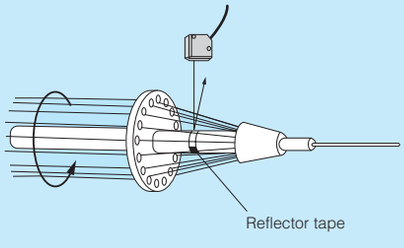
- Checking for displaced label



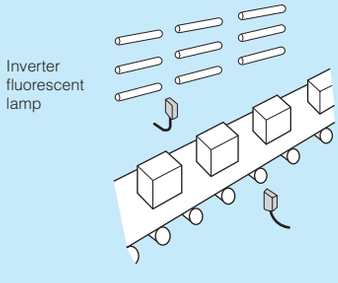
- Sensor for game machine activation



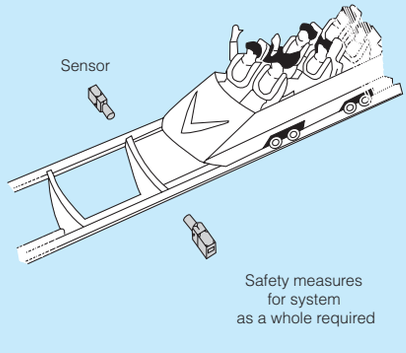
- Detection of wire strands (checking for broken thread)



- Detection of object under strong ambient light



- Detection of passage of roller coaster



ASG Series

Embedded Amplifier Photo Sensors
for Glass detection

- **Reliably detects inclined transparent glass**
  Ideal for flush-mounting in robot end-effecter.
- **Unique optical system allows stable detection regardless of warpage or inclination of glass**
  Unprecedented reliability in inclined object detection is realized by the use of two red LED light sources
- **Thin (4mm) embedded amplifier photo sensor**
  Counterbores for M3 countersunk screws convenient for flush-mounting in robot end-effecter.

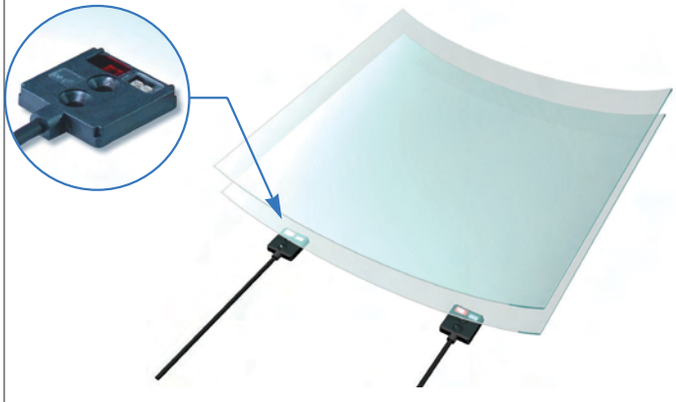
Type

Detection method	Detecting distance	Model	Operation mode	Output mode
Diffuse-reflective type	20mm	**ASG-S20R**	Light-ON	NPN Open collector
Limited reflection type	3～15mm	**ASG-Z15R**		

Applications

Sensor flush-mounted in robot End-Effecter

Photo sensor of only 4 mm in thickness flush-mounted in robot hand for detecting the presence of liquid crystal glass.



Optical system employing two LEDs as light sources.
Used for reliable detection of inclined or warped glass.

Difference between ASG-S20R and ASG-Z15R

- ASG-S20R is a diffuse-reflective type sensor with a wide activation range.
  If the detected glass is warped, the detecting distance can be 25 mm at maximum.
- ASG-Z15R is a limited zone-reflective sensor with a wide activation range.
  If the glass to detect is warped, the detecting distance can be 18 mm at maximum. The sensor is not activated by transparent glass in contact with the sensor.

Rating/Performance/Specification

	Type		ASG-S20R	ASG-Z15R
Rating/performance	Detection method		Diffuse-reflective sensor for glass detection	Limited zone-reflective sensor for glass detection
	Detection object		Transparent glass	
	Detecting distance		Transparent glass 20mm max. 25 mm max. (*)	Transparent glass 3 - 15 mm 18 mm max. (*)
	Power supply		12~24V DC ±10% / Ripple 10% max.	
	Light source		2 red LEDs	
	Current consumption		25 mA max.	
	Operation mode		Light-ON	
	Output mode	Control output	NPN open collector output	
		Rating	Sink current 50 mA (30 VDC max.)	
	Short circuit protection		Provided	
	Indicator		Operation indicator : orange LED	
	Response time		0.5 ms max.	
	Connection		Permanently attached cord (0.15 sq. 3 core 2m length)	
	Mass		Approx. 30 g	

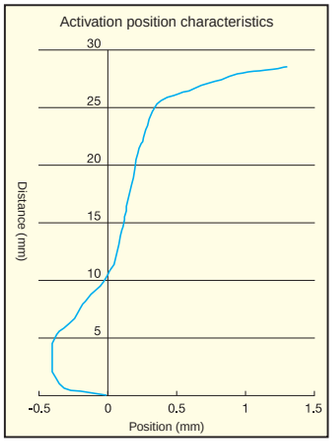
(*) The maximum distance means the distance to the farthest part of an inclined transparent glass. This sensor does not have a sensitivity adjustment volume and must be used with no object interfering with the detection in the surrounding area.

Environmental Specification

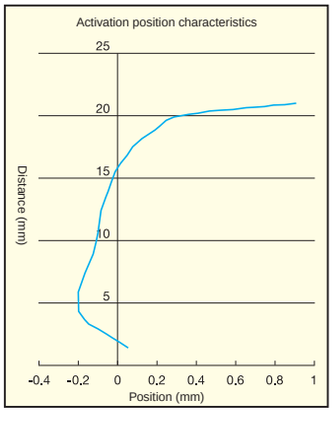
Environment	Ambient light	5,000 lx max.
	Ambient temperature	–10 - +55 –C (non-freezing)
	Ambient humidity	35~85%RH (non-condensing)
	Vibration	10 - 55 Hz / 1.5 mm amplitude / 2 hours each in 3 directions
	Protective structure	IP40

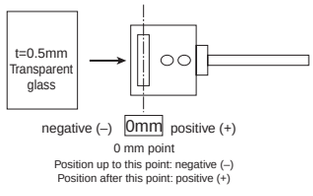
Activation Position Characteristics (Typical Example)

● ASG-S20R



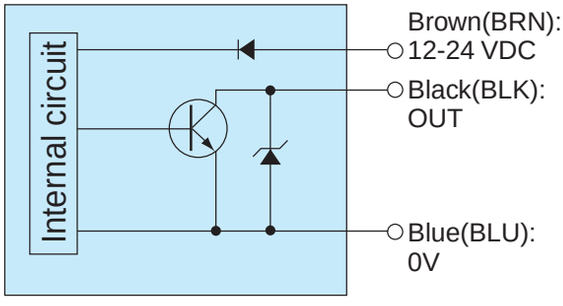
● ASG-Z15R





Input/Output Circuit and Connection

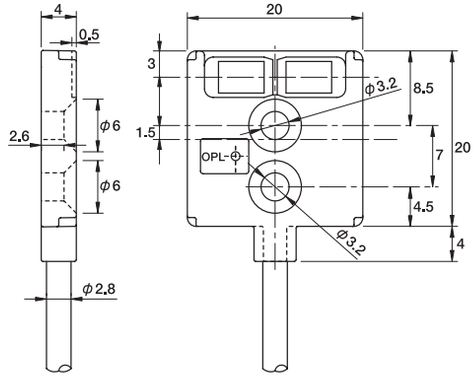
NPN output



- The output transistor turns off when load short circuit or overload occurs.
  Check the load and turn the power back on.

Dimensions (in mm)

CAD



- No mounting bracket is provided.
- The tightening torque should be max 0.6 N·m.

UM2 Series

Embedded Amplifier Photo Sensors

- **Highly-advanced type of ultra miniature sensor**
- **High-intensity indicator and red LED light source**
  Allows long distance checking of both sensor operation and light transmission.
- **NPN and PNP output types are available**
- **Excellent water resistance to IP 67 standard**
  Sensor allows washing with water.

Type

Detection method	Detecting distance	Model	In-line sensitivity adjustment volume	Operation mode	Output mode
Through-beam type	150mm	**UM2-T15DT**	—	Dark-ON (Contact Takex for Light-ON type.)	NPN Open collector (Contact Takex for PNP-output type.)
		UM2-T15DTV	Provided		
	500mm	**UM2-T50DT**	—		
		UM2-T50DTV	Provided		
		UM2-T50DS	—		
		UM2-T50DSV	Provided		
Limited reflection type	5~30mm	**UM2-Z3SV**	Provided	Light-ON	
		UM2-Z3DSV		Dark-ON	

- **In-line sensitivity adjustment allows for wider range of applications**
  Models with space-saving and easy-to-use in-line volume adjustment are available.

- Length of cord between sensor (receiver) and in-line sensitivity adjustment : 300 mm (fixed)
- Mounting bracket (separately available): model UM-V2

Rating/Performance/Specification

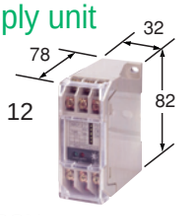
	Type		UM2-T15DT	UM2-T15DTV	UM2-T50DT	UM2-T50DTV	UM2-T50DS	UM2-T50DSV	UM2-Z3SV	UM2-Z3DSV
Rating/performance	Detection method		Through-beam type						Limited reflection type	
	Detecting distance		150mm		500mm				5 - 30mm*	
	Detection object		ϕ2mm (Min.) Opaque		ϕ3mm (Min.) Opaque				————	
	Power supply		24V DC ±10% / Ripple 10% max. *1						12 - 24V DC ±10%/ Ripple 10% max.	
	Current consumption	Transmitter	15mA max.						26mA max.	30mA max.
		Receiver	15mA max.	22mA max.	15mA max.	22mA max.	15mA max.	22mA max.		
	Output mode		NPN open collector Rating: sink current 80 mA (30 VDC) max. (PNP output type also available. *2)							
	Operation mode		Dark-ON						Light-ON	Dark-ON
	Response time		0.5ms max							
	Operating angle		15° (at receiver)						————	
	Hysteresis		————						Up to 10% of detecting distance	
Specification	Light source (light wavelength)		Red LED (660nm)							
	Indicator		Operation indicator (orange LED)—— For through-beam type, provided on receiver. Stability indicator (green LED)							
	Volume (VR)		———	In-line sensitivity adjustment	———	In-line sensitivity adjustment	———	In-line sensitivity adjustment		
	Material	Case	ABS resin							
		Lens	Acrylic resin							
	Connection		Permanently attached cord (outer dimension: dia. 2.8)							
			Transmitter: 0.15sq. 2 core 2 m length (gray) Receiver: 0.15sq. 3 core 2 m length (black)						0.15sq. 3 core 2 m length (black)	
	Mass	Transmitter	Approx. 30g						Approx. 40g	
		Receiver	Approx. 30g	Approx. 40g	Approx. 30g	Approx. 40g	Approx. 30g	Approx. 40g		
	Accessory		Mounting screws, washers, nuts (material: Fe), screwdriver for adjustment (provided for models with adjustment volume only), operation manual							
	Notes		*Standard detection object: 50 x 50 mm white drawing paper *1 12 VDC type also available. *2 PNP output type models identified by ﾒPﾓ at the end of model number. Comes with output conversion unit.							

Environmental Specification

Environment	Ambient light	3,000 lx max.
	Ambient temperature	–25 - +55 –C (non-freezing)
	Ambient humidity	35 - 85%RH (non-condensing)
	Protective structure	IP67
	Vibration	10 - 55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction

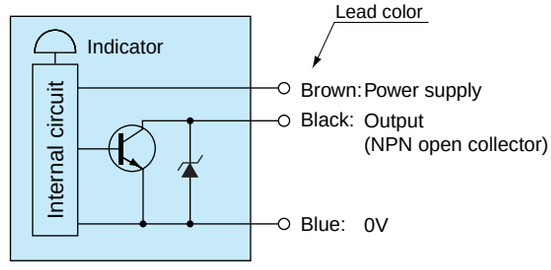
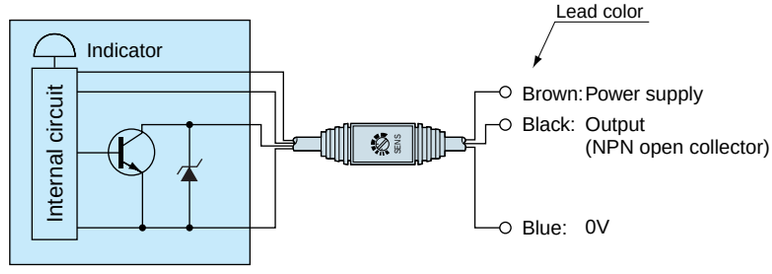
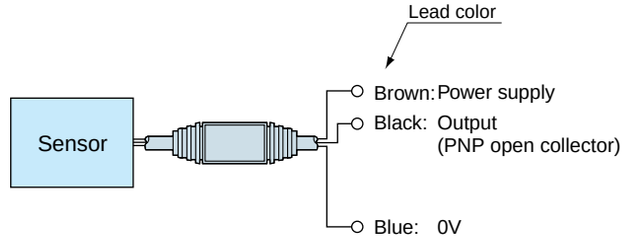
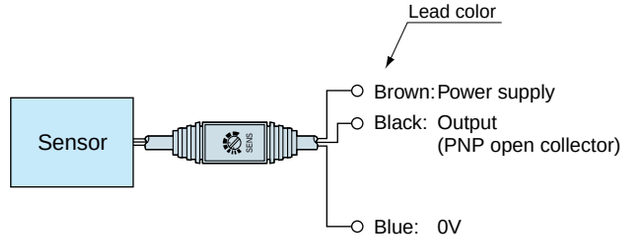
● Applicable power supply unit

PS series
High capacity of 200 mA at 12 VDC



(General-purpose type) PS3N
PS3N-SR
(Multifunctional type) PS3F
PS3F-SR

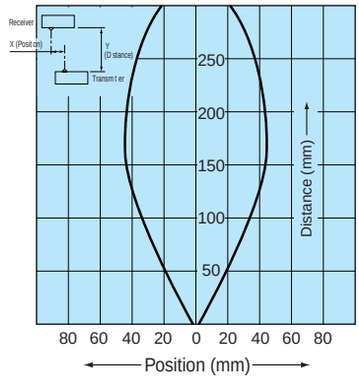
Input/Output Circuit and Connection

Model	Input/output circuit and connection
NPN output type UM2-T15DT UM2-T50DT UM2-T50DS	 The transmitter is provided with power supply lines (brown: operating power; blue: 0 V) only.
NPN output type with in-line sensitivity adjustment UM2-T15DTV UM2-T50DTV UM2-T50DSV UM2-Z3SV UM2-Z3DSV	 The transmitter is provided with power supply lines (brown: operating power; blue: 0 V) only.
PNP output type UM2-T15DTP UM2-T50DTP UM2-T50DSP	PNP open collector output available with in-line output conversion unit.  The transmitter is provided with power supply lines (brown: operating power; blue: 0 V) only.
PNP output type with in-line sensitivity adjustment UM2-T15DTVP UM2-T50DTVP UM2-T50DSVP UM2-Z3SVP UM2-Z3DSVP	PNP open collector output available with in-line volume/output conversion unit.  The transmitter is provided with power supply lines (brown: operating power; blue: 0 V) only.

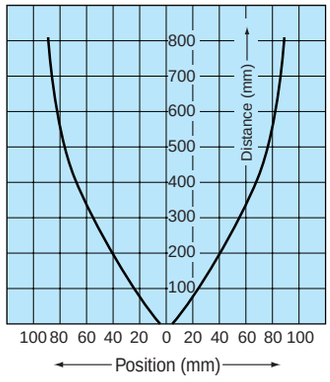
Characteristics (Typical Example)

● Directional characteristics

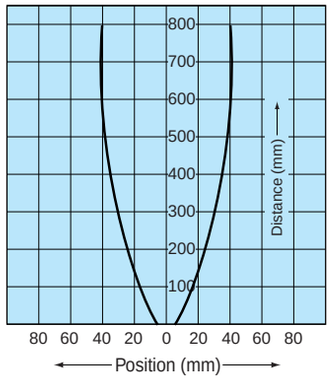
UM2-T15DT・UM2-T15DTV



UM2-T50DT・UM2-T50DTV

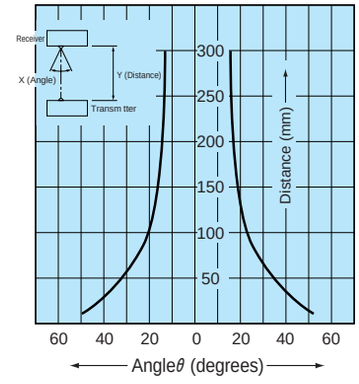


UM2-T50DS・UM2-T50DSV

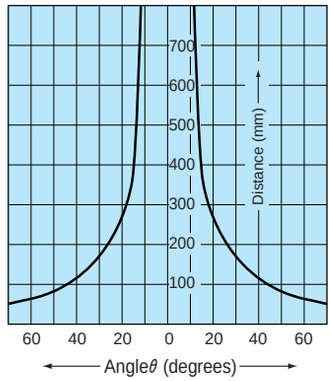


● Operating angle characteristics

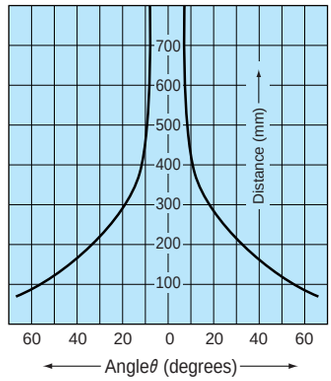
UM2-T15DT・UM2-T15DTV



UM2-T50DT・UM2-T50DTV

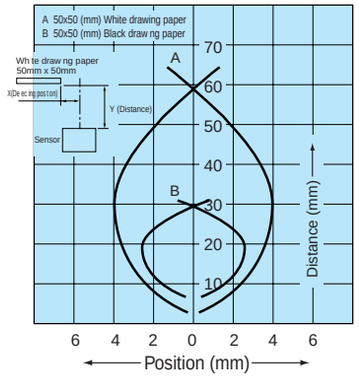


UM2-T50DS・UM2-T50DSV



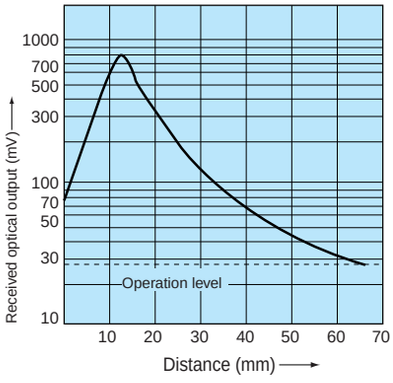
● Activation area characteristics

UM2-Z3SV・UM2-Z3DSV



● Distance-area characteristics

UM2-Z3SV・UM2-Z3DSV



UM2

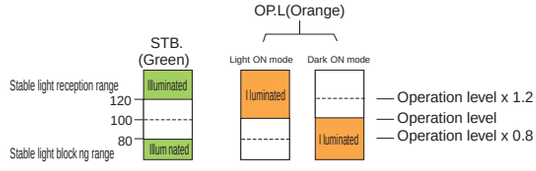
For Correct Use

Be sure to follow the instructions in the operation manual provided for correct use of the product.

- Do not use the product for detection for the protection of human body.
- When using the product for safety purposes, ensure safety with the control system as a whole as well as the detection.
- This product is not explosion proof.

About indicators

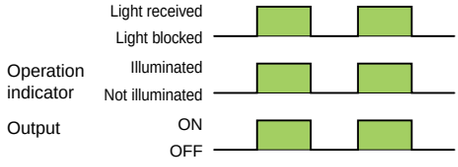
- The operation indicator (orange LED) and stability indicator (green LED) show the levels of light intensity as described in the figure below.
- After aligning the optical axis and adjusting the sensitivity, use a detection object to block and unblock the light beam several times to make sure that the sensitivity level is in a range that allows stable activation and deactivation. Setting the sensitivity in a range allowing stable operation achieves higher reliability against changes in the operating environment generated after the sensitivity is set.



- The orange LED (OP.L) is the operation indicator.
  In the L.ON (light ON) mode, the indicator is illuminated when a certain amount of light is detected.
  In the D.ON (dark ON) mode, the indicator is illuminated when a certain amount of light is not detected.

Operation timing chart

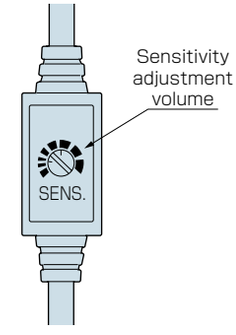
Light-ON mode



Dark-ON mode

Sensor mounting and adjustment

- No mounting bracket is provided.
- For mounting, use the M2 x 10 screws, washers and nuts provided.
  The tightening torque should not exceed 0.3 N·m. Excessively high torque may damage the sensor.
- The models with an in-line volume allows sensitivity adjustment when light is not adequately blocked due to translucent or small objects in detection with a through-beam-type sensor or when any influence of the background must be avoided or the amount of reflected light is small in detection with a reflective-type sensor.
  Turning the volume counterclockwise reduces the sensitivity.



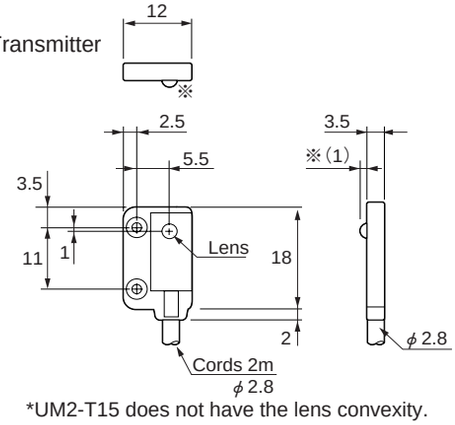
Notes on usage

- Avoid use in which the power is turned on and off consecutively.
- For output, avoid the transient condition immediately after power-up (50 ms).
- To extend the cord, use thick wires (at least 0.3 mm2) and limit their length to within 50 m whenever possible. Take voltage drop into consideration when the length exceeds 50 m.
- Be sure to route the sensor lines separately from any power transmission or high-voltage line. Using the same conduit or duct may cause electric induction, which leads to faulty operation or damage.

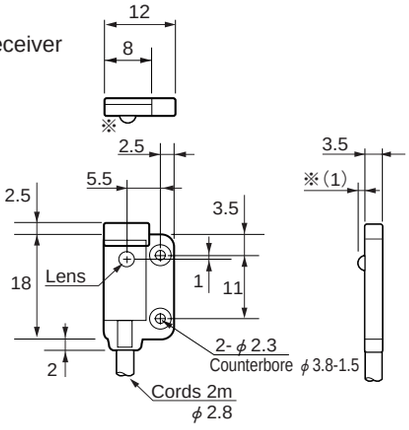
Dimensions (in mm)

UM2-T15DT
UM2-T15DTV (sensor)
UM2-T50DT
UM2-T50DTV (sensor)

Transmitter



Receiver

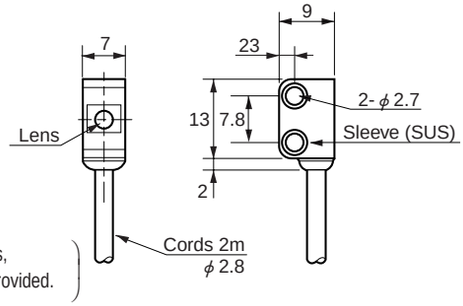


M2 x 10 mm screws, nuts, internal toothed washers provided.

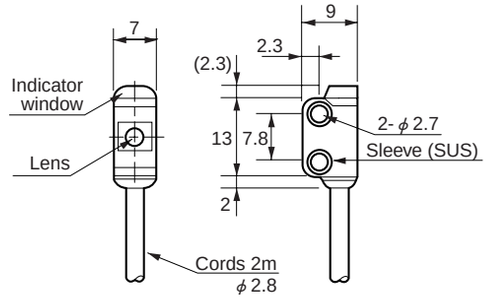
*UM2-T15 does not have the lens convexity.

UM2-T50DS
UM2-T50DSV (sensor)

Transmitter

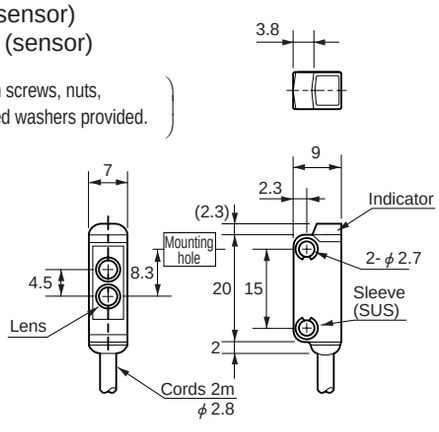


Receiver



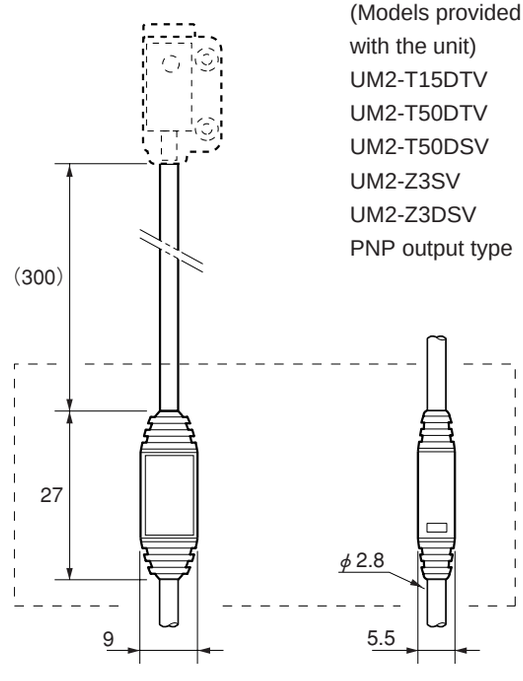
M2.6 x 12 mm screws, nuts, internal toothed washers provided.

UM2-Z3SV (sensor)
UM2-Z3DSV (sensor)



M2.6 x 12 mm screws, nuts, internal toothed washers provided.

● In-line sensitivity adjustment volume/PNP output conversion unit
Provided in the receiver cord for through-beam model.



(Models provided with the unit)
UM2-T15DTV
UM2-T50DTV
UM2-T50DSV
UM2-Z3SV
UM2-Z3DSV
PNP output type

● For mounting, directly screw onto the surface.
The tightening torque should be up to 0.3 N·m.

GN series

Embedded Amplifier Photo Sensors

- New type of amplifier built-in photo sensor
- Slim and compact side-on models
  - Lightweight and compact
    Thin, space-saving sensor allowing flexible mounting
  - Flat lens less affected by dust or dirt attached
    Superb stability with the high power (detecting distance of 10 m)
  - High-intensity indicators for increased visibility
    Easy checking of sensor operation from a distance

Type

Detection method	Detecting distance	Model		Operation mode	Output mode
		NPN type	PNP type		
Through-beam type	10m	**GN-T10RS**	**GN-T10RSPN**	Light-ON/Dark-ON selectable (with switch)	Open collector
Polarization reflector type	0.03～1.3m	**GN-M2RS**	**GN-M2RSPN**		
Diffuse-reflective type	400㎜	**GN-R40RS**	**GN-R40RSPN**		

- Infrared LED type
  For the through-beam and diffuse-reflective models, types that employ infrared LED as the light source are available.
  Fro details, see Rating/Performance/Specification.
- M8 connector type
  M8 connector connection types are available for all models.
  Fro details, see Rating/Performance/Specification.
  For connector specifications, see p. 180.


M8 connector type

Optional Parts

Type		Model	Pinhole diameter / Direction of polarization	Detecting distance with plate/filter attached: Red LED	Detecting distance with plate/filter attached: Infrared LED
For through-beam type only	Pinhole plate	**GNP1**	φ1mm	400mm	300mm
		GNP2	φ2mm	1m	1m
		GNP3	φ3mm	3m	2.5m
		GNP5-1	5×1mm	2m	1.7m
	Interference prevention filter	**GN-PFA**	Longitudinal	5m (Applicable to red LED type only)	
		GN-PFB	Horizontal		

Type	Model	Shape
Cord with M8 connector	**FBC-4R2S**	Straight (2 m)
	FBC-4R2L	Angled (2 m)

Rating/Performance/Specification

Rating/performance	Type	Permanently attached cord	NPN type	**GN-T10RS**	**GN-T7S**	**GN-M2RS**	**GN-R40RS**	**GN-R30S**	**GN-R7S**
			PNP type	**GN-T10RSPN**	**GN-T7SPN**	**GN-M2RSPN**	**GN-R40RSPN**	**GN-R30SPN**	**GN-R7SPN**
		Connector	NPN type	**GN-T10RS-J**	**GN-T7S-J**	**GN-M2RS-J**	**GN-R40RS-J**	**GN-R30S-J**	**GN-R7S-J**
			PNP type	**GN-T10RSPN-J**	**GN-T7SPN-J**	**GN-M2RSPN-J**	**GN-R40RSPN-J**	**GN-R30SPN-J**	**GN-R7SPN-J**
	Detection method			Through-beam type		Polarization reflector type	Diffuse-reflective type		
	Detecting distance			10m	7m	0.03~1.3m *1	400mm	300mm	70mm
	Detection object			ϕ6mm (Min.) Opaque		Glossy objects including mirror-like materials and stainless-steel plates or Opaques	Standard detection object: 200 x 200 mm white drawing paper		Standard detection object: 100 x 100 mm white drawing paper
	Power supply			12-24V DC ±10% / Ripple 10% max.					
	Current consumption			Transmitter: 22mA max. Receiver: 15mA max.		25mA max.			
	Output mode	Control output	NPN type	Rating: sink current 100 mA (30 VDC max.) / Residual voltage: 1 V or less					
			PNP type	Rating: source current 100 mA (30 VDC max.) / Residual voltage: 2 V or less					
		Stability output	NPN type	Rating: sink current 50 mA (30 VDC max.) / Residual voltage: 1 V or less					
			PNP type	Rating: source current 50 mA (30 VDC max.) / Residual voltage: 2 V or less					
	Operation mode			Light-ON/Dark-ON selectable (with switch)					
	Anti Interference feature			———		Provided (operation may be affected depending on the setting)			
	Response time			0.5ms max.					
	Operating angle			10° (at receiver)		30° (at reflector)	———		
	Hysteresis			———			10% max.		
Specification	Light source (light wavelength)			Red LED (700nm)	Infrared LED (880nm)	Red LED (640nm)		Infrared LED (880nm)	
	Indicator			Transmitter: Power indicator (orange LED) Receiver: Operation indicator (orange LED) Stability indicator (green LED)		Operation indicator (orange LED) Stability indicator (green LED)			
	Volume (VR)			Sensitivity adjustment (on receiver for through-beam type)					
	Switch (SW)			Light-ON/Dark-ON selector switch					
	Short circuit protection			Provided for control output and stability output					
	Material	Case		Polybutylene terephthalate					
		Lens		Methacrylate					
	Connection	Permanently attached cord		Permanently attached cord (outer dimension: dia. 3.5) Transmitter 0.2sq. 2 core 2 m length (gray) Receiver 0.2 sq. 4 core 2 m length (black)		Permanently attached cord (outer dimension: dia. 3.5) 0.2sq. 4 core 2 m length (black)			
		Connector		M8 connector (cord with M8 connector separately available)					
	Mass	Permanently attached cord		Transmitter/receiver: approx. 60g		Approx. 60g			
		Connector		Transmitter/receiver: approx. 10g		Approx. 10g			
	Accessory					K-71 reflector			
				Screwdriver for sensitivity adjustment, operation manual, mounting bracket GN-B1 (provided for permanently attached cord type only)					

*1 The distance with use of K-7 (separately available) is 0.01 - 2 m.

Environmental Specification

Environment	Ambient light	5,000 lx max.
	Ambient temperature	–25 - +55 −C (non-freezing)
	Ambient humidity	35 - 85%RH (non-condensing)
	Protective structure	IP67
	Vibration	10 - 55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Dielectric strength	AC1000V 1 min.
	Insulation resistance	500 VDC, 20 MΩ or higher
	Shock	500 m/s² / 3 times each in 3 directions

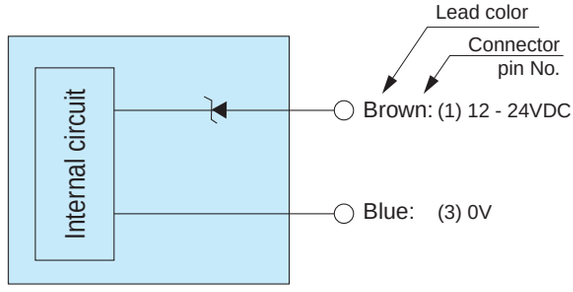
● Applicable power supply unit

PS series
High capacity of 200 mA at 12 VDC

(General-purpose type) PS3N
PS3N-SR
(Multifunctional type) PS3F
PS3F-SR

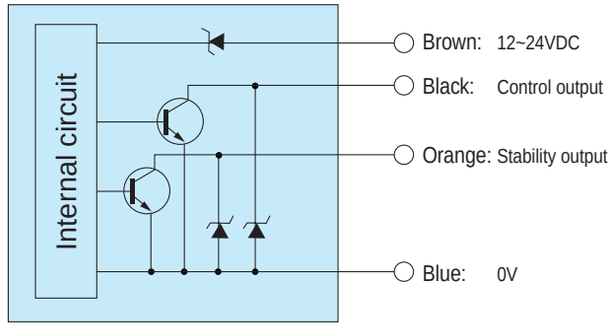
Input/Output Circuit and Connection

Transmitter of through-beam type

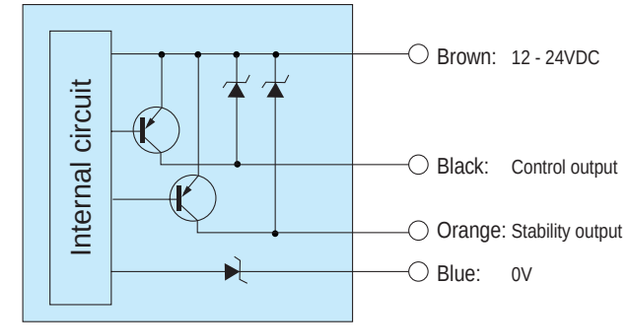


Receiver of through-beam type/polarization reflector type/diffuse-reflective type

NPN output type



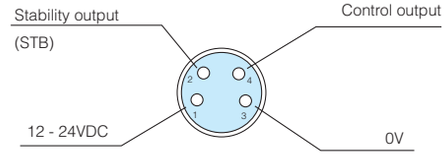
PNP output type



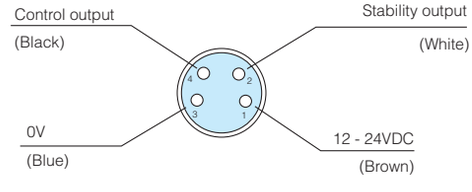
- The output transistor turns off when load short circuit or overload occurs. Check the load and turn the power back on.
To extend the cord, use thick wires (at least 0.3 mm^2).

Connector type pin assignment and connection

(Sensor)



(Cord with M8 connector)



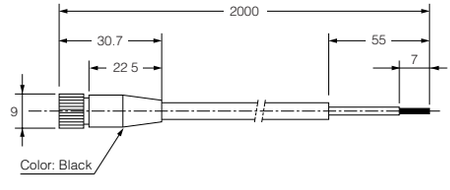
Lead color	Pin No.	Function
Brown	1	12 - 24 VDC
White	2	STB output
Blue	3	0V
Black	4	Control output

Cord with M8 connector (optional)

(in mm)

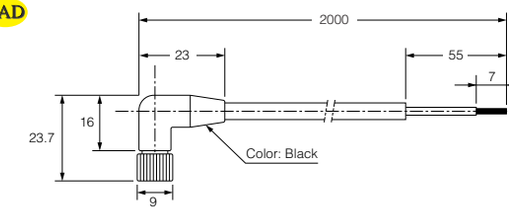
FBC-4R2S (straight)

CAD



FBC-4R2L (angled)

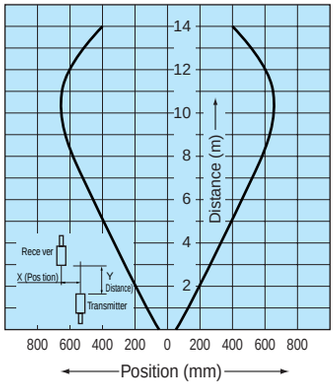
CAD



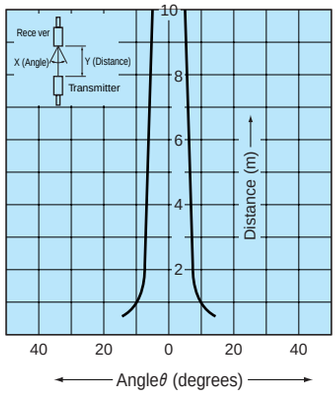
Characteristics (Typical Example)

Through-beam type GN-T10RS (PN) (-J)

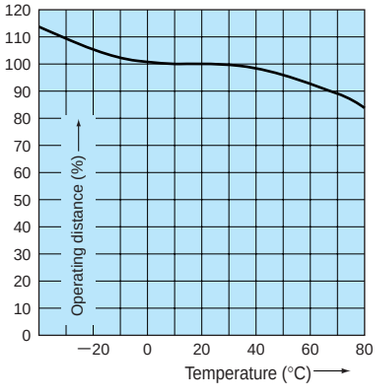
● Directional characteristics



● Operating angle characteristics

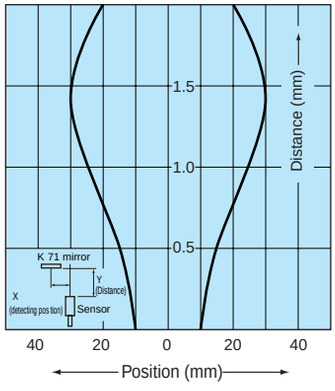


● Temperature characteristics

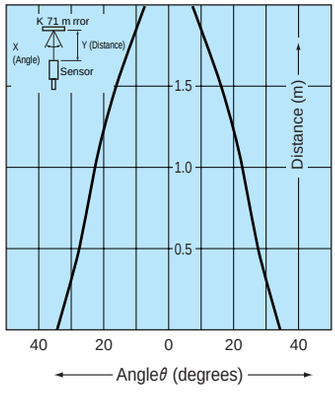


Polarization reflector type GN-M2RS (PN) (-J)

● Directional characteristics

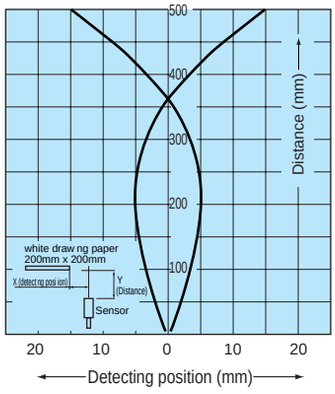


● Operating angle characteristics

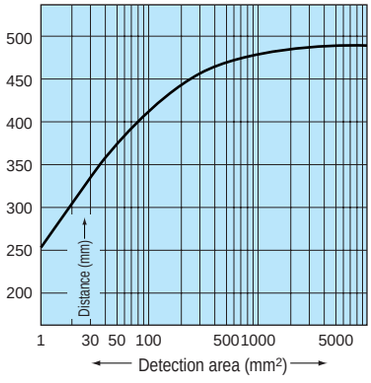


Diffuse-reflective type GN-R40RS (PN) (-J)

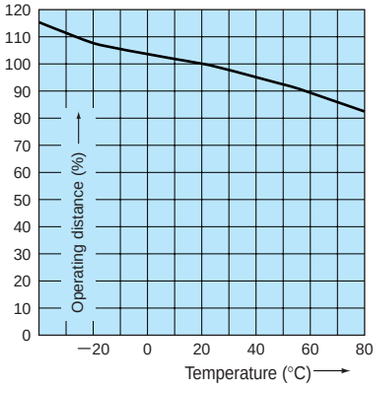
● Activation area characteristics



● Distance-area characteristics



● Temperature characteristics



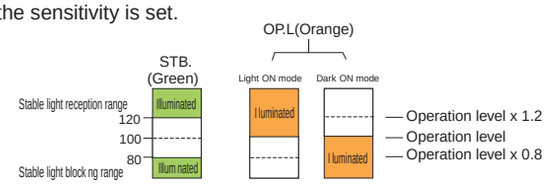
For Correct Use

Be sure to follow the instructions in the operation manual provided for correct use of the product.

- Do not use the product for detection for the protection of human body.
- When using the product for safety purposes, ensure safety with the control system as a whole as well as the detection.
- This product is not explosion proof.

About indicators

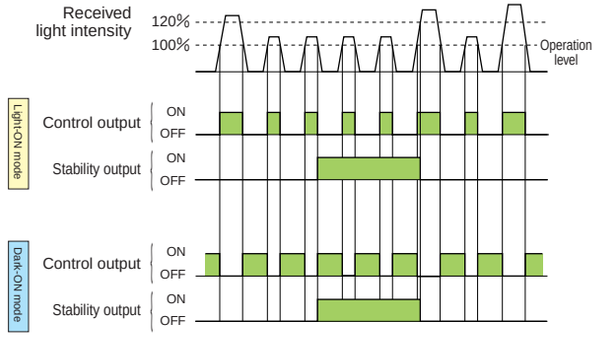
- The operation indicator (orange LED) and stability indicator (green LED) show the levels of light intensity as described in the figure below.
- After aligning the optical axis and adjusting the sensitivity, use a detection object to block and unblock the light beam several times to make sure that the sensitivity level is in a range that allows stable activation and deactivation. Setting the sensitivity in a range allowing stable operation achieves higher reliability against changes in the operating environment generated after the sensitivity is set.



- The orange LED (OP.L) is the operation indicator.
  In the L.ON (light ON) mode, the indicator is illuminated when a certain amount of light is detected.
  In the D.ON (dark ON) mode, the indicator is illuminated when a certain amount of light is not detected.

Stability output

The stability output can be used to check for reduction of the light intensity level along with any change in the operating environment or operation over time or to perform initial check of the operation. When two consecutive detections have occurred with the intensity of light detected exceeding the operation level but not reaching 120 % of the level (range allowing stable operation), the stability signal is output when the control output is deactivated.



Reflector of polarization reflector type

The detection distance varies depending on the reflector model used.

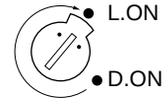
Reflector model	K-71	K-7	S-25
Detecting distance	0.03 - 1.3m	0.01 - 2m	50 - 600mm
Remarks	Accessory	Optional	Optional

Mounting of sensor

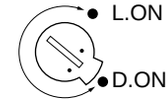
The tightening torque for mounting screws should not exceed 0.6 N·m.

Switching between light ON and dark ON and setting sensitivity

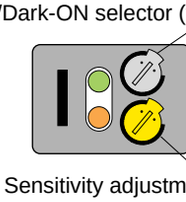
(For the light ON mode)
Turn the switch to L.ON.



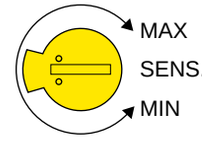
(For the dark ON mode)
Turn the switch to D.ON.



Light-ON/Dark-ON selector (white)



Sensitivity adjustment volume (yellow)



Sensitivity can be adjusted for detection with a transmission-type model in which blocking of the light beam is inadequate due to a translucent or small object or for detection with a reflection-type model in which any influence of the background should be avoided or the sensor must detect low intensity of reflected light. Turning the volume counterclockwise reduces the sensitivity.

For setting the light ON/dark ON switch (white) and adjusting the sensitivity volume (yellow), use the adjustment screwdriver supplied and turn carefully. Turning the volumes with excessive force may damage the volumes.

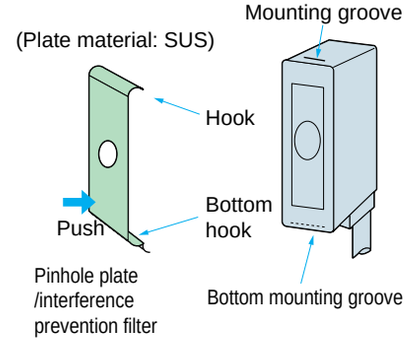
About pinhole plate

Pinhole plates allow the reduction of the size of a detection object or the margin of movement. Using the sensitivity adjustment volume in combination allows detection of even smaller or near-transparent objects.

Interference prevention filters

When two sensors are mounted close to or in contact with each other, interference prevention filters can be used to avoid faulty operation caused by mutual-interference.
Interference prevention filters can be used only for transmission-type sensors emitting red light.

Attachment of pinhole plate
/interference prevention filter



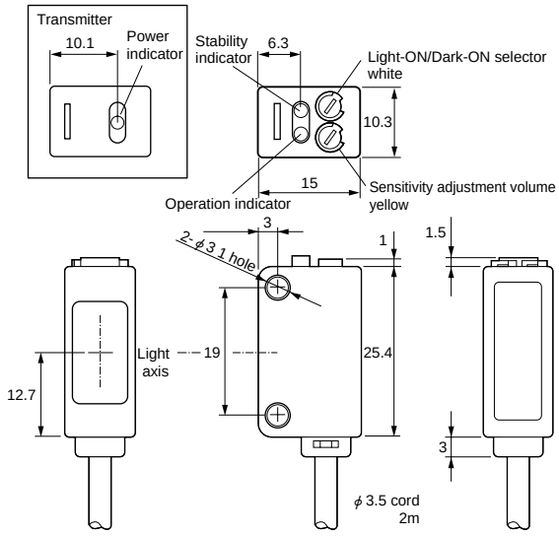
Put a hook of the plate on the mounting groove at the top of the sensor and press the bottom of the plate in until it clicks.

Dust, drops of water, etc. in the pinhole or the filter may cause faulty operation.

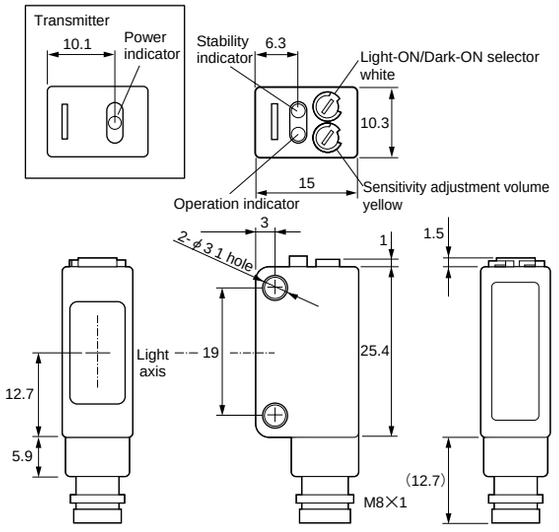
Dimensions (in mm)

All permanently attached cord model

CAD

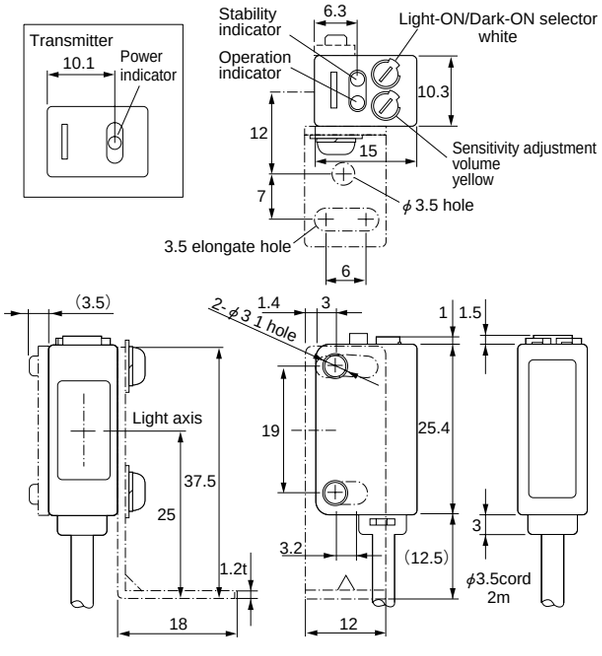


All connector connection (-J) models



(Mounting brackets do not come with connector types.)

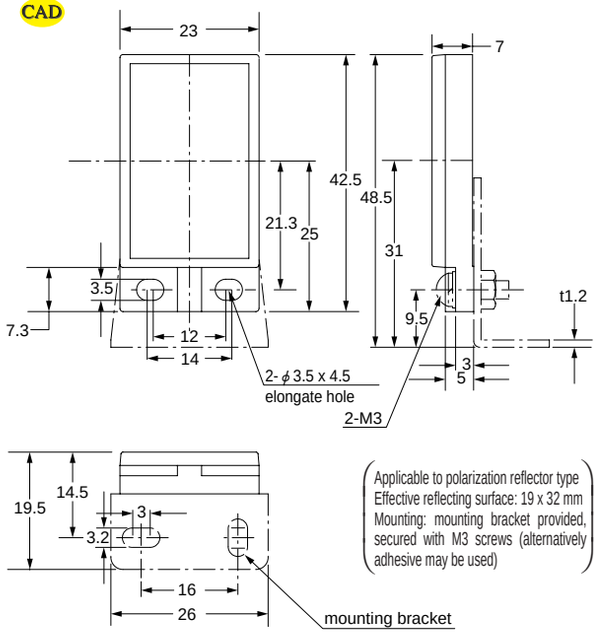
All permanently attached cord models



(With GN-B1 mounting bracket attached)

Reflector K-71

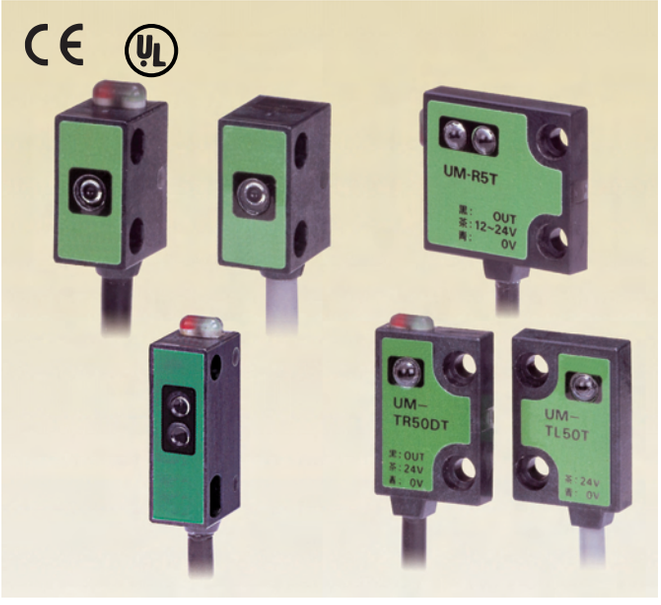
CAD



Applicable to polarization reflector type
Effective reflecting surface: 19 x 32 mm
Mounting: mounting bracket provided, secured with M3 screws (alternatively adhesive may be used)

UM series

Embedded Amplifier Photo Sensors

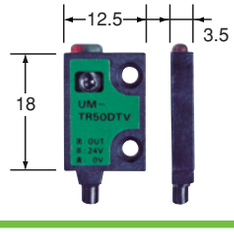


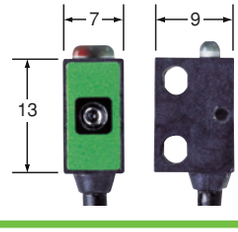
- Ultra miniature size
  (extra thin, extra compact)
- Long distance detecting up to 1 m
- Ideal for integrating into small devices
  - Thinness of 3.5 mm achieved with embedded amplifier type!
    Extremely small volume: less than 0.8 cm^3
    Volume fraction: about 1/5 (to conventional Takex product)
  - Low cost
  - Red LED light source allows checking of emitted light spot
  - Equipped with stability and operation indicators
  - Wide range of applications from small-scale FA to system wide FA

Type

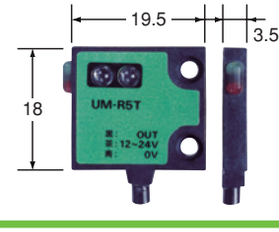
Detection method	Detecting distance	Model	In-line sensitivity adjustment volume	Operation mode	Output mode
Through-beam type	150mm	**UM-T15DT**	—	Dark-ON (Contact Takex for Light-ON type.)	NPN Open collector (Contact Takex for PNP-output type.)
		UM-T15DTV	Provided		
	500mm	**UM-T50DT**	—		
		UM-T50DTV	Provided		
		UM-T50DS	—		
		UM-T50DSV	Provided		
	1m	**UM-T100DT**	—		
		UM-T100DS	—		
Polarization reflector type	2~30mm	**UM-R3T**	—	Light-ON (Contact Takex for Dark-ON type.)	
		UM-R3TV	Provided		
	2~50mm	**UM-R5T**	—		
		UM-R5TV	Provided		
Diffuse-reflective type	5~30mm	**UM-Z3SV**	Provided		

Through-beam type

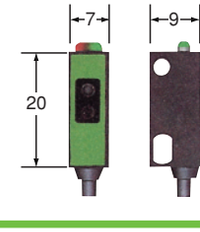




Diffuse-reflective type



Limited reflection type



Rating/Performance/Specification

	Type		UM-T15DT	UM-T15DTV	UM-T50DT	UM-T50DTV	UM-T50DS	UM-R3T	UM-R3TV	UM-R5T	UM-R5TV	UM-Z3SV
Rating/performance	Detection method		Through-beam type					Diffuse-reflective type				Limited reflection type
	Detecting distance		150mm		500mm (*1m)			2 - 30mm *1		2 - 50mm*1		5 - 30mm *1
	Detection object		ϕ 3mm (Min.) Opaque					————				
	Power supply		24V DC ±10% / Ripple 10% max. *2					12 - 24V DC ±10% / Ripple 10% max.				
	Current consumption	Transmitter	15mA max.					20mA max.	27mA max.	20mA max.	27mA max.	27mA max.
		Receiver	15mA max.	22mA max.	15mA max.	22mA max.	15mA max.					
	Output mode		NPN open collector Rating: sink current 80 mA (30 VDC) max. (PNP output type also available.)									
	Operation mode		Dark-ON					Light-ON				
	Response time		0.5ms max.									
	Operating angle		25°					————				
	Hysteresis		————					Up to 10% of detecting distance				
Specification	Light source (light wavelength)		Red LED (660nm) (*Infrared LED)									
	Indicator		Operation indicator (red LED)—— For through-beam type, provided on receiver. Stability indicator (green LED)									
	Volume		———	In-line sensitivity adjustment *3	———	In-line sensitivity adjustment *3	——— *4	———	In-line sensitivity adjustment *3	———	In-line sensitivity adjustment *3	In-line sensitivity adjustment *3
	Material	Case	Liquid crystalline polyester (filler: polypropylene)									
		Lens	Acrylic resin				ABS resin	Acrylic resin				ABS resin
	Connection		Permanently attached cord (outer dimension: dia. 2.8)									
			Transmitter 0.15 sq. 2 core 2 m length (gray) Receiver 0.15 sq. 3 core 2 m length (black)					0.15 sq. 3 core 2 m length (black)				
	Mass	Transmitter	Approx. 30g	Approx. 30g	Approx. 30g	Approx. 30g	Approx. 30g	Approx. 30g	Approx. 40g	Approx. 30g	Approx. 40g	Approx. 40g
		Receiver	Approx. 30g	Approx. 40g	Approx. 30g	Approx. 40g	Approx. 30g					
	Notes		*1 Standard detection object: 50x 50 mm white drawing paper *2 12 VDC type also available. *3 Length of cord between sensor and in-line sensitivity adjustment volume: 30 cm (fixed) *4 Model with in-line sensitivity adjustment volume available									

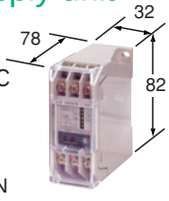
*Models with detecting distance of 1 m are also available (infrared LED used as light source).
For model numbers, see "Type."

Environmental Specification

Environment	Ambient light	3,000 lx max.
	Ambient temperature	–25 - +55 –C (non-freezing)
	Ambient humidity	35-85%RH (non-condensing)
	Protective structure	IP64
	Vibration	10 - 55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction

● Applicable power supply unit

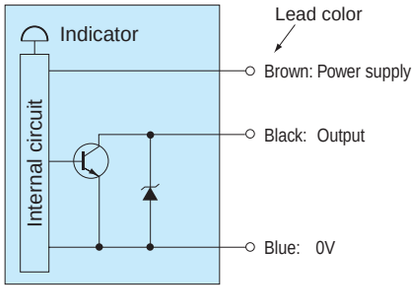
PS series
High capacity of 200 mA at 12 VDC

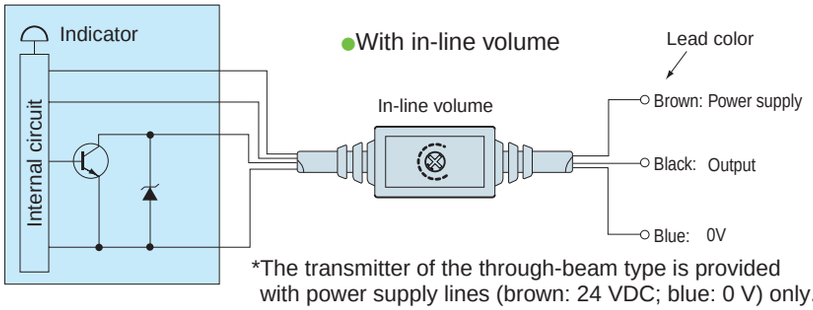


(General-purpose type) PS3N
PS3N-SR
(Multifunctional type) PS3F
PS3F-SR

Input/Output Circuit and Connection

(Shows receiver of through-beam type as typical example. Power supply for reflective type: 12-24 VDC.)



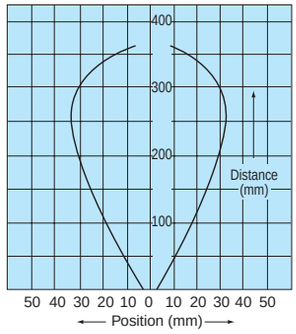


*The transmitter of the through-beam type is provided with power supply lines (brown: 24 VDC; blue: 0 V) only.

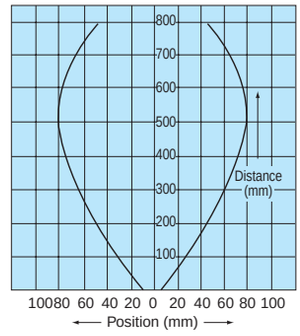
Characteristics (Typical Example)

● Directional characteristics

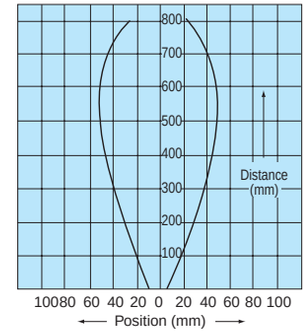
UM-T15DT・UM-T15DTV



UM-T50DT・UM-T50DTV

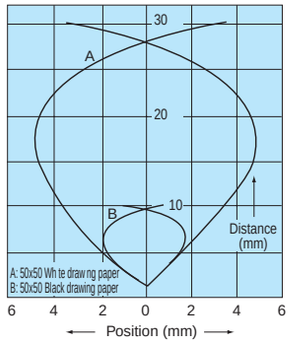


UM-T50DS

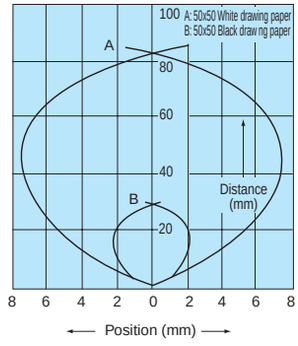


● Activation area characteristics

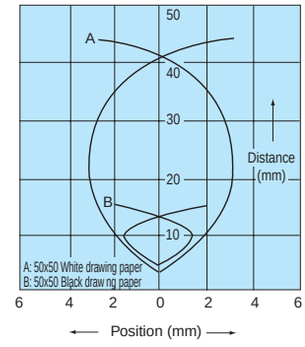
UM-R3T・UM-R3TV



UM-R5T・UM-R5TV

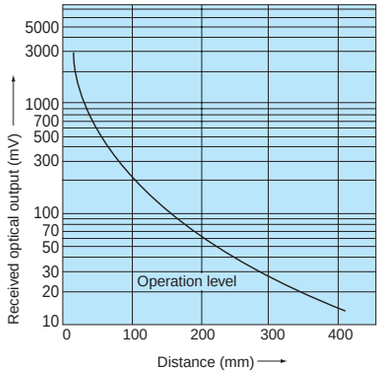


UM-Z3SV

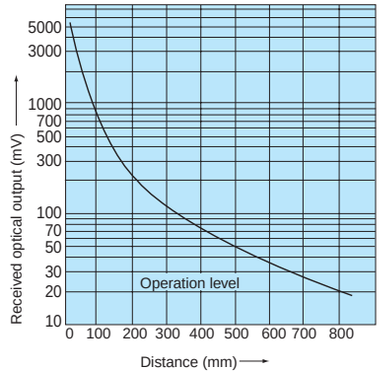


● Distance-area characteristics

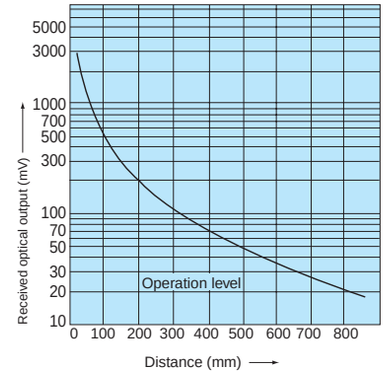
UM-T15DT・UM-T15DTV



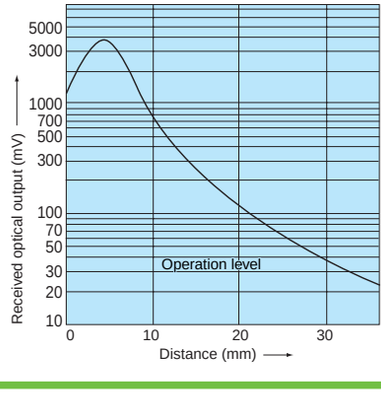
UM-T50DT・UM-T50DTV



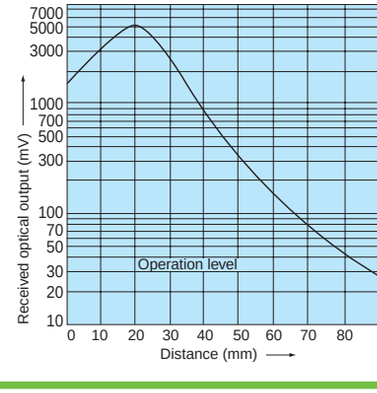
UM-T50DS



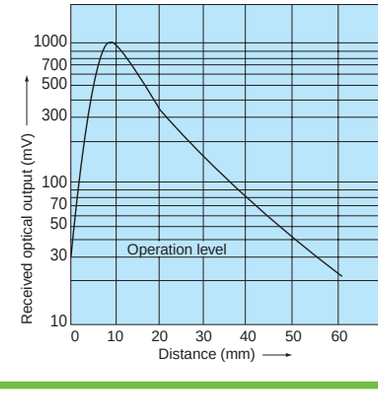
UM-R3T・UM-R3TV



UM-R5T・UM-R5TV



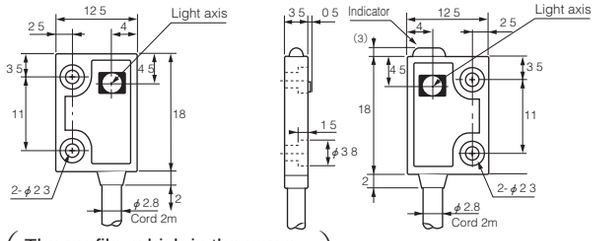
UM-Z3SV



Dimensions (in mm)

UM-T15DT
UM-T15DTV(*1)

CAD Transmitter Receiver

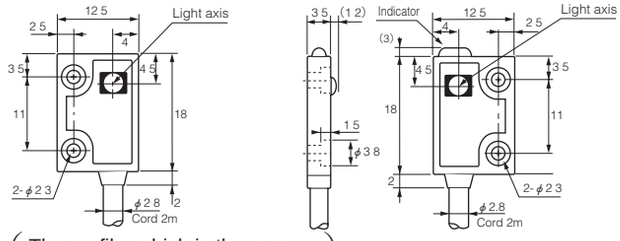


The profile, which is the same as the receiver except that indicator is omitted.

M2 x 10 mm screws, nuts, internal toothed washers provided.

UM-T50DT・UM-T100DT
UM-T50DTV(*1)

CAD Transmitter Receiver

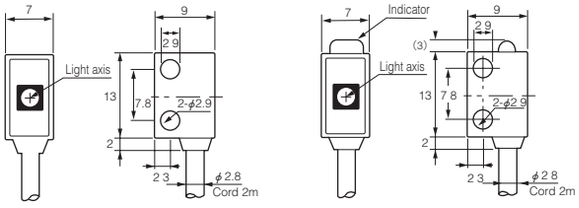


The profile, which is the same as the receiver except that it has no indicator, is omitted.

M2 x 10 mm screws, nuts, internal toothed washers provided.

UM-T50DS
UM-T100DS

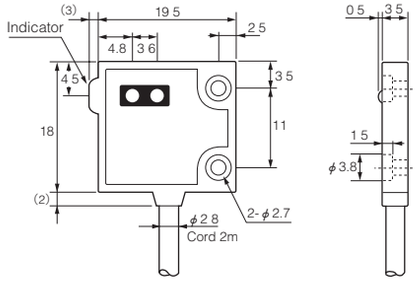
CAD Transmitter Receiver



M2.6 x 12 mm screws, nuts, internal toothed washers provided.

UM-R3T
UM-R3TV(*1)

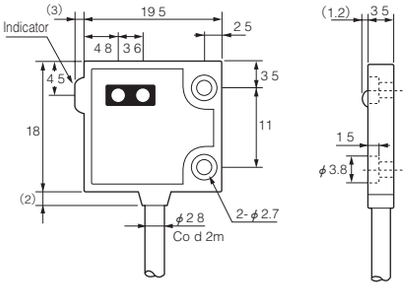
CAD



M2 x 10 mm screws, nuts, internal toothed washers provided.

UM-R5T
UM-R5TV(*1)

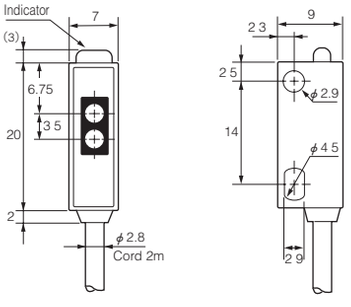
CAD



M2 x 10 mm screws, nuts, internal toothed washers provided.

UM-Z3SV(※1)

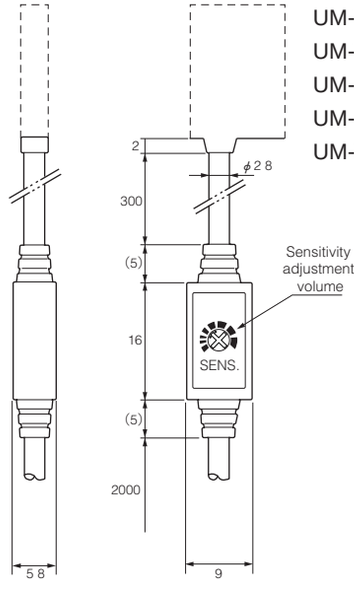
CAD



M2.6 x 12 mm screws, nuts, internal toothed washers provided.

(*1) Models identified by "V" at the end of the model number are equipped with a sensitivity adjustment volume. For through-beam type, the volume is provided in the receiver cord.

CAD



UM-T15DTV
UM-T50DTV
UM-R3TV
UM-R5TV
UM-Z3SV

- Directly screw onto the surface for mounting. The tightening torque should not exceed 0.3 N・m. Mounting brackets are available as optional parts.

- Slim slide-on style sensor
- Basic function model for applications ranging from flush-mounting to small conveyor lines
- In-line sensitivity adjustment

<Sample application> detection of translucent objects

Sensitivity adjustment allows detection of objects even if they do not completely block light.

<Sample application> detection of small objects

Small object that blocks light axis but cannot be detected due to light going around it may be detected by adjusting sensitivity.

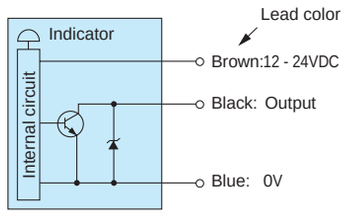
(Note) Be sure to test the operation before use.

Type

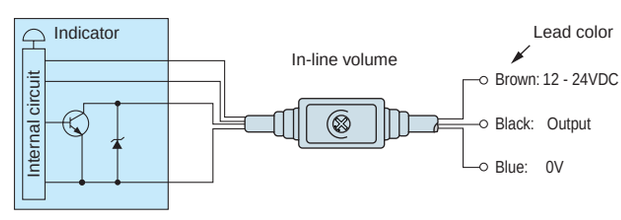
Detection method	Detecting distance	Model	In-line sensitivity adjustment volume	Operation mode	Output mode
Through-beam type	500mm	**UM-T50DNS**	—	Dark-ON	NPN Open collector
		UM-T50DNSV	Provided		
		UM-T50NS	—	Light-ON	
		UM-T50NSV	Provided		

Input/Output Circuit and Connection

Model: UM-TR50DNS
UM-TR50NS



Model: UM-TR50DNSV
UM-TR50NSV
With in-line sensitivity adjustment volume



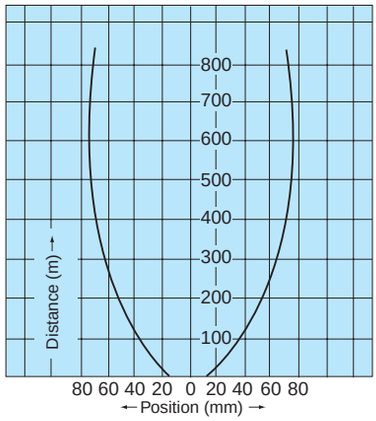
The transmitter of the through-beam type is provided with power supply lines (brown: 12~24 VDC; blue: 0 V) only.

Rating/Performance/Specification

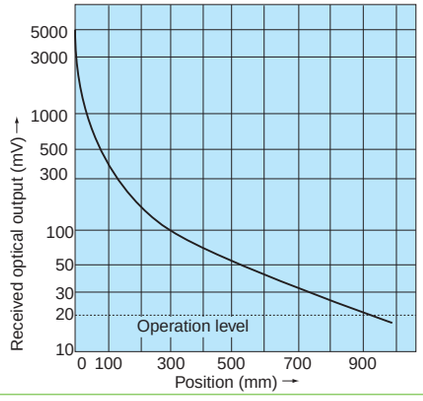
	Type		UM-T50DNS	UM-T50DNSV	UM-T50NS	UM-T50NSV
Rating/performance	Detection method		Through-beam type			
	Detecting distance		500mm			
	Detection object		ϕ 3mm (Min.) Opaque			
	Power supply		12 - 24V DC ±10% / Ripple 10% max.			
	Current consumption	Transmitter	14mA max.			
		Receiver	14mA max.	22mA max.	14mA max.	22mA max.
	Output mode		NPN open collector Rating: sink current 100 mA (30 VDC) max.			
	Operation mode		Dark-ON		Light-ON	
	Response time		0.5ms max.			
	Operating angle		13°			
	Hysteresis		———			
Specification	Light source (light wavelength)		Red LED (660nm)			
	Indicator		Operation indicator (red LED)		Stability indicator (green LED)	
	Volume		———	In-line sensitivity adjustment *	———	In-line sensitivity adjustment *
	Material	Case	Polybutylene terephthalate			
		Lens	Polyarylate			
	Connection		Permanently attached cord (outer dimension: dia. 2.8) Transmitter 0.15 sq. 2 core 2 m length (gray) Receiver 0.15 sq. 3 core 2 m length (black)			
	Mass	Transmitter	Approx. 30g			
		Receiver	Approx. 35g	Approx. 40g	Approx. 35g	Approx. 40g
	Notes		* Length of cord between sensor and in-line sensitivity adjustment: 300 mm (fixed)			
Environment specification	Ambient light		3,000 lx max.			
	Ambient temperature		–25 - +55 −C (non-freezing)			
	Ambient humidity		35 - 85%RH (non-condensing)			
	Protective structure		IP64			
	Vibration		10 - 55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction			

Characteristics (Typical Example)

● Directional characteristics



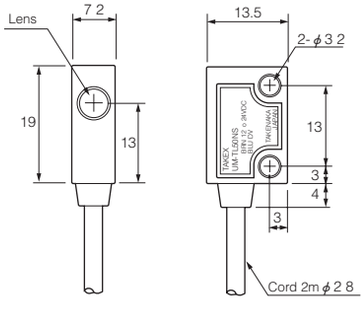
● Distance-area characteristics



Dimensions (in mm)

Transmitter

CAD

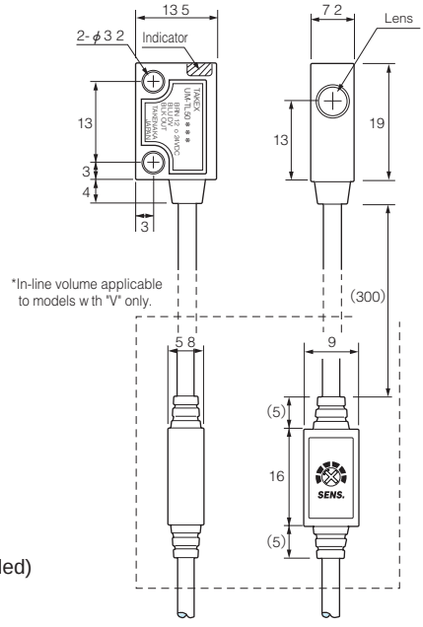


- No mounting bracket is provided.
- For mounting, use the screws provided.
  The tightening torque not exceed 0.3 N·m.

(M3 x 15 mm screws, nuts, two 3-piece sems screws provided)

Receiver

CAD



Mini-G series Embedded Amplifier Photo Sensors

- Ultra small size ideal for embedded use
- IP 67 water resistance for wet environments
- Stability output is provided
- High-speed response of 0.35 ms
  - High-powered light penetrating business cards: GT1SN, GT1N
  - Long detecting distance of 10 m: GT3RSN
  - High-performance detection at shorter distance: GS5SN, GS5N
  - Less affected by background: limited reflection type
  - Easy light axis alignment: red LED type

Type

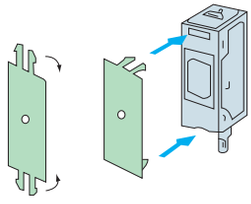
Detection method	Detecting distance	Model		Operation mode	Output mode
		Side-on type	Head-on type		
Through-beam type	1m	**GT1SN**	———	Light-ON/ Dark-ON selectable (with switch)	NPN Open collector PNP output type also available
		———	**GT1N**		
	7m	———	**GT3N**		
	10m	**GT3RSN**	———		
	7m	**GT7SN**	———		
Reflector type	0.01～2m	**GSM2RSN**	———		
Diffuse-reflective type	70mm	**GS5SN**	———		
		———	**GS5N**		
	400mm	**GS20RSN**	———		
	300mm	———	**GS20RN**		
	300mm	**GS20SN**	———		
	200mm	———	**GS20N**		
Limited reflection type	1～40mm	**GSZ3SN**	———		
	3～30mm	**GSZ3RSN**			

Optional Parts

Type	Model	Pinhole diameter	Applicable model and detecting distance (attached to both transmitter and receiver)	
Pinhole plate (SUS)	**GP1**	ϕ 1mm	**GT3RSN** ·····400㎜ **GT7SN** ·····300㎜	Two plates required for attaching to both transmitter and receiver.
	GP2	ϕ 2mm	**GT3RSN** ·····1m **GT7SN** ·····1m	
	GP3	ϕ 3mm	**GT3RSN** ·····3m **GT7SN** ·····2.5m	
	GP5-1	5 x 1mm	**GT3RSN** ·····2m **GT7SN** ·····1.7m	

(Models GT1N is provided with stick-on pinhole sheets.)

● Attachment of pinhole plate

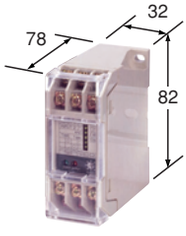


Manually bend the top and bottom parts at the base and insert the bent parts into the sensor slits.

Protective cover	**G-MSB1**	Applicable to side-on type	Rigid SUS covers for protecting sensors and reflectors from impact, etc. See p. 211 for details.
	G-MTB1		
	G-K7B	Applicable to K-7 and K-71 reflectors	

● Applicable power supply unit

PS series
High capacity of 200 mA at 12 VDC



(General-purpose type) PS3N
PS3N-SR
(Multifunctional type) PS3F
PS3F-SR

Mini-G

Rating/Performance/Specification

Rating/performance	Type	Side-on	**GT1SN**	——	**GT3RSN**	**GT7SN**	**GSM2RSN**	**GS5SN**	**GS20RSN**	**GS20SN**	**GSZ3SN**	**GSZ3RSN**
		Head-on	**GT1N**	**GT3N**	——	——	——	**GS5N**	**GS20RN**	**GS20N**	——	——
	Detection method		Through-beam type				Reflective type	Diffuse-reflective type			Limited reflection type	
	Detecting distance		1m	7m	10m	7m	0.01～2m*	70mm	400mm (GS20RSN) 300mm (GS20RN)	300mm (GS20SN) 200mm (GS20N)	1～40mm	3～30mm
	Detection object		ϕ6mm (Min.) Opaque				——	50 x 50 mm white drawing paper	100 x 100 mm white drawing paper		————	
	Power supply		24V DC ±10% / Ripple 10% max.									
	Current consumption		Transmitter: 23mA max. Receiver: 18 mA max.		Transmitter: 20mA max. Receiver: 18 mA max.	Transmitter: 23mA max. Receiver: 18 mA max.	20mA max.	25mA max.	20mA max.	22mA max.		20mA max.
	Output mode	Control output	NPN open collector output Rating: sink current 100 mA (30 VDC) max. (PNP output type also available)									
		Stability output	NPN open collector output Rating: sink current 50 mA (30 VDC) max. (PNP output type does not have stability output)									
	Operation mode		Light-ON/Dark-ON selectable (with switch)									
	Response time		0.35ms max.									
	Hysteresis		————					10% max.				
	Operating angle		30° (at receiver)	10° (at receiver)			30° (at reflector)	————————				
Specification	Light source (light wavelength)		Infrared LED (880nm)		Red LED (700nm)	Infrared LED (880nm)	Red LED (700nm)	Red LED (900nm)	Red LED (700nm)	Red LED (900nm)	Red LED (900nm)	Red LED (700nm)
	Indicator		Transmitter: Power indicator (red LED) Receiver: Operation indicator (red LED) Stability indicator (green LED)				Operation indicator (red LED) Stability indicator (green LED)					
	Volume		SENS: Sensitivity adjustment (on receiver for through-beam type)									
	Switch		Light-ON/Dark-ON selector switch provided L.ON side---Light-ON / D.ON side--- Dark-ON On the bottom for head-on type, on the back for side-on type									
	Short circuit protection		Provided (for control output only)									
	Material	Case	Polyarylate									
		Lens	Polycarbonate	Polyarylate			Polycarbonate	Polyarylate			Polycarbonate	Acrylic
	Connection		Permanently attached cord (outer dimension: dia. 3) (Transmitter) 0.15 sq. 2 core 2 m length (gray) (Receiver) 0.15 sq. 4 core 2 m length(black)				Permanently attached cord (outer dimension: dia. 3) 0.15 sq. 4 core 2 m length(black)					
	Mass		About 50 g (transmitter/receiver)				Approx. 50g					
	Notes		(Pair of) pinhole sheets provided (only GT1N)	————	Pinhole plates optional		*When used with K-71 reflector provided					
			Mounting bracket, operation manual provided									

Environmental Specification

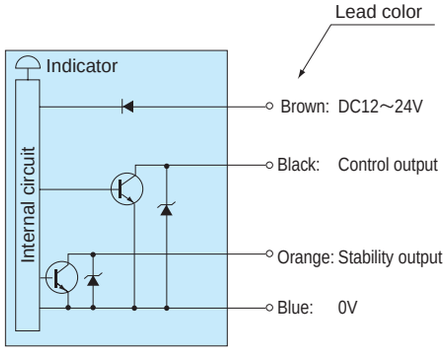
Environment	Ambient light	5,000 lx max.
	Ambient temperature	–25 - +55 –C (non-freezing)
	Ambient humidity	35~85%RH (non-condensing)
	Protective structure	IP67
	Vibration	10~55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	500 m/s2 / 3 times each in 3 directions
	Dielectric strength	1,000 VAC for 1 minute
	Insulation resistance	500 VDC, 20 MΩ or higher

* Detecting distances for different reflectors

The detecting distance depends on the reflector used.

Reflector model	K-71	K-7	S-25
Detecting distance	0.01 - 2m	0.01 - 3m	70 - 400mm

Input/Output Circuit and Connection

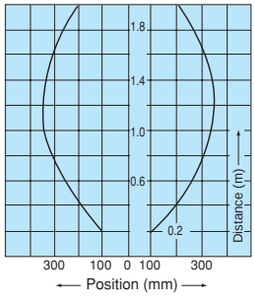


- The transmitter is provided with power supply lines (brown: 12 - 24 VDC; blue: 0 V) only.
- The output transistor turns off when load short circuit or overload occurs.
  Check the load and turn the power back on.

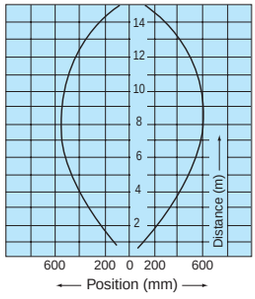
Characteristics (Typical Example)

Directional characteristics

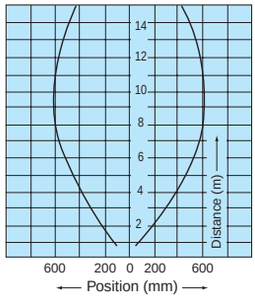
GT1SN・GT1N



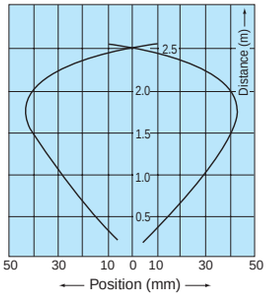
GT3N・GT7SN



GT3RSN

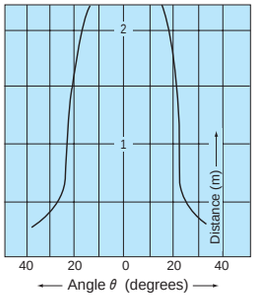


GSM2RSN (K-71)

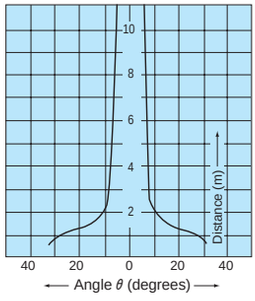


Operating angle characteristics

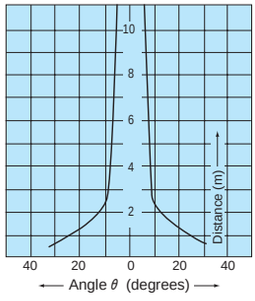
GT1SN・GT1N



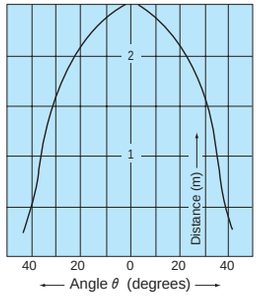
GT3N・GT7SN



GT3RSN

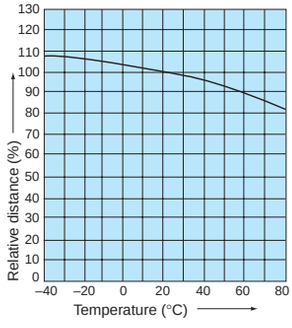


GSM2RSN (K-71)

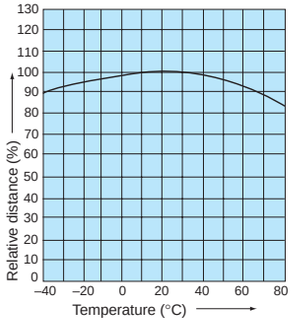


Temperature characteristics

Reflective type

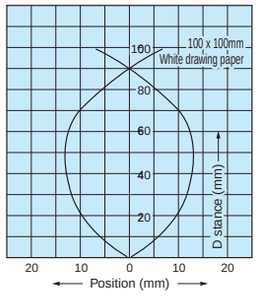


Through-beam type

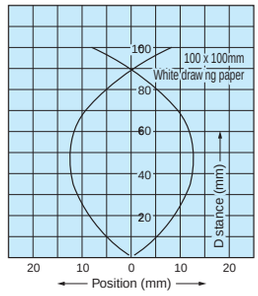


● Activation area characteristics

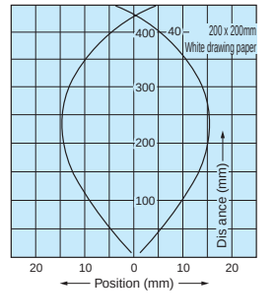
GS5SN



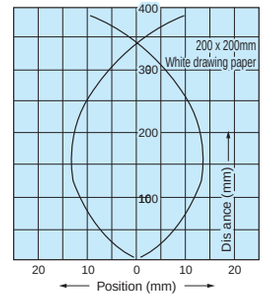
GS5N



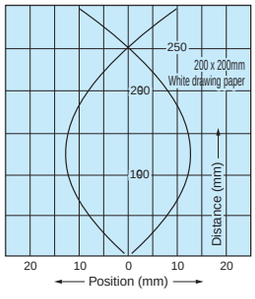
GS20RSN



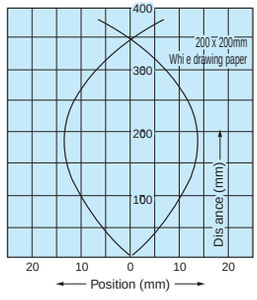
GS20RN



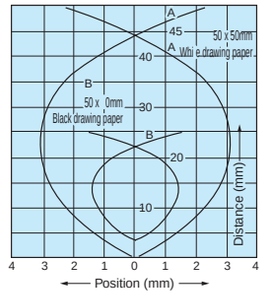
GS20N



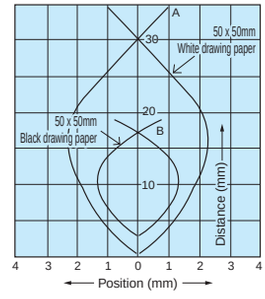
GS20SN



GSZ3SN

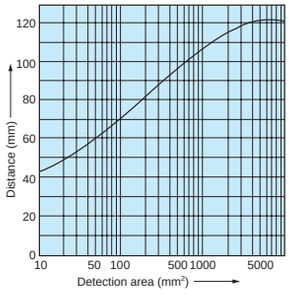


GSZ3RSN

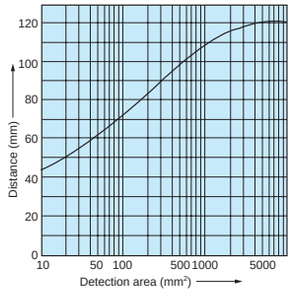


● Distance-area characteristics

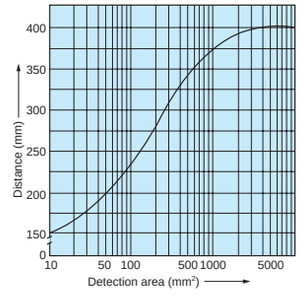
GS5SN



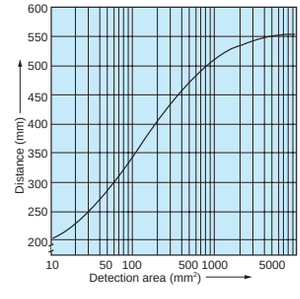
GS5N



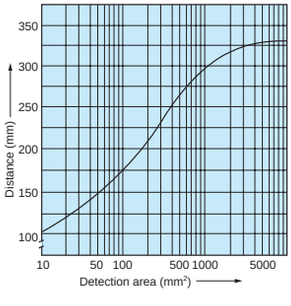
GS20RN



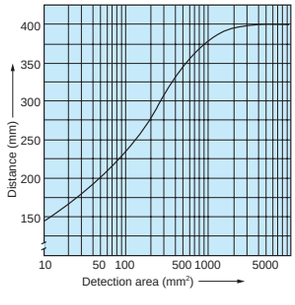
GS20RSN



GS20N



GS20SN

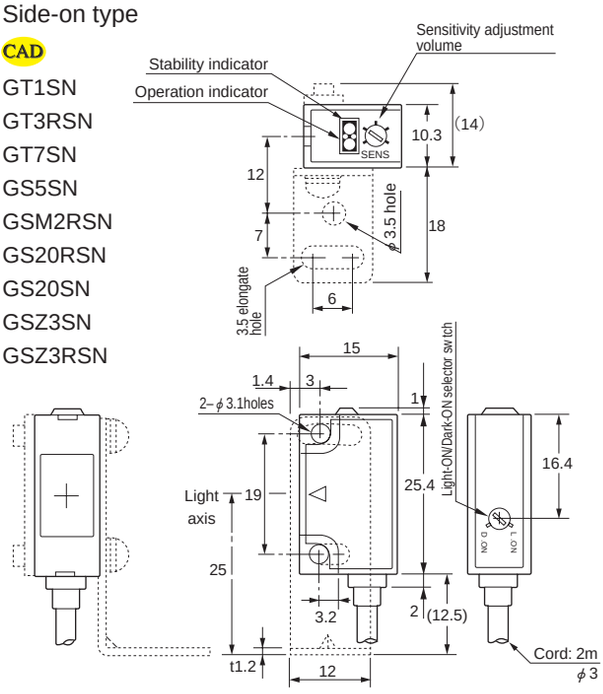


Dimensions (in mm; tightening torque for mounting screws: 0.6 N·m max.)

Side-on type

CAD

GT1SN
GT3RSN
GT7SN
GS5SN
GSM2RSN
GS20RSN
GS20SN
GSZ3SN
GSZ3RSN

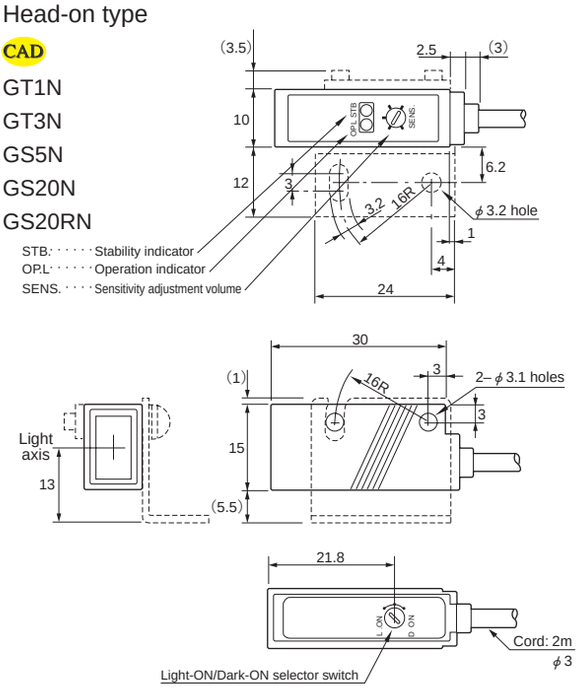


*The transmitter side of the through-beam type is provided with power indication only.

Head-on type

CAD

GT1N
GT3N
GS5N
GS20N
GS20RN

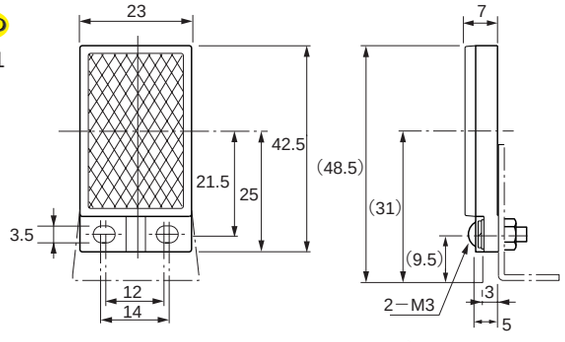


*The transmitter side of the through-beam type is provided with power indication only.

Reflector

CAD

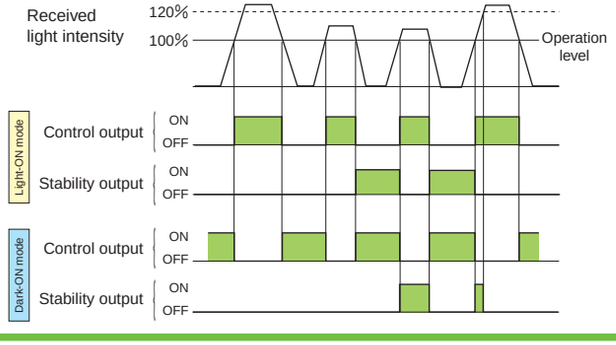
K71



Applicable to polarization reflector type
Effective reflecting surface: 19 x 32 mm
Mounting: mounting bracket provided, secured with M3 screws (alternatively adhesive may be used

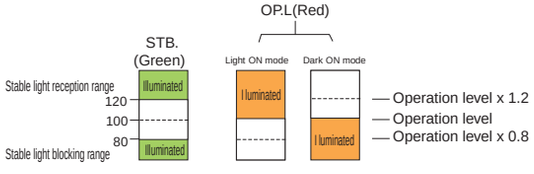
Stability output

The stability output can be used to check for reduction of the light intensity level along with any change in the operating environment or operation over time or to perform initial check of the operation. When two consecutive detections have occurred with the intensity of light detected exceeding the operation level but not reaching 120 % of the level (range allowing stable operation), the stability signal is output when the control output is deactivated. (This output is not available with the PNP output types of the Mini-G Series.)



Indicators

- The operation indicator (red LED) and stability indicator (green LED) show the levels of light intensity as described in the figure below.
- After aligning the optical axis and adjusting the sensitivity, use a detection object to block and unblock the light beam several times to make sure that the sensitivity level is in a range that allows stable activation and deactivation.
- Setting the sensitivity in a range allowing stable operation achieves higher reliability against changes in the operating environment generated after the sensitivity is set.



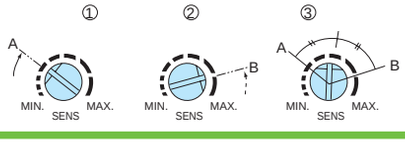
The orange LED (OP.L) is the operation indicator.
In the L.ON (Light-ON) mode, the indicator is illuminated when a certain amount of light is detected.
In the D.ON (Dark-ON) mode, the indicator is illuminated when a certain amount of light is not detected.

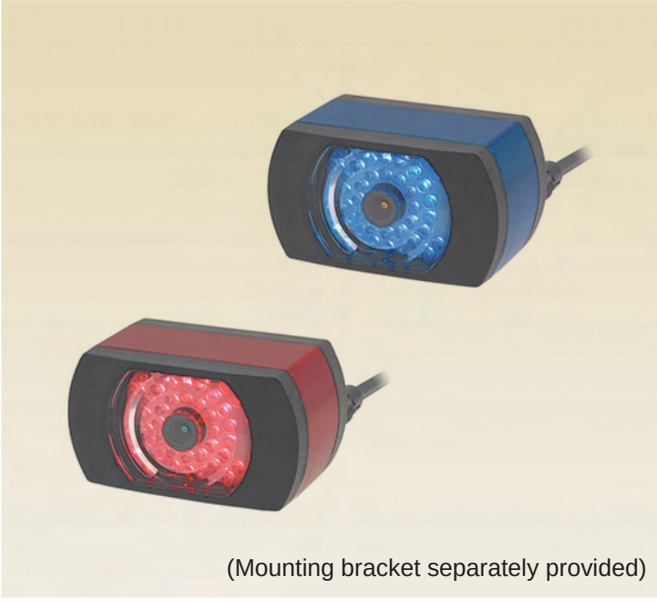
Sensitivity adjustment (for Light-ON mode)

(Adjustment for Light-ON mode)

- When any light-reflecting object is in the background

(1) Place the object to be detected in a given position, turn up the sensitivity adjustment volume (SENS.) gradually and find the point at which the operation indicator (red LED) is illuminated (Point A).
(2) Remove the object, turn down the sensitivity adjustment volume gradually from MAX. and find the point at which the operation indicator (red LED) goes out (Point B). (If the operation indicator is not illuminated even at Max., MAX. is regarded as Point B.)
(3) Set the volume at midway between Points A and B.





(Mounting bracket separately provided)

- World's first 2D sensing utilizing the BGS method
- Size (area/presence), number and position of object detected with compound eye utilizing a pulsating light and 3072 points of reference
- Reflective sensor using a new system integrating transmitter / receiver amplifier and monitor function in one unit
- Anti-Interference feature

Type

Detection method	Detecting distance	Model	Operation mode	Output mode
Compound eye detection	80～200mm	**VS-S20R**	Judgment	NPN open collector
		VS-S20B		
	100～500mm	**VS-S50RNF**		
		VS-S50BNF		

Optional Parts

Type	Model	Description
Special mounting bracket	**DX-B1**	H-shaped (for face mounting)
	DX-B2	L-shaped (for side mounting)

BGS method

Unique pulsating light emission employed for less influence of background and increased stability against disturbing light.

MSR feature

Provided with a feature to minimize the effect of mirror surface (VS-S20R, VS-S20B) for accurate object detection

Long distance/wide field of view

Wide detection field with a detecting area of 250 x 180 mm at a distance of 500 mm (VS-S50RNF, VS-S50BNF; MSR feature not provided).

Anti-Interference feature

Anti-interference detection feature in master/slave mode is available for use of two sensors installed in parallel or face-to-face.

Rating/Performance/Specification

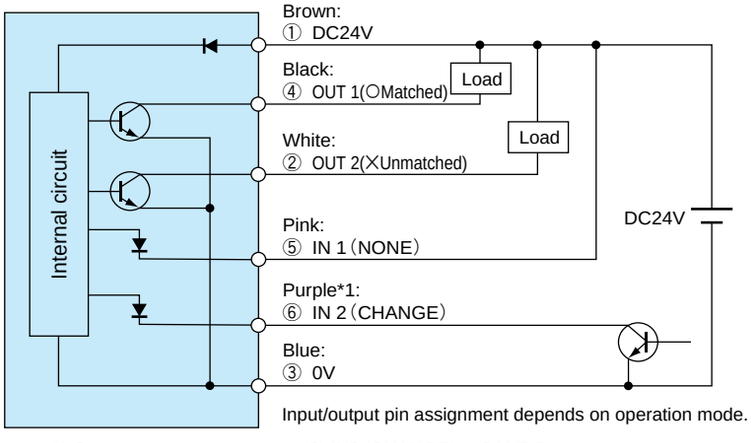
	Type	VS-S20R／VS-S20B※2	VS-S50RNF／VS-S50BNF※2
0Rating/performance	Detecting distance	80 - 200mm	100 - 500mm
	Detecting area (field of view)	100 (H) x 75 (V) mm at 200 mm	250 (H) x 180 (V) mm at 500 mm
	Detecting resolution	Total number of points in detecting area (field of view) 3072 point = 64 (H) x 48 (V)	
	Minimum detectable object	ϕ 1 mm (at detecting distance of 200 mm, 2 x zoom)	
	Power supply	24V DC ±10% / Ripple 10% max.	
	Current consumption	300mA max.	
	Output	2 NPN open collector 2 outputs	
		Sink current 50 mA (30 VDC) max. Residual voltage: 2 V max.	
	Input	2 inputs	
		Rating: 5mA 24VDC	
	Response time	25 ms max. in Continuous mode and at shutter speed 240	
Specification	Mirror surface rejection	Provided	Not provided
	Light source (wavelength)	Red LED (639nm) Blue LED (466nm) *2	
	Light-sensitive element	2D photo diode array	
	Indicator	LCD display	
	Operating switch	3 pushbutton switches for UP, DOWN, ENTER	
	Material	Body: aluminum / Lens: acrylic / Front/rear panel: ABS	
	Connection	6-pin waterproof plastic connector connection	
	Mass	Approx. 250g	
	Accessory	Cord with connector *1, operation manual	

*1: 0.2 mm2 x 6 / 2 m (outer diameter: 5 mm)
*2: Blue light source

Environmental Specification

Environment	Ambient light	1,000 lx max. (on light receiving surface)
	Ambient temperature	–10 - +45 –C (non-freezing)
	Ambient humidity	35 - 85%RH (non-condensing)
	Protective structure	IP65
	Vibration	10 - 55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	500 m/s² / 3 times each in 3 directions
	Dielectric strength	1,000 VAC 50/60Hz for 1 minute
	Insulation resistance	500 VDC, 20 MΩ or higher

Input/Output Circuit and Sample Connection (in Continuous mode)



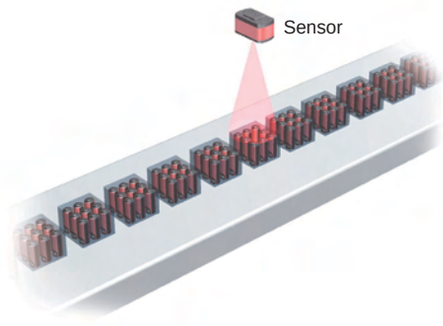
Input/output pin assignment depends on operation mode.

*1 Connect unused purple line (6) IN2 (CHANGE) to 24 VDC.

Sample Applications

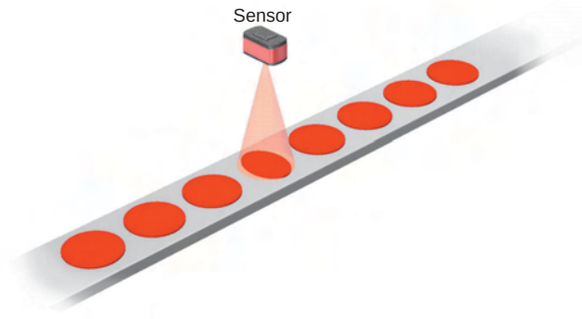
Checking of quantity in field of view

Field examined to check for any missing work.



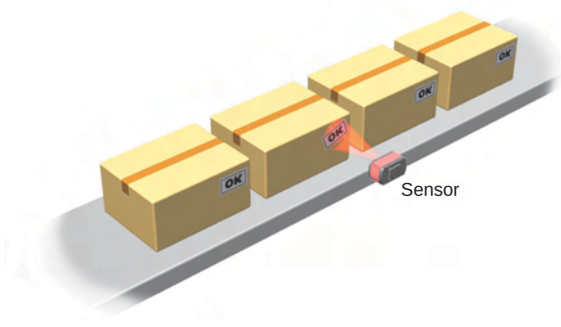
Work area judgment

Field examined to check for nonstandard size.



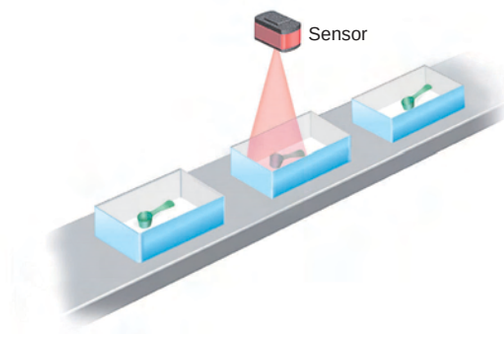
Detection of label at specified position

Presence of label at specified position checked by XY coordinate teaching.



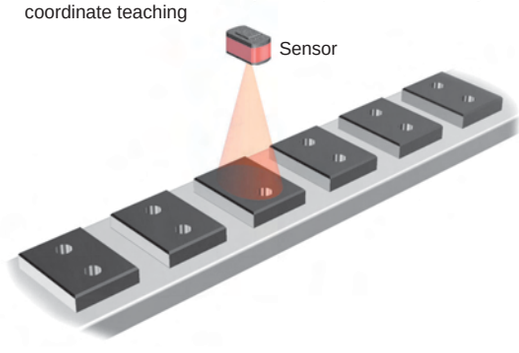
Detection of parts in containers

Presence of measuring cups in containers checked.



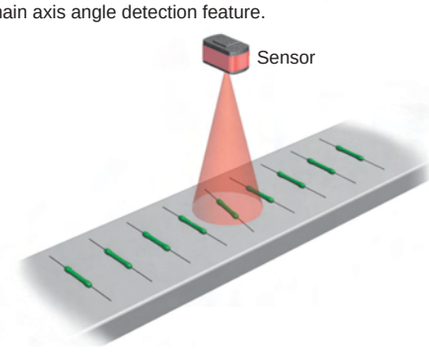
Detection of hole at specified position

Presence of bored hole at specified position checked by XY coordinate teaching



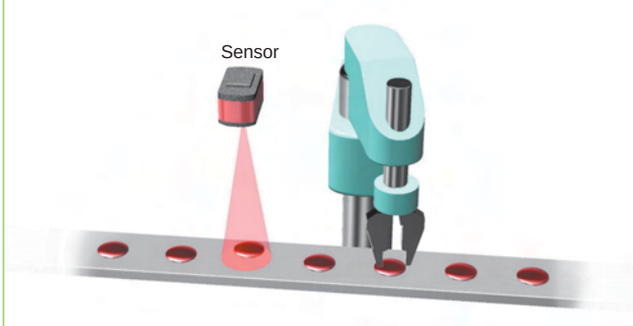
Checking for angular displacement

Angular displacement of parts, etc. arranged in parallel checked by main axis angle detection feature.



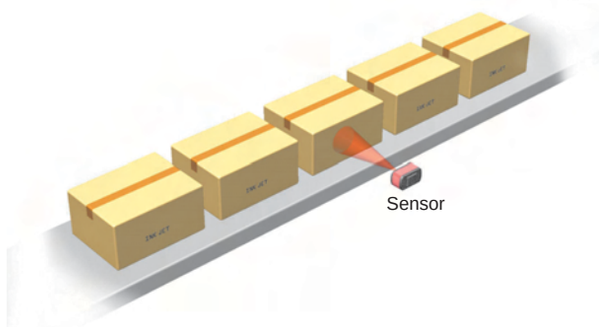
Checking of position in detecting area

Position of work checked during picking by robot.

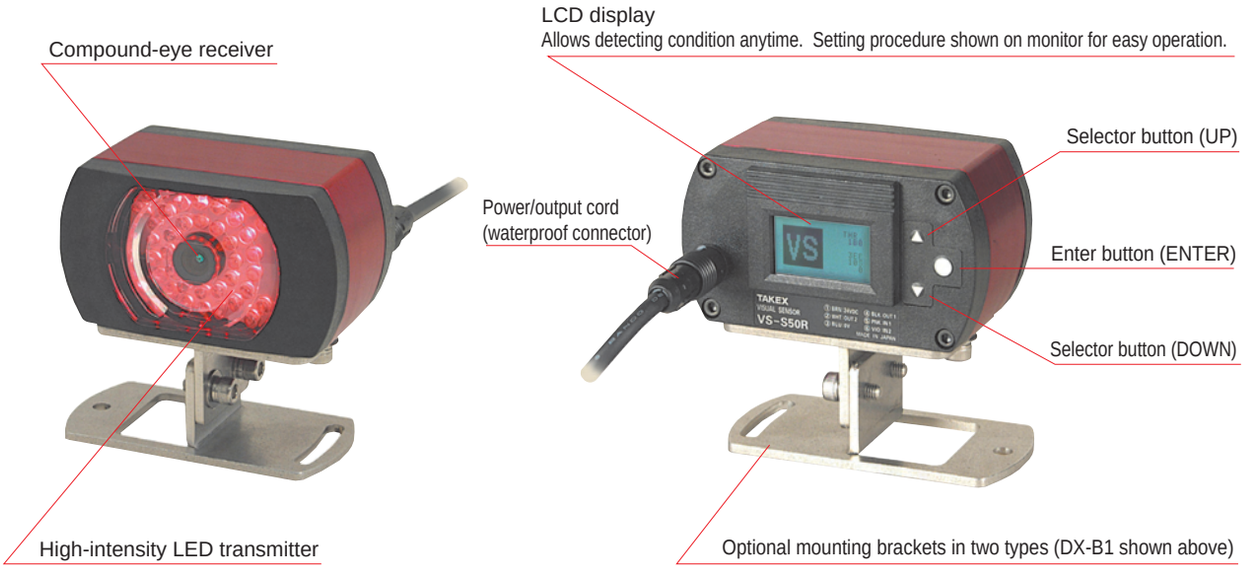


Detection of presence in detecting area

Presence of print by inkjet printer checked.



Appearance and Part Names

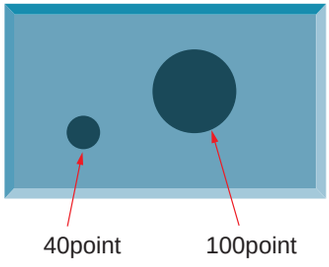


Detection/Judgment Feature

Detection of size (area/presence)

Applications

- Detection of nonstandard shape, etc.
- Checking of presence of print, label, etc.

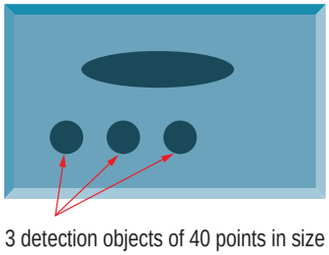


Two or more (up to 100) objects in the field can be individually detected to determine size, which allows the detection of a particular object alone by setting the upper and lower limits of the size (area). Presence can also be checked.

Determination of count

Applications

- Checking of package for smaller number of objects than specified
- Checking of connector lead count



3 detection objects of 40 points in size

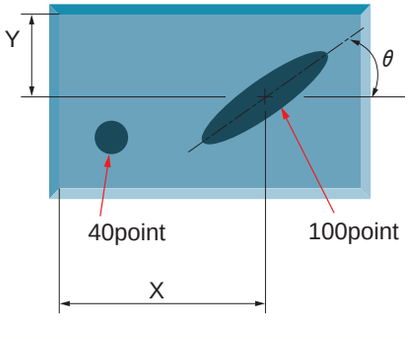
Two or more (up to 100) objects in the field can be individually detected for size determination, this provides determination of the number of detection objects of a given size as:

- Larger than the setting,
- Equal to the setting, or
- Smaller than the setting.

Checking of position

Applications

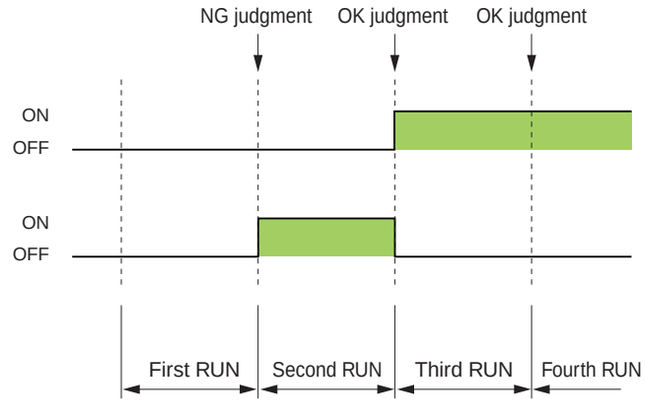
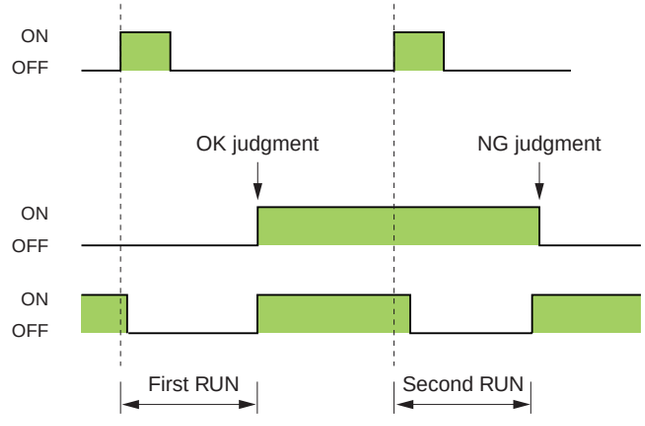
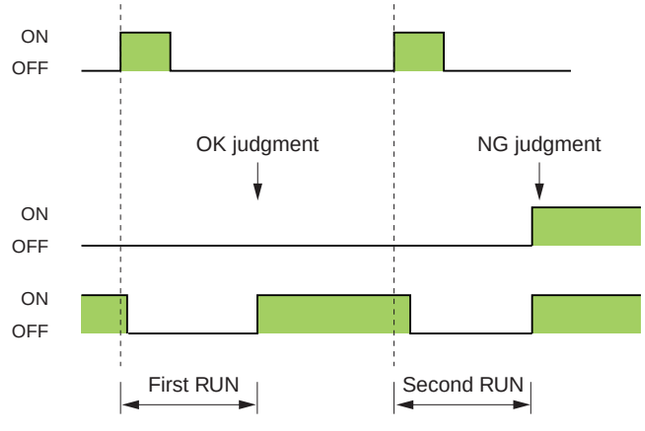
- Checking for displaced stickers
- Checking for wrong type mixed in



Two or more (up to 100) objects in the field can be individually detected for size determination, which therefore allows the user to determine the position of one detected object of a given size by:

- X-coordinate of the center of gravity,
- Y-coordinate of the center of gravity, and
- Inclination (θ).

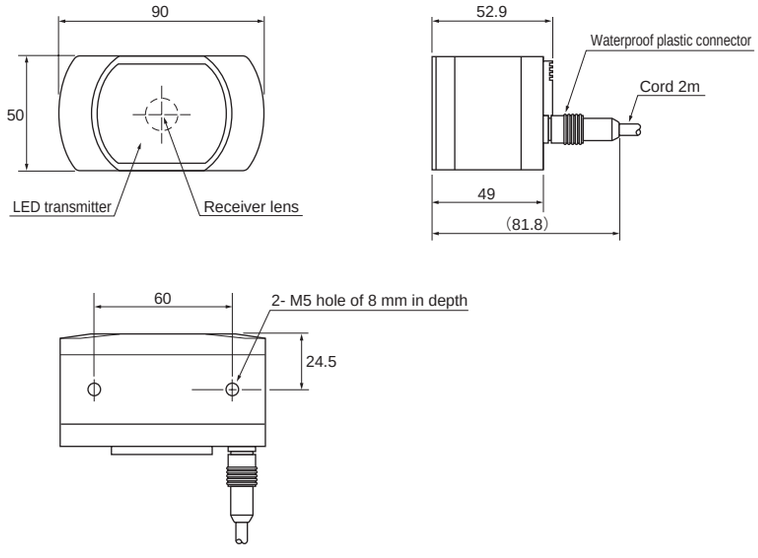
Judgment Output Timing Chart

Operation mode	Input/output setting	Operation timing chart
Continuous/Self synchronization mode	OUT1：OK OUT2：NG	
External synchronization mode If a TRIGGER signal is input while the READY output is active, a RUN is started. The READY output is deactivated during a RUN. The output mode factory setting is OK, which means that the signal is output when the detection is judged OK.	IN1：TRIGGER OUT1：OK/NG OUT2：READY	
External synchronization mode When NG is selected as the output mode, the signal is output when the detection is judged NG.	IN1：TRIGGER OUT1：OK/NG OUT2：READY	

Dimensions (in mm)

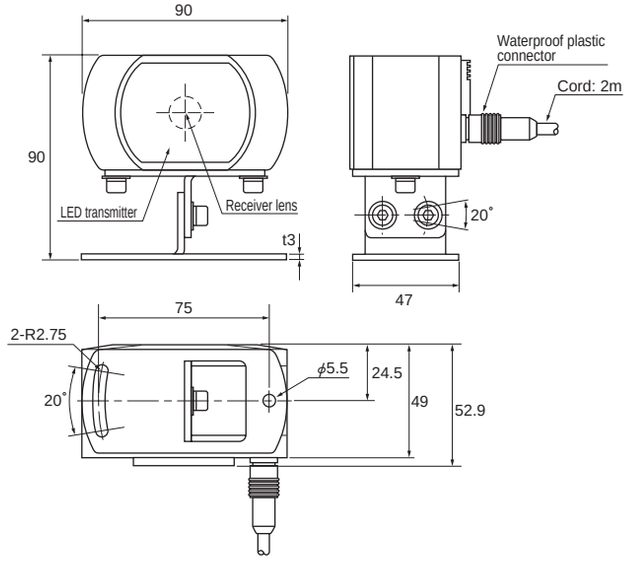
Body

CAD



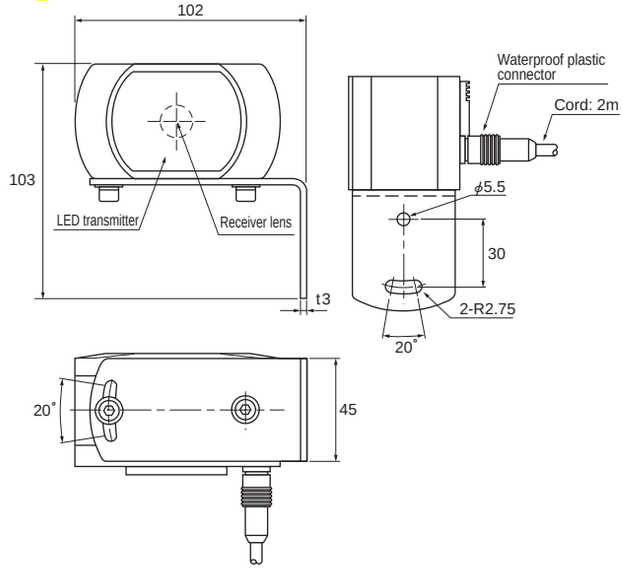
With mounting bracket model DX-B1 attached
Mounting brackets are optional.

CAD



With mounting bracket model DX-B2 attached
Mounting brackets are optional.

CAD



GA Series

Polarization reflector/ diffuse-reflective type

- **Simple operation of just pressing button**

  One large button alone handling sensitivity adjustment and Light-ON/Dark-ON switching

- **Sensitivity adjustment not requiring placing of work**

  Simple sensitivity adjustment without placement of work for detection in narrow spaces or of falling objects that cannot be easily stopped

- **Equipped with inverter light suppression circuit**

  Faulty operation under inverter fluorescent lamps prevented

- **IP 67 water resistance allows washing**

  Reliable use even in sites subject to water or high moisture

Type

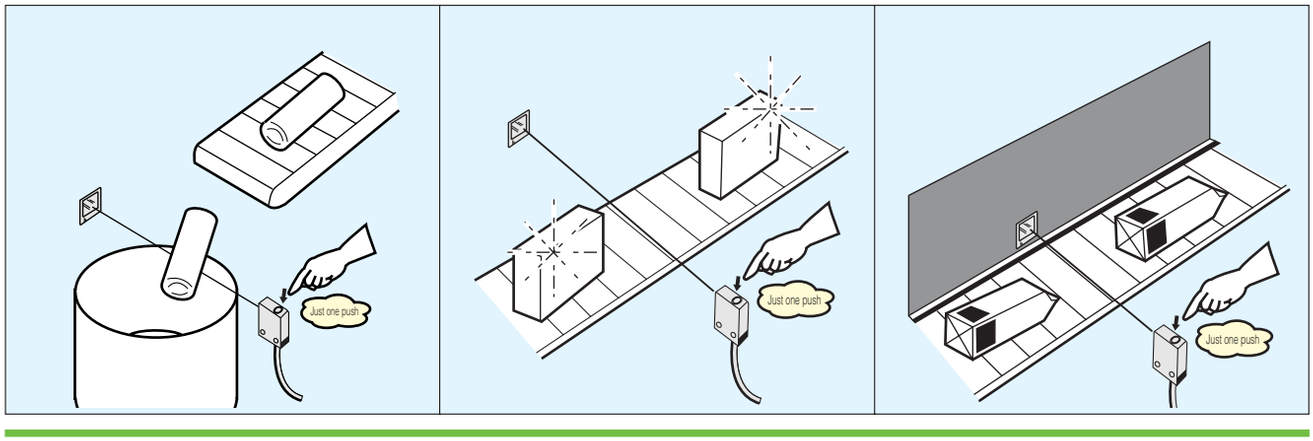
Detection method	Detecting distance	Model		Operation mode	Output mode
		NPN type	PNP type		
Polarization reflector type	0.1 - 3m	**GA-M3R**	**GA-M3RPN**	Light-ON/ Dark-ON (by teaching)	Open collector
Diffuse-reflective type	500mm	**GA-S05R**	**GA-S05RPN**		

Optional Parts

Product name	Model	Description
Polarization reflector	**K-7**	Dimensions: 60 x 40 mm / Detecting distance: 0.1 - 3 m
	K-71	Dimensions: 35 x 23 mm / Detecting distance: 0.1 - 1.8 m
Mounting bracket	**GA-B1**	Vertical mounting bracket
	GA-B2	Horizontal mounting bracket
Protective cover	**G-MSB1**	Rigid protective cover doubling as mounting bracket. See p. 211.
	G-MTB1	
	G-K7B	

Polarization reflectors and mounting brackets do not come with sensors. Select and purchase appropriate models according to the detecting and mounting conditions.

Sample Applications



Rating/Performance/Specification

Rating/performance	Type	NPN type	**GA-M3R**	**GA-S05R**
		PNP type	**GA-M3RPN**	**GA-S05RPN**
	Detection method		Polarization reflector type	Diffuse-reflective type
	Detecting distance		0.1 - 3 m (With K-7 reflector)	500mm (Standard detection object: 200 x 200 mm white drawing paper)
	Power supply		12-24V DC ±10% / Ripple 10% max.	
	Current consumption	NPN type	30mA max.	
		PNP type	30mA max.	
	Output mode (Control output)	NPN type	Open collector output Rating: Sink current 100 mA (30 VDC) max. / Residual voltage: 1 V or less	
		PNP type	Open collector output Rating: source current 100 mA (30 VDC) max. / Residual voltage: 1 V or less *	
	Output mode (Stability output)	NPN type	Open collector output Rating: Sink current 50 mA (30 VDC) max. / Residual voltage: 1 V or less *	
		PNP type	Open collector output Rating: source current 50 mA (30 VDC) max. / Residual voltage: 1 V or less *	
	Operation mode		Light-ON/Dark-ON selectable	
	Response time		1ms max.	
Specification	Light source		Red LED (700nm)	Red LED (644nm)
	Indicator		Operation indicator (orange LED) Stability indicator (green LED)	
	Setting button		For sensitivity adjustment and Light-ON/Dark-ON switching	
	Short circuit protection		Provided	
	Material		Case: polyarylate Lens: acrylic	Case: polycarbonate Lens: acrylic
	Connection		Permanently attached cord (outer dimension: dia. 4.2mm) 0.2 sq. 4 core 2 m length	
	Mass		Body: about 60 g	
	Accessory		Operation manual, explanation sticker (Note: reflector and mounting bracket separately available)	

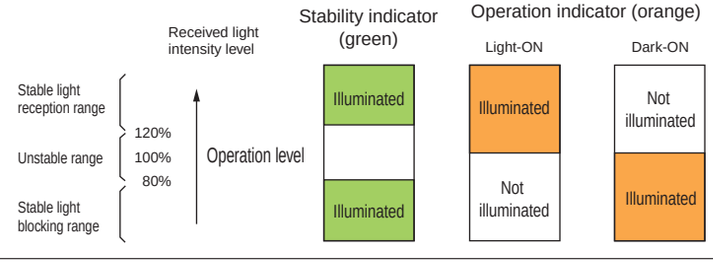
* The residual voltage of GA-M3R (PN) is 2 V max.

Environmental Specification

Environment	Ambient light	5,000 lx max.
	Ambient temperature	–25 - +55 –C (non-freezing)
	Ambient humidity	35~85%RH (non-condensing)
	Protective structure	IP67
	Vibration	10 - 55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	500 m/s2 / 3 times each in 3 directions
	Dielectric strength	1,000 VAC for 1 minute
	Insulation resistance	500 VDC, 20 MΩ or higher

Indicators

The figure below shows the illumination of operation and stability indicators for different received light intensity levels. Set the sensitivity in such a way that the sensor operates in a sensitivity range that allows stable activation.



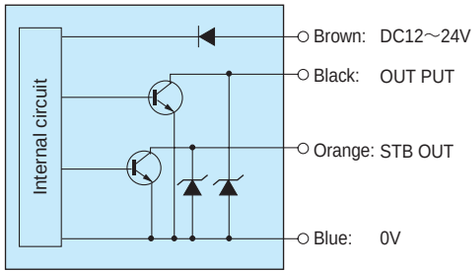
Stability output

When seven consecutive detections have occurred with the intensity of light detected not reaching the range allowing stable operation, the stability signal is output.

Input/Output Circuit and Connection

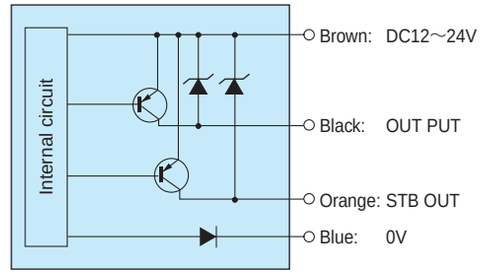
NPN output

GA-M3R
GA-S05R



PNP output

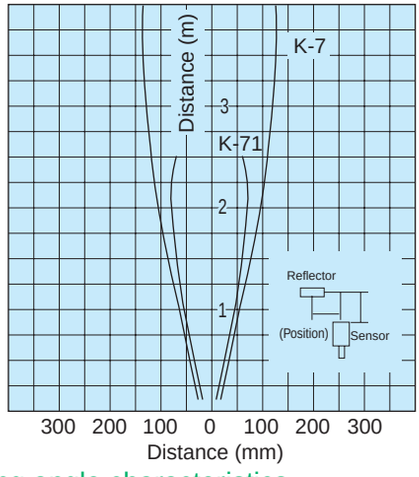
GA-M3RPN
GA-S05RPN



Characteristics (Typical Example)

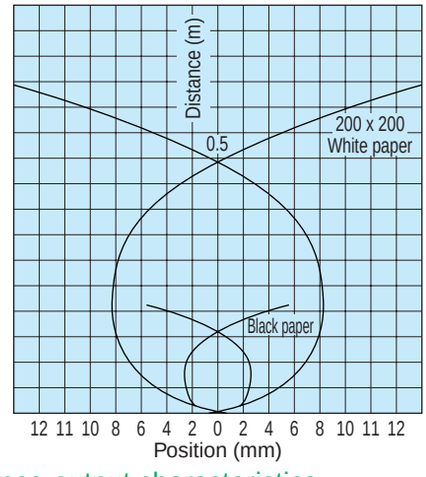
● Directional characteristics

GA-M3R
GA-M3RPN



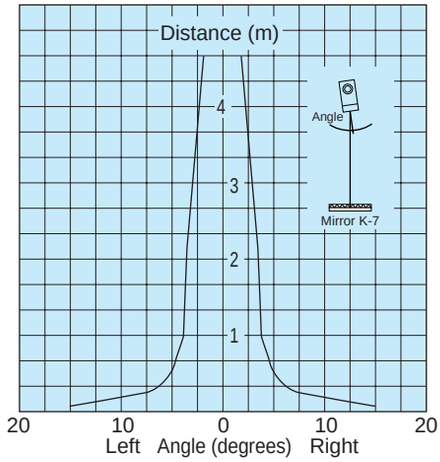
● Activation area characteristics

GA-S05R
GA-S05RPN



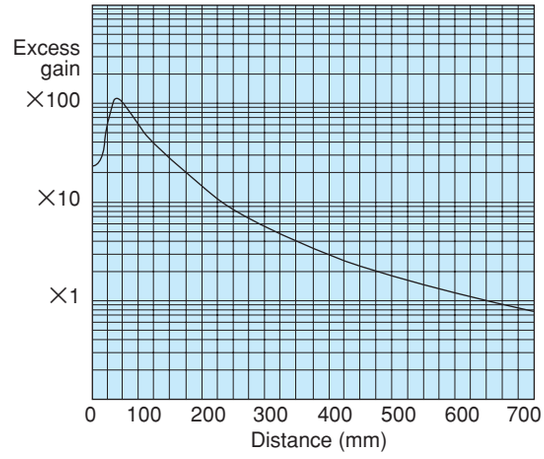
● Operating angle characteristics

GA-M3R
GA-M3RPN



● Distance-output characteristics

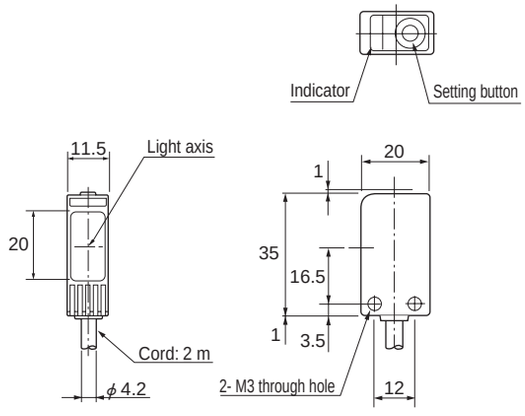
GA-S05R
GA-S05RPN



Dimensions (in mm)

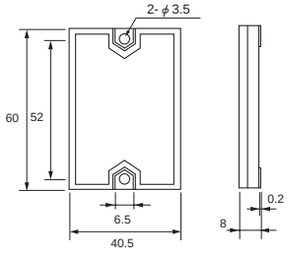
Sensor body
GA-M3R
GA-M3RPN
GA-S05R
GA-S05RPN

CAD



Polarization reflector
K-7

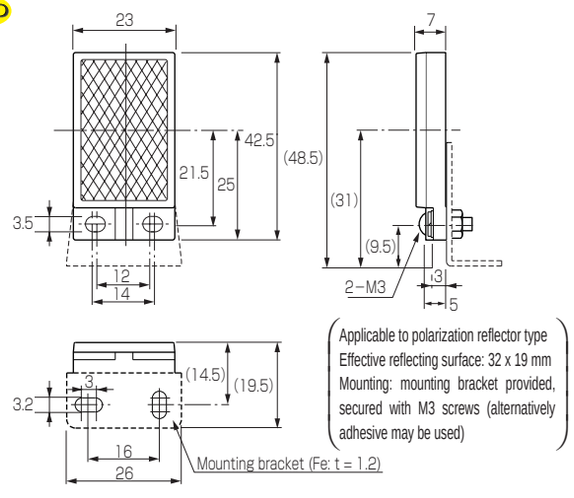
CAD



Applicable to polarization reflector type
Effective reflecting surface: 56 x 36 mm
Mounting: secured with M3 screws
(alternatively adhesive may be used)
Protective structure: IP 67

Polarization reflector
K-71

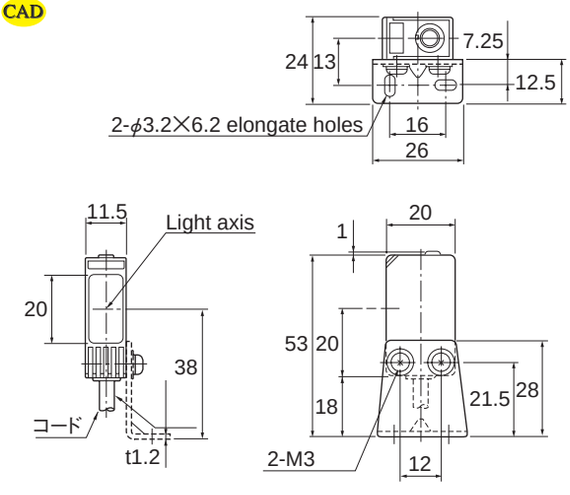
CAD



Applicable to polarization reflector type
Effective reflecting surface: 32 x 19 mm
Mounting: mounting bracket provided,
secured with M3 screws (alternatively
adhesive may be used)

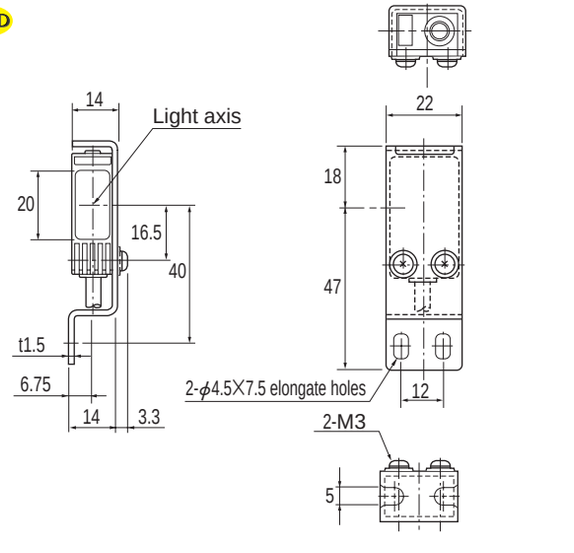
With separately available mounting bracket (GA-B1) attached

CAD



With separately available mounting bracket (GA-B2) attached

CAD

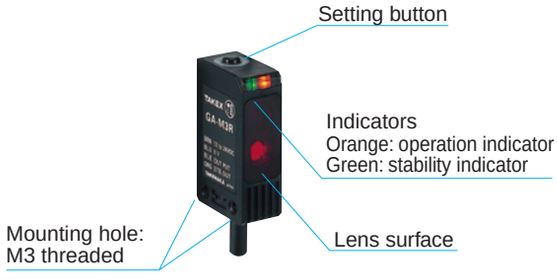


GA-M3R
GA-M3RPN

For Correct Use

Be sure to follow the instructions in the operation manual provided for correct use of the product.

Part names

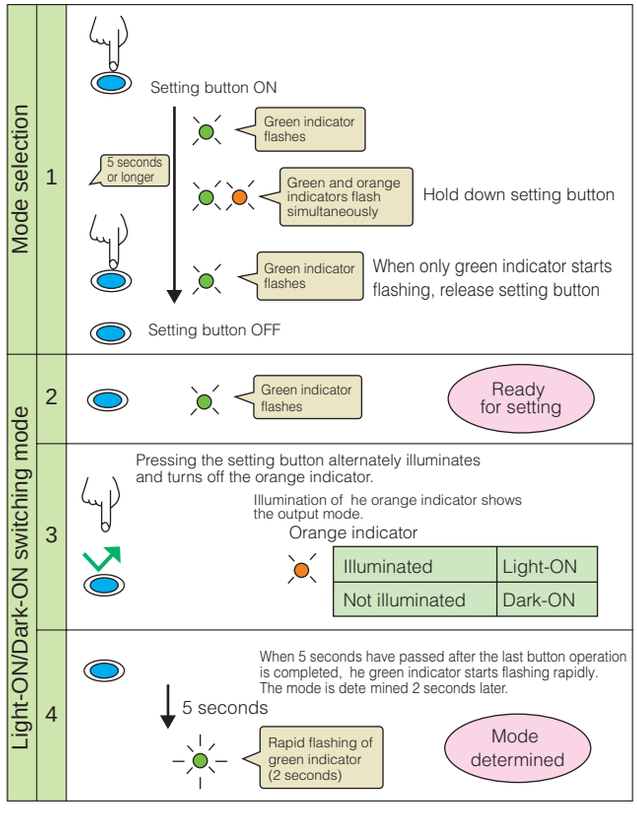


This sensor only has one setting button and no sensitivity adjustment volume or selector switch. Light-ON/Dark-ON switching and sensitivity setting are handled with the setting button alone.
Enter the sensitivity setting mode or Light-ON/Dark-ON switching mode by pressing and holding down the button for a period of time as specified below:

Hold down setting button for 2 - 4 seconds
⇨ Sensitivity setting mode
Hold down setting button for 5 seconds or longer
⇨ Light-ON/Dark-ON switching mode

Switching between Light-ON/Dark-ON mode

The factory setting is Dark-ON mode.
Be sure to check and set either the Light-ON or Dark-ON mode before setting the sensitivity.
Enter the Light-ON/Dark-ON switching mode by pressing the setting button for 5 seconds or longer. While the button is operated, the state of the output before starting the operation of the button is maintained.



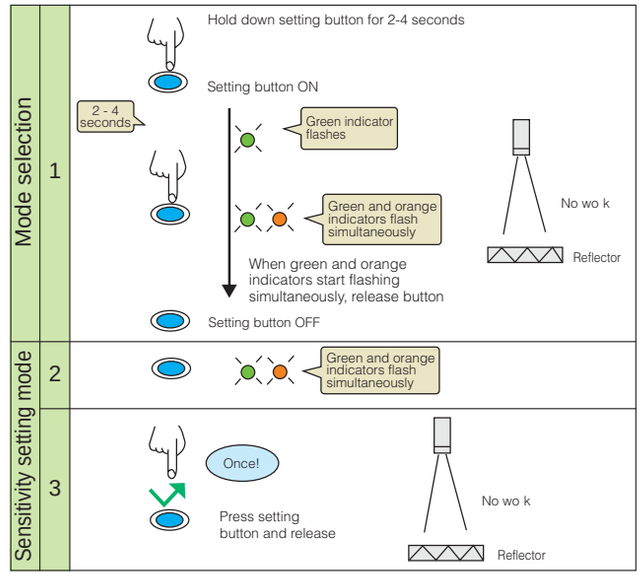
Sensitivity setting

The factory setting is maximum sensitivity. No special sensitivity adjustment is required if the detection object is something that completely blocks the light such as corrugated cardboard box. Adjust the sensitivity as required according to the state of the detection object or sensor mounting condition. Use the table below as guidelines:

Detection object	Sensitivity setting
Translucent object such as milky white plastic case	⇨ Single-touch teaching
Continuously moving object such as falling object	⇨ Full auto teaching
Object that completely blocks light such as corrugated cardboard box	⇨ Maximum sensitivity setting

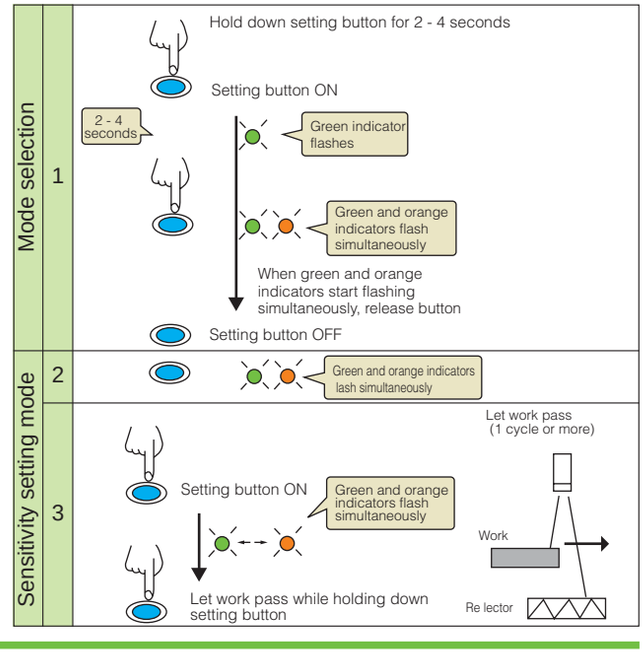
Single-touch teaching —Auto teaching—

No work needs to be placed. Set the sensitivity while the light is received.
Just a single operation of the button sets the optimum sensitivity for the given received light intensity.



Full auto teaching

When it is not possible to make "no-work" state as in detection of continuously moving (e.g. falling) object

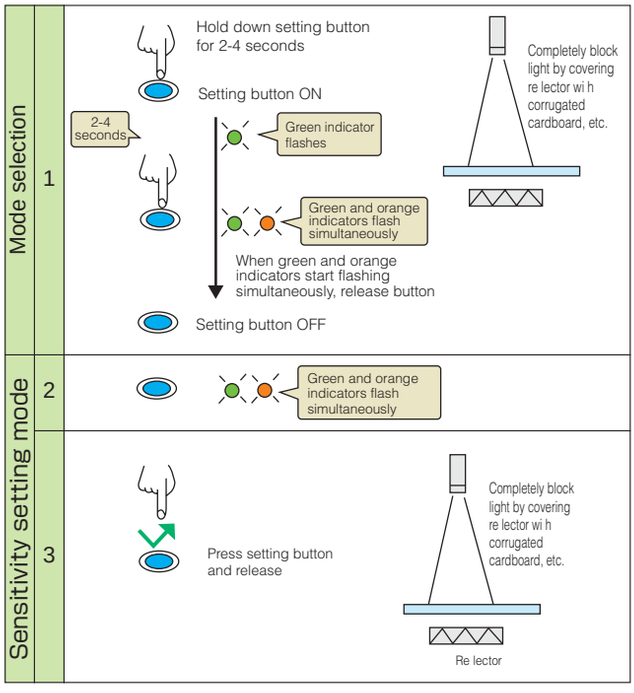


For Correct Use

Be sure to follow the instructions in the operation manual provided for correct use of the product.

Maximum sensitivity setting

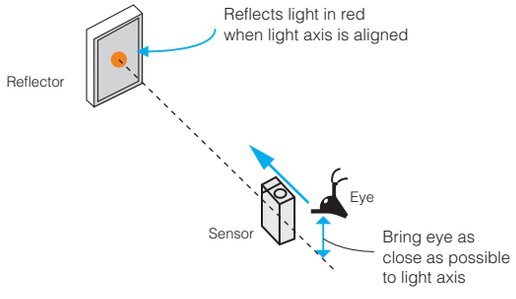
Enter the sensitivity setting mode with the light blocked and press the setting button once. The sensitivity is set at the maximum, which is the factory setting.



Installation

- Polarization reflectors and mounting brackets do not come with sensors. Purchase appropriate reflectors and mounting brackets according to the application.
- Sensor mounting
  The mounting holes in the sensor are M3 threaded. Select M3 screws of an appropriate length so that the screw-in length to the body of the sensor will be at least 10 mm.
  The tightening torque should be up to 0.5 N·m.
  If the effective length of the screw to the sensor is too short, the thread of the sensor may be damaged.
- Secure the sensor on a solid base.
  Inadequate securing allowing the sensor to move when the setting button is pressed hampers accurate sensitivity setting.
  Be sure to firmly secure the sensor.
  Make sure that the sensor and reflector are fixed before use.
  If the sensor or reflector is allowed to move, the operation may become unstable.
  Rotation of the reflector with reference to the sensor is especially likely to cause problems such as chattering.
- If the ambient temperature is low enough for freezing to occur, the operation of the setting button may not feel smooth. In such a case, press hard until the indicator flashes.

Light axis alignment



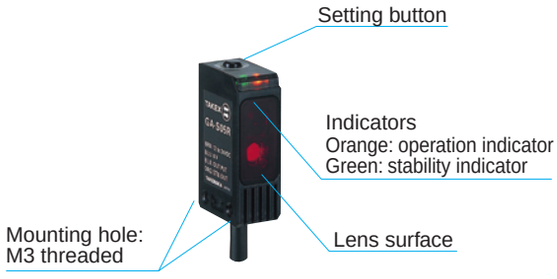
Place the reflector and sensor face-to-face and look towards the reflector from right behind the sensor.
Adjust the mounting of the sensor so that the light is reflected on the reflector in red.
For accurate alignment, try to look from as close to the sensor light axis as possible.

GA-S05R
GA-S05RPN

For Correct Use

Be sure to follow the instructions in the operation manual provided for correct use of the product.

Part names

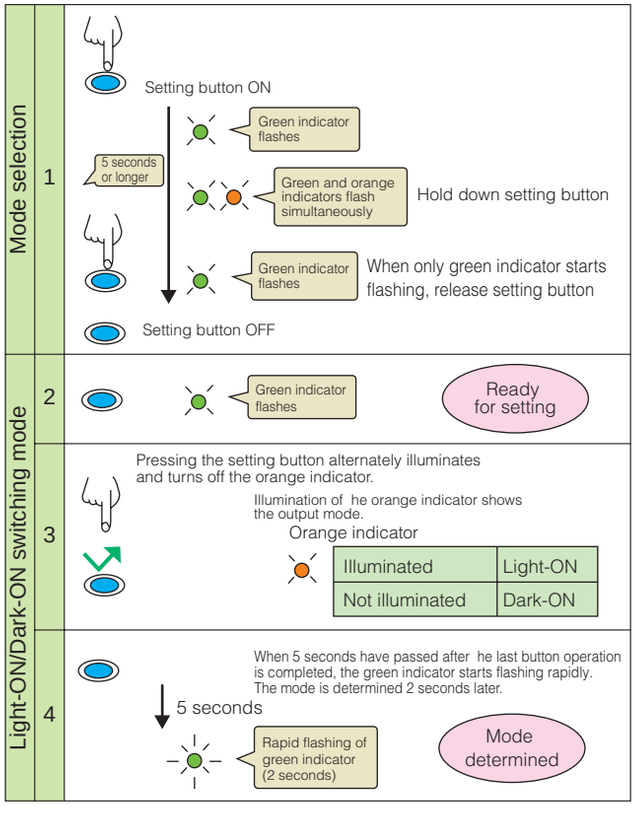


This sensor only has one setting button and no sensitivity adjustment volume or selector switch. Light-ON/Dark-ON switching and sensitivity setting are handled with the setting button alone.
Enter the sensitivity setting mode or Light-ON/Dark-ON switching mode by pressing and holding down the button for a period of time as specified below:

Hold down setting button for 2 - 4 seconds
⇨ Sensitivity setting mode
Hold down setting button for 5 seconds or longer
⇨ Light-ON/Dark-ON switching mode

Switching between Light-ON/Dark-ON mode

The factory setting is Dark-ON mode.
Be sure to check and set either the Light-ON or Dark-ON mode before setting the sensitivity.
Enter the Light-ON/Dark-ON switching mode by pressing the setting button for 5 seconds or longer. While the button is operated, the state of the output before starting the operation of the button is maintained.



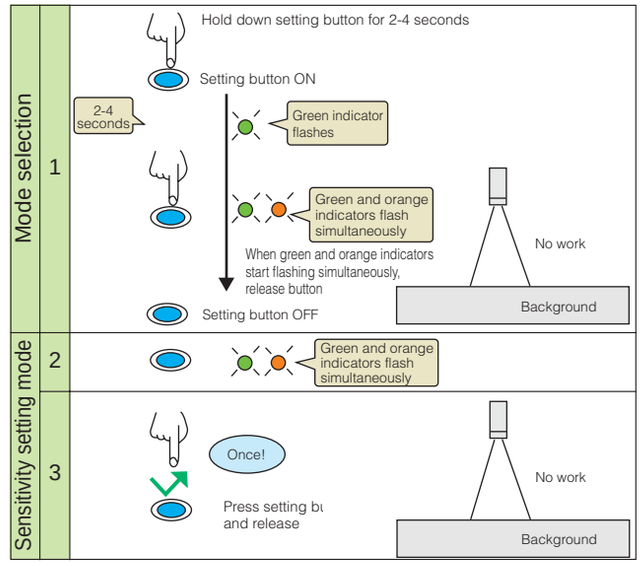
Sensitivity setting

The factory setting is maximum sensitivity. No special sensitivity adjustment is required if there is no background object in the direction of the detection. Adjust the sensitivity as required depending on whether there is any background object such as a wall or conveyor and according to the state of the detection object or sensor mounting condition. Use the table below as guidelines:

Detection object	Sensitivity setting
With background object such as wall	⇨ Single-touch teaching
Continuously moving object such as falling object	⇨ Full auto teaching

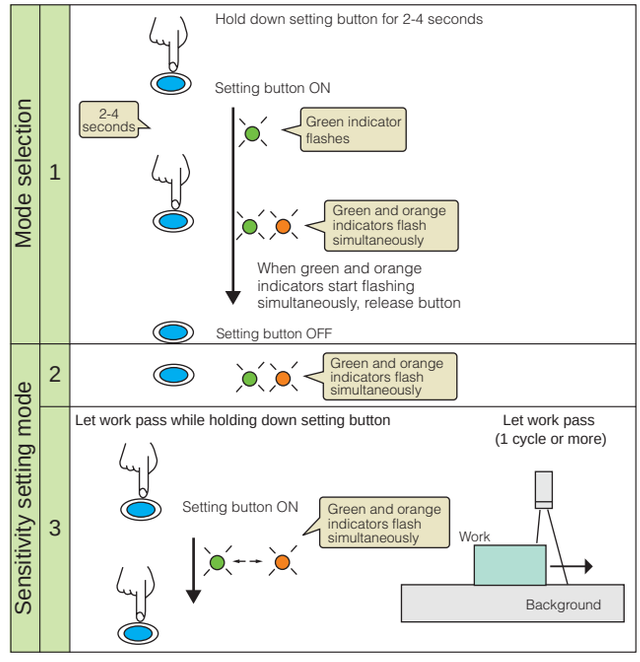
Single-touch teaching —Auto teaching—

No work needs to be placed. Just a single operation of the button sets the optimum sensitivity for the given received light intensity even an object such as wall is in the background.



Full auto teaching

When it is not possible to make ‹no-work› state as in detection of continuously moving (e.g. falling) object



For Correct Use

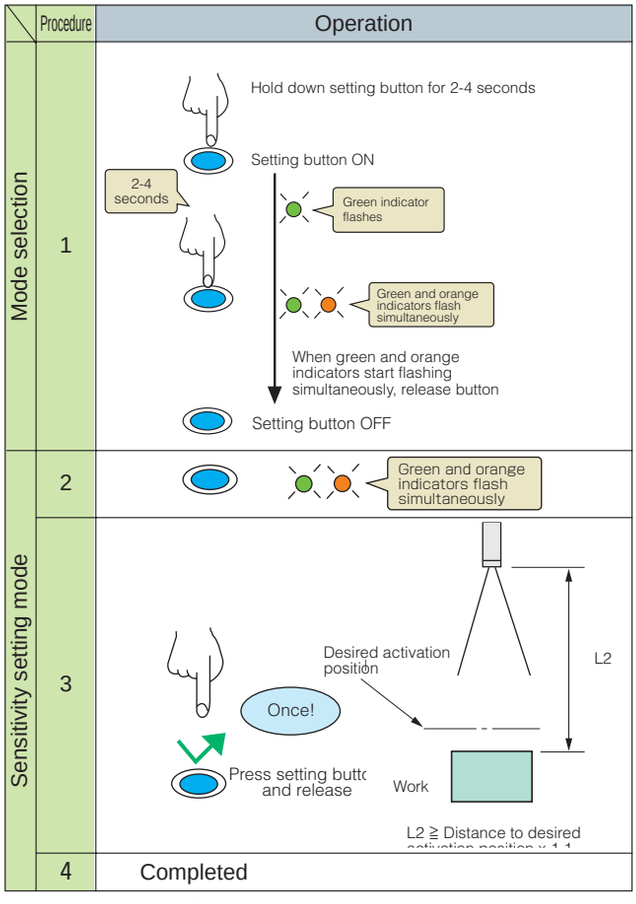
Be sure to follow the instructions in the operation manual provided for correct use of the product.

Arbitrary activation position setting

To set the detection point of the sensor at an arbitrary position

Place the work at a point about 90 % of the distance to the desired activation position and select the sensitivity setting mode.

Move the work to a point about 110 % of the distance to the desired activation position and press the setting button once.

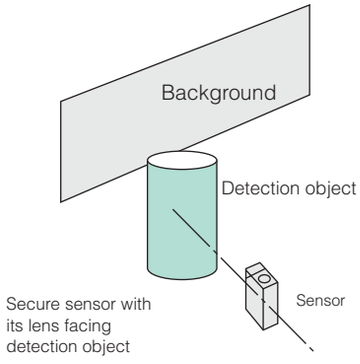


Although shorter distance between L1 and L2 allows more precise setting, too short a distance makes the setting similar to the single-touch teaching with only the background taken into account.

Try to make the difference between L1 and L2 at least ±10 % of the distance to the desired activation position whenever possible.

Installation

- No mounting bracket is provided. Purchase mounting brackets separately available according to the application.
- Sensor mounting
  The mounting holes in the sensor are M3 threaded. Select M3 screws of an appropriate length so that the screw-in length to the body of the sensor will be at least 10 mm.
  The tightening torque should be up to 0.5 N·m.
  If the effective length of the screw to the sensor is too short, the thread of the sensor may be damaged.
- Secure the sensor firmly on a solid base so that the sensor will not move when the setting button is pressed.
  Inadequate securing allowing the sensor to move when the setting button is pressed hampers accurate sensitivity setting.

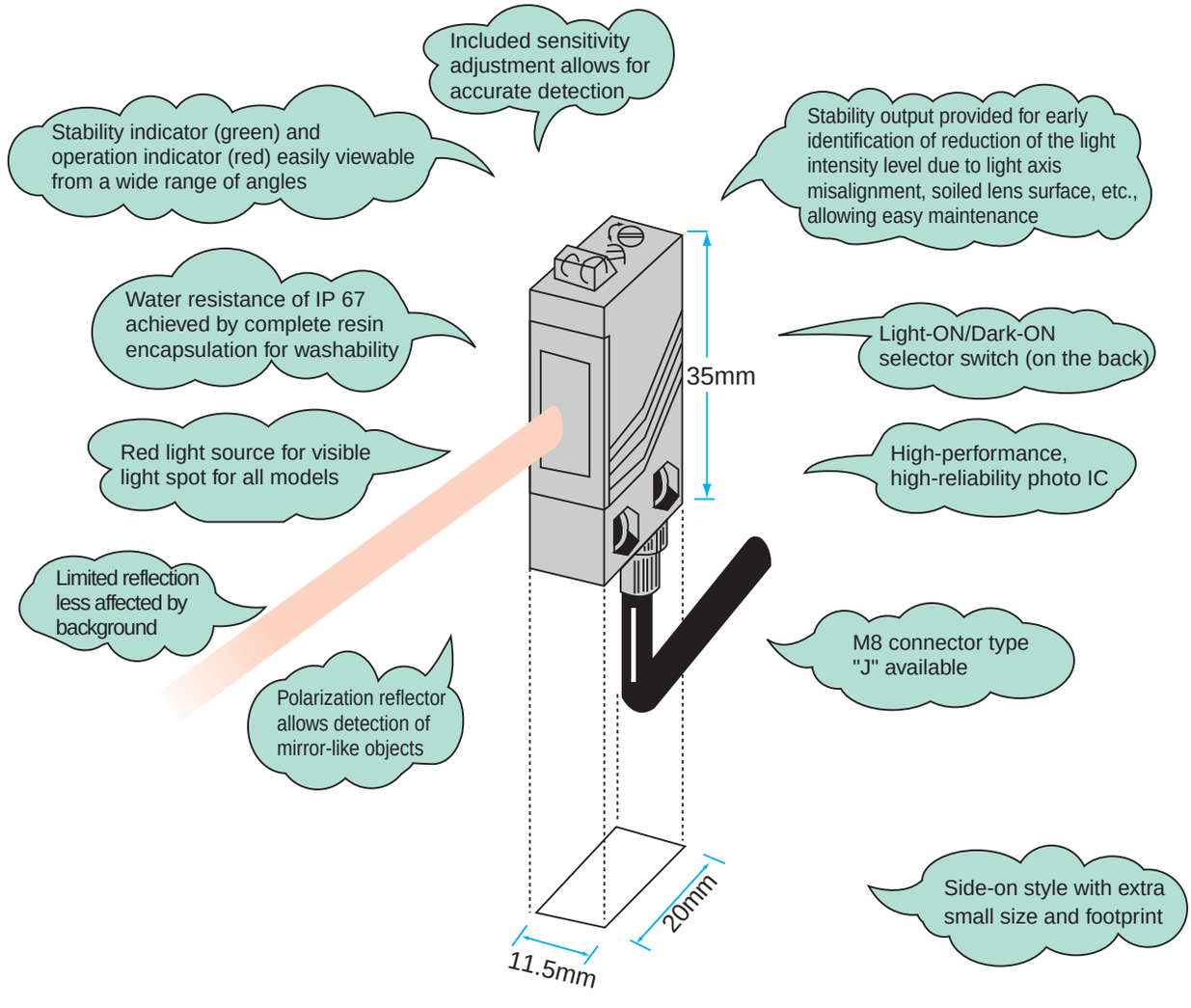


- If the ambient temperature is low enough for freezing to occur, the operation of the setting button may not feel smooth. In such a case, press hard until the indicator flashes.

Middle-G Series Embedded Amplifier Photo Sensors

- IP 67 water resistance
- Detects mirror-like materials (mirrors, glossy objects) (polarization reflector type)
  - Switch selectable operation mode
  - Sensitivity adjustment for fine detection
  - Globally compatible PNP types also conveniently provided with stability output
  - Optional rigid protective cover (mounting bracket) available

Ideal for embedded use



Type

Detection method	Detecting distance	Model		Operation mode	Output mode
		Side-on type	Head-on type		
Through-beam type	7m	GT5RSN	———	Light-ON/ Dark-ON selectable	NPN open collector
		GT5RSN-J	———		
		———	GT5RN		
		———	GT5RN-J		
Polarization reflector type	0.03 -1.5m	GMR2RSN	———		
		GMR2RSN-J	———		
		———	GMR2RN		
		———	GMR2RN-J		
Diffuse-reflective type	500mm	GSR05RSN	———	(with switch)	(PNP output type also available)
		GSR05RSN-J	———		
		———	GSR05RN		
		———	GSR05RN-J		
Limited reflection type	20～50mm	GSZ5RS	———		
		GSZ5RS-J	———		
		———	GSZ5R		
		———	GSZ5R-J		

- PNP output type
  PNP output types are available for all models.
  PNP output type models are identified by "PN" at the end of model number.
  The rating/performance other than the output is the same as NPN type.

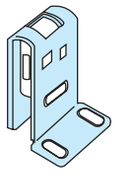
Optional Parts

Type	Model	Applicable model	Description
Reflector	K-7	All polarization reflector type models	Detecting distance With K-7: 0.03-2.5 m With S-25: 70-400 mm
	S-25 *		
Protective cover	G-MSB1	Side-on type models	Rigid SUS covers for protecting sensors and reflectors from impact, etc.
	G-MTB1		
	G-MTB2	Head-on type models	
	G-K7B	K-7 and K-71 reflectors	
Cord with M8 connector	FBC-4R2S	M8 connector type sensor models with "-J"	Straight (2 m)
	FBC-4R2L		Angled (2 m)

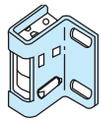
* One sheet contains 25.

Protective cover

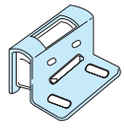
G-MSB1
(For side-on style)



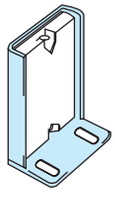
G-MTB1
(For side-on style)



G-MTB2
(For head-on style)



G-K7B
(For reflector)



For dimensions, see "Dimensions (protective cover)."

Middle-G

Rating/Performance/Specification

Rating/performance	Model	Side-on	**GT5RSN**	**GMR2RSN**	**GSR05RSN**	**GSZ5RS**
		Head-on	**GT5RN**	**GMR2RN**	**GSR05RN**	**GSZ5R**
	Detection method		Through-beam type	Polarization reflector type	Diffuse-reflective type	Limited reflection type
	Detecting distance		7m	0.03 - 1.5m*	500mm	20 - 50mm
	Detection object		ϕ 20mm (Min.) Opaque	Glossy objects including mirror-like materials and stainless-steel plates or opaque objects	Standard detection object: 100 x 100mm white drawing paper	————
	Power supply		12 - 24V DC ±10% / Ripple 10% max. (*15 V power supply)			
	Current consumption		Transmitter: 20 mA max. Receiver: 20 mA max.	30mA max.		
	Output mode	Control output	NPN open collector output Rating: sink current 100 mA (30 V DC) max. (PNP output type also available)			
		Stability output	NPN open collector output Rating: sink current 50 mA (30 V DC) max. (PNP output type also available)			
	Operation mode		Light-ON/Dark-ON selectable (with switch)			
	Response time		0.5ms max.			
	Hysteresis		————		10% max.	
	Operating angle		10° (at receiver)	30° (reflector)	————	
Specification	Light source (light wavelength)		Red LED (700nm)			
	Indicator		Transmitter: power indicator (red LED) Receiver: operation indicator (red LED) Stability indicator (green LED)	Operation indicator (red LED) Stability indicator (green LED)		
	Volume		SENS: sensitivity adjustment (on receiver for through-beam type)			
	Switch		Light-ON/Dark-ON selector switch provided			
	Short circuit protection		Provided (for control output only)			Provided
	Material	Case	Polyarylate			
		Lens	Acrylic			
	Connection		Permanently attached cord (outer dimension: dia. 4.2) Transmitter of through-beam type: 0.3 sq. 2 core 2 m length(gray) Receiver of through-beam type: 0.2 sq. 4 core 2 m (black)			
	Mass		About 80 g (transmitter/receiver)	About 80g		
	Notes			K-71 reflector provided		
				Screwdriver for sensitivity adjustment provided		
			*1 Contact Takex for 5 VDC power supply models available for head-on types. ● All models are provided with a mounting bracket. Polarization reflector types are provided with a bracket for reflector and adhesive sheet for mounting the reflector.			

Environmental Specification

Environment	Ambient light	5,000 lx max.
	Ambient temperature	–25 - +55°C (non-freezing)
	Ambient humidity	35~85%RH (non-condensing)
	Protective structure	IP67
	Vibration	10-55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	500 m/s^2 / 3 times each in 3 directions
	Dielectric withstanding	1,000 VAC for 1 minute
	Insulation resistance	500 VDC, 20 MΩ or higher

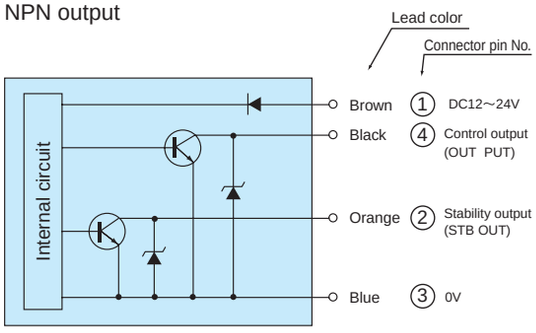
*Detecting distances for different reflectors

● The detecting distance depends on the reflector used.

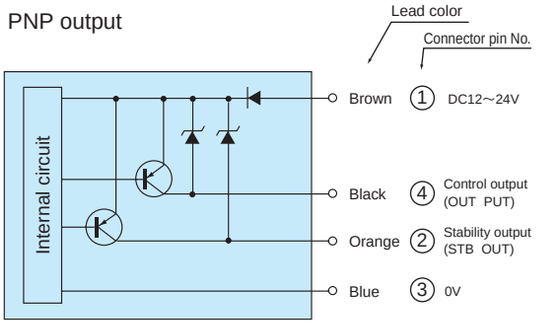
Reflector model	K-71	K-7	S-25
Detecting distance	0.03 - 1.5m	0.03 - 2.5m	70 - 400mm

Input/Output Circuit and Connection

NPN output



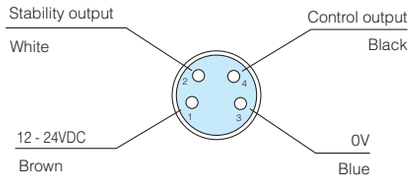
PNP output



- The transmitter is provided with power supply lines (brown: 12-24 VDC; blue: 0 V) only.
- The output transistor turns off when load short circuit or overload occurs.
- Check the load and turn the power back on.

● M8 connector type (-J) pin assignment and connection

(Receiver/reflective type sensor)



The colors show lead colors for use in combination with the optional cord with M8 connector.

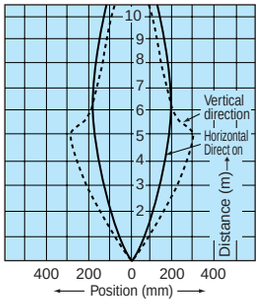
(Transmitter)

Lines other than Lines 1 (brown) and 3 (blue) are unused.

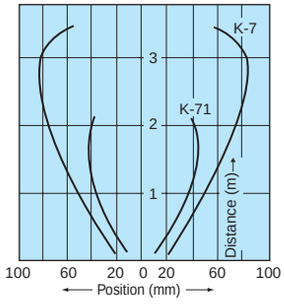
Characteristics (Typical Example)

● Directional characteristics

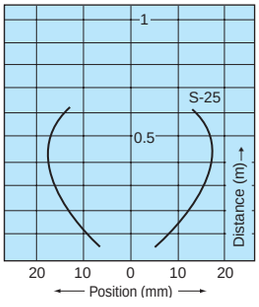
GT5RSN・GT5RN



GMR2RSN (K-7)
GMR2RN (K-71)

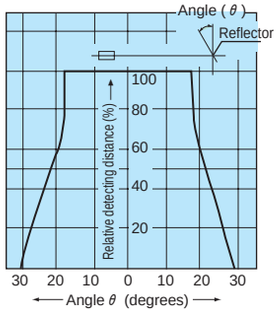


GMR2RSN
GMR2RN (S-25)



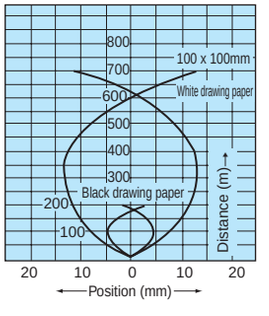
● Operating angle characteristics

GMR2RSN・GMR2RN



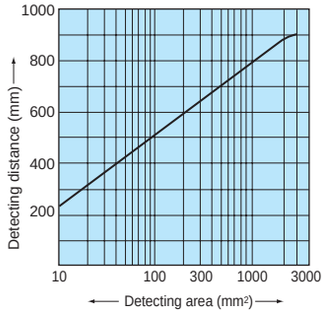
● Activation area characteristics

GSR05RSN・GSR05RN



● Distance-area characteristics

GSR05RSN・GSR05RN

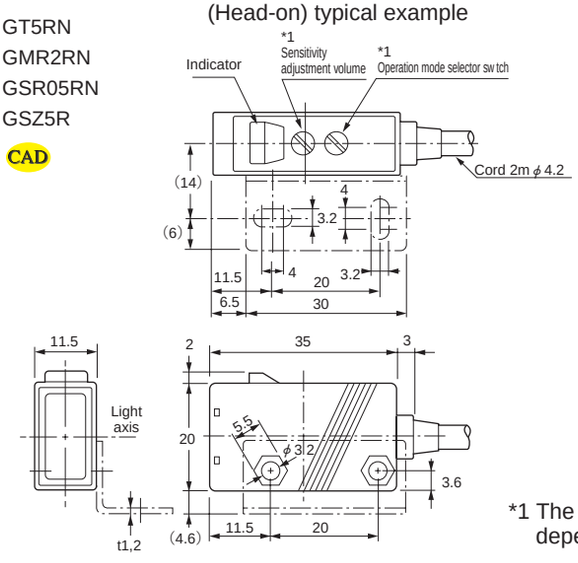


Dimensions (in mm; tightening torque for mounting screws: 0.6 N·m max.)

GT5RN
GMR2RN
GSR05RN
GSZ5R

CAD

(Head-on) typical example

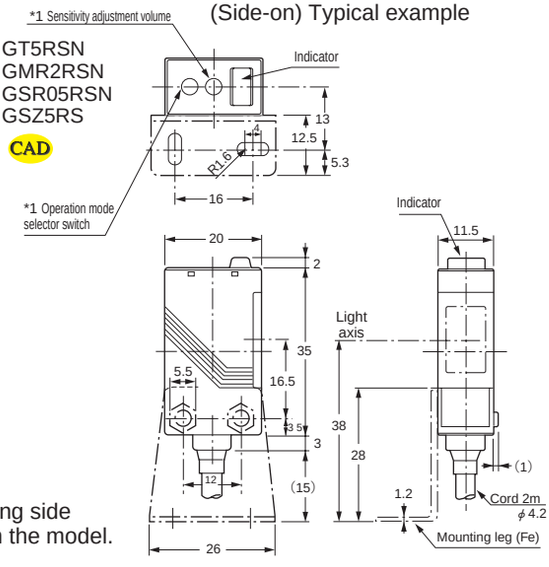


*1 The operating side depends on the model.

GT5RSN
GMR2RSN
GSR05RSN
GSZ5RS

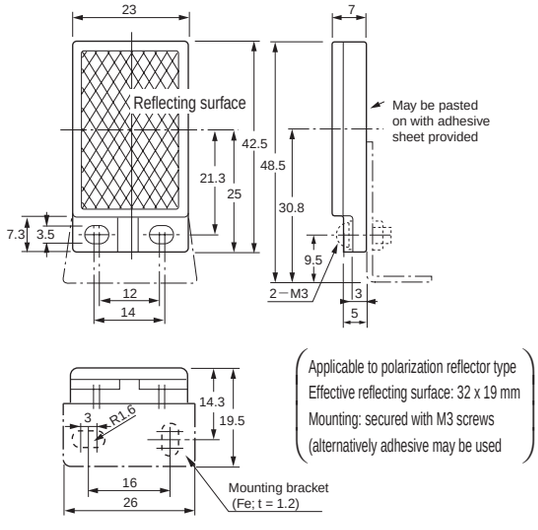
CAD

(Side-on) Typical example



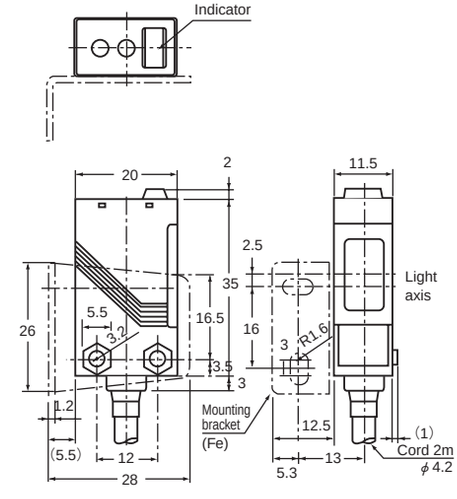
CAD

(K-71 reflector)



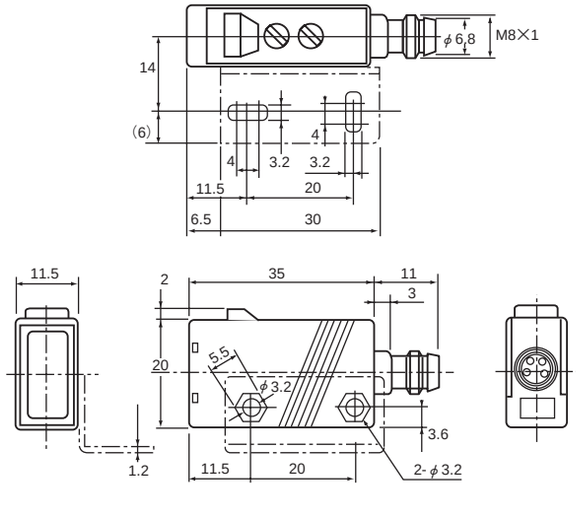
Applicable to polarization reflector type
Effective reflecting surface: 32 x 19 mm
Mounting: secured with M3 screws
(alternatively adhesive may be used

(Mounting bracket in different orientation)



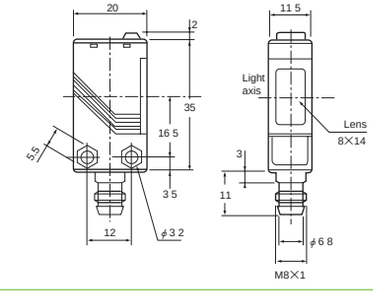
CAD

"-J" (M8 connector type) head-on model



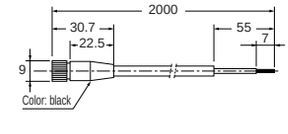
CAD

"-J" (M8 connector type) side-on model



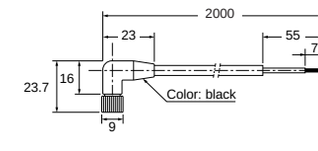
FBC-4R2S (Straight)

CAD



FBC-4R2L(Angled)

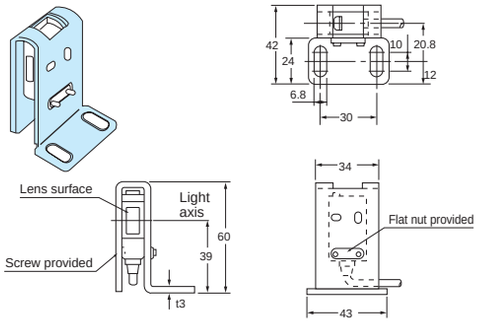
CAD



Dimensions (protective cover) (in mm)

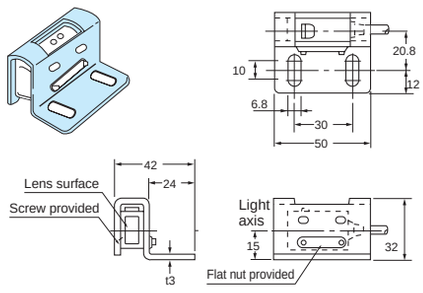
G-MSB1 (side-on)

CAD



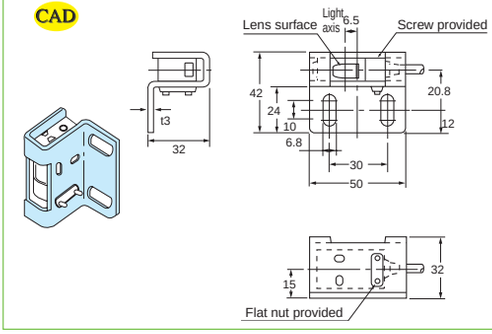
G-MTB2 (head-on)

CAD



G-MTB1 (side-on)

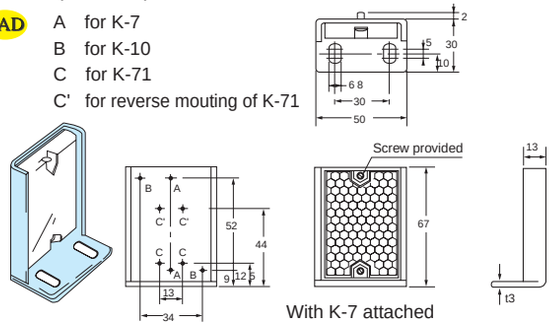
CAD



G-K7B (reflector)

CAD

A for K-7
B for K-10
C for K-71
C' for reverse mouting of K-71



Operation Mode Switching

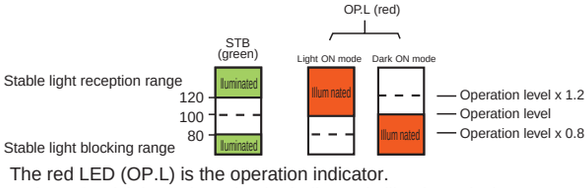
- Operation mode selector switch is provided for all models.

Light-ON mode　　Dark-ON mode

Light-ON mode: LIGHT (L)
Dark-ON mode: DARK (D)

Indicators

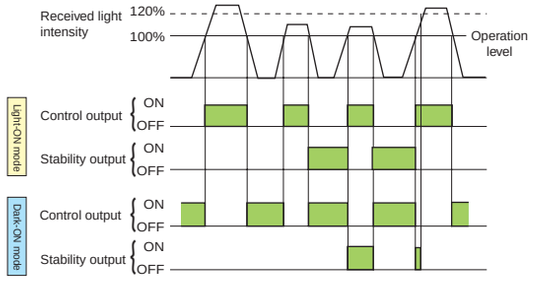
- The operation indicator (red LED) and stability indicator (green LED) show the levels of light intensity as described in the figure below.
- After aligning the optical axis and adjusting the sensitivity, use a detection object to block and unblock the light beam several times to make sure that the sensitivity level is in a range that allows stable activation and deactivation.
- Setting the sensitivity in a range allowing stable operation achieves higher reliability against changes in the operating environment generated after the sensitivity is set.



The red LED (OP.L) is the operation indicator.
In the L.ON (Light-ON) mode, the indicator is illuminated when a certain amount of light is detected.
In the D.ON (Dark-ON) mode, the indicator is illuminated when a certain amount of light is not detected.

Stability output

The stability output can be used to check for reduction of the light intensity level along with any change in the operating environment or operation over time or to perform initial check of the operation. When two consecutive detections have occurred with the intensity of light detected exceeding the operation level but not reaching 120 % of the level (range allowing stable operation), the stability signal is output when the control output is deactivated.



Sensitivity adjustment (for diffuse-reflective type)

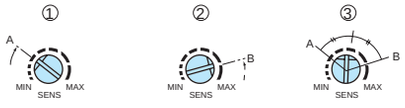
(Adjustment for Light-ON mode)

- When any light-reflecting object is in the background

(1)Place the object to be detected in a given position, turn up the sensitivity adjustment volume (SENS.) gradually and find the point at which the operation indicator (red LED) is illuminated (Point A).

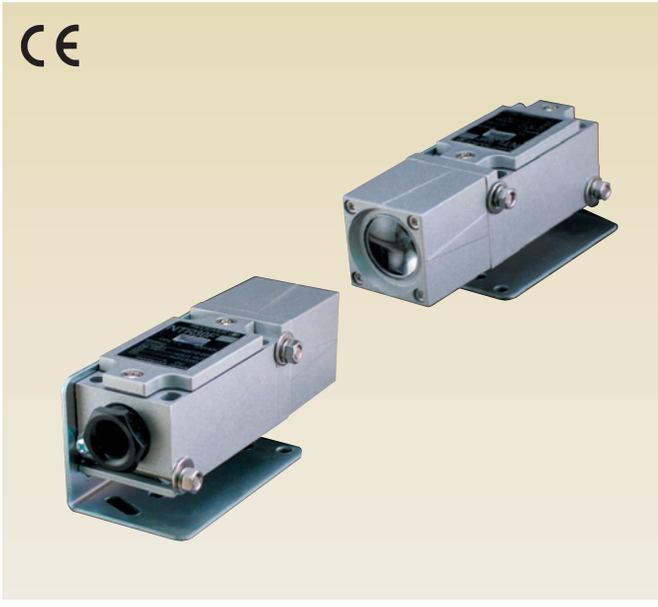
(2)Remove the object, turn down the sensitivity adjustment volume gradually from MAX. and find the point at which the operation indicator (red LED) goes out (Point B). (If the operation indicator is not illuminated even at Max., MAX. is regarded as Point B.)

(3)Set the volume at midway between Points A and B.



NT30F Series

Embedded Amplifier Photo Sensors



- Self-diagnostic feature
- High power for reliable detection in adverse environment
- Long distance detection of up to 30 m

- DIN compatible zinc die-cast case
- Receiver provided with "stability output circuit" for monitoring adequate light reception together with indicator and output terminal. Also equipped with monitor output jack for additional reliability in light axis alignment by use of earphone and Light-ON/Dark-ON selector switch.
- Transmitter provided with "check signal input terminal" and "monitor output" for overall operation checking of transmitter and receiver.

Type

Detection method	Detecting distance	Model	Operation mode	Output mode
Through-beam type	30m	**NT30F**	Light-ON/Dark-ON selectable (with switch)	Current output/ voltage output

- Extra long-distance of 50 m and 100 m also available
  Models allowing even longer detecting distance are also available.
  50 m type: model NT50 / 100 m type: model NT100

Optional Parts

Type	Model	Description	
Pinhole plate	**30P1**	ϕ 1	Reduces the smallest allowable detection object diameter and activation area. Note that detecting distance is reduced as well.
	30P3	ϕ 3	
	30P5	ϕ 5	
	30P7	ϕ 7	
	30P10	ϕ 10	
Earphone	**EC30**	Simplifies light axis alignment for long-distance setting by monitoring sound.	
Hood	**H301**	Hood for shielding from outside light.	
	F301	Hood for shielding from outside light. Energy-saving airless dust hood taking advantage of muffler effect for preventing soiling of lens.	
	A301	Air purge hood.	

Pinhole plate

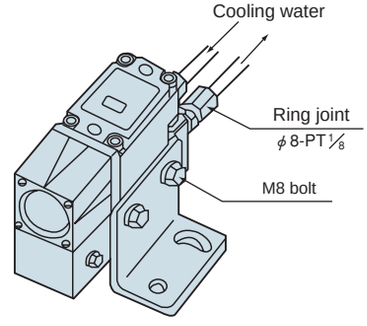
Earphone

Airless hood

Hood

Model Equipped with Water-Cooing Jacket

Water-cooling type	**NTL30FW**	Transmitter	For protecting sensor from ambient temperature
	NTR30FW	Receiver	



Rating/Performance/Specification

	Model	NT30F	
Rating/performance	Detection method	Through-beam type	
	Detecting distance	30m	
	Detection object	ϕ 22mm (Min.) Opaque	
	Power supply	12 - 24V DC ±10% / Ripple 10% max.	
	Current consumption	Transmitter: 50 mA max. Receiver: 35 mA max.	
	Output mode	Current output/voltage output (Rating) Current output : sink current 100 mA (30 VDC) max. Voltage output: output impedance 4.7 kΩ	
	Operation mode	Light-ON/Dark-ON selectable (with switch)	
	Self-diagnosis feature	(Transmitter) Check signal input (Terminal No. 4) Monitor output (Terminal No. 3): activated when normal (For current/voltage: sink current 100 mA (30 VDC) max. output impedance 4.7 kΩ)	
		(Receiver) Stability output (Terminal No. 4): activated when abnormal (NPN open collector sink current 100 mA (30 VDC) max.) Received light monitor, earphone jack terminal	
	Response time	5ms max. (*0.5ms)	
Specification	Light source	Infrared LED	
	Indicator	(Transmitter) P.L power indicator (red LED) NORM.OP: monitor output indicator (green LED)	(Receiver) OP.L operation indicator (red LED) UP: Stability indicator (green LED)
	Switch (SW)	Light-ON/Dark-ON selector switch provided	
	Short circuit protection	provided	
	Case material	Zinc die-cast	
	Connection	Terminal block connection (screw: M3.5; terminal pitch: 8.1 mm)	
	Mass	About 700 g (transmitter/receiver)	

Environmental Specification

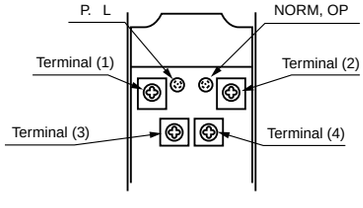
Environment	Ambient light	20,000 lx max.
	Ambient temperature	-25 - +55°C (non-freezing) *1
	Ambient humidity	35~85%RH (non-condensing)
	Protective structure	IP66
	Vibration	10 - 55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction

*High-speed response type (0.5 ms) also available: model NT30FA

*1 Some models may be used in environment of 110 °C by attaching water-cooling jacket.

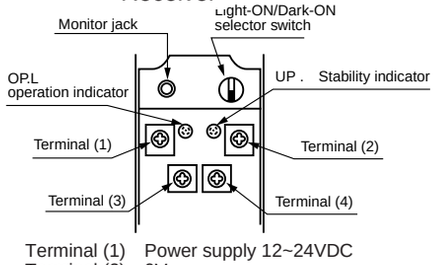
Terminal Block and Connection

Transmitter



Terminal (1)	Power supply 12 - 24VDC
Terminal (2)	0V
Terminal (3)	monitor output Voltage/current output
Terminal (4)	Check signal input
Indicator	PL: power indicator (red LED)
Indicator	NORM.OP: monitor output (green LED)

Receiver



Terminal (1)	Power supply 12~24VDC
Terminal (2)	0V
Terminal (3)	Output: voltage/current output
Terminal (4)	Stability output (current output) Open collector
Indicator	OP.L operation indicator (red LED)
Indicator	UP: Stability indicator (green LED)
	Selector switch: Light-ON/Dark-On selector switch
	Monitor jack: for earphone for light axis alignment

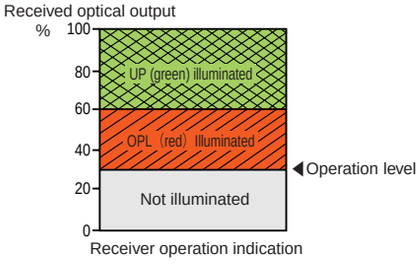
Note) Be sure to use the earphone specified (EC30 separately available).

Operation and Stability Indicators

When the received light intensity is under the operation level, neither of the indicator is illuminated.

When the light intensity reaches the operation level, OP.L is illuminated (with selector switch set to LIGHT).

When the light intensity reaches twice as much as the operation level, the stability indicator UP is illuminated.



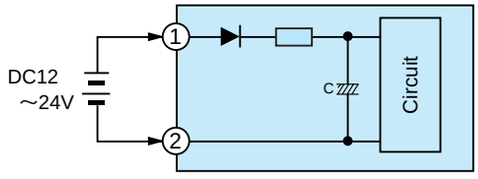
NT30F

Input/Output Circuit and Connection

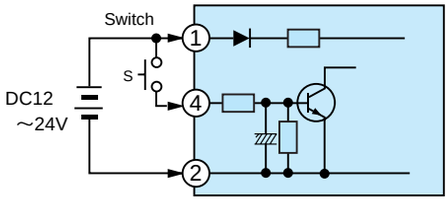
Transmitter (NTL30F)

Power supply connection

Indicator illuminated when power is supplied, indicating normal operation



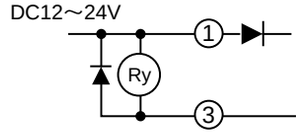
(For use of check signal input (HOLD))



Connect a switch, etc. between Terminals (1) and (4) (normally-open contact) and pres the switch. The light emission stops after about 25 ms and the output level turns H.

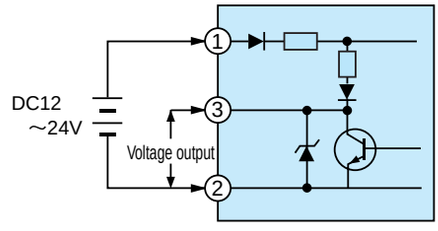
Use of monitor output

(For relay output (control))



Relay activated when normal (relay of 30 VDC, 100 mA max.)

(For voltage output)



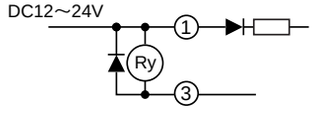
Light emission state = indicator (NORM.OP) illuminated
output: ON (level)

Receiver (NTR30F)

Output connection

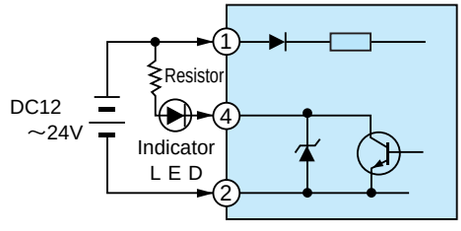
Terminal assignment for power supply same as transmitter:

(For relay output)



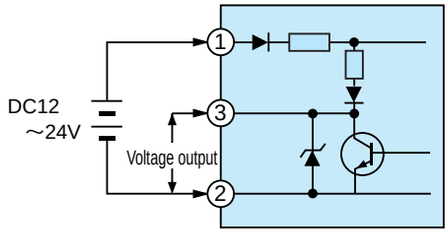
(relay of 30 VDC, 100 mA max.)

(For use of stability output)



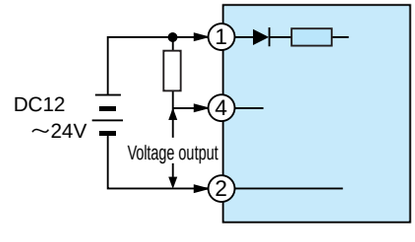
Abnormal: ON (L level) indicator illuminated
Note) Connect a resistor in series with the indicator.
(Hint) Resistance: 2 - 4 KΩ

(For voltage output)



Output mode selectable with switch between Light-ON/Dark ON

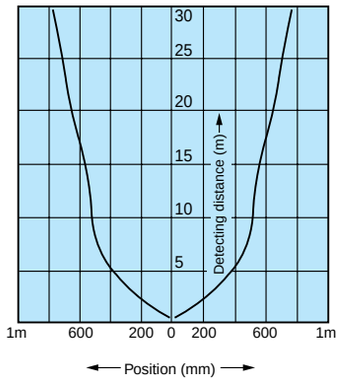
(For voltage output)



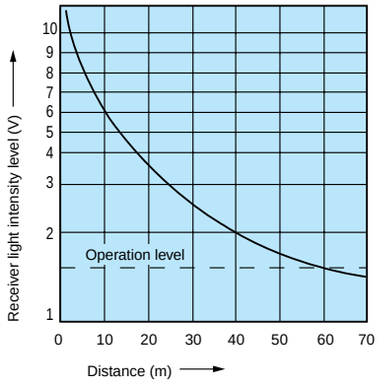
Connect a resister between Terminals (4) and (1) for voltage output between Terminal (4) and (2).
Output between Terminals (4) and (2): OFF (H level) when normal.

Characteristics (Typical Example)

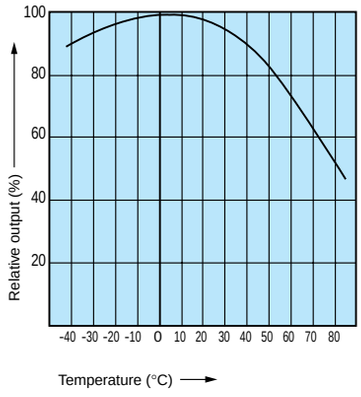
● Directional characteristics



● Distance-output characteristics

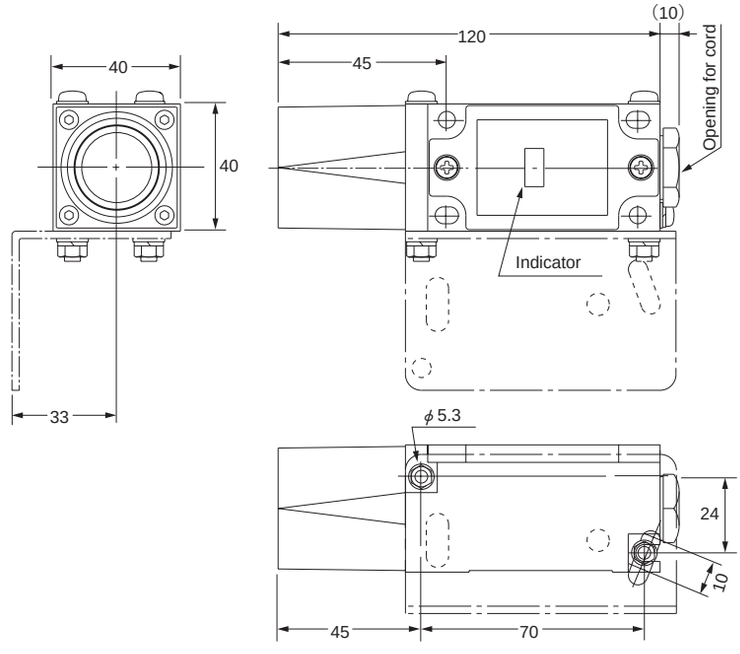


● Temperature characteristics



Dimensions (in mm)

CAD



For connection, use cables of 9-11 mm in diameter.
Loosen the screws on the lid of the body to remove the lid.
For mounting, use a solid base not subject to vibration.
Use 2 M6 bolts for securing the sensor body (separately prepare bolts, nuts, washers, etc.).

Mounting bracket (accessory)

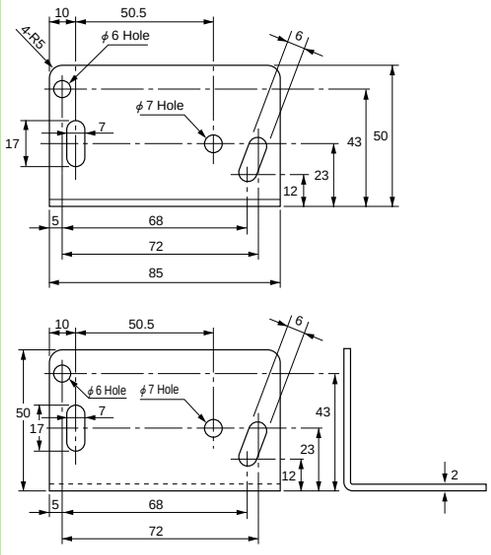
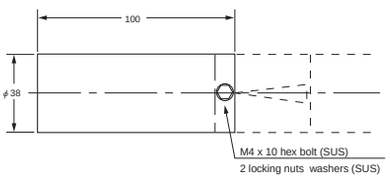


Plate thickness: 2 mm

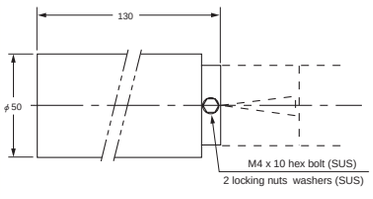
(NT30F + H301 hood)

CAD



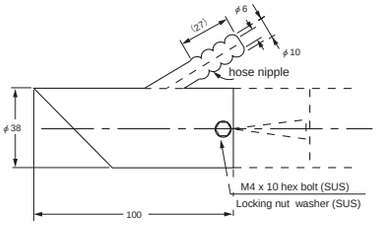
(NT30F + F301 airless hood)

CAD



(NT30F + A301 air purge hood)

CAD



- M18 cylindrical type compatible with European Standards (CENELEC)
- Polarization reflector type capable of detecting mirror-like objects
  - Thorough short circuit protection
  - Water resistance of IP 66 achieved by resin molding
  - Dramatic improvement of environment resistance including prevention of damage and falling off electronic components caused by vibration and enhanced robustness

Type

Detection method	Detecting distance	Model		Operation mode	Output mode	Remarks
		NPN type	PNP type			
Through-beam type	3m	**CXT8** ※	**CXT8PN** ※	Light-ON /Dark-ON selectable (with control lead)	Open collector	Infrared LED long-distance type
Polarization reflector type	2 m max.	**CX-M2RD**	**CX-M2RDPN**	Dark-ON		Red LED capable of detecting mirror-like objects
Diffuse-reflective type	100 mm max.	**CX-R01**	**CX-R01PN**	Light-ON		Infrared LED
	300 mm max.	**CX-R03V**	**CX-R03VPN**			Infrared LED type provided with adjustment for ease of fine detection

*Connector connection models convenient for mounting and wiring also available
Models CXT8-J, CXT8PN-J
Cord with connector separately available required for connector connection models
Model CX-C4 — 4-core, 2.5 m

Rating/Performance/Specification

Rating/performance	Model	NPN type	CXT8	CX-M2RD	CX-R01	CX-R03V
		PNP type	CXT8PN	CX-M2RDPN	CX-R01PN	CX-R03VPN
	Detection method		Through-beam type	Polarization reflector type	Diffuse-reflective type	
	Detecting distance		3m	2m*1	100mm *2	300mm *3
	Detection object		ϕ15mm (Min.) Opaque	Mirror-like objects / opaque objects / translucent objects	Opaque objects / translucent objects	
	Power supply		12 - 24V DC ±10% / Ripple 10% max.			
	Current consumption	NPN type	Transmitter: 25 mA max. Receiver: 15 mA max.	20mA max.	17mA max.	20mA max.
		PNP type	Transmitter: 25 mA max. Receiver: 20 mA max.	24mA max.	23mA max.	26mA max.
	Output mode	NPN type	Open collector Rating: sink current 100 mA (30 VDC) max.			
		PNP type	Open collector Rating: source current 100 mA (30 VDC) max.			
	Operation mode		Light-ON/Dark-ON selectable (with control lead)	Dark-ON	Light-ON	
	Response time		1ms max.	0.35ms max.		
	Operating angle		7° (at receiver)	10° (at receiver)	————	
	Hysteresis		————		5% max.	
Specification	Light source (wavelength)		Infrared LED (940nm)	Red LED (700nm)	Infrared LED (950nm)	
	Indicator		Transmitter: Power indicator (red LED) Receiver: Light reception indicator (red LED)	Operation indicator (red LED)		
	Volume		————			Sensitivity adjustment
	Short circuit protection		Provided			
	Material		Lens: Polycarbonate Case: Polycarbonate	Lens: Acrylic Case: Polycarbonate	Lens: Polycarbonate Case: Polycarbonate	
	Connection		Permanently attached cord (outer diameter: 4 mm) Transmitter: 0.2 sq. 2 core 2 m length (gray) Receiver: 0.2 sq. 4 core 2 m length (black)	Permanently attached cord (outer dimension: dia. 4) 0.2sq. 3 core 2 m length (black)		
	Mass		Transmitter: About 65 g Receiver: About 65 g	About 65 g		
	Notes		Slit plate (optional) 3 x 10, 4 x 10, 5 x 10 in 1 set	K-7 reflector provided	————	

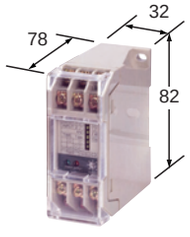
*1 With K-7 reflector *2 With 50 x 50 mm white drawing paper *3 With 100 x 100 mm white drawing paper

Environmental Specification

Environment	Ambient light	10,000 lx max. (5,000 lx max. for through-beam type)
	Ambient temperature	-25 - +55°C (non-freezing)
	Ambient humidity	35 - 85%RH (non-condensing)
	Protective structure	IP66
	Vibration	10 - 55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	100 m/s² / 3 times each in 3 directions
	Dielectric withstanding	500 VAC for 1 minute
	Insulation resistance	500 VDC, 20 MΩ or higher

Applicable power supply unit

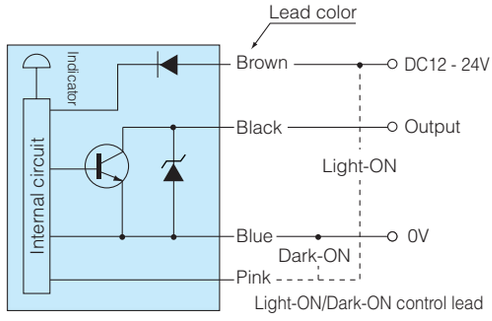
PS Series
High capacity of 200 mA at 12 VDC



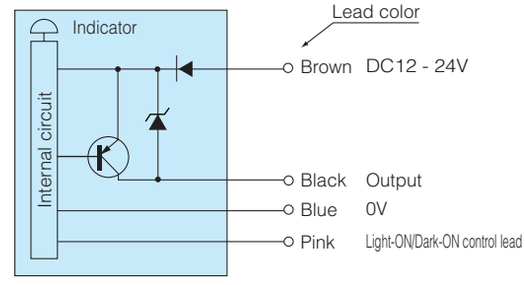
(General-purpose type) PS3N
PS3N-SR
(Multifunctional type) PS3F
PS3F-SR

Input/Output Circuit and Connection

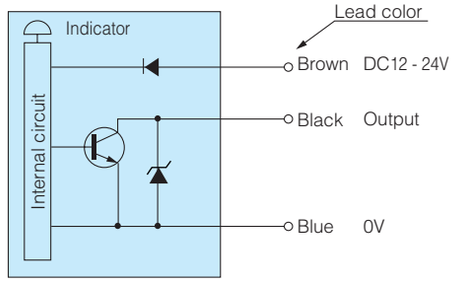
CXT8



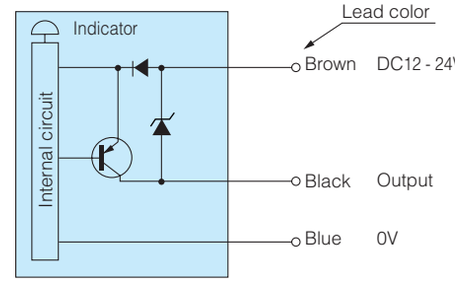
CXT8PN



CX-M2RD NPN output
CX-R01
CX-R03V



CX-M2RDPN PNP output
CX-R01PN
CX-R03PN

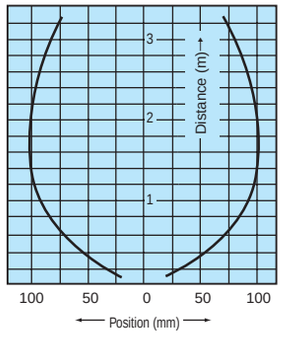


- The output transistor turns off when load short circuit or overload occurs. Check the load and turn the power back on.

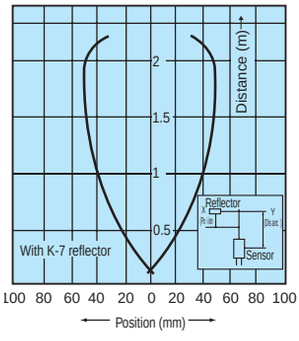
Characteristics (Typical Example)

Directional characteristics

CXT8

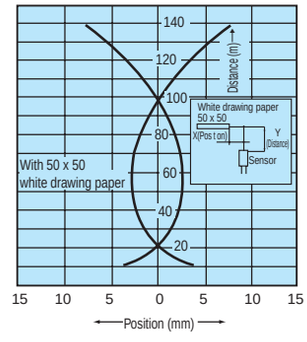


CX-M2RD・CX-M2RDPN

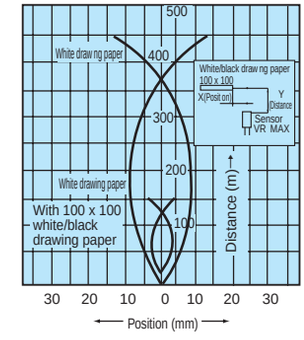


Activation area characteristics

CX-R01・CX-R01PN

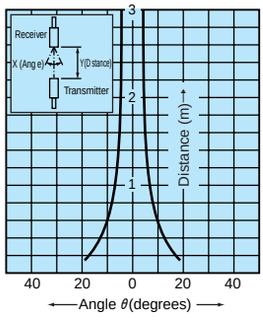


CX-R03V・CX-R03VPN



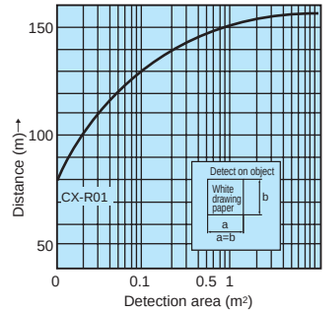
Operating angle characteristics

CXT8 (PN)

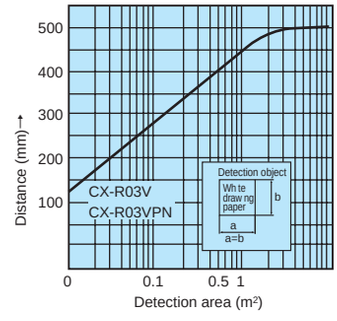


Distance-output characteristics

CX-R01・CX-R01PN

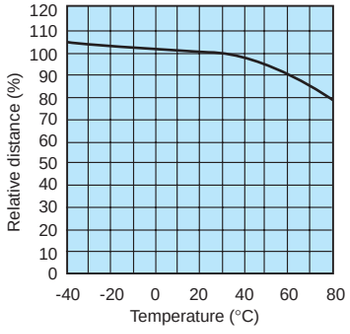


CX-R03V・CX-R03VPN

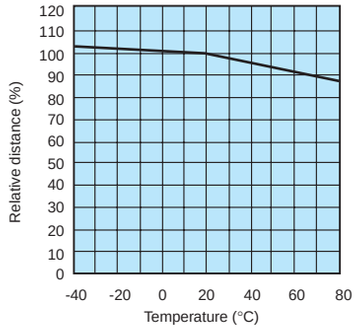


● Temperature characteristics

CX-M2RD
CX-M2RDPN

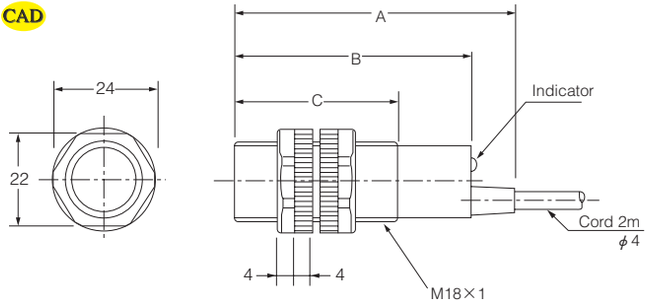


CX-R01
CX-R01PN
CX-R03V
CX-R03VPN



Dimensions (in mm)

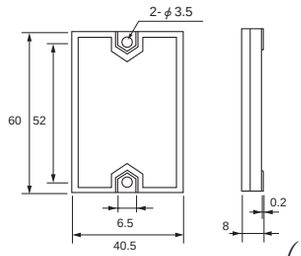
CAD



(In mm)

Model	A	B	C
CX-M2RD **CX-M2RDPN**	66.2	56.2	38.2
CXT8 **CX-R01** **CX-R01PN** **CX-03V** **CX-R03VPN**	65	55	37

CAD K-7 reflector



Applicable to polarization reflector type
Effective reflecting surface : 56 x 36 mm
Mounting: secured with M3 screws
(alternatively adhesive may be used)
Protective structure: IP 67

(Notes on mounting)

- Excessive tightening torque may damage the thread of the nut to cause loosening. Make sure that the tightening torque is up to 0.98 N·m.
- This sensor does not allow adjustment of mounting angle once it is secured. Pay attention to the light axis especially for through-beam types to avoid misalignment.

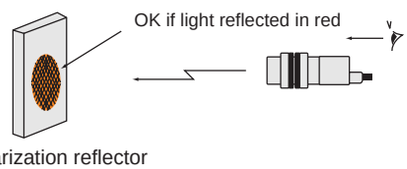
Setting

(Through-beam type)

- For light axis alignment, swivel the receiver vertically and horizontally to install it at the center of the area in which the light reception indicator (red LED) is illuminated for the individual direction.
- Repeat activation and deactivation to check the operation.

(Polarization reflector type)

- Arrange the sensor in line with the reflector. Swivel the sensor vertically and horizontally with reference to the reflector, use the operation indicator to check the area in which the sensor is activated (indicator goes out) and install the sensor at the center of the area. Taking advantage of the red light spot on the reflector seen from behind the sensor allows easy setting.



Polarization reflector

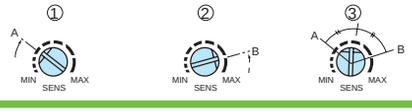
(Diffuse-reflective type)

- Set the sensor so that the operation indicator (red LED) is illuminated with the detection object placed at a given position and not illuminated with the object removed.
- Bring any background of the detection object as far away as possible or use black surface with low reflectance.
- The detecting distance depends on the surface condition of the detection object. This sensor is not provided with a sensitivity adjustment volume and needs to be adjusted for stable operation by changing the distance, angle, background object, etc.

(Diffuse-reflective type with adjustment)

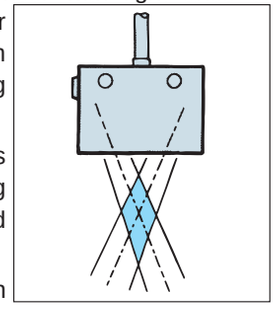
- Adjustment with any light-reflecting object in the background

(1) Place the object to be detected in a given position, turn up the sensitivity adjustment volume (SENS) gradually from the minimum (MIN) and find the point at which the operation indicator (red LED) is illuminated (Point A).
(2) Remove the object, turn down the sensitivity adjustment volume gradually from the maximum (MAX) and find the point at which the operation indicator (red LED) goes out (Point B). (If the operation indicator is not illuminated even at MAX, MAX is regarded as Point B.)
(3) Set the volume at midway between Points A and B.



Stable detection performance by limiting detection zone for less influence of disturbance

Reflective type photo sensor with light axes of transmitter and receiver crossed at about 20 mm from sensor for limiting detection zone

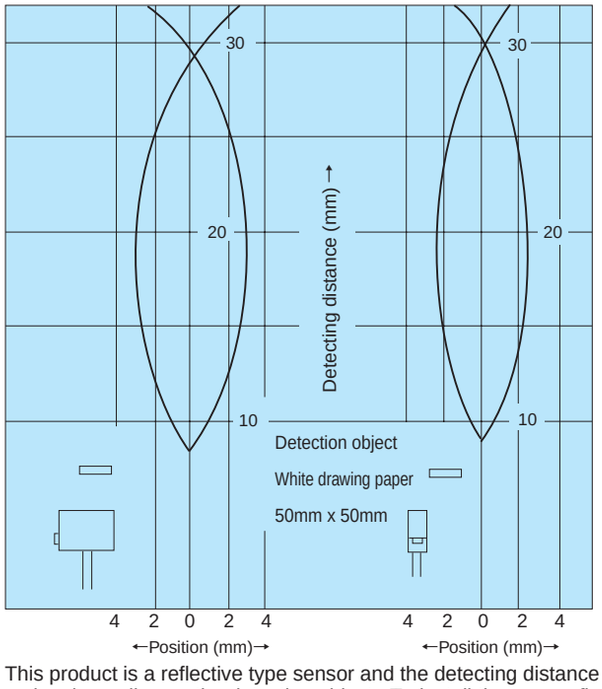


- Detection method less affected by disturbing external or background reflection
- Highly-accurate detection achieved by restricting detection zone

Type

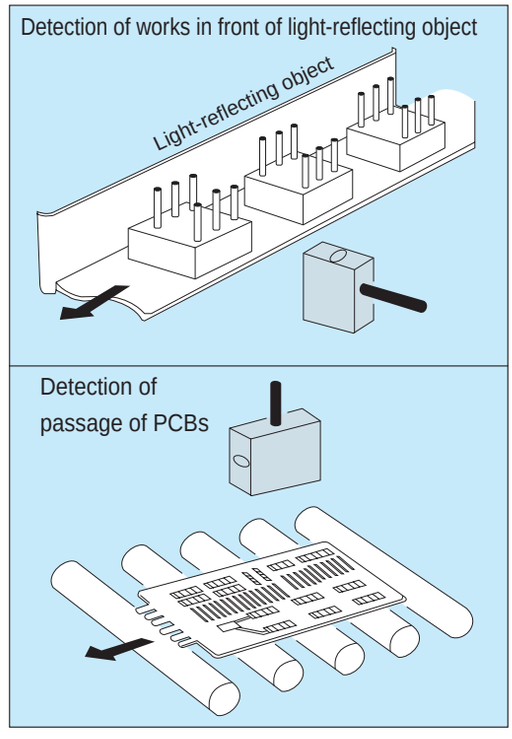
Detection method	Detecting distance	Model	Operation mode	Output mode
Limited reflection type	10~30mm	**DLZ-S30**	Light-ON	NPN open collector
		DLZ-S30D	Dark-ON	
		DLZ-S30-PN	Light-ON	PNP open collector
		DLZ-S30D-PN	Dark-ON	

Activation area characteristics(Typical Example)



This product is a reflective type sensor and the detecting distance varies depending on the detection object. To install the sensor first check the distance using the object to confirm.

Sample Applications

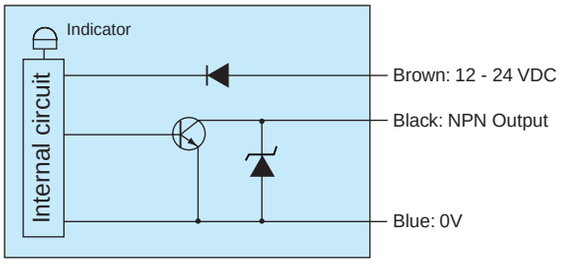


Rating/Performance/Specification

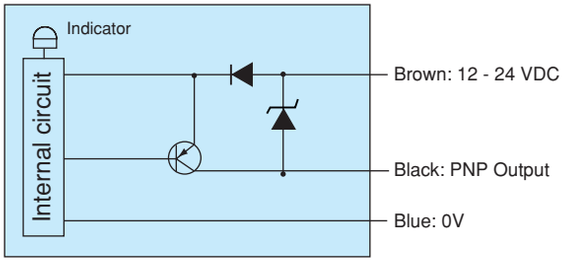
	Model	DLZ-S30	DLZ-S30D	DLZ-S30-PN	DLZ-S30D-PN
Rating/performance	Detection method	Limited reflection type (specular reflection)			
	Detecting distance	About 30mm (50 x 50 mm white drawing paper)			
	Detection object	ϕ 10 max.			
	Power supply	12 - 24V DC ±10% / Ripple 10% max.			
	Current consumption	30mA max.			
	Output mode	NPN open collector		PNP open collector	
	Rating	Sink current 100 mA (30 VDC) max.		Source current 100 mA (30 VDC) max.	
	Operation mode	Light-ON	Dark-ON	Light-ON	Dark-ON
	Response time	0.5ms max.			
	Hysteresis	2% max.			
Specification	Light source	Infrared LED (wavelength: 880 nm)			
	Indicator	Operation indicator (red LED)			
	Short circuit protection	Provided			
	Material: Case	Polyarylate			
	Material: Lens	Polycarbonate			
	Connection	Permanently attached cord (outer dimension: dia. 4) 0.2 sq. 3 core 2 m length			
	Mass	About 70 g			
	Ambient light	5,000 lx max.			
	Ambient temperature	-25 - +55°C (non-freezing)			
	Ambient humidity	35 - 85%RH (non-condensing)			
	Protective structure	IP65			

Input/Output Circuit and Connection

(NPN output)



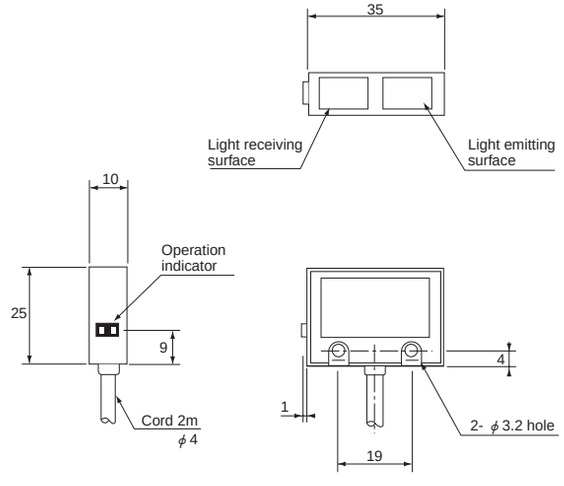
(PNP output)



- The output transistor turns off when load short circuit or overload occurs.
  Check the load and turn the power back on.

Dimensions (in mm)

CAD



- No mounting bracket is provided.
- The tightening torque should not exceed 0.6 N·m.

GM series

Embedded Amplifier Photo Sensors

- Equipped with inverter light suppression circuit
- Perforated objects reliably detected with large-diameter light spot (GM-S Series)

Applications

- Lead frame detection
- PDB detection
- Board detection

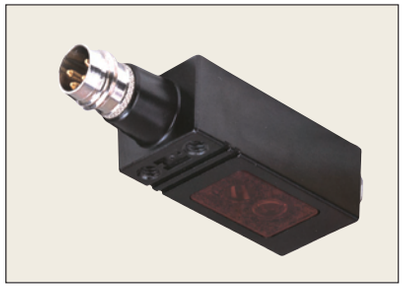
Type

Detection method	Detecting distance	Model		Operation mode	Output mode
		NPN type	PNP type		
Wide-angle diffuse-reflective type	50mm	**GM-S5RT(-J)**	**GM-S5RTPN(-J)**	Light-ON	Open collector
Limited zone-reflective type		**GM-Z5RT(-J)**	**GM-Z5RTPN(-J)**		

Optional Parts

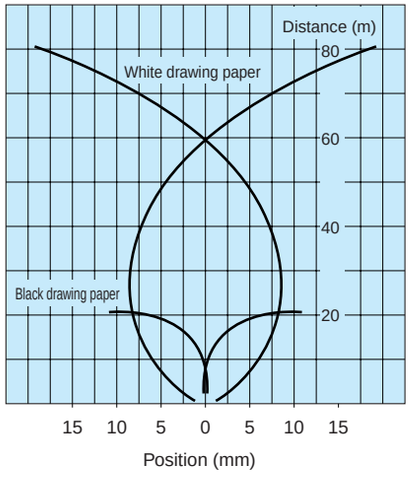
Type	Model	Shape
Cord with M8 connector	**FBC-4R2S**	Straight (2 m)
	FBC-4R2L	Angled (2 m)

M8 connector type (-J)

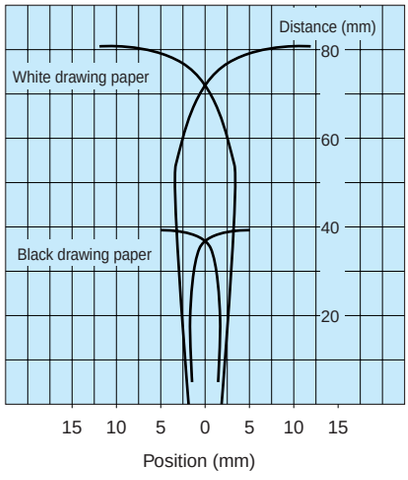


Directional characteristics (Typical Example)

- GM-S5RT



- GM-Z5RT

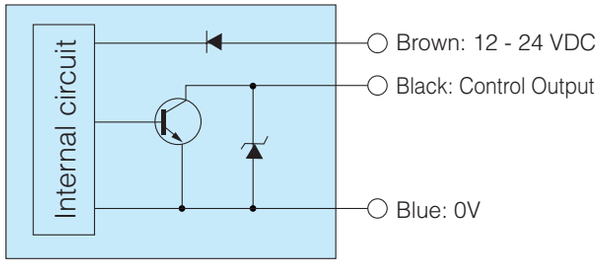


Rating/Performance/Specification

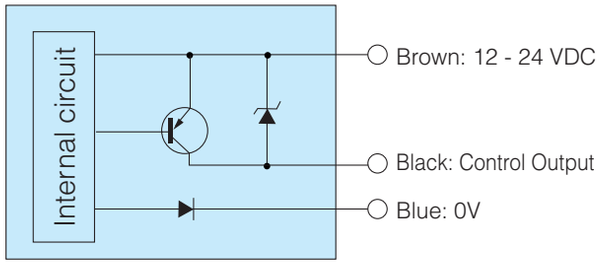
Rating/performance	Model	NPN type	GM-S5RT	GM-Z5RT
		PNP type	GM-S5RTPN	GM-Z5RTPN
	Detection method		Wide-angle diffuse-reflective type	Limited zone-reflective type
	Detecting distance		50mm (Standard detecting object: 100 x 100 mm white drawing paper)	50mm (Standard detecting object: 50 x 50 mm white drawing paper)
	Power supply		12-24V DC ±10% / Ripple 10% max.	
	Current consumption		32mA max.	30mA max.
	Emitted light spot diameter		About 20 mm (at 20 mm)	About 4 mm (at 20 mm)
	Control output		Open collector output	
		Rating	NPN type: Sink current 100 mA (30 VDC) max. / Residual voltage: 1 V or less PNP type: Sink current 100 mA (30 VDC) max. / Residual voltage: 1 V or less	
	Operation mode		Light-ON	
	Response time		1ms max	
Rating / Performance	Light source		Red LED (644nm)	
	Indicator		Operation indicator (orange LED) Stability indicator (green LED)	
	Volume		SENS: sensitivity adjustment volume	
	Short circuit protection		Provided	
	Connection		Permanently attached cord (outer dimension: dia. 3.9mm) 0.2 sq. 3 core 2 m length	
			Connector type with M8 connector (-J at the end of model No.)	
	Mass		About 50g (permanently attached cord) About10g (M8 connector type)	
	Accessory		Screwdriver for adjustment, operation manual	

Input/Output Circuit and Connection

- (NPN output)



- (PNP output)

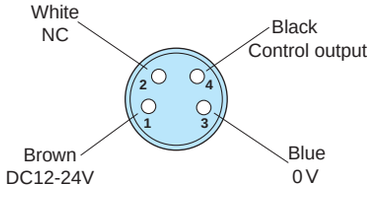


- The output transistor turns off when load short circuits or an overload occurs.
  Check the load and turn the power back on.

Environmental Specification

Environment	Ambient light	5,000 lx max.
	Ambient temperature	-25 - +55 °C (non-freezing)
	Ambient humidity	35-85%RH (non-condensing)
	Protective structure	IP67
	Vibration	10~55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	500 m/s² / 3 times each in 3 directions
	Dielectric withstanding	1,000 VAC for 1 minute
	Insulation resistance	500 VDC, 20 MΩ or higher

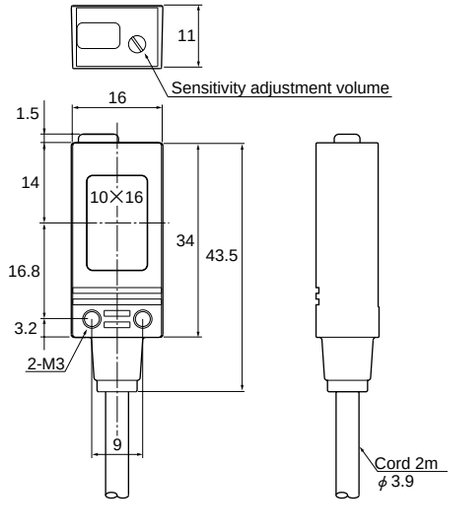
M8 connector type (-J) connection



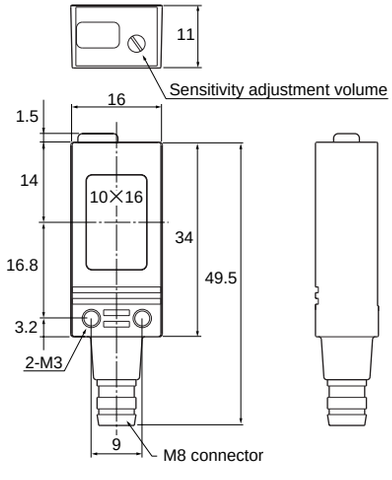
- The colors show lead colors for use in combination with the optional cord with M8 connector.
- White line (NC) is unused.

Dimensions (in mm)

Permanently attached cord



M8 connector type (-J)



Ultra thin beam and high power are achieved at the same time

LD-M10R (polarization reflector type)

- Ultra thin laser beam is ideal for detecting minute objects
- Long distance detection up to 15 m is possible (with K-7 reflector)
- Various reflectors available for different detecting distances

LD-S20R (diffuse-reflective)

- Variable-focus spot adjustable down to ϕ1
  (In the range of 80-300 mm from light receiving surface)
- Red laser for simple position checking of emitted light spot
  - Extra thin laser beam ideal for detection of passage/presence or protrusion of minute objects through gap or small hole

Warning

Laser beam employed
Do not look into the beam, do not direct light to human body and follow all instructions for correct and safe use.

Type

Detection method	Detecting distance	Model	Operation mode	Output mode
Polarization reflector type	The detecting distance depends on the reflector used.	**LD-M10R**	Light-ON/ Dark-ON selectable (with switch)	NPN open collector
		LD-M10RPN		PNP open collector
Diffuse-reflective type	80～300mm	**LD-S20R**		NPN open collector
		LD-S20RPN		PNP open collector

Optional Parts

Product name	Model	Detecting distance(m)	Effective reflecting surface (mm)	Purpose/application
Reflector	**K-15**	0.3～7	36×55	For minute object detection
	S-0503A	0.5～7	24×24	For minute object detection
	K-72	1～5	29×8	For minute object detection
	K-MT4	1～7	35×35	For minute object detection
	K-71	3～5	32×19	When there is restriction to mounting of reflector
	K-7	3～15	56×36	For long distance detection

■Select according to the detecting distance of the application and purpose (separately available).
Note that reflectors other than mentioned above may not be compatible with the sensor.

Rating/Performance/Specification

	Type	NPN output type	PNP output type	NPN output type	PNP output type
Rating/performance	Model	**LD-M10R**	**LD-M10RPN**	**LD-S20R**	**LD-S20RPN**
	Detection method	Polarization reflector type		Variable-focus reflective type	
	Spot variable range	————		80mm - 300mm *3	
	Detecting distance	Depending on reflector (separately available)		30-300mm (10 x 10 mm white drawing paper) *3	
	Power supply	12-24V DC ±10% / Ripple 10% max.			
	Current consumption	35mA max. *1	40mA max. *1	35mA max. *1	40mA max. *1
	Output mode	NPN open collector output Sink current 100 mA (30 VDC) max.	PNP open collector output Source current 100 mA (30 VDC) max.	NPN open collector output Sink current 100 mA (30 VDC) max.	PNP open collector output Source current 100 mA (30 VDC) max.
	Operation mode	Light-ON/Dark-ON selectable			
	Anti Interference	Provided			
	Light Emission Stop Function	No-voltage input (contact/non-contact)			
	Response time	0.5ms max.			
	Spot diameter	15 x 7 mm ellipse (at 15 m)		ϕ1mm(adjustable range: 80-300 mm from light receiving surface)	
	Smallest detectable mark width	————		1 mm (black mark on white background) at 300 mm	
Specification	Light source (wavelength)	Red semiconductor laser (650 nm) Class 2			
	Indicator	Operation indicator (red LED) Stability indicator (green LED)			
	Volume	SENS: sensitivity adjustment			
	Switch	Light-ON/Dark-ON selector switch provided			
	Short circuit protection	Provided			
	Connection	Permanently attached cord (outer dimension: dia. 4) 0.2 sq. 4 core 2 m length (black)			
	Material	Case: heat-resistant ABS Lens: Acrylic		Case: heat-resistant ABS Transmitter lens: glass / Transmitter hood: aluminum / Receiver lens: acrylic	
	Mass	Approx. 80g			
	Accessory	Operation manual, mounting bracket, screwdriver for sensitivity adjustment, warning label, instruction label *2			

*1 Allow sufficient margin in the capacity of the power supply (the laser diode is equipped with a circuit that maintains the same light intensity level by increasing the current if it becomes dark).

*2 The LD-M10 R Series is not provided with a reflector, which is optional.

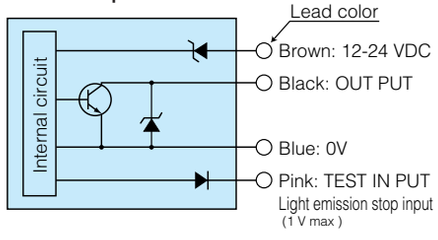
*3 Distance from the sensor receiving lens surface.

Environmental Specification

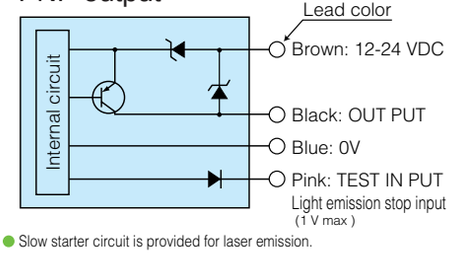
Environment	Ambient light	5,000 lx max.
	Ambient temperature	-10 - +55°C (non-freezing)
	Ambient humidity	35 - 85%RH (non-condensing)
	Protective structure	LD-M Series: IP67 LD-S Series: IP66
	Vibration	10 - 55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	LD-M series: 500 m/s² / 3 times each in 3 directions LD-S series: 300 m/s² / 3 times each in 3 directions
	Dielectric withstanding	1,000 VAC for 1 minute
	Insulation resistance	500 VDC, 20 MΩ or higher

Input/Output Circuit and Connection

- NPN output

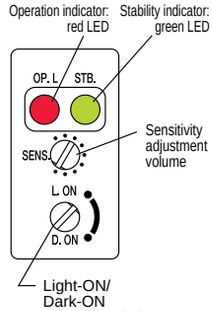


- PNP output



- Slow starter circuit is provided for laser emission.
  The laser light is illuminated about 1 second after power-up or reset of short circuit caused by emission stop input.
- The output transistor turns off when load short circuit or overload occurs.
  Check the load and turn he power back on.

Panel Indication



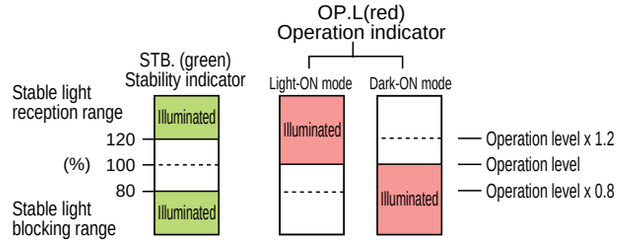
● Operation indicator (OP.L)
Red LED illuminated when output transistor is turned on.

● Stability indicator (STB.)
Green LED illuminated when received light intensity is less than 80% and more than 120 % of operation level.

● Sensitivity adjustment volume (SENS.)
Turning clockwise increases the sensitivity and counterclockwise decreases the sensitivity.

● Light-ON/Dark-ON selector switch
Setting the switch to L.ON (Light-ON) activates the output when a certain amount of light is detected.
Turning the switch to D.ON (Dark-ON) activates the output when a certain amount of light is not detected.

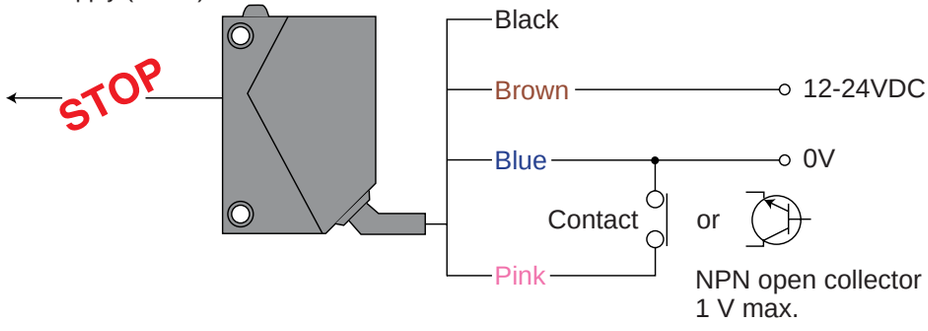
About indicators



- The operation indicator (red LED) and stability indicator (green LED) indicate the levels as shown above. After light axis alignment and sensitivity adjustment have been completed, repeat activation and deactivation to make sure that the sensitivity is in the stable activation/deactivation range.
- Setting within the stable range increases the reliability against variation of environment after setting.

Using Light Emission Stop Function

- Short-circuiting TEST IN PUT (pink) and 0 V (blue) stops the laser light emission at arbitrary timing. When not using the light emission stop function, connect TEST INPUT (pink) to the positive terminal of the power supply (brown).



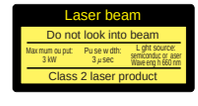
For Correct Use

・Do not use the product for detection for the protection of human body.
・When using the product for safety purposes, ensure safety with the control system as a whole as well as the detection.
・This product is not explosion proof.

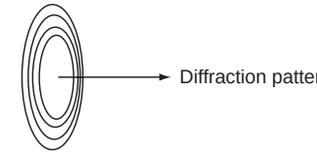
- The semiconductor laser used in this product falls under the following class as defined in JIS C 6802 "Safety of Laser Products."
  ・Class 2 (Emits visible radiation from which the eyes are generally protected by the aversion reactions)
- This product employs a parallel beam of laser and care should be taken not to allow the laser light to enter human eye directly or by specular reflection. Never look into the laser radiation outlet of the transmitter connected to power supply.
  Looking straight into the laser light may damage the eye.
- This product is provided with warning and instruction labels as shown below for notifying and alerting the operator of the sensor of the degree of danger. After the product has been installed, attach the labels in prominent locations on the sensor.

Warning label

Instruction level
●Class 2



- The radiated laser beam is elliptic due to the characteristics of semiconductor laser. In addition, diffraction pattern is generated due to optical diffraction phenomenon.



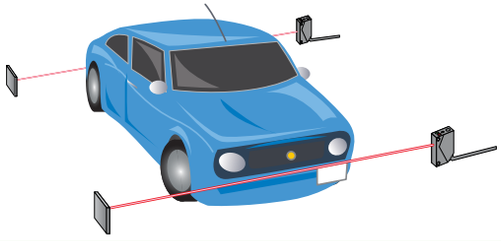
- Be notified that this product uses semiconductor laser and is prone to deterioration due to surge current or static electricity.
- The laser diode is equipped with a circuit that maintains the same light intensity level by increasing the current if it becomes dark. For this reason, allow sufficient margin in the capacity of the power supply.
- Always avoid use in which the power is turned on and off consecutively.
- Be sure to turn off the power before moving including mounting and removing or repairing.
- Follow the notes on safety and handling in the operation manual provided for correct use.

Sample Applications

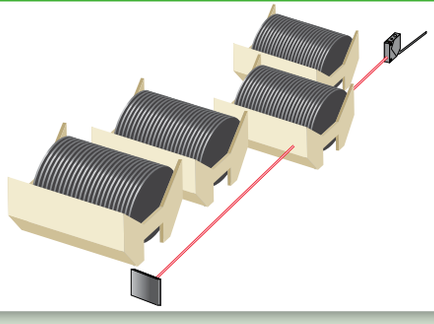
LD-M10R Series

Detection of position of vehicle in multilevel parking garage

Checks for any protrusion of vehicle in multilevel parking garage.



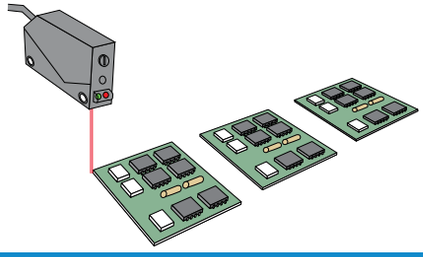
Detection of displaced cassettes



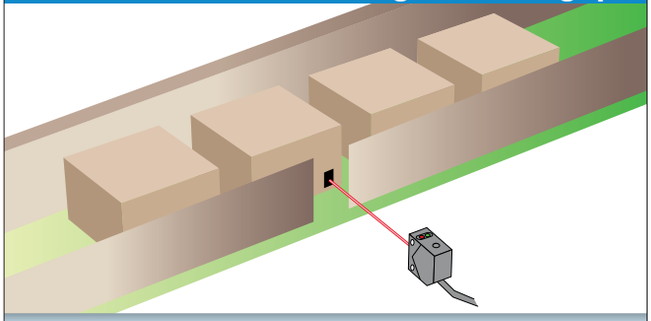
LD-S20R Series

Positioning of hybrid boards

High-precision positioning achieved with micro-spot laser beam.



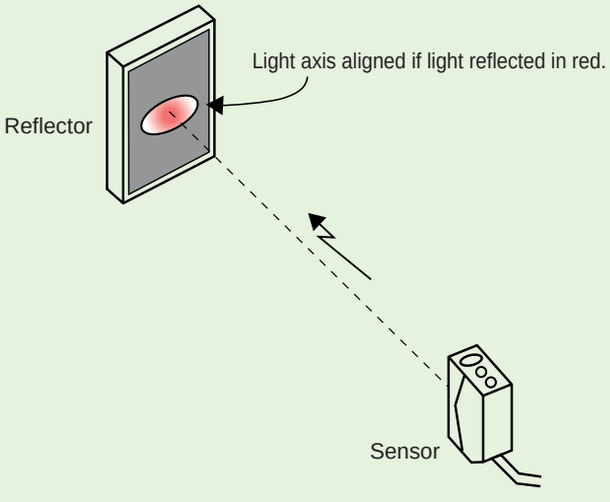
Detection of marks on corrugated cardboard boxes through narrow gap



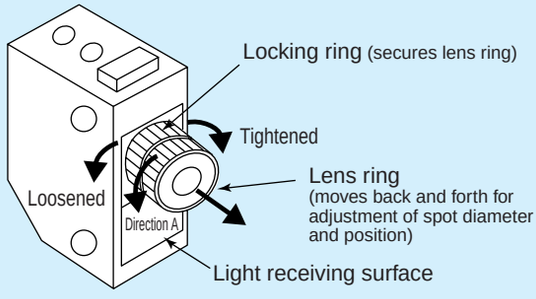
Setting/adjustment

1) Arrange the sensor face-to-face and in line with the reflector. Swivel the sensor vertically and horizontally with reference to the reflector, use the operation indicator (red LED) to check the area in which the sensor is activated and install the sensor at the center of the area. Make sure that the stability indicator (green LED) is illuminated.
2) Use the sensitivity adjustment volume for fine-tuning when detecting thin rod-like or small objects.

(Note)
Light reflected on the object may be detected depending on the object such as glossy detection objects including stainless steel. In this case, use the sensitivity adjustment volume to prevent detection of light from the object.



Spot position adjustment for variable-focus type sensor

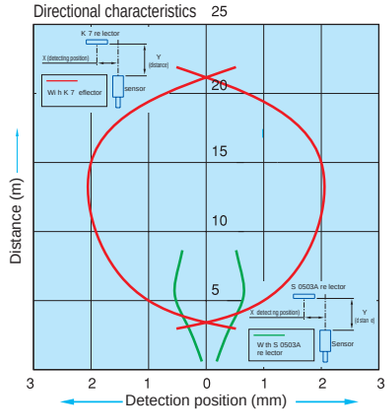


- The spot position is variable between 80 and 300 mm from the light receiving surface.
- The factory setting makes the spot diameter smallest at 300 mm from the light receiving surface. For adjusting the spot position, make sure that there is no obstacle especially in front of the receiver lens and follow the procedure below:

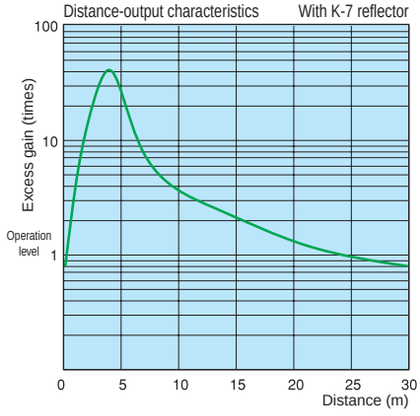
1) For viewing the spot, place a white piece of paper in front of the detection object. (Never look into the laser radiation outlet.)
2) (With the locking ring tightened,) turn the lens ring for adjusting the spot diameter and position while monitoring the spot on the white paper. In the figure above, turning in the direction A brings the spot position closer to the sensor.
The lens ring is designed to require a certain amount of force to turn for preventing loosening, which may be felt when turning the lens.
3) When adjusting for a short distance, loosen the locking ring a little, make adjustment as described above and securely tighten the locking ring.
4) After the adjustment, mount and secure the sensor body again.

Characteristics (Typical Example)

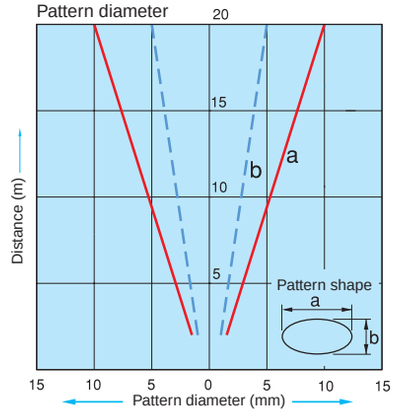
LD-M10R series
Directional characteristics



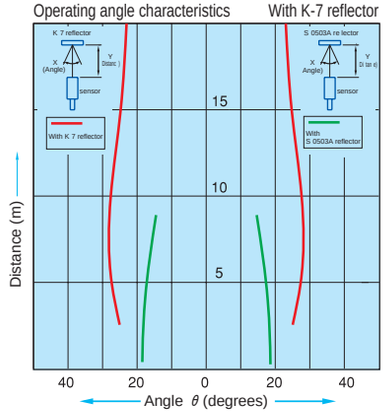
LD-M10R series
Distance-output characteristics With K-7 reflector



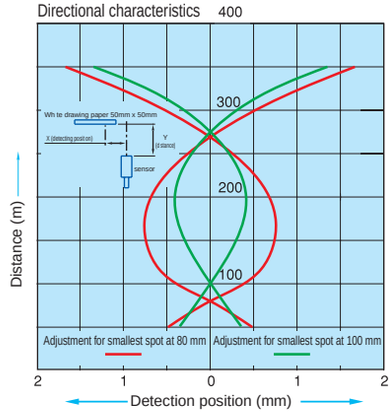
LD-M10R series
Pattern diameter



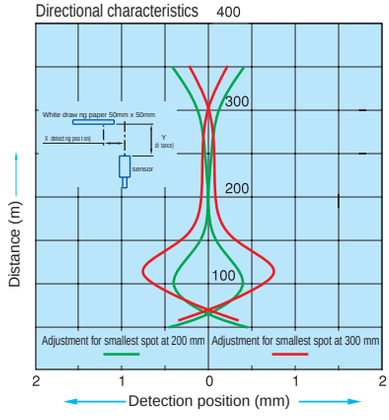
LD-M10R series
Operating angle characteristics With K-7 reflector



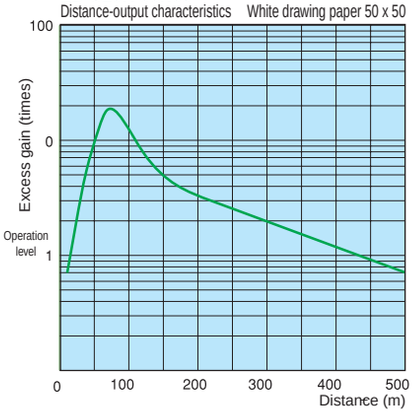
LD-S20R series
Directional characteristics



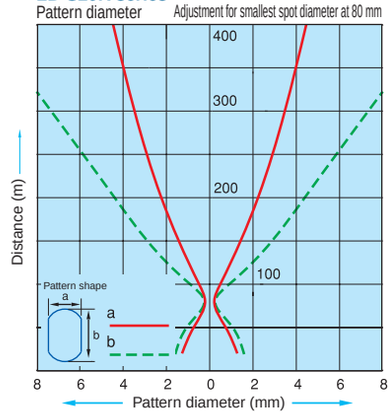
LD-S20R series
Directional characteristics



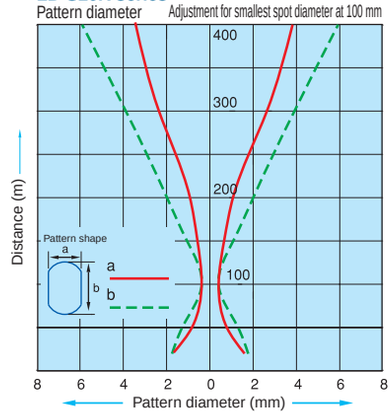
LD-S20R series
Distance-output characteristics White drawing paper 50 x 50



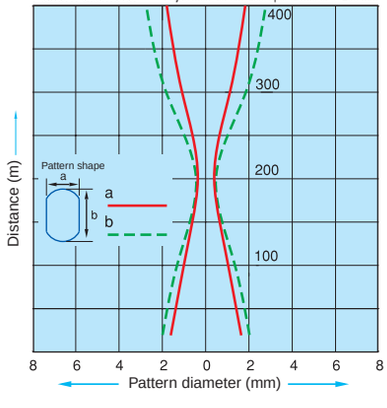
LD-S20R series
Pattern diameter Adjustment for smallest spot diameter at 80 mm



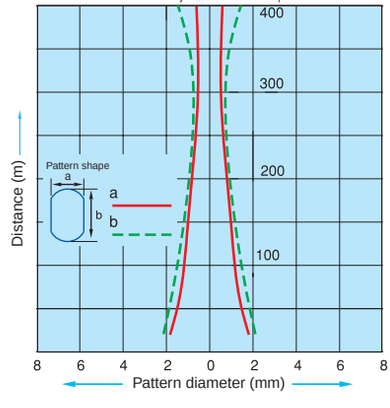
LD-S20R series
Pattern diameter Adjustment for smallest spot diameter at 100 mm



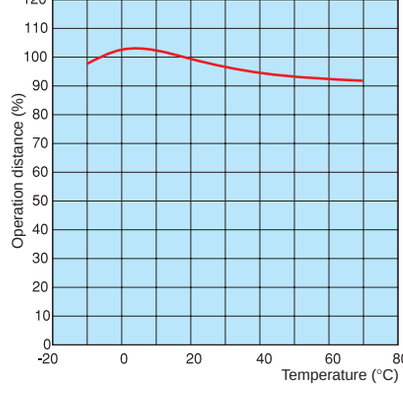
LD-S20R series
Pattern diameter Adjustment for smallest spot diameter at 200 mm



LD-S20R series
Pattern diameter Adjustment for smallest spot diameter at 300 mm

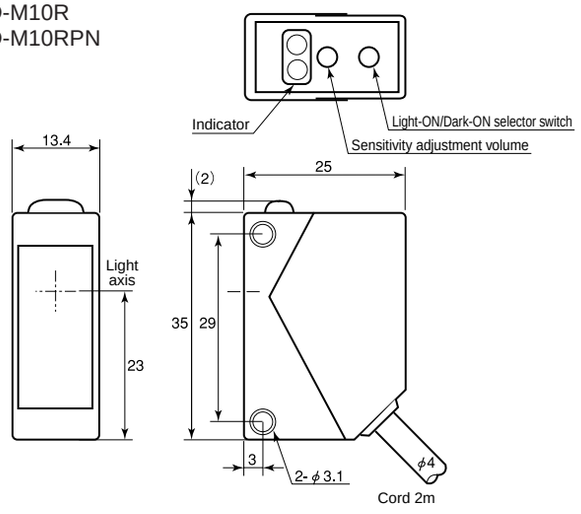


LD-M10R series LD-S20R series
Temperature characteristics (LD-S20R (PN)/LD-M10R (PN))

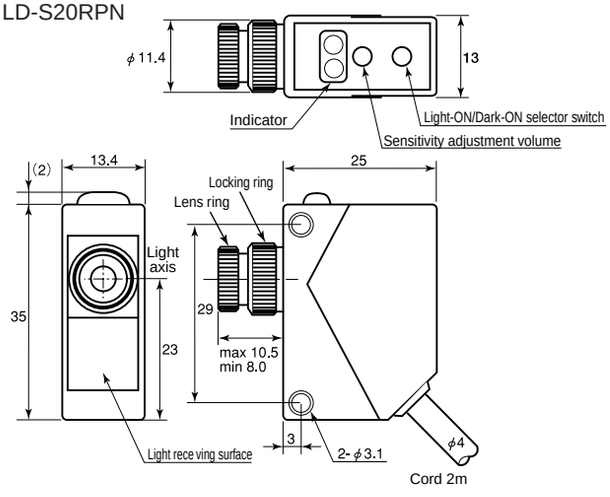


Dimensions (in mm)

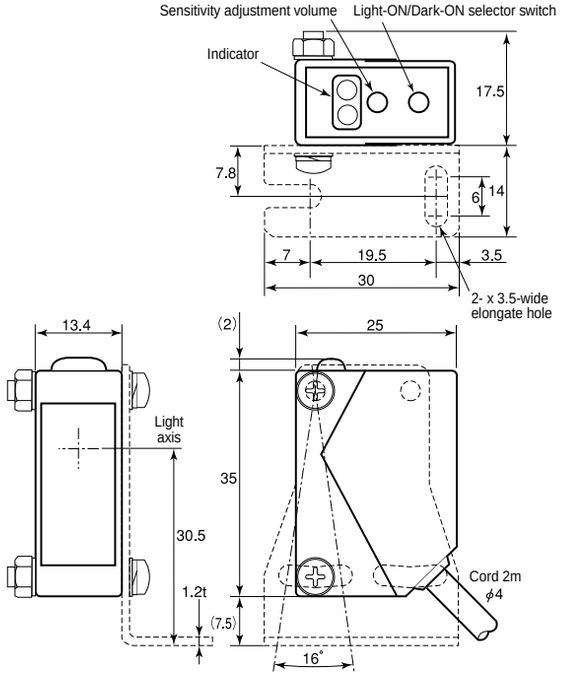
LD-M10R
LD-M10RPN



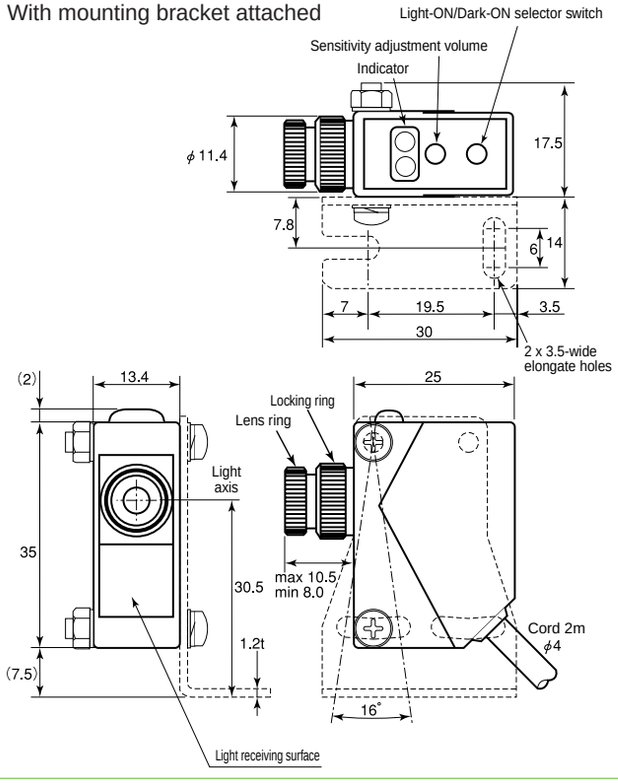
LD-S20R
LD-S20RPN



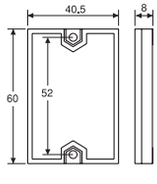
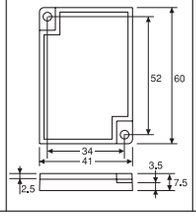
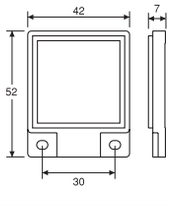
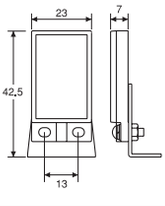
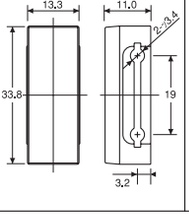
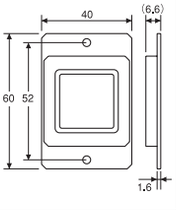
With mounting bracket attached

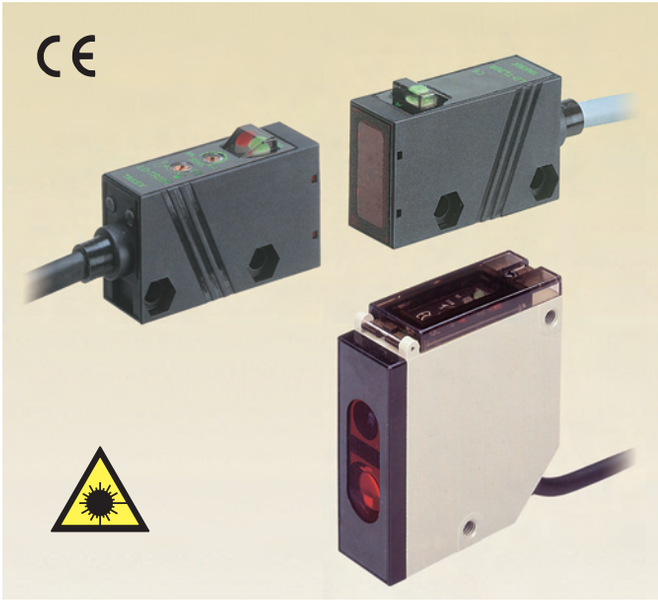


With mounting bracket attached



Optional Parts (in mm)

Reflector model	K-7	K-15	K-MT4	K-71	K-72	S-0503A
Detecting distance	3〜15m	0.3〜7m	1〜7m	3〜5m	1〜5m	0.5〜7m
Effective reflecting surface	56×36mm	36×55mm	35×35mm	32×19mm	29×8mm	24×24mm
Dimensions (in mm)						



Thin red laser beam allows highly-accurate detection

- Minute object detected at long distance
- Wide variety of models for different detecting distances and detection objects
- Simple adjustment with red spot
- Class 1 and 2 models available

Reflective type (LD-S33R)

- 0.5 mm mark detected at long distance of 300 mm
- Small-field beam allowing detection through gaps and small holes
- Light emission stop function provided

Take safety measures according to the operation manual.

Type

Detection method	Detecting distance	Model	Detection object	Operation mode	Output mode
Through-beam type	20m	**LD-T20R**	Opaque objects of ϕ20 mm or larger	Light-ON/ Dark-ON selectable (with switch)	Open collector
	15m	**LD-T20R-P2**	Opaque objects of ϕ2 mm or larger		
	7m	**LD-T20R-P1**	Opaque objects of ϕ1 mm or larger		
	3m	**LD-T20R-P05**	Opaque objects of ϕ0.5 mm or larger		
	0.7m	**LD-T20R-P03**	Opaque objects of _0.3 mm or larger		
	20m	**LD-T20R-C1**	Opaque objects of _20 mm or larger		
	10m	**LD-T20R-C1-P2**	Opaque objects of _2 mm or larger		
	5m	**LD-T20R-C1-P1**	Opaque objects of _1 mm or larger		
Limited reflection type	200～400mm	**LD-S33R**	0.5mm min. (black mark on white background) Detecting distance 300mm		NPN open collector output

- PNP output type

PNP output types are available for all models.
PNP output type models are identified by "PN" at the end of model number.
The rating/performance other than the output is the same as those of NPN types.

Optional parts

Type	Model	Applicable model	Shape, etc.
Cord with M8 connector	**FBC-4R2S**	For M8 connector type	Straight with 4-core cord of 2 m (transmitter/receiver)
	FBC-4R2L		Angled with 4-core cord of 2 m (transmitter/receiver)
Protective cover	**G-MTB2**	For through-beam LD-T20R	Rigid protective cover doubling as mounting bracket. See "Dimensions (optional parts)."

Rating/Performance/Specification

Rating/performance	Model	NPN type	**LD-T20R**	**LD-T20R-C1**	**LD-S33R**
		PNP type	**LD-T20RPN**	**LD-T20RPN-C1**	————
	Detection method		Through-beam type		Limited reflection type
	Power supply		12 - 24V DC ±10% / Ripple 10% max.		
	Current consumption	NPN type	Transmitter: 20 mA max. Receiver: 20 mA max.		38mA以下
		PNP type	Transmitter: 20 mA max. Receiver: 25 mA max.		————
	Output mode	Control output	NPN open collector output Rating: sink current 100 mA (30 VDC) max.		NPN open collector 2 outputs Rating: sink current 100 mA (30 VDC) max.
			PNP open collector output Rating: source current 100 mA (30 VDC) max.		————
		Stability output	NPN open collector output Rating: sink current 50 mA (30 VDC) max.		————
			PNP open collector output Rating: source current 50 mA (30 VDC) max.		————
	Operation mode		Light-ON/Dark-ON selectable		
	Response time		0.5ms max.		
	Operating angle		30° (at receiver)		————
Specification	Spot diameter		————		About 2 mm at 300 mm
	Smallest detectable mark width		————		0.5 mm (black mark on white background) at 300 mm
	Light source (light wavelength)		Red semiconductor laser (650 nm) Class 2	Red semiconductor laser (650 nm) Class 1	Red semiconductor laser (650 nm) Class 2
	Indicator		Transmitter: power indicator (green LED)		Operation indicator (red LED) Stability indicator (green LED)
			Receiver: operation indicator (red LED) Stability indicator (green LED)		
	Volume		SENS: sensitivity adjustment (at receiver)		8-turn sensitivity adjustment
	Switch		Light-ON/Dark-ON selector switch provided		
	Short circuit protection		Provided (for control output only)		Provided
	Material	Case	Polyarylate		Body: zinc die-cast / Aluminum head: heat-resistant ABS / Display: polycarbonate
		Lens	Acrylic		Glass
	Connection		Permanently attached cord(outer dimension: dia. 4.2) Transmitter: 0.3 sq. 2 core 2 m length (gray) Receiver: 0.2 sq. 4 core 2 m length (black)		Permanently attached cord (outer dimension: dia. 4.5) 0.2 sq. 5 core 2 m length
			-J type: M8 connector connection		————
	Mass		Permanently attached cord type: about 80 g (transmitter/receiver) / -J type: about 25 g (transmitter/receiver)		Approx. 300g
	Notes		Mounting bracket, operation manual, warning label, instruction label		

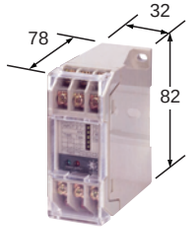
Environmental Specification

		LD-T20R	**LD-S33R**
Environment	Ambient light	5,000 lx max.	Sunlight: Light receiving surface illumination 10,000 max. Incandescent lamp: receiving surface illumination 3,000 lx max.
	Ambient temperature	-10 - +55°C	
	Ambient humidity	35 - 85%RH	
	Protective structure	IP67	IP66
	Vibration	10 - 55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction	
	Shock	500 m/s² / 3 times each in 3 directions	100 m/s² / 3 times each in 3 directions
	Dielectric withstanding	1,000 VAC for 1 minute	
	Insulation resistance	500 VDC, 20 MΩ or higher	

● Applicable power supply unit

PS Series

High capacity of 200 mA at 12 VDC

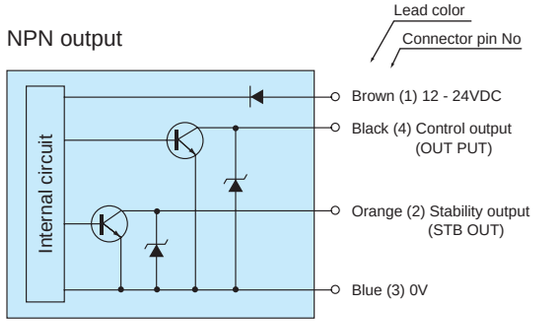


(General-purpose type) PS3N
PS3N-SR

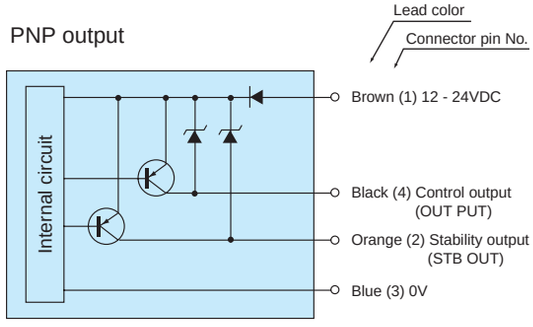
(Multifunctional type) PS3F
PS3F-SR

Input/Output Circuit and Connection

NPN output



PNP output



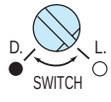
- The output transistor turns off when load short circuit or overload occurs. Check the load and turn the power back on.
- The stability output is not provided with short circuit protection.

Switching between Light-ON and Dark-ON

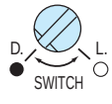
The operation mode selector switch is provided on the receiver.

Turn to L for Light-ON mode and D for Dark-ON mode.

Light-ON mode



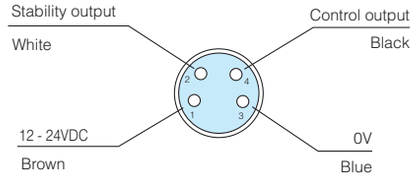
Dark-ON mode



M8 connector type (-J)

Pin assignment

(Receiver)



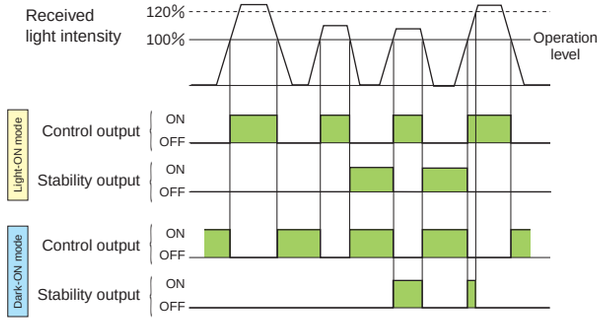
The colors show lead colors for use in combination with the optional cord with M8 connector.

(Transmitter)

Lines other than Lines 1 (brown) and 3 (blue) are unused.

Stability output

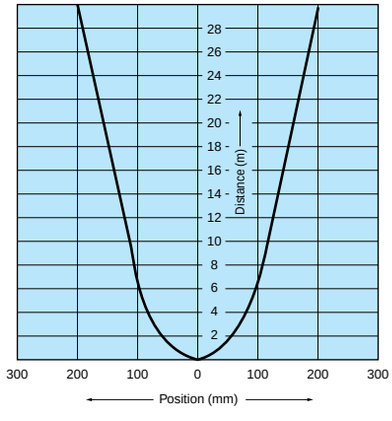
The stability output can be used to check for reduction of the light intensity level along with any change in the operating environment or operation over time or to perform initial check of the operation. When two consecutive detections have occurred with the intensity of light detected exceeding the operation level but not reaching 120 % of the level (range allowing stable operation), the stability signal is output when the control output is deactivated.



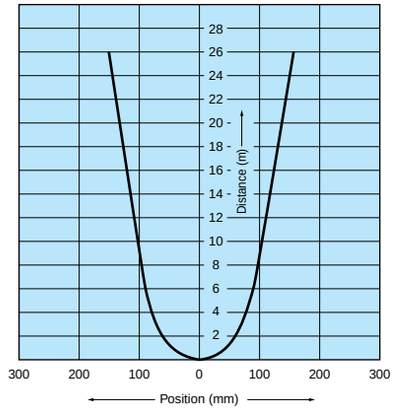
Characteristics (Typical Example)

Directional characteristics

LD-T20R

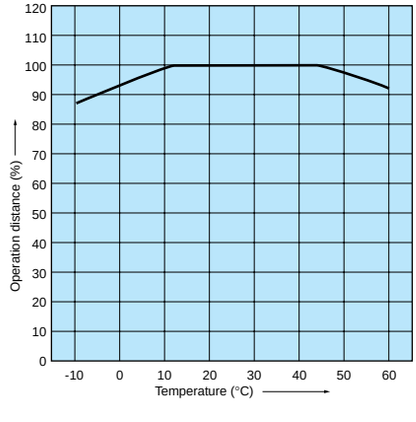


LD-T20R-C1



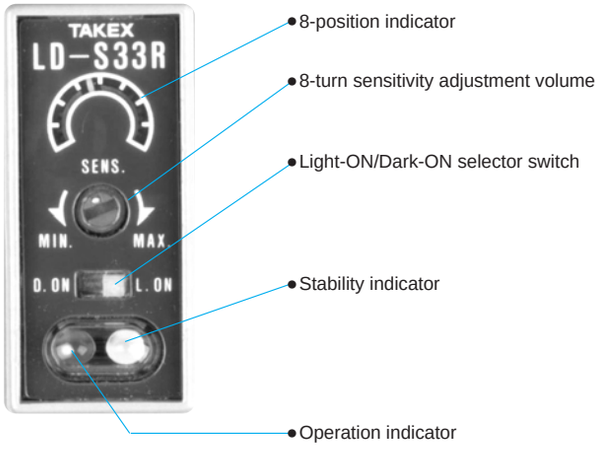
Temperature characteristics

LD-T20R, LD-T20R-C1



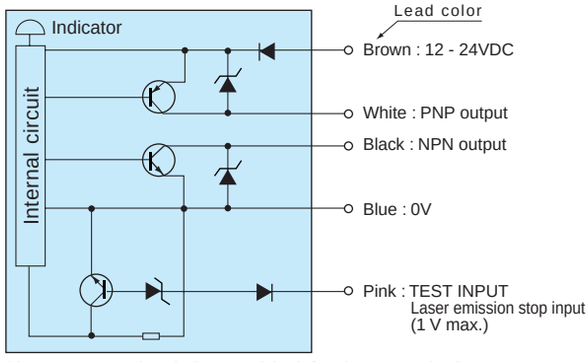
Panel Indication

LD-S33R



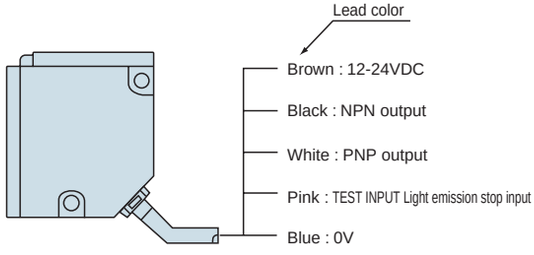
Input/Output Circuit and Connection

LD-S33R

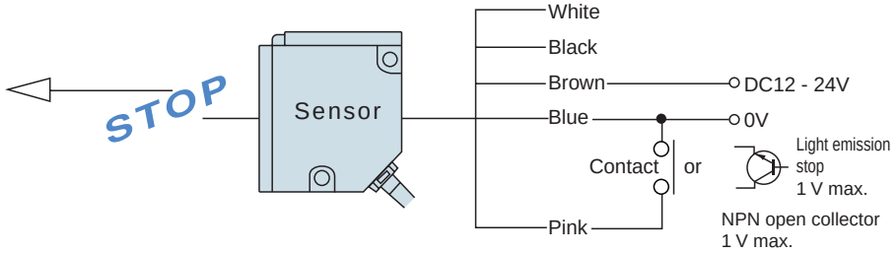


Slow starter circuit is provided for laser emission. The laser light is illuminated about 0.5 seconds after power-up or reset of short circuit caused by emission stop input.

The output transistor turns off when load short circuit or overload occurs. Check the load and turn the power back on.



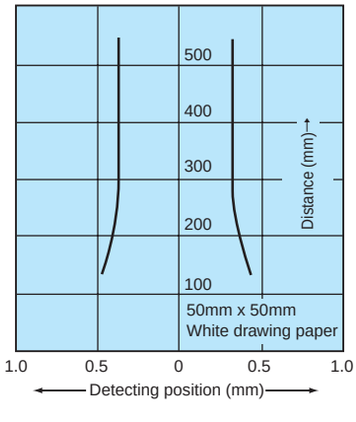
Using Light Emission Stop Function (LD-S33R only)



Short-circuiting the blue and pink leads of the transmitter stops the laser light emission at arbitrary timing.

Activation Area Characteristics (Typical Example)

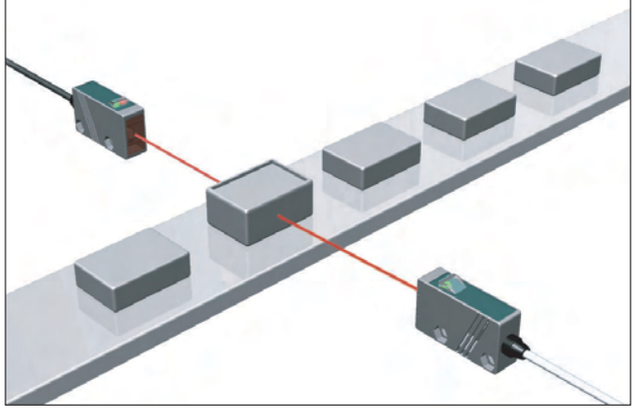
LD-S33R



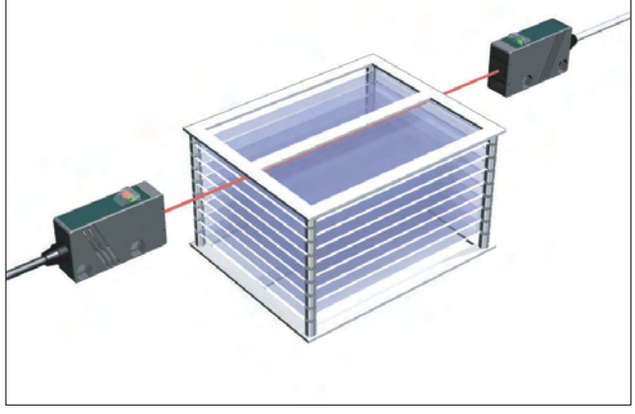
Sample Applications

Highly-accurate detection achieved with extra thin beam

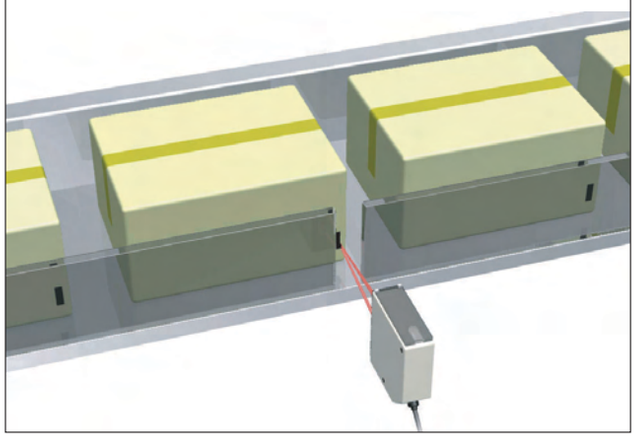
Checking for wrong case mixed in



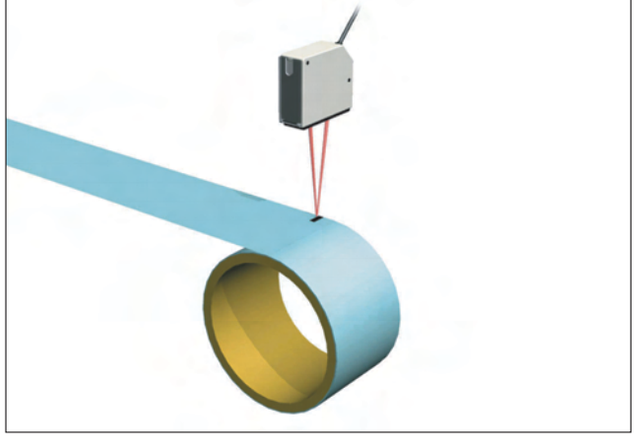
Detection of presence of boards



Detection of marks on corrugated cardboard boxes through narrow gap



Detection of end mark of rolled paper



For Correct Use

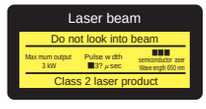
- Do not use the product for for the protection of human body.
- When using the product for safety purposes, ensure "System-Wide" safety with the control system as a whole as well as the detection.
- This product is not explosion proof.

- The semiconductor laser used in this product falls under the following class as defined in JIS C 6802 "Safety of Laser Products."
  - Class 1 (Intrinsically safe under the rationally predictable operation conditions)
  - Class 2 (Emits visible radiation from which the eyes are generally protected by the aversion reactions)
- This product employs a parallel beam of laser and care should be taken not to allow the laser light to enter human eye. Never look into the laser radiation outlet of the transmitter connected to power supply. Looking straight into the laser light may damage the eye.
- This product is provided with warning and instruction labels as shown below for notifying and alerting the operator of the sensor of the degree of danger. After the product has been installed, attach the labels in prominent locations on the sensor.

Warning label

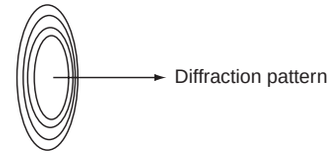
Instruction level

●Class 2



●Class 1

- The radiated laser beam is elliptic due to the characteristics of semiconductor laser. In addition, diffraction pattern is generated due to optical diffraction phenomenon.

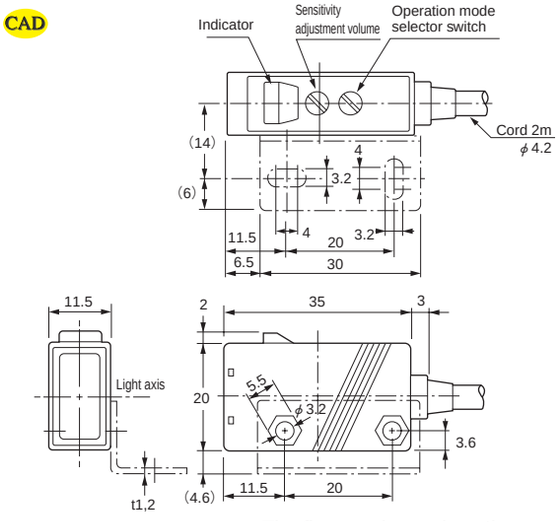


- Be notified that this product uses semiconductor laser and is prone to deterioration due to surge current or static electricity.
- The laser diode is equipped with a circuit that maintains the same light intensity level by increasing the current if it becomes dark. For this reason, allow sufficient margin in the capacity of the power supply.
- Always avoid use in which the power is turned on and off consecutively.
- Be sure to turn off the power before moving including mounting and removing or repairing.

Dimensions (in mm)

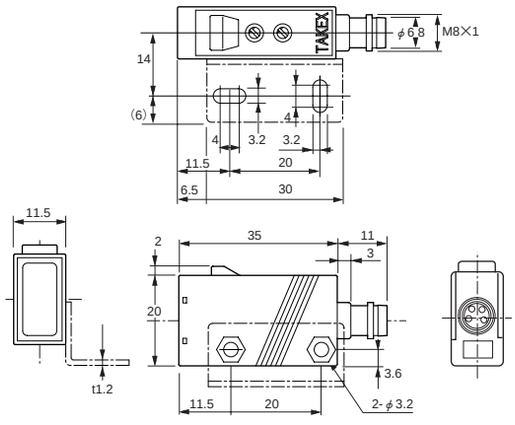
LD-T20R (-C1) Series

CAD



M8 connector type (-J type)

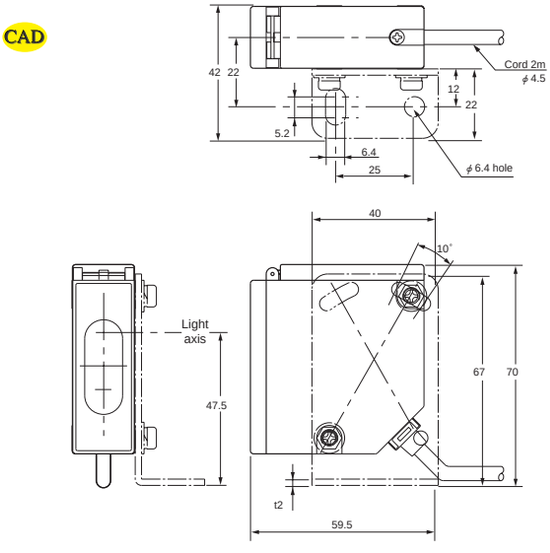
CAD



The figures above show the receiver. The transmitter has a different panel side.

LD-S33R

CAD

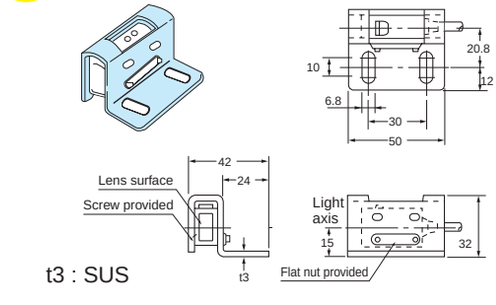


With mounting bracket attached

Dimensions (Optional parts) (in mm)

G-MTB2

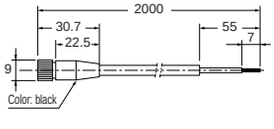
CAD



t3 : SUS

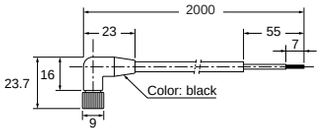
FBC-4R2S(straight)

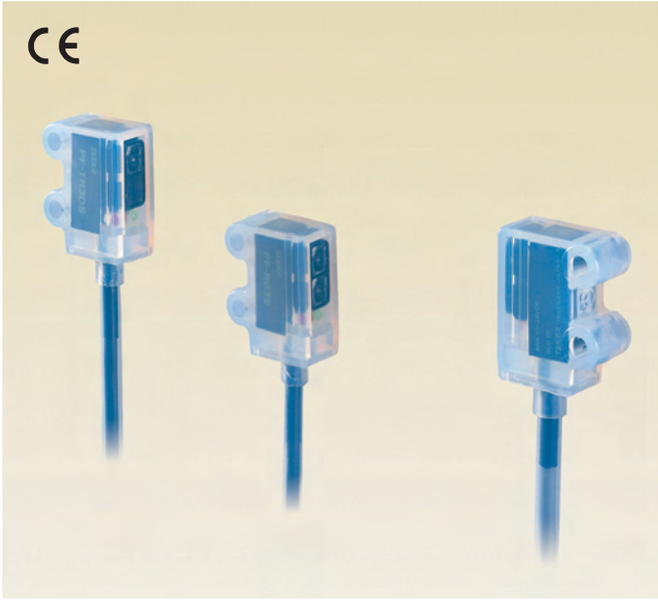
CAD



FBC-4R2L(angled)

CAD





- Embedded amplifier sensor with body and cord covered with fluoroplastic (PFA) housing and tube for enhanced resistance to oils and chemicals.

  Excellent resistance to oils and chemicals, capable of immersed use.

- Easy-to-use embedded amplifier sensor
- Long detecting distance (through-beam: 3 m; diffuse-reflective: 30 cm)
- High-speed response of 0.35 ms
- Optional external sensitivity adjustment employed

Type

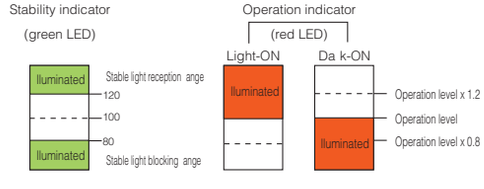
Detection method	Detecting distance	Model	Operation mode	Output mode
Through-beam type	3m	**PF-T3DS**	Dark-ON	NPN open collector output
Diffuse-reflective type	300mm	**PF-R03S**	Light-ON	

- Red LED models

  Red LED is used for light emitting element for resistance to underwater attenuation for detection of objects in water.
  Model PF-T3RDS (through-beam)
  Model PF-R03RS (reflective)

Indicators

- The operation indicator (red LED) and stability indicator (green LED) show the levels of light intensity as described in the figure below.
- After aligning the optical axis and adjusting the sensitivity, use a detection object to block and unblock the light beam several times to make sure that the sensitivity level is in a range that allows stable activation and deactivation.
- Setting the sensitivity in a range allowing stable operation achieves higher reliability against changes in the operating environment generated after the sensitivity is set.



The red LED (OP.L) is the operation indicator.
In the L.ON (Light-ON) mode, the indicator is illuminated when a certain amount of light is detected.
In the D.ON (Dark-ON) mode, the indicator is illuminated when a certain amount of light is not detected.

Chemical resistance of PFA (fluoroplastic)

Substance	PFA	Substance	PFA
Bunker A, B, C heavy oil	○	Mineral oil	○
Aniline	○	Ethylene trichloride	○
Acrylic nitrile	○	Bichromate of soda	○
Asphalt	○	Barium nitrate	○
Acetone	○	Silicon oil	○
Alcohol	○	Vegetable oil	○
Ammonia	○	Thinner	○
Isooctane	○	Barium hydroxide	○
Isobutyl alcohol	○	Phenol	○
Isobutyl methyl ketone	○	Turbine oil	○
Ethanol (ethyl alcohol)	○	Sodium carbonate	○
Ether	○	Turpentine	○
Ethylene glycol	○	Natural volatile oil	○
Enamel paint	○	Kerosene	○
Ammonium chloride	○	Trichloroethane	○
Calcium chloride	○	Trichloroethylene	○
Sodium chloride	○	Toluene	○
Barium chloride	○	Naphtha	○
Chlorine	○	Lactic acid	○
Gasoline	○	Nitrobenzene	○
Glass raw material	○	Fluorine	×
Dilute hydrochloric acid	○	Ferrosilicon	○
Dilute caustic soda	○	Freon 11	○
Dilute acetic acid	○	Propyl alcohol	○
Dilute nitric acid	○	Propylene glycol	○
Dilute sulfuric acid	○	Benzene	○
Citric acid	○	Methanol (methyl alcohol)	○
Glycerin	○	Methyl violet	○
Cresol	○	Water	○
Chloroform	○	Carbon tetrachloride	○
Light oil	○	Ammonium sulfate	○

○ : applicable × : inapplicable

Rating/Performance/Specification

	Model	PF-T3DS	PF-R03S
Rating/performance	Detection method	Through-beam type	Diffuse-reflective type
	Detecting distance	3m	300mm
	Detection object	ϕ 20mm (Min.) Opaque	Standard detection object: 100 x 100 mm white drawing paper
	Power supply	12-24V DC ±10% / Ripple 10% max.	
	Current consumption	Transmitter: 12 mA max. Receiver: 15 mA max.	20mA max.
	Operation mode	Dark-ON(*1)	Light-ON(*2)
	Output mode	NPN open collector output Sink current 100 mA, 30 V DC max.	
	Response time	0.35ms max.	
	Hysteresis	———	10% max.
	Operating angle	10° (at receiver)	———
Specification	Light source (wavelength)	Infrared LED (880 nm)	
	Indicator	Transmitter: power indicator (red LED) Receiver: operation indicator (red LED) Stability indicator (green LED)	Operation indicator (red LED) Stability indicator (green LED)
	Volume	Not provided (optional: sensitivity adjustable with external volume)	
	Short circuit protection	Provided	
	Case material	PFA (fluoroplastic)	
	Connection	Permanently attached cord 3m length (2 m protected with PFA tube)	
		Transmitter: 0.15 sq. 2 core Receiver: 0.15 sq. 4 core	0.15 sq. 4 core
	Mass	About 100 g (transmitter/receiver)	About 100g
	Notes		

*1 Model PF-T3S for Light-ON mode
*2 Model PF-R03DS for Dark-ON mode

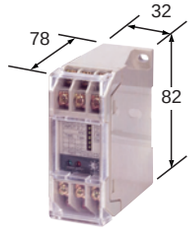
Environmental Specification

Environment	Ambient light	5,000 lx max.
	Ambient temperature	-25 - +55°C (non-freezing/ non-condensing)
	Protective structure	IP 67g (sensor body and cord up to 2 m from body) *
	Vibration	10-55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	500 m/s^2 / 3 times each in 3 directions
	Dielectric withstanding	1,000 VAC for 1 minute
	Insulation resistance	500 VDC, 20 MΩ or higher

*Indicates Class g oil resistance in addition to IEC Standard IP 67 protective structure.

● Applicable power supply unit

PS Series
High capacity of 200 mA at 12 VDC



(General-purpose type)	PS3N
	PS3N-SR
(Multifunctional type)	PS3F
	PS3F-SR

Using In-line Volume Unit for PFA Sensor (optional)

In-line volume unit models provided with an operation mode selector switch, sensitivity adjustment volume and operation indicator are available for adjustment at a distant location.

● Specification

Model: PF-V2 (NPN output)
PF-V2PN (PNP output)
Power supply: 12~24V DC ±10% / Ripple 10% max.
Output mode: Open collector output
100 mA (30 VDC) max. / Residual voltage: 1 V max.
Response time: 0.3ms max.
Short circuit protection: Provided
Connection: permanently attached cord (2 m)
Sensor: ϕ 4 with four 0.2 mm2 cores
Power/output: ϕ 4 with three 0.2 mm2 cores
Case material: Polycarbonate
Mass: Approx. 150g

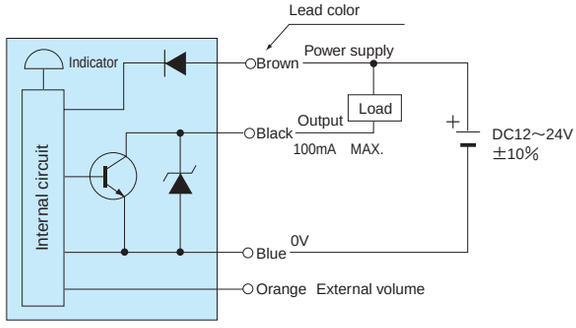
● Connection

Connect to the receiver of a through-beam sensor or reflective-type sensor.

(Note) The volume unit and the cord are not covered with PFA (fluoroplastic) and should be used in normal atmosphere.

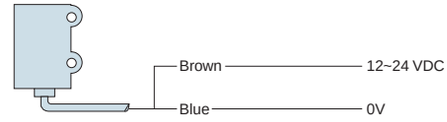
PF

Input/Output Circuit and Connection

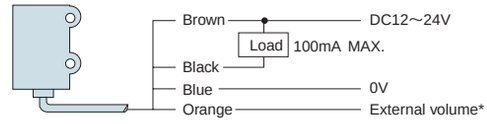


- The output transistor turns off when load short circuit or overload occurs.
  Check the load and turn the power back on.

Through-beam type transmitter



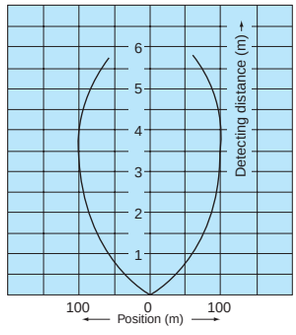
Through-beam type receiver and diffuse-reflective type



*Cut this lead off when not using the volume unit (model PF-V2) to leave it open and prevent it from touching other leads.

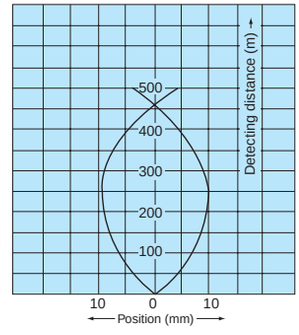
Directional characteristics(Typical Example)

PF-T3DS



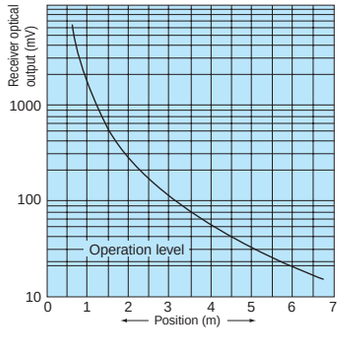
Activation area characteristics(Typical Example)

PF-R03S

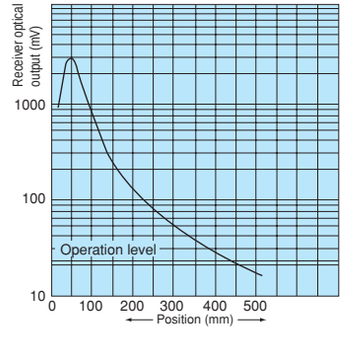


Distance-Output Characteristics (Typical Example)

PF-T3DS

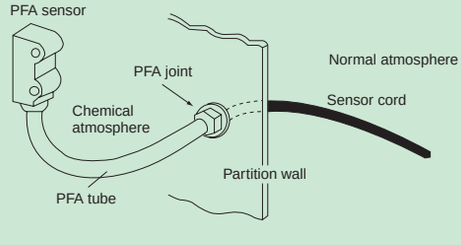


PF-R03S



Hint on Handling (Reference Example)

- The sensor body and part of the cord is covered with PFA (fluoroplastic). A vinyl chloride cord extends out of the PFA tube (at 2 m from the sensor) and there is no sealing between the PFA tube and the cord. When using in chemical atmosphere, use the separately-available PFA joint, etc. in the partition wall between the chemical and normal atmospheres to route the cord.

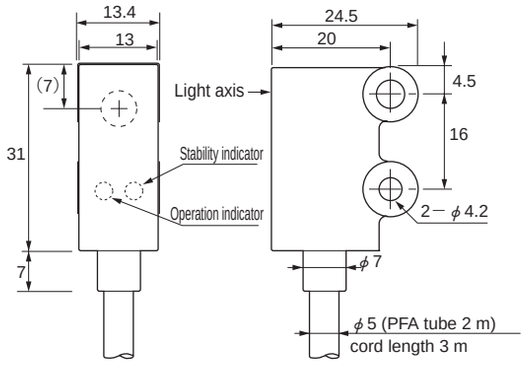


●PFA joint
Model AC-PF-05

Dimensions (in mm)

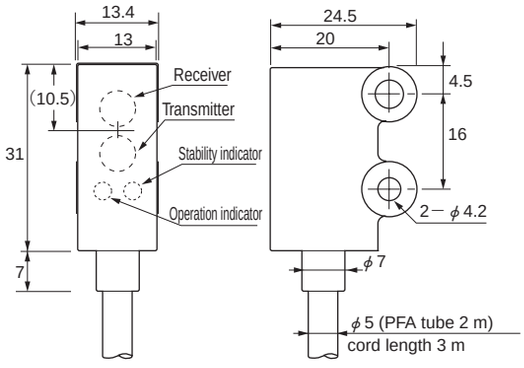
PF-T3DS

CAD



PF-R03S

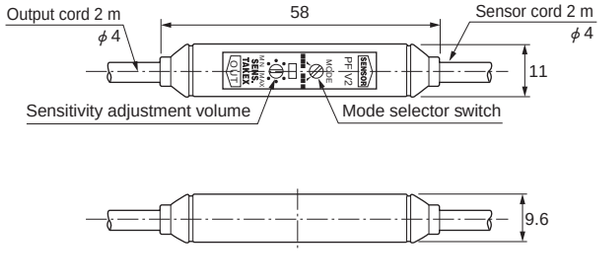
CAD



(The only indicator on the transmitter is power indicator.)

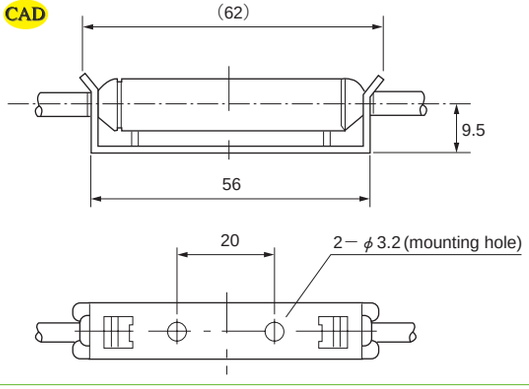
PF-V2 volume unit (optional)

CAD



With mounting bracket HZ-01 attached

CAD



For Correct Use

- Do not bend the PFA tube into a radius of 30 mm or smaller.
- The tensile strength and bending strength of the sensor body and tube should be 0.2 N·m max.
- This product can be used under water at a depth of 50 cm at most. Be sure to refer to the chemical resistance performance table to check resistance before using the sensor in chemical solution.
- Do not use the sensor in hazardous environment requiring.
- To extend the cord, use wires of at least 0.3 mm^2. Do not extend the cord between the sensor and external volume.
- Use M4 screws to mount the sensor. When using stainless steel screws, the tightening torque should be 0.6 N·m max. For higher chemical resistance, use fluoroplastic (PFA) screws.
- While PFA (fluoroplastic) has resistance to chemicals, it is not completely chemical proof against fluorine or strongly acidic chemicals. The durability may vary depending on the permeability, erosiveness or temperature of chemicals and sensor operating condition.

- The electric operation guarantee period of the product is 1 year after delivery. The resistance to chemicals of PFA in terms of appearance is not covered since the durability may vary.

GA series

Transparent container detection

- **Simple operation of just pressing button**
  Single touch can make adjustment for transparent object with high transmission
  Optical system capable of fine detection of transparent objects employed
- **Reflector exclusively for transparent container detection**
  Tarnish-proof reflector especially designed for transparent objects employed
- **Equipped with inverter light suppression circuit**
  Faulty operation under inverter fluorescent lamps prevented
- **IP 67 water resistance allowing washing**

Type

Detection method	Detecting distance	Model	Operation mode	出力モード
Reflector type	0.1-1m	**GA-MT1R**	Light-ON/ Dark-ON selectable (by teaching)	NPN open collector
		GA-MT1RPN		PNP open collector

Optional Parts

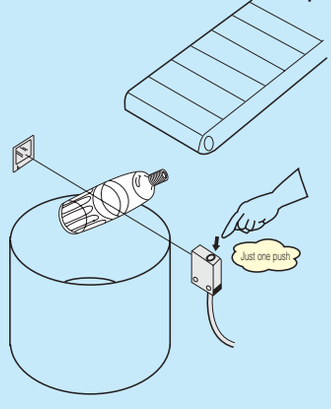
Type	Model	Description
Mounting bracket	**GA-B1**	Vertical mounting bracket
	GA-B2	Horizontal mounting bracket
Protective cover	**G-MSB1**	Rigid protective cover doubling as mounting bracket.
	G-MTB1	
	G-K7B	
Reflector	**K-MT4**	Accessory (when purchase separately)

Mounting brackets do not come with sensors. Select and purchase appropriate models according to the mounting conditions

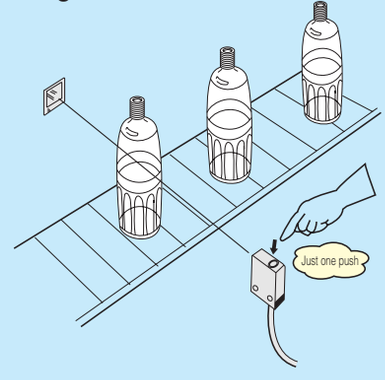
Sensitivity adjustment for transparent object detection difficult with conventional volume type made by single-touch operation

Sample Applications

Full auto teaching for translucent objects or falling objects that are difficult to stop



Single-touch teaching for transparent objects with high transmission



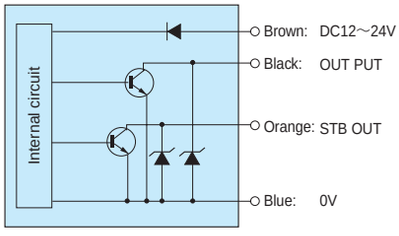
Rating/Performance/Specification

			NPN output type	PNP output type
Rating/performance	Type			
	Model		GA-MT1R	GA-MT1RPN
	Detection method		Reflector type	
	Detecting distance		0.1-1m (with K-MT4 reflector)	
	Power supply		12-24V DC ±10% / Ripple 10% max.	
	Current consumption		25mA max.	25mA max.
	Output mode	Control output	NPN open collector	PNP open collector
		Rating	Sink current 100 mA (30 VDC) max. Residual voltage: 1 V or less	Source current 100 mA (30 VDC) max. Residual voltage: 1 V or less
		Stability output	NPN open collector	PNP open collector
		Rating	Sink current 50 mA (30 VDC) max. Residual voltage: 1 V or less	Source current 50 mA (30 VDC) max. Residual voltage: 2 V or less
	Operation mode		Light-ON/Dark-ON selectable	
	Response time		1ms max.	
Specification	Light source		Red LED (700 nm)	
	Indicator		Operation indicator (orange LED) Stability indicator (green LED)	
	Setting button		For sensitivity setting and Light-ON/Dark-ON selection *1	
	Short circuit protection		Provided	
	Material	Sensor	Lens: acrylic Case: polycarbonate	
		Reflector	Mirror: acrylic / Base: heat-resistant ABS	
	Connection		Permanently attached cord (outer dimension: dia. 4.2) 0.2 sq. 4 core 2 m length	
	Mass		Body: about 60 g / Reflector: about 15 g	
	Notes		Special reflector (K-MT4), operation manual, explanation sticker, (Note) mounting bracket separately available	

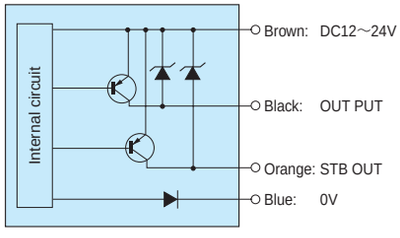
*1 Factory settings Sensitivity: Max.
Mode: Dark-ON

Input/Output Circuit and Connection

NPN output
GA-MT1R



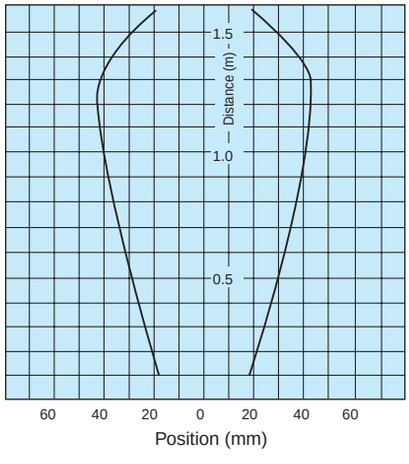
PNP output
GA-MT1RPN



Environmental Specification

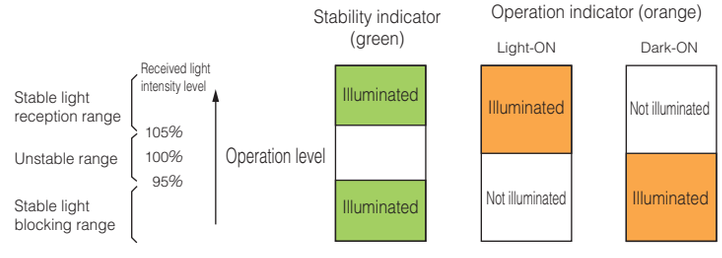
Ambient light	5,000 lx max.
Ambient temperature	-25 - +55°C (non-freezing)
Ambient humidity	35~85%RH (non-condensing)
Protective structure	IP 67
Vibration	10-55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
Shock	500 m/s² / 3 times each in 3 directions
Dielectric withstanding	1,000 VAC for 1 minute
Insulation resistance	500 VDC, 20 MΩ or higher

Directional characteristics (Typical example)



Indicators

The figure below shows the illumination of operation and stability indicators for different received light intensity levels. Set the sensitivity in such a way that the sensor operates in a sensitivity range that allows stable activation.



Stability output

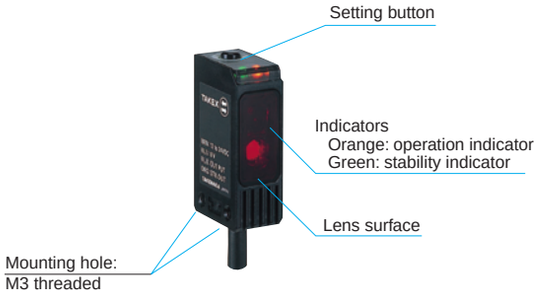
When seven consecutive detections have occurred with the intensity of light detected not reaching the stable light reception range, the stability signal is output.

GA-MT1R
GA-MT1RPN

For Correct Use

Be sure to follow the instructions in the operation manual provided for correct use of the product.

Part names

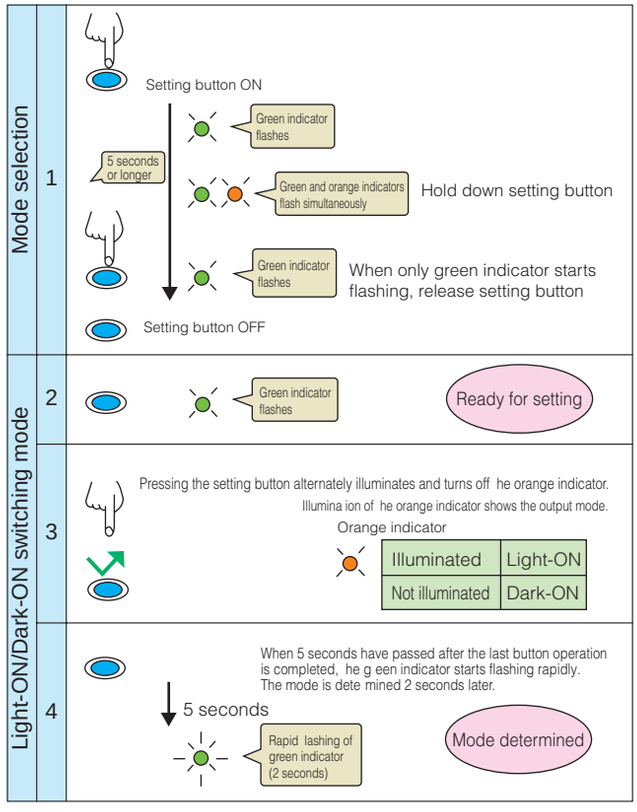


This sensor only has one setting button and no sensitivity adjustment volume or selector switch. Light-ON/Dark-ON switching and sensitivity setting are handled with the setting button alone.
Enter the sensitivity setting mode or Light-ON/Dark-ON switching mode by pressing and holding down the button for a period of time as specified below:

Hold down setting button for 2-4 seconds
⇒Sensitivity setting mode
Hold down setting button for 5 seconds or longer
⇒Light-ON/Dark-ON switching mode

Switching between Light-ON/Dark-ON mode

The factory setting is Dark-ON mode.
Be sure to check and set either the Light-ON or Dark-ON mode before setting the sensitivity.
Enter the Light-ON/Dark-ON switching mode by pressing the setting button for 5 seconds or longer. While the button is operated, the state of the output before starting the operation of the button is maintained.



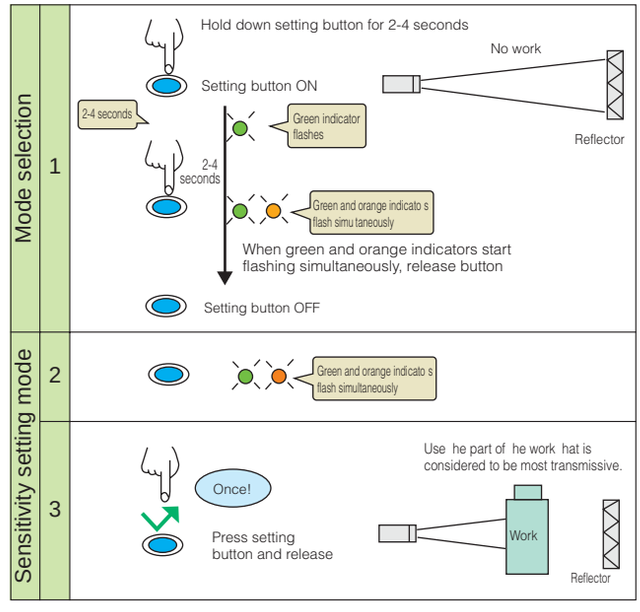
Sensitivity setting

The factory setting is maximum sensitivity. Adjust the sensitivity as required according to the state of the detection object or sensor mounting condition. Use the table below as guidelines:

Detection object	Sensitivity setting
Transparent object with high transmission such as PET bottle	Single-touch teaching-1
Translucent object such as milky white plastic case	Single-touch teaching-2
Continuously moving object such as falling object	Full auto teaching
Object that completely blocks ight such as corrugated cardboard box	Maximum sensitivity setting

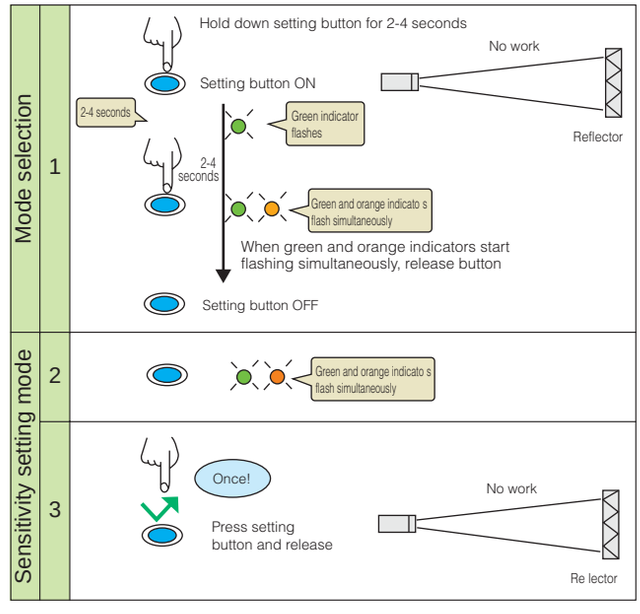
Single-touch teaching-1 transparent object with high transmission such as PET bottle

With the work removed, select the sensitivity setting mode. Then place the work at a given position and press the setting button once.



Single-touch teaching-2- translucent object such as milky white plastic case

No work needs to be placed. Set the sensitivity while the light is received. Just a single operation of the button sets the optimum sensitivity for the given received light intensity.



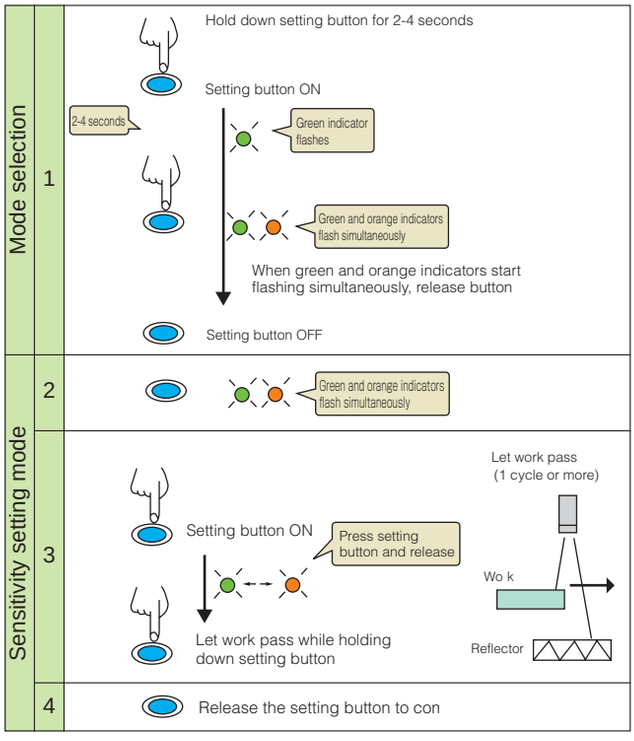
TAKEX

For Correct Use

Be sure to follow the instructions in the operation manual provided for correct use of the product.

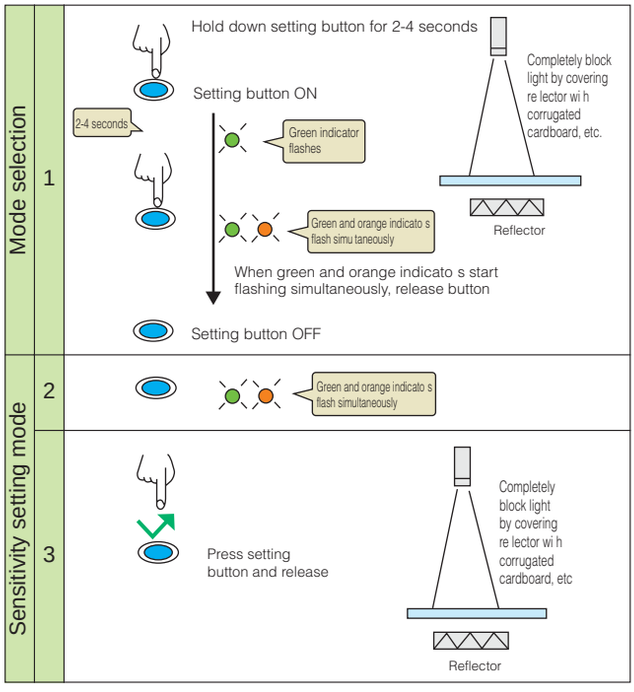
Full auto teaching

When it is not possible to make "no-work" state as in detection of continuously moving (e.g. falling) object



Maximum sensitivity setting

Enter the sensitivity setting mode with the light blocked and press the setting button once. The sensitivity is set at the maximum, which is the factory setting.

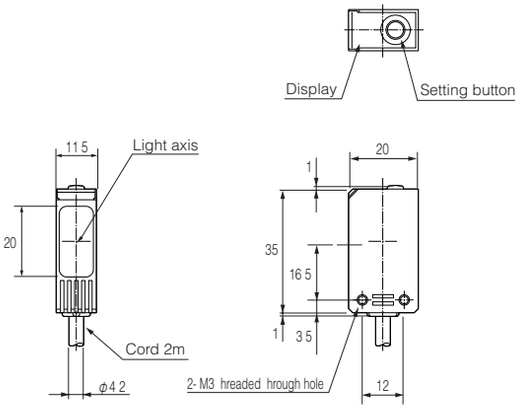


Installation

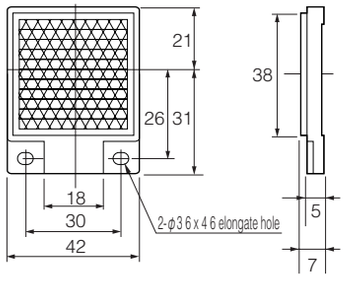
- Use the special reflector (K-MT4) that comes with the sensor. Using other types of reflector may degrade the performance of the product.
- No mounting bracket is provided. Purchase mounting brackets separately available according to the application.
- Sensor mounting
  For securing the sensor, use screws of an adequate length.
  If the effective length of the screw to the sensor is too short, the thread of the sensor may be damaged.
  The mounting holes in the sensor are M3 threaded. Select M3 screws of an appropriate length so that the screw-in length to the body of the sensor will be at least 10 mm.
  The tightening torque should be up to 0.5 N·m.
- Secure the sensor firmly on a solid base so that the sensor will not move when the setting button is pressed.
  Inadequate securing allowing the sensor to move when the setting button is pressed hampers accurate sensitivity setting.
- Make sure that the sensor and reflector are fixed before use.
  If the sensor or reflector is allowed to move, the operation may become unstable.
  Rotation of the reflector with reference to the sensor is especially likely to cause problems such as chattering.
- If the ambient temperature is low enough for freezing to occur, the operation of the setting button may not feel smooth. In such a case, press hard until the indicator flashes.

Dimensions (in mm)

Sensor body



Reflector K-MT4



NES series

Photo sensors for transparent object detection

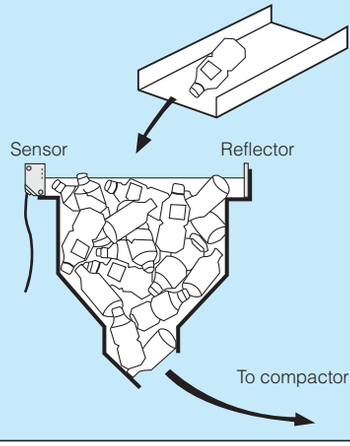
- Transparent objects such as PET bottles and ampoules detectable
- Teaching method for sensitivity ajustment is employed for less variation and automatic of optimum sensitivity, allowing reliable detection
  - Full auto teaching: set without stopping work
  - Auto teaching: set with work stopped
  - External teaching: setting from a distant location

Type

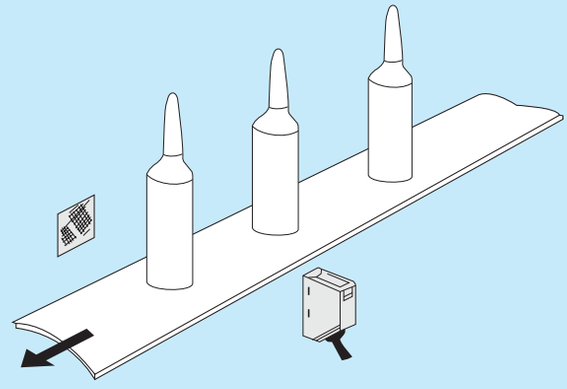
Detection method	Detecting distance	Model	Operation mode	Output mode
Polarization reflector type	0.2～1m	**NES-MT1**	Light-ON	NPN open collector
		NES-MT1D	Dark-ON	

Sample Applications (In preparation for the unlikely event of unstable detection due to lens effect, etc., check the operation using sample objects.)

Detection of overfill of PET bottles



Detection of ampoules



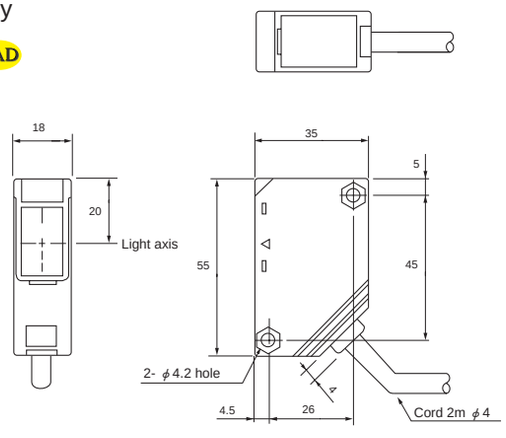
Rating/Performance/Specification

	Model	NES-MT1	NES-MT1D
Rating/performance	Detection method	Polarization reflector type	
	Detecting distance	0.2-1m (with K-MT4, reflector provided for sensor)	
	Power supply	12-24V DC ±10%	
	Current consumption	30mA max.	
	Output mode	NPN open collector output	
	Output rating	Sink current 100 mA (30 VDC) max. Residual voltage: 1 V or less	
	Operation mode	Light-ON	Dark-ON
	External teaching	No-voltage input (contact/non-contact)	
	Response time	1ms max.	
	Operating angle	30° (at reflector)	
Specification	Light source (wavelength)	Red LED (700nm)	
	Indicator	Light reception indicator (Red LED) Stability indicator (green LED)	
	Sensitivity adjustment	Full auto teaching/auto teaching with rotary switch (provided) or external teaching input	
	Protection circuit	Output short circuit protection, reverse connection protection	
	Material	(Sensor) Lens: acrylic / Case: heat-resistant ABS (Reflector) Mirror: acrylic / Base: heat-resistant ABS	
	Connection	Permanently attached cord (outer dimension: dia. 4) 0.2 sq. 4 core 2 m length	
	Mass	Sensor: about 150 g (including mounting bracket) / Reflector: about 15 g	
	Accessory	Mounting bracket, screwdriver for teaching, reflector (K-MT4), operation manual	

Dimensions (in mm)

Body

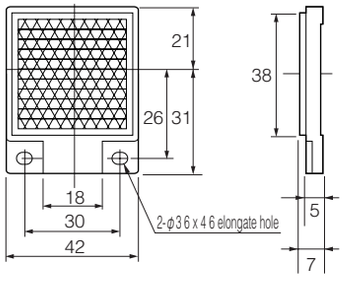
CAD



Reflector

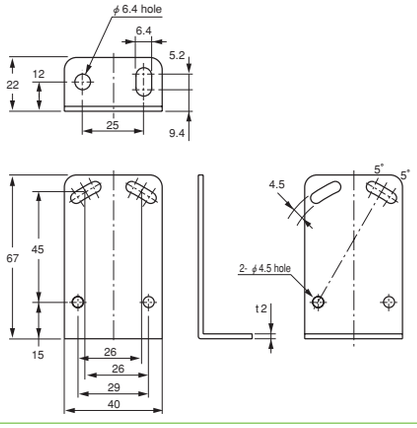
Model: K-MT4

CAD

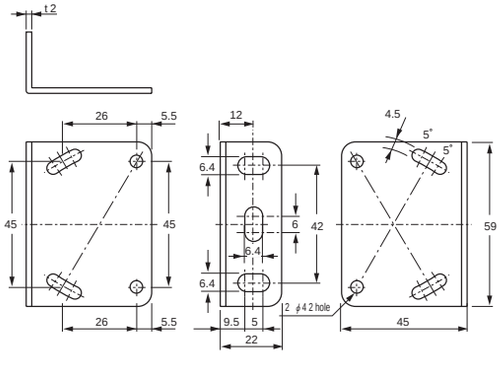


Mounting bracket NE-B1 (for vertical mounting)

CAD

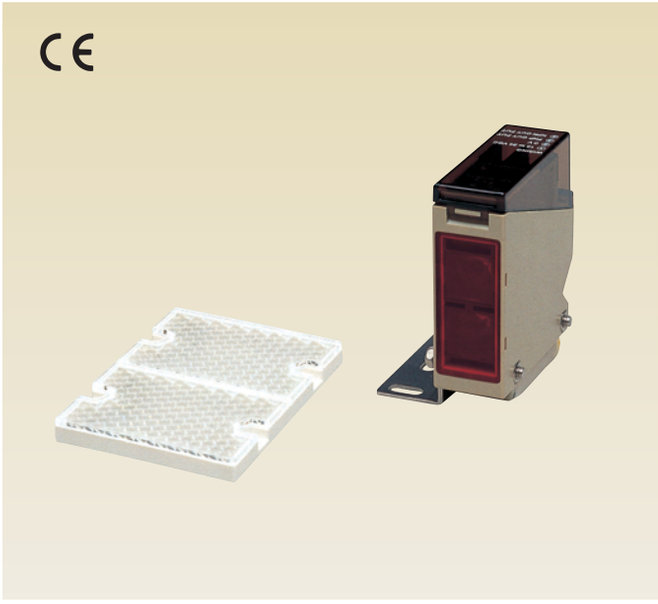


Mounting bracket NE-B2 (for back-to-back mounting)



NAL-M10R

Long-distance polarization reflector type
Embedded amplifier photo sensors

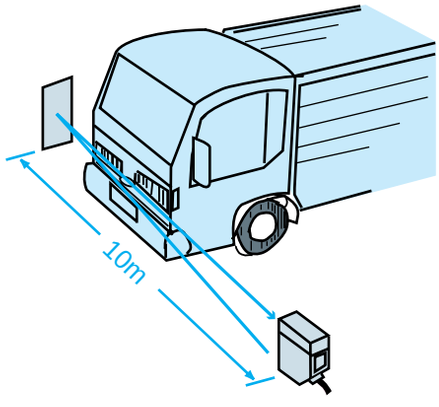


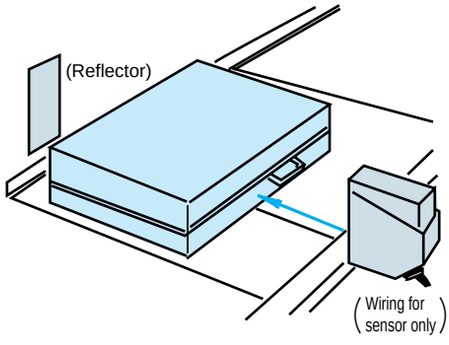
- Long distance detection up to 10 m achieved with reflector type
- Capable of reliably detecting mirror surface objects
- NPN/PNP output
- Stable operation checked in one view with stability indicator

Type

Detection method	Detecting distance	Model	Operation mode	Output mode	Power supply
Polarization reflector type	0.5～10m	**NAL-M10RTC**	Light-ON/ Dark-ON selectable (with switch)	NPN/PNP open collector output	DC12-24V

- Long detecting distance of 10 m ideal for detection of large objects and use on large conveyors
- Reflector type only requiring wiring for one unit contributing to cost reduction





- Polarization reflector capable of reliably detecting glossy objects
- Detecting condition checked at a glance with stability indicator

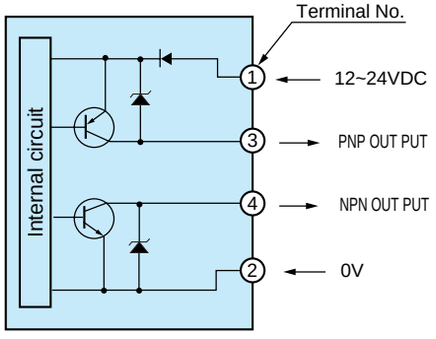
Rating/Performance/Specification

Rating/performance	Model		**NAL-M10RTC**
	Detection method		Polarization reflector type
	Detecting distance		0.5~10m *1
	Detection object		Mirror-like objects, opaque objects
	Power supply		12-24V DC ±10% / Ripple 10% max.
	Current consumption		30mA max.
	Output mode		NPN/ PNP open collector (2 outputs) Rating; 100 mA (30 VDC) max. (NPN: sink current PNP: source current)
	Operation mode		Light-ON/Dark-ON selectable
	Response time		0.5ms max.
	Operating angle		30° (at reflector)
Specification	Light source		Red LED (670 nm)
	Indicator		Operation indicator (orange LED) Stability indicator (green LED)
	Switch		Light-ON/Dark-ON selector switch
	Short circuit protection		Provided
	Material	Case	Polycarbonate
		Lens	Acrylic
		Terminal cover	Polycarbonate
		Mounting bracket	Stainless steel (SUS 304)
	Connection		Terminal block (with M3.5 screws)
	Mass		200 g max. (including mounting bracket)

*With reflector model K-77 (accessory)

Input/Output Circuit and Connection

● Open collector output

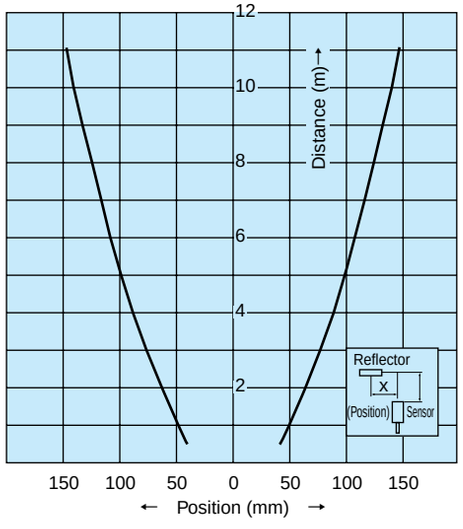


The output transistor turns off when load short circuit or overload occurs. Check the load and turn the power back on.

Environmental Specification

Environment specification	Ambient light	Sunlight: illumination on light receiving surface 10,000 max.
		Incandescent lamp: illumination on light receiving surface 3,000 max.
	Ambient temperature	-25 - +55°C (non-freezing)
	Ambient humidity	35-85%RH (non-condensing)
	Protective structure	IP 67
	Vibration	10-55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	500 m/s² / 3 times each in 3 directions
	Dielectric withstanding	1,000 VAC for 1 minute
	Insulation resistance	500 VDC, 20 MΩ or higher

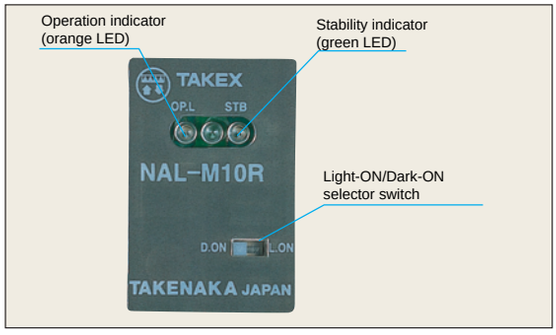
Directional characteristics (Typical example)



NAL-M10R

For Correct Use

Operation panel



◆Operation indicator(O.P)

Orange LED illuminated when output is activated

◆Stability indicator(STB)

Green LED illuminated when the received light level is within the range allowing stable activation (120% or more of the operation level) or stable deactivation (80% or less of the operation level).

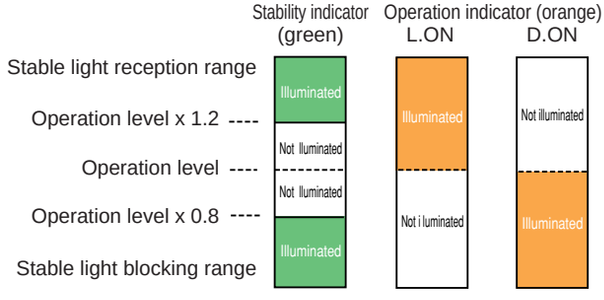
◆D.ON/L.ON selector switch

D.ON: output activated when light is blocked)

L.ON: (output activated when light is received)

Indicators

- The operation indicator (orange LED) and stability indicator (green LED) respectively show different received light intensity levels as described in the figure below.



- Repeat activation and deactivation to make sure that the sensitivity is in the stable activation/deactivation range.
- Setting within the stable range increases the reliability against variation of environment after setting.

Detecting distances for different reflectors

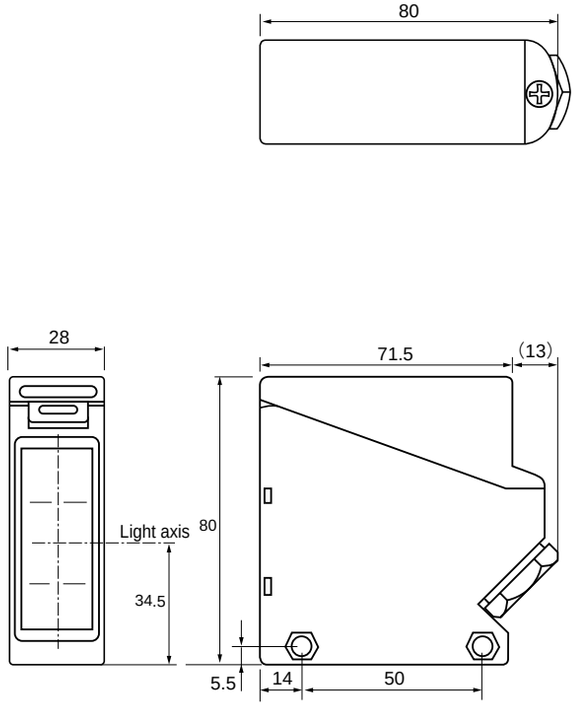
The detecting distance depends on the reflector used.

Reflector model	K-77	K-7	K-71	S-510G
Detecting distance	0.5～10m	0.5～7.5m	0.5～4m	0.5～6m
Remarks	Accessory	Optional	Optional	Optional

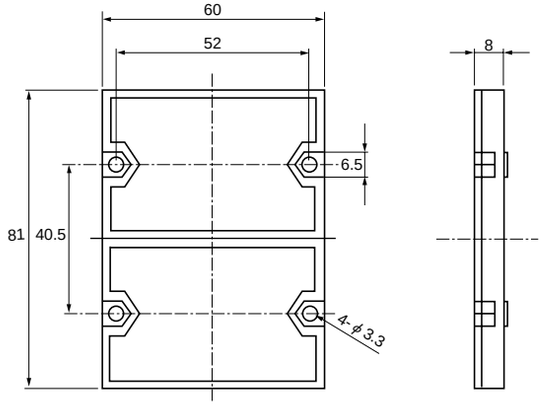
- Do not use the product for the protection of human body.
- When using the product for safety purposes, ensure safety with the control system as a whole as well as the detection.
- This product is not explosion proof.

Dimensions (in mm)

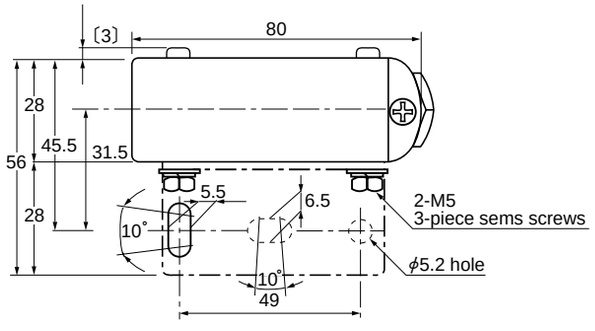
Body

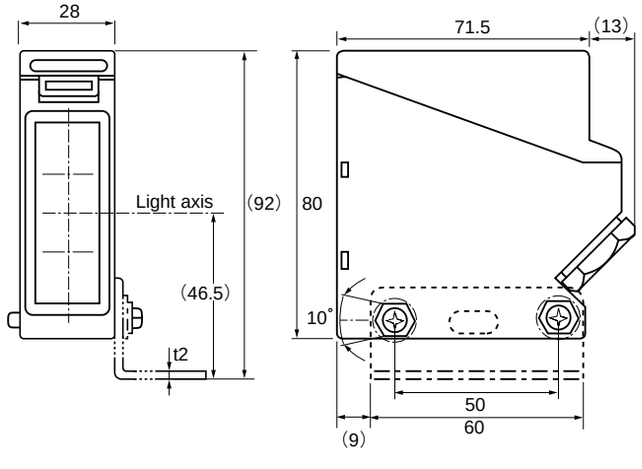


Reflector (Accessory)
K-77

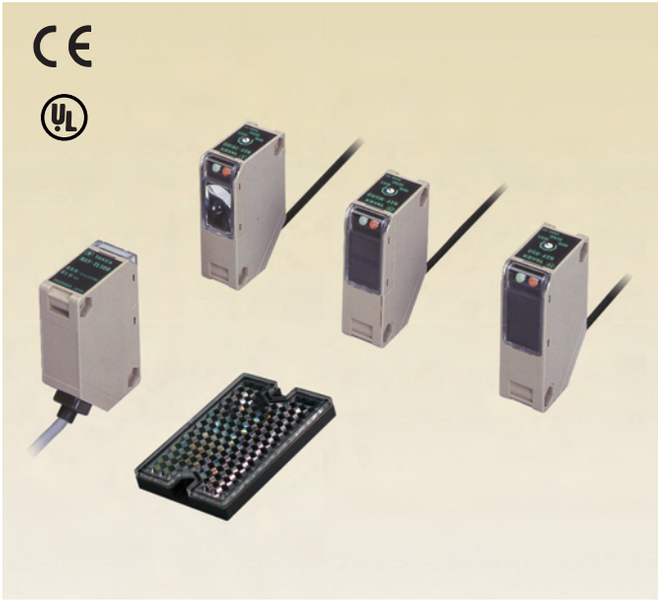


With mounting bracket (accessory) attached





NE-DC Series Embedded Amplifier Photo Sensors



- Longest-in-class detecting distance
  (30 m with through-beam style sensor)
  Through-beam type: 10 m, 30 m
  Reflector type: 5 m
  Diffuse-reflective type: 1 m
- Polarization reflector method reliably detects mirror-like objects
- Red LED light source for ease of adjustment
  (through-beam 10 m model, polarization reflector model)
- External light emission stop input feature is convenient for checking "before" operation, prevention of interference and timing (through-beam type only)
- Polarization filter (separately available) for adjacent mounting of 2 units (through-beam type NE-T10RD-DC)

Type

Detection method	Detecting distance	Model		Light source	Output mode
		Dark-ON mode	Light-ON mode		
Through-beam type	10m	**NE-T10RD-DC**	**NE-T10R-DC**	Red LED	NPN/PNP open collector
		NE-T10RD-DC-J	**NE-T10R-DC-J**		
	30m	**NE-T30D-DC**	**NE-T30-DC**	Infrared LED	
		NE-T30D-DC-J	**NE-T30-DC-J**		
Polarization reflector type	0.03～5m	**NE-M5RD-DC**	**NE-M5R-DC**	Red LED	
		NE-M5RD-DC-J	**NE-M5R-DC-J**		
Diffuse-reflective type	1m	**NE-R10D-DC**	**NE-R10-DC**	Infrared LED	
		NE-R10D-DC-J	**NE-R10-DC-J**		

Optional Parts

Type	Model	Applicable model	Description
Pinhole plate	**NE-P3**	**NE-T10R (D) -DC** **NE-T30 (D) -DC**	Hole diameter ϕ 3 (Detecting distance with plate attached P.262)
	NE-P5		Hole diameter ϕ 5 (Detecting distance with plate attached P.262)
	NE-P5×1		Hole diameter 5 x 1mm (Detecting distance with plate attached P.262)
Reflector	**K-71**	**NE-M5R (D) -DC**	Detecting distance: 0.03-2m
	K-2		Detecting distance: 0.3-3m
	S-510G		Detecting distance: 0.1-3m
Interference prevention filter	**NE-PFA**	**NE-T10R (D) -DC**	Longitudinal polarization filter
	NE-PFB		Horizontal polarization filter
Mounting bracket	**NE-B1**	All models	Vertical mounting
	NE-B2		Back-to-back mounting
Cord with M8 connector	**FBC-4R2S**	Permanently attached cord with connector (-J) type	M8 straight (2m)
	FBC-4R2L		M8 angled (2m)

Rating/Performance/Specification

	Model	NE-T10RD-DC ※	NE-T30D-DC ※	NE-M5RD-DC	NE-R10-DC
Rating/performance	Detection method	Through-beam type		Polarization reflector type	Diffuse-reflective type
	Detecting distance	10m max.	30m max.	0.03~5m max. *1	1m max. *2
	Detection object	ϕ 20mm (Min.) Opaque		Mirror-like objects (Note)/opaque objects/translucent objects	Opaque objects/ translucent objects (Note 1)
	Power supply	12-24V DC ±10% / Ripple 10%			
	Current consumption	Transmitter: 5 mA max. Receiver: 15 mA max.	Transmitter: 20 mA max. Receiver: 15 mA max.	22mA max.	26mA max.
	Output mode	NPN/PNP open collector 2 outputs Rating: 100 mA, (30 VDC) max. *3			
	Operation mode	Dark-ON *4			Light-ON *5
	Light emission stop function	Provided (no-voltage input)		————	
	Response time	1ms max.		0.5ms max.	
	Hysteresis	————			10% max.
	Operating angle	3° (at receiver)	5° (at receiver)	30° (reflector)	————

*Set model No. Transmitter model: NE-TL10R-DC Receiver model: NE-TR10RD-DC
Transmitter model: NE-TL30-DC Receiver model: NE-TR30D-DC

*1 With reflector model K-7 (accessory) *2 With standard detection object (200 x 200 mm white drawing paper)
*3 NPN: sink current; PNP: source current *4 Light-ON type available
*5 Dark-ON type available

Specification	Light source	Red LED (700nm)	Infrared LED (880 nm)	Red LED (700nm)	Infrared LED (880 nm)
	Indicator	Transmitter: power indicator (red LED) *6 Receiver: operation indicator (red LED) Stability indicator (green LED)		Operation indicator (red LED) Stability indicator (green LED)	
	Volume	————		Sensitivity adjustment	
	Material	Lens: Acrylic Case: heat-resistant ABS			
	Connection *7	Permanently attached cord Transmitter: 0.3 sq. 3 core 2 m length Receiver: 0.3 sq. 4core 2 m length		Permanently attached cord Transmitter: 0.3 sq. 4 core 2 m length	
	Mass	About 130 g (transmitter/receiver)		About 130 g	
	Accessory *8	————		K-7 reflector	————
	Notes	Light-ON type Model NE-T10R-DC	Light-ON type Model NE-T30-DC	Light-ON type Model NE-M5R-DC	Dark-ON type Model NE-R10D-DC

*6 Not provided for transmitter model NE-TL 10R-DC
*7 Connector type separately available (-J type: cord length 0.3 m)
*8 Mounting brackets are not provided. See Dimensions.

Environmental Specification

Environment	Ambient light	10,000 lx max.
	Ambient temperature	-25 - +55°C (non-freezing)
	Ambient humidity	35~85%RH (non-condensing)
	Protective structure	IP66
	Vibration	10-55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	100 m/s2 / 3 times each in 3 directions
	Dielectric withstanding	500 VAC for 1 minute
	Insulation resistance	500 VDC, 20 MΩ or higher

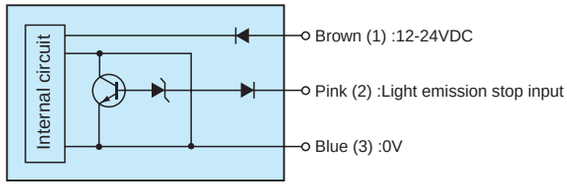
(Note) Some materials do not allow stable detection. Mirror-like objects wrapped in transparent film, glossy objects, laminated aluminum nameplates, etc., may inherently affect polarization. In such cases, the polarized waves of the sensor may be disturbed, which causes unstable detection.

(Note 1) Detecting objects with higher transmission may offer shorter detecting distances.

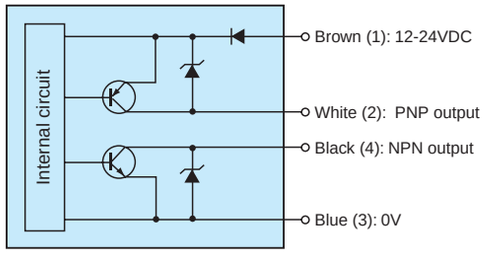
NE-DC

Input/Output Circuit and Connection

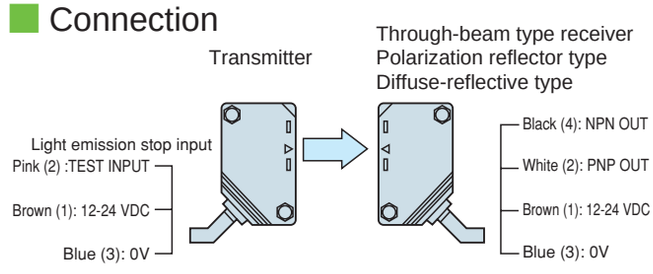
Transmitter



Receiver/sensor



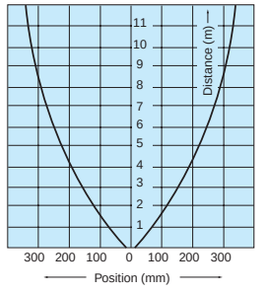
Connection



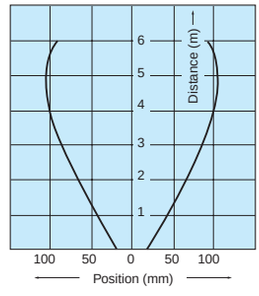
- The output transistor turns off when load short circuit or overload occurs. Check the load and turn the power back on.
- Circled numbers show connector pin Nos. for -J type.

Directional characteristics (Typical Example)

NE-T10R (D) -DC (-J)

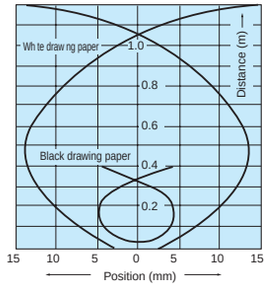


NE-M5R (D) -DC (-J)



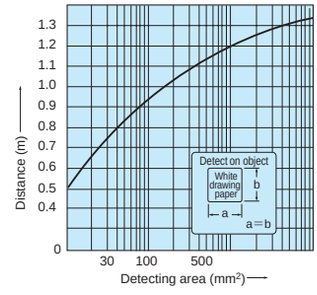
Activation area characteristics (Typical example)

NE-R10 (D) -DC (-J)



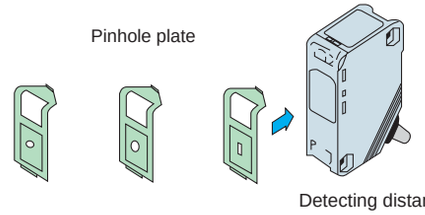
Distance-area characteristics (Typical example)

NE-R10 (D) -DC (-J)



Pinhole Plate (optional)

Pinhole plates as described below are available for through-beam type models. Use of pinhole plates reduces the smallest allowable detection object diameter and activation area.



NE-P3 (φ3) NE-P5 (φ5) NE-P5×1 (5×1mm)

Detecting distance with plates attached to both transmitter and receiver

Sensor model	Pinhole plate model		
	NE-P3	NE-P5	NE-P5×1
NE-T10R(D)-DC	1m	3m	0.7m
NE-T30(D)-DC	3m	7m	2m

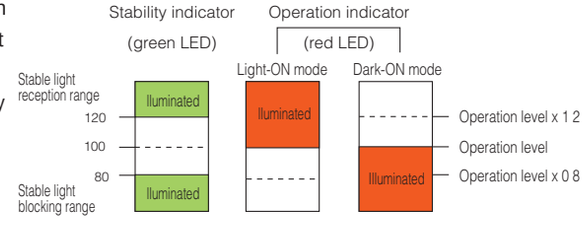
Detecting Distances for Different Reflectors (Model: NE-M5RD-DC)

The detecting distance depends on the reflector used.

Reflector model	Detecting distance
K-7 (Accessory)	0.03-5m
K-71	0.03-2m
K-2	0.1-3m
S-510G	0.1-3m

Indicators

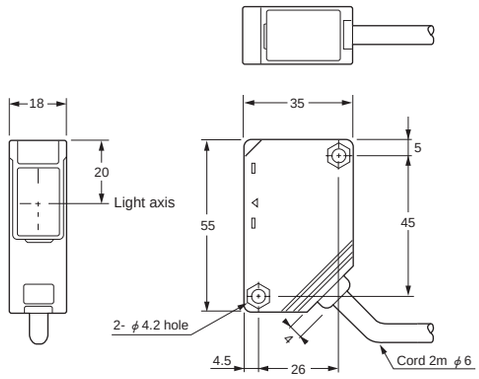
- Light axis alignment and sensitivity adjustment are simple. Setting within the stable range increases the reliability against variation of environment after setting.
- The operation indicator (red LED) and stability indicator (green LED) respectively show different received light intensity levels as described in the figure.



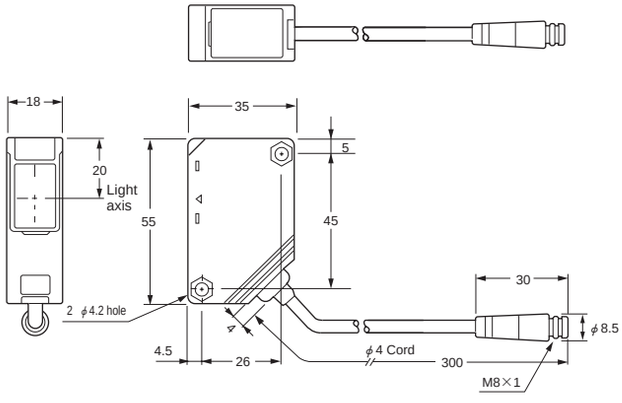
Dimensions (in mm)

Body

CAD

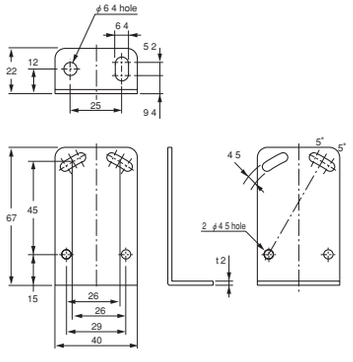


With connector (-J type)

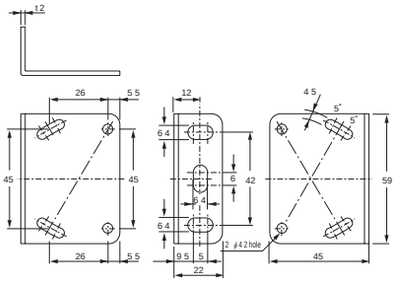


Mounting bracket NE-B1 (for vertical mounting)

CAD



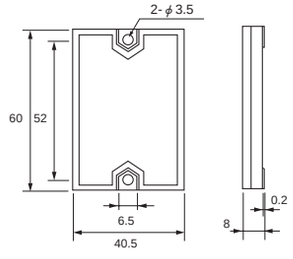
Mounting bracket NE-B2 (for back-to-back mounting)



The NE-DC Series sensors are not provided with mounting brackets. Two types of brackets are available as optional parts.

Reflector K-7

CAD

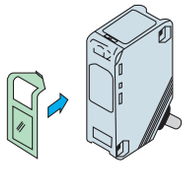


Applicable to polarization reflector type
Effective reflecting surface: 56 x 36 mm
Mounting: secured with M3 screws
(alternatively adhesive may be used)
Protective structure: IP 67

Attachment of Interference Prevention Filter (optional)

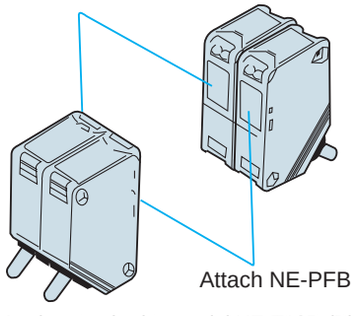
Model
NE-PFA (longitudinal type)
NE-PFB (horizontal type)

Use of filters allows adjacent mounting of through-beam type sensors.
For adjacent mounting of two sensors, use the longitudinal type for one pair and horizontal type for the other.



Insert into grooves at the top and bottom of the lens side of the transmitter and receiver.

Attach NE-PFA



Attach NE-PFB

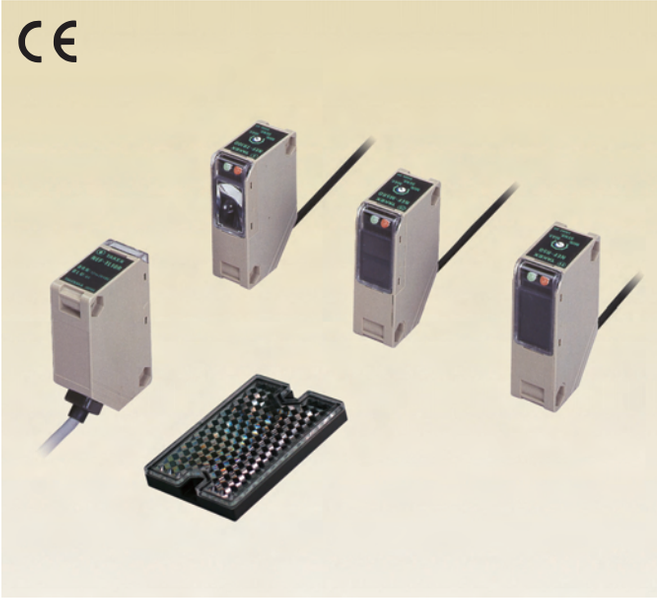
May be attached to model NE-T10R (D).
The detecting distance with the filters attached is up to 5 m.

For Correct Use

- Avoid turning power "On and Off" consecutively.
- Do not use output signals in the transient condition while the power is turned on/off.
- The tightening torque for the sensor body and mounting bracket should not exceed 0.8 N·m max.
- While this product has a waterproof structure (IP 66), do not use in a place subject to constant water spray or under water. Also note that use in a place subject to corrosive gas, vibration/shock or direct splash of oils/chemicals may lead to faulty operation.

NEF series

Embedded Amplifier Photo Sensors



- Highly resistant to inverter noise as well as disturbing light including inverter fluorescent lamps or other light emitters
- Reasonably priced

Photo sensor ideal for use in places subject to:

- Lighting including fluorescent and mercury lamps
- Light emission of other photo sensors
- Various types of intense light such as the installation on carriages and vehicles

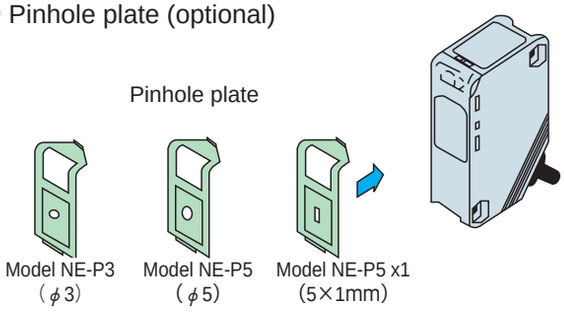
Type

Detection method	Detecting distance	Model	Operation mode	Output mode
Through-beam type	10m	**NEF-T10RD**	Dark-ON	NPN/PNP open collector (2 output)
Polarization reflector type	0.03-5m	**NEF-M5RD**		
Diffuse-reflective type	1m	**NEF-R50**	Light-ON	

Even more ensured stable detection

Stable detection of small objects

- Pinhole plate (optional)

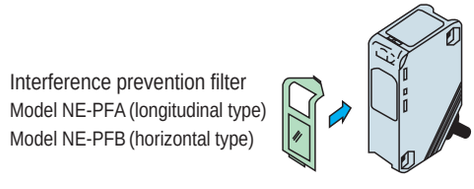


Detecting distance with plate attached (to both transmitter and receiver)

Model	NE-P3	NE-P5	NE-P5×1
Hole diameter	ϕ3	ϕ5	5×1
Detecting distance	1m	3m	0.7m

Adjacent mounting of through-beam type sensors

- Interference prevention filter (optional)



- Type

Product name	Model	Description
Pinhole plate	**NE-P3**	Hole diameter 3mm
	NE-P5	Hole diameter 5mm
	NE-P5×1	Hole diameter 5 x 1mm
Interference prevention filter	**NE-PFA**	Longitudinal polarization filter
	NE-PFB	Horizontal polarization filter

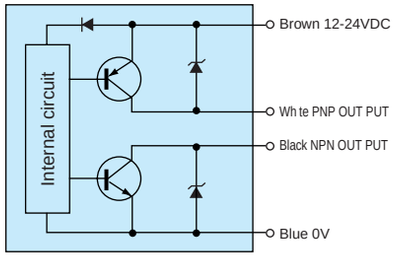
Rating/Performance/Specification

	Model	NEF-T10RD	NEF-M5RD	NEF-R50
Rating/performance	Detection method	Through-beam type	Polarization reflector type	Diffuse-reflective type
	Detecting distance	10 max.	0.03~5m max. *	1m max.
	Detection object	ϕ20mm (Min.) Opaque	Mirror-like objects /opaque objects	Opaque objects/translucent objects
	Power supply	12-24V DC ±10% / Ripple 10%		
	Current consumption	Transmitter: 30mA max. Receiver: 25mA max.	40mA max.	
	Output mode Control output	NPN/ PNP open collector (2 outputs) NPN: sink current 100 mA (30 VDC) max. PNP: source current 100 mA (30 VDC) max.		
	Operation mode	Dark-ON		Light-ON
	Response time	5ms max		
	Hysteresis	————		10 % max.
	Operating angle	3° (at receiver)	30° (at reflector)	————
Specification	Light source (Light wavelength)	Red LED (700 nm)		Infrared LED (880 nm)
	Indicator	Transmitter: power indicator (red LED) Receiver: operation indicator (orange LED) Stability indicator (green LED)	Operation indicator (orange LED) Stability indicator (green LED)	
	Volume (VR)	SENS: sensitivity adjustment (on receiver for through-beam type)		
	Short circuit protection	Provided		
	Material: Case	Heat-resistant ABS		
	Material: Lens	Acrylic		
	Connection	Permanently attached cord (outer dimension: dia. 6) Transmitter of through-beam type: 0.3 sq. 2 core 2 m length (gray) Receiver of through-beam type: 0.2 sq. 4 core 2 m length (black)		
	Mass	Transmitter: About 130 g Receiver: About 150 g	About 150 g	
	Accessory	K-7 reflector Screwdriver for adjustment, mounting bracket, operation manual		
	Note	*With K-7 reflector (accessory)		

Environmental Specification

Environment	Ambient light	10,000 max.
	Ambient temperature	-25 - +55°C (non-freezing)
	Ambient humidity	35-85%RH (non-condensing)
	Protective structure	IP 66
	Vibration	10 55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	100 m/s2 / 3 times each in 3 directions
	Dielectric withstanding	1000 VAC for 1 minute
	Insulation resistance	500 VDC, 20 MΩ or higher

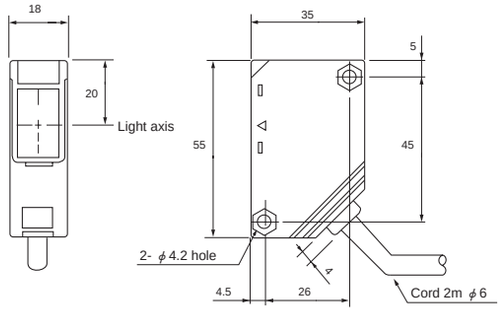
Input/Output Circuit and Connection



Dimensions (in mm)

Body

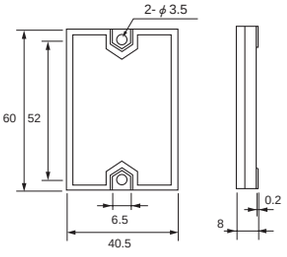
CAD



Reflector (Model / K-7)

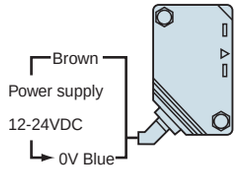
CAD

Applicable to polarization reflector type
Effective reflecting surface: 36 x 56 mm
Mounting: secured with M3 screws
(alternatively adhesive may be used)
Protective structure: IP 67

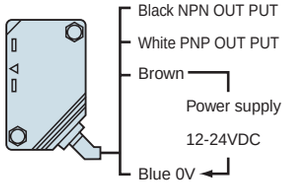


Connection

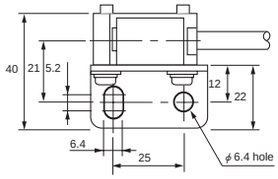
Through-beam type transmitter

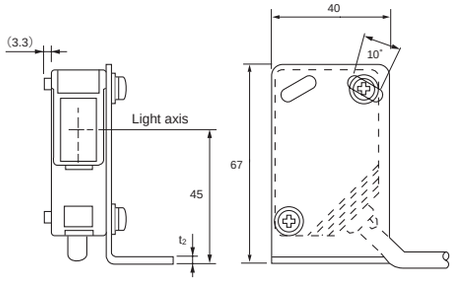


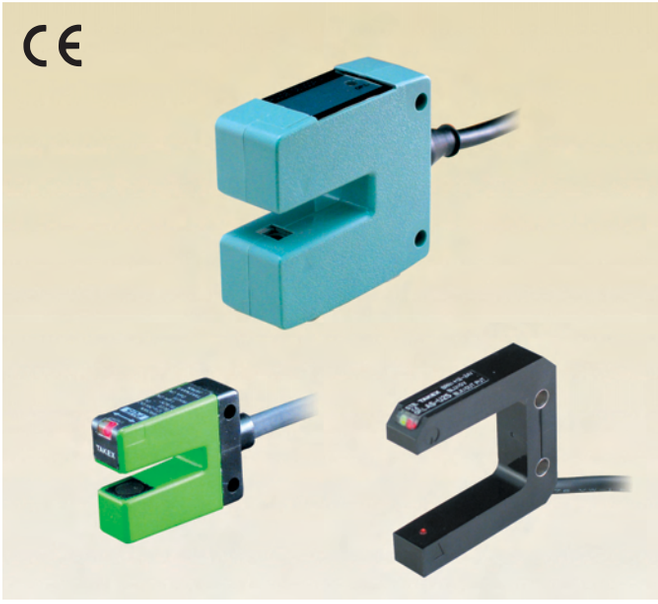
Through-beam type receiver
Polarization reflector type
Diffuse-reflective type



With mounting bracket provided attached







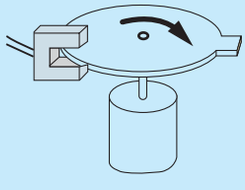
- No light axis alignment necessary
- Ideal for position checking or of stacker crane in automatic warehouse

Type

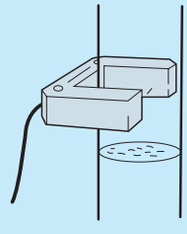
Detection method	Detecting distance	Model		Operation mode	Output mode
		NPN type	PNP type		
U-shaped through-beam type	5 mm fixed	**PU5**	——	Light-ON/ Dark-ON selectable (depending on cable)	NPN open collector
	10 mm fixed	**PU10**			Current output/ voltage output
	19 mm fixed	**AS-U20**	——	Light-ON	NPN open collector
		AS-U20D	——	Dark-ON	
	25 mm fixed	**AS-U25**	——	Light-ON	
		AS-U25D	——	Dark-ON	
	30 mm fixed	**AS-U30**	**AS-U30PN**	Light-ON	
		AS-U30D	**AS-U30DPN**	Dark-ON	

Sample Applications

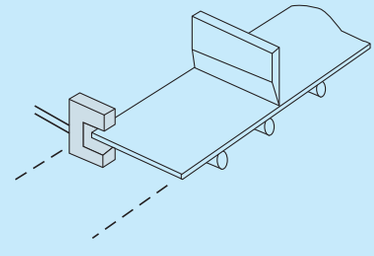
- Positioning of forming machine, stepping motor, etc.



- Detection of presence of liquid, powder, etc.

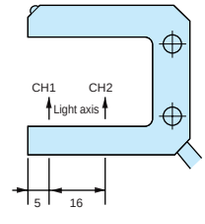


- Specified-length cutting of sheet material



- 2-channel output type

2-channel output types are separately available
Model AS-U25-2
Model AS-U25D-2



Rating/Performance/Specification

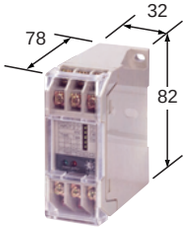
	Model	PU5	PU10	AS-U20(D)	AS-U25(D)	AS-U30(D)
Rating/performance	Detection method	Through-beam type (U-shaped)				
	Detecting distance	5 mm fixed	10 mm fixed	19 mm fixed	25 mm fixed	30 mm fixed
	Detection object	ϕ 1mm (Min.) Opaque	ϕ 2mm (Min.) Opaque			ϕ 5mm (Min.) Opaque
	Power supply	12-24V DC ±10% / Ripple 10% max.				
	Current consumption	20mA max.	45mA max.	25mA max.		35mA max.
	Output mode	NPN open collector Sink current 100 mA (30 VDC) max.	Current output Sink current 75 mA (48 VDC) voltage output Output impedance: 4.7 kΩ	NPN open collector*2 Rating: sink current 100 mA (30 VDC) max.		
	Operation mode	Light-ON/Dark-ON (2 outputs)		Dark-ON*1		
	Response time	200 μs max.	50 μs max.	0.35ms max.		0.5ms max.
Specification	Light source (wavelength)	Infrared LED (910 nm)	Infrared LED (940 nm)	Red LED (650nm)		Red LED (950nm)
	Indicator	Light reception indicator (red LED)		Operation indicator (red LED) Stability indicator (green LED)		Operation indicator (red LED)
	Short circuit protection	————		Provided		
	Material Case	Polycarbonate	Polycarbonate	Heat-resistant ABS		ABS
	Material Lens	Polycarbonate	Acrylic			
	Connection	Permanently attached cord (outer dimension: dia. 5 x 3) 0.14 sq. 4 core 1 m length	Permanently attached cord (outer dimension: dia. 6.2) 0.3 sq. 4 core 3 m length	Permanently attached cord (outer dimension: dia. 4) 0.2 sq. 3 core 2 m length		Permanently attached cord (outer dimension: dia. 4.2) 0.3 sq. 3 core 2 m length
	Mass	About 40g	About 220g	About 55g	About 60g	About 140g
	Notes	*1 Light-ON type separately available AS-U20, as-U25, AS-U30 *2 PNP output type separately available AS-U30PN, AS-U30DPN				

Environmental Specification

Environment	Ambient temperature	AS series: -25 - +55°C (non-freezing) PU series: -10 - +55°C
	Ambient humidity	35-85%RH (non-condensing)
	Protective structure	IP67 (IP 40 for PU10)
	Vibration	10-55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	500 m/s2 / 3 times each in 3 directions
	Insulation resistance	500 VDC, 100 MΩ higher

Applicable power supply unit

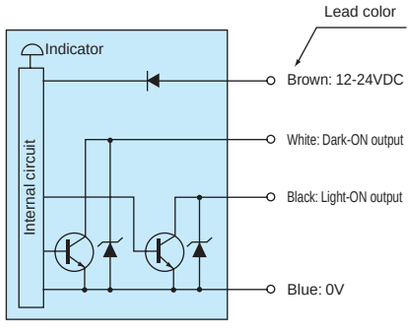
PS Series
High capacity of 200 mA at 12 VDC



(General-purpose type) PS3N
PS3N-SR
(Multifunctional type) PS3F
PS3F-SR

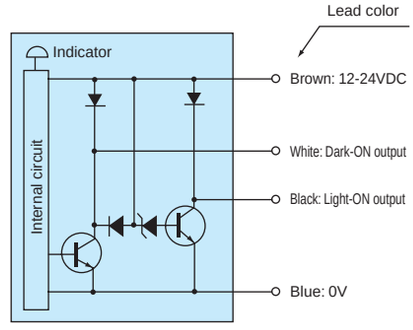
Input/Output Circuit and Connection

PU5



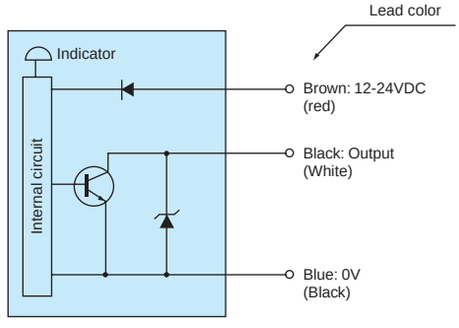
*Insulate any unused output lead.

PU10

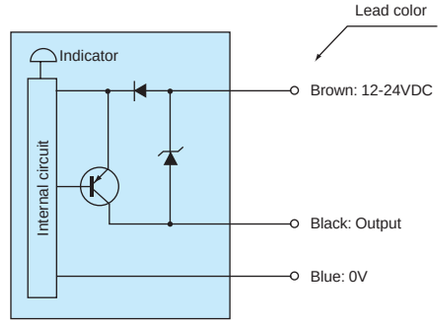


*Insulate any unused output lead

AS-U20
AS-U20D
AS-U25
AS-U25D
AS-U30
AS-U30D



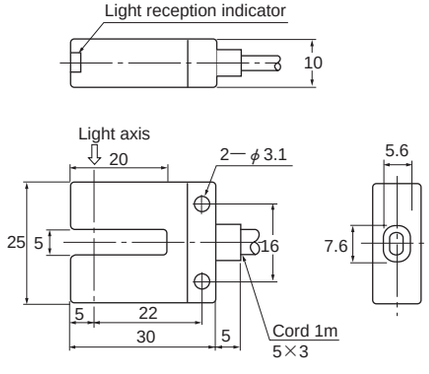
AS-U30PN
AS-U30DPN



Dimensions (in mm)

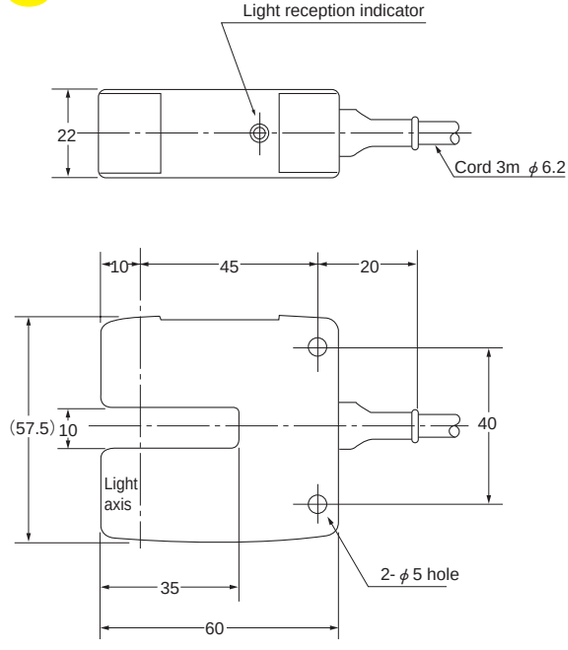
PU5

CAD



PU10

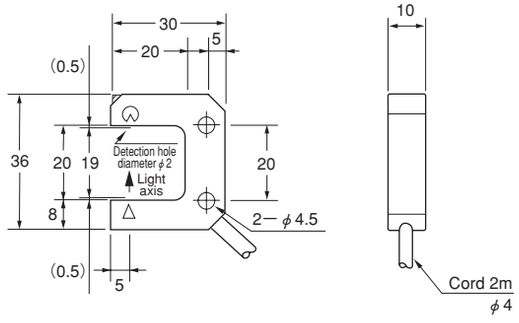
CAD



Dimensions (in mm)

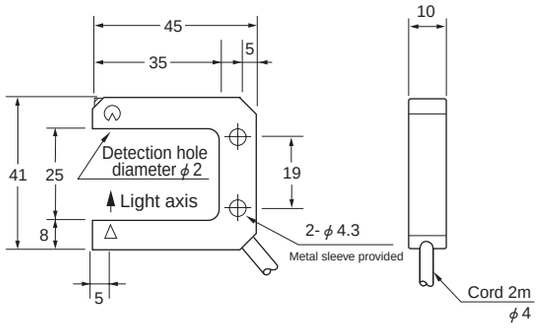
AS-U20, AS-U20D

CAD



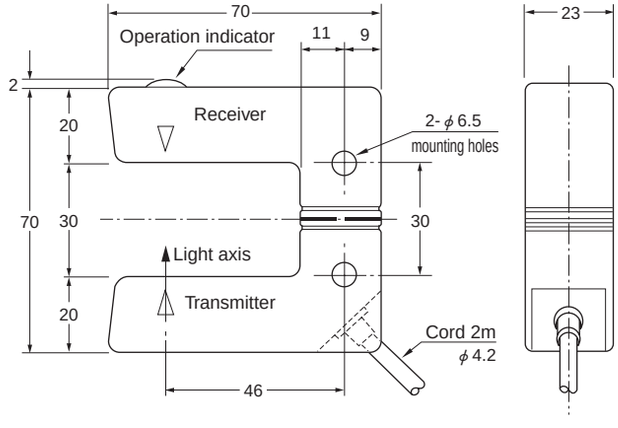
AS-U25, AS-U25D

CAD



AS-U30(PN), AS-U30D(PN)

CAD

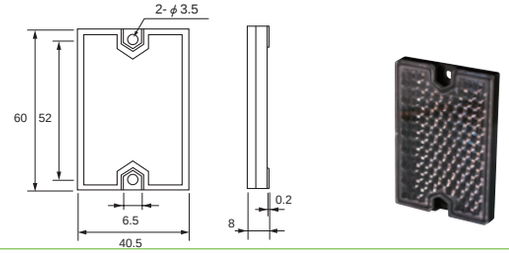


Reflector

Dimensions (in mm)

K-7
CAD

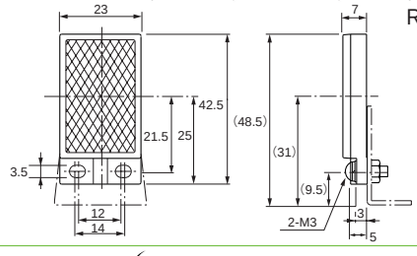
Applicable to polarization reflector type
Effective reflecting surface: 56 x 36 mm
Material: Mirror: acrylic / Base: heat-resistant ABS
Protective structure: IP 67
Mounting: secured with M3 screws (alternatively adhesive may be used)



K-71
CAD

Applicable to polarization reflector type
Effective reflecting surface: 32 x 19 mm
Mounting: mounting bracket provided, secured with M3 screws (alternatively adhesive may be used)

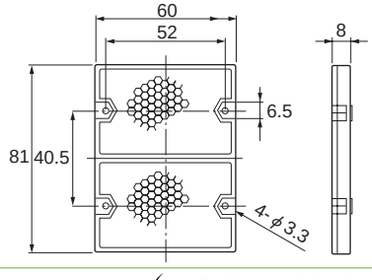
Resin molded product



K-77

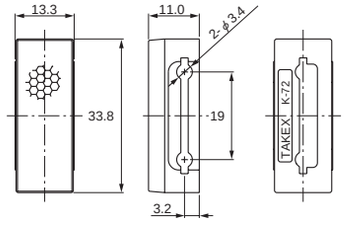
Applicable to polarization reflector type
Effective reflecting surface: 68 x 56 mm
Mounting: secured with M3 screws (alternatively adhesive may be used)

Resin molded product

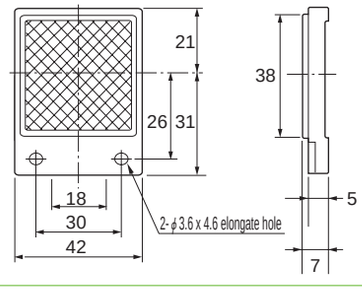


K-72

Applicable to polarization reflector type
Effective reflecting surface: 29 x 8 mm
Material: Mirror: acrylic / Base: heat-resistant ABS
Protective structure: IP 67
Mounting: mounting bracket provided, secured with M3 screws



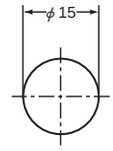
K-MT4

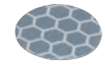


S-15
CAD

Effective reflecting surface: ϕ15
Mounting: Pasted: adhesive on back side

Resin sheet

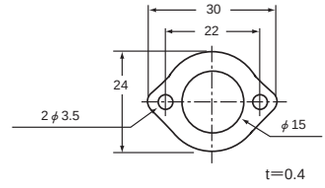




S-15B
CAD

Effective reflecting surface: ϕ15
Mounting: Secured by pasting or with M3 screws

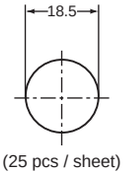
Resin sheet

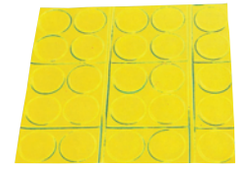


S-25

Effective reflecting surface: ϕ18.5 mm x 25 per sheet
Mounting: Pasted: adhesive on back side

Resin sheet

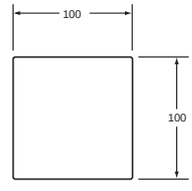




S-100
S-200

Effective reflecting surface: 100mm x 100mm (S-100)
Mounting: Pasted: adhesive on back side

Resin sheet (cut able)

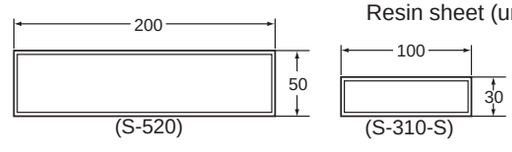


(S-100)

S-520
S-310-S

Applicable to polarization reflector type
(S-520) Effective reflecting surface: 198 x 48 mm / Color: yellow
(S-310-S)Effective reflecting surface: 98 x 28 mm / Color: Silver
Mounting: Pasted: adhesive on back side

Resin sheet (uncut able)



S-510G

Applicable to polarization reflector type
Effective reflecting surface: 100 x 50mm
Mounting: Pasted: adhesive on back side

Resin sheet (cut able)