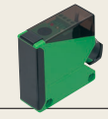
Background suppression photo sensors

- DA-S series
- DX-7 series
- DL-S series
- DL series
- DLA series

Background suppression photo sensors

Unlike the conventional diffuse-reflective type photo sensors that operate based on received light intensity, background suppression photo sensors employ a ranging method based on the principle of triangular distance measurement.
For this reason, detection is less affected by the soiling of the lens surface, color of the detection object, objects in the background, etc. and therefore, higher stability is ensured.

List of models

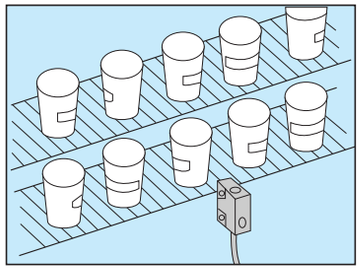
Type	Appearance (Typical example)	Model	Detecting distance (50mm 100mm 500mm 1m 2m)	See page
Self-teaching		**DA-S40R(-J)**	70～400mm	330
		DA-S70(-J)	70～700mm	
		**DA-S100RP**	0.2～1m	334
		DA-S100RTC		
		DA-S200P	0.2～2m	
		DA-S200TC		
Phase difference detection		**DX-7AH**	0.5～7.5m	342
Short-range		**DL-S3R**	10～30mm	348
		DL-S3		
		DL-S4R	10～40mm	
		DL-S4		
		DL-S5R	10～50mm	
		DL-S5		
Medium-range		**DL-S10R**	10～100mm	
		DL-S10		
		DL-S15	10～150mm	
		DL-S20	10～200mm	
Long-range, slim		**DL-S100R(-J)**	0.2～1m	354
		DL-S202(-J)	0.2～2m	
Long-range, low-cost		**DL-S100P(TC)**	0.2～1m	360
		DL-S200P(TC)	0.2～2m	
Analog output		**DLA-S150**	50～150mm	362
		DLA-S300	150～300mm	
		DLA-S1000	0.2～1m	
Reflector type		**DSM-500**	0.5～6m	

Characteristics shared by background suppression sensors

1 Less influence of background

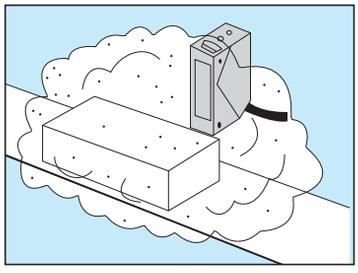
Unwanted light reflection from the background of the detecting object is less likely to affect detection.

No more restrictions on installation



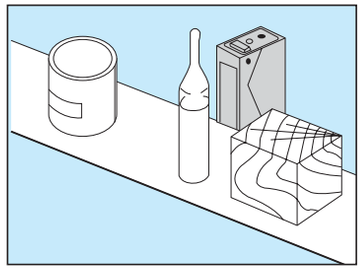
2 Resistance to soiling of lens or work

Stable detection ensured in adverse environment



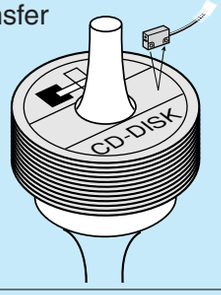
3 Less influence of color, shape and material of objects

A white object with high reflectance and black object with low reflectance are detected at a similar distance. Objects in mixed colors or undergoing color change can be stably detected.

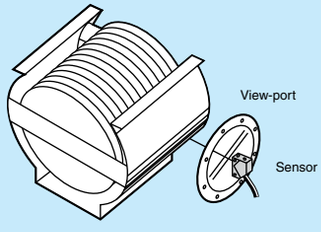


Applications

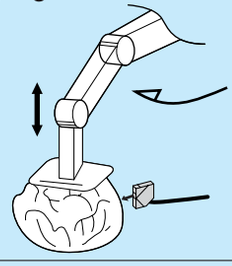
- Detection of presence of CDs in transfer



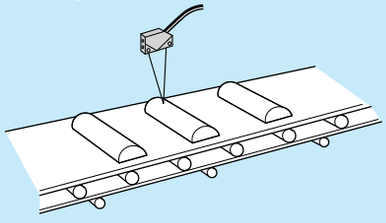
- Detection of wafer carrier (in vacuum chamber)



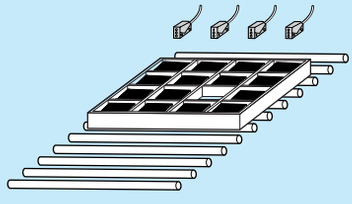
- Suction grip check on lettuce wrapping machine



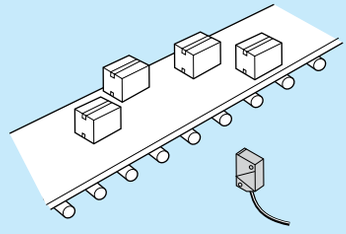
- Detection of fish paste on conveyor



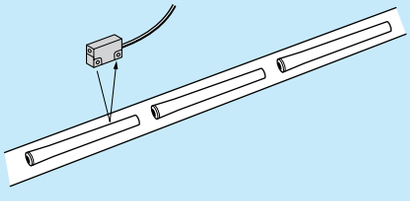
- Checking for missing tiles



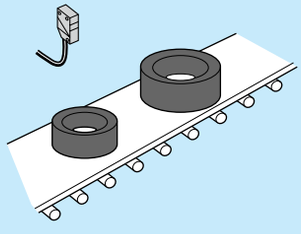
- Detection of passing corrugated cardboard boxes



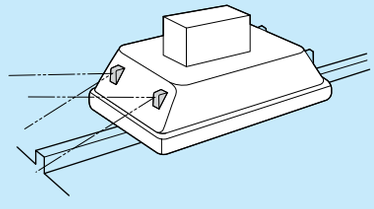
- Detection of bobbins



- Detection of tires from a distance

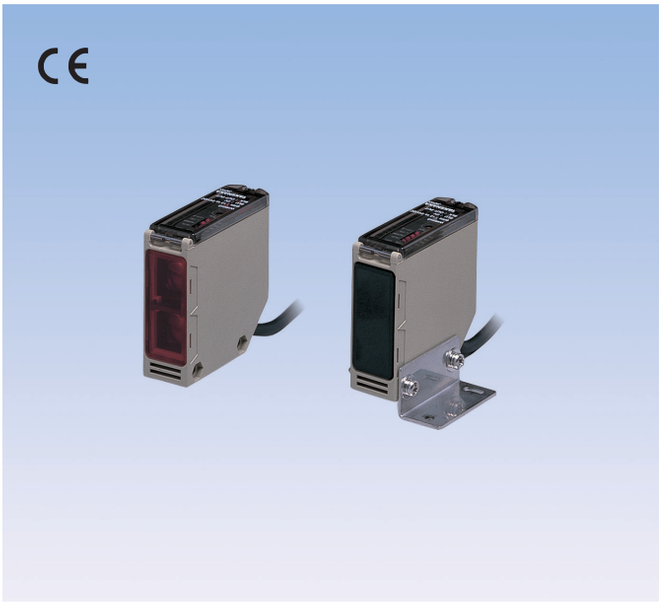


- Prevention of collision of carriage on track



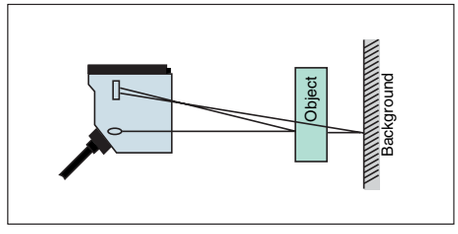
DA-S 40R / 70 series

Self-teaching background suppression sensors



- Self-teaching feature
- PSD-based ranging technique employed

Operation less affected by change of received light intensity due to color or material of the object, soiling of sensor, etc. or light reflected on background, allowing more stable detection



Type

Type	Detecting distance	Model		Output mode	Connection
		NPN output	PNP output		
Self-teaching	70～400mm	**DA-S40R**	**DA-S40RPN**	Open collector	Permanently attached cord
	70～700mm	**DA-S70**	**DA-S70PN**		
	70～400mm	**DA-S40R-J**		NPN/PNP open collector 2 outputs	M8 connector
	70～700mm	**DA-S70-J**			

Optional Parts

Type	Model	Shape
Cord with M8 connector	**FBC-4R2S**	Straight
	FBC-4R2L	Angled

Rating/Performance/Specification

Rating/performance	Model	NPN type	**DA-S40R**	**DA-S70**	**DA-S40R-J**	**DA-S70-J**
		PNP type	**DA-S40RPN**	**DA-S70PN**		
	Detection method		Distance limited reflection			
	Detecting distance *		70-400mm	70-700mm	70-400mm	70-700mm
	Range*		100-400mm	100-700mm	100-400mm	100-700mm
	Power supply		12-24V DC ±10% / Ripple 10% max.			
	Current consumption		50mA max.			
	Output mode		Open collector Rating: 100 mA (30 VDC) max. NPN: sink current / PNP: source current		NPN/PNP open collector 2 outputs Rating: 100 mA (30 VDC) max. NPN: sink current / PNP: source current	
	Short circuit protection		Provided			
	Operation mode		Light-ON/Dark-ON selectable			
	Timer function		On delay/off delay selectable Delay time: 0-1 s			
	Response time		3ms max.			
	Hysteresis (Typical example)		10% max. of detecting distance			
Specification	Light source (wavelength)		Red LED (650 nm)	Infrared LED (880 nm)	Red LED (650 nm)	Infrared LED (880 nm)
	Light-sensitive element		PSD			
	Indicator		Operation indicator: orange LED Stability indicator: green LED Error indicator: red LED			
	Switch		Set button switch SET/RUN selector switch ZONE/NOR. selector switch D.ON/L.ON selector switch ON DLY/OFF DLY selector switch			
	Teaching method		Auto teaching			
	Teaching mode		Normal teaching/zone teaching			
	Material	Case	Polycarbonate			
		Lens	Acrylic	Polycarbonate	Acrylic	Polycarbonate
		Cover	Polyarylate			
		Mounting bracket	Stainless steel (SUS304)			
	Connection		Permanently attached cord (0.2 sq. 3 core 2 m length)		M8 connector	
	Mass		100 g max. (including mounting bracket)			
	Accessory		Mounting bracket (with screws) *1, screwdriver for volume adjustment, operation manual			

*Detection object: 300×300mm white drawing paper *1 Not provided for M8 connector type "-J."

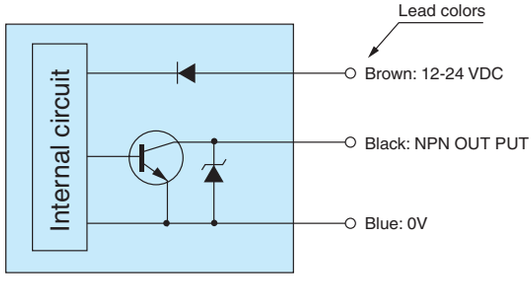
Environmental Specification

Environment	Ambient light	Sunlight: illumination on light receiving surface 10,000 lx max. Incandescent lamp: illumination on light receiving surface 3,000 lx max.
	Ambient temperature	–25 - +55°C (Storage: –30 - 70°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 directions
	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

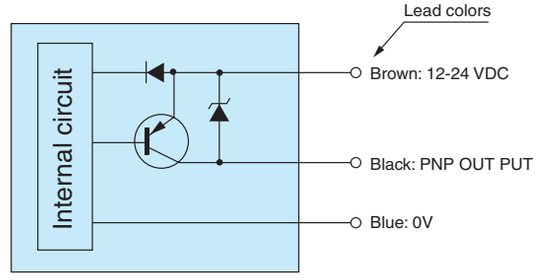
DA-S40R/70

Input/Output Circuit and Connection

• NPN output

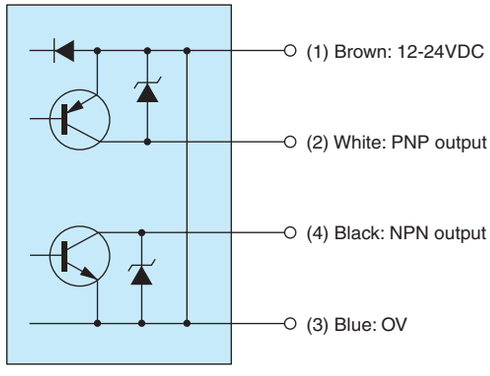


• PNP output



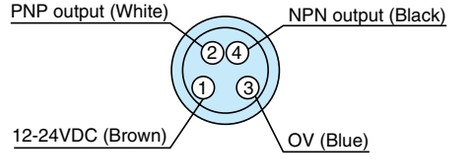
The output transistor turns off when load short circuit or overload occurs.
Check the load and turn the power back on.

• M8 connector type

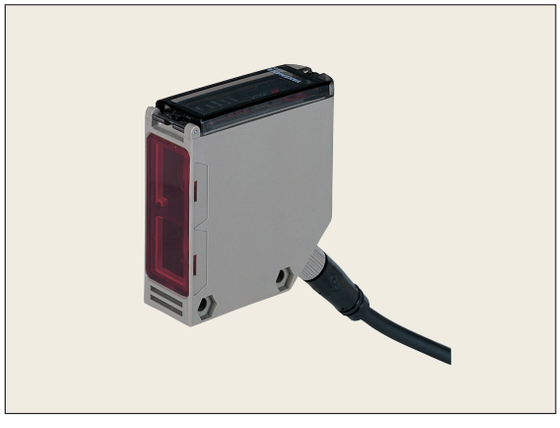


[Output mode]
NPN/PNP open collector 2 outputs
Rating: 100 mA (30 VDC) max.
NPN: sink current / PNP: source current

Pin assignment



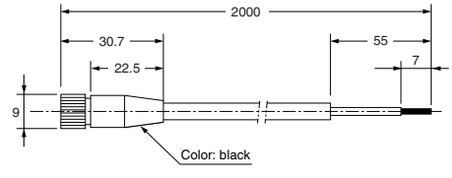
Colors show lead colors for optional cord with M8 connector



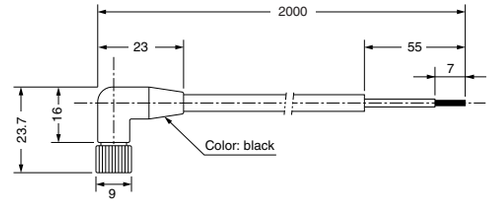
Optional Parts (in mm)

Cord with M8 connector

FBC-4R2S (Straight)



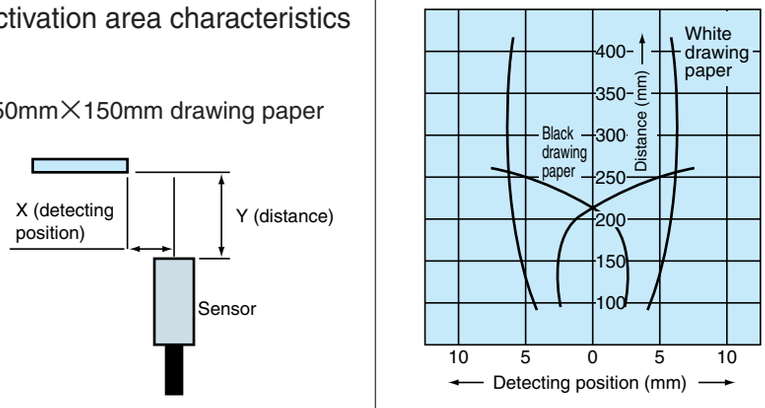
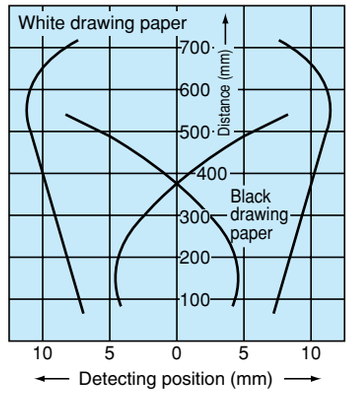
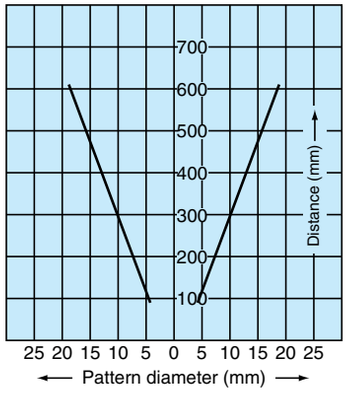
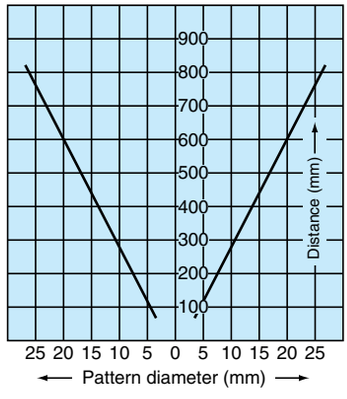
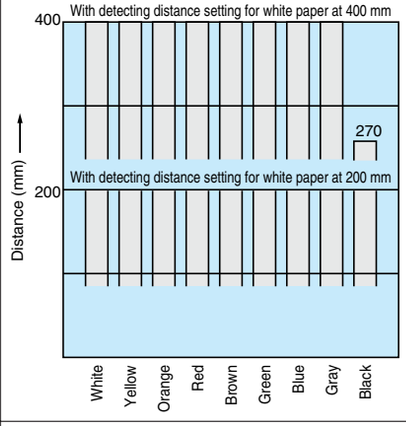
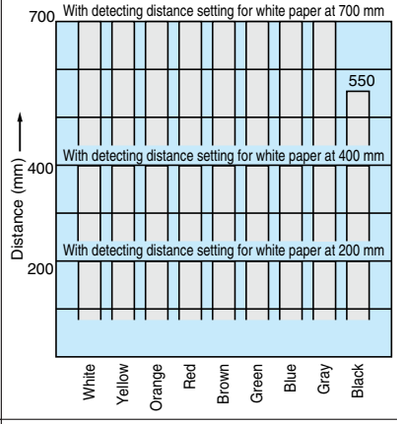
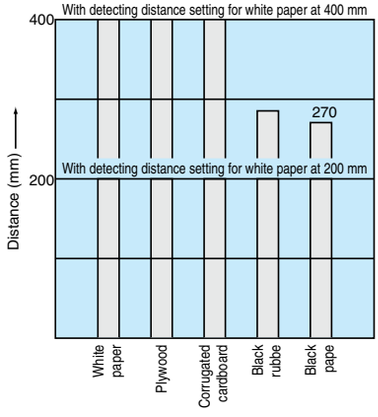
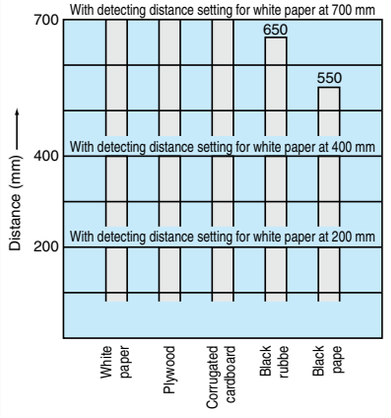
FBC-4R2L ((Angled)



Dimensions

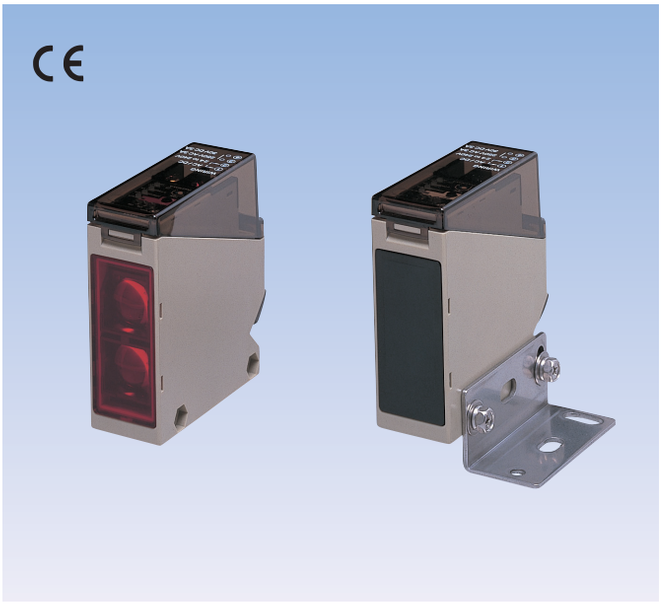
See P. 341.

Characteristics (Typical Example)

	Model DA-S40R	Model DA-S70
● Activation area characteristics 150mm×150mm drawing paper		
● Emitted light beam diameter		
● Color paper detecting distance 170mm×170mm color paper		
● Detecting distance by material		

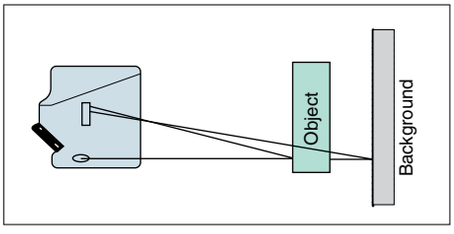
DA-S 100R/200 series

Self-teaching background suppression sensors



- Long detecting distance: 2 m
- Self-teaching feature
- PSD-based ranging technique employed
- Anti Interference feature

Operation less affected by change of received light intensity due to color or material of the object, soiling of sensor, etc. or light reflected on background, allowing more stable detection



Type

Type	Detecting distance	Model	Output mode	Power supply	Connection
Self-teaching	0.2～1m	**DA-S100RTC**	NPN/PNP open collector 2 outputs	12-24VDC	Terminal block
	0.2～2m	**DA-S200TC**			
	0.2～1m	**DA-S100RP**	Relay output 1a	24-24OV AC/DC	
	0.2～2m	**DA-S200P**			

Rating/Performance/Specification

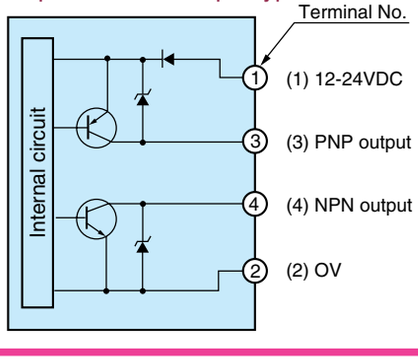
	Model		DA-S100RTC	DA-S200TC	DA-S100RP	DA-S200P
Rating/performance	Detection method		Distance limited reflection			
	Detecting distance *		0.2-1m	0.2-2m	0.2-1m	0.2-2m
	Range*		0.4-1m	0.4-2m	0.4-14m	0.4-2m
	Power supply		12-24V DC ±10% / Ripple 10%		12-24V DC ±10% 50/60Hz	
	Current / power consumption		45mA max.		2.5W max.	
	Output mode		NPN/PNP open collector 2 outputs Rating: 100 mA (30 VDC) max. NPN: sink current / PNP: source current		Relay output 1a Rating: 3A 250 VAC max. resistance load 3A 30 VDC max. resistance load	
	Short circuit protection		Provided		—	
	Anti Interference		Provided			
	Operation mode		Light-ON/Dark-ON selectable			
		Timer function	On delay/off delay selectable			
			Delay time: 0-5 s			
	Response time		5ms max.		20ms max.	
	Hysteresis (Typical example)		10% max. of detecting distance			
Specification	Light source (wavelength)		Red LED (650 nm)	Infrared LED (880 nm)	Red LED (650 nm)	Infrared LED (880 nm)
	Light-sensitive element		PSD			
	Indicator		Operation indicator: orange LED Stability indicator: green LED Error indicator: red LED			
	Switch (SW)		Set button switch SET/RUN selector switch ZONE/NOR. selector switch D.ON/L.ON selector switch ON DLY/OFF DLY selector switch			
	Teaching method		Auto teaching			
	Teaching mode		Normal teaching/zone teaching			
	Material	Case	Polycarbonate			
		Lens	Acrylic	Polycarbonate	Acrylic	Polycarbonate
		Cover	Polycarbonate			
		Mounting bracket	Stainless steel (SUS304)			
	Connection		Terminal block (with M3.5 screws)			
	Mass		200 g max. (including mounting bracket)			
	Accessory		Mounting bracket (with screws), screwdriver for volume adjustment, cord securing nuts, bushings, operation manual			

*Detection object: 300×300mm white drawing paper

Environmental specification	Ambient light	Sunlight: illumination on light receiving surface 10,000 lx max. Incandescent lamp: illumination on light receiving surface 3,000 lx max.
	Ambient temperature	–25 - +55°C (Storage: –30 - 70°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 directions
	Shock	500 m/s² / 3 times each in 3 directions
	Dielectric withstanding	1,000 VAC for 1 minute / 2,000 VAC for 1 minute
	Insulation resistance	500 VDC, 20 MΩ or higher / 500 VDC, 100 MΩ or higher

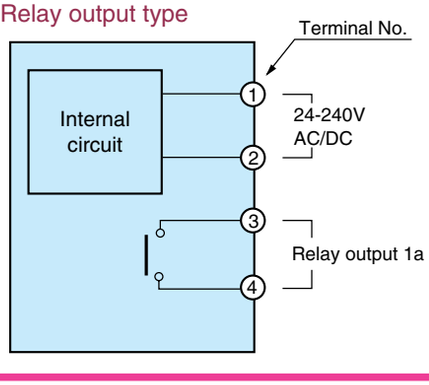
Input/Output Circuit and Connection

● Open collector output type



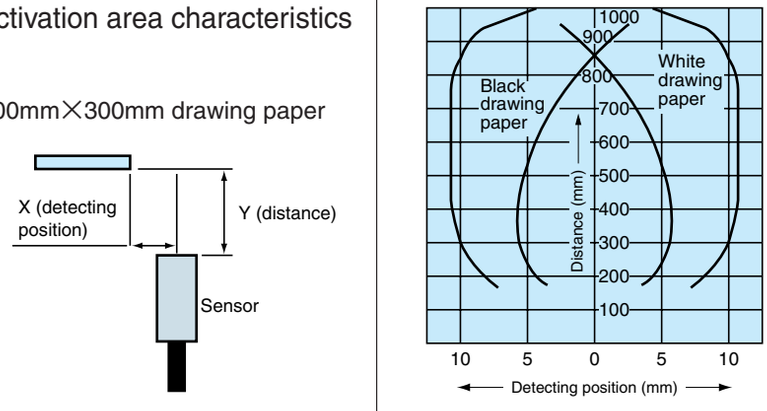
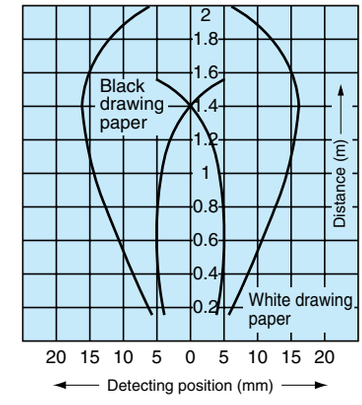
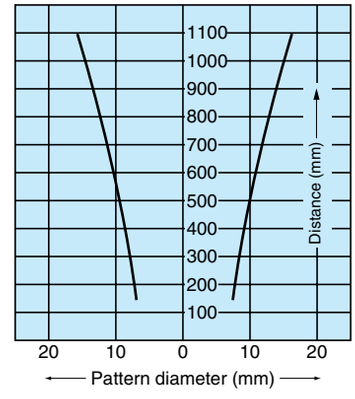
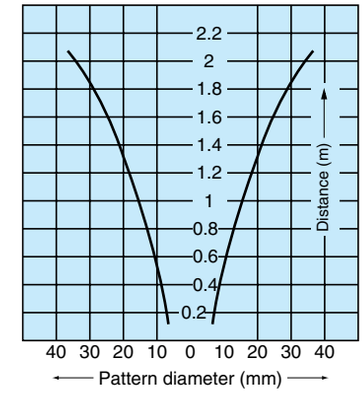
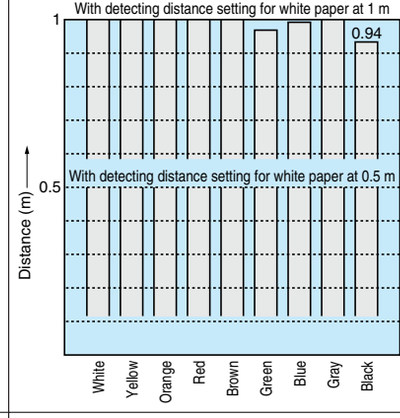
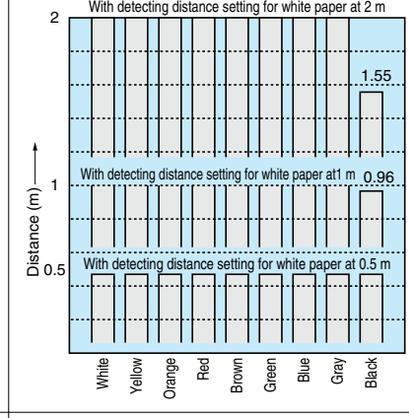
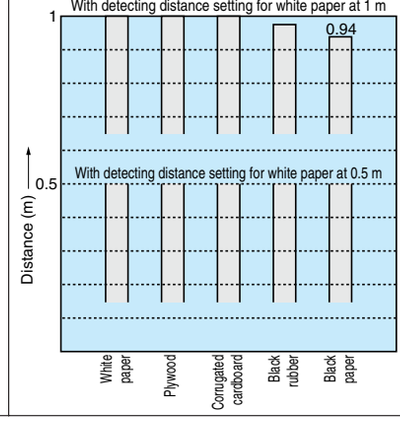
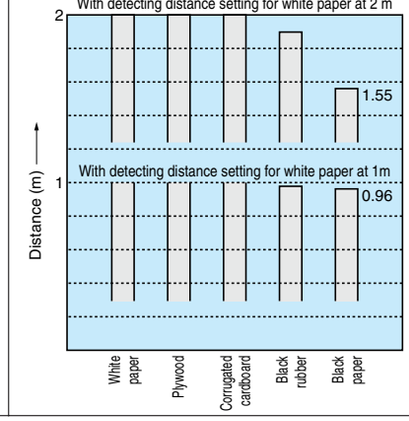
The output transistor turns off when load short circuit or overload occurs. Check the load and turn the power back on.

● Relay output type



DA-S100R/200

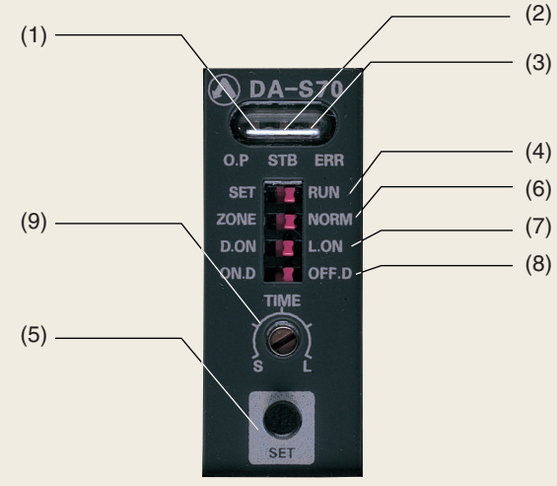
Characteristics (Typical Example)

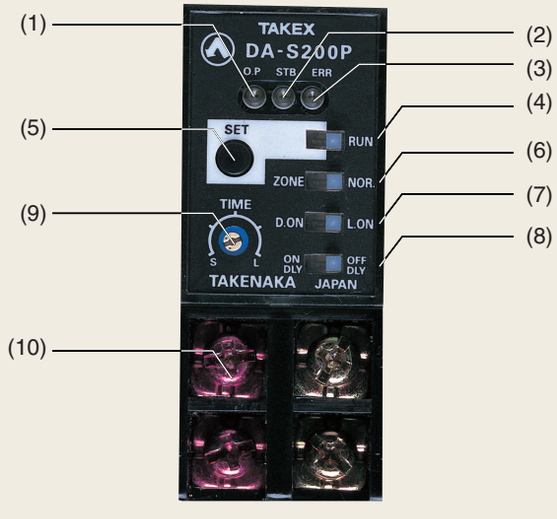
	Model DA-S100R	Model DA-S200R
● Activation area characteristics 300mm×300mm drawing paper		
● Emitted light beam diameter		
● Color paper detecting distance 170mm×170mm color paper		
● Detecting distance by material		

For Correct Use

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

• Panel display and functions





No.	<Name> Function description
(1)	<Operation indicator (O.P)> The orange LED is illuminated to indicate operation
(2)	<Stability indicator (STB)> The green LED is illuminated when the received light level is in a range that allows stable activation (120% or higher of the activation level) or stable deactivation (80% or lower of the activation level). The stability indicator does not show the margin of distance but intensity of light with reference to the operation level. The distance at which the indicator is illuminated may vary depending on the reflectance of the detection object. Situations in which the stability indicator is not illuminated may cause unstable detection.
(3)	<Error indicator (ERR)> The Red LED is illuminated or flashes if any error occurs during teaching.
(4)	<SET/RUN selector switch> [SET] setting allows teaching (distance setting). [RUN] setting activates the sensor at the distance stored with [SET].
(5)	<Set button switch (SET)> Pressing the Set button with the selector switch at [SET] enables distance teaching.
(6)	<ZONE/NOR. selector switch> [ZONE] setting enables operation in the range between the 2 teaching points (set distance). [NOR] setting enables operation between the teaching point (set distance) and the sensor.
(7)	<D.ON/L.ON selector switch> [D.ON] setting enables the following operation: Activated outside of the detecting range in the ZONE mode. Activated when a certain amount of light is not receive in the NOR mode. [L.ON] setting enables the following operation: Activated in the detecting range in the ZONE mode. Activated when a certain amount of light is received in the NOR mode.
(8)	<ON DLY/OFF DLY selector switch> [ON DLY] setting enables the on-delay timer. [OFF DLY] setting enables the off-delay timer.
(9)	<Delay time adjustment volume (TIME)> MIN(S) setting overrides the delay and enables normal on/off operation.
(10)	<Terminal block> For the DA-S100R/200 Series only.

● Teaching pattern and detection setting

Four teaching patterns are available:
(1) NOR mode 1-point teaching
(2) NOR mode 2-point teaching
(3) ZONE mode teaching
(4) Maximum distance (default) teaching
The following section provides applications, setting procedure, sensor operation and notes.

(1) NOR mode 1-point teaching and applications

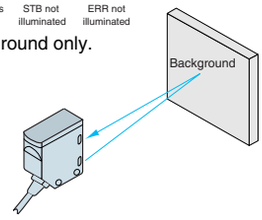
This type of setting is suitable for detection in which it is difficult to provide the detection object at a specific place and the background (reflecting object such as wall and conveyor) is within the sensor detecting range.
Applications: detection of object on conveyor or on this side of the background

Setting procedure

1) Set the ZONE/NOR selector switch to [NOR].

2) Set the SET/RUN selector switch to [SET].
The operation indicator (orange LED) starts flashing.

3) Press the SET button with the background only.



The stability indicator (green LED) is illuminated when the SET button is pressed.

Release the SET button when the stability indicator (green LED) is illuminated.

Note: Holding down the button enables the maximum distance teaching mode.

When the SET button is released, the stability indicator (green LED) stays illuminated and the operation indicator (orange LED) starts flashing.

Teaching (distance setting) is complete.

4) Set the SET/RUN selector switch to [RUN].

Operation

- The detecting range is within the set detecting distance.
- The set activation position is within about 20% on this side of the background.
- Set the operation mode by selecting between L.ON and D.ON.

(2) NOR mode 2-point teaching and applications

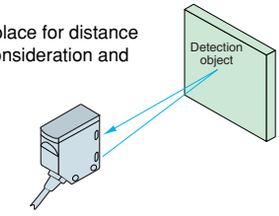
Use the actual detection object for setting the detecting distance. This type of setting is intended for detection not susceptible to the background.
Applications: detection of object on conveyor, distinction between different heights or positions of objects

Setting procedure

1) Set the ZONE/NOR selector switch to [NOR].

2) Set the SET/RUN selector switch to [SET].
The operation indicator (orange LED) starts flashing.

3) Provide the detection object at a place for distance setting with a margin taken into consideration and press the SET button twice.



The stability indicator (green LED) is illuminated when the SET button is pressed for the first and second times alike.

Release the SET button when the stability indicator (green LED) is illuminated.

Note: Holding down the button enables the maximum distance teaching mode.

When the SET button is released, the stability indicator (green LED) stays illuminated and the operation indicator (orange LED) starts flashing.

Pressing the SET button twice sets the distance.

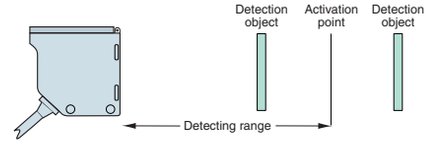
4) Set the SET/RUN selector switch to [RUN].

Operation

- The detecting range is within the set detecting distance.
- The activation position is ± 5 % with reference to the position of the detection object used for the teaching.
- Set the operation mode by selecting between L.ON and D.ON.

Notes

- When the SET button is pressed 3 or more times, the last two teaching operations overrides the previous operations for teaching.
- If the SET button is pressed at different positions for the first and second teaching operations, the activation position is set midway between the distances set by the first and second teaching operations.



The detecting range is between the activation point and the sensor.

(3) ZONE mode teaching and applications

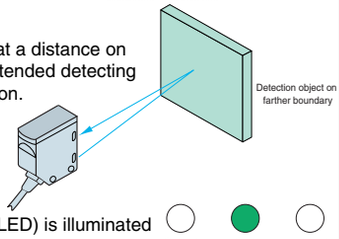
A detection zone is set within the sensor detecting distance.
Applications: detection of object in a range between two points at different distances from the sensor disregarding the father and nearer ranges or provision of a non-detection zone within the detecting distance

Setting procedure

1) Set the ZONE/NOR selector switch to [ZONE].

2) Set the SET/RUN selector switch to [SET].
The operation indicator (orange LED) starts flashing.

3) Provide the detection object at a distance on the farther boundary of the intended detecting range and press the SET button.

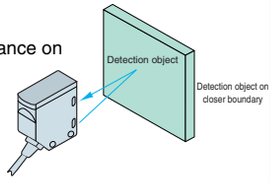


The stability indicator (green LED) is illuminated when the SET button is pressed.

When the SET button is released, the stability indicator (green LED) stays illuminated and the operation indicator (orange LED) starts flashing.

The first teaching point has been set.

4) Provide the detection object at a distance on the closer boundary of the intended detecting range and press the SET button.



While the SET button is pressed, the operation indicator (orange LED) is not illuminated and only the stability indicator (green LED) is illuminated.

When the SET button is released, again the stability indicator (green LED) stays illuminated and the operation indicator (orange LED) starts flashing.

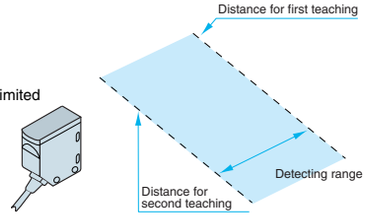
The second teaching point has been set.

(Teaching may be started at either the farter or closer boundary.)

5) Set the SET/RUN selector switch to [RUN].

Operation

- The detecting range is the limited zone between the farter and closer boundaries.



- L.ON/D.ON setting and operation
  L.ON : activated within the detecting range
  D.ON : activated outside of the detecting range

Notes

- Set the closer boundary at within 80% of the farther boundary setting.
- When the SET button is pressed 3 or more times, the last two teaching operations overrides the previous operations for teaching.

(4) Maximum distance (default setting) teaching

The sensitivity is set at maximum for detection.
Applications: extension of the detecting distance as much as possible to make the most of the maximum detecting distance of the sensor when no background object (reflecting object such as wall and conveyor) is present

Setting procedure

1) Set the ZONE/NOR selector switch to [NOR].

2) Set the SET/RUN selector switch to [SET].
The operation indicator (orange LED) starts flashing.

3) Press and hold down the SET button for 3 seconds or longer.

(1) When the button has been held down for 1.5 seconds, the operation indicator (orange LED) stops flashing and stays illuminated.

(2) When the button has been held down for another 1.5 seconds, the stability indicator (green LED) is illuminated. Release the SET button.

(3) The setting is complete.

(4) Set the SET/RUN selector switch to [RUN].

Operation

- The maximum detecting distance of the sensor is enabled for detection of objects.

Note

- The detecting distance may be shorter than the maximum allowable teaching distance with the background or object present.

Teaching error

The error indicator [ERR] (red LED) is illuminated or flashes if any error occurs during teaching. The error is reset when successful teaching has been completed.

◎NOR mode teaching

- Possible cause: no detection object present or insufficient light reception
- Indicator operation

・SET button pressed	・SET button released
	

(Note: Holding down the button enables the maximum distance teaching mode.)

- Correction: Adjust the distance between the sensor and the detection object or background and perform teaching operation (distance setting) again.

◎ZONE mode teaching

- Possible cause: no detection object present, insufficient light reception or insufficient interval between 2 points
- Indicator operation

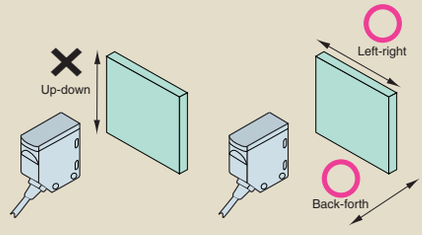
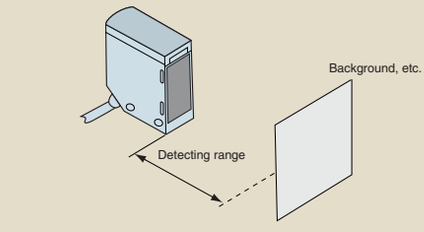
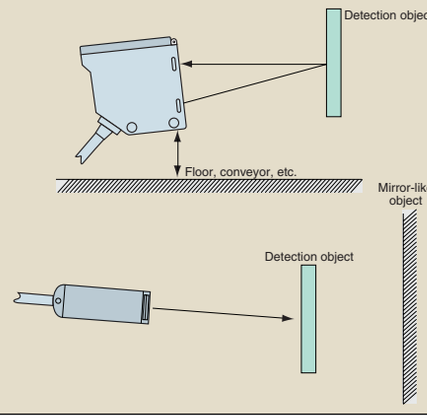
・SET button pressed	・SET button released
	

- Correction: Adjust the distance between the sensor and the detection object or background or between 2 points and perform teaching operation (distance setting) again.

For Correct Use

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

- Notes on installation and countermeasures

	Notes	Countermeasures
	**Some limitations apply regarding the orientation of the sensor and direction of the movement of the detection object. However, up-down movement is allowed within the set detecting distance.**	**Note the installation and direction of movement of the object as shown in the figure when installing the sensor.**
	**In the NOR mode, faulty operation may occur when the object moves outside of the sensor detecting range (farther boundary).**	**Provide background (wall or object not to be detected) outside of the detecting range (farther boundary) for preventing faulty operation.**
	In the ZONE mode, faulty operation may occur when the object passes outside of the sensor detecting range (closer boundary) if the farther boundary of the detecting zone is set close to the background (wall or object not to be detected).	**Remove the background object or use the on-delay timer.**
	**Detection may be unstable if any glossy floor or conveyor is present under the sensor.**	**Mount the sensor at an angle or leave a gap of 200 mm or longer between the sensor and the object underneath.**
	Faulty operation may be caused by a slight angle variation when any mirror-like or glossy object (in the background) is present on the side of the farther boundary.	**Mount the sensor at an angle and check the operation with the detection object.**

- A dead zone may be generated on the closer side depending on the type of detecting object.
- Ensure that no strong beam of sunlight, fluorescent or incandescent lamp, etc. enters the operating range of the sensor.

- Do not use the sensor for detection for protection of human body.
- For safety applications, ensure safe operation of the detection and control system as a whole.
- This product is not explosion proof.

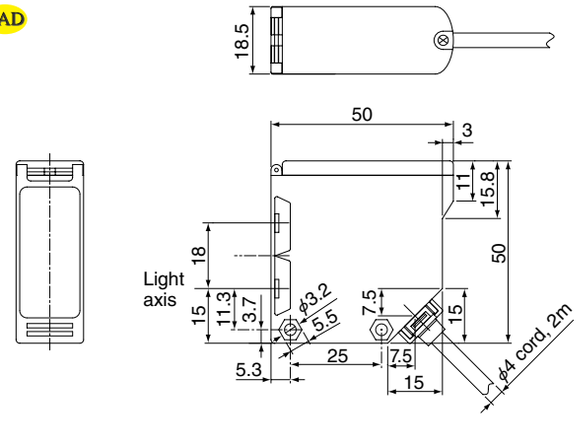
Dimensions (in mm)

Model	
DA-S40R	**DA-S70**
DA-S40RPN	**DA-S70PN**
DA-S40R-J	**DA-S70-J**

Model	
DA-S100RTC	**DA-S200TC**
DA-S100RP	**DA-S200P**

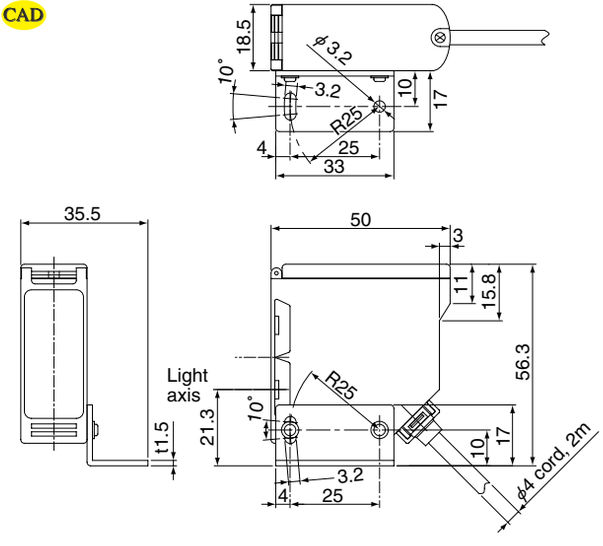
Permanently attached cord type

CAD



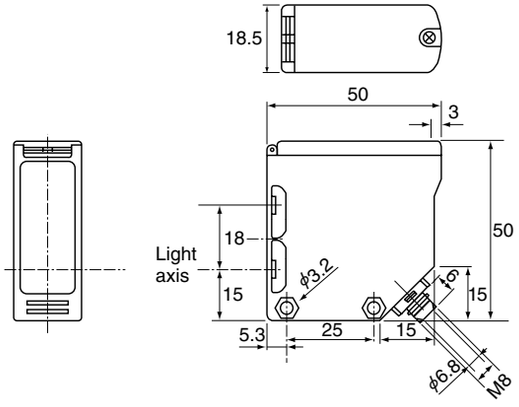
With mounting bracket attached

CAD

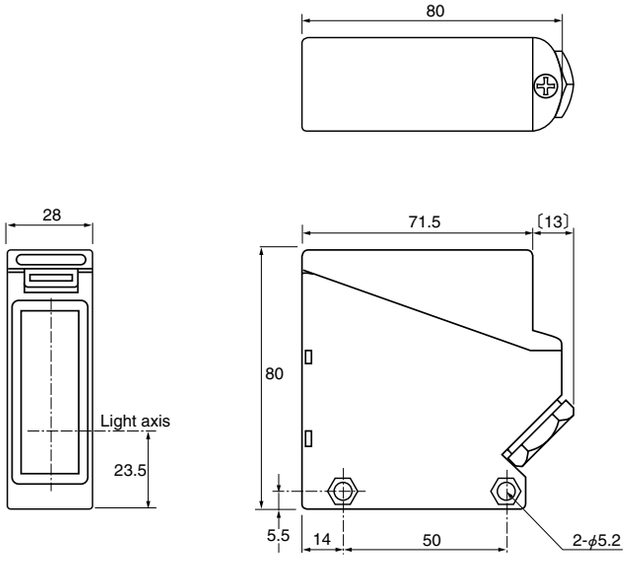


M8 connector type

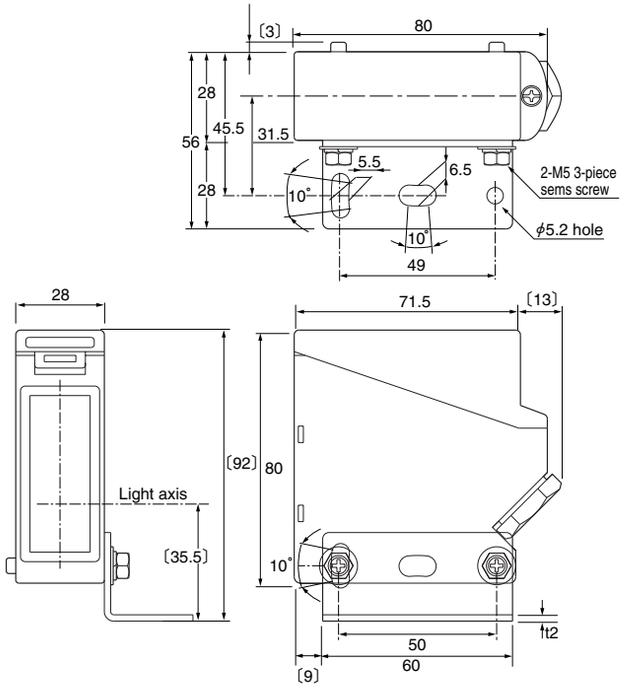
(Mounting bracket is not provided with the connector type.)



Body

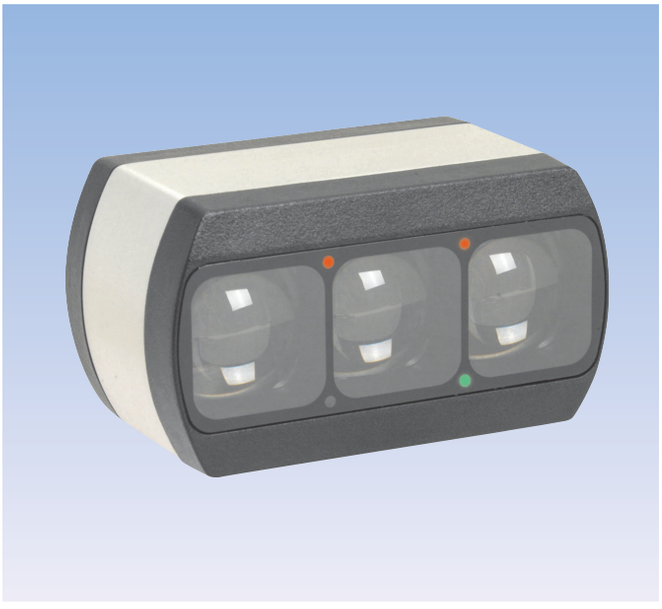


With mounting bracket attached



DX-7 series

Phase difference distance detection



- Phase difference method employed
- Long detecting distance 7 m with direct reflection type
- Long detecting distance and high resolution simultaneously achieved
  Less influence of object color, etc.
- Applicable to wide variety of detecting situations by teaching
  Capable of point/zone sensing
- Anti Interference feature

Type

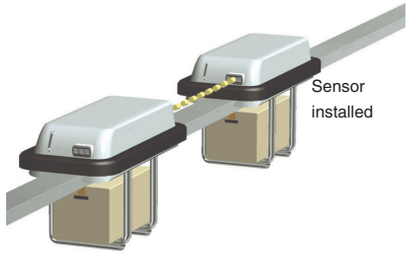
Type/detection method	Detecting distance	Model	Operation mode	Output mode
Diffuse-reflective phase difference detection	0.5～7.5m	**DX-7AH**	Output in proportion to distance	Analog output/ comparator output

Optional parts

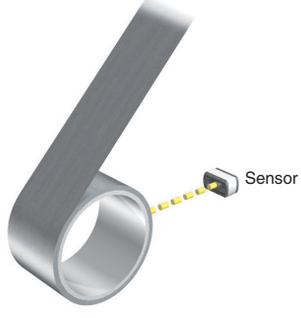
Type	Model	Shape
Special mounting bracket	**DX-B1**	H-shaped (for face mounting)
	DX-B2	L-shaped (for side mounting)

Dimensions (in mm)

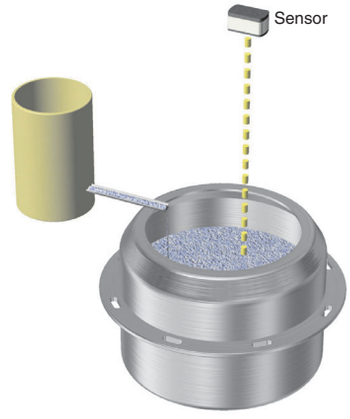
- Prevention of collision of overhead traveling cranes and unmanned cranes



- Control of large winder



- Detection of level of grain or fine particle in tank



Rating/Performance/Specification

Model		DX-7AH
Detecting distance		0.5-7.5m (*1)
Standard detecting object		700×700mm white drawing paper
Power supply		12-24V DC ±10% / Ripple 10% max.
Power consumption		2.3W max.
Analog output	Current output	4-20mA±10% (allowable load resistance: 250 Ω max.)
	Resolution	±5%F.S. max. (*2)
	Linearity	10%F.S. max
	Response frequency	About 20Hz
Comparator output	Output mode	NPN open collector Sink current: 50 mA (30 VDC) max. / Residual voltage: 2 V or less
	Response frequency	About 20Hz
	Mode switching	Light-ON/Dark-ON selectable
	Load short circuit protection	Provided
Anti Interference		Provided Master/slave setting
Light source (wavelength)		Infrared LED (870nm)
Switch (SW)		Pushbutton switch×3
Teaching method		Auto teaching (for comparator output only)
Teaching mode		1-point normal teaching, 2-point normal teaching, 1-point zone teaching
Material	case	Aluminum (alumite finish)
	Front/back panel	ABS resin
	Lens	Polycarbonate
	Lens front cover	Polycarbonate
Connection		6-pin waterproof plastic connector
Mass		About 200 g
Accessory		Cord with connector (*3), 250-Ω resistor for current-voltage conversion, operation manual

*1 Note that any object with high reflectance at a distance of 40-80 m may cause faulty operation.
The comparator output is designed for a distance of 0.5-7 m.
*2 Output of higher resolution may be available by averaging or integration.
*3 0.2 mm²×6 cores, 2 m (outer diameter: 5 mm)

Environmental Specification

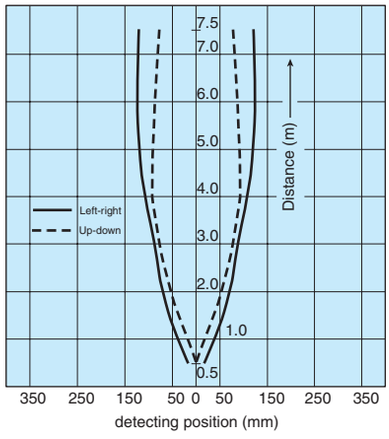
Model	DX-7AH
Ambient light	5000 lx max. (on light receiving surface)
Ambient temperature	–10 - +55 °C (non-freezing)
Ambient humidity	35-85%RH (non-condensing)
Protective structure	IP65
Vibration	10-55 Hz / 1.5 mm amplitude / 2 hours each in 3 directions
Shock	500 m/s2 / 3 times each in 3 directions
Dielectric withstanding	1,000 VAC for 1 minute
Insulation resistance	500 VDC, 20 MΩ or higher

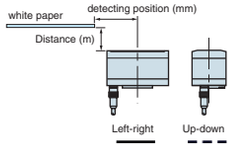
- Do not use the sensor for detection for protection of human body.
- For safety applications, ensure safe operation of the detection and control system as a whole.

Characteristics (Typical Example)

Activation area characteristics

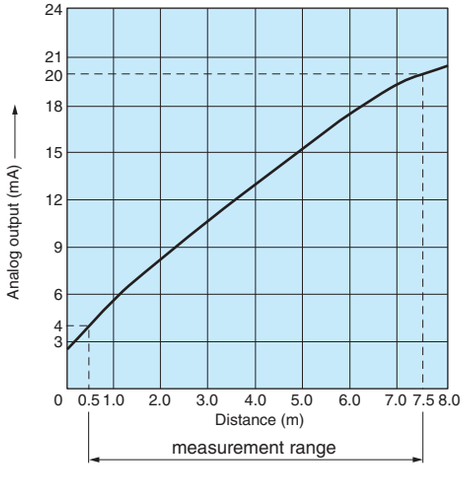
With no background





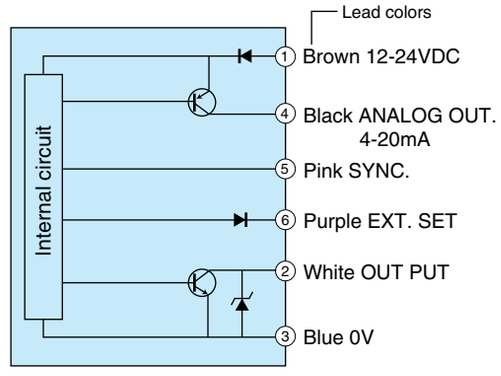
Distance-output characteristics

Standard detecting object
700×700mm white drawing paper

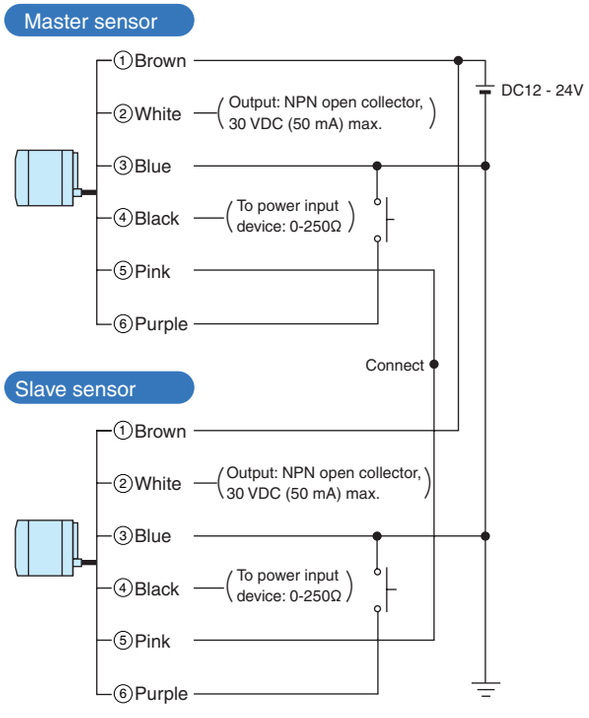


DX-7

Input/Output Circuit and Connection

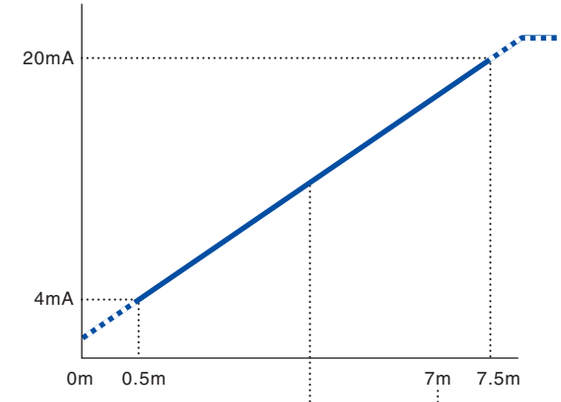


- When not using the EXT.SET line (purple), connect it with the power supply (+ V).
- For standalone use without enabling the Anti Interference, connect the (5) SYNC. line (pink) with the GND.



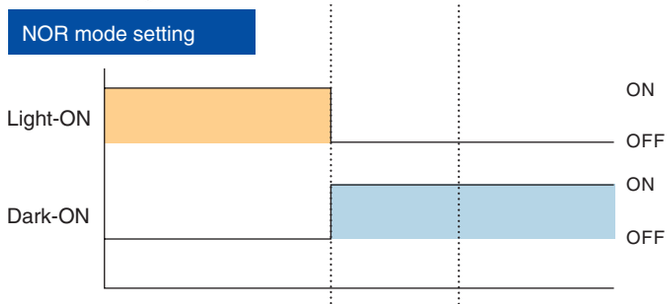
Operation Chart

Analog output



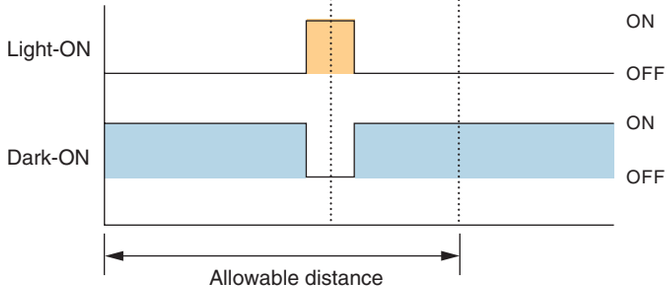
Current output of 4-20 mA available for detecting distance of 0.5-7.5 m.

NOR mode setting



Sensor activated/deactivated at setting.

1-point ZONE mode setting

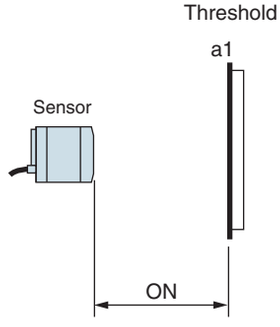
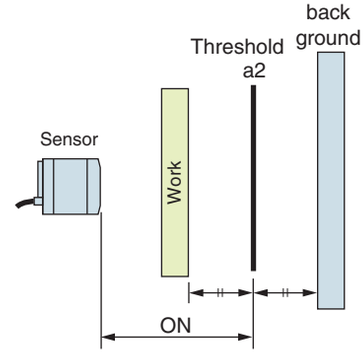
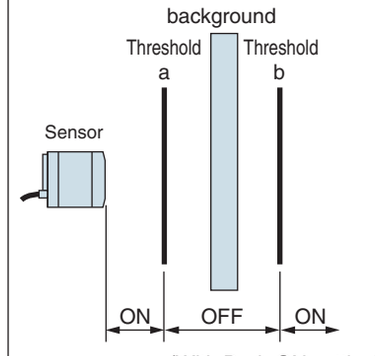


Caution

If any background (wall, etc.) is present at a distance of 8-30 m from the sensor, a work that passes through the detecting range may cause:

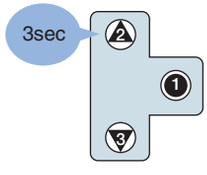
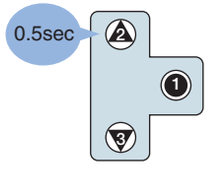
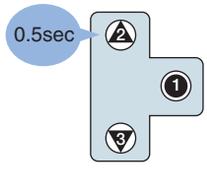
- Output of a value for a closer point than the correct analog value on the edge of the work when the analog output is used.
- Transient activation on the edge of the work when the comparator output is used.

Teaching Modes for Different Detecting Situations

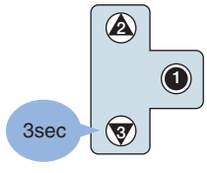
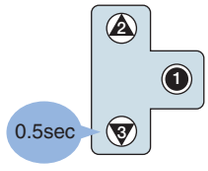
Detecting situation	Detection of work at specific position	Detection by setting threshold between background and work	Detection of glossy work on this side of background by setting threshold only with background
Teaching	1-point normal teaching	2-point normal teaching	1-point zone teaching (may be performed externally)
Method	Teaching with work provided at intended point of detection	Teaching with background and work	Teaching with background (conveyor, ground, etc.)
Threshold	Threshold a1 set at position of teaching	Threshold a2 set midway between background and work	Thresholds a and b set at about ±5% with reference to distance to background
Operating range			 (With Dark-ON setting)

Outline of Teaching Procedure

- 1-point normal teaching/2-point normal teaching

Procedure	Operation	
	1-point normal teaching	2-point normal teaching
(1)	Provide the detecting object at the intended position.	Provide the detecting object
(2)	Press and hold down Button 2 until the RUN indicator (green) starts flashing (for about 3 seconds). 	
(3)	Press Button 2 again with the object kept at the position (for about 0.5 seconds). 	Move the detection object and press Button 2 (for about 0.5 second). 

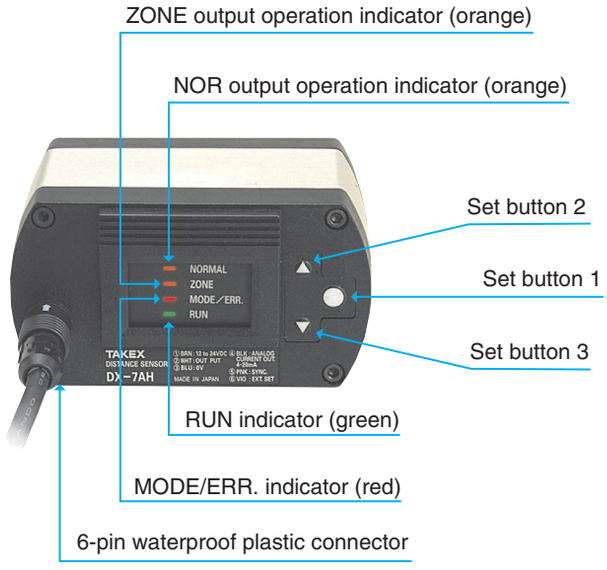
- 1-point zone teaching/external teaching

Procedure	Operation
(1)	Direct the detecting side of the sensor toward the background (conveyor, ground, etc.).
(2)	Press and hold down Button 3 (external switch for external teaching) until the RUN indicator (green) and MODE/ERR. indicator (red) start flashing alternately (for about 3 seconds). 
(3)	Pres Button 3 (external switch for external teaching) once again (for about 0.5 seconds). 

- This type of teaching is used for teaching only with the background or detecting a glossy work on this side of the background.
- The glossy work is recognized as being on that side of the background for detection.

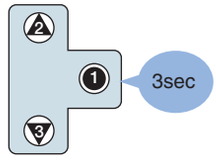
DX-7

Indicators and Set Buttons (Sensor Rear Panel)



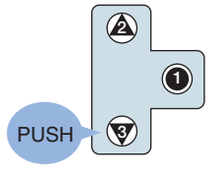
Light-ON/Dark-ON Mode Setting

(1) The MODE indicator (red) turns on and off every time the button is held down for about 3 seconds.



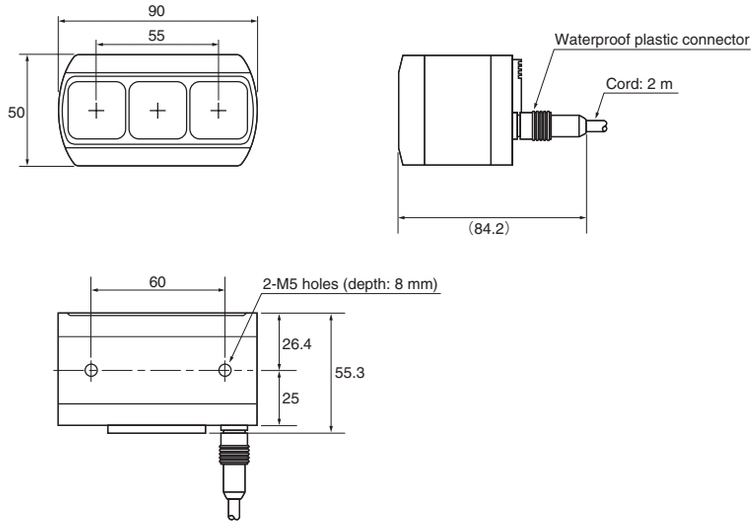
MODE/ERR. not illuminated: Light-ON
MODE/ERR. illuminated: Dark-ON

Master/Slave Mode Setting

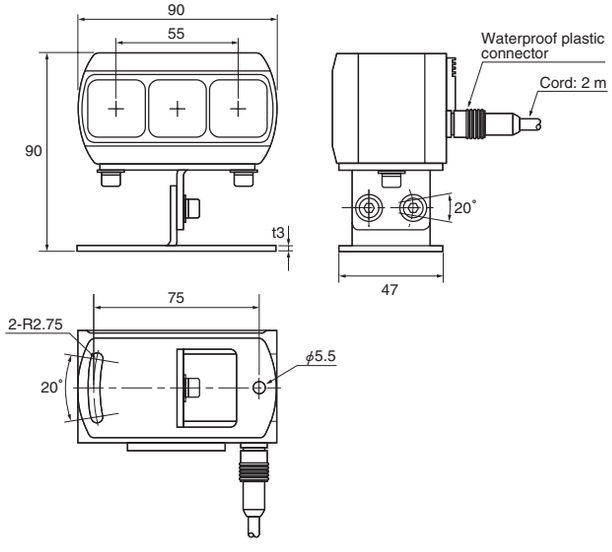
Procedure	Operation
(1)	Supply power while holding down Button 3. 
(2)	Release Button 3.
(3)	The slave mode has been enabled. Repeating the above steps alternates between the master and slave modes. RUN illuminated: master mode RUN not illuminated: slave mode

Dimensions (in mm)

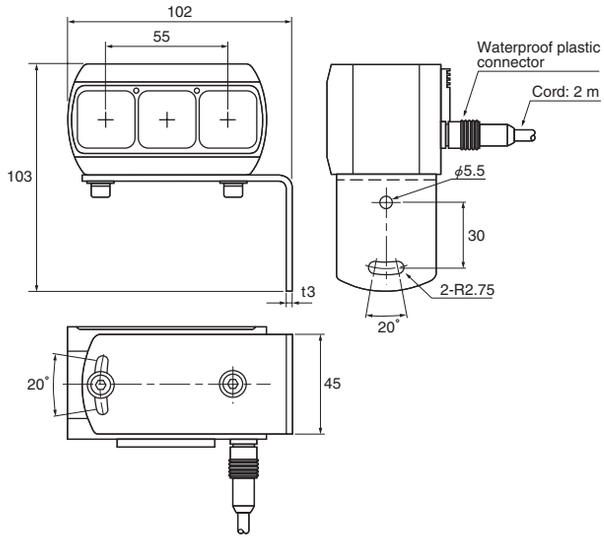
Body



With mounting bracket DX-B1 (optional) attached

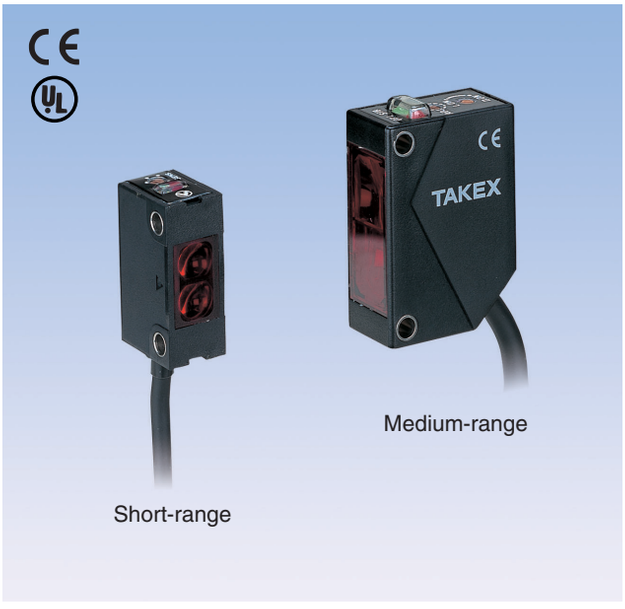


With mounting bracket DX-B2 (optional) attached



DL-S series

Background suppression photo sensors



- Self-diagnosis feature
  - Sensor signaling an error due to degradation of receiver light intensity level
  - Feature applicable to countering soiling of lens or light axis misalignment over time, allowing easy maintenance
- IP 67 water resistance allows washing

  Sensor when line is washed
- Visible beam spot for ease of checking (red LED type)

Type

Type	Detecting distance	Model	Light source	Operation mode	Output mode
Short-range	10～30mm	**DL-S3R**	Red	Light-ON/ Dark-ON selectable (with switch)	NPN open collector
		DL-S3	Infrared		
	10～40mm	**DL-S4R**	Red		
		DL-S4	Infrared		
	10～50mm	**DL-S5R**	Red		
		DL-S5	Infrared		
Medium-range	10～100mm	**DL-S10R**	Red		
		DL-S10	Infrared		
	10～150mm	**DL-S15**			
	10～200mm	**DL-S20**			

- Red LED medium-range type

  Model DL-S20R

  Red LED employed as light emitting element for clear identification of detecting position

  Detecting distance: 200 mm

Rating/Performance/Specification

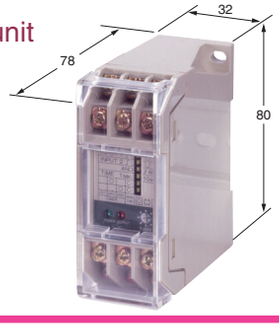
Rating/performance	Type		Short-range						Medium-range			
			Red LED			Infrared LED			Red LED	Infrared LED		
	Model		DL-S3R	DL-S4R	DL-S5R	DL-S3	DL-S4	DL-S5	DL-S10R	DL-S10	DL-S15	DL-S20
	Detection method		Distance limited reflection									
	Detecting range *1		10-30mm	10-40mm	10-50mm	10-30mm	10-40mm	10-50mm	10-100mm	10-100mm	10-150mm	10-200mm
	Range of distance adjustment with volume		10% less than maximum detecting distance			20% less than maximum detecting distance			10% less than maximum detecting distance			
	Power supply		12-24V DC ±10% / Ripple 10% max.									
	Current consumption		27mA max.						30mA max.			
	Output mode	Control output	NPN open collector *2 Rating: sink current 100 mA (30 VDC) max.									
		Stability output	NPN open collector *2 Rating: sink current 50 mA (30 VDC) max.									
	Operation mode		Light-ON/Dark-ON selectable (with switch)									
	Response time		0.35ms max.									
	Hysteresis		5% max.									
Specification	Light source (light wavelength)		Red LED (700 nm)			Infrared LED (880 nm)			Red LED (700 nm)	Infrared LED (880 nm)		
	Light-sensitive element		2-division photodiode									
	Indicator		Operation indicator: red LED/Stability indicator: green LED									
	Volume (VR)		Distance adjustment volume									
	Switch (SW)		Light-ON/Dark-ON selector switch L.ON: Light-ON D.ON: Dark-ON									
	Short circuit protection		Provided (for control output only)									
	Material		Case and lens: polyarylate						Case: heat-resistant ABS / Lens: polyethersulfone			
	Connection		Permanently attached cord (Outer dimension: dia.3) 0.15sq. 4 core, 2 m length, black						Permanently attached cord (Outer dimension: dia.4) 0.15sq. 4 core, 2 m, black			
	Mass		50g max.						80g max.			
	Notes		*1 With volume at MAX: white drawing paper of 50×50mm for short-range type, 100×100mm for medium-range type *2 PNP output types available for all models ("PN" added at the end of model No.: Ex. DL-S3RPN) / No stability output provided for PNP output type									

Environmental Specification

Environment	Ambient light	5,000lx 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 directions
	Shock	500 m/s² / 10 times each in 3 directions

- Applicable power supply unit

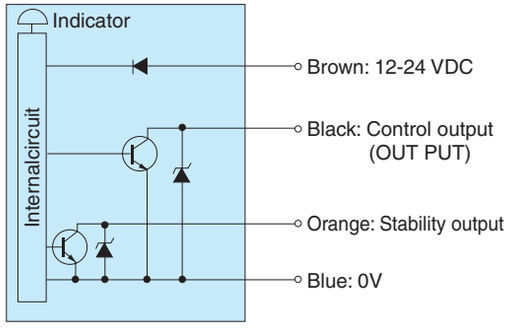
PS Series
High capacity of 200 mA at 12 VDC



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

DL-S

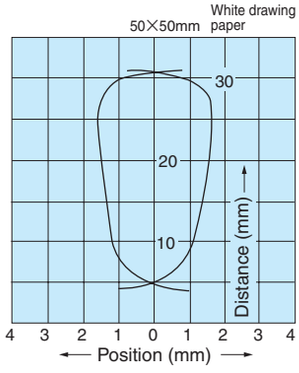
Input/Output Circuit and Connection



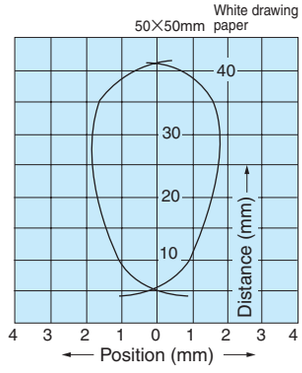
- The output transistor turns off when load short circuit or overload occurs. Check the load and turn the power back on.
- Note that the stability output is not provided with the short circuit protection circuit.

Activation area characteristics (Typical example)

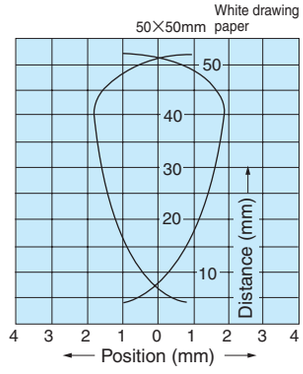
DL-S3R



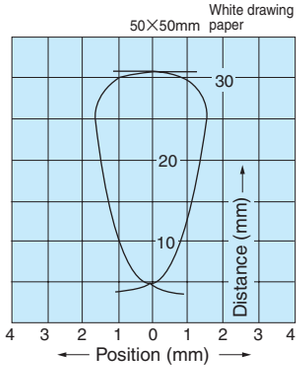
DL-S4R



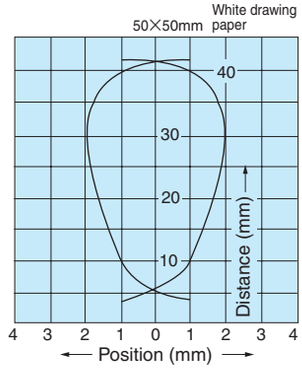
DL-S5R



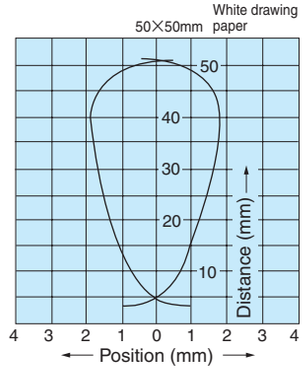
DL-S3



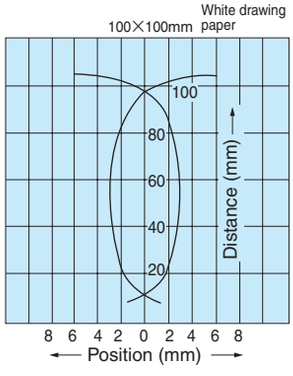
DL-S4



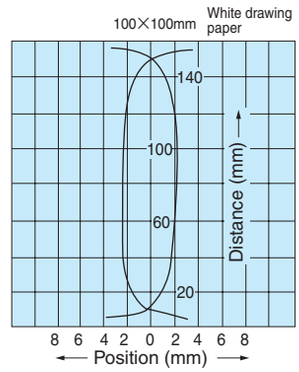
DL-S5



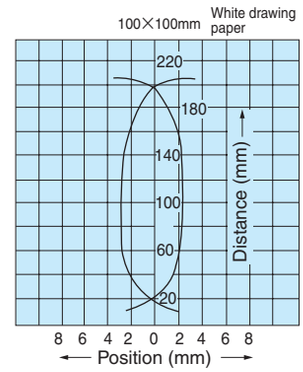
DL-S10R・S10



DL-S15

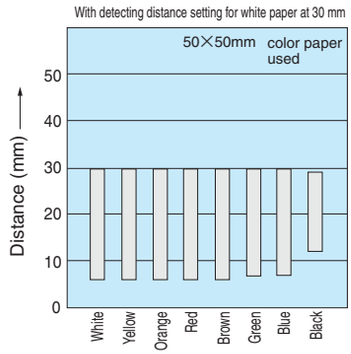


DL-S20

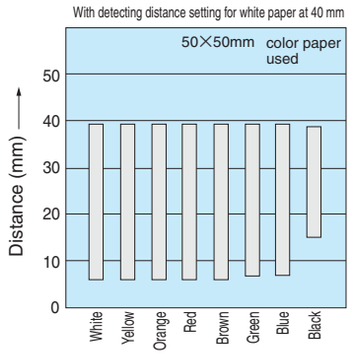


Color Paper Detection Characteristics (Typical Example)

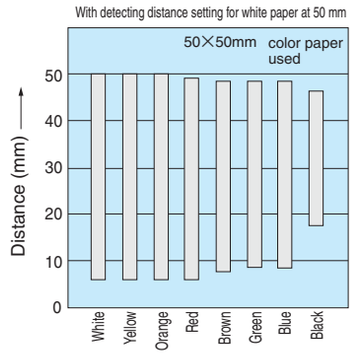
DL-S3R



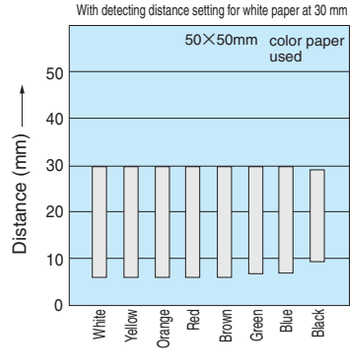
DL-S4R



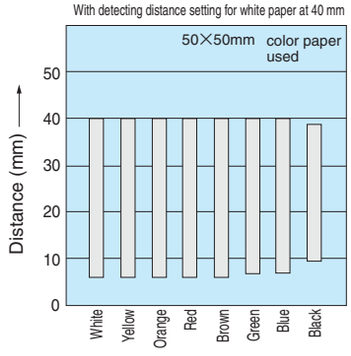
DL-S5R



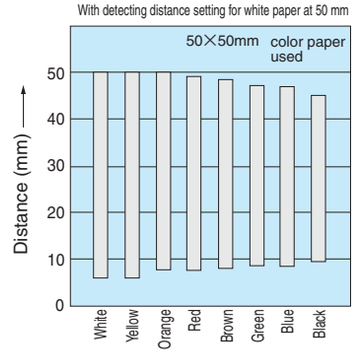
DL-S3



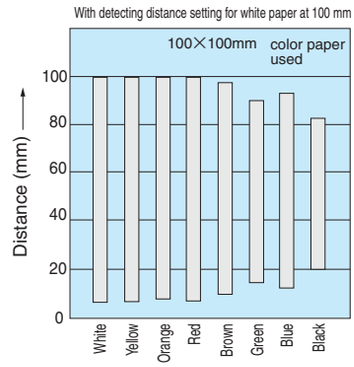
DL-S4



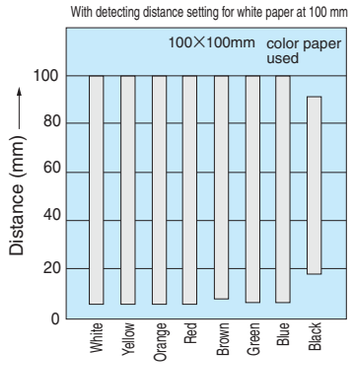
DL-S5



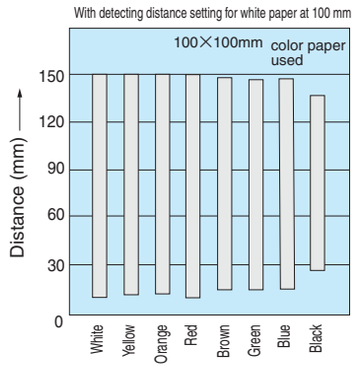
DL-S10R



DL-S10

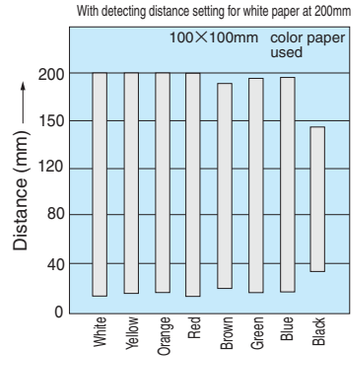


DL-S15

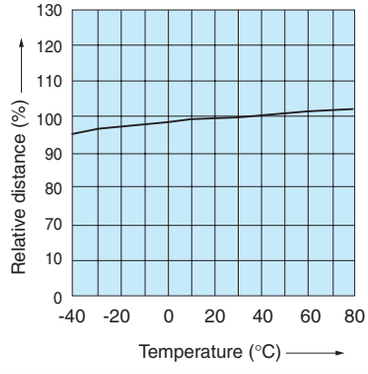


Temperature Characteristics (Typical Example)

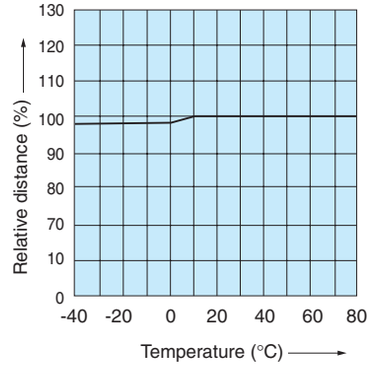
DL-S20



DL-S10R



DL-S10・S15・S20

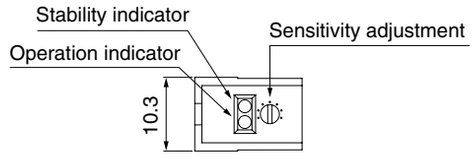


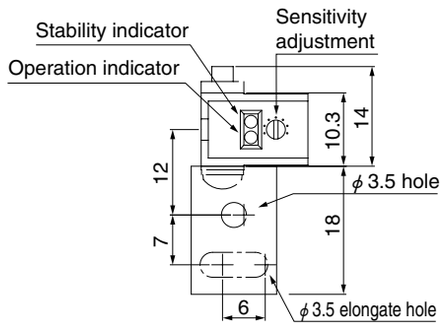
Dimensions (in mm)

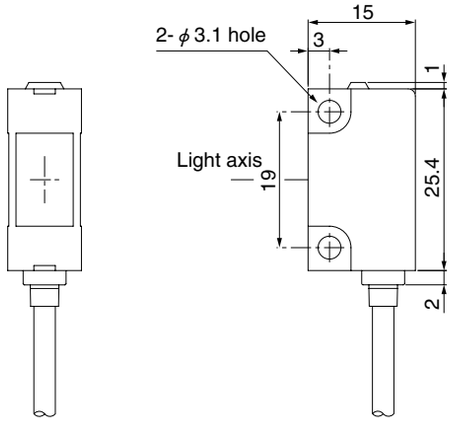
Short-range

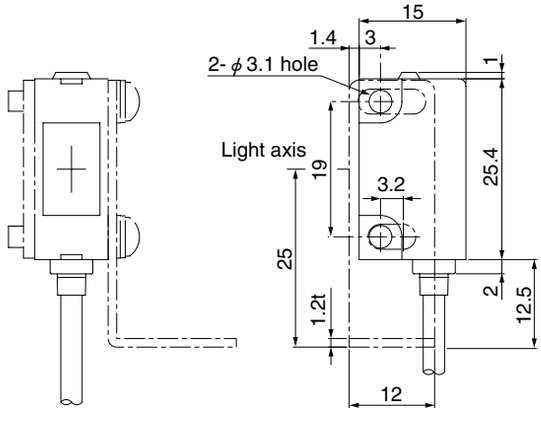
CAD

With mounting bracket (accessory) attached





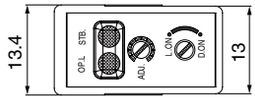


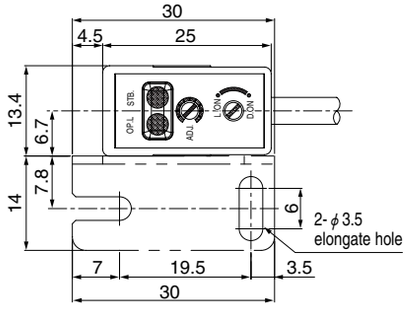


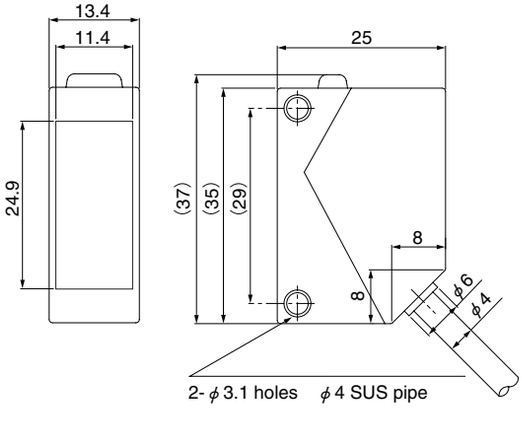
Medium-range

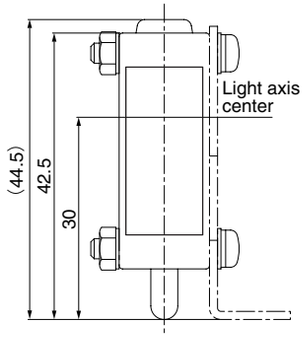
CAD

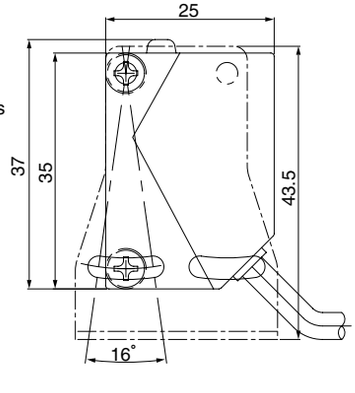
With mounting bracket (accessory) attached









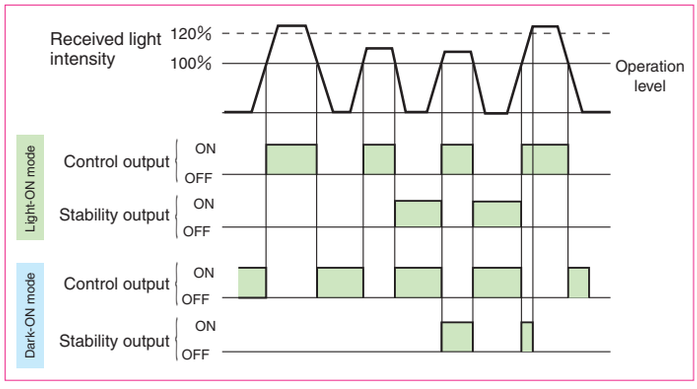


For Correct Use

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

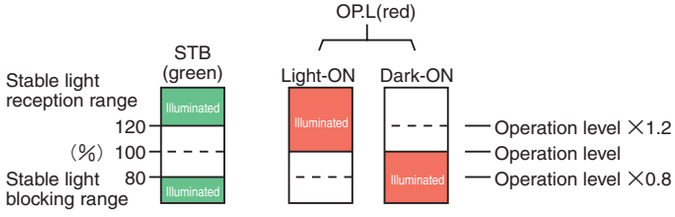
• Stability output

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 detection has occurred with the level of received light 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.



• Indicators

- The operation indicator (red LED) and stability indicator (green LED) show the levels of light intensity as described in the figure on the right.
- After aligning the optical axis, 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.



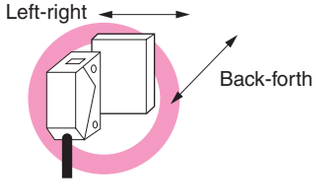
- The red LED (OP.L) is the operation indicator.
  In the L.ON (Light-ON) mode, the indicator is illuminated when a certain amount of light is detected.
  In the D.ON (Dark-ON) mode, the indicator is illuminated when a certain amount of light is not detected.

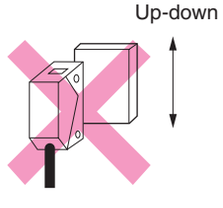
• Light-ON/Dark-ON switching

For Light-ON mode: Set the switch to L (Light).
For Dark-ON mode: Set the switch to D (Dark).

• Detecting direction

The 2-division photodiode has directionality and the sensor may not be used in a certain direction. The direction of movement of the object must be as shown in the figure.





Prohibited direction

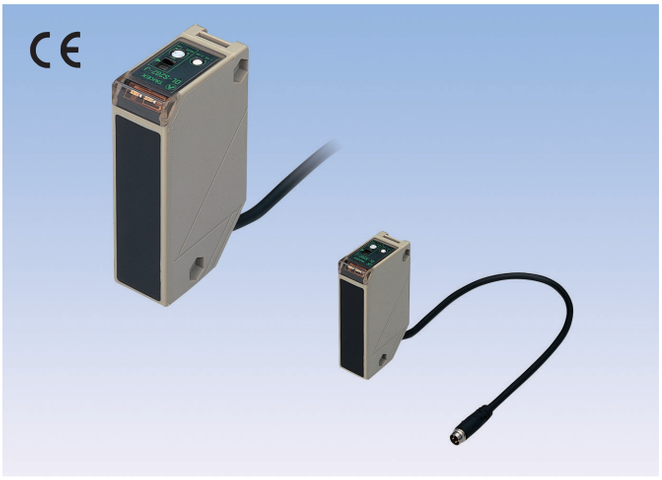
*Up-down movement shown in the figure may be allowed within the detecting distance set with the distance adjustment.

• Background

Any glossy or mirror-like object present in the background of the detection object may cause faulty operation depending on the angle of the background. In such cases, mount the sensor at an angle.

DL-S series

Background suppression photo sensors



- High-intensity red LED for ease of light axis adjustment <DL-S100R (-J)>
- Light intensity for long distance offering adverse environment
- Compact size and enhanced functions
- IP 66 protective structure

Type

Type	Detecting distance	Model	Operation mode	Output mode	Power supply
Long-range	0.2～1m	**DL-S100R**	Light-ON/ Dark-ON selectable (with switch)	NPN/PNP open collector 2 outputs	12-24VDC
		DL-S100R-J			
	0.2～2m	**DL-S202(R)**			
		DL-S202-J			

Optional parts

Type	Model	Shape
Special mounting bracket	**AC-BDL1**	Vertical mounting
	AC-BDL2	Back mounting
Cord with M8 connector	**FBC-4R2S**	Straight
	FBC-4R2L	Angled

Panel display and functions

Operation indicator (red)
Illuminated when output is activated. High-intensity red LED for excellent visibility.

Light-ON/Dark-ON selector switch
Turn the switch to L.ON or D.ON for Light-ON or Dark-ON mode respectively.
Be sure to turn all the way to the end.

Stability indicator (green)
Illuminated when received light intensity is about 120% of operation level or higher. Use of the sensor at an operation level allowing illumination of the stability indicator ensures stable detection.

Distance setting indicator
The position on the distance setting scale is shown in accordance with the 5-turn sensitivity adjustment, allowing easy reading of setting during fine-tuning.

Distance adjustment
5-turn adjustment is employed for easy fine-tuning of detecting position. Turn to FAR or NEAR for longer or shorter detecting distance respectively.

Rating/Performance/Specification

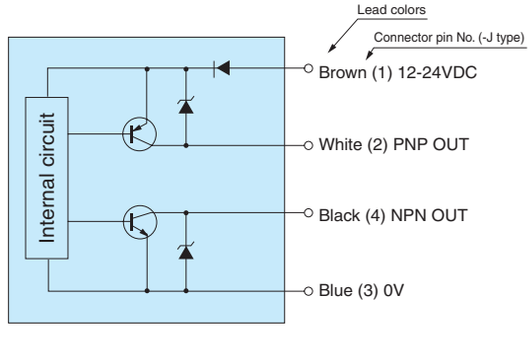
	Model	DL-S100R	DL-S100R-J	DL-S202(R)	DL-S202-J
Rating/performance	Detection method	Distance limited reflection			
	Range	0.2 – 1m (with 200×200mm white drawing paper)		0.2 – 2m (with 200×200mm white drawing paper)	
	Detecting distance	0.1 – 1m (with adjustment at MAX.)		0.1 – 2m (with adjustment at MAX.)	
	Power supply	12-24V DC ±0% / Ripple 10% or less			
	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 (with switch)			
	Response time	2 ms max.			
	Hysteresis	10% max of detecting distance			
Specification	Light source	Red LED (650 nm)		Infrared LED (880 nm)*	
	Light-sensitive element	2-division photodiode			
	Indicator	Red LED: operation indicator / Green LED: stability indicator			
	Volume (VR)	NEAR/FAR: 5-turn optical distance adjustment			
	Switch (SW)	Light-ON/Dark-ON selector switch			
	Short circuit protection	Provided			
	Material	Case and lens: polyarylate			
	Connection	Permanently attached cord (Outer dimension: dia.4) 0.2sq. 4 core 2m length	Cord with M8 connector (cord: Outer dimension: dia.4 0.2sq. 4 core 3m length End: M8 4-pin connector)	Permanently attached cord (Outer dimension: dia.4) 0.2sq. 4 core 2m length	Cord with M8 connector (cord: Outer dimension: dia.4 0.2sq. 4 core 3m length End: M8 4-pin connector)
	Mass	100g max.	60g max.	100g max.	60g max.

*Red LED type (R added at the end of model No.) separately available

Environmental Specification

Environmental specification	Ambient light	Sunlight: illumination on light receiving surface 10,000 lx max. Incandescent lamp: illumination on light receiving surface 3,000 lx max.
	Ambient temperature	–25 - +55°C (non-freezing)
	Ambient humidity	35-85%RH (non-condensing)
	Noise	Power supply line: 250 V / Cycle: 10 ms / Pulse width: 1 μs Radiation: 1 kV / Cycle: 10 ms / Pulse width 1 μs (with noise simulator)
	Protective structure	IP66
	Vibration	10-55 Hz / 1.5 mm amplitude / 2 hours each in 3 directions
	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

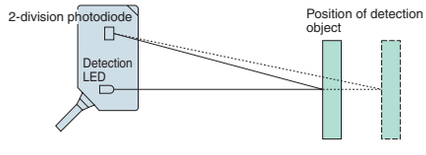
Input/Output Circuit and Connection



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

Distance detection with 2-division photodiode

While ordinary reflective-type sensors operate based on the received light intensity, sensors with 2-division photodiode judge distances based on the angle of the received light.
This makes sensors with 2-division photodiode to be less susceptible to variation in the received light intensity due to change of the color or material of the detection object, reflection on the background or soiling of the sensors, allowing stable detection.



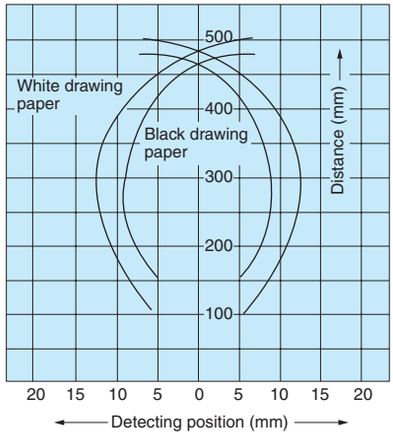
Detection based on change of angle of received light according to change of distance from detection object.

DL-S

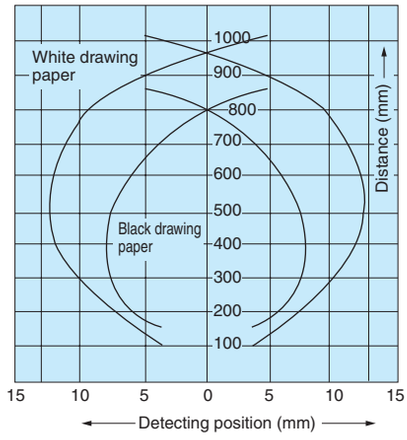
Model: DL-S100R Characteristics (Typical Example)

- Activation area characteristics

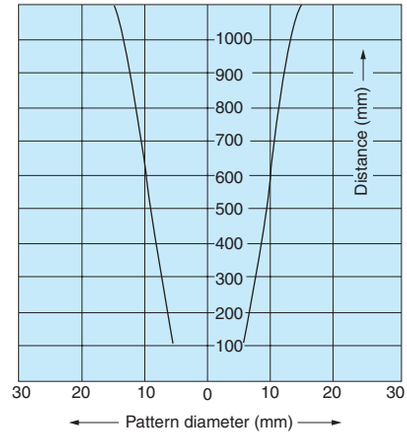
With 200×200mm white paper at 500 mm



With 200×200mm white paper at 1 m

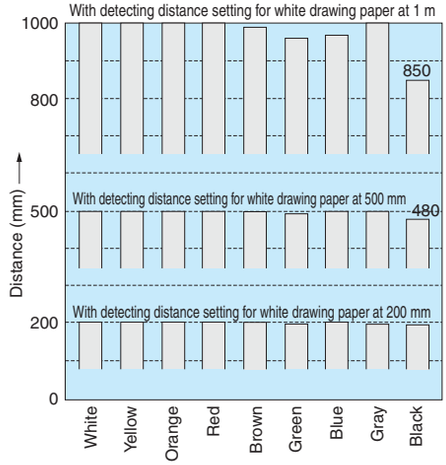


- Emitted light beam diameter

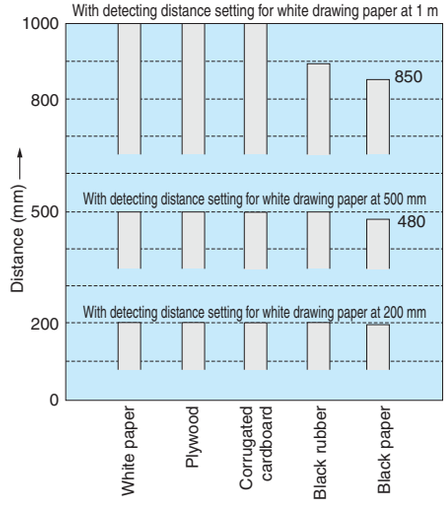


- Color paper detecting distance

150×150mm color paper



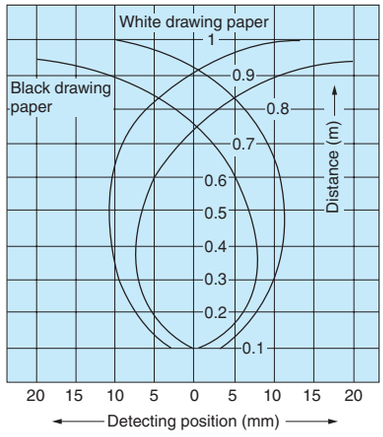
- Detecting distance by material



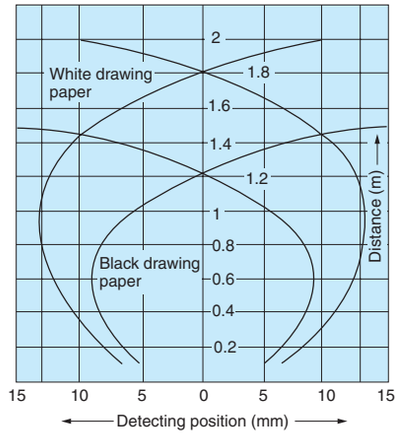
Model: DL-S202R Characteristics (Typical Example)

• Activation area characteristics

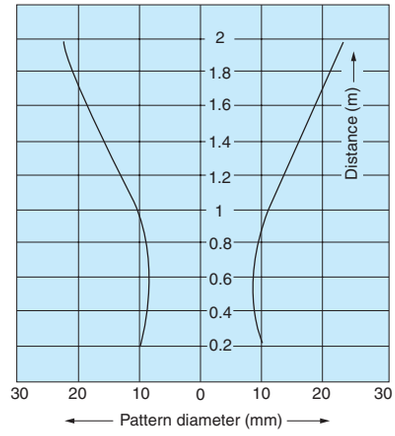
With 200×200mm white paper at 1 m



With 200×200mm white paper at 2 m

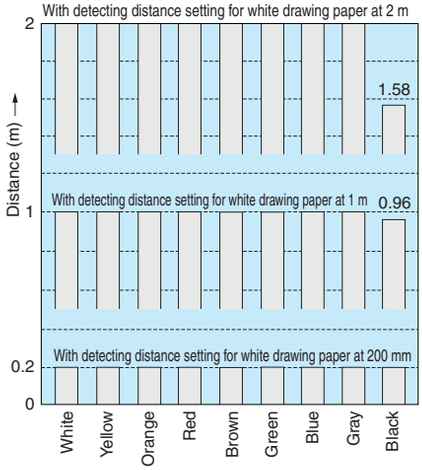


• Emitted light beam diameter

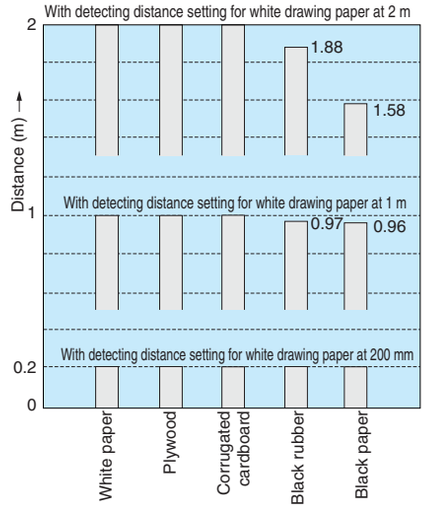


• Color paper detecting distance

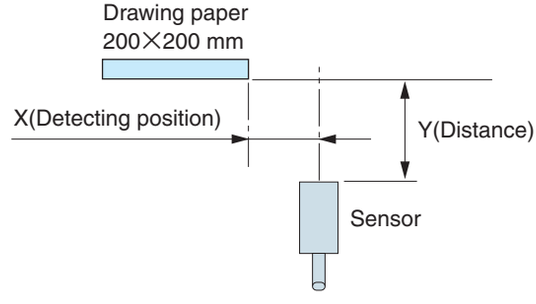
150×150mm color paper



• Detecting distance by material



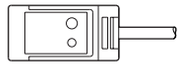
Activation area characteristics

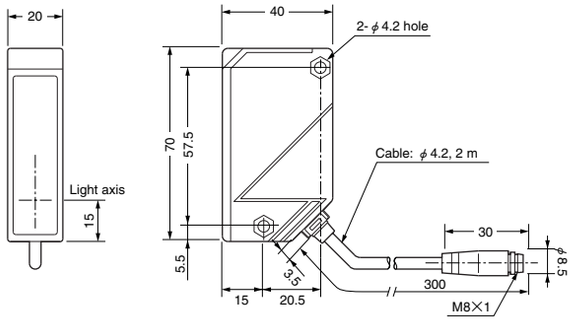


Dimensions (in mm)

Body
DL-S100R(-J)
DL-S202(R)(-J)

CAD

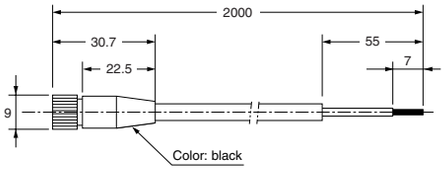




Cord with M8 connector (optional)

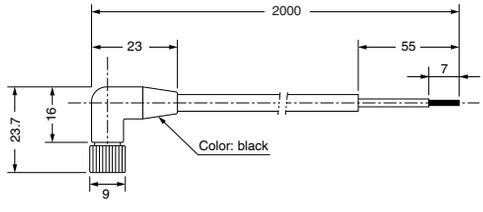
FBC-4R2S (straight)

CAD



FBC-4R2L (angled)

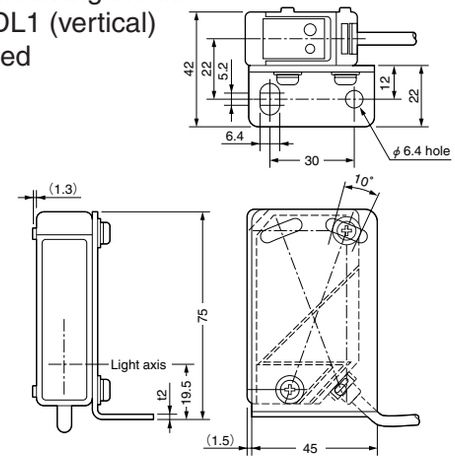
CAD



Special mounting bracket (optional)

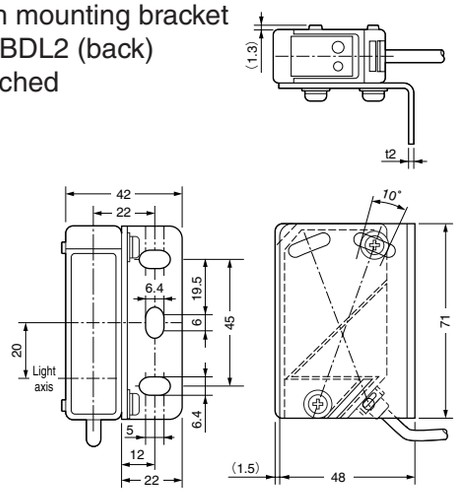
CAD

With mounting bracket
AC-BDL1 (vertical)
attached



With mounting bracket
AC-BDL2 (back)
attached

CAD

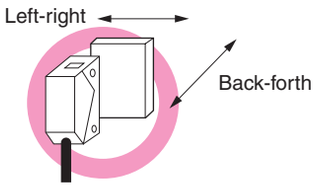


For Correct Use

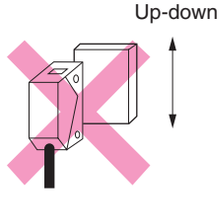
Be sure to follow the instructions in the operation manual provided for correct use of the product.

• Detecting direction

The 2-division photodiode has directionality and the sensor may not be used in a certain direction. The direction of movement of the object must be as shown in the figure.



Permitted direction



Prohibited direction

Up-down movement shown in the figure may be allowed within the detecting distance set with the distance adjustment.

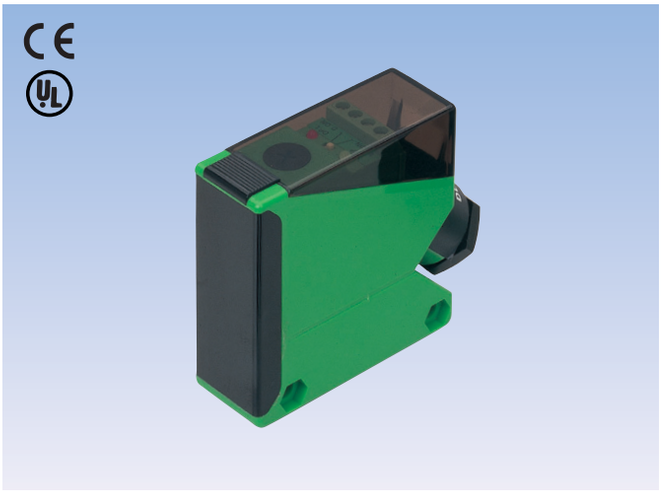
• Background

Any glossy or mirror-like object present in the background of the detection object may cause faulty operation depending on the angle of the background. In such cases, mount the sensor at an angle.

• Stability indicator

The stability indicator does not show the margin of distance but intensity of light with reference to the operation level. The distance at which the indicator is illuminated/not illuminated may vary depending on the reflectance of the detection object. Situations in which the stability indicator is not illuminated may cause unstable detection.

- Do not use the sensor for protection of human body.
- For safety applications, ensure safe operation of the detection and control system as a whole.



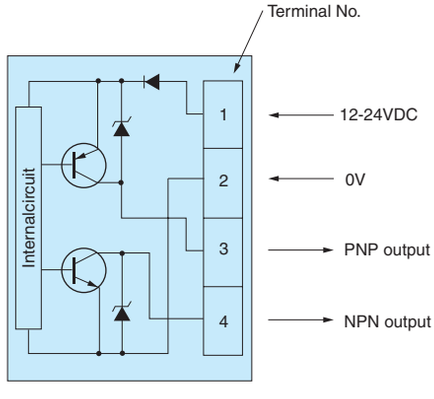
- Long distance 1 m, 2 m
- erminal block offering fully open space for wiring

Type

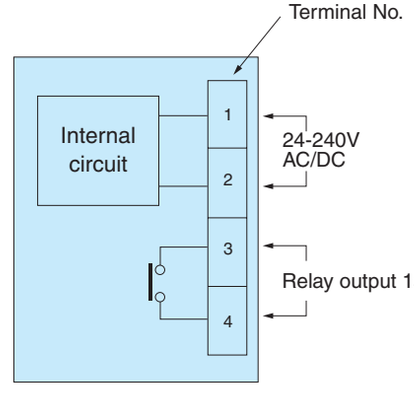
Type	Detecting distance	Model	Operation mode	Output mode	Power supply
Long-range	0.2～1m	**DL-S100TC**	Light-ON/ Dark-ON selectable (with switch)	NPN/PNP open collector 2 outputs	12-24VDC
	0.2～2m	**DL-S200TC**			
	0.2～1m	**DL-S100P**		Relay output 1a	24-240V AC/DC
	0.2～2m	**DL-S200P**			

Input/Output Circuit and Connection

DL-S100TC
DL-S200TC



DL-S100P
DL-S200P



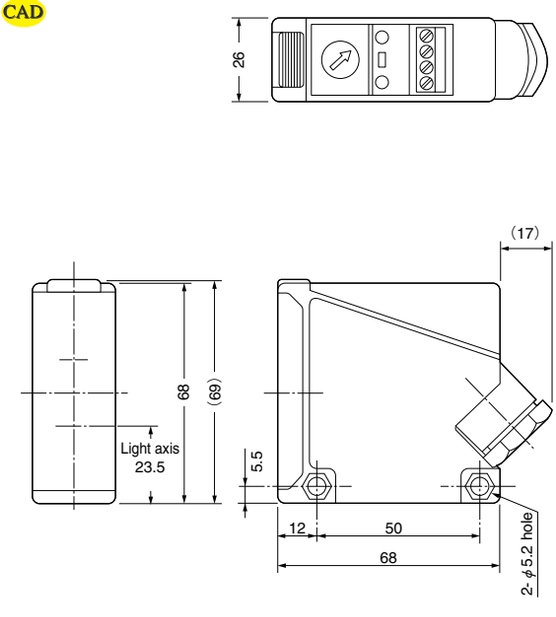
Rating/Performance/Specification

	Type	Long distance type (with terminal block)			
		Open collector output (amplifier integrated)		Relay output (AC/DC power supply type)	
	Model	**DL-S100TC**	**DL-S200TC**	**DL-S100P**	**DL-S200P**
Rating/performance	Detection method	Distance limited reflection			
	Detecting distance	0.2-1m *1	0.2-2m *1	0.2-1m *1	0.2-2m *1
	Power supply	12-24V DC ±10% / Ripple 10% or less		24-240V AC/DC ±10% 50/60Hz	
	Current consumption	30mA max.		DC power supply: 30 mA max. / AC power supply: 4 W max.	
	Output mode	NPN/PNP open collector 2 outputs Rating: current 100 mA (30 VDC) max. *2		Relay output 1a 3A 250 V 750 VA AC max. resistance load 3A 30 V 90 W DC max. resistance load	
	Operation mode	Light-ON/Dark-ON selectable (with switch)			
	Response time	10ms max.		20ms max.	
	Hysteresis	10% max of detecting distance			
Specification	Light source	Infrared LED (880 nm)*			
	Light-sensitive element	2-division photodiode			
	Indicator	OP.L: operation indicator (red LED) UP: stability indicator (green LED)			
	Volume (VR)	NEAR/FAR: Optical distance adjustment			
	Switch (SW)	Light-ON/Dark-ON selector switch L.ON: Light-ON D.ON: Dark-ON			
	Short circuit protection	Provided		———	
	Material	Body: polycarbonate / Front, terminal cover: acrylic			
	Connection	Terminal block			
	Mass	170 g max. (including mounting bracket)			
	Notes	*1 With 200×200mm white drawing paper *2 NPN: sink current / PNP: source current			

Dimensions (in mm)

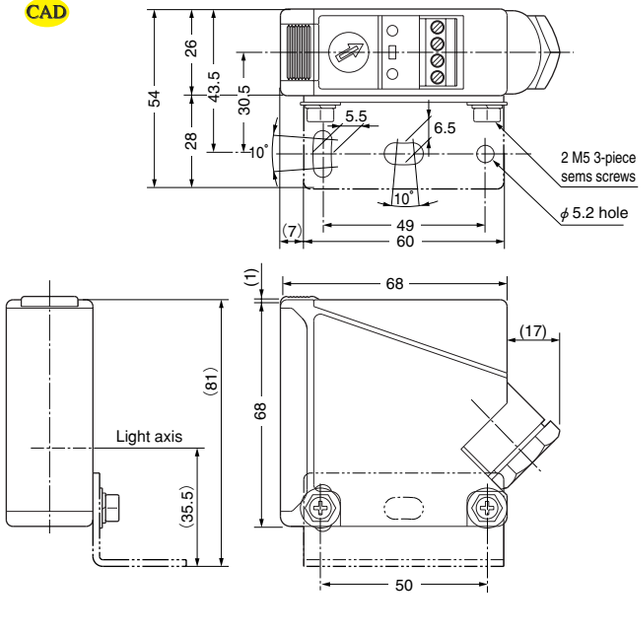
All models

CAD



With mounting bracket (accessory) provided

CAD



DLA series

Background suppression photo sensors

- Analog sensor less influenced by color or gloss of object
- Analog output available
- 2-stage comparator for long and short ranges for high-precision control (DLA-S300, -S1000, DSM-500)

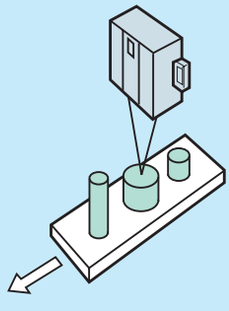
Type

Type/detection method		Detecting distance	Model	Operation mode	Output mode
Analog output	Diffuse-reflective type	50～150mm	**DLA-S150**	Output in proportion to distance	Analog output
		150～300mm	**DLA-S300**		Analog output/comparator output
		0.2～1m	**DLA-S1000**		
	Reflector type	0.5～6m	**DSM-500**		

Dimensions (in mm)

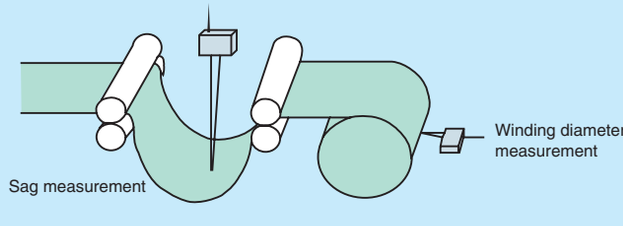
- Height check

  Works sorted according to height



- Film winding control

  ”Sag” and “winding diameter” of film measured to be used for inverter control for winding film at constant torque



Rating/Performance/Specification

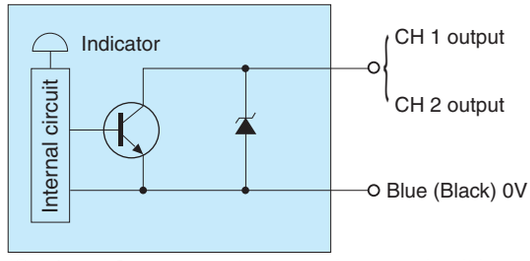
Rating/performance	Type		Distance measurement			Reflector measurement
			Short-range	Medium-range	Long-range	Long-range
	Model		**DLA-S150**	**DLA-S300**	**DLA-S1000**	**DSM-500**
	Detection method		Diffuse-reflective type			Reflector type
	Detecting distance		50-150mm *	150-300m *	0.2-1m *	0.5-6m
	Power supply		24V DC ±5% / Ripple 10% or less			
	Current consumption		60mA max.	70mA max.	100mA max.	70mA max.
	Output mode	Analog output	1 – 10V DC (output impedance: 1 KΩ)		3 – 9V DC (output impedance: 1 KΩ)	2 – 7.5V DC (output impedance: 1 KΩ)
		Comparator output	———	NPN open collector 2 outputs Rating: sink current 50 mA (30 V) max.		
	Operation mode		Output in proportion to distance			
Specification	Light source		Infrared LED			
	Light-sensitive element		PSD			
	Indicator		Power supply indicator (red LED)	Power supply indicator: green LED Operation indicator: red LED×4 Provided on front and back panels(CH1 / CH2)		
	Volume (VR)		———	For CH 1: short range For CH 2: long range		
	Connection		Permanently attached cord (ϕ 4) 2 m	Permanently attached cord (ϕ 6) 2 m		
	Mass		100g max.	350g max.		
	Notes		*With white and black paper			Reflector provided (model MR5)

Environmental Specification

Environment	Ambient light	1,000 lx max. (DSM500: 4000lx)
	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
	Shock	147 m/s2 / 3 times each in 3 directions
	Protective structure	IP40 (DLA-S150) IP66 (DLA-S300, -S1000) IP65 (DSM-500)

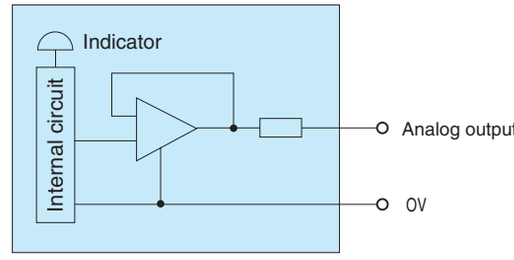
Input/Output Circuit and Connection

(Comparator output)



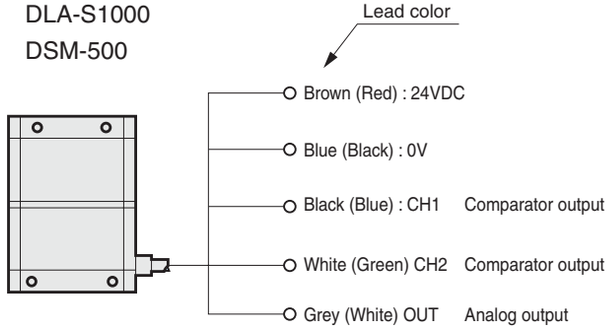
(CH 1 and 2 are two outputs sharing one circuit.)

(Analog output)



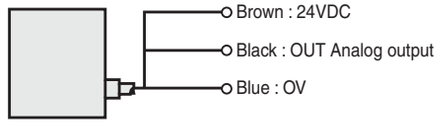
Connection

DLA-S300
DLA-S1000
DSM-500



(Colors in parentheses show lead colors for DSM-500.)

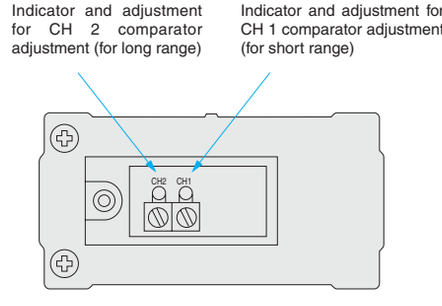
DLA-S150



(DLA-S150 does not have a comparator output.)

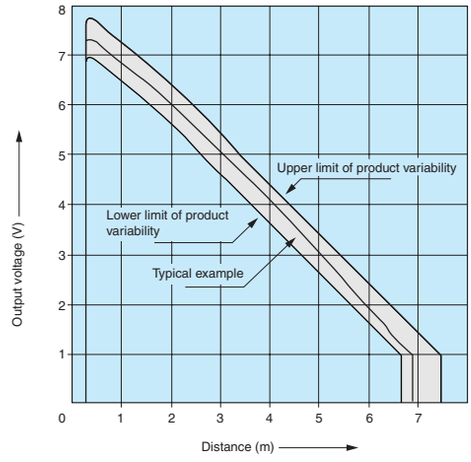
Comparator Output Adjustment (DLA-S300, -S1000, DSM-500)

Provide the detection object at the intended position and turn the adjustment for CH 1 until the LED for CH 1 is illuminated.
CH 1 stays activated at the position or closer to the sensor.
Adjust CH 2 in the same way.



Distance-Output Characteristics (Model DSM-500)

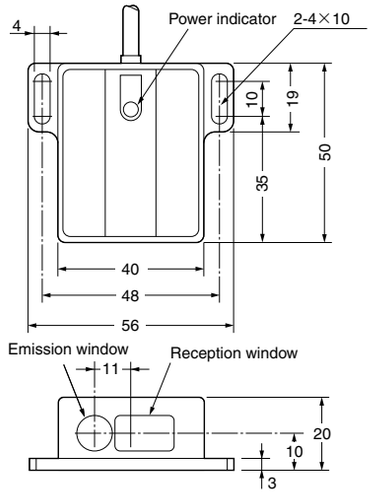
The plot at the center of the chart shows typical output characteristics. The range marked by the lines above and below shows that the output variation among different products is within the range. While the output at the same distance may vary within this range depending on the product, there is little output variation in repetitive operation of one product.

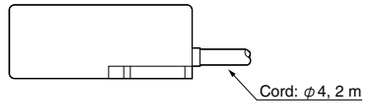


Dimensions (in mm)

DLA-S150

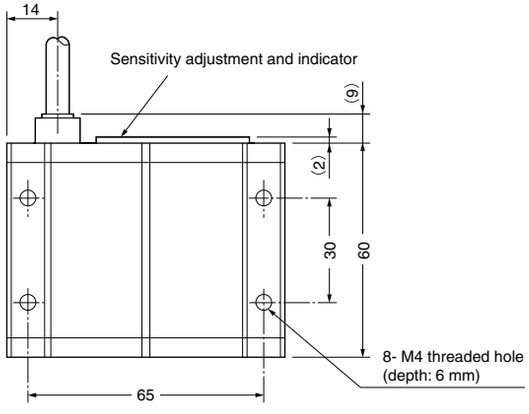
CAD





DLA-S300
DLA-S1000
DSM-500

CAD



(Reflector for DSM500: model MR5)