

280

Digital amplifier separate type

**DS** series

Contact Ramco for technical and application support

**Long Distance Laser Sensing**

Water resistant sensor head usable even  
in water-splashing areas

**Visible red laser light source**

Various sensor heads Coaxial  
reflective design

**Related  
products**

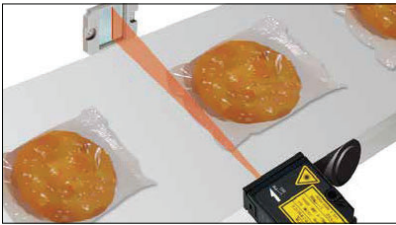
Fiber type

**D3RF**  
● P.110

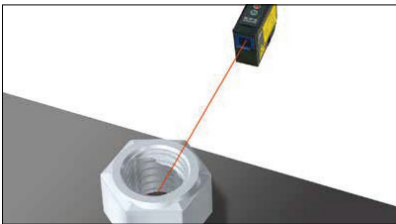
Built-in amplifier

**Z-L**  
● P.272
**High-accuracy height difference detection**  
**BGS-HL,**  
**BGS-HDL**  
 ● P.310


Confirmation of arrival of  
workpieces with complex shapes



Detection of thread for metal parts



Checking existence of small parts

**Selection table**

## ■ Sensor head

Type	Shape	Detection mode	Sensing distance <small>(Figures in parentheses are with sensitivity correction settings ON)</small>	Model <small>(Models in parentheses are connector types)</small>
Coaxial retro-reflective		Long	(0.2 to 20 m) 0 to 8 m	<b>DSR-800</b>
		Standard	0 to 5 m	
		Fast	0 to 2 m	
		Long	(1 to 70 m) 0.5 to 50 m	<b>DSR-5000</b>
		Standard	0.3 to 35 m	
		Fast	0.1 to 20 m	
Coaxial diffuse reflective		Long	(1.5 m) 1 m	<b>DSD-100</b>
		Standard	0.7 m	
		Fast	0.25 m	
Through-beam			2 m	<b>DSTC-200</b> (DSTC-200-M8)
Through-beam length measurement			2 m 0.5 m (length measurement mode)	<b>DSTA-200</b> (DSTA-200-M8)

Ramco Innovations  
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## Selection table

### Advanced function type amplifier unit

	Control output	Analog output	External input	Connection type	Model	
					NPN type	PNP type
Stand-alone type	2 ch	4 to 20 mA	Select from teaching, synchronization, laser off, or counter reset	Cable type 2 m	<b>D2SA-MNS</b>	<b>D2SA-MPS</b>
Inter-connection master					<b>D2SA-MN</b>	<b>D2SA-MP</b>
Inter-connection slave					<b>D2SA-SN</b>	<b>D2SA-SP</b>

### Standard type amplifier unit

	Control output	Analog output	External input	Connection type	Model	
					NPN type	PNP type
Stand-alone type	1 ch	-	-	Cable type 2 m	<b>D2SA-MN3S</b>	<b>D2SA-MP3S</b>
Inter-connection master					<b>D2SA-MN3</b>	<b>D2SA-MP3</b>
Inter-connection slave					<b>D2SA-SN1</b>	<b>D2SA-SP1</b>
Stand-alone type			Select from teaching, synchronization, laser off, or counter reset	M8 Connector type	<b>D2SA-MNS-M8</b>	<b>D2SA-MPS-M8</b>
Inter-connection master					<b>D2SA-MN-M8</b>	<b>D2SA-MP-M8</b>
Inter-connection slave					<b>D2SA-SN-M8</b>	<b>D2SA-SP-M8</b>

● For the connector type, please purchase an optional JCN series connector cable.

## Options/Accessories

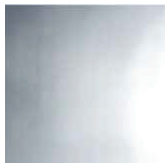
### Reflector



**MP-45**  
Included with DSR-800 and DSR-5000



**P250F**  
Included with DSR-5000



**MP-225**  
225 x 225 mm reflective sheet  
Can be cut to any size freely using scissors. (Adhesive type)

### Lens attachment



**BL-W130L-1**  
Line beam approx. 40 x 1 mm (at a distance of 300 mm)  
Area beam approx. 35 x 35 mm (at a distance of 300 mm)

### End plate



**BEF-EB01-W190**  
(2 pieces)

### Connector cables



**Straight**  
**JCN-S**  
Cable length: 2 m  
**JCN-5S**  
Cable length: 5 m  
**JCN-10S**  
Cable length: 10 m



**L-shaped**  
**JCN-L**  
Cable length: 2 m  
**JCN-5L**  
Cable length: 5 m  
**JCN-10L**  
Cable length: 10 m

### Extension cable for emitter

**DSCN-T3-M8**  
Cable length: 3 m  
Connects to the connector type through-beam type sensor head emitter, cable extends to 5 m.

### Extension cable for receiver

**DSCN-D3-M8**  
Cable length: 3 m  
Connects to the connector type through-beam type sensor head receiver, cable extends to 5 m.

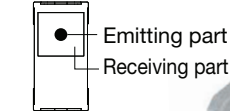
## Various sensor heads

Five types of sensor heads for various applications are available. Because the spot light size remains hardly changed at any distance, you don't have to worry about light spreading. Also, if a lens attachment is installed to a coaxial retro-reflective type, the beam can be focused as a line or spread across an area.

### Coaxial retro-reflective type: DSR-800

Sensing distance 8 m (Long mode)

Coaxial structure



(Front diagram)

Spot size  $\phi 2$  mm (at a distance of 2 m)

### Long range coaxial retro-reflective type: DSR-5000

Sensing distance 50 m (Long mode)

Spot size  $\phi 2$  mm (at a distance of 2 m)

◀ With lens attachment equipped

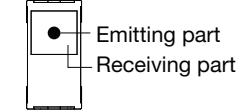
Spot size in line state approx.  $40 \times 1$  mm (300 mm)

Spot size in area state approx.  $35 \times 35$  mm (300 mm)

### Coaxial diffuse reflective type: DSD-100

Sensing distance 1 m (Long mode)

Coaxial structure



(Front diagram)

Spot size  $\phi 1$  mm  
(at a distance of 1 m)

○By using the analog output of the sensor amplifier, it is also possible to monitor the distance to the workpiece.

### Through-beam type: DSTC-200

Sensing distance 2 m (Long mode)

Spot size  $\phi 2$  mm  
(at a distance of 2 m)

### Through-beam/length measurement type: DSTA-200

Sensing distance  
500 mm (length measurement mode  
"Lnth", Long mode)  
2m (Long mode)

Spot size  $30 \times 2.5$  mm  
(at a distance of 1.5 m)

○By using the analog output of the sensor amplifier, it is also possible to monitor the width, size, etc., of the workpiece.

**\*Length measurement mode "Lnth" is equipped only on the advanced function type amplifier unit.**

### Degree of protection on IP67

All sensor heads have achieved a degree of protection on IP67. Sensor breakage will not occur even if direct contact with water is made.

\*Water or oil that adhere to the detection surface could cause light to refract and prevent detection from being performed correctly.

### Visible red laser

A visible red laser of laser class 2 is employed as the light source (through-beam type and through-beam/length measurement type are Class 1). Since the spot light can be seen, adjustment of the light axis is simple.

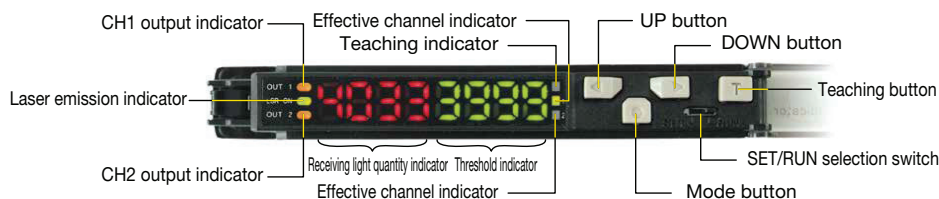
### Sensitivity correction setting function

When higher receiving light quantity and longer sensing distances are necessary, the receiving sensitivity can be corrected by turning ON the sensitivity correction setting, which will enable stable detection to be performed.

## Operation

### Dual display

Displaying the threshold and receiving light quantity side by side enables sensitivity adjustments to be performed quickly and easily.



### By linking master and slave units, wiring can be reduced and cross-talk can be prevented (inter-connection types only)

Connecting up to 4 amplifiers, stable detection with reduced wiring and no cross talk is possible. (Up to 8 units can be connected if cross-talk prevention is not used)

In addition, connecting with the fiber amplifier D2RF series is also possible.

\*For the response time when connected, set Long mode or Standard mode.



### Counter function

Features a built-in counter function in which the output turns ON when the count value reaches the preset number.

Counter resets can also be input externally.



## Extensive input and output

### External Teaching input

Teaching can be performed externally without operating the sensor unit.

### Synchronous input

Output signals from another sensor can be directly input to the sensor amplifier as simultaneous signals.

### Laser OFF input

Laser can be turned to OFF except when necessary. (Excluding standard type amplifier unit cable type)

### Equipped with two control outputs and one analog output.

Advanced function type amplifier units D2SA-MNS, D2SA-MN and D2SA-SN are equipped with two control outputs and one 4 to 20 mA analog output. Precise control depending on the receiving light quantity can be performed by one amplifier.

## Specifications

### ■ Sensor head

Type		Coaxial retro-reflective type	Long range coaxial retro-reflective type	Coaxial diffuse reflective type
Model	Cable type	<b>DSR-800</b>	<b>DSR-5000</b>	<b>DSD-100</b>
	Connector type	—	—	—
Sensing distance	Long mode	0 to 8 m <sup>*1</sup> (With sensitivity correction settings ON: 0.2 to 20 m)	0.5 to 50 m <sup>*2</sup> (With sensitivity correction settings ON: 1 to 70 m)	1 m (With sensitivity correction settings ON: 1.5 m) <sup>*3</sup>
	Standard mode	0 to 5 m <sup>*1</sup>	0.3 to 35 m <sup>*2</sup>	0.7 m <sup>*3</sup>
	Fast mode	0 to 2 m <sup>*1</sup>	0.1 to 20 m <sup>*2</sup>	0.25 m <sup>*3</sup>
Spot size		Approx. ø2 mm / at a distance of 2 m	Approx. ø2 mm / at a distance of 2 m	Approx. ø1 mm / at a distance of 1 m
Light source		Red semiconductor laser (650 nm 3 mW max Class 2 <IEC/JIS> <sup>*4</sup> )		
Indicators		Laser emission indicator (green LED) Output indicator (orange LED)		
Connection with amplifier		Cable with system specific plug (e-CON)		
Applicable regulations		EMC directive (2004/108/EC) / FDA regulations (21 CFR 1040.10)		
Applicable standards		EN 60947-5-7		
Company standards		Noise resistance: Feilen Level 3 cleared		
Environmental resistance	Ambient temperature/humidity	-10 to +55°C (no freezing) / 35 to 85% RH (no condensation)		
	Ambient illuminance	Sunlight: 10,000 lx Incandescent lamp: 3000 lx		
	Vibration resistance	10 to 55 Hz; double amplitude 1.5 mm; 2 hours in each of the X, Y, and Z directions		
	Shock resistance	Approx. 50 G (500 m/s <sup>2</sup> ); 3 times in each of the X, Y, and Z directions		
Degree of protection/materials		IEC regulation IP67 Housing, cover: PC Window: PMMA (glass fiber filled)		
Weight (including cable)		45 g		
Included accessories		Reflector: MP-45	Reflector: MP-45 and P250F	—

\*1. Sensing distance when using the lens attachment BL-W130L-1 is as follows.

Line beam, Long mode: 2 m / Standard mode: 1.5 m / Fast mode: 1 m

Area beam, Long mode: 1.5 m / Standard mode: 1 m / Fast mode: 0.6 m

\*2. DSR-5000 includes two reflectors; P250F and MP-45.

Sensing distances in the table are when using P250F. The sensing distances when using MP-45 are as follows.

Long mode: 0.5 m to 20 m / Standard mode: 0.3 m to 10 m / Fast mode: 0.1 to 5 m

\*3. Using a 200 × 200 mm white sheet of paper.

\*4. Classified as Class II in the US FDA standards.

Note) The measurement condition is at an ambient temperature of +24°C (normal temperature) unless otherwise designated.

## ■ Sensor head

Type		Through-beam type	Through-beam/length measurement type
Model	Cable type	<b>DSTC-200</b>	<b>DSTA-200</b>
	Connector type	<b>DSTC-200-M8</b>	<b>DSTA-200-M8</b>
Sensing distance	Long mode	2 m	2 m 0.5 m: Length measurement mode*1
	Standard mode		
	Fast mode		
Spot size		Approx. ø2 mm / at a distance of 2 m	Approx. 30 × 2.5 mm / at a distance of 2 m
Light source		Red semiconductor laser (650 nm 390 μW max Class 1 <IEC/JIS>*2)	
Indicators		Laser emission indicator (green LED) Output indicator (orange LED)	
Connection with amplifier		Cable type: Cable with system specific plug (e-CON) / Connector type: Dedicated M8 connector cable with system specific plug (e-CON)	
Applicable regulations		EMC directive (2004/108/EC) / FDA regulations (21 CFR 1040.10)	
Applicable standards		EN 60947-5-7	
Company standards		Noise resistance: Feilen Level 3 cleared	
Environmental resistance	Ambient temperature/humidity	-10 to +55°C (no freezing) / 35 to 85% RH (no condensation)	
	Ambient illuminance	Sunlight: 10,000 lx Incandescent lamp: 3000 lx	
	Vibration resistance	10 to 55 Hz; double amplitude 1.5 mm; 2 hours in each of the X, Y, and Z directions	
	Shock resistance	Approx. 50 G (500 m/s <sup>2</sup> ); 3 times in each of the X, Y, and Z directions	
Degree of protection/materials		IEC regulation IP67 Housing, cover: PC Window: PMMA (glass fiber filled)	
Weight (including cable)		90 g	115 g
Included accessories		Dedicated M8 connector cable with system specific plug (e-CON) (connector type only)	

\*1. For the response time when in length measurement mode, set Long mode or Standard mode. In addition, use an advanced function type for the amplifier unit.

\*2. Classified as Class II in the US FDA standards.

Note) The measurement condition is at an ambient temperature of +24°C (normal temperature) unless otherwise designated.

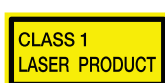
## Notes for sensor usage

**Warning**

Do not look directly at the laser or intentionally shine the laser beam in another person's eyes. Doing so may cause damage to the eyes or health.



DSR-800  
DSR-5000  
DSD-100



DSTC-200  
DSTC-200-M8  
DSTA-200  
DSTA-200-M8

■ Regarding the laser label, this product emits a Class 2 (II) visible laser beam that is compliant with JIS C6802/IEC/FDA laser safety standards. A CLASS 2/CLASS II warning label and explanation label (English) is affixed to the side of the sensor head.

\* The DSTC-200/-M8/DSTA-200/-M8 emitters DSTC-D/DSTA-D and DSTC-S/DSTA-S are Class II in FDA standards (when exported to the United States), but are Class 1 according to JIS/IEC standards, so change the label that they are packaged with for use.



## Specifications

### ■ Advanced function type amplifier

Type			Stand-alone type	Inter-connection master	Inter-connection slave
Model	NPN	Cable type	D2SA-MNS	D2SA-MN	D2SA-SN
	PNP		D2SA-MPS	D2SA-MP	D2SA-SP
Response time			60 μs (Fast mode)* <sup>1</sup> / 500 μs (Standard mode) / 2 ms (Long mode)		
Distance adjustment			Teaching / manual adjustment		
Indicators			Laser emission indicator (green LED) Output CH1 and CH2 indicator (orange LED) Teaching indicator (red LED) Channel CH1 and CH2 indicator (green LED)		
Digital display			7-segment, 8-digit display		
I/O settings			Input settings (select from teaching* <sup>2</sup> , synchronization, laser off, or counter reset) Output settings (CH2 output can be set for use as control output or an alarm output)		
Control output			NPN/PNP Open collector MAX. 100 mA/30 VDC		
Analog output			4 to 20 mA* <sup>3</sup> (usable in Long mode or Standard mode)		
Timer function			OFF delay / ON delay / one-shot / no display 1 ms to 9 s (adjustment is possible in 1 ms increments)		
Output mode			Light ON / Dark ON function switching		
Connection type			Cable type: Cable length: 2 m (ø3.8 mm)		
Insulation resistance			20 MΩ or more (with 500 VDC)		
Rating	Supply voltage		12 to 24 VDC ±10%, including 10% ripple (p-p)		
	Current consumption		45 mA or less (at 24 V)		
Applicable regulations			EMC directive (2004/108/EC)		
Applicable standards			EN 60947-5-7		
Company standards			Noise resistance: Feilen Level 3 cleared		
Environmental resistance	Ambient temperature/humidity		-25 to +55°C* <sup>4</sup> (no freezing) / 35 to 85% RH (no condensation)		
	Vibration resistance		10 to 55 Hz; double amplitude 1.5 mm; 2 hours in each of the X, Y, and Z directions		
	Shock resistance		Approx. 50 G (500 m/s <sup>2</sup> ); 3 times in each of the X, Y, and Z directions		
	Degree of protection/materials		IEC regulation IP50 Housing, cover: PC		
Weight			Cable type: Approx. 65 g (including cable)		
Included accessories			Mounting bracket		

\*1. For the response time when connected, set Long mode or Standard mode.

\*2. External teaching is a teaching mode set in the amplifier main unit and executed in advance.

\*3. Load impedance 300 Ω or less

\*4. Total No. of connectable units when including the master unit: 1 to 3 units. -25 to +50°C when linking a total of 4 to 8 units.

## ■ Standard type amplifier

Type			Stand-alone type	Inter-connection master	Inter-connection slave
Model	NPN	Cable type	D2SA-MN3S	D2SA-MN3	D2SA-SN1
		Connector type	D2SA-MNS-M8	D2SA-MN-M8	D2SA-SN-M8
	PNP	Cable type	D2SA-MP3S	D2SA-MP3	D2SA-SP1
		Connector type	D2SA-MPS-M8	D2SA-MP-M8	D2SA-SP-M8
Response time			60 μs (Fast mode) <sup>*1</sup> / 500 μs (Standard mode) / 2 ms (Long mode)		
Distance adjustment			Teaching / manual adjustment		
Indicators			Laser emission indicator (green LED) Output indicator (orange LED) Teaching indicator (red LED) Channel indicator (green LED)		
Digital display			7-segment, 8-digit display		
I/O settings			Select from teaching <sup>*2</sup> , synchronization, laser off, or counter reset (Can be set for connector types only)		
Control output			NPN/PNP Open collector MAX. 100 mA/30 VDC		
Analog output			—		
Timer function			OFF delay / ON delay / one-shot / no display 1 ms to 9 s (adjustment is possible in 1 ms increments)		
Output mode			Light ON / Dark ON function switching		
Connection type			Cable type: Cable length: 2 m (ø3.8 mm), Connector type: M8, 4-pin		
Insulation resistance			20 MΩ or more (with 500 VDC)		
Rating	Supply voltage		12 to 24 VDC ±10%, including 10% ripple (p-p)		
	Current consumption		45 mA or less (at 24 V)		
Applicable regulations			EMC directive (2004/108/EC)		
Applicable standards			EN 60947-5-2		
Company standards			Noise resistance: Feilen Level 3 cleared		
Environmental resistance	Ambient temperature/humidity		-25 to +55°C <sup>*3</sup> (no freezing) / 35 to 85% RH (no condensation)		
	Vibration resistance		10 to 55 Hz; double amplitude 1.5 mm; 2 hours in each of the X, Y, and Z directions		
	Shock resistance		Approx. 50 G (500 m/s <sup>2</sup> ); 3 times in each of the X, Y, and Z directions		
	Degree of protection/materials		IEC regulation IP50 Housing, cover: PC		
Weight			Cable type: Approx. 65 g (including cable)		
Included accessories			Mounting bracket		

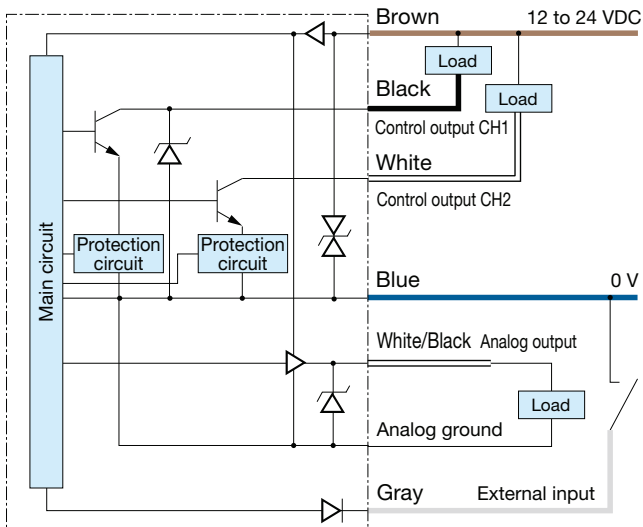
\*1. For the response time when connected, set Long mode or Standard mode.

\*2. External teaching is a teaching mode set in the amplifier main unit and executed in advance.

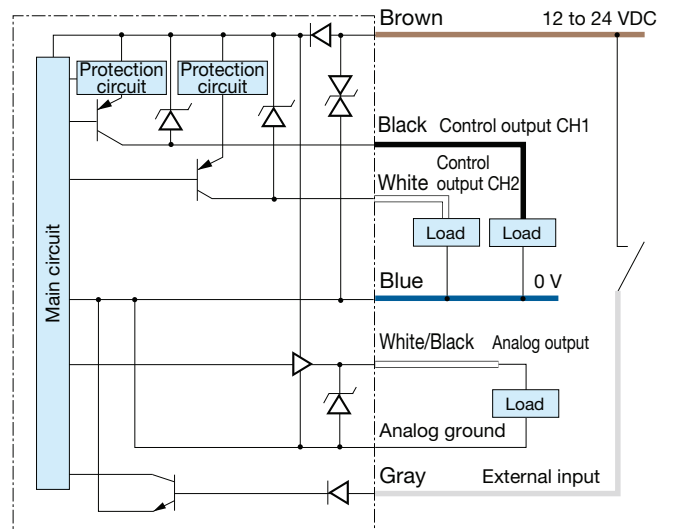
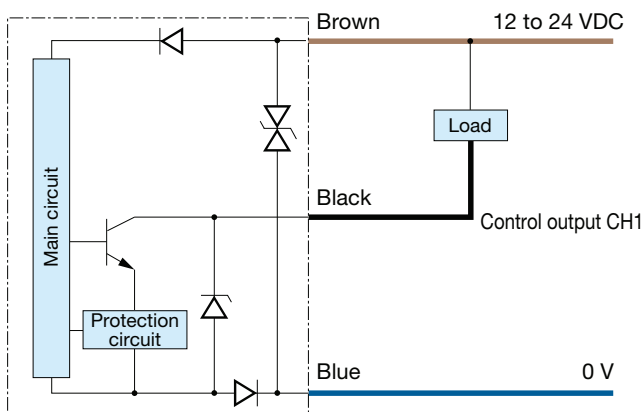
\*3. Total No. of connectable units when including the master unit: 1 to 3 units. -25 to +50°C when linking a total of 4 to 8 units.

● For the connector type, please purchase an optional JCN series connector cable.

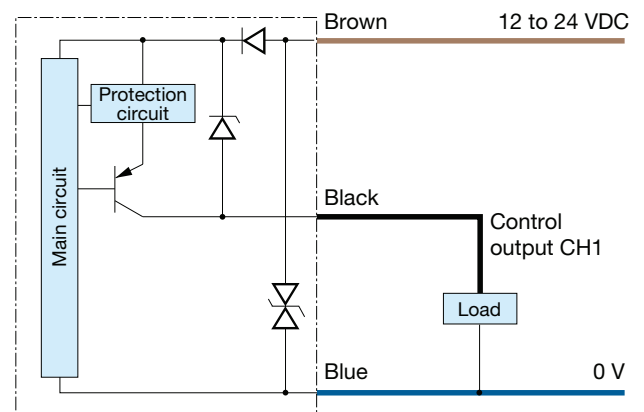


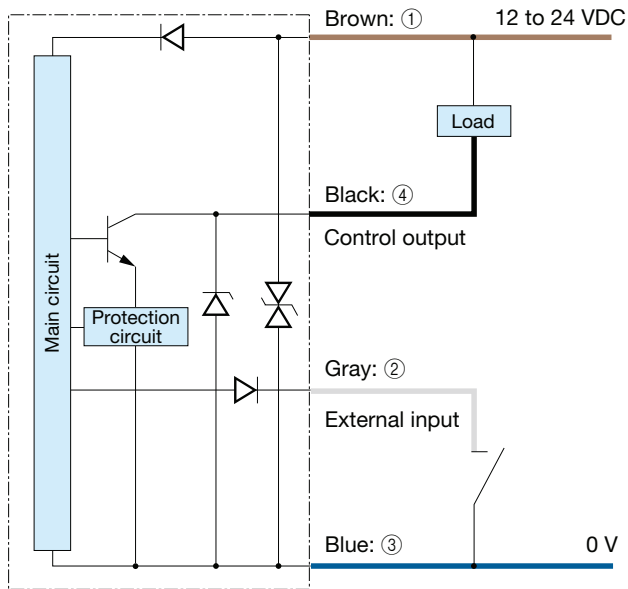
**I/O circuit diagram****D2SA-M□S, D2SA-M□, D2SA-S□**■ **NPN output type**

\*The D2SA-S□□ slave unit does not have power supply wires (brown/blue) because power is supplied from the master unit.

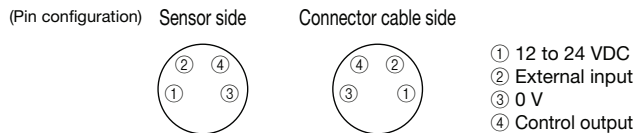
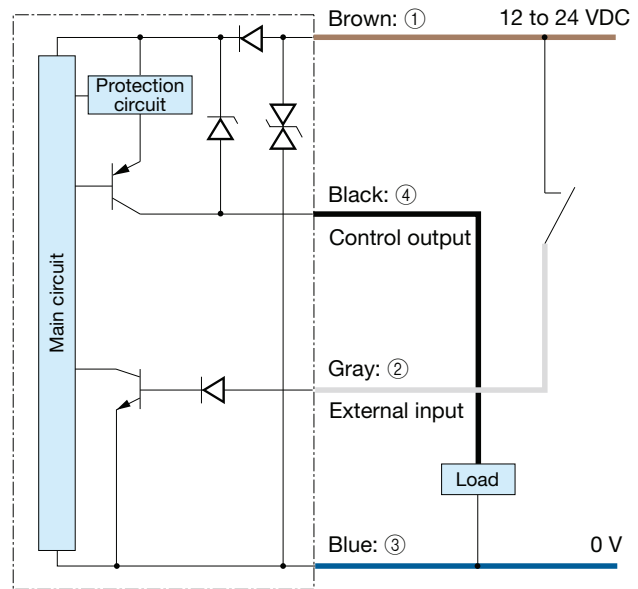
■ **PNP output type****D2SA-M□3S, D2SA-M□3, D2SA-S□1**■ **NPN output type**

\*The D2SA-S□□ slave unit does not have power supply wires (brown/blue) because power is supplied from the master unit.

■ **PNP output type**

**D2SA-M□S-M8, D2SA-M□-M8, D2SA-S□-M8**■ **NPN output type**

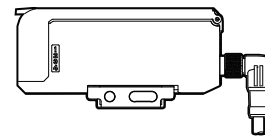
\*The D2SA-S□-M8 slave unit does not have power supply wires (brown/blue) because power is supplied from the master unit.

■ **Connector type**■ **PNP output type****Connecting**

- When not used for external input, cut the lead wire and wrap it individually with insulating tape, and do not connect it to any other terminal.
- ① to ④ correspond to connector pin No.

**Notes**

- Connect frame ground to the earth when the switching regulator is used for power supply.
- Because wiring sensor wires with high-voltage wires or power supply wires can result in malfunctions due to noise, which can cause damage, make sure to wire separately.
- Avoid using the transient state while the power is on (approx. 100 ms).
- The connector direction is fixed as the drawing below when you use L-shaped connector cable. Be aware that rotation is not possible.

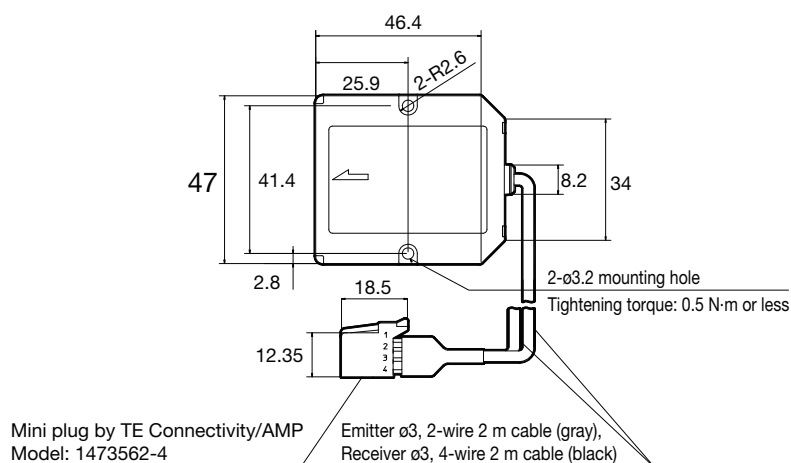
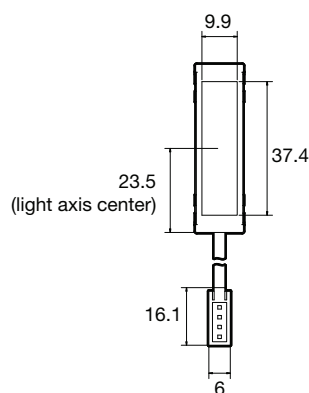
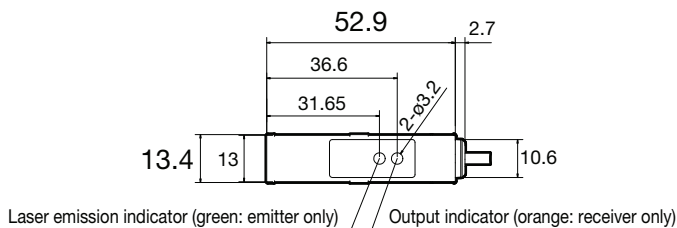


## Dimensions

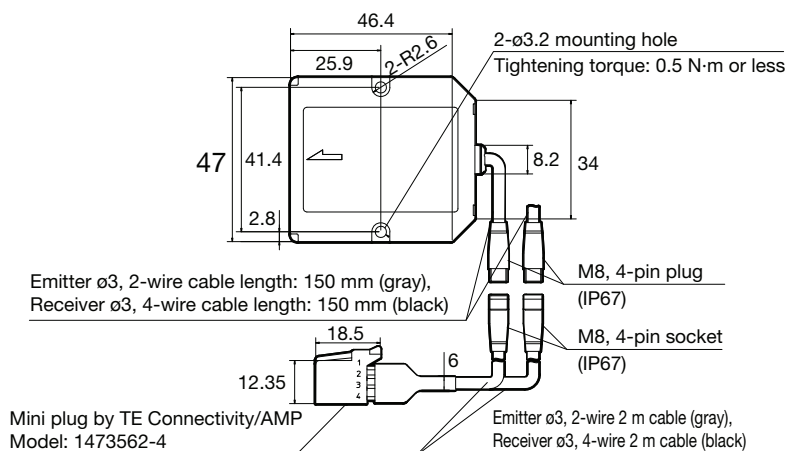
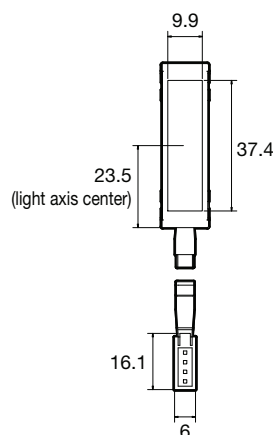
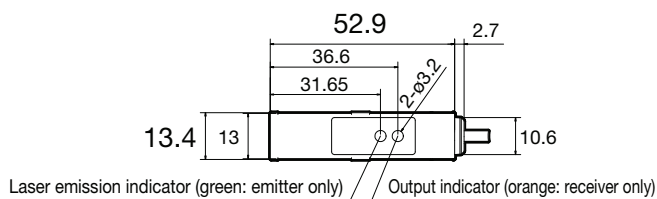
### Sensor head

(Unit: mm)

#### ■ DSTA-200

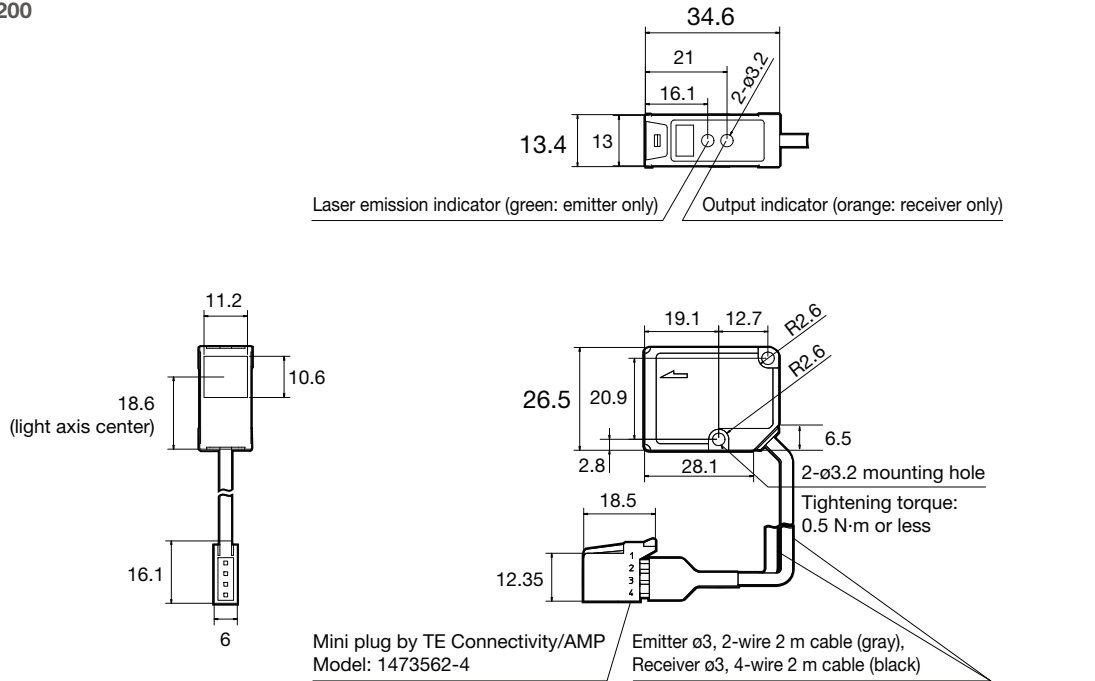


#### ■ DSTA-200-M8

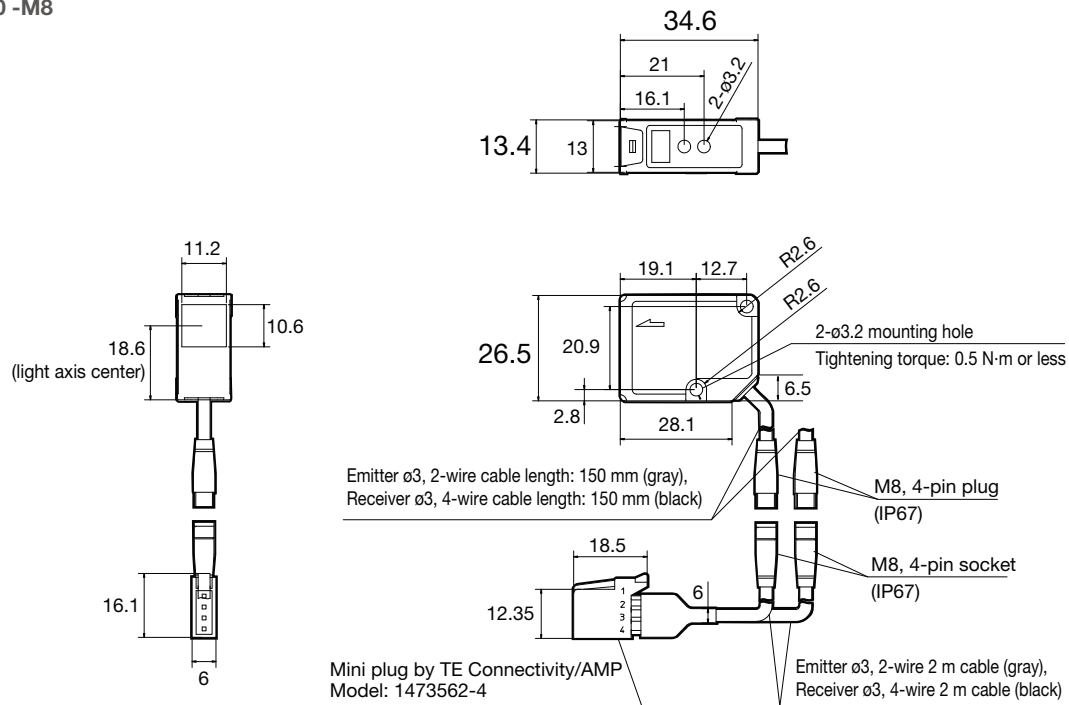


■ DSTC-200

(Unit: mm)



■ DSTC-200 -M8

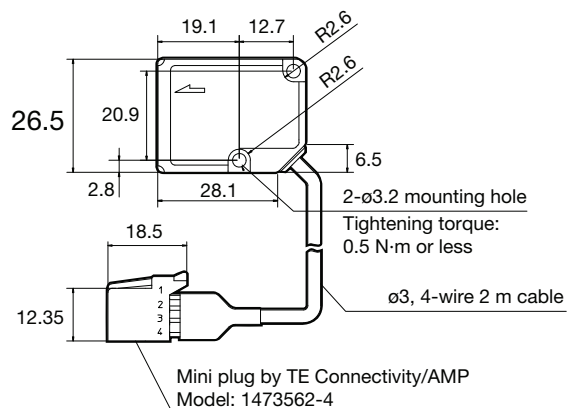
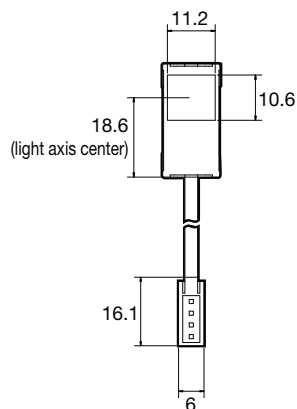
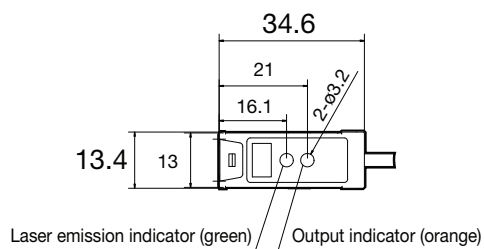


## Dimensions

### Sensor head

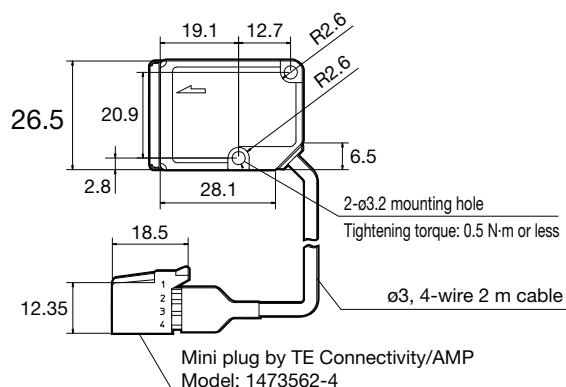
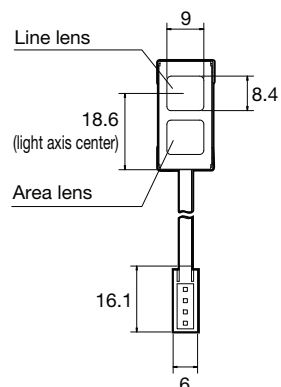
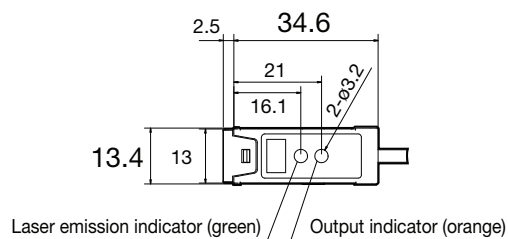
■ DSR-800/DSR-5000/DSD-100

(Unit: mm)



### Lens attachment diagram

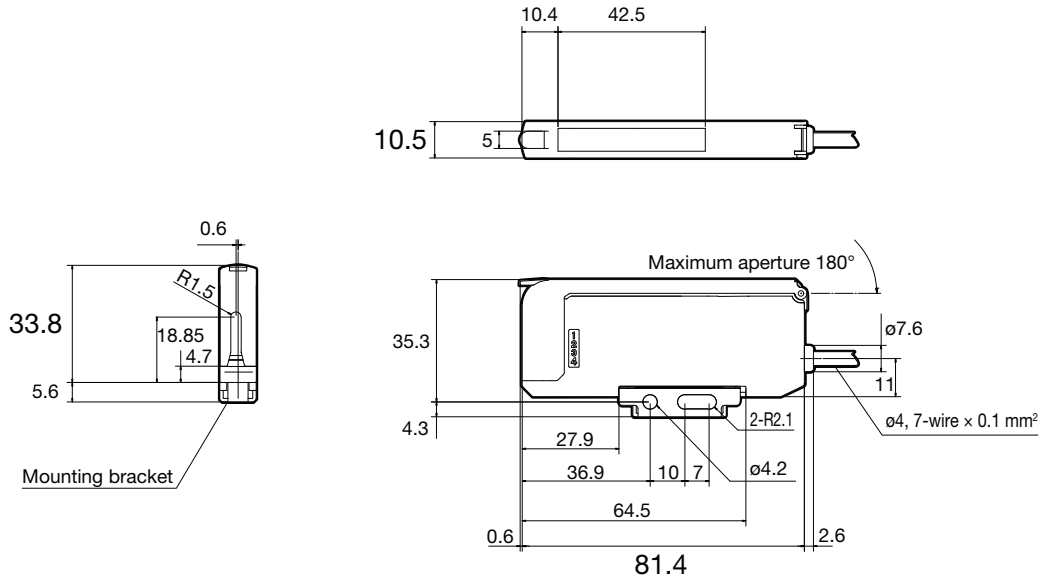
■ DSR-800+BL-W130L-1



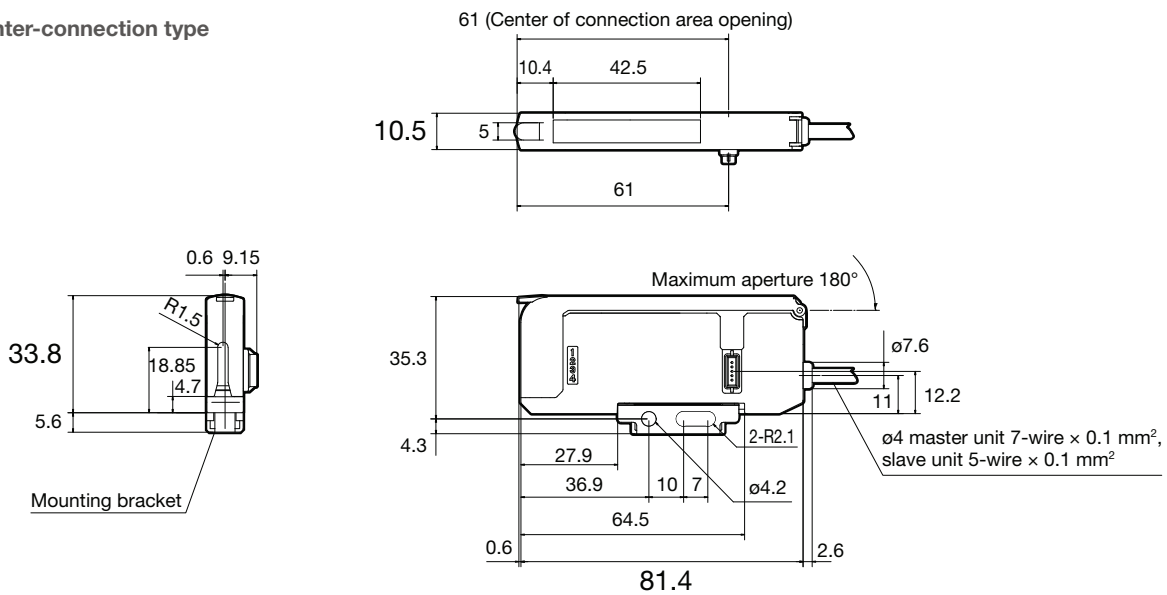
## Amplifier unit

(Unit: mm)

### ■ D2SA Stand-alone type



### ■ D2SA inter-connection type



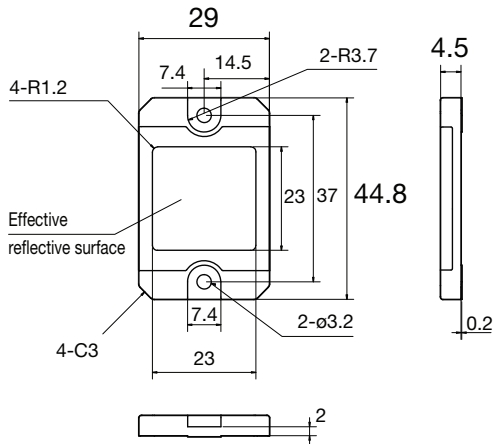


## Dimensions

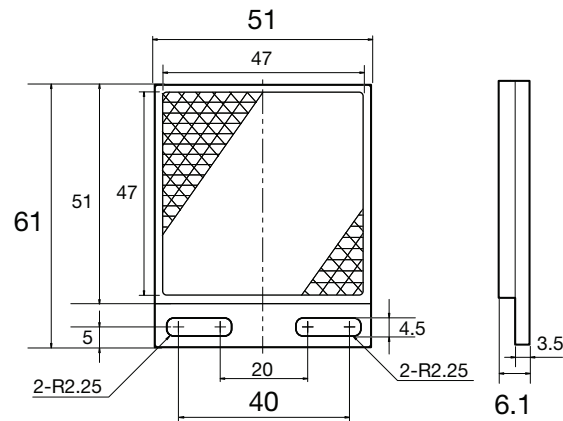
### Reflective sheet

(Unit: mm)

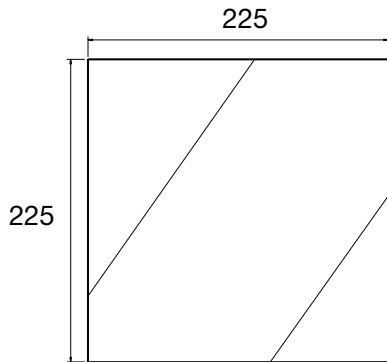
#### ■ MP-45 (included with DSR-800 and DSR-5000)



#### ■ P250F (included with DSR-5000)

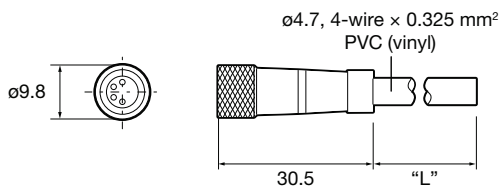


#### ■ MP-225 (optional)

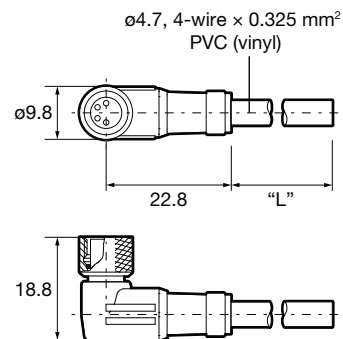


### Connector cable (optional)

#### ■ JCN-S, JCN-5S, JCN-10S

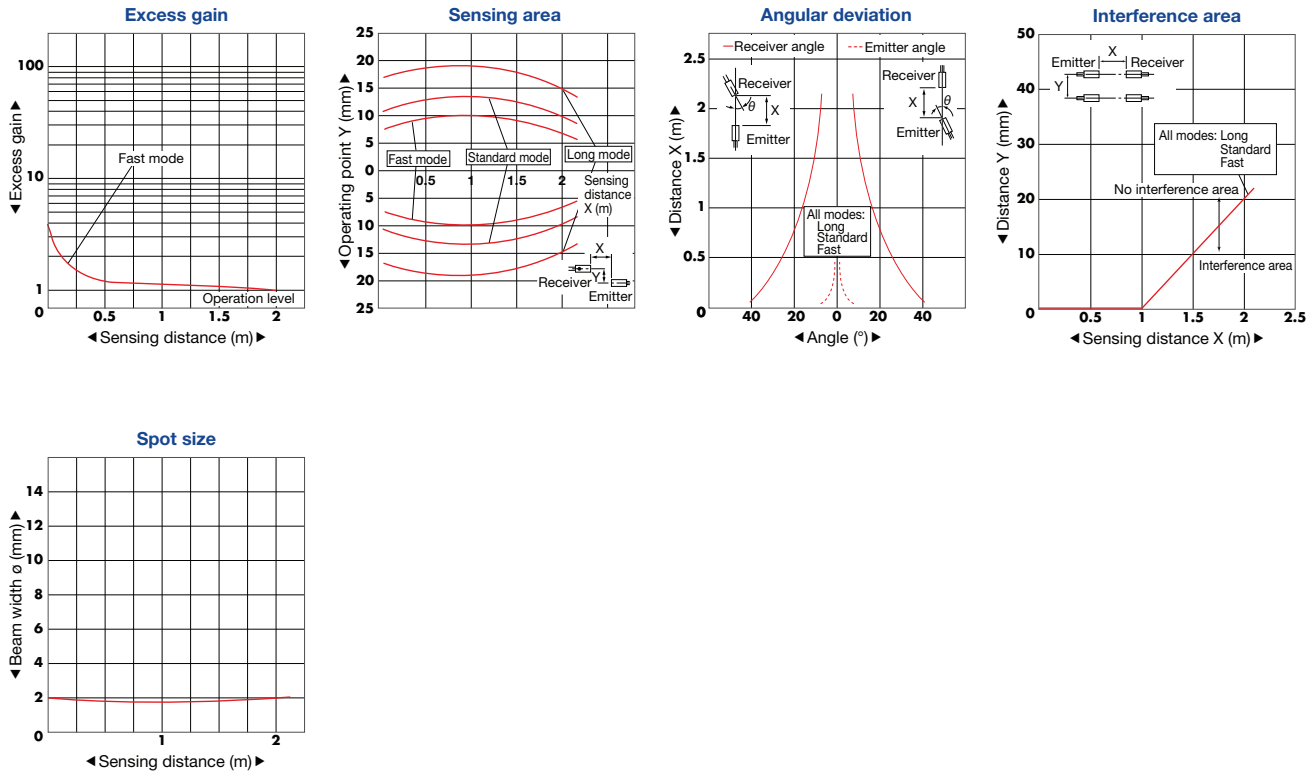
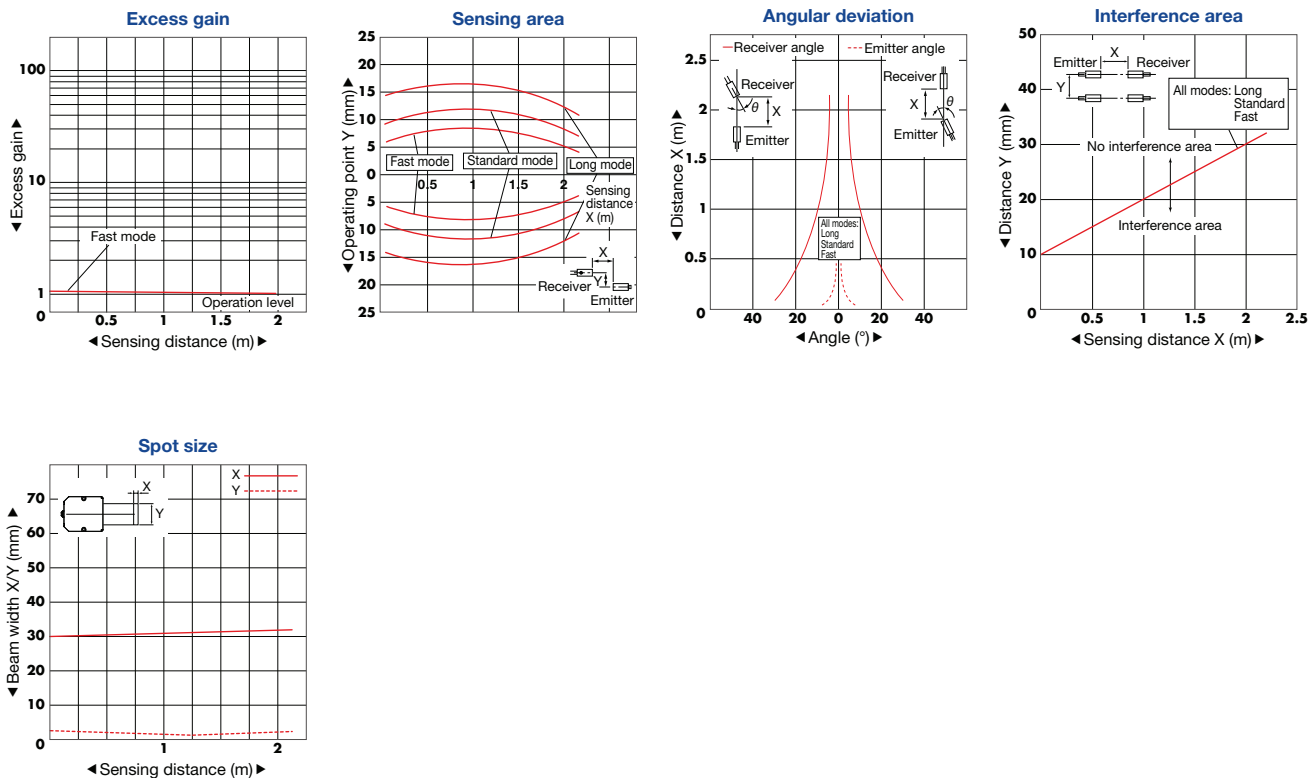


#### ■ JCN-L, JCN-5L, JCN-10L



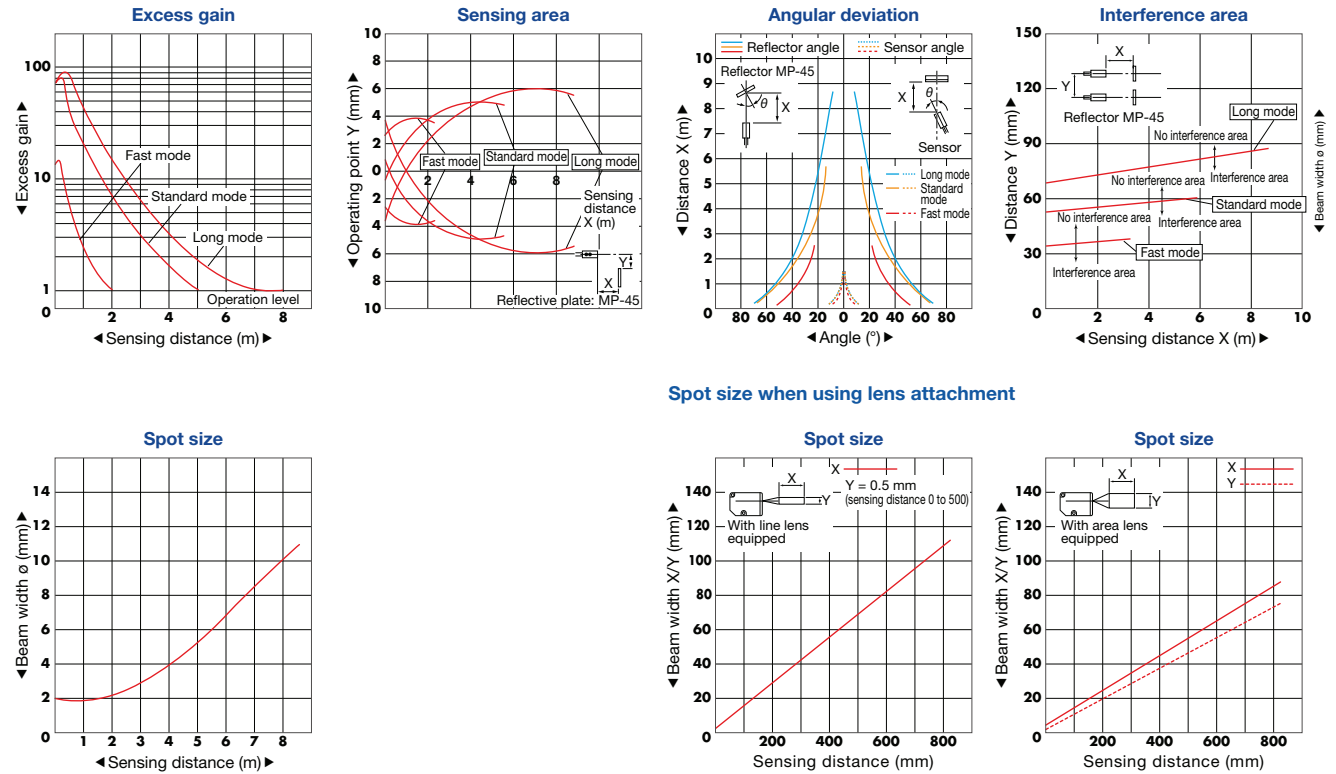
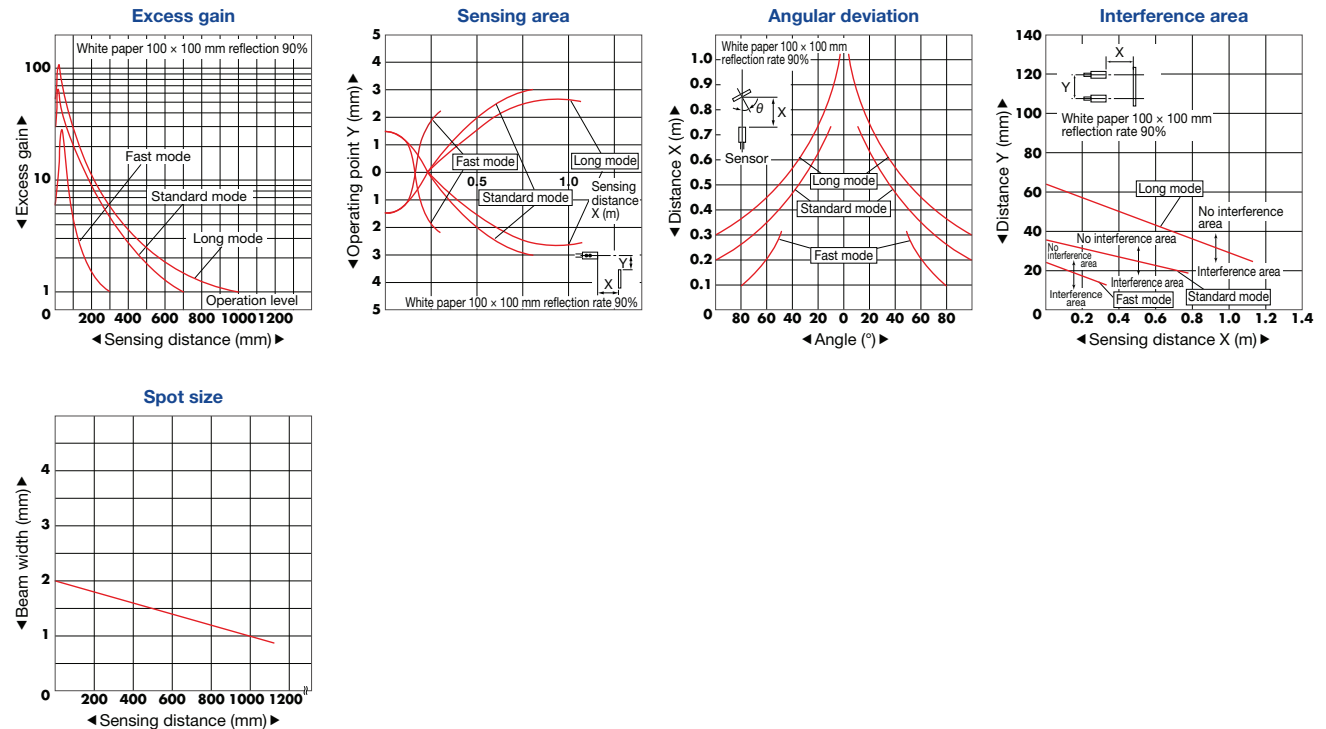
## Typical characteristic data

\*Contact us for any other characteristic data that may be required.

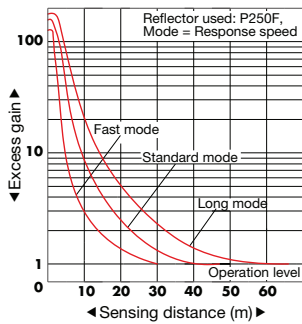
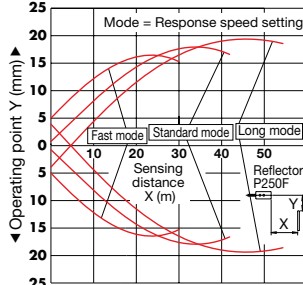
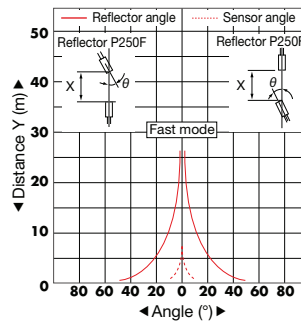
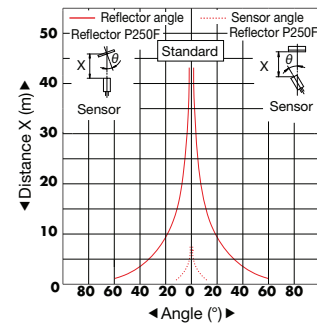
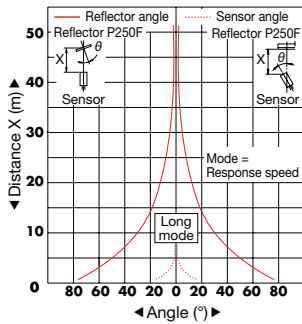
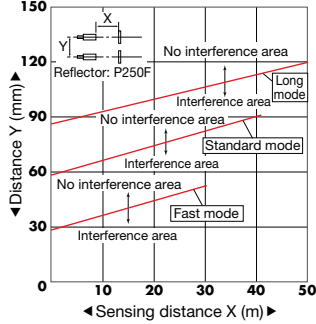
**DSTC-200****DSTA-200**

## Typical characteristic data

\*Contact us for any other characteristic data that may be required.

**DSR-800****DSD-100**

\*Interference area data are of cases where 5 amplifiers or more are linked or not link-connected.

**DSR-5000****Excess gain****Sensing area****Angular deviation: Fast mode****Angular deviation: Standard mode****Angular deviation: Long mode****Interference area****Spot size**