

# Panasonic INSTRUCTION MANUAL

Photoelectric Sensor

Ultra-compact type

## EX-20 Series

MEUEN-EX20 V2.0

Thank you for purchasing products from Panasonic Electric Works SUNX Co., Ltd. Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Kindly keep this manual in a convenient place for quick reference.

### WARNING

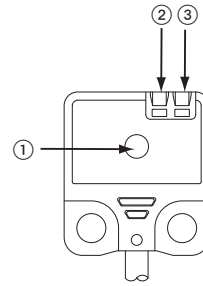
- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

## 1 CAUTIONS

- This product has been developed / produced for industrial use only.
- A thin 0.1mm<sup>2</sup> cable is used for this product. Do not use excessive force when pulling on the cable: it may cause cable to break.
- EX-24□(-PN) types are not incorporated with a sensitivity adjuster. Maintain adequate distance from reflective objects in the background, e.g. conveyors, since they may adversely effect sensing.
- If a reflective object is present in the background, the sensing of EX-28□A(-PN) may be affected. When setting up the sensor, confirm that the reflective object has no effect. If the reflective object affects sensing, removing the reflective object, color it black, or take other appropriate measures.
- If sensors are mounted close together and the ambient temperature is near the maximum rated value, provide for enough heat radiation / ventilation.
- Make sure that the power supply is off while wiring.
- Incorrect wiring will damage the sensor.
- Verify that the supply voltage including the ripple is within the rating. Verify that the supply voltage variation is within the rating.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this product, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- You can extend the cable up to 50m max. with 0.3mm<sup>2</sup> or more cable for both emitter and receiver (thru-beam types). However, in order to reduce noise, make the wiring as short as possible.
- Do not use during the initial transient time (0.5s) after the power supply is switched on.
- Ensure that the sensor is not directly exposed to the following light sources as they may adversely effect sensing performance: fluorescent light from a rapid-starter lamp, a high frequency lighting device, sunlight etc.
- Do not apply stress directly to the sensor cable joint by forcibly bending or pulling.
- This sensor is suitable for indoor use only.
- Avoid dust, dirt and steam. Do not use this sensor in places having excessive vapor, dust, etc., or where it may come in direct contact with water or corrosive gas.
- Take care that the sensor does not come in contact with oil, grease, organic solvents such as thinner, etc., strong acid, or alkalines.

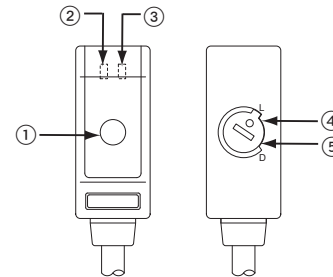
## 2 PART DESCRIPTION

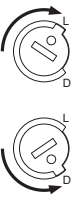
EX-21□



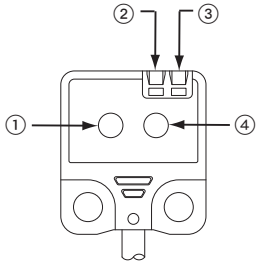
No.	Part	Description
1	Beam axis	
2	Stability indicator (green)	<b>Receiver only.</b> Lit when detection is stable according to the parameters set.
3	Operation indicator (orange)	<b>Receiver only.</b> Lit when the output is ON.

EX-23□



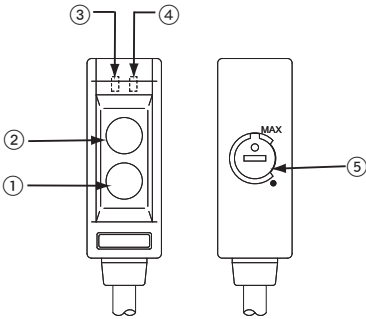
No.	Part	Description
1	Beam axis	
2	Stability indicator (green)	<b>Receiver only.</b> Lit when detection is stable according to the parameters set.
3	Operation indicator (orange)	<b>Receiver only.</b> Lit when the output is ON.
4	Operation mode switch	<b>Receiver only.</b> <ul style="list-style-type: none"> <li>• L: Light-ON Turn the operation mode switch fully clockwise until it stops.</li> <li>• D: Dark-ON Turn the operation mode switch fully counterclockwise until it stops.</li> </ul> 
5	Sensitivity adjuster	<b>Emitter only.</b> Sensing range increased when turned clockwise. See "SENSITIVITY ADJUSTMENT" on page 2.

EX-24□



No.	Part	Description
1	Receiver	
2	Stability indicator (green)	Lit when detection is stable according to the parameters set.
3	Operation indicator (orange)	Lit when the output is ON.
4	Emitter	

EX-22□, EX-26□, EX-28□, EX-29□



No.	Part	Description
1	Emitter	
2	Receiver	
3	Stability indicator (green)	Lit when detection is stable according to the parameters set.
4	Operation indicator (orange)	Lit when the output is ON.
5	Sensitivity adjuster	Sensing range increased when turned clockwise. See "SENSITIVITY ADJUSTMENT" on page 2.

### 3 SENSITIVITY ADJUSTMENT

To understand sensitivity adjustment, you must first understand the difference between the "light received" and the "dark" condition.

Do not confuse the "light received" and "dark" condition with the operation modes "Light-ON" and "Dark-ON"!

Sensor type	Light received condition	Dark condition
<b>Thru-beam</b>		
<b>Retroreflective</b>		

Sensor type	Light received condition	Dark condition
<b>Diffuse reflective</b>		
<b>Convergent reflective, Narrow view reflective</b>		

Relation between output and indicators

Light-ON			Dark-ON			
Stability indicator	Operation indicator	Output	Sensing condition	Output	Operation indicator	Stability indicator
☀	☀	ON	Stable light	OFF	●	☀
●	●		Unstable light			●
☀	●	OFF	Unstable dark	ON	☀	●
●	☀		Stable dark			☀

☀ = lit, ● = unlit

**Procedure**

This procedure assumes that "Light-ON" is set for the operation mode. If "Dark-ON" is the operation mode, the output will behave the other way around.

➡ Use the accessory screwdriver and turn the adjuster slowly. Using excessive force will damage the adjuster.

➡ When using EX-22□(-PN) at a sensing range of 50mm or less, the sensitivity adjustment range is extremely narrow.

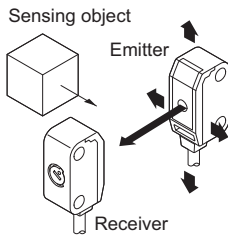
Step	Sensitivity adjuster	Description
1		Turn the sensitivity adjuster fully counter-clockwise to the minimum sensitivity position (●).
2		In the "light received" condition, turn the sensitivity adjuster slowly clockwise to find point A where the sensor output turns ON.*1
3		In the "dark" condition, turn the sensitivity adjuster clockwise until the sensor output turns ON.*1 Turn it back slowly to confirm point B, where the sensor output just turns OFF.*1 If the sensor output does not turn ON even when the sensitivity adjuster is turned fully clockwise, point B is the position at MAX.
4		The position exactly between points A and B is the optimum sensing position.

\*1Remember, this only applies if the operation mode is Light-ON.

## 4 BEAM ALIGNMENT

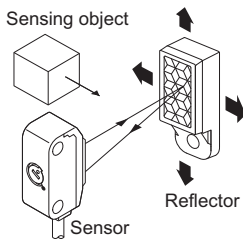
### Thru-beam type sensor

- For EX-23(-PN), set the operation mode switch to the Light-ON mode position (L side).
- Placing the emitter and the receiver face to face along a straight line. Move the emitter up, down, left and right to determine where light is received with the help of the receiver's operation indicator (orange). Set the emitter in the middle of this area.
- Adjust the angle of the emitter by twisting it up, down, left and right.
- In a similar manner, adjust the angle of the receiver.
- Check that the stability indicator (green) lights up.
- For EX-23(-PN), choose the desired operation mode, Light-ON or Dark-ON, with the operation mode switch.



### Retroreflective type sensor

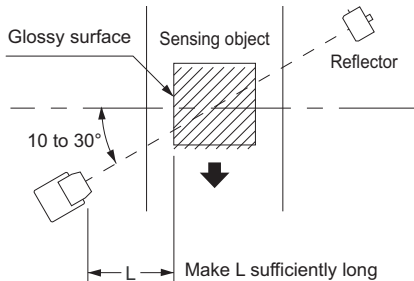
- Turn the sensitivity adjuster fully clockwise to the maximum sensitivity position (MAX).
- Placing the sensor and the reflector face to face along a straight line. Move the reflector up, down, left and right to determine where light is received the help of the operation indicator (orange). Set the reflector in the middle of this area.
- Adjust the angle of the reflector by twisting it up, down, left and right.
- In a similar manner, adjust the angle of the sensor.
- Check that the stability indicator (green) lights up.



## 5 RETROREFLECTIVE TYPE SENSOR

When setting up the EX-29□(-PN) sensor, observe the following when detecting glossy materials.

- Make "L" shown in the diagram sufficiently long.
- Install at an angle of 10 to 30 degrees to the sensing object.

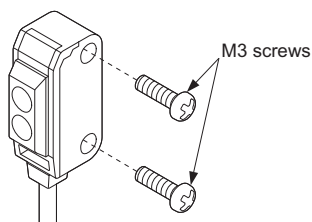


## 6 MOUNTING

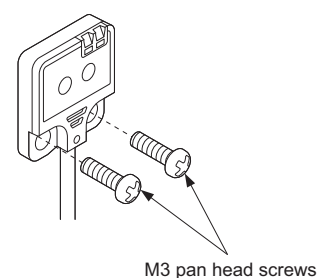
Mount using M3 screws. For the front sensing type sensor, use M3 pan head screws without washers.

☛ The tightening torque should be 0.5N·m or less.

Side sensing type



Front sensing type



## Mounting brackets

Optional sensor mounting brackets are available.

☛ The tightening torque should be 0.5N·m or less.

	Model no.	Description
Front sensing	MS-EX20-1	Two 5mm M3 pan head screws are attached. Material: stainless steel (SUS304).
	MS-EX20-3	
Side sensing	MS-EX20-2	Two 14mm M3 screws with washers are attached. Material: stainless steel (SUS304).
	MS-EX20-4	
	MS-EX20-5	

## 7 SLIT MASKS

☛ The slit mask is only available for the thru-beam type sensor.

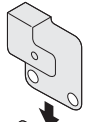
Optional slit masks help the sensor detect small objects. The accuracy of the position being sensed is also increased. However, the sensing range is reduced.

Sensor type	Slit mask model no.	Description
EX-21□	OS-EX20-05	Slit diameter: 0.5mm.
	OS-EX20-05X3	Slit: 0.5 x 3.0mm.
EX-23□	OS-EX20E-05	Slit diameter: 0.5mm.
	OS-EX20E-05X3	Slit: 0.5 x 3.0mm

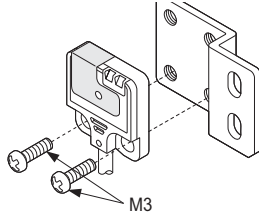
### Mounting method

☛ The tightening torque should be 0.5N·m or less.

① Slip the slit mask onto the sensor.



② Align the holes and mount with the M3 screws provided.



## 8 MOUNTING SPACER

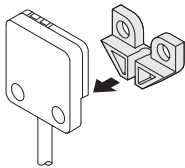
The optional mounting spacer is only available for front sensing type sensors.

Part no.: MS-EX20-FS.

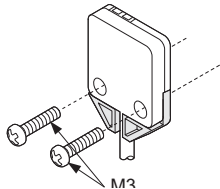
### Mounting method

☛ The tightening torque should be 0.5N·m or less.

① Fit the mounting spacer on the sensor.



② Align the holes and mount with the M3 screws provided.

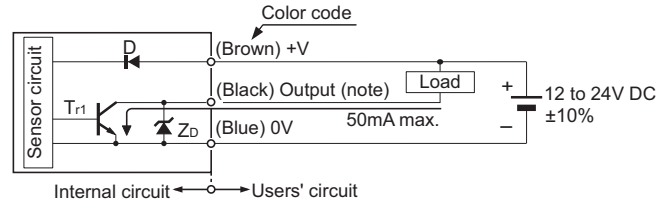


## 9 I/O CIRCUIT DIAGRAMS

The following symbols are used in this section.

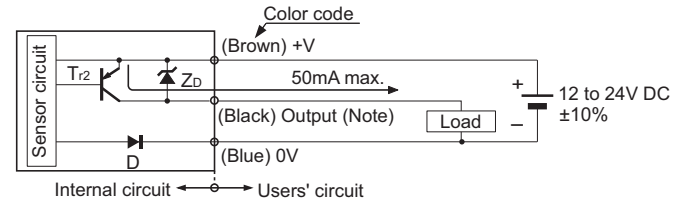
Symbol	Meaning
D	Reverse supply polarity protection diode
Z <sub>D</sub>	Surge absorption zener diode
Tr <sub>1</sub>	NPN output transistor
Tr <sub>2</sub>	PNP output transistor

### NPN output type



☛ Only the thru-beam receiver incorporates the output.

### PNP output type



☛ Only the thru-beam receiver incorporates the output.

## 10 SPECIFICATIONS

Type		Thru-beam		Retroreflective	Diffuse reflective	Convergent reflective		Narrow-view reflective
						Diffused beam	Spot beam	Long distance spot beam
		Front sensing	Side sensing	Side sensing	Side sensing	Front sensing	Side sensing	Side sensing
Model no.*1	Light-ON	EX-21A(-PN)	EX-23(-PN)*2	EX-29A(-PN)	EX-22A(-PN)	EX-24A(-PN)	EX-26A(-PN)	EX-28A(-PN)
	Dark-ON	EX-21B(-PN)		EX-29B(-PN)	EX-22B(-PN)	EX-24B(-PN)	EX-26B(-PN)	EX-28B(-PN)
Sensing range		1m	2m	30 to 300mm*3	5 to 160mm*4	2 to 25mm*5	6 to 14mm*6	45 to 115mm*7
Sensing object		Min. $\varnothing$ 2.6mm opaque object*8	Min. $\varnothing$ 3mm opaque object*9	$\varnothing$ 15mm or more opaque or translucent object*3	Opaque, translucent or transparent object	Min. $\varnothing$ 0.1mm copper wire*10	Min. $\varnothing$ 0.1mm copper wire*10	Opaque, translucent or transparent object*11
Hysteresis		-			15% or less of operation distance			
Repeatability (perpendicular to sensing axis)		0.05mm or less		0.5mm or less	0.3mm or less	0.1mm or less*10	0.05mm or less*10	0.3mm or less
Supply voltage		12 to 24V DC $\pm$ 10% Ripple P-P 10% or less						
Current consumption		Emitter: 10mA or less, Receiver: 10mA or less		13mA or less				
Output		EX-□A, EX-□B, EX-23			EX-□A-PN, EX-□B-PN, EX-23-PN			
		NPN open-collector transistor <ul style="list-style-type: none"> <li>• Maximum sink current: 50mA</li> <li>• Applied voltage: 30V DC or less (between output and 0V)</li> <li>• Residual voltage: 1V or less (at 50mA sink current) 0.4V or less (at 16mA sink current)</li> </ul>			PNP open-collector transistor <ul style="list-style-type: none"> <li>• Maximum source current: 50mA</li> <li>• Applied voltage: 30V DC or less (between output and +V)</li> <li>• Residual voltage: 1V or less (at 50mA source current) 0.4V or less (at 16mA source current)</li> </ul>			
Short-circuit protection		Incorporated						
Response time		0.5ms or less						
Operation indicator		Orange LED, lights up when the output is ON. Thru-beam type sensor: located on the receiver.						
Stability indicator		Green LED lights up under stable light received condition or stable dark condition. Thru-beam type sensor: located on the receiver.						
Sensitivity adjuster		-	Continuously variable adjuster	Continuously variable adjuster	-	Continuously variable adjuster		
Degree of protection		IP67 (IEC)						
Ambient temperature		-25 to +55°C (No dew condensation or icing allowed), Storage: -30 to +70°C						
Ambient humidity		35 to 85% RH, Storage: 35 to 85% RH						
Emitting element		Red LED (modulated)						
Material		Enclosure: Polyethylene terephthalate, Lens: Polyallylate						
Cable		0.1mm <sup>2</sup> 3-core (thru-beam type sensor emitter: 2-core) cabtyre cable, 2m long						
Weight		Emitter, receiver: approx. 20g each		Approx. 20g				
Accessories		-	Adjusting screwdriver: 1 pc.	<ul style="list-style-type: none"> <li>• RF-200 reflector: 1 pc.</li> <li>• Adjusting screwdriver: 1 pc.</li> </ul>	Adjusting screwdriver: 1 pc	-	Adjusting screwdriver: 1 pc.	

\*1 Model nos. with the suffix -PN are PNP output types. On the label of thru-beam types, the P suffix denotes the emitter, e.g.. EX-□P; D denotes the receiver, e.g. EX-□D. The retroreflective type with the suffix -Y does not include the reflector RF-200.

\*2 Light-ON or Dark-ON can be selected via the operation mode switch located on the receiver.

- \*<sup>3</sup>The sensing range and the sensing object of the retroreflective type sensor are specified for the RF-200 reflector. The sensing range specified refers to the setting range for the sensor when used with the reflector; the sensor itself can detect an object less than 30mm away. If the distance to the reflector is 100mm or less, the sensing object should be opaque.
- \*<sup>4</sup>With 200 x 200mm non-glossy paper. If you use this product at a sensing range of 50mm or less, the sensitivity adjustment range becomes extremely narrow.
- \*<sup>5</sup>Convergence point: 10mm. With 50 x 50mm white non-glossy paper.
- \*<sup>6</sup>Convergence point: 10mm. With 50 x 50mm white non-glossy paper. Spot diameter 1mm with a setting distance of 10mm.
- \*<sup>7</sup>With 100 x 100mm white non glossy paper. Spot diameter 5mm with a setting distance of 80mm.
- \*<sup>8</sup>Setting distance between emitter and receiver: 1m.
- \*<sup>9</sup>Setting distance between emitter and receiver: 2m.
- \*<sup>10</sup>Setting distance: 10mm.
- \*<sup>11</sup>Min.  $\varnothing$ 1mm copper wire. Setting distance: 80mm.

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