Adjustable Range Reflective Photoelectric Sensor Amplifier Built-in

EQ-30 SERIES

Related Information
■ General terms and conditions..... F-7
■ Glossary of terms..... P.1455~
■ Sensor selection guide..... P.271~
■ General precautions ..... P.1458~

CE Conforming to EMC Directive

PNP output type available

Interference prevention

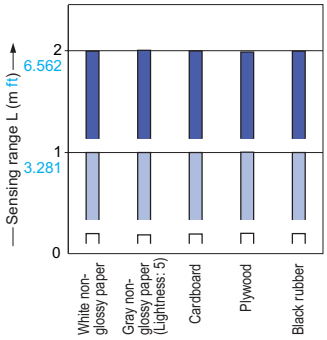
Unaffected by color or material, 2 m (6.562 ft) distance adjustable range reflective sensing

Hardly affected by object color or background

As the **EQ-30** series is incorporated with a 2-segment photodiode as the receiving element with a unique circuitry, it detects an object at the same distance regardless of its color or the background beyond the adjusted sensing range.

(However, when the background is specular, it may be necessary to change the angle of the sensor.)

EQ-34: Correlation between material (200 × 200 mm 7.874 × 7.874 in) and sensing range (typical)

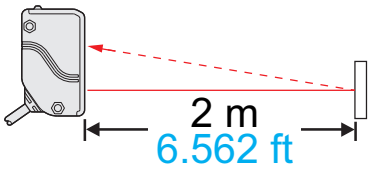


2 m 6.562 ft
1 m 3.281 ft
0.2 m 0.656 ft

These bars indicate the sensing range with the respective objects when the distance adjuster is set at the sensing range of 2 m 6.562 ft, 1 m 3.281 ft and 0.2 m 0.656 ft long, each, with white non-glossy paper.

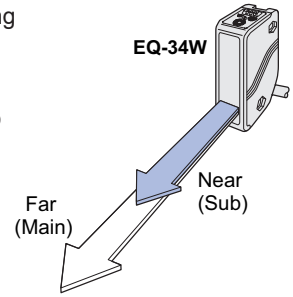
Long sensing range 2 m 6.562 ft

The **EQ-30** series can detect an object 2 m 6.562 ft away.
It is suitable for various applications, such as, sensing objects or positioning objects traveling on a wide assembly line, etc.



Two distances (far and near) can be set EQ-34W

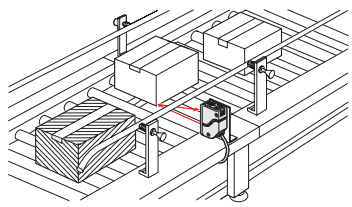
With **EQ-34W**, two sensing distances, Far (Main) and Near (Sub), can be set. Hence, one sensor can suffice where, earlier, two were required.



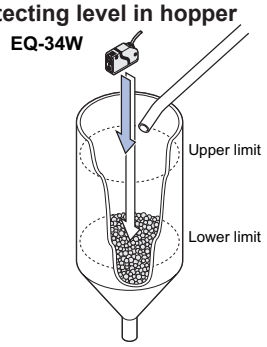
NOTICE: EQ-34W & EQ-34W-C5 part numbers are discontinued as of Sept. 29, 2017. All other part numbers remain available to order.

APPLICATIONS

Detecting a passage of cardboard box



Detecting level in hopper

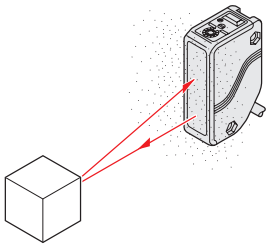


NOTICE: EQ-34W & EQ-34W-C5 part numbers are discontinued as of Sept. 29, 2017. All other part numbers remain available to order.

ENVIRONMENTAL RESISTANCE

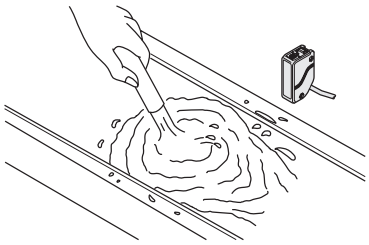
Insusceptible to contamination on lens

The fixed-focus sensing keeps the detectability better than diffuse reflective type sensors even if the lens is contaminated by dirt, dust, mist, or smoke under an unclean environment.



Waterproof

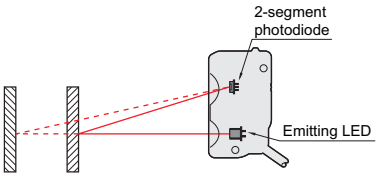
It has IP67 protection. It can be used in places splashed with water.



Note: However, take care that if it is exposed to water splashes during operation, it may detect a water drop itself.

Principle of adjustable range reflective sensing with 2-segment photodiode

Normal reflective type sensors operate by sensing the variation in the amount of incident beam.
However, the adjustable range reflective sensing type sensor incorporating the 2-segment photodiode operates by sensing the variation in the incident beam angle. Thus, the output is activated according to the distance of the object from the sensor. This system helps the **EQ-30** series in being unaffected by object color or a background, enabling stable sensing.

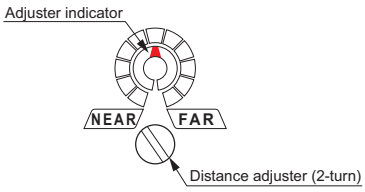


Sensing is based on the difference in the incident beam angle of the dotted line and the solid line in the above figure.

OPERABILITY

Mechanical 2-turn adjuster with indicator

It features a mechanical 2-turn distance adjuster with an indicator that shows the set distance at a glance.



MOUNTING / SIZE

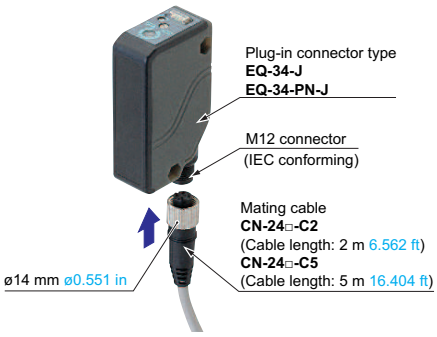
Compact

It saves space, since a miniaturized housing of W20 × H68 × D40 mm W0.787 × H2.677 × D1.575 in has been designed for the adjustable range reflective sensing sensor even though the adjustable sensing range is 2 m 6.562 ft long.

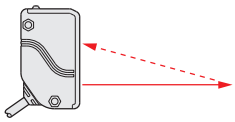
VARIETIES

Plug-in connector type is available

Plug-in connector type, which can be easily disconnected for replacement is available. In case a problem occurs, anyone can replace the sensor in a minute. (Excluding **EQ-34W**)

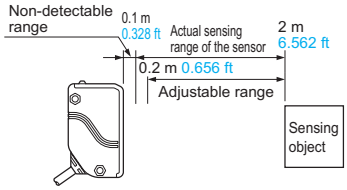


ORDER GUIDE

Type	Appearance	Adjustable range (Note)	Model No.	Output
NPN output		0.2 to 2 m 0.656 to 6.562 ft	**EQ-34**	NPN open-collector transistor
PNP output			**EQ-34-PN**	PNP open-collector transistor
Two outputs			**EQ-34W**	Two NPN open-collector transistor outputs Discontinued as of Sept. 29, 2017

NOTE: Mounting bracket is not supplied with the sensor. Please select from the range of optional sensor mounting brackets (two types).

Note: The adjustable range stands for the maximum sensing range which can be set with the adjuster.
The sensor can detect an object 0.1 m 0.328 ft, or more, away.
However, the detectable range of Near (Sub) type of **EQ-34W** begins at 0.2 m 0.656 ft.



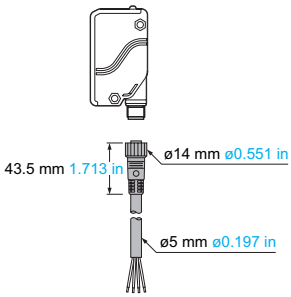
Plug-in connector type (Not available for EQ-34W)

Plug-in connector type (standard: cable type) is also available. (excluding **EQ-34W**)
When ordering this type, suffix "**-J**" to the model No.
Please order the suitable mating cable separately.
Model No.: **EQ-34-J**, **EQ-34-PN-J**

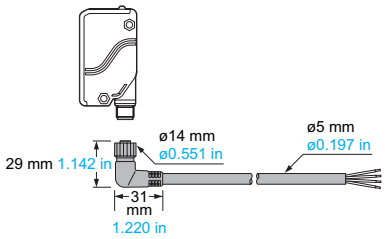
• Mating cable

Type	Model No.	Description	
Straight	**CN-24-C2**	Length: 2 m 6.562 ft	0.34 mm² 4-core cabtyre cable with connector on one end Cable outer diameter: ø5 mm ø0.197 in
	CN-24-C5	Length: 5 m 16.404 ft	
Elbow	**CN-24L-C2**	Length: 2 m 6.562 ft	
	CN-24L-C5	Length: 5 m 16.404 ft	

• CN-24-C□



• CN-24L-C□



5 m 16.404 ft cable length type

5 m 16.404 ft cable length type (standard : 2 m 6.562 ft) is also available for NPN output type and two outputs type.
When ordering this type, suffix "**-C5**" to the model No.
Model No.: **EQ-34-C5**, **EQ-34W-C5**

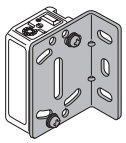
OPTIONS

Designation	Model No.	Description
Sensor mounting bracket	**MS-EQ3-1**	Back angled mounting bracket
	MS-EQ3-2	Foot angled mounting bracket

Note: The plug-in connector type does not allow use of some sensor mounting brackets because of the protrusion of the connector.

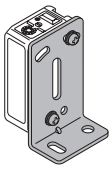
Sensor mounting bracket

• MS-EQ3-1



Two M4 (length 25 mm 0.984 in) screws with washers and two M4 nuts are attached.

• MS-EQ3-2



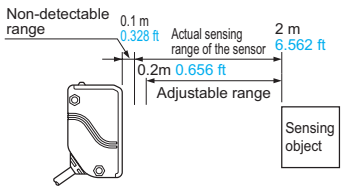
Two M4 (length 25 mm 0.984 in) screws with washers and two M4 nuts are attached.

SPECIFICATIONS

Item / Type	NPN output	PNP output	Two outputs Discontinued as of Sept. 29, 2017
Model No.	**EQ-34**	**EQ-34-PN**	**EQ-34W**
Adjustable range (Note 2)	0.2 to 2 m 0.656 to 6.562 ft		Far (Main): 0.2 to 2 m 0.656 to 6.562 ft Near (Sub): Refer to diagram in (Note 3)
Sensing range (with white non-glossy paper at setting distance 2 m 6.562 ft)	0.1 to 2 m 0.328 to 6.562 ft		Far (Main): 0.1 to 2 m 0.328 to 6.562 ft Near (Sub): 0.2 to 2 m 0.656 to 6.562 ft [with Near (Sub) distance for adjuster at max.]
Hysteresis	10 % or less of operation distance (With white non-glossy paper)		
Repeatability	Along sensing axis: 10 mm 0.394 in or less, Perpendicular to sensing axis: 1 mm 0.039 in or less (with white non-glossy paper)		
Supply voltage	10 to 30 V DC Ripple P-P 10 % or less		
Current consumption	50 mA or less	55 mA or less	90 mA or less
Output	NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1 V or less (at 100 mA sink current) 0.4 V or less (at 16 mA sink current)	PNP open-collector transistor • Maximum source current: 100 mA • Applied voltage: 30 V DC or less (between output and +V) • Residual voltage: 1 V or less (at 100 mA source current) 0.4 V or less (at 16 mA source current)	<Far (Main) output, Near (Sub) output> NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1 V or less (at 100 mA sink current) 0.4 V or less (at 16 mA sink current)
Output – Utilization category	DC-12 or DC-13		
Output – Output operation	Switchable either Detection-ON or Detection-OFF		
Output – Short-circuit protection	Incorporated		
Response time	2 ms or less		
Operation indicator	Red LED (lights up when the output is ON)		Far (Main) output: Red LED [lights up when the Far (Main) output is ON] Near (Sub) output: Red LED [lights up when the Near (Sub) output is ON]
Stability indicator	Green LED (lights up under stable light received condition or stable dark condition) (Note 4)		
Distance adjuster	2-turn mechanical adjuster with pointer		Far (Main): 2-turn mechanical adjuster with pointer Near (Sub): Variable adjuster
Automatic interference prevention function	Incorporated (Note 5)		
Environmental resistance – Pollution degree	3 (Industrial environment)		
Environmental resistance – Protection	IP67 (IEC)		
Environmental resistance – Ambient temperature	–20 to +55 °C –4 to +131 °F (No dew condensation or icing allowed), Storage: –25 to +70 °C –13 to +158 °F		
Environmental resistance – Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH		
Environmental resistance – Ambient illuminance	Incandescent light: 3,000 ℓx at the light-receiving face		
Environmental resistance – EMC	EN 60947-5-2		
Environmental resistance – Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure		
Environmental resistance – Insulation resistance	20 MΩ, or more, with 250 V megger between all supply terminals connected together and enclosure		
Environmental resistance – Vibration resistance	10 to 55 Hz frequency, 1.5 mm 0.059 in amplitude (10 G max.) in X, Y and Z directions for two hours each		
Environmental resistance – Shock resistance	500 m/s² acceleration (50 G approx.) in X, Y and Z directions for three times each		
Emitting element	Infrared LED (Peak emission wavelength: 880 nm 0.035 mil, modulated)		
Material	Enclosure: Polyalylate and Polyethylene terephthalate, Lens: Polyalylate		
Cable	0.3 mm² 3-core (**EQ-34W**: 4-core) cabtyre cable, 2 m 6.562 ft long		
Cable extension	Extension up to total 100 m 328.084 ft is possible with 0.3 mm², or more, cable.		
Weight	Net weight: 150 g approx., Gross weight: 200 g approx.		
Accessory	Adjusting screwdriver: 1 pc.		

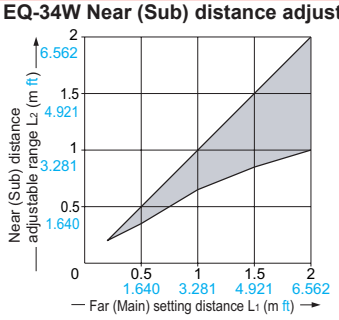
Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.

2) The adjustable range stands for the maximum sensing range which can be set with the adjuster. The sensor can detect an object 0.1 m 0.328 ft, or more, away.
However, the detectable area of the Near (Sub) type of the **EQ-34W** begins at 0.2 m 0.656 ft.



3) The Near (Sub) distance adjustable range, L_2, changes with the setting of the Far (Main) distance, L_1, as shown in the table below.

EQ-34W Near (Sub) distance adjustable range Discontinued as of Sept. 29, 2017



EQ-34W	
Far (Main) setting distance L_1	Near (Sub) distance adjustable range L_2
2 m 6.562 ft	1 to 2 m 3.281 to 6.562 ft
1.5 m 4.921 ft	0.85 to 1.5 m 2.789 to 4.921 ft
1 m 3.281 ft	0.65 to 1 m 2.133 to 3.281 ft
0.5 m 1.640 ft	0.35 to 0.5 m 1.148 to 1.640 ft
0.2 m 0.656 ft	0.2 m 0.656 ft

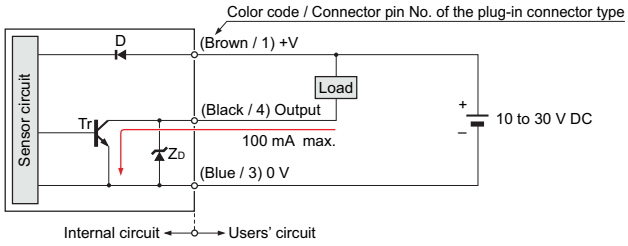
4) Refer to "**Stability indicator** (p.361)" of "**PRECAUTIONS FOR PROPER USE**" for details of the stability indicator.

5) Detection may become unstable depending on the setting conditions or the sensing objects. After setting up this product, make sure to check operations using actual sensing objects.

I/O CIRCUIT AND WIRING DIAGRAMS

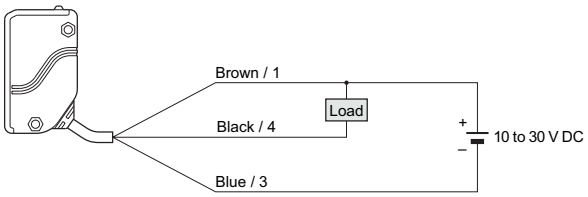
EQ-34 — NPN output type

I/O circuit diagram

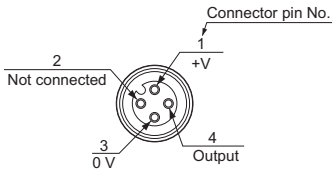


Symbols … D : Reverse supply polarity protection diode
ZD: Surge absorption zener diode
Tr : NPN output transistor

Wiring diagram

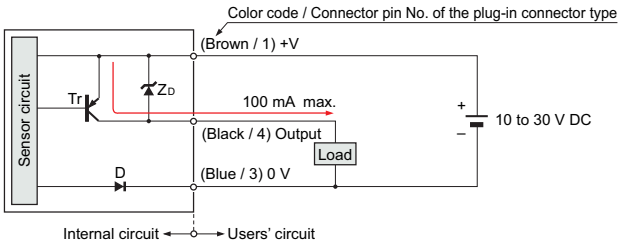


Connector pin position (Plug-in connector type)



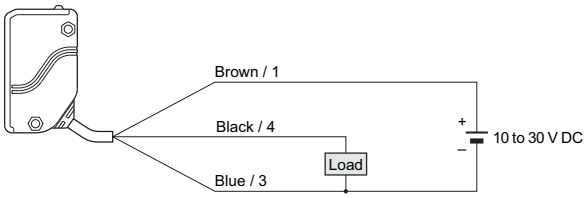
EQ-34-PN — PNP output type

I/O circuit diagram

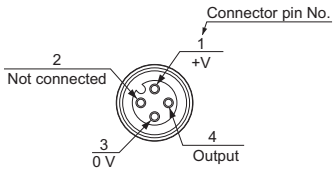


Symbols … D : Reverse supply polarity protection diode
ZD: Surge absorption zener diode
Tr : PNP output transistor

Wiring diagram



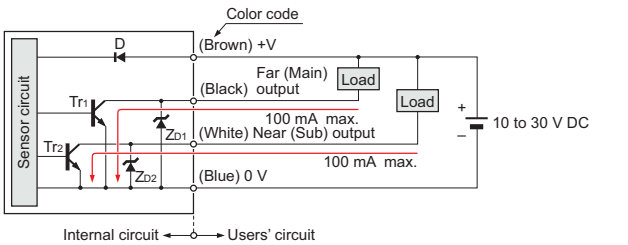
Connector pin position (Plug-in connector type)



EQ-34W — Two outputs type

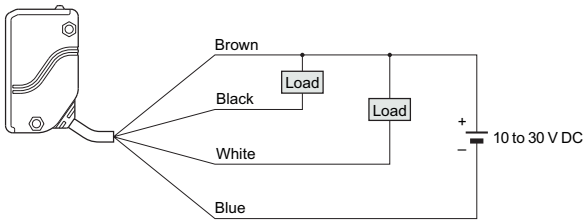
I/O circuit diagram

Discontinued as of Sept. 29, 2017



Symbols … D: Reverse supply polarity protection diode
ZD1, ZD2: Surge absorption zener diode
Tr1, Tr2 : NPN output transistor

Wiring diagram

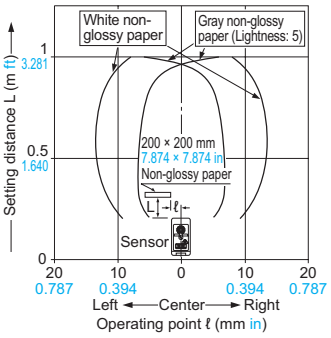


SENSING CHARACTERISTICS (TYPICAL)

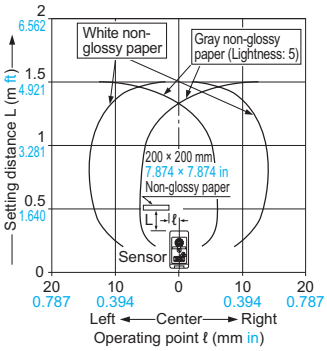
EQ-34 EQ-34-PN

Sensing fields

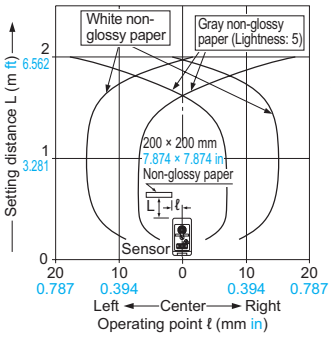
• Setting distance: 1 m 3.281 ft



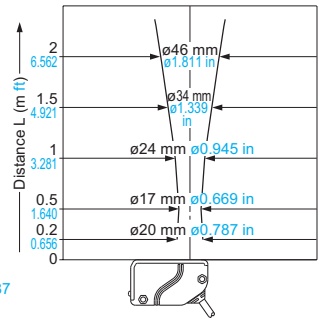
• Setting distance: 1.5 m 4.921 ft



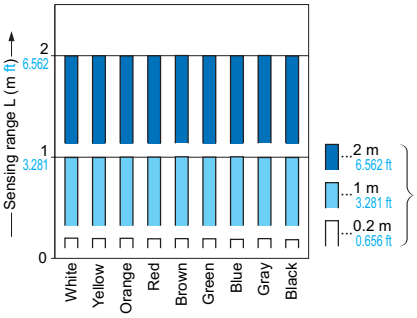
• Setting distance: 2 m 6.562 ft



Emitted beam

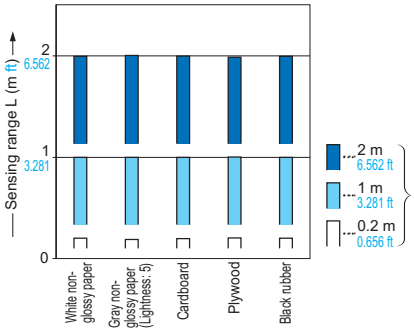


Correlation between color (200 × 200 mm 7.874 × 7.874 in non-glossy paper) and sensing range



These bars indicate the sensing range with the respective colors when the distance adjuster is set at the sensing range of 2 m 6.562 ft, 1 m 3.281 ft and 0.2 m 0.656 ft long, each, with white color.
The sensing distance varies depending also on material.

Correlation between material (200 × 200 mm 7.874 × 7.874 in) and sensing range

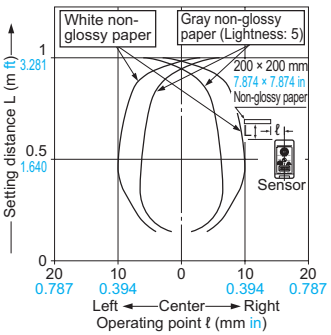


These bars indicate the sensing range with respective objects when the distance adjuster is set at the sensing range of 2 m 6.562 ft, 1 m 3.281 ft and 0.2 m 0.656 ft long, each, with white non-glossy paper.

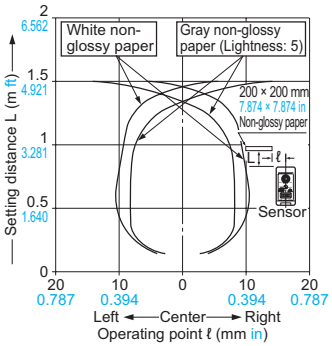
EQ-34W Discontinued as of Sept. 29, 2017

Sensing fields

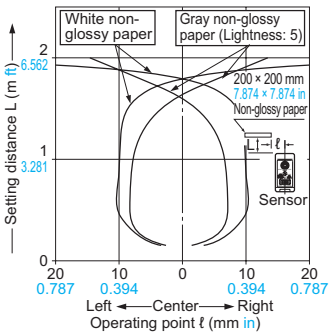
• Far (Main)
[Far (Main) setting distance: 1 m 3.281 ft]



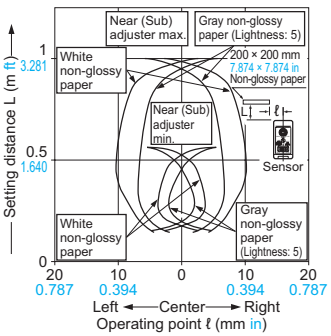
• Far (Main)
[Far (Main) setting distance: 1.5 m 4.921 ft]



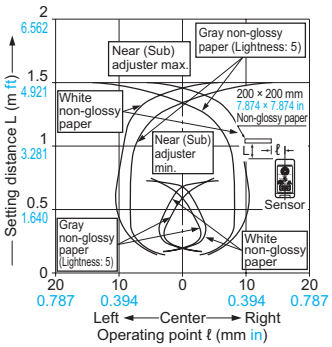
• Far (Main)
[Far (Main) setting distance: 2 m 6.562 ft]



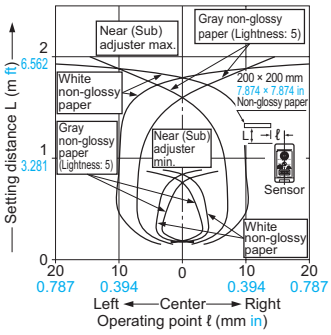
• Near (Sub)
[Far (Main) setting distance: 1 m 3.281 ft]



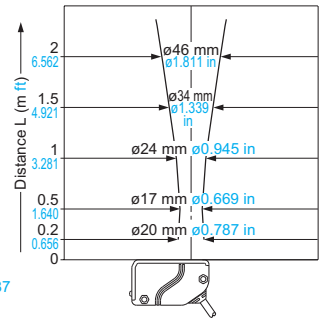
• Near (Sub)
[Far (Main) setting distance: 1.5 m 4.921 ft]



• Near (Sub)
[Far (Main) setting distance: 2 m 6.562 ft]



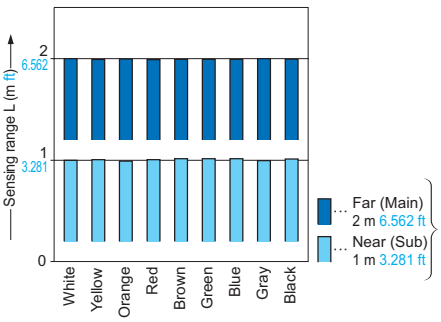
Emitted beam



SENSING CHARACTERISTICS (TYPICAL)

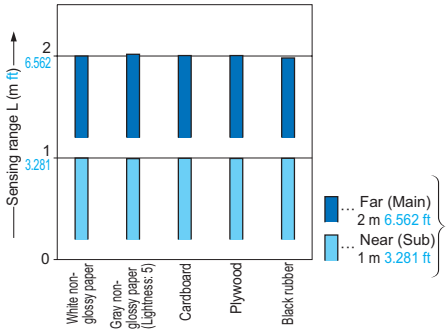
EQ-34W Discontinued as of Sept. 29, 2017

Correlation between color (200 × 200 mm 7.874 × 7.874 in non-glossy paper) and sensing range



These bars indicate the sensing range with respective colors when the distance adjuster is set at the sensing range of Far (Main) 2 m 6.562 ft and Near (Sub) 1 m 3.281 ft long, each, with white color. The sensing distance varies depending also on material.

Correlation between material (200 × 200 mm 7.874 × 7.874 in) and sensing range



These bars indicate the sensing range with re- spective objects when the distance adjuster is set at the sensing range of Far (Main) 2 m 6.562 ft and Near (Sub) 1 m 3.281 ft long, each, with white non-glossy paper.

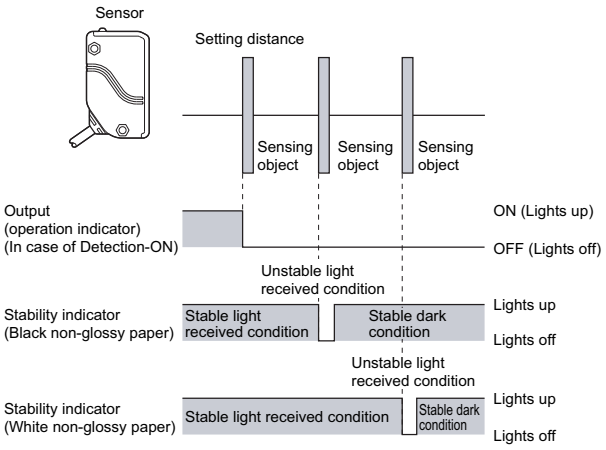
PRECAUTIONS FOR PROPER USE

Refer to p.1458~ for general precautions.

- 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.

Stability indicator

- Since the **EQ-30** series uses a 2-segment photodiode as its receiving element, and sensing is done based on the difference in the incident beam angle of the reflected beam from the sensing object, the output and the operation indicator operate according to the object distance. Further, the stability indicator shows the margin of the incident light intensity and not that of the object distance. Hence, the distance at which it lights up/off depends on the object reflectivity and is not at all related to the output operation. Do not use the sensor when the stability indicator is off (unstable light received condition), since the sensing will be unstable.

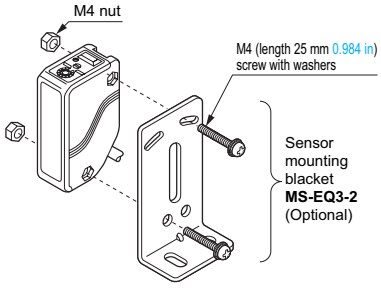


Others

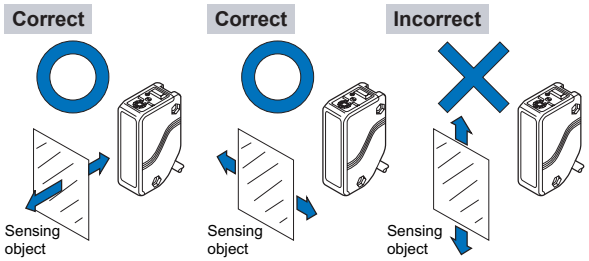
- Do not use during the initial transient time (50 ms) after the power supply is switched on.
- When connecting the mating cable to the plug-in connector type, the tightening torque should be 0.4 N·m or less.

Mounting

- The tightening torque should be 0.8 N·m or less.

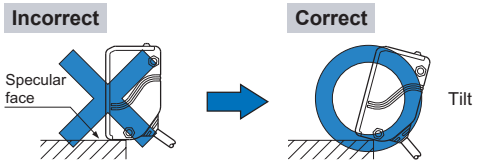


- Care must be taken regarding the sensor mounting direction with respect to the object's direction of movement.



Do not make the sensor detect an object in this direction because it may cause unstable operation.

- When detecting a specular object (aluminum or copper foil) or an object having a glossy surface or coating, please take care that there are cases when the object may not be detected due to a small change in angle, wrinkles on the object surface, etc.
- When a specular body is present below the sensor, use the sensor by tilting it slightly upwards to avoid wrong operation.

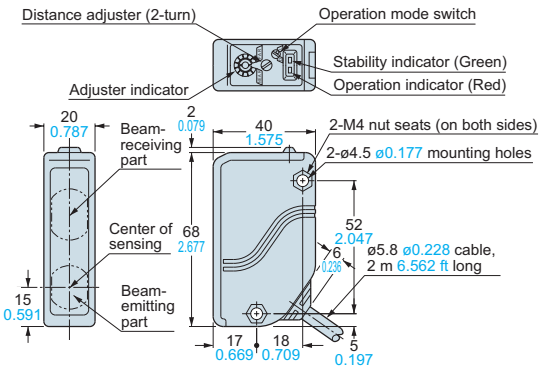


- If a specular body is present in the background, wrong operation may be caused due to a small change in the angle of the background body. In that case, install the sensor at an inclination and confirm the operation with the actual sensing object.
- Take care that some objects may produce a dead zone right (less than 0.1 m 0.328 ft) in front of the sensor.

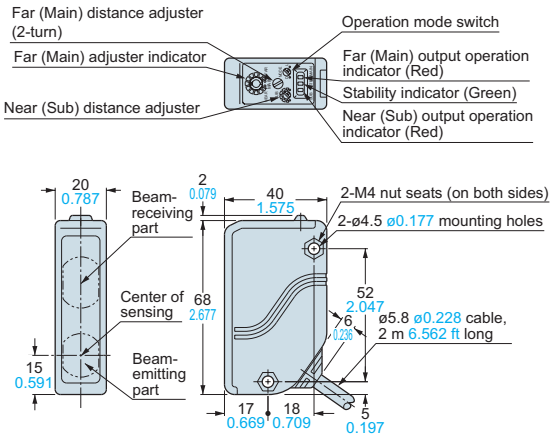
DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from our website.

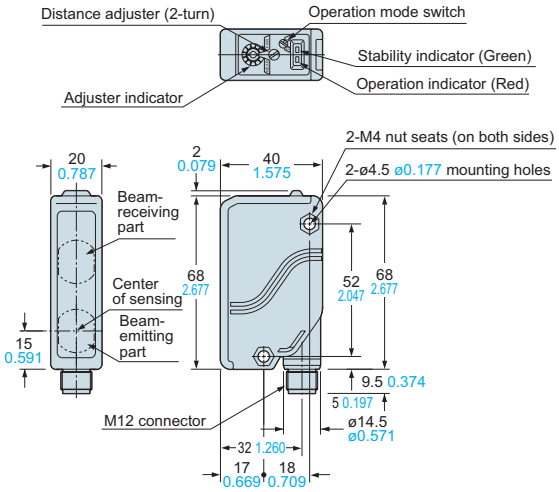
EQ-34 EQ-34-PN — Sensor



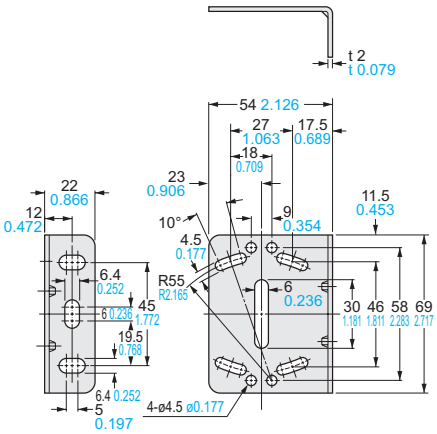
EQ-34W Discontinued as of Sept. 29, 2017 — Sensor



EQ-34-J EQ-34-PN-J — Sensor



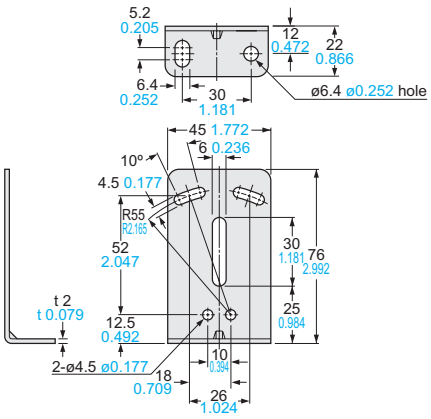
MS-EQ3-1 — Sensor mounting bracket (Optional)



Material: Cold rolled carbon steel (SPCC)

Two M4 (length 25 mm 0.984 in) screws with washers and two M4 nuts are attached.

MS-EQ3-2 — Sensor mounting bracket (Optional)



Material: Cold rolled carbon steel (SPCC)

Two M4 (length 25 mm 0.984 in) screws with washers and two M4 nuts are attached.