

| PHOTOELECTRIC |
| ---: |
| SENSORS |
| MICRO |
| PHOTOELECTRIC |
| SENSORS |
| AREA |
| SENSORS |
| LIGHT CURTAINS/ |
| SAFETY |
| COMPONENTS |
| PRESSURE / |
| FLOW |
| SENSORS |
| INDUCTIVE |
| PROXIMITY |
| SENSORS |
| PARTICULAR |
| USE SENSORS |
| SENSOR |
| OPTIONS |
| SIMPLE |
| WIRE-SAVING |
| UNITS |
| WIRE-SAVING |
| SYSTEMS |
| MEASUREMENT |
| SENSORS |
| STATICELECTRICITY |
| PREVENTION |
| DEVICES |
| LARKER |
| MARERS |

HUMAN MACHINE
INTERFACES
Selection

Guide $|$| Amplifier |
| ---: |
| Built-in |

## Long sensing range

An adjustable range to 2.5 m 8.202 ft allows plenty of space for installation.
1 m 3.281 ft sensing range type also available. Adjust the volume easily to suit your needs when using at close range.

## Hardly affected by background objects

Because the sensor doesn't detect objects outside the preset sensing field by using the 2 -segment photodiode adjustable range system, it will not malfunction even if someone walks behind the sensing object or machines or conveyors are in the background.

Note: Please note that malfunction may occur when there are specular objects or objects with a mirror-like surface in the background. [Refer to p. 368 "Mounting" of "PRECAUTIONS FOR PROPER USE" section.

## MOUNTING

## Convenient terminal block type

Cabling enabled by way of a terminal block that eliminates waste.


## Impervious to variations color or angle

The optical system has been optimized. Since the sensor is hardly influenced at all by angles or the gloss of objects compared to the previous model, it is possible to detect both white objects and black objects at almost a constant distance.
The difference in sensing range between white non-glossy paper and gray non-glossy paper (lightness: 5 ) is approx $5 \%$ when set at a distance of 2 m 6.562 ft .


## OPERABILITY

## An easy to set adjuster with indicator

Equipped with a 2-turn adjuster with indicator, making it easy to set for short or long distances.



## VARIETIES

## Equipped with both NPN and PNP outputs EQ-51ם

We've added a DC-voltage type with NPN and PNP transistor outputs all in one sensor. Its BGS / FGS function controls any background effects for more stable sensing.

## Multi-voltage

EQ-50■
Because it can function with 24 to 240 V AC and 12 to 240 V DC, almost any power supply anywhere in the world will do.

## Convenient timer function models

Types with an ON-delay / OFF-delay timer available. OFF-delay, e.g. useful when the response of the connected device is slow, ON-delay, e.g. useful to detect objects that take a long time to move.

- Operation: ON-delay, OFF-delay
- Timer period: 0.1 to 5 sec .
(individual setting possible)


## FUNCTIONS

BGS / FGS functions make even the most challenging settings possible!

## The BGS function is best suited for background not present



When object and background are separated BGS (Background suppression) function The sensor judges that an object is present when light is received at position A of the light-receiving element (2-segment element).
This is useful if the object and background are far apart.
Not affected if the background color changes or someone passes behind the conveyor.

The FGS function is best suited for background present


When object and background are close together
When the object is glossy or uneven FGS (Foreground suppression) function The sensor judges that no object is present when light is received at position $B$ of the light receiving element ( 2 -segment element) (The conveyor is detected). This function is useful if the object and the background are close together or if the object is glossy or uneven. However, sensing is impossible if there is no background (conveyor, etc.).


[^0]FIBER
SENSORS
LASER
SENSORS

## PHOTOELECTRLC

SENSORS
MICRO
PHOTOELECTRIC
SENSORS
AREA
SENSORS
LIGHT CURTAINS /
SAFETY
COMPONENTS
PRESSURE /
FLOW
SENSORS
INDUCTIVE
PROXIMITY
SENSORS
PARTICULAR USE SENSORS

SENSOR
OPTIONS
SIMPLE
WIRE-SAVING
UNITS
WIRE-SAVING
SYSTEMS

MEASUREMENT
SENSORS
STATIC ELECTRICITY
PREVENTION
DEVICES
LASER
MARKERS

PLC

## HUMAN MACHINE

 INTERFACESENERGY CONSUMPTION
VISUALIZATION
COMPONENTS
FA COMPONENTS

MACHINE VISION
SYSTEMS
UV CURING
SYSTEMS

| Selection <br> Guide |
| :--- |
| Amplifier |
| Buxit-in |
| Power Supply |
| Built--i |
| Amplifier- |
| separated |
| CX-400 |
| CY-100 |
| EX-10 |
| EX-20 |
| EX-30 |
| EX-40 |
| CX-440 |
| EQ-30 |
| EQ-500 |
| MQ-W |
| RX-LS200 |
| RX |

RT-610

## ENVIRONMENTAL RESISTANCE

## Little affected by contamination on lens

Even if the lens surface gets somewhat dirty from dust particles, there is very little change in the operation field, by usage adjustable range system.


## Waterproof

IP67 protection permits use in environments where water may splash.

Note: Sensor may detect a water drop itself, if it is exposed to water splashes during operation.

## ORDER GUIDE

| Type | Appearance | Sensing range | Model No. | Supply voltage | Output | Timer function |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |

## OPTION

|  |  |  |
| :--- | :---: | :---: |
| Designation | Model No. | Description |
| Sensor mounting <br> bracket | MS-EQ5-01 | Foot / back angled mounting bracket |

Sensor mounting bracket

- MS-EQ5-01



## SPECIFICATIONS

| Type |  | Multi-voltage |  |  |  | DC-voltage |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | With timer |  | With timer |  | With timer |  | With timer |
| Item | Model No. | EQ-501 | EQ-501T | EQ-502 | EQ-502T | EQ-511 | EQ-511T | EQ-512 | EQ-512T |
| Adjustable range (Note 2,3) |  | 0.2 to 2.5 mm 0.656 to 8.202 ft |  | 0.2 to 1.0 m 0.656 to 3.281 ft |  | 0.2 to 2.5 m 0.656 to 8.202 ft |  | 0.2 to 1.0 m 0.656 to 3.281 ft |  |
| Sensing range (at max. seting distance) (Note 3) |  | 0.1 to 2.5 m 0.328 to 8.202 ft |  | 0.1 to 1.0 mm 0.328 to 3.281 ft |  | 0.1 to 2.5 mm 0.328 to 8.202 ft |  | 0.1 to 1.0 m 0.328 to 3.281 ft |  |
| Hysteresis (Note 3) |  | $10 \%$ or less of operation distance |  |  |  |  |  |  |  |
| Supply voltage |  | 24 to 240 V AC $\pm 10$ \% or 12 to 240 V DC $\pm 10$ \% Ripple P-P 10 \% or less |  |  |  | 12 to 24 V DC $\pm 10 \%$ Ripple P-P $10 \%$ or less |  |  |  |
| Power / Current consumption |  | AC: 4 VA or less DC: 3 W or less | AC: 5 VA or less DC: 4 W or less | AC: 4 VA or less DC: 3 W or less | AC: 5 VA or less DC: 4 W or less | 45 mA or less |  |  |  |
| Output |  | Relay contact 1a <br> - Switching capacity: 250 V AC 3 A (resistive load) 30 V DC 3 A (resistive load) <br> - Electrical life: 100,000 or more switching operations (switching frequency 1,200 operations/hour) <br> - Mechanical life: 50 million or more switching operations (switching frequency 18,000 operations/hour) |  |  |  | NPN open-collector transistor <br> - Maximum sink current: 100 mA <br> - Applied voltage: 30 V DC or less (between output and 0 V ) <br> - Residual voltage: 1 V or less (at 100 mA sink current) 0.4 V or less (at 16 mA sink current) <br> PNP open-collector transistor <br> - Maximum source current: 100 mA <br> - Applied voltage: 30 V DC or less (between output and +V ) <br> - Residual voltage: 1 V or less (at 100 mA source current) 0.4 V or less (at 16 mA source current) |  |  |  |
| Output operation |  | Switchable either Detection-ON or Detection-OFF |  |  |  |  |  |  |  |
|  |  | - |  |  |  | Incorporated |  |  |  |
| Response time |  | 20 ms or less (For EQ-50 $\square$ T depends on the setting timer period) |  |  |  | 2 ms or less (For EQ-51םT depends on the setting timer period) |  |  |  |
| Operation indicator |  | Orange LED (lights up when the output is ON) |  |  |  |  |  |  |  |
| Stability indicator |  | Green LED (lights up under stable operating condition) |  |  |  |  |  |  |  |
| Distance adjuster |  | 2-turn mechanical adjuster with indicator |  |  |  |  |  |  |  |
| Sensing mode |  | - |  |  |  | Switchable either BGS or FGS function |  |  |  |
| Timer function |  | $\square$ | Incorporated with variable <br> (0.1 to 5 sec .) ON-delay / OFF-delay timer | $\qquad$ | Incorporated with variable (0.1 to 5 sec .) ON-delay / OFF-delay timer | $\qquad$ | Incorporated with variable ( 0.1 to 5 sec .) ON-delay / OFF-delay timer | $\qquad$ | Incorporated with variable <br> (0.1 to 5 sec.) ON-delay / OFF-delay timer |
| Automatic interference prevention function |  | Incorporated (Note 4) |  |  |  |  |  |  |  |
|  | Protection | IP67 (IEC) |  |  |  |  |  |  |  |
|  | Ambient temperature | -20 to $+55^{\circ} \mathrm{C}-4$ to $+131{ }^{\circ} \mathrm{F}$ (No dew condensation or icing allowed), Storage: -30 to $+70^{\circ} \mathrm{C}-22$ to $+158{ }^{\circ} \mathrm{F}$ |  |  |  |  |  |  |  |
|  | Ambient humidity | 35 to 85 \% RH, Storage: 35 to 85 \% RH |  |  |  |  |  |  |  |
|  | Ambient illuminance | Incandescent light: 3,000 lx at the light-receiving face |  |  |  |  |  |  |  |
|  | Voltage withstandability | 2,000 V AC for one min. among supply terminals, non-supply metal parts and relay contact output terminals, 1,000 V AC for one min. between relay contacts |  |  |  | $1,000 \mathrm{~V}$ AC for one min. between all supply terminals connected together and enclosure |  |  |  |
|  | Insulation resistance | $100 \mathrm{M} \Omega$, or more, with 500 V DC megger among supply terminals, non-supply metal parts and relay contact output terminals as well as between relay contacts |  |  |  | $20 \mathrm{M} \Omega$, or more, with 250 V DC megger between all supply terminals connected together and enclosure |  |  |  |
|  | Vibration resistance | 10 to 55 Hz frequency, 1.5 mm 0.059 in amplitude in $\mathrm{X}, \mathrm{Y}$ and Z directions for two hours each |  |  |  |  |  |  |  |
|  | Shock resistance | $500 \mathrm{~m} / \mathrm{s}^{2}$ acceleration (50 G approx.) in $\mathrm{X}, \mathrm{Y}$ and Z directions for three times each |  |  |  |  |  |  |  |
| Emitting element |  | Infrared LED (Peak emission wavelength: 855 nm 0.034 mil, modulated) |  |  |  |  |  |  |  |
| Receiving element |  | 2-segment photodiode |  |  |  |  |  |  |  |
| Material |  | Enclosure: ABS, Front cover: Polycarbonate, Display cover: Polycarbonate |  |  |  |  |  |  |  |
| Connection method |  | Screw-on terminal connection |  |  |  |  |  |  |  |
| Cable |  | Suitable for round cable $\varnothing 9$ to $\varnothing 11 \mathrm{~mm} \varnothing 0.354$ to $\varnothing 0.433$ in |  |  |  |  |  |  |  |
| Cable length |  | Total length up to 100 m 328.084 ft is possible with $0.3 \mathrm{~mm}^{2}$, or more, cabtyre cable. |  |  |  |  |  |  |  |
| Weight |  | Net weight: 100 g approx. |  |  |  | Net weight: 85 g approx. |  |  |  |
| Accessory |  | Adjusting screwdriver: 1 pc. |  |  |  |  |  |  |  |


| $\begin{aligned} & \text { FIBER } \\ & \text { SENSORS } \end{aligned}$ |
| :---: |
| $\begin{aligned} & \text { LASER } \\ & \text { SENSORS } \end{aligned}$ |
| $\begin{aligned} & \text { PHOTO- } \\ & \text { ELECTRIC } \\ & \text { SENSORS } \end{aligned}$ |
| $\begin{aligned} & \text { MICRO } \\ & \text { PHOTO- } \\ & \text { ELECTRIC } \\ & \text { SENSORS } \\ & \hline \end{aligned}$ |
| AREA SENSORS |
| $\begin{aligned} & \text { LIGHT } \\ & \text { CURTANS/ } \\ & \text { SAFETY } \\ & \text { COMPONENTS } \end{aligned}$ |
| $\begin{aligned} & \text { PRESSURE/ } \\ & \text { FLOW } \\ & \text { SENSORS } \end{aligned}$ |
| INDUCTIVE PROXIMITY SENSORS SENSOR |
| $\begin{aligned} & \text { PARTICULAR } \\ & \text { USE } \\ & \text { SENSORS } \end{aligned}$ |
| $\begin{aligned} & \text { SENSOR } \\ & \text { OPTIONS } \end{aligned}$ |
| SIMPLE <br> WRESSAVING UNTS |
| WIRE-SAVING SYSTEMS |
| $\begin{aligned} & \text { MEASURE- } \\ & \text { MENT } \\ & \text { SENSORS } \end{aligned}$ |
| $\begin{aligned} & \text { STATC } \\ & \text { EEECRICITY } \\ & \text { PREVEVTION } \\ & \text { DVVCES } \end{aligned}$ |
| LASER MARKERS |
| PLC |
| HUMAN MACHINE INTERFACES |
| $\begin{aligned} & \text { ENERQY } \\ & \text { CONSUMPTION } \\ & \text { VISAALZTAON } \\ & \text { COMPONENTS } \\ & \hline \end{aligned}$ |
| FA COMPONENTS |
| MACHINE VISION SYSTEMS |
| $\begin{aligned} & \text { UV } \\ & \text { CURING } \\ & \text { SYSTEMS } \end{aligned}$ |



I/O circuit diagram Terminal arrangement diagram


## EQ-511(T) EQ-512(T)

I/O circuit diagram
Terminal arrangement diagram


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


| ZD1, ZD2: Surge absorption zener diode |
| :--- |
| Tr1: NPN output transistor |
|  |


| $\begin{array}{r} \text { MICRO } \\ \text { PHOTO- } \\ \text { ELECTRRC } \\ \text { SENSORS } \\ \hline \end{array}$ |
| :---: |
| $\begin{aligned} & \text { AREA } \\ & \text { SENSORS } \end{aligned}$ |
| $\begin{array}{r} \text { LIGHTS } \\ \text { CURAANS/ } \\ \text { CAFETY } \\ \text { COMPONENTS } \end{array}$ |
|  |
| $\begin{aligned} & \text { INDUCTIVE } \\ & \text { PROXIMITY } \end{aligned}$ |

RENSORS
PARTICULAR

## I/O CIRCUIT AND WIRING DIAGRAMS

## - SENSING CHARACTERISTICS (TYPICAL)

## EQ-501(T) EQ-511(T)

## Sensing fields

- Setting distance: 1 m 3.281 ft

- Setting distance: 2.5 m 8.202 ft



## Emitted beam



Correlation between material
$(200 \times 200 \mathrm{~mm} 7.874 \times 7.874 \mathrm{in})$ and sensing range

Correlation between sensing object size and sensing range


## SENSING CHARACTERISTICS (TYPICAL)

EQ-502 (T) EQ-512 (T)

## Sensing fields

- Setting distance: 0.5 m 1.640 ft

- Setting distance: 1 m 3.281 ft


Correlation between material
( $200 \times 200 \mathrm{~mm} 7.874 \times 7.874 \mathrm{in}$ ) and sensing range


Correation between color ( $200 \times 200 \mathrm{~mm} 7.874 \times 7.874$ in non-glossy paper) and sensing range Emitted beam

These bars indicate
the sensing range with
the respective colors
when the distance
adjuster is set to a
sensing range of 1 m
$3.281 \mathrm{ft} / 0.5 \mathrm{~m} 1.640 \mathrm{ft}$
long, respectively, with
white non-glossy
paper.
$\left.\begin{array}{l}\text { The sensing range } \\ \text { also varies depending } \\ \text { on material. } \\ \begin{array}{l}1\end{array} \\ \hline \ldots .281 \mathrm{ft} \\ 0.5 \mathrm{~m} \\ 1.640 \mathrm{ft}\end{array}\right\}$


Correlation between sensing object size and sensing range

PRECAUTIONS FOR PROPER USE

- Never use this product as a sensing device for personnel protection.

4.- 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.

## Mounting

- The tightening torque should be $0.8 \mathrm{~N} \cdot \mathrm{~m}$ or less.
- Care must be taken regarding the sensor mounting direction with respect to the object's direction of movement.

-When detecting a specular object (aluminum or copper foil, etc.) or an object having a glossy surface or coating, please note that there are cases when the object may not be detected due to a change in angle, wrinkles on the object surface, etc.
- If a specular body is present in the background, faulty 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.

Do not make the sensor detect an object in this direction because it may cause unstable operation
-When a specular body is present below the sensor, use the sensor by tilting it slightly upwards to avoid faulty operation.


- This product is not easily affected by the reflected light intensity since this sensor is the adjustable range reflective type. When the reflected light intensity is remarkably low, the sensing range may be affected. In that case, mount the sensor, while checking light-up of the stable indicator (green).
- The mounting screws of the terminal cover and display cover should certainly be tightened to maintain water-resistance; the tightening torque of the screws should be 0.3 to $0.5 \mathrm{~N} \cdot \mathrm{~m}$.


## Automatic interference prevention function

- When the sensors are mounted closely, use them in the interference prevented area, as shown below.

- Note that the detection may be unstable depending on the mounting conditions or the sensing object to be used. In the state that this product is mounted, be sure to check the operation with the actual sensing object to be used.

| Selection <br> Guide |
| :--- |
| Amplifier <br> Built-in |
| Power Suply <br> Builtin |
| Amplifier- <br> separated |
| CX-400 |
| CY-100 |
| EX-10 |
| EX-20 |
| EX-30 |
| EX-40 |
| CX-440 |
| EQ-30 |
| EQ-500 |
| MQ-W |
| RX-LS200 |
| RX |
| RT-610 |

## PRECAUTIONS FOR PROPER USE

## Wiring

- Check all wiring before applying power since incorrect wiring may damage the internal circuit. Also, carefully tighten the terminal screws so that the wires of adjacent terminals do not touch.
- The mounting hole for the terminal cover fixing screws inclines 70 degrees to the terminal cover, as shown in the figure below.
To avoid damaging this product or screw, take care when tightening or loosening a screw.

- To maintain water-resistance, the cable should have an outer diameter between $\varnothing 9$ to $\varnothing 11 \mathrm{~mm} \varnothing 0.354$ to $\varnothing 0.433$ in with a smooth covering material that allows the attached conduit connector to be securely tightened; the tightening torque of the screw should be of 1.5 to $2.0 \mathrm{~N} \cdot \mathrm{~m}$.
- If an external surge voltage exceeding 4 kV is impressed (DC-voltage type: 1 kV ), the internal circuit will be damaged, and a surge suppressing element should be used.
- Prepare the cable end as shown below.


## Conduit connector construction and cabling



Note: When assembling the conduit connector, pay attention to the direction of the gland packing.
Furthermore, in order to maintain water-resistance, fit the gland packing such that the seating surface of the gland packing contacts the packing holder part of the terminal cover evenly.

- The size of conduit is $\mathrm{M} 20 \times 1.5 \mathrm{~mm} 0.787 \mathrm{in}$.
- If pressure terminals are to be used, affix the connected pressure terminals to a terminal (M3.5 screw).


## Dimensions of the suitable crimp terminals

(Unit: mm in)
Round type

Note: Use crimp terminals with insulating sleeves.
Recommended crimp terminal: Nominal size $1.25 \times 3.50 .049 \times 0.138$.

- The tightening torque for the terminal screws should be 0.3 to $0.5 \mathrm{~N} \cdot \mathrm{~m}$.

Part description


Notes: 1) The operation mode switch of the DC-voltage type is the DIP switch. Refer to 'DC-voltage type' of 'Operation mode switch' for details.
2) Incorporated on EQ-5■T only.

## Operation mode switch

Multi-voltage type (L-ON / D-ON mode only)

Operation mode switch | Description |
| :--- |

Note: Turn the operation mode switch gradually and lightly with the attached screwdriver. Turning with excessive strength will cause damage to the adjuster.

## DC-voltage type



## BGS / FGS function (DC-voltage type only)

- DC-voltage type sensor incorporates BGS / FGS function. Select either the BGS or FGS function depending on the positions of the background and sensing object.
- BGS / FGS function is set with the operation mode switch.
- FGS function is used when the sensing object contacts the background (conveyor, etc).
- Depends on a selection of either BGS or FGS function, the output operation changes as follows.



## Timer function (EQ-5 $\quad$ T only)

-EQ-5 $\quad \mathbf{T}$ incorporates an OFF-delay timer, which is useful when the response of the connected device is slow, etc., and an ON-delay timer, which is useful for detecting objects that move slowly, for example.

- The OFF-delay and ON-delay timers can be used simultaneously.
- For DC-voltage type, set the DIP switch for the timer mode to 'Timer ON' side.


## Time chart

| Sensing |
| ---: |
| condition |

Timer period: $\mathrm{T}=0.1$ to 5 sec . (variable)

## DIMENSIONS (Unit: mm in)

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

EQ-501(T) EQ-502(T) EQ-511(T) EQ-512(T)


Notes: 1) The operation mode switch of the DC-voltage type is the DIP switch.
2) For EQ-5 $\square$ T only.

## Stability indicator

- Since the EQ-500 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 (orange) operate according to the object distance.
Furthermore, the stability indicator (green) shows the margin of the setting distance.



## Others

- Do not use during the initial transient time ( 50 ms ) after the power supply is switched on.
- Its distance adjuster is mechanically operated. Do not drop; avoid other shocks.

Assembly dimensions with sensor mounting bracket MS-EQ5-01 (Optional) (Foot angled mounting)


## X-ON Electronics

Largest Supplier of Electrical and Electronic Components
Click to view similar products for Photoelectric Sensors category:
Click to view products by Panasonic manufacturer:

Other Similar products are found below :
E3JM-DS70R4T-US E3L2DC4 E3RA-DN12 2M E3RA-DP12 2M E3S5LE4S E3S-AD38 E3S-CR11 5M E3SCT11D5M E3SCT11M1J03M E3T-SL14R E3T-SL24 5M E3T-ST12R E3X-CN02 E3X-CN11 5M E3X-CN21 10M E3ZM-B66 E3ZM-CL81H 2M E3Z-T62 2M NJL5303R-TE1 PB10CNT15PO PD60CNX20BP CX-491-P-J CX-491-Z XUM2BKCNL2T XUM2BKCNL2T XUM2BNANL2R Y92EES30M Y92E-GS08SS ZXTDS04T ZX-XC4A 4M E3E23Y2US E3JM-DS70S4-US E3RA-RN11 2M E3S5LE42M E3S-LS20XB4 5M E3TFD14N E3T-FD14R E3T-SL21 5M E3T-SL21M E3T-ST11R E3T-ST12 5M E3X-DA41-S-M1J 0.3M E3X-DAB6 E3X-DAG8 E3ZMB86 E3ZM-CR81 2M E3ZM-CR86 E3Z-T61A-L 2M ZX-XGC2R ZX-XB1A


[^0]:    Note: Refer to "BGS / FGS function (p.369)" of "PRECAUTIONS FOR PROPER USE" for operation of BGS / FGS function.

