NEW
Compact & Long Range
Laser Distance Sensor
HG-F1 SERIES

Pinpoint detection from
3 m 9.843 ft away
Laser Distance Sensor HG-F1 Series

The laser distance sensor HG-F1 series features a lightweight and high-strength aluminum diecast case with a built-in TOF sensor module. Determines distance by measuring the time for the emitted beam to be reflected and return so that a single model can cover a measurement range of 250 to 3,000 mm (9.843 to 118.110 in).

**Capable of long-range sensing of up to 3 m 9.843 ft**

The sensor unit can be installed and set up anywhere so that equipment designing flexibility can be enhanced.

**Distance measuring system ensures stable sensing.**

The sensor measures the distance to the workpiece so that the performance is minimally affected by changes in workpiece colors or materials.

**Two types of spot mode**

The product employs the most suitable spot beams for distance ranging and for installation / adjustment. The emitted beam spot check mode facilitates adjustment in long-range sensing.

**Detects the presence / absence of target in the area outside the robot arm’s operating range.**
Long-range, 3-m 9.843-ft sensing capability allows installation anywhere

The long-distance sensing capability enables the installation of sensors at positions where they do not interfere with human workers or robot arm operation or at distant locations where the sensors will not be affected by scattering debris.

### Comparison of product series

<table>
<thead>
<tr>
<th>Product name / series name</th>
<th>Model No.</th>
<th>Measurable range / Measurement center distance and Measurement range</th>
<th>Beam diameter (typical value)</th>
<th>Repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact &amp; Long Range Laser Distance Sensor HG-F1 series</td>
<td>HG-F1</td>
<td>250 to 3,000 mm 9.843 to 118.11 in</td>
<td>Approx. ø10 mm ø0.394 in at the measuring distance of 1,000 mm 39.370 in</td>
<td>10 mm 0.394 in or less</td>
</tr>
<tr>
<td>Panasonic's CMOS type Micro Laser Distance Sensor HG-C series</td>
<td>HG-C1030</td>
<td>30±5 mm 1.181±0.197 in</td>
<td>Approx. ø50 μm ø1.969 mil</td>
<td>10 μm 0.394 mil</td>
</tr>
<tr>
<td></td>
<td>HG-C1050</td>
<td>50±15 mm 1.969±0.591 in</td>
<td>Approx. ø70 μm ø2.756 mil</td>
<td>30 μm 1.181 mil</td>
</tr>
<tr>
<td></td>
<td>HG-C1100</td>
<td>100±35 mm 3.937±1.378 in</td>
<td>Approx. ø120 μm ø4.724 mil</td>
<td>70 μm 2.756 mil</td>
</tr>
<tr>
<td></td>
<td>HG-C1200</td>
<td>200±80 mm 7.874±3.150 in</td>
<td>Approx. ø300 μm ø11.811 mil</td>
<td>200 μm 7.874 mil</td>
</tr>
<tr>
<td></td>
<td>HG-C1400</td>
<td>400±200 mm 15.748±7.874 in</td>
<td>Approx. ø500 μm ø19.685 mil</td>
<td>300 μm 11.811 mil</td>
</tr>
</tbody>
</table>

* The sensing object used for the HG-F1 series was a sheet of white non-glossy paper measuring 200 × 200 mm 7.874 in × 7.874 in and the sensing object used for the HG-C series was white ceramics.

* The beam diameter was defined as 1/e^2 (approx. 13.5%) of the center light intensity.

It is the size at a measuring distance of 1,000 mm 39.370 in in the case of the HG-F1 series or at the measurement center distance in the case of the HG-C series.
Distance measuring system ensures stable sensing.

The product is equipped with a 7-segment display that indicates measured distances digitally in mm. Quantification of detection states enables the setting of the most suitable threshold values consistently for anyone.

Digital display of measured distance

- Measured distance is displayed in mm.

Measurement of distance to the workpiece

- Not easily affected by material or color.
- Enables the confirmation of quantity of stacked objects and detects position.

Confirmation of delivery of workpiece / quantity of stacked objects at transfer robot section

Analog output

- Measured values can be output to an external device (analog voltage: 0 to +5 V, analog current: +4 to +24 mA)
- The analog scaling setting enables the acquisition of data from a desired measurement range.

Compact and robust aluminum diecast body

The HG-F1 series sensor has been downsized to about 80% of the previous long range distance sensor model (EQ-500 series) by volume ratio. The unit body is made of aluminum diecast so it is lightweight and robust.

Compact shape

20 (W) × 44 (H) × 25 (D) mm
0.787 (W) × 1.732 (H) × 0.984 (D) in

Lightweight and robust
Aluminum diecast body

High bending resistance
Standard cable
Selective use of spot beam according to specific usage conditions

**Emitted beam spot check mode**

Work efficiency can be improved by selecting the most suitable spot beam type from the two options according to specific usage conditions. The spot beam emitted for measurement blends in with the surroundings to minimize the discomfort resulting from the laser that comes into the field of vision. During installation / adjustment, the emitted beam spot check mode allows clear recognition of the beam spot and enables the reliable confirmation of sensing position even in the case of long-distance sensing.

**Visible light laser (Class 1) achieves pinpoint detection**

**Narrow field sensing**

The spot beam is smaller than that of a conventional adjustable-range distance sensor so that pinpoint detection is possible.

**Illustrated image of beam diameter**

<table>
<thead>
<tr>
<th>HG-F1 series</th>
<th>Panasonic’s Adjustable Range Reflective Photoelectric Sensor EQ-500 series</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 m</td>
<td>Ø4.7 mm/Ø0.185 in</td>
</tr>
<tr>
<td>0.5 m</td>
<td>Ø20 mm/Ø0.787 in</td>
</tr>
<tr>
<td>1 m</td>
<td>Ø70 mm/Ø2.756 in</td>
</tr>
<tr>
<td>1.5 m</td>
<td>Ø20.8 mm/Ø0.819 in</td>
</tr>
<tr>
<td>2 m</td>
<td>Ø20.8 mm/Ø0.819 in</td>
</tr>
<tr>
<td>2.5 m</td>
<td>Ø20.8 mm/Ø0.819 in</td>
</tr>
<tr>
<td>3 m</td>
<td>Ø20.8 mm/Ø0.819 in</td>
</tr>
</tbody>
</table>

* The above beam diameters are typical values. Confirm the appropriateness of the beam diameter in actual installation condition.
* The beam diameter may be affected by the materials of surrounding objects and their distances.
* The typical beam diameter of the EQ-501 / EQ-511 is used as the diameter of the EQ-500 series.
Useful functions

Teaching function

**Normal sensing mode**

### 2-point teaching

**Basic teaching method**

- **Threshold value 1**
- **Threshold value 2**

The threshold value is set automatically at the midpoint between the two points specified by teaching.

### Limit teaching

- **Threshold value 1**
- **Threshold value 2**

When the sensing object is located closer to the sensor than the background object, the threshold value for detection is set.

With an object below the sensor, press the TEACH key to set the valid range for distances via threshold values. In addition, a single output can be used to judge whether two thresholds are within the range of "Pass" and outside the range of "Fail."

**Window comparator mode**

### 1-point teaching

This method performs one-point teaching for the distance to the reference surface of the sensing object and sets the value obtained by subtracting the amount of shift from the result in threshold value 1 and the value obtained by adding the amount of shift to the result in threshold value 2.

### 2-point teaching

This method performs two-point teaching (sensing objects 1 and 2) for the two reference surfaces and sets the results in threshold value 1 and threshold value 2.

### 3-point teaching

This method performs three-point teaching (sensing objects 1, 2 and 3) for the three reference surfaces and sorts the teaching results in the descending order (Max, Middle, Min). Then, it sets the intermediate value between Min and Middle in threshold value 1 and sets the intermediate value between Middle and Max in threshold value 2.

**Zero set function**

This function compulsorily sets the measured value to "zero." The zero point can be set at a desired value. It is useful when measuring steps or tolerance with reference to the height of a sensing object.

Keep pressing both keys for 3 seconds.

* The zero set indicator (yellow) will turn ON while the zero set is valid.
* If the zero set function is executed while the peak / bottom hold function is valid, the held measurement value will be reset and the zero set function cannot be set.
* If the peak / bottom hold function is enabled while the zero set function is valid, the zero set setting will be cancelled.
* If an error occurs, the zero set function cannot be set.
* An external input can be used to set the zero set function.

**External input setting function**

One of three functions, “zero set function,” “teaching function” and “emission stopping function” can be assigned to an external input line.

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Timer setting function

The timer operation can be selected from “off delay timer”, “on delay timer”, “one-shot timer” and “no timer”. The timer period can also be selected.*

- **Off delay timer**
  - **Function**: Extends the signal output for the set timer period.
  - **Usage**: Useful when the connected device is slow to respond and the ON time is required to be extended.

- **On delay timer**
  - **Function**: Overrides the signal output for the set timer period after the detection.
  - **Usage**: Useful when it is necessary to override temporary signals or to provide control after a time lag.

- **One-shot timer**
  - **Function**: Outputs the signal for the set timer period after the detection.
  - **Usage**: Useful when the signal duration needs to be constant due to the condition of input from the connected device. Also useful when the temporary signal needs to be extended to a certain time length.

* The timer period can be selected from the following: 5 ms, 10 ms, 25 ms, 50 ms, 100 ms, 250 ms, 500 ms, 1,000 ms and 5,000 ms.

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Applications

- **Confirmation of door parts installation**
- **Detection of remaining amount of sheet**
- **Detection of car seats**
- **Detection of vertically stacked objects**
- **Detection of remaining amount in hopper**
- **Detection of parts through viewing port**
- **Detection from the outside of robot arm’s operating range**
- **Load presence confirmation**
- **Detection of vehicle body position**

Shown above are application examples. Note that detection may not be possible in some cases due to the shapes, color, luster, etc. of the workpieces used by the customer. Be sure to confirm proper operation with actual machines. If the sensors fail to detect, consult our sales office in charge.
### OPTIONS

<table>
<thead>
<tr>
<th>Designation</th>
<th>Model No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple mounting bracket</td>
<td>MS-HG-01</td>
<td>Foot angled mounting bracket</td>
</tr>
</tbody>
</table>

**Simple mounting bracket**

- MS-HG-01

Material: Stainless steel (SUS304)

Two M3 (length 25 mm 0.984 in) screws with washers (SPCC) are attached.

### WIRING DIAGRAMS

**HG-F13A-A-N**

- **NPN output type**

  - **Color code**
    - (Brown) +V
    - (Pink) External input
    - (Black) Control output
    - (Blue) 0 V
    - (Gray) Analog output
    - (Shield) Analog ground
  - **24 V DC ±10%**
  - **Analog input device**

  **Non-voltage contact or NPN open-collector transistor**

- **or**

  - **External input**
    - Invalid: +8 V to +V DC or open
    - Valid: 0 to +1.2 V DC

Note: Insulate the unused terminals in order to prevent input errors and short-circuits.

**HG-F13A-A-P**

- **PNP output type**

  - **Color code**
    - (Brown) +V
    - (Black) Control output
    - (Pink) External input
    - (Blue) 0 V
    - (Gray) Analog output
    - (Shield) Analog ground
  - **24 V DC ±10%**
  - **Analog input device**

  **Non-voltage contact or PNP open-collector transistor**

- **or**

  - **External input**
    - Invalid: 0 to +0.6 V DC or open
    - Valid: +4 V to +V DC

Note: Insulate the unused terminals in order to prevent input errors and short-circuits.
### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>NPN output type</th>
<th>PNP output type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable regulations and certifications</td>
<td>CE Marking (EMC Directive, RoHS Directive), UKCA Marking (EMC Regulations, RoHS Regulations), FDA Regulations, TÜV SÜD NRTL certification (USA, Canada)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurable range</td>
<td>250 to 3,000 mm 9.843 in to 118.110 in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Displayable range (Note 2)</td>
<td>200 to 3,300 mm 7.874 in to 129.921 in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>10 mm 0.394 in or less (target object: sheet of white non-glossy paper measuring 200 × 200 mm 7.874 × 7.874 in)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>30 mm 1.181 in (default setting) Possible to vary up to 1 mm 0.039 in minimum in the PRO mode (Note 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity</td>
<td>±2% F.S. (Note 4) (at a measuring distance of 500 mm to 3,000 mm 19.685 in to 118.110 in)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature characteristics</td>
<td>0.1% F.S./°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light source</td>
<td>Red semiconductor laser: Class 1 [JIS / IEC / GB / KS / FDA (Note 5)]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beam diameter (Note 6)</td>
<td>Approx. ø10 mm ø0.394 in (typical) (at the measuring distance of 1,000 mm 39.370 in)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>24 V DC ±10%, Ripple P-P 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption (Note 7)</td>
<td>40 mA or less (at 24 V DC supply voltage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control output</td>
<td>NPN open-collector transistor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output operation</td>
<td>Switchable between Light-ON / Dark-ON, (Default: Light-ON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-circuit protection</td>
<td>Incorporated (Auto reset type)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog output</td>
<td>NPN open-collector transistor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output range (Note 9)</td>
<td>0 mA to +20.8 mA, Possible to set the distance range (Default: 250 to 3,000 mm 9.843 in to 118.110 in)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output impedance</td>
<td>100 Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output range (Note 9)</td>
<td>0 mA to +20.8 mA, Possible to set the distance range (Default: 250 to 3,000 mm 9.843 in to 118.110 in)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output impedance</td>
<td>250 Ω or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>Switchable between 35 ms / 100 ms / 300 ms / 2,000 ms (Default: 100 ms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External input</td>
<td>NPN non-contact input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input condition</td>
<td>Valid: +8 to +12 V DC or Open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid: 0 to +1.2 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input impedance: approx. 10 kΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PNP non-contact input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input condition</td>
<td>Valid: +8 to +12 V DC or Open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid: 0 to +1.2 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input impedance: approx. 10 kΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External input function</td>
<td>Switchable between zero set, teaching, or emission stop (Default: zero set)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching function</td>
<td>Switchable between normal sensing mode (2-point / limit) or window comparator mode (1-point / 2-point / 3-point)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Default: Normal sensing mode)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timer function</td>
<td>Switchable between OFF / ON delay / OFF delay / one-shot (Default: OFF)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timer period</td>
<td>Switchable between 5 ms / 10 ms / 25 ms / 50 ms / 100 ms / 250 ms / 500 ms / 1,000 ms / 5,000 ms (Default: 5 ms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pollution degree</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overvoltage category</td>
<td>Category I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient altitude (Note 8)</td>
<td>2,000 m 6561.680 ft or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental resistance</td>
<td>Protection: IP67 (IEC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-10 to +45 °C +14 to 113 °F (No dew condensation or icing allowed), Storage: -20 to +60 °C -4 to 140 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>35 to 85% RH, Storage: 35 to 85% RH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient illuminance</td>
<td>Incandescent light: 3,000 lx or less at the light-receiving face</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>10 to 55 Hz (period: 1 min.), frequency, 1.5 mm 0.059 in double amplitude in X, Y and Z directions for two hours each</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock resistance</td>
<td>500 m/s² acceleration (approx. 50 G) in X, Y and Z directions three times each</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable</td>
<td>0.2 mm² 5-core composite cable, 2 m 6.562 ft long</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable extension</td>
<td>Extension up to total 10 m 32.808 ft is possible with 0.3 mm², or more, cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Enclosure: Aluminum die-cast, Front cover: Acrylic, Cable: PVC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>Net weight: approx. 85 g, Gross weight: approx. 130 g</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1) Unless otherwise specified, measurement conditions are as follows: Power supply voltage of 24 VDC, ambient temperature of +20 °C +68 °F, response time of 100 ms, and measuring distance of 1,000 mm 39.370 in. The target object is a 200 mm × 200 mm 7.874×7.874 in white non-glossy paper.
2) When an object is detected, the range of numerical values that appear on the digital display is regarded as the displayable distance. When zero setting is performed, the displayable distance varies depending on the zero setting distance.
3) Changing the hysteresis may result in unstable sensing. After making a change, perform operation check using actual equipment.
4) F.S. (full scale) represents a range from 0 mm to 3,000 mm 0 in to 118.110 in.
5) This product complies with the FDA regulations (FDA 21 CFR 1040.10 and 1040.11) in accordance with FDA Laser Notice No. 56, except for complying with IEC 60825-1 Ed. 3.
6) The beam diameter is defined as 1/e² (approx. 13.5%) of the center light intensity. Due to leak light outside the defined range, the measurement values may be affected if the reflectance around the detecting point is higher than that of the detecting point.
7) Analog output is not included.
8) Do not use or store this product in environments where ambient air is pressurized to an air pressure higher than the atmospheric pressure at an altitude of 0 m.
9) When the intensity of received light is unstable, the voltage is output as 0 V and the current is output as 0 mA.
REPEATABILITY CHARACTERISTICS (TYPICAL)  * Be sure to confirm proper condition in actual installation condition.

Repeatability by sensing distance/ by response time

<table>
<thead>
<tr>
<th>Measuring distance</th>
<th>White non-glossy paper</th>
<th>Gray non-glossy paper</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Response time</td>
<td>Response time</td>
</tr>
<tr>
<td></td>
<td>35 ms</td>
<td>100 ms</td>
</tr>
<tr>
<td>250 mm</td>
<td>9.843 in</td>
<td>0.197 in</td>
</tr>
<tr>
<td>500 mm</td>
<td>19.685 in</td>
<td>0.236 in</td>
</tr>
<tr>
<td>1,000 mm</td>
<td>39.370 in</td>
<td>0.276 in</td>
</tr>
<tr>
<td>2,000 mm</td>
<td>78.740 in</td>
<td>0.276 in</td>
</tr>
<tr>
<td>3,000 mm</td>
<td>118.110 in</td>
<td>0.276 in</td>
</tr>
</tbody>
</table>

* The above values were obtained using a sheet of white non-glossy paper measuring 200 × 200 mm 7.874 × 7.874 in (N9 to N9.5, reflectance: approx. 80%) or a sheet of gray non-glossy paper measuring 200 × 200 mm 7.874 × 7.874 in (NS, reflectance: approx. 20%).

SENSING CHARACTERISTICS (TYPICAL)  * Be sure to confirm proper condition in actual installation condition.

Emitted beam characteristics

Correlation between material and sensing distance

- Setting distance: 1,000 mm 39.370 in
- Setting distance: 2,500 mm 98.425 in
**PRECAUTIONS FOR PROPER USE**

- This catalog is a guide to select a suitable product. Be sure to read instruction manual attached to the product prior to its use.

- 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.

- If the product is controlled or adjusted using a procedure other than the one specified in the instruction manual or user's manual, exposure to the hazardous laser radiation may result.

**Part description**

**Beam emitting part (laser opening)**

**Beam receiving part**

**Operation / display section**

**Mounting hole**

**Emitted beam spot check method**

- The emitted beam spot check mode is available to facilitate the confirmation of the laser beam spot position. When this mode is used, the beam spot becomes brighter and flashes.

  Activate the emitted beam spot check mode by following the procedure described below and adjust the workpiece position.

1. After turning ON the power, make sure that the display shows the following measurement screen. Then, press and hold the UP key for 3 seconds or longer. The emitted beam spot check mode will be activated.

2. The product emits a spot beam in 1-second intervals. While observing the beam spot, move the sensor unit and adjust the optical axis.

- When the "emitted beam spot check mode" is used, sensing objects cannot be measured.
- By holding down the UP key for 3 seconds or longer while the "emitted beam spot check mode" is selected, you can return to the measurement display.
- The display automatically returns to the measurement display when 2 minutes elapse after the sensor is set to the "emitted beam spot check mode". To continue to adjust the beam axis, hold down the UP key for 3 seconds or longer again to set the "emitted beam spot check mode".

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<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Digital display (Red)</td>
<td>Displays measured values and settings.</td>
</tr>
<tr>
<td>2</td>
<td>PRO indicator (Yellow)</td>
<td>Lit when PRO mode is set.</td>
</tr>
<tr>
<td>3</td>
<td>Zero set indicator (Yellow)</td>
<td>Lit while the zero set function is ON.</td>
</tr>
<tr>
<td>4</td>
<td>Teaching indicator (Yellow)</td>
<td>Lit while teaching is in progress</td>
</tr>
<tr>
<td>5</td>
<td>Output operation indicator (Orange)</td>
<td>Lit while control output is ON.</td>
</tr>
<tr>
<td>6</td>
<td>Laser radiation indicator (Green)</td>
<td>Lit while laser beams are being emitted.</td>
</tr>
</tbody>
</table>

- This product is classified as a Class-1 laser product under the IEC / JIS / GB / KS standards and FDA regulations*. Do not look at the laser beam through an optical observation system such as a lens since doing so is very dangerous.
- The following label is affixed on the side of the product as per the safety regulation for laser products.

* This product complies with the FDA regulations (FDA 21 CFR 1040.10 and 1040.11) in accordance with Laser Notice No. 56 of the FDA regulations, except for the conformity with IEC 60825-1 Ed. 3.

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< Measurement screen >

/ Emitted beam spot check mode screen

Hold down for 3 seconds.
Installation

- When mounting the sensor unit, use M3 screws with washers (length: 25 mm 0.984 in or longer) (not included with the product). The tightening torque should not exceed 0.5 N.m.

- When using multiple sensors, mount them so that emitted laser beams do not directly enter the beam receiving parts of other sensors in order to avoid mutual interference. Also, mount them so that spot beams irradiated on a workpiece do not overlap with those of other sensors.

- Do not mount the sensors closely side by side to prevent heat generation. Otherwise, the product temperature may exceed the specified temperature due to heat generation.

- To prevent the product from falling due to loose screws, take prevention measures such as using screws with washers depending on the operating environment.

- Use the tightening torque of 0.5 N.m or less when using the simple mounting bracket MS-HG-01 (optional).

Power supply

- Verify that the supply voltage fluctuations are within the rating when using the product. Note that applying a voltage greater than the rated voltage or directly applying AC power will result in damage or burning.

- To ensure performance, use the product at least 30 minutes (warm-up time) after the power is turned ON.

- If power is supplied from a commercial switching regulator,

- If surges occur, take countermeasures such as connecting a surge absorber to the source of the surges.

- Do not turn OFF the power while conducting teaching or saving settings such as the PRO mode setting. Doing so can damage the internal memory of the product and may disable the product from restarting.

- Do not turn OFF the power supply before cleaning the light emitting and receiving windows of this product.

- Keep the light emitting and receiving windows of this product clean and free of water, oil, fingerprints, and other substances that refract light as well as dust, grit, and other objects that intercept light. When cleaning the surfaces, wipe them with a lint-free soft cloth or lens cleaning paper.

- Make sure to turn OFF the power supply before cleaning the light emitting and receiving windows of this product.

- This product is a precision device. Do not drop or otherwise subject to shock. Doing so may cause product failure.

- Due to the detection principle, if there is a background object in a similar fitting to allow the adjustment of beam axis.

- If specular reflection light enters the beam receiving part, proper measurement may not be possible. When the reflectance of a detection object is high, be careful in installation.

- When exporting this product to the US, affix the provided FDA certificate / identification label near the end of the cable.

- When this product becomes unusable or unnecessary, dispose of the product properly as industrial waste in accordance with the applicable law in the country.
**PRECAUTIONS FOR PROPER USE**

**List of Setting Items**

- The following items can be set in the product. For the method of setting each item, refer to the User’s Manual for HG-F1 Series.

* The User’s Manual can be downloaded from our website.

<table>
<thead>
<tr>
<th>No.</th>
<th>Setting item</th>
<th>Display screen</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Response time setting</td>
<td></td>
<td>Used to set the time from when the sensor starts measurement until a measurement value is finalized and output. &lt;Default: 100&gt;</td>
</tr>
<tr>
<td>2</td>
<td>Output operation setting</td>
<td></td>
<td>Used to set the operation mode of control output. &lt;Default: L-on&gt;</td>
</tr>
<tr>
<td>3</td>
<td>Sensing output setting (teaching)</td>
<td></td>
<td>Used to set the threshold teaching method. &lt;Default: &quot;f&quot; &gt;</td>
</tr>
<tr>
<td>4</td>
<td>Analog output setting</td>
<td></td>
<td>Used to select analog output as either analog voltage output or analog current output. &lt;Default: Analog v.oUt&gt;</td>
</tr>
<tr>
<td>5</td>
<td>Analog scaling setting</td>
<td></td>
<td>Used to set optional two points as the upper limit value and the lower limit value for performing twopoint correction on the analog output before data is output. Set the measured value A as the lower limit value and the measured value B as the upper limit value. &lt;Measured value A default: 0, measured value B default: 3,000&gt;</td>
</tr>
<tr>
<td>6</td>
<td>Hysteresis setting</td>
<td></td>
<td>Used to set the hysteresis value. &lt;Default: 30&gt;</td>
</tr>
<tr>
<td>7</td>
<td>Shift amount setting</td>
<td></td>
<td>Used to set the threshold value for limit teaching and 1-point teaching. &lt;Default: 60&gt;</td>
</tr>
<tr>
<td>8</td>
<td>External input setting</td>
<td></td>
<td>Used to set either the zero setting, teaching, or emission stop function. &lt;Default: 0SEt&gt;</td>
</tr>
<tr>
<td>9</td>
<td>Timer setting</td>
<td></td>
<td>Used to set whether to use the timer setting of control output. &lt;Default: non&gt;</td>
</tr>
<tr>
<td>10</td>
<td>Timer period setting</td>
<td></td>
<td>Used to set the timer period when &quot;OFF delay timer, ON delay timer, or One-shot timer&quot; is set in the timer setting. &lt;Default: 5&gt;</td>
</tr>
<tr>
<td>11</td>
<td>Hold setting</td>
<td></td>
<td>Used to set the digital display, the control output and analog output operation when a measurement error occurs (insufficient light intensity, saturation of light intensity, out of measurement range). &lt;Default: oFF&gt;</td>
</tr>
<tr>
<td>12</td>
<td>ECO setting</td>
<td></td>
<td>Used to turn OFF the digital display to save electricity when not operating. &lt;Default: oFF&gt;</td>
</tr>
<tr>
<td>13</td>
<td>Reset setting</td>
<td></td>
<td>Used to reset all the settings of this product to the factory default settings. &lt;Default: no&gt;</td>
</tr>
</tbody>
</table>
**PRECAUTIONS FOR PROPER USE**

**Error indication**

- In case of an error, try the following remedy.

<table>
<thead>
<tr>
<th>Error code</th>
<th>Description</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| Er01       | Internal memory is abnormal, damaged, or has passed its life expectancy. | • Switch the power OFF and then ON, and select and execute the reset setting (initialization of this product) from setting items.  
• If the sensor does not recover after the above action, consult your Panasonic representative. |
| Er11       | Control output load has shortcircuited and excessive current is flowing. | Turn OFF the power and check the load. |
| Er31       | During zero setting, the measurement is not performed properly. | Check if the sensing distance to be set is within the specification range. |
| Er41       | During teaching, the measurement is not performed properly. | Check if the sensing distance to be set is within the specification range. |
| Er51       | The beam emitting part or the beam receiving part is abnormal. | Turn the power OFF and then ON. If the sensor does not recover after the above action, consult your Panasonic representative. |
| Er90, Er91, Er92, Er93, Er94, Er95, Er96 | System error | The product could be faulty. Please consult your Panasonic representative. |

**Main Inspection Items**

- Inspect the sensor regularly to maintain performance and enable optimum use.

The main inspection items are as follows:
- Is the product installation loose?
- Have any input and output terminals become loose or come off?
- Are there cracks in the cable?
- Is the spot beam deviated from the set position?
- Is the supplied power within the rated voltage range (24 V DC ±10%)?
- Is the ambient temperature within the specified range (-10 to +45 °C, +14 to +113 °F)?
- Is the ambient humidity within the specified range (35 to 85% RH)?
- Are the light emitting and receiving windows of the sensor contaminated with dirt or foreign matter?
DIMENSIONS (Unit: mm in)


- ø4.1 mm 0.161 in, 2 m 6.562 ft long cable (5-core composite cable)

- Laser emission indicator (Green)
- Output operation indicator (Orange)
- Teaching indicator (Yellow)
- Zero set indicator (Yellow)
- PRO indicator (Yellow)

**Beam emitting part**
- 2-M3 × 0.5 0.020
- 2-M3 × 0.5 0.059

**Beam receiving part**
- UP key
- DOWN key

**MS-HG-01**

**Simple mounting bracket (Optional)**

Assembly dimensions

- Material: Stainless steel (SUS304)
- Two M3 (length 25 mm 0.984 in) screws with washers (SPCC) are attached.
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