Panasonic® INSTRUCTION MANUAL

Micro Laser Distance Sensor [CMOS] HG-C Series

ME-HGC1000 No.0096-83V

Thank you very much for purchasing Panasonic products.
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

- This product is for the sensing (determination and measurement) of objects. Do not use this product to secure safety, such as accident prevention which may affect human life and property.
- Avoid observing beams continuously, particularly in a dark surrounding environment.
- Do not stare into laser beam with an optical device such as telephoto optics.
- Never attempt to disassemble, repair, or modify this product.
- Control or adjustment according to procedures other than those provided in this Installation Instructions Manual may cause exposure to hazardous emitted laser beams.

1 REGULATIONS AND STANDARDS

- This product complies with the following regulations / standards.

<Conformity Directives/Conforming Regulations>
EU Law : EMC Directives 2014/30/EU
British Legislation : EMC Regulations 2016/1091
- Applicable Standards
  EN 61000-6-4, EN 61000-6-2
<Standards in US / Canada>
CAN/CSA-C22.2 NO. 60947-5-2-14

c ⚡US

2 CONFIRMATION OF PACKED CONTENTS

☐ Sensor   1 pc.
☐ Laser warning label (JIS Standards, GB Standards, KS Standards)   1 set each
☐ FDA certificate / identification label   1 pc.
☐ Instruction Manual (Japanese, English, Korean)   1 pc. each language
☐ General Information for Safety, Compliance, and Instructions   1 pc.

3 SAFE USE OF LASER PRODUCT

- For the purpose of preventing any injury which may occur to the user by the use of the laser product in advance, the following standards have been established by the IEC Standards, EN Standards, JIS Standards, GB Standards, KS Standards and FDA Regulations.

IEC : IEC 60825-1:2014
EN : EN 60825-1:2014/A11:2021
JIS : JIS C 6802:2014
GB : GB 7247.1-2012
KS : KS C IEC 60825-1:2014
FDA : PART 1040.10, 1040.11(Laser Notice No.56 applied)

These standards classifies laser products according to the level of hazard and provide the safety measures for respective classes.
This product belongs to "Class 2 laser product" according to IEC 60825-1:2014(EN 60825-1:2014/A11:2021) "Radiation Safety of Laser Products".

- Explanation of hazard levels

Classification	Summary of hazard evaluation
Class 2	A laser that emits visible light with the wavelength range of 400 nm to 700 nm under which eyes can be protected by an aversive reaction (Avoidance behavior) such as a blink.

When an unexpected failure occurs, dangerous radiation may be generated. Therefore, pay special attention to safety.
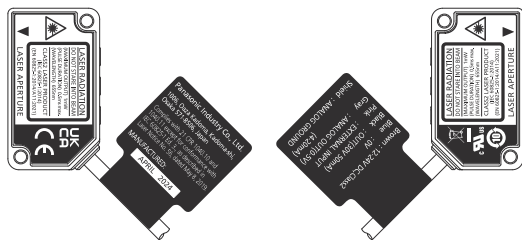
● WARNING label

JIS Standards

IEC(EN) Standards

GB Standards

KS Standards

● FDA certificate / identification label

Panasonic Industry Co., Ltd.
1006, Oaza Kadoma, Kadoma-shi, Osaka 571-8506, Japan
Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.
MANUFACTURED:
APRIL, 2024

Brown : 12-24V DC,Class2
Blue : 0V
Black : OUT(30V 50mA)
Pink : EXTERNAL INPUT
Gray : ANALOG OUT(0-5V)
   (4-20mA)
Shield : ANALOG GROUND
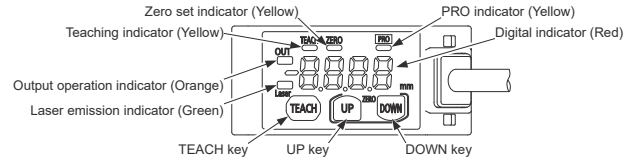
<Label position>

- A warning label according to IEC (EN) standards is affixed to this product, and warning labels according to JIS, GB, and KS standards are included with it. Remove the IEC (EN) warning label, and then affix an appropriate label to the product as needed.
- When exporting this product to the United States of America attach the FDA certificate / identification label to the cable close to the sensing device.

FDA

● **Exporting to the USA**
If this product is incorporated into facilities or equipment to be exported to the USA, it is subject to the laser regulations of the U.S. Food and Drug Administration (FDA). To prevent laser products from affecting their users, PART1040 (Performance Standards for Light-Emitting Products) was established as one of the FDA regulations. These standards classify laser products into classes according to the hazard level of laser and prescribe safety and preventive measures that should be implemented for each class.
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. (**Class 2 Laser Product**)
When exporting this product to the USA, affix the FDA certificate / identification label near the end of the cable.

4 PART DESCRIPTION

Zero set indicator (Yellow)
Teaching indicator (Yellow)
PRO indicator (Yellow)
Digital indicator (Red)
Output operation indicator (Orange)
Laser emission indicator (Green)
TEACH key
UP key
DOWN key

5 MOUNTING

- When mounting this product, use M3 screw with washer (prepare separately). Use a tightening torque of 0.5N·m for mounting.
- When mounting this product using the sensor mounting bracket (optional), also use a tightening torque of 0.5N·m.
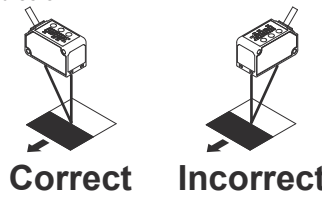

M3 screws with washers (prepare separately)
Mounting hole dimensions
Laser aperture
37 mm
18 mm
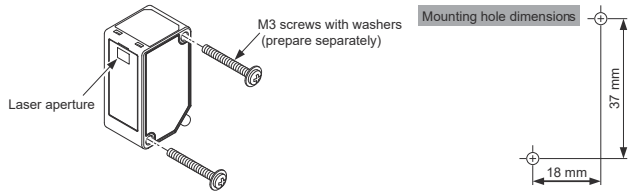
Mounting Direction

● **Direction to a movable body**
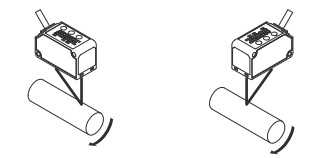**<When there are differences in material and color>**
• When performing measurements of moving objects with excessively different materials and colors, mount the product per the following directions to minimize measurement errors.


Correct | **Incorrect**

<Measurement of rotating objects>
• When measuring rotating objects, mount the product as follows. Measurement can be performed with minimized effect on the object caused by up / down deflection, position deviation and etc.


Correct | **Incorrect**

<When there is a step>
• When there is a step in the moving object, mount the product as follows. Measurement can be performed with minimized effect from the edges of the steps.
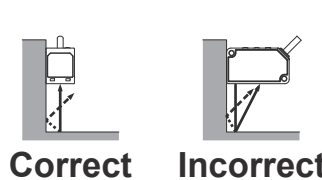

Correct | **Incorrect**
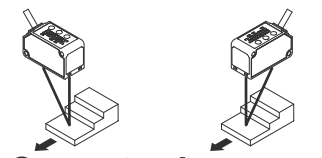
● **Measuring of narrow locations and recesses**
• When measuring in narrow locations or inside holes, mount the product so that optical path from the light emitting part to light-receiving part is not interrupted.
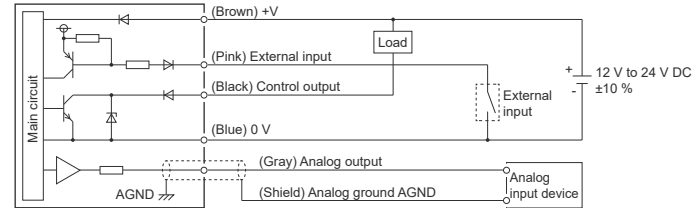

Correct | **Incorrect**
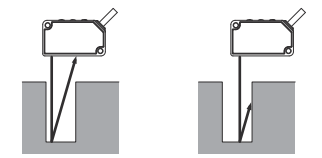
● **Mounting the sensor to a wall**
• Mount the product as follows, so that the multiple light reflections on the wall do not emit to the light-receiving part. When the reflection factor on a wall is high, it is effective to use a dull black color.
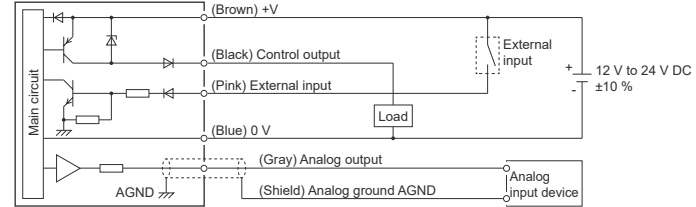

Correct | **Incorrect**

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6 I/O CIRCUIT DIAGRAMS

● **NPN Output Type**

(Brown) +V
Load
(Pink) External input
(Black) Control output
External input
12 V to 24 V DC ±10 %
(Blue) 0 V
(Gray) Analog output
Analog input device
AGND
(Shield) Analog ground AGND

● **PNP Output Type**

(Brown) +V
(Black) Control output
External input
(Pink) External input
Load
12 V to 24 V DC ±10 %
(Blue) 0 V
(Gray) Analog output
Analog input device
AGND
(Shield) Analog ground AGND

7 TEACHING

2-point teaching

- This is the basic teaching method.

Distance
ON
OFF
Threshold
Background | Sensing object

1. Press the TEACH key in the background present condition.

2. Press the TEACH key in the sensing object present condition.

Good Stable sensing is possible

HArd Stable sensing is not possible

Limit-teaching

- This is teaching method in case small object or object in background are existing.

<When an object in background is used as reference>

Distance
UP key
Threshold
Teaching value
Background

<When a sensing object is used as reference>

Distance
Teaching value
DOWN key
Threshold
Sensing object

1. Press the TEACH key in the background present condition or the sensing object present condition.

2. When an object in the background is used as a reference, press the UP key to set the threshold on the sensor side.
When a sensing object is used as a reference, press the DOWN key to set the threshold on the sensing object side.

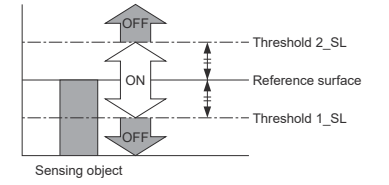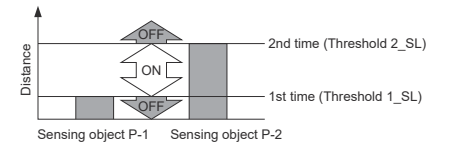Automatic

Good

3. Teaching is completed.

1-point teaching (Window comparator mode)

- This is mode is used for setting the threshold range for the distance from the reference value of the sensing object, by performing 1-point teaching. This mode is used for sensing within the threshold range.
- When performing 1-point teaching (window comparator mode), preset "Window comparator mode 1" in the sensing output setting of the PRO mode. For the setting method, refer to "**12 PRO MODE SETTING**."

OFF
ON
OFF
Threshold 2_SL
Reference surface
Threshold 1_SL
Sensing object

1. Press the TEACH key twice in the sensing object present condition.
(1st time: TEACH key, 2nd time: Teaching)
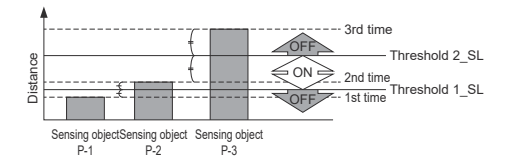
Automatic

2. Teaching is completed.

2-point teaching (Window comparator mode)

- This is method to set the threshold range by conducting the 2-point teaching.
- When performing 2-point teaching (window comparator mode), preset "Window comparator mode 2" in the sensing output setting of the PRO mode. For the setting, refer to "**12 PRO MODE SETTING**."
- When conducting teaching, use sensing objects (P-1 and P-2) whose distance are different from each other.

Distance
OFF
ON
OFF
2nd time (Threshold 2_SL)
1st time (Threshold 1_SL)
Sensing object P-1 | Sensing object P-2

1. Press the TEACH key in the sensing object P-1 present condition. (1st time)

2. Press the TEACH key in the sensing object P-2 present condition. (2nd time)

Good Stable sensing is possible
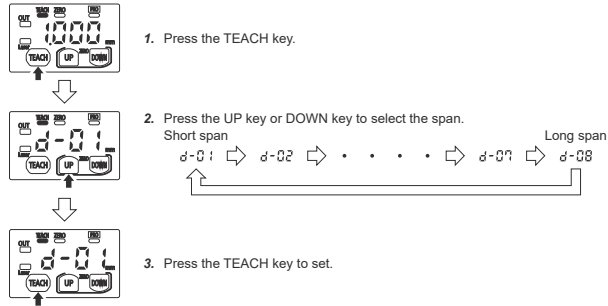
HArd Stable sensing is not possible

3-point teaching (Window comparator mode)

- This is the method to perform 3-point teaching (P-1, P-2, P-3) and to set the threshold range by setting threshold 1_SL in the mid-point between the 1st time and 2nd time, and threshold 2_SL in the mid-point between the 2nd time and 3rd time as shown in the following figure.
- When performing 3-point teaching (window comparator mode), preset "Window comparator mode 3" in the sensing output setting of the PRO mode. For the setting, refer to "**12 PRO MODE SETTING**."
- When performing teaching, use sensing objects (P-1, P-2, P-3) with different distance.
- After teaching, P-1, P-2 and P-3 will be automatically rearranged from the smaller value.

Distance
OFF
ON
OFF
3rd time
Threshold 2_SL
2nd time
Threshold 1_SL
1st time
Sensing object P-1 | Sensing object P-2 | Sensing object P-3

1. Press the TEACH key in the sensing object P-1 present condition. (1st time)

2. Press the TEACH key in the sensing object P-2 present condition. (2nd time)

3. Press the TEACH key in the sensing object P-3 present condition. (3rd time)

Good Stable sensing is possible

HArd Stable sensing is not possible

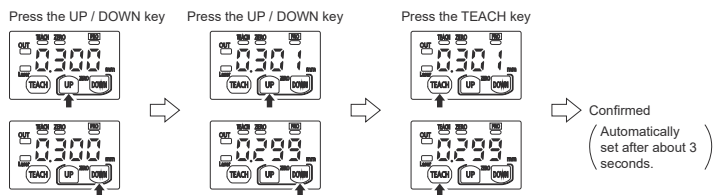## Span adjustment in rising differential mode or trailing differential mode

- This mode is used to cancel the gradual changes in the measured value, and to only detect sudden changes.
- When performing rising differential mode or trailing differential mode, preset "Rising differential mode" or "Trailing differential mode" in the sensing output setting of the PRO mode. For the setting method, refer to "**12 PRO MODE SETTING**."
- The threshold can be set by using the threshold value fine adjustment function. For the threshold value fine adjustment function, refer to "**8 THRESHOLD VALUE FINE ADJUSTMENT FUNCTION**."

1. Press the TEACH key.

2. Press the UP key or DOWN key to select the span.

Short span   Long span
d-01 ⇒ d-02 ⇒ • • • ⇒ d-07 ⇒ d-08

3. Press the TEACH key to set.

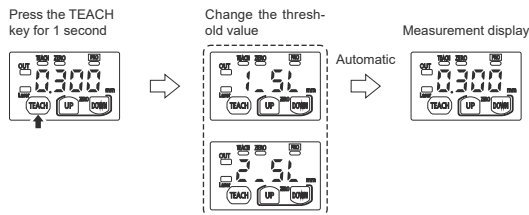## 8 THRESHOLD VALUE FINE ADJUSTMENT FUNCTION

- Fine adjustment of the threshold can be performed in the measurement display.
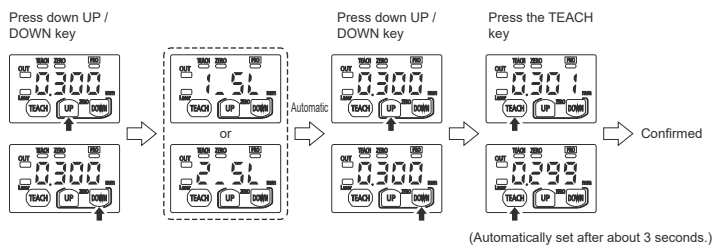- Fine adjustment of the threshold can be performed even after teaching.

<Normal sensing mode, rising differential mode or trailing differential mode>

Press the UP / DOWN key → Press the UP / DOWN key → Press the TEACH key

Confirmed (Automatically set after about 3 seconds)

<Window comparator mode>

- When the sensing output is set to window comparator mode, the display of "1.5L" and "2.5L" can be changed by pressing the TEACH key for 1 second.

Press the TEACH key for 1 second → Change the threshold value → Measurement display (Automatic)
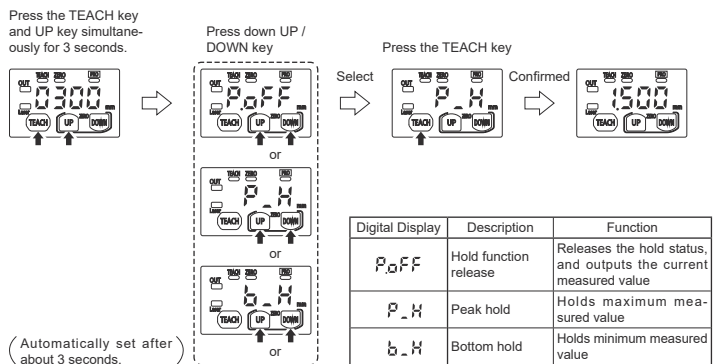
- When performing a fine adjustment of the threshold of "1.5L" or "2.5L", press the UP key or DOWN key. After "1.5L" or "2.5L" is displayed, the fine adjustment of the threshold can be performed.

Press down UP / DOWN key → Press down UP / DOWN key → Press the TEACH key

Confirmed

(Automatically set after about 3 seconds.)

9 PEAK / BOTTOM HOLD FUNCTION

- The peak / bottom hold function, is for displaying the peak value and bottom value.
- When the zero set function is executed while the peak / bottom hold function is set to "Peak hold" or "Bottom hold", the held measured value will be reset.

Press the TEACH key and UP key simultaneously for 3 seconds. → Press down UP / DOWN key → Select → Press the TEACH key → Confirmed

(Automatically set after about 3 seconds.)

Digital Display	Description	Function
PoFF	Hold function release	Releases the hold status, and outputs the current measured value
P_H	Peak hold	Holds maximum measured value
b_H	Bottom hold	Holds minimum measured value

10 ZERO SET FUNCTION

- The zero set function is the function to compulsorily set the measured value to "zero".
- The zero set indicator (yellow) will turn ON when the zero set is valid.
- When the zero set function is executed while the peak / bottom hold function is valid, the held measured value will be reset.
- When the display setting is set to Offset, the zero set function cannot be set.
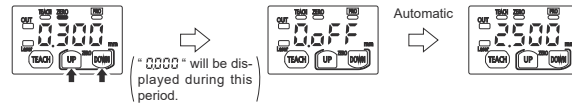
<Zero set setting>

Press the UP key and DOWN key simultaneously for 3 seconds.

Confirmed

<Zero set release>

Press the UP key and DOWN key simultaneously for 6 seconds.

"0000" will be displayed during this period.

Automatic

- The setting or releasing of the zero set from an external input operates as in the following figure.

ON
OFF
10 ms or more   1 sec.
Zero set setting   Zero set release
Zero set valid period
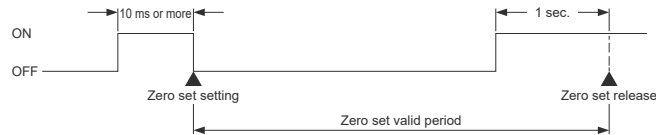
- When the power is turned ON again, zero set from external input can be released. At this time, the zero set will not be saved.
- Even when the zero set is set in the sensor, the zero set can be set or released from an external input. However, when the power is turned ON again, the zero set set in the sensor will be displayed.

11 KEY LOCK FUNCTION

- The key lock function is to prevent acceptance of key operations, so that the conditions set in each setting mode are not changed accidentally.
- When key operation is performed after the key lock is set, "Loc" will be displayed on the digital display.

<Key lock setting>

Press the TEACH key and DOWN key simultaneously for 3 seconds.

Automatic

<Key lock release>

Press the TEACH key and DOWN key simultaneously for 3 seconds.

Automatic
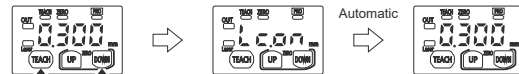
12 PRO MODE SETTING

Part description
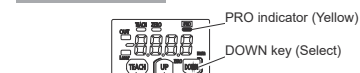
PRO indicator (Yellow)
DOWN key (Select)
TEACH key (Confirmed)
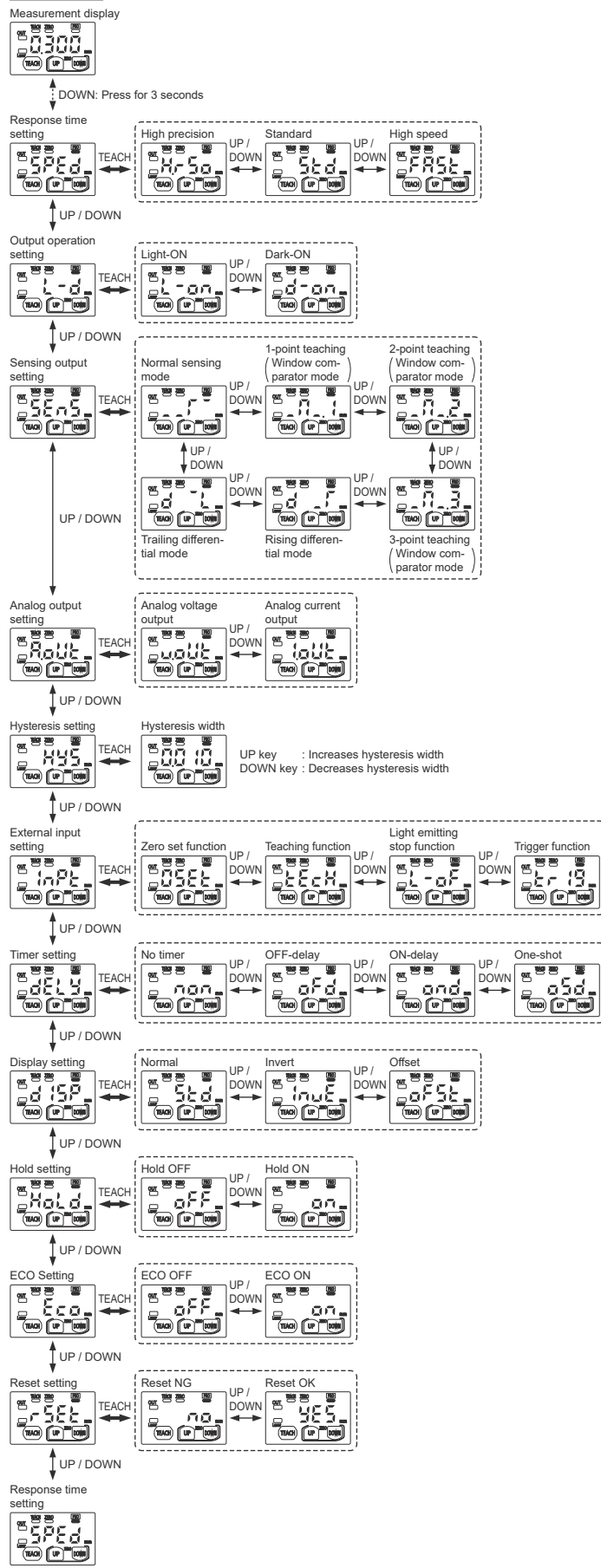UP key (Select)

Arrow description in figures

◄► : Press the TEACH key
◄—► : Press UP key or DOWN key
◄···► : Press DOWN key

- The PRO indicator (yellow) will turn ON when the PRO mode is set.
- When the DOWN key is pressed for 3 seconds or more in the middle of the PRO MODE setting, the display returns to the measurement display.

Item	Default setting	Description
Response speed setting	Hr5o	Set the response time. "Hr5o": High precision 10ms, "5td": Standard 5ms "FA5t": High speed 1.5ms
Output operation setting	L-on	Select the control output operation mode. "L-on": Light-ON, "d-on": Dark-ON
Sensing output setting	--r-	Set the sensing output. "--r-": Normal sensing mode "-n.1-": 1-point teaching (Window comparator mode) "-n.2-": 2-point teaching (Window comparator mode) "-n.3-": 3-point teaching (Window comparator mode) "d--r": Trailing differential mode "d--r": Rising differential mode
Analog output setting	uoUt	Sets the output operation of analog output setting. "uoUt": Analog voltage output (0 V to +5 V) "ioUt": Analog current output (4 mA to 20 mA)
Hysteresis setting	<HG-C1030> 0.010 <HG-C1050> 0.03 <HG-C1100> 0.00 <HG-C1200> 0.2 <HG-C1400> 0.8	Set the hysteresis width. HG-C1030: 0.001 mm to 5.00 mm HG-C1050: 0.01 mm to 15.00 mm HG-C1100: 0.02 mm to 35.00 mm HG-C1200: 0.1 mm to 80.0 mm HG-C1400: 0.2 mm to 200.0 mm
External input setting	0SEt	Set the external input. "0SEt": Zero set function, "tECH": Teaching function "L-oF": Light emitting stop function, "tr 19": Trigger function
Timer setting	non	Set the timer operation. The timer time is fixed at 5 ms. "non": No timer, "oFd": OFF-delay timer "ond": ON-delay timer, "o5d": One-shot timer
Display setting	5td	The display of the measured value can be changed. "5td": Normal, "inuE": Invert, "oF5t": Offset
Hold setting	oFF	Set the control output and the analog output operation when a measurement error occurs (insufficient light intensity, saturation of light intensity, out of measurement range). "oFF": Hold OFF, "on": Hold ON
ECO Setting	oFF	The digital display can be set to go OFF when key operation is not performed for 30 seconds. Current consumption can be reduced. "oFF": ECO OFF, "on": ECO ON
Reset setting	no	Return to the default setting (factory setting). "no": Reset NG, "yE5": Reset OK

Procedure

Measurement display

DOWN: Press for 3 seconds

Response time setting — SPEd — TEACH
High precision (Hr5o) / Standard (5td) / High speed (FA5t)

UP / DOWN

Output operation setting — L-d — TEACH
Light-ON (L-on) / Dark-ON (d-on)

UP / DOWN

Sensing output setting — 5En5 — TEACH
Normal sensing mode / 1-point teaching (Window comparator mode) / 2-point teaching (Window comparator mode)
Trailing differential mode / Rising differential mode / 3-point teaching (Window comparator mode)

UP / DOWN

Analog output setting — Rout — TEACH
Analog voltage output (uoUt) / Analog current output (ioUt)

UP / DOWN

Hysteresis setting — HY5 — TEACH
Hysteresis width
UP key : Increases hysteresis width
DOWN key : Decreases hysteresis width

UP / DOWN

External input setting — inPt — TEACH
Zero set function (0SEt) / Teaching function (tECH) / Light emitting stop function (L-oF) / Trigger function (tr 19)

UP / DOWN

Timer setting — dELY — TEACH
No timer (non) / OFF-delay (oFd) / ON-delay (ond) / One-shot (o5d)

UP / DOWN

Display setting — di5P — TEACH
Normal (5td) / Invert (inuE) / Offset (oF5t)

UP / DOWN

Hold setting — HoLd — TEACH
Hold OFF (oFF) / Hold ON (on)

UP / DOWN

ECO Setting — Eco — TEACH
ECO OFF (oFF) / ECO ON (on)

UP / DOWN

Reset setting — r5Et — TEACH
Reset NG (no) / Reset OK (yE5)

UP / DOWN

Response time setting — SPEd

13 CAUTIONS

- This product has been developed / produced for industrial use only.
- Make sure that the power supply is OFF before starting the wiring.
- If the wiring is performed incorrectly, it will cause a failure.
- 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.
- 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.
- If noise generating devices (switching regulators, inverter motors, etc.) are used around the sensor mounting area, make sure to connect the frame ground (FG) terminal of the device.
- Allow at least 30 minutes of warming up after turning on the power to ensure the performance of the product.

- The overall length of the cable can be extended to 10 m maximum with a cable size of 0.3 mm² or more.
- Make sure that stress by forcible bend or pulling is not applied to the sensor cable joint.
- When wiring a sensor that is fixed in place, do not pull the cable with a force of 29.4 N or more.
- Although it depends on the type, light from rapid start type or high frequency lighting type fluorescent lights, sunlight and etc. may affect the sensing, therefore make sure to prevent direct incident light.
- This product is suitable for indoor use only.
- Keep water, oil, fingerprints and etc. which reflect light, or dust, particles or etc. which interrupts the light, away from the emitting / receiving surfaces of this product. If contaminants adhere to the surface, wipe off with a dust-free soft cloth, or lens cleaning paper.
- Do not use the sensor in locations where there is excessive vapor, dust or etc. or in an atmosphere where corrosive gases, etc. is generated.
- Take care that the product does not come in contact with oil, grease, organic solvents such as thinner, etc., strong acid or alkaline.
- Make sure to turn OFF the power supply, before cleaning the light emitting / receiving windows of the sensor head.
- There is a certain deviation in the directionality of this product. Install the product using a mounting bracket or similar fitting to allow the adjustment of optical axis.
- The internal memory (nonvolatile) of this product has a service life. Settings cannot be configured more than 100,000 times.

14 ERROR INDICATION

- In case of errors, attempt the following measures.

Error indication	Description	Remedy
<Hold OFF> - - - - <Hold ON> Measured value blinks	Insufficient amount of reflected light. The sensing object is out of the sensing range.	Confirm that the sensing distance is within the specification range. Adjust the installation angle of the sensor.
Er01	Flash memory is damaged or passed its life expectancy.	Please contact our office.
Er11	Load of the sensing output is short-circuited causing an over-current to flow.	Turn OFF the power and check the load.
Er21	The semiconductor laser is damaged or passed its life expectancy.	Please contact our office.
Er31	• When zero set is set, the measurement is not performed normally. • Since the display setting is set to "Offset", the zero set function can not be used.	• Confirm that the sensing distance is within the specification range. • Set the display to any setting except "Offset".
Er41	During teaching, the measurement is not performed normally.	Confirm that the sensing distance is within the specification range.
Er90 Er91 Er92 Er93	System error	Please contact our office.

15 SPECIFICATIONS

Type		Measurement center 30 mm type	Measurement center 50 mm type	Measurement center 100 mm type	Measurement center 200 mm type	Measurement center 400 mm type
Model No.	NPN output	HG-C1030	HG-C1050	HG-C1100	HG-C1200	HG-C1400
	PNP output	HG-C1030-P	HG-C1050-P	HG-C1100-P	HG-C1200-P	HG-C1400-P
Measurement center distance		30 mm	50 mm	100 mm	200 mm	400 mm
Measurement range		±5 mm	±15 mm	±35 mm	±80 mm	±200 mm
Repeatability		10 μm	30 μm	70 μm	200 μm	300 μm (measurement distance 200 mm to 400 mm) 800 μm (measurement distance 400 mm to 600 mm)
Linearity		±0.1 %F.S.			±0.2 %F.S.	±1 2 %F.S. (measurement distance 200 mm to 400 mm) ±3 3 %F.S. (measurement distance 400 mm to 600 mm)
Temperature characteristic		0.03 %F.S./°C				
Light source		Red semiconductor laser Class 2 [IEC / EN / JIS / GB / KS / FDA (Note 2)] Max. output: 1mW, Emission peak wavelength: 655nm				
Beam diameter (Note 3)		Approx. ø50 μm	Approx. ø70 μm	Approx. ø120 μm	Approx. ø300 μm	Approx. ø500 μm
Supply voltage		12 V to 24 V DC ±10 %, Ripple P-P 10 % or less				
Power consumption		40 mA or less (at 24 V DC supply voltage), 65 mA or less (at 12 V DC supply voltage)				
Control output		<NPN output type> NPN open-collector transistor • Maximum sink current: 50 mA • Applied voltage: 30 V DC or less (Between control output to 0V) • Residual voltage: 1.5 V or less (At 50 mA sink current) • Leakage current: 0.1 mA or less			<PNP output type> PNP open-collector transistor • Maximum source current: 50 mA • Applied voltage: 30 V DC or less (Between control output to +V) • Residual voltage: 1.5 V or less (At 50 mA source current) • Leakage current: 0.1 mA or less	
Output operation		Switchable either Light-ON or Dark-ON				
Short-circuit protection		Incorporated (Auto reset type)				
Analog output	Analog voltage output	• Output range: 0 V to +5 V (at alarm: +5.2 V) • Output impedance: 100 Ω				
	Analog current output	• Output range: 4 mA to 20 mA (at alarm: 0 mA) • Load impedance: 300 Ω or less				
Response time		Switchable between 1.5ms / 5ms / 10ms				
External input		<NPN output type> NPN non-contact input • Input conditions Invalid: +8 V to +V DC or Open Valid: 0 V to +1.2 V DC • Input impedance: Approx. 10 kΩ			<PNP output type> PNP non-contact input • Input conditions Invalid: 0 V to +0.6 V DC or Open Valid: +4 V to +V DC • Input impedance: Approx. 10 kΩ	
Protection		IP67 (IEC)				
Degree of pollution		2				
Ambient temperature		-10 °C to +45 °C (No dew condensation or icing allowed), Storage: -20 °C to +60 °C				
Ambient humidity		35 % to 85 % RH, Storage: 35 % to 85 % RH				
Ambient illuminance		Incandescent lamp: Acceptance surface illuminance 3,000 fx or less				
Operating altitude		2,000 m or less				
Cable		0.2 mm² 5-core composite cable, 2 m long				
Material		Enclosure: Aluminum die-cast, Front cover: Acrylic				
Weight		Approx. 35 g (without cable), approx. 85 g (including cable)				

Notes: 1) Supply voltage: 24 V DC, ambient temperature: +20 °C, response time: 10 ms, and analog output value of measurement center center distance are used for unspecified measurement conditions. The subject is white ceramics.
2) 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.
3) This is the size in the measurement center distance. These values were defined by using 1/e² (approx. 13.5 %) of the center light intensity. Due to leak light outside the specified area, the reflectance around the detecting point may be higher than at the point and this may affect the measurement value.

Panasonic Industry Co., Ltd.