Panasonic

INSTRUCTION MANUAL

Compact Laser Displacement Sensor

Standard type **HL-G1□-A-C5**

High-function type **HL-G1□-S-J**

0631999 MJE-HLG1 No.0077-28V

Thank you very much for purchasing Panasonic products. 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.
Download the **HL-G1** Series User's Manual (PDF) from our Website. (http://panasonic.net/id/pidsx/global). Be sure to refer to the User's Manual for information in detail before making settings in the control panel of the sensor head.

⚠ WARNING

- This product is intended to detect the objects and does not have the control function to ensure safety such as accident prevention.
- Do not use the product as a sensing device to protect human body.
- Please use the products that comply with local laws and standards for human body protection specified by e.g., OSHA, ANSI and IEC.
- Install a fail-safe device when the product is used for the purpose that has a possibility of physical injury or serious extended damage.
- Do not use the product in the atmosphere of flammable gas, to prevent explosion.

BEFORE USE

- Before using the product, check the sensor head model and contents of packing.

- **Sensor head model**
  Check the model name of product at the top of sensor head.

- **Packing**
  Check that all of the following components are included in the package.
  - 1 sensor head unit
  - 2 Instruction manual
    (Japanese / English: 1, Chinese / Korean: 1)
  - Laser warning labels (one set)

1 OVERVIEW

- This product is a compact laser displacement sensor incorporating a digital display and controller functions.
- The standard type has three outputs plus analog outputs (current and voltage outputs), thus supporting multi input signals.
- The high-function type incorporates serial communications functions in addition to the specifications of the standard type, and can be easily controlled by host devices.

2 CAUTIONS ON HANDLING LASER LIGHT

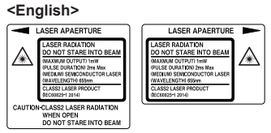
- In order to prevent the accidents by laser product and protect the users, IEC, JIS, GB, KS and FDA establish the following standards respectively.
  IEC : IEC 60825-1:2014 (EN 60825-1:2014)
  JIS : JIS C 6802:2014
  GB : GB 7247.1:2012
  KS : KS C IEC 60825-1:2013
  FDA : PART 1040(PERFORMANCE STANDARDS FOR LIGHT-EMITTING PRODUCTS)
  These standards classifies laser products according to the level of hazard and provide the safety measures for respective classes.

- **Laser hazardous class**
  Classification according to IEC 60825-1:2014(JIS C 6802:2014)

Class	Model	Description of hazardous evaluation
Class 2	**HL-G1□-A-C5** **HL-G1□-S-J**	Visible beam, low power. Blink response of eye affords protection.

- **WARNING label**

<English>



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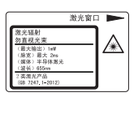

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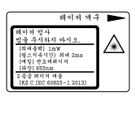

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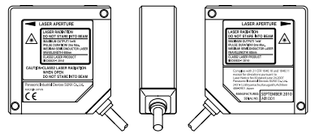
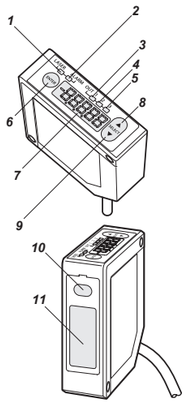


- Install the product so the laser beam comes higher or lower than eye level in order not to watch the beam directly during operation. Laser safety distance (Nominal Ocular Hazard Distance: NOHD) is approx. 0.4 m. The laser beam must be terminated at the end of its path by a diffuse reflector or an absorber.
- Please contact Panasonic Industrial Devices SUNX if the system breaks down. It is not equipped with a function that stops laser radiation automatically during disassembling the sensor head. The users therefore may be exposed to laser beam in disassembling the sensor head.
- Do not use the system in the manner other than specified in this Instruction Manual.

3 I/O BLOCK AND NOMENCLATURE



	Name	Function	Wiring color	
Analog Output Lines	A(V)	Analog voltage output	Shield single conductor	Black
	AGND	Analog ground		
	A(I)	Analog current output	Shield single conductor	Gray
	AGND	Analog ground		
I/O Terminal Block	OUT1	Judgment output 1	Black	
	OUT2	Judgment output 2	White	
	OUT3	Judgment output 3 or alarm output	Gray	
	TM	Timing input	Pink	
	MI	Zero-set, Reset, Memory change, Teaching, Save, and Laser control inputs	Violet	
	NP	NPN / PNP type switching input	Pink / Violet	
	+SD	Transmission data	Twisted -pair wire	Green
	-SD	Transmission data		Sky Blue
	+RD	Reception data	Twisted -pair wire	Orange
	-RD	Reception data		Yellow
	SG	Signal ground	Shield	
	+V	24 VDC input for power supply	Brown	
	0V	Power supply ground	Blue	

* No SD/RD terminals are prepared for **HL-G1□-A-C5** standard types.

1 Laser Indicator (LASER)
2 Alarm Indicator (ALARM)
3 OUT1 Indicator (OUT1)
4 OUT2 Indicator (OUT2)
5 OUT13 Indicator (OUT3)
6 [ENTER] Key
7 Digital Display
8 [UP] Key
9 [DOWN] Key
10 Emitter
11 Receiver

4 SPECIFICATIONS

Model No.	Standard type	HL-G103-A-C5	HL-G105-A-C5	HL-G108-A-C5	HL-G112-A-C5	HL-G125-A-C5
	High-function type	HL-G103-S-J	HL-G105-S-J	HL-G108-S-J	HL-G112-S-J	HL-G125-S-J
Measurement method		Diffuse reflection				
Measurement center distance		30mm	50mm	85mm	120mm	250mm
Measurement method		±4mm	±10mm	±20mm	±60mm	±150mm
Beam source		Red semiconductor laser Class 2 (JIS / IEC / GB / KS / FDA laser notice No. 50) Max output: 1mW, Emission peak wavelength: 655nm				
Beam diameter (Note 2)		0.1 × 0.1mm	0.5 × 1mm	0.75 × 1.25mm	1.0 × 1.5mm	1.75 × 3.5mm
Beam receiving element		CMOS image sensor				
Resolution		0.5μm	1.5μm	2.5μm	8μm	20μm
Linearity		±0.1%F.S.				±0.3%F.S.
Temperature characteristics		±0.08%F.S./°C				
Supply voltage		24V DC ±10% including ripple 0.5V (P - P)				
Current consumption		100 mA max.				
Sampling cycle		200μs, 500μs, 1ms, 2ms				
Analog output	Voltage	Output range: 0 to 10.5 V (normal), 11 V (at alarm) Output impedance: 100Ω				
	Current	Output range: 3.2 to 20.8 mA (normal), 21.6 mA (at alarm) Load impedance: 300Ω max.				
OUT1 OUT2 OUT3		Judgment output or alarm output (switchable) NPN open-collector transistor / PNP open-collector transistor (switchable)				
		<Settings for NPN> • Peak in-flow current: 50mA • Applied voltage: 3 to 24V DC (between output and 0V) • Residual voltage: 2V max. (at in-flow current of 50mA) • Leakage current: 0.1mA or less			<Settings for PNP> • Peak in-flow current: 50mA • Residual voltage: 2.8V max. (at in-flow current of 50mA) • Leakage current: 0.1mA or less	
	Output operation	Open when the output is ON.				
	Short-circuit protection	Incorporated (Auto-reset)				
NP switching input		At 0V: NPN open-collector output At supply voltage of 24V DC: PNP open-collector output				
Timing input		NPN operation: ON when connecting or connected to 0V (depending on settings) PNP operation: ON when connecting or connected to positive terminal of external power supply (depending on settings)				
Multiple input		Zero set, reset, Memory change, Teaching, Save, or Laser control depending on input time. NPN operation: Depending on time to connect 0 V PNP operation: Depending on time to connect positive terminal of external power supply				
Communications interface (high-function type)		RS-422 or RS-485 Baud rate: 9,600 / 19,200 / 38,400 / 115,200 / 230,400 / 460,800 / 921,600 bps Data length: 8 bits, stop bit length: 1 bit, parity check: none, BCC: yes, end code: CR				
Indicator	Laser radiation indicator	Green LED ON at laser radiation				
	Alarm indicator	Orange LED ON when measurement is disabled due to insufficient amount of light				
	Output indicator	Yellow LED (No. of indicators: 3) ON at output				
Digital display		Red LED for sign and 5-digit display				
Protective structure		IP67 (except connector)				
Pollution degree		2				
Insulation resistance		20MΩ min. at 250V DC megger (between charged parts and casing)				
Dielectric Withstand		1,000V AC for 1 min. (between charged parts and casing)				
Vibration resistance		Endurance: 10 to 55 Hz (at 1-minute cycle), 1.5 mm double-amplitude				
Vibration resistance		500m/s² three times each in X, Y, and Z directions				
Ambient illumination (Note 3)		3,000lx max. (illumination level of light receiving surface under incandescent light)				

Ambient temperature		-10 to 45°C (No dew condensation or icing allowed), At storage: -20 to 60°C
Ambient humidity		35 to 85%RH, At storage: 35 to 85%RH
Ambient Height(Note 4)		2,000m or less
Material		Casing: PBT, Front cover: Acrylic, Cable: PVC
Cable length		Standard type: 5m; high-function type: 0.5m
Cable extension		High-function type: extendable to 20 m with an optional extension cable (sold separately).
Tightening torque		0.8N·m or less
Mass	Standard type	Approx. 70g (without cable), approx. 320g (including cable), and approx. 380g (with packing)
	High-function type	Approx. 70g (without cable), approx. 110g (including cable), and approx. 160g (with packing)
Applicable regulations		Conforming to EMC Directive

Notes: 1) The following measurement conditions are applied unless otherwise specified; power voltage: 24V DC, ambient temperature: 20°C, sampling cycle: 500μs, average number of sampling times: 1,024 times, measurement center distance, and measurement object: white ceramic.
2) The diameter is the size of the object at the measurement center distance and determined by $1/e^2$ (approximately 13.5%) of the center beam intensity. The reflectance around the detecting point may be higher than at the point due to leak light outside the specified area, and this may affect the measurement value.
3) Variance is ±0.1%F.S. or less depending on the ambient illuminance.
4) Do not use or store in an environment that has been pressurized to an air pressure higher than the atmospheric pressure at 0m.

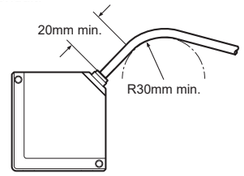
5 CAUTIONS

Connections

- Be sure to turn OFF the power supply before connecting or disconnecting any connectors.
- When connecting or disconnecting the connectors, be sure to hold the connector area not to apply extra force to the cable.
- Be careful not to touch terminals or to let foreign objects get in the connector after disconnecting connectors.
- Be careful not to apply force to around the connector of sensor head cable and extension cable. Do not bend the cables near connectors, which causes disconnection of the cable.

Wiring

- Do not roll up the sensor cable (bundle in parallel) with other wirings. Keep it at least 100mm away from other wires. Cables should be separated from high voltage and power circuit lines. If it is unavoidable, shield it by running through a conductive material such as grounded electrical conduit.
- Install the product as far away as possible from noise source such as high-voltage lines, high-voltage device, power lines, power device, machines which generate a large starting and stopping surge, welding machines and inverter motor.
- Do not pull the cable with a force of 29.4 N or greater.
- When bending the cable, bend it at least 20 mm away from the cable lead-out part with the minimum bending radius of 30 mm or more.
- When wiring the cable, do not apply undue stress to the base of the cable connection and unwind the cable from the roll.
- When moving the sensor head during operation, be careful not to apply excessive bending stress to the cable. The cable in the moving part may be damaged. Therefore, use an extension cable for the moving part and, when the extension cable is damaged, immediately replace it. Otherwise, it may result in failure.



When wiring the cable, unwind the cable from the roll.

Warming Up

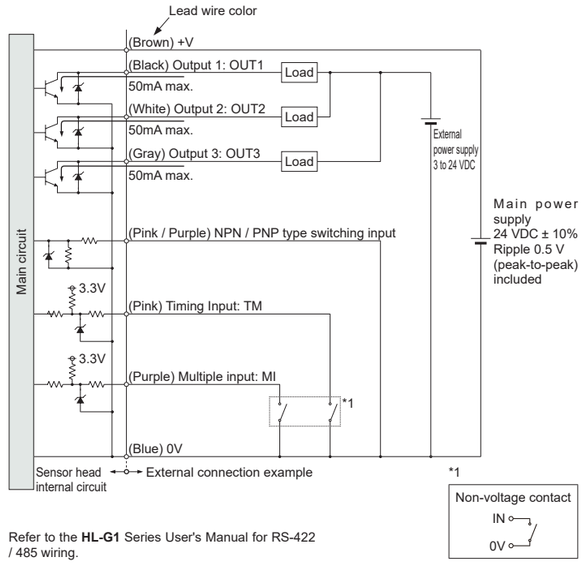
- Allow at least 30 minutes of warming up after turning on the power to ensure the performance of the product.

Environment

- Mount the sensor head to an aluminum or steel plate with a minimum surface area of 200cm² if the ambient temperature is 40°C or higher. In the case of installing two or more sensor heads in parallel, mount each sensor head to an aluminum or steel plate with a minimum surface area of 200cm² and make sure that the ambient temperature does not exceed 40°C.
- The life of the semiconductor laser depends on the ambient temperature during use. When using the product near a heat source, take measures to keep the ambient temperature of the sensor head as lower as possible. Mount the sensor on a device having good heat radiation because the sensor itself also generates heat.
- Keep the emitter surface and the receiver surface clean, not to attach light refractors such as water, oil and fingerprints, or light blockers such as dust and dirt. When cleaning these parts, wipe them off using a soft lint-free cloth or lens cleaning paper.
- Install the sensor head at where extraneous light (such as sunlight or light which has the same wavelength as laser beam) do not enter the receiver. If high accuracy is required, install a light shield plate or the like on the sensor head.
- The sensor head has protection against immersion, while the connectors are not structurally dustproof, waterproof, or corrosion-resistant. Do not use the product underwater or in the rain.
- Do not use the product in dusty places or that exposed to flammable or corrosive gases, droplet, direct sunlight, severe vibration or impact.

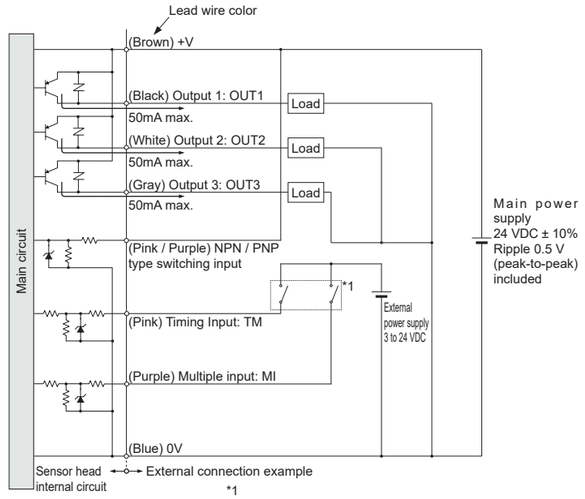
6 I/O CIRCUIT

- **NPN Type**



Refer to the **HL-G1** Series User's Manual for RS-422 / 485 wiring.

- **PNP Type**



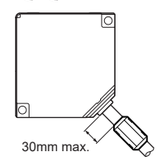
Refer to the **HL-G1** Series User's Manual for RS-422 / 485 wiring.

7 APPLICABLE STANDARDS / REGULATIONS

- "**SPECIFICATIONS**" shows the product, the following standards/regulations are relevant.

  EC Directives: EMC directive

  - Make sure that the length of signal and power lines connected to the product is less than 30m in order to meet CE marking requirements.
    Attach a ferrite core to the head cable as shown.
    Recommended ferrite core: SEIWA ELECTRIC MFG. Co., Ltd.E04SR200935AB or equivalent one.



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