

# Panasonic

**NEW**  
Thru-beam Type  
Digital Displacement Sensor

CMOS Type

HG-T SERIES

CE  
(Excluding SC-HG1-USB)

FDA

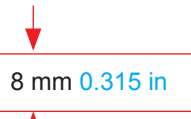
The Industry's Highest-Class\*  
Measurement Accuracy Is  
Now Yours.



\* Among thru-beam type digital sensors, as of January 2019 in-company survey

# Ultra-slim

## HG-T series



The ultra-slim unit with a thickness of 8 mm 0.315 in allows easy installation in a limited space such as the inside of equipment.

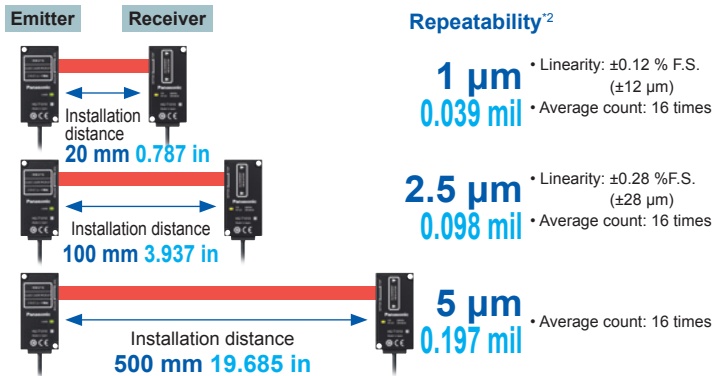
### Wide-angle measurement

The belt-shaped laser beam with a measurement width of 10 mm 0.394 in is used for measurement of dimensions and positions.



### Industry's highest\*1 measurement accuracy

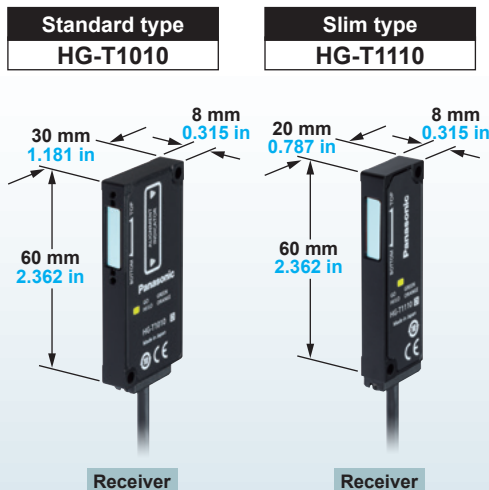
The HG-T series boasts repeatability\*2 of 1 μm 0.039 mil and offers the highest\*1 measurement accuracy in the industry.



- Sampling cycle setting can be selected from two options. Standard: 1 ms, High speed: 0.5 ms.
  - Average count setting can be selected from 11 options. 1 time, 2 times, 4 times, 8 times, 16 times, 32 times, 64 times, 128 times, 256 times, 512 times, 1,024 times
- \*1 As of January 2019, in-company survey  
\*2 This is the P-P value of digital measurement value with half shading at the middle position of the installation distance.

### Two types of sensor heads are available.

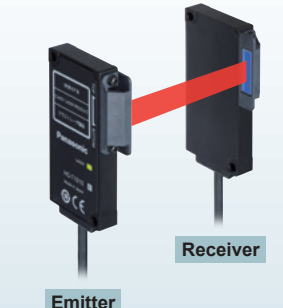
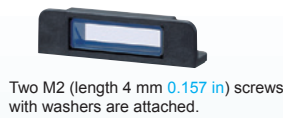
Two types of sensor heads, one with a standard type receiver and the other with a slim type receiver, are available.



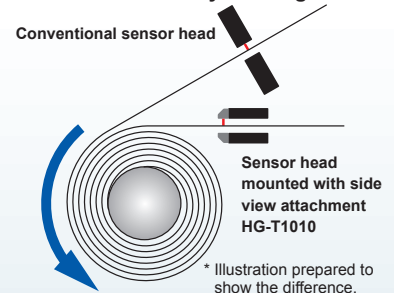
### Side view attachment is available (optional). HG-T1010

Side view attachment (optional) is available for the standard type sensor head HG-T1010. This attachment can bend the laser beam at a right angle to allow flexible installation of the sensor head.

#### Side view attachment HG-TSV10



#### Application example: Lithium-ion battery winding section



Use of the side view attachment enables the installation of the sensor head closer to the winding section than when a conventional sensor head is used, thus contributing to the improvement of winding accuracy.

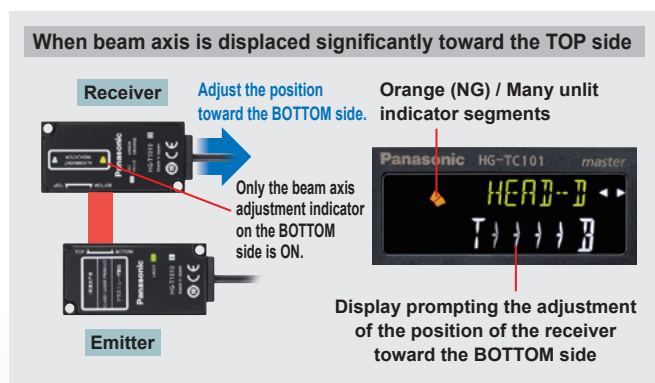
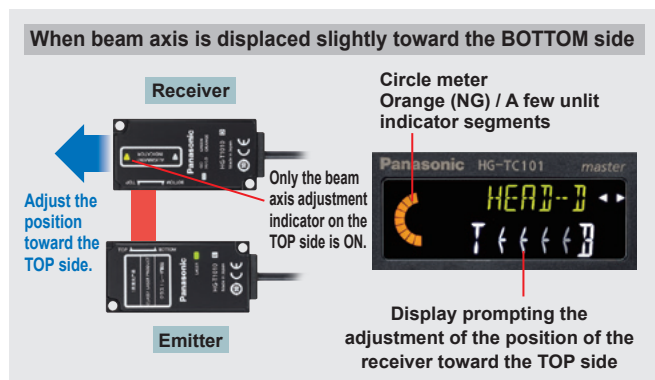
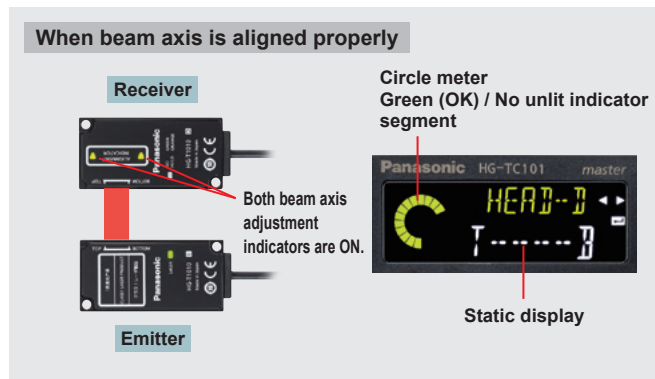
- \* Two side view attachment units are required when using the attachment on both emitter and receiver.
- \* The slim type sensor head HG-T1110 cannot be mounted with the side view attachment.
- \* Be sure to confirm proper detection using actual equipment in advance when using the side view attachment.

# Ease of Installation

## Beam axis adjustment assist function

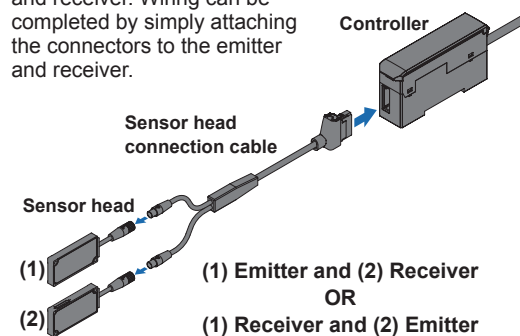
The standard type sensor head **HG-T1010** indicates the direction of receiver displacement relative to the emitter on the controller's display screen and with the beam axis adjustment indicators on the receiver in an easy-to-understand fashion.

\* The slim type sensor head **HG-T1110** displays the displacement information only on the controller's display section.



## Automatic emitter / receiver cable recognition

The **HG-T** series automatically recognizes the positional relationship of the emitter and receiver connected to the sensor head connection cable at the time the controller is turned ON. This function eliminates the need for identifying the correct cables to connect to the emitter and receiver. Wiring can be completed by simply attaching the connectors to the emitter and receiver.



**Emitter and receiver can be connected to either connectors!**

\* The sensor head connection cable is branched into two cables on the sensor head connecting side, but the two cables can be connected interchangeably to the emitter and receiver.

## Die-cast aluminum case

The sensor head case is made of light and strong die-cast aluminum. It minimizes measurement fluctuations due to temperature effects. The die-cast aluminum case does not easily become distorted in shape by tightening of mounting screws as compared to a resin case. It is highly resistant to deterioration due to ageing. This robust case helps prevent deviations of beam axis alignment.



## IP67 protection

The **HG-T** series features a protection structure of IP67 (IEC) so it can be used in a place where the product may be exposed to water or large amounts of dust.



\* Note that if the beam emitting / receiving surfaces of the sensor head are adhered with water or dust, correct measurements become inaccurate.  
\* The sensor head is watertight, but the connectors are not structurally resistant to dust, water or corrosion. Therefore, the **HG-T** series cannot be submerged in water or placed under falling water for measurement operation. Be sure to use the product in an appropriate environment.



# High-performance Controller

## Dual display for added indication flexibility (equipped with NAVI function)

The 2-line digital display simultaneously shows head measurement (measured value) and judgment value (calculated value).

## All-direction LCD

The high-contrast LCD provides sharp and clear indications and wide viewing angle.

## Equipped with intuitive circle meter

Values between allowable maximum and minimum values are indicated in green. Values outside of the allowable range are indicated in orange. This provides at-a-glance understanding of the margin to the tolerance limits.



Higher than maximum value

Lower than minimum value

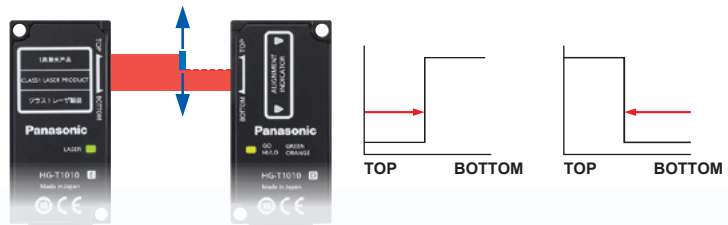
## Five types of detection modes

### Industry's First!\*

#### Auto edge detection mode

Edge detection can be started from either the TOP or BOTTOM without registering the detection direction. This eliminates the need for checking the detection direction.

\* As of January 2019, according to in-company survey



#### Edge detection mode



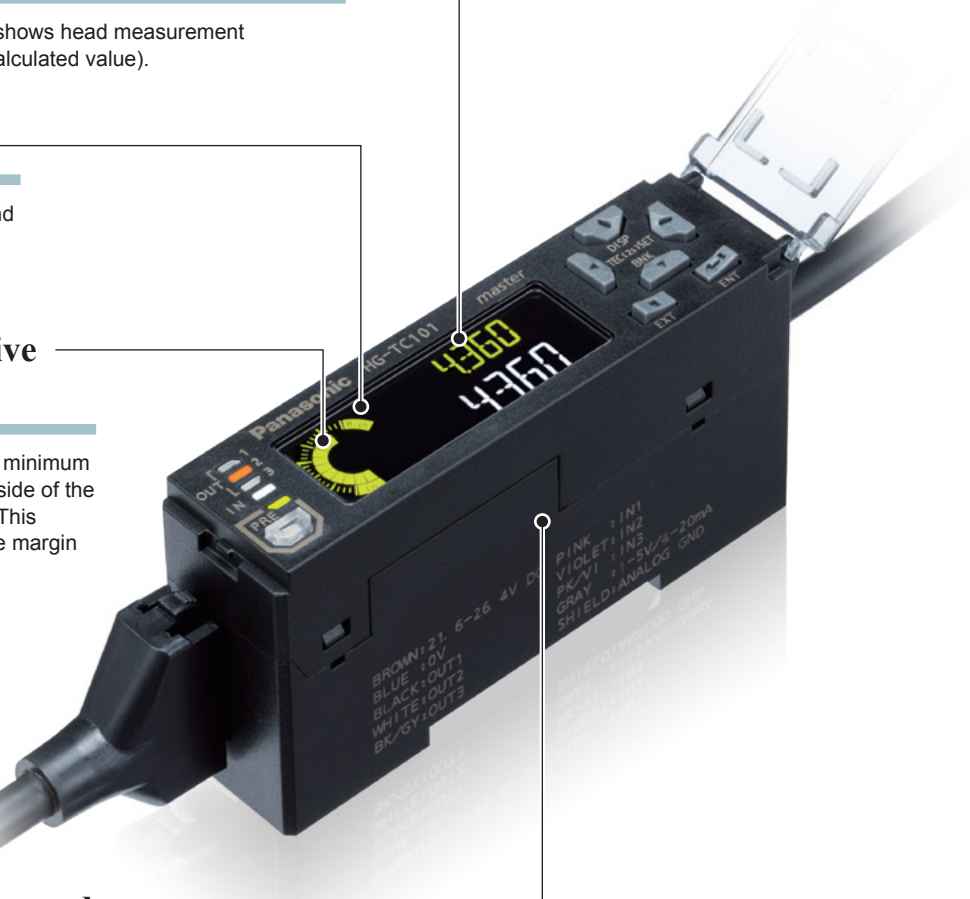
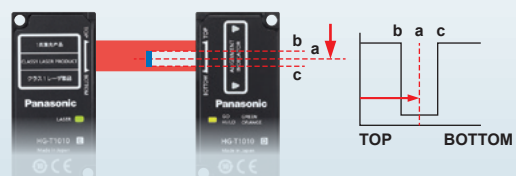
#### External form / width detection mode



#### Inside diameter / gap detection mode

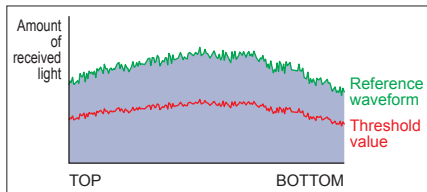


#### Central position detection mode

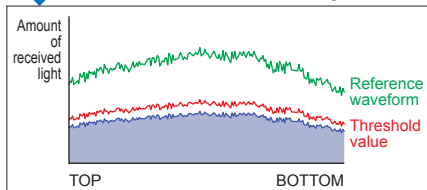


## Monitoring of effects caused by stains

Notifies when the detection performance decreases due to accumulated stains.



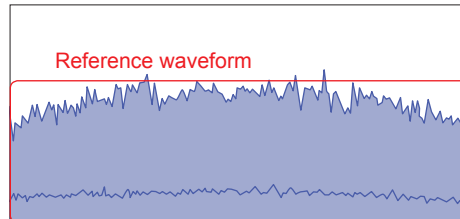
Decrease in the amount of received light due to accumulated stains



An alarm is output when the amount of received light decreases below the threshold value, with the condition of the reference waveform considered as 100 %.

**Alarm output**

Checks the degree of contamination based on the amount of light of the reference waveform (considered as 100 %).



### Stain check setting items

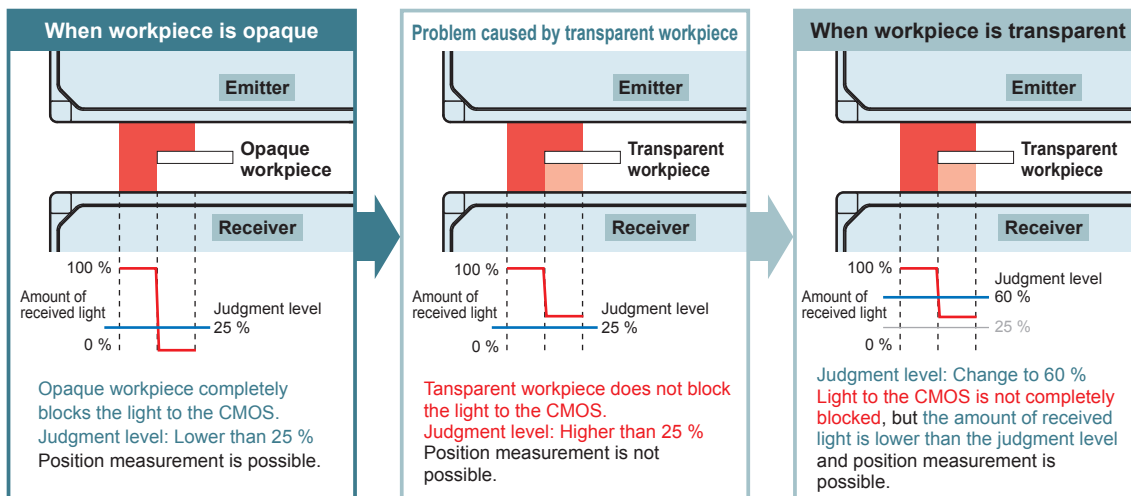
One of the following four settings can be selected.

- Low sensitivity setting ON (LOW) [default]
- High sensitivity setting ON (HIGH)
- User setting ON (USER)  
Adjustable in the range of 50 to 95 %
- Stain check OFF (OFF)

\* The reference waveform can be confirmed by using the "HG-T Configuration Tool" USB-based PC setting software and SC-HG1-USB USB communication unit. For details, refer to page 6.

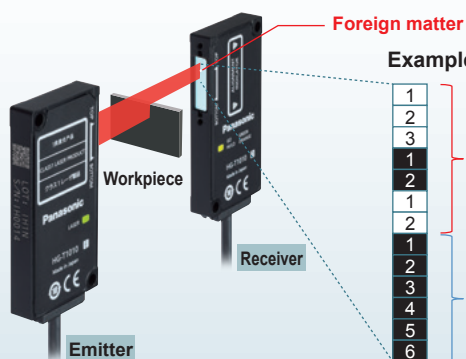
## Stable measurement of even transparent workpieces

The judgment level can be adjusted according to the degree of transparency.



## Elimination of effects caused by fine foreign matters

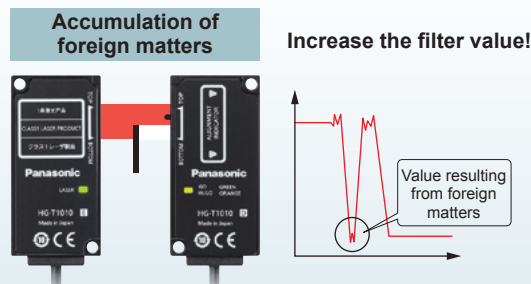
The judgment filter value can be adjusted for the prevention of erroneous detections due to fine foreign matters. The judgment filter value can be set to a desired value between 3 and 50.



Example) Judgment filter value set to 3

Light interception section consists of only 2 continuous pixels, **judging that the light is received.**

Light interception section consists of 3 or more continuous pixels, **judging that the light is blocked.**



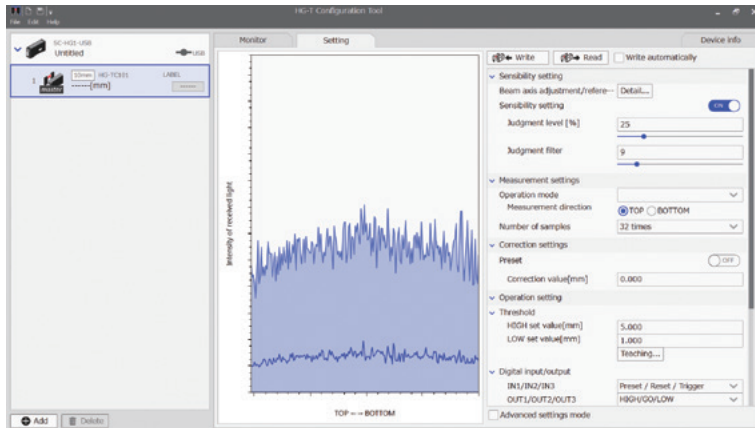
Increasing the filter value ignores values resulting from foreign matters.

# Convenient Tool Software

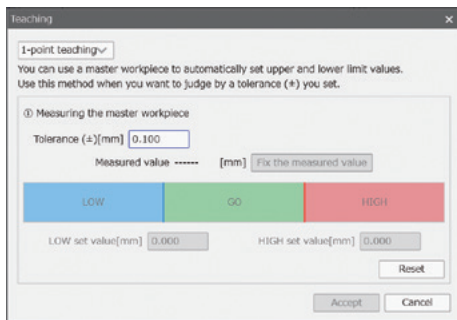
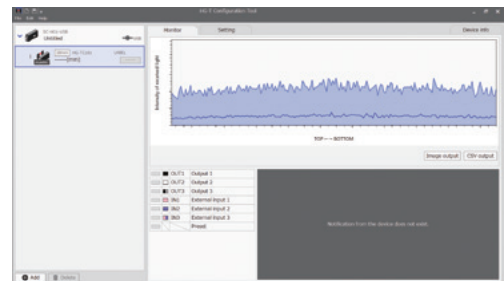
Combined use of the USB-based PC setting software, “HG-T Configuration Tool,” and the USB communication unit, “SC-HG1-USB,” enables confirmation and change of current values and settings in the HG-T series using a PC.

## USB-based PC setting software

### HG-T Configuration Tool



Settings such as name, judgment level and filter value can be changed for each controller while observing the waveform.



- Compatible communication unit: SC-HG1-USB
- Supported OS: Microsoft Windows® 7 (32-bit / 64-bit)\*1, Microsoft Windows® 8 (8.1) (32-bit / 64-bit), Microsoft Windows® 10 (32-bit / 64-bit)
- Required hard disk space: 100 MB or more
- Required USB port: USB 2.0

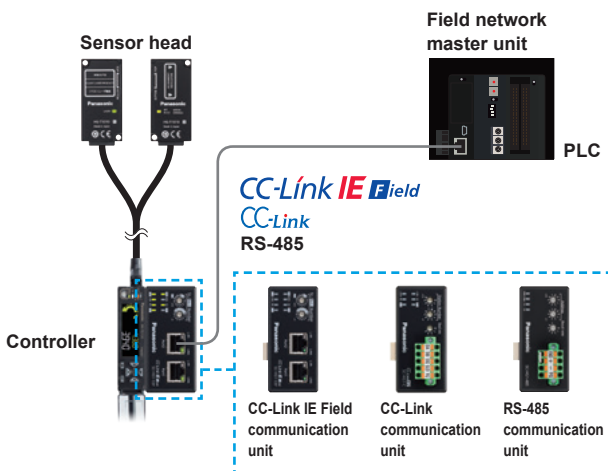
\*1 In the case of a PC running Microsoft Windows® 7, “Microsoft .NET Framework 4.5.1” is required.

\*2 Microsoft and Windows are registered trademarks or trademarks of Microsoft Corporation in the U.S. and/or other countries.

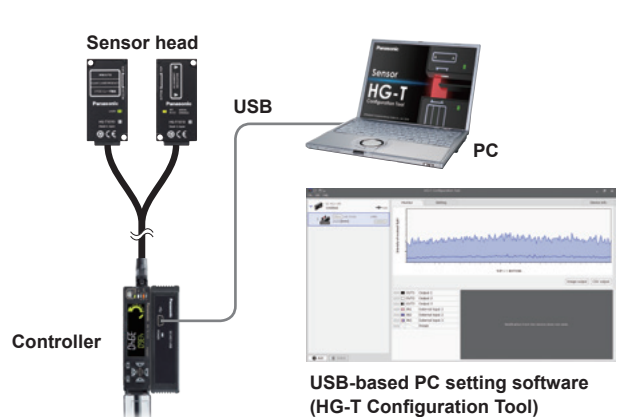
The USB-based PC setting software, “HG-T Configuration Tool,” can be downloaded free from our website.

## System configuration

### Connecting to PLC



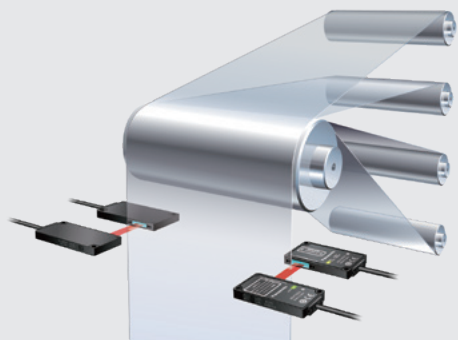
### Connecting to PC



Communication units for field networks such as CC-Link as CC-Link IE Field are available so the HG-T series can be linked with a production system for IoT application.

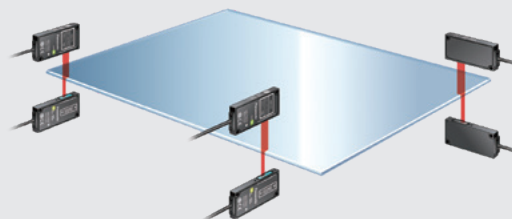
# Applications

## Measurement of meandering on lithium-ion battery winding machine



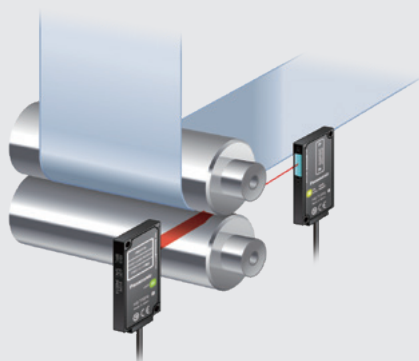
Thanks to the compact design, the sensor head can be installed at a location close to the winding core. This improves the meander measurement accuracy.

## Glass substrate positioning



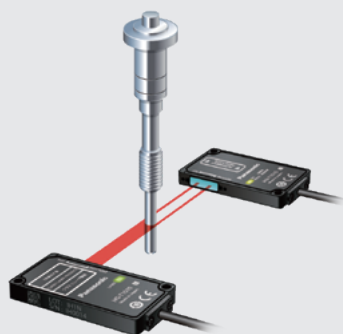
The judgment level adjustment function ensures stable detection and measurement of even transparent workpieces.

## Detection of clearance between rollers



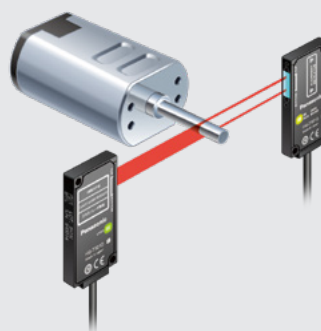
The clearance between rollers can be measured for stabilizing the workpiece quality. The compact head is easy to install.

## Shaft diameter measurement



Shaft diameters can be measured. The original head structure and proprietary algorithm achieve stable detection without being affected by secondary reflections by metal surfaces.

## Measurement of motor shaft eccentricity



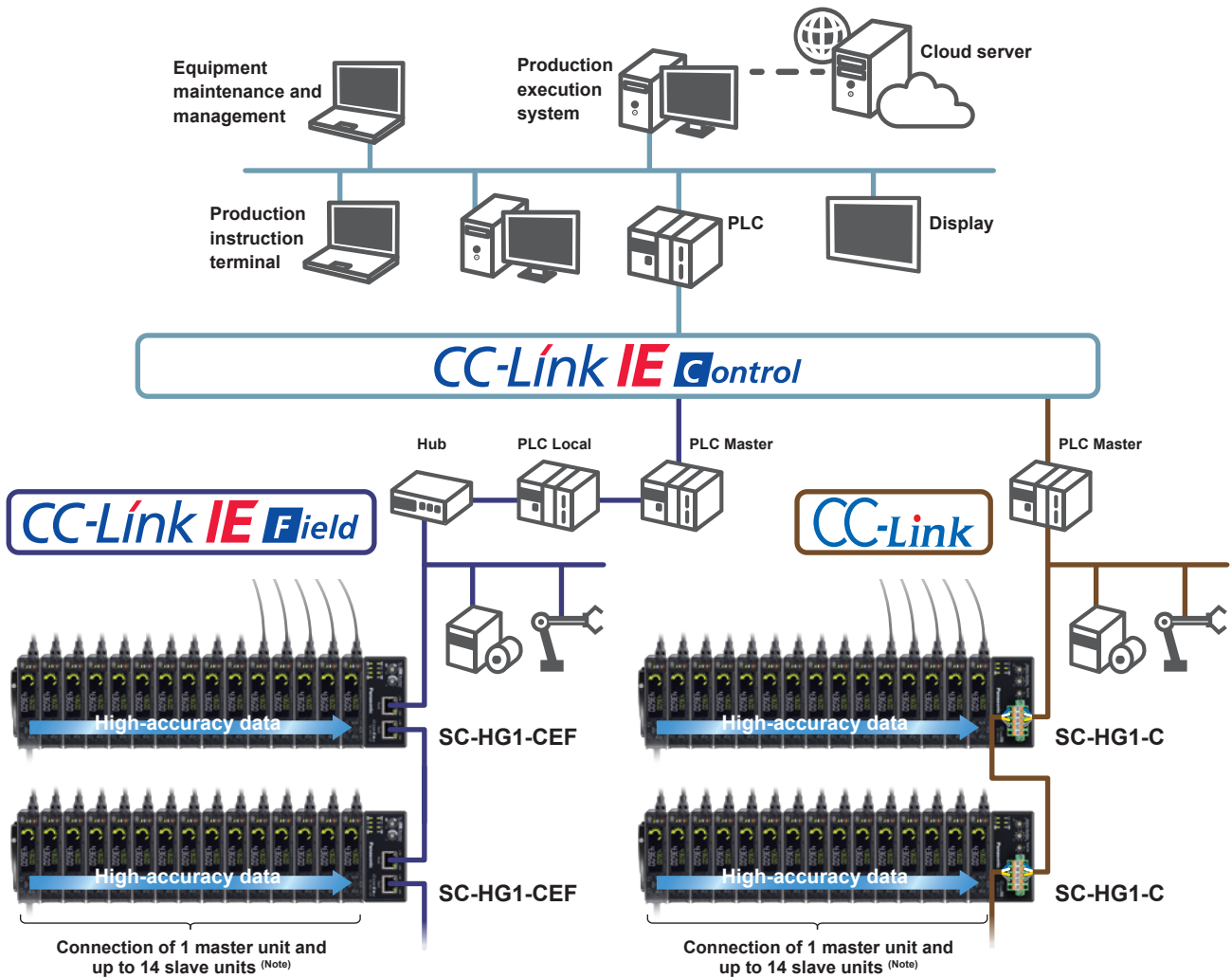
Shaft eccentricity can be measured by using the central position detection mode and measuring the distance to the shaft center.

# Communication unit for digital displacement sensor

## Directly send the measurement values of multiple sensors to a host!

### CC-Link IE Field / CC-Link communication unit

The communication unit for digital displacement sensor can be used to connect directly to a CC-Link / CC-Link IE Field network. This lets you acquire digital data and ON / OFF information in real-time without a program. In addition, you can change controller settings and log measurement data via the CC-Link / CC-Link IE Field network, so you can also use the system for preventative maintenance of digital displacement sensors.



Note: When connected to a communication unit for digital displacement sensor, up to 14 slave units can be connected per master unit

CC-Link IE Field communication unit  
**SC-HG1-CEF**

**CC-Link IE Field**

Communication speed:  
**1 Gbps**

**iQSS support is planned**

CC-Link communication unit  
**SC-HG1-C**

**CC-Link**

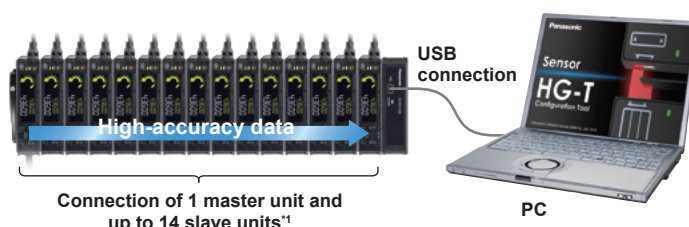
Communication speed:  
**10 Mbps (max.)**

**Supports iQSS**



## USB communication unit

The USB communication unit provides convenient functions that facilitate the setting of the HG-T series while observing the waveform of received light by operating the dedicated USB-based PC setting software. The USB-based PC setting software can be downloaded free from our website.



USB communication unit  
**SC-HG1-USB**



Communication specification: **USB 2.0 Full Speed<sup>\*2</sup>**  
Communication protocol: **Proprietary protocol**  
USB port: **USB Mini-B (1 port)**

## USB-based PC setting software

### HG-T Configuration Tool

- Compatible communication unit: SC-HG1-USB
- Supported OSs: Microsoft Windows® 7 (32-bit / 64-bit)<sup>\*3</sup>, Microsoft Windows® 8 (8.1) (32-bit / 64-bit), Microsoft Windows® 10 (32-bit / 64-bit)
- Required hard disk space: 100 MB or more
- Required USB port: USB 2.0

\*1 When connected to the communication unit for digital displacement sensor, up to 14 slave units can be connected per master unit.

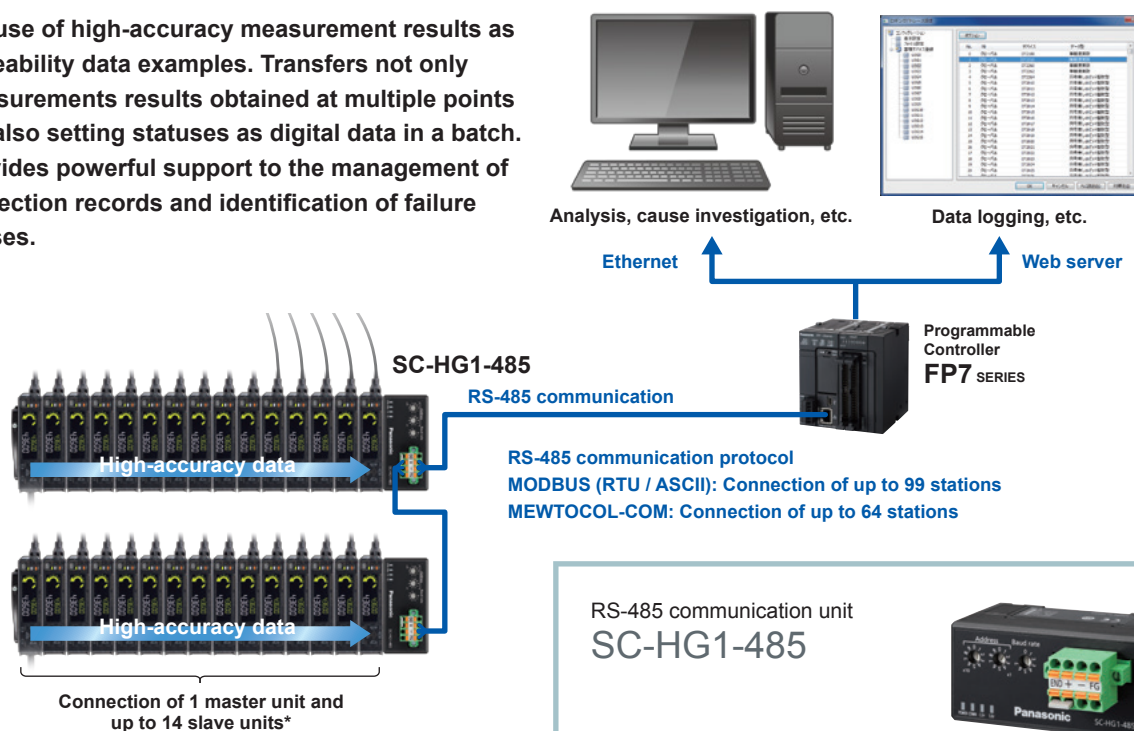
\*2 Dependent on PC environment.

\*3 In the case of a PC running Microsoft Windows® 7, "Microsoft .NET Framework 4.5.1" is required.

\*4 Microsoft and Windows are registered trademarks or trademarks of Microsoft Corporation in the U.S. and/or other countries.

## RS-485 communication unit

For use of high-accuracy measurement results as traceability data examples. Transfers not only measurements results obtained at multiple points but also setting statuses as digital data in a batch. Provides powerful support to the management of inspection records and identification of failure causes.



RS-485 communication unit  
**SC-HG1-485**





Communication speed: 1.2 kbps / 2.4 kbps / 4.8 kbps / 9.6 kbps / 19.2 kbps / 38.4 kbps / 57.6 kbps / 115.2 kbps

\* When connected to a communication unit for digital displacement sensor, up to 14 slave units can be connected per master unit.


## ORDER GUIDE

### Sensor heads




Type	Appearance	Measurement width	Installation distance	Repeatability (Note 1)	Laser class	Model No.
Measurement width 10 mm 0.394 in	Standard type 	10 mm 0.394 in	0 to 500 mm 0 to 19.685 in	1 μm 0.039 mil { Installation distance: 20 mm 0.787 in }  2.5 μm 0.098 mil { Installation distance: 100 mm 3.937 in }  5 μm 0.197 mil { Installation distance: 500 mm 19.685 in }	Class 1 { IEC / JIS / GB / FDA (Note 2) }	<b>HG-T1010</b>
	Slim type 					Emitter: 8 × 30 × 60 mm 0.315 × 1.181 × 2.362 in Receiver: 8 × 30 × 60 mm 0.315 × 1.181 × 2.362 in

Notes: 1) This is the P-P value of digital measurement value with half shading at the middle position of the installation distance.  
 2) This product complies with 21 CFR 1040.10 and 1040.11 Laser Notice No. 50, dated June 24, 2007, issued by CDRH (Center for Devices and Radiological Health) under the FDA (Food and Drug Administration).

### Sensor head connection cables

Type	Appearance	Model No.	Cable length	Description
Sensor head connection cables 		<b>CN-HT-C2</b>	2 m 6.562 ft	This cable is used to connect the sensor head to the controller. The cable is branched into two cables on the sensor head connecting side, but the two cables can be connected interchangeably to the emitter and receiver.
		<b>CN-HT-C5</b>	5 m 16.404 ft	
		<b>CN-HT-C10</b>	10 m 32.808 ft	
		<b>CN-HT-C20</b>	20 m 65.617 ft	





### Controllers

Type	Appearance	Model No.	Output	Maximum number of connectable controllers
Master unit		<b>HG-TC101</b>	NPN open-collector transistor	Up to 15 slave units can be connected per master unit (Note)
		<b>HG-TC101-P</b>	PNP open-collector transistor	
Slave units		<b>HG-TC111</b>	NPN open-collector transistor	
		<b>HG-TC111-P</b>	PNP open-collector transistor	
	Wire-saving type		<b>HG-TC113</b>	

Note: When connected to a communication unit for digital displacement sensor, up to 14 slave units can be connected per master unit.


## ORDER GUIDE

### Communication units for digital displacement sensors



Type	Appearance	Model No.	Description
USB communication unit (Note 1)		<b>SC-HG1-USB</b>	<p>When used together with the "HG-T Configuration Tool" USB-based PC setting software, current values and settings in the HG-T series can be confirmed or changed on the PC screen.</p> <ul style="list-style-type: none"> <li>* The USB-based PC setting software, "HG-T Configuration Tool," can be downloaded free from our website.</li> <li>• Communication specification: USB 2.0 Full Speed (Note 2)</li> <li>• Communication protocol: Proprietary protocol</li> <li>• USB port: USB Mini-B (1 port)</li> <li>• Number of connectable units Controller: Up to 15 units (1 master unit, 14 slave units) per <b>SC-HG1-USB</b> unit</li> </ul>
CC-Link IE Field communication unit		<b>SC-HG1-CEF</b>	<p>Can directly send high-accuracy measurement values to a CC-Link IE Field host device.</p> <ul style="list-style-type: none"> <li>• Communication method CC-Link IE Field</li> <li>• Number of connected units Host (CC-Link IE Field): Max. 121 units (1 master station, 120 slave stations) Controllers: Maximum of 15 units (1 master, 14 slaves) per <b>SC-HG1-CEF</b> unit</li> </ul>
CC-Link communication unit		<b>SC-HG1-C</b>	<p>Can directly send high-accuracy measurement values to CC-Link Master.</p> <ul style="list-style-type: none"> <li>• Communication method Switchable CC-Link Ver. 1.10 or 2.00</li> <li>• Number of occupied station CC-Link Ver. 1.10: 4 stations, CC-Link Ver. 2.00: Switchable 2 or 4 stations</li> <li>• Number of connected units Controllers: Maximum of 15 units (1 master, 14 slaves) per <b>SC-HG1-C</b> unit</li> </ul>
RS-485 communication unit		<b>SC-HG1-485</b>	<p>Can directly send high-accuracy measurement values by RS-485 communication</p> <ul style="list-style-type: none"> <li>• Communication protocol MODBUS (RTU / ASCII) / MEWTOCOL-COM</li> <li>• Number of connected units Host (RS-485): 1 to 99 units when MODBUS (RTU / ASCII) is used, 1 to 64 units when MEWTOCOL-COM is used Controllers: Maximum of 15 units (1 master, 14 slaves) per <b>SC-HG1-485</b> unit</li> </ul>

Notes: 1) The USB communication unit cannot be used with contact-type digital displacement sensors **HG-S** series.  
2) Dependent on PC environment.

### End plates

Type	Appearance	Model No.	Description
End plates		<b>MS-DIN-E</b> 2 pcs. per set	Always use this when connecting controllers and a digital displacement sensor communication unit.

## OPTIONS

Type	Appearance	Model No.	Description
Side view attachment		<b>HG-TSV10</b>	<p>Designed for exclusive use with the <b>HG-T1010</b> standard type sensor head. This attachment can bend the laser beam at a right angle, thus allowing flexible installation of the sensor head.</p> <p>Two M2 (length 4 mm 0.157 in) screws with washers are attached.</p> <ul style="list-style-type: none"> <li>* Two pieces of attachment are required when using the attachment on both emitter and receiver.</li> <li>* Be sure to confirm proper detection using actual equipment in advance when using the attachment.</li> </ul>
Computer software for CC-Link IE Field / CC-Link		<b>SC-PC1</b>	<p>A PC installed with this software can be used to monitor the current values of the digital displacement sensor, to create a CSV file of setting information, to display the log data, to create a CSV file of log data, etc. via Mitsubishi Electric PLC (MELSEC series).</p> <ul style="list-style-type: none"> <li>• Compatible communication units for digital displacement sensor: <b>SC-HG1-CEF</b>, <b>SC-HG1-C</b></li> <li>• Supported OS: Microsoft Windows® 7 (32-bit), Japanese version</li> <li>• Required hard disk space: 50 MB or more</li> </ul>

Note: Microsoft and Windows are registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

## SPECIFICATIONS

### Sensor heads

		Type	Measurement width 10 mm 0.394 in / Standard type	Measurement width 10 mm 0.394 in / Slim type
Item	Model No.		HG-T1010	HG-T1110
Regulatory compliance		EMC Directive, RoHS Directive, FDA regulations		
Compatible controller		HG-TC101 (-P), HG-TC111 (-P), HG-TC113		
Position detection method		CMOS-based		
Installation distance		0 to 500 mm 0 to 19.685 in		
Measurement width		10 mm 0.394 in		
Light source		Red semiconductor laser: Class 1 [IEC / JIS / GB / FDA (Note 2)] Maximum output: 0.3 mW, Peak emission wavelength: 655 nm		
Repeatability (Note 3)		1 μm 0.039 mil (Installation distance: 20 mm 0.787 in) 2.5 μm 0.098 mil (Installation distance: 100 mm 3.937 in) 5 μm 0.197 mil (Installation distance: 500 mm 19.685 in)		
Linearity (Note 4)		±0.12 % F.S. (Installation distance: 20 mm 0.787 in) ±0.28 % F.S. (Installation distance: 100 mm 3.937 in)		
Minimum sensing object (Note 5)		ø0.5 mm ø0.020 in (Installation distance: 500 mm 19.685 in)		
Temperature characteristics (Note 6)		±0.03 % F.S./°C		
Operation indicator	Emitter	Laser radiation indicator (Green)		
	Receiver	Beam axis adjustment indicator (Orange / Green), Judgment output indicator (Orange / Green)	Judgment output indicator (Orange / Green)	
Pollution degree		2		
Operating altitude		2,000 m 6,561.68 ft or less (Note 8)		
Environmental resistance	Protection	IP67 (IEC) (Excluding connectors)		
	Ambient temperature	-10 to +45 °C +14 to +113 °F (No dew condensation or icing allowed), Storage: -20 to +60 °C -4 to +140 °F		
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH		
	Ambient illuminance	Incandescent light: 5,000 lx or less at the light-receiving face (Note 7)		
	Insulation resistance	20 MΩ or higher, using 250 V DC megger (between all terminals and case)		
	Vibration resistance	10 to 55 Hz frequency, 1.5 mm 0.059 in double amplitude in X, Y and Z directions for two hours each		
Shock resistance		196 m/s <sup>2</sup> acceleration in X, Y and Z directions three times each		
Grounding method		Capacitor grounding		
Material		Case: Die-cast aluminum, Light emitting and light receiving surfaces: Glass		
Cable		0.2 m 0.656 ft 4-core shielded cable with round connectors		
Net weight		Emitter: 30 g approx., Receiver: 30 g approx.	Emitter: 30 g approx., Receiver: 25 g approx.	

- Notes: 1) Specification values are based on the digital measurement values obtained by the sensor head and controller HG-TC□. Where measurement conditions have not been specified precisely, the conditions used were as follows: ambient temperature = +20 °C +68 °F, controller's average count setting 16 times, measurement target = nontransparent knife edge, installation distance = 100 mm 3.937 in, positional condition of measurement target = Half shading at the middle position of installation distance.
- 2) This product complies with 21 CFR 1040.10 and 1040.11 Laser Notice No. 50, dated June 24, 2007, issued by CDRH (Center for Devices and Radiological Health) under the FDA (Food and Drug Administration).
- 3) This is the P-P value of digital measurement value with half shading at the middle position of the installation distance.
- 4) Indicates an error with the ideal straight line of digital measured values.
- 5) When the light is blocked at the center position of 500 mm 19.685 in installation distance
- 6) When the light is half-blocked at the center position of 100 mm 3.937 in installation distance
- 7) When the sampling cycle of the controller is set to "standard sampling"
- 8) Do not use or store in an environment that has been pressurized to an air pressure higher than the atmospheric pressure at 0 m.



**SPECIFICATIONS**

**Controller**

Item	Model No.	Type	Master unit		Slave unit		
			High performance type		High performance type	Wire-saving type	
			NPN output	HG-TC101	HG-TC111	HG-TC113	
PNP output	HG-TC101-P	HG-TC111-P					
Regulatory compliance			EMC Directive, RoHS Directive				
Compatible sensor head			HG-T1010, HG-T1110				
Number of connectable units			Up to 15 slave units can be connected to a master unit. (Note 2)				
Supply voltage			24 V DC ±10 %, including ripple 0.5 V (P-P)				
Current consumption (Note 3)			100 mA or less (when sensor head is connected)				
Analog outputs (Switching type) (Note 4)	Analog voltage output	<ul style="list-style-type: none"> <li>Voltage output range: 1 to 5 V/F.S. (default value)</li> <li>Linearity: ±0.05 % F.S.</li> </ul>	<ul style="list-style-type: none"> <li>Output when alarm occurs: 5.2 V</li> <li>Output impedance: 100 Ω max.</li> </ul>	—			
	Analog current output	<ul style="list-style-type: none"> <li>Current output range: 4 to 20 mA/F.S. (default value)</li> <li>Linearity: ±0.25 % F.S.</li> </ul>	<ul style="list-style-type: none"> <li>Output when alarm occurs: 0 mA</li> <li>Load impedance: 250 Ω max.</li> </ul>	—			
Control outputs (Output 1, Output 2, Output 3)	<NPN output type> NPN open-collector transistor		<PNP output type> PNP open-collector transistor		—		
	<ul style="list-style-type: none"> <li>Maximum sink current: 50 mA (Note 5)</li> <li>Applied voltage: 30 V DC or less (between output and 0 V)</li> <li>Residual voltage: 1.5 V or less (at 50 mA sink current)</li> <li>Leakage current: 0.1 mA or less</li> </ul>		<ul style="list-style-type: none"> <li>Maximum source current: 50 mA (Note 5)</li> <li>Applied voltage: 30 V DC or less (between output and +V)</li> <li>Residual voltage: 1.5 V or less (at 50 mA source current)</li> <li>Leakage current: 0.1 mA or less</li> </ul>		—		
	Short-circuit protection	Incorporated (automatic reset type)				—	
	Judgment output	N.O. / N.C. switching type				—	
Alarm output	Open when alarm occurs				—		
External output switching			Output 1, Output 2, and Output 3 can be switched to 3-value, 2-value, Logic, and Logic 2.				
External inputs (Input 1, Input 2, Input 3)	<NPN output type> Non-contact input or NPN open-collector transistor		<PNP output type> Non-contact input or PNP open-collector transistor		—		
	<ul style="list-style-type: none"> <li>Input conditions</li> <li>Invalid: +8 V to +V DC or open</li> <li>Valid: 0 to +1.2 V DC</li> <li>Input impedance: 10 kΩ approx.</li> </ul>		<ul style="list-style-type: none"> <li>Input conditions</li> <li>Invalid: 0 to +0.6 V DC or open</li> <li>Valid: +4 V to +V DC</li> <li>Input impedance: 10 kΩ approx.</li> </ul>		—		
	Trigger input	Input time 2 ms or more (ON)				—	
	Laser emission stop input	Input time 20 ms or more (ON)				—	
	Preset input	Input time 20 ms or more (ON)				—	
	Reset input	Input time 20 ms or more (ON)				—	
Bank input A / B (Note 6)	Input time 20 ms or more (ON)				—		
External input switching			Input 1, Input 2, and Input 3 can be switched to "Preset / Reset / Trigger", "Bank Input A / Bank Input B / Select (Preset, Reset, Trigger)", or "Laser emission stop".				
Sampling cycle			1 ms (standard sampling) / 0.5 ms (high-speed sampling)				
Average count (response time) (Note 6)			1 time (2 ms), 2 times (3 ms), 4 times (5 ms), 8 times (9 ms), 16 times (17 ms), 32 times (33 ms), 64 times (65 ms), 128 times (129 ms), 256 times (257 ms), 512 times (513 ms), and 1,024 times (1,025 ms) switching type				
Display resolution			1 μm <b>0.039 mil</b>				
Display range			-199.999 to 199.999 mm <b>-7.874 to 7.874 in</b>				
Pollution degree			2				
Operating altitude			2,000 m <b>6561.68 ft</b> or less (Note 7)				
Environmental resistance	Protection		IP40 (IEC)				
	Ambient temperature		-10 to +50 °C <b>+14 to +122 °F</b> (No dew condensation or icing allowed) (Note 5), Storage: -20 to +60 °C <b>-4 to +140 °F</b>				
	Ambient humidity		35 to 85 % RH, Storage: 35 to 85 % RH				
	Voltage withstandability		1,000 V AC for one minute between all supply terminals connected together and enclosure				
	Insulation resistance		20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure				
	Vibration resistance		10 to 150 Hz frequency, 0.75 mm <b>0.030 in</b> double amplitude (10 to 58 Hz), Maximum acceleration 49 m/s <sup>2</sup> (58 to 150 Hz) in X, Y and Z directions for two hours each				
	Shock resistance		98 m/s <sup>2</sup> acceleration (10 G approx.) in X, Y and Z directions five times each				
Material			Case: Polycarbonate, Cover: Polycarbonate, Switches: Polyacetal				
Cable			0.2 mm <sup>2</sup> 2-core (brown and blue lead wires) / 0.15 mm <sup>2</sup> 7-core composite cable, 2 m <b>6.562 ft</b> long	0.15 mm <sup>2</sup> 7-core composite cable, 2 m <b>6.562 ft</b> long	—		
Net weight			140 g approx.		140 g approx.	60 g approx.	

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were as follows: supply voltage +24 V DC, ambient temperature +20 °C +68 °F.

- 2) When connected to a communication unit for digital displacement sensor, up to 14 slave units can be connected per master unit.
- 3) Current consumption does not include analog current output.
- 4) Linearity is a value calculated from digitally measured values at F.S. = 16 mA for current output or F.S. = 4 V for voltage output.
- 5) When slave units are connected to the master unit, the maximum sink current / source current of control output and ambient temperature vary depending on the number of connected slave units as shown below.

Number of connected slave units	Maximum sink current and source current of control output		Ambient temperature
	When communication unit is connected		
1 to 7 units	1 to 6 units	20 mA	-10 to +45 °C <b>+14 to +113 °F</b>
8 to 15 units	7 to 14 units	10 mA	

- 6) Average count (response time) is for when the sampling cycle is set to 1 ms (standard sampling). Response times differ when the sampling cycle is set to 0.5 ms (high-speed sampling).
- 7) Do not use or store in an environment that has been pressurized to an air pressure higher than the atmospheric pressure at 0 m.

## SPECIFICATIONS

### Communication units for digital displacement sensors

Designation		USB communication unit
Item	Model No.	<b>SC-HG1-USB</b>
Compatible controllers		<b>HG-TC</b> □
Maximum number of connectable controllers		Maximum of 15 controllers (one master, 14 slaves) per <b>SC-HG1-USB</b> unit
Supply voltage (Note 3)		24 V DC ±10 %, including ripple 0.5 V (P-P) (Within specified power supply voltage range)
Current consumption		50 mA or less
Communication method		USB 2.0 Full Speed (Note 4)
Communication protocol		Our dedicated protocol
USB port		USB Mini-B (1 port)
Pollution degree / Operating altitude		2 / 2,000 m <b>6561.680 ft</b> or less (Note 5)
Environmental resistance	Protection	IP40 (IEC)
	Ambient temperature	-10 to +45 °C <b>+14 to +113 °F</b> (No dew condensation or icing allowed), Storage: -20 to +60 °C <b>-4 to +140 °F</b>
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH
	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure
	Insulation resistance	20 MΩ or more, with 250 V DC megger
	Vibration resistance	10 to 150 Hz frequency, 0.75 mm <b>0.030 in</b> double amplitude (10 to 58 Hz), Maximum acceleration 49 m/s <sup>2</sup> (58 to 150 Hz) in X, Y and Z directions for two hours each
Shock resistance		98 m/s <sup>2</sup> acceleration (10 G approx.) in X, Y and Z directions five times each
Material		Enclosure: Polycarbonate
Weight		Net weight: 35 g approx., Gross weight: 95 g approx

- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C **+68 °F**.  
 2) USB 2.0 (Mini-B) cable for the connection of a PC is not provided with the product. Please purchase a USB 2.0 (Mini-B) cable.  
 3) Power is supplied from a connected controller / master unit.  
 4) Dependent on PC environment.  
 5) Do not use or store in an environment that has been pressurized to an air pressure higher than the atmospheric pressure at 0 m.

Designation		CC-Link IE Field communication unit
Item	Model No.	<b>SC-HG1-CEF</b>
Regulatory compliance		EMC Directive, RoHS Directive
Compatible controllers		<b>HG-TC</b> □, <b>HG-SC</b> □
Maximum number of connectable controllers		Maximum of 15 controllers (one master, 14 slaves) per <b>SC-HG1-CEF</b> unit
Supply voltage (Note 2)		24 V DC ±10 %, including ripple 0.5 V (P-P)
Current consumption		200 mA or less
Communication method		CC-Link IE Field
Remote station type		Remote device station
Network No. setting		1 to 239 (decimal) [1 to EF (hex)] (0 and 240 or more: Error) (Note 3)
Cyclic transmission (Maximum number of links per station)		RX / RY: 128 points each (128 bits), 16 bytes RW / RWw: 64 points each (64 words), 128 bytes
Transient transmission		Server function only, data size 1,024 bytes
Station No. setting		1 to 120 (decimal) (0 and 121 or more: Error)
Baud rate		1 Gbps
Transmission line types		Line, star (mixing of line and star types is possible), ring
Maximum transmission distance		100 m <b>328.084 ft</b>
Maximum number of connectable units		121 units (1 master station, 120 slave stations)
Cascade connection levels		Maximum 20
Pollution degree / Operating altitude		2 / 2,000 m <b>6561.680 ft</b> or less (Note 4)
Environmental resistance	Protection	IP40 (IEC)
	Ambient temperature	-10 to +45 °C <b>+14 to +113 °F</b> (No dew condensation or icing allowed), Storage: -20 to +60 °C <b>-4 to +140 °F</b>
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH
	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure
	Insulation resistance	20 MΩ or more, with 250 V DC megger between all supply terminals connected together and enclosure
	Vibration resistance	10 to 150 Hz frequency, 0.75 mm <b>0.030 in</b> double amplitude (10 to 58 Hz), Maximum acceleration 49 m/s <sup>2</sup> (58 to 150 Hz) in X, Y and Z directions for two hours each
Shock resistance		98 m/s <sup>2</sup> acceleration (10 G approx.) in X, Y and Z directions five times each
Material		Enclosure: Polycarbonate
Communication cable		Ethernet cable that satisfies 1000BASE-T standard Category 5e or higher (Double-shielded / STP, straight cable) (Note 5)
Weight		Net weight: 100 g approx., Gross weight: 150 g approx.

- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C **+68 °F**.  
 2) Power is supplied from a connected controller / master controller.  
 3) For the network No. setting on this product, convert the network number to hex and set the hex value.  
 4) Do not use or store in an environment that has been pressurized to an air pressure higher than the atmospheric pressure at 0 m.  
 5) Use CC-Link Partner Association recommended cable.

Designation		CC-Link communication unit				
Item	Model No.	<b>SC-HG1-C</b>				
Regulatory compliance		EMC Directive (Note 2), RoHS Directive				
Compatible controllers		<b>HG-TC</b> □, <b>HG-SC</b> □				
Maximum number of connectable controllers		Maximum of 15 controllers (one master, 14 slaves) per <b>SC-HG1-C</b> unit				
Supply voltage (Note 3)		24 V DC ±10 %, including ripple 0.5 V (P-P)				
Current consumption		80 mA or less				
Communication method		Switchable CC-Link Ver.1.10 or 2.00				
Remote station type		Remote device station				
Number of occupied station		CC-Link Ver.1.10: 4 stations, CC-Link Ver.2.00: Switchable 2 or 4 stations				
Station No. setting		1 to 64 (0 and 65 or more: Error)				
Baud rate		10 Mbps	5 Mbps	2.5 Mbps	625 kbps	156 kbps
Maximum transmission distance		100 m <b>328.084 ft</b>	160 m <b>524.934 ft</b>	400 m <b>1,312.336 ft</b>	900 m <b>2,952.756 ft</b>	1,200 m <b>3,937.008 ft</b>
Pollution degree / Operating altitude		2 / 2,000 m <b>6561.680 ft</b> or less (Note 4)				
Environmental resistance	Protection	IP40 (IEC)				
	Ambient temperature	-10 to +45 °C <b>+14 to +113 °F</b> (No dew condensation or icing allowed), Storage: -20 to +60 °C <b>-4 to +140 °F</b>				
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH				
	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure				
	Insulation resistance	20 MΩ or more, with 250 V DC megger between all supply terminals connected together and enclosure				
	Vibration resistance	10 to 150 Hz frequency, 0.75 mm <b>0.030 in</b> double amplitude (10 to 58 Hz), Maximum acceleration 49 m/s <sup>2</sup> (58 to 150 Hz) in X, Y and Z directions for two hours each				
Shock resistance		98 m/s <sup>2</sup> acceleration (10 G approx.) in X, Y and Z directions five times each				
Material		Enclosure: Polycarbonate				
Communication cable		Specified cable (shielded twisted cable) (Note 5)				
Weight		Net weight: 80 g approx., Gross weight: 130 g approx.				

- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C **+68 °F**.  
 2) If our product will be incorporated in a customer product that will comply with the EMC Directive, install our product in a conductive box in accordance with "PLC User's Manual [Published by Mitsubishi Electric Corporation]".  
 3) Power is supplied from a connected controller / master controller.  
 4) Do not use or store in an environment that has been pressurized to an air pressure higher than the atmospheric pressure at 0 m.  
 5) Use only a special-use communication cable that is approved by the CC-Link Partner Association.

Designation		RS-485 communication unit
Item	Model No.	<b>SC-HG1-485</b>
Regulatory compliance		EMC Directive, RoHS Directive
Compatible controllers		<b>HG-TC</b> □, <b>HG-SC</b> □
Supply voltage (Note 2)		24 V DC ±10 %, Ripple P-P 10 % or less (Within specified power supply voltage range)
Current consumption		40 mA or less
Communication method		Two-wire half duplex communication
Synchronization method		Start-stop synchronization
Communication protocol		MODBUS (RTU / ASCII) / MEWTOCOL-COM
Baud rate		1.2 kbps / 2.4 kbps / 4.8 kbps / 9.6 kbps / 19.2 kbps / 38.4 kbps / 57.6 kbps / 115.2 kbps
Electrical characteristics		Complies with EIA RS-485
Number of connectable units	Host (RS-485)	1 to 99 units when MODBUS (RTU / ASCII) is used, 1 to 64 units when MEWTOCOL-COM is used
	Sensors	Maximum of 15 controllers (1 master, 14 slaves) per <b>SC-HG1-485</b> unit
Stop bit length		1 bit / 2 bits
Parity check		Even / Odd / None
Data bit length		8 bits (RTU) / 7 bits (ASCII)
Pollution degree / Operating altitude		2 / 2,000 m <b>6561.680 ft</b> or less (Note 3)
Environmental resistance	Protection	IP40 (IEC)
	Ambient temperature	-10 to +45 °C <b>+14 to +113 °F</b> (No dew condensation or icing allowed), Storage: -20 to +60 °C <b>-4 to +140 °F</b>
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH
	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure
	Insulation resistance	20 MΩ or more, with 250 V DC megger between all supply terminals connected together and enclosure
	Vibration resistance	10 to 150 Hz frequency, 0.75 mm <b>0.030 in</b> double amplitude (10 to 58 Hz), Maximum acceleration 49 m/s <sup>2</sup> (58 to 150 Hz) in X, Y and Z directions for two hours each
Shock resistance		98 m/s <sup>2</sup> acceleration (10 G approx.) in X, Y and Z directions five times each
Material		Enclosure: Polycarbonate
Total extension distance		Communication cable: 1,200 m <b>3,937.008 ft</b> or less between <b>SC-HG1-485</b> (terminal) and PLC
Weight		Net weight: 75 g approx., Gross weight: 120 g approx.
Accessory		Termination resistor switching jumper pin: 1 pc.

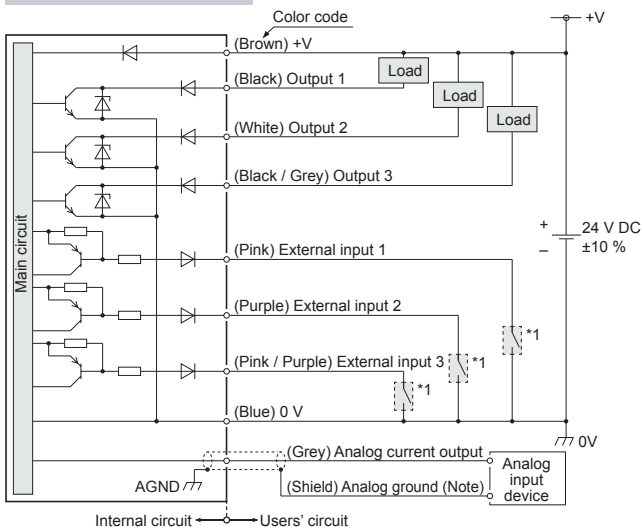
- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C **+68 °F**.  
 2) Power is supplied from a connected controller / master controller.  
 3) Do not use or store in an environment that has been pressurized to an air pressure higher than the atmospheric pressure at 0 m.

I/O CIRCUIT DIAGRAMS

For communication unit for digital displacement sensors, refer to the instruction manual. The instruction manual can be downloaded from our website.

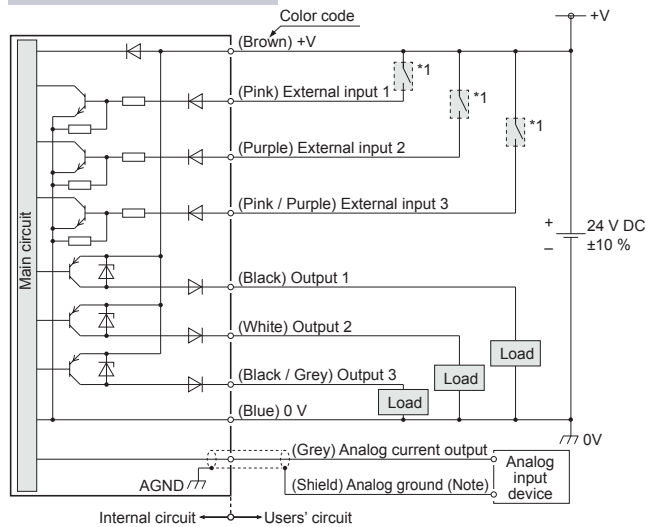
NPN output type

HG-TC101 / Master unit

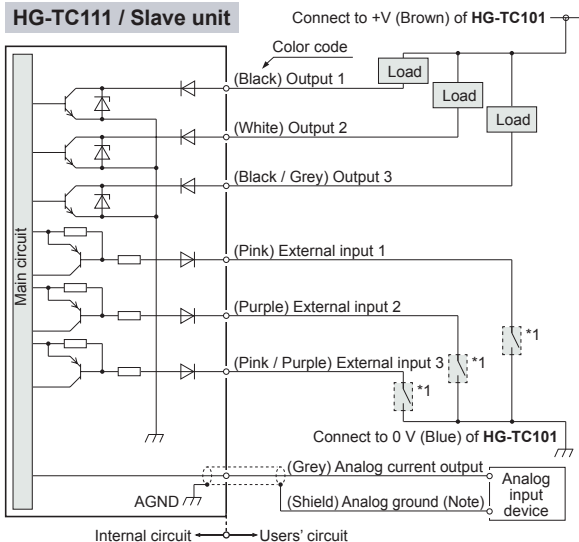


PNP output type

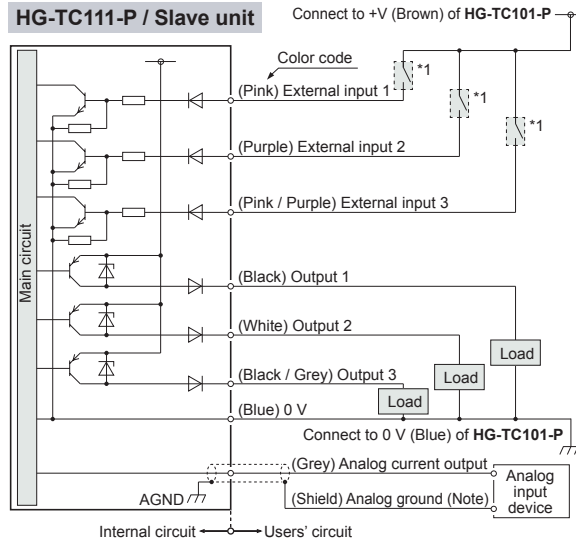
HG-TC101-P / Master unit



HG-TC111 / Slave unit



HG-TC111-P / Slave unit



\* 1

Non-voltage contact or NPN open collector transistor

0 to +1.2 V DC: Effective  
+8 V to +V DC or open: Ineffective

Note: Use shielded wire for the analog output.

\* 1

Non-voltage contact or PNP open collector transistor

+4 V to +V DC: Effective  
0 to +0.6 V DC or open: Ineffective

Note: Use shielded wire for the analog output.

PRECAUTIONS FOR PROPER USE

Refer to the instruction manual for details. The instruction manual can be downloaded from our website.

- 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.
- When using sensing devices for personnel protection, use products that meet the laws and standards for personnel protection that apply in each region or country, such as OSHA, ANSI and IEC.

**Cautions for laser beams**

- This product is classified as a Class 1 Laser Product in IEC / JIS / GB standards and in FDA\* regulations. Do not look at the laser beam through optical system such as a lens.
- The warning label and the proof label are attached to the product. Handle the product according to the instruction given on the label.

\* This product complies with 21 CFR 1040.10 and 1040.11 Laser Notice No. 50, dated June 24, 2007, issued by CDRH (Center for Devices and Radiological Health) under the FDA (Food and Drug Administration).

User's Manual available for download

The HG-T series User's Manual is available for download from our website.

## PRECAUTIONS FOR PROPER USE

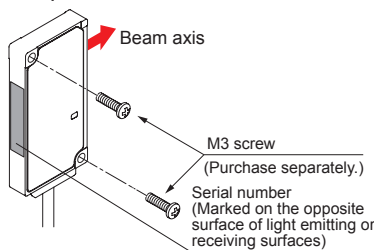
Refer to the instruction manual for details.  
The instruction manual can be downloaded from our website.

### Sensor head

#### Mounting

- The light emitting and receiving surfaces of the sensor head must be free of water, oil, fingerprints, and other substances that refract light as well as dust, grit, and other objects that intercept light.
- Do not allow ambient light such as sunlight to directly hit the light receiving section of the sensor head. In particular, if precision is required, use this product by mounting a douser (or similar material) on the sensor head.
- A serial number is marked on each opposite surface of the light emitting and receiving surfaces of the sensor head. Use a pair of emitter and receiver that have the same serial number.

- For the installation of sensor heads, use M3 screws and tighten to the torque of 0.5 N·m. M3 screws are not provided with the product.

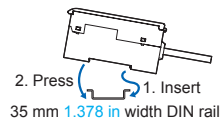


### Controller

#### Mounting

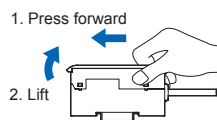
##### Mounting

1. Insert the rear of the mounting part into the DIN rail.
2. While pressing down on the rear of the mounting part, insert the front of the mounting part into the DIN rail.



##### Removal method

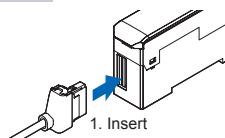
1. Grasp the product and push forward.
2. Lift the front to remove.



### Attaching the sensor head connection cable

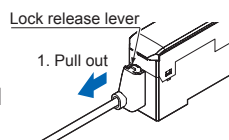
#### Mounting

1. Insert the sensor head connection cable into the connector for the sensor head connection cable on the controller.



#### Removal method

1. Grasp the controller, and while pressing on the lock release lever on the connector of the sensor head connection cable, pull toward you to disconnect.



Note: If you attempt to disconnect the cable by pulling it without pressing the lock release lever, cable wire breakage and connector damage may occur.

### Connection

- Always shut off the power before connecting a slave unit to or disconnecting a slave unit from the master unit. Risk of controller damage if you attempt connection with the power on.
- Insert the male connector firmly into the female connector. Risk of controller damage if not completely connected.
- When connecting slave units to a master unit, connect only NPN output types, or only PNP output types. Dissimilar output types cannot be connected together.

- To connect units, the units must be mounted on a DIN rail. Attach end plates **MS-DIN-E** (optional) so as to enclose the connected units at the ends.

- If the **HG-TC** controller is used together with the **HG-SC** controller for contact-type digital displacement sensor **HG-S** series, make sure to use the **HG-SC** controller manufactured in and after February, 2019. Furthermore, connect the slaves units of the same series to the side closer to the master unit and the slave units of the other series to the far side.

### Common

#### Wiring

- The product is designed to fulfill the specifications when combined with the **HG-T** sensor head and **HG-TC** controller. If the product is used in combination with other products, it not only fails to meet the specifications but also generates a malfunction in some cases.
- For the controller DC power supply, only use a power supply that is isolated by means of an isolation transformer or otherwise.
- Risk of short-circuiting and damage to the controller or power supply if a transformer such as an auto transformer is used. Risk of short-circuiting and damage to the controller or power supply if incorrectly mounted or connected.

- Make sure that the power supply is off while performing wiring or expansion work.
- After you have completed wiring work, check the wiring carefully before switching on the power.
- 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.
- Make sure that stress by forcible bend or pulling is not applied directly to the sensor cable joint.

#### Others

- This device has been developed / produced for industrial use only.
- Do not use this product outside the range of the specifications. Risk of an accident and product damage. There is also a risk of a noticeable reduction of service life.
- Do not use during the initial transient time after the power supply is switched on.
- To ensure performance, use the product at least 30 minutes (warm-up time) after the power is turned ON.
- This product (controller and sensor head receiver) uses an EEPROM. The EEPROM has a service life of one million setting operations.
- This product is suitable for indoor use only.
- Avoid dust, dirt, and steam.
- Take care that the product does not come in direct contact with organic solvents such as thinner.
- Take care that the product does not come in direct contact with strong acid or alkaline.
- Take care that the product does not come in direct contact with oil or grease.
- Do not use in an environment containing inflammable or explosive gases.
- Performance may not be satisfactory in a strong electromagnetic field.
- The sensor head is watertight, but the connector is not dustproof, waterproofing, or corrosion-resistant due to its structural reasons, so measurements cannot be taken under the water or in the rain. Pay attention to the environment where the product is used.
- This product is a precision device. Do not drop or otherwise subject to shock. Risk of product damage.
- Never attempt to disassemble, repair, or modify the product.

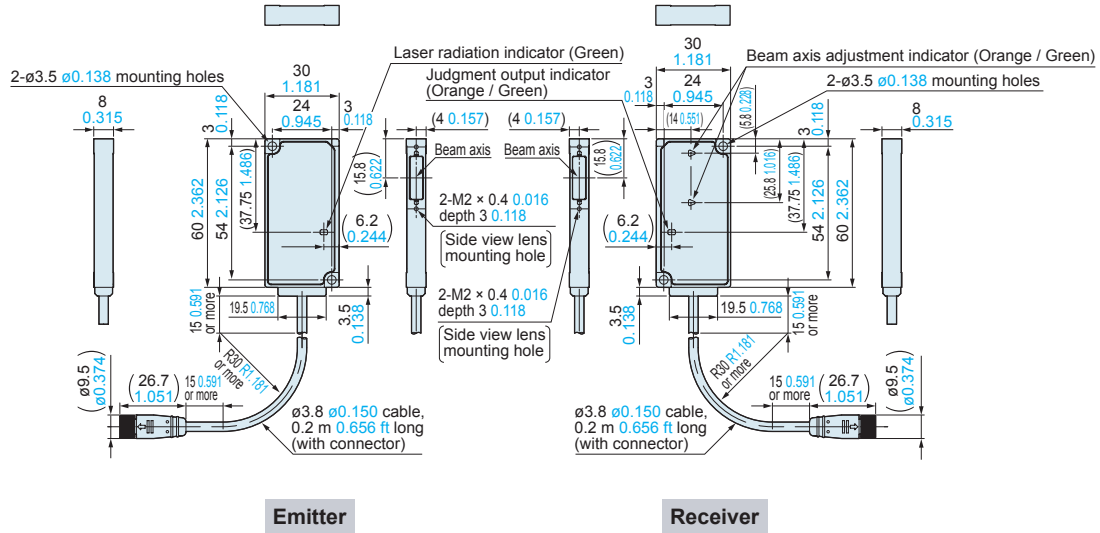


**DIMENSIONS (Unit: mm in)**

The CAD data can be downloaded from our website.

**HG-T1010**

Sensor head (Standard type)

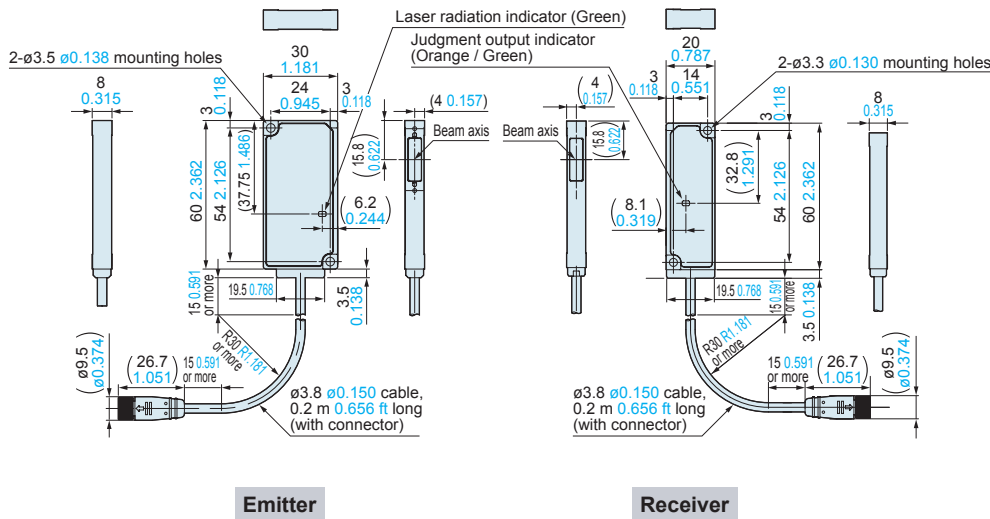


**Emitter**

**Receiver**

**HG-T1110**

Sensor head (Slim type)

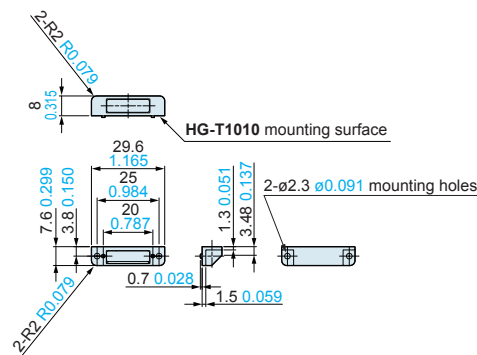


**Emitter**

**Receiver**

**HG-TSV10**

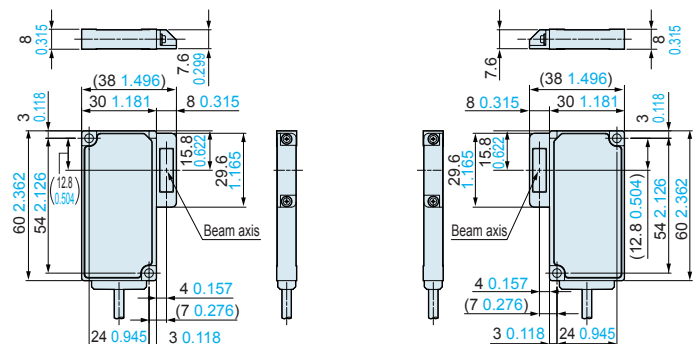
Side view attachment (Optional)



Two M2 (length 4 mm 0.157 in) screws with washers are attached.

**Assembly dimensions**

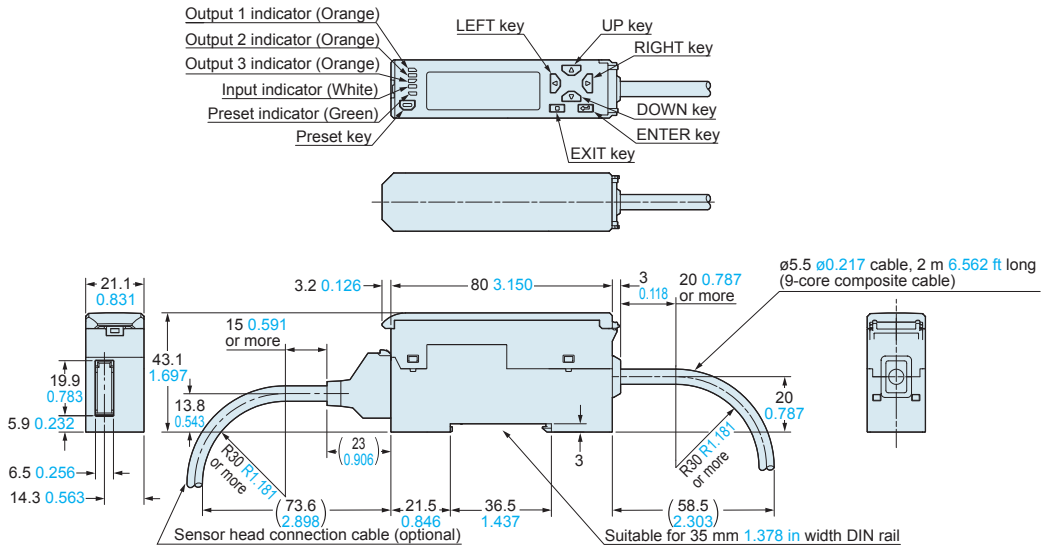
The diagram shows the attachment mounted on the receiver of the standard type sensor head **HG-T1010**. Can be installed in either direction.



Notes: 1) The attachment cannot be installed to the slim type sensor head **HG-T1110**.  
2) Be sure to confirm proper detection using actual equipment in advance when using the attachment.

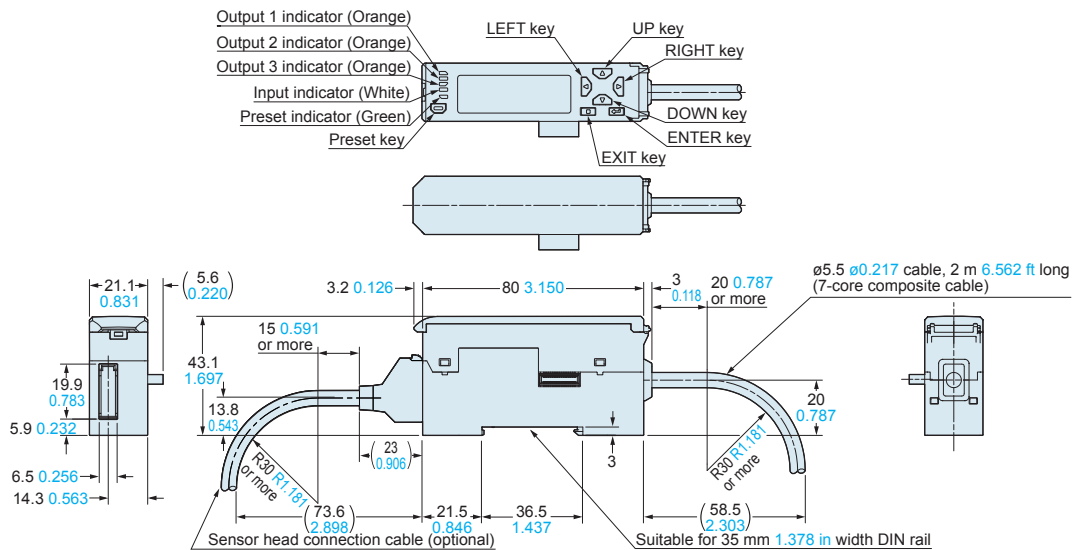
### HG-TC101 HG-TC101-P

Controller (Master unit)



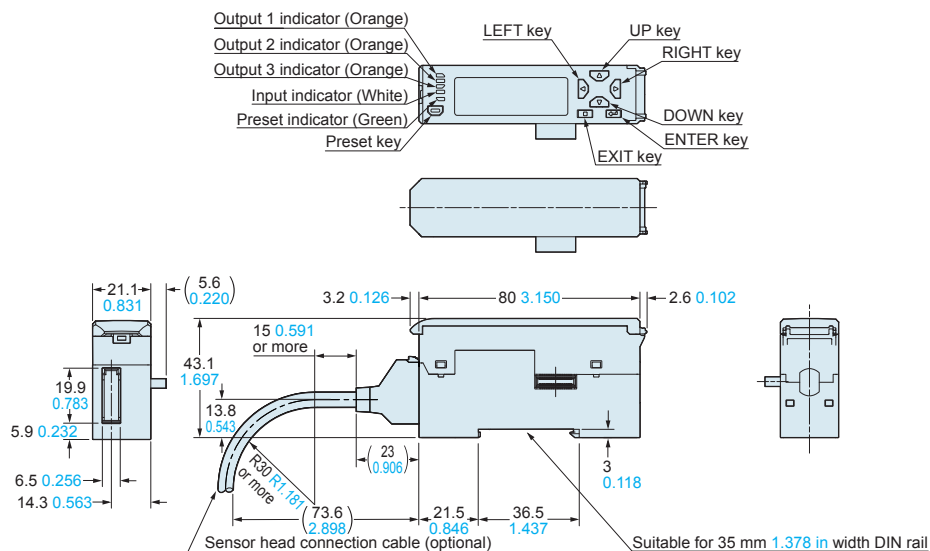
### HG-TC111 HG-TC111-P

Controller (Slave unit)



### HG-TC113

Controller (Slave unit)

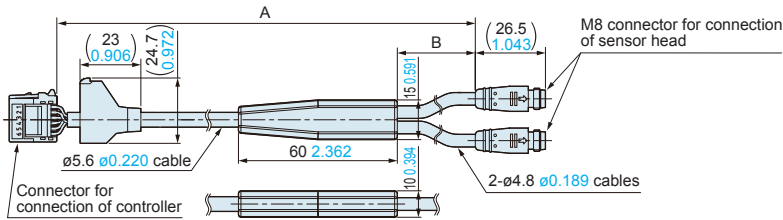


**DIMENSIONS (Unit: mm in)**

The CAD data can be downloaded from our website.

**CN-HT-C□**

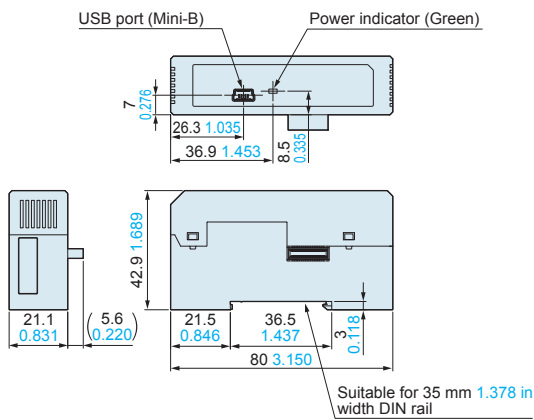
**Sensor head connection cable**



Model No.	A	B
<b>CN-HT-C2</b>	2,000	500
	78.740	19.685
<b>CN-HT-C5</b>	5,000	500
	196.850	19.685
<b>CN-HT-C10</b>	10,000	1,000
	393.701	39.370
<b>CN-HT-C20</b>	20,000	1,000
	787.402	39.370

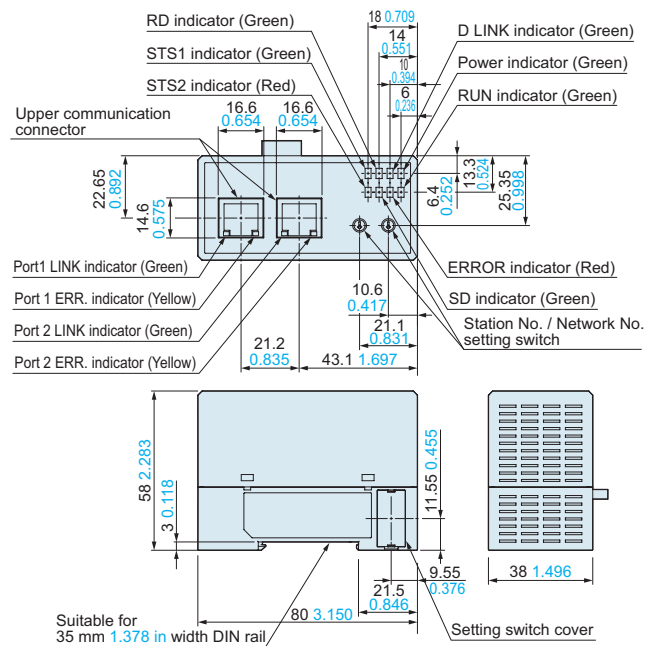
**SC-HG1-USB**

**USB communication unit**



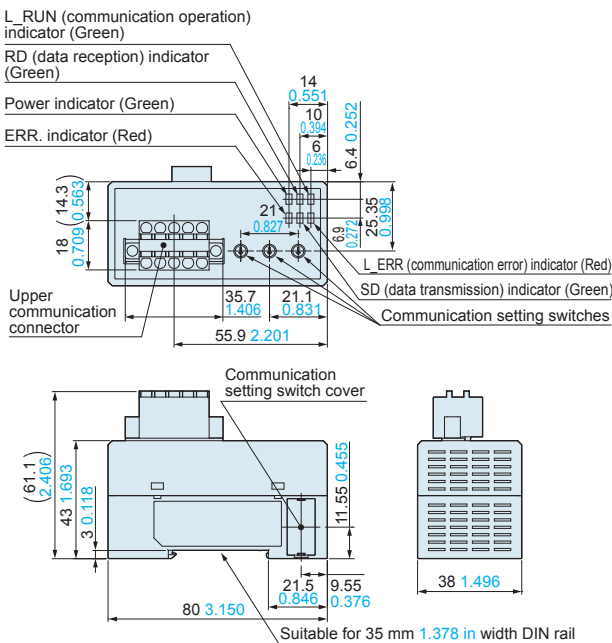
**SC-HG1-CEF**

**CC-Link IE Field communication unit**



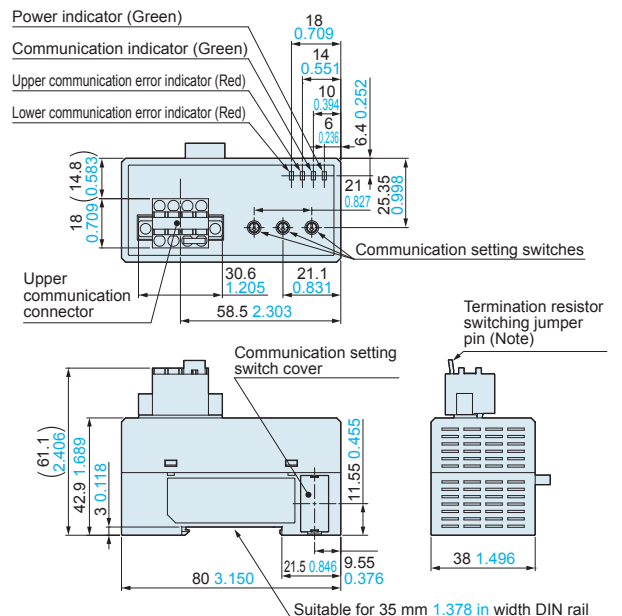
**SC-HG1-C**

**CC-Link communication unit**



**SC-HG1-485**

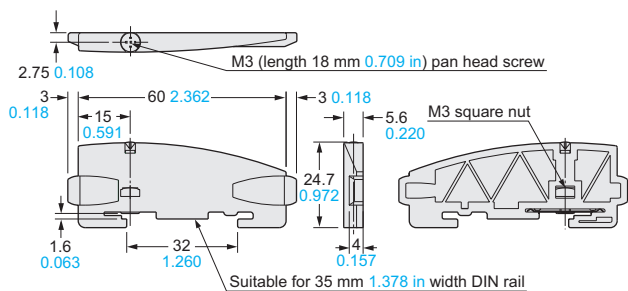
**RS-485 communication unit**



Note: The termination resistor switching jumper pin is not attached to the product at the factory. Attach the termination resistor switching jumper pin to the unit at the terminating end. Make sure that the termination resistor switching jumper pin have been removed from all units except the one at the terminating end.

### MS-DIN-E

### End plates



Material: Polycarbonate

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