Panasonic
INDUSTRY

CMOS Type | Self-Monitoring Sensor

Thru-beam Type Digital Displacement Sensor

HG-T SERIES

CE | FDA

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

Equipped with Self-monitoring Function

* Among thru-beam type digital sensors, as of November 2020 in-company survey

Ultra-slim

HG-T series

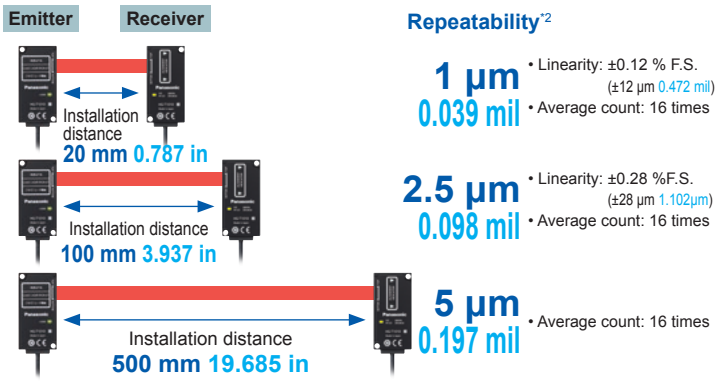
The ultra-slim unit with a thickness of 8 mm 0.315 in allows easy installation in a limited space such as the inside of equipment.

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.



Repeatability*2

1 µm 0.039 mil
- Linearity: ±0.12 % F.S. (±12 µm 0.472 mil)
- Average count: 16 times

2.5 µm 0.098 mil
- Linearity: ±0.28 %F.S. (±28 µm 1.102µm)
- Average count: 16 times

5 µm 0.197 mil
- Average count: 16 times

- 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 November 2020, 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.

Standard type	Slim type
HG-T1010	HG-T1110

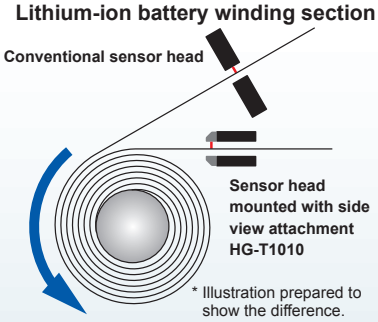
Side view attachment is available (optional). HG-T1010

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

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

■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.

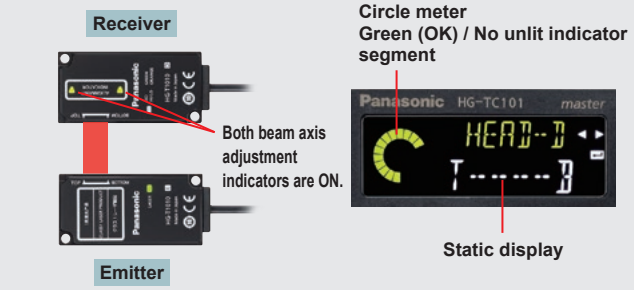
Ease of Installation

Beam axis adjustment assist function

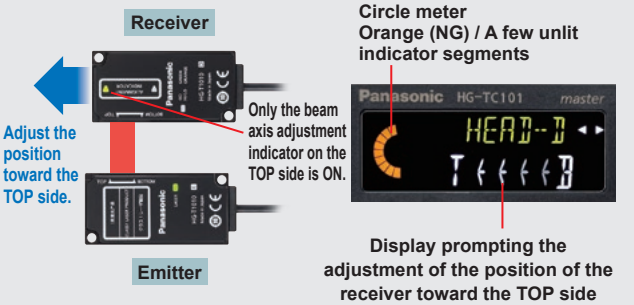
The standard type sensor head **HG-T1010** indicates the direction of receiver displacement relative to the emitter on the controller's display screen and with the beam axis adjustment indicators on the receiver in an easy-to-understand fashion.

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

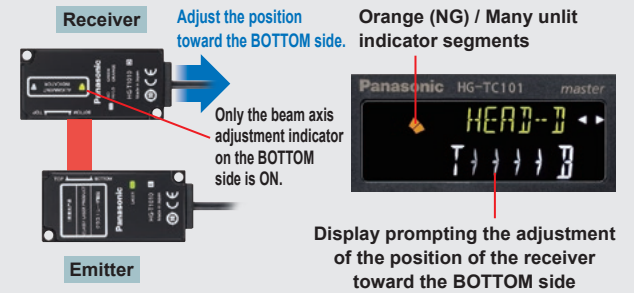
When beam axis is aligned properly



When beam axis is displaced slightly toward the BOTTOM side

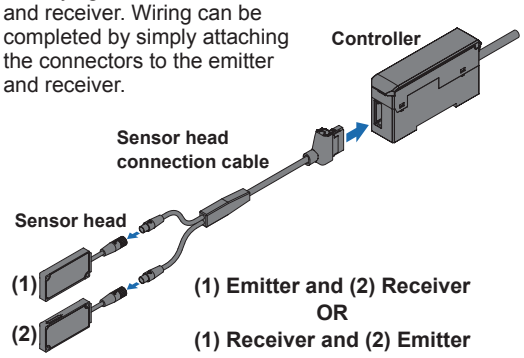


When beam axis is displaced significantly toward the TOP side



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.

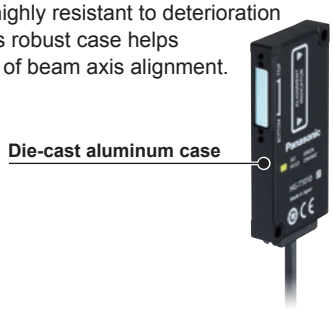


Emitter and receiver can be connected to either connectors!

* 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

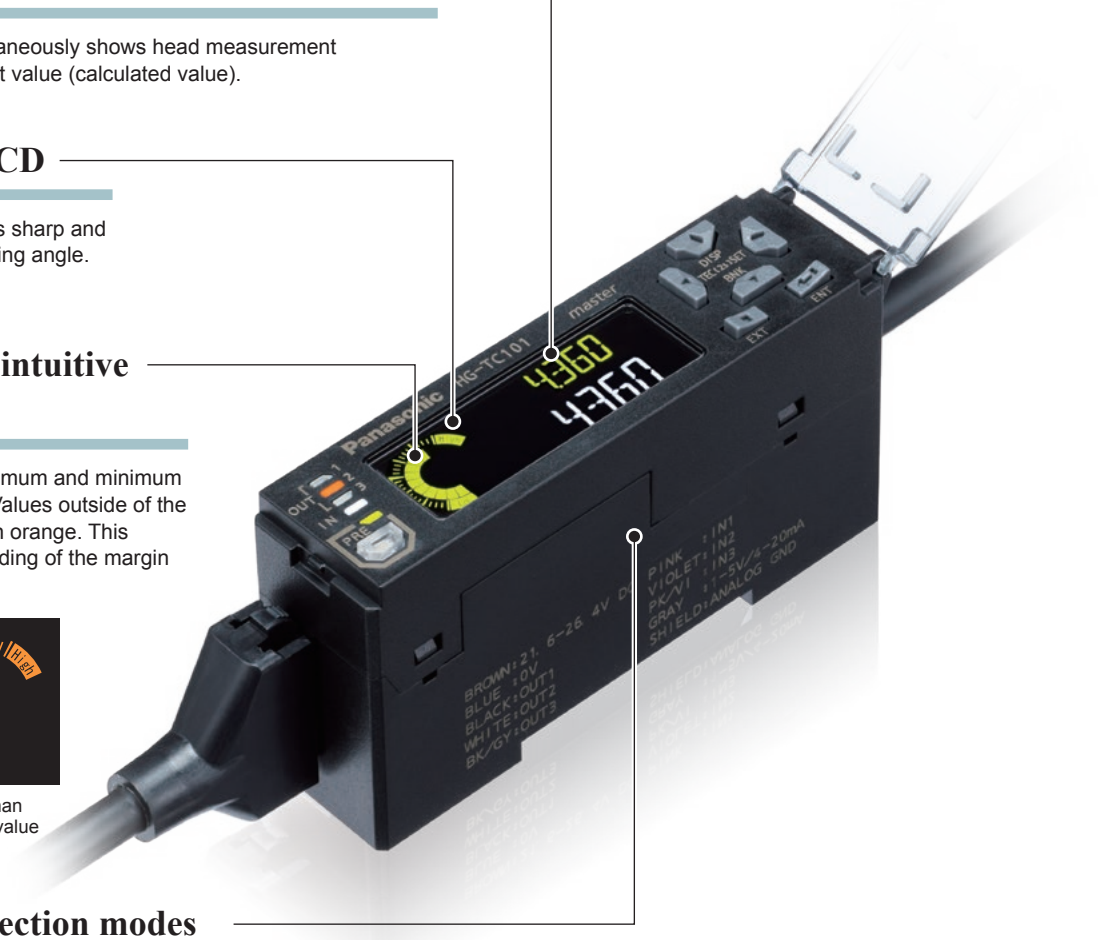
The high-contrast LCD provides sharp and clear indications and wide viewing angle.

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

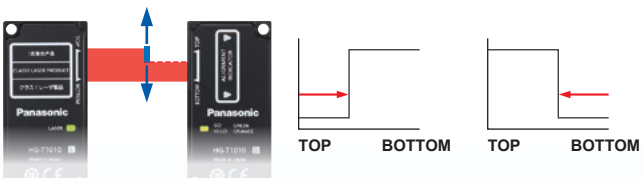
Lower than minimum value



Six types of detection modes

Auto edge detection mode

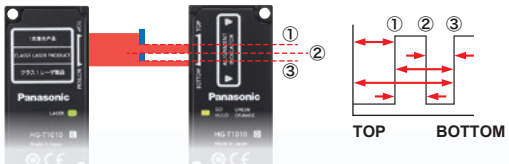
Edge detection can be started from either the TOP or BOTTOM without registering the detection direction. This eliminates the need for checking the detection direction.



NEW User assigned edge detection mode

* Provided in products manufactured in November 2020 and after.

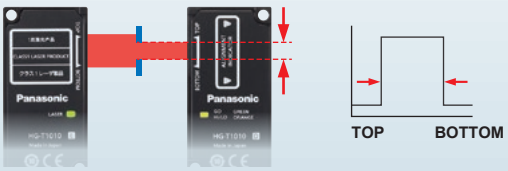
The user can select any two edges from multiple edges on the measurement target and obtain the measurement of the distance between the two edges.



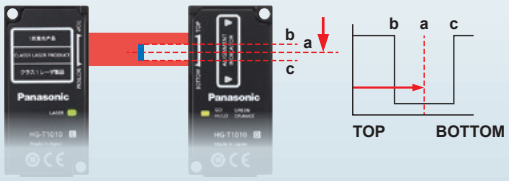
Edge detection mode

External form / width detection mode

Inside diameter / gap detection mode

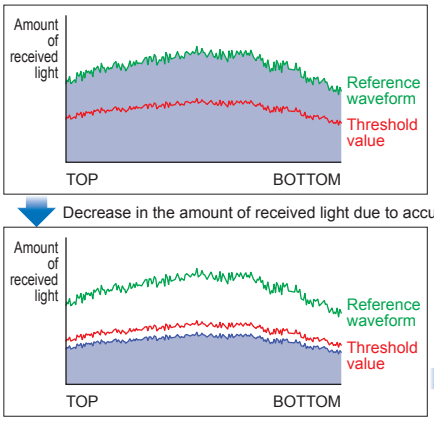


Central position detection mode



Monitoring of effects caused by stains

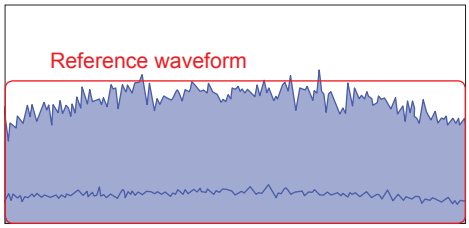
Notifies when the detection performance decreases due to accumulated stains.



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 %).



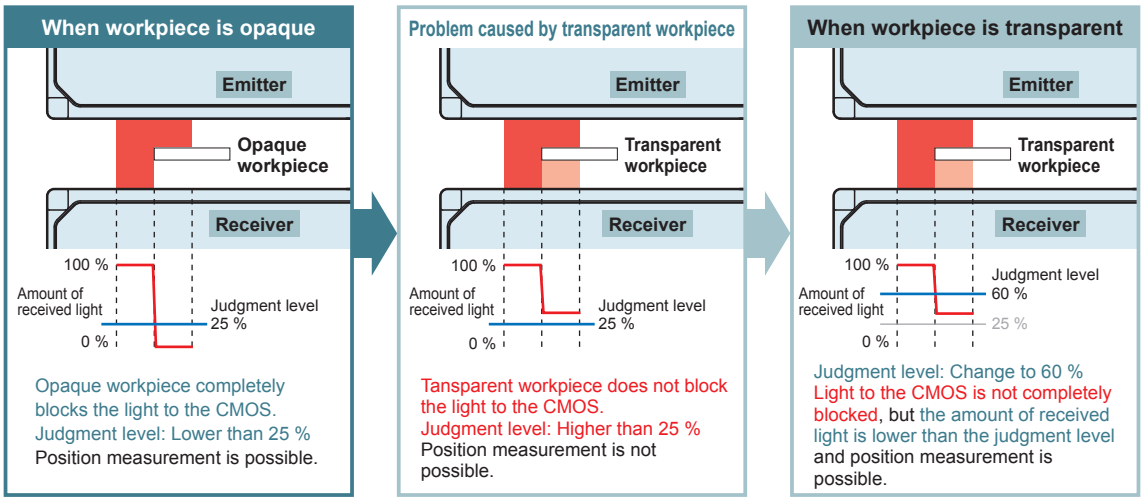
Stain check setting items
One of the following four settings can be selected.

- 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 a combination of the "**HG-T Configuration Tool**" USB-based PC setting software and USB communication unit **SC-HG1-USB** or RS-485 communication unit **SC-HG1-485**. For details, refer to page 15.

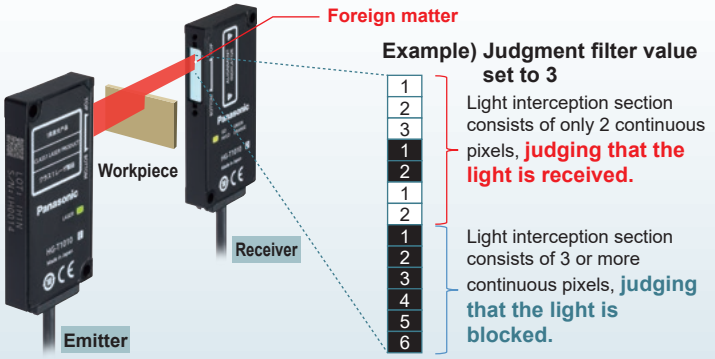
Stable measurement of even transparent workpieces

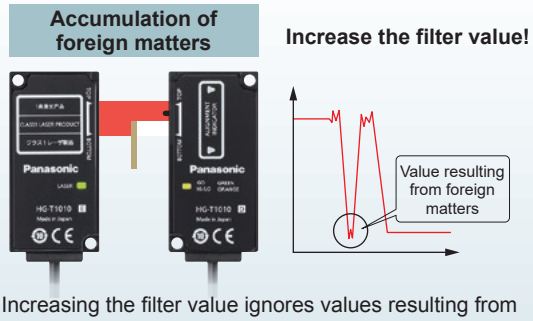
The judgment level can be adjusted according to the degree of transparency.



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.



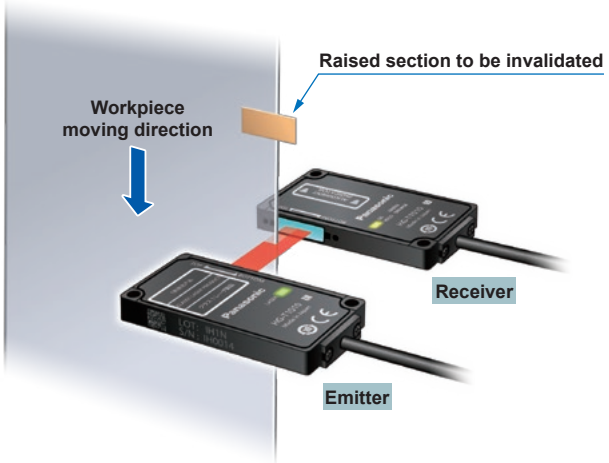


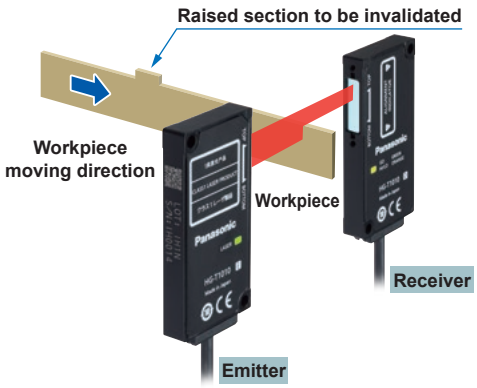
Increasing the filter value ignores values resulting from foreign matters.

Invalidation of abrupt changes in measurements NEW

* Provided in products manufactured in November 2020 and after.

If there is an abrupt change at the edge of workpiece, this function invalidates the change and stabilizes the judgment value.



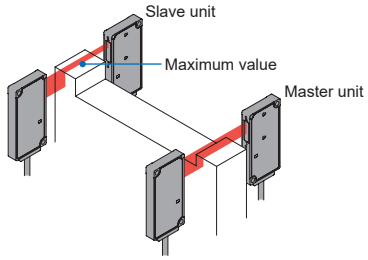


Equipped with 5 arithmetic functions

Calculation is performed using the measurements obtained by the connected controller. The judgment result can be displayed on the digital display of the master unit or output from the master unit. Connect only the controller to be used for calculation purposes.

1 Maximum value

The largest measured value among those in the master and slave units is set as calculated value.

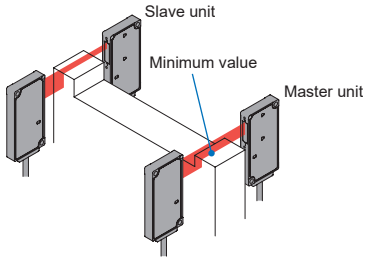


In above case:
[Master unit] Calculated value
= Largest [Slave unit] Measured value

* None of the connected slave units outputs judgment result.
(Always OFF)

2 Minimum value

The smallest measured value among those in the master and slave units is set as calculated value.

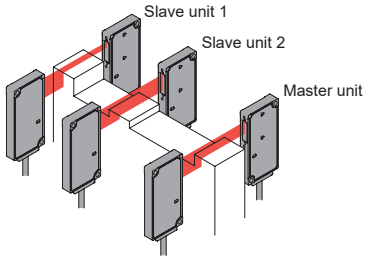


In above case:
[Master unit] Calculated value
= Smallest [Master unit] Measured value

* None of the connected slave units outputs judgment result.
(Always OFF)

3 Average value

The average value of the measured values in the master and slave units is set as calculated value.

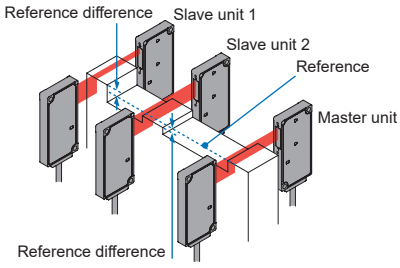


[Master unit] Calculated value = ([Master unit] + [Slave unit 1] + ... + [Slave unit n]) / (1 + n)
n = Number of slave units

* None of the connected slave units outputs judgment result.
(Always OFF)

4 Reference value

Each slave unit sets the difference between its measured value and the master unit's measured value as calculated value.
Each slave unit outputs judgment result.

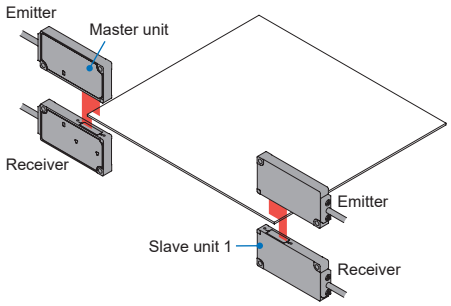


In above case:
[Slave unit 1] Calculated value =
[Slave unit 1] Measured value – [Master unit] Measured value
[Slave unit 2] Calculated value =
[Slave unit 2] Measured value – [Master unit] Measured value

* The master unit performs judgment operation without performing calculation.
* The master unit cannot use the hold function.

5 Thickness / width

Two sensor heads clamp the detection target and computes its thickness/width.



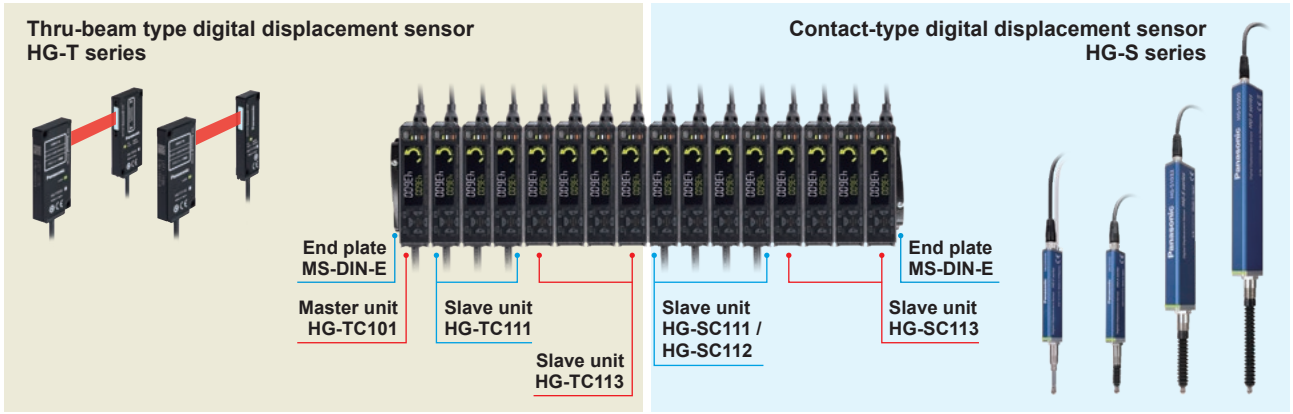
Calculated value = [Master unit] Measured value + [Slave unit 1] Measured value

* The slave unit close to the master unit does not output the judgment result. (Always OFF)
* When two or more slave units are connected, the second and subsequent slave units perform ordinary judgment operations without performing calculation.

Connectable to compact-type digital displacement sensor HG-S series

When the **HG-TC**□*1 controller is combined with the **HG-SC**□*1 controller for contact-type digital displacement sensor **HG-S** series, up to 15 slave units (up to 14 slave units if communication unit for digital displacement sensors is connected) can be connected to one master unit.
Connect the same-series slave units close to the master unit and connect slave units of other series on the far side.
*1 Be sure to use controllers manufactured in or after February 2019.

< Example: Connection of 8 units of HG-S series to 8 units of HG-T series (NPN output type) >



* 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.
* After the connection, attach end plates (optional) to both ends of the controller for secure installation.
* If **HG-TC**□ and **HG-SC**□ controllers are used in combination, there are limitations on the functions below.

Item	Description of limitation
Calculation function	Calculation is only performed when the slave unit is the same series as the master unit. Calculation is not performed when the slave unit series is different from the master unit series. “CALC” does not appear in the display of a slave unit of a different series.
Input all	The master unit only performs input all when the slave units are the same series. A slave unit of a different series from the master unit does not perform input even when the external input settings match those of the master unit.
Copy function	Copying is only performed when the slave unit is the same series as the master unit. When copying is executed, “NOW COPY” appears even on the display of a slave unit of a different series from the master unit, but copying is not performed.

Contact-type digital displacement sensor

Self-Monitoring Sensor

Contact-type digital displacement sensor HG-S SERIES

CE

The optical absolute method eliminates “value skipping” and “unset zero point”!

Sensor head

- Tip deviation amount of 35 µm 1.378 mil or less (typical value) *1
- Plain bearings with 2-point support structure offering high lateral load resistance
- Hot-swappable
- Bending-resistant cable

*1: Calculated based on the upper and lower plain bearing clearances in the 10 mm 0.394 in type product.

10 mm 0.394 in type — Air-driven type
10 mm 0.394 in type — Regular type
32 mm 1.260 in type — Regular type
50 mm 1.969 in type — Regular type

Development target:

Slim & Robust

- **The 10 mm 0.394 in type has a slim 11 × 18 × 84.5 mm 0.433 × 0.709 × 3.327 in body, for easy adjacent installation**
- **Class-top robustness in the industry**

Lateral load resistance No. 1* in class
Vibration / impact resistance No. 1* in class

* As of January 2021, in-company survey.

Development goal:

Highest Accuracy in Class

- **Resolution of 0.1 µm 0.004 mil* and indication accuracy of 1.0 µm 0.039 mil or less***
- **Absolute value scale reading for elimination of “value skipping” and “unset zero point”**

Resolution No. 1* in class
Indication accuracy No. 1* in class
Optical absolute method

* In the case of high-precision sensor heads (**HG-S1110**□). As of January 2021, in-company survey.

Controller

Development focus:

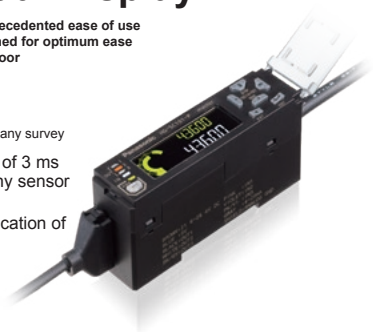
Intuitive Dual Display

- **2-line digital display for unprecedented ease of use**
- **Full-fledged functions designed for optimum ease of operation on production floor**

Industry's first*

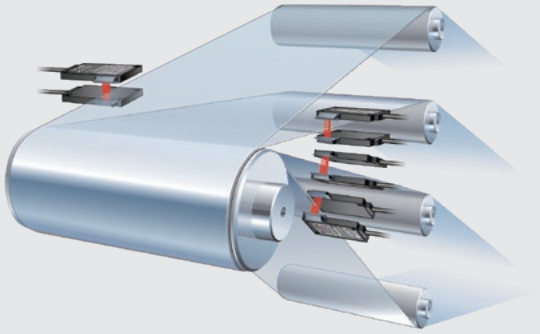
* As of September 2015, in-company survey

- High-speed response of 3 ms in combination with any sensor head
- Alarm setting for notification of upward thrust



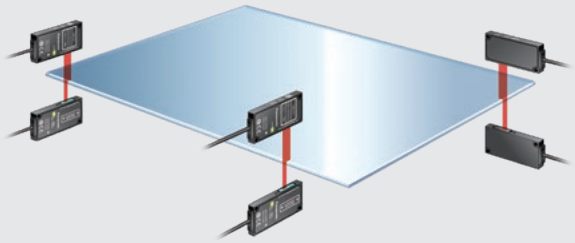
Applications

Measurement of meandering on lithium-ion battery winding machine



Use of the side view attachment (optional) enables the mounting of the sensor near the winding core for improved meander measurement accuracy.

Glass substrate positioning

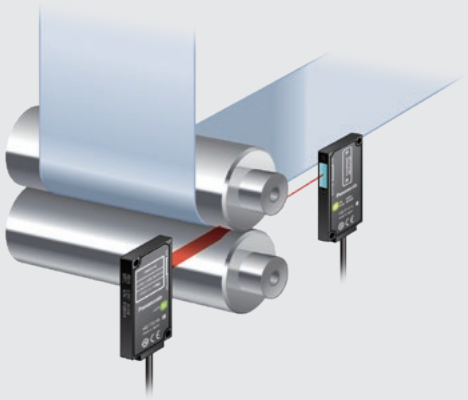


The judgment level adjustment function ensures stable detection and measurement of even transparent workpieces.

Detection of lifted bearing parts

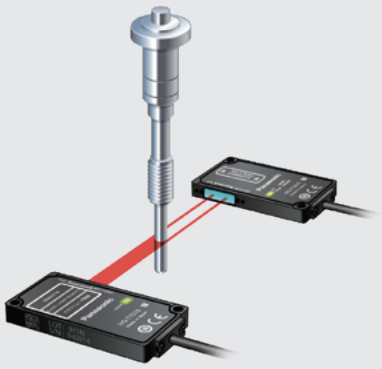
Use of the side view attachment (optional) enables the flexible installation of the sensor in a limited space.

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 sensors

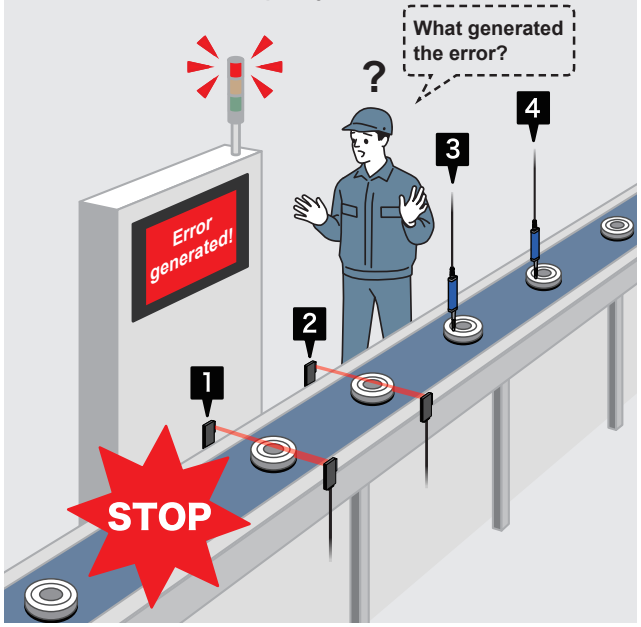
Compatible with self-monitoring function

Suitable for use on manufacturing lines Sensor equipped with a new self-monitoring function!

**A sensor with a self-monitoring function diagnoses its own state and notifies when readjustment of settings / setup is required or when maintenance is needed.
The sensor determines its status and indicates "Normal," "Notification," "Caution" or "Fault."
When not in normal status, the sensor checks the cause of problem and corrective measure, thus reducing equipment downtime and maintenance workload.**

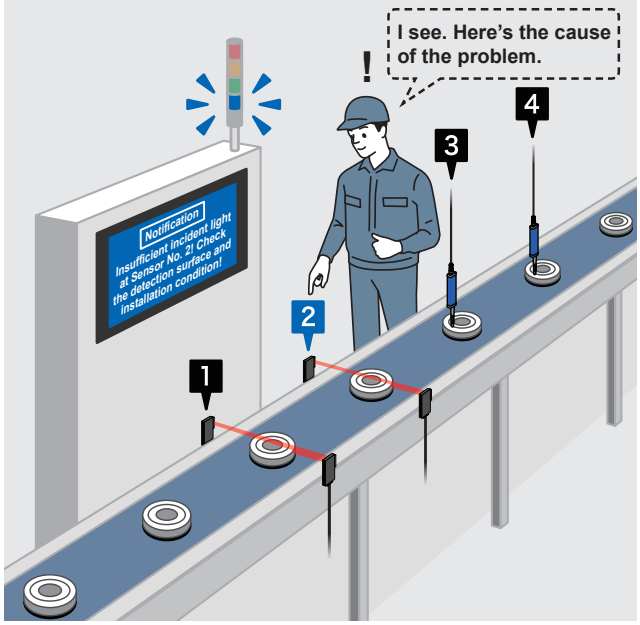
Conventional manufacturing line

If an error is generated, the line stops. However, the cause of the error cannot be identified quickly.



Manufacturing line installed with self-monitoring sensors

Each sensor informs of its status so that even if a problem occurs, the error generating source can be identified immediately and the detail be grasped.

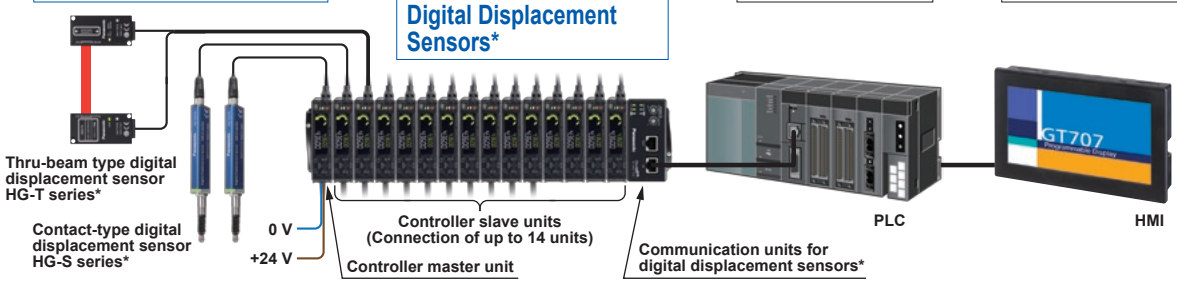


Self-monitoring function: Four types of status indication and judgment of state

Status	Judgement of the state	
Normal	Operation is normal.	
Notification	Check the settings. Detected state is unstable.	* Recover to the normal state through checking installation and settings. Reduction in the incident light intensity.
Caution	Getting close to the end of service life. Reached the state where the device should be replaced.	* Limitation in the writing frequency into the memory or in the operation hours, etc.
Fault	Short-circuited or broken. Reached the state where it is impossible to control as a device.	* Short-circuited output, damaged EEPROM, etc.

Example of a system that utilizes the self-monitoring function

HG-T / HG-S series* + Communication Unit for Digital Displacement Sensors* + PLC + HMI



* To use the self-monitoring function with the thru-beam type digital displacement sensors **HG-T** series and contact-type digital displacement sensors **HG-S** series, a communication unit for digital displacement sensors (any of the following: **SC-HG1-ETC**, **SC-HG1-CEF**, **SC-HG1-C** or **SC-HG1-485**) that supports the self-monitoring function is required.

Identification of malfunctioning location and cause

The sensor self-diagnoses its state, so if a malfunction occur, it is easy to identify the problem location and discover the cause of the problem. Therefore, even if there is no experienced worker or skilled technician at the site to respond to the problem, it is possible to take an appropriate measure immediately. This minimizes the restoration time and reduces the maintenance workload.

Reduction of downtime

Reduction of maintenance workload

Dirty detection surface

End-of-life / damaged sensor

Positional deviation

Easy planning of maintenance schedule

Conventional sensors can generate unexpected malfunctions and require many hours for maintenance and replacement; thus, an unscheduled shutdown of the manufacturing line may be required from time to time. The self-monitoring function notifies the sensor replacement timing, thus allowing for planning the most efficient maintenance and replacement schedule. This helps prevent unexpected shutdowns of the manufacturing line and improves productivity.

Improved productivity

Predictive maintenance

Details of self-monitoring function

HG-T series' self-monitoring function

Status	Response parameter	Measures	Controller **HG-TC**□	
			Error code (Note 1)	Measurement alarm (Note 1)
Notification	Sensor head unconnected	Status check	E200	—
	Connected sensor head incompatible	Status check	E230	—
	Connected unit count check error	Status check	E160 (For master units only)	—
	NPN / PNP output type mixture error	Status check	E100 (For master units only)	—
	Calculated unlit count error	Status check	E110 (For master units only)	—
	Copy executionerror (Slave unit problem)	Status check	E170 (For master units only)	—
	Detection capability limit (obtained edge information) (Note 2)	Sensing object check	—	Measurement alarm 1
	The amount of entering light is too much due to the influences of ambient light, etc. (Note 2)	Status check	—	Measurement alarm 1
	The amount of entering light decreases due to stain on the detection surface, beam axis misalignment, etc.	Sensing object check	—	Measurement alarm 2
	The specified measurement direction differs from the insertion direction of the detected object.	Status check / Sensing object check	—	Measurement alarm 2
Caution	Controller cumulative run time exceeded (87,600 hours)	Controller replacement	—	—
	Sensor head cumulative run time exceeded (87,600 hours)	Sensor head replacement	—	—
	Controller memory saving count exceeded (1,000,000 times)	Controller replacement	—	—
	Sensor head memory saving count exceeded (for receivers only, 1,000,000 times)	Sensor head replacement	—	—
Fault	Controller memory function damaged	Controller replacement	E600	—
			E610	
			E620	
	Sensor head memory function damaged	Sensor head replacement	E630 (For receivers only) E640 (For emitters only)	—
	Output section short-circuit error	Status check / Replacement	E700	—
	Detection circuit damaged	Sensor head replacement	E240	—
	System error	Controller replacement	E900	—
			E910	
			E911	
			E912	
			E920	

Notes: 1) Error codes and alarms are displayed on **HG-TC**□ controllers.
2) If "Alarm condition selection (ALM.CND)" is set to "Hold last value (HOLD)", Measurement alarm 1 is not notified.

Communication unit for digital displacement sensors

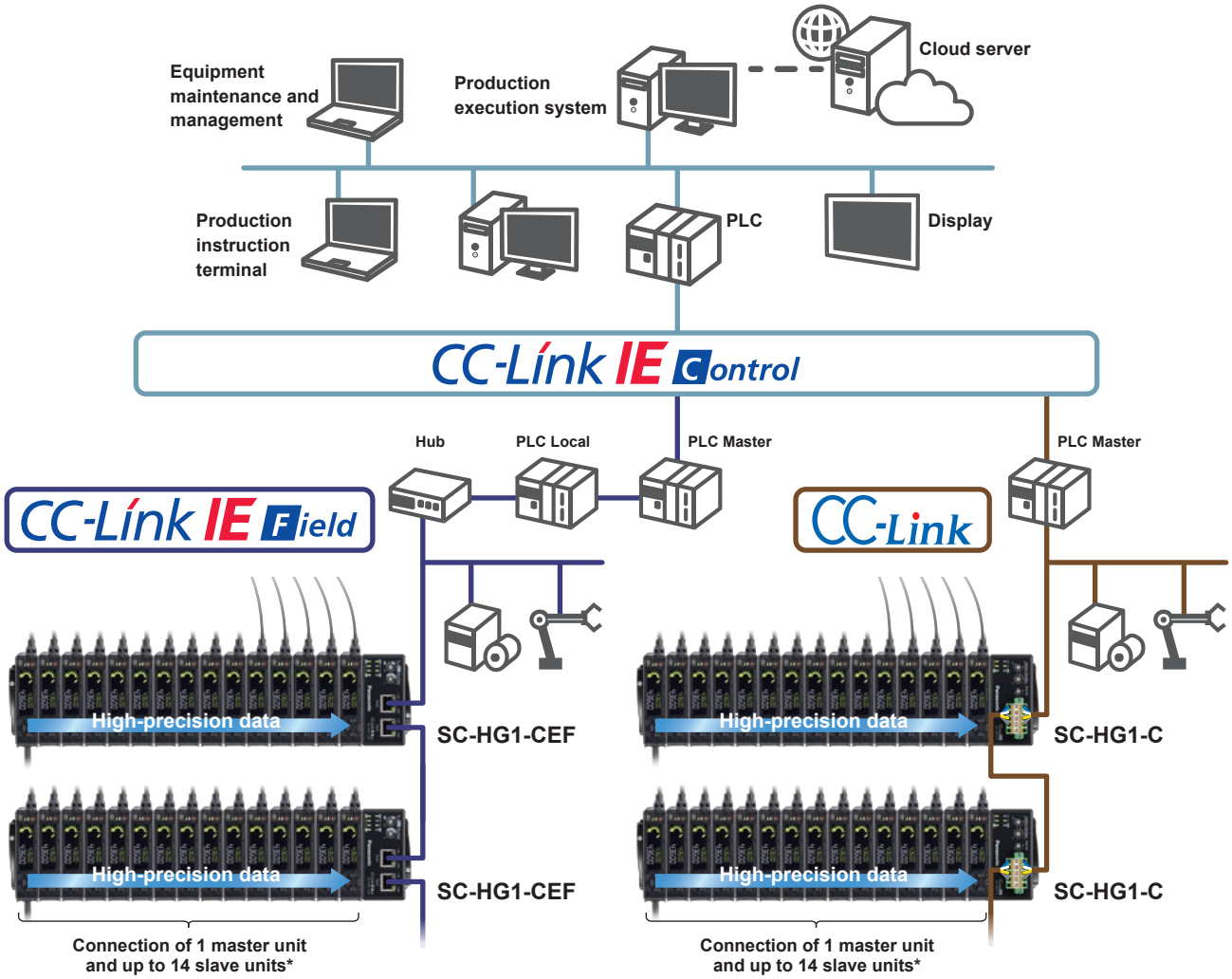
Compatible with self-monitoring function

Direct transfer of measurement data obtained by multiple sensors to host device!

CC-Link IE Field Communication Unit / CC-Link Communication Unit

Compatible with self-monitoring function

Use of our communication unit for digital displacement sensors allows direct connection to the CC-Link / CC-Link IE Field network.
This enables real-time acquisition of digital data and ON / OFF information without any program.
Furthermore, it can be used to change controller settings and log measurement data via CC-Link / CC-Link IE Field network, for example, for predictive maintenance of digital displacement sensors.



* 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

* Units shipped in and after December 2019 are compatible with self-monitoring function.

CC-Link communication unit

SC-HG1-C

CC-Link Supports iQSS

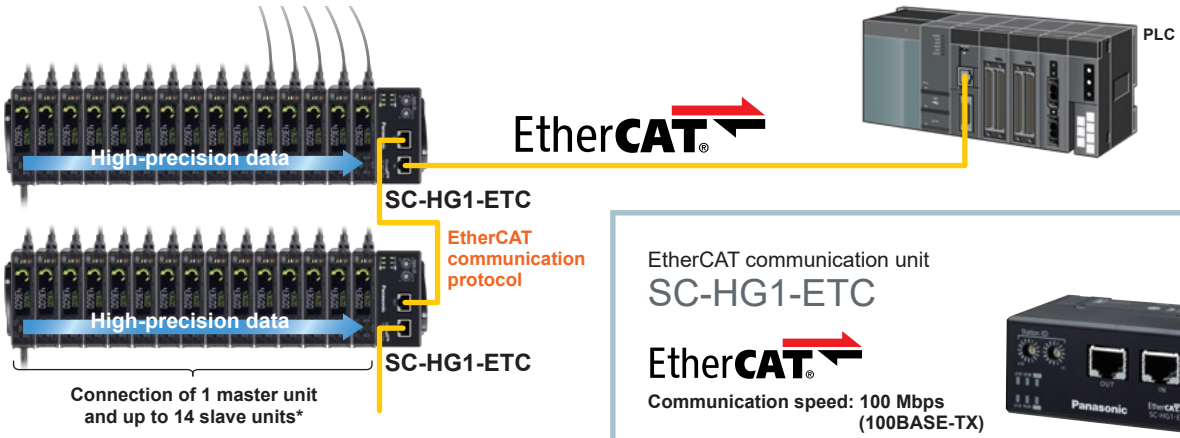
Communication speed: 10 Mbps (max.)

* Units manufactured in and after December 2019 are compatible with self-monitoring function.

EtherCAT Communication Unit

Compatible with self-monitoring function

Our product line also includes a communication unit that enables connection with EtherCAT.
This unit communicates measurement (judgment) data and error codes cyclically at a high-speed sampling rate and transfers the data to the host device with accuracy intact.
Furthermore, settings of multiple sensors can be read and written, and the bank can be switched via EtherCAT.



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

EtherCAT communication unit
SC-HG1-ETC

Communication speed: 100 Mbps (100BASE-TX)

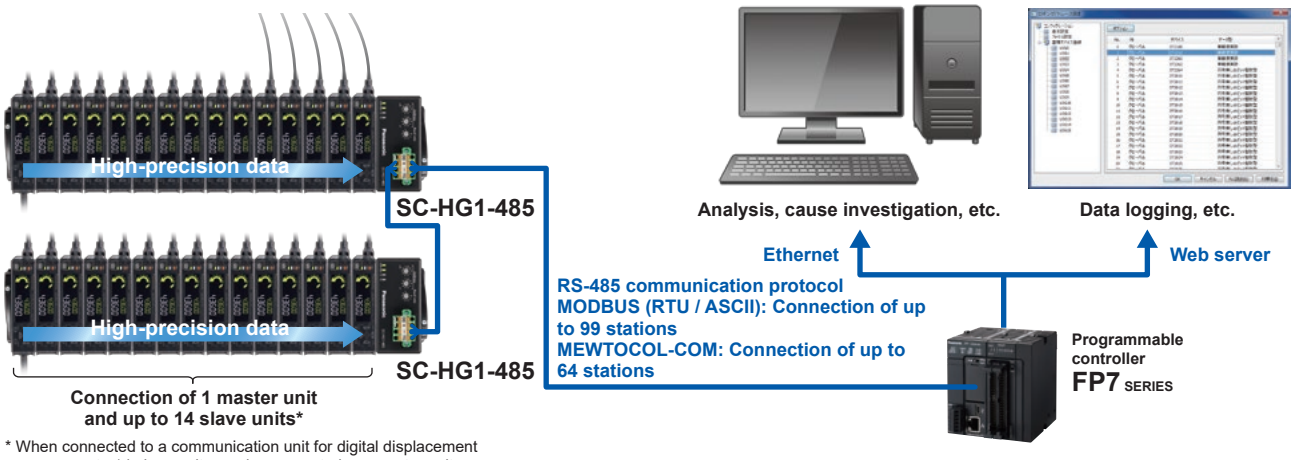
* Supports the self-monitoring function regardless of the manufacturing date.

* EtherCAT is a registered trademark patent-protected technology, licensed by Beckhoff Automation GmbH of Germany.

RS-485 Communication Unit

Compatible with self-monitoring function

For use of high-precision measurement results as traceability data. 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.



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

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

* Units manufactured in and after November 18 2019 are compatible with self-monitoring function.

USB-based PC setting software

HG-T Configuration Tool

- **Compatible communication unit: SC-HG1-USB / SC-HG1-485**
- **Compatible OS: Microsoft Windows® 8 (8.1) (32 bit / 64 bit), Microsoft Windows® 10 (32 bit / 64 bit)**
- **Required RAM: 2 GB or more**
- **Required hard disk space: 200 MB or more**
- **Communication interface: USB2.0 (SC-HG1-USB), RS-485 (SC-HG1-485)**

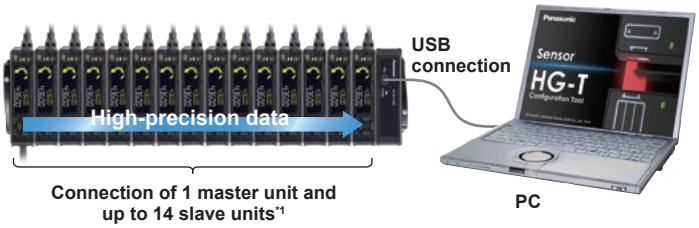
* **SC-HG1-485** supported by Ver. 1.20 or newer version of **HG-T Configuration Tool**
* For the detail of the USB-based PC setting software, refer to page 15.
* Microsoft and Windows are registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Communication unit for digital displacement sensors

USB communication unit

* Not compatible with self-monitoring function.

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.



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

USB communication unit

SC-HG1-USB

Communication specification: USB 2.0 Full Speed*2
Communication protocol: Proprietary protocol
USB port: USB Mini-B (1 port)

*1 Dependent on PC environment.

USB-based PC setting software

HG-T Configuration Tool

- **Compatible communication unit: SC-HG1-USB / SC-HG1-485**
- **Compatible OS: Microsoft Windows® 8 (8.1) (32 bit / 64 bit), Microsoft Windows® 10 (32 bit / 64 bit)**
- **Required RAM: 2 GB or more**
- **Required hard disk space: 200 MB or more**
- **Communication interface: USB2.0 (SC-HG1-USB), RS-485 (SC-HG1-485)**

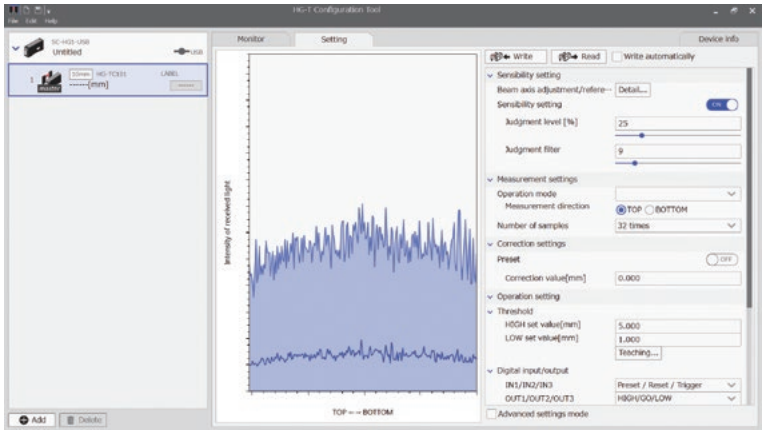
* **SC-HG1-485** supported by Ver. 1.20 or newer version of **HG-T Configuration Tool**
* For the detail of the USB-based PC setting software, refer to page 15.
* Microsoft and Windows are registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Convenient Tool Software

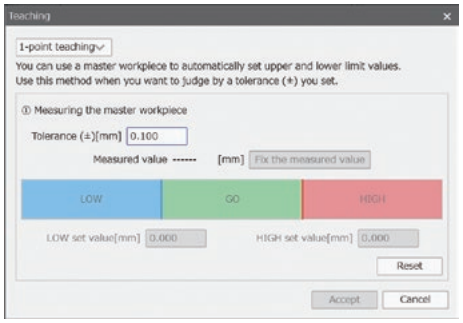
When the USB-based PC setting software, "HG-T Configuration Tool," is used together with the USB communication unit SC-HG1-USB or RS-485 communication unit SC-HG1-485, current values and settings in the HG-T series can be confirmed and changed using a PC.

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.



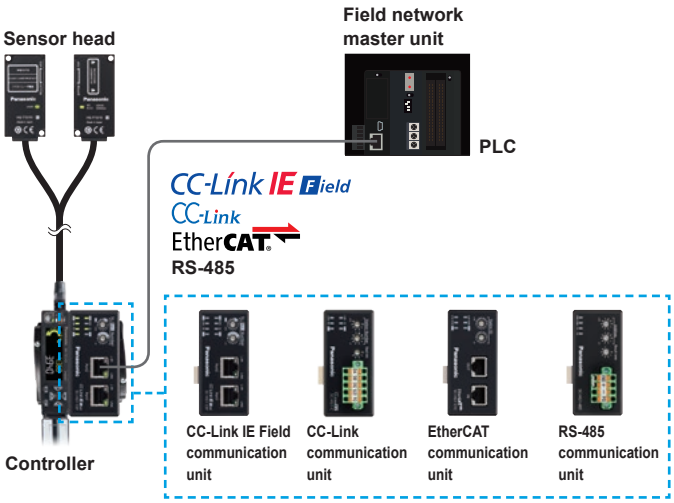
- **Compatible communication unit*1*2*3: SC-HG1-USB, SC-HG1-485**
- **Compatible OS*4*5: Microsoft Windows® 8 (8.1) (32 bit / 64 bit), Microsoft Windows® 10 (32 bit / 64 bit)**
- **Required RAM: 2 GB or more**
- **Required hard disk space: 200 MB or more**
- **Communication interface: USB2.0 (SC-HG1-USB), RS-485 (SC-HG1-485)**

*1: **SC-HG1-485** supported by Ver. 1.20 or newer version of **HG-T Configuration Tool**
*2: **SC-HG1-USB** and **SC-HG1-485** cannot be used simultaneously.
*3: To connect **SC-HG1-485** via USB, the customer must arrange a USB2.0→RS-485 converter.
*4: Microsoft and Windows are registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
*5: OS versions of which Microsoft has ended support are excluded.

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

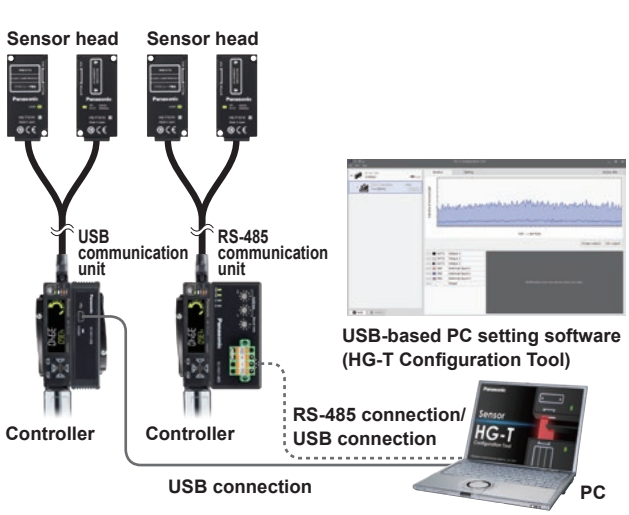
System configuration

Connecting to PLC



Our product lineup includes communication units compatible with a variety of field networks such as CC-Link, CC-Link IE Field and EtherCAT. They can link with a production system and enable the incorporation and utilization of IoT.

Connecting to PC



* USB communication unit and RS-485 communication unit cannot be used simultaneously.
* To connect RS-485 communication unit via USB, the customer must arrange a USB2.0→RS-485 converter.

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	 Emitter: 8 × 30 × 60 mm 0.315 × 1.181 × 2.362 in Receiver: 8 × 30 × 60 mm 0.315 × 1.181 × 2.362 in	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)]	**HG-T1010**
	Slim type	 Emitter: 8 × 30 × 60 mm 0.315 × 1.181 × 2.362 in Receiver: 8 × 20 × 60 mm 0.315 × 0.787 × 2.362 in					**HG-T1110**

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		**CN-HT-C2**	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.
		CN-HT-C5	5 m 16.404 ft	
		CN-HT-C10	10 m 32.808 ft	
		CN-HT-C20	20 m 65.617 ft	

Controllers

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

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
CC-Link IE Field communication unit Compatible with self-monitoring function (Note 1)		**SC-HG1-CEF**	Can directly send high-precision measurement values to a CC-Link IE Field host device. • Communication method: CC-Link IE Field • 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 **SC-HG1-CEF** unit
CC-Link communication unit Compatible with self-monitoring function (Note 1)		**SC-HG1-C**	Can directly send high-precision measurement values to CC-Link Master. • Communication method Switchable CC-Link Ver.1.10 or 2.00 • Number of occupied station CC-Link Ver.1.10: 4 stations, CC-Link Ver.2.00: Switchable 2 or 4 stations • Number of connected units Controllers: Maximum of 15 units (1 master, 14 slaves) per **SC-HG1-C** unit
EtherCAT communication unit Compatible with self-monitoring function (Note 1)		**SC-HG1-ETC**	Can directly send high-precision measurement values to EtherCAT Master. • Communication protocol: EtherCAT • Number of connected units Controllers: Maximum of 15 units (1 master, 14 slaves) per **SC-HG1-ETC** unit
RS-485 communication unit Compatible with self-monitoring function (Note 1)		**SC-HG1-485**	Can directly send high-precision measurement values by RS-485 communication. • Communication protocol: MODBUS (RTU / ASCII) / MEWTOCOL-COM • 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 **SC-HG1-485** unit When used together with the "**HG-T Configuration Tool**" USB-based PC setting software (Ver. 1.20 or newer), current values and settings in the **HG-T** series can be confirmed or changed on the PC screen. * The USB-based PC setting software, "**HG-T Configuration Tool**," can be downloaded free from our website.
USB communication unit (Note 2)		**SC-HG1-USB**	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. * The USB-based PC setting software, "**HG-T Configuration Tool**," can be downloaded free from our website. • Communication specification: USB 2.0 Full Speed (Note 3) • Communication protocol: Proprietary protocol • USB port: USB Mini-B (1 port) • Number of connectable units Controller: Up to 15 units (1 master unit, 14 slave units) per **SC-HG1-USB** unit

Notes: 1) The following products support the self-monitoring function:
SC-HG1-CEF: Products shipped in and after December 2019, **SC-HG1-C**: Products manufactured in and after December 2019, **SC-HG1-ETC**: All, **SC-HG1-485**: Products manufactured on and after November 18, 2019.
2) The USB communication unit cannot be used with contact-type digital displacement sensors **HG-S** series.
3) Dependent on PC environment.

End plates

Type	Appearance	Model No.	Description
End plates		**MS-DIN-E**	End plates are used to securely hold the controller and communication unit for digital displacement sensors connected on a DIN rail by pressing from both ends. Be sure to use the end plates when connecting units. 2 pcs per set

OPTIONS

Type	Appearance	Model No.	Description
Side view attachment		**HG-TSV10**	Designed for exclusive use with the **HG-T1010** standard type sensor head. This attachment can bend the laser beam at a right angle, thus allowing flexible installation of the sensor head. Two M2 (length 4 mm 0.157 in) screws with washers are attached. * Two pieces of attachment are required when using the attachment on both emitter and receiver. * Be sure to confirm proper detection using actual equipment in advance when using the attachment.

SPECIFICATIONS

Sensor heads

Item \ Type / Model No.		Measurement width 10 mm 0.394 in / Standard type	Measurement width 10 mm 0.394 in / Slim type
		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 7)	
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 8)	
	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^2 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) Do not use or store in an environment that has been pressurized to an air pressure higher than the atmospheric pressure at 0 m.
8) When the sampling cycle of the controller is set to "standard sampling"

SPECIFICATIONS

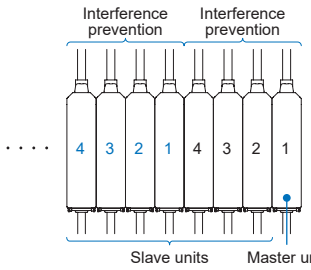
Controller

Item \ Type		Master unit	Slave unit	
		High performance type	High performance type	Wire-saving type
Model No.	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 / Current consumption (Note 3)		24 V DC ±10 %, including ripple 0.5 V (P-P) / 100 mA or less (when sensor head is connected)		
Analog outputs (Switching type) (Note 4)	Analog voltage output	• Voltage output range: 1 to 5 V/F.S. (default value) • Linearity: ±0.05 % F.S.	• Output when alarm occurs: 5.2 V • Output impedance: 100 Ω max.	—
	Analog current output	• Current output range: 4 to 20 mA/F.S. (default value) • Linearity: ±0.25 % F.S.	• Output when alarm occurs: 0 mA • Load impedance: 250 Ω max.	—
Control outputs (Output 1, Output 2, Output 3)		<NPN output type> NPN open-collector transistor • Maximum sink current: 50 mA (Note 5) • Applied voltage: 30 V DC or less (between output and 0 V) • 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 (Note 5) • Applied voltage: 30 V DC or less (between output and +V) • Residual voltage: 1.5 V or less (at 50 mA source current) • Leakage current: 0.1 mA or less	—
	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 • Input conditions Invalid: +8 V to +V DC or open Valid: 0 to +1.2 V DC • Input impedance: 10 kΩ approx.	<PNP output type> Non-contact input or PNP open-collector transistor • Input conditions Invalid: 0 to +0.6 V DC or open Valid: +4 V to +V DC • Input impedance: 10 kΩ approx.	—
	Input time	• Trigger input: 2 ms or more (ON) • Laser emission stop input, preset input, reset input, bank input A/B(Note 6): 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 0.039 mil		
Display range		-199.999 to 199.999 mm -7.874 to 7.874 in		
Interference prevention function		Incorporated (Note 7)	—	
Pollution degree / Operating altitude		2 / 2,000 m 6561.68 ft or less (Note 8)		
Environmental resistance	Protection	IP40 (IEC)		
	Ambient temperature	-10 to +50 °C +14 to +122 °F (No dew condensation or icing allowed) (Note 5), Storage: -20 to +60 °C -4 to +140 °F		
	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 0.030 in double amplitude (10 to 58 Hz), Maximum acceleration 49 m/s^2 (58 to 150 Hz) in X, Y and Z directions for two hours each		
	Shock resistance	98 m/s^2 acceleration (10 G approx.) in X, Y and Z directions five times each		
Material		Case: Polycarbonate, Cover: Polycarbonate, Switches: Polyacetal		
Cable		0.2 mm^2 2-core (brown and blue lead wires) / 0.15 mm^2 7-core composite cable, 2 m 6.562 ft long	0.15 mm^2 7-core composite cable, 2 m 6.562 ft 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	When communication unit is connected	Maximum sink current and source current of control output	Ambient temperature
1 to 7 units	1 to 6 units	20 mA	-10 to +45 °C +14 to +113 °F
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) This function operates for each set of 4 connected controllers.



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

Communication unit for digital displacement sensors

Item \ Designation	Model No.	CC-Link IE Field communication unit
		SC-HG1-CEF
Regulatory compliance		EMC Directive, RoHS Directive
Compatible controllers		**HG-TC□**, **HG-SC□**
Maximum number of connectable controllers		Maximum of 15 controllers (one master, 14 slaves) per **SC-HG1-CEF** unit
Supply voltage (Note 2)		24 V DC ±10 %, including 0.5 V ripple (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, RWr / RWw: 64 points each (64 words), 128 bytes
Transient transmission		Server function only, data size 1024 bytes
Station No. setting		1 to 120 (decimal) (0 and 121 or more: Error)
Communication speed		1 Gbps
Transmission line type		Line, star (mixing of line and star types is possible), ring
Maximum transmission distance		100 m 328.084 ft
Maximum number of units connectable		121 units (1 master station, 120 slave stations)
Cascade connection levels		Maximum 20
Pollution degree		2
Operating altitude		2,000 m 6561.68 ft or less (Note 4)
Environmental resistance	Protection	IP40 (IEC)
	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
	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 0.030 in double amplitude (10 to 58Hz), maximum acceleration 49 m/s^2 (58 to 150 Hz) in X, Y and Z directions for two hours each
	Shock resistance	98 m/s^2 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 ambient temperature +20 °C +68 °F.
2) Power is supplied from a connected controller / master controller.
3) For the network number 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.

Item \ Designation	Model No.	CC-Link communication unit				
		SC-HG1-C				
Regulatory compliance		EMC Directive (Note 2), RoHS Directive				
Compatible controllers		**HG-TC□**, **HG-SC□**				
Maximum number of connectable controllers		Maximum of 15 controllers (one master, 14 slaves) per **SC-HG1-C** unit				
Supply voltage (Note 3)		24 V DC ±10 %, including 0.5 V ripple (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)				
Communication speed		10 Mbps	5 Mbps	2.5 Mbps	625 kbps	156 kbps
Maximum transmission distance		100 m 328.084 ft	160 m 524.934 ft	400 m 1,312.336 ft	900 m 2,952.756 ft	1,200 m 3,937.008 ft
Pollution degree		2				
Operating altitude		2,000 m 6561.68 ft or less (Note 4)				
Environmental resistance	Protection	IP40 (IEC)				
	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				
	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 0.030 in double amplitude (10 to 58 Hz), maximum acceleration 49 m/s^2 (58 to 150 Hz) in X, Y and Z directions for two hours each				
	Shock resistance	98 m/s^2 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 ambient temperature +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.

Item \ Designation	Model No.	EtherCAT communication unit
		SC-HG1-ETC
Regulatory compliance		EMC Directive, RoHS Directive
Compatible controllers		**HG-TC□**, **HG-SC□**
Maximum number of connectable controllers		Maximum of 15 controllers (one master, 14 slaves) per **SC-HG1-ETC** unit
Supply voltage (Note 2)		24 V DC ±10 %, including ripple 0.5 V (P-P)
Current consumption		100 mA or less
Communication protocol		EtherCAT
Compliance		IEEE 802.3u (100BASE-TX)
Communication speed		100 Mbps (100BASE-TX)
Communication connector		RJ-45 × 2
Node-to-node distance		100 m 328.084 ft or less
Supported functions		Process data object communication (cyclic communication) Mailbox communication (message communication) CoE Explicit Device Identification Station Alias
Pollution degree		2
Operating altitude (Note 3)		2,000 m 6,561.68 ft or less
Environmental resistance	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
	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure
	Insulation resistance	20 MΩ or higher, using 250 V DC megger between all supply terminals connected together and enclosure
	Vibration resistance	10 to 150 Hz frequency, 0.75 mm 0.030 in double amplitude (10 to 58Hz), maximum acceleration 49 m/s^2 (58 to 150 Hz) in X, Y and Z directions for two hours each
	Shock resistance	98 m/s^2 (10 G approx.) acceleration in X, Y, and Z directions five times each
Grounding method		Casing: Floating type
Material		Enclosure: Polycarbonate
Communication cable		Category 5e (shielded twisted pair cable recommended)
Weight		Net weight: 90 g approx., Gross weight: 150 g appox.

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.

SPECIFICATIONS

Item \ Designation / Model No.		RS-485 communication unit
		SC-HG1-485
Regulatory compliance		EMC Directive, RoHS Directive
Compatible controllers		**HG-TC□**, **HG-SC□**
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
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
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
	Controllers	Maximum of 15 controllers (one master, 14 slaves) per **SC-HG1-485** unit
Stop bit length		1 bit / 2 bits
Parity check		Even / Odd / None
Data bit length		8 bits (RTU) / 7 bits (ASCII)
Pollution degree		2
Operating altitude		2,000 m 6561.68 ft or less (Note 3)
Environmental resistance	Protection	IP40 (IEC)
	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
	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 0.030 in double amplitude (10 to 58Hz), maximum acceleration 49 m/s^2 (58 to 150 Hz) in X, Y and Z directions for two hours each
	Shock resistance	98 m/s^2 acceleration (10 G approx.) in X, Y and Z directions five times each
Material		Enclosure: Polycarbonate
Total extension distance		Communication cable: 1,200 m 3,937.008 ft or less between **SC-HG1-485** (terminal) and PLC
Weight		Net weight: 75 g approx., Gross weight: 120 g approx.
Accessories		Termination resistor switching jumper pin: 1 pc.

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were ambient temperature +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.

Item \ Designation / Model No.		USB communication unit
		SC-HG1-USB
Regulatory compliance		EMC Directive (Note 2), RoHS Directive
Compatible controllers		**HG-TC□**
Maximum number of connectable controllers		Maximum of 15 controllers (one master, 14 slaves) per **SC-HG1-USB** unit
Supply voltage (Note 3)		24 V DC ±10 %, Ripple (P-P) 10 % or less (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) (Note 5)
Pollution degree		2
Operating altitude		2,000 m 6561.680 ft or less (Note 6)
Environmental resistance	Protection	IP40 (IEC)
	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
	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 0.030 in double amplitude (10 to 58 Hz), Maximum acceleration 49 m/s^2 (58 to 150 Hz) in X, Y and Z directions for two hours each
	Shock resistance	98 m/s^2 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

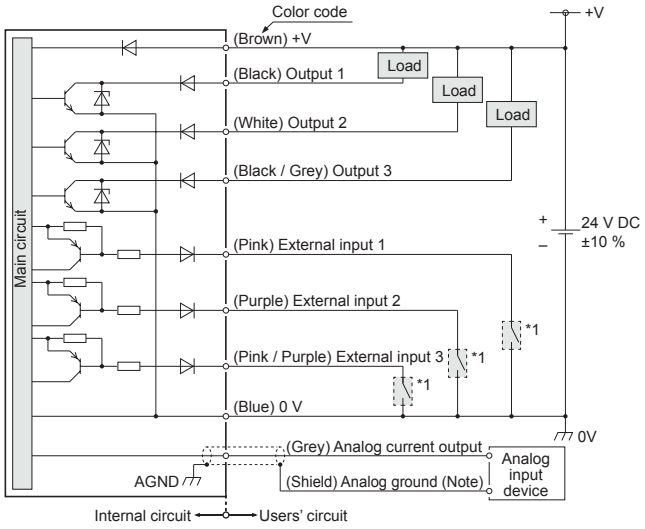
Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C +68 °F.
2) Applicable to products shipped in October 2019 and after.
3) Power is supplied from a connected controller / master unit.
4) Dependent on PC environment.
5) USB 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.
6) 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

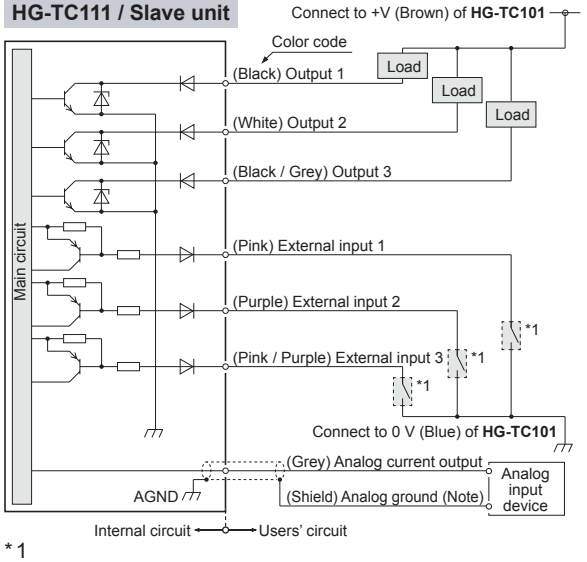
For communication unit for digital displacement sensors, refer to the instruction manual.
The instruction manual can be downloaded from our website.

NPN output type

HG-TC101 / Master unit

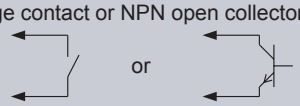


HG-TC111 / Slave unit



*1

Non-voltage contact or NPN open collector transistor

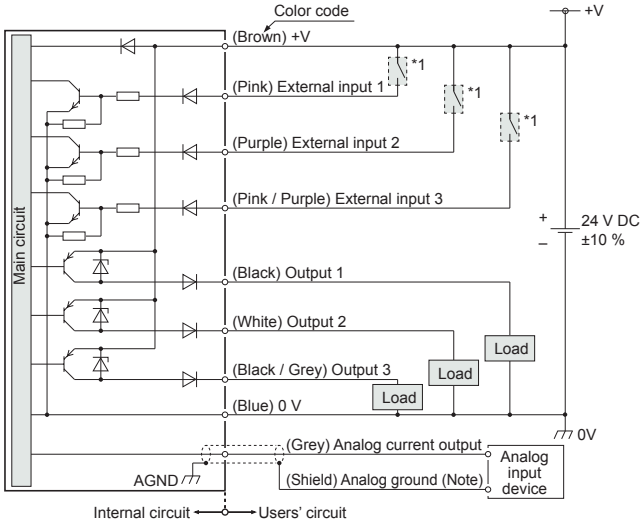


0 to +1.2 V DC: Effective
+8 V to +V DC or open: Ineffective

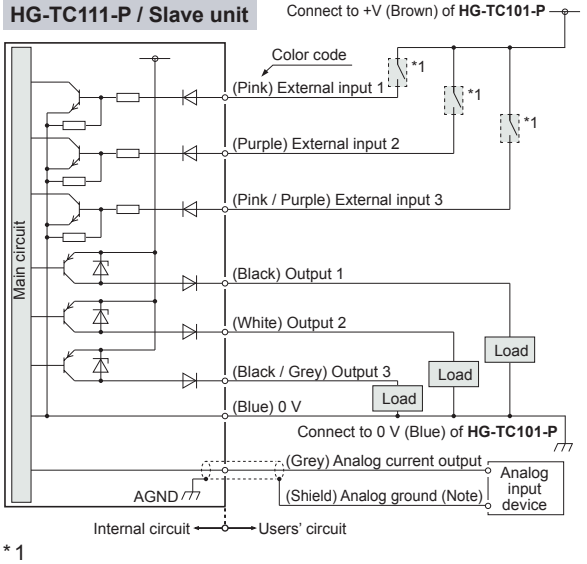
Note: Use shielded wire for the analog output.

PNP output type

HG-TC101-P / Master unit

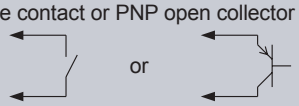


HG-TC111-P / Slave unit



*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.

User's Manual available for download

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

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).

PRECAUTIONS FOR PROPER USE

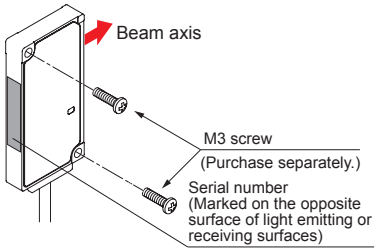
Refer to the instruction manual for details.
The instruction manual can be downloaded from our website.

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.

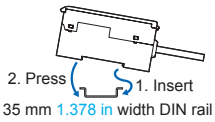


Controller

Mounting

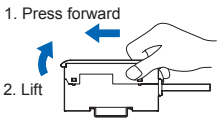
Mounting

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

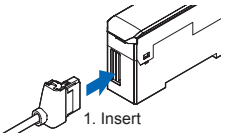
1. Grasp the product and push forward.
2. Lift the front to remove.



Attaching the sensor head connection cable

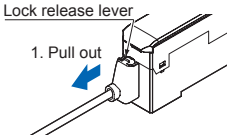
Mounting

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 or 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.

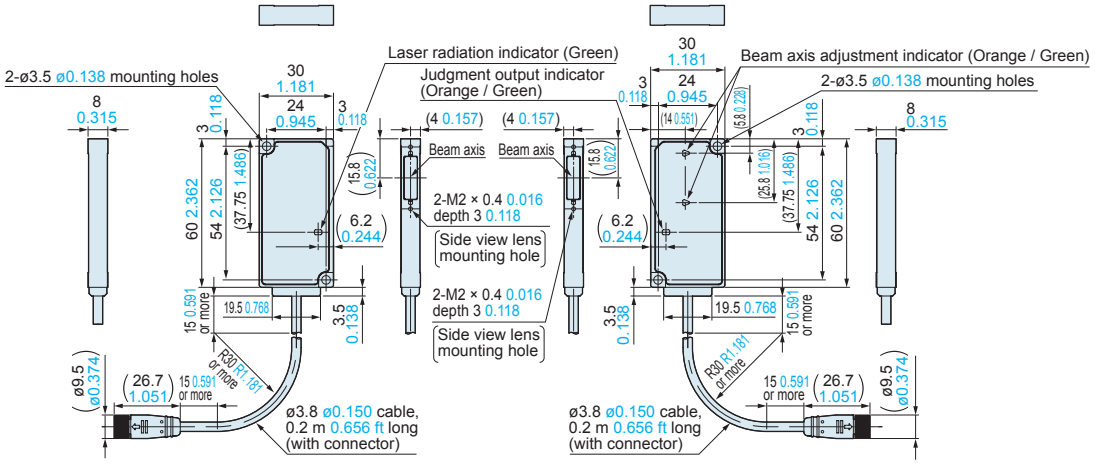
Others

- 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.

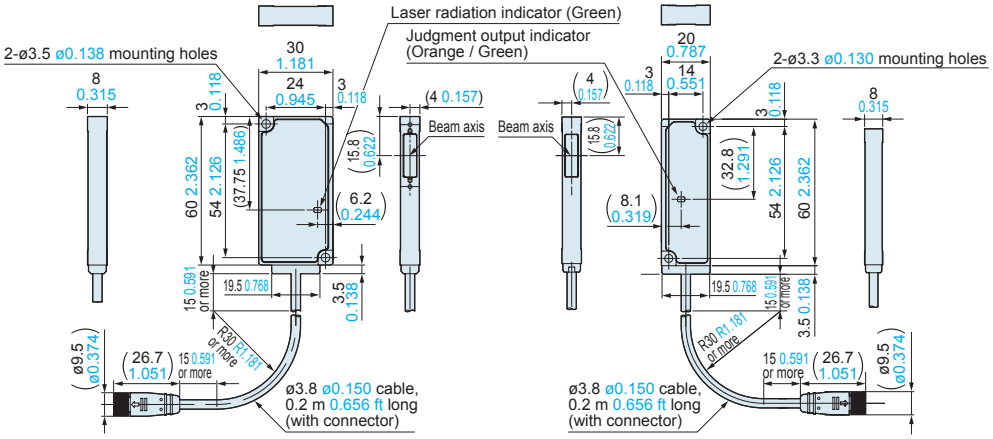
DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from our website.

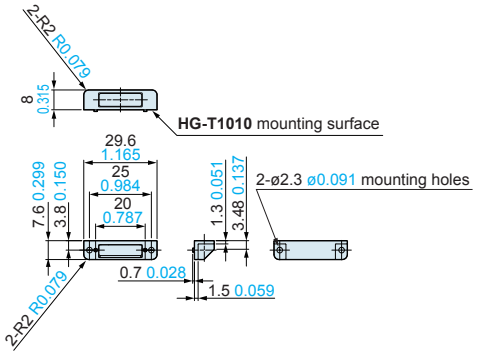
HG-T1010 — Sensor head (Standard type)



HG-T1110 — Sensor head (Slim type)



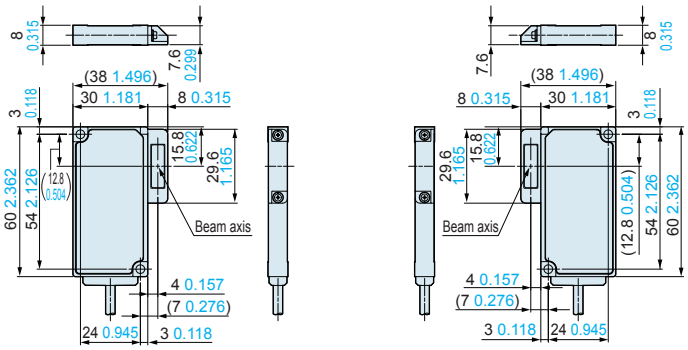
HG-TSV10 — Side view attachment (Optional)



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.

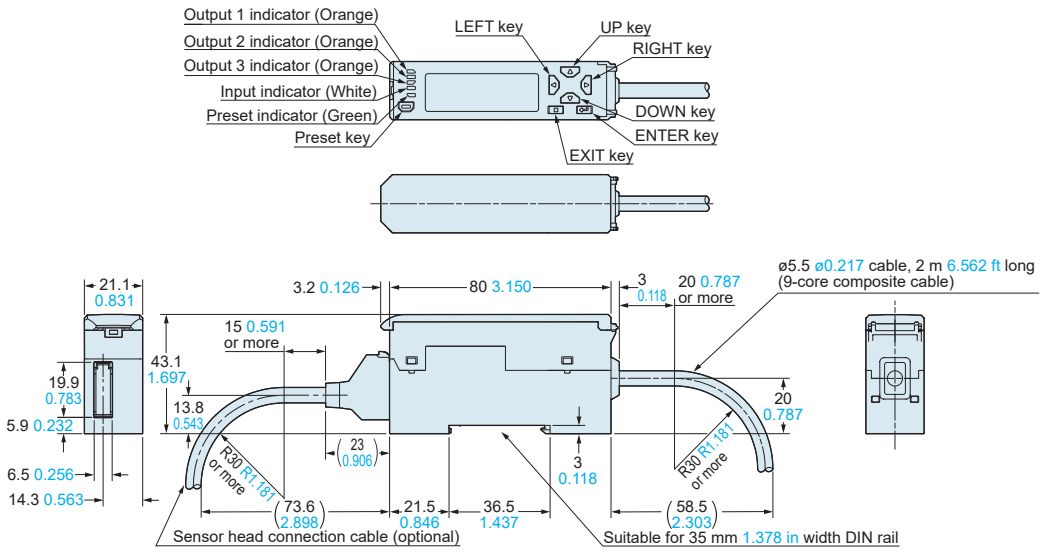


Notes: 1) The attachment cannot be installed to the slim type sensor head **HG-T1110**.
2) Be sure to confirm proper detection using actual equipment in advance when using the attachment.

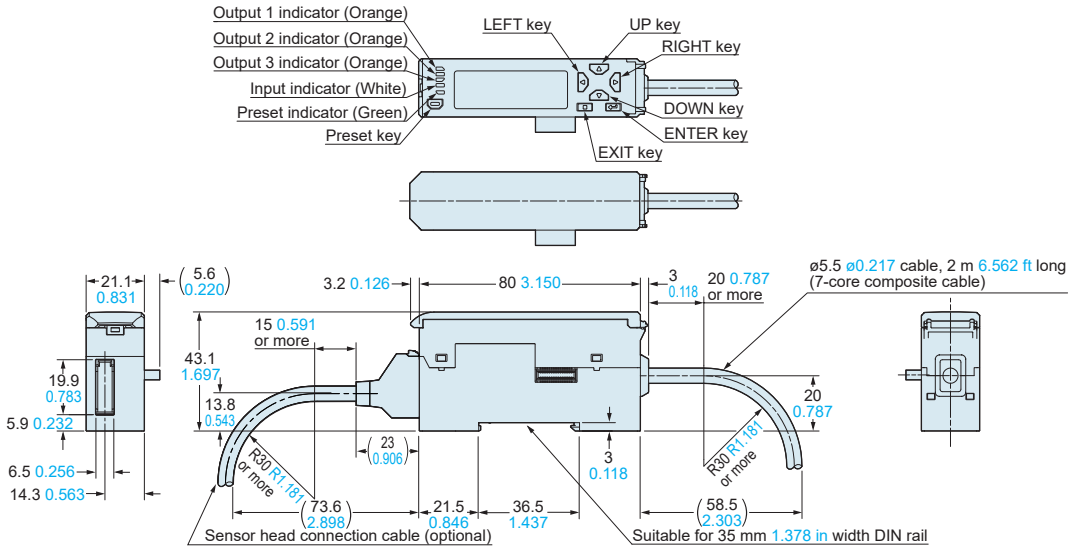
DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from our website.

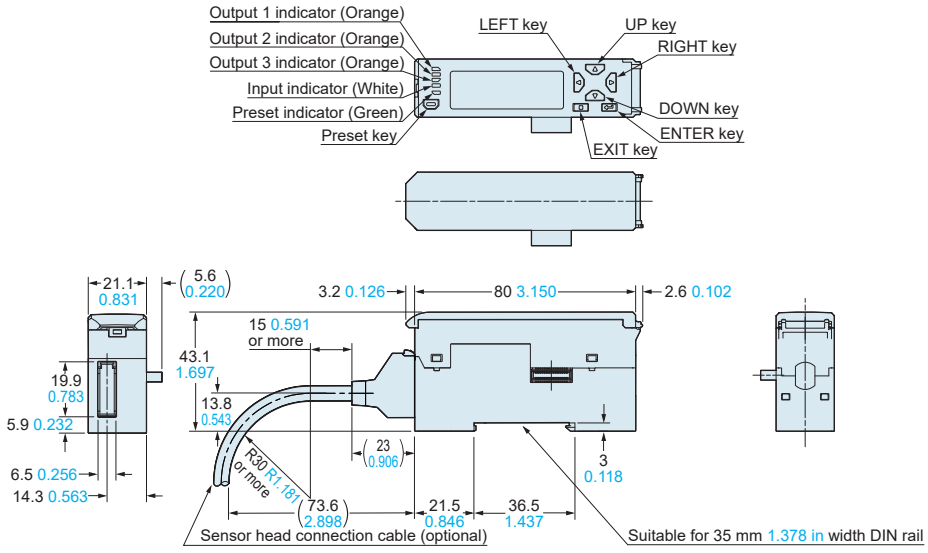
HG-TC101 HG-TC101-P — Controller (Master unit)



HG-TC111 HG-TC111-P — Controller (Slave unit)



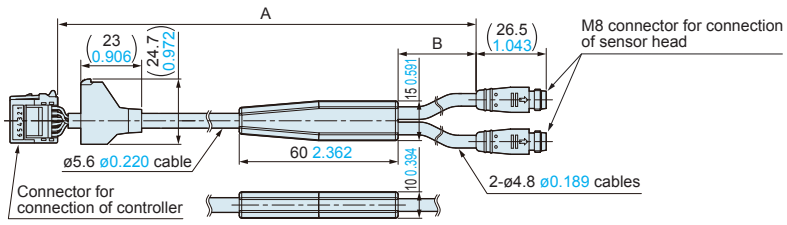
HG-TC113 — Controller (Slave unit)



DIMENSIONS (Unit: mm in)

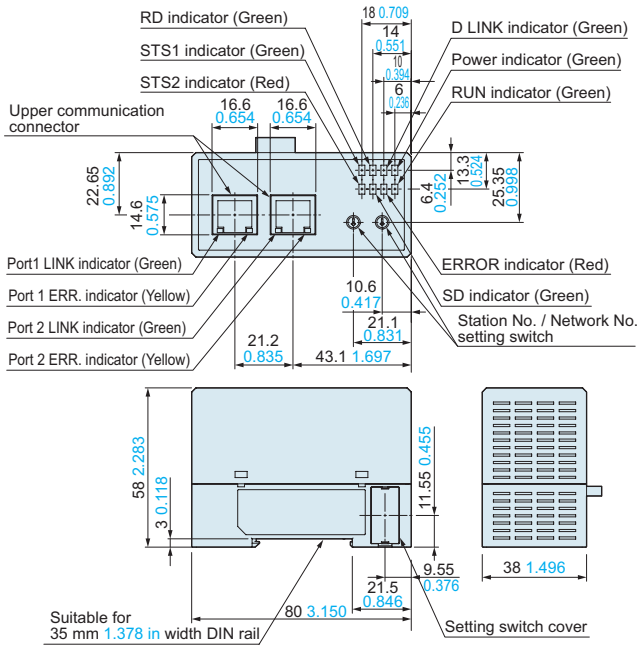
The CAD data can be downloaded from our website.

CN-HT-C□ Sensor head connection cable

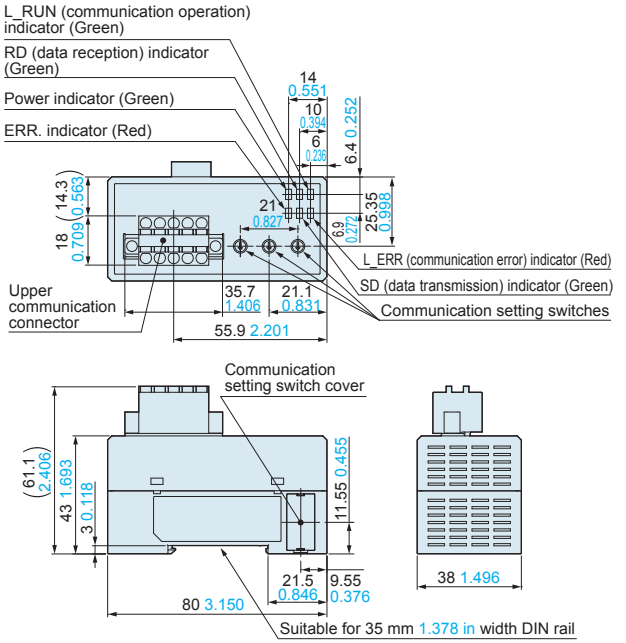


Model	A	B
CN-HT-C2	2,000 78.740	500 19.685
CN-HT-C5	5,000 196.850	500 19.685
CN-HT-C10	10,000 393.701	1,000 39.370
CN-HT-C20	20,000 787.402	1,000 39.370

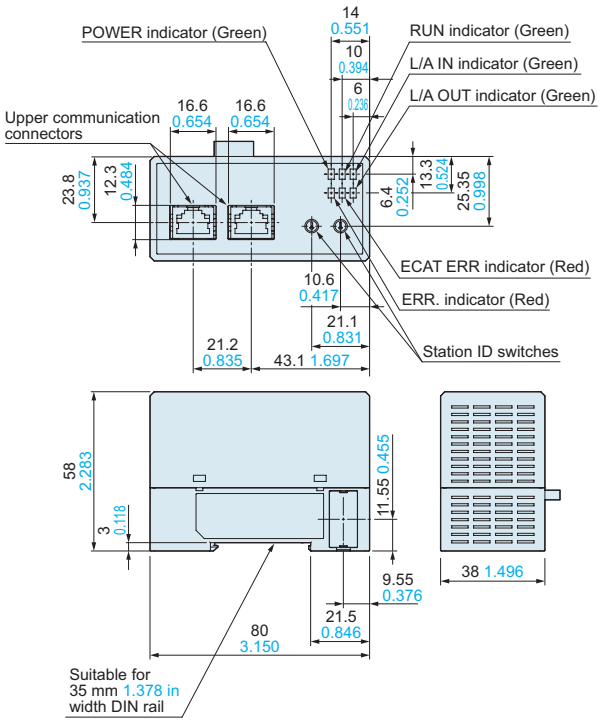
SC-HG1-CEF CC-Link IE Field communication unit



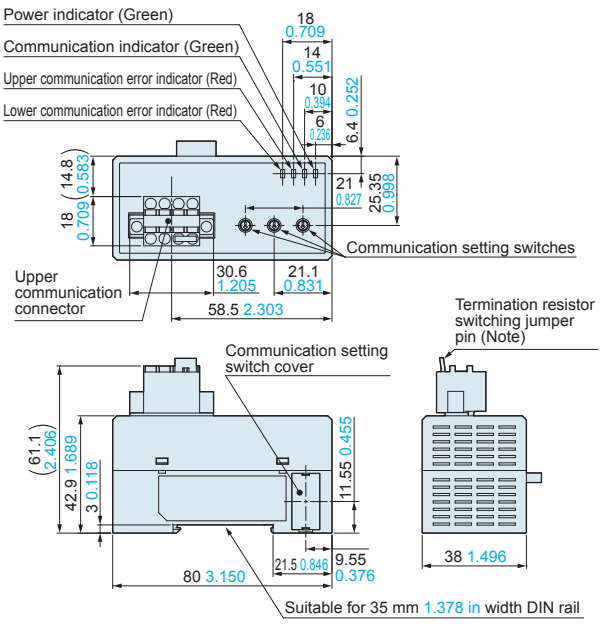
SC-HG1-C CC-Link communication unit



SC-HG1-ETC EtherCAT communication unit



SC-HG1-485 RS-485 communication unit

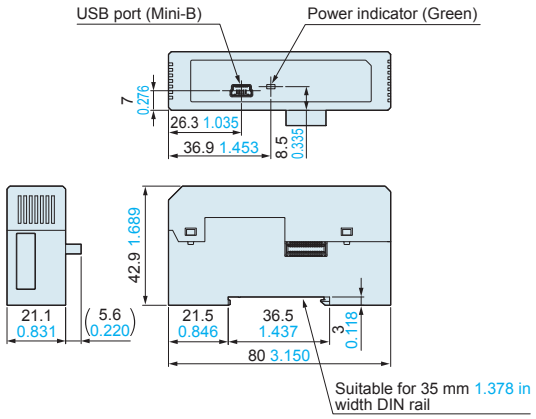


Note: The termination resistor switching jumper pin is not attached to the product at the factory. Attach the termination resistor switching jumper pin to the unit at the terminating end. Make sure that the termination resistor switching jumper pin have been removed from all units except the one at the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

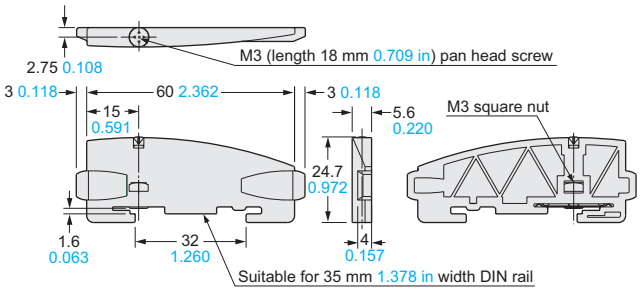
DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from our website.

SC-HG1-USB USB communication unit



MS-DIN-E End plate



Material: Polycarbonate

Contact-type digital displacement sensor

Self-Monitoring Sensor

Contact-type digital displacement sensor HG-S SERIES

CE

The optical absolute method eliminates “value skipping” and “unset zero point”!

Sensor head

- Tip deviation amount of 35 µm 1.378 mil or less (typical value) *1
- Plain bearings with 2-point support structure offering high lateral load resistance
- Hot-swappable
- Bending-resistant cable

*1: Calculated based on the upper and lower plain bearing clearances in the 10-mm type product.

10 mm 0.394 in type	10 mm 0.394 in type	32 mm 1.260 in type	50 mm 1.969 in type
Air-driven type	Regular type		

Development target:

Slim & Robust

- **The 10 mm 0.394 in type has a slim 11 × 18 × 84.5 mm 0.433 × 0.709 × 3.327 in body, for easy adjacent installation**
- **Class-top robustness in the industry**

Lateral load resistance No. 1* in class

Vibration / impact resistance No. 1* in class

* As of January 2021, in-company survey.

Development goal:

Highest Accuracy in Class

- **Resolution of 0.1 µm 0.004 mil* and indication accuracy of 1.0 µm 0.039 mil or less***
- **Absolute value scale reading for elimination of “value skipping” and “unset zero point”**

Resolution No. 1* in class

Indication accuracy No. 1* in class

Optical absolute method

* In the case of high-precision sensor heads (**HG-S1110**□). As of January 2021, in-company survey.

Controller

Development focus:

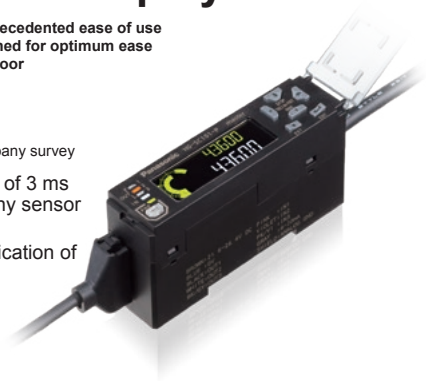
Intuitive Dual Display

- **2-line digital display for unprecedented ease of use**
- **Full-fledged functions designed for optimum ease of operation on production floor**

Industry’s first*

* As of September 2015, in-company survey

- High-speed response of 3 ms in combination with any sensor head
- Alarm setting for notification of upward thrust



Please contact .....

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