Panasonic® **INSTRUCTION MANUAL**

Transmission-Type Digital Displacement Sensor / Controller
HG-TC□

MJE-HGTC No.0090-33V

Thank you very much for purchasing Panasonic products. Read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Kindly keep this manual in a convenient place for quick reference.

⚠ WARNING

- Never use this product as a device for personnel protection.
- When using 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.

This document provides a brief summary of mounting, wiring, and other related information. For detailed information, refer to the "**HG-T Series User's Manual**" (our web site:https://panasonic.net/id/pidsx/global).

1 REGULATIONS AND STANDARDS

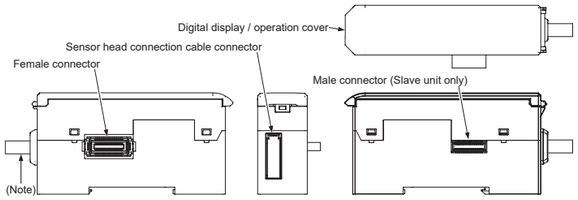
- This product conforms to the regulations and standards below.

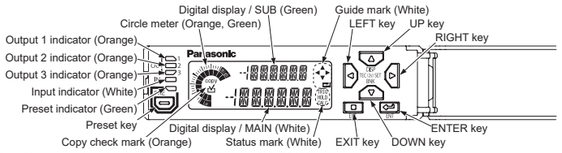
<Conformity Directives/Conforming Regulations>
EU Law : EMC Directives 2014/30/EU
British Legislation : EMC Regulations 2016/1091
- Applicable Standards
EN 61000-6-4: 2007 +A1: 2011, EN 61000-6-2:2005

2 CONTENTS OF PACKAGE

☐ Controller	1 pc.
☐ Instruction Manual (English / Japanese, Chinese / Korean)	1 pc. each
☐ General Information for Safety, Compliance, and Instructions	1 pc.

3 DESCRIPTION OF PARTS



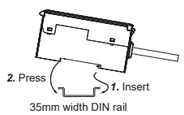


Note: Not included on the slave unit / Wire-saving type **HG-TC113**.

4 MOUNTING

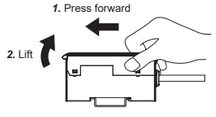
How to mount

1. Fit the rear part of the mounting section of the controller on a DIN rail.
2. Press down the rear part of the mounting section of the unit on the DIN rail and fit the front part of the mounting section to the DIN rail.



How to remove

1. Push the controller forward.
2. Lift up the front part of the controller to remove it.

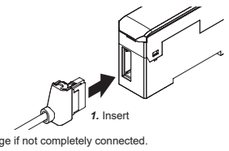


- **Connecting the sensor head connection cable**

Always shut off the power before connecting a slave unit to or disconnecting a sensor head connection cable from this product. Risk of controller damage if you attempt connection with the power ON.

How to mount

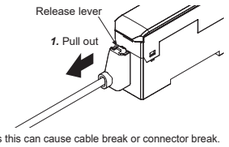
1. Insert the sensor head connection cable into the connector for the sensor head connection cable on the controller.



Note: Insert the connector firmly. Risk of sensor head or controller damage if not completely connected.

How to remove

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



Note: Do not pull by holding the cable without pressing the release lever, as this can cause cable break or connector break.

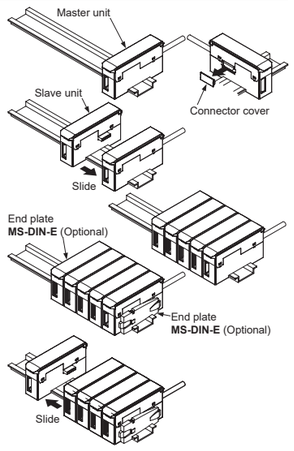
5 CONNECTING SLAVE UNITS

- Always shut OFF the power before connecting a slave unit or communication unit to or disconnecting a slave unit or communication 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.
- 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.
- Up to 15 slave units can be connected per master unit. (When communication unit consolidated: up to 14 slave units)
- When the **HG-T** controller and **HG-S** controller are used in combination, connect the slave units of the same series to the side closer to the master unit, and connect the slave units of the different series to the far side.
- When the **HG-T** controller and **HG-S** controller are used in combination, some functions such as computation function and copy function are restricted. For detailed information, refer to the "**HG-T Series User's Manual**"(our web site:https://panasonic.net/id/pidsx/global).
- If the **HG-T** controller is connected with **HG-S** controller manufactured prior to January 2019, it will not operate properly. Be sure to connect the product to **HG-S** controller manufactured in or after February 2019.
- 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 mount or remove a controller, refer to "**4 MOUNTING**".

How to connect

1. Mount one master unit on the DIN rail.
2. Remove the connector cover.
3. Mount each slave unit one at a time on the DIN rail. Remove all connector covers except for the cover on the last end slave unit.
4. Slide each slave unit and connect the female and male connectors.
5. Attach end plates **MS-DIN-E** (optional) with the flat side facing in so as to enclose the connected units at the ends.
6. Tighten the screws to fasten the end plates. Tighten to a torque of 0.3N·m or less.

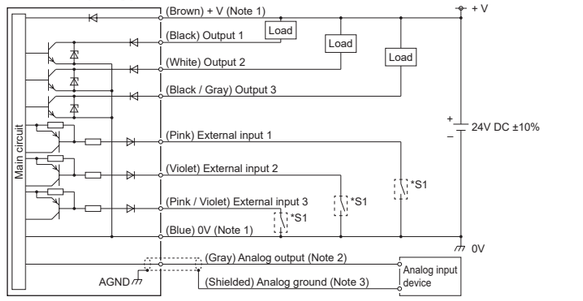


How to remove

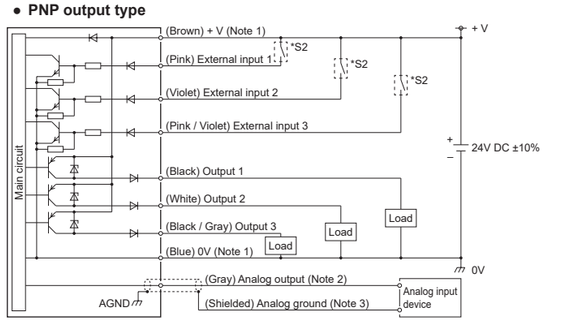
1. Loosen the screws on the end plate.
2. Remove the end plate.
3. Slide and remove the controllers, one at a time.

6 I/O CIRCUIT DIAGRAMS

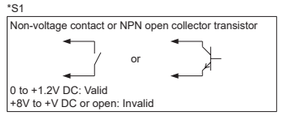
- **NPN output type**



- **PNP output type**



*S1



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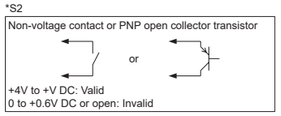
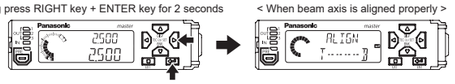


Notes: 1) The **HG-TC111**□ cables do not have +V or 0V. Power is supplied from the connector of the master unit.
2) Regarding the method of switching analog outputs, refer to the "**HG-T Series User's Manual**".
3) Use shielded wire for the analog output.

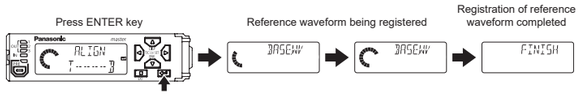
7 BEAM AXIS ADJUSTMENT FUNCTION AND REFERENCE WAVEFORM REGISTRATION

- Be sure to register a reference waveform after installing the sensor head. If the reference waveform is not registered, the product cannot measure correctly.
- For detailed information, refer to the "**HG-T Series User's Manual**"(our web site:https://panasonic.net/id/pidsx/global).

- By pressing and holding the RIGHT and ENTER keys simultaneously for 2 seconds, you can display the sensor head beam status on the digital display on the controller.



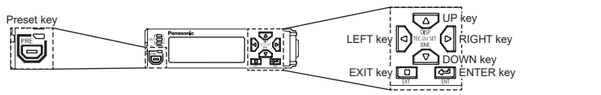
- If the beam axis is not aligned, you conduct adjustment by checking the digital display on the controller.
- Align the beam axis, and then press the ENTER key to save the reference waveform data in the EEPROM of the sensor head beam receiver.



8 MODE SELECTION

For details on the procedures for operating the product, refer to the "**HG-T Series User's Manual**".

- The modes and shortcut functions that can be used from the home screen after the power is turned ON are as follows.



- **Teaching mode (long press LEFT key for 2 seconds)**
  You can set the HIGH set value and LOW set value.
- **HIGH set value fine adjustment function (short-press UP key)**
  You can fine adjust the HIGH set value as needed.
- **LOW set value fine adjustment function (short-press DOWN key)**
  You can fine adjust the LOW set value as needed.
- **Display switching mode (long press UP key for 2 seconds)**
  You can change the display of the digital display / SUB (green) as needed for the task.
- **Preset (short-press PRESET key)**
  You can perform zero-point adjustment, and shift to any preset value.
  You can cancel preset by long-pressing the preset key for 2 seconds.
- **Bank mode (long press DOWN key for 2 seconds)**
  You can write / read the HIGH set value or LOW set value to / from a specified bank (1 to 3).
- **Setting mode (long press RIGHT key for 2 seconds)**
  You can change basic settings or configure advanced function settings.
- **Key lock (long press ENTER key + EXIT key for 3 seconds)**
  This prevents accidental key operations during measurement.

9 CAUTIONS

- 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.
- The controller **HG-TC**□ is designed to be used with the special sensor head **HG-T**□. If used with other than the special sensor head option, the specifications will not be met and product malfunctioning or damage may occur.

- This product has been developed / produced for industrial use only.
- This product uses an EEPROM. The EEPROM has a service life of one million setting operations.
- 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.
- Verify that the supply voltage fluctuations are 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.
- Do not use during the initial transient time after the power supply is switched ON.
- Make sure that the power supply is OFF while performing wiring or connecting a slave unit work.
- Take care that short-circuit of the load or wrong wiring may burn or damage the product.
- After you have completed wiring work, check the wiring carefully before switching on the power.
- Do not wire in parallel with a high-voltage line or power line, or run through the same conduit. Risk malfunctioning due to induction.
- Do not apply stress such as excessive bending or pulling to the extracted part of a cable.
- This product is suitable for indoor use only.
- Avoid dust, dirt, and steam.
- Do not use this sensor in places where it may come in contact with corrosive gas, etc.
- Ensure that the product does not come into contact with organic solvents such as thinner.
- Ensure that the product does not come into contact with strong acid or alkaline.
- Ensure that the product does not come into contact with oil or grease.
- This product cannot be used in an environment containing flammable or explosive gases.
- Performance may not be satisfactory in a strong electromagnetic field.
- 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.
- When the product becomes unusable or unneeded, dispose of the product appropriately as industrial waste.

10 SPECIFICATIONS

Type		Master unit	Slave unit	
		High performance type		Wire-saving type
Model No.	NPN output	**HG-TC101**	**HG-TC111**	**HG-TC113**
	PNP output	**HG-TC101-P**	**HG-TC111-P**	
Applicable sensor head		**HG-T**□		
Number of connectable units		Up to 15 slave units can be connected per master unit. (When communication unit consolidated: up to 14 slave units)		
Supply voltage		24V DC ±10%, including 0.5V ripple (P-P)		
Current consumption (Note 2)		100mA or less (when sensor head is connected) (Note 2)		
Analog output (Switching type) (Note 3)	Analog voltage output	• Voltage output range: 1 to 5V / F.S. (default value) • Alarm output: 5.2V • Linearity: ±0.05% F.S. • Output impedance: 100Ω MAX.		–
	Analog current output	• Current output range: 4 to 20mA / F.S. (default value) • Alarm output: 0mA • Linearity: ±0.25% F.S. • Load impedance: 250Ω MAX.		–
Control output (Output 1 / Output 2 / Output 3)		<NPN output type> NPN open-collector transistor • Maximum sink current: 50mA (Note 4) • Applied voltage: 30V DC or less (between output and 0V) • Residual voltage: 1.5V or less (at 50mA sink current) • Leakage current: 0.1mA or less <PNP output type> PNP open-collector transistor • Maximum source current: 50mA (Note 4) • Applied voltage: 30V DC or less (between output and +V) • Residual voltage: 1.5V or less (at 50mA source current) • Leakage current: 0.1mA or less		–
Short-circuit protection		Incorporated (automatic reset type)		–
Decision output		N.O./N.C. switching type		–
Alarm output		Open when alarm		–
External input (Input 1 / Input 2 / Input 3)		<NPN output type> Non-contact input or NPN open-collector transistor • Input condition Invalid: +8V to +V DC or open Valid: 0 to +1.2V DC • Input impedance: Approx. 10kΩ <PNP output type> Non-contact input or PNP open-collector transistor • Input condition Invalid: 0 to +0.6V DC or open Valid: +4V to +V DC • Input impedance: Approx. 10kΩ		–
Trigger input		Input time 2ms or more (ON)		–
Laser emission halt input		Input time 20ms or more (ON)		–
Preset input		Input time 20ms or more (ON)		–
Reset input		Input time 20ms or more (ON)		–
Bank input A / B		Input time 20ms or more (ON)		–
Sampling cycle		1 ms (standard sampling) / 0.5 ms (high-speed sampling)		
Average count (Response time) (Note 5)		1 time (2ms), 2 times (3ms), 4 times (5ms), 8 times (9ms), 16 times (17ms), 32 times (33ms), 64 times (65ms), 128 times (129ms), 256 times (257ms), 512 times (513ms), 1,024 times (1,025ms) switching type		
Display resolution		1μm		
Display range		-199.999 to 199.999mm		
Protection		IP40 (IEC)		
Pollution degree		2		
Ambient temperature		-10 to +50°C (No dew condensation or icing allowed) (Note 4), Storage: -20 to +60°C		
Ambient humidity		35 to 85% RH, Storage: 35 to 85% RH		
Operating altitude		2,000m or less (Note 6)		
Material		Case: Polycarbonate, Cover: Polycarbonate, Switches: Polyacetal		
Cable		0.2mm² 2-core (brown, blue lead wires) / 0.15mm² 7-core composite cable, 2m long	0.15mm² 7-core composite cable, 2m long	–
Weight (controller only)		Approx. 140g	Approx. 140g	Approx. 60g

Notes: 1) Measured at a supply voltage of +24V DC and an ambient temperature of +20°C, unless otherwise indicated.
2) Current consumption does not include analog current output.
3) Linearity is the value to the digital measurement value based on the F.S. = 16mA when analog current is output or the F.S. = 4V when analog voltage is output.
4) When slave units are connected to the master unit, the maximum sink current / source current of the 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 / source current of control output	Ambient temperature
	When communication unit consolidated		
1 to 7 units	1 to 6 units	20mA	-10 to +45°C
8 to 15 units	7 to 14 units	10mA	

5) Average count (response time) figures have been calculated based on a sampling cycle of 1ms (standard sampling). Response time varies if the sampling cycle is set to 0.5ms (high-speed sampling). Refer to the "**HG-T Series User's Manual**".
6) Do not use or store in an environment pressurized to atmospheric pressure or higher at an altitude of 0m.

11 ERROR DISPLAY

Error Display	Description	Action
E100	Both NPN output types and PNP output types are connected.	Connect only units of the same output type.
E110	Number of connectable units exceeded.	Connect no more than 15 slave units per master unit. (When communication unit consolidated: up to 14 slave units)
E120 E130	Cannot communicate between controllers.	Switch OFF the power, make sure the controllers are connected correctly, and then switch ON the power again.
E140	The calculation function is valid but no slave units are connected.	Change calculation mode to OFF.
E150	The calculation function is valid but an insufficient number of slave units are connected.	Change calculation mode to OFF, or change the calculation application selection setting.
E160	The saved number of connected units does not match the actual number of connected units.	Set the number of connected units check function to OFF.
E170	The copy function was executed using the master unit, but the copy operation does not start due to abnormal operation of the slave unit.	Switch the power OFF and switch it back ON again, and then check if the slave unit is operating properly.
E180	Cannot communicate between controllers.	Switch OFF the power, make sure the controllers are connected correctly, and then switch ON the power again.
E200	• Sensor head not connected. • Broken wire in sensor head connection cable. • Sensor head failure. • Sensor head other than the **HG-T** series is connected.	• Check if the sensor head is correctly connected. • Check if there is a broken wire in the sensor head connection cable. If there is a broken wire in the sensor head connection cable, replace the cable. • Replace the sensor head. • Connect **HG-T** series sensor head.
E230	Paired sensor heads are both beam emitters or both beam receivers.	Check the connected sensor heads.
E240	Beam emitter abnormality	Replace the sensor head.
E500	Unable to preset by external input.	Check if the power just been switched on or reset has just been input, or if a display value is outside the display upper/lower limit or an alarm has occurred.
E510	Beam alignment function was used while the laser emission halt input was ON.	Turn the laser emission halt input OFF, and then align the beam axis.
E600	Unable to write to the EEPROM of the controller.	• Switch the power OFF then ON, and execute initialization of the controller from setting mode. • If the controller does not recover after the above, it is possible that the EEPROM write count is over 1 million. Replace the controller.
E610	Unable to read from the EEPROM of the controller.	
E620	The EEPROM of the controller write count is over the service life of 1 million.	
E630	Unable to write to or read from the EEPROM of the sensor head or beam receiver.	• Switch the power OFF then on, and execute initialization of the controller from setting mode. • If the problem cannot be corrected by the above action, please contact our company.
E640	Unable to write to or read from the non-volatile memory of the sensor head or beam emitter.	
E700	The detection output load has short-circuited and excessive current is flowing.	Switch OFF the power and check the load.
E900 E910 E911 E912 E920	An error has occurred in the internal controller.	Switch the power OFF then ON, and execute initialization of the controller from setting mode.

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