

High-accuracy Digital Contact Sensor GT2-70 Series

User's Manual

Read this manual before use.

Keep this manual in a safe place for future reference.



Introduction

This manual describes the basic operations and hardware functions of the GT2-70 Series. Read the manual carefully to ensure safe performance and function of the GT2-70 Series. Keep this manual in a safe place for future reference. Ensure that the end user of this product receives this manual.

■ Symbols

The following symbols alert you to matters concerning the prevention of injury and product damage.

 WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a situation which, if not avoided, could result in product damage as well as property damage.

 Reference	Provides advanced and useful information for operation.
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Safety Information for GT2-70 Series

 CAUTION	Turn off the power immediately in the following cases. Using the unit in an abnormal condition could cause fire, or electric shock. • If liquid including water, chemicals or debris enters the unit. • If the unit is dropped or the case is damaged. • If smoke or unpleasant odor is present.
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Precautions for Usage

 CAUTION	• Apply the correct power voltage. Failure to do so may cause fire, electric shock, or malfunction. • Do not attempt to open or modify the GT2-70 Series. Doing so may cause fire or electric shock. • Do not use this product for the purpose to protect a human body or a part of human body. • This product is not intended for use as explosion-proof product. Do not use this product in a hazardous location and/or potentially explosive atmosphere.
NOTICE	• Be sure to turn the power off when you plug/unplug the cable that leads to the unit and its accessories. • Do not turn off the power while setting items. Otherwise, the data being set or all the data may be lost. • At startup and during operation, be sure to monitor the functions and performance of the GT2-70 Series. • Do not attempt to open or modify the GT2-70 Series or use it in any way other than as described in the specifications. If the GT2-70 Series is modified or used other than as described, the warranty will be voided. • When the GT2-70 Series is used in combination with other devices, its function and performance may be degraded, depending on the operating conditions and surrounding environment. • When the GT2-70 Series is used in combination with other instruments, function performance may be degraded, depending on operating conditions and the surrounding environment. Use the GT2-70 Series after fully studying the effect of combined use with other instruments. • To aid in preventing malfunction, do not expose the GT2-70 Series to extreme temperature fluctuations. Installation environment To use the GT2-70 Series correctly and safely, avoid installing it in the following locations; doing so may lead to breakdown of the unit. • Locations outside • Location that is humid, dusty or poorly ventilated • Location with a high surrounding air temperature such as a place exposed to direct sunlight • Location where there are flammable or corrosive gases • Location where the unit may be directly subjected to vibration or shock • Location where water, oil or chemicals may splash onto the unit • Location where static electricity is present

NOTICE	Corrective action for electromagnetic noise Do not install the GT2-70 Series near a power source or high-voltage cable, otherwise electromagnetic noise may cause the GT2-70 Series to malfunction. Take corrective action for electromagnetic noise by using noise filters, laying cables separately, and/or installing insulation on the amplifier and the sensor head. Handling of the sensor head • The GT2-70 Series and peripheral devices are precision machines. Do not drop, or cause any other impact to these devices. Doing so may cause damage or malfunction. • Do not apply force greater than what is listed below to the spindle. Do not apply rotational torque. Otherwise the spindle may break. • The GT2-P12KL(F)/P12L(F)/PA12K/PA12 spindle can rotate a maximum of about 4.5°, the GT2-S1/S5 spindle can rotate a maximum of about 2°. When using an offset contact (OP-77683) or similar, if pressure in the rotational direction is applied to the contact, the measurement position may change. • Although the GT2-PA12K/PA12/H12K/H12KF/H12/H12F/H32/H50/A12K/A12/A32/A50 has a protection rating of IP67, avoid using it immersed in water or in places where liquid such as oil may come into contact with it. • Although the GT2-P12K(F)/P12(F) has a protection rating of IP67G/NEMA Type 13 and the GT2-S1/S5 has a protection rating of IP67G, some types of oil may damage the device. • If dust, metal powder, or a similar substance becomes attached to the spindle of the GT2-PA12K/PA12, mechanical responses may become slow. If this happens, replace the dust seal. Refer to the instruction manual included with the replacement dust seal (OP-87932) for instructions on how to replace the dust seal. • Applying an external magnetic field to the GT2-S1/S5 may affect the measured value. Avoid installations close to motors and other such devices that generate strong magnetic fields. • Iron and other such ferromagnets being close to the GT2-S1/S5 may affect the measured value. In the case of an installation next to a ferromagnet, perform calibration after installation. For the calibration procedure, see "Calibration setting mode."
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Other Precautions

Effects of surrounding air temperature

To use the GT2-70 Series with high accuracy, do not use the GT2-70 Series environments in which the surrounding air temperature changes sharply. It will take about 20 minutes on the 1 mm/5 mm type, 40 minutes on the 12 mm type, and 60 minutes on the 32 mm/50 mm type for the internal temperature distribution of the equipment to be completely adjusted when the surrounding air temperature has changed by 10°C.

Warming up

The circuit is not stable immediately after the power turns ON, which sometimes causes the indicated value to gradually fluctuate.

Wait about 20 minutes when using the GT2-S1/S5, about 5 minutes when using the GT2-P12K(L)(F)/P12(L)(F)/PA12K(L)/PA12(L)/H12K(L)(F)(LF)/H12(L)(F)(LF)/A12K(L)/A12(L) and about 10 minutes when using the GT2-H32(L)/H50/A32/A50 after the power turns on before starting operation.

GT2-PA12K(L)/PA12(L) (See illustration 1 for the pneumatic circuit)

- This model uses a single-acting cylinder. The internal spring will return the sensor head to its home position.
- The air supply hole cannot be removed.
- Use an air filter, mist separator, etc. to provide clean dry air. Empty the drainage from the filter regularly, before it exceeds the specified line.
- Before connecting the air tube to the air supply hole, be sure to blow plenty of air through the pipes (flushing) to remove any foreign matter.
- Make sure that the air pressure of the supplied air is constant and in the range of 0.24 to 0.26 MPa for the GT2-PA12K/PA12 and in the range of 0.05 to 0.07 MPa for the GT2-PA12KL/P12L. Use a precision regulator to control the air pressure. If the air pressure is below the minimum pressure given above, the spindle may not extend fully.
- When supplying air (with the spindle extended), up to 3 L/min of air will be emitted from the tip for the GT2-PA12(K) and up to 0.4 L/min of air will be emitted from the tip for the GT2-PA12(K)L.
- The measuring ability of the device changes according to the air pressure of the air supply. Refer to  "Specifications" (page 7-1) for details.

GT2-A12K(L)/A12(L)/A32/A50 (See illustration 1 for the pneumatic circuit)

- This model uses a single-acting cylinder. The internal spring will return the sensor head to its home position when air pressure is removed. DO NOT supply air to the exhaust valve.
- The air cylinder cannot be removed.
- Use the regulator to supply the stable air pressure to the sensor head.
- Use the air filter and mist separators to supply dry air.
- Make sure that the air pressure of the air supply is constant and in the range of 0.25 MPa to 0.5 MPa.
- The coupling socket and the exhaust valve that are supplied with the air cylinder are dedicated for this product. They cannot be removed.

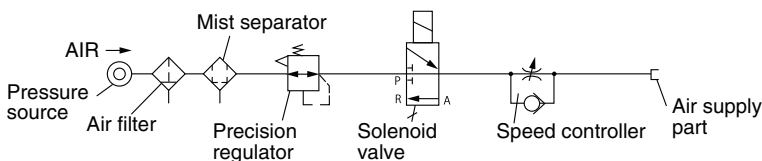


Illustration 1 - Pneumatic circuit

Power supply

- Noise superimposed on the power supply may cause malfunction. Be sure to use the DC stabilized power supply with an insulation transformer.
- In the case of a commercially available switching regulator, be sure to ground the frame ground terminal or the ground terminal.

About dust protective boot

When the dust boot of the sensor head is damaged, use an optional dust boot sold separately. (For the GT2-S1: OP-88063 (Material: NBR). For the GT2-S5: OP-88065 (Material: NBR). For the GT2-P12K(F)/P12(F)/H12K(F)/H12(F)/A12K/A12: OP-84332 (Material: NBR (attached when shipped)). For the GT2-P12K(F)/P12(F): OP-87859 (Material: Fluororubber). For the GT2-H32/A32: OP-84459 (Material: NBR (attached when shipped)). For the GT2-H50/A50: (Material: NBR (attached when shipped)). Attach the dust boot correctly.

The dust boot may deteriorate, depending on the environment it is used in. In this case, replace the dust boot regularly.

* Do not use the dust boot on the GT2-P12KL/P12L/PA12K(L)/PA12(L)/H12KL(F)/H12L(F)/H32L.

Precautions on Regulations and Standards

CE Marking

Keyence Corporation has confirmed that this product complies with the essential requirements of the applicable EC Directive, based on the following specification. Be sure to consider the following specification when using this product in the Member State of European Union.

- EMC Directive

- Applicable standard EN61326-1, Class A
- This product is designed for use in industrial environments.

Remarks: This specification does not give any guarantee that the end-product with this product incorporated complies with the essential requirements of EMC Directive. The manufacturer of the end-product is solely responsible for the compliance on the end-product itself according to EMC Directive.

UL Certificate

The Amplifiers are UL Recognized products.

- UL File No. E120439 (Category: NRNT2/NRNT8)

Be sure to consider the following specifications when using these products as an UL recognized products.

- Use the power supply with Class 2 output defined in NFPA70 (NEC: National Electrical Code).
- GT2 series are evaluated as open type devices. These products can not be a part of an enclosure.

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Before Use

1

This chapter describes the package contents of the GT2-70 Series and the name and function of each part.

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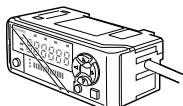
1-2 Identifying Part Names and Functions 1-10

Before using the unit, make sure that the following equipment and accessories are included in the package.

Sensor Amplifier

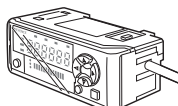
DIN-rail mount type

GT2-71N/71P/71CN/71CP (Main unit)
GT2-71MCN/71MCP (Main unit analog output)



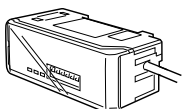
Sensor amplifier x 1
Instruction Manual x 1
Head connector label x 1
(Used in the calculation dedicated mode)

GT2-72N/72P/72CN/72CP (Expansion unit)



Sensor amplifier x 1

GT2-71D (Pulse output)



Sensor amplifier x 1
Instruction Manual x 1
Switch cover label x 1

Amplifier connection cable

Use for quick disconnect type amplifiers (GT2-71CN/71CP/72CN/72CP/71MCN/71MCP).

GT2-CA2M/CA10M

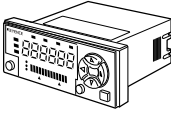


Panel mount type

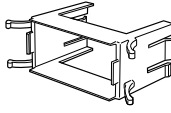
1

Before Use

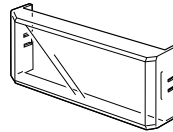
- GT2-75N/75P (main unit) -



Sensor amplifier x 1



Panel mounting bracket x 1



Front protection cover x 1



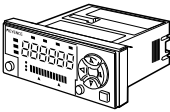
Power cable (2 m) x 1
(12 cores)



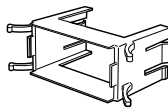
Head connector label x 1
(Used in the calculation
dedicated mode)

Instruction Manual x 1

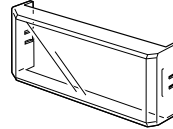
- GT2-76N/76P (expansion unit) -



Sensor amplifier x 1



Panel mounting bracket x 1



Front protection cover x 1



I/O cable (2 m) x 1
(10 cores)



Expansion cable
(50 mm) x 1

Sensor Head

1

Before Use

·GT2-S1



Sensor head x 1
Precautions for usage x 2

·GT2-S5



Sensor head x 1
Precautions for usage x 2

·GT2-P12K/P12



Sensor head x 1
Precautions for usage x 1

·GT2-P12KL/P12L



Sensor head x 1
Precautions for usage x 1

·GT2-P12KF/P12F



Sensor head x 1
Precautions for usage x 1
Nut x 1
Key spanner x 1

·GT2-PA12K(L)/PA12(L)



Sensor head x 1
Precautions for usage x 2

·GT2-H12KF/H12F



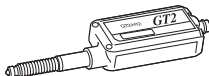
Sensor head x 1
Precautions for usage x 1
Nut x 1
Key spanner x 1

·GT2-H12KLF/H12LF



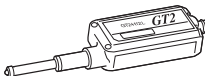
Sensor head x 1
Precautions for usage x 1
Nut x 1
Key spanner x 1

·GT2-H12



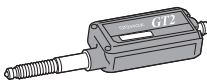
Sensor head x 1
Precautions for usage x 1

·GT2-H12L(Low stress type)



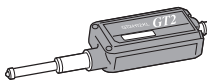
Sensor head x 1
Precautions for usage x 1

- GT2-H12K(High accuracy type) - -



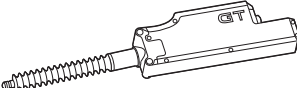
Sensor head x 1
Precautions for usage x 1

- GT2-H12KL (High accuracy type/low stress type) - -



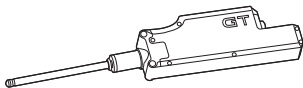
Sensor head x 1
Precautions for usage x 1

- GT2-H32 - - -



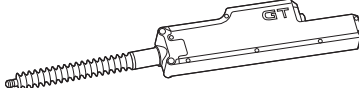
Sensor head x 1
Precautions on Handling x 1

- GT2-H32L(Low stress type) - - -



Sensor head x 1
Precautions on Handling x 1

- GT2-H50 - - -



Sensor head x 1
Precautions on Handling x 1

- GT2-A12(Air cylinder type) - - -



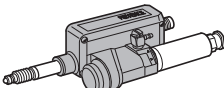
Sensor head x 1
Precautions on Handling x 1

- GT2-A12L (Air cylinder, low stress type) - - -



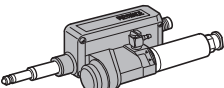
Sensor head x 1
Precautions on Handling x 1

- GT2-A12K (Air cylinder, high accuracy type) - - -

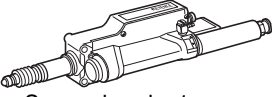
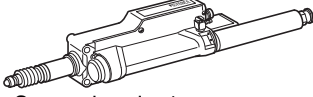


Sensor head x 1
Precautions on Handling x 1

- GT2-A12KL (Air cylinder, high accuracy, low stress type) - - -



Sensor head x 1
Precautions on Handling x 1

- GT2-A32(Air cylinder type)  Sensor head x 1 Precautions on Handling x 1	- GT2-A50(Air cylinder type)  Sensor head x 1 Precautions on Handling x 1
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Sensor Head Connection Cable

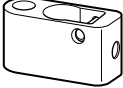
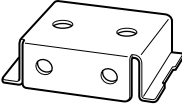
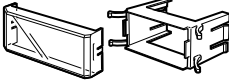
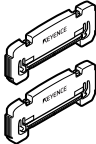
- GT2-CH2M/5M/10M/20M (M8 straight connector) 	- GT2-CHL2M/5M/10M/20M (M8 L-shaped connector) 
- GT2-CHP2M/5M/10M (M8 oil-resistant straight connector) 	

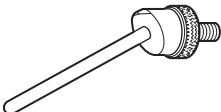
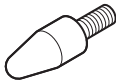
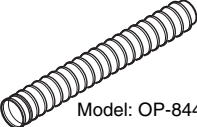
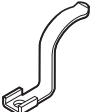
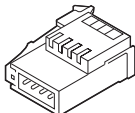
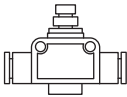
NOTICE

- The M8 L-shaped connector type cable cannot be used with the GT2-H32(L)/H50/A32/A50.
- When a protection rating of IP67G and NEMA Type 13 enclosure is required for GT2-P12K(F)/P12(F), or a protection rating of IP67G is required for GT2-S1/S5 use an M8 oil-resistant straight connector type cable. Other cables do not meet the IP67G protection rating or NEMA Type 13 enclosure rating.

We have thoroughly inspected the package contents before shipment. However, in the event of defective or broken items, contact your nearest KEYENCE office.

List of Optional Parts

 Model: OP-76874 For use with a 1/5/12 mm stroke Mounting bracket A (Key wrench supplied)	 Model: OP-76875 For use with a 1/5/12 mm stroke Mounting bracket B	 Model: OP-84396 For use with a 1/5/12 mm stroke Mounting bracket C (Key wrench supplied)
 Model: OP-84327 GT2-H32(L)/H50/A32/A50 Mounting bracket D (Key wrench supplied)	 Model: OP-87220 For use with a 1/5/12 mm stroke Mounting bracket E	 Model: OP-87863 For GT2-S1/S5 and GT2-P** (Screw and hexagonal wrench supplied) Mounting bracket F
 Model: OP-76877 For DIN rail type amplifier Mounting bracket	 Model: OP-84394 Panel mounting bracket (Included with panel-mountable amplifier units)	 Model: OP-26751 End unit (two pieces)
 Model: OP-77678 Standard contact (Key wrench supplied) Included with the GT2-P12(L)(F)/ PA12(L)/H12(L)/H32(L)/H50/ A12(L)/A32/A50 as standard	 Model: OP-77679 Flat plate contact (Key wrench supplied) A flat type contact with the surface roughness of 1 µm.	 Model: OP-77680 Roller contact (Key wrench supplied) A contact with the roller eccentricity of 10 µm.
 Model: OP-93332 High accuracy roller contact (Key wrench supplied) A contact with the roller eccentricity of 5 µm.	 Model: OP-77681 Needle contact (Key wrench supplied) Carbide (tungsten alloy) is used at the tip.	 Model: OP-77682 Carbide contact (Key wrench supplied) Included with the GT2-S1/S5/ P12K(L)(F)/PA12K(L)/H12K(L)/ A12K(L) as standard equipment. Carbide (tungsten alloy) is used at the tip.

 Model: OP-77683 Offset contact (Key wrench supplied) Used to detect multiple small targets.	 Model: OP-80228 Fluorine resin contact (Key wrench supplied) A contact that uses fluorine resin.	 Model: OP-81970 Ceramic contact (Key wrench supplied) A ceramic ball is used at the tip.
 Dust boot for GT2-S1 Model: OP-88063 Included with (mounted on) the sensor head.	 Dust boot for GT2-S5 Model: OP-88065 Included with (mounted on) the sensor head.	 Model: OP-84332 Dust boot for GT2-P12K/ P12KF/P12/P12F/H12K/ H12KF/H12/H12F/A12K/A12 (Key wrench supplied) Included with (mounted on) the sensor head.
 Model: OP-84459 Dust boot for GT2-H32/A32 (Key wrench supplied) Included with (mounted on) the sensor head.	 Model: OP-84460 Dust boot for GT2-H50/A50 (Key wrench supplied) Included with (mounted on) the sensor head.	 Model: OP-87859 Dust boot for GT2-P12K/ P12KF/P12/P12F (Key wrench supplied) Fluorine coated dust boot.
 Model: OP-87932 Replacement dust seal for GT2-PA12K/PA12 (Key wrench and replacement packing supplied) Replacement dust seal.	 Model: OP-77684 Spacer (Key wrench supplied) Used to extend the spindle for 12.2 mm.	 Model: OP-84397 Lift lever (Key wrench supplied)
 Model: OP-84338 Connector for GT2 (two pieces) Replacement connector for the sensor head connection cable	 Model: OP-35361 Expansion cable: 300 mm Used when connecting the panel mount type amplifiers side by side.	 Model: OP-87970 Speed controller Adjusts the spindle extension speed. (For the GT2-PA12K/ PA12/A12K(L)/A12(L)/A32/A52)

 Model: OP-87984 Small diameter standard contact Included with the GT2-PA12 as standard.	 Model: OP-87985 Small diameter carbide contact Included with the GT2-PA12K as standard. Carbide (tungsten alloy) is used at the tip.	 Model: OP-88117 Relay amplifier mounting bracket for the GT2-S1/S5
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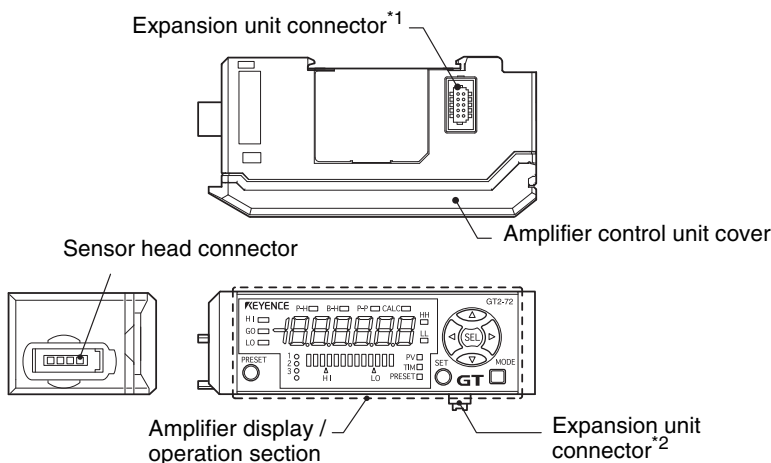
1-2 Identifying Part Names and Functions

Sensor Amplifier Unit

Reference

For GT2-71D (pulse output type), refer to "Chapter 6 Functions and Settings of GT2-71D".

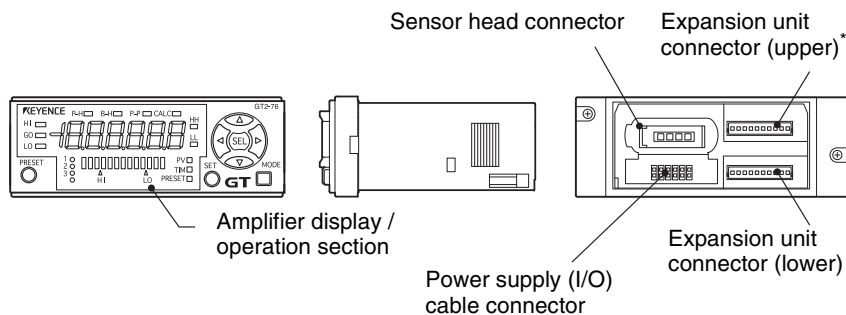
DIN rail mount amplifier unit (GT2-71(C)N/71(C)P, GT2-72(C)N/72(C)P, GT2-71MCN/71MCP)



*1 When shipped from the factory, the expansion cover is installed.

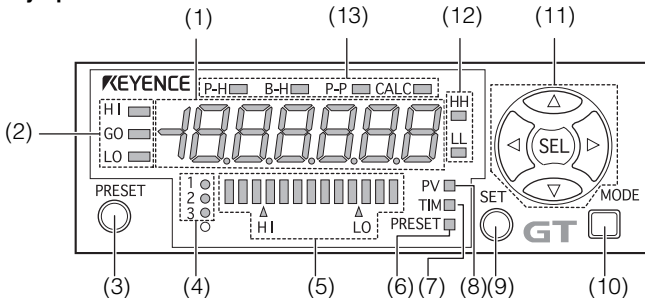
*2 This is not installed on the main unit (GT2-71(C)N/71(C)P/71MCN/71MCP).

Panel mounting amplifier unit (GT2-75N/75P, GT2-76N/76P)



* The main unit (GT2-75N/75P) has no upper expansion unit connector.

Amplifier display/operation section

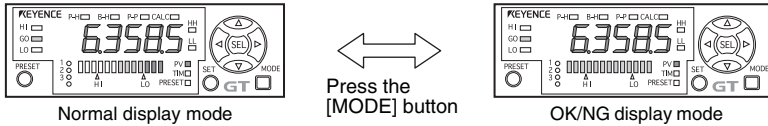


Item		Description
(1) Digital LED display		Displays the detected values and setting.
(2) Position indicator		Indicates HI/GO/LO positions. When an error occurs, HI and LO light at the same time.
(3) [PRESET] button		Used when adjusting the origin.
(4) Bank indicator		The indicator of the bank No. being selected lights in green. When all bank indicators are turned off, "Bank 0" is selected.
(5) Bar LED	Normal display mode *1	Lights the LEDs according to the increase/decrease of the measured values. Indicates (lights in green) the position of the setting data of HIGH/LOW by the HIGH/LOW position indicator.
	OK/NG display mode *1	• If the measured value is "GO", all the LEDs are lit in green. • When in a criterion wait state*2, all the LEDs turn off. • If the measured value is "HIGH (or LOW)", all the LEDs are lit in red.
(6) Preset indicator		• Lights in green for 0.3 seconds when the preset signal is entered. • Lights in red when the preset value is displayed (set).
(7) Timing input indicator		• When "04. Timing type" of the function setting mode is set to "t-in", this lights in green while the timing signal is entered. • When using the internal timing, this lights in green since the data is determined until the data exceeds (falls below) the timing level.
(8) PV indicator		Lights in red when the P.V. value display screen is displayed.
(9) [SET] button		Used to automatically adjust the set point.
(10) [MODE] button		Used for starting or ending the adjustment when adjusting the settings. This is used also when switching*1 the display mode of the bar LED.
(11) Arrow buttons		Menu selection • Left/right arrow button: Used to select the menu. • Up/down arrow button: Used to change the contents of the menu.
(12) Special output indicator *3		Lights in red when judged as HH/LL if the option other than "no. USE" is selected for "16. Special Output Setting" in the basic setting mode.

1
Before Use

Item	Description
(13) Status indicator	When the hold mode is selected for "01. Detection mode" in the function setting mode, the indicator corresponding to the selected hold mode lights in red when the P.V. value display screen is displayed. If the calculation function is used when the expansion unit is added, CALC lights in red when the P.V. value display screen or the calculated value display screen is displayed. "3-1 Main Screens" (page 3-2)

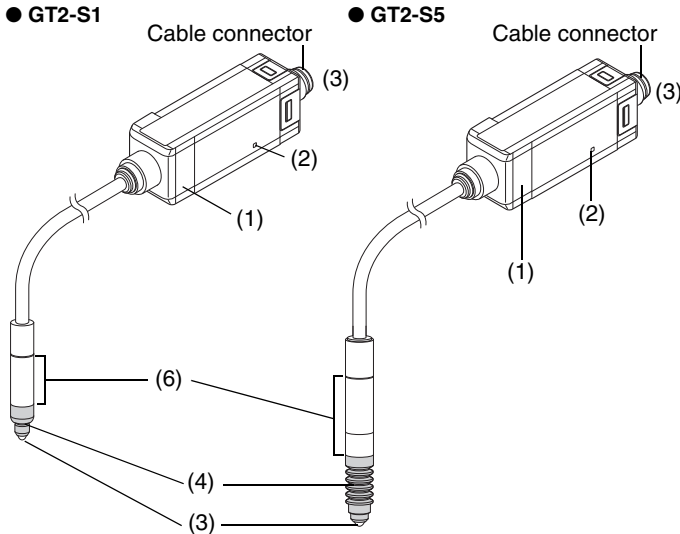
*1 Briefly pushing the [MODE] button on the P.V. value display screen will switch the bar LED display mode.



- *2 The criterion wait state refers to the following cases:
- During the sampling period when using the internal timing
 - When "-----" is displayed in the P.V. value display screen
- *3 This item is not used on the GT2-71MCN/71MCP.

Sensor Head Unit

GT2-S1/S5



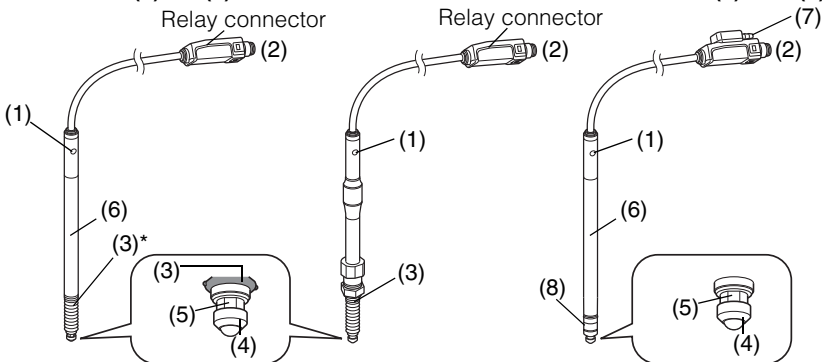
Item		Description			
(1) Operation indicator	During normal operations	When judged as HIGH/LOW: Lights red When judged as GO: Lights green In a criterion wait state: Turns off			
	During setting	Blinks red or green			
	When setting power save function	Turns off			
	When an error occurs	Lights red			
(2) Position indicator		Type	Value displayed on the amplifier*1		
			Outside of measuring range	Within measuring range	Measured center
		GT2-S1	>1 or <0	0 ≤ measured value ≤ 1	0.5±0.1
		GT2-S5	>5 or <0	0 ≤ measured value ≤ 5	2.5±0.25
		Position indicator	Turns off	Lights red	Lights green
		*1 When the preset function, lever ratio setting, and calibration function are not in use			
(3) Sensor head cable connector		Connects to the sensor head connection cable.			
(4) Dust boot		Complies with IP67G (JIS) and IP67 (IEC)			
(5) Contact		The carbide type (OP-77682) is attached when the product is shipped from the factory.			
(6) Mounting fastener		Use this part to mount the sensor head to a fixture. If the sensor head is fixed at other places than the mounting fastener, the unit may be damaged.			

GT2-P12K(L)(F)/P12(L)(F)/PA12K/PA12

● GT2-P12K(L)/P12(L)

● GT2-P12KF/P12F

● GT2-PA12K(L)/PA12(L)



* Not included in the GT2-P12KL/P12L.

Item		Description
(1) Operation indicator	During normal operations*1	When judged as HIGH/LOW : Lights red When judged as GO : Lights green In a criterion wait state*2 : Turns off
	During setting	Blinks red or green*3
	When setting power save function	Turns off*4
	When an error occurs	Lights red
(2) Sensor head cable connector		Connects to the sensor head connection cable.
(3) Dust boot*5		Ensures an IP67G and NEMA Type 13 enclosure rating.
(4) Contact		When shipped from the factory, the standard type (OP-77678) is supplied for the GT2-P12(L)(F)/PA12 and the carbide type (OP-77682) is supplied for the GT2-P12K(L)(F)/PA12K. Various types of contacts are available for different applications.  "List of Optional Parts" (page 1-7)  "A3 Replacing the Contact" (page A-8)
(5) Spindle		Displays the amount of movement of the spindle as the detection value.
(6) Mounting fastener		Use this part to mount the sensor head to a fixture. If the sensor head is fixed at other places than the mounting fastener, the unit may be damaged. A mounting bracket is attached to GT2-H12KF/H12F/H12KLF/H12LF.
(7) Air port		Supplied air extends the spindle*6.
(8) Dust seal*7		Attached when shipped. When replacing, use the replacement dust seal OP-87932.

*1 When "CALc (calculation mode)" is selected for "A1. APL (calculation mode settings)", the expansion unit operates in the same way as the main unit.

*2 The criterion wait state refers to the following cases:

- During the sampling period when using the internal timing
- When "-----" is displayed in the P.V. value display screen

*3 The blinking color changes according to the lighting color of the normal operation. (The indicator blinks in red in a criterion wait state.)

*4 Turns off only when "All (Full eco)" is selected in "23. Eco (Power Save Function)".

 "23. Power Save Function" (page 5-44)

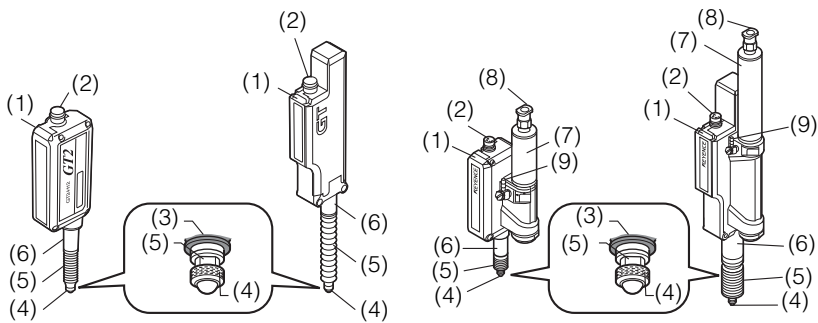
*5 The dust boot can be replaced.

 "A4 Replacing the Dust Boot" (page A-10)

*6 See  page 2-20 for the air supply method.

*7 This is not present on the GT2-PA12KL/P12L.

GT2-H12K(L)(F)(LF)/H12(L)(F)(LF)/H32(L)/H50/A12K(L)/A12(L)/A32/A50

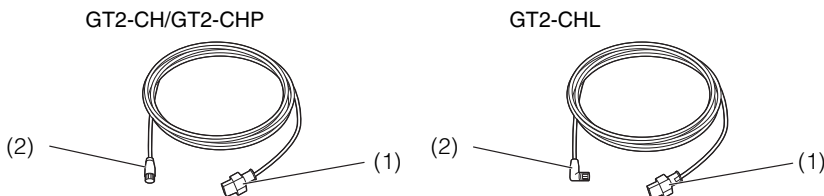


Item		Description
(1) Operation indicator	During normal operations* ¹	When judged as HIGH/LOW : Lights red When judged as GO : Lights green In a criterion wait state* ² : Turns off
	During setting	Blinks red or green* ³
	When setting power save function	Turns off* ⁴
	When an error occurs	Lights red
(2) Sensor head cable connector		Connects to the sensor head connection cable.
(3) Dust boot* ⁵		Ensures an IP67 enclosure rating.
(4) Contact		When shipped from the factory, the standard type (OP-77678) is supplied for the GT2-H12(L)/H32(L)/H50/A12(L)/A32/A50 and the carbide type (OP-77682) is supplied for the GT2-H12K(L)/A12K(L). Various types of contacts are available for different applications.  "List of Optional Parts" (page 1-7)  "A3 Replacing the Contact" (page A-8)
(5) Spindle		Displays the amount of movement of the spindle as the detection value.
(6) Mounting fastener		Use this part to mount the sensor head to a fixture. If the sensor head is fixed at other places than the mounting fastener, the GT2-70 Series unit may be damaged. A mounting bracket is attached to GT2-H12KF/H12F/H12KLF/H12LF.
(7) Air cylinder		This air cylinder is a single-acting push type* ⁶ . Supplying air extends the spindle.
(8) Coupling socket		This is the socket used to supply air to the air cylinder. Connect an air tube with an inside diameter of 2.5 mm and an outside diameter of 4 mm.
(9) Exhaust valve		This is the exhaust valve* ⁷ that causes the air cylinder to push out. In order to guarantee the IP67 enclosure rating, connect an air tube with an inside diameter of 2.5 mm and an outside diameter of 4 mm, and place the edge of the tube in a location that will not come into contact with dust or water.

- *1 When "CALc (calculation mode)" is selected for "A1. APL (calculation mode settings)", the expansion unit operates in the same way as the main unit.
- *2 The criterion wait state refers to the following cases:
 - During the sampling period when using the internal timing
 - When "-----" is displayed in the P.V. value display screen
- *3 The blinking color changes according to the lighting color of the normal operation.
(The indicator blinks in red in a criterion wait state.)
- *4 Turns off only when "All (Full eco)" is selected in "23. Eco (Power Save Function)".
 "23. Power Save Function" (page 5-44)
- *5 The dust boot can be replaced, but the IP67 enclosure rating cannot be guaranteed after replacement.
 If you need the IP67 enclosure rating to be guaranteed, replace the sensor head.
 "A4 Replacing the Dust Boot" (page A-10)
- *6 Vent air exhaust to the atmosphere.
- *7 The air cylinder returns to the previous position by a spring in the air cylinder, so do not supply air to the exhaust valve.

NOTICE	The GT2-P12KL/P12L/PA12KL/PA12L/H12KL/H12L/H12KLF/H12LF/H32L/A12KL/A12L does not have the dust boot. The protection rating is equivalent to "IP40". Do not install the dust boot to the GT2-P12KL/P12L/H12KL/H12L/H12KLF/H12LF/H32L/A12KL/A12L. It can hinder the return movement of the spindle.
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Sensor Head Connection Cable



Item	Description
(1) Amplifier connector	Connects to the amplifier.
(2) Sensor head connector	Connects to the sensor head.

The relationship between the model of the sensor head connector and the cable length is as follows.

Model	Cable length
GT2-CH2M/GT2-CHL2M/GT2-CHP2M	2 m
GT2-CH5M/GT2-CHL5M/GT2-CHP5M	5 m
GT2-CH10M/GT2-CHL10M/GT2-CHP10M	10 m
GT2-CH20M/GT2-CHL20M	20 m

GT2-CHL*M cannot be used with GT2-H32(L)/H50/A32/A50.

Installation and Connection

This chapter describes precautions when installing and connecting the GT2-70 Series.

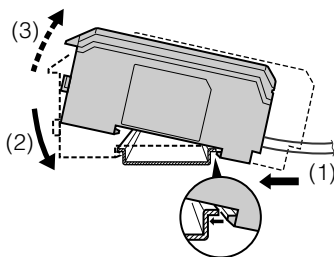
- 2-1 Mounting and Wiring the Sensor Amplifier2-2
- 2-2 Connecting and Mounting the Sensor Head2-13

Mounting the Sensor Amplifier

DIN-rail mount type (Main unit)

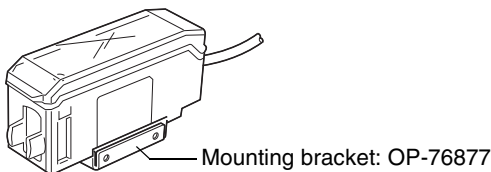
This section describes how to mount the DIN-rail mount type:
(Main unit: GT2-71(C)N/71(C)P/71MCN/71MCP/71D).

- 1** Fit the tab of the lower part of the main unit to the DIN rail. While inserting the main unit in the direction of Arrow (1), push the body down in the direction of Arrow (2).



- 2** To detach the amplifier, while pushing the main unit in the direction of Arrow (1), pull the body up in the direction of Arrow (3).

When using the mounting bracket OP-76877, mount as shown below.



DIN-rail mount type (Expansion unit)

This section describes how to mount the DIN-rail mount type:
(Expansion unit: GT2-72(C)N/72(C)P).

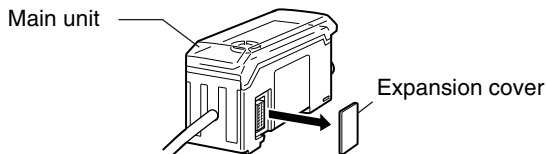
The expansion unit can only be used in addition to the main unit.

Up to 14 expansion units can be added to one main unit.

NOTICE

- When adding an amplifier (expansion unit), be sure the power of both main and expansion units is OFF before operation. Working with the power ON may damage the units.
- Be sure to completely connect an expansion unit to a main unit. Improper connections may damage the equipment.
- When connecting expansion units, some of the specifications are restricted depending on the number of units to be connected. For details, refer to □ "Chapter 7 Specifications" (page 7-1).
- An expansion unit of different output type cannot be added (for example, an expansion unit with an NPN output cannot be added to a main unit with an PNP output).
- No expansion unit can be connected to the pulse output type (GT2-71D).
- An expansion unit with an DIN-rail mount type cannot be added to a main unit with an panel mount type.

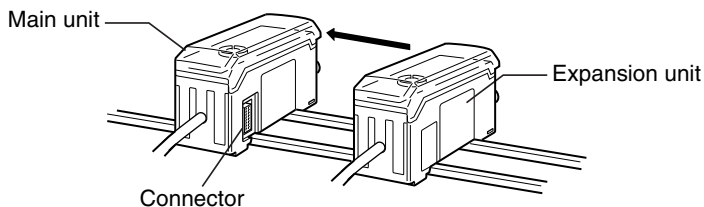
1 Detach the expansion cover of the amplifier (main unit).



2 Mount the expansion unit to be added to the DIN rail.

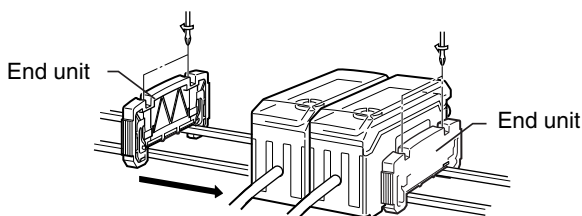
Refer to "DIN-rail mount type (Main unit)" for details about mounting.

- 3** Push and fix the expansion unit to the connector of the main unit until it clicks.



- 4** Mount the separately sold end units (OP-26751: a set of two pieces) on both sides of the amplifiers (the main unit and the expansion unit), then fix the end units with screws on the upper part of each end unit (2 points x 2 units).

The mounting method of the end unit is the same as that of the amplifier.

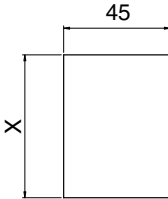


Panel mount type (Main unit)

This section describes how to mount the panel mount type: GT2-75N/75P (main unit).

1 Cut panel openings based on the dimensions below.

- Panel cutout when mounting the unit vertically

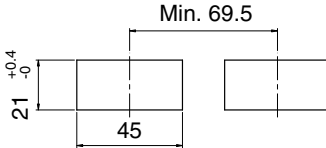


Panel thickness of mounting area
1 to 6 mm

$$X = 24 \times (\text{No. of amplifiers} - 1) + 21$$

(Unit: mm)

- Panel cutout when mounting the unit horizontally

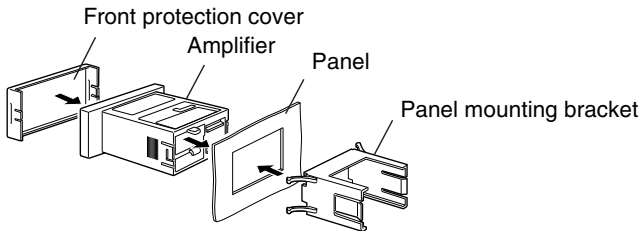


(Unit: mm)

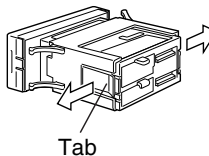
Reference

When mounting the units side by side, ensure the center pitch between the sensor amplifiers is 69.5 mm or more.

2 Insert the panel mounting bracket in the direction shown below into the main unit from the back, then fit the front protection cover to the main unit face.



To detach the panel mounting bracket, pull it while pushing apart the tabs provided on its both ends.



Panel mount type (Expansion unit)

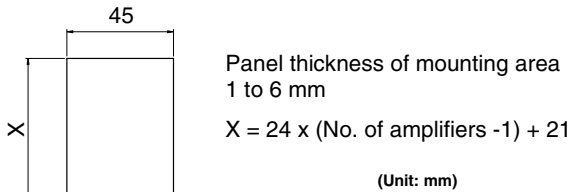
This section describes how to mount the panel mount type: GT2-76N/76P (expansion unit).
The expansion unit can only be used in addition to the main unit. Up to 14 expansion units can be added to one main unit.

NOTICE

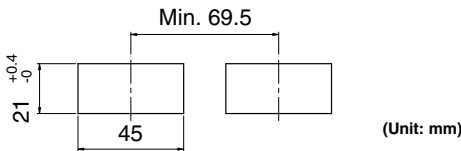
- Turn OFF the power before connecting the expansion cable. Inserting or pulling the cable when the power is turned ON may damage the equipment.
- Be sure to completely connect the expansion cable. Improper connections may damage the equipment.
- When connecting expansion units, some of the specifications are restricted depending on the number of units to be connected. For details, refer to "Chapter 7 Specifications" (page 7-1).
- An expansion unit of different output type cannot be added (for example, an expansion unit with an NPN output cannot be added to a main unit with an PNP output).
- An expansion unit of the panel mount type cannot be added to a main unit of the DIN rail mount type.

1 Cut panel openings for mounting according to the number of expansion units to be mounted (n).

- Panel cutout when mounting the expansion unit vertically

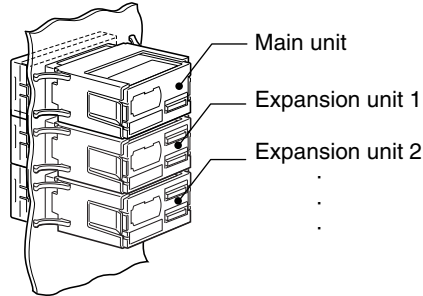


- Panel cutout when mounting the expansion unit horizontally



2 Mount the amplifier to the panel.

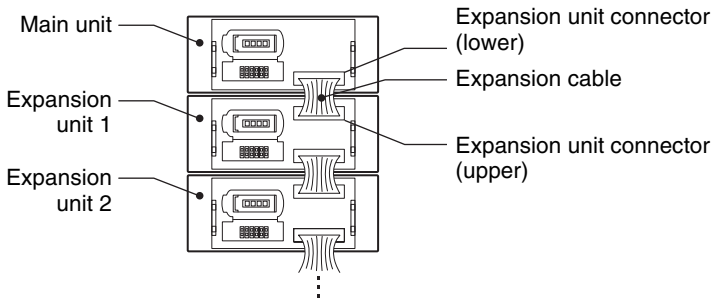
Mount the units in such a manner that the main unit is placed on the top.



Refer to "Panel mount type (Main unit)" (page 2-5) for details about how to mount the amplifier.

3 Connect the amplifiers with an expansion cable (50 mm flat cable).

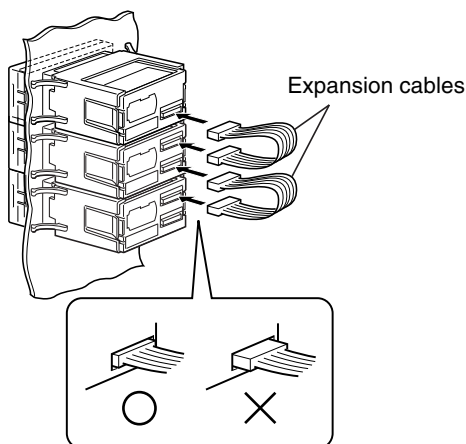
Connect the expansion cable between the adjacent connectors.



NOTICE

Be sure to connect the expansion cable when the power is turned OFF. Improper connections may damage the GT2-70 Series.

Connecting or disconnecting the cable when the power is turned ON also may damage the GT2-70 Series.



- Do not connect between "the expansion connector (upper) - expansion connector (upper)" or "the expansion connector (lower) - expansion connector (lower)".
- When mounting the amplifiers side by side, a separately sold 300 mm expansion cable (OP-35361) is required. When even one 300 mm expansion cable is used, limit the number of the expansion units to four.

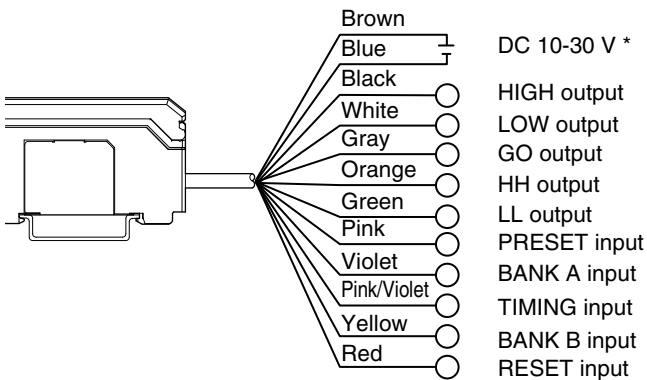
Sensor Amplifier Wiring

NOTICE

Insulate the unused I/O lines individually.

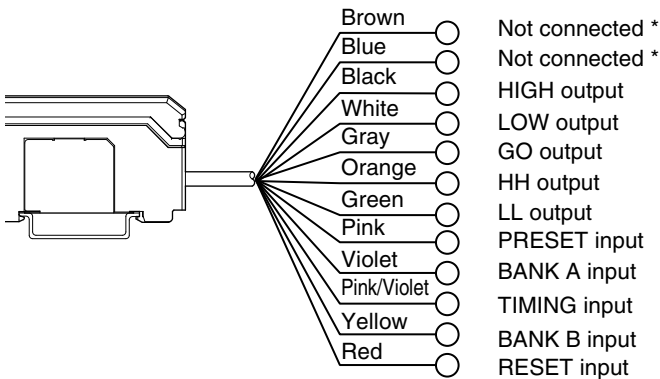
DIN-rail mount type

■ GT2-71(C)N/71(C)P (Main unit)



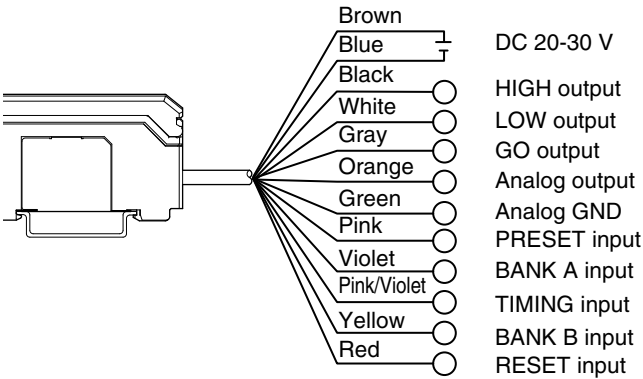
* When an expansion unit is added, supply DC 20-30 V.

■ GT2-72(C)N/72(C)P (Expansion unit)

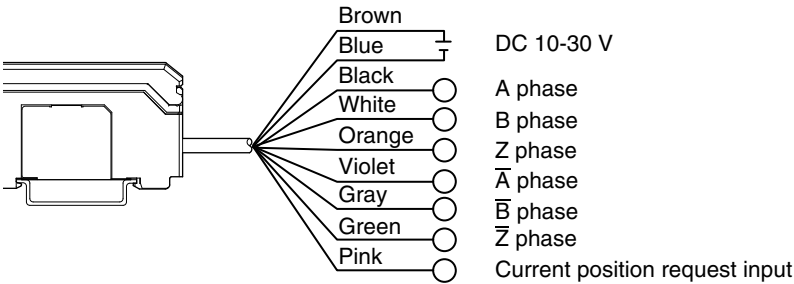


* Brown and blue lines are available only on the GT2-72CN/72CP (connector type).

■ GT2-71MCN/71MCP (Analog output)



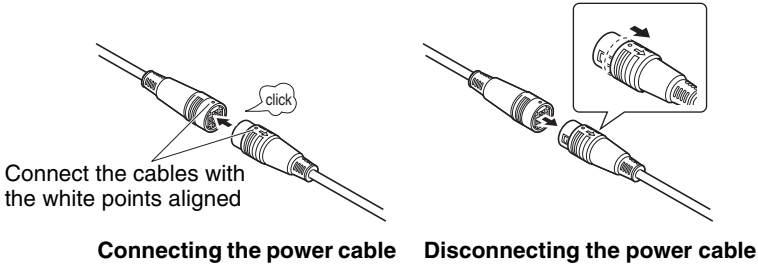
■ GT2-71D (Pulse output)



DIN-rail mounting connector type

■ Connecting the power cable (I/O cable)

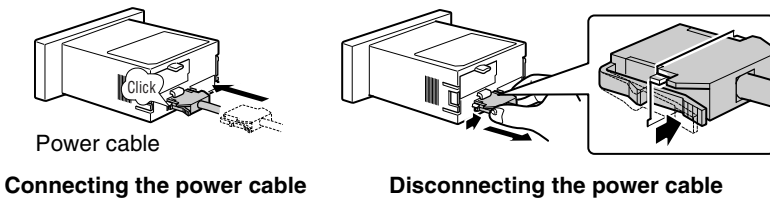
Quick disconnect type amplifiers must be connected with the power cable (I/O cable) GT2-CA2M/CA10M (sold separately).



Panel mount type

■ Connecting the power cable (I/O cable)

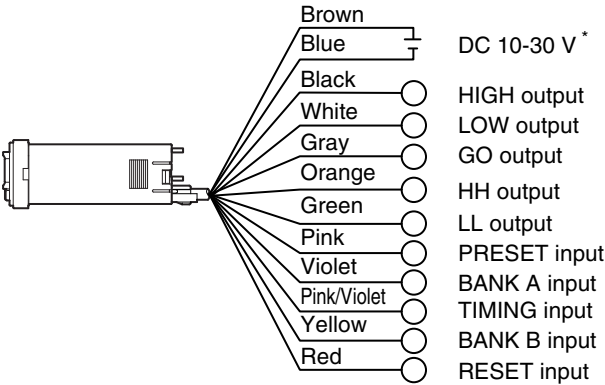
The accessory power cable (I/O cable) must be connected to the amplifier of the panel mount type.



Reference

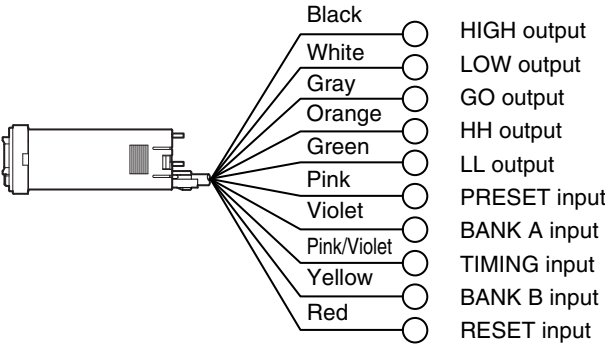
- The number of power cable wires is different between the main unit and the expansion unit (Main unit: 12 wires, Expansion unit: 10 wires).
- The power of the expansion unit is supplied through the expansion cable being connected to the main unit.

■ GT2-75N/75P (Main unit)



* When an expansion unit is added, supply DC 20-30 V.

■ GT2-76N/76P (Expansion unit)



* The power is supplied to the expansion unit from the connected main unit.

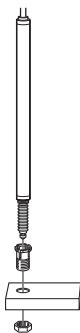
Mounting the Sensor Head

Mounting directly to a jig

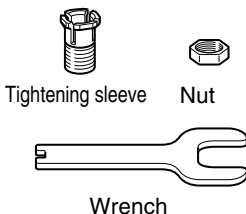
Before mounting the sensor head directly to a jig, create a hole on the jig. Attach the sensor head using mounting bracket A (OP-76874), mounting bracket D (OP-84327), or mounting bracket C (OP-84396). A mounting bracket is provided with the GT2-P12KF/P12F/H12K(L)F/H12(L)F as standard. Attach it with the supplied nut.

● 1/5/12 mm stroke sensor head other than the flange type

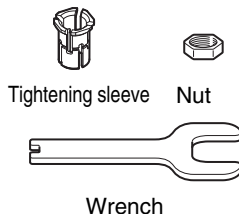
Mounting diagram



Package contents of the mounting bracket A (OP-76874)

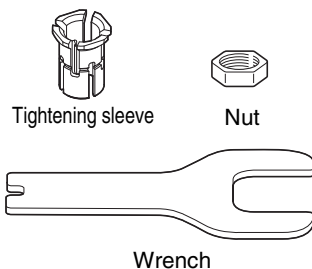
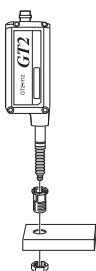


Package contents of the mounting bracket C (OP-84396)



● GT2-H32(L)/H50/A32/A50

Package contents of the mounting bracket D (OP-84327)

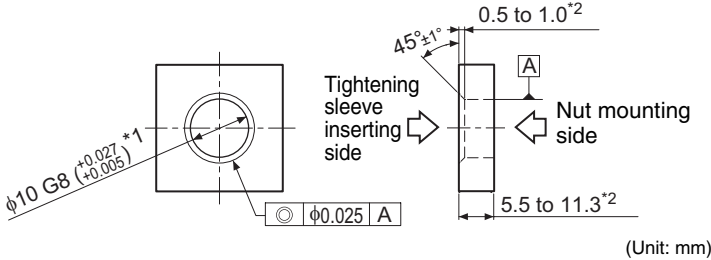


NOTICE

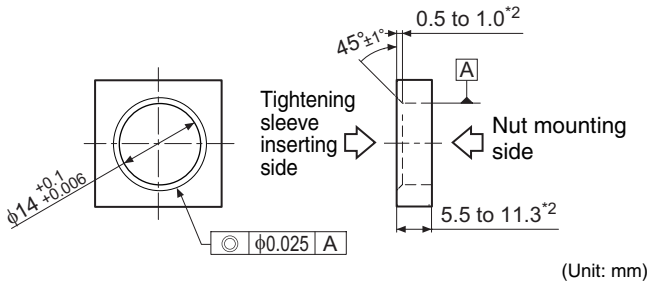
When mounting the GT2-H32L facing upward, be sure to use the mounting holes on the side of the sensor head. If the sensor head is mounted using mounting bracket D, the spindle may not fully extend.

1 Drill a mounting hole according to the illustration below.

- 1/5/12 mm stroke sensor head other than the flange type



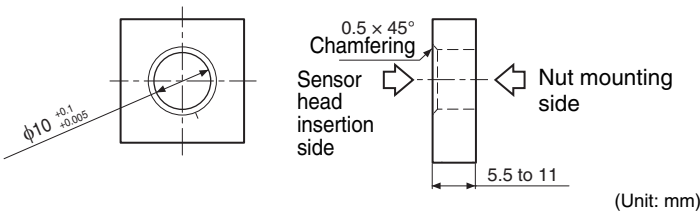
- GT2-H32(L)/H50/A32/A50



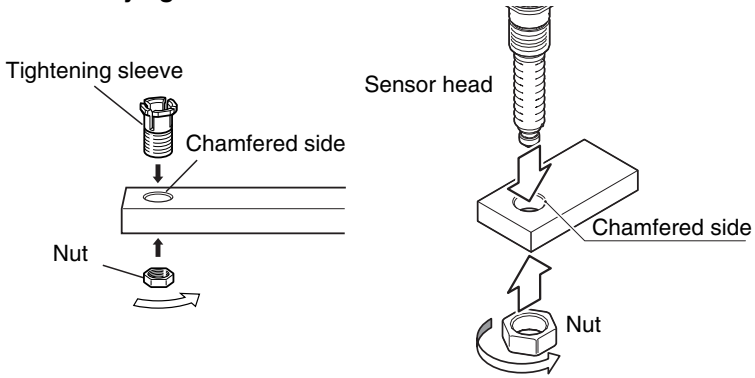
*1 For mounting bracket C
 $\phi 10\ +0.1\ +0.005$

*2 Processing accuracy: ± 0.05

- GT2-P12KF/P12F/H12K(L)F/H12(L)F



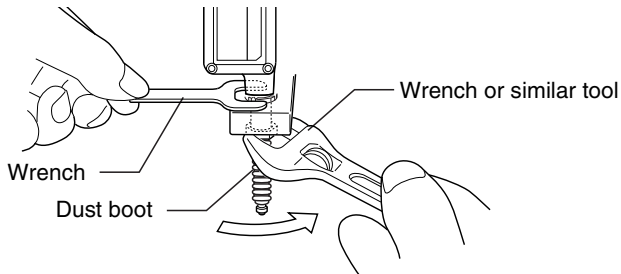
2 Insert the tightening sleeve into the hole (from the chamfered side), and loosely tighten with the nut.



NOTICE

Strongly tightening the nut without the sensor head inserted may deform the tightening sleeve.

3 Insert the sensor head into the tightening sleeve. While securing the tightening sleeve with the included wrench, tighten the nut with a separate wrench.



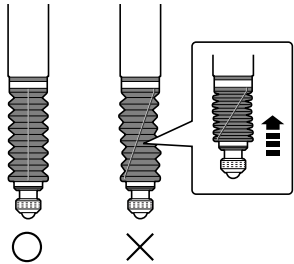
NOTICE

Tightening the nut while fixing the sensor head may lead to damage.

- The tightening torque for mounting bracket A (OP-76874), mounting bracket C (OP-84396), and the nuts supplied with the GT2-H12K(L)F/H12(L)F/P12KF/P12F is between 5 and 7 N•m (the recommended tightening torque is 5 N•m) for all products other than the GT2-S5 and is between 4 and 5 N•m (the recommended tightening torque is 4 N•m) for the GT2-S5. Apply tightening torque between 15 and 18 N•m (20 to 23 N•m when using the GT2-A32/A50) to mounting bracket D (OP-84327). Use the wrench that matches the nut width.
- Care must be taken not to damage the dust boot when tightening.

4 Rotate the dust boot so that the side line is straight. (Models other than GT2-PA12K/PA12)

Check with the spindle pushed in.



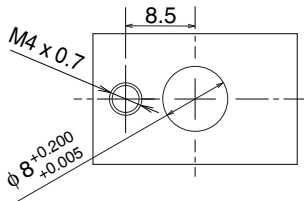
NOTICE

- If the dust boot is not straight, it becomes easier to damage when the spindle is moved.
- GT2-H12KL/H12L/H32L/A12KL/A12L has no dust boot.

Using mounting bracket F

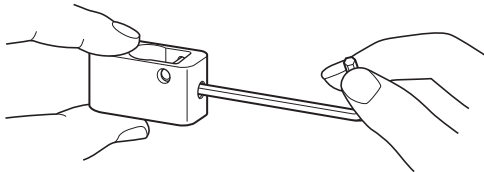
1 Refer to the illustration below and cut the jig to create a sensor head mounting hole.

- GT2-S1/S5/P12K(L)/P12(L)/PA12K(L)/PA12(L)

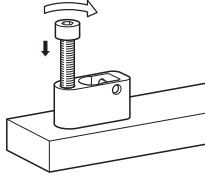


Make sure that the metal plating mounting bracket F attaches to is at least 5 mm thick.

2 Loosen the screw on the side of mounting bracket F using the supplied hexagonal wrench.



- 3** Align mounting bracket F with the hole made in step 1 and secure it using the supplied hexagonal wrench.



- 4** Insert the sensor head, and tighten the screw loosened in step 2 using the supplied hexagonal wrench to secure. The recommended tightening torque is 0.6 to 0.8 N·m. Make sure that the dust boot does not obstruct the metal plating that mounting bracket F is attached to.

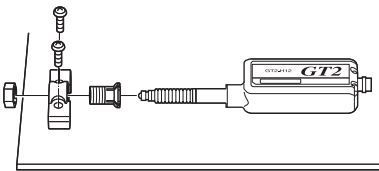
NOTICE

- Make sure that the dust boot does not become damaged during the procedure.
- When loosening the screw with the hexagonal wrench, insert the long end of the hexagonal wrench into the hex screw and rotate the small end with your hand.
- Do not forcibly tighten the hex screw.
- Cannot be used with GT2-P12KF/P12F/H***A***.

Mounting on the side of a table

To mount a 1/5/12 mm stroke sensor head other than the flange type on the side face of a table or the like, use the included mounting bracket B (OP-76875) or mounting bracket E (OP-87220).

Mounting diagram



Package contents of the mounting bracket B (OP-76875)



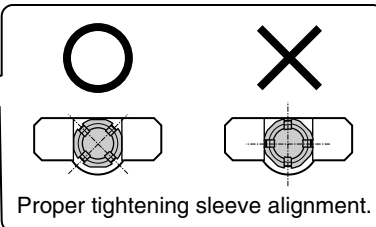
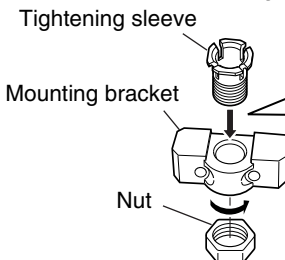
Tightening sleeve Nut Mounting bracket

Package contents of the mounting bracket E (OP-87220)



Tightening sleeve Nut Mounting bracket

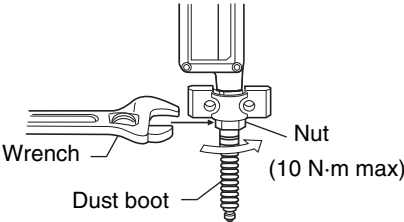
- 1** Insert the tightening sleeve into the mounting bracket from the slotted side, and loosely tighten with the nut.



Proper tightening sleeve alignment.

2	Installation and Connection	NOTICE	• If the tightening sleeve is inserted from the wrong side, the sensor head cannot be secured. • Strongly tightening the nut without the sensor head inserted may deform the tightening sleeve. • Mounting bracket C (OP-84396) and mounting bracket D (OP-84327) cannot be used together with the side mounting bracket (OP-76875).

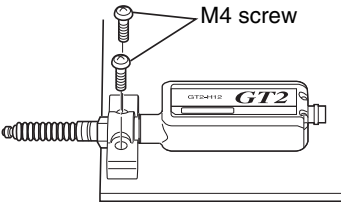
2 Insert the sensor head into the tightening sleeve, and tighten the nut with a wrench.



3	Installation and Connection	NOTICE	Tightening the nut while fixing the sensor head may lead to damage. • Apply a tightening torque of 5 to 7 N·m (the recommended tightening torque is 5 N·m) for all products other than the GT2-S5 and a tightening torque of 4 to 5 N·m (the recommended tightening torque is 4 N·m) for the GT2-S5. Use the wrench that fits the width of the nut. • Care must be taken not to damage the dust boot when tightening.

3 Secure the sensor head with M4 screws.

Mount the sensor head with the model label on top. For GT2-P12K(L)/P12(L)/PA12K/PA12, mount so that the status lamp is on top.



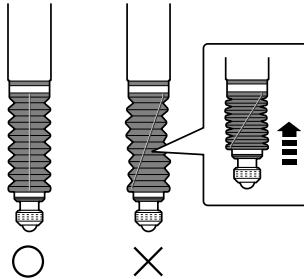
NOTICE

- Never apply tightening torque over 1.4 N•m.
- Care must be taken not to damage the dust boot when tightening.
- Install the sensor head with the model label facing up. The sensor head cannot be installed in another orientation.

4

Rotate the dust boot so that the side line is straight.

Check with the spindle pushed in.

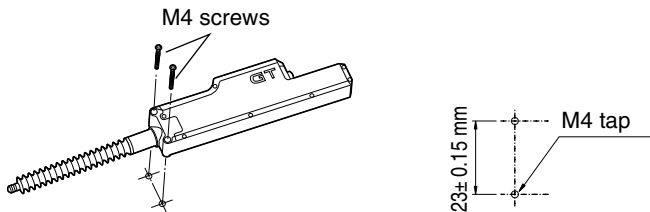


NOTICE

- If the dust boot is not straight, it becomes easier to damage when the spindle is moved.
- GT2-H12KL/H12L/A12KL/A12L has no dust boot.

Mounting to the mounting holes

The mounting holes on the side of the GT2-H32(L)/H50/A32/A50 unit can be used to install to the side of a table or other surface.



NOTICE

- Roughness of the mounting surface may cause the sensor to tilt, and sufficient accuracy may not be obtained. When performing a high-accuracy measurement, use a jig to mount the sensor head.
- "Mounting directly to a jig" (page 2-13)
- Apply tightening torque between 1.2 and 1.5 N•m.

2

Installation and Connection

Installing the Air Tube

Available air tubes

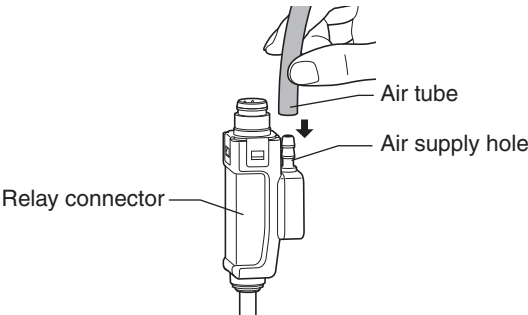
Use a tube with the following specifications.

Item		Description
Recommended tubing material		Nylon, Urethane
Tubing size	Outer diameter	φ4 mm
	Inner diameter	φ2.5 mm

How to Attach/Detach the Air Tube (GT2-PA12K(L)/PA12(L))

Attaching the air tube

Insert the air tube into the air supply hole on the relay connector.

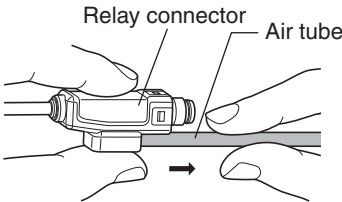


NOTICE

- For best results, cut the end of the tube at a right angle, and ensure that the outer perimeter is not damaged, and that it still maintains a circular cross section.
- If the tube is not properly inserted, air leakage may result.
- After attaching, pull on the tube to make sure it is secure.

Detaching the air tube

To detach the air tube, pull the air tube in the direction of the arrow, as indicated in the figure below.



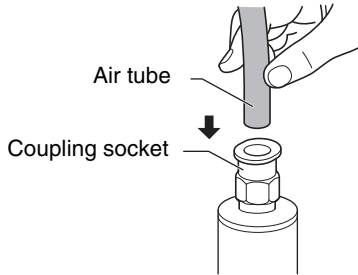
NOTICE

Before detaching the tube, be sure to stop any air flow.

■ How to attach/detach the air tube (GT2-A12K(L)/A12(L)/A32/A50)

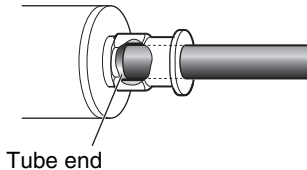
● Attaching the air tube

Feed the tubing into the socket until it bottoms out (about 1/2").
The socket will ensure a tight seal around the tubing.



- For best results, cut the end of the tube at a right angle, ensure that the outer perimeter is not damaged, and that it still maintains a circular cross section.
- If the tube is not properly inserted, air leakage may result (see figure below).

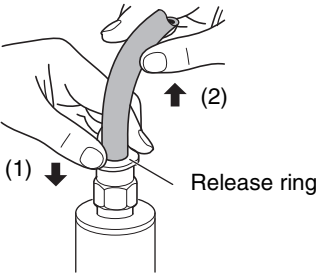
NOTICE



- After attachment, pull on the tube to make sure it is secure.

● **Detaching the air tube**

To detach the air tube, (1) press down on the release ring, (2) pull out the tube.



NOTICE

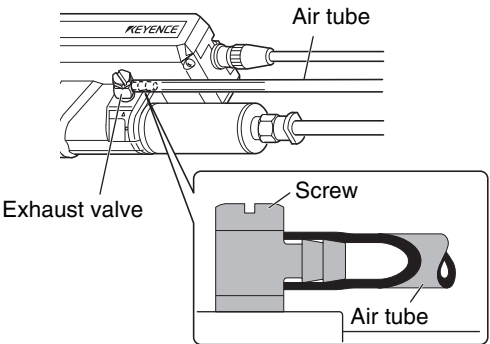
- Before detaching the tube, be sure to stop any air flow.
- Press down on the release ring evenly from both sides, and pull the tube out. Uneven pressure may result in damage to the tube or damage to the operation of the air cylinder.

■ **If the IP67 enclosure rating is required (GT2-A12K/A12/A32/A50)**

To maintain an IP67 enclosure rating, the following must be satisfied:

- Firmly connect tubing with $\phi 2.5$ mm inner diameter to the exhaust port until it bottoms out.

Ensure that the tube end is free of dirt or water.



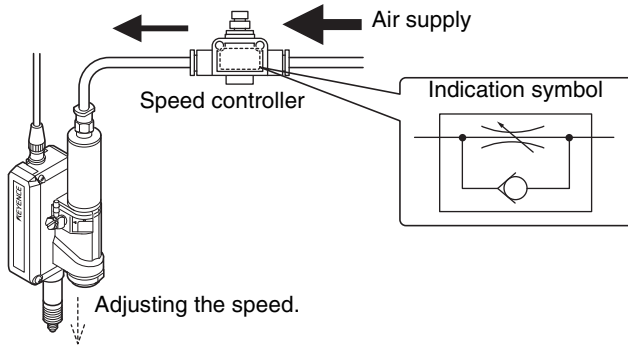
- Tighten the screw of the exhaust valve with a torque of 0.5 to 0.6 N•m. If the screw is loose, the IP67 rating cannot be guaranteed.

Reference

By loosening the screw of the exhaust valve, you can change the exhaust port angle.

■ Adjustment of Spindle Movement Speed

To adjust the spindle movement speed, install a speed controller between the cylinder and the air supply. Using OP-87970 (for the GT2-PA12K/PA12/A12K(L)/A12(L)/A32/A50) is recommended.



NOTICE

- To further decrease spindle movement speed, use a coil-shaped tube (OP-87986) or similar to increase the distance between the air supply hole and the speed controller.
- The speed controller will not operate if installed in the reverse direction.

■ Pneumatic circuit (for GT2-P***A***)

Use the information below as reference for the pneumatic circuit.

- Use a regulator to supply stable air pressure to the sensor head.
- Use an air filter, mist separator, etc. to provide dry air.

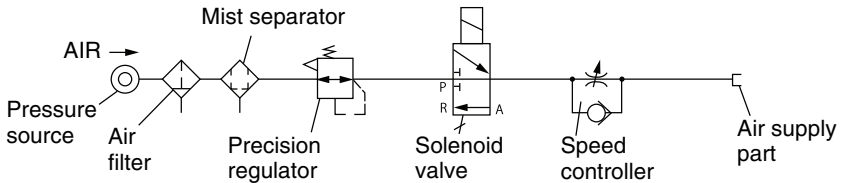
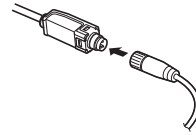


Illustration 1 - Pneumatic circuit

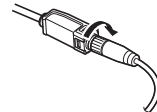
Connecting the sensor head connection cable

- For GT2-S1/S5/P***/PA***

1 Insert the sensor head connection cable into the cable connector on the relay connector cable.



2 Secure the connector with the sensor head connecting cable screw.

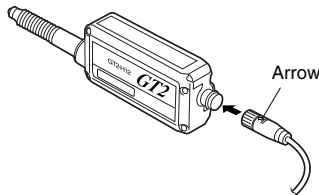


NOTICE	When connecting the connector, be sure to insert it straight, and tighten it securely. (Recommended tightening torque: 0.4 to 0.5 N·m*) If the connection is not tight enough, the connector may be loosened by vibration or other causes, leading to a connection failure. (* After tightening it firmly by hand, use pliers or other tools to rotate it about 30° for further tightening.)
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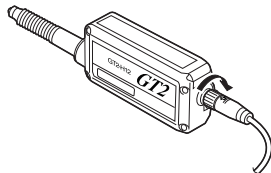
- For units other than GT2-P***/PA***

NOTICE	The M8 L-shaped connector (GT2-CHL*M) cannot be used with the GT2-H32(L)/H50/A32/A50.
--	--

1 Insert the sensor head connection cable into the cable connector of the sensor head.



2 Secure the connector with the screws of the sensor head connection cable.



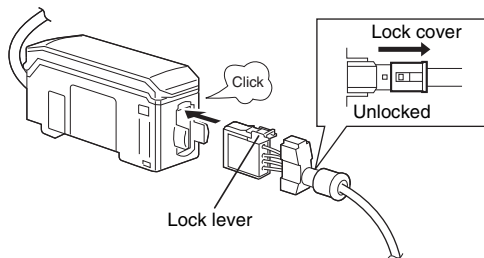
NOTICE

- When connecting the connector, be sure to insert it without tilt, and tighten it securely. (Recommended tightening torque: 0.4 to 0.5 N·m*)
If the connection is not tight enough, the connector may be loosened by vibration or other causes, leading to a connection failure.
(* After tightening it strongly by hand, use pliers or other tools to rotate it about 30° for further tightening.)
- When the head is attached to a moving part, and the cable will be repeatedly bent, ensure that the cable between the sensor head and relay connector does not bend. Instead, bend the sensor head cable connecting the relay connector and the amplifier.

- To disconnect the sensor head connection cable, reverse the steps above.

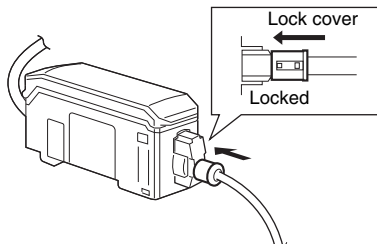
Connecting the Amplifier**DIN-rail mount type**

- 1 Remove the lock cover of the connector of the sensor head connection cable, and insert the sensor head connection cable into the connector on the side of the amplifier until it clicks.**

**NOTICE**

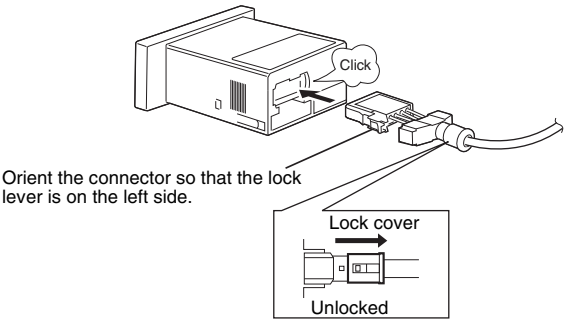
To disconnect the sensor head connection cable, press and hold the lock lever on the side of the connector and disconnect the cable.

- 2 Put the lock cover on the connector, and lock the lock cover.**



Panel mount type

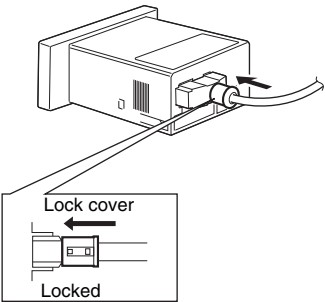
- 1** Remove the lock cover of the connector of the sensor head connection cable, and insert the sensor head connection cable into the connector on the back of the amplifier until it clicks.



NOTICE

To disconnect the sensor head connection cable, press and hold the lock lever on the side of the connector and disconnect the cable.

- 2** Put the lock cover on the connector, and lock the lock cover.



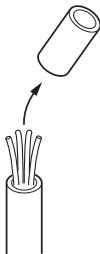
Installing the Head Cable Connector (OP-84338)

NOTICE

When the connector is changed, be sure to connect it to the amplifier, and check that it operates correctly.
If it does not operate correctly, crimp the connector again with pliers or a similar tool.
The connector cannot be reused if it is crimped once.

1 Cut the cables to a necessary length.

Peel back the cable insulation about 15 mm from the end.

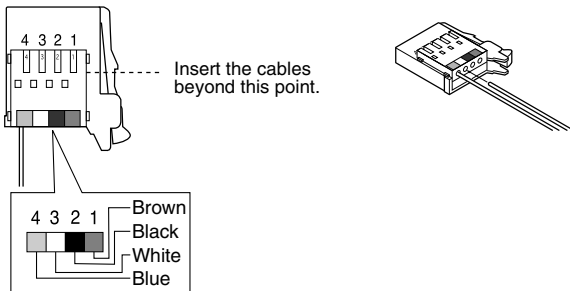


NOTICE

Do not peel the insulation of the core wires.

2 Insert the cables into the connector holes of the matching color.

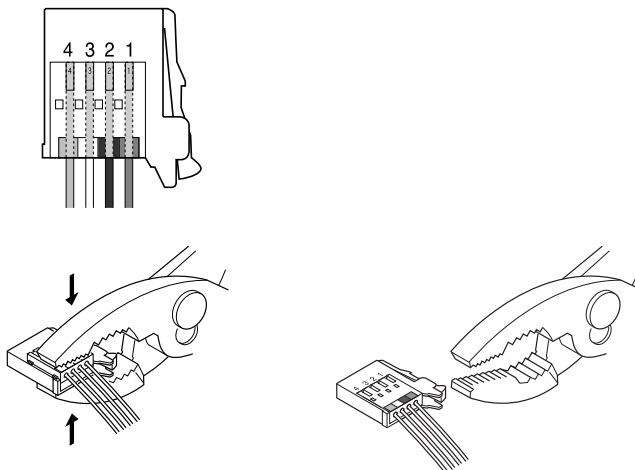
The cables are lightly locked when they reach the end.



- 3** Check that all the cables are inserted to the designated position, and crimp the connector parallel with pliers or a similar tool to secure the cables.

2

Installation and Connection



Basic Usage of the GT2-70 Series

This chapter describes the basic setting method for the GT2-70 Series (except for GT2-71D).

For the setting method for GT2-71D, refer to chapter 6.

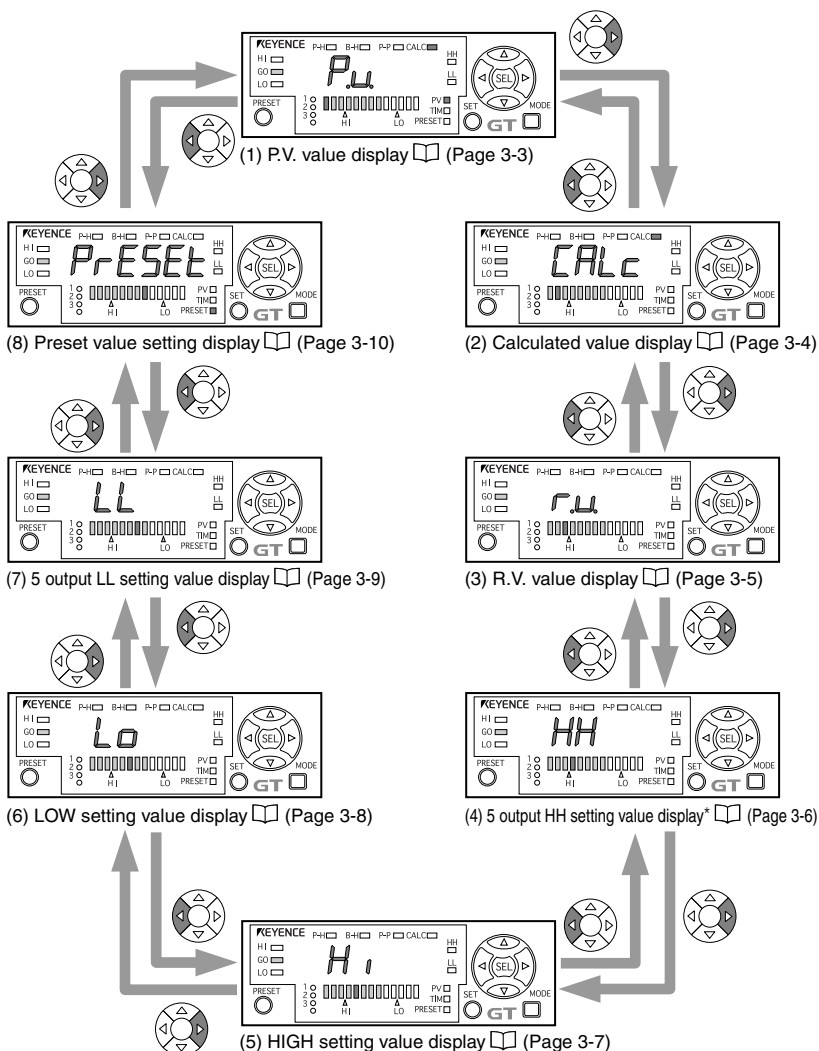
3-1	Main Screens	3-2
3-2	Origin Alignment	3-11
3-3	Setting the Tolerances	3-14
3-4	Setting the HH/LL Criterion Value	3-21
3-5	Analog Output Function	3-27
3-6	Useful Functions	3-30

3-1 Main Screens

The following main screens appear on the main unit and are switched using the [Left]/[Right] arrow buttons as shown below.

Display Patterns of the Main Screens

Some main screens are not displayed depending on the connection pattern, settings, and model of the amplifier. For details on each screen, refer to the pages of the detail description.



* This screen does not appear on the GT2-71MCN/71MCP (analog output type).

(1) P.V. value display

The P.V. (= Present Value) display shows the current measurement of the displaced contact.

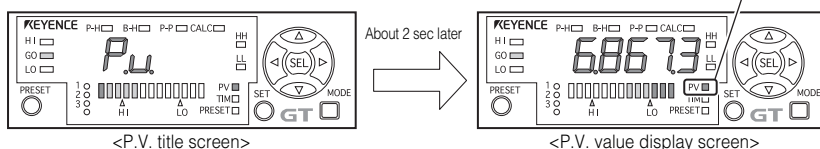
When using the hold functions, the held value is displayed and the criterion output is performed based on that value.

Reference

The P.V. value display screen is not displayed in the following case.

- The main screen of an expansion unit when "CALC (calculation mode)" is selected in the function setting "A1. Calculation Mode" and the setting other than "C5. rEF (reference difference)" is selected in the function setting "A2. Calculation Method" of the main unit.

On the P.V value display,
"PV indicator" is lit in red.



- Approximately two seconds after the title screen appears, it changes to the digital LED display.
- From the "P.V. value setting screen", the tolerance calibration can be set.
 - "Tolerance calibration" (page 3-16)
- When the calculation function is used, the status indicator "CALC" lights in red.
 - "5-6 Calculation Setting Mode" (page 5-57)
- The preset, measurement direction, multiplier, and calibration function setting are displayed according to the P.V. value.
 - "Preset Function (Displaying a value by Adding or Subtracting a Desired Value)" (page 3-30)
 - "10. Measurement Direction" (page 5-18)
 - "11. Multiplier" (page 5-19)
 - "30. Calibration Function Setting" (page 5-52)

(2) Calculated value display

The calculated value display screen shows a calculated value such as a maximum or minimum value of multiple detection points created when adding one or more expansion units.

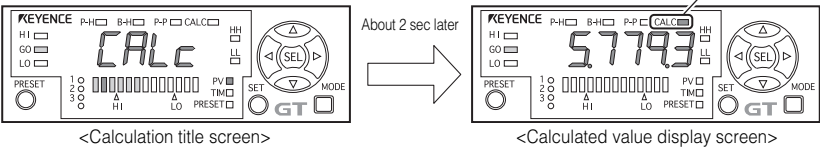
For details on calculation function, refer to "5-6 Calculation Setting Mode" (page 5-57).

Reference

The calculated value display screen is not displayed in the following cases.

- When no expansion units are added.
- When "noCALc (not calculation)" is selected in the function setting "A1. Calculation Mode" of the main unit.
- On the main screen of the main unit when "C5. rEF (reference difference)" is selected in the function setting "A2. Calculation Method" of the main unit.
- On the main screen of the expansion unit when the setting other than "C5. rEF (reference difference)" is selected in the function setting "A2. Calculation Method" of the main unit.

When the calculation function is used, the status indicator "CALC" lights in red.



- Approximately two seconds after the title screen appears, it changes to the digital LED display.
- In the calculated value display screen, the displayed value is not held even when using the hold function mode.

(3) R.V. value display

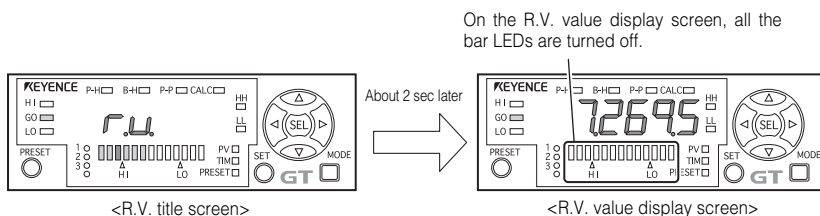
The R.V. (= Raw Value) value display shows the actual measured displacement of the target, via the position of the spindle.

The displayed value is not held even when using the hold function mode, which allows the actual detection value (spindle position) to be checked.

Reference

The R.V. value display screen is not displayed in the following case.

- On the main screen of the main unit when "CAL.noH (calculation dedicated mode)" is selected in the function setting "A1. Calculation Mode" of the main unit.



- Approximately two seconds after the title screen appears, it changes to the digital LED display.
- The preset, measurement range multiplier, and calibration function are accessible from the Raw Value screen.

📖 "Preset Function (Displaying a value by Adding or Subtracting a Desired Value)" (page 3-30)

📖 "10. Measurement Direction" (page 5-18)

📖 "11. Multiplier" (page 5-19)

📖 "30. Calibration Function Setting" (page 5-52)

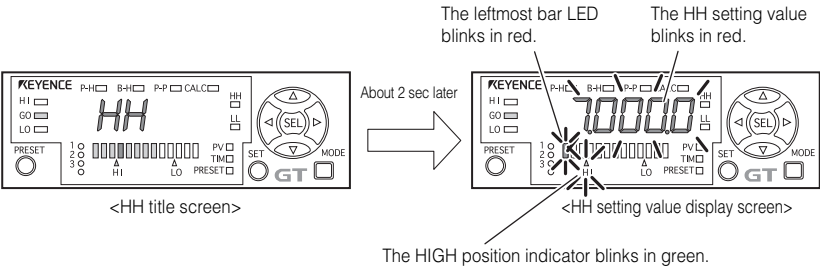
(4) 5 output HH setting value display

When using the 5 output function, display/set the HH setting value higher than the HIGH setting value.

When the P.V. value exceeds the value set here, the HH criterion is output.
For details on the 5 output function, refer to [16. Special Output Setting] (page 5-26).

Reference

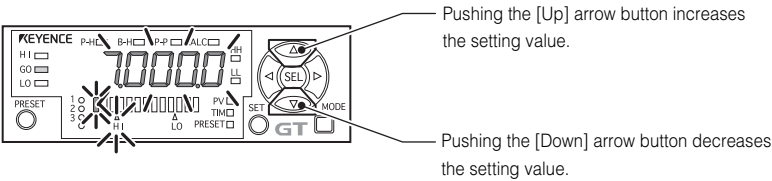
- 5 output HH setting value screen is not displayed in the following cases.
- When the setting other than "5out (5 output)" is selected in the basic setting "16. Special Output Setting" of the main/expansion unit.
 - On the main screen of the expansion unit when "CALc (calculation mode)" is selected in the function setting "A1. Calculation mode" and the setting other than "C5. rEF (reference difference)" is selected in the function setting "A2. Calculation Method" of the main unit.
 - When the sensor amplifier is GT2-71MCN/71MCP (analog output type).



- Approximately two seconds after the title screen appears, it changes to the digital LED display.

■ Changing the HH setting value

You can change the setting using the [Up] or [Down] arrow button while the HH setting value screen is displayed (while the displayed value, HIGH position indicator and the leftmost bar LED blink).



Item	Setting range	Initial value
HH setting value	-199.9999 to 199.9999	7.0000

Reference

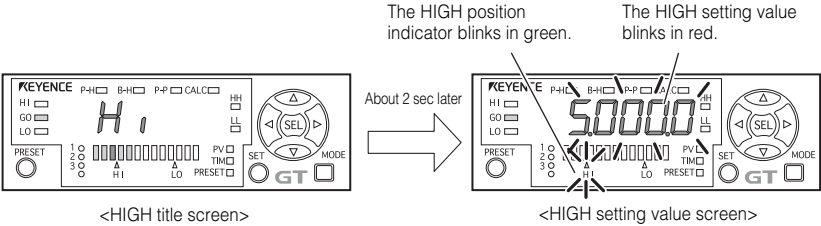
The changed HH setting value can be initialized after simultaneously holding down the [Up] and [Down] arrow buttons for 2 seconds or more while the HH setting value screen is displayed.

(5) HIGH setting value display

Displays the upper limit value of the acceptable measuring range.
If the P.V. value exceeds this value, the HIGH output activates.
If the P.V. value stays between the HIGH setting value and LOW setting value, the GO output activates.

Reference

- The HIGH setting value screen is not displayed in the following case.
- On the main screen of the main unit when "CALc (calculation mode)" is selected in the function setting "A1. Calculation Mode" and the setting other than "C5.rEF (reference difference)" is selected in the function setting "A2. Calculation Method" of the main unit.

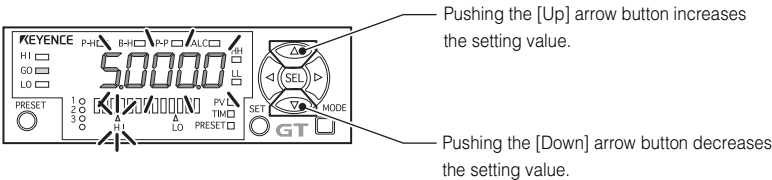


- Approximately two seconds after the title screen appears, it changes to the digital LED display.
- From the " (5) HIGH setting value display" and " (6) LOW setting value display", the two-point calibration can be set.

Two-point calibration" (page 3-18)

Changing the HIGH setting value

You can change the setting using the [Up] or [Down] arrow button while the HIGH setting value screen is displayed.



Item	Setting range	Initial value
HIGH setting value	-199.9999 to 199.9999	5.0000

Reference

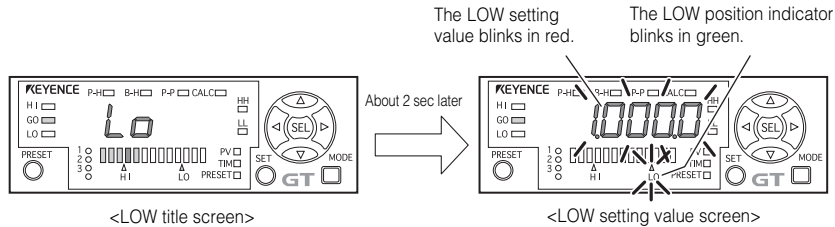
The changed HIGH setting value can be initialized after simultaneously holding down the [Up] and [Down] arrow buttons for 2 seconds or more while the HIGH setting value screen is displayed.

(6) LOW setting value display

Displays the lower limit value of the acceptable measuring range.
If the P.V. value drops below this value, the LOW output activates.
If the P.V. value stays between the HIGH setting value and LOW setting value, the GO output activates.

Reference

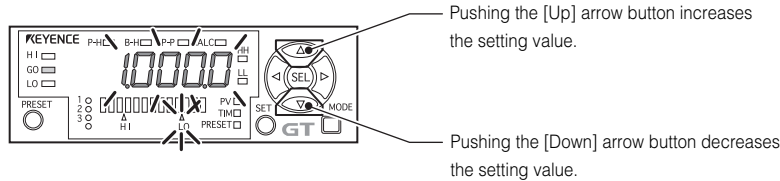
- The LOW setting value screen is not displayed in the following case.
 - On the main screen of the expansion unit when "CALc (Calculation Mode)" is selected in the function setting "A1. Calculation Mode" and the setting other than "C5. rEF (Reference difference)" is selected in the function setting "A2. Calculation Method" of the main unit.



- Approximately two seconds after the title screen appears, it changes to the digital LED display.
 - One can perform a two-point calibration from the "(5) HIGH setting value display" and "(6) LOW setting value display".
- 📖 "Two-point calibration" (page 3-18)

■ Changing the LOW setting value

You can change the setting value using the [Up] or [Down] arrow button while the LOW setting value screen is displayed.



Item	Setting range	Initial value
LOW setting value screen	-199.9999 to 199.9999	1.0000

Reference

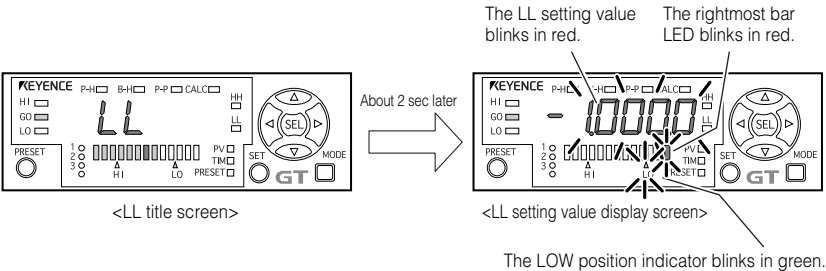
The changed LOW setting value can be initialized after simultaneously holding down the [Up] and [Down] arrow buttons for 2 seconds or more while the LOW setting value screen is displayed.

(7) 5 output LL setting value display

When using the 5 output function, display/set the LL setting value lower than the LOW setting value.
When the P.V. value drops below the value set here, the LL criterion is output.
For details on the 5 output function, refer to [16. Special Output Setting] (page 5-26).

Reference

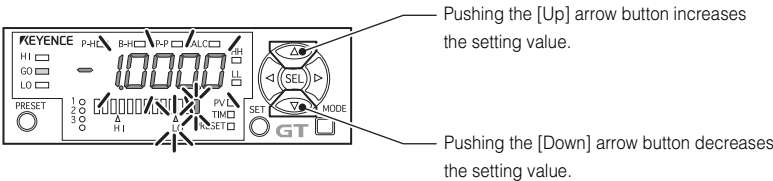
- 5 output LL setting value screen is not displayed in the following cases.
- When the setting other than "5out (5 output)" is selected in the basic setting "16. Special Output Setting" of the main/expansion unit.
 - On the main screen of the expansion unit "CALc (Calculation Mode)" is selected in the function setting "A1. Calculation Mode", and the setting other than "C5. rEF (reference difference)" is selected in the function setting "A2. Calculation Method" of the main unit.
 - When the sensor amplifier is GT2-71MCN/71MCP (analog output type).



- Approximately two seconds after the title screen appears, it changes to the digital LED display.

■ Changing the LL setting value

You can change the setting using the [Up] or [Down] arrow button while the LL setting value screen is displayed (while the displayed value, LOW position indicator and the leftmost bar LED blink).



Item	Setting range	Initial value
LL setting value	-199.9999 to 199.9999	-1.0000

Reference

The changed LL setting value can be initialized after simultaneously holding down the [Up] and [Down] arrow buttons for 2 seconds or more while the LL setting value screen is displayed.

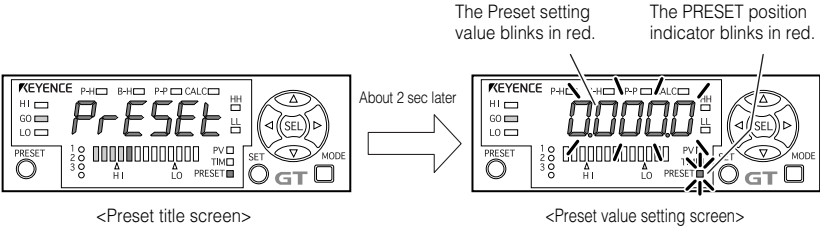
(8) Preset value setting display

Display/Set the number to be added to or subtracted from the display value.

For details on the preset function, refer to "Preset Function (Displaying a value by Adding or Subtracting a Desired Value)" (page 3-30).

Reference

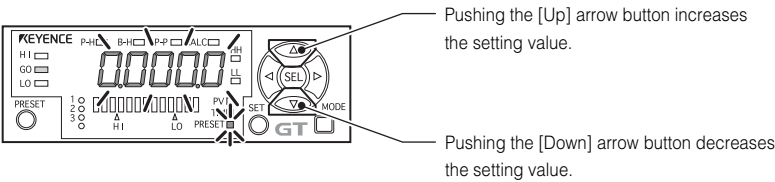
- The preset value setting screen is not displayed in the following case.
 - On the main screen of the main unit when the setting other than "CAL.noH (calculation dedicated mode)" is selected in function setting "A1. Calculation Mode" of the main unit.



- Approximately two seconds after the title screen appears, it changes to the digital LED display.

■ Changing the preset setting value

You can change the setting value using the [Up] or [Down] arrow button while the Preset setting value screen is displayed (when the displayed value and the PRESET position indicator blink).



Item	Setting range	Initial value
Preset setting value	-199.9999 to 199.9999	0.0000

Reference

The changed preset setting value can be initialized after simultaneously holding down the [Up] and [Down] arrow buttons for 2 seconds or more while the preset value setting screen is displayed.

3-2 Origin Alignment

When you use the GT2-70 Series for the first time or when you replace the sensor head, you must reset the origin.

The tolerance range will be now based on the new origin.

📖 "3-3 Setting the Tolerances" (page 3-14)

The origin can be adjusted either by the sensor directly or from a remote external input.

Align the origin by the following methods.

- Adjusting the origin directly from the sensor
- Origin alignment by external input

NOTICE	• You cannot align the origin when the R.V. value display screen is displayed as "-----". (Immediately after the power is turned on, or immediately after the reset input) • Aligned origin is written to the internal memory every time, so the changed origin is saved even after the power is turned off. The origin alignment can be performed up to about a million times. • If you frequently perform origin alignment through an external input, select "OFF" for " 21. Store Preset Value". If "OFF" is selected, origin alignment can be set, however it is not written to the internal memory. (When the power is turned off, it returns to the previously stored origin.) 📖 "21. Store Preset Value" (page 5-42)
---	--

Reference

We recommend that you should periodically reset the origin for more accurate judgment.

Adjusting the Origin Directly from the Sensor

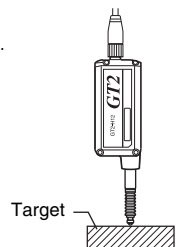
This section describes the procedures of the origin alignment using the operation buttons of the sensor amplifier.

1 Place the sensor's contact on the desired target to serve as the origin.

Reference

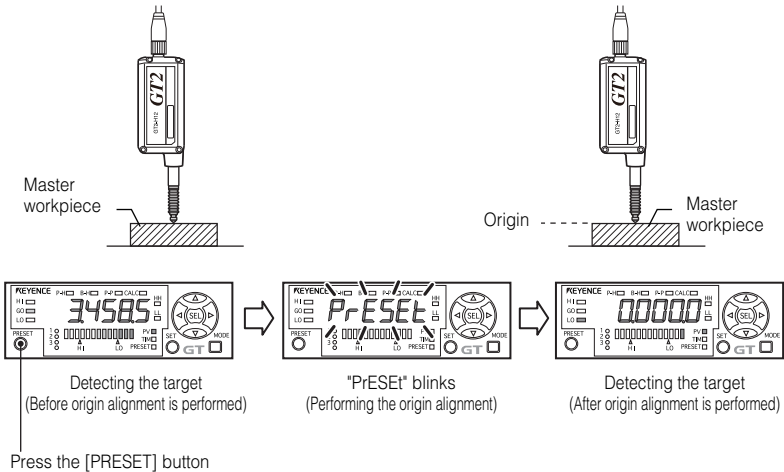
The origin can only be set on the main screen.

📖 "3-1 Main Screens" (page 3-2)



2 Press the [PRESET] button while the master workpiece is in place.

After "PrESeT" blinks several times on the amplifier display screen, "0.000.0" * is displayed on the P.V. value display, and the origin has been set.



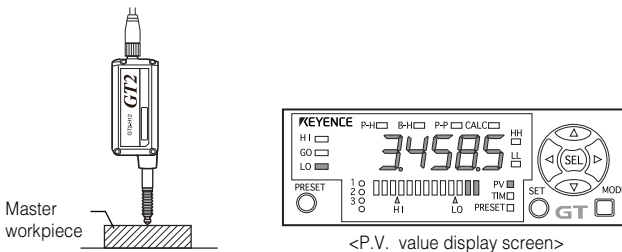
* When using the preset function, the specified preset value is displayed.

Reference To reset the origin to factory default, hold down the [PRESET] button.
After "PrESeT" is displayed, "rESeT" blinks, indicating that the origin alignment is reset to the factory default setting.

■ Origin alignment combined with the preset function

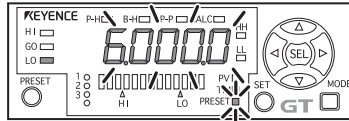
When you want to display a desired value for the measured value, such as when measuring a master workpiece, the origin can be aligned without changing the mounting position of the sensor head by combining the preset function.

1 Place the sensor's contact on the desired target to serve as the origin.



2 Set a value that you want to display when measuring the master workpiece.

Example If you want to make the measured value for the master workpiece 6.000.0, set the preset value to 6.000.0.

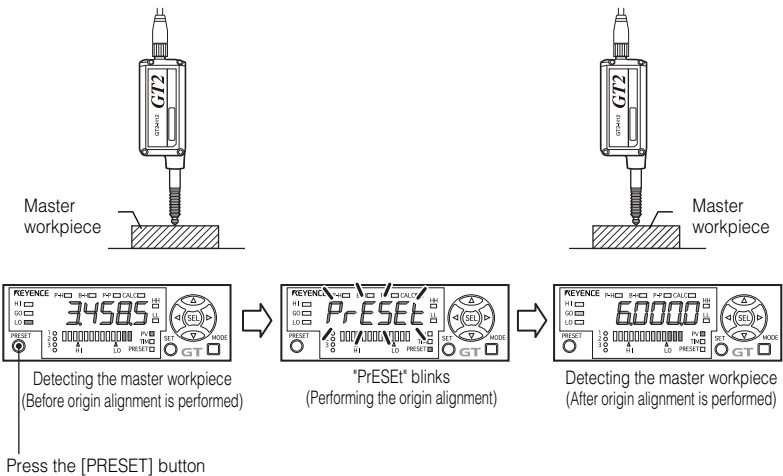


<Preset value setting screen>

☞ " (8) Preset value setting display" (page 3-10)

3 Press the [PRESET] button while the master workpiece is in place.

After "PrESET" blinks several times on the amplifier display screen, "6.000.0" is displayed on the P.V. value display screen.



Origin Alignment by External Input

By short-circuiting "Preset input" (pink line) from the external device, origin alignment is performed within the minimum input time. (The preset indicator blinks for about 0.3 seconds.)

☞ "7-2 I/O Diagram" (page 7-14)

☞ "Minimum Input Time" (page 7-20)

Reference

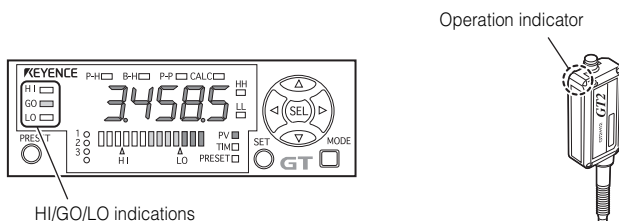
When origin alignment is performed by external input, "PrESET" is not displayed.

3-3 Setting the Tolerances

The tolerances of the GT series are comprised of upper and lower limits. Any measured value that goes beyond the upper or lower limits will activate the HIGH or LOW outputs respectively. Any measured value that lies between the tolerances will activate a GO output.

These outputs are displayed on both the sensor amplifier as well as the head. A HIGH or LOW output is displayed as a red operation indicator light where as a GO output is a green light. The operation indicator on the head is easily visible so that a user can simply glance at the sensor and know whether the target is good or defective.

The operation indicator blinks while the sensor head is being set, so even if multiple devices are installed side by side, the sensor head currently being set can be recognized at a glance.



The tolerances can be set either manually or automatically.

Item		Procedure for setting the value
Manual setting		Directly enter the tolerances (HIGH setting value, LOW setting value).
Automatic setting	Tolerance calibration	Measure the master workpiece and set the tolerance.
	Two-point calibration	Measure the good and defective product and set the tolerance.

Reference

When setting the tolerances manually or by two-point calibration, be sure to set them as "HIGH setting value > LOW setting value".

- The criterion output when setting as "HIGH setting value < LOW setting value" is as follows.
 - Regardless of the detected value, the GO criterion is not output.
 - When the value that is over the HIGH setting value and under the LOW setting value is detected, the HIGH criterion and the LOW criterion are output at the same time.
- When "5 out (5 output)" is selected in "16. Special output setting", 5 levels of judgment are possible with two additional setting values.

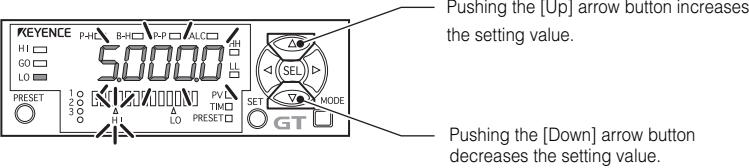
For the HH/LL setting method, refer to "3-4 Setting the HH/LL Criterion Value" (page 3-21).

Setting the Tolerances Manually

This is a method for directly setting the Tolerances (HIGH setting value, LOW setting value).

1 On the main screen of "HIGH setting value", set a value using the [Up]/[Down] arrow button.

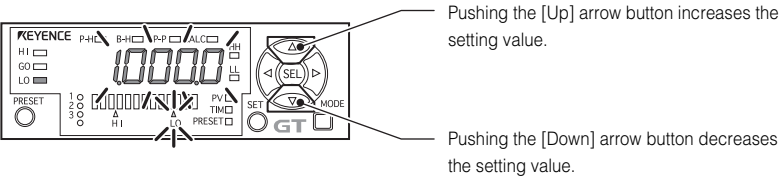
📖 " (5) HIGH setting value display" (page 3-7)



Item	Setting range	Initial value
HIGH setting value	-199.9999 to 199.9999	5.0000

2 On the main screen of "LOW setting value", set a value using the [Up]/[Down] arrow button.

📖 " (6) LOW setting value display" (page 3-8)



Item	Setting range	Initial value
LOW setting value screen	-199.9999 to 199.9999	1.0000

3 To return to the P.V. value display screen, press the [Right]/[Left] arrow buttons.

Reference

When the HIGH setting value or LOW setting value is set, the new setting values immediately take effect.

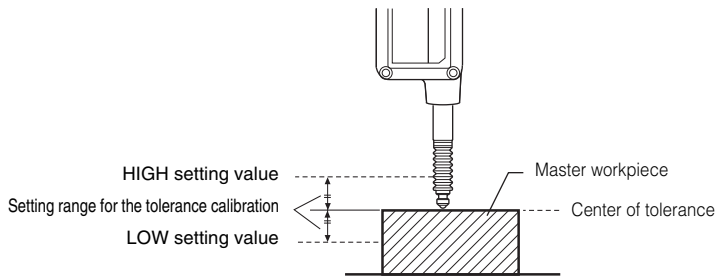
Setting Up the Tolerances Automatically

The upper limit value (HIGH setting value) and lower limit value (LOW setting value) are automatically set.

Tolerances can be set with "Tolerance calibration" when a master workpiece is available and with "Two-point calibration" when actual good and defective targets are available.

Tolerance calibration

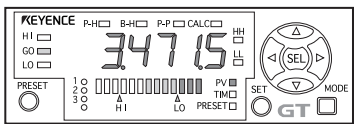
This is a method for setting a range based on the detection value of a master workpiece when the master workpiece is available.



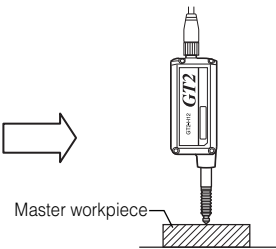
Reference The tolerance calibration cannot be performed when "-----" is displayed.
When "-FFFF" or "FFFF" is displayed, the tolerance cannot be set correctly.

- 1 While on the "P.V. display screen", position the sensor head to measure the master workpiece and display value you want to use as are ference.

(1) P.V. value display" (page 3-3)

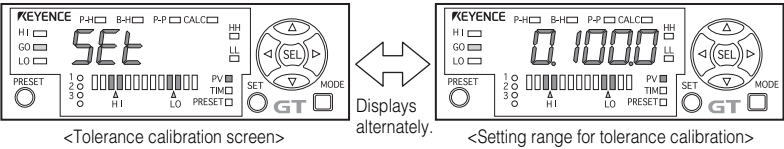


<P.V. value display screen>

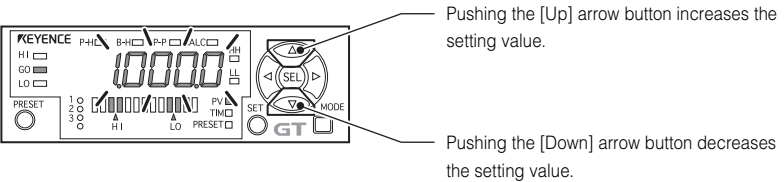


2 Press the [SET] button to capture that value.

The value captured is the now the center of tolerance.



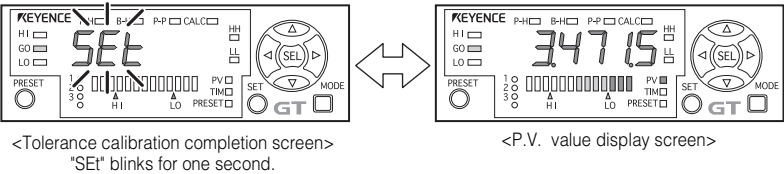
3 Adjust the tolerance calibration range by using the [Up]/[Down] arrow buttons.



Item	Setting range	Initial value
setting range for tolerance calibration	-199.9999 to 199.9999	0.1000

4 Press the [SET] button to complete the tolerance calibration setup.

"SEt" blinks, and the HIGH setting value and LOW setting value are determined. After it blinks for about a second, it returns to the P.V. value display screen.



Reference

The HIGH setting value and LOW setting value can be adjusted after the tolerance calibration is set.

☞ " (5) HIGH setting value display" (page 3-7)

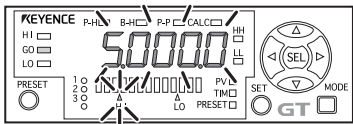
☞ " (6) LOW setting value display" (page 3-8)

Two-point calibration

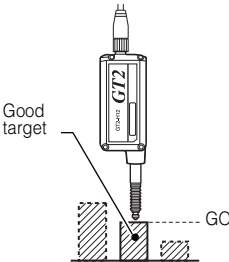
This is a method to set the intermediate value between a good target and a defective target as the tolerance when a good target, a HIGH defective target and a LOW defective target are available.

Reference The two-point calibration cannot be performed when "-----" "-FFFF" or "FFFF" is shown on the R.V. value display.

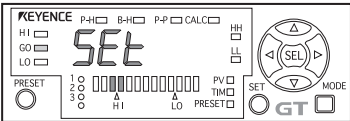
- 1** On the main screen of "HIGH setting value display", detect the good target that you want to be judged as a GO output.



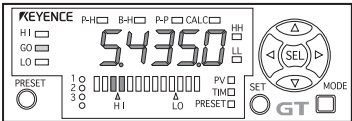
<HIGH setting value screen>



- 2** Press the [SET] button while the good target is being detected.

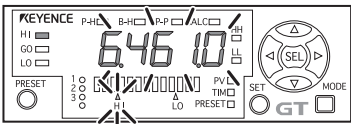


Displays alternately.

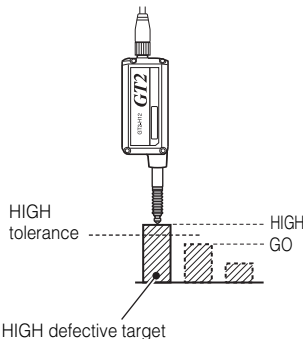


Detected value for the good target

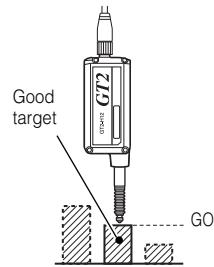
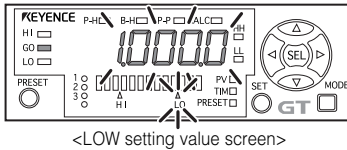
- 3** Press the [SET] button while the HIGH defective target is being detected.
The value for the HIGH defective target is captured.



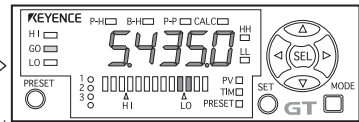
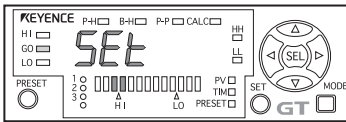
For the HIGH setting value, the intermediate value of the detected values of the good target captured in step 2 and the HIGH defective target captured in step 3 is set.



- 4** Display the main screen of "LOW setting value screen" and detect a good target that you want to judge as a good workpiece (GO criterion).



- 5** Press the [SET] button while the good target is being detected.

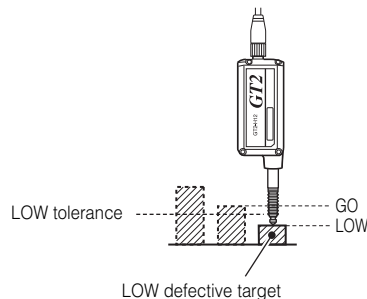


Detected value for the good target

- 6** Press the [SET] button while the LOW defective target is being detected.
The value for the LOW defective target is captured.



The intermediate value between the detection value of the good target captured in step 5 and the detection value of the LOW defective target captured in step 6 is set as the LOW setting value.



- 7** Press the [Right]/[Left] arrow buttons to return to the P.V. value display screen.

Two-point calibration is complete.



Reference

The HIGH setting value and LOW setting value can be adjusted after the two-point calibration is set.

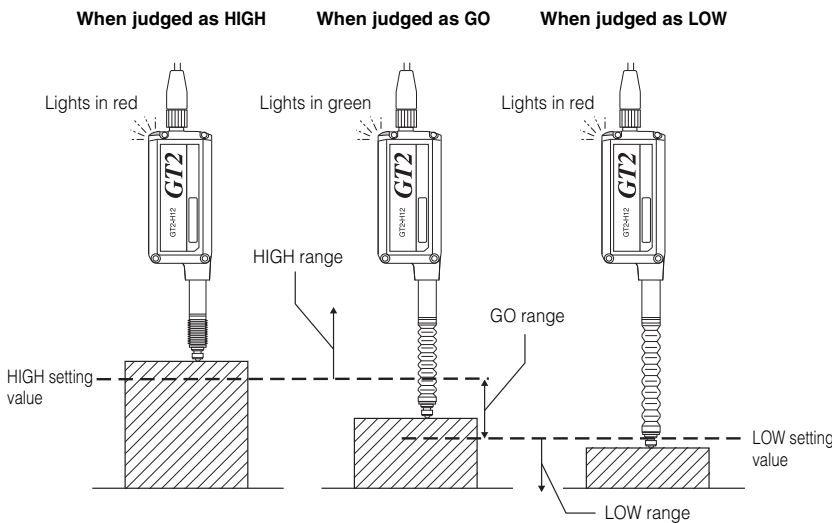
☞ " (5) HIGH setting value display" (page 3-7)

☞ " (6) LOW setting value display" (page 3-8)

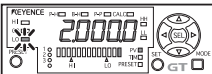
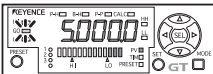
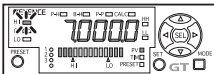
Displaying the Detection Result

After the tolerance setup of the GT2-70 Series is completed the following results are displayed on the sensor amplifier and sensor head.

In this example, the tolerances "HIGH setting value = 6.0000" and "LOW setting value = 3.0000" are set.



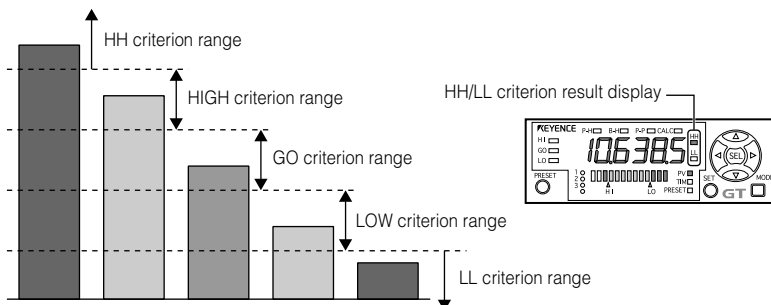
P.V. value display screen



When "5out (5 output)" is selected in "16. Special Output Setting" of the basic setting mode, HH setting value can be set above the upper limit (HIGH setting value) and the LL setting value can be set below the lower limit (LOW setting value).

The criterion is displayed and output in 5 levels by adding HH criterion and LL criterion to HIGH criterion, LOW criterion, and GO criterion.

Reference When the sensor amplifier is GT2-71MCN/71MCP (analog output type), the HH/LL criterion value cannot be set.



HH/LL criterion value is set either manually or automatically.

Item		Setting method
Manual setting		Directly input the criterion value (HH setting value, LL setting value).
Automatic setting	Two-point calibration	Detect the good target and HH/LL criterion target, and automatically set the tolerance.

- Reference**
- The HH setting value/LL setting value can be set only when "5out (5 output)" is selected in "16. Special Output Setting" of the basic setting mode.
 - When setting the criterion values manually and or with the two-point calibration, make sure to set the values in the following relationship. HH setting value > HIGH setting value > LOW setting value > LL setting value
 - When setting the values as "HH setting value < HIGH setting value", the HIGH setting value is not output.
 - When setting the values as "LOW setting value < LL setting value", the LOW setting value is not output.
 - Criterion outputs when setting the values as "HH setting value < LL setting values" are as follows.
 - Regardless of the detected value, the GO criterion, HIGH criterion, and LOW criterion are not output.
 - When the value that is over the HH setting value and under the LL setting value is detected, the HH criterion and the LL criterion are output at the same time.

Setting HH/LL Criterion Value Manually

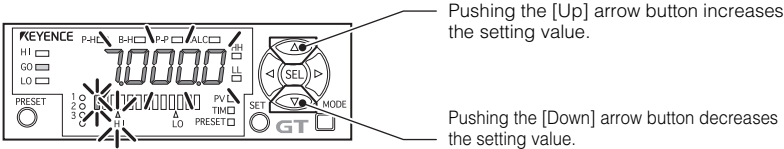
Following is a method for directly setting the HH/LL criterion value (HH setting value, LL setting value).

Reference

When the sensor amplifier is GT2-71MCN/71MCP (analog output type), the HH/LL criterion value cannot be set.

1 Display the "HH setting value screen" of the basic screen and set a desired value using the [Up] or [Down] arrow button.

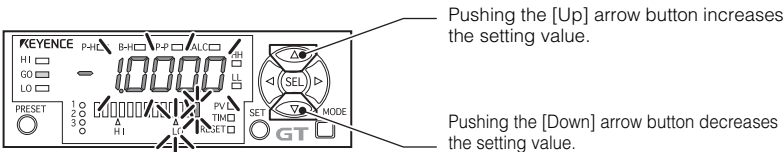
📖 "(4) 5 output HH setting value display" (page 3-6)



Item	Setting range	Initial value
HH setting value	-199.9999 to 199.9999	7.0000

2 Display the "LL setting value screen" of the basic screen and set a desired value using the [Up] or [Down] arrow button.

📖 "(7) 5 output LL setting value display" (page 3-9)



Item	Setting range	Initial value
LL setting value	-199.9999 to 199.9999	-1.0000

3 Return to the P.V. value display screen using the [Right] or [Left] arrow button.

Reference

When the HH setting value/LL setting value is set, the criterion identification and output start at the same time with a new setting value.

Setting HH/LL Criterion Value Automatically

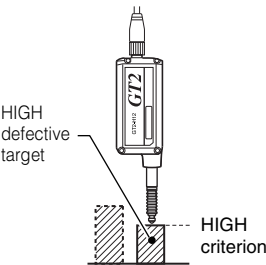
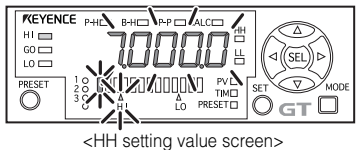
You can set the HH/LL criterion value (HH setting value, LL setting value) automatically (two-point calibration).

The following is a method to set the intermediate value between the detected values of the HIGH defective target, HH defective target, LOW defective target, and LL defective target as the tolerance for each pair when these defective targets are available.

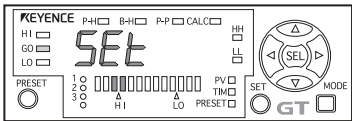
Reference

- When the sensor amplifier is GT2-71MCN/71MCP (analog output type), the HH/LL criterion value cannot be set.
- When the R.V. value display screen is displayed as "-----", the two-point calibration cannot be performed. When "-FFFF" or "FFFF" is displayed, the tolerance cannot be set correctly.

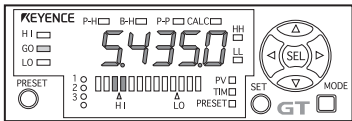
- 1** Display "HH setting value screen" of the main screen and detect the HIGH defective target (the detected target that you want to judge as the HIGH criterion).



- 2** While the HIGH defective target is being detected, press the [SET] button to capture the value.



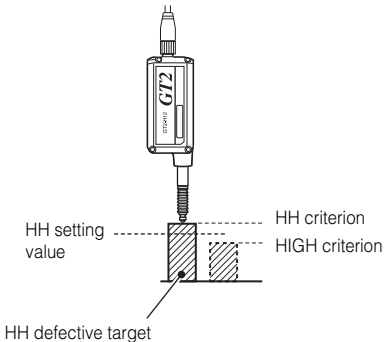
Displays alternately.



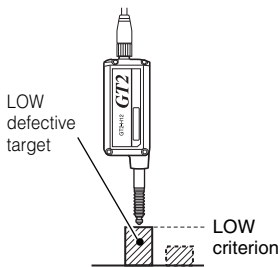
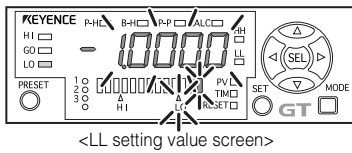
Detected value for the HIGH defective target

3 When the HH defective target is detected, press the [SET] button to capture the value.

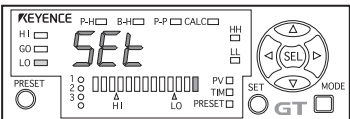
The detected value of the HH defective target is captured, and the HH setting value is determined.



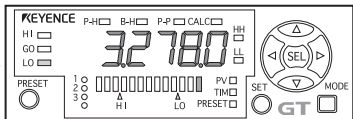
4 Display "LL setting value screen" of the basic screen and detect the Low defective target (the detected target that you want to judge as the LOW criterion).



5 While the LOW defective target is being detected, press the [SET] button to capture the value.



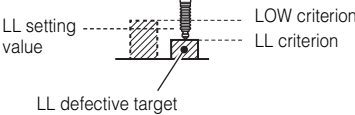
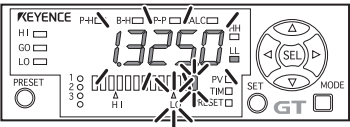
Displays alternately.



Detected value for the LOW defective target

6 When the LL defective target is detected, press the [SET] button to capture the value.

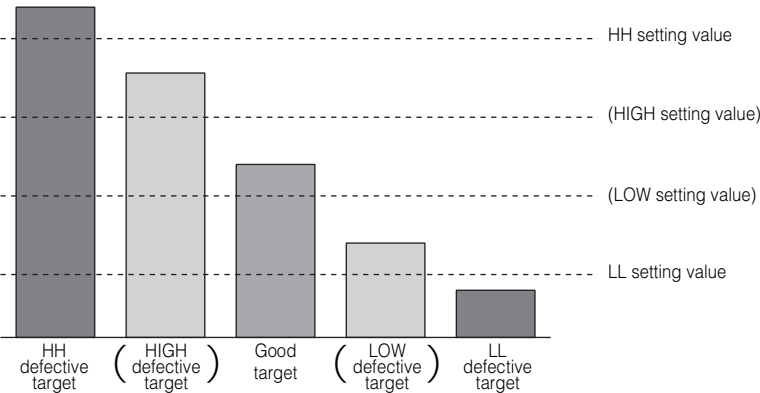
The detected value of the LL defective target is captured, and the LL setting value is determined.



For the LL setting value, the intermediate value of the detected values of the LOW defective target captured in step 5 and the LL defective target captured in step 6 is set.

7 Return to the P.V. value display screen using the [Right] or [Left] arrow button.

The two-point calibration is completed.



Reference

The HH setting value and LL setting value can be adjusted after the two-point calibration is set.

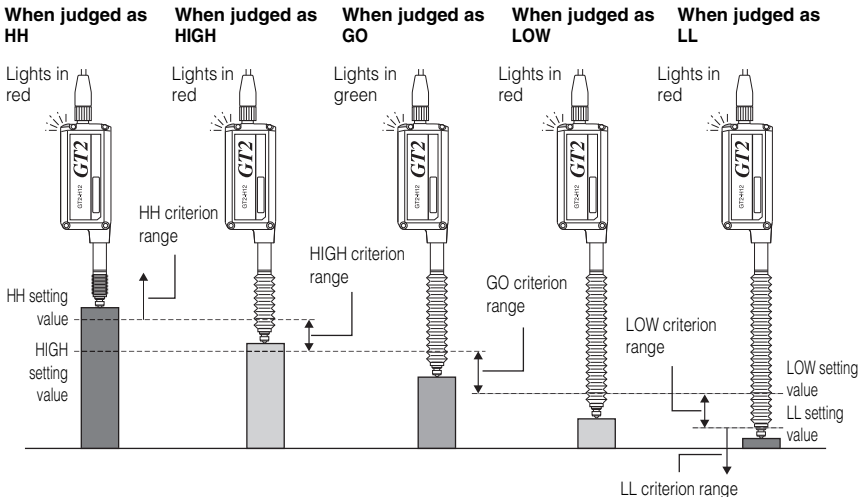
📖 "(4) 5 output HH setting value display" (page 3-6)

📖 "(7) 5 output LL setting value display" (page 3-9)

Displaying the Detection Result

After the HH/LL criterion values are complete and detection is performed, the following results are displayed on the sensor amplifier and sensor head.

In this example, the criterion values are set as "HIGH setting value = 7.0000", "LOW setting value = 3.0000", "5 output HH setting value = 9.000", and "5 output LL setting value = 1.000".



P.V. value display screen



Reference

- Operations of the HH output/LL output change depending on the items selected in "16. Special Output Setting".
 - "16. Special Output Setting" (page 5-26)
- When the sensor amplifier is GT2-71MCN/71MCP (analog output type), the HH/LL criterion value cannot be set.

3-5 Analog Output Function

If the sensor amplifier is GT2-71MCN/71MCP (analog output type), the measurement value (R.V. value) can be output after being converted into the electric current value (4 to 20 mA).

Reference

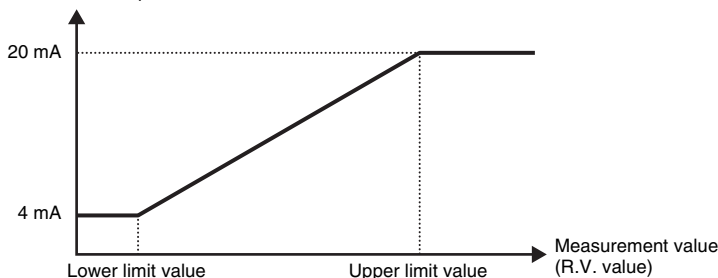
- The analog output function is available only when the sensor amplifier is GT2-71MCN/71MCP.
- When the sensor amplifier is in an error state, 0 mA are output.
- When "Calculation dedicated mode" is selected in "A1. Calculation mode setting", the measurement value (R.V. value) is output based on the CALC value (calculation result value).

Analog Output

When "dEFAlt (default)" is selected in "16. Analog Range Setting", the sensor amplifier (GT2-71MCN/71MCP) converts the measurement value (R.V. value) into an electric current value (4 to 20 mA) and outputs it as follows.

📖 "16. Analog Range Setting" (page 5-37)

Electric current output



Upper limit value

The upper limit varies depending on the sensor head being used.

Sensor head	Upper limit value
1 mm stroke type	1.0000
5 mm stroke type	5.0000
12 mm stroke type	12.0000
32 mm stroke type	32.0000
50 mm stroke type	50.0000
"Calculation dedicated mode" is selected	12.0000

Lower limit value

The lower limit value is the position where the R.V. value display screen shows "0.0000" regardless of the sensor head being used.

Analog output specifications

Output range	4 to 20 mA
Resolution	3 μ A
Accuracy	Set range $\pm$ 0.25%
Update cycle	1 ms
Response time	Response time set on the amplifier + 1 ms (100% response)
Load resistance	Max. 350 Ω

Free Range Analog Setting

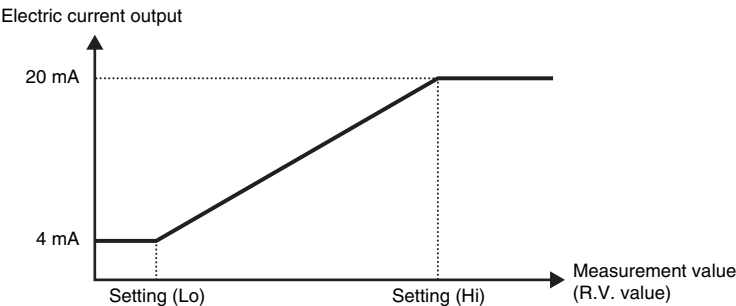
When "FrEE (Free range settings)" is selected in "16. Analog Range Setting", the range of the analog output can be set to a desired value in "17. Free Range Settings (Hi)" and "18. Free Range Settings (Lo)".

📖 "17. Free Range Settings (Hi)" (page 5-38)

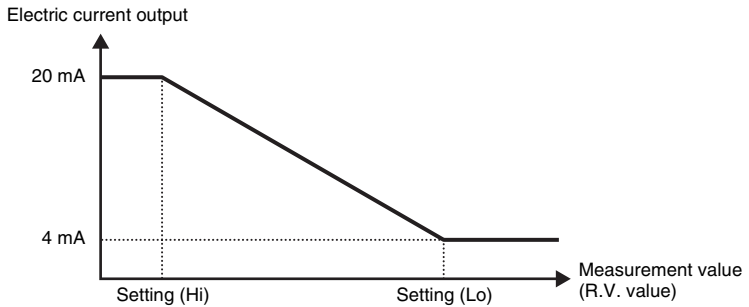
📖 "18. Free Range Settings (Lo)" (page 5-39)

Item	Setting range
Free range settings (Hi)/Free range settings (Lo)	-199.9999 to 199.9999 (unit: mm)

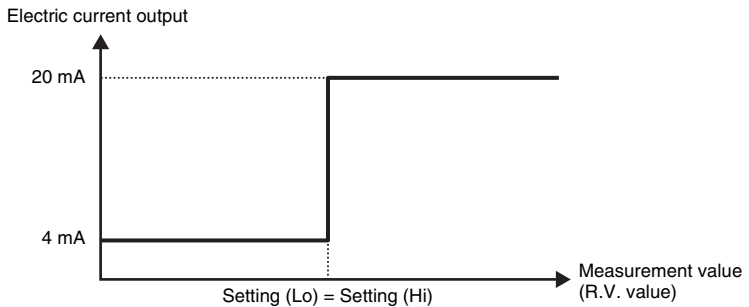
When the setting is Hi > Lo



When the setting is $Hi < Lo$



When the setting is $Hi = Lo$



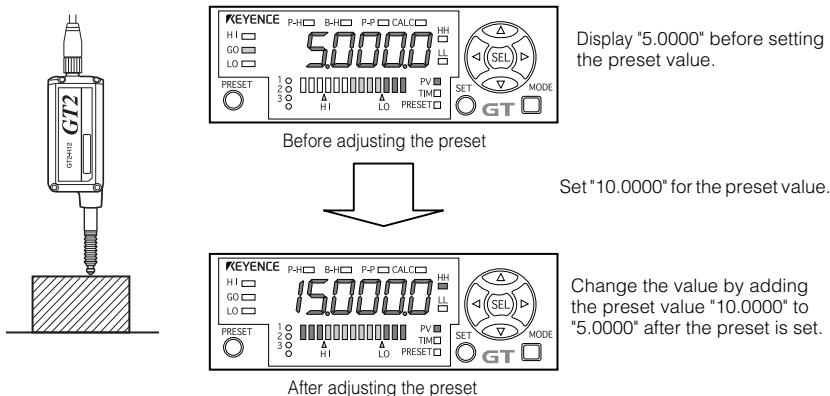
- * When the measurement value (R.V. value) is less than the Hi/Lo Setting, 4 mA is output. When the measurement value (R.V. value) is greater than the Hi/Lo Setting, 20 mA is output.

3-6 Useful Functions

Preset Function (Displaying a value by Adding or Subtracting a Desired Value)

When the preset value is set, the displayed value can be changed by adding or subtracting the desired value (preset value).

Example To change the value by adding "10.0000"



- Adjust the preset on the main screen of "Preset value setting screen".
 [Icon] " (8) Preset value setting display" (page 3-10)
- The criterion outputs are judged by setting the value to which the preset value is added as the detected value. After the preset values is set, set the criterion values (5 output HH setting value/HIGH setting value/LOW setting value/LL setting value) again.
- By combining with the origin alignment, a desired value can be displayed as the detected value of the workpiece (master workpiece).
 [Icon] "3-2 Origin Alignment" (page 3-11)

Bank Function (Registering Multiple Criterion Values and Preset Values)

With GT2-70 Series, you can register up to four pre-registered HI/GO/LO settings.

- HH setting value
- HIGH setting value
- LOW setting value
- LL setting value
- Preset point (origin alignment position)
- Preset value

By using the bank function, registered setting items can be switched easily according to the changes of the type of the detection target.



Reference

The preset point can be set for each bank individually or for all the banks together.

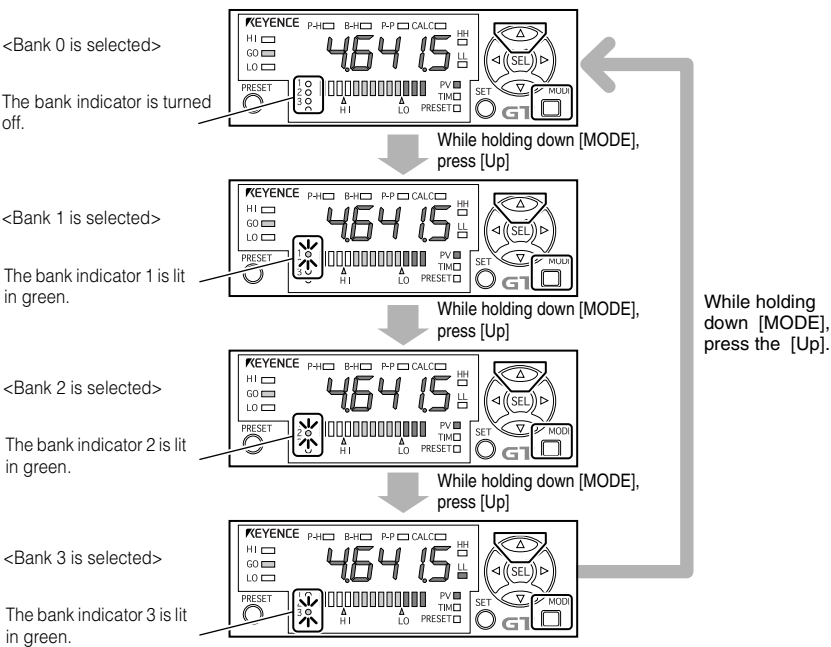
"22. Preset Point" (page 5-43)

How to switch the bank

The bank can be switched either by button operations of the sensor amplifier or by an external input.

■ Switching the bank by button operation

While holding down the [MODE] button, press the [UP] arrow button. Each pressing of the [Up] button allows the bank to switch to another one.



Reference

The bank can be switched by external input only when the key lock is active.

Therefore, when the key lock is activated, the bank switches depending on the status (combination of ON/OFF) of the BANK A input (violet wire) and Bank B input (yellow wire).

☞ "Switching the bank by external input" (page 3-33)

The selected bank is retained even after turning off the power and turning it back on.

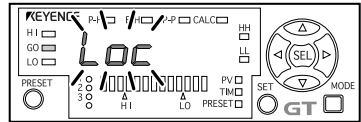
■ Switching the bank by external input

Switching the bank using an external input is performed using Bank A input (violet wire) and Bank B input (yellow wire).

1 Set the key lock function.

If you switch the bank using an external input, the sensor amplifier must be in a key locked state or full key locked state.

📖 "Key Lock" (page 3-39)



2 Switch the banks by combining ON/OFF of the BANK A input and Bank B input.

- The bank input should be 20 ms or longer.
📖 "Minimum Input Time" (page 7-20)
- The combination patterns of BANK A input and BANK B input are as follows.

Bank	Input line 1	Input line 2
Bank 0	OFF	OFF
Bank 1	ON	OFF
Bank 2	OFF	ON
Bank 3	ON	ON

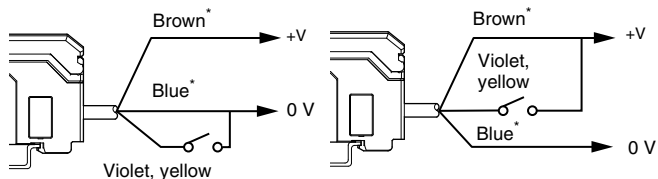
ON: Short-circuited
OFF: Open

- The display when the bank is switched using the input line function is the same as when the bank is switched using the buttons.
📖 "Switching the bank by button operation" (page 3-32)
- When key lock is deactivated, the bank selected by the input line is retained.

Reference

GT2-71(C)N/72(C)N/75N/76N

GT2-71(C)P/72(C)P/75P/76P



* The expansion units (GT2-72N/76N, GT2-72P/76P) have no brown-blue line. (The power wires of the main unit and those of the expansion unit are bussed together.)
The brown and blue lines are not connected on the GT2-72CN/72CP.

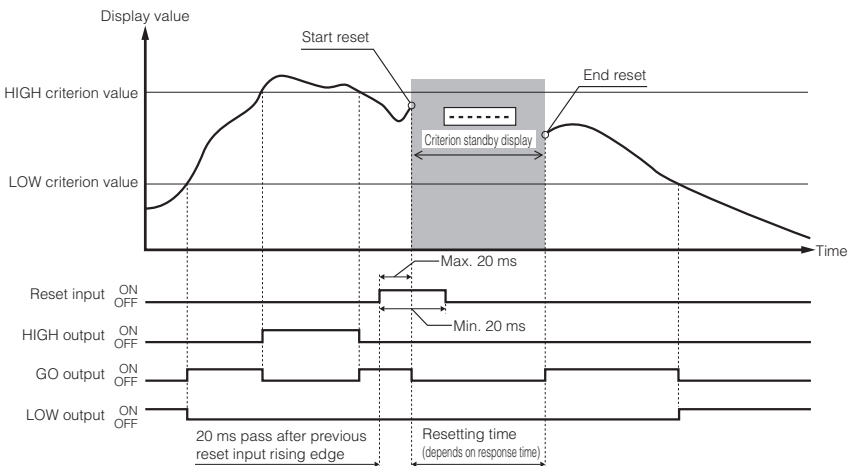
📖 "7-2 I/O Diagram" (page 7-14)

Reset Input (Resetting Internal Values)

When a reset signal is input from an external input (red wire), all of the outputs are turned off (when N.O. is set) and the P.V. and R.V. values become "- - - - -" during the reset (from 20 ms after the rise of the reset input to the completion of reset).

Reference

The resetting time is the same as the response time set in "03. Response Time" (page 5-9).



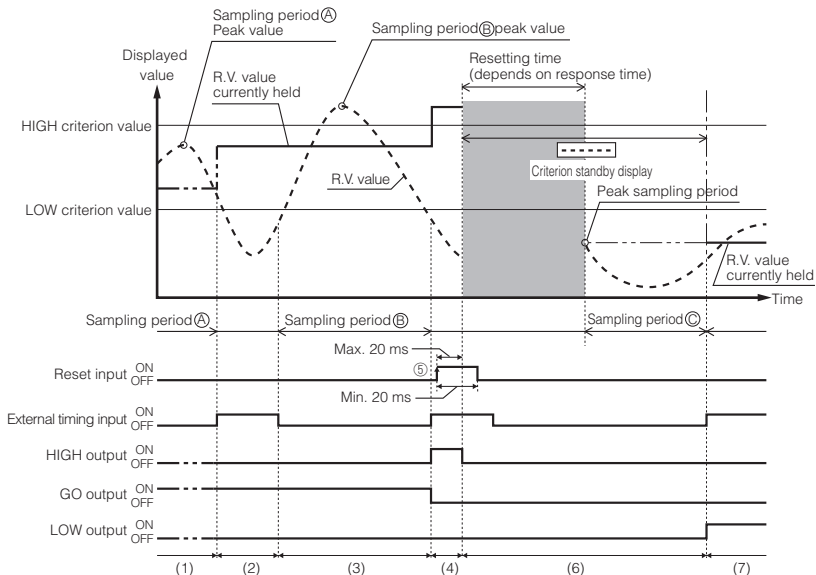
Reference

Wait until 20 ms have passed after the previous reset input before entering a new reset input. If fewer than 20 ms pass, the reset input may not be recognized.

Reset input when using the hold function

When a reset signal is input from an external input (red wire) while using the hold function, all of the criterion outputs are turned off (when N.O. is set) and the P.V. and R.V. values becomes "-----" from the time that resetting starts to the time when the next external timing input turns on.

Reference The resetting time is the same as the response time set in "03. Response Time" (page 5-9).



- (1) The peak value is stored while the external timing input is off (sampling period ①).
- (2) At the rise time of the external timing input (end of the sampling period ①), the peak value stored during the sampling period ① is displayed. This peak value is taken as a measured value and the GO output turns on.
- (3) Peak value is stored while the external timing input is off (sampling period ②).
- (4) At the rise time of the external timing input (end of the sampling period ②), the peak value stored during the sampling period ② is displayed. The peak value is taken as the measured value. In this case, The HIGH output turns on.
- (5) When a reset signal currently held is activated, all of the criterion outputs are turned off 20 ms after the reset input started at the latest. At this time, "-----" is displayed on the sensor amplifier.
- (6) After the resetting time ends, sampling starts when the external timing input turns off. Sampling continues until the next external timing input turns on and the peak value is saved.
- (7) At the rise time of the external timing input (end of the sampling period ③), the peak value stored during the sampling period ③ is displayed. This peak value is taken as a measured value and the GO output turns on.

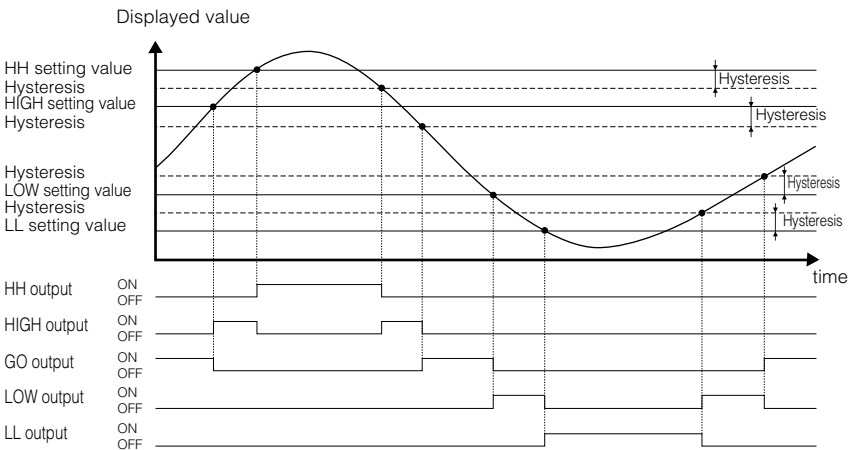
Reference Wait until 20 ms have passed after the previous reset input before entering a new reset input. If fewer than 20 ms pass, the reset input may not be recognized.

Hysteresis

If the P.V. value is fluctuating around the tolerances, the outputs may repeatedly turn on and off. By increasing the hysteresis value, the delta between the SET and RESET distance widens to reduce output chattering.

You can set the hysteresis in the basic setting mode of "14. Hysteresis".

📖 "14. Hysteresis" (page 5-22)



Reference

- The hysteresis is set to "0.0030" when shipped from the factory.
- The hysteresis is available during HIGH/GO/LOW criterion output, and HH/LL output when "5out (5 output)" is selected in "16. Special Output Setting".
- The hysteresis of HH/LL output cannot be changed when "Lt (limit output)" or "Lt.USER (limit output user setting)" is selected in "16. Special Output Setting".

Initialization (Initial Reset)

Reset all settings* to the factory default setting.

* The span adjustment result set in the calibration setting is not initialized.

📖 "30. Calibration Function Setting" (page 5-52)

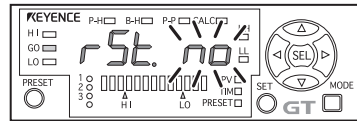
1 On the main screen, while holding down the [MODE] button, press the [SET] button five times.

The initialization screen appears.

"no" is blinking.

Reference

When you press either [PRESET], [SET], [LEFT], or [RIGHT], the initialization is canceled and the screen returns to the main screen.



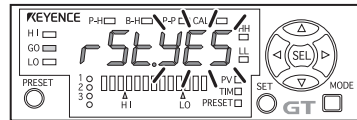
<Initialization screen>

2 Select "rSt.YES" by using the [Up]/[Down] arrow buttons.

"YES" is blinking.

Reference

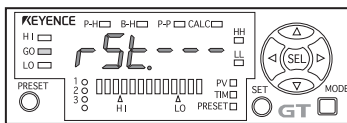
When you press either [PRESET], [SET], [LEFT], or [RIGHT], the initialization is canceled and the screen returns to the main screen.



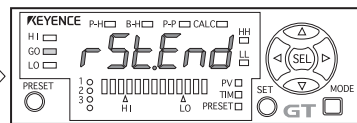
3 Press the [MODE] button to start initialization.

Initialization is completed when "rSt.End" is displayed.

After the initialization is completed, the screen automatically returns to the main screen.



<Resetting screen>



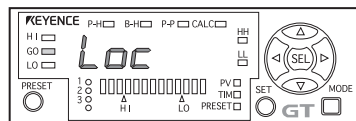
<Reset completion screen>

Reference

When you attempt to initialize the equipment while the key lock function is set, the screen shown on the right appears and the initialization fails.

You must first cancel the key lock setting before attempting to initialize the unit.

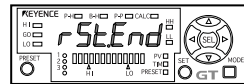
📖 "Key Lock" (page 3-39)



Switching the Display Unit (mm/inch)

The display unit can be switched from the initial reset screen.
This section explains how to switch from "mm" display to "inch" display.

- 1 Display "rSt.YES" from the initial reset screen.**
Refer to "Initial reset" for more details on how to display "rSt.YES".
- 2 Pressing the [MODE] button, press the [SET] button for 2 seconds or more.**
- 3 Use the up and down Arrow button to select "inch".**
- 4 Press the [MODE] button.**
"rSt.End" will appear.
Switching the display unit is completed.



Key Lock

The key lock function prevents unwanted button pushing.

Use either of the following key lock functions according to the purpose.

Key lock: Disables the operations other than the display switching and the operation of the [PRESET] button.

Full key lock: Disables all operations other than the display switching.

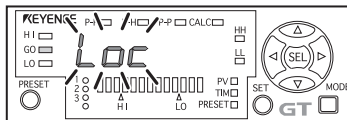
If you switch the bank by an external input, the key lock function (or full key lock) must be set.

📖 "Switching the bank by external input" (page 3-33)

Setting the key lock

On the main screen, while holding down the [MODE] button, press the [Up] arrow button for two seconds or more.

The key lock screen appears and then changes to the main screen.



Key lock screen

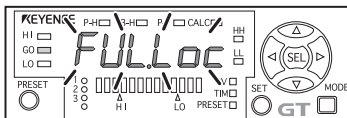
Reference

During key lock, only the switching of the main screen display and the operation of the [PRESET] button are accepted.

Full key lock

Display the main screen, and while pressing the [MODE] button, press the [Down] arrow button for two seconds or more.

The full key lock screen appears, and then changes to the main screen.



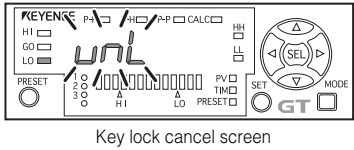
Reference

While the full key lock function is set, only the switching of the main screen display is accepted.

Canceling the key lock

Under the key locked state, while holding down the [MODE] button, press the [Up] or [Down] arrow button for two seconds or more.

The key lock cancel screen appears and then changes to the main screen.



Copy Function

This copies the settings of the main unit to the expansion unit.

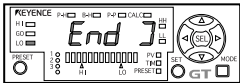
The copy function is available for "function setting", "basic setting", and "additional function setting" respectively.

📖 "List of Setting Modes" (page 5-2)

NOTICE	• The copy function is available only when the expansion unit is added. • This function cannot be used when a model other than the GT2-70 Series is added. • The "calibration setting" cannot be copied.

1 Configure the settings of the main unit for each setting mode, and display the "End J" screen.

The "End J" screen appears in the end when the [Right] arrow button is kept pressed in each setting mode.



<Main unit screen>
➡ Press and hold + for at least 2 sec

2 Press and hold the [Up] and [Down] arrow buttons at the same time while the "End J" screen is displayed (for at least two seconds).

The copy screen appears.
"no" is blinking



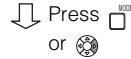
<Main unit screen>
➡ + / +

3 Select "CPY.YES" with the [Up]/[Down] arrow buttons.

"YES" is blinking



<Main unit screen>



4 Press the [MODE] button or the [Right] arrow button to copy the settings to the connected expansion unit.



<Expansion unit screen>

Reference

The following settings will not be copied.

- When the main unit is GT2-71MCN/71MCP (analog output type), items of "16. Analog Range Setting", "17. Free Range Settings (Hi)", and "18. Free Range Settings (Lo)"
- 16. Special Output Setting (only when "ALL.Go" or "ALL.Lt" is selected)
- Limit output teaching position, jam detection checkpoint setting (only when "Lt.USER" (limit output user setting) is selected in "16. Special Output Setting")
- Jam detection teaching position, jam detection checkpoint setting (only when "USER (user)" is selected in "24. Jam detection function")
- The following items when "CAL.noH (calculation dedicated mode)" is selected in "A1. Calculation mode setting"
 - "10. Measurement Direction"
 - "11.Multiplier"
 - Additional function settings (except for "23. Power save function")

MEMO

Using Detection Modes

This chapter describes the detection mode and the setting method of the GT2-70 Series.

4-1	Judging with the Current Value	4-2
4-2	Judging after the Detection Value is Stabilized	4-4
4-3	Judging by the Maximum Value (Peak Hold)	4-10
4-4	Judging by the Minimum Value (Bottom Hold)	4-19
4-5	Judging with the Difference between Maximum and Minimum Values	4-28
4-6	Holding HIGH/LOW Output	4-32

The standard detection mode is used to perform judgment with the current value. In the standard detection the displayed value (P.V. value) and criterion output are always updated.

In addition, the displayed value (P.V. value) and criterion output can be held via timing input.

Holding the Desired Value

When the external timing is input during the standard detection mode, desired timing data (displayed value, criterion output) currently detected can be held.

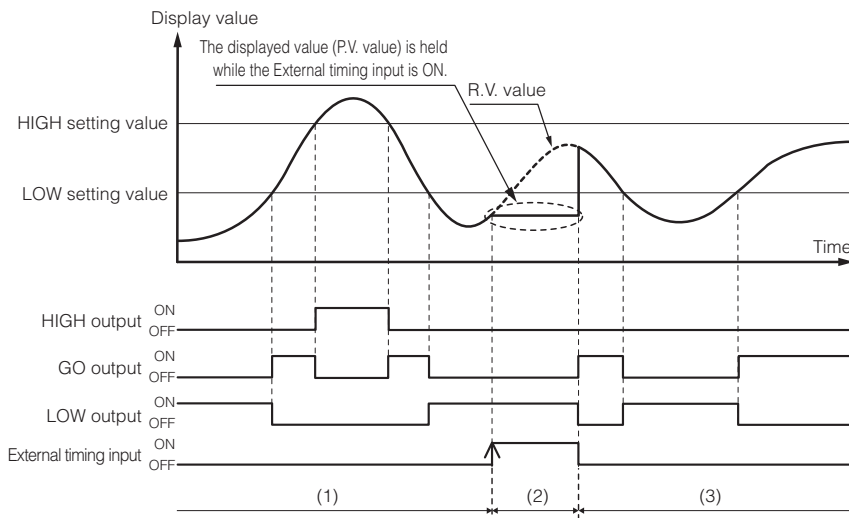
4

■ Timing chart

This section describes changes in the displayed value (P.V. value) and criterion output by the external timing input.

In the following example, "N.O" is set for "12. Output mode".

📖 "12. Output Mode" (page 5-20)



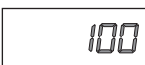
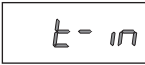
- (1) While the external timing input is off, the displayed value (P.V. value) and criterion output are updated according to the changes of the detection value (R.V. value) from the sensor head.
- (2) The displayed value (P.V. value) and criterion output are held when the external timing is turned on (on the rising edge).
The displayed value (P.V. value) and criterion output do not change regardless of the changes of the detection value (R.V. value) of the sensor head while they are currently held.
- (3) When the external timing input is off, the hold state of the displayed value (P.V. value) and criterion output is cancelled to start the update of the value again.

Reference

For the connection procedure of the external timing input, refer to "7-2 I/O Diagram" (page 7-14).

Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting
 	 Select "Std (Standard detection)" and press the  button.  "01. Detection Mode" (page 5-7)
 	 Select a desired response time and press the  button. "400" is displayed when using GT2-P**/PA**.  "03. Response Time" (page 5-9)
 	 Select "t-in (external timing input)" and press the  button.  "04. Timing Type" (page 5-11)
 	 End the setting and return to the main screen.

4-2 Judging after the Detection Value is Stabilized

When you want to perform judgment only after starting judgment for a workpiece and waiting for fluctuation of the value to end (in other words, when the value is stabilized), set self-timing in the standard detection mode.

There are two methods to perform judgment after fluctuations end.

(1) Judging after a Certain Period of Time Has Passed (Delay Timer)	page 4-4
(2) Automatically Detecting the End of the Fluctuation	page 4-7

(1) Judging after a Certain Period of Time Has Passed (Delay Timer)

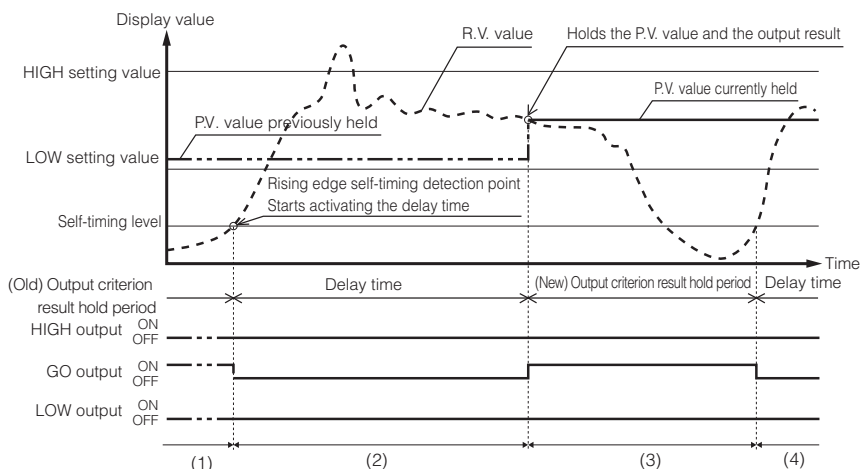
When the delay timer is selected for internal (self-) timing setting during the standard detection the data (displayed value and criterion output) can be held automatically when the specified time (user-specified delay time) is elapsed after the detection value exceeds the arbitrary set level.

■ Timing chart

This section describes changes in the displayed value (P.V. value) and criterion output according to the internal (self-) timing.

In the following example, "N.O" is set for "12. Output mode".

📖 "12. Output Mode" (page 5-20)



- (1) The last output result is held. The displayed value (P.V. value) is also the value that is previously held.
- (2) When the detection value (R.V. value) exceeds the self-timing level, all outputs are turned off and the delay timer starts. At this point, the displayed value (P.V. value) remains unchanged and keeps the value that is previously held.
- (3) The criterion result is output based on the detection value (R.V. value) when the set delay time is elapsed. At this point, the criterion value is held and the displayed value (P.V. value) is updated to the newly held value.

- (4) When the detection value (R.V. value) drops below the self-timing level and exceeds it again, all outputs are turned off and the delay timer starts. The displayed value (P.V. value) remains unchanged and keeps the value that has been held in step (3) until the delay time is elapsed.

Reference

If the detection value (R.V. value) drops below the self-timing level before the delay time has elapsed, the data cannot be held and the error shown to the right appears.

☞ "A2 Error Messages" (page A-5)

In this case, the HIGH and LOW outputs will be on while the GO output is off.

Press the SET button or perform reset input to release the error state. Also when the detection value (R.V. value) exceeds the timing level again, the error is canceled.

When the power is turned on or the error display is reset, the criterion standby display shown to the right is displayed until the first P.V. value is fixed (when the P.V. value display is set) and all outputs are turned off.

Criterion standby display

The setting of hysteresis is reflected on the self-timing level.

☞ "14. Hysteresis" (Page 5-22)

■ Setting procedure

In the function setting mode (press and hold the button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting
	Select "Std (Standard detection)" and press the button. ☞ "01. Detection Mode" (page 5-7)
	Select a desired response time and press the button. "400" is displayed when using GT2-P***/PA***. ☞ "03. Response Time" (page 5-9)
	Select "SELF.L" (rising edge) or "SELF.L" (falling edge) and press the button. ☞ "04. Timing Type" (page 5-11)
	Set the self-timing level to a desired value and press the button. ☞ "05. Self-timing Level" (page 5-12)

4-2 Judging after the Detection Value is Stabilized

Setting item	Setting	
06 dLY 	t.d 	Select "t.d (Delay timer)" and press the   button.  "06. Self Timing Delay Types" (page 5-13)
07 d-t 	t= 1000 	Set the delay timer to a desired value and press the   button.  "07. User-specified Delay Time" (page 5-14)
End] 	End 	End the setting and return to the main screen.

(2) Automatically Detecting the End of the Fluctuation

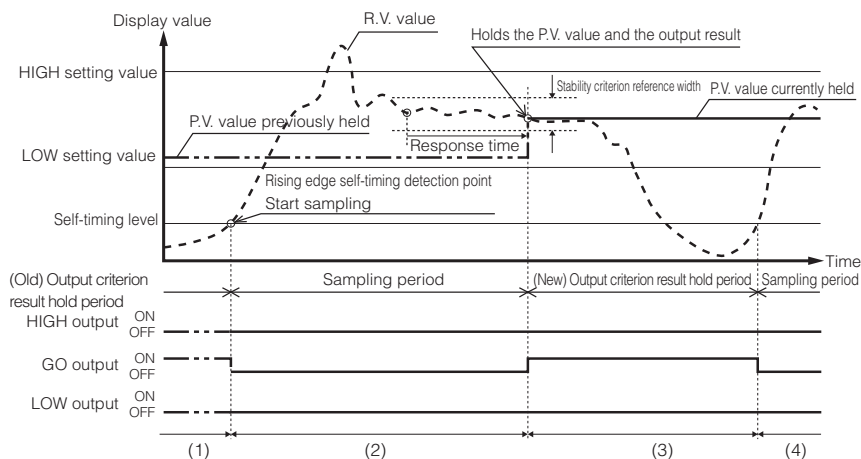
When the static hold is selected for internal (self-) timing setting during the standard detection the data (displayed value and criterion output) is automatically held when the detection value is stable within the specified stability width after the detected value exceeds the arbitrary set level (self-timing level).

■ Timing chart

This section describes changes in the displayed value (P.V. value) and criterion output according to the internal (self-) timing (static hold).

In the following example, "N.O" is set for "12. Output mode".

□ "12. Output Mode" (page 5-20)



- (1) The last output result is held. The displayed value (P.V. value) is also the value that is previously held.
- (2) When the detection value (R.V. value) exceeds the self-timing level, all outputs are turned off and the sampling starts. At this point, the displayed value (P.V. value) remains unchanged and keeps the value that is previously held.
- (3) The criterion result is output based on the detection value (R.V. value) when the response time* elapses after the detection value (R.V. value) is stable within the stability criterion reference width during the sampling period. At this point, the criterion value is held and the displayed value (P.V. value) is updated to the newly held value.
- (4) When the detection value (R.V. value) drops below the self-timing level and exceeds it again, all outputs are turned off and the sampling starts. The displayed value (P.V. value) remains unchanged and keeps the value that has been held in step (3) until the value is updated again.

* For details on the response time, refer to "03. Response Time" (page 5-9).

Reference

If the detection value (R.V. value) drops below the self-timing level before the detection value is stabilized, the error shown to the right appears.

☞ "A2 Error Messages" (page A-5)

In this case, the HIGH and LOW outputs will be on while the GO output is off.

Press the SET button or perform reset input to release the error state.

Also when the detection value (R.V. value) exceeds the timing level again, the error is canceled.

When the power is turned on or the error display is reset, the criterion standby display shown to the right is displayed until the first P.V. value is fixed (when the P.V. value display is set) and all outputs are turned off.

Er. dly

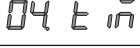


Criterion standby display

- When the value of the stability criterion reference width is small, the sampling continues until the detection value is stabilized. When the displayed value is not held (cannot obtain the displayed value) even after a long time, increase the stability criterion reference width or extend the response time.
☞ "03. Response Time" (page 5-9)
- The setting of hysteresis is reflected on the self-timing level.
☞ "14. Hysteresis" (Page 5-22)

■ Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting
 	 Select "Std (Standard detection)" and press the  button. ☞ "01. Detection Mode" (page 5-7)
 	 Select a desired response time and press the  button. "400" is displayed when using GT2-P***/PA***. ☞ "03. Response Time" (page 5-9)
 	 Select "SELF.L (rising edge)" or "SELF.L (falling edge)" and press the  button. ☞ "04. Timing Type" (page 5-11)
 	 Select the self-timing level to a desired value and press the  button. ☞ "05. Self-timing Level" (page 5-12)

Setting item	Setting
  	Select "Stbd (static hold)" and press the  button.
 "06. Self Timing Delay Types" (page 5-13)	

A. When setting with the specified stability width

Setting item	Setting
  	Select "dEFALT (default)" and press the  button.
 "08. Static Hold Delay Stability" (page 5-15)	
  	End the setting and return to the main screen.

B. When setting the stability width manually

Setting item	Setting
  	Select "USEr (User)" and press the  button.
 "08. Static Hold Delay Stability" (page 5-15)	
  	Set the stability width to a desired value and press the  button.
 "09. Static Hold Delay Stability Width" (page 5-16)	
  	End the setting and return to the main screen.

When the peak hold detection mode is used, the peak value in the period specified with the external input or internal input can be taken as the criterion value. The following setting methods are available in the peak hold detection mode.

Method to specify the sampling period	Timing to update the hold value	Reference page
(1) Specifying the Sampling Period from External Input	At the end of the sampling period	4-10
	Regularly during the sampling period	4-13
(2) Using without the Timing Input	At the end of the sampling period	4-15
	Regularly during the sampling period	4-17

Reference

When the power is turned on or the error display is reset*, the criterion standby display occurs until the first P.V. value is fixed and all outputs are turned off.



Criterion standby display

- * You can reset the error display by using any of the following methods.
- Enter RESET from the external device.
 - Press the [SET] button (when the error is displayed).

(1) Specifying the Sampling Period from External Input

When the external input is entered during the peak hold detection mode, data (displayed value, criterion output) of a desired sampling period currently detected can be held.

The update timing of the displayed value (P.V. value) to be held and that of the criterion output vary depending on the setting of the hold update method.

Updating the peak value (P.V. value) and criterion output at the end of the sampling period

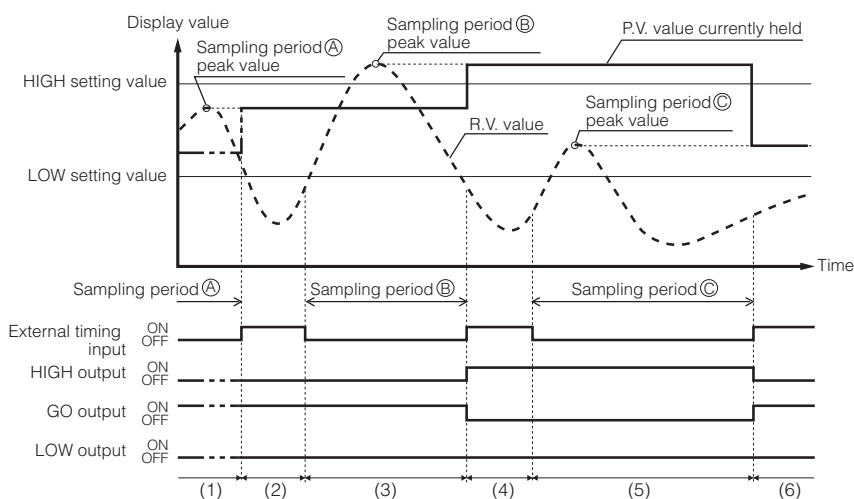
When the hold update method is set to "tim (timing input)", the display and the criterion output of the peak value (P.V. value) to be held are updated by the external timing input.

■ Timing chart

This section describes the changes in the display value (P.V. value) and criterion output by the external input when the detection mode is set to "P-H (peak hold)" and the hold update method is set to "tim (timing input)".

In the following example, "N.O" is set for "12. Output mode".

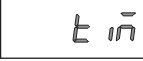
 "12. Output Mode" (page 5-20)



- (1) The maximum value (peak value) of the detection value (R.V. value) is held while the external timing input is off (sampling period ㉠).
- (2) At the rising edge of the external timing input (end of the sampling period ㉠), the peak value held during the sampling period is displayed as the P.V. value. The resulting output (in this case, GO criterion output) will turn on based on the peak value.
- (3) The maximum value (peak value) of the detection value (R.V. value) is held while the external timing input is off (sampling period ㉡).
- (4) At the rising edge of the external timing input (end of the sampling period ㉡), the peak value held during the sampling period is displayed as the P.V. value. The resulting output (in this case, HIGH criterion output) will turn on based on the peak value.
- (5) The maximum value (peak value) of the detection value (R.V. value) is held while the external timing input is off (sampling period ㉢).
- (6) At the rising edge of the external timing input (end of the sampling period ㉢), the peak value held during the sampling period is displayed as the P.V. value. The resulting output (in this case, GO criterion output) will turn on based on the peak value.

■ Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting	
		 Select "P-H (peak hold)" and press the  button.  "01. Detection Mode" (page 5-7)
		 Select "t in (timing input)" and press the  button.  "02. Hold Update Method" (page 5-8)
		 Select a desired response time and press the  button. "400" is displayed when using GT2-P***/PA***.  "03. Response Time" (page 5-9)
		 Select "t-in (external timing input)" and press the  button.  "04. Timing Type" (page 5-11)
		 End the setting and return to the main screen.

Updating the peak value (P.V. value) regularly during the sampling period

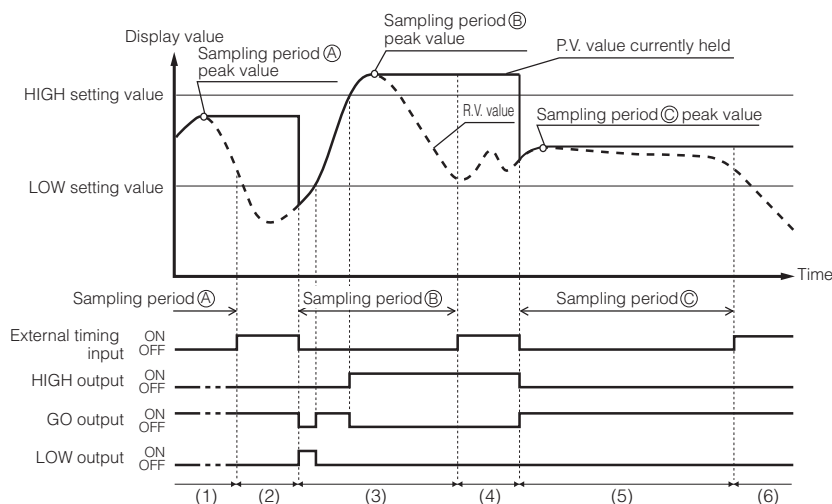
When the hold update method is set to "rEAL (regular update)", the display of the peak value (P.V. value) and criterion output are updated regularly.

■ Timing chart

This section describes the changes in the display value (P.V. value) when the detection mode is set to "P-H (peak hold)" and the hold update method is set to "rEAL (regular update)".

In the following example, "N.O" is set for "12. Output mode".

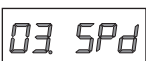
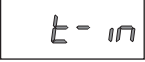
📖 "12. Output Mode" (page 5-20)



- (1) The maximum value (peak value) of the detection value (R.V. value) when the external timing input is off (sampling period ①) is always updated and displayed as the P.V. value.
The resulting output (in this case, GO criterion output) will turn on based on the peak value that is always updated.
- (2) At the rising edge of the external timing input (end of the sampling period ①), the peak value and criterion output detected during the sampling period ① are held.
- (3) At the falling edge of the external timing input, the peak value is reset. The maximum value (peak value) of the detection value (R.V. value) when the external timing input is off (sampling period ②) is always updated and displayed as the P.V. value.
The resulting output (in this case, GO criterion output) will turn on based on the peak value that is always updated.
- (4) At the rising edge of the external timing input (end of the sampling period ②), the peak value and criterion output detected during the sampling period ② are held.
- (5) At the falling edge of the external timing input, the peak value is reset. The maximum value (peak value) of the detection value (R.V. value) when the external timing input is off (sampling period ③) is always updated and displayed as the P.V. value.
The resulting output (in this case, GO criterion output) will turn on based on the peak value that is always updated.
- (6) At the rising edge the external timing input (end of the sampling period ③), the peak value and criterion output detected during the sampling period ③ are held.

■ Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting	
		 Select "P-H (peak hold)" and press the  button.  "01. Detection Mode" (page 5-7)
		 Select "rEAL (regular update)" and press the  button.  "02. Hold Update Method" (page 5-8)
		 Select a desired response time and press the  button. "400" is displayed when using GT2-P***/PA***.  "03. Response Time" (page 5-9)
		 Select "t-in (external timing input)" and press the  button.  "04. Timing Type" (page 5-11)
		 End the setting and return to the main screen.

(2) Using without the Timing Input

When internal (self) timing is selected during the peak hold detection mode, the sampling period is set automatically based on the desired self-timing level and the data (displayed value and criterion output) can be held.

The update timing of the displayed value (P.V. value) to be held and that of the criterion output vary depending on the setting of the hold update method.

Updating the peak value (P.V. value) and criterion output at the end of the sampling period

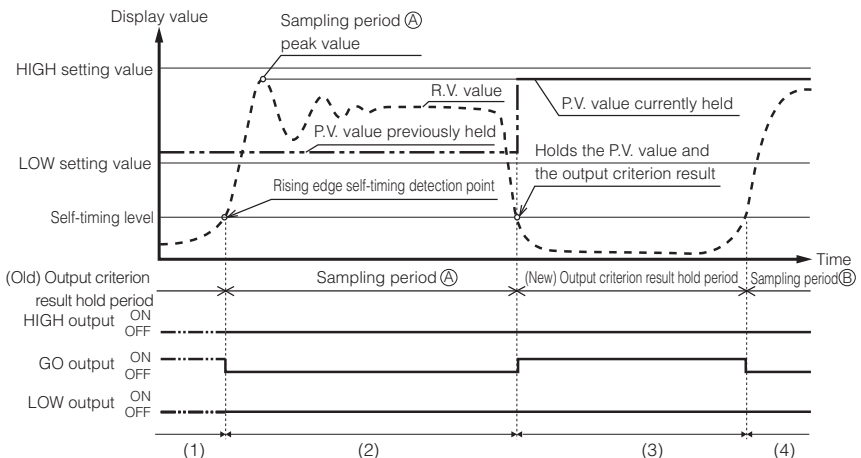
When the hold update method is set to "tim (timing input)", the display and the criterion output of the peak value (P.V. value) to be held are updated based on the self-timing level.

■ Timing chart

This section describes the changes in the displayed value (P.V. value) and criterion output by the internal (self) timing input when the detection mode is set to "P-H (peak hold)" and the hold update method is set to "tim (timing input)".

In the following example, "N.O" is set for "12. Output mode".

□ "12. Output Mode" (page 5-20)

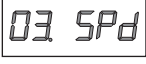
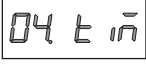


- (1) The last output result is held. The displayed value (P.V. value) is also the value that is previously held.
- (2) When the detection value (R.V. value) exceeds the self-timing level, all outputs are turned off and the maximum detected value (peak value) of the sampling period is held. The displayed value remains unchanged at this point and keeps the value that is previously held.

- (3) If the measured value drops below the self-timing level, the resulting output will turn on based on the peak value in the sampling period (In this case the GO criterion output will turn on). At this point, the criterion output is held and the displayed value (P.V. value) is updated to the value (peak value of the sampling period $\textcircled{A}$) that is newly held.
- (4) Once the measured value drops below the self-timing level and rises above the self-timing level again, all outputs turn off and the new peak value will be detected during the sampling period $\textcircled{B}$. The displayed value (P.V. value) remains unchanged and keeps the value that has been held in step (3) until the detection value (R.V. value) drops below the self-timing level again.

■ Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting
	 Select "P-H (peak hold)" and press the  button.  "01. Detection Mode" (page 5-7)
	 Select " t_{in} (timing input)" and press the  button.  "02. Hold Update Method" (page 5-8)
	 Select a desired response time and press the  button. "400" is displayed when using GT2-P***/PA***.  "03. Response Time" (page 5-9)
	 Select "SELF.r (rising edge)" and press the  button.  "04. Timing Type" (page 5-11)
	 Set the self-timing level to a desired level and press the  button.  "05. Self-timing Level" (page 5-12)
	 End the setting and return to the main screen.

Updating the peak value (P.V. value) regularly during the sampling period

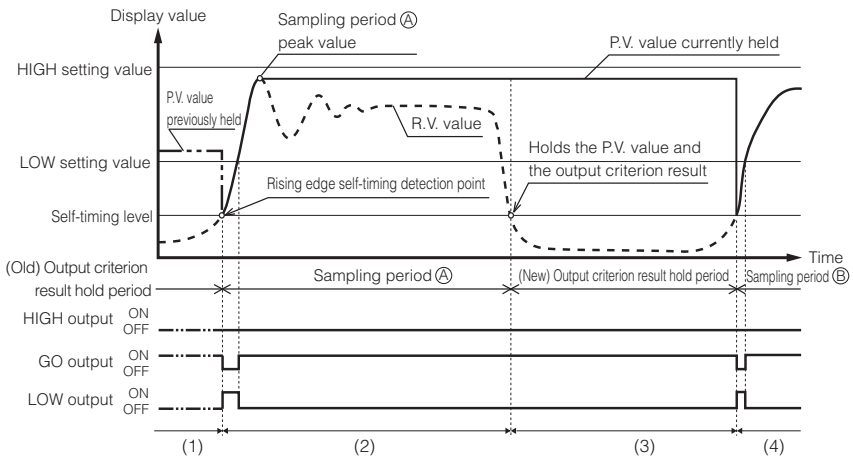
When the hold update method is set to "rEAL (regular update)", the display of the peak value (P.V. value) and criterion output are updated regularly.

■ Timing chart

This section describes the changes in the display value (P.V. value) when the detection mode is set to "P-H (peak hold)" and the hold update method is set to "rEAL (regular update)".

In the following example, "N.O" is set for "12. Output mode".

📖 "12. Output Mode" (page 5-20)



- (1) The last output result is held. The displayed value (P.V. value) is also the value previously held.
- (2) When the detection value (R.V. value) exceeds the self-timing level, the P.V. values that are held are cleared and the maximum detected value (peak value) of the sampling period is always updated and displayed. The resulting output will turn on based on the updated P.V. value.
- (3) When the detection value (R.V. value) drops below the self-timing level, the resulting output will turn on based on the peak value in the sampling period (A), and the peak value and the displayed value (P.V. value) are held.
- (4) Once the detection value (R.V. value) drops below the self-timing level and rises above the self-timing level again, the P.V. values that are held are cleared and the maximum detected value (peak value) of the sampling period (B) is always updated and displayed. The resulting output will turn on based on the updated P.V. value.

■ Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting	
		 Select "<i>P-H</i> (peak hold)" and press the  button.  "01. Detection Mode" (page 5-7)
		 Select "<i>rEAL</i> (regular update)" and press the  button.  "02. Hold Update Method" (page 5-8)
		 Select a desired response time and press the  button. "400" is displayed when using GT2-P***/PA***.  "03. Response Time" (page 5-9)
		 Select "<i>SELF.r</i> (rising edge)" and press the  button.  "04. Timing Type" (page 5-11)
		 Set the self-timing level to a desired level and press the  button.  "05. Self-timing Level" (page 5-12)
		 End the setting and return to the main screen.

When the bottom hold detection mode is used, the smallest value in the period specified with the external input or internal input can be taken as the criterion value. The following setting methods are available in the bottom hold detection mode.

Method to specify the sampling period	Timing to update the hold value	Reference page
(1) Specifying the Sampling Period from External Input	At the end of the sampling period	4-19
	Regularly during the sampling period	4-22
(2) Using without the Timing Input	At the end of the sampling period	4-24
	Regularly during the sampling period	4-26

Reference

When the power is turned on or the reset operation is performed*, the criterion standby display appears until the first P.V. value is fixed, and all the outputs are turned off.



Criterion standby display

- * You can perform reset by using any of the following methods.
- Enter RESET from an external device.
 - Press the [SET] button (when an error is displayed).

(1) Specifying the Sampling Period from External Input

When the external input is entered during the bottom hold detection mode, the data (displayed value, criterion output) of a desired sampling period currently detected can be held.

The update timing of the displayed value (P.V. value) to be held and that of the criterion output vary depending on the setting of the hold update method.

Updating the bottom value (P.V. value) and criterion output at the end of the sampling period

When the hold update method is set to "tim (timing input)", the display timing and the criterion output of the bottom value (P.V. value) to be held are updated by the external timing input.

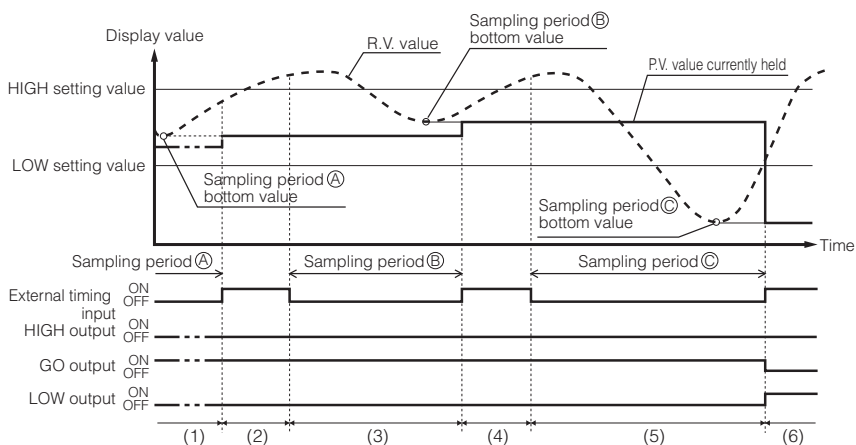
■ Timing chart

This section describes the changes in the displayed value (P.V. value) and criterion output by the external timing input when the detection mode is set to "b-H (bottom hold)" and the hold update method is set to "tim (timing input)".

In the following example, "N.O" is set for "12. Output mode".

□ "12. Output Mode" (page 5-20)

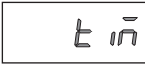
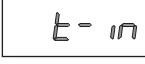
4-4 Judging by the Minimum Value (Bottom Hold)



- (1) The minimum value (bottom value) of the detection value (R.V. value) is held while the external timing input is off (sampling period Ⓐ).
- (2) At the rising edge of the external timing input (end of the sampling period Ⓐ), the bottom value held during the sampling period is displayed as the P.V. value. The resulting output (in this case, GO criterion output) will turn on based on the bottom value.
- (3) The minimum value (bottom value) of the detection value (R.V. value) is held while the external timing input is off (sampling period Ⓑ).
- (4) At the rising edge of the external timing input (end of the sampling period Ⓑ), the bottom value held during the sampling period is displayed as the P.V. value. The resulting output (in this case, GO criterion output) will turn on based on the bottom value.
- (5) The minimum value (bottom value) of the detection value (R.V. value) is held while the external timing input is off (sampling period Ⓒ).
- (6) At the rising edge of the external timing input (end of the sampling period Ⓒ), the bottom value held during the sampling period is displayed as the P.V. value. The resulting output (in this case, LOW criterion output) will turn on based on the bottom value.

■ Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting
 	 Select "b-H (bottom hold)" and press the  button.  "01. Detection Mode" (page 5-7)
 	 Select "t in (timing input)" and press the  button.  "02. Hold Update Method" (page 5-8)
 	 Select a desired response time and press the  button. "400" is displayed when using GT2-P***/PA***.  "03. Response Time" (page 5-9)
 	 Select "t-in (external timing input)" and press the  button.  "04. Timing Type" (page 5-11)
 	 End the setting and return to the main screen.

Updating the bottom value (P.V. value) regularly during the sampling period

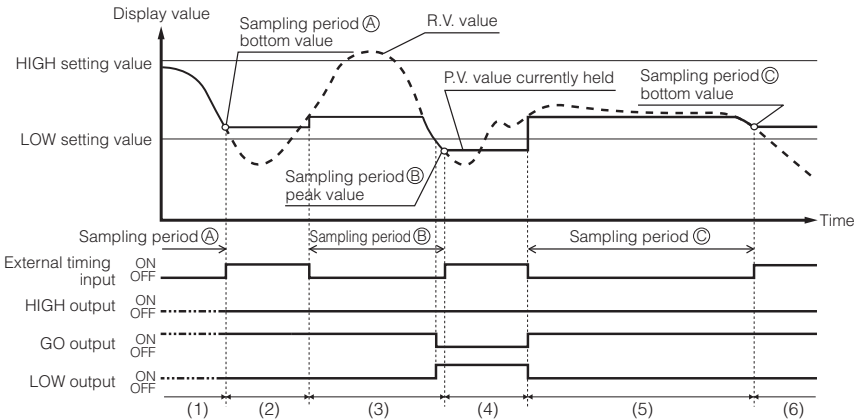
When the hold update method is set to "rEAL (regular update)", the display of the bottom value (P.V. value) and criterion output are updated regularly.

■ Timing chart

This section describes the changes in the display value (P.V. value) when the detection mode is set to "b-H (bottom hold)" and the hold update method is set to "rEAL (regular update)".

In the following example, "N.O" is set for "12. Output mode".

📖 "12. Output Mode" (page 5-20)



(1) The minimum value (bottom value) of the detection value (R.V. value) when the external timing input is off (sampling period ①) is always updated and displayed as the P.V. value.

The resulting output (in this case, GO criterion output) will turn on based on the bottom value that is always updated.

(2) At the rising edge of the external timing input (end of the sampling period ①), the bottom value and criterion output detected during the sampling period ① are held.

(3) At the falling edge of the external timing input, the bottom value is reset. The minimum value (bottom value) of the detection value (R.V. value) when the external timing input is off (sampling period ②) is always updated and displayed as the P.V. value.

The resulting output (in this case, GO criterion output, then Low criterion output) will turn on based on the bottom value that is always updated.

(4) At the rising edge of the external timing input (end of the sampling period ②), the criterion output value and criterion output detected during the sampling period ② are held.

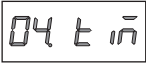
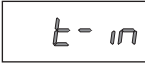
(5) The minimum value (bottom value) of the detection value (R.V. value) when the external timing input is off (sampling period ③) is always updated and displayed as the P.V. value.

The resulting output (in this case, GO criterion output) will turn on based on the bottom value that is always updated.

(6) At the rising edge of the external timing input (end of the sampling period ③), the bottom value and criterion output detected during the sampling period ③ are held.

■ Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting
  	Select "b-H (bottom hold)" and press the  button.  "01. Detection Mode" (page 5-7)
  	Select "rEAL (regular update)" and press the  button.  "02. Hold Update Method" (page 5-8)
  	Select a desired response time and press the  button. "400" is displayed when using GT2-P***/PA***.  "03. Response Time" (page 5-9)
  	Select "t-in (external timing input)" and press the  button.  "04. Timing Type" (page 5-11)
  	End the setting and return to the main screen.

(2) Using without the Timing Input

When internal (self) timing is selected during the bottom hold detection mode, the sampling period is set automatically based on the desired self-timing level and the data (displayed value and criterion output) can be held.

The update timing of the displayed value (P.V. value) to be held and that of the criterion output vary depending on the setting of the hold update method.

Updating the bottom value (P.V. value) and criterion output at the end of the sampling period

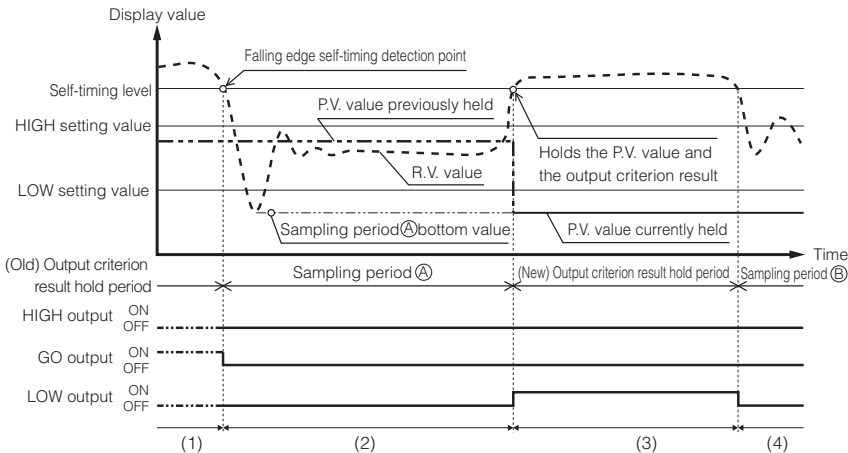
When the hold update method is set to "tim (timing input)", the display and the criterion output of the bottom value (P.V. value) to be held are updated based on the self-timing level.

■ Timing chart

This section describes the changes in the displayed value (P.V. value) and criterion output by the internal (self) timing input when the detection mode is set to "b-H (bottom hold)" and the hold update method is set to "tim (timing input)".

In the following example, "N.O" is set for "12. Output mode".

📖 "12. Output Mode" (page 5-20)



- (1) The last output result is held. The displayed value (P.V. value) is also the value that is previously held.
- (2) When the detected value (R.V. value) drops below the self-timing level, all outputs are turned off and the minimum detected value (bottom value) of the sampling period is held. The displayed value (P.V. value) remains unchanged at this point and keeps the value that is previously held.
- (3) If the measured value exceeds the self-timing level, the resulting output will turn on based on the bottom value in the sampling period (In this case the LOW criterion output will turn on). At this point,

the criterion output is held and the displayed value (P.V. value) is updated to the value (bottom value of the sampling period ㉔) that is newly held.

- (4) Once the measured value rises above the self-timing level and drops below the self-timing level again, all outputs turn off and the new bottom value will be detected during the sampling period ㉔. The displayed value (P.V. value) remains unchanged and keeps the value that has been held in step (3) until the detected value (R.V. value) rises above the self-timing level again.

■ Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting
 	 Select "b-H (bottom hold)" and press the  button.  "01. Detection Mode" (page 5-7)
 	 Select "t in (timing input)" and press the  button.  "02. Hold Update Method" (page 5-8)
 	 Select a desired response time and press the  button. "400" is displayed when using GT2-P***/PA***.  "03. Response Time" (page 5-9)
 	 Select "SELF.L (falling edge)" and press the  button.  "04. Timing Type" (page 5-11)
 	 Set the self-timing level to a desired level and press the  button.  "05. Self-timing Level" (page 5-12)
 	 End the setting and return to the main screen.

Updating the bottom value (P.V. value) regularly during the sampling period

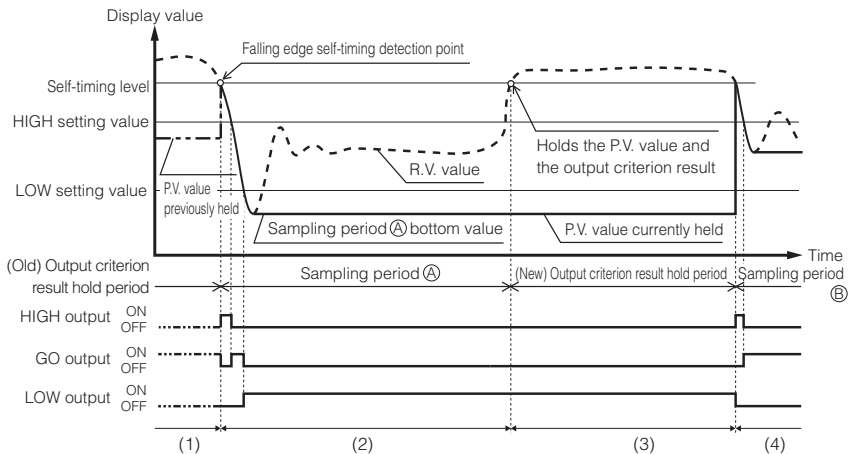
When the hold update method is set to "rEAL (regular update)", the display of the bottom value (P.V. value) and criterion output are updated regularly.

■ Timing chart

This section describes the changes in the display value (P.V. value) when the detection mode is set to "b-H (bottom hold)" and the hold update method is set to "rEAL (regular update)".

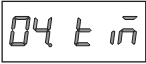
In the following example, "N.O" is set for "12. Output mode".

📖 "12. Output Mode" (page 5-20)



■ Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting
 	 Select "b-H (bottom hold)" and press the  button.  "01. Detection Mode" (page 5-7)
 	 Select "rEAL (regular update)" and press the  button.  "02. Hold Update Method" (page 5-8)
 	 Select a desired response time and press the  button. "400" is displayed when using GT2-P***/PA***.  "03. Response Time" (page 5-9)
 	 Select "SELF.L (falling edge)" and press the  button.  "04. Timing Type" (page 5-11)
 	 Set the self-timing level to a desired level and press the  button.  "05. Self-timing Level" (page 5-12)
 	 End the setting and return to the main screen.

When the Peak-to-Peak hold detection mode is used, the difference between the peak value and the bottom value specified with the external timing input can be taken as the criterion value.

The following setting methods are available in the peak-to-peak hold detection mode.

Method to specify the sampling period	Timing to update the hold value	Reference page
Specifying the Sampling Period from External Input	At the end of the sampling period	4-28
	Regularly during the sampling period	4-30

* The internal (self) timing function cannot be set during the peak-to-peak detection mode.

Reference

When the power is turned on or the reset operation is performed*, the criterion standby display appears until the first P.V. value is fixed and all the outputs are turned off.



Criterion standby display

* You can perform reset by using any of the following methods.

- Enter RESET from an external device
- Press the [SET] button (when an error is displayed)

Specifying the Sampling Period from External Input

When the external input is entered during the bottom hold detection mode, data (displayed value, criterion output) of a desired timing currently detected can be held.

The update timing of the displayed value (P.V value) to be held and that of the criterion output vary depending on the setting of the hold update method.

Updating the peak-to-peak value (P.V. value) and criterion output at the end of the sampling period

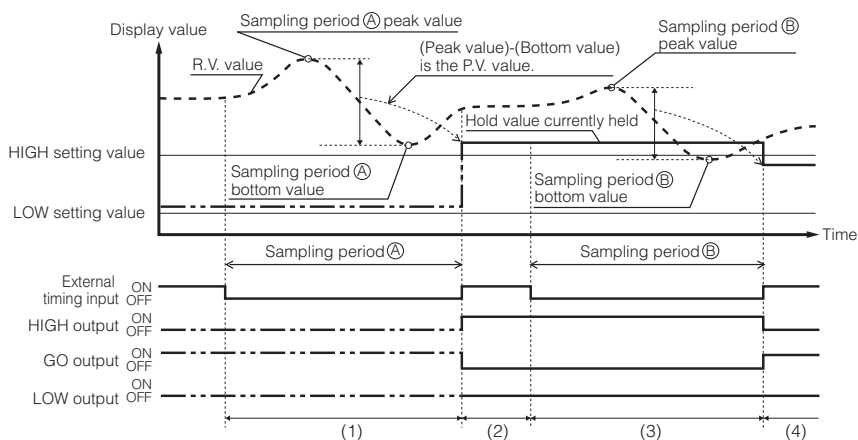
When the hold update method is set to "tim (timing input)", the display of the display and the criterion output of the peak-to-peak value (P.V. value) to be held are updated by the external timing input.

■ Timing chart

This section describes the changes in the displayed value (P.V. value) and criterion output by the external input when the detection mode is set to "P-P (peak-to-peak)" and the hold update method is set to "tim (timing input)".

In the following example, "N.O" is set for "12. Output mode".

 "12. Output Mode" (page 5-20)



- (1) The maximum value (peak value) and the minimum value (bottom value) of the detection value (R.V. value) are held while the external timing input is off (sampling period ①).
- (2) At the rising edge of the external timing input (end of the sampling period), the difference between the peak value and the bottom value held during the sampling period ① is calculated and displayed as the P.V. value. The resulting output (in this case, HIGH criterion output) will turn on based on the value of (peak value - bottom value).
- (3) The maximum value (peak value) and the minimum value (bottom value) of the detection value (R.V. value) are held while the external timing input is off (sampling period ②).
- (4) At the rising edge of the external timing input (end of the sampling period), the difference between the peak value and the bottom value held during the sampling period ② is calculated and displayed as the P.V. value. The resulting output (in this case, GO criterion output) will turn on based on the value of (peak value - bottom value).

■ Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting
 	 Select "P-P (peak-to-peak)" and press the  button.  "01. Detection Mode" (page 5-7)
 	 Select "t in (timing input)" and press the  button.  "02. Hold Update Method" (page 5-8)

Setting item	Setting
03 SPD  100	Select a desired response time and press the  button. "400" is displayed when using GT2-P***/PA***.  "03. Response Time" (page 5-9)
End]  End	End the setting and return to the main screen.

4

Updating peak-to-peak value (P.V. value) regularly during the sampling period

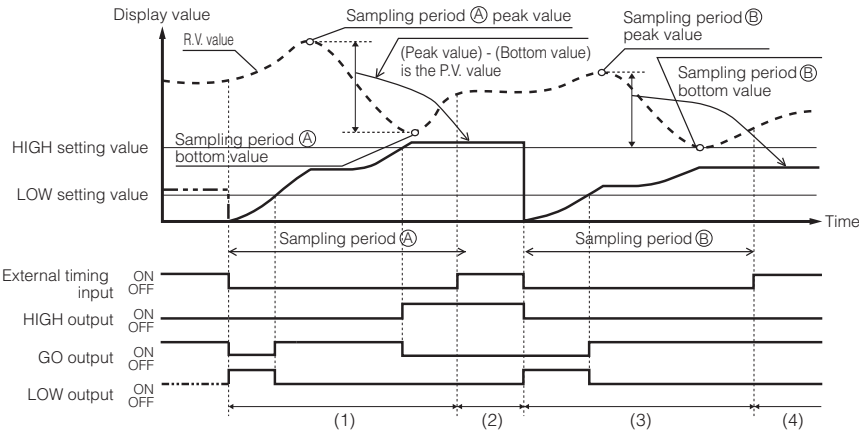
When the hold update method is set to "rEAL (regular update)", the display of the peak-to-peak value (P.V. value) and criterion output are updated regularly.

■ Timing chart

This section describes the changes in the display value (P.V. value) when the detection mode is set to "P-P (peak-to-peak)" and the hold update method is set to "rEAL (regular update)".

In the following example, "N.O" is set for "12. Output mode".

 "12. Output Mode" (page 5-20)



- (1) The P.V. value is cleared when the external timing input is turned off. The difference between the maximum detected value (peak value) and the minimum detected value (bottom value) in the sampling period (A) is always calculated and the display is updated as the P.V. value. The criterion value is output based on the updated P.V. value.
- (2) At the rising edge of the external timing input (end of the sampling period), the maximum value of the difference between the peak value and the bottom value in the sampling period (A) is held and displayed, and the criterion result is also held (in this case, HIGH criterion output).

- (3) The P.V. value is cleared when the external timing input is turned off. The difference between the maximum detected value (peak value) and the minimum detected value (bottom value) in the sampling period ⑤ is always calculated and the display is updated as the P.V. value. The criterion value is output based on the updated P.V. value.
- (4) At the rising edge of the external timing input (end of the sampling period), the maximum value of the difference between the peak value and the bottom value in the sampling period is held and displayed as it is, and the criterion result (GO criterion output in this case) is also held.

Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting
  	Select "P-P (peak-to-peak)" and press the  button.  "01. Detection Mode" (page 5-7)
  	Select "rEAL (regular update)" and press the  button.  "02. Hold Update Method" (page 5-8)
  	Select a desired response time and press the  button. "400" is displayed when using GT2-P***/PA***.  "03. Response Time" (page 5-9)
  	End the setting and return to the main screen.

4-6 Holding HIGH/LOW Output

When the NG hold detection mode is used, the output can be held if the HIGH or LOW output turns on during the period specified by the external timing (while the external timing input is off).

With this function, it can be judged whether the HIGH or LOW output turns on during the continuous detection by watching the subsequent criterion outputs with the timing input turned off at the start of the detection and turned on at the end of the detection.

Timing Chart in the NG Hold Detection Mode

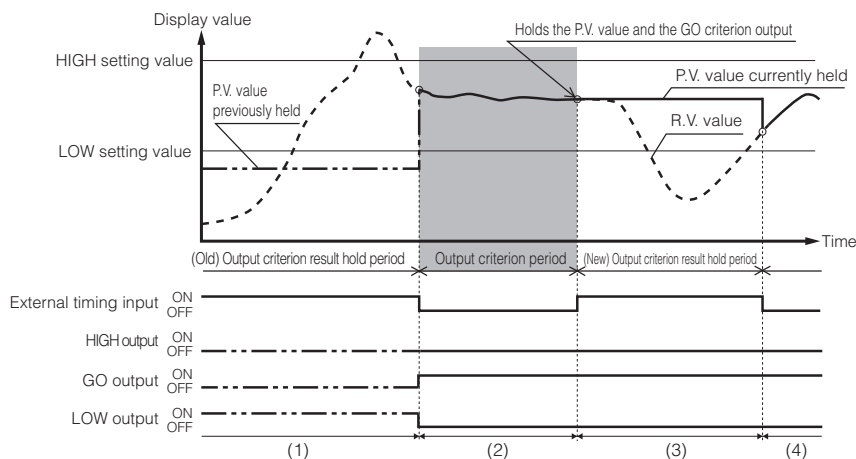
When the external timing is input during the NG hold detection mode, the desired timing data (displayed value, criterion output) currently detected can be held.

■ When the HIGH/LOW output does not turn on during the output criterion period

This section describes the changes in the display value and criterion output when the GO criterion is held.

In the following example, "N.O" is set for "12. Output mode".

📖 "12. Output Mode" (page 5-20)



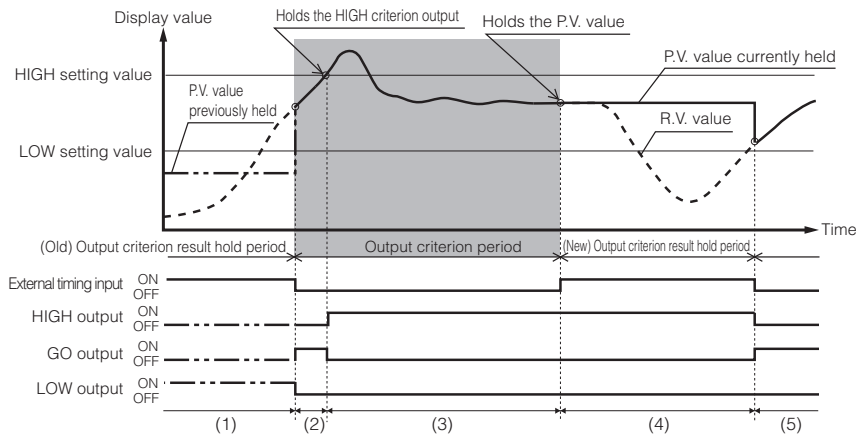
- (1) The last output result is held while the external input is on the displayed value (P.V. value) is also the value that is previously held.
- (2) The HIGH/LOW criterion outputs are monitored while the external timing input is off. The hold state of the displayed value (P.V. value) is canceled and displayed according to the detection value (R.V. value) of the sensor head.
- (3) When neither the HIGH nor LOW outputs are on during the output criterion period (when the external timing input is off), the GO criterion output is held. The value when the external timing input starts is held for the displayed value (P.V. value).
- (4) The hold status of the criterion output and displayed value (P.V. value) is canceled when the next external timing input turns off.

■ When the HIGH output turns on during the output criterion period

This section describes the changes in the displayed value and criterion output when the HIGH criterion is held.

In the following example, "N.O" is set for "12. Output mode".

📖 "12. Output Mode" (page 5-20)



- (1) The last output result is held while the external input is on the displayed value (P.V. value) is also the value that is previously held.
- (2) The HIGH/LOW criterion outputs are monitored while the external timing input is off. The hold state of the displayed value (P.V. value) is canceled and the detection value (R.V. value) is displayed.
- (3) When the HIGH criterion is detected during the output criterion period (when the external timing input is off), the HIGH criterion output is held. Once the criterion output is held, the criterion output no longer changes along with the changes of the detection value (R.V. value) even during the output criterion period.
- (4) The HIGH criterion is detected during the output criterion period (when the output timing input is off), so the HIGH criterion output is held even after the output criterion period is finished. The value when the external timing input starts is held for the displayed value (P.V. value). The displayed value (P.V. value) is kept held (in this example, value within the GO range) until the external input turns off next time and the HIGH criterion output is held.
- (5) The hold status of the criterion output and displayed value (P.V. value) is canceled when the next external timing input turns off.

Reference

The hold status of the HIGH criterion output is canceled with the reset input.

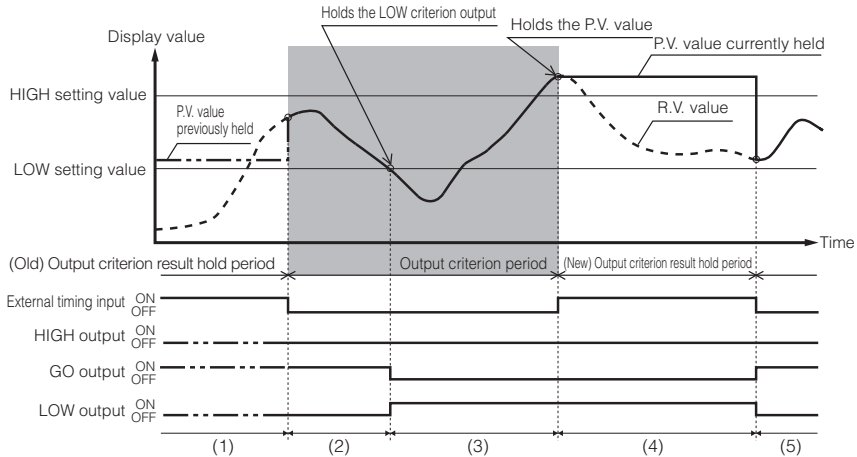
📖 "Reset Input (Resetting Internal Values)" (page 3-34)

■ When the LOW output turns on during the output criterion period

This section describes the changes in the displayed value and criterion output when the LOW criterion is held.

In the following example, "N.O" is set for "12. Output mode".

📖 "12. Output Mode" (page 5-20)



- (1) The last output result is held while the external input is on the displayed value (P.V. value) is also the value that is previously held.
- (2) The HIGH/LOW criterion outputs are monitored while the external timing input is off. The hold state of the displayed value (P.V. value) is canceled and displayed according to the detection value (R.V. value) of the sensor head.
- (3) When the LOW criterion is detected during the output criterion period (when the external timing input is off), the LOW criterion output is held. Once the criterion output is held, the criterion output does not change according to the changes of the detection value (R.V. value) even if it is during the output criterion period.
- (4) The LOW criterion is detected during the output criterion period (when the output timing input is off), so the LOW criterion output is held even after the output criterion period is finished. The value when the external timing input starts is held for the displayed value (P.V. value).
- (5) The hold status of the criterion output and displayed value (P.V. value) is canceled when the next external timing input turns off.

Reference

The hold status of the LOW criterion output is canceled with the reset input.

📖 "Reset Input (Resetting Internal Values)" (page 3-34)

■ Setting procedure

In the function setting mode (press and hold the  button for 2 seconds or more in the main screen), set the following items.

Setting item	Setting
 	 Select "nG-H (NG hold detection)" and press the  button.  "01. Detection Mode" (page 5-7)
 	 Select a desired response time and press the  button. "400" is displayed when using GT2-P***/PA***.  "03. Response Time" (page 5-9)
 	 End the setting and return to the main screen.

MEMO

Setting Various Functions

This chapter describes various detection functions of the GT2-70 Series.

5-1	Detection Functions	5-2
5-2	Function Setting Mode	5-6
5-3	Basic Setting Mode	5-17
5-4	Additional Function Setting Mode	5-40
5-5	Calibration Setting Mode.....	5-51
5-6	Calculation Setting Mode.....	5-57

List of Setting Modes

With the GT2-70 Series, you can set various functions to support many kinds of detection methods.

Mode	Description	Entering the mode
Function setting mode	Sets up functions related to detection and timing.  "5-2 Function Setting Mode" (page 5-6)	Press and hold the [MODE] button for at least two seconds.
Basic setting mode	Sets basic output functions and desired number of digits to be displayed.  "5-3 Basic Setting Mode" (page 5-17)	Press and hold the [MODE] and [SET] buttons at the same time for at least two seconds.
Additional function setting mode	Power save and core alarm control.  "5-4 Additional Function Setting Mode" (page 5-40)	Press and hold the [MODE] button and the left arrow key at the same time for at least two seconds.
Calibration setting mode	Sets the calibration function.  "5-5 Calibration Setting Mode" (page 5-51)	Press and hold the [MODE] button and the right arrow key at the same time for at least two seconds.
Calculation setting mode	Calculation based on the multiple detected targets to check the degree of flatness, twist, or warpage.  "5-6 Calculation Setting Mode" (page 5-57)	Press and hold the [MODE] button for at least two seconds. (This mode can be set only when the expansion unit is added.)

Reference

Each setting mode can be entered only from the main screen.

 "3-1 Main Screens" (page 3-2)

Parameter Setting List

■ Function setting mode

 "5-2 Function Setting Mode" (page 5-6)

- **Entering function setting mode: Press and hold the [MODE] button for at least two seconds.**

No.	Item	Description	Reference page
01	Detection mode	Select the detection mode.	5-7
02	Hold update method	When "P-H", "b-H", or "P-P" is selected in 01, select "Timing input" or "Regular update" for the update timing of the hold value.	5-8
03	Response time	Longer response time makes the average data time longer, which stabilizes the value.	5-9
04	Timing type	For the timing input, select "External timing" or "Self timing (internal timing)".	5-11
05	Self-timing level	When self timing is selected in 04, set the threshold of the timing input.	5-12

No.	Item	Description	Reference page
05	Self timing delay type	When "Std" is selected in 01, select the timing to fix the criterion value after the value rises above (or falls below) the self-timing level: "When the setting time is elapsed (delay timer)" or "After the display value is stabilized (static hold)".	5-13
07	User specified delay time	Set the delay time when "When the setting time is elapsed (delay timer)" is selected in 05.	5-14
08	Static hold delay stability criterion	Set the reference of stability criterion when "After the display value is stabilized (static hold)" is selected in 05.	5-15
09	Static hold delay stability width	Enter a desired number when USER (user specification) is selected in 08.	5-16

■ Basic setting mode

📖 "5-3 Basic Setting Mode" (page 5-17)

- **Entering basic setting mode: Press and hold the [MODE] and [SET] buttons at the same time for at least two seconds.**

No.	Item	Description	Reference page
10	Measurement direction change	Set the "Normal" or "Reverse" to set the measurement value to increase or decrease based on position.	5-18
11	Multiplier	Set the ratio of the detected value.	5-19
12	Output mode	Set "ON (N.O.)" or "OFF (N.C.)" for output judgment.	5-20
13	Displayed number of digits	Set the number of display digits.	5-21
14	Hysteresis	Set the hysteresis value.	5-22
15	Batch input setting	Set to make input to all added expansion units when an input is made to the input line of the main unit.	5-24

The settings for items numbered 16 and higher are different depending on the amplifier unit being used.

When using a model other than GT2-71MCN/MCP (analog output type)

No.	Item	Description	Reference page
16	Special output setting	Select the function of the special output lines (orange, green).	5-26
-	Limit output HH side teaching	Set the reference position where the limit output turns on toward the spindle contraction side when the "Lt.USER" is selected in 15.	5-33
17	Limit output HH side criterion position setting	With the reference position being 0, set the position where the limit output of the contraction side turns on.	5-34
-	Limit output LL side teaching	Set the reference position where the limit output turns on toward the spindle extension side when the "Lt.USER" is selected in 15.	5-35
18	Limit output LL side criterion position setting	With the reference position being 0, set the position where the limit output extension side turns on.	5-36

When using GT2-71MCN/MCP (analog output type)

No.	Item	Description	Reference page
15	Analog range setting	Set the analog output range to "dEFALt (head stroke)" or "FrEE (free range)".	5-37
17	Free range settings (Hi side)	Set the Hi side for the free range setting when "FrEE" is selected in 15.	5-38
18	Free range settings (Lo side)	Set the Lo side for the free range setting when "FrEE" is selected in 15.	5-39

■ Additional function setting mode

📖 "5-4 Additional Function Setting Mode" (page 5-40)

- **Entering additional function setting mode: Press and hold the [MODE] and [<] buttons at the same time for at least two seconds.**

No.	Item	Description	Reference page
20	Select preset data	Select the data to use when performing the preset.	5-41
21	Preset memory	Set whether or not to save "zero-point correction".	5-42
22	Preset point setting	Set the memory method for "zero-point correction" when using the bank function.	5-43
23	Power-saving function (ECO)	To decrease the power consumption or not to display the numerical value, set this function.	5-44
24	Jam detection function	When the spindle does not return due to an undetected event in external timing input, set to detect such an event as an error.	5-45
-	Jam detection teaching	Set the reference position for the jam detection.	5-49
25	Jam detection position	Set the position to perform the jam detection function with the reference position being 0.	5-50

■ Calibration setting mode

📖 "5-5 Calibration Setting Mode" (page 5-51)

- **Entering calibration setting mode: Press and hold the [MODE] and [>] buttons at the same time for at least two seconds.**

No.	Item	Description	Reference page
30	Calibration function setting	Set the calibration function.	5-52
-	1st point detection/capture	Set the zero point (1st point).	5-53
31	2nd point target value	Set the target value of the span adjustment (2nd point).	5-54
-	2nd point detection/capture	Set the detection position for the span adjustment.	5-55

■ Calculation setting mode

📖 "5-6 Calculation Setting Mode" (page 5-57)

- **Entering calculation setting mode: After setting an expansion unit, press and hold the [MODE] button on the main unit for at least two seconds.**

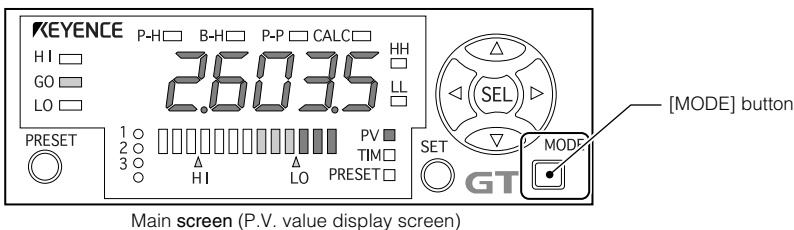
No.	Item	Description	Reference page
R1	Calculation mode setting	Set the calculation mode when an expansion unit(s) is added. * The calculation mode will appear only when an expansion unit(s) is added.	5-57
R2	Calculation method	Set the calculation method when "noCALc" is selected in R1.	5-58

5-2 Function Setting Mode

Entering Function Setting Mode

Enter the function setting mode by the following procedure.

- On the main screen, press and hold the [MODE] button for at least two seconds.



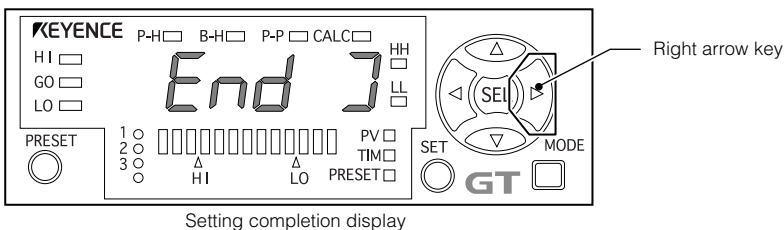
Reference

When "CALC (Calculation mode)" is selected in "A1. Calculation Mode" (except when "C5.rEF (Reference difference)" is selected in "A2. Calculation method"), the expansion unit cannot enter the function setting mode.

Exiting Function Setting Mode

Exit the function setting mode by either of the following procedures to display the main screen.

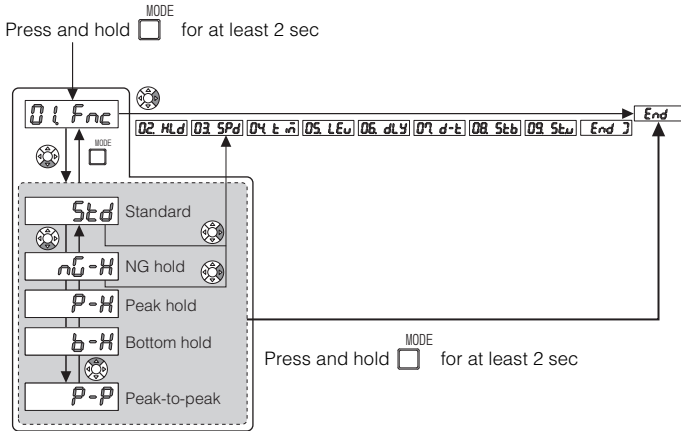
- Press and hold the [MODE] button for at least two seconds.
- Or press the right arrow key several times until the setting completion display appears, and press the right arrow key once more.



01. Detection Mode

01 Fnc

Select the mode when detecting the target.



📖 "Entering Function Setting Mode" (page 5-6)

Detection mode	Description	Initial value
Standard detection 	On "P.V. value display screen", the displayed values and criterion output are always updated. In addition, the displayed values and criterion output can be held by the timing input. 📖 "4-1 Judging with the Current Value" (page 4-2)	○
NG hold detection 	Holds the output when the detected value exceeds (drops below) the HIGH (LOW) setting during external timing. 📖 "4-6 Holding HIGH/LOW Output" (page 4-32)	
Hold detection	Peak hold 	Holds the peak value during external (or internal) timing. 📖 "4-3 Judging by the Maximum Value (Peak Hold)" (page 4-10)
	Bottom hold 	Holds the bottom value during external (or internal) timing. 📖 "4-4 Judging by the Minimum Value (Bottom Hold)" (page 4-19)
	Peak-to-peak 	Holds the peak-to-peak value within the "Sampling period" defined external timing. 📖 "4-5 Judging with the Difference between Maximum and Minimum Values" (page 4-28)

📖 "Chapter 4: Using Detection Modes" (page 4-1)

02. Hold Update Method

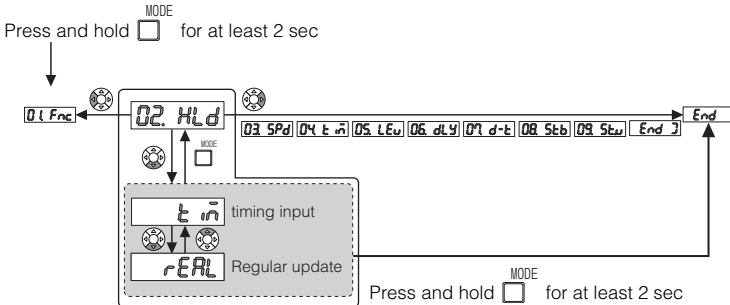
02. Hld

Selects the method by which the hold display P.V. value is updated.

Reference

This is only available when *P-H* (peak hold), *b-H* (bottom hold) or *P-P* (peak-to-peak) is selected in "*01 Fnc* (Detection mode)".

📖 "01. Detection Mode" (page 5-7)



📖 "Exiting Function Setting Mode" (page 5-6)

Item	Description	Default Setting
Timing input 	The P.V. value to hold and display is not updated during the sampling period, and is updated after the sampling period finishes.	○
Regular update 	During the sampling period, each hold value (P.V. value) is displayed with regular updates.	

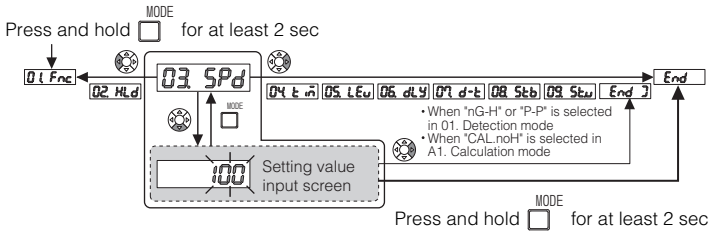
Reference

For more details about operations, refer to 📖 "Chapter 4: Using Detection Modes" (page 4-1).

03. Response Time

03 SPD

The response time is the time from when the sensor head starts detection until the measured value has been processed.



📖 "Entering Function Setting Mode" (page 5-6)

When using GT2-S1/S5/H***A***

Item	Setting range	Default Setting
Response time	hSP*/5/10/100/500/1000 (unit: ms)	100

* Response time is 3 ms when hSP is selected.

When using GT2-P***PA***

Item	Setting range	Default Setting
Response time	hSP*/20/40/400/2000/4000 (unit: ms)	400

* Response time is 12 ms when hSP is selected.

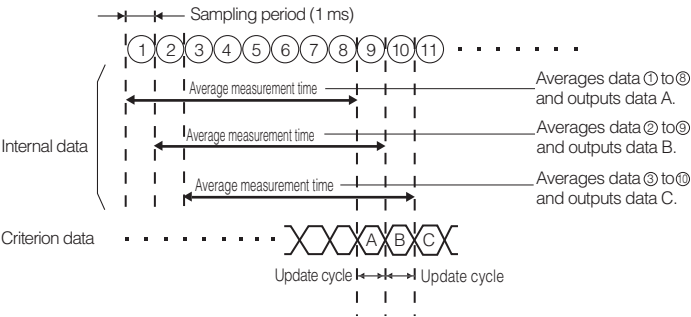
With the GT2-70 Series, the internal data that have been sampled are averaged according to the response time. If you increase the response time, the number of averaged samples will be increased. If you decrease the response time, the number of averaged samples will be decreased.

When using GT2-S1/S5/H***A***

Response time (ms)	Average frequency (times)	Average time (ms)	Internal value update cycle (ms)
hSP (3)	1	1	1
5	3	3	1
10	8	8	1
100	94	94	4
500	480	480	16
1000	960	960	32

5-2 Function Setting Mode

Example If you set a response time of 10 ms (average time: 8 ms, number of averaged samples 8), data will be obtained and output as follows:



- Reference**
- If you want to detect instantaneous changes, set a short response time.
 - If you want to ignore instantaneous changes or fluctuations of values, set a long response time.

When using GT2-P***/PA***

Item	Setting range	Default Setting
Response time	hSP*/20/40/400/2000/4000 (unit: ms)	400

* Response time is 12 ms when hSP is selected.

Response time (ms)	Average frequency (times)	Average time (ms)	Internal value update cycle (ms)
hSP (12)	1	4	4
20	3	12	4
40	8	32	4
400	94	376	16
2000	480	1920	64
4000	960	3840	128

04. Timing Type

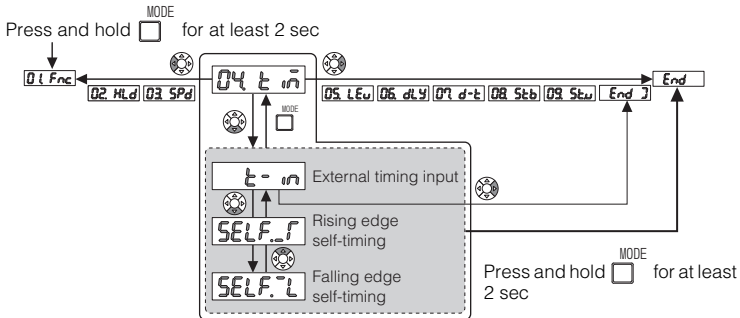
04 t in

Selects a type of timing input.

Reference

This item can be set only when *Std* (Standard), *P-H* (Peak hold), or *b-H* (Bottom hold) is selected for *01 Fnc* (Detection mode).

📖 "01. Detection Mode" (page 5-7)



📖 "Entering Function Setting Mode" (page 5-6)

Item	Description	Default Setting
External timing input 	Select this when using the input (pink/violet) from an external device. 📖 "I/O Diagram" (page 7-14)	○
Rising edge self-timing 	When the detected value exceeds the self-timing level (a change from the value below the self-timing level to the one above the self-timing level), the timing input occurs. 📖 "05. Self-timing Level" (page 5-12)	
Falling edge self-timing 	When the detected value drops below the self-timing level (a change from the value above the self-timing level to the one below the self-timing level), the timing input occurs. 📖 "05. Self-timing Level" (page 5-12)	

Reference

For more details about operations, refer to 📖 "Chapter 4: Using Detection Modes" (page 4-1).

05. Self-timing Level

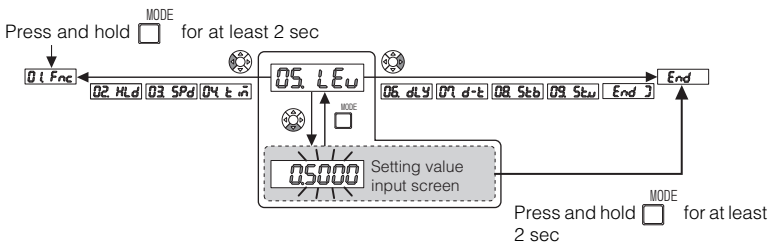
05. LEL

The self-timing level is the set point to trigger the timing input automatically when it detects a change in the values.

Reference

This item can be set only when either *SELF.F* (Rising edge self-timing) or *SELF.L* (Falling edge self-timing) is selected for "04. *t_{in}*" (Timing type)".

☞ "04. Timing Type" (page 5-11)



☞ "Entering Function Setting Mode" (page 5-6)

Item	Setting range	Default Setting
Self-timing level	-199.9999 to 199.9999 (unit: mm)	0.5000

Reference

The hysteresis can be set for the self-timing level.

☞ "14. Hysteresis" (page 5-22)

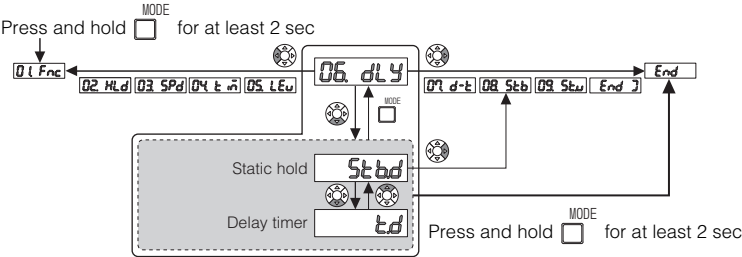
06. Self Timing Delay Types

06. dLY

The Self timing delay is basically an on-delay. The delayed time is the point from where the timing input activates to the point where the desired value is measured and held.

Reference

- This item can be set only under the following conditions.
- *Std* (Standard) is selected for "01 *Fnc* (Detection mode)".
 - Either *SELF_↑* (Rising edge self-timing) or *SELF_↓* (Falling edge self-timing) is selected for "04 *t_{in}* (Timing type)".
01. "01. Detection Mode" (page 5-7)
04. "04. Timing Type" (page 5-11)



01. "Entering Function Setting Mode" (page 5-6)

Item	Description	Default Setting
Static hold Std	After the timing input by the self-timing level occurs, when the range of fluctuation of the detected value stays below a constant value, the value is considered to be "stabilized" and it is held. (The range of fluctuation can be set to any value.) 08. "08. Static Hold Delay Stability" (page 5-15)	0
Delay timer td	After the timing input by the self-timing level occurs, the delay timer starts operation. It holds the value after the delay time specified has elapsed. 07. "07. User-specified Delay Time" (page 5-14)	

07. User-specified Delay Time

07 d-t

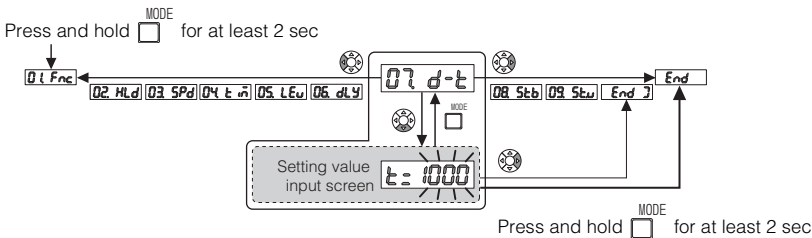
Set the delay time to fix the criterion value after the timing input occurs using the self-timing input.

Adjusting the on-delay time.

Reference

This item can be set only when *t_d* (Delay timer) is selected for "05dLY (Self-timing delay type)".

☞ "06. Self Timing Delay Types" (page 5-13)



☞ "Entering Function Setting Mode" (page 5-6)

Item	Setting range	Default Setting
User-specified delay time	0 to 9999 (unit: ms)	1000

08. Static Hold Delay Stability

08. Stb

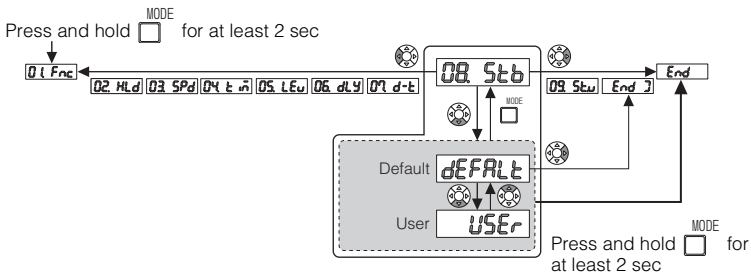
Select the setting method for the value of the stability width in the static hold delay stability.

Adjusting the stability width.

Reference

This item can be set only when *Stbd* (Static hold) is selected for "05.dLY (Self-timing delay type)".

☐ "06. Self Timing Delay Types" (page 5-13)



☐ "Entering Function Setting Mode" (page 5-6)

Item	Description	Default Setting
Default 	The stability width is set to the default value (0.0100 mm). ☐ "06. Self Timing Delay Types" (page 5-13)	0
User 	The stability width can be set to any value. You can specify the value in "09. Static hold delay stability width". ☐ "09. Static Hold Delay Stability Width" (page 5-16)	

Reference

For more details about operations, refer to ☐ "Chapter 4: Using Detection Modes" (page 4-1).

09. Static Hold Delay Stability Width

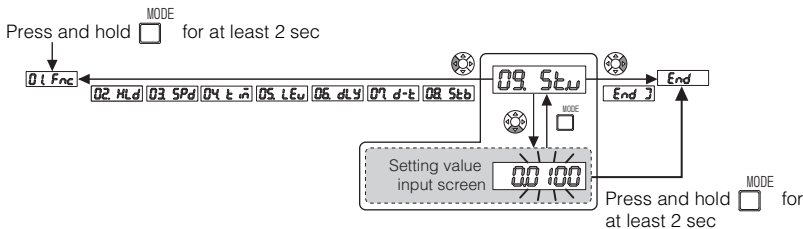
09 Stw

Set the value of the stability width when the static hold delay is set.

Reference

This item can be set only when *USER* (User) is selected for "08Stb" (Static hold delay stability criterion).

☞ "08. Static Hold Delay Stability" (page 5-15)



☞ "Entering Function Setting Mode" (page 5-6)

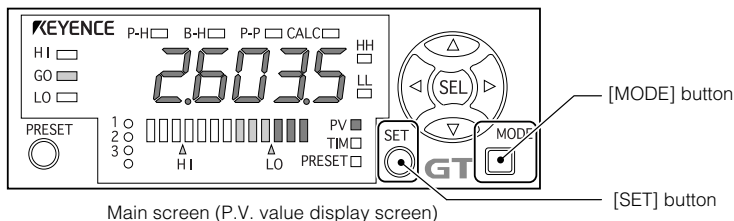
Item	Setting range	Default Setting
Static hold delay stability width	0.0000 to 199.9999 (unit: mm)	0.0100

5-3 Basic Setting Mode

Entering Basic Setting Mode

Enter the function setting mode by the following procedure.

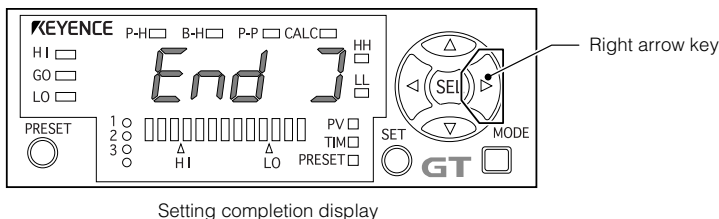
- From the main screen, press and hold the [MODE] and [SET] buttons at the same time for at least two seconds.



Exiting Basic Setting Mode

Use one of the following methods to exit basic setting mode and display the main screen.

- After the settings are complete, press and hold the [MODE] button for at least two seconds.
- After the settings are complete, press the right arrow key several times until the setting completion display appears, and press the right arrow key once more.



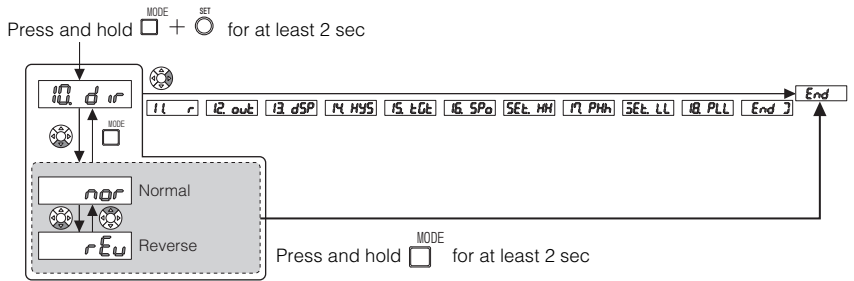
10. Measurement Direction

Display the value detected when the sensor head spindle is pressed as a positive (normal) or negative (reverse) value.

Reference

On the main unit, this setting is available to set only when "noCALC (No calculation)" or "CALC (Calculation mode)" is selected in "R1 RPL (Calculation mode)".

"5-6 Calculation Setting Mode" (page 5-57)



"Entering Basic Setting Mode" (page 5-17)

Measurement direction	Description	Default Setting
Normal 	Value increases based on the amount that the spindle is pushed in (amount of movement). 	
Reverse 	Value decreases based on the amount that the spindle is pushed in (amount of movement). 	

NOTICE

When changing the measurement direction, reset the following parameters:

- **HIGH setting value** ("(5) HIGH setting value display" (page 3-7))
- **LOW setting value** ("(6) LOW setting value display" (page 3-8))
- **Timing type** ("04. Timing Type" (page 5-11))
- **Self-timing level** ("05. Self-timing Level" (page 5-12))

11. Multiplier

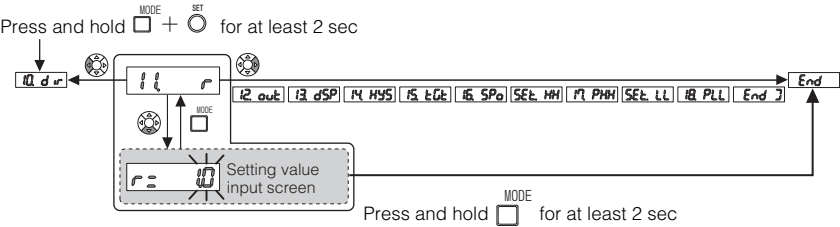


When the detection point is located beyond a lever or in other similar cases, the display value can be displayed by multiplying the actual detected value.

Reference

On the main unit, this setting is available to set only when "noCALC (No calculation)" or "CALC (Calculation mode)" is selected in "Rt APL (Calculation mode)".

Book "Calculation Setting Mode" (page 5-57)



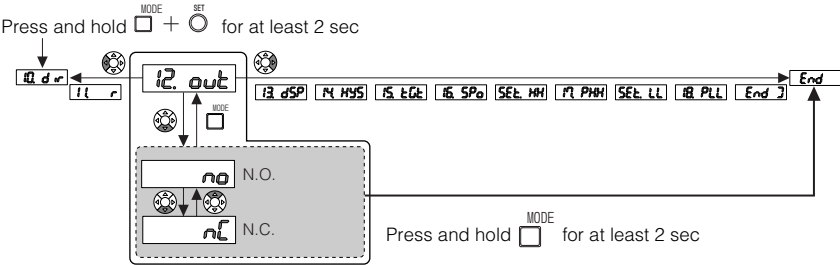
Book "Entering Basic Setting Mode" (page 5-17)

Item	Setting range	Default Setting
Multiplier	0.1 to 100.0	1.0

12. Output Mode

i2. out

Set the output mode (ON (N.O.) or OFF (N.C.)) of the criterion output.



"Entering Basic Setting Mode" (page 5-17)

Output mode	Description	Default Setting
N.O. (Normal open) 	Turns on output for criterion output.	O
N.C. (Normal close) 	Turns off output for criterion output.	

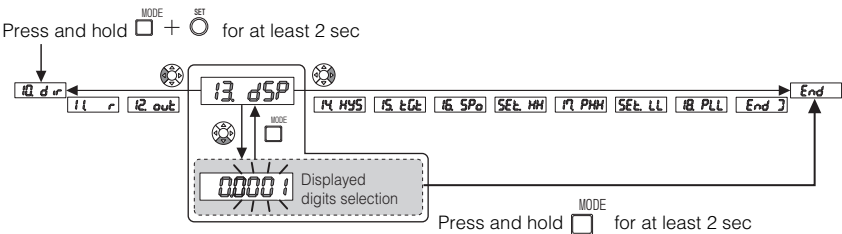
Example

Judgment	Output mode	Criterion output
HIGH criterion	N.O. (Normal open)	HIGH output: ON
		GO output: OFF
		LOW output: OFF
	N.C. (Normal close)	HIGH output: OFF
		GO output: ON
		LOW output: ON

13. Displayed Number of Digits

13. dSP

Set the number of digits of the display value in the digital display.
Set this when you want to display only the necessary digits.



📖 "Entering Basic Setting Mode" (page 5-17)

Item	Setting range	Default Setting
Displayed number of digits	0.0001/0.001/0.01/ __ _ 0.1 (unit: mm)	0.0001

Reference

- Changes to the displayed number of digits are applied only to the P.V. value, R.V. value, and calculated value displays.
- When the displayed value is less than 1.000.0, "__ _ 0.1" is displayed by omitting the first 0.

Example

 → 

 → 

Changes to the displayed number of digits do not affect criterion output.

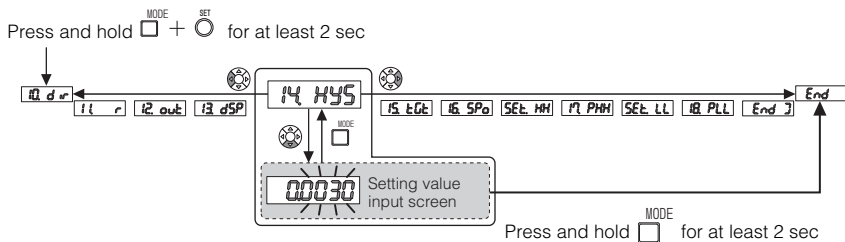
14. Hysteresis

14 HYS

- Set the hysteresis value.
- The hysteresis value is common among the HH setting value, HIGH setting value, LOW setting value, LL setting value, and self-timing level.
- "(5) HIGH setting value display" (page 3-7)
 - "(6) LOW setting value display" (page 3-8)
 - "3-4 Setting the HH/LL Criterion Value" (page 3-21)
 - "05. Self-timing Level" (page 5-12)

Reference

- The hysteresis setting is not applied to the limit output.
- "Limit output" (page 5-27)
 - Hysteresis refers to the characteristic where the criterion value that turns on the criterion output and the one that turns off the criterion output are different.
 - If the P.V. value is fluctuating around the tolerances the outputs may repeatedly turn on and off.
Setting the hysteresis changes the width between the tolerances that turn the outputs on and off, thus preventing this phenomenon.
- "3-3 Setting the Tolerances" (page 3-14)

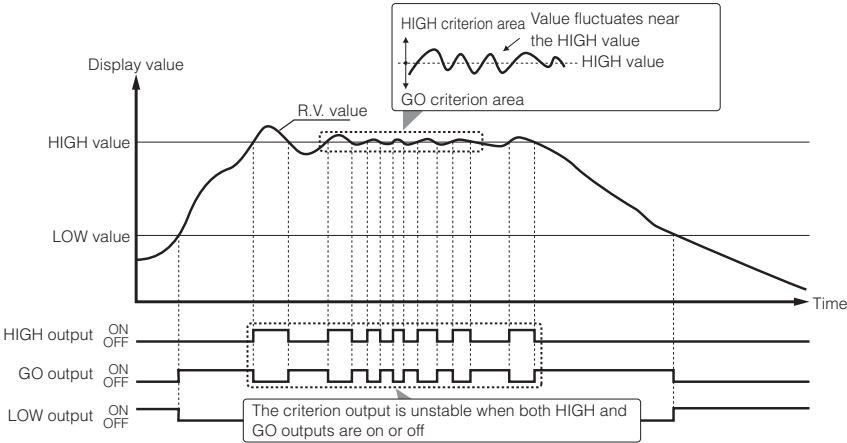


"Entering Basic Setting Mode" (page 5-17)

Item	Setting range	Default Setting
Hysteresis	0.0000 to 199.9999 (unit: mm)	0.0030

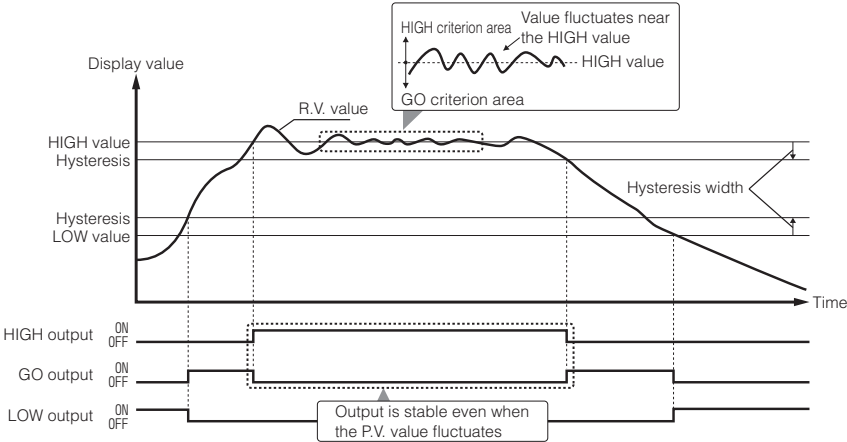
When hysteresis is not set (setting is 0)

Setting the hysteresis to 0 causes fluctuations in the P.V. value to directly affect the criterion output, so it is useful for applications that require strict tolerance measurements. However, when the detected values fluctuate close to the tolerances, the criterion output becomes unstable.



When hysteresis is set

When the hysteresis is set, the output is stable and does not react excessively to fine variations in the P.V. value close to the tolerances. A large hysteresis tends to produce a more stable output, but it also becomes more difficult to output for GO when the P.V. value varies close to the tolerances.



15. Batch Input Settings



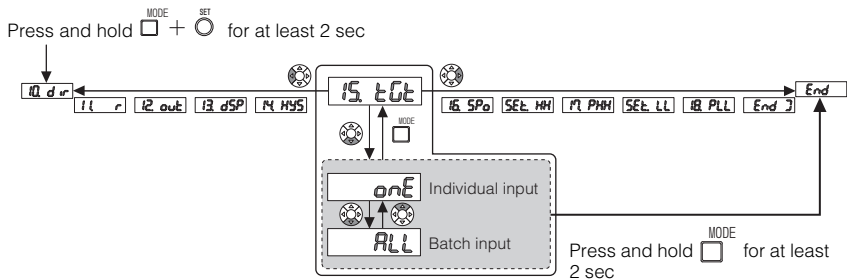
When there is input on the line to the main unit, settings can be batch input to all expansion units.

Batch input settings allow timing input and preset input to the main unit to be input to all expansion units when expansion units are connected.

📖 "7-2 I/O Diagram" (page 7-14)

Reference

- When the batch setting mode is set, the input response time becomes longer.
- 📖 "7-4 Timing Chart" (page 7-18)
- This setting is only available for main units that have expansion units connected.
 - This cannot be set if a model other than the GT2-70 Series is added.
 - Batch input is available with the following functions.
 - External timing input (pink/violet lines)
 - External preset input (pink line)
 - Reset input (red line)
 - External bank A switch input (violet line)
 - External bank B switch input (yellow line)
 - Key lock, full key lock



📖 "Entering Basic Setting Mode" (page 5-17)

Item	Description	Default Setting
Individual input 	Input into main and expansion units individually. Additionally, the key lock function can be set individually.	O
Batch input 	Input to the main unit is also input to any connected expansion units. Additionally, using the key lock function on the main unit activates it for all expansion units. At this time, key lock cannot be deactivated from expansion units.	

Reference

- When batch input settings are being used, the input lines to all expansion units are deactivated.
- "ALL.Loc" will be displayed when attempting to deactivate the key lock on an expansion unit while the key lock or the full key lock on the main unit is active when using batch input settings.

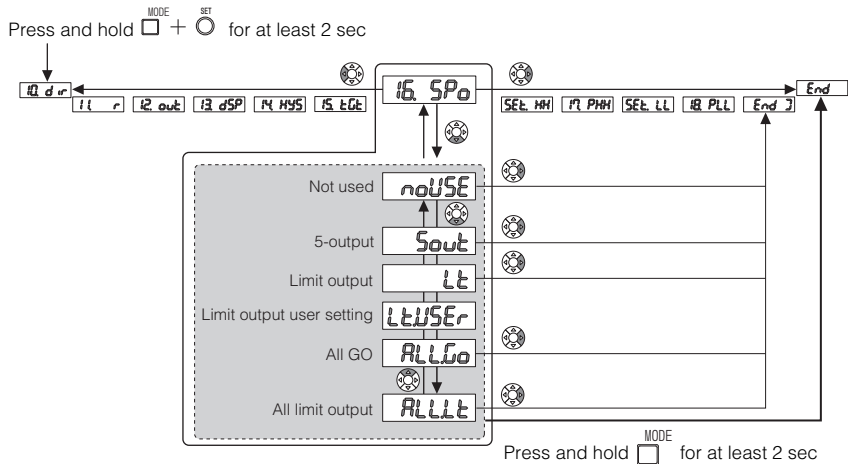
16. Special Output Setting

16. SPo

Selects the special output (orange, green) function.

"7-2 I/O Diagram" (page 7-14)

Reference This setting can be set only when the sensor amplifier is GT2-71(C)/71(C)P/72(C)N/72(C)P/75N/75P/76N/76P.
For GT2-71MCN/MCP (analog output type), refer to "16. Analog Range Setting" (page 5-37).



Reference The items that can be selected (displayed) are different depending on the settings in "A1. Calculation mode". (When the expansion unit is not added, the items that can be selected (displayed) are the same as for "noCALC".)

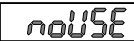
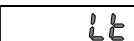
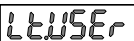
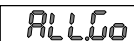
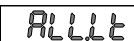
16 Special output setting	noUSE	Sout	Lt	LtUSER	ALLGo ^{*1}	ALLLt ^{*1}
A1 Calculation mode						
noCALC	O	O	O	O	O	-
CALC	O	O ^{*2}	O	O	O ^{*3}	-
CALnoH	O	O	-	-	O	O

^{*1} This can be set only on the main unit that an expansion unit is added.

^{*2} On the expansion unit, this can be set only when "C5.rEF (Reference difference)" is selected in "A2. Calculation Mode".

^{*3} This can be set only when "C5.rEF (Reference difference)" is selected in "A2. Calculation method".

"Entering Basic Setting Mode" (page 5-17)

Item	Description	Default Setting
Not used 	Special output (orange line, green line) functions are not used.	○
5-output 	Uses the special outputs (orange line, green line) as the HH and LL criterion output. The HH and LL side criterion values are set on the main screen.  "(4) 5 output HH setting value display" (page 3-6)  "(7) 5 output LL setting value display" (page 3-9)	
Limit output 	Inspects the sensor head spindle mechanical position (extension-side end, contraction-side end) for limit output.	
Limit output user setting 	Sets the sensor head spindle mechanical position (extension-side end, contraction-side end).	
All GO 	Outputs HH output (orange line) when all connected expansion units and the main unit * are set to GO criterion output, otherwise it outputs LL output (green line).	
All limit output 	Outputs HH output (orange line) when the HH-side limit output is ON for all connected expansion units and outputs LL output (green line) when the LL-side limit output is ON for all connected expansion units	

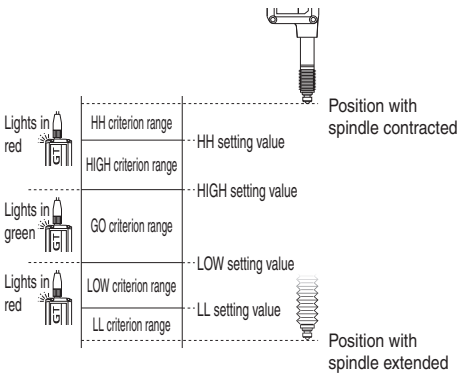
* Main unit output is not included when "CAL.noH" is selected in "A1. Calculation mode".

Special Output Settings

■ When "5out (5-output)" is selected

If "5out" is selected under "16. Special output settings", HH and LL criterion can be output in addition to normal criterion output (HIGH, GO, LOW).

The HH criterion performs criterion output according to the value set above the HIGH setting value (HH setting value > HIGH setting value). The LL criterion performs criterion output according to the value set below the LOW setting value (LL setting value < LOW setting value).



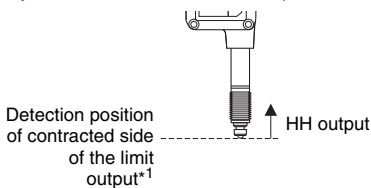
Reference

- Make settings such that the HH setting value is higher than the HIGH setting value. If the HH setting value is set below the HIGH setting value, the HIGH criterion will not be output.
- Make settings such that the LL setting value is lower than the LOW setting value. If the LL setting value is set above the LOW setting value, the LOW criterion will not be output.
- If the HH setting value is lower than the LL setting value, each output will be as follows.
 - GO, HIGH and LOW criterion will not be output regardless of the detection value.
 - If values above the HH setting value or below the LL setting value are detected, HH criterion output and LL criterion output are both output.
- When setting criterion values, make sure that the HH setting value is the largest, the LL setting value is the smallest and that the HIGH setting value is greater than the LOW setting value.
- Set the HH setting value on the "5-output HH setting value screen" of the main screen.
 - "(4) 5 output HH setting value display" (page 3-6)
- Set the LL setting value on the "5-output LL setting value screen" of the main screen.
 - "(7) 5 output LL setting value display" (page 3-9)

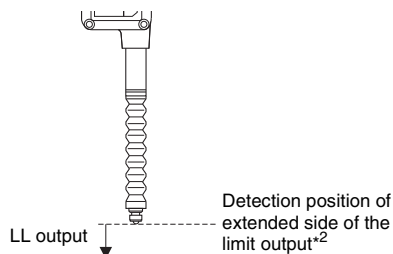
■ When "Lt (limit output)" is selected

When "Lt" is selected from "16. Special Output Settings", HH is output on the spindle contraction side and LL is output on the spindle extension side.

The factory default mechanical positions are detected for both the HH and LL output positions, and so they are output with no effect from settings such as measurement adjustment direction or multiplier.



*1 Position when contracted the amount of the detection range from the origin position set when shipped from the factory



*2 Origin position set when shipped from the factory

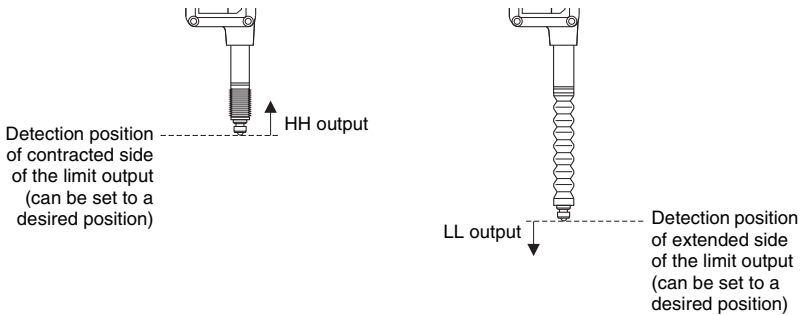
Reference

- When "Lt" is selected, limit output detection position for the HH or LL sides cannot be changed. Select "LtUSER" to set a specific detection position.
- Contraction side HH and extension side LL will normally be output even if the measurement adjustment direction is changed.

■ When "Lt.USER (limit output user settings)" is selected

When "Lt.USER" is selected from "16. Special output settings", limit output extension (HH) side detection position and contraction (LL) side detection position can be set to specific positions.

The detection positions for the contraction (HH) side and the extension (LL) side are output without any effects from settings such as measurement change position or multiplier.

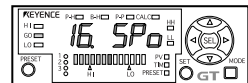


Setting procedure

1 Enter basic setting mode, select "16. Special Output Settings", and then select "Lt.USER (limit output user setting)".

📖 "Entering Basic Setting Mode" (page 5-17)

Use the / buttons to display "16. SPo (16. Special Output Settings)", then use the / buttons to select "Lt.USER (limit output user settings)".

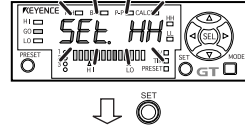


Use the / buttons or the button to confirm the setting.

2 Select "Set.HH".

📖 "Limit Output HH Side Teaching" (page 5-33)

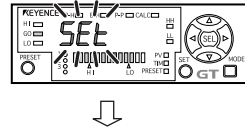
"SEt.HH" will not be displayed if any selection other than "Lt.USER" under "16. Special Output Settings" is selected.



3 Move the spindle to the position you wish to set as the HH side limit output detection reference position, then press the [SET] button.

This calibrates the HH side limit output detection reference position.

"SEt" will blink and the HH side limit output will be set when [SET] is pressed at the reference position.



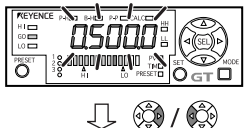
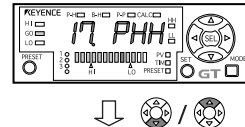
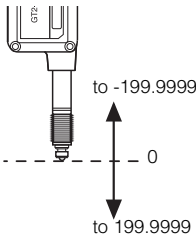
The screen will return to "SEt.HH" after the setting is made.

4 Select "17. Limit output HH side criterion position settings" to specify the HH side ON position.

📖 "17. Limit Output HH Side Criterion Position Setting" (page 5-34)

Setting range: -199.9999 to 199.9999 (mm)

Default setting: 0.5000

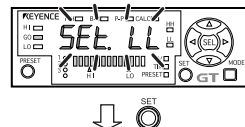


HH side limit output
detection reference position

Use the / buttons or the button to confirm the setting.

5 Select "SEt.LL".

📖 "Limit Output LL Side Teaching" (page 5-35)



■ When "ALL.Go (all go)" is selected

The HH output is output only if "ALL.Go" is selected under "16 Special Output Settings" and the main unit and all connected expansion units are judged as the GO criterion. In other cases, the LL output of the main unit is output.

Reference

- This is only available for main units that are connected to one or more expansion units.
- If the number of expansion units is changed after configuring the settings, reconfigure the settings.

Condition for the main unit HH output to turn ON: When all connected expansion units and the main unit* output the GO criterion

Condition for the main unit LL output to turn ON: When the main unit HH output is OFF

* Main unit output is not included when "CAL.noH" is selected in "A1. Calculation mode".

■ When "ALL.Lt (all limit output)" is selected

When "16. Special output setting" is set to "ALL.Lt", if the HH side limit outputs for all connected expansion units are set to ON, the main unit HH output will be ON and if the LL side limit outputs for all connected expansion units are set to ON, the main unit LL output will be ON.

Reference

- This can only be set on the main unit when "CAL.noH" is set under "A1. Calculation mode" and there are 2 or more expansion units connected.
- The main unit judges output for HH and LL output for expansion units with "16. Special output settings" set to "Lt" or "Lt.USER".

Condition for the main unit HH output to turn ON: When all connected expansion units with "16. Special output settings" is set to "Lt" or "Lt.USER" have their limit output set to HH criterion

Condition for the main unit LL output to turn ON: When all connected expansion units with "16. Special output settings" is set to "Lt" or "Lt.USER" have their limit output set to LL criterion

Reference

The main unit judges output for HH and LL output for When "16. Special Output Settings" is set to "noUSE" or "5out" on all expansion units, HH and LL output are not output on the main unit.

Limit Output HH Side Teaching

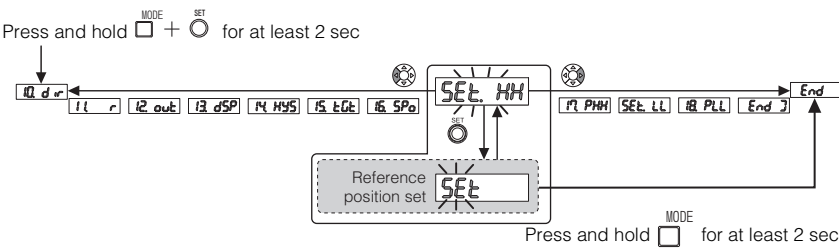
SEt. HH

This section describes how to set the limit output HH side detection position to the desired position.

For the setting procedure, refer to "When "Lt.USER (limit output user settings)" is selected" (page 5-29).

Reference

- Limit output HH side calibration is only available when "Lt.USER (limit output user settings)" under "16. Special Output Settings" is selected.
- This setting can be set only when the sensor amplifier is GT2-71(C)N/71(C)P/72(C)N/72(C)P/75N/75P/76N/76P.



"Entering Basic Setting Mode" (page 5-17)

17. Limit Output HH Side Criterion Position Setting

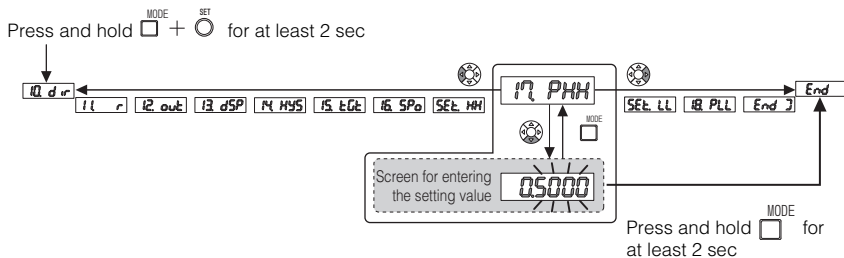
17 PHH

This sets the limit output HH side criterion position to a specified position.

For information about the setting procedure, refer to "When "Lt.USER (limit output user settings)" is selected" (page 5-29).

Reference

- Limit output HH side criterion position setting is only available when "Lt.USER (limit output user settings)" under "16. Special Output Settings" is selected.
- This setting can be set only when the sensor amplifier is GT2-71(C)N/71(C)P/72(C)N/72(C)P/75N/75P/76N/76P.



"Entering Basic Setting Mode" (page 5-17)

Item	Setting range	Default Setting
Limit output HH side criterion position settings	-199.9999 to 199.9999 HH side limit output detection reference position to -199.9999 0 to 199.9999	0.5000

Reference

- Make sure the settings reflect multipliers and calibration.
 - "11. Multiplier" (page 5-19)
 - "30. Calibration Function Setting" (page 5-52)
- There is no effect from the settings in "10. Measurement Direction".
 - "10. Measurement Direction" (page 5-18)

Limit Output LL Side Teaching

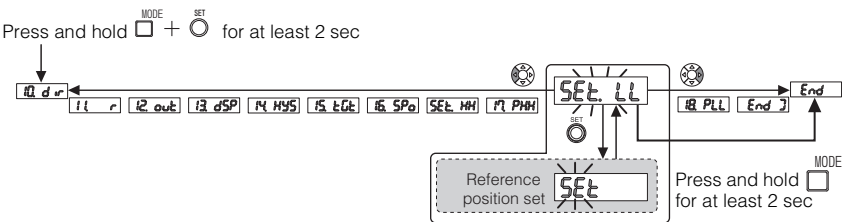
SET. LL

This section describes how to set the limit output LL side detection position to the desired position.

For information about the setting procedure, refer to "When "Lt.USER (limit output user settings)" is selected" (page 5-29).

Reference

- Limit output LL side calibration is only available when "Lt.USER (limit output user settings)" under "16. Special Output Settings" is selected.
- This setting can be set only when the sensor amplifier is GT2-71(C)N/71(C)P/72(C)N/72(C)P/75N/75P/76N/76P.



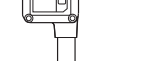
"Entering Basic Setting Mode" (page 5-17)

12 PL

For information about the setting procedure, refer to  "When "Lt.USER (limit output user settings)" is selected" (page 5-29).

- Limit output LL side calibration is only available when "Lt.USER (limit output user settings)" under "16. Special output settings" is selected.
- This setting can be set only when the sensor amplifier is GT2-71(C)/N/71(C)/P/72(C)/N/72(C)/P/75N/75P/76N/76P.



Item	Setting range	Default Setting
Limit output LL side criterion position settings	-199.9999 to 199.9999  LL side limit output detection reference position to 199.9999 0 to -199.9999	0.5000

- Make sure the settings reflect multipliers and calibration.
 - 📖 "11. Multiplier" (page 5-19)
 - 📖 "30. Calibration Function Setting" (page 5-52)
- There is no effect from the settings in "10. Measurement Direction".
 - 📖 "10. Measurement Direction" (page 5-18)

16. Analog Range Setting

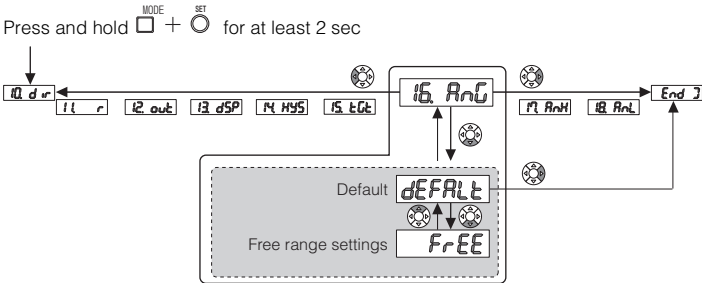
16. AnG

This sets the analog output range.

📖 "3-5 Analog Output Function" (Page 3-27)

Reference

This setting can be set only when the sensor amplifier is GT2-71MCN/MCP (analog output type).
For GT2-71(C)N/71(C)P/72(C)N/72(C)P/75N/75P/76N/76P, refer to 📖 "16. Special Output Setting" (page 5-26).



📖 "Entering Basic Setting Mode" (page 5-17)

Item	Description	Default Setting
Default 	The analog current is output according to the maximum stroke of the sensor head.	0
Free range settings 	The upper limit value (Hi) and the lower limit value (Lo) of the analog output range can be set to a desired value.	

For details about the analog output, refer to 📖 "3-5 Analog Output Function" (page 3-27).

17. Free Range Settings (Hi)

17.0000

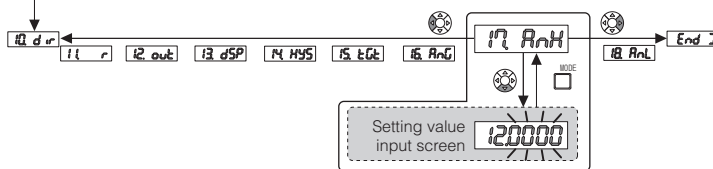
This sets the setting value of the Hi side of the free range settings.

☞ "3-5 Analog Output Function" (Page 3-27)

Reference

- This setting can be set only when "FrEE (free range settings)" is selected in "16. Analog Range Setting".
- This setting can be set only when the sensor amplifier is GT2-71MCN/MCP (analog output type).

Press and hold  +  for at least 2 sec



☞ "Entering Basic Setting Mode" (page 5-17)

Item	Setting range	Default Setting
Free range settings (Hi)	-199.9999 to 199.9999 (unit: mm)	12.0000

18. Free Range Settings (Lo)

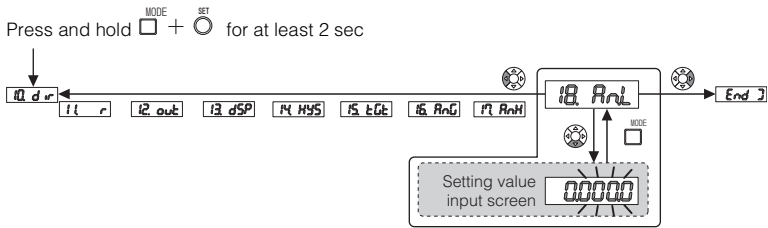
18. RnL

This sets the setting value of the Lo side of the free range settings.

☰ "3-5 Analog Output Function" (Page 3-27)

Reference

- This setting can be set only when "FrEE (free range settings)" is selected in "16. Analog Range Setting".
- This setting can be set only when the sensor amplifier is GT2-71MCN/MCP (analog output type).



☰ "Entering Basic Setting Mode" (page 5-17)

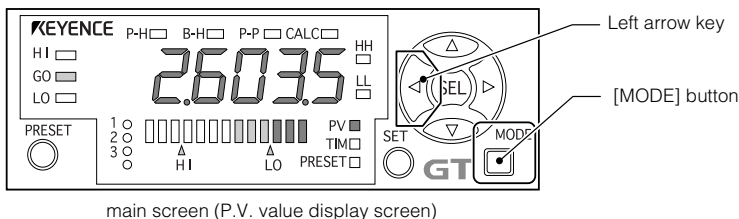
Item	Setting range	Default Setting
Free range settings (Lo)	-199.9999 to 199.9999 (unit: mm)	0

5-4 Additional Function Setting Mode

Entering Additional Function Setting Mode

The following method can be used to enter additional function setting mode.

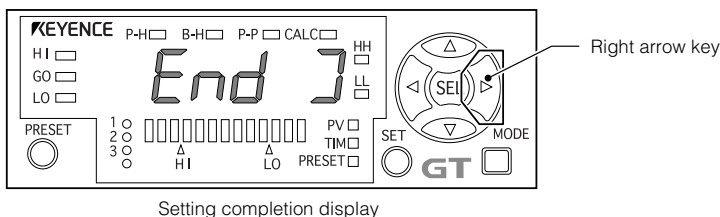
- On the main screen, press and hold the [MODE] button and the left arrow key at the same time for at least two seconds.



Exiting Additional Function Setting Mode

Use one of the following methods to exit additional function setting mode and display the main screen.

- After the settings are complete, press and hold the [MODE] button for at least two seconds.
- After the settings are complete, press the right arrow key several times until the setting completion display appears, and press the right arrow key once more.



20. Select Preset Data

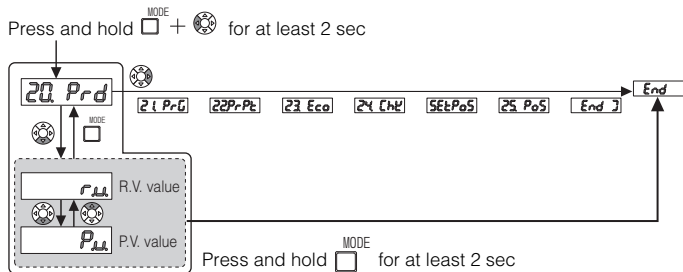
20 Prd

Selects the data to be used when making presets (origin alignment). When the P.V. value is selected, it can be preset by the held value.

📖 "3-2 Origin Alignment" (page 3-11)

Reference

- This is not available on main units with "CAL.noH" selected under "A1. Calculation Mode".
- This is preset by the R.V. value at the time of external preset input for main units with "CALc" selected under "A1. Calculation Mode". (The CALC value is not preset)
- This is preset by the R.V. value at the time of external preset input for main units with "C5.rEF" selected under "A2. Calculation Method" that have expansion units where "P.V." is selected. (The CALC value is not preset)
- When "01. Detection Mode" is set to "P-P", the R.V. value will be preset even if "P.V." is selected.



📖 "Entering Additional Function Setting Mode" (page 5-40)

Item	Description	Default Setting
R.V. value 	Records the R.V. value when making presets (origin alignment).	0
P.V. value 	Records the P.V. value when making presets (origin alignment).	

21. Store Preset Value

21 PrG

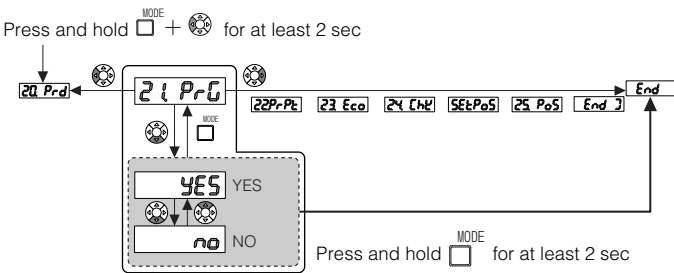
The origin information is stored into memory. The information is saved even after the power is turned off.

When the sensor amplifier turns on, it loads the latest saved origin information.

📖 "3-2 Origin Alignment" (page 3-11)

Reference

- Information can be saved in the storage area even when the power is turned off about one million times.
Set "NO" in situations such as when the origin is frequently aligned with an external signal.
- This is not available on main units with "CAL.noH" selected under "A1. Calculation Mode".



📖 "Entering Additional Function Setting Mode" (page 5-40)

Item	Description	Default Setting
YES (save) 	The origin information is saved in memory region that is not cleared when the power is turned off when the origin alignment is set. Set this parameter when the origin for the detected workpieces does not change frequently.	0
NO (do not save) 	The origin information is saved temporary in memory but is cleared when the power is turned off. The origin information is cleared when the power is turned off, so origin alignment must be performed every time that the power is turned on.	

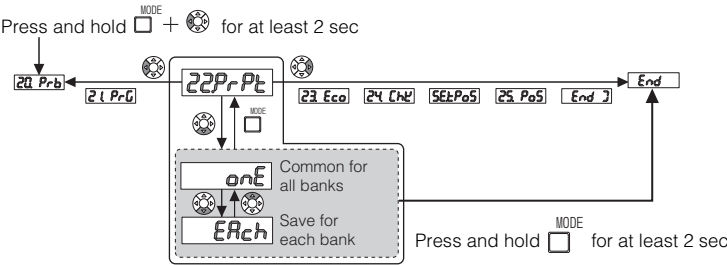
22. Preset Point

22P-Pl

Selects the data to be used when making presets (origin alignment) with per-bank memory.
When "onE" is selected, the last preset point (origin alignment) written at power on is used for all banks.

📖 "3-2 Origin Alignment" (page 3-11)

Reference This is not available on main units with "CAL.noH" selected under "A1. Calculation Mode".



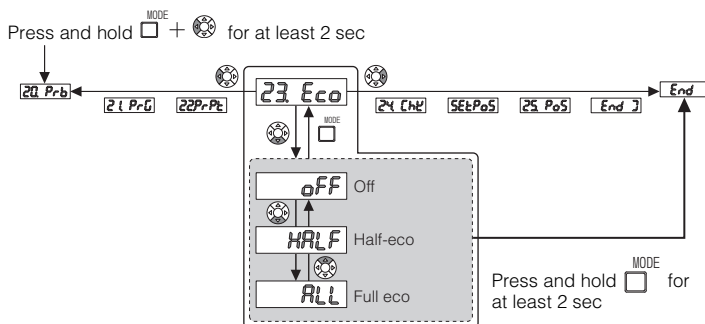
📖 "Entering Additional Function Setting Mode" (page 5-40)

Item	Description	Default Setting
onE 	Use the information for the last preset point (origin alignment) written to memory for all banks.	○
ERch 	Store the preset point (origin alignment) information separately for each bank.	

23 Eco

When operating in the power save state, pressing any button will return to the normal display. If buttons are not pressed in the normal display for one minute, the GT2-70 Series returns to power save mode.

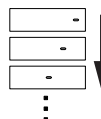
When operating in power save mode, only "Origin alignment" is active. To perform other operations, press any button to return to the normal display before operating.



 "Entering Additional Function Setting Mode" (page 5-40)

Item	Description	Default Setting
Off 	Power save is turned off. Sensor amplifier: Normal display Operation indicator: Normal display	○
Half-eco 	Only the sensor amplifier enters power save mode. Sensor amplifier: Animation display* Operation indicator: Normal display	
Full eco 	The sensor amplifier and sensor head both enter power save mode. Sensor amplifier: All indicators off (nothing is displayed) Operation indicator: Indicators off	

* Only one segment blinks at a time on the digital display, moving in order on the display from right to left. If an error occurs, the error is not displayed.

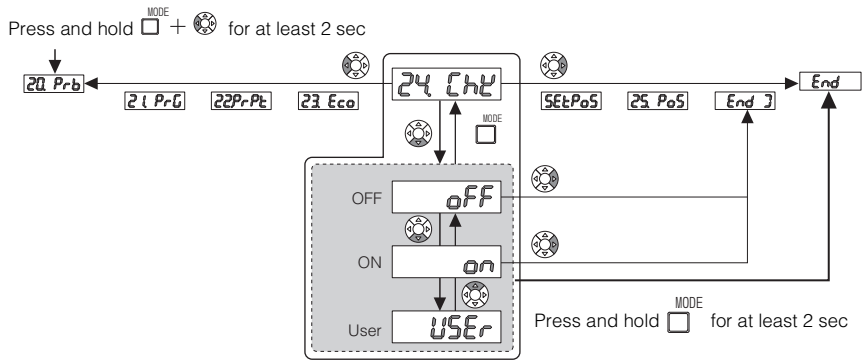


24. Jam Detection Function

24 CHL

If a contact sensor is used for a long period of time, the spindle may lose its ability to fully extend which reduces its ability to perform detection correctly. The jam detection function checks for this malfunction and outputs error.

- Reference**
- This is not available on main units with "CAL.noH" selected under "A1. Calculation Mode".
 - Jam detection function can only be set if "t-in (External timing)" is selected in "04. Timing type".



📖 "Entering Additional Function Setting Mode" (page 5-40)

Item	Description	Default Setting
OFF 	The jam detection function is not used.	0
ON 	Checks whether the spindle moves to the "-FFFF (fully extended)" or "FFFF (fully compressed)" position when the external input is on (while not performing detection).	
User 	Sets a custom position for the jam detection checkpoint.	

* When a problem is detected, the core alarm error display appears and an error is output.

Er. CHL

Core alarm error display

Jam detection

■ When enabled

When "on" is selected in "24. Jam detection function", the points where the spindle is fully extended or fully compressed are used as checkpoints for the core alarm. These checkpoints are used to determine whether the spindle is operating correctly.

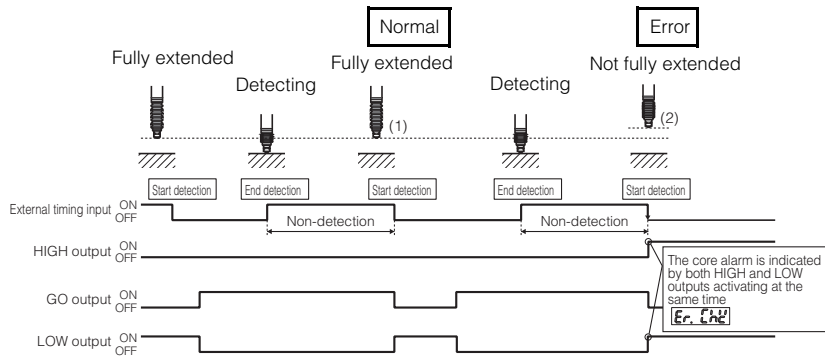
The jam detection function checks whether the spindle returns to its original position (if it is fully extended or fully compressed) during the non-detection state*¹ that occurs after detection ends and before the next detection begins. An error outputs if the spindle fails to return to its original position.

The non-detection state is determined by the external timing input. The non-detection state occurs when the external timing input is on. While the external timing input is on, if the spindle reaches a fully extended (or fully compressed) state even once*², this is recognized as normal operation. If the fully extended (or fully compressed) state is not reached*², an error is output.

*¹ The non-detection state is when the external timing input is on.

*² The fully compressed state is the position where the HH limit output of the spindle turns on, and the fully extended state is the position where the LL limit output of the spindle turns on.

If "USER" is selected, the jam detection checkpoint can be set at a desired position.



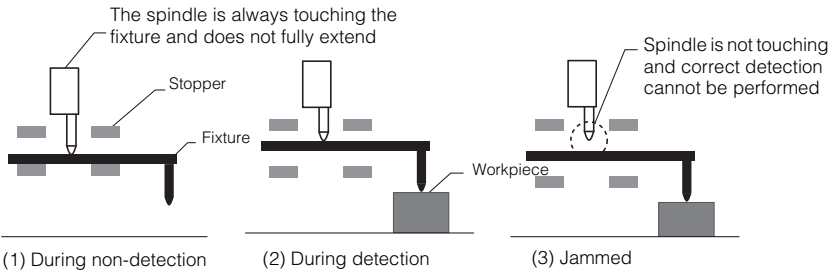
In the diagram above, detection is started while the spindle is extended (external timing input is off) and detection ends when the detection point is reached (external timing input ON: output hold).

Figure (1) is in the non detection state (external timing input ON) and has the spindle extended without generating an error. Figure (2) has the spindle setting off a core alarm and thus not being extended so that entering the detection state (external timing input OFF) generates an error (Core alarm error "E_r. C_hL", HIGH and LOW criterion output both ON).

■ When "USER" is selected

When "USER" is selected for "24. Jam detection function", the jam detection checkpoint (reference point for core alarm) can be set to any position.

Set the position when using with a fixture or when the spindle does not fully extend (or fully compress) during the non-detection state.

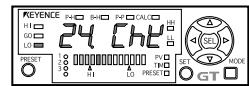


- (1) During non-detection, the sensor head is always touching the fixture, so the spindle is not fully extended (does not reach the position where the LL limit output turns on).
- (2) During detection, the fixture is used to detect the workpiece.
- (3) If the spindle jams, detection cannot be performed correctly.

Setting procedure

1 Enter additional function setting mode, select "24. Jam detection function" and select "USER" (User)".

- ☐ "Entering Additional Function Setting Mode" (page 5-40)



After displaying the "24. CH (24. Jam detection function)" by using the / button, select "USER (User)" using the / button.

The setting is fixed by pressing the / button (or the button).

2 Select "SEt PoS".

- ☐ "Jam Detection Teaching" (page 5-49)



If "24. Jam detection function" is set to "on" or "off", "SEt PoS" is not displayed.

3 Move to the position that you want to set as the reference point for the spindle checkpoint and press the [SET] button.

Teaching is performed to recognize the reference position for the core alarm.

Pressing the [SET] button at the reference position causes "SEt" to blink. The position is fixed as the reference position for the checkpoint.

After fixing the position, the display returns to "SEt PoS".

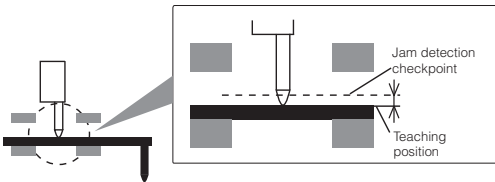


4 Select "25. Jam detection checkpoint setting" and set the jam detection checkpoint (position).

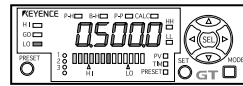
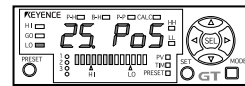
📖 "25. Jam Detection Checkpoint Setting" (page 5-50)

Setting range: -199.9999 to 199.9999 (mm)

Initial value: 0.5000 (mm)



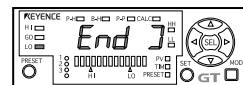
When not detecting



The setting is fixed by pressing the  /  button (or the  button).

5 End the setting.

Press the  button or press and hold the  button for at least two seconds to end the setting.



Press  or press and hold  for at least 2 sec

Return to the main screen

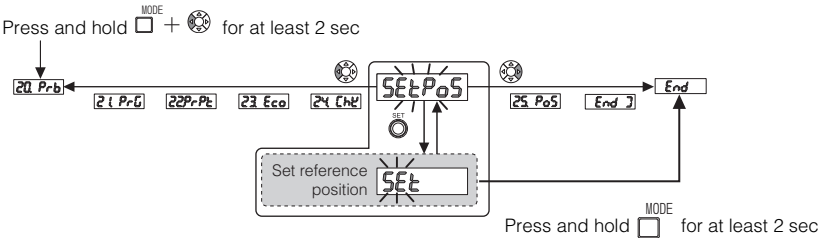
Jam Detection Teaching

SEtPoS

Sets the reference point when setting a custom position for the jam detection checkpoint.

For information about the setting procedure, refer to "When "USER" is selected" (page 5-47).

Reference Jam detection teaching can only be set if "24. Jam detection function" is set to "USER (User)".



"Entering Additional Function Setting Mode" (page 5-40)

25. Jam Detection Checkpoint Setting

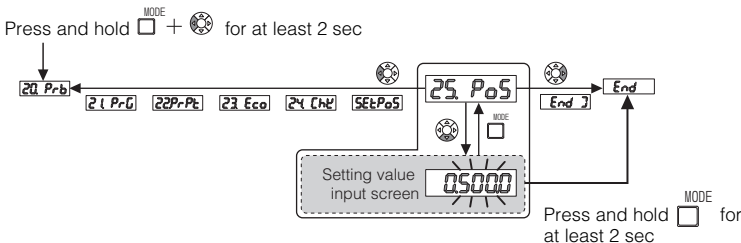
25. Pos

Sets a custom position for the jam detection checkpoint.

For information about the setting procedure, refer to "When "USEr" is selected" (page 5-47).

Reference

Jam detection teaching can only be set if "24. Jam detection function" is set to "USEr (User)".



"Entering Additional Function Setting Mode" (page 5-40)

Item	Setting range	Default Setting
Jam detection checkpoint setting	-199.9999 to 199.9999 0 to 199.9999: Jam detection determination position Setting range: 0 to 199.9999 When the spindle extends beyond the position of the jam detection checkpoint, a jam detection is triggered.	0.5000

Reference

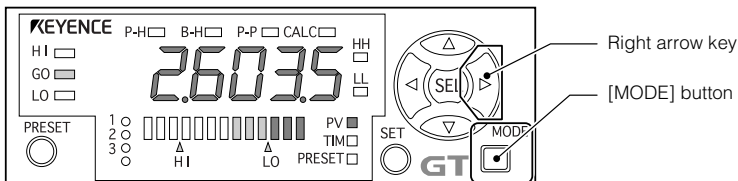
- Set this parameter according to the value applied in Multiplier or Calibration.
 - "11. Multiplier" (page 5-19)
 - "30. Calibration Function Setting" (page 5-52)
- There is no effect from the settings in "10. Measurement Direction".
 - "10. Measurement Direction" (page 5-18)
- To perform jam detection during compression, set the range to "-199.9999 to 0".

5-5 Calibration Setting Mode

Entering Calibration Setting Mode

The following method can be used to enter calibration setting mode.

- On the main screen, press and hold the [MODE] button and the right arrow key at the same time for at least two seconds.



<Main screen (P.V. value display screen)>

Reference

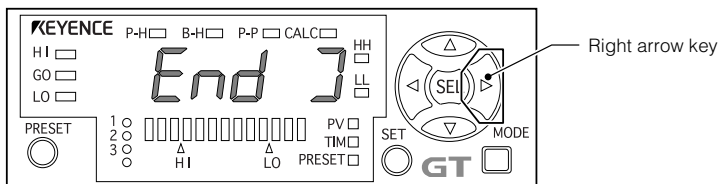
On the main unit, the error display shown to the right appears and calibration setting mode cannot be entered when "CAL.noH" is selected in "A1. Calculation Mode".

CAL.noH

Exiting Calibration Setting Mode

Use one of the following methods to exit calibration setting mode and display the main screen.

- After the settings are complete, press and hold the [MODE] button for at least two seconds.
- After the settings are complete, press the right arrow key several times until the setting completion display appears, and press the right arrow key once more.

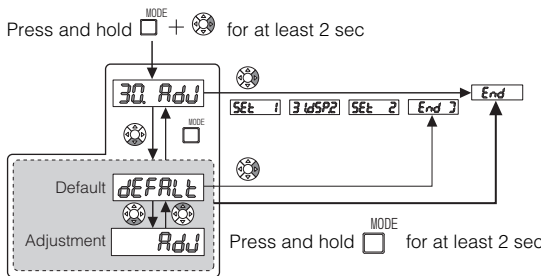


<Setting completion display>

30. Calibration Function Setting

30. Adj

After replacing a sensor head, this parameter can be used to perform origin alignment or span adjustment, which reduces the effects of misalignment that occur during installation and produces detection values that are closer to the values achieved before replacement.



📖 "Entering Calibration Setting Mode" (page 5-51)

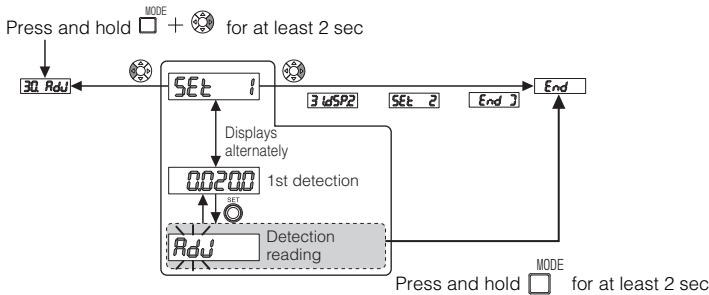
Item	Description	Default Setting
Default 	Reset the span adjustment value to the default state. 📖 "31. 2nd Target Setting" (page 5-54)	○
Adjustment 	Performs origin alignment and span adjustment.	

1st Detection/Capture

SEt 1

Sets the origin, which is used as the reference for the calibration settings.

Reference The parameter can be set only when "30. Calibration function setting" is set to "Adj (Adjustment)".

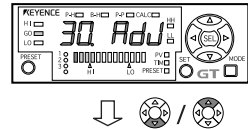


☞ "Entering Calibration Setting Mode" (page 5-51)

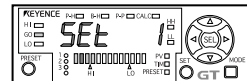
Setting procedure

- 1 Enter the calibration setting mode and select "30. Calibration function setting" and then "Adj (Adjustment)".

☞ "30. Calibration Function Setting" (page 5-52)



- 2 Select "SEt 1".



- 3 Move to the spindle origin position and press the [SET] button.

"Adj" blinks and the origin position (preset value).



☞ "Preset Function (Displaying a value by Adding or Subtracting a Desired Value)" (page 3-30)

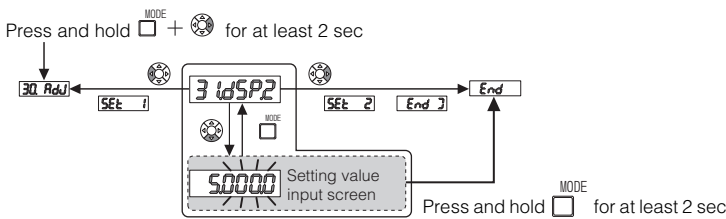
31. 2nd Target Setting

3 185P2

Sets the target value for span adjustment.

Reference

The parameter can be set only when "30. Calibration function setting" is set to "AdJ (Adjustment)".



📖 "Entering Calibration Setting Mode" (page 5-51)

Item	Setting range	Initial value
2nd target setting	-199.9999 to 199.9999 (unit: mm)	5.0000

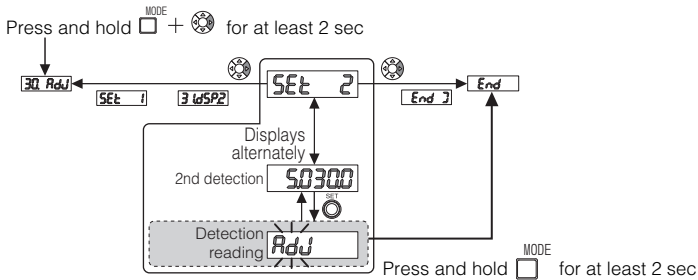
2nd Detection/Capture

SEt 2

Reads the detection value for span adjustment and corrects for the amount of difference between the 2nd target value.

Reference

The parameter can be set only when "30. Calibration function setting" is set to "AdJ (Adjustment)".



☞ "Entering Calibration Setting Mode" (page 5-51)

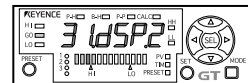
Setting procedure

1 Enter calibration mode and define the 1st detection position.

☞ "30. Calibration Function Setting" (page 5-52)

☞ "1st Detection/Capture" (page 5-53)

2 Select "31. 2nd target setting" and enter the target value.

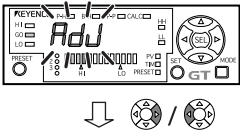


3 Select "SEt 2".



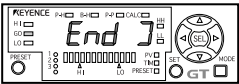
4 Move to the detection position that is to be set as the 2nd spindle position and press the [SET] button.

"Adj" blinks and the difference between the target value and the detected value is corrected.



5 End the calibration setting.

Press the  button or press and hold the  button for at least two seconds to end the setting.



Press  or press and hold  for at least 2 sec

Return to the main screen

Reference

- A calibration error occurs under the following situations and the error screen is displayed. And calibration cannot be performed.
 - When the 1st position is not determined
 - When the values between the target and detection values does not match
 - When the results of the span adjustment is more than twice the factory default value (Increase the Multiplier before performing calibration.)
- When performing calibration, reset the following parameters:
 - HIGH setting value ( "(5) HIGH setting value display" (page 3-7))
 - LOW setting value ( "(6) LOW setting value display" (page 3-8))
 - Self-timing level ( "05. Self-timing Level" (page 5-12))
- To reset the span adjustment to the factory default state, select "Default" in "30. Calibration function setting".
 "30. Calibration Function Setting" (page 5-52)



Calibration error screen

5-6 Calculation Setting Mode

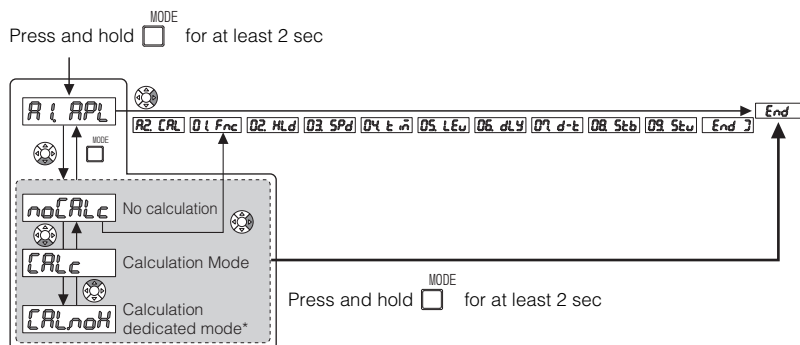
The calculation setting mode is one of the function setting modes, and it can be set and used only when an expansion unit is added.

Calculation Setting Mode

R I APL

This is one of the function setting modes for the main unit when an expansion unit is added. It performs the calculation setting.

📖 "5-2 Function Setting Mode" (page 5-6)



* This is only available for main units that are connected to two or more expansion units.

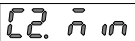
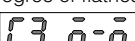
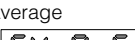
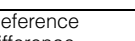
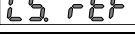
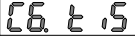
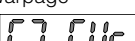
📖 "Entering Function Setting Mode" (page 5-6)

Item	Description	Default Setting
No calculation noCALc	No calculations are performed. The main unit and all expansion units operate independently.	○
Calculation Mode CALc	The detection values of the main unit and the expansion units are calculated via the application and the main unit outputs the criterion result. 📖 "Applications" (page 5-58)	
Calculation dedicated mode CALnoH	- Calculates expansion unit detection values and outputs the criterion result without connecting the main unit to the sensor head.* - Connected expansion units output the individual criterion results based on settings and detection values, regardless of the application being used.	

* When using the calculation dedicated mode, connecting a sensor head to the main unit will cause "Er.noH" to be displayed and the main unit will produce error output (HIGH criterion output and LOW criterion output are ON simultaneously).

Applications

The following applications can be used in the calculation mode and calculation dedicated mode:

Application	Description	Default Setting	Max. units		Reference page
			Calculation mode	Calculation dedicated mode	
Max. value 	The maximum detected value from the expansion units is taken as a criterion value.	0	1 unit or more	2 units or more	5-65
Min. value 	The minimum detected value from the expansion units is taken as a criterion value.		1 unit or more	2 units or more	5-66
Degree of flatness 	Extracts maximum and minimum detected values from the expansion units, and the difference between them is taken as a criterion value.		1 unit or more	2 units or more	5-67
Average 	The total of the values from the expansion units is divided by the number of units. The resulting average value is taken as a criterion value.		1 unit or more	2 units or more	5-68
Reference difference 	Subtracts the display value of the main unit from each expansion unit and uses the resulting value as the criterion value for the expansion unit.		1 unit or more	—— *	5-69
Twist 	The degree of twist calculated based on the detected values from four detection points is taken as the criterion value.		Only when three units are connected.	Only when four units are connected.	5-70
Warpage 	The degree of warpage calculated based on the detected values from three detection points is taken as the criterion value.		Only when two units are connected.	Only when three units are connected.	5-72
Thickness 	Places the detection target between the expansion units and uses the thickness as the criterion value.		Only when one unit is connected.	Only when two units are connected.	5-74

* During the calculation dedicated mode, "C5. rEF (Reference difference)" is not available.

Reference

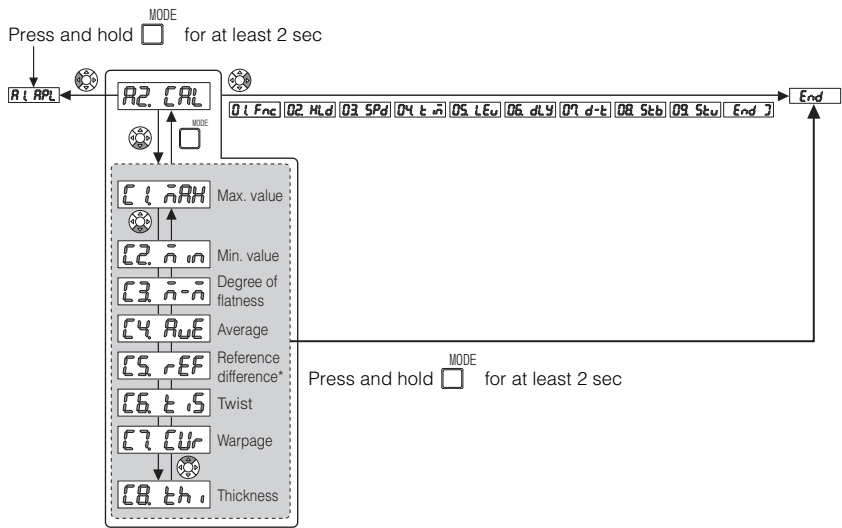
- When the calculation function is set, if the number of expansion units is changed the next time the power is turned on, the error display as shown to the right appears. Reset the error by following the procedure below.


Number of expansion units error

- Turn off the power, and change the number of units back to the previous number of units, then turn on the power again.
- Reset the calculation function on the main unit.
- The available calculation methods vary depending on the number of expansion units added.

Selecting an application

The procedure for selecting an application is as follows.



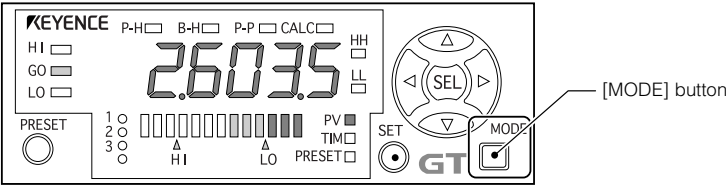
* Not displayed when "CAL.noH (calculation dedicated mode)" is selected in "A1. Calculation mode".

Entering calculation setting mode

The following can be used to enter calculation setting mode.

- On the main screen, press and hold the [MODE] button for at least two seconds. Enter the function setting mode, then select "CALc" or "CAL. noH".

📖 "Entering Function Setting Mode" (page 5-6)



Main screen (P.V. value display screen)

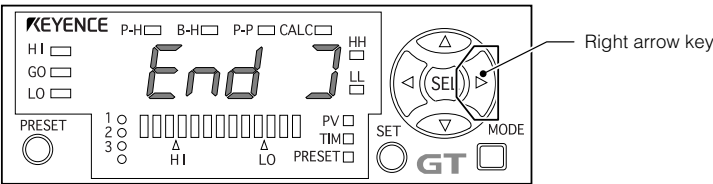
Reference

Calculation setting mode cannot be entered if there are not any expansion units.

Exiting calculation setting mode

Use one of the following methods to exit calculation setting mode and display the main screen.

- After the calculation setting mode settings are complete, press and hold the [MODE] button for at least two seconds.
- After the calculation setting mode settings are complete, press the right arrow key several times until the setting completion display appears, then press the right arrow key once more.



Setting completion display

Precautions for Calculation Setting

■ Response time when the calculation function is used

When the calculation function is used, the response time varies depending on the response time set in the main unit, the number of units that have been added, and the types of main/expansion units.

This section describes the response time when the calculation function is used.

"ALL.Go output" when "noCALc" is set in "A1.APL"

The actual ALL.Go output response time of the main unit is determined by either of the slower one: "the response time of the main unit" or "the value where the time in the following table is added to the slowest response time set in the expansion unit".

📖 "When "ALL.Go (all go)" is selected" (page 5-32)

Number of added expansion units	Time to be added (ms)
2 units	5.5
3 units	6.5
4 units	11.5
5 units	12.5
6 units	17.5
7 units	18.5
8 units	23.5

Number of added expansion units	Time to be added (ms)
9 units	24.5
10 units	29.5
11 units	30.5
12 units	35.5
13 units	36.5
14 units	41.5
15 units	42.5

Reference

- If connecting RS-232C Communication Unit DL-RS1A or the BCD Output Unit DL-RB1A, add "7 ms" to the value in the table above.
- ALL.Go output is output only on the main unit.
- Refer to pages 5-9 and 5-10 for response time.

Criterion output when a setting other than "C5. rEF (Reference difference)" is set

The actual criterion output response time is determined by adding the following time to the response time that has been set in the main unit.

Number of added expansion units	Time to be added (ms)	Number of added expansion units	Time to be added (ms)
2 units	5.5	9 units	24.5
3 units	6.5	10 units	29.5
4 units	11.5	11 units	30.5
5 units	12.5	12 units	35.5
6 units	17.5	13 units	36.5
7 units	18.5	14 units	41.5
8 units	23.5	15 units	42.5

Reference

- When "RS-232C Communication Unit DL-RS1A" or "BCD Output Unit DL-RB1A" is connected, add "7 ms" to the above time.
- When a setting other than "C5. rEF" is set, the criterion output is output only on the main unit.

Criterion output when "C5. rEF (Reference difference)" is set

The actual criterion output response time is determined by adding the following time to the response time that has been set in the main unit.

☞ "C5. Reference Difference" (page 5-69)

Number of added expansion units	Time to be added (ms)	Number of added expansion units	Time to be added (ms)
2 units	5.5	9 units	24.5
3 units	6.5	10 units	29.5
4 units	11.5	11 units	30.5
5 units	12.5	12 units	35.5
6 units	17.5	13 units	36.5
7 units	18.5	14 units	41.5
8 units	23.5	15 units	42.5

Reference

When "RS-232C Communication Unit DL-RS1A" or "BCD Output Unit DL-RB1A" is connected, add "7 ms" to the above time only for the expansion unit.

"ALL.Go output" when "C5. rEF (Reference difference)" is set

The actual ALL.Go output response time is determined by adding the following time to the response time that has been set in the main unit.

📖 "When "ALL.Go (all go)" is selected" (page 5-32)

Number of added expansion units	Time to be added (ms)
2 units	8.0
3 units	9.5
4 units	17.0
5 units	18.5
6 units	26.0
7 units	27.5
8 units	35.0

Number of added expansion units	Time to be added (ms)
9 units	36.5
10 units	44.0
11 units	45.5
12 units	53.0
13 units	54.5
14 units	62.0
15 units	63.5



Reference

- When "RS-232C Communication Unit DL-RS1A" or "BCD Output Unit DL-RB1A" is connected, add "7 ms" to the above time.
- ALL.Go output is output only on the main unit.

Criterion output when "CAL.noH (calculation dedicated mode)" is set

The actual criterion output response time is determined by adding the following time to the response time that has been set in the main unit.

📖 "Calculation Setting Mode" (page 5-57)

Number of added expansion units	Time to be added (ms)	
	Main unit	Expansion unit
2 units		
3 units		
4 units	6.5	0
5 units	11.5	0
6 units	12.5	0
7 units	17.5	0
8 units	18.5	0
9 units	23.5	0

Number of added expansion units	Time to be added (ms)	
	Main unit	Expansion unit
9 units	24.5	0
10 units	29.5	0
11 units	30.5	0
12 units	35.5	0
13 units	36.5	0
14 units	41.5	0
15 units	42.5	0



Reference

When "RS-232C Communication Unit DL-RS1A" or "BCD Output Unit DL-RB1A" is connected, add "7 ms" to the above time only for the main unit.

"ALL.Go output" when "CAL.noH (calculation dedicated mode)" is set

The actual ALL.Go output response time is determined by adding the following time to the response time that has been set in the main unit.

- ☞ "Calculation Setting Mode" (page 5-57)
- ☞ "When "ALL.Go (all go)" is selected" (page 5-32)

Number of added expansion units	Time to be added (ms)	Number of added expansion units	Time to be added (ms)
2 units		9 units	24.5
3 units	6.5	10 units	29.5
4 units	11.5	11 units	30.5
5 units	12.5	12 units	35.5
6 units	17.5	13 units	36.5
7 units	18.5	14 units	41.5
8 units	23.5	15 units	42.5

- Reference

 - When "RS-232C Communication Unit DL-RS1A" or "BCD Output Unit DL-RB1A" is connected, add "7 ms" to the above time only for the main unit.
 - ALL.Go output is output only on the main unit.

"ALL.Lt output" when "CAL.noH (calculation dedicated mode)" is set

The ALL.Lt output response time is determined by adding the following time to the response time that has been set in the main unit.

- ☞ "Calculation Setting Mode" (page 5-57)
- ☞ "When "ALL.Lt (all limit output)" is selected" (page 5-32)

Number of added expansion units	Time to be added (ms)	Number of added expansion units	Time to be added (ms)
2 units		9 units	24.5
3 units	6.5	10 units	29.5
4 units	11.5	11 units	30.5
5 units	12.5	12 units	35.5
6 units	17.5	13 units	36.5
7 units	18.5	14 units	41.5
8 units	23.5	15 units	42.5

- Reference

 - When "RS-232C Communication Unit DL-RS1A" or "BCD Output Unit DL-RB1A" is connected, add "7 ms" to the above time only for the main unit.
 - ALL.Lt output is output only on the main unit.

Precautions when using the calculation function or calculation only mode.

If the sensor head connected to the main unit is GT2-H***A*** and the sensor head connected to the expansion unit is GT2-P***, the response time of the expansion unit becomes 4 times slower than that of the main unit.

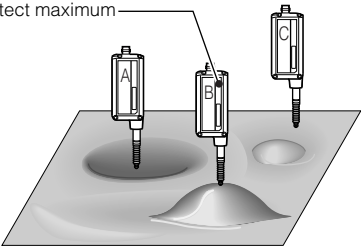
Furthermore, if the sensor head connected to the main unit is GT2-P*** and the sensor head connected to the expansion unit is GT2-H/A***, the response time of the expansion unit becomes 4 times faster than that of the main unit.

C1. Max. Value



When "C1. Max. Value" is selected, the maximum value detected from the main unit and expansion units is used as the value.

Sensor head used to detect maximum



The value detected by the sensor head B is taken as the criterion value.

■ Amplifier display

Main screens that can be displayed are as follows:

Calculation Setting Mode	Sensor amplifier	P.V. value display	Calculated value (CALC value) display	R.V. value display	HIGH/LOW setting display	HH/LL setting display	Preset value setting display
Calculation mode	Main unit	Yes ^{*1}	Yes ^{*2}	Yes ^{*3}	Yes	Yes	Yes
	Expansion unit	-	-	Yes ^{*3}	-	-	Yes
Calculation only mode	Main unit	Yes ^{*4}	Yes ^{*5}	-	Yes	Yes	-
	Expansion unit	Yes ^{*6}	-	Yes ^{*3}	Yes	Yes	Yes

- *1 Displays the largest detection value (criterion value) from the main unit and expansion units according to the hold settings.
- *2 Displays the largest detection value from the main unit and expansion units as an R.V. value (without holding the value when using hold).
- *3 Displays the detected value for the sensor head connected to each amplifier as an R.V. value (without holding the value when using hold).
- *4 Displays the largest detection value (criterion value) from the expansion units according to the hold settings.
- *5 Displays the largest detection value from the expansion units as an R.V. value (without holding the value when using hold).
- *6 Displays the detected value for the sensor head connected to each amplifier according to the hold settings.

■ Output

Outputs are as follows:

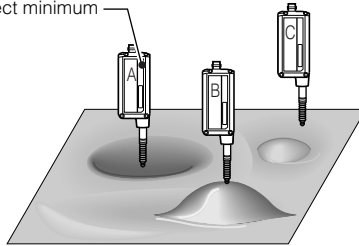
Sensor amplifier		Output
Main unit		The maximum value detected with the main unit and expansion units is taken as the value and the result is output.
Expansion unit	Calculation Mode	Criterion output is not performed (always off).
	Calculation dedicated mode	Criterion output is performed individually based on the detection value from the connected sensor head.

C2. Min. Value



When "C2. Min. Value" is selected, the minimum value detected from the main unit and expansion units used as the value.

Sensor head used to detect minimum



The value detected by the sensor head A is taken as the value.

■ Amplifier display

Main screens that can be displayed are as follows:

Calculation Setting Mode	Sensor amplifier	P.V. value display	Calculated value (CALC value) display	R.V. value display	HIGH/LOW setting display	HH/LL setting display	Preset value setting display
Calculation mode	Main unit	Yes*1	Yes*2	Yes*3	Yes	Yes	Yes
	Expansion unit	-	-	Yes*3	-	-	Yes
Calculation only mode	Main unit	Yes*4	Yes*5	-	Yes	Yes	-
	Expansion unit	Yes*6	-	Yes*3	Yes	Yes	Yes

- *1 Displays the smallest detection value (criterion value) from the main unit and expansion units according to the hold settings.
- *2 Displays the smallest detection value from the main unit and expansion units as an R.V. value (without holding the value when using hold).
- *3 Displays the detected value for the sensor head connected to each amplifier as an R.V. value (without holding the value when using hold).
- *4 Displays the smallest detection value (criterion value) from the expansion units according to the hold settings.
- *5 Displays the smallest detection value from the expansion units as an R.V. value (without holding the value when using hold).
- *6 Displays the detected value for the sensor head connected to each amplifier according to the hold settings.

■ Output

Outputs are as follows:

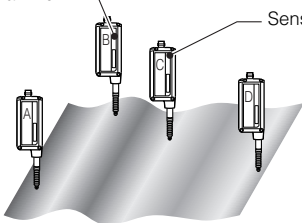
Sensor amplifier		Output
Main unit		The minimum value detected from the main unit and expansion units is taken as a value, and the result is output.
Expansion unit	Calculation Mode	Criterion output is not performed (always off).
	Calculation dedicated mode	Criterion output is performed individually based on the detection value from the connected sensor head.

C3. Degree of flatness

C3 $\bar{a}-\bar{a}$

When "C3. Degree of flatness" is selected, the maximum and minimum values detected with the main unit and expansion units are extracted and the difference between them (maximum value - minimum value) is used as a the value.

Sensor head used to detect maximum



Sensor head used to detect minimum

The criterion value is calculated as the detection value of sensor head B minus the detection value of sensor head C.

■ Amplifier display

Main screens that can be displayed are as follows:

Calculation Setting Mode	Sensor amplifier	P.V. value display	Calculated value (CALC value) display	R.V. value display	HIGH/LOW setting display	HH/LL setting display	Preset value setting display
Calculation mode	Main unit	Yes ^{*1}	Yes ^{*2}	Yes ^{*3}	Yes	Yes	Yes
	Expansion unit	-	-	Yes ^{*3}	-	-	Yes
Calculation only mode	Main unit	Yes ^{*4}	Yes ^{*5}	-	Yes	Yes	-
	Expansion unit	Yes ^{*6}	-	Yes ^{*3}	Yes	Yes	Yes

- *1 Displays the result (criterion value) after calculating the maximum value minus the minimum value from the main unit and expansion units according to the hold settings.
- *2 Displays the difference between the maximum value and minimum value from the main unit and expansion units as an R.V. value (without holding the value when using hold).
- *3 Displays the detected value for the sensor head connected to each amplifier as an R.V. value (without holding the value when using hold).
- *4 Displays the result (criterion value) after calculating the maximum value minus the minimum value from the expansion units according to the hold settings.
- *5 Displays the result after calculating the maximum value minus the minimum value from the expansion units as an R.V. value (without holding the value when using hold).
- *6 Displays the detected value for the sensor head connected to each amplifier according to the hold settings.

■ Output

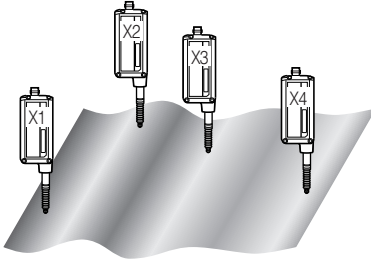
Outputs are as follows:

Sensor amplifier		Output
Main unit		The calculation result of the maximum value minus the minimum value detected with the main unit and expansion units is taken as the value and the result is output.
Expansion unit	Calculation Mode	Criterion output is not performed (always off).
	Calculation dedicated mode	Criterion output is performed individually based on the detection value from the connected sensor head.

C4. Average

C4 Ave

When "C4. Average" is selected, the average detected value from the main unit and expansion units is used as the value.



The formula for obtaining an average value is shown below.
 $(X1 + X2 + X3 + \dots Xn) / n$
n: The total number of sensor amplifiers that are connected.

■ Amplifier display

Main screens that can be displayed are as follows:

Calculation Setting Mode	Sensor amplifier	P.V. value display	Calculated value (CALC value) display	R.V. value display	HIGH/LOW setting display	HH/LL setting display	Preset value setting display
Calculation mode	Main unit	Yes ^{*1}	Yes ^{*2}	Yes ^{*3}	Yes	Yes	Yes
	Expansion unit	-	-	Yes ^{*3}	-	-	Yes
Calculation only mode	Main unit	Yes ^{*4}	Yes ^{*5}	-	Yes	Yes	-
	Expansion unit	Yes ^{*6}	-	Yes ^{*3}	Yes	Yes	Yes

- *1 Performs calculations to average the detection values from the main unit and expansion units, and then displays the calculation result (criterion value) according to the hold settings.
- *2 Performs calculations to average the detection values from the main unit and expansion units, and then displays the calculation result as an R.V. value (without holding the value when using hold).
- *3 Displays the detected value for the sensor head connected to each amplifier as an R.V. value (without holding the value when using hold).
- *4 Performs calculations to average the detection values from the connected expansion units, and then displays the calculation result (criterion value) according to the hold settings.
- *5 Performs calculations to average the detection values from the connected expansion units, and then displays the calculation result as an R.V. value (without holding the value when using hold).
- *6 Displays the detected value for the sensor head connected to each amplifier according to the hold settings.

■ Output

Outputs are as follows:

Sensor amplifier		Output
Main unit		Performs calculation to obtain an average value of those detected from the main unit and expansion units. The resulting value of calculation is taken as the value and the result is output.
Expansion unit	Calculation Mode	Criterion output is not performed (always off).
	Calculation dedicated mode	Criterion output is performed individually based on the detection value from the connected sensor head.

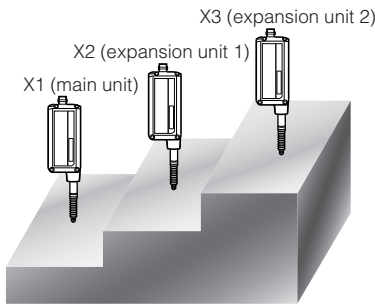
C5. Reference Difference

C5 rEF

If "C5. Reference difference" is selected, each expansion unit calculates (Detected value in the expansion unit) - (detected value in the main unit) based on the main unit. The calculation result is displayed as the value.

Reference

Can be set only when "CALc (Calculation mode)" is selected in "A1. Calculation Mode".



The formula to obtain a reference difference is shown below.
 Expansion unit 1 = X2 - X1
 Expansion unit 2 = X3 - X1
 .
 .
 .

Amplifier display

Main screens that can be displayed are as follows:

Sensor amplifier	P.V. value display	Calculated value display	R.V. value display	HIGH/LOW setting display	HH/LL setting display	Preset value setting display
Main unit	○	-	○ ^{*3}	○	○	○
Expansion unit	○ ^{*1}	○ ^{*2}	○ ^{*3}	○	○	○

- *1 Performs calculation to obtain a reference difference of "Expansion unit - main unit" based on the main unit, and then displays the calculation result (criterion value) according to the hold settings.
- *2 Performs the calculation to obtain a reference difference of "Expansion unit - main unit" based on the main unit, and then displays the calculation result by keeping the R.V. value (without holding the calculation result even when using the hold function).
- *3 Displays the detected value for the sensor head connected to each amplifier as an R.V. value (without holding the value when using hold).

Output

Outputs are as follows:

Sensor amplifier	Output
Main unit	Calculation is not performed and the criterion is output based on the detection value from the main unit according to each setting.
Expansion unit	"Detection value of this unit" minus "Detection value of the main unit" is calculated, and the calculation result is output as the criterion value for the criterion result.

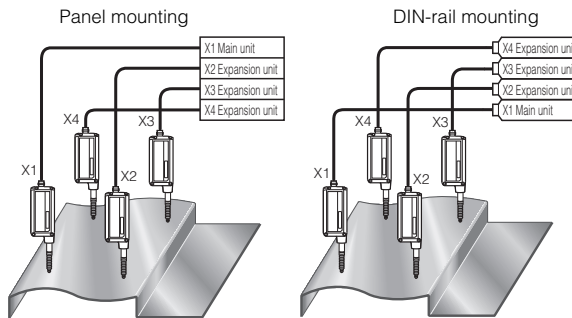
C6. Twist

C6. t.5

If "C6. Twist" is selected, the degree of twist is calculated from the four detected values and the calculation result is displayed as the value.

Reference

- When "CALc (Calculation mode)" is selected in "A1. Calculation mode":
"C6. Twist" can be selected only when four units are configured (1 main unit + 3 expansion units).
- When "CAL.noH (Calculation dedicated mode)" is selected in "A1. Calculation mode":
"C6. Twist" can be selected only when five units are configured (1 main unit + 4 expansion units).



The formula to obtain a degree of twist is shown below.

$$(X1 - X2) - (X4 - X3)$$

* X1 is a main unit and X2 to X4 are expansion units.

■ Amplifier display

Main screens that can be displayed are as follows:

Calculation Setting Mode	Sensor amplifier	P.V. value display	Calculated value (CALC value) display	R.V. value display	HIGH/LOW setting display	HH/LL setting display	Preset value setting display
Calculation mode	Main unit	Yes ^{*1}	Yes ^{*2}	Yes ^{*3}	Yes	Yes	Yes
	Expansion unit	-	-	Yes ^{*3}	-	-	Yes
Calculation only mode	Main unit	Yes ^{*4}	Yes ^{*5}	-	Yes	Yes	-
	Expansion unit	Yes ^{*6}	-	Yes ^{*3}	Yes	Yes	Yes

*1 Performs calculations to obtain the degree of twist from the detection values from the main unit and expansion units, and then displays the calculation result (criterion value) according to the hold settings.

*2 Performs calculations to obtain the degree of twist from the detection values from the main unit and expansion units, and then displays the calculation result as an R.V. value (without holding the value when using hold).

- *3 Displays the detected value for the sensor head connected to each amplifier as an R.V. value (without holding the value when using hold).
- *4 Performs calculations to obtain the degree of twist from the detection values from the connected expansion units, and then displays the calculation result (criterion value) according to the hold settings.
- *5 Performs calculations to obtain the degree of twist from the detection values from the connected expansion units, and then displays the calculation result as an R.V. value (without holding the value when using hold).
- *6 Displays the detected value for the sensor head connected to each amplifier according to the hold settings.

■ **Output**

Outputs are as follows:

Sensor amplifier		Output
Main unit		Performs calculation to obtain a degree of twist by using the values detected from the main unit and expansion units. The resulting value of calculation is taken as the value and the result is output.
Expansion unit	Calculation Mode	Criterion output is not performed (always off).
	Calculation dedicated mode	Criterion output is performed individually based on the detection value from the connected sensor head.

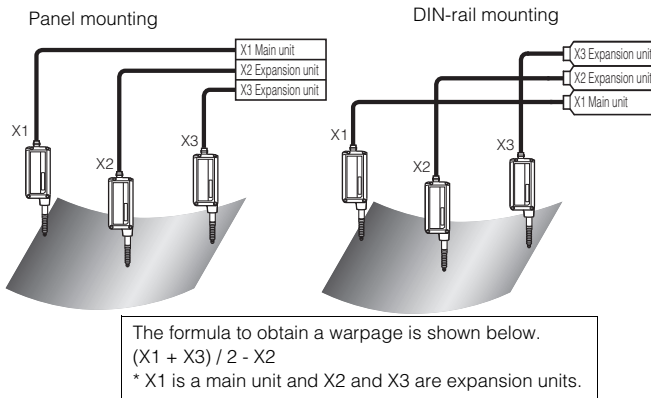
C7. Warpage



If "C7. Warpage" is selected, the degree of warpage is calculated from the three detected values and the calculation result is displayed as the value.

Reference

- When "CALc (Calculation mode)" is selected in "A1. Calculation mode":
"C7. Warpage" can be selected only when three units are configured (1 main unit + 2 expansion units).
- When "CAL.noH (Calculation dedicated mode)" is selected in "A1. Calculation mode":
"C7. Warpage" can be selected only when four units are configured (1 main unit + 3 expansion units).



Amplifier display

Main screens that can be displayed are as follows:

Calculation Setting Mode	Sensor amplifier	P.V. value display	Calculated value (CALC value) display	R.V. value display	HIGH/LOW setting display	HH/LL setting display	Preset value setting display
Calculation mode	Main unit	Yes*1	Yes*2	Yes*3	Yes	Yes	Yes
	Expansion unit	-	-	Yes*3	-	-	Yes
Calculation only mode	Main unit	Yes*4	Yes*5	-	Yes	Yes	-
	Expansion unit	Yes*6	-	Yes*3	Yes	Yes	Yes

*1 Performs calculations to obtain the warpage from the detection values from the main unit and expansion units, and then displays the calculation result (criterion value) according to the hold settings.

*2 Performs calculations to obtain the warpage from the detection values from the main unit and expansion units, and then displays the calculation result as an R.V. value (without holding the value when using hold).

- *3 Displays the detected value for the sensor head connected to each amplifier as an R.V. value (without holding the value when using hold).
- *4 Performs calculations to obtain the warpage from the detection values from the connected expansion units, and then displays the calculation result (criterion value) according to the hold settings.
- *5 Performs calculations to obtain the warpage from the detection values from the connected expansion units, and then displays the calculation result as an R.V. value (without holding the value when using hold).
- *6 Displays the detected value for the sensor head connected to each amplifier according to the hold settings.

■ **Output**

Outputs are as follows:

Sensor amplifier		Output
Main unit		Performs calculation to obtain a warpage value by using the values detected from the main unit and expansion units. The resulting value of calculation is taken as the value and the result is output.
Expansion unit	Calculation Mode	Criterion output is not performed (always off).
	Calculation dedicated mode	Criterion output is performed individually based on the detection value from the connected sensor head.

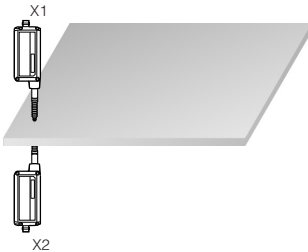
C8. Thickness

C8. th.

If "C8. Thickness" is selected, the thickness of the target is calculated from the detected value obtained by placing the target between the two sensor heads. The calculation result is displayed as the value.

Reference

- When "CALc (Calculation mode)" is selected in "A1. Calculation mode": "C8. Thickness" can be selected only when two units are configured (1 main unit + 1 expansion unit).
- When "CAL.noH (Calculation dedicated mode)" is selected in "A1. Calculation mode": "C8. Thickness" can be selected only when three units are configured (1 main unit + 2 expansion units).



The formula to obtain a thickness is shown below.
 $X1 + X2$

■ Amplifier display

Main screens that can be displayed are as follows:

Calculation Setting Mode	Sensor amplifier	P.V. value display	Calculated value (CALC value) display	R.V. value display	HIGH/LOW setting display	HH/LL setting display	Preset value setting display
Calculation mode	Main unit	Yes*1	Yes*2	Yes*3	Yes	Yes	Yes
	Expansion unit	-	-	Yes*3	-	-	Yes
Calculation only mode	Main unit	Yes*4	Yes*5	-	Yes	Yes	-
	Expansion unit	Yes*6	-	Yes*3	Yes	Yes	Yes

- *1 Performs calculations to obtain the thickness from the detection values from the main unit and expansion units, and then displays the calculation result (criterion value) according to the hold settings.
- *2 Performs calculations to obtain the thickness from the detection values from the main unit and expansion units, and then displays the calculation result as an R.V. value (without holding the value when using hold).
- *3 Displays the detected value for the sensor head connected to each amplifier as an R.V. value (without holding the value when using hold).
- *4 Performs calculations to obtain the thickness from the detection values from the connected expansion units, and then displays the calculation result (criterion value) according to the hold settings.
- *5 Performs calculations to obtain the thickness from the detection values from the connected expansion units, and then displays the calculation result as an R.V. value (without holding the value when using hold).
- *6 Displays the detected value for the sensor head connected to each amplifier according to the hold settings.

■ Output

Outputs are as follows:

Sensor amplifier		Output
Main unit		Performs calculation to obtain a thickness by using detected values from the main unit and expansion units. The resulting value of calculation is taken as a criterion value and the result is output.
Expansion unit	Calculation Mode	Criterion output is not performed (always off).
	Calculation dedicated mode	Criterion output is performed individually based on the detection value from the connected sensor head.

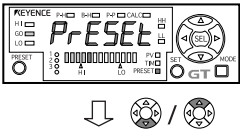
■ **Origin alignment when "C8. Thickness" is selected**

Perform the origin alignment using the following steps if "C8. Thickness" is selected in the calculation mode.

Setting procedure

1 Display the preset value display from the main screen of the main and expansion units.

📖 "(8) Preset value setting display" (page 3-10)



2 Set preset values for the main and expansion units.

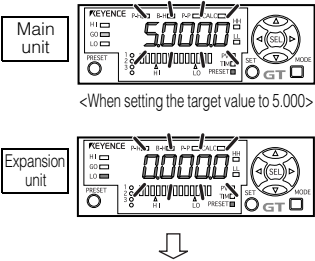
Set the following preset values:

- Main unit: Detected value of the master workpiece (target value)
- Expansion unit: 0.0000

In calculation only mode

- Expansion unit 1: Detected value of the master workpiece (target value)
- Expansion unit 2: 0.0000

* When the [PRESET] button is pressed, "no uAL" is displayed, and preset values cannot be set.

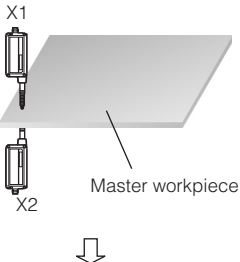


3 Detects the master workpiece.

4 Perform the origin alignment on the main and expansion units.

To perform the origin alignment, press the [PRESET] button.
Press the [PRESET] button on the main unit or expansion unit (expansion unit 1 or expansion unit 2 in calculation only mode) to perform origin alignment.

📖 "Origin Alignment" (page 3-11)



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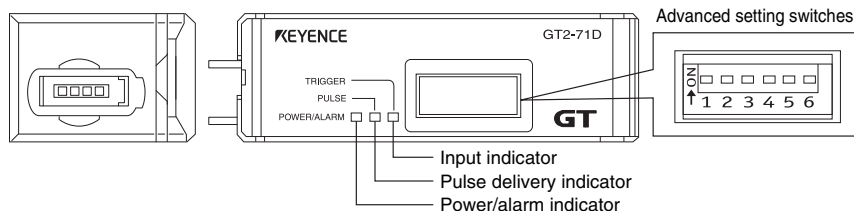
Functions and Settings of GT2-71D

This chapter describes the functions and settings of GT2-71D (pulse output type).

6-1	GT2-71D (pulse output type)	6-2
6-2	Pulse output settings.....	6-3
6-3	Outputting Current Position Information.....	6-5

6-1 GT2-71D (pulse output type)

Names of parts of the amplifier



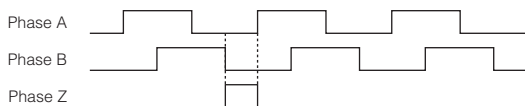
Item	Description
Power/alarm indicator	Lights up green when the power is turned on. Flashes red when there is an error*.
Pulse delivery indicator	Flashes green when delivering a pulse.
Input indicator	Lights green when there is current position request input.
Advanced setting switches	Sets the advanced information for pulse output.

* An error occurs in the following situations.

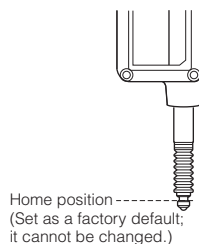
- For 700 ms after power turns on (power on reset time)
- Head is not connected or becomes disconnected
- Overcurrent flows through the output

Output signal

The signals output by GT2-71D are A, B, and Z phase signals, which are voltage differential format line driver output that is compliant with EIA-422.



Z phase turns on when the sensor head spindle is detected at home position.



6-2 Pulse output settings

Advanced setting switch

Perform pulse output settings with the advanced setting switch.

Setting item	Switch No.	Description											
Minimum phase difference	1	Set A phase or B phase ($\bar{A}$ phase or $\bar{B}$ phase) as the minimum phase difference.											
	2	<table><tr><th>0.5μs</th><th>2.5μs*</th><th>5μs</th><th>25μs</th></tr><tr><td>ON </td><td>ON </td><td>ON </td><td>ON </td></tr><tr><td>1 2</td><td>1 2</td><td>1 2</td><td>1 2</td></tr></table> * This is the factory default setting.	0.5μs	2.5μs*	5μs	25μs	ON 	ON 	ON 	ON 	1 2	1 2	1 2
0.5μs	2.5μs*	5μs	25μs										
ON 	ON 	ON 	ON 										
1 2	1 2	1 2	1 2										
Pulse resolution	3	Set the pulse resolution.											
	4	<table><tr><th>0.1μm</th><th>0.5μm*</th><th>1μm</th><th>10μm</th></tr><tr><td>ON </td><td>ON </td><td>ON </td><td>ON </td></tr><tr><td>3 4</td><td>3 4</td><td>3 4</td><td>3 4</td></tr></table> * This is the factory default setting.	0.1μm	0.5μm*	1μm	10μm	ON 	ON 	ON 	ON 	3 4	3 4	3 4
0.1μm	0.5μm*	1μm	10μm										
ON 	ON 	ON 	ON 										
3 4	3 4	3 4	3 4										
Pulse fluctuation direction	5	<table><tr><th>Pulse expands when the spindle is pushed in*</th><th>Pulse shrinks when the spindle is pushed in</th></tr><tr><td>ON </td><td>ON </td></tr><tr><td>5</td><td>5</td></tr></table> * This is the factory default setting.	Pulse expands when the spindle is pushed in*	Pulse shrinks when the spindle is pushed in	ON 	ON 	5	5					
	Pulse expands when the spindle is pushed in*	Pulse shrinks when the spindle is pushed in											
ON 	ON 												
5	5												
(Not used)	6	_____											

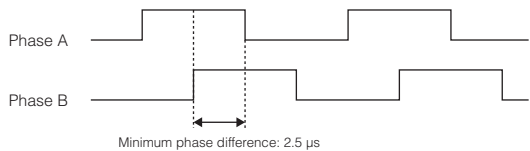
Reference

When using a sensor head other than GT2-S1/S5/P12K(F)/PA12K/H12K(L)(F)/A12K(L), even if the pulse resolution is set to 0.1 μ m, a resolution of 0.5 μ m is used.

Phase A /phase B minimum phase difference	Phase A cycle	Allowable frequency of the counter
0.5 μ s	2 μ s	500 kHz
2.5 μ s	10 μ s	100 kHz
5 μ s	20 μ s	50 kHz
25 μ s	100 μ s	10 kHz

Minimum phase difference

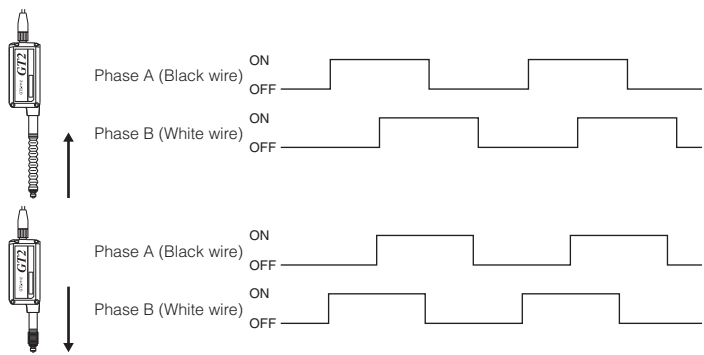
Set the minimum phase difference of phase A and phase B (phase $\overline{A}$ and phase $\overline{B}$).



Pulse fluctuation direction

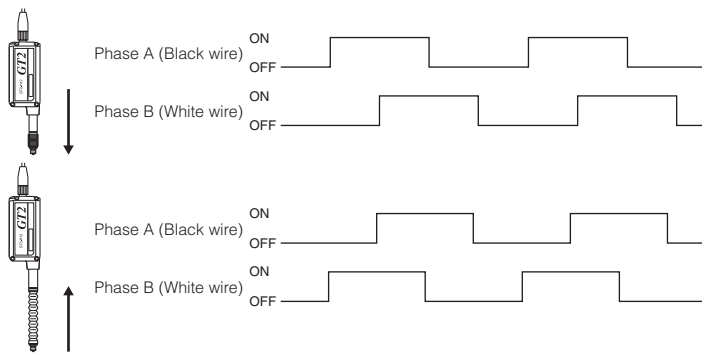
■ Direction where pulse increases when the spindle contracts

When advanced setting switch 5 is turned off (factory default setting), the pulse increases when the spindle contracts, and the pulse decreases when the spindle extends.



■ Direction where pulse increases when the spindle extends

When advanced setting switch 5 is turned on, the pulse increases when the spindle extends, and the pulse decreases when the spindle contracts.



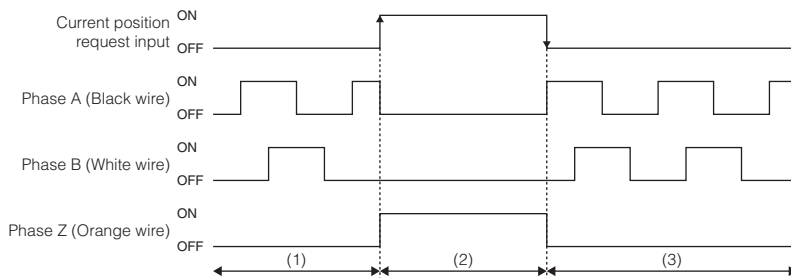
This section describes functions of GT2-71D.

Current position notification output function

When the automatic current position request input line (pink wire) is turned off from on, a pulse is output from the home position to the current mechanical position of the spindle.

This function can be used when there is a difference between the counter value and the measurement position, such as cases where the power is turned off during measurement or other troubles occur.

📖 "Sensor Amplifier Wiring" (Page 2-9)



- (1) When the automatic current position request input (pink wire) is turned off, the pulse of the spindle is output according to the amount of movement.
- (2) When the automatic current position request input (pink wire) is turned on, all pulse outputs are turned off.
- (3) When the automatic current position request input (pink wire) is turned from on to off, the number of pulses from the home to the current position is output.

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Specifications

7

This chapter describes the specifications, circuit diagrams, and dimensions of the GT2-70 Series.

7-1	Specifications.....	7-2
7-2	I/O Diagram.....	7-14
7-3	Pulse Output Type Circuit Diagram.....	7-17
7-4	Timing Chart	7-18
7-5	Dimensions	7-22

7-1 Specifications

Sensor Head

■ Short type

Model		GT2-S1	GT2-S5
Detection system		Differential transformer	
Measuring range^{*1}		1 mm	5 mm
Operation range^{*1}		2 mm	7 mm
Resolution		0.1 μm	
Indication accuracy^{*2, *4}		1 μm (P-P)	
Measuring force^{*3}	When installed facing down	1.12 N	1.0 N
	When installed sideways	1.1 N	0.95 N
	When installed facing up	1.08 N	0.9 N
Sampling interval		1 ms	
Mechanical response^{*4}		40 Hz	20 Hz
Operation indicator		2-color LED (red, green)	
Environmental resistance	Enclosure rating^{*5}	IP67G (JIS), IP67 (IEC)	
	Surrounding air temperature	-10 to +55°C (No freezing)	
	Relative humidity	10 to 85%RH (No condensation)	
	Vibration resistance	10 to 55 Hz, Compound amplitude 1.5 mm, 2 hours each in X, Y, and Z axis	
	Shock resistance	1000 m/s ² (IEC60068-2-27)	
Material	Main unit	Main unit cover: SUS440C (GT2-S1), SUS430F (GT2-S5) Cable between the sensor head and relay connector: PUR, Relay amplifier: PPSU	
	Dust boot	NBR	
	Contact^{*6}	SUS304, tungsten carbide	
Head cable		Sold separately (connected to relay connector)	
Weight (excluding cable)^{*7}		Approx. 30 g	Approx. 40 g

*1 The measuring range indicates the range over which the measured value is displayed.

The operation range indicates the range over which the spindle can actually move.

*2 For the GT2-S1, the indication accuracy is 1 μm for an arbitrary width of 0.1 mm within the area of measuring range center ± 0.15 mm and is 2 μm over this whole area.

For the GT2-S5, the indication accuracy is 1 μm for an arbitrary width of 0.2 mm within the area of measuring range center ± 0.3 mm and is 2 μm over this whole area.

Over the whole measuring range, the indication accuracy is linearity ± 0.15% of F.S.

(F.S. is 1 mm for the GT2-S1 and 5 mm for the GT2-S5.)

*3 Typical value in the vicinity of the measured center value. Note that the measuring force varies depending on the installation status of the dust boot.

*4 When the surrounding temperature is 20°C.

*5 When an M8 oil-resistant cable (GT2-CHP2M/CHP5M/CHP10M) is used for the sensor head cable.

*6 The contact is a separately sold option.

*7 Including the relay connector.

Note: Cannot be used with amplifier units purchased before April 15th, 2014.

■ Pencil type

Model		GT2-P12K	GT2-P12KF	GT2-P12KL	GT2-P12	GT2-P12F	GT2-P12L
Detection system		Scale shot system II Absolute type (without tracking error)					
Measuring range		12 mm					
Resolution		0.1 μm			0.5 μm		
Indication accuracy *1		1 μm (P-P)			2 μm (P-P)		
Measuring force *2	When installed facing down	1.0 N	0.2 N	1.0 N		0.2 N	
	When installed sideways	0.95 N	0.15 N	0.95 N		0.15 N	
	When installed facing up	0.9 N	0.1 N	0.9 N		0.1 N	
Sampling interval		4 ms					
Mechanical response *1		10 Hz	4 Hz	10 Hz		4 Hz	
Operation indicator		2-color LED (red, green)					
Environmental resistance	Enclosure rating	IP67G (JIS)*3 IP67 (IEC) NEMA Type 13*3		-	IP67G (JIS)*3 IP67 (IEC) NEMA Type 13*3		-
	Surrounding air temperature	-10 to +55°C (No freezing)					
	Relative humidity	35 to 85% RH (No condensation)					
	Vibration resistance	10 to 55 Hz, Compound amplitude 1.5 mm, 2 hours each in X, Y, and Z axis					
	Shock resistance	1000 m/s ² (IEC60068-2-27)					
Material	Main unit	Main unit cover: SUS303, Indicator: PET, Sensor head - Connection cable: PUR, Relay connector: PBT					
	Dust boot	NBR	-	NBR		-	
	Contact point *4	SUS304, tungsten carbide			SUS304, SUS440C		
Head cable		Sold separately (connected to relay connector)					
Weight (excluding cable) *5		Approx. 35 g	Approx. 45 g	Approx. 35 g		Approx. 45 g	Approx. 35 g

*1 When the surrounding temperature is 20°C. Entire measuring range.

*2 This is a typical value at the center of the measuring range. The measuring force varies depending on the mounted condition of the dust boot.

Also, add 0.4 N to the measuring force listed above when using the OP-87859.

*3 When using an M8 oil resistant cable (GT2-CHP2M//CHP5M/CHP10M) as the sensor head cable.

*4 The contact is a separately sold option.

*5 Including the relay connector.

Note: Cannot be used with amplifier units purchased before April 15th, 2014.

■ Air cylinder types

Model		GT2-PA12K	GT2-PA12KL	GT2-PA12	GT2-PA12L
Detection system		Scale shot system II Absolute type (without tracking error)			
Measuring range		12 mm			
Resolution		0.1 μm		0.5 μm	
Indication accuracy *1		1 μm (P-P)		2 μm (P-P)	
Measuring force *2	When installed facing down	1.2 N	0.4 N	1.2 N	0.4 N
	When installed sideways	1.15 N	0.35 N	1.15 N	0.35 N
	When installed facing up	1.1 N	0.3 N	1.1 N	0.3 N
Sampling interval		4 ms			
Pressure range		0.24 to 0.26 MPa	0.05 to 0.07 MPa	0.24 to 0.26 MPa	0.05 to 0.07 MPa
Max. pressure		0.5 MPa			
Fluid to use		Clean dry air			
Operation indicator		2-color LED (red, green)			
Environmental resistance	Enclosure rating	IP67 (IEC)	-	IP67 (IEC)	-
	Surrounding air temperature	0 to +55°C (No freezing)			
	Relative humidity	35 to 85% RH (No condensation)			
	Vibration resistance	10 to 55 Hz, Compound amplitude 1.5 mm, 2 hours each in X, Y, and Z axis			
	Shock resistance	1000 m/s² (IEC60068-2-27)			
Material	Main unit	Main unit cover: SUS303, Spindle: SUS430, Indicator: PET, Sensor head - Connection cable: PUR, Relay connector: PBT			
	Spindle	SUS430 (Fluorine-based coating), Dust seal: SUS303/SU304/aluminium (alumite treated)/special polyester fiber	SUS430/SUS440C	SUS430 (Fluorine-based coating), Dust seal: SUS303/SU304/aluminium (alumite treated)/special polyester fiber	SUS430/SUS440C
	Contact point *3	SUS304, tungsten carbide		SUS304, SUS440C	
Head cable		Sold separately (connected to relay connector)			
Weight (excluding cable) *4		Approx. 35 g			

*1 When the surrounding temperature is 20°C. Entire measuring range.

*2 This is a representative value when using the GT2-PA12K/PA12 with a pressure of 0.25 MPa and when using the GT2-PA12KL/PA12L with a pressure of 0.06 MPa. The measuring force varies depending on the air pressure used. See table 1 for more details.

*3 The contact is a separately sold option.

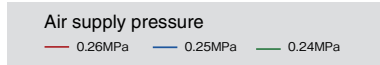
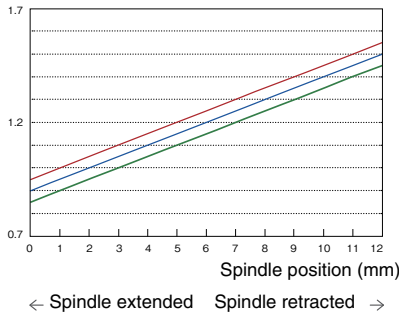
*4 Including the relay connector.

Note: Cannot be used with amplifier units purchased before April 15th, 2014.

GT2-PA12K/PA12

Table 1. Relationship between spindle position and measuring force grouped according to used air pressure.

Measuring force (N)

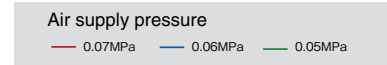
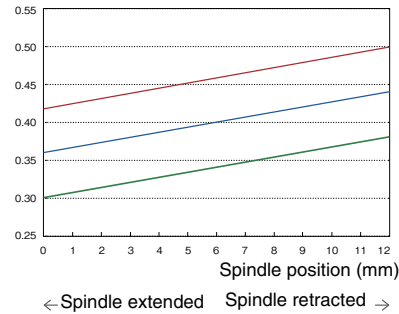


* When installing side mounting, the measuring force is -0.05 N. When installing upward mounting, the measuring force is -0.1 N.

GT2-PA12KL/PA12L

Table 2. Relationship between spindle position and measuring force grouped according to used air pressure.

Measuring force (N)



* When installing side mounting, the measuring force is -0.05 N. When installing upward mounting, the measuring force is -0.1 N.

■ Box type

Model		GT2-H12K	GT2-H12KF	GT2-H12KL	GT2-H12KLF	GT2-H12	GT2-H12F	GT2-H12L	GT2-H12LF
Detection system		Scale shot system Absolute type (without tracking error)							
Measuring range		12 mm							
Resolution		0.1 μm				0.5 μm			
Indication accuracy *1		1 μm (P-P)				2 μm (P-P)			
Measuring force *2	When installed facing down	1.0 N	0.4 N		1.0 N		0.4 N		
	When installed sideways	0.9 N	0.3 N		0.9 N		0.3 N		
	When installed facing up	0.8 N	0.2 N		0.8 N		0.2 N		
Sampling interval		1 ms							
Mechanical response *1		10 Hz	4 Hz		10 Hz		4 Hz		
Operation indicator		2-color LED (red, green)							
Environmental resistance	Enclosure rating	IP67(IEC)	-		IP67(IEC)		-		
	Surrounding air temperature	-10 to +55°C (No freezing)							
	Relative humidity	35 to 85% RH (No condensation)							
	Vibration resistance	10 to 55 Hz, Compound amplitude 1.5 mm, 2 hours each in X, Y, and Z axis							
	Shock resistance	1000 m/s ² (IEC60068-2-27)							
Material	Main unit	Main unit cover: zinc die-cast, Indicator: polyarylate (PAR)							
	Dust boot	NBR	-		NBR		-		
	Contact point *3	SUS304, tungsten carbide				SUS304, SUS440C			
Cable		Sold separately (connected to M8 connector)							
Weight (excluding cable)		Approx. 95 g	Approx. 100 g	Approx. 95 g	Approx. 100 g	Approx. 95 g	Approx. 100 g	Approx. 95 g	Approx. 100 g

*1 When the surrounding temperature is 20°C. Entire measuring range.

*2 This is a typical value at the center of the measuring range. The measuring force varies depending on the mounted condition of the dust boot.

*3 The contact is a separately sold option.

■ Box type (long range type)

Model		GT2-H32	GT2-H32L	GT2-H50
Detection system		Scale shot system Absolute type (without tracking error)		
Measuring range		32 mm		50 mm
Resolution		0.5 μm		
Indication accuracy *1		3 μm (P-P)		3.5 μm (P-P)
Measuring force *2	When installed facing down	2.1 N	1.2 N	3.2 N
	When installed sideways	1.8 N	0.9 N	2.8 N
	When installed facing up	1.5 N	0.6 N	2.4 N
Sampling interval		1 ms		
Mechanical response *1		6 Hz	5 Hz	7 Hz
Operation indicator		2-color LED (red, green)		
Environmental resistance	Enclosure rating	IP67	-	IP67
	Surrounding air temperature	-10 to +55°C (No freezing)		
	Relative humidity	35 to 85% RH (No condensation)		
	Vibration resistance	10 to 55 Hz, Compound amplitude 1.5 mm, 2 hours each in X, Y, and Z axis		
Material	Main unit	Main unit cover: zinc die-cast, Indicator: polyarylate (PAR)		
	Dust boot	NBR	-	NBR
	Contact point *3	SUS304, SUS440C		
Cable		Sold separately (connected to M8 connector)		
Weight (excluding cable)		Approx. 270 g		Approx. 320 g

*1 When the surrounding temperature is 20°C. Entire measuring range.
 *2 This is a typical value at the center of the measuring range. The measuring force varies depending on the mounted condition of the dust boot.
 *3 The contact is a separately sold option.

■ Box type (Air cylinder type)

Model		GT2-A12K	GT2-A12KL	GT2-A12	GT2-A12L
Detection system		Scale shot system Absolute type (without tracking error)			
Measuring range		12 mm			
Resolution		0.1 μm		0.5 μm	
Indication accuracy *1		1 μm (P-P)		2 μm (P-P)	
Measuring force *2	When installed facing down	1.2 N	0.4 N	1.2 N	0.4 N
	When installed sideways	1.1 N	0.3 N	1.1 N	0.3 N
	When installed facing up	1.0 N	0.2 N	1.0 N	0.2 N
Sampling interval		1 ms			
Pressure range		0.25 to 0.5 MPa			
Max. pressure		1.0 MPa			
Fluid to use		Dry air			
Operation indicator		2-color LED (red, green)			
Environmental resistance	Enclosure rating	IP67(IEC)*3	-	IP67(IEC)*3	-
	Surrounding air temperature	0 to +55°C (No freezing)			
	Relative humidity	35 to 85% RH (No condensation)			
	Vibration	10 to 55 Hz, Compound amplitude 1.5 mm, 2 hours each in X, Y, and Z axis			
	Shock resistance	1000 m/s ² (IEC60068-2-27)			
Material	Main unit	Main unit cover: zinc die-cast, Cylinder: aluminum alloy, Air coupling socket (resin part): polyacetal, Air coupling socket (metal part): nickel plated brass, Indicator: polyarylate (PAR)			
	Dust boot	FKM	-	NBR	-
	Contact point *4	SUS304, tungsten carbide		SUS304, SUS440C	
Sensor head cable		Sold separately (connected to M8 connector)			
Weight (excluding sensor head cable)		Approx. 145 g			

*1 When the surrounding temperature is 20°C. Entire measuring range.

*2 This is a typical value at the center of the measuring range. The measuring force varies depending on the mounted condition of the dust boot.

The measuring force is not affected by the air supply pressure.

*3 Connect an air tube to the exhaust valve so that no foreign materials enter from the valve.

*4 The contact is a separately sold option.

■ Box type (Air cylinder type/long range type)

Model		GT2-A32	GT2-A50
Detection system		Scale shot system Absolute type (without tracking error)	
Measuring range		32 mm	50 mm
Resolution		0.5 μm	
Indication accuracy *1		3 μm (P-P)	3.5 μm (P-P)
Measuring force *2	When installed facing down	2.1 N	3.2 N
	When installed sideways	1.8 N	2.8 N
	When installed facing up	1.5 N	2.4 N
Sampling interval		1 ms	
Pressure range		0.25 to 0.5 MPa	
Max. pressure		1.0 MPa	
Fluid to use		Dry air	
Operation indicator		2-color LED (red, green)	
Environmental resistance	Enclosure rating	IP67(IEC)*3	
	Surrounding air temperature	0 to +55°C (No freezing)	
	Relative humidity	35 to 85% RH (No condensation)	
	Vibration *4	10 to 55 Hz, Compound amplitude 1.5 mm, 2 hours each in X, Y, and Z axis	
Material	Main unit	Main unit cover: zinc die-cast, Cylinder: aluminum alloy, Air coupling socket (resin part): polyacetal, Air coupling socket (metal part): nickel plated brass, Indicator: polyarylate (PAR)	
	Dust boot	NBR	
	Contact point *5	SUS304, SUS440C	
Sensor head cable		Sold separately (connected to M8 connector)	
Weight (excluding sensor head cable)		Approx. 340 g	Approx. 405 g

*1 When the surrounding temperature is 20°C. Entire measuring range.
 *2 This is a typical value at the center of the measuring range. The measuring force varies depending on the mounted condition of the dust boot.
 The measuring force is not affected by the air supply pressure.
 *3 Connect an air tube to the exhaust valve so that no foreign materials enter from the valve.
 *4 When using mounting bracket D (OP-84327), the double amplitude becomes 0.75 mm.
 *5 The contact is a separately sold option.

Sensor Amplifier

■ GT2-71(C)N/71(C)P/72(C)N/72(C)P/75N/75P/76N/76P/71MCN/71MCP

Item		Specifications				
Type	Mounting type ^{*1}	DIN rail mount		Panel mount		DIN rail mount
	Main unit/ Expansion unit ^{*2}	Main unit	Expansion unit	Main unit	Expansion unit	Main unit
Model	NPN output	GT2-71(C)N	GT2-72(C)N	GT2-75N	GT2-76N	GT2-71MCN
	PNP output	GT2-71(C)P	GT2-72(C)P	GT2-75P	GT2-76P	GT2-71MCP
Number of units that can be added ^{*2}		Up to 14 expansion units for 1 main unit				
Supply voltage ^{*2}		10 to 30 VDC, Class 2 including 10% ripple (P-P).			20 to 30 VDC, Class 2 including 10% ripple (P-P).	
Display range		-199.9999 to 199.9999				
Display resolution		0.1 μm				
Current consumption	Normal	2200 mW max. (73.3 mA max. at 30 V)			2700 mW max. (90 mA max. at 30 V)	
	Power saving (eco half)	1800 mW max. (60.0 mA max. at 30 V)			2300 mW max. (76.7 mA max. at 30 V)	
	Power saving (eco)	1700 mW max. (56.7 mA max. at 30 V)			2200 mW max. (73.3 mA max. at 30 V)	
Response time		hsp (3 ms), 5 ms, 10 ms, 100 ms, 500 ms, 1000 ms (hsp (12 ms), 20 ms, 40 ms, 400 ms, 2000 ms, 4000 ms when using GT2-P***/PA*** with a sensor head)				
Control output (HH/HIGH/GO/ LOW/LL) ^{*3}	NPN	NPN open collector 40 V 50 mA max. Residual voltage: 1 V max. ^{*2}				
	PNP	PNP open collector 30 V 50 mA max. Residual voltage: 1 V max. ^{*2}				
Control input	Timing input	Input time: 2 ms min.				
	Preset input					
	Reset input	Input time: 20 ms min.				
	Bank input					
Analog output	Output range	_____			4 to 20 mA, Maximum load resistance 350Ω (Can be set anywhere within the analog output range)	
	Response time	_____			Specified response time + 1 ms	
Environmental resistance	Surrounding air temperature ^{*2}	-10 to +50°C (No freezing) ^{*2}				
	Relative humidity	35 to 85%RH (No condensation)				
	Vibration	10 to 55 Hz, Horizontal amplitude: 1.5 mm, 2 hours each in X, Y, and Z axis				
Material		Main unit cover/Front cover: Polycarbonate (PC), Keytop: Polyacetal (POM), Front sheet: Polyethylene terephthalate (PET), Cable: Polyvinyl chloride (PVC)				
Weight	GT2-71N/ 71P/72N/72P	Approx. 140 g (Including a power cable)				
	GT2-75N/ 75P/76N/76P	Approx. 140 g (Including a panel mounting bracket, front protective cover, power cable)				
	GT2-71(M)CN/ 71(M)CP/72CN/72CP	Approx. 70 g				

- *1

When using the DIN rail mount type unit, be sure to mount it to a DIN rail (fixed to a metal plate). Use the end unit (OP-26751) when connecting expansion units.
- *2

When adding an expansion unit(s), the following restrictions apply depending on the number of connected units.

When connecting 2 to 8 units including the main unit

• Supply voltage: 20 to 30 VDC

• Control output current: 20 mA max.

• (GT2-71MCN/71MCP only) surrounding air temperature: -10 to +45°C

When connecting 9 to 15 units including the main unit

• Supply voltage: 20 to 30 VDC

• Control output current:

10 mA max. (including the output current of the DL-RB1A)

• Residual voltage: 1.5 V max

• (GT2-71MCN/71MCP only) surrounding air temperature: -10 to +45°C

*3

HH and LL are not available for GT2-71MCN/71MCP.
- GT2-71D
- | Item | | Specifications |
|-----------------------------------|------------------------------|---|
| Type | Mounting type | DIN rail mount |
| | Main unit/
Expansion unit | Main unit |
| Model | | GT2-71D |
| Number of units that can be added | | Expansion not possible |
| Supply voltage | | 10 to 30 VDC, including 10% ripple (P-P). Class 2 |
| Indicators | | Power indicator (green), alarm indicator (red), pulse output indicator (green), input indicator (green) |
| Pulse resolution | | Select from 0.1 μm, 0.5 μm, 1 μm, 10 μm. |
| Power consumption | | 1600 mW or less (53.3 mA or less with 30 V) |
| Minimum phase difference | | Select from 0.5 μs, 2.5 μs, 5 μs, 25 μs. |
| Control input (homing) | | No-voltage input (with contact, without contact), input time 20 ms or more |
| Output signal | | Phase A/B/Z 90° phase difference, differential square-wave (EIA-422 compliant) x 4 |
| Output signal level | | +5 V |
| Environmental resistance | Surrounding air temperature | -10 to +50°C (No freezing) |
| | Relative humidity | 35 to 85%RH (No condensation) |
| | Vibration | 10 to 55 Hz, Horizontal amplitude: 1.5 mm, 2 hours each in X, Y, and Z axis |
| Material | Main unit cover | Polycarbonate (PC) |
| Weight | | Approx. 110 g (including a power cable) |
- 7

Specifications
- GT2-70-M-E
- 7-11

Status Table

State		Amplifier		Control input			Control output	Sensor head
		Digital display	Criterion indicator	Timing	Preset	Bank switching * During key lock only	Criterion output	indicator
Detecting (P.V./R.V.)	Normal	No. of digits for the detection result* ¹	Criterion result	Yes	Yes	Yes	Criterion result	On * ³ When all are OFF: Off
	Criterion standby	"-----"	Off	No	No		All OFF (All ON when N.C. is selected)	Off
During setting		Setting display	According to detection	According to detection	According to detection		Criterion result	Blinks * ⁴
During error		Error display	HIGH/ LOW on	No ("Er.Chk" or "ErC" according to detection)	No * ²		HIGH/ LOW output	Lights in red
When power is turned on		Off	Off				All OFF (All ON when N.C. is selected)	Off

- *1 When the detection result is out of the display range (-199.9999 to 199.9999), -FFFF/FFFF is displayed.
- *2 "Er.Chk", "ErC", "Er.com", and "Er.CAL" are on ("ErH", "ErE", and "Er.Unit" are off)
- *3 GO: green, HH/HIGH/LOW/LL: red (For HH/LL, when "5out (5 output)" is selected)
- *4 GO: green, HH/HIGH/LOW/LL/All OFF (All ON when N.C. is selected): red (For HH/LL, when "5out (5 output)" is selected)

Reference

When the power save function is set, the state changes to the following.
 "23. Power Save Function" (Page 5-44)

State	Amplifier		Sensor head
	Digital display	Criterion indicator	
HALF	Animation display *	Normal display or normal operations	Normal display or normal operations
ALL	Off	Off	Off

*Displays one segment at a time sequentially.

Power On Reset Time

The following table shows the time from when the power is turned on until the sensor outputs a signal.

Note that the times depend on the response times.

When the connected sensor head is GT2-P***/PA***

Response time	Time until output
hsp (12 ms)	Approx. 3 s
20 ms	Approx. 3 s
40 ms	Approx. 3 s
400 ms	Approx. 3.5 s
2000 ms	Approx. 5 s
4000 ms	Approx. 7 s

When the connected sensor head is GT2-S1/S5/H***/A***

Response time	Time until output
hsp (3 ms)	Approx. 3 s
5 ms	Approx. 3 s
10 ms	Approx. 3 s
100 ms	Approx. 3 s
500 ms	Approx. 3.5 s
1000 ms	Approx. 4 s

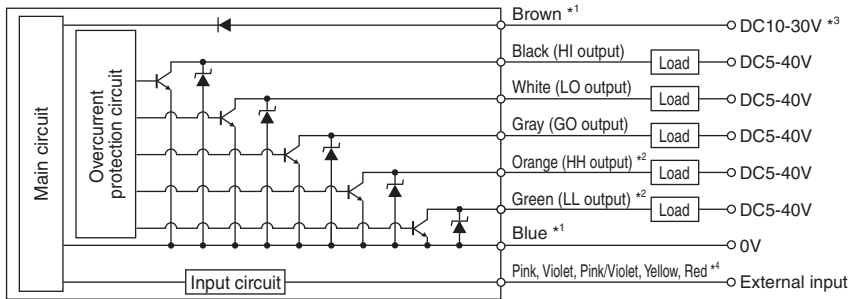
* Approx. 0.7 seconds for the GT2-71D.

 "03. Response Time" (Page 5-9)

7-2 I/O Diagram

I/O Diagram

■ GT2-71(M)(C)N/72(C)N/75N/76N



*1 Brown and blue are available for main units (GT2-71(M)(C)N/75N) only.

Not available for expansion units (GT2-72N/76N).

The expansion unit of the connector type (GT2-72CN) is not connected.

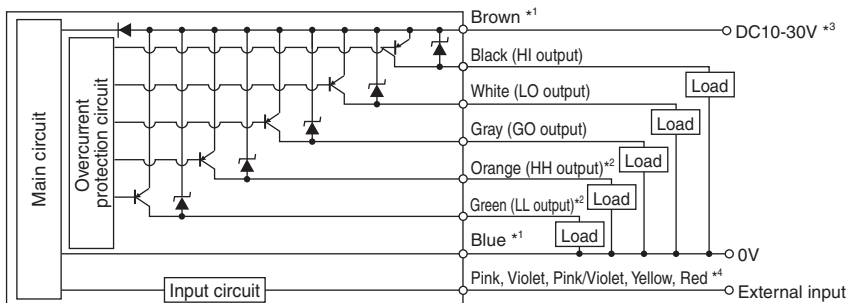
*2 In the analog type (GT2-71MCN), the orange and green lines are analog output lines.

Refer to the analog output circuit diagram for details.

*3 When an expansion unit is connected or for the analog type (GT2-71MCN), the voltage is DC20-30V.

*4 Refer to external input circuit diagram for details about external input.

■ GT2-71(M)(C)P/72(C)P/75P/76P



*1 Brown and blue are available for main units (GT2-71(M)(C)P/75P) only.

Not available for expansion units (GT2-72P/76P).

The expansion unit of the connector type (GT2-72CP) is not connected.

*2 In the analog type (GT2-71MCP), the orange and green lines are analog output lines.

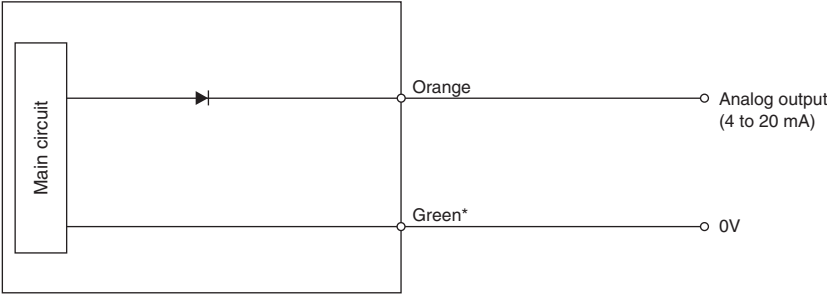
Refer to the analog output circuit diagram for details.

*3 When an expansion unit is connected or for the analog type (GT2-71MCP), the voltage is DC20-30V.

*4 Refer to external input circuit diagram for details about external input.

Analog output circuit diagram

■ GT2-71MCN/71MCP

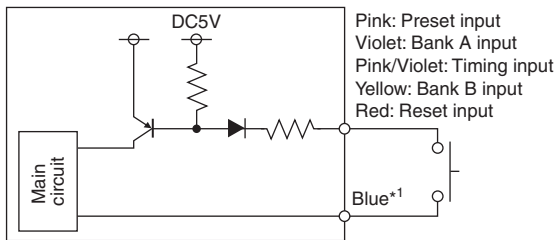


* The green line is internally common with the blue line.

See page 3-28 for analog output specifications.

External Input Circuit Diagram

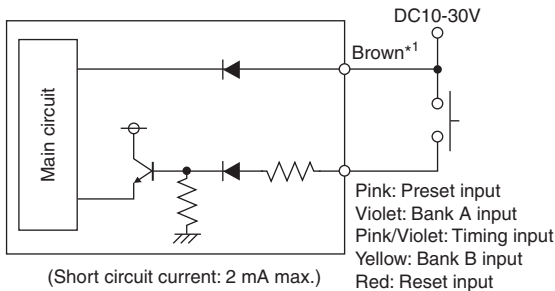
■ GT2-71(M)(C)N/72(C)N/75N/76N



(Short circuit current: 1 mA max.)

*1 Blue is available for main units (GT2-71(M)(C)N/75N) only.
Not available for expansion units (GT2-72N/76N).
Connector type expansion units (GT2-72CN) are not connected.
(Short-circuit the input signal with blue line of the main unit)

■ GT2-71(M)(C)P/72(C)P/75P/76P



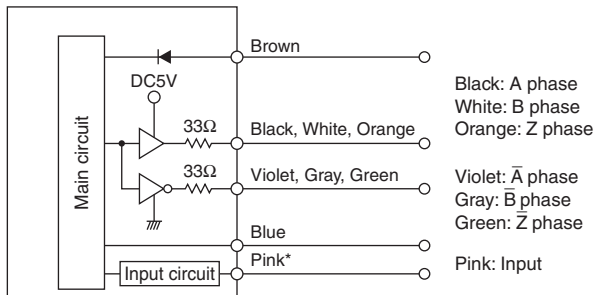
(Short circuit current: 2 mA max.)

*1 Brown is available for main units (GT2-71(M)(C)P/75P) only.
Not available for expansion units (GT2-72P/76P).
Connector type expansion units (GT2-72CP) are not connected.
(Short-circuit the input signal with brown line of the main unit)

7-3 Pulse Output Type Circuit Diagram

I/O circuit diagram

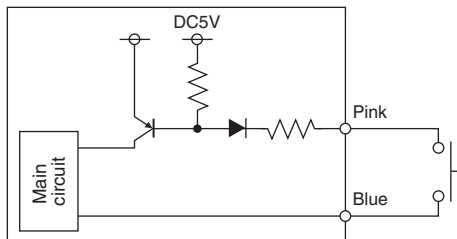
■ GT2-71D



* Refer to external input circuit diagram for details about external input.

External input circuit diagram

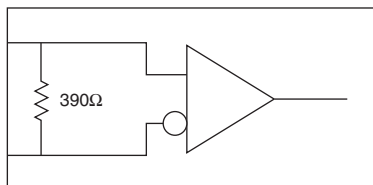
■ GT2-71D



(Short circuit current: 1 mA max.)

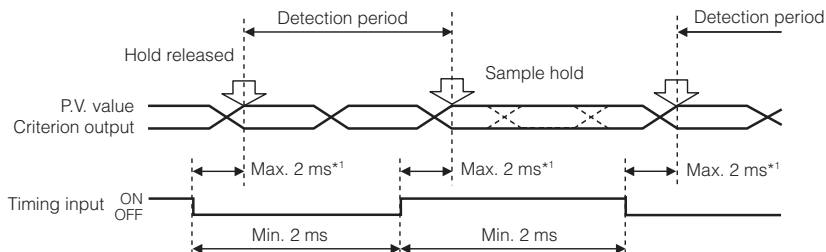
Recommended input device

■ Line receiver AM26LS32 or equivalent



7-4 Timing Chart

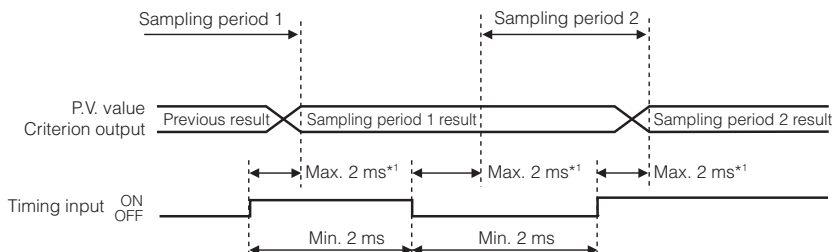
Standard Detection



*1 The duration is max. 4 ms for the expansion unit when "ALL (Batch input)" is selected in "15. Batch input settings".

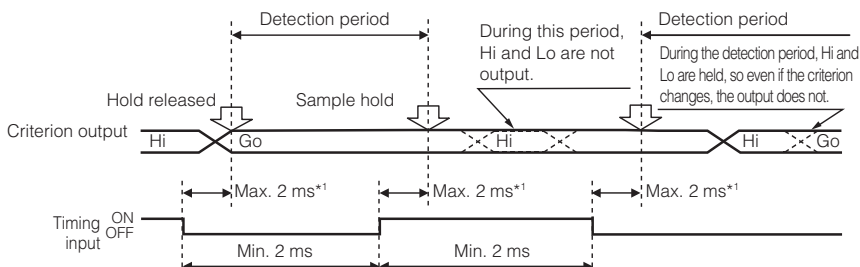
Peak Hold, Bottom Hold, Peak-to-Peak

This is the timing chart when "t-in (timing input)" is selected in "02. Hold update method".



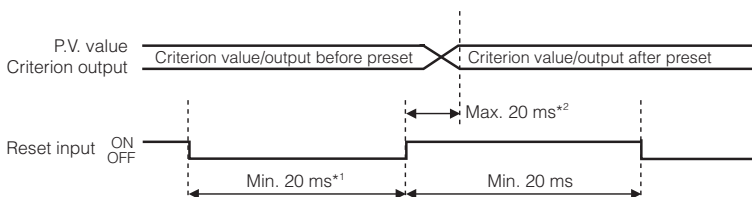
*1 The duration is max. 4 ms for the expansion unit when "ALL (Batch input)" is selected in "15. Batch input settings".

NG Hold



*1 The duration is max. 4 ms for the expansion unit when "ALL (Batch input)" is selected in "15. Batch input settings".

Preset Input



*1 When "ALL (Batch input)" is selected in "15. Batch input settings", the preset input is as follows.

When the number of the added expansion unit is 7 or less: Min. 100 ms

When the number of the added expansion unit is 8 or more: Min. 200 ms

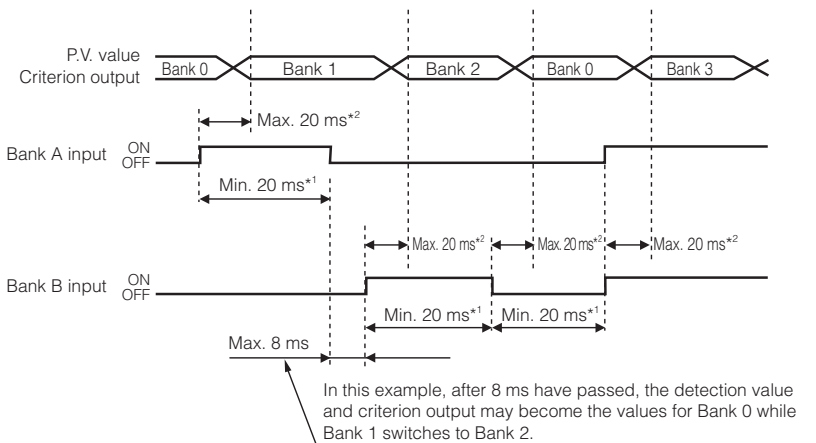
*2 When "ALL (Batch input)" is selected in "15. Batch input settings", the response time of the expansion unit is as follows.

When the number of the added expansion unit is 7 or less: Max. 100 ms

When the number of the added expansion unit is 8 or more: Max. 200 ms

(When performing the preset input after the reset input, the time twice longer than the above values is required at most.)

Bank Input



*1 When "ALL (Batch input)" is selected in "15. Batch input settings", the preset input is as follows.

When the number of the added expansion unit is 7 or less: Min. 100 ms

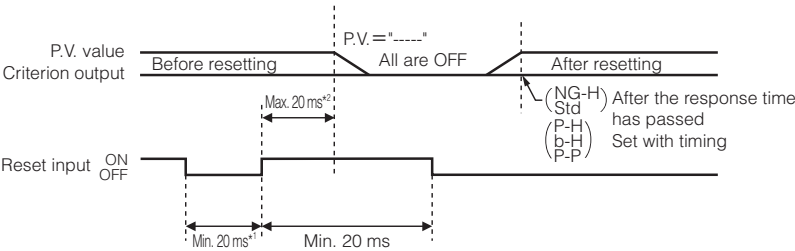
When the number of the added expansion unit is 8 or more: Min. 200 ms

*2 When "ALL (Batch input)" is selected in "15. Batch input settings", the response time of the expansion unit is as follows.

When the number of the added expansion unit is 7 or less: Max. 100 ms

When the number of the added expansion unit is 8 or more: Max. 200 ms

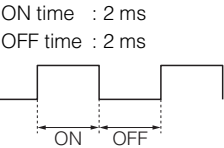
Reset Input



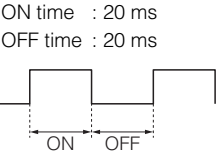
- *1 When "ALL (Batch input)" is selected in "15. Batch input settings", the preset input is as follows.
When the number of the added expansion unit is 7 or less: Min. 100 ms
When the number of the added expansion unit is 8 or more: Min. 200 ms
- *2 When "ALL (Batch input)" is selected in "15. Batch input settings", the response time of the expansion unit is as follows.
When the number of the added expansion unit is 7 or less: Max. 100 ms
When the number of the added expansion unit is 8 or more: Max. 200 ms
(When performing the reset input after the preset input, the time twice longer than the above values is required at most.)

Minimum Input Time

Timing input



Preset input, Reset input

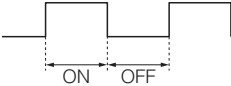


- * When "ALL (Batch input)" is selected in "15. Batch input settings"
ON time : 20 ms
OFF time : (When the number of the added expansion unit is 7 or less) 100 ms
(When the number of the added expansion unit is 8 or more) 200 ms



Bank input

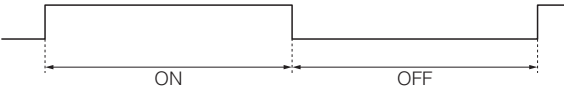
ON time : 20 ms
OFF time : 20 ms



* When "ALL (Batch input)" is selected in "15. Batch input settings"

ON time : (When the number of the added expansion unit is 7 or less) 100 ms
(When the number of the added expansion unit is 8 or more) 200 ms

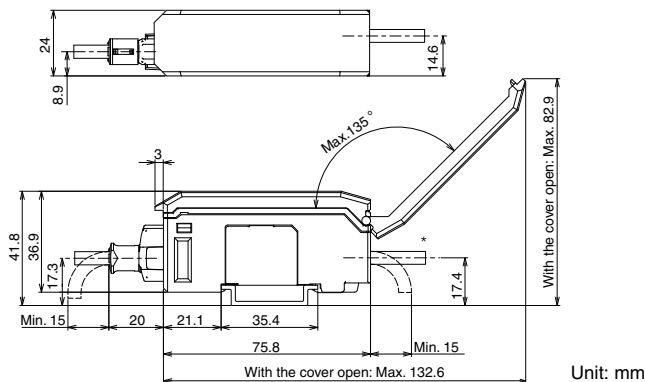
OFF time : (When the number of the added expansion unit is 7 or less) 100 ms
(When the number of the added expansion unit is 8 or more) 200 ms



7-5 Dimensions

Sensor Amplifier

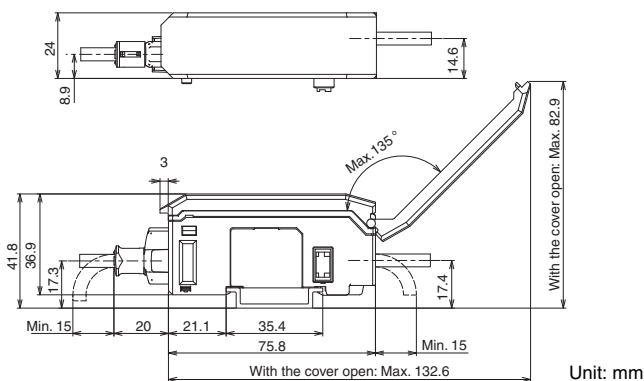
■ GT2-71(C)N/71(C)P/71MCN/71MCP/71D



* Cable specifications

- GT2-71N/71P
 $\phi 4.7$ 12-strand x brown, blue: 0.20 mm²; black, white, gray, orange, green, pink, violet, yellow, red, violet/pink stripe: 0.15 mm²; cable length: 2 m
- GT2-71CN/71CP/71MCN/71MCP
 $\phi 4.7$ 12-strand connector cable, cable length: 0.3 m
- GT2-71D
 $\phi 4.7$ 9-strand x brown, blue, violet, pink, orange, gray, white, black, green: 0.15 mm²; cable length: 2 m

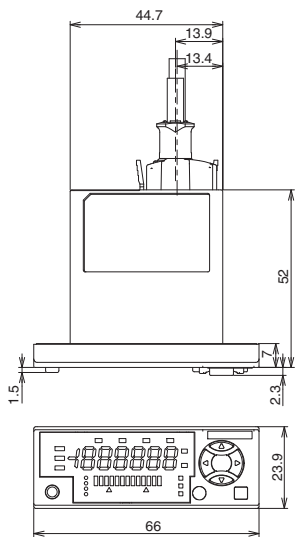
■ GT2-72(C)N/72(C)P



* Cable specifications

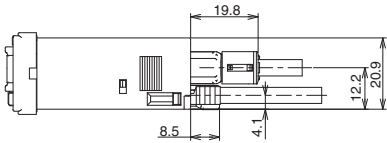
- GT2-72N/72P
 $\phi 4.7$ 10-strand x black, white, gray, orange, green, pink, violet, yellow, red, violet/pink stripe: 0.15 mm²; cable length: 2 m
- GT2-72CN/72CP
 $\phi 4.7$ 10-strand connector cable, cable length: 0.3 m

■ GT2-75N/75P/76N/76P



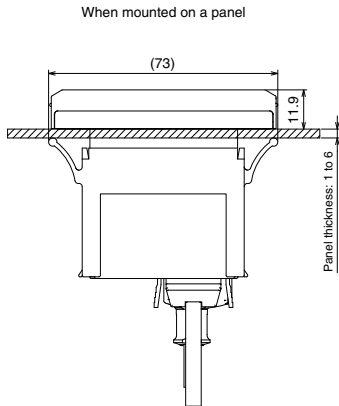
* Cable specifications

- GT2-75N/75P
φ4.7 12-strand x brown, blue: 0.20 mm²; black, white, gray, orange, green, pink, violet, yellow, red, violet/pink stripe: 0.15 mm²; cable length: 2 m
- GT2-76N/76P
φ4.7 10-strand x black, white, gray, orange, green, pink, violet, yellow, red, violet/pink stripe: 0.15 mm²; cable length: 2 m

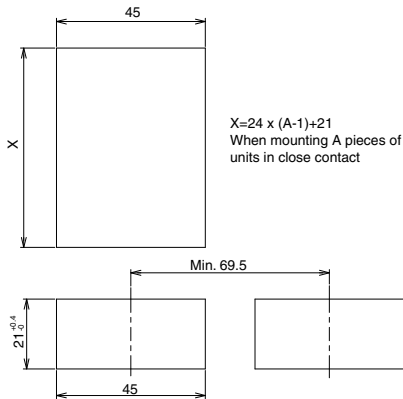


Unit: mm

■ Panel Cutout Dimensions



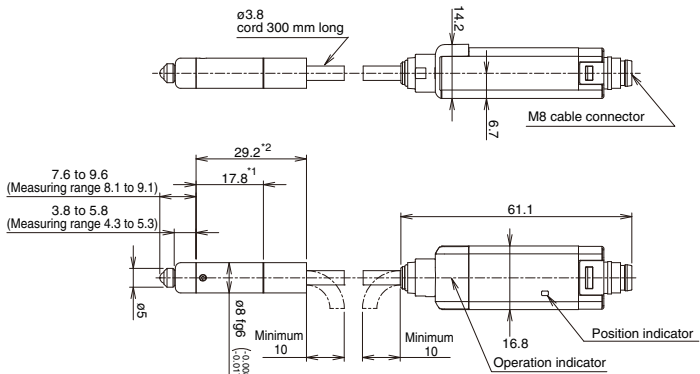
Panel Cutout Dimensions



Unit: mm

Sensor Head

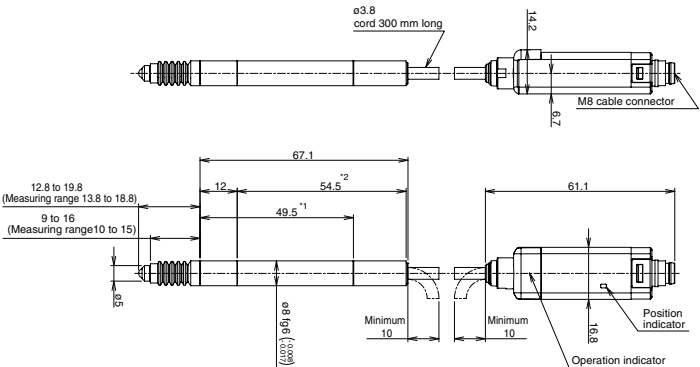
GT2-S1



*1 Possible fixing range of mounting brackets A, B, C, and E
*2 Possible fixing range of mounting bracket F

Unit: mm

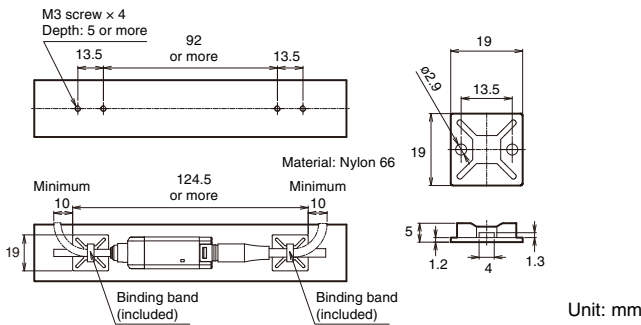
GT2-S5



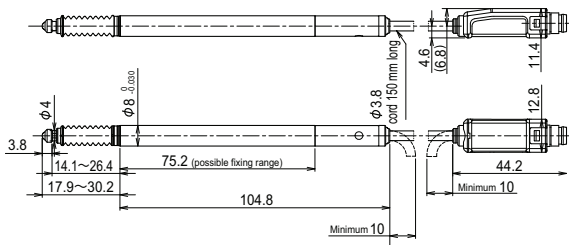
*1 Possible fixing range of mounting brackets A, B, C, and E
*2 Possible fixing range of mounting bracket F

Unit: mm

■ Short amplifier mounting bracket
OP-88117



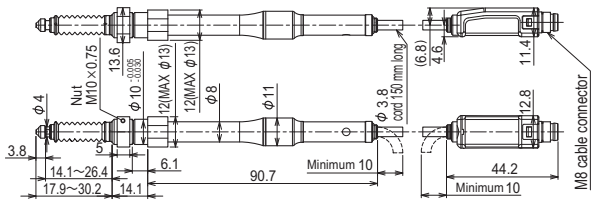
■ GT2-P12K(L)/P12(L)



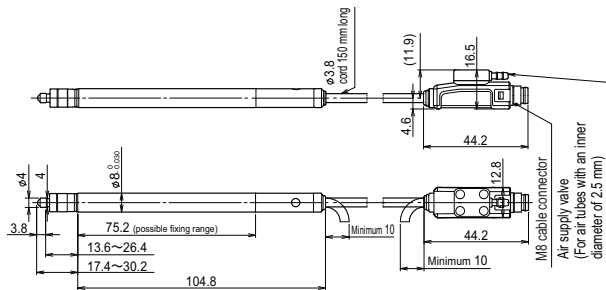
Reference

There is no dust boot for GT2-P12KL/P12L.

■ GT2-P12KF/P12F

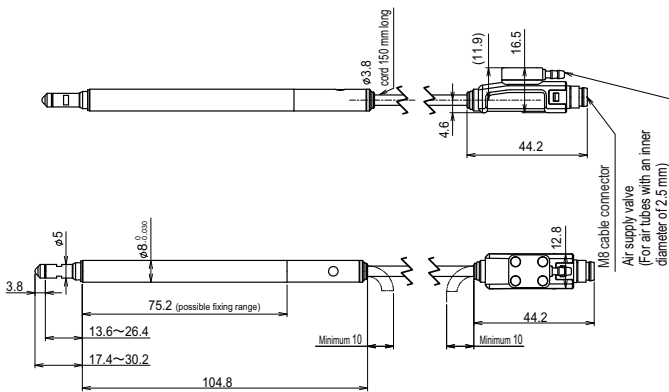


■ GT2-PA12K/PA12



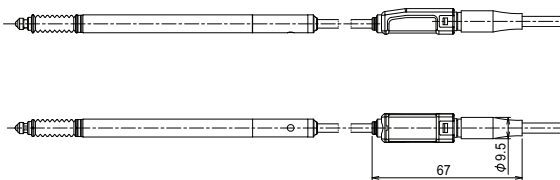
Unit: mm

■ GT2-PA12KL/PA12L



Unit: mm

■ With the sensor head cable attached

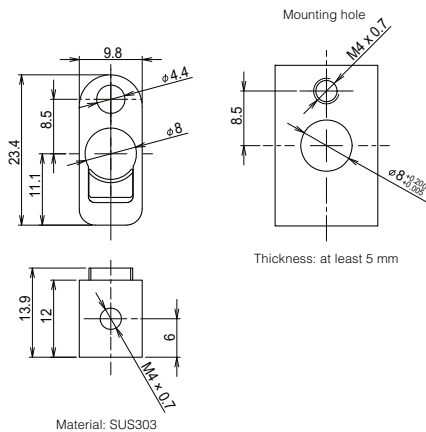


Unit: mm

Reference

φ10 when using GT2-CHP2M/5M/10M

■ OP-87863 (Mounting bracket F)



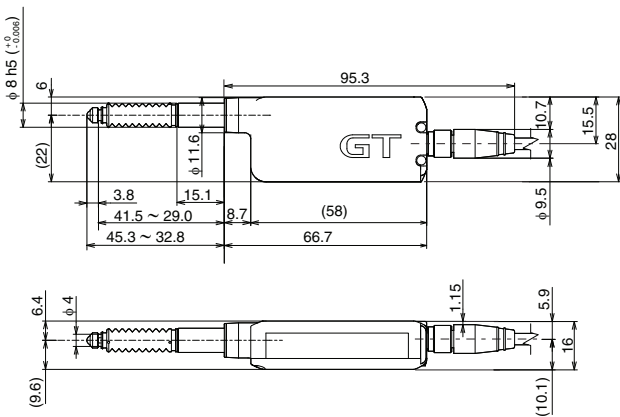
Unit: mm

Reference

OP-87863 (Mounting bracket F) cannot be used with GT2-H*** / A***.

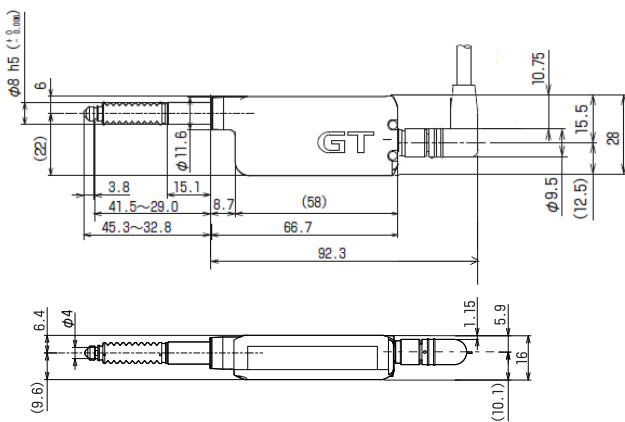
■ GT2-H12K(L)/H12(L)

When GT2-CH2M/5M/10M/20M is mounted



Unit: mm

When GT2-CHL2M/5M/10M/20M is mounted



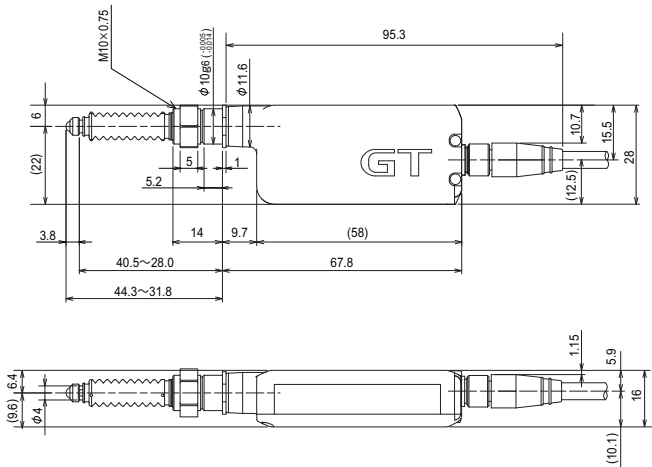
Unit: mm

Reference

There is no dust boot for GT2-H12KL/H12L.

■ GT2-H12KF/H12F/H12KLF/H12LF

With GT2-CH2M/5M/10M/20M attached



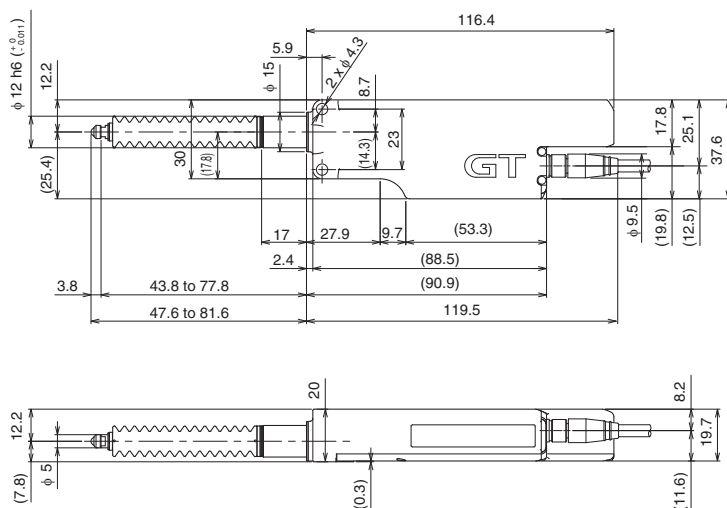
Unit: mm

Reference

There is no dust boot for GT2-H12KLF/H12LF.

■ GT2-H32(L)

When GT2-CH2M/5M/10M/20M is mounted



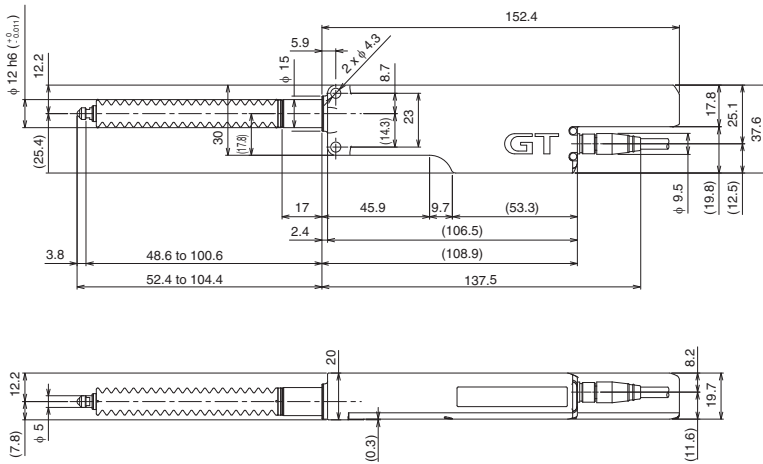
Unit: mm

Reference

There is no dust boot for GT2-H32L.

■ GT2-H50

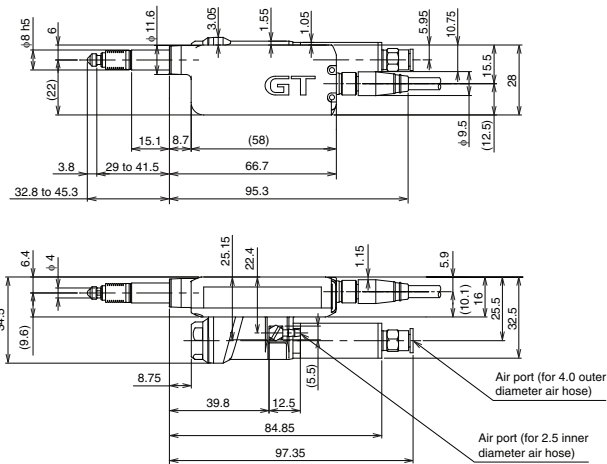
When GT2-CH2M/5M/10M/20M is mounted



Unit: mm

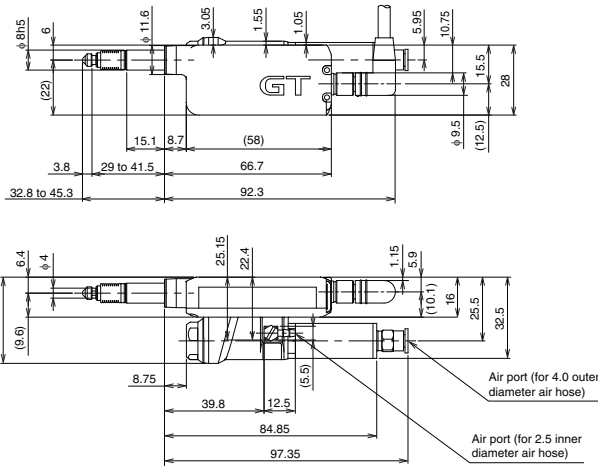
■ GT2-A12K(L)/A12(L)

When GT2-CH2M/5M/10M/20M is mounted



Unit: mm

When GT2-CHL2M/5M/10M/20M is mounted



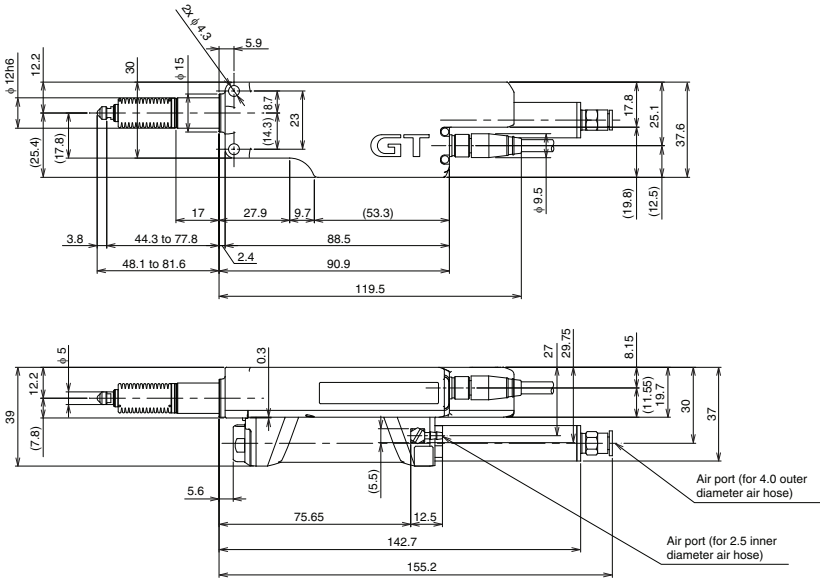
Unit: mm

Reference

There is no dust boot for GT2-A12KL/A12L.

■ GT2-A32

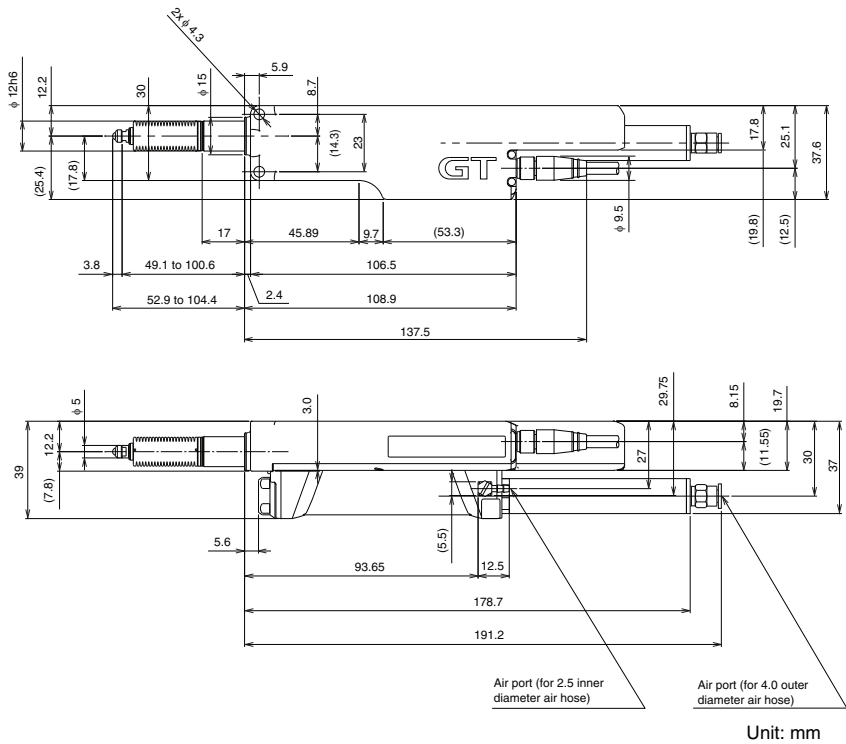
When GT2-CH2M/5M/10M/20M is mounted



Unit: mm

GT2-A50

When GT2-CH2M/5M/10M/20M is mounted



MEMO

Appendix

A

A1	Troubleshooting.....	A-2
A2	Error Messages.....	A-5
A3	Replacing the Contact.....	A-8
A4	Replacing the Dust Boot	A-10
A5	How to Mount the Lift Lever	A-15
A6	How to replace the dust seal.....	A-17
A7	Index	A-20

This section describes the actions to take when a problem occurs.

Problem	Check points	Remedy
Nothing is displayed on the panel.	Is the power cable connected correctly?	Connect the power cable correctly. 📖 "Sensor Amplifier Wiring" (page 2-9)
	Is the power save function running?	Turn off the power save function. 📖 "23. Power Save Function" (page 5-44)
Values are not displayed.	Is the target within the detection range?	Adjust the target to correctly fall within the detection range.
	Is timing control set for the detection mode?	Set the timing control for the detection mode. 📖 "01. Detection Mode" (page 5-7)
	Is the internal timing level set correctly?	Correctly adjust the timing level. 📖 "05. Self-timing Level" (page 5-12)
	When using static hold, is the stability width set to the correct value?	Set the criterion reference to USEr and increase the stability criterion reference width. 📖 "08. Static Hold Delay Stability" (page 5-15)
	Are the output line and input line short-circuited?	Check the wiring.
The value fluctuates.	Is the response time set too fast?	Set the response time to a slower value. 📖 "03. Response Time" (page 5-9)
	Are the target or sensor head vibrating?	Take anti-vibration measures.
	When using static hold, is the stability width set to the correct value?	Set the criterion reference to USEr and decrease the stability criterion reference width. 📖 "08. Static Hold Delay Stability" (page 5-15)
	Are the output line and input line short-circuited?	Check the wiring.
The values are incorrect.	Is the target tilted or located in an incorrect position?	Adjust the target to correctly fall within the detection range.
	Is the sensor head firmly secured?	Use the optional mounting bracket. 📖 "Mounting the Sensor Head" (page 2-13)
	Does the surrounding air temperature significantly change?	Keep the surrounding air temperature constant.
	- Is the origin alignment set correctly? - Is the preset value set correctly? - Is the preset input line connected correctly?	Configure the settings correctly. 📖 "3-2 Origin Alignment" (page 3-11) 📖 "Preset Function (Displaying a value by Adding or Subtracting a Desired Value)" (page 3-30)
	Is the proper calibration value set?	Redo the calibration. 📖 "30. Calibration Function Setting" (page 5-52)
	Are the contacts aligned correctly?	If the contacts can separate easily, secure them with thread lock.
	Are the output line and input line short-circuited?	Check the wiring.
The outputs change even when paused.	Check the hysteresis. (The factory default hysteresis is 0.003 mm.)	Increase the hysteresis. 📖 "14. Hysteresis" (page 5-22)
Bank switching cannot be performed with external input.	Is the key lock turned on?	Turn off the key lock. 📖 "Key Lock" (page 3-39)

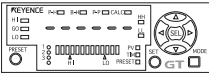
Problem	Check points	Remedy
"-----" is displayed when the power is turned on.	Is hold detection selected? ("-----" is displayed until the first criterion value is recognized.)	A value will appear once the first criterion value is recognized. ☐ "01. Detection Mode" (page 5-7)
The display stays at 0.000.	Does the value change during the sampling period of Peak-to-Peak hold?	During Peak-to-Peak hold, the amount of variation is displayed, so if the value stays the same, then the displayed value remains as zero.
Criterion output cannot be output properly.	Is the unit properly wired?	Check the output circuit and wiring, and connect properly. ☐ "7-2 I/O Diagram" (page 7-14)
	Are the tolerances set correctly?	Reset the tolerances ☐ "3-3 Setting the Tolerances" (page 3-14)
	Is the hysteresis set correctly?	Set it up correctly. ☐ "14. Hysteresis" (page 5-22)
The unit in the thousands place (0.0001) does not appear.	Is the displayed number of digits set correctly?	Set it up correctly. ☐ "13. Displayed Number of Digits" (page 5-21)
The A1.APL parameters do not appear.	- Are expansion units added? If expansion units are added, it only appears on the main unit.) - Are the amplifiers connected to each other correctly?	Check the connections for the expansion units. ☐ "2-1 Mounting and Wiring the Sensor Amplifier" (page 2-2)
Calculations for twist, warpage, and thickness cannot be set.	Are the number of expansion units correct? Each of those calculations are available only when there are 4, 3, or 2 units.) Are the amplifiers connected to each other correctly?	Connect the correct number of units. ☐ "5-6 Calculation Setting Mode" (page 5-57)
When calculating the reference distance, the response time cannot be set.	Are you attempting to set the response time for an expansion unit?	During calculation, set the response time for the main unit? ☐ "03. Response Time" (page 5-9)
The value fluctuates, but the bar LED does not change.	Is R.V. display selected?	Set P.V. display. ☐ "3-1 Main Screens" (page 3-2)
	Is the bar LED display method set to OK/NG display mode?	During P.V. display, use the MODE button to switch the bar display mode. ☐ "1-2 Identifying Part Names and Functions" (page 1-10)
	Are the HIGH setting value and LOW setting value vastly different from the measured value?	Set the correct value. (When the measured value is far from the HIGH/LOW setting values, or if the value is fairly close to the difference between the HIGH/LOW setting values, the bar LED does not change.)

Problem	Check points	Remedy
The preset values for the HIGH setting value and LOW setting value changed.	Was bank switching performed?	Use key operations to select the original bank. (The factory default is bank 0). Check whether the bank input wire is connected correctly.  "Sensor Amplifier Wiring" (page 2-9)
During tolerance calibration, "no vAL" is displayed.	When the measured value (P.V. value) is "-----", tolerance calibration cannot be performed.	Adjust the target to fall within the detection range. A value will appear once a measured value is recognized through timing.

A2

While the error message that starts with "Er" is displayed, the HIGH and LOW outputs turn ON at the same time (excluding "ErC").

Error screen	Error contents	Action
	- When using the calculation function, the number of expansion units connected when the power is turned on differs from the number of expansion units programmed in the main unit when setting the calculation settings. - When using the calculation function, the model other than the GT2-70 Series is added	- Set the calculation mode again or initialize the main unit.  "Initialization (Initial Reset)" (page 3-37) - After turning the power off, check the connection between the amplifiers.
	An error has occurred in the main unit when performing the reference difference (rEF) of the calculation function, or an error has occurred in one of the expansion units when performing a calculation function item other than the reference difference (rEF).	Check the error contents on the main unit and expansion units.
	The sensor head is connected to the main unit that is set to the calculation dedicated mode.	Remove the sensor head from the main unit or set the main unit to the setting other than the calculation dedicated mode.
	The display reads "com.Loc" and settings cannot be changed.	The connected communication unit DL-RS1A read/write setting switch is set to RW. Set the read/write setting switch to R.  "RS-232C Communication Unit DL-RS1A User's Manual"  Reference Even when "com.Loc" is displayed, the external input can be used for bank switching, reset input, and preset input. When accessing the main unit via Communication Unit <DL-CL1> <DL-DN1> <DL-EP1> (Inputting external input, changing set values) Operations on the sensor amplifier are locked for approximately 10 seconds. Then "com-Unlock" is displayed, and the lock is released.
	The calculation mode is used, so the function setting mode cannot be changed.	Check the calculation mode setting. The function setting mode can be changed only when the calculation mode setting on the main unit is set to "C0.oFF" or "C5.rEF".
	During tolerance calibration, the criterion value (P.V. value) is "-----". When PRESET is entered on the main unit in calculation only mode	Perform the tolerance calibration after performing the timing input to fix the measured value.

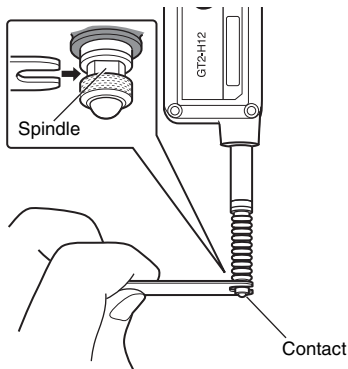
Error screen	Error contents	Action
	The criterion value (P.V. value) is not fixed because the timing input is not performed when the hold detection is selected.	Perform the timing input.
	Operations on the expansion unit are locked while the batch input is selected and the key lock is active on the main unit.	Cancel the key lock on the main unit.
	After ALL GO is selected in the special output setting, the number of expansion units changed.	• If the number of expansion units has been changed, set the special output setting again. • If the number of expansion units has not been changed, check if each expansion unit operates correctly, then turn on the power again.

A3 Replacing the Contact

Products other than the GT2-S1/S5

This section describes replacing the contact. Remove the sensor head before performing this operation.

- 1 Use the supplied key wrench to hold the spindle securely.

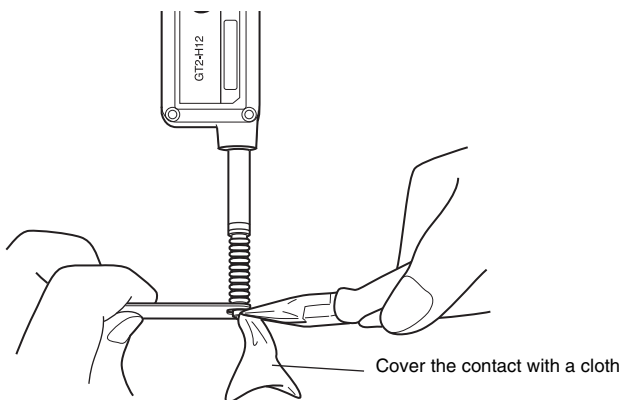


NOTICE

If force is applied to twist the spindle, the sensor head may be damaged.

- 2 Use pliers or a similar tool to grasp the contact and remove it.

Pliers and similar tools cannot be used on the fluorocarbon contact (OP-80228). Remove this contact with your fingers.



NOTICE

- Cover the contact with a piece of cloth to cushion it while you grasp the contact with the pliers. Pliers and similar tools cannot be used on the fluorocarbon contact (OP-80228). Remove this contact with your fingers.
 - Do not rotate the unit while performing these steps.
- 📖 "21. Store Preset Value" (page 5-42)

3 As described in step 1, use the supplied key wrench to hold the spindle securely.

4 As described in step 2, replace the contact.

NOTICE	• For the roller contact or offset contact, secure the side of the contact being used with a fixing nut. We also recommend using a thread lock to prevent wobbling. • When using a roller contact, only apply to the roller in the direction of movement and not along other axes. • When installing the contact, never apply tightening torque over 0.2 N·m. Use a tightening torque of 0.002 N·m or less for the fluorocarbon contact (OP-80228) only. We also recommend using thread lock to prevent movement.
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GT2-S1/S5

1 Remove the sensor head from the metal plate or similar object, and then use pliers or a similar tool to pinch and remove the contact.

With a fluoroplastic type contact (OP-80228), do not use pliers or a similar tool. Instead, remove the contact with your fingers.

NOTICE	• Cover the contact with cloth or a similar material before pinching the contact with a tool such as pliers. • Ensure that the force exerted in the rotational direction is not applied to the main unit when performing this work.
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2 Follow the reverse procedure as that shown in step 1 to attach the contact.

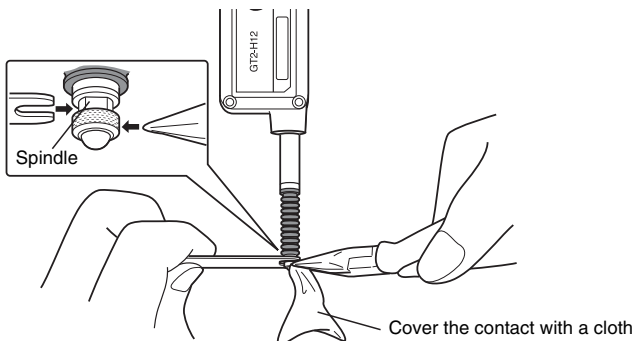
NOTICE	• When using a roller contact or an offset contact, align the contact in the direction that you want to use it, and then use the intermediate fixing nut to fix the contact in place. We also recommend that you apply adhesive to prevent the contact from becoming loose. • When using a roller contact, align it with the direction of movement and ensure that no forces are applied to the shaft other than the force in the rotational direction. • Do not attach or remove the contact when the sensor head main unit is fixed in place on a metal plate or similar object. Be sure to perform the attachment or removal operation after first removing the sensor head from the metal plate or similar object. • Apply a tightening torque of 0.2 N·m or less. • Apply a tightening torque of 0.002 N·m or less only for the fluoroplastic type contact (OP-80228). We also recommend that you apply adhesive to prevent the contact from becoming loose.
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3 Check that you cannot easily remove the contact by hand.

This section describes the replacement of the dust boot. Remove the sensor head from the device before replacement.

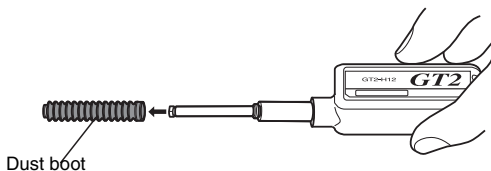
1 Use the supplied key wrench to secure the spindle and pliers or similar tool to remove the contact.

Pliers and similar tools cannot be used on the fluorocarbon contact (OP-80228). Remove this contact with your fingers.

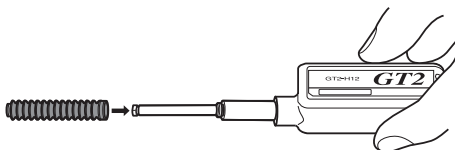


A Appendix NOTICE	If force is applied to twist the spindle, the sensor head may be damaged. Cover the contact with a piece of cloth to cushion it while you grasp the contact with the pliers. Pliers and similar tools cannot be used on the fluorocarbon contact (OP-80228). Remove this contact with your fingers.
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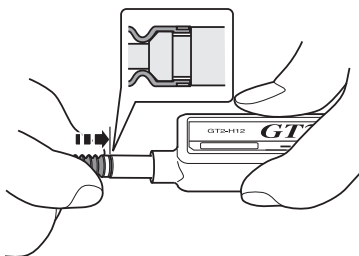
2 Remove the dust boot.



3 Install a new dust boot.



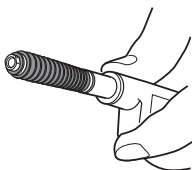
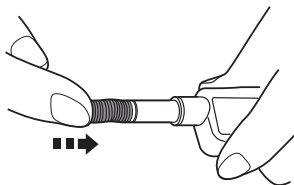
4 Insert the dust boot until it fits in the spindle groove.



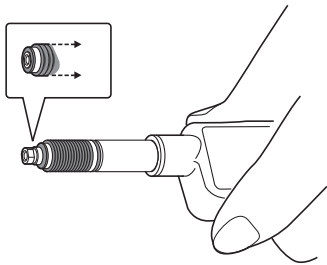
Reference

Rotating the dust boot makes it easier to insert.

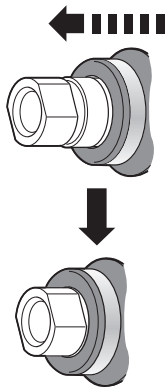
5 As shown in the drawing below, press on the end of the dust boot with your fingers and pass the tip of the spindle through the dust boot.



- 6** Thread the spindle completely through the end as shown in the drawing below.



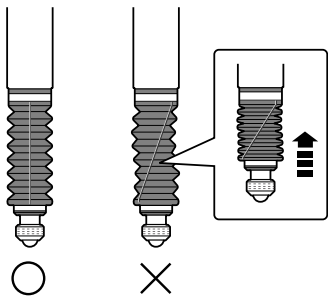
- 7** Slide the dust boot so that it fits in the spindle groove.



- 8** As described in step 1, use the supplied key wrench to secure the spindle and use pliers or similar tool to remove the contact.

9 Rotate the dust boot either up or down until the ridges on the dust boot (which protrude slightly) line up completely straight.

This is easier to check with the spindle pushed in.



NOTICE

If the dust boot is not straight, the spindle may apply stress when it moves, which may damage the sensor head.

GT2-S1/S5

The dust boots that comply with the sensor head models are shown below.

Sensor head	Model
GT2-S1	OP-88063
GT2-S5	OP-88065

- 1

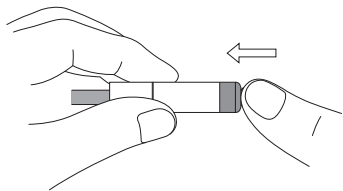
Remove the contact. For the way to remove the contact, see "Replacing the contact."
- 2

Remove the dust boot. Pinch the dust boot between your fingers, and then pull it free.
- 3

Attach the new dust boot.
Insert the dust boot until it reaches the groove at the back of the section for the dust boot.

Reference

When installing the OP-88063 on the GT2-S1, it is easy to attach the dust boot by pressing it and the spindle as shown in the following figure.



The silver part on the tip can be seen.



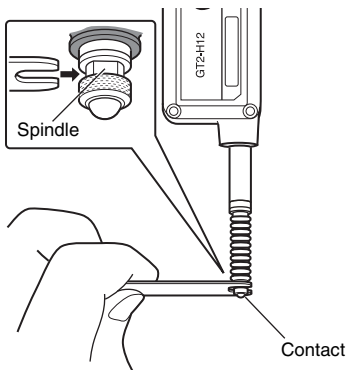
The tip is covered with the dust boot.

4 Attach the contact.

Mount the lift lever (OP-84397) between the spindle and the contact. Remove the sensor head from the device beforehand.

The lift lever cannot be mounted on the GT2-S1/S5.

1 Use the supplied key wrench to hold the spindle securely.

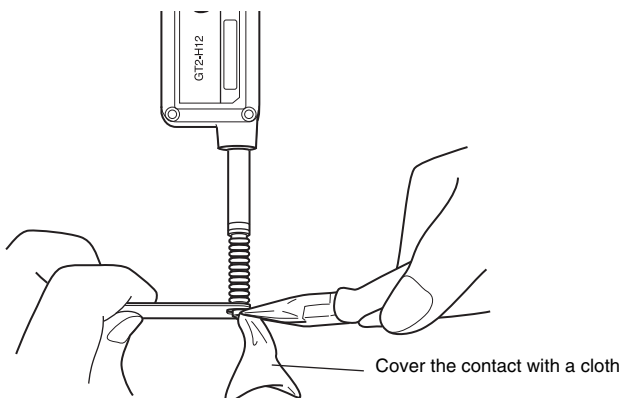


NOTICE

If force is applied to twist the spindle, the sensor head may be damaged.

2 Use pliers or a similar tool to grasp the contact and remove it.

Pliers and similar tools cannot be used on the fluorocarbon contact (OP-80228). Remove this contact with your fingers.

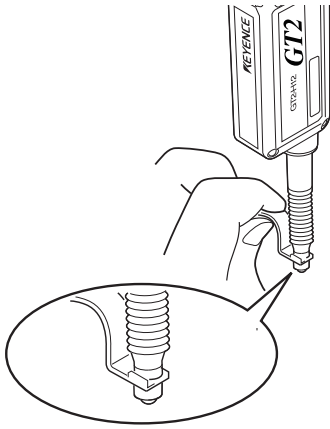


NOTICE

- Cover the contact with a piece of cloth to cushion it while you grasp the contact with the pliers. Pliers and similar tools cannot be used on the fluorocarbon contact (OP-80228). Remove this contact with your fingers.
- Do not rotate the unit while performing these steps.

3 Mount the lift lever.

After mounting, secure the lift lever in place with the spindle and remove or attach the contact.



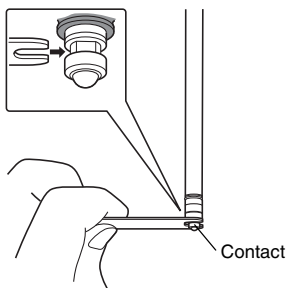
A6 How to replace the dust seal

To prevent foreign objects and liquid from entering the sensor head, be sure to replace the dust seal in a clean environment. Also, be sure to remove the sensor head from any metallic plates, etc. before replacing the contact.

1 Use a clean cloth soaked in ethanol to wipe off any dirt on the sensor head.

* If you are using the contact attached as standard when the GT2-PA12K/PA12 is shipped, there is no need to detach the contact. Accordingly, steps 2, 3, 9 and 10 in the procedure below can be skipped. Perform steps 4 to 8.

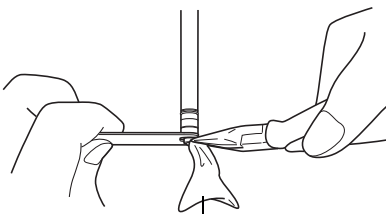
2 Secure the spindle of the sensor head with the supplied key wrench.



NOTICE

The sensor head may be damaged if the spindle rotates.

3 Use pliers or similar to grip the contact and remove it. Fluoroplastic type contacts (OP-80228) should be removed by hand without using pliers or similar.



Cover the contact with a cloth or similar.

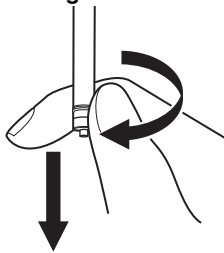
NOTICE

- Cover the contact with a cloth or similar when gripping it with pliers. Fluoroplastic type contacts (OP-80228) should be removed by hand without using pliers or similar.
- Ensure that work does not cause the main part to rotate.

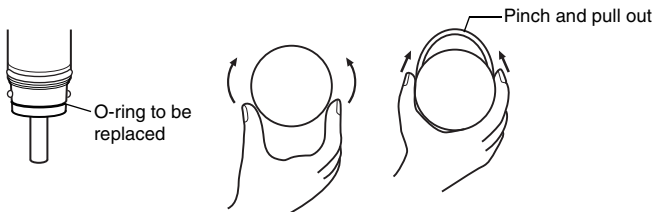
A

Appendix

- 4** Press the dust seal towards the sensor head and turn in the direction indicated by the arrow in the figure below to remove it.



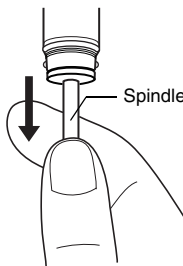
- 5** Remove the O-ring to be replaced and clean the groove in which the O-ring was inserted.



NOTICE	Be careful not to damage the O-ring groove. * It may become damaged if tools are inserted into it.
---------------	--

- 6** Use a clean cloth soaked in ethanol to remove any dirt, grease or similar from the spindle.

* Also make sure to remove any grease from the part of the spindle that is exposed when the spindle is pulled out or fully extended. The spindle has a fluorine-based coating. Wipe it gently when cleaning it.



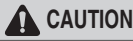
NOTICE	The replacement dust seal comes with specialized grease applied to it. Do not apply more grease or oil to it.
---------------	--

- 7** Fit the O-ring supplied with this product into the groove.
Make sure that the O-ring does not have any hair, dust, or dirt on it.

NOTICE

The O-ring may break or become damaged if it becomes caught on a tool or nail, or if it is pulled too much. We recommend completing this procedure by hand.

- 8** Follow the procedure in step 4 in reverse to attach the replacement dust seal. Fit the groove in the side of the replacement dust seal onto the protrusion on the sensor head, and turn it while pushing it in. Wipe off any fluorine-based grease which comes out. When the replacement dust seal has been attached, check that it does not come off when pulled.



CAUTION

Fluorine-based grease is used on the dust seal. If this gets on your hands and you then light a cigarette, gases will be produced which are harmful to humans.

- 9** As in step 1, use a key wrench to secure the spindle.

- 10** Attach the contact as in step 2.

NOTICE

- Secure the roller and offset contacts with the securing nut in the middle according to the direction you wish to use. Applying a thread locking agent is recommended to prevent the nut from becoming loose.
- Be sure not to apply any force that is not in the rotation direction to the axis of the roller contact.
- Do not attach or remove the contact when the sensor head main unit is fixed in place on a metal plate or similar. Be sure to remove the sensor head from the metal plate or similar before attaching or removing the contact.
- Apply a tightening torque of 0.2 N•m or less to the contact. Note that a tightening torque of 0.002 N•m or less should be applied only for fluoroplastic type contacts (OP-80228). Applying a thread locking agent is recommended to prevent the nut from becoming loose.

This index provides a list of terms used in this document. It is arranged in alphabetic order.

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Revision History

Date of printing	Version	Revision contents
February 2014	Official release	
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KEYENCE CORPORATION

www.keyence.com/glb

1-3-14, Higashi-Nakajima, Higashi-Yodogawa-ku, Osaka, 533-8555, Japan PHONE: +81-6-6379-2211

AUSTRIA

Phone: +43 2236 378266 0

BELGIUM

Phone: +32 15 281 222

BRAZIL

Phone: +55-11-3045-4011

CANADA

Phone: +1-905-366-7655

CHINA

Phone: +86-21-3357-1001

CZECH REPUBLIC

Phone: +420 220 184 700

FRANCE

Phone: +33-1-56-37-78-00

GERMANY

Phone: +49-6102-3689-0

HONG KONG

Phone: +852-3104-1010

HUNGARY

Phone: +36 1 802 7360

INDIA

Phone: +91-44-4963-0900

INDONESIA

Phone: +62-21-2966-0120

ITALY

Phone: +39-02-6688220

KOREA

Phone: +82-31-789-4300

MALAYSIA

Phone: +60-3-7883-2211

MEXICO

Phone: +52-55-8850-0100

NETHERLANDS

Phone: +31 40 20 66 100

PHILIPPINES

Phone: +63-2-8981-5000

POLAND

Phone: +48 71 36861 60

ROMANIA

Phone: +40 269 232 808

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Phone: +65-6392-1011

SLOVAKIA

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THAILAND

Phone: +66-2-369-2777

UK & IRELAND

Phone: +44 1908-696-900

USA

Phone: +1-201-930-0100

VIETNAM

Phone: +84-24-3772-5555

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