Magnescale®

Counter Module

MF10-CM

Read all the instructions in the manual carefully before use and strictly follow them.
Keep the manual for future references.

Instruction Manual

PRECAUTIONS ON SAFETY

● Meanings of Signal Words

⚠CAUTION Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

● Caution Indications

⚠PRECAUTIONS	
Do not use the product with voltage in excess of the rated voltage. Excess voltage may result in malfunction or fire.	
Never use the product with an AC power supply. Otherwise, explosion may result.	

PRECAUTIONS FOR SAFE USE

The following precautions must be observed to ensure safe operation of the product. Doing so may cause damage or fire.

■ Installation Environment
- Do not use the product in environments subject to flammable or explosive gases.
- To secure the safety of operation and maintenance, do not install the product close to high-voltage devices and power devices.
- Do not use the product in any atmosphere or environment that exceeds the ratings.
- Do not use the product in environments subject to exposure to water, oil, chemicals, etc.

■ Installation and Wiring
- Do not install the product in locations subjected to strong magnetic field or electric field.
- Be sure to turn OFF the power when you plug/unplug the connector with the measuring unit, connect/disconnect with the counter module, or add counter modules.
- High-Voltage lines and power lines must be wired separately from this product. Wiring them together or placing them in the same duct may cause induction, resulting in malfunction or damage.

■ Others
- Do not attempt to disassemble, repair, or modify the product in any way.
- Do not use the product if the case is damaged.
- When disposing of the product, treat it as industrial waste.
- When making setting, be sure to check safety such as by stopping the equipment.

PRECAUTIONS FOR CORRECT USE

■ Installation Location
- Do not install the product in the following locations.

(1) Locations subject to direct sunlight
(2) Locations subject to condensation due to high humidity
(3) Locations subject to corrosive gas
(4) Locations subject to vibration or mechanical shocks exceeding the rated values
(5) Place where there are dusts, salt contents or iron powders

■ Installation
- Do not apply the forces on the cord exceeding the following limits:Pull: 40 N; torque: 0.1 N·m; pressure: 20 N; bending: 3 kg
- Do not pull or twist the measuring unit connector with excessive force when it is fixed to the counter module. (9.8 N or less)
- Be sure to mount the module to the DIN rail until it clicks.
- To prevent electric shock or short circuit, put a protection cap (attached with MG50 Series) on unused connection power supply terminals.

■ Others
- Always keep the protective cover in place when using the product. Not doing so may cause malfunction.
- Do not use thinner, benzine, acetone, and lamp oil for cleaning.

Checking the Package Content

- Counter module: 1
- Instruction manual (this sheet)

Compatible Interface Unit (Sold Separately)

- MG50 Series, MG51

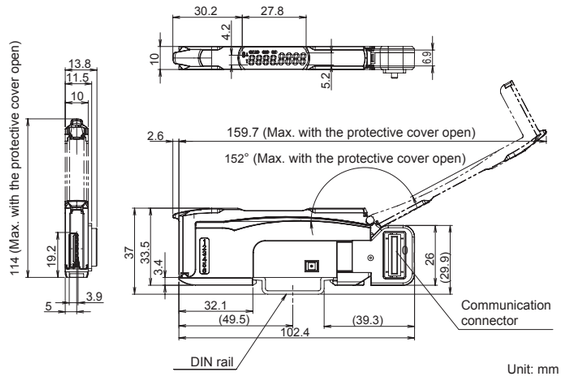
[For U.S.A. and Canada]

THIS CLASS A DIGITAL DEVICE COMPLIES WITH PART15 OF THE FCC RULES AND THE CANADIAN ICES-003. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS.
(1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND
(2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDERSIGNED OPERATION.

CET APPAREIL NUMÉRIQUE DE LA CLASSE A EST CONFORME À LA NORME NMB-003 DU CANADA.

1 Installation

1-1 Dimensions



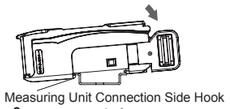
Unit: mm

※ Dimensions in parentheses ( ) indicates the ones with related components.
The cover could come off if it is tilted by 152 degrees or more.

1-2 Mounting the Counter Module

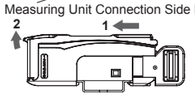
■ Mounting on DIN rail

1. Let the hook on the counter module's measuring unit connection side catch the rail.
2. Push the module until the hook clicks into place.



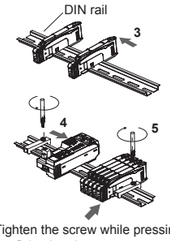
■ Removing from DIN rail

1. Push the module in the direction 1.
2. Lift the module in the direction of arrow 2 while performing step (1).



■ Joining Counter Modules

(1) Mount the counter module one at a time onto the DIN rail. Slide the counter module until the communication connector is closely attached. (Arrow 3)
(2) Use fixing bracket at the both ends of the grouped counter modules to prevent them from separating due to vibration or other cause. (Arrow 4)
(3) Tighten the screw on the fixing bracket using a driver. (Arrow 5)

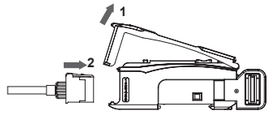


Tighten the screw while pressing the fixing bracket.

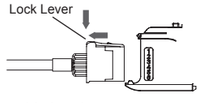
CHECK! For the maximum number of modules that can be connected, refer to the specifications of counter module. Always use the fixing brackets.

1-3 Mounting the Measuring Unit

1. Open the protection cover.
2. Insert the measuring unit, with the lock lever on its connector area facing upward, all the way into the connector port.



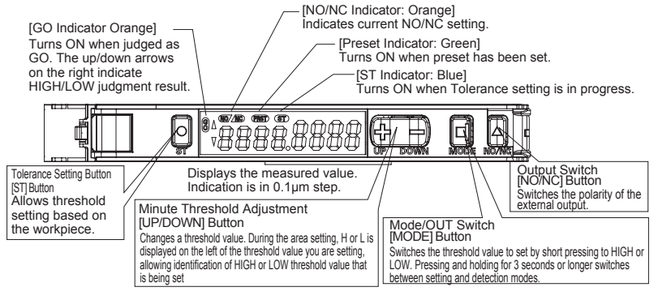
To remove it, press and hold the lock lever then pull the measuring unit out.



* Fix the cable in a suitable position to prevent possible cable breakage.

2 Settings

2-1 Setting and Display Overview



2-2 Switching Control Output

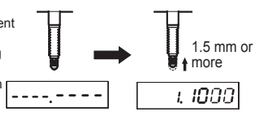
Press △ button.
NO/NC

Under NO (Normal Open) setting, the output turns on when a workpiece is within the tolerance (GO).
NO of [NO/NC Indicator] turns ON.

Under NC (Normal Close) setting, the output turns on when a workpiece is outside the tolerance (NoGO).
NC of [NO/NC Indicator] turns ON.

2-3 Reference Point

When reference point use setting is ON (See 3 Convenient Setting Features)
The measured value is not displayed until the measuring unit passes the reference point after power ON.
When the reference point is used, turn on the power with the spindle extended as far as possible, and then move the spindle 1.5 mm or more.



2-4 Tolerance Judgment

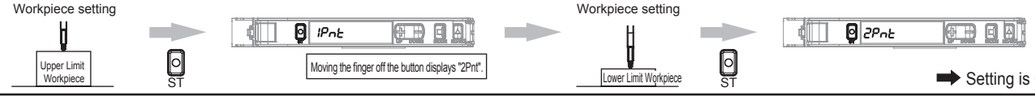
* Also see "5. Detailed Settings" when making the settings.

Setting for sensing within the range of the upper and lower limits (Threshold 2-point)

① 2-point area setting

1. Select [Area detection Mode] after the process of following [Setting Mode]→[Judgment Output Mode]
2. Press and hold the [MODE] button for 3 seconds or longer to exit the Setting Mode.
3. Follow the procedure below and make the settings.

Threshold value HIGH : Upper Limit Workpiece Height
Threshold value LOW : Lower Limit Workpiece Height

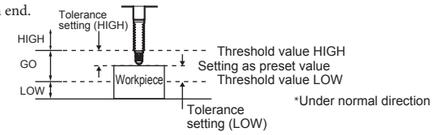


Measuring a workpiece with ± tolerance (Threshold 2-point)

② ± tolerance setting

1. Select [Setting Mode] → [Tolerance Setting : HIGH] and configure the tolerance value on the High end.
2. Select [Tolerance Setting : LOW] and configure the tolerance value on the Low end.
3. Select [Area detection Mode] in [Judgment Output Mode]
4. Press and hold the [MODE] button for 3 seconds or longer to exit the Setting Mode.
5. Follow the procedure below and make the settings.

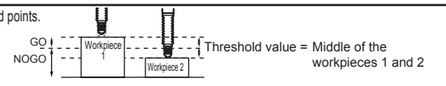
Threshold value HIGH : Preset value + Tolerance setting (HIGH)
Threshold value LOW : Preset value - Tolerance setting (LOW)

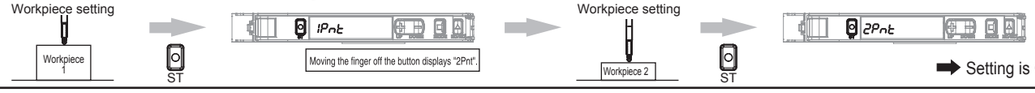


Measuring for one reference (Threshold 1-point)

③ 2-point setting Threshold value setting: Set the value in the middle between the measured values for the 1st and 2nd points.

1. Select [Normal Detection Mode] after the process of following [Setting Mode]→[Judgment Output Mode]
2. Press and hold the [MODE] button for 3 seconds or longer to exit the Setting Mode.
3. Follow the procedure below and make the settings.

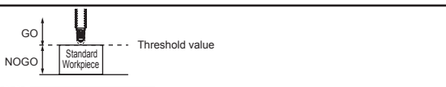


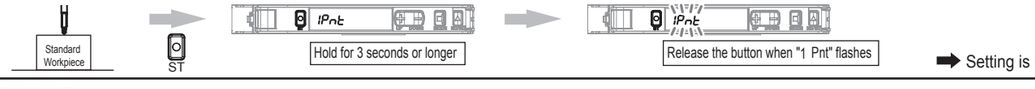


Measuring for standard workpiece as reference (Threshold 1-point)

④ 1-point setting Threshold setting: Set the workpiece value as the threshold.

1. Select [Normal detection Mode] after the process of following [Setting Mode]→[Judgment Output Mode]
2. Press and hold the [MODE] button for 3 seconds or longer to exit the Setting Mode.
3. Follow the procedure below and make the settings.





● Setting Error

Error / Display / Cause	Error Origin Tuning Type	Remedy
Tolerance Judgment Error EtUn Err The 1st and the 2nd measuring points are close, or tolerance setting is too small.	① ②	· Ensure the wider distance between the 1st and the 2nd measuring points. · Set the larger difference between the tolerance settings of HIGH and LOW. · For hysteresis setting, configure a smaller setting value.
Near Error nEAr Err The difference between the 1st and the 2nd measured values is too small.	③	· Configure the preset value again. · Configure the tolerance setting again. · For hysteresis setting, configure a smaller setting value.
Overflow Error ouEr FLoY The preset or tolerance setting value is too large.	① ② ③ ④	· Configure the preset value again. · Configure the tolerance setting again.
Underflow Error Undr FLoY The preset or tolerance setting value is too small.	① ② ③ ④	· Configure the preset value again. · Configure the tolerance setting again.

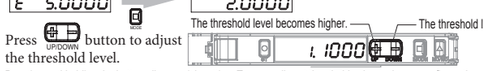
2-5 Minute Adjustment of Threshold Level

1. Under [Detection Mode], press and hold MODE button.
2. The threshold value blinks.

<<For Area Detection Mode Setting>>

<<For Normal Detection Mode Setting>>

3. Press UP/DOWN button to adjust the threshold level.

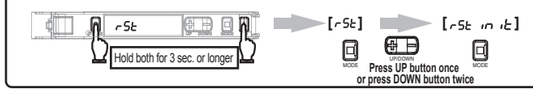


Pressing and holding the button allows quick setting. To manually set threshold values, always configure them so that "HIGH threshold value > LOW threshold value". If they are configured as "HIGH threshold value < LOW threshold value";
- GO judgment is not given regardless of a measured value.
- HIGH and LOW indicators turn ON at the same time and error output is provided if the judgment result is other than HIGH/LOW.

3 Convenient Setting Features

Initializing Settings

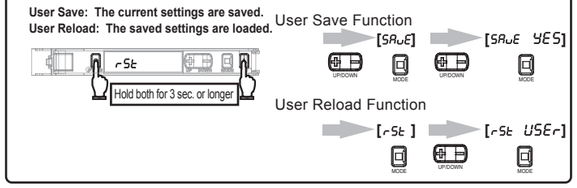
● Setting Reset Initialize all settings to the factory-set defaults.



Saving/Reading Settings

● User Save Function/User Reset Function

User Save: The current settings are saved.
User Reload: The saved settings are loaded.



Using the measuring unit reference point/Setting the point at power ON as origin

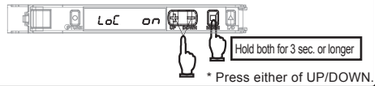
● Reference Point Use Setting

1. Select [Setting Mode] → [Reference Point Use Setting].
   ON : The module automatically waits for the reference point signal. When the reference point is used, turn on the power with the spindle extended as far as possible, and then move the spindle 1.5 mm or more. A measured value is displayed.
   OFF: The reference point is set as the position of the measuring unit at power ON, and the measured value is displayed.
   The displayed value is the preset value.
   * After the setting, turning the power OFF then ON, or searching the reference point again, reflects the reference point use setting to measurement.
   * When the reference point use setting is ON, a hyphen mark (-) is displayed until the measuring unit passes the reference point.

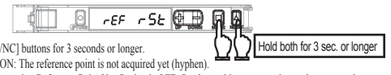
Preventing Malfunction

● Key Lock Function Disables all the button operations.

Enable/Cancel
(The same procedure)



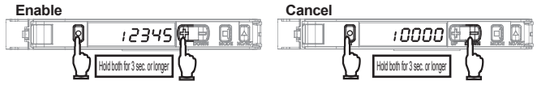
● Reference point search again
(to capture the measuring unit reference point again)



1. Press and hold [MODE] and [NO/NC] buttons for 3 seconds or longer.
   * Reference Point Use Setting is ON: The reference point is not acquired yet (hyphen).
   Pass the measuring unit reference point. Reference Point Use Setting is OFF: Set the position at execution to the preset value.

● Preset Function

Set any preset value for the criteria position and perform measurement and judgment output.
The preset value on factory shipment is 0, which can be used for zero-resetting.



Enable
1. Select [Setting Mode] → [Preset Input Value] and set any value.
   Press and hold the [MODE] button for 3 seconds or longer to exit the Setting Mode.
2. Under the [Detection Mode], press and hold [ST] and [UP] buttons for 3 seconds or longer.

Cancel
1. Under the [Detection Mode], press and hold [ST] and [DOWN] buttons for 3 seconds or longer.

* When the reference point use setting is ON, the reference position information is saved and can be recovered after power OFF.
* A preset value can be configured within a range from -1999.9999 to 9999.9999. (in 0.0001 step with initial value of 0)

4 Maintenance

4-1 Troubleshooting

● Troubleshooting

Phenomena	Cause	Remedy
Nothing is shown on the indication.	Is the power supply ON? Are the cables not broken?	Check the wiring and measuring unit, the power supply voltage and capacity.
The counter module restarts during operation.		
Nothing is shown on the digital indication.	Is the Eco Function not turned ON ?	Turn OFF the Eco function. → Refer to "5 Detailed Settings".
The measured value is not displayed in 0.0001 step	Have the display digits configuration properly ?	Configure it properly. → Refer to "5 Detailed Settings".
The judgment output is not properly provided	Have the tolerance setting and hysteresis properly configured?	Configure the tolerance setting and hysteresis properly. → Refer to "5 Detailed Settings".
Lost tracking of the settings made.	–	Reset the settings. → Refer to "5 Detailed Settings".

● Error Display

Error Name / Display	Cause	Remedy
Load short circuit detection error E-St	The judgment output is short circuited.	Turn off the power supply, check whether the counter module connectors are short-circuited, and then turn on the power supply again.
Overcurrent protection error E-Hd CUr	A connection error is found in the measuring unit.	Check if the measuring unit is correctly mounted, and turn ON the power supply again.
Counter module EEPROM error E-nE 01 E-nE 02	An error is found in the counter module setting memory.	Turn ON the power again. Reset the settings if the error is not corrected.
Measuring unit communications time-out error E-HdCon1	A communications error is found between the measuring unit and the counter module.	Turn OFF the power supply and check if the measuring unit and counter module are correctly connected, and then turn ON the power supply again. If the error persists, the measuring unit or counter module is broken. Replace the measuring unit or counter module.
Measuring unit memory error E-HdnEn2	An error is found in measuring unit setting memory.	Turn OFF the power supply and check if the measuring unit is correctly connected, and then turn ON the power supply again. If the error persists, the measuring unit is broken. Replace the measuring unit.
Measuring unit speed error E-Hd SPd	The speed of passing the reference point was too high.	Check that excessive impact is not applied to the measuring unit. Turn ON the power supply again or perform the reference point research. → Refer to "3 Convenient Setting Features"
Measuring unit signal level error E-Hd Lu	A measuring unit circuit failure	Check if the measuring unit is correctly mounted, and then turn ON the power supply again. If the error persists, the measuring unit is broken. Replace the measuring unit.

● Status Display

Error Name / Display	Cause	Remedy
Lock ON LoC on	The key lock function enabled	Cancel the key lock function. → Refer to "3 Convenient Setting Features"
Measured value upper limit error ouEr	The measured value is over the display upper limit (9999.9999).	Review the preset value.
Measured value lower limit error Lo	The measured value is under the display lower limit (-1999.9999).	Review the preset value.
Moving average count unreached ----	The measured values for the number of moving average count is being acquired from the measuring unit.	Please wait until the moving average result is calculated
Reference point not acquired ----.----	The measuring unit did not pass the reference point.	Have the measuring unit pass the reference point (the point the measuring unit is pressed in by 1.5 mm or more from where it is fully extended).

4-2 Ratings and Specifications

Control output	2
Display resolution	Minimum 0.1 µm
Connection method	Interface Unit compatible connector
Power supply voltage	Supplied from the connector through the MG50.
Power consumption	Power supply voltage 24 V: Normal mode: 2040 mW max. (Power consumption 85 mA max.) Power saving (ECO ON) : 1800 mW max. (Power consumption 75 mA max.) (ECO LO) : 1920 mW max. (Power consumption 80 mA max.)
Control output	Please refer to the specification of a MG50.
Protection circuit	Power supply reverse polarity protection, output short-circuit protection
Ambient temperature range	Operating: 1 to 2 amplifiers connected: 0°C to 55°C, 3 to 10 amplifiers connected: 0°C to 50°C, 11 to 16 amplifiers connected: 0°C to 45°C, 17 to 30 amplifiers connected: 0°C to 40°C Storage: -30°C to 70°C (with no icing or condensation)
Ambient humidity range	Operating and storage: 35% to 85% RH (with no condensation)
Insulation resistance	20 MΩ min. (at 500 VDC)
Dielectric strength	1,000 VAC, 50/60 Hz, 1 minute
Mass (packed state/sensor)	Approx. 65 g/Approx. 25 g

5 Detailed Settings

Hold [MODE] button for 3 seconds or longer to enter Setting mode.

Setting mode provides the function settings described hereafter. The initial display shown after transition from one function to another represents the factory default.

A

1. Function Selection **Enabling 4 to 13**

FUnC dFLt (Basic setting) ↔ FUnC oPt (Detailed setting)

2. Detection Function **Changing Response Time**

dEt Stnd (STND Standard Mode) ↔ dEt GIGA (GIGA Giga Mode) ↔ dEt SHS (SHS Super High-speed Mode) ↔ dEt HS (HS High-speed Mode)

Usually, use SHS Super High-speed mode.

	Response time	Average Count	Measurement Cycle
SHS	3 ms	1	1 ms
HS	10 ms	8	1 ms
STND	100 ms	98	1 ms
GIGA	1000 ms	998	1 ms

3. Output Mode Selection **Specify signal the assignment to two outputs.**

out nor (Normal Output Mode) ↔ out HYbd (Hybrid Output Mode)

■ Normal Output Mode *For NO (Normal Open)

Output line	GO Judgment	NoGO Judgment	Error Judgment/ Undetermined
Control Output 1	ON	OFF	OFF
Control Output 2	OFF	OFF	ON

The NC (Normal Close) output is reversed. The indicator is not reversed.

■ Hybrid Output Mode

Output line	HIGH Judgment	GO Judgment	LOW Judgment	Error Judgment/ Undetermined
Control Output 1	ON	ON	OFF	OFF
Control Output 2	OFF	ON	ON	OFF

* If the judgment output mode is [Normal Detection Mode], the output is provided in the [Normal Output] pattern regardless of the setting.
The output switching timing for control outputs 1 and 2 is offset by up to 500 µs.

Function Selection: [dFLt] → A

Function Selection: [oPt]

4. BANK Switching **Set values are saved for each configured bank.**

bAnK 1 (BANK1) ↔ bAnK 2 (BANK2) ↔ bAnK 3 (BANK3) ↔ bAnK 4 (BANK4)

5. Tolerance setting (HIGH) **Configure HIGH tolerance value for tolerance judgment.**

HtoL (Tolerance setting (HIGH)) — The value is used to calculate the HIGH tolerance value for performing tolerance Judgment.

0.1000 (Enter tolerance HIGH value) — The tolerance value can be set by ▲▼ buttons. (from -199.9999 to 999.9999, in 0.0001 step, with initial value of 0.1)

6. Tolerance setting (LOW) **Configure LOW tolerance value for tolerance judgment.**

LtoL (Tolerance setting (LOW)) — The value is used to calculate the LOW threshold value for performing tolerance judgment.

- 0.1000 (Enter tolerance LOW value) — The tolerance value can be set by ▲▼ buttons. (from -199.9999 to 999.9999, in 0.0001 step, with initial value of -0.1)

7. Reference Point Use Setting Select whether using the measuring unit reference point or setting the point at power ON as origin.

rEF on (Using measuring unit) ↔ rEF oFF (Origin at Power On)

* Pay attention that this setting is not reflected until the power is turned OFF then ON again or the origin is searched again.

→ Refer to "3 Convenient Setting Features"

B

8. Direction **Specify a direction to increment/decrement the measured value.**

drCt nor (Normal) ↔ drCt rEv (Reverse)

For normal (nor) case: The pressing-in direction is +.
For reversed (rEv): The pressing-in direction is -.

9. Judgment Output Mode **Change the judgment output mode.**

Go AreA (Area Detection Mode) ↔ Go Stnd (Normal Detection Mode)

Area Detection Mode: The threshold values are set as HIGH/LOW. Judgment (display/output) is done with three levels; (HIGH) if the value exceeds the HIGH threshold value, (LOW if the value falls under the LOW threshold value, and (GO) if the value is within the tolerable range.

Normal Detection Mode: The threshold value is set and the judgment is done for non-defect (GO) or defect (NoGO).

10. Display Digits **Set the number of digits to display under the detection mode.**

0.0001 (0.1 µm step) ↔ 0.001 (1 µm step) ↔ 0.01 (10 µm step) ↔ 0.1 (100 µm step)

* Judgment is made for measured value including non-display digit s (in 0.1µm step).

11. Preset Input Value

PrSt (Preset Input Value) — → See Preset Function in "3 Convenient Setting Features"

0.0000 (Preset Input Value) — The preset value can be set by ▲▼ button. (from -1999.9999 to 9999.9999, in 0.0001 step, with initial value of 0) Pressing and holding the button allows quick setting.

12. Eco Function **Saving Power Consumption**

ECo oFF (Normal mode) ↔ ECo on (Eco Function ON) ↔ ECo Lo (Eco Function LO)

Eco Function	7-segment display
Normal mode	Always ON
ON	Turns OFF if there is no key operation for 10 seconds. ※
LO	Dims if there is no key operation for 10 seconds. ※

※The display turns ON if there is a key operation.

13. Hysteresis width

HStd (Standard setting) ↔ HUSr (User setting)

0.0001 (Standard setting) ↔ 8888.8888 (User setting input)

Set the hysteresis width . Hysteresis width is provided for threshold to prevent the judgment output from becoming unstable near the boundaries.

* If chattering occurs, check the output stability while setting the hysteresis width.
* Usually, set the value to zero,

The hysteresis width can be set by ▲▼ button. (from 0.0000 to 9999.9999, in 0.0001 step, with initial value of 0.0001)

A Move to Detection Mode by holding the button for 3 seconds or longer.

Note) After finish the setting, if the measuring unit which measuring length differs is re-connected, the setting value will be initialized.

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