

# Durable Temperature and Humidity Sensor

## ■ Overview

The durable temperature and humidity sensor (Model number HTY1000T1100, HTY1010T1100) is a highly precise and reliable sensor using the resistance temperature detector (Pt100, JIS C1604 class A) for the temperature sensor and the macromolecule capacitance type humidity sensor, FP4™ developed by Azbil Corporation.

In addition to highly precise temperature/humidity measurement, it has functions to detect and recover the drift\* caused by the chemical atmosphere in the laboratory or factory facilities.

\* Drift is a phenomenon that output error of the humidity element becomes larger due to aging.

JIS: Japanese Industrial Standards



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## Safety Precautions

Please read instructions carefully and use the product as specified in this manual.

Be sure to keep this manual nearby for quick reference.

### Restrictions on Use

This product was developed, designed, and manufactured for general air conditioning use.

Do not use the product in a situation where human life may be at risk or for nuclear applications in radiation-controlled areas. If you wish to use the product in a radiation-controlled area, please contact Azbil Corporation.

Particularly when the product is used in applications like the following where safety is especially required, implementation of fail-safe design, redundant design, regular maintenance, etc., should receive appropriate consideration so that the product can be used safely and reliably.

- Safety devices for protecting the human body
- Start/stop control devices for transportation machines
- Aeronautical/aerospace machines

For system design, application design, instructions for use, or product applications, please contact Azbil Corporation. Azbil Corporation bears no responsibility for any result, or lack of result, deriving from the customer's use of the product.

### Recommended Design Life (Recommended Period of Use)

It is recommended that this product be used within its design life. The design life is the period during which you can use the product safely and reliably based on the design specifications. If the product is used beyond this period, its failure ratio may increase due to time-related deterioration of parts, etc. The design life during which the product can operate reliably with the lowest failure ratio and least deterioration over time is estimated scientifically based on acceleration tests, endurance tests, etc., taking into consideration the operating environment, conditions, and frequency of use as basic parameters.

The recommended design life of this product is 10 years.

The design life specified for this product assumes that maintenance, such as replacement of the limited-life parts, is carried out properly. Refer to the section on maintenance in this manual.

## Warnings and Cautions

	<b>WARNING</b>	Alerts users that improper handling may cause death or serious injury.
	<b>CAUTION</b>	Alerts users that improper handling may cause minor injury or material loss.

## Symbols

	Notifies users that specific actions are prohibited to prevent possible danger. The symbol inside  graphically indicates the prohibited action. (For example, the sign on the left notifies that disassembly is prohibited.)
	Instructs users to carry out a specific obligatory action to prevent possible danger. The symbol inside  graphically indicates the actual action to be carried out. (For example, the sign on the left indicates general instructions.)

 <b>WARNING</b>	
	Do not use the product in the environment that chemical concentration of special inflammable materials is high enough to ignite at 180 °C or less. Doing so might cause fire.
	While [HEAT] lights up, do not touch the element. Doing so might cause burns because it is heated at 180 °C.

 <b>CAUTION</b>	
	Install, wire, and use this product under the conditions specified by this manual. Failure to do so may cause fire or device failure.
	Installation and wiring must be performed by personnel qualified to do instrumentation and electrical work. Mistakes in installation or wiring may cause fire or electric shock.
	All wiring must comply with applicable codes and ordinances. Otherwise there is a danger of fire.
	Before wiring or maintenance, be sure to turn off the power to this product. Failure to do so may result in electric shock or device failure.
	Provide a circuit protector (e.g., a fuse or circuit breaker) for the power source. Failure to do so may cause a short circuit leading to fire or device failure.
	After wiring or maintenance, be sure to reattach the cover. Failure to do so may result in electric shock.
	Do not disassemble this product. Doing so may cause electric shock or device failure.

**IMPORTANT**

- Be careful so as not to pinch fingers while opening or closing the cover.
- Do not use transceivers or low-power wireless devices near this product.

#### ● Cautions for connecting to system

When this product fails, a room or duct might be over humidified due to decline of its output. Implement the safety measures such as setting of the alarm function, or independent safety measures by the controller.  
When specific errors are detected, the maximum analog value, voltage: 5.6 V or current: 22.4 mA, will be output for one minute.  
Design the system so that this analog value is detected by the connected controller.

#### ● Cautions for installing this product

##### <Prohibitions for installing this product>

Do not install the product in the following environments. Doing so may cause malfunction of the device or device failure in a short period of use.

- Where exposed to direct wind or rain.
- Where droplets of water may drop.
- Where exposed to direct sunlight.
- Where vibrations or shocks are applied (outside of the specifications).
- Where exposed to steam directly (when the product is mounted to the HVAC such as steam humidification system).
- Where chemicals or oils are adhered (chemical cracks might be made on the case. When they are adhered, wipe them immediately with a dry soft cloth.)

##### <Prohibited installation location for indoor temperature/humidity sensor>

Do not mount the indoor temperature/humidity sensor in locations such as the following. Temperature/humidity may not be correctly measured.

- Where air circulation is interfered.
- Where temperature, humidity, or air velocity is not stabilized such as near the doorway.
- Where affected by draft, down flow, cold/hot wind form water pipe or duct, or radiated heat.
- Where affected by airflow caused by a conduit located at the back side of a wall.
- Where environment between the right sensor and the left sensor is different.
- Where temperature difference between the right sensor and the left sensor varies.
- Where temperature difference between the sensor element and the case is  $\pm 1$  °C or more.

##### <Prohibited installation location for duct temperature/humidity sensor>

Do not mount the duct temperature/humidity sensor in locations such as the following. Temperature/humidity may not be correctly measured.

- Where pressure difference between internal and external of a duct is 10 kPa or more.
- Where temperature difference between internal and external of a duct is 30 °C or more.
- Where droplets of water, due to humidification by steam diffusive atomization or condensation in ducts, directly attach on the sensor element.

#### ● Notes for measurement

- Precision when the product was shipped from the factory is specified.  
Although the product is used within the specifications, precision might deteriorate due to aging. In order to maintain the precision of the product, do the regular maintenance.
- Be sure to attach the filter to the product.  
If the filter is not attached, the humidity-measuring element may fail within a short period of time.
- If the product is exposed to high temperature and humidity atmosphere or chemicals such as organic solvent, the output from the sensor might drift.  
Although the element is heated, the drift might not be recovered completely.  
For details, refer to ■ *Troubleshooting*.
- After powering on, the two sensors is heated one time, and then measurement will start normally.  
For details, refer to ■ *Functions*.
- Ambient temperature change around the case might deteriorate precision of the product.  
For details, refer to ■ *Specifications*.
- If the cover is opened while measuring, the output may vary due to temperature change around the circuits.
- If a measurement, temperature, humidity error occurs between the two sensor, the sensor 2 is tuned to be the same value with the sensor 1 by adjusting the start time of heating.  
Therefore, if the temperature difference varies, measurement errors will be made.
- Temperature on the surface of wall is different from that of atmosphere, the measurement value might be affected.
- The settings and the accumulated heating time are saved in the nonvolatile memory. The saved data will not be erased by power off. However, be aware that the data is saved only when the [enter] key is pressed or the heating process ends. If the power is off before pressing the [enter] key or completing the heating process, the settings or the accumulated heating time updated last might not be saved.

## ■ Features

- The product enables wide range of temperature and humidity sensing with high accuracy.
- The product has a new temperature/humidity element FP4 that was developed by Azbil Corporation and enables simultaneous measuring the temperature and humidity, and special functions. The following features are provided:
  - Drift recovery function  
In order to minimize the output drift, the element is treated in the elevated temperature to vaporize the remained chemicals in the polymer.
  - Drift detection function  
Periodically compares the measured value with the internal reference value to detect the drift.
- The product has double elements to enable continuous measurement during while detecting or recovering drift of the element.
- The element is replaceable.
- Measurement output function  
Outputs measured temperature, humidity, and dew point temperature in analog (1–5 V or 4–20 mA) .
- CE marking  
This product conforms to the standards for CE marking.

## ■ Model Numbers

Basic model number	Power	Humidity output	Temperature output	Common code	Description
HTY1000					Indoor sensor
HTY1010					Duct sensor
	T				24 V DC, 24 V AC
		1			1–5 V output / 4–20 mA output*
			1		1–5 V output / 4–20 mA output*
				00	

\* Default setting is 1–5 V.  
Output can be switched to 4–20 mA by the output changeover switch.

### ● Parts ordered separately

Part Number	Description
83157235-001	Mounting bracket (mounting the sensor unit for duct)
83170626-004	Mounting bracket set for main unit (mounting the case for duct)
83157240-004	Cable gland attachment set (cable diameter: φ11–14)
83104098-004	Seal connector (cable diameter: φ10.5–14.5)
DY3002A1005	Mounting bracket for installing in a instrument shelter (L-shape bracket)

### ● Replacement parts

Part Number	Description
83170626-001	Filter: 2 pcs
83170626-002	Cap set: 2 pcs
83170626-003	Element for replacement: 2 pcs

## ■ Specifications

(1/2)

Item		Specification	
Measuring range		Indoor	Duct
	Temperature	0–50 °C	-20–60 °C
	Humidity	0–95 % RH	0–100 % RH
	Dew point temperature	-30–50 °C Td (at 10–100 % RH)	-40–60 °C Td (at 10–100 % RH)
Accuracy		Refer to ● <i>Accuracy at the rated operating conditions</i>	
Output signal		1–5 V (voltage output) , or 4–20 mA (current output) * Linear output for both * Selectable by the output changeover switch	
Output range* <sup>1</sup>		Indoor	Duct
	Temperature	0–50 °C	-20–60 °C
	Humidity	0–100 % RH	0–100 % RH
	Dew point temperature	-30–50 °C Td	-40–60 °C Td
Output signal load resistance		Indoor	Duct
	Voltage output	Min. load resistance: 500 kΩ	
	Current output	Max. load resistance: 500 Ω	
Responsiveness		Indoor	Duct sensor
	Temp. time constant	Max. 8 minutes at airflow 0.15 m/s	Max. 4 minutes at airflow 2 m/s
	Humidity/dew point time constant	Max. 1 minute at airflow 0.15 m/s (at 25 °C)	Max. 1 minute at airflow 2 m/s (at 25 °C)
Power voltage		24 V AC +10 %/-15 %, 50/60 Hz ±2 % 24 V DC ±10 %	
Power consumption		During drift detection or recovery ([HEAT] lights up)	During measurement of temperature/humidity
	24 V AC	Max. 7 VA	Max. 6 VA
	24 V DC	Max. 4 W	Max. 3 W
Insulation resistance		500 V DC, 20 MΩ or more (between case and terminals)	
Withstand voltage		500 V AC, max. 1 mA leakage current for 1 minute (between case and terminals)	
Dew point variation control performance	Dew point variation (Evaluation conditions)	Max. ±2 °C Td (18 °C, 77 % RH (13.9 °C Td) → 32 °C, 33 % RH (13.7 °C Td) )	
Warming up time		Min. 30 minutes * The case cover to be closed. * Excludes the amount time in which the sensor fits in the environment.	
Indicator		LCD, LED (in error condition: lights up red or blinks)	

\*1 The upper limit of temperature output is 110 % of the output range.  
Other than the upper limit, outputs in the output range.

Item		Specification					
Environment conditions		Indoor			Duct		
		Rated operation	Boundary operation	Transportation/ storage (in packed state)	Rated operation	Boundary operation	Transportation/ storage (in packed state)
Temperature	Case	0–50 °C	-10–50 °C	-30–70 °C	0–50 °C	-10–50 °C	-30–70 °C
	Sensor				-20–60 °C	-20–60 °C	
Humidity	Case	0–95 % RH	0–98 % RH	5–95 % RH (without condensation)	0–95 % RH	0–98 % RH	5–95 % RH (without condensation)
	Sensor				0–100 % RH	0–100 % RH	
Vibration		4.9 m/s <sup>2</sup> (10–65 Hz)	—	9.8 m/s <sup>2</sup> (10–150 Hz) (in packed state)	4.9 m/s <sup>2</sup> (10–65 Hz)	—	9.8 m/s <sup>2</sup> (10–150 Hz) (in packed state)
Shock		—			30 G		
Air velocity		0.15– 0.45 m/s	0–5 m/s	—	1–15 m/s	0–15 m/s	—
Difference pressure (between internal and external of duct)		—			10 kPa		—
Protective structure		IP40			IP54 * Inapplicable for the sensor unit. * Applicable for the duct case when it is assembled with the specified seal connector and the cable.		
Major materials	Humidity element	Liquid crystal polymer containing GF 20 %					
	Case, filter cap	Polycarbonate containing GF 20 %					
	Main unit mounting bracket	Fusion galvanized steel sheet					
	Filter	Fluororesin					
	Printed circuit board	Glass epoxy resin (GE4)					
	Mounting bracket	Polycarbonate containing GF 20 %					
	Sensor cable	Polyvinyl chloride					
Weight	Indoor	490 g					
	Duct sensor	610 g					
	Main unit mounting bracket	200 g					
Wiring		1.25 mm <sup>2</sup> shielded multi-core cable (6-core) (CVV-S) * Be sure to ground the shielding on the power supply side. * Max. cable length: 100 m					

● Accuracy at the rated operating conditions

Item	Specification				
Standard operating conditions* <sup>1</sup>	Temperature	Humidity	Air velocity		
	Indoor	25 ± 2 °C	50 ± 2 % RH	0.15–0.2 m/s (down flow)	
Duct sensor			1–8 m/s (vertical to filter)		
Temperature accuracy * <sup>2</sup> , * <sup>3</sup>	Measurement range		Accuracy of LCD indication		
	Standard	25 ± 2 °C	±0.2 °C ± 1 digit		
	Indoor	15–35 °C	±0.3 °C ± 1 digit		
		0–50 °C	±0.5 °C ± 1 digit		
Duct* <sup>6</sup>	-20–60 °C	±0.3 °C ± 1 digit			
Humidity accuracy * <sup>2</sup> , * <sup>3</sup> , * <sup>4</sup>	Measurement range		Accuracy of LCD indication		
	Standard	50 ± 2 % RH	25 ± 2 °C	±2 % RH ± 1 digit	
	Indoor	10–90 % RH	20–30 °C	±2 % RH ± 1 digit	
			15–35 °C	±3 % RH ± 1 digit	
			0–50 °C	±5 % RH ± 1 digit	
	Duct* <sup>6</sup> , * <sup>7</sup>	10–90 % RH	5–60 °C	±2 % RH ± 1 digit	
-20–5 °C			±3 % RH ± 1 digit		
Dew point accuracy * <sup>2</sup> , * <sup>4</sup> , * <sup>5</sup>	Measurement range		Accuracy of LCD indication		
	Standard	50 ± 2 % RH	25 ± 2 °C	±1 °C Td ± 1 digit	
	Indoor	40–100 % RH	20–30 °C	±1 °C Td ± 1 digit	
			30–40 % RH	20–30 °C	±2 °C Td ± 1 digit
			10–30 % RH	20–30 °C	±3 °C Td ± 1 digit
	Duct* <sup>6</sup>	30–100 % RH	5–40 °C	±1 °C Td ± 1 digit	
			-20–60 °C	±2 °C Td ± 1 digit	
10–30 % RH			5–40 °C	±3 °C Td ± 1 digit	
Output conversion accuracy * <sup>8</sup>					
	1–5 V output	± (0.05 + 0.01 t ) % F.S. ( t : the absolute value of the difference between case ambient temperature and 25 °C)			
4–20 mA output	± (0.1 + 0.01 t ) % F.S. ( t : the absolute value of the difference between case ambient temperature and 25 °C)				

- \*1 Standard accuracy is for the measurement of standard operating conditions. Also, it should satisfy the following conditions.
- For the indoor sensor, there should be no temperature gradient between the sensor assembly and the case.
  - The accuracy is defined for the indications on the LCD. For the voltage/current output, the conversion accuracy should be added.
  - The accuracy is defined when the product is shipped. It may deteriorate over long time use.
- \*2 1 digit means temperature: 0.1 °C, humidity: 0.1 % RH, and dew point: 0.1 °C Td.
- \*3 Accuracy after replacing the element is as follows:  
 Temperature: ±0.3 °C ± 1 digit (at standard temp. 25 ± 2 °C)  
 Humidity: ±3 % RH ± 1 digit (at standard humidity 50 % RH, temp. 25 ± 2 °C).
- \*4 For details of the accuracy for humidity and dew point, refer to Fig. 1–4.
- \*5 The supercooled saturated water vapor pressure is used for the dew point lower than 0 °C.
- \*6 The accuracy of the sensor for ducts is affected by the ambient temperature of the case. Temperature characteristics of the case are described below. (|t|: the absolute value of the difference between case ambient temperature and the reference temperature of 25 °C)  
 Temperature: ±0.02|t| °C  
 Relative-humidity: ±0.09|t| % RH  
 Dew point temp.: ±0.03|t| °C Td (50–100 % RH), ±0.05|t| °C Td (30–50 % RH), ±0.07|t| °C Td (20–30 % RH),  
 ±0.14|t| °C Td (10–20 % RH)
- \*7 If there is a temperature difference between inside and outside of the duct, a temperature error occurs on the sensor 2 for duct use. This temperature error is automatically corrected by the correction between sensors function. The temperature error, without correcting the difference between sensors, is estimated at ± 0.6 °C when the temperature difference between inside and outside of the duct is 30 °C and air velocity in the duct is 1 m/s. (The temperature error does not occur on the sensor 1 for duct as far as the the temperature difference between inside and outside of the duct is less than 30 °C, refer to < Prohibited installation location for duct temperature/humidity sensor >.)
- \*8 It is accuracy when an indicated value is converted to an output. ±1/2 digit is added separately.  
 For this reason, there is a discrepancy between the displayed value on the unit and the received value.  
 Ex.: If the sensor is used indoors, output is 1–5 V, and ambient temp. is 35 °C, the conversion error of temperature output (Δt) is given as follows:  
 Full scale calculation: ±(0.05 + 0.01|35-25|) = ±0.15 % F.S.  
 When engineering unit conversion is applied for ±0.15 % F.S., it will be ±0.15 % F.S. x 50/100 = ±0.075 °C since the temperature range for indoor sensor is 0–50 °C. Since 1 digit of a temperature display is 0.1 °C, 1/2 digit is 0.05 °C.  
 Therefore, the output conversion accuracy (Δt) is given as: Δt = ±(0.075 + 0.05) °C = ±0.125 °C.  
 Ex.: If the sensor is used for a duct, output is 1–5 V, case ambient temp. is 35 °C, and the measurement source is 20 °C, 10 °C Td, the output accuracy of dew point is given as follows:  
 Output accuracy = Apparatus accuracy ± Temperature characteristics of case\*<sup>8</sup> ± Output conversion accuracy\*<sup>9</sup>  
 = ±1 °C Td ± 0.3 °C Td ± 0.2 °C Td = ±1.5 °C Td.
- \*9 Temperature characteristics of case: ±0.03 x |35-25| = ±0.3 °C Td
- \*10 Output conversion accuracy ± (0.05 + 0.01 x |35-25|) = ±0.15 % F.S.  
 Since range of the dew point temperature sensor is 100 °C Td, ±0.15 % F.S. = ±0.15 °C Td, and then the output conversion accuracy is ±0.15 ± 1/2 digit = ±0.2 °C Td.

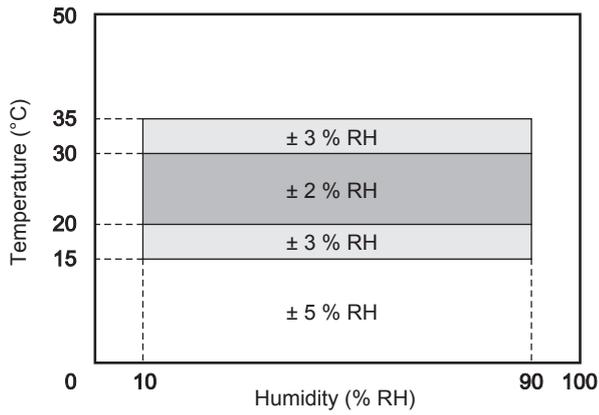


Figure 1. Indoor sensor, humidity accuracy

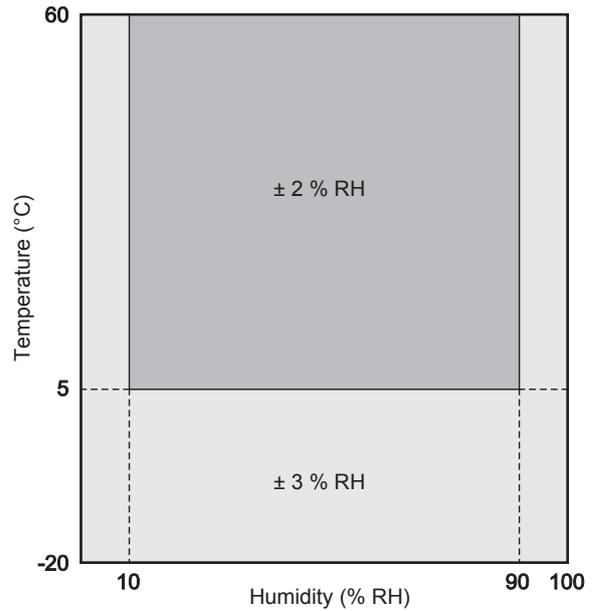


Figure 2. Duct sensor, humidity accuracy

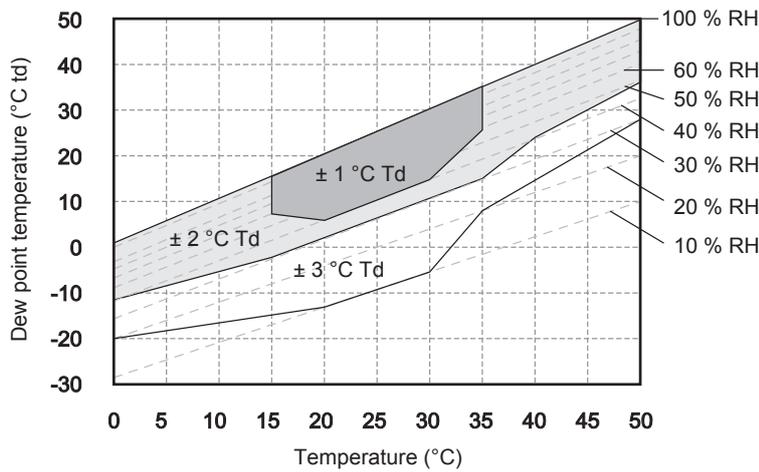


Figure 3. Indoor sensor, dew point temperature accuracy

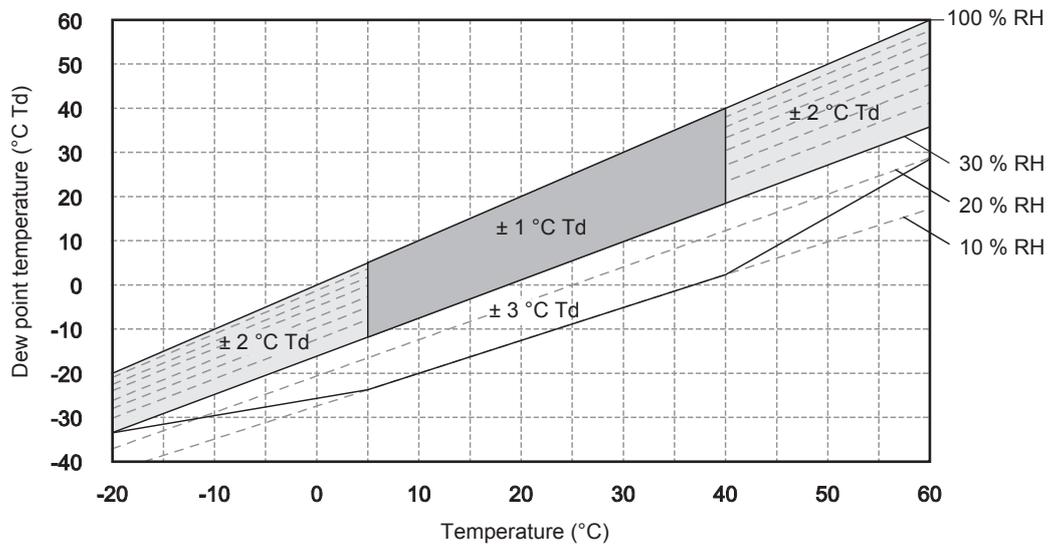


Figure 4. Duct sensor, dew point temperature accuracy (case ambient temperature: 25 °C)

- (Note) 1. Dew point temperature is calculated from the measurement accuracy of temperature and humidity.
- 2. For the duct sensor, assumes no influence from the case temperature.

## ■ CE Marking Conformity

This product complies with the following Electromagnetic Compatibility (EMC) .

EMC: EN61326-1 Class A, Table 2 (For use in an industrial electromagnetic environment)  
CISPR11

## ■ Dimensions and Parts Identifications

### ● Indoor sensor

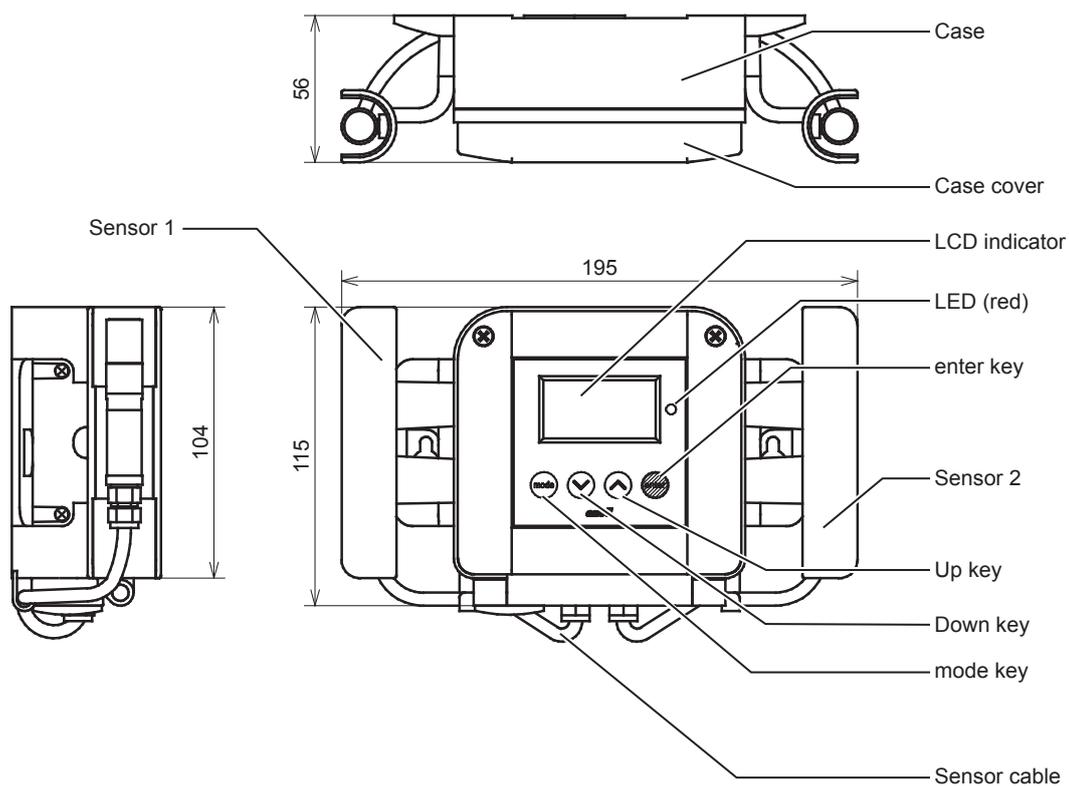


Figure 5. Indoor sensor dimensions (unit: mm)

AB-7007

● Duct sensor

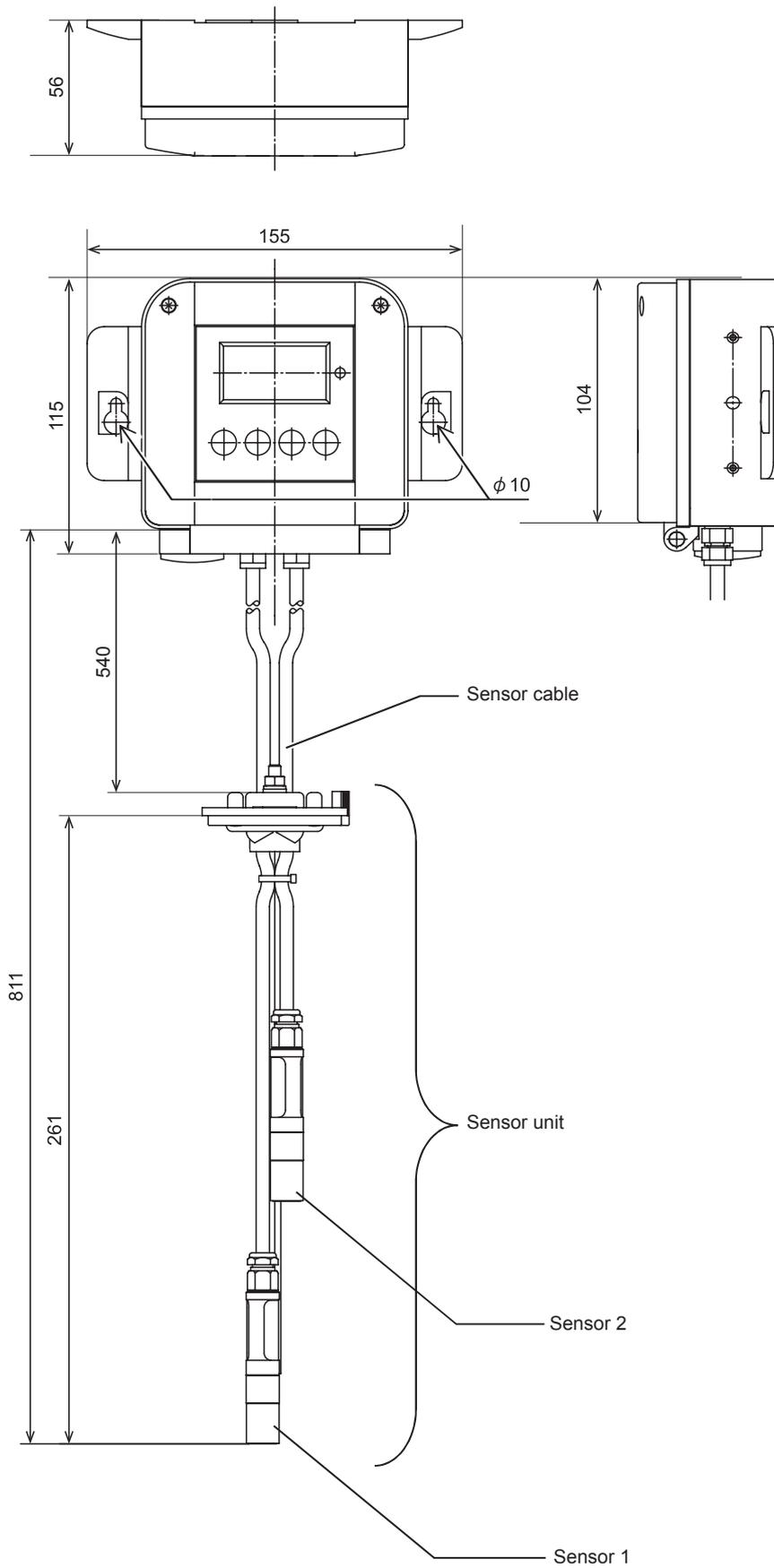


Figure 6. Duct sensor dimensions (unit: mm)

< Mounting bracket >

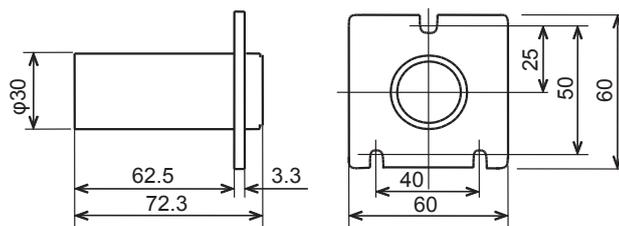


Figure 7. Duct sensor mounting bracket dimensions (unit: mm)

< Mounting bracket for main unit >

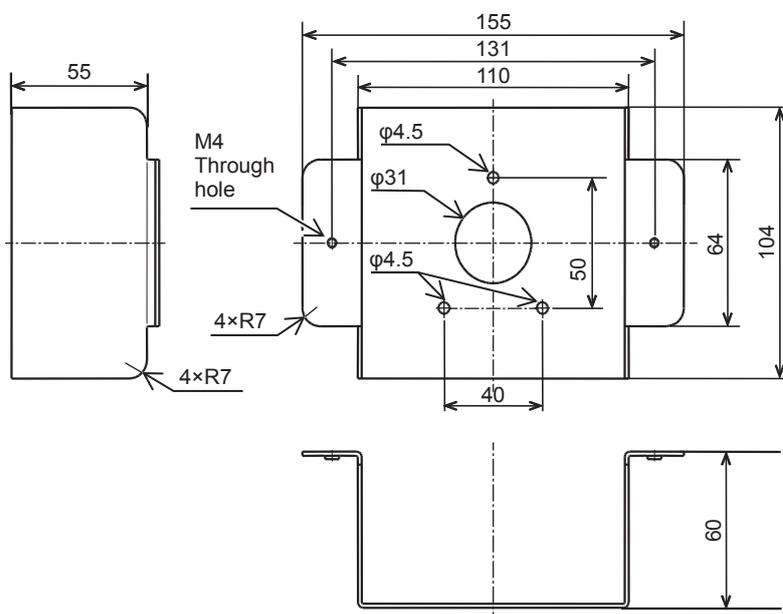


Figure 8. Main unit for duct mounting bracket dimensions (unit: mm)

## ■ Output Changeover

**IMPORTANT**

- The output signal can be switched, voltage output (1–5 V) or current output (4–20 mA), by setting the output changeover switch (S1).
- Set the switch according to the output destination.
- If the output signal setting is incorrectly set, the device connected to the output might be damaged.
- Do not apply excessive force to the output changeover switch. Doing so may damage the product.

- (1) Loosen the screw on the case cover to open the cover.
- (2) Check the setting position of the output changeover switch (S1) inside the case. The output changeover switch (S1) is located at the lower position of the terminal block.

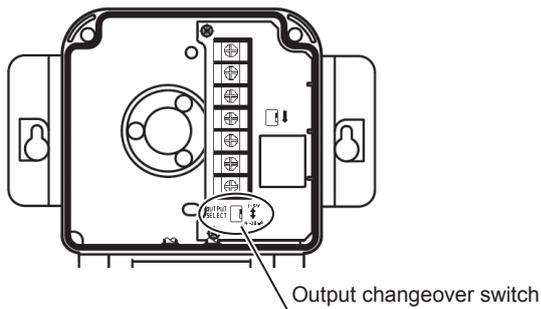


Figure 9. Output changeover switch (S1) position

- (3) Select the output signal, voltage output (1–5 V) or current output (4–20 mA), by setting the output changeover switch (S1). Factory preset is voltage output 1–5 V.

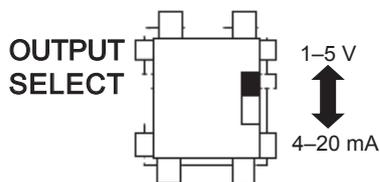


Figure 10. Output changeover switch (S1)

## ■ Installation

### ⚠ CAUTION

- ⚠ Install, wire, and use this product under the conditions specified by this manual. Failure to do so may cause fire or device failure.
- ⚠ Installation and wiring must be performed by personnel qualified to do instrumentation and electrical work. Mistakes in installation or wiring may cause fire or electric shock.

**IMPORTANT**

- Installation work might be carried out in a chemical environment. In this case, check the chemicals used and take necessary measures according to the chemicals.
- Do not step on the product.
- If an insufficient heating occurs with the temperature/humidity element, the maximum analog value, voltage: 5.6 V or current: 22.4 mA, will be output for one minute. The maximum analog value must be detected by the connected controller.
- Be sure to attach the filter to the product. If the filter is not attached, the humidity-measuring element may fail within a short period of time.

### ● Installation location

#### < Indoor temperature/humidity sensor >

- Mount the product on a wall 1.5 m above the floor where typical temperature of a room can be measured.
- Mount the product where 0.15–0.45 m/s air velocity is allowed.

(Note) When mounting, be sure to secure the maintenance space shown in ● *Maintenance space*.

#### < Duct temperature/humidity sensor >

- Mount the sensor where typical temperature/humidity in a duct can be measured and the rated operating conditions are secured.
- Mount the product where air flows on the side of the sensor unit.
- Adjust to match the airflow direction indicated on the sensor unit (stamp) the actual airflow direction.

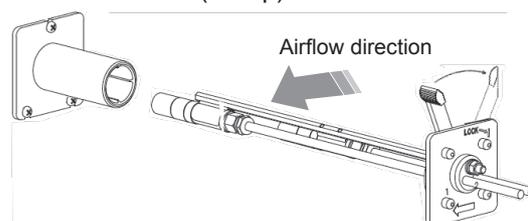


Figure 11. Airflow direction

(Note) When mounting, be sure to secure the maintenance space shown in ● *Maintenance space*.

● Maintenance space

- Sensor unit  
Side: Min. 300 mm
- Operation panel  
Front: Min. 600 mm  
Top/bottom: Min. 200 mm

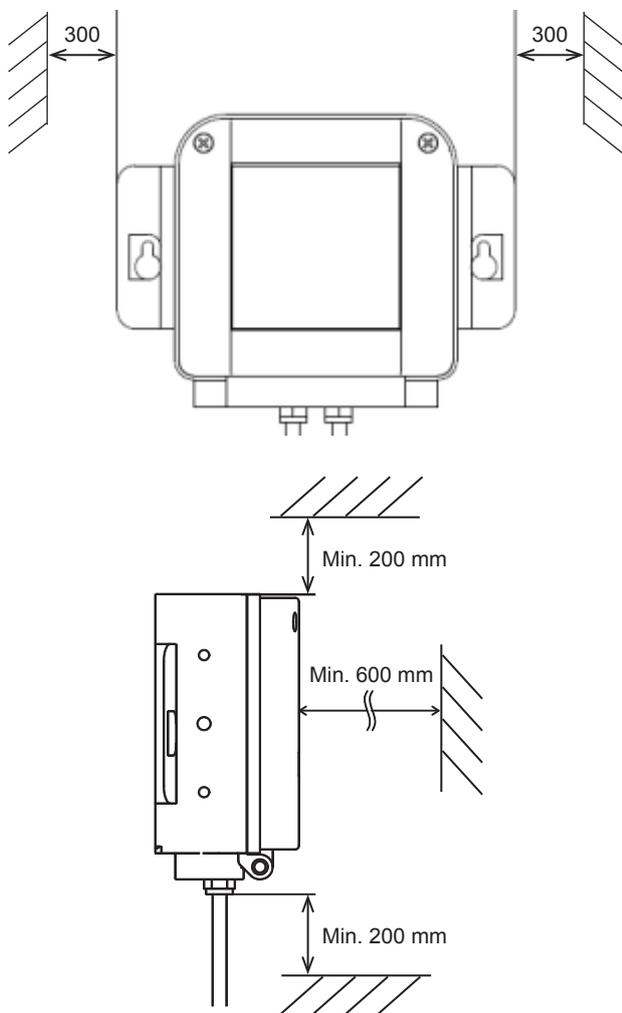


Figure 12. Maintenance space

● Prohibited installation location

Do not install the product in the following environments.

Doing so might cause malfunction of the device or device failure in a short period of use.

- Where exposed to direct wind or rain.
- Where droplets of water may drop.
- Where exposed to direct sunlight.
- Where vibrations or shocks are applied.  
(Outside of the specifications)
- Where exposed to steam directly.  
(When the product is mounted to the HVAC such as steam humidification system)
- Where chemicals or oils are adhered.  
(Chemical cracks might be made on the case. When they are adhered, wipe them immediately with a dry soft cloth. )

< Prohibited installation location for indoor temperature/humidity sensor >

Do not mount the indoor temperature/humidity sensor in locations such as the following. Temperature/humidity may not be correctly measured.

- Where air circulation is interfered.
- Where temperature, humidity, or air velocity is not stabilized such as near the doorway.
- Where affected by draft, down flow, cold/hot wind form water pipe or duct, or radiated heat.
- Where affected by airflow caused by a conduit located at the back side of a wall.
- Where environment between the right sensor and the left sensor is different.
- Where temperature difference between the right sensor and the left sensor varies.
- Where temperature difference between the sensor element and the case is  $\pm 1$  °C or more.

< Prohibited installation location for duct temperature/humidity sensor >

Do not mount the duct temperature/humidity sensor in locations such as the following. Temperature/humidity may not be correctly measured.

- Where pressure difference between internal and external of a duct is 10 kPa or more.
- Where temperature difference between internal and external of a duct is 30 °C or more.
- Where droplets of water, due to humidification by steam diffusive atomization or condensation in ducts, directly attach on the sensor element.

● Notes for installation

**IMPORTANT** • Be careful so as not to pinch fingers while opening or closing the cover.

- Do not get a cable caught when the case cover is closed.
- If the cable for the sensor unit is pulled strongly, the cable may be slipped off.
- By bringing a hand etc. close to the sensor unit, it may be damaged by electrostatic discharge.

< Duct sensor >

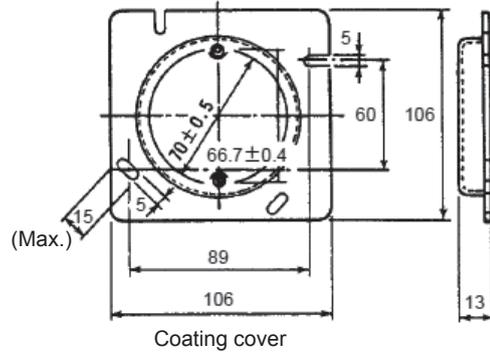
- Do not mount the sensor unit upward at the bottom of the duct.
- Minimum bending radius of the sensor cable is 30 mm.
- Fix the sensor cable by a cable tie.  
If the cable moves during measurement, the output may get unstable temporarily.
- Be sure to use the cable gland mounting set (ordered separately, P/N: 83157240-004) or the seal connector (ordered separately, P/N: 83104098-004).  
If both the cable gland mounting set and the seal connector are not used, the protective level IP-54 cannot be secured.
- If connectors for the cable gland is used, mount the cable gland downward.

● Installation procedure

< Indoor sensor >

Preparation

- Box cover  
JIS C8340: 1999, for outlet box, mounting pitch 66.7 mm



Coating cover  
Dimensions of cover with JIS flange (unit: mm)  
(for medium size square box, commercial part)

Figure 13. Box cover

- (1) Loosen the screw on the case cover to open the cover. The cover opens to 160 degrees toward you.

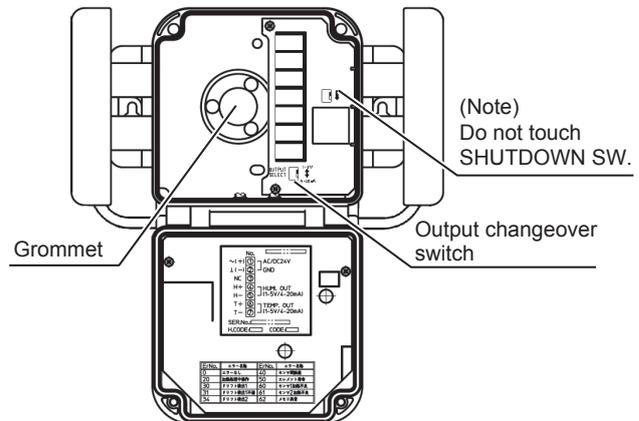


Figure 14. Position of grommet

- (2) Make a hole in the grommet with a screw driver etc.
- (3) Pass the cable through the grommet.
- (4) Attach the case on the box cover with the accessory mounting screws (M4, L = 10, 2 pcs).

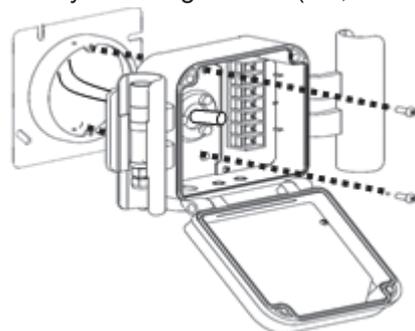


Figure 15. Attaching case

- (5) Check the setting position of the output changeover switch inside the case.
- (6) Close the case cover.

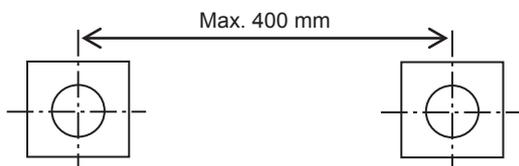
< Duct sensor >

Preparation

- Mounting bracket (P/N: 83157235-001)
- Mounting bracket for main unit (P/N: 83170626-004)

- (1) Stick the hole-opening label (P/N: 83157193-001) where the sensor should be mounted.
- (2) Make holes as follows:
  - Mounting bracket for main unit:  $\phi 3.5 \times 3$
  - For duct:  $\phi 3.5 \times 3, \phi 31 \times 1$

(Note) Space between the hole-opening labels should be 400 mm or less. If the space is over the specified, the cable of a sensor unit may not reach.



(Note) For the mounting bracket for the main unit, the center hole ( $\phi 31$ ) is not used. So do not open the hole.

Figure 16. Opening holes

- (3) Place the longer mounting bracket toward you, insert the packing, and then fasten the mounting bracket with the accessory tapping screws (x3).

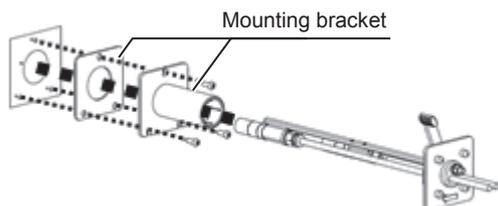


Figure 17.

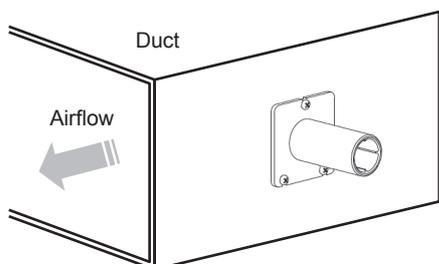


Figure 18. Attaching the mounting bracket

- (4) Wind heat insulation material around the duct as necessary. If the duct is covered with heat insulation, remove the insulation partially to attach the mount bracket. After attaching the bracket, fill any gaps with the thermal insulation.

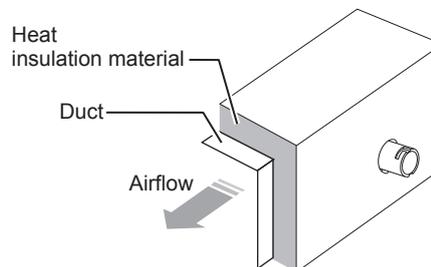


Figure 19. Heat insulating material installation

- (5) Fasten the mounting bracket for the main unit to the duct with the accessory tapping screws (x3).

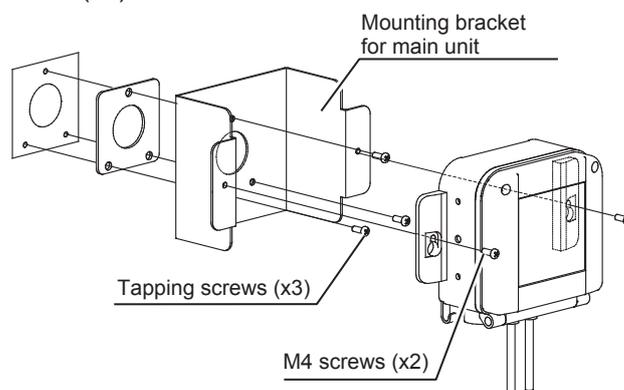


Figure 20. Attaching case

- (6) Attach two screws (M4, x2) at the lugs on both sides of mounting bracket for main unit. To avoid overtightening the M4 screws, leave space under the screw heads.
- (7) Insert the lugs of case under the M4 screw heads that are fastened at the lugs of mounting bracket for main unit.
- (8) Fasten the case to the mounting bracket for main unit with the M4 screws (x2).
- (9) Turn the stopper of the sensor unit to the opposite direction to the **LOCK** arrow.

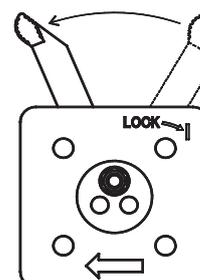


Figure 21. Sensor lock release

- (10) Align the tab with the slit on the mounting bracket, and then insert the sensor unit into the duct through the hole on the mounting bracket for the sensor.
- (11) When the sensor unit is firmly inserted, turn the stopper 45 degrees to the direction of the **LOCK** arrow.  
The sensor unit is fastened to the mounting bracket.

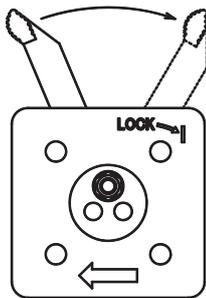
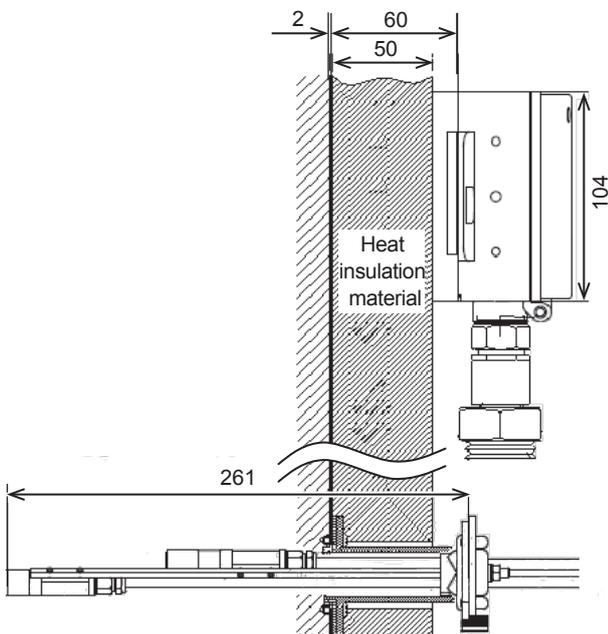


Figure 22. Sensor lock

- (12) Open the case cover to check the setting position of the output changeover switch inside the case.
- (13) Close the case cover.



(Note) This figure shows the case for the cable gland wiring.

Figure 23. Mounting diagram for duct

## ■ Wiring

⚠ CAUTION	
!	Installation and wiring must be performed by personnel qualified to do instrumentation and electrical work. Mistakes in installation or wiring may cause fire or electric shock.
!	All wiring must comply with applicable codes and ordinances. Otherwise there is a danger of fire.
!	Before wiring, be sure to turn off the power to this product. Failure to do so may result in electric shock or device failure.
!	After wiring, be sure to reattach the cover. Failure to do so may result in electric shock.

**IMPORTANT** • If more than the rated voltage is accidentally applied to this product, replace the product with a new one for safety.

### ● Notes for wiring

- If the connectors for cable gland are used, use the O-ring included in the cable gland attachment kit (ordered separately, P/N: 83157240-004) and the specified shield multi-core cable.

### ● Wiring procedure

#### Preparation

Prepare appropriate parts according to the number cores in the cable used.

- When the seal connector is used  
Seal connector (ordered separately, P/N: 83104098-004)
- When the cable gland is used  
Cable gland attachment kit (ordered separately, P/N: 83157240-004)

(1) Loosen the screw on the case cover to open the cover.

(2) If the sensor is used for ducts, pass the cable.

(Note) If the sensor is used indoors, go to the step (3).

- When the seal connector is used
  - ① Fasten the seal connector to the case with a screw.
  - ② Pass the cable.
  - ③ Hold the cable and fasten it.
- When the cable gland is used
  - ① Temporarily assemble the cable gland connector and the attachment (cable gland set) with a screw.

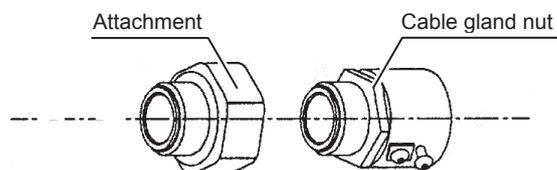


Figure 24. Cable gland connector

- ② Select a suitable O-ring for the cable used.
- ③ Pass the cable.
- ④ Pull the cable upward and fasten the attachment to the case with a screw.
- ⑤ Tighten the nut (accessory of the cable gland) at the location where the screw for fastening the cable gland is easily accessed.

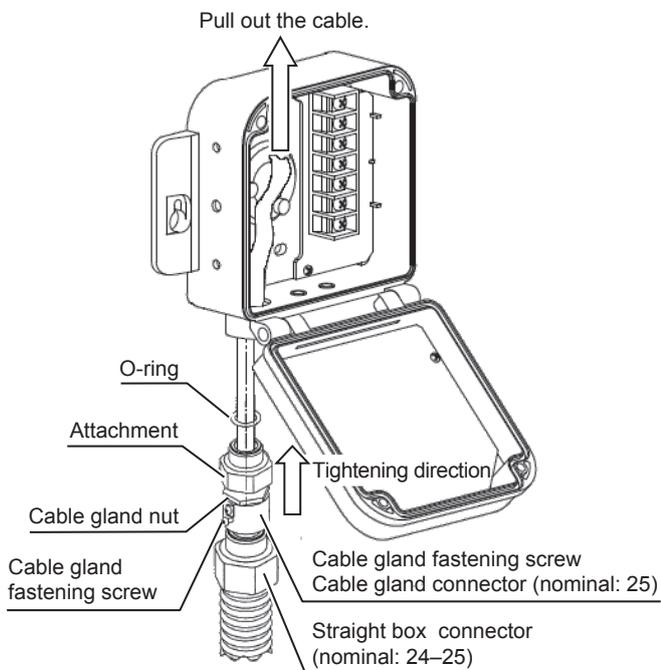


Figure 25. Cable gland attachment

- (3) Connect wires to the terminal blocks. M3.5 round crimping terminal with insulating tube or with insulating caps should be used.

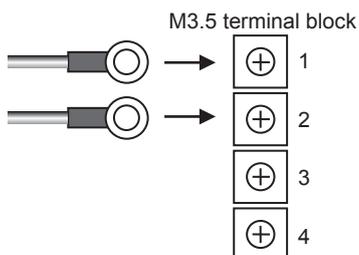


Figure 26. Terminals

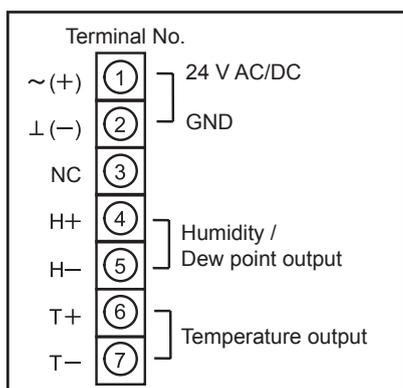


Figure 27. Wiring diagram

- (4) Close the case cover and fasten it with the screws.

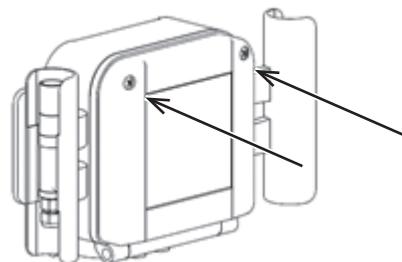


Figure 28. Case cover

- (5) Check that the wiring has been done correctly again.
- (6) Turn on the power switch.

## ■ Functions

### ● Basic operation

There are two sensors, sensor 1 and sensor 2.

When one of the two sensors is being heated, measurement is carried out by the other one and the results can be output.

Each sensor has two measuring modes, measuring and non-measuring mode.

When one sensor is in the measuring mode, its measured value will be displayed on the LCD and be output as an analog value.

The other one is in non-measuring mode.

- (1) After the power is ON, waits the amount of time defined by Heating Start Delay Time, and then starts the first heating.
- (2) The non-measuring sensor (sensor 1 or sensor 2) will be heated for the period (minutes) defined by heating time. \*1  
While the sensor is being heated, [HEAT] lights up.
- (3) When heating is completed, the sensor will be cooled down for 30–60 minutes.  
While the sensor is being cooled down, [HEAT] blinks.
- (4) When cooling down is completed, the sensor will be switched in the measuring mode.
- (5) When the amount of time defined by Heating Cycle Time elapses, next heating starts for the non-measuring sensor.

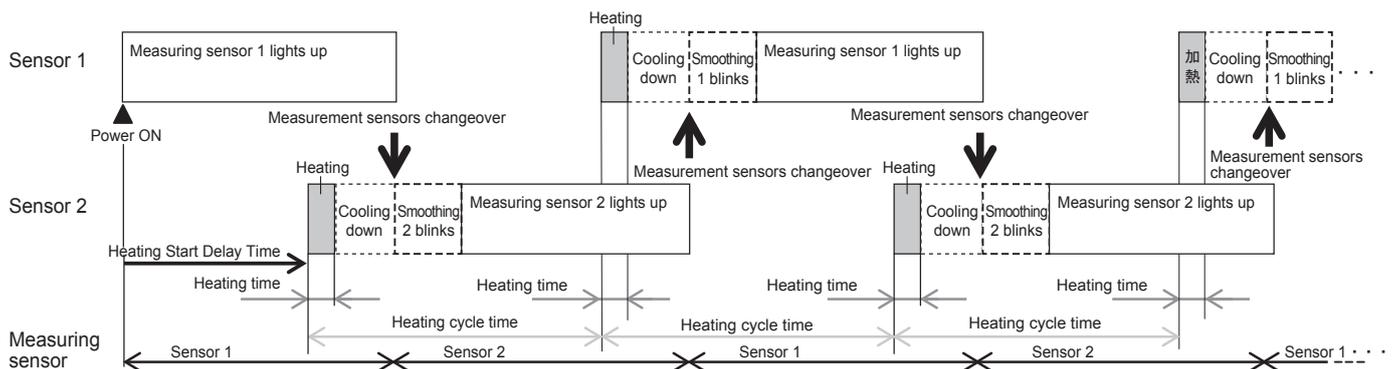


Figure 29. Basic operation after power ON (sensor 1 is in measuring mode)

(Note) Also, sensor 2 can be the measuring sensor when the power is turned on.

\*1 While heating operation, if the minimum of humidity measured by the sensor being heated does not fall less than 10 % RH, extends the heating time maximum 30 minutes.

After extending heating, when the humidity falls less than 10 % RH, heating will be stopped.

In this case, if the drift 1 is detected, the error (E-30) will occur.

If the next heating is carried out normally, E-30 will be canceled automatically.

If E-30 occurs frequently, take a measure from the followings.

- Extend the heating time.
- Shorten the heating cycle.

### ● Correction between two sensors

If a measurement, temperature, or humidity error occurs between the two sensor, the sensor 2 is tuned to be the same value with the sensor 1 by adjusting the start time of heating.

- Environment-resistant function

This temperature/humidity sensor, FP4 developed by Azbil, consists of two elements: Temperature sensing element (resistance temperature detector Pt100) and Macromolecule capacitance type humidity sensing element.

The resistance temperature sensor (Pt100) is also used for heating the humidity sensing element in order to recover or detect each deterioration mode (see Table 3).

< Drift recovery function >

The temperature/humidity sensing element, FP4, vaporizes the residual chemicals in macromolecules by heating process in order to recover the drifted performance to its initial state.

The applicable chemicals for this function and resistances to them are described below.

- Continuous exposure concentrations

When 10 minutes heating process is carried out every 24 hours, the concentration and period in which the drifted value is recovered within  $\pm 2$  % RH.

Table 1. Chemical resistance of drift recovery function

Chemical		Specification		
Organic solvent	Ethanol	250 ppm	Exposed for 3 years	10 minutes heating every 24 hours
Organic solvent	Acetone	100 ppm	Exposed for 3 years	10 minutes heating every 24 hours
Organic solvent	Methyl ethyl ketone	100 ppm	Exposed for 3 years	10 minutes heating every 24 hours
Organic solvent	Ethyl lactate	50 ppm	Exposed for 3 years	10 minutes heating every 24 hours
Organic solvent	NMP (N-methyl-2-pyrrolidone)	200 ppm	Exposed for 3 years	10 minutes heating every 24 hours

- Allowable concentrations

After 24 hours exposure, the concentrations and heating period in which the drifted measured value is recovered within  $\pm 1$  % RH.

Table 2. Chemical resistance of drift recovery function

Chemical		Specification		
Organic solvent	Ethanol	1000 ppm	Exposed for 24 hours	15 minutes heating
Organic solvent	Acetone	750 ppm	Exposed for 24 hours	20 minutes heating
Organic solvent	Methyl ethyl ketone	300 ppm	Exposed for 24 hours	15 minutes heating
Organic solvent	Ethyl lactate	50 ppm	Exposed for 24 hours	10 minutes heating
Organic solvent	NMP (N-methyl-2-pyrrolidone)	200 ppm	Exposed for 24 hours	10 minutes heating

- Reference

Chemical resistances not related with heating recovery function is described below.

Chemical		Specification		
Disinfectant	Formalin	300 ppm	Exposed for 24 hours	$\pm 5$ % RH
Inorganic compound	Ammonia	10 ppm	Exposed for 24 hours	$\pm 3$ % RH

## &lt; Drift detection function &gt;

Since the humidity sensor's element needs to be exposed to the measurement atmosphere, it cannot be separated from the external environment. Therefore, a certain amount of drift cannot be avoided. The main environment and deterioration modes that cause a drift are described below.

Table 3. Main environment and deterioration modes

Operation environment	Cause of drift	Deterioration modes	Detection function
Manufactures of semiconductor, pharmacy, etc.	Organic solvents evaporated from the production material, adhesives, ink, etc.	Since the organic solvents infiltrate into the macromolecule and its conductivity changes, the measurement value will drift. Especially in a lower humidity environment (less than 30 % RH), the drift tends to large. According to the operating environment, it may deteriorate in a short period. The drift recovery function is effective.	Drift detection 1
Animal breeding facilities, hospitals, etc (open air, hot spring, etc.)	Salts contained in disinfectants, acids, sulfurous acid gas in the air	When the substance, adhering on the surface or nearby of element, absorbs moisture, the measurement value will drift. Especially in a higher temperature environment, the drift tends to large. It will take time to deteriorate. The drift will be recovered temporarily by the drift recovery function.	Drift detection 2

(Note) The drift may be recovered by cleaning the element. For details, refer to ■ *Maintenance*.

## • Drift detection 1

If organic solvents cannot be removed by the heating operation, the measurement value may drift. Although the relative humidity of the humidity element while heating is almost 0 %, if an organic solvent remains in a humidity element, it will become a high value. The measured humidity while heating is compared with the initial value (shipped from factory) to detect the drift. If it is detected, the error code E-30 is displayed.

## &lt; How to detect drift detection 1 &gt;

- (1) In the initial state of element (when it is shipped from factory or the element is replaced), the minimum humidity during heating operation is stored in the memory.
- (2) Compares the minimum humidity during heating operation with the value stored in the memory. The compared value can be checked in the maintenance mode No. 14-1, 14-2.
- (3) If the comparison result is larger than the preset value (drift error level), the error code E-30 is displayed. The drift error level can be set by the setting mode No. 8.

(Note) If the dew point temperature of ambient during heating operation is 30 °C Td or more, the drift detection 1 cannot be detected. Error code E-31 is displayed.

## • Drift detection 2

When the deliquescent (hygroscopic) substance adheres on the surface or nearby of element, the measured humidity may drift higher. Although the deliquescent substance will not be removed by heating, the drift will be recovered temporarily since the moisture is evaporated. Therefore, the humidity measurement value of an element that was heated is compared with the value of another element to detect the drift.

## &lt; How to detect drift detection 2 &gt;

- (1) or (2) is carried out.
- (1) When the heating operation for the sensor 1 is completed, at the timing of switching the sensor from 2 to 1, the difference between sensor 1 and 2 is stored in the memory.
- (2) When the heating operation for the sensor 2 is completed, at the timing of switching the sensor from 1 to 2, the difference between sensor 1 and 2 is stored in the memory. The difference value can be checked in the maintenance mode No. 15.
- (3) If both the stored differences are larger than the preset value (drift error level), the error code E-34 will be displayed.

## ■ Operations

### ● Indications on LCD

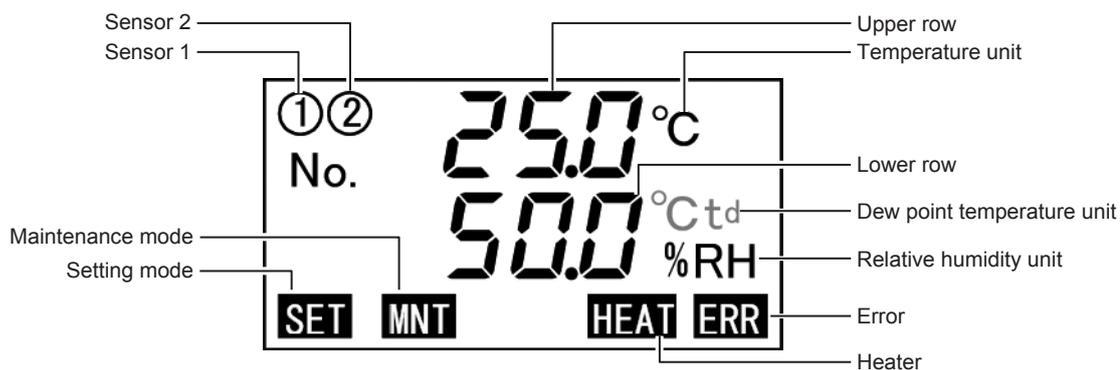


Figure 30. Indications on LCD

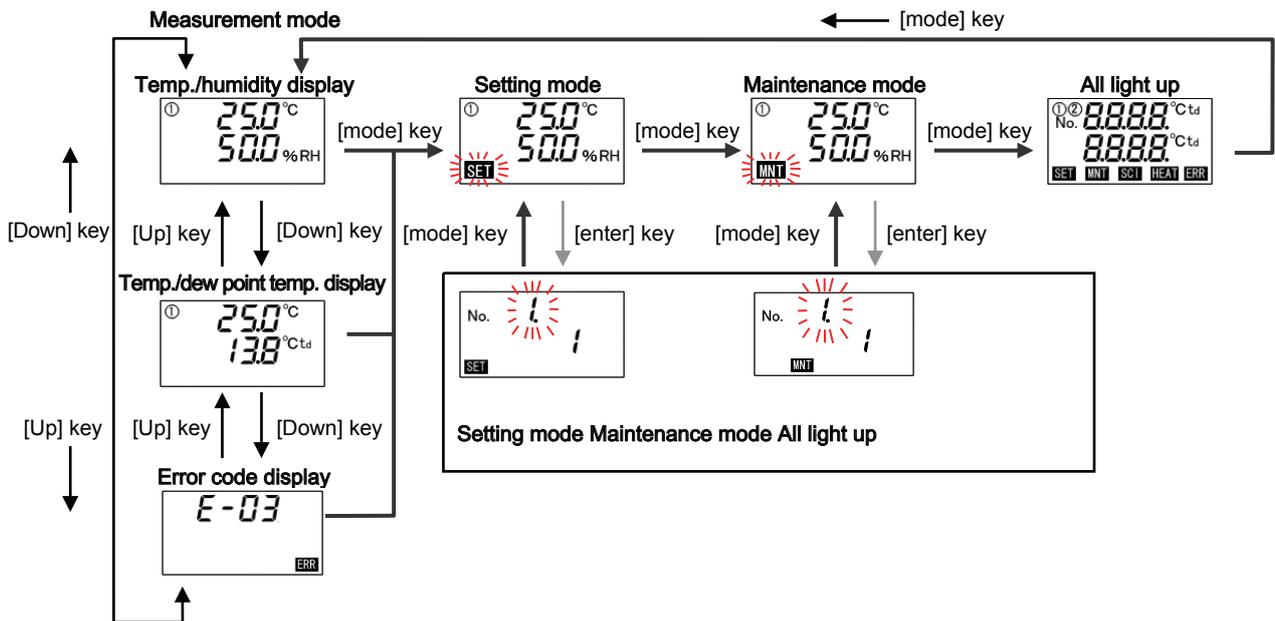
Table 4. LCD indication details

Indication	State	Description
①	Lights up	Sensor 1 is measuring.
	Blinks	Sensor 1 is smoothing.
②	Lights up	Sensor 2 is measuring.
	Blinks	Sensor 2 is smoothing.
Upper row	Displays the temperature measurement value or error code.	Measurement mode
	Displays the Set No.	Setting mode, maintenance mode
Lower row	Displays the humidity or dew point temperature.	Measurement mode
	Displays the settings.	Setting mode, maintenance mode
°C	Lights up	Displaying the temperature in measurement mode.
°Ctd	Lights up	Displaying the dew point temperature in measurement mode.
%RH	Lights up	Displaying the humidity in measurement mode.
No.	Lights up	Setting mode, maintenance mode
	Lights up about 1 second.	Key operation during keylock
SET	Lights up	Setting mode
	Blinks	Setting mode selected
MNT	Lights up	Maintenance mode
	Blinks	Maintenance mode selected
HEAT	Lights up	Heater is ON.
	Blinks	Cooling down
ERR	Lights up	Error occurs

● Operation keys

Key		Specification
mode key		Changes the displaying mode as: Measurement mode -> Maintenance mode -> All light up -> Measurement mode -> ... , by pressing it.
Down key		Changes the screen in the measurement mode. Decreases the numerical value.
Up key		Changes the screen in the measurement mode. Increases the numerical value.
enter key		Enters the specified numerical value into the system. The key is effective when the value or mode is blinking.

● Operation mode transition diagram



Setting mode / maintenance mode common operation

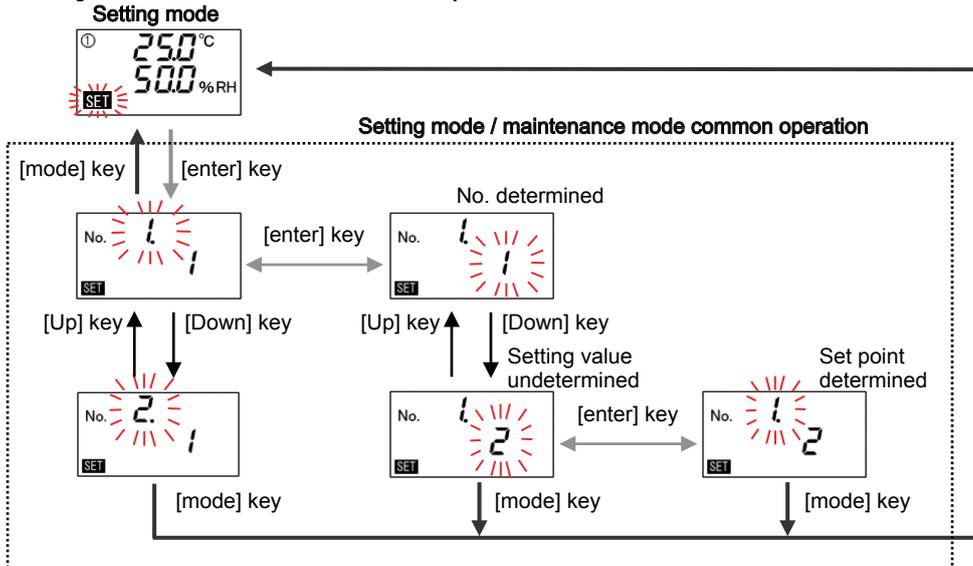


Figure 31. Operation mode transition diagram (in the setting mode)

## ● Operation method

To prevent chattering, please press the keys firmly to operate them.

Item	Operation method
Changing the settings (When settings are located on multiple rows)	(1) Specify Set No. or Subsection No. by pressing the [enter] key. (2) Change the set point (blinking at the lower row) by pressing the [Up] or [Down] key. Press and hold the key to accelerate changing of the value. (3) Press the [enter] key to enter the value.
Enabling setting change	Select Set No. 9 in the setting mode or Set No. 11 in the maintenance mode, and then change the set point to 1 (enabled) by pressing the [Up] or [Down] key. <b>Note</b> "--" is not displayed at the row where the Subsection No. is located. When "--" is displayed on the right side of the Set No., it means that setting change is disabled.
Keylock	While the temperature is being displayed in the measurement mode, press the [enter] key for 2 seconds or more. <b>Note</b> <ul style="list-style-type: none"> <li>When the keys are locked, all the indicators on the LCD light up for 1 second.</li> <li>When the keys are locked, if the keys other than [enter] key are pressed, "No." lights up for 1 second.</li> <li>When the keys are not accessed for 30 minutes, the keys will be locked.</li> </ul>
Unlock the keys	While the keys are locked, press the [enter] key for 2 seconds or more. <b>Note</b> When the keys are unlocked, all the indicators on the LCD light up for 1 second.
Error cancellation (other than major failures)	While the error No. is displayed, press the [enter] key for 2 seconds or more. <b>Note</b> <ul style="list-style-type: none"> <li>This operation is effective for the errors other than major failures.</li> <li>The errors will be canceled when causes of the errors are restored.</li> </ul>
Changing mode	Press the [mode] key.

## ● Mode operations

- When the set point is input or changed, press the [enter] key.  
The Set No. blinks and the input or changed set point becomes effective.
- When no keys are accessed for 10 minutes, the screen will automatically switch to the screen on which the measurement values are displayed.  
In this case, humidity or dew point temperature is displayed according to the set point on the Set No. 1 of setting mode.
- When the keys are not accessed for 30 minutes, the keys will be locked.

### < Setting mode >

Parameters for measurement and calculation are displayed or set up.

In order to change the settings for Set No. 1–8, set "1" (change enabled) to Set No. 9.

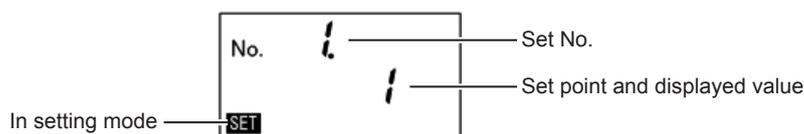


Figure 32. Setting mode screen

Table 5. Setting mode

Set No.	Item	Set point	Default	Description	Remarks
1	Output selection (CH 1)	Humidity: 1 Dew point: 2	1	Specify that the output signal at the terminal between No.4 and 5 (see Fig. 27) is humidity or dew point temperature.	—
2	Heating Start Delay Time* <sup>1</sup> , * <sup>3</sup>	1–24 (hr)	2	Defines amount of time from power ON to the first heating operation.	—
3	Heating Cycle Time automatic selection* <sup>3</sup> , * <sup>4</sup>	ON: 1 OFF: 0	0	When this setting is enabled (ON), the heating cycle will be automatically changed according to the result of the drift detection 2. <b>Note</b> When you enable this setting, be sure to understand well the heating operation of this product.	<b>Note</b> When the Heating Cycle Time automatic selection is enabled (ON), the heating time (No. 5) cannot be specified. To specify the heating time, disable the Heating Cycle Time automatic selection (OFF), and specify it. Specify the heating time approximately 10 minutes.
4	Heating Cycle Time* <sup>1</sup> , * <sup>3</sup>	3–240 (hr) None: 0	12	Specify the Heating Cycle Time.	When the Heating Cycle Time automatic selection (No. 3) is disabled (OFF), this function becomes effective.
5	Heating time* <sup>2</sup> , * <sup>3</sup>	5–30 (min)	10	Specify the heating time.	When the Heating Cycle Time automatic selection (No. 3) is disabled (OFF), this function becomes effective.
6	Drift detection 1	ON: 1 OFF: 0	1	Enables (ON) or disables (OFF) the drift detection 1.	When this product is used in an environment where the error E-31 (Drift detection 1 is not applicable, see Table 7) occurs frequently, disable this setting (OFF).
7	Changeover smoothing	ON: 1 OFF: 0	1	Enables (ON) or disables (OFF) the smoothing function that is used to gradually correlate the two sensors' performance when they are switched after the sensor heating process.	When this function is enabled, responsiveness while operating may be delayed. It will take about 2 minutes to execute the function.
8	Drift error level	3–100 (% RH)	5	Specifies the drift level that causes the drift detection 1 and 2, minor failures.	—
9	Enabling or disabling setting change	Disabled: 0 Enabled: 1	0	Enables or disables to change settings of the set mode.	Effective for the set mode 1–8.
10	Heating drift No.	—	0	Displays the operation status when the Heating Cycle Time automatic selection (No. 3) is enabled (ON).	Display only. Cannot change the settings.
11	Heating step No.	—	3	Displays the operation status when the Heating Cycle Time automatic selection (No. 3) is enabled (ON).	Display only. Cannot change the settings.
12	Heating end sensor No. (1 or 2)	—	1	Displays the sensor No. that was heated last time.	Display only. Cannot change the settings.

\*1 When Heating Start Delay Time and Heating Cycle Time are changed, the timer that triggers the next heating process will be reset and restarts. When the amount of time defined by Heating Cycle Time elapses, next heating will start.

\*2 If Heating Cycle Time is changed while heating, the timer for Heating Time will be reset and restarts.

\*3 The settings cannot be changed while replacing the sensor element.

\*4 If the Heating Cycle Time automatic selection (No. 3) is changed from OFF (0) to ON (1) during operation

- For products with an H code\*<sup>5</sup> of 01 or later, the automatically selected heating cycle and 10-minute (fixed) heating time will apply starting from the next heating operation

- For products with an H code of 00, the heating cycle and heating time before the change will apply to the next heating operation, and the automatically selected heating cycle and 10-minute heating time will apply to heating operations after that.

If the Heating Cycle Time (No. 4) is set to none (0), automatic heating will not be executed. To apply the automatic settings, execute manual heating.

\*5 A number written on the terminal label.

● Maintenance mode

It is used during maintenance.

The following items are displayed and set.

- Manual changeover the measurement sensors.
- Manual heating the humidity sensors ON/OFF
- Test output
- Offset of the measurement data
- Element replacement mode
- Displays the accumulated heating time ratio and the accumulated heating time.

In order to change the settings for Set No. 1–10, set "1" (change enabled) to Set No. 11.

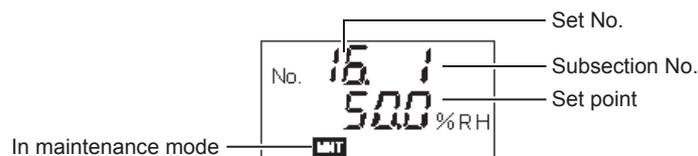


Figure 33. Maintenance mode screen

Table 6. Maintenance mode

(1/2)

Set No.	Subsection No.	Item	Set point	Default	Description	Remarks
1	—	Measurement sensors changeover (1/2)	—	1	Switches the measurement sensors.	Cannot be switched while heating or cooling down.
2	—	Sensor 1 manual heating*1	ON : 1 OFF : 0	0	Manually heats the sensor 1. (It is possible to heat it when it is not used for measuring.)	
3	—	Sensor 2 manual heating*1	ON : 1 OFF : 0	0	Manually heats the sensor 2. (It is possible to heat it when it is not used for measuring.)	
4	1	CH 1 test output value	0, 50, 100	0	Select the test output value of CH 1.	Ratio of output range (%)
	2	CH 1 test output*2	ON : 1 OFF : 0	0	Turn ON/OFF the test output of CH 1.	When the keys are not accessed for 30 minutes, the setting will become OFF.
5	1	CH 2 test output value	0, 50, 100	0	Select the test output value of CH 2.	Ratio of output range (%)
	2	CH 2 test output*2	ON : 1 OFF : 0	0	Turn ON/OFF the test output of CH 2.	When the keys are not accessed for 30 minutes, the setting will become OFF.
6	—	Humidity offset	-10.0–10.0	0	Specifies the humidity offset value.	Set point in 0.1 increments
7	—	Temperature offset	-5.0–5.0	0	Specifies the temperature offset value.	Set point in 0.1 increments
8	—	Sensor element replacement mode*3	ON : 1 OFF : 0	0	Enables (ON) to replace the sensor element.	—

\*1 Counter for the accumulated heating cycle starts when the manual heating process is enabled (ON).

\*2 If the set point is set to 1 (ON), the analog output value changes regardless of the measurement value.

\*3 If the set point is set to 1 (ON), the analog output value is disabled regardless of the measurement value.

Set No.	Subsection No.	Item	Set point	Default	Description	Remarks
9	1	Element constant 1* <sup>4</sup>	0-9999	—	Specifies the element constant 1.	It is effective if the sensor element replacement mode is enabled (ON) when the product was adjusted so by the factory preset.
	2	Element constant 2* <sup>4</sup>	0-9999	—	Specifies the element constant 2.	
	3	Element constant 3* <sup>4</sup>	0-9999	—	Specifies the element constant 3.	
	4	Element constant 4* <sup>4</sup>	0-9999	—	Specifies the element constant 4.	
	5	Element constant 5* <sup>4</sup>	0-9999	—	Specifies the element constant 5.	
	6	Element constant 6* <sup>4</sup>	0-9999	—	Specifies the element constant 6.	
10	—	Sensor element heating after replacement* <sup>4</sup> , * <sup>5</sup>	ON : 1 OFF : 0	0	Enables (ON) to heat the sensor element after replacing it.	It is effective if the sensor element replacement mode is enabled (ON) .
11	—	Enabling or disabling setting change	Disabled:0 Enabled : 1	0	Enables or disables to change settings of the maintenance mode.	Effective for the maintenance mode Set No. 1-10.
12	—	Accumulated heating time ratio (%)	—	0	Displays the ratio of accumulated heating time compared to the element's service life 608 hours.	Display only Cannot change the settings.
13	1	Sensor 1 accumulated heating time (hr)	—	0	Displays the accumulated heating time of sensor 1.	
	2	Sensor 2 accumulated heating time (hr)	—	0	Displays the accumulated heating time of sensor 2.	
14	1	Drift detection 1 Drift value of humidity sensor 1	—	0	Displays the output of humidity sensor 1 when the drift detection 1 occurs.	
	2	Drift detection 1 Drift value of humidity sensor 2	—	0	Displays the output of humidity sensor 2 when the drift detection 1 occurs.	
15	—	Drift detection 2 Value of drift	—	0	Displays the value of drift detection 2.	
16	1	Humidity measurement value of the non-measuring sensor* <sup>6</sup>	—	—	Displays the humidity measurement value of the non-measuring sensor.	
	2	Temperature measurement value of the non-measuring sensor* <sup>6</sup>	—	—	Displays the temperature measurement value of the non-measuring sensor.	

\*4 Can change the setting by enabling No. 8 (ON).

\*5 If the set point is changed to 0 (OFF), No. 8 and 9 can be changed.

\*6 Displays the measurement value just when the [enter] key is pressed.

## ■ Maintenance

### ⚠ CAUTION



Before maintenance, be sure to turn off the power to this product. Failure to do so may result in electric shock or device failure.



After maintenance, be sure to reattach the cover. Failure to do so may result in electric shock.

**IMPORTANT**

- Maintenance work might be carried out in a chemical environment. In this case, check the chemicals used and take necessary measures according to the chemicals.
- Be careful so as not to pinch fingers while opening or closing the cover.
- Do not remove the cap other than replacing the element. The element might deteriorate by invasion of dust, etc.

This product is adjusted and inspected when it is shipped from the factory.

No field adjustment is required. Do the product maintenance described below.

### ● Regular check

In order to maintain the accuracy of this product, do the following maintenance works.

#### < Drift detection >

- (1) Check that the drift detection 1 error (E-30) or the drift detection 2 error (E-34) has not occurred.
- (2) Check the amount of drifts for the humidity sensor 1 drift detection 1 (Set No. 14.1), humidity sensor 2 drift detection 1 (Set No. 14.2), and the drift value (Set No. 15) of humidity sensor 1 and 2.
- (3) If the amount of drifts is likely to exceed the drift error level before next inspection, execute the troubleshooting.

#### < Element service life >

- (1) Check that the element service life error (E-50) has not occurred.
- (2) Check the accumulated heating time ratio (Set No. 12).
- (3) If the accumulated heating time is likely to exceed the service life before next inspection, replace the sensor element.

#### < Cleaning >

When dust etc. have adhered to the sensor and the case, brush away the dust using a soft brush etc.

Do not use a chemical cloth or detergent.

### ● Filter replacement

Replace the filter (P/N 83170626-001) periodically at the regular inspection, or when it becomes dirty with dust etc.

- (1) Pull out the old filter from the filter cap and put a new one over it.

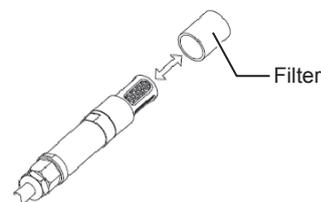


Figure 34. Filter replacement

### ● On-site adjustment

Offset of temperature and humidity can be adjusted. If there are differences between the measurement value and the reference meter, adjust the offset.

For details, refer to ■ *Operations*.

- (1) Switch to the maintenance mode.
- (2) Select the humidity offset (Set No. 6) or temperature offset (Set No. 7) to set the offset value.

- Note**
1. Use a reliable measuring instrument as the reference meter.
  2. When the offset was adjusted at the installed location, accuracy of the product is not guaranteed.

### ● Curing

When the product is installed in an animal breeding facility, an operating room, etc., and if the room is fumigated, take measures to cure the product.

There are two methods to cure it.

- Using a curing case
  - Use a commercial curing case (recommended: SUGICO Co. P/N SH-25256). Push the case over the product to the wall. Close the gaps between the case and wall with curing tape. Recommended size: 200×120×60 (W×H×D) or more.
- Using curing sheet
  - Use bubble wrap (size: 400×300 (W×H)) as curing sheet to cover the product. Stick the sheet over the product on the wall with curing tape so as not to make gaps around the product.
  - If the antiseptic solution is adhered on the case cover, chemical cracks may occur. So remove the curing case or sheet after the antiseptic solution is dried.

### ● Cautions for power restoration

- (1) The first heating after power restoration will start when the heating delay time elapses.
- (2) Correction between sensors is disabled. In order to execute measurements correctly, the heating processes must be applied to the sensor 1 and sensor 2 (random order) with the specified parameters.

For details, refer to ■ *Functions*.

## ■ Troubleshooting

Error codes can be checked by pressing the [✓]/[∧] key. The error codes from E-20 to E-34 can be canceled by pressing the [enter] key for 2 seconds or more while the error codes being displayed. Also, if cause of the error is removed at the time of next error checking, the error will be canceled automatically.

(Note) When the keys are locked, press the [enter] key 2 seconds or more. The keys will be unlocked.

Table 7. Error indications

Error code	Item	Description	Error level	LED indication	Output	Measures
0	No errors	No errors	—	—	—	—
20	Heating operation when heating is prohibited	<ul style="list-style-type: none"> <li>• Element replacement or manual heating operation was attempted during heating operation or no element attached.</li> <li>• Manual heating was carried out during measurement.</li> </ul>	Alert	OFF	Normal	<ul style="list-style-type: none"> <li>• Do not replace the element or execute the manual heating operation during the heating operation.</li> <li>• Do not execute the manual heating operation without the element attached.</li> </ul>
30	Drift detection 1	When the drift detection 1 is carried out, the humidity measurement data, comparing with the initial value, is larger than the value specified by the drift error level.	Minor failure	Blinks	Normal	<ul style="list-style-type: none"> <li>• Replace the element. For details, refer to &lt;Element replacement&gt;.</li> <li>• Extend the heating time (default: 10 minutes) or shorten the heating cycle (default : 12 hours) .</li> </ul>
31	Drift detection 1 not applicable	Heating operation was executed at the dew point treatment 30 °C Td or more.	Minor failure	Blinks	Normal	<ul style="list-style-type: none"> <li>• Execute the heating operation under the dew point temperature 30 °C Td.</li> <li>• In the setting mode, disable the drift detection 1 (Set No. 6) .</li> </ul>
34	Drift detection 2	When the drift detection 2 was carried out, the drift value exceeded the upper limit.	Minor failure	Blinks	Normal	<ul style="list-style-type: none"> <li>• Clean the element. For details, refer to &lt;Element cleaning&gt;.</li> <li>• Replace the element. For details, refer to &lt;Element replacement&gt;.</li> </ul>
40	Measurement error between sensors (comparing the read data of sensors) *4	The read value difference between the sensors, just before executing the heating operation, is 1 °C or more, or 5 % RH or more.	Minor failure	Blinks	Normal	<ul style="list-style-type: none"> <li>• Make the installation environment of 2 sensors the same.</li> <li>• Replace the element. For details, refer to &lt;Element replacement&gt;.</li> <li>• If the error is not recovered, the product has failed. Stop using it.</li> </ul>
50	Element heating service life reached*1	Accumulated heating time ratio 100 % or more	Minor failure	Blinks	Normal	Replace the element. For details, refer to <Element replacement>.
60	Sensor 1 heating insufficient	The minimum humidity measured by sensor 1 during heating operation is 10 % RH or more.	Major failure	ON	Error output*2	Replace the element. For details, refer to <Element replacement>.
61	Sensor 2 heating insufficient	The minimum humidity measured by sensor 2 during heating operation is 10 % RH or more.	Major failure	ON	Error output*2	Replace the element. For details, refer to <Element replacement>.
62	EEPROM file error	EEPROM checksum diagnostic error	Major failure	ON	Error output*3	• Replace the product.

\*1 When the accumulated heating time reaches 608 hours (calculated as 10 minutes/day for 10 years), the error will appear.

\*2 If the sensor heating process was done unsuccessfully, only the humidity measurement value is output as "error output" (5.6 V for 1–5 V, 22.4 mA for 4–20 mA). After displaying the error code for 1 minute, the measurement value of the measuring sensor that is not being heated is output. The heating operation is applied every heating cycle, if the insufficient heating is detected again, the error code will appear. If the same error is reported to the connected controller every heating cycle, the error cannot be recovered by the sensor heating operation. Replace the element.

\*3 When the EEPROM file is error, the temperature and humidity measurement value is output as "error output" (0 V for 1–5 V, 0 mA for 4–20 mA).

\*4 For products with an H code\*5 of 01 or later, if error code 40 (measurement error between sensors) is not canceled, the heating operation or sensor changeover will be executed at the specified heating cycle and heating time. For products with an H code of 00, the heating operation and sensor changeover will not be executed until error code 40 is canceled.

\*5 A number written on the terminal label.

● Drift detection 1 (error code: E-30)

Effectiveness of "drift recovery function", which is useful for the drift caused by organic solvent, will decrease as time goes by.

Finally, the amount of drift becomes large and an error will occur.

- Heat the element, and when it is stopped automatically, execute diagnosis for the drift value of element. When the error occurs, its error code will appear. When the error occurs, replace both the elements (x2) together.

\* For details, refer to ● *Disposition when error occurs (Element replacement)*.

- If the error occurs in a short period (ex. within one year), it is suspected that the product was exposed to the atmosphere that exceeds the capability of the heating process.
- Extend the heating time (default: 10 minutes) or shorten the heating cycle (default: 12 hours). However, be aware that the service life may become shorter by taking the action above.

(Note) Although the element is normal, the drift detection 1 occurs frequently, increase the drift error level (Set No. 8) in the setting mode.

● Drift detection 2 (error code: E-34)

If the error occurs due to accumulation of deliquescent material on the element, clean the element. If no improvement is observed by cleaning, replace the element.

\* For details, refer to ● *Disposition when error occurs (Element cleaning)*.

● Disposition when error occurs (Element cleaning)

If deliquescent material adheres to the surface of humidity sensor element, the humidity measurement value may drift and the drift detection 2 occurs. Clean the element with pure water to flush the accumulated material on the element, and then the drift value will decrease.

**IMPORTANT**

- Element cleaning does not always guarantee decreasing of drift. After cleaning the element, if the error occurs again, replace the element.
- If the element is heated while it is wet, it may be damaged. Be sure to dry the element and then heat it.
- If the element is cleaned excessively, it may be damaged. Maximum number of cleaning for the element is 10.
- Be sure to attach the filter to the product. If the filter is not attached, the humidity-measuring element may fail within a short period of time.

< Element cleaning >

- (1) Remove the element from the probe of the sensor to clean it with pure water.

To clean the element, use a cleaning bottle to flush the electrode of element (marked by ○ in Fig. 35) with pure water.

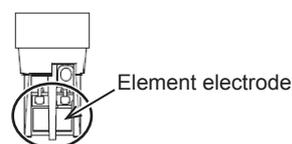


Figure 35.

- (2) Hold and face the element as shown in Fig. 35.
- (3) From slightly upper position to downward, jet pure water from the cleaning bottle for about 2 seconds to flush the contamination on the electrode of element.
- (4) Redo the step (3) for 3–5 times.

(Note) There are connector pins as shown by the arrow in Fig. 36. Be careful not to jet water on the connector pins.

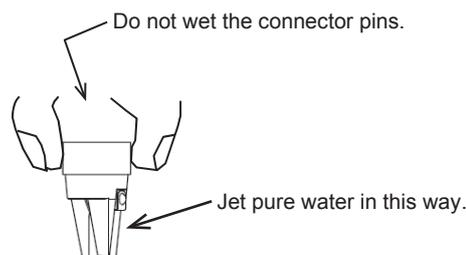


Figure 36.

- (5) Shake the element lightly to splash the water droplets. Then, dry the element naturally (25 °C 50 % RH) for 30 minutes to one hour.
- (6) Check that the element is dried.
- (7) Attach the element to the probe.
- (8) Execute the manual heating for the cleaned element by the sensor 1 manual heating (Set No. 2) or sensor 2 manual heating (Set No. 3). For details, refer to *Element manual heating*.

(Note) While drying the element, keep it so as not to attach dust etc. to the element.

- Disposition when error occurs (Element replacement)

⚠ WARNING	
	While [HEAT] lights up, do not touch the element. Doing so might cause burns because it is heated at 180 °C.

IMPORTANT ● Do not touch the electrode of element.
--

< Note for storing the spare element >

- Avoid a high temperature and humidity places.
- Store it in a place away from sunlight (ultraviolet rays) .
- Do not apply excessive force.

< Note for replacing element >

IMPORTANT ● Be sure to attach the filter to the product. If the filter is not attached, the humidity-measuring element may fail within a short period of time.
--

- To replace the element, rotate the cap holding part where the filter is not attached. Failure to do so, the cap might be damaged. To attach the cap, screw it up with fingers without using a tool.
- Heating process cannot be carried out without the element attached.
- While replacing the element, no output is activated (0 V / 0 mA) . No measurement is done.
- When the element is replaced, be sure to replace both the elements (x2) together.
- Just after replacement, measurement may not be carried out correctly. Wait until the element fits in the environment.
- After the element is replaced, the accumulated heating time and the accumulated heating time ratio become "0".
- When the error code E-30, E-34, E-60, or E-61 appears, or the element is faulty, replace the element.
- Be sure to replace the element in the ambient, dew point temperature is lower than 30 °C Td . When the dew point temperature is 30 °C Td or more, the initial value of the drift detection 1 cannot be measured correctly.

< Element replacement >

For details, refer to ■ Operations.

- (1) Prepare new elements (P/N 83170626-003) for replacement.

(Note) Be sure to replace both the elements (x2) together for the sensor 1 and sensor 2.

- (2) Switch to the maintenance mode.

> [MNT] will light up.

- (3) Enable the setting change; set "1: Enabled" to Set No. 11.

- (4) Change the element replacement mode, Set No. 8 , from 0 to 1.

> Output from the sensor will be disabled (0 V/0 mA) .

(Note) Do not replace the element during the heating operation. The set point cannot be changed from "0."

- (5) Remove the cap.

Leave the filter attached on the cap.

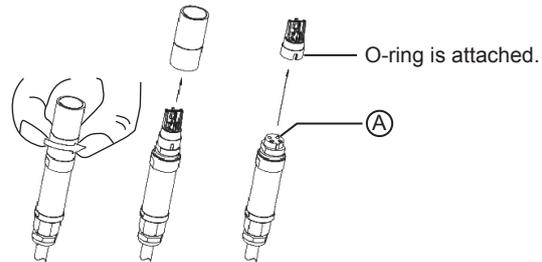


Figure 37.

- (6) Remove the old elements from the sensor 1 and sensor 2.

(Note) Check that the O-ring does not stay at A illustrated in Fig. 37. If the O-ring stay at there, remove it.

- (7) Check that each of new element contains the O-ring, and attach the elements. At this time, check the number 1 or 2 printed on the element.

- (8) Attach the cap.

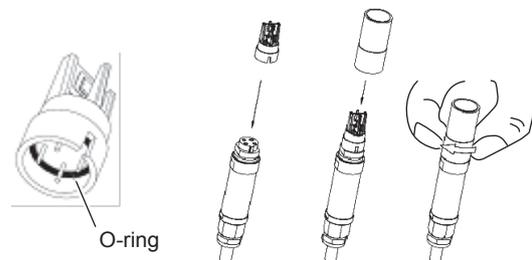


Figure 38.

- (9) Select the element constant item (Set No. 9.1 to 9.6) in order, and set the constant 1 to 6 for the new elements.

- (10) Select the element replacement heating (Set No. 10) , and change the set point from 0 to 1.

> The heater turns on and [HEAT] lights up. Execute this heating process for both the elements.

> The heating process will automatically end in about 50 minutes.

> When the heating process ends, the sensor 1 is assigned for the measuring sensor and measurement will start. The next heating starts when the heating cycle time elapses after completion of the heating process.

## &lt; Element manual heating &gt;

If the measurement value drifts since the element was exposed in high humidity, organic solvent, or chemical ambient, recover the drift by the manual heating process.

(Note) After the manual heating, the next heating starts when the heating cycle time elapses after the starting time of the heating process.

For details, refer to ■ *Operations*.

(1) Switch to the maintenance mode.

> [MNT] will light up.

(2) Enable the setting change; set "1: Enabled" to Set No. 11.

(3) Change the sensor 1 manual heating (Set No. 2) or sensor 2 manual heating (Set No. 3) from 0 to 1.

> The heating operation will be carried out for the amount of time specified in the setting mode, heating time (Set No. 5).

> When the specified time elapses, the heating will stop automatically.

(Note 1) If the heating has already started, the manual heating is not effective.

Although the heating can be stopped manually, the sensor will be in the cooling down state. When the heating is stopped manually, the drift detection 1 is not carried out.

(Note 2) When the Heating Cycle Time automatic selection is enabled (ON), the heating time (Set No. 5) cannot be specified.

Disable the setting (OFF) and specify the heating time. Specify the heating time approximately 10 minutes.

## ■ Disposal

Dispose of the product as industrial waste in accordance with your local regulations.

Do not reuse all or part of this product.

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*Specifications are subject to change without notice.*

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