

## Insertion Temperature/Humidity Sensor HTY78X3/ TY78X3/ HY78X3

### General

Insertion temperature/humidity sensor HTY78X3 series uses a Pt100 platinum film temperature sensing element and a polymer capacitive film humidity sensing element (FP3 specially developed by Yamatake) which ensures highly accurate and reliable temperature/humidity sensing. It is designed to be installed in return air ducts of commercial buildings, in return air chambers of air handling units or in ventilated shield for meteorological instruments. TY78X3 series for sensing temperature only and HY78X3 series for sensing humidity only are also available.



### Features

- 1) Wide sensing range
- 2) Excellent long term stability
- 3) Highly resistant to environment.
- 4) Quick response and high repeatability.
- 5) Easy to install in a duct (bracket prepared)
- 6) Splash-proof housing (IP54)
- 7) No need of maintenance for the head of TY series (splash-proof without filter)

### Models

| Model No. | Shape | Type | Power supply | Humidity output | Temperature output | Fixed | Fixed | Description                           |
|-----------|-------|------|--------------|-----------------|--------------------|-------|-------|---------------------------------------|
| HTY78     |       |      |              |                 |                    |       |       | Insertion temperature/humidity sensor |
| TY78      |       |      |              |                 |                    |       |       | Insertion temperature sensor          |
| HY78      |       |      |              |                 |                    |       |       | Insertion humidity sensor             |
|           | 0     |      |              |                 |                    |       |       | Insertion length: Long                |
|           | 1     |      |              |                 |                    |       |       | Insertion length: Short               |
|           |       | 3    |              |                 |                    |       |       |                                       |
|           |       |      | T            |                 |                    |       |       | 24 V DC or 24 V AC                    |
|           |       |      | Z            |                 |                    |       |       | No power supply needed                |
|           |       |      |              | 0               |                    |       |       | W/o humidity sensor                   |
|           |       |      |              | 1               |                    |       |       | Humidity output 1-5 V                 |
|           |       |      |              | 4               |                    |       |       | Humidity output 4-20 mA               |
|           |       |      |              | 6               |                    |       |       | Humidity output 0-10 V                |
|           |       |      |              |                 | 0                  |       |       | W/o temperature sensor                |
|           |       |      |              |                 | P                  |       |       | Temperature Pt 100                    |
|           |       |      |              |                 |                    | 0     | 0     |                                       |

Select a model No. from below

|              |   |                         |
|--------------|---|-------------------------|
| HTY7803T1P00 | Humidity (1-5 V) + temperature (Pt 100)   | Insertion length: Long  |
| HTY7803T4P00 | Humidity (4-20 mA) + temperature (Pt 100) | Insertion length: Long  |
| HTY7803T6P00 | Humidity (0-10 V) + temperature (Pt 100)  | Insertion length: Long  |
| HTY7813T1P00 | Humidity (1-5 V) + temperature (Pt 100)   | Insertion length: Short |
| HTY7813T4P00 | Humidity (4-20 mA) + temperature (Pt 100) | Insertion length: Short |
| HTY7813T6P00 | Humidity (0-10 V) + temperature (Pt 100)  | Insertion length: Short |
| TY7803Z0P00  | Temperature (Pt 100)                      | Insertion length: Long  |
| TY7813Z0P00  | Temperature (Pt 100)                      | Insertion length: Short |
| HY7803T1000  | Humidity (1-5 V)                          | Insertion length: Long  |
| HY7803T4000  | Humidity (4-20 mA)                        | Insertion length: Long  |
| HY7803T6000  | Humidity (0-10 V)                         | Insertion length: Long  |
| HY7813T1000  | Humidity (1-5 V)                          | Insertion length: Short |
| HY7813T4000  | Humidity (4-20 mA)                        | Insertion length: Short |
| HY7813T6000  | Humidity (0-10 V)                         | Insertion length: Short |

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## Safety Instructions

Please read instructions carefully and use the product properly. Please keep this instruction on hand for reference at any time.

### Usage Restrictions

This product is targeted for general air conditioning. Do not use this product in a situation where human life may be affected. If this product is used in clean rooms or places where reliability or control accuracy is particularly required, please contact Yamatake's sales representatives. Yamatake Building Systems Co., Ltd. bears no responsibility for any benefit, or lack of benefit, derived from the operation by the customer.

### CAUTION

-  Installer must be a trained, experienced service technician.
-  Check the ratings given in this instructions to prevent equipment damage.
-  Check the environment given in this instructions to prevent equipment damage.
-  Disconnect power supply before wiring to prevent electric shock or equipment damage.
-  All wiring must comply with local codes and ordinances.
-  Use crimp contacts with insulation jackets for wire terminals.
-  Do not remove or disassemble casing except for wiring. May result in equipment damage.
-  When the product is faulty, the reduced output may result in excessively humid status. Take safety measures at controller.

## Specifications

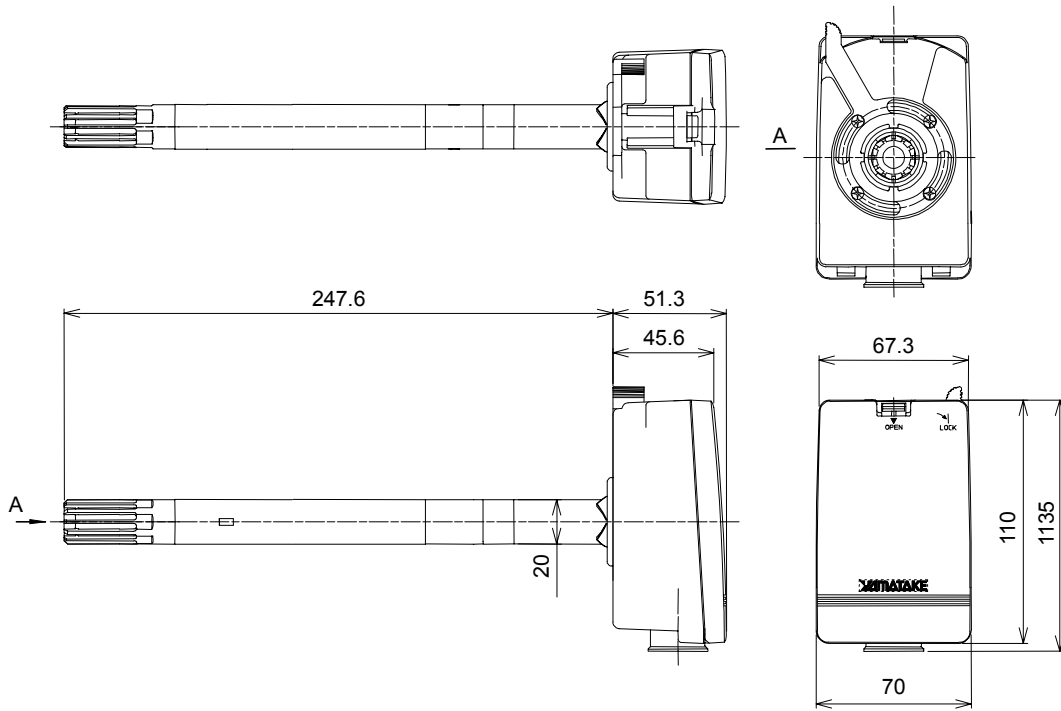
| Item                                     | Specifications  |  |
|--|---|--|
| Measurement range                        | Temp.   | -20 to 60 °C   |
|  | Humid.  | 0 to 100 % RH (-5 to 55 °C)  |
| Output signal                            | Temp.   | 100 / 0 °C   |
|  | Humid.  | 1-5 V DC (linear to 0 to 100 % RH) (output impedance: min. 10 k $\Omega$ )<br>0-10 V DC (linear to 0 to 100 % RH) (output impedance: min. 10 k $\Omega$ )<br>4-20 mA DC (linear to 0 to 100 % RH) (maximum permissible load 300 $\Omega$ ) |
| Sensing accuracy                         | Temp.   | +/- 0.3 °C (at conditions of -20 to 60 °C)   |
|  | Humid.  | +/- 3 % RH (at conditions of 30 to 70 % RH 25 °C)<br>+/- 5 % RH (at conditions of 20 to 80 % RH 15 to 35 °C)   |
| Time constant<br>(at air velocity 2 m/s) | Temp.   | TY series max. 1 min.<br>HTY, HY series max. 4 min.  |
|  | Humid.  | Max. 1 min   |
| Environmental conditions                 | Temp.   | Rated operating conditions: -20 to 60 °C 0 to 100 % RH (non-condensing)  |
|  |   | Extreme operating conditions: -20 to 60 °C 0 to 100 % RH (non-condensing)  |
|  |   | Storage conditions: -30 to 70 °C 5 to 95 % RH (non-condensing)   |
| Humid.                                   | Rated operating conditions: -5 to 55 °C 10 to 100 % RH (non-condensing)   |  |
|  | Extreme operating conditions: -20 to 60 °C 0 to 100 % RH (non-condensing)   |  |
|  | Storage conditions: -30 to 70 °C 5 to 95 % RH (non-condensing)  |  |
| Air velocity                             | Extreme operating conditions: 0 to 15 m/s   |  |
| Power supply                             | 24 V AC +10/-15 % (50/60 Hz), 24 V DC +/- 10 % (only for HTY, HY series)  |  |
| Power consumption                        | 0.2 VA  | (at conditions of 24 V AC, HTY, HY series 1-5 V, 0-10 V output model)  |
|  | 150 mW  | (at conditions of 24 V DC, HTY, HY series 1-5 V, 0-10 V output model)  |
|  | 1.0 VA  | (at conditions of 24 V AC, HTY, HY series 4-20 mA output model)  |
|  | 800 mW  | (at conditions of 24 V DC, HTY, HY series 4-20 mA output model)  |
| Dielectric strength                      | 500 V AC less than 1 mA of leak for 1 minute  |  |
| Insulation resistance                    | 500 V DC min. 20 M  |  |
| Vibration resistance                     | 9.8 m/s <sup>2</sup> (10 to 150 Hz)   |  |
| Protection                               | Housing IP54 (when splash-proof connectors and designated multi-core cables are used or when a designated conduit is used)<br>The head of TY series is IP24 |  |
| Installation                             | Duct, air chamber, ventilated case for meteorological instruments (with special bracket)  |  |
| Wiring                                   | Terminal block connection   |  |
| Material                                 | Housing:  | GF20 % Polycarbonate mixed resin, gray (equivalent to DIC-651)   |
|  | Filter cap:   | Denatured PPE resin, gray (equivalent to DIC-651)  |
| Weight                                   | Approx. 240 g (7803 series) Approx. 210 g (7813 series)   |  |
| Accessories                              | None  |  |
| Order separately                         | 83157235-001  | Mounting bracket   |
|  | 83157240-004  | Conduit mounting set (for HTY, HY series, applicable cable outer diameter 11 to 14 $\phi$ )  |
|  | 83157240-009  | Conduit mounting set (for TY series, applicable cable outer diameter 9.4 to 11 $\phi$ )  |
|  | 83104098-004  | Seal connector (for HTY, HY series, applicable cable outer diameter 10.5 to 14.5 $\phi$ )  |
|  | 83104098-003  | Seal connector (for TY series, applicable cable outer diameter 8.5 to 12.5 $\phi$ )  |
|  | DY8000A1001   | Sensor shield for outdoor  |
|  | DY3002A1005   | Ventilated case mounting bracket (L shape metal)   |
| Order separately for maintenance         | 83162945-003  | Filter set   |

HTY78\*3/HY78\*3 series have passed the following tests:

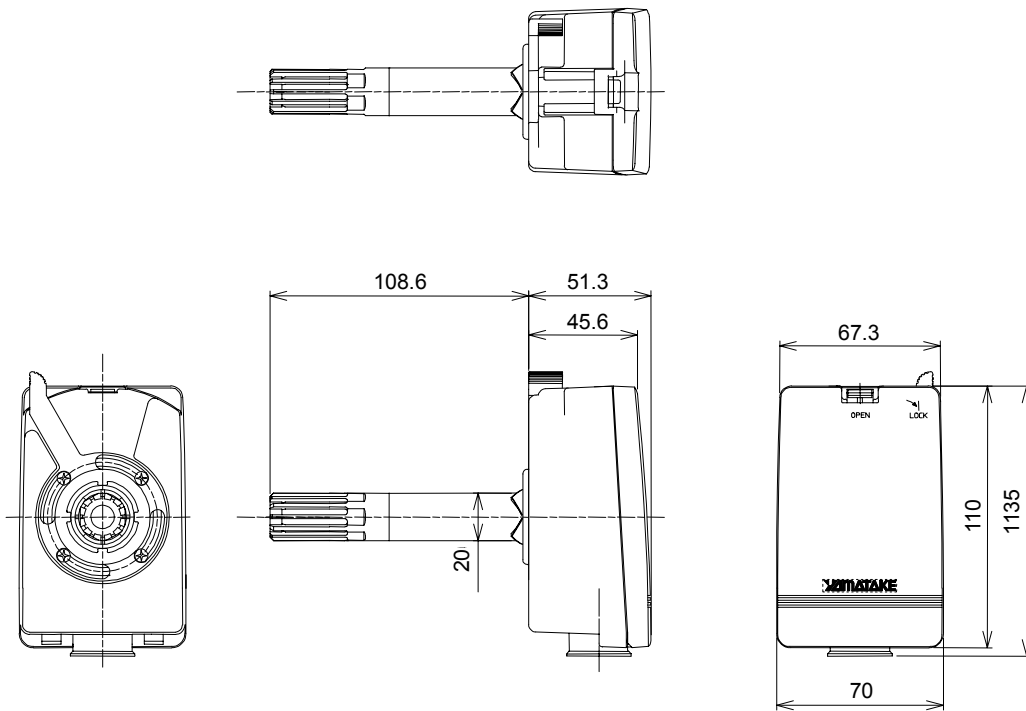
EN50081-1/1992 (EN55011/1998 group 1, class B)

EN50082-1/1997 (EN61000-4-2, EN61000-4-3, ENV50204, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-11)

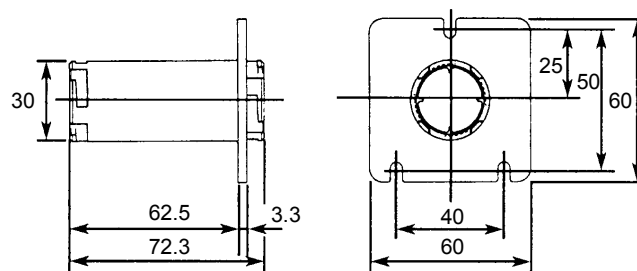
Dimensions (mm)



(1) 7803 series



(2) 7813 series




(3) Mounting bracket

## Installation

### Important

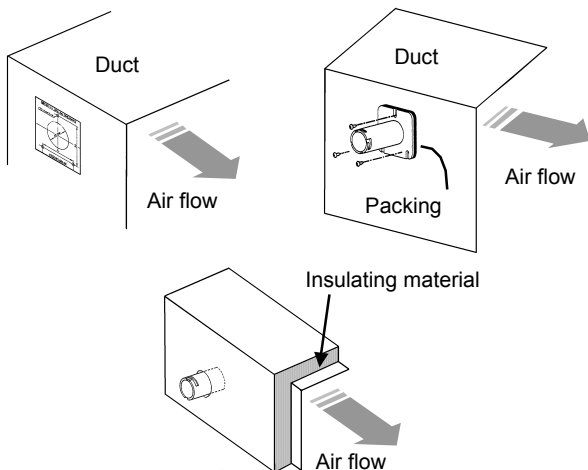
- 1) Select a location where the typical temperature and humidity of the measured fluid can be sensed and where the wind speed requirements are met.
- 2) Make sure that the temperature and humidity elements are entirely immersed in the measured fluid. Also, make sure that air can pass over the side of the sensor.
- 3) Allow adequate service clearance at the front of the cover.
- 4) When installing in steam heating air handling unit, make sure the steam does not directly expose. (It may exceed the extreme operating condition.)
- 5) When inserting the insertion part facing upward, prevent dew condensation. (The condensed dew will remain in the filter cap and measurement difference will occur until it becomes dried.)

 CAUTION

 Do not step on the unit.

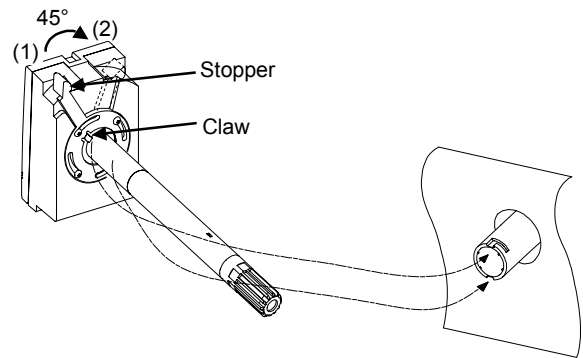
### Mounting 7803 series (duct mounted)

- 1) Prepare the mounting bracket in advance. Attach the mounting label at the sensor mounting position and make a hole in the duct at the point indicated on the label. Fix the mounting bracket onto the duct with M4 screws, inserting packing between the duct and the bracket. Cover the duct with an insulating material. (If you cover the duct with an insulating material first, fill the clearance between the bracket and the duct with the insulating material after fixing the bracket.)



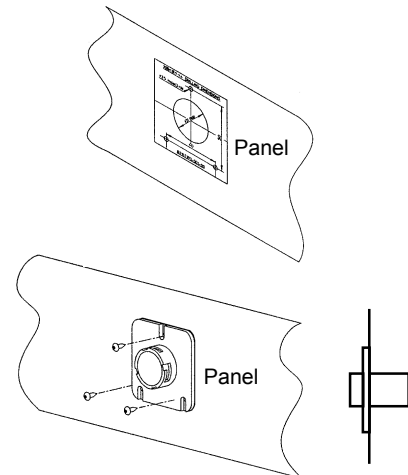
- 2) Turn the stopper of the main unit to the left and insert the main unit into the bracket, aligning the claw to the

bracket groove. Fix it by turning the stopper 45 ° in the clockwise direction.

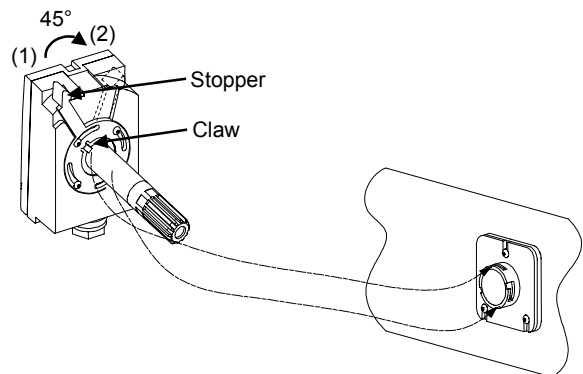


### Mounting 7813 series (air handling unit mounted)

- 1) Prepare the mounting bracket in advance. Attach a mounting label at the desired mounting position and make a hole in the air handling unit return air chamber. Fix the mounting bracket onto the duct with M4 screws (included) between the duct and the bracket.



- 2) Turn the stopper of the main unit to the left and insert the main unit into the bracket, aligning the claw to the bracket groove. Fix it by turning the stopper 45 ° clockwise.



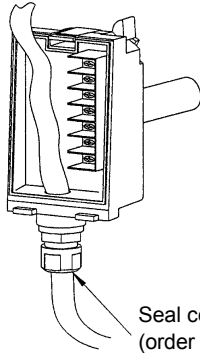
**Wiring (common instructions for 7803 series and 7813 series)**

1) Dismount the cover.

(i) Cable connection

Prepare the proper seal connector (order separately) in advance, if required.

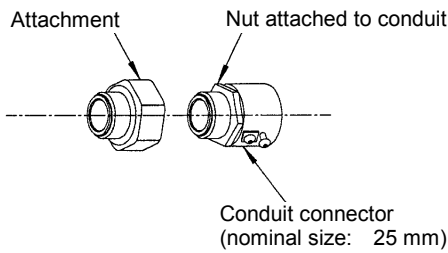
Screw the threaded seal connector into the main and lead the cable through it.



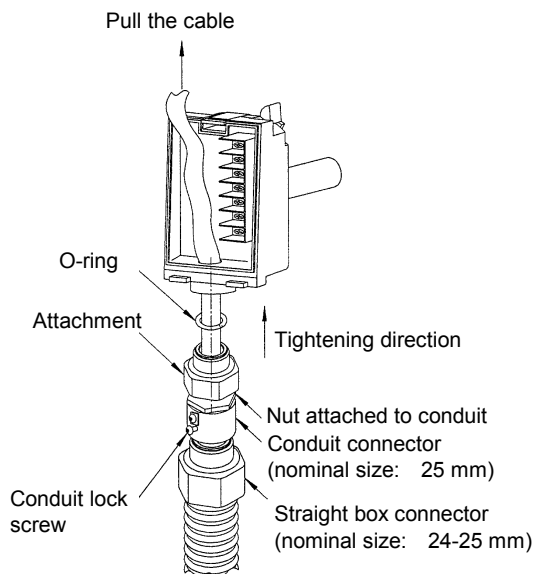
Seal connector (order separately)

(ii) Conduit connection

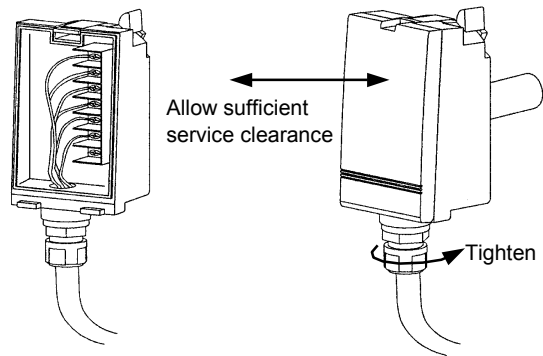
According to the number of cable cores, prepare a conduit set (order separately) in advance. Fix the conduit connector and the attachment tentatively with a screw. Select an O-ring ideal for the cable.



Lead the cable, as shown in the following diagram. Pull up the cable and fix the attachment to the main unit with a screw. Tighten the nut on the conduit at a point where the conduit lock screw can be tightened easily.



2) Connect the wires to the terminals and close the cover. Tighten the seal connector. (only when cable connected)



|              |       |   |   |           |                 |                 |
|--------------|-------|---|---|-----------|-----------------|-----------------|
| Power supply | ~ (+) | ⊕ | 1 | 24 V AC   | HTY7803T1P00    | HY7803T1000     |
|              | ⊥ (-) | ⊕ | 2 | (24 V DC) |                 |                 |
| Humidity     | +     | ⊕ | 3 | 1.5 V DC  | HTY7803T4P00    | HY7813T1000     |
|              | -     | ⊕ | 4 | 0-10 V DC | HTY7803T6P00    | HY7813T4000     |
| Temperature  |       | ⊕ | 5 | 4-20 mA   | HTY7813T1P00    | HY7813T6000     |
|              | A     | ⊕ | 6 |           | HTY7813T4P00    | (Cable cores:4) |
|              | B     | ⊕ | 7 | Pt 100    | HTY7813T6P00    | TY7803Z0P00     |
|              | B     | ⊕ |   |           | (Cable cores:7) | TY7813Z0P00     |
|              |       | ⊕ |   |           |                 | (Cable cores:3) |

Terminal Nos. and cable cores

## Wiring Instructions

Shielded multi-core cables (CVV-S) of 1.25 mm<sup>2</sup> or 2 mm<sup>2</sup> must be used. Be sure to ground the shielded cable on the controller side.

If you don't need splash-proof, a 1.25 mm<sup>2</sup> or 2 mm<sup>2</sup> IV cable may be used for power and a 1.25 mm<sup>2</sup> shielded cable for humidity and temperature signals.

The maximum cable length is 100 m.

Never connect power supply to temperature output.

Always check wiring before supplying power.

Never share 24 V AC transformer to other products.

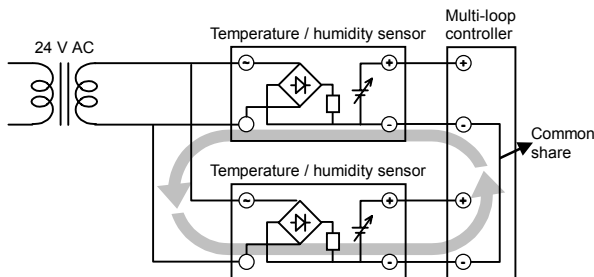
## Use of individual AC transformer of humidity transmitter

### ⚠ CAUTION



Use insulated transformer to supply 24 V AC power supply voltage  
 Never share 24 V AC power supply with other equipment.  
 If a transformer is shared with other equipment, loop will be formed at common and the sensor/transmitter may be damaged.

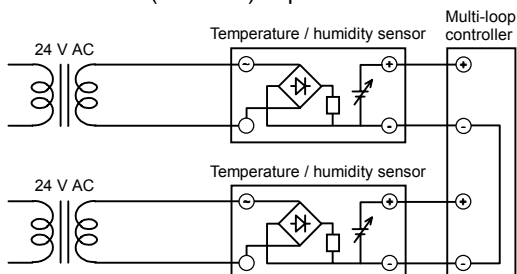
- Transformer (24 V AC power supply) shared



✗ Not Good

Common loop formed

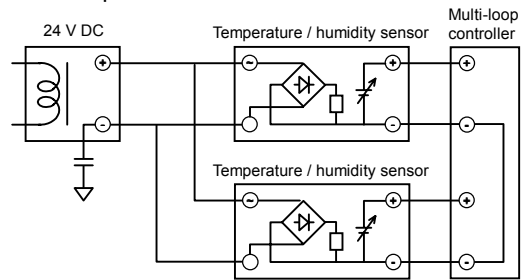
- Transformer (24 V AC) separated



○ Good

No common loop formed

- 24 V DC power shared



○ Good

Common loop formed, however, not so affected by common mode noise.

Follow the next instructions to prevent an induction current flowing from the humidity sensor to the controller input circuit, or to prevent an influence on the generating noise due to inadequate time constant of the controller input.

- Use a controller with a low pass filter with a removal ratio of 40dB or higher (normal mode).
- Connect an isolator to the controller input circuit if a removal ratio is unknown.
- If you use a Yamatake controller, no problem will occur.

## Maintenance

Since the temperature / humidity sensor have been inspected and adjusted accurately before shipment, they need no adjustment at the site. However, follow the maintenance instructions below:

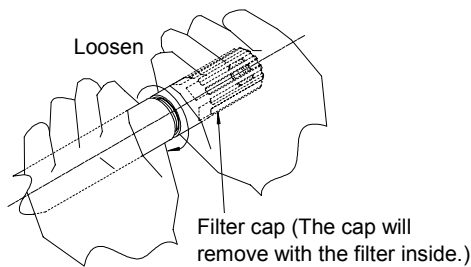
- Periodical inspection  
 Determine the periodical inspection intervals according to the amount of suspended dust and other contaminants in the environment. Regularly check the sensor's accuracy and the condition of its cover.
- Troubleshooting  
 If any problem occurs during operation, refer to the following table for appropriate solutions.

## Troubleshooting

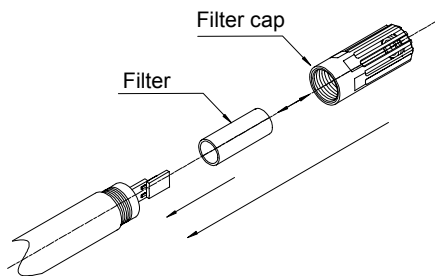
| Problem...            | Check...   | Action...   |
|-----------------------|--|---|
| - No output generated | - Check loose connection<br>- Check Incorrect wiring<br>- Check supply voltage | - Tighten the terminal brock<br>- Re-wire   |
| - Unstable output     | - Check sensor damage  | - Replace sensor  |
| - Slow response       | - Check the sensor for water leakage or condensation                           | - Remove the unit from bracket.<br>Dry the unit with no power.  |
| - Error in output     | - Check the installed location<br>- Check the dust, soil.                      | - Refer to the Installation instructions<br>- Clean filter<br>- Replace filter<br>- Humidity one point adjustment<br>- Replace sensor |

### 3) Replacing the filter:

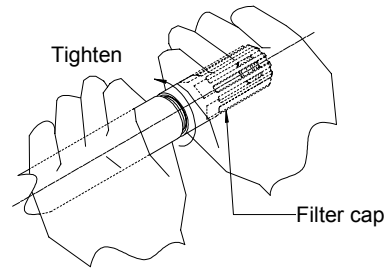
- (1) Prepare filter set (order separately) in advance.  
Remove the filter cap and filter by hand.



- (2) Cover the sensor with the new filter and then put the new filter cap over.

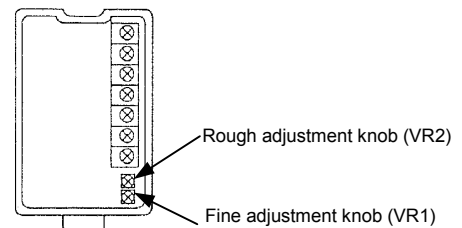


- (3) Tighten the filter cap.



### 4) Humidity one point adjustment

When you find a calibration error in the humidity sensor, re-calibrate the sensor using the adjustment volume (VR1, VR2) located on the circuit board. The output value is increased by turning this volume in clockwise direction and decreased by turning it counterclockwise. Use referenced humidity meter of adequate accuracy. A digital multimeter is recommended to check the output voltage.



Parts Identification of adjustment volume

## Cautions

1. After unpacking, age the transmitter in the ambient atmosphere for at least 24 hours.
2. To calibrate and adjust, take care the heat from human body or appliances.



Specifications are subject to change without notice.

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