

Insertable Thermostat for Ducts and Pipes

Overview

Model TY6801Z is an insertable thermostat for ducts and pipes that controls the temperature of air in ducts and liquid in tanks or pipes (two-position control).

Features

- Electric two-position control
The temperature sensing element, filled with liquid, detects changes in temperature. The built-in microswitch is for heating and cooling control.
- Easy temperature setting
Use the setting knob on the front to set the temperature.
- Differential gap adjustment
Use the dial for adjusting the differential gap to set a differential gap appropriate for the system.



Model Numbers

Model No.		Description
TY68		Insertable thermostat for ducts and pipes
	01	No selection
	Z	No power required
	60	Temperature setting range: -5–60 °C Allowable max. temperature of temperature sensor: 90 °C
	70	Temperature setting range: 25–90 °C Allowable max. temperature of temperature sensor: 120 °C
	80	Temperature setting range: 40–120 °C Allowable max. temperature of temperature sensor: 150 °C
	00	Capillary length 2 (m)*
	10	Capillary length 5 (m)*

* Actual length of capillary tube is 1.92–2.08 m for the 2 m type, 4.85–5.15 m for the 5 m type. Order the capillary considering the minimum required length.

Auxiliary devices (optional parts)

Model No.	Name	Note	Reference
112624AA-J	Immersion well	R1/2 SUS304	Figure 2. in • “Optional parts” in ■ “Dimensions” <i>AB-4074, Immersion Wells Specifications/Instructions</i>
83165370-002	Pressure fitting	1/2NPT	Figure 5. in • “Optional parts” in ■ “Dimensions”
DY3002A1021	Bulb holder	Construction material	Figure 6. in • “Optional parts” in ■ “Dimensions” <i>AB-7685 Specifications/Instructions</i>

Safety Instructions

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.

Caution for Instrumentation Design

Considering unexpected failures or contingencies, be sure to design and check safety of the system and equipment.

Recommended Design Life (Recommended Peri-od 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 11 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.

Prohibitions for installing this product



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 usage.

- Where special chemicals or corrosive gas (such as ammonia, sulfur, chlorine, ethylenic compound, acids, etc.) exist.
- Where water droplets or excessive damp air exists.
- Where condensation is made on the product.
- Where it would be exposed to direct sunlight, direct wind or rain, or high temperature.
- Where vibrations or shocks are applied.
- Where dust or particles will not easily enter into the product.
- Use this product for a controlled fluid that does not damage copper, copper alloy, silver wax, solder, etc.





Cautions for installing this product







- Mount the temperature sensor where representative temperature of the measuring object can be measured.
- Do not mount the temperature sensor in locations such as the following. Temperature may not be correctly measured.
 - Where exposed to warm or cold wind directly.
 - Where air stagnates or there is a draft.
 - Where water level changes largely.
 - Where the temperature sensor cannot be securely mounted.
 - Where unauthorized persons have easy access.
- Secure space around the product for maintenance.








Warnings and Cautions

 WARNING	Alerts users that improper handling may cause death or serious injury.
 CAUTION	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.)

 WARNING	
	Before wiring, setting, maintenance, or replacement, be sure to turn off the power source. Failure to do might cause electric shock or device failure.
	Ground this product with a ground resistance of less than 100 Ω. Improper grounding might cause electric shock or malfunction.
	If seal connectors or conduits cannot be used, use grommets. Failure to do so might cause electric shock due to touching the terminals.
	After wiring, changing the settings, engineering work, maintenance, or replacement, be sure to reattach the terminal cover. Failure to do so may result in electric shock.
	If you use this product to control a device that could cause a fire such as a heater, be sure to implement safety measures.

 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. Failure to do so may cause fire or electric shock.
	All wiring must comply with applicable codes and ordinances. Otherwise there is a danger of fire.
	Use crimp terminals with insulation for connections to the product terminals. Failure to do so may cause a short circuit leading to fire or device failure.
	Tighten the terminal screws with the specified torque. Insufficient tightening of the terminal screws may cause fire or overheating.
	Do not disassemble this product. Doing so may cause electric shock or device failure.

IMPORTANT

- Properly use this product according to the manual for this product and the manuals for other devices connected to this product.
- Implement the following safety measures.
 - Create a function to avoid or notify the abnormal conditions to other equipment if this product breaks down.
 - To use this product for controlling a heating device such as a hot water heater, create a function to prevent dry-heating. If the enclosed liquid leaks, the contacts are welded, etc., the output might get stuck on ON.

■ Specifications

Item		Specifications		
Model No.		Model TY6801Z60__	Model TY6801Z70__	Model TY6801Z80__
Size	Main unit	114 x 51.5 x 43.5 (mm) (excluding the protruding part)		
	Temperature sensor	φ9.5 x 100 mm	φ9.5 x 85 mm	φ9.5 x 70 mm
	Capillary thickness	φ2		
	Capillary length	2 m (1.92–2.08 m) 5 m (4.85–5.15 m)		
Differential gap		2–7 °C (variable)		2.5–8 °C (variable)
Switching operation		When the temperature rises, terminal C and L are Closed, terminal C and H are Open. When the temperature falls, terminal C and L are Open, terminal C and H are Closed.		
Switch contact rating	Motor load	125 V AC	250 V AC	
	Operating	8.5 A	4.5 A	
	Startup	51 A	27 A	
Minimum allowable current value		50 mA		
Environmental conditions	Operating conditions	Ambient temperature: –20–70 °C Ambient humidity: 30–90 % RH (without condensation)		
	Transport/storage conditions	Ambient temperature: –20–70 °C Ambient humidity: 30–90 % RH (without condensation)		
Mounting		Mount the thermostat using the mounting holes on the back side of it.		
Wiring		Wire to the terminal screws (M4) on the microswitch. Recommended tightening torque: 0.7–1.0 N·m		
Material	Main unit	Cold rolled steel plate SPCC (plated)		
	Cover	ABS resin		
	Temperature sensor	Copper, copper alloy, silver wax, and solder		
	Capillary tube	Phosphorus deoxidized copper C1220		
Weight		0.45 kg		
Color	Main unit	Silver		
	Cover	Light gray		
Accessories		Mounting main unit M3 screws (8 mm long, carbon wire for cold heading SWCH) (x3) Hexagonal nuts (soft steel wire rod SWRM) (x3) Washers (brass C2801) (x3) Grommet (nylon resin, black) (x1)		

Reference: ● “Auxiliary devices (optional parts)” in ■ “Model Numbers” (information on auxiliary devices)

■ Dimensions

● Thermostat

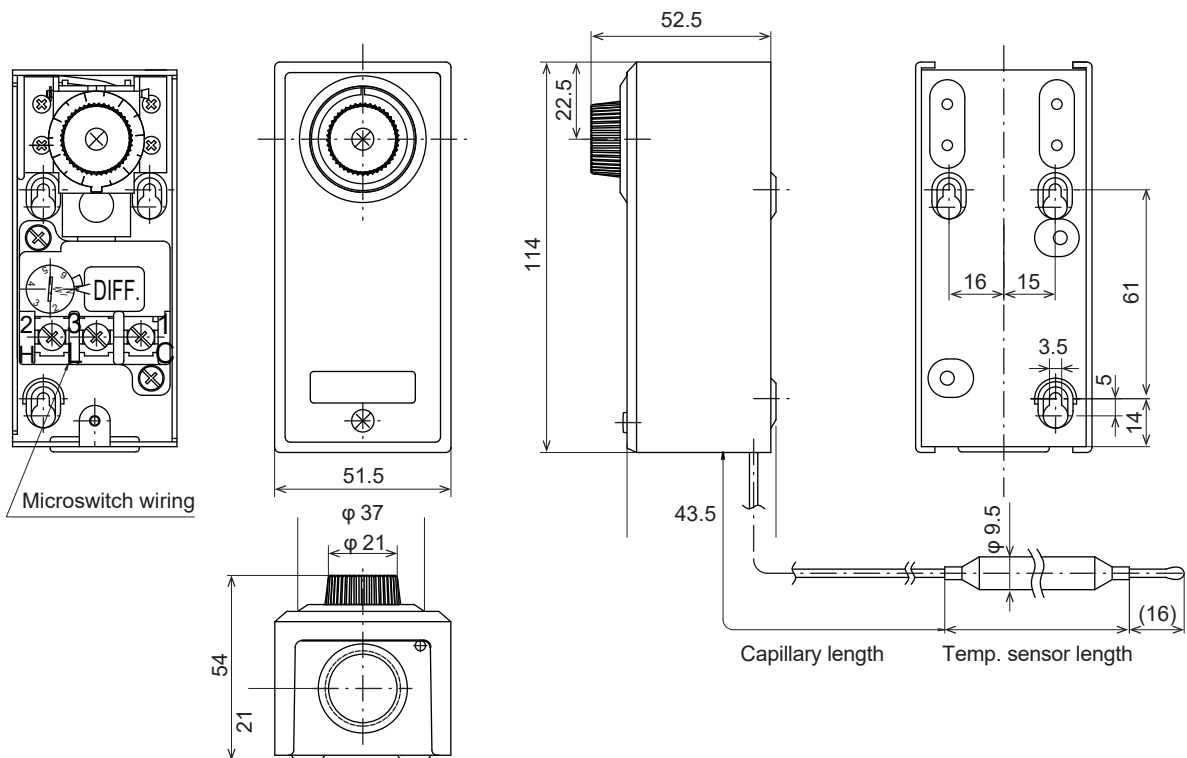


Figure 1 Dimensions (mm)

Table 1 Temperature sensor and capillary tube

Model No.	TY6801Z60	TY6801Z70	TY6801Z80
Temperature sensor	φ9.5 x 100 mm	φ9.5 x 85 mm	φ9.5 x 70 mm
Capillary length	2 m (1.92–2.08 m)	2 m (1.92–2.08 m)	2 m (1.92–2.08 m)
	5 m (4.85–5.15 m)	5 m (4.85–5.15 m)	5 m (4.85–5.15 m)

● **Optional parts**

Immersion well

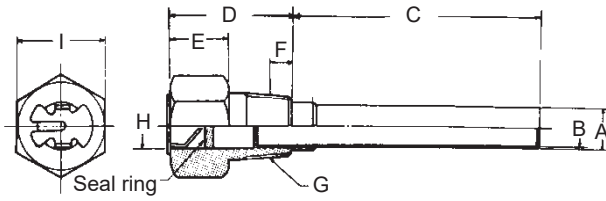


Figure 2 Model No.112624AA-J Dimensions

Table 2 Immersion well

Model No.	Dimensions diagram	Dimensions (mm)								
		A ϕ	B ϕ	C	D	E	F	G	H ϕ	I
112624AA-J	Figure 2	16	14	140	50	30	8	R 1/2 screw	14.3	23

Pressure fitting

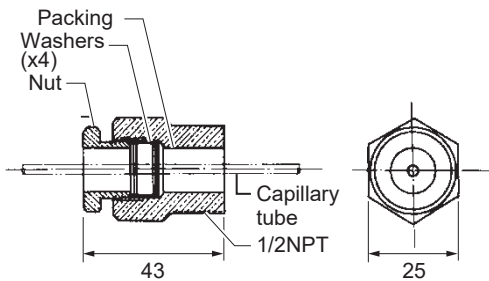


Figure 3 Dimensions of Model 83165370-002 (mm)

Table 3 Pressure fitting

Max. pressure	490 KPa
Upper temperature limit	80 °C

- Set the packing and washers on the plug and screw in the nut.
- When the clamping force suddenly increases, turn the nut by at least half a turn to tighten it.

(*Turning the nut too much may damage the packing.)

- Make sure that the threads of the nut are not visible.
- Make sure that no fluid leaks.
- Do not reuse a used packing. Use a new one.

Bulb holder

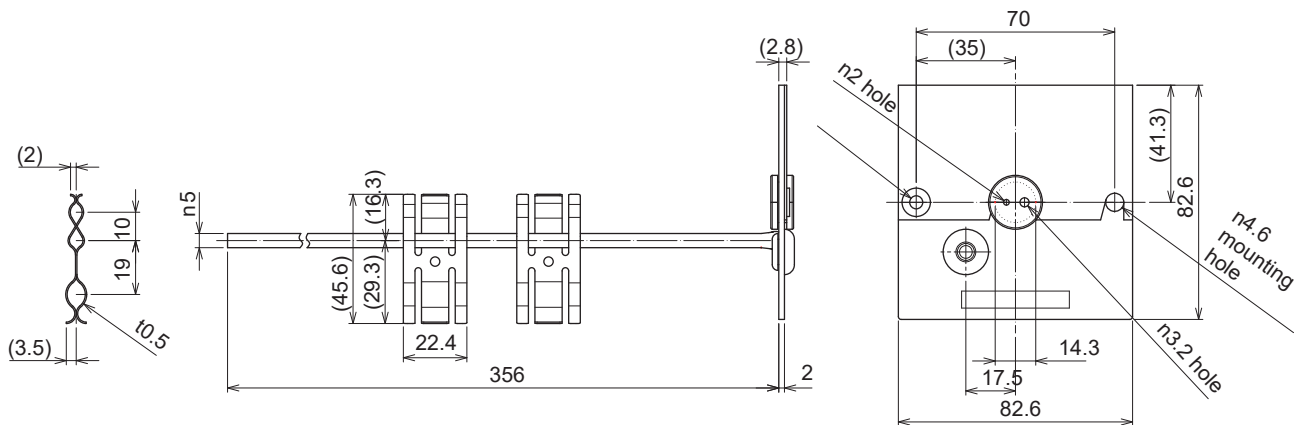




Figure 4 Dimensions of Model DY3002A1021 (mm)

■ Mounting

⚠ CAUTION	
	Install 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. Failure to do so may cause fire or electric shock.

● Prohibitions for installing this product

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 usage.

- Where special chemicals or corrosive gas (such as ammonia, sulfur, chlorine, ethylenic compound, acids, etc.) exist.
- Where water droplets or excessive damp air exists.
- Where condensation forms on the product.
- Where it would be exposed to direct sunlight, direct wind or rain, or high temperature.
- Where vibrations or shocks are applied. (direct installation on an air conditioner, duct, etc.)
- Where dust or particles can easily enter into the product.
- Where unauthorized persons have easy access.
- Use this product for a controlled fluid that does not damage copper, copper alloy, silver wax, solder, etc.

● Cautions for installing this product

- Mount the temperature sensor where representative temperature of the measuring object can be measured.
- Do not mount the temperature sensor in locations such as the following.
Temperature may not be correctly measured.
 - Where exposed to warm or cold wind directly.
 - Where air stagnates or there is a draft.
 - Where water level changes largely.
 - Where the temperature sensor cannot be securely mounted.
- Secure space around the product for maintenance.

● Notes for installation

Install the product on a wall the ambient temperature of which does not change by much.

Reference: *AB-4074, Immersion Wells Specifications/Instructions* (when installing the immersion well)
AB-7685, Bulb Holder Specifications/Instructions (when using the bulb holder)

Note: The operation value changes by about 1.0 °C for every 10 °C change in the ambient temperature of the main unit.

Example: When the ambient temperature of the main unit is 20 °C at the time of installation and the actual operating temperature is 0 °C at that time

- If the ambient temperature of the main unit changes to 10 °C, the actual operating temperature will be +1.0 °C.
- If the ambient temperature of the main unit changes to 30 °C, the actual operating temperature will be -1.0 °C.

Main unit

- Do not install this product where there is vibration.
- Do not install this product where the product gets splashed by water such as a spa facility or pool.
- Do not turn screws other than the cover mounting screw, terminal screws, and ground screw.

Capillary tube

- If the capillary tube is bent or twisted, it may be blocked, preventing the enclosed liquid from moving and impairing the tube's function.
- Ensure that the bending radius is at least 10 mm.
- Install this product in a place free of vibration.
- Do not hold the capillary tube when carrying the product.

Temperature sensor

- Ensure that the external pressure is 2.94 MPa or lower.
- Do not hold the temperature sensor when carrying the product.
- Do not fold or damage the pinch section with enclosed liquid at the tip of the temperature sensor.
- Do not seriously damage or scratch the temperature sensor.
- Use this product for a controlled fluid that does not damage the materials of the temperature sensor (copper, copper alloy, silver wax, and solder).
- If the temperature sensor is attached at a higher position than the main unit, part of the capillary tube should be lower than the main unit. Water made by condensation, etc. may enter the main unit and cause a short circuit, fire, or failure.
- Use the temperature sensor in an environment where the liquid temperature takes 3 minutes or more to change by 1°C and the room temperature takes 18 minutes or more to change by 1°C.

Remark: The relationships between the temperature of the main unit, the temperature of the temperature sensor, and the temperature of the capillary tube are not limited.

● Installation method

Secure this product using three keyhole-shaped mounting holes inside the main unit.

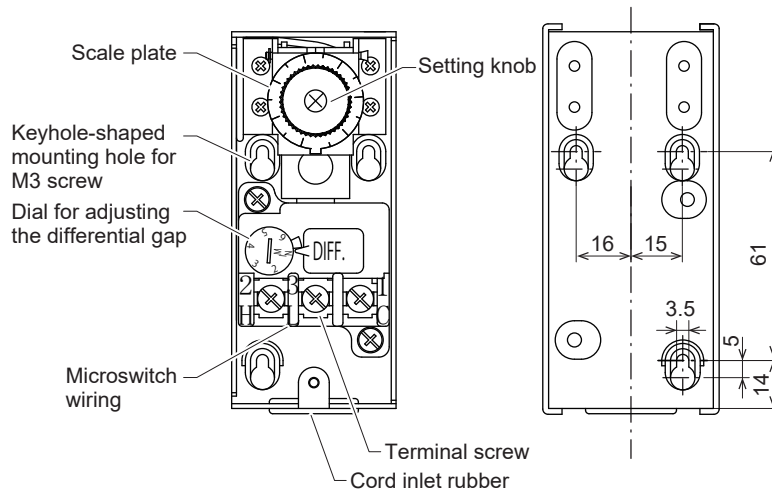


Figure 5 Main unit mounting (mm)

Note: Tighten the screw at part A of the keyhole-shaped mounting hole in the figure below. Tightening the screw at part B deforms the main unit, which causes problems.

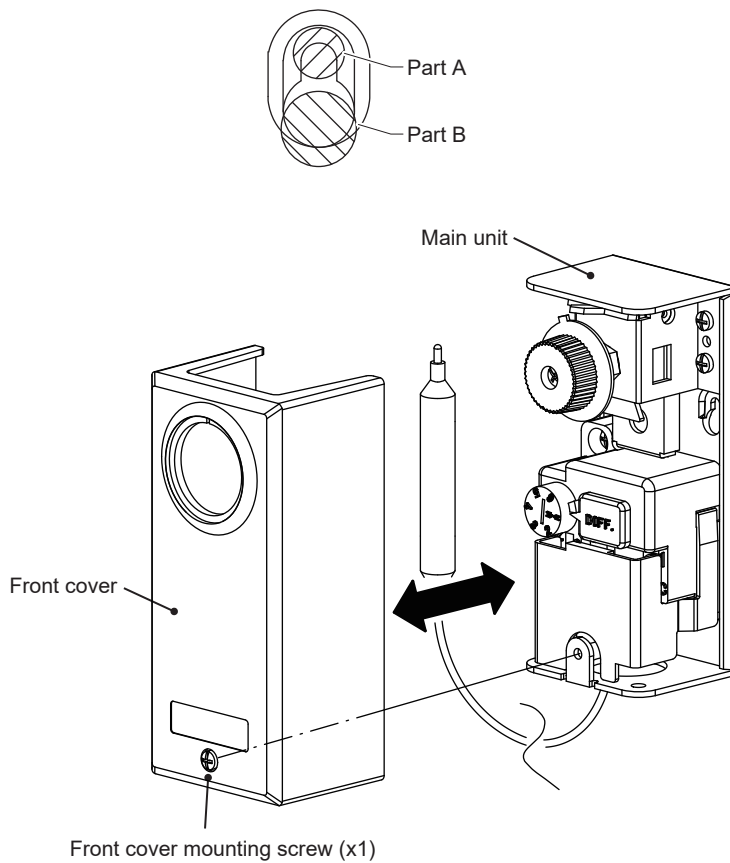


Figure 6 Attaching/detaching the front cover

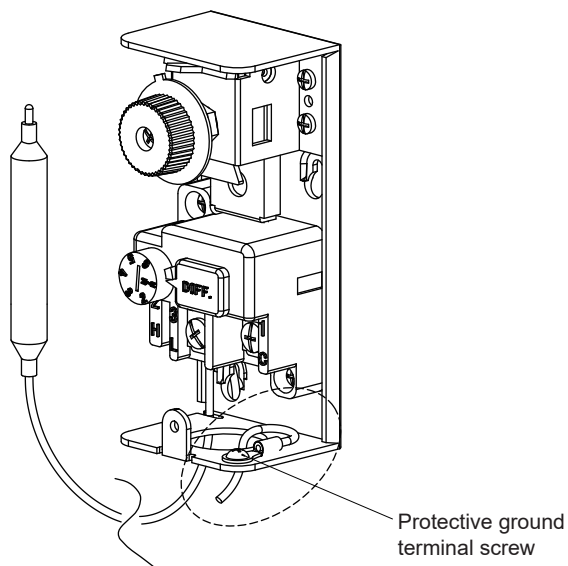


Figure 7 Location of protective ground terminal screw

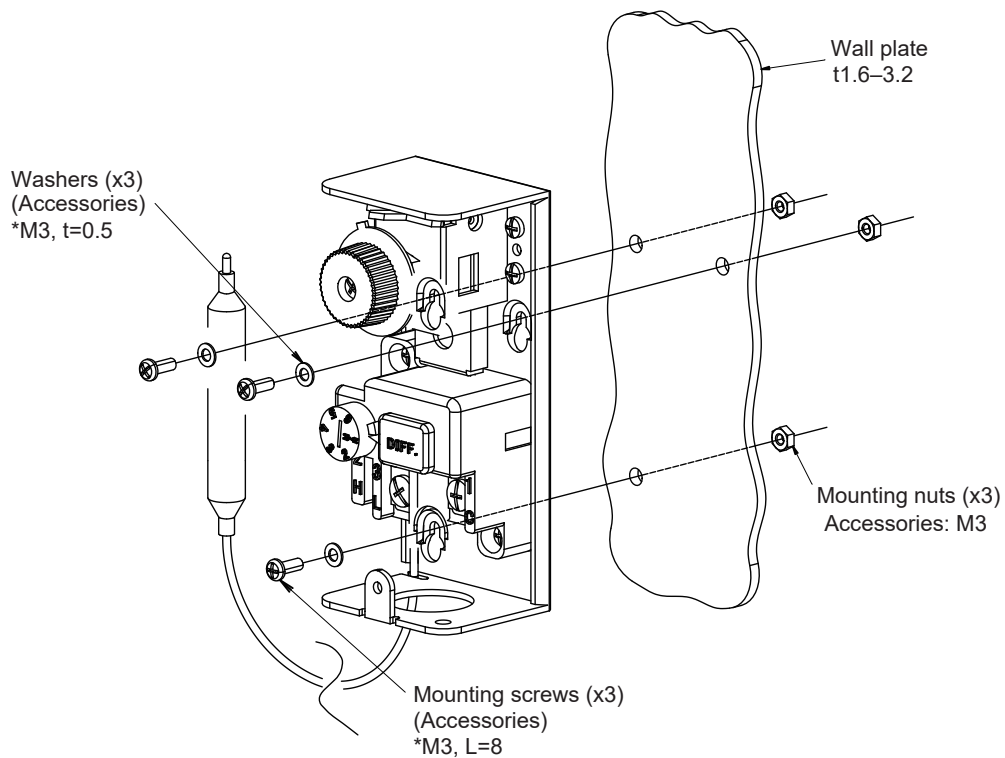
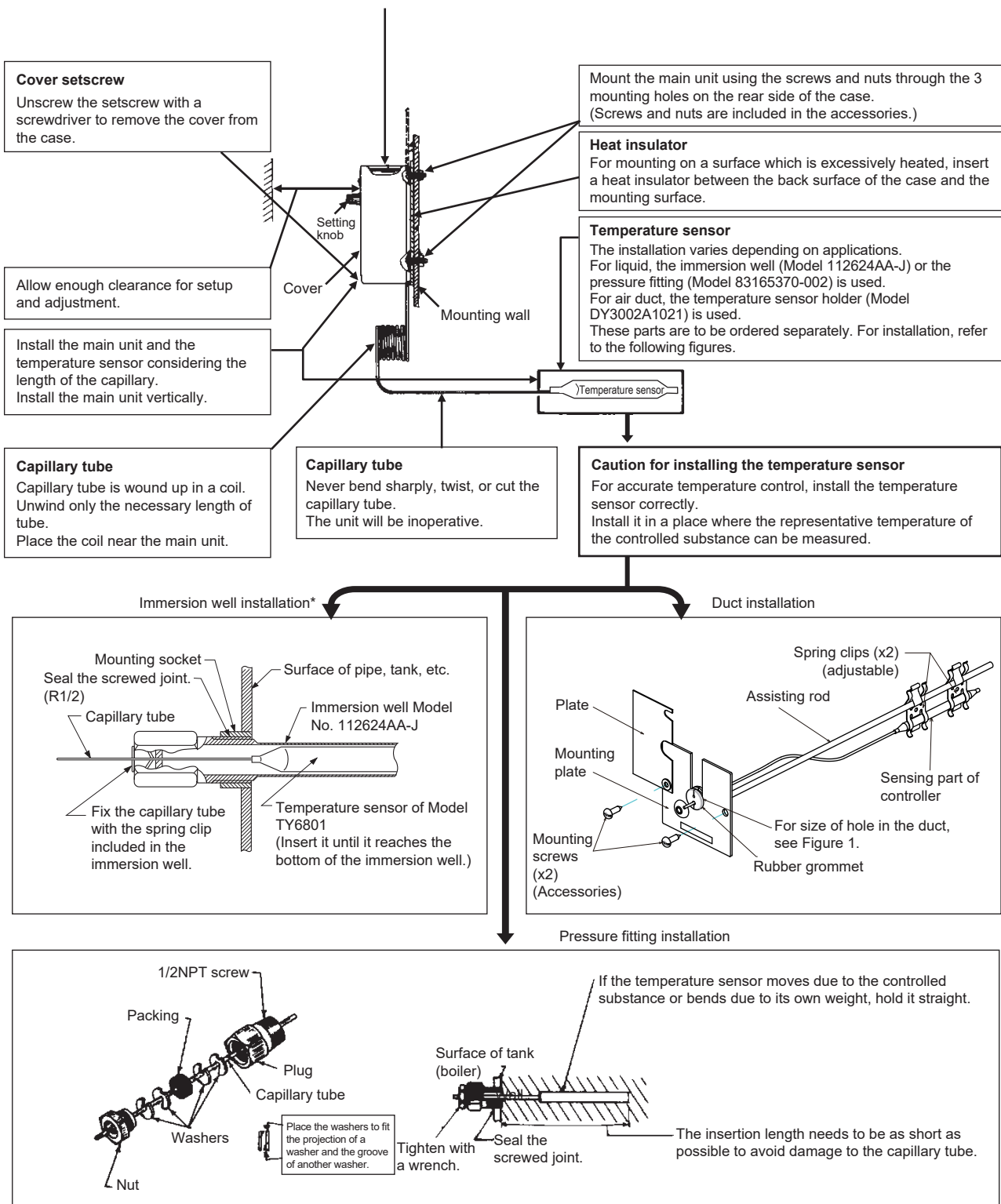


Figure 8 Mounting of the product on a wall or panel



* If the immersion well is used, fill the well with silicon grease (model No. 83165527-001) to improve the response performance of the temperature sensor.

Figure 9 Mounting

● Attaching the grommet (accessory part)

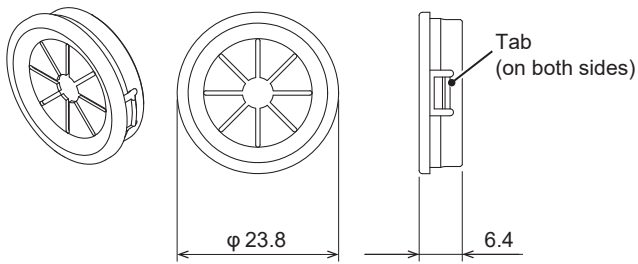


Figure 10 Grommet (mm)

For the included grommet, use the wiring port at the bottom of the main unit shown in Figure 12. If seal connectors or conduits cannot be used, use grommets. Failure to do so might cause electric shock due to touching the terminals. The grommet prevents fingers from entering into the opening in order to prevent electric shock.

* Before wiring, attach the grommet.

- (1) Insert the grommet in the wiring port as illustrated in Figure 11.

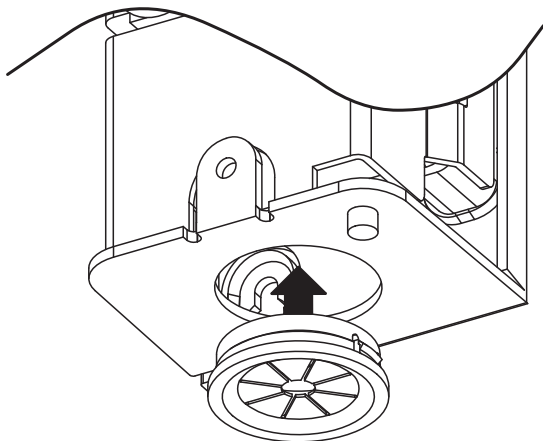


Figure 11 Attaching the grommet

- (2) Push the grommet until the tab clicks.
- (3) Ensure the grommet is firmly inserted.

* Pass wires through the grommet following the instructions in this manual.

■ Wiring

⚠ WARNING	
	Before wiring, be sure to turn off the power source. Failure to do so may result in electric shock or device failure.
	Ground this product with a ground resistance of less than 100 Ω. Improper grounding may cause electric shock or malfunction.
	After the wiring work, attach the cover at the original position. Failure to do so may result in electric shock.
	If you use this product to control a device that could cause a fire such as a heater, be sure to implement safety measures.

⚠ CAUTION	
	Wire and use this product under the conditions specified by this manual. Failure to do so may cause fire or device failure.
	Wiring must be performed by personnel qualified to do instrumentation and electrical work. Failure to do so may cause fire or electric shock.
	All wiring must comply with applicable codes and ordinances. Otherwise there is a danger of fire.
	Use crimp terminals with insulation for connections to the product terminals. Failure to do so may cause a short circuit leading to fire or device failure.
	Tighten the terminal screws with the specified torque. Insufficient tightening of the terminal screws may cause fire or overheating.

<p>IMPORTANT</p> <ul style="list-style-type: none"> • To use this product properly, follow the instructions described in this manual and the manuals for other devices connected to this product. • Connect appropriate loads, which satisfy the contact rating specified in the specifications, to the terminals. • If a timer, auxiliary relays, etc. are used for additional features, select reliable parts and implement them in circuits correctly. • Correctly supply power, voltage and frequency to the devices as specified in their specifications. • During wiring, do not scratch, deform, or damage the temperature sensor. Doing so may cause incorrect operation. • After wiring, check that wires are correctly connected. • Incorrect wiring may cause device damage or malfunction.
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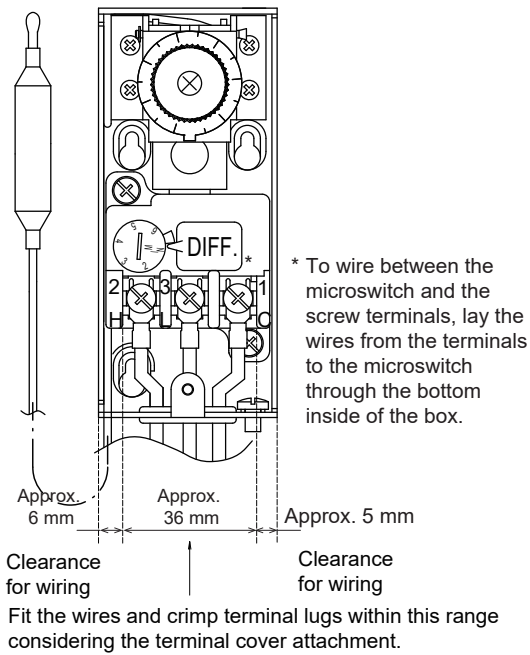


Figure 12 Wiring diagram

● **Wiring method**

· If a cable gland, conduit or grommet is used

- (1) Remove the front cover and terminal cover.

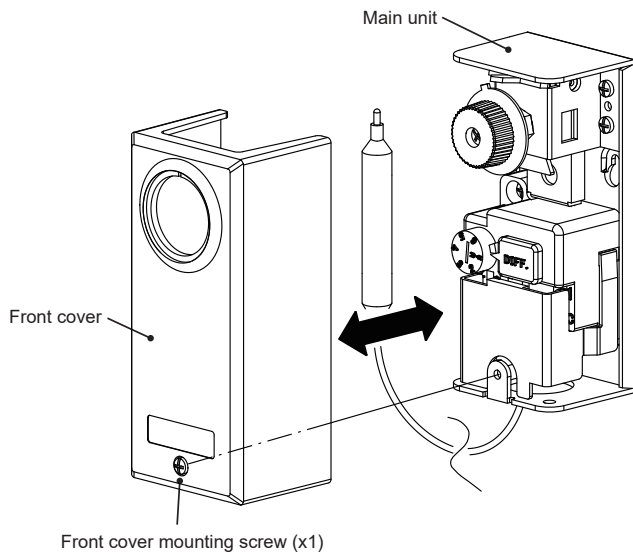


Figure 13 Attaching/detaching the front cover

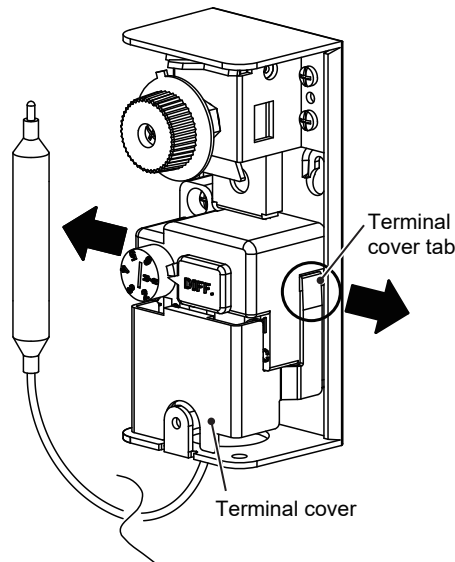
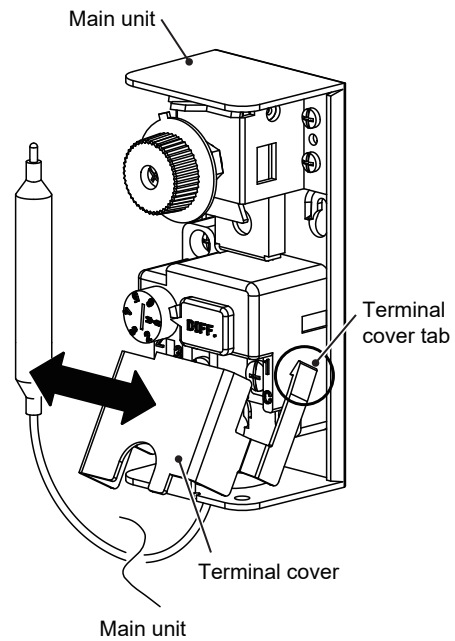


Figure 14 Attaching/detaching the terminal cover

- (2) Check the power supply to be used.
 - High insulation performance
 - Enough current capacity
- (3) Turn off equipment that makes up the circuit.
- (4) Pass the electric wires through a cable gland or conduit.
- (5) Pull the electric wires into the case.
- (6) Connect the wires using the specified round terminals (M4 size).
- (7) Check that the wires are correctly placed.
- (8) Reattach the terminal cover (figure 14) and the front cover (figure 13).

If cable glands or conduits are not used, use grommets. Hold the wires near the product in order to reduce the tension on the wires.

● **Wiring diagram and example**

Terminal screws are provided with the microswitch to connect electric wires. Refer to the wiring diagram below.

Note: Check terminal markings before making connections.

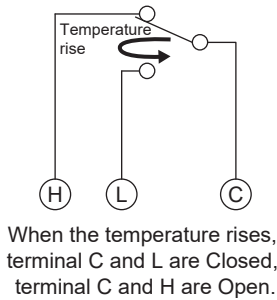
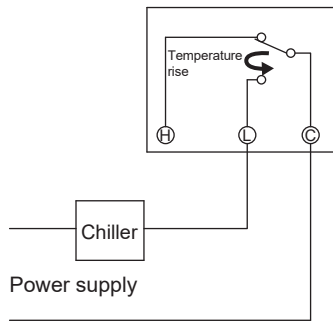
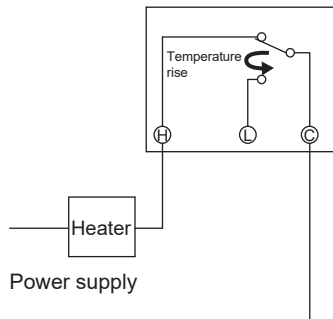


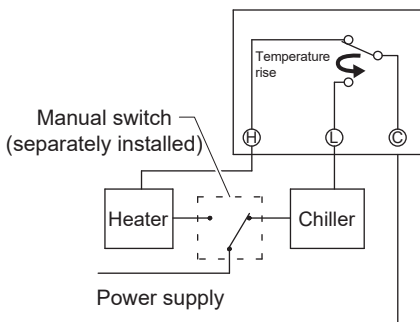
Figure 15 Internal wiring diagram



Simple automatic control system that uses the chiller only



Simple automatic control system that uses the heater only



Manual cooling/heating switching method individually equipped with a manual switch

■ **Settings**

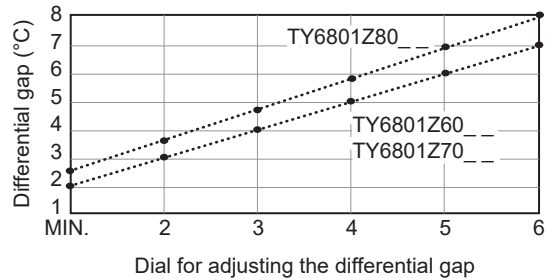
Note the following points during setup and adjustment.

- Do not turn screws other than the setting knob, the dial for adjusting the differential gap, and terminal screws.

● **Temperature setting**

Here, the procedure for model No. TY6801Z6___ with a temperature rise point of 30 °C and a temperature drop point of 25 °C is described as an example.

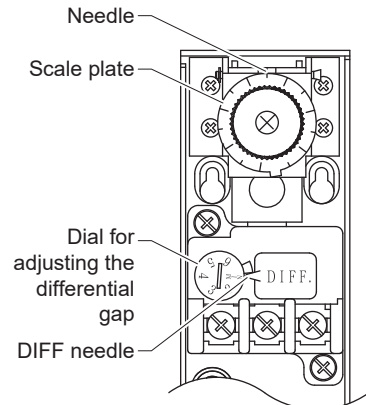
- (1) Adjust the higher set temperature to 30 °C. Turn the scale plate and position the needle at 30.
- (2) Adjust the lower set temperature to 25 °C. Calculate the differential gap. Difference between ON and OFF: 30 °C – 25 °C = 5 °C
- (3) When the differential gap temperature is 5 °C, the scale position on the dial for adjusting the differential gap should be 4.



Model No.	Differential gap (°C)	
	MIN	MAX
TY6801Z60__	2	7
TY6801Z70__	2.5	8
TY6801Z80__	2.5	8

- (4) Turn the dial for adjusting the differential gap to move the DIFF needle to 4.

* Note that the scale on the dial for adjusting the differential gap does not indicate the differential gap (°C).



- (5) If the set temperature contains an error, redo steps (1) to (4) for readjustment.
- (6) Reattach the front cover.
- (7) Check the operation.

Operations

Power on the thermostat to run it automatically.
 Installing the temperature sensor on the controlled target and turning on the device starts operation.
 An operation example of model No. TY6801Z6___ is shown below.

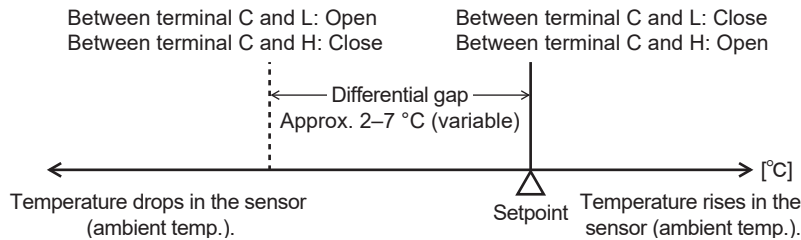


Figure 16 Setpoint and differential gap

Cooling control

Example of wiring for cooling and controlling the measuring object to 0 °C (temperature setpoint: 0 °C, differential gap: 3 °C)

- (1) When the temperature of the controlled target rises to the setpoint (0 °C), the internal switch works to close the terminal C and L, and then the chiller starts.
- (2) When the temperature of the controlled target falls to -8 °C, that is, setpoint (0 °C) minus the differential gap (3 °C), the internal switch works to open the terminal C and L, and then the chiller stops.
- (3) The operations (1) and (2) described above are repeated automatically to control the temperature at the setpoint (0 °C).

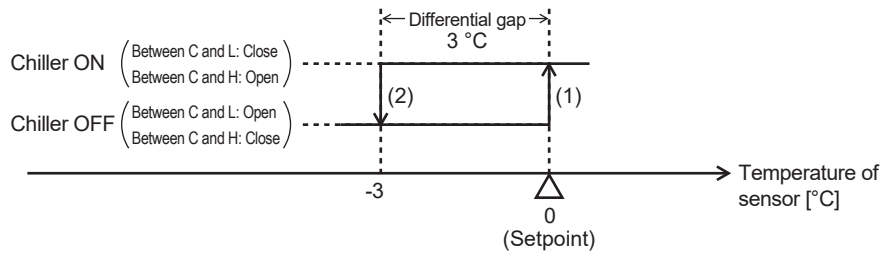


Figure 17 Example of cooling control

Heating control

Example of wiring for heating and controlling the measuring object to 50 °C (temperature setpoint: 50 °C, differential gap: 3 °C)

- (1) When the temperature of the controlled target falls to 47 °C, that is setpoint (50 °C) minus the differential gap (3 °C), the internal switch works to close the terminal C and H, and then the heater starts.
- (2) When the temperature of the controlled target rises to the setpoint (50 °C), the internal switch works to open the terminal C and H, and then the heater stops.
- (3) The operations (1) and (2) described above are repeated automatically to control the temperature at the setpoint (50 °C).

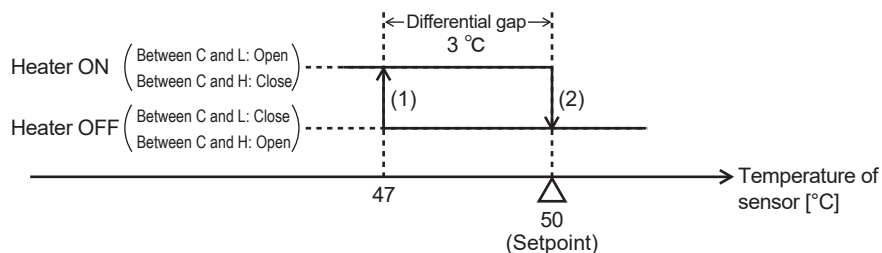


Figure 18 Example of heating control

Note: The solenoid valve may be frequently turned ON/OFF depending on the device. In this case, increase the differential gap by turning the dial for adjusting the differential gap.

● **Operation check**





IMPORTANT

- Check that the installed device operates normally. If the operation point contains an error, change the set value to remove the error.
- Because of the delayed response of the detecting element, the differential gap may seem to be large. Adjust the mounting location, etc. to eliminate delayed responses.


- (1) Turn on the power to the product.
- (2) Turn the setting knob to set the setpoint.
- (3) Check that the control target equipment runs or stops normally as intended.
- (4) Turn off the power to the product.

■ **Maintenance**

⚠ WARNING

	Before maintenance, be sure to turn off the power source. Failure to do so may result in electric shock or device failure.
	Ground this product with a ground resistance of less than 100 Ω. Improper grounding may cause electric shock or malfunction.
	After maintenance work, be sure to reattach the cover. Failure to do so may result in electric shock.
	If you use this product to control a device that could cause a fire such as a heater, be sure to implement safety measures.

⚠ CAUTION

	Do not disassemble this product. Doing so may cause electric shock or device failure.
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Determine the appropriate cycle of maintenance and inspection, taking into consideration the environmental conditions, frequency of use, etc. If use is only occasional, inspection before use is recommended.

Maintain and inspect the product following the procedures below.

- (1) Wipe dirt and dust on the temperature sensor and capillary tube using a soft clean cloth or brush so that the element can be effectively exposed to the air.
- (2) Check that the temperature sensor is not deformed, flattened, or damaged.
- (3) In the same way as (1), wipe the setting knob and the terminal posts of the microswitch and the nearby parts.
- (4) Check that the terminal screws are firmly tightened.
- (5) Check that the wires are well insulated.

■ **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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Building Systems Company

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Rev. 1.1 Feb. 2023
(J: AI-7660, Rev. 1.1)