

MODEL OB-30, OB-30U OB-31, OB-31U TEMPERATURE REGULATOR

INSTRUCTION MANUAL

Thank you very much for choosing the Yoshitake's product. To ensure the correct and safe use of the product, please read this manual before use. This manual shall be kept with care for future references.

The symbols used in this manual have the following meanings.

| | | |
|---|----------------|---|
|  | Warning | This symbol indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury. |
|  | Caution | This symbol indicates a hazardous situation that, if not avoided, may result in minor or moderate injury or may result in only property damage. |

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YOSHITAKE

1. Specifications

■ Body

| | | | | |
|----------------------------|---------------------------------|---------------------------------|-------------------------|---------------------------------|
| Model | OB-30 | OB-30U | OB-31 | OB-31U |
| Purpose | For heating | | For cooling | |
| Application | Steam, Hot water | | Cold water, Refrigerant | |
| Maximum pressure | 1.0 MPa (1.7 MPa for hot water) | | 1.7 MPa | |
| Max. differential pressure | 1.0 MPa | | | |
| Valve seat leakage | 0.05% or less of rated flow | | | |
| Max. temperature | 185°C | | | |
| Material | Body | Bronze | | |
| | Valve disc | PTFE | | |
| | Valve seat | Stainless steel | | |
| Connection | JIS Rc screwed | JIS Rc screwed (union joint) | JIS Rc screwed | JIS Rc screwed (union joint) |

■ Sensor

| | | |
|---------------------------|------------------------------------|---------------------------------------|
| Heated fluid | Cold and hot water, Oil, Liquid | |
| Cooled fluid | | |
| Maximum pressure | 1.0 MPa | |
| Material | Thermal bulb | Copper pipe (Nickel chrome plated) |
| | Capillary tube | Copper |
| | Flexible tube | Stainless steel |
| Standard capillary length | 2 m | |
| Connection | JIS R1/2 screwed | |

- Available with thermal well (stainless steel made).
- Available with capillary of 3 or 5 meters.

■ Temperature adjusting range

| Temperature adjusting range (°C) | Withstand temperature (°C) |
|----------------------------------|----------------------------|
| 0-35 | 75 |
| 25-70 | 110 |
| 40-100 | 140 |
| 60-130 | 170 |
| 70-150 | 190 |

- The term “withstand temperature” means the temperature from pressure resistance of the bellows.
- The maximum temperature of the thermal bulb for cooling is 100°C.



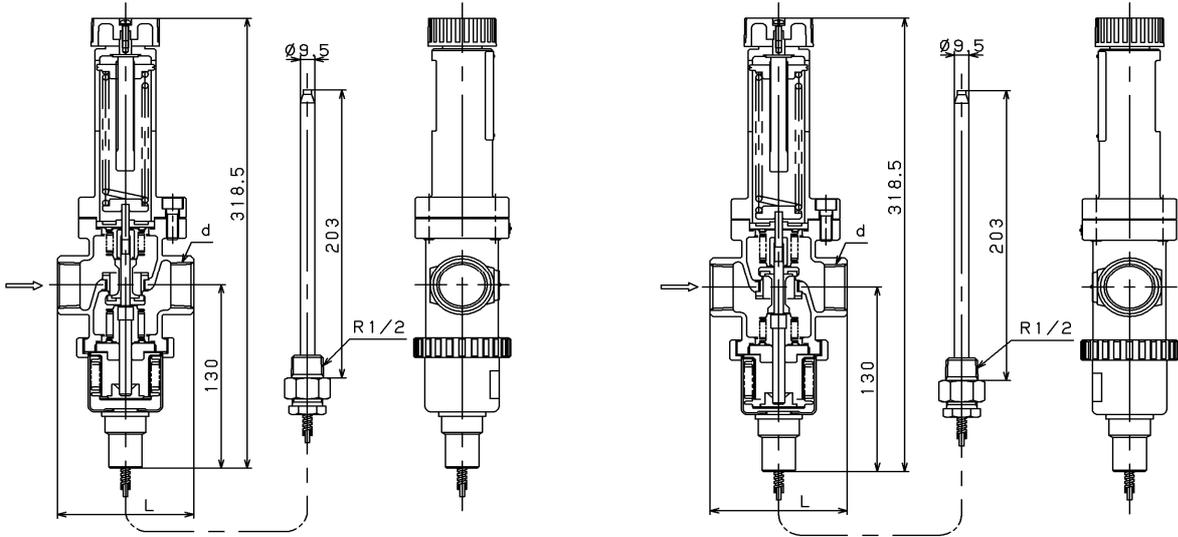
Caution

Please confirm that the indications on the product correspond with the specifications of the ordered product model before use.

* If they are different, please contact us without using the product.

2. Dimensions and Weights

■ OB-30, OB-31



OB-30

OB-31

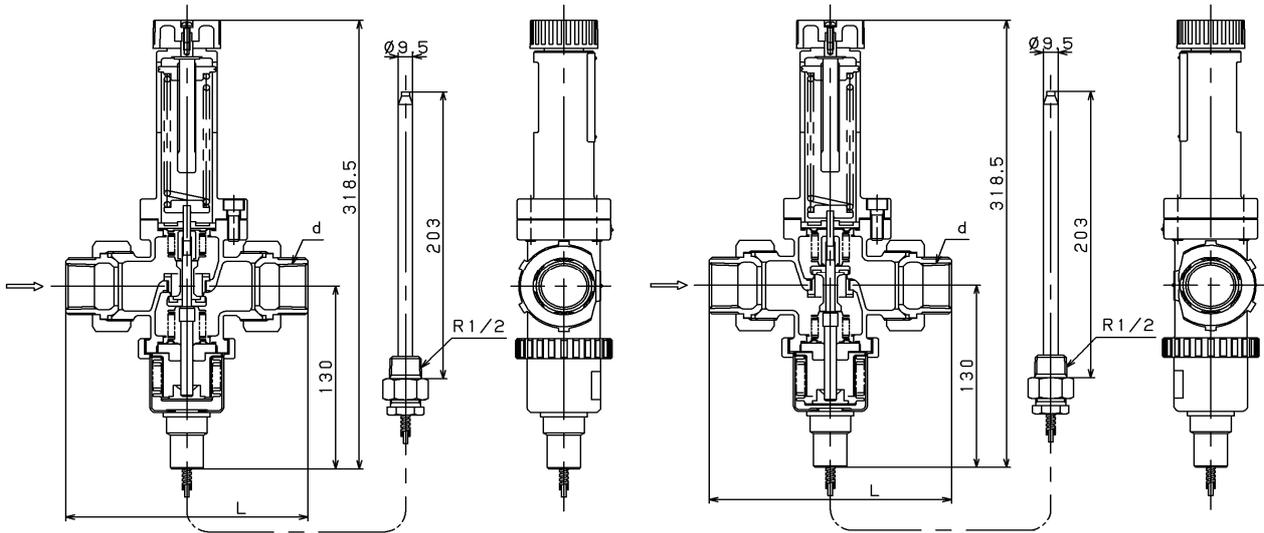
• Body (mm)

| Nominal Size | d | L | Weight (kg) |
|--------------|--------|----|-------------|
| 15A | Rc 1/2 | 75 | 2.1 |
| 20A | Rc 3/4 | 80 | 2.2 |
| 25A | Rc 1 | 90 | 2.4 |

• Sensor

| Capillary length | Weight |
|------------------|--------|
| 2 m | 0.6 kg |

■ OB-30U, OB-31U



OB-30U

OB-31U

• Body (mm)

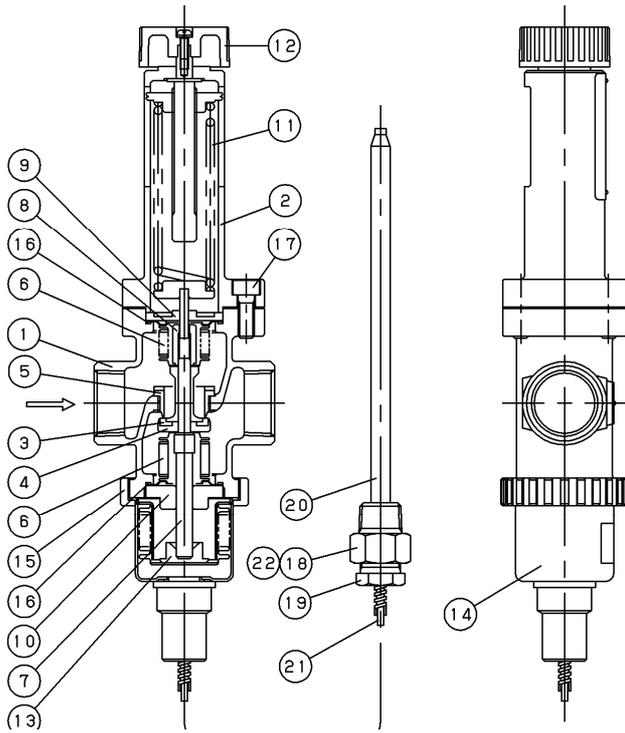
| Nominal Size | d | L | Weight (kg) |
|--------------|--------|-----|-------------|
| 15A | Rc 1/2 | 160 | 3.1 |
| 20A | Rc 3/4 | 160 | 3.1 |
| 25A | Rc 1 | 160 | 3.1 |

• Sensor

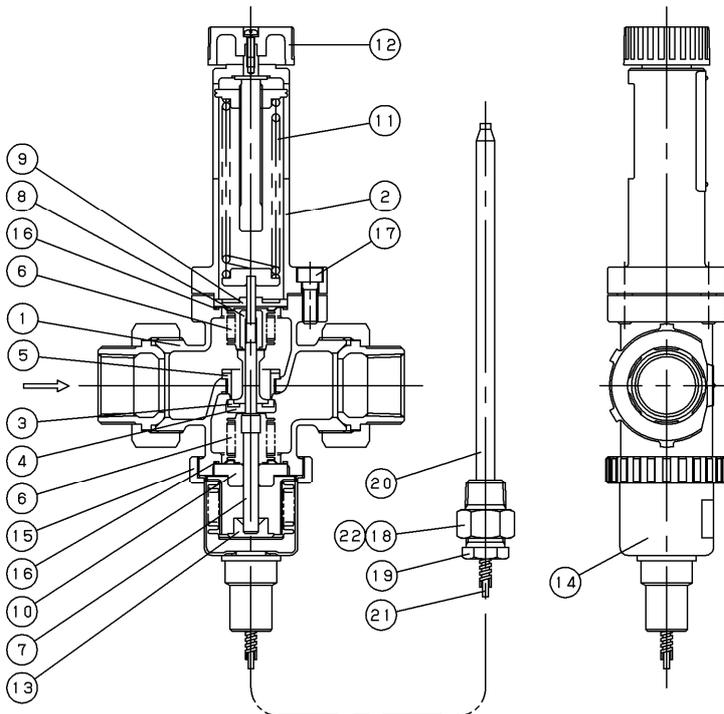
| Capillary length | Weight |
|------------------|--------|
| 2 m | 0.6 kg |

3. Operation

■ OB-30, OB-30U



OB-30



OB-30U

| No. | Part name |
|-----|-------------------|
| 1 | Body |
| 2 | Spring chamber |
| 3 | Disc |
| 4 | Valve |
| 5 | Valve seat |
| 6 | Balance bellows |
| 7 | Spindle |
| 8 | Nut |
| 9 | Guide |
| 10 | Guide |
| 11 | Spring |
| 12 | Handle |
| 13 | Bellows follower |
| 14 | Bellows |
| 15 | Ring |
| 16 | Gasket |
| 17 | Bolt |
| 18 | Bushing |
| 19 | Washer of packing |
| 20 | Thermal bulb |
| 21 | Capillary tube |
| *22 | Packing |

The parts marked “*” are available as consumable supply.

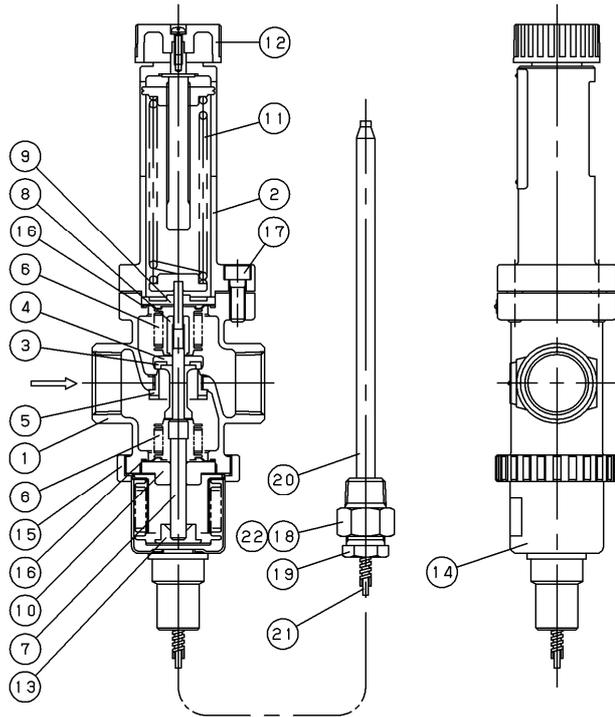
Thermal bulb with Thermal well (stainless steel) does not need bushing for thermal bulb.

Heating the thermal bulb [20] makes its inner pressure rise, while cooling it makes the pressure lower. The bellows [14] expands/contracts responding to the change in the internal pressure that is transmitted through the capillary tube [21], and this allows the valve [4] open/close.

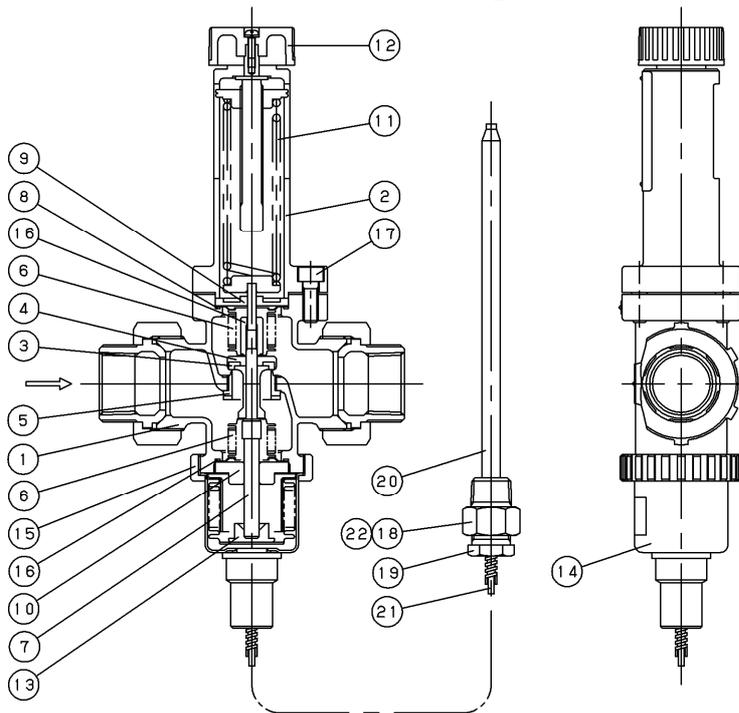
When the temperature of the thermal bulb rises, the bellows expands and applies lifting force to the spindle [7] to close the valve. When the temperature of the bulb lowers, the downward force applied to the spindle by the spring [11] opens the valve.

The set temperature can be adjusted by turning the handle [12] to change the load of the spring.

■ OB-31, OB-31U



OB-31



OB-31U

| No. | Part name |
|-----|-------------------|
| 1 | Body |
| 2 | Spring chamber |
| 3 | Disc |
| 4 | Valve |
| 5 | Valve seat |
| 6 | Balance bellows |
| 7 | Spindle |
| 8 | Nut |
| 9 | Guide |
| 10 | Guide |
| 11 | Spring |
| 12 | Handle |
| 13 | Bellows follower |
| 14 | Bellows |
| 15 | Ring |
| 16 | Gasket |
| 17 | Bolt |
| 18 | Bushing |
| 19 | Washer of packing |
| 20 | Thermal bulb |
| 21 | Capillary tube |
| *22 | Packing |

The parts marked “**” are available as consumable supply.

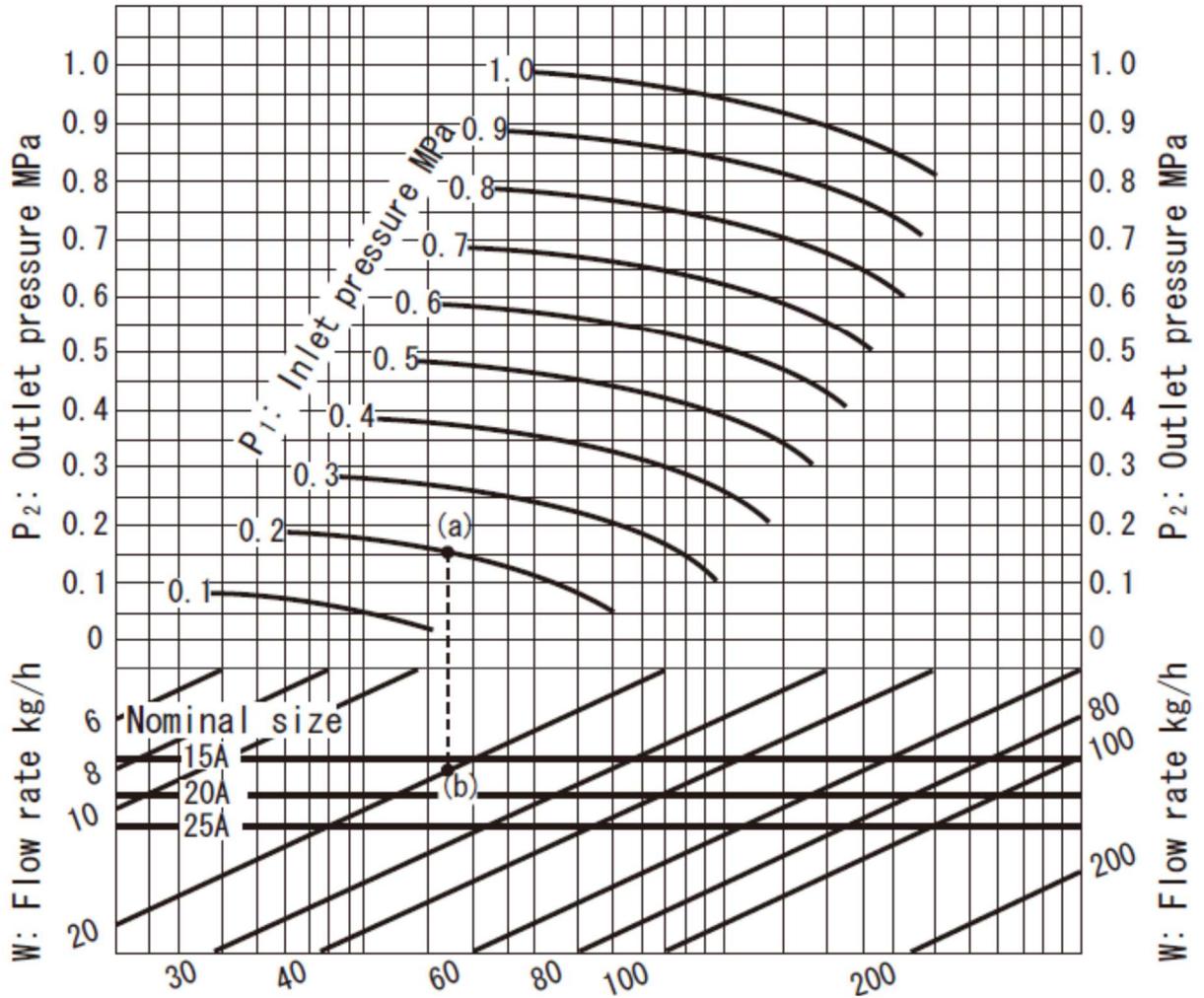
Heating the thermal bulb [20] makes its inner pressure rise, while cooling it makes the pressure lower. The bellows [14] expands/contracts responding to the change in the internal pressure that is transmitted through the capillary tube [21], and this allows the valve [4] open/close.

When the temperature of the thermal bulb rises, the bellows expands and applies lifting force to the spindle [7] to open the valve. When the temperature of the bulb lowers, the downward force applied to the spindle by the spring [11] closes the valve.

The set temperature can be adjusted by turning the handle [12] to change the load of the spring.

4. Nominal Size Selection

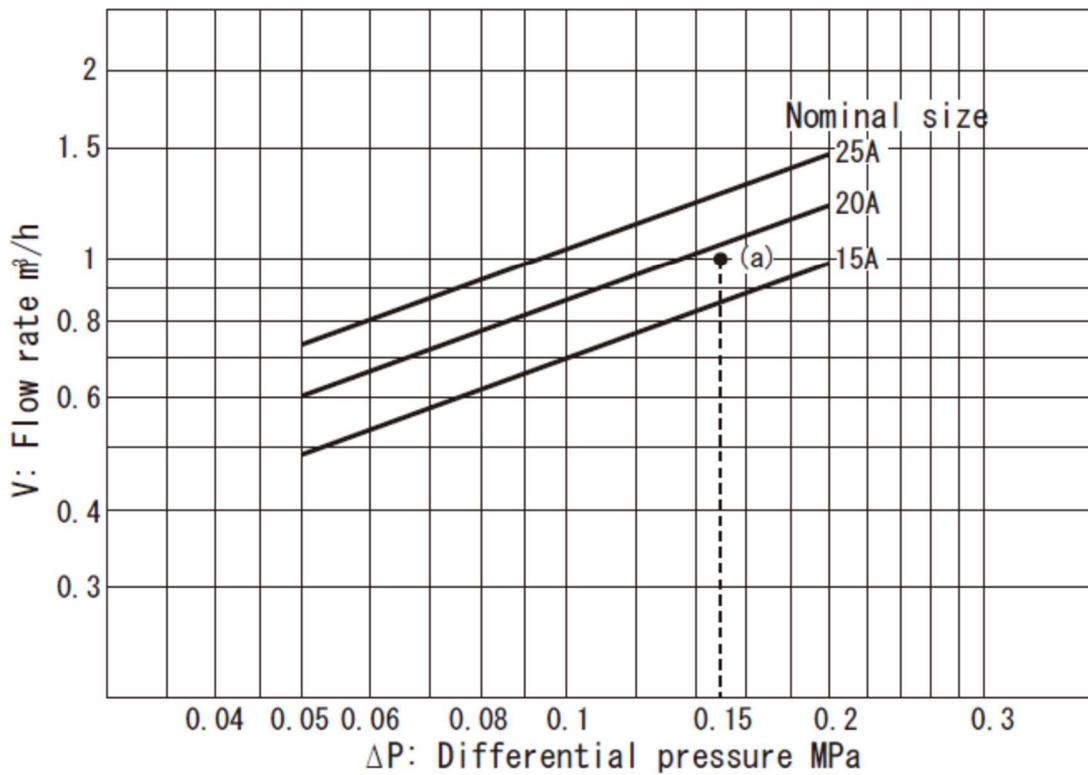
■OB-30, OB-30U
[For steam]



<How to use the chart>

When selecting the nominal size of a temperature regulator whose inlet pressure (P₁), outlet pressure (P₂), and steam flow rate are 0.2 MPa, 0.15 MPa, and 20 kg/h, respectively, first find intersection point (a) of the inlet pressure of 0.2 MPa and the outlet pressure of 0.15 MPa. Trace down vertically from this intersection point (a) to find intersection point (b) with the flow rate of 20 kg/h. Since this intersection point (b) lies between nominal sizes 15A and 20A, select the larger one, 20A.

■OB-31, OB-31U
[For water]



<How to use the chart>

When selecting the nominal size of a temperature regulator whose inlet pressure, outlet pressure, and flow rate are 0.3 MPa, 0.15 MPa, and 1 m³/h, respectively, first find intersection point (a) of the differential pressure (ΔP) of 0.15 MPa (0.3 MPa – 0.15 MPa) before and after the valve and the flow rate of 1 m³/h. Since this intersection point (a) lies between nominal sizes 15A and 20A, select the larger one, 20A.

* Chart of the flow rate is a reference value.

5. Installation

5.1 Precaution for installation



Caution

1. Do not disassemble the product unless it is necessary.
 - * Disassembly may prevent the product from functioning properly.
 2. Be sure to remove foreign substances and scale from the piping before connecting the product.
 - * Foreign substances and scale may prevent the product from functioning properly.
 3. Be sure to install a strainer (60 to 80 mesh) at the inlet side of the product.
 - * Foreign substances and scale may prevent the product from functioning properly.
 4. Be sure to install pressure gauges at the inlet and outlet sides of the product for operation check.
 - * Failure to follow this notice hampers correct temperature regulation.
 5. When installing, check the direction and posture of the product.
 - * Setting the product in a wrong direction or posture prevents the product from functioning properly.
 6. Install the product to a place where the ambient temperature does not exceed the set temperature.
 - * The ambient temperature beyond the set temperature hampers correct temperature regulation.
 7. Install a thermometer close to the thermal bulb.
 - * Failure to follow this notice hampers correct temperature regulation.
 8. Make sure that more than 3/4 of the thermal bulb's total length is in direct contact with the fluid to be heated or cooled.
 - * Failure to follow this notice hampers correct temperature regulation.
 9. The bend radius of the capillary tube should be more than 40 mm. Avoid bending at a sharp angle, twisting or pulling it with force.
 - * Failure to follow this notice may damage the capillary tube and prevent the product from functioning properly.
 10. Make sure that the capillary tube is not in contact with steam piping.
 - * Failure to follow this notice hampers correct temperature regulation.
 11. Do not apply excessive load, torque or vibration to the product.
 - * Failure to follow this notice may result in malfunction or a drastically shortened service life of the product.
12. The body and the sensor are separately packaged.

5.2 Installation of body

- (1) Be sure not to lose the bellows follower [13] (attached component).
- (2) Install the body to horizontal piping with the handle [12] facing upward.
- (3) Check the direction of the product so that the fluid flowing and the arrow marked on the body [1] are in the same direction.
- (4) Be sure to install pressure gauges, a strainer and a bypass line to the piping. (See "7.5 Piping example")
- (5) The pressure of heating or cooling fluid should be reduced with a reducing valve if it exceeds the maximum pressure.
- (6) Before stopping operation of the product for an extended period, completely discharge the condensate inside the product and piping, and close the stop valves installed at before and after the product.
- (7) Before leading fluid into the product, be sure to remove foreign substances and scale from the piping completely by using a bypass line.

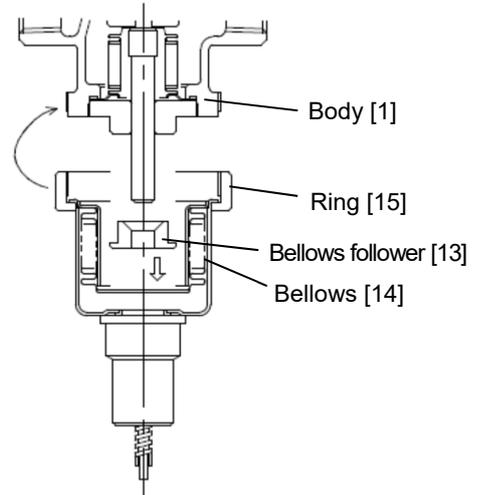
5.3 Installation of thermal bulb

- (1) Although the thermal bulb [20] can be mounted in any posture, make sure that more than 3/4 of its total length is in direct contact with the fluid to be heated or cooled.
- (2) Screw in the bushing [18] first, then use the washer of packing [19] to secure the thermal bulb.
- (3) The bend radius of the capillary tube [21] should be more than 40 mm. Avoid bending at a sharp angle, twisting or pulling it with force.
- (4) Install a thermometer close to the thermal bulb.
- (5) When inserting the thermal bulb into the piping for temperature detection, it should be installed at a point where the circulation is best.
 - * The thermal bulb is made of copper and can be easily bent if it bumps against something. Handle with care.

5.4 Assembly of body and sensor

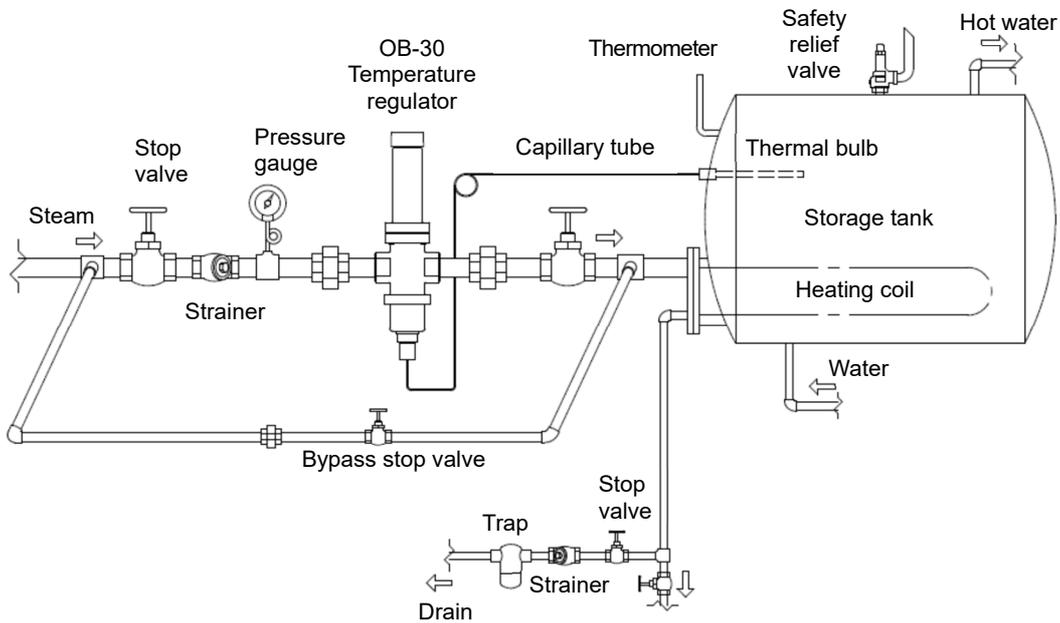
Place the bellows follower [13], which is packaged with the body, into the bellows [14] with its flat surface facing downward and then screw it into the lower surface of the body [1] by the ring [15].

It makes the assembly easier to loosen the handle [12] to direction of the "L" position. Be sure not to lose the bellows follower because the product does not function properly without it.

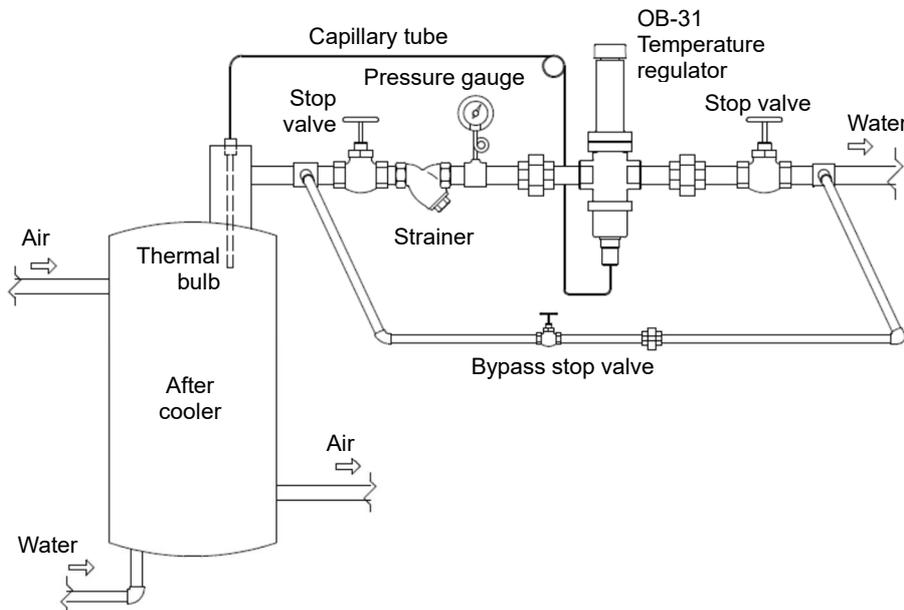


5.5 Piping example

■OB-30, OB-30U (for heating)



■OB-31, OB-31U (for cooling)



6. Operating Procedure

6.1 Precaution for operation



Warning

When the product is used for hot fluid, do not touch the product with bare hands.
* The product having hot fluid may scald your skin.



Caution

1. Before leading fluid into the product, close the stop valves at the inlet and outlet of the product and remove foreign substances and scale from the piping completely by using a bypass line. When blowing fluid via the bypass line, keep fluid temperature from exceeding the withstand temperature of the product.
* Failure to follow this notice prevents the product from functioning properly due to the ingress of foreign substances and scale into the product. Applying fluid exceeding the withstand temperature makes the spindle bent and unusable.
2. Adjust set temperature while watching the thermometer with enough time.
* Failure to follow this notice hampers correct temperature regulation.
3. Before stopping operation of the product for an extended period, completely discharge the fluid inside the product and piping, and close the stop valves installed at before and after the product.
* Failure to follow this notice may cause malfunction due to rusting inside the product and piping.
4. If condensate accumulates while the product closes, install a trap to discharge the condensate.
* Failure to follow this notice may cause malfunction due to rusting inside the product and the pipes.

6.2 Adjustment

Taking a wrong adjusting procedure may cause hunting, scale problems or water hammer, and can heavily damage the main parts of the product. Be sure to follow the procedure below.

1. Close the stop valves at the inlet and outlet sides of the product. Open the bypass stop valve and blow fluid through the bypass line with enough time. After discharging, be sure to close the bypass stop valve.
2. Turn the handle [12] and move the indicator to the desired temperature position on the scale. To raise the temperature, turn the handle clockwise (to direction of the "H" position). To lower the temperature, turn it counterclockwise (to direction of the "L" position).
3. Slowly open the inlet stop valve to its full open position, and then, open the outlet stop valve little by little to its full open position.
4. Adjust the handle till the desired temperature is obtained while watching the thermometer with enough time.

[Scale reading and set temperature]

| Scale reading | OB-30, OB-30U (for heating) | | | | |
|---------------|-----------------------------|---------|----------|----------|----------|
| | 0-35°C | 25-70°C | 40-100°C | 60-130°C | 70-150°C |
| 0 | -10°C | 14°C | 28°C | — | — |
| 1 | 5°C | 30°C | 47°C | 58°C | 67°C |
| 2 | 20°C | 46°C | 66°C | 81°C | 91°C |
| 3 | 31°C | 62°C | 86°C | 105°C | 119°C |
| 4 | 42°C | 78°C | 106°C | 132°C | 162°C |

| Scale reading | OB-31, OB-31U (for cooling) | | |
|---------------|-----------------------------|---------|----------|
| | 0-35°C | 25-70°C | 40-100°C |
| 0 | — | — | — |
| 1 | -14°C | 11°C | 23°C |
| 2 | 9°C | 38°C | 55°C |
| 3 | 32°C | 65°C | 94°C |
| 4 | 55°C | 98°C | 141°C |

- The tables above show the set temperature per scale reading as a guide. Because the temperature varies slightly according to the conditions of use, adjust the handle till the desired temperature is obtained.

7. Maintenance

7.1 Troubleshooting

■OB-30, OB-30U

| Trouble | Cause | Remedy |
|-------------------------------------|--|--|
| Temperature does not rise. | 1. Inadequate adjustment. | 1. Readjust according to "8.2 Adjustment" on page 8. |
| | 2. Insufficient drainage from the trap of heat exchanger, etc. | 2. Check the trap and replace it if necessary. |
| Temperature rises excessively. | 1. Inadequate adjustment. | 1. Readjust according to "8.2 Adjustment" on page 8. |
| | 2. Foreign substances stuck or damage on the disc [3] and valve seat [5]. | 2. Remove the foreign substances. If there is damage on the parts, please contact us to disassemble the product and replace the parts. |
| | 3. The thermal bulb [20] or bellows [14] is damaged. | 3. Replace the sensor. |
| Large error of temperature control. | 1. The thermal bulb [20] and thermometer are installed in wrong positions. | 1. Reinstall them at points where the circulation is best. |
| | 2. Inlet pressure is too high. | 2. When steam consumption is small, lower the inlet pressure for better temperature control. |
| Outside leakage. | 1. Leakage from the gasket [16]. | 1. Please contact us to retighten the gasket, or disassemble the product to replace the part. |
| | 2. Balance bellows [6] is damaged. | 2. Please contact us to disassemble the product and replace the part. |

■OB-31, OB-31U

| Trouble | Cause | Remedy |
|-------------------------------------|--|--|
| Temperature does not lower. | 1. Inadequate adjustment. | 1. Readjust according to "8.2 Adjustment" on page 8. |
| | 2. The thermal bulb [20] or bellows [14] is damaged. | 2. Replace the sensor. |
| Temperature lowers excessively. | 1. Inadequate adjustment. | 1. Readjust according to "8.2 Adjustment" on page 8. |
| | 2. Foreign substances stuck or damage on the disc [3] and valve seat [5]. | 2. Remove the foreign substances. If there is damage on the parts, please contact us to disassemble the product and replace the parts. |
| Large error of temperature control. | 1. The thermal bulb [20] and thermometer are installed in wrong positions. | 1. Reinstall them at points where the circulation is best. |
| | 2. Inlet pressure is too high. | 2. When steam consumption is small, lower the inlet pressure for better temperature control. |
| Outside leakage. | 1. Leakage from the gasket [16]. | 1. Please contact us to retighten the gasket, or disassemble the product to replace the part. |
| | 2. Balance bellows [6] is damaged. | 2. Please contact us to disassemble the product and replace the part. |

7.2 Precaution for inspection



Warning

Inspection must be done by experienced professional or valve manufacturer. Completely discharge the pressure inside of the product, piping and equipment prior to disassembly and inspection. When fluid is hot, cool down the product to the condition that it can be touched with bare hands.

* Failure to follow this notice may result in scalds, injury or contamination on the surroundings due to the residual pressure.



Caution

1. Do not disassemble the bellows while the thermal bulb is heated.
* Failure to follow this notice may damage the bellows and prevent the product from functioning properly.
2. Do not give any shock to the thermal bulb.

Warranty Information

1. Limited warranty

This product has been manufactured using highly-advanced techniques and subjected to strict quality control. Please be sure to use the product in accordance with instructions on the manual and the label attached to it.

Yoshitake warrants the product to be free from any defects in material and workmanship under normal usage for a period of one year from the date of receipt by the original user, but no longer than 24 months from the date of shipment from Yoshitake's factory.

2. Parts supply after product discontinuation

This product may be subject to discontinuation or change for improvement without any prior notice. After the discontinuation of the product, Yoshitake supplies the repair parts for 5 years otherwise individually agreed.

3. This warranty does not cover the damage due to any of below:

- (1) Valve seat leakage or malfunction caused by foreign substances inside piping.
- (2) Improper handling or misuse.
- (3) Improper supply conditions such as abnormal water pressure/quality.
- (4) Water scale or freezing.
- (5) Trouble with power/air supply.
- (6) Any alteration made by other than Yoshitake.
- (7) Use under severe conditions deviating from the design specifications (e.g. in case of corrosion due to outdoor use).
- (8) Fire, flood, earthquake, thunder and other natural disasters.
- (9) Consumable parts such as O-ring, gasket, diaphragm and etc.

Yoshitake is not liable for any damage or loss caused by malfunction or defect of the product.