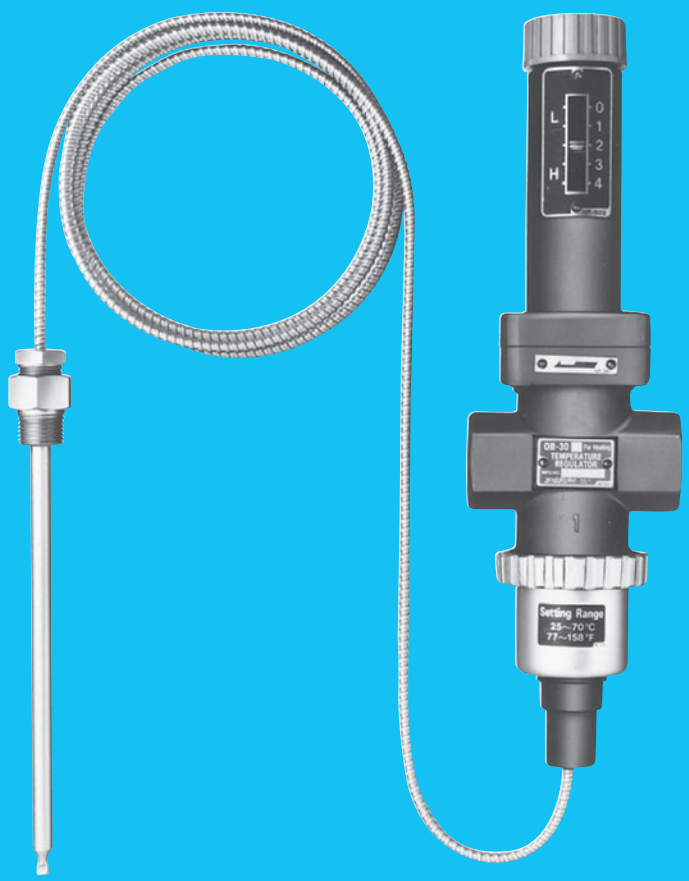
Temperature Regulator

13



Step 0 Type/Structure/Features

Please refer to this for type, structure and features of Temperature Regulator.

Step 1 Selection

Please look at the ID chart to choose the right products depending on the intended uses.
Details are on the product page.

Step 2 Sizing

Please check the required Cv value from size selection data on P.13-7, or size selection chart on the product page of each products.

Step 3 Attention for usage

What is Temperature Regulator?

· A temperature regulator, that is self-acting, automatically controls the steam/liquid flow, in response to the temperature changes in the cooled/heated media, and keeps the cooled/heated fluid temperature at a constant level.
· Automatic temperature regulator requires no electricity for operation, so it keeps on operating in case of electricity failure.
· No need for electric construction and temperature can be adjusted just by twisting the handle.

Selection of Temperature Regulator

Heating
Controls heating media in order to maintain set temperature.

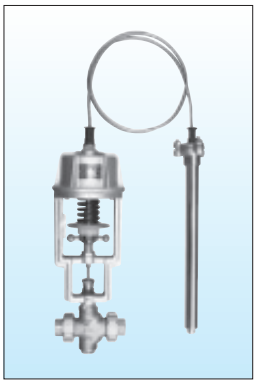
- Direct acting type — Use steam or hot water in order to raise the temperature of heat exchanger and storage tank.
- Pilot type — Use steam or hot water in order to raise the temperature of heat exchanger and storage tank. It has larger flow capacity than direct acting type.

Cooling
Controls cooling media in order to maintain set temperature.

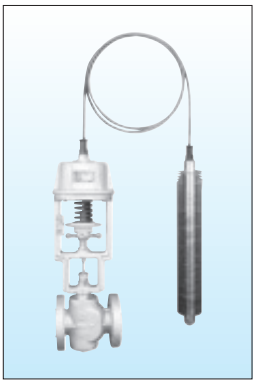
- Direct acting type — Use cold water or cooling media in order to cool down the temperature of liquid such as lubricant oil.

Bellows

- Internal pressure bellows — Recommended to be used at a place where the difference between the set temperature and the ambient temperature is 30℃ or more.
- External pressure bellows — Insusceptible to the ambient temperature and usable even at a place where the difference between the set temperature and the ambient temperature is 30℃ or less.



For liquid



For air

Features of Direct Acting Type <OB-30>

Step 0

Application

For small heat exchanger, HVAC and plating apparatus.

Red or Blue handle

Red for heating and blue for cooling. Easily adjust the temperature by handle without any tool.

Dial

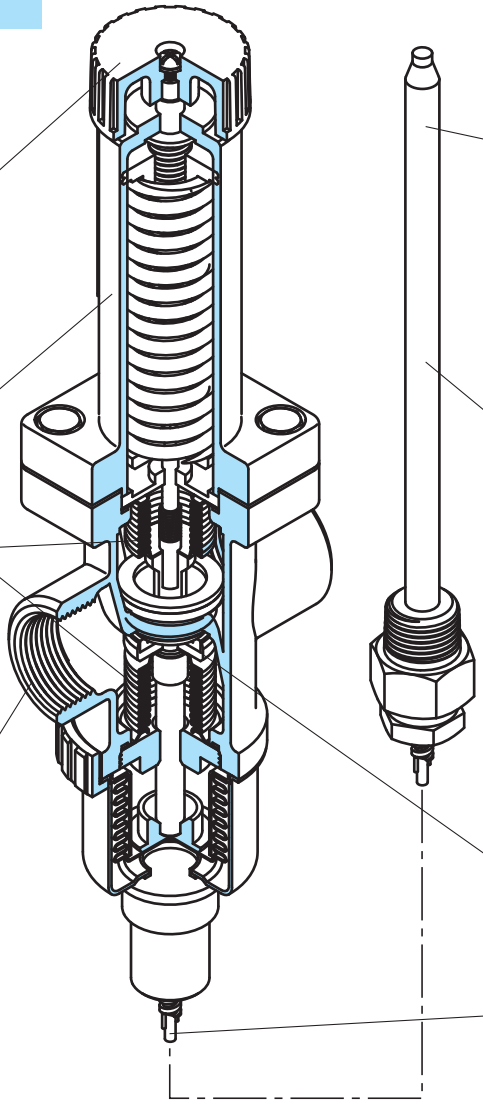
For checking the set temperature.

Pressure balancing mechanism

Equipped with two bellows called balance bellows which ensure stable temperature regulation, the OB-30 is not affected by inlet pressure fluctuation.

Light and compact

Enables easy piping construction.



Thermal bulb

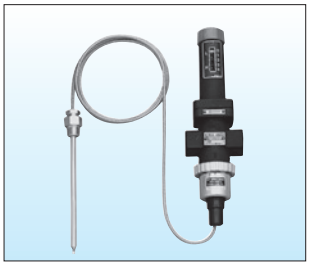
Thermal bulb can be installed in any position because the temperature is sensed by sealing gas which will not be mixed with fluid in case of breakage. It is especially recommended to the food processing industry.

All sizes of both heating and cooling type use same thermal bulb. It is available with stainless steel (SUS304) made thermal well as an option.

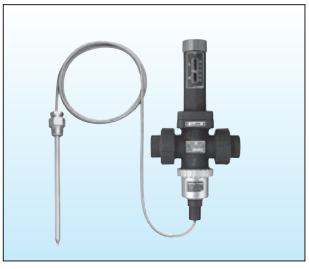
High durability and sealing function

Stainless steel and PTFE materials are used for the valve disc, which ensures high durability and sealing function.

2 m is the standard of capillary tube. 3 m and 5 m is also available.

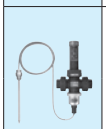
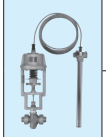
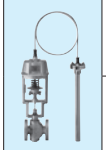


OB-30



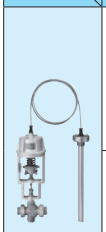
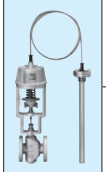
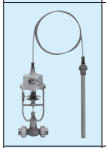
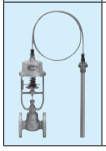
OB-30U

Temperature Regulator ID-Charts

	Model	Type	Fluid	Material	Max. Press. (MPa)	Max. Temp. (℃)	Connection	Size	Feature	Page
	OB-30	External pressure bellows	Steam	CAC406	1.0	185℃	JIS Rc	15-25A	· Heating (red handle) · Low-leakage designed single seat valve	13-11
			Hot water		1.7					
	OB-30U		Steam		1.0		JIS Rc (union joint)	15-25A		13-11
			Hot water		1.7					
	OB-31	External pressure bellows	Cold water, Refrigerant	CAC406	1.7	185℃	JIS Rc	15-25A	· Cooling (blue handle) · Low-leakage designed single seat valve	13-11
	OB-31U						JIS Rc (union joint)	15-25A		13-11
	OB-2000	External pressure bellows	Steam	FCD450	1.0 or 2.0	220℃	JIS Rc	15-50A	· Heating · Pilot type · Large flow capacity	13-14
							JIS 10KFF JIS 20KRF	15-100A		
	OB-1	Internal pressure bellows	Steam, Hot water	CAC406	0.7	180℃	JIS Rc (union joint)	15-40A	· Heating	13-17
	OB-1G	External pressure bellows						15-40A	· Low temperature heating	13-17
	OB-2	Internal pressure bellows	Steam, Hot water	FC200	0.2-0.7*	180℃	JIS 10KFF	15-150A	· Heating	13-20
	OB-2G	External pressure bellows						15-125A	· Low temperature heating	13-20

* Max. pressure depends on size. For details please refer to P.13-20.

Step 1

	Model	Type	Fluid	Material	Max. Press. (MPa)	Max. Temp. (℃)	Connection	Size	Feature	Page
	OB-3	Internal pressure bellows	Cold water, Refrigerant	CAC406	0.7	180℃	JIS Rc (union joint)	15-40A	· Cooling	13-23
	OB-3G	External pressure bellows						15-40A	· Low temperature cooling	13-23
	OB-4	Internal pressure bellows	Cold water, Refrigerant	FC200	0.2-0.7 *	180℃	JIS 10KFF	15-150A	· Cooling	13-26
	OB-4G	External pressure bellows						15-125A	· Low temperature cooling	13-26
	OB-5	Internal pressure bellows	Steam, Hot water	CAC406	0.5	180℃	JIS Rc (union joint)	15-25A	· Low-leakage designed single seat valve	13-29
	OB-6	Internal pressure bellows		FC200	0.5	180℃	JIS 10KFF	15-25A	· Low-leakage designed single seat valve	13-31

* Max. pressure depends on size. For details please refer to P.13-26.

Nominal Size Selection for Temperature Regulator

Step 2

■Calculation formula for Cv value

(1) For steam

When $P_2 > \frac{P_1}{2}$ $\quad Cv = \frac{Wk}{138\sqrt{\Delta P(P_1 + P_2)}}$

When $P_2 \leqq \frac{P_1}{2}$ $\quad Cv = \frac{Wk}{120P_1}$

(2) For liquid

$$Cv = \frac{0.365V\sqrt{G}}{\sqrt{\Delta P}}$$

W: Max. flow rate of steam [kg/h]
P_1: Inlet pressure [MPa · A]
P_2: Outlet pressure [MPa · A]
ΔP: $P_1 - P_2$ [MPa]
k : 1 + 0.0013 x {superheated steam temperature [℃] – saturated steam temperature [℃]}
G : Specific gravity (against water in the case of fluid)
V : Max. flow rate of fluid [m^3/h]
Cv: Cv value of each nominal size

■Cv value table

Model \ Nominal size	15A	20A	25A	32A	40A	50A	65A	80A	100A	125A	150A
OB-30, 31	0.8	1	1.2	—	—	—	—	—	—	—	—
OB-2000	5.0	7.2	10.9	14.3	18.8	32	54	70	108	—	—
OB-1, 1G	2	2	4	7	10	—	—	—	—	—	—
OB-2, 2G	2	2	4	7	10	14	21	27	42	72	94
OB-3, 3G	2	2	4	7	10	—	—	—	—	—	—
OB-4, 4G	2	2	4	7	10	14	21	27	42	72	94
OB-5	1	1	2	—	—	—	—	—	—	—	—
OB-6	1	1	2	—	—	—	—	—	—	—	—

■Point to remember when selecting the size

· If system has small capacity and seat leakage become a problem, select single valve type such as OB-30 Series, OB-5 or OB-6.
· Differential pressure between inlet and outlet of temperature regulator should be 0.05 MPa in principle. It is recommended that inlet pressure be 0.2-0.3 MPa to obtain the best performance of the temperature regulator and its longer product life.

■Formula for calculating necessary steam volume

<Calculation formula>

The quantity of steam required to increase the temperature of Q kg of water by B℃ in time A (h) is:

$$W = \frac{B \times Q}{500 \times A}$$

Select a nominal size by applying the calculated quantity of steam W and the steam pressure P to the flow rate chart for nominal size selection.

<Calculation example>

When increasing the temperature of 7000 kg of water from 20℃ to 60℃ in an hour with 0.5 MPa steam

$$W = \frac{(60 - 20) \times 7000}{500 \times 1} = 560 \text{ (kg/h)}$$

· Set the safety factor at 80 to 90%.

W: Quantity of steam
B: Temperature (difference of temperature)
Q: Water (kg)
A: Time (hr)

Guidelines for Temperature Regulator OB-30 Series

Step 3

OB-30 Series

Precautions during Installation

· Installation of body

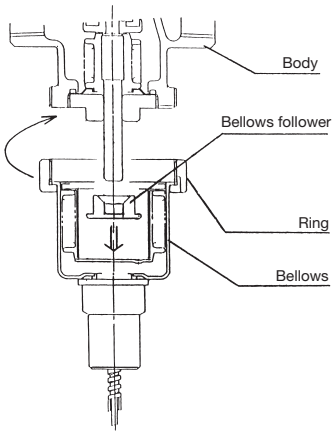
1. Be sure not to lose the bellows follower (attached component).
2. Install the temperature regulator perpendicularly to horizontal piping with the handle facing upward.
3. Check the direction of the temperature regulator so that the fluid flowing and the arrow marked on the body are in the same direction.
4. Be sure to install pressure gauge, strainer and bypass line to the piping (see "Piping Example" below).
5. The pressure of heating fluid should be reduced with a pressure reducing valve if it exceeds the maximum pressure.
6. Completely discharge the fluid inside the piping and close the stop valves installed at before and after the temperature regulator before stopping operation of the product for an extended period.
7. Be sure to remove foreign matter from the piping through the bypass line at the starting before operating the temperature regulator.

· Installation of thermal bulb

1. Although the thermal bulb 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 on bushing first, then use washer of packing to secure the thermal bulb.
3. 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.
4. Install the 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.

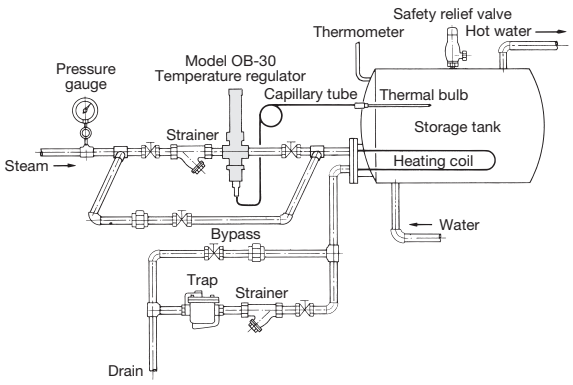
· Assembly of body and thermal bulb

Install the bellows follower into the bellows at thermal bulb with its flat surface facing downward and then screw it into the lower surface of the body by the ring. During the assembly, it makes assembly easy to loosen the handle to direction of the "Low" position.

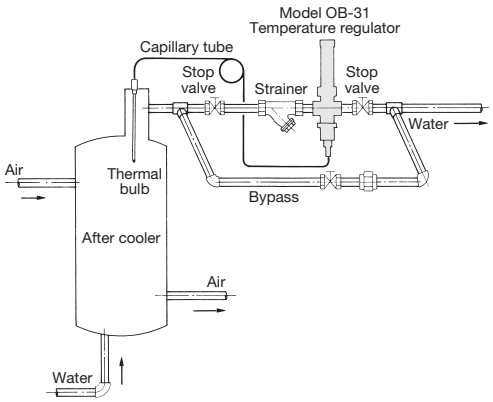


■Piping example

· OB-30 · 30U (for heating)



· OB-31 · 31U (for cooling)



Guidelines for Temperature Regulator OB-2000 Series

OB-2000 Series

Precautions during Installation

OB-2000 series

· Installation of main valve

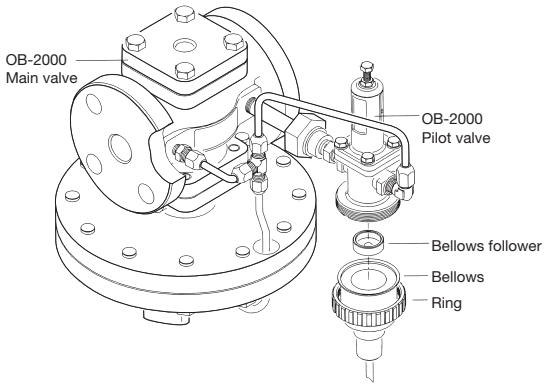
1. Be sure that there are no foreign matters or scales inside the piping before plumbing.
2. Install the temperature regulator perpendicularly to horizontal piping with the handle facing upward.
3. Check the direction of the temperature regulator so that the fluid flowing and the arrow marked on the body are in the same direction.
4. Be sure to install pressure gauge, strainer and bypass line to the piping (see "Piping Example" below).
5. The pressure of heating or cooling fluid should be reduced with a reducing valve if it exceeds the maximum pressure.
6. Completely discharge the fluid inside the piping and close the stop valves installed at before and after the temperature regulator before stopping operation of the product for an extended period.
7. Be sure to remove foreign matter from the piping through the bypass line at the starting before operating the temperature regulator.

· Installation of thermal bulb

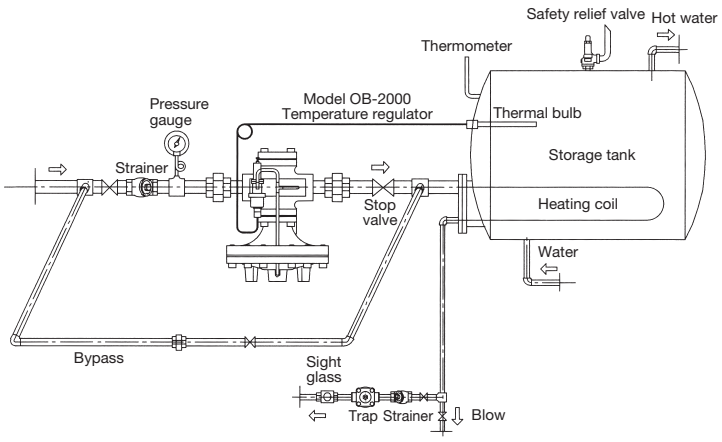
1. Although the thermal bulb can be mounted in any posture, make sure that more than 3/4 of its total length is in direct contact with the fluid to be heated.
2. Screw on bushing first, then use washer of packing to secure the thermal bulb.
3. The bend radius of the capillary tube should be more than 40 mm. Avoid bending at a sharp angle, twisting or pulling it with force.
4. Install the 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.

· Assembly of pilot valve body and thermal bulb

Install the bellows follower into the bellows at thermal bulb with its flat surface facing downward and then screw the ring to assemble the bellows follower.



■Piping example



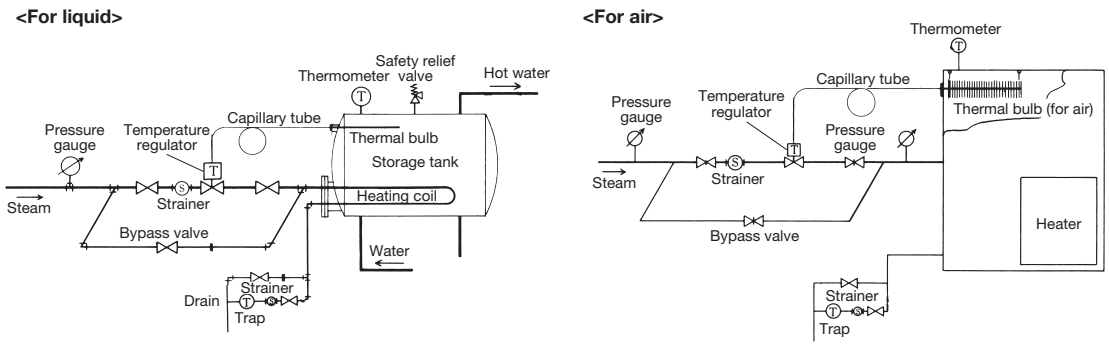
Step 3

OB-1 to 6

· Installation of body

1. Install the temperature regulator vertically to horizontal piping with the frame facing upward.
2. Be sure to install the temperature regulator on the place below the preset temperature. If the ambient temperature exceeds the preset temperature, it leads to the product malfunction.
3. Be sure to install pressure gauge, strainer and bypass line to the piping (see Fig. 1 below).
4. The pressure of heating or cooling fluid should be reduced with a reducing valve if it exceeds the maximum pressure.
5. Do not apply an excessive load, torque or vibration to the product during plumbing.
6. Completely discharge the fluid inside the piping and close the stop valves installed at before and after the temperature regulator before stopping operation of the product for an extended period.
7. Be sure to remove foreign matter from the piping through the bypass line at the ventilation before opening the temperature regulator circuit.

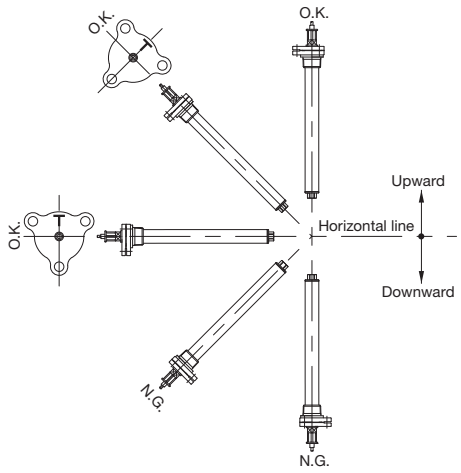
Fig.1 Piping example



· Installation of thermal bulb

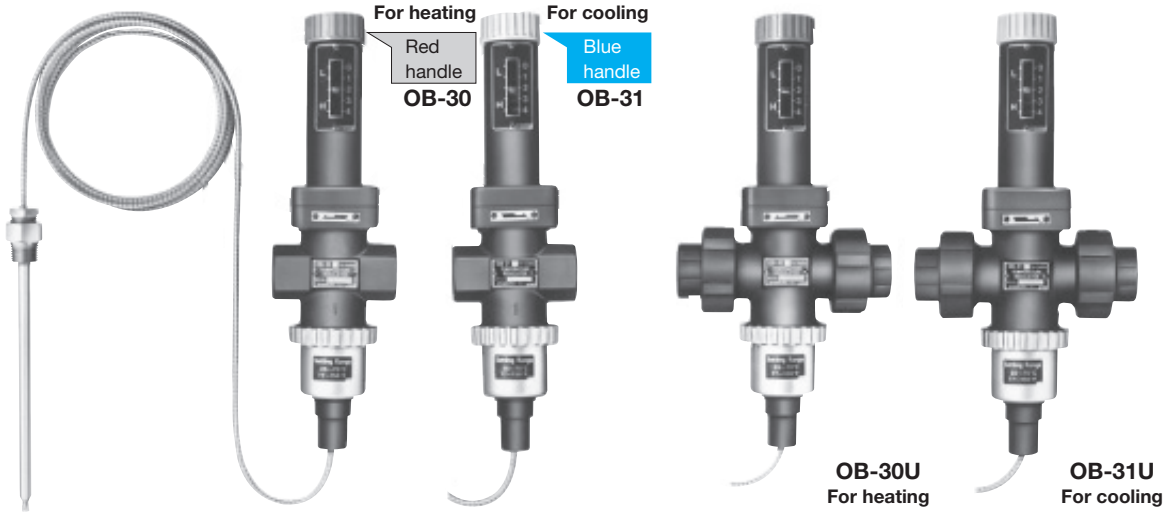
1. Avoid bending the capillary tube at a sharp angle, twisting or entangling.
2. Make sure that more than 3/4 of the thermal bulb's total length is in direct contact with the fluid to be heated or cooled.
3. Install the thermometer close to the thermal bulb.
4. Install the thermal bulb on the place where temperature detection is needed.
5. When plumbing, make sure that the connecting part of the thermal bulb is faced downward and (T) position at the flange or the joint nut section is located at uppermost part (see Fig. 2).
6. Remove the companion flange bolts from attaching part of the thermal bulb. Then screw the flange and insert the bulb to align holes of companion flange, tighten the bolts uniformly. Do not twist conduit pipe (except for the OB-5 · 6).

Fig. 2 Mounting postures of thermal bulb



OB-30,30U
OB-31,31U

Direct acting type | Pilot operated type | Heating | Cooling
Bellows | Diaphragm | Single valve | Double valve
Soft seat



■Features

1. Red handle type is for heating and blue handle type for cooling. It is possible to identify their application at a glance.
2. Excellent durability and high sealability ensured by valve part of stainless steel and fluororesin.
3. Single valve and balance bellows structure offers stable temperature control without being affected by inlet pressure fluctuations.
4. Easy changeable thermal specification by easy attachment and detachment of the body and thermal bulb.
5. Wide temperature adjusting range, applicable to wide variety of applications.
6. The thermal bulb is usable for heating and cooling, which is common for all sizes (15 to 25A). It is possible to select models considering the temperature adjusting range only.
7. Easy setting of the initial temperature by handle operation.

■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 rate			
Max. temperature		185℃			
Material	Body	Cast 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	Copper pipe
	Capillary tube	Stainless steel
Standard capillary length		2 m
Connection		JIS Rc screwed

· Available with thermal well (stainless steel made). Please refer to P.13-37.
* In the case of attached to spring chamber, the bush of thermal bulb will be unnecessary. Please refer to P.13-36.
· Available with capillary of 3 or 5 meter.

■Temperature Adjusting Range

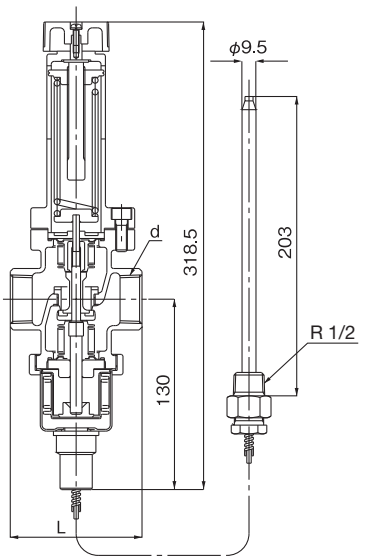
Temperature adjusting range (˚C)	Withstand temperature (˚C)
0-35	75
25-70	110
40-100	140
60-130	170
70-150	190

· 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.

■Dimensions (mm) and Weights (kg)

· Body (OB-30·31)

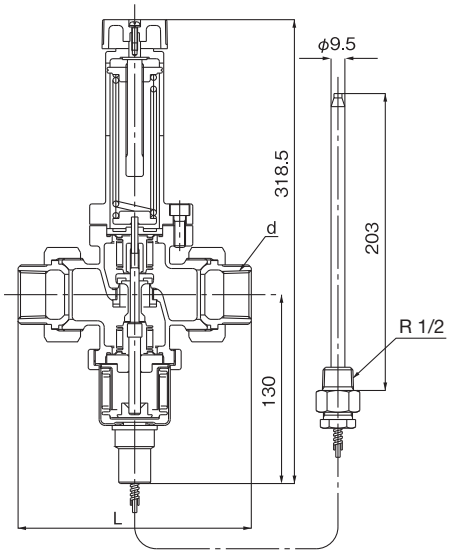
Nominal size	d	OB-30·31	
		L	Body weight
15A	Rc 1/2	75	2.1
20A	Rc 3/4	80	2.2
25A	Rc 1	90	2.4



OB-30

· Body (OB-30U·31U)

Nominal size	d	OB-30U·31U	
		L	Body weight
15A	Rc 1/2	160	3.1
20A	Rc 3/4	160	3.1
25A	Rc 1	160	3.1

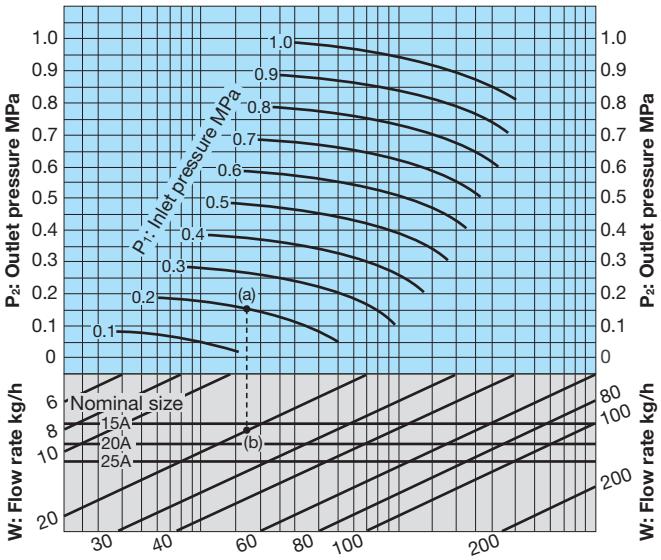


OB-31U

· Sensor (Common to OB-30·31·30U·31U)

Capillary length	2 m
Weight	0.6 kg

■OB-30·30U Nominal Size Selection Chart (For Steam)

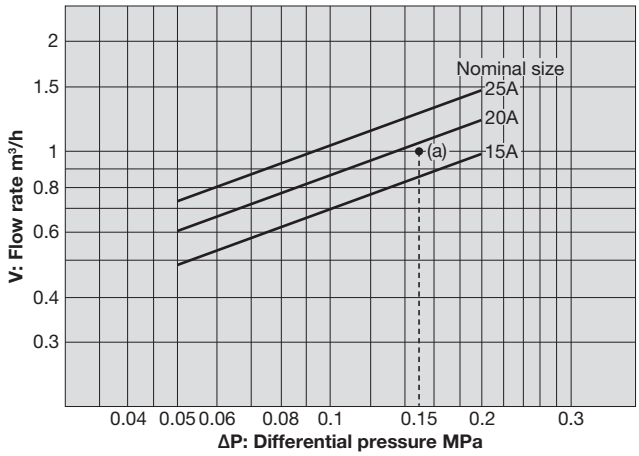


How to use the chart

When selecting the nominal size of a temperature regulator whose inlet pressure (P_1), outlet pressure (P_2), 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.

* Chart of the flow rate is a reference value.

■OB-31·31U Nominal Size Selection Chart (For Water)



How to use the chart

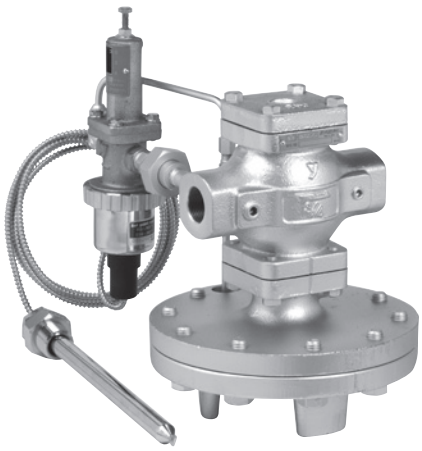
When selecting the nominal size of a temperature regulator whose inlet pressure, outlet pressure, and flow rate are 0.3 MPa, 0.15 MPa, and 1 m^3/h, respectively, first find intersection point (a) of the differential pressure (ΔP) of 0.15 MPa (0.3 MPa – 0.15 MPa) before and after the valve and the flow rate of 1 m^3/h. Since this intersection point (a) lies between nominal sizes 15A and 20A, select the larger one, 20A.

· When the OB-30 or OB-30U is used and the fluid is hot water, use the selection chart shown above.

* Chart of the flow rate is a reference value.

OB-2000

Direct acting type | **Pilot operated type** | **Heating** | Cooling
Bellows | **Diaphragm** | Single valve | Double valve
Soft seat



OB-2000 Screwed type

OB-2000 Flanged type

■Features

1. Large capacity.
2. Excellent sealability ensured by the spherical valve.
3. Wide temperature adjusting range. The thermal bulb can be installed in any direction.
4. Since the body and the thermal bulb are easy to attach and detach, they can be replaced easily for thermal specification change.

■Specifications

Model		OB-2000	
Application	Heating	Steam	
	Heated	Cold and hot water, Oil, Non-dangerous fluids	
Maximum Pressure	Body	2.0 MPa *1	
	Thermal bulb	1.0 MPa	
Minimum differential pressure		0.05 MPa	
Max. temperature		220°C	
Temperature adjusting range		−8 – 183°C	
Valve seat leakage		0.01% or less of rated flow rate	
Material	Body	Ductile cast iron	
	Main valve, valve seat	Stainless steel	
	Diaphragm	Stainless steel	
	Pilot valve	Stainless steel	
	Pilot valve seat	Stainless steel	
	Thermal bulb	Copper pipe (nickel chrome plated) *2	
Standard capillary length		2 m	
Connection		JIS Rc screwed	JIS 10K FF, 20K RF flanged

*1 Maximum pressure of JIS 10K FF flanged is 1.0 MPa.
· Available with thermal well (stainless steel made). Please refer to P.13-41.
· Available with capillary of 3 or 5 meter.
*2 In the case of attached to spring chamber, the bush of thermal bulb will be unnecessary. Please refer to P.13-40.
· Available with NPT or BSPT screwed.
· Available with ASME or EN flanged.

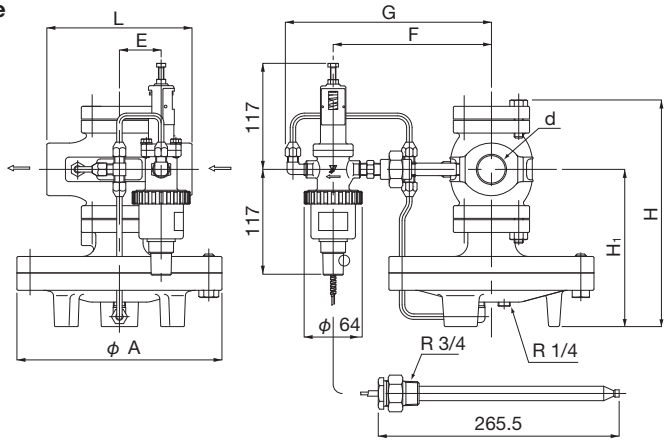
■Temperature Adjusting Range

Temperature adjusting range (°C)	Withstand temperature (°C)
−8 – 15	35
10-36	56
30-62	82
55-94	114
80-127	147
115-183	203

· The term “withstand temperature” means the temperature from pressure resistance of the bellows.

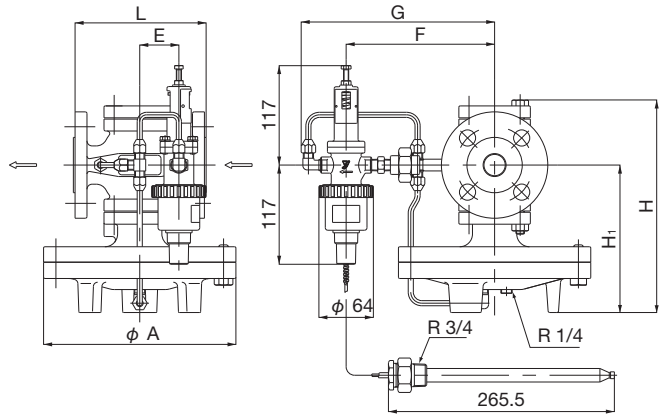
■Dimensions (mm) and Weights (kg)

· **OB-2000 Screwed type**



Nominal size	d	L	H_1	H	A	E	F	G	Weight
15A	Rc 1/2	150	170	244	200	45	169	222	14.1
20A	Rc 3/4	150	170	244	200	45	169	222	14.1
25A	Rc 1	160	175	251	226	46	174	227	18.1
32A	Rc 1-1/4	180	192	282	226	55	182	235	21.6
40A	Rc 1-1/2	180	192	282	226	55	182	235	21.6
50A	Rc 2	230	216	319	276	60	189	242	32.7

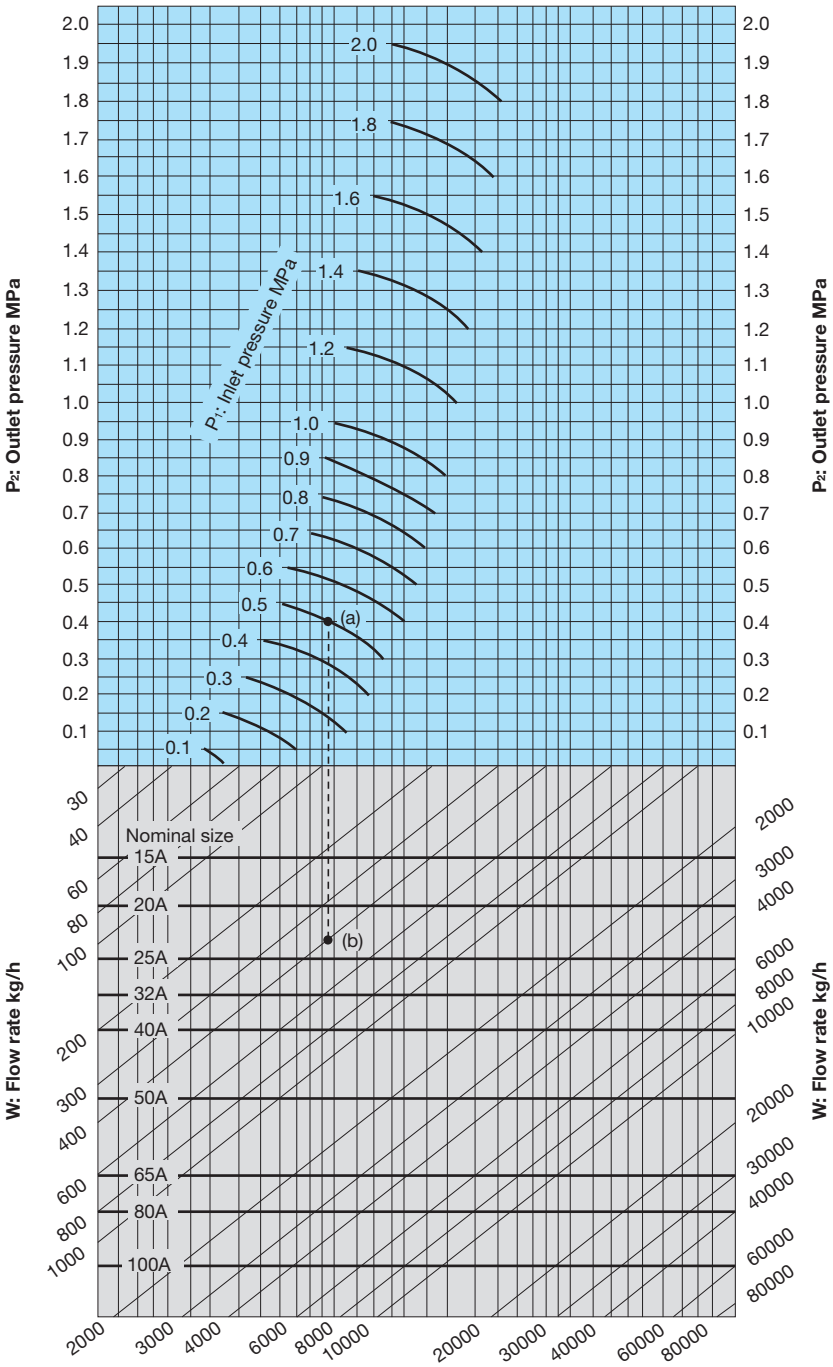
· **OB-2000 Flanged type**



Nominal size	L	H_1	H	A	E	F	G	Weight
15A	146 (142)	170	244	200	45	169	222	15.6 (15.4)
20A	146 (142)	170	244	200	45	169	222	16.1 (15.9)
25A	156 (152)	175	251	226	46	174	227	21.1 (20.7)
32A	176 (172)	192	282	226	55	182	235	24.1 (23.7)
40A	196 (192)	192	282	226	55	182	235	24.6 (24.2)
50A	222 (218)	216	319	276	60	189	242	35.7 (35.5)
65A	282 (278)	251	373	352	75	206	259	63.3 (63.0)
80A	302 (294)	265	399	352	80	217	270	70.3 (68.1)
100A	342 (330)	321	488	401	105	234	287	110.0 (106.4)

· The above values within parentheses are JIS 10K FF flanged.

■Nominal Size Selection Chart (For Steam)



[Example]

When selecting the nominal size of a temperature regulator whose inlet pressure (P_1), outlet pressure (P_2), and steam flow rate are 0.5 MPa, 0.4 MPa, and 400 kg/h, respectively, first find intersection point (a) of the inlet pressure of 0.5 MPa and the outlet pressure of 0.4 MPa. Trace down vertically from this intersection point (a) to find intersection point (b) with the flow rate of 400 kg/h. Since this intersection point (b) lies between nominal sizes 20A and 25A, select the larger one, 25A.

* Chart of the flow rate is a reference value.

OB-1,1G

Direct acting type | Pilot operated type | Heating | Cooling
Bellows | Diaphragm | Single valve | Double valve
Soft seat

■Features

1. Easy plumbing due to union type connection screw.
2. No need for adjusting tool due to the attached adjusting handle, making adjustment easy.
3. Double valve structure offers larger flow late than single valve type.
4. Excellent accuracy since special packing is used for spindle gland packing which affects opening/closing operation of the valve.
5. The OB-1G ensures distinguished temperature resistance due to external pressure type bellows.

■Specifications

Model		OB-1	OB-1G
Application	Heating	Steam, Hot water	
	Heated	Cold and hot water, Oil, Non-dangerous fluids	
Maximum pressure	Body	0.7 MPa	
	Thermal bulb	1.0 MPa	
Max. temperature		180˚C	
Temperature adjusting range	For liquid	40-120˚C	15-100˚C
	For air	40-120˚C	15-100˚C
Ambient temperature		Set temperature −10˚C or less	Set temperature +30˚C or less
Material	Body	Cast bronze	
	Valve	Phosphor bronze	
	Valve spindle	Stainless steel	
	Bellows	Phosphor bronze	
	Thermal bulb	Stainless steel	
Standard capillary length		2 m	
Connection		JIS Rc screwed (union joint)	

* Valve seat leakage: Refer to P.13-43.
· If the ambient temperature is higher than the set temperature or less than 40˚C, use the OB-1G (with external pressure type bellows).
· Available with capillary of up to 5 meter. (Please refer to P.13-46 for errors of set temperature).
· Available with thermal well (SUS304 made or with a PTFE cap) for liquid.

■Temperature Adjusting Range

· OB-1

Temperature adjusting range (℃)		Withstand temperature (℃)
For liquid	For air	
40-60	40-60	70
50-70	50-70	80
60-80	60-80	90
80-100	80-100	110
100-120	100-120	130

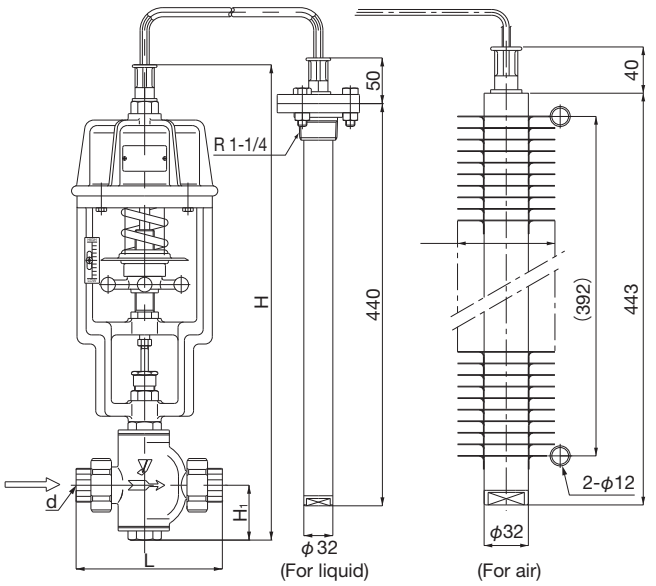
· The term “withstand temperature” means the temperature from pressure resistance of the bellows.
· Available with temperature adjusting range of 30℃ (the OB-1 only).

· OB-1G

Temperature adjusting range (℃)		Withstand temperature (℃)
For liquid	For air	
15-35	15-35	50
20-40	20-40	50
35-55	35-55	70
40-60	40-60	90
50-70	50-70	100
60-80	60-80	110
70-90	70-90	120
80-100	80-100	130

· The term “withstand temperature” means the temperature from pressure resistance of the bellows.

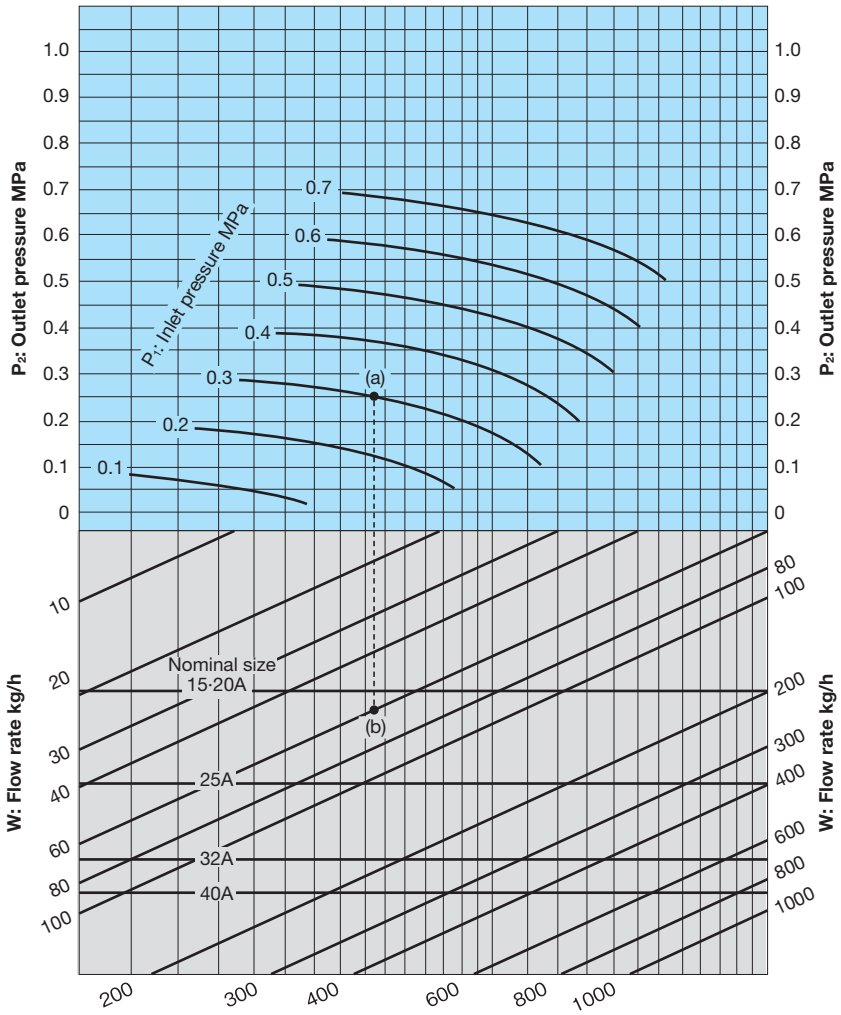
■Dimensions (mm) and Weights (kg)



OB-1G has a little difference in bellows structure.

Nominal size	d	L	H_1	H	Weight
15A	Rc 1/2	148	55	510	11
20A	Rc 3/4	148	55	510	11
25A	Rc 1	160	60	520	12
32A	Rc 1-1/4	195	60	520	12
40A	Rc 1-1/2	210	65	530	13

■Nominal Size Selection Chart (For Steam)



How to use the chart

When selecting the nominal size of a temperature regulator whose inlet pressure (P_1), outlet pressure (P_2), and steam flow rate are 0.3 MPa, 0.25 MPa, and 60 kg/h, respectively, first find intersection point (a) of the inlet pressure of 0.3 MPa and the outlet pressure of 0.25 MPa. Trace down vertically from this intersection point (a) to find intersection point (b) with the flow rate of 60 kg/h. Since this intersection point (b) lies between nominal sizes 15A or 20A and 25A, select the larger one, 25A.

* Chart of the flow rate is a reference value.

■Valve Seat Leakage

Unit: steam (kg/h), water (ℓ /h)

15A	20A	25A	32A	40A	50A	65A	80A	100A	125A	150A
1.5	1.5	1.8	2.4	3.0	3.6	4.8	6.0	7.2	9.0	10.8

* The values in the table above are max. valve seat leakage observed under the conditions of 0.5 MPa or max. pressure and set temperature + 5℃ (– 5℃ for cooling).

OB-2,2G

Direct acting type | Pilot operated type | Heating | Cooling
Bellows | Diaphragm | Single valve | Double valve
Soft seat

■Features

1. No need for adjusting tool due to the attached adjusting handle, making adjustment easy.
2. Double valve structure offers larger flow rate than single valve type.
3. Excellent accuracy since special packing is used for spindle gland packing which affects opening/closing operation of the valve.
4. The OB-2G ensures distinguished temperature resistance due to an external pressure type bellows.

■Specifications

Model		OB-2	OB-2G
Application	Heating	Steam, Hot water	
	Heated	Cold and hot water, Oil, Non-dangerous fluids	
Maximum pressure	Body	15A-40A: 0.7 MPa〔1.0 MPa〕 50A: 0.5 MPa〔0.7 MPa〕 65A: 0.5 MPa〔0.7 MPa〕 80A: 0.4 MPa〔0.5 MPa〕 100A: 0.4 MPa 125A: 0.2 MPa〔0.35 MPa for OB-2〕 150A: 0.2 MPa	
	Thermal bulb	1.0 MPa	
Max. temperature		180℃	
Temperature adjusting range	For liquid	40-120℃	15-100℃
	For air	40-120℃	15-100℃
Ambient temperature		Set temperature −10℃ or less	Set temperature +30℃ or less
Material	Body	Cast iron	
	Valve, valve seat	Phosphor bronze (stainless steel)	
	Valve spindle	Stainless steel	
	Bellows	Phosphor bronze	
	Thermal bulb	Stainless steel	
Standard capillary length		15A-80A: 2 m 100A-150A: 3 m	
Connection		JIS 10K FF flanged	

* Valve seat leakage: Refer to P.13-43.
· If the ambient temperature is higher than the set temperature or less than 40℃, use the OB-2G (with external pressure type bellows).
· If using at a pressure higher than 0.5 MPa, with stainless steel trim parts is recommended.
· Available with capillary of up to 5 meter. (Please refer to P.13-46 for errors of set temperature).
· Available with Max. temperature inside [ ]. (Valve and valve seat material, and bellow is different from standard type).
· Available with thermal well (SUS304 made or with a PTFE cap) for liquid.

■Temperature Adjusting Range

· OB-2

Temperature adjusting (℃)		Withstand temperature (℃)
For liquid	For air	
40-60	40-60	70
50-70	50-70	80
60-80	60-80	90
80-100	80-100	110
100-120	100-120	130

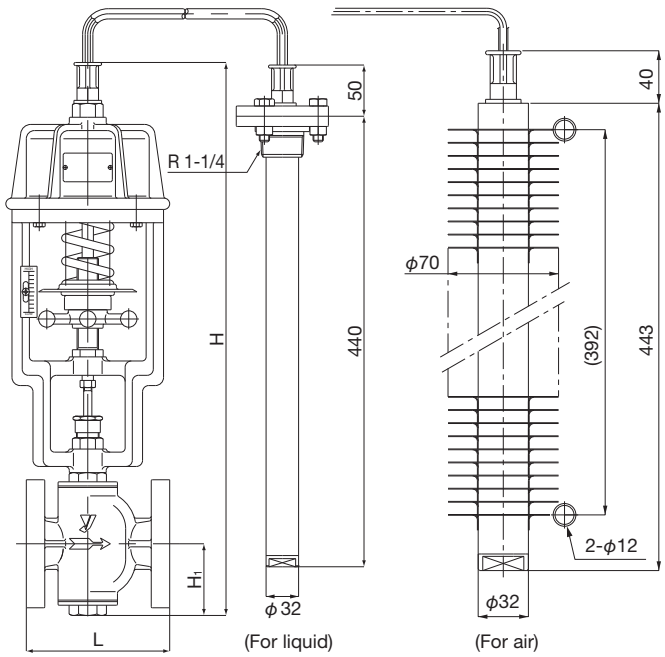
· The term “withstand temperature” means the temperature from pressure resistance of the bellows.
· Available with temperature adjusting range of 30℃ (the OB-2 only).

· OB-2G

Temperature adjusting (℃)		Withstand temperature (℃)
For liquid	For air	
15-35	15-35	50
20-40	20-40	50
35-55	35-55	70
40-60	40-60	90
50-70	50-70	100
60-80	60-80	110
70-90	70-90	120
80-100	80-100	130

· The term “withstand temperature” means the temperature from pressure resistance of the bellows.

■Dimensions (mm) and Weights (kg)

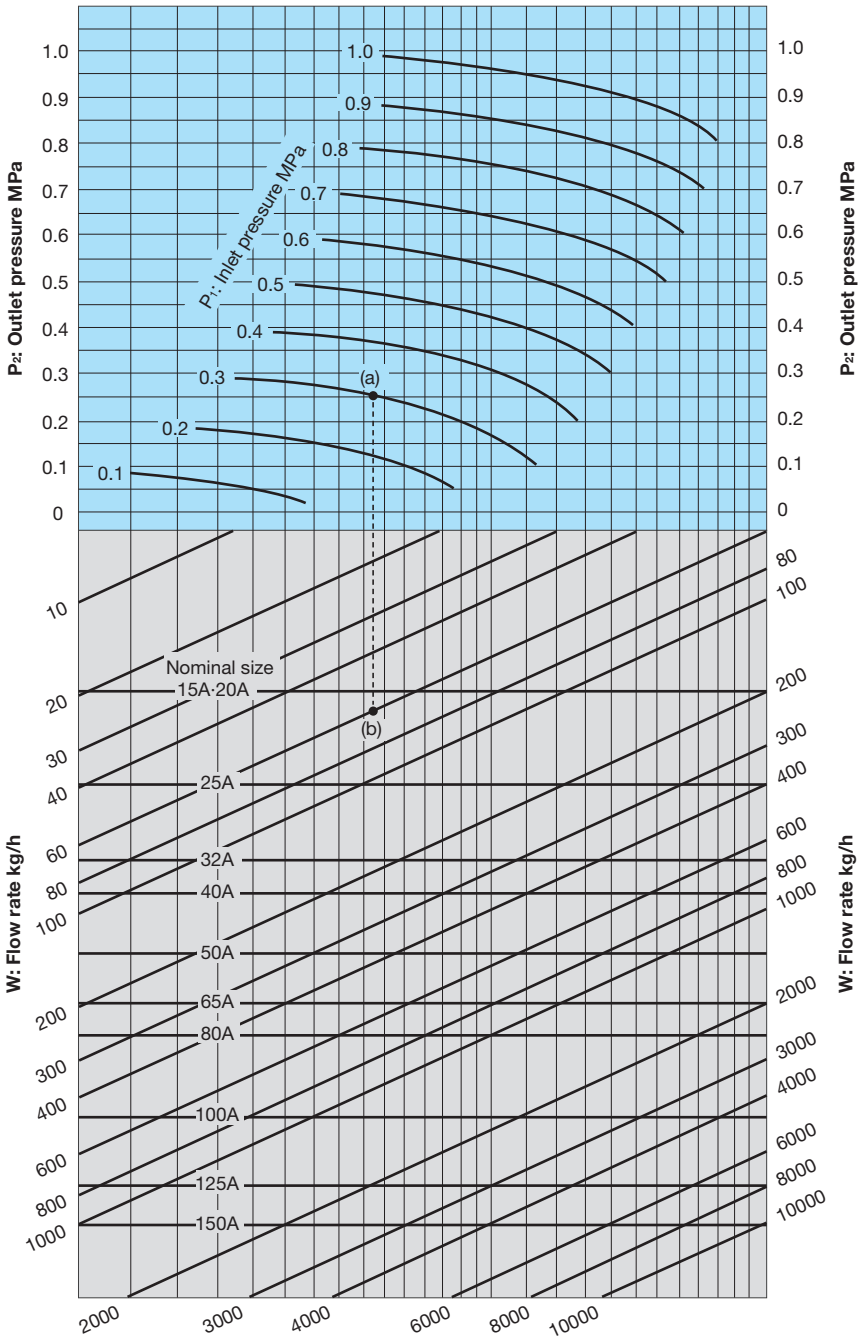


Structure will be little different depends on sizes.
OB-2G has a little difference in bellows structure.

Nominal size	L	H_1	H	Weight
15A	126	60	520	15
20A	130	60	520	16
25A	140	70	540	18
32A	150	75	550	21
40A	160	75	550	23
50A	180	110	620	29
65A	215	125	650	38
80A	260	135	700	48
100A	300	160	750	58
125A	360	190	810	76
150A	382	220	980	125

· The OB-2G comes in nominal size up to 125A.

■Nominal Size Selection Chart (For Steam)



How to use the chart

When selecting the nominal size of a temperature regulator whose inlet pressure (P_1), outlet pressure (P_2), and steam flow rate are 0.3 MPa, 0.25 MPa, and 60 kg/h, respectively, first find intersection point (a) of the inlet pressure of 0.3 MPa and the outlet pressure of 0.25 MPa. Trace down vertically from this intersection point (a) to find intersection point (b) with the flow rate of 60 kg/h. Since this intersection point (b) lies between nominal sizes 15A or 20A and 25A, select the larger one, 25A.

* Chart of the flow rate is a reference value.

OB-3,3G

Direct acting type | Pilot operated type | Heating | Cooling
Bellows | Diaphragm | Single valve | Double valve
Soft seat

■Features

1. Piping can be easily connected due to a union type connection screw.
2. These temperature regulators do not require any adjusting tool because equipped with an adjusting handle which leads to easy adjustment.
3. Since these temperature regulators adopt a dual-valve structure, the flow rate is larger than that of single-valve temperature regulators.
4. A special packing proud of excellent accuracy is used for the valve rod gland packing that affects the opening and closing of the valve.
5. OB-3G ensures distinguished temperature resistance due to an external pressure type bellows.

■Specifications

Model			OB-3	OB-3G
Application		Cooling	Cold water, Refrigerant	
		Cooled	Cold and hot water, Oil, Non-dangerous fluid	
Max. pressure		Body	0.7 MPa	
		Thermal valve	1.0 MPa	
Maximum temperature			180℃	
Temperature adjusting range		For liquid	40-120℃	15-100℃
		For air	40-120℃	15-100℃
Ambient temperature			Set temp. -10℃ or less	Set temp. 30℃ or less
Material	Body		Cast bronze	
	Valve, valve seat		Phosphor bronze	
	Valve spindle		Stainless steel	
	Bellows		Phosphor bronze	
	Thermal valve	For liquid	Stainless steel	
		For air	Stainless steel with fin	
Standard capillary length			2 m	
Connection			JIS Rc screwed (union joint)	

* Valve seat leakage: Refer to P.13-43.
· If the ambient temperature is higher than the set temperature or less than 40℃, use the OB-3G (with external pressure type bellows).
· Available with capillary of up to 5 meter. (Please refer to P.13-46 for errors of set temperature).
· Available with thermal well (SUS304 made or with a PTFE cap) for liquid.

■Temperature Adjusting Range

· OB-3

Temperature adjusting (℃)		Withstand temperature (℃)
For liquid	For air	
40- 60	40- 60	70
50- 70	50- 70	80
60- 80	60- 80	90
80-100	80-100	110
100-120	100-120	130

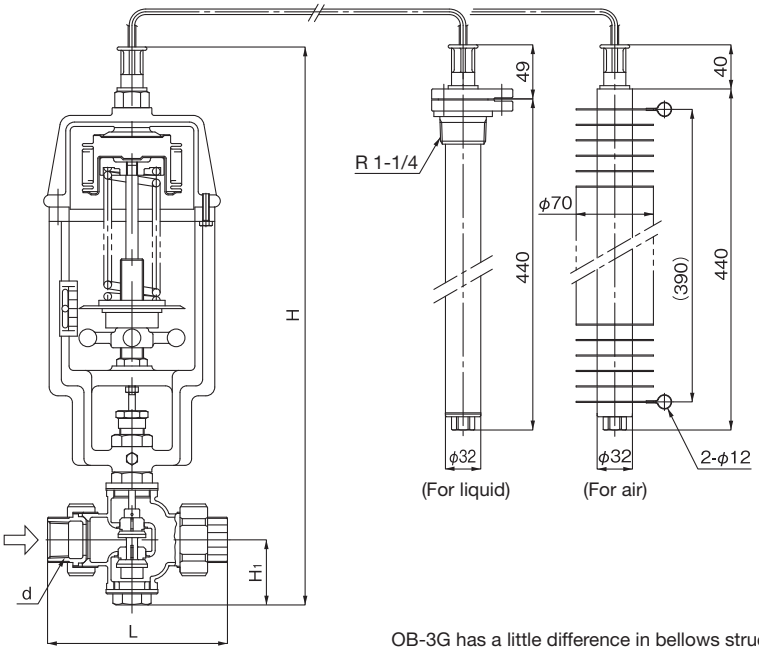
· The term “Withstand temperature” means the temperature from pressure resistance of the bellows.
· Available with temperature adjusting range of 30℃ (the OB-3 only).

· OB-3G

Temperature adjusting (℃)		Withstand temperature (℃)
For liquid	For air	
15- 35	15- 35	50
20- 40	20- 40	50
35- 55	35- 55	70
40- 60	40- 60	90
50- 70	50- 70	100
60- 80	60- 80	110
70- 90	70- 90	120
80-100	80-100	130

· The term “Withstand temperature” means the temperature from pressure resistance of the bellows.

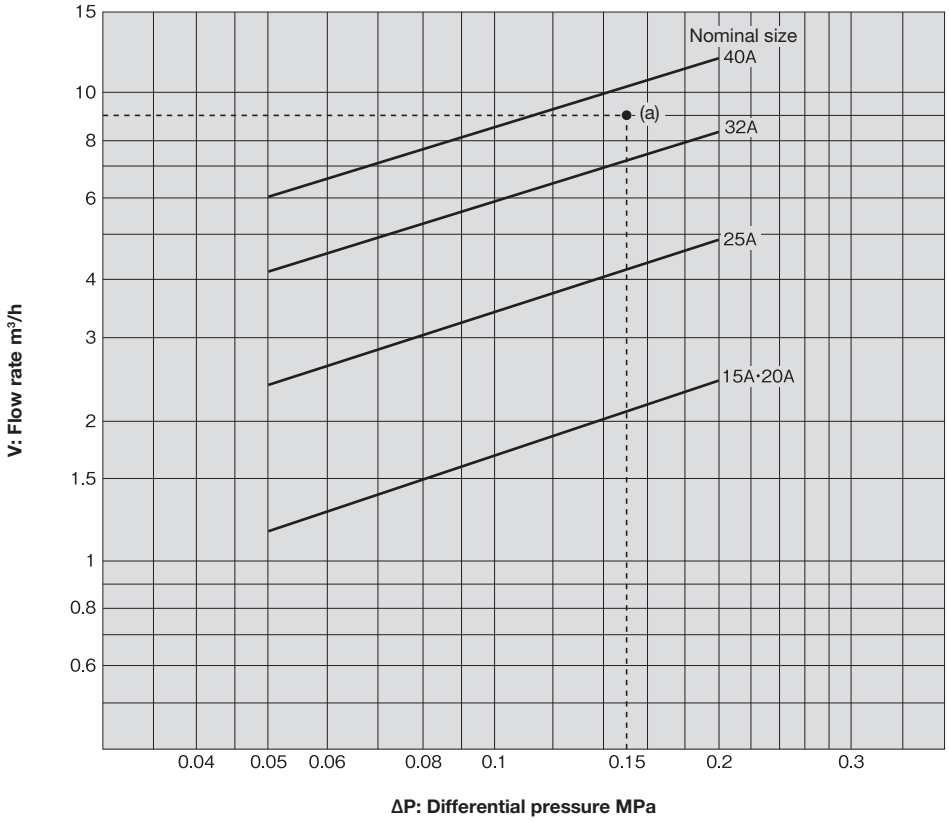
■Dimensions (mm) and Weights (kg)



OB-3G has a little difference in bellows structure.

Nominal size	d	L	H_1	H	Weight
15A	Rc 1/2	148	55	510	11
20A	Rc 3/4	148	55	510	11
25A	Rc 1	160	60	520	12
32A	Rc 1-1/4	195	60	520	12
40A	Rc 1-1/2	210	65	530	13

■Nominal Size Selection Chart (For Water)



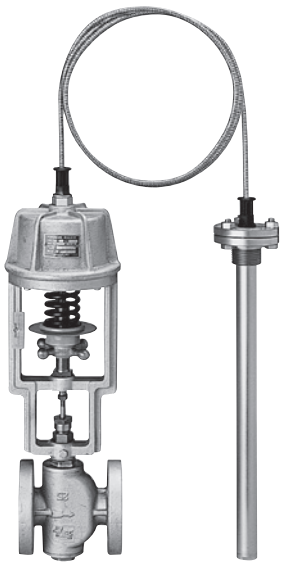
How to use the chart

When inlet pressure is 0.3 MPa, outlet pressure is 0.15 MPa, and flow rate is 9 m^3/h, first find the intersection point (a) with the differential pressure (ΔP) 0.15 MPa (0.3 MPa – 0.15 MPa) before and after valve and the flow rate 9 m^3/h. Since this intersection point (a) locates between nominal sizes 32A and 40A, select the larger one, 40A.

* Chart of the flow rate is a reference value.

OB-4,4G

Direct acting type | Pilot operated type | Heating | Cooling
Bellows | Diaphragm | Single valve | Double valve
Soft seat



■Features

1. These temperature regulators do not require any adjusting tool because equipped with an adjusting handle which leads to easy adjustment.
2. Since these temperature regulators adopt a dual-valve structure, the flow rate is larger than that of single-valve temperature regulators.
3. A special packing proud of excellent accuracy is used for the valve rod gland packing that affects the opening and closing of the valve.
4. OB-4G ensures distinguished temperature resistance due to an external pressure type bellows.

■Specifications

Model			OB-4	OB-4G
Application		Cooling	Cold water, Refrigerant	
		Cooled	Cold and hot water, Oil, Non-dangerous fluid	
Max. pressure		Body	15A-40A: 0.7 MPa 〔1.0 MPa〕 50A: 0.5 MPa 〔0.7 MPa〕 65A: 0.5 MPa 〔0.7 MPa〕 80A: 0.4 MPa 〔0.5 MPa〕 100A: 0.4 MPa 125A: 0.2 MPa 〔0.35 MPa for OB-2〕 150A: 0.2 MPa	
		Thermal valve	1.0 MPa	
Maximum temperature			180℃	
Temperature adjusting range		For liquid	40-120℃	15-100℃
		For air	40-120℃	15-100℃
Ambient temperature			Set temp. -10℃ or less	Set temp. 30℃ or less
Material		Body	Cast iron	
		Valve, valve seat	Phosphor bronze (Stainless steel)	
		Valve spindle	Stainless steel	
		Bellows	Phosphor bronze	
	Thermal valve	For liquid	Stainless steel	
		For air	Stainless steel with fin	
Standard capillary length			15A-80A: 2 m 100A-150A: 3 m	
Connection			JIS 10K FF flanged	

* Valve seat leakage: Refer to P.13-43.
· If the ambient temperature is higher than the set temperature or less than 40℃, use the OB-4G (with external pressure type bellows).
· Available with capillary of up to 5 meter. (Please refer to P.13-46 for errors of set temperature).
· Available with Max. temperature inside [ ]. (Valve and valve seat material, and bellows is different from standard type).
· Available with thermal well (SUS304 made or with a PTFE cap) for liquid.

■Temperature Adjusting Range

· OB-4

Temperature adjusting (℃)		Withstand temperature (℃)
For liquid	For air	
40-60	40-60	70
50-70	50-70	80
60-80	60-80	90
80-100	80-100	110
100-120	100-120	130

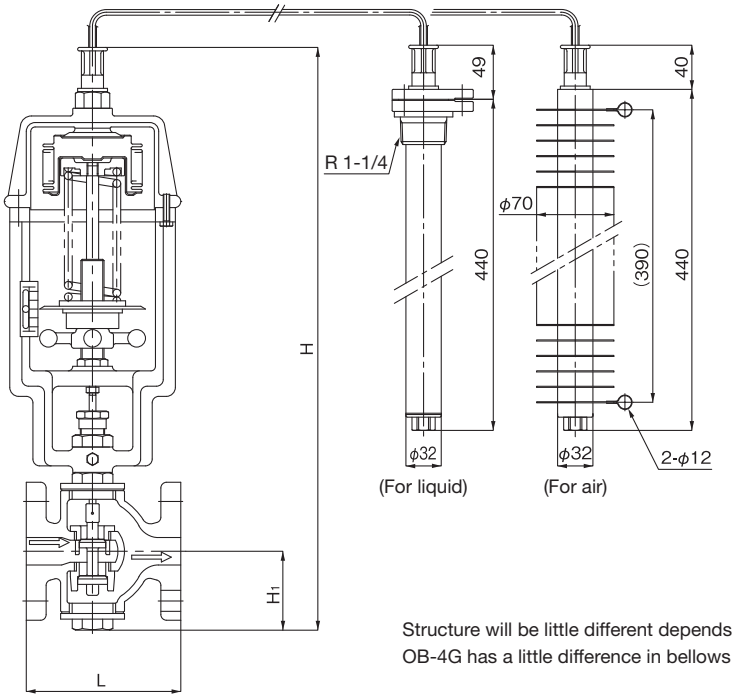
· The term “Withstand temperature” means the temperature from pressure resistance of the bellows.
· Available with temperature adjusting range of 30℃ (the OB-4 only).

· OB-4G

Temperature adjusting (℃)		Withstand temperature (℃)
For liquid	For air	
15-35	15-35	50
20-40	20-40	50
35-55	35-55	70
40-60	40-60	90
50-70	50-70	100
60-80	60-80	110
70-90	70-90	120
80-100	80-100	130

· The term “Withstand temperature” means the temperature from pressure resistance of the bellows.

■Dimensions (mm) and Weights (kg)

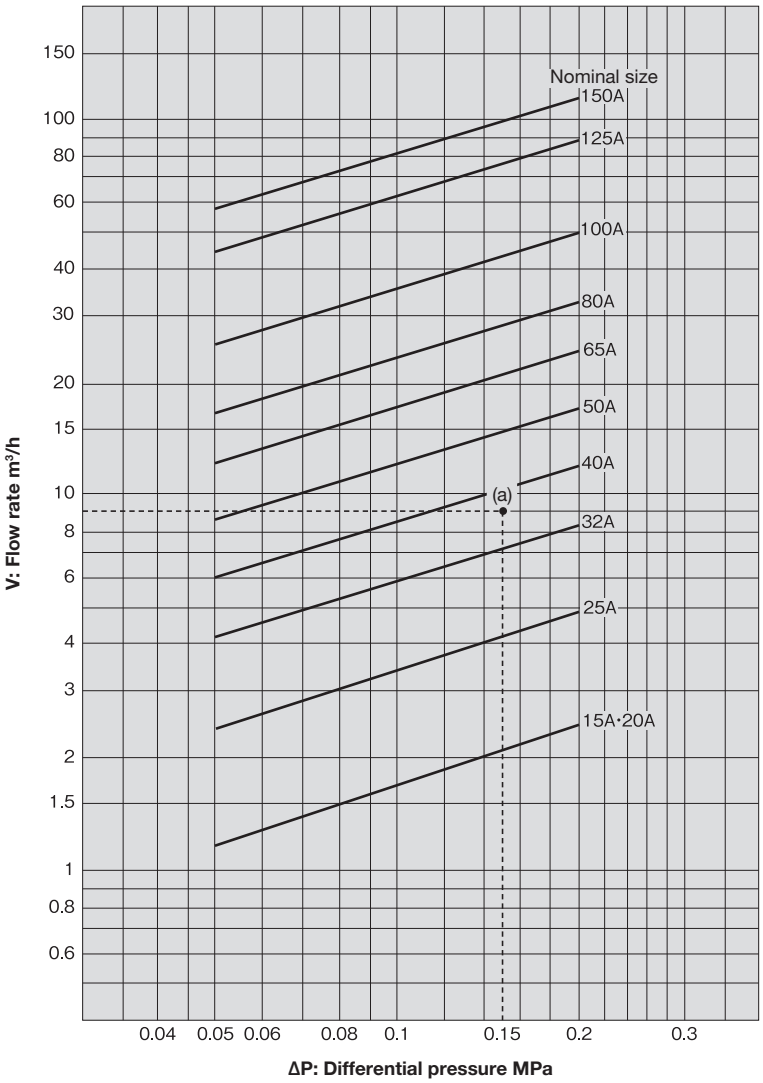


Structure will be little different depends on sizes.
OB-4G has a little difference in bellows structure.

Nominal size	L	H_1	H	Weight
15A	126	60	520	15
20A	130	60	520	16
25A	140	70	540	18
32A	150	75	550	21
40A	160	75	550	23
50A	180	110	620	29
65A	215	125	650	38
80A	260	135	700	48
100A	300	160	750	58
125A	360	190	810	76
150A	382	220	980	125

· OB-4G comes in nominal size up to 125A.

■Nominal Size Selection Chart (For Air)



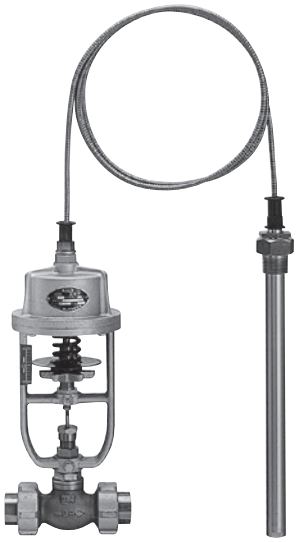
How to use the chart

When inlet pressure is 0.3 MPa, outlet pressure is 0.15 MPa, and flow rate is 9 m^3/h, first find the intersection point (a) with the differential pressure (ΔP) 0.15 MPa (0.3 MPa – 0.15 MPa) before and after valve and the flow rate 9 m^3/h. Since this intersection point (a) locates between nominal sizes 32A and 40A, select the larger one, 40A.

* Chart of the flow rate is a reference value.

OB-5

Direct acting type | Pilot operated type | **Heating** | Cooling
Bellows | Diaphragm | **Single valve** | Double valve
Soft seat



■Features

1. Low leakage designed single-seat valve.
2. Small and light weight compared with other temperature regulators.
3. These temperature regulators do not require any adjusting tool because equipped with an adjusting handle which leads to easy adjustment.
4. A special packing proud of excellent accuracy is used for the valve rod gland packing that affects the opening and closing of the valve.
5. Piping can be easily connected due to a union type connection screw.

■Specifications

Application		Heating	Steam, Hot water
		Heated	Cold and hot water, Oil, Non-dangerous fluid
Max. pressure		Body	0.5 MPa
		Thermal valve	1.0 MPa
Maximum temperature			180˚C
Temperature adjusting range		For liquid	40-120˚C
		For air	40-120˚C
Ambient temperature			Set temp. -10˚C or less
Material	Body		Cast bronze
	Valve		Stainless steel
	Valve seat		Stainless steel
	Valve spindle		Stainless steel
	Bellows		Phosphor bronze
	Thermal valve	For liquid	Stainless steel
		For air	Stainless steel with fin
Standard capillary length			2 m
Connection			JIS Rc screwed (union joint)

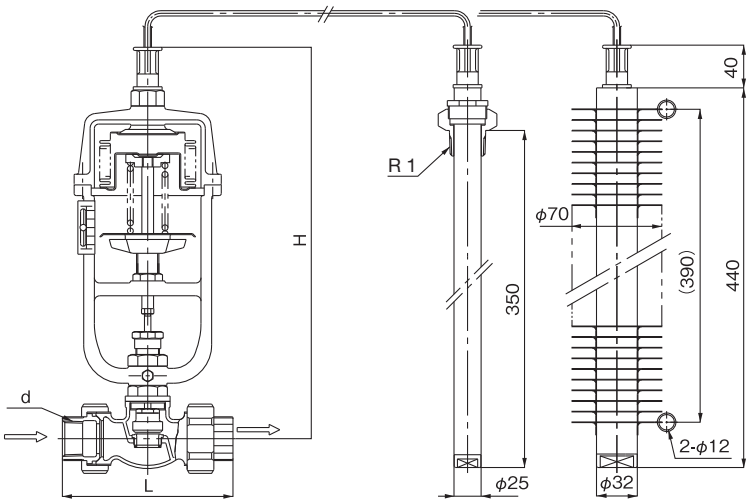
* Valve seat leakage: Refer to P.13-43.
· Available with capillary of up to 5 meter. (Please refer to P.13-46 for errors of set temperature).
· Available with low-temperature heating (15-35˚C, 20-40˚C, 35-55˚C) for OB-5G.
· Available with thermal well (SUS304 made or with a PTFE cap) for liquid.

■Temperature Adjusting Range

Temperature adjusting (˚C)		Withstand temperature (˚C)
For liquid	For air	
40-60	40-60	70
50-70	50-70	80
60-80	60-80	90
80-100	80-100	110
100-120	100-120	130

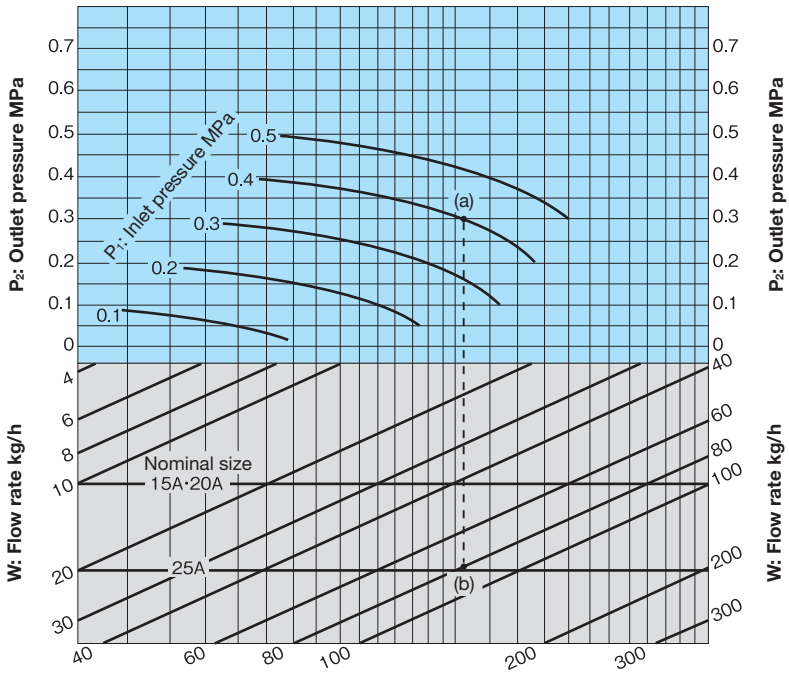
· The term “Withstand temperature” means the temperature from pressure resistance of the bellows.
· Available with temperature adjusting range of 30˚C (the OB-5 only).

■Dimensions (mm) and Weights (kg)



Nominal size	d	L	H	Weight
15A	Rc 1/2	148	360	6
20A	Rc 3/4	148	360	6
25A	Rc 1	160	360	7

■Nominal Size Selection Chart (For Steam)



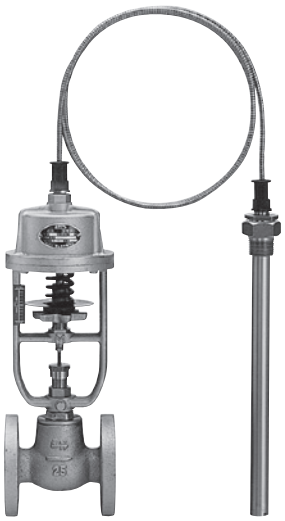
* Chart of the flow rate is a reference value.

How to use the chart

When inlet pressure (P_1) is 0.4 MPa, outlet pressure (P_2) is 0.3 MPa, and flow rate is 80 kg/h, first find intersection point (a) of the inlet pressure 0.4 MPa and the outlet pressure 0.3 MPa. Trace down vertically from this intersection point (a) and find intersection point (b) with the flow rate 80 kg/h. Since this intersection point (b) locates between nominal sizes 15A or 20A and 25A, select the larger one, 25A.

OB-6

Direct acting type | Pilot operated type | **Heating** | Cooling
Bellows | Diaphragm | **Single valve** | Double valve
Soft seat



■Features

1. Low leakage designed single-seat valve.
2. Small and light weight compared with other temperature regulators.
3. These temperature regulators do not require any adjusting tool because equipped with an adjusting handle which leads to easy adjustment.
4. A special packing proud of excellent accuracy is used for the valve rod gland packing that affects the opening and closing of the valve.

■Specifications

Application		Heating	Steam, Hot water
		Heated	Cold and hot water, Oil, Non-dangerous fluid
Max. pressure		Body	0.5 MPa
		Thermal valve	1.0 MPa
Maximum temperature			180℃
Temperature adjusting range		For liquid	40-120℃
		For air	40-120℃
Ambient temperature			Set temp. -10℃ or less
Material		Body	Cast iron
		Valve	Stainless steel
		Valve seat	Stainless steel
		Valve spindle	Stainless steel
		Bellows	Phosphor bronze
	Thermal valve	For liquid	Stainless steel
		For air	Stainless steel with fin
Standard capillary length			2 m
Connection			JIS 10K FF flanged

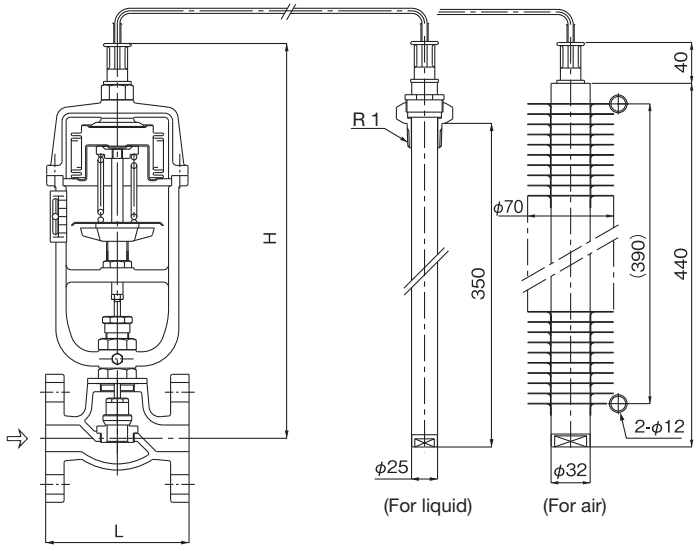
* Valve seat leakage: Refer to P.13-43.
· Available with capillary of up to 5 meter. (Please refer to P.13-46 for errors of set temperature).
· Available with low-temperature heating (15-35℃, 20-40℃, 35-55℃) for OB-6G.
· Available with thermal well (SUS304 made or with a PTFE cap) for liquid.

■Temperature Adjusting Range

Temperature adjusting (℃)		Withstand temperature (℃)
For liquid	For air	
40-60	40-60	70
50-70	50-70	80
60-80	60-80	90
80-100	80-100	110
100-120	100-120	130

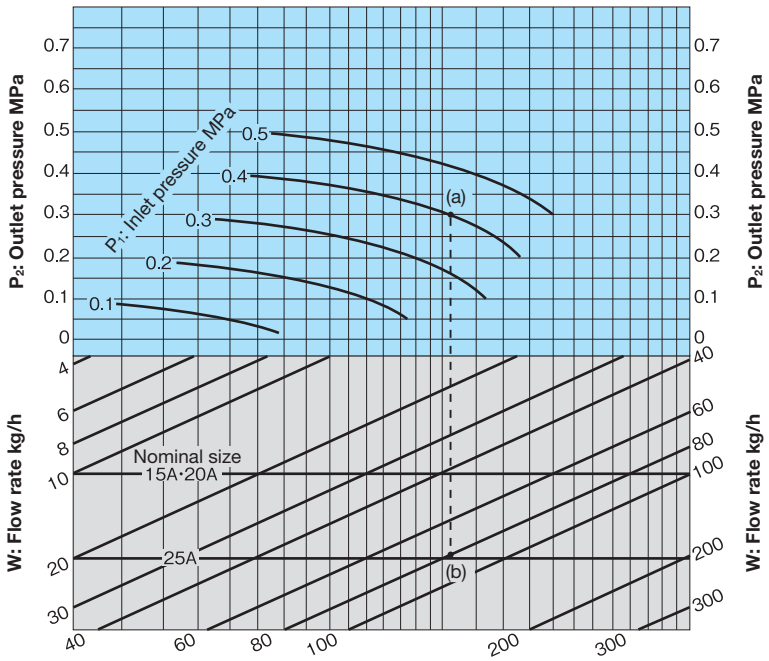
· The term “Withstand temperature” means the temperature from pressure resistance of the bellows.
· Available with temperature adjusting range of 30℃ (the OB-6 only).

■Dimensions (mm) and Weights (kg)



Nominal size	L	H	Weight
15A	130	380	9
20A	130	380	10
25A	140	385	12

■Nominal Size Selection Chart (For Steam)



* Chart of the flow rate is a reference value.

How to use the chart

When inlet pressure (P_1) is 0.4 MPa, outlet pressure (P_2) is 0.3 MPa, and flow rate is 80 kg/h, first find intersection point (a) of the inlet pressure 0.4 MPa and the outlet pressure 0.3 MPa. Trace down vertically from this intersection point (a) and find intersection point (b) with the flow rate 80 kg/h. Since this intersection point (b) locates between nominal sizes 15A or 20A and 25A, select the larger one, 25A.

Temperature Regulator – Annex

⚠CAUTION Please refer to the manual attached to the product for procedures for installation and operation.

OB-30 series Temperature Regulator – Annex

Disassembly and troubleshooting

OB-30 series

Please note that body and sensor are supplied separately. Assemble body and sensor according to the following procedures.

· Installation of body

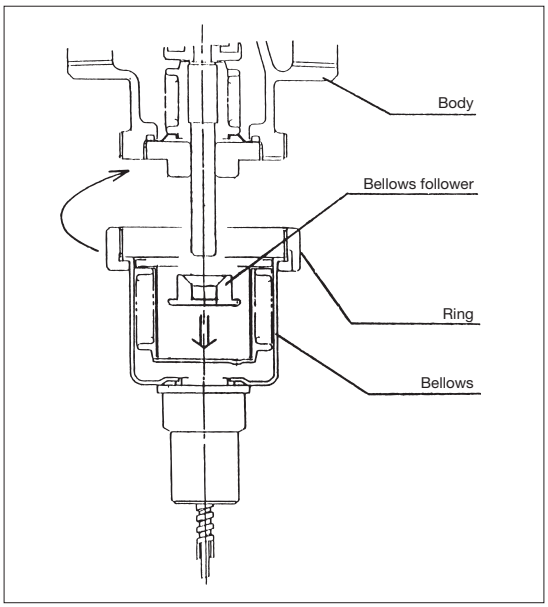
1. Please be sure not to lose the bellows follower (attached component).
2. Install the body to horizontal piping with the handle facing upward.
3. Check the direction of the product so that the fluid flowing and the arrow marked on the body are in the same direction.
4. Be sure to install pressure gauges, a strainer and a bypass line to the piping. (See P.13-8 to 10.)
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.

· Installation of thermal bulb

1. Although the thermal bulb 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 first, then use the washer of packing to secure the thermal bulb.
3. 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.
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.

· Assembly of body and sensor

Place the bellows follower, which is packaged with the body, into the bellows with its flat surface facing downward and then screw it into the lower surface of the body by the ring. It makes the assembly easier to loosen the handle to direction of the “L” position. Be sure not to lose the bellows follower because the product does not function properly without it.

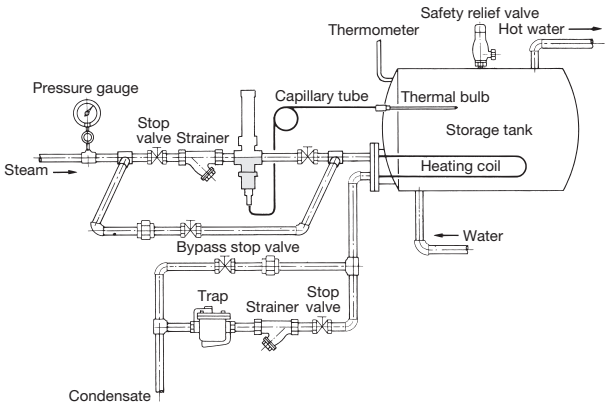


Completely discharge the internal pressure from the valves before disassembly.

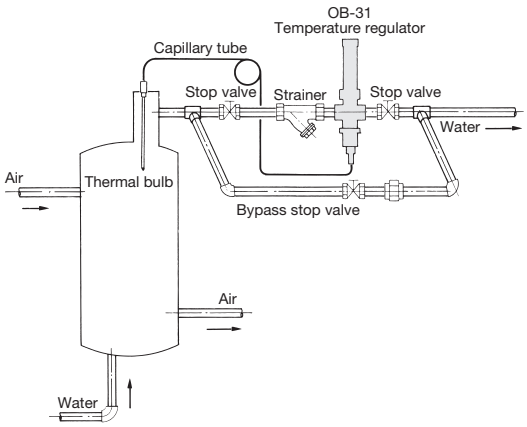
⚠CAUTION Please refer to the manual attached to the product for procedures for installation and operation.

Piping example — OB-30 series

· OB-30, OB-30U (for heating)



· OB-31, OB-31U (for cooling)



Adjustment — OB-30 series

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 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.
5. Scale reading and set temperature
   The tables 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.
6. Please note that too much frequent adjustment by handle can lead damage on the internal parts.

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

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

Completely discharge the internal pressure from the valves before disassembly.

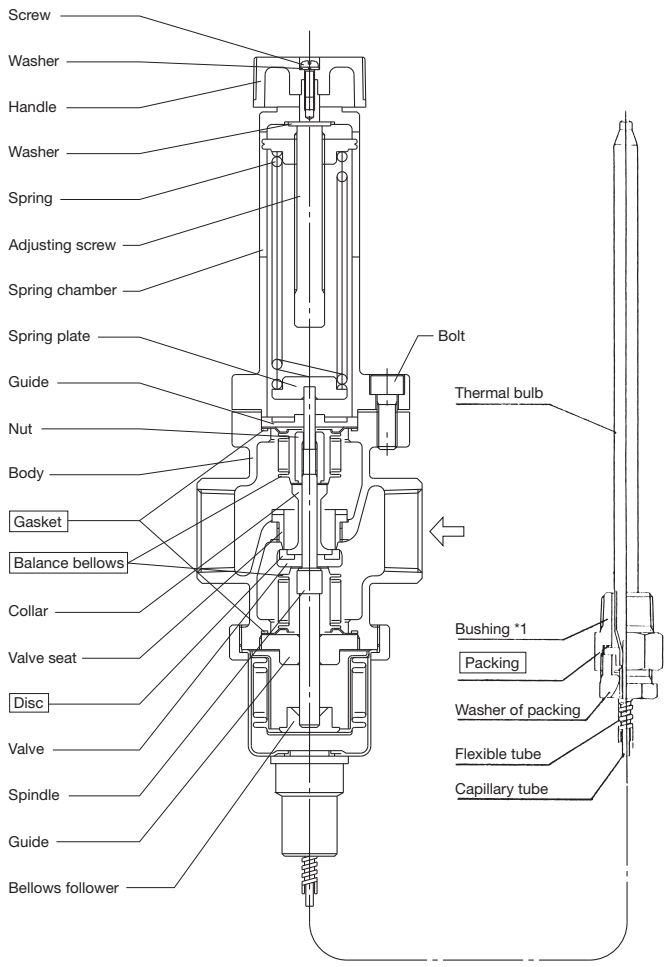
⚠CAUTION **Please refer to the manual attached to the product for procedures for installation and operation.**

Disassembly and troubleshooting — OB-30 series

Make sure to close the stop valves installed at before and after the product, prior to disassembly.
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.

1. Loosen the handle to direction of the “L” position.
2. Loosen the ring and detach the bellows. Be sure not to lose the bellows follower.
3. Loosen the bolt (nominal size: 6) and detach the spring chamber.
4. Detach the upper and lower guides (Width across flat: 17 mm).
5. While setting a tool such as a spanner (width across flat: 6 mm) at the lower part of the spindle, loosen the nut by using a socket wrench (nominal size: 10, Hex.) and detach the nut. You can detach all the internal parts except for the valve seat.
6. Reassemble in the reverse order from disassembly.

* Please see the manual attached to the product for detailed procedures.



The parts shown in the rectangle boxes ▭ are available as consumable supply.
*1 Thermal bulb with Thermal well (stainless steel) does not need bushing for thermal bulb.

Completely discharge the internal pressure from the valves before disassembly.

⚠CAUTION Please refer to the manual attached to the product for procedures for installation and operation.

· OB-30·30U (for heating)

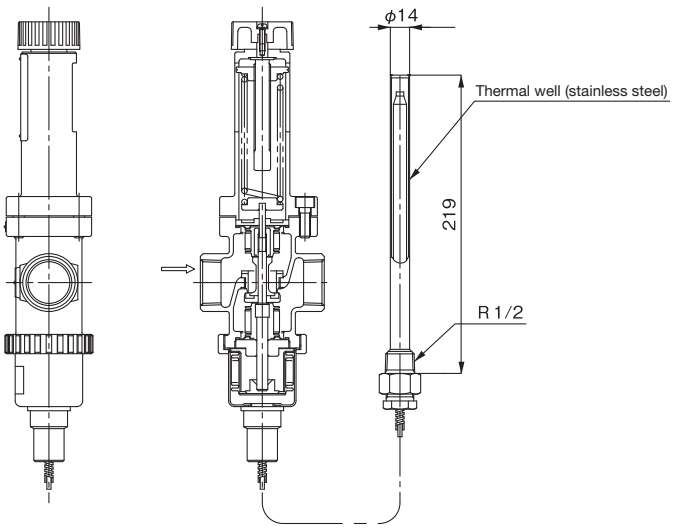
Trouble	Cause	Remedy
Temperature does not rise.	● Inadequate adjustment.	Readjust according to the adjustment procedures.
	● Insufficient drainage from the trap of heat exchanger, etc.	Check the trap and replace it if necessary.
Temperature rises excessively.	● Inadequate adjustment.	Readjust according to the adjustment procedures.
	● Foreign substances are stuck between disc and valve seat, or either of the parts is damaged.	Remove the foreign substances. If there is damage on the parts, please contact us to disassemble and replace the parts.
	● The thermal bulb or bellows is damaged.	Replace the sensor.
Large error of temperature control.	● The thermal bulb and thermometer are installed in wrong positions.	Reinstall them at points where circulation is best.
	● Inlet pressure is too high.	When steam consumption is small, lower the the inlet pressure for better temperature control.
Outside leakage.	● Leakage from the gasket.	Retighten the gasket, or disassemble the product to replace the part.
	● Balance bellows is damaged.	Disassemble the product and replace the balance bellows.

· OB-31·31U (for cooling)

Trouble	Cause	Remedy
Temperature lowers excessively.	● Inadequate adjustment.	Readjust according to the adjustment procedures.
	● Foreign substances are stuck between disc and valve seat, or either of the parts is damaged.	Remove the foreign substances. If there is damage on the parts, please contact us to disassemble and replace the parts.
Temperature does not lower.	● Inadequate adjustment.	Readjust according to the adjustment procedures.
	● Thermal bulb or bellows is damaged.	Replace the sensor.
Large error of temperature control.	● Thermal bulb and thermometer are installed in wrong positions.	Reinstall them at points where the circulation is best.
	● Inlet pressure is too high.	Lower the inlet pressure for better temperature control.
Outside leakage.	● Leakage from the gasket.	Retighten the gasket, or disassemble the product to replace the part.
	● Balance bellows is damaged.	Disassemble the product and replace the balance bellows.

Special thermal bulb — Temperature regulator

· OB-30·30U (for heating)



Completely discharge the internal pressure from the valves before disassembly.

⚠CAUTION Please refer to the manual attached to the product for procedures for installation and operation.

OB-2000 series Temperature Regulator – Annex

Precautions for installation

OB-2000 series

· Installation of body

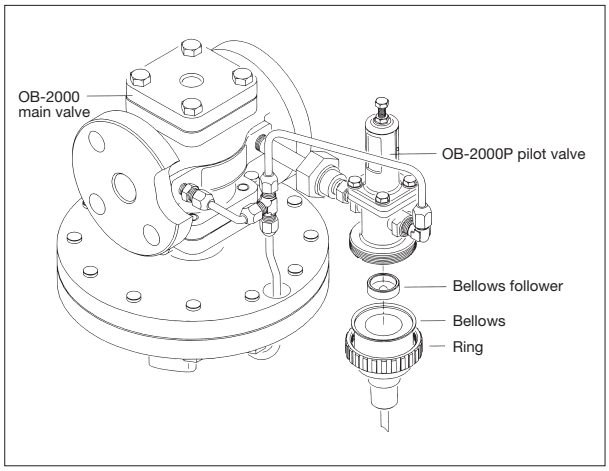
1. Check that there is no foreign substances inside the piping.
2. Install the product to horizontal piping with the posture in which the diaphragm chamber faces downwards.
3. Check the direction of the product so that the fluid flowing and the arrow marked on the body are in the same direction.
4. Be sure to install pressure gauges, strainers, and a bypass line to the piping.
5. The heating fluid pressure should be reduced with a pressure 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 from the piping completely by using a bypass line.

· Installation of thermal bulb

1. Although the thermal bulb 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.
2. Screw in the bushing first, then use the washer of packing to secure the thermal bulb.
3. 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. Secure the capillary tube not to allow it touch steam piping.
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.

· Procedures for assembling pilot valve and sensor

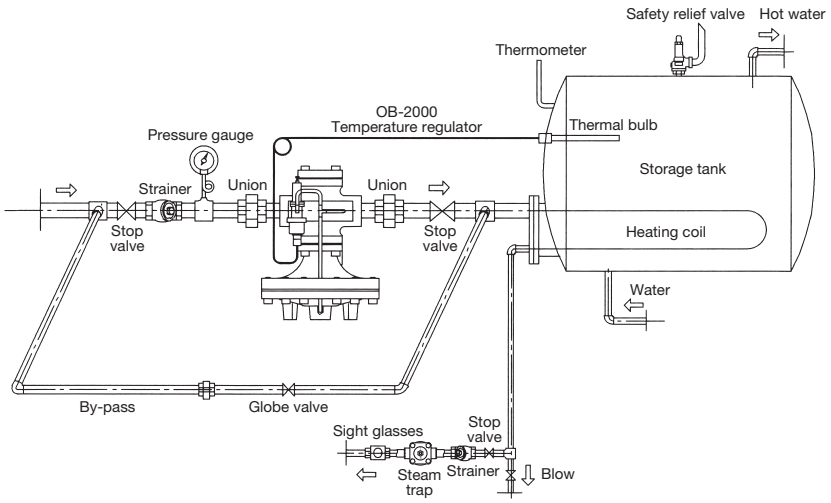
Place the bellows follower, with its flat face downward, into the bellows. And then, screw the ring into the bellows.
Please be careful not to lose the bellows follower attached to the product.



Completely discharge the internal pressure from the valves before disassembly.

⚠CAUTION Please refer to the manual attached to the product for procedures for installation and operation.

Piping example — OB-2000 series



Adjustment — OB-2000 series

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. Be sure that fluid temperature does not exceed the max. temperature while blowing.
2. Turn the adjustment screw and move the indicator to the desired temperature position on the scale. To raise the temperature, turn the screw clockwise. To lower the temperature, turn it counterclockwise.
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 screw till the desired temperature is obtained while watching the thermometer with enough time.
5. Scale reading and set temperature
   The table show the set temperature per scale reading as a guide. Because the temperature varies slightly according to conditions of use, adjust the screw till the desired temperature is obtained.

Scale reading / Adjustment range	−8-15℃	10-36℃	30-62℃	55-94℃	80-127℃	115-183℃
0.5	−11℃	4℃	22℃	45℃	68℃	101℃
1.0	− 2℃	15℃	37℃	61℃	89℃	130℃
1.5	6℃	25℃	49℃	76℃	107℃	153℃
2.0	14℃	34℃	58℃	91℃	125℃	178℃
2.5	21℃	43℃	67℃	106℃	147℃	210℃

Completely discharge the internal pressure from the valves before disassembly.

⚠CAUTION **Please refer to the manual attached to the product for procedures for installation and operation.**

Disassembly and troubleshooting

OB-2000 series

Make sure to close the stop valves installed at before and after the product, and completely discharge the pressure and condensate inside the product, prior to disassembly.

· Disassembly of pilot valve

1. Make sure that thermal bulb is not subjected to temperature higher than the max. allowable temperature.
2. Slightly loosen the lock nut, rotate the adjusting screw counterclockwise to completely release the spring (no compression).
3. Detach the bolts of the spring chamber and dismount the spring chamber and spring, etc.
4. Detach the bellows plate and take out the seal bellows.
5. Loosen the ring and take out the bellows. Be careful not to lose the bellows follower.
6. Detach the guide and take out the pilot valve.
7. Detach the bellows plate from the guide, and then take out the seal bellows.

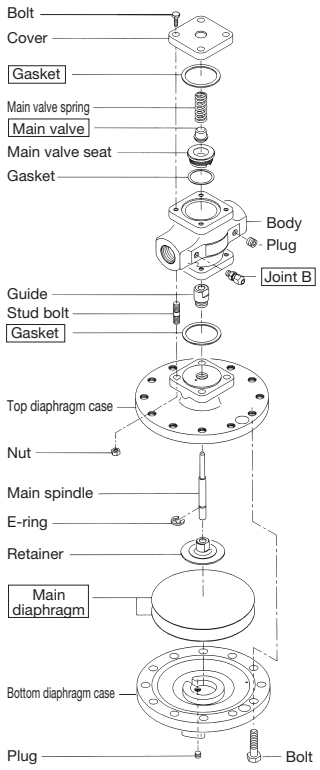
· Disassembly of main body – main valve

1. Detach the bolts of the cover, separate the cover from the body, and take out the main valve spring and main valve.
2. The dedicated tool is required to dismount valve seat.

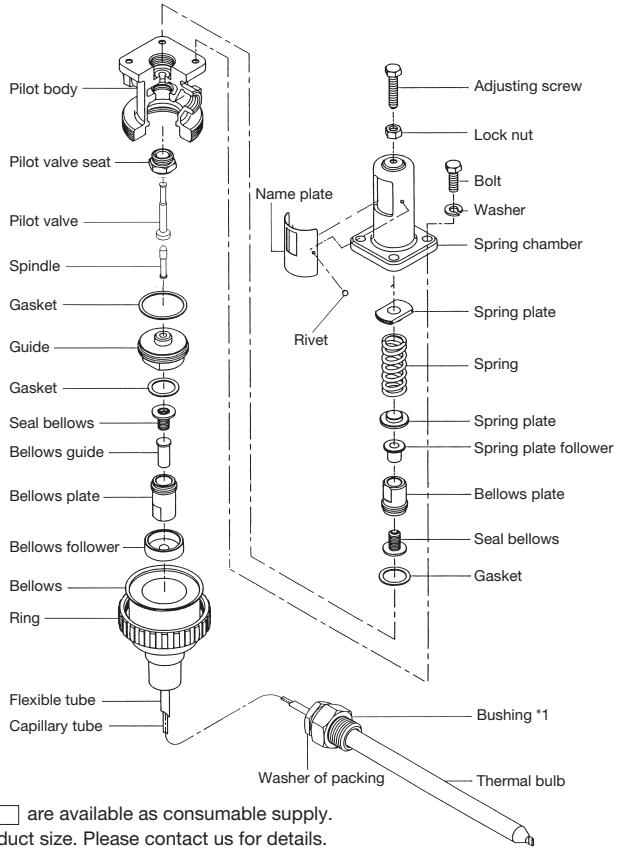
· Disassembly of main body – diaphragm

1. Detach the pipe C at the tee and at the elbow.
2. Detach the bolts of the diaphragm cases. Dismount the diaphragm case, main diaphragm, retainer, and main spindle.

OB-2000 Main valve



OB-2000 Pilot valve



The parts shown in the rectangle boxes ☐ are available as consumable supply.
Some of structures differ according to product size. Please contact us for details.
*1 Bushing is not required when using thermal well (stainless-steel made).

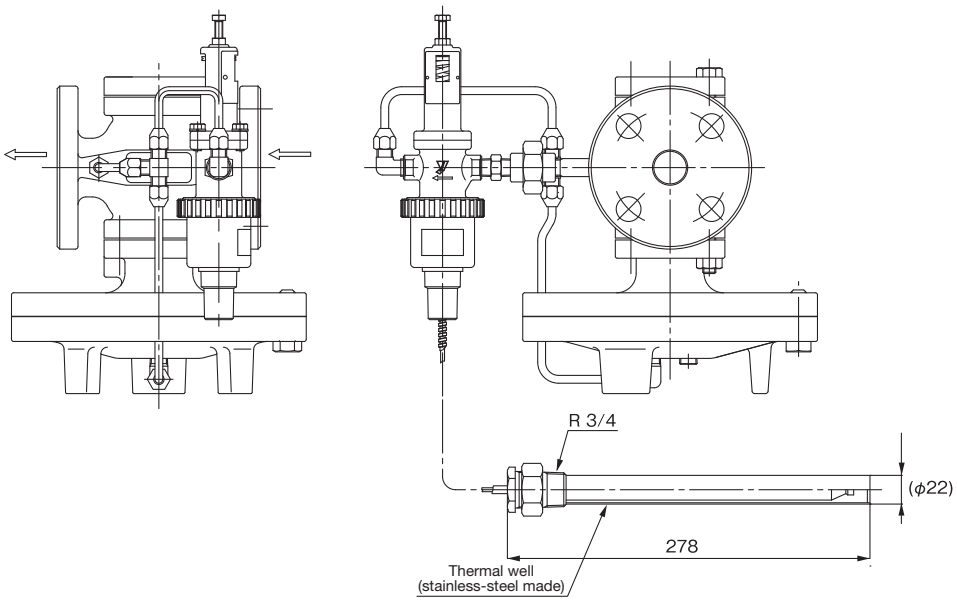
Completely discharge the internal pressure from the valves before disassembly.

⚠CAUTION Please refer to the manual attached to the product for procedures for installation and operation.

Trouble	Cause	Remedy
Temperature does not rise.	● Inadequate adjustment.	Readjust according to the adjustment procedures.
	● Nominal size of the product is too small for the specifications of the system.	Replace the product with one of proper nominal size.
	● Temperature range of sensor is not proper.	Check the label and replace the sensor.
	● Ambient temperature exceeds set temperature.	Lower the ambient temperature by providing fans or ventilation windows.
	● Insufficient drainage from the trap of heat exchanger.	Open the trap's by-pass line and check the condition.
	● Main diaphragm is damaged.	Detach Joint C and open the by-pass valve. If the fluid flows out from the diaphragm chamber, replace the diaphragm.
	● Joint C orifice is clogged.	Disassemble and clean.
	● There is no orifice in Joint B.	Replace it with proper one.
Temperature rises excessively.	● Inadequate adjustment.	Readjust according to the adjustment procedures.
	● Foreign substances are stuck between main valve and main valve seat, or either of the parts is damaged.	Release the adjusting spring and detach the pipe D, and supply fluid from the inlet. If the fluid flows out from the tee, disassemble and clean. In case of damage, lap the parts.
	● Foreign substances are stuck between pilot valve and pilot valve seat, or either of the parts is damaged.	Detach pipe D and apply fluid to the inlet, while applying thermal bulb with a temperature higher than set temperature. If the fluid flows out from elbow, disassemble and clean. In case of damage, lap the parts.
	● Joint B orifice is clogged.	Disassemble and clean.
	● Thermal bulb or bellows is damaged.	Replace the sensor.
	● Leakage from by-pass line.	Repair or replace.
Large error of temperature control.	● Thermal bulb and thermometer are installed in wrong positions.	Reinstall them at points where the circulation is best.
	● Inlet pressure is too high.	When steam consumption is small, lower the inlet pressure for better temperature control.
	● Spindle and guide, or, pilot valve and guide do not move smoothly.	Disassemble and clean, or replace.
Outside leakage.	● Leakage from the gasket.	Retighten or replace the gasket.
	● Seal bellows is damaged.	Replace the seal bellows.

Special specifications — Temperature regulator

· **OB-2000**



Completely discharge the internal pressure from the valves before disassembly.

⚠CAUTION Please refer to the manual attached to the product for procedures for installation and operation.

OB-1 to 6 Temperature Regulator – Annex

Precautions for installation and piping example

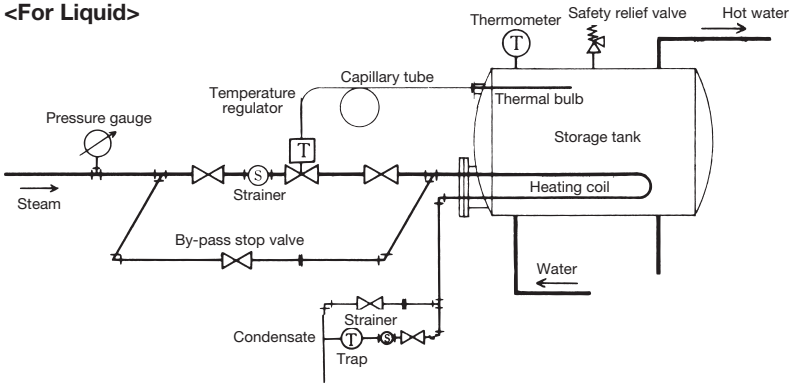
Temperature regulator

· Installation of body

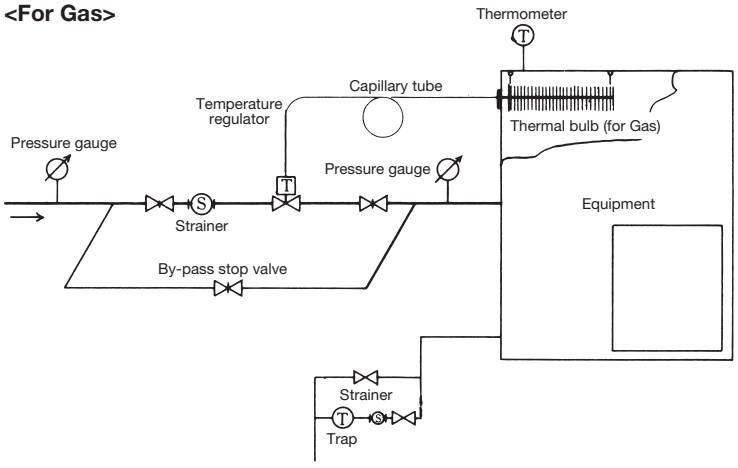
1. Install the product to horizontal piping with the posture in which the frame is higher than and vertical to the piping.
2. Install the product to a place where the ambient temperature does not exceed the set temperature.
   The ambient temperature beyond the set temperature hampers correct temperature regulation.
3. Be sure to install pressure gauges, strainers, and a by-pass line. (See Fig. 1.)
4. The heating/cooling fluid pressure should be reduced with a pressure reducing valve if it exceeds the maximum pressure.
5. Do not apply excessive load, torque or vibration to the product.
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 from the piping completely by using a bypass line.

Fig.1 Piping example

<For Liquid>



<For Gas>



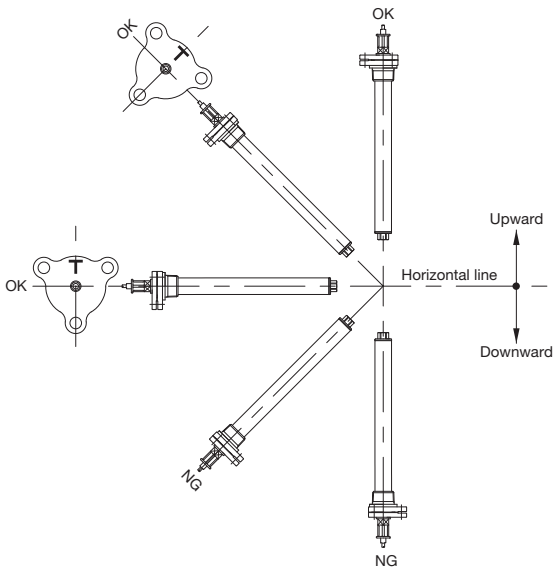
Completely discharge the internal pressure from the valves before disassembly.

⚠CAUTION **Please refer to the manual attached to the product for procedures for installation and operation.**

· Installation of thermal bulb

1. Avoid bending the capillary tube at a sharp angle, twisting or pulling it with force. Secure the capillary tube not to allow it touch steam piping or any other of high temperature.
   The bend radius of the capillary tube should be more than 40 mm.
2. Make sure that more than 3/4 of its total length is in direct contact with the fluid to be heated.
3. Install a thermometer close to the thermal bulb.
4. Install a thermal bulb to the most ideal point to detect the temperature.
5. Install a thermal bulb in a posture in which the top of thermal bulb is higher than the other side (connecting part to the tube), and in which the marking (on flange or nut) is always at highest position.
6. Detach the bolts from companion flanges, and screw one piece of comparison flange into the point where the temperature should be sensed. Then, insert the thermal bulb and align the bolt holes of both comparison flanges. Next, fasten the bolts evenly with careful attention not to twist the pipe.
   (This step is not applied to OB-5 and OB-6.)

Fig.2 Thermal bulb installation example



Adjustment procedures — Temperature regulator

Incorrect adjustment may cause hunting, scale problems or water hammer, and may heavily damage the main parts of the product. Be sure to follow the steps below.

1. Close the stop valves before and after 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.
While blowing, be careful not to apply fluid of higher temperature than the max. allowable temperature of the product.
2. Turn the handle and move the indicator to the desired temperature position on the scale. To raise the temperature, turn the handle counterclockwise (when seen from the top). To lower the temperature, turn it clockwise (when seen from the top). Reading scale is only for reference, so please adjust the temperature by using a thermometer.
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.

Seat leakage — Temperature regulator

· Unit: Steam (kg/h), Water (ℓ /h)

Model \ Nominal size	15A	20A	25A	32A	40A	50A	65A	80A	100A	125A	150A
OB-1, 1G, 2, 2G 3, 3G, 4, 4G	1.5	1.5	1.8	2.4	3.0	3.6	4.8	6.0	7.2	9.0	10.8
OB-5, 6	0.12	0.12	0.18	—	—	—	—	—	—	—	—

* These values are max. leakage amount under the working pressure of 0.5 MPa or max. pressure at the temperature of “set temperature +5℃” for heating, or at the temperature of “set temperature -5℃” for cooling.

Completely discharge the internal pressure from the valves before disassembly.

⚠CAUTION **Please refer to the manual attached to the product for procedures for installation and operation.**

Disassembly and disposal — Temperature regulator

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

· Disassembly of bellows

1. Detach the thermal bulb from the tank/piping.
2. Turn the handle clockwise to release the spring (no compression).
3. Detach the bolts of bellows cover and dismount the bellows.
   Caution) Do not apply heat to thermal bulb while the bellows is dismounted. For the thermal bulb of lower temperature range, the thermal bulb has to be put in water while step 3 above.

· Disassembly of valve

[OB-1, OB-1G, OB-2, OB-2G, OB-5, OB-6]
①Turn the handle counterclockwise to push up the spring.
②Detach the top cover and pull it up to take out the valve.
③Dismount the spindle joint and dismount the valve.
[OB-3, OB-3G, OB-4, OB-4G]
①Turn the handle clockwise to release the spring (no compression).
②Loosen the lock nut and disconnect the spindle. (It is recommended that you put marking on the parts with an oil-based pen before loosening the lock nut, so that you can easily reassemble.)
③Detach the bottom cover and take out the valve.

· Precaution for disposal

[OB-1, OB-1G, OB-2, OB-2G, OB-3, OB-3G, OB-4, OB-4G, OB-5, OB-6]
* Thermal bulb contains alcohol or CFC. Disposal should be done accordingly.

Completely discharge the internal pressure from the valves before disassembly.

⚠CAUTION Please refer to the manual attached to the product for procedures for installation and operation.

OB-1, OB-1G, OB-2, OB-2G, OB-5, OB-6

Trouble	Cause	Remedy
Temperature does not rise.	● Inadequate adjustment.	Readjust according to the adjustment procedures.
	● Nominal size of the product is too small for the specifications of the system.	Replace the product with one of proper nominal size.
	● Temperature range of the product is not proper.	Check the name plate and replace the product.
	● Ambient temperature exceeds set temperature.	Lower the ambient temperature by providing fans or ventilation windows.
	● Insufficient drainage from the trap of heat exchanger.	Open the trap's by-pass line and check the condition.
	● Heat radiation area is too small.	Recalculate the heat radiation area required, or reconsider the piping around the product.
Temperature rises excessively.	● Inadequate adjustment.	Readjust according to the adjustment procedures.
	● Foreign substances are stuck at the valve, or the valve is damaged.	Disassemble and remove the foreign substances. Lap the valve and valve seat if scratches are found.
	● Leakage from by-pass line.	Repair or replace.
	● Thermal bulb or bellows is damaged.	Replace the temperature-sensing parts or the product.
Large error of temperature control.	● Spindle does not move smoothly due to over-tightened cap nut.	Loosen the cap nut to make the spindle move smoothly.
	● Bellows or spindle is deformed due to outer shocks or excessive heat.	Replace the product.
	● Thermal bulb and thermometer are installed improperly or in wrong positions.	Reinstall them properly in proper positions.

OB-3, OB-3G, OB-4, OB-4G

Trouble	Cause	Remedy
Temperature does not fall.	● Inadequate adjustment.	Readjust according to the adjustment procedures.
	● Nominal size of the product is too small for the specifications of the system.	Replace the product with one of proper nominal size.
	● Temperature range of the product is not proper.	Check the name plate and replace the product.
	● Thermal bulb or bellows is damaged.	Replace the temperature-sensing parts or the product.
Temperature falls excessively.	● Inadequate adjustment.	Readjust according to the adjustment procedures.
	● Foreign substances are stuck at the valve, or the valve is damaged.	Disassemble and remove the foreign substances. Lap the valve and valve seat if scratches are found.
	● Leakage from by-pass line.	Repair or replace.
	● Ambient temperature exceeds set temperature.	Lower the ambient temperature by providing fans or ventilation windows.
Large error of temperature control.	● Spindle does not move smoothly due to over-tightened cap nut.	Loosen the cap nut to make the spindle move smoothly.
	● Bellows or spindle is deformed due to outer shocks or excessive heat.	Replace the product.
	● Thermal bulb and thermometer are installed improperly or in wrong positions.	Reinstall them properly in proper positions.

Completely discharge the internal pressure from the valves before disassembly.

⚠CAUTION Please refer to the manual attached to the product for procedures for installation and operation.

Tolerance for set temperature — Temperature regulator

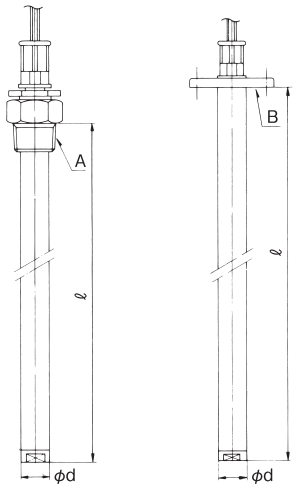
· Temperature tolerance differs according to the thermal bulb, bellows, and capillary tube length. Please refer to the table below.

Model / Application / Capillary tube length	OB-1, 2, 3, 4, 5, 6		OB-1G·2G·3G·4G
	For Liquid	For Gas	For Liquid and Gas
2 m	±2°C	±3°C	±3.5°C
2-3.5 m	±2.5°C	±3.5°C	±4°C
3.5-5 m	±3°C	±4°C	±4.5°C

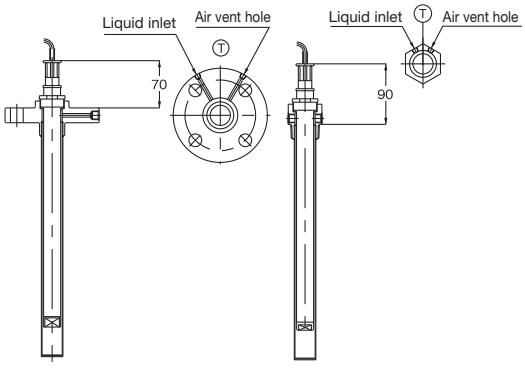
* If the set temperature exceeds 100°C, add ±1.0°C.
* "Tolerance for set temperature" is the maximum temperature difference from the set temperature which can be observed before the valve starts to open from the closed position. Please note that this is not temperature control range.

Special of thermal bulb — Temperature regulator

<For liquid>



· Thermal bulb with thermal well



■Table of minimum length (ℓ) for internal pressure type thermal bulb (mm)

A / B / d / Nominal size	R 3/4 / 20A or larger / 19	R 1 / 25A or larger / 25	R 1-1/4 / 32A or larger / 32
15-25A	300	200	200
32-40A	300	250	200
50A	350	300	200
65A	550	350	250
80A	650	350	300
100A	—	600	350
125A	—	600	440
150A	—	—	440

■Table of minimum length (ℓ) for external pressure type thermal bulb (mm)

A / B / d / Nominal size	R 3/4 / 20A or larger / 19	R 1 / 25A or larger / 25	R 1-1/4 / 32A or larger / 32
15-25A	750	400	350
32-40A	750	400	350
50A	750	400	350
65A	750	400	350
80A	750	400	350
100A	—	600	440
125A	—	600	440
150A	—	—	—

■Table of minimum length (ℓ) for internal high pressure type thermal bulb (mm)

A / B / d / Nominal size	R 3/4 / 20A or larger / 19	R 1 / 25A or larger / 25	R 1-1/4 / 32A or larger / 32
15-25A	350	200	200
32-40A	450	250	200
50A	550	300	200
65A	550	300	250
80A	—	550	300
100A	—	600	350
125A	—	—	440
150A	—	—	440

Completely discharge the internal pressure from the valves before disassembly.