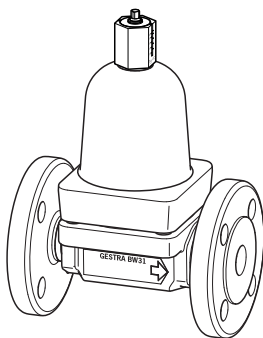
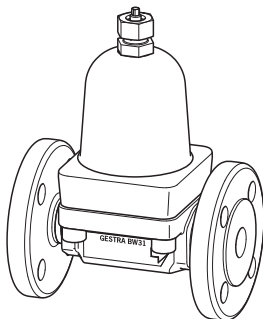

 BW 31, BW 31A, DN 15 – 25 mm (½–1")  
without external adjusting device

 BW 31, DN 15 – 25 mm (½–1")  
with external adjusting device

 BW 31A, DN 15 – 25 mm (½–1")  
with external adjusting device

### End connections

The equipment can be supplied with the following connections:

- Flange EN 1092-1, B1, PN 40 (DN 15-25 mm (½–1"))
- Flange EN 1092-1, B1, PN 25 (DN 40 mm (1½"))
- Flange ASME B 16.5, Class 150 RF (DN 15-25, 40 mm (½–1", 1½"))
- Screwed socket G: ISO 228-1
- Screwed socket NPT: ASME B 16.11

## Calorimat Return-Temperature Control Valves

### BW 31, BW 31A

PN 40 / Class 150, DN 15 – 25

PN 25 / Class 150, DN 40

### System description

#### Description

The return-temperature control valve regulates demand-based consumption in industrial heating systems. When the temperature of the fluid drops, it increases the flow in the return line. Fluid only flows when its temperature is below the closing temperature. This maintains an adequate fluid flowrate as well as constant pressure and temperatures and reduces heat losses.

The closing temperature is factory-set and can be changed within the adjustable temperature range.

#### Installation

The valve must be installed in the return line, paying attention to the arrow indicating the direction of flow. It may be installed in any position, but ideally in a horizontal line with the cover pointing upwards or downwards.

### Optional features

- External adjusting device
- Special external adjusting device
- Controller SL: Reduced bleed flow

### Function

The equipment regulates the flow of fluid using a Thermovit regulator and spring pressure.

When the fluid temperature drops, the flow orifice opens, letting more fluid through. When the fluid temperatures rises, the Thermovit regulator closes the flow orifice more, so that less fluid can pass through.

The flow orifice always remains slightly open. Consequently, there is always a minimal flow (known as the "bleed flow"). The Thermovit regulator is therefore continuously immersed in the fluid and can respond directly to changes in temperature.

### Use

<b>BW 31</b>	for hot water
<b>BW 31A</b>	for heating oil

### Closing temperatures

	Closing temperature ranges [°C] <sup>1)</sup>			
	DN 15 ½"	DN 20 ¾"	DN 25 1"	DN 40 1½"
BW 31	20 – 130	20 – 115		20 – 110
BW 31 with external adjusting device	60 – 130	40 – 115		50 – 110
BW 31 with special external adjusting device	20 – 110	20 – 90		20 – 75
BW 31A	120 – 270	100 – 280		100 – 270
BW 31A with external adjusting device	90 – 270	70 – 270		
BW 31A with special external adjusting device	60 – 160	30 – 170		25 – 85

<sup>1)</sup> For the BW 31 and BW 31A without external adjusting device, please state the desired closing temperature. We can supply equipment that is set to a fixed closing temperature in 5 °C increments within the ranges above.

### Pressure & temperature ratings

#### Pressure & temperature ratings of DN 15 mm (½"), DN 20 mm (¾"), and DN 25 mm (1")

Max. differential pressure Δ PMX: 6 bar

Connection	Flanges EN PN 40 (CL 300), screwed sockets, socket-weld ends, butt-weld end					
Service pressure [bar]	<b>40.0</b>	37.1	33.3	27.6	25.7	23.8
Inlet temperature [°C]	-10/20	100	200	300	350	400
Connection	Flanges ASME Class 150					
Service pressure [bar]	19.6	17.7	13.8	10.2	8.4	6.5
Inlet temperature [°C]	-29/38	100	200	300	350	400

#### Pressure & temperature ratings of DN 40 mm (1½")

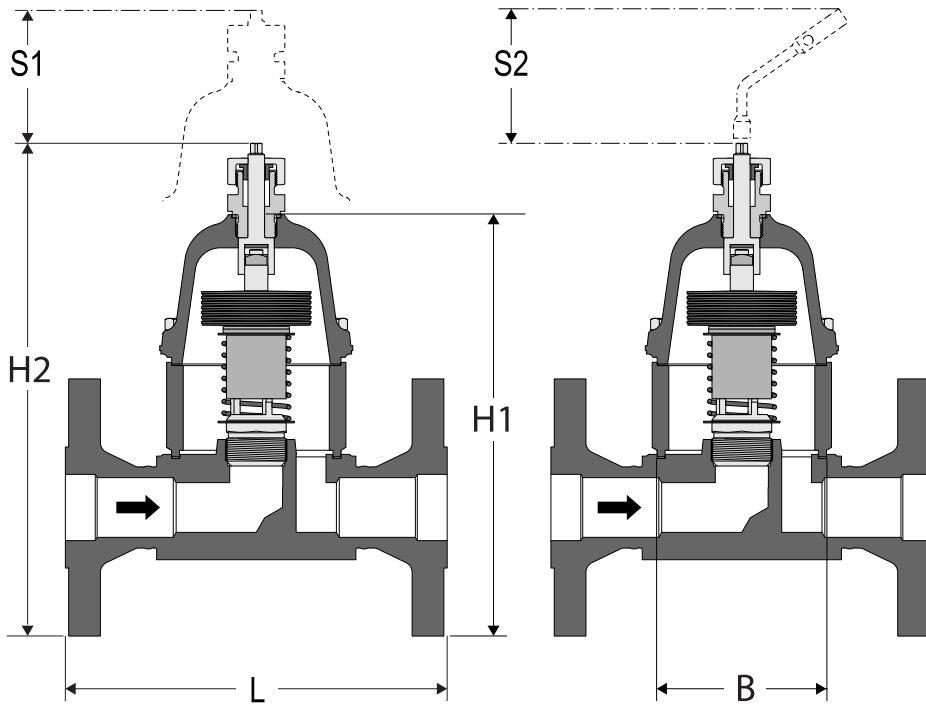
Max. differential pressure Δ PMX: 6 bar

Connection	Flanges EN PN 25 (CL 300), screwed sockets, socket-weld ends, butt-weld end					
Service pressure [bar]	<b>40.0</b>	37.1	33.3	27.6	25.7	23.8
Inlet temperature [°C]	-10/20	100	200	300	350	400
Connection	Flanges ASME Class 150					
Service pressure [bar]	19.6	17.7	13.8	10.2	8.4	6.5
Inlet temperature [°C]	-29/38	100	200	300	350	400

## Materials

Component	EN	ASTM
Body	1.0460	SA 105
Cover		
Bolts in body	1.7225	A 193 B7
Thermovit regulator	Stainless steel	
Body gasket	Graphite/CrNi	
External adjusting device, BW 31	1.4404	F 316 L
Sealing ring of external adjusting device, BW 31	EPDM	
Gasket of external adjusting device, BW 31 and BW 31A	St	
External adjusting device, BW 31A	1.4571	—
Stuffing box bush, BW 31A	Graphite	

## Dimensions and weights



### BW 31

	Flanges EN PN 40 <sup>1)</sup>				Flange ASME Class 150/Class 300				Screwed sockets, socket-weld ends				Butt-weld end			
	15	20	25	40	15	20	25	40	15	20	25	40	15	20	25	40
Nominal size DN	15	20	25	40	15	20	25	40	15	20	25	40	15	20	25	40
L: Length [mm]	150	150	160	200	150	150	160	216/230 <sup>2)</sup>	95	95	95	130	200	200	200	250
H1: Height without EAD <sup>3)</sup> [mm]	128	128	128	188	128	128	128	188	128	128	128	188	128	128	128	188
H2: Height with EAD <sup>3)</sup> [mm]	170	170	170	230	170	170	170	230	170	170	170	230	170	170	170	230
S1: Service dimension [mm]	110	110	110	70	110	110	110	70	110	110	110	70	110	110	110	70
W: Width of cover flange [mm]	85	85	85	115	85	85	85	115	85	85	85	115	85	85	85	115
Weight [kg]	4.4	5.3	5.7	12	4.4	5.3	5.7	12	2.4	2.4	2.4	8.0	2.9	2.9	2.9	8.5

### BW 31A

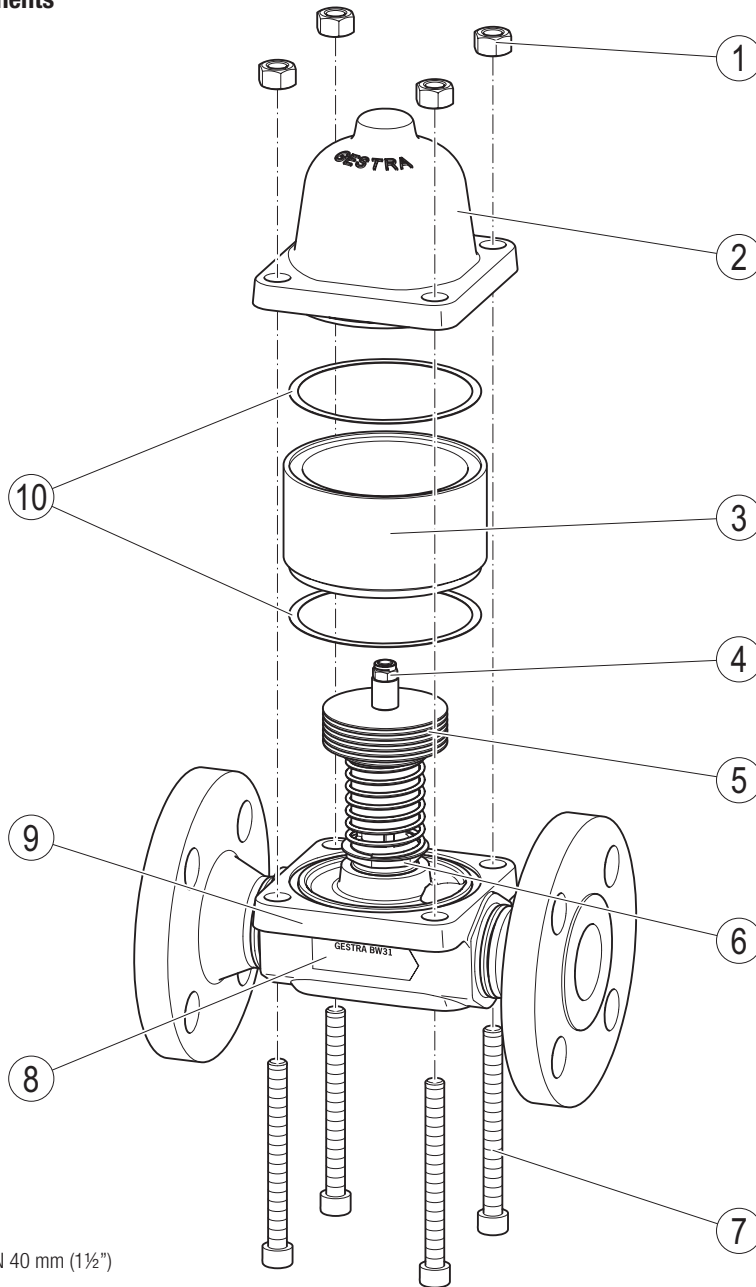
	Flanges EN PN 40 <sup>1)</sup>				Flange ASME Class 150/Class 300				Screwed sockets, socket-weld ends				Butt-weld end			
	15	20	25	40	15	20	25	40	15	20	25	40	15	20	25	40
Nominal size DN	15	20	25	40	15	20	25	40	15	20	25	40	15	20	25	40
L: Length [mm]	150	150	160	200	150	150	160	216/230 <sup>2)</sup>	95	95	95	130	200	200	200	250
H1: Height without EAD <sup>3)</sup> [mm]	128	128	128	188	128	128	128	188	128	128	128	188	128	128	128	188
H2: Height with EAD <sup>3)</sup> [mm]	165	165	165	225	165	165	165	225	165	165	165	225	165	165	165	225
S1: Service dimension [mm]	110	110	110	70	110	110	110	70	110	110	110	70	110	110	110	70
W: Width of cover flange [mm]	85	85	85	115	85	85	85	115	85	85	85	115	85	85	85	115
Weight [kg]	4.4	5.3	5.7	12	4.4	5.3	5.7	12	2.4	2.4	2.4	8.0	2.9	2.9	2.9	8.5

1) DN 40: PN25

2) Class 300: 230 mm

S2 EAD: External adjusting device, equipment with fitted socket wrench requires an additional distance of 100 mm.

## Components



Shown: DN 40 mm (1½")

No.	Designation
1	Nuts (DN 40 only)
2	Cover
3	Spacer ring (DN 40 only)
4	Adjusting nut
5	Bimetallic regulator disks

No.	Designation
6	Thermovolt regulator
7	Allen screws
8	Name plate with direction of flow
9	Body
10	Gaskets (2 for DN 40)

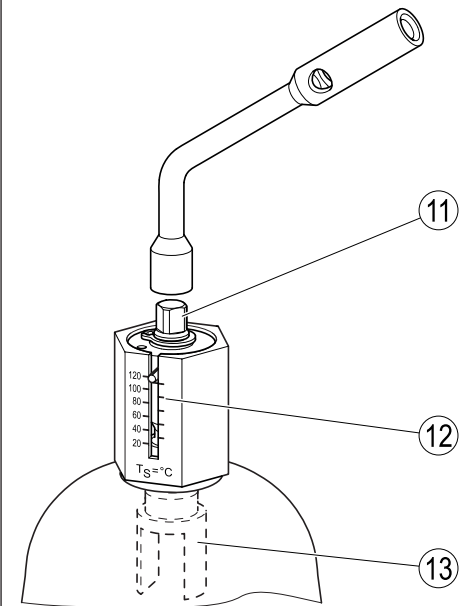
## Spare parts

See relevant Installation & Operating Manual

## Optional features

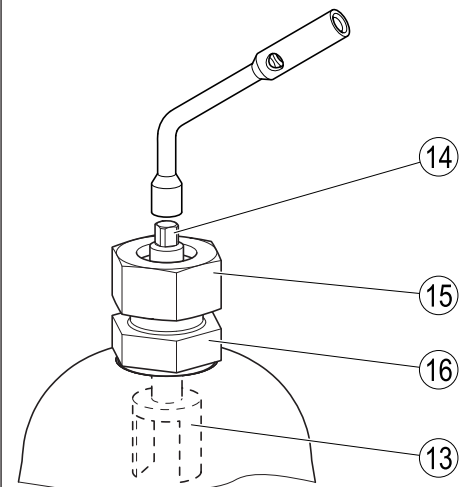
As an option, an external adjusting device (EAD) may be used. You can use this to adjust the closing temperature during operation without removing the cover. Different external adjusting devices are available for different types of equipment.

### External adjusting device for BW 31



No.	Designation
11	Square (used with socket wrench)
12	Temperature scale
13	Forked adjustment piece

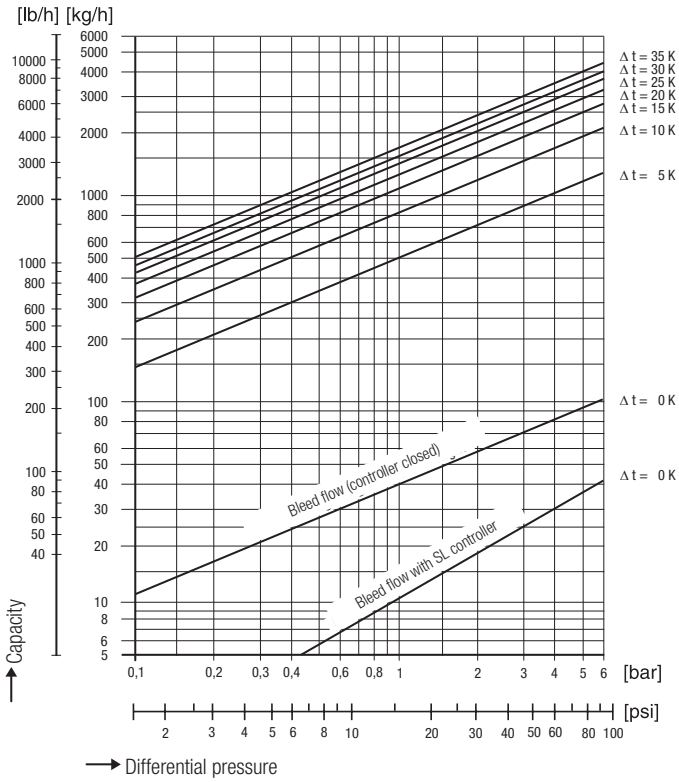
### External adjusting device for BW 31A



No.	Designation
13	Forked adjustment piece
14	Square (used with socket wrench)
15	Locknut
16	Twin nipple

# Flow chart

## BW 31, DN 15 mm (1/2")



The charts show the flowrate as a function of the differential pressure  $\Delta p$  and temperature differential  $\Delta t$ .

$$\text{Temperature differential } \Delta t = \text{closing temperature } t_S - \text{return temperature } t_R$$

The Thermovit regulator is closed at  $\Delta t = 0\text{ K}$  ( $t_R = t_S$ ). When the Thermovit regulator is closed, the flowrate is basically the bleed flow.

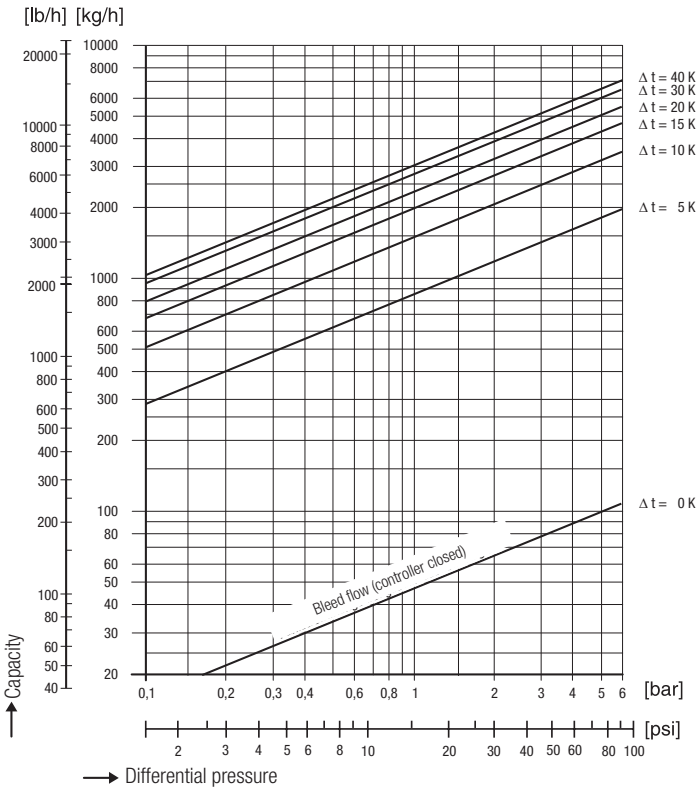
### Determining the nominal size DN and closing temperature $t_S$

Necessary data

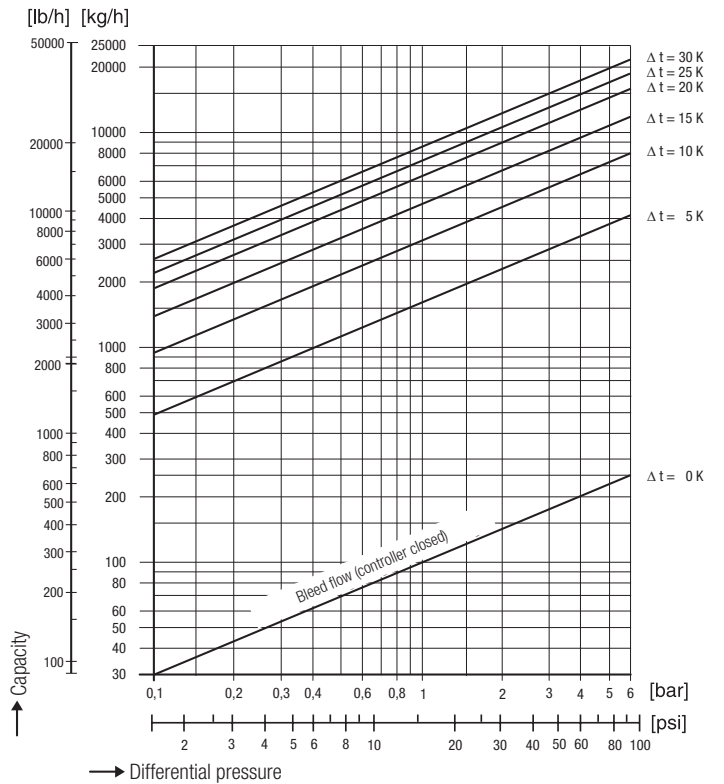
- Fluid
  - Flowrate [kg/h]
  - Differential pressure [bar]
  - Desired return temperature  $t_R$  [°C]
  - Maximum admissible closing temperature  $t_S$  [°C]
- or desired temperature differential  $\Delta t$  [K]

$$t_S = t_R + \Delta t$$

## BW 31, DN 20 and 25 mm (3/4 and 1")

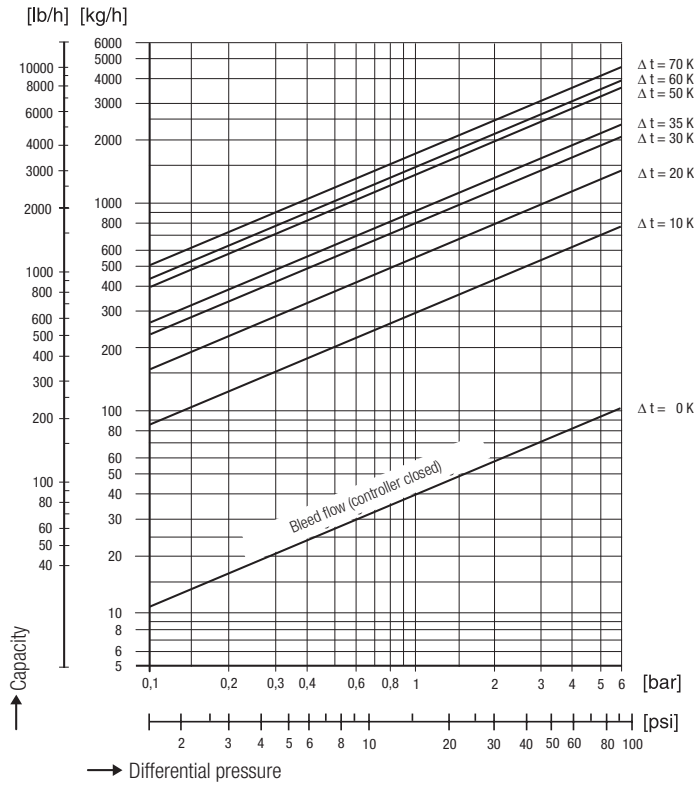


## BW 31, DN 40 mm (1 1/2")



# Flow chart

## BW 31A, DN 15 mm (1/2")



The charts show the flowrate as a function of the differential pressure  $\Delta p$  and temperature differential  $\Delta t$ .

$$\text{Temperature differential } \Delta t = \text{closing temperature } t_S - \text{return temperature } t_R$$

The Thermovit regulator is closed at  $\Delta t = 0\text{ K}$  ( $t_R = t_S$ ). When the Thermovit regulator is closed, the flowrate is basically the bleed flow.

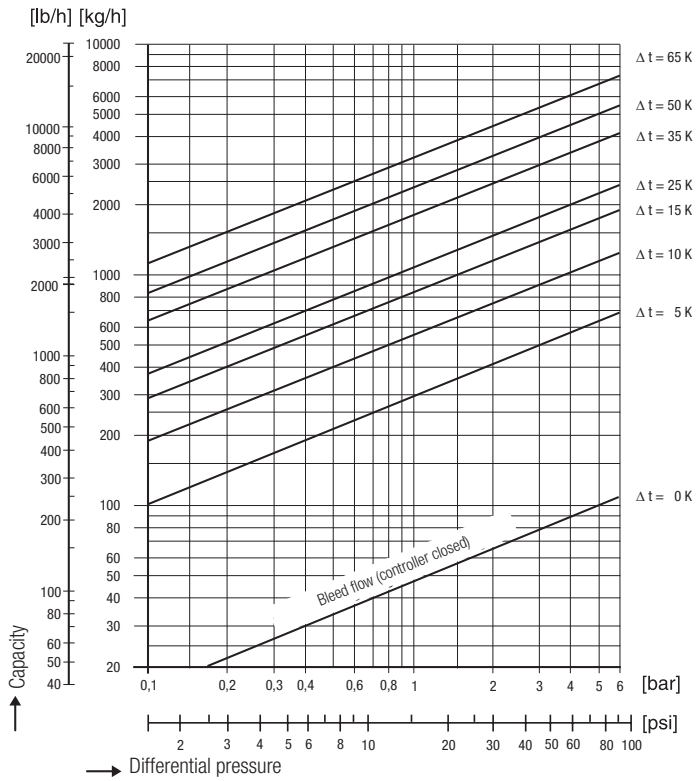
### Determining the nominal size DN and closing temperature $t_S$

Necessary data

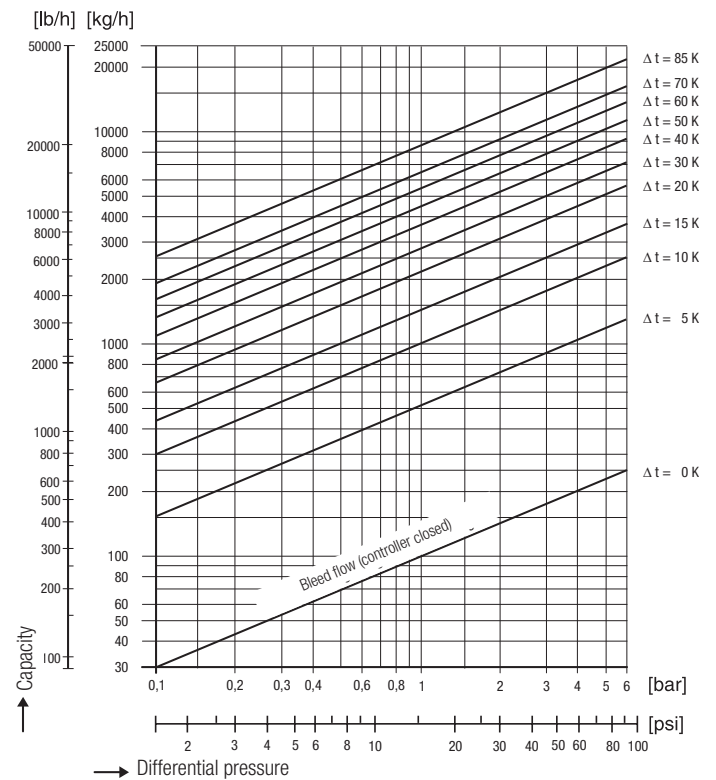
- Fluid
- Flowrate [kg/h]
- Differential pressure [bar]
- Desired return temperature  $t_R$  [°C]
- Maximum admissible closing temperature  $t_S$  [°C] or desired temperature differential  $\Delta t$  [K]

$$t_S = t_R + \Delta t$$

## BW 31A, DN 20 and 25 mm (3/4 and 1")

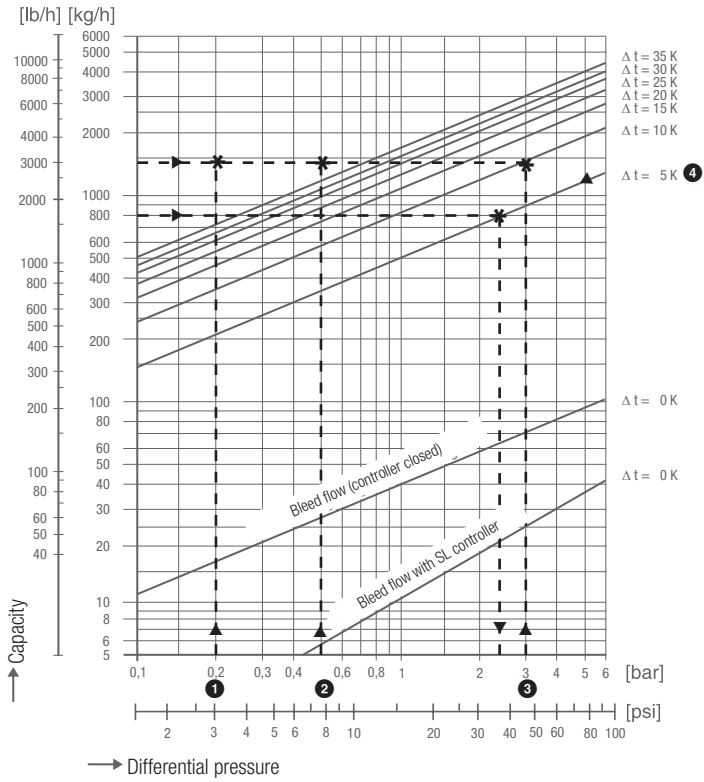


## BW 31A, DN 40 (1 1/2")

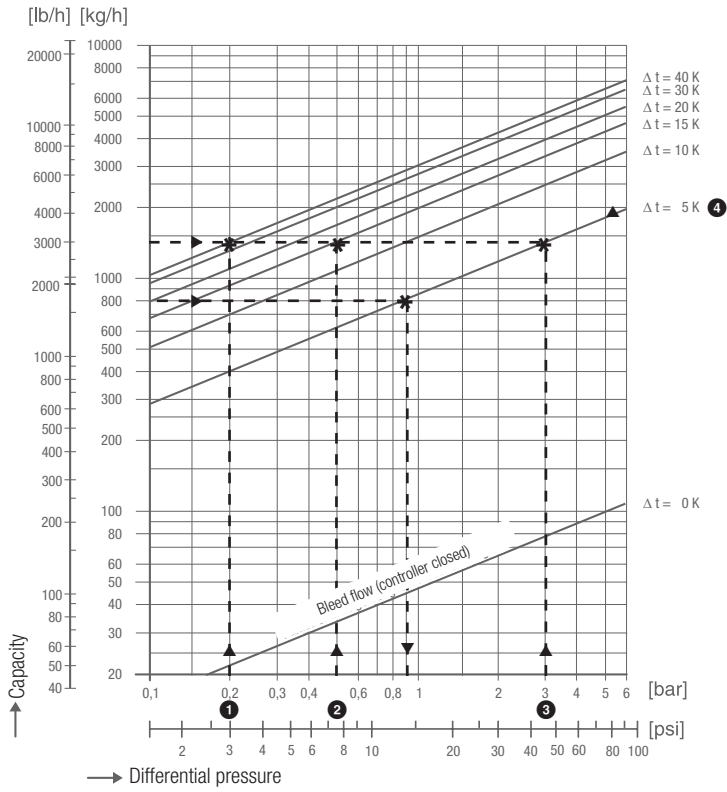


**Sizing examples 1, 2, 3, 4**

**BW 31, DN 15 mm (1/2")**



**BW 31, DN 20 and 25 mm (3/4 and 1")**



## Sizing examples (①, ②, ③, ④ see charts for BW 31 DN 15 and DN 20/25)

### Method A

#### Determining the flowrate and differential pressure

##### Necessary data

- Fluid: Hot water
- Flowrate: 1,450 kg/h
- Differential pressure: ① 0.2 bar / ② 0.5 bar / ③ 3.0 bar
- Desired return temperature:  $t_R = 70\text{ °C}$

From the chart, determine the point of intersection of the flowrate and differential pressure. They must intersect on or below the uppermost  $\Delta t$  curves. If the curves intersect above the  $\Delta t$  curves, the nominal size is too small. Choose a larger nominal size or install a second valve in parallel.

Check that the closing temperature  $t_S$  is technically possible in the process and is admissible for the partial load range.

### Method B

#### Determining the flowrate and temperature differential

##### Necessary data

- Fluid: Hot water
- Flowrate: 800 kg/h
- Desired temperature differential: ④  $\Delta t = 5\text{ K}$
- Achievable, maximum available differential pressure: 1.5 bar
- Desired return temperature:  $t_R = 70\text{ °C}$

The point of intersection of the flowrate and the  $\Delta t$  curve 5K results in the required differential pressure.

Check that the differential pressure is admissible and feasible. If the differential pressure is too high, check whether a larger nominal size is possible.

### Results from sizing examples

Method	Example	BW 31 DN 15 mm (½")	BW 31 DN 20 / 25 mm (¾ / 1")
A	① $\Delta p = 0.2\text{ bar}$	Equipment is not suitable Point of intersection above $\Delta t = 35\text{ K}$ curve Nominal size too small Check whether a larger nominal size is possible.	Equipment is suitable $\Delta t \sim 40\text{ K}$ $t_S = 70\text{ °C} + 40\text{ °C} = 110\text{ °C}$ Check that the high closing temperature is technically possible in the process and is admissible for the partial load range.
	② $\Delta p = 0.5\text{ bar}$	Equipment is not suitable Point of intersection above $\Delta t = 35\text{ K}$ curve Nominal size too small Check whether a larger nominal size is possible.	Equipment is suitable $\Delta t \sim 15\text{ K}$ $t_S = 70\text{ °C} + 15\text{ °C} = 85\text{ °C}$ Check that the high closing temperature is technically possible in the process and is admissible for the partial load range.
	③ $\Delta p = 3.0\text{ bar}$	Equipment is suitable $\Delta t \sim 10\text{ K}$ $t_S = 70\text{ °C} + 10\text{ °C} = 80\text{ °C}$ Check that the closing temperature of 80 °C is admissible in the process. We recommend a BW 31 DN 15 mm (½") valve with external adjusting device.	Equipment is suitable $\Delta t \sim 5\text{ K}$ $t_S = 70\text{ °C} + 5\text{ °C} = 75\text{ °C}$ The closing temperature $t_S$ is only slightly above the desired return temperature $t_R$ .
B	④ $\Delta t = 5\text{ K}$	Equipment is not suitable $\Delta p \sim 2.5\text{ bar}$ The differential pressure is not available in the system. Check whether a larger nominal size is possible.	Equipment is suitable $\Delta p \sim 0.9\text{ bar}$ $t_S = 70\text{ °C} + 5\text{ °C} = 75\text{ °C}$ The differential pressure is available in the system. Equipment BW 31 DN 20 or 25 mm (¾ or 1"), required closing temperature $t_S = 75\text{ °C}$

## Calorimat Return-Temperature Control Valves

### **BW 31, BW 31A**

PN 40 / Class 150, DN 15 – 25

PN 25 / Class 150, DN 40

### **Inspection & Certification**

Documentation regarding material tests and in-house examination with test report EN10204 available. All inspection requirements have to be stated with the enquiry or order. After supply of the equipment certification cannot be established.

Charges and extent of the above mentioned test certificates as well as the different tests confirmed therein are listed in our Price List "Test and Inspection Charges for Standard Equipment". For other tests and inspections than those listed above, please consult us.

### **Application of European Directives**

#### **Pressure Equipment Directive**

The equipment conforms to this directive and can be used for the following fluids:

#### **BW 31**

- Group 2 fluids

#### **BW 31A**

- Group 1 fluids
- Group 2 fluids

#### **ATEX Directive**

The equipment does not have its own potential ignition source and is therefore not subject to this directive.

Once installed, static electricity may arise between the equipment and the connected system.

During use in potentially explosive atmospheres, the discharge or prevention of possible electrostatic charging is the responsibility of the plant manufacturer or owner.

If there is a possibility of fluid escaping, e.g. via actuating devices or leaks in screwed connections, the plant manufacturer or owner must take this into consideration when dividing the area into zones.

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Please note our terms of sale and delivery.

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