

## Data sheet

# Manual presetting valves LENO™ MSV-BD

## Description

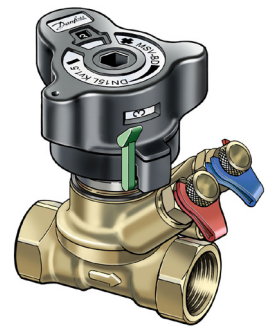
LENO™ MSV-BD is a range of manual valves for balancing flow in heating and cooling systems.

LENO™ MSV-BD is a combined presetting and shut off valve with a range of unique features:

- Removable hand wheel for easy mounting.
- 360° turnable measuring station for convenient measuring and draining.
- Numeric presetting scale, visible from more angles.
- Easy locking of presetting.
- Built-in test plugs for Ø 3 mm needles.
- Drain connection with separate draining of inlet and outlet side of valve.
- Open-close with Allen key for extra force.
- Open-closed colour indicator.

It is recommended to use LENO™ MSV-BD in constant flow systems. The valve may be mounted in flow or return.

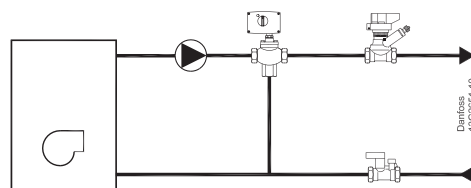
DN 15 and 20 valves are available with internal or external thread. Other dimensions with internal thread.



Danfoss PFM 1000/PFM 100 measuring instruments contain valve data for LENO™ MSV-BD in memory.

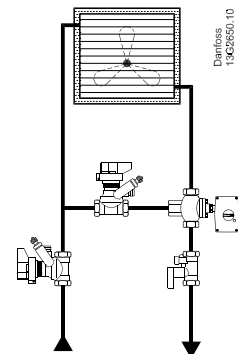
## Application

### Boiler, flat station or heat pump in 1-family houses



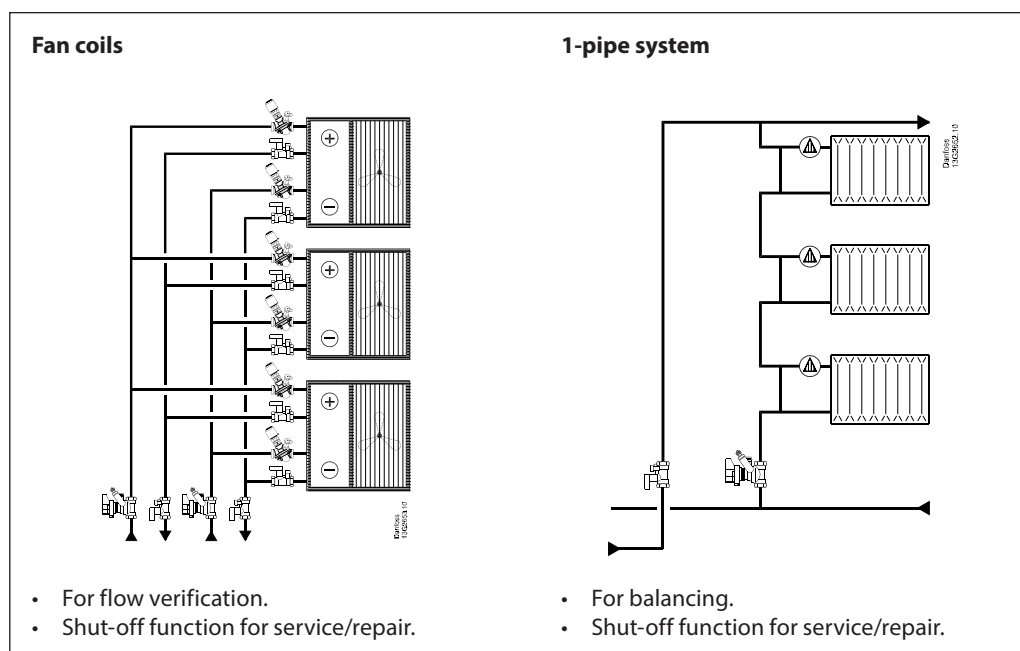
- For balancing.
- Shut-off function for service/repair.

### Air handling unit



- For constant flow.
- For balancing.
- Shut-off function for service/repair.

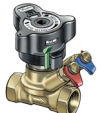
## Application



**DOMESTIC HOT WATER SYSTEMS:** Depending on local legislation it can be used in Domestic hot water applications.

## Ordering

### LENO™ MSV-BD valve with internal thread

| Type                                                                                | Material                | Size<br>(mm) | $k_{vs}$<br>(m³/h) | Connection | Quantity | Code No.        |
|-------------------------------------------------------------------------------------|-------------------------|--------------|--------------------|------------|----------|-----------------|
|  | DZR brass <sup>1)</sup> | DN 15 LF     | 2.5                | ½"         | 1        | <b>003Z4000</b> |
|                                                                                     |                         | DN 15        | 3.0                | ½"         | 1        | <b>003Z4001</b> |
|                                                                                     |                         | DN 20        | 6.0                | ¾"         | 1        | <b>003Z4002</b> |
|                                                                                     |                         | DN 25        | 9.5                | 1"         | 1        | <b>003Z4003</b> |
|                                                                                     |                         | DN 32        | 18                 | 1¼"        | 1        | <b>003Z4004</b> |
|                                                                                     |                         | DN 40        | 26                 | 1½"        | 1        | <b>003Z4005</b> |
|                                                                                     |                         | DN 50        | 40                 | 2"         | 1        | <b>003Z4006</b> |
|                                                                                     |                         | DN 15        | 3.0                | ½"         | 8        | <b>003Z4261</b> |
|                                                                                     |                         | DN 20        | 6.6                | ¾"         | 8        | <b>003Z4262</b> |
|                                                                                     |                         | DN 25        | 9.5                | 1"         | 8        | <b>003Z4263</b> |

### LENO™ MSV-BD valve with external thread

| Type                                                                                | Material                | Size<br>(mm) | $k_{vs}$<br>(m³/h) | Connection          | Code No.        |
|-------------------------------------------------------------------------------------|-------------------------|--------------|--------------------|---------------------|-----------------|
|  | DZR brass <sup>1)</sup> | DN 15 LF     |                    |                     | <b>003Z4100</b> |
|                                                                                     |                         | DN 15        | 3.0                | G ¾ A <sup>2)</sup> | <b>003Z4101</b> |
|                                                                                     |                         | DN 20        | 6.0                | G 1 A               | <b>003Z4102</b> |

### LENO™ MSV-BD/S set solution

| Type                                                                                | Material                | Size<br>(mm) | $k_{vs}$<br>(m³/h) | Drain flow <sup>3)</sup><br>(l/h) | Connection | Code No.        |
|-------------------------------------------------------------------------------------|-------------------------|--------------|--------------------|-----------------------------------|------------|-----------------|
|  | DZR brass <sup>1)</sup> | DN 15        | 3.0                | 281                               | ½"         | <b>003Z4051</b> |
|                                                                                     |                         | DN 20        | 6.0                | 277                               | ¾"         | <b>003Z4052</b> |
|                                                                                     |                         | DN 25        | 9.5                | 316                               | 1"         | <b>003Z4053</b> |
|                                                                                     |                         | DN 32        | 18                 | 305                               | 1¼"        | <b>003Z4054</b> |
|                                                                                     |                         | DN 40        | 26                 | 208                               | 1½"        | <b>003Z4055</b> |
|                                                                                     |                         | DN 50        | 40                 | 308                               | 2"         | <b>003Z4056</b> |

<sup>1)</sup> Corrosion resistant brass

<sup>2)</sup> Eurocone DIN V 3838

<sup>3)</sup> Drain flow is measured at 1 bar static pressure and 0.1 bar differential pressure.

## Ordering (continued)

### Accessories

| Type                                        | Code No. |
|---------------------------------------------|----------|
| Standard test plugs, 2 pcs.                 | 003Z4662 |
| Measuring test plugs, 53 mm, red and blue   | 003Z3946 |
| Operating handle                            | 003Z4652 |
| Drain connection, ½" thread                 | 003Z4096 |
| Drain connection, ¾" thread                 | 003Z4097 |
| Flow measuring instrument PFM 1000 (10 bar) | 003Z8260 |
| Flow measuring instrument PFM 1000 (20 bar) | 003Z8261 |
| Identification tag & strips, 10 pcs.        | 003Z4660 |
| MSV-BD insulation, DN 15                    | 003Z4781 |
| MSV-BD insulation, DN 20                    | 003Z4782 |
| MSV-BD insulation, DN 25                    | 003Z4783 |
| MSV-BD insulation, DN 32                    | 003Z4784 |
| MSV-BD insulation, DN 40                    | 003Z4785 |
| MSV-BD insulation, DN 50                    | 003Z4786 |

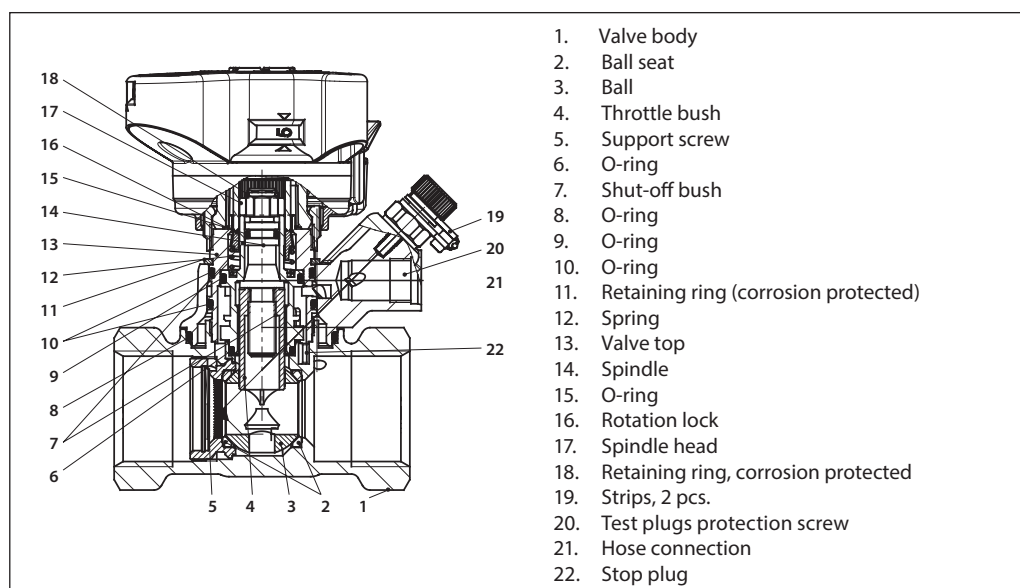
### LENO™ MSV-BD valve with external thread

| Pipe<br>(mm) | Valve thread | PEX fittings, Code no. | Alupex fittings, Code no. |
|--------------|--------------|------------------------|---------------------------|
| 12 x 1.1     | G ¾          | 013G4150               |                           |
| 12 x 2       | G ¾          | 013G4152               | 013G4182                  |
| 13 x 2       | G ¾          | 013G4153               |                           |
| 14 x 2       | G ¾          | 013G4154               | 013G4184                  |
| 15 x 1.7     | G ¾          | 013G4165               |                           |
| 15 x 2.5     | G ¾          | 013G4155               | 013G4185                  |
| 16 x 1.5     | G ¾          | 013G4157               |                           |
| 16 x 2       | G ¾          | 013G4156               | 013G4186                  |
| 16 x 2.25    | G ¾          |                        | 013G4187                  |
| 17 x 2       | G ¾          | 013G4162               |                           |
| 18 x 2       | G ¾          | 013G4158               | 013G4188                  |
| 18 x 2.5     | G ¾          | 013G4159               |                           |
| 20 x 2       | G ¾          | 013G4160               | 013G4190                  |
| 20 x 2.5     | G ¾          | 013G4161               | 013G4191                  |

### Compression fittings for valves with external thread

| Steel/copper pipes                                                                  | Dimension | Code no. |
|-------------------------------------------------------------------------------------|-----------|----------|
|  | G ¾ x 15  | 013G4125 |
|                                                                                     | G ¾ x 16  | 013G4126 |
|                                                                                     | G ¾ x 18  | 013G4128 |
|                                                                                     | G 1 x 18  | 013U0134 |
|                                                                                     | G 1 x 22  | 013U0135 |

## Design



### Materials and parts in contact with water

|              |                       |
|--------------|-----------------------|
| Valve body   | DZR brass             |
| O-rings      | EPDM                  |
| Ball         | Brass/chromium plated |
| Ball sealing | Teflon                |

## Technical data

|                                         |                                                           |
|-----------------------------------------|-----------------------------------------------------------|
| Max. static working pressure            | 20 bar                                                    |
| Static test pressure                    | 30 bar                                                    |
| Max. differential pressure across valve | 2.5 bar (250 kPa)                                         |
| Max. flow temperature                   | 120 °C                                                    |
| Min. temperature                        | -20 °C                                                    |
| Cooling liquids                         | Ethylene glycol / propylene glycol and HYCOOL (max. 30 %) |

## Fitting

Before fitting the valve the installer must ensure that the pipe system is clean and:

1. the valve can be turned 360 degrees (if threaded pipe is used).
2. the valve is fitted according to the flow direction arrow.

### Removal of the handle

1. Set the handle at 0.0.
2. Release the setting lock (green).
3. Unscrew the union nut.

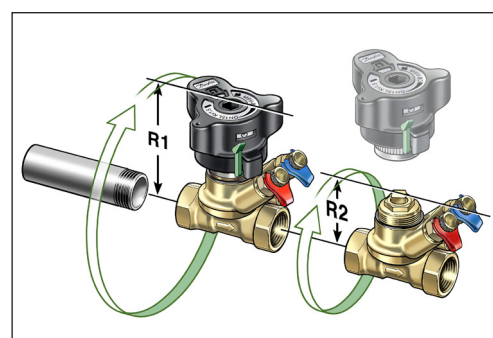
### Calibration of the handle

Before refitting, ensure that the handle setting is 0.0.

### For DN 15 - 20 valves with external thread

Danfoss offers a complete range of compression fittings for steel, copper and PEX pipes.

| DN | R1/R2<br>(mm) |
|----|---------------|
| 15 | 86/67         |
| 20 | 89/69         |
| 25 | 91/71         |
| 32 | 118/84        |
| 40 | 118/84        |
| 50 | 124/90        |



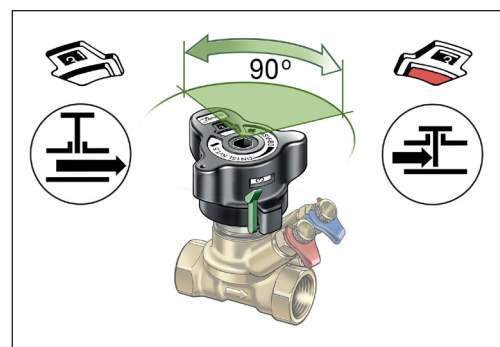
## Shut-off

In order to shut-off the valve the handle must be pressed down.

The shut-off function features a ball valve, which only requires a 90 degree turn to shut the valve completely.

An indicator window shows the actual setting:

- red = closed
- white = open



## Draining

### Note!

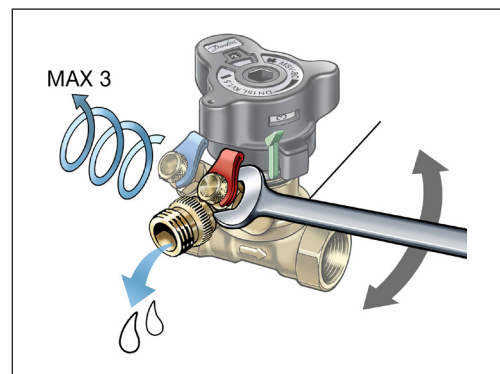
**The drain connection is an accessory and must be purchased separately.**

The drain tap can rotate 360 degrees for convenient operation.

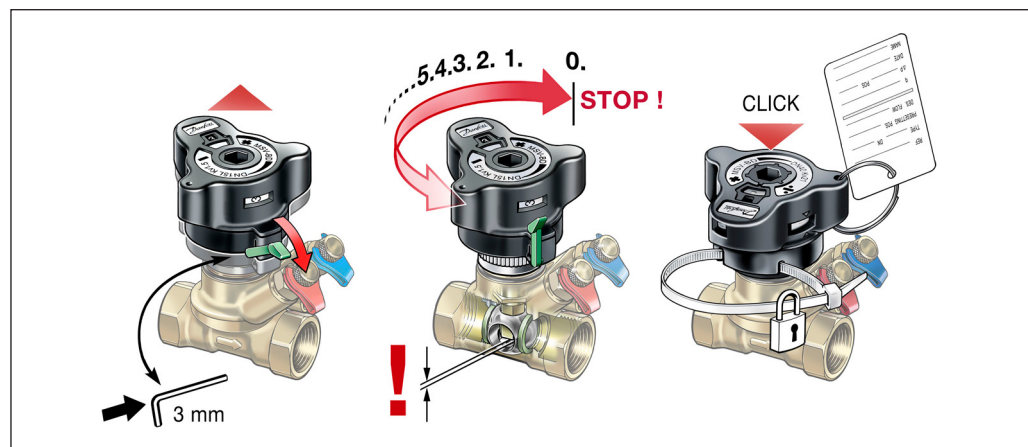
Draining the system pipes can be done selectively:

When the red test plug is opened, the valve inlet pipe is drained.

Opening the blue test plug will drain the pipe on the valve outlet side. Test plugs unscrewing protection screw is located between valve test plugs.



## Setting and sealing



The valve has a presetting feature for setting/adjusting flow ratings.

Setting the required flow is made in 5 steps:

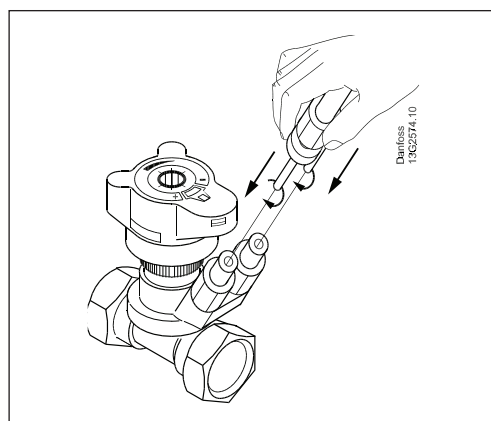
1. In open position, release the lock using the green lever or a 3 mm Allen key.
2. The handle pops up automatically.
3. The calculated value can now be set.
4. The setting is locked when the handle is pressed to click.
5. The setting can be sealed by using a strip as shown.

## Measuring

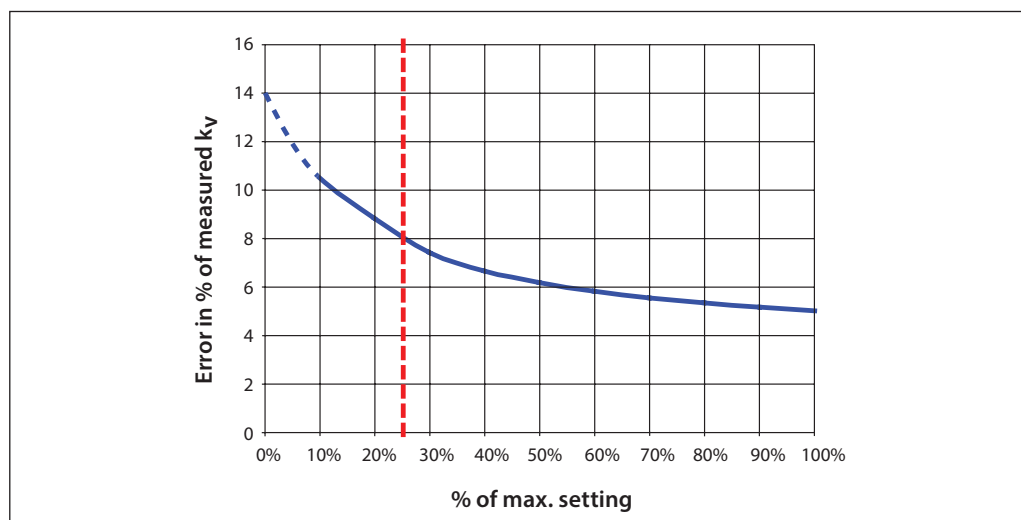
The flow through the LENO™ MSV-BD valve can be measured using Danfoss PFM 1000 or other brands of measuring instruments. The LENO™ MSV-BD valve is supplied with two test plugs for Ø3 mm needles. A twin bracket enables the user to connect both needles simultaneously.

Procedure for flow measuring:

1. Select flow measuring.
2. Select valve brand.
3. Select valve type and dimension.
4. Enter presetting.
5. Connect valve and instrument.
6. Calibrate static pressure.
7. Measure the flow.



## Measuring accuracy

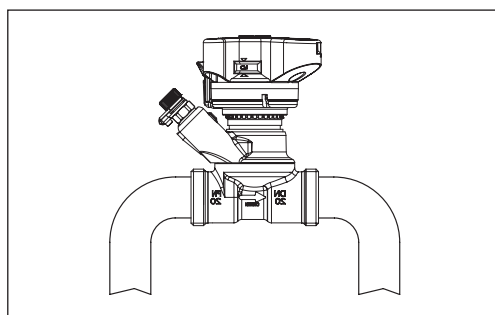


LENO™ MSV-BD is very accurate, due to the separate functions for presetting and shut-off. Valve can be mounted everywhere in the system (closed to T-pieces, elbows, pumps, etc.), since it is unaffected by turbulence in any setting or installation.

The red line indicates 25% of max. flow.

According to BS7350:1990 flow rates must be within following values:

- ± 18% at 25% open position
- ± 10% at fully open position



## Kv-signal

kv-signal values are used for non-Danfoss measuring instruments. Danfoss PFM 1000 have all data in memory, and the instruments are using this formula:

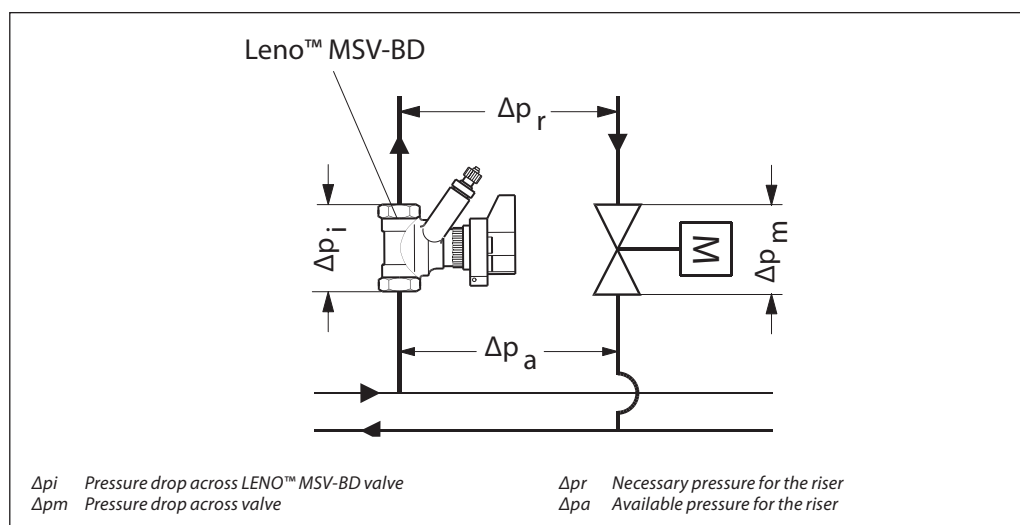
$$\Delta P_{val} = \Delta P_{sig} \left( \frac{k_{v-sig}}{k_{v-val}} \right)^2$$

$\Delta p$  across the test plugs ( $k_{v-sig}$ ) and  $\Delta p$  across the valve ( $k_{v-val}$ ) is not the same due to turbulence influence for pressure measuring.

## Kv-signal values

| Setting | DN 15LF | DN 15 | DN 20 | DN 25 | DN 32 | DN 40 | DN 50 |
|---------|---------|-------|-------|-------|-------|-------|-------|
| 0.0     | 0.07    | 0.10  | 0.12  | 0.34  | 0.51  | 1.05  | 1.75  |
| 0.1     | 0.08    | 0.11  | 0.16  | 0.44  | 0.73  | 1.20  | 2.01  |
| 0.2     | 0.09    | 0.12  | 0.20  | 0.53  | 0.92  | 1.36  | 2.25  |
| 0.3     | 0.11    | 0.13  | 0.26  | 0.61  | 1.10  | 1.55  | 2.47  |
| 0.4     | 0.12    | 0.14  | 0.32  | 0.67  | 1.26  | 1.74  | 2.69  |
| 0.5     | 0.13    | 0.16  | 0.38  | 0.73  | 1.43  | 1.95  | 2.91  |
| 0.6     | 0.15    | 0.19  | 0.45  | 0.79  | 1.60  | 2.17  | 3.12  |
| 0.7     | 0.16    | 0.21  | 0.53  | 0.84  | 1.78  | 2.40  | 3.35  |
| 0.8     | 0.17    | 0.24  | 0.60  | 0.90  | 1.97  | 2.64  | 3.58  |
| 0.9     | 0.19    | 0.26  | 0.67  | 0.95  | 2.18  | 2.88  | 3.82  |
| 1.0     | 0.20    | 0.29  | 0.74  | 1.01  | 2.39  | 3.13  | 4.07  |
| 1.1     | 0.21    | 0.32  | 0.82  | 1.08  | 2.62  | 3.39  | 4.33  |
| 1.2     | 0.23    | 0.34  | 0.89  | 1.14  | 2.87  | 3.64  | 4.60  |
| 1.3     | 0.25    | 0.37  | 0.96  | 1.22  | 3.12  | 3.90  | 4.89  |
| 1.4     | 0.27    | 0.40  | 1.03  | 1.29  | 3.38  | 4.16  | 5.18  |
| 1.5     | 0.30    | 0.44  | 1.09  | 1.37  | 3.64  | 4.43  | 5.49  |
| 1.6     | 0.32    | 0.47  | 1.16  | 1.46  | 3.92  | 4.69  | 5.80  |
| 1.7     | 0.35    | 0.51  | 1.23  | 1.55  | 4.19  | 4.96  | 6.13  |
| 1.8     | 0.37    | 0.54  | 1.30  | 1.65  | 4.48  | 5.24  | 6.46  |
| 1.9     | 0.40    | 0.58  | 1.38  | 1.75  | 4.76  | 5.51  | 6.80  |
| 2.0     | 0.43    | 0.61  | 1.45  | 1.85  | 5.05  | 5.80  | 7.14  |
| 2.1     | 0.46    | 0.65  | 1.53  | 1.96  | 5.35  | 6.08  | 7.49  |
| 2.2     | 0.49    | 0.69  | 1.61  | 2.07  | 5.65  | 6.38  | 7.84  |
| 2.3     | 0.52    | 0.73  | 1.69  | 2.18  | 5.96  | 6.68  | 8.19  |
| 2.4     | 0.56    | 0.77  | 1.78  | 2.29  | 6.27  | 6.99  | 8.55  |
| 2.5     | 0.59    | 0.80  | 1.87  | 2.41  | 6.60  | 7.30  | 8.91  |
| 2.6     | 0.62    | 0.85  | 1.97  | 2.53  | 6.94  | 7.63  | 9.27  |
| 2.7     | 0.66    | 0.89  | 2.07  | 2.65  | 7.29  | 7.98  | 9.64  |
| 2.8     | 0.69    | 0.93  | 2.17  | 2.77  | 7.67  | 8.33  | 10.00 |
| 2.9     | 0.73    | 0.97  | 2.29  | 2.89  | 8.06  | 8.70  | 10.37 |
| 3.0     | 0.76    | 1.01  | 2.40  | 3.01  | 8.48  | 9.08  | 10.74 |
| 3.1     | 0.80    | 1.04  | 2.52  | 3.13  | 8.92  | 9.48  | 11.11 |
| 3.2     | 0.83    | 1.08  | 2.65  | 3.25  | 9.38  | 9.90  | 11.49 |
| 3.3     | 0.87    | 1.12  | 2.78  | 3.37  | 9.87  | 10.33 | 11.88 |
| 3.4     | 0.90    | 1.16  | 2.91  | 3.49  | 10.38 | 10.79 | 12.27 |
| 3.5     | 0.94    | 1.20  | 3.05  | 3.62  | 10.91 | 11.26 | 12.67 |
| 3.6     | 0.97    | 1.25  | 3.19  | 3.74  | 11.46 | 11.74 | 13.09 |
| 3.7     | 1.01    | 1.30  | 3.33  | 3.87  | 12.02 | 12.25 | 13.51 |
| 3.8     | 1.06    | 1.35  | 3.47  | 4.00  | 12.58 | 12.77 | 13.95 |
| 3.9     | 1.10    | 1.41  | 3.61  | 4.13  | 13.12 | 13.30 | 14.41 |
| 4.0     | 1.14    | 1.47  | 3.75  | 4.26  | 13.64 | 13.85 | 14.88 |
| 4.1     | 1.18    | 1.53  | 3.89  | 4.39  | 14.12 | 14.41 | 15.38 |
| 4.2     | 1.23    | 1.59  | 4.02  | 4.53  | 14.52 | 14.98 | 15.89 |
| 4.3     | 1.27    | 1.66  | 4.15  | 4.68  | 14.84 | 15.55 | 16.44 |
| 4.4     | 1.31    | 1.73  | 4.28  | 4.82  |       | 16.13 | 17.00 |
| 4.5     | 1.35    | 1.81  | 4.40  | 4.98  |       | 16.69 | 17.59 |
| 4.6     | 1.39    | 1.91  | 4.52  | 5.13  |       | 17.25 | 18.21 |
| 4.7     | 1.43    | 2.00  | 4.62  | 5.29  |       | 17.80 | 18.86 |
| 4.8     | 1.47    | 2.08  | 4.72  | 5.46  |       | 18.32 | 19.54 |
| 4.9     | 1.51    | 2.16  | 4.82  | 5.64  |       | 18.80 | 20.24 |
| 5-0     | 1.54    | 2.23  | 4.90  | 5.81  |       | 19.25 | 20.97 |
| 5.1     | 1.60    | 2.30  | 4.97  | 6.00  |       | 19.65 | 21.73 |
| 5.2     | 1.66    | 2.36  | 5.04  | 6.19  |       | 19.98 | 22.51 |
| 5.3     | 1.72    | 2.41  |       | 6.38  |       | 20.24 | 23.30 |
| 5.4     | 1.79    | 2.46  |       | 6.57  |       | 20.41 | 24.12 |
| 5.5     | 1.87    | 2.50  |       | 6.77  |       | 20.48 | 24.94 |
| 5.6     | 1.93    | 2.54  |       | 6.96  |       |       | 25.76 |
| 5.7     | 1.99    | 2.57  |       | 7.15  |       |       | 26.58 |
| 5.8     | 2.04    |       |       | 7.34  |       |       | 27.38 |
| 5.9     | 2.09    |       |       | 7.52  |       |       | 28.16 |
| 6.0     | 2.14    |       |       | 7.69  |       |       | 28.90 |
| 6.1     | 2.18    |       |       | 7.85  |       |       | 29.59 |
| 6.2     | 2.22    |       |       | 7.98  |       |       | 30.21 |
| 6.3     | 2.26    |       |       |       |       |       | 30.74 |
| 6.4     |         |       |       |       |       |       | 31.17 |
| 6.5     |         |       |       |       |       |       | 31.47 |
| 6.6     |         |       |       |       |       |       | 31.61 |

# Valve size and presetting



## Example

Given:  
 Max. pipe flow Q .....2.0 m<sup>3</sup>/h  
 $\Delta p_r$  .....15 kPa  
 $\Delta p_a$  .....45 kPa  
 $\Delta p_m$  .....10 kPa  
 $\Delta p_i$  ..... $\Delta p_a - \Delta p_r - \Delta p_m$

$$\Delta p_i = 45 \text{ kPa} - 15 \text{ kPa} - 10 \text{ kPa} = 20 \text{ kPa}$$

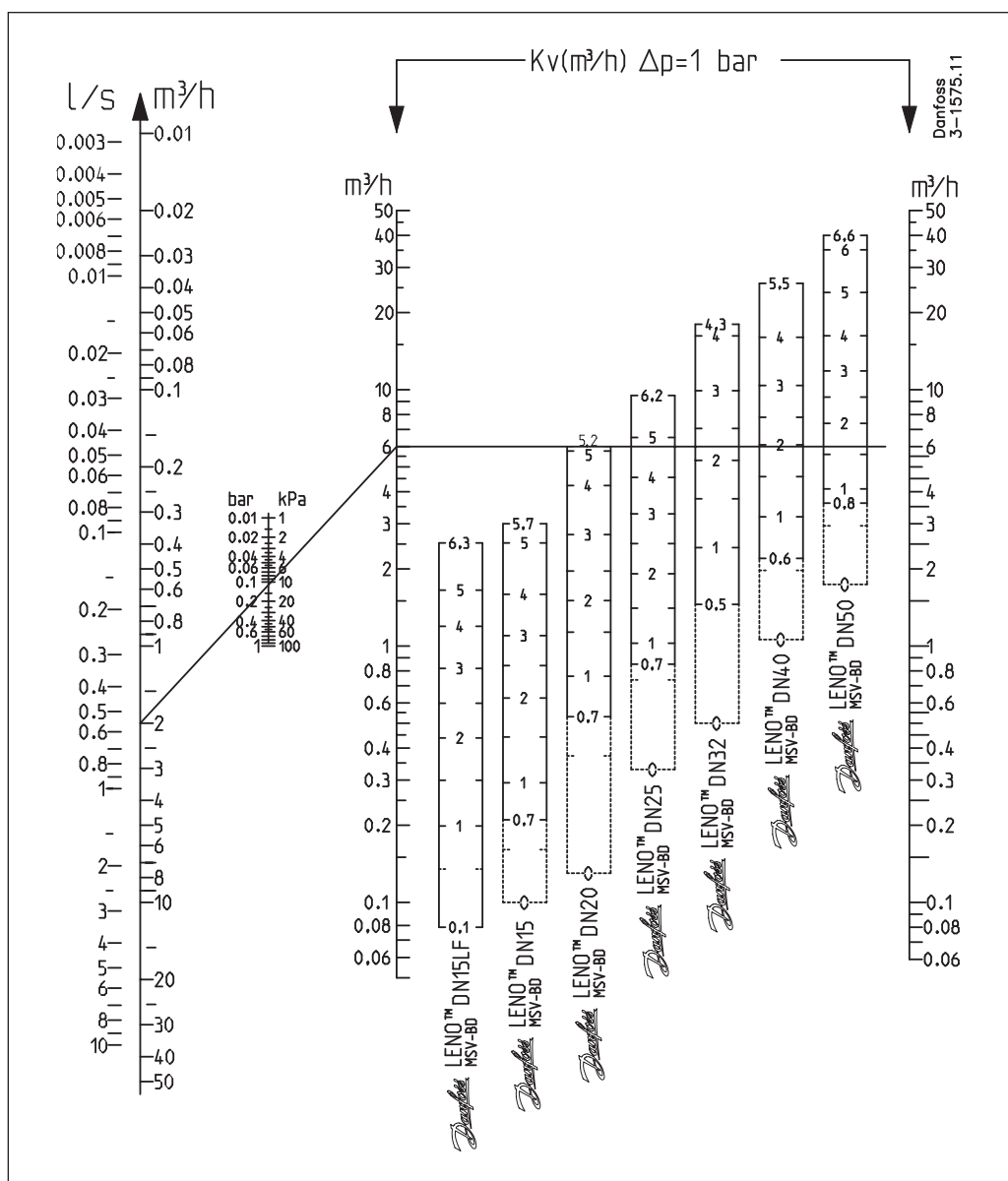
Correct valve size and presetting is found in the sizing and flow diagrammes, p 9.

$$Q = 2.0 \text{ m}^3/\text{h} \text{ and } \Delta p_i = 20 \text{ kPa}$$

Setting can be also calculated from the formula:

$$k_v = \frac{Q[\text{m}^3/\text{h}]}{\sqrt{\Delta p_i[\text{bar}]}} = \frac{2.0}{\sqrt{0.20}} = 4.5 \text{ m}^3/\text{h}$$

## Sizing



## Correction factors

Medium: Ethylene glycol / propylene glycol percentage (max. 30 %).

| Temp.<br>°C | Flow, m³/h |      |      |      |      |      |      |
|-------------|------------|------|------|------|------|------|------|
|             | 25         | 30   | 40   | 50   | 60   | 65   | 100  |
| -40.0       | 1)         | 1)   | 1)   | 1)   | 0.89 | 0.88 | 1)   |
| -17.8       | 1)         | 1)   | 0.93 | 0.91 | 0.90 | 0.89 | 0.86 |
| 4.4         | 0.95       | 0.95 | 0.93 | 0.92 | 0.91 | 0.90 | 0.87 |
| 26.6        | 0.96       | 0.95 | 0.94 | 0.93 | 0.92 | 0.91 | 0.88 |
| 48.9        | 0.97       | 0.96 | 0.95 | 0.94 | 0.93 | 0.92 | 0.90 |
| 71.1        | 0.98       | 0.98 | 0.96 | 0.95 | 0.94 | 0.94 | 0.95 |
| 93.3        | 1.00       | 0.99 | 0.97 | 0.96 | 0.95 | 0.95 | 0.92 |
| 115.6       | 2)         | 2)   | 2)   | 2)   | 2)   | 2)   | 0.94 |

1) Below freezing point

2) Above boiling point

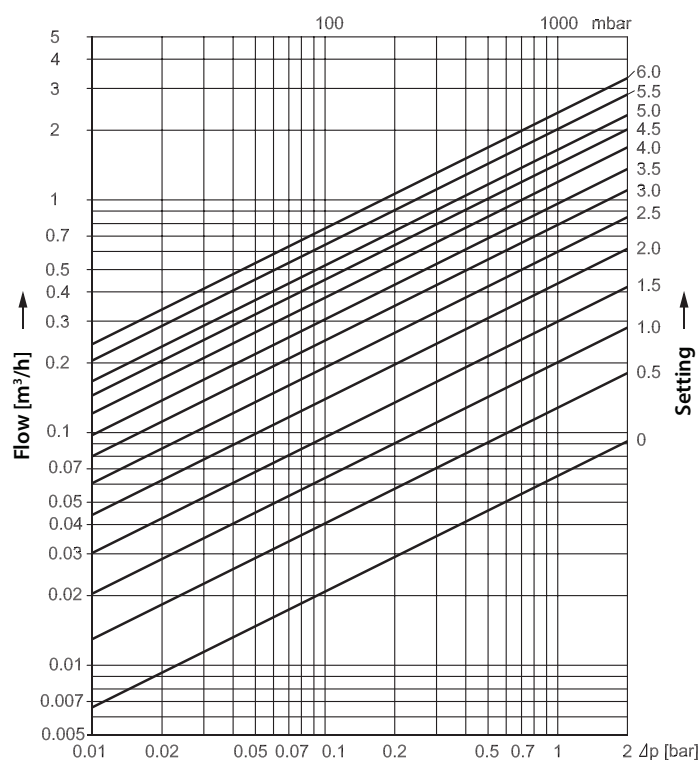
## Example

Flow needed .....30 m³/h

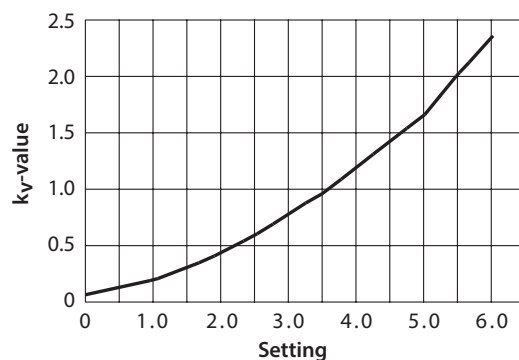
Flow after correction .....30 x 0.95 = 28 m³/h

Flow diagrammes,  
DN 15 LF

LENO™ MSV-BD DN 15 LF



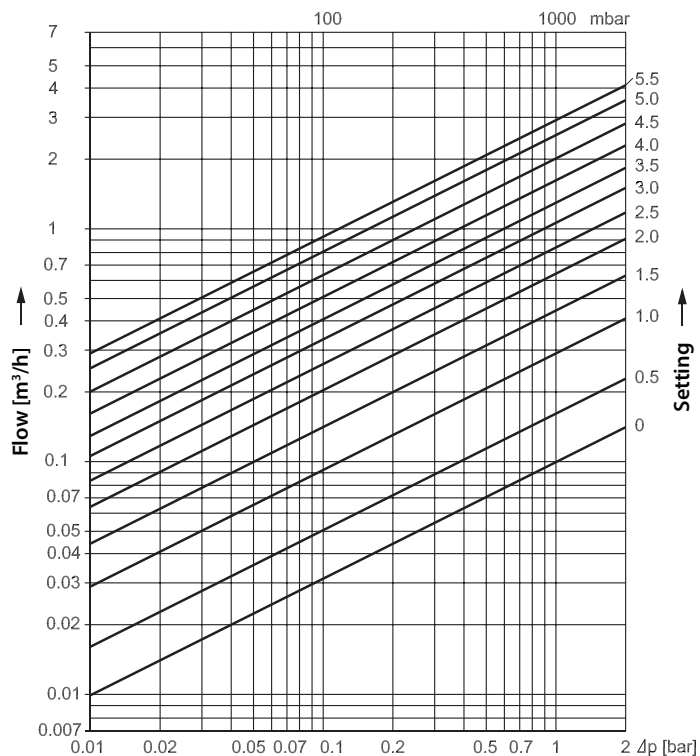
Flow characteristics



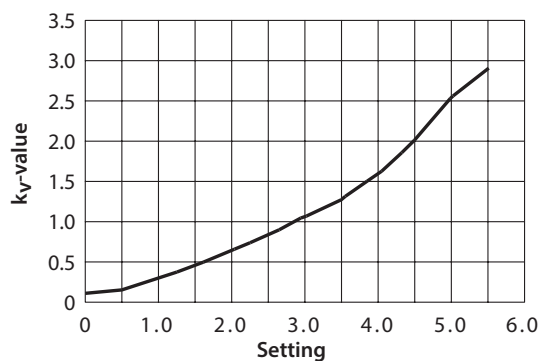
| Setting | k <sub>v</sub> -value |
|---------|-----------------------|
| 0.0     | 0.07                  |
| 0.1     | 0.08                  |
| 0.2     | 0.09                  |
| 0.3     | 0.11                  |
| 0.4     | 0.12                  |
| 0.5     | 0.13                  |
| 0.6     | 0.15                  |
| 0.7     | 0.16                  |
| 0.8     | 0.17                  |
| 0.9     | 0.19                  |
| 1.0     | 0.20                  |
| 1.1     | 0.22                  |
| 1.2     | 0.23                  |
| 1.3     | 0.25                  |
| 1.4     | 0.28                  |
| 1.5     | 0.30                  |
| 1.6     | 0.32                  |
| 1.7     | 0.35                  |
| 1.8     | 0.38                  |
| 1.9     | 0.41                  |
| 2.0     | 0.44                  |
| 2.1     | 0.47                  |
| 2.2     | 0.50                  |
| 2.3     | 0.53                  |
| 2.4     | 0.56                  |
| 2.5     | 0.60                  |
| 2.6     | 0.63                  |
| 2.7     | 0.67                  |
| 2.8     | 0.71                  |
| 2.9     | 0.74                  |
| 3.0     | 0.78                  |
| 3.1     | 0.82                  |
| 3.2     | 0.86                  |
| 3.3     | 0.89                  |
| 3.4     | 0.93                  |
| 3.5     | 0.97                  |
| 3.6     | 1.01                  |
| 3.7     | 1.05                  |
| 3.8     | 1.10                  |
| 3.9     | 1.15                  |
| 4.0     | 1.19                  |
| 4.1     | 1.24                  |
| 4.2     | 1.29                  |
| 4.3     | 1.33                  |
| 4.4     | 1.38                  |
| 4.5     | 1.43                  |
| 4.6     | 1.48                  |
| 4.7     | 1.52                  |
| 4.8     | 1.56                  |
| 4.9     | 1.61                  |
| 5.0     | 1.65                  |
| 5.1     | 1.72                  |
| 5.2     | 1.78                  |
| 5.3     | 1.86                  |
| 5.4     | 1.94                  |
| 5.5     | 2.03                  |
| 5.6     | 2.10                  |
| 5.7     | 2.17                  |
| 5.8     | 2.23                  |
| 5.9     | 2.30                  |
| 6.0     | 2.36                  |
| 6.1     | 2.42                  |
| 6.2     | 2.47                  |
| 6.3     | 2.53                  |

Flow diagrammes,  
DN 15

LENO™ MSV-BD DN 15



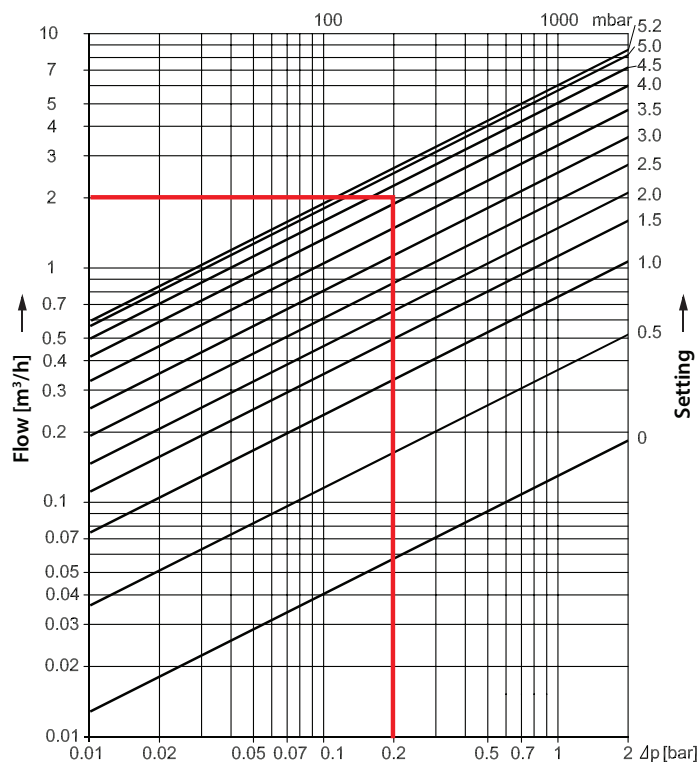
Flow characteristics



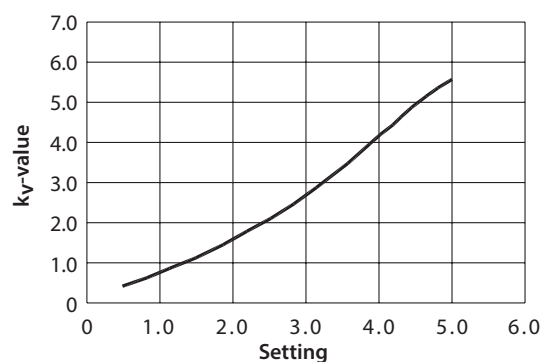
| Setting | k <sub>v</sub> -value |
|---------|-----------------------|
| 0.0     | 0.10                  |
| 0.1     | 0.11                  |
| 0.2     | 0.12                  |
| 0.3     | 0.13                  |
| 0.4     | 0.14                  |
| 0.5     | 0.16                  |
| 0.6     | 0.19                  |
| 0.7     | 0.21                  |
| 0.8     | 0.24                  |
| 0.9     | 0.27                  |
| 1.0     | 0.29                  |
| 1.1     | 0.32                  |
| 1.2     | 0.35                  |
| 1.3     | 0.38                  |
| 1.4     | 0.41                  |
| 1.5     | 0.44                  |
| 1.6     | 0.48                  |
| 1.7     | 0.51                  |
| 1.8     | 0.55                  |
| 1.9     | 0.59                  |
| 2.0     | 0.63                  |
| 2.1     | 0.67                  |
| 2.2     | 0.71                  |
| 2.3     | 0.75                  |
| 2.4     | 0.80                  |
| 2.5     | 0.84                  |
| 2.6     | 0.88                  |
| 2.7     | 0.93                  |
| 2.8     | 0.97                  |
| 2.9     | 1.02                  |
| 3.0     | 1.06                  |
| 3.1     | 1.10                  |
| 3.2     | 1.14                  |
| 3.3     | 1.19                  |
| 3.4     | 1.23                  |
| 3.5     | 1.28                  |
| 3.6     | 1.34                  |
| 3.7     | 1.40                  |
| 3.8     | 1.46                  |
| 3.9     | 1.52                  |
| 4.0     | 1.59                  |
| 4.1     | 1.66                  |
| 4.2     | 1.74                  |
| 4.3     | 1.82                  |
| 4.4     | 1.91                  |
| 4.5     | 2.00                  |
| 4.6     | 2.12                  |
| 4.7     | 2.23                  |
| 4.8     | 2.33                  |
| 4.9     | 2.43                  |
| 5.0     | 2.53                  |
| 5.1     | 2.61                  |
| 5.2     | 2.70                  |
| 5.3     | 2.77                  |
| 5.4     | 2.84                  |
| 5.5     | 2.90                  |
| 5.6     | 2.95                  |
| 5.7     | 3.00                  |

Flow diagrammes,  
DN 20

LENO™ MSV-BD DN 20



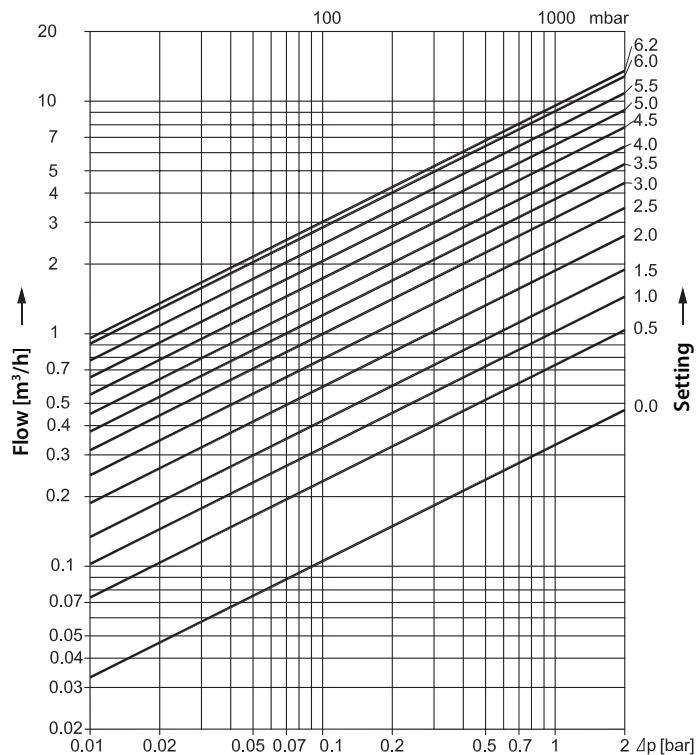
Flow characteristics



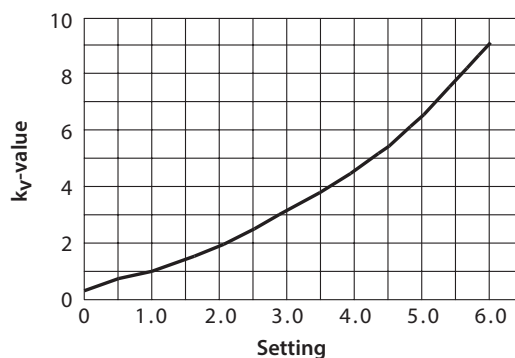
| Setting | $k_v$ -value |
|---------|--------------|
| 0.0     | 0.13         |
| 0.1     | 0.15         |
| 0.2     | 0.19         |
| 0.3     | 0.24         |
| 0.4     | 0.30         |
| 0.5     | 0.37         |
| 0.6     | 0.45         |
| 0.7     | 0.53         |
| 0.8     | 0.61         |
| 0.9     | 0.68         |
| 1.0     | 0.76         |
| 1.1     | 0.84         |
| 1.2     | 0.92         |
| 1.3     | 0.99         |
| 1.4     | 1.06         |
| 1.5     | 1.13         |
| 1.6     | 1.21         |
| 1.7     | 1.28         |
| 1.8     | 1.35         |
| 1.9     | 1.43         |
| 2.0     | 1.50         |
| 2.1     | 1.59         |
| 2.2     | 1.67         |
| 2.3     | 1.76         |
| 2.4     | 1.86         |
| 2.5     | 1.96         |
| 2.6     | 2.07         |
| 2.7     | 2.19         |
| 2.8     | 2.31         |
| 2.9     | 2.44         |
| 3.0     | 2.58         |
| 3.1     | 2.72         |
| 3.2     | 2.87         |
| 3.3     | 3.03         |
| 3.4     | 3.19         |
| 3.5     | 3.36         |
| 3.6     | 3.53         |
| 3.7     | 3.70         |
| 3.8     | 3.87         |
| 3.9     | 4.05         |
| 4.0     | 4.23         |
| 4.1     | 4.40         |
| 4.2     | 4.58         |
| 4.3     | 4.75         |
| 4.4     | 4.91         |
| 4.5     | 5.07         |
| 4.6     | 5.22         |
| 4.7     | 5.37         |
| 4.8     | 5.51         |
| 4.9     | 5.64         |
| 5.0     | 5.77         |
| 5.1     | 5.88         |
| 5.2     | 6.00         |

Flow diagrammes,  
DN 25

LENO™ MSV-BD DN 25



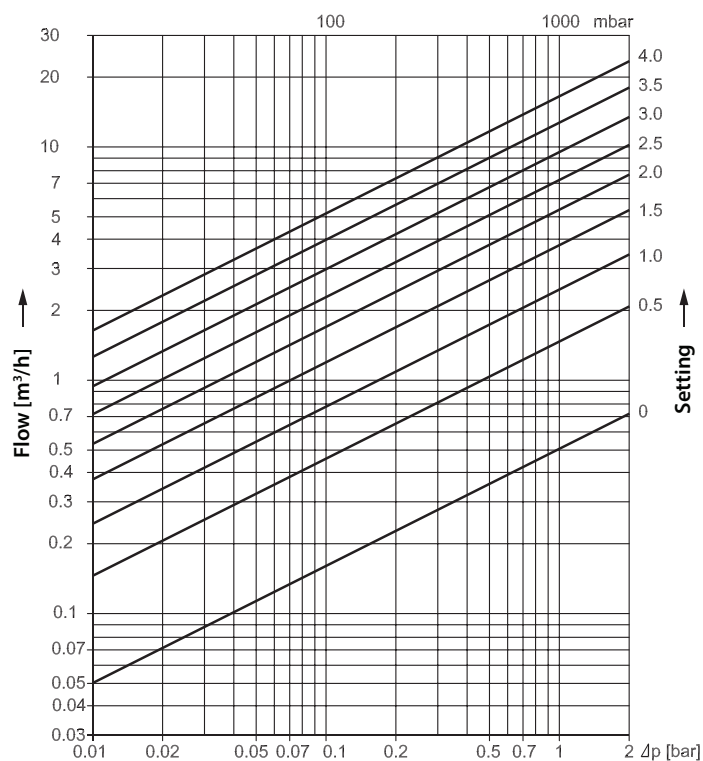
Flow characteristics



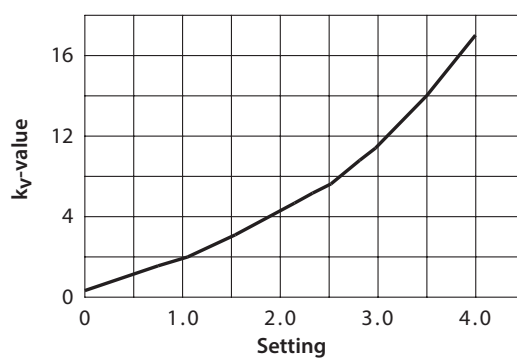
| Setting | k <sub>v</sub> -value |
|---------|-----------------------|
| 0.0     | 0.33                  |
| 0.1     | 0.44                  |
| 0.2     | 0.53                  |
| 0.3     | 0.61                  |
| 0.4     | 0.68                  |
| 0.5     | 0.74                  |
| 0.6     | 0.79                  |
| 0.7     | 0.85                  |
| 0.8     | 0.91                  |
| 0.9     | 0.96                  |
| 1.0     | 1.03                  |
| 1.1     | 1.09                  |
| 1.2     | 1.16                  |
| 1.3     | 1.24                  |
| 1.4     | 1.32                  |
| 1.5     | 1.41                  |
| 1.6     | 1.50                  |
| 1.7     | 1.60                  |
| 1.8     | 1.70                  |
| 1.9     | 1.80                  |
| 2.0     | 1.91                  |
| 2.1     | 2.03                  |
| 2.2     | 2.15                  |
| 2.3     | 2.26                  |
| 2.4     | 2.39                  |
| 2.5     | 2.51                  |
| 2.6     | 2.64                  |
| 2.7     | 2.76                  |
| 2.8     | 2.89                  |
| 2.9     | 3.02                  |
| 3.0     | 3.15                  |
| 3.1     | 3.28                  |
| 3.2     | 3.41                  |
| 3.3     | 3.54                  |
| 3.4     | 3.68                  |
| 3.5     | 3.81                  |
| 3.6     | 3.95                  |
| 3.7     | 4.09                  |
| 3.8     | 4.24                  |
| 3.9     | 4.39                  |
| 4.0     | 4.55                  |
| 4.1     | 4.71                  |
| 4.2     | 4.88                  |
| 4.3     | 5.05                  |
| 4.4     | 5.23                  |
| 4.5     | 5.42                  |
| 4.6     | 5.62                  |
| 4.7     | 5.83                  |
| 4.8     | 6.05                  |
| 4.9     | 6.27                  |
| 5.0     | 6.51                  |
| 5.1     | 6.75                  |
| 5.2     | 7.00                  |
| 5.3     | 7.26                  |
| 5.4     | 7.53                  |
| 5.5     | 7.80                  |
| 5.6     | 8.06                  |
| 5.7     | 8.33                  |
| 5.8     | 8.59                  |
| 5.9     | 8.84                  |
| 6.0     | 9.08                  |
| 6.1     | 9.30                  |
| 6.2     | 9.50                  |

Flow diagrammes,  
DN 32

LENO™ MSV-BD DN 32



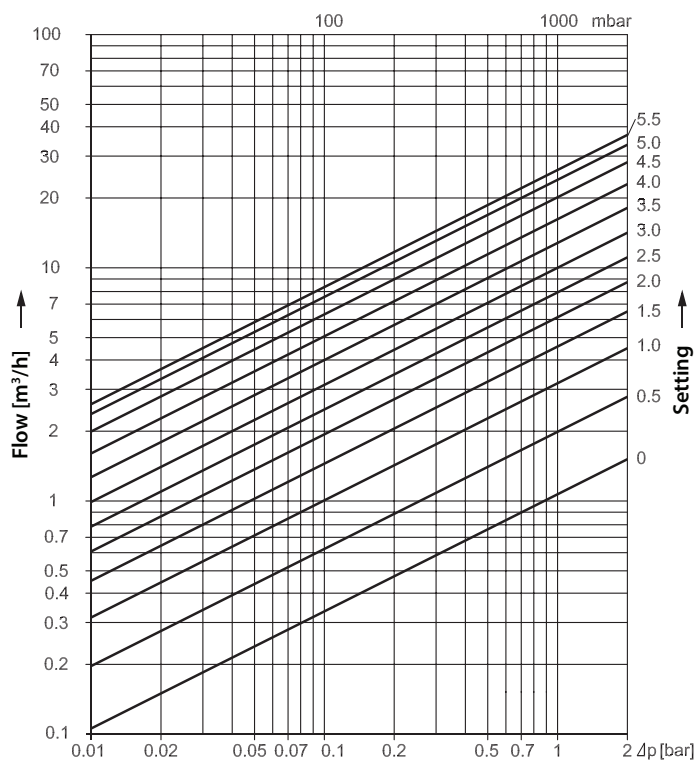
Flow characteristics



| Setting | k <sub>v</sub> -value |
|---------|-----------------------|
| 0.0     | 0.50                  |
| 0.1     | 0.75                  |
| 0.2     | 0.95                  |
| 0.3     | 1.13                  |
| 0.4     | 1.29                  |
| 0.5     | 1.45                  |
| 0.6     | 1.62                  |
| 0.7     | 1.80                  |
| 0.8     | 1.99                  |
| 0.9     | 2.20                  |
| 1.0     | 2.42                  |
| 1.1     | 2.66                  |
| 1.2     | 2.92                  |
| 1.3     | 3.19                  |
| 1.4     | 3.47                  |
| 1.5     | 3.75                  |
| 1.6     | 4.05                  |
| 1.7     | 4.36                  |
| 1.8     | 4.67                  |
| 1.9     | 4.98                  |
| 2.0     | 5.30                  |
| 2.1     | 5.63                  |
| 2.2     | 5.97                  |
| 2.3     | 6.32                  |
| 2.4     | 6.68                  |
| 2.5     | 7.06                  |
| 2.6     | 7.46                  |
| 2.7     | 7.89                  |
| 2.8     | 8.34                  |
| 2.9     | 8.83                  |
| 3.0     | 9.35                  |
| 3.1     | 9.92                  |
| 3.2     | 10.52                 |
| 3.3     | 11.16                 |
| 3.4     | 11.85                 |
| 3.5     | 12.51                 |
| 3.6     | 13.23                 |
| 3.7     | 13.98                 |
| 3.8     | 14.74                 |
| 3.9     | 15.49                 |
| 4.0     | 16.23                 |
| 4.1     | 16.91                 |
| 4.2     | 17.51                 |
| 4.3     | 18.00                 |

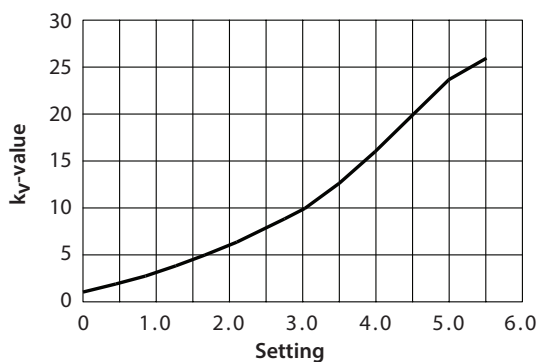
Flow diagrammes,  
DN 40

LENO™ MSV-BD DN 40



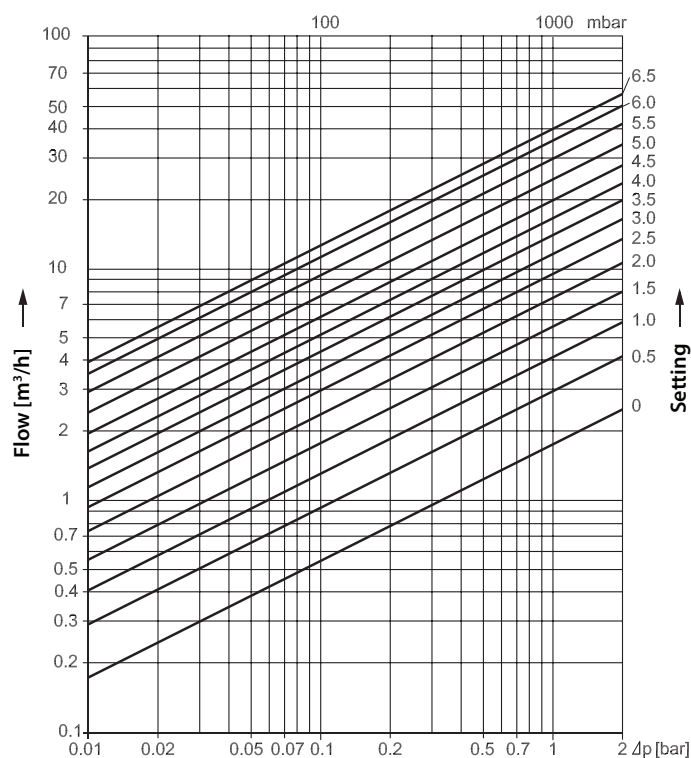
| Setting | k <sub>v</sub> -value |
|---------|-----------------------|
| 0.0     | 1.06                  |
| 0.1     | 1.21                  |
| 0.2     | 1.38                  |
| 0.3     | 1.56                  |
| 0.4     | 1.76                  |
| 0.5     | 1.97                  |
| 0.6     | 2.20                  |
| 0.7     | 2.43                  |
| 0.8     | 2.68                  |
| 0.9     | 2.93                  |
| 1.0     | 3.19                  |
| 1.1     | 3.46                  |
| 1.2     | 3.73                  |
| 1.3     | 4.01                  |
| 1.4     | 4.29                  |
| 1.5     | 4.58                  |
| 1.6     | 4.87                  |
| 1.7     | 5.17                  |
| 1.8     | 5.47                  |
| 1.9     | 5.78                  |
| 2.0     | 6.09                  |
| 2.1     | 6.41                  |
| 2.2     | 6.74                  |
| 2.3     | 7.09                  |
| 2.4     | 7.44                  |
| 2.5     | 7.80                  |
| 2.6     | 8.18                  |
| 2.7     | 8.58                  |
| 2.8     | 9.00                  |
| 2.9     | 9.44                  |
| 3.0     | 9.90                  |
| 3.1     | 10.38                 |
| 3.2     | 10.89                 |
| 3.3     | 11.43                 |
| 3.4     | 12.00                 |
| 3.5     | 12.60                 |
| 3.6     | 13.22                 |
| 3.7     | 13.88                 |
| 3.8     | 14.56                 |
| 3.9     | 15.28                 |
| 4.0     | 16.02                 |
| 4.1     | 16.79                 |
| 4.2     | 17.57                 |
| 4.3     | 18.38                 |
| 4.4     | 19.19                 |
| 4.5     | 20.02                 |
| 4.6     | 20.82                 |
| 4.7     | 21.61                 |
| 4.8     | 22.38                 |
| 4.9     | 23.12                 |
| 5.0     | 23.81                 |
| 5.1     | 24.44                 |
| 5.2     | 25.00                 |
| 5.3     | 25.46                 |
| 5.4     | 25.80                 |
| 5.5     | 26.00                 |

Flow characteristics

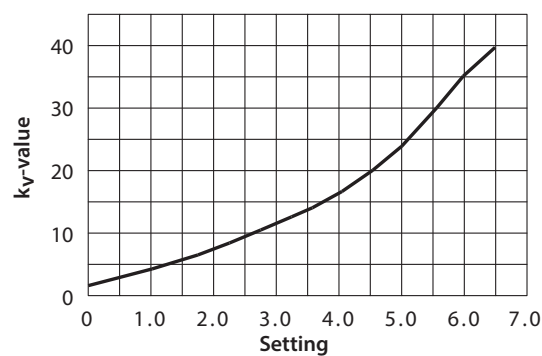


Flow diagrammes,  
DN 50

LENO™ MSV-BD DN 50

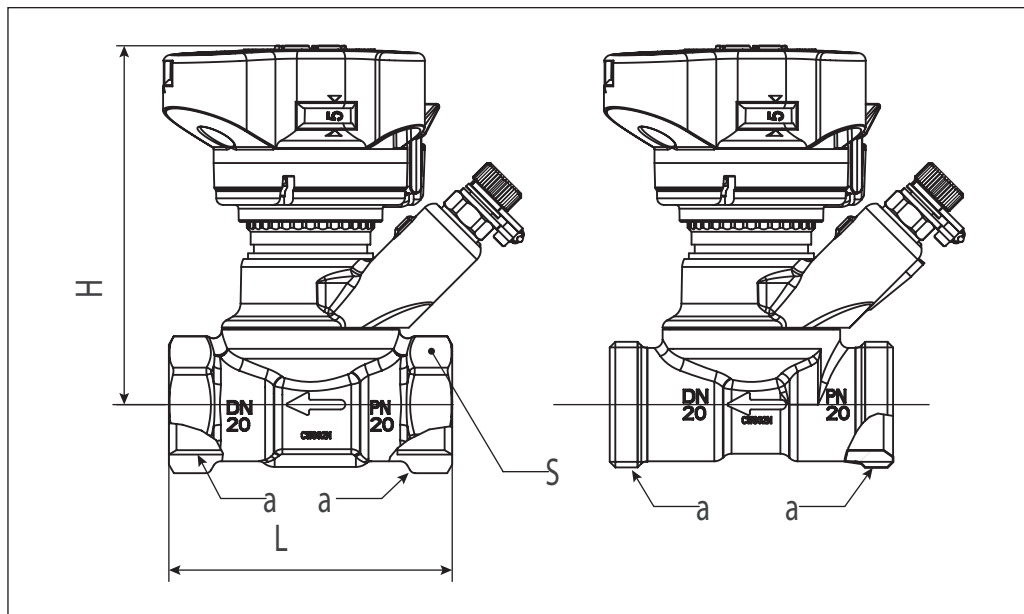


Flow characteristics



| Setting | k <sub>v</sub> -value |
|---------|-----------------------|
| 0.0     | 1.74                  |
| 0.1     | 2.03                  |
| 0.2     | 2.28                  |
| 0.3     | 2.51                  |
| 0.4     | 2.73                  |
| 0.5     | 2.95                  |
| 0.6     | 3.16                  |
| 0.7     | 3.38                  |
| 0.8     | 3.61                  |
| 0.9     | 3.85                  |
| 1.0     | 4.10                  |
| 1.1     | 4.37                  |
| 1.2     | 4.65                  |
| 1.3     | 4.95                  |
| 1.4     | 5.26                  |
| 1.5     | 5.59                  |
| 1.6     | 5.93                  |
| 1.7     | 6.28                  |
| 1.8     | 6.64                  |
| 1.9     | 7.01                  |
| 2.0     | 7.39                  |
| 2.1     | 7.78                  |
| 2.2     | 8.17                  |
| 2.3     | 8.56                  |
| 2.4     | 8.96                  |
| 2.5     | 9.36                  |
| 2.6     | 9.76                  |
| 2.7     | 10.17                 |
| 2.8     | 10.58                 |
| 2.9     | 10.99                 |
| 3.0     | 11.41                 |
| 3.1     | 11.84                 |
| 3.2     | 12.27                 |
| 3.3     | 12.71                 |
| 3.4     | 13.16                 |
| 3.5     | 13.62                 |
| 3.6     | 14.10                 |
| 3.7     | 14.60                 |
| 3.8     | 15.12                 |
| 3.9     | 15.66                 |
| 4.0     | 16.23                 |
| 4.1     | 16.84                 |
| 4.2     | 17.47                 |
| 4.3     | 18.14                 |
| 4.4     | 18.84                 |
| 4.5     | 19.59                 |
| 4.6     | 20.38                 |
| 4.7     | 21.21                 |
| 4.8     | 22.08                 |
| 4.9     | 23.00                 |
| 5.0     | 23.96                 |
| 5.1     | 24.96                 |
| 5.2     | 26.00                 |
| 5.3     | 27.07                 |
| 5.4     | 28.17                 |
| 5.5     | 29.30                 |
| 5.6     | 30.44                 |
| 5.7     | 31.64                 |
| 5.8     | 32.83                 |
| 5.9     | 34.01                 |
| 6.0     | 35.14                 |
| 6.1     | 36.23                 |
| 6.2     | 37.24                 |
| 6.3     | 38.14                 |
| 6.4     | 38.93                 |
| 6.5     | 39.56                 |
| 6.6     | 40.00                 |

## Dimensions



| MSV-BD   | Size     | a<br>Thread ISO 228-1 | L<br>(mm) | H<br>(mm) | S<br>(mm) |
|----------|----------|-----------------------|-----------|-----------|-----------|
| 003Z4000 | DN 15 LF | G ½                   | 65        | 92        | 27        |
| 003Z4001 | DN 15    | G ½                   | 65        | 92        | 27        |
| 003Z4002 | DN 20    | G ¾                   | 75        | 95        | 32        |
| 003Z4003 | DN 25    | G 1                   | 85        | 98        | 41        |
| 003Z4004 | DN 32    | G 1¼                  | 98        | 121       | 50        |
| 003Z4005 | DN 40    | G 1½                  | 100       | 125       | 55        |
| 003Z4006 | DN 50    | G 2                   | 130       | 129       | 67        |
| 003Z4100 | DN 15 LF | G ¾ A                 | 70        | 92        | -         |
| 003Z4101 | DN 15    | G ¾                   | 70        | 92        | -         |
| 003Z4102 | DN 20    | G 1 A                 | 75        | 95        | -         |

## Tender specifications

LENO™ MSV –BD can be used in heating and cooling systems.

| Features                                                   | LENO™ MSV-BD |
|------------------------------------------------------------|--------------|
| Balancing / Commissioning                                  | •            |
| Presetting                                                 | •            |
| Fixed orifice                                              |              |
| Self sealing test plugs                                    | •            |
| Digital visible scale from more sides                      | •            |
| Shut-off function (ball valve)                             | •            |
| Draining / filling                                         | •            |
| Draining / filling on both sides of the valve              | •            |
| Removable handle                                           | •            |
| Closing indicator                                          | •            |
| Allen key for ball valve                                   | •            |
| Parallel test plugs                                        | •            |
| 360° rotating measuring station (drain tap and test plugs) | •            |

Presetting values are visible on top of the valve and from all sides.

Presetting is locked by pressing down the handle. When locked, the shut-off function can be used without changing the presetting.

The handle is released with the green key or with a 3 mm Allen key.

To prevent unintended changes of the presetting, the handle can be sealed by using a strip.

The system can be drained and filled on both sides of the ball valve.

External thread versions comes in sizes DN 15 and DN 20 and are prepared for Danfoss standard fittings. DN 15 is designed with Euro cone, according to DIN V 3838.

LENO™ MSV-BD has a leakage rate A according to ISO 5208, the ball valve is 100% tight.

The LENO™ MSV-BD measuring accuracy is 8% at 25% of max. setting.

Accuracy is according to BS 7350 : 1990.

Measuring instruments must be equipped with Ø3 mm measuring needles. Danfoss measuring instruments PFM 1000 contain all relevant valve data.

Valve sizes..... DN 15 (LF) – DN 50

Pressure class..... PN20

Static test pressure ..... 30 bar

Working temperature..... -20°C to 120°C

Working area..... 10-100% of the  $k_{VS}$ -value

The valve body is made of DZR brass.

The ball is made of chromium plated brass.

O-rings are made from EPDM rubber.





**Danfoss A/S**

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