**SIEMENS**

VVF53..

VXF53..

# Acvatix™
# Valves VVF..,VXF..
# Basic Documentation

CE1P4030en
12.09.2011

**Building Technologies**

Siemens Switzerland Ltd.
Industry Sector
Building Technologies Division
Gubelstrasse 22
6301 Zug
Switzerland
Phone +41 41-724 24 24
www.siemens.com/sbt

# Table of contents


**1 About this document ....... 5**
1.1 Navigation ....... 5
1.2 Revision history ....... 5
1.3 Reference documents ....... 5
1.3.1 2- and 3-port valves with flanged connections ....... 5
1.4 Before you start ....... 5
1.4.1 Trademarks ....... 5
1.4.2 Copyright ....... 6
1.4.3 Quality assurance ....... 6
1.4.4 Document use / request to the reader ....... 6
1.5 Validity of documentation ....... 6
**2 Engineering ....... 7**
2.1 Product description ....... 7
2.1.1 2-port valves ....... 7
2.1.2 3-port valves ....... 7
2.1.3 Type plate ....... 8
2.2 Use ....... 9
2.2.1 Compatibility with medium and temperature ranges ....... 9
2.2.2 Fields of use ....... 10
2.3 Type summary and equipment combinations ....... 11
2.3.1 2-port valves with flanged connections ....... 11
2.3.2 3-port valves with flanged connections ....... 14
2.3.3 Overview of actuators ....... 15
2.4 Ordering ....... 16
2.5 Accessories ....... 16
2.5.1 Electrical accessories ....... 16
2.5.2 Mechanical accessories ....... 17
2.5.3 Adapters ....... 17
2.6 Product replacement ....... 18
2.6.1 2-port valves ....... 18
2.6.2 3-port valves ....... 19
2.6.3 Accessories ....... 19
2.7 Spare parts ....... 20
2.8 Valve sizing for fluids (water, heat transfer oil) ....... 21
2.8.1 Procedure for valve sizing ....... 21
2.8.2 Flow chart ....... 22
2.8.3 Impact of fluid properties on valve sizing ....... 23
2.8.3.1 Density ρ ....... 23
2.8.3.2 Specific heat capacity c ....... 23
2.8.3.3 Kinematic viscosity v ....... 24
2.8.4 Influencing factors with selected groups of fluids ....... 25
2.8.5 Rangeability $S_v$, minimum controllable output $Q_{min}$ ....... 25
2.9 Sizing valves for steam ....... 26
2.10 Calculation examples for water, heat transfer oil and steam ....... 29
2.10.1 Example for water: Heater with pressure and variable volumetric flow 29
2.10.2 Example for water: Heater with low differential pressure without main pump ....... 30
2.10.3 Example for heat transfer oil ....... 31
2.10.4 Example for steam ....... 33

2.11 Valve characteristics ....35
2.11.1 2-port valves....35
2.11.2 3-port valves....35
2.12 Operating pressure and medium temperature....36
2.12.1 ISO 7005 and EN 1092 – a comparison....36
2.12.2 PN 16 valves with flanged connections....37
2.12.3 PN 25 valves with flanged connections....38
2.13 Cavitation....39
2.14 Medium quality and medium treatment....40
2.14.1 Water....40
2.14.2 Water with antifreeze....41
2.14.3 Deionized, demineralized water and super-clean water....42
2.14.4 Heat transfer oil (thermal oil)....42
2.15 Engineering notes....43
2.15.1 Strainer (dirt trap)....43
2.15.2 Avoiding flow noise....44
2.15.3 Avoiding false circulation....44
2.15.4 Thermal insulation....45
2.16 Warranty....46

**3 Handling....47**
3.1 Mounting and installation....47
3.1.1 Mounting positions....47
3.1.2 Direction of flow for fluids and steam....47
3.1.3 Flanges....48
3.1.4 Stem heating element ASZ6.6....50
3.1.5 Thermal insulation....50
3.2 Commissioning and maintenance....51
3.2.1 Commissioning....51
3.2.2 Maintenance....51
3.3 Disposal....51

**4 Functions and control....52**
4.1 Selection of acting direction and valve characteristic....52
4.2 Calibration....53
4.3 Technical and mechanical design....53
4.3.1 Plug stop....54
4.3.2 Valve stem, valve neck, coupling....54
4.3.3 Converting a 2-port to a 3-port valve....54
4.3.4 Converting a 3-port to a 2-port valve....54
4.3.5 Flange types....55

**5 Technical data....56**

**6 Dimensions....58**

**7 Revision numbers....60**

**8 Addendum....61**
8.1.1 Abbreviations....61
8.1.2 Important formulas....62
8.1.3 Valve-related glossary....62
8.1.4 Hydraulics-related glossary....63
8.1.5 Media-related glossary....64
8.1.6 Trade names....64
8.1.7 Overview of antifreeze and brines used in the trade....64

# 1 About this document

## 1.1 Navigation

You will find information about a specific valve throughout the document. The structure of chapters 2 to 4 is as follows:

| | |
|---|---|
| 2 Engineering | **device oriented** |
| 3 Handling | **process oriented** |
| 3.1 Mounting and installation | |
| 3.2 Commissioning and maintenance | |
| 3.3 ... | |
| 4 Functions and control | **assembly oriented** |
| 4.1 Selection of acting direction and valve characteristic | |
| 4.2 Calibration | |
| 4.3 ... | |

## 1.2 Revision history

| Revision | Date | Changes | Chapter | Page(s) |
|---|---|---|---|---|
| First edition | 12.09.2011 | - | - | - |

## 1.3 Reference documents

### 1.3.1 2- and 3-port valves with flanged connections

| Type of document | VVF43..<br>VXF43.. | VVF53..<br>VXF53.. |
|---|---|---|
| Data Sheet | N4404 | N4405 |
| Mounting Instructions | M4030 | M4030 |
| CE Declaration of Conformity (PED) | T4030 | T4030 |
| Environmental Declaration | E4404 | E4405 |

## 1.4 Before you start

### 1.4.1 Trademarks

The table below lists the trademarks used in this document and their legal owners. The use of trademarks is subject to international and domestic provisions of the law.

| Trademarks | Legal owner |
|---|---|
| Acvatix™ | Siemens AG |

All product names listed in the table are registered (®) or not registered (™) trademarks of the owner listed in the table. We forgo the labeling (e.g. using the symbols ® and ™) of trademarks for the purposes of legibility based on the reference in this section.

### 1.4.2 Copyright



### 1.4.3 Quality assurance

The document was prepared with great care. Please make sure that you are aware of the latest document revision date.

- The contents of all documents are checked at regular intervals
- Any corrections necessary are included in subsequent versions
- Documents are automatically amended as a consequence of modifications and corrections to the products described

If you find lack of clarity while using this document, or if you have any criticisms or suggestions, please get in touch with your local contact person in the nearest Siemens branch office. For addresses of the Siemens branch offices, please visit www.siemens.com/acvatix.

### 1.4.4 Document use / request to the reader

Before using our products, it is important that you read the documents supplied with or ordered at the same time as the products (equipment, applications, tools, etc.) carefully and in full.

We assume that persons using our products and documents are authorized and trained appropriately and have the technical knowledge required to use our products as intended.

More information on the products and applications is available:

- On the intranet (Siemens employees only) at https://workspace.sbt.siemens.com/content/00001123/default.aspx.
- From the Siemens branch office near you or from your system supplier
- From the Support Team at headquarters (fieldsupport-zug.ch.sbt@siemens.com) if there is no local point of contact

Siemens assumes no liability to the extent allowed under the law for any losses resulting from a failure to comply with the aforementioned points or for improper compliance of the same.

## 1.5 Validity of documentation

This document shall serve as a knowledge base. In addition to basic knowledge, it provides general technical information about valves used in HVAC plants.

For project engineers, electrical HVAC planners, system integrators, and service engineers, the document contains all information required for planning, engineering, correct installation, commissioning, and servicing.

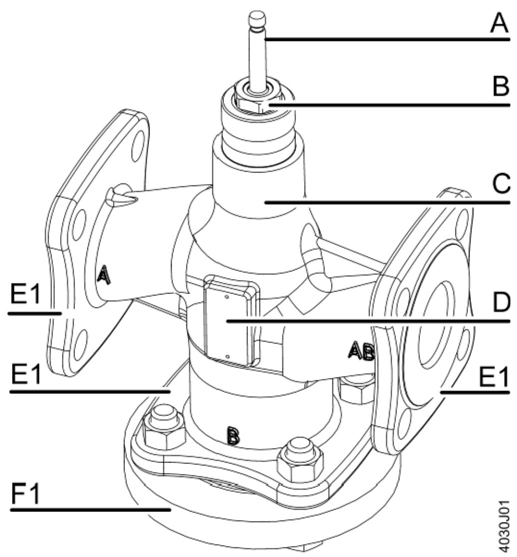
# 2 Engineering

## 2.1 Product description

The large-stroke valve line consists of 2-port and 3-port valves.

### 2.1.1 2-port valves

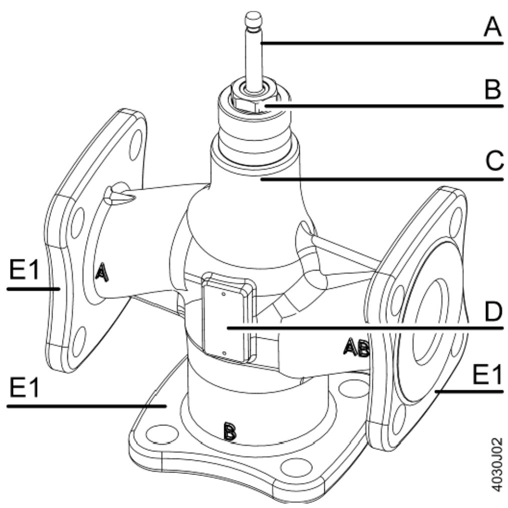
| Type of valve | Product number | Connections |
|---|---|---|
| High-performance valves for higher medium temperatures | VVF43.., VVF53.. | Flanged |




| | | | Page |
|---|---|---|---|
| A | Valve stem | | 54 |
| B | Stem sealing gland | | 19 |
| C | Valve neck | | 54 |
| D | Type plate | | 8 |
| E1 | Flange | Connections | 55 |
| F1 | Blank flange | | |

### 2.1.2 3-port valves

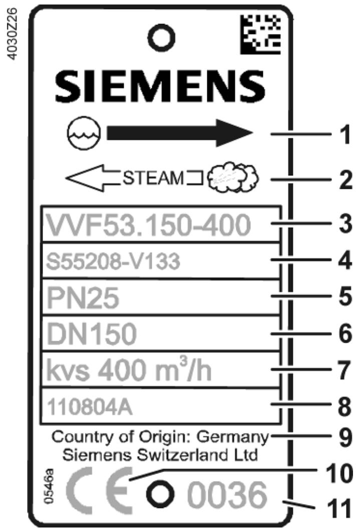
| Type of valve | Product number | Connections |
|---|---|---|
| High-performance valves for higher medium temperatures | VXF43.., VXF53.. | Flanged |




| | | | Page |
|---|---|---|---|
| A | Valve stem | | 54 |
| B | Stem sealing gland | | 19 |
| C | Valve neck | | 54 |
| D | Type plate | | 8 |
| E1 | Flange | Connections | 55 |

## 2.1.3 Type plate

**2-port valves**



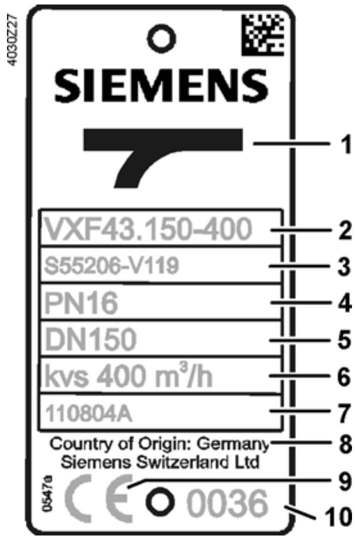

1 Flow direction for fluids
2 Flow direction for steam
Port markings are cast integral
3 Product number
4 Stock number
5 Nominal pressure class
6 Nominal size
7 $k_{vs}$ value
8 Serial number
9 Country of origin
10 CE mark conforming to PED 97/23/EC. Applies only to valves of category I or II conforming to PED 97/23/EC
11 Notified body number for monitoring production centers as per module A1 of PED 97/23/EC. Applies only to valves of category II

Fluids

Steam

QR code (Siemens in-house usage)

**3-port valves**




1 Flow direction for fluids
Port markings are cast integral
2 Product number
3 Stock number
4 Nominal pressure class
5 Nominal size
6 $k_{vs}$ value
7 Serial number
8 Country of origin
9 CE mark conforming to PED 97/23/EC. Applies only to valves of category I or II conforming to PED 97/23/EC
10 Notified body number for monitoring production centers as per module A1 of PED 97/23/EC. Applies only to valves of category II

QR code (Siemens in-house usage)

## 2.2 Use

The valves are used as control or shutoff valves in heating, ventilation and air conditioning plants for the production and distribution of heat or cooling energy, as well as in district heating plants and in steam applications.

All 3-port valves can be used as mixing valves (preferred use) or diverting valves. For use in closed or open hydraulic circuits, observe chapter "Cavitation", page 39.

### 2.2.1 Compatibility with medium and temperature ranges

| **Type of medium** | | | **Product number** | | | | **Notes** |
|---|---|---|---|---|---|---|---|
| Version [1] | | | H | | | | |
| | **Temperature range** | | | | | | |
| | $T_{min}$ [°C] | $T_{max}$ [°C] | VVF43.. | VXF43.. | VVF53.. | VXF53.. | |
| Type of connection [2] | | | F | F | F | F | - |
| Cold water | 1 | 25 | ■ | ■ | ■ | ■ | - |
| Low-temperature hot water | 1 | 130 | ■ | ■ | ■ | ■ | - |
| High-temperature hot water [3] | 130 | 150 | ■ | ■ | ■ | ■ | - |
| | 150 | 180 | ■ | ■ | ■ | ■ | - |
| | 180 | 220 | - | - | ■ | ■ | - |
| Water with antifreeze | -5 | 150 | ■ | ■ | ■ | ■ | When using V..F43/53 for medium temperatures below -5 °C, the stem sealing gland must be replaced |
| | -10 | 150 | ■ | ■ | ■ | ■ | |
| | -20 | 150 | ■ | ■ | ■ | ■ | |
| Cooling water [4] | 1 | 25 | ■ | ■ | ■ | ■ | - |
| Brines | -5 | 150 | ■ | ■ | ■ | ■ | When using V..F43/53 for medium temperatures below -5 °C, the stem sealing gland must be replaced |
| | -10 | 150 | ■ | ■ | ■ | ■ | |
| | -20 | 150 | ■ | ■ | ■ | ■ | |
| Saturated steam | 100 | 150 | ■ | - | ■ | - | - |
| | 150 | 200 | ■ | - | ■ | - | - |
| | 200 | 220 | - | - | ■ | - | - |
| Superheated steam [5] | 120 | 150 | ■ | - | ■ | - | - |
| | 150 | 220 | ■ | - | ■ | - | - |
| Heat transfer oils | 20 | 220 | ■ | ■ | ■ | ■ | On the basis of mineral oil |
| Super-clean water (Demineralized and deionized water) | 1 | 150 | - | - | - | - | |

1) Version: H = high-performance
2) Type of connection: F = flanged
3) Differentiation due to saturated steam curve. For details, refer to chapter 2.12, page 36
4) Open circuits
5) Min. dryness at inlet: 0.98

Note

For a detailed list of the permissible types of antifreeze and brines, refer to "8.1.7 Overview of antifreeze and brines used in the trade", page 64. The notes given under "2.14 Medium quality and medium treatment", page 40 must also be observed.

## 2.2.2 Fields of use

| Fields of use | Product number | | | |
|---|---|---|---|---|
| | 3-port valves | | 2-port valves | |
| Version [1] | H | | H | |
| | VXF43.. | VXF53.. | VVF43.. | VVF53.. |
| Type of connection [2] | F | F | F | F |
| **Generation** | | | | |
| Boiler plants | ■ | ■ | ■ | ■ |
| District heating plants | - | - | ■ | ■ |
| Chiller plants | ■ | ■ | ■ | ■ |
| Cooling towers [3] | ■ | ■ | ■ | ■ |
| **Distribution** | | | | |
| Heating groups | ■ | ■ | ■ | ■ |
| Air handling units | ■ | ■ | ■ | ■ |

[1] Version: H = high-performance
[2] Type of connection: F = flanged
[3] Open circuits

# 2.3 Type summary and equipment combinations

## 2.3.1 2-port valves with flanged connections

| PN 16 [1] | Actuators | Data Sheet | | Stroke / Positioning force | 20 mm<br>800 N | | 20 mm<br>1000 N | | 20 mm<br>2800 N | | 40 mm<br>2800 N | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | SAX.. [2] | N4501 | | |  | |  | |  | |  | |
| | SKD.. [2] | N4561 | | | | | | | | | | |
| | SKB.. | N4564 | | | | | | | | | | |
| | SKC.. | N4566 | | | | | | | | | | |
| Data Sheet N4404 | | DN | $k_{vs}$ | $S_V$ | SAX.. [2] $\Delta p_s$ | $\Delta p_{max}$ | SKD.. [2] $\Delta p_s$ | $\Delta p_{max}$ | SKB.. $\Delta p_s$ | $\Delta p_{max}$ | SKC.. $\Delta p_s$ | $\Delta p_{max}$ |
| -20…220 °C | Stock number | | [m³/h] | | [kPa] | | | | | | | |
| **VVF53.15-.. [3]** | S55208-.. | 15 | 0.16…1.25 | > 50 | 2500 | 1200 | 2500 | 1200 | 2500 | 1200 | - | - |
| **VVF53.15-.. [3]** | S55208-.. | 15 | 1.6…4 | > 100 | | | | | | | | |
| **VVF53.20-.. [3]** | S55208-.. | 20 | 6.3 | | | | | | | | | |
| **VVF53.25-.. [3]** | S55208-.. | 25 | 5…10 | | 1600 | | 2100 | | | | | |
| **VVF53.32-.. [3]** | S55208-.. | 32 | 16 | | 900 | 750 | 1200 | 1100 | | | | |
| **VVF53.40-.. [3]** | S55208-.. | 40 | 12.5…25 | | 550 | 500 | 750 | 650 | 2000 | | | |
| **VVF53.50-.. [3]** | S55208-.. | 50 | 31.5…40 | | 350 | 300 | 450 | 400 | 1200 | 1150 | | |
| **VVF43.65-50** | S55206-V100 | 65 | 50 | > 100 | - | - | - | - | - | - | 700 | 650 |
| **VVF43.65-63 [4]** | S55206-V101 | 65 | 63 | | | | | | | | | |
| **VVF43.80-80** | S55206-V102 | 80 | 80 | | | | | | | | 450 | 400 |
| **VVF43.80-100 [4]** | S55206-V103 | 80 | 100 | | | | | | | | | |
| **VVF43.100-125** | S55206-V104 | 100 | 125 | | | | | | | | 300 | 250 |
| **VVF43.100-160 [4]** | S55206-V105 | 100 | 160 | | | | | | | | | |
| **VVF43.125-200 [4]** | S55206-V106 | 125 | 200 | | | | | | | | 175 | 160 |
| **VVF43.125-250 [4]** | S55206-V107 | 125 | 250 | | | | | | | | | |
| **VVF43.150-315 [4]** | S55206-V108 | 150 | 315 | | | | | | | | 125 | 100 |
| **VVF43.150-400** | S55206-V109 | 150 | 400 | | | | | | | | | |

1) Flange type: 21; flange design: B (see "Flange types", page 55)
2) Suitable for medium temperatures up to 150 °C
3) See VVF53.., PN 25 (Data Sheet N4405): Flange dimensions for PN 25 are the same as those for PN 16
4) Valve characteristic is optimized for maximum volumetric flow:
- $k_{vs}$ value 63 m³/h from 90% stroke,
- $k_{vs}$ values 100, 160, 200 and 250 m³/h from 80% stroke,
- $k_{vs}$ value 315 m³/h from 70% stroke

Note

For applications with steam the maximum differential and closing pressures differ from the values above. For further details refer to "Applications with steam" on page 12.

| PN 25<br>PN 16 [1)]<br>[2)] <br>Data Sheet N4405 | Actuators: SAX.. [3)] N4501, SKD.. [3)] N4561, SKB.. N4564, SKC.. N4566 | | | Stroke / Positioning force | 20 mm / 800 N<br><br>SAX.. [3)] | | 20 mm / 1000 N<br><br>SKD.. [3)] | | 20 mm / 2800 N<br><br>SKB.. | | 40 mm / 2800 N<br><br>SKC.. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -20…220 °C | Stock number | DN | $k_{vs}$ [m³/h] | $S_V$ | $\Delta p_s$ [kPa] | $\Delta p_{max}$ [kPa] | $\Delta p_s$ [kPa] | $\Delta p_{max}$ [kPa] | $\Delta p_s$ [kPa] | $\Delta p_{max}$ [kPa] | $\Delta p_s$ [kPa] | $\Delta p_{max}$ [kPa] |
| **VVF53.15-0.16** | S55208-V100 | 15 | 0.16 | > 50 | 2500 | 1200 | 2500 | 1200 | 2500 | 1200 | - | - |
| **VVF53.15-0.2** | S55208-V101 | 15 | 0.2 | | | | | | | | | |
| **VVF53.15-0.25** | S55208-V102 | 15 | 0.25 | | | | | | | | | |
| **VVF53.15-0.32** | S55208-V103 | 15 | 0.32 | | | | | | | | | |
| **VVF53.15-0.4** | S55208-V104 | 15 | 0.4 | | | | | | | | | |
| **VVF53.15-0.5** | S55208-V105 | 15 | 0.5 | | | | | | | | | |
| **VVF53.15-0.63** | S55208-V106 | 15 | 0.63 | | | | | | | | | |
| **VVF53.15-0.8** | S55208-V107 | 15 | 0.8 | | | | | | | | | |
| **VVF53.15-1** | S55208-V108 | 15 | 1 | | | | | | | | | |
| **VVF53.15-1.25** | S55208-V109 | 15 | 1.25 | | | | | | | | | |
| **VVF53.15-1.6** | S55208-V110 | 15 | 1.6 | > 100 | | | | | | | | |
| **VVF53.15-2** | S55208-V111 | 15 | 2 | | | | | | | | | |
| **VVF53.15-2.5** | S55208-V112 | 15 | 2.5 | | | | | | | | | |
| **VVF53.15-3.2** | S55208-V113 | 15 | 3.2 | | | | | | | | | |
| **VVF53.15-4** | S55208-V114 | 15 | 4 | | | | | | | | | |
| **VVF53.20-6.3** | S55208-V116 | 20 | 6.3 | | | | | | | | | |
| **VVF53.25-5** | S55208-V117 | 25 | 5 | | 1600 | | 2100 | | | | | |
| **VVF53.25-6.3** | S55208-V118 | 25 | 6.3 | | | | | | | | | |
| **VVF53.25-8** | S55208-V119 | 25 | 8 | | | | | | | | | |
| **VVF53.25-10** | S55208-V120 | 25 | 10 | | | | | | | | | |
| **VVF53.32-16** | S55208-V122 | 32 | 16 | | 900 | 750 | 1200 | 1100 | | | | |
| **VVF53.40-12.5** | S55208-V123 | 40 | 12.5 | | 550 | 500 | 750 | 650 | 2000 | | | |
| **VVF53.40-16** | S55208-V124 | 40 | 16 | | | | | | | | | |
| **VVF53.40-20** | S55208-V125 | 40 | 20 | | | | | | | | | |
| **VVF53.40-25** | S55208-V126 | 40 | 25 | | | | | | | | | |
| **VVF53.50-31.5** | S55208-V127 | 50 | 31.5 | | 350 | 300 | 450 | 400 | 1200 | 1150 | | |
| **VVF53.50-40** | S55208-V128 | 50 | 40 | | | | | | | | | |
| **VVF53.65-63** [4)] | S55208-V129 | 65 | 63 | | - | - | - | - | - | - | 700 | 650 |
| **VVF53.80-100** [4)] | S55208-V130 | 80 | 100 | | | | | | | | 450 | 400 |
| **VVF53.100-160** [4)] | S55208-V131 | 100 | 160 | | | | | | | | 300 | 250 |
| **VVF53.125-250** [4)] | S55208-V132 | 125 | 250 | | | | | | | | 175 | 160 |
| **VVF53.150-400** | S55208-V133 | 150 | 400 | | | | | | | | 125 | 100 |

1) DN 15…50: Flange dimensions for PN 16 and PN 25
DN 65…150: Flange dimensions for PN 25 only
2) Flange type: 21; flange design: B (see "Flange types", page 55)
3) Suitable for medium temperatures up to 150 °C
4) Valve is optimized for maximum volumetric flow:
- $k_{vs}$ value 63 m³/h from 90% stroke,
- $k_{vs}$ values 100, 160 and 250 m³/h from 80% stroke

Note

Other maximum differential and closing pressures are valid for applications with steam, for further details refer to "Applications with steam" on page 12.

**Applications with steam**

**Operate valves of the product lines VVF43.. and VVF53.. with inverted flow direction for steam.** This results in significantly higher closing pressures $\Delta p_s$ and higher maximum differential pressures $\Delta p_{max}$ in combination with electrohydraulic actuators of the product lines SKD.., SKB.. und SKC...
In some cases the $k_{vs}$ value may be reduced and it has to be assured from the system side, that the maximum differential pressure $\Delta p_{max}$ at system start is not exceeded, so that the actuator can reliably open the valve.

| ⧓ | Actuators | Data Sheet | | Stroke / Positioning force | 20 mm / 1000 N | | 20 mm / 2800 N | | 40 mm / 2800 N | |
|---|---|---|---|---|---|---|---|---|---|---|
| PN 25<br>PN 16 [1)]<br> 2)<br>Data Sheet N4405 | SKD.. [3)]<br>SKB..<br>SKC.. | N4561<br>N4564<br>N4566 | | | <br>SKD.. [3)] | | <br>SKB.. | | <br>SKC.. | |
| | | | DN | $k_{vs}$ | $S_V$ | $\Delta p_s$ | $\Delta p_{max}$ | $\Delta p_s$ | $\Delta p_{max}$ | $\Delta p_s$ | $\Delta p_{max}$ |

| VVF53.. | 100…220 °C | Stock number | DN | $k_{vs}$ [m³/h] | $S_V$ | SKD.. $\Delta p_s$ [kPa] | SKD.. $\Delta p_{max}$ [kPa] | SKB.. $\Delta p_s$ [kPa] | SKB.. $\Delta p_{max}$ [kPa] | SKC.. $\Delta p_s$ [kPa] | SKC.. $\Delta p_{max}$ [kPa] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VVF53.. | **VVF53.15-0.16** | S55208-V100 | 15 | 0,16 | > 50 | 2500 | 1200 | 2500 | 1200 | - | - |
| | **VVF53.15-0.2** | S55208-V101 | | 0,2 | | | | | | | |
| | **VVF53.15-0.25** | S55208-V102 | | 0,25 | | | | | | | |
| | **VVF53.15-0.32** | S55208-V103 | | 0,32 | | | | | | | |
| | **VVF53.15-0.4** | S55208-V104 | | 0,4 | | | | | | | |
| | **VVF53.15-0.5** | S55208-V105 | | 0,5 | | | | | | | |
| | **VVF53.15-0.63** | S55208-V106 | | 0,63 | | | | | | | |
| | **VVF53.15-0.8** | S55208-V107 | | 0,8 | | | | | | | |
| | **VVF53.15-1** | S55208-V108 | | 1 | | | | | | | |
| | **VVF53.15-1.25** | S55208-V109 | | 1,25 | | | | | | | |
| | **VVF53.15-1.6** | S55208-V110 | | 1,6 | > 100 | | | | | | |
| | **VVF53.15-2** | S55208-V111 | | 2 | | | | | | | |
| | **VVF53.15-2.5** | S55208-V112 | | 2,5 | | | | | | | |
| | **VVF53.15-3.2** | S55208-V113 | | 3,2 | | | | | | | |
| | **VVF53.15-4** [4)] | S55208-V114 | | 3,6 | | | | | | | |
| | **VVF53.20-6.3** [4)] | S55208-V116 | 20 | 5 | | | | | | | |
| | **VVF53.25-5** | S55208-V117 | 25 | 5 | | | | | | | |
| | **VVF53.25-6.3** | S55208-V118 | | 6,3 | | | | | | | |
| | **VVF53.25-8** | S55208-V119 | | 8 | | | | | | | |
| | **VVF53.25-10** [4)] | S55208-V120 | | 8 | | | | | | | |
| | **VVF53.32-16** [4)] | S55208-V122 | 32 | 15 | | | | | | | |
| | **VVF53.40-12.5** | S55208-V123 | 40 | 12,5 | | | 1000 | | | | |
| | **VVF53.40-16** | S55208-V124 | | 16 | | | | | | | |
| | **VVF53.40-20** | S55208-V125 | | 20 | | | | | | | |
| | **VVF53.40-25** [4)] | S55208-V126 | | 23 | | | | | | | |
| | **VVF53.50-31.5** | S55208-V127 | 50 | 31,5 | | | 600 | | | | |
| | **VVF53.50-40** | S55208-V128 | | 40 | | | | | | | |
| | **VVF53.65-63** | S55208-V129 | 65 | 63 | | - | - | - | - | 2500 | 1000 |
| | **VVF53.80-100** | S55208-V130 | 80 | 100 | | | | | | | 750 |
| | **VVF53.100-160** [4)] | S55208-V131 | 100 | 150 | | | | | | | 500 |
| | **VVF53.125-250** [4)] | S55208-V132 | 125 | 220 | | | | | | | 300 |
| | **VVF53.150-400** [4)] | S55208-V133 | 150 | 360 | | | | | | | 200 |

| | **PN 16**<br>**Data Sheet N4404**<br>**100…220 °C** | **Stock number** | **DN** | $k_{vs}$ [m³/h] | $S_V$ | SKD.. [3)] $\Delta p_s$ [kPa] | SKD.. $\Delta p_{max}$ [kPa] | SKB.. $\Delta p_s$ [kPa] | SKB.. $\Delta p_{max}$ [kPa] | SKC.. $\Delta p_s$ [kPa] | SKC.. $\Delta p_{max}$ [kPa] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VVF43.. | **VVF43.65-50** | S55206-V100 | 65 | 50 | > 100 | - | - | - | - | 1600 | 800 |
| | **VVF43.65-63** | S55206-V101 | | 63 | | | | | | | |
| | **VVF43.80-80** | S55206-V102 | 80 | 80 | | | | | | | 750 |
| | **VVF43.80-100** | S55206-V103 | | 100 | | | | | | | |
| | **VVF43.100-125** | S55206-V104 | 100 | 125 | | | | | | | 500 |
| | **VVF43.100-160** [4)] | S55206-V105 | | 150 | | | | | | | |
| | **VVF43.125-200** | S55206-V106 | 125 | 200 | | | | | | | 300 |
| | **VVF43.125-250** [4)] | S55206-V107 | | 220 | | | | | | | |
| | **VVF43.150-315** [4)] | S55206-V108 | 150 | 280 | | | | | | | 200 |
| | **VVF43.150-400** [4)] | S55206-V109 | | 360 | | | | | | | |

1) DN 15…50: Flange dimensions for PN 16 and PN 25
DN 65…150: Flange dimensions for PN 25 only
2) Flange type: 21; flange design: B (see "Flange types", page 55)
3) Suitable for medium temperatures up to 150 °C
4) Reduced $k_{vs}$ value

## 2.3.2 3-port valves with flanged connections

**PN 16** [1)]

**Data Sheet N4404**

| Actuators | Data Sheet |
|---|---|
| **SAX..** [2)] | N4501 |
| **SKD..** [2)] | N4561 |
| **SKB..** | N4564 |
| **SKC..** | N4566 |




| -20…220 °C | Stock number | DN | $k_{vs}$ [m³/h] | $S_V$ | Stroke 20 mm, 800 N: SAX.. [2)] $\Delta p_{max}$ [kPa] A/B→AB | SAX.. [2)] AB→A/B | Stroke 20 mm, 1000 N: SKD.. [2)] $\Delta p_{max}$ [kPa] A/B→AB | SKD.. [2)] AB→A/B | Stroke 20 mm, 2800 N: SKB.. $\Delta p_{max}$ [kPa] A/B→AB | SKB.. AB→A/B | Stroke 40 mm, 2800 N: SKC.. $\Delta p_{max}$ [kPa] A/B→AB | SKC.. AB→A/B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VXF53.15-..** [3)] | S55208-.. | 15 | 1.6/2.5/4 | > 100 | 1200 | 200 | 1200 | 200 | 1200 | 200 | - | - |
| **VXF53.20-..** [3)] | S55208-.. | 20 | 6.3 | | | | | | | | | |
| **VXF53.25-..** [3)] | S55208-.. | 25 | 6.3/10 | | | | | | | | | |
| **VXF53.32-..** [3)] | S55208-.. | 32 | 16 | | 750 | | 1100 | | | | | |
| **VXF53.40-..** [3)] | S55208-.. | 40 | 16/25 | | 500 | | 650 | | | | | |
| **VXF53.50-..** [3)] | S55208-.. | 50 | 40 | | 300 | | 400 | | 1150 | | | |
| **VXF43.65-63** [4)] | S55206-V115 | 65 | 63 | > 100 | - | - | - | - | - | - | 650 | 200 |
| **VXF43.80-100** [4)] | S55206-V116 | 80 | 100 | | | | | | | | 400 | 200 |
| **VXF43.100-160** [4)] | S55206-V117 | 100 | 160 | | | | | | | | 250 | 150 |
| **VXF43.125-250** [4)] | S55206-V118 | 125 | 250 | | | | | | | | 160 | 100 |
| **VXF43.150-400** | S55206-V119 | 150 | 400 | | | | | | | | 100 | 70 |

1) Flange type: 21; flange design: B (see "Flange types", page 55)
2) Suitable for medium temperatures up to 150 °C
3) See VXF53.., PN 25 (data sheet N4405): Flange dimensions for PN 25 are the same as for PN 16
4) Valve is optimized for maximum volumetric flow:
- $k_{vs}$ value 63 m³/h from 90% stroke,
- $k_{vs}$ values 100, 160 and 250 m³/h from 80% stroke

**PN 25**
**PN 16** [1)] [2)]

**Data Sheet N4405**

| Actuators | Data Sheet |
|---|---|
| **SAX..** [3)] | N4501 |
| **SKD..** [3)] | N4561 |
| **SKB..** | N4564 |
| **SKC..** | N4566 |




| -20…220 °C | Stock number | DN | $k_{vs}$ [m³/h] | $S_V$ | Stroke 20 mm, 800 N: SAX.. [3)] $\Delta p_{max}$ [kPa] A/B→AB | SAX.. [3)] AB→A/B | Stroke 20 mm, 1000 N: SKD.. [3)] $\Delta p_{max}$ [kPa] A/B→AB | SKD.. [3)] AB→A/B | Stroke 20 mm, 2800 N: SKB.. $\Delta p_{max}$ [kPa] A/B→AB | SKB.. AB→A/B | Stroke 40 mm, 2800 N: SKC.. $\Delta p_{max}$ [kPa] A/B→AB | SKC.. AB→A/B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VXF53.15-1.6** | S55208-V140 | 15 | 1.6 | > 100 | 1200 | 200 | 1200 | 200 | 1200 | 200 | - | - |
| **VXF53.15-2.5** | S55208-V141 | 15 | 2.5 | | | | | | | | | |
| **VXF53.15-4** | S55208-V142 | 15 | 4 | | | | | | | | | |
| **VXF53.20-6.3** | S55208-V144 | 20 | 6.3 | | | | | | | | | |
| **VXF53.25-6.3** | S55208-V145 | 25 | 6.3 | | | | | | | | | |
| **VXF53.25-10** | S55208-V146 | 25 | 10 | | | | | | | | | |
| **VXF53.32-16** [4)] | S55208-V148 | 32 | 16 | | 750 | | 1100 | | | | | |
| **VXF53.40-16** | S55208-V149 | 40 | 16 | | 500 | | 650 | | | | | |
| **VXF53.40-25** [4)] | S55208-V150 | 40 | 25 | | | | | | | | | |
| **VXF53.50-40** [4)] | S55208-V152 | 50 | 40 | | 300 | 100 | 400 | | 1150 | | | |
| **VXF53.65-63** [4)] | S55208-V153 | 65 | 63 | | - | - | - | - | - | - | 650 | 200 |
| **VXF53.80-100** [4)] | S55208-V154 | 80 | 100 | | | | | | | | 400 | 200 |
| **VXF53.100-160** [4)] | S55208-V155 | 100 | 160 | | | | | | | | 250 | 150 |
| **VXF53.125-250** [4)] | S55208-V156 | 125 | 250 | | | | | | | | 160 | 100 |
| **VXF53.150-400** | S55208-V157 | 150 | 400 | | | | | | | | 100 | 70 |

1) DN 15…50: Flange dimensions for PN 16 and PN 25
DN 65…150: Flange dimensions for PN 25 only
2) Flange type: 21; flange design: B (see "Flange types", page 55)
3) Suitable for medium temperatures up to 150 °C
4) Valve is optimized for maximum volumetric flow:
- $k_{vs}$ value 63 m³/h from 90% stroke,
- $k_{vs}$ values 16, 25, 40, 100, 160 and 250 m³/h from 80% stroke

## 2.3.3 Overview of actuators

| Product number | Stock number | Stroke | Positioning force | Operating voltage | Positioning signal | Spring return time | Positioning time | LED | Manual adjuster | Auxiliary functions |
|---|---|---|---|---|---|---|---|---|---|---|
| **SAX31.00** | S55150-A105 | 20 mm | 800 N | AC 230 V | 3-position | - | 120 s | - | Press and fix | 1) |
| **SAX31.03** | S55150-A106 | | | | | | 30 s | | | |
| **SAX61.03**<br>**SAX61.03U** | S55150-A100<br>S55150-A100-A100 | | | AC 24 V<br>DC 24 V | 0…10 V<br>4…20 mA<br>0…1000 Ω | | | ✓ | | 2), 3) |
| **SAX81.00** | S55150-A102 | | | | 3-position | - | 120 s | - | Press and fix | 1) |
| **SAX81.03**<br>**SAX81.03U** | S55150-A103<br>S55150-A103-A100 | | | | | | 30 s | | | |
| **SKD32.21** | SKD32.21 | 20 mm | 1000 N | AC 230 V | 3-position | 8 s | Opening: 30 s<br>Closing: 10 s | - | Turn, position is maintained | 1) |
| **SKD32.50** | SKD32.50 | | | | | - | 120 s | | | |
| **SKD32.51** | SKD32.51 | | | | | 8 s | | | | |
| **SKD60** | SKD60 | | | AC 24 V | 0…10 V<br>4…20 mA<br>0…1000 Ω | - | Opening: 30 s<br>Closing: 15 s | ✓ | | 2) |
| **SKD62**<br>**SKD62U** | SKD62<br>SKD62U | | | | | 15 s | | | | |
| **SKD62UA** | SKD62UA | | | | | | | | | 4) |
| **SKD82.50**<br>**SKD82.50U** | SKD82.50<br>SKD82.50U | | | | 3-position | - | 120 s | - | | 1) |
| **SKD82.51**<br>**SKD82.51U** | SKD82.51<br>SKD82.51U | | | | | 8 s | | | | |
| **SKB32.50** | **SKB32.50** | 20 mm | 2800 N | AC 230 V | 3-position | - | 120 s | - | Turn, position is maintained | 1) |
| **SKB32.51** | **SKB32.51** | | | | | 10 s | | | | |
| **SKB60** | SKB60 | | | AC 24 V | 0…10 V<br>4…20 mA<br>0…1000 Ω | - | Opening: 120 s<br>Closing:10 s | ✓ | | 2) |
| **SKB62**<br>**SKB62U** | SKB62<br>SKB62U | | | | | 10 s | | | | |
| **SKB62UA** | SKB62UA | | | | | | | | | 4) |
| **SKB82.50**<br>**SKB82.50U** | SKB82.50<br>SKB82.50U | | | | 3-position | - | 120 s | - | | 1) |
| **SKB82.51**<br>**SKB82.51U** | SKB82.51<br>SKB82.51U | | | | | 10 s | | | | |
| **SKC32.60** | SKC32.60 | 40 mm | 2800 N | AC 230 V | 3-position | - | 120 s | - | Turn, position is maintained | 1) |
| **SKC32.61** | SKC32.61 | | | | | 18 s | | | | |
| **SKC60** | SKC60 | | | AC 24 V | 0…10 V<br>4…20 mA<br>0…1000 Ω | - | Opening: 120 s<br>Closing: 20 s | ✓ | | 2) |
| **SKC62**<br>**SKC62U** | SKC62<br>SKC62U | | | | | 20 s | | | | |
| **SKC62UA** | SKC62UA | | | | | | | | | 4) |
| **SKC82.60**<br>**SKC82.60U** | SKC82.60<br>SKC82.60U | | | | 3-position | - | 120 s | - | | 1) |
| **SKC82.61**<br>**SKC82.61U** | SKC82.61<br>SKC82.61U | | | | | 18 s | | | | |

1) Auxiliary switch, potentiometer
2) Position feedback, forced control, selection of valve characteristic
3) Optional: Sequence control, selection of acting direction
4) Plus sequence control, stroke limitation, and selection of acting direction

# 2.4 Ordering

Example

| Product number | Stock number | Description | Quantity |
|---|---|---|---|
| VVF53.15-0.16 | S55208-V100 | 2-port valve | 1 |
| ASZ6.6 | S55845-Z108 | Stem heating element | 1 |
| - | 4 284 8806 0 | Stem sealing gland EPDM | 1 |

Delivery

Actuator, valve and accessories are packed and supplied as separate items.

Note

Counter-flanges, bolts and gaskets must be provided on site.

# 2.5 Accessories

## 2.5.1 Electrical accessories

| Product number | Stock no. | Description | Note | |
|---|---|---|---|---|
| ASZ6.5 | ASZ6.5 | Stem heating element | Required for medium temperatures < 0 °C |  |
| ASZ6.6 | S55845-Z108 | Stem heating element | Required for medium temperatures < 0 °C |  |

**Note**
Valve lines V..F43/53..

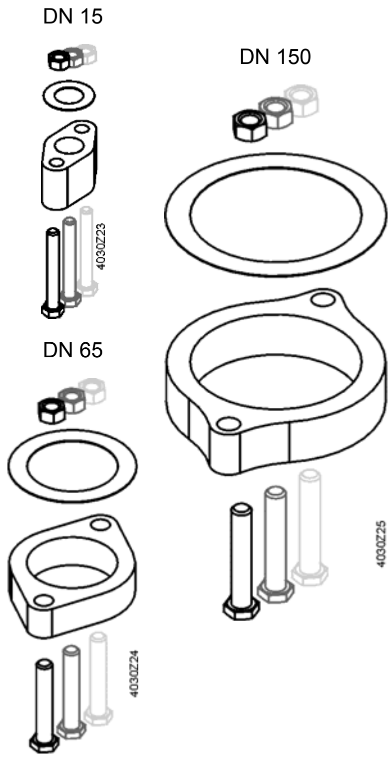
When using a stem heating element and the medium temperature is below –5 °C, the stem sealing gland must be replaced. In that case, the sealing gland must be ordered also (stock number 4 284 8806 0).

## 2.5.2 Mechanical accessories

| Product number | Stock number | Mechanical stroke inverter | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Description | Valves | DN | SAX.. | SKD.. | SKB.. | SKC.. | |
| **ASK50** | ASK50 | • Mechanical change of acting direction for valves with 20 mm stroke<br>• 0% stroke of the actuator corresponds to 100% stroke of the valve<br>• To be fitted between valve and actuator | V..F53.. | 15…50 | - | ✓ | - | - |  |
| **ASK51** | ASK51 | • Mechanical change of acting direction for valves with 20 mm stroke<br>• 0% stroke of the actuator corresponds to 100% stroke of the valve<br>• To be fitted between valve and actuator | V..F53.. | 15…50 | - | - | ✓ | - |  |

| Product number | Stock number | Description | Remark | |
|---|---|---|---|---|
| - | 428488060 | Sealing gland | When using valves of the V..F43.. or V..F53.. lines with a stem heating element and a medium temperature of below -5 °C, the stem sealing gland must be replaced. |  |

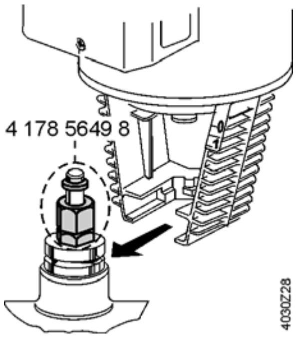
## 2.5.3 Adapters

| Adapter type | Stock number | Bolts included | Description | VXF41.. | Examples |
|---|---|---|---|---|---|
| **ALF41B15** | S55845-Z110 | 4x M12x90mm | Adapter for replacing 3-port valves VXF41.. by VXF43.. for DN ≥ 65 and VXF53.. for DN 15…50.<br>• Due to different dimensions of the bypass flange<br>• Every valve to be replaced requires an adapter<br>• Adapter is supplied with the required number and size of bolts and nuts as well as two suitable flat sealings | DN 15 |  |
| **ALF41B25** | S55845-Z111 | 4x M12x90mm | | DN 25 | |
| **ALF41B40** | S55845-Z112 | 4x M16x90mm | | DN 40 | |
| **ALF41B50** | S55845-Z113 | 4x M16x90mm | | DN 50 | |
| **ALF41B65** | S55845-Z114 | 4x M16x90mm | | DN 65 | |
| **ALF41B80** | S55845-Z115 | 8x M16x110mm | | DN 80 | |
| **ALF41B100** | S55845-Z116 | 8x M16x110mm | | DN 100 | |
| **ALF41B125** | S55845-Z117 | 8x M16x110mm | | DN 125 | |
| **ALF41B150** | S55845-Z118 | 8x M20x110mm | | DN 150 | |

# 2.6 Product replacement

The valves covered by this document replace the valves of the VVF../VXF.. lines that have been produced by Siemens, Landis & Staefa and Landis & Gyr since 1974.

For most types of valves operating in the field, a one-to-one replacement is available.
This does not apply to a small number of special valves that were marketed in certain regions. If there is a need to replace such valves, please contact your Siemens branch office. It that case, it might be necessary to change the piping.




Stem coupling for SKC32../62/82.. (stock no. 4 178 5649 8)

Further use of actuators of the SKD32../60/62/82.., SKB32../60/62/82.., SQX31../61../81.., and SQX32../62../82.. lines is possible.
Actuators of the SKC32../62/82.. lines require a new stem coupling since the diameter of the new stem is only 10 mm. Stem couplings must be ordered as separate items (stock no. 4 178 5649 8).

If the valve to be replaced was driven by an actuator of the SKD31../61../81.., SKB31../61../81.. or SKC31../61../81.. lines, Siemens recommends to replace the actuator as well, the reason being the actuator’s age.

The tables below list former valve types and their successors. There is also an online replacement guide "Old2New" available; for access, go to www.siemens.com/hit under "Old2New replacement guide".

## 2.6.1 2-port valves

| 2-port valves with flanged connections | | | | | | | | | Replacement | |
|---|---|---|---|---|---|---|---|---|---|---|
| Product number | | | | | | DN | Adapter | Stem coupling 1) | Product number | DN |
| VVF41.49 | VVF41.494 | | | VVF41.495 | | 50 | - | - | VVF53.50.. 2) | 50 |
| VVF41.50 | VVF41.504 | - | - | VVF41.505 | - | 50 | - | - | VVF53.50.. | 50 |
| **VVF41..** | **VVF41..4** | | | **VVF41..5** | | 65...150 | - | 4 178 5649 8 | VVF43.. | 65...150 |
| | | | | | | | | | | |
| VVF45.49 | VVF45.494 | | | | | 50 | - | 4 178 5649 8 | - | - |
| VVF45.50 | VVF45.504 | - | - | - | - | 50 | - | 4 178 5649 8 | VVF53.50 | 50 |
| **VVF45..** | **VVF45..4** | | | | | 65...150 | - | 4 178 5649 8 | VVF43.. | 65...150 |
| | | | | | | | | | | |
| **VVF52..** | **VVF52..A** | **VVF52..G** | **-** | **VVF52..M** | - | 15...40 | - | - | VVF53.. | 15...40 |

1) Since the new valves use uniform stem couplings, valves driven by electrohydraulic actuators SKC.. require a new stem coupling

2) Replacement valves are the same nominal size DN, but have different $k_{vs}$ values. This must be taken into consideration when replacing a valve in the plant (stability, active stroke range)

Note

When using valves of the V..F43.. or V..F53.. lines with a stem heating element and a medium temperature of below -5 °C, the stem sealing gland must be replaced. In that case, the sealing gland must be ordered also (stock number 4 284 8806 0).

## 2.6.2 3-port valves

| 3-port valves with flanged connections | | | | | | | | Replacement | |
|---|---|---|---|---|---|---|---|---|---|
| Product number | | | | | DN | Adapter | Stem coupling [1)] | Product number | DN |
| **VXF41..** | **VXF41..4** | - | **VXF41..5** | - | 15 | ALF41B15 | - | VXF53.. | 15 |
| | | | | | 25 | ALF41B25 | - | | 25 |
| | | | | | 40 | ALF41B40 | - | | 40 |
| VXF41.49.. | VXF41.494.. | | VXF41.495.. | | 50 | ALF41B50 | - | VXF53.50.. [1)] | 50 |
| VXF41.50.. | VXF41.504.. | | VXF41.505.. | | | ALF41B50 | - | VXF53.50.. | |
| **VXF41..** | **VXF41..4** | | **VXF41..5** | | 65 | ALF41B65 | 4 178 5649 8 | VXF43.. | 65 |
| | | | | | 80 | ALF41B80 | 4 178 5649 8 | | 80 |
| | | | | | 100 | ALF41B100 | 4 178 5649 8 | | 100 |
| | | | | | 125 | ALF41B125 | 4 178 5649 8 | | 125 |
| | | | | | 150 | ALF41B150 | 4 178 5649 8 | | 150 |

1) Replacement valves are the same nominal size DN, but have different $k_{vs}$ values. This must be taken into consideration when replacing a valve in the plant (stability, active stroke range)

Note

When using valves of the V..F43.. or V..F53.. lines with a stem heating element and the medium temperature is below -5 °C, the stem sealing gland must be replaced. In that case, the sealing gland must be ordered also (stock number 4 284 8806 0).

**Notes**

When replacing old valves by new valves, the installation might have to be modified.

Valve lines VXF53../VXF43..

The dimension of the bypass is smaller than that of the valves of the former VXF41.. line. This means that a one-to-one replacement of the VXF41.. valves requires an ALF41B.. adapter. This adapter compensates for the difference in dimensions, thus facilitating replacement of the valve without having to modify the piping.

## 2.6.3 Accessories

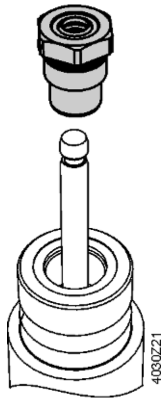
| Product number | Stock number | Description | Note | |
|---|---|---|---|---|
| **ASZ6.5** | ASZ6.5 | Stem heating element | Required for medium temperatures < 0 °C |  |

**Note**

The ASZ6.5 stem heating element is suitable for use with the SKB.., SKC.., SKD.., and SQX.. actuators. However, when replacing both the valve and the actuator, actuators of the SAX.. line also require replacement of the ASZ6.5 by the ASZ6.6 stem heating element.

## 2.7 Spare parts

**Stem sealing gland**




| Product number | DN | Stock number | Comments |
|---|---|---|---|
| **2-port valves (high-performance)** | | | |
| VVF53.. | DN 15…150 | 74 284 0061 0 | - |
| | | 4 284 8806 0 | For medium temperatures below -5 °C |
| VVF43.. | DN 65…150 | 74 284 0061 0 | - |
| | | 4 284 8806 0 | For medium temperatures below -5 °C |
| **3-port valves (high-performance)** | | | |
| VXF53.. | DN 15…150 | 74 284 0061 0 | - |
| | | 4 284 8806 0 | For medium temperatures below -5 °C |
| VXF43.. | DN 65…150 | 74 284 0061 0 | - |
| | | 4 284 8806 0 | For medium temperatures below -5 °C |

**2-port valves VVF..**
Spare parts for expired product lines

| Product number | DN | Stock number | Stem diameter | Remarks |
|---|---|---|---|---|
| **2-port valves (high-performance)** | | | | |
| VVF41.. | DN 50…150 | 4 679 5629 0 | 14 mm | - |
| VVF41..4 | | 4 679 5630 0 | 14 mm | • PTFE sleeve<br>• For temperatures ≤ 180 °C |
| VVF41..5 | | 4 284 9540 0 | 14 mm | • PTFE sleeve<br>• Silicone-free version<br>• For temperatures ≤ 180 °C |
| VVF45.. | DN 50…150 | 4 679 5629 0 | 14 mm | - |
| VVF45..4 | | 4 679 5630 0 | 14 mm | • PTFE sleeve<br>• For temperatures ≤ 180 °C |
| VVF52.. | DN 15…40 | 4 284 8806 0 | 10 mm | - |
| VVF52..A<br>VVF52..G | | 4 284 8829 0 | 10 mm | • PTFE sleeve<br>• For temperatures ≤ 180 °C |
| VVF52..M | | 4 284 9538 0 | 10 mm | • PTFE sleeve<br>• Silicone-free version<br>• For temperatures ≤ 180 °C |

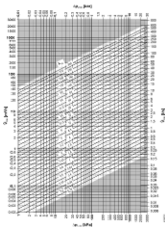
**3-port valves VXF..**
Spare parts for expired product lines

| Product number | DN | Stock number | Stem diameter | Remarks |
|---|---|---|---|---|
| **3-port valves (high-performance)** | | | | |
| VXF41.. | DN 15…40 | 4 284 8806 0 | 10 mm | - |
| VXF41..4 | | 4 284 8829 0 | 10 mm | • PTFE sleeve<br>• For temperatures ≤ 180 °C |
| VXF41..5 | | 4 284 9538 0 | 10 mm | • PTFE sleeve<br>• Silicone-free version<br>• For temperatures ≤ 180 °C |
| VXF41.. | DN 50…150 | 4 679 5629 0 | 14 mm | - |
| VXF41..4 | | 4 679 5630 0 | 14 mm | • PTFE sleeve<br>• For temperatures ≤ 180 °C |
| VXF41..5 | | 4 284 9540 0 | 14 mm | • PTFE sleeve<br>• Silicone-free version<br>• For temperatures ≤ 180 °C |

## 2.8 Valve sizing for fluids (water, heat transfer oil)

### 2.8.1 Procedure for valve sizing

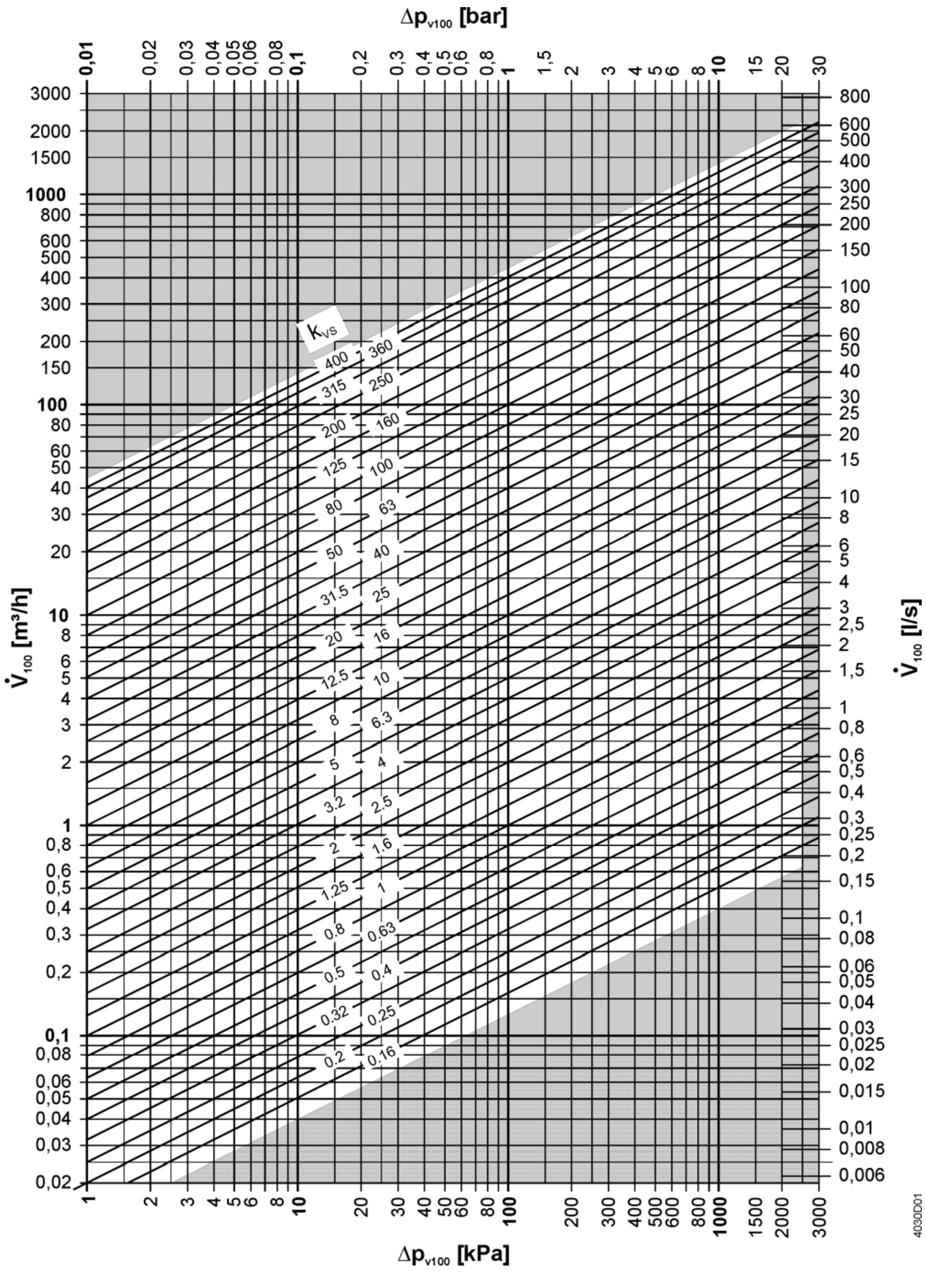
Essential values and formulas required for valve sizing:

| **Sizing and selection of valves and actuators** | | |
|---|---|---|
| **1** | Determine the basic hydraulic circuit | - |
| **2** | Determine $\Delta p_{VR}$ or $\Delta p_{MV}$ | One of the factors that determines control stability is the valve authority $P_V$. It is determined depending on the type of header and the hydraulic circuit<br>• Header with pressure and variable volumetric flow<br>Continue with $\Delta p_{VR}$<br>• Header with pressure and constant volumetric flow, or<br>• Header with low differential pressure and variable volumetric flow<br>Continue with $\Delta p_{MV}$ |
| **3** | Determine $\Delta p_{V100}$ | $\Delta p_{V100} \geq \frac{\Delta p_{VR}}{2}$<br>$\Delta p_{V100} \geq \Delta p_{MV}$ |
| **4** | Determine the volumetric flow $V_{100}$ | Determine $V_{100}$ depending on the type of medium<br>Water without antifreeze: $\dot{V}_{100} = \frac{\dot{Q}_{100}}{1.163 \cdot \Delta T}$<br>Water with antifreeze, heat transfer oil: $\dot{V}_{100} = \frac{\dot{Q}_{100} \cdot 3600}{c \cdot \rho \cdot \Delta T}$<br>For steam, see "2.9 Sizing valves for steam", page 26 |
| **5** | Determine the $k_{vs}$ value | There are different ways to determine the $k_{vs}$ value:<br>Flow chart<br><br>By way of calculation<br>$k_V = \frac{\dot{V}_{100}}{\sqrt{\frac{\Delta p_{V100}}{100}}}$<br>Determine the $k_{vs}$ value according to:<br>$0.85 \cdot k_V - value < k_{VS} - value$ 1)<br>or within the following band:<br>$0{,}74 \cdot k_{VS} - value < k_V < 1.175 \cdot k_{VS} - value$<br>HIT sizing and selection:<br>www.siemens.com/hit<br>Valve slide rule<br><br>This procedure shows the mathematical approach. The following examples make use of the flow chart and show the way of calculation |
| **6** | Check the resulting differential pressure $\Delta p_{V100}$ | The resulting differential pressure $\Delta p_{V100}$ is used for calculating the valve authority $P_V$:<br>$\Delta p_{V100} = 100 \cdot \left(\frac{\dot{V}_{100}}{k_{vs}}\right)^2$ |
| **7** | Select a suitable line of valves | Select the type of valve (2-port, 3-port, or 3-port valve with bypass):<br>• Type of connection (flanged, externally or internally threaded, soldered)<br>• PN class<br>• Nominal size DN<br>• Maximum or minimum medium temperature<br>• Type of medium |
| **8** | Check the valve authority $P_V$ (control stability) | Check $P_V$ with the resulting differential pressure $\Delta p_{V100}$:<br>• Header with pressure and variable volumetric flow<br>$P_V = \frac{\Delta p_{V100}}{\Delta p_{VR}}$<br>• Header with pressure and constant volumetric flow, or<br>• Header with low differential pressure and variable volumetric flow<br>$P_V = \frac{\Delta p_{V100}}{\Delta p_{V100} + \Delta p_{MV}}$ |
| **9** | Select the actuator | Select the actuator according to the following criteria:<br>• Operating voltage<br>• Positioning signal<br>• Positioning time<br>• Spring return function<br>• Auxiliary functions |
| **10** | Check the working ranges | Differential pressure $\Delta p_{max} > \Delta p_{V0}$<br>Closing pressure $\Delta p_s > H_0$ |
| **11** | Valve and actuator | Write down product and stock number of the selected valve and actuator |

1) Experience shows that the selected $k_{vs}$ value is usually too high. To the benefit of a higher valve authority Siemens recommends to check sensibly whether a valve with a $k_{vs}$ value of approx. 85% of the calculated $k_{vs}$ value is possible. If this is not possible, the second rule applies.

### 2.8.2 Flow chart

**Fluids** Kinematic viscosity υ < 10 $mm^2/s$



## 2.8.3 Impact of fluid properties on valve sizing

Valves are sized based on the volumetric flow passing through them. The most important characteristic of a valve is its $k_{vs}$ value. Since this value is determined with water at a temperature of +5…30 °C and a differential pressure Δp of 100 kPa (1 bar), additional influencing factors must be taken into consideration if the properties of the medium passing through the valve are different.

The following properties of a medium affect valve sizing:

- The density ρ and the specific heat capacity c have a direct impact on the volumetric flow, which transfers the required amount of heat or cooling energy
- The kinematic viscosity ν influences the flow conditions (laminar or turbulent) in the valve and thus the differential pressure Δp at a given volumetric flow V

### 2.8.3.1 Density ρ

The amount of heat Q carried by a fluid depends on the available mass flow m, the specific heat capacity c, and the temperature spread ΔT:

$$\dot{Q} = \dot{m} \cdot c \cdot \Delta T$$

In the HVAC field, calculations are usually based on the volumetric flow V, resulting from the available mass flow m and the density ρ:

$$\dot{Q} = \dot{V} \cdot \rho \cdot c \cdot \Delta T$$

Within the temperature range normally used in the HVAC field, the density ρ of water is assumed to be about 1000 kg/m$^3$ and the specific heat capacity c 4.19 kJ/(kg·K). This makes it possible to apply a simplified formula with a constant of 1.163 kWh/(m$^3$·K) for calculating the volumetric flow V in m$^3$/h:

$$\dot{V} = \frac{\dot{Q}}{1.163 \cdot \Delta T}$$

The rated capacity $Q_{100}$ of a plant with the valve fully open is calculated with the following formula:

$$\dot{V}_{100} = \frac{\dot{Q}_{100}}{1.163 \cdot \Delta T}$$

For watery solutions, such as mixtures of water and antifreeze, or other fluids like heat transfer oils, refer to the chapters below.

### 2.8.3.2 Specific heat capacity c

The amount of heat Q carried by a fluid depends on the available mass flow m, the specific heat capacity c, and the temperature spread ΔT.

Within the temperature range normally used in the HVAC field, the specific heat capacity c of water changes only slightly. Therefore, the approximate value used for the specific heat capacity c is 4.19 kJ/(kg·K). This makes it possible to apply a simplified formula with a constant of 1.163 kWh/(m$^3$·K) for calculating the volumetric flow V in m$^3$/h:

$$\dot{V} = \frac{\dot{Q}}{1.163 \cdot \Delta T}$$

If watery solutions, such as mixtures of water and antifreeze, or other fluids like heat transfer oils are used for the transmission of heat, the required volumetric flow V is to be calculated with the density ρ and the specific heat capacity c at the operating temperature:

$$\dot{V} = \frac{\dot{Q}}{\rho \cdot c \cdot \Delta T}$$

The specific heat capacity of fluids is specified in trade literature. For mixtures, the specific heat capacity c is calculated on the basis of the mixture's mass proportions $m_1$ and $m_2$:

$$c_{Gemisch} = \frac{m_1 \cdot c_1 + m_2 \cdot c_2}{m_1 + m_2}$$

In the case of heating applications, the specific heat capacity $c_1$ or $c_2$ at the highest temperature must be used, and in the case of cooling applications that at the lowest temperature.

### 2.8.3.3 Kinematic viscosity $\nu$

The kinematic viscosity $\nu$ affects the type of flow (laminar or turbulent) and thus the friction losses inside the valve. It has a direct impact on the differential pressure at a given volumetric flow.

The kinematic viscosity $\nu$ is specified either in $mm^2/s$ or centistokes (cSt):
1 cSt = $10^{-6}$ $m^2/s$ = 1 $mm^2/s$

Water at a temperature of between 5 and 30 °C is used to determine the $k_{vs}$ value as a comparison value. Within this temperature range, water has a kinematic viscosity of 1.6 to 0.8 $mm^2/s$. The flow inside the valve is turbulent.

When sizing valves for media with other kinematic viscosities $\nu$, a correction must be made. Up to a kinematic viscosity $\nu$ of less than 10 $mm^2/s$, the impact is negligible since it is smaller than the permissible tolerance of the $k_{vs}$ value (+/-10%).

In general practice, the correction is made by applying a correction factor $F_R$, which gives consideration to the different flow and friction conditions when calculating the $k_{vs}$ value.

$F_R$ is the factor used for the impact of the valve's Reynolds number. It must be applied when there is nonturbulent flow in the valve, when the differential pressure is low, for example, in the case of high-viscosity fluids, very low flow coefficients, or combinations of them. It can be determined by way of experiment.

$F_R$ = flow coefficient for nonturbulent flow conditions divided by the flow coefficient ascertained under the same plant conditions for turbulent flow (EN 60534-2-1[1998])

$k_v$ value under nonturbulent flow conditions

$$k_V = \frac{\dot{V}_{100}}{F_R} \cdot \frac{1}{\sqrt{\frac{\Delta p_{100}}{100}}}$$

**Correction factor $F_R$ for different kinematic viscosities ν**

| Kinematic viscosity [mm²/s] | Correction factor $F_R$ | Kinematic viscosity [mm²/s] | Correction factor $F_R$ |
|---|---|---|---|
| 2000 | 0.52 | 60 | 0.73 |
| 1500 | 0.53 | 40 | 0.77 |
| 1000 | 0.55 | 30 | 0.8 |
| 800 | 0.56 | 25 | 0.82 |
| 600 | 0.57 | 20 | 0.83 |
| 400 | 0.60 | 15 | 0.86 |
| 300 | 0.61 | 10 | 0.90 |
| 250 | 0.62 | 8 | (0.93) [1)] |
| 200 | 0.64 | 6 | (0.94) [1)] |
| 150 | 0.70 | 4 | (0.95) [1)] |
| 100 | 0.69 | 3 | (0.97) [1)] |
| 80 | 0.70 | | |

[1)] Impact in the case of kinematic viscosities up to 10 mm²/s is negligible

## 2.8.4 Influencing factors with selected groups of fluids

Media properties to be considered for a few selected groups of fluids:

| | **Density ρ** | **Specific heat capacity c** | **Kinematic viscosity ν** |
|---|---|---|---|
| **Formula** | $\dot{V}_{100} = \frac{\dot{Q}_{100} \cdot 3600}{c \cdot \rho \cdot \Delta T}$ | $\dot{V}_{100} = \frac{\dot{Q}_{100} \cdot 3600}{c \cdot \rho \cdot \Delta T}$ | $k_V = \frac{\dot{V}_{100}}{F_R} \cdot \frac{1}{\sqrt{\frac{\Delta p_{100}}{100}}}$ |
| **Group of fluids** | | | |
| Water | No | No | No ($F_R = 1$) |
| Water with antifreeze | Yes | Yes | No ($F_R = 1$) |
| Heat transfer oils | Yes | Yes | Yes |
| Brines | Yes | Yes | Yes |

Notes on water and water with antifreeze

The HVAC Integrated Tool (HIT) supports sizing and selection of valves for water and water with antifreeze (www.siemens.com/hit).

Notes on heat transfer oils and brines

When sizing valves for use with heat transfer oils or brines, the medium properties specified by the suppliers must be taken into account:

- Specific heat capacity c
- Kinematic viscosity ν
- Specific density ρ
- During the heating up phase, the kinematic viscosity ν can reach a high level while the volumetric flow V and thus the available amount of heat $Q_{heating\ up\ phase}$ are much smaller than planned. This must be taken into account during the planning phase and when sizing the valves, see "2.10.3 Example for heat transfer oil", page 31.

## 2.8.5 Rangeability $S_v$, minimum controllable output $Q_{min}$

When sizing and selecting a valve, it must be ensured that – in the controlled operating state – the output does not drop below the minimum controllable output $Q_{min}$. Otherwise, the controlling element only regulates in on/off mode within the range of the initial flow surge. On/off mode reduces the plant's energy efficiency and adversely affects the controlling element's life.

The rangeability $S_V$ is an important characteristic used for assessing the controllable range of a controlling element.
The smallest volumetric flow $k_{vr}$ that can be controlled is the volumetric flow passing through the valve when it opens. Output $Q_{min}$ is the smallest output of a consumer (e.g. of a radiator) that can be controlled in modulating mode.

$$S_V = \frac{k_{vs}}{k_{vr}}$$

For more detailed information on the subject, refer to the brochure "Hydraulics in building systems" (ordering no. 0-91917-en).

## 2.9 Sizing valves for steam

Since steam is compressible, valve sizing for steam must be based on other criteria. The most important characteristic of compressible flow is that the speed of flow in the throttling section can only increase up to the speed of sound. When this limit is reached, the speed of flow and thus the volumetric flow, or the steam mass flow, no longer increases, even if the differential pressure $\Delta p$ rises. To ensure good controllability and favorably priced valve selection, it is advisable to have the differential pressure in normal operation as close as possible to the critical pressure ratio.

Before starting valve sizing, the plant-related process parameters and the prevailing operating state must be defined:

- Absolute steam pressure [kPa abs], [bar abs]
- Temperature of saturated or superheated steam [°C]
- Differential pressure $\Delta p_{max}$ in normal operation

The dryness of saturated steam at the valve's inlet must be > 0.98.

During plant startup or shutdown, supercritical pressure conditions can occur:

- In terms of potential damage to the valve, a subcritical pressure ratio is far less crucial since the speed of flow lies below the speed of sound, material abrasion is reduced, and the noise level is lower

**Sizing procedure**

1. Calculate the steam mass flow m based on the amount of energy required $Q_{100}$, the steam pressure, and the steam temperature.
2. Determine whether the pressure ratio is in the sub- or supercritical range.
3. Determine the $k_{vs}$ value based on the steam mass flow and the steam pressure.

**Calculation of $k_{vs}$ value for steam**

| Steam mass flow $\dot{m} = \frac{Q_{100} \cdot 3600}{r_{p_1}}$ | Pressure ratio = $\frac{p_1 - p_3}{p_1} \cdot 100\%$ |
|---|---|
| **Subcritical range** | **Supercritical range** |
| $\frac{p_1 - p_3}{p_1} \cdot 100\% < 42\%$ | $\frac{p_1 - p_3}{p_1} \cdot 100\% \geq 42\%$ |
| Pressure ratio < 42% subcritical | Pressure ratio $\geq$ 42% supercritical (not recommended) |
| $k_{vs} = 4.4 \cdot \frac{\dot{m}}{\sqrt{p_3 \cdot (p_1 - p_3)}} \cdot k$ | $k_{vs} = 8.8 \cdot \frac{\dot{m}}{p_1} \cdot k$ |

$Q_{100}$ = rated capacity in kW

$r_{p1}$ = specific heat capacity of steam in kJ/kgK

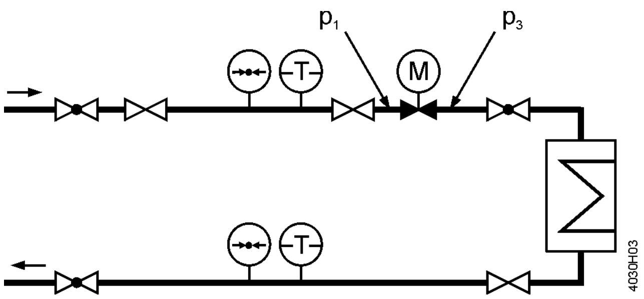
$p_1$ = absolute pressure at the valve inlet in kPa (prepressure)

$p_3$ = absolute pressure at the valve outlet in kPa

$\dot{m}$ = steam mass flow in kg/h

k = factor for superheating the steam = 1 + 0.0012 x $\Delta T$ (for saturated steam, k = 1)

$\Delta T$ = temperature spread in K of saturated steam and superheated steam




Note | The level of absolute pressure $p_1$ at the valve inlet must be at least such that the absolute pressure $p_3$ at the valve outlet is higher than the atmospheric pressure.

**Notes on the supercritical range**

When there is a pressure ratio $(p_1 - p_3) / p_1 > 0.42$, the flow passing through the narrowest section of the valve reaches the speed of sound. This can lead to higher noise levels. A throttling system operating at a lower noise level (multistage pressure reduction, damping throttle by the outlet) alleviates the problem.

Subcritical < 42%

- Steam-controlled heat transfer medium without condensation
- Shutoff valve on the steam side of condensation-controlled heat transfer media

Supercritical ≥ 42%

- Steam humidifier
- Steam-controlled heat transfer medium with condensation in the heat exchanger

**Recommendation for differential pressure $\Delta p_{max}$**

For saturated and superheated steam, the differential pressure $\Delta p_{max}$ across the valve should be as close as possible to the critical pressure ratio.

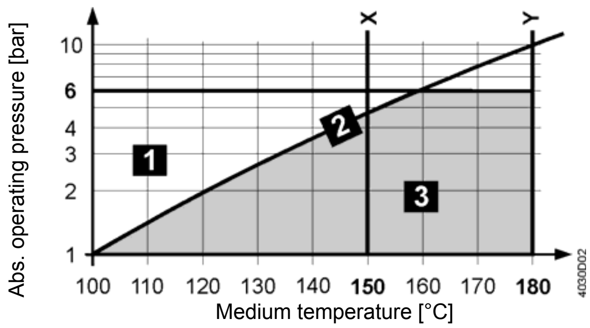



Chart example: The chart of the selected valve must be observed
X and Y: Suitable actuators, depending on the 2-port valve

| | | |
|---|---|---|
| 1 | Wet steam | To be avoided |
| 2 | Saturated steam | Permissible operating range |
| 3 | Superheated steam | |

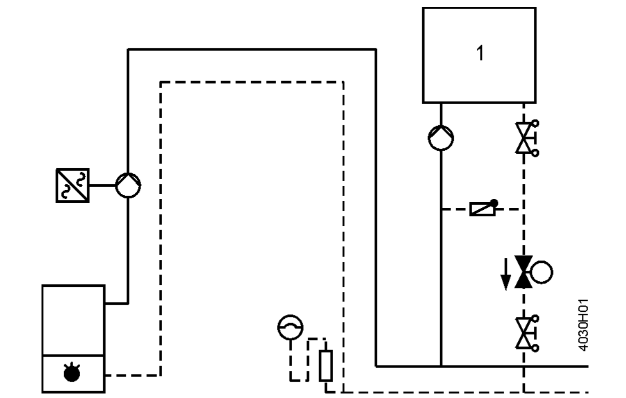
## Water vapor table

Water vapor table for the saturated state (pressure table)

| Pressure p [kPa] | Pressure p [bar] | Temperature T [°C] | Spec. volume water V' [dm³/kg] | Spec. volume steam V'' [m³/kg] | Density steam ρ'' [kg/m³] | Enthalpy water h' [kJ/kg] | Enthalpy steam h'' [kJ/kg] | Heat of vaporization r [kJ/kg] |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.010 | 6.9808 | 1.0001 | 129.20 | 0.007739 | 29.34 | 2514.1 | 2485.0 |
| 2 | 0.020 | 17.513 | 1.0012 | 67.01 | 0.01492 | 73.46 | 2533.6 | 2460.2 |
| 3 | 0.030 | 24.100 | 1.0027 | 45.67 | 0.02190 | 101.00 | 2545.6 | 2444.6 |
| 4 | 0.040 | 28.983 | 1.0040 | 34.80 | 0.02873 | 121.41 | 2554.5 | 2433.1 |
| 5 | 0.050 | 32.898 | 1.0052 | 28.19 | 0.03547 | 137.77 | 2561.6 | 2423.8 |
| 6 | 0.060 | 36.183 | 1.0064 | 23.74 | 0.04212 | 151.50 | 2567.5 | 2416.0 |
| 7 | 0.070 | 39.025 | 1.0074 | 20.53 | 0.04871 | 163.38 | 2572.6 | 2409.2 |
| 8 | 0.080 | 41.534 | 1.0084 | 18.10 | 0.05523 | 173.86 | 2577.1 | 2403.2 |
| 9 | 0.090 | 43.787 | 1.0094 | 16.20 | 0.06171 | 183.28 | 2581.1 | 2397.9 |
| 10 | 0.10 | 45.833 | 1.0102 | 14.67 | 0.06814 | 191.83 | 2584.8 | 2392.9 |
| 20 | 0.20 | 60.086 | 1.0172 | 7.650 | 0.1307 | 251.45 | 2609.9 | 2358.4 |
| 30 | 0.30 | 69.124 | 1.0223 | 5.229 | 0.1912 | 289.30 | 2625.4 | 2336.1 |
| 40 | 0.40 | 75.886 | 1.0265 | 3.993 | 0.2504 | 317.65 | 2636.9 | 2319.2 |
| 50 | 0.50 | 81.345 | 1.0301 | 3.240 | 0.3086 | 340.56 | 2646.0 | 2305.4 |
| 60 | 0.60 | 85.954 | 1.0333 | 2.732 | 0.3661 | 359.93 | 2653.6 | 2293.6 |
| 70 | 0.70 | 89.959 | 1.0361 | 2.365 | 0.4229 | 376.77 | 2660.1 | 2283.3 |
| 80 | 0.80 | 93.512 | 1.0387 | 2.087 | 0.4792 | 391.72 | 2665.8 | 2274.0 |
| 90 | 0.90 | 96.713 | 1.0412 | 1.869 | 0.5350 | 405.21 | 2670.9 | 2265.6 |
| 100 | 1.0 | 99.632 | 1.0434 | 1.694 | 0.5904 | 417.51 | 2675.4 | 2257.9 |
| 150 | 1.5 | 111.37 | 1.0530 | 1.159 | 0.8628 | 467.13 | 2693.4 | 2226.2 |
| 200 | 2.0 | 120.23 | 1.0608 | 0.8854 | 1.129 | 504.70 | 2706.3 | 2201.6 |
| 250 | 2.5 | 127.43 | 1.0675 | 0.7184 | 1.392 | 535.34 | 2716.4 | 2181.0 |
| 300 | 3.0 | 133.54 | 1.0735 | 0.6056 | 1.651 | 561.43 | 2724.7 | 2163.2 |
| 350 | 3.5 | 138.87 | 1.0789 | 0.5240 | 1.908 | 584.27 | 2731.6 | 2147.4 |
| 400 | 4.0 | 143.62 | 1.0839 | 0.4622 | 2.163 | 604.67 | 2737.6 | 2133.0 |
| 450 | 4.5 | 147.92 | 1.0885 | 0.4138 | 2.417 | 623.16 | 2742.9 | 2119.7 |
| 500 | 5.0 | 151.84 | 1.0928 | 0.3747 | 2.669 | 640.12 | 2747.5 | 2107.4 |
| 600 | 6.0 | 158.84 | 1.1009 | 0.3155 | 3.170 | 670.42 | 2755.5 | 2085.0 |
| 700 | 7.0 | 164.96 | 1.1082 | 0.2727 | 3.667 | 697.06 | 2762.0 | 2064.9 |
| 800 | 8.0 | 170.41 | 1.1150 | 0.2403 | 4.162 | 720.94 | 2767.5 | 2046.5 |
| 900 | 9.0 | 175.36 | 1.1213 | 0.2148 | 4.655 | 742.64 | 2772.1 | 2029.5 |
| 1'000 | 10 | 179.88 | 1.1274 | 0.1943 | 5.147 | 762.61 | 2776.2 | 2013.6 |
| 1'100 | 11 | 184.07 | 1.1331 | 0.1774 | 5.637 | 781.13 | 2779.7 | 1998.5 |
| 1'200 | 12 | 187.96 | 1.1386 | 0.1632 | 6.127 | 798.43 | 2782.7 | 1984.3 |
| 1'300 | 13 | 191.61 | 1.1438 | 0.1511 | 6.617 | 814.70 | 2785.4 | 1970.7 |
| 1'400 | 14 | 195.04 | 1.1489 | 0.1407 | 7.106 | 830.08 | 2787.8 | 1957.7 |
| 1'500 | 15 | 198.29 | 1.1539 | 0.1317 | 7.596 | 844.67 | 2798.9 | 1945.2 |
| 1'600 | 16 | 201.37 | 1.1586 | 0.1237 | 8.085 | 858.56 | 2791.7 | 1933.2 |
| 1'700 | 17 | 204.31 | 1.1633 | 0.1166 | 8.575 | 871.84 | 2793.4 | 1921.5 |
| 1'800 | 18 | 207.11 | 1.1678 | 0.1103 | 9.065 | 884.58 | 2794.8 | 1910.3 |
| 1'900 | 19 | 209.80 | 1.1723 | 0.1047 | 9.555 | 896.81 | 2796.1 | 1899.3 |
| 2'000 | 20 | 212.37 | 1.1766 | 0.09954 | 10.05 | 908.59 | 2797.2 | 1888.6 |
| 2'500 | 25 | 223.94 | 1.1972 | 0.07991 | 12.51 | 961.96 | 2800.9 | 1839.0 |
| 3'000 | 30 | 233.84 | 1.2163 | 0.06663 | 15.01 | 1008.4 | 2802.3 | 1793.9 |
| 4'000 | 40 | 250.33 | 1.2521 | 0.04975 | 10.10 | 1087.4 | 2800.3 | 1712.9 |
| 5'000 | 50 | 263.91 | 1.2858 | 0.03743 | 25.36 | 1154.5 | 2794.2 | 1639.7 |
| 6'000 | 60 | 275.55 | 1.3187 | 0.03244 | 30.83 | 1213.7 | 2785.0 | 1571.3 |
| 7'000 | 70 | 285.79 | 1.3513 | 0.02737 | 36.53 | 1267.4 | 2773.5 | 1506.0 |
| 8'000 | 80 | 294.97 | 1.3842 | 0.02353 | 42.51 | 1317.1 | 2759.9 | 1442.8 |
| 9'000 | 90 | 303.31 | 1.4179 | 0.02050 | 48.79 | 1363.7 | 2744.6 | 1380.9 |
| 10'000 | 100 | 310.96 | 1.4526 | 0.01804 | 55.43 | 1408.0 | 2727.7 | 1319.7 |
| 11'000 | 110 | 318.05 | 1.4887 | 0.01601 | 62.48 | 1450.6 | 2729.3 | 1258.7 |
| 12'000 | 120 | 324.65 | 1.5268 | 0.01428 | 70.01 | 1491.8 | 2689.2 | 1197.4 |
| 13'000 | 130 | 330.83 | 1.5672 | 0.01280 | 78.14 | 1532.0 | 2667.0 | 1135.0 |
| 14'000 | 140 | 336.64 | 1.6106 | 0.01150 | 86.99 | 1571.6 | 2642.4 | 1070.7 |
| 15'000 | 150 | 342.13 | 1.6579 | 0.01034 | 96.71 | 1611.0 | 2615.0 | 1004.0 |
| 20'000 | 200 | 365.70 | 2.0370 | 0.005877 | 170.2 | 1826.5 | 2418.4 | 591.9 |
| 22'000 | 220 | 373.69 | 2.6714 | 0.003728 | 268.3 | 2011.1 | 2195.6 | 184.5 |
| 22'120 | 221.2 | 374.15 | 3.17 | 0.00317 | 315.5 | 2107.4 | 2107.4 | 0 |

## 2.10 Calculation examples for water, heat transfer oil and steam

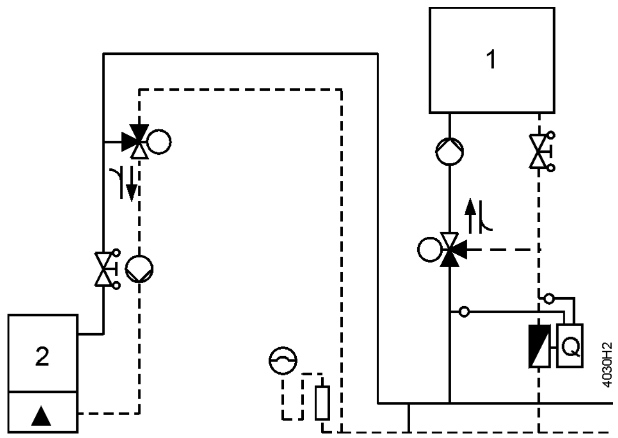
### 2.10.1 Example for water: Heater with pressure and variable volumetric flow

| | | |
|---|---|---|
| HVAC plant using a header with pressure, header with variable volumetric flow |  | **Air heating coil 1**<br><br>Flow 60 °C<br>Return 40 °C<br>Supply air 20 °C<br>Outside air 10 °C<br>Output 55 kW<br>$\Delta p_{VR}$ 34 kPa<br>$\Delta p_{piping}$ 11 kPa<br><br>**Other plant data**<br><br>Pressure class PN 16<br>Control DC 0…10 V<br>Operating voltage AC 24 V |

| | | |
|---|---|---|
| **1** | Determine the basic hydraulic circuit | Injection circuit with 2-port valve |
| **2** | Determine $\Delta p_{VR}$ or $\Delta p_{MV}$ | With pressure and variable volumetric flow → $\Delta p_{VR}$<br>$\Delta p_{VR}$ = 34 kPa |
| **3** | Determine $\Delta p_{V100}$ | With pressure and variable volumetric flow → $\Delta p_{V100} \geq \frac{\Delta p_{VR}}{2}$<br>$\Delta p_{V100}$ = 17 kPa |
| **4** | Determine the volumetric flow $V_{100}$ | $\dot{V}_{100} = \frac{Q_{100}}{1.163 \cdot \Delta T} = \frac{55\,kW}{1.163 \cdot (60\,°C - 40\,°C)} = 2.36\,m^3/h$ |
| **5** | Determine the $k_{vs}$ value | *Flow chart*<br>Use the flow chart to determine the $k_{vs}$ value:<br>1. $k_{vs}$ value: 5 $m^3/h$<br>2. $k_{vs}$ value: 6.3 $m^3/h$<br><br>*By way of calculation*<br>$k_v = \frac{\dot{V}_{100}}{\sqrt{\frac{\Delta p_{V100}}{100}}} = \frac{2.36\,m^3/h}{\sqrt{\frac{17\,kPa}{100}}} = 5.7\,m^3/h$<br>$k_{vs}$ value ≥ 0.85 • 5.7 $m^3/h$ = 4.8 $m^3/h$ → $k_{vs}$ value = 5 $m^3/h$ or 6.3 $m^3/h$<br>1. $k_{vs}$ value: 5 $m^3/h$<br>2. $k_{vs}$ value: 6.3 $m^3/h$ |
| **6** | Check the resulting differential pressure $\Delta p_{V100}$ | First $k_{vs}$ value: $\Delta p_{V100} = 100 \cdot \left(\frac{\dot{V}_{100}}{k_{vs}}\right)^2 = 100 \cdot \left(\frac{2.36\,m^3/h}{5\,m^3/h}\right)^2 = 22.3\,kPa$<br>Second $k_{vs}$ value: $\Delta p_{V100} = 100 \cdot \left(\frac{\dot{V}_{100}}{k_{vs}}\right)^2 = 100 \cdot \left(\frac{2.36\,m^3/h}{6.3\,m^3/h}\right)^2 = 14\,kPa$ |
| **7** | Select suitable line of valves | • 2-port valve (resulting from the basic hydraulic circuit)<br>• Flanged (specified by the planner)<br>• PN class 16 (specified by the planner)<br>• Nominal size DN (resulting from the selected valve)<br>• Maximum medium temperature: 60 °C<br>• Type of medium: Water<br><br>→ 1st selection: VVF53.25-5<br>2nd selection: VVF53.20-6.3 or VVF53.25-6.3 |

| | | |
|---|---|---|
| **8** | Check the valve authority $P_V$ (control stability) | Check $P_V$ using the resulting differential pressure $\Delta p_{V100}$:<br>First $k_{vs}$ value: $P_V = \frac{\Delta p_{V100}}{\Delta p_{VR}} = \frac{22.3\,kPa}{34\,kPa} = 0.66$<br>Second $k_{vs}$ value: $P_V = \frac{\Delta p_{V100}}{\Delta p_{VR}} = \frac{14\,kPa}{34\,kPa} = 0.41$<br>→ Higher valve authority $P_V$ → $k_{vs}$ value = 5 $m^3/h$ |
| **9** | Select the actuator | Select actuator according to the following criteria:<br>• Operating voltage<br>• Positioning signal<br>• Positioning time<br>• Spring return function<br>• Auxiliary functions |
| **10** | Check the working ranges | Differential pressure $\Delta p_{max} > \Delta p_{V0}$<br>Closing pressure $\Delta p_s > H_0$ |
| **11** | Select valve and actuator | Type of valve: VVF53.25-5<br>Type of actuator: According to the table |

## 2.10.2 Example for water: Heater with low differential pressure without main pump

| | | |
|---|---|---|
| HVAC plant using a header with low differential pressure without main pump |  | **Heating group 1**<br>Flow 60 °C<br>Return 45 °C<br>Output 70 kW<br>$\Delta p_{heat\ meter}$ 8 kPa<br>$\Delta p_{piping}$ 3 kPa<br>**Other plant data**<br>Pressure class PN 16<br>Control 3-position<br>Operating voltage AC 230 V<br>**1** Heating group 1<br>**2** Boiler 1 |

| | | |
|---|---|---|
| **1** | Determine the basic hydraulic circuit | Mixing circuit |
| **2** | Determine $\Delta p_{VR}$ or $\Delta p_{MV}$ | Header with low differential pressure and variable volumetric flow → $\Delta p_{MV}$<br>$\Delta p_{MV} = \Delta p_{piping} + \Delta p_{heat\ meter}$ = 3 kPa + 8 kPa = 11 kPa |
| **3** | Determine $\Delta p_{V100}$ | Header with low differential pressure and variable volumetric flow → $\Delta p_{V100} \geq \Delta p_{MV}$<br>$\Delta p_{V100}$ = 11 kPa |
| **4** | Determine the volumetric flow $V_{100}$ | $\dot{V}_{100} = \frac{Q_{100}}{1.163 \cdot \Delta T} = \frac{70\,kW}{1.163 \cdot (60\,°C - 45\,°C)} = 4\,m^3/h$ |
| **5** | Determine the $k_{vs}$ value | *Flow chart*<br>Use the flow chart to determine the $k_{vs}$ value:<br>$k_{vs}$ value: 12 $m^3/h$<br>*By way of calculation*<br>$k_v = \frac{\dot{V}_{100}}{\sqrt{\frac{\Delta p_{V100}}{100}}} = \frac{4\,m^3/h}{\sqrt{\frac{11kPa}{100}}} = 12.1m^3/h$<br>$k_{vs}$ value ≥ 0.85 • 12 $m^3/h$ = 10.2 $m^3/h$ → $k_{vs}$ value = 10 $m^3/h$<br>$k_{vs}$ value: 10 $m^3/h$ |

| | | |
|---|---|---|
| **6** | Check the resulting differential pressure $\Delta p_{V100}$ | $\Delta p_{V100} = 100 \cdot \left(\frac{\dot{V}_{100}}{k_{vs}}\right)^2 = 100 \cdot \left(\frac{4 m^3/h}{10 m^3/h}\right)^2 = 16$ kPa |
| **7** | Select suitable line of valves | • 2-port valve (resulting from the basic hydraulic circuit)<br>• Flanged (specified by the planner)<br>• PN class 16 (specified by the planner)<br>• Nominal size DN (resulting from selected valve)<br>• Maximum medium temperature: 60 °C<br>• Type of medium: Water<br><br>→ Selection: VXF53.25-10 |
| **8** | Check the valve authority $P_V$ (control stability) | Check $P_V$ using the resulting differential pressure $\Delta p_{V100}$:<br>$P_V = \frac{\Delta p_{V100}}{\Delta p_{V100} + \Delta p_{MV}} = \frac{16 kPa}{16 kPa + 11 kPa} = 0.59$ |
| **9** | Select the actuator | Select actuator according to the following criteria:<br>• Operating voltage<br>• Positioning signal<br>• Positioning time<br>• Spring return function<br>• Auxiliary functions |
| **10** | Check the working ranges | Differential pressure $\Delta p_{max} > \Delta p_{V0}$<br><br>Closing pressure $\Delta p_s > H_0$ |
| **11** | Select valve and actuator | Type of valve: VXF53.25-10<br><br>Type of actuator: According to the table |

## 2.10.3 Example for heat transfer oil

As outlined in chapter "2.8.3 Impact of fluid properties on valve sizing", page 23, when sizing a valve, the density ρ, the specific heat capacity c, and the kinematic viscosity ν must be taken into consideration. Also, to ensure correct and efficient operation, a closer look should be taken at the controlled mode and the startup mode.

| **Properties** | |
|---|---|
| Description | Mobiltherm 603 |
| Max. permissible flow temperature | 285 °C |
| Max. permissible film temperature | 315 °C |
| Kinematic viscosity at 20 °C | 50.5 $mm^2/s$ |
| Kinematic viscosity at 100/200/300 °C | 4.2/1.2/0.58 $mm^2/s$ |
| Density at 20 °C | 859 $kg/m^3$ |
| Density at 100/200/300 °C | 811/750/690 $kg/m^3$ |
| Specific heat capacity c at 20 °C | 1.89 kJ/kgK |
| Specific heat capacity c at 100/200/300 °C | 2.18/2.54/2.91 kJ/kgK |

When planning and commissioning a plant or when sizing valves, the suppliers' specifications must be observed. The experience and know-how of the suppliers help select the right type of heat transfer oil.

| **Plant data** | Consumer: Air-heat transfer oil heat exchanger<br>Differential pressure $\Delta p_{VR}$: 50 kPa (0.5 bar)<br>Flow temperature $T_{VL}$: 280 °C<br>Return temperature $T_{RL}$: 230 °C<br>Required capacity $Q_{100}$: 55 kW<br>Basic hydraulic circuit: Throttling circuit | |
|---|---|---|
| **Operating data** | **Controlled mode when heated up** | **Heating up mode** |
| Required capacity Q | $Q_{100}$ = 55 kW | Q is undefined |
| Temperature spread ΔT | 50 K | - |
| Determine the volumetric flow $V_{100}$ | $\dot{V}_{100} = \frac{\dot{Q}_{100} \cdot 3600}{c \cdot \rho \cdot \Delta T}$<br>$\dot{V}_{100} = \frac{55 kW \cdot 3600}{2.91 kJ/kgK \cdot 690 kg/m^3 \cdot 50 K}$<br>$\dot{V}_{100} = 1.97 m^3/h$ | - |
| Differential pressure $\Delta p_{V100}$ | With pressure and variable volumetric flow<br>→ $\Delta p_{V100} \geq \frac{\Delta p_{VR}}{2}$<br>→ $\Delta p_{V100}$ = 25 kPa (0.25 bar) | Must be calculated |
| Flow temperature $T_{VL}$ | 280 °C | Approx. 20 °C |
| Kinematic viscosity ν | At 300 °C: 0.58 $mm^2/s$ | 50.5 $mm^2/s$ |
| Correction factor $F_R$ | At 280 °C: 1<br>Kinematic viscosity υ <10 $mm^2/s$ | At 20 °C: 0.75<br>Interpolated according to the correction factor table on page 25 |
| Determine the $k_{vs}$ value | $k_V = \frac{\dot{V}_{100}}{F_R} \cdot \frac{1}{\sqrt{\frac{\Delta p_{100}}{100}}}$<br>$F_R$ = 1<br>$k_v = \frac{\dot{V}_{100}}{\sqrt{\frac{\Delta p_{V100}}{100}}} = \frac{1.97 m^3/h}{\sqrt{\frac{25 kPa}{100}}} = 3.94 m^3/h$<br>$k_{vs}$ value ≥ 0.85 • 3.94 $m^3/h$ = 3.35 $m^3/h$<br>-> $k_{VS}$ value = 5 $m^3/h$ | - |
| Volumetric flow resulting from the selected $k_{vs}$ value | $\dot{V}_{100} = k_{vs} \cdot F_R \cdot \sqrt{\frac{\Delta p_{V100}}{100}}$<br>$\dot{V}_{100} = 5 m^3/h \cdot 1 \cdot \sqrt{\frac{25 kPa}{100}}$<br>$\dot{V}_{100} = 2.5 m^3/h$ | $\dot{V}_{100} = k_{vs} \cdot F_R \cdot \sqrt{\frac{\Delta p_{V100}}{100}}$<br>$\dot{V}_{100} = 5 m^3/h \cdot 0.75 \cdot \sqrt{\frac{25 kPa}{100}}$<br>$\dot{V}_{100} = 1.9 m^3/h$<br>→ In the heating up phase, the volumetric flow is reduced by 5%! |
| Select the 2-port valve | VVF61.242 | |

## 2.10.4 Example for steam

As outlined in chapter "2.9 Sizing valves for steam", page 26, it must be determined first whether a supercritical or subcritical pressure ratio exists in the plant.

**Example 1: By way of calculation**

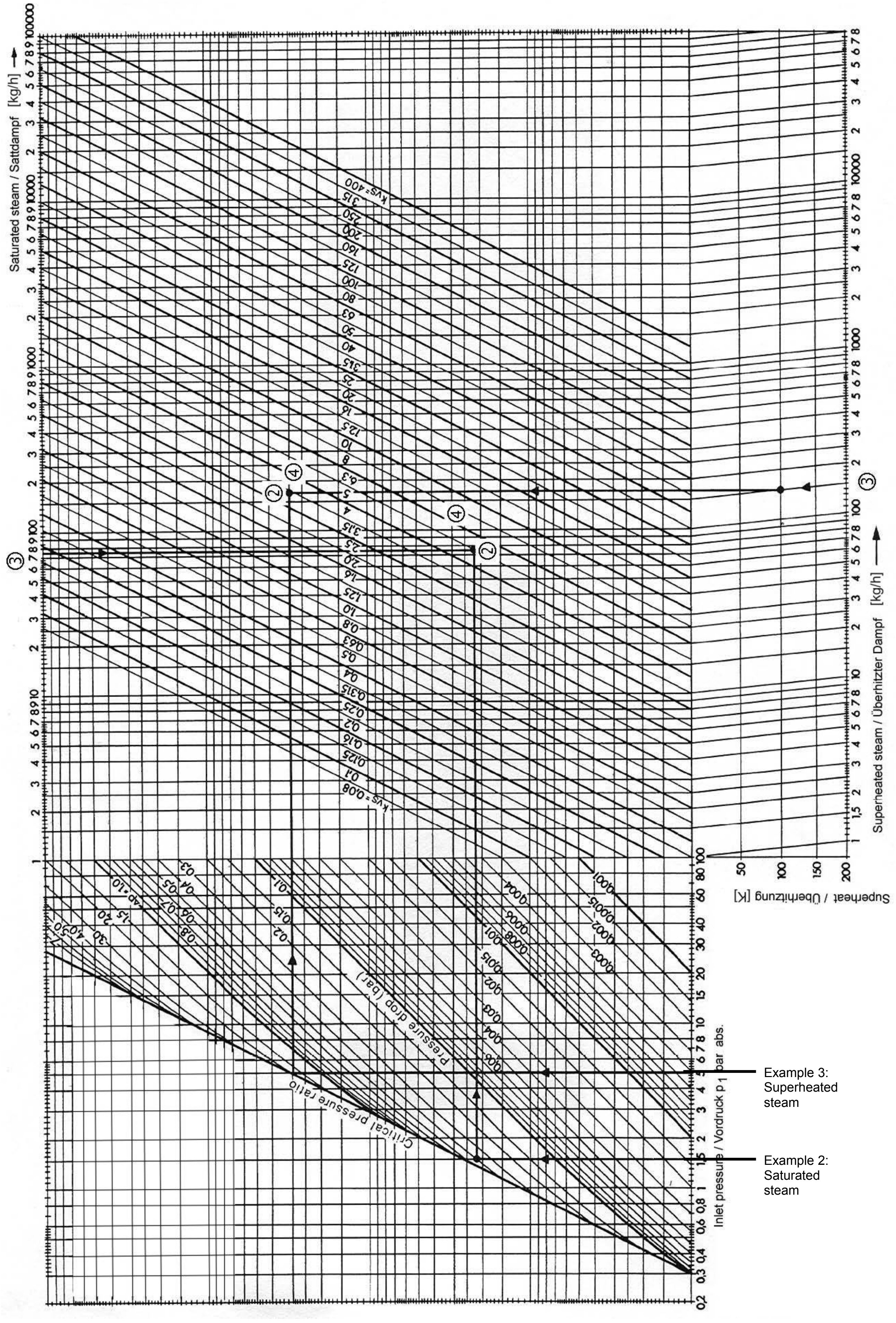
| | | |
|---|---|---|
| | Saturated steam = 151.8 °C<br>Prepressure $p_1$ = 500 kPa (5 bar)<br>Steam mass flow $\dot{m}$ = 460 kg/h | |
| Given | Pressure ratio = 30% | Pressure ratio ≥ 42% (supercritical permitted) |
| | **Subcritical pressure ratio** | **Supercritical pressure ratio** |
| Required | $k_{vs}$, valve type | $k_{vs}$, valve type |
| Solution | $p_3 = p_1 - \frac{30\% \cdot p_1}{100\%}$<br>$p_3 = 500\,kPa - \frac{30\% \cdot 500\ kPa}{100\%} = 350\ kPa\ (3.5 bar)$<br>$k_v = 4.4 \cdot \frac{460\ kg/h}{\sqrt{350\,kPa \cdot (500\,kPa - 350\,kPa)}} \cdot 1$<br>$k_v$ = 8.83 $m^3/h$ | $k_v = 8.8 \cdot \frac{460\,kg/h}{500\,kPa} \cdot 1$<br>$k_v$ = 8.09 $m^3/h$ |
| Selected | $k_{vs}$ = 10 $m^3/h$ → VVF53.25-10 | $k_{vs}$ = 8 $m^3/h$ → VVF53.25-8 |

**Example 2: With chart**

| | |
|---|---|
| Given | Saturated steam = 133.5 °C<br>Prepressure $p_1$ = 150 kPa (1.5 bar)<br>Steam mass flow $\dot{m}$ = 75 kg/h<br>Differential pressure = 40 kPa (0.4 bar) |
| Required | $k_{vs}$, valve type |
| Solution | 1. Vertical line upward to an absolute prepressure $p_1$ = 1.5 bar (150 kPa).<br>2. Horizontal line to the right to the point of intersection 1.5 bar (15 kPa) and differential pressure 0.4 bar (40 kPa).<br>3. Vertical line downward to 75 kg/h.<br>4. Point of intersection $k_{vs}$ value<br>Select available $k_{vs}$ value of VVF.. valve lines.<br>5. Selected kvs value: 5 $m^3$/h. |
| Selected | $k_{vs}$ value: 5 $m^3/h$ → VVF53.25-5 |

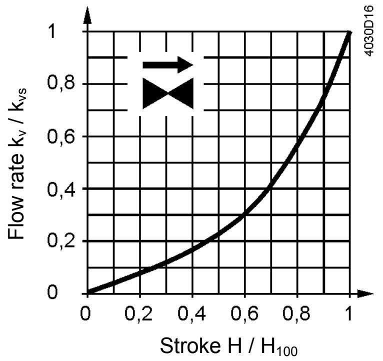
**Example 3: With chart**

| | |
|---|---|
| Given | Superheated steam = 251.8 °C<br>Saturated steam = 151.8 °C<br>Superheating $\Delta T$ = 100 K<br>Prepressure $p_1$ = 500 kPa (5 bar)<br>Steam mass flow $\dot{m}$ = 150 kg/h<br>Differential pressure = 200 kPa (2 bar) |
| Required | $k_{vs}$, valve type |
| Solution | 1. Vertical line upward to an absolute prepressure $p_1$ = 5 bar (500 kPa).<br>2. Horizontal line to the right to the point of intersection 5 bar (500 kPa) and differential pressure 2 bar (200 kPa).<br>3. Scale "Superheated steam": Along the line at 150 kg/h upward to superheating at 100 K, then the vertical line upward.<br>4. Point of intersection $k_{vs}$ value<br>Select available $k_{vs}$ value of VVF.. valve lines.<br>5. Selected kvs value: 3.15 $m^3$/h. |
| Selected | $k_{vs}$ value: 3.15 $m^3/h$ → VVF53.15-3.2 |


Saturated steam / Sattdampf [kg/h]
Superheated steam / Überhitzter Dampf [kg/h]
Superheat / Überhitzung [K]
Inlet pressure / Vordruck p1 bar abs.
Pressure drop (bar)
Critical pressure ratio
kvs = 400
kvs = 0,08
Example 3: Superheated steam
Example 2: Saturated steam

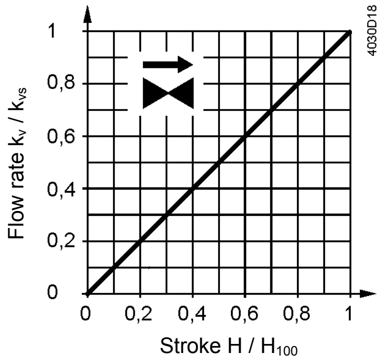
# 2.11 Valve characteristics

## 2.11.1 2-port valves



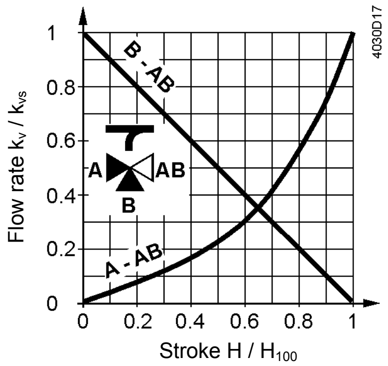

0…30%: Linear
30…100%: Equal-percentage
$n_{gl}$ = 3 as per VDI / VDE 2173
For certain valve lines and high $k_{vs}$ values, the valve characteristic is optimized for maximum volumetric flow $k_{V100}$.

For valves:
VVF43.125-250
VVF43.150-400
VVF53.125-250
VVF53.150-400




0…100%: Linear

## 2.11.2 3-port valves



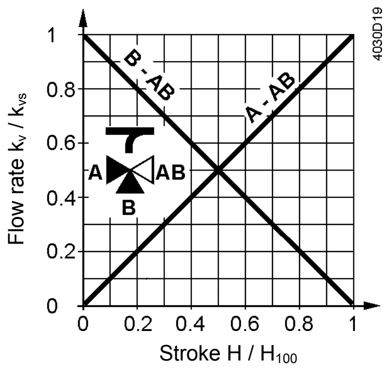

**Throughport A-AB**
0...30%: Linear
30...100%: Equal-percentage
$n_{gl}$ = 3 as per VDI / VDE 2173
For certain valve lines and high $k_{vs}$ values, the valve characteristic is optimized for maximum volumetric flow $k_{v100}$.

**Bypass B-AB**
0...100%: Linear

Port AB = constant flow
Port A = variable flow
Port B = bypass (variable flow)

**Mixing**: Flow from port A and port B to port AB
**Diverting**: Flow from port AB to port A and port AB

For valves:
VXF43.125-250
VXF43.150-400
VXF53.125-250
VXF53.150-400




**Throughport A-AB**
0...100%: Linear

**Bypass B-AB**
0...100%: Linear

## 2.12 Operating pressure and medium temperature

### 2.12.1 ISO 7005 and EN 1092 – a comparison

ISO 7005 and EN 1092 cover PN-classified, round flanges for pipes, valves, plain fittings and accessories, plus their dimensions and tolerances, categorized according to different types of materials.
Both standards also contain the assignment of pressures and medium temperatures.
The connecting dimensions, flange and face types plus descriptions conform to the relevant ISO 7005 standards.

- ISO 7005, part 1: Steel flanges
- ISO 7005, part 2: Cast iron flanges
- ISO 7005, part 3: Flanges made of copper alloys

Since the valves covered by this document are used throughout the world, the international standard ISO 7005 was selected as a basis. The information given below explains the differences between ISO 7005 and EN 1092.

EN 1092: Part 1, steel flanges

The international standard ISO 7005-1 on steel flanges was used as a basis for the development of EN 1092. EN 1092 deviates from ISO 7005 in the following ways:

- It solely covers flanges with PN designation
- A number of technical requirements of flanges originating from DIN standards have been changed

The differences between EN 1092-1 and ISO 7005-1 are as follows:

- In many cases, the pressure-temperature assignments of this standard have been reduced, either by limiting the assignments at lower temperatures – which may no longer exceed the value of the PN class – or by increasing the rate at which the admissible pressure drops on temperature rise
- In addition to the PN 2.5 – PN 40 range of flanges originating from DIN standards, which is defined in ISO 7005, EN 1092 also contains flanges up to PN 400

EN 1092: Part 2, cast iron flanges

In terms of flanges of the same PN class, this standard refers to ISO 7005-2 and ISO 2531. Flange types and connecting dimensions are compatible with the same DN and PN class of ISO 7005 and ISO 2531.

- Pressure-temperature assignments: There are no differences between EN 1092-2 and ISO 7005-2

EN 1092: Part 3, flanges made of copper alloys

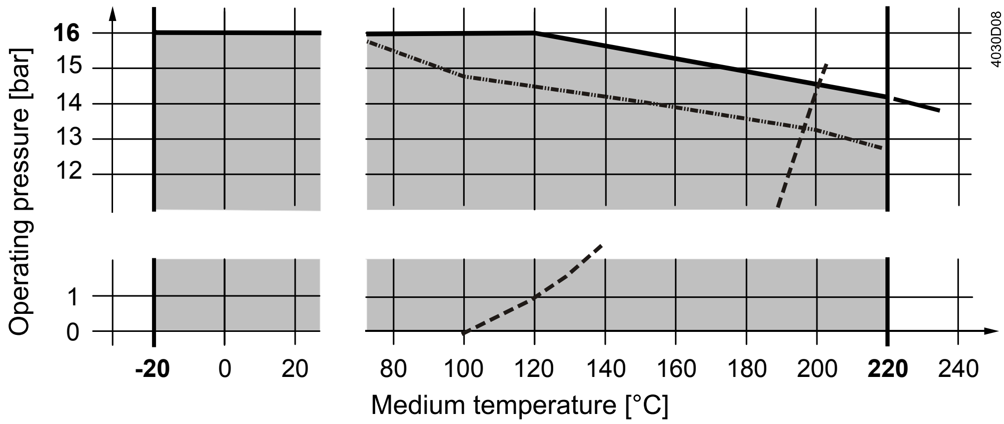
In terms of flanges of the same PN class, this standard refers to ISO 7005-3. Flange types and connecting dimensions are compatible with the same DN and PN class of ISO 7005.

- Pressure-temperature assignments: There are no differences between EN 1092-3 and ISO 7005-3

⚠ To be able to make use of the permissible operating pressures and operating temperatures according to EN 1092-1 as listed in the following tables/graphs, high-quality steel is required when using steel flanges.
Otherwise, the permissible plant operating pressures must be reduced as specified in EN 1092-1.

## 2.12.2 PN 16 valves with flanged connections

**Fluids**
with V..F43..




--- Curve for saturated steam; steam forms below this line

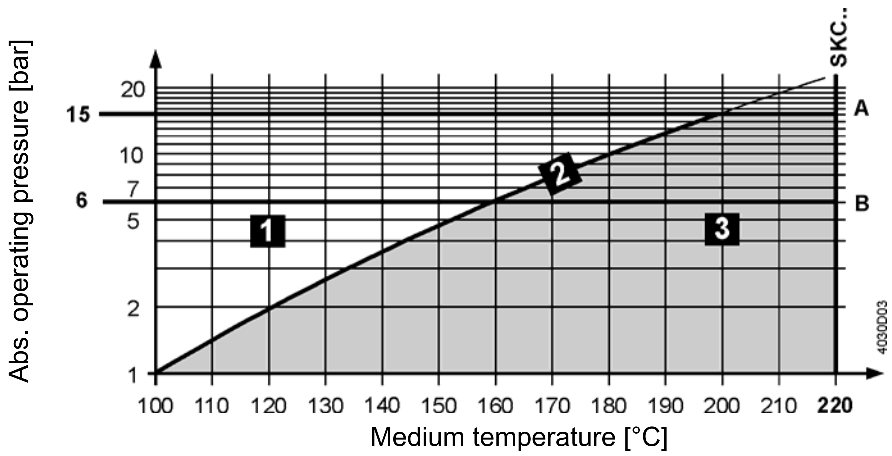
— · · Operating pressure according to EN 1092, valid for 2-port valves with blank flange

**Operating pressure and operating temperatures as per ISO 7005, EN 1092 and EN 12284**

Notes

- V..F53..: Applies when these valves are used in PN 16 plants
- All relevant local directives must be observed

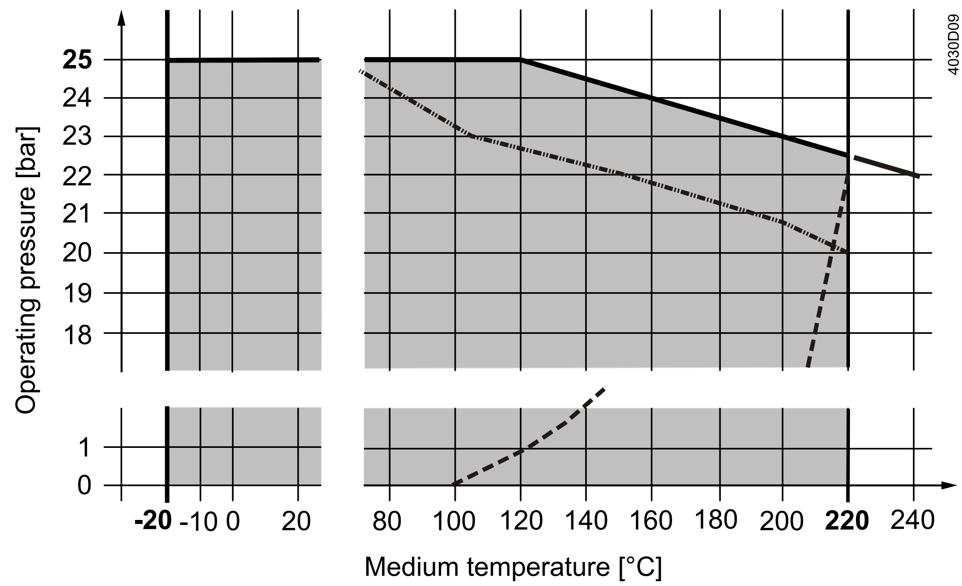
**Saturated steam**
**Superheated steam**
with VVF43..




| | | |
|---|---|---|
| 1 | Wet steam | To be avoided |
| 2 | Saturated steam | Permissible operating range |
| 3 | Superheated steam | |
| A | Subcritical pressure ratio | |
| B | Supercritical pressure ratio | |

## 2.12.3 PN 25 valves with flanged connections

**Fluids**
V..F53..




--- Curve for saturated steam; steam forms below this line

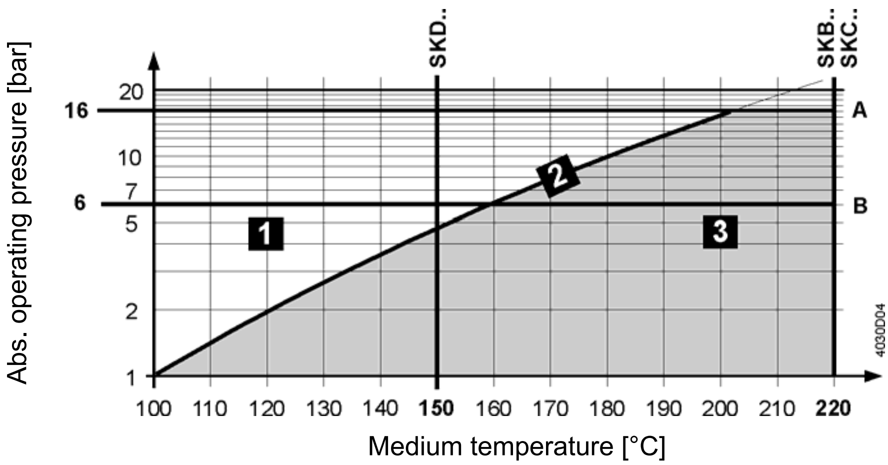
_ . . Operating pressure according to EN 1092, valid for 2-port valves with blank flange

**Operating pressure and operating temperatures as per ISO 7005, EN 1092 and EN 12284**

Note

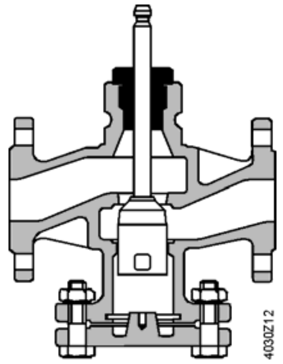
- All relevant local directives must be observed

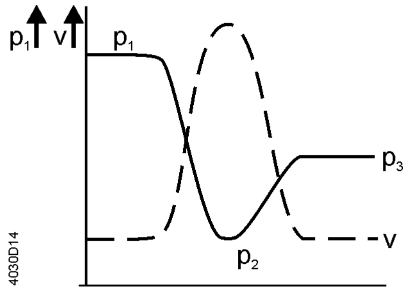
**Saturated steam**
**Superheated steam**
VVF53..




| | | |
|---|---|---|
| 1 | Wet steam | To be avoided |
| 2 | Saturated steam | Permissible operating range |
| 3 | Superheated steam | |
| A | Subcritical pressure ratio | |
| B | Supercritical pressure ratio | |

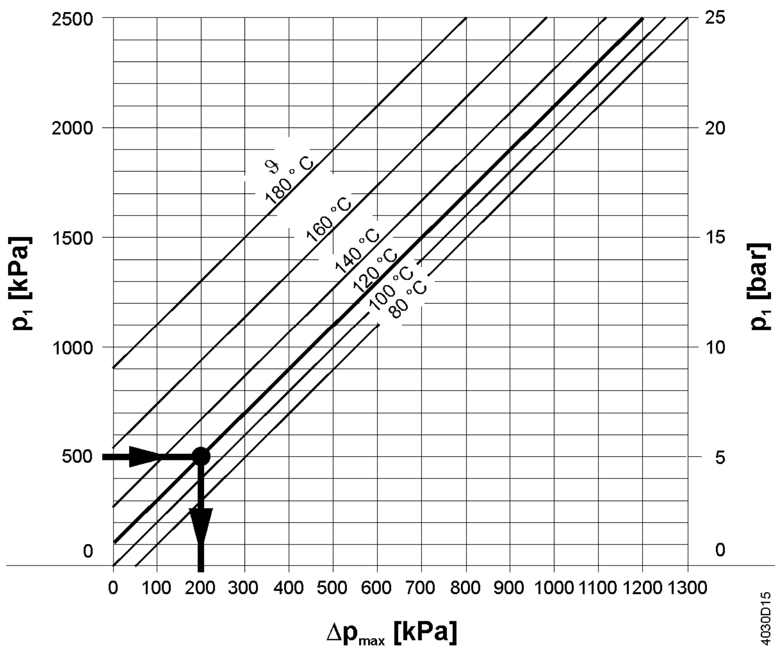
## 2.13 Cavitation



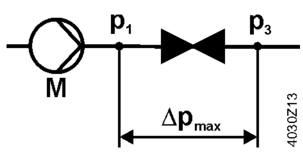




Due to high speeds of the medium in the narrowest section of the valve, local underpressure occurs ($p_2$). If this pressure drops below the medium's boiling pressure, cavitation occurs (steam bubbles), possibly leading to material removal (abrasion). Also, when cavitation sets in, the noise level increases abruptly. Cavitation can be avoided by limiting the pressure differential across the valve as a function of the medium temperature and the prepressure.

– – – Progression of speed
—— Progression of pressure p




$\Delta p_{max}$ = differential pressure with valve almost fully closed at which cavitation can largely be avoided
$p_1$ = static pressure at valve inlet
$p_3$ = static pressure at valve outlet
M = pump
ϑ = water temperature



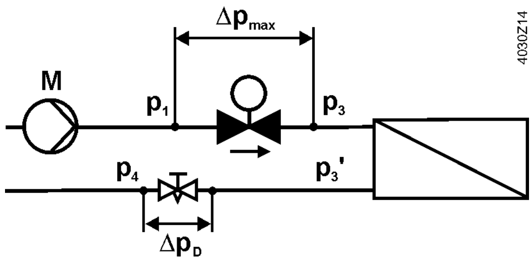

**Example for low-temperature hot water**

Pressure $p_1$ at valve inlet: 500 kPa (5 bar)
Water temperature: 120 °C

From the chart above it can be seen that with the valve almost fully closed, the maximum permissible differential pressure $\Delta p_{max}$ is 200 kPa (2 bar).

**Example for cold water** Spring water cooling as an example for avoiding cavitation:

| | | |
|---|---|---|
| Cold water | = | 12 °C |
| $p_1$ | = | 500 kPa (5 bar) |
| $p_4$ | = | 100 kPa (1 bar) (atmospheric pressure) |
| $\Delta p_{max}$ | = | 300 kPa (3 bar) |
| $\Delta p_{3\text{-}3'}$ | = | 20 kPa (0.2 bar) |
| $\Delta p_D$ (throttle) | = | 80 kPa (0.8 bar) |
| $p_3'$ | = | pressure downstream from the consumer in kPa |




Note

To avoid cavitation in the case of cold water circuits, it must also be made certain that there is sufficient static counter-pressure at the valve’s outlet. This can be ensured by installing a throttling valve downstream from the heat exchanger, for example. In that case, the maximum pressure drop across the valve should be selected according to the 80 °C curve in the flow chart above on page 39.

## 2.14 Medium quality and medium treatment

All relevant local directives must be observed whenever it comes to water quality, corrosion or contamination.

### 2.14.1 Water

Note

- Water treatment as per VDI 2035 to avoid boiler scale and damage due to corrosion on the water side
- The requirements of DIN EN 12953-10 should be observed
- Local guidelines and directives should be observed

**Planning**

Install a strainer (dirt trap).

**Installation and commissioning**

- The company making the installation is responsible for the water quality in HVAC plants
- Before filling a hydraulic HVAC circuit with water, the installer must observe the specifications of suppliers regarding water quality. If such specifications or regulations are not observed, severe damage to the plant can occur
- When commissioning a plant, the company that made the installation is obliged to write a commissioning report including information about water quality and filling (plant volume) and, if necessary, about water treatment and the additives used

Recommendation

Keep a plant record.

**Maintenance and service**

The installer should check hydraulic HVAC circuits at least once a year.

Before adding water to a hydraulic HVAC circuit, the installer must observe the specifications of suppliers regarding water quality (water treatment as per VDI 2035). If such specifications or regulations are not observed, severe damage to the plant can occur.

When adding water at a later stage, the company that made the installation is obliged to write a commissioning report including information about water quality and the filling (plant volume) and, if necessary, about water treatment and the additives used.

Recommendation

To prevent boiler scale and damage resulting from corrosion, the water quality in open or closed plants must be checked at regular intervals. The plant record must always be kept up to date.

### 2.14.2 Water with antifreeze

**Note**

For water with antifreeze, such as ethylene glycol or propylene glycol, the supplier-specific values for the density ρ, the specific heat capacity c, and the kinematic viscosity ν are to be determined by way of concentration and medium temperature. These values must be observed when sizing valves to make certain that correct $k_{vs}$ values are obtained.

In the case of antifreeze concentrations with a kinematic viscosity of < 10 $mm^2/s$, correction factors for the sizing of valves are not required. Refer to chapter "2.8.3 Impact of fluid properties on valve sizing", page 23.

**Planning**

- The type of antifreeze (product and dosage) added to the system must be approved by the supplier for use in HVAC plants
- If several additives are used (e.g. antifreeze and hardness stabilizers), the required combination must be approved by the same supplier
- Install a strainer (dirt trap)

**Installation and commissioning**

- The company making the installation is responsible for the correct antifreeze concentration and water quality in HVAC plants
- Before filling a hydraulic HVAC circuit with a medium, the installer must observe the specifications of the supplier. If such specifications or regulations are not observed, severe damage to the plant can occur
- When commissioning a plant, the company that made the installation is obliged to write a commissioning report including information about water quality, antifreeze concentration and filling (plant volume) and, if necessary, about water treatment and the additives used

Recommendation

Keep a plant record.

**Maintenance and service**

The installer should check hydraulic HVAC circuits at least once a year.
According to supplier specifications, the antifreeze concentration, the pH value, and the concentration of inhibitors must be checked once a year, for example.

Recommendation

The antifreeze concentration and water quality in open or closed HVAC plants must be checked at regular intervals. The plant record must always be kept up to date.

## 2.14.3 Deionized, demineralized water and super-clean water

**Note**

These media have an impact on valve selection (material of O-rings, gaskets, plug/seat, and valve body). Compatibility must be checked.

| Deionized water | Demineralized water | Super-clean water |
|---|---|---|
| The ions of salts contained in the water have been removed | The minerals contained in the water have been removed | Intensely treated water with a high specific resistance and containing no organic substances |

To avoid corrosion and to ensure a long service life of the valves, gaskets and plugs, the following limits must be observed:

- Oxygen: < 0.02 mg/l
- pH value: 8.2…8.5
- Electric conductance: < 5 μSi
- Sum of alkaline earths: < 0.0051 mmol/l
- Hardness: < 0.03 °dH

**Planning**

- The media must be approved by the supplier for use in HVAC plants
- Install a strainer (dirt trap)

**Installation and commissioning**

- The company making the installation is responsible for the quality of the media used
- Before filling a hydraulic HVAC circuit with a medium, the installer must observe the supplier's specification. If such specifications or regulations are not observed, severe damage to the plant can occur
- When commissioning a plant, the company that made the installation is obliged to write a commissioning report including information about medium quality and filling (plant volume) and, if necessary, about water treatment and additives used

Recommendation

Keep a plant record.

**Maintenance, service**

The installer should check hydraulic HVAC circuits at least once a year.

Recommendation

The quality of the medium used in open or closed HVAC plants must be checked at regular intervals. The plant record must always be kept up to date.

## 2.14.4 Heat transfer oil (thermal oil)

**Note**

Heat transfer oil has an impact on valve selection (material of O-rings and gaskets). Compatibility must be checked.

When planning and commissioning a plant or when sizing valves, the suppliers' specifications must be observed. To make certain the right type of heat transfer oil is used, one should rely on the suppliers' experience and know-how.

When using heat transfer oil (thermal oil), the following supplier-specific values must be taken into consideration:

- Correction factor $F_R$, if the supplier-specific kinematic viscosity $\nu$ exceeds 10 $mm^2/s$
- Density ρ
- Room and operating temperature
- During the heating up phase, the kinematic viscosity $\nu$ is very high. The volumetric flow is much smaller than planned and thus the available amount of energy $Q_{heating\ up\ phase}$ as well. This must be taken into account during the planning phase and when sizing the valve

Refer to chapter "2.8.3 Impact of fluid properties on valve sizing", page 23.

**Types of heat transfer oil**

- Heat transfer media on the basis of mineral oil
- Synthetic heat transfer fluids
- Organic heat transfer fluids as per DIN 4754
- Heat transfer media of a uniform substance or mixture
- Heat transfer oils on the basis of silicon

**Planning**

Install a strainer (dirt trap).

**Installation and commissioning**

- The company making the installation is responsible for the quality of the media used
- Before filling a hydraulic HVAC circuit with a medium, the installer must observe the supplier’s specification. If such specifications or regulations are not observed, severe damage to the plant can occur
- When commissioning a plant, the company that made the installation is obliged to write a commissioning report including information about medium quality and filling (plant volume) and, if necessary, about water treatment and the additives used

Recommendation

Keep a plant record.

**Maintenance and service**

The installer should check hydraulic HVAC circuits at least once a year.

Before adding medium to a hydraulic HVAC circuit, the installer must observe the supplier’s specification. If such specifications or regulations are not observed, severe damage to the plant can occur.
When adding medium at a later stage, the company that made the installation is obliged to write a commissioning report including information about the quality of the medium and the filling (plant volume) and, if necessary, about treatment and additives used.

Recommendation

The quality of the medium in open or closed plants must be checked at regular intervals. The plant record must always be kept up to date.

## 2.15 Engineering notes

### 2.15.1 Strainer (dirt trap)

Open and closed HVAC plants require a strainer (dirt trap). This improves the quality of the water, ensures proper functioning of the valve, and a long service life of the HVAC plant with its components.

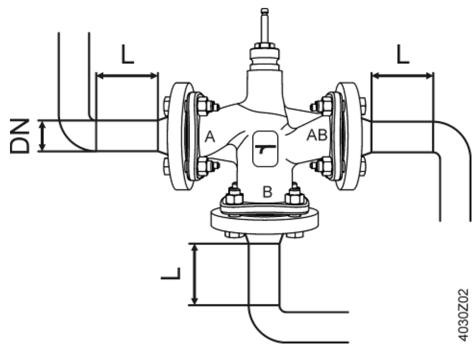
### 2.15.2 Avoiding flow noise

To reduce flow noise, abrupt reductions in pipe diameters, tight pipe bends, sharp edges or reductions in the vicinity of valves should be avoided. A settling path should be provided.

Recommendation:

- L ≥ 10 x DN, at least 0,4 m

Also, the flow must be free from cavitation (refer to Cavitation page 39).




### 2.15.3 Avoiding false circulation

When 3-port valves in HVAC plants are fully closed, false circulation can occur when hot water rises or when water is pulled away near rectangular pipe connections.

**Note**

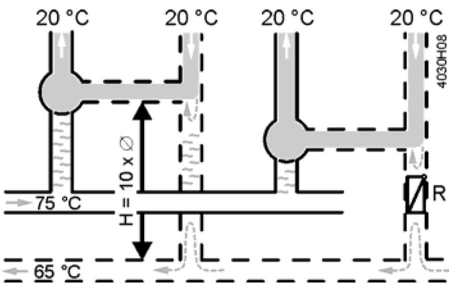
False circulation can be avoided by proper planning – with almost no extra cost – but remedy is usually very costly in existing plants.

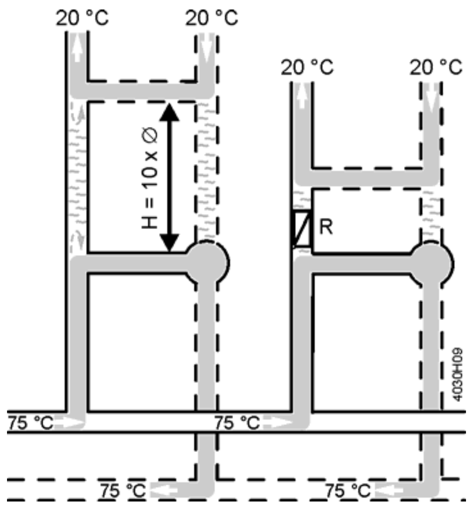
**Measures against false circulation**

- Observe guide value for the water speed: 0.5…1 m/s.
  The lower the water speed, the smaller the risk that the diverted flow pulls water from the critical piping section. If required, balancing valves can be installed to improve flow conditions
- Observe a certain distance between bypass and collector/header or short-circuit: H ≥ 10 x pipe dia., minimum 400 mm

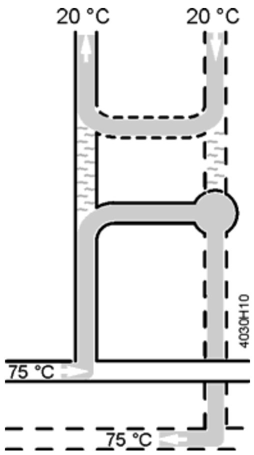
or

- Installation of a check valve or gravity brake R with small spring pressure in the critical piping section, aimed at ensuring a minimum flow in the opening range



- Welded elbows.

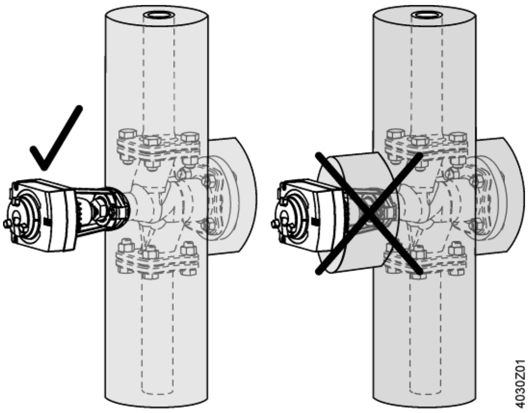



## 2.15.4 Thermal insulation

Insulated pipes and valves save energy.

Actuators must never be insulated. This is to make certain that heat produced by the actuator can be dissipated, thus preventing overheating.

Recommendation:
Thermal insulation of pipes and valves conforming to EnEV 2009




Recommendation [1)]

| # | Type of pipes/valves | Minimum thickness of thermal insulation |
|---|---|---|
| 1 | Inside diameter up to 22 mm | 20 mm |
| 2 | Inside diameter 22…35 mm | 30 mm |
| 3 | Inside diameter 35…100 mm | Same as inside diameter |
| 4 | Inside diameter > 100 mm | 100 mm |
| 5 | Through walls and ceilings, at pipe crossings and connections, at central network distributors | ½ of requirements of # 1…4 |
| 6 | Pipes of central heating systems which, after January 31, 2002, were installed between heated rooms of different users | ½ of requirements of # 1…4 |
| 7 | Pipes according to # 6 in the floor's structure | 6 mm |
| 8 | Cooling energy distribution/cold water pipes and valves of room ventilation and air conditioning systems | 6 mm |

[1)] Applies to a heat conductance of 0.035 W/(m·K)

When using materials with a heat conductance other than 0.035 W/(m·K), the minimum thickness of the insulating layers must be appropriately adapted. For the conversion and heat conductance of insulating material, the calculation methods and data applied by established technical rules must be used.

## 2.16 Warranty

The engineering data listed in chapter "Type summary and equipment combinations" on page 11 are ensured only when the valves are used in connection with the specified Siemens actuators.

Note

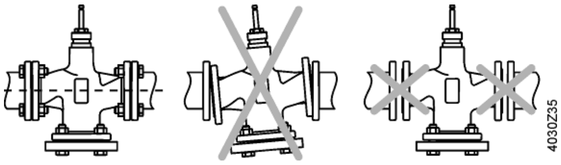
If the valves are used in combination with actuators supplied by thirds, proper functioning must be ensured by the user himself and Siemens Building Technologies will assume no liability.

# 3 Handling

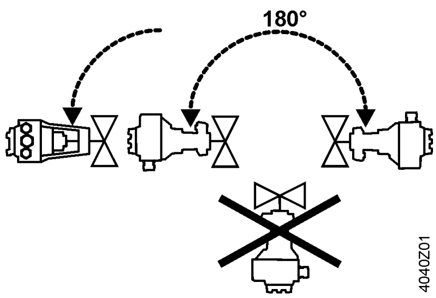
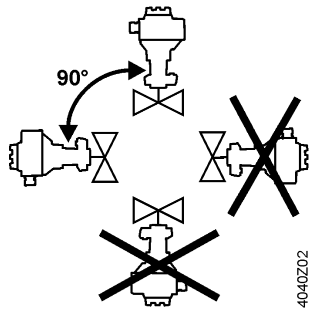
## 3.1 Mounting and installation

Note

The valves must be installed free from distortion:




### 3.1.1 Mounting positions

| Indoors | Outdoors [1] |
|---|---|
|   |   |

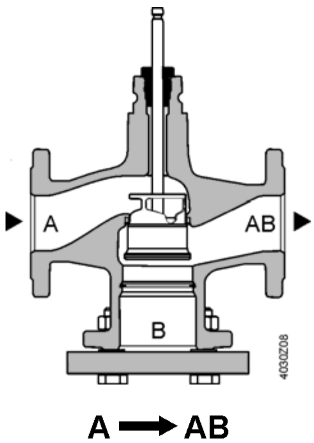
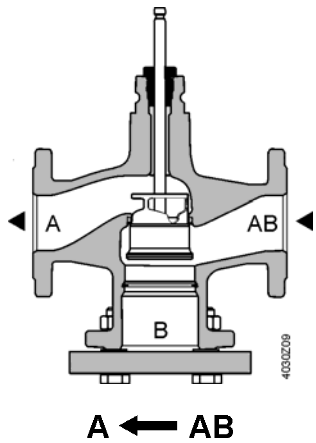
[1] Only in combination with weather shield ASK39.1 and actuators SAX..

Mounting positions apply to both 2- and 3-port valves.

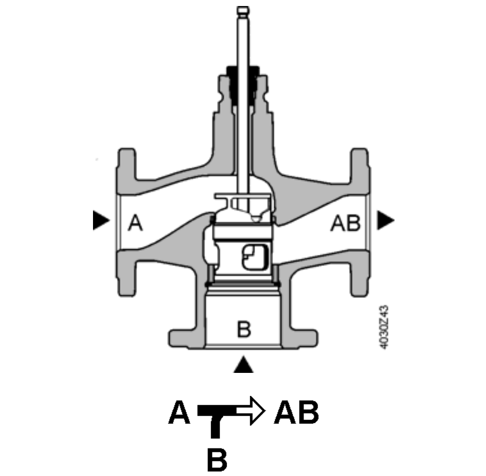
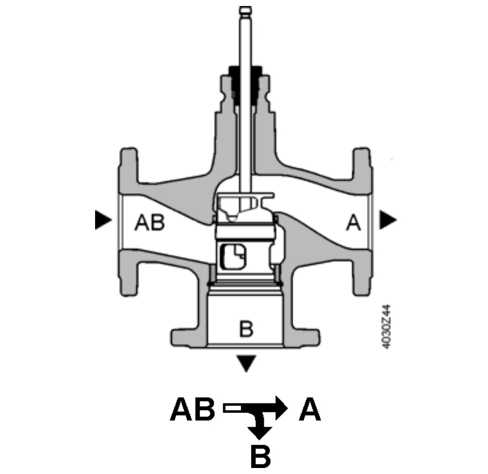
### 3.1.2 Direction of flow for fluids and steam

For general illustration and further details, refer to chapter "4.3 Technical and mechanical design", page 53.

**2-port valves**

| Fluids | Steam |
|---|---|
| VVF43.., VVF53.. | VVF43.., VVF53.. |
| Closing against the pressure | Closing with the pressure |
|   |   |

**3-port valves**

| Fluids | |
|---|---|
| Mixing valve (preferred use) | Diverting valve |
|   |   |

## 3.1.3 Flanges

To ensure that flanges are correctly connected, the nominal, maximum and minimum tightening torques must be observed. They depend on the strength and size of the bolts and nuts, the material of the flanges, the PN class, the flange gaskets used and the medium in the hydraulic system.

The tightening torques also depend on the specification of the gasket supplier and must be observed, using a torque wrench.

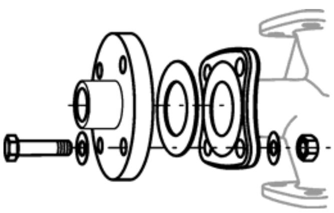
To determine the right tightening torques, refer to the suppliers' specifications. According to EN 1515-1, the selection of materials for bolts and nuts is also dependent on the PN class, the temperatures, and other operating conditions, such as the type of medium.

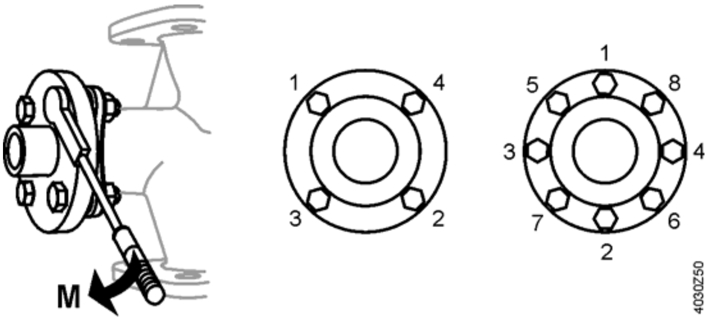
Recommendation

Use a torque wrench.

**Procedure**

1. Clean the flanges.
2. Place the gaskets between the flanges.
3. Fit the bolts, washers and nuts and tighten them by hand.
4. Tighten the bolts crosswise in 3 steps as shown below (M = tightening torque):
   - Step 1: 25% M
   - Step 2: 50% M
   - Step 3: 100% M






1 to 8 = order for tightening the bolts
M = tightening torque

Notes:
- Too low or too high tightening torques can cause leakage at the flange connections or even lead to broken flanges
- Observe the following table "Guide values for tightening torques", page 49

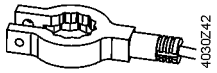
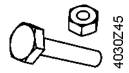
5. When the operating temperature is reached, retighten the bolts.

Guide values for tightening torques

| DN | 15 | 20 | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 125 | 150 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Max. tightening torque** [Nm] | | | | | | | | | | | |
| PN 6 | - | - | - | - | - | - | - | - | - | - | - |
| PN 10 | - | - | - | - | - | - | - | - | - | - | - |
| PN 16 | 1) | 1) | 1) | 1) | 1) | 1) | 120 | 120 | 120 | 120 | 200 |
| PN 25 | 40 | 40 | 40 | 120 | 120 | 120 | 120 | 120 | 200 | 300 | 300 |
| PN 40 | 40 | 40 | 40 | 120 | 120 | 120 | 120 | 120 | 200 | 300 | 300 |

1) V..F43.. is available only in nominal diameters of DN 65…150, for smaller nominal diameters use V..F53..

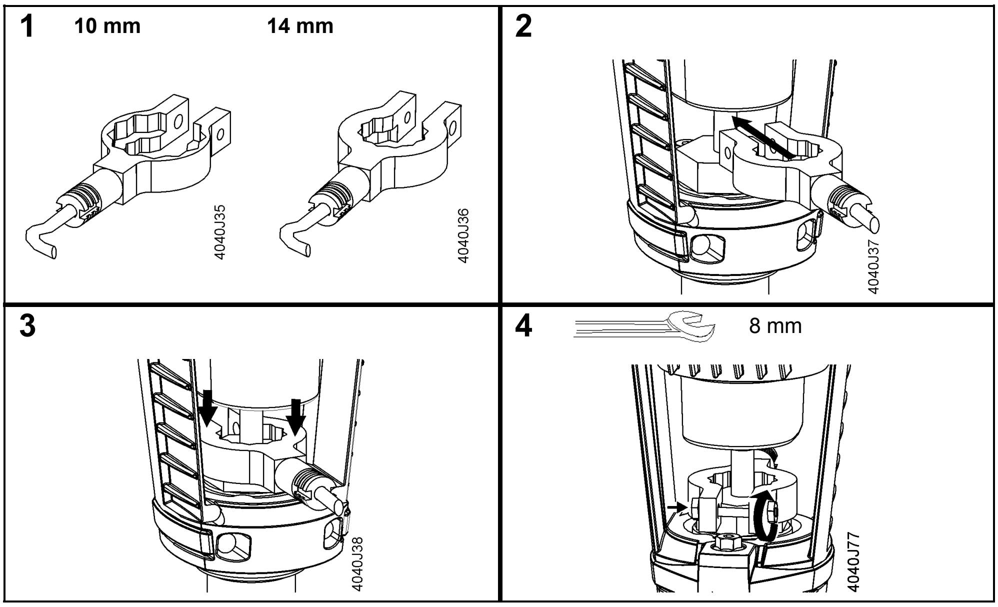
## 3.1.4 Stem heating element ASZ6.6

| Scope of delivery | |
|---|---|
| 1 Stem heating element ASZ6.6 | 1 screw M4 x 30 mm including nut |
|   |   |

To fit the stem heating element, stroke actuator and valve must be assembled. The stem heating element is powered separately.

**Special notes on mounting**

Prior to mounting, check the following:
1. Actuator and Siemens valve are assembled.
2. Observe compatibility and choice of combinations.




**Note**
Valve lines V..F43/53..

When using a stem heating element and medium temperatures are below -5 °C, the stem sealing gland must be replaced.
In that case, the sealing gland must be ordered also (stock number 4 284 8806 0).

## 3.1.5 Thermal insulation

Refer to "Thermal insulation", page 45

## 3.2 Commissioning and maintenance

### 3.2.1 Commissioning

The valve may be put into operation only if actuator and valve are correctly assembled.

Note

Ensure that actuator stem and valve stem are rigidly connected in all positions.

**Function check**

| Valve | Throughport A→AB | Bypass B→AB |
|---|---|---|
| Valve stem extends | Closes | Opens |
| Valve stem retracts | Opens | Closes |

### 3.2.2 Maintenance

The valves are maintenance-free.

## 3.3 Disposal

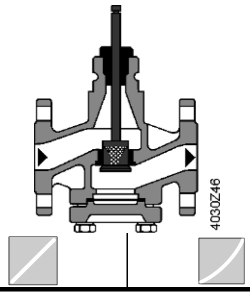
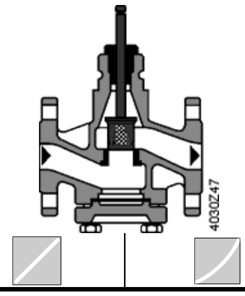
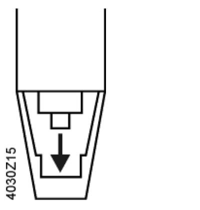
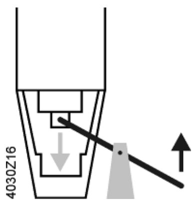
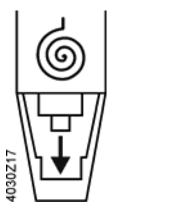
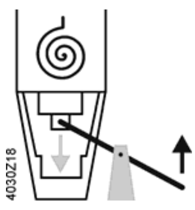
Before disposal, the valve must be dismantled and separated into its various constituent materials.
Legislation may demand special handling of certain components, or it may be sensible from an ecological point of view.
**All local and currently valid legislation must be observed.**

# 4 Functions and control

## 4.1 Selection of acting direction and valve characteristic

The valve's characteristic and acting direction (push to open, pull to open, normally open, normally closed) have an impact on the acting direction and valve characteristic selected with the actuator's DIL switches as well as on the required function in the event of a power failure (actuator with or without spring return function).

The objective is the following: As the positioning signal Y increases, the volumetric flow V through the valve shall rise or, in the event of a power failure, the valve shall fully open, V = 100% (NO = normally open), or fully close, V = 0% (NC = normally closed), depending on plant requirements.

| **Actuator pushing** | | | Push to open  | | Pull to open  | |
|---|---|---|---|---|---|---|
|  | **DIL switches** | **Acting direction** | Direct | | Reverse | |
| | | **Flow characteristic** | Linear | Equal-percentage | Linear | Equal-percentage |
| | **Without spring return function** | **No power applied** | Maintains the position | | | |
|  | **DIL switches** | **Acting direction** | No mechanical stroke inverter required<br>Selection of acting direction via DIL switch | | | |
| | | **Flow characteristic** | | | | |
| | **Without spring return function** | **No power applied** | | | | |
|  | **DIL switches** | **Acting direction** | Direct | | Reverse | |
| | | **Flow characteristic** | Linear | Equal-percentage | Linear | Equal-percentage |
| | **With spring return function** | **No power applied** | Closed (NC function)<br>V = 0% | | Open (NO function)<br>V = 100% | |
|  | **DIL switches** | **Acting direction** | Reverse | | Direct | |
| | | **Flow characteristic** | Linear | Equal-percentage | Linear | Equal-percentage |
| | **With spring return function** | **No power applied** | Fully open (NO function)<br>V = 100% | | Fully closed (NC function)<br>V = 0% | |

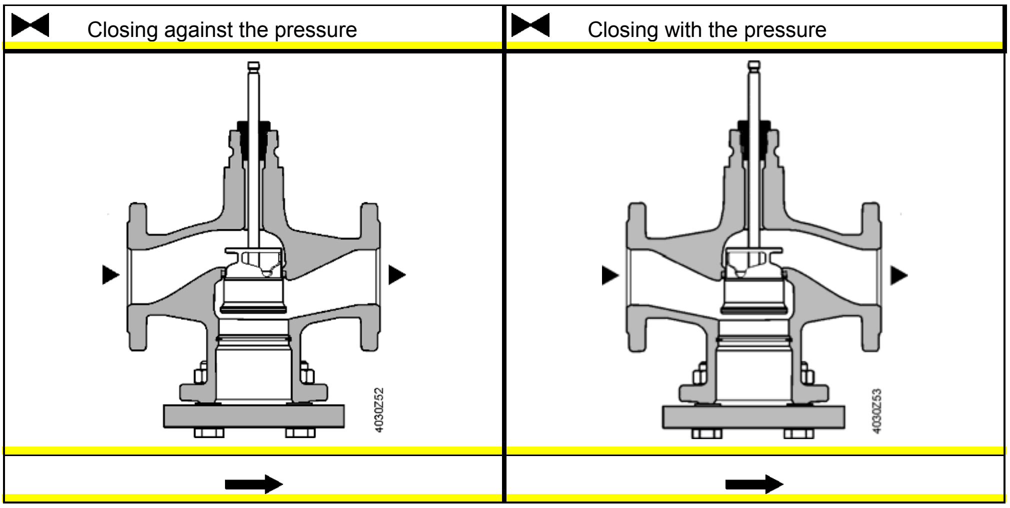
# 4.2 Calibration

Calibration must be performed when valve and actuator are correctly assembled.

# 4.3 Technical and mechanical design

The illustrations below only show the valves' basic design; constructional features, such as the shape of plugs, may differ.

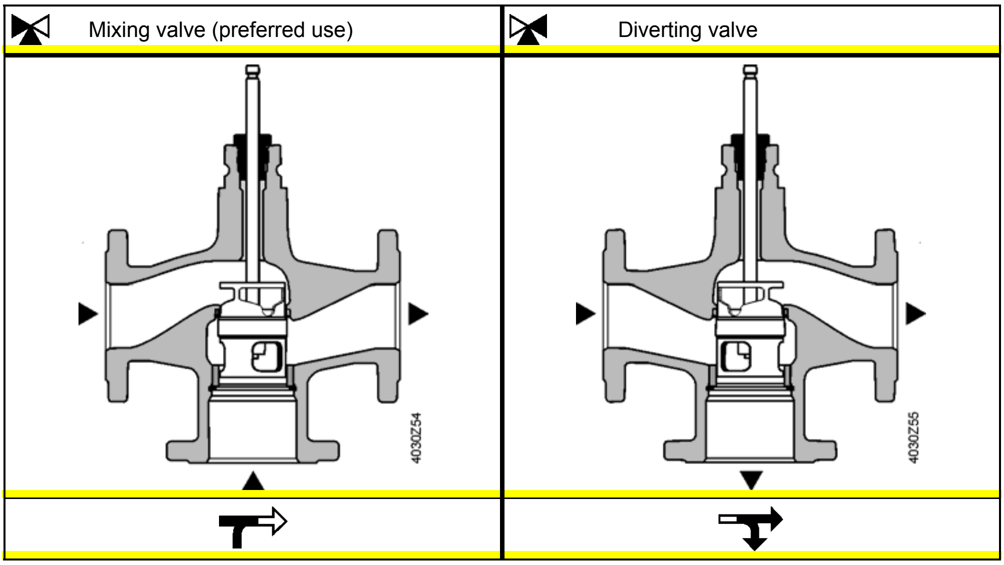
**2-port valves**




Note

**2-port valves do not become 3-port valves by removing the blank flange!**

**3-port valves**



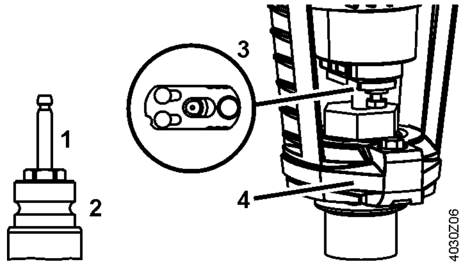

Depending on the nominal valve size, a guided parabolic, perforated or slot plug is used – rigidly connected to the valve stem.

The seat is pressed into the valve body together with a special sealing compound.

### 4.3.1 Plug stop

The built-in plug stop …
- supports secure guidance of the plug in all stroke positions,
- prevents the head of the stem from immersing into the sealing gland, thus avoiding damage to the seal,
- prevents loss of plug as long as no actuator is fitted.

### 4.3.2 Valve stem, valve neck, coupling




- The diameter of the valve stem is 10 mm with all types of valves
- The same valve stem design ensures compatibility with the actuators

**1** Valve stem
**2** Valve neck
**3** Valve stem coupling
**4** Valve neck coupling

### 4.3.3 Converting a 2-port to a 3-port valve

Is is not possible to convert a 2-port valve to a 3-port valve.

2-port valves do not become 3-port valves by removing the blank flange!

### 4.3.4 Converting a 3-port to a 2-port valve

Every type of 3-port valve can be converted to a 2-port valve.

Notes

In that case, the type plate is no longer in compliance with the valve's function. Siemens does not supply replacement type plates.

## 4.3.5 Flange types

Flanges, flange dimensions and flange connections conform to ISO 7005 and EN 1092 respectively.

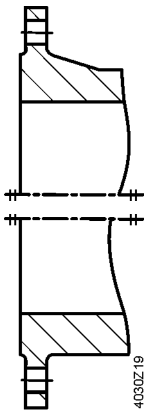
**Valve types**

- 2-port valves VVF..
- 3-port valves VXF..

**Flange type**

Type 21 (integral flange) as per ISO 7005 is an integral component of a pressure device.

**Type of flange and flange face**




Type B
(raised face)
Type B1

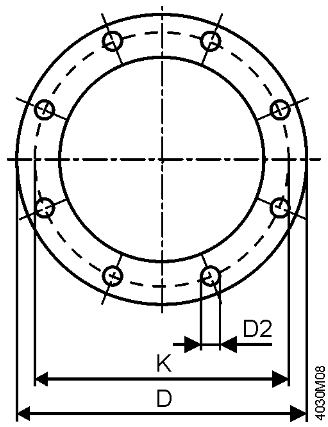
The illustration shows the transition from the flange to the valve body of the V..F.. valves (not true to scale, faces only outlined)

**Gaskets**

In the case of ISO 7005, the gaskets do not constitute part of the standard – in contrast to EN 1092.

**Note**
Up to DN 50, PN 25 is also used for PN 16

Up to DN 50, the flange dimensions of pressure classes PN 16 and PN 25 are identical. For this reason, for $k_{vs}$ values ≤ 40 $m^3/h$ and nominal sizes ≤ DN 50, the valves of the V..F53.. line (PN 25) are listed in place of the valves of the V..F43.. line (PN 16).




**Connecting dimensions**
[mm]
PN 16/PN 25 to DN 50

| **DN** | **D** Outside diameter of flange | **K** Diameter of bolt circle | **D2** Diameter of bolt holes | **Bolts** Quantity | Size |
|---|---|---|---|---|---|
| 10 | 90 | 60 | 14 | 4 | M12 |
| 15 | 95 | 65 | 14 | 4 | M12 |
| 20 | 105 | 75 | 14 | 4 | M12 |
| 25 | 115 | 85 | 14 | 4 | M12 |
| 32 | 140 | 100 | 18 | 4 | M16 |
| 40 | 150 | 110 | 18 | 4 | M16 |
| 50 | 165 | 125 | 18 | 4 | M16 |

# 5 Technical data

| | | V..F43.. | V..F53.. |
|---|---|---|---|
| **Function data** | PN class | PN 16 | PN 25 (PN 16) |
| | Type of connection | Flanged | |
| | Operating pressure | Within the range of the permissible medium temperature according to the charts on pages 37…38 | |
| | Valve characteristic [1)]<br>Throughport 0…30%<br>30…100%<br><br>$k_{vs}$ = 250 / 400 m³/h | <br>Linear<br>Equal-percentage; $n_{gl}$ = 3 to VDI / VDE 2173<br><br>Linear | |
| | Bypass | Linear | |
| | Leakage rate Throughport | 0…0.01% of $k_{vs}$ value (class IV) | |
| | Bypass | 0.5…2% of $k_{vs}$ value with SKD.., SKB.., and SKC..<br>0.05% of $k_{vs}$ value with SAX.. | |
| | Media<br>Cold water<br>Low-temperature hot water<br>High-temperature hot water<br>Water with antifreeze<br>Cooling water<br>Drinking water<br>Brines<br>Saturated steam<br>Superheated steam<br>Heat transfer oils | According to the table on page 9, "2.2.1 Compatibility with medium and temperature ranges" | |
| | Medium temperature<br>Also refer to page 36 | -20…220 °C [2)] | |
| | Rangeability $S_V$<br>DN 15, $k_{vs}$ ≤ 1.25 | - | > 50 |
| | DN 15, $k_{vs}$ > 1<br>DN 20<br>DN 25<br>DN 32<br>DN 40<br>DN 50 | | > 100 |
| | DN 65<br>DN 80<br>DN 100<br>DN 125<br>DN 150 | > 100 | |
| | Nominal stroke<br>DN 15<br>DN 20<br>DN 25<br>DN 32<br>DN 40<br>DN 50 | - | 20 mm |
| | DN 65<br>DN 80<br>DN 100<br>DN 125<br>DN 150 | 40 mm | 40 mm |
| **Materials** | Valve body | EN-GJS-400-18-LT | |
| | Blank flange VVF.. | P265GH | |
| | Valve stem | Stainless steel | |
| | Seat | Stainless steel | |
| | Plug | Stainless steel | |
| | Stem sealing gland [2)] | Stainless steel<br>FEPM (silicone-free) | |
| | Adapter ALF41B.. | Steel S235JRG2 | |
| **Dimensions** | - | See table on page 58 | |
| **Weight** | - | See table on page 58 | |
| **Connections** | Flanged | ISO 7005 | - |

| | | V..F43.. | V..F53.. |
|---|---|---|---|
| **Environmental conditions** | Operation | IEC 60721-3-3 | |
| | Class | 3K5, 3Z11 | |
| | Temperature | -15…+55 °C | |
| | Rel. humidity | 5…95% r.h. | |
| | Storage | IEC 60721-3-1 | |
| | Class | 1K3 extended | |
| | Temperature | -15…+55 °C | |
| | Rel. humidity | 5…95% r.h. | |
| | Transport | IEC 60721-3-2 | |
| | Class | 2K3, 2M2 | |
| | Temperature | -30…+65 °C | |
| | Rel. humidity | < 95% r.h. | |
| **Standards** | Pressure Equipment Directive | PED 97/23/EC | |
| | Pressure-carrying accessories | According to article 1, section 2.1.4 | |
| | Fluid group 2 | PN 16 | PN 25 |
| | Without CE certification as per article 3, section 3 (sound engineering practice) | ≤ DN 50 | ≤ DN 40 |
| | Category I, with CE certification | DN 65…125 | DN 50…100 |
| | Category II, with CE certification, notified body identification number 0036 | DN 150 | DN 125…150 |
| | PN class | ISO 7268 | |
| | Operating pressure | ISO 7005, DIN EN 12284 | |
| | Length of flanged valves | DIN EN 558-1, line 1 (flanges to ISO 7005), without PN 6 | - |
| | Valve characteristic | VDI 2173 | |
| | Leakage rate | Throughport, bypass as per EN 60534-4 / EN 1349 | |
| | Water treatment | VDI 2035 | |
| | Environmental conditions | Storage: IEC 60721-3-1<br>Transport: IEC 60721-3-2<br>Operation: IEC 60721-3-3 | |
| | Environmental compatibility | ISO 14001 (environment)<br>ISO 9001 (quality)<br>SN 36350 (environmentally compatible products)<br>RL 2002/95/EC (RoHS) | |

1) For certain valve lines and high $k_{vs}$ values, the valve characteristic is optimized for maximum volumetric flow $k_{V100}$

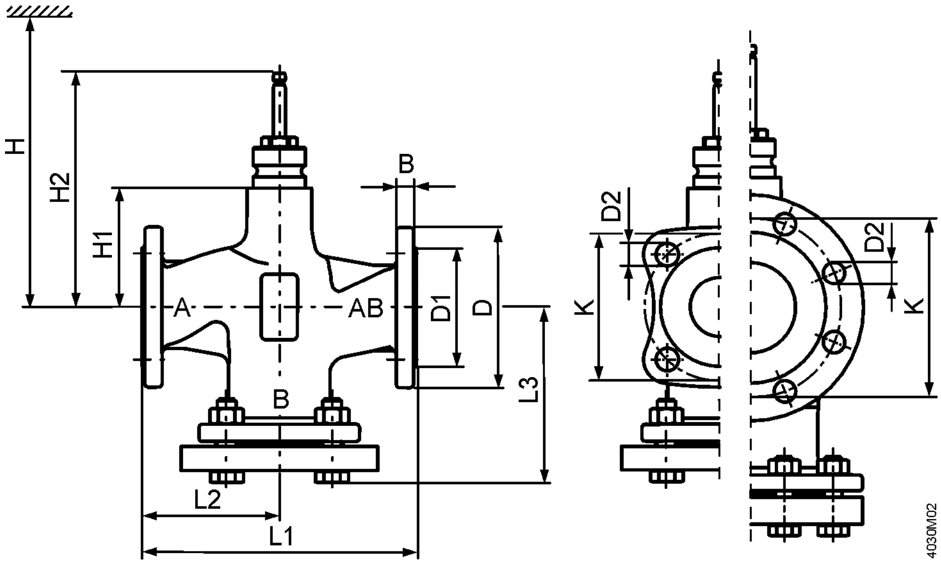
2) For medium temperatures < -5 °C, the stem sealing gland must be replaced. The sealing gland must be ordered separately, stock number 4 284 8806 0.

3) Medium temperatures > 220°C are permitted for heat transfer oils only

# 6 Dimensions

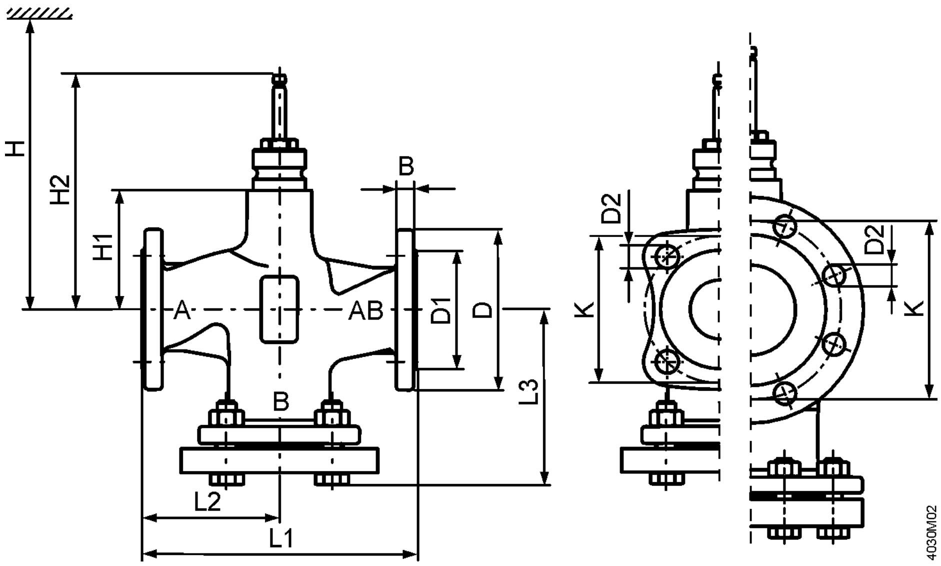
Note — Dimensions in mm, weight in kg

**VVF43..**



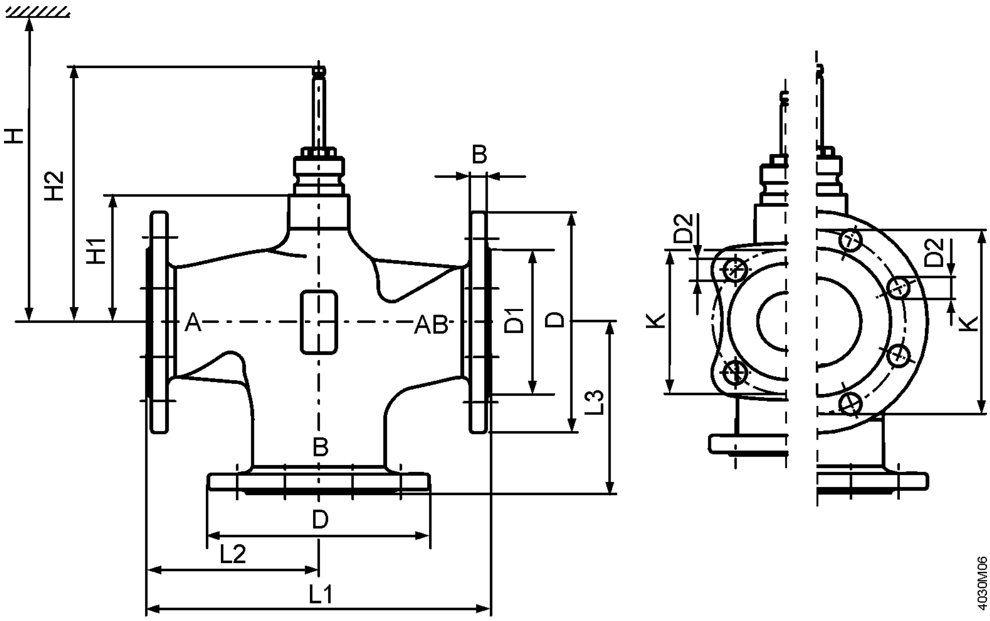

| Product number | DN | kg | B | Ø D | Ø D1 | Ø D2 | L1 | L2 | L3 | Ø K | H1 | H2 | H SAX.. | H SKD.. | H SKB.. | H SKC.. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VVF43..** | 65 | 22.1 | 17 | 185 | 118 | 19 (4x) | 290 | 145 | 178 | 145 | 115 | 231,5 | - | - | - | 690 |
| | 80 | 28.1 | 17 | 200 | 132 | 19 (8x) | 310 | 155 | 190 | 160 | 115 | 231,5 | - | - | - | 690 |
| | 100 | 34.1 | 17 | 220 | 156 | 19 (8x) | 350 | 175 | 206 | 180 | 146 | 262,5 | - | - | - | 721 |
| | 125 | 46.6 | 17 | 250 | 184 | 19 (8x) | 400 | 200 | 233 | 210 | 159 | 275,5 | - | - | - | 734 |
| | 150 | 67.5 | 17 | 284 | 211 | 23 (8x) | 480 | 240 | 275,5 | 240 | 186.5 | 303 | - | - | - | 762 |

**VVF53..**



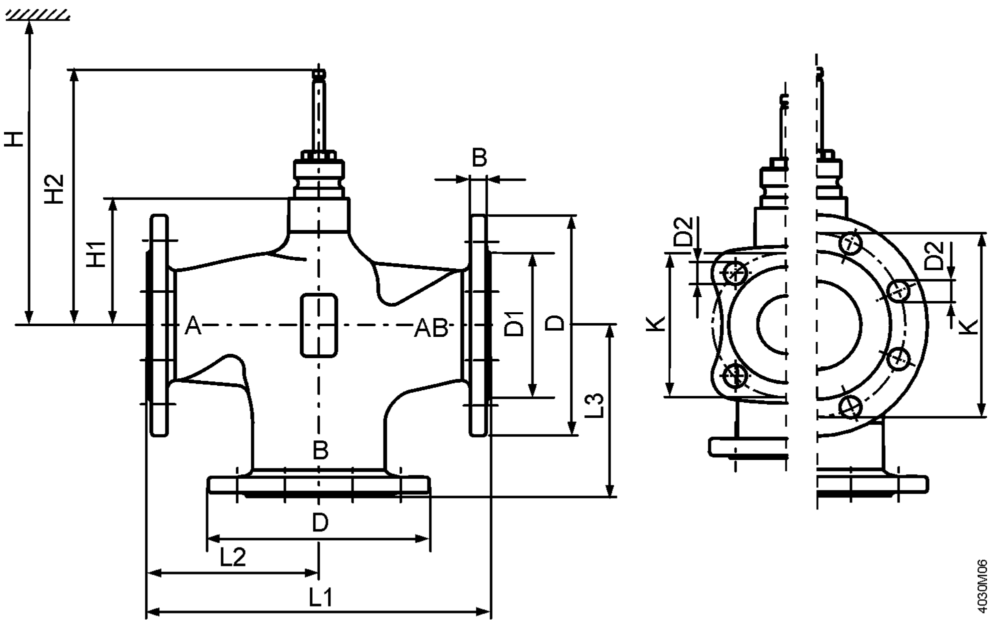

| Product number | DN | kg | B | Ø D | Ø D1 | Ø D2 | L1 | L2 | L3 | Ø K | H1 | H2 | H SAX.. | H SKD.. | H SKB.. | H SKC.. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VVF53..** | 15 | 4.2 | 14 | 95 | 46 | 14 (4x) | 130 | 65 | 87,5 | 65 | 63 | 159,5 | 505 | 563 | 638 | - |
| | 20 | 5.4 | 16 | 105 | 56 | 14 (4x) | 150 | 75 | 99,5 | 75 | 63 | 144,4 | 505 | 563 | 638 | - |
| | 25 | 6.1 | 15 | 115 | 65 | 14 (4x) | 160 | 80 | 104,5 | 85 | 63 | 159,5 | 505 | 563 | 638 | - |
| | 32 | 8.8 | 17 | 140 | 76 | 19 (4x) | 180 | 90 | 119 | 100 | 60 | 156,5 | 502 | 560 | 635 | - |
| | 40 | 10.2 | 16 | 150 | 84 | 19 (4x) | 200 | 100 | 129 | 110 | 60 | 156,5 | 502 | 560 | 635 | - |
| | 50 | 13.7 | 16 | 165 | 99 | 19 (4x) | 230 | 115 | 146 | 125 | 100 | 196,5 | 542 | 600 | 675 | - |
| | 65 | 21.8 | 17 | 185 | 118 | 19 (8x) | 290 | 145 | 178 | 145 | 115 | 231,5 | - | - | - | 690 |
| | 80 | 28.1 | 17 | 200 | 132 | 19 (8x) | 310 | 155 | 190 | 160 | 115 | 231,5 | - | - | - | 690 |
| | 100 | 38 | 17 | 235 | 156 | 23 (8x) | 350 | 175 | 212,5 | 190 | 146 | 262,5 | - | - | - | 721 |
| | 125 | 51.9 | 17 | 270 | 184 | 28 (8x) | 400 | 200 | 242 | 220 | 159 | 275,5 | - | - | - | 734 |
| | 150 | 74.1 | 17 | 297 | 211 | 28 (8x) | 480 | 240 | 284 | 250 | 186.5 | 303 | - | - | - | 762 |

**VXF43..**




| Product number | DN | kg | B | Ø D | Ø D1 | Ø D2 | L1 | L2 | L3 | Ø K | H1 | H2 | H | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | SAX.. | SKD.. | SKB.. | SKC.. |
| VXF43.. | 65 | 17.1 | 17 | 185 | 118 | 19 (4x) | 290 | 145 | 145 | 145 | 115 | 231.5 | - | - | - | 690 |
| | 80 | 21.2 | 17 | 200 | 132 | 19 (8x) | 310 | 155 | 155 | 160 | 115 | 231.5 | - | - | - | 690 |
| | 100 | 27.1 | 17 | 220 | 156 | 19 (8x) | 350 | 175 | 175 | 180 | 146 | 262.5 | - | - | - | 721 |
| | 125 | 37.1 | 17 | 250 | 184 | 19 (8x) | 400 | 200 | 200 | 210 | 159 | 275.5 | - | - | - | 734 |
| | 150 | 54.5 | 17 | 284 | 211 | 23 (8x) | 480 | 240 | 240 | 240 | 186.5 | 303 | - | - | - | 762 |

**VXF53..**




| Product number | DN | kg | B | Ø D | Ø D1 | Ø D2 | L1 | L2 | L3 | Ø K | H1 | H2 | H | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | SAX.. | SKD.. | SKB.. | SKC.. |
| VXF53.. | 15 | 3.2 | 14 | 95 | 46 | 14 (4x) | 130 | 65 | 65 | 65 | 63 | 159.5 | 505 | 563 | 638 | - |
| | 20 | 4.1 | 16 | 105 | 56 | 14 (4x) | 150 | 75 | 75 | 75 | 63 | 159.5 | 505 | 563 | 638 | - |
| | 25 | 4.6 | 15 | 115 | 65 | 14 (4x) | 160 | 80 | 80 | 85 | 63 | 159.5 | 505 | 563 | 638 | - |
| | 32 | 6.1 | 17 | 140 | 76 | 19 (4x) | 180 | 90 | 90 | 100 | 60 | 156.5 | 502 | 560 | 635 | - |
| | 40 | 7.2 | 16 | 150 | 84 | 19 (4x) | 200 | 100 | 100 | 110 | 60 | 156.5 | 502 | 560 | 635 | - |
| | 50 | 9.8 | 16 | 165 | 99 | 19 (4x) | 230 | 115 | 115 | 125 | 100 | 196.5 | 542 | 600 | 675 | - |
| | 65 | 16.8 | 17 | 185 | 118 | 19 (8x) | 290 | 145 | 145 | 145 | 115 | 231.5 | - | - | - | 690 |
| | 80 | 21.2 | 17 | 200 | 132 | 19 (8x) | 310 | 155 | 155 | 160 | 115 | 231.5 | - | - | - | 690 |
| | 100 | 29 | 17 | 235 | 156 | 23 (8x) | 350 | 175 | 175 | 190 | 146 | 262.5 | - | - | - | 721 |
| | 125 | 39.7 | 17 | 270 | 184 | 28 (8x) | 400 | 200 | 200 | 220 | 159 | 275.5 | - | - | - | 734 |
| | 150 | 57 | 17 | 297 | 211 | 28 (8x) | 480 | 240 | 240 | 250 | 186.5 | 303 | - | - | - | 762 |

# 7 Revision numbers

**VVF..**

| Product number | Valid from rev. no. | Product number | Valid from rev. no. | Product number | Valid from rev. no. |
|---|---|---|---|---|---|
| **VVF43.65-50** | ..A | **VVF53.15-0.16** | ..A | **VVF53.25-5** | ..A |
| **VVF43.65-63** | ..A | **VVF53.15-0.2** | ..A | **VVF53.25-6.3** | ..A |
| **VVF43.80-80** | ..A | **VVF53.15-0.25** | ..A | **VVF53.25-8** | ..A |
| **VVF43.80-100** | ..A | **VVF53.15-0.32** | ..A | **VVF53.25-10** | ..A |
| **VVF43.100-125** | ..A | **VVF53.15-0.4** | ..A | **VVF53.32-16** | ..A |
| **VVF43.100-160** | ..A | **VVF53.15-0.5** | ..A | **VVF53.40-12.5** | ..A |
| **VVF43.125-200** | ..A | **VVF53.15-0.63** | ..A | **VVF53.40-16** | ..A |
| **VVF43.125-250** | ..A | **VVF53.15-0.8** | ..A | **VVF53.40-20** | ..A |
| **VVF43.150-315** | ..A | **VVF53.15-1** | ..A | **VVF53.40-25** | ..A |
| **VVF43.150-400** | ..A | **VVF53.15-1.25** | ..A | **VVF53.50-31.5** | ..A |
| - | | **VVF53.15-1.6** | ..A | **VVF53.50-40** | ..A |
| - | | **VVF53.15-2** | ..A | **VVF53.65-63** | ..A |
| - | | **VVF53.15-2.5** | ..A | **VVF53.80-100** | ..A |
| - | | **VVF53.15-3.2** | ..A | **VVF53.100-160** | ..A |
| - | | **VVF53.15-4** | ..A | **VVF53.125-250** | ..A |
| - | | **VVF53.20-6.3** | ..A | **VVF53.150-400** | ..A |

**VXF..**

| Product number | Valid from rev. no. | Product number | Valid from rev. no. | Product number | Valid from rev. no. |
|---|---|---|---|---|---|
| **VXF43.65-63** | ..A | **VXF53.15-1.6** | ..A | **VXF53.40-25** | ..A |
| **VXF43.80-100** | ..A | **VXF53.15-2.5** | ..A | **VXF53.50-40** | ..A |
| **VXF43.100-160** | ..A | **VXF53.15-4** | ..A | **VXF53.65-63** | ..A |
| **VXF43.125-250** | ..A | **VXF53.20-6.3** | ..A | **VXF53.80-100** | ..A |
| **VXF43.150-400** | ..A | **VXF53.25-6.3** | ..A | **VXF53.100-160** | ..A |
| - | | **VXF53.25-10** | ..A | **VXF53.125-250** | ..A |
| - | | **VXF53.32-16** | ..A | **VXF53.150-400** | ..A |
| - | | **VXF53.40-16** | ..A | - | |

# 8 Addendum

## 8.1.1 Abbreviations

| Abbreviation | Unit | Term | Explanation |
|---|---|---|---|
| c | [kJ/kgK] | Specific heat capacity | See "Specific heat capacity", page 62 |
| DN | - | Nominal size | Characteristic for matching parts of a piping system |
| $F_R$ | - | Correction factor | Factor for impact of valve's Reynolds number |
| H | [mm] | Stroke | Travel of valve or actuator stem |
| $H_0$ | [m] | Shutoff head | Pump head when medium is supplied. The head generated by a pump when the valve is fully closed |
| $k_v$ | [$m^3$/h] | Nominal flow | Amount of cold water (5…30 °C) passing through the valve at the respective stroke and at a differential pressure of 100 kPa (1 bar) |
| $k_{vr}$ | [$m^3$/h] | - | Smallest volumetric flow that can be controlled, that is, when the valve starts to open (opening step) |
| $k_{vs}$ | [$m^3$/h] | Nominal flow | Nominal flow rate of cold water (5…30 °C) through the fully open valve ($H_{100}$) at a differential pressure of 100 kPa (1 bar) |
| m | [kg/h] | Mass flow<br>Steam mass flow | - |
| PN | - | PN class | Characteristic relating to the combination of mechanical and dimensional properties of a component in a piping system |
| $P_v$ | - | Valve authority | See "Valve authority Pv", page 62 |
| $Q_{100}$ | [kW] | Rated capacity | Design capacity of plant |
| $Q_{min}$ | [kW] | | Smallest output of a consumer that can be controlled in modulating mode |
| $r_{p1}$ | [kJ/kgK] | | Specific heat capacity of steam |
| $S_v$ | - | Rangeability | See "Rangeability SV", page 62 |
| $V_{100}$ | [$m^3$/h],<br>[l/s] | Volumetric flow | Volume per unit of time through the fully open valve ($H_{100}$) |
| ρ | [kg/$m^3$] | Density | Mass per volume |
| υ | [$mm^2$/s],<br>[cSt] | Kinematic viscosity | 1 $mm^2$/s = 1 cSt (centistoke), also refer to 2.8.3.3 Kinematic viscosity ν, page 24 |
| Δp | [kPa] | Differential pressure | Pressure difference between plant sections |
| $\Delta p_{max}$ | [kPa] | Max. differential pressure | Maximum permissible differential pressure across the valve's throughport (control path) for the entire positioning range of the motorized valve |
| $\Delta p_{MV}$ | [kPa] | - | Differential pressure across the section with variable flow |
| $\Delta p_s$ | [kPa] | Closing pressure | Maximum permissible differential pressure at which the motorized valve still closes securely against the pressure |
| $\Delta p_{v0}$ | [kPa] | - | Maximum differential pressure across the valve's fully closed throughport (control path) |
| $\Delta p_{v100}$ | [kPa] | Differential pressure at nominal flow rate | Differential pressure across the fully open valve and the valve's throughport A – AB at the volumetric flow $V_{100}$ |
| $\Delta p_{VR}$ | [kPa] | - | Differential pressure of flow and return |
| ΔT | [K] | Temperature spread | Temperature difference of flow and return |

### 8.1.2 Important formulas

| Value | Formula | | Unit |
|---|---|---|---|
| **Differential pressure $\Delta p_{V100}$ across the fully open valve** | $\Delta p_{V100} = 100 \cdot \left( \frac{\dot{V}_{100}}{k_{vs}} \right)^2$ | | [kPa] |
| **Rangeability $S_V$** | $S_V = \frac{k_{vs}}{k_{vr}}$ | | - |
| **Valve authority $P_V$** | Header with pressure, variable volumetric flow<br>$P_V = \frac{\Delta p_{V100}}{\Delta p_{VR}}$ | • Header with pressure, constant volumetric flow<br>• Header with low differential pressure, variable volumetric flow<br>$P_V = \frac{\Delta p_{V100}}{\Delta p_{V100} + \Delta p_{MV}}$ | - |
| **Volumetric flow $V_{100}$** | Water without antifreeze<br>$\dot{V}_{V100} = \frac{Q_{V100}}{1{,}163 \cdot \Delta T}$ | Water with antifreeze<br>$\dot{V}_{V100} = \frac{Q_{V100} \cdot 3600}{c \cdot \rho \cdot \Delta T}$ | [$m^3$/h] |

### 8.1.3 Valve-related glossary

| | |
|---|---|
| DIN EN 14597 | Standard on temperature controls and temperature limiters for use in heat generating plants. This standard also covers actuating equipment (actuating devices) with safety function for temperature and pressure limitation as per DIN EN 14597 |
| HIT | The HVAC Integrated Tool (HIT) supports sizing and selection of valves for water with antifreeze (www.siemens.com/hit) |
| Actuating device | Combination of valve and actuator |
| Rangeability $S_V$ | Characteristic of an actuating device, used to assess the device's controllable range; ratio of the nominal flow rate $k_{vs}$ to the smallest controllable flow $k_{vr}$ |
| Valve authority $P_v$ | Ratio of the differential pressure across the fully open valve ($H_{100}$) to the differential pressure across the valve plus that of the pipe section with variable volume. To ensure correct control, the valve authority must be a minimum of 0.25 |
| Specific heat capacity | The specific heat capacity is the amount of heat required to heat the mass of 1 kg of a substance by 1 K.<br>It increases as the temperature of the substance rises; in the case of gases, also as the pressure of the substance rises. Therefore, with gases, a distinction is made between $c_P$, the specific heat at a constant pressure, and $c_V$, the specific heat at a constant volume |

### 8.1.4 Hydraulics-related glossary

| | |
|---|---|
| Film temperature | Temperature of the valve surfaces that are in contact with the heat transfer oil at which the oil starts to disintegrate |
| Cavitation | Due to high speeds of the medium in the narrowest section of the valve, local underpressure occurs. If this pressure drops below the medium's boiling pressure, cavitation occurs (steam bubbles), possibly leading to material removal (abrasion). Also, when cavitation starts, the noise level increases abruptly. Cavitation can be avoided by limiting the pressure differential across the valve as a function of the medium temperature and the prepressure. For more detailed information, refer to "2.13 Cavitation", page 39 |
| Selection of valve characteristic | Certain types of Siemens actuators are equipped with DIL switches for the selection of a linear or an equal-percentage valve characteristic. The objective is to linearize the volumetric flow through the consumer and the valve |
| Closed circuit | The medium circulates in a closed hydraulic system with no contact to the atmosphere |
| Open circuit | The circulating medium is in contact with the atmosphere, that is, the hydraulic system is open to atmosphere (e.g. cooling towers with open tanks, or showers). Hence, the system can absorb oxygen from the surrounding air, which can lead to rust; in addition, more attention is to be paid to cavitation; for more information, refer to "2.13 Cavitation", page 39 |
| Control stability | The stability of a closed control loop depends on the degree of difficulty S of the controlled system and the circuit amplification $V_0$. For more detailed information, refer to the Siemens brochure "Control technology" (ordering no. 0-91913-en) |
| Return temperature $T_{RL}$ | Temperature of the medium at which it returns from the consumer to the heat or cooling source |
| Gravity circulation | The density of a medium depends on its temperature. If a medium is hot in one place and cold in another, it starts to circulate due to different densities |
| Volumetric flow V | Volume of a medium that passes through an opening for a certain time |
| Flow temperature $T_{VL}$ | Temperature of a heating or cooling medium at which it leaves its source to enter a hydraulic circuit |
| Selection of acting direction | Certain types of Siemens actuators are equipped with DIL switches for selection of the operating action of the respective valve (push to open, pull to open, normally open, normally closed). The objective is to drive the valve to the fully open or fully closed position should a power failure occur, depending on plant requirements |
| Forced control | If forced control is demanded, no consideration is given to any other control command. For example, if there is risk of frost, more heat is supplied to prevent freeze-ups |

### 8.1.5 Media-related glossary

| | |
|---|---|
| Enthalpy | Amount of energy contained in a thermodynamic system (heat content) |
| FDA | Food and Drug Administration (USA) |
| Saturated steam | Boundary between wet and superheated steam;<br>Wet steam: Parts of the gaseous water condensate to become very fine droplets<br>Superheated steam: "Dry" steam without water droplets |
| Brine | Solution consisting of salt and water |
| Heat transfer oil/thermal oil | Heat transfer fluid on the basis of mineral oil, synthetic, organic, or on the basis of silicon, uniform or mixed |
| Water | Chemical compound consisting of oxygen (O) and hydrogen (H). Also refer to VDI 2035 for information on avoiding damage to drinking and domestic hot water plants |
| Water with antifreeze | The water contains an antifreeze which also inhibits corrosion. For the types of antifreeze used in the trade, also refer to chapter "8.1.7 Overview of antifreeze and brines used in the trade", page 64 |
| Glycol | Glycol is added to water to lower the water's melting point. Examples are ethylene glycol and propylene glycol. Refer to chapter "8.1.7 Overview of antifreeze and brines used in the trade", page 64 |
| Water, deionized | The ions of salts contained in the water have been removed |
| Water, demineralized | The minerals contained in the water have been removed |
| Water, super-clean water | Specially treated water; various processes are used to remove dissolved salts and other undesirable substances. It has a high specific resistance and contains no organic substances |

### 8.1.6 Trade names

| **Trademark** | **Legal owner** |
|---|---|
| Acvatix | Siemens |
| Glythermin | BASF |
| Antifrogen, Protectogen | Clariant |
| Dowcal | Dow |
| Zitrec, Freezium | Arteco NV/SA |
| TYFOCOR, TYFOXIT | Tyforop Chemie GmbH |
| GLYKOSOL, PEKASOL, PEKASOLar | Glykol & Sole GmbH |
| Temper | Temper Technology |

### 8.1.7 Overview of antifreeze and brines used in the trade

The list below is not exhaustive. It specifies manufacturer data and is not to be regarded as an official approval for Siemens products in the indicated temperature range. For temperature ranges of individual product lines, see chapter 2.12, page 36.
The notes given under "2.14 Medium quality and medium treatment", page 40 must also be observed.

| | Supplier | Product number | Basic medium | Permissible limit weight fractions | Temperature range of medium | Usage |
|---|---|---|---|---|---|---|
| Water with antifreeze | **BASF** www.basf.com | Glythermin® NF | Heat transfer medium on the basis of ethylene glycol and inhibitors | - | -35…150 °C | No known restriction |
| | | Glythermin® P 44-00 | Basis: Propylene glycol plus anticorrosion additives | - | -50…150 °C | No known restriction |
| | | Glythermin® P 44-92 | Basis: Propylene glycol plus anticorrosion additives | - | -50…150 °C | No known restriction |
| | | Glythermin® P 82-00 | Heat transfer medium for solar plants on the basis of glycol and inhibitors | - | -27… 170 °C | No known restriction |
| | | Glysantin FC | Basis Ethylene glycol → Automobile applications, engine test bed | 60% | -40°C…120°C | No known restriction |
| | **Clariant** www.antifrogen.de | Antifrogen SOL | Basis: Propylene glycol and glycol with a higher boiling point plus anticorrosion additives. Ready to use, premixed with desalinated water (frost protection -27 °C) | Ready-to-use mixture | -27… 170 °C | No known restriction |
| | | Antifrogen KF | Basis: Potassium formate plus anticorrosion additives | 50% | -50…20 °C | Restricted - compatibility must be tested |
| | | Antifrogen N | Basis: Monoethylene glycol plus anticorrosion additives | 70% | -35…150 °C | No known restriction |
| | | Antifrogen L | Basis: Propylene glycol plus anticorrosion additives | 100% | -25…150 °C | No known restriction |
| | **Dow** www.dow.com/heattrans | Dowcal 10 | Heat transfer medium on the basis of ethylene glycol and special inhibitor | - | -50…170 °C | No known restriction |
| | | Dowcal 20 | Heat transfer medium on the basis of propylene glycol for higher temperatures than other propylene glycol fluids | - | -45…160 °C | No known restriction |
| | | Dowcal N | Heat transfer medium on the basis of propylene glycol with little acute toxicity if swallowed; widely used in the food and beverage industry and in other sectors to lower the freezing point | - | -45…120 °C | No known restriction |
| | **Arteco NV/SA** www.zitrec.com/ | Zitrec MC | Multipurpose heat transfer medium on the basis of monoethylene glycol, mixed with an adequate amount of water | < 70% | -55…120 °C | No known restriction |
| | | Zitrec LC | Multipurpose heat transfer medium on the basis of monopropylene glycol, mixed with an adequate amount of water | < 70% | -55…120 °C | No known restriction |
| | | Zitrec FC | Multipurpose heat transfer medium on the basis of monopropylene glycol, mixed with an adequate amount of water; all substances contained in the medium are approved by FDA | < 70% | -50…120 °C | No known restriction |
| | | Zitrec S | Multipurpose heat transfer medium without glycol, on the basis of a substance consisting of potassium formate and sodium propionate | Ready-to-use mixture | -55…120 °C | Restricted - compatibility must be tested |
| | **Tyforop Chemie GmbH** www.tyfo.de/index_deutsch.html | TYFOCOR® L | Freezing and anticorrosion agent, safe with regard to health, specifically for keeping food cool and for solar plants, virtually odourless, hygroscopic liquid. It is based on propylene glycol, which poses no hazard to health and which may be used as a coolant or heat-transfer fluid in food processing and water purification applications. | - | -25…140 °C | Restricted - compatibility, especially with respect to soft solder - individual case must be tested |
| | | TYFOCOR® HTL | Ready-to-use heat transfer medium for solar plants with higher thermal loads, clear, blue-green colored liquid with a faint odour and is based on 1,2-propylene glycol and polyethylene glycol. | - | ...170°C | Restricted - compatibility, especially with respect to soft solder - individual case must be tested |
| | | TYFOCOR® LS | Special, ready-to-use heat transfer medium, evaporating without residue, for solar plants with high thermal loads (vacuum tube collectors); faint odour, based on physiologically unobjectionable propylene glycol, and water. | - | -25…170 °C | Restricted - compatibility, especially with respect to soft solder - individual case must be tested |

| | Supplier | Product number | Basic medium | Permissible limit weight fractions | Temperature range of medium | Usage |
|---|---|---|---|---|---|---|
| | | Tyfocor | Clear, colorless, faint odour liquid, based on ethylene glycol. | | -50…140 °C | Restricted - compatibility, especially with respect to soft solder - individual case must be tested |
| | | Tyfocor G-LS | Reversibly evaporable special heat-transfer fluid based on 1,2-propylene glycol, for use in solar thermal systems | | …170 °C | Restricted - compatibility, especially with respect to soft solder - individual case must be tested |
| | | TYFO-SPEZIAL | High-quality, powerful brine, specifically for use in earth linked thermal heat pump systems | | -10…30 °C | Restricted - copper, brass and bronze material is not resistant, test sealing material in individual case |
| | **Glykol & Sole GmbH**<br><br>www.glykolundsole.com/ | GLYKOSOL N | Yellowish fluid on the basis of monoethylene glycol for use as a heat transfer medium with highly efficient anticorrosion additives and hardness stabilizers; free from nitrite, amine and phosphate | 25…40%, depending on the application | -50…170 °C | No known restriction |
| | | GLYKOSL WP | Based on Ethandiol 1,2 (ethyleneglycol) | - | - | Check permissibility in individual case |
| | | PEKASOL 2000 | Aqueous solution of environmentally safe alkaline earth formate and acetate.<br>PEKASOL 2000 is free of amine, nitrite and phosphate. | - | -60…60°C | Restricted - compatibility, especially with respect to soft solder and zinc - individual case must be tested |
| | | PEKASOL L | Yellowish fluid on the basis of propylene glycol for use as a heat transfer medium with highly efficient anticorrosion additives and hardness stabilizers; free from nitrite, amine and phosphate | 25…40%, depending on the application | -50…185 °C | No known restriction |
| | | PEKASOLar 100<br>PEKASOLar 50 | PEKASOLar 100 and its dilutions are colorless and odorless liquids on basis of propylene glycol with newly developed additives<br><br>New installations must be adequately cleaned before filling. Recommended is a 5% pro KÜHLSOLE PEX 130 solution. | - | -50…150 °C | Restricted - compatibility, especially with respect to soft solder - individual case must be tested |
| | **Arteco NV/SA**<br><br>www.zitrec.com/Products_Freezium.htm | Freezium | Salt brine on the basis of potassium formate, specially developed for use in indirect cooling systems and heat pumps. Suitable for a temperature range from -60 to 95 °C | 24 ..50% | -60…35 °C | Restricted - individual case must be tested |
| | **Tyforop Chemie GmbH**<br><br>www.tyfo.de/index_deutsch.html | TYFOXIT®F15-F50 | High-performance coolant on the basis of potassium formate (safe with regard to food). Available as a ready-to-use mixture in 6 variants (F15 - F50), cooling limits from<br>-15 to -60 °C. Excellent flow properties at low temperatures, due to low viscosity | - | -60…100 °C | Restricted permissibility, more precise evaluations at 20...80 °C necessary<br>(test soft solder in individual case) |
| | | TYFOXIT® 1.25 | High-performance coolant on the basis of potassium acetate (safe with regard to food). Supplied as a concentrate or ready-to-fill mixture and suited for use at temperatures down to -55 °C | - | -55…100 °C | Restricted permissibility, more precise evaluations at 20...80 °C necessary<br>(test soft solder in individual case) |

| | Supplier | Product number | Basic medium | Permissible limit weight fractions | Temperature range of medium | Usage |
|---|---|---|---|---|---|---|
| | **Temper Technology**<br><br>www.temper.se/Temper_(eng)/Temper/Download_information/Temper_DXNI-2251_.aspx | Temper | Synthetic and homogenized, glycol-free solutions on the basis of salts; suitable for temperatures from -10 to -50 °C; colorless to slightly yellowish; contain no amines or nitrites, but additives to support protection against corrosion and to improve lubrication | Ready-to-use mixtures | -55…180 °C | Restricted [2) ] - check compatibility, especially with respect to fiber gasket, PTFE (Teflon), FPM (Viton), soft solder unsuitable<br><br>Cast iron at higher temperatures unsuitable<br><br>Non-ferrous metal suited to a limited extent, must be tested in individual case |

[1)] Supplier's Usage Instructions must be observed.
[2)] Restricted usage with regard to concentration or temperature

# Index


2-port valves
  product description .... 7
  valve characteristics .... 35
  with flanged connections .... 11
3-port valves
  product description .... 7
  valve characteristics .... 35
  with flanged connections .... 14
Abbreviations .... 61
Accessories
  adapters .... 17
  electrical .... 16
  mechanical .... 17
Acting direction .... 52
Actuator overview .... 15
Antifreeze .... 9, 64
Brines .... 9, 64
Calculation examples
  example for heat transfer oil .... 31
  example for steam .... 33
  example for water .... 29, 30
Calibration .... 53
Cavitation .... 39
Circulation .... 44
Commissioning .... 51
Compatibility .... 9, 56
Converting .... 54
Correction factor .... 25
Coupling .... 54
Dimensions .... 58
Direction of flow .... 47
Disposal .... 51
Engineering notes .... 43
Equipment combinations .... 11
Fields of use .... 10
Flanges
  connection .... 48
  faces .... 55
  types .... 55
Flow noise .... 44
Formulas .... 62
Function check .... 51
Installation .... 47
Kinematic viscosity
  flow chart .... 22
  impact on valve sizing .... 24, 61
Maintenance .... 51
Mechanical design .... 53
Medium
  heat transfer oil .... 42
  thermal oil .... 42
  water .... 40
  water with antifreeze .... 41
  water, deionized, demineralized, super-clean... 42
Medium quality .... 9, 40, 64
Medium temperature .... 36
Medium treatment .... 40
Mounting .... 47
Mounting positions .... 47
Operating pressure .... 36
Ordering .... 16
Plug stop .... 54
Product replacement .... 18
  2-port valves .... 18
  3-port valves .... 19
  Accessories .... 19
Rangeability .... 25
Spare parts .... 20
Stem heating element .... 50
Stem sealing gland .... 20
Strainer (dirt trap) .... 43
Technical data .... 56
Technical design .... 47, 53
Temperature range .... 9
Thermal insulation .... 45
Tightening torques .... 49
Trade names .... 64
Trademarks .... 5
Type plate .... 8
Type summary .... 11, 46
Use .... 9
Valve characteristic .... 52
Valve neck .... 54
Valve sizing
  fluids .... 21
  impact of fluid properties .... 23
  procedure .... 21
  steam .... 26
Valve stem .... 54
Warranty .... 46
Water vapor table .... 28
Weight .... 58

Siemens Switzerland Ltd.
Building Technologies Group
International Headquarters
Gubelstrasse 22
CH-6301 Zug
Phone +41 41-724 24 24
Fax +41 41-724 35 22
www.siemens.com/sbt