Acvatix™

2-port seat valves PN16 with flanged connection

VVF45..

- **Nodular cast iron EN-GJS-400-15 valve body**
- **DN 50...150**
- **k_{vs} 19...300 m^3/h**
- **Can be equipped with SKB..- or SKC..- electrohydraulic actuators**

Use

For use in district heating, heating, ventilating, and air conditioning systems as a control or safety shutoff valve
For open and closed circuits (mind "Cavitation", refer to page 5).

Type summary

Product number	DN	k_{vs} [m^3 / h]	S_v
VVF45.49	50	19	> 50
VVF45.50		31	> 100
VVF45.65	65	49	
VVF45.80	80	78	
VVF45.90	100	124	
VVF45.91	125	200	
VVF45.92	150	300	

DN = Nominal size
k_{vs} = Nominal flow rate of cold water (5…30 °C) through the fully open valve (H_{100}) by a differential pressure of 100 kPa (1 bar)
S_v = Rangeability k_{vs} / k_{vr}
k_{vr} = Smallest k_v value, at which the flow characteristic tolerances can still be maintained, by a differential pressure of 100 kPa (1 bar)

High performance versions

Product number	Type suffix	Description	Examples
VVF45..4	4	Sealing gland with PTFE sleeve for temperatures up to 180 °C	VVF45.65**4**

Accessories

Product number	Description
ASZ6.5	Electric stem heating element, AC 24 V / 30 W, required for media below 0 °C

Ordering

Example:

Product number	*Stock number*	*Designation*	*Quantity*
VVF45.50	VVF45.50	2-port seat valve PN16 with flanged connection	1

Delivery: Valves, actuators and accessories are packed and supplied separately.
The valves are supplied without counter-flanges and without flange gaskets.

Spare parts, Rev. no. See overview, page 11.

Equipment combinations

Valves		Actuators			
		SKB..		SKC..	
	H_{100}	Δp_{max}	Δp_s	Δp_{max}	Δp_s
	[mm]	[kPa]			
VVF45.49	20	1200	1600		
VVF45.50					
VVF45.65	40			1000	1600
VVF45.80				700	
VVF45.90				450	
VVF45.91				300	
VVF45.92				200	

H_{100} = Nominal stroke
Δp_{max} = Maximum permissible differential pressure across the valve, valid for the entire actuating range of the motorized valve
Δp_s = Maximum permissible differential pressure at which the motorised valve will close securely against the pressure (close off pressure).

Actuator overview

Product number	Actuator type	Operating voltage	Positioning signal	Spring return	Positioning time	Positioning force	Data sheet
SKB32.50	Electro-hydraulic	AC 230 V	3-position	-	120 s	2800 N	N4564
SKB32.51				Yes			
SKB82.50		AC 24 V		-			
SKB82.51				Yes			
SKB60			DC 0…10 V [1]	-			
SKB62..				Yes			
SKC32.60	Electro-hydraulic	AC 230 V	3-position	-	120 s	2800 N	N4566
SKC32.61				Yes			
SKC82.60		AC 24 V		-			
SKC82.61				Yes			
SKC60			DC 0…10 V [1]	-			
SKC62..				Yes			

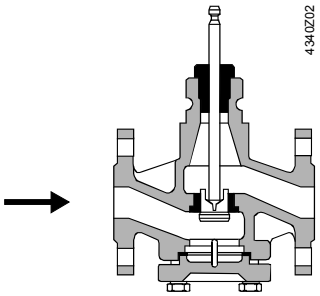
[1] or DC 4…20 mA or 0…1000 Ω

Pneumatic actuators

Do not use VVF45.. with pneumatic actuators.

Technical design / mechanical design

Valve cross section



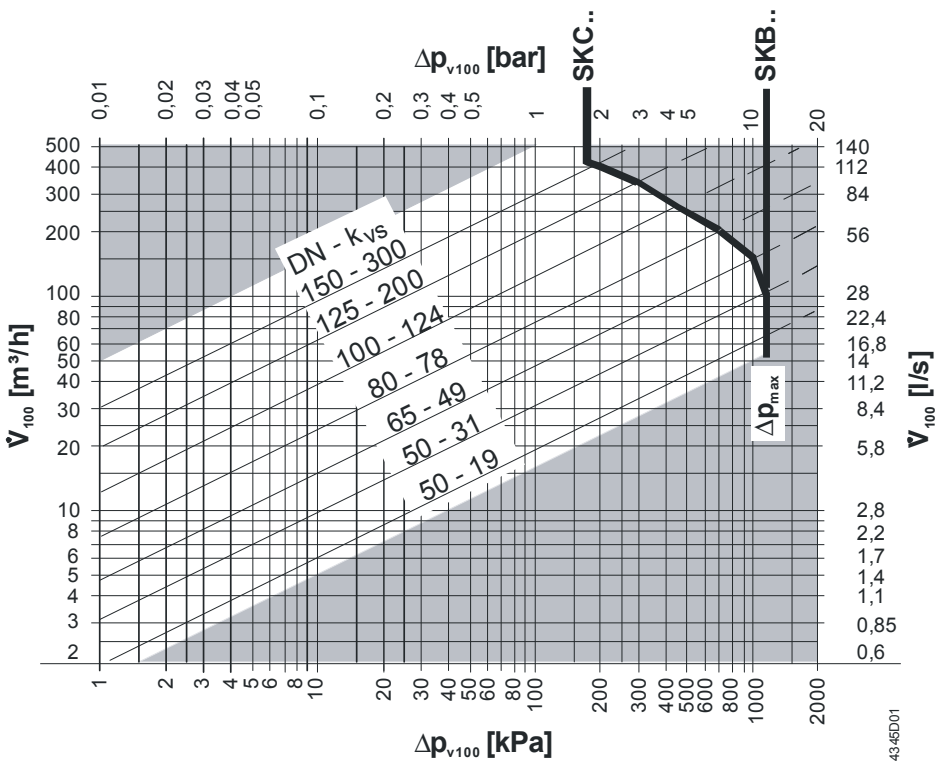
For all nominal sizes, a guided slot plug is used that is directly connected to the valve stem.

The seat is screwed to the valve body with the aid of special gland material.

Schematic representation, design variations are possible.

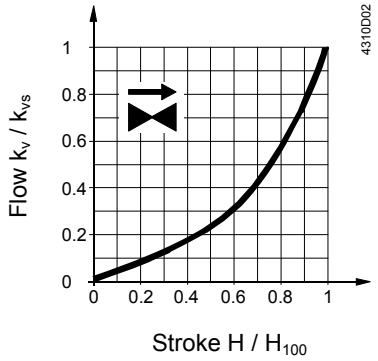
⚠ **The two-port seat valve does not become a three-port valve by removing the blank flange!**

Flow diagram



Δp_{max}	=	Maximum permissible differential pressure across the valve, valid for the entire actuating range of the motorised valve
Δp_{v100}	=	Differential pressure across the fully open valve and the valve's control path by a volume flow V_{100}
$\dot{V}_{100}$	=	Volume flow through the fully open valve (H_{100})
100 kPa	=	1 bar ≈ 10 mWC
1 m³/h	=	0.278 l/s water at 20 °C

Valve flow characteristic



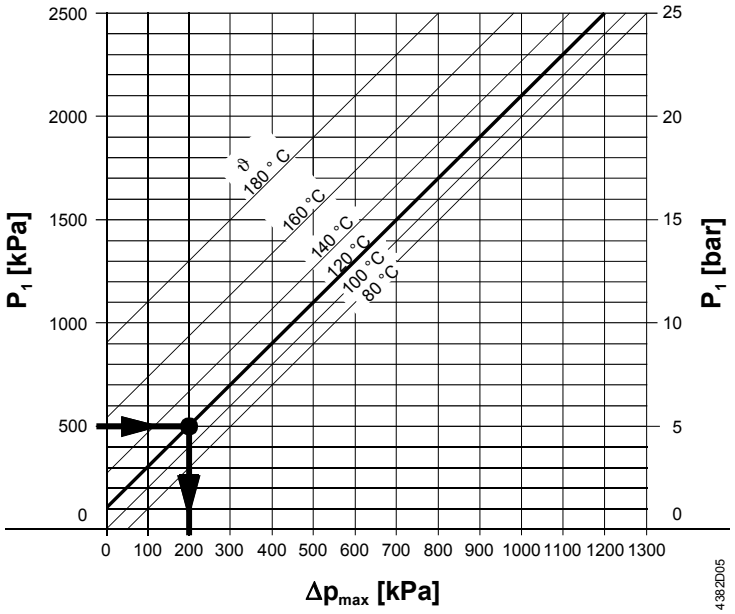
0…30 % → linear
30…100 % → equal percentage
n_{gl} = 3 as per VDI / VDE 2173

Cavitation

Cavitation accelerates wear on the valve plug and seat, and also results in undesirable noise. Cavitation can be avoided by not exceeding the differential pressure shown in the "Flow diagram" on page 4, and by adhering to the static pressures shown below.

Note on chilled water

To avoid cavitation in chilled water circuits ensure sufficient counter pressure at valve outlet, e.g. by a throttling valve after the heat exchanger. Select the pressure drop across the valve at maximum according to the 80 °C curve in the flow diagram below.



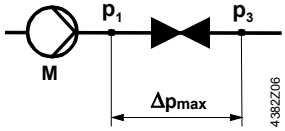
Δp_{max} = Differential pressure with valve almost closed, at which cavitation can largely be avoided

p_1 = Static pressure at inlet

p_3 = Static pressure at outlet

M = Pump

ϑ = Water temperature



High temperature hot water example:

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

From the diagram above, it will be seen that with the valve almost closed, the maximum permissible differential pressure Δp_{max} is 200 kPa (2 bar).

Chilled water example:

Spring water cooling as an example of avoiding cavitation:

Chilled water = 12 °C

p_1 = 500 kPa (5 bar)

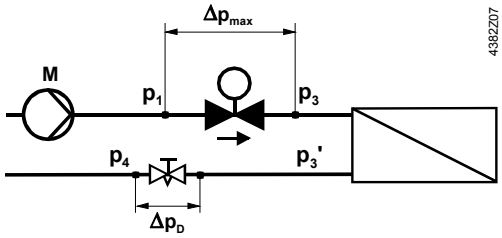
p_4 = 100 kPa (1 bar) (atmospheric pressure)

Δp_{max} = 300 kPa (3 bar)

$\Delta p_{3\text{-}3'}$ = 20 kPa (0.2 bar)

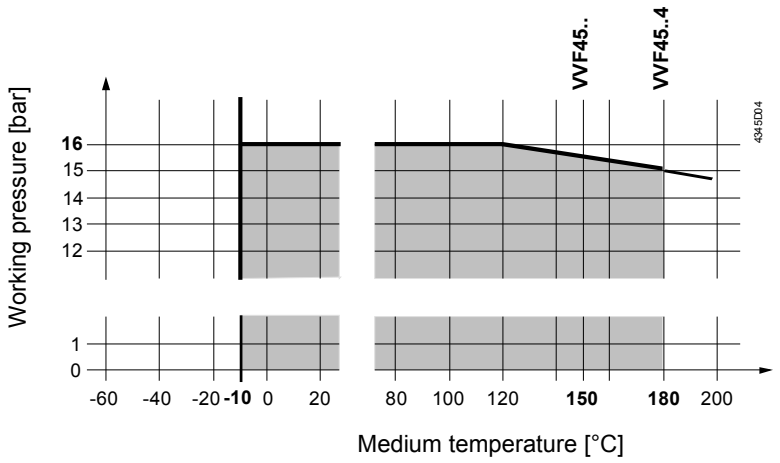
Δp_D (throttle) = 80 kPa (0.8 bar)

p_3' = pressure after consumer in kPa



Working pressure and medium temperature

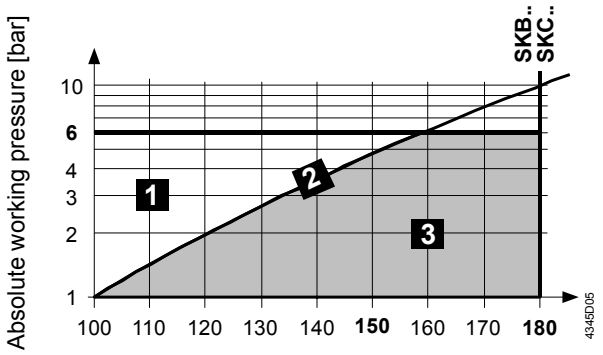
Fluids



Working pressure and medium temperature staged as per ISO 7005

Current local legislation must be observed.

Saturated steam
Superheated steam



< 150 °C: VVF45..
> 180 °C: VVF45..4

1	wet steam	avoid
2	saturated steam	permissible range of use
3	superheated steam	

Recommendation

For saturated steam and superheated steam the differential pressure Δp_{max} across the valve should be close to the critical pressure ratio.

$$\text{Pressure ratio} = \frac{p_1 - p_3}{p_1} \cdot 100\%$$

p_1 = absolute pressure before valve in kPa
p_3 = absolute pressure after valve in kPa

Calculation of the k_{vs} value for steam

Subcritical range

$$\frac{p_1 - p_3}{p_1} \cdot 100\% < 42\%$$

Pressure ratio < 42% subcritical

$$k_{vs} = 4.4 \cdot \frac{\dot{m}}{\sqrt{p_3 \cdot (p_1 - p_3)}} \cdot k$$

Supercritical range

$$\frac{p_1 - p_3}{P_1} \cdot 100\% \geq 42\%$$

Pressure ratio ≥ 42% supercritical (not recommended)

$$k_{vs} = 8.8 \cdot \frac{\dot{m}}{p_1} \cdot k$$

$\dot{m}$ = steam quantity in kg/h
k = factor for superheating of steam = 1 + 0.0012 · ΔT (k = 1 for saturated steam)
ΔT = temperature differential in K between saturated steam and superheated steam

Example

given	saturated steam 143.6 °C p_1 = 400 kPa (4 bar) $\dot{m}$ = 1400 kg/h pressure ratio = 30 %	saturated steam 143.6 °C p_1 = 400 kPa (4 bar) $\dot{m}$ = 1400 kg/h pressure ratio = 42 % (supercritical permitted)
required	k_{vs}, valve type	k_{vs}, valve type
procedure	$p_3 = p_1 - \frac{30 \cdot p_1}{100}$ $p_3 = 400 - \frac{30 \cdot 400}{100} = 280 \text{ kPa } (2.8\text{bar})$ $k_{vs} = 4.4 \cdot \frac{1400}{\sqrt{280 \cdot (400 - 280)}} \cdot 1 = 33.6 \text{ m}^3/\text{h}$	$k_{vs} = 8.8 \cdot \frac{1400}{400} \cdot 1 = 30.8 \text{ m}^3/\text{h}$
selected	k_{vs} = 49 m^3/h ⇨ VVF45.654	k_{vs} = 31 m^3/h ⇨ VVF45.504

Notes

Engineering

We recommend installation in the return pipe, as the temperatures in this pipe are lower for applications in heating systems, which in turn, extends the stem sealing gland's life.

⚠ In open circuits the valve plug may seize as the result of scale deposits. In these applications, only the most powerful SKB.. or SKC.. actuators should be used. Further the valve should be exercised at regular intervals (two to three times per week). A strainer MUST be fitted at the valve inlet

Ensure cavitation free flow (refer to page 5).

⚠ To ensure the reliability of the valve, we recommend the fitting of a strainer at the valve inlet even in closed circuits.

⚠ For media below 0 °C, use the electric ASZ6.5 stem heating element to prevent the valve stem from freezing in the sealing gland. For safety reasons, the stem heating element has been designed for AC 24 V / 30 W operating voltage.

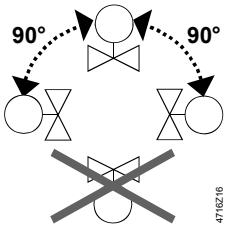
The use of these valves for steam is subject to specific parameters:
Observe diagram for steam on page 6 and "Technical data" on page 9!

Mounting

Both valve and actuator can easily be assembled at the mounting location. Neither special tools nor adjustments are required.

The valve is supplied with Mounting Instructions 74 319 0509 0.

Orientation



Direction of flow

When mounting, pay attention to the valve's flow direction symbol →.

Commissioning ⚠ **Commission the valve only if the actuator has been mounted correctly.**

Valve stem retracts:	valve opens	=	increasing flow
Valve stem extends:	valve closes	=	decreasing flow

Maintenance

VVF45.. valves require no maintenance.

Warning ⚠

When doing service work on the valve / actuator:

- Deactivate the pump and turn off the power supply
- Close the shutoff valves
- Fully reduce the pressure in the piping system and allow pipes to completely cool down

If necessary, disconnect the electrical wires.

Before putting the valve into operation again, make certain the actuator is correctly fitted.

Stem sealing gland

The glands can be exchanged without removing the valve, provided the pipes are depressurized and cooled off and the stem surface is unharmed.
If the stem is damaged in the gland range, replace the entire stem-plug-unit.
Contact your local office or branch.

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.
Current local legislation must be observed.

Warranty

The technical data given for these applications is valid only in conjunction with the Siemens actuators as detailed under "Equipment combinations", page 2.
All terms of the warranty will be invalidated by the use of actuators from other manufacturers.

Technical data

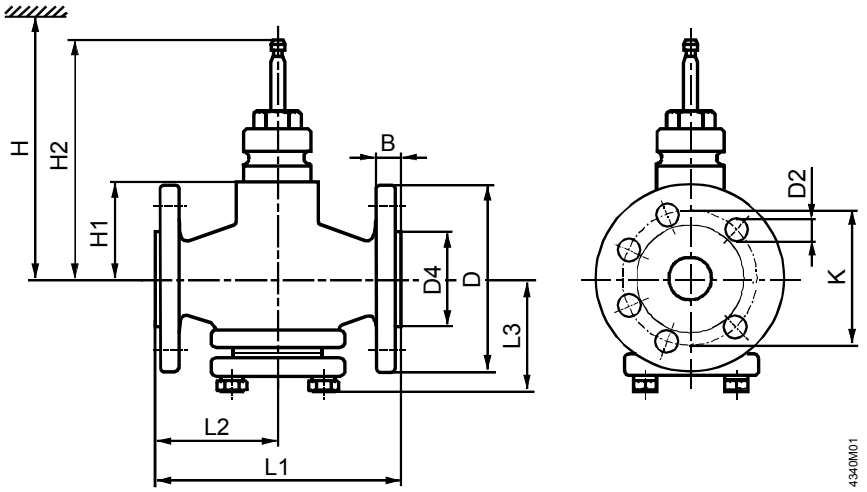
Functional data	PN class		PN 16 to ISO 7268
	Working pressure		to ISO 7005 within the permissible medium temperature range according to the diagram on page 6
	Flow characteristic	• 0…30 %	• linear
		• 30…100 %	• equal percentage; n_{gl} = 3 to VDI / VDE 2173
	Leakage rate		0…0.02 % of k_{vs} value to DIN EN 1349
	Permissible media:	water	cooling water, chilled water, low temperature hot water, high temperature hot water, water with anti-freeze; recommendation: water treatment to VDI 2035
		brine	
		steam	saturated steam, super-heated steam dryness at inlet minimum 0.98
		heat transfer oils	(use only valves with suffix 4)
	Medium temperature [1]		
	water, brine [2]	VVF45..	-10…150 °C
		VVF45..4	≤ 180 °C
	saturated steam	VVF45..4	≤ 180 °C ≤ 600kPa (6 bar) abs
	superheated steam	VVF45..4	≤ 180 °C ≤ 600kPa (6 bar) abs permissible temperature and pressure range according to the diagram on page 6
	heat transfer oils	VVF45..4	≤ 180 °C (use only valves with suffix 4)
	Rangeability S_v		DN 50…150: >100 (VVF45.49: > 50)
	Nominal stroke		DN 50: 20 mm DN 65…150: 40 mm
Industry standards	Pressure Equipment Directive Pressure Accessories		PED 97/23/EC as per article 1, section 2.1.4
	Fluid group 2:	• DN 50	• without CE-marking as per article 3, section 3 (sound engineering practice)
		• DN 65…125	• category I, with CE-marking
		• DN 150	• category II, with CE-marking, test authority number 0036
	Environmental compatibility		ISO 14001 (Environment) ISO 9001 (Quality) SN 36350 (Environmentally compatible products) RL 2002/95/EG (RoHS)
Materials	Valve body		nodular cast iron EN-GJS-400-15
	Stem		stainless steel
	Plug, seat		stainless steel
	Sealing gland		standard version: brass, silicon-free special version: stainless steel
	Gland materials		standard version: EPDM O-rings, silicon-free special version: VVF45..4: PTFE sleeves
Dimensions / Weight	Refer to "Dimensions", page 10		
	Flange connections		to ISO 7005

[1] For 150…180 °C use special versions with type suffix 4.

[2] Electric stem heating element ASZ6.5 required for media below 0 °C.

Dimensions

Dimensions in mm



Product number	DN	B	D	D2	D4	K	L1	L2	L3	H1	H2	H		kg
			Ø	Ø	Ø							SKB..	SKC..	[kg]
VVF45.49	50	20	165	19 (4x)	99	125	230	115	96	96	192.5	> 671		15
VVF45.50														
VVF45.65	65		185		118	145	290	145	126	114	230.5		> 689	23.5
VVF45.80	80	22	200		132	160	310	155	148	126	242.5		> 701	30
VVF45.90	100	24	220	19 (8x)	156	180	350	175	165	146	262.5		> 721	39
VVF45.91	125	26	250		184	210	400	200	184	163	279.5		> 738	59.5
VVF45.92	150		285	23 (8x)	211	240	480	240	210	186	302.5		> 761	82

DN = Nominal size

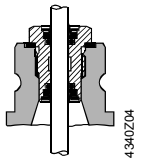
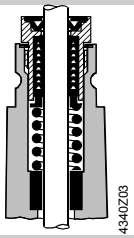
H = Total actuator height plus minimum distance to the wall or the ceiling for mounting, connection, operation, maintenance etc.

H1 = Dimension from the pipe centre to install the actuator (upper edge)

H2 = Valve in the «Closed» position means that the valve stem is fully extended

Spare parts

Order numbers for spare parts

	Sealing gland		Set
			Plug with stem, circlip, sealing
Product number	**VVF45..**	**VVF45..4**	**VVF45.., VVF45..4**
VVF45.49	4 679 5629 0	4 679 5630 0	74 676 0058 0
VVF45.50	4 679 5629 0	4 679 5630 0	74 676 0059 0
VVF45.65	4 679 5629 0	4 679 5630 0	74 676 0048 0
VVF45.80	4 679 5629 0	4 679 5630 0	74 676 0049 0
VVF45.90	4 679 5629 0	4 679 5630 0	74 676 0050 0
VVF45.91	4 679 5629 0	4 679 5630 0	74 676 0051 0
VVF45.92	4 679 5629 0	4 679 5630 0	74 676 0052 0

Revision numbers

Product number	Valid from rev. no.	Product number	Valid from rev. no.
VVF45.49	..03	VVF45.494	..02
VVF45.50	..03	VVF45.504	..02
VVF45.65	..03	VVF45.654	..02
VVF45.80	..03	VVF45.804	..02
VVF45.90	..03	VVF45.904	..02
VVF45.91	..03	VVF45.914	..02
VVF45.92	..03	VVF45.924	..02