SIEMENS

VVF47..

VXF47..

VVF42..C, VVF42..KC

VXF42..C

VVF52..KC

VVF53..C

Acvatix™
Valves
VVF47..,VXF47..,VVF42..C,VVF42..KC,VXF42..C, VVF52..KC, VVF53..C

Basic documentation

A6V10423210_en--_c
2024-04-19

Smart Infrastructure

Control Products and Systems

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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 3.1 Mounting and installation 3.2 Commissioning and maintenance 3.3 Disposal	**process oriented**
4	Functions and control 4.1 Selection of acting direction and valve characteristic 4.2 Calibration 4.3 Technical and mechanical design	**assembly oriented**

1.2 Revision history

Revision	Date	Changes	Section	Page(s)
c	2024-04-19	Added VVF53..C relevant info, updated V..F47, V..F42..C relevant info.	-	-
b	2023-04-19	Added VVF52..KC relevant info.	-	-

1.3 Reference documents

1.3.1 2- and 3-port valves with flanged connections

Type of document	VVF47.. VXF47..	VVF42..C VVF42..KC VXF42..C	VVF52..KC	VVF53..C
Data Sheet	N4419	A6V10794157	A6V14027860	A6V14669668
Mounting Instructions	M4419	A6V10794155	A6V13880003	DN 15...150: A5W00739629A DN 200, DN 250: A5W90000815
CE Declaration of Conformity (PED)	T4419	A6V10794200	A5W90001953A	DN 15...150: A5W00006523 DN 200, DN 250: A5W90001026
Environmental Declaration	E4419	A6V10794205	A5W00309337A	DN15...150: A5W00735647A DN200, DN250: A5W90001031

1.4 Before you start

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- Any corrections necessary are included in subsequent versions
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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

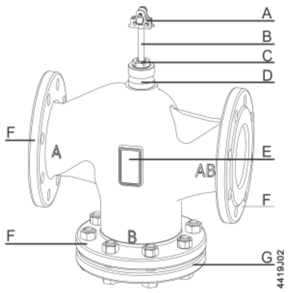
2.1 Product description

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

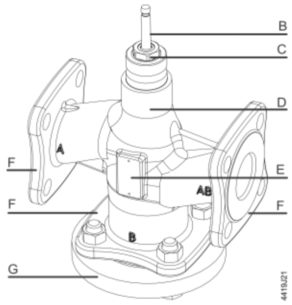
2.1.1 2-port valves

Type of valve	Product number	Connections
Standard valves	VVF47.., VVF42..C, VVF42..KC VVF52..KC, VVF53..C	Flanged

VVF47..



VVF42..C
VVF42..KC
VVF52..KC
VVF53..C



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D	**Valve neck**	40
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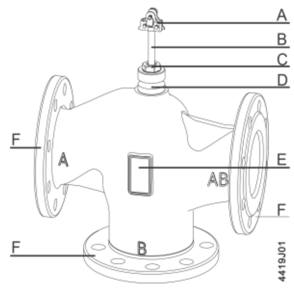
G	**Blank flange**	

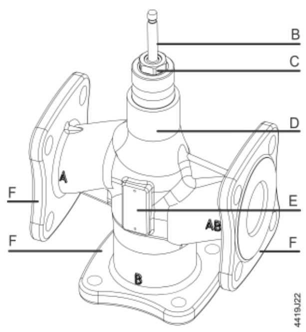
2.1.2 3-port valves

Type of valve	Product number	Connections
Standard valves	VXF47.., VXF42..C	Flanged

VXF47



VXF42..C



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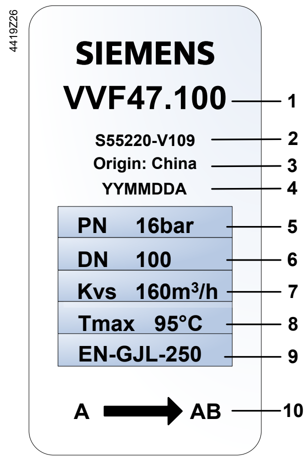
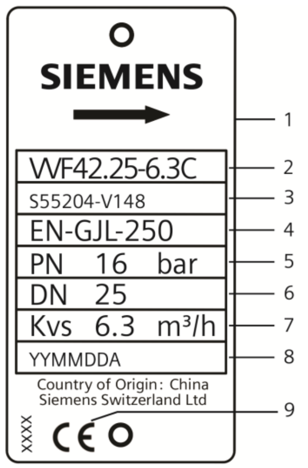
2.1.3 Type plate

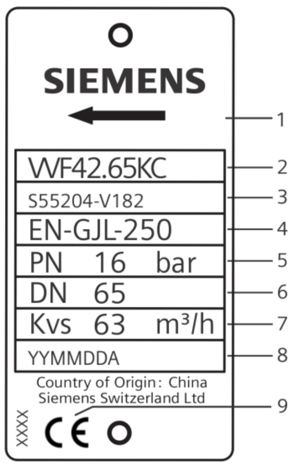
2-port valves



1 Product number
2 Stock number
3 Country of origin
4 Serial number
5 Nominal pressure class
6 Nominal size
7 k_{vs} value
8 Max. temperature range
9 Valve housing material
10 Flow direction



1. Flow direction for fluids
2. Product number
3. Stock number
4. Valve housing material
5. Nominal pressure class
6. Nominal size
7. K_{VS} value
8. Serial number
9. CE mark



1. Flow direction for fluids
2. Product number
3. Stock number
4. Valve housing material
5. Nominal pressure class
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7. K_{VS} value
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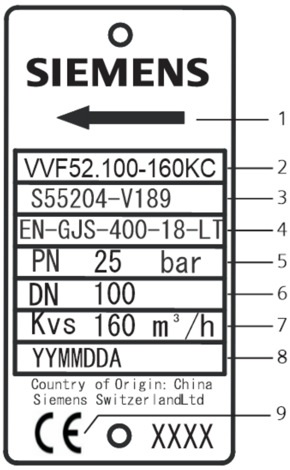
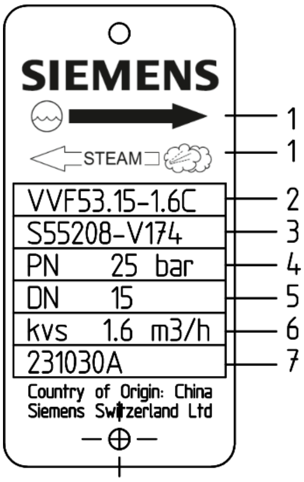


1. **1.** Flow direction for fluids
2. **2.** Product number
3. **3.** Stock number
4. **4.** Valve housing material
5. **5.** Nominal pressure class
6. **6.** Nominal size
7. **7.** K_{VS} value
8. **8.** Serial number



1. **1.** Flow direction for fluids
2. **2.** Product number
3. **3.** Stock number
4. **4.** Nominal pressure class
5. **5.** Nominal size
6. **6.** K_{VS} value
7. **7.** Serial number
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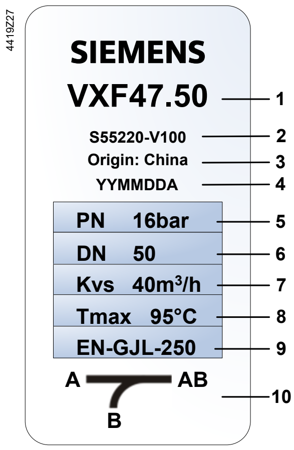
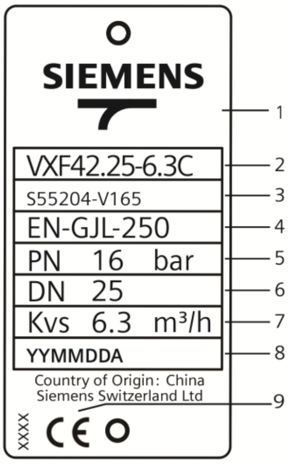
3-port valves



1 Product number
2 Stock number
3 Country of origin
4 Serial number
5 Nominal pressure class
6 Nominal size
7 k_{vs} value
8 Max. temperature range
9 Valve housing material
10 Flow direction



1 Flow direction for fluids
2 Product number
3 Stock number
4 Valve housing material
5 Nominal pressure class
6 Nominal size
7 K_{VS} value
8 Serial number
9 CE mark

2.2 Use

The valves are used as control or shutoff valves in heating, ventilation and air conditioning plants systems as a control valve.

For closed circuits only.

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 "2.13 Cavitation", page 38.

2.2.1 Compatibility with medium and temperature ranges

Medium	Temperature range		Valve				Note
	T_{min} (℃)	T_{max}(℃)	VVF42..C	VVF42..KC / VVF52..KC	VXF42..C	VVF53..C	
Cold water	1	25	■	■	■	■	-
Low-temperature hot water	1	130	■	■	■	■	-
High-temperature hot water [1]	130	150	■	■	■	■	-
	150	180	-	-	-	■	-
Water with antifreeze	-5	150	■	■	■	■	For medium temperatures below 0℃, the stem heating ASZ6.6 has to be installed.
	-10	150	■	■	■	■	
	-20	150	-	-	-	■	
Cooling water [2]	1	25	-	■	-	■	-
Brines	-5	150	■	■	■	■	For medium temperatures below 0℃, the stem heating ASZ6.6 has to be installed.
	-10	150	■	■	■	■	
	-20	150	-	-	-	■	
Super-clean water (demineralized and deionized water)	1	150	-	-	-	■	-
Demineralized water according to VDI 2035 / SWKI_B 102-01	1	150	■	■	■	■	-
	[1] Differentiation due to saturated steam curve [2] Open circuits						

2.2.2 Fields of use

Fields of use	Product number					
	3-port valves		2-port valves			
	VXF47..	VXF42..C	VVF47..	VVF42..C	VVF42..KC/ VVF52..KC	VVF53..C
Generation						
Boiler plants	-	■	-	■	■	■
District heating plants	-	-	-	■	■	■
Chiller plants	■	■	■	■	■	■
Cooling towers [1]	-	-	-	-	■	■
Distribution						
Heating groups	■	■	■	■	■	■
Air handling units	■	■	■	■	■	■

[1] Open circuits

2.3 Type summary and equipment combinations

2.3.1 2-port valves with flanged connections

∆pmax = Maximum permissible differential pressure across the valve, valid for the entire actuating range of the motorized valve

∆pS = Maximum permissible differential pressure at which the motorized valve will close securely against the pressure (close off pressure)

⧓	Actuators	Datasheet	Stroke / Positioning force		20 mm / 700 N		40 mm / 1600 N	
PN 16 	SBX.. SBV..	N4519 N4519						
Data sheet N4419, 1…95°C	Stock number	DN	k_{vs} [m³/h]	S_V	SBX..		SBV..	
					Δp_s [kPa]	Δp_{max} [kPa]	Δp_s [kPa]	Δp_{max} [kPa]
VVF47.50	S55220-V106	50	40	>50	300	300	-	-
VVF47.65	S55220-V107	65	63		175	175	400	300
VVF47.80	S55220-V108	80	100		100	100	250	250
VVF47.100	S55220-V109	100	160		-	-	400	300
VVF47.125	S55220-V110	125	250				400	300
VVF47.150	S55220-V111	150	315				400	300

⧓	Actuators	Data Sheet	Stroke / Positioning force		20 mm								40 mm					
					800 N		800 N		1000 N		2800 N		1600 N		1600 N		2800 N	
PN 16 	SAX.. SAV.. SKD.. SKB.. SKC..	N4501 N4503 N4561 N4564 N4566																
Data Sheet A6V10794157, -10…150 °C	Stock number	DN	k_{vs} [m³/h]	S_V	SBX..**		SAX..*		SKD..		SKB..		SBV..**		SAV..*		SKC..	
					Δp_s	Δp_{max}	Δp_s	Δp_{max}	Δp_s	Δp_{max}	Δp_s	Δp_{max}	Δp_s	Δp_{max}	Δp_s	Δp_{max}	Δp_s	Δp_{max}
					[kPa]													
VVF42.25-6.3C	S55204-V148	25	6.3	> 50	1600	400	1600	400	1600	400	1600	400	-	-	-	-	-	-
VVF42.25-10C	S55204-V149	25	10															
VVF42.32-16C	S55204-V150	32	16		900		900		1200									
VVF42.40-16C	S55204-V151	40	16		550		550		750				1250	400	1250	400		
VVF42.40-25C	S55204-V152	40	25															
VVF42.50-31.5C	S55204-V153	50	31.5	> 100	350	300	350	300	450		1200		750		750			
VVF42.50-40C	S55204-V154	50	40															
VVF42.65-50C	S55204-V155	65	50		200	150	200	150	250	200	700		450	400	450	400		
VVF42.65-63C	S55204-V156	65	63															
VVF42.80-80C	S55204-V157	80	80		125	75	125	75	175	125	450		250	225	250	225		
VVF42.80-100C	S55204-V158	80	100															
VVF42.100-125C	S55204-V159	100	125		-	-	-	-	-	-	-	-	160	125	160	125	-	-
VVF42.100-160C	S55204-V160	100	160															
VVF42.125-200C	S55204-V161	125	200										125	90	125	90	-	-
VVF42.125-250C	S55204-V162	125	250															
VVF42.150-315C	S55204-V163	150	315										80	60	80	60	-	-
VVF42.150-400C	S55204-V164	150	400															
VVF42.65KC	S55204-V182	65	63		1600	1800	1600	1800	1600	1800	1600	1800	-	-	-	-	-	-
VVF42.80KC	S55204-V183	80	100															
VVF42.100KC	S55204-V184	100	160		-	-	-	-	-	-	-	-	1600	500	1600	500	1600	1800
VVF42.125KC	S55204-V185	125	200															
VVF42.150KC	S55204-V186	150	315										1400		1400			

* Suitable for medium temperatures up to 130℃.

** Suitable for medium temperatures up to 95℃.

VVF52..KC	Actuators				SKD..		SKB..		SKC..	
										
PN 25	**Stroke**				**20 mm**		**20 mm**		**40 mm**	
	**Positioning force**				**1000 N**		**2800 N**		**2800 N**	
	Data sheet				**N4561**		**N4564**		**N4566**	
-10...150 ℃	**Stock number**	**DN**	**Kvs [m3/h]**	**Sv**	**Δps**	**Δpmax**	**Δps**	**Δpmax**	**Δps**	**Δpmax**
					[kPa]					
VVF52.65-63KC	S55204-V187	65	63	>100	2500	800	2500	800	-	-
VVF52.80-100KC	S55204-V188	80	100	>100						
VVF52.100-160KC	S55204-V189	100	160	> 100	-	-	-	-	2500	800
VVF52.125-200KC	S55204-V190	125	200	> 100						
VVF52.150-315KC	S55204-V191	150	315	> 100						

	Actuators	Data Sheet		Stroke Positioning force	20 mm						40 mm			
					800 N		1000 N		2800 N		1600 N		2800 N	
PN 25, PN 16 	SAX.. SKD.. SKB.. SAV.. SKC..	N4501 N4561 N4664 N4503 N4566												
Datasheet A6V14669668 -10…150 °C	Stock number	DN	Kvs [m³/h]	S_V	SAX..		SKD..		SKB..		SAV..		SKC..	
					Δp_s	Δp_{max}	Δp_s	Δp_{max}	Δp_s	Δp_{max}	Δp_s	Δp_{max}	Δp_s	Δp_{max}
					[kPa]									
VVF53.15-0.16C	S55208-V164	15	0.16	> 50	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-0.2C	S55208-V165	15	0.2	> 50	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-0.25C	S55208-V166	15	0.25	> 50	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-0.32C	S55208-V167	15	0.32	> 50	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-0.4C	S55208-V168	15	0.4	> 50	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-0.5C	S55208-V169	15	0.5	> 50	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-0.63C	S55208-V170	15	0.63	> 50	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-0.8C	S55208-V171	15	0.8	> 50	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-1C	S55208-V172	15	1	> 50	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-1.25C	S55208-V173	15	1.25	> 50	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-1.6C	S55208-V174	15	1.6	> 100	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-2C	S55208-V175	15	2	> 100	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-2.5C	S55208-V176	15	2.5	> 100	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-3.2C	S55208-V177	15	3.2	> 100	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.15-4C	S55208-V178	15	4	> 100	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.20-6.3C	S55208-V179	20	6.3	> 100	2500	1200	2500	1200	2500	1200	-	-	-	-
VVF53.25-5C	S55208-V180	25	5	> 100	1600	1200	2100	1200	2500	1200	-	-	-	-
VVF53.25-6.3C	S55208-V181	25	6.3	> 100	1600	1200	2100	1200	2500	1200	-	-	-	-
VVF53.25-8C	S55208-V182	25	8	> 100	1600	1200	2100	1200	2500	1200	-	-	-	-
VVF53.25-10C	S55208-V183	25	10	> 100	1600	1200	2100	1200	2500	1200	-	-	-	-
VVF53.32-16C	S55208-V184	32	16	> 100	900	750	1200	1100	2500	1200	-	-	-	-
VVF53.40-12.5C	S55208-V185	40	12.5	> 100	550	500	750	650	2000	1200	1250	1150	-	-
VVF53.40-16C	S55208-V186	40	16	> 100	550	500	750	650	2000	1200	1250	1150	-	-
VVF53.40-20C	S55208-V187	40	20	> 100	550	500	750	650	2000	1200	1250	1150	-	-
VVF53.40-25C	S55208-V188	40	25	> 100	550	500	750	650	2000	1200	1250	1150	-	-
VVF53.50-31.5	S55208-V127	50	31.5	> 100	350	300	450	400	1200	1150	750	700	-	-
VVF53.50-40	S55208-V128	50	40	> 100	350	300	450	400	1200	1150	750	700	-	-
VVF53.65-63	S55208-V129	65	63	> 100	-	-	-	-	-	-	450	400	700	650
VVF53.80-100	S55208-V130	80	100	> 100	-	-	-	-	-	-	250	225	450	400
VVF53.100-160	S55208-V131	100	160	> 100	-	-	-	-	-	-	160	125	300	250
VVF53.125-250	S55208-V132	125	250	> 100	-	-	-	-	-	-	125	90	175	160
VVF53.150-400	S55208-V133	150	400	> 100	-	-	-	-	-	-	80	60	125	100
VVF53.50-40K	S55208-V134	50	40	> 100	-	-	2500	1250	2500	1250	-	-	-	-
VVF53.65-63K	S55208-V135	65	63	> 100	-	-	-	-	-	-	-	-	2500	1250
VVF53.80-100K	S55208-V136	80	100	> 100	-	-	-	-	-	-	-	-	2500	1250
VVF53.100-150K	S55208-V158	100	150	> 100	-	-	-	-	-	-	-	-	2500	1250
VVF53.125-220K	S55208-V159	125	220	> 100	-	-	-	-	-	-	-	-	2500	1250
VVF53.150-315K	S55208-V160	150	315	> 100	-	-	-	-	-	-	-	-	2500	1250
VVF53.200-450K	S55208-V161	200	450	> 50	-	-	-	-	-	-	-	-	1200	800
VVF53.250-630K	S55208-V162	250	630	> 50	-	-	-	-	-	-	-	-	1000	800

2.3.2 3-port valves with flanged connections

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 motorized valve will close securely against the pressure (close off pressure)

	Actuators	Datasheet		Stroke Positioning force	20 mm	40 mm
					700 N	1600 N
PN 16 	SBX.. SBV..	N4519 N4519				
Data sheet					SBX..	SBV..
N4419	Stock number	DN	k_{vs}	S_V	Δp_{max}	Δp_{max}
1…95°C			[m^3/h]		[kPa]	
VXF47.50	S55220-V100	50	40		300	-
VXF47.65	S55220-V101	65	63		175	300
VXF47.80	S55220-V102	80	100	>50	100	250
VXF47.100	S55220-V103	100	160			200
VXF47.125	S55220-V104	125	250		-	100
VXF47.150	S55220-V105	150	315			75

	Actuators	Data Sheet		Stroke Positioning force	20 mm								40 mm					
					800 N		800 N		1000 N		2800 N		1600 N		1600 N		2800 N	
PN 16 	SBX.. SBV.. SAX.. SAV.. SKD.. SKB.. SKC..	N4519 N4519 N4501 N4503 N4561 N4564 N4566																
Data Sheet	**Stock number**	**DN**	k_{vs}	S_V	SBX..** Δp_{max}		SAX..* Δp_{max}		SKD.. Δp_{max}		SKB.. Δp_{max}		SBV..** Δp_{max}		SAV..* Δp_{max}		SKC.. Δp_{max}	
A6V10794157					A→AB B	AB→A B	A→AB B	AB→A B	A→AB B	AB→A B	A→AB B	AB→A B	A→AB B	AB→A B	A→AB B	AB→A B	A→AB B	AB→A B
-10…150 °C			[m^3/h]				[kPa]											
VXF42.25-6.3C	S55204-V165	25	6.3															
VXF42.25-10C	S55204-V166	25	10										-	-	-	-		
VXF42.32-16C	S55204-V167	32	16	> 50	400		400											
VXF42.40-16C	S55204-V168	40	16			100		100	400	100								
VXF42.40-25C	S55204-V169	40	25															
VXF42.50-31.5C	S55204-V170	50	31.5		300		300				-	-	400	100	400	100	-	-
VXF42.50-40C	S55204-V171	50	40															
VXF42.65-50C	S55204-V172	65	50		150		150		200	80								
VXF42.65-63C	S55204-V173	65	63			50		50										
VXF42.80-80C	S55204-V174	80	80		75		75		125	50			225	50	225	50		
VXF42.80-100C	S55204-V175	80	100	> 100														
VXF42.100-125C	S55204-V176	100	125										125		125		250	
VXF42.100-160C	S55204-V177	100	160															
VXF42.125-200C	S55204-V178	125	200		-	-	-	-	-	-	-	-	90	50	90	50	160	50
VXF42.125-250C	S55204-V179	125	250															
VXF42.150-315C	S55204-V180	150	315										60		60		100	
VXF42.150-400C	S55204-V181	150	400															

* Suitable for medium temperatures up to 130℃.
** Suitable for medium temperatures up to 95℃.

2.3.3 Overview of actuators

Product type	Stock number	Stroke	Positioning force	Operating voltage	Positioning signal	Spring return time	Positioning time	LED	Manual adjuster	Auxiliary functions
SBX51	S55160-A108	20 mm	700 N	AC 24 V	4…20 mA	-	120 s	-	Spanner	1)
SBX61	S55160-A100				DC 0…10 V					5)
SBX118.00/NB	S55160-A106				NB-IoT DC 0…10 V (0)4…20 mA					-
SBX118.00	S55160-A107				Modbus RTU DC 0…10 V (0)4…20 mA					
SBX81	S55160-A101				3-position					
SBX31	S55160-A102			AC 230 V						
SBV151	S55160-A109	40 mm	1600 N	AC 24 V	4…20 mA		180 s			5)
SBV61	S55160-A103				DC 0…10 V					
SBV81	S55160-A104				3-position					-
SBV31	S55160-A105			AC230 V						-
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	S55150-A100			AC 24 V DC 24 V	0…10 V 4…20 mA 0…1000 Ω			✓		2), 3)
SAX81.00	S55150-A102				3-position	-	120 s	-	Press and fix	1)
SAX81.03	S55150-A103						30 s			
SKD32.21	SKD32.21	20 mm	1000 N	AC 230 V	3-position	8 s	Opening: 30 s 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 4…20 mA 0…1000 Ω	-	Opening: 30 s Closing: 15 s	✓		2)
SKD62 **SKD62U**	SKD62 SKD62U					15 s				
SKD62UA	SKD62UA									4)
SKD82.50 **SKD82.50U**	SKD82.50 SKD82.50U				3-position	-	120 s	-		1)
SKD82.51 **SKD82.51U**	SKD82.51 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 4…20 mA 0…1000 Ω	-	Opening: 120 s Closing: 20 s	✓		2)
SKB62 **SKB62U**	SKB62 SKB62U					10 s				
SKB62UA	SKB62UA									4)
SKB82.50 **SKB82.50U**	SKB82.50 SKB82.50U				3-position	-	120 s	-		1)
SKB82.51 **SKB82.51U**	SKB82.51 SKB82.51U					10 s				
SAV31.00	S55150-A112	40 mm	1600 N	AC 230 V	3-position	-	120 s	-	Press and fix	-
SAV61.00 **SAV61.00U**	S55150-A110 S55150-A110-A100			AC 24 V DC 24 V	DC 0... 10V DC 4... 20 mA 0... 1000 Ω			✓		2)
SAV81.00 **SAV81.00U**	S55150-A111 S55150-A111-A100				3-position			-		-
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 4…20 mA 0…1000 Ω	-	Opening: 120 s Closing: 20 s	✓		2)
SKC62 **SKC62U**	SKC62 SKC62U					20 s				
SKC62UA	SKC62UA									4)
SKC82.60 **SKC82.60U**	SKC82.60 SKC82.60U				3-position	-	120 s	-		1)
SKC82.61 **SKC82.61U**	SKC82.61 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
[5] 4…20 mA function module

2.4 Ordering

Example

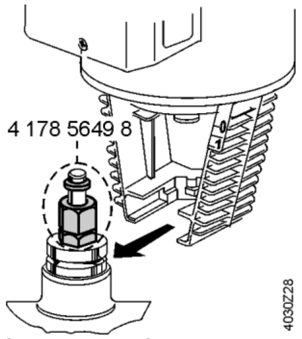
Product type	Stock number	Quantity
VXF42.65-63C	S55204-V173	1
SKD32.50	BPZ:SKD32.50	1

Delivery
Valves, actuators and accessories are packed and delivered as separate items.
Counter-flanges, bolts, and gaskets must be provided on site.

2.5 Accessories

Product type	Stock number	Description	Note	Example
ASZ6.6	S55845-Z108	Stem heating element	Required for medium temperatures <0℃.	

2.6 Product replacement



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

The VVF42..C, VXF42..C valves replace the valves of the C/VVF31../VXF31.., C/VVF40../VXF40.. lines that have been produced by Siemens Beijing plant.

For most types of valves operating in the field, a one-to-one replacement is available.

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.

2-port valves with flanged connections					Replacement	
Type		DN	Adapter	Stem coupling [1]	Product type	DN
VVF31..	k_{VS}- 6.3, 10, 12, 16, 19, 25, 31, 40, 49, 63, 78, 100	15...80	-	-	VVF42..C	15...80
VVF31..	k_{VS}- 125, 160, 200, 250, 300, 315	100...150	-	4 178 5649 8	VVF42..C	100...150
VVF40..	k_{VS}- 6.3, 10, 12, 16, 19, 25, 31, 40, 49, 63, 78, 100	25...80	-	-	VVF42..C	15...80
VVF40..	k_{VS}- 125, 160, 200, 250, 300, 315	100...150	-	4 178 5649 8	VVF42..C	100...150
VVF31..	k_{VS}- 6.3, 10, 12, 16, 19, 25, 31, 40, 49, 63, 78, 100	15...80	-	-	VXF42..C	15...80
VVF31..	k_{VS}- 125, 160, 200, 250, 300, 315	100...150	-	4 178 5649 8	VXF42..C	100...150
VVF40..	k_{VS}- 6.3, 10, 12, 16, 19, 25, 31, 40, 49, 63, 78, 100	25...80	-	-	VXF42..C	15...80
VVF40..	k_{VS}- 125, 160, 200, 250, 300, 315	100...150	-	4 178 5649 8	VXF42..C	100...150

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

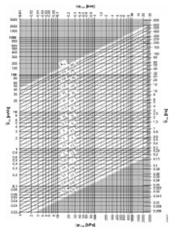
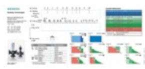
2.7 Spare parts

Stem sealing gland for	DN	Stock number	Example
VVF42..C VVF42..KC VVF52..KC VXF42..C VVF53..C	25...80	BPZ: 428488060	Stem sealing gland 
VVF42..C VVF42..KC VVF52..KC VXF42..C	100…150	BPZ: 467956290	

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:

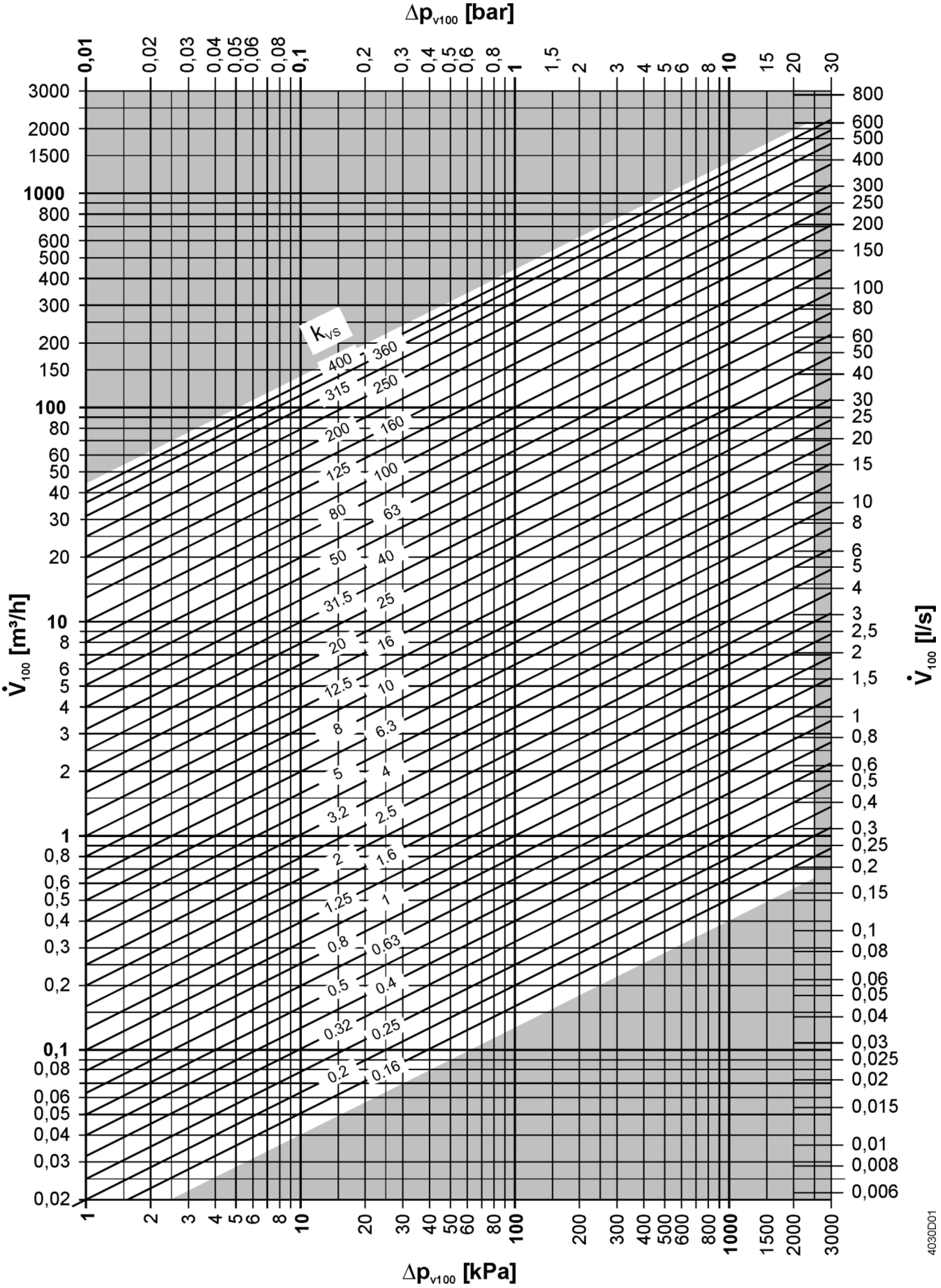
Sizing and selection of valves and actuators		
1	Determine the basic hydraulic circuit	-
2	Determine Δp_{VR} or Δp_{MV}	One of the factors that determines control stability is the valve authority P_V. It is determined depending on the type of header and the hydraulic circuit • Header with pressure and variable volumetric flow Continue with Δp_{VR} • Header with pressure and constant volumetric flow, or • Header with low differential pressure and variable volumetric flow Continue with Δp_{MV}
3	Determine Δp_{V100}	$\Delta p_{V100} \geq \frac{\Delta p_{VR}}{2}$	$\Delta p_{V100} \geq \Delta p_{MV}$
4	Determine the volumetric flow V_{100}	Determine V_{100} depending on the type of medium Water without antifreeze: $\dot{V}_{100} = \frac{\dot{Q}_{100}}{1.163 \cdot \Delta T}$ Water with antifreeze, heat transfer oil: $\dot{V}_{100} = \frac{\dot{Q}_{100} \cdot 3600}{c \cdot \rho \cdot \Delta T}$
5	Determine the k_{vs} value	There are different ways to determine the k_{vs} value: Flow chart  By way of calculation $k_V = \frac{\dot{V}_{100}}{\sqrt{\frac{\Delta p_{V100}}{100}}}$ Determine the k_{vs} value according to: $0.85 \cdot k_V - \text{value} < k_{VS} - \text{value}$ [1] or within the following band: $0{,}74 \cdot k_{VS} - \text{value} < k_V < 1.175 \cdot k_{VS} - \text{value}$ HIT sizing and selection: www.siemens.com/hit Valve slide rule  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 Δp_{V100}	The resulting differential pressure Δp_{V100} is used for calculating the valve authority P_V: $\Delta p_{V100} = 100 \cdot \left(\frac{\dot{V}_{100}}{k_{vs}}\right)^2$
7	Select a suitable line of valves	Select the type of valve (2-port, 3-port, or 3-port valve with bypass): • Type of connection (flanged, externally or internally threaded, soldered) • PN class • Nominal size DN • Maximum or minimum medium temperature • Type of medium
8	Check the valve authority P_V (control stability)	Check P_V with the resulting differential pressure Δp_{V100}: • Header with pressure and variable volumetric flow $P_V = \frac{\Delta p_{V100}}{\Delta p_{VR}}$ • Header with pressure and constant volumetric flow, or • Header with low differential pressure and variable volumetric flow $P_V = \frac{\Delta p_{V100}}{\Delta p_{V100} + \Delta p_{MV}}$
9	Select the actuator	Select the actuator according to the following criteria: • Operating voltage • Positioning signal • Positioning time • Spring return function • Auxiliary functions
10	Check the working ranges	Differential pressure $\Delta p_{max} > \Delta p_{V0}$ 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 mm²/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 ν

The kinematic viscosity ν 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 ν 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 ν, a correction must be made. Up to a kinematic viscosity ν 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).

2.8.5 Rangeability Sv, minimum controllable output Qmin

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 Δp 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 Δp_{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.

Steam mass flow $\dot{m} = \frac{Q_{100} \cdot 3600}{r_{p_1}}$	Pressure ratio = $\frac{p_1 - p_3}{p_1} \cdot 100\%$

Calculation of k_{vs} value for steam

Subcritical range

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

Pressure ratio < 42 % subcritical

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

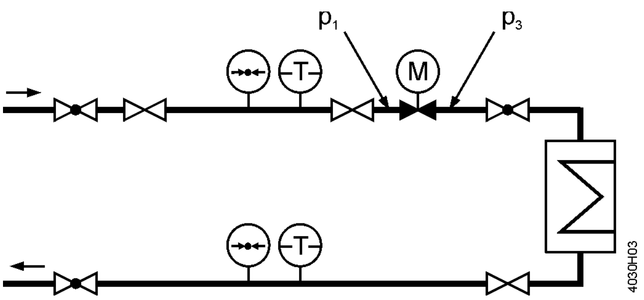
Supercritical range

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

Pressure ratio ≥ 42 % supercritical (not recommended)

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

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 ΔT (for saturated steam, k = 1)
ΔT = 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 Δp_{max}

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

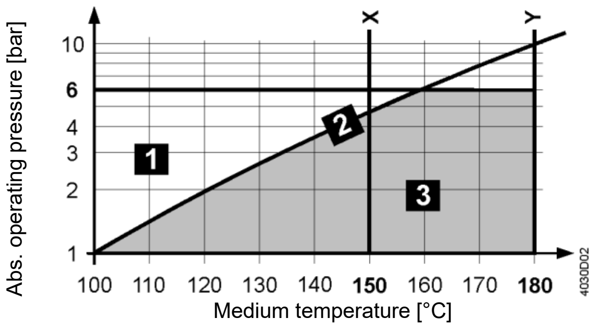


Chart example: The chart of the selected valve must be observed. The detailed diagrams for the valve lines can be found in the respective data sheets.
X and Y: Suitable actuators, depending on the 2-port valve

Water vapor table

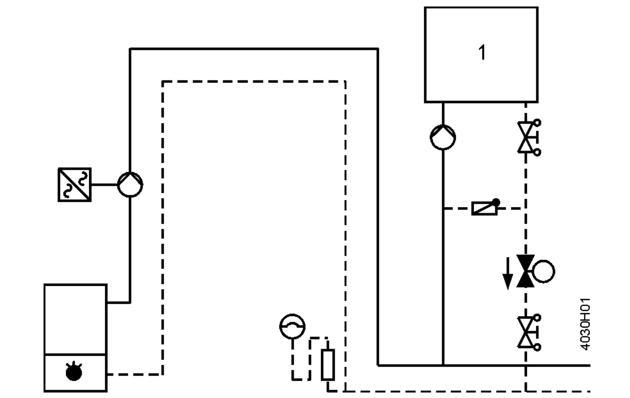
1	Water	-
2	Wet steam	To be avoided
3	Saturated steam Superheated steam	Permissible operating range

Water vapor table for the saturated state (pressure table)

Pressure p [kPa]	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

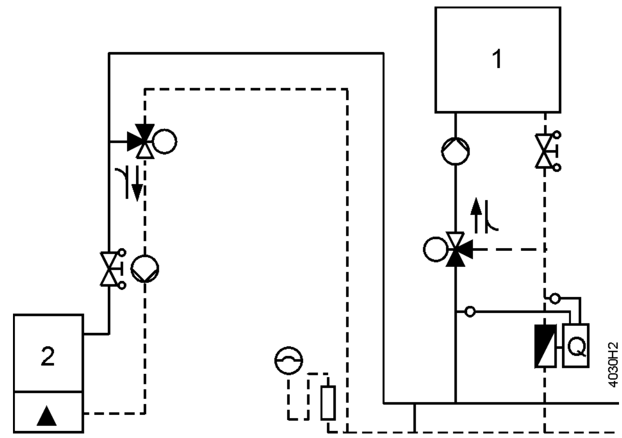
2.10.1 Example for water: Heater with pressure and variable volumetric flow

HVAC plant using a header with pressure, header with variable volumetric flow		**Air heating coil 1** Flow 60 °C Return 40 °C Supply air 20 °C Outside air 10 °C Output 510 kW Δp_{VR} 34 kPa Δp_{piping} 11 kPa **Other plant data** Pressure class PN 16 Control DC 0…10 V Operating voltage AC 24 V

1	Determine the basic hydraulic circuit	Injection circuit with 2-port valve
2	Determine Δp_{VR} or Δp_{MV}	With pressure and variable volumetric flow → Δp_{VR} Δp_{VR} = 34 kPa
3	Determine Δp_{V100}	With pressure and variable volumetric flow → $\Delta p_{V100} \geq \frac{\Delta p_{VR}}{2}$ Δp_{V100} = 17 kPa
4	Determine the volumetric flow V_{100}	$\dot{V}_{100} = \frac{Q_{100}}{1.163 \cdot \Delta T} = \frac{510\,kW}{1.163 \cdot (60\,°C - 40\,°C)} = 21.9\,m^3/h$
5	Determine the k_{vs} value	*Flow chart* Use the flow chart to determine the k_{vs} value: 1. k_{vs} value: 40 m^3/h 2. k_{vs} value: 63 m^3/h *By way of calculation* $k_v = \frac{\dot{V}_{100}}{\sqrt{\frac{\Delta p_{V100}}{100}}} = \frac{21.9\,m^3/h}{\sqrt{\frac{17\ kPa}{100}}} = 53.2 m^3/h$ k value ≥ 0.85 • 53.2 m^3/h = 45.2^3/h → k_{vs} value = 40 m^3/h or 63 m^3/h 1. k_{vs} value: 40 m^3/h 2. k_{vs} value: 63 m^3/h
6	Check the resulting differential pressure Δp_{V100}	First k_{vs} value: $\Delta p_{V100} = 100 \cdot \left(\frac{\dot{V}_{100}}{k_{vs}}\right)^2 = 100 \cdot \left(\frac{21.9\,m^3/h}{40\,m^3/h}\right)^2 = 30.0\,kPa$ Second k_{vs} value: $\Delta p_{V100} = 100 \cdot \left(\frac{\dot{V}_{100}}{k_{vs}}\right)^2 = 100 \cdot \left(\frac{21.5 m^3/h}{63 m^3/h}\right)^2 = 12.1 kPa$
7	Select suitable line of valves	• 2-port valve (resulting from the basic hydraulic circuit) • Flanged (specified by the planner) • PN class 16 (specified by the planner) • Nominal size DN (resulting from the selected valve) • Maximum medium temperature: 60 °C • Type of medium: Water → 1st selection: VVF47.50 2nd selection: VVF47.65

8	Check the valve authority P_V (control stability)	Check p_v using the resulting differential pressure Δp_{V100}: First k_{vs} value: $P_V = \frac{\Delta p_{V100}}{\Delta p_{VR}} = \frac{30.0\,kPa}{34\,kPa} = 0.88$ Second k_{vs} value: $P_V = \frac{\Delta p_{V100}}{\Delta p_{VR}} = \frac{12.1\,kPa}{34\,kPa} = 0.36$ → Lower valve authority p_v → k_{vs} value = 63 m^3/h
9	Select the actuator	Select actuator according to the following criteria: Operating voltage Positioning signal Positioning time Spring return function Auxiliary functions
10	Check the working ranges	Differential pressure $\Delta p_{max} > \Delta p_{v0}$ Closing pressure $\Delta p_s > H_0$
11	Select valve and actuator	Type of valve: VVF47.65 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** Flow 60 °C Return 45 °C Output 70 kW $\Delta p_{heat\ meter}$ 8 kPa Δp_{piping} 3 kPa **Other plant data** Pressure class PN 16 Control 3-position Operating voltage AC 230 V **1** Heating group 1 **2** Boiler 1

1	Determine the basic hydraulic circuit	Mixing circuit
2	Determine Δp_{VR} or Δp_{MV}	Header with low differential pressure and variable volumetric flow → Δp_{MV} $\Delta p_{MV} = \Delta p_{piping} + \Delta p_{heat\ meter}$ = 3 kPa + 8 kPa = 11 kPa
3	Determine Δp_{V100}	Header with low differential pressure and variable volumetric flow → $\Delta p_{V100} \geq \Delta p_{MV}$ Δp_{V100} = 11 kPa
4	Determine the volumetric flow V_{100}	$\dot{V}_{100} = \frac{Q_{100}}{1.163 \cdot \Delta T} = \frac{700\,kW}{1.163 \cdot (60\,°C - 45\,°C)} = 40\,m^3/h$
5	Determine the k_{vs} value	*Flow chart* Use the flow chart to determine the k_{vs} value: k_{vs} value: 120 m^3/h *By way of calculation* $k_v = \frac{\dot{V}_{100}}{\sqrt{\frac{\Delta p_{V100}}{100}}} = \frac{40\,m^3/h}{\sqrt{\frac{11\,kPa}{100}}} = 121\,m^3/h$ k_{vs} value ≥ 0.85 • 121 m^3/h = 102 m^3/h → k_{vs} value = 100 m^3/h

		k_{vs} value: 100 m^3/h
6	Check the resulting differential pressure Δp_{V100}	$$\Delta p_{V100} = 100 \cdot \left(\frac{\dot{V}_{100}}{k_{vs}}\right)^2 = 100 \cdot \left(\frac{40\, m^3/h}{100\, m^3/h}\right)^2 = 16\ kPa$$
7	Select suitable line of valves	• 2-port valve (resulting from the basic hydraulic circuit) • Flanged (specified by the planner) • PN class 16 (specified by the planner) • Nominal size DN (resulting from selected valve) • Maximum medium temperature: 60 °C • Type of medium: Water → Selection: VXF47.80
8	Check the valve authority P_V (control stability)	Check P_V using the resulting differential pressure Δp_{V100}: $$P_V = \frac{\Delta p_{V100}}{\Delta p_{V100} + \Delta p_{MV}} = \frac{16\,kPa}{16\,kPa + 11\,kPa} = 0.59$$
9	Select the actuator	Select actuator according to the following criteria: • Operating voltage • Positioning signal • Positioning time • Spring return function • Auxiliary functions
10	Check the working ranges	Differential pressure $\Delta p_{max} > \Delta p_{V0}$ Closing pressure $\Delta p_s > H_0$
11	Select valve and actuator	Type of valve: VXF47.80 Type of actuator: According to the table

2.10.3 Example for heat transfer oil

As outlined in chapter "**Error! Reference source not found.**", page **Error! Bookmark not defined.**, 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 Differential pressure Δp_{VR}: 50 kPa (0.5 bar) Flow temperature T_{VL}: 200 °C Return temperature T_{RL}: 150 °C Required capacity Q_{100}: 55 kW 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}	$\dot{V}_{100} = \frac{\dot{Q}_{100} \cdot 3600}{c \cdot \rho \cdot \Delta T}$ $\dot{V}_{100} = \frac{55\text{kW} \cdot 3600}{2{,}54\text{kJ/kgK} \cdot 750\text{kg/m}^3 \cdot 50\text{K}}$ $\dot{V}_{100} = 2{,}08 m^3/h$	-
Differential pressure Δp_{V100}	With pressure and variable volumetric flow → $\Delta p_{V100} \geq \frac{\Delta p_{VR}}{2}$ → Δp_{V100} = 25 kPa (0.25 bar)	Must be calculated
Flow temperature T_{VL}	200 °C	Approx. 20 °C
Kinematic viscosity ν	At 200 °C: 1.2 mm^2/s	50.5 mm^2/s
Correction factor F_R	At 200 °C: 1 Kinematic viscosity υ <10 mm^2/s	At 20 °C: 0.75 Interpolated according to the correction factor table on page 23
Determine the k_{vs} value	$k_V = \frac{\dot{V}100}{F_R} \cdot \frac{1}{\sqrt{\frac{\Delta p100}{100}}}$ $F_R = 1$ $k_v = \frac{\dot{V}_{100}}{\sqrt{\frac{\Delta p_{V100}}{100}}} = \frac{2{,}08 m^3/h}{\sqrt{\frac{25kPa}{100}}} = 4{,}16 m^3/h$ k_{vs}-Wert ≥ 0.85 · 4.16 m^3/h = 3.54 m^3/h -> k_{VS} value = 5 m^3/h	-
Volumetric flow resulting from the selected k_{vs} value	$\dot{V}_{100} = k_{vs} \cdot F_R \cdot \sqrt{\frac{\Delta p_{V100}}{100}}$ $\dot{V}_{100} = 5\, m^3/h \cdot 1 \cdot \sqrt{\frac{25\text{ kPa}}{100}}$ $\dot{V}_{100} = 2.5\, m^3/h$	$\dot{V}_{100} = k_{vs} \cdot F_R \cdot \sqrt{\frac{\Delta p_{V100}}{100}}$ $\dot{V}_{100} = 5\, m^3/h \cdot 0.75 \cdot \sqrt{\frac{25\text{ kPa}}{100}}$ $\dot{V}_{100} = 1.9\, m^3/h$ → In the heating up phase, the volumetric flow is reduced by 5 %!
Select the 2-port valve	VVF63.25-5	

2.10.4 Example for steam

As outlined in chapter “**Error! Reference source not found.**”, page **Error! Bookmark not defined.**, it must be determined first whether a supercritical or subcritical pressure ratio exists in the plant.

Example 1: By way of calculation

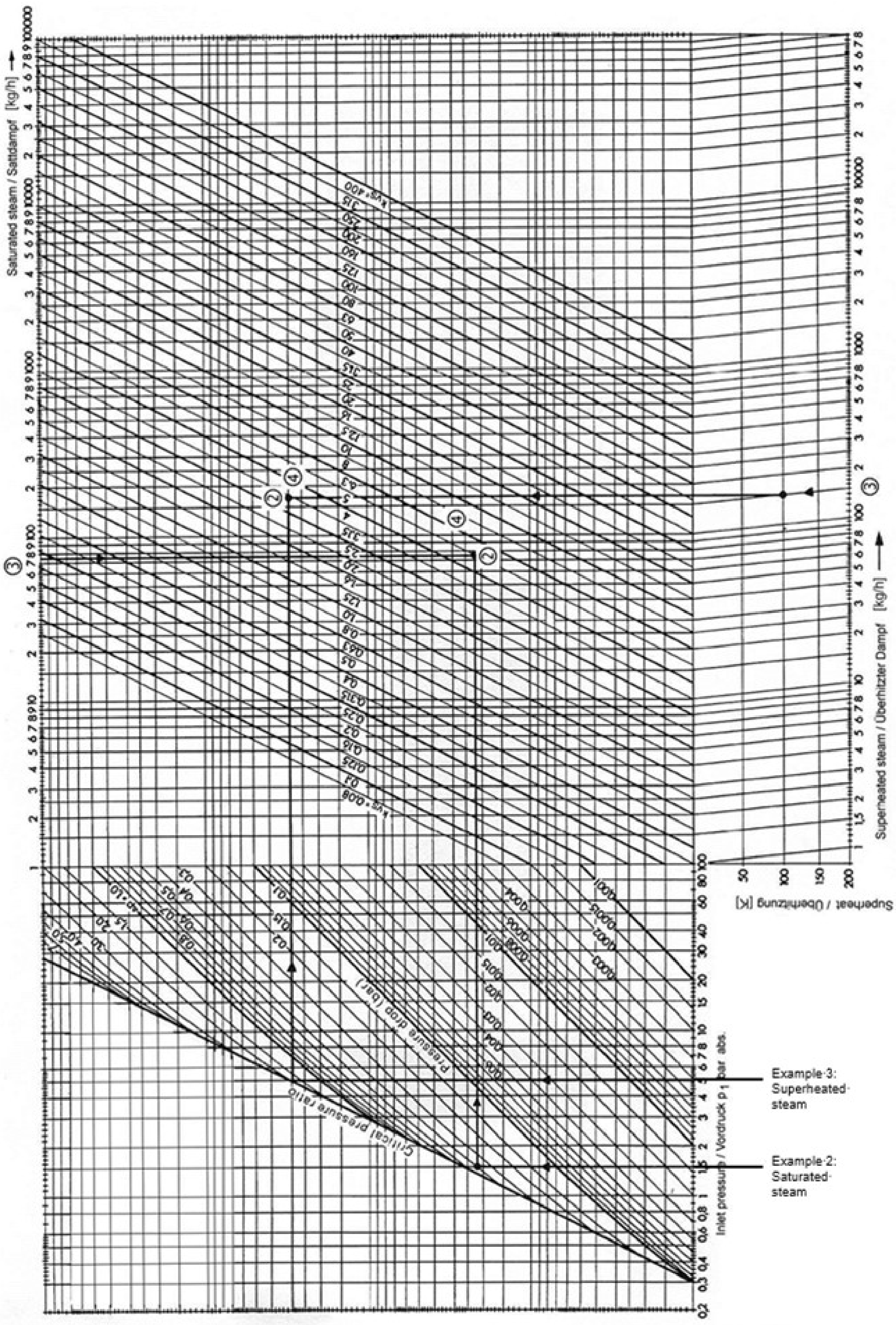
	Saturated steam = 151.8 °C Prepressure p_1 = 500 kPa (5 bar) Steam mass flow $\dot{m}$ = 460 kg/h	
Given	Pressure ratio = 30 %	Pressure ratio ≥ 42 % (supercritical permitted)
	Subcritical pressure ratio	**Supercritical pressure ratio**
Required	k_{vs}, valve type	k_{vs}, valve type
Solution	$p_3 = p_1 - \frac{30\% \cdot p_1}{100\%}$ $p_3 = 500\,kPa - \frac{30\% \cdot 500\,kPa}{100\%} = 350\,kPa\,(3.5bar)$ $k_v = 4.4 \cdot \frac{460\,kg/h}{\sqrt{350\,kPa \cdot (500\,kPa - 350\,kPa)}} \cdot 1$ k_v = 8.83 m^3/h	$k_v = 8.8 \cdot \frac{460\,kg/h}{500\,kPa} \cdot 1$ 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 = 111.4 °C Prepressure p_1 = 150 kPa (1.5 bar) Steam mass flow $\dot{m}$ = 75 kg/h 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). 2. Horizontal line to the right to the point of intersection 1.5 bar (15 kPa) and differential pressure 0.4 bar (40 kPa). 3. Vertical line downward to 75 kg/h. 4. Point of intersection k_{vs} value Select available k_{vs} value of VVF.. valve lines. 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 Saturated steam = 151.8 °C Superheating ΔT = 100 K Prepressure p_1 = 500 kPa (5 bar) Steam mass flow $\dot{m}$ = 150 kg/h 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). 2. Horizontal line to the right to the point of intersection 5 bar (500 kPa) and differential pressure 2 bar (200 kPa). 3. Scale "Superheated steam": Along the line at 150 kg/h upward to superheating at 100 K, then the vertical line upward. 4. Point of intersection k_{vs} value Select available k_{vs} value of VVF.. valve lines. 5. Selected kvs value: 3.15 m^3/h.
Selected	k_{vs} value: 3.15 m^3/h → VVF53.15-3.2

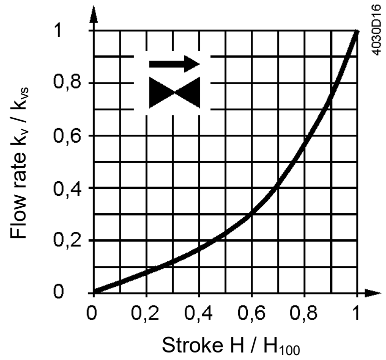

Example 3:
Superheated steam
Example 2:
Saturated steam

2.11 Valve characteristics

2.11.1 2-port valves

For VVF47..
VVF42.. C
VVF42..KC

other than
VVF47.125-250
VVF47.150-315
VVF42.125-250C
VVF42.150-400C

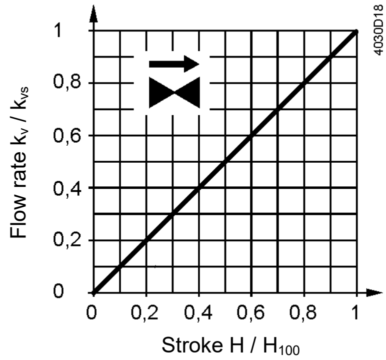


0…30 %: Linear
30…100 %: Equal-percentage
n_{gl} = 3 as per VDI / VDE 2173

The design of the characteristic are according to LGBR(SBT)

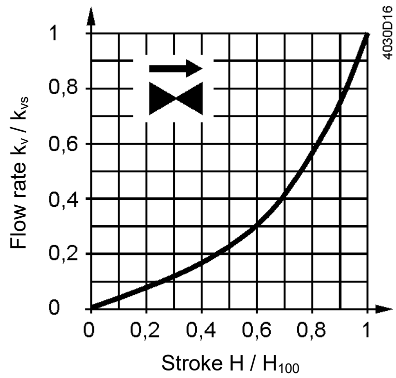
For valve k_{vs}-values 100 and 160m³/h & V.F42.150-315C, the characteristic is optimized for maximum volumetric flow k_{V100} at 80 %...100 %

For :
VVF47.125-250
VVF47.150-315
VVF42.125-250C
VVF42.150-400C



0…100 %: Linear

For:
VVF52..KC

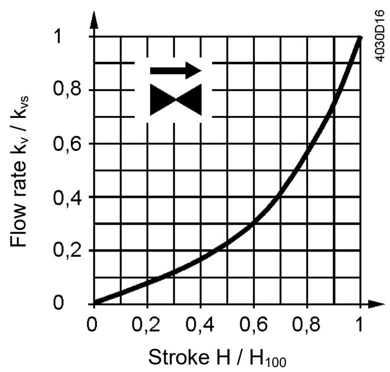


0...30 %: Linear

30...100 %: Equal percentage (n_{gl} = 3 to VDI/VDE 2173)

The characteristic can be optimized for maximum volumetric flow k_{V100} at 80...100 %.

For:
VVF53..C

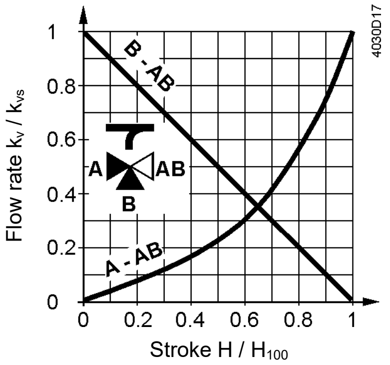


0…30 %: Linear
30…100 %: Equal percentage
n_{gl} = 3 to VDI / VDE 2173

For high k_{vs} values the valve characteristic is optimized for maximum volumetric flow k_{V100}.

2.11.2 3-port valves

For VXF47..
VXF42..C
other than
VXF42.125-250C
VXF42.150-400C

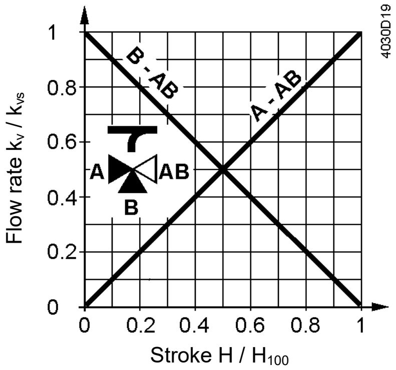


Through port A-AB
0...30 %: Linear
30...100 %: Equal-percentage
n_{gl} = 3 as per VDI / VDE 2173

For valve k_{vs}-values ≥ 100m³/h, the characteristic is optimized for maximum volumetric flow k_{V100} at 80 %...100 %

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

For :
VXF42.125-250C
VXF42.150-400C



Through port A-AB
0... 100 %: Linear
Bypass B-AB
0... 100 %: Linear

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

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 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

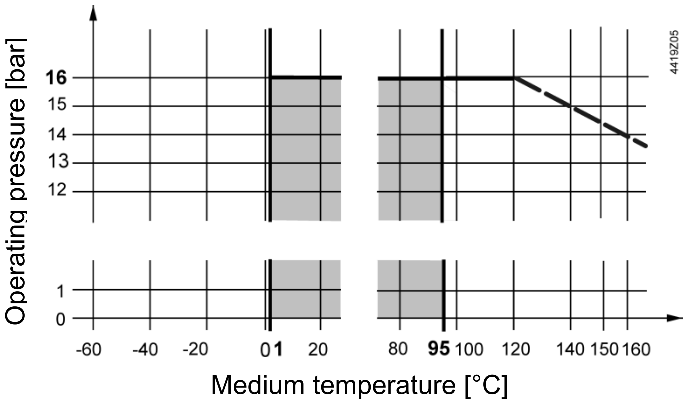
2.12.2 PN 16 valves with flanged connections

Operating pressure and operating temperatures according to ISO 7005, EN 1092 and EN 12284

!	***NOTICE***
	All relevant local directives must be observed.

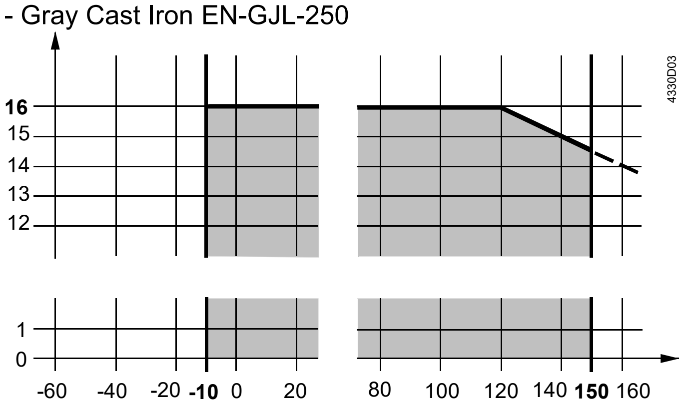
Figures in this section: X-axis: Medium temperature (℃); Y-axis: Operating pressure (bar)

For valves VVF47.. and VXF47...

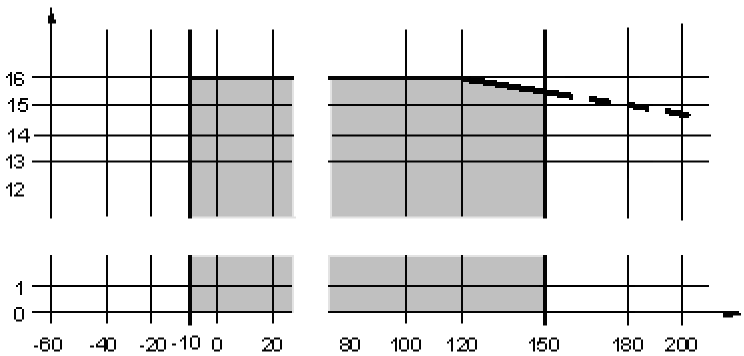


For valves VVF42.. and VXF42...

- Gray Cast Iron EN-GJL-250



- PN16 Nodular Cast Iron EN-GJS-400-18-LT



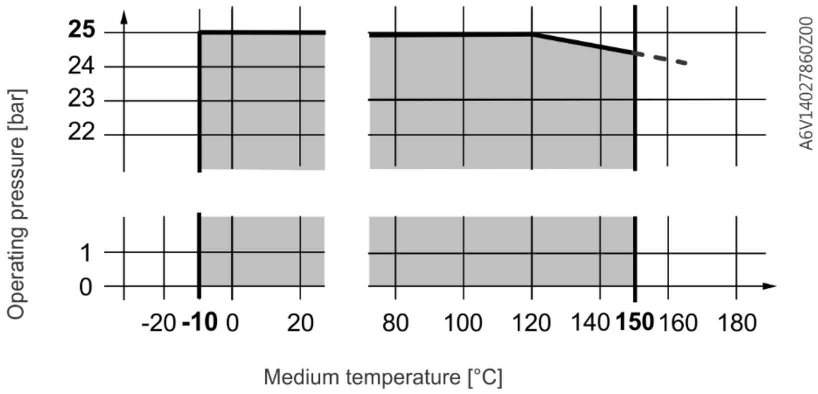
Operating Pressure and Medium Temperature in accordance to ISO7005-2 and AD2000 – W3/1 and AD2000-W3/2 (available in German only) for PN16

2.12.3 PN 25 valves with flanged connections

!	***NOTICE***
	All relevant local directives must be observed.

Figures in this section: X-axis: Medium temperature (℃); Y-axis: Operating pressure (bar)

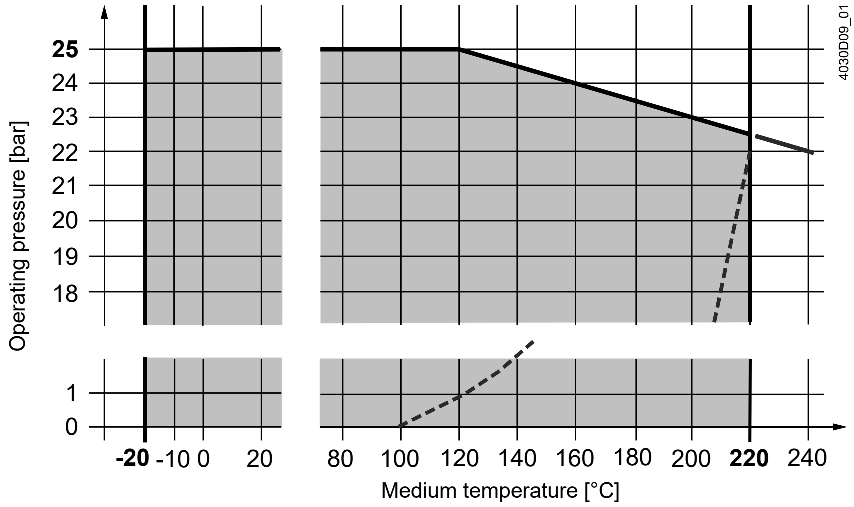
For valves VVF52..KC



Operating pressure and medium temperature in accordance to ISO 7005, EN 1092 and EN 12284.

Operating pressure and medium temperature

Fluids
with V..F53..C



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

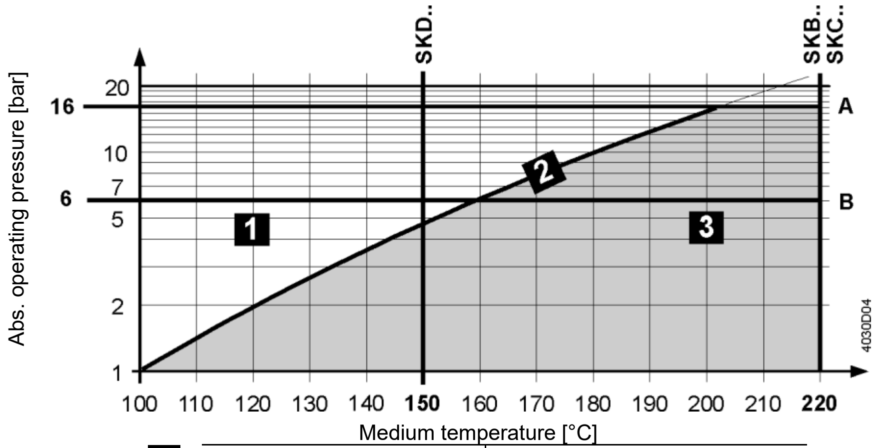
─ ·· Operating pressure according to EN 1092, valid for 2-port valves with blank flange

Operating pressure and operating temperatures according to ISO 7005, EN 1092 and EN 12284

Notes

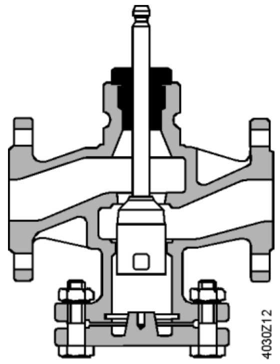
All relevant local directives must be observed

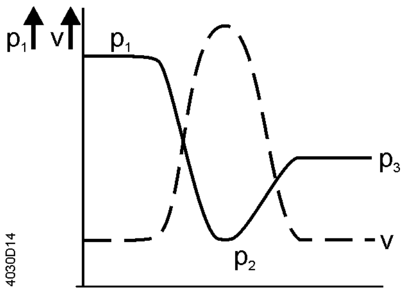
Saturated steam
Superheated steam
with VVF53..C



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

2.13 Cavitation

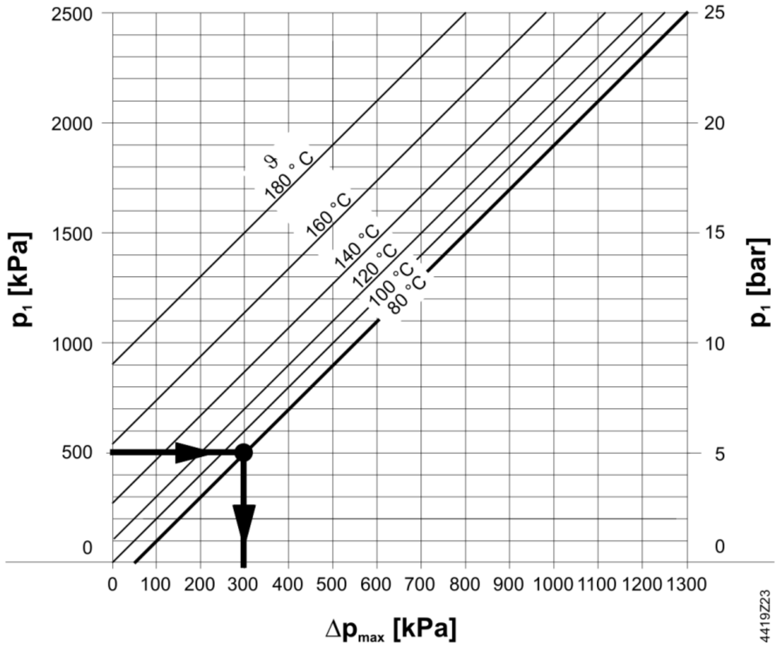




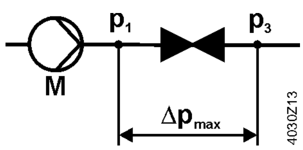
Due to high speeds of the medium in the narrowest section of the valve, local underpressure occurs (p_2). If this pressure drops below the medium's boiling pressure, cavitation occurs (steam bubbles), possibly leading to material removal (abrasion). Also, when cavitation sets in, the noise level increases 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



Δp_{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)

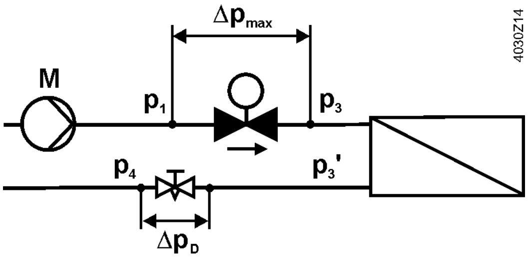
Water temperature: 80 °C

From the chart above it can be seen that with the valve almost fully closed, the maximum permissible differential pressure Δp_{max} is 300 kPa (3 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)
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 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 page18.

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 closed plants must be checked at regular intervals. The plant record must always be kept up to date.

2.14.2 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 closed HVAC 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.

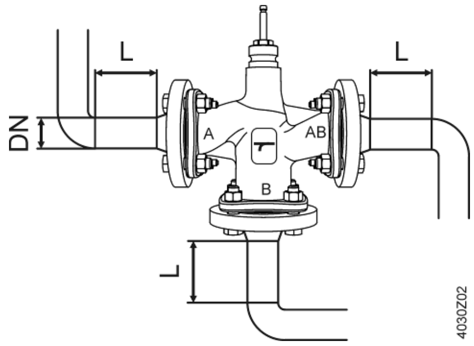
2.15.2 Avoiding flow noise

Recommendation

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.

- L ≥ 10 x DN, at least 0,4 m

Also, the flow must be free from cavitation (refer to chapter "2.13 Cavitation", page 38).



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.

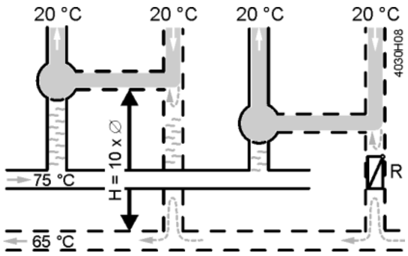
Note:
False circulation can be avoided by proper planning – with almost no extra cost – but remedy is usually very costly in existing plants.

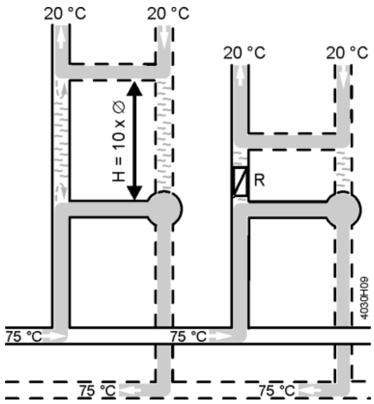
Measures against false circulation

- 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

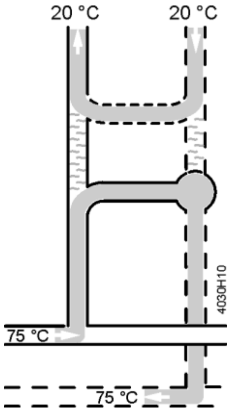
or

- 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.



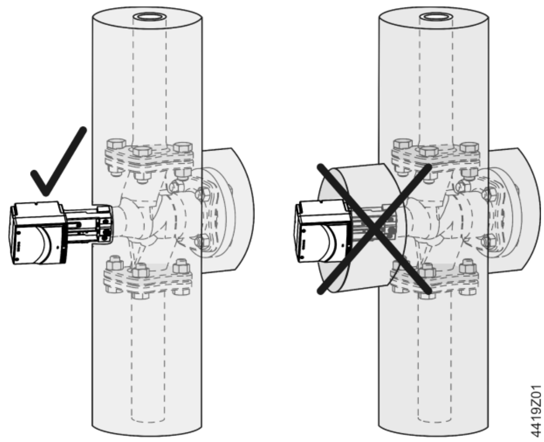
2.15.4 Thermal insulation

Recommendation

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.

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

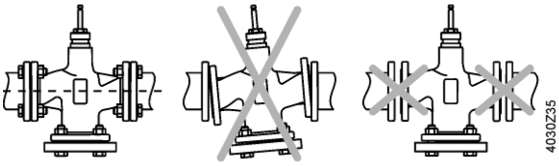
The engineering data listed in chapter "Type summary and equipment combinations" on page 12 are ensured only when the valves are used in connection with the specified Siemens actuators.

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

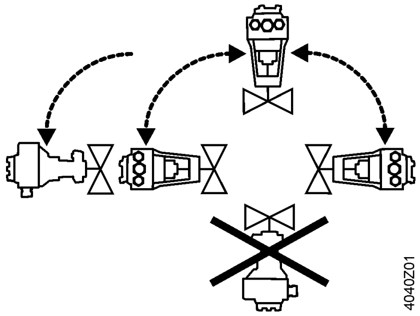
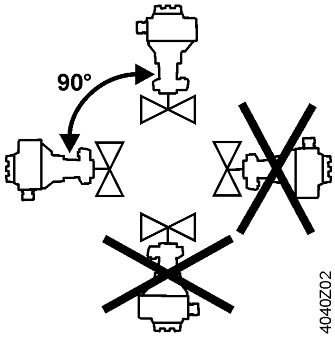
3.1 Mounting and installation

Note:
The valves must be installed free from distortion.



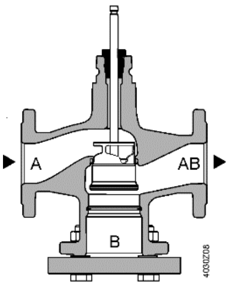
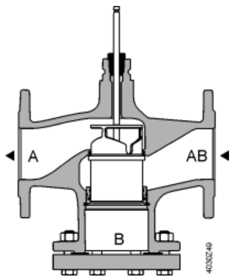
3.1.1 Mounting positions

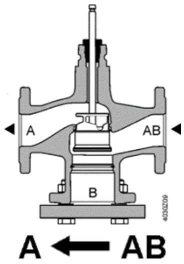
Mounting positions apply to both 2- and 3-port valves.

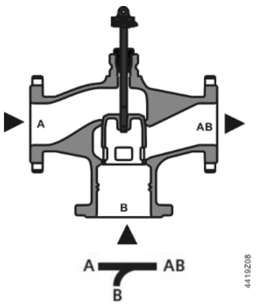
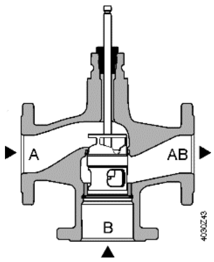
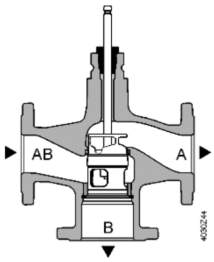
Indoors	Outdoors
	

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", page11.

2-port valves	
 Fluids	
 Closing against the pressure	Closing with the pressure
VVF47.., VVF42..C, VVF53..C  **A ⟶ AB**	VVF42..KC, VVF52..KC  **A ⟵ AB**
For use with all actuators	

2-port valves
Steam
Closing with the pressure
VVF53..C 
Use with electro-hydraulic actuators only

3-port valves		
Fluids		
Mixing valve (preferred use)		Diverting valve
VXF47.. 	VXF42..C 	VXF42..C 

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

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.

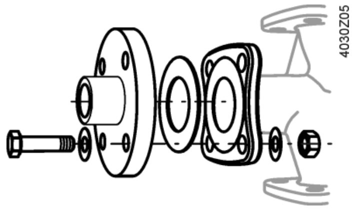
The tightening torques also depend on the specification of the gasket supplier and must be observed, using a torque wrench.

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.

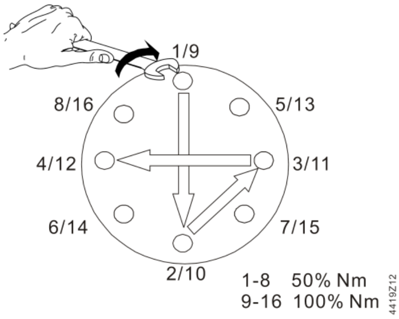
Recommendation
Use a torque wrench.

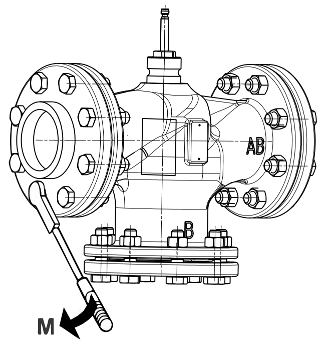
Procedure

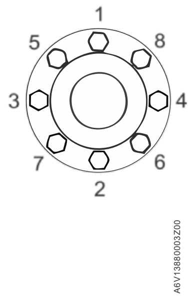
1. Clean the flanges.
2. Place the gaskets between the flanges.
3. Fit the bolts, washers and nuts and tighten them by hand.
4. Tighten the bolts crosswise in 2 steps as shown below (M = tightening torque):
   - Step 1: 50 % M
   - Step 2: 100 % M



PN 16 **PN 25**







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”

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

Guide values for tightening torques

Max. tightening torque [Nm]						
DN	50	65	80	100	125	150
PN 16	70	70	70	120	120	200
PN25	-	120	120	210	300	300

3.1.4 Thermal insulation

Refer to chapter "Thermal insulation", page 33.

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.

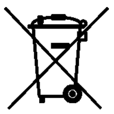
Function check

Valve	Through port 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



The valve is considered an electronics device for disposal in terms of European Directive 2012/19/EU and may not be disposed of as domestic garbage.

- Disassemble the valve into individual parts prior to disposing of it and sort the individual parts by the various types of materials.
- Comply with all local and currently applicable laws and regulations.

4 Functions and control

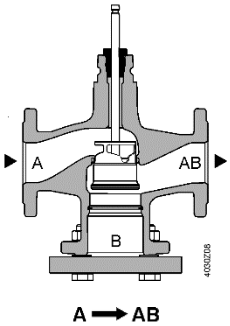
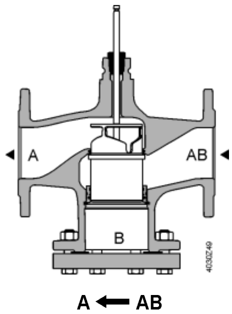
4.1 Selection of acting direction and valve characteristic

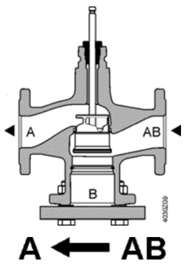
The valve's characteristic and acting direction (push to open, pull to open, normally open, normally closed) can't be selected.

4.2 Calibration

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

4.3 Technical and mechanical design

2-port valves	
Fluids	
Closing against the pressure	Closing with the pressure
VVF47.., VVF42..C, VVF53..C  	VVF42..KC, VVF52..KC 
For use with all actuators	

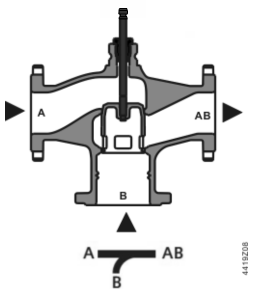
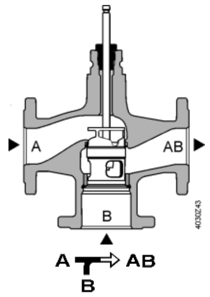
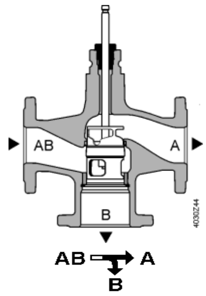
2-port valves
Steam
Closing with the pressure
VVF53..C 
Use with electro-hydraulic actuators only

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

The VVF42..K valves use a pressure-compensated plug. This enables the same type of actuators to be used for the control of volumetric flow at higher differential pressures.

Note

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

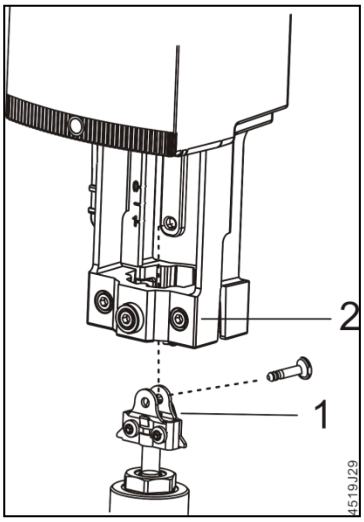
3-port valves		
Fluids		
Mixing valve (preferred use)		Diverting valve
VXF47.. 	VXF42..C 	VXF42..C 

4.3.1 Plug stop

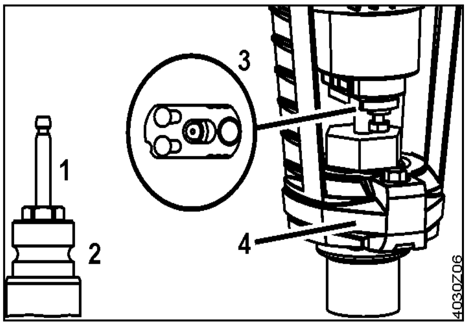
The built-in plug stop …

- 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 stem coupling (1) and neck coupling (2) ensures compatibility with Siemens large-stroke valves VVF47.., VXF47..., VVF42..C, or VXF42..C



- The diameter of the valve stem is 10 mm with all types of valves VVF42.. or VXF42...
- 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

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

Note: 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

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

4.3.5 Flange types

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

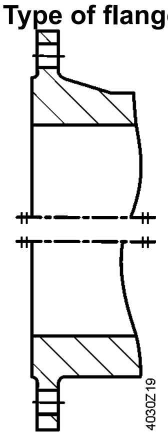
Valve types

• 2-port valves	VVF47..	VVF42 .., VVF42..KC, VVF52..KC, VVF53..C
• 3-port valves	VXF47..	VXF42 ..

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.

5 Technical data

VVF47.. VXF47..

Funtional 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 25	
	Flow characteristic through-port 0…30 % 30…100 % bypass 0…100 %	 Linear Equal percentage; n_{gl}= 3 to VDI/VDE 2173 Linear	
	Leakage rate through-port bypass	 0…0.1 % of kvs value to DIN EN 1349 0.5…2 % of kvs value	
	Permissible media	Chilled water, low temperature hot water, high temperature hot water, water with anti-freeze, brine; Recommendation: water treatment to VDI 2035	
	Medium temperature	1…95℃	
	Rangeability Sv	DN 50…150: >50	
	Nominal stroke	DN 50…80: 20mm DN 100…150: 40mm	
Materials	Valve body	Grey cast iron EN-GJL-250	
	Stem	Stainless steel	
	Plug	Bronze or stainless steel	
	Sealing gland	O-ring: EPDM Wiper ring: PTFE	
Dimensions/Weight	Refer to “Dimensions”, page 45		
	Flange connections	To ISO 7005	
Environment	Operation	Class Temperature Rel. Humidity	3K5, 3Z11 -10…55℃ 5…95 % r.h.
	Storage	Class Temperature Rel. Humidity	1K3 enhanced -15…50 % <95 % r.h.
	Transport	Class Temperature Rel. Humidity	2K3, 2M2 -30..+65℃ <95 % r.h.
Norms	PN Class	ISO 7268	
	Working pressure	ISO 7005	
	Flanges	ISO 7005	
	Length of flanged valves	DIN EN 558-1, Series 1	
	Valve flow characteristic	VDI 2035	
	Leakage rate	Throughport, bypass according to EN 60534-4/ EN 1349	
	Water treatment	VDI 2015	
	Environment	Storage: IEC 60721-3-1 Transport: IEC 60721-3-2 Operation: IEC 60721-3-3	
	Environmental compatibility	ISO 14001 (Environment) ISO 9001 (Quality) SN 36350 (Environmentally compatible products) Directive 2002/95/EC(RoHS)	

VVF42.. VXF42..

Functional data	PN class	PN 16	
	Connection	Flange	
	Operating pressure	See page 34	
	Valve characteristics 1)	See page 33	
	Leakage rate	Through port: 0...0.02 % of k_{vs} value Bypass: 0.5...2 % of k_{vs} value (k_{vs} ≥ 6.3)	
	Permissible media	See page 11	
	Medium temperature	-10...150℃	
	Rangeability	To DN 40: > 50 From DN 50: >100	
	Nominal stroke	To DN 80: 20 mm From DN 100: 40 mm	
Materials	Valve body	DN25-DN100: HT250 which equals to GJL250 DN125-DN150: QT400-18 which equals to GJS 400-18	
	Blank flange	Same as valve body	
	Valve stem	Stainless steel	
	Seat	VVF42..C, VXF42..C: Machined VVF42..KC: Stainless steel	
	Plug	DN25 Brass DN32-DN150 Stainless steel	
	Stem sealing gland	Brass EPDM O-rings PTFE sleeve silicon-free	
	Compensation sealing (VVF42..KC only)	Stainless steel EPDM	
Envirionmental conditions	Storage IEC 60721-3-1	Class	1K3
		Temperature	-15..+55℃
		Rel. humidity	5...95 % r.h.
	Transport IEC 60721-3-2	Class	2K3, 2M2
		Temperature	-30...+65℃
		Rel. humidity	<95 % r.h.
	Operation IEC 60721-3-3	Class	3K5, 3Z11
		Temperature	-15..+55℃
		Rel. humidity	5...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	
	Without CE certification as per article 3, section 3 (sound engineering practice)	≤ DN 50	
	Category I, with CE certification	DN 65...150	
	PN class	ISO 7268	
	Operating pressure	ISO 7005	
	Flanges	ISO 7005	
	Length of flanged valves	DIN EN 558-1, line 1	
	Valve characteristic	VDI 2173	
	Leakage rate	Through port, bypass according to EN 60534-4 / EN 1349	
	Water treatment	VDI 2035	
	Environmental compatibility	The product environmental declaration (A6V10794205) contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal).	

VVF52..KC

Functional data	PN class	PN 25	
	Connection	Flange	
	Operating pressure	See page 34	
	Valve characteristics [1]	See page 33	
	Leakage rate	Through port: 0...0.02 % of k_{vs} value	
	Permissible media	See page 11	
	Medium temperature	-10...150 ℃	
	Rangeability	To DN 40: > 50 From DN 50: >100	
	Nominal stroke	To DN 80: 20 mm From DN 100: 40 mm	
Materials	Valve body, blank flange	QT400-18L which equals to EN-GJS-400-18-LT	
	Valve stem	Stainless steel	
	Seat	Stainless steel	
	Plug	Stainless steel	
	Stem sealing gland	Brass EPDM O-rings PTFE sleeve Silicon-free	
	Compensation sealing	Stainless steel EPDM	
Envirionmental conditions	Storage IEC 60721-3-1	Temperature	-15..+55℃
		Rel. humidity	5...95 % r.h.
	Transport IEC 60721-3-2	Temperature	-30...+65℃
		Rel. humidity	<95 % r.h.
	Operation IEC 60721-3-3	Temperature	-15..+55℃
		Rel. humidity	5...95 % r.h.
Standards	Pressure Equipment Directive Pressure-carrying accessories	2014/68/EU Scope: Article 1, section 1 Definitions: Article 2, section 5	
	Fluid group 2	PN 25	
	DN 65…125	Category I, Module A, with CE-marking as per article 14, section 2	
	DN 150	Category II, Module A2, with CE-marking as per article 14, section 2 notified body number 0035	
	EU conformity (CE)	A5W90001953*	
	PN class	ISO 7268	
	Operating pressure	ISO 7005	
	Flanges	ISO 7005	
	Length of flanged valves	DIN EN 558, line 1	
	Valve characteristic	VDI 2173	
	Leakage rate	Through port, according to EN 60534-4 / EN 1349	
	Water treatment	VDI 2035	
	Environmental compatibility	The product environmental declaration (A5W00309337A) contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal).	

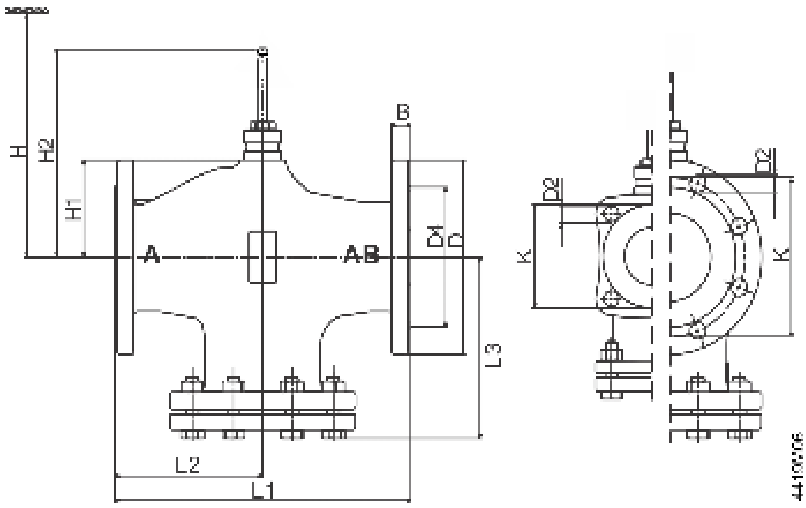
VVF53..C

Functional data	PN class		PN 25
	Connection		Flange
	Operating pressure		See Section "Operating pressure and medium temperature" on page 37
	Valve characteristics [1]		See section "**Error! Reference source not found.**", **Error! Bookmark not defined.**
	Leakage rate	Throughport	DN 15…150: 0…0.01 % of k_{vs} value (Class IV) DN 200, DN 250: 0…0.02 % of k_{vs} value
	Bypass	Bypass	0.5…2 % of k_{vs} value with SKD.., SKB.., SKC.. 0…0.05 % of k_{vs} value with SAX.., SAV..
	Permissible media		See table "**Error! Reference source not found.**", **Error! Bookmark not defined.**
	Medium temperature		-20…220 °C [2] VVF53..K: -5…220 ° C
	Rangeability		DN 15, k_{vs} ≤ 1.25 m³/h: >50 DN 15...150: >100 DN 200, DN 250: >50
	Nominal stroke		Up to DN 50: 20 mm From DN 65: 40 mm
Materials	Valve body		DN 15…150: EN-GJS-400-18-LT DN 200, DN 250: ASTM A216WCB(GP240GH)
	Blank flange	VVF..	DN 15…250: P265GH (EN 10028-2)
	Valve stem, seat, plug		Stainless steel
	Stem sealing gland		Stainless steel DN 15…150: FEPM (silicone-free) DN 200, DN 250: PTFE (not silicone-free)
	Compensation sealing		Stainless steel DN 50…150: FEPM (silicone-free) DN 200, DN 250: PTFE+carbon (not silicone-free)
	Adapter ALF41B..		Steel S235JRG2
Norms and directives	Pressure Equipment Directive		PED 2014/68/EU
	Pressure Accessories		Scope: Article 1, section 1 Definition: Article 2, section 5
	Fluid group 2:		
		≤ DN 40	without CE-marking, as per article 4, section 3 (sound engineering practice) [3]
		DN 50…100	Category I, Module A, with CE-marking, as per article 14, section 2
		DN 125…150	Category II, Module A2, with CE-marking, as per article 14, section 2 notified body number 0036
		DN 200, DN 250	Category II, Module A2, with CE-marking, as per article 14, section 2 notified body number 0035
	EU Conformity (CE)		
		DN 50…150	A5W00006523 [4]
		DN 200, DN 250	A5W90001026 [4]
	PN class		ISO 7268
	Operating pressure		ISO 7005, DIN EN 12284
	Flanges		ISO 7005
	Length of flanged valves		DIN EN 558-1, line 1
	Valve characteristic		VDI 2173
	Leakage rate		Throughport, Bypass according to EN 60534-4 / EN 1349
	Water treatment		VDI 2035

Environmental conditions			
	Storage: IEC 60721-3-1	Class	1K3
		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.
	Operation: IEC 60721-3-3	Class	3K5, 3Z11
		Temperature	-15…55 °C
		Rel. humidity	5…95 % r.h.
Environmental compatibility	The product environmental declaration A5W00735647A [4)], CE1E4404en02 [4)] and A5W90001031 [4)] contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal).		
Dimensions / Weight	Dimensions		See „**Error! Reference source not found.**“, page **Error! Bookmark not defined.** + **Error! Bookmark not defined.**
	Weight		See „**Error! Reference source not found.**“, page **Error! Bookmark not defined.** + **Error! Bookmark not defined.**

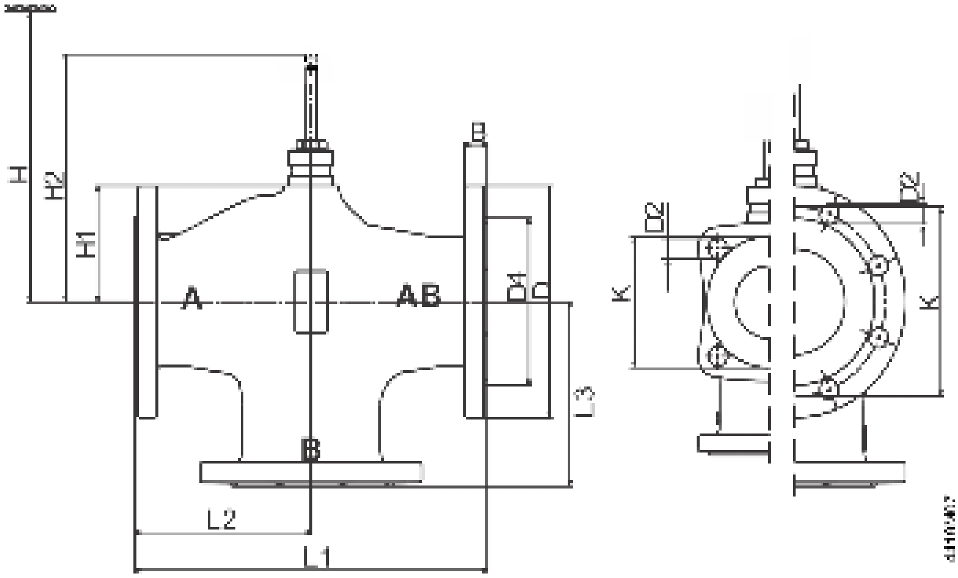
6 Dimensions

VVF47..



	DN	B	Ø D	Ø D2	Ø D4	K	L1	L2	L3	H1	H2	H		Weight
												SBX..	SBV..	
		mm												kg
VVF47.50	50	20	165	19 (4x)	99	125	230	115	143	50	146	> 410	-	11.0
VVF47.65	65	20	185	19 (4x)	118	145	290	145	173	75	171	> 435	>500	16.0
VVF47.80	80	22	200	19 (8x)	132	160	310	155	185	75	171	> 435	>500	23.8
VVF47.100	100	24	220	19 (8x)	156	180	350	175	205	110	226		> 530	32.5
VVF47.125	125	26	250	19 (8x)	184	210	400	200	233	123	239		> 540	45.0
VVF47.150	150	26	285	23 (8x)	211	240	480	240	275	150	267		> 670	65.0

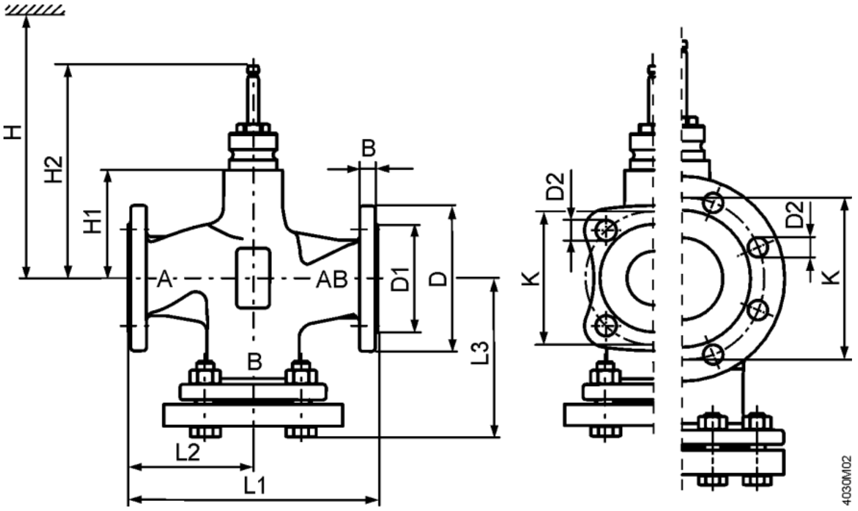
VXF47..



	DN	B	Ø D	Ø D2	Ø D4	K	L1	L2	L3	H1	H2	H		Weight
												SBX..	SBV..	
	mm													kg
VXF47.50	50	20	165	19 (4x)	99	125	230	115	115	50	146	> 410	-	8.7
VXF47.65	65	20	185	19 (4x)	118	145	290	145	145	75	171	> 435	>500	12.9
VXF47.80	80	22	200	19 (8x)	132	160	310	155	155	75	171	> 435	>500	19.5
VXF47.100	100	24	220	19 (8x)	156	180	350	175	175	110	226		> 530	27.7
VXF47.125	125	26	250	19 (8x)	184	210	400	200	200	123	239		> 540	38.3
VXF47.150	150	26	285	23 (8x)	211	240	480	240	240	150	267		> 570	54.1

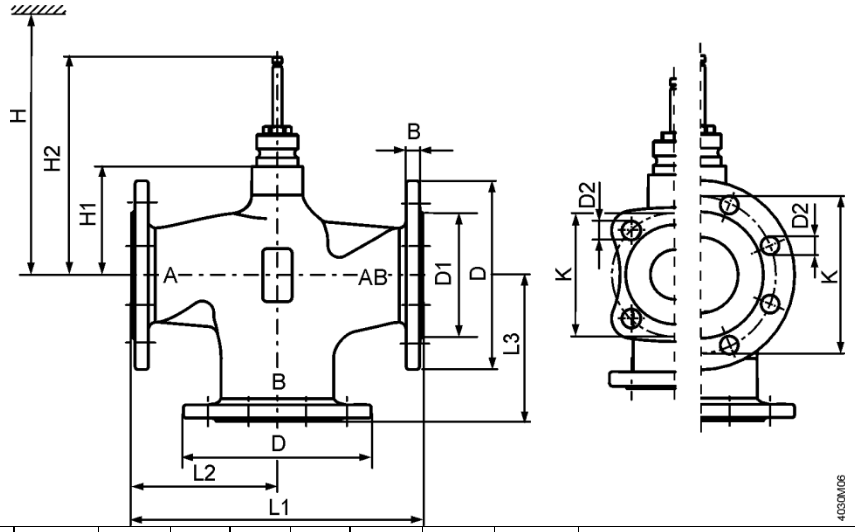
DN = Nominal size
H = Total actuator height plus minimum distance to the wall or the ceiling for mounting, connection, operation, maintenance etc.
H1 = Dimension from the pipe centre to install the actuator (upper edge)
H2= Valve in the “Closed” position means that the stem is fully extended

VVF42..C, VVF42..KC



	DN	B	øD	øD1	øD2	L1	L2	L3	øK	H1	H2	H					Weight
												SAX..	SKD..	SKB..	SAV..	SKC..	
	mm																kg
VVF42.25..	25 [1]	13	115	65	14 (4x)	160	80	101.5	85	37	133.5	479	537	612	-	-	5.0
VVF42.32..	32 [1]	15	140	76	19 (4x)	180	90	116	100	38	133.5	479	537	612	-	-	7.4
VVF42.40..	40 [1]	15	150	84	19 (4x)	200	100	126	110	38	133.5	479	537	612	502	-	8.9
VVF42.50..	50 [1]	16	165	99	19 (4x)	230	115	144	125	51.5	146.5	492	550	625	516.5	-	11.9
VVF42.65..	65	17	185	118	19 (4x)	290	145	174	145	75	171.5	517	575	650	540	-	16.7
VVF42.80..	80	19	200	132	19 (8x)	310	155	186	160	75	171.5	517	575	650	540	-	26.6
VVF42.100..	100	20	220	156	19 (8x)	350	175	205	180	110	226.5	-	-	-	575	685	36.5
VVF42.125..	125	15	250	184	19 (8x)	400	200	228	210	123	239.5	-	-	-	588	698	45.7
VVF42.150..	150	15	284	211	23 (8x)	480	240	272.5	240	150.5	267	-	-	-	615.5	726	63.6
VVF42.65KC	65	17	185	118	19 (4x)	290	145	174	145	75	171.5	517	575	650	540	-	16.7
VVF42.80KC	80	19	200	132	19 (8x)	310	155	186	160	75	171.5	517	575	650	540	-	26.9
VVF42.100KC	100	20	220	156	19 (8x)	350	175	206	180	110	226.5	-	-	-	575	685	36.7
VVF42.125KC	125	15	250	184	19 (8x)	400	200	228	210	123	239.5	-	-	-	588	698	44.4
VVF42.150KC	150	15	284	211	23 (8x)	480	240	272.5	240	150.5	267	-	-	-	615.5	726	65.0

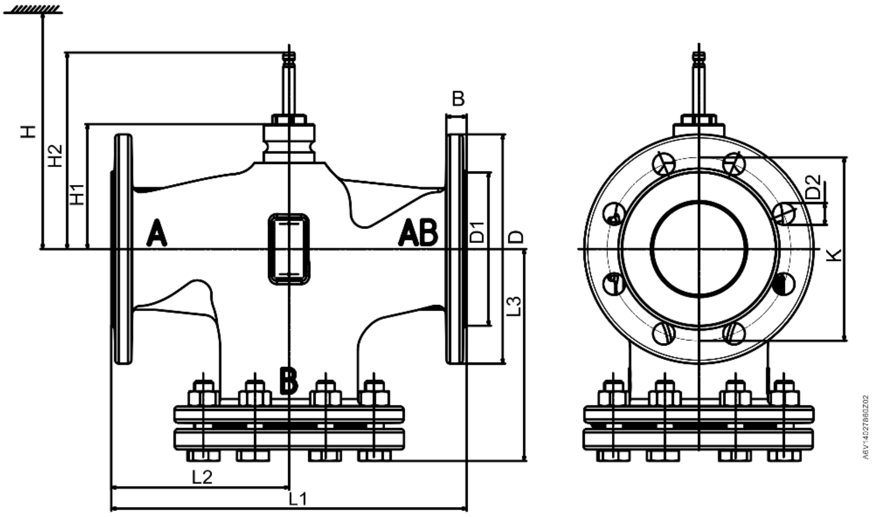
VXF42..C



	DN	B	⌀D	⌀D1	⌀D2	L1	L2	L3	⌀K	H1	H2	H					Weight
												SAX..	SKD..	SKB..	SAV..	SKC	
	mm																kg
VXF42.25..	25 [1]	13	115	65	14 (4x)	160	80	80	85	37	133.5	479	537	612	502	-	4.1
VXF42.32..	32 [1]	15	140	76	19(4x)	180	90	90	100	38	133.5	479	537	612	503	-	6.1
VXF42.40..	40 [1]	15	150	84	19(4x)	200	100	10	110	38	133.5	479	537	612	503	-	7.1
VXF42.50..	50[1]	16	165	99	19 (4x)	230	115	115	125	51.5	146.5	492	550	625	516.5	-	9.5
VXF42.65..	65	17	185	118	19 (4x)	290	145	145	145	75	171.5	517	575	650	540	-	13.9
VXF42.80..	80	19	200	132	19 (8x)	310	155	155	160	75	171.5	517	575	650	540	-	21.5
VXF42.100..	100	20	220	156	19 (8x)	350	175	175	180	110	226.5	-	-	-	575	685	31.1
VXF42.125..	125	15	250	184	19 (8x)	400	200	200	210	123	239.5	-	-	-	588	698	38.4
VXF42.150..	150	15	284	211	23 (8x)	480	240	240	240	150.5	267	-	-	-	615.5	726	53.6

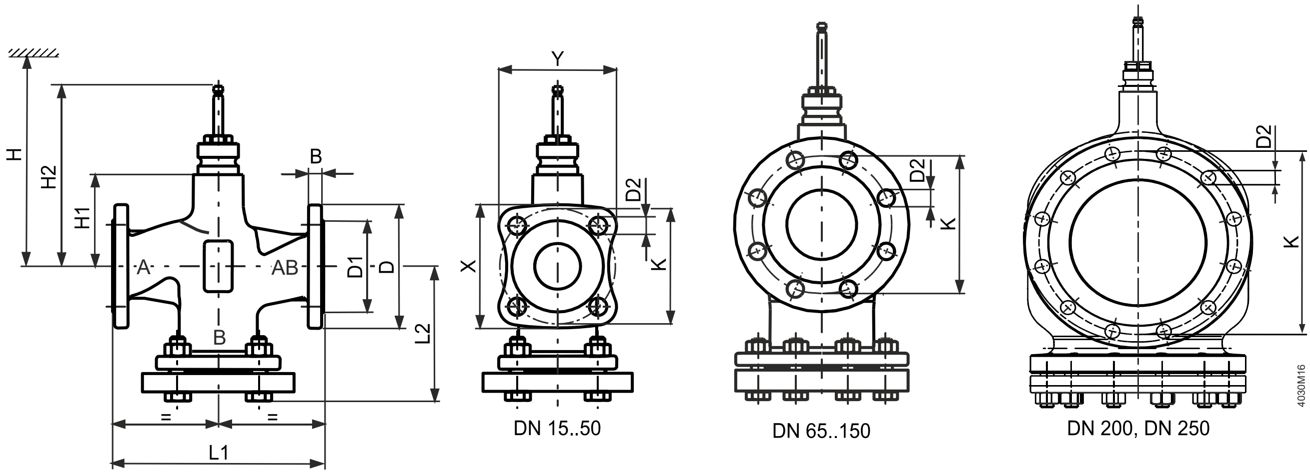
DN = Nominal size
H = Total actuator height plus minimum distance to the wall or the ceiling for mounting, connection, operation, maintenance etc.
H1 = Dimension from the pipe centre to install the actuator (upper edge)
H2 = Valve in the “Closed” position means that the stem is fully extended

VVF52..KC



	DN	B	⌀D	⌀D1	⌀D2	L1	L2	L3	⌀K	H1	H2	H			Weight
												SKD..	SKB..	SKC..	
	mm														kg
VVF52..KC	65	18	185	120	19(8x)	290	145	173	145	75	171.5	575	650	-	65
	80	18	200	134	19(8x)	310	155	185	160	75	171.5	575	650	-	80
	100	18	235	158	23(8x)	350	175	207.5	190	110	226.5	-	-	685	100
	125	18	270	186	28(8x)	400	200	233	220	123	239.5	-	-	698	125
	150	18	297	213	28(8x)	480	240	274	250	150.5	267	-	-	726	18

VVF53..



Product number	DN	kg	B	Ø D	Ø D1	Ø D2	L1	L2	X	Y	Ø K	H1	H2	H				
														SAX..	SKD..	SKB..	SAV..	SKC..
VVF53..C VVF53..	15	4.2	12	95	46	14 (4x)	130	87.5	79	76	65	63	159.5	505	563	638	-	-
	20	5.3	14	105	56	14 (4x)	150	99.5	86.6	83	75	63	144.4	505	563	638	-	-
	25	6.1	13	115	65	14 (4x)	160	104.5	94.4	90.1	85	63	159.5	505	563	638	-	-
	32	8.7	15	140	76	19 (4x)	180	119	115.6	110.7	100	60	156.5	502	560	635	-	-
	40	10.1	14	150	84	19 (4x)	200	129	123.2	117.8	110	60	156.5	502	560	635	525	-
	50	13.6	14	165	99	19 (4x)	230	146	135.2	128.4	125	100	196.5	542	600	675	565	-
	65	22	14	185	118	19 (8x)	290	178	-	-	145	115	231.5	-	-	-	580	690
	80	27.4	14	200	132	19 (8x)	310	190	-	-	160	115	231.5	-	-	-	580	690
	100	38.2	14	235	156	23 (8x)	350	212.5	-	-	190	146	262.5	-	-	-	611	721
	125	53.1	14	270	184	28 (8x)	400	242	-	-	220	159	275.5	-	-	-	624	734
	150	73.4	14	297	211	28 (8x)	480	284	-	-	250	186.5	303	-	-	-	652	762
VVF53..K	50	13.6	14	165	99	19 (4x)	230	146	135.2	128.4	125	100	196.5	-	600	675	-	-
	65	22	14	185	118	19 (8x)	290	178	-	-	145	115	231.5	-	-	-	-	690
	80	27.6	14	200	132	19 (8x)	310	190	-	-	160	115	231.5	-	-	-	-	690
	100	38.6	14	235	156	23 (8x)	350	212.5	-	-	190	146	262.5	-	-	-	-	721
	125	53.8	14	270	184	28 (8x)	400	242	-	-	220	159	275.5	-	-	-	-	734
	150	75	14	297	211	28 (8x)	480	284	-	-	250	186.5	303	-	-	-	-	762
	200	133	30	360	274	26 (12X)	600	265	-	-	310	243	359.5	-	-	-	-	818
	250	200	32	425	330	30 (12X)	730	290	-	-	370	275	391.5	-	-	-	-	850

7 Revision number

Product type	Valid from rev. number	Product type	Valid from rev. number
VVF47.50	..B	**VXF47.50**	..B
VVF47.65	..B	**VXF47.65**	..B
VVF47.80	..B	**VXF47.80**	..B
VVF47.100	..C	**VXF47.100**	..B
VVF47.125	..C	**VXF47.125**	..B
VVF47.150	..C	**VXF47.150**	..B
VVF42.25-6.3C	..A	**VXF42.25-6.3C**	..A
VVF42.25-10C	..A	**VXF42.25-10C**	..A
VVF42.32-16C	..A	**VXF42.32-16C**	..A
VVF42.40-16C	..A	**VXF42.40-16C**	..A
VVF42.40-25C	..A	**VXF42.40-25C**	..A
VVF42.50-31.5C	..A	**VXF42.50-31.5C**	..A
VVF42.50-40C	..A	**VXF42.50-40C**	..A
VVF42.65-50C	..A	**VXF42.65-50C**	..A
VVF42.65-63C	..A	**VXF42.65-63C**	..A
VVF42.80-80C	..A	**VXF42.80-80C**	..A
VVF42.80-100C	..A	**VXF42.80-100C**	..A
VVF42.100-125C	..A	**VXF42.100-125C**	..A
VVF42.100-160C	..A	**VXF42.100-160C**	..A
VVF42.125-200C	..A	**VXF42.125-200C**	..A
VVF42.125-250C	..A	**VXF42.125-250C**	..A
VVF42.150-315C	..A	**VXF42.150-315C**	..A
VVF42.150-400C	..A	**VXF42.150-400C**	..A
VVF42.65KC	..A	**VVF52.65-63KC**	..A
VVF42.80KC	..A	**VVF52.80-100KC**	..A
VVF42.100KC	..A	**VVF52.100-160KC**	..A
VVF42.125KC	..A	**VVF52.125-200KC**	..A
VVF42.150KC	..A	**VVF52.150-315KC**	..A
VVF53.15-0.16C	..A	**VVF53.32-16C**	..A
VVF53.15-0.2C	..A	**VVF53.40-12.5C**	..A
VVF53.15-0.25C	..A	**VVF53.40-16C**	..A
VVF53.15-0.32C	..A	**VVF53.40-20C**	..A
VVF53.15-0.4C	..A	**VVF53.40-25C**	..A
VVF53.15-0.5C	..A		
VVF53.15-0.63C	..A		
VVF53.15-0.8C	..A		
VVF53.15-1C	..A		
VVF53.15-1.25C	..A		
VVF53.15-1.6C	..A		
VVF53.15-2C	..A		
VVF53.15-2.5C	..A		
VVF53.15-3.2C	..A		
VVF53.15-4C	..A		
VVF53.20-6.3C	..A		
VVF53.25-5C	..A		
VVF53.25-6.3C	..A		
VVF53.25-8C	..A		
VVF53.25-10C	..A		

8 Addendum

8.1 Abbreviations

Abbreviation	Unit	Term	Explanation
c	[kJ/kgK]	Specific heat capacity	See "Specific heat capacity", page 65
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 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 65
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 65
V_{100}	[m^3/h], [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], [cSt]	Kinematic viscosity	1 mm^2/s = 1 cSt (centistoke), also refer to chapter "2.8.3.3 Kinematic viscosity v", page 22
Δp	[kPa]	Differential pressure	Pressure difference between plant sections
Δp_{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
Δp_{MV}	[kPa]	-	Differential pressure across the section with variable flow
Δp_s	[kPa]	Closing pressure	Maximum permissible differential pressure at which the motorized valve still closes securely against the pressure
Δp_{v0}	[kPa]	-	Maximum differential pressure across the valve's fully closed throughport (control path)
Δp_{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}
Δp_{VR}	[kPa]	-	Differential pressure of flow and return
ΔT	[K]	Temperature spread	Temperature difference of flow and return

8.2 Important formulas

Value	Formula		Unit
Differential pressure Δp_{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 $P_V = \frac{\Delta p_{V100}}{\Delta p_{VR}}$	• Header with pressure, constant volumetric flow • Header with low differential pressure, variable volumetric flow $P_V = \frac{\Delta p_{V100}}{\Delta p_{V100} + \Delta p_{MV}}$	-
Volumetric flow V_{100}	Water without antifreeze $\dot{V}_{V100} = \frac{Q_{V100}}{1{,}163 \cdot \Delta T}$	Water with antifreeze $\dot{V}_{V100} = \frac{Q_{V100} \cdot 3600}{c \cdot \rho \cdot \Delta T}$	[m³/h]

8.3 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. 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

8.4 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 chapter "2.13 Cavitation", page 38
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 chapter "2.13 Cavitation", page 38
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

8.5 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; Wet steam: Parts of the gaseous water condensate to become very fine droplets 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 antifreeze which also inhibits corrosion. For the types of antifreeze used in the trade, also refer to chapter "8.7 Overview of antifreeze and brine used in the trade", page 67
Glycol	Glycol is added to water to lower the water's melting point. Examples are ethylene glycol and propylene glycol. Refer to chapter "8.7 Overview of antifreeze and brine used in the trade", page 67
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

8.6 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

8.7 Overview of antifreeze and brine 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 34. The notes given under "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

	Supplier	Product number	Basic medium	Permissible limit weight fractions	Temperature range of medium	Usage
		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
		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 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. 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 PEKASOLar 50	PEKASOLar 100 and its dilutions are colorless and odorless liquids on basis of propylene glycol with newly developed additives 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 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 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 -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 (test soft solder in individual case)

	Supplier	Product number	Basic medium	Permissible limit weight fractions	Temperature range of medium	Usage
		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 (test soft solder in individual case)
	Temper Technology 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 Cast iron at higher temperatures unsuitable 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

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