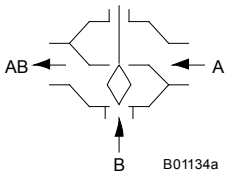
BUS: Flanged three-way valve, PN 40



How energy efficiency is improved
Accurate control with high reliability.

Areas of application
Continuous control of cold/warm/hot water, water vapour and air in HVAC systems, in closed networks. Water quality as per VDI 2035. Assembly with AVP 242 to AVP 244 actuators as a regulating unit.

Features
- Nominal pressure 40 bar
- Control valve contains no silicone grease; matt black
- Nominal diameters DN15 to DN150
- Linear control passage characteristic DN15 to DN100
- Equal percentage control passage characteristic DN125 to DN150
- Linear mixing passage characteristic
- With the spindle retracted, the valve is closed
- Can only be used as control valve
- Temperature range up to 220 °C
- Version with bellows down to -60 °C, version with graphite seal up to 260 °C

Technical description
- Valve with flange connection as per EN 1092-2, Form B raised face
- Cast steel valve body
- Stainless steel valve seat
- Stainless steel spindle
- Stainless steel plug
- Maintenance-free stainless steel stuffing box with spring-loaded PTFE washer

Type	Nominal diameter DN	Connection PN	k_{VS} value m^3/h	Weight kg
BUS 015 F235	15	40	1,0	7,2
BUS 015 F225	15	40	1,6	7.2
BUS 015 F215	15	40	2,5	7,2
BUS 015 F205	15	40	4,0	7,2
BUS 020 F205	20	40	6,3	8,4
BUS 025 F205	25	40	**10,0**	**9,4**
BUS 032 F205	32	40	**16,0**	**12,4**
BUS 040 F205	40	40	**25,0**	**15,5**
BUS 050 F205	50	40	**40,0**	**19,2**
BUS 065 F205	65	40	**63,0**	**27,6**
BUS 080 F205	80	40	**100,0**	**36,5**
BUS 100 F205	100	40	**160,0**	**61,2**
BUS 125 F305	125	40	**220,0**	**82,5**
BUS 150 F305	150	40	**320,0**	**113,5**

Operating temperature [1]	-10...220 °C	Valve stroke	
Operating pressure	-10...50 °C 40 bar	DN 15...50	20 mm
	120 °C 36,3 bar	DN 65...100	30 mm
	220 °C 29,4 bar	DN 125...150	40 mm
Valve characteristic for			
ctrl passage DN15…100	linear	Dimension drawing	M10462
ctrl passage DN125…150	equal percentage		
mixing passage	linear	Fitting instructions	MV 506071
Valve control ratio	> 30:1	AVP 242 assembly	MV 506012
Stuffing box	stainless steel / PTFE	AVP 243/244 assembly	MV 506013
Leakage rate at max. Δp_S:			
control passage	≤ 0.05% of k_{VS} value	Material declaration	MD 76.126
mixing passage	≤ 1.0% of k_{VS} value		

[1] Down to -10 °C, no stuffing box heater is required. At temperatures between -10 °C and -60 °C, use special version with bellows-type mechanical seal (available on request, only to DN 100). Application: water with anti-freeze (glycol to 55% and brine solution), max. operating pressure 30 bar.
Above 130 °C or 180 °C, use the relevant adaptor (accessory). Above 220 °C and up to 260 °C, use stuffing box with graphite seal (accessory).

Accessories

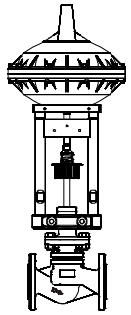
0372336 180* Adaptor (required for medium 130…180 °C; MV 505902)
0372336 240* Adaptor (required for medium 180…240 °C; MV 505902)
0378373 001 Stuffing box with graphite seal for temp. 220…260 °C; DN 15…50; MV 506080
0378373 002 Stuffing box with graphite seal for temp. 220…260 °C; DN 65…100; MV 506080
0378373 003 Stuffing box with graphite seal for temp. 220…260 °C; DN 125…150; MV 506080

*) Dimension drawing or wiring diagram available under the same number

Warranty The technical data and pressure differences indicated here are only applicable in combination with Sauter actuators. Any warranty shall lapse if actuators from other manufacturers are used.

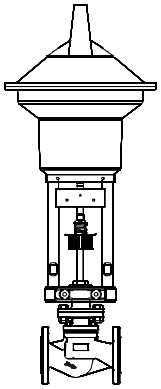
N.B.: These valves should be used only as control valves. Diverting valves can be ordered on request as a special version.

BUS combined with pneumatic actuator


B10977

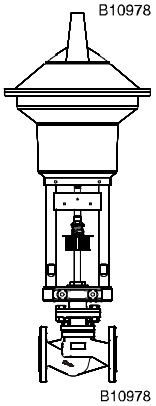
Actuator Pressure p_{stat} Running time: Stroke:	**AVP 242 F021** **32 bar** **8 s** **20 mm**	
Valve	Against the pressure **Δp_{max}**	**Δp_s**
BUS 015	12,1	15,6
BUS 020	7,7	15,6
BUS 025	6,6	9,4
BUS 032	4,7	7,2
BUS 040	3,0	4,1
BUS 050	1,9	2,6

For temperatures above 130 °C, accessories are required


B10978

Actuator Pressure p_{stat} Running time: Stroke:	**AVP 243 F021** **40 bar** **24 s** **20 mm**		**AVP 244 F021** **40 bar** **40 s** **20 mm**	
Valve	Against the pressure **Δp_{max}**	**Δp_s**	Against the pressure **Δp_{max}**	**Δp_s**
BUS 015	21,1	21,7	24,5	24,5
BUS 020	13,5	21,7	17,5	17,5
BUS 025	11,6	13,1	14,7	14,7
BUS 032	8,3	9,9	10,4	10,4
BUS 040	5,3	5,7	6,2	6,2
BUS 050	3,4	3,7	3,9	3,9

For temperatures above 130 °C, accessories are required


B10978

Actuator Pressure p_{stat} Running time: Stroke:	**AVP 243 F031** **25 bar** **24 s** **30 mm / 40 mm**		**AVP 244 F031** **40 bar** **40 s** **30 mm / 40 mm**	
Valve	Against the pressure **Δp_{max}**	**Δp_s**	Against the pressure **Δp_{max}**	**Δp_s**
BUS 065	1,7	2,2	4,4	4,4
BUS 080	1,1	1,5	2,9	2,9
BUS 100	0,7	0,9	1,9	1,9
BUS 125	0,4	0,7	1,3	1,3
BUS 150	0,3	0,5	1,0	1,0

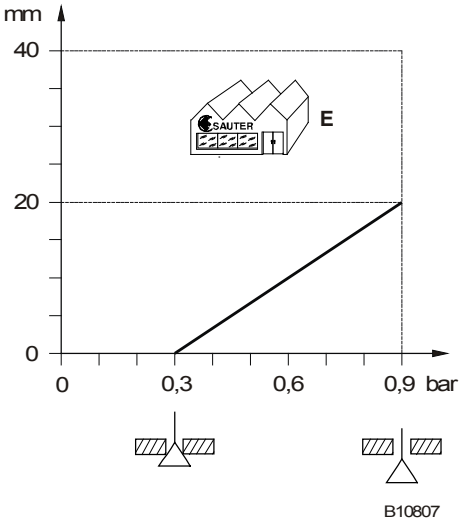
For temperatures above 130 °C, accessories are required

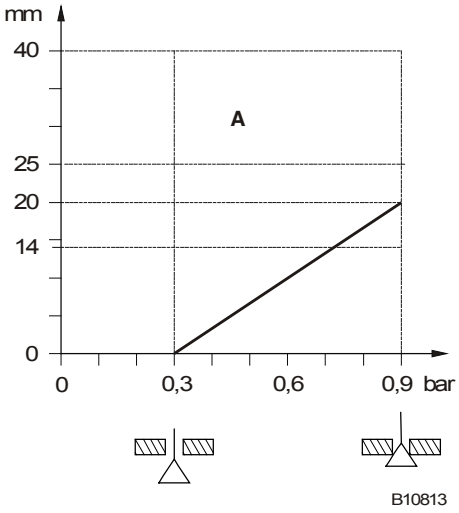
Valve: Variant F, for technical data and accessories see Valve Type Table
Drive: Variant F, for technical data, accessories and installation position see section 71
Example: BUS 040 F205/AVP 242 F021 or AVP 243 F021
Valve control passage A-AB is closed when actuator is pressureless = factory setting
Valve control passage A-AB is open when actuator is pressureless = on request

Δp_{max} [bar]= Max. permissible pressure difference across the valve at which the drive can still firmly open and close the valve while taking Δp_v into account.

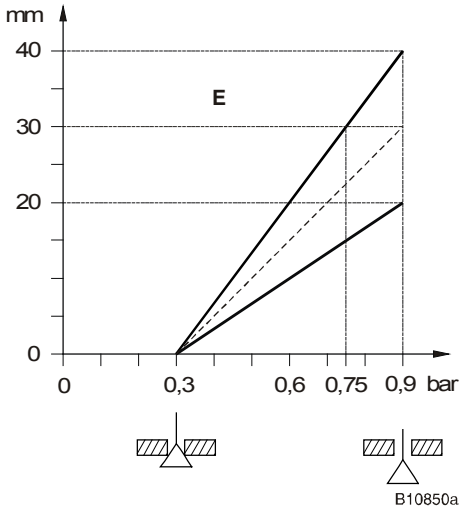
Δp_s [bar]= Max. permissible pressure difference across the valve at which, in the event of a malfunction (pipe break after the valve), the drive can close the valve firmly and quickly.

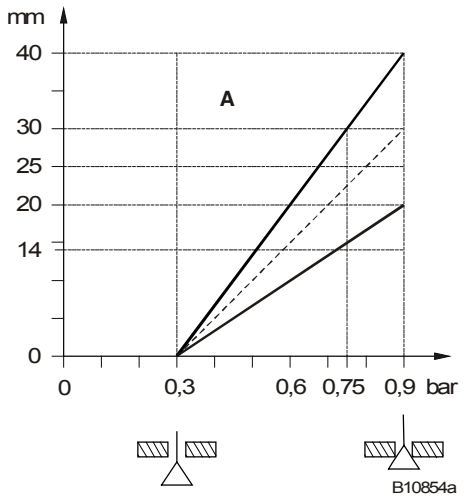
Pressure/stroke characteristics (with valve fitted)
Characteristic is not variable
DN15...50:





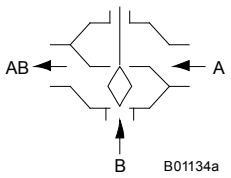
DN65...150:
Characteristic is variable





Operation
Using an electric drive, the valve can be moved to any position. The valve's control passage closes when the valve spindle is extended These valves should be used only as control valves. Please observe the direction of flow marked on the valve itself. Fluidic variables in accordance with EN 60534.

Used as a control valve



Description
These control valves are distinguished by their great reliability and accuracy and make an important contribution towards efficient control. They run very quietly and meet sophisticated requirements, e.g. provide closing functions with spring, overcome differential pressures, control the temperature of the medium and provide a cut-off function.
The valve spindle is fixed to the drive spindle automatically. The stainless-steel plug regulates either a linear or an equal-percentage throughflow in the control passage. The valve's high level of seal is guaranteed by a stainless-steel ring pressed into both valve seats and by the appropriate valve plug.
The stuffing box requires no maintenance. It comprises conically formed PTFE rings and a spring. The spring ensures a permanent tension on the seals, which guarantees their tightness with regard to the valve spindle. In addition, a supply of grease ensures that the valve spindle is always lubricated. Furthermore, the grease prevents any particles in the medium from reaching the PTFE seal.

Engineering and fitting notes
The valves are combined with the pneumatic actuators AVP 242, 243 and 244. The actuator is slotted onto the valve and fixed with screws. The pneumatic actuator links with the valve spindle automatically when the former is pressurised with compressed air. The mechanism automatically closes the connection to the valve as soon as it has reached the lower valve seat.

Fitting position
The control unit can be fitted in any position except facing downwards. The ingress of condensate, drops of water etc. into the drive should be prevented. If fitted horizontally, and with regard to the valve spindle, the maximum permissible weight on the valve is 25 kg unless the actuator is supported (to be carried out by the client) or is subject to forces acting otherwise.
Up to 130°C: in any position, but not facing downwards.

Above 130°C: At temperatures above 130°C or 180°C, the valve should be fitted in the horizontal position and the correct adaptor for the relevant temperature should be employed. The adaptor can also serve as an extension, allowing the actuator to protrude from the piping insulation. To protect the actuator against heat, the pipes should be insulated.

When fitting the drive to the valve, care must be taken not to turn the valve plug on the stainless-steel seat, otherwise the seal may be damaged. When insulating the valve, the insulation should not extend beyond the connecting clamp on the drive.

Fitting outdoors
If the devices are fitted outdoors, we recommend that additional measures be taken to protect them against the effects of the weather.

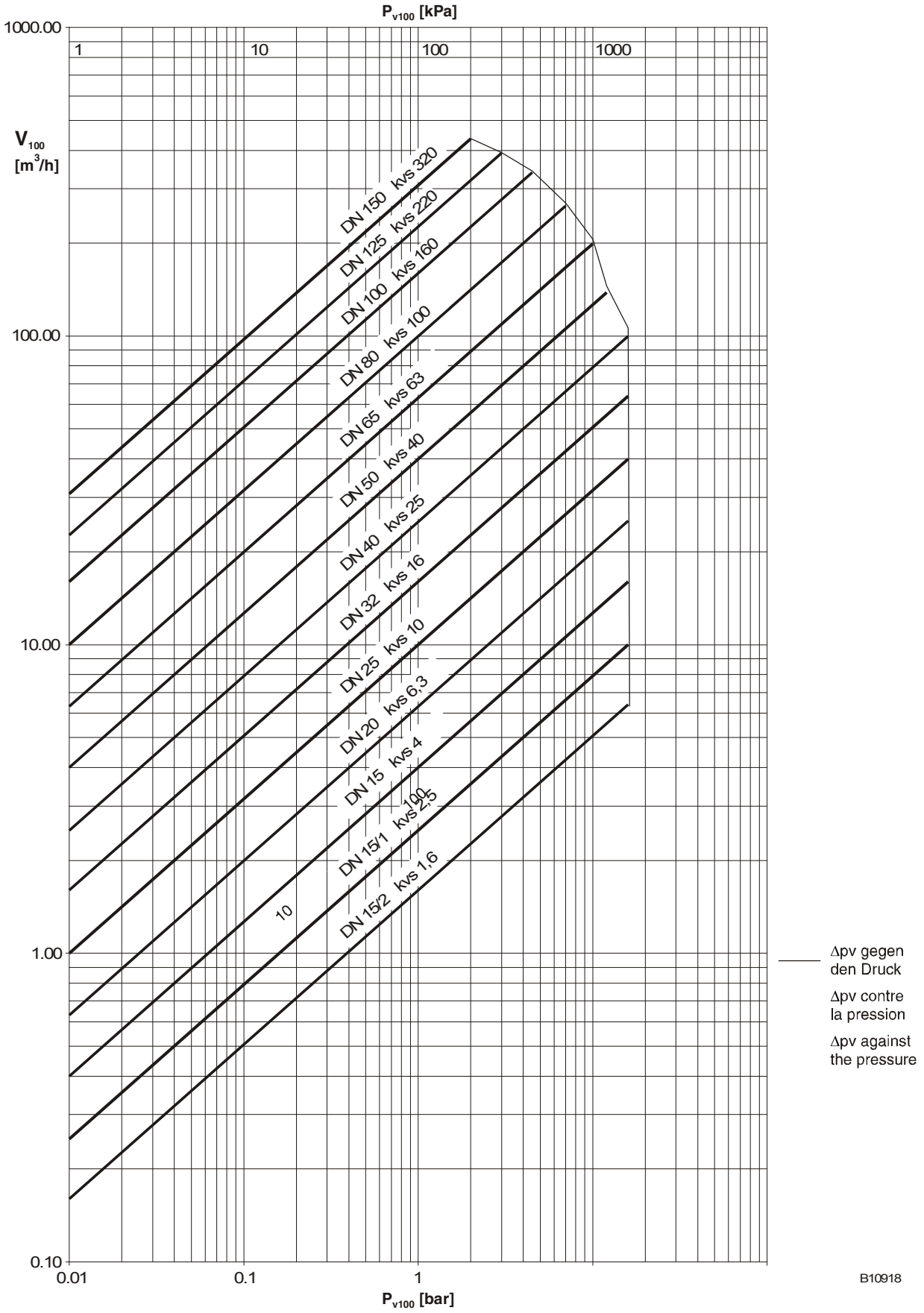
Applications with steam
The valves can be used for steam applications up to 200°C with the same Δp_{max} values. We recommend, however, that the valves be used only for open/close operations. When used as a control valve, care should be taken to ensure that valve does not function largely in the upper third of its stroke range. This results in an extremely high flow speed, which greatly reduces the valve's serviceable life.

Applications with water
In order to restrain contaminants in the water (e.g. welding beads, rust particles etc.) and prevent the spindle seal from being damaged, we recommend the employment of collective filters, e.g. for each floor or feed pipe. The composition of the water should be in accordance with VDI 2035.
If an auxiliary medium is used, please contact the supplier of the medium in order to clarify whether the valve materials are compatible. Please refer to the materials table below. If glycol is used, we recommend a concentration of between 20% and 55%. The valves are not suitable for use with drinking water or in zones where there is a risk of explosion.

Other notes concerning hydraulics and noises in systems
The valves can be used in a low-noise environment. To avoid noises, the pressure differences Δp_{max} listed below should not be exceeded. These are shown as recommended values in the table of pressure losses.

The pressure difference Δp_v is the highest pressure permitted to act on the valve, regardless of the stroke position, so that the risk of cavitation and erosion is limited. The force of the actuator has no influence on these values. Cavitation accelerates wear and causes noise. In order to prevent cavitation, particularly in applications with steam, the pressure difference Δp_{crit} should not exceed the value
$\Delta p_{crit} = (p1 - p_v) \times 0{,}5$
p1 = Upstream pressure before the valve (bar) p_v = Steam pressure
Absolute pressure was used in these calculations.

Flow-rate chart BUS



Additional technical data

Type	Δp_v	
	Against the pressure	With the pressure
BUS 015 F225	40 bar	–
BUS 015 F215	40 bar	–
BUS 015 F205	40 bar	–
BUS 020 F205	40 bar	–
BUS 025 F205	40 bar	–
BUS 032 F205	40 bar	–
BUS 040 F205	40 bar	–
BUS 050 F205	30 bar	–
BUS 065 F205	30 bar	–
BUS 080 F205	25 bar	–
BUS 100 F205	25 bar	–
BUS 125 F305	15 bar	–
BUS 150 F305	15 bar	–

Pressure and temperature data	EN 764. EN 1333
Parameters related to flow mechanics	EN 60534
Sauter slide rule for valve sizing	7 090011 003
Manual for slide rule	7 000129 003
Technical manual: 'Regulating Units'	7 000477 003
Parameters, installation notes, control, general	Valid EN, DIN, AD, TRD and UVV regulations
CE conformity, Pressure Equipment Directive (fluid group II)	97/23/EC
BUS 15 up to BUS 150: CE-0525 symbol	Category II

Combination: AVN 224S actuator, not certified as per DIN 32730 or EN 14597

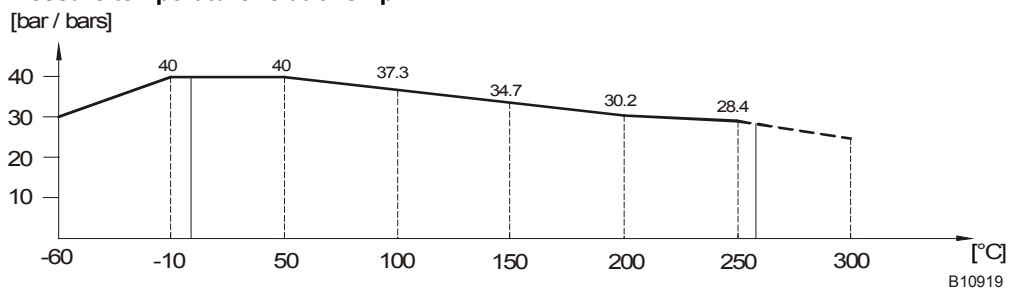
Additional information

Valve body of cast steel as per DIN EN 10213, code GP240GH+N, material number 1.0619+N, with smooth-drilled flanges as per EN 1092-1, Form B sealing strip. Valve body protected by matt black paint (RAL 9005). Recommended for the welding-neck flange as per EN 1092-1. Valve fitting width as per EN 558-1, Series 1. Flat seal on the body of the valve of asbestos-free material.

DIN material numbers

	DIN material number	DIN designation
Valve body	1.0619+N	GP240GH+N
Valve seat	1.4021	X 20 Cr 13
Spindle	1.4021	X 20 Cr 13
Plug	1.4021	X 20 Cr 13
Stuffing box	1.4021	X 20 Cr 13
Seal underneath packing box	Cu	DIN 7603

Pressure/temperature relationship



Explanation of terms used

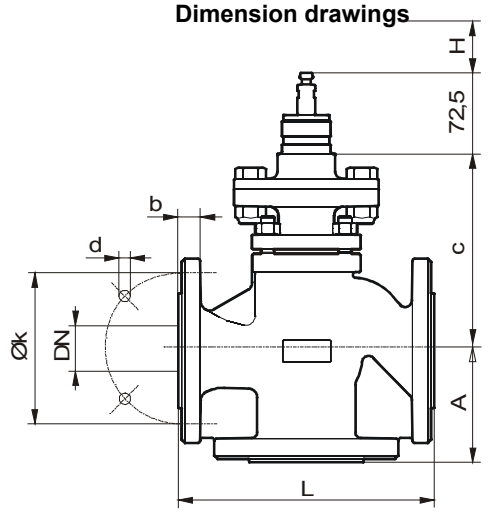
Δp_v
Maximum permissible pressure difference across the valve in any stroke position, limited by the noise level and erosion.
The valve as a traversed element is defined by this parameter specifically in its hydraulic behaviour. By monitoring cavitation, erosion and the noise thus produced, improvements can be achieved in both life expectancy and durability.

Δp_{max}
Maximum permissible pressure difference across the valve at which the drive can firmly open and close the valve.
Static pressure and fluidic influences are taken into account. This value helps to maintain a smooth stroke action and the high level of sealing. In doing so, the valve's Δp_v value is never exceeded.

Δp_s
Maximum permissible pressure difference across the valve in the event of a malfunction (e.g. power failure, excess temperature or pressure, burst pipe) at which the drive can firmly close the valve and, if necessary, hold the full operating pressure against atmospheric pressure. Since this is a quick-close functions with 'fast' stroke, Δp_s can be larger than Δp_{max} or, respectively, Δp_v. The resultant fluidic disturbances are soon overcome and play a minor role here.
On the three-way valves, the values apply only for the control passage.

Δp_{stat}
Line pressure across the valve. This corresponds largely to the dead pressure when the pump is switched off, e.g. due to the level of liquid in the installation, an increase in pressure via the pressure store, steam pressure etc.

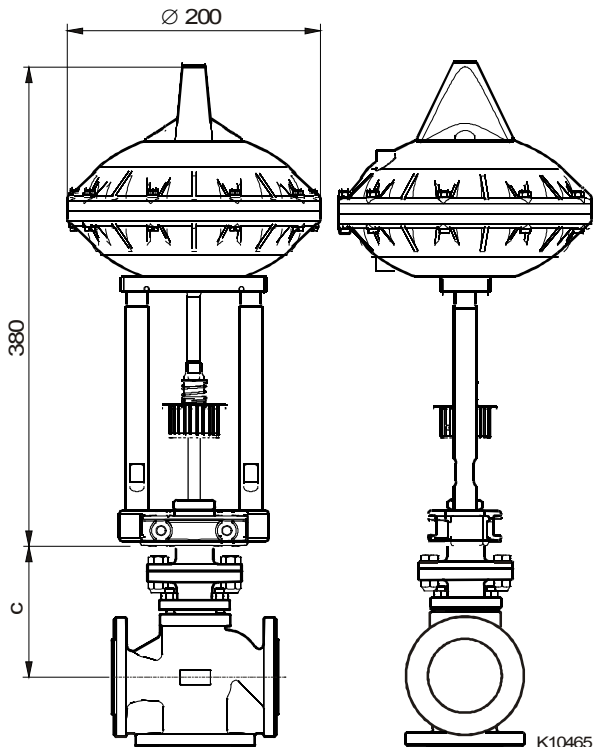
Dimension drawings



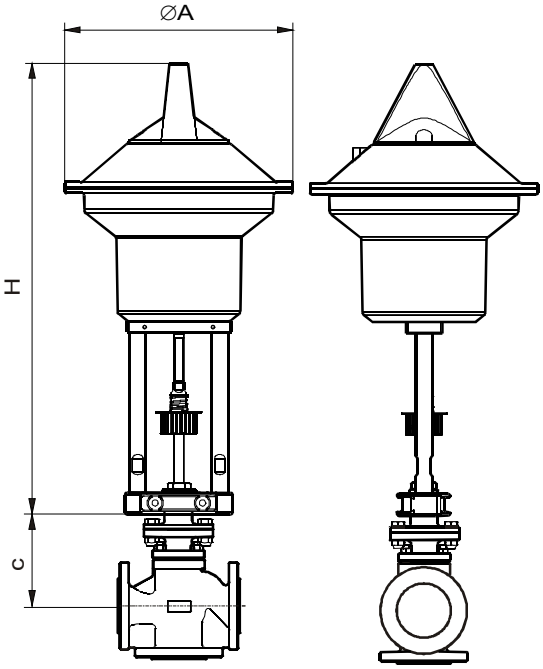
BUS	DN	A	c	L	H	k	d	b
015	15	65	143	130	20	65	14 x 4	16
020	20	70	143	150	20	75	14 x 4	18
025	25	75	147	160	20	85	14 x 4	18
032	32	80	173	180	20	100	19 x 4	18
040	40	90	179	200	20	110	19 x 4	18
050	50	100	177	230	20	125	19 x 4	20
065	65	120	213	290	30	145	19 x 8	22
080	80	130	229	310	30	160	19 x 8	24
100	100	150	248	350	30	190	23 x 8	24
125	125	200	295	400	40	220	28 x 8	26
150	150	210	357	480	40	250	28 x 8	28

M10462a

AVP 242



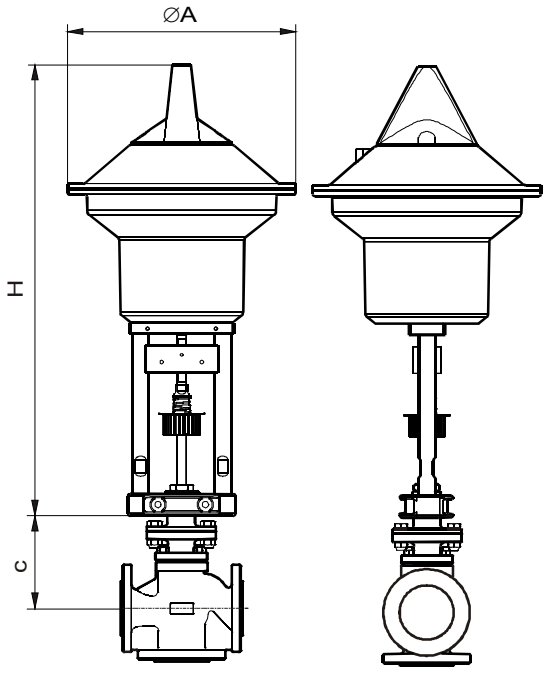
AVP 243, 244



AVP . . .	A	H
243 F021	250	497
243 F031	250	517
244 F021	335	536
244 F031	335	556

K10466

AVP243, 244

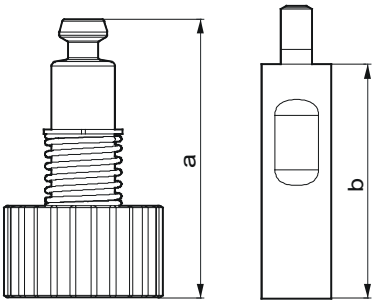


AVP . . .	A	H
243 F021	250	497
243 F031	250	517
244 F021	335	536
244 F031	335	556

K10467

Accessories

0372336 180
0372336 240



0372336	T (°C)	a (mm)	b (mm)
180	180	69,4	60
240	260	109,4	100

Z10217

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Sauter Components