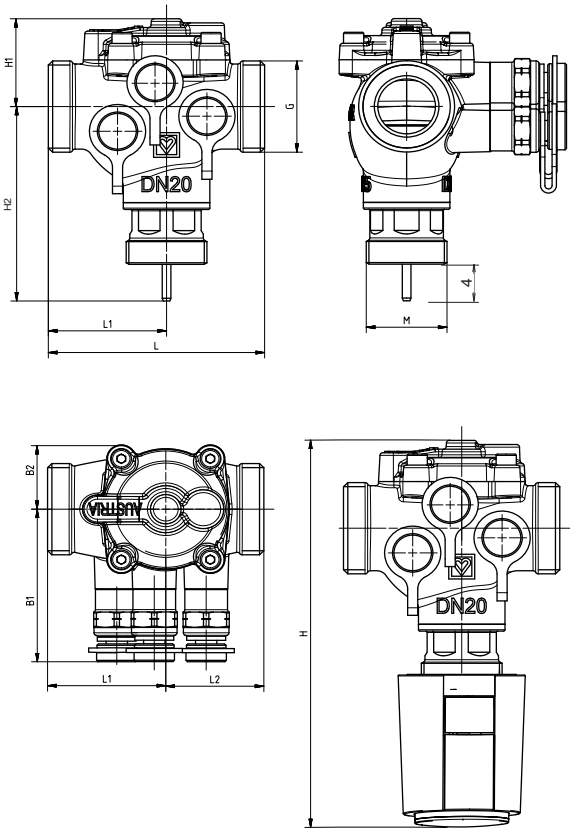
HERZ Pressure independent control valves with three test points

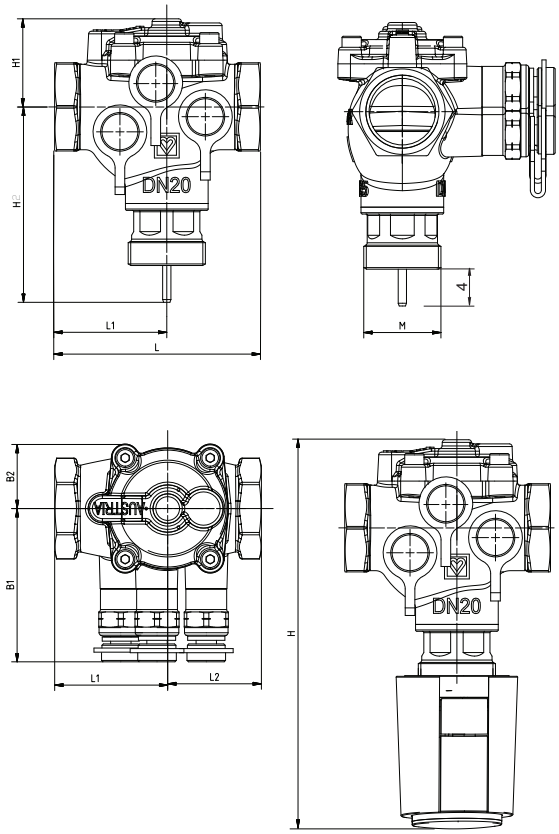
Datasheet **4006** 56,57,76,77 / **4206** 06,07,76,77, Issue 0822

Dimensions in mm

1 **4006** XX M SMART



1 **4206** XX M SMART



Installation dimensions and order numbers

Order number	DN	Thread, inch		L, mm	H1, mm	H2, mm	H*, mm	B1, mm	B2, mm	L1, mm	L2, mm	M, mm
1 **4006** 56 M SMART	15 SF	MT	3/4 flat sealing	75	32	70,9	157,7	54,6	23,3	41	34	28
1 **4006** 76 M SMART	15 HF		3/4 flat sealing	75	32	70,9	157,7	54,6	23,3	41	34	28
1 **4006** 57 M SMART	20 SF		1 G flat sealing	75	32	70,9	157,7	55,6	23,2	41	34	28
1 **4006** 77 M SMART	20 HF		1 G flat sealing	75	32	70,9	157,7	55,6	23,2	41	34	28
1 **4206** 06 M SMART	15 SF	FT	1/2	75	32	70,9	157,7	31,2	23,2	41	34	28
1 **4206** 76 M SMART	15 HF		1/2	75	32	70,9	157,7	55,2	23,2	41	34	28
1 **4206** 07 M SMART	20 SF		3/4	75	32	70,9	157,7	31,6	23,3	41	34	28
1 **4206** 77 M SMART	20 HF		3/4	75	32	70,9	157,7	55,6	23,3	41	34	28

* with 1 **7990** 3X actuator;

M - with measuring valves

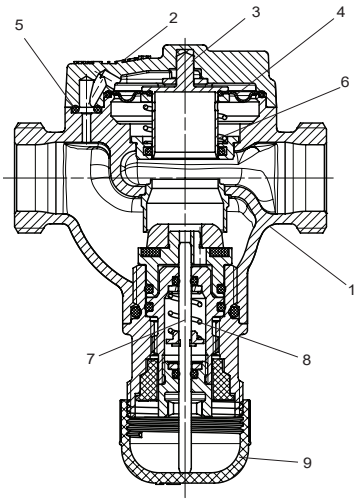
Technical specifications

	SMART			
	DN 15SF	DN15HF	DN 20SF	DN 20HF
1 4006 ..; 1 4206 ..	56; 06	76	57; 07	77
k_{VS}- value	1,75	2,62	2,62	3,54
Flowrate @ 100% setting, [l/h]	800	1200	1200	2000
Max. differential pressure over the valve, bar	6	6	6	6
Operating pressure	max. 25 bar			
Min. operating temperature	2 °C (pure water); - 20 °C (antifreeze)			
Max. operating temperature	130 °C			
Stroke	4 mm			
Control range	20 % - 100 %			
Water quality	Water purity in accordance with the ÖNORM H 5195 and VDI 2035 standards Ethylene and propylene glycol can be mixed to a ratio of 25 - 50 vol. [%].			

The integrated control unit together with the actuating drive is responsible for modular control. Various actuating drives might be used (see also chapter: Accessories and spare parts).

Materials

N	Description	Materials
1	Housing	DZR brass
2	Membrane housing	brass
3	Membrane piston unit	chrome-nickel steel
4	Membrane	EPDM
5	O-Rings	EPDM
6	Spring	spring steel
7	Pin	stainless steel
8	Spring	spring steel
9	Protective cap	plastic, red
Water purity in accordance with the ÖNORM H 5195 and VDI 2035 standards		



The use of ethylene and propylene glycol in a mixture ratio of 25 - 50% by volume [%] is permitted. Ammonia contained in hemp damages brass valve housings. EPDM seals are swollen by mineral oils or lubricants containing mineral oil and thus lead to failure of the EPDM seals. For frost and corrosion protection agents based on ethylene and propylene glycol can be found in the manufacturer's documentation.

Pursuant to Article 33 of the REACH Regulation (EC No. 1907/2006), we are obliged to point out that the material lead is listed on the SVHC list and that all brass components manufactured in our products exceed 0.1% (w / w) lead (CAS: 7439-92-1 / EINECS: 231-100-4). Since lead is a component part of an alloy, actual exposure is not possible and therefore no additional information on safe use is necessary.

Field of application

The Pressure Independent Balancing Control Valve (PIBCV) is used in all heating and cooling systems with circulation pumps. The valve automatically maintains flow to the required part of the system at the set rate by measuring and immediately adjusting to any variation in pressure. No additional measurements are necessary and the correct flow rate is achieved at all operating conditions. The diaphragm responds to the pressure upstream and downstream of the regulating valve (via an internal impulse line). The valve settings directly affect the volumetric flow through the valve. It is thus possible to set the maximum flow rate based on the flow chart when the valve is fitted. This allows for the balancing of heating circuits, cooling water systems, ceiling cooling and heating panels, air heaters, etc. without

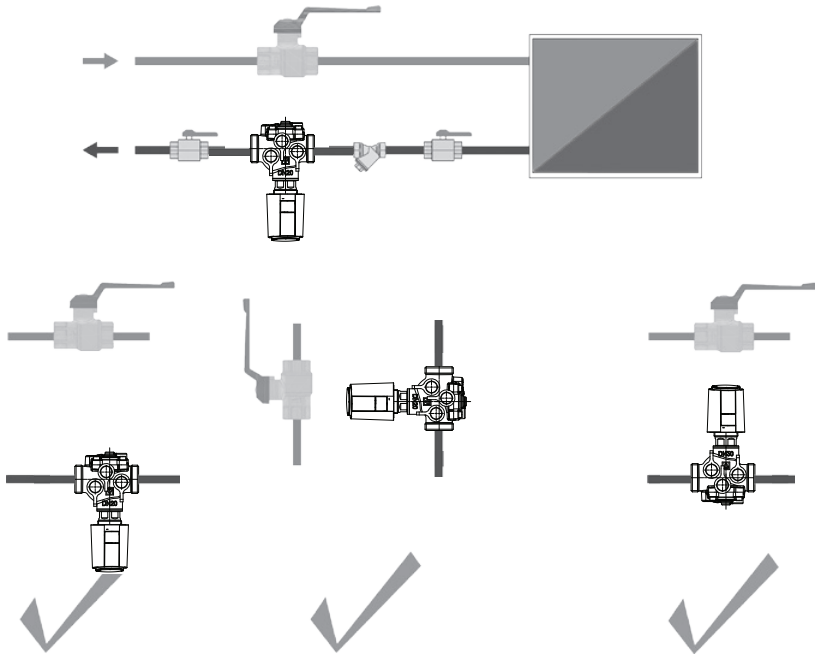
any need to first assess the pressure variations in the system. The valve‘s principal application is as a control valve for terminal units.

System flushing

If it is necessary to flush the system in the direction opposite to the direction of valve´s operation, it is important to take into account the maximum allowed differential pressure on the valve for backflushing, equal to 300 kPa. It is also recommended not to exceed the value of the backwash flow more than 3 times the nominal flow rate of the valve.

Installation

The installation takes place in the return, the installation position does not matter. The direction of flow is indicated in the direction of the arrow on the housing. It is recommended to install a shut-off valve before and after the combination valve. The combination valve is shut off with the HERZ setting tool (1 4006 02). The desired flow rate is set in % of the maximum flow rate. Shut off by turning to the right to the stop (display < 0 % red area).



Application

It is assumed that a consumer needs a volume flow of 600 l/h. The setting value is searched for the HERZ combination valve SMART DN 15SF (1 4006 56, 1 4206 06). The maximum flow at valve DN 15SF is 800 l / h, that corresponds to the setting 100%:

$$\frac{600\ l/h}{800\ l/h} \times 100\% = 75\%$$

The 600 l/h is required thus presetting is 75%, which must be set on the valve. A control measurement is then to be carried out. Please note that a minimum differential pressure according to the data sheet must be available for correct operation on the valve.

The HERZ combi valve 4006 is operated with 2-point or continuously acting actuators. However, continuous control is always recommended. The reason for this is that constant and energy-saving control is essential for fast-working systems such as cooling systems or air heaters. Maximum energy savings can only be achieved with regulating valves.

With continuous control, the volume flow is controlled continuously with the slightest fluctuations between minimum and maximum flow. The continuous control also protects all other system-specific components, right down to the pump. The 2-point control is recommended for slow systems such as underfloor heating.

HERZ 4006 PICVs have several advantages over conventional series connection of volume flow controller and differential pressure controller, since the volume flow controller limits the flow depending on the differential pressure of the system, while the differential pressure is variable. If the amount of water is reduced when the room temperature is reached, the differential pressure increases. The resulting operating point is completely different from that of hydraulic balancing. This means that valves connected in series interfere with themselves.

The valve authority for the HERZ combination valve is ideally “1”. A valve authority below 0.3 is an ON / OFF control. In order to ensure the efficiency of your system and proper operation, modular control with an authority greater than 0.5 should be aimed for. Since the HERZ valve 4006 compensates for the different differential pressures, the volume flow to the consumer is kept constant. An over or under supply of the individual consumers is therefore excluded.

Hydraulic balancing is always a relevant topic in building technology. The combination valves 4006 SMART and 4206 SMART enable the construction of a technical building system with reduced planning effort.

For systems with a large number of PICVs installed, the use of a differential pressure control valves 4002 is recommended to avoid noise problems, the occurrence of water hammer and an unstable system operation.

Application example

Combi valves are used in fan coil heat supply systems. A combination valve is installed in the return of each fan coil and acts as regulating valve.

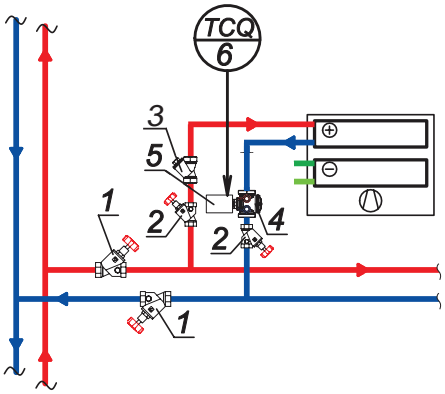
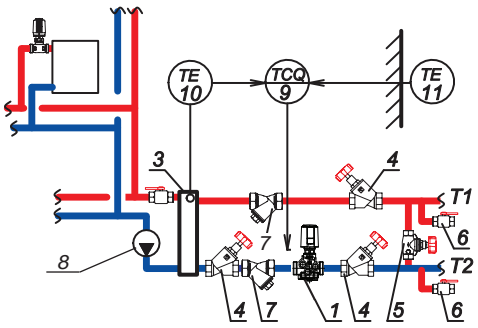


Diagram of a four-pipes fan coil heat supply system (extract)
1, 2 - shut-off valve STRÖMAX-A 4115;
3 - strainer 4111;
4 - PICV 4006 SMART;
5 - 7990 thermal actuators;
6 - electronic continuous controller.

PICVs in use with a hydraulic distributor.



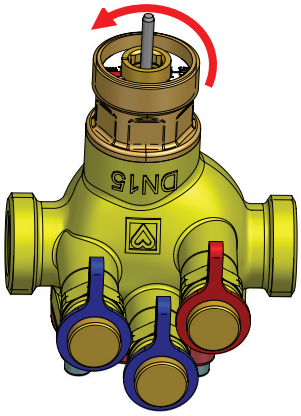
1 - PICV 4006;
2 - 7990 thermal actuator;
3 - hydraulic distributor;
4 - shut-off valve STRÖMAX-A 4115;
5 - line regulating valve STRÖMAX-GM 4217;
6 - THERMOFLEX 4119 boiler fill and drain valve;
7 - strainer 4111;
8 - circulation pump;
9 - electronic continuous controller;
10 - heating water temperature sensor;
11 - Outside temperature sensor.

Pressetting

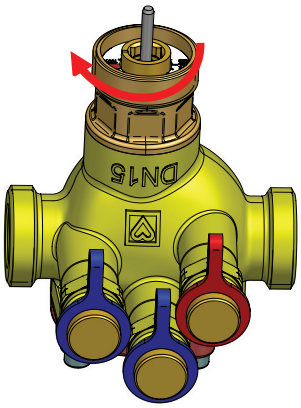
The respective setting of the control unit is clearly shown in percentages. The valve is preset with the HERZ setting key (1 4006 02). The desired flow is set in% of the maximum flow. To shut off, turn to the right to <0% (red area).

VE [%] = (Desired flow / maximum flow)*100

open = anticlockwise



close = clockwise



1 **4006** 02



How to perform a flow measurement:

- Connect the measuring computer to the test points
- Enter the dimensions, valve type and setting -> display flow

Warning notices

The valves must be installed for the correct application using clean fittings. A HERZ strainer (4111) should be fitted to prevent impurities.

Test points

Three test points are fitted on the same side of the valve and factory sealed. Thanks to this arrangement they are easily accessible and measurement devices can be quickly fitted, no matter in what position the valve has been installed.

Disposal

Local and currently applicable legislation must be observed for disposal.

Valve selection

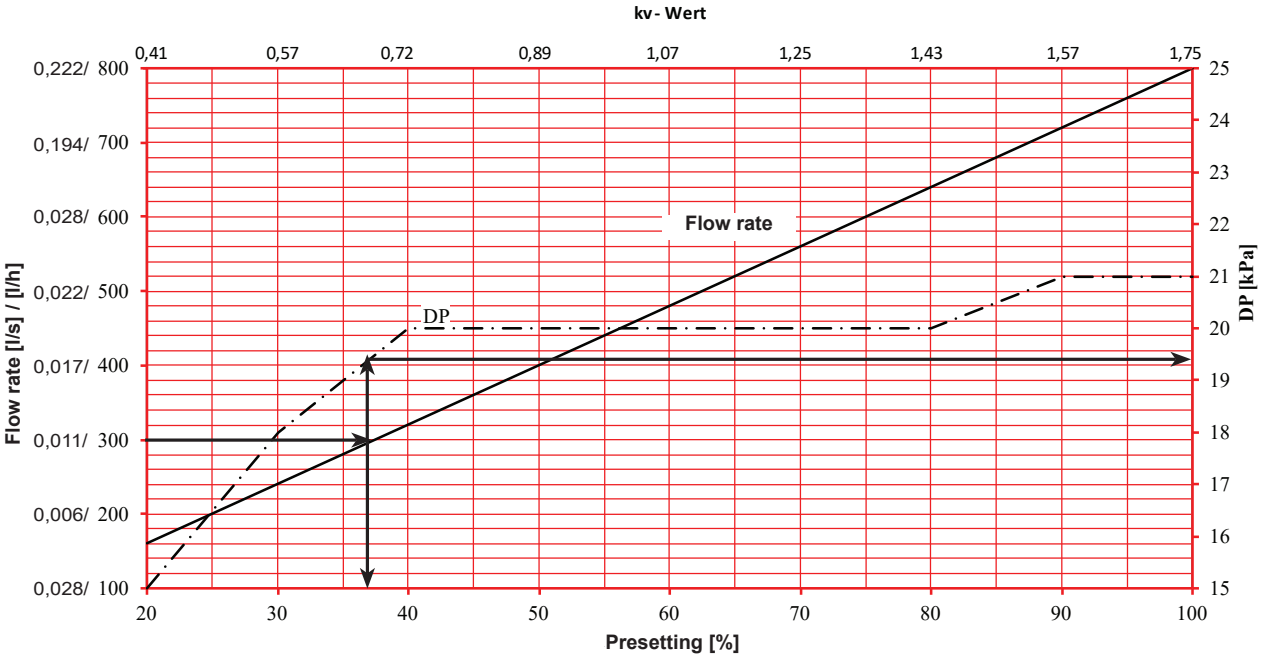
Select the valve with the smallest dimension that guarantees the necessary nominal flow with an additional safety surcharge. The setting should be as open as possible.

The flow rate calculation is based on the following formula:

$$V = \frac{3600 \times Q}{c \times \rho \times \Delta T} \times 1000, [l/h]$$

V ... volume flow [l / h]
Q ... heat output [kW]
c ... specific heat capacity 4.19 [kJ / kgK]
ρ ... density of water [kg / m³]
ΔT ... temperature difference flow and return [K]

With the help of the kv diagram, the respective minimum differential pressure [kPa] can be determined depending on the flow [l / h] and the default setting [%].



Functional principle of a PICV combination valve

A Pressure Independent Balancing and Control Valve (PIBCV or PICV) combines a regulating and control valve with a differential pressure controller.

Balancing and control valve

The valve has a linear characteristic. The adjustment of the required flow volume is done at the valve spindle, where the maximum stroke is adjusted. Settings between 20 % and 80 % of the nominal flow are recommended. The adjustment of the maximum stroke allows actuators with stroke detection to utilise their full control bandwidth (e.g. 0-10 V).

Differential pressure controller

The differential pressure controller keeps the differential pressure constant across the balancing and control valve. As the valve is independent from the system differential pressure, the preset flow volume will remain constant at all times despite any change in the system conditions..

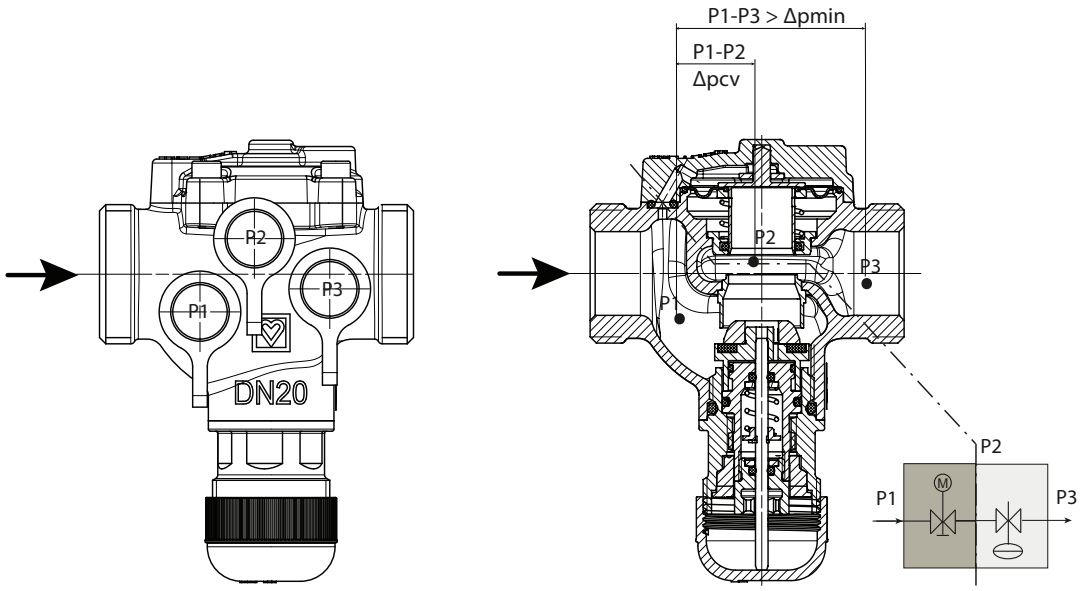
Test points

The dimensions DN15SF, DN15HF, DN20SF and DN20HF have 3 test points P1, P2 and P3. The valve requires a minimum differential pressure in order to operate correctly.

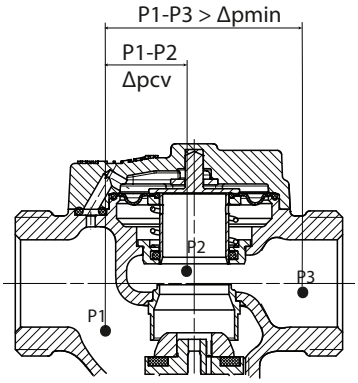
Measuring across P1-P3 will determine the minimum differential pressure that the valve requires to operate correctly.

Measuring across P1-P2 determines the differential pressure required to calculate the valve flow volume from the kv values (shown in the table) for each % preset position.

The differential pressure can be checked with the HERZ measuring computer 1 **8900** 05.



k_V - values of the control valve in the PIBCV (test points P1 - P2)



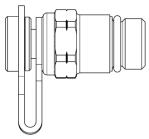
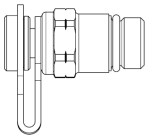
Presetting	DN 15 SF	DN 15 HF	DN 20 SF	DN 20 HF
[%]	[m³/h]	[m³/h]	[m³/h]	[m³/h]
20	0,352	0,530	0,548	0,983
21	0,370	0,557	0,579	1,040
22	0,389	0,585	0,611	1,097
23	0,407	0,613	0,643	1,154
24	0,425	0,641	0,674	1,211
25	0,443	0,669	0,706	1,268
26	0,462	0,697	0,738	1,325
27	0,480	0,724	0,769	1,382
28	0,498	0,752	0,801	1,439
29	0,517	0,780	0,832	1,496
30	0,535	0,808	0,864	1,553
31	0,554	0,837	0,898	1,616
32	0,573	0,867	0,932	1,679
33	0,592	0,896	0,965	1,742
34	0,610	0,926	0,999	1,805
35	0,629	0,955	1,033	1,867
36	0,648	0,985	1,067	1,930
37	0,667	1,014	1,100	1,993
38	0,686	1,044	1,134	2,056
39	0,705	1,073	1,168	2,119
40	0,724	1,103	1,202	2,182
41	0,742	1,142	1,238	2,246
42	0,760	1,181	1,274	2,311
43	0,778	1,220	1,310	2,376
44	0,796	1,260	1,347	2,441
45	0,814	1,299	1,383	2,506
46	0,833	1,338	1,419	2,571
47	0,851	1,377	1,455	2,636
48	0,869	1,417	1,492	2,700
49	0,887	1,456	1,528	2,765
50	0,905	1,495	1,564	2,830
51	0,924	1,531	1,598	2,893
52	0,942	1,566	1,632	2,957
53	0,961	1,602	1,665	3,020
54	0,979	1,637	1,699	3,083

55	0,998	1,672	1,733	3,146
56	1,016	1,708	1,767	3,210
57	1,035	1,743	1,800	3,273
58	1,053	1,779	1,834	3,336
59	1,072	1,814	1,868	3,399
60	1,090	1,850	1,902	3,463
61	1,112	1,883	1,937	3,536
62	1,134	1,915	1,972	3,609
63	1,156	1,948	2,007	3,683
64	1,178	1,980	2,042	3,756
65	1,199	2,013	2,077	3,829
66	1,221	2,046	2,113	3,903
67	1,243	2,078	2,148	3,976
68	1,265	2,111	2,183	4,050
69	1,286	2,144	2,218	4,123
70	1,308	2,176	2,253	4,196
71	1,332	2,212	2,292	4,271
72	1,355	2,248	2,331	4,346
73	1,379	2,284	2,369	4,421
74	1,402	2,320	2,408	4,496
75	1,425	2,356	2,447	4,571
76	1,449	2,392	2,485	4,646
77	1,472	2,428	2,524	4,721
78	1,496	2,464	2,562	4,796
79	1,519	2,500	2,601	4,871
80	1,543	2,536	2,640	4,946
81	1,568	2,574	2,683	4,990
82	1,594	2,612	2,726	5,035
83	1,620	2,651	2,769	5,080
84	1,646	2,689	2,812	5,125
85	1,672	2,728	2,855	5,169
86	1,698	2,766	2,898	5,214
87	1,723	2,804	2,941	5,259
88	1,749	2,843	2,985	5,304
89	1,775	2,881	3,028	5,348
90	1,801	2,919	3,071	5,393
91	1,824	2,963	3,106	5,538
92	1,847	3,007	3,142	5,682
93	1,871	3,050	3,177	5,827
94	1,894	3,094	3,213	5,971
95	1,917	3,138	3,248	6,116
96	1,940	3,181	3,284	6,261
97	1,963	3,225	3,319	6,405
98	1,987	3,269	3,355	6,550
99	2,010	3,312	3,390	6,694
100	2,033	3,356	3,426	6,839

Accessories and spare parts

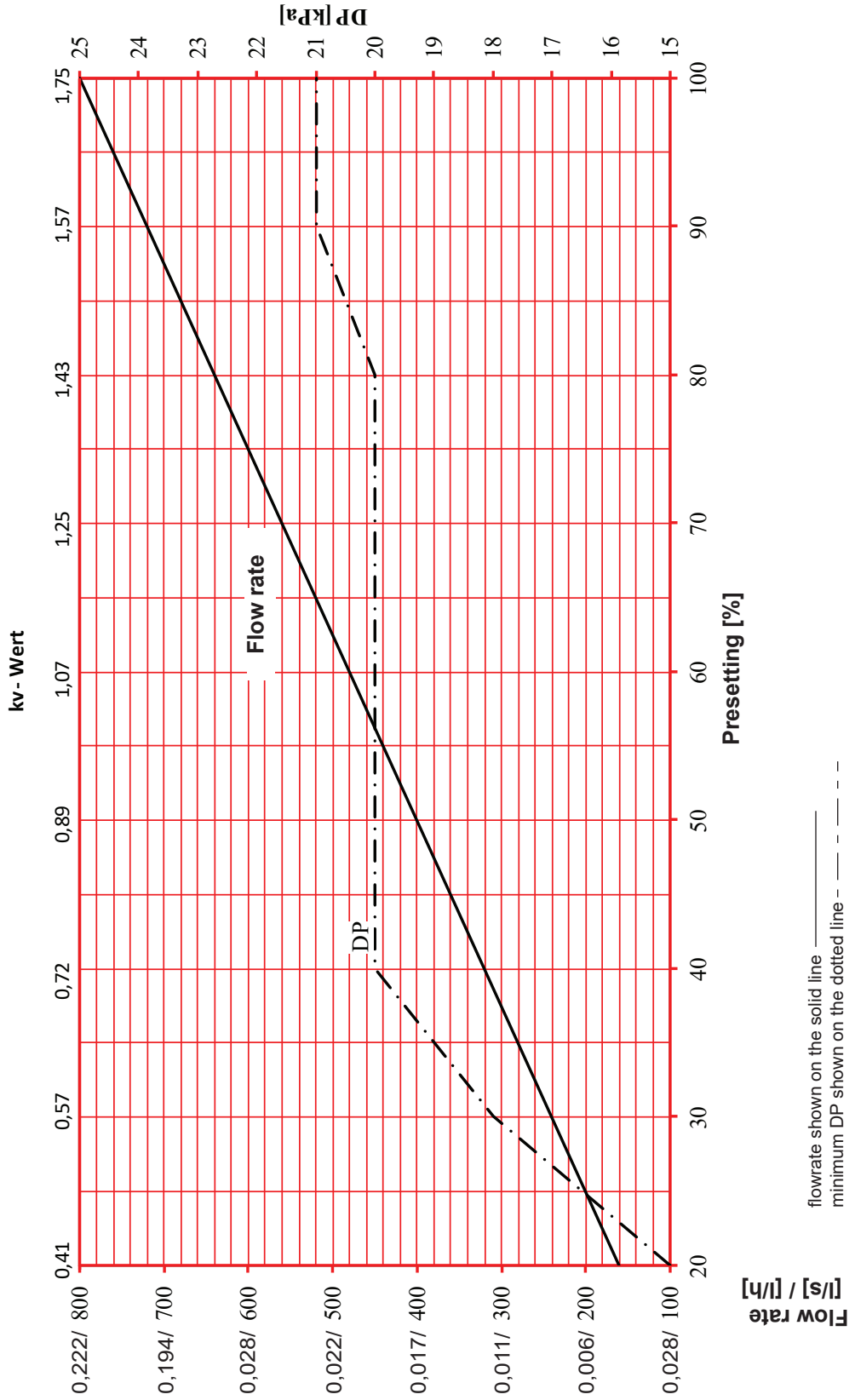
Order number	Description	Image
1 **7990** 31	HERZ actuating drive for continuous control M 28 x 1.5, 0..10 V, 5 mm stroke, adapter M 28 x 1.5 colour blue integrated, male connector, cable loose, without limit switch. Closing force 100 N, 1.2 watt.	
1 **7990** 32	HERZ actuating drive for continuous control M 28 x 1.5, 0..10 V, 6.5 mm stroke, adapter M 28 x 1.5 colour blue integrated, male connector, cable loose, without limit switch. Closing force 125 N, 1.2 watt with valve stroke detection.	
1 **7708** 53	HERZ actuating drive for 2-point control forfloor heating circuit distributors and valves M 28 x 1.5, 2-point, also suitable for pulse-pause operation, 5 mm stroke, adapter M 28 x 1.5 colour red integrated, cable fixed, without limit switch. Closing force 100 N. Power consumption 1 watt.	
1 **7708** 52	HERZ actuating drive for 2-point control for floor heating circuit distributors and valves M 28 x 1.5, 2-point, also suitable for pulse-pause operation, 5 mm stroke, adapter M 28 x 1.5 colour red integrated, cable fixed, without limit switch. Closing force 100 N. Power consumption 1 watt.	
1 **7708** 40	HERZ geared motor 3-point Adapter M 28 x 1.5 colour blue integrated, 24 V, stroke distance max. 8.5 mm, max. actuation force 200 N.	
1 **7708** 41	HERZ geared motor 3-point Adapter M 28 x 1.5 colour blue integrated, 230 V, stroke distance max. 8.5 mm, max. actuation force 200 N.	
1 **7708** 42	HERZ geared motor DDC 0–10 V Adapter M 28 x 1.5 colour blue integrated, 24 V, stroke distance max. 8.5 mm, max. actuation force 200 N.	
1 **7708** 46	HERZ geared motor DDC 0–10 V Adapter M 28 x 1.5 colour blue integrated, 24 V, stroke distance max. 8.5 mm, max. actuation force 200 N. With valve port detection and feedback channel.	

Accessories

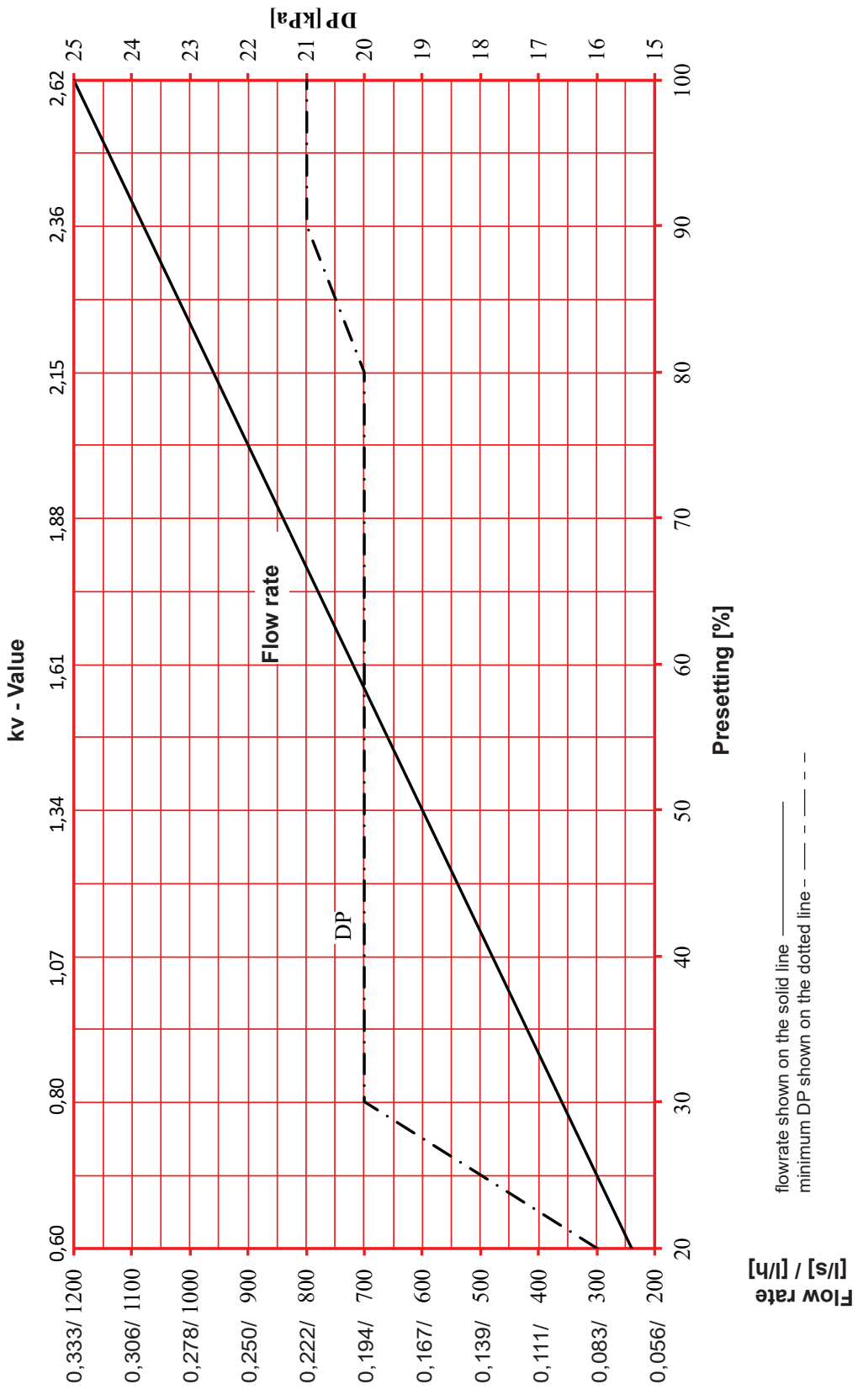
Order number	Dim.	Description	Model
1 **0284** 05	1/8″	Quick test point for combi valve - pressure-independent control valve SMART, brass version, blue cap (return) for pressure transducer	
1 **0284** 06	1/8″	Quick test point for combi valve - pressure-independent control valve SMART, brass version, red cap (supply) for pressure transducer	
1 **4006** 02		Pre-setting key HERZ Combi valve pressure-independent control valve for 4006/4206	

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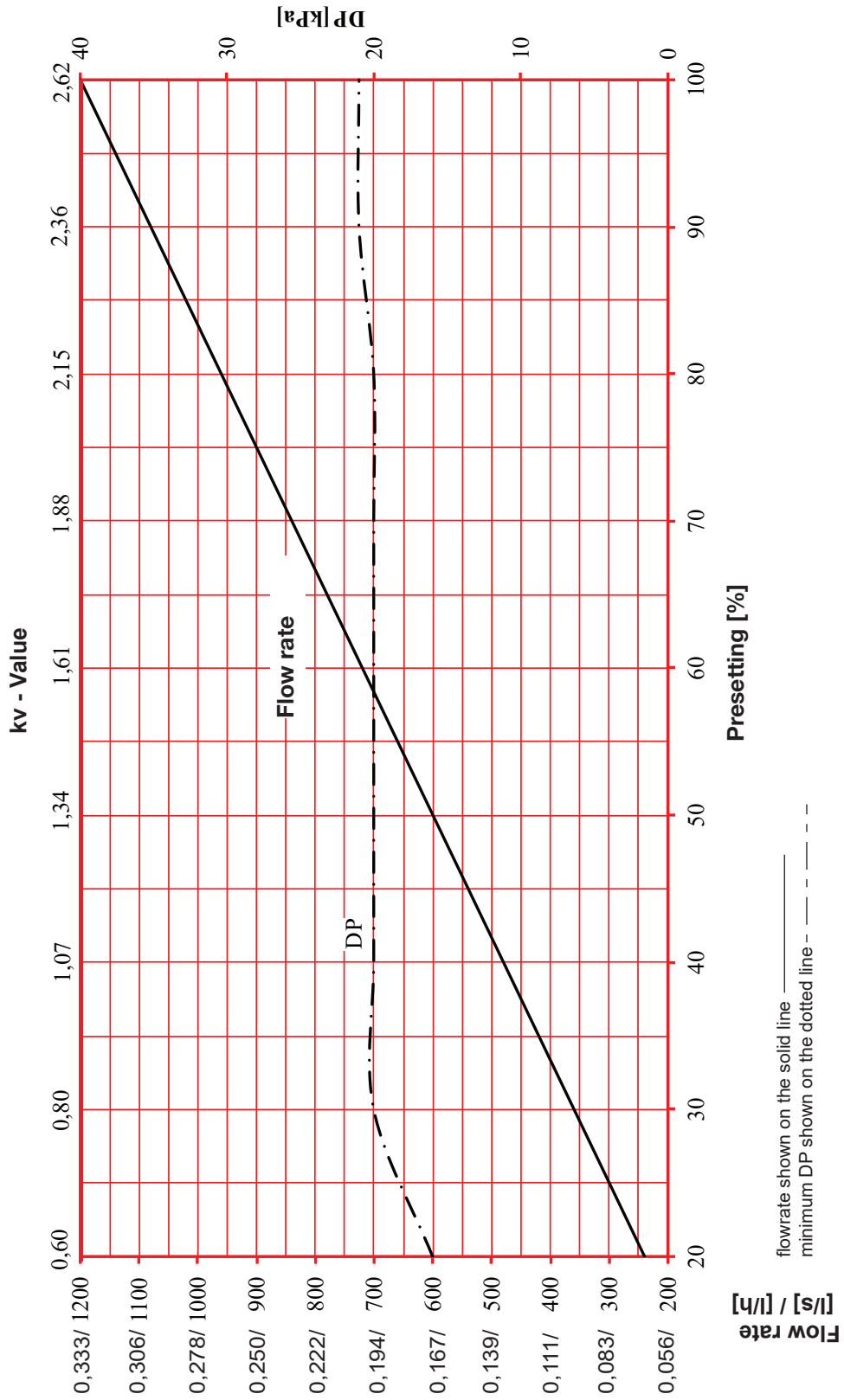
HERZ standard diagram	HERZ - PICV SMART
1 4206 06 / 1 4006 56	DN 15 SF



HERZ standard diagram	HERZ - PICV SMART
1 4206 76 / 1 4006 76	DN 15 HF



HERZ - Standard diagram	HERZ - PICV SMART
1 4206 07 / 1 4006 57	DN 20 SF



HERZ - Standard diagram	HERZ - PICV SMART
1 4206 77 / 1 4006 77	DN 20HF

