SINGLE-PORTED GLOBE CONTROL VALVES **TYPE Z®**

APPLICATIONS:

Single-ported globe control valves type Z® are used in automatic and remote control systems to control flow of gases and liquids. Wide range of material and design versions make the valves widely sought-after in chemical industry, heat and power generation industry, paper industry, food industry, metallurgy and coal mining (versions for Western Europe market is marked: BR11).

CHARACTERISTICS:

- range of nominal sizes from DN15 to DN250 for pressure values PN10 to CL300,
- various materials of valve body cast and internal parts, adapted to specific working conditions,
- wide range of flow ratios and control characteristics,
- reduction in aggressive and toxic media emissions to environment through application of bellow seal bonnets or bonnet packings meeting requirements of TA - LUFT,
- easy assembly and dismantling of valve internal parts for maintenance and service,
- high durability and reliability due to application of top-class materials and surface improvement processes (burnishing, stelliting, heat treatment, CrN coatings),
- possibility of mating with reversible action P/R (column) multi-spring actuators and changing the spring range with no extra parts (keeping the number of springs),
- possibility of fitting actuators with top drive,
- possibility of performing diagnostics of “valve-actuator” system due to application of smart electro-pneumatic positioners,
- high tightness of closure due to application of soft valve seats (with PTFE seals in the whole range of flows and characteristics, for valve plugs, balanced and unbalanced,
- same flow ratios and control characteristics for “hard” valve seats (metal-to-metal) and “soft” valve seats (metal-gasket), for valve plugs, balanced and unbalanced,
- reliable actuator-stem and valve seat-body connections,
- small guiding sleeve control forces due to application of balanced valve plugs in valves DN40…250,
- top-class flat and bonnet packings,
- wide range of electric actuators,
- possibility of mating with NN type hand operated drives,
- possibility of special executions for oxygen, hydrogen, gas fuels, low temperature mediums (liquid oxygen, liquid nitrogen), acid gases containing H_2S; explosive atmospheres as per 94/9/EC - ATEX,
- competitive prices – due to simple and functional design of valves and actuators and applied materials,
- design and production process meets the requirements of Quality Management System ISO 9001 and Directive 97/23/EC, and regulations of AD2000 Merkblatt, designated for installation on pipelines,

Z ® is a trademark registered with Republic of Poland Patent Office.

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DESIGN AND TECHNICAL SPECIFICATION:

Body (1): single-ported, flanged, cast in cast iron or cast steel.
Nominal sizes: DN15; 20; 25; 32; 40; 50; 65; 80; 100; 150; 200; 250
Nominal pressure: PN10; 16; 25; 40 (as per PN-EN 1092-1:2010 and PN-EN 1092-2:1999); CL150; CL300 (as per PN-EN 1759-1:2005).
Steel flanges CL150; CL300 are so designed that they can be assembled with flanges executed per American standards ANSI/ASME B16.5 and MSS SP44. In American standards flanges are identified with nominal values in "Classes", to which nominal pressure (PN) values as per PN-ISO 7005-1:2002 correspond.
Equivalent identification as per PN are: CL150: PN 20 and CL300: PN 50.

Table 1. Flanged end connections

Material	Nominal pressure	Facing of flange types			
		Raised face	Groove	Recess	Ring - joint
		Identification			
Grey iron	PN10; 16	B [2]	-	-	-
Spheroidal iron	PN10; 16; 25; 40		-	-	-
Cast steel	PN10; 16; 25; 40		D	F	-
	CL150		-	-	J (RTJ)
	CL300		DL (D1 [1])	F (F1)	
[1]) - only for CL300; [2]) - B1 – (Ra=12.5 mm, concentric surface structure "C"), B2 – (Ra as agreed with the customer); () - identification of connections as per ASME B16.5					
Possible execution of flanges per specification and indicated standards					

Face-to-face dimensions: as per PN-EN 60534-3-1; 2000r. - Fig. no. 7 ; Table 19 and 20. Series 1 - for PN10; 16; 25; 40; series 37- for CL150; series 38 - for CL300

Bonnet (2) - non-cast - assembled to body via assembly plate (DN15-100)
- cast (DN150-250): a) standard, b) extension (for cast steel valves), c) bellows (for cast steel valves).

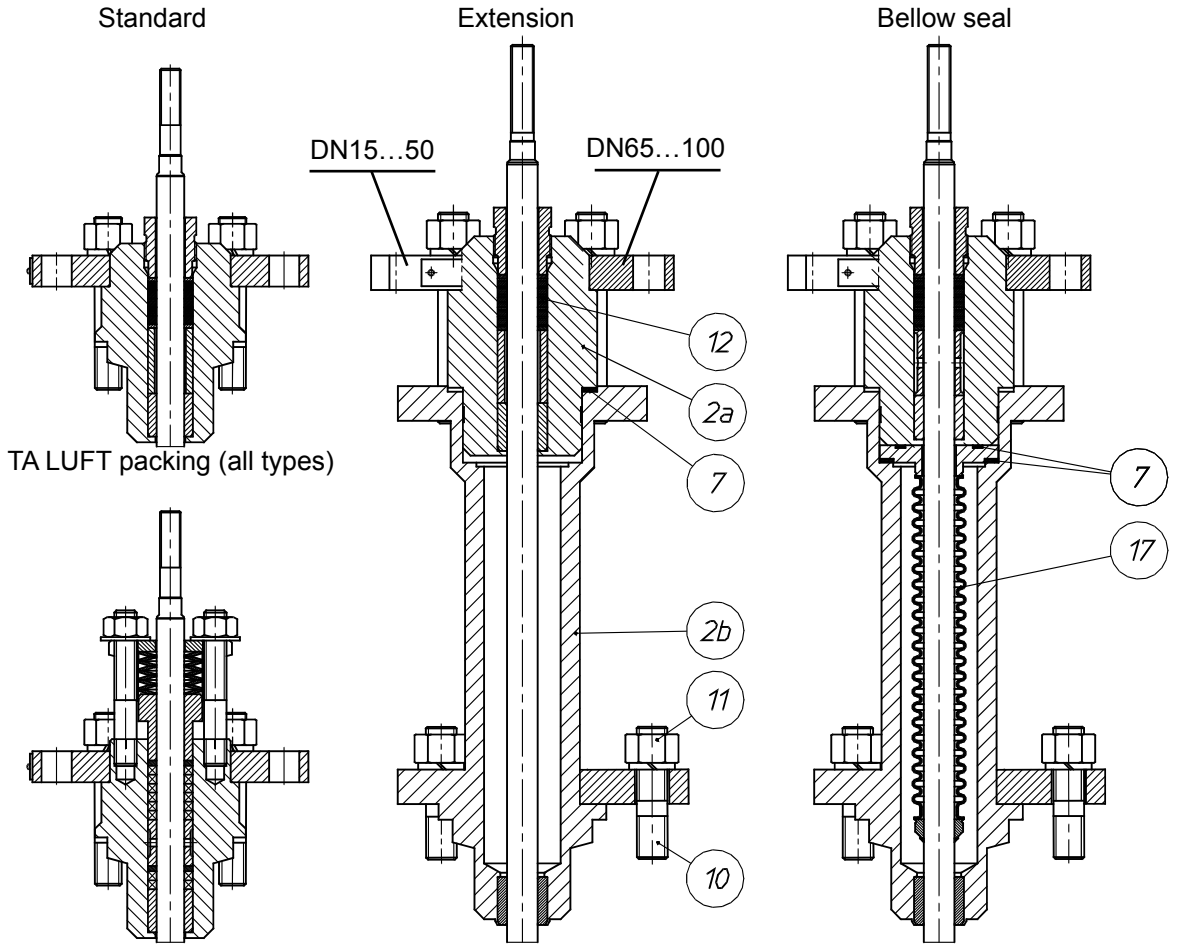


Fig. 1. Bonnets DN15…100

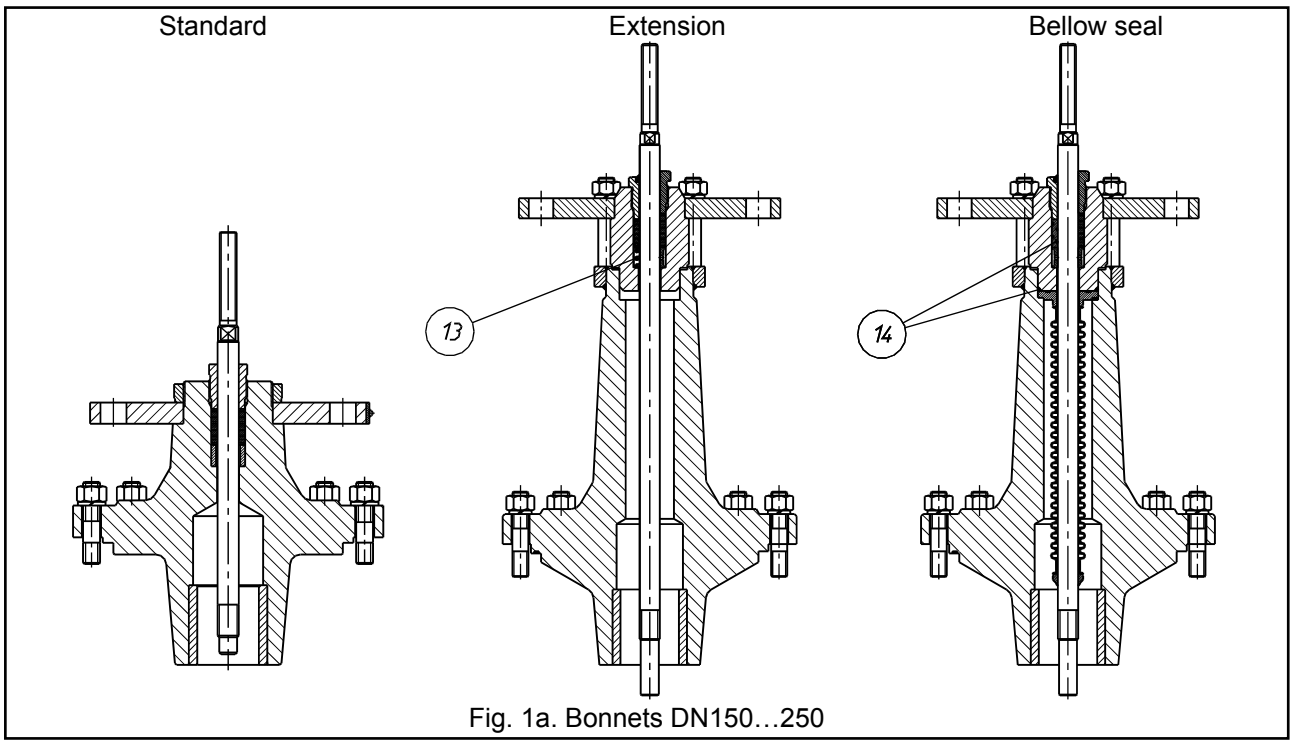


Fig. 1a. Bonnets DN150…250

Valve plug (3) - contoured, balanced, unbalanced

- control characteristics: - linear (L)
  - equal percentage (P)
  - quick-opening (S)
- rangeability: - 50:1

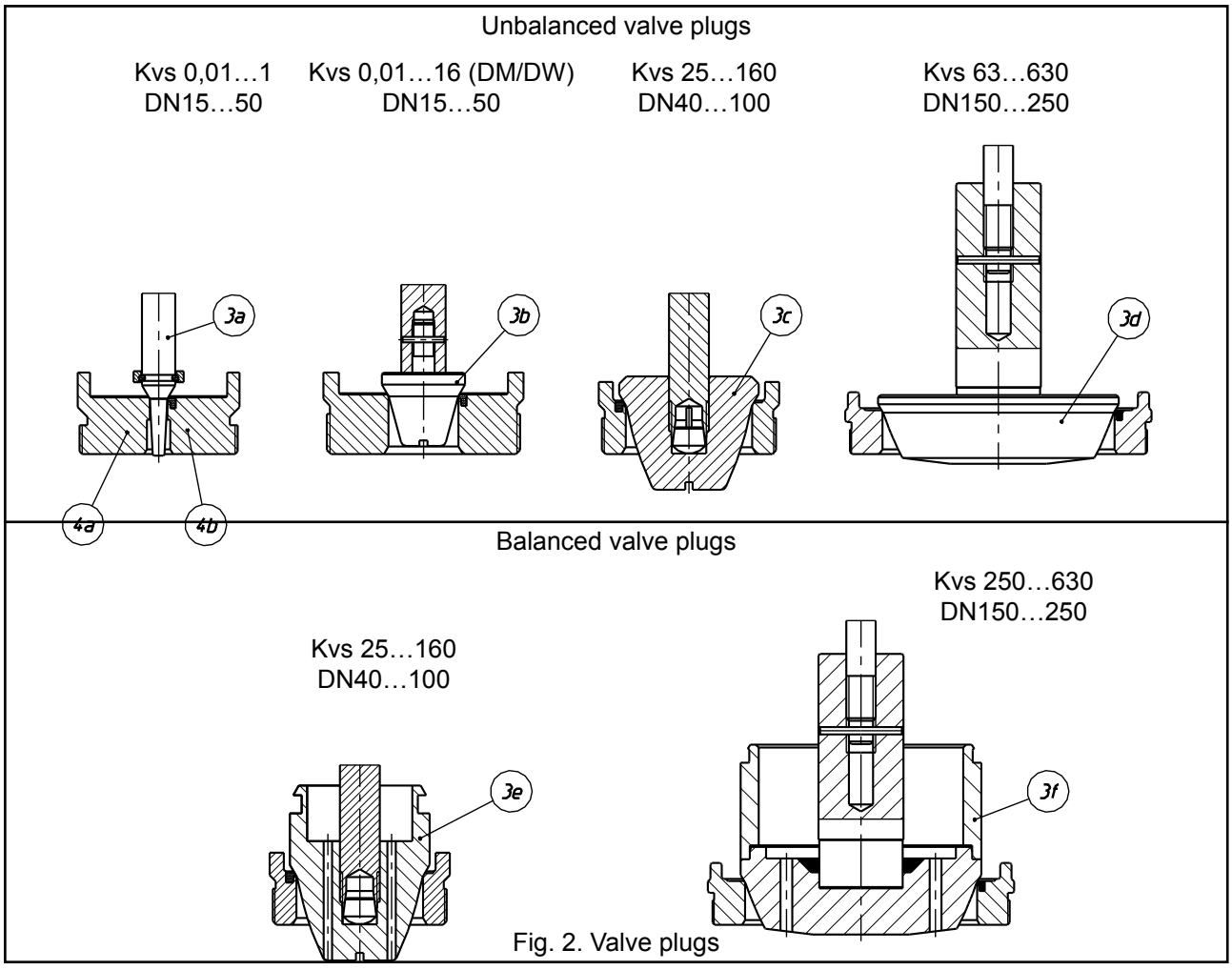


Fig. 2. Valve plugs

Valve seat (4) - screwed in, with centering cone, sealing and preventing unscrewing:
- hard version,
- soft version (PTFE packing).

Valve plug stem (5) - burnished or quenched and tempered, polished sealing contact surface
Drain plug (6) - steel or stainless steel: allows cleaning of body interior (delivered separately)
Body gasket (7) - asbestos-free:
- flat – aramid and hardened graphite (1.4571); in metallic casing (1.4571), multiple edges
- bonnet: - packings formed in various materials (PTFE-V; PTFE+graphite; expan ded graphite; braided graphite);
  - with TA Luft compression springs (PTFE-V; graphite)

Table 2. Packing types with application ranges.

Packing	PN / CL	Temperature [˚C]		
		Bonnet		
		Standard	Extension	Bellow
PTFE-V	PN10…CL300	-46...+200	-198...-46 +200...+300	-100...+200
PTFE + Graphite				
PTFE-V / TA-LUFT				
Graphite		+200...+300	+300...+450	+200...+400
Graphite / TA-LUFT				

Leakage class: - basic: Class IV as per PN-EN 60534-4 - hard valve seat
- bubble-tight Class VI as per PN-EN 60534-4 - soft valve seat

Table 3. Listing of components with materials

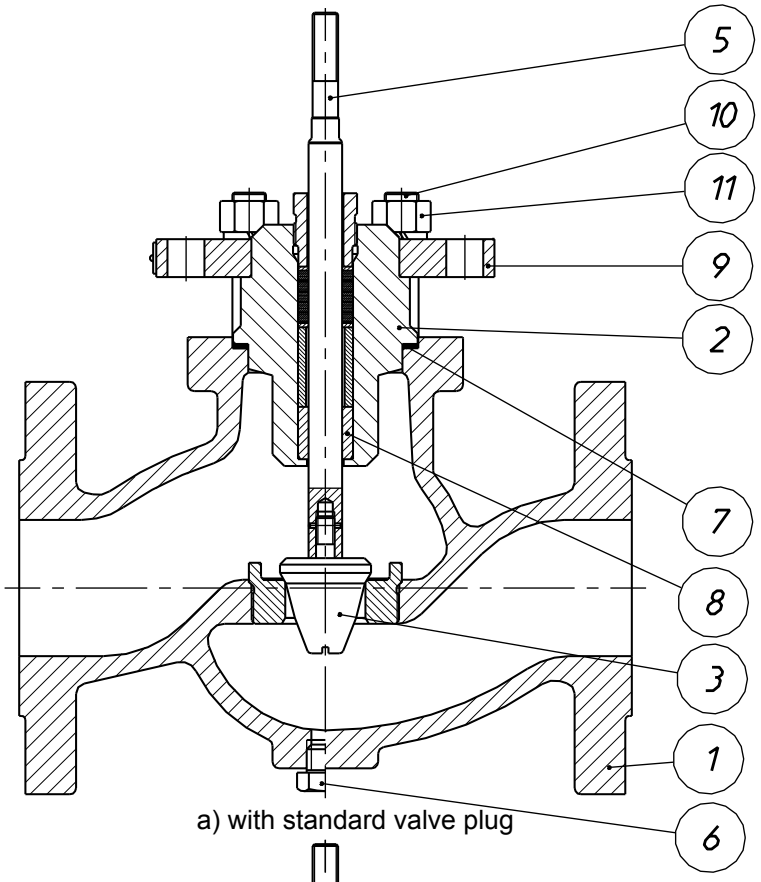
Item	Component		Materials					
1	Body		EN-GJL 250 (EN-JL 1040)	EN-GJS 400-18 LT (EN-JS 1025)	GP 240 GH (1.0619)	WCB	GX5CrNiMo 19-11-2 (1.4408)	CF8M
2	Bonnet	DN15…100	S 355 J2G3 (1.0570)				X6CrNiMoTi 17-12-2 (1.4571)	
		DN150…250	EN-GJL 250 (EN-JL 1040)	EN-GJS 400-18 LT (EN-JS 1025)	GP 240 GH (1.0619)	WCB	GX5CrNiMo 19-11-2 (1.4408)	CF8M
3	Plug		X6CrNiMoTi 17-12-2; (1.4571) X6CrNiMoTi 17-12-2; (1.4571) + stellite + CrN X17CrNi 16-2 ; (1.4057) + heat treatment					
4	Seat		X6CrNiMoTi 17-12-2; (1.4571) X6CrNiMoTi 17-12-2; (1.4571) + stellite X6CrNiMoTi 17-12-2; (1.4571) + PTFE X17CrNi 16-2; (1.4057) + heat treatment					
5	Stem		X6CrNiMoTi 17-12-2; (1.4571) X6CrNiMoTi 17-12-2; (1.4571) + stellite + CrN X17CrNi 16-2 ; (1.4057) + heat treatment					
6	Drain plug		S 355 J2G3 (1.0570)				X6CrNiMoTi 17-12-2; (1.4571)	
7	Body gasket		in metal casing X6CrNiMoTi 17-12-2 (1.4571) ; NOVATEC PREMIUM; SIGRAFLEX HOCHDRUCK; MWK-50 SPETOMET					
8	Guiding sleeve		X6CrNiMoTi 17-12-2; (1.4571) + CrN X6CrNiMoTi 17-12-2; (1.4571) + stellite + CrN X17CrNi 16-2 ; (1.4057) + heat treatment					
9	Compression plate		C45 (1.0503); X30Cr13 (1.4028); X6CrNiMoTi 17-12-2; (1.4571)					
10	Bolt		8.8				A4 - 70	
11	Nut		8				A4 - 70	
12	Packing		PTFE + GRAFIT; PTFE - „V"; GRAPHITE					
13	Spring		12R10 (SANDVIK)					
14	O-ring		Fluorine rubber (FKM)					
15	Guiding sleeve		X6CrNiMoTi 17-12-2; (1.4571) + CrN X6CrNiMoTi 17-12-2; (1.4571) + stellite + CrN X17CrNi 16-2 ; (1.4057) + heat treatment					
16	Seal ring		PTFE + X6CrNiMoTi 17-12-2 (1.4571); TURCON + X6CrNiMoTi 17-12-2 (1.4571)					
17	Bellow		X6CrNiMoTi 17-12-2; (1.4571)					

Relevant materials standards	
Material	Standard
EN-GJL 250 ; (EN-JL 1040)	PN-EN 1561
EN-GJS 400-18 LT ; (EN-JS 1025)	PN-EN 1563
GP 240 GH ; (1.0619)	PN-EN 10213-2
WCB	ASTM A 216
GX5CrNiMo 19-11-2 ; (1.4408)	PN-EN 10213-4
CF8M	ASTM A 351
S 355 J2G3 ; (1.0570)	PN-EN 10025
X6CrNiMoTi 17-12-2 ; (1.4571)	PN-EN 10088
X17CrNi 16-2 ; (1.4057)	PN-EN 10088
C45 (1.0503)	PN-EN 10083-1
X30Cr13 (1.4028)	PN-EN 10088

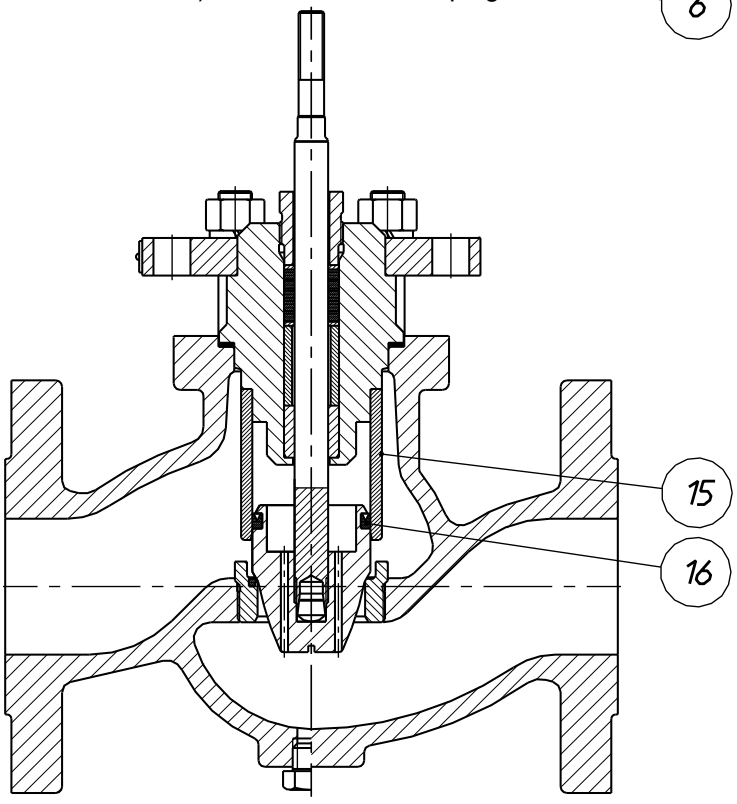
NOTE:
Hardening method used for hardening of valve internal parts comprises:
a) stelliting – padding of surfaces with stellite: ~40HRC
b) CrN coating – introducing chromium nitride to external layer of detail, to the depth of ca.0.1 mm;~950HV
c) heat treatment: plug (~45HRC), seat (~35HRC), stem (~35HRC), guide sleeve (~45HRC)
d) Maximum working temperature -200…+250°C (for KEFLOY 25 material), higher temperatures: upon consultation with the manufacturer.

Table 4. Working parameters for special executions of valves.

Valve execution	Working temperature [˚C]		Max working pressure [bar]
	Min.	Max.	
With balanced plug	-50	+200	40
With soft valve seat (PTFE)	-100		35
With bellow seal bonnet	-100	+400	35

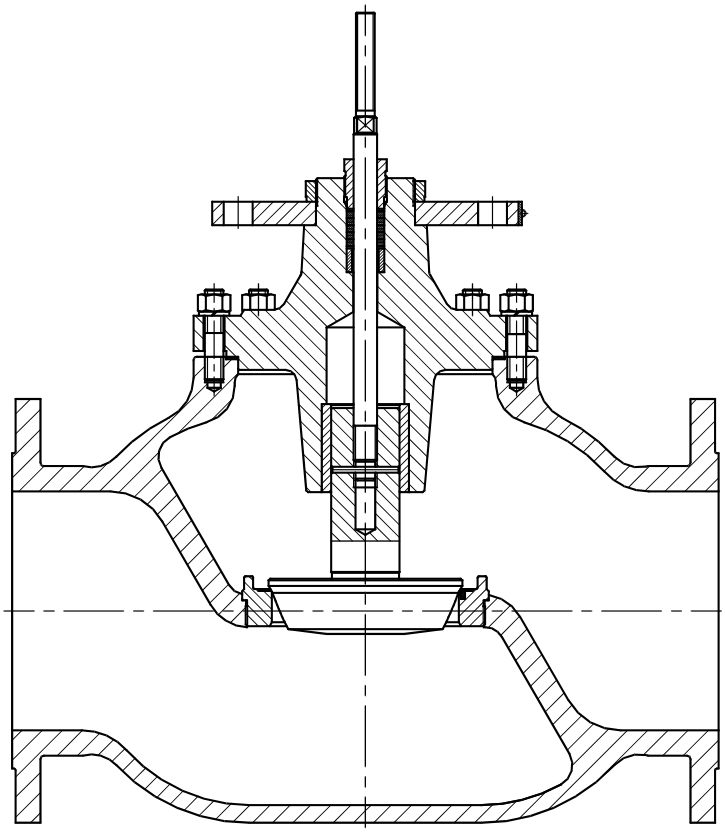


a) with standard valve plug

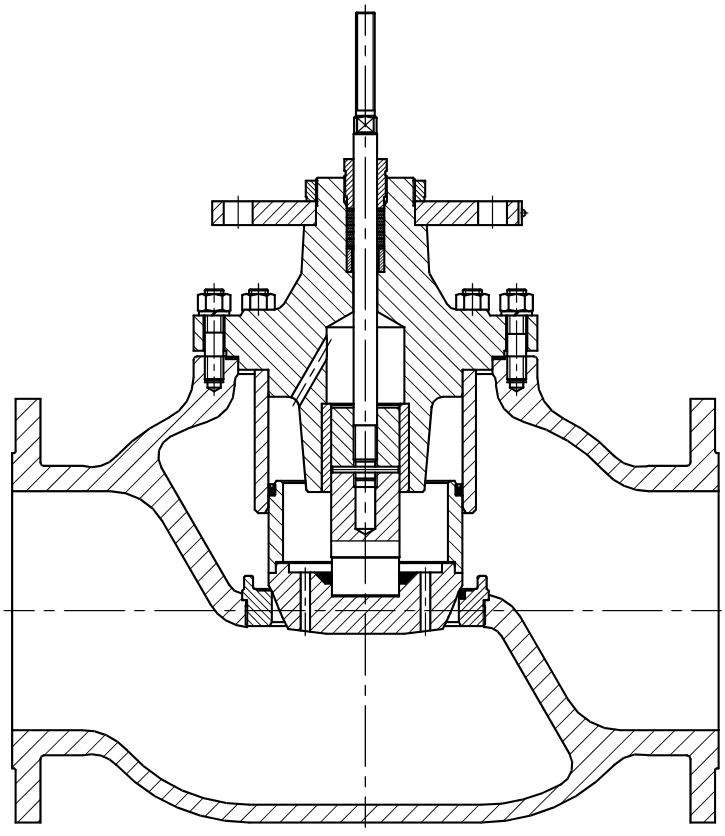


b) with balanced valve plug

Fig. 3. Control valve DN15-100



a) with standard valve plug



b) with balanced valve plug

Fig. 4. Control valve DN150-250

Table 5…11. Allowable working overpressure for materials at proper temperatures

Table 5. Material: EN-GJL 250 as per PN-EN 1561

PN	Standard	Temperature [˚C]						
		-10…120	150	180	200	230	250	300
		Allowable working pressure [bar]						
PN10	PN-EN 1092-2	10	9	8,4	8	7,4	7	6
PN16		16	14,4	13,4	12,8	11,8	11,2	9,6

Table 6. Material: EN-GJS 400-18 LT as per PN-EN 1563

PN	Norma	Temperature [˚C]					
		-10…120	150	200	250	300	350
		Allowable working pressure [bar]					
PN10	PN-EN 1092-2	10	9,7	9,2	8,7	8	7
PN16		16	15,5	14,7	13,9	12,8	11,2
PN25		25	24,3	23	21,8	20	17,5
PN40		40	38,8	36,8	34,8	32	28

Table 7. Material: GP240GH (1.0619) as per PN-EN 10213-2

PN / CL	Norma	Temperature [˚C]							
		-10…50	100	150	200	250	300	350	400
		Allowable working pressure [bar]							
PN10	EN 1092-1	10	9,2	8,8	8,3	7,6	6,9	6,4	5,9
PN16		16	14,8	14	13,3	12,1	11	10,2	9,5
CL150	PN-EN 1759-1	17,3	15,4	14,6	13,8	12,1	10,2	8,4	6,5
PN25	EN 1092-1	25	23,2	22	20,8	19	17,2	16	14,8
PN40		40	37,1	35,2	33,3	30,4	27,6	25,7	23,8
CL300	PN-EN 1759-1	45,3	40,1	38,1	36	32,9	29,8	27,8	25,7

Table 8. Material: GX5CrNiMo 19-11-2 (1.4408) as per PN-EN 10213-4

PN / CL	Norma	Temperature [˚C]									
		-10…50	100	150	200	250	300	350	400	425	450
		Allowable working pressure [bar]									
PN10	EN 1092-1	10	10	9	8,4	7,9	7,4	7,1	6,8	-	6,7
PN16		16	16	14,5	13,4	12,7	11,8	11,4	10,9	-	10,7
CL150	PN-EN 1759-1	17,9	16,3	14,9	13,5	12,1	10,2	8,4	6,5	5,6	4,7
PN25	EN 1092-1	25	25	22,7	21	19,8	18,5	17,8	17,1	-	16,8
PN40		40	40	36,3	33,7	31,8	29,7	28,5	27,4	-	26,9
CL300	PN-EN 1759-1	46,7	42,5	38,9	35,3	32,9	30,5	28,8	27,6	27,2	26,9

Table 9. Material: G20Mn5 (1.6220) wg PN-EN 10213-3

PN / CL	Norma	Temperature [˚C]					
		-40	100	150	200	250	300
		Allowable working pressure [[bar]					
PN10	-	6	6	3,8	3,6	3,48	3,4
PN16		16	16	10,1	9,6	9,28	9,07
PN25		25	25	15,8	15	14,5	14,2
PN40		40	28	28	27	26	25

Table 10. Material: WCB as per ASTM A216

PN / CL	Norma	Temperature [˚C]								
		-10…50	100	150	200	250	300	350	375	400
		Allowable working pressure [bar]								
PN10	EN 1092-1	10	10	9,7	9,4	9	8,3	7,9	7,7	6,7
PN16		16	16	15,6	15,1	14,4	13,4	12,8	12,4	10,8
CL150	PN-EN 1759-1	19,3	17,7	15,8	14	12,1	10,2	8,4	7,4	6,5
PN25	EN 1092-1	25	25	24,4	23,7	22,5	20,9	20	19,4	16,9
PN40		40	40	39,1	37,9	36	33,5	31,9	31,1	27
CL300	PN-EN 1759-1	50	46,4	45,1	43,9	41,8	38,9	36,9	36,6	34,6

Table 11. Material: CF8M as per ASTM A351

PN / CL	Norma	Temperature [˚C]									
		-10…50	100	150	200	250	300	350	375	400	425	450
		Allowable working pressure [bar]										
PN10	EN 1092-1	8,9	7,8	7,1	6,6	6,1	5,8	5,6	5,5	5,4	5,4	5,3
PN16		14,3	12,5	11,4	10,6	9,8	9,3	9	8,8	8,7	8,6	8,5
CL150	PN-EN 1759-1	18,4	16	14,8	13,6	12	10,2	8,4	7,4	6,5	5,6	4,6
PN25	EN 1092-1	22,3	19,5	17,8	16,5	15,5	14,6	14,1	13,8	13,6	13,5	13,4
PN40		35,6	31,3	28,5	26,4	24,7	23,4	22,6	22,1	21,8	21,6	21,4
CL300	PN-EN 1759-1	48,1	42,3	38,6	35,8	33,5	31,6	30,4	29,6	29,3	29	29

NOTES:

1. It is allowed to apply spheroidal iron up to -40°C, carbon steel up to -60°C, and acid proof cast steel up to -196°C, provided that working pressure is reduced respectively, working temperature impact tests are performed and cast is heat treated. Details are to be consulted with manufacturer.
2. Working pressure for intermediate temperature values can be calculated by interpolation.

Table 12. Flow ratios Kvs [m³/h] for unbalanced valve plugs

Kvs [m³/h]	Stroke [mm]	Valve seat diameter D [mm]	F_D [kN]		Nominal size DN												Characteristics		
			Hard valve seat	Soft valve seat	15	20	25	32	40	50	65	80	100	150	200	250	L	P	S
0,010	20	6,35	0,1	0,16	■	■	■	■	■	■							■		
0,016					■	■	■	■	■	■							■		
0,025					■	■	■	■	■	■							■		
0,040					■	■	■	■	■	■							■		
0,063					■	■	■	■	■	■							■		
0,10					■	■	■	■	■	■							■		
0,16					■	■	■	■	■	■							■		
0,25					■	■	■	■	■	■							■	■	
0,40					■	■	■	■	■	■							■	■	
0,63					■	■	■	■	■	■							■	■	
1,0					■	■	■	■	■	■							■	■	
1,6		9,52	0,15	0,25	■	■	■	■	■	■							■	■	
2,5		12,7	0,2	0,3	■	■	■	■	■	■							■	■	
4,0					■	■	■	■	■	■							■	■	■
6,3		19,05	0,3	0,5		■	■	■	■	■							■	■	■
10		20,64	0,35	0,5			■	■	■	■							■	■	■
16		25,25	0,4	0,6				■	■	■	■						■	■	■
25		31,72	0,5	0,8					■	■	■	■					■	■	■
40		41,25	0,7	1,0						■	■	■	■				■	■	■
63	38	50,8	0,8	1,3							■	■	■	■			■	■	■
94		66,7	1,1	1,7								■	■	■	■		■	■	■
125		88,9	1,4	2,2									■	■	■	■	■	■	■
160													■	■	■	■	■	■	■
250	50	107,92	1,7	2,7										■	■	■	■	■	■
320		126,95	2,0	3,2										■	■	■	■	■	■
500	63	158,72	2,5	4,0											■	■	■	■	■
630		195	3,1	4,9												■	■	■	■
Calculated ratios: $F_L = 0,9$; $X_T = 0,72$; Fd = 0,46 ; xFz = 0,65																			

Table 13. Flow ratios Kvs [m³/h] for balanced valve plugs

Kvs [m³/h]	Stroke [mm]	Valve nominal size DN								Characteristics		
		40	50	65	80	100	150	200	250	L	P	S
25	20	■	■							■	■	■
40			■	■						■	■	■
63	38			■	■					■	■	■
94					■	■				■	■	■
125						■				■	■	■
160						■				■	■	■
250	50						■	■		■	■	■
320							■	■		■	■	■
500	63							■	■	■	■	■
630								■	■	■	■	■

NOTE:
Valve seat diameter for balanced valve plug flow ratio Kvs 250 is 126.95 mm.

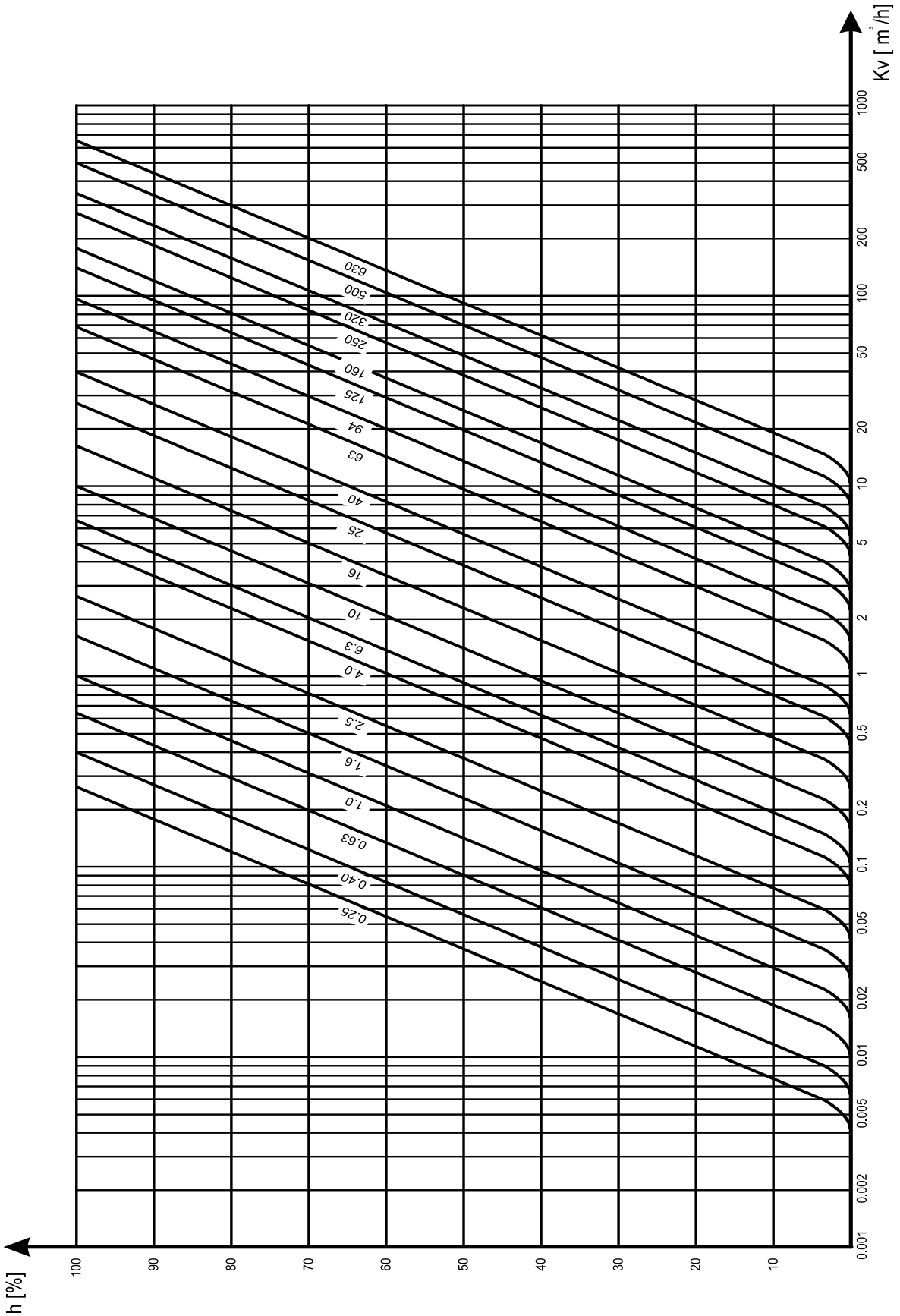


Diagram 1. Equal percentage flow characteristics for control valves Kvs=0.25…630 m³/h

ALLOWABLE PRESSURE DROPS Δp.

Pressure drops Δp [bar] in Tables 15 and 16 apply to closed valve and they are calculated for valve drive potential. Actual pressure drops should not exceed 70% of allowable working pressure for given nominal pressure, material execution and working temperature, as per tables 5…11.

$$\Delta p = \frac{Fs - F_D}{0{,}785 \cdot 10^{-4} \cdot D^2} \quad \text{or} \quad Fs = 0{,}785 \cdot 10^{-4} \cdot D^2 \cdot \Delta p + F_D$$

where
- Δp [bar] - calculated pressure drop
- Fs [kN] - actuator available force (Table 14)
- F_D [kN] - valve plug to valve seat pressure (Table 12)
- D - valve seat diameter [mm] (Table 12)

Table 14. Available force F_S [kN] of pneumatic actuators

Actuator size	Direct actuator P			Reverse actuator R					
	Supply pressure [kPa]			Spring range [kPa]					
	140	250	400	20 - 100	40 - 120; 40 - 200	60 - 140	80 - 240	120 - 280	180 - 380
160	0,64	2,4	4,8	0,32	0,64	0,96	1,28	1,92	-
250	1,0	3,8	7,5	0,5	1,0	1,5	2,0	3,0	-
400	1,6	6,0	12,0	0,8	1,6	2,4	3,2	4,8	-
630	2,5	9,5	18,9	1,3	2,5	3,8	5,0	7,6	11,3
1000	4,0	15,0	30,0	2,0	4,0	6,0	8,0	12,0	18,0

NOTE:
1. For direct actuators P adopted spring range is 20 – 100 kPa
2. For electric and other actuators Δp value can be calculated using above formula and data from Tables 12 and 14, taking nominal load capacity as available force F_S, as per actuator catalog chart.
3. For balanced valve plugs available force Fs at least equal to F_D value for soft valve seats in Table 12 should be adopted.

Table 15. Allowable pressure drops Δp [bar] for valves with unbalanced valve plugs and hard valve seats, with pneumatic actuators.

Flow ratio Kvs [m³/h]	Valve nominal diameter DN	Stroke [mm]	Air – to – close					Air – to – open		
			Actuator		Δp [bar]			Actuator		Δp [bar]
			Size	Spring range [kPa]	Supply pressure [kPa]			Size	Spring range [kPa]	
					140	250	400			
do 4	15; 20; 25; 32; 40; 50	20	160	20-100	34	-	-	160	20-100 40-200	9 34
6,3	20; 25; 32; 40; 50				11	40	-		20-100 40-200 60-140	7 11 23
10	25; 32; 40; 50				9	40	-		20-100 40-200 60-140 80-240	0,7 9 19 28
16	32; 40; 50				4	40	-		20-100 40-200 60-140 80-240 120-280	- 4 11 17 30
do 4	15; 20; 25; 32; 40; 50		250		40	-	-	250	20-100 40-200	23 40
6,3	20; 25; 32; 40; 50				24	40	-		20-100 40-200 60-140	7 24 40
10	25; 32; 40; 50				20	40	-		20-100 40-200 60-140 80-240	5 20 34 40
16	32; 40; 50				12	40	-		20-100 40-200 60-140 80-240 120-280	2 12 22 32 40
	65		400		24	40	-	400	20-100 40-200 60-140	8 24 40
25	40; 50; 65; 80				14	40	-		20-100 40-200 60-140 80-240 120-280	4 14 24 34 40
40	50; 65; 80; 100				6,5	38	40		40-200 60-140 80-240 120-280	6 12 18 29
63	65; 80; 100	38	630	20-100	8,5	40	-	630	40-200 60-140 80-240 120-280 180-380	9 15 21 34 40
	150		1000		16	40	-	1000	40-200 80-240 120-280	16 36 40
94	80; 100		630		4	24	40	630	40-200 60-140 80-240 120-280 180-380	4 8 11 18 29
	150; 200		1000		8	32	40	1000	40-200 80-240 120-280 180-380	8 20 31 40
125; 160	100		630		2	13	28	630	40-200 60-140 80-240 120-280 180-380	2 4 6 10 16
	150; 200; 250		1000		4	22	40	1000	40-200 80-240 120-280 180-380	4 10 17 26
250	150; 200; 250	50			2,5	14	30		40-200 80-240 120-280 180-380	2,5 6,5 11 17,5
320	150; 200; 250				1,5	10	22		40-200 80-240 120-280 180-380	1,5 4,5 8 12,5
500	200; 250	63			-	6	14		40-200 80-240 120-280 180-380	- 2,5 5 7,5
630	250				-	4	9		40-200 80-240 120-280 180-380	- 1,5 3 5

Note: 1. In Table 15, theoretical acceptable pressure drops are included. Actual pressure drops with consideration of tolerance of spring manufacture and friction of internal parts of the actuator are lower than those given by 20%.
Pressure drops chosen that way guarantee internal tightness of closing of the valves.
2. In air-to-open valves actuator with spring range of 40-200 [kPa] can be replaced with actuator with spring range of 40-120 [kPa], at the same pressure drops.
3. In valves with balanced valve plugs and hard valve seats for pressure drops up to Δp=40 [bar], actuators are to be selected as below:
- for air-to-close action: spring range 20-100 [kPa], supply pressure 140 [kPa]
- for air-to-open action: spring range 40-120 [kPa], or 40-200 [kPa]

Table 16. Allowable pressure drops Δp [bar] for valves with unbalanced valve plugs and soft valve seats, with pneumatic actuators.

Flow ratio Kvs [m³/h]	Valve nominal diameter DN	Stroke [mm]	Air – to – close					Air – to – open		
			Actuator		Δp [bar]			Actuator		Δp [bar]
			Size	Spring range [kPa]	Supply pressure [kPa]			Size	Spring range [kPa]	
					140	250	400			
do 4	15; 20; 25; 32; 40; 50	20	160	20-100	25	-	-	160	20-100 40-200	- 25
6,3	20; 25; 32; 40; 50				5	35	-		40-200 60-140	5 16
10	25; 32; 40; 50				3	35	-		40-200 60-140 80-240	3 13 22
16	32; 40; 50				-	35	-		40-200 60-140 80-240 120-280	- 6 12 25
do 4	15; 20; 25; 32; 40; 50		250		35	-	-	250	20-100 40-200	15 35
6,3	20; 25; 32; 40; 50				17	35	-		40-200 60-140	17 35
10	25; 32; 40; 50				12	35	-		40-200 60-140 80-240	12 26 35
16	32; 40; 50				6	35	-		40-200 60-140 80-240 120-280	6 16 26 35
	65		400		18	35	-	400	40-200 60-140 80-240	18 34 35
25	40; 50; 65; 80				10	35	-		40-200 60-140 80-240 120-280	10 20 30 35
40	50; 65; 80; 100				3,5	35	-		40-200 60-140 80-240 120-280	3,5 9 15 26
63	65; 80; 100	38	630	20-100	6	35	-	630	40-200 60-140 80-240 120-280 180-380	6 12 19 31 35
	150		1000		13	35		1000	40-200 80-240 120-280	13 33 35
94	80; 100		630		3	23	35	630	40-200 60-140 80-240 120-280 180-380	3 7 10 18 28
	150; 200		1000		7	35	-	1000	40-200 80-240 120-280 180-380	7 19 30 35
125; 160	100		630		-	11	26	630	40-200 60-140 80-240 120-280 180-380	- 2 4 8 14
	150; 200; 250		1000		2,5	20	35	1000	40-200 80-240 120-280 180-380	2 9 15 25
250	150; 200; 250	50			1,2	13	29		40-200 80-240 120-280 180-380	1 5 10 16
320	150; 200; 250				-	9	21		40-200 80-240 120-280 180-380	- 3,5 6,5 11,5
500	200; 250	63			-	5	8		40-200 80-240 120-280 180-380	- 2 4 7
630	250				-	3	8		40-200 80-240 120-280 180-380	- 1 2 4

Note:

1. In Table 16, theoretical acceptable pressure drops are included. Actual pressure drops with consideration of tolerance of spring manufacture and friction of internal parts of the actuator are lower than those given by 20%.
   Pressure drops chosen that way guarantee internal tightness of closing of the valves.
2. In air-to-open valves actuator with spring range of 40-200 [kPa] can be replaced with actuator with spring range of 40-120 [kPa], at the same pressure drops.
3. In valves with balanced valve plugs and soft valve seats for pressure drops up to Δp=35 [bar],actuators are to be selected as below:
   - for air-to-close action: spring range 20-100 [kPa], supply pressure 140 [kPa]
   - for air-to-open action: spring range 40-120 [kPa], or 40-200 [kPa]
4. For rotary actuators – R, supply pressure is to be 40 kPa higher than upper spring range [kPa].

VALVE DRIVES:

1. Diaphragm multi-spring pneumatic actuators w/o manual drive type P/R or with top-mounted handweel type P/R-N – as per Tables 17 and 20.

Table 17. Pneumatic actuators

Size	Diaphragm effective area [cm^2]	Stroke [mm]	Rev per rated stroke (P/R-N)
160	160	20	5
250	250	20	5
400	400	20	5
630	630	38	9
1000	1000	38; 50; 63	8; 10; 13

CHARACTERISTICS:

- complete reversibility of operation allows changing function P (direct action) and R (reverse action) with no additional parts,
- option of changing spring range (tension) with no additional parts,
- option of pre-tensioning of springs,
- option of using fittings with NAMUR connections,
- option of fitting with top-mounted handweel.

DESIGN AND TECHNICAL SPECIFICATION:

As per Fig. 5.

CONSTRUCTION:

Actuator diaphragm cases (1) and (2) of steel sheets making pressure chamber
Diaphragm (3) of constant effective area, linear relationship between control actuator pressure and plug movement. Executed in neoprene with polyester spacer.
Diaphragm plate (4) stamped from steel sheet, with spring seats.
Support (6) is used for tightening and operating the stem.
Springs (7) of construction spring steel. There are 3, 6 or 12 springs regarding the required range.
Bushing (8) and spacers (9) – used for altering actuator action from direct to reverse and altering spring range.
Warning plates (10) with information on safe disassembly.

TECHNICAL SPECIFICATION:

Control air connection: NPT 1/4”

Pipe diameter: ∅ 6x1 (or ∅ 8x1 - as per request)

Spring ranges: 20…100 kPa; 40…120 kPa; 60…140 kPa - 3 springs,
40…200 kPa; 80…240 kPa; 120…280 kPa - 6 springs,
180…380 kPa - 12 springs; (only sizes 630-1000).

Max supply pressure: actuator size 160…630 - 600 kPa, for actuator size 1000 - 500 kPa.

Actuator ambient temperature range: -40…+80°C
Optional accessories:
- top-mounted handweel,
- pneumatic positioner,
- electro-pneumatic positioner,
- air-set,
- three-way solenoid valve,
- lock-up,
- limit switches,
- quick exhaust valve.

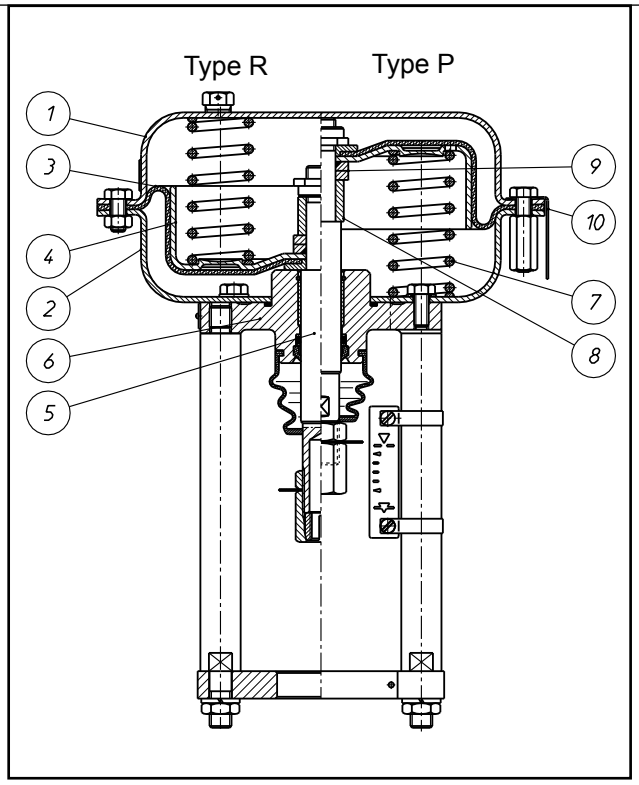


Fig. 5. P/R multi-spring actuator

2. Electric actuators

There is a possibility of employing any electric or electro-hydraulic actuator following adjustment of connecting elements. Details and technical specifications of electric actuators as per separate catalog charts.

3. NN manual drives

Drives allowing manual operation of valve, adapted to direct assembly on valve (with no extra parts).

Table 18. Drive sizes.

Size	Stroke [mm]	Rev per rated stroke
250	20	5
400	20	5
630	38	9
1000	38; 50; 63	8; 10; 13

EXTERNAL DIAMETERS AND CONNECTION DIAMETERS, WEIGHTS OF VALVES, PNEUMATIC ACTUATORS AND MANUAL DRIVES

Table 19. Valve connection diameters [mm]

DN	d_1	d_3	E	L	L_1	P	R
15…25	M12x1,25	12	44	125	111	12,5	110
32…50				118	102	16,5	132
						20,5	160
65…100		16	50	122	104	16,5	132
						20,5	160
150…250	M16x1,5	20	95	200	180		
			80	138	118	24,5	216

Note:

1) R and ∅P can be as per customer request
2) R=160 - for electrical actuators
3) L and L_1 - for valve plug location – valve closed
4) L=138 - for electric actuators

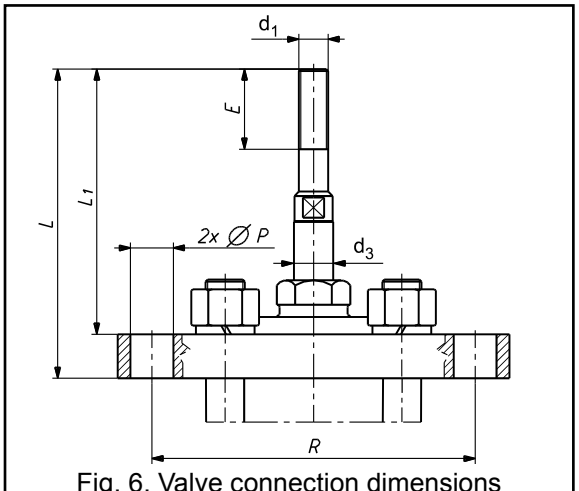
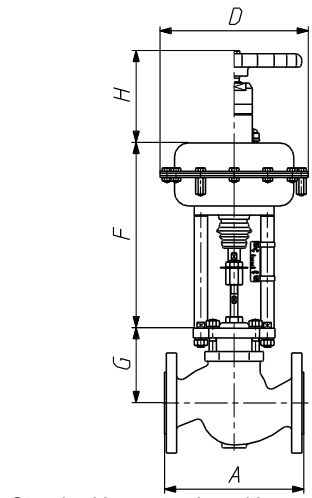
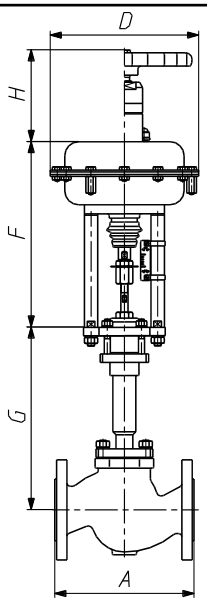


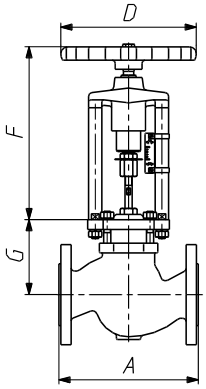
Fig. 6. Valve connection dimensions



Standard bonnet valve with pneumatic actuator



Expansion or bellows seal valve with pneumatic actuator



Manual drive valve NN

Fig. 7. Valve external dimensions

Table 20. Valve dimensions incl. drives [mm].

DN	A			G		F									D									H
	CL150	CL300	PN10…40	Standard bonnet.	Ext. and bellow seal bonnet	P/R 160	P/R 250	P/R 400	P/R 630	P/R 1000	NN 250	NN 400	NN 630	NN 1000	P/R 160	P/R 250	P/R 400	P/R 630	P/R 1000	NN 250	NN 400	NN 630	NN 1000	
15	184	190	130	107	241	288	306	-	-	-	290	-	-	-	210	240	-	-	-	225	-	-	-	162
20	184	194	150	107	241	288	306	-	-	-	290	-	-	-	210	240	-	-	-	225	-	-	-	162
25	184	197	160	107	241	288	306	-	-	-	290	-	-	-	210	240	-	-	-	225	-	-	-	162
32	200	213	180	114	243	288	306	-	-	-	290	-	-	-	210	240	-	-	-	225	-	-	-	162
40	222	235	200	118	253	288	306	312	-	-	290	290	-	-	210	240	305	-	-	225	225	-	-	162
50	254	267	230	122	257	288	306	312	-	-	290	290	-	-	210	240	305	-	-	225	225	-	-	162
65	276	292	290	166	410		-	312	402	-	-	290	308	-		-	305	375	-	-	225	305	-	162
80	298	317	310	166	410		-	312	402	-	-	290	308	-		-	305	375	-	-	225	305	-	162
100	352	368	350	173	417		-	312	402	-	-	290	308	-		-	305	375	-	-	225	305	-	162
150	451	473	480	305	510		-	-	-	585	-	-	-	510		-	-	-	477	-	-	-	450	240
200	543	568	600	458	623		-	-	-	585	-	-	-	510		-	-	-	477	-	-	-	450	240
250	673	708	730	475	623		-	-	-	585	-	-	-	510		-	-	-	477	-	-	-	450	240

Note: Dimension A for CL150 and CL300 refers to bodies with valve face B or RF. For other body versions you can calculated A_1 dimension using formulas in Table 21.

Table 21.

Body	Marking		A_1
	PN	ANSI	
Groove CL300	D1	GF	$A_1 = A + 5 \times 2$
Recess CL300	F1	FF	
Ring-joint CL300 DN15	J	RTJ	$A_1 = A + 5{,}5 \times 2$
Ring-joint CL150			$A_1 = A + 6{,}5 \times 2$
Ring-joint CL300 DN20…40			
Ring-joint CL300 DN50…250			$A_1 = A + 8 \times 2$

Table 22. Valve weights w/o drives [kg].

DN	Valve	
	Standard bonnet	Extended and bellow seal bonnet
15	6	9
20	7	10
25	7,5	11
32	9,5	13
40	11,5	16
50	14,5	20
65	20	28
80	28,5	36,5
100	42	50
150	120	135
200	180	195
250	320	335

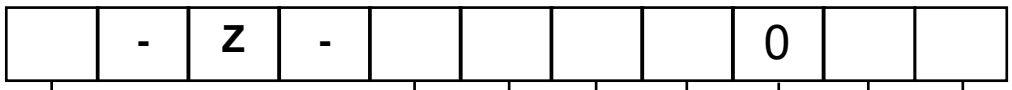
Table 23. Actuator weights [kg]

Actuator	Weight
P / R - 160	9
P / R - N - 160	13,5
P / R - 250	10
P / R - N - 250	14,5
P / R - 400	16
P / R - N - 400	20,5
P / R - 630	30
P / R - N - 630	37
P / R - 1000	74
P / R - N - 1000	100

Table 24. Manual drive weights [kg]

Drive	Weight
NN - 250	5,5
NN - 400	6,5
NN - 630	8,5
NN - 1000	40

PARTITION AND MARKING



Type and action:

- pneumatic with direct action:	**P**
- pneumatic with reverse action:	**R**
- pneumatic with top manual drive:	**PN; RN**
- electric:	**E**
- manual:	**NN**

Bonnet:

- standard:	**1**
- extension:	**2**
- bellow seal:	**3**
- other:	**X**

Packing:

- PTFE, braided	**A**
- PTFE, typ V	**B**
- PTFE, for oxygen	**C**
- graphite, braided	**D**
- graphite, expanded	**E**
- TA-Luft, PTFE	**F**
- TA-Luft, graphite	**G**

Leakage class:

- basic: class IV	**4**
- bubble: class IV	**6**

Valve plug:

- unbalanced	**7**
- balanced	**8**

Choke cages:

- no choke cages	**0**

Plug characteristics and type:

- linear, contoured	**L**
- equal percentage	**P**
- quick-opening, (on-off)	**S**
- other	**X**

Body material:

- grey iron	**1**
- spheroidal iron	**2**
- carbon steel	**3**
- stainless steel	**5**
- other	**X**

MARKING EXAMPLE:

Control valve type Z with reverse action pneumatic actuator with top-mounted handweel, extension bonnet, expanded graphite stem sealing, leakage class IV, equal percentage contoured plug, execution in stainless steel:

RN-Z-2E470P5

Marking is shown on valve nameplate.

Additional information:
- nominal size [DN],
- nominal pressure [PN],
- max working temperature [TS],
- max working pressure [PS],
- test pressure [PT],
- flow ratio [Kvs],
- plug stroke [H],
- plug stroke fluid group [1 or 2],
- serial number and year of manufacture.

ORDERING:

The order should contain all information as per data questionnaire. Full information can be obtained from the Sales and Marketing Department or Technical and Development Department.

Revision: Z/03/2011
Valid until the next revision.