

ROTARY PLUG CONTROL VALVES TYPE BR33

APPLICATION AREA:

Rotary plug control valves BR33 represent the design of valves, where change in flow ratio is achieved through eccentrically set rotary plug.

Such structures are particularly useful for control of flow under heavy-duty conditions, with high probability of cavitation and erosion.

High rangeability (200:1) and wide range of material and design variants make them ideal for application in many branches of industry, such as power generation, metallurgy, chemical and petroleum industry, food industry, paper industry, etc.

FEATURES:

- one-piece valve body (cast with bonnet), no static or dynamic sealing except shaft sealing chamber,
- no "detachment effect" between plug and seat,
- ability to change K_v without changing plug or seat,
- easy replacement of rotary, symmetrical plug,
- elongated bonnet allows application of double sealing for shaft, meeting "low emission" standards equal to TA-LUFT conditions,
- the same K_v coefficients for "hard" and "soft" seats,
- leakage class less than 0.01% K_v s for "hard" seats (metal-metal),
- same flow direction for "hard" and "soft" seats,
- valve-actuator connection accessible from outside, which allows pivoting actuator to valve axis by 90° increments,
- special executions: with heat jacket, erosion-proof, for crystallizable media.



DESIGN AND TECHNICAL SPECIFICATION:

Body (1)

flanged or flangeless, cast in cast steel

Nominal sizes:

DN 25; 40; 50; 80; 100; 150; 200; 250; 300

Nominal pressures:

PN10; 16; 25; 40 (as per PN-EN 1092-1:2006);

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. Nominal pressures and end connections

Nominal pressure	Facing of flange types			
	Raised face	Groove	Recess	Ring-joint
	Identification			
PN10; 16; 25; 40	B	D	F	-
CL150	B (RF)	-	-	J (RTJ)
CL300		DL (D1)	F (F1)	
() - identification of connections as per ASME B16.5				

37-700 Przemyśl, 23 Obozowa St.
tel. +48 16 678 66 01, fax +48 16 678 65 24
marketing@polna.com.pl, www.polna.com.pl

Face-to-face dimensions:

a) flanged valves

as per PN-EN 60534-3-1:2000;

Table 1, Series 1

as per ANSI B16.10:1992;

Table 1 i 2, Series 19

b) flangeless (sandwich)

as per PN-EN 60534-3-2:2002

Bridge (2)

functions as rotary closure, cast in grey iron or steel (welded),

Valve plug (3)

working piece in the form of globe section:

- flow characteristics:
 - linear (L)
 - equal percentage (P) only with positioner
- rangeability: 200 : 1

Valve seat (4) loosely resting in body opening; susceptible to fitting to spherical cap of valve plug

- hard
- soft (with PTFE sealing)

Leakage class:

- basic: class IV as per PN-EN 60534-4 - metallic seat
- bubble-tight: class VI as per PN-EN 60534-4 - soft seat

Screw plug (5) fixing seat to body (medium flow direction „under plug”); in special executions its function is preventing erosion (medium flow direction „above plug”)

Shaft (6) transmits torque from actuator to valve plug; burnished, with polished sealing interface.

Guiding sleeves of plug (7) and shaft (8) - function as slide bearings; surface hardened (CrN coating) or PTFE coated

Packing (9) -packing kits formed in various materials (PTFE-V; PTFE+graphite; braided or expanded graphite); special “low emission” kit, with follower sprigs TA-LUFT.

Table 2. Packing types with application ranges.

Packing	Nominal pressure PN / CL	Temperature [°C]
PTFE - V	PN10 - 40 CL150; CL300	-46...+200
PTFE + Graphite		
PTFE - V / TA-LUFT		
Graphite		+200...+250 (+200...+450)*
Graphite / TA-LUFT		
* - drive retracted from valve (extended yoke)		

Table 3...6. Allowable working overpressure for materials at proper temperatures.

Table 3.		Material: GP240GH (1.0619) as per PN-EN 10213-2								
PN / CL	Standard	Temperature [°C]								
		-10...50	100	150	200	250	300	350	400	
		Allowable working pressure [bar]								
PN10	EN 1092-1	10	9,3	8,7	7,8	7,1	6,4	6	5,8	
PN16		16	14,9	13,9	12,4	11,4	10,3	9,6	9,2	
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	23,3	21,7	19,4	17,8	16,1	15	14,4	
PN40		40	37,3	34,7	30,2	28,4	25,8	24	23,1	
CL300	PN-EN 1759-1	45,3	40,1	38,1	36	32,9	29,8	27,8	25,7	

Table 5.		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	8,7	7,8	7	6,4	6	5,6	5,3	5,1	-	5	
PN16		13,9	12,4	11,2	10,3	9,6	9	8,5	8,2	-	8	
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	22,8	21,1	19,6	18,3	17,2	16,1	15,6	15	-	14,8	
PN40		34,7	31,1	28,1	25,8	24	22,6	21,3	20,4	-	20,1	
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 4.		Material: WCB as per ASTM A216									
PN / CL	Standard	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 6.		Material: CF8M as per ASTM A351											
PN / CL	Standard	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 carbon steel up to -60°C, and acid proof 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 7. Listing of components with materials

Item		Component	Materials			
1.		Body	GP240GH; (1.0619)	WCB	GX5CrNiMo 19-11-2; (1.4408)	CF8M
2.		Bridge				
	3.	Plug	X6CrNiMoTi 17-12-2 (1.4571); X6CrNiMoTi 17-12-2+ stellite X2CrNiMoTi 17-12-2 (1.4404); X2CrNiMoTi 17-12-2+stellite			
	4a.	Metallic seat	X6CrNiMoTi 17-12-2 (1.4571); X6CrNiMoTi 17-12-2+stellite X2CrNiMoTi 17-12-2 (1.4404); X2CrNiMoTi 17-12-2+stellite			
	4b.	Soft seat	X6CrNiMoTi 17-12-2+PTFE; X2CrNiMoTi 17-12-2+PTFE			
5.		Screw plug	X6CrNiMoTi 17-12-2 (1.4571)			
6.		Shaft				
	7.	Guiding sleeve	X6CrNiMoTi 17-12-2 (1.4571)+CrN X6CrNiMoTi 17-12-2+PTFE			
	8.	Shaft sealing				
	9.	Packing kit	PTFE-V; PTFE+graphite; GRAPHITE			
10a ,10b		Sealing ring	FKM			
11.		Sweep ring	VMQ			
12.		Disk spring	12R10 (SANDVIK)			
13.		Spacer sleeve	X6CrNiMoTi 17-12-2 (1.4571)			
14.		Lubricating sleeve				
15.		Follower sleeve				
16.		Pressing lever	X6CrNiMoTi 17-12-2 (1.4571) ;GX5CrNiMo 19-11-2 (1.4408)			
	17.	Cylindrical pin	X6CrNiMoTi 17-12-2 (1.4571)			
	18.	Conical pin				
19.		Stud bolt	8.8		A4-70	
20.		Nut	8		A4-70	
Material relevant standard						
Material			Standard			
GP240GH (1.0619)			PN-EN 10213-2			
WCB			ASTM A 216			
GX5CrNiMo19-11-2 (1.4408)			PN-EN 10213-4			
CF8M			ASTM A 351			
X6CrNiMoTi 17-12-2 (1.4571)			PN-EN 10088			
X2CrNiMoTi 17-12-2 (1.4404)			PN-EN 10088			
NOTES						
		- Spare part				

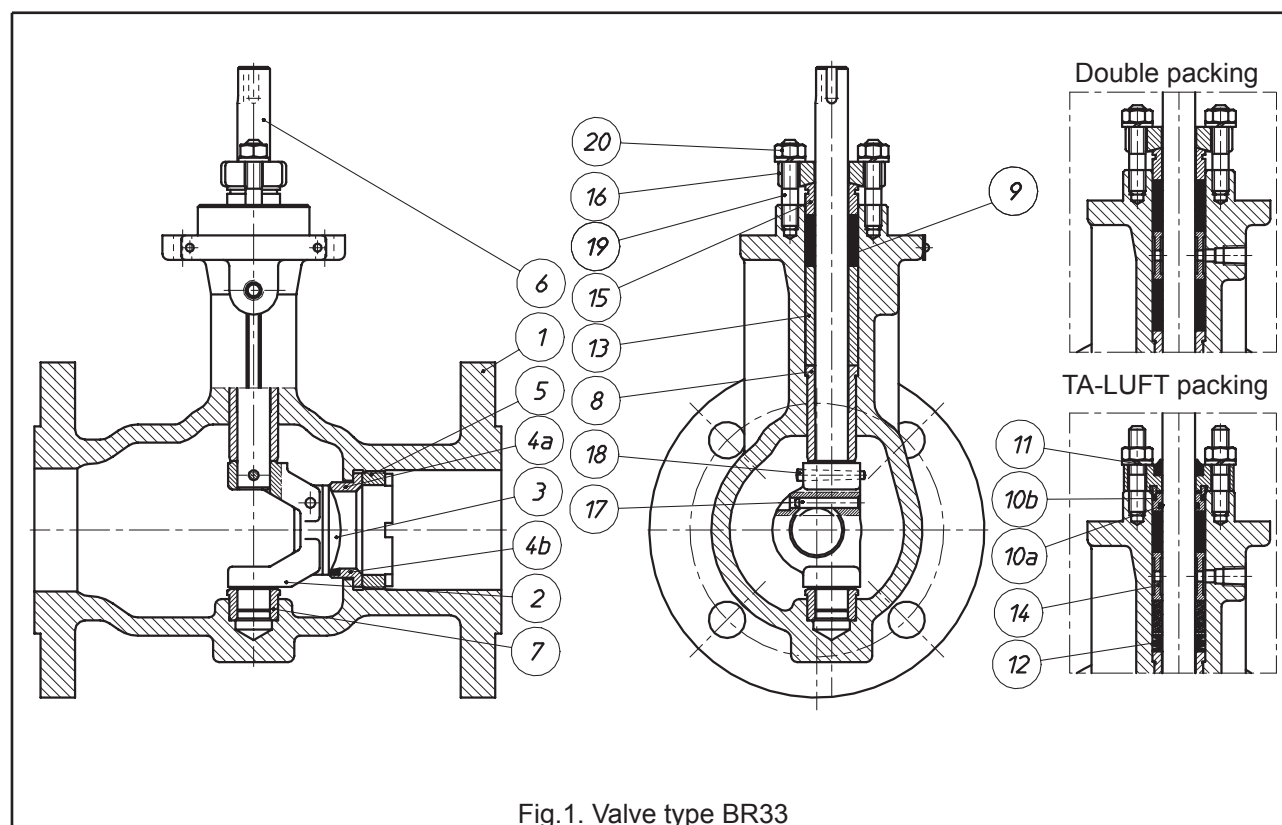


Fig.1. Valve type BR33

K_v FLOW RATIOS AND PRESSURE DROPS Δp

Table 8. Metallic seat (leakage class IV); reverse action actuator (air-to-open)

Actuator type						99-1-R [120 cm ²]		99-2-R [240 cm ²]		99-3-R [780 cm ²]	
Spring range [kPa]						100-200	160-320	80-160	160-320	100-200	160-320
DN	K _v _s 100%	K _v _s 75%	K _v _s 45%	K _v _s ^{**} 120%	Seat dia. [mm]	Maximum pressure drop [bar]					
25	15	11	7	18	18	50*	-	-	-	-	-
25	6	5	3	7	12	50*	-	-	-	-	-
40	40	30	18	48	28,5	50*	-	-	-	-	-
40	16	12	7	19	20	50*	-	-	-	-	-
50	60	45	27	72	38	50*	-	-	-	-	-
50	24	18	11	29	26	50*	-	-	-	-	-
80	150	113	68	180	58	11	32	50*	50*	-	-
80	60	45	27	72	38	33	50*	50*	50*	-	-
100	240	180	108	288	72	2	13	27	50*	-	-
100	96	72	43	115	48	11	36	50*	50*	-	-
150	500	375	225	600	110	-	-	9	23	50*	50*
150	200	150	90	240	72	-	-	25	50*	50*	50*
200	800	600	360	960	136	-	-	-	13	44	50*
200	320	240	144	384	88	-	-	-	37	50*	50*
250	1250	938	563	1500	170	-	-	-	5	20	45
250	500	375	225	600	110	-	-	-	17	50*	50*
300	1800	1350	810	2160	200	-	-	-	2	12	28
300	720	540	324	864	126	-	-	-	10	34	50*

Table 9. Soft seat (leakage class VI); reverse action actuator (air-to-open)

Actuator type						99-1-R [120 cm ²]		99-2-R [240 cm ²]		99-3-R [780 cm ²]	
Spring range [kPa]						100-200	160-320	80-160	160-320	100-200	160-320
DN	K _v _s 100%	K _v _s 75%	K _v _s 45%	K _v _s ^{**} 120%	Seat dia. [mm]	Maximum pressure drop [bar]					
25	15	11	7	18	18	50*	-	-	-	-	-
25	6	5	3	7	12	50*	-	-	-	-	-
40	40	30	18	48	28,5	50*	-	-	-	-	-
40	16	12	7	19	20	50*	-	-	-	-	-
50	60	45	27	72	38	50*	-	-	-	-	-
50	24	18	11	29	26	50*	-	-	-	-	-
80	150	113	68	180	58	14	35	50*	50*	-	-
80	60	45	27	72	38	38	50*	50*	50*	-	-
100	240	180	108	288	72	5	16	30	50*	-	-
100	96	72	43	115	48	15	40	50*	50*	-	-
150	500	375	225	600	110	-	-	10	25	50*	50*
150	200	150	90	240	72	-	-	28	50*	50*	50*
200	800	600	360	960	136	-	-	-	15	38	50*
200	320	240	144	384	88	-	-	-	39	50*	50*
250	1250	938	563	1500	170	-	-	-	6	18	39
250	500	375	225	600	110	-	-	-	19	48	50*
300	1800	1350	810	2160	200	-	-	-	3	11	25
300	720	540	324	864	126	-	-	-	11	30	50*

* - Do not exceed nominal pressure

** - For 120% setting it is recommended that listed pressure drops are reduced

Calculated ratios:

$$F_L=0,854, \quad X_T=0,6, \quad F_D=0,7, \quad xF_Z=0,58$$

Table 10. Metallic seat (leakage class IV); direct action actuator (air-to-close)

Actuator type						99-1-P [120 cm ²]		99-2-P [240 cm ²]		99-3-P [780 cm ²]	
Voltage pressure [kPa]						240	400	240	400	240	400
DN	Kv _s 100%	Kv _s 75%	Kv _s 45%	Kv _s ^{**} 120%	Seat dia. [mm]	Maximum pressure drop [bar]					
25	15	11	7	18	18	50*	50*	-	-	-	-
25	6	5	3	7	12	50*	50*	-	-	-	-
40	40	30	18	48	28,5	50*	50*	-	-	-	-
40	16	12	7	19	20	50*	50*	-	-	-	-
50	60	45	27	72	38	50*	50*	-	-	-	-
50	24	18	11	29	26	50*	50*	-	-	-	-
80	150	113	68	180	58	11	50*	50*	50*	-	-
80	60	45	27	72	38	33	50*	50*	50*	-	-
100	240	180	108	288	72	2	24	27	50*	-	-
100	96	72	43	115	48	11	50*	50*	50*	-	-
150	500	375	225	600	110	-	-	9	38	50*	50*
150	200	150	90	240	72	-	-	25	50*	50*	50*
200	800	600	360	960	136	-	-	-	23	44	50*
200	320	240	144	384	88	-	-	-	50*	50*	50*
250	1250	938	563	1500	170	-	-	-	10	20	50*
250	500	375	225	600	110	-	-	-	29	50*	50*
300	1800	1350	810	2160	200	-	-	-	5	12	44
300	720	540	324	864	126	-	-	-	17	34	50*

Table 11. Soft seat (leakage class VI); direct action actuator (air-to-close)

Actuator type						99-1-P [120 cm ²]		99-2-P [240 cm ²]		99-3-P [780 cm ²]	
Voltage pressure [kPa]						240	400	240	400	240	400
DN	Kv _s 100%	Kv _s 75%	Kv _s 45%	Kv _s ^{**} 120%	Seat dia. [mm]	Maximum pressure drop [bar]					
25	15	11	7	18	18	50*	50*	-	-	-	-
25	6	5	3	7	12	50*	50*	-	-	-	-
40	40	30	18	48	28,5	50*	50*	-	-	-	-
40	16	12	7	19	20	50*	50*	-	-	-	-
50	60	45	27	72	38	50*	50*	-	-	-	-
50	24	18	11	29	26	50*	50*	-	-	-	-
80	150	113	68	180	58	14	50*	50*	50*	-	-
80	60	45	27	72	38	38	50*	50*	50*	-	-
100	240	180	108	288	72	5	27	30	50*	-	-
100	96	72	43	115	48	15	50*	50*	50*	-	-
150	500	375	225	600	110	-	-	10	40	50*	50*
150	200	150	90	240	72	-	-	28	50*	50*	50*
200	800	600	360	960	136	-	-	-	50*	38	50*
200	320	240	144	384	88	-	-	-	50*	50*	50*
250	1250	938	563	1500	170	-	-	-	11	18	50*
250	500	375	225	600	110	-	-	-	30	48	50*
300	1800	1350	810	2160	200	-	-	-	6	11	50*
300	720	540	324	864	126	-	-	-	19	30	50*

* - Do not exceed nominal pressure

** - For 120% setting it is recommended that listed pressure drops are reduced

VALVE DRIVES

Rotary pneumatic valves, diaphragm and spring type 99, with or without a handwheel - special design to drive BR33 valves.

Table 12. Types of rotary pneumatic actuators .

Size	Diaphragm effective area [cm ²]	Spring range [kPa]	Rotation angle of output element (crankshaft)
99-1	120	100...200, 160...320	25°- 45° - 60° - 90°
99-2	240	80...160, 160...320	
99-3	780	100...200, 160...320	

ACTUATOR CHARACTERISTICS:

- total reversibility of action, allowing change in function from “air-to-close - P” to “air-to-open - R”, with no extra parts,
- ability to mount actuator on valve, in various positions, pivoting with 90° increments,
- option with a handwheel,
- fixed diaphragm effective area, ensuring linear movement to pressure ratio,
- optional NAMUR connections.

DESIGN AND TECHNICAL SPECIFICATION OF ACTUATOR:

Body (21) - among the basic components of actuator, designed to hold and assemble other components; executed in grey or spheroidal iron.

Yoke (28) - connects valve to actuator; executed in grey iron or pressed in steel sheets and welded.

Diaphragm (25) and spring (26) case - make a pressure chamber and springs case; executed as steel die; welded or cast in spheroidal iron.

Diaphragm (31) - executed in acrylic-butadiene rubber (NBR); reinforced with nylon insert.

Diaphragm plate (24) - formed in plastic or cast in aluminum alloy.

Lever (22) - transmits plane motion of membrane unit to rotary movement of crankshaft; executed in spheroidal cast-iron.

Crankshaft (23) - in connection with lever makes an output (driving) element of actuator in the form of rotating pin with key grooves; cast in alloy steel and heat processed.

Spring (29) - executed in construction spring steel; 2 springs for range 160 - 320 kPa.

Bearing pin (27) - connects lever and crankshaft; in special execution (extended) projects from the body and connects actuator to accessories (positioner, limit switches, etc.); executed in alloy steel (stainless steel).

BASIC TECHNICAL SPECIFICATION OF ACTUATOR:

- maximum supply pressure: 450 kPa
- control air connection: G 1/4"
- connection pipes diameter: Ø6x1 (Ø8x1)
- ambient temperature range: - 40°C ...+ 80°C
- control pressure change tolerance:
 - with no positioner: 4% of nominal range
 - with positioner: 1.5% of nominal range
- hysteresis deviation:
 - with no positioner: 4% of stroke range
 - with positioner: 1% of stroke range
- dead zone:
 - with no positioner: 2% of nominal pressure range
 - with positioner: 1% of nominal pressure range
- optional accessories (on request):
 - handwheel,
 - positioner,
 - air set,
 - three-way solenoid valve,
 - lock-up valve,
 - limit switches,
 - quick exhaust valve.

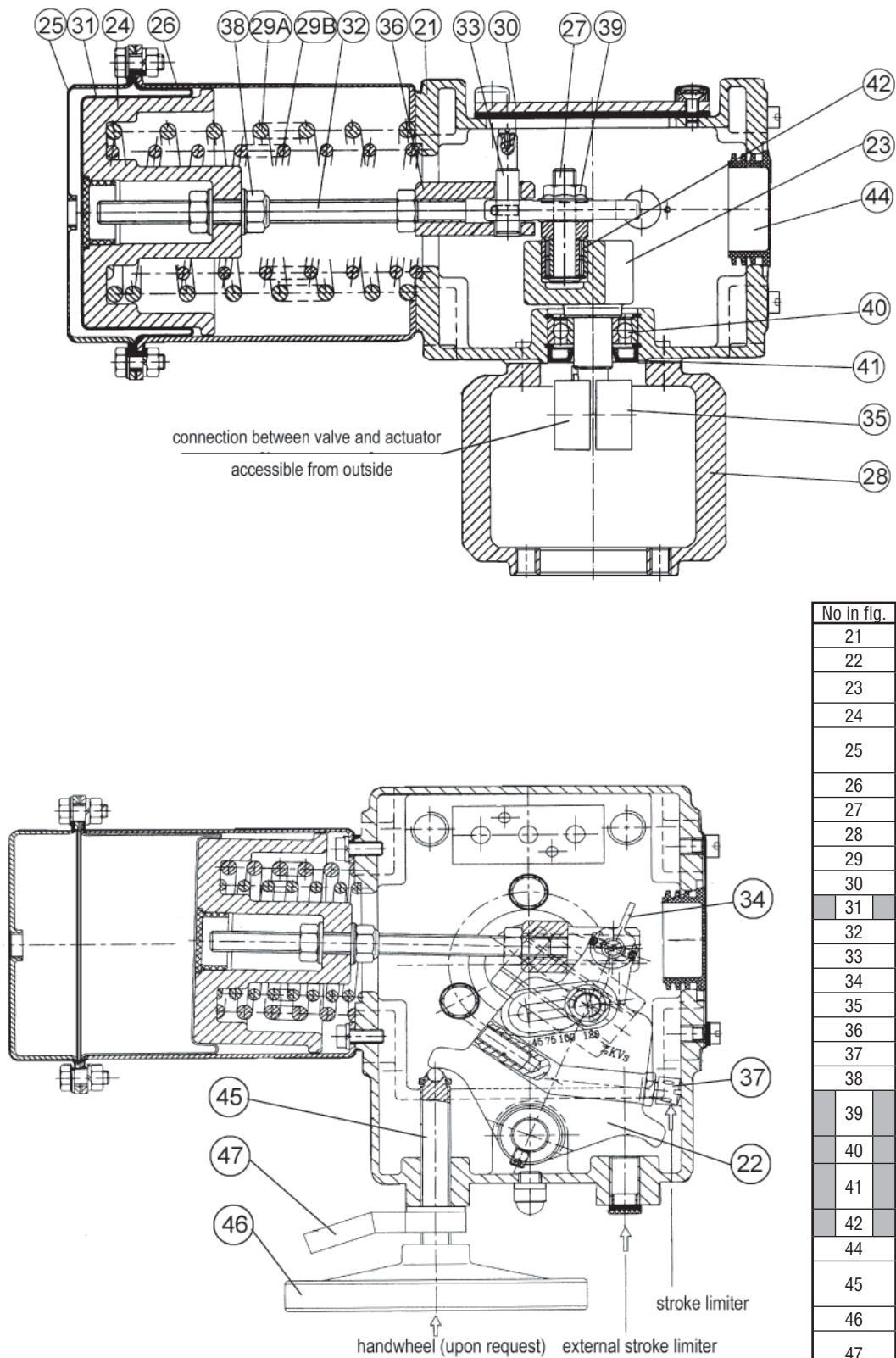


Fig. 2. Rotary pneumatic actuator (spring and diaphragm) type 99

Pneumatic actuators, rotary piston type:

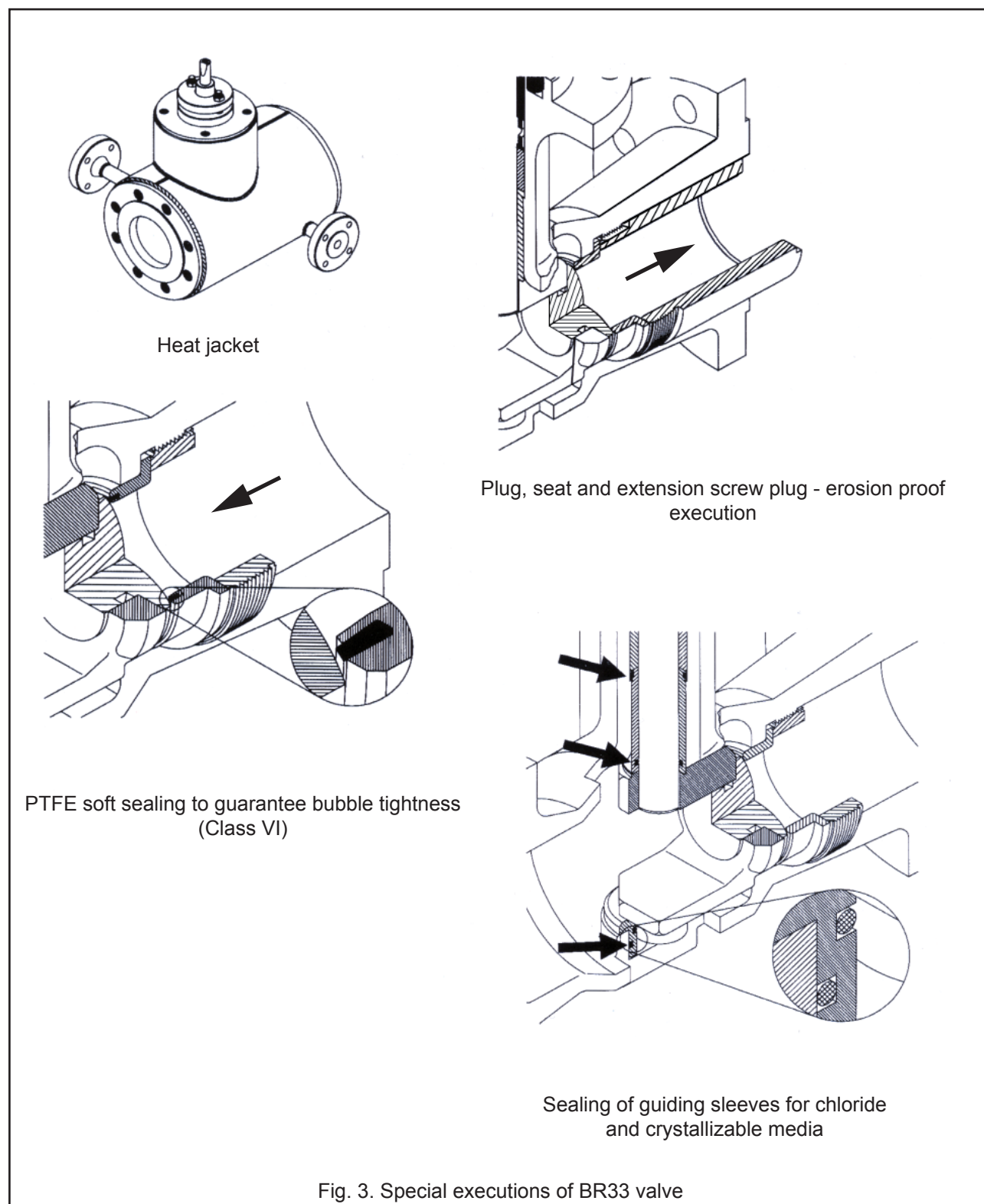
It is possible to apply rotary piston (spring or springless) actuators by any manufacturer, as required. For detailed technical specifications of actuators and completion methods refer to catalog charts.

Electric actuators:

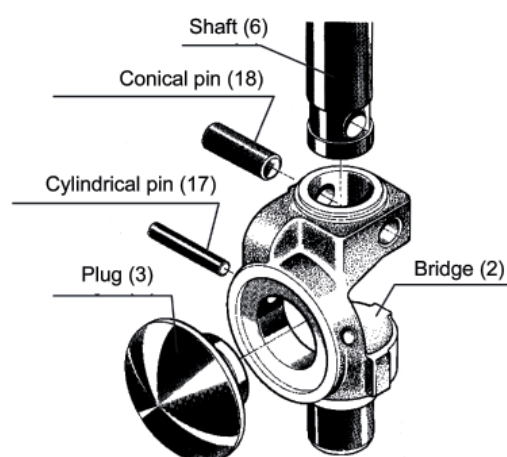
In process installations where no pneumatic actuators can be applied, valves can be driven using electric rotary actuators of various types. For technical specifications refer to separate catalog charts.

SPECIAL EXECUTIONS:

Valve executions as per Fig.3.



OPERATION PRINCIPLE (transformation of plane motion to rotary motion)



Adjustment of rotation angle of actuator type 99 (patent pending) via system of two levers. **Lever (22)** attached to **diaphragm (24)** plate always turns by 30° , hence stroke, pressure range and positioner feedback lever position do not change. With change in setting of **bearing pin (27)** turn angle of **crankshaft (23)** (and also valve shaft) changes too, within values 25° , 45° , 60° and 90° , which corresponds with changes in flow ratio values to 45%, 75%, 100% and 120% Kvs. In closed position of valve movement of bearing pin to crankshaft guide at the beginning of lever rotation is parallel, hence closed position of valve is maintained. **Connector (35)**, which connects actuator to valve shaft, allows turning of actuator to valve by each 90° , and since it is accessible from outside it eliminates the need for actuator or valve disassembly. Required position (see Fig.5) can be set by manufacturer as per customer's request.

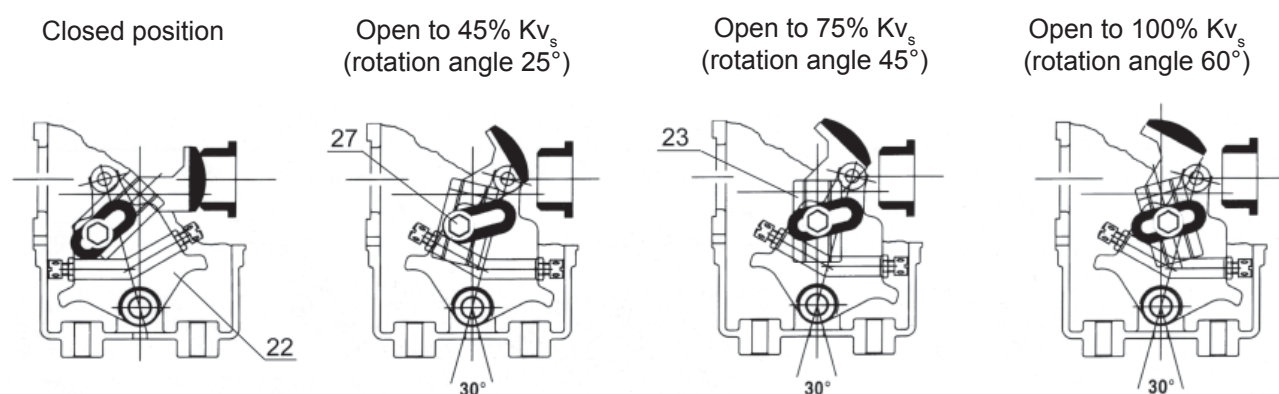


Fig. 4. Bearing pin (27) position on lever (22) regarding crankshaft (23) (valve shaft - Kv_s) rotation angle.

1. Air-to-open mode (fail-to-close position)

2. Air-to-close mode (fail-to-open)

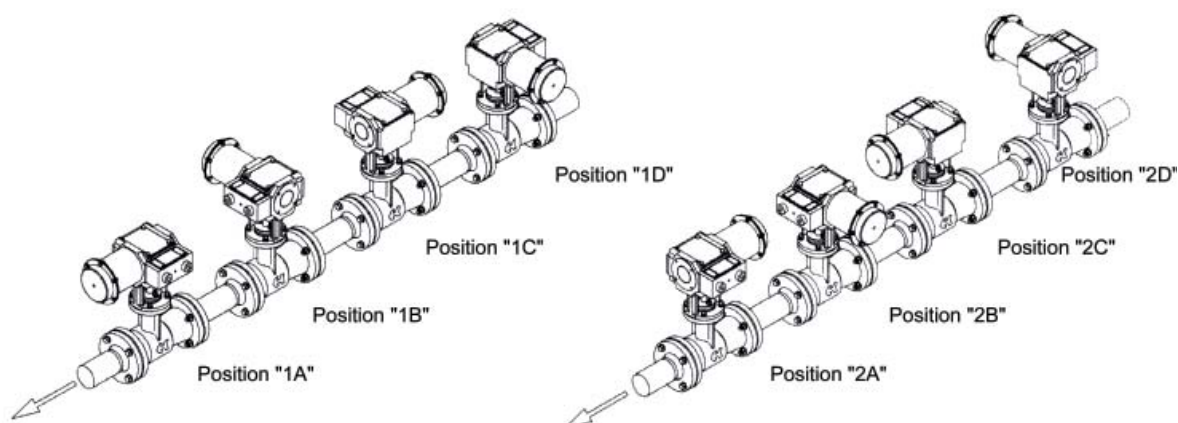


Fig. 5. Possible actuator type 99 positions to valve axis.

EXTERNAL SIZES, END CONNECTION SIZES; WEIGHTS

Table 13. Valve end connection sizes

DN	End connection as per ISO 5211	E	F	G
25...50	F07	83	16	55
80...100	F12	83	16	85
		116	28	
150	F14	113	28	100
		123	36	

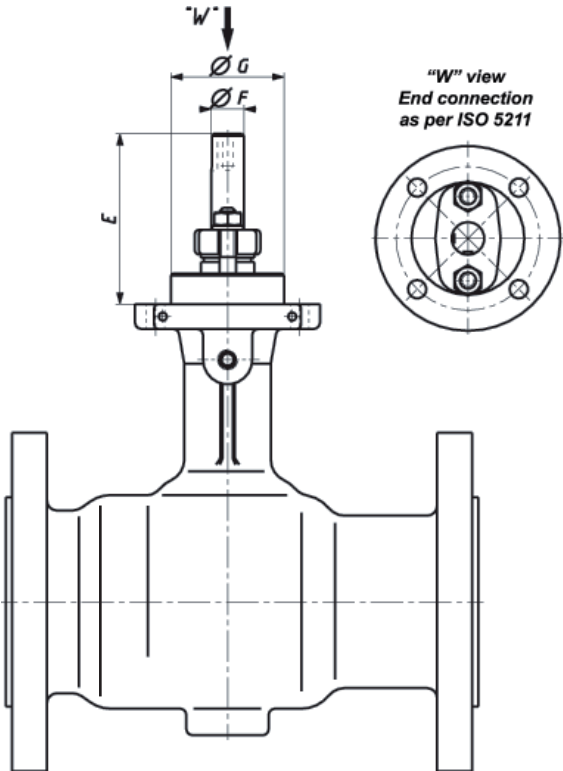


Table 14. Actuator type 99 end connection sizes

Size	End connection as per ISO 5211	L	K	$G^{+0.5}_{+0.3}$	F	S	Weight [kg]
99-1	F07	110	36	55	16	24	18
	F12			85			
99-2	F12	180	60	85	28	60	54
	F14			100			
	F16	200		130			

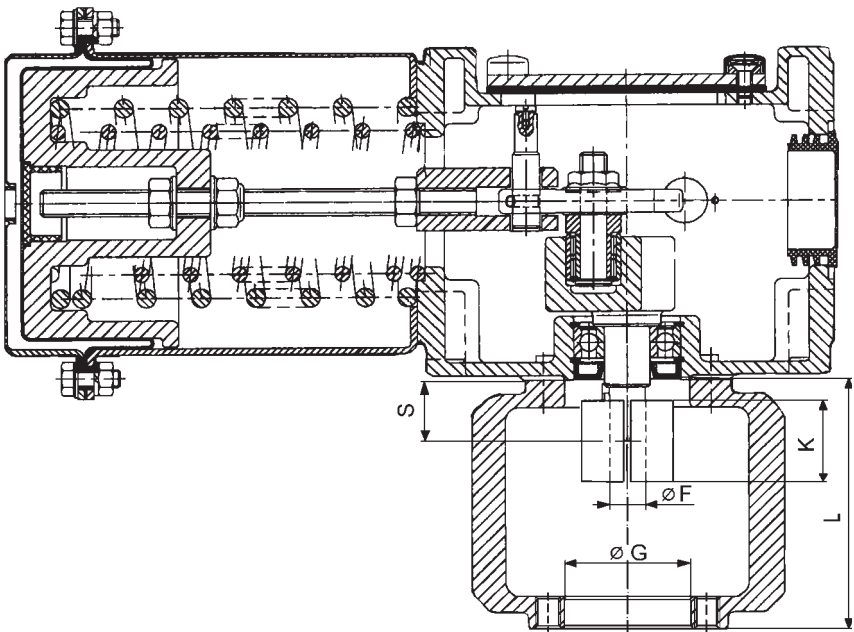
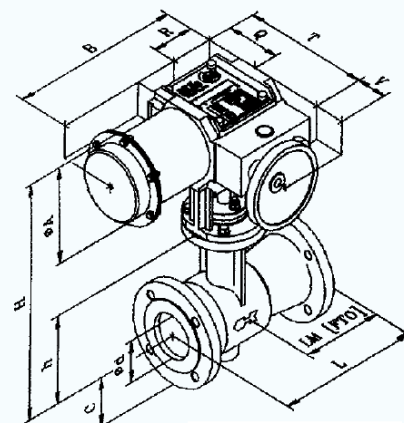
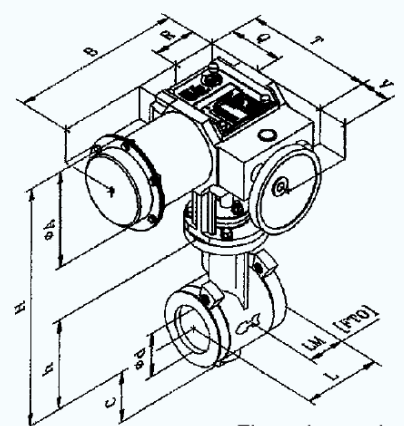
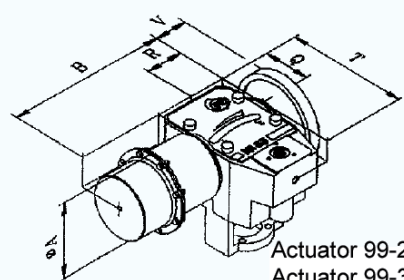


Table 15. Dimensions of valves with actuators type 99

DN	Flanges	Actuator	H [mm]	h [mm]	d [mm]	A [mm]	C [mm]	L [mm]	LM [mm]	B [mm]	R [mm]	Q [mm]	V [mm]	T [mm]	Weight 1) [kg]
25	PN40	99-1	409	134	37	175	55	160	89	274	92	105	90	234	20
25	CL150	99-1	409	134	37	175	55	184	113	274	92	105	90	234	20
25	CL300	99-1	409	134	37	175	55	197	126	274	92	105	90	234	21
25	Sandw.	99-1	409	134	37	175	55	102	60	274	92	105	90	234	18
40	PN40	99-1	415	140	48	175	64	200	115	274	92	105	90	234	22
40	CL150	99-1	415	140	48	175	64	222	137	274	92	105	90	234	22
40	CL300	99-1	415	140	48	175	64	235	150	274	92	105	90	234	23
40	Sandw.	99-1	415	140	48	175	64	114	64	274	92	105	90	234	20
50	PN40	99-1	420	145	60	175	70	230	123	274	92	105	90	234	23
50	CL150	99-1	420	145	60	175	70	255	135	274	92	105	90	234	23
50	CL300	99-1	420	145	60	175	70	267	141	274	92	105	90	234	25
50	Sandw.	99-1	420	145	60	175	70	124	70	274	92	105	90	234	22
80	PN40	99-1	467	192	88	175	90	310	190	274	92	105	90	234	34
80	PN40	99-2	607	192	88	250	90	310	190	573	135	143	75	348	55
80	CL150	99-1	467	192	88	175	90	298	178	274	92	105	90	234	34
80	CL150	99-2	607	192	88	250	90	298	178	573	135	143	75	348	55
80	CL300	99-1	467	192	88	175	90	318	197	274	92	105	90	234	39
80	CL300	99-2	607	192	88	250	90	318	197	573	135	143	75	348	60
80	Sandw.	99-1	467	192	88	175	90	165	92	274	92	105	90	234	31
80	Sandw.	99-2	607	192	88	250	90	165	92	573	135	143	75	348	52
100	PN40	99-1	477	202	107	175	103	350	215	274	92	105	90	234	55
100	PN40	99-2	617	202	107	250	103	350	215	573	135	143	75	348	76
100	CL150	99-1	477	202	107	175	103	353	223	274	92	105	90	234	55
100	CL150	99-2	617	202	107	250	103	353	223	573	135	143	75	348	76
100	CL300	99-1	477	202	107	175	103	368	234	274	92	105	90	234	65
100	CL300	99-2	617	202	107	250	103	368	234	573	135	143	75	348	86
100	Sandw.	99-1	477	202	107	175	103	194	116	274	92	105	90	234	51
100	Sandw.	99-2	617	202	107	250	103	194	116	573	135	143	75	348	72
150	PN40	99-2	699	284	162	250	195	480	270	573	135	143	75	348	100
150	PN40	99-3	789	284	162	430	195	480	270	925	220	230	90	526	190
150	CL150	99-2	699	284	162	250	195	451	241	573	135	143	75	348	100
150	CL150	99-3	789	284	162	430	195	451	241	925	220	230	70	526	190
150	CL300	99-2	699	284	162	250	195	473	263	573	135	143	75	348	114
150	CL300	99-3	789	284	162	430	195	473	263	925	220	230	70	526	204
150	Sandw.	99-2	699	284	162	250	195	229	140	573	135	143	75	348	82
150	Sandw.	99-3	789	284	162	430	195	229	140	925	220	230	70	526	172
200	PN40	99-2	727	312	204	250	216	600	365	573	135	143	75	348	190
200	PN40	99-3	817	312	204	430	216	600	365	925	220	230	70	526	280
200	CL150	99-2	727	312	204	250	216	543	336,5	573	135	143	75	348	180
200	CL150	99-3	817	312	204	430	216	543	336,5	925	220	230	70	526	270
200	CL300	99-2	727	312	204	250	216	568	349	573	135	143	75	348	210
200	CL300	99-3	817	312	204	430	216	568	349	925	220	230	70	526	300
200	Sandw.	99-2	727	312	204	250	216	243	157	573	135	143	75	348	130
200	Sandw.	99-3	817	312	204	430	216	243	157	925	220	230	70	526	220
250	PN40	99-2	751	336	250	250	250	730	430	573	135	143	75	348	230
250	PN40	99-3	841	336	250	430	250	730	430	925	220	230	70	526	320
250	CL150	99-2	751	336	250	250	250	673	401,5	573	135	143	75	348	200
250	CL150	99-3	841	336	250	430	250	673	401,5	925	220	230	70	526	290
250	CL300	99-2	751	336	250	250	250	708	421	573	135	143	75	348	230
250	CL300	99-3	841	336	250	430	250	708	421	925	220	230	70	526	320
250	Sandw.	99-3	841	336	250	430	250	297	190	925	220	230	70	526	230
300	PN40	99-2	769	338	300	250	258	850	553	573	135	143	75	348	430
300	PN40	99-3	859	338	300	430	258	850	553	925	220	230	70	526	520
300	Sandw.	99-2	769	342	300	250	238	338 ²⁾	197,5	573	135	143	75	348	300
300	Sandw.	99-3	859	342	300	430	238	338 ²⁾	197,5	925	220	230	70	526	390

Flanged valve
Actuator 99-1Flangeless valve
"Sandwich"
Actuator 99-1Actuator 99-2
Actuator 99-3

- 1) - Valve weight (w/o actuators)
2) - non-compliant with PN-EN 60534-3-2

CLASSIFICATION AND MARKING:

Actuator unit	
Type:	99P 99R 99PN 99RN PT E
- pneumatic, rotary, diaphragm-spring, direct action:	
- pneumatic, rotary, diaphragm-spring, reverse action:	
- pneumatic, rotary, diaphragm-spring, direct action, with a handwheel:	
- pneumatic, rotary, diaphragm-spring, reverse action, with a handwheel:	
- pneumatic, piston type:	
- electric:	

Valve unit	
Type:	BR33
End connection type:	FL SD
- flanged:	
- flangeless (sandwich):	
Flow characteristics:	L P
- linear:	
- equal percentage:	
Leakage class:	4 6
- basic: class IV as per PN-EN 60534-4:	
- bubble: class VI as per PN-EN 60534-4:	

MARKING EXAMPLE:

Control valve type BR33, with actuator type 99, reverse action, with no handwheel, flanged, linear characteristics, basic leakage class:

99R - BR33 - FL - L - 4

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 fluid group (1), serial number / year of manufacture.

MARKING OF ACTUATOR TYPE 99:

Type:	
Diaphragm effective area:	1 2 3
- 120 cm ²	
- 240 cm ²	
- 780 cm ²	
Actuator types:	P PN R RN
- direct action actuator, with no handwheel:	
- direct action actuator, with handwheel:	
- reverse action actuator, with no handwheel:	
- reverse action actuator, with handwheel:	
Spring range:	1 2 3
- 80...160 kPa:	
- 160...320 kPa:	
- 100...200 kPa:	
End connection as per ISO 5211:	
- F07; F12; F14; F16.	

MARKING EXAMPLE:

Pneumatic actuator type 99, diaphragm effective area: 240 cm²; simple action, with handwheel, spring range 80...160 kPa; end connection F12:

99 - 2 - PN - 1 - F12

ORDERING

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



ROTARY PLUG CONTROL VALVES TYPE BR 33 WITH ELECTRIC AND PISTON ACTUATORS

APPLICATION AREA:

The rotary plug control valves type BR 33 have already been manufactured for coupling with diaphragm-type spring-loaded rotary pneumatic actuators type BR 99. The presented solutions are intended to expand the offer of acutation to cover rotary pneumatic actuators and electric motors that are available on the market in abundant diversity and used by a number of manufacturers.

FEATURES:

- capable to incorporate alternative drives manufactured with connecting ports to ISO 5211,
- wide series of design types and variations,
- extensive offer of additional equipments and accessories,
- wide range of torque values,
- small dimensions,
- cost effectiveness in relation to technical performances.

TECHNICAL PARAMETERS OF VALVES:

The valve with a rotary plug and a one-piece body, type BR 33.

Sizes: DN 25; 40; 50; 80; 100; 150; 200; 250; 300.

Pressure ranges and connection ports:

PN10...40; CL150; 300 - with flanges

CL300 - without flanges (sandwich type).

Flow coefficient Kvs: 3...1800.

Materials: body: carbon steel GP240GH (1.0619),

stainless steel GX5CrNiMo 19-11-2 (1.4408)

interanal parts: X6CrNiMo 17-12-2 (1.4571).

Temperature: -40...+250 [°C] (option +450 [°C]).



Please refer to the data sheet "GLOBE VALVES WITH ROTARY PLUG TYPE BR 33" for further information.

ROTARY PISTON PNEUMATIC ACTUATION (AT SERIES):

Design options:

- double action,
- single action (spring-loaded to return to the initial position).

Maximum torque for individual ports to ISO 5211:

Type: F 05 - 125 [Nm],

F 07 - 250 [Nm],

F 12 - 1000 [Nm],

F 14 - 2000 [Nm]

F 16 - 4000 [Nm].

Control pressure: 300 do 800 [kPa].

Ambient temperature: -20...+80 [°C] (other temperature ranges upon agreement)

Control utilities: purified and dried compressed air, natural gases

Rotation angle: 90°

37-700 Przemysł, 23 Obozowa St.
tel. +48 16 678 66 01, fax +48 16 678 65 24
marketing@polna.com.pl, www.polna.com.pl

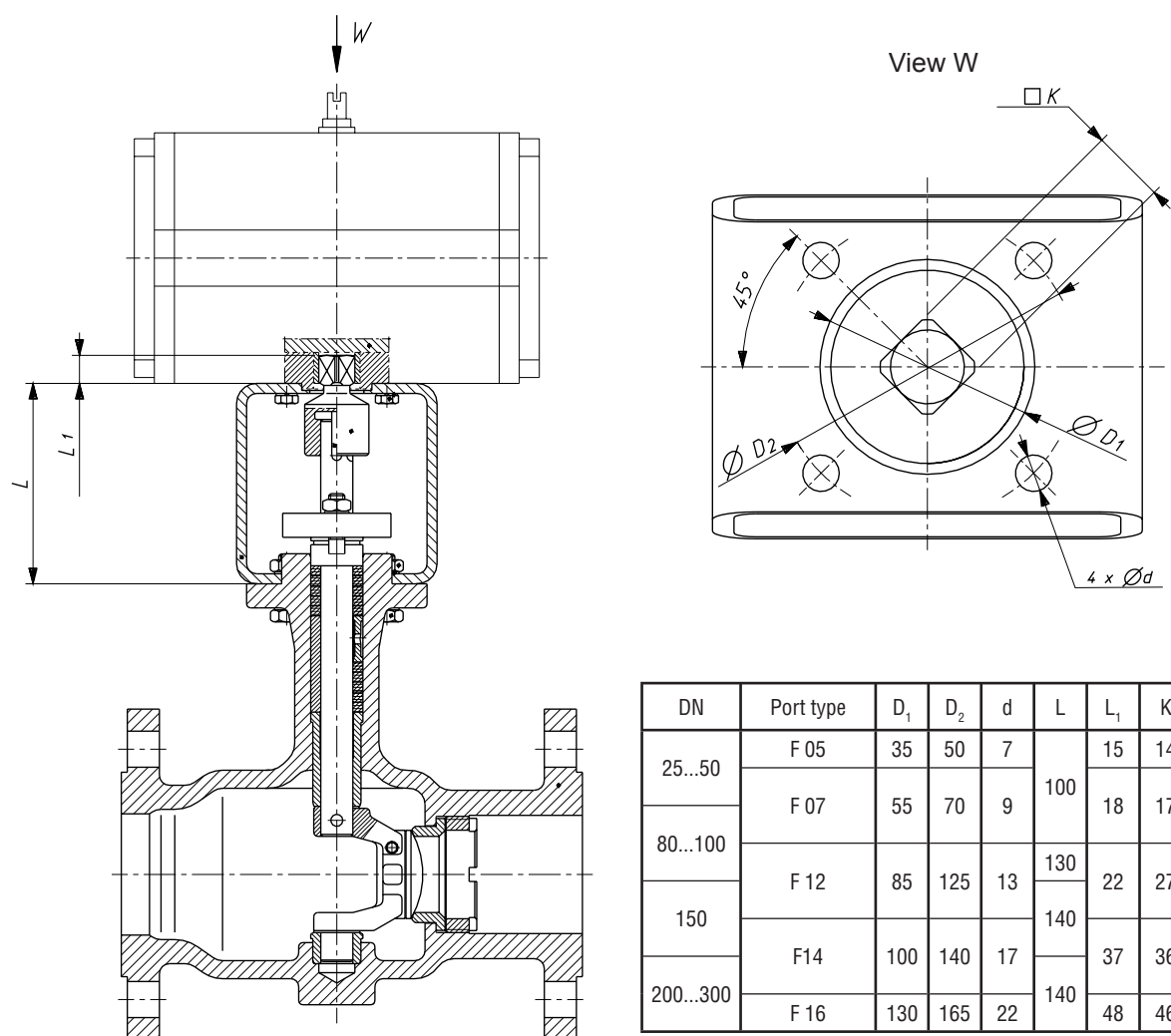


Fig. 1. Dimensional drawing for connections

DIMENSIONS FOR ASSEMBLY WITH A ROTARY ELECTRIC DRIVING UNIT:

Power supply:	230V AC; 24V AC; 3x400 V.
Control signal:	0 - 10 V; 2 - 10 V; 0 - 20 mA; 4 - 20 mA.
Design options:	• infinite control, • On/Off.
Maximum torque:	as per pneumatic actuators.
Rotation angle:	90°
Ambient temperature:	-20...+60°C (other temperature ranges upon agreement).
Additional equipment (optional) :	torque switches, limit switches, position transmitters of current or potentiometer types, position indicator, manual override.

Please refer to the data sheets provided by manufacturers of driving units for more detailed information.

PERMISSIBLE PRESSURE DROPS:

Permissible pressure drops across the closed valve depend on the following factors:

- available torque of the actuator,
- nominal diameter of the valve DN,
- orifice seat diameter D,
- type of valve seat closing ("metal" – "soft")

According to recommendations of actuator manufacturers the 25% surplus of available torque was adopted.

$$\Delta p = \frac{10 \cdot (0,75 M_d - K)}{C}$$

where:

- Δp [bar] - maximum permissible pressure drop across the closed valve,
 M_d [Nm] - maximum available torque of the actuator at the border position (valve closed),
 D [mm] - internal diameter of the valve seat,
 C - coefficient that depends on relation between valve and seat diameters (full or reduced flow), in accordance to Table 2,
 K - coefficient that depends on valve diameter and its closing type in accordance to Table 2,
 $K=K_1$ - "metal to metal" closing (hard/metal seated valve - leakage class IV to PN-EN 60534-4),
 $K=K_2$ - "metal to PTFE" closing (soft seated valve - leakage class VI to PN-EN 60534-4).

DN	25		40		50		80		100		150		200		250		300	
D	12	18	20	28,5	26	38	38	58	48	72	72	110	88	136	110	170	126	200
C	0,45	1,03	2,2	4,6	3,9	8,2	11,5	26,9	23,5	52,9	72	169	131	312	253	635	390	980
K_1 (metal-metal)	0,82	1,23	2,3	2,9	2,9	4,4	6,1	9,2	10,4	14,3	19,6	32	30,1	47,3	48	74,8	62	100
K_2 (metal-PTFE)	1,23	2,05	3,5	4,6	5,1	7,3	10,2	15,3	16,9	24,7	33,8	52	49,5	77,4	77	123	106	165

Tabel 2 Calculation coefficients

Example 1:

What is the pressure drop across the valve BR 33, with DN 100, PN40 full flow, soft seated, with the actuator type AP6SR from SIRCA, single-acting, 6 springs on each side of the actuator and closing torque of the actuator 354 Nm?

$$M_d = 354 \text{ Nm} ; K = K_2 = 24,7 ; C = 52,9$$

$$\Delta p = \frac{10 \cdot (0,75 \cdot 354 - 24,7)}{52,9} = 45,5 \text{ [bar]}$$

As the rated (nominal) pressure of the valve is PN 40, the pressure drop should not exceed $\Delta p = 40$ bar.

Example 2:

The same actuator as in Example 1 has the connecting port F12 and can be combined with the valve DN 150. What is the pressured drop across the valve for full flow and soft seated plug powered by the actuator as above?

$$M_d = 354 \text{ Nm} ; K = K_2 = 52 ; C = 169$$

$$\Delta p = \frac{10 \cdot (0,75 \cdot 354 - 52)}{169} = 12,6 \text{ [bar]}$$

Example 3:

Find out an electric actuator that will guarantee pressure drop $\Delta p = 20$ bar across the valve DN 80, full flow, metal seated poppet, port to connect the actuator is F12 or F07.

$$\Delta p = \frac{10 \cdot (0,75 M_d - K)}{C} \rightarrow M_d = \frac{\Delta p \cdot C + 10 K}{7,5}$$

where:

$$\Delta p = 20 \text{ bar} ; C = 26,9 ; K = K_1 = 9,26$$

$$M_d = \frac{20 \cdot 26,9 + 10 \cdot 9,2}{7,5} = 84 \text{ Nm}$$

Thus, the actuator ISOMACT SP 2 with torque of 125 Nm and the F07 connecting port to ISO 5211 was selected.

ORDER PLACEMENT:

Orders must contain all the information that is required to calculate valve parameters based on the technical data questionnaire. Please do not hesitate to ask the officers from the Marketing and Sales Department as well as the Technical Department for assistance to choose valves that suit your needs.