

## ROTARY PLUG CONTROL VALVES TYPE Z33® WITH ELECTRIC AND PISTON ACTUATORS

### APPLICATION AREA:

The rotary plug control valves type Z33 have already been manufactured for coupling with diaphragm-type spring-loaded rotary pneumatic actuators type P/R-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), G20Mn5 (1.6220)

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°

**Z33®** is a trademark registered with Republic of Poland Patent Office.

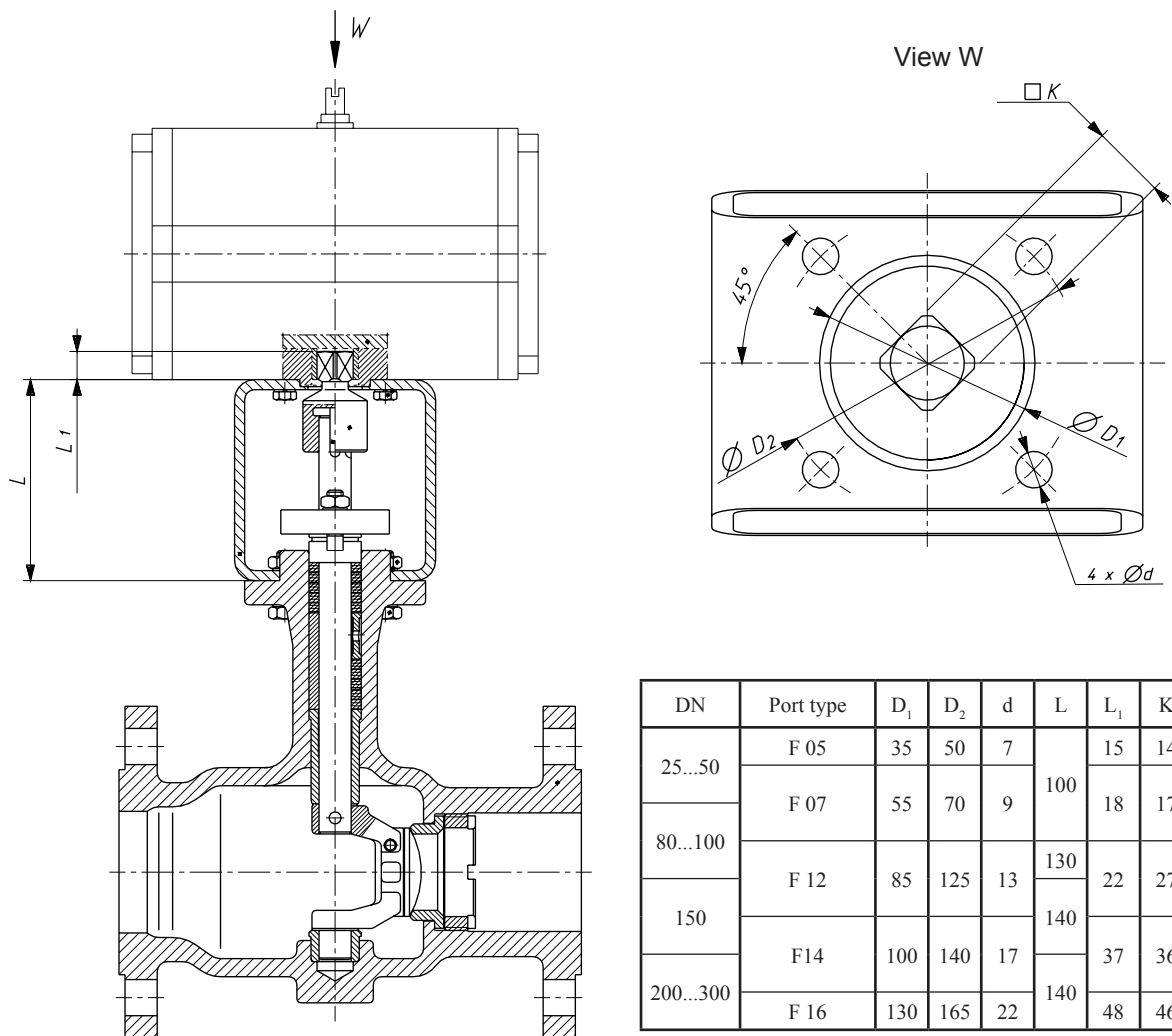


Fig. 1. Dimensional drawing for connections

**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.

where:

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

- $\Delta p$  [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).

Table 2 Calculation coefficients

Example 1:

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

What is the pressure drop across the valve Z33, 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.

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

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.

**NOTES:**