

PRESSURE REDUCING VALVE RP45 (ASME)

DESCRIPTION

The ADCA RP45 series pressure reducing valves are single seated, bellows sealed controllers that operate without auxiliary energy. Designed for use with steam, compressed air, and other gases compatible with the construction. These valves are particularly suitable for reducing steam pressure in all energy and process systems where pressures must be kept under control.

MAIN FEATURES

Specially designed high durability bellows, providing pressure balancing and frictionless plug stem.
Robust construction (fit-and-forget).
Suitable for use with high pressure turndowns.
Interchangeable actuators and adjustment springs.

OPTIONS: Soft sealing in PTFE/GR for use with steam.
 Soft sealing in nitrile rubber for use with air and gases.
 Low-noise flow divider.
 Sensing pipe on body.

USE: Steam, compressed air and other gases compatible with the construction. Limited use with liquids. Consult manufacturer before installing the valve with liquids.

AVAILABLE MODELS: RP45S and RP45ST or N – carbon steel.
 Suffix T: soft sealed with PTFE/GR.
 Suffix N: soft sealed with nitrile rubber.

SIZES: 1/2" to 6".

CONNECTIONS: Flanged ASME B16.5 Class 150 or 300.

AVAILABLE ACTUATORS: A1, A10, A11, A12, A3, A4, B1, B3, B4 and C11 – carbon steel.
 A2, A21, B2 and B21 – SG iron or carbon steel.

INSTALLATION: See IMI – Installation and maintenance instructions.



RP45
1/2" to 4"

RP45
6"



RP45
1/2" to 4"
with sensing pipe
on body

| CE MARKING – GROUP 2 (PED – European Directive) | | |
|--|--------------|---------------|
| Class 150 | Class 300 | Category |
| 1/2" to 2" | 1/2" to 1" | SEP |
| 2 1/2" to 4" | 1 1/2" to 4" | 1 (CE marked) |
| 6" | 6" | 2 (CE marked) |

LIMITING CONDITIONS

| Valve model | RP45S | RP45S | RP45ST | RP45ST | RP45SN | RP45SN |
|---|-----------|-----------|-----------|-----------|-----------|-----------|
| Body design conditions | Class 150 | Class 300 | Class 150 | Class 300 | Class 150 | Class 300 |
| Maximum upstream pressure | 13 bar | 25 bar | 13 bar | 25 bar | 13 bar | 25 bar |
| Maximum downstream pressure (1/2" to 4") | 13 bar | 18 bar | 13 bar | 18 bar | 13 bar | 18 bar |
| Maximum downstream pressure (6") | 12 bar | 16,5 bar | 12 bar | 16,5 bar | 12 bar | 16,5 bar |
| Minimum downstream pressure | 0,15 bar | 0,15 bar | 0,15 bar | 0,15 bar | 0,15 bar | 0,15 bar |
| Maximum operating temperature | 200 °C | 250 °C | 200 °C | 200 °C | 80 °C | 80 °C |
| Maximum reducing ratio | 25:1 | 25:1 | 25:1 | 25:1 | 10:1 | 10:1 |
| Rangeability | 10:1 | 10:1 | 10:1 | 10:1 | 10:1 | 10:1 |
| Maximum hydraulic factory valve body test | 24 bar | 60 bar | 24 bar | 60 bar | 24 bar | 60 bar |

Remark: Other soft materials and temperature limits on request.

| Actuator model | A1 | A10 | A11 | A12 | A2 | A21 | A3 | A4 | B1 | B2 | B21 | B3 | B4 | C11 |
|----------------------------------|---------|-----|-----|-----|----|-----|-----|-----|----|----|-----|-----|-----|-----|
| Maximum operating pressure (bar) | 25 | 25 | 25 | 25 | 12 | 18 | 2,5 | 1,5 | 25 | 13 | 18 | 2,5 | 1,5 | 25 |
| Maximum operating temperature | 90 °C * | | | | | | | | | | | | | |

* The water seal pot must be installed in the sensing pipe when operating with steam or liquids at temperatures above 90 °C.

FLOW RATE COEFFICIENTS (m³/h)

| SIZE | 1/2" | 3/4" | 1" | 1 1/2" | 2" | 2 1/2" | 3" | 4" | 6" |
|------|------|------|-----|--------|------|--------|------|-------|-----|
| Kvs | 4,8 | 6,9 | 9,1 | 14,4 | 26,5 | 51,5 | 79,5 | 129,5 | 204 |

SATURATED STEAM CAPACITY TABLE (kg/h)

| INLET (barg) | SIZE | | | | | | | | |
|--------------|------|------|------|--------|------|--------|-------|-------|-------|
| | 1/2" | 3/4" | 1" | 1 1/2" | 2" | 2 1/2" | 3" | 4" | 6" |
| 0,5 | 51 | 68 | 90 | 186 | 300 | 460 | 800 | 1250 | 1800 |
| 0,75 | 63 | 84 | 112 | 230 | 360 | 580 | 1000 | 1550 | 2350 |
| 1 | 75 | 100 | 133 | 280 | 430 | 700 | 1200 | 1850 | 3200 |
| 1,5 | 100 | 133 | 175 | 360 | 590 | 910 | 1600 | 2500 | 4000 |
| 2 | 126 | 170 | 230 | 450 | 730 | 1160 | 2000 | 3050 | 4700 |
| 2,5 | 150 | 200 | 260 | 550 | 880 | 1390 | 2400 | 3600 | 6500 |
| 3 | 175 | 240 | 310 | 640 | 1010 | 1600 | 2700 | 4300 | 8500 |
| 4 | 220 | 290 | 390 | 800 | 1300 | 2000 | 3400 | 5400 | 10000 |
| 5 | 260 | 350 | 480 | 1000 | 1600 | 2500 | 4200 | 6500 | 12000 |
| 6 | 330 | 440 | 580 | 1220 | 1930 | 3000 | 5100 | 8000 | 14000 |
| 7 | 400 | 520 | 700 | 1430 | 2300 | 3600 | 6100 | 9500 | 16000 |
| 8 | 450 | 600 | 800 | 1670 | 2700 | 4100 | 7100 | 11000 | 18000 |
| 9 | 500 | 670 | 880 | 1800 | 2900 | 4600 | 7800 | 12000 | 20000 |
| 10 | 560 | 750 | 980 | 2000 | 3200 | 5100 | 8500 | 13500 | 22000 |
| 12 | 680 | 900 | 1180 | 2500 | 4000 | 6100 | 10500 | 16300 | 25000 |
| 14 | 800 | 1050 | 1400 | 2900 | 4700 | 7200 | 12600 | 19000 | 29000 |
| 16 | 920 | 1230 | 1630 | 3400 | 5500 | 8300 | 14600 | 22000 | 33000 |
| 18 | 1040 | 1400 | 1860 | 3800 | 6200 | 9500 | 16600 | 25000 | 38000 |
| 20 | 1170 | 1540 | 2100 | 4200 | 7000 | 10800 | 18600 | 28000 | 42000 |
| 22 | 1330 | 1780 | 2350 | 4900 | 7800 | 12200 | 21000 | 32000 | 45000 |
| 24 | 1500 | 2000 | 2600 | 5400 | 8700 | 13700 | 23500 | 36000 | 48000 |
| 25 | 1600 | 2150 | 2800 | 5700 | 9200 | 14500 | 25500 | 38000 | 50000 |

Remark: For pressure ratios where $P2 > 0,7 P1$ and/or when the operating medium is superheated steam, a correction factor must be applied. See next page.

CORRECTION FACTORS

Pressure ratio:

The capacities given in the "Saturated steam capacity table" are applicable in scenarios where $P_2 < 0,7 P_1$.

In the remaining scenarios a correction factor must be applied:

| PRESSURE RATIO * P2 / P1 | CORRECTION FACTOR f |
|-----------------------------|------------------------|
| ≥ 0,7 | 1,25 |
| ≥ 0,8 | 1,6 |
| ≥ 0,9 | 2,25 |

* Pressure ratio in bar abs (barg + 1)

Superheated steam:

When the medium is superheated steam, instead of saturated steam, a correction factor must also be applied. The required mass flow must be multiplied by the following factor:

$\frac{V_h}{V_s}$, where V_h = specific volume of superheated steam, and
 V_s = specific volume of saturated steam.

ACTUATOR AND SPRING SELECTION TABLE

| SIZE | ACTUATOR | | | | | | | | | | | | | | | | |
|--------|--------------------|-----------|-----------|---------|---------|----------|---------|-------|-------|--------|---------|---------|---------|-------|------|--------|-----|
| | | A4 | | A3 | A2 | A21 | A1 | | A10 | A11 | A12 | B4 | B3 | B2 | B21 | B1 | C11 |
| 1/2" | Spring range (bar) | 0,15-0,49 | 0,5-0,99 | 1,0-1,6 | 1,7-3,8 | 3,9-5,5 | 5,6-8,2 | - | - | 8,3-13 | 10-18 | - | - | - | - | - | - |
| | Spring N° | 66 | 60 | 60 | 60 | 60 | 60 | - | - | 60 | 60.1 | - | - | - | - | - | - |
| 3/4" | Spring range (bar) | 0,15-0,49 | 0,5-0,99 | 1,0-1,6 | 1,7-3,8 | 3,9-5,5 | 5,6-8,2 | - | - | 8,3-13 | 10-18 | - | - | - | - | - | - |
| | Spring N° | 66 | 60 | 60 | 60 | 60 | 60 | - | - | 60 | 60.1 | - | - | - | - | - | - |
| 1" | Spring range (bar) | 0,15-0,49 | 0,5-0,99 | 1,0-1,6 | 1,7-3,8 | 3,9-5,5 | 5,6-8,2 | - | - | 8,3-13 | 10-18 | - | - | - | - | - | - |
| | Spring N° | 66 | 60 | 60 | 60 | 60 | 60 | - | - | 60 | 60.1 | - | - | - | - | - | - |
| 1 1/2" | Spring range (bar) | 0,15-0,49 | 0,5-0,99 | 1,0-1,6 | 1,7-3,8 | 3,9-5,5 | 5,6-8,2 | - | - | 8,3-13 | 10-18 | - | - | - | - | - | - |
| | Spring N° | 66 | 60 | 60 | 60 | 60 | 60 | - | - | 60 | 60.1 | - | - | - | - | - | - |
| 2" | Spring range (bar) | 0,15-0,49 | 0,5-0,99 | 1,0-1,9 | 2,0-4,2 | 4,3-6,9 | 7-8,5 | - | 10-18 | 8,6-13 | - | - | - | - | - | - | - |
| | Spring N° | 67 | 61 | 61 | 61 | 61 | 64 | - | 61 | 64 | - | - | - | - | - | - | - |
| 2 1/2" | Spring range (bar) | 0,15-0,49 | 0,5-0,99 | 1,0-1,9 | 2,0-4,2 | 4,3-6,9 | 7-8,5 | - | 10-18 | 8,6-13 | - | - | - | - | - | - | - |
| | Spring N° | 67 | 61 | 61 | 61 | 61 | 64 | - | 61 | 64 | - | - | - | - | - | - | - |
| 3" | Spring range (bar) | 0,15-0,45 | 0,46-0,99 | 1,0-1,9 | 2,0-5,0 | 5,1-8,9 | 9-13 | 11-18 | - | - | - | - | - | - | - | - | - |
| | Spring N° | 68 | 62 | 62 | 62 | 62 | 65 | 62 | - | - | - | - | - | - | - | - | - |
| 4" | Spring range (bar) | 0,15-0,45 | 0,46-0,99 | 1,0-1,9 | 2,0-6,0 | 6,1-13,0 | - | 11-18 | - | - | - | - | - | - | - | - | - |
| | Spring N° | 69 | 63 | 63 | 63 | 63 | - | 63 | - | - | - | - | - | - | - | - | - |
| 6" | Spring range (bar) | - | - | - | - | - | - | - | - | - | 0,5-1,5 | 1,1-2,5 | 1,5-5,5 | 4-8,5 | 6-12 | 8-16,5 | |
| | Spring N° | - | - | - | - | - | - | - | - | - | 70 | 70 | 70 | 70 | 70 | 70 | |

HOW TO SIZE (USING STEAM TABLE)

Example

Required saturated steam capacity: 500 kg/h; Upstream pressure: 3 bar; Required downstream pressure: 2 bar.

Solution:

First determine correction factor for pressure ratio: $(2+1) / (3+1) = 0,75 \rightarrow f = 1,25$

Then multiply the given capacity: $500 \times 1,25 = 625 \text{ kg/h}$

Afterwards, refer to the cell with the number "3" in the column "INLET" of the saturated steam capacity table. In that line, the values for selection of the pressure reducing valve size can be found. In this particular scenario, a value equal to or higher than 625 kg/h is required, and the right selection would be 11/2", with a capacity of 640 kg/h.

On the actuator and spring selection table, for a downstream pressure of 2 bar, the recommended actuator is the A2, and the regulating spring is N° 60.

Remarks: Never size the valve according to the pipe diameter in which it has to be fitted, but according to the actual flow required. Pipe sizing must also respect the maximum recommended flow velocities, according to the medium.

HOW TO SIZE (USING Kvs)

Please consult formulas on IS PV10.00 E or consult manufacturer.

HOW TO ORDER

RP45S 11/2" Class 150 valve complete with spring N° 60, A2 actuator, condensate vessel and copper sensing pipe.

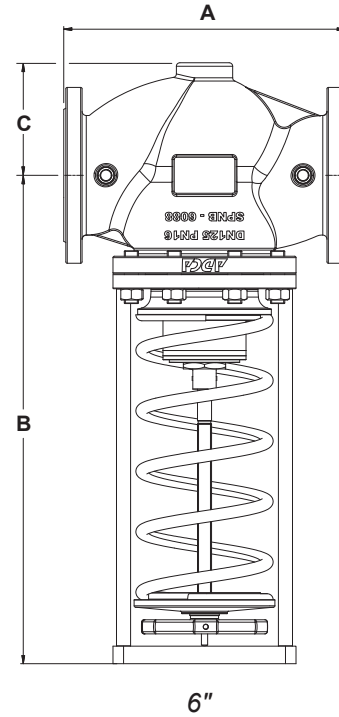
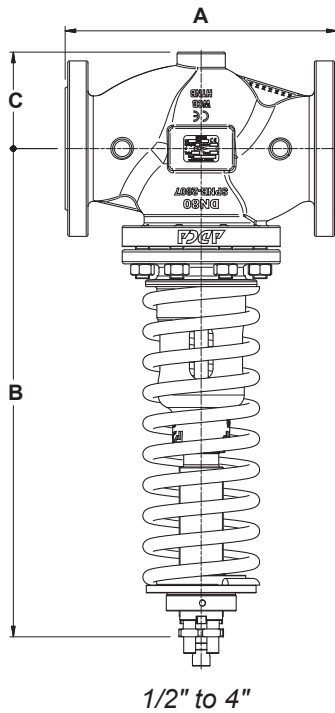
INSTALLATION

Horizontal installation with the actuator vertically, pointing downwards.

Installation with the actuator pointing upwards is possible only when the medium temperature is below 90 °C.

The sensing pipe, if not fitted on the valve body, must be installed downstream of the valve at a minimum of 1 meter away or 15 pipe diameters.

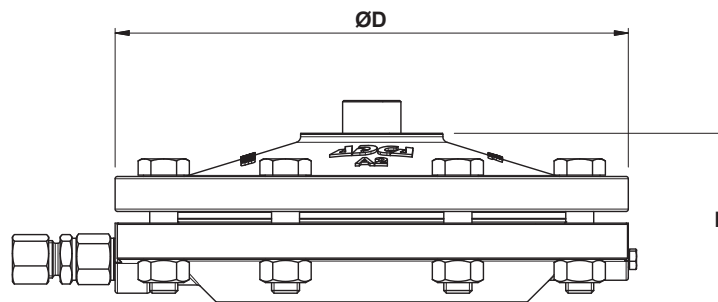
In steam applications, a "Y" strainer, humidity separator and steam trap should be installed upstream of the valve.



DIMENSIONS – VALVE (mm)

| DIMENSION | | SIZE | | | | | | | | |
|--------------|-----------|------|------|------|--------|------|--------|------|------|-------|
| | | 1/2" | 3/4" | 1" | 1 1/2" | 2" | 2 1/2" | 3" | 4" | 6" |
| A | CLASS 150 | 184 | 184 | 184 | 222 | 254 | 276 | 298 | 352 | 451 |
| | CLASS 300 | 190 | 194 | 197 | 235 | 267 | 292 | 318 | 368 | 473 |
| B | CLASS 150 | 366 | 366 | 371 | 384 | 470 | 495 | 556 | 597 | 710 |
| | CLASS 300 | 366 | 366 | 371 | 384 | 470 | 495 | 556 | 597 | 710 |
| C | CLASS 150 | 44,5 | 49 | 54 | 65 | 85 | 100 | 110 | 130 | 180 |
| | CLASS 300 | 47,5 | 58,5 | 62 | 78 | 85 | 100 | 110 | 130 | 180 |
| WGT. (kg) | CLASS 150 | 8,9 | 9,2 | 10,4 | 14 | 20,5 | 29,9 | 42,2 | 55 | 113 |
| | CLASS 300 | 9,3 | 10,2 | 11,8 | 16,8 | 22,8 | 33 | 47,5 | 62,9 | 129,4 |

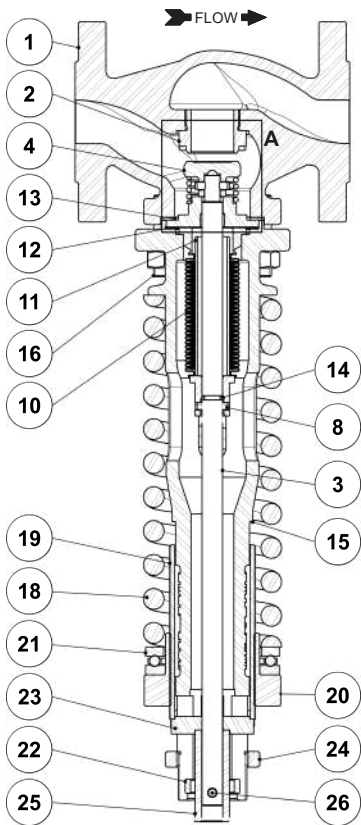
Remarks: In the beginning of year 2022 new face to face dimensions have been defined for some Class 150 valves. Valves may still be supplied with the previous face to face dimensions under request. Consult the manufacturer.



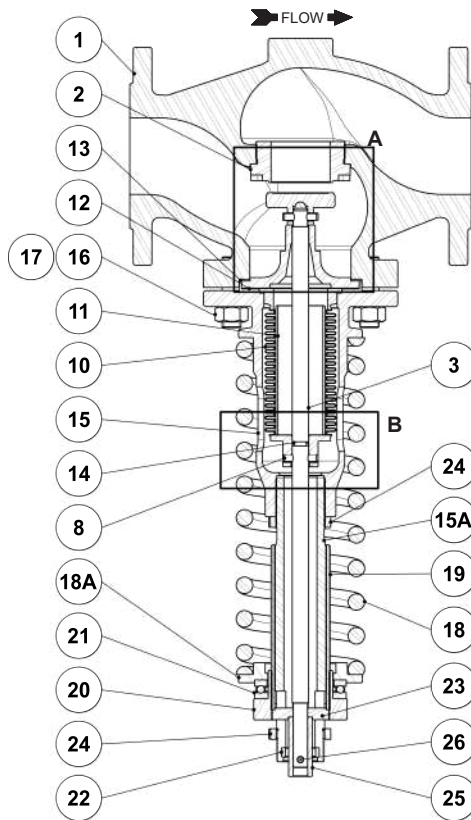
DIMENSIONS – ACTUATOR (mm)

| DIMENSION | ACTUATOR | | | | | | | | | | | | | |
|-------------|----------|-----|-----|-----|-----|-----|------|------|-----|-----|-----|------|------|-----|
| | A1 | A10 | A11 | A12 | A2 | A21 | A3 | A4 | B1 | B2 | B21 | B3 | B4 | C11 |
| ØD | 172 | 172 | 172 | 172 | 220 | 220 | 282 | 340 | 172 | 220 | 220 | 283 | 340 | 145 |
| E | 67 | 67 | 67 | 67 | 74 | 74 | 71 | 81 | 80 | 86 | 86 | 88 | 98 | 93 |
| WEIGHT (kg) | 4,3 | 4,3 | 4,3 | 4,3 | 7,3 | 7,3 | 11,3 | 16,3 | 4,4 | 7,4 | 7,4 | 11,6 | 18,6 | 2,3 |

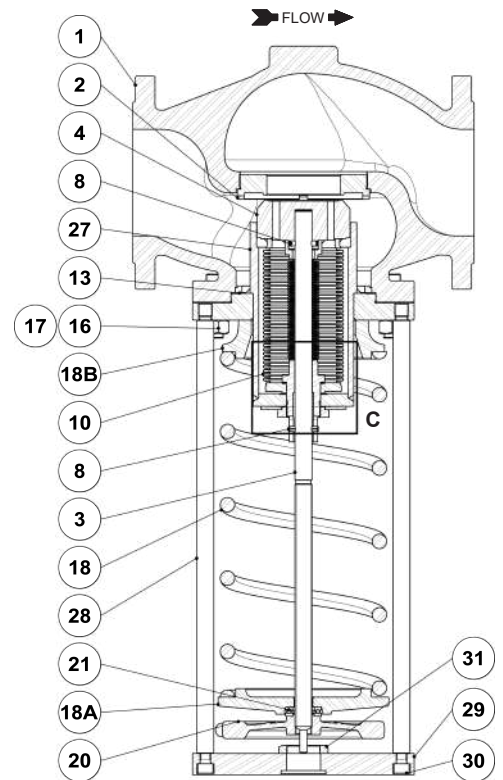
MATERIALS



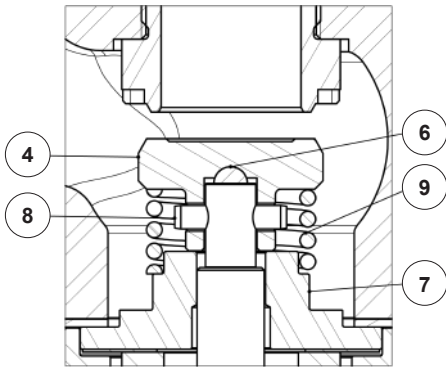
1/2" to 2"



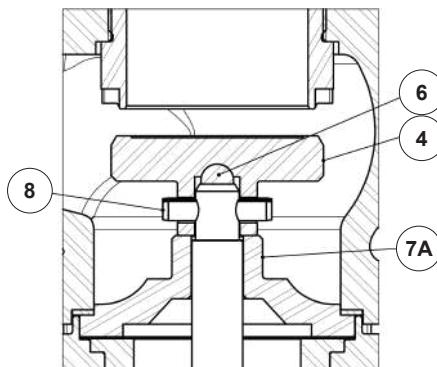
2 1/2" to 4"



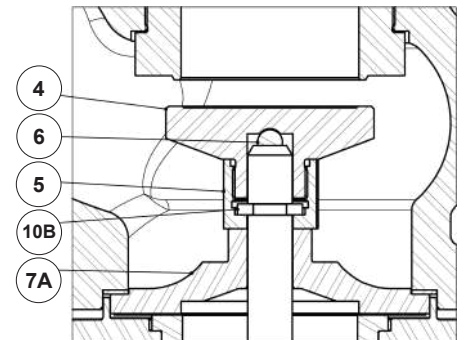
6"



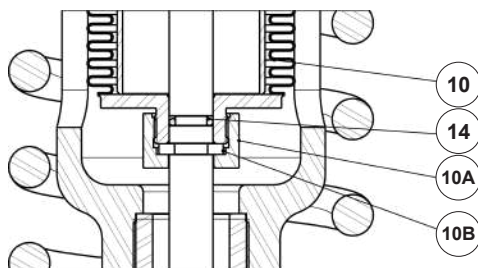
Detail A
(1/2" to 1 1/2")



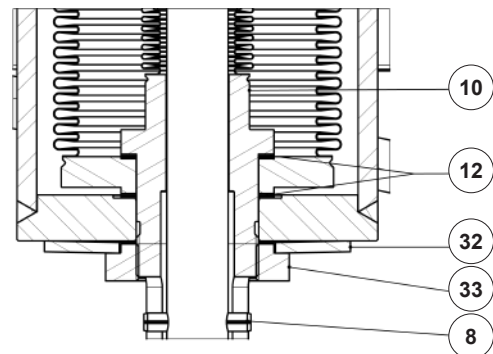
Detail A
(2" and 2 1/2")



Detail A
(3" and 4")



Detail B
(3" and 4")

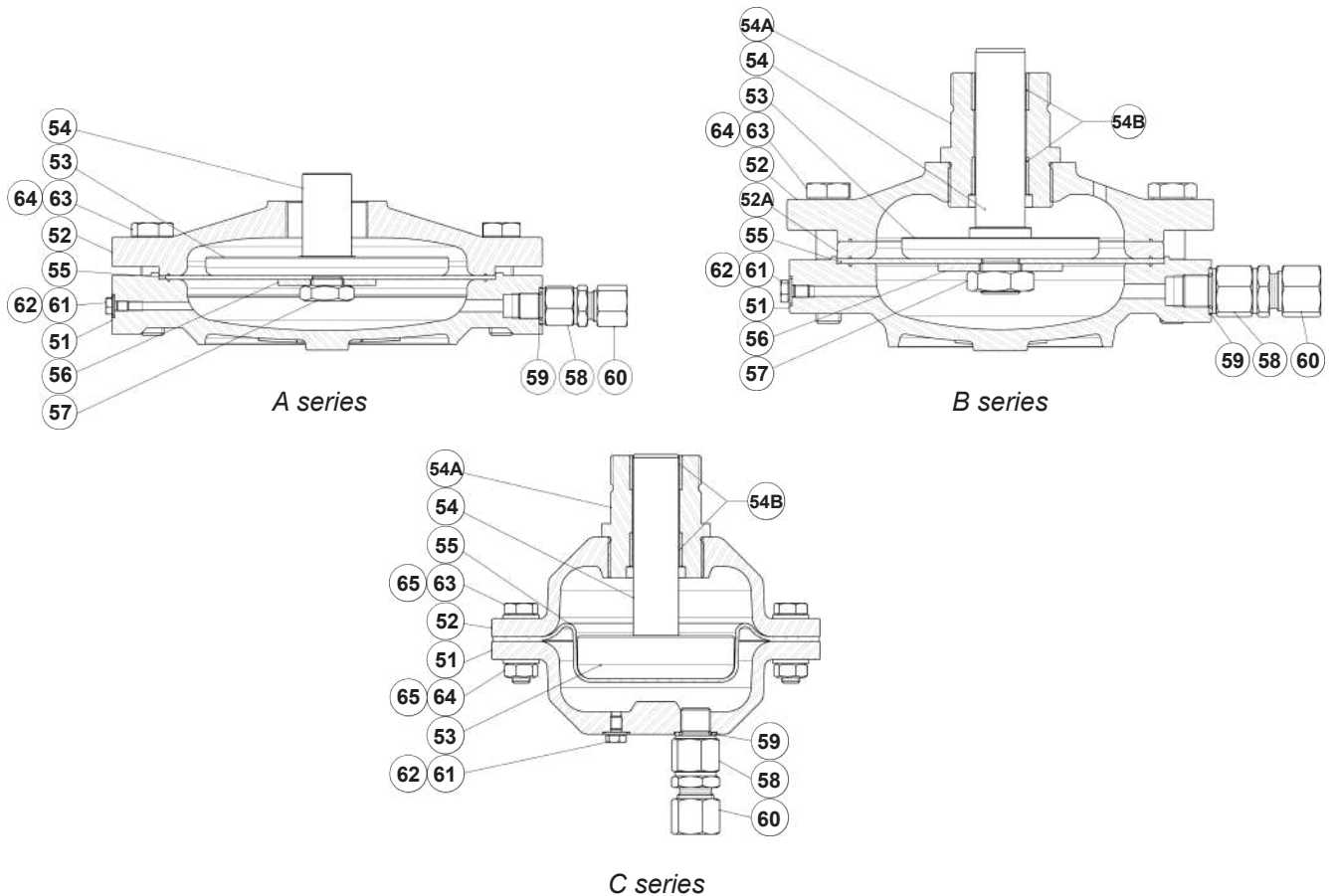


Detail C
(6")

MATERIALS – VALVE

| POS. N° | DESIGNATION | 1/2" to 4" | 6" |
|---------|-----------------------|----------------------------|----------------------------|
| 1 | Valve body | A216 WCB / 1.0619 | A216 WCB / 1.0619 |
| 2 | Seat | AISI 316 / 4.4401 | AISI 316 / 4.4401 |
| 3 | Stem | AISI 304 / 1.4301 | AISI 304 / 1.4301 |
| 4 | * Valve plug | AISI 420 / 1.4021 | AISI 316 / 4.4401 |
| 5 | Nut | AISI 316 / 1.4401 | AISI 316 / 4.4401 |
| 6 | Ball | AISI 440C / 1.4125 | – |
| 7 | Stem guide | AISI 304 / 1.4301 | – |
| 7A | Stem guide | AISI 304 / 1.4301 | – |
| 8 | Pin | AISI 301 / 1.4310 | AISI 304 / 1.4301 |
| 9 | Compensating spring | AISI 302 / 1.4300 | – |
| 10 | * Bellows | AISI 316Ti / 1.4571 | AISI 316 / 1.4401 |
| 10A | Nut | AISI 316 / 1.4401 | – |
| 10B | Split ring | AISI 316 / 1.4401 | – |
| 11 | Guide tube | CuZn39Pb3 | – |
| 12 | Bellows gasket | Stainless steel / Graphite | Stainless steel / Graphite |
| 13 | Body gasket | Stainless steel / Graphite | Stainless steel / Graphite |
| 14 | O-ring | EPDM | – |
| 15 | Piston body | A216 WCB / 1.0619 | – |
| 15A | Piston body extension | P355T1 / 1.0421 | – |
| 16 | Studs | Steel 8.8; EN 10269 steel | Steel 8.8; EN 10269 steel |
| 17 | Nuts | Steel 8.8; EN 10269 steel | Steel 8.8; EN 10269 steel |
| 18 | * Adjustment spring | Spring steel | Spring steel |
| 18A | Lower spring plate | C45E / 1.1191 | A216 WCB / 1.0619 |
| 18B | Upper spring plate | – | S235JG2R / 1.0038 |
| 19 | Threaded tube | CuZn39Pb3 | – |
| 20 | Spring adjusting nut | C45E / 1.1191 | A216 WCB / 1.0619 |
| 21 | Ball bearing | Zinc plated steel | Zinc plated steel |
| 22 | Spacer | S355JR / 1.0045 | – |
| 23 | Pressure star | S235JR / 1.0038 | – |
| 24 | Lock nut | C45E / 1.1191 | – |
| 25 | Pressure tube | C45E / 1.1191 | – |
| 26 | Pin | AISI 303 / 1.4305 | – |
| 27 | Bellows housing | – | S355JR / 1.0045 |
| 28 | Pillars | – | C45E / 1.1191 |
| 29 | Pillars flange | – | C45E / 1.1191 |
| 30 | Bolts | – | Zinc plated steel |
| 31 | Stem nut | – | A351 CF8 / 1.4308 |
| 32 | Belleville washer | – | P235GH / 1.0345 |
| 33 | Tightening nut | – | S235JR / 1.0038 |

* Available spare parts.



MATERIALS – ACTUATOR

| POS. N° | DESIGNATION | A1 / A10 / A11 / A12 / A3 / A4 | A2 / A21 | B1 / B3 / B4 | B2 / B21 | C11 |
|---------|-------------------------|-----------------------------------|--|------------------------------|--|---------------------|
| 51 | Lower diaphragm chamber | A216 WCB / 1.0619 | GJS-400-15 / 0.7040 A216 WCB / 1.0619 | A216 WCB / 1.0619 | GJS-400-15 / 0.7040 A216 WCB / 1.0619 | S235JR / 1.0038 |
| 52 | Upper diaphragm chamber | A216 WCB / 1.0619 | GJS-400-15 / 0.7040 A216 WCB / 1.0619 | A216 WCB / 1.0619 | GJS-400-15 / 0.7040 A216 WCB / 1.0619 | S235JR / 1.0038 |
| 52A | Spacer ring | – | – | S355JR / 1.0045 | S355JR / 1.0045 | – |
| 53 | Pressure plate | A216 WCB / 1.0619 | GJS-400-15 / 0.7040 | S355JR / 1.0045 | S355JR / 1.0045 | C45E / 1.1191 |
| 54 | Diaphragm plate spindle | A216 WCB / 1.0619 | GJS-400-15 / 0.7040 | AISI 420 / 1.4021 | AISI 420 / 1.4021 | AISI 420 / 1.4021 |
| 54A | Guide | – | – | C45E / 1.1191 | C45E / 1.1191 | C45E / 1.1191 |
| 54B | * Plain bearing | – | – | Bronze | Bronze | Bronze |
| 55 | * Diaphragm | Neoprene reinforced polyamid | Neoprene reinforced polyamid | Neoprene reinforced polyamid | Neoprene reinforced polyamid | Reinforced NBR |
| 56 | Washer | Copper | Copper | Copper | Copper | – |
| 57 | Hex nut | CuZn39Pb3 | CuZn39Pb3 | CuZn39Pb3 | CuZn39Pb3 | – |
| 58 | Flow restrictor | AISI 303 / 1.4305 | AISI 303 / 1.4305 | AISI 303 / 1.4305 | AISI 303 / 1.4305 | AISI 303 / 1.4305 |
| 59 | Gasket | Copper | Copper | Copper | Copper | Copper |
| 60 | Compression fitting | AISI 316Ti / 1.4571 | AISI 316Ti / 1.4571 | AISI 316Ti / 1.4571 | AISI 316Ti / 1.4571 | AISI 316Ti / 1.4571 |
| 61 | Vent screw | Zinc plated steel | Zinc plated steel | Zinc plated steel | Zinc plated steel | Zinc plated steel |
| 62 | Washer | Copper | Copper | Copper | Copper | Copper |
| 63 | Bolts | Zinc plated steel | Zinc plated steel | Zinc plated steel | Zinc plated steel | Zinc plated steel |
| 64 | Nuts | Zinc plated steel | Zinc plated steel | Zinc plated steel | Zinc plated steel | Zinc plated steel |
| 65 | Washer | – | – | – | – | Zinc plated steel |

* Available spare parts.