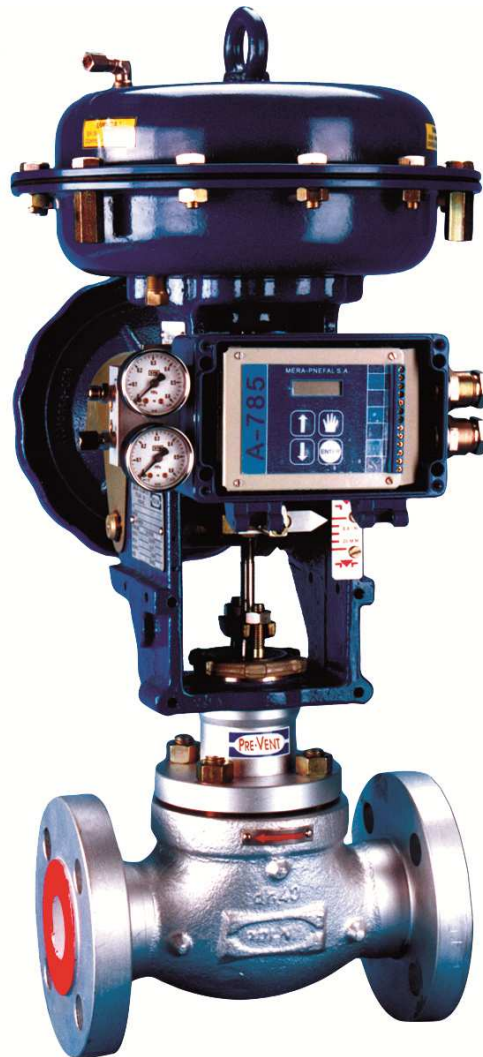


## BR12a Instruction Manual



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To ensure trouble-free and safe operation of the valve, it is essential to be familiar with the contents of this BR12a Instruction Manual, and also with the general instructions for installation and operation, before installing and operating the valve.

Failure to observe or comply with these operating instructions will invalidate the manufacturer's guarantee and liability. The manufacturer's general conditions of sales and terms of delivery shall apply unless otherwise stated.

## 1. FUNCTIONAL PRINCIPLE

The valve regulates mass-flow by a linear movement of the valve stem, which may be operated pneumatically, electrically or manually. As the stroke of the valve alters, the circular gap between the valve seat and the valve plug is increased or reduced. This directly influences the amount of fluid flowing through the valve.

## 2. INSTALLATION

The valve may be mounted in any position; however, for valves of DN 80 size and above, vertical installation with the actuator mounted above is preferred. For valves with extended construction, bellows, or drives weighing more than 50 kg, a suitable support or suspension mounting should be provided for the actuator, otherwise its own weight might cause wear and leakage at the stuffing box.

## 3. OPERATING CONDITIONS

Regulator valves should be operated under conditions that take into account the size and nature of the construction and the type of material. To ensure trouble-free operation over the whole operational lifetime, the regulator valve and its accessories should be regularly inspected and maintained.

### Normal operating conditions:

- a) With pneumatic actuator  
Ambient temperature from - 25 to + 80°C, with silicone diaphragm of -40 °C to +80 °C  
Relative humidity up to 98 %.  
The control and feed air supplies must contain no mechanical impurities, oil or corrosive substances, copper or aluminium alloys, and must be dehumidified such that the dew-point corresponds to a temperature that is at least 10 °C lower than the operating temperature of the position controller and the positioning drive.
- b) With electrical actuator  
In accordance with the manufacturer's instructions.
- c) With hand-operated actuator of type NN  
Ambient temperature from - 25 to + 80°C  
Relative humidity up to 98 %.

## 4. OPERABILITY, MAINTENANCE AND REPAIR - STANDARD CONSTRUCTION

The operability of the regulator valve during use is based on maintaining an appropriate flow characteristic and not exceeding the permitted leakage level for the valve.

To ensure long-term correct and safe operation of the valve, it is essential to carry out regular recorded inspections. Valves that operate continuously should be checked at least every 6 months. Valves that operate discontinuously should be checked at least every 12 months.

If it is necessary to carry out maintenance or repair work on the regulator valve, it should be carried out as follows:

#### 4.1. Stuffing box

A key criterion for operability is external seal-tightness, which is provided by the stuffing box.

The stuffing box to be used is normally pre-specified based on the operating conditions.

With normal stuffing box, the tightness of the seal is achieved by tightening the sealing nut or the lantern ring.

WARNING:

**When the valve is supplied, the stuffing box nut is only hand-tightened. Before putting the valve into service, it is essential to tighten the sealing sufficiently to achieve an adequate contact pressure, thus ensuring a secure external seal, but without blocking the valve spindle.**

If self-adjusting stuffing box used, the constant contact pressure is provided by a stainless steel spring. For this reason, the stuffing box nut should be screwed in up to the stop.

To change the stuffing box, proceed as follows:

Before changing the stuffing box, ensure that the valve is not under pressure and is not contaminated.

1. Loosen the upper part (bonnel) of the valve by opening the body nuts (19) between the body and the top of the valve.
2. Lift the upper part of the valve out of the body, along with the valve stem and the valve plug. Loosen the lantern ring (14) by slackening the nuts (16), and withdraw the valve stem and valve plug from the upper part of the valve.
3. Remove all parts of the stuffing box (13,24) from the packing space using suitable tools, and carefully clean out the packing space.
4. Fit a new body gasket (9) and seating seal (8) carefully clean the surfaces of the seal in the body and on the upper part.
5. Insert the valve stem and the valve plug into the upper part of the valve.
6. Carefully locate the upper part of the valve on the valve body and fasten it in place with the nuts (19).
7. Carefully fit the new stuffing box parts over the valve stem and into the packing space, taking care to get everything in the correct order (insert the parts in reverse order to the order in which they were taken out).
8. Fit on the lantern ring and secure it with the nuts (16).
9. Connect the actuator and the valve solidly back together.

#### 4.2. Replacement of the valve seat and the valve plug

If it is necessary to change the valve seat and valve stem due to a change in the operating conditions or due to wear and tear, proceed as follows:

Before making the change, ensure that the valve is not under pressure and is not contaminated.

In order to achieve a better seal when changing the valve seat and valve block, we recommend lapping the seat and the plug with a fine abrasive paste.

## Replacing the valve plug

1. Loosen the upper part (bonnel) of the valve by opening the body nuts (19) between the body and the top of the valve.
2. Lift the upper part of the valve out of the body, along with the valve stem and the valve plug. Disconnect the drive stem from the valve stem. Remove the clamping bush (6) or perforated clamping bush (cage) (7).
3. Undo the stuffing box by loosening the nuts (16) on the lantern ring (14) and withdraw the valve stem and valve plug from the upper part of the valve.
4. Knock out the dowel pin (20) using a punch, and unscrew the valve plug; screw a new plug on to the stem (3), drill it and knock in a dowel to secure it in place again.
5. Push the stem with its new plug into the upper part (bonnel) of the valve.
6. To seal the valve, also remove the seat (5), fit a new seat gasket (8) and replace the seat again.
7. Replace the clamping cage (6) or perforated cage (7) on the valve seat. Carefully place the bonnel of the valve onto the valve body and fasten it down with the nuts (19).
8. Pre-tension the stuffing box by tightening the nuts (16) on the lantern ring (14).
9. Re-connect the actuator and the valve.

## Replacing the seat

1. Loosen the upper part (bonnel) of the valve by opening the body nuts (19) between the body and the top of the valve. Remove the clamping cage (6) or the perforated cage (7).
2. Since the valve seat (5) is only clamped in place, it can normally be removed without using any special tools.
3. Fit a new seat gasket (8) and a new valve seat (5). Replace the clamping cage or perforated cage on the seat.
4. Re-assemble the valve as when changing the valve plug, see 4.2 above (items 7-9).

## 5. OPERABILITY, MAINTENANCE AND REPAIR – MODELS WITH EXTENDED OR BELLOWS CONSTRUCTION

The regulator valve's operability during use is based on maintaining an appropriate flow characteristic and not exceeding the permitted leakage level for the valve.

To ensure long-term correct and safe operation of the valve, it is essential to carry out regular recorded inspections. Valves that operate continuously should be checked at least every 6 months. Valves that operate discontinuously should be checked at least every 12 months.

If it is necessary to carry out maintenance or repair work on the regulator valve, it should be carried out as follows:

### 5.1. Stuffing box

A key criterion for operability is external seal-tightness, which is provided by the stuffing box.

The stuffing box to be used is normally pre-specified based on the operating conditions. With normal stuffing box, the tightness of the seal is achieved by tightening the nuts (16) on the lantern ring (14).

WARNING:

**When the valve is supplied, the stuffing box is only hand-tightened. Before putting the valve into service, it is essential to tighten the sealing via the nuts (16), sufficiently to achieve an adequate contact pressure, thus ensuring a secure external seal, but without blocking the valve stem.**

If self-adjusting stuffing box are used, the constant contact pressure is provided by a stainless steel spring. For this reason, the stuffing box nuts (16) should be screwed in up to the stop.

For models with extended and bellows construction, the stuffing box is changed as described in item 4 above.

## 5.2. Replacement of the valve seat and the valve plug

If it is necessary to change the valve seat and valve plug due to a change in the operating conditions or due to wear and tear, proceed as follows:

Before making the change, ensure that the valve is not under pressure and is not contaminated.

In order to achieve a better seal when changing the valve seat and valve block, we recommend lapping the seat and the block with a fine abrasive paste.

### Replacing the valve plug

The procedure is identical to that described for models of normal construction; however, please note:

To avoid damage in the models with metal bellows (the version with extension bonnel does not have a bellows), take care that no torque is applied to the bellows when unscrewing the valve plug and screwing it back in. We recommend applying an opposing torque to the valve stem.

Replacing the seat

Exactly as described in item 4.2 above.

## 5.3. Replacing the bellows

1. Loosen the upper part of the valve by opening the body nuts (19) between the body and the bonnel of the valve.
2. Lift the upper part of the valve out of the body, along with the bellows (23), upper bonnel (2C), valve stem and valve plug. Disconnect the actuator stem from the valve stem. Remove the clamping cage (6) or perforated cage (cage) (7).
3. Loosen the gasket on the upper bonnel cover. Unfasten the connecting nuts (31) on the bellows, and take off the upper bonnel (2C).
4. Unscrew the fastening nut (27) from the upper part of the bellows (25).
5. Withdraw the bellows (25) from the bellows bonnel, along with the valve stem.
6. Dismantle the valve plug (4a; 4b) from the bellows as described in item 5.2.
7. Clean the surfaces of the gaskets on the connecting piece.
8. Screw the valve plug back onto the new valve stem with bellows as described and dowel in place.
9. **WARNING**  
**Take great care that no torque is applied to the bellows when unscrewing the valve plug and screwing it back in.**
10. Fit a new bellows gasket (26) and insert the bellows from below into the bellows bonnel. Replace the securing nut (27) and tighten it. Fit a new body gasket (29), replace the upper bonnel gasket, and fasten it to the bellows bonnel (23) using the connecting nuts (31).
11. Pre-tension the stuffing box by tightening the nuts (16) on the lantern ring (14).
12. Fit a new gasket (8) and a new valve seat (5). Replace the clamping cage or perforated cage on the seat.
13. Re-assemble the valve as when changing the valve plug, see 4.2 above (items 7-9).

## 6. PNEUMATIC P/R DRIVE

(For drawing numbers, see BR11 manual)

When the pressure rises in the actuator pressure chamber, a force is applied to the diaphragm in the actuator unit. If this force exceeds the spring force of the springs in the second chamber, the springs are compressed and the actuator stem starts to travel out or in, according to the function. If the pressure continues to increase, once the maximum spring force is reached the springs will be pressed against the end-stop and the actuator will stop. Thus, a single actuating pneumatic drive can reach a defined position in proportion to the air pressure.

The size of the drive is based on the cm<sup>2</sup> surface of the diaphragm.

Drive size	Hub	Spring range (kPa)													
		1		2		3		4		5		6		7	
		20 – 100	40 – 200	40 – 120	80 – 240	60 – 140	120 – 280	180 – 380	How many springs	total compression (mm)	How many springs	total compression (mm)	How many springs	total compression (mm)	How many springs
250	20	3	-	6	-	3	-	6	-	3	6	6	6	-	-
400	20	3	-	6	-	3	-	6	-	3	6	6	6	-	-
630	38	3	-	6	-	3	10	6	10	3	10+10	6	10+10	12	10+10
1000	38	3	-	6	-	3	9.5	6	9.5	3	9.5+9.5	6	9.5+9.5	12	9.5+9.5
	50	3	-	6	-	3	12.5	6	12.5	3	12.5+12.5	6	12.5+12.5	12	12.5+12.5
	63	3	-	6	-	3	16	6	16	3	16+16	6	16+16	12	16+16

Spring range and drive sizes for pneumatic drives of type P/R

P type drive: Single acting diaphragm actuator.  
 Safe position NO (open on loss of pressure)  
 When pressure rises in the upper chamber, the actuator stem travels out.

R type drive: Single acting diaphragm actuator.  
 Safe position NC (closed on loss of pressure)  
 When pressure rises in the lower chamber, the actuator stem travels in.

### 6.1. Changing the operating mode of the drive

No additional components are required in order to alter the direction of operation of type P/R pneumatic actuator.

#### Changing P to R and vice versa

1. Disconnect the valve from the actuator.
2. Ensure that no air pressure is applied to the actuator.
3. Remove the top cover of the actuator, taking care that the tensioning nuts (long nuts) (82) are unscrewed to the ends – in accordance with the notes on the warning label,

The further steps in the procedure depend on the current operating mode of the actuator before it is changed.

**To change the actuator function from P to R, proceed as follows:**

4. Undo the special nuts (34) from the bolts on the actuator.
5. Remove the diaphragm with its diaphragm plate, spacer ring, washer and spacer cover (or spacer covers for drive sizes 630 and 1000).
6. Remove the springs (31) from the lower cover.
7. Turn the diaphragm together with all the parts as listed above through 180 degrees, and fit the diaphragm back over the actuator stem.
8. Screw the special nuts (34) on to the actuator bolts, thus compressing the whole of the above group of components.
9. Place the springs on the diaphragm plate so that they fit in the guide cut-outs and their ends are aligned with the axis of the bolts.
10. Place the top cover over the springs and initially tighten the tensioning nuts (82).
11. Compress the springs evenly until the upper part of the drive end-stop is pressed against the lower part, then insert the rest of the bolts and screw on the nuts.

**To change the drive function from R to P, proceed as follows:**

4. Remove the springs (31) from the diaphragm plate (28).
5. Undo the special nuts (34) from the bolts on the actuator.
6. Remove the diaphragm with its diaphragm plate, spacer ring, washer and spacer cover (or spacer covers for drive sizes 630 and 1000).
7. Place the springs in the designated locations in the lower cover.
8. Turn the diaphragm together with all the parts as listed above through 180 degrees, and fit the diaphragm back over the drive bolts, so that the 6 mm diameter opening on the base and the nut on the edge of the diaphragm plate are axially aligned with one of the openings on the edge of the diaphragm.
9. Screw the special nuts (34) on to the actuator stem, thus compressing the whole of the above group of components.
10. Place the springs on the diaphragm plate (28) so that they fit in the guide cut-outs. To check that the springs are in the correct position, rotate the diaphragm (to the position of the notch on the nut at the edge of the diaphragm plate) until the 6 mm opening on the base is visible. By sighting through the opening, check that there is a spring in place on the underside.
11. Place the top cover over the springs and initially tighten the tensioning nuts (82).
12. Compress the springs evenly until the upper part of the drive end-stop is pressed against the lower part, then insert the rest of the bolts and screw on the nuts.

## **6.2. Changing the diaphragm**

Should it be necessary to change a diaphragm, the actuator should be dismantled as described in item 6.1. Instead of putting the actuator back together in reverse order, it should simply be re-assembled in its original order after changing the diaphragm.



## 7. PNEUMATIC TYPE P1/R1 DRIVE

When the pressure rises in the actuator pressure chamber, a force is applied to the diaphragm in the actuator unit. If this force exceeds the spring force of the springs in the second chamber, the springs are compressed and the drive stem starts to travel out or in, according to the function. If the pressure continues to increase, once the maximum spring force is reached the springs will be pressed against the end-stop and the drive will halt. Thus, single acting pneumatic actuator can reach a defined position in proportion to the air pressure.

The size of the drive is based on the cm<sup>2</sup> surface of the diaphragm.

Drive size	Hub	Spring range (kPa)													
		1		2		3		4		5		6		7	
		20 – 100	40 – 200	40 – 120	80 – 240	60 – 140	120 – 280	180 – 380	How many springs	total compression (mm)	How many springs	total compression (mm)	How many springs	total compression (mm)	How many springs
400	20	3	-	6	-	3	5	6	5	3	5+5	6	5+5	-	-
	630	20	3	-	6	-	3	5	6	5	3	5+5	6	5+5	12
1000	38	3	-	6	-	3	9,5	6	9,5	3	9,5+9,5	6	9,5+9,5	12	9,5+9,5
	50	3	-	6	-	3	12,5	6	12,5	3	12,5+12,5	6	12,5+12,5	12	12,5+12,5
	63	3	-	6	-	3	15,5	6	15,5	3	15,5+15,5	6	15,5+15,5	12	15,5+15,5
1500	38	3	-	6	-	3	9,5	6	9,5	3	9,5+9,5	6	9,5+9,5	12	9,5+9,5
	50	3	-	6	-	3	12,5	6	12,5	3	12,5+12,5	6	12,5+12,5	12	12,5+12,5
	63	3	-	6	-	3	15,5	6	15,5	3	15,5+15,5	6	15,5+15,5	12	15,5+15,5
	80	3	-	6	-	3	9,5	6	9,5	3	9,5+9,5	6	9,5+9,5	12	9,5+9,5

Spring range and actuator sizes for pneumatic actuators of type P1/R1

P1 type drive: Single diaphragm actuator.

Safe position NO (open on loss of pressure)

When pressure rises in the upper chamber, the drive stem travels out.

R1 type drive: Single diaphragm actuator.

Safe position NC (closed on loss of pressure)

When pressure rises in the lower chamber, the drive stem travels in.

## 7.1. Changing the operating mode of the actuator

1. No additional components are required in order to alter the direction of operation of type P1/R1 pneumatic actuator.
2. Disconnect the valve stem from the actuator stem.
3. Remove the top cover of the actuator (44), taking care that the tension lock is loosened right to the end in accordance with the note on the warning label.

The further steps in the procedure depend on the current operating mode of the drive before it is changed.

### To change the drive function from P1 to R1, proceed as follows:

4. Loosen the thin nut (53) on the actuator stem.
5. Remove the diaphragm (55) with its diaphragm plate (45), spacer ring (47), washer (50) and cover (or spacer covers for drive sizes 630 and 1000) (48/49); take care, the stem must be secured before it can fall out of the sealing gland system.
6. Remove the springs from the lower casing.
7. Turn the diaphragm together with all the parts as listed above through 180 degrees, and fit them over the actuator stem in reverse order to that in which they were taken off.
8. Screw the thin nut onto the actuator stem so as to press all the above components together.
9. Place the springs in the cut-outs provided for the purpose on the diaphragm plate, so that they are evenly distributed around the axis of the stem.
10. Place the top cover of the actuator on the springs and compress the springs evenly. First tighten the tensioning nuts (remembering to insert the warning notice), until the upper drive cover is screwed firmly against the lower actuator cover. Then insert the rest of the bolts and screw on the respective nuts.

### To change the drive function from R1 to P1, proceed as follows:

11. Remove the springs from the diaphragm plate.
12. Loosen the thin nut (53) on the drive stem.
13. Remove the diaphragm (55) with its diaphragm plate (45), spacer ring (47), washer (50) and cover (or spacer covers for drive sizes 630 and 1000) (48/49); take care, the stem must be secured before it can fall out of the sealing gland system.
14. Place the springs (54) in the places provided in the lower cover of the actuator (43).
15. Turn the diaphragm together with all the parts as listed above through 180 degrees, and fit them on the actuator stem so that the 6 mm diameter opening on the base and the nut on the edge of the diaphragm plate (45) lie in the axis of one of the openings on the circumference of the diaphragm.
16. Arrange the diaphragm system on the springs so that the springs are located in the corresponding cut-outs in the diaphragm plate. To check that the springs are in the correct position, gently rotate the diaphragm (to the position of the notch on the nut at the edge of the diaphragm plate) until the 6 mm opening on the base (45) is visible. By sighting through the opening, check that there is a spring in place on the underside.
17. Screw the thin nut (53) on to the actuator stem so that all the above components are pressed together.
18. Place the upper cover of the valve on the front of the stem and compress the springs evenly. First tighten the tensioning nuts (long nuts) (remember to insert the warning notice!), until the upper actuator cover is firmly screwed against the lower drive cover. Then insert the rest of the bolts and screw on the respective nuts.

## 7.2 Changing the control air range (spring range) for pneumatic actuator type P1/R1

The construction of the positioning drive permits the use of different control air ranges; this is achieved by applying different numbers of springs, or altering their pre-tensioning by fitting spacers:

- 5.0 mm – 2 off (for 20 mm hub),
- 9.5 mm – 2 off (for 38 and 80 mm hubs),
- 12.5 mm – 2 off (for 50 mm hub),
- 15.5 mm – 2 off (for 63 mm hub) – for drive sizes 1000 and 1500.

For the nominal range, the elements are mounted on the actuator stem on the inside of the diaphragm plate. Additional tensioning of the springs is achieved by fitting either one or two spacers to the outer side of the diaphragm plate, depending on the desired range.

The change in pre-tensioning is achieved by altering the position using the following spacers: 5 mm for the 20 mm hub; 9.5 mm for the 38 and 80 mm hubs; 12.5 mm for the 50 mm hub, and 15.5 mm for the 63 mm hub. Additional 4.5 mm thick spring plates are used for the 80 mm hub.

The number of components is given in Table 1, and the way in which they are fitted is shown in the overall layout drawing for positioning drives.

## 8. OTHER ACTUATORS

It is possible to equip model BR12a valves with electrical actuator. Sizing the actuator to the regulator valve is normally a part of the bidding process.

It is also possible to supply model BR12a valves with a purely manual operation (type NN), or to fit the pneumatic actuator with an additional hand-wheel (type P/R-N).

(See the following diagrams)

## 9. DRAWINGS / SPARE PARTS LIST

Number and description of parts.

No.	Description
<b>Individual valve components</b>	
1	Body
2a	Standard bonnel
2b	Extension bonnel
2c	Upper bonnel
3	Stem
4a	Parabolic valve plug
4b	Perforated plug
5	Valve seat
6	Clamping cage
7	Perforated clamping cage
8	Valve seat gasket
9	Body gasket
10	Guide sleeve
11	Blind plugs
12	Securing nut
13	Pressure sleeve
14	Thrust lever
15	Double-nut bolt
16	Nut
17	Thin nut
18	Double-nut bolt
19	Nut
20	Slot dowel
21	Company nameplate
22	Rivet pin
23	Bellows bonnel
24	Stuffing box
25	Bellows
26	Seal
27	Nut
28	Securing washer
29	Seal
30	Double-nut bolt
31	Nut
32	Guiding ring
33	Seal
34	Spacer sleeve (TA air)
35	Seal packing (TA air)
36	Spacer sleeve (TA air)
37	Stuffing box (TA air)

No.	Description
<b>Individual components of positioning drive</b>	
38	Pressure sleeve (TA air)
39	Leaf spring (TA air)
40	Pressure plate (TA air)
41	Double-nut bolt (TA air)
42	Bracket
43	Lower actuator cover
44	Upper actuator cover
45	Diaphragm plate
46	Stem
47	Spacer ring
48	Spacer sleeve
49	Spacer sleeve
50	Washer
51	Support ring
52	Tensioning nut
53	Thin nut
54	Spring
55	Diaphragm
56	Flange of actuator stem P1/R1-400
57	Stroke plate
58	Actuator supplier nameplate
59	Valve supplier nameplate
60	Warning label
61	Stroke indicator
62	Sliding sleeve
63	Cover
64	Air vent plug
65	Rivet pin 3x6
66	Bolt
67	Bolt
68	Bolt
69	Bolt
70	Shaft bolt
71	Nut
72	Washer
73	O ring
74	Washer ring
75	Circlip
76	O ring

No.	Description
77	Z wiper ring
78	O ring
79	Nut
80a	Shaft connecting piece, upper, P1/R1 630
80b	Shaft connecting piece, upper, P1/R1 1000; 1500
81a	Shaft connecting piece, lower, P1/R1 630
81b	Shaft connecting piece, upper, P1/R1 1000; 1500
82a	Connecting sleeve P1/R1-630
82b	Connecting sleeve P1/R1 1000; 1500
83	Grub screw
84	Drive bolt
85	Drive wheel
86	Support nut
87	Lever
88	Drive joint
89	Lever axle
90	Pivot pins
91	Spindle nut
92	Drive cover
93	Longitudinal journal bearing
94	Slot dowel
95	Support ring (P1/R1B-400;630)
96	Circlip
97	Circlip
98	Circlip
99	Bolt
100	Washer
101	Connecting piece (for electrical positioning motors)
<b>Individual components of type 20 drive</b>	
102	Drive bracket
103	Drive wheel
104	Drive sleeve
105	Drive cover
106	Drive shaft
107	Slot
108	Stroke plate
109	Ball bearing
110	Oiler
111	Indicator
112	Slot dowel
113	Shaft bolt

Figure 1: Regulator valve type Z1A with pneumatic drive type P1/R1 and side-mounted hand-wheel (cross-section)

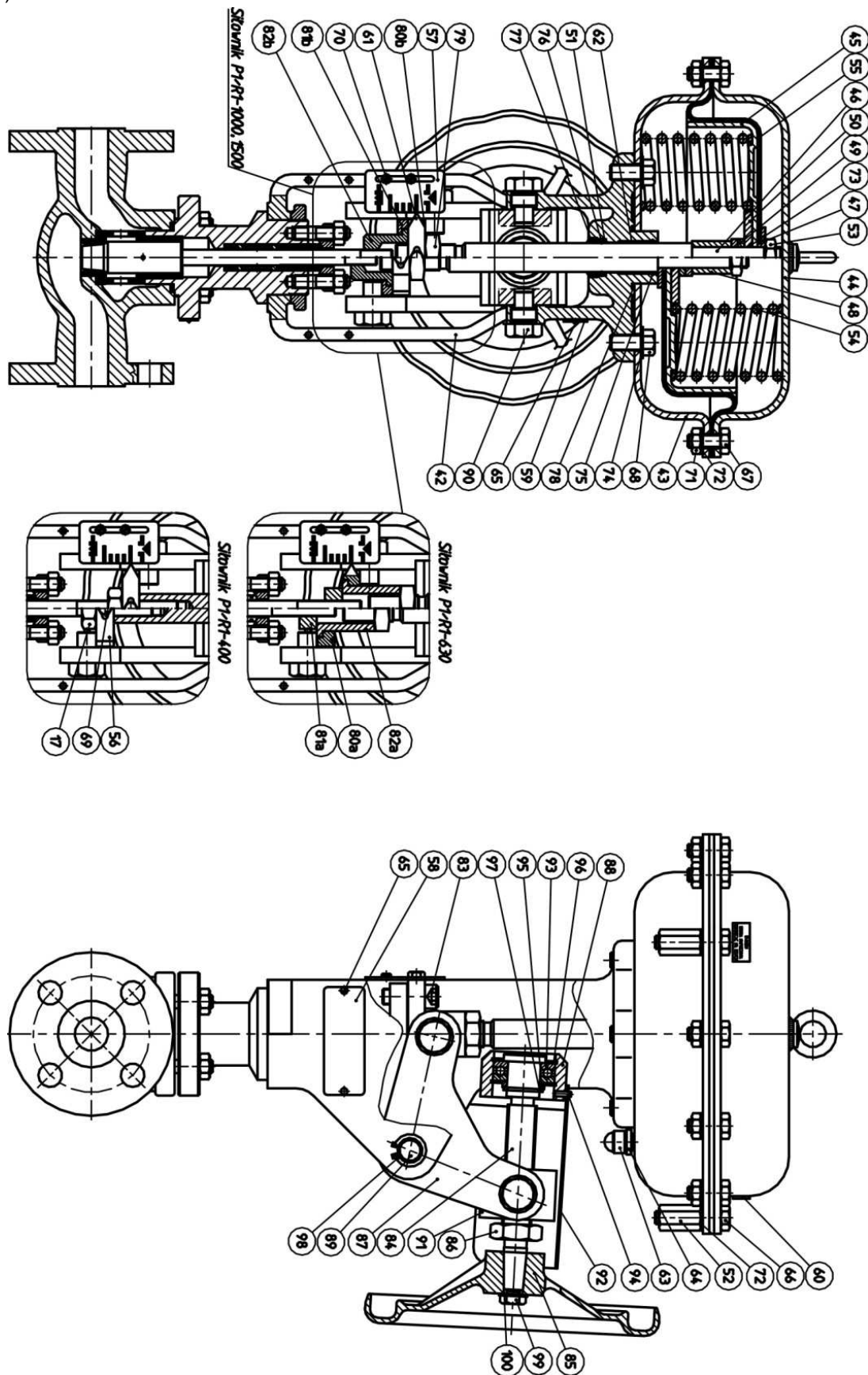


Figure 2: Different types of valve plug and pressing cages

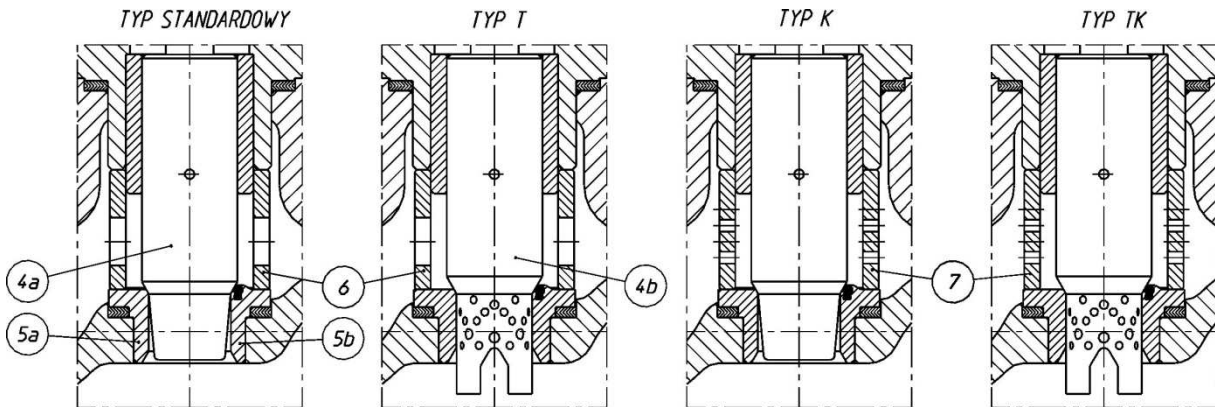


Figure 3: Different models of control valve type BR12a

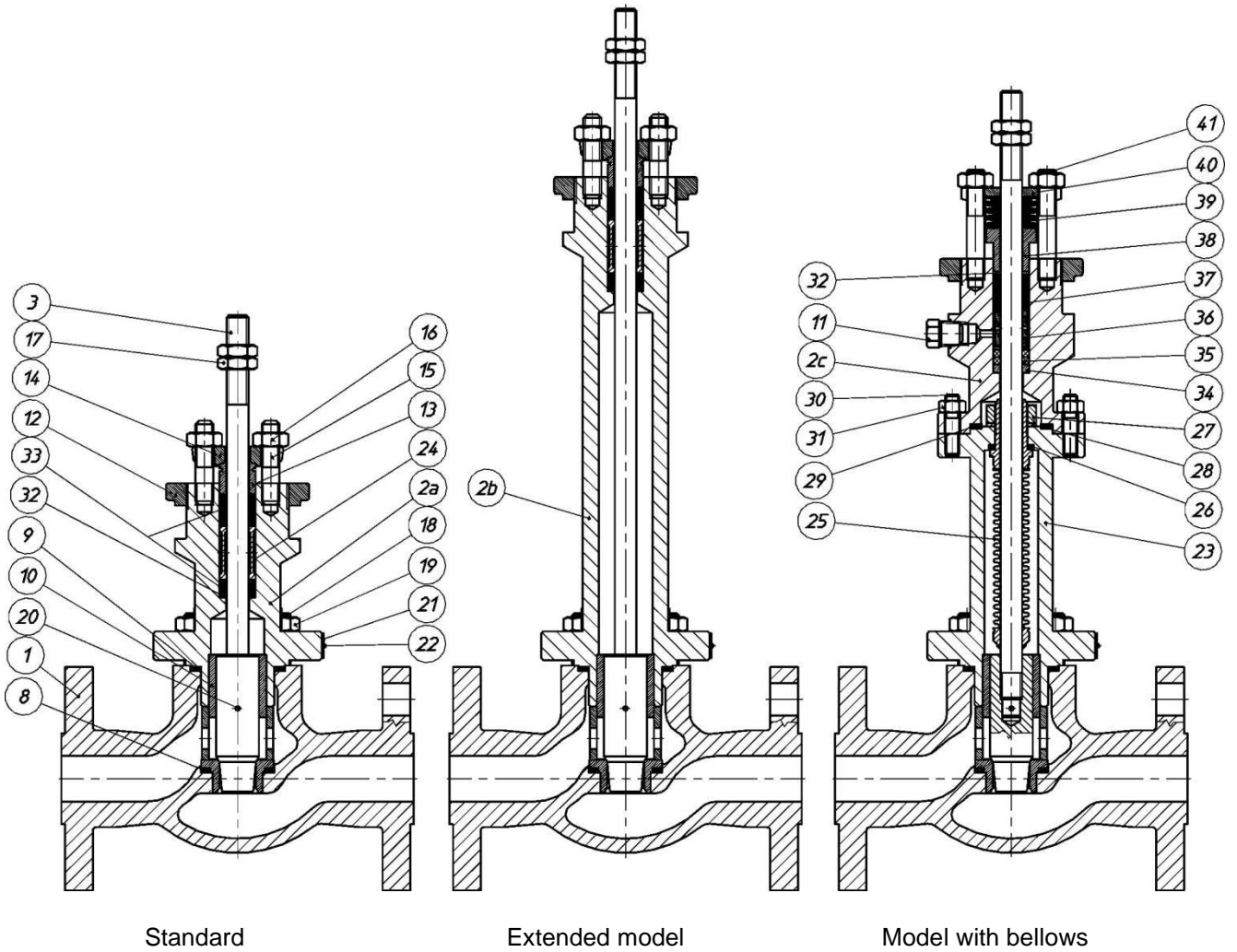


Figure 4: Pneumatic positioning actuator with manual handwheel, type P/R-N

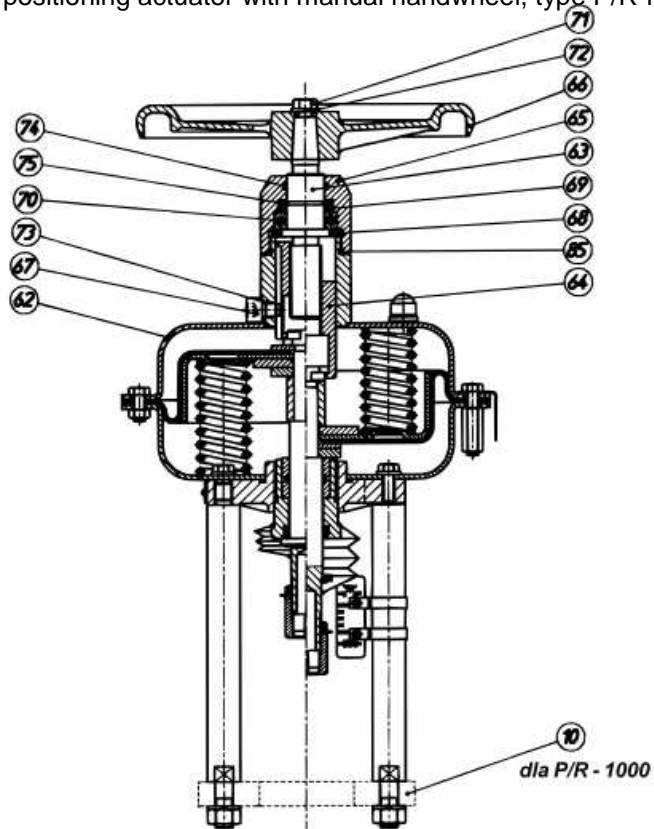
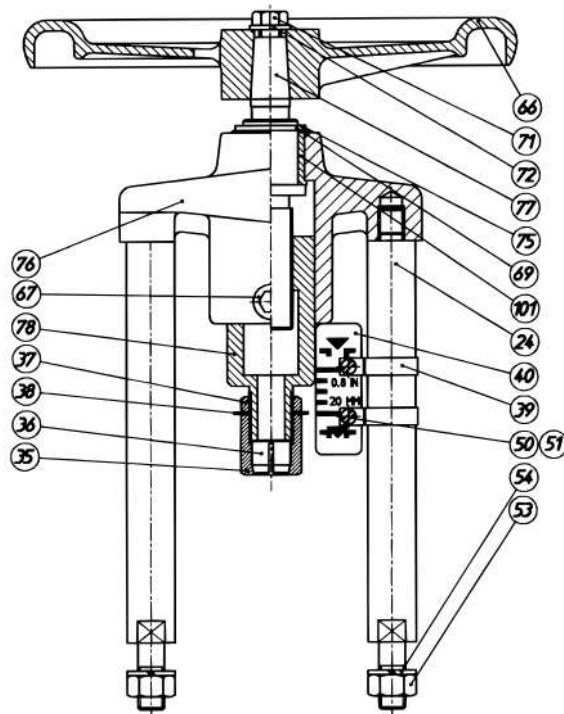


Figure 5: Manual actuator, type NN



## 10. Contacting us

Details / specific information (Operating instructions with spare parts lists) are available for download on our website.

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