DIAPHRAGM MULTI-SPRING PNEUMATIC ACTUATORS **TYPE P/R**

APPLICATION AREA

The multi-spring membrane pneumatic actuators of P/R type are applied for control operation of control valves and other positioning elements in industrial automatic systems.
There are three following design options of the acutator:

- direct action (air - advances the steam) - type P,
- reverse action (air – retracts the steam) - type R,
- direct action, handwheel - type PN,
- reverse action, handwheel - type RN

FEATURES

- completely reversible action, option to change spring range w/o extra parts,
- rigid structure of cast yoke,
- wide range of the available forces,
- linear relationship between rod displacement and control pressure as a result of using membranes with constant active area,
- various ranges of spring pressures due to changeability of spring number and /or dislocation of distance fencers,
- capability of the actuator to incorporate side-mounted handwheel, pneumatic or electro-pneumatic positioners, limit switches, air sets, three-way pneumatic solenoid valves, lockup valves, position transducers,
- high strength of diaphragms, springs and packings,
- small size and weight

TECHNICAL PARAMETERS

- input signal range:	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
- max. supply pressure:	400 kPa (450 kPa for the range 180…380 kPa)	
- working temperature:	- 40...+80°C	
- relative humidity:	max. 98%	

Diaphragm effective area	Stroke	Spring range
[cm^2]	[mm]	[kPa]
250	20	1...6
400		
630	20; 38	1...7
1000	38; 50; 63	

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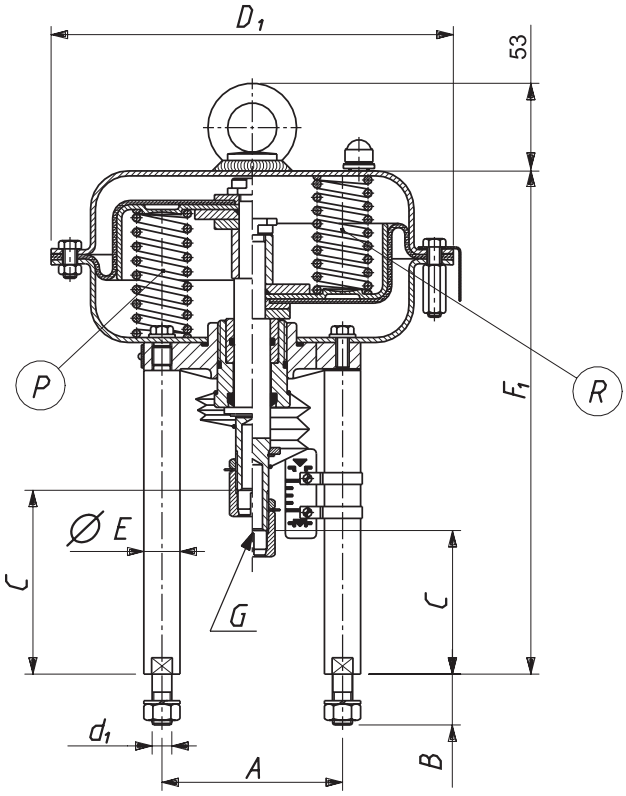
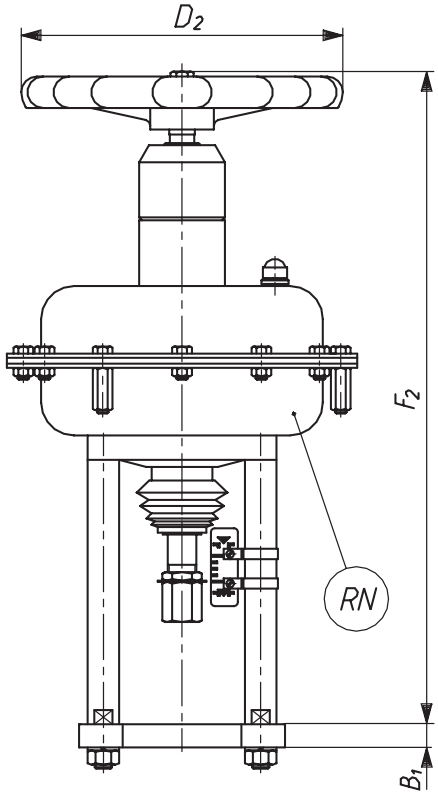
DIMENSIONS AND WEIGHT





Actuator size	A	B	B_1	C		D_1	D_2	d_1	E	F_1	F_2	G	Weight	
				P, PN	R, RN								P,R	PN, RN
	[mm]												[kg]	
250	110	31	18	112	86	240	225	M12	22	306	456	M12 x 1,25	10	14,5
400	132	39	20	116		305		M16	28	312	462		16	20,5
630			22	134		375	305		28	402	552		30	37
1000	216	50		210	135	477	450	M24	42	585	815	M16 x 1,5	74	100

PRODUCT CODE

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Type:

- direct action:	**P**
- reverse action:	**R**
- direct action, handwheel:	**PN**
- reverse action, handwheel:	**RN**

Size:

250
400
630
1000

Spring range [kPa]:

20…100	**1**
40…200	**2**
40…120	**3**
80…240	**4**
60…140	**5**
120…280	**6**
180…380	**7**

Stroke [mm]:

20
38
50
63

Example of the product code:
The pneumatic actuator of inversed action, with a handwheel, size – 400, stroke 20 mm, spring range 40...200:

RN - 400 - 20 - 2

Revision: P/R/08/2007
Valid until the next revision.

ACTUATORS **TYPE P5/R5**
INTEGRATED WITH SMART POSITIONER

APPLICATION AREA

The diaphragm multi-spring pneumatic actuators of P5/R5 type are applied for control operation of control valves and other positioning elements in industrial automatic systems. They are dedicated to collaborate with an integrated smart positioner type SPIROSTER 07 manufactured by the Zakład Automatyki Przemysłowej INTEC from Wrocław.

FEATURES

The P5/R5 actuator:

- completely reversible action, option to change spring range w/o extra parts,
  There are three design options of the actuators:
  - direct action (air - advances the steam) - type P5,
  - reverse action (air – retracts the steam) - type R5,
  - direct action, handwheel - type P5N,
  - reverse action, handwheel - type R5N
- no external piping with pulse lines between the adjuster and the actuator for both P5 and R5 options. All the interconnection for feeding and control air are performed via internal channels of the adjuster and the actuator. It eliminates the need to use pulse pipes that must be made of materials suitable for operating conditions of the actuator and eradicates the risk of possible damages during transportation and operation,
- totally eliminated penetration of ambient air into interior of the actuator, which is crucial for improving durability of its diaphragm and extends lifetime of sealing.
- mechanical link between the adjuster and the actuator steam comprises no levers and is installed in the safe way that prevents from mechanical damages and contaminations,
- mechanical, rotary indicator of the valve opening,
- suitable for heavy-duty conditions, such as corrosive agents, potentially explosive atmosphere or aggressive chemicals. All internal parts are made of stainless steel. The cast yoke is protected against corrosion by coating with epoxy powder paints,
- high insensitivity to shocks and vibrations due to reliable mounting of the adjuster and reduced number of connecting and fixing parts,
- possible application of top-mounted handwheel,
- conformity with relevant EU directives concerning the product.

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THE ELECTRO-PNEUMATIC ADJUSTER **SPIROSTER 07:**

- fuzzy-logic, intelligent algorithm for positioning (FUZZY PID),
- contactless measurement of the actuator position with use of a resolver,
- current loop control signal (4 ... 20 mA) or controllability via local networks (MODBUS, PROFIBUS, etc.)
- feedback signal 4…20 mA,
- binary signals of limit positions,
- local and remote control,
- tightening of fittings by clamping,
- automatic, non-intrusive settings of limit position,
- possible splitting of positioning range,
- automatic, adaptive adjustment of dynamic parameters for the actuator,
- internal PID controller for the adjustment process – the actuator can operate as an independent, autonomous controller of a process,
- piezoelectric electro-pneumatic transducer,
- customized characteristic curves for the adjustment process.

OPERATION PRINCIPLE

Operation principle of the actuator is illustrated on drawings Fig. 1, 2 and 3.
The feeding air is delivered via a pipeline to a pressure coupling (13) and then via internal channels (1) to the adjuster (2).
The control air from the adjuster is forwarded to the channel (3) in the actuator yoke.
Further direction of airflow depends on positions of screws (4, 5) and desired function of the actuator.
For the R5 actuator of inversed operation (Fig. 1) the air is forwarded directly to the pressure chamber (6). The non-pressure chamber (7) is connected to channels (14) and vent plug (10) via the opening (8) in the actuator rod and the guiding sleeve (9).
In case of the P5 actuator of direct operation (Fig. 2) the control air penetrates via a guiding sleeve and an opening in the actuator rod to the pressure chamber whereas the non-pressure chamber is connected directly to a vent (14, 10).
The vent passage (14) is connected with interior of the adjuster by the channel (15) (Fig. 3).
If a check valve (16) is installed instead of the vent plug (10) then the non-pressure chamber is isolated from the ambient atmosphere and is supplied solely with pure air from the adjuster.
Switchover of the actuator function is possible when the device is in service with no additional parts or specialized tools.

TECHNICAL PARAMETERS

- input signals range:

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

- maximum supply pressure: do 600 kPa
- working temperature: - 20...+70°C
- relative humidity: max. 98%

Active area of the membrane	Stroke	Spring range
[cm^2]	[mm]	[kPa]
250	20	1...6
400		
630	20; 38	1...7

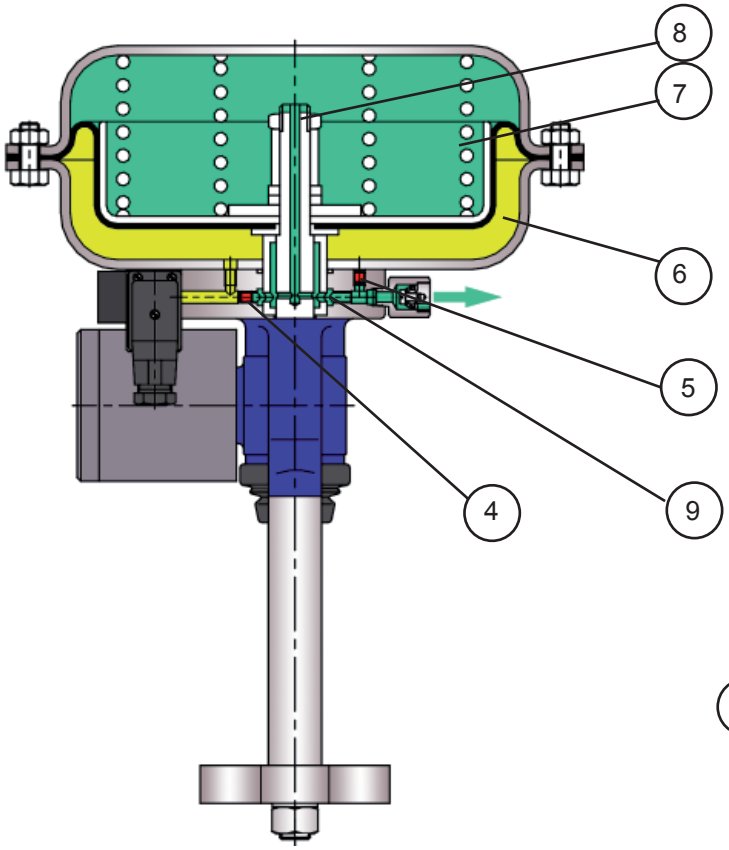


Fig. 1 The R5 actuator

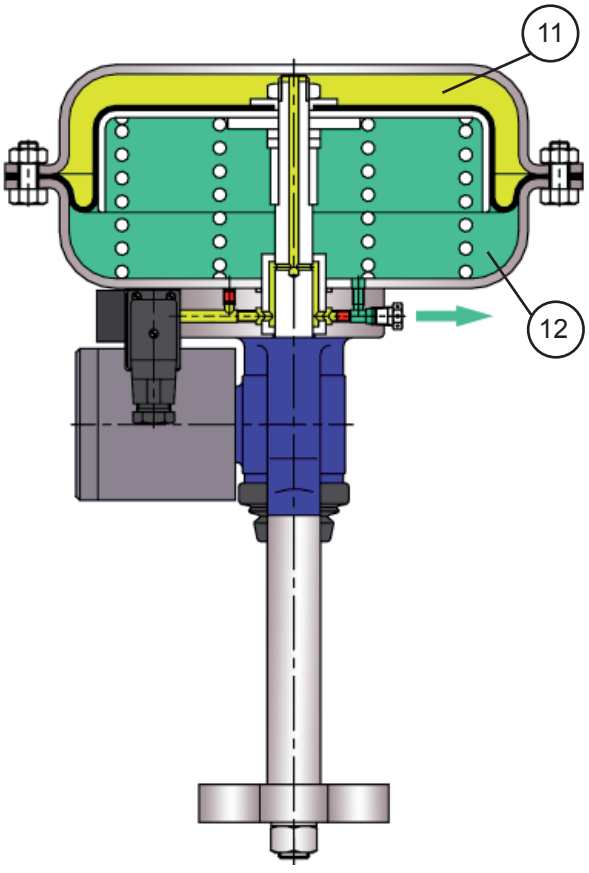


Fig. 2 The P5 actuator

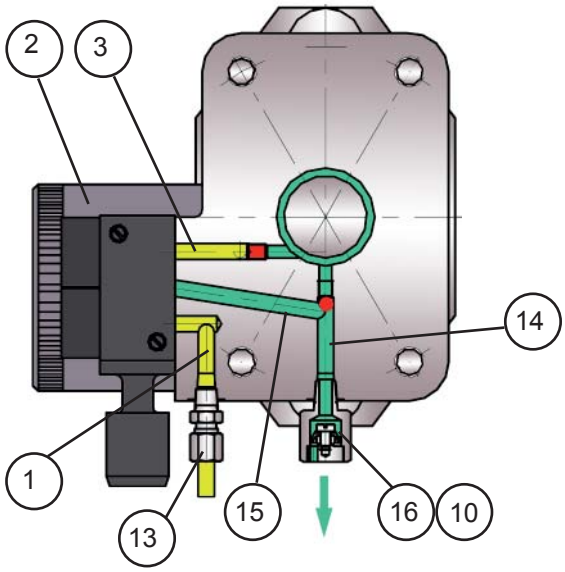
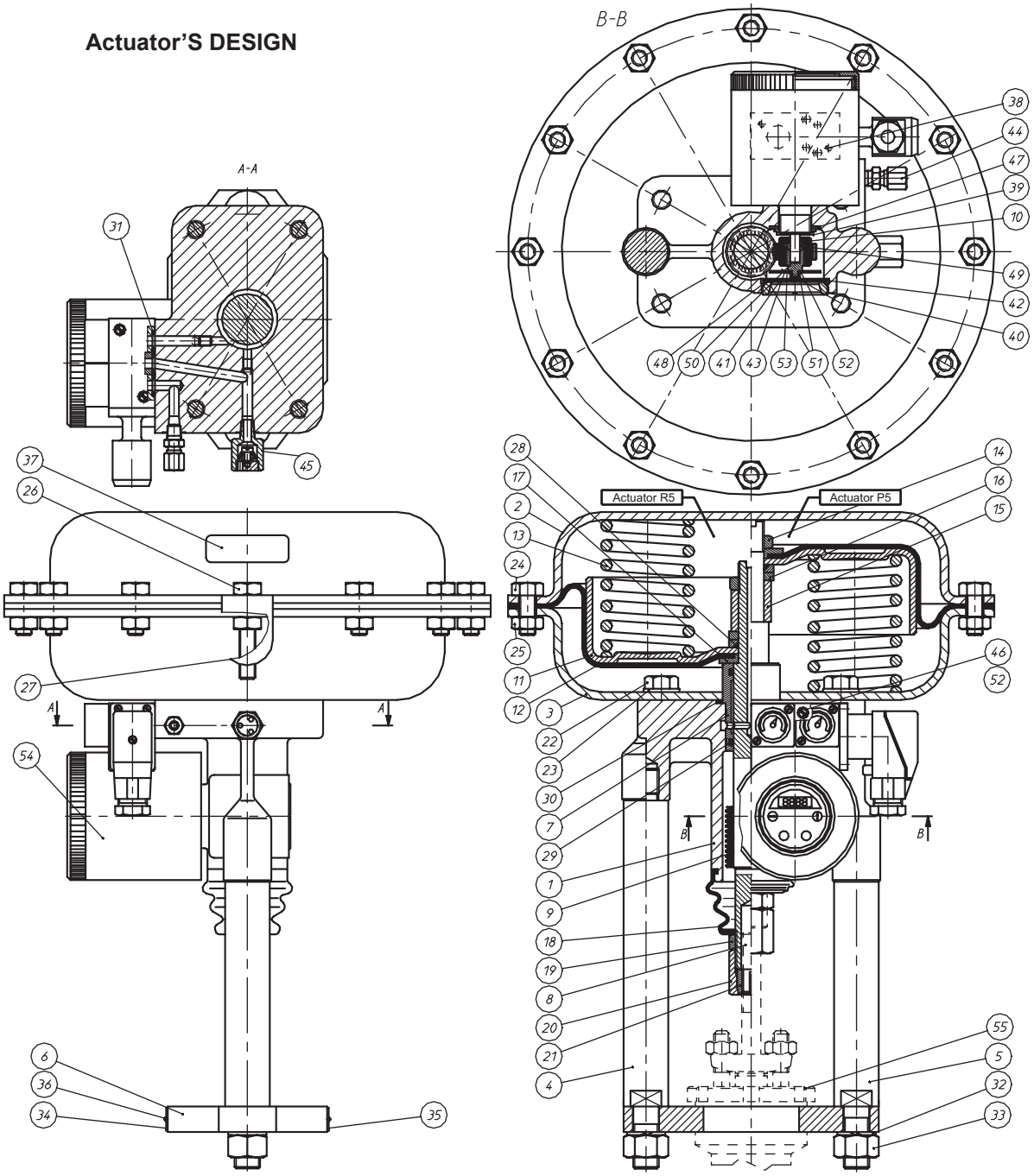


Fig. 3 Airflow inside the yoke of the R5 actuator

Actuator'S DESIGN



Pos.	Part name
1	Yoke
2	Upper dia. case
3	Lower dia. case
4	Column
5	Column
6	Connecting plate
7	Rest sleeve
8	Steam
9	Rack
10	Pinion
11	Diaphragm plate
12	Diaphragm
13	Spring
14	Nut
15	Spacing sleeve
16	Spacing sleeve
17	Spacing ring
18	Cover
19	Check nut
20	Connecting nut
21	Lock nut
22	Bolt
23	Washer ring P
24	Bolt
25	Nut
26	Bolt
27	Warning plate
28	Packing ring 15,3x2,4 „ON”

Pos.	Part name
29	Packing ring 22,2x3 „OR”
30	Packing ring 36,2x3 „ON”
31	Packing ring 6,3x2,4 „ON”
32	Spring washer
33	Nut
34	Nameplate of the actuator
35	Nameplate of the valve
36	Rivet pin
37	Trademark „POLNA”
38	Clamping bolt M6x8
39	Special nut
40	Eyelet mounting
41	Eyelet
42	Indicator sticker II
43	Indicator sticker I
44	Straight coupling
45	Check valve
46	Screw M4x35
47	Toothed washer DIN 6798 A2/I 21
48	Packing ring 36x2 „ON”
49	Cutting ring
50	Stud bolt
51	Thin nut M4
52	Washer B 4,3 DIN125
53	Disk
54	Adjuster SPIROSTER 07
55	Mounting nut
56	Handwheel

Fig. 4 The pneumatic actuator P5/R5

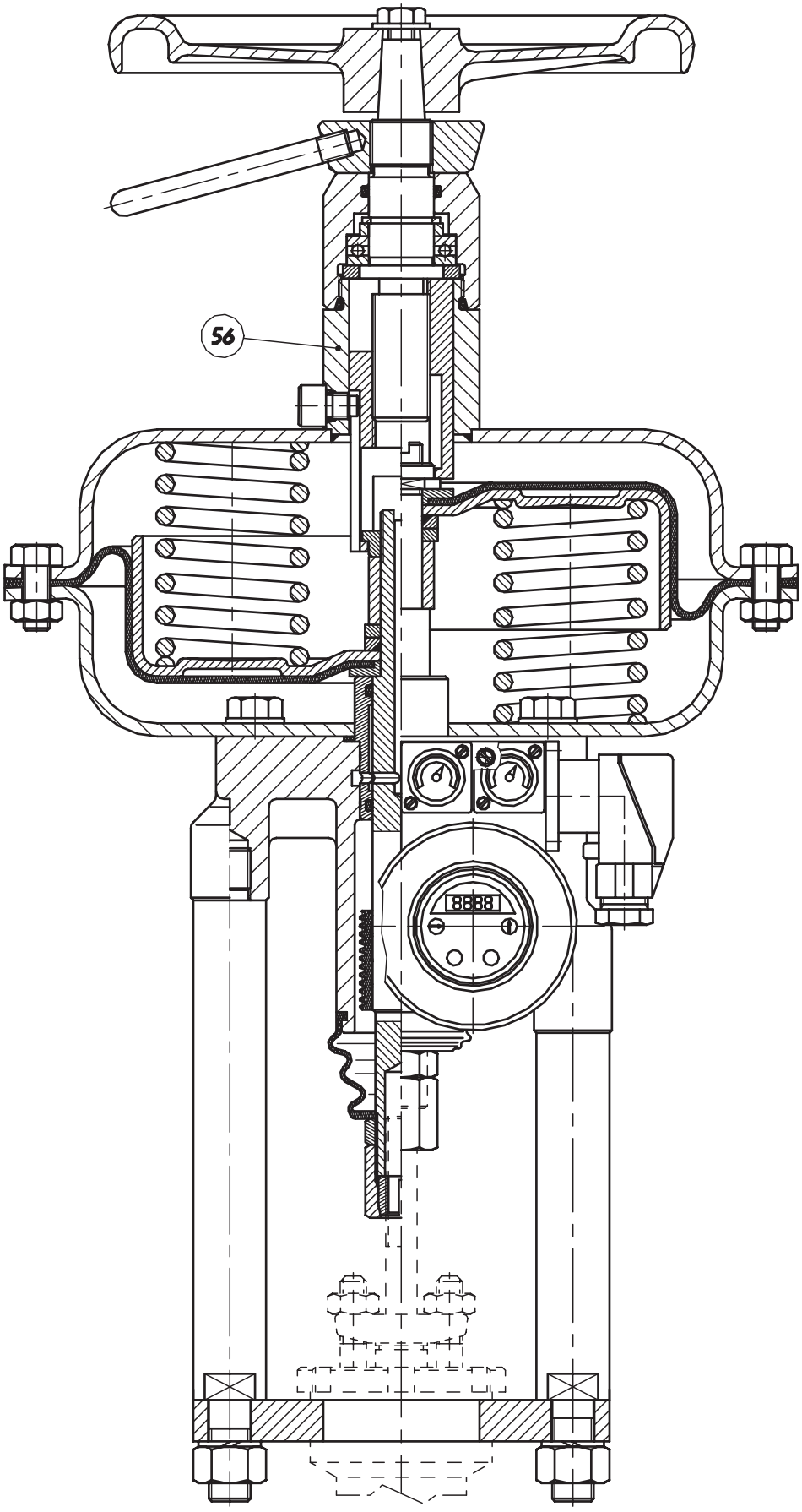
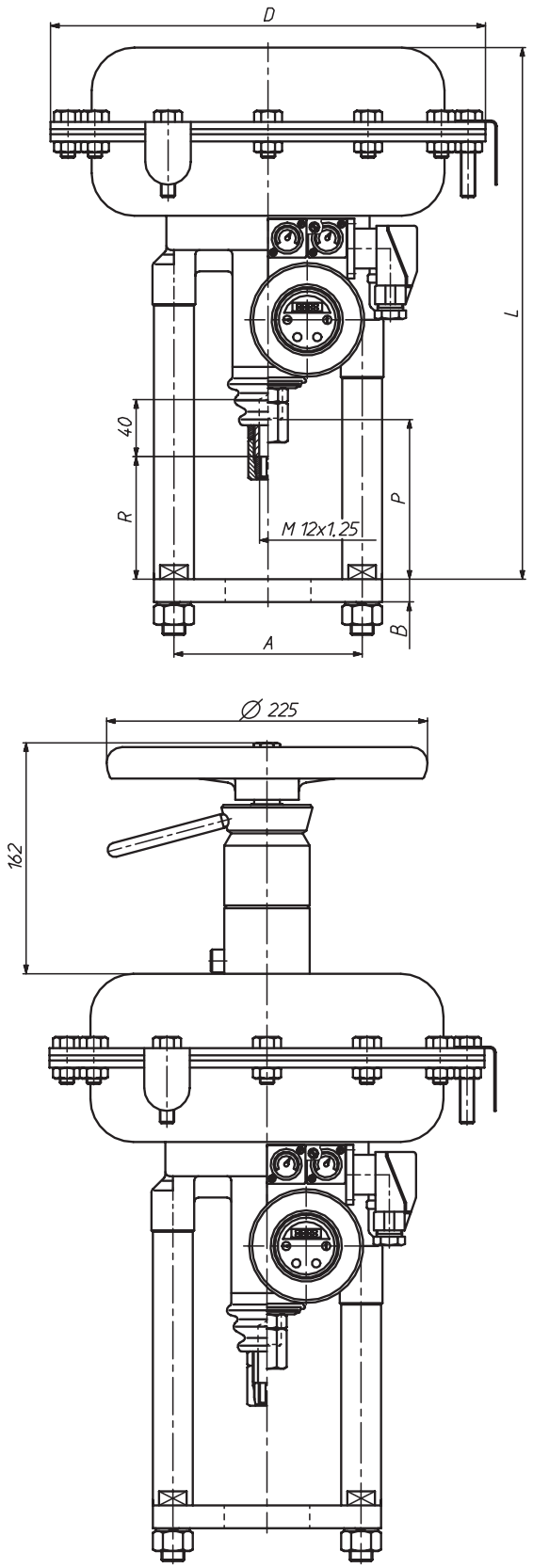


Fig. 5 The pneumatic actuator, type P5/R5, with a handwheel



Actuator size	A	B	D	L	R	P	Weight [kg]	Weight with a handwheel [kg]
250	110	14	240	357	84	108	15	19,5
400	132	16	305	373		110	20	24,5
630		18	375	491		126	38	45

Fig. 6 Dimensions and weights (with the adjuster)

PRODUCT CODE

Pneumatic actuator

Type:

- direct action, without drive	**P5**
- reverse action, without drive	**R5**
- direct action, with a handwheel:	**P5N**
- reverse action, a handwheel:	**R5N**

Size:

	250
	400
	630

Stroke:

- 20 mm	**20**
- 38 mm	**38**

Spring range:

- 20…100 kPa	**1**
- 40…200 kPa	**2**
- 40…120 kPa	**3**
- 80…240 kPa	**4**
- 60…140 kPa	**5**
- 120…280 kPa	**6**
- 180…380 kPa	**7**

Venting of the non-pressure chamber of the actuator to the atmosphere:

- free flow	**0**
- protected	**1**

Input signal:

- 4…20 mA	**1**
- MODBUS	**2**
- PROFIBUS PA	**3**

Feedback signal:

- no feedback	**0**
- 4…20 mA	**1**

Limit indicators:

- no indicators	**0**
- indicator OC	**1**

Built-in process controller:

- no controller	**0**
- with a PID controller	**1**

Local pressure gauges:

- no pressure gauges	**0**
- with two pressure gauges	**1**

Example of the product code:
The pneumatic actuator of reverse action, with a handwheel, size 630 cm^2, stroke 38 mm, spring range180...380 kPa, venting of the non-pressure chamber of the actuator to the atmosphere protected, input signal 4…20 mA, feedback signal 4…20 mA, no limit indictors, internal PID process controller, with two pressure gauges.

R5N-630-38-7-1-1-1-0-1-1

NOTES:

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