

Operational, Assembly and Maintenance Instructions for the Pneumatic Quarter-Turn Actuator Series 30a



Fig. 1 – Pneumatic multi-turn actuator

1. Design and operation

The pneumatic quarter-turn actuators of the series 30a are diaphragm actuators with rolling diaphragm and centrally fitted readjusting spring.

The regulating pressure supplied generates a force at the diaphragm surface which opposes the compression springs arranged in the actuator.

The stroke of the drive rod is transmitted via a lever mechanism onto the drive shaft.

The regulating pressure p_{st} generates at the diaphragm surface "A" (14) the force $F = p_{st} \times A$, which opposes the compression springs (11) arranged in the actuator.

The diaphragm stroke "H" is transmitted via the drive shaft (10) and the connection links (15) and (16) onto the lift shaft (8) and turned into a motion of rotation. By means of two external stop screws (25), the starting and finishing point of the bevel can be limited.

The stroke "H" is proportional to the regulating pressure p_{st} . The spring rate and the spring prestress determine the respective regulating pressure range.

This may be altered by turning the plate spring (7) in a wide range. For each size of actuator, there are two different springs foreseen as standard. Spring 1 can be employed to a pressure of 3,5 bar, spring 2 to max. 6 bar.

The connection of the valve can optionally be effected at both ends of the swivel joint (8). Both connections are designed as square sockets in accordance with DIN/ISO 5211. These various connection alternatives determine the safety positioning of the control element::

Safety position "spring closing":

The spring (11) closes the valve when pressure is reduced on the diaphragm or in the case of power failure. With increasing regulating pressure, opening occurs against the force of the spring.

Safety position "spring opening":

The spring (11) opens the control element when pressure is reduced on the diaphragm or in the case of power failure. With increasing regulating pressure, closing occurs against the force of the spring.

2. Assembly instructions

Introduction:

These assembly and operational instructions contain important information concerning the installation, operation, maintenance and storage of the actuators.. Please read these instructions carefully and store them safely in case of possible questions.



The equipment may only be mounted and commissioned by qualified personnel who are acquainted with the starting-up and operation of this product. Qualified personnel in the sense of these installation and operational instructions are persons who, as a result of their training, their knowledge and experience, plus their knowledge of the relevant standards, are able to judge the tasks for which they are responsible and to recognize possible dangers. Dangers presented at the control valves by flow medium, regulating pressure and moving parts are to be prevented by appropriate measures. Over and above this, it has to be ensured that the control valve is only employed where operating pressure and temperatures do not exceed the design criteria laid down when ordering. The appropriate transportation and professional storage of the equipment are presupposed.

Multi - Turn Actuator Series 30a

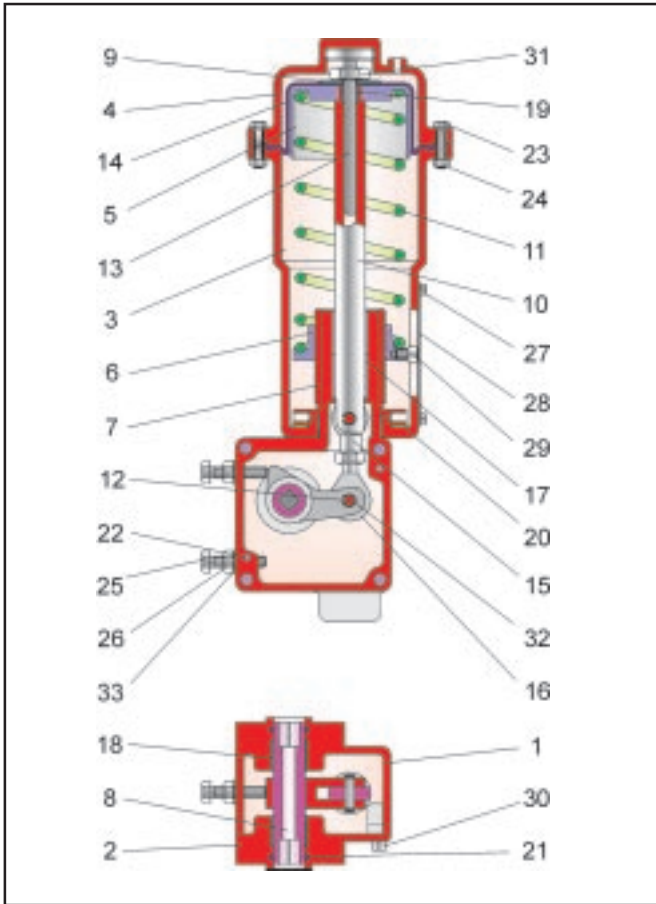


Fig. 2 – Cross section through an actuator Series 30a (size 0 to 4)

Pos.	Description	Material
1	Bearing housing	EN-JS 1049 (GGG 40.3)
2	Bearing cover	EN-JS 1049 (GGG 40.3)
3	Actuator body	EN-JS 1049 (GGG 40.3)
4	Cover	EN-JS 1049 (GGG 40.3)
5	Diaphragm disk	EN-JS 1049 (GGG 40.3)
6	Spring plate	St 52-3
7	Adjustable plate spring	St 52-3
8	Swivel joint	St 52-3
9	Washer	St 37-2
10	Axle drive shaft	WN 1.4104
11	Compression spring	WN 1.8159
12	Connection pin	WN 1.4104
13	Centering pin	WN 1.4104
14	Diaphragm	BUNA
15	Connection link	
16	Connection link	
17	Bushing	Glycodur F
18	Bushing	Glycodur F
19	Bushing	Glycodur F
20	Bearing washer	PTFE
21	O-ring seal	Viton
22	Tapered pin	WN 1.4301
23	Screw	A2-70
24	Nut	A2-70
25	Screw	A2-70
26	Nut	A2-70
27	Screw	A2-70
28	Type plate	WN 1.4301
29	Screw	A2-70
30	Screw	A2-70
31	Nut	A2-70
32	Circlip	WN 1.8159
33	Spring washer	WN 1.4301

Table 1 - Parts list


Preparation for assembly:

In order to assemble the actuator, all parts have to be prepared i.e. the parts have to be carefully cleaned and placed on an even and clean base. It should be remembered that plastic parts are almost always soft and particularly sensitive and especially the diaphragm may not be damaged. Before beginning assembly, all parts should be checked concerning reusability and all threads should be greased.

Assembly of the actuators - sizes 0 to 4:

The O-rings (21) and the Glycodur bushings (18) are positioned in the bearing housing (1) and the bearing cover (2). The Glycodur bushings (17) are pressed into the actuator body. (3).

The bearing housing (1) and the actuator body (3) are screwed together and glued (for example with Loctite). The Glycodur bushing (19) is pressed into the axle drive shaft (10). The pre-mounted axle drive shaft (10) is now placed in the actuator body (3) and then the smooth running of the bearings is checked.

 Care must be taken that the rounded side of the axle drive shaft (10) points towards the side of the swivel joint bearing (8).

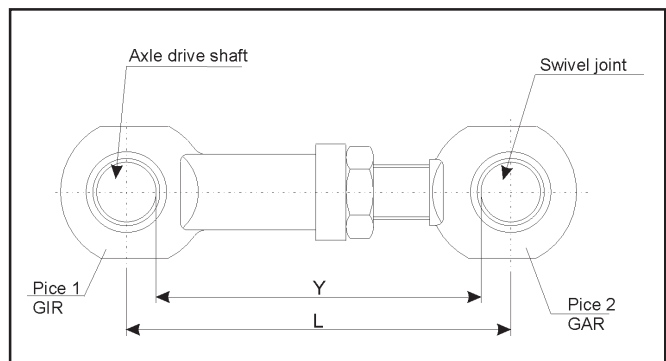


Fig. 3 – Pre-assembly of the standard connection links

Actuator-size	Connection link		standard		with hand-level	
			L	Y	L	Y
0	GIR 6 UK	GAR 6 UK	56	50		
1	GIR 8 UK	GAR 8 UK	64	56	66	58
2	GIR 12 UK	GAR 12 UK	87	75	91	79
3	GIR 12 UK	GAR 12 UK	87	75		
4	GIR 12 UK	GAR 12 UK	87	75		
5	GIR 20 UK	GAR 20 UK	130	110		
6	GIR 20 UK	GAR 20 UK	131	111		

Table 2 – Assembled size of the connection links

The pre-mounted connection link (15) (see fig. 3 , table 2) is connected with the axle drive shaft (10) by means of a connection pin (12) and the circlips (32). The swivel joint (8) is now positioned in the bearing housing (1) and is connected to the pre-mounted connection link (16) by means of a connection pin (12) and the circlips (32). The spring plate (6) is screwed onto the adjustable plate spring (7) to limit stop.

The bearing washer (20) is placed in the actuator body (3). The pre-mounted adjustable plate spring (7 and 6) is also placed in the actuator body. The screw (29) can now be screwed into the spring plate.

The compression spring (11) is now positioned on the spring plate. The free threaded end of the axle drive shaft (10) is bound with Teflon tape to seal. The diaphragm disk (5) can then be screwed on.

The rolling diaphragm (14) is now positioned on the diaphragm disk (5) and carefully pressed into the body gap with the aid of a spoon-type instrument as supplementary tool.

The washer (9) is laid on the diaphragm and fastened with the nut (31).

The radial balance error, which can possibly occur during the assembly of the components axle drive shaft (10), diaphragm disk (5), rolling diaphragm (14) etc., is to be eliminated by mediation.

The centering pin (13) is screwed to the cover (4). The pre-assembled cover (4) is then carefully placed upon the actuator body (3), with the centering pin being fed into the axle drive shaft (10).

The cover is now adjusted with the screws (23) and the nuts (24). Finally, a uniform and alternate tightening of the screws is carried out.

The sealing surface between the bearing housing (1) and the bearing cover (2) is coated with a commercially available liquid sealant (e.g. Curil). The bearing cover (2) is then positioned and adjusted with the tapered pins (22). Finally, the bearing cover is screwed down uniformly and alternately with the screws (30).

The compression spring can now be pre-loaded for the respective operating range.

By means of a supplementary tool, the spring range is set at the adjustable plate spring (7).

- turn to left, greater spring range,
- turn to right, smaller spring range.



Please pay attention to the two spring ranges:

- maximum regulating pressure 3,5 bar, with spring 1
- maximum regulating pressure 6,0 bar, with spring 2

The type plate (28) is now screwed onto the actuator with the screws (27) so that it covers the grooves which are required for the prestress of the spring. In order to seal this spot, coat beforehand with silicon.

The screws (25) with nuts (26) and spring washer (33) are screwed into the bearing housing. The precise regulating range can now be set.



When mounted at the valve, the actuator should be set once again at any rate.

Assembly of the actuators - sizes 5 and 6:

The O-rings (21) and the Glycodur bushings (18) are positioned in the bearing housing (1) and the bearing cover (2). The Glycodur bushings (17) are pressed into the actuator body. (3).

The bearing housing (1) and the actuator body (3) are screwed together and glued (for example with Loctite).

The spring plate (6) is screwed onto the adjustable plate spring (7) so that a prestress of the compression spring is produced during the further stages of assembly.

The pre-mounted adjustable plate spring (7 and 6) is placed in the actuator body. The compression spring (11) is now positioned on the spring plate.



Please pay attention to the two spring ranges:

- maximum regulating pressure 3,5 bar, with spring 1
- maximum regulating pressure 6,0 bar, with spring 2

The Glycodur bushing (19) is pressed into the axle drive shaft (10).

The pre-mounted connection link (15) (see fig. 3 , table 2) is connected with the axle drive shaft (10) by means of a connection pin (12) and the circlips (32).

The free threaded end of the axle drive shaft (10) is bound with Teflon tape to seal. The diaphragm disk (5) can then be screwed on.

The pre-mounted axle drive shaft is now inserted into the actuator body (3) and the bearings are checked for smooth running.

Under a suitable press, the pre-mounted axle drive shaft is now pressed so far into the actuator body that the swivel joint (8) can be mounted.

The swivel joint (8) is now positioned in the bearing housing (1) and is connected to the pre-mounted connection link

(16) by means of a connection pin (12) and the circlips (32).



By pressing in the axle drive shaft, the prestress of the compression spring is achieved.

When the swivel joint is connected with the connection link, the press can be relieved and the further assembly may be continued.

The rolling diaphragm (14) is now positioned on the diaphragm disk (5) and carefully pressed into the body gap with the aid of a spoon-type instrument as supplementary tool.

The washer (9) is laid on the diaphragm and fastened with the nut (31).

The radial balance error, which can possibly occur during assembly, is also to be eliminated here by mediation.

The centering pin (13) is screwed to the cover (4). The pre-assembled cover (4) is then carefully placed upon the actuator body (3), with the centering pin being fed into the axle drive shaft (10).

The cover is now adjusted with the screws (23) and the nuts (24). Finally, a uniform and alternate tightening of the screws is carried out.

The sealing surface between the bearing housing (1) and

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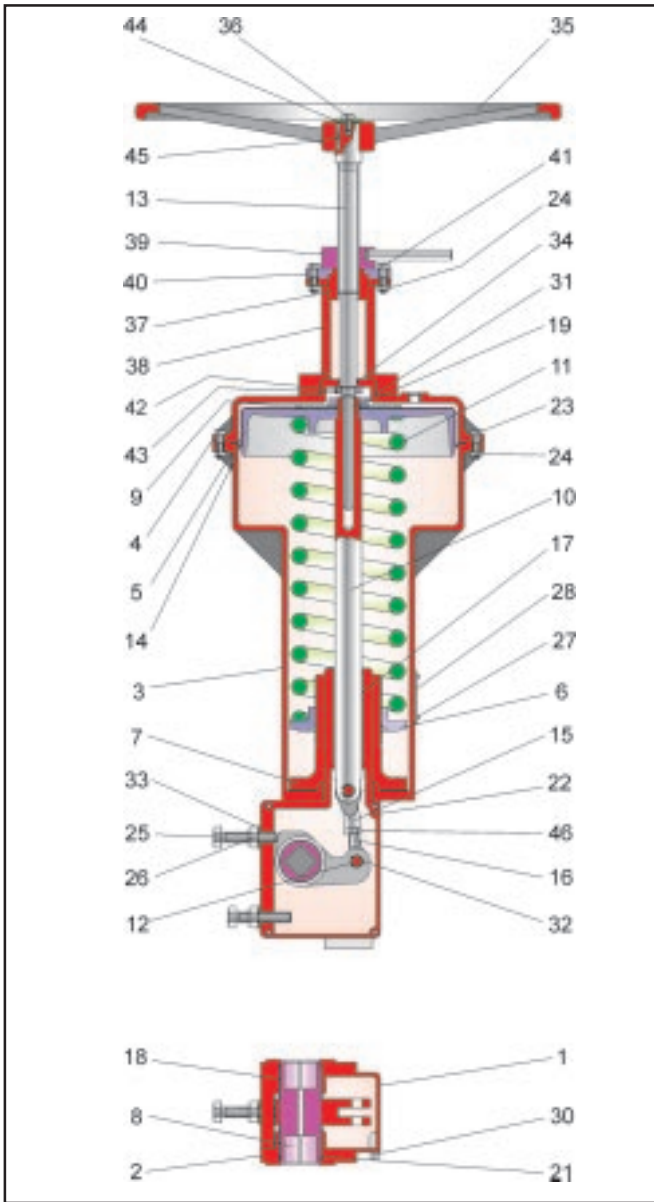


Fig. 4 – Cross section through an actuator (size 5 to 6) with manual actuation

Pos.	Description	Material
1	Bearing housing	EN-JS 1049 (GGG 40.3)
2	Bearing cover	EN-JS 1049 (GGG 40.3)
3	Actuator body	EN-JS 1049 (GGG 40.3)
4	Cover	EN-JS 1049 (GGG 40.3)
5	Diaphragm disk	EN-JS 1049 (GGG 40.3)
6	Spring plate	EN-JS 1049 (GGG 40.3)
7	Adjustable plate spring	EN-JS 1049 (GGG 40.3)
8	Swivel joint	St 52-3
9	Washer	St 37-2
10	Axle drive shaft	WN 1.4104
11	Compression spring	WN 1.8159
12	Connection pin	WN 1.4104
13	Threaded spindle	WN 1.4571
14	Diaphragm	BUNA
15	Connection link	Hartchrom / PTFE
16	Connection link	Hartchrom / PTFE
17	Bushing	Glycodur F
18	Bushing	Glycodur F
19	Bushing	Glycodur F
21	O-ring seal	Viton
22	Tapered pin	WN 1.4301
23	Screw	A2-70
24	Nut	A2-70
25	Screw	A2-70
26	Nut	A2-70
27	Screw	A2-70
28	Type plate	WN 1.4301
30	Screw	A2-70
31	Nut	A2-70
32	Circlip	WN 1.8159
33	Spring washer	WN 1.4301
34	O-ring	Viton
35	Handwheel	GD-Al
36	Screw	A2-70
37	Threaded insert	C45
38	Distance sleeve	St 37
39	Locknut	WN 1.4571
40	Mounting cover	St 37
41	Screw	A2-70
42	Nut	A2-70
43	Setscrew	A2-70
44	Washer	WN 1.4305
45	Fit key	St 50-2K
46	Nut	A2-70

Table 3 - Parts list

the bearing cover (2) is coated with a commercially available liquid sealant (e.g. Curil). The bearing cover (2) is then positioned and adjusted with the tapered pins (22). Finally, the bearing cover is screwed down uniformly and alternately with the screws (30).

The type plate (28) is now screwed onto the actuator in the foreseen position with the screws (27).

The screws (25) with nuts (26) and spring washer (33) are screwed into the bearing housing. The precise regulating range can now be set.



When mounted at the valve, the actuator should be set once again at any rate.

Disassembly of the actuators:

Should it become necessary to disassemble the actuator for maintenance, the actuator has to be dismantled from the valve.



Caution: Before the disassembly of any components, it has to be ensured that the actuator is not under pressure. Care also has to be taken that the actuator is in the safety position (springs released).

The disassembly takes place in reverse order to the assembly.

Although nothing can happen during disassembly, one should only disassemble with **released** springs. Particularly with the larger actuators, however, the connection point, axle drive shaft / connection links with the connection pin (12) should only be disassembled under a press.

The connection pin (12) can then be safely expelled and the springs released by releasing the tension at the press. To exchange the diaphragm (14), the cover (4) can be dismantled without danger. The nuts (31) and the washers (9) can be safely loosened.

When the diaphragm has been replaced, the assembly proceeds in accordance with the assembly instructions. Never use sharp instruments (screwdrivers, saw blades etc.) during assembly.

When tightening the nuts (29) do not twist the unit but brace with a strap wrench.

3. Alteration of the direction of operation / safety position



Fig. 5 – Alteration of direction of operation

- Run actuator in safety position so that the springs are released.
- Before separating the actuator from the valve, the precise direction of rotation of the valve and the actuator should be noted. This is very important e.g. in the case of a double eccentric butterfly valve, as the false direction of rotation destroys the butterfly valve.
- Having precisely determined the direction of rotation, the actuator is separated from the valve by loosening the kit.
- By turning the actuator 180° longitudinally, the direction of rotation is altered.

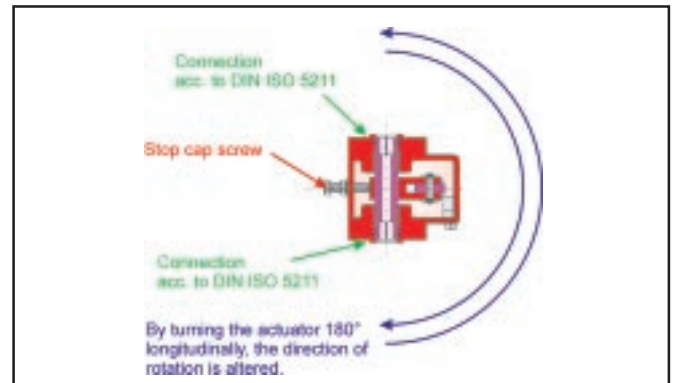


Fig. 6 – Alteration of direction of operation by turning actuator 180°

- Beforehand, however, on the side where the valve is to be fixed, mounted accessories such as positioner, limit switch etc. have to be dismantled.
- Before re-mounting the actuator on the valve, the correct direction of rotation should once again be ensured.
- The assembly then follows.
- Positioner, limit switch etc. are again mounted resp. reset anew.
- The valve can be positioned by setting the two hexagonal screws at the bearing housing of the actuator.
- To this end, the lock nuts are loosened and, after positioning, are tightened again.

4. Maintenance instructions

Routine maintenance or lubrication of the pneumatic quarter-turn actuator BR 30a is not required.

The disassembly for the purpose of maintenance is described in chapter 2 under "Disassembly of the actuators".

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5. Conditions for operation



Important information:

- Ensure that the actuator is only employed within the permissible limits (see technical specifications).
- The operation of the actuator outside the permissible temperature range can overstress and damage sealings and bearing.
- The operation of the actuator above the maximum permissible operating pressure can lead to damage of internal components and housing.
- The operation of the actuator in an extremely corrosive atmosphere without suitable protection can lead to damage of internal and external components.
- Switch off all supply lines and ensure that the actuator is unpressurized before you carry out the installation or maintenance.
- Never loosen or remove the cover or mounted accessories when the actuator is under pressure.
- Check the direction of rotation and position of the actuator in a trial run before mounting the actuator on a valve.
- If the actuator is to be employed as part of a system, as a safety element or as part of a switching circuit, the prescribed laws and safety regulations are to be observed at all times.

Operating conditions:

Employ dry, oiled or non-oiled compressed air or non-corrosive gases which are compatible with the internal components and lubricant. The operating medium must have a dew point of -35°C or a minimum of 10°C below the ambient temperature. The particle size may not exceed $30\mu\text{m}$.

Operating pressure:

The max. operating pressure is 6 bar as standard. The actuators can normally be employed in the pressure range from 2,5 bar to 6 bar (exceptions with special identification are to be agreed upon with the supplier).

Regulating pressures:

- max. regulating pressure 3,5 bar, with spring 1
- max. regulating pressure 6,0 bar, with spring 2

Operating temperature

Standard operation: from -35°C to $+90^{\circ}\text{C}$.

Stroke:

For strokes of the actuators see technical data sheet:

Standard operation: 90° rotation with end cap setting at 0° and 90° , + or -3° adjustable.

Effective diaphragm surface:

The actuator has in the various sizes effective diaphragm surfaces of 60 cm^2 , 105 cm^2 , 240 cm^2 , 470 cm^2 , 780 cm^2 and 1300 cm^2 .

Grease:

The actuators are greased ex works for normal operation for the entire service life. The standard grease is suitable for the temperature range from -35°C to $+90^{\circ}\text{C}$.

For AT actuators, the recommended greases for standard operational conditions are:

- Kluber Unigear LA02
- Esso (Exxon) Beacon EP2
- Fina marson EP L2
- Shell Alvania EP2
- Mobilux EP2

Design:

Diaphragm actuator with rolling diaphragm and centrally fitted readjusting spring.

May be used in closed rooms and in the open without additional weather protection.

Coating and corrosion protection:

All actuators are protected against corrosion in the case of normal environmental influences. The corrosion protection of the different types of coating is described in the technical data sheet. Before the installation of the actuator in an aggressive atmosphere, please ensure that the correct type has been chosen.

Actuator designation and type plate:

Pfeiffer diaphragm quarter-turn actuators are equipped with type plates which contain the following information: Series, regulating pressure, air torque, spring torque and type of spring.

On request, the series, nominal diameter, nominal pressure, kvs-value as well as the characteristic curve of the actuator can be included.

The possibility also exists to include the measuring point number as well as special features.

Pfeiffer Chemie-Armaturenbau GmbH
Hooghe Weg 41
47906 Kempen
Tel. (0 21 52) 20 02 - 0 Fax (0 21 52) 15 80

Com-No. / Geräte-Nr. / instrument-no. []

Antriebsdaten / actuator data

Baureihe / series 30- []

für Zuluft / supply air [] bar

Md min Luft / min torque with air [] Nm

Md min Feder / min torque with spring [] Nm

Feder Typ / spring type []

Armaturendaten / valve data

Baureihe / series []

DN [] PN 10 / 16 []

Kvs / cv [] Kennlinie characteristic =% lin Δ -Z Δ -C

MeßSt. Nr. / TAG No. []

Sonstiges / anything []

Germany

Actuator data

1 order number
2 number of actuator / valve (e.g. 006 / 001)
3 series
4 regulating pressure
5 min. torque
6 min. spring torque
7 type of spring (spring 1 or spring 2)

Valve data
(only on request)

8 series
9 nominal diameter
10 nominal pressure
11 kvs - value
12 characteristic curve (equal percentage / linear / open-closed)

General data
(only on request)

13 measuring point number
14 special features

Fig. 7 – Type plate

6. Dimensions and weights

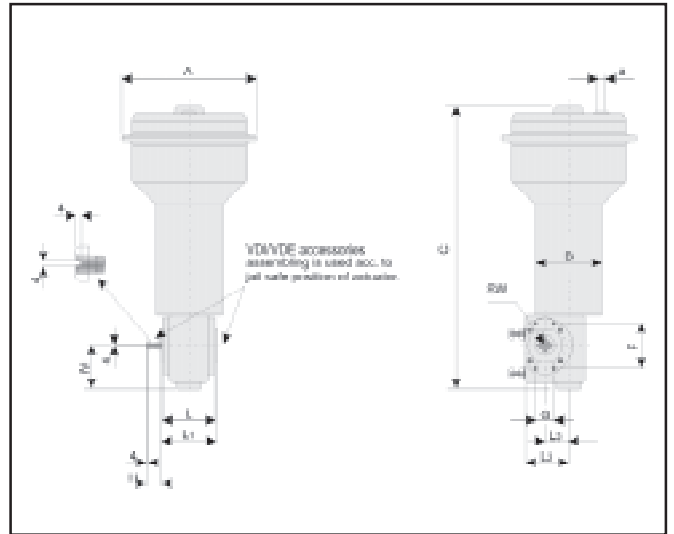


Fig. 8 - Dimensional Diagram

Size	0	1	2	3	4	5	6
Ø A	134	175	189	240	320	410	510
Ø B	90	114	120	150	187	244	250
C	364	453	550	570	713	989	1128
L	94	94	126	126	126	152	190
L1	100	100	132	132	132	160	200
L2	75	75	100	100	115	130	165
L3	40	40	56	56	56	80	90
M	60	76	95	95	99	145	145
a	R1/4"	R1/4"	R1/4"	R1/4"	R3/8"	R1/2"	R1/2"
SW	11	14	17	22	27	36	46
DIN / ISO	F 04	F05	F07	F 10	F 12	F 14	F 16
F	80	80	80	130	130	130	80
G	30	30	30	30	30	30	30
H	30	30	30	30	30	30	30
VDI / VDE	2	2	2	3	3	3	2
Weight	10	16	22	30	62	120	190

Table 4 - Dimensions in mm and weight in kg

7. Air volume

Size	0	1	2	3	4	5	6
Effective diaphragm area [cm ²]	60	105	125	240	470	780	1300
Rated travel [mm]	55	60	90		120		
Travel volume at rated travel [dm ³]	0,33	0,63	1,13	2,16	4,23	9,36	15,6

Table 5 - Air volume

8. Queries to the manufacturer

(in the case of queries, please quote)

1. order number (embossed on the type plate)
2. series (type)
3. regulating pressure
4. type of spring
5. accessories mounted

**For your special requirements please contact
our technical sales department.**

Pfeiffer Chemie-Armaturenbau GmbH

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Values subject to change