SP4000 Self-Operated Cage Type Pressure Regulating Valve
(hereafter called as pressure regulating valve)

Caution

Due to the installation,operation or maintenance performed by non-professional persons may cause equipment damages or injuries.The work must be performed by professional persons.

Product Overview

SP4000 Self-operated Pressure Regulator is a Spring-setting direct-operated universal pressure regulator. It can be use for upstream and downstream pressure control. The lowest control pressure is 3KPa and the highest control pressure is 3000 KPa.The lowest operating temperature is -48℃ and the highest operating temperature is 300℃.

Product Feature

- Convenient Combination---Normalized modular design allows the changeover between downs tream and upstream pressure control mode, different regulation ranges and operating temperature c an be performed with the replacement of extremely few parts.

- Overload Safety---The safety shall be ensured under any circumstances. The self-operated regulator allows medium to enter the actuator. So the overload of the system usually badly damaged the regulator. The overload protection mechanism of SP4000 regulator can safely bear the overload pressure one or few dozens times higher than the upper limit pressure of the regulation range. The overload pressure can reach the nominal pressure of the valve in most configurations.

- Reliable Sealing---The valve stem of SP4000 regulator is a long bellow structure. Sealing O-rin g is used as a back-up sealing method, which provides an extremely reliable sealing for valve stem.

- High Accuracy---The friction of bellow stem is far lower than conventional parking structure. The optimally designed spring and actuator will definitely find their best combination for process

pressure, which makes the regulator have very high overall control accuracy.

- EasyAdjustment---The adjustment of pressure setting can be easity done by turning of adjusting nut. The adjustment operation is more easy andfast due to the elimination of conventional pillars structure.
- Strong Adaptability---There are multiple actuator types, valve plug structures, rubber partsmaterials can choose to meet the operational requirements of different medium and temperatures.
- Balanced Valve Plug---The valve plug with O-ring balance structure can be used to minimized the influuence of the pressure difference on the non-balance of the valve stem and guarantee the pressure withstanding performance and precision of the pressure regulating valve.
- Low Leakage---Single-seat plug has very low leakage during the closing of the regulator. The soft-sealed plug can completely shut off the flow and make the system enter into a holding-pressure state.
- Stainless Actuator---As an important part of the reguator, the actuator is made of stainless plate to ensure its high pressure-strength and long service life.
- Easy Maintenance---The selection criteria of the every structure of the SP4000 regulator is to make sure the most convenient installation and maintenance while ensuring the performance requirements are met.

The top-mounted push-down installation method allows you to inspect and maintain the internal parts without any special tools and without remove the valve body.

The bonnet central alignment method is adopted to avoid all unnecessary repeat matching operation. The internal part has sufficient clearance to make sure itself can be easity taken out or put in. The dissembling of the internal parts can be easily performed even the carbon steel regulator rusts after long-term operation.

- Universal Parts---SP4000 regulator has estremely high parts universality with the whole self-operated products series manufactured by our company. It helps to reduce the inventory of spare parts.

Specification Series and Performance Indicator

- BodySize(Flangedconnection)
  DN40(11/2"),DN50(2"),DN65(21/2")
  DN80(3"),DN100(4"),DN150(6"),DN200(8")
- Pressure Rating
  PN16,40,64 ANSI 150LB,300LB,600LB
  Can also be customized
- Bellow Stem Pressure Rating: 3.8MPa
- Feedback Interface
  ZG1/4" 10mm card set of connector is provided in the plant, 10mm weld-end connector will be provided if the control pressure is over 2.0MPa.

Flow Factor

Valve size	40	50	65	80	100	150	200
KV (Downstream control)	25	40	65	100	160	320	480
KV (Upstream control)	22	36	58	90	145	280	430

Note:Diameters listed in above table are standard diameters.The valves can also be made with reduced diameters.

- PressureMeasuringMethod

Measuredatoutsideofthevalveorvalveflange.

- LeakageClass

Soft-sealing VI

Rated capacity of hard sealed 0.003X valve

- Closing Class

<10 of upper limit of reguation range

- Flow Characteristics

L (Normal)

EQ%(Special processing)

- Operation Temperature

For the soft sealing valve,the temperature depends on the material of the sealing part and diaphragm.

NBR -29-82℃
FKM -8-120℃
SR -48-85℃
EPDM -38-115℃
PTFE -40-150℃

Bellows actuator -40-300℃

Spring Range、The Actuator Configuration、Difference Pressure and Precision

- Single-Diaphragm and Dual-Diaphragm Actuator

Actuator number	Spring number	Spring range KPa	Difference pressure (MPa)/Theoretical precision		Maxactuator pressure KPa
			DN40	DN50	
01.01.00 04.01.00	HS005	150-450	1.3/5%	1.3/6%	2500
	HS006	200-610	1.7/6%	1.7/7%	
	HS007	280-850	2.4/6%	2.4/7%	
01.02.00 04.02.00	HS004	50-150	0.9/5%	0.9/6%	2000
	HS005	78-230	1.3/5%	1.3/6%	
	HS006	110-310	1.7/6%	1.7/7%	
	HS007	140-430	2.4/6%	2.4/7%	
01.03.00 04.03.00	HS001	7-21	0.3/4%	0.3/5%	1500
	HS002	14-42	0.5/4%	0.5/5%	
	HS003	21-63	0.7/4%	0.7/5%	
	HS004	28-85	0.9/5%	0.9/6%	
	HS005	40-120	1.3/5%	1.3/6%	
	HS006	55-170	1.7/6%	1.7/7%	
01.04.00 04.04.00	HS001	3-8	0.3/4%	0.3/5%	800
	HS002	5-17	0.5/4%	0.5/5%	
	HS003	8-25	0.7/4%	0.7/5%	
	HS004	11-34	0.9/5%	0.9/6%	
01.09.00	HS007	500-1500	2.4/6%	2.0/7%	4500
01.10.00	HS007	1000-3000	2.4/6%	2.0/7%	

- PTFE Single-Diaphragm Actuator

Actuator number	Spring number	Spring range KPa	Difference pressure (MPa)/Theoretical precision		Max actuator pressure KPa
			DN40	DN50	
01.12.00	HS001	8-25	0.3/4%	0.3/5%	450
	HS002	16-50	0.5/4%	0.5/5%	
01.13.00	HS001	3-9	0.3/4%	0.3/5%	350
	HS002	6-18	0.5/4%	0.5/5%	

- Bellows actuator

Actuator number	Spring number	Spring range KPa	Difference pressure (MPa)/Theoretical precision		Max actuator pressure KPa
			DN40	DN50	
03.01.00	HS007	650-2000	2.4/6%	2.4/7%	4500
03.02.00	HS007	265-800	2.4/6%	2.4/7%	3000
	HS006	180-560	1.7/6%	1.7/7%	

03.03.00	HS007	100-320	2.4/6%	2.4/7%	1500
	HS006	76-230	1.7/6%	1.7/7%	
	HS005	60-180	1.3/5%	1.3/6%	
03.04.00	HS002	12-36	0.7/4%	0.7/5%	800
	HS004	25-75	0.9/5%	0.9/6%	
	HS005	35-110	1.3/5%	1.3/6%	
	HS006	50-150	1.7/6%	1.7/7%	
	HS007	65-200	2.4/6%	2.4/7%	

The trip of the (Dn40-50) pressure regulating valve is 12mm. But it is only the mechanical trip, in fact, generally the regulation trip is 1/4 x valve seat diameter.

- Single-Diaphragm and Dual-Diaphragm Actuator

Actuator number	Spring number	Spring range KPa	Difference pressure (MPa)/Theoretical precision			Max actuator pressure KPa
			DN65	DN80	DN100	
01.05.00 04.05.00	HS033	120-360	1.0/4%	1.0/6%	1.0/7%	2000
	HS034	165-500	1.5/5%	1.5/7%	1.5/8%	
	HS032+034	270-820	2.4/5%	2.4/7%	2.4/8%	
01.06.00 04.06.00	HS031	33-100	0.6/4%	0.6/6%	0.6/7%	1500
	HS033	65-190	1.0/4%	1.0/6%	1.0/7%	
	HS034	90-270	1.5/5%	1.5/7%	1.4/5%	
	HS032+034	150-450	2.4/5%	2.4/7%	2.4/8%	
01.07.00 04.07.00	HS029	7-21	0.3/4%	0.3/6%	0.3/7%	800
	HS030	10-30	0.4/4%	0.4/6%	0.4/7%	
	HS031	14-42	0.6/4%	0.6/6%	0.6/7%	
	HS033	25-75	1.0/4%	1.0/6%	1.0/7%	
	HS034	36-110	1.5/5%	1.5/7%	1.5/8%	
01.08.00 04.08.00	HS029	3-10	0.3/4%	0.3/6%	0.3/7%	500
	HS030	5-15	0.4/4%	0.4/6%	0.4/7%	
	HS031	7-21	0.6/4%	0.6/6%	0.6/7%	
	HS033	13-39	1.0/4%	1.0/6%	1.0/7%	
01.11.00	HS032+034	600-1800	2.4/5%	2.4/7%	2.4/8%	3500

- Bellows actuator

Actuator number	Spring number	Spring range KPa	Difference pressure (MPa)/Theoretical precision			Max actuator pressure KPa
			DN65	DN80	DN100	
03.05.00	HS033	530-1600	1.0/4%	1.0/6%	1.0/7%	4500
	HS034	720-2200	1.5/5%	1.5/7%	1.5/8%	
	HS032+034	1200-3600	2.4/5%	2.5/7%	2.5/8%	
03.06.00	HS031	110-330	0.6/4%	0.6/6%	0.6/7%	3000
	HS033	210-630	1.0/4%	1.0/6%	1.0/7%	
	HS034	300-900	1.5/5%	1.5/7%	1.5/8%	
	HS032+034	480-1450	2.4/5%	2.4/7%	2.4/8%	
03.07.00	HS029	23-69	0.3/4%	0.3/6%	0.3/7%	800
	HS030	35-100	0.4/4%	0.4/6%	0.4/7%	
	HS031	45-135	0.6/4%	0.6/6%	0.6/7%	
	HS033	85-250	1.0/4%	1.0/6%	1.0/7%	
	HS034	120-360	1.5/5%	1.5/7%	1.5/8%	
03.08.00	HS029	15-45	0.3/4%	0.3/6%	0.3/7%	800
	HS030	22-66	0.4/4%	0.4/6%	0.4/7%	
	HS031	31-94	0.6/4%	0.6/6%	0.6/7%	
	HS033	56-170	1.0/4%	1.0/6%	1.0/7%	

- PTFE Single-Diaphragm Actuator

Actuator number	Spring number	Spring range KPa	Difference pressure (MPa)/Theoretical precision			Max actuator pressure KPa
			DN65	DN80	DN100	
01.14.00	HS029	3-10	0.3/4%	0.3/6%	0.3/7%	300
	HS030	5-15	0.4/4%	0.4/6%	0.4/7%	
	HS031	7-21	0.6/4%	0.6/6%	0.6/7%	
	HS033	13-39	1.0/4%	1.0/6%	1.0/7%	

The trip of the (Dn65-100) pressure regulating valve is 22mm. But it is only the mechanical trip, in fact, generally the regulation trip is 1/4 x valve seat diameter.

- Single-Diaphragm and Dual-Diaphragm Actuator

Actuator number	Springn umber	Spring range KPa	Differencepressure (MPa)/Theoretical precision		Maxactuator pressure KPa
			DN150	DN200	
01.15.00 04.15.00	HS036	65-195	0.35/7%	0.35/9%	2000
	HS037	130-390	0.7/7%	0.7/9%	
	HS038	260-780	1.4/7%	1.4/9%	
01.16.00 04.16.00	HS035	17-51	0.18/7%	0.18/9%	1500
	HS036	35-105	0.35/7%	0.35/9%	
	HS037	70-210	0.7/7%	0.7/9%	
	HS038	140-420	1.4/7%	1.4/9%	
01.17.00 04.17.00	HS035	7-21	0.18/7%	0.18/9%	800
	HS036	14-42	0.35/7%	0.35/9%	
	HS037	28-84	0.7/7%	0.7/9%	
	HS038	56-168	1.4/7%	1.4/9%	
01.18.00 04.18.00	HS035	3.5-11	0.18/7%	0.18/9%	500
	HS036	7-21	0.35/7%	0.35/9%	
	HS037	14-42	0.7/7%	0.7/9%	

- Bellows actuator

Actuator number	Spring number	Spring range KPa	Difference pressure (MPa)/Theoretical precision		Max actuator pressure KPa
			DN150	DN200	
03.09.00	HS036	290-875	0.35/7%	0.35/9%	4500
	HS037	580-1750	0.7/7%	0.7/9%	
	HS038	1160-3500	1.4/7%	1.4/9%	
03.10.00	HS035	56-175	0.18/7%	0.18/9%	3000
	HS036	112-350	0.35/7%	0.35/9%	
	HS037	225-700	0.7/7%	0.7/9%	
	HS038	450-1400	1.4/7%	1.4/9%	
03.11.00	HS035	23-71	0.18/7%	0.18/9%	800
	HS036	47-142	0.35/7%	0.35/9%	
	HS037	95-285	0.7/7%	0.7/9%	
	HS038	190-570	1.4/7%	1.4/9%	
03.12.00	HS035	6-19	0.18/7%	0.18/9%	800
	HS036	31-93	0.35/7%	0.35/9%	
	HS037	60-180	0.7/7%	0.7/9%	

- PTFE Single-Diaphragm Actuator

Actuator number	Spring number	Spring range KPa	Difference pressure (MPa)/Theoretical precision		Max actuator pressure KPa
			DN150	DN200	
01.19.00	HS035	3.5-11	0.18/7%	0.18/9%	300
	HS036	7-21	0.35/7%	0.35/9%	
	HS037	14-42	0.7/7%	0.7/9%	

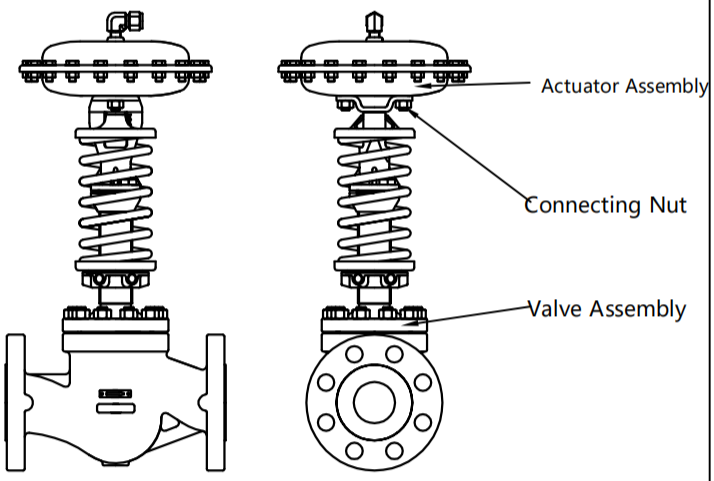
The trip of the (Dn150-200) pressure regulating valve is 32mm. But it is only the mechanical trip, in fact, generally the regulation trip is 1/4 x valve seat diameter.

Remark: The theoretical precision indicates the theoretical pressure deviation of the valve under 10-50% travel and constant pressure difference . It will be affected by the pressure difference change and flow in actual application. The actual deviation is computed by the process parameter.

For the back-pressure control valve, the maximum operation pressure difference is the upper limit of the pressure range.

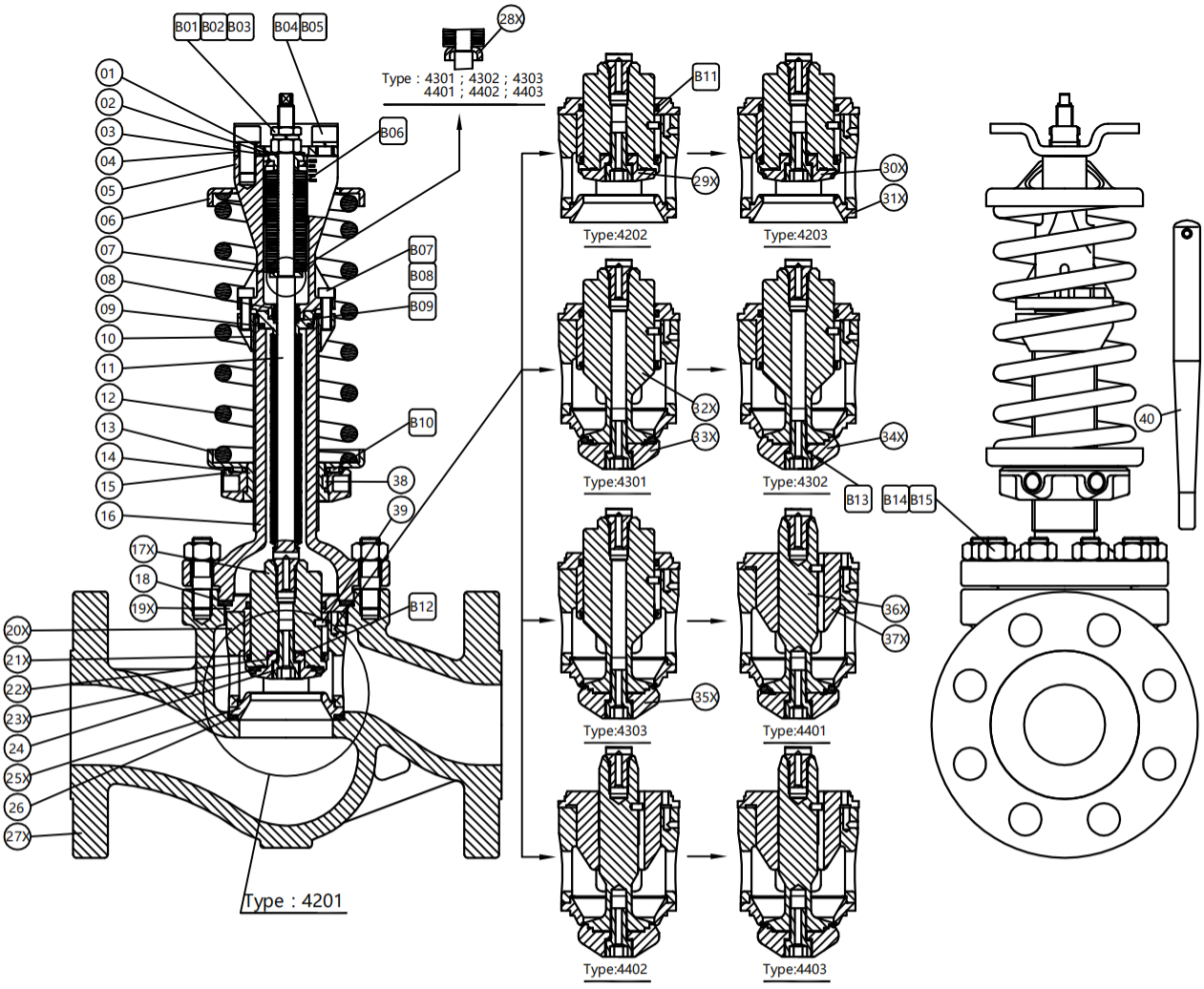
Unbalanced valve plug is only applicable to the back pressure valve and the pressure range ≤100KPa.

Structure、Parts List and Material



The reguatoris mainly comprisedof actuator assembly and valve assembly as two independent assemblies.These two assemblies are connected as a whole with connecting nut.

Component Structure, Parts List and Parts Material of Pressure-Regulating Valve

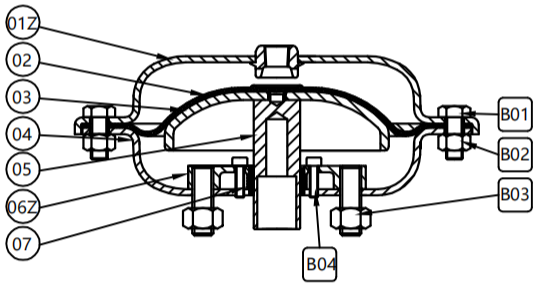


SN	Name of Part	Material
01	Cushion	304SS
02	Sliding Cushion	PTFE
03	Press Cushion	304SS
04	Connecting Plate	304SS
05	Bracket	CF8
06	Up Spring Seat	304SS
07	Washer 1	304SS
08	Guide Bush	PTFE
09	Sealing Ring	316SS+Graphite 316L+Graphite 316L+PTFE
10	Connection Flange	CF8
11	Bellows Valve Stem Component	304SS;316L
12	Setting Spring	60Si2mnA
13	Down Spring Seat	304SS
14	Adjusting Nut	HPb59-1
15	Adjusting Nut Cover	CF8
16	Bonnet	WCB;CF8;CF3M
17X	Reducing Valve Plug	304SS;316L
18	Sealing Ring of Bonnet	316SS+Graphite 316L+Graphite 316L+PTFE
19X	Guide Bush	304SS;316L
20X	Cage	CF8;CF3M; 304SS;316L
21X	Guide Bush	PTFE
22X	Press Plate	304SS;316L
23X	Valve Cushion	NBR;FKM;SR;PTFE
24	Screw	304SS;316L
25X	Valve Seat	304SS;316L
26	Sealing Rring of Valva Seat	316SS+Graphite 316L+Graphite 316L+PTFE
27X	Body	WCB;CF8;CF3M
28X	Washer	304SS
29X	Hard Sealing Reducing Valve Plug	304SS;316L
30X	Hard Sealing Bead Welding Reducing Valve Plug	304SS+STL 316L+STL
31X	Hard Sealing Bead Welding Valve Seat	304SS+STL 316L+STL
32X	Balanced Back-Pressure Valve Plug	304SS;316L
33X	Press Plate	304SS;316L
34X	Hard Sealing Back-Pressure Valve Plug	304SS;316L
35X	Bead Welding Back-Pressure Valve Plug	304SS+STL 316L+STL
36X	Unbalanced Back-Pressure Valve Plug	304SS;316L
37X	Guide Bush	304SS;316L
38	Block	304SS
39	Pin	304SS;316L
40	Adjustment Lever	Dg20

B01	Thin Hex Nut	304SS
B02	Hex Nut	304SS
B03	Spring Washer	304SS
B04	Socket Head Screw	304SS
B05	Spring Washer	304SS
B06	Overload Spring	304SS
B07	Socket Head Screw	304SS
B08	Spring Washer	304SS
B09	O-Ring	NBR;FKM;SR
B10	Needle Bearing	GCr15
B11	O-Ring	NBR;FKM;SR
B12	O-Ring	NBR;FKM;SR
B13	Tooth Cushion	304SS;316L
B14	Stud	45#;304SS
B15	Hex Nut	45#;304SS

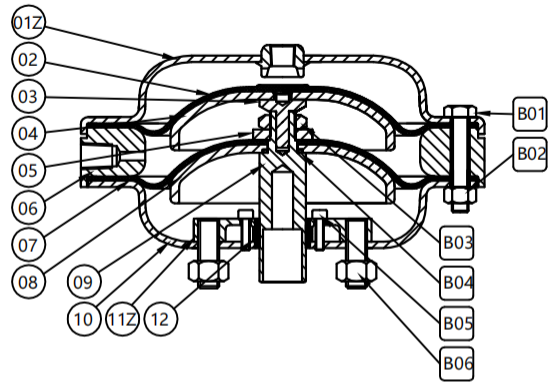
Actuator Structure、Parts List and Parts Material

Single-Diaphragm Actuator (Type 01)



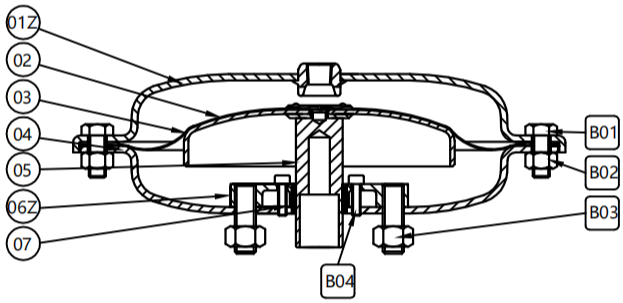
SN	Name of Part	Material
01Z	Upper Diaphragm case	304SS;316L
02	Diaphragm	NBR;FKM;SR;EPDM
03	Diaphragm Plate	20#
04	Lower Diaphragm Case	304SS;316L
05	Push Stem	304SS
06Z	Press Plate	304SS
07	Guide Bush	PTFE
B01	Hex Bolts	304SS
B02	Hex Nut	304SS
B03	Hex Nut	304SS
B04	Socket Head Screw	304SS

Dual-Diaphragm Actuator (Type 04)



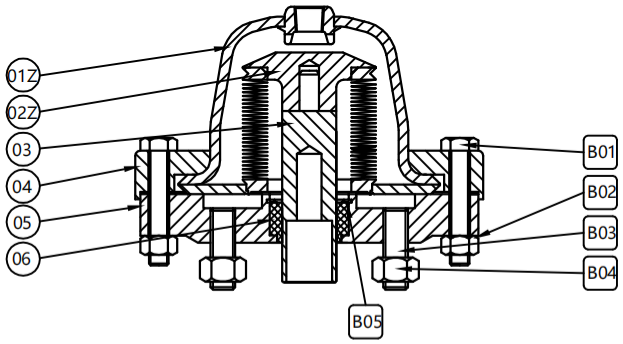
SN	Name of Part	Material
01Z	Upper Diaphragm Case	304SS,316L
02	Diaphragm	NBR;FKM;SR;EPDM
03	Connecting Pin	304SS
04	Up Diaphragm Plate	20#
05	Washer	304SS
06	Pad	304SS,316L
07	Diaphragm	NBR;FKM;SR;EPDM
08	Lower Diaphragm Plate	20#
09	Push Stem	304SS
10	Lower Diaphragm Case	304SS;316L
11Z	Press Plate	304SS
12	Guiding Bush	PTFE
B01	Hex Bolts	304SS
B02	Hex Nut	304SS
B03	Hex Nut	304SS
B04	O-Ring	NBR;FKM;SR
B05	Socket Head Screw	304SS
B06	Hex Nut	304SS

PTFE Single-Diaphragm Actuator (Type 01)



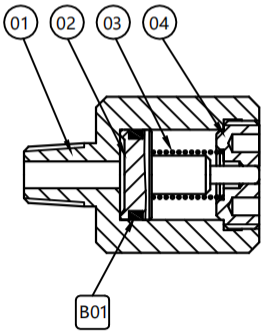
SN	Name of Part	Material
01Z	Upper Diaphragm case	304SS;316L
02	Diaphragm	NBR+PTFE
03	Diaphragm Plate	20#
04	Lower Diaphragm Case	304SS;316L
05	Push Stem	304SS
06Z	Press Plate	304SS
07	Guiding Bush	PTFE
B01	Hex Bolts	304SS
B02	Hex Nut	304SS
B03	Hex Nut	304SS
B04	Socket Head Screw	304SS

Bellows Actuator (Type 03)



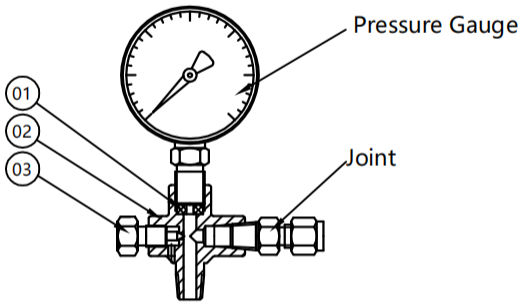
SN	Name of Part	Material
01Z	Upper Case	304SS;316L
02Z	Bellows Assembly	304SS;316L
03	Push Stem	304SS;316L
04	Press Plate	304SS
05	Lower Case	304SS
06	Guiding Bush	PTFE
B01	Hex Bolts	304SS;316L
B02	Hex Nut	304SS
B03	Stud	304SS
B04	Hex Nut	304SS
B05	Circlip	304SS

Indicator Assembly(For the Double-Diaphragm Actuator)



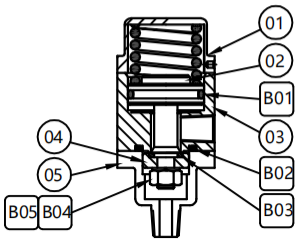
SN	Name of Part	Material
01	Cylinder	304SS;316L
02	Piston	304SS;316L
03	Spring	304SS
04	Cylinder Cover	304SS
B01	O-Ring	NBR;FKM;SR

Composite-Joint(With the Exhaust Port and the Pressure Gauge)



SN	Name of Part	Material
01	Sealing Ring	PTFE
02	Composite-Joint	304SS;316L
03	Vent Plug	304SS;316L

Overload Protection Device



SN	Name of Part	Material
01	Cylinder Cover	304SS
02	Piston	304SS;316L
03	Cylinder	304SS;316L
04	Press Pad	304SS;316L
05	Lower Case	304SS;316L
B01	O-Ring	NBR;FKM;SR
B02	O-Ring	NBR;FKM;SR
B03	O-Ring	NBR;FKM;SR
B04	Hex Nnut	304SS
B05	Spring Washer	304SS

Type Clssification、Operational Principle

● The pressure regulating valve is divided into upstream-pressure control and downstream-pressure control.

The upstream control regulator (4301,4302,4303,4401,4402,4403) has an inverted-installed plug. The plug close when the actuator an't bear any pressure. The upstream mediam pressure introduced into actuator's diaphragm case to generate a pushing force.
This pushing force will be compared with preset compression force of a setting spring .
When the pushing force is large than the preset compression force,the plug will be opened.
The upstream pressure will be released until the balance among upstream pressure, actuator pushing force and spring compression force is reached. Than the plug will be kept at the openness corresponding to upstream release flow .When the upstream pressure changed due to the fluctuation of upstream flow or downstream back pressure, the previous balance will be broke, the plug will move to compensate the change.The plug will open more when the pressure increases or close more when the pressure reduces to restore the pressure. In a few words, the upstream pressure will be controlled to a certain range no matter whatever the process parameters changes.
The plug will close to maintain the pressure when the upstream pressure continuously decreases to a pressure that is lower than a original set point.

The upstream pressure regulating valve includes balance type (4301,4302,4303) and unbalance type (4401,4403,4403).

The balanced valve plug is designed O-ring balance structure. The pressure difference has small influence for control. So it can be used under the higher pressure difference, but it is affected by operation temperature and corrosion resistance on O-ring.
So the influence of the medium temperature and corrosion on O-ring must be considered.

The unbalanced valve plug is suitable for low-preesure difference control.
Without restrictions of the balance O-ring.
The valve plug can resist higher operation temperature and corrosion resistance.
Without the resistance of the O-ring, so the valve plug is suitable for low-pressure control system.

The downstream control regulator(4201,4202,4203) has a normally-installed plug.The plug opens when the actuator can't bear any pressure. After the mediam into the downstream being throttled by the regulator valve seat and plug, the downstream pressure will be introduced into the actuator's diaphragm case to generate a pushing force.This pushing force will be compared with preset compression force of a setting spring. When the pushing force is large than the preset compression force, the plug will be pushed to make adjustment the pushing force is balanced with the spring force. Then the plug will be kept at the openness corresponding to dowstream flow. When the dowstream pressure changed due to the fluctuation of upstream pressure or dowstream flow, the previous balance will be broke. The plug will move to compensate the change. The plug will close more when the pressure increases or open more when the pressure reduces to restore the pressure. In a few words, the downstream pressure will be controlled to a certain range no matter whatever the process parameters changes. When the downstream flow is zero, the downstream pressure will build up gradually until it overcomes the spring force to make the plug close to maintain the downstream pressure.

The downstream pressure regulating valve is designed as balance valve plug structure.
The pressure difference change has little influence on the control.

The value of setting pressure depends on the configuration between the spring and actuator.
The effective area of an actuator is fixed for an assembled reguator.
The valve of the setting pressure will be changed with the changing of pushing force of the spring.
Therefore, the process pressure can be adjusted with the turning of adjusing nut.

The valve plug seal is divided into soft seal、head seal and hard alloy bead welding hard seal.

The soft sealing(4201,4301,4401)mainly inserts sealing gasket of various material on the plug to ensure tight sealing.But its' application is restricted with the operating temperature.

The hard seal(4202,4302,4402)and hard alloy bead welding hard seal(4203,4303,4403)are metal-to-metal seal and have a higher operation temperature. The pressure withstanding difference and temperature withstanding performance after the bead welding hard alloy are better. But the hard seal valve plug has little leaked after closed.

● The actuators are mainly divided into single-diaphragm,double-diaphragm and bellows actuator.

Single-diaphragm actuator has one diaphragm. It is used for generalized operating condition . The diaphragm can be made of various rubber to meet the requirements of various working medium and temperature. Diaphragm in some lowpressure models can be line d with PTFE film to enhance their corrosion performance.

Double-diaphragm actuator has two diaphragm. It is used for important operating conditions to prevent the leakage of medium when one diaphragm is broken. One diaphragm works under normal conditions when another diaphragm is used as back-up. When the first diaphragm breaks, the second diaphragm will immediately works when the medium enters to the place between the two diaphragm without the leakage of the medium. At the same time, the piston of the indicator will be pop out as an indication for the replacement of the diaphragm.

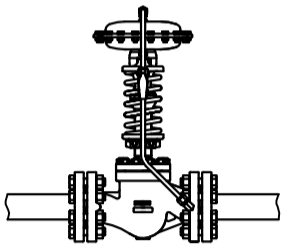
Bellows actuator uses stainless bellow as a pressure sensing element for the reguator's control. It is used for the operating conditions with high temperature and corrosion that rubber diaphragm can not be used.

The composite connector can be used for the feedback connector for actuator. It has its own vent for release of the residual pressure in the actuator when the actuator is maintained. The pressure gauge connector designed at the end can be directly used for the pressure gauge.

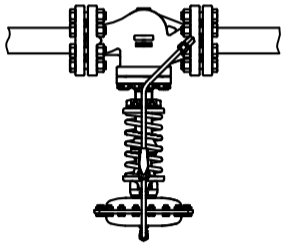
● Overload protection device is connected in series between the actuator and the pressure guiding pipe. When thesystem presssure is overload can protect the actuator and valve.

Install

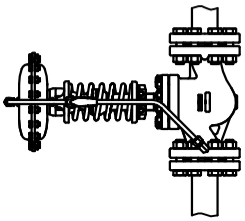
● The flow direction of the regulator must be the same with the direction arrow sign on the body of the regulator when it is installed.
The regulator must be vertically installed to avoid horizontal installation whenever is possible.



Right



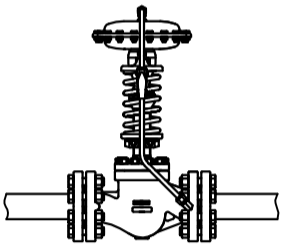
Right



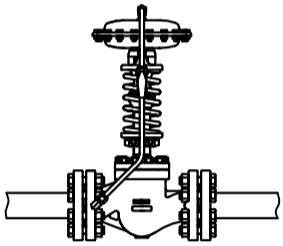
Not recommended for installation, will increase wear.

Shut-off valves should be installed either at the upstream and downstream of the regulator for inpection and maintenance. The by-pass valve should be installed for emergency in important applications.

The regulator with pressure measured from the valve flange can be directly installed on the piping.



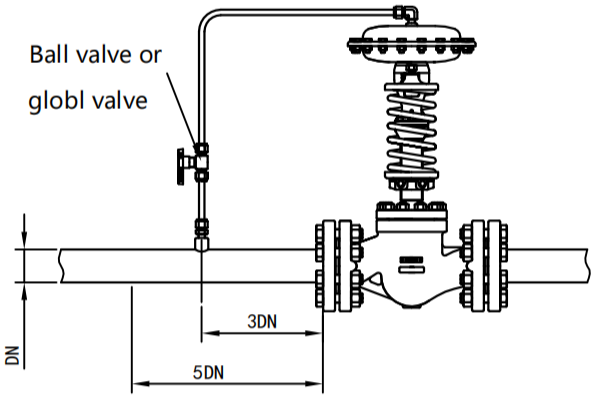
Reduce Pressure Valve



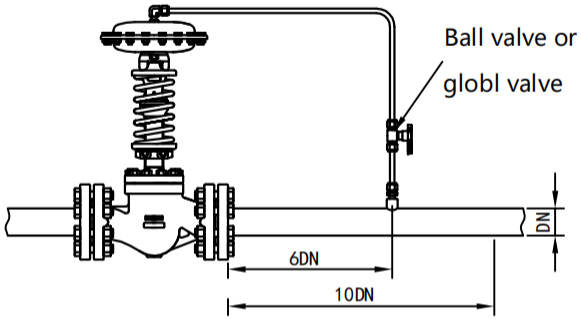
Back Pressure Valve

● The pressure gauge or other pressure detection instrument should be installed before and after the pressure regulating valve for pressure adjustment.The compound connector can be used to directly install the pressure gauge on the pressure regulating valve.

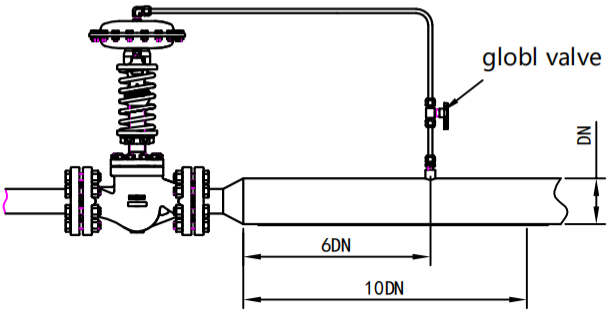
● The reguator with external feedback must be installed with pressure instroduction pipe at the locale.The pressure instroduction pipe should be installed with global valve or ball valve. There should be a straight section of 5DN pipe upstream for the upstream control regulator. The pressure measuring point should be designed at a 3DN pipe section. There should be a straight section of 10DN pipe downstream for the downstream cotrol regulator. The pressure measuring point should be designed at a 6DN pipe section. The increased pipe diameter will be used if the pipe downstream the valve in increased.



Back Pressure Valve



Reduce Pressure Valve



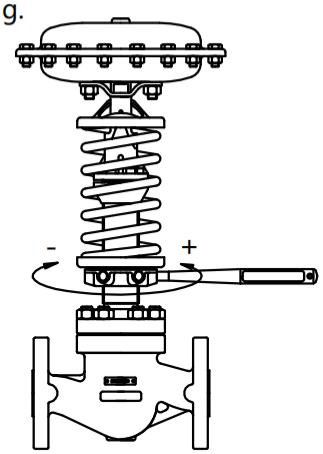
Downstream Expanding

When the piping will be pressure tested after the installation of the regulator, the global valve or ball valve on the pressure introduction pipe should be closed.

Operation

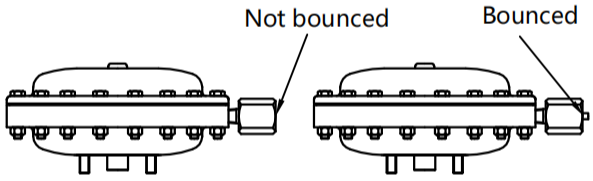
● To make sure the components of the regulator are correctly installed before the regulator is put into operation.

● The globl valve or ball valve on the pressure introduction pipe should be opened. The by-pass valve should be closed. The down stream globe valve should be opened.The downstream system should be kept completely open for upsteram control valve. A certain amount of downstream flow should be ensured for downstream control valve. Then the upstream globe valve should be slowly opened to put the regulator into operation. The operator should watch the indication of pressure gauge during this process. When there is a preassure deviation, the adjusting stem should be used to turn the adjusting nut to change the setting of the pressure. The pressure will be increased with the compressing of the spring and reduce with releasing of the spring.



● When the downstream system of the downstrem regulator stops, flow can be shut off for soft-sealing regulator to maintain the downstream pressure. The downstream pressure may gradually buid up because of the trace leakage of the regulator with hard sealing.The ratio of the build-up depends on the capacity of downstream system. We suggest that the upstream globe valve should be closed if the hard-sealed regulator will be put out of operation for a long time.

● The indication of the indicator of double-diaphragm actuator should be checked frequently during the operation.It should be replaced if the first diaphragm is damaged.



The diaphragm is normal

The fist diaphragm is damaged, it should be replaced

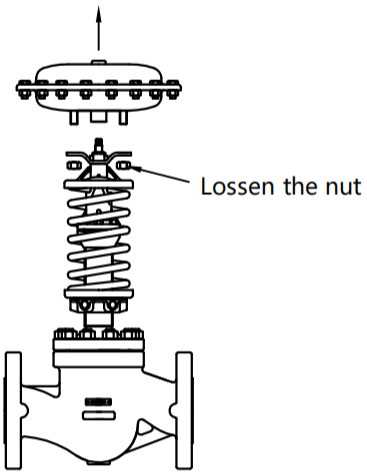
Waring

If pressure test will be performed on the regulator at locale, it should be noticed that the regulator is different with normal valve. The test pressure should not be determined according to the rated pressure of the valve body. The test pressure of the valve assemblies should not higher than the allowable pressure of the bellow stem . The test pressure of the actuator should not higher than the maximum pressure. The actuator can only be tested with pneumatic pressure but no hydraulic pressure.

Repair Points

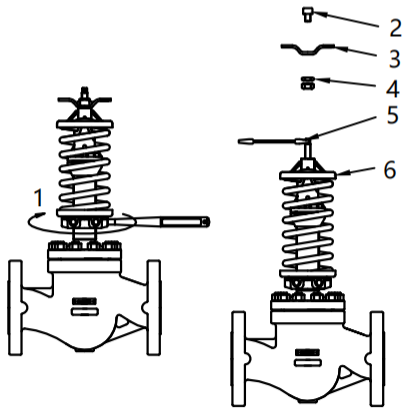
- The internal pressure of the regulator must be completely released and separated with operation system whenever the regulator will be disassemble.

- The actuator and valve assembly are separate assemble. That can be individually inspected and serviced after disassemble.



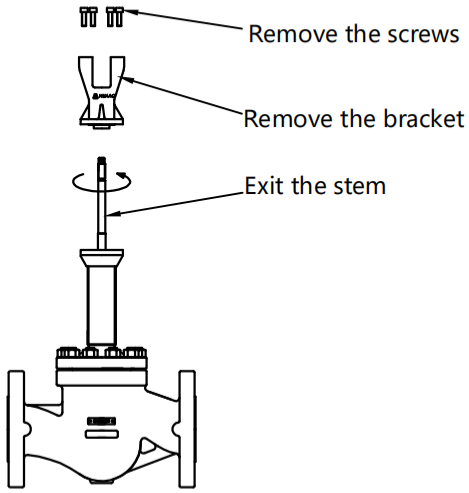
- The main inspection and maintenance job of the actuator is to change the diaphragm or bellow assemblies. , These assemblies can be inspected or replaced after the removing of the outer ringscrew of the actuator.

- The spring should be completely loosed before the disassembly of the regulator assembly.The screws, connecting plate and nuts can only be removed after the spring is completeltely loosed.Then the spring seat, spring and overload spring can be removed.It should be noticed that the removing of the nut should be performed when the stem is stuck with the spanner to prevent the tuming the stem damaged the bellow.

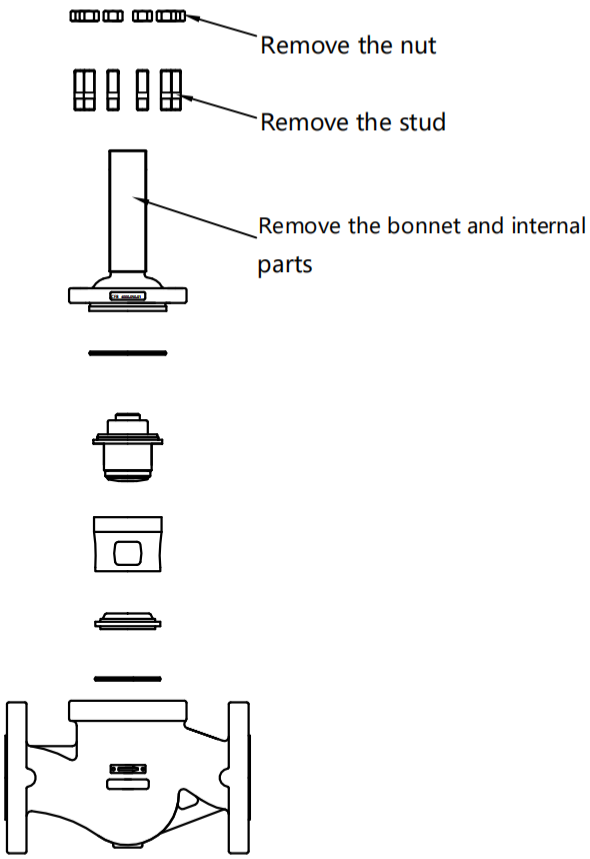


1: Completely relax
2: Remove the screws
3: Remove the connecting plate
4: Remove the nut
5: When remove the nut should be stuck the stem
6 : Remove the spring seat、spring、overload spring

● The bonnet should not be loosed at first during the removing of the bellow stem. The bracket should be removed before the exiting out of the stem.



● The internal parts of the regulator are fixed with the compression of the bonnet. All internal parts can be removed afte the removing of bonnet.



Description on The Nameplate

- Type
- Nominal Diameter
- Nominal Pressure
- Material of Body/Internal Parts
- Material of Diaphragm
- Regulation Range
- Maximun Pressure of Actuator
- Kv Value
- Operating Temperature
- Flange Standard
- Serial Number

Mode Establishment

SP 4 □ □ □ □ — □ — □

DN: 40-DN40(11/2")
50-DN50(2")
65-DN65(21/2")
80-DN80(3")
100-DN100(4")
150-DN150(6")
200-DN200(8")

16-PN16-1.6MPa
40-PN40-4.0MPa
64-PN64-6.4MPa
150-150lb
300-300lb
600-600lb

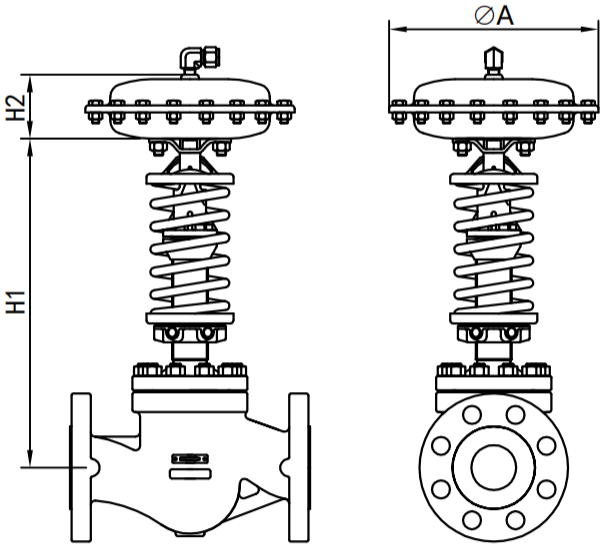
ADD "X" to reduce the noise cage, not as a standard cage

The valve plug type
1: Soft sealing
2: Hard sealing
3: Hard sealing with bead welding

The actuator type
1: Single-Diaphragm actuator
2: Double-Diaphragm actuator
3: Bellows actuator

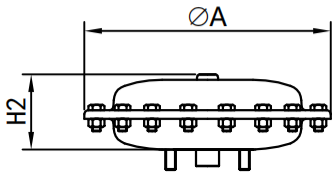
Cnotrol mode
2: Downstream control
3: Balance upstream control
4: Unbalance upstream control

Dimension

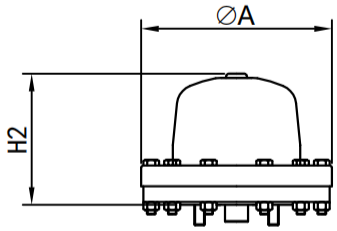


Valve Size 40			50	65	80	100	150	200
L	PN16(150lb)	222	254	276	298	352	451	600
	PN40(300lb)	235	267	292	317	368	473	600
	PN64(600lb)	251	286	311	337	394	508	650
H1		366	370	512	512	520	752	827
Weight Kg	PN16(150lb)	18	22	55	62	85	135	185
	PN40(300lb)	18	22	60	71	93	145	198
	PN64(600lb)	21	25	72	85	112	170	235

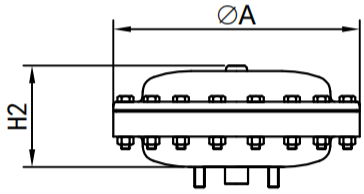
Remark:
The actuator weight will be different due to different configurations. The weight indicates average weight.



Single-Diaphragm Actuator (Type 01)



Bellows Actuator (Type 03)



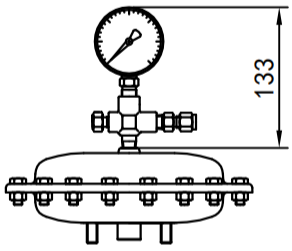
Double-Diaphragm Actuator (Type 04)

Actuator	H2	A
01.01.00	71	157
01.02.00	71	191
01.03.00	71	233
01.04.00	71	327
01.09.00	68	154
01.10.00	68	154
01.12.00	71	233
01.13.00	71	327
01.05.00	88	191
01.06.00	88	233
01.07.00	88	327
01.08.00	88	494
01.14.00	88	494
01.15.00	112	191
01.16.00	112	233
01.17.00	112	327
01.18.00	112	494
01.19.00	112	494
01.11.00	86	188

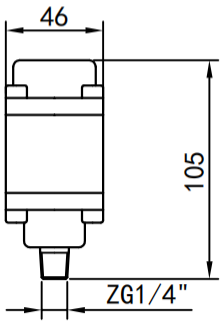
Actuator	H2	A
03.09.00	146	115
03.10.00	153	178
03.11.00	201	284
03.12.00	201	284

Actuator	H2	A
04.01.00	96	157
04.02.00	96	191
04.03.00	96	233
04.04.00	96	327
04.05.00	113	191
04.06.00	113	233
04.07.00	113	327
04.08.00	113	494
04.09.00	137	191
04.10.00	137	233
04.11.00	137	327
04.12.00	137	494

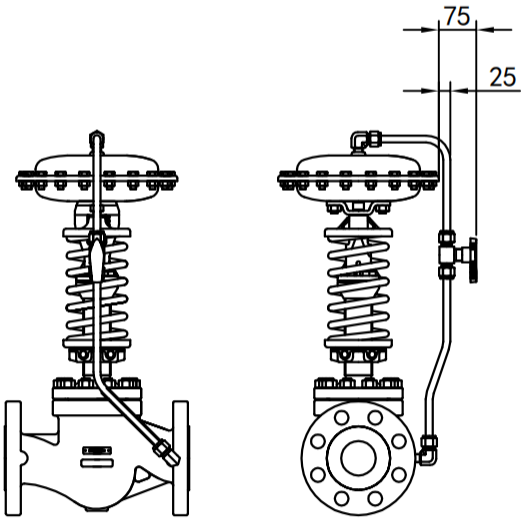
Actuator	H2	A
03.01.00	116	115
03.02.00	123	178
03.03.00	171	284
03.04.00	171	284
03.05.00	116	115
03.06.00	123	178
03.07.00	171	284
03.08.00	171	284



Composite-Joint



Overload Protection Device



Measured from Valve Flange.

Experience Sharing

- Dowerstream Safety Device

As for downstream control regulating valver, the safety of the downstream equipment must be seriously evaluated. The maximum downstream pressure may equal to the upstream pressure in this abnormal condition.The downstream safety valve or other safety-release devices must be installed. The tripping pressure of the safety valve should be higher than the setting pressure with a certain range, this range normally should be about 30%.The discharge capacity of the safety valve should be selected based on the full-opened discharge capacity of the regulator. The maximum flow of the by-pass valve should also be considered whenever necessary.

- Upstream Safety Device

It should be cleared that the regulator is not a safety valve. The responsibility of safety valve can not be satisfied with upstream control regulator. The safety of the upstream system should be evaluated.If there is any potential safety risk when the regulator failed, other safety valve or safety device must be installed.

- The Calculation of The Flow Coefficient and Selection KV Value.

The detailed calculation of the flow cofficient will not be described here because the method is the same with normal valve. It should be noticed that the maximum openness of the valve should be not higher than 70% when the KV value is selected. The suitable range of the openness should be 10-60%.

- Cotrol Instability

The main instability conditon happens with there is continuous equal-amplitude oscillation that can not be attenuated naturally. The reasons include the small capacity of the system, openness of the regulator. But these reasons are not always apply, some system can be stady controlled with openness under 1%. The main cause of the instability is the amplification factor of the system is too large. The instability is difficult to be predicted, instability can be normal eliminated with the gradually closing of the valve on the pressure introduction piping. If the instability can not be eliminated with this method, suitable valve seat diameter or KV value should be reselected.

The blocking of the regulator caused by foreign matters will also case oscillation. It can only be removed with maintenance.

- Selection of Pressure Measuring Method

The pressure measuring methods include field piping measurement and reguator flang measure.The field measurement has a higher accuracy. The flange measurement is easy for installation. Pressure measuring method has small effect on the upstream control regulator. The expansion of the medium should be considered carefully for the measuring method of the downstream control regulator. When the dimater of the regulator is the same with the downstream pipeline, the flange mersuring method should be selected. When the diameter of the downstream pipeline is larger than the regulator's, the filed pipeline measuring method should be selected.

- Selection of Regulation Range

The regulation range selected must cover the process setting required. There will be a number of regulatio ranges can be used for the same setting valu.The ranges should be selected to make the setting value is at the middle or uper middle of the range It is because that the theoretical deviation of every combination of spring and actuator is fixed. The deviation will b smaller when the setting value is closer to the upper limit of the regulation range. Generally,it is suitable to make the setting value is in the 40-85% of the regulation range.

- Selection of Actuator

It must be noticed that the regulator is different with conventional valve The medium will enter the actuator (excepting the actulator with isolation tank) and make direct contact with the diaphragm. Therefore, we should conside that whether there is any corroison to the diapgragm will be caused by the medium or whether the temperature of the medium is higher than the allowed temperature of the diaphragm when we select the suitable material of the diaphragm. The material of the diaphragm is rubber. Bellow actuator should be selected whenever the rubber can not meet the requirements. The matial used for the bellow is 316L stainless steel. Rubber lined with PTFE membrance can also be used under low pressure operating conditions.

Double-diaphragm should be selected when the medium should not be released when the diaphragm is damaged.

- Selection of Valve Plug

Soft sealing is the primary selection for the sealing of the plug. The corrosion on the sealing gasket caused by the medium and the operational temperature range of the sealing gasket should also be evaluated. The hard-sealing plug should be selected for high temperature conditions. The plug and seat sealed with hard alloy bead welding have better high temperature performance. The hard sealing should also be selected when the differential pressure under normal temperature is larger than 1.8MPa, soft sealing can be selected for gas medium.

Selection Criteria

- Pipeline Dimensions
- Medium
- Medium Temperature、Ambient Temperature
- Medium Density
- Upstream Pressure、Downstream Pressure
- Flowrate
- Setting Pressure
- Flange Standard
- Requirements on Material of The Body and Internal parts
- Pressure Measuring Method
- Other Special Requirements

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