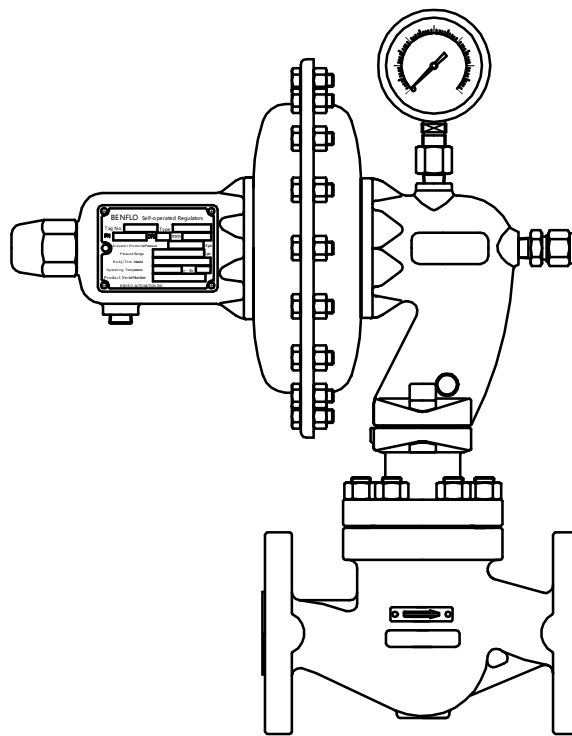


Micro-pressure Blanketing Gas Regulating Valve

Type SP439



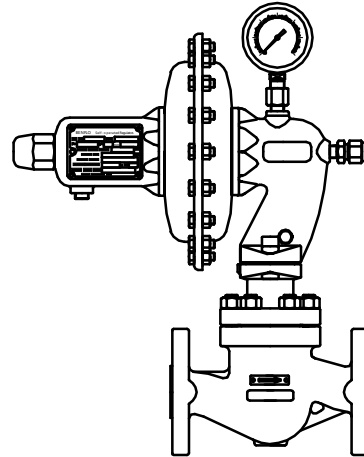
 SP439 Micro-pressure Blanketing Gas Regulating Valve (hereafter called as pressure regulating valve)

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

SP439 Pressure regulating valve is a spring-driven micro-pressure regulating valve and can reduce and stabilize high-pressure gas to the extreme low pressure. It is only used for downstream pressure control. It is also used for micro-pressure control of different gases. Especially apply to the nitrogen blanketing system. The minimum control pressure is 0.3KPa. The maximum control pressure is 15KPa. The minimum operation temperature is -48 °C. The maximum operation temperature is 120 °C.


Product Feature

- **Compact Structure**---The embedded spring structure makes the pressure regulating valve more compact and well protected.
- **No Packing**---Any friction resistance will affect the control precision of the pressure regulating valve at the micro-pressure control. SP439 pressure regulating valve without packing makes the regulating mechanism have highly sensitive and reduces leakage point.
- **Amplify Push Force**---The control pressure is very low of the micro-pressure control valve, so the actuator generates limited push force. The lever force-amplification regulation device of the pressure regulating valve can amplify the micro push force of the diaphragm assembly by 6 times, so this pressure regulating valve provides excellent regulating and difference pressure withstanding performance. When the downstream system flow reduce to "0", the valve plug will shut off the flow at the micro-pressure state and hold the system pressure.
- **Overload Safety**---To reduce the influence of the parts gravity for control pressure. The whole regulating device of the pressure regulating valve should be designed as light and precise as far as possible. The downstream pressure is very low during normal operation. The force on the regulating device is very small. The overload is unavoidable in actual operation. The downstream pressure can reach the upstream pressure at abnormal state. At this time, the push force generated by the diaphragm assembly is very destructive to the regulation device. The overload device of the pressure regulating valve can effectively uninstall the overload force and avoid damage to the regulation device. Namely when the pressure regulating valve is operating, in most case, the diaphragm case of the actuator can fully withstand the maximum operation pressure of upstream and it will not be damaged.

- Easy Pressure Regulation---The screw regulating device can realize easy, convenient and quick pressure regulation.
- Soft Sealing---The valve plug designed as soft sealing structure and can easily shut off the flow.
- Stainless Actuator---As an important part of the regulator, the actuator is made of stainless plate to ensure its high pressure-strength and long service life.
- Easy Installation---The direction of pipeline and installation space can not be estimated when the valve is outputted. It is not convenient to calibrate and watch the pressure regulating valve due to influences from the surrounding devices after installation. The actuator and regulation device of the SP439 pressure regulating valve can rotate by 360° under non-disassembled state and old performance parameters are not affected after adjustment.
- Easy Maintenance---The selection criteria of the every structure of the SP439 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 before disassembling the regulator.

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 easily taken out or put in.
- Universal Parts---SP439 regulator has extremely 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

- Body Size(Flanged connection)
DN15(1/2"),DN20(3/4"),DN25(1"),DN40(1 1/2"),DN50(2")
- Pressure Rating
PN16,40,64 ANSI 150LB,300LB,600LB
Can also be customized
- Flow Factor

Diameter of Valve seat	2	4	6	8	10	12	12	18	22
KV	0.1	0.3	0.6	1	1.6	2.5	4.5	6.5	10

Remak: maximum 4.5 KV is allow for DN15, maximum 6.5 KV is for DN20, the diameter is other not limited for types.

- Feedback Interface
ZG1/4" 10mm card set of connector is provided in the plant.
- Pressure Measuring Method
Measured at inside of the valve or flang and or outside.
Applied to the tank nitrogen blanketing , measuring from top of tank.

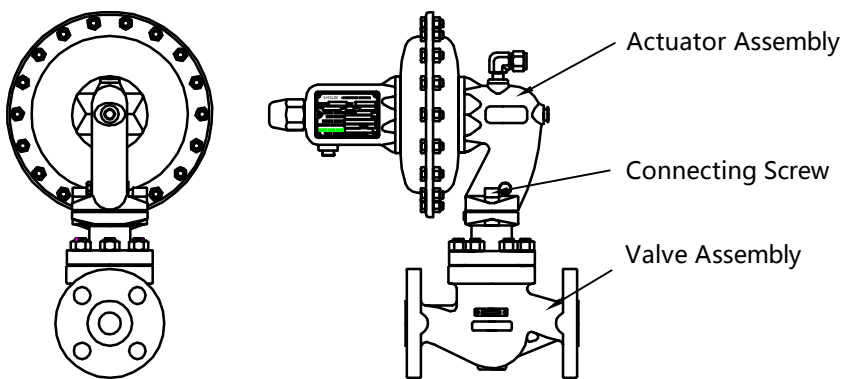
- Leakage Class
Soft-sealing VI
- Closing Class
<10% of upper limit of reguation range.
- Operation Temperature
This is soft-sealing valves, the temperature depends on the material of the sealing part and diaphragm.
NBR -29-82°C
FKM -8-120°C
SR -48-85°C
EPDM -38-115°C
- Flow Characteristics
L (Normal)
EQ%(Secical processing)

Spring Range、The Actuator Configuration、 Difference Pressure and Precision

Actuator number	Spring number	Spring range KPa	Permitted difference pressure of different valve seat (MPa)/ theoretical reference precision: upper limit of % X pressure range.									Max actuator pressure KPa
			2	4	6	8	10	12	14	18	22	
02.11.00	HS008	0.3-0.5	1.5/2%	0.9/3%	0.4/5%	0.2/7%	0.14/9%					800
	HS009	0.3-0.8	1.5/2%	1.5/3%	0.7/5%	0.4/7%	0.24/9%	0.16/11%				
	HS010	0.45-1.4	1.5/2%	1.5/3%	1.2/5%	0.7/7%	0.4/8%	0.3/10%				
	HS011	1-3	1.5/2%	1.5/4%	1.5/6%	1.5/8%	1.0/9%	0.7/11%	0.5/13%	0.3/16%		
	HS012	2.4-7	1.5/2%	1.5/4%	1.5/6%	1.5/8%	1.5/10%	1.5/11%	1.1/13%	0.6/16%	0.4/20%	
	HS013	3.3-10	1.5/2%	1.5/4%	1.5/6%	1.5/8%	1.5/10%	1.5/11%	1.5/13%	0.9/16%	0.6/20%	
	HS014	5-15	1.5/2%	1.5/5%	1.5/7%	1.5/9%	1.5/11%	1.5/14%	1.5/16%	1.2/20%	0.8/25%	
02.12.00	HS020	0.3-0.45	1.5/2%	1.5/2%	0.9/3%	0.5/5%	0.3/6%	0.2/7%	0.15/8%	0.1/10%	0.06/12%	500
	HS021	0.25-0.75	1.5/2%	1.5/2%	1.5/3%	1.0/5%	0.6/6%	0.4/7%	0.3/8%	0.18/10%	0.12/12%	
	HS022	0.5-1.5	1.5/2%	1.5/3%	1.5/3%	1.5/5%	1.2/6%	0.8/7%	0.6/8%	0.36/10%	0.23/12%	
	HS023	0.8-2.5	1.5/2%	1.5/3%	1.5/3%	1.5/5%	1.5/6%	1.4/7%	1.0/8%	0.6/10%	0.4/12%	
	HS024	1.3-3.9	1.5/2%	1.5/3%	1.5/3%	1.5/5%	1.5/6%	1.5/7%	1.5/8%	0.9/10%	0.6/12%	
	HS025	2-6	1.5/2%	1.5/3%	1.5/3%	1.5/5%	1.5/6%	1.5/7%	1.5/8%	1.2/10%	0.8/12%	
	HS026	5-15	1.5/2%	1.5/3%	1.5/4%	1.5/6%	1.5/7%	1.5/9%	1.5/10%	1.5/10%	1.2/12%	

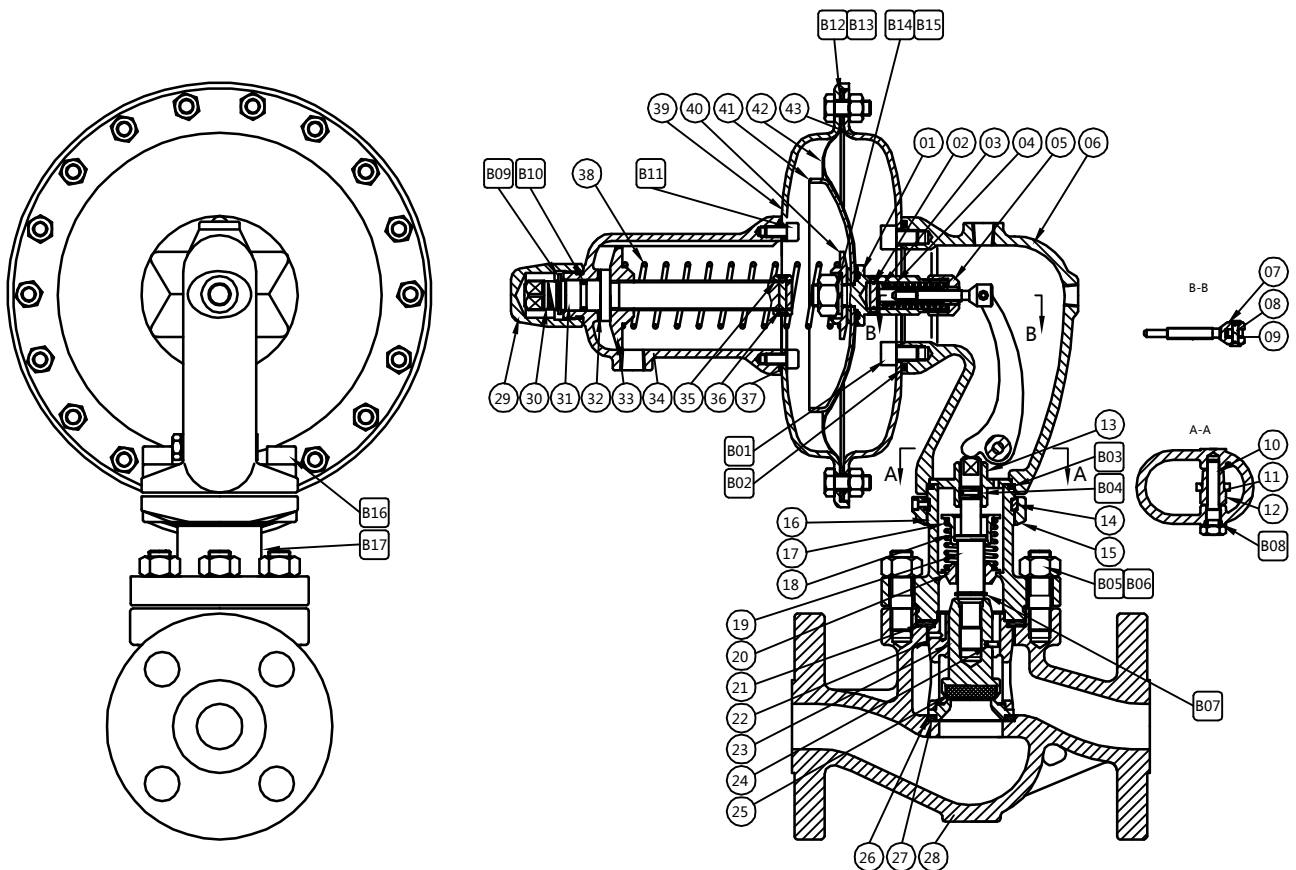
Remark: The theoretical precision indicates the theoretical pressure deviation of the valve under 10-50% travel and constant pressure difference. It will be affected by the pressure difference change and flow in actual application. The actual theoretical deviation is computed by the process parameter.

Structure, Parts List and Material



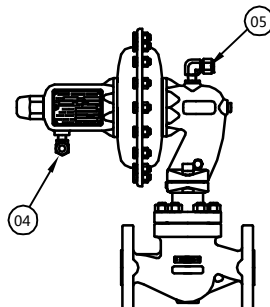
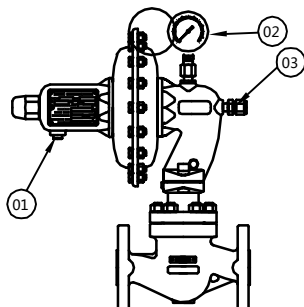
The regulator is mainly comprised of actuator assembly and valve assembly as two independent assemblies. These two assemblies are connected as a whole with connecting screw.

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



SN	Name of Part	Material	SN	Name of Part	Material
01	Connecting Set	304SS , 316L	23	Valve Plug	304SS , 316L
02	Pin	304SS , 316L	24	Pin	304SS , 316L
03	Connecting Rod	304SS , 316L	25	Valve Cushion	NBR;FKM;SR;PTFE
04	Spring	304SS , 316L	26	Valve Seat	304SS , 316L
05	Screw Set	304SS , 316L	27	Sealing Ring of Valve Seat	316SS+Graphite
06	End Cover	CF8,CF3M			316L+Graphite
07	Connecting Bolt	304SS , 316L			316L+PTFE
08	Pin	304SS , 316L	28	Body	WCB,CF8,CF3M
09	Washer	PTFE	29	Protective Cover	304SS
10	Bottom Pin	304SS , 316L	30	Arrow	304SS
11	Lever	304SS , 316L	31	Screw	304SS
12	Shaft Set	304SS , 316L	32	Washer	PTFE
13	Guide Bush	304SS , 316L	33	Nut	Hpb59-1
14	Block Ring	304SS	34	Spring Cover	CF8
15	Flange	CF8	35	Block Ring	304SS
16	Bonnet	CF8,CF3M	36	Pin	304SS
17	Spring	304SS , 316L	37	O-Ring	NBR
18	Spring Seat	304SS , 316L	38	Setting Spring	304SS
19	Spring Stem	304SS , 316L	39	Diaphragm Case	304SS , 316L
20	Spring Seat	304SS , 316L	40	Spring Seat	304SS
21	Sealing Ring of Bonnet	316SS+Graphite 316L+Graphite 316L+PTFE	41	Diaphragm Plate	LY12
22	Cage	CF8,CF3M,304SS,316L	42	Diaphragm	NBR,FKM,SR,EPDM
			43	Diaphragm Case	304SS , 316L
B01	Socket Head Screw	304SS , 316L	B09	Socket Head Screw	304SS
B02	O-Ring	NBR,FKM,SR	B10	Socket Head Screw	304SS
B03	O-Ring	NBR,FKM,SR	B11	Circlip	304SS
B04	Socket Head Screw	304SS	B12	O-Ring	NBR
B05	O-Ring	NBR,FKM,SR	B13	Socket Head Screw	304SS
B06	O-Ring	NBR,FKM,SR	B14	Hex Bolts	304SS
B07	O-Ring	NBR,FKM,SR	B15	Hex Nut	304SS
B08	O-Ring	NBR,FKM,SR	B16	Hex Nut	304SS
			B17	Spring Washer	304SS

Annex



- 01 Plug 304SS , 316L
- 02 Pressure Gauge
- 03 Card Set of Joint
304SS , 316L
- 04 Card Set of Joint
304SS , 316L
- 05 Card Set of Joint
304SS , 316L

Operational Principle

The medium flows into the valve flows out via the flow regulation of valve plug and valve seat. The downstream pressure is being into the actuator diaphragm case and generates push force and compared to the setting spring. When this push force is more than the spring force, the diaphragm assembly will drive the valve plug to reduce the openness. On the contrary, when the push force is less than the spring force, the openness of valve plug will increase. Namely the downstream pressure reduces and the openness of the valve plug increases. The downstream pressure increases and the openness of valve plug reduces. Till the push force is equal to the spring force. At this time, the valve plug will keep the openness of the downstream pressure and flow. At this time, this pressure is the set pressure of the pressure regulating valve. When the upstream pressure or downstream flow changes and leads to change to the downstream pressure, the old balance will be damaged. The diaphragm assembly will drive the valve plug for regulation and compensation and restore the pressure. On the whole, regardless of operation condition how changes, the downstream pressure will be always controlled within certain scope. When the downstream flow reduces to "0", the downstream pressure gradually increase till it exceeds the spring force to close the valve plug. The downstream pressure is under hold state. The level regulation device of the pressure regulating valve will effectively amplify push force. If the pressure slightly higher than the set value, it will close the pressure regulating valve tightly.

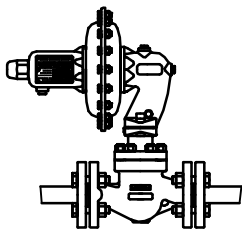
The value of setting pressure depends on the configuration between the spring and actuator. The effective area of an actuator is fixed for an assembled regulator. The valve of the setting pressure will be changed with the changing of pushing force of the spring. Therefore, the process pressure can be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

The pressure regulating valve is designed with soft seal structure and lever force amplification device. The valve plug can effectively cut off the flow under the micro-pressure state.

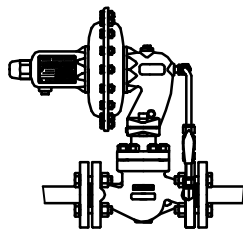
Installation

- The flow direction of the installed pressure regulating valve should be consistent with the arrow direction on the valve. The body of the pressure regulating valve should keep as level as possible. If necessary, other installation direction is taken. Although it affects operation performance. The pressure regulating valve is the micro-pressure control valve. The weight of the control component inside the valve changes the gravity direction and aslo leads to small deviation to old set pressure. The valve is installed horizontally for debugging, so the changed installation direction may corred the set pressure.

- Shut-off valves should be installed either at the upstream and downstream of the regulator for inspection and maintenance. The by-pass valve should be installed for emergency in important applications.
- The pressure gauge or other pressure detection instrument should be installed before and after the pressure regulating valve for pressure adjustment.
- The pressure regulating valve can include a pressure gauge. This pressure gauge displays the downstream control pressure.
- The regulator with pressure measured from the valve inside and flange can be directly installed on the piping.

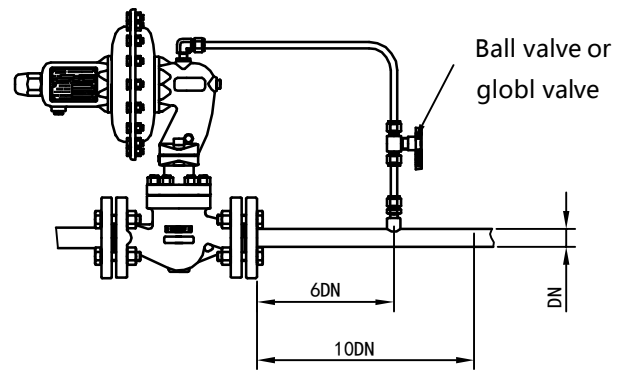


Measured From Internal

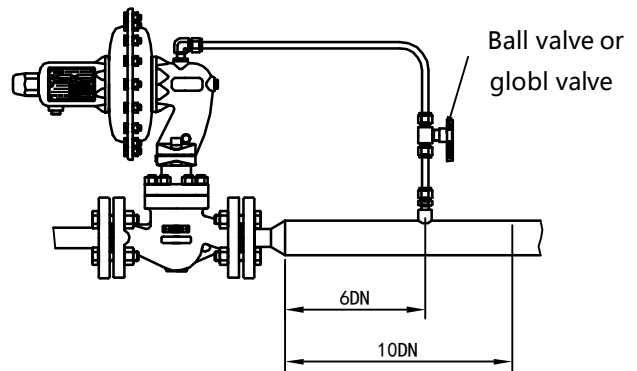


Measured From Flange

- When the pressure regulating valve is external measured pressure, the pipe should be installed with the pressure guide pipe. The pressure guide pipe should be installed with of the ball valve or globe valve. The 10DN straight pipe should be installed after the valve. The pressure measured point should be located at 6DN. If the diameter expansion pipe is behind the valve, refer to the diameter of the expanded pipe.

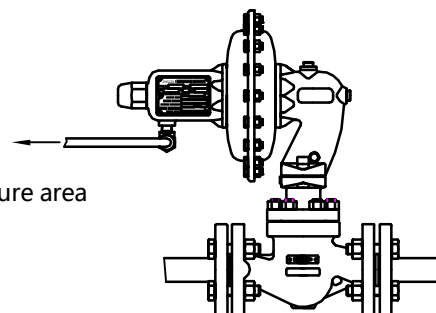


Equal Diameter



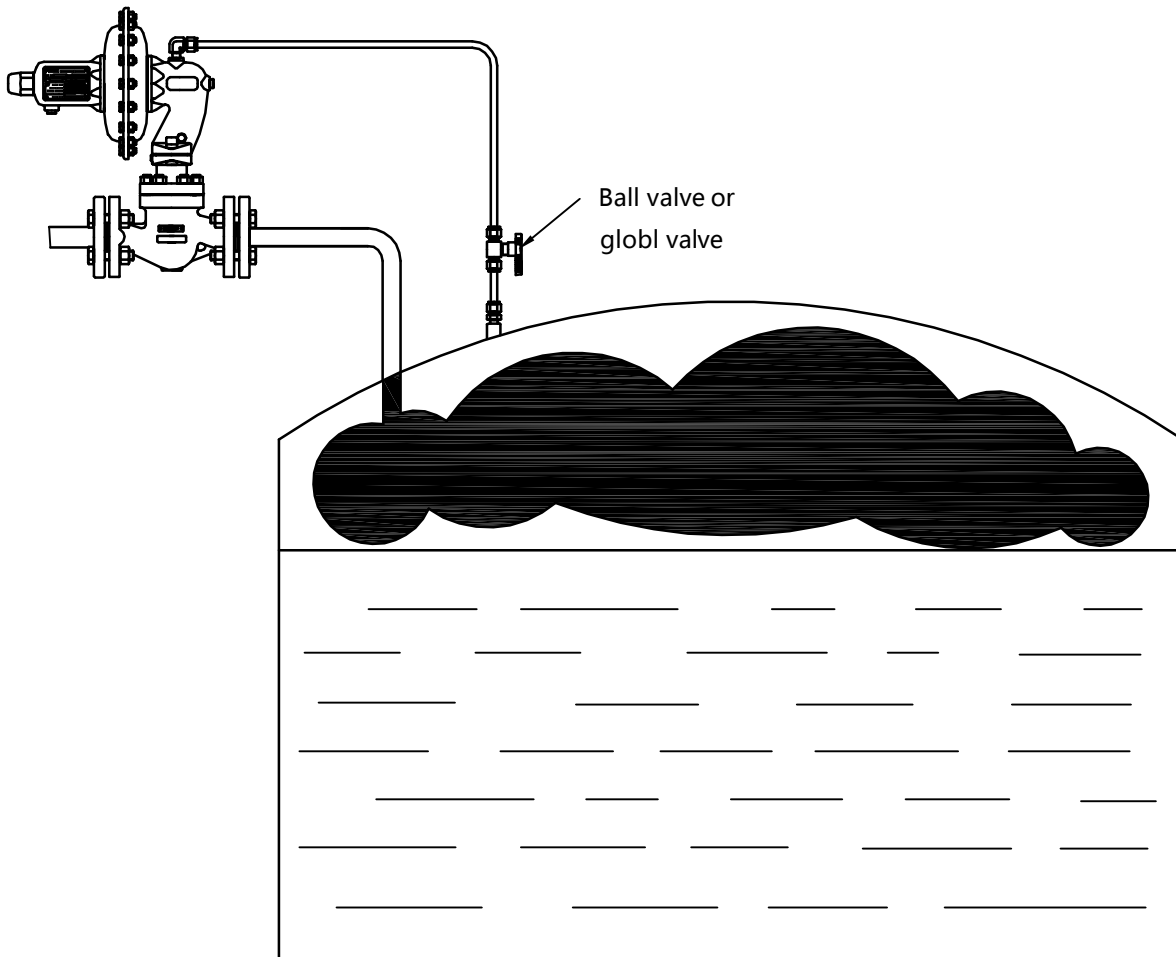
Downstream Expanding

- When the pressure regulating valve diaphragm is damaged, it will lead to medium leakage. If the medium leakage is forbidden at the field, the flow guide pipe can be installed on the actuator of the pressure regulating valve to guide the flow to the secure area.



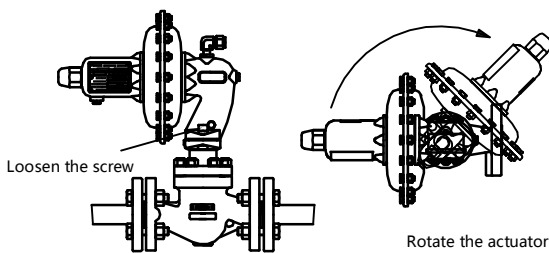
Install the Guide Pipe

- For the nitrogen blanketing tank, the measured point of the pressure regulating valve is collected at the top of the tank, so it can fully meet the flow requirement of the nitrogen blanketing via the output flow of the pressure regulating valve and keep the tank top micro positive pressure to the atmospheric pressure. Generally the tank is installed with breathing valve and pressure regulating valve. The tank sucks the gas by pressure regulating valve during normal operation and discharge gas via the breathing valve. When the pressure regulating valve fails or the nitrogen breaks, the breathing valve can suck the gas to avoid the tank shrinkage.



For Tank Nitrogen Blanketing

● When it is not convenient to regulate and watch the installed pressure regulating valve at the field the pressure regulating valve collides with other devices, to loosen the connection screw, the actuator can wholly rotate in 360°. When a proper installation position is identified, you should screw up it without need of disassembling the valve and making any adjustment.



● The piping should be flushed or purged before the installation of the regulator to remove any particulates or welding slag.

● 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. Internal-measured pressure regulating valve should be removed after the pipeline pressure test.

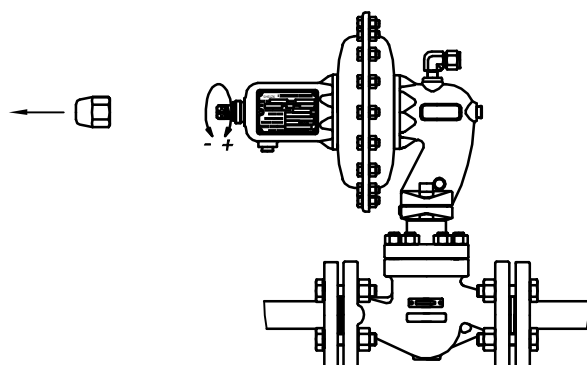
Warning

After the pressure regulating valve is delivered to the site, its pressure should be tested. The pressure regulating valve is different from the common valve and nominal pressure of the valve can not be referred to. For the internal-measurement pressure regulating valve, the test pressure shall not exceed the highest pressure of the actuator. For the flange-measurement and the external-measurement pressure regulating valve, the valve assembly test pressure can be the nominal pressure of the valve. The actuator shall not exceed the highest pressure, but in testing must only be by gas.

Operation

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

● To open the ball valve or globe valve on the pressure on the guide pipe. First close the bypass valve (if provided) and open the downstream globe valve, guarantee that downstream system has certain flow, slowly open the upstream globe valve and watch the pressure gauge, if no exception, you can fully open the upstream globe valve, the pressure regulating valve enters operation state. To change the output pressure, you should open the protection cover on the actuator and rotate the adjusting screw. To rotate clockwise, the pressure will increase, on the contrary, the pressure will reduce.

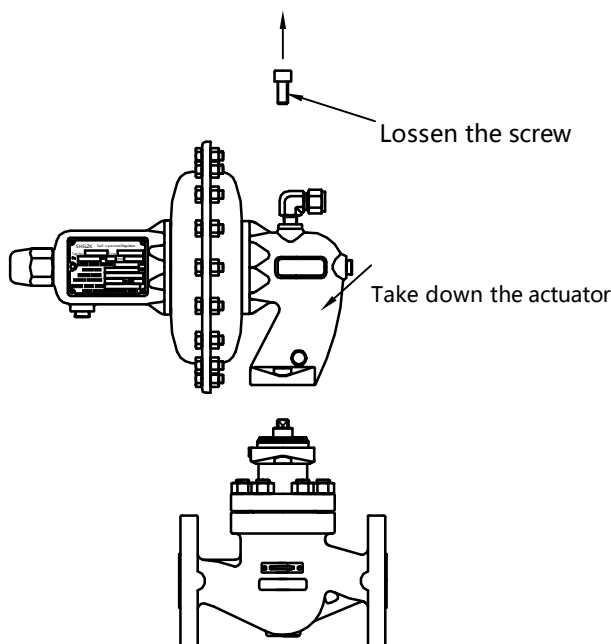


- If the pressure regulating valve includes a pressure gauge, you should open the upstream globe valve as

slowly and stably as possible to avoid damage to the micro-pressure gauge of the diaphragm box.

Fixing Points

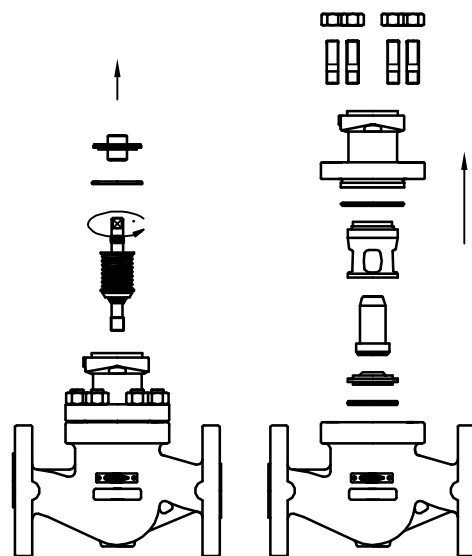
- The internal pressure of the regulator must be completely released and separated with operation system whenever the regulator will be disassemble.
- The actuator and valve assembly are separate assemble, that can be individually inspected and serviced after disassemble.



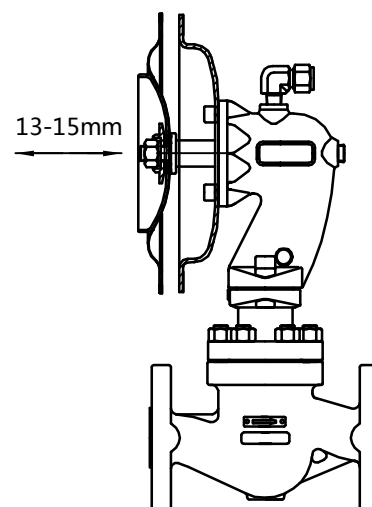
- In any case, before the actuator is disassembled, you should first rotate the adjusting screw in anti-clock direction, fully loosen the spring and disassemble it.

- When removing the valve stem, don't loosen the bonnet nut. The plug will not rotate on the bonnet pressed state.

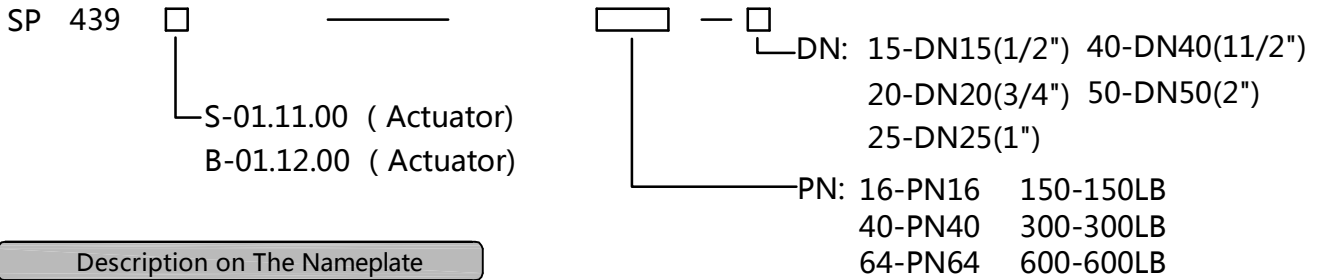
- The internal parts of the regulator are fixed with the compression of the bonnet, all internal parts can be removed after the removing of bonnet.



- When the diaphragm assembly of the actuator is installed again, its stroke should be about 13-15mm.



Mode Establishment



Description on The Nameplate

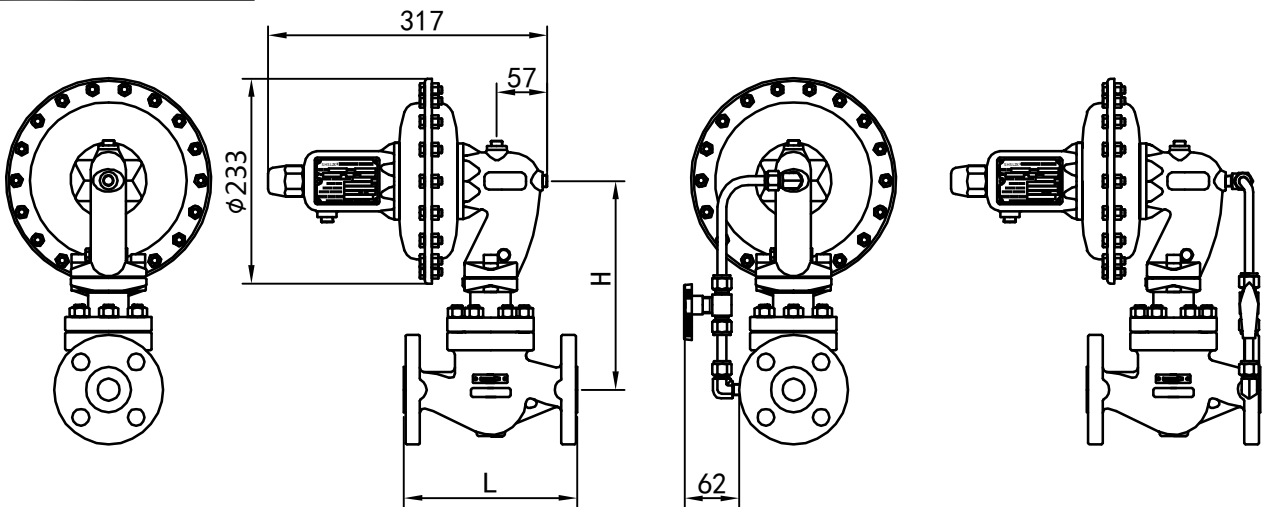
- Type
- Nominal Diameter
- Nominal Pressure
- Material of Body/Internal Parts
- Material of Diaphragm
- Regulation Range
- Maximun Pressure of Actuator
- Kv Value
- Operating Temperature
- Flange Standard
- Serial Number

Selection Criteria

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

Dimension

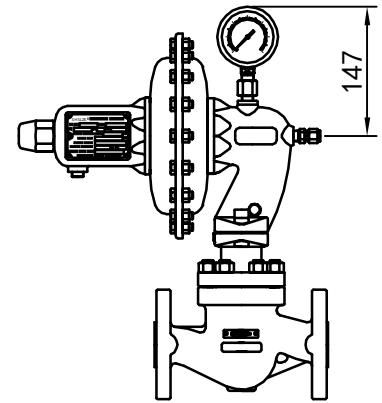
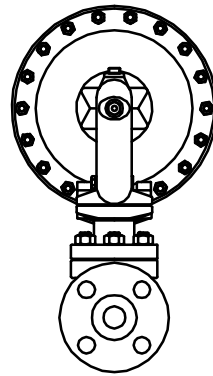
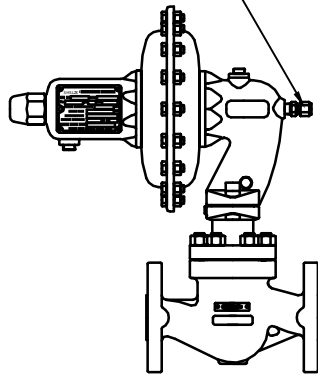
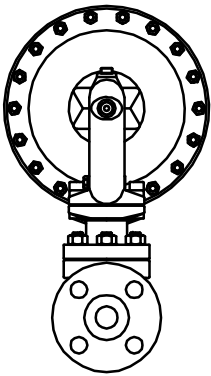
With The (02.11.00) Actuator



Measured From Internal

Measured From Flange

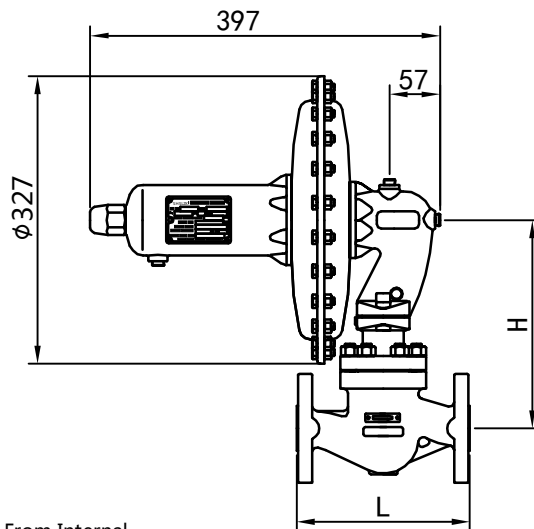
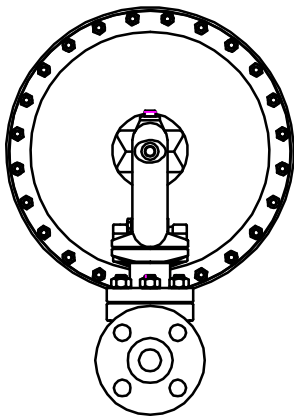
10mm Card Set of joint



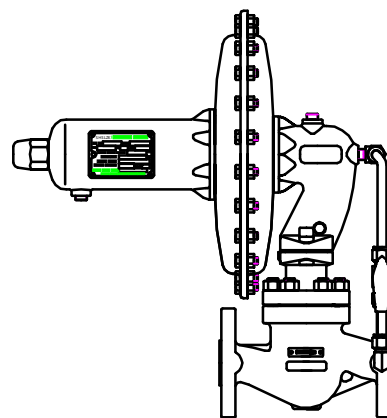
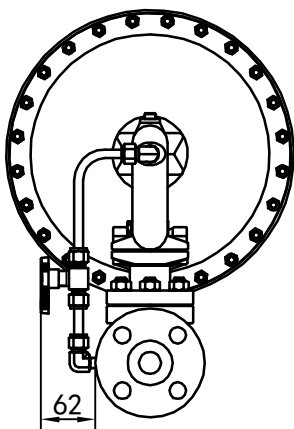
Measured From External

With the Pressure Gauge

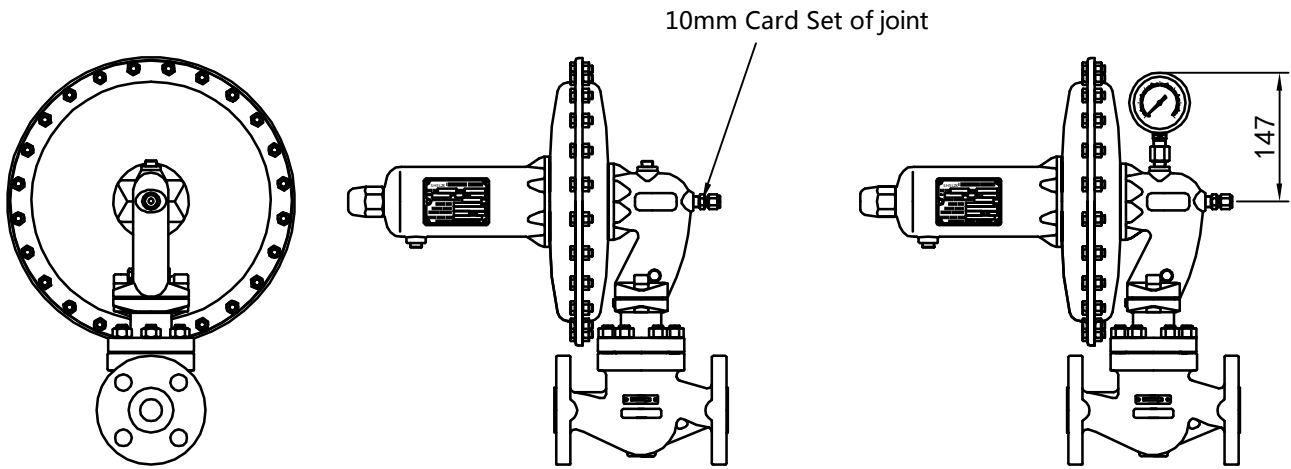
With the (02.12.00) Actuator



Measured From Internal



Measured From Flange

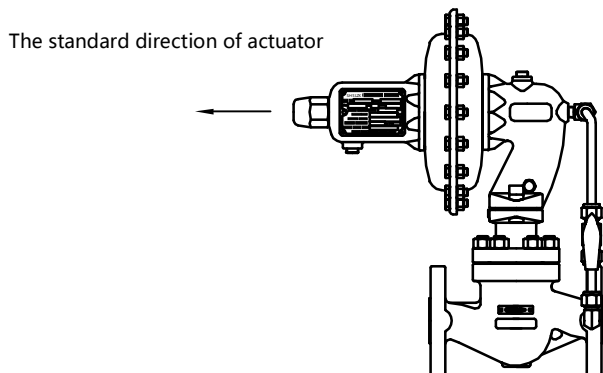


Measured From Outernal

With the Pressure Gauge

Nominal Diameter		DN15 1/2"	DN20 3/4"	DN25 1"	DN40 1 1/2"	DN50 2"
L	PN16(150lb)	181	181	184	222	254
	PN40(300lb)	181	194	197	235	267
	PN64(600lb)	206	206	210	251	286
H		227	227	237	246	256
Kg Weight 02.11.00/02.12.00	PN16(150lb)	11/14	12/15	13/16	18/21	21/24
	PN40(300lb)	11/14	12/15	13/16	18/21	21/24
Actuator	PN64(600lb)	12/15	15/18	17/20	22/25	25/28

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



When the measured point from flange should first determine the actuator position. Otherwise the actuator adjusted also need to install the pressure guiding pipe.

Experience Sharing

● Dowerstream Safety Device

As for micro-pressure regulating valve, 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 50%. 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.

● Generally the pressure regulating valve is used for tank blanketing with breathing valve. The exhaust pressure of the breathing valve should be at least 50% higher than the set pressure of the pressure regulating valve, so it is not easy to control disturbance. The nitrogen can be saved. The drainage of the breathing valve should be sum of the drainage capacity of the tank in feeding and temperature increase, maximum gas supply capacity of the pressure regulating valve and maximum gas supply capacity of the bypass(if the bypass is provided).

When the pressure regulating valve is used for tank blanketing, the measured point should be directly collected at the top and should not be collected from downstream pipeline. When no flow is available, the downstream system is an enclosed system, the pressure of different points are same. When the valve starts to charge the nitrogen, the pressure of the pipeline and tank top includes high deviation under dynamic condition. Even if the pressure control of the downstream pipeline is normal, the tank top has a negative pressure. For the system with a small flow, the pressure can be collected from pipeline, but you should carefully compute whether the flow of the downstream pipeline under pressure-relieved micro-pressure state meets the requirement of tank nitrogen blanketing. If the downstream pipeline has enough expanded diameter, the measured point can be collected from the pipeline, you should also compute the pipeline flow under micro-pressure state.

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

The detailed calculation of the flow coefficient 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%.

To identify the flow of the tank nitrogen blanketing, we should consider the maximum drainage capacity of the feed out pump and top gas shrinkage when the tank temperature reduce. Namely the pressure regulating valve has enough output flow to keep the micro positive pressure of the tank top in any case.

- Selection of Regulation Range

The regulation range selected must cover the process setting required. There will be a number of regulation ranges can be used for the same setting value. The ranges should be selected to make the setting value is at the middle or upper middle of the range. It is because that the theoretical deviation of every combination of spring and actuator is fixed, the deviation will be 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 and make direct contact with the diaphragm. Therefore, we should consider that whether there is any corrosion to the diaphragm 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.

Type SP439

Micro-pressure Blanketing Gas Regulating Valve

BENFLO AUTOMATION INC.

(Partner Of SaiLing Automation Equipment Co.,Ltd.)

Add.: North Ending of Zhennan Rd., Jianshe Town, Chongming District, Shanghai, CHINA

Tel: 0086.021.54478118

Cell-phone: 0086.18917033508

E-mail: Phil@benflo.com

E-mail: benfloautomation@gmail.com

Http:// www.benflo.com