



Self-Operated Pressure Regulator -ZPL600 Series

Installation And Operation Instruction

Self-Operated Pressure Regulator
-ZPL600 Series



ZPL630F(ZZYVP)

Product Overview

Self-operated pressure regulator requires no external energy supply. It utilizes the energy of the controlled medium itself as the power source, introducing it into the actuator to control the position of the valve plug, thereby changing the flow area, adjusting the pressure difference and flow rate at both ends, and ultimately stabilizing the upstream or downstream pressure at the set value.

Featuring advantages such as sensitive action, excellent sealing performance, and minimal pressure fluctuation, it's widely applied in automatic control systems for pressure reduction/stabilization or pressure relief/stabilization of gas, liquid, and steam media in various industrial equipment.

Types

Model ZPL610F (ZZYP, ZZYM): Self-operated Pressure Regulator

Model ZPL620F (ZZVP, ZZVM): Self-operated Micro-Pressure Regulator

Model ZPL630F (ZZYVP-BI): Pilot-Guided Pressure Regulator (Nitrogen Sealing Device)

Model ZFQ: Explosion-Proof Flame Arrestor Breathing Valve



Application and Features

The ZPL610 self-operated pressure regulating valve is an actuating product that operates automatically by utilizing the energy of the medium being regulated, without requiring any external power source. Its most notable feature is the ability to function in environments without electricity or compressed air, while also conserving energy. The pressure set point can be freely adjusted within a specified range.

The ZPL610 self-operated pressure regulating valve offers **three types of internal trim** configurations to meet various process requirements:

Single-seat self-operated pressure regulating valve

Sleeve-type self-operated pressure regulating valve

Double-seat self-operated pressure regulating valve

Three types of bonnet designs for different process conditions:

Standard (for general applications)

Extended bonnet (for wider pressure regulation ranges)

Heat-dissipating (for temperatures ranging from 350°C to 550°C)

Available with **three types of actuator** mechanisms:

Diaphragm (standard diaphragm and reinforced diaphragm); Piston; Metal diaphragm (0Cr18Ni9)

*Users can select the appropriate configuration based on operating conditions (pressure difference, temperature, medium state) and leakage requirements.

The ZPL610f self-operated pressure regulator employs a quick-opening flow characteristic, ensuring sensitive operation and high regulation accuracy (error $\leq 10\%$). With its compact design (compared to weight-loaded pressure reducing valves) and ease of adjustment, It is suitable for reducing and stabilizing pressure (for downstream regulation) or relieving and stabilizing pressure (for upstream regulation) of gases, liquids, and steam in diverse equipment.

Structure and Working Principle

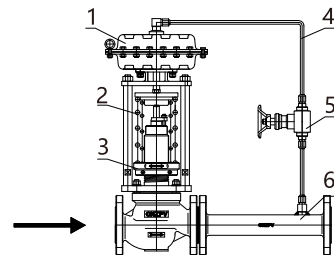
The ZPL610 self-operated pressure regulating valve consists of a sensing actuator, valve body, pressure tap tube, and upstream (or downstream) connection pipe. A condenser is included and must be installed upside down when in use.

For valves used to control downstream pressure, the valve action mode is pressure-closing type. Its working principle is as follows:

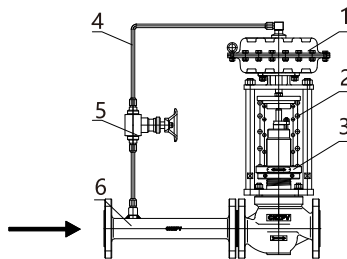
The medium flows into the valve body in the direction of the arrow, passes through the valve seat and valve plug for throttling, and then exits. Meanwhile, another branch of the medium is introduced via the pressure tap tube (a condenser is required when the medium is steam) into the actuator, acting on the diaphragm, causing the valve plug to move accordingly, thereby achieving pressure reduction and stabilization. If the downstream pressure increases, the force acting on the diaphragm increases, compressing the spring and moving the valve plug to reduce the valve opening until the downstream pressure drops to the set value. Similarly, if the downstream pressure decreases, the force acting on the diaphragm decreases, and the spring's reaction force moves the valve plug to increase the valve opening until the downstream pressure rises back to the set value.

For a pressure regulating valve used to control upstream pressure, the valve action mode is pressure-opening type. Its working principle is as follows:

The medium flows into the valve body in the direction of the arrow, passes through the valve seat and valve plug for throttling, and then exits. Meanwhile, another branch of the medium is introduced via the pressure tap tube (a condenser is required when the medium is steam) into the actuator, acting on the diaphragm, causing the valve plug to move accordingly, thereby achieving pressure relief and stabilization. If the upstream pressure increases, the force acting on the diaphragm increases, compressing the spring and moving the valve plug to increase the valve opening until the upstream pressure drops to the set value. Similarly, if the upstream pressure decreases, the force acting on the diaphragm decreases, and the spring's reaction force moves the valve plug to reduce the valve opening until the upstream pressure rises back to the set value. If the upstream pressure is lower than the set value, the valve remains fully closed.



ZPL610-16B (Downstream Pressure Control)

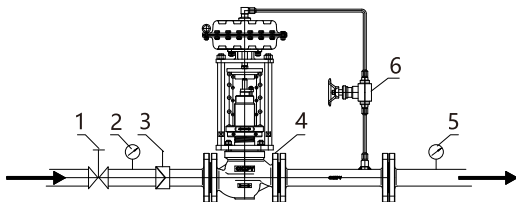


ZPL610-16K (Upstream Pressure Control)

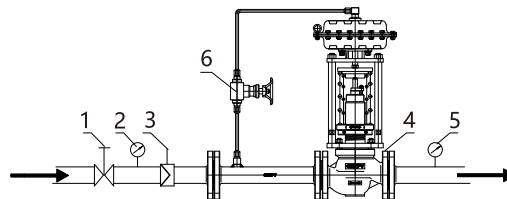
- 1.Actuator 2. Spring 3.Adjusting plate
4.Pressure tap tube 5. Needle valve 6.Connection pipe

Application Range:

When the ZPL610 self-operated pressure regulating valve is used with gas or low-viscosity liquid media, it is normally installed upright on a horizontal pipeline, and only when space constraints do not permit this should it be installed upside down or at an angle (and if the medium is confirmed to be very clean, component No. 3 may be omitted).



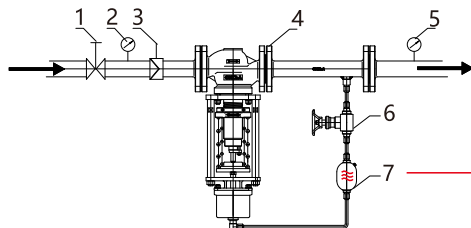
ZPL610-16B (Downstream Pressure Control)



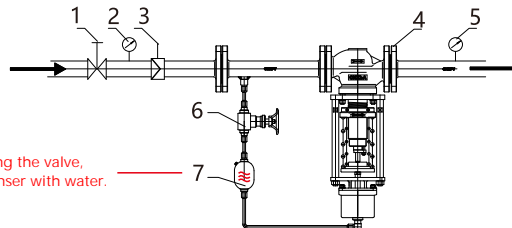
ZPL610-16K (Upstream Pressure Control)

1.Globe valve 2.Pressure gauge 3.Check valve 4.Pressure regulating valve 5.Pressure gauge 6.Needle valve

2.When the ZPL610 self-operated pressure regulator is used with steam or high-viscosity liquid media, it is normally installed upside down (inverted) on a horizontal pipeline.



ZPL610-16B (Downstream Pressure Control)



ZPL610-16K (Upstream Pressure Control)

Before using the valve,
fill the condenser with water.

1.Globe valve 2.pressure gauge 3.check valve 4.pressure regulating valve 5.pressure gauge 6. needle valve 7.condenser

Main Parts Material:

Name of parts	Materials	Name of parts	Materials
Body	ZG230-450、ZG0Cr18Ni9、ZG0Cr18Ni12Mo2	Spring	60Si2Mn
Bonnet	ZG230-450、ZG0Cr18Ni9、ZG0Cr18Ni12Mo2	Seal ring/gasket	Stainless Steel+Flexible Graphite
Core	1Cr18Ni9、0Cr18Ni12Mo2(bead welding)、PTFE	Packing	PTFE+Flexible Graphite
Seat	1Cr18Ni9、0Cr18Ni12Mo2 (bead welding)	Bellows Pipe	Stainless Steel
Valve Stem	1Cr18Ni9、0Cr18Ni12Mo2	Diaphragm	Nitrile、Fluorine、oil-resistant Rubber
Membrane cover	Q235、Q235 PTFE(Coating)	O-Ring	PTFE、Oil-resistance Rubber

Parameters & Indicators

Nominal Diameter(DN)	20	25	32	40	50	65	80	100	125	150	200	250	300
Rated CV Value	5	8	12.5	20	32	50	80	125	160	320	450	630	900
Rated Travel-Length	8		10		12	15	18	20	30	40	45	60	65

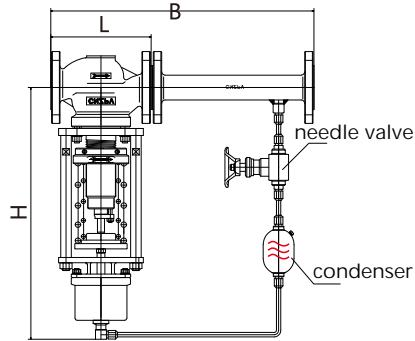
Nominal Diameter(DN)	20 (Or:G3/4)											
Seat's Diameter	2	3	4	5	6	7	8	9	10	12	15	20
Rated CV Value	0.02	0.08	0.12	0.20	0.32	0.50	0.80	1.20	1.80	2.80	4.0	5.0
Rated Travel-Length(mm)	8											

ZPL610(ZZYP) Self-Operated Pressure Regulator

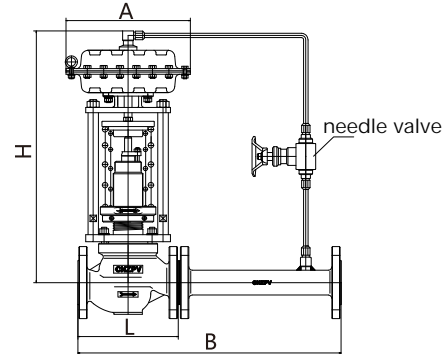
Nominal Diameter/DN(mm)	20	25	32	40	50	65	80	100	125	150	200	250	300
Nominal Pressure	Mpa	1.6, 2.5, 4.0, 6.4(6.3) / 2.0, 5.0, 11.0											
	Bar	16, 25, 40, 64(63)/20, 50, 110											
	Lb	ANSI: Class150、 Class300、 Class600											
Pressure Ranges (Kpa)	15~50、 40~80、 60~100、 80~140、 120~180、 160~220、 200~260、 240~300、 280~350、 330~400、 380~450、 430~500、 480~560、 540~620、 600~700、 680~800、 780~900、 880~1000、 900~1200、 1000~1500、 1200~1600、 1300~1800、 1500~2100、 (Other range require special design)												
Flow Characteristic	Quick-Opening												
Regulation Precision	±5-10(%)												
Working Temps	-60~350()						350~550()						
Leakage Level	Metal-Metal Seal: Grade IV, Soft-Seat: Grade VI (GB/T4213-92)												
Decompression Rate: 1.25 ~ 10													

Outer Size

Nominal Diameter(mm)		20	25	32	40	50	65	80	100	125	150	200	250	300
Flange Distance L(PN16.25.40)		150	160	180	200	230	290	310	350	400	480	600	730	850
Flange Distance L(PN64)		230		260		300	340	380	430	500	550	650	775	900
Connecting pipe Length(B)		383		512		603	862		1023	1380		1800	2000	2200
Pressure Ranges (Kpa)	15~140	H	475	520		540	710		780	840		880	940	950
		A	280	308										
	120~300	H	455	500		520	690		760	800		870	900	950
		A	230											
	280~500	H	450	490		510	680		750	790		860	890	940
		A	176				194		280					
	480~1000	H	445	480		670		740	780	780		850	880	930
		A	176				194			280				



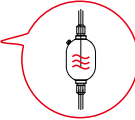
For steam or high viscosity liquid use



For gas or conventional liquid use

During installation, the following points should be noted:

- (1) The condenser should be positioned higher than the actuator of the pressure regulator and lower than the upstream and downstream piping connections. Before commissioning, the condenser should be filled with cold water, and thereafter refilled with water approximately once every three months.
- (2) The pressure tapping point should be located at an appropriate position relative to the regulator. For upstream pressure control, the tapping point should be at a distance greater than twice the pipe diameter; for downstream pressure control, the tapping point should be at a distance greater than six times the pipe diameter.
- (3) To facilitate on-site maintenance and operation, adequate space should be reserved around the pressure regulator. Stop valves (isolation valves) and a manual bypass valve should be installed upstream and downstream of the regulator.
- (4) When the nominal size of the pressure regulator is large (DN ≥ 100), a fixed support bracket should be provided.
- (5) If the medium is confirmed to be very clean, component No. 3 may be omitted from installation.
- (6) The self-operated regulator may be smaller in size than the pipeline diameter; however, this does not apply to the strainer (filter) and the stop valve (isolation valve).



Maintenance

The self-operated pressure regulator has been factory-set to the specified setpoint. However, if the user wishes to change the setpoint, or if the actual indicated value deviates from the setpoint for any reason, the adjustment rod can be used to rotate Component No. 7 (adjustment dial). Rotating clockwise decreases the pressure, while rotating counterclockwise increases the pressure. Adjust the pressure level according to the nameplate instructions on the product's adjustment dial.



ZPL620(ZZVP)Self-Operated Micro-Pressure Regulator

Applications & Features

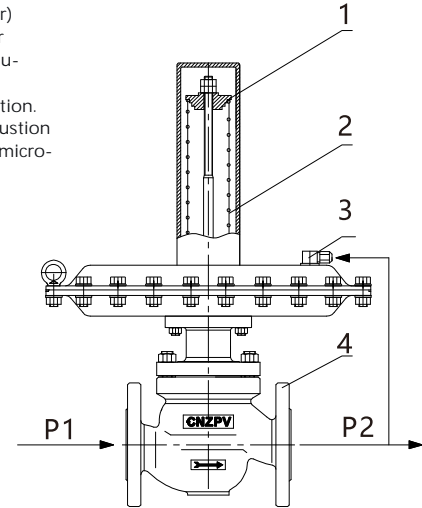
The ZPL620 Self-Operated Micro-Pressure Regulator (hereinafter referred to as the pressure regulator) requires no external energy source. It utilizes the energy of the controlled medium itself as the power source to achieve automatic regulation. This product features a quick-opening flow characteristic regulation mechanism with a single-seat valve. It offers stable medium pressure, high control accuracy, safe and reliable sealing performance, and allows the setpoint to be adjusted arbitrarily during operation. Therefore, it is suitable for various applications such as fuel gas regulation in industrial furnace combustion systems, petroleum work-in-progress, protective gas (nitrogen blanketing) for oil storage tanks, and micro-pressure automatic regulation of heat treatment protective gases.

- 1.No external driving energy required – Low equipment cost.
- 2.Packingless, frictionless moving components – Sensitive regulation and high control accuracy.
- 3.Adjustable setpoint with wide range – Facilitates continuous user adjustment.
- 4.Simple piping – Easy installation.

Operating Principle

Type B (Back-pressure regulating-downstream pressure control):The self-operated micro-pressure regulator (Type B) controls the downstream pressure, with the initial valve plug position in the open state. The upstream pressure P1 is reduced to downstream pressure P2 through the throttling effect of the valve plug and seat. P2 is then transmitted via the impulse line to the detecting head (diaphragm chamber), where it acts on the diaphragm. When the force generated by P2 balances the opposing spring force, the position of the valve plug determines the valve opening, thereby controlling the downstream pressure.

Type K (Pressure-reducing regulating-upstream pressure control):The self-operated micro-pressure regulator (Type K) controls the upstream pressure, with the initial valve plug position in the closed state. The upstream pressure P1 is reduced to downstream pressure P2 through the throttling effect of the valve plug and seat. Simultaneously, P1 is transmitted via the impulse line to the detecting head (diaphragm chamber), where it acts on the diaphragm. When the force generated by P1 balances the opposing spring force, the position of the valve plug determines the valve opening, thereby controlling the upstream pressure.



- 1.Pressure adjusting nut
- 2.Pressure setting spring
- 3.Detecting head (diaphragm chamber)
- 4.Valve body

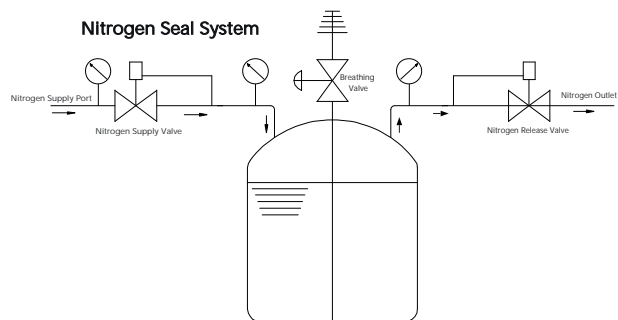
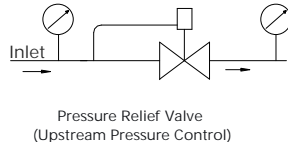
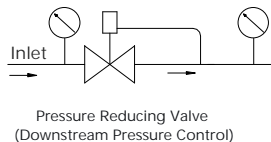
Main Parts&Materials

Part's Name	Materials
Body	ZG230-450、ZG0Cr18Ni9、ZG0Cr18Ni12Mo2
Bonnet	ZG230-450、ZG0Cr18Ni9、ZG0Cr18Ni12Mo2
Plug	1Cr18Ni9、0Cr18Ni12Mo2(Stellite)、PTFE
Seat	1Cr18Ni9、0Cr18Ni12Mo2(Stellite)
Stem	1Cr18Ni9、0Cr18Ni12Mo2
Actuator Cover	Q235、Q235 Coating with PTFE

Part's Name	Materials
Spring	60Si2Mn
Gasket	Stainless steel + flexible graphite
Packing	PTFE / flexible graphite
Bellows	Stainless Steel
Diaphragm	NBR /EPDM/FKM/oil-resistant rubber
O-Ring	Oil-resistant rubber / PTFE

Scope of Application

Control Principle

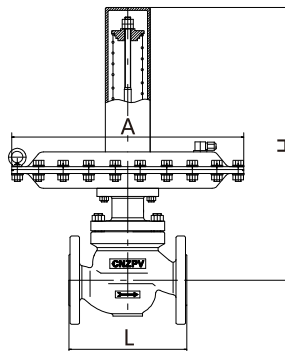


Main Technical Parameters and Performance Specifications

Nominal Diameter DN (mm)	20		25	32	40	50	65	80	100	125	150	
Seat Diameter D (mm)	6	15	20	25	32	40	50	65	80	100	125	150
Rated Flow Coefficient Kv	0.32	4	5	8	12.5	20	32	50	80	125	160	320
Pressure Adjustment Range (kPa)	The pressure adjustment range is selectable within 0.5 ~ 100 kPa.											
Nominal Pressure PN (MPa)	1.0 1.6											
Controlled Medium Temperature (°C)	-40~80											
Flow Characteristic	Quick Opening											
Regulation Error (%)	±5											
Allowable Pressure Drop (MPa)	1.61.61.10.40.6											
Effective Diaphragm Area of Actuator (cm ²)	600											
Leakage Rate	Metal seat: Leakage Class IV (10-4× Kv);Soft seat: Zero leakage (Bubble-tight)											

Overall Dimensions (Subject to Actual Product)

DN	PN16		
	L	A	H
20	150	394	500
25	160	394	500
32	180	394	520
40	200	394	530
50	230	394	540
65	290	394	650
80	310	394	670
100	350	394	700
125	400	394	750
150	480	394	800



Installation, Application and Precautions

1. Before installation, the pipeline shall be cleaned. A sufficient length of straight pipe shall be provided at the valve inlet, and a strainer (filter) shall be installed.
2. The valve shall be installed upright and vertically on a horizontal pipeline. Inclined installation should be avoided as far as possible.
3. To ensure continuous production during maintenance or in the event of valve failure, a bypass line may be provided.
4. The pressure has been factory-adjusted to the setpoint. If a different setpoint is required, adjust the top adjusting nut.
5. For standard factory-supplied pressure regulators, the ambient temperature shall not exceed $-25^{\circ}\text{C} \sim +55^{\circ}\text{C}$. (Special requirements must be advised before ordering.)
6. When adjusting the pressure: Remove the top cover of the micro-pressure regulator. Adjust the spring until the upstream or downstream pressure meets the on-site operating requirements. Reinstall the spring cover to protect against dust and moisture ingress.

Maintenance

The self-operated micro-pressure regulator requires no special maintenance. However, the valve plug, valve seat, and moving parts of the hard core should be cleaned periodically to remove any adhered deposits. Replacement of the valve plug, diaphragm, or other worn components may also be carried out as necessary.



Applications & Features

The ZPL630 pilot-operated self-operated pressure regulator requires no external energy, using the controlled medium itself as the power source for automatic regulation. With a single-seat quick-opening valve, it offers stable pressure, high accuracy, reliable sealing, and adjustable setpoint during operation. It is ideal for fuel gas regulation in industrial furnaces, petroleum processing, nitrogen blanketing for oil storage tanks, and micro-pressure control of heat treatment protective gases.

- 1.No external driving energy required-Low equipment cost.
- 2.Packingless, frictionless moving components-Sensitive regulation and high control accuracy.
- 3.Adjustable setpoint with wide range-Facilitates continuous user adjustment.
- 4.Extremely high pressure reduction ratio-For example, 0.8 MPa upstream pressure to 50 Pa downstream pressure, achieving a pressure differential ratio of 1,600.

Structure and Working Principle

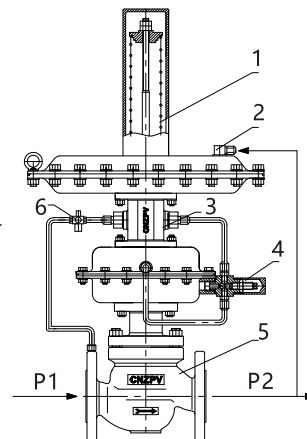
For the pilot-operated self-operated pressure regulator, the initial position of the main valve plug is in the closed state, while the initial position of the pilot valve plug is in the fully open position.

The upstream pressure P1 is throttled through the main valve plug and seat, becoming the downstream pressure P2. At the same time, P1 is also throttled through the pilot valve plug and then directed into the upper and lower diaphragm chambers of the main valve.

The gas intake to the lower diaphragm chamber is regulated via the needle valve on the main valve, creating a pressure differential between the upper and lower diaphragm chambers.

This differential pressure drives the main valve plug to open.

The downstream pressure P2 is transmitted through the impulse line to the lower diaphragm chamber of the pilot valve, where it acts on the diaphragm. When the force generated by P2 balances the opposing spring force, the position of the pilot valve plug determines the opening of the pilot valve. This, in turn, controls the pressure differential between the upper and lower diaphragm chambers of the main valve, ultimately determining the position of the main valve plug and thereby regulating the pressure.



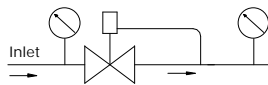
1. Pressure setting spring
2. Pilot actuator
3. Pilot valve
4. Needle valve
5. Main valve
6. Air filter regulator

Main Parts&Materials

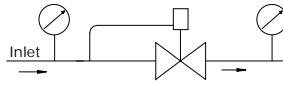
Part's Name	Materials
Body	ZG230-450、ZG0Cr18Ni9、ZG0Cr18Ni12Mo2
Plug	1Cr18Ni9、0Cr18Ni12Mo2(Stellite)、PTFE
Seat	1Cr18Ni9、0Cr18Ni12Mo2(Stellite)
Stem	1Cr18Ni9、0Cr18Ni12Mo2
Actuator Cover	Q235、Q235 Coating With PTFE
Spring	60Si2Mn
Gasket	Stainless steel + flexible graphite
Packing	PTFE / flexible graphite
Bellows	Stainless Steel
Diaphragm	NBR /EPDM/FKM/oil-resistant rubber
O-Ring	Oil-resistant rubber / PTFE

Scope of Application

Control Principle



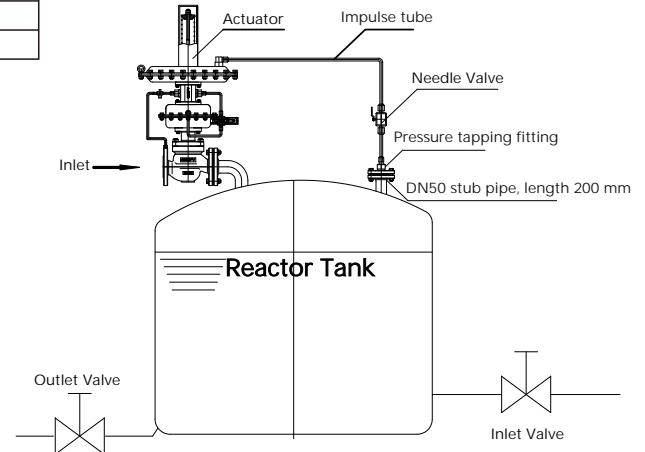
Pressure Reducing Valve
(Downstream Pressure Control)



Pressure Relief Valve
(Upstream Pressure Control)

Tank Installation Diagram&Instructions:

Based on the length of the impulse line provided by our company, open a hole on the tank and weld a DN50 stub pipe (length: 200 mm). Then open a 15 hole on the flange cover, weld on a pressure tapping connection, and tighten the ferrule-type fitting. For convenient maintenance, install a manual ball valve between the self-operated regulator and the tank.

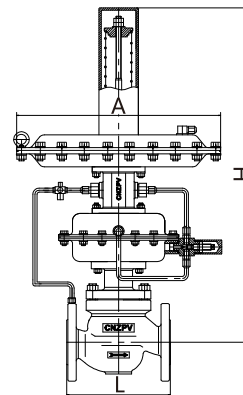


Main Technical Parameters and Performance Specifications

Nominal Diameter DN(mm)	20		25	32	40	50	65	80	100	125	150	
Seat Diameter D(mm)	6	15	20	25	32	40	50	65	80	100	125	150
Rated Flow Coefficient Kv	0.32	4	5	8	12.5	20	32	50	80	125	160	320
Pressure Adjustment Range(kPa)	The pressure adjustment range is selectable within 0.5 ~ 100 kPa											
Nominal Pressure PN(MPa)	1.0 1.6											
Controlled Medium Temperature()	-40~80											
Flow Characteristic	Quick Opening											
Regulation Error(%)	±5											
Allowable Pressure Drop(MPa)	1.6			1.6		1.1		0.4		0.6		
Effective Diaphragm Area of Actuator(cm²)	200			280			400					
Leakage Rate	Metal seat:Leakage Class IV(10-4 × Kv); Soft seat:Zero Leakage(Bubble-Tight)											

Overall Dimensions (Subject to Actual Product)

DN	PN16		
	L	A	H
20	150	394	715
25	160	394	715
32	180	394	735
40	200	394	755
50	230	394	755
65	290	394	795
80	310	394	795
100	350	394	825
125	400	394	1105
150	480	394	1105



Installation, Application, and Precautions for Self-Operated Pressure Regulators

1. Before installation, the pipeline shall be cleaned, and a sufficient length of straight pipe shall be provided at the valve inlet, along with a strainer.
2. The valve shall be installed upright and vertically on a horizontal pipeline; inclined installation should be avoided whenever possible.
3. To ensure continuous production during maintenance or in the event of a valve failure, a bypass line may be installed.
4. The pressure has been preset to the required value at the factory. To change the setpoint, adjust the top adjusting nut.
5. For standard factory-supplied pressure regulators, the ambient temperature shall not exceed -25°C to 55°C (special requirements must be specified when ordering).
6. For self-operated pressure regulators with a pilot valve, the needle valve has been optimally adjusted at the factory. Do not alter this adjustment.

Maintenance

1. Self-operated pressure regulators with a pilot valve require no special maintenance. However, the valve plug, valve seat, and moving parts of the hard core shall be cleaned periodically to remove adhered deposits, or replace the valve plug, diaphragm, etc.
2. When performing pipeline pressure test on a system with a self-operated regulator, the regulator shall be removed and replaced with a spool piece (short connection), or a bypass line shall be provided. Block valves shall be installed upstream and downstream of the self-operated regulator to prevent the medium from entering the regulator from either side. At the same time, a valve shall be installed on the bypass line. After the pressure test is completed, vent the pressure from the pipeline, close the bypass valve, and then reopen the upstream and downstream block valves of the self-operated regulator.
3. If the self-operated regulator is equipped with a bypass line, care shall be taken to keep the bypass valve closed to prevent the medium from flowing straight through the bypass, which may cause safety hazards to the equipment.