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## **MIL 10R-21R Series** - Direct Operated Pressure Regulators





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## Introduction

The Models 10R and 21R self acting pressure regulating valves are designed to handle a wide variety of process pressure control applications. Construction features have been carefully selected to provide optimum performance.

## Features

### Heavy Guiding

A well accepted industry standards of shank or top and bottom guiding to provide adequate support against side loads.

### High Capacity with Low Recovery

Flow capacity is at top levels for contemporary valves and is attained with very little pressure recovery as indicated by a high critical flow factor.

### Reduced Capacity Trim

Option for reduced capacity is available giving a substantial reduction in capacity while maintaining desirable flow characteristics.



## High Performance Materials

Materials of construction have been selected for high performance and long life when handling the pressure drop capabilities of the valve.

## Configurations

The 10R - 21R Series valves are designed for use with the direct acting spring diaphragm actuators for reducing back pressure and differential pressure applications.

# Typical Applications

Self actuating valves are pressure regulators which control the pressure of the flowing liquids and gases, without any external signal from any controller. These valves are preferred over control valves because to it is low cost, independence of external power source, absence of accessories like positioners and any feedback linkages. On the other hand, they have limitations in relation to control valves in terms of accuracy, which limits its use to non critical applications. The fluid flowing through the valve has to be checked for material compatibility and for temperature limitations of the diaphragm and associated wetted parts in the actuators.

The self regulating valves are broadly classified into:

### Upstream Pressure control

Upstream regulating valve is normally termed as “Back Pressure Regulators” or “Pressure Relief Valve” which control fluid pressure at the upstream at set pressure throughout the flow range within specified built up pressure. External pressure sensing line is connected to the actuator from the upstream pipe at a specified straight run from the regulator flange. They are commonly used in industry to regulate pressure of industrial equipments, tanks etc.

### Downstream Pressure control

Downstream pressure regulating valve is also termed as “Pressure Reducing Valve” which control fluid pressure downstream at a set pressure throughout the flow range within specified droop. External pressure sensing line is connected to the actuator from the downstream pipe at a specified straight run from the regulator flange. They

have several commercial and residential uses. Typical applications include industrial, commercial, gas pipe line, gas skids, tanks, instrument air etc.

10R - 21R series regulators are direct operated valves, which is simple in construction & easy to maintain. These valves also have comparison to pilot operated regulators as both use external pressure sensing to control the pressure.

Typical applications of self regulating valves in industry are;

### Air

Industrial air has many uses such as cooling and as a power source for pneumatic tools, sprayers, conveyors etc. This air runs from a compressor throughout the plant. Instrument air comes from a common airline or there maybe separate airlines throughout the plant. Pressure reducing valves are used to maintain air pressure to specific application limits.

### Steam

Steam has a wide variety of applications in process industries, power plants, oil refineries, chemical production, etc. To minimize piping cost, steam is generated and distributed at higher pressures than required by the process load. Pressure reducing regulators are utilized in these applications to reduce the steam pressure to usable levels.

### Tank Blanketing

It is the process of covering the surface of a stored commodity, which is volatile or toxic, with an inert gas for safety tank. Pressure relief valves are used to vent the excessive blanketing pressure, which can originate from ambient temperature or volume increase. Downstream pressure regulators shall be used to control the pressure of the blanketing gas, which is normally Nitrogen and supplied at a higher pressure which is reduced to a specific blanketing pressure required by the user.

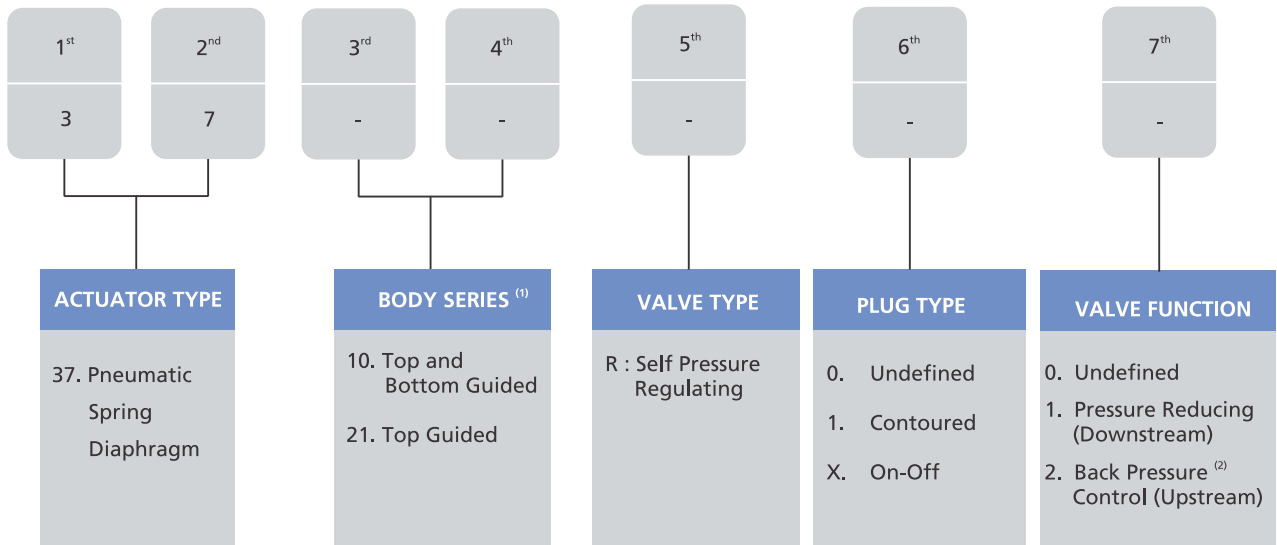
### Other applications

Other applications of self regulating valves include liquids, process gases and fuel gas services. Fuel gas is used for many residential, commercial and industrial applications. For corrosive media, special consideration must be given while selecting a regulator and all the parts must be compatible with the fluid.



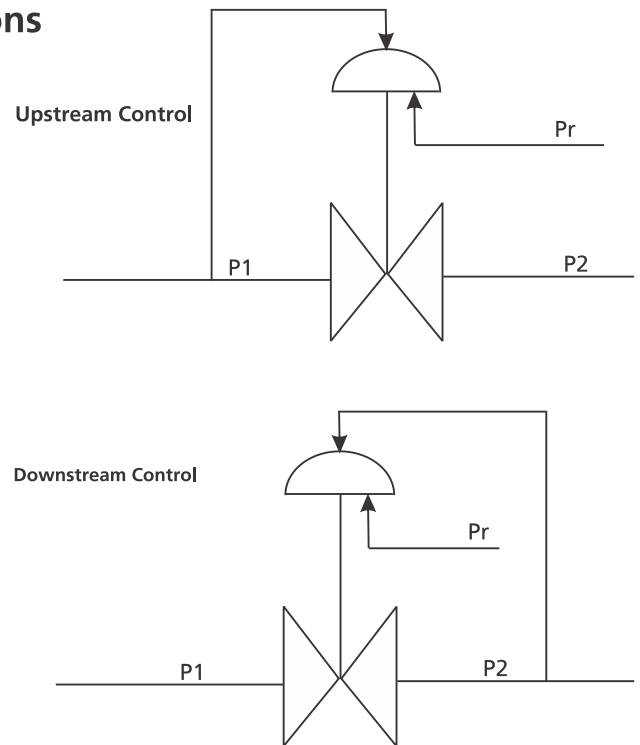
## Technical Information

### Model Decodification



### Standard Sizes / Ratings / End Connections

VALVE SIZE (inch)	RATING (ASME CLASS)	
	150# & 300#	600#
0.75	F	F S T
1	F	F S T
1.5	F	F S T
2	F	F S T
2.5 <sup>(2)</sup>	F	F B
3 <sup>(2)</sup>	F	F B
4 <sup>(2)</sup>	F	F B



F: Flanged (RF, RTJ, FF) B: Butt Weld S: Socket Weld T: Threaded

<sup>(1)</sup> Former models 525, 526 & 535-H recodified as 10R 01, 10R 02 & 21R 01 respectively in view of similarity with MIL 10000 & MIL 21000 series in construction and design features.

<sup>(2)</sup> For valve model 10 R only



## General Data

BODY	
Type	: Globe
Recommended Flow direction	: 10R - Flow passing into the seats 21R - Flow to open

GLAND SEAL	
Type	: Adjustable packing box with PTFE or Graphite moulded split rings
Temperature Range	: <ul style="list-style-type: none"> <li>• <math>\leq 180\text{ }^{\circ}\text{C}</math> : PTFE,</li> <li>• <math>&gt; 180\text{ }^{\circ}\text{C}</math> : Graphite</li> </ul>

BONNET	
Type	: Stud bolted
Temperature range	: $-73\text{ }^{\circ}\text{C}$ to $203\text{ }^{\circ}\text{C}$

TRIM	
Plug Type	: Unbalanced contoured
Option	: <ul style="list-style-type: none"> <li>• Disc type</li> <li>• Plug with PTFE insert for Class VI leakage (<math>C_v &gt; 6</math>)</li> </ul>
Seat Type	: Threaded metal or Soft seat
Option	: Seat ring with Carbon Filled PTFE insert for Class VI leakage ( $C_v \leq 6$ )
Guiding	: 10R - Double Seat top and bottom guided 21R - Top guided
Characteristics	: On-Off

## 10 R - Flow Coefficients (Rated Cv)

Critical Flow Factor ( $C_c$  of  $F_D$ ): 0.9 (full area) & 0.95 (reduced area)

Trim Size	SIZE (inch)						
	0.75	1	1.5	2	2.5	3	4
Full Area	6	9	21	36	54	75	125
Reduced Area	2.4	3.6	8.4	14.4	21.6	30	50

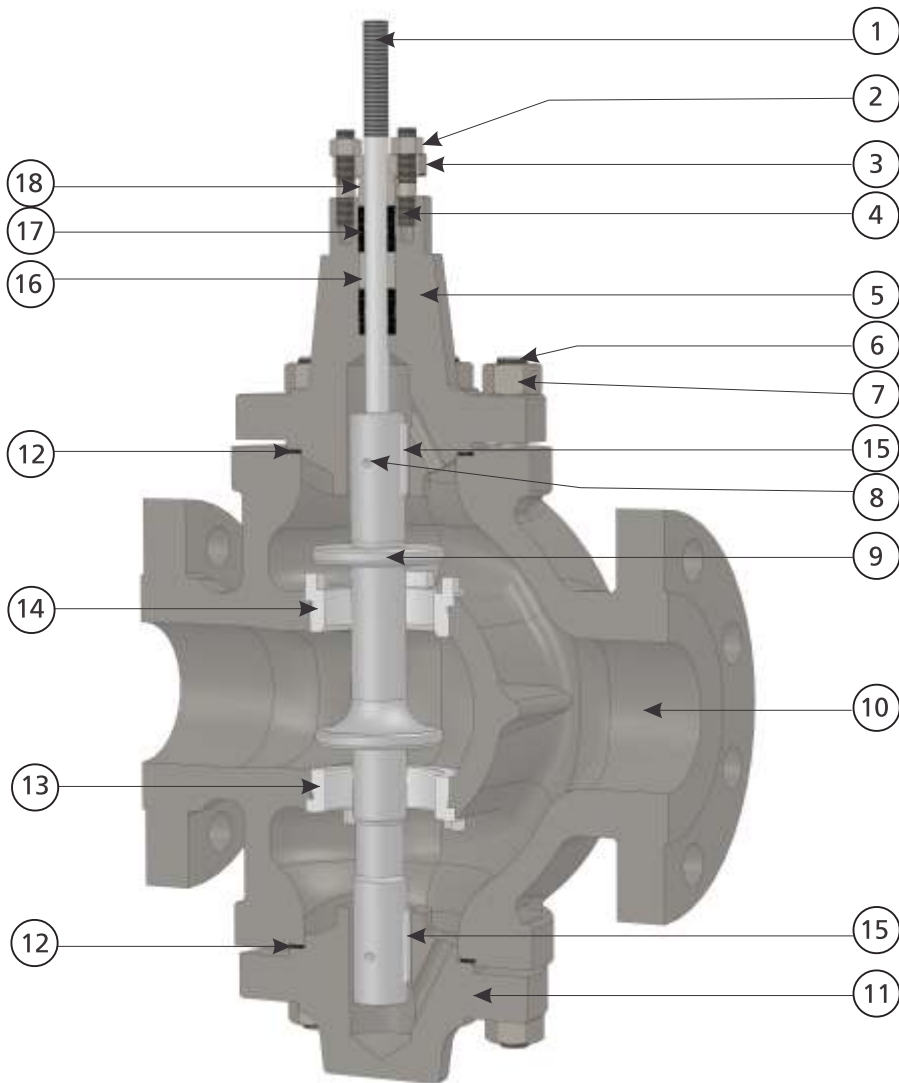
## 21 R - Flow Coefficients (Rated Cv)

Critical Flow Factor ( $C_c$  of  $F_D$ ): 0.90

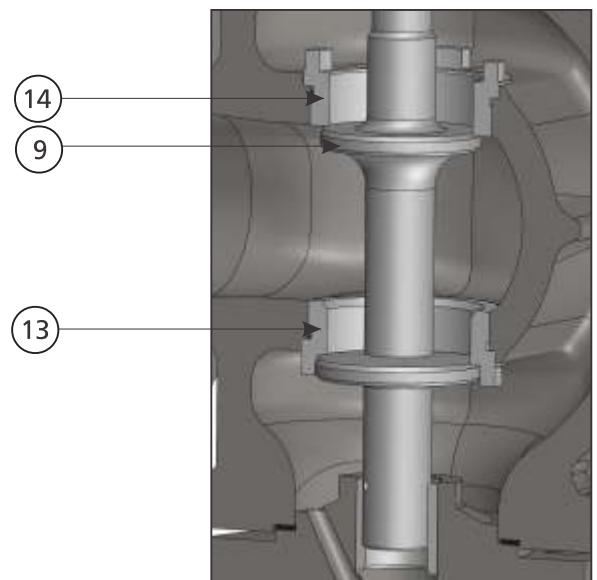
VALVE SIZE (inch)	RATED Cv					
	0.250	0.375	0.500	0.810	1.250	1.625
0.75 & 1	1.7	3.7	6	10.5		
1.5	1.7	3.7	6	10.5	28	35
2	1.7	3.7	6	10.5	30	40



## Construction



**MIL 10 R 01 Pressure Reducing  
Construction (Up Seating)**



**MIL 10 R 02 Back Pressure Control  
Construction (Down Seating)**



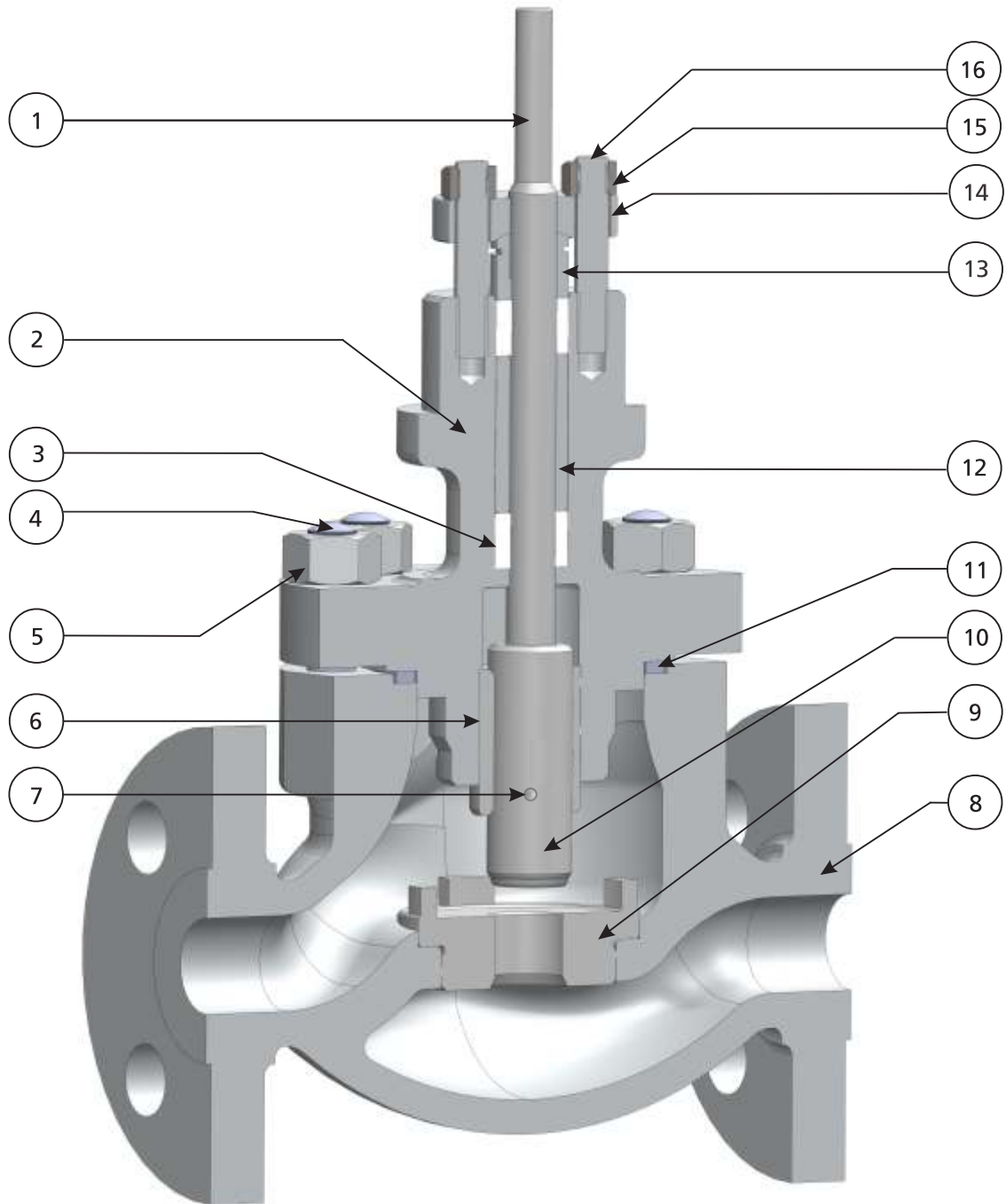
## Material of Construction

DRAWING Ref No.	PART NAME	STANDARD MATERIAL*
1	Plug Stem	316 SST
2	Packing Flange Nut	ASTM A 194 Gr 8
3	Packing Flange	ASTM A 105
4	Packing Flange Stud	ASTM A193 Gr B8
5,10	Bonnet, Body	Carbon Steel : ASTM A216 Gr WCC
		Alloy Steel : ASTM A 217 Gr. WC6 / WC9
		Stainless Steel : ASTM A351 Gr CF8M
6	Body Stud	ASTM A194 Gr. 2H
7	Body Nut	ASTM A193 Gr. B7
8	Plug Pin	316 SST
9	Plug	316 / 316 SST Stellited
11	Blind Flange	Carbon Steel : ASTM A216 Gr WCC
		Alloy Steel : ASTM A 217 Gr. WC6 / WC9
		Stainless Steel : ASTM A351 Gr CF8M
12	Body Gasket	316L SST + Graphite
13	Lower Seat Ring	316 SST/ 316 SST Stellited
14	Upper Seat Ring	316 SST/ 316 SST Stellited
15	Guide Bush	440OC SST Heat Treated/ 316 SST Stellited
16	Packing Spacer	304 SST
17	Packing	PTFE $\leq 180^{\circ}\text{C}$ / Graphite $>180^{\circ}\text{C}$
18	Packing Follower	304 SST

\*Material indicated above are for reference only. MIL reserves the right to supply alternate material / forms due to constant product upgradation. Other specific material are available on request.



# Construction



MIL 21R 01 Pressure Reducing Construction





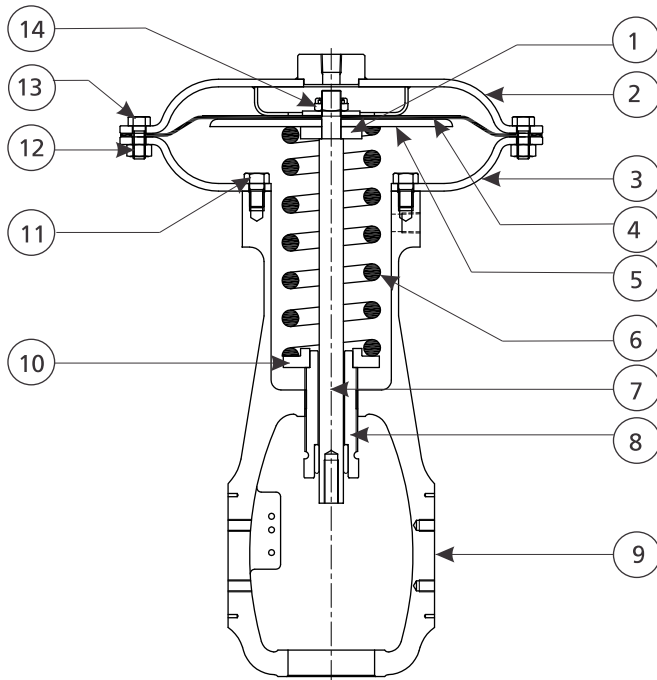
## Material of Construction

DRAWING REF No.	PART NAME	STANDARD MATERIAL*
1	Valve Plug Stem	316 SST
		17.4 PH SST H 1075
		Super Alloy (ASTM A 638 Gr. 660)
2,8	Bonnet, Body	Carbon Steel : ASTM A 216 Gr. WCC
		Alloy Steel : ASTM A 217 Gr. WC6
		Alloy Steel : ASTM A 217 Gr. WC9 / C5
		Stainless Steel : ASTM A 351 Gr. CF8 / CF8M / CF3 / CF3M
3	Gland Packing	PTFE ≤180 °C
		Graphite >180 °C
4	Body Stud	ASTM A 193 Gr. B7
5	Body Nut	ASTM A 194 Gr. 2H
6	Guide Bush	440 C SST Heat Treated
		316 SST Stellite
7	Plug Pin	316 SST
9	Seat Ring	410 SST / 316 SST
10	Valve Plug	410 SST
		316 SST
		316 SST Stellite No.6
		17.4 PH SST H 900
		ASTM A 743 Gr. CA6NM, Nitrided
11	Body Gasket	316L SST + Graphite
12	Packing Spacer / Lantern Ring	304 SST
13	Packing Follower	304 SST
14	Packing Flange	ASTM A 105
15	Packing Flange Nut	ASTM A 194 Gr. 8
16	Packing Flange Stud	ASTM A 193 Gr. B8

\* : Material indicated above are for reference only. MIL reserves the right to supply alternate material / forms due to constant product upgradation. Other specific material are available on request.



## Construction (Actuator)

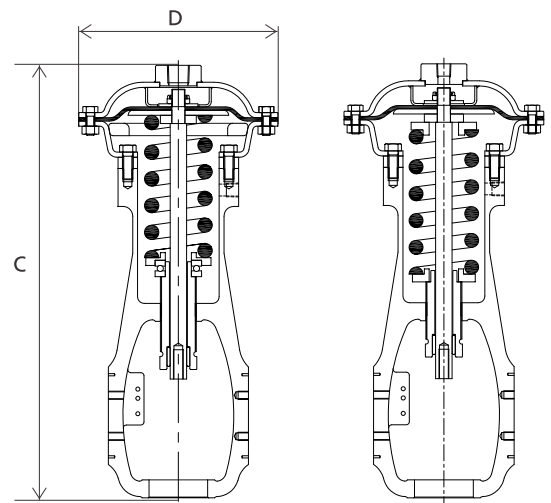


Case 9

REF NO	PART NAME
1	Spring guide (upper spring seat)
2	Diaphragm case (upper)
3	Diaphragm case (lower)
4	Diaphragm
5	Diaphragm plate
6	Actuator Spring
7	Actuator Stem
8	Spring adjuster
9	Yoke
10	Spring button (lower spring seat)
11	Cap Screw
12	Nut (diaphragm case)
13	Cap Screw (diaphragm case)
14	Nut (actuator stem)

### SIZING / INSTALLATION TIPS

- Over sizing of regulators to be avoided and select the nearest possible Cv.
- At lower set pressure (below 1 psig) these valves have high accuracy in control (+1%). At higher set pressure upto 250 psig typical accuracy ranges around 10%.
- In case of downstream pressure regulator, droop is the reduction of outlet pressure below the set point experience by pressure reducing regulators as the flow rate increases. It is stated as a percent, in inches of water column (mbar) or in pounds per square inch (bar) and indicate the difference between the outlet pressure setting made at low flow rates and the actual outlet pressure at the published maximum flow rate. Droop is also called offset or proportional band.
- In case of upstream pressure regulator, built up pressure is the increase of pressure over the set point as flow increases which is normally expressed in percentage.
- Set point adjustments to be made with the valve passing at least 5% of normal operating flows.
- Pressure regulator is not a safety device. Over pressure protection / safety valves / devices to be provided in addition to the pressure regulators for protection of the equipments.
- External sensing lines shall be tapped at minimum recommended straight run from the regulator flange. Tapping external sensing point close to flanges and bend / elbow etc are not recommended as there could be fluid turbulence and this may cause hunting and pressure fluctuations.
- Valves are normally mounted inverted to minimize accumulation of condensates in diaphragm area.



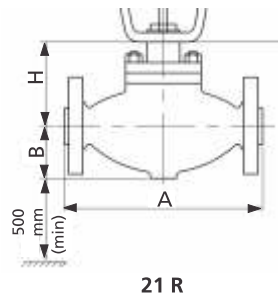
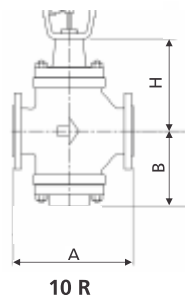
Case 3.5 & 4

Case 5

Actuator Case	Spring Range (psig)	Max. Static Pressure (psig)	C (mm)	D (mm)
3.5	80 - 250	250	425	195
4	60 - 125	250	425	195
5	3 - 12 10 - 35 30 - 75	250	425	195
9	0.5 - 3 2 - 10 6 - 20 15 - 40	60	425	280



## Dimensions and Weights



BODY SERIES	VALVE SIZE (inch)	A(mm)							B (mm)	H (mm)	WEIGHT (Kg)
		ASME 150# FLANGED		ASME 300# FLANGED		ASME 600# FLANGED		ASME 150 to 600# BW, SW & Threaded			
		RF	RTJ	RF	RTJ	RF	RTJ				
10 R*	0.75	184	190	193	206	206	206	152	114	145	36
	1	184	196	196	209	209	209	152	114	145	38
	1.5	222	235	235	248	259	259	203	137	152	49
	2	254	266	266	282	284	300	235	152	182	72
	2.5	276	280	292	296	311	314	276	162	195	78
	3	298	311	317	333	337	340	337	198	233	115
	4	353	365	368	384	394	397	394	206	240	140
21 R*	0.75	184	195	194	206	206	206	209	51	127	18
	1	184	197	197	209	209	209	209	51	14	18
	1.5	223	235	235	248	251	251	251	64	140	24
	2	254	267	267	283	286	289	286	76	140	29

\*- Approximate dimensions and weights furnished are for reference only

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