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T208VR Series Vacuum Regulator

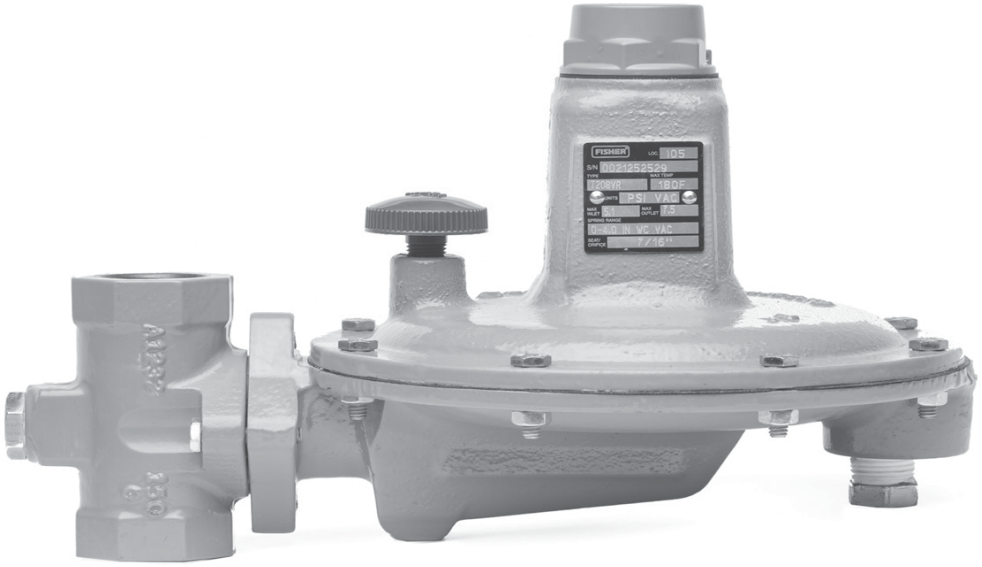


Figure 1. *Typical T208VR Series Vacuum Regulator*

Introduction

The T208VR Series direct-operated vacuum regulators are used where a decrease in vacuum must be limited, such as between a tank and vacuum source to control vacuum in tank. The Type T208VR has internal pressure registration. The Type T208VRM has a control line connection and blocked throat for external pressure registration.

Features

- **Tamper Resistant Adjustment**—Closing cap and spring case on many types allow installation of sealing wire to discourage or detect unauthorized adjustment of pressure setting.
- **Precision Control of Low Pressure Settings**—Large diaphragm area provides more accurate control at low pressure settings.
- **Easy Conversion**—The T208VR Series Vacuum Regulators are easily adapted between external and internal registration.
- **Common Spare Parts**—The Types T208VR and T208VRM share common spare parts with other T208 Series products.
- **Corrosion Resistance**—Constructions are available in a variety of materials for compatibility with corrosive process gases.

Specifications

This section lists the specifications of the T208VR Series Vacuum Regulator. Factory specification, such as maximum temperature, maximum inlet and outlet pressures, spring range and seat or orifice size are stamped on the nameplate fastened on the regulator at the factory.

Available Configurations

Type T208VR: Direct-operated vacuum regulator with internal pressure registration

Type T208VRM: Direct-operated vacuum regulator with blocked throat and control line connection for external pressure registration

Body Sizes and End Connection Styles(1)

BODY SIZE		BODY MATERIAL	END CONNECTION STYLE
NPS	DN		
3/4 or 1	20 or 25	Gray cast iron	NPT
		WCC Carbon steel, LCC Carbon steel or CF8M/CF3M Stainless steel	NPT or CL150 RF

Maximum (Casing) Pressure(2)

Gray Cast Iron: 35 psig / 2.41 bar

WCC Carbon steel, LCC Carbon steel or CF8M/CF3M Stainless steel: 75 psig / 5.17 bar

Maximum Emergency Inlet (Casing) Pressure to Avoid Internal Parts Damage(2)

35 psig / 2.41 bar

Maximum Emergency Vacuum Pressure(2)

Full Vacuum

Maximum Operating Vacuum Pressure(2)

11 psig / 0.76 bar vacuum

Vacuum Control Pressure Ranges(2)

See Table 2

Pressure Registration

Type T208VR: Internal

Type T208VRM: External

Orifice Size

7/16 in. / 11 mm

Flow Capacities

See Tables 3 and 4

Flow Coefficients

Regulating:

C_g: 95

C_v: 3.01

C_1: 31.4

Wide Open:

C_g: 97

C_v: 3.11

C_1: 31.4

Material Temperature Capabilities(2)

Nitrile (NBR)

Gray Cast Iron or WCC Carbon steel Body: -20 to 180°F / -29 to 82°C

LCC Carbon steel or CF8M/CF3M Stainless steel Body: -40 to 180°F / -40 to 82°C

Fluorocarbon (FKM): 40 to 300°F / 4 to 149°C

Spring Case Connection

1/4 NPT

Diaphragm Case Connection

1/2 NPT

Construction Materials

See Table 1

Pressure Setting Adjustment

Adjusting nut

Additional Options

Umbrella vent assembly for spring case connection

Approximate Weight

19 lbs / 8.6 kg

1. All flanges are welded. Weld-on flange dimension is 14 in. / 356 mm face-to-face.
2. The pressure/temperature limits in this Bulletin and any applicable standard or code limitation should not be exceeded.

Principle of Operation

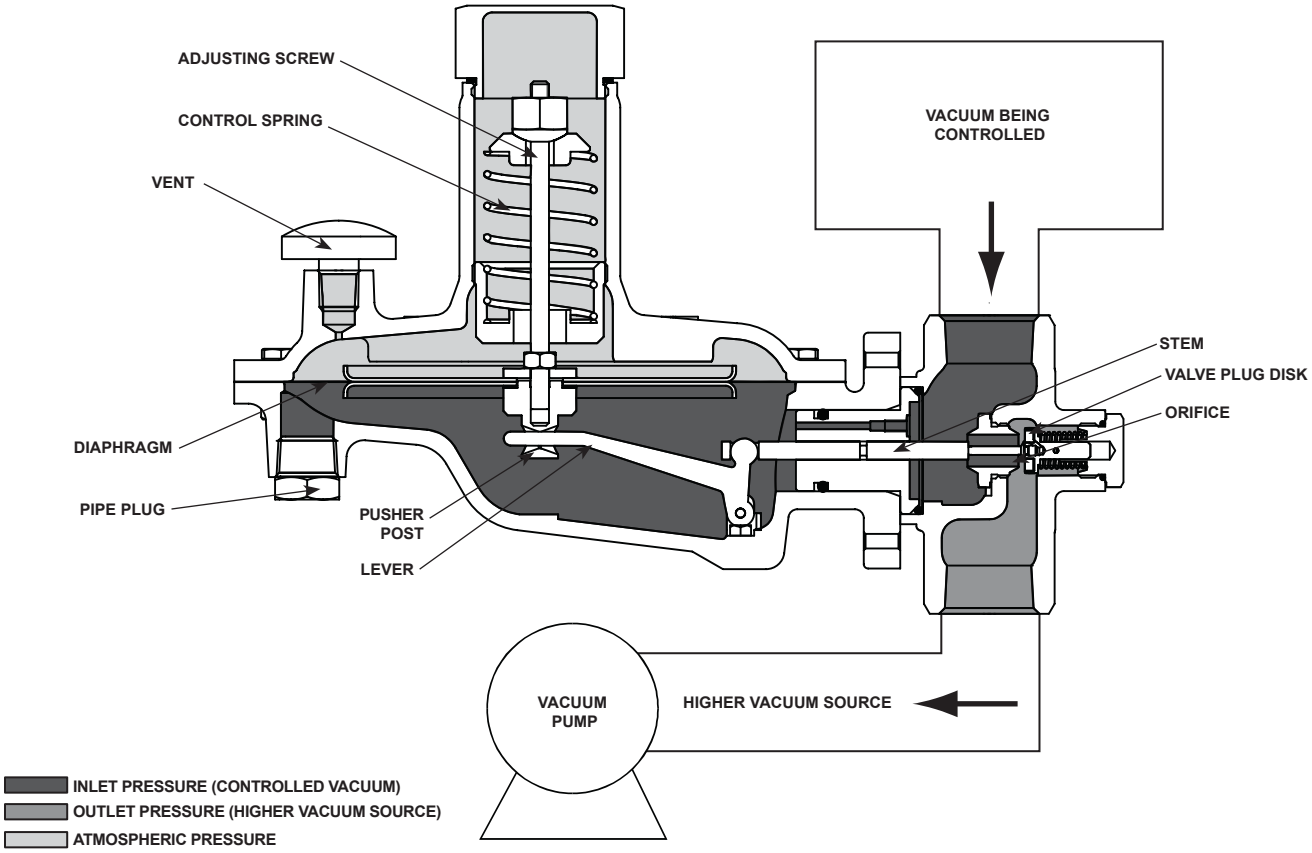
The T208VR Series vacuum regulators are used to maintain a constant vacuum at the regulator inlet. A decrease in this vacuum (increase in absolute pressure) beyond this value registers on the diaphragm and opens the disk. This permits a downstream vacuum of lower absolute pressure than the upstream vacuum to restore the upstream vacuum to its original pressure setting. On the Type T208VR, pressure registers underneath the diaphragm. The Type T208VRM has a control line connecting the diaphragm casing to the vacuum line and an O-ring stem seal blocking the throat causing registration pressure to flow through the control line.

Installation

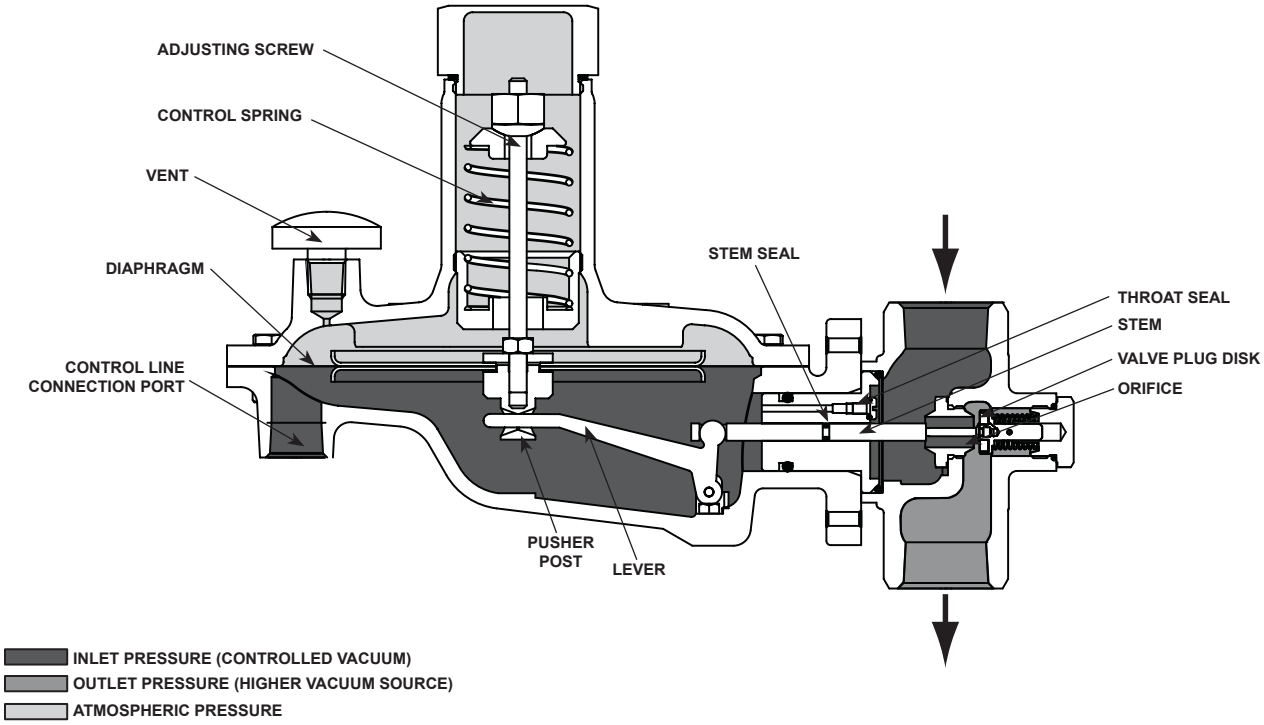
A T208VR Series regulator may be installed in any orientation as long as flow through it matches the direction of the arrow on the body. Normal installation is with the spring case vertical above or below the diaphragm case. When exposed to the weather, the vent should be protected by the optional umbrella vent or pointed down to allow condensate to drain. External dimensions and connections are shown in Figure 4.

Note

Downstream piping will vary with the installation, but to obtain the calculated characteristics, the pipe should be the same size as the outlet and should be straight for the first 18 in. / 457 mm.



TYPE T208VR WITH INTERNAL PRESSURE REGISTRATION



TYPE T208VRM WITH EXTERNAL PRESSURE REGISTRATION

Figure 2. *T208VR Series Operational Schematic*

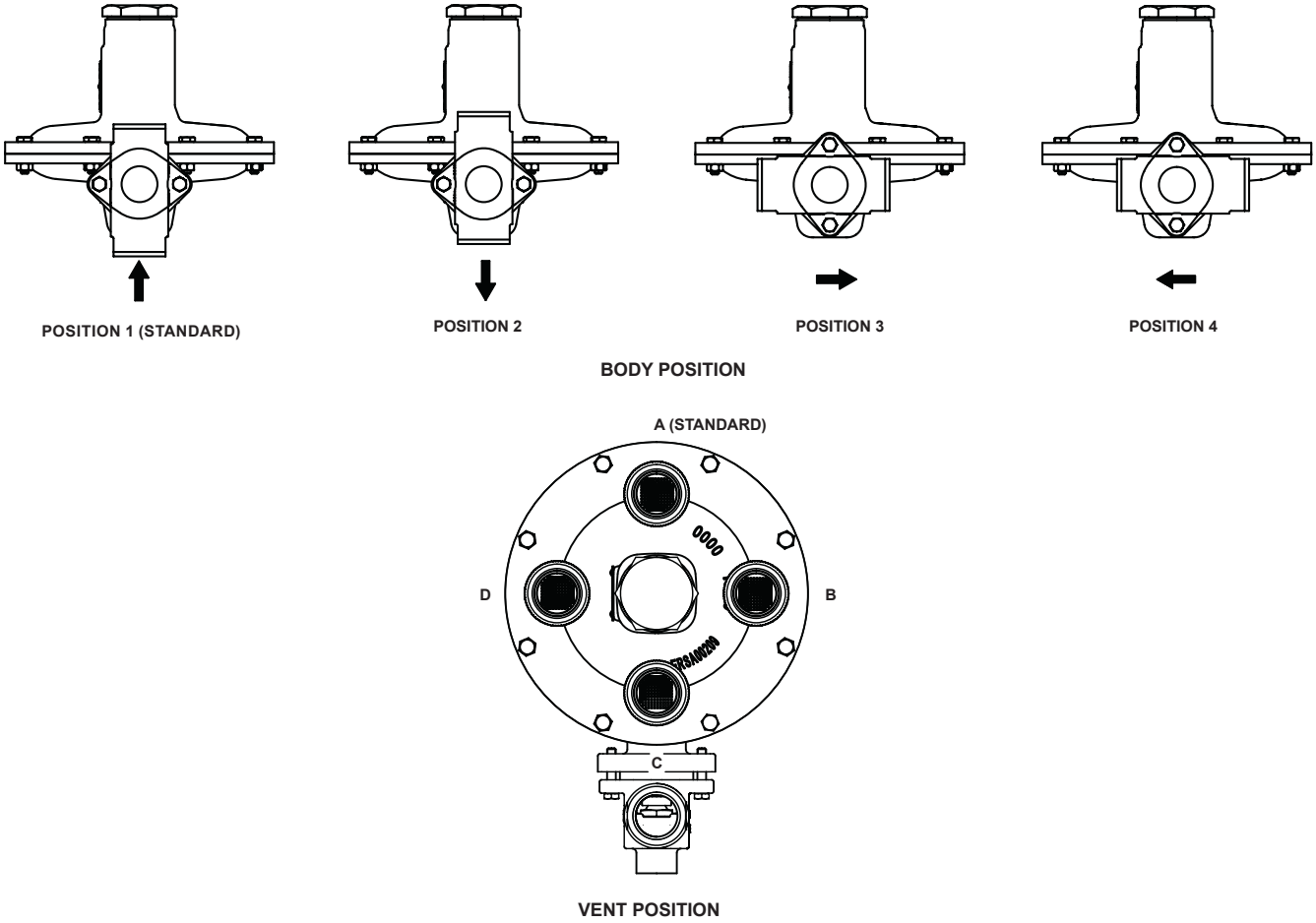


Figure 3. *Body and Vent Position*

Table 1. *Construction Materials*

BODY	SPRING CASE	DIAPHRAGM CASE	PUSHER POST, ORIFICE AND STEM	LEVEL ASSEMBLY	DIAPHRAGM	DISK	O-RING
Gray cast iron, WCC Carbon steel, LCC Carbon steel or CF8M/CF3M Stainless steel	Gray cast iron, WCC Carbon steel, LCC Carbon steel or CF8M/CF3M Stainless steel	Gray cast iron, WCC Carbon steel, LCC Carbon steel or CF8M/CF3M Stainless steel	316 Stainless steel	302 Stainless steel	Nitrile (NBR) or Fluorocarbon (FKM)	Nitrile (NBR) or Fluorocarbon (FKM)	Nitrile (NBR) or Fluorocarbon (FKM)

Table 2. *Vacuum Control Pressure Ranges*

VACUUM CONTROL PRESSURE RANGE, PART NUMBER AND COLOR CODE	SPRING WIRE DIAMETER		SPRING FREE LENGTH	
	In.	mm	In.	mm
0 to 4 in. w.c. / 0 to 10 mbar 0N039427222 Unpainted	0.062	1.57	3.063	77.80
0.05 to 0.75 psig / 3.5 to 52 mbar 0N086027022 Unpainted	0.105	2.67	2.500	63.50
0.15 to 1.75 psig / 10 to 121 mbar 0N086127022 Unpainted	0.125	3.18	2.500	63.50
0.25 to 2.75 psig / 17 to 190 mbar 0N022027022 Dark Green	0.135	3.43	2.500	63.50
1.5 to 4.75 psig / 0.10 to 0.33 bar 0N004327022 Yellow	0.162	4.11	2.500	63.50
3.0 to 11.0 psig / 0.20 to 0.76 bar 1D141827012 Blue	0.207	5.26	2.500	63.50

Table 3. *Type T208VR Capacities*

BODY SIZE		VACUUM CONTROL PRESSURE RANGE		VACUUM CONTROL PRESSURE SETTING		CHANGE IN VACUUM		CAPACITIES IN SCFH / Nm^3/h OF AIR Orifice Size, 7/16 In. / 11 mm		DOWNSTREAM VACUUM, psig / bar
NPS	DN	psig	bar	psig	bar	psig	bar	SCFH	Nm^3/h	
3/4	20	0 to 4 in. w.c.	0 to 10 mbar	2 in. w.c.	4.98 mbar	1 in. w.c.	2.49 mbar	731	19.6	11 / 0.76
		0.05 to 0.75	3.45 to 51.7 mbar	0.4	27.6 mbar	0.1	6.89 mbar	529	14.2	
		0.15 to 1.75	10.3 to 121 mbar	1	68.9 mbar	0.2	13.8 mbar	519	13.9	
		0.25 to 2.75	17.2 to 190 mbar	1.5	0.10	0.3	20.7 mbar	553	14.8	
		1.5 to 4.75	0.10 to 0.33	3.1	0.21	0.6	41.4 mbar	463	12.4	
		3 to 12.8	0.21 to 0.88	8.0	0.55	1.6	0.11	284	7.6	
1	25	0 to 4 in. w.c.	0 to 10 mbar	2 in. w.c.	4.98 mbar	1 in. w.c.	2.49 mbar	877	23.5	
		0.05 to 0.75	3.45 to 51.7 mbar	0.4	27.6 mbar	0.08	6.89 mbar	551	14.8	
		0.15 to 1.75	10.3 to 121 mbar	1	68.9 mbar	0.2	13.8 mbar	532	14.2	
		0.25 to 2.75	17.2 to 190 mbar	1.5	0.10	0.3	20.7 mbar	529	14.2	
		1.5 to 4.75	0.10 to 0.33	3.1	0.21	0.6	41.4 mbar	493	13.2	
		3 to 12.8	0.21 to 0.88	8	0.55	1.6	0.11	298	8.0	

Table 4. *Type T208VRM Capacities*

BODY SIZE		VACUUM CONTROL PRESSURE RANGE		VACUUM CONTROL PRESSURE SETTING		CHANGE IN VACUUM		CAPACITIES IN SCFH / Nm^3/h OF AIR Orifice Size, 7/16 In. / 11 mm		DOWNSTREAM VACUUM, psig / bar
NPS	DN	psig	bar	psig	bar	psig	bar	SCFH	Nm^3/h	
3/4	20	0 to 4 in. w.c.	0 to 10 mbar	2 in. w.c.	4.98 mbar	1 in. w.c.	2.49 mbar	749	20.1	11 / 0.76
		0.05 to 0.75	3.45 to 51.7 mbar	0.4	27.6 mbar	0.1	6.89 mbar	628	16.8	
		0.15 to 1.75	10.3 to 121 mbar	1	68.9 mbar	0.2	13.8 mbar	525	14.1	
		0.25 to 2.75	17.2 to 190 mbar	1.5	0.10	0.3	20.7 mbar	566	15.2	
		1.5 to 4.75	0.10 to 0.33	3.1	0.21	0.6	41.4 mbar	501	13.4	
		3 to 12.8	0.21 to 0.88	8.0	0.55	1.6	0.11	297	8.0	
1	25	0 to 4 in. w.c.	0 to 10 mbar	2 in. w.c.	4.98 mbar	1 in. w.c.	2.49 mbar	904	24.2	
		0.05 to 0.75	3.45 to 51.7 mbar	0.4	27.6 mbar	0.08	6.89 mbar	645	17.3	
		0.15 to 1.75	10.3 to 121 mbar	1	68.9 mbar	0.2	13.8 mbar	878	23.5	
		0.25 to 2.75	17.2 to 190 mbar	1.5	0.10	0.3	20.7 mbar	600	16.1	
		1.5 to 4.75	0.10 to 0.33	3.1	0.21	0.6	41.4 mbar	514	13.8	
		3 to 12.8	0.21 to 0.88	8	0.55	1.6	0.11	315	8.4	

Conversion Factors

To determine equivalent capacities of natural gas, propane, butane, or nitrogen, multiply the calculated capacity by the following appropriate conversion factor: 1.29 for natural gas, 0.810 for propane, 0.707 for butane or 1.018 for nitrogen. For gases of other specific gravities, divide by the square root of the appropriate specific gravity. Then, if capacity is desired in normal cubic meters per hour at 0°C and 1.01325 bar, multiply SCFH by 0.0268.

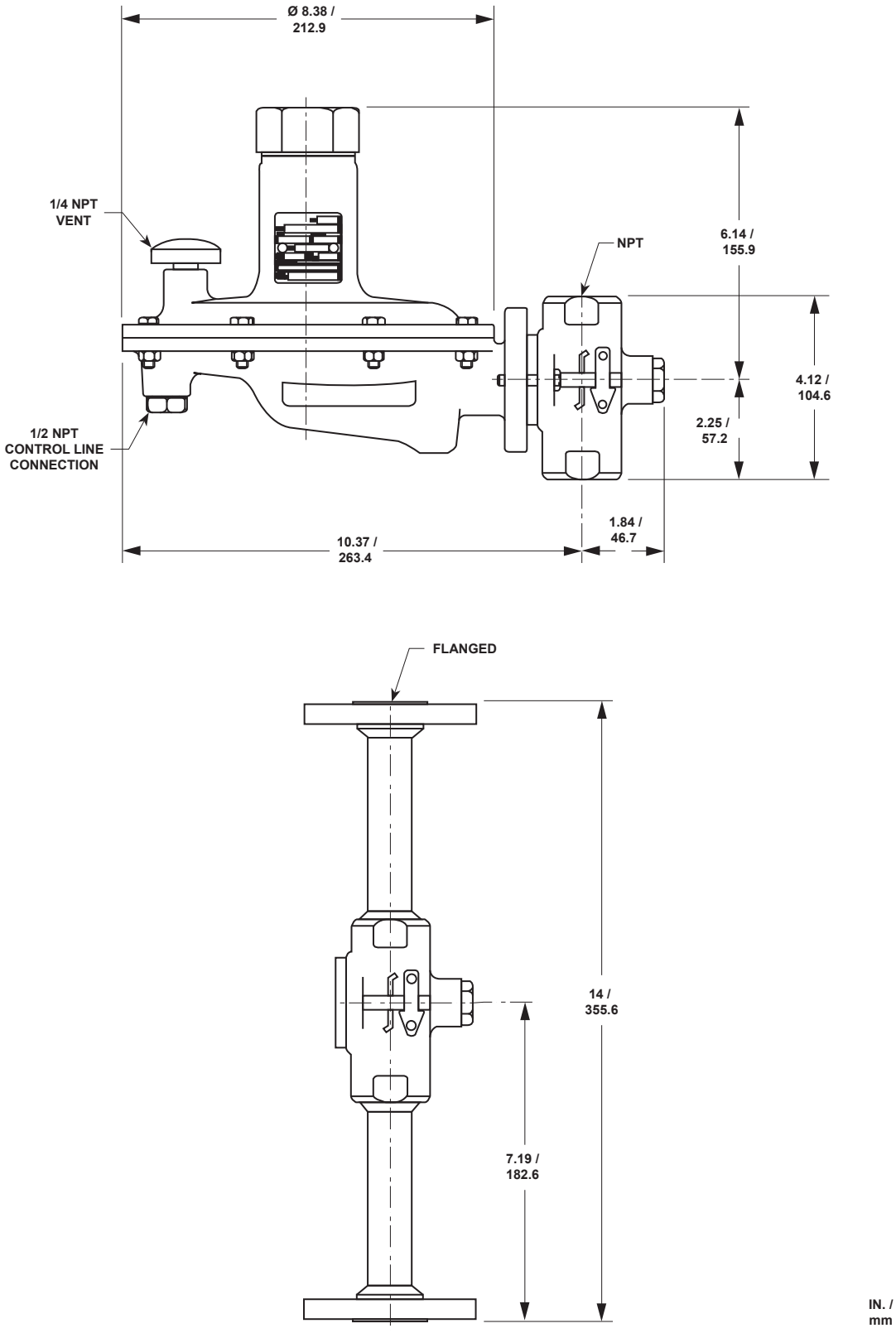


Figure 4. *T208VR Series Dimensions*

Ordering Information

When ordering, complete the ordering guide on this page. Refer to the Specifications section on page 2. Review the description to the right of each specification and the information in each referenced table or figure. Specify your choice whenever a selection is offered.

Ordering Guide

Type (Select One)
- ☐ T208VR, Internal pressure registration***
- ☐ T208VRM, External pressure registration***

Body Size (Select One)
- ☐ NPS 3/4 / DN 20***
- ☐ NPS 1 / DN 25***

Body Material and End Connection Style (Select One)

Gray Cast Iron
- ☐ NPT***

CF8M/CF3M Stainless steel
- ☐ NPT **(standard)*****
- ☐ CL150 RF***

WCC Carbon steel
- ☐ NPT **(standard)*****
- ☐ CL150 RF***

LCC Carbon steel
- ☐ NPT**
- ☐ CL150*

Vacuum (Control) Pressure Range (See Table 2, Select One)
- ☐ 0 to 4.0 in. w.c. / 0 to 10 mbar, Unpainted***
- ☐ 0.05 to 0.75 psig / 3.5 to 52 mbar, Unpainted***
- ☐ 0.15 to 1.75 psig / 10 to 121 mbar, Unpainted***
- ☐ 0.25 to 2.75 psig / 17 to 190 mbar, Dark Green***
- ☐ 1.5 to 4.75 psig / 0.10 to 0.33 bar, Yellow***
- ☐ 3.0 to 12.8 psig / 0.20 to 0.88 bar, Blue***

Diaphragm, Disk and O-ring Material (Select One)
- ☐ Nitrile (NBR) **(standard)*****
- ☐ Fluorocarbon (FKM)***

Closing Cap Material (Select One)
- ☐ Zinc **(standard)*****
- ☐ Steel***

Body Position (See Figure 3, Select One)
- ☐ Position 1 **(standard)*****
- ☐ Position 2***
- ☐ Position 3***
- ☐ Position 4***

Vent Position (See Figure 3, Select One)
- ☐ Position A **(standard)*****
- ☐ Position B***
- ☐ Position C***
- ☐ Position D***

Spring Case Orientation/Vent Type (Select One)
- ☐ Spring Case Up **(standard)** (Type Y602-11)***
- ☐ Spring Case Down (Type Y602-2)***

Replacement Parts Kit (Optional)
- ☐ Yes, send one replacement parts kit to match this order.

Ordering Guide (continued)

Regulators Quick Order Guide	
* * *	Readily Available for Shipment
* *	Allow Additional Time for Shipment
*	Special Order, Constructed from Non-Stocked Parts. Consult your local Sales Office for Availability.
Availability of the product being ordered is determined by the component with the longest shipping time for the requested construction.	

Specification Worksheet

Application (Please designate units):

Specific Use _____

Line Size _____

Fluid Type and Specific Gravity _____

Fluid Temperature _____

Does the Application Require Overpressure Protection?

☐ Yes ☐ No If yes, which is preferred:

☐ Relief Valve ☐ Monitor Regulator ☐ Shutoff Device

Is overpressure protection equipment selection assistance desired? _____

Pressure:

Maximum Inlet Pressure _____

Minimum Inlet Pressure _____

Differential Pressure _____

Set Pressure _____

Maximum Flow (Q_{max}) _____

Performance Required:

Accuracy Requirements?

Less than or Equal to:

☐ 5% ☐ 10% ☐ 20% ☐ Wide Open

Other Requirements:

_____

Webadmin.Regulators@emerson.com
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Facebook.com/EmersonAutomationSolutions
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Emerson Automation Solutions

Americas
McKinney, Texas 75070 USA
T +1 800 558 5853
+1 972 548 3574

Asia Pacific
Singapore 128461, Singapore
T +65 6777 8211

Europe
Bologna 40013, Italy
T +39 051 419 0611

Middle East and Africa
Dubai, United Arab Emirates
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