

July 2019

## 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.

# T208VR Series

## 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<sup>(1)</sup>

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

### Maximum (Casing) Pressure<sup>(2)</sup>

**Cast Iron:** 35 psig / 2.41 bar

**Steel/Stainless steel:** 75 psig / 5.17 bar

### Maximum Emergency Inlet (Casing) Pressure to Avoid Internal Parts Damage<sup>(2)</sup>

35 psig / 2.41 bar

### Maximum Emergency Vacuum Pressure<sup>(2)</sup>

Full Vacuum

### Maximum Operating Vacuum Pressure<sup>(2)</sup>

11 psig / 0.76 bar vacuum

### Vacuum Control Pressure Ranges<sup>(2)</sup>

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<sup>(2)</sup>

#### Nitrile (NBR)

*Cast Iron/Steel Body:* -20 to 180°F / -29 to 82°C

*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.

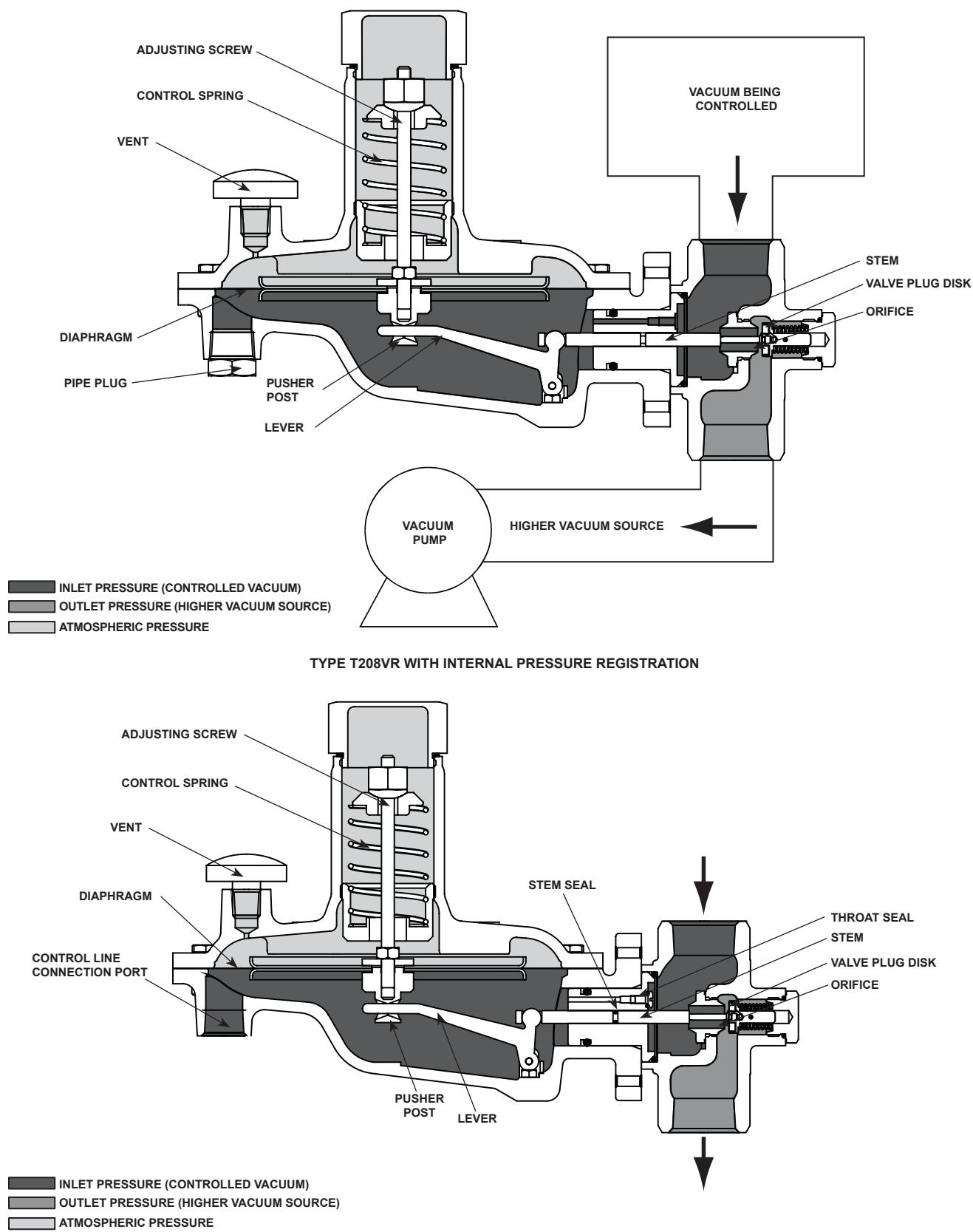


Figure 2. T208VR Series Operational Schematic

# T208VR Series

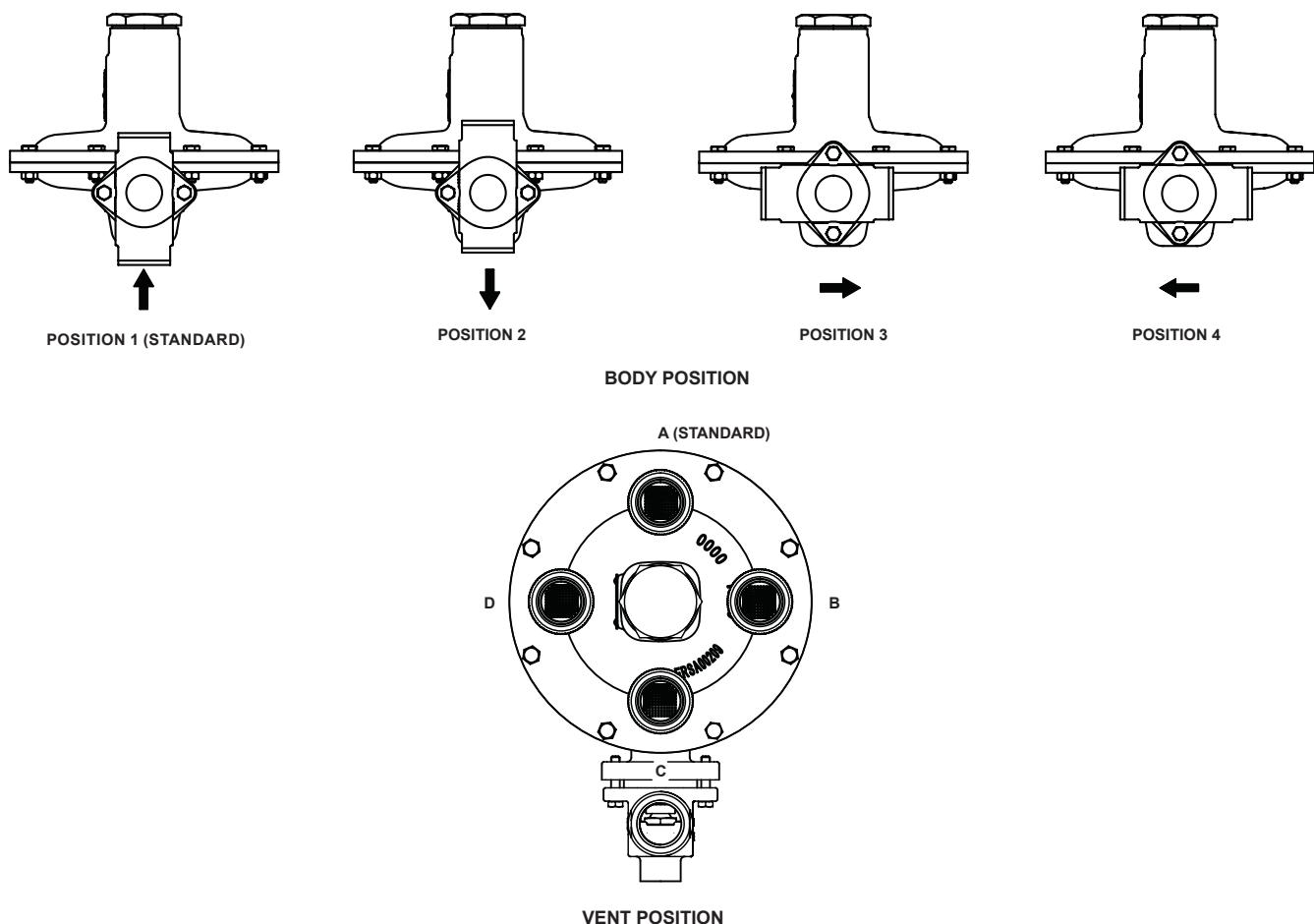


Figure 3. Body and Vent Position

Table 1. Construction Materials

BODY	SPRING CASE	DIAPHRAGM CASE	PUSHER POST, ORIFICE AND STEM	LEVEL ASSEMBLY	DIAPHRAGM	DISK	O-RING
Gray cast iron, 316L/316 Stainless steel or Carbon steel	Gray cast iron, 316L/316 Stainless steel or Carbon steel	Gray cast iron, 316L/316 Stainless steel or Carbon 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 ON039427222 Unpainted	0.062	1.57	3.063	77.80
0.05 to 0.75 psig / 3.5 to 52 mbar ON086027022 Unpainted	0.105	2.67	2.500	63.50
0.15 to 1.75 psig / 10 to 121 mbar ON086127022 Unpainted	0.125	3.18	2.500	63.50
0.25 to 2.75 psig / 17 to 190 mbar ON022027022 Dark Green	0.135	3.43	2.500	63.50
1.5 to 4.75 psig / 0.10 to 0.33 bar ON004327022 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 <sup>3</sup> /h OF AIR		DOWNSTREAM VACUUM, psig / bar
								Orifice Size, 7/16 In. / 11 mm		
NPS	DN	psig	bar	psig	bar	psig	bar	SCFH	Nm <sup>3</sup> /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	11 / 0.76
		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

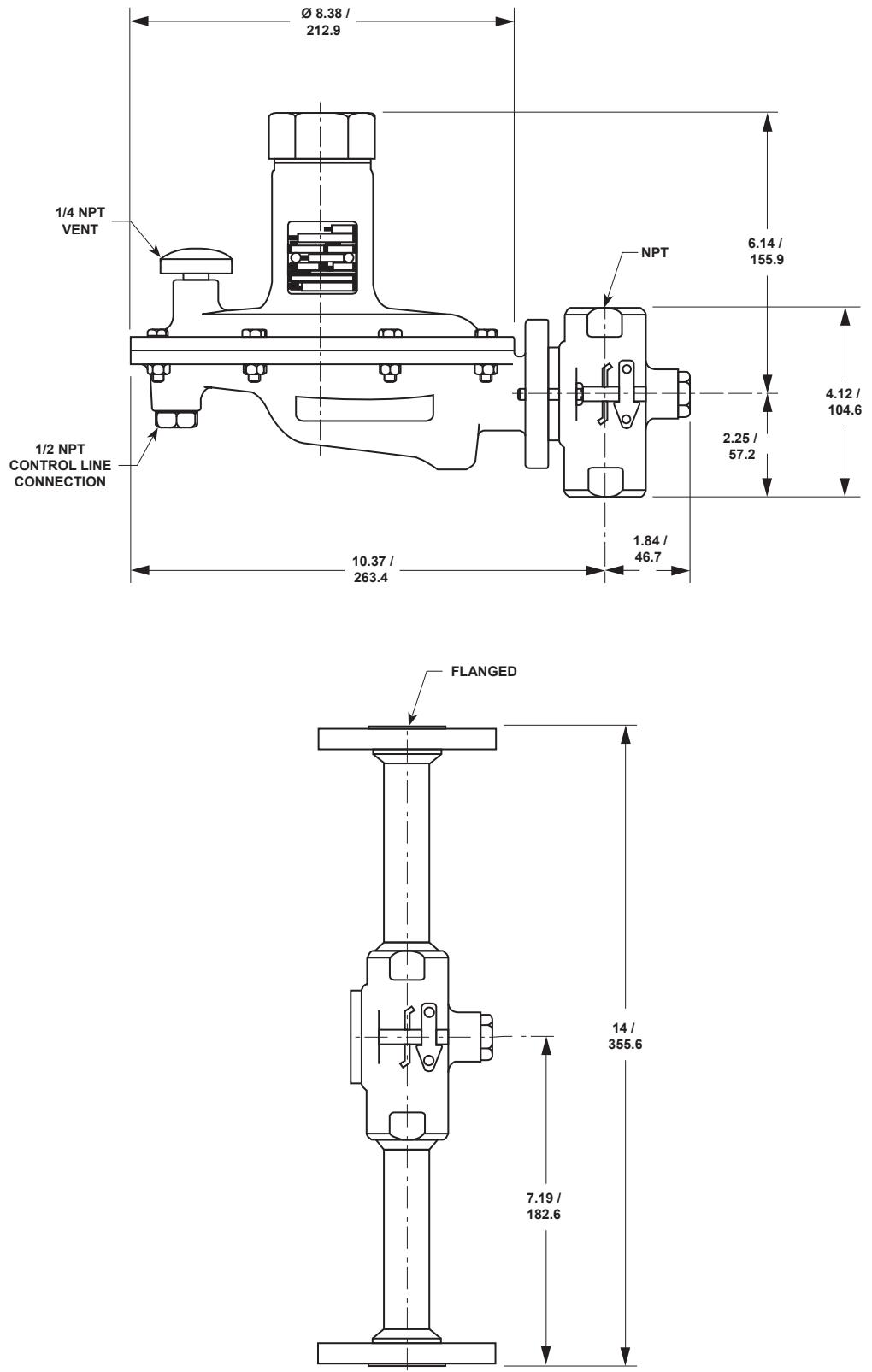
BODY SIZE		VACUUM CONTROL PRESSURE RANGE		VACUUM CONTROL PRESSURE SETTING		CHANGE IN VACUUM		CAPACITIES IN SCFH / Nm <sup>3</sup> /h OF AIR		DOWNSTREAM VACUUM, psig / bar
								Orifice Size, 7/16 In. / 11 mm		
NPS	DN	psig	bar	psig	bar	psig	bar	SCFH	Nm <sup>3</sup> /h	
3/4	20	0 to 4 in. w.c.	0 to 10 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	11 / 0.76
		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.

# T208VR Series



ERSA02741

**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\*\*\*

#### Stainless Steel

- NPT (**standard**)\*\*\*
- CL150 RF\*\*\*

#### Carbon Steel

- NPT (**standard**)\*\*\*
- CL150 RF\*\*\*

### 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.

# T208VR Series

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<sub>max</sub>) \_\_\_\_\_

### Performance Required:

Accuracy Requirements?

Less than or Equal to:

5%  10%  20%  Wide Open

### Other Requirements:

 [Webadmin.Regulators@emerson.com](mailto:Webadmin.Regulators@emerson.com)

 [Facebook.com/EmersonAutomationSolutions](https://Facebook.com/EmersonAutomationSolutions)

 [Fisher.com](https://Fisher.com)

 [LinkedIn.com/company/emerson-automation-solutions](https://LinkedIn.com/company/emerson-automation-solutions)

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