

# T208VR Series Tank Blanketing 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.

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## Specifications

This section lists the specifications of the T208VR Series Tank Blanketing 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

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

### Maximum (Casing) Pressure<sup>(1)</sup>

35 psig / 2.4 bar

### Maximum Emergency Vacuum Pressure<sup>(1)</sup>

Full Vacuum

### Maximum Operating Vacuum Pressure<sup>(1)</sup>

See Table 2

### Change in Control Pressure to Wide-Open<sup>(1)</sup>

See Table 2

### Pressure Registration

**Type T208VR:** Internal

**Type T208VRM:** External

### Orifice Size

7/16 inch / 11 mm

### Capacities

See Table 2

### Flow Coefficients

#### Regulating:

**C<sub>g</sub>:** 95

**C<sub>v</sub>:** 3.01

**C<sub>i</sub>:** 31.4

#### Wide Open:

**C<sub>g</sub>:** 127

**C<sub>v</sub>:** 3.66

**C<sub>i</sub>:** 34.8

### Material Temperature Capabilities<sup>(1)</sup>

#### Nitrile (NBR):

-20 to 180°F / -29 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

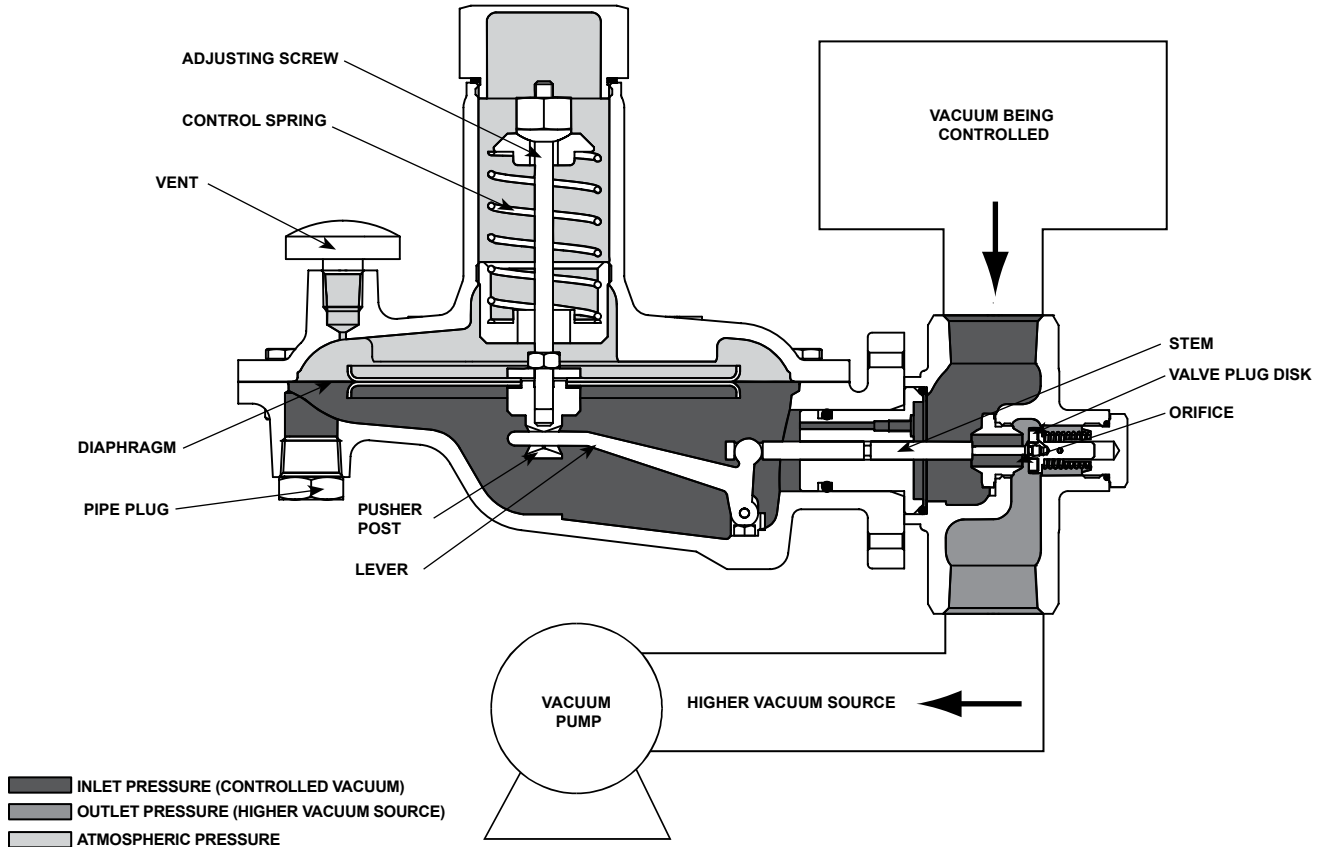
19 pounds / 8.6 kg

1. The pressure/temperature limits in this Bulletin and any applicable standard or code limitation should not be exceeded.

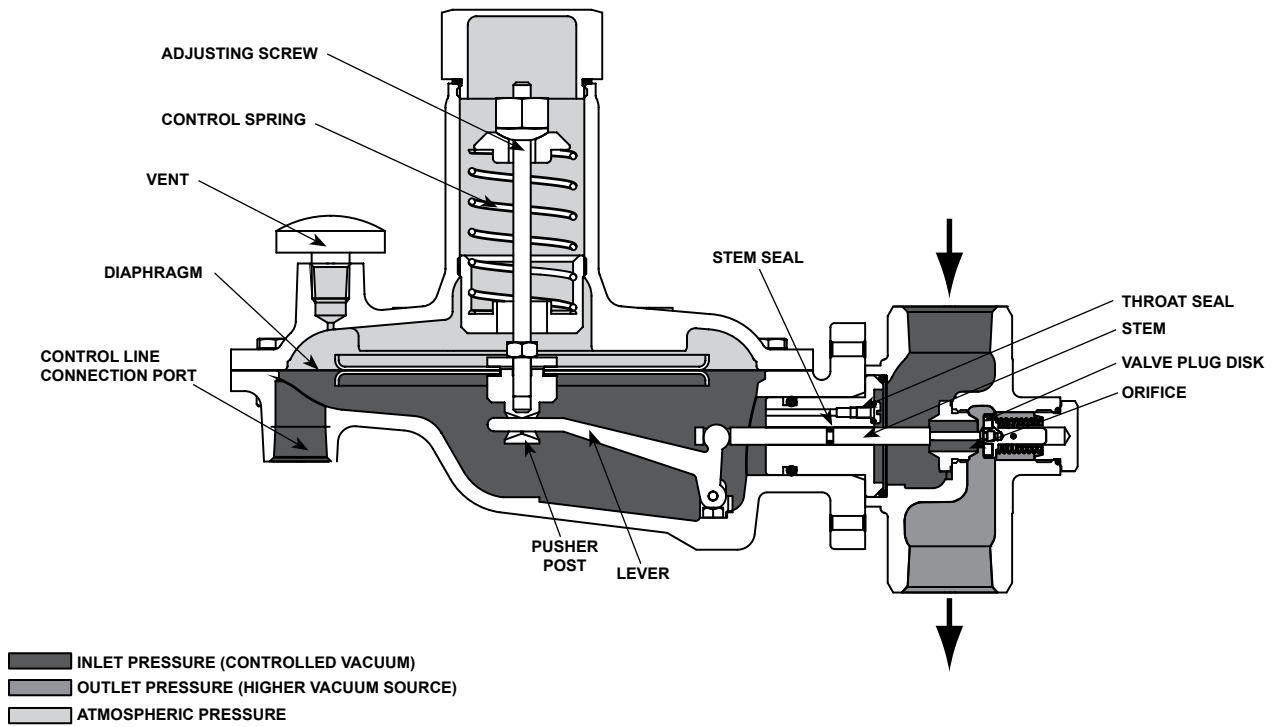
## Principle of Operation

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.



TYPE T208VR WITH INTERNAL PRESSURE REGISTRATION



TYPE T208VRM WITH EXTERNAL PRESSURE REGISTRATION

Figure 2. T208VR Series Operational Schematic

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**Table 1. Construction Materials**

BODY	SPRING CASE	DIAPHRAGM CASE	PUSHER POST, ORIFICE AND STEM	LEVEL ASSEMBLY	DIAPHRAGM	DISK	O-RING
Gray cast iron or 316L/316 Stainless steel	Gray cast iron or 316 Stainless steel	Gray cast iron or 316L/316 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. T208VR Series Capacities**

SPRING RANGE, PART NUMBER AND COLOR CODE	SPRING WIRE DIAMETER		SPRING FREE LENGTH		MAXIMUM OPERATING INLET VACUUM		CONTROL PRESSURE SETTING VACUUM		MAXIMUM OPERATING OUTLET VACUUM		CHANGE IN CONTROL PRESSURE TO WIDE-OPEN		CAPACITY IN SCFH / Nm <sup>3</sup> /h OF 1.0 SPECIFIC GRAVITY AIR	
	Inch	mm	Inch	mm	psig	bar	psig	bar	psig	bar	psig	bar	SCFH	Nm <sup>3</sup> /h
0 to 4 inches w.c. / 0 to 10 mbar ON039427222 Unpainted	0.062	1.57	3.063	77.80	5.1	0.35	2 inches w.c.	5 mbar	7.5	0.52	1 inch w.c.	2 mbar	1345	36.0
0.05 to 0.75 psig / 3.5 to 52 mbar ON086027022 Unpainted	0.105	2.67	2.500	63.50	5.7	0.39	0.5	0.03	7.5	0.52	5.5 inches w.c.	14 mbar	1317	35.3
0.15 to 1.75 psig / 10 to 121 mbar ON086127022 Unpainted	0.125	3.18	2.500	63.50	6.5	0.45	1	0.07	7.5	0.52	0.44	0.03	1289	34.5
0.25 to 2.75 psig / 17 to 190 mbar ON022027022 Dark Green	0.135	3.43	2.500	63.50	7.4	0.51	2	0.14	7.5	0.52	0.63	0.04	1202	32.2
1.5 to 4.75 psig / 0.10 to 0.33 bar ON004327022 Yellow	0.162	4.11	2.500	63.50	7.5	0.52	4	0.28	9.2	0.63	1.44	0.10	1067	28.6
3.0 to 12.8 psig / 0.20 to 0.88 bar 1D141827012 Blue	0.207	5.26	2.500	63.50	12.0	0.83	9	0.62	12	0.83	3.88	0.27	898	24.1

## 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 inches / 457 mm.**

## Capacity Information

To determine the flow capacities for the T208VR Series vacuum regulators, use the following formula:

$$Q = P_{1abs} C_g \text{SIN} \left( \frac{3415}{C_1} \sqrt{\frac{\Delta P}{P_{1abs}}} \right) \text{DEG}$$

where,

- Q = flow capacity in SCFH (60°F and 14.7 psia) of air at 60°F
- P<sub>1abs</sub> = absolute inlet pressure in psia (P<sub>1</sub> gauge + 14.7)
- C<sub>g</sub> = flow coefficient (from Specifications section)
- C<sub>1</sub> = See Specification section
- ΔP = pressure drop across vacuum breaker or regulator

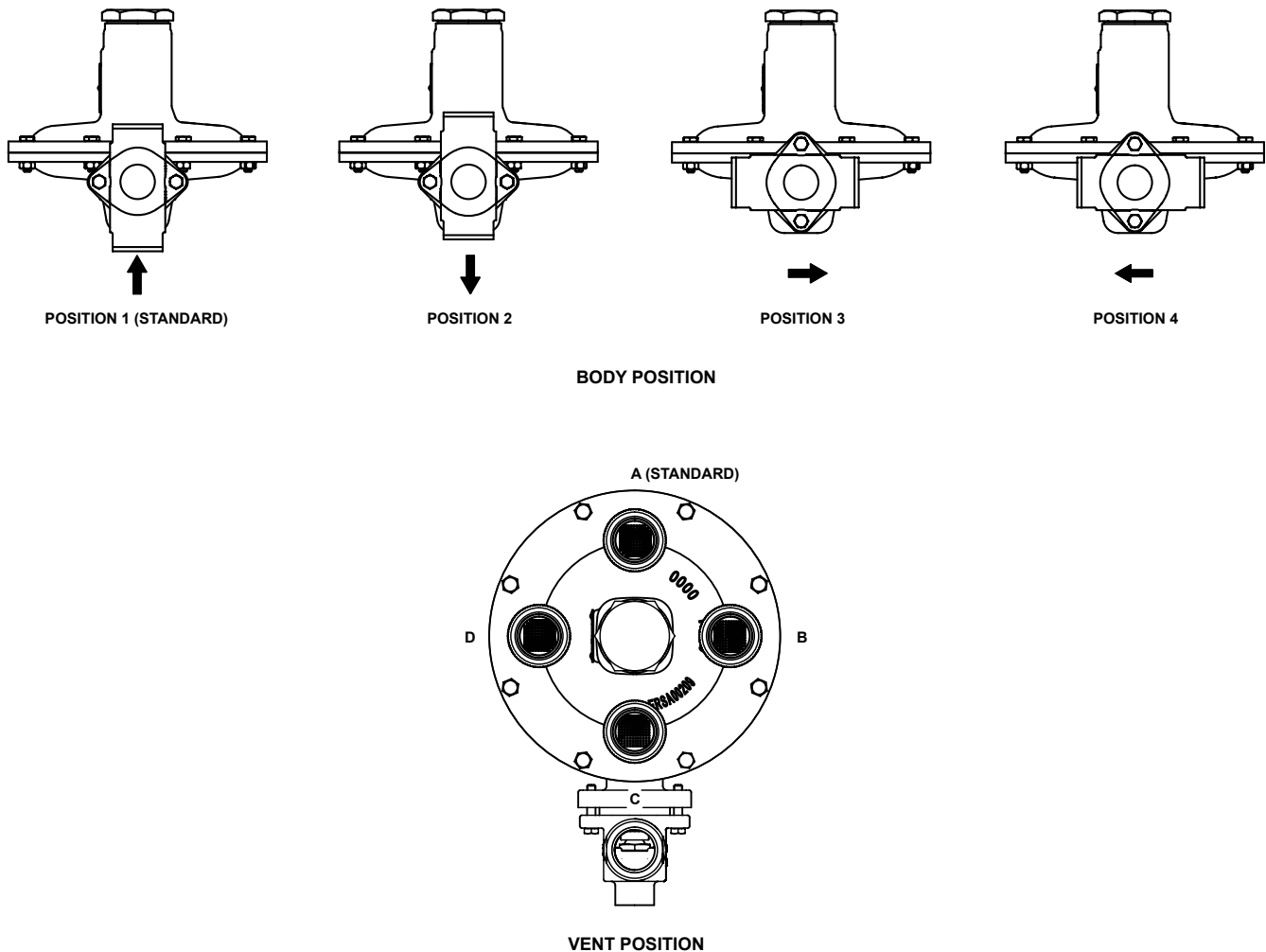


Figure 3. Body and Vent Position

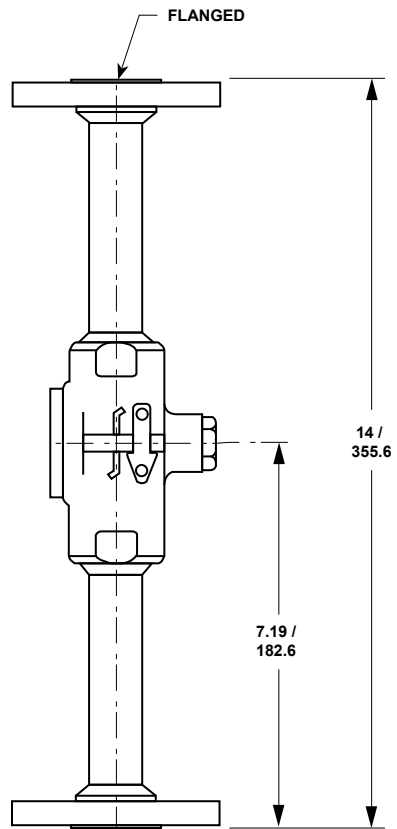
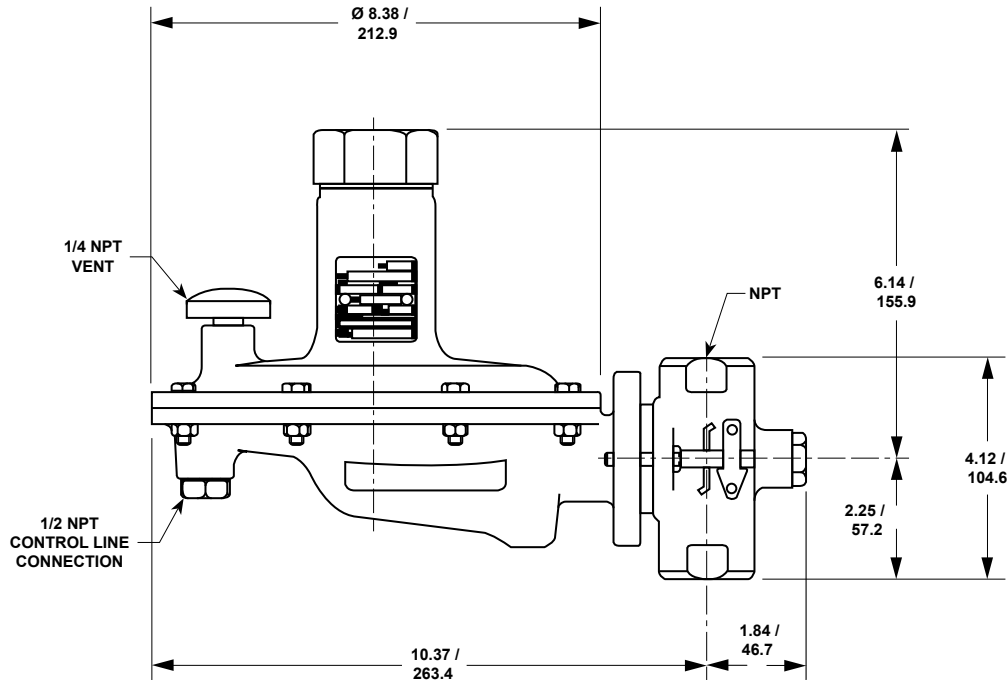
### Note

If the actual change in (control) pressure (from the service conditions) is less than the minimum change in (control) pressure required to fully open the vacuum regulator (Table 2), the  $C_g$  in the formula must be reduced accordingly. To obtain the correct reduced  $C_g$ , multiply the  $C_g$  from specifications table by the ratio of the actual change in (control) pressure to the minimum change in (control) pressure required to fully open the vacuum regulator.

### 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.

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INCH /  
mm

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)

- 3/4 inch / DN 20\*\*\*
- 1 inch / DN 25\*\*\*

### Body Material and End Connection Style (Select One)

#### Gray Cast Iron

- NPT\*\*\*

#### Stainless Steel

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

### Vacuum (Control) Pressure Range (See Table 2, Select One)

- 0 to 4.0 inches 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.

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:**  
 \_\_\_\_\_

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