

T205VB Series Tank Blanketing Vacuum Breakers

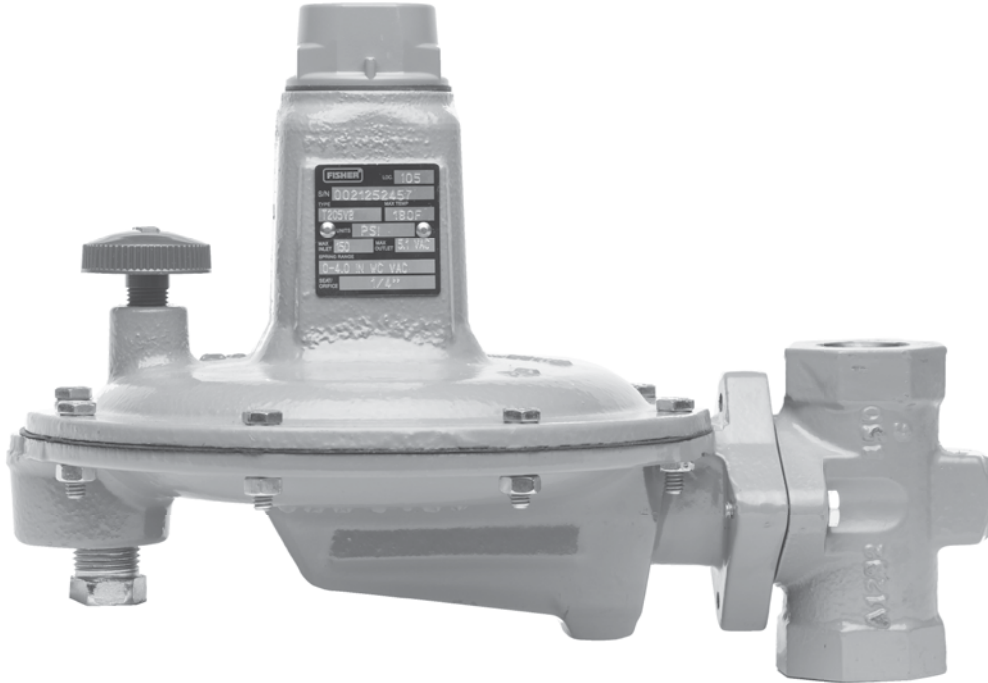


Figure 1. Typical T205VB Series Vacuum Breaker

Introduction

The T205VB Series vacuum breakers (Figure 1) are used for precise control of small capacity, low-pressure service applications where an increase in vacuum must be limited. These direct-operated vacuum breakers are available in 3/4 and 1-inch / DN 20 and 25 body sizes and have 1/4 or 1/2-inch / 6.4 or 13 mm orifice.

The T205VB Series is available in two configurations: Type T205VB for internal pressure registration requiring no downstream control line and Type T205VBM which has a blocked throat and a control line connection and an O-ring stem seal for external pressure registration.

Features

- **Common Spare Parts**—The Types T205VB and T205VBM have common spare parts with the other T205 Series products.
- **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.
- **Easy Conversion**—The Type T205VB (internal pressure registration) converts easily to the Type T205VBM (external pressure registration).
- **Precision Control of Low-Pressure Settings**—Large diaphragm area provides more accurate control at low-pressure settings.
- **Corrosion Resistance**—Constructions are available in a variety of materials for compatibility with corrosive gases.

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Specifications

The Specifications section on this page provides the ratings and other specifications for the T205VB Series. Factory specification such as type, maximum inlet pressure, maximum temperature, maximum outlet pressure, spring range and orifice size are stamped on the nameplate fastened on the regulator at the factory.

Available Configurations

Type T205VB: Direct-operated vacuum breaker with internal registration.

Type T205VBM: Direct-operated vacuum breaker equipped with a blocked throat and control line connection for external pressure registration.

Body Sizes

3/4 inch / DN 20

1 inch / DN 25

End Connection Styles

See Table 1

Body Inlet Pressure Rating⁽¹⁾

Gray Cast Iron: 150 psig / 10.3 bar

Stainless Steel: 200 psig / 13.8 bar

Maximum Operating Inlet Pressure

150 psig / 10.3 bar

Maximum Outlet (Casing) Pressure⁽¹⁾

35 psig / 2.41 bar

Maximum Allowable Vacuum Pressure

See Table 5

Maximum Emergency Outlet Pressure to Avoid Internal Parts Damage⁽¹⁾

35 psig / 2.41 bar

Vacuum Control Pressure Ranges⁽¹⁾

See Table 4

Flow Coefficients

See Table 2

Flow Capacities

See Table 6

Construction Materials

See Table 3

Temperature Capabilities⁽¹⁾

Nitrile (NBR):

-20 to 180°F / -29 to 82°C

Fluorocarbon (FKM):

40 to 300°F / 4 to 149°C

Pressure Registration

Type T205VB: Internal

Type T205VBM: External

Orifice Size

1/4 inch / 6.4 mm

1/2 inch / 13 mm

Pressure Setting Adjustment

Adjusting Nut

Spring Case Connection

1/4 NPT

Diaphragm Case Connection

1/2 NPT

Approximate Weight

18.7 pounds / 8.5 kg

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

Principle of Operation

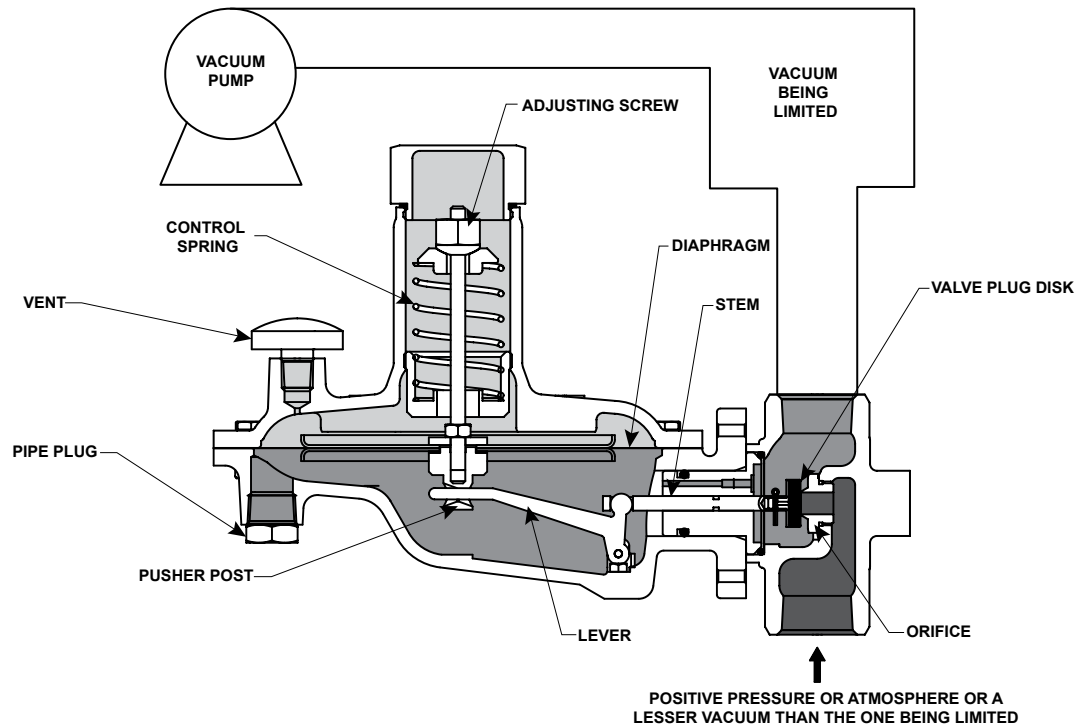
The T205VB Series vacuum breakers are used in applications where an increase in vacuum must be limited. See Figure 2. An increase in vacuum (decrease in absolute pressure) beyond a setpoint is sensed on the under side of the diaphragm, opening the disk assembly. This permits positive pressure, atmosphere or an upstream vacuum that has higher absolute pressure than the downstream vacuum to enter the system and restore the controlled vacuum to its original pressure setting. On the Type T205VB, the pressure registers internally underneath the diaphragm. The Type T205VBM has a control line connecting the diaphragm casing to the vacuum line and a throat seal allowing for registration only through the control line connection.

Installation

A T205VB 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. If used in hazardous gas service on indoor installation this connection should be piped outdoors. External dimensions and connections are shown in Figure 3.

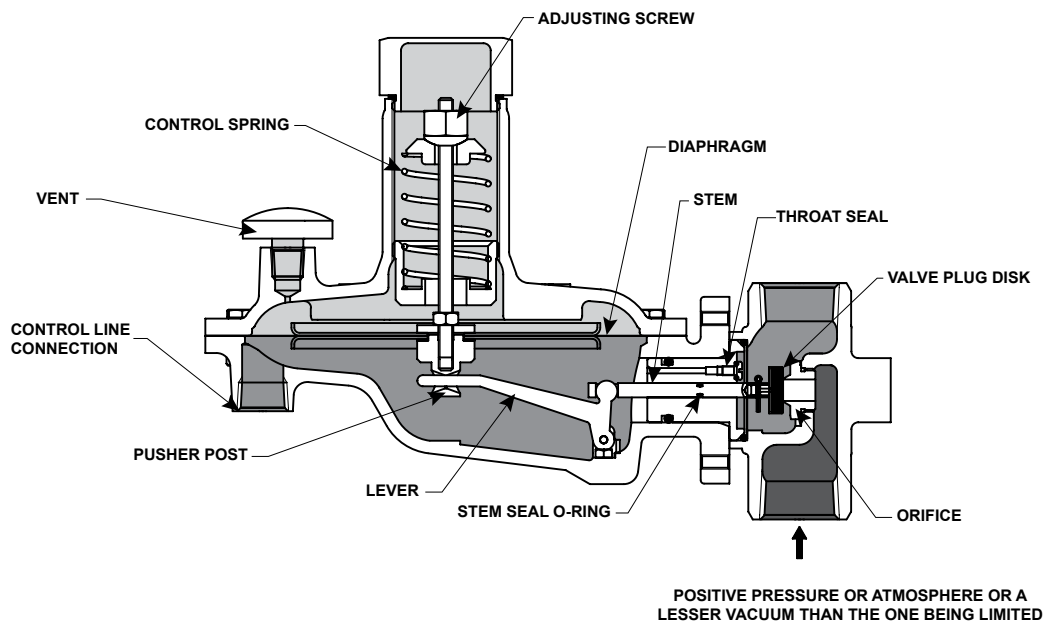
Note

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.



TYPE T205VB WITH INTERNAL PRESSURE REGISTRATION

- INLET PRESSURE
- OUTLET PRESSURE
- ATMOSPHERIC PRESSURE



TYPE T205VBM WITH EXTERNAL PRESSURE REGISTRATION

- INLET PRESSURE
- OUTLET PRESSURE
- ATMOSPHERIC PRESSURE

Figure 2. T205VB Series Operational Schematic

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Table 1. Body Sizes, End Connection Styles and Body Inlet Pressure Rating

BODY SIZE		BODY MATERIAL	END CONNECTION STYLE ⁽¹⁾	BODY INLET PRESSURE RATING	
Inch	DN			psig	bar
3/4 or 1	20 or 25	Gray cast iron	NPT	150	10.3
		Stainless steel	NPT or CL150 RF	200	13.8

1. All flange dimensions are 14-inches / 356 mm face-to-face.

Table 2. Flow Coefficients

ORIFICE SIZE		FLOW COEFFICIENT					
		Regulating			Wide Open		
Inch	mm	C _g	C _v	C _i	C _g	C _v	C _i
1/4	6.4	44	1.5	29.3	44	1.6	27.5
1/2	13	173	4.7	36.8	174	5.1	34.1

Table 3. Construction Materials

BODY, LOWER CASING AND SPRING CASE	TRIM	DIAPHRAGM	DISK	O-RING
Gray cast iron or Stainless steel	Stainless steel	Nitrile (NBR) or Fluorocarbon (FKM)	Nitrile (NBR) or Fluorocarbon (FKM)	Nitrile (NBR) or Fluorocarbon (FKM)

Table 4. Vacuum Control Pressure Ranges

VACUUM CONTROL PRESSURE RANGE ¹⁽²⁾		CHANGE IN VACUUM TO WIDE-OPEN				SPRING PART NUMBER	SPRING COLOR	SPRING WIRE DIAMETER		SPRING FREE LENGTH	
		1/4-inch / 6.4 mm Orifice		1/2-inch / 13 mm Orifice				Inch	mm	Inch	mm
psig	mbar	psig	bar	psig	bar						
0 to 4 in. w.c.	0 to 10	0.6 in. w.c.	1.5 mbar	1.3 in. w.c.	3 mbar	0N039427222	Unpainted	0.062	1.6	3.06	78
0 to 1.0	0 to 69	10 in. w.c.	25 mbar	0.7	0.05	0N086127022	Unpainted	0.125	3.2	2.50	64
0 to 2.1	0 to 145	1.2	0.08	2.4	0.17	0N004327022	Yellow	0.162	4.1	2.50	64
0 to 5	0 to 0.34 bar	3.2	0.22	6.3	0.43	1D141827012	Blue	0.207	5.3	2.50	64
1. Spring ranges based on atmospheric inlet pressure. 2. To convert to inches Hg, multiply psig value by 2.04.											

1. Spring ranges based on atmospheric inlet pressure.
2. To convert to inches Hg, multiply psig value by 2.04.

Capacity Information

To determine flow capacities for the T205VB Series vacuum breakers, use the following formula:

$$Q = P_{1abs} C_g \sin \left[\frac{3415}{C_1} \sqrt{\frac{\Delta P}{P_{1abs}}} \right] \text{ DEG}$$

where,

- Q = flow capacity in SCFH (60°F and 14.7 psia) of air
P_{1abs} = absolute inlet pressure in psia (P₁ gauge + 14.7)
C_g = flow coefficient (from Table 2)
C₁ = flow coefficient (from Table 2)
ΔP = pressure drop across vacuum breaker

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 breaker (Table 6), the C_g in the formula must be reduced accordingly. To obtain the correct reduced C_g, multiply

the C_g from Table 2 by the ratio of the actual change in (control) pressure to the minimum change in (control) pressure required to fully open the vacuum breaker.

Conversion Factors

To determine equivalent capacities for 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.

Example Problem Using Formula

This example involves a Type T205VB vacuum breaker with its outlet connected to a vessel in which the vacuum must be limited. This breaker has a 1/4-inch / 6.4 mm orifice and a control spring set to start opening and admit atmospheric pressure whenever the vacuum

Table 5. Maximum Setpoints for Achieving Wide-Open Flow

SPRING RANGE, PART NUMBER AND COLOR CODE ⁽¹⁾⁽²⁾	ORIFICE SIZE		MAXIMUM ALLOWED VACUUM	MAXIMUM SETPOINTS FOR ACHIEVING WIDE-OPEN FLOW AT SPECIFIC INLET PRESSURES					
				0 psi / 0 bar	25 psi / 1.7 bar	50 psi / 3.4 bar	75 psi / 5.2 bar	100 psi / 6.9 bar	125 psi / 8.6 bar
	Inch	mm		psig / bar	psig / bar	psig / bar	psig / bar	psig / bar	psig / bar
0 to 4 inches w.c. / 0 to 10 mbar 0N039427222 Unpainted	1/4	6.4	5.1 / 0.35	4 inches w.c. / 10 mbar	4 inches w.c. / 10 mbar	3.5 inches w.c. / 8.7 mbar	3 inches w.c. / 7.5 mbar	2.5 inches w.c. / 6.2 mbar	2 inches w.c. / 5 mbar
	1/2	13		4 inches w.c. / 10 mbar	3 inches w.c. / 7.5 mbar	1.5 inches w.c. / 3.7 mbar	0 inch w.c. / 0 mbar	0 inch w.c. / 0 mbar	0 inch w.c. / 0 mbar
0 to 1.0 psig / 0 to 69 mbar 0N086127022 Unpainted	1/4	6.4	6.0 / 0.41	1 / 0.07	1 / 0.07	1 / 0.07	1 / 0.07	0.96 / 0.07	0.92 / 0.06
	1/2	13		1 / 0.07	0.95 / 0.07	0.9 / 0.06	0.85 / 0.06	0.8 / 0.05	0.75 / 0.05
0 to 2.1 psig / 0 to 145 mbar 0N004327022 Yellow	1/4	6.4	7.1 / 0.49	2.1 / 0.14	2.1 / 0.14	2.1 / 0.4	2.1 / 0.14	2.05 / 0.14	2.0 / 0.14
	1/2	13		2.1 / 0.14	2.1 / 0.14	2.05 / 0.14	1.98 / 0.14	1.92 / 0.13	1.86 / 0.13
0 to 5 psig / 0 to 0.34 bar 1D141827012 Blue	1/4	6.4	12.0 / 0.83	5.0 / 0.34	5.0 / 0.34	5.0 / 0.34	5.0 / 0.34	5.0 / 0.34	5.0 / 0.34
	1/2	13		5.0 / 0.34	5.0 / 0.34	5.0 / 0.34	5.0 / 0.34	5.0 / 0.34	5.0 / 0.34

1. Spring ranges based on atmospheric inlet pressure.

2. To convert to inches Hg, multiply psig value by 2.04.

Table 6. Type T205VB Capacities

SPRING RANGE, PART NUMBER AND COLOR CODE ⁽¹⁾	VACUUM CONTROL SETTING ⁽²⁾		ORIFICE SIZE		CHANGE IN VACUUM TO WIDE-OPEN		CAPACITIES IN SCFH / Nm ³ /h OF 1.0 SPECIFIC GRAVITY AIR	
	psig	bar	Inch	mm	psig	bar	SCFH	Nm ³ /h
0 to 4 inches w.c. / 0 to 10 mbar 0N039427222 Unpainted	2 inches w.c.	5 mbar	1/4	6.4	0.6 inch w.c.	1.5 mbar	102	2.73
			1/2	13	1.3 inches w.c.	3 mbar	370	9.92
0 to 1.0 psig / 0 to 69 mbar 0N086127022 Unpainted	0.5	34 mbar	1/4	6.4	10 inches w.c.	25 mbar	298	7.99
			1/2	13	0.7	48 mbar	1137	30.5
0 to 2.1 psig / 0 to 145 mbar 0N004327022 Yellow	2	0.14	1/4	6.4	1.2	83 mbar	513	13.7
			1/2	13	2.4	0.17	1968	52.7
0 to 5 psig / 0 to 0.35 bar 1D141827012 Blue	4	0.28	1/4	6.4	3.2	0.22	627	16.8
			1/2	13	6.3	0.43	2468	66.1

1. Spring ranges based on atmospheric inlet pressure.
2. To convert to inches Hg, multiply psig value by 2.04.

pump downstream from the vessel increases the vessel vacuum to more than 4 inches w.c. / 10 mbar. It is desirable to find the air flow by the time the pump has increased the vessel vacuum to 9 inches w.c. / 22 mbar and the breaker has opened more. To find the air flow through the breaker under these conditions:

1. Check whether the change in outlet (controlled) pressure of 5 inches w.c. / 12 mbar is less than the minimum change in outlet (controlled) pressure required to fully open the vacuum breaker. Since the minimum change in outlet (controlled) pressure required to fully open the vacuum breaker with a 1/4-inch / 6.4 mm orifice and control spring is

0.6 inch w.c. / 1.5 mbar from Table 4, no reduction in the regulating C_g of 44 (Table 2) need to be made.

2. Solve the problem by using the appropriate values in the formula as follows, remembering that the ΔP across the vacuum breaker is 9 inches w.c. / 0.325 psig / 22 mbar:

$$Q = 14.7(44) \sin \left[\frac{3415}{29.3} \sqrt{\frac{0.325}{14.7}} \right] \text{ DEG}$$

$$= 193 \text{ SCFH} / 5.17 \text{ Nm}^3/\text{h of Air}$$

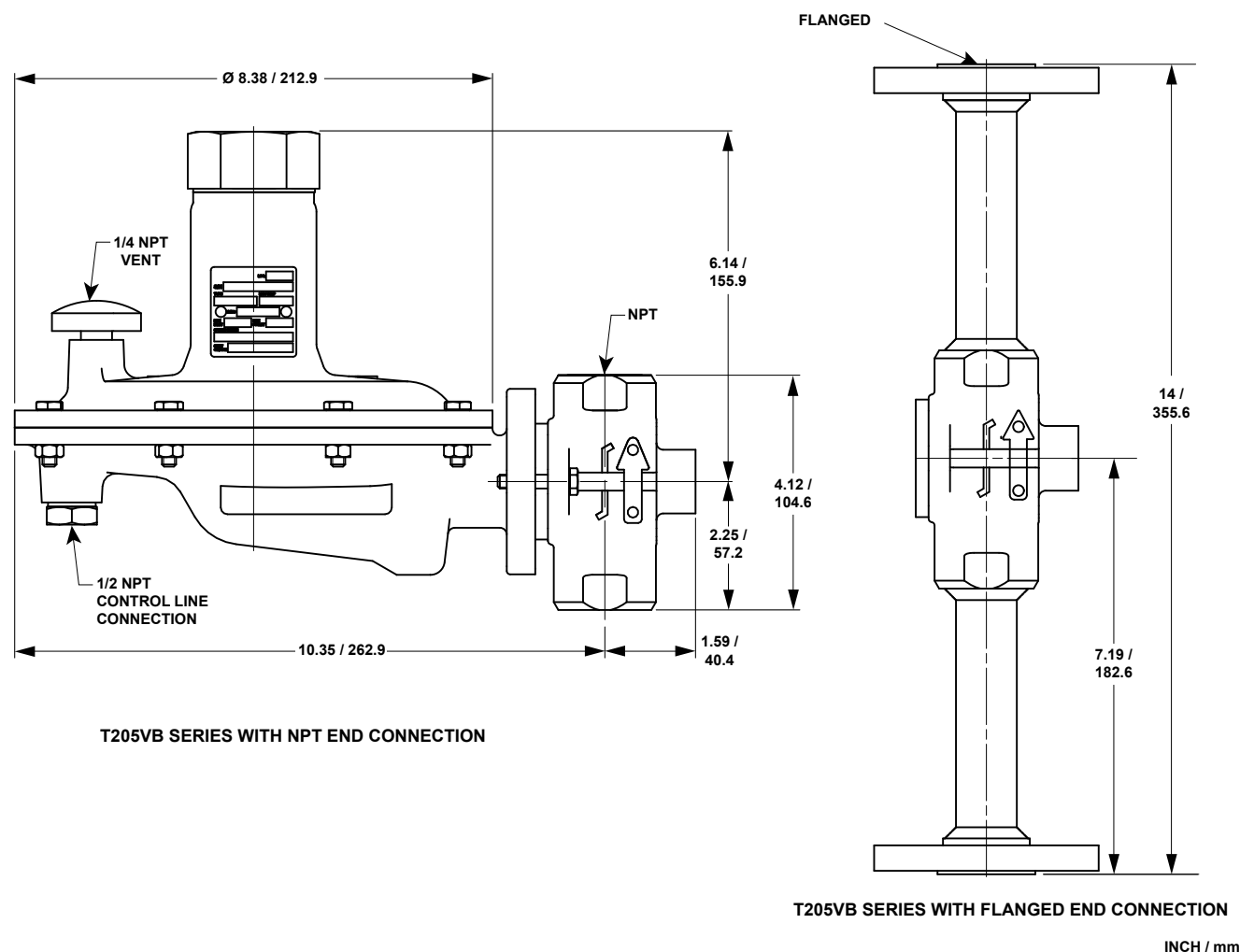


Figure 3. T205VB Series Dimension

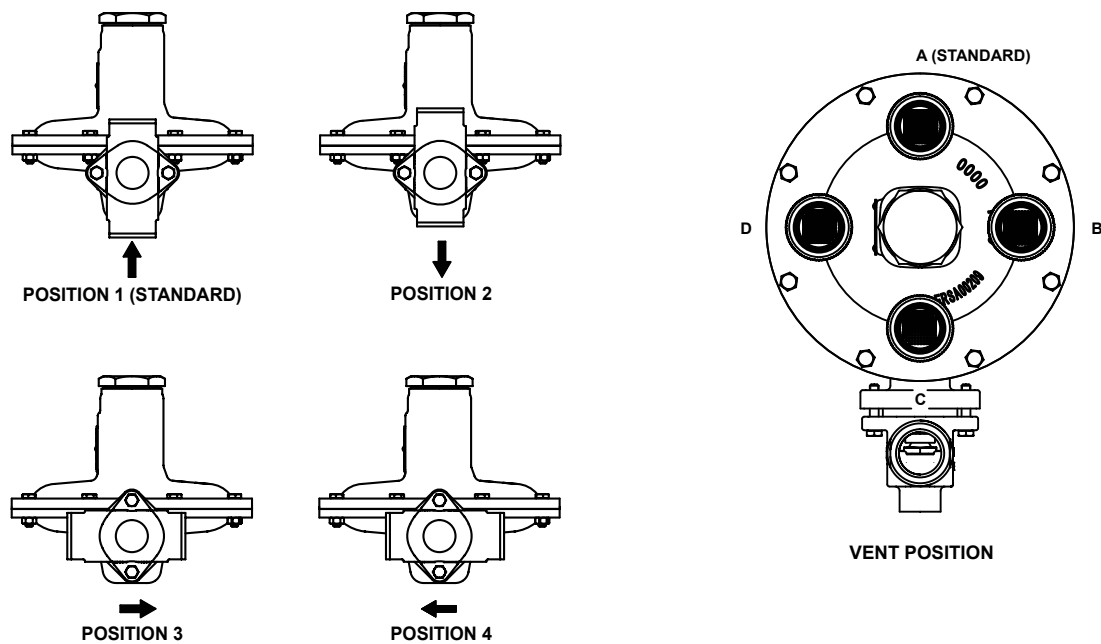


Figure 4. Body and Vent Orientation

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)

- ☐ T205VB, Internal pressure registration
- ☐ T205VBM, 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 (Select One)

- ☐ 0 to 4 inches w.c. / 0 to 10 mbar, Unpainted***
- ☐ 0 to 1.0 psig / 0 to 69 mbar, Unpainted***
- ☐ 0 to 2.1 psig / 0 to 145 mbar, Yellow***
- ☐ 0 to 5 psig / 0 to 0.34 bar, Blue***

Orifice Size (Select One)

- ☐ 1/4 inch / 6.4 mm (standard)***
- ☐ 1/2 inch / 13 mm**

Diaphragm, Disk and O-ring Material

- ☐ Nitrile (NBR) (standard)
- ☐ Fluorocarbon (FKM)

Closing Cap Material (Select One)

- ☐ Zinc (standard)
- ☐ Steel

Body Position (See Figure 4, Select One)

- ☐ Position 1 (standard)***
- ☐ Position 2***
- ☐ Position 3***
- ☐ Position 4***

Vent Orientation (See Figure 4, Select One)

- ☐ Position A (standard)***
- ☐ Position B***
- ☐ Position C***
- ☐ Position D***

Spring Case Orientation/Vent Type (Select One)

- ☐ Spring Case Up (Type Y602-11) (standard)
- ☐ 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:	
Specific Use	_____
Line Size	_____
Fluid Type	_____
Specific Gravity	_____
Temperature	_____
Does the Application Require Overpressure Protection?	
☐ Yes	☐ No
Pressure:	
Maximum Inlet Pressure	_____
Minimum Inlet Pressure	_____
Differential Pressure	_____
Set Pressure	_____
Maximum Flow	_____
Accuracy Requirements:	
Less Than or Equal To:	
☐ 5%	☐ 10% ☐ 20% ☐ Wide-Open
Construction Material Requirements (if known):	

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