

# 167D Series Switching Valves



P1185

TYPE 167D TWO-WAY SWITCHING VALVE



P1184

TYPE 167DA THREE-WAY SWITCHING VALVE

Figure 1. 167D Series Switching Valves

## Introduction

The 167D Series switching valves are typically used to deliver constant reduced pressure of gaseous fluids to pilot-operated controllers and other pneumatic instrumentation.

- The Types 167D and 167DS are two-way switching valves.
- The Types 167DA and 167DAS are three-way switching valves.

## Features

- **Compact**—The Types 167D and 167DA switching valves are engineered for outstanding performance in a compact, lightweight package.
- **Easy, Accurate Adjustment**—With a choice of springs for optimum resolution, the switching point is set to a specific requirement by an adjusting screw atop the spring case.
- **Sour Gas Service Capability**—NACE MR0175 and MR0103 compliant construction available.
- **Optional Stainless Steel Construction**—The Types 167DS and 167DAS provide high resistance to corrosion especially beneficial in offshore applications.
- **Ease of Maintenance**—No special tools are required to perform maintenance, and all maintenance can be performed with the valve in the line.
- **Rugged Construction**—The Types 167D and 167DA switching valves are engineered for longer service life with minimal maintenance requirements.
- **Corrosion Resistant Fasteners**—Bolting and adjusting screw are double zinc-chromated for enhanced corrosion resistance. Optional stainless steel bolting and adjusting screw are also available.

Patent Pending



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# Bulletin 71.7:167D

## Specifications

**Body Size, Inlet and Outlet Connection Style**  
**Ports A and C:** 1/4 or 1/2 NPT  
**Vent and Control Pressure Connections**  
**(Port D) and Port B:** 1/4 NPT

**Construction Materials**  
 See Table 3

**Maximum Inlet Pressure (Body Rating)<sup>(1)</sup>**  
 400 psig (27,6 bar)

**Set Pressure Ranges**  
 See Table 1

**Maximum Diaphragm Pressure<sup>(1)</sup>**  
 50 psi (3,4 bar) over outlet pressure setting

**Flow and Sizing Coefficients**  
 See Table 2

**Approximate Weights**  
**Types 167D and 167DA:** 1.2 pounds (0,5 kg)  
**Types 167DS and 167DAS:** 2.8 pounds (1 kg)

**Spring Case Vent Location**  
 Aligned with inlet standard, other positions optional

**Temperature Capabilities<sup>(1)</sup>**  
**Nitrile (NBR)**  
*Standard Bolting:* -20° to 180°F (-29° to 82°C)  
*Stainless Steel Bolting:* -40° to 180°F (-40° to 82°C)  
**Fluorocarbon (FKM):**  
 0° to 300°F (-18° to 149°C)

- Options**
- All Types**
- Handwheel adjusting screw
  - NACE MR0175 or NACE MR0103 construction<sup>(2)</sup>
  - Panel mount (includes spring case with 1/4 NPT vent, handwheel, and panel mounting nut)
  - Closing cap (available on spring case with 1/4 NPT vent)
  - Fluorocarbon (FKM) elastomers for high temperatures and/or corrosive chemicals
  - Stainless steel stem and valve plug

1. The pressure/temperature limits in this Bulletin and any applicable standard or code limitation should not be exceeded.  
 2. Product complies with the material requirements of NACE MR0175 or MR0103. Environmental limits may apply.

**Table 1. Set Pressure Ranges and Control Spring Data**

TYPES	SET PRESSURE RANGE, PSIG (bar)	CONTROL SPRING DATA					MAXIMUM PRESSURE CHANGE ON DIAPHRAGM FOR FULL STROKE, PSID (bar d)
		Color	Material	Part Number	Wire Diameter, Inch (mm)	Free Length, Inch (mm)	
167D, 167DA	0 to 15 (0 to 1,0) 0 to 20 (0 to 1,4) 0 to 35 (0 to 2,4)	Yellow stripe White stripe Purple stripe	Music Wire	GG00421X012 GE40282X012 GE40283X012	0.142 (3,61) 0.145 (3,68) 0.156 (3,96)	1.425 (36,2)	8 (0,55) 8 (0,55) 11 (0,76)
	0 to 60 (0 to 4,1) 0 to 125 (0 to 8,6)	Brown stripe Pink stripe	Chrome Silicon	GE40284X012 GE40345X012	0.170 (4,32) 0.207 (5,26)		14 (0,96) 31 (2,1)
167DS, 167DAS	0 to 20 (0 to 1,4) 0 to 35 (0 to 2,4) 0 to 60 (0 to 4,1) 0 to 125 (0 to 8,6) 0 to 150 (0 to 10,3)	White Purple Brown Pink Gold	Inconel®	GE40320X012 GE40321X012 GE40322X012 GE40323X012 GE40324X012	0.148 (3,76) 0.162 (4,12) 0.177 (4,50) 0.218 (5,54) 0.234 (5,94)	1.750 (44,4)	6 (0,41) 10 (0,69) 13 (0,90) 27 (1,9) 36 (2,5)

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**Table 2. Flow and Sizing Coefficients**

TYPES	BODY SIZE	PORT	WIDE-OPEN FLOW COEFFICIENTS		C <sub>1</sub>	IEC SIZING COEFFICIENT
			C <sub>g</sub>	C <sub>v</sub>		X <sub>t</sub>
167D, 167DS	1/4 NPT	C	41.46	1.09	37.56	0.89
	1/2 NPT		46.50	1.18	39.03	0.96
167DA, 167DAS	All sizes	B	27.79	0.96	28.74	0.52
	1/4 NPT	C	49.35	1.60	30.58	0.59
	1/2 NPT		58.86	1.81	32.22	0.66

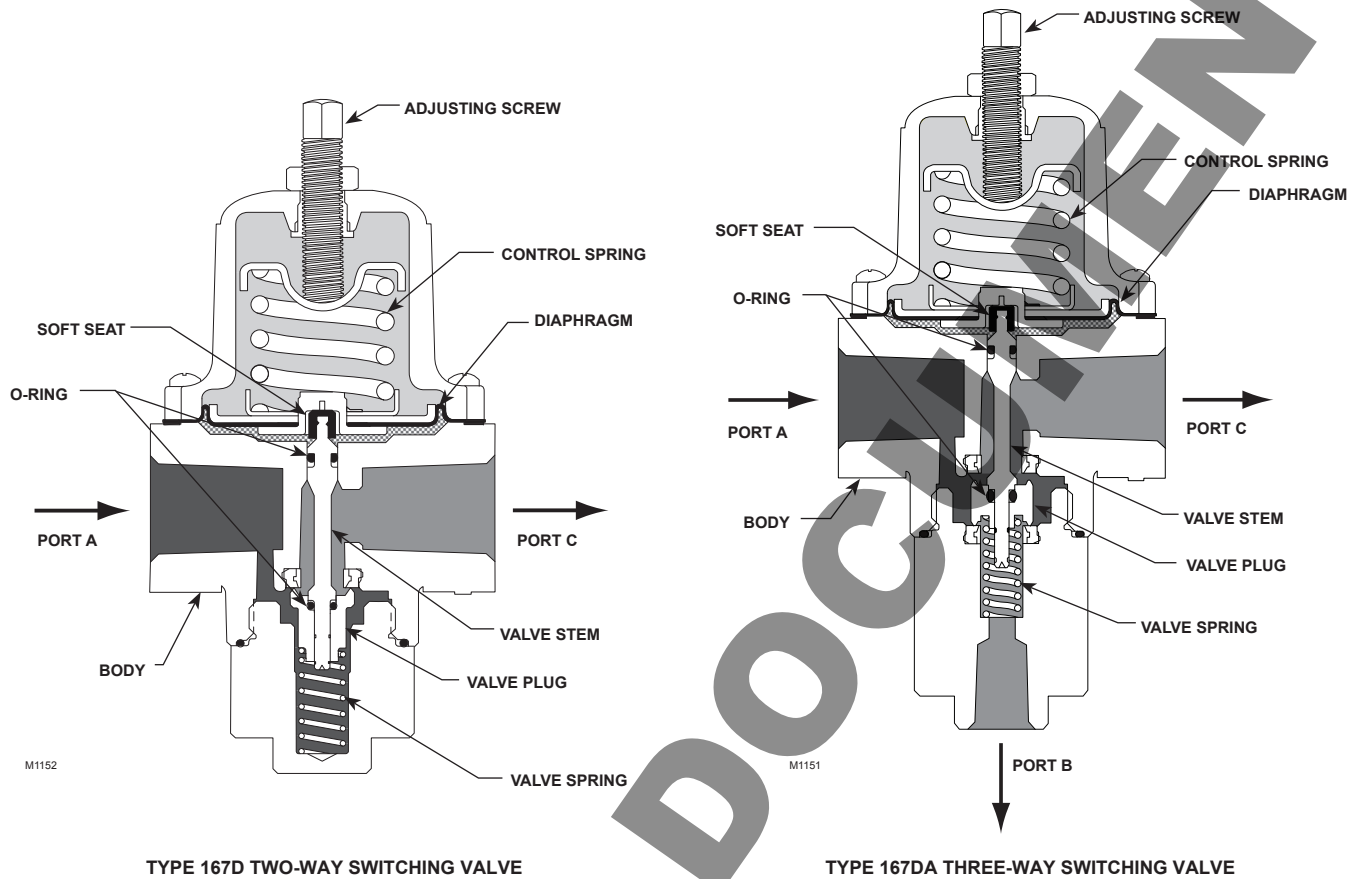
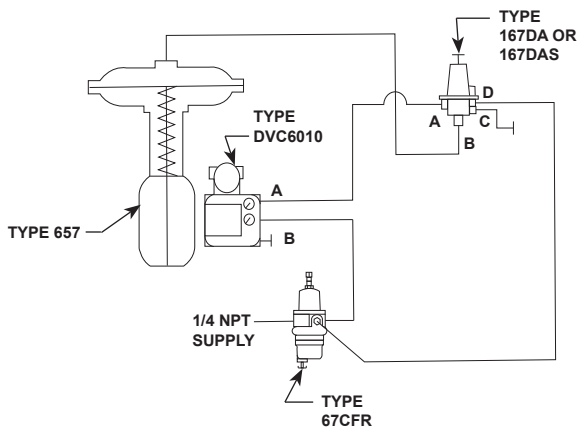


Figure 2. 167D Series Operational Schematics (Port D not shown)

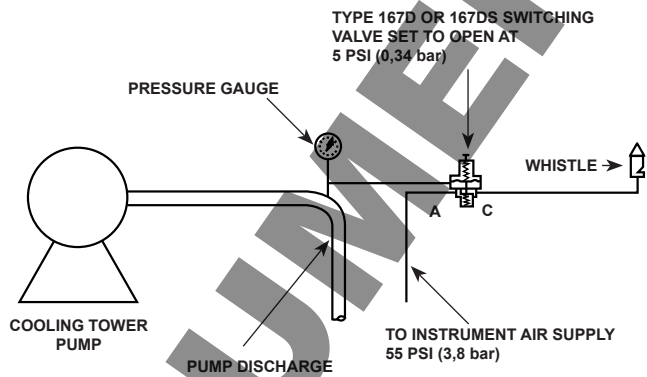
Table 3. Construction Materials

PART NAME	TYPES	
	167D and 167DA	167DS and 167DAS
BODY AND SPRING CASE	Aluminum (ASTM B85/Alloy 380)	CF8M/CF3M Stainless steel
SPRING RETAINER	Aluminum	316L Stainless steel
UPPER SPRING SEAT	Zinc-plated steel	316 Stainless steel
DIAPHRAGM PLATE	Chromate conversion coated Aluminum	
CONTROL SPRING	Zinc-plated steel and Chrome Silicon	Inconel®
VALVE STEM	Brass or Aluminum	316L Stainless steel
VALVE PLUG	Brass or 316L Stainless steel	
VALVE SPRING	302 Stainless steel or Inconel® (NACE)	
DIAPHRAGM, O-RINGS, AND SOFT SEAT	Nitrile (NBR) or Fluorocarbon (FKM)	
BOLTING, ADJUSTING SCREW	Zinc-plated steel	Zinc-plated steel or 316 Stainless steel
HEXNUT	Zinc-plated steel or 316 Stainless steel	316 Stainless steel
HANDWHEEL	Zinc-plated steel screw with resin handwheel	



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**Figure 3.** Typical 167DA or 167DAS Installation (Lockup system using Type 167DA or 167DAS to close air circuit to diaphragm of main valve in case of plant air failure. Main valve will remain in position it occupied at time of supply pressure failure.)



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**Figure 4.** Typical 167D or 167DS Installation (Warning system using Type 167D or 167DS two-way valve to activate a whistle when pump discharge pressure falls.)

## Principle of Operation

Refer to Figure 2 and also refer to Figures 3 through 5 for port D location. Control pressure enters the switching valves through Port D (not shown in Figure 2) and registers under the diaphragm. Control pressure overcomes the spring force and the diaphragm and valve plug are raised, closing port C and opening port B of the Type 167DA three-way switching valve. In this condition the Type 167D construction is turned off and the Type 167DA construction provides flow from path A to B. If, either intentionally or through pneumatic failure, the control pressure drops below the spring force, the diaphragm and valve plug move downward, opening port C and closing port B of the Type 167DA three way switching valve. In this condition both constructions provide a flow path from port A to port C. The pressure change necessary to switch the valve depends on the spring used and the setting of the adjusting screw on the switching valve.

## Installation

The switching valve can be mounted in any position, providing the vent in the spring case is free from obstruction. Connect the pneumatic control line to the port marked "D" on the valve body. Ports A and C (and B on the Types 167DA and 167DAS valve) are connected for the desired switching valve response to loss or decrease in pneumatic pressure.

Figure 5 shows typical application of the Types 167DA and 167DAS switching valve. If the control valve inlet pressure falls below a predetermined setting, the on-off controller turns off control pressure to the switching valve. This causes the switching valve to bleed the control valve diaphragm pressure to atmosphere, closing the control valve. The control valve remains closed until the inlet pressure is restored to the desired setting.

Dimensions are shown in Figure 7.

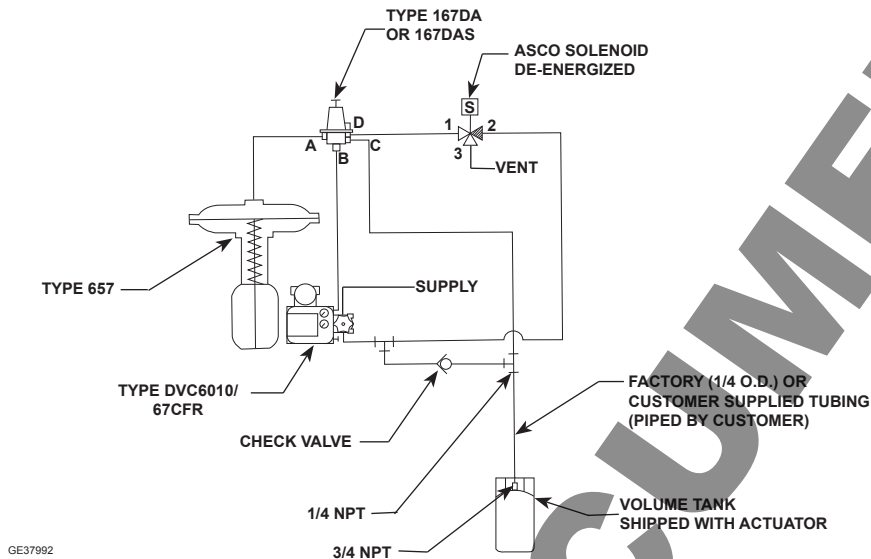


Figure 5. Typical Switching Valve Application

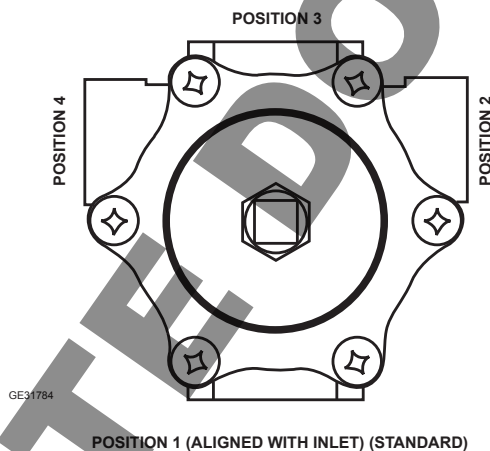


Figure 6. 167D Series Vent Positions

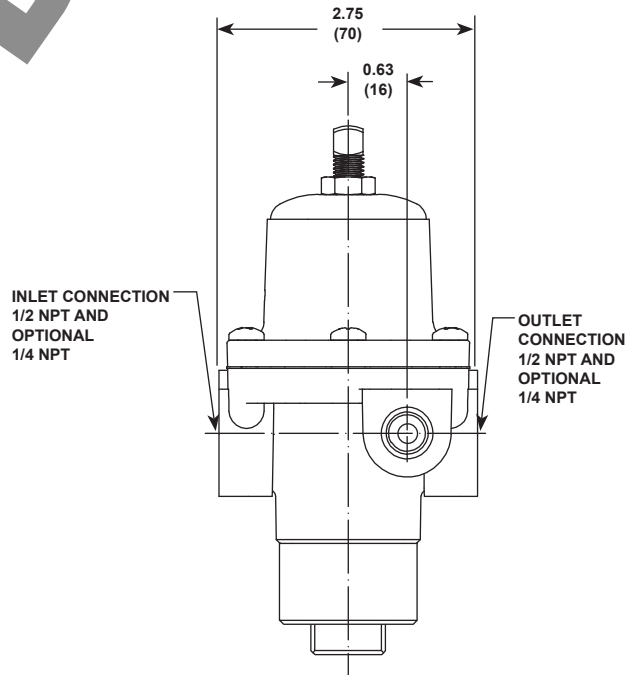
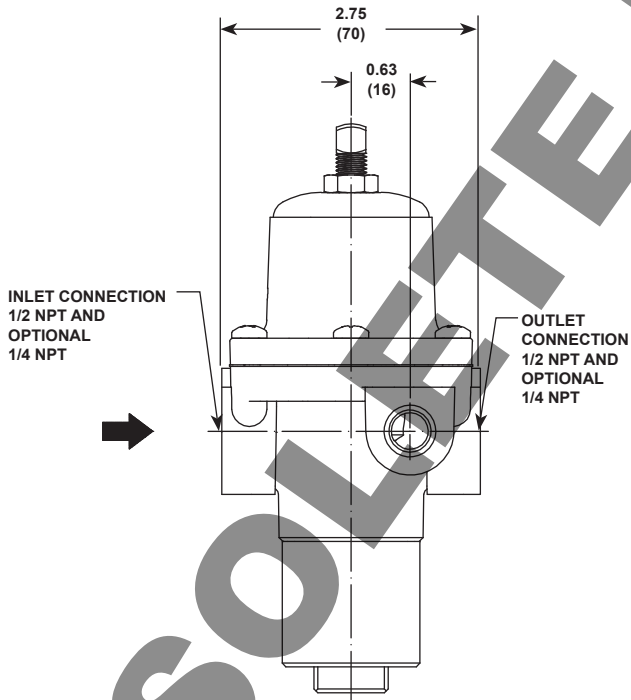
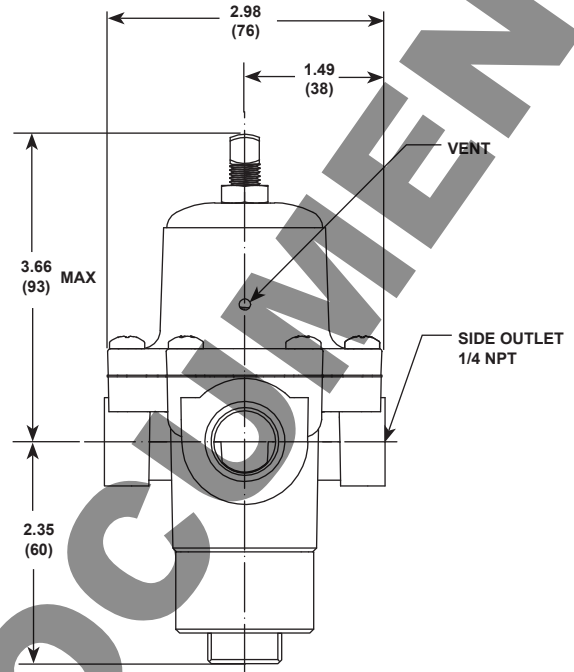
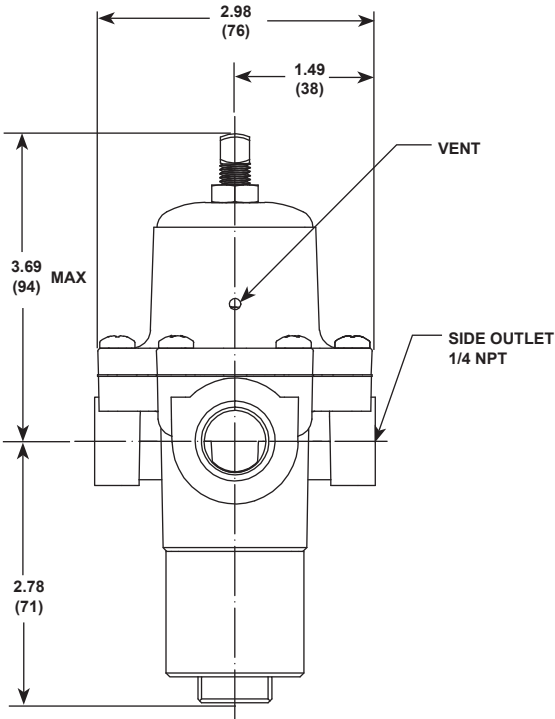
## Overpressure Protection

The 167D Series switching valves have maximum outlet pressure ratings that are lower than their maximum inlet pressure ratings. A pressure-relieving or pressure-limiting device is needed if inlet pressure can exceed the maximum outlet pressure rating. Overpressuring any portion of a switching valve or associated equipment may cause leakage, parts damage, or personal injury due to bursting of pressure-containing parts or explosion of accumulated gas. Switching valve operation within ratings does not preclude the possibility of damage from external sources or from debris in the pipeline. A switching valve should be inspected for damage periodically and after any overpressure condition.

## Universal NACE Compliance

Optional materials are available for applications handling sour gases. These constructions comply with the recommendations of all NACE International sour service standards.

The manufacturing processes and materials used by Emerson assure that all products specified for sour gas service comply with the chemical, physical, and metallurgical requirements of NACE MR0175 and/or NACE MR0103. Customers have the responsibility to specify correct materials. Environmental limitations may apply and shall be determined by the user.



INCHES (mm)

GG01159

167DA SERIES

GG02448

167D SERIES

Figure 7. 167D Series Dimensions

Ordering Guide

Type (Select One)

- 167D (two-way, aluminum)\*\*\*
167DS (two-way, stainless steel)\*\*\*
167DA (three-way, aluminum)\*\*\*
167DAS (three-way, stainless steel)\*\*\*

Body Size (Ports A and C) (Select One)

- 1/4 NPT
1/2 NPT

Quantity (Specify) \_\_\_\_\_

Spring Case Style (Select One)

- Drilled hole vent (Types 167D and 167DA standard)\*\*\*
1/4 NPT vent (Types 167DS and 167DAS standard)\*\*\*
Single hole panel mount\*\*\*

Adjusting Screw (Select One)

- Square head (Types 167D and 167DA standard)\*\*\*
Square head with closing cap (Types 167DS and 167DAS standard)\*\*\*
Handwheel\*\*\*

Set Pressure Range (Select One)

- 0 to 15 psig (0 to 1,0 bar)\*\*\*
0 to 20 psig (0 to 1,4 bar)\*\*\*
0 to 35 psig (0 to 2,4 bar)\*\*\*
0 to 60 psig (0 to 4,1 bar)\*\*\*
0 to 125 psig (0 to 8,6 bar)\*\*\*
0 to 150 psig (0 to 10,3 bar) (Types 167DS and 167DAS only)\*\*\*

Diaphragm, O-Rings, and Valve Plug (Select One)

- Nitrile (NBR) (standard)\*\*\*
Fluorocarbon (FKM)\*\*

Spring Case Vent Location (Select One)

- Position 1 - Aligned with inlet (standard)\*\*\*
Position 2
Position 3
Position 4

NACE MR0175 Construction (Optional)(1)

- Yes (not available with gauge)\*\*

NACE MR0103 Construction (Optional)

- Yes (not available with gauge)\*\*

Replacement Parts Kit (Optional)

- Yes, send one replacement parts kit to match this order.

1. Product complies with the material requirements of NACE MR0175. Environmental limits may apply.

Table with 2 columns: Availability (\*\*\*, \*\*, \*) and Description (Readily Available for Shipment, Allow Additional Time for Shipment, Special Order, Constructed from Non-Stocked Parts. Consult your local Sales Office for Availability.)

Specification Worksheet Application (Please designate units): Specific Use, Line Size, Gas Type and Specific Gravity, Gas Temperature, Does the Application Require Overpressure Protection?, Pressure (Please designate units): Maximum Inlet Pressure, Minimum Inlet Pressure, Downstream Pressure Setting(s), Maximum Flow, Performance Required: Accuracy Requirements, Need for Extremely Fast Response?, Other Requirements.



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