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 for 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.
### Specifications

**Available Configurations**

Types 167D and 167DS: Two-way switching valves  
Types 167DA and 167DAS: Three-way switching valves

**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 4

**Maximum Operating Inlet Pressure**

1. Types 167D and 167DS: 400 psig / 27,6 bar  
2. Types 167DA and 167DAS: 125 psig / 8,6 bar  
3. Types 167DA and 167DAS (NACE): 100 psig / 6,9 bar

**Set Pressure Ranges**

See Tables 1 and 2

**Maximum Diaphragm Pressure**

150 psi / 10,3 bar over outlet pressure setting up to a maximum of 250 psi / 17,2 bar

**Flow and Sizing Coefficients**

See Table 3

**Spring Case Vent Location**

Aligned with inlet standard, other positions optional

**Temperature Capabilities**

Nitrile (NBR)  
Standard Service (Types 167D and 167DA only): -20° to 180°F / -29° to 82°C  
Low Temperature Service (Types 167D and 167DA only) and Standard Service (Types 167DS and 167DAS only): -40° to 180°F / -40° to 82°C  
Fluorocarbon (FKM)  
High Temperature Service: 0° to 300°F / -18° to 149°C

**Approximate Weights**

Types 167D and 167DA: 1.2 pounds / 0,5 kg  
Types 167DS and 167DAS: 2.8 pounds / 1 kg

### Options

**Types 167D and 167DA**

- Handwheel adjusting screw  
- Fluorocarbon (FKM) diaphragm, soft seat, and O-rings  
- Stainless steel valve stem and plug. Includes stainless steel seat.  
- 1-hole panel mount with handwheel adjusting screw and 1/4 NPT tap spring case  
- 3-hole panel mount bonnet with handwheel adjusting screw and 1/4 NPT spring case  
- 1/4 NPT tapped vent spring case  
- 1/4 NPT tapped vent and closing cap  
- Adjusting screw with locknut and a lock wire to one flange bolt (For Type 167D only)  
- Panel mounting bracket. Includes 1/4 NPT spring case, standard adjusting screw, nut, and bracket.

**Types 167DS and 167DAS**

- Handwheel adjusting screw  
- Fluorocarbon (FKM) diaphragm, soft seat, and O-rings  
- 1-hole panel mount with handwheel adjusting screw and 1/4 NPT tap spring case  
- Panel mounting bracket. Includes 1/4 NPT spring case, standard adjusting screw, nut, and bracket.  
- Size 30-70 casing mounting bracket. Includes Nut, fasteners, and bracket.

---

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.
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 raises the valve plug, 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.
### Table 1. Three-Way Switching Valves Set Pressure Ranges and Control Spring Data

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SET PRESSURE RANGE</th>
<th>CONTROL SPRING DATA</th>
<th>MAXIMUM PRESSURE CHANGE ON TO SHIFT FROM PORT B CLOSED TO PORT C CLOSED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Port A or C as Inlet</td>
<td>Port B as Inlet</td>
<td>Color Code</td>
</tr>
<tr>
<td>167DA</td>
<td>14 to 20 16 to 35</td>
<td>7 to 20 10 to 30</td>
<td>0.48 to 1.4 0.69 to 2.1</td>
</tr>
<tr>
<td></td>
<td>25 to 60 40 to 125</td>
<td>25 to 50 40 to 90</td>
<td>1.7 to 3.4 2.8 to 6.2</td>
</tr>
<tr>
<td>167DAS</td>
<td>14 to 20 16 to 35</td>
<td>7 to 20 10 to 30</td>
<td>0.48 to 1.4 0.69 to 2.1</td>
</tr>
</tbody>
</table>

Inconel® is a mark owned by Special Metals Corporation.

### Table 2. Two-Way Switching Valves Set Pressure Ranges and Control Spring Data

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SET PRESSURE RANGE</th>
<th>CONTROL SPRING DATA</th>
<th>MAXIMUM PRESSURE CHANGE ON TO SHIFT FROM PORT B CLOSED TO PORT C CLOSED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Port A as Inlet</td>
<td>Color Code</td>
<td>Material</td>
</tr>
<tr>
<td>167D</td>
<td>3 to 15 5 to 35</td>
<td>0.21 to 1.0 0.34 to 2.4</td>
<td>Yellow stripe White stripe Purple stripe</td>
</tr>
<tr>
<td></td>
<td>25 to 60 40 to 125</td>
<td>1.7 to 4.1 2.8 to 8.6</td>
<td>Brown stripe Pink stripe</td>
</tr>
<tr>
<td>167DS</td>
<td>5 to 20 5 to 35</td>
<td>0.34 to 1.4 0.34 to 2.4</td>
<td>White Purple Brown Pink</td>
</tr>
<tr>
<td></td>
<td>5 to 60 10 to 150</td>
<td>1.7 to 4.1 2.8 to 10.3</td>
<td>3.4 to 10.3</td>
</tr>
</tbody>
</table>

### Table 3. Flow and Sizing Coefficients

<table>
<thead>
<tr>
<th>TYPES</th>
<th>BODY SIZE</th>
<th>PORT</th>
<th>WIDE-OPEN FLOW COEFFICIENTS</th>
<th>IEC SIZING COEFFICIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>167D, 167DS</td>
<td>1/4 NPT</td>
<td>C</td>
<td>41.46</td>
<td>1.09</td>
</tr>
<tr>
<td></td>
<td>1/2 NPT</td>
<td>46.50</td>
<td>1.18</td>
<td>39.03</td>
</tr>
<tr>
<td>167DA, 167DAS</td>
<td>All sizes</td>
<td>B</td>
<td>27.79</td>
<td>0.96</td>
</tr>
<tr>
<td></td>
<td>1/4 NPT</td>
<td>49.35</td>
<td>1.60</td>
<td>30.58</td>
</tr>
<tr>
<td></td>
<td>1/2 NPT</td>
<td>58.86</td>
<td>1.81</td>
<td>32.22</td>
</tr>
</tbody>
</table>

### Table 4. Construction Materials

<table>
<thead>
<tr>
<th>PART NAME</th>
<th>TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>BODY AND SPRING CASE</td>
<td>167D and 167DA</td>
</tr>
<tr>
<td>SPRING RETAINER</td>
<td>Aluminum</td>
</tr>
<tr>
<td>UPPER SPRING SEAT</td>
<td>Zinc-plated steel</td>
</tr>
<tr>
<td>DIAPHRAGM PLATE</td>
<td>Chromate conversion coated Aluminum</td>
</tr>
<tr>
<td>CONTROL SPRING</td>
<td>Zinc-plated steel and Chrome Silicon</td>
</tr>
<tr>
<td>VALVE STEM</td>
<td>Brass or 316L Stainless Steel</td>
</tr>
<tr>
<td>VALVE PLUG</td>
<td></td>
</tr>
<tr>
<td>VALVE SPRING</td>
<td>302 Stainless steel or Inconel® X-750 (NACE)</td>
</tr>
<tr>
<td>BOLTING, ADJUSTING SCREW</td>
<td>Zinc-plated steel</td>
</tr>
<tr>
<td>HEXNUT</td>
<td>Zinc-plated steel or 316 Stainless steel</td>
</tr>
<tr>
<td>HANDWHEEL</td>
<td>Zinc-plated steel screw with resin handwheel</td>
</tr>
</tbody>
</table>

Inconel® is a mark owned by Special Metals Corporation.
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.
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)***
- 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)

Set Pressure Range (Select One) (continued)

Two-Way Switching Valve

Port A as Inlet
- 3 to 15 psig / 0,21 to 1,0 bar (Type 167D only)***
- 5 to 20 psig / 0,34 to 1,4 bar***
- 5 to 35 psig / 0,34 to 2,4 bar***
- 25 to 60 psig / 1,7 to 4,1 bar***
- 40 to 125 psig / 2,8 to 8,6 bar***
- 50 to 150 psig / 3,4 to 10,3 bar (Type 167DS 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.

Specification Worksheet

Application (Please designate units):
Specific Use ____________________________
Line Size ____________________________
Gas Type and Specific Gravity ____________________________
Gas Temperature ____________________________

Does the Application Require Overpressure Protection?
- Yes □ No □ If yes, which is preferred:
- Relief Valve □ Monitor Regulator
- Shut-off Device

Is overpressure protection equipment selection assistance desired?

Pressure (Please designate units):
Maximum Inlet Pressure ($P_{\text{max}}$) ____________________________
Minimum Inlet Pressure ($P_{\text{min}}$) ____________________________
Downstream Pressure Setting(s) ($P_2$) ____________________________
Maximum Flow ($Q_{\text{max}}$) ____________________________

Performance Required:
- Accuracy Requirements?
- Need for Extremely Fast Response?
- Other Requirements:

<table>
<thead>
<tr>
<th>Regulators Quick Order Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>***</td>
</tr>
<tr>
<td>**</td>
</tr>
<tr>
<td>*</td>
</tr>
</tbody>
</table>

* * *  Readily Available for Shipment
* * Allow Additional Time for Shipment
* Special Order, Constructed from Non-Stocked Parts. Consult your local Sales Office for Availability.

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

Application (Please designate units):
Specific Use ____________________________
Line Size ____________________________
Gas Type and Specific Gravity ____________________________
Gas Temperature ____________________________

Does the Application Require Overpressure Protection?
- Yes □ No □ If yes, which is preferred:
- Relief Valve □ Monitor Regulator
- Shut-off Device

Is overpressure protection equipment selection assistance desired?

Pressure (Please designate units):
Maximum Inlet Pressure ($P_{\text{max}}$) ____________________________
Minimum Inlet Pressure ($P_{\text{min}}$) ____________________________
Downstream Pressure Setting(s) ($P_2$) ____________________________
Maximum Flow ($Q_{\text{max}}$) ____________________________

Performance Required:
- Accuracy Requirements?
- Need for Extremely Fast Response?
- Other Requirements:

<table>
<thead>
<tr>
<th>Regulators Quick Order Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>***</td>
</tr>
<tr>
<td>**</td>
</tr>
<tr>
<td>*</td>
</tr>
</tbody>
</table>

* * *  Readily Available for Shipment
* * Allow Additional Time for Shipment
* Special Order, Constructed from Non-Stocked Parts. Consult your local Sales Office for Availability.

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