General Description

Series D*FX proportional directional control valves are direct operated solenoid valves with electronic spool position feedback, and on-board integrated control electronics. D*FX valves are user configurable to proportionally control flow in response to voltage or current command signals. Valves are available in sizes NG6 (CETOP 3) and NG10 (CETOP 5).

Three electronic control options are available simplifying user application. Configurations include the industrial standard 7-pin interface, or options for a user configurable simple proportional analog outer closed loop, or ± 10V reference outputs which can be used as user command voltage references.

D*FX valve performance is characterized by high resolution flow control, repeatability, and good dynamic performance. Typical applications include precise and reproducible control of actuator speed in rapid/slow speed profiling, and smooth acceleration and deceleration performance.

Features

- Integrated valve electronics.
- Versatile electronic control options.
- Spool position feedback.

Specifications

<table>
<thead>
<tr>
<th>Interface DIN</th>
<th>Flow Rating @ 10 Bar (150 PSI) ∆p (P → A, B → T) LPM (GPM)</th>
<th>Maximum Flow LPM (GPM)</th>
<th>Step Response (time to reach 90% of a 100% step command) ms</th>
<th>Hysteresis %</th>
<th>Repeatability %</th>
</tr>
</thead>
<tbody>
<tr>
<td>NG6 (CETOP 3)</td>
<td>20 (5.3)</td>
<td>47 (12.5)</td>
<td>60</td>
<td>&lt;1.5</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td>NG10 (CETOP 5)</td>
<td>60 (15.9)</td>
<td>170 (45)</td>
<td>75</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Command Signal (impedance) (select by ordering code)
- 24V Version 'J'
  - 0 ± 10 VDC (100K ohm)
  - 0 ± 20 mA (499 ohm)
- 12V Version 'K'
  - 0 ± 5 VDC

Command Polarity
- Pin ‘D’ more positive than ‘E’; Flow P to A

Spool Position Monitor
- 24V Version ‘J’
- 12V Version ‘K’

Voltage References:
- Not a powered output
  - Only for 10K Ohm pots

Mating Connector
- Not a powered output
  - Only for 10K Ohm pots

Environmental Protection Class
- NEMA 4 (IP65)

1) Actual pressure drop required for each metering land, up to the specified maximum flow rate is:

ΔP_{actual} = (5) \left( \frac{Q_{actual}}{Q_{rated}} \right)^2 \text{Bar}, \quad (Q \text{ in LPM})

\text{or}

= (75) \left( \frac{Q_{actual}}{Q_{rated}} \right)^2 \text{PSI}, \quad (Q \text{ in GPM})

Flow rate for different ∆p per control edge:

Q_{x} = Q_{\text{nom}} \cdot \sqrt{\frac{\Delta p_{x}}{\Delta p_{\text{nom}}}}
**Ordering Information**

### Series D*FX

**Proportional Directional Flow Control Valve with Spool Position Feedback and Integrated Electronics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1FX</td>
<td>NG6/CETOP 3</td>
</tr>
<tr>
<td>D3FX</td>
<td>NG10/CETOP 5</td>
</tr>
</tbody>
</table>

#### Spool Type

<table>
<thead>
<tr>
<th>Code</th>
<th>Spool Type</th>
<th>Flow</th>
<th>Style</th>
<th>Seal</th>
</tr>
</thead>
<tbody>
<tr>
<td>E01</td>
<td>B31</td>
<td>A31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E02</td>
<td>B32</td>
<td>A32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E85***</td>
<td>–</td>
<td>–</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Reduced flow rate on port B.
** Reduced flow rate on port A.
*** 5% lap spool for special applications. Consult Factory;
D1FX: Flow code F, C style only.
D3FX: Flow code M, C style only.

#### Flow at Δp 5 Bar (72.5 PSI) per metering edge

<table>
<thead>
<tr>
<th>Code</th>
<th>Style</th>
<th>Flow Rate (LPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>D1FX</td>
<td>7.5 (2)</td>
</tr>
<tr>
<td></td>
<td>D3FX</td>
<td>–</td>
</tr>
<tr>
<td>F</td>
<td>D1FX</td>
<td>15 (4)</td>
</tr>
<tr>
<td></td>
<td>D3FX</td>
<td>–</td>
</tr>
<tr>
<td>H</td>
<td>D1FX</td>
<td>20 (5.3)</td>
</tr>
<tr>
<td></td>
<td>D3FX</td>
<td>20 (5.3)</td>
</tr>
<tr>
<td>K**</td>
<td>D1FX</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>D3FX</td>
<td>30 (7.9)</td>
</tr>
<tr>
<td>M</td>
<td>D1FX</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>D3FX</td>
<td>40 (10.6)</td>
</tr>
<tr>
<td>S</td>
<td>D1FX</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>D3FX</td>
<td>60 (15.9)</td>
</tr>
</tbody>
</table>

* Spool type E only.
** Spool type E01 only.

#### Seal

- A

#### Electronic Design

- 0

#### Supply Voltage

- 0

#### Electronic Accessories

- 0

#### Valve Accessories

- 0

#### Design Series

- A

*Available only with D1FX Electronic Design Codes C & D.

**Mounting Interface**

Refer to Mounting Interface Dimensions in the Proportional Directional Valve section of this catalog.

**Accessories**

Refer to the Accessories section for bolt kits, subplates, connectors and pre-assembled cable assemblies.
**Application Guidelines**

D*FX proportional valves are available in three control configurations. Option ‘B’ conforms to the industrial proportional valve standard and is interchangeable with most competitors’ valves of this type. Options ‘C’ and ‘D’ are designed to simplify user application by providing specific features. Note that the ‘B’ control option uses the industrial standard CE compliant 7-pin MS connector while options ‘C’ and ‘D’ use a 6-pin MS connector. Refer to the table below for connector pinout assignments.

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Electronic Design Option</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>‘-B’</td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td></td>
</tr>
<tr>
<td>Power Supply</td>
<td>+V</td>
</tr>
<tr>
<td></td>
<td>0V</td>
</tr>
<tr>
<td>Reference</td>
<td>+10V</td>
</tr>
<tr>
<td>Outputs</td>
<td>-10V</td>
</tr>
<tr>
<td>Enable</td>
<td>–</td>
</tr>
<tr>
<td>Command</td>
<td>+CMD</td>
</tr>
<tr>
<td>Spool Position</td>
<td>–</td>
</tr>
<tr>
<td>Monitor</td>
<td></td>
</tr>
<tr>
<td>Outer Loop</td>
<td>–</td>
</tr>
<tr>
<td>Protective</td>
<td>G</td>
</tr>
</tbody>
</table>

**Design ‘B’ Option — Industrial Standard 7-Pin MS Connector Interface**

Electronic design option ‘B’ implements the industrial standard 7-pin MS connector interface. The design provides a differential command input that is user configurable as voltage or current, an external valve enable feature, and a spool position monitor output. To specify this option, refer to the Ordering Information page, Electronic Design block.

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**Internal Adjustment**

Refer to the Installation Guide for set-up, configuration, and application guidelines (packaged with each valve).

D1FX: Installation Bulletin 2583-M1/USA
D3FX: Installation Bulletin 2587-M1/USA
Design ‘C’ Option — User Configurable Analog Outer Closed Loop

Electronic design option ‘C’ provides an additional analog closed outer loop function for user application. This feature can be used to control simple position control loops where analog resolution and a single proportional gain control are adequate. The design provides a single ended command input that is user configurable as voltage or current, and an outer loop feedback sensor voltage input. ±10 volt outputs are available to reference the outer loop feedback sensor if required. To specify this option, refer to the Ordering Information page, Electronic Design block.

Design ‘D’ Option — Single Ended, Bipolar Command Input, with ± Volt Reference Output

Electronic design option ‘D’ provides a single ended, bipolar command input that is user configurable as voltage or current. ±10 volt references are available for user supplied off-board command potentiometers. A spool position monitor output is also provided. To specify this option, refer to the Ordering Information page, Electronic Design block.

Note 1: Install jumper JP1 for current command input. Refer to Installation Bulletin 2583-M1/USA (D1FX).  
Note 2: Install jumper JP4 to invert user outer loop feedback input signal.

Note 1: Install jumper JP1 for current command input. Refer to Installation Bulletin 2583-M1/USA (D1FX).  
Note 2: Refer to specifications.
Proportional Directional Control Valves

Series D*FX

Performance Curves

D1FX Flow Characteristics
at \( \Delta p = 5 \) Bar (72.5 PSI) per metering edge

\[ P \rightarrow A : B \rightarrow T; \text{ or } P \rightarrow B : A \rightarrow T \]

D3FX Flow Characteristics
at \( \Delta p = 5 \) Bar (72.5 PSI) per metering edge

\[ P \rightarrow A : B \rightarrow T; \text{ or } P \rightarrow B : A \rightarrow T \]

D1FX Operating Limits 1)
at 100% Command

\[ P \rightarrow A : B \rightarrow T; \text{ or } P \rightarrow B : A \rightarrow T \]

D3FX Operating Limits 1)
at 100% Command

\[ P \rightarrow A : B \rightarrow T; \text{ or } P \rightarrow B : A \rightarrow T \]

1) Shaded area: Actual flow subject to the system load dynamics
Note: 81 and 82 spools - decrease limits by 15%

D1FX Frequency Response
at 10% Command, 50% Offset

D3FX Frequency Response
at 10% Command, 50% Offset
Proportional Directional Control Valves
Series D*FX

Dimensions

D1FX
Inch equivalents for millimeter dimensions are shown in (**)

D3FX
Inch equivalents for millimeter dimensions are shown in (**)

Manual overrides both sides

Manual overrides both sides