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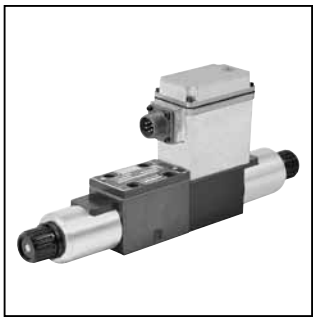
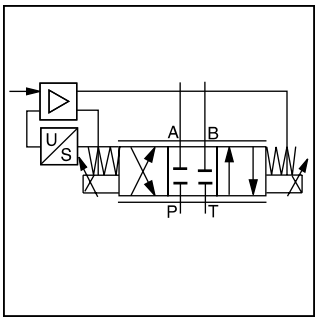
General Description

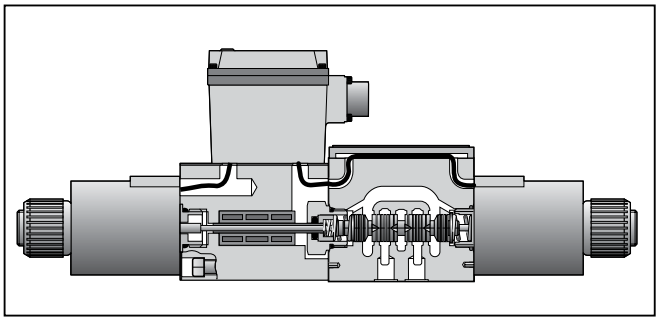
Series D*FX proportional directional control valves are direct operated solenoid valves with electronic spool position feedback, and on-board integrated control electronics. D*FX valves are user configurable to proportionally control flow in response to voltage or current command signals. Valves are 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.
- Spring centered spool.
- Manual override.
- Progressive flow characteristics for high resolution flow rate adjustment for small commands.
- LED functional diagnostics.

Specifications

Interface DIN	**NG6 (CETOP 3)**	**NG10 (CETOP 5)**
Flow Rating @10 Bar (150 PSI) Δp (P→A, B→T) (spool options up to)[1] LPM (GPM)	20 (5.3)	60 (15.9)
Maximum Flow LPM (GPM)	47 (12.5)	170 (45)
Step Response (time to reach 90% of a 100% step command) ms	60	75

Hysteresis %	<1.5
Repeatability %	<0.5
Max. Operating Pressure Port P, A, B Bar (PSI) Port T	 315 (4500) 35 (500)
Fluid Cleanliness Level	ISO Class 18/16/13
Fluid Viscosity, Recommended	75 – 600 SSU
Fluid Temperature, Recommended	0°C to +60°C (+32°F to +140°F)
Ambient Operating Temperature	-20°C to +60°C (-4°F to +140°F)
Electrical Power Requirements 24V Version 'J': NG6 (03) 24V Version 'J': NG10 (05) 12V Version 'K': NG06 (03) only	 18 to 30 VDC, 3A 18 to 30 VDC, 4A 11.5 to 15 VDC, 4A

Command Signal (impedance) (select by ordering code) 24V Version 'J'	 0 ± 10 VDC (100K ohm) 0 ± 20 mA (499 ohm)
Command Polarity	Pin 'D' more positive than 'E'; Flow P to A
Spool Position Monitor 24V Version 'J' 12V Version 'K'	 0 ± 10 VDC 0 ± 5 VDC
Mating Connector 7-Pin CE for Electronic Design 'B' 6-Pin for Electronic Design 'C' & 'D'	 Part #5004072 Part #697561
Environmental Protection Class	NEMA 4 (IP65)

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

$$\Delta P_{actual} = (5)\left(\frac{Q_{actual}}{Q_{rated}}\right)^2 \text{ Bar; (Q in LPM)} \quad [or] \quad = (75)\left(\frac{Q_{actual}}{Q_{rated}}\right)^2 \text{ PSI; (Q in GPM)}$$

Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

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Hydraulic Valve Division
Elyria, Ohio, USA

D*FX

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

Code	Description
D1FX	NG6/CETOP 3
D3FX	NG10/CETOP 5

Spool Type | Flow | Style | Seal | Electronic Design | Supply Voltage | 0 Electronic Accessories | 0 Valve Accessories | Design Series

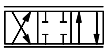
NOTE: Not required when ordering.

Code	Description
J	24 VDC
K	12 VDC*

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

Code	Description*
B	Standard CE Compliant
C	On-board Configurable Outer Closed Loop
D	On-board ±10V Reference Voltages

*All designs are user configurable to voltage or current command.

Code			Spool Type
$Q_A=Q_B$	$Q_A>Q_B$*	$Q_B>Q_A$**	
E01	B31	A31	
E02	B32	A32	
E85***	–	–	

* 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.

Code	Description
N	Nitrile
V	Fluorocarbon

Note: NG10 (CETOP5) valves are supplied with bolt kit BK98 (1/4 – 20 x 1.625). For metric bolt kit BK385 (M6 x 40 mm), add "-X6181" to ordering code.

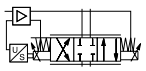
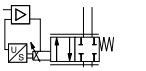
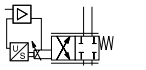
Weight:

D1FX	3.4 kg (7.5 lbs.)
D3FX	8.3 kg (18.3 lbs.)

Code	Flow at Δp 5 Bar (72.5 PSI) per metering edge	
	D1FX LPM (GPM)	D3FX LPM (GPM)
C	7.5 (2)*	–
F	15 (4)	–
H	20 (5.3)*	20 (5.3)*
K**	–	30 (7.9)
M	–	40 (10.6)
S	–	60 (15.9)*

* Spool type E only.

** Spool type E01 only.

Code	Style
C	
K	
E*	

* Only available on D1FX

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.

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Application Guidelines

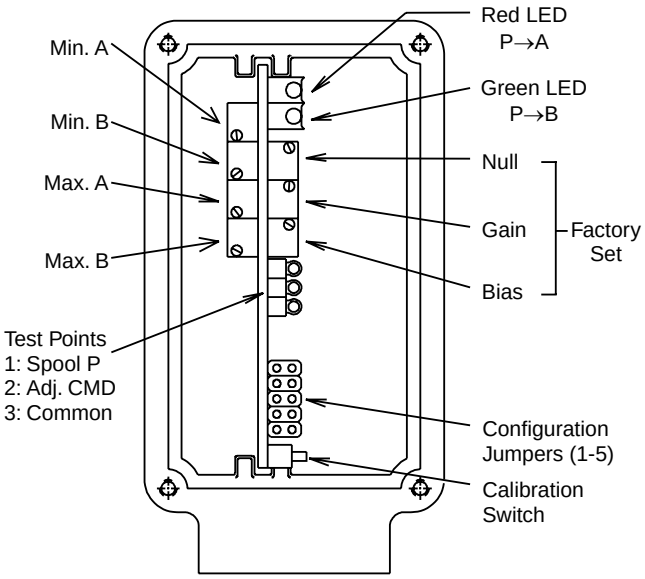
D*FX proportional valves are available in three control configurations. Option 'B' conforms to the industrial proportional valve standard and is interchangeable with most competitors' valves of this type. Options 'C' and 'D' are designed to simplify user application by providing specific features. Note 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 pin-out assignments.

Specifications		Electronic Design Option		
		'-B'	**'-C'**	**'-D'**
Function		Connector Pin Assignment		
Power Supply	+V	A	E	E
	0V	B	D	D
Reference	+10V	–	A	A
Outputs	-10V	–	F	F
Enable		C	–	–
Command	+CMD	D	B	B
	-CMD	E	–	–
Spool Position Monitor		F	–	C
Outer Loop Feedback – user		–	C	–
Protective Ground		G	–	–

Internal Adjustment

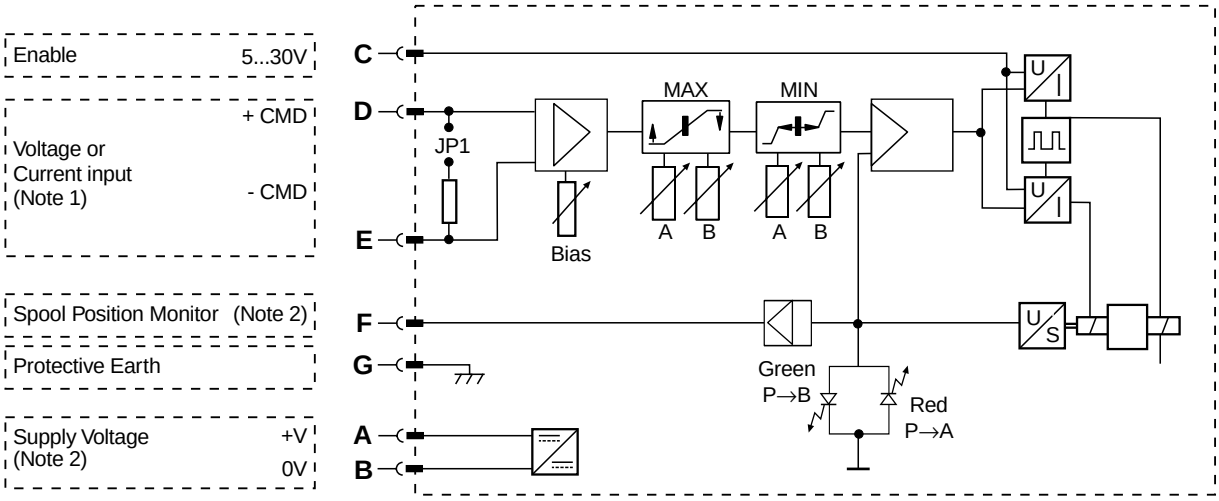
Refer to the Installation Guide for set-up, configuration, and application guidelines (packaged with each valve).

D1FX: Installation Bulletin 2583-M1/USA
D3FX: Installation Bulletin 2587-M1/USA



Design '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.



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

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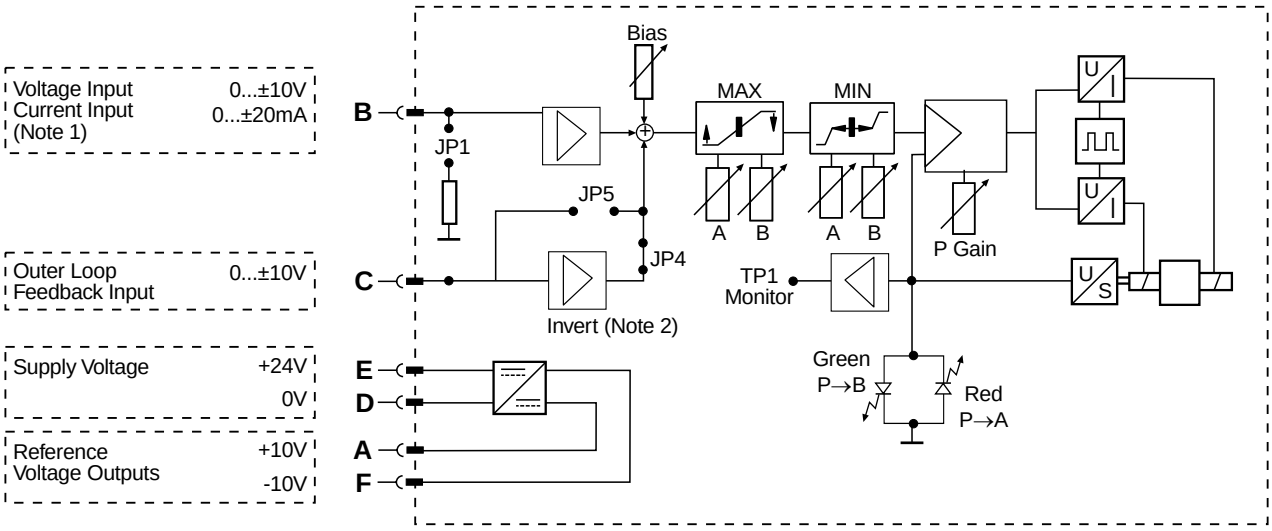
Design ‘C’ Option — User Configurable Analog Outer Closed Loop

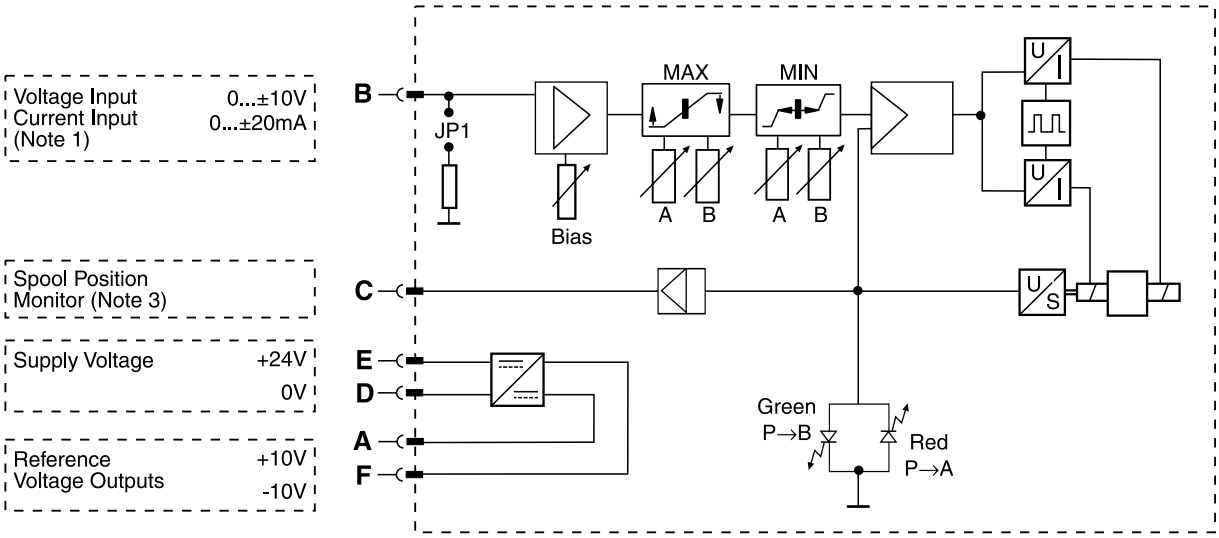
Electronic design option ‘C’ provides an additional analog closed outer loop function for user application. This feature can be used to control simple position control loops where analog resolution and a single proportional gain control are adequate. The design provides a single ended command input that 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.



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.

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: Refer to specifications.

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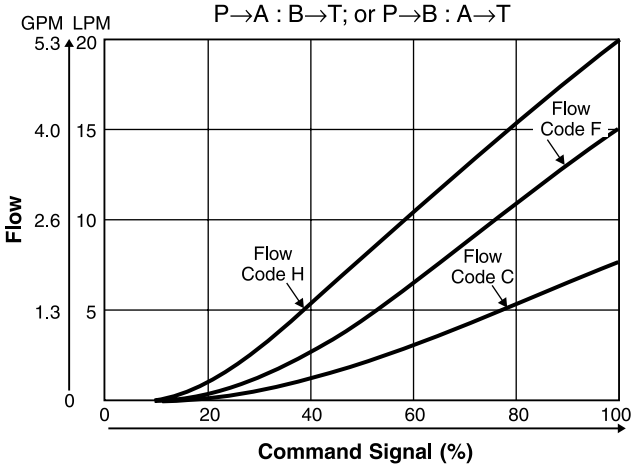
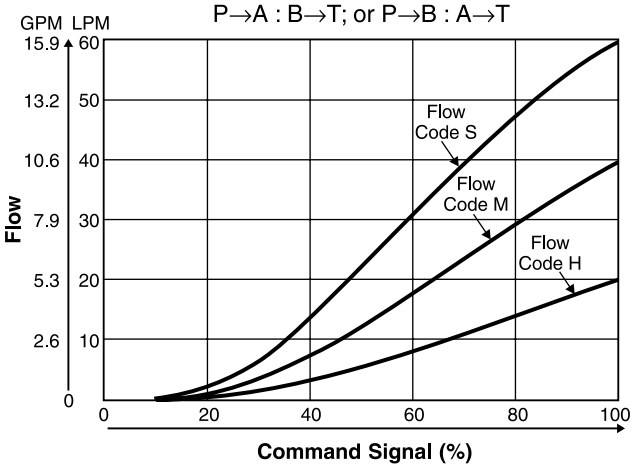
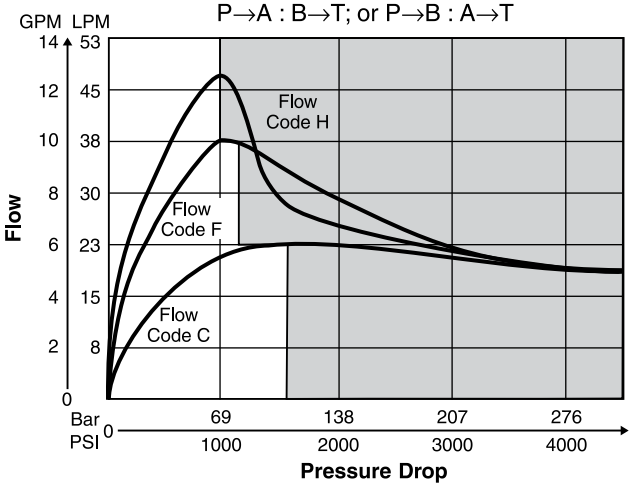
D1FX Flow Characteristics
at Δp = 5 Bar (72.5 PSI) per metering edge
P→A : B→T; or P→B : A→T



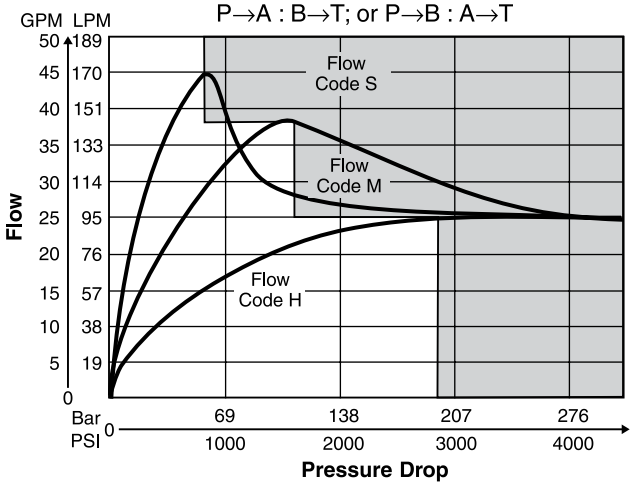
D3FX Flow Characteristics
at Δp = 5 Bar (72.5 PSI) per metering edge
P→A : B→T; or P→B : A→T



D1FX Operating Limits 1)
at 100% Command
P→A : B→T; or P→B : A→T

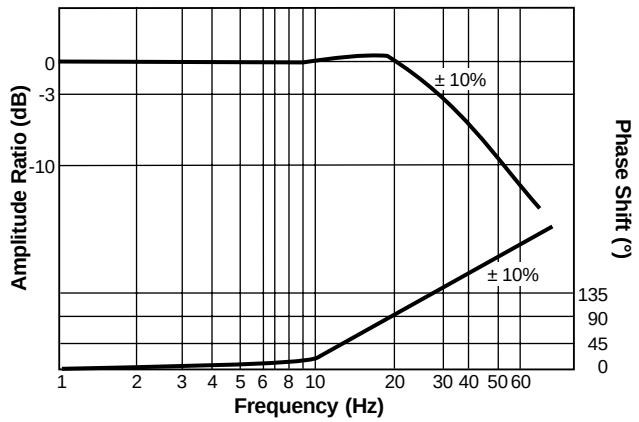


D3FX Operating Limits 1)
at 100% Command
P→A : B→T; or P→B : A→T

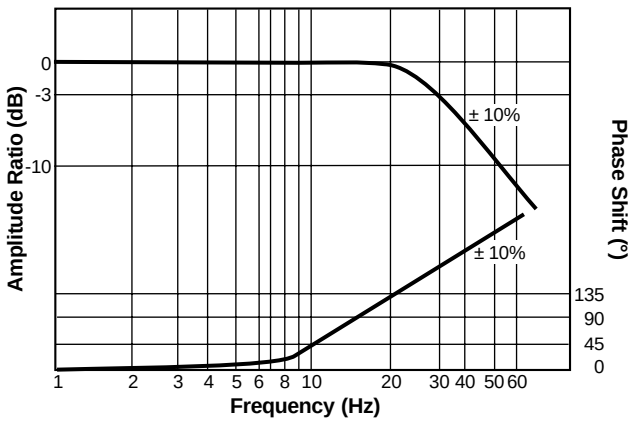


1) Shaded area: Actual flow subject to the system load dynamics
Note: 81 and 82 spools - decrease limits by 15%

D1FX Frequency Response
at 10% Command, 50% Offset



D3FX Frequency Response
at 10% Command, 50% Offset



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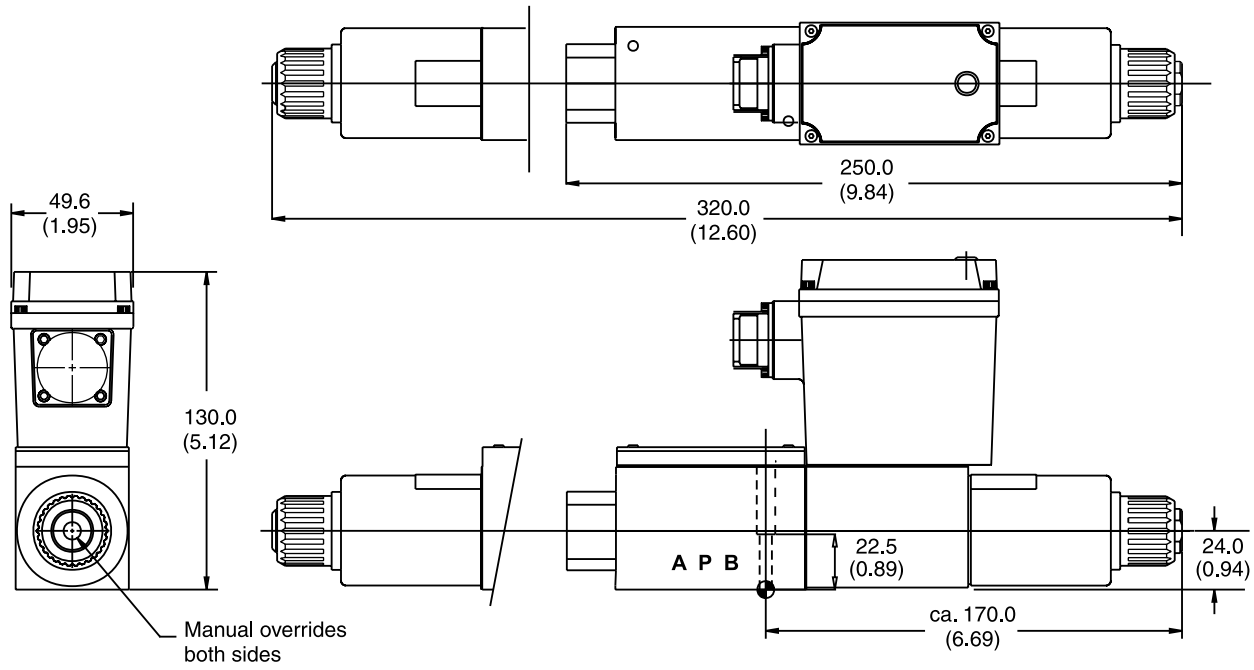
D1FX

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



D3FX

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