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General Description

Series D*FH is a high response, proportional servo-valve with an on-board drive amplifier. The D*FM is a high response, direct actuated servovalve with high resolution around low command inputs. The D*FM is designed for more precise control of position loops, force loops, and machine tool feed rates.

Series D*FH and D*FM incorporate the use of state-of-the-art drive electronics with an LVDT for continuous monitoring of the spool position. Zero lap spools are standard for closed loop applications with two different 'power down' configurations. The valves feature frequency response levels greater than 100 Hz for D1FH and D1FM, and 45 Hz for D3FH and D3FM, along with low hysteresis and excellent repeatability.

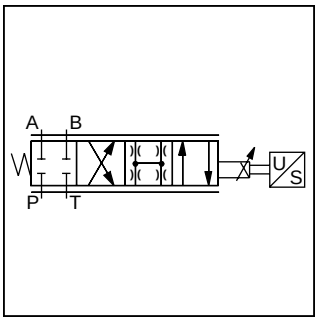
Operation

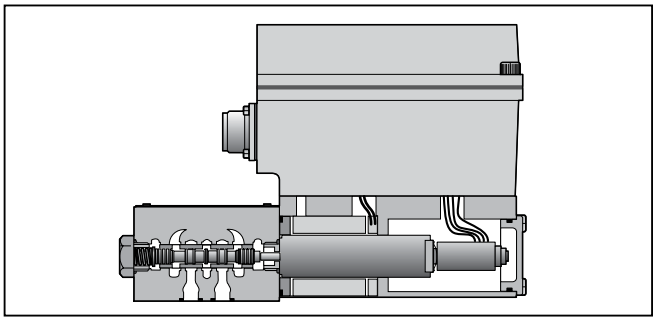
Series D*FH

Series D*FH valve uses a precision lapped spool and sleeve configured with four control positions. During normal operation, the valve will shift from the center position to either side providing flow out the 'A' or 'B' port. When the drive amplifier is disabled by either removing the enable or loss of electrical power, the valve will shift through P→B in less than 10ms to a fourth position. The fourth position will block all four ports in one version. A second version that is available will block the 'P' port and allow the 'A' and 'B' ports to bleed to the 'T' (tank line). (Refer to the "Flow With No Enable" in Troubleshooting section)

Series D*FM

The high resolution Series D*FM adds hydraulic and electronic control compensation to the standard D*FH valve. This feature enhances the tuning and accuracy of systems utilizing high resolution feedback transducers and control compensation available in high performance motion controllers. The D*FM valve uses a precision lapped spool and sleeve configured with four control positions. The fourth position (disabled) is available in an all ports blocked configuration or 'A' and 'B' ports bleed to tank configuration.





Features

- **On-Board Electronic Drive Amplifier —** The unit is shipped as a factory preset and tested unit. (No adjustment is necessary)
- **High Frequency Response —** The valve has a very high frequency response which is necessary for many closed loop applications.
- **Four Position Spool Capability —** The four position spool provides predictable flow in the event of a power failure to the drive electronics, within the limits of the power curve.
- **315 Bar Pressure Capability —** The maximum operating pressure rating for the D*FH and D*FM is 315 Bar or 4500 PSI (Port P, A, B).
- **Spool Position Feedback —** The LVDT continuous feedback monitoring circuit provides low hysteresis and excellent repeatability.
- **Drive Enable Feature —** Output to the coil is shut down when the enable signal (10 to 30 VDC) is not present. The valve will then shift to the fourth position flow path selected by the user. (E50 or E80 spool)
- **High Resolution Around Null —** For precise control of critical position, force, or feed rates (D*FM Version only)
- **Cylinder Ratio Adjust —** To match following error on extend and retract. (D*FM Version only)

Note:
The tank line of either style valve must have a minimum pressure of 1.4 Bar (20 PSI). Maximum tank line pressure is 35 Bar (500 PSI).

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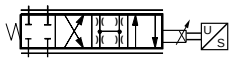
D		F					C		B	J	0	0		
Directional Control Valve	Size	Flow Control	Style	Spool Type	Flow	Style	Seal	Electronic Variation	Supply Voltage	Electric Accessories	Valve Accessories	Design Series	Product Variation

NOTE: Not required when ordering.

Code	Description
1	NG6/CETOP 3
3	NG10/CETOP 5

Code	Description
H	High Response
M	High Response, Dual Gain

Spool Type
Flow QA equal to flow QB

Code	Symbol
E50[1]	
E80[1]	
E53[2] (60/40)	
E83[2] (60/40)	
E84[2,3] (40/60)	

1) D1FH and D3FH only
2) D1FM only
3) D1FM*M flow code only
D3FM*Y flow code only

Code	Description
C	Bi-directional, 4 way, with 4th position on power down

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
B	Voltage Input 0 ... ±10 V (user configurable to 0 ... ± 20 mA)

Code	Description
J	24 VDC

Code	Description
Omit	Standard (with enable)
X6262	Pin 'C' is 0V reference instead of an enable (for competitive interchange only). Valve enables with power. (note 4)

Note 4: **Do NOT apply an enable signal to Pin C.** Unlike many other valves with the same 7-pin connector, Pin C is not for an enable signal. Pin C is a 0V reference used for DMMs or scopes to monitor pin F. It is not a power supply common. Using it as a power supply common will damage the PC board.

Code	Flow at Δp 35 Bar (500 PSI) per metering edge			
	D1FH LPM (GPM)	D1FM LPM (GPM)	D3FH LPM (GPM)	D3FM LPM (GPM)
B	5 (1.3)	–	–	–
D	10 (2.6)	–	–	–
F	–	12 (3.2)	–	–
H	20 (5.3)	–	–	–
M	40 (10.6)	40 (10.6)	–	–
P	–	–	50 (13.2)	–
Y	–	–	100 (26.5)	100 (26.5)

Maximum supply pressure is 315 Bar (4500 PSI). This is the pressure drop across the load and the valve. For maximum pressure drop per land, refer to the table on page A47.

Weight:

D1F	3.7 kg (8.2 lbs.)
D3F	7.7 kg (17.0 lbs.)

Mounting Interface

Refer to the 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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Specifications

	D1FH, D1FM	D3FH, D3FM
Interface	NFPA D03, CETOP 3, NG6	NFPA D05, CETOP 5, NG10
Flow Rating At 35 Bar DP (500 PSI) per metering edge	[1] B spool 5 LPM (1.3 GPM) [1] D spool 10 LPM (2.6 GPM) [1] H spool 20 LPM (5.3 GPM) [1,2] M spool 40 LPM (10.6 GPM) [2] F spool 12 LPM (3.2 GPM)	[1] P spool 50 LPM (13.2 GPM) [1,2] Y spool 100 LPM (26.4 GPM)
Frequency Response	> 100 Hz (-3 dB at 5% signal)	> 45Hz (-3 dB at 5% signal)
Step Response	< 12 ms at 100% signal	< 25 ms at 100% signal
Power Consumption	40 VA max (See voltage supply)	60 VA max (See voltage supply)

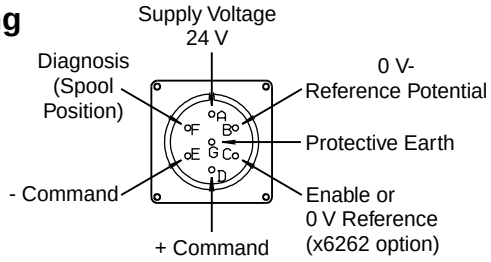
D1FH, D1FM, D3FH, D3FM			
Max. Operating Press. **Port P, A, B** **Port T**	315 Bar (4500 PSI) 35 Bar (500 PSI)	**Operating Temp. Range (Ambient)**	0 to 60° C (32 to 140° F)
Min. Tank Line Press.	1.4 Bar (20 PSI)	**Fluid Cleanliness Level**	ISO Class 15/12/10 (For longer life) ISO Class 16/14/11 (For normal operation)
Typical Spool Overlap	Zero Lap		
Pressure Gain **% of Change/1%** **Change in Command**	[1] Typical 40% [1] Minimum 25% [2] Typical 90%	**Voltage Supply**	24 VDC (21 VDC Min., 30 VDC Max.) Peak Current 4A (PSD24 power supply recommended)
Hysteresis	< 0.5%	**Command Signals**	± 10 VDC at 100 K ohm input impedance ± 20 mA at 499 ohm input impedance
Repeatability	< 0.5%		
Viscosity Range	17 to 65 cSt / mm^2/s (79 to 301 SSU)		
Fluids	Mineral base hydraulic fluid	**Protection Class**	IP65, NEMA 4 (As factory sealed)

Note: 1) D*FH only 2) D*FM only

Maximum Flow and Pressure Differential

Spool Code		Flow Code						
		B	**D**	**F**	**H**	**M**	**P**	**Y**
E50	**Max ΔP Per Land**	100 Bar (1500 PSI)	100 Bar (1500 PSI)	60 Bar (850 PSI)	70 Bar (1000 PSI)	52 Bar (750 PSI)	70 Bar (1000 PSI)	50 Bar (725 PSI)
	Max Flow	8.3 LPM (2.2 GPM)	16.3 LPM (4.3 GPM)	9.7 LPM (5.2 GPM)	26.9 LPM (7.1 GPM)	46.2 LPM (12.2 GPM)	69.6 LPM (18.4 GPM)	121 LPM (32 GPM)
E80	**Max ΔP Per Land**	100 Bar (1500 PSI)	100 Bar (1500 PSI)	60 Bar (850 PSI)	70 Bar (1000 PSI)	52 Bar (750 PSI)	70 Bar (1000 PSI)	50 Bar (725 PSI)
	Max Flow	8.3 LPM (2.2 GPM)	16.3 LPM (4.3 GPM)	9.7 LPM (5.2 GPM)	26.9 LPM (7.1 GPM)	46.2 LPM (12.2 GPM)	69.6 LPM (18.4 GPM)	121 LPM (32 GPM)

Wiring



Installation Guidelines

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

D*FH and D*FM: Bul. HY14-2599-M1/US

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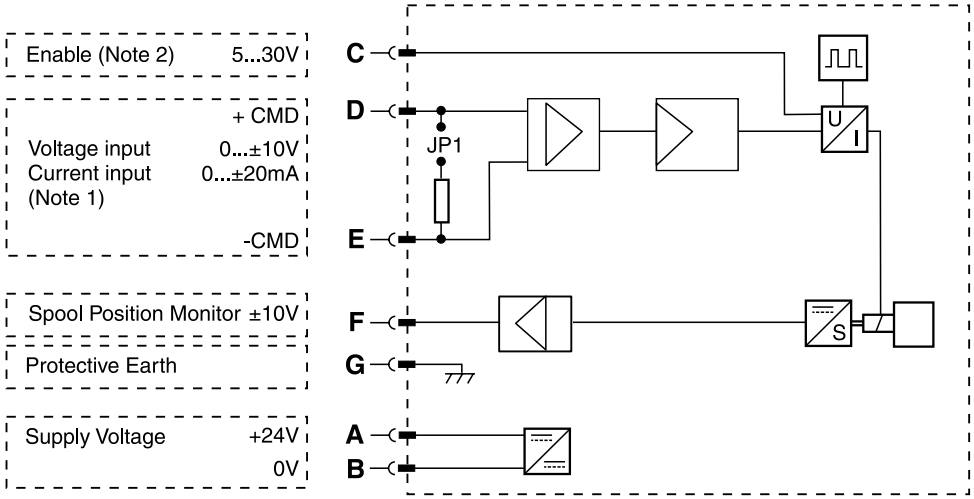
Block Diagram

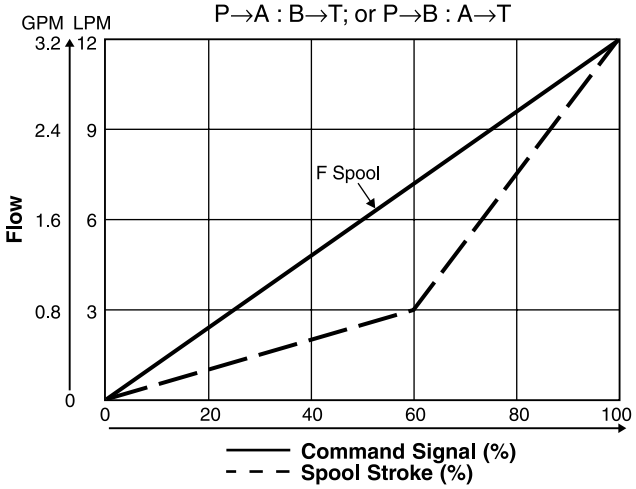


Note 1: Install jumper JP1 for current command input. Refer to installation guide Bul. HY14-2599-M1/US.
Note 2: Valves can be ordered with pin 'C' internally grounded to be interchangeable with some competitor products. Refer to Ordering Information page.

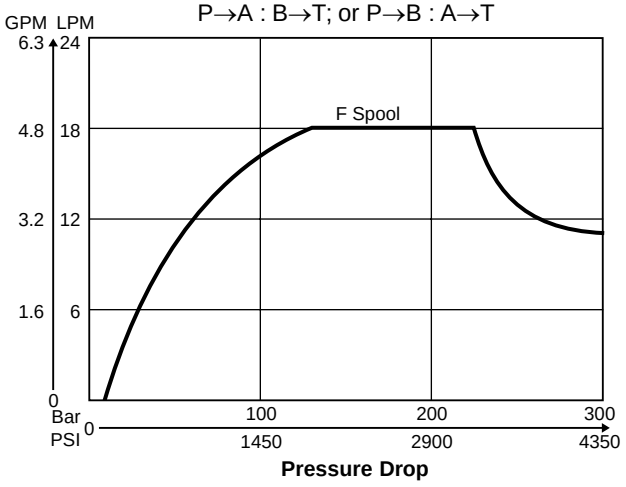
Performance Curves

D1FM series proportional valves are electronically compensated dual flow-gain valves. The command voltage/flow transfer function is linear while the actual spool stroke/flow gain is designed to provide very high resolution at low flows. The D1FM series proportional valves are particularly well suited for machine tool feed applications, or where very fine flow resolution is required while maintaining a rapid advance function in a single valve. The D1FM frequency response is the same as the D1FH; refer to the next page.

D1FM Flow Characteristics
at Δp = 35 Bar (500 PSI) per metering edge
P→A : B→T; or P→B : A→T



D1FM Operating Limits
at 100% Command
P→A : B→T; or P→B : A→T



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Hydraulic Valve Division
Elyria, Ohio, USA

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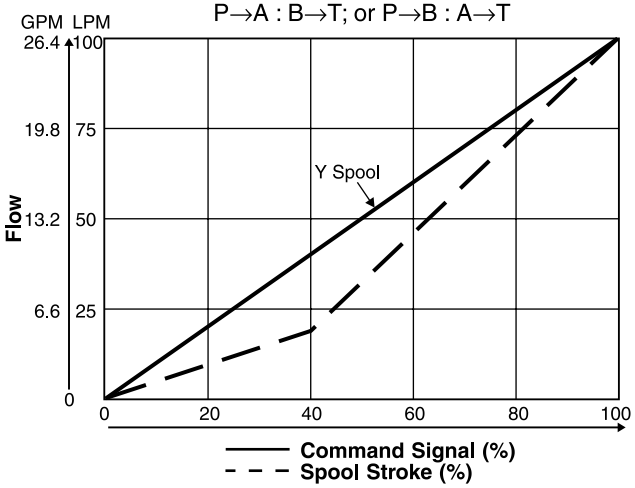
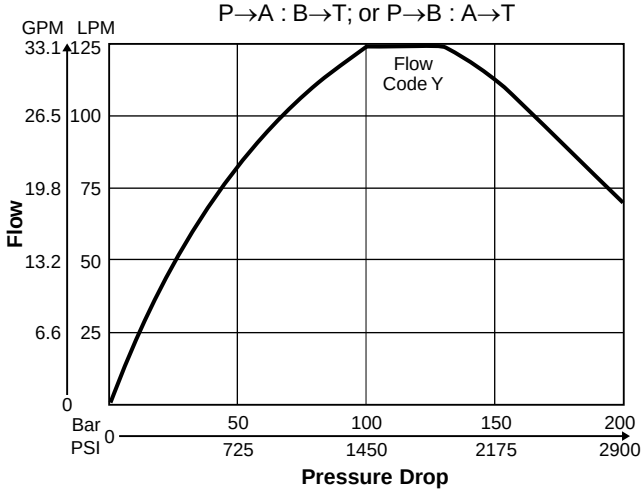
D3FM Flow Characteristics

at Δp = 35 Bar (500 PSI) per metering edge
P→A : B→T; or P→B : A→T



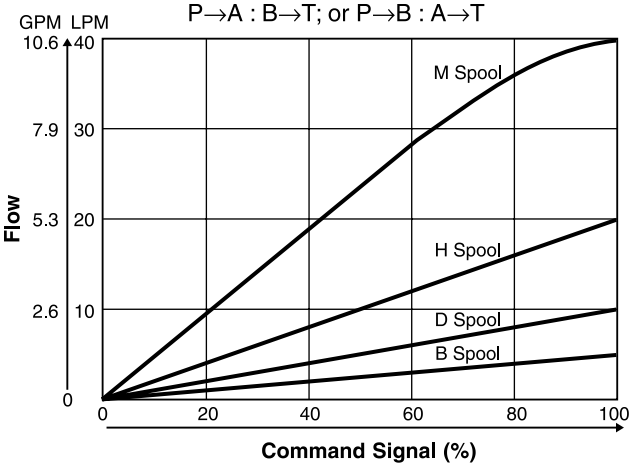
D3FM Operating Limits

at 100% Command
P→A : B→T; or P→B : A→T



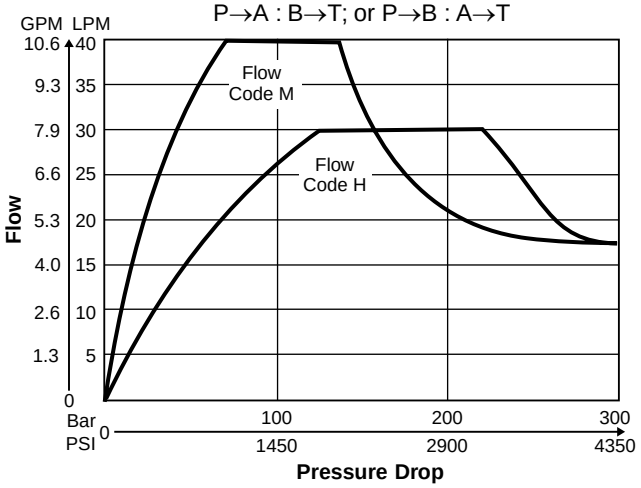
D1FH Flow Characteristics

at Δp = 35 Bar (500 PSI) per metering edge
P→A : B→T; or P→B : A→T



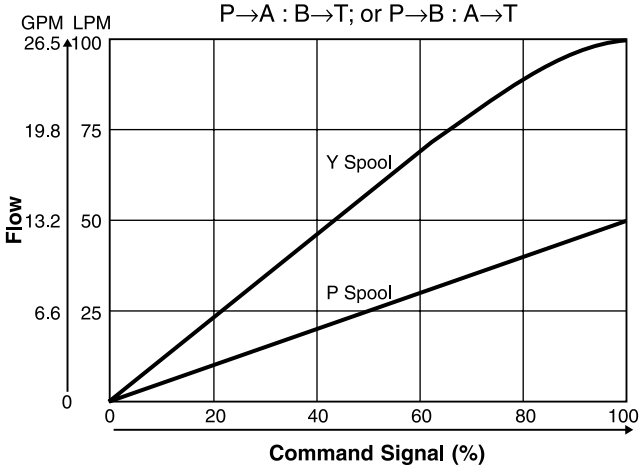
D1FH Operating Limits

at 100% Command
P→A : B→T; or P→B : A→T



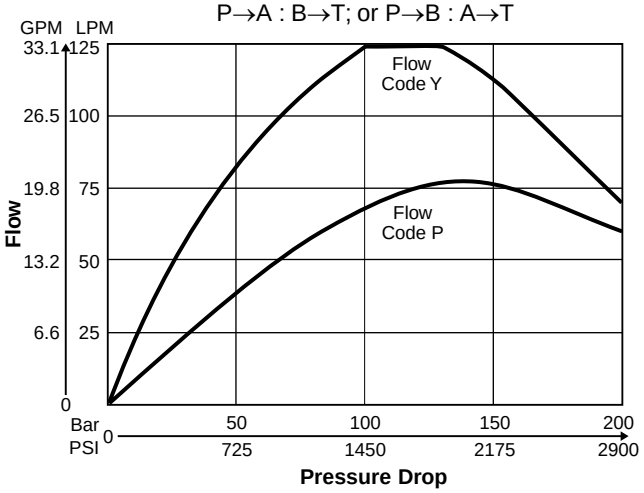
D3FH Flow Characteristics

at Δp = 35 Bar (500 PSI) per metering edge
P→A : B→T; or P→B : A→T



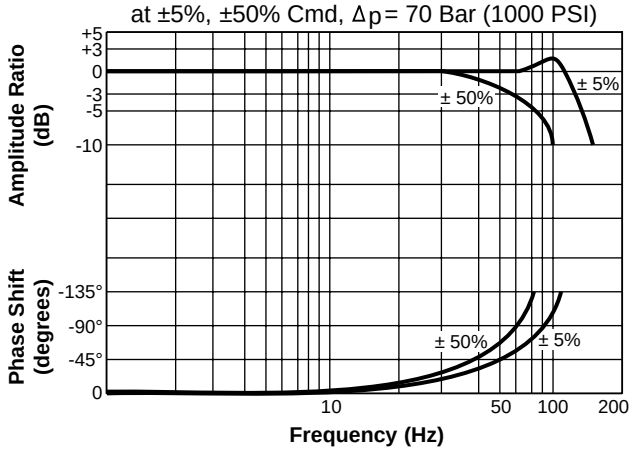
D3FH Operating Limits

at 100% Command
P→A : B→T; or P→B : A→T



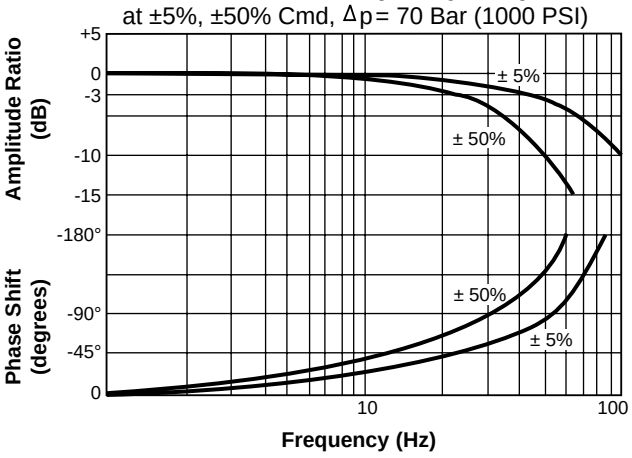
D1FH and D1FM Frequency Response

at ±5%, ±50% Cmd, Δp= 70 Bar (1000 PSI)



D3FH and D3FM Frequency Response

at ±5%, ±50% Cmd, Δp= 70 Bar (1000 PSI)



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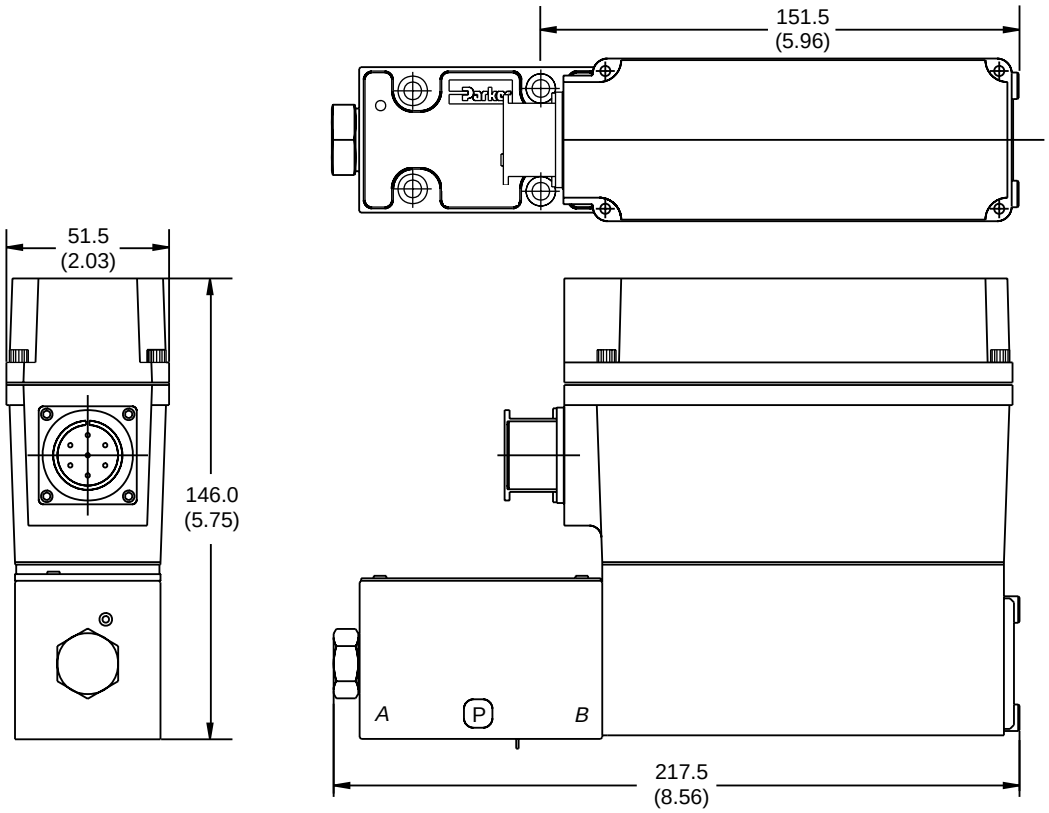
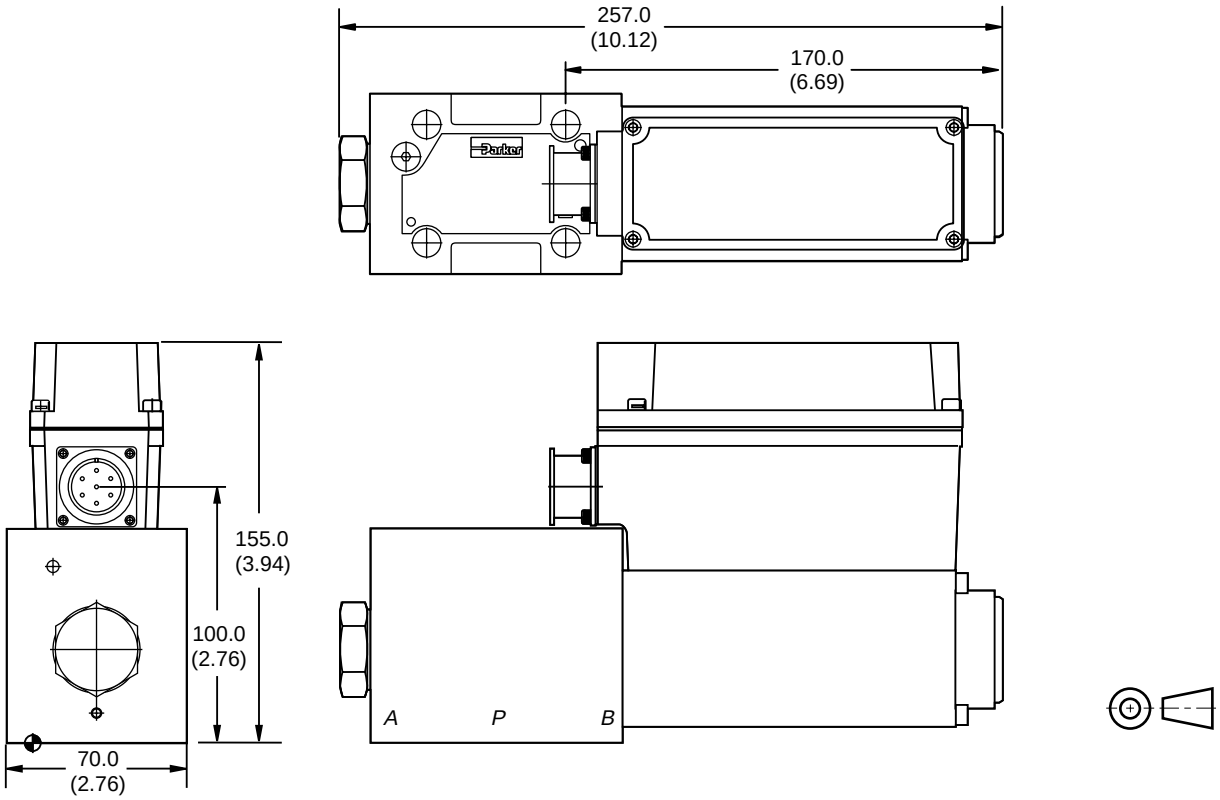
D1FH and D1FM

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



D3FH and D3FM

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



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