

General Description

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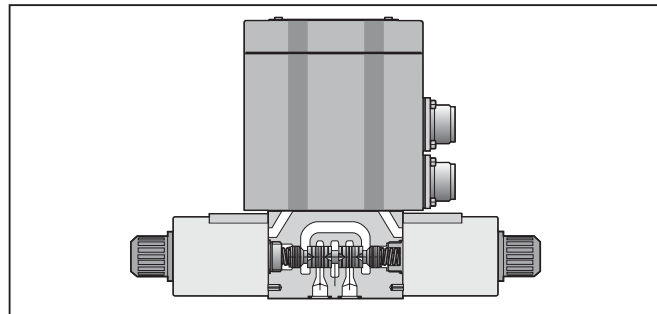
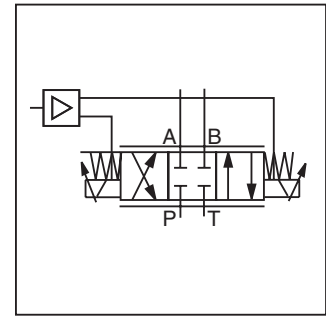
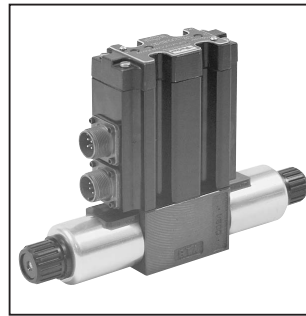
Series D**FL proportional directional control valves are packaged with an integrated microprocessor based open-loop motion profiler. The valve directly accepts electrical on/off logic signals which trigger simple motion profiles controlling actuator speed, acceleration, and deceleration.

D**FL valves are user configurable to operate in one of two control modes: 'Slow Shift' or 'Motion Profiler'. Refer to application guidelines for details. Both DC and AC voltage logic interfaces are available providing a direct interface to PLC's, for a simple field upgrade from AC operated directional valves.

Valves are available in sizes NG6 (CETOP 3), NG10 (CETOP 5), NG16 (CETOP 7) and NG25 (CETOP 8).

Features

- Integrated microprocessor based valve electronics.
- On-board, open-loop motion control profiler.
- Optically isolated 'on-off' inputs trigger motion profiles.
- User selectable operation modes: Slow Shift or Profiler.
- Test points indicating speed and ramp settings.
- On-board microprocessor self diagnostics on start-up.



- LED functional diagnostic indicators.
- Spring centered spool.
- Manual overrides.



Specifications

Interface DIN		NG6 (CETOP 3)			NG10 (CETOP 5)			NG16 (CETOP 7)		NG25 (CETOP 8)	
Flow Rating @10 Bar (150 PSI) Δp (P→A, B→T) (spool options up to) ¹⁾	LPM (GPM)	20 (5.3)			60 (15.9)			100 (26)		200 (53)	
Maximum Flow	LPM (GPM)	27 (7.3)	34.1 (9)	30 (8)	62.1 (18)	83.3 (22)	118 (31)	144 (38)		372 (98)	
Pilot Flow											
Continuous	LPM (GPM)	N/A			N/A			<1.2 (0.3)		<1.2 (0.3)	
Step Input	LPM (GPM)	N/A			N/A			2.2 (0.6)		4.5 (1.2)	
Operating Pressure											
Port P, A, B	Bar (PSI)	315 (4500)						345 (5000) max.			
Port P, internal pilot		N/A						20 (290) min.			
Port T, internal drain		35 (500)						10 (150) max.			
Port T, external drain		N/A						345 (5000) max.			
Port Y, pilot drain		N/A						10 (150) max.			
Port X, external pilot		N/A						20-345 (290-5000)			
Fluid Cleanliness Level		ISO Class 16/13									
Fluid Viscosity, Recommended		80 – 1000 SSU									
Fluid Temperature, Recommended		0°C to +60°C (+32°F to +140°F)									
Environmental Protection Class		NEMA 4 (IP65)									
Ambient Operating Temperature		-20°C to +60°C (-4°F to +140°F)									

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

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

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



D*FL Proportional Directional Control Valves with Intergrated Motion Control Electronics

Code Description
D1FL NG6/CETOP 3
D3FL NG10/CETOP 5
See Note 1.

Spool Type

Code		Spool Type
Q _A =Q _B	Q _A >Q _B ¹⁾	
E01	B31	
E02	B32	

1) Reduced flow rate on Port B, nominal flow on Port A.

Flow

Code Description
N Nitrile
V Fluorocarbon

Style

Code Description
T AC Voltage Logic Interface
W DC Voltage Logic Interface

Electronic Variation

Code Description
J 24 VDC

Supply Voltage

Electronic Accessories

Valve Accessories

Code Description
0 Standard
4 CSA Approved

Design Series
NOTE: Not required when ordering.

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

Code	D1FL LPM (GPM)	D3FL LPM (GPM)
C	7.5 (2.0)*	–
F	15 (4.0)	–
H	20 (5.3)*	20 (5.3)*
M	–	40 (10.6)
S	–	60 (15.9)*

* Only with spool type E*

Note 1: 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:
D1FL 3.2 kg (7.0 lbs.)
D3FL 7.9 kg (17.5 lbs.)

DFL** Pilot Operated Proportional Directional Control Valves with Intergrated Motion Control Electronics

Code Description
D41FL NG16/CETOP 7
D91FL NG25/CETOP 8

Spool Type

Code			Spool Type
Q _A =Q _B	Q _A >Q _B	Q _B >Q _A	
E21	B41	A41	
E22	B42	A42	

V-Notch Spools

Flow

Code Description
N Nitrile
V Fluorocarbon

Style

Code Description
T AC Voltage Logic Interface
W DC Voltage Logic Interface

Electronic Variation

Electronic Accessories

Valve Accessories

Code Description
0 Standard
2 Pilot Pressure Reducer⁽³⁾
4 CSA Approved

Design Series
NOTE: Not required when ordering.

Pilot Connection

Code Description
1 Internal External
2 External External
4 Internal Internal
5 External Internal

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

Code	D41FL LPM (GPM)	D91FL LPM (GPM)
D	100 (26.5)	–
F	–	200 (53)

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.

Weight:
D41FL 10.9 kg (24.0 lbs.)
D91FL 19.1 kg (42.0 lbs.)

⁽³⁾ Recommended for pilot pressure applications >205 Bar (3000 PSI)

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Supply Voltage	V	12 to 28
Maximum Current	A	3.5
Motion Profile Adjustment Speed Ramps (minimum limited by actual valve step response)		User set; potentiometers inside electronics enclosure. 0 to 100% valve opening; two speeds forward, two speeds retract. 0.025 to 15 seconds; one acceleration, two deceleration adjustments. Shared both forward/retract.
Test Points V1, V2, V3, V4 R1, R2, R3		Inside electronics enclosure. 0 to 5 volts, corresponding to 0 to 100% valve opening, or speed. 0 to 5 volts, corresponding to 0.025 to 15 seconds ramp time.
Logic Interface Ordering code field: Electrical variation (options available all valve sizes)	W	T
Electrical Isolation	DC Optical-Coupled	AC Optical-Coupled
Polarity	Signal pins A, C & E; referenced to 0V pins B, D & F respectively.	Signal pins A, C & E; referenced to AC neutral pins B, D & F respectively.
Input Impedance ohms	>2000	>2000
Input Voltage, Absolute Max. V	28 VDC	130 VAC
Logic "on" (1), Min. Voltage V	>9.6 VDC	>96 VAC
Logic "on" (1), Current mA	3.2 mA	3.2 mA
Logic "off" (0), Min. Voltage V	<6.0 VDC	<51 VAC
Logic "off" (0), Current mA	3.2 mA	3.2 mA
Mating Connectors (order separately) Power Supply Connector Logic Input Connector	Part # 1210292 (4-pin MS) Part # MS3106E-14S-6S (6-pin MS)	

Application Guidelines

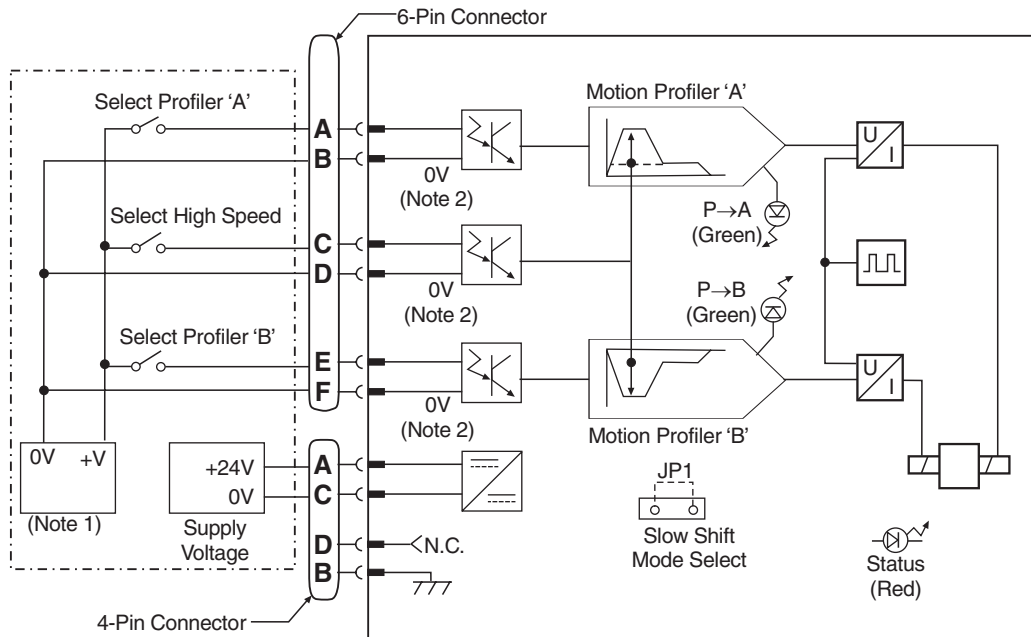
The D**FL series proportional valves accept discrete on/off logic signals which trigger simple motion profiles controlling actuator speed, acceleration, and deceleration. All motion control potentiometer adjustments and jumper headers are located inside the electronics enclosure. Two modes of operation are user selectable by a jumper setting (JP1): 'Motion Profiler' or 'Slow Shift'. The 'Motion Profiling' mode provides two-speed velocity control typically used in rapid traverse and feed circuits. The 'Slow Shift' provides single velocity control. Both modes allow individual speed adjustment for actuator extend and retract. Ramp adjustments for extend and retract profiles are shared. Refer to **Interface and Motion Profile** diagrams on the following pages.

Both DC and AC voltage logic interfaces are available. Refer to ordering code field 'Electronic Variation' and the technical data sheet for more information. Note that the interface connections are polarity sensitive. Refer to the block diagram and technical specifications.

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

- D1FL: Installation Guide Bulletin 2589-M2/USA
- D3FL: Installation Guide Bulletin 2589-M3/USA
- D41FL,
- D91FL: Installation Guide Bulletin 2589-M1/USA

Block Diagram — Wiring



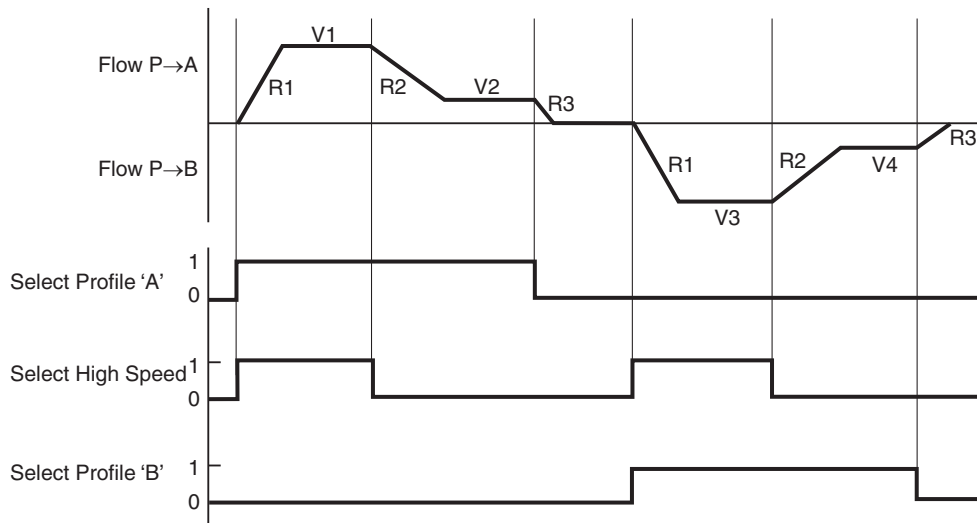
Notes:

- 1) DC logic source shown, refer to technical data for A.C.
- 2) 0V reference for DC interface, neutral for AC version.



Interface — ‘Motion Profiler’ mode (see timing diagram below)

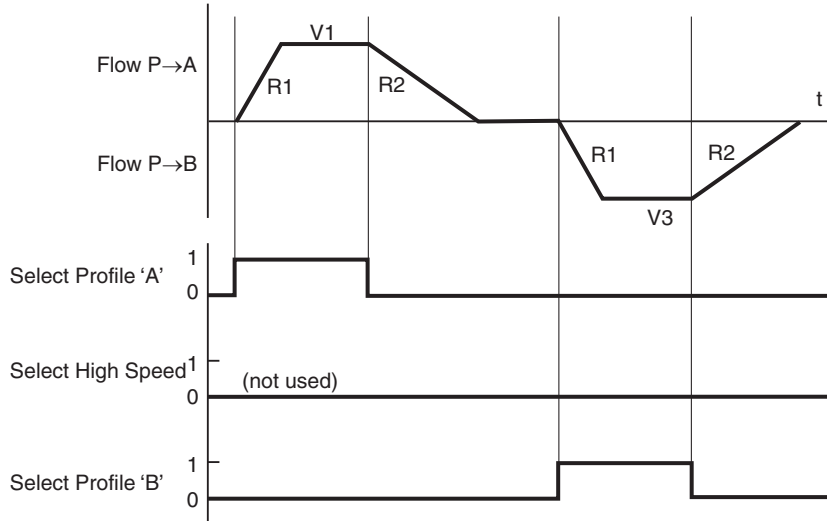
The ‘Motion Profiler’ mode is selected by removing connecting jumper ‘JP1’ on the electronics card inside the electronics enclosure. To trigger a rapid traverse, opening the valve P→A / B→T; apply a positive logic signal to logic inputs ‘Select Profile A’, and ‘Select High Speed’ (6-pin connector input pins A&B, and C&D). The valve will smoothly accelerate the actuator to the velocity set by potentiometer ‘V1’, at a ramp rate set by potentiometer ‘R1’. When logic input ‘Select High Speed’ is deselected the actuator will smoothly decelerate the actuator to the feed velocity set by Potentiometer ‘V2’, at a ramp rate set by potentiometer ‘R2’. When logic input ‘Select Profile A’ is deselected the actuator will smoothly decelerate the actuator to a stop at a ramp rate set by potentiometer ‘R3’. When neither ‘Select Profile’ inputs are selected, regardless of the ‘Select High Speed’ input state, the valve is held in the centered hydraulic condition. Reversing the actuator, directing flow P→B / A→T, follows the same logic using logic input ‘Select Profile B’. Refer to the timing diagram below for the corresponding potentiometers. Note that although all four speeds are independent, the three ramps are shared by both ‘A’ and ‘B’ profiles.



Interface — ‘Slow Shift’ mode (see timing diagram below)

A

The ‘Slow Shift’ mode is selected by connecting jumper ‘JP1’ on the electronics card inside the electronics enclosure. The ‘Slow Shift’ mode logically operates the same as the ‘Motion Profiler’ mode, except the ‘Select High Speed’ logic input is not used and only one speed for each actuator direction is available.



4-Pin Power Supply Plug

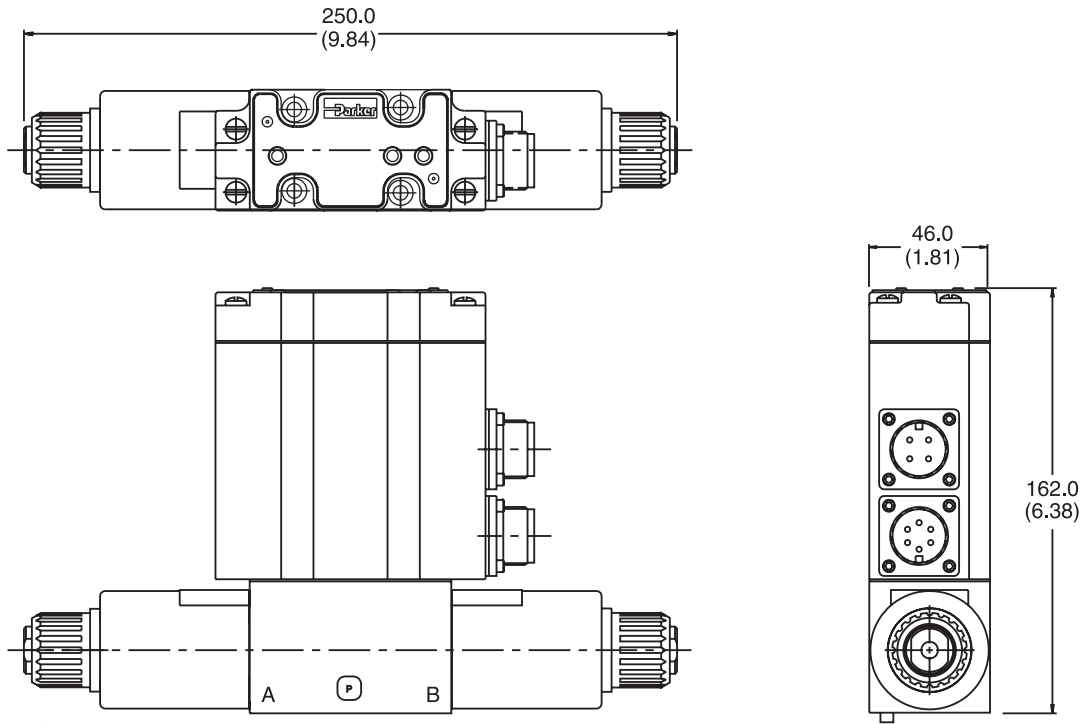
	Pin	Description
	A	Supply Voltage
	B	Protective Ground
	C	Supply 0V
	D	Not Used

6-Pin Logic Input Plug

	Pin	Description
	A	Select Profile "A" (+)
	B	Select Profile "A" (0V or neutral)
	C	Select "High Speed" (+)
	D	Select "High Speed" (0V or neutral)
	E	Select Profile "B" (+)
	F	Select Profile "B" (0V or neutral)

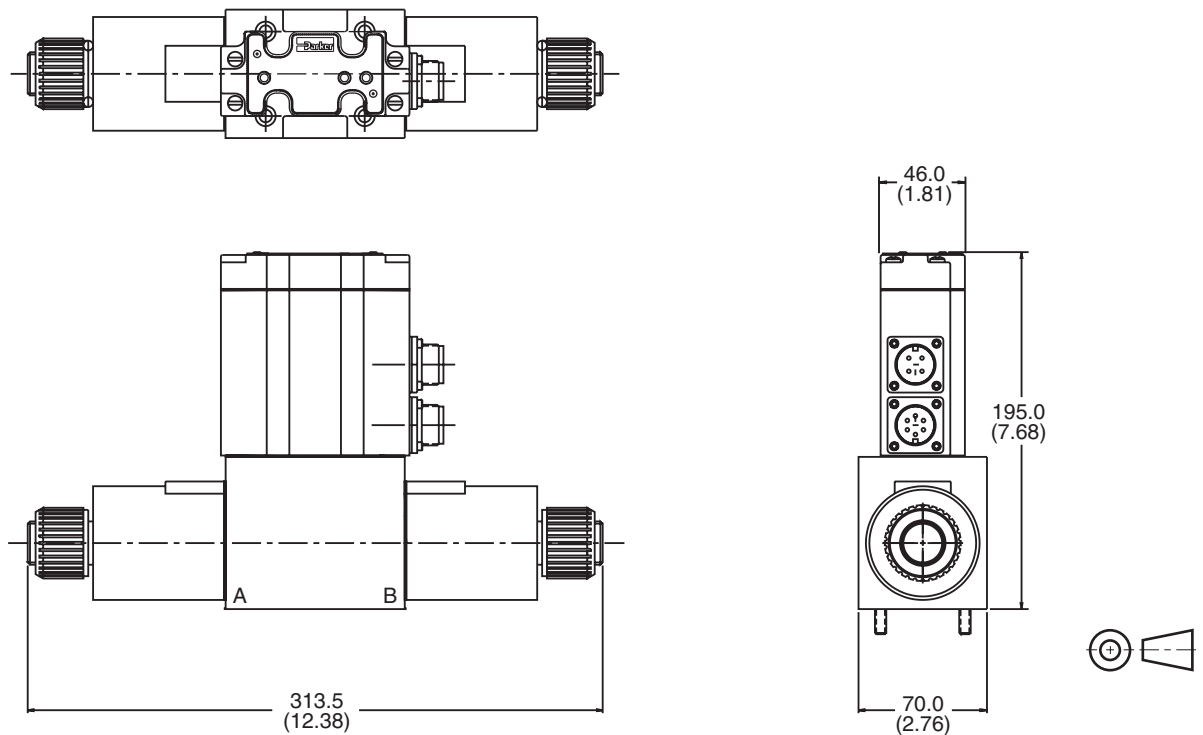
D1FL

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



D3FL

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



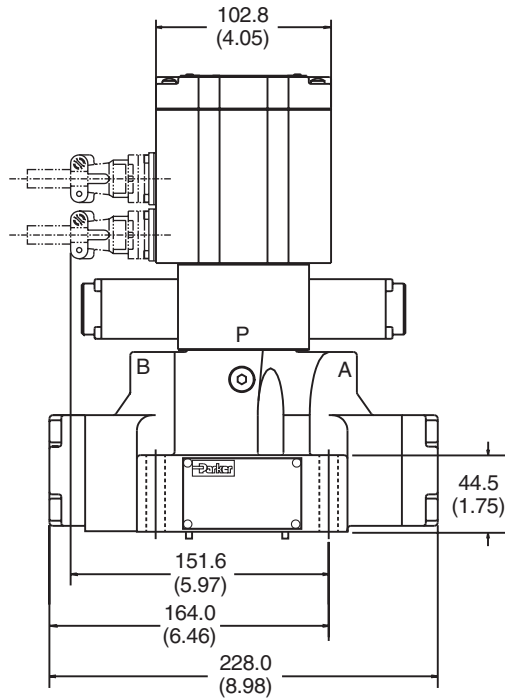
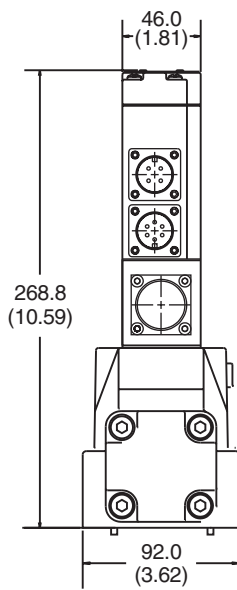
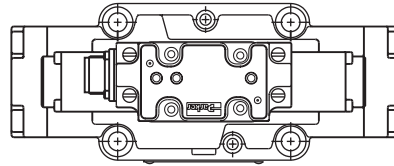
Dimensions

**Proportional Directional Control Valves
Series D41FL and D91FL**

D41FL

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

A



D91FL

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

