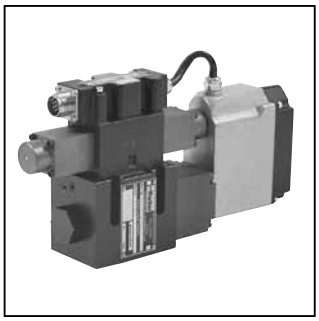
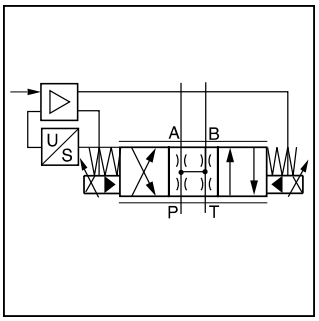
A

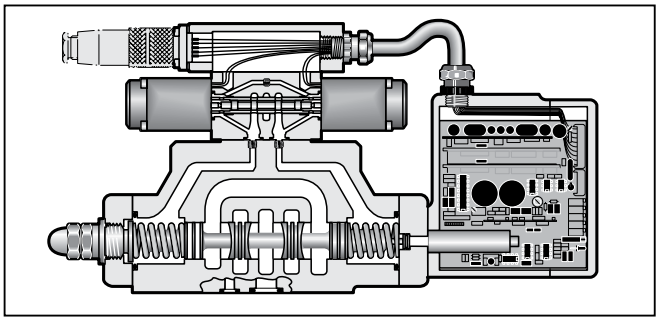
General Description

Series D*1FH proportional directional control valves are high performance, two stage pilot operated solenoid valves with electronic spool position feedback, and on-board integrated control electronics. Valves are available in sizes NG10 (CETOP 5), NG16 (CETOP 7), NG25 (CETOP 8) and NG32 (CETOP 10).

D*1FH valve performance is characterized by high resolution flow control, repeatability and high dynamic performance. Typical applications include precise and reproducible control of actuator speed in rapid/slow speed profiling, and smooth acceleration and deceleration performance. Zero lap spools are available for closed loop applications.







Features

- Standard DIN/ISO/CETOP/NFPA interfaces.
- Integrated valve electronics.
- Spool position feedback.
- High frequency response.
- Spring centered main stage spool.
- LED functional diagnostic indicator.
- Wide selecton of spool options, and flow capacity.
- 2:1 ratio spool options.

CE

Specifications

Interface DIN	**NG10 (CETOP 5)**	**NG16 (CETOP 7)**	**NG25 (CETOP 8)**	**NG32 (CETOP 10)**
Flow Rating @10 Bar (150 PSI) Δp (P→A, B→T) (spool options up to)[1] LPM (GPM)	80 (21)	240 (63)	400 (106)	1000 (264)
Pressure Gain (Zero Lap Spool) %	3.5	3.0	2.5	—
Maximum Flow (spool options up to)[1] LPM (GPM)	170 (45)	420 (111)	900 (238)	2000 (528)
Pilot Flow				
Continuous LPM (GPM)	<1.2 (0.3)	<1.2 (0.3)	<1.2 (0.3)	<1.2 (0.3)
Step Input LPM (GPM)	2 (0.5)	4 (1.1)	9 (2.4)	18 (4.8)
Step Response (time to reach 90% of a 100% step command) ms	25	45	65	150

Hysteresis	%	<0.5
Repeatability	%	<0.5
Operating Pressure		
Port P, A, B	Bar (PSI)	345 (5000) max.
Port P, internal pilot		20 (290) min.
Port T, internal drain		10 (150) max.
Port T, external drain		345 (5000) max.
Port Y, pilot drain		10 (150) max.
Port X, external pilot		20-345 (290-5000)
Electrical Power Requirements		18 to 30 VDC, 2.2A
Command Signal (impedance) (select by ordering code)		0 ± 10 VDC (100K ohm) 0 ± 20 mA (500 ohm)
Command Polarity		Pin 'D' more positive than 'E' produces flow P to B

Mating Connector (order separately)	Part #5004072 (7-pin CE)
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)
Temperature Drift	0.005%/°C (0.009%/°F)

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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D	□	1	F	H	□	□	□	□	□	0	□	[ ]
Directional Control Valve	Size	Pilot Operated	Flow Control	High Response	Spool Type	Flow	Pilot Oil Connection	Seal	Input Signal	Options	Valve Accessories	Design Series

NOTE: Not required when ordering.

Code	Description
3	NG10/CETOP 5
4	NG16/CETOP 7
8	NG25/CETOP 8
9[1)]	NG25/CETOP 8
11	NG32/CETOP 10

1) with enlarged ports ∅ 32mm

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
B	Voltage Input 0 ... ±10V
E	Current Input 0 ... ±20 mA
S	Current Input 4 ... 20 mA

Code	Pilot	Drain
1	Internal	External
2	External	External
4	Internal	Internal
5	External	Internal

Code	Description
0	Standard
8	Monitor Switch

Code			
$Q_A=Q_B$	$Q_A>Q_B$ [2)]	$Q_B>Q_A$ [3)]	Spool Type
			Overlap Sine
E01	B31	A31	
E02	B32	A32	

2) 2:1 Ratio: Reduced Flow Rate; Port B, Rated Flow Rate; Port A
3) 2:1 Ratio: Reduced Flow Rate; Port A, Rated Flow Rate; Port B

Code	Flow at Δp 5 Bar (72.5 PSI) per Metering Edge			
	Sine Notch Spools			
	D31 LPM (GPM)	D41 LPM (GPM)	D81/91 LPM (GPM)	D111 LPM (GPM)
A	55 (14.6)	–	–	–
B	–	105 (27.8)	–	–
C	80 (21)	140 (37)	–	–
E	–	190 (50)	250 (66)	–
F	–	240 (63)	310 (82)	–
H	–	–	400 (106)	500 (32)
L	–	–	–	1000 (264)

V-Notch Spool Options - Spool Type and Flow Codes

Code		V-Notch
$Q_A=Q_B$	$Q_A>Q_B$ [4)]	Spool Type
E21	B41	
E22	B42	

Code	Flow at Δp 5 Bar (72.5 PSI) per metering edge		
	D31 LPM (GPM)	D41 LPM (GPM)	D81/D91 LPM (GPM)
B	–	–	–
D	–	120 (32)	–
F	–	–	300 (79)

4) 2:1 Ratio: Reduced Flow Rate on Port B, Rated Flow Rate on Port A
Code A* for spool $Q_B>Q_A$ optional

Bolt Kit:

D31FH	BK98
D41FH	BK160
D81/91FH	BK228
D111FH	BK150

Weight:

D31FH	8.1 kg (17.9 lbs.)
D41FH	11.6 kg (25.6 lbs.)
D81/91FH	20.7 kg (45.6 lbs.)
D111FH	62.0 kg (137.0 lbs.)

Mating Connector: Part # 5004072 (7-Pin CE) Order Separately

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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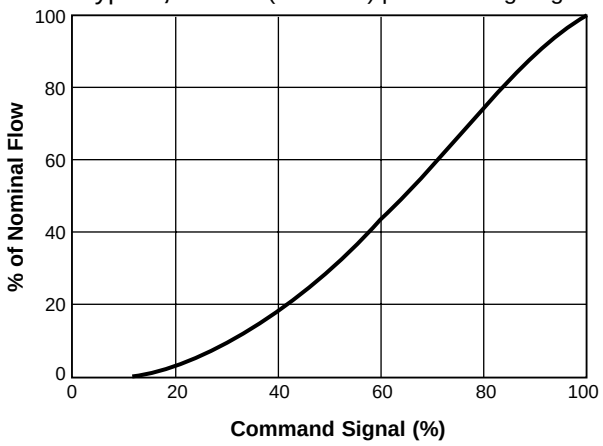
Note: Depending on the spool type selected, the actual flow characteristic may deviate from the typical flow curves as shown.

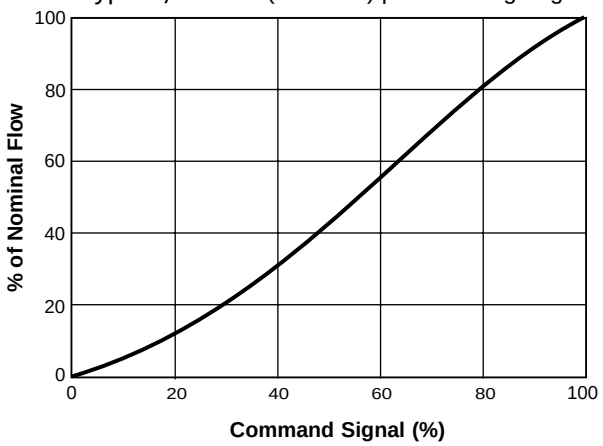
Flow Characteristics – Overlap Spools

Typical, at 5 Bar (72.5 PSI) per metering edge

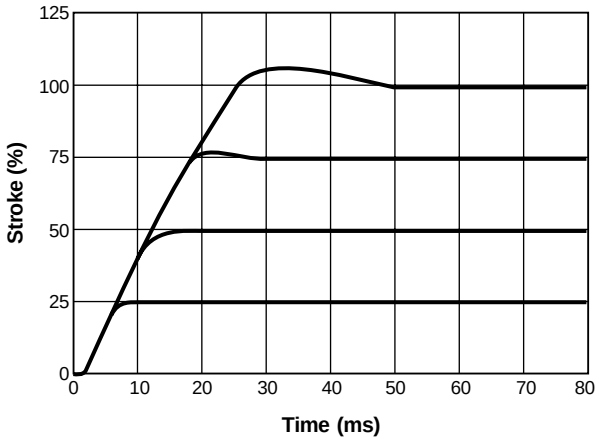


Flow Characteristics – Zero Lap Spools

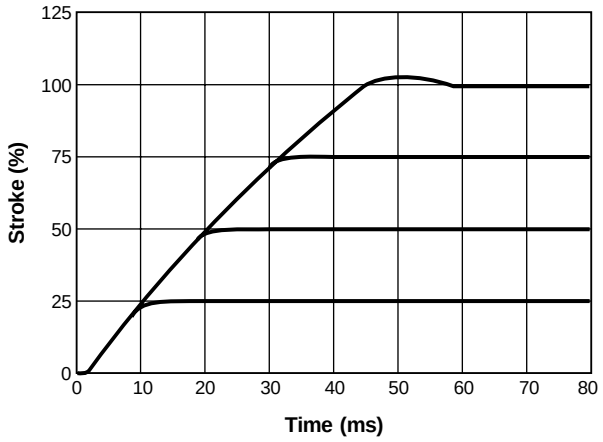
Typical, at 5 Bar (72.5 PSI) per metering edge



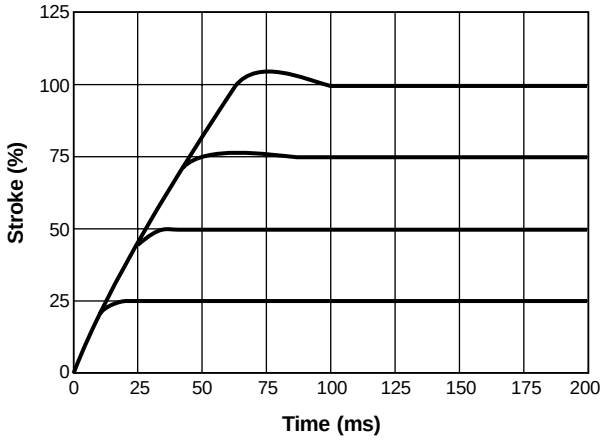
D31FH Step Response



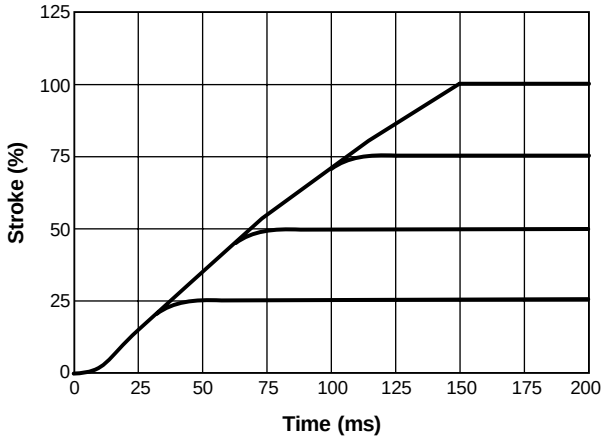
D41FH Step Response



D81FH and D91FH Step Response



D111FH Step Response



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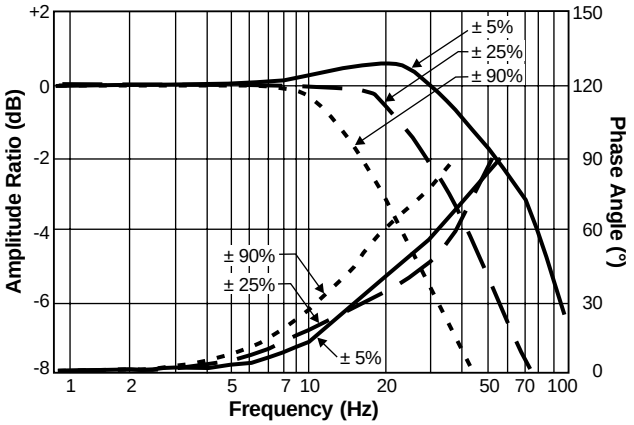
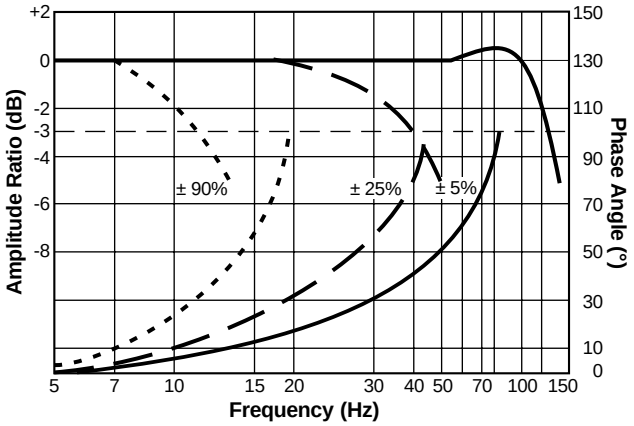
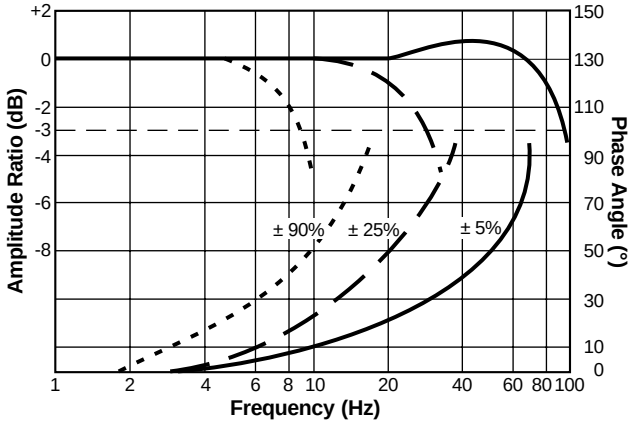
D31FH Frequency Response



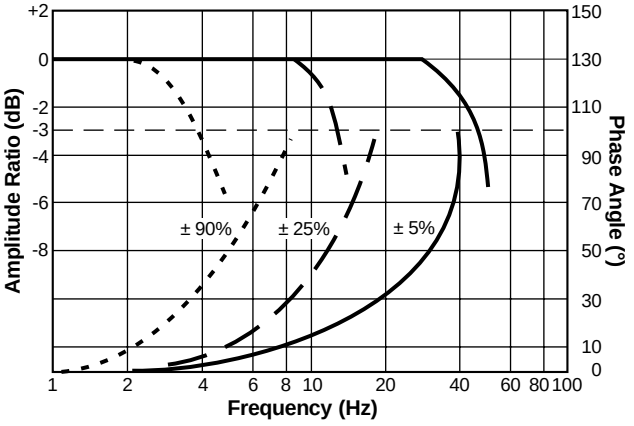
D41FH Frequency Response



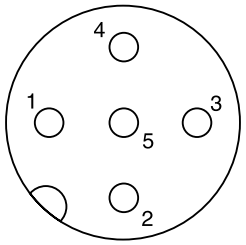
D81FH and D91FH Frequency Response



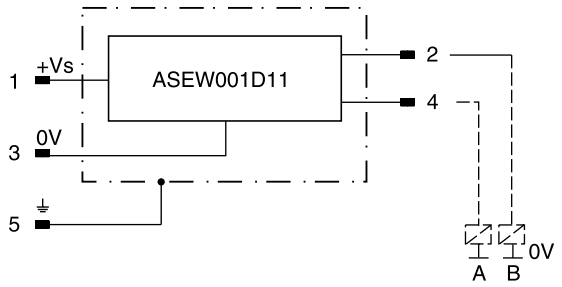
D111FH Frequency Response



Monitor Switch M12x1 Pin Assignment



1 + Supply 18...42V
2 Output B (normally closed)
3 0V
4 Output A (normally closed)
5 Earth ground



Signal	Output A (pin 4)	Output B (pin 2)
Neutral	Closed	Closed
	Open	Closed
	Closed	Open

The neutral position is monitored. The signal changes after less than 10% of the spool stroke.

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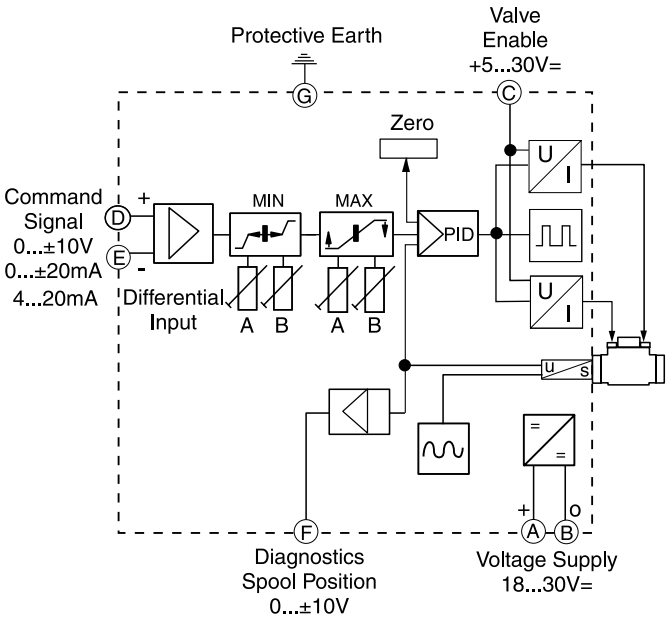
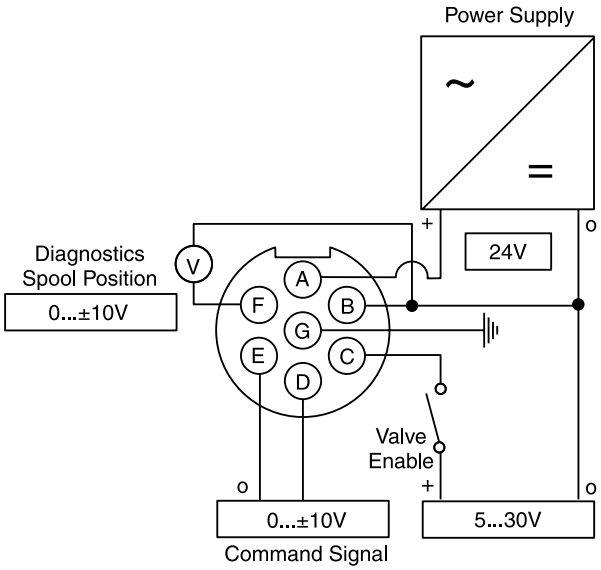
Function Diagram, Valve Electronics



Wiring Connection



Valve Enable Input

The valve power stage electronics is enabled by applying a positive voltage to pin 'C' with respect to power supply 0V pin 'B'. A voltage between 5 and 30 volts is a logical enable, less than 5 volts disables the valve.

Diagnostics — Valve Spool Position

Spool position can be monitored by measuring the voltage on pin 'F' with respect to power supply 0V pin 'B' of the valve input connector. The same signal is available inside the enclosure as a calibration aid as shown.

Status LED

A status lamp (LED) is located inside the electronics enclosure and visible through a transparent lens. Refer to the table below.

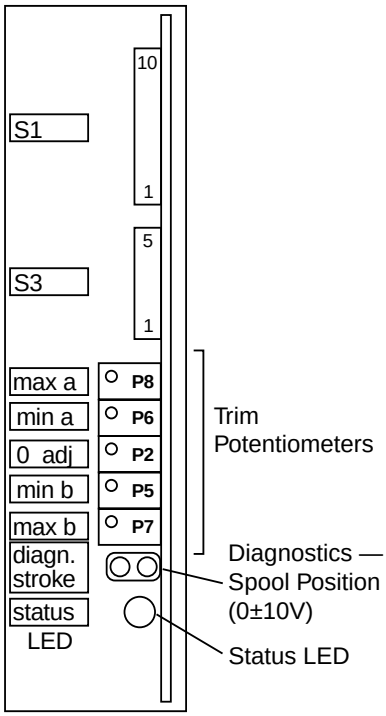
Display Color	Indicates
Green	Normal operation
Off	Supply voltage outside permissible range of 18 to 30 VDC
Red	Spool position error / Low pilot pressure

Electronics Adjustment

Electronic valve adjustments are located inside the electronics enclosure. Refer to installation manual: DFH- (Series 30) 2573 / GB.

Integrated Control Electronics

Arrangement of potentiometers, status LED, and internal valve spool monitor point.



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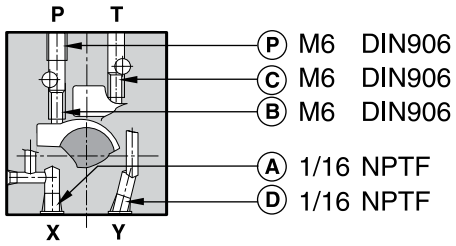
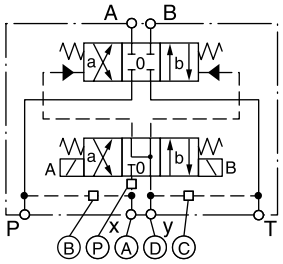
Pilot Flow
Oil Inlet (Supply) and Outlet (Drain)

D31FH

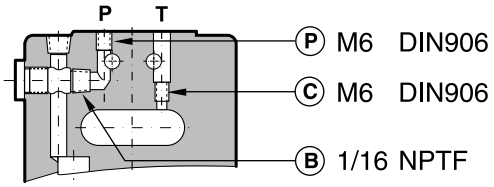


○ open, ● closed

Pilot oil Inlet	Pilot oil Drain	A	B	C	D
internal	external	●	○	●	○
external	external	○	●	●	○
internal	internal	●	○	○	●
external	internal	○	●	○	●

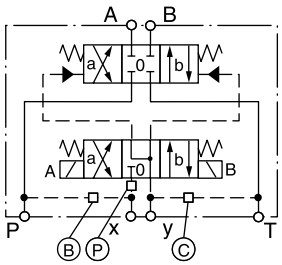


D41FH

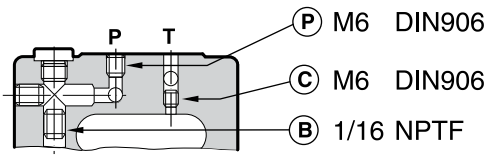


○ open, ● closed

Pilot oil Inlet	Pilot oil Drain	B	C
internal	external	○	●
external	external	●	●
internal	internal	○	○
external	internal	●	○

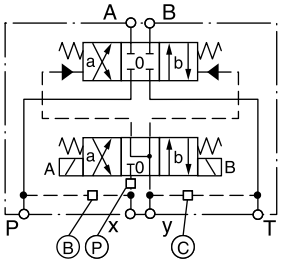


D81FH and D91FH

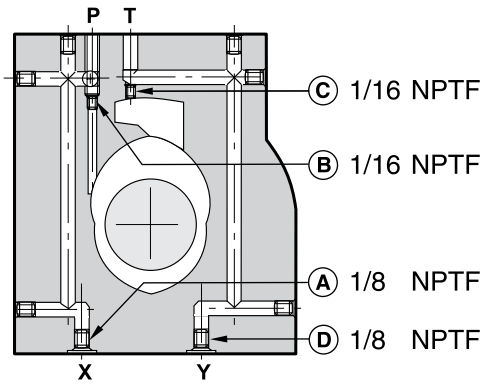


○ open, ● closed

Pilot oil Inlet	Pilot oil Drain	B	C
internal	external	○	●
external	external	●	●
internal	internal	○	○
external	internal	●	○

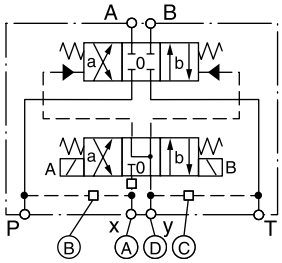


D111FH



○ open, ● closed

Pilot oil Inlet	Pilot oil Drain	A	B	C	D
internal	external	●	○	●	○
external	external	○	●	●	○
internal	internal	●	○	○	●
external	internal	○	●	○	●



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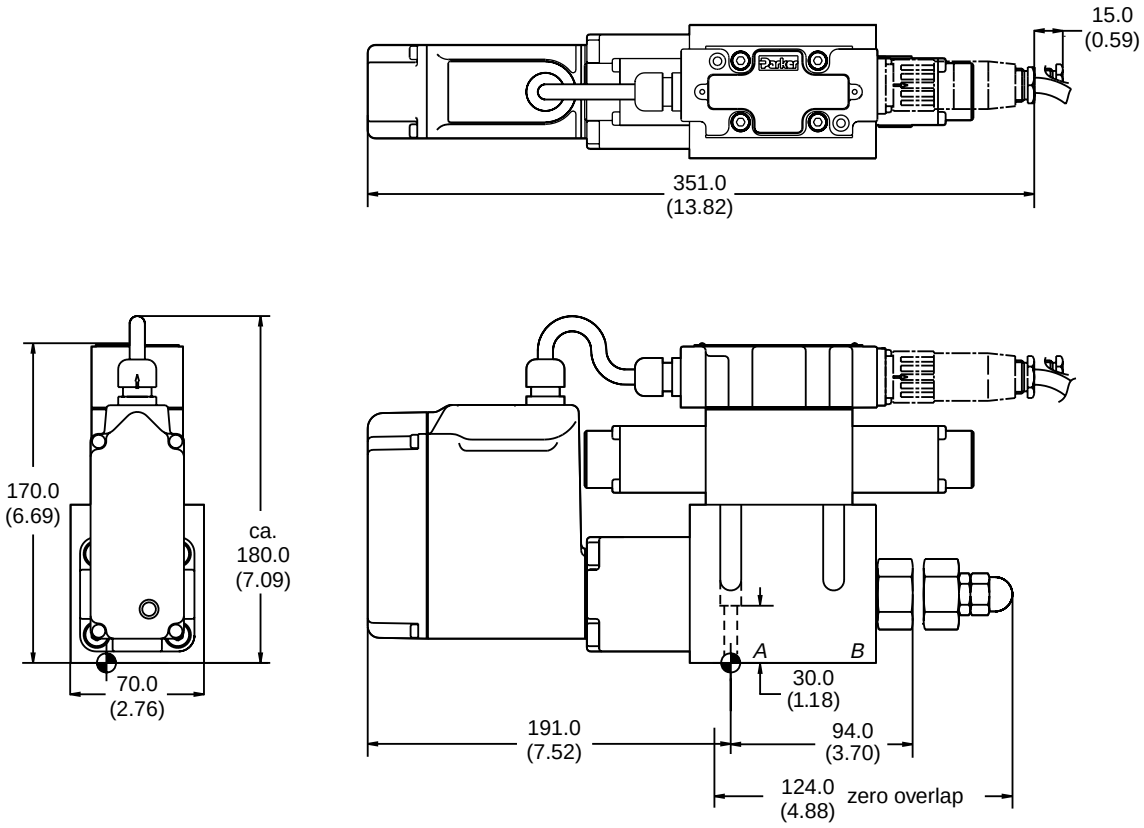
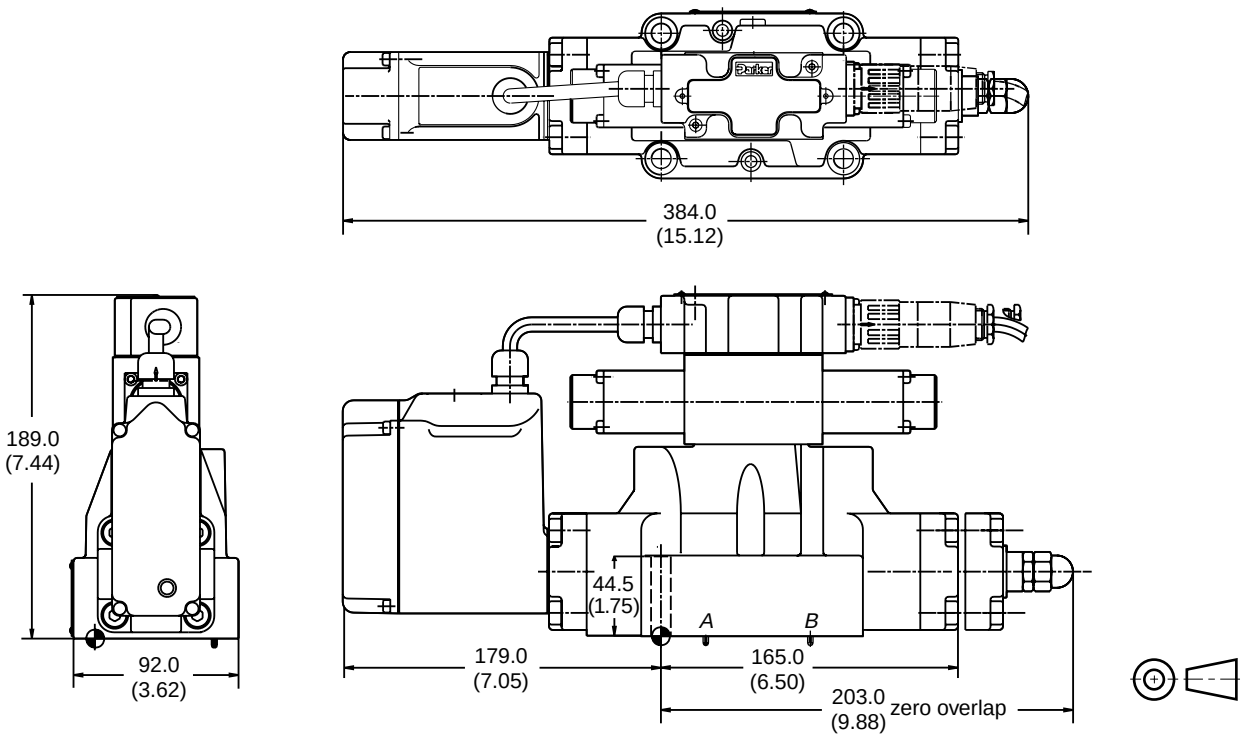
D31FH

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



D41FH

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



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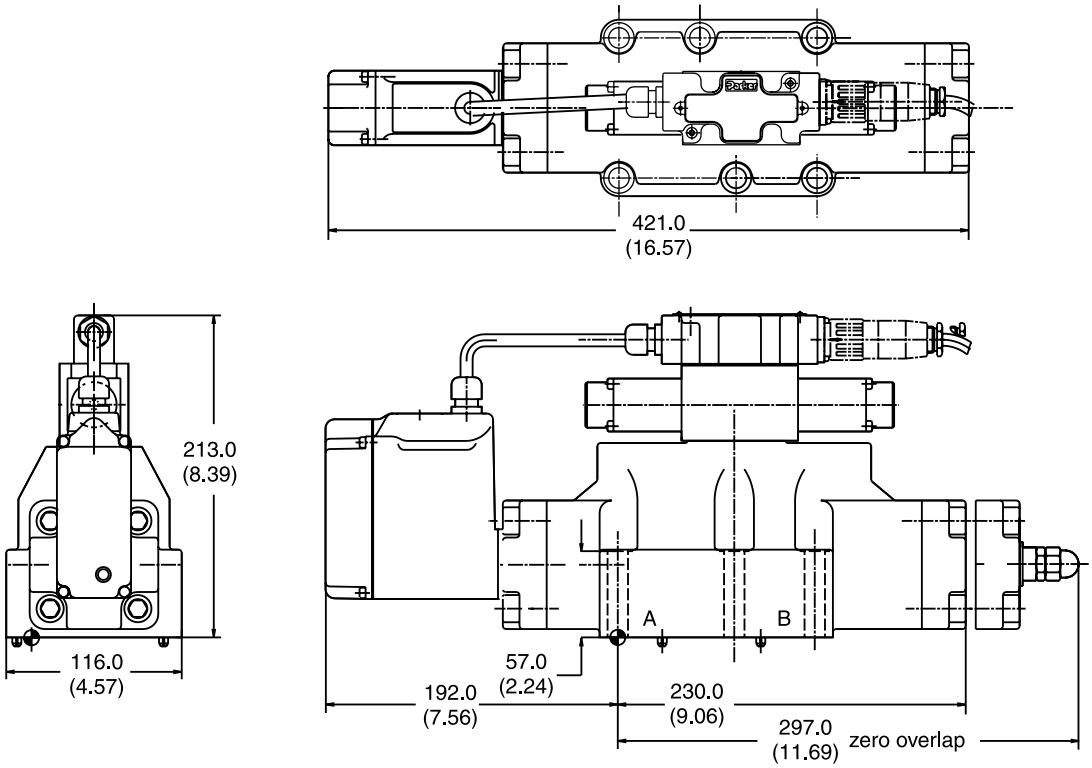
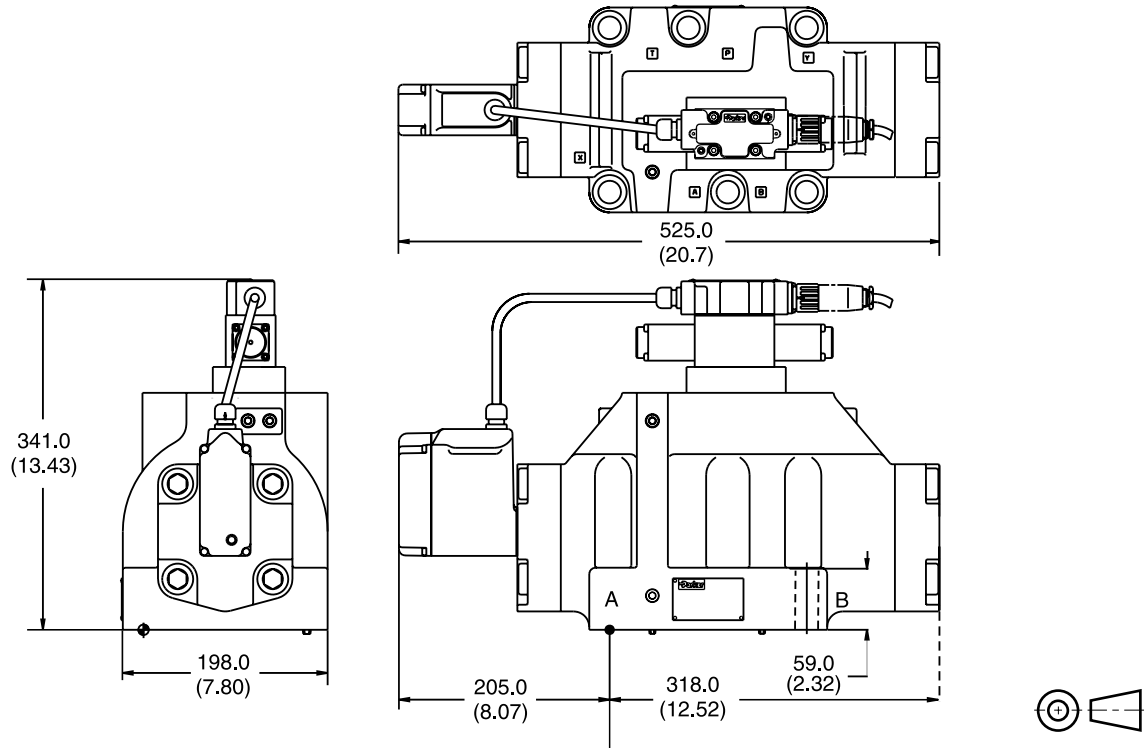
D81FH and D91FH

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



D111FH

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



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General Description

Series D*1FE pilot operated proportional valves are designed for high precision applications that require a safe middle position of the main spool at power down.

The pilot is a 3-position valve with an overlapped middle position. This ensures that the main stage spring pushes the spool into the middle position at power down without an unintended jerk of the actuator.

The D*1FE series is available in 5 sizes:

D31FE NG10 (CETOP 5)

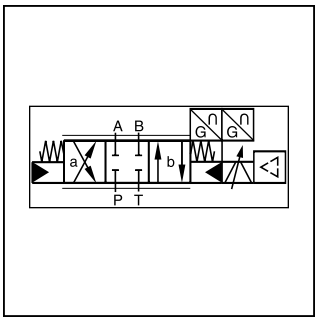
D41FE NG16 (CETOP 7)

D91FE NG25 (CETOP 8) for port diam. up to 32 mm

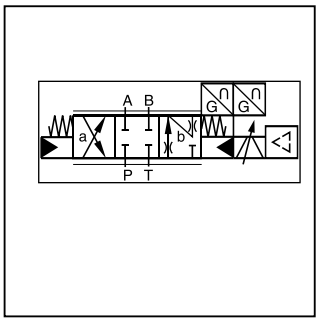
D111FE NG32 (CETOP10)

The innovative integrated regenerative function in the A-line (optional) allows new energy saving circuits with differential cylinders. The hybrid version can switch between regenerative mode and standard mode at any time.

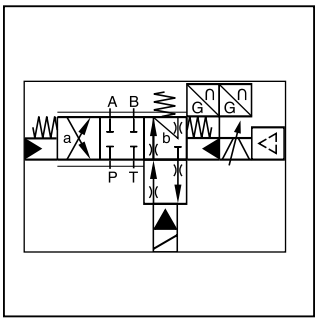
D41FE Standard



Standard D*1FE



NEW: A-Regeneration D*1FER



NEW: Hybrid D*1FEZ

Features

- High dynamics.
- High flow.
- Defined spool positioning at power-down.
- Onboard electronics.
- **NEW:** Energy saving A-regeneration optionally integrated.
- **NEW:** Switchable hybrid version.

D41FEE52 (Standard)