Electrohydraulic Motion Controls

Proportional Directional & Pressure Control Valves
Servovalves, Electronics, Accessories

Catalog HY14-2550/US

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

Parker

ENGINEERING YOUR SUCCESS.

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SAFETY GUIDE

For safety information, see Safety Guide SG HY14-1000 at www.parker.com/safety or call 1-800-CParker.

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Cat HY14-2550-frtcvr.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

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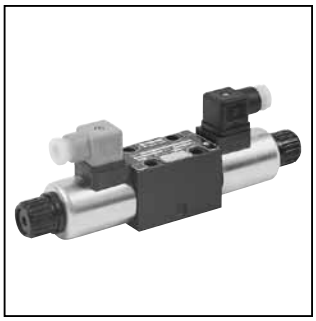
A

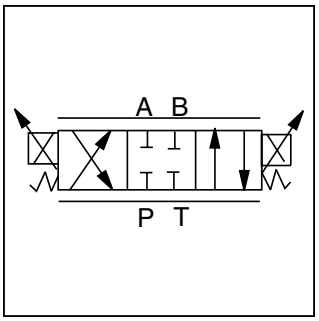
A

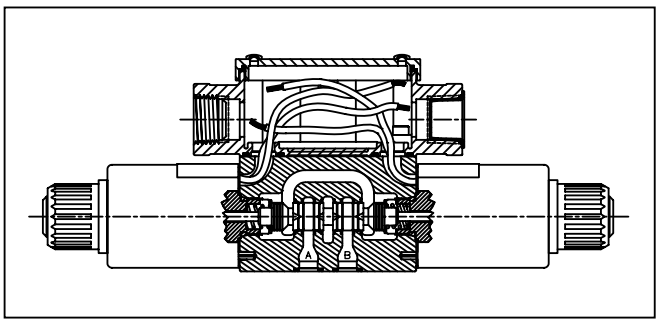
General Description

Series D*FW direct operated proportional directional control solenoid valves are available in sizes NG6 (CETOP 3) and NG10 (CETOP 5).

Typical applications include reproducible control of actuator speed in rapid/slow speed profiling, and smooth acceleration and deceleration performance.





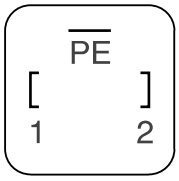


Features

- Standard DIN/ISO/CETOP/NFPA interfaces.
- Progressive flow characteristics for improved low flow resolution.
- Spring centered spool.
- Wide selection of spool options and flow capacity.

Wiring D*FW — Solenoid Coil

(without integrated electronics)



1 = coil connection
2 = coil connection
PE = ground potential

Specifications

Interface DIN	NG6 (CETOP 3)	NG10 (CETOP 5)
Flow Rating @10 Bar (150 PSI) Δp (P→A, B→T) (spool options up to) LPM (GPM)	20 (5.3)	60 (15.9)
Maximum Flow (refer to operating limit curves) LPM (GPM)	48 (12.5)	170 (45)
Step Response (time to reach 90% of a 100% step command) ms	100	165

Hysteresis	%	<8	**Fluid Viscosity, Recommended**	80 – 1000 SSU
Repeatability	%	<2	**Fluid Temperature, Recommended**	0°C to +60°C (+32°F to +140°F)
Max. Operating Pressure Port P, A, B / Port T	Bar (PSI)	315 (4500) / 35 (500)	**Environmental Protection Class**	NEMA 1 (IP54)
Fluid Cleanliness Level		ISO Class 16/13	**Ambient Operating Temperature**	-20°C to +60°C (-4°F to +140°F)

D		F	W								0	
Directional Control Valve	Size	Flow Control	Open Loop	Spool Type	Flow	Style	Seal	Solenoid Voltage	Solenoid Accessories	Valve Accessories	Design Series

NOTE: Not required when ordering.

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

Code	Description
J[2]	24 VDC
K	12 VDC
M[2]	9 VDC

(2) Not for D3FW

Code	Description
0	Standard[1]

(1) Metal can coils

Code	Description
F[3]	Free Coil Lead Wires
W[5]	Socket Connector DIN 43650 without Plug

(3) D1FW, 9V overmolded coil only.
(4) Contact factory for custom lead wire and connector options in OEM quantities.
(5) Not available 9V coil.

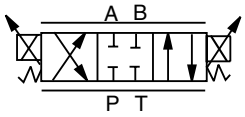
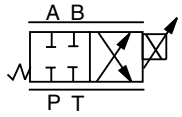
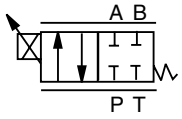
Code	Description
N	Nitrile
V	Fluorocarbon

Code	Spool Overlap			
	$Q_A > Q_B$ [1]		$Q_A = Q_B$	
	10%	Spool Type	10% / 20%	Spool Type
B31			E01 / E81*	
B32			E02 / E82*	
			E09 / –	

1) Reduced Flow Rate on Port B, Nominal Flow Rate on Port A
Code A* for spool $Q_B > Q_A$ optional
Refer to factory for ratio spool options.
* Use E01 or E02 for new applications.

Code	Flow at Δp 5 Bar (72.5 PSI) per metering edge	
	D1FW LPM (GPM)	D3FW LPM (GPM)
C	7.5 (2.0)*†	–
F	15 (4.0)	–
H	20 (5.3)†#	20 (5.3)*†
K**	–	30 (7.8)
M	–	40 (10.6)
S	–	60 (15.9)†#

Refer to factory for ratio spool options.
* E09 spools only available where indicated.
** E01 spool only.
† Type E spool only.
# Not available with E81, E82.

Code	Style
C	
E	
K	

Bolt Kits:

D1FW	BK209	(4) 10-24x1.25 SHCS
D3FW	BK98	(4) 1/4-20x1.62 SHCS

Weight:

D1FW	2.5 kg (5.5 lbs.)
D3FW	6.8 kg (15.0 lbs.)

Driver Cards

Refer to the Electronics section for driver cards and support electronics.

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 and connectors.

D_FW.indd, dd

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Hydraulic Valve Division
Elyria, Ohio, USA

Electrical Specifications

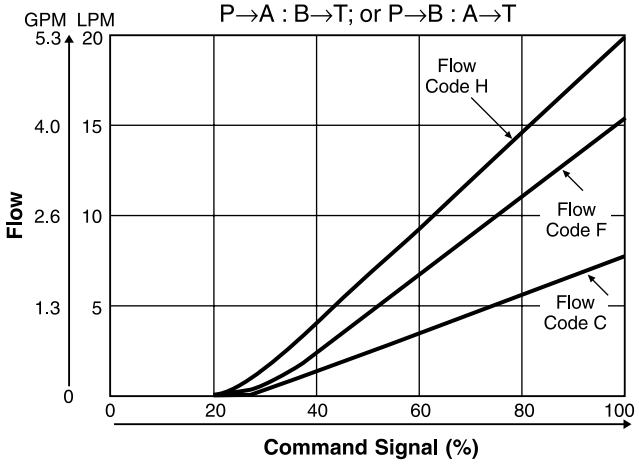
A

Series D*FW
without integrated electronics

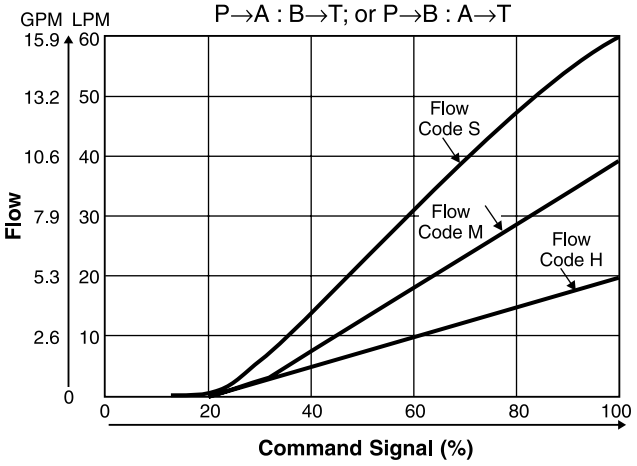
Interface DIN		NG6 (CETOP 3)			NG10 (CETOP 5)	
Solenoid Order Code		**J**	**K**	**M**	**K**	**J**
Nominal Resistance	**ohms**	24	6	3.3	4	16
Nominal Current	**amps**	0.9	1.8	2.5	2.5	1.25
Nominal Voltage	**voltage**	**24**	**12**	**9**	**12**	**24**
Environmental Protection Class		NEMA 1 (IP54)				
Mating Connectors — Solenoid (DIN 43650)		Part #692914 (Black)				
		Part #692915 (Gray)				

Performance Curves

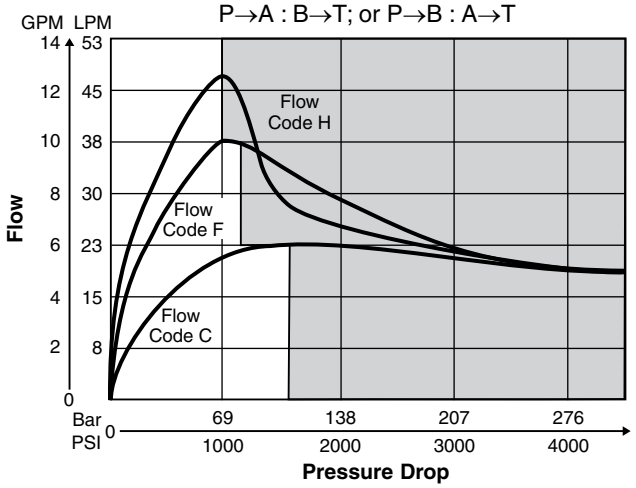
D1FW Flow Characteristics
at Δp = 5 Bar (72.5 PSI) per metering edge
P→A : B→T; or P→B : A→T



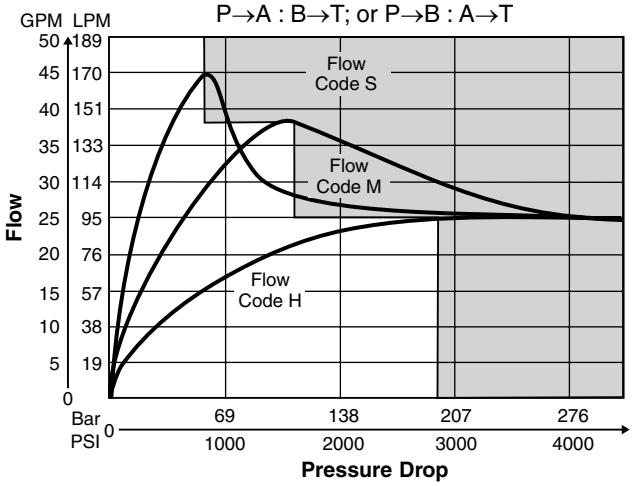
D3FW Flow Characteristics
at Δp = 5 Bar (72.5 PSI) per metering edge
P→A : B→T; or P→B : A→T



D1F* Operating Limits [1)]
at 100% Command
P→A : B→T; or P→B : A→T



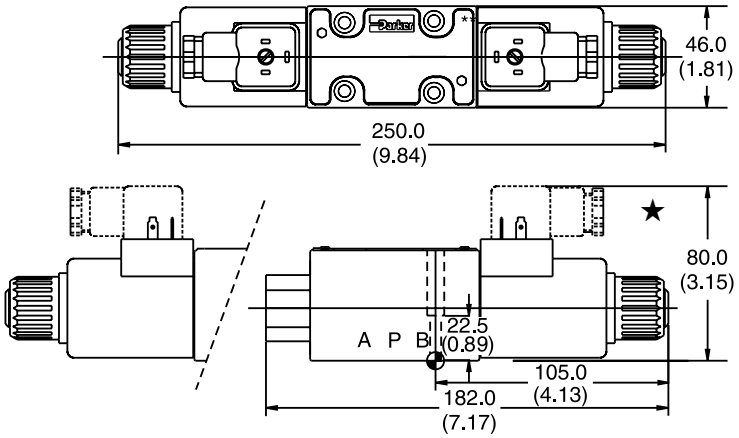
D3F* Operating Limits [1)]
at 100% Command
P→A : B→T; or P→B : A→T



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

D1FW with Hirschmann Connectors

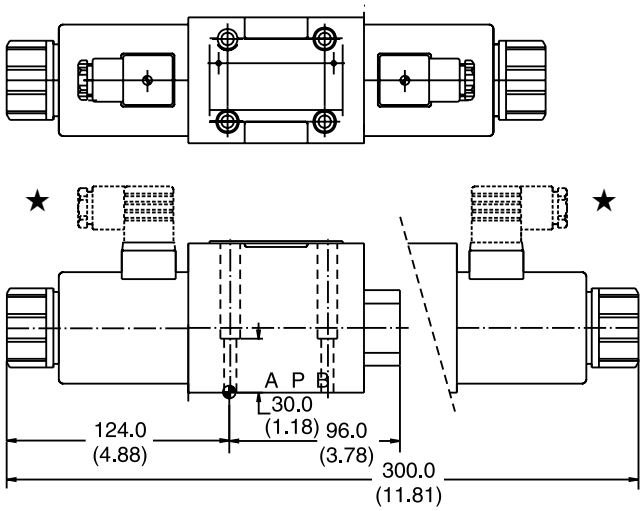
Inch equivalents for millimeter dimensions are shown in (**)



D3FW with Hirschmann Connectors

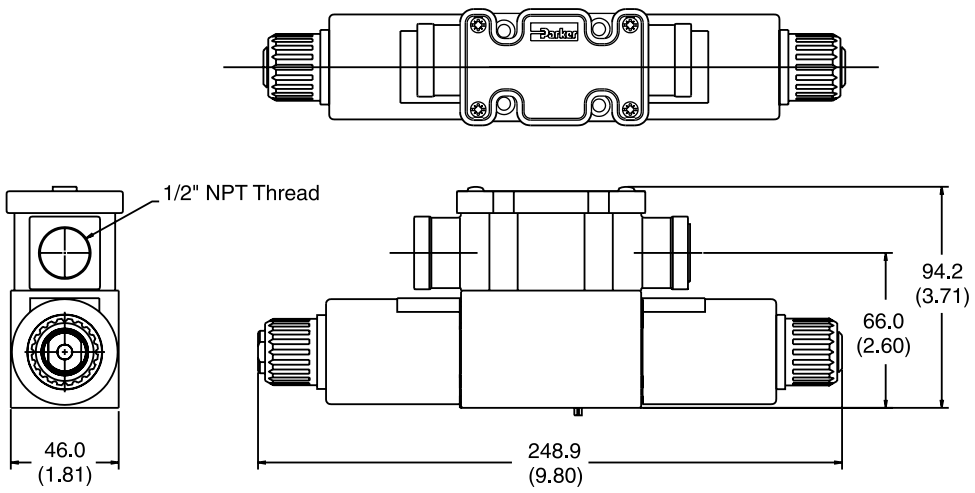
★ Order plugs separately.

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



D1FW with Conduit Box

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



D_FW.indd, dd

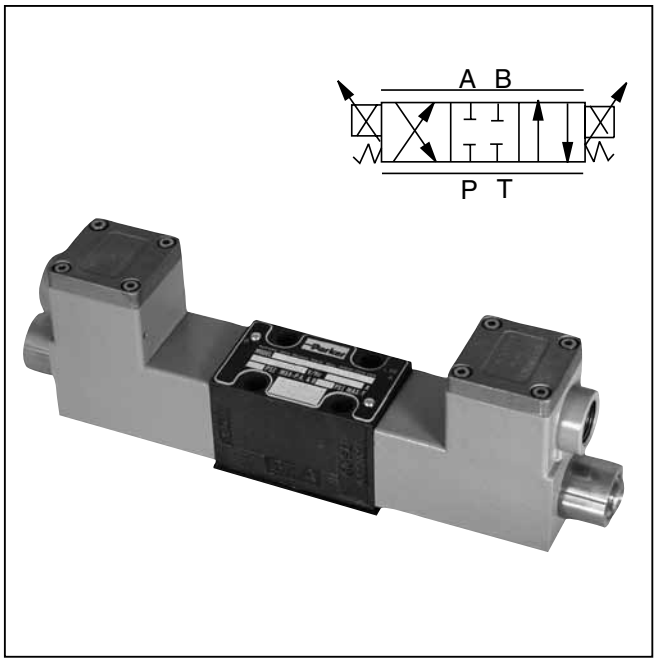
Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

A

General Description

Series D1FW direct operated proportional directional control solenoid valves are available with explosion proof solenoids for hazardous conditions. Valves are available in sizes NG6 (CETOP 3).

Typical applicatons include reproducible control of acutator speed in rapid/slow speed profiling, and smooth acceleration and deceleration performance.



Features

- Standard DIN/ISO/CETOP/NFPA interfaces.
- Progressive flow characteristics for improved low flow resolution.
- Spring centered spool.
- Wide selection of spool options and flow capacity.
- Single piece rugged solenoid assembly.

Specifications

Interface DIN	**NG6 (CETOP 3)**
Flow Rating @10 Bar (150 PSI) Δp (P→A, B→T) (spool options up to) LPM (GPM)	20 (5.3)
Maximum Flow (refer to operating limit curves) LPM (GPM)	48 (12.5)
Step Response (time to reach 90% of a 100% step command) ms	100

Hysteresis	%	<8	**Fluid Viscosity, Recommended**	80 – 1000 SSU
Repeatability	%	<2	**Fluid Temperature, Recommended**	0°C to +60°C (+32°F to +140°F)
Max. Operating Pressure			**Environmental Protection Class**	NEMA 4 (IP65)
Port P, A, B	Bar (PSI)	315 (4500)		
Port T		35 (500)	**Ambient Operating Temperature**	-20°C to +60°C (-4°F to +140°F)
Fluid Cleanliness Level		ISO Class 16/13		

Complies with:

Ex d IIC

AEx d IIC for Class I Zone 1

UL1203, UL1604, CSA E61241-1-1
Class II Div 1

C US

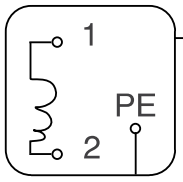
Ex d IIC Ex tD A21 CE 1180 Ex II 2GD

EN60079-0, EN60079-1
EN61241-0, EN61241-1

Wiring D1FW — Solenoid Coil

(without integrated electronics)

CE



1 = coil connection
2 = coil connection
PE = ground potential

Ex

C US

D	1	F	W	☐	☐	☐	☐	L	E	T	⌐ ¬
Directional Control Valve	Size	Flow Control	Open Loop	Spool Type	Flow	Style	Seal	Solenoid Voltage	Solenoid Accessories	Valve Accessories	Design Series

NOTE: Not required when ordering.

Code	Description
1	DIN NG6 CETOP 3 NFPA D03

Code	Description
L	6 VDC

Code	Description
T	Exd IIc ATEX / CSA

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
E	Explosion Proof

Code		
Spool Overlap		
10%	20%	Spool Type
E01	E81*	
E02	E82*	
E09	–	

Refer to factory for ratio spool options.

* Use E01 or E02 for new applications.

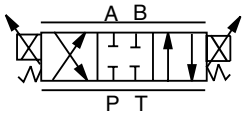
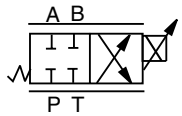
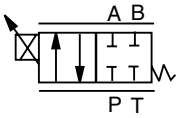
Code	Flow at Δp 5 Bar (72.5 PSI) per metering edge LPM (GPM)
C	7.5 (2.0)*
F	15 (4.0)
H	20 (5.3)†#

Refer to factory for ratio spool options.

* E09 spools only available where indicated.

† Type E spool only.

\# Not available with E81, E82.

Code	Style
C	
E	
K	

Bolt Kit:

BK209	(4) 10-24x1.25 SHCS
BK375	(4) M5 x 30mm SHCS

Weight:

NG6	4.1 kg (9.1 lbs.)

A

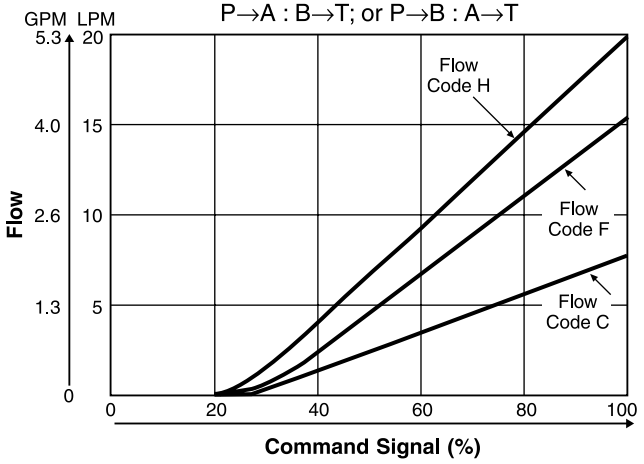
Electrical Specifications
Explosion Proof

Interface DIN		NG6 (CETOP 3)
Solenoid Order Code		**L**
Nominal Resistance	ohms	2.0
Nominal Current	amps	2.4
Nominal Voltage	voltage	5
Nominal Wattage	watts	11.5
Environmental Protection Class		IP66

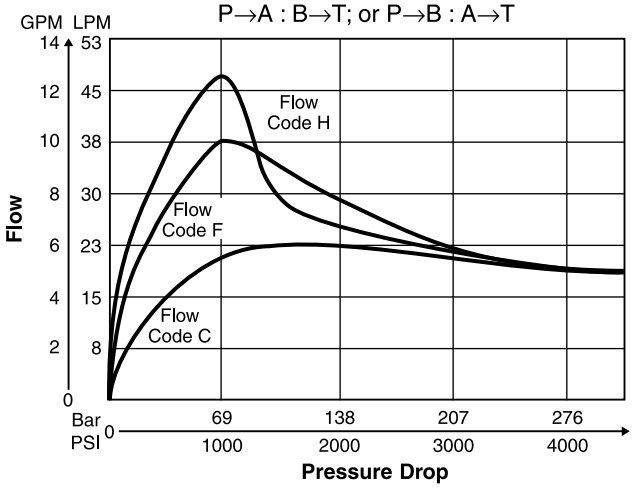
Explosion Proof Ratings	
CSA	Exd IIc, AExd Class I Zone I
ATEX	EEx d IIc G T4 -54°C to 90°C

Performance Curves

D1FW Flow Characteristics
at Δp = 5 Bar (72.5 PSI) per metering edge
P→A : B→T; or P→B : A→T

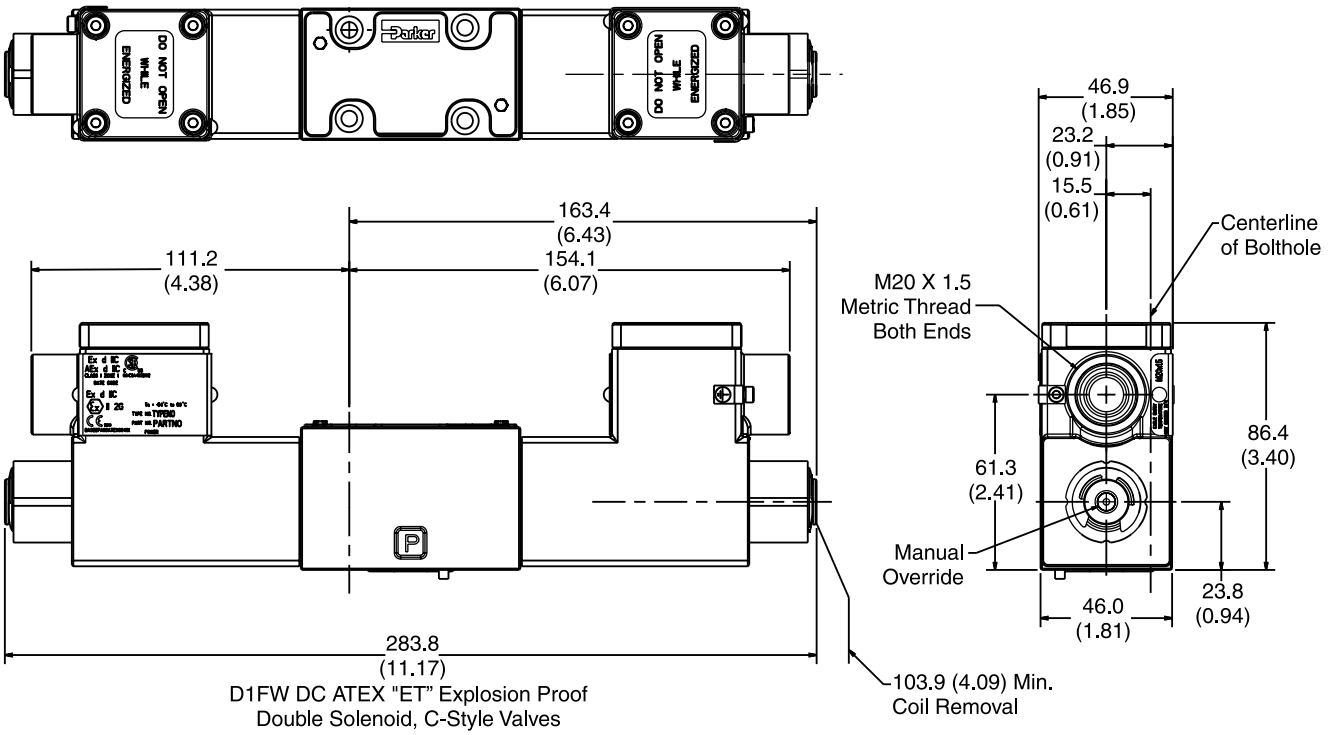


D1FW Operating Limits
at 100% Command
P→A : B→T; or P→B : A→T

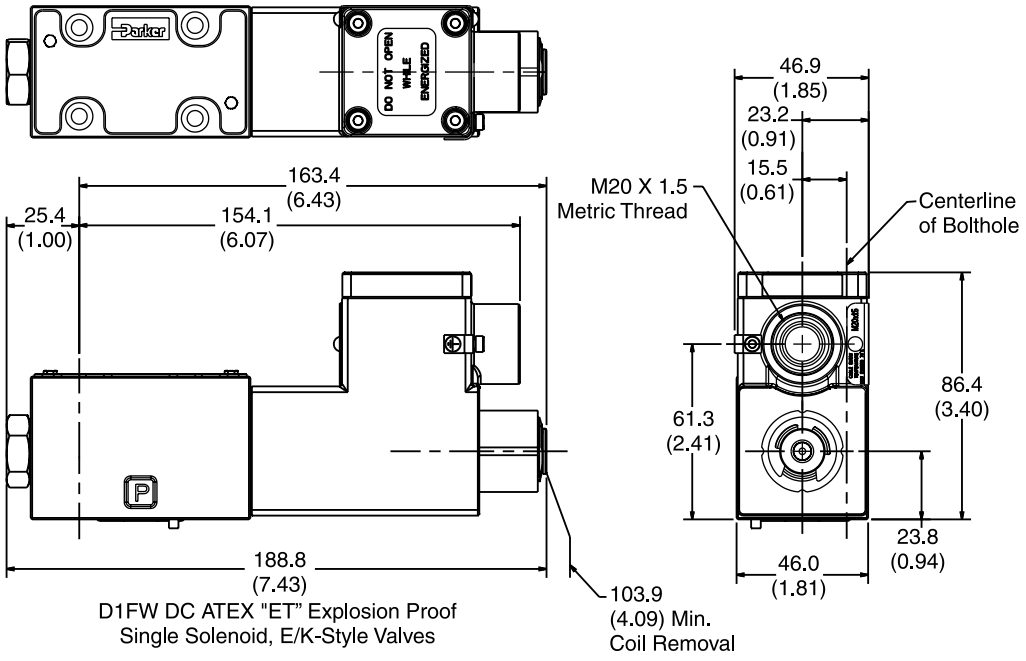


A

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



D1FW DC ATEX "ET" Explosion Proof
Double Solenoid, C-Style Valves



D1FW DC ATEX "ET" Explosion Proof
Single Solenoid, E/K-Style Valves

A

General Description

Series D1FB (NG6) proportional directional valves are available with and without onboard electronics (OBE).

D1FB OBE:

The digital onboard electronics is situated in a robust metal housing, which allows the usage under rough environmental conditions.

The nominal values are factory set. The cable connection to a serial RS232 interface is available as an accessory.

D1FB for external electronics:

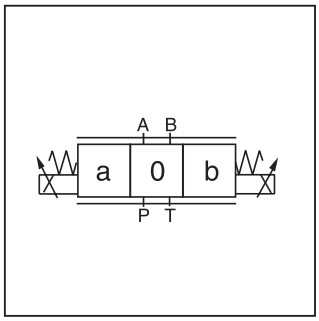
The parameters can be saved, changed and duplicated in combination with the digital power amplifier PWD00A-400.

The valve parameters can be edited with the common ProPxD software for both versions.

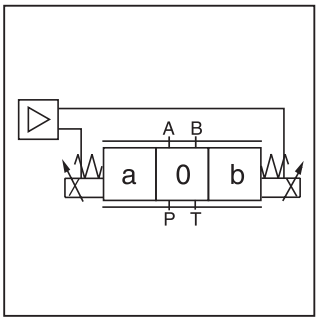
Series D1FB valves can be ordered with spool/sleeve design (D1FB*0) for maximum precision, as well as spool/body design (D1FB*3) for high nominal flow - see functional limit curves for maximum flow capability.

D1FB

D1FB OBE



D1FB

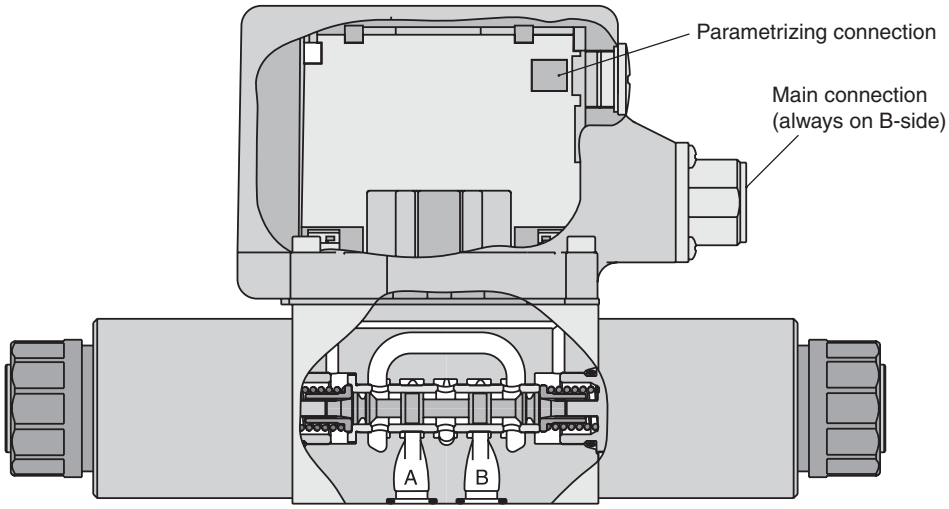


D1FB OBE

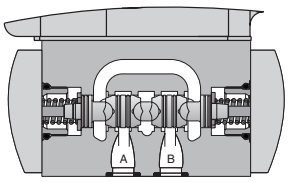
Features

- Spool/sleeve and spool/body.
- 3 command options for D1FB OBE: +/- 10V, 4…20mA, +/- 20mA
- High repeatability from valve to valve.
- Low hysteresis.
- Manual override.
- Digital onboard electronics.

D1FB*0 OBE
Spool/Sleeve Design



D1FB*3 OBE
Spool/Body Design



D	1	F	B			0					
Directional Control Valves	Size	Flow Control	Standard Dynamics Standard Repeatability	Spool	Style		Seal	Solenoid Voltage	Solenoid Accessories	Design	Design Series

NOTE: Not required when ordering.

Code	Description
1	DIN NG6 CETOP 3 NFPA D03

D1FB*0: Spool/Sleeve Design

Code	Solenoid
M	9V/2.7A
J	24V/0.8A

D1FB*3: Spool/Body Design

Code	Solenoid
K	12V / 2.2A
J	24V / 1.1A

Code	Description
0	Spool/sleeve design
3	Spool/body design

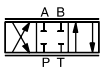
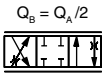
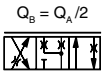
Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
W*	Connector as per DIN 43650 without plug
J*	Connector DT04-2P "Deutsch"

* Please order plugs separately. See Accessories.

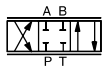
D1FB*0: Spool/Sleeve Design

Overlap

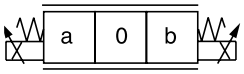
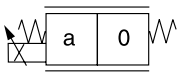
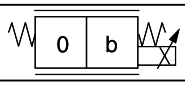
Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01H E01F E01C		20 (5.3) 12 (3.2) 6 (1.6)
E02H E02F E02C		20 (5.3) 12 (3.2) 6 (1.6)
E03H E03F E03C		20 (5.3) 12 (3.2) 6 (1.6)
B31H B31F		20/10 (5.3/2.6) 12/6 (3.2/1.6)
B32H B32F		20/10 (5.3/2.6) 12/6 (3.2/1.6)

D1FB*3: Spool/Body Design

Overlap

Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01K E01H E01F		30 (7.9) 20 (5.3) 10 (2.6)
E02K E02H E02F		30 (7.9) 20 (5.3) 10 (2.6)

[1] Only for style C.
No defined spool positioning at power down.

Code	Style
C	
E	
K	

Bolt Kit:

BK209	(4) 10-24x1.25 SHCS
BK375	(4) M5x30

Weight:

D1FB	2.2 kg (4.9 lbs.)

D	1	F	B	□	□	0	□	□	□	□	
Directional Control Valves	Size	Flow Control	Standard Dynamics Standard Repeatability	Spool	Style		Seal	Input Signal	Options	Design	Design Series NOTE: Not required when ordering.

Code	Description
1	DIN NG6 CETOP 3 NFPA D03

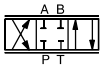
Code	Description
0	Spool/sleeve design
3	Spool/body design

Code	Input signal [1]	Function	Port	Options
F0	0...+/-10V	0...+10V > P-A	6 + PE	Potentiometer supply
G0	0...+/-20mA	0...+20mA > P-A	6 + PE	—
S0	4...20mA	12...20mA > P-A	6 + PE	—
W5 [2]	0...+/-10V 4...20mA	0...+10V > P-A 12...20mA > P-A	11 + PE	Potentiometer supply & command preset channel

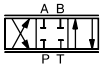
[1] Single solenoid always 0...+10V respectively 4...20 mA
[2] Factory set ± 10V on delivery

Code	Description
N	Nitrile
V	Fluorocarbon

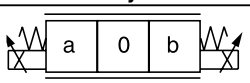
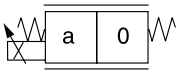
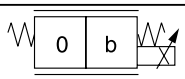
D1FB*0: Spool/Sleeve Design

Overlap		
Code	**Spool**	**Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge**
E01H E01F E01C		20 (5.3) 12 (3.2) 6 (1.6)
E02H E02F E02C		20 (5.3) 12 (3.2) 6 (1.6)
E03H E03F E03C		20 (5.3) 12 (3.2) 6 (1.6)
B31H B31F	$Q_B = Q_A/2$ 	20/10 (5.3/2.6) 12/6 (3.2/1.6)
B32H B32F	$Q_B = Q_A/2$ 	20/10 (5.3/2.6) 12/6 (3.2/1.6)

D1FB*3: Spool/Body Design

Overlap		
Code	**Spool**	**Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge**
E01K E01H E01F		30 (7.9) 20 (5.3) 10 (2.6)
E02K E02H E02F		30 (7.9) 20 (5.3) 10 (2.6)

[1] Only for style C.
No defined spool positioning at power down.

Code	Style
C	
E	
K	

Bolt Kit:
BK209 (4) 10-24x1.25 SHCS
BK375 (4) M5x30

Weight:
D1FB 2.5 kg (5.5 lbs.)

Please order plugs separately. See Accessories.

Parametrizing cable OBE => RS232
Item no. 40982923

A

General			
Design	Direct operated proportional DC valve		
Actuation	Proportional solenoid		
Size	NG6 / CETOP 3 / NFPA D03		
Mounting Interface	DIN 24340 / ISO 4401 / CETOP RP121 / NFPA		
Mounting Position	Unrestricted		
Ambient Temperature [°C]	-20...+60; (-4°F...+140°F)		
$MTTF_D$ Value (OBE) [years]	150 (75)		
Vibration Resistance [g]	10 Sinus 5...2000 Hz acc. IEC 68-2-6 30 Random noise 20...2000 Hz acc. IEC 68-2-36 15 Shock acc. IEC 68-2-27		
Hydraulic			
Maximum Operating Pressure	Ports P, A, B 350 Bar (5075 PSI); Port T 210 Bar (3045 PSI)		
Maximum Pressure Drop PABT / PBAT	350 Bar (5075 PSI)		
Fluid	Hydraulic oil as per DIN 51524...535, other on request		
Fluid Temperature [°C]	-20...+60; (-4°F...+140°F)		
Viscosity **Permitted [cSt] / [mm²/s]** **Recommended [cSt] / [mm²/s]**	 20...380 (93...1761 SSU) 30...80 (139...371 SSU)		
Filtration	ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)		
Nominal Flow at Δp= 5 Bar (72.5 PSI) per Control Edge *	**D1FB*0 (Spool/sleeve)**	**D1FB*3 (Spool/body)**	
	6 LPM (1.6 GPM) / 12 LPM (3.2 GPM) / 20 LPM (5.3 GPM)	10 LPM (2.6 GPM) / 20 LPM (5.3 GPM) / 30 LPM (7.9 GPM)	
Leakage at 100 Bar (1450 PSI) [ml/min]	<50 (overlap spool) <400 (zerolap spool)	<60	
Overlap [%]	25, electrically normalized at 10 (see flow characteristics)		
Static / Dynamic			
Step Response at 100% Step [ms]	30	30	
Hysteresis [%]	<4	<6	
Temperature Drift Solenoid Current [%/K]	<0.02		
Electrical			
Duty Ratio [%]	100		
Protection Class	Standard (as per EN175301-803) IP65 in accordance with EN60529 (plugged and mounted) DT04-2P "Deutsch" IP69K (plugged and mounted)		
Solenoid	**Code "M"**	**Code "K"**	**Code "J" (Spool/sleeve)**
Supply Voltage [V]	9	12	24
Current Consumption [A]	2.7	2.2	0.8 (1.1)
Resistance [Ohm]	2.7	4.4	18.6
Coil Insulation Class	F (155 °C); (331°F)		
Solenoid Connection	Connector as per EN 175301-803 (code W), DT04-2P "Deutsch" connector (code J). Solenoid identification as per ISO 9461.		
Wiring Minimum [mm²]	3x1.5 (AWG 16) overall braid shield (Code W), "Deutsch" connector DP4 2-Pin (Code J)		
Wiring Length Maximum [m]	50 (164 ft.)		

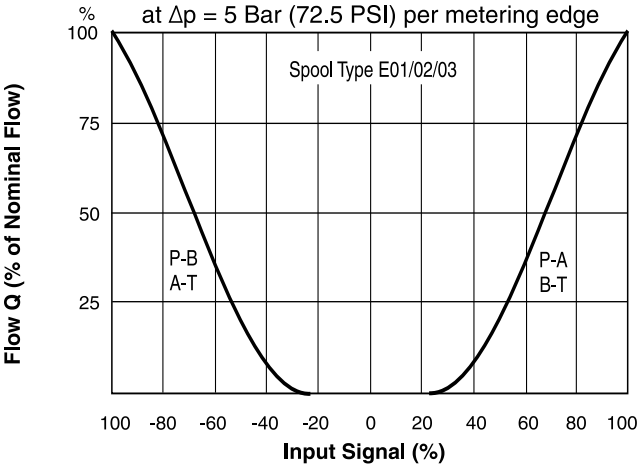
* Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

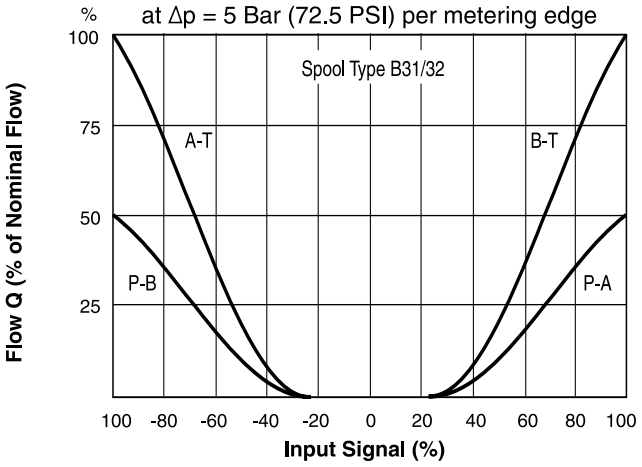
Continued on the next page

Electrical		
Duty Ratio	**[%]**	100
Protection Class		IP65 in accordance with EN 60529 (plugged and mounted)
Supply Voltage/ripple **DC**	**[V]**	18...30, ripple < 5% eff., surge free
Current Consumption **Maximum**	**[A]**	2.0
Pre-fusing Medium Lag	**[A]**	2.5
Input Signal		
Codes F0 & W5 Voltage	**[V]**	+10...0...-10, ripple < 0.01 % eff., surge free, Ri = 100kOhm, 0...+10V => P -> A
Codes S0 & W5 Current	**[mA]**	4...12...20, ripple < 0.01 % eff., surge free, Ri = 200Ohm, 12...20mA => P -> A < 3.6 mA = enable off, > 3.8 mA = enable on (acc. to NAMUR NE43)
Code G0	**[mA]**	+20...0...-20, ripple < 0.01 % eff., surge free, Ri = 200Ohm, 0...+20mA => P -> A
Differential input max.		
Codes F0, G0 & S0	**[V]**	30 for terminal D and E against PE (terminal G) 11 for terminal D and E against 0V (terminal B)
Code W5	**[V]**	30 for terminal 4 and 5 against PE (terminal PE) 11 for terminal 4 and 5 against 0V (terminal 2)
Channel Recall Signal	**[V]**	0...2.5: off / 5...30: on / Ri = 100 kOhm
Adjustment Ranges:		
Min	**[%]**	0...50
Max	**[%]**	50...100
Ramp	**[s]**	0...32.5
Interface		RS 232, parametrizing connection 5 pole
EMC		EN 61000-6-2, EN 61000-6-4
Central Connection		
Codes F0, G0 & S0		6 + PE acc. to EN 175201-804
Code W5		11 + PE acc. to EN 175201-804
Wiring Minimum		
Codes F0, G0 & S0	**[mm²]**	7 x 1.0 (AWG16) overall braid shield
Code W5	**[mm²]**	11 x 1.0 (AWG20) overall braid shield
Wiring Length Maximum	**[m]**	50 (164 ft.)

A

D1FB*0 Flow

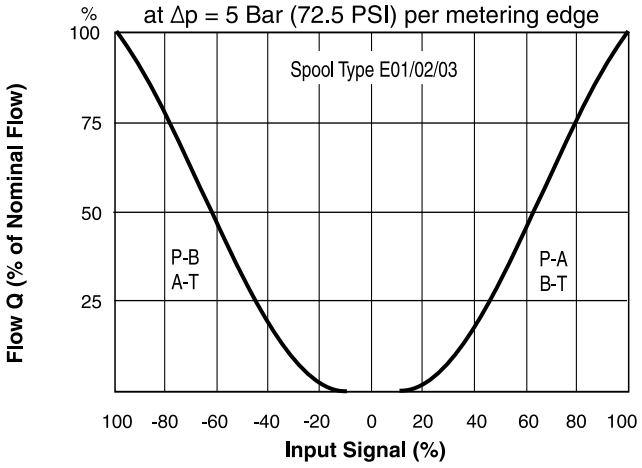


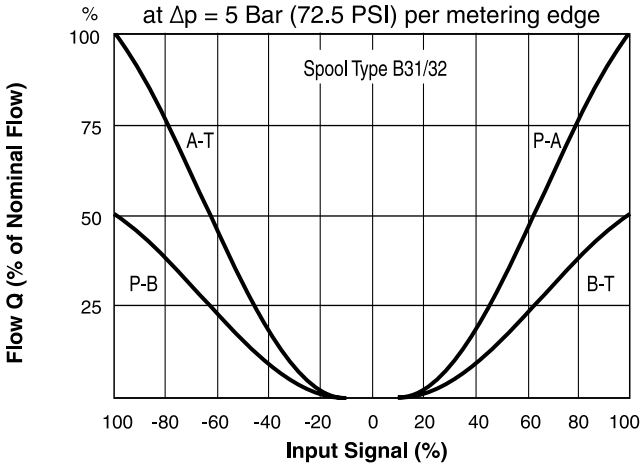


All performance curves measured with HLP46 at 50°C (122°F).

D1FB*0 OBE Flow

(Electrically set to opening point 10%)

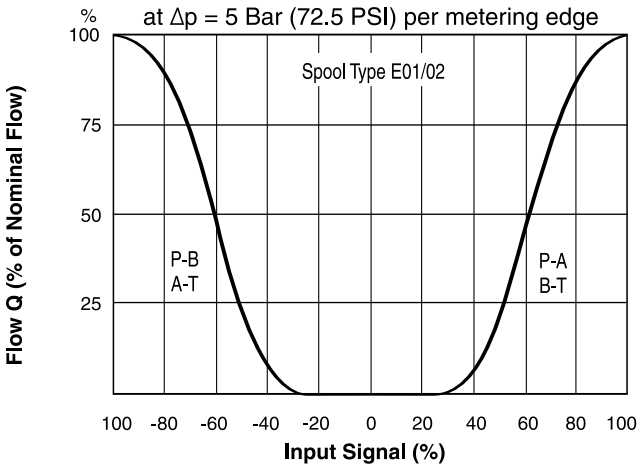




All performance curves measured with HLP46 at 50°C (122°F).

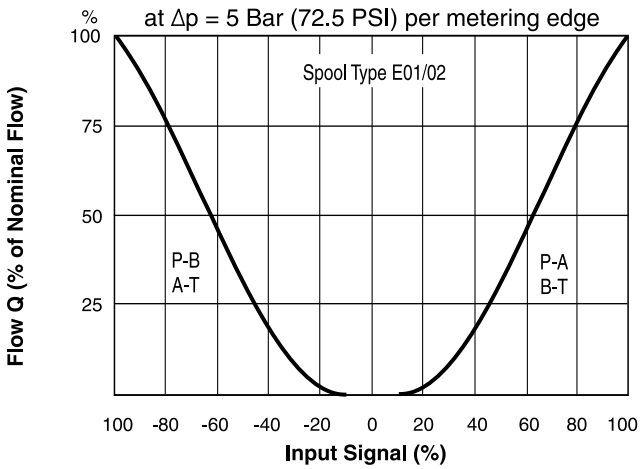
A

D1FB*3 Flow



D1FB*3 OBE Flow

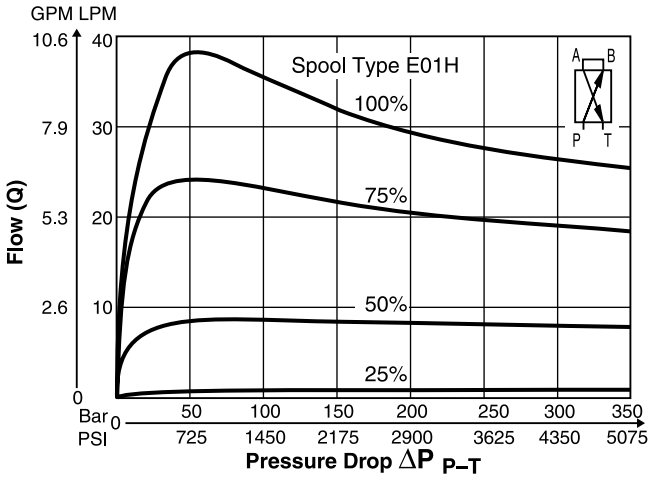
(Electrically set to opening point 10%)

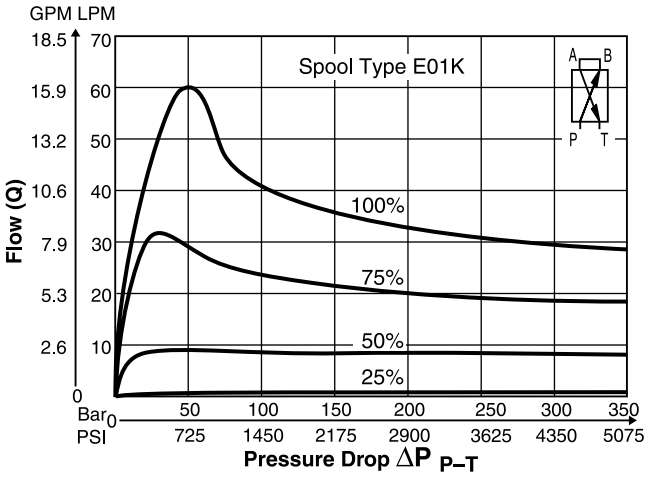


All performance curves measured with HLP46 at 50°C (122°F).

Functional Limits

At 25%, 50%, 75% and 100% command signal (symmetric flow). At asymmetric flow a reduced flow limit has to be considered – typically approx. 10% lower.



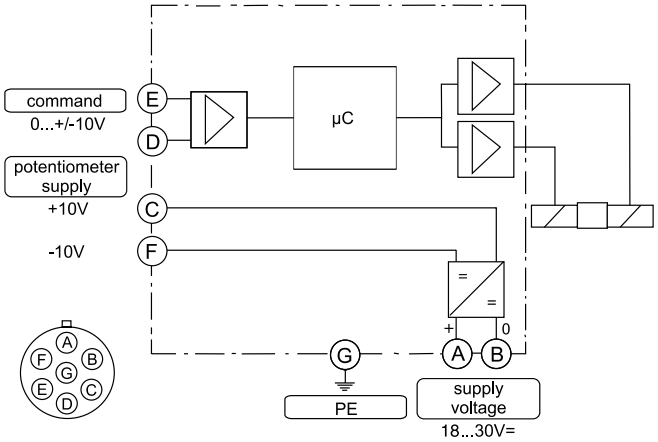


All performance curves measured with HLP46 at 50°C (122°F).

A

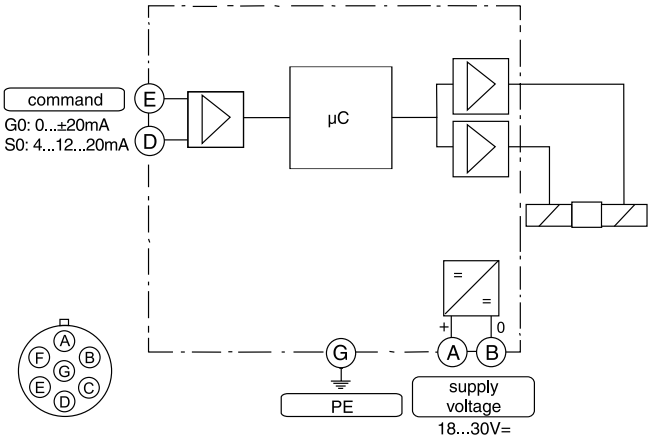
Code F0

6 + PE acc. to EN 175201-804



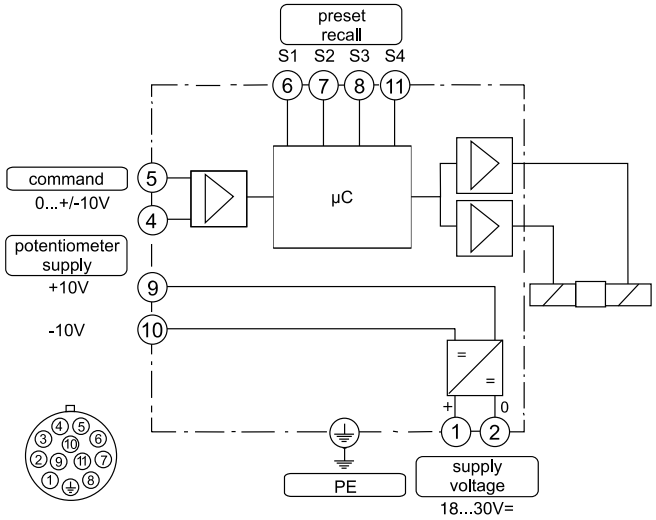
Code G0, S0

6 + PE acc. to EN 175201-804



Code W5

11 + PE acc. to EN 175201-804

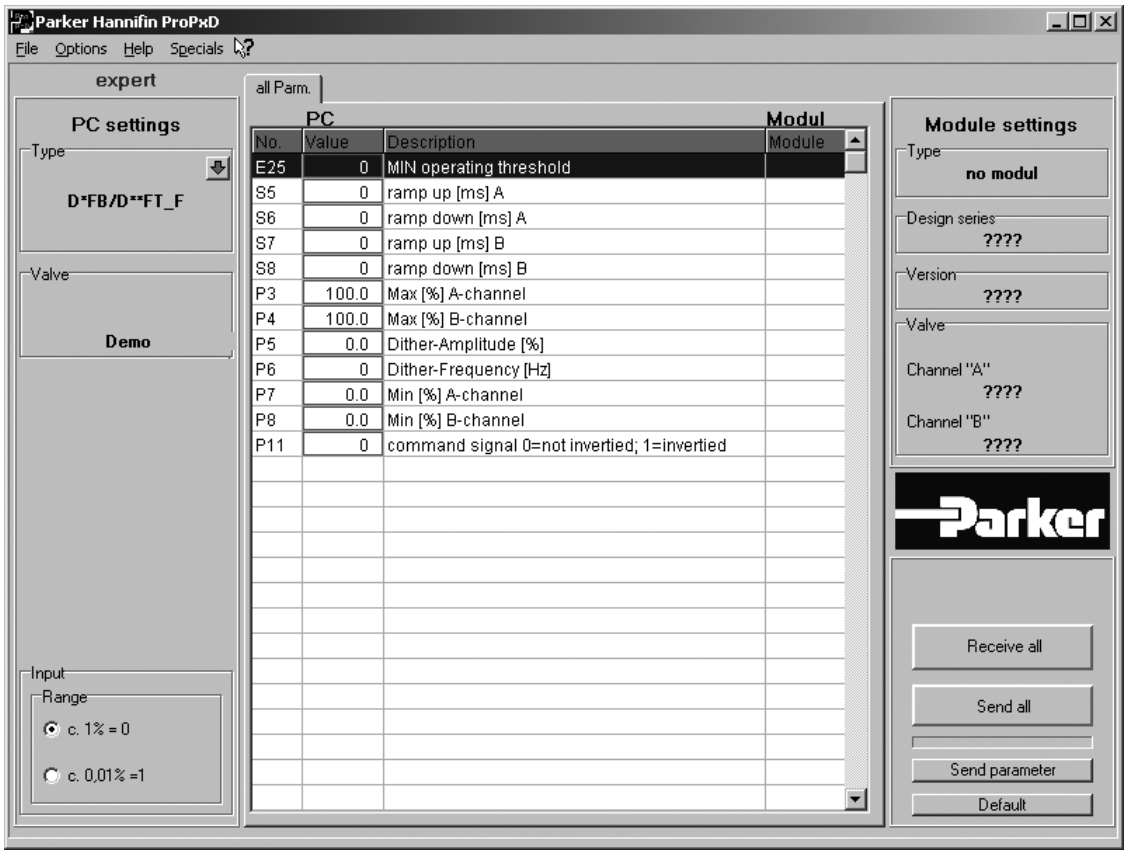


ProPxD Interface Program

The ProPxD software permits comfortable parameter setting for the module electronics. Via the clearly arranged entry mask the parameters can be noticed and modified. Storage of complete parameter sets is possible as well as printout or record as a text file for further documentation. Stored parameter sets may be loaded anytime and transmitted to other valves. Inside the electronics a nonvolatile memory stores the data with the option for recalling or modification.

Features

- Simple editing of all parameters.
- Storage and loading of optimized parameter adjustments.
- Executable with all Windows® operating systems from Windows® 95 upwards.
- Communication between PC and electronics via serial interface RS-232.
- Simple to use PC user software, free of charge: www.parker.com/euro_hcd – see "Software Downloads"

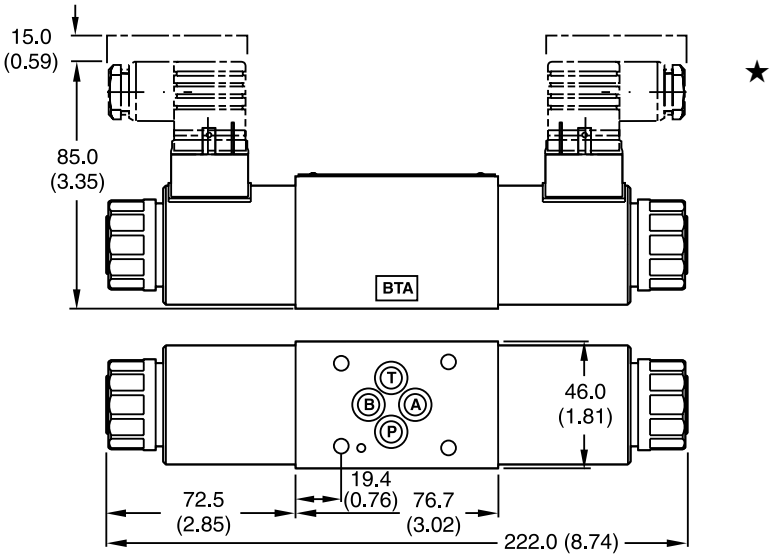


The parametrizing cable may be ordered under item no. 40982923.

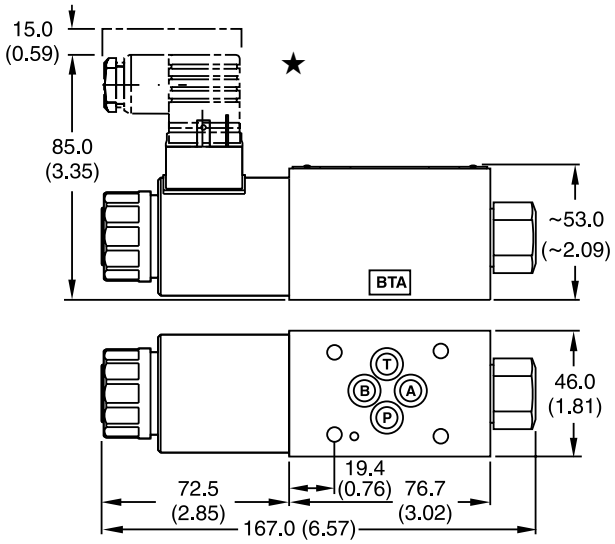
A

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

D1FB*C



D1FB*K

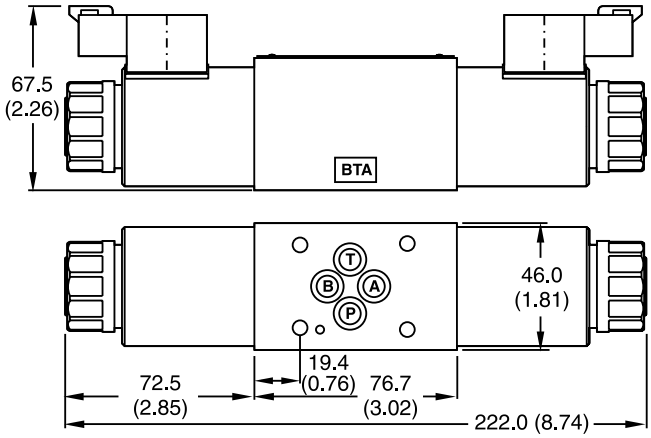


★ Order plugs separately.

Dimensions with DT04-2P "Deutsch" Connector

(Only C style shown)

D1FB*C



Surface Finish	Kit			Seal Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK375 BK209	4x M5x30 DIN 912 12.9 4x 10-24x1.25	7.6 Nm (5.6 lb.-ft.) ±15 %	Nitrile: SK-D1FB Fluorocarbon: SK-D1FBV

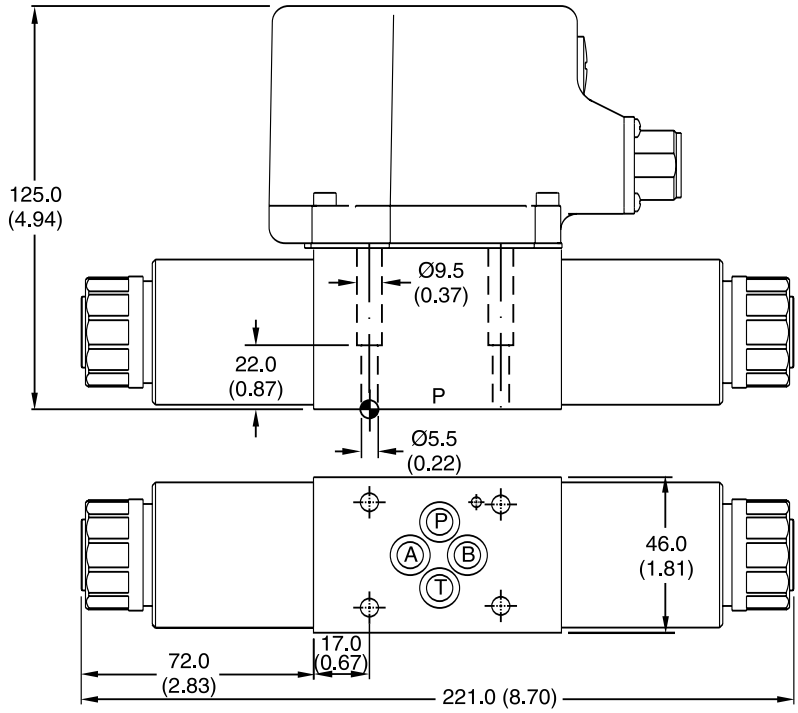
D1FB.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

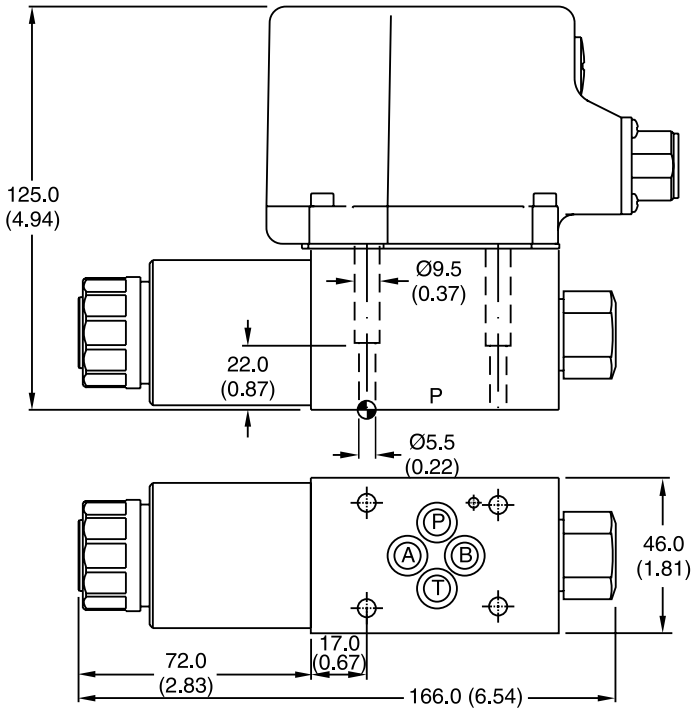
A

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

D1FB*C OBE



D1FB*E OBE



Surface Finish	Kit			Seal Kit
R_{max}6.3 ▱ 0.01/100	BK375 BK209	4x M5x30 DIN 912 12.9 4x 10-24x1.25	7.6 Nm (5.6 lb.-ft.) ±15 %	Nitrile: SK-D1FB Fluorocarbon: SK-D1FBV

D1FB.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

General Description

Series D3FB (NG10) proportional directional valves are available with and without onboard electronics (OBE).

D3FB OBE:

The digital onboard electronics is situated in a robust metal housing, which allows the usage under rough environmental conditions.

The nominal values are factory set. The cable connection to a serial RS232 interface is available as accessory.

D3FB for external electronics:

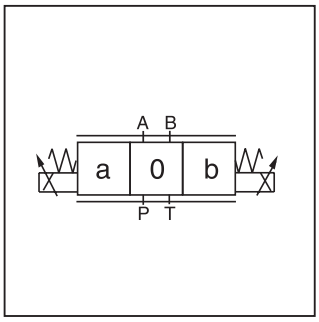
The parameters can be saved, changed and duplicated in combination with the digital power amplifier PWD00A-400.

The valve parameters can be edited with the common ProPxD software for both versions.

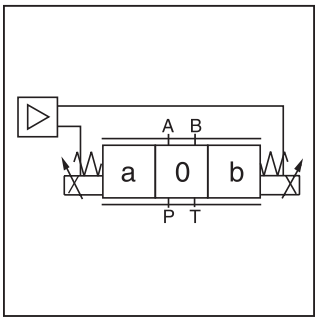
Series D3FB valves can be ordered with spool/sleeve design (D3FB*0) for maximum precision, as well as spool/body design (D3FB*3) for high nominal flow - see functional limit curves for maximum flow capability.

D3FB

D3FB OBE



D3FB



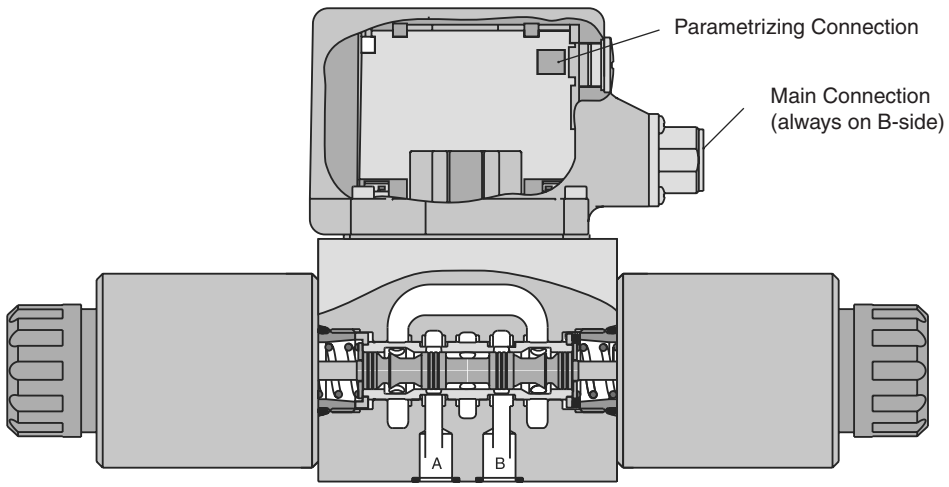
D3FB OBE

CE

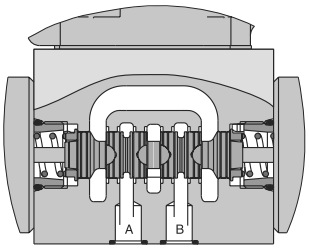
Features

- Spool/sleeve and spool/body.
- 3 command options for D3FB OBE: +/- 10V, 4…20mA, +/- 20mA
- High repeatability from valve to valve.
- Low hysteresis.
- Manual override.
- Digital onboard electronics.

D3FB*0 OBE
Spool/Sleeve Design



D3FB*3 OBE
Spool/Body Design



D	3	F	B			0			W		
Directional Control Valves	Size	Flow Control	Standard Dynamics Standard Repeatability	Spool	Style		Seal	Solenoid Voltage	Solenoid Accessories	Design	Design Series

NOTE: Not required when ordering.

Code	Description
	DIN NG10
3	CETOP 5 NFPA D05

D3FB*0: Spool/Sleeve Design

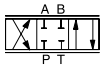
Code	Solenoid
K	12V / 2.95A

D3FB*3: Spool/Body Design

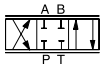
Code	Solenoid
K	12V / 2.95A
J	24V / 1.5A

Code	Description
0	Spool/sleeve design
3	Spool/body design

D3FB*0: Spool/Sleeve Design

Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01M E01S		40 (10.6) 60 (15.9)
E02M E02S		40 (10.6) 60 (15.9)
B31M B31S		40 / 20 (10.6 / 5.3) 60 / 30 (15.9 / 7.9)
B32M B32S		40 / 20 (10.6 / 5.3) 60 / 30 (15.9 / 7.9)

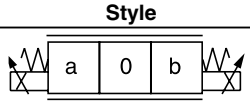
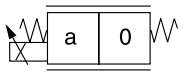
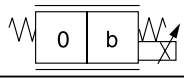
D3FB*3: Spool/Body Design

Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01M E01S E01U		40 (10.6) 60 (15.9) 80 (21.2)
E02M E02S E02U		40 (10.6) 60 (15.9) 80 (21.2)

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
W*	Connector as per DIN 43650 without plug

* Please order plugs separately. See Accessories.

Code	Style
C	
E	
K	

Bolt Kit:

BK98	(4) 1/4-24x1.625 SHCS
BK385	(4) M6x40

Weight:

D3FB	6.5 kg (14.3 lbs.)

D	3	F	B	☐	☐	0	☐	☐	☐	☐	⌜⌝ ⌞⌟
Directional Control Valves	Size	Flow Control	Standard Dynamics Standard Repeatability	Spool	Style		Seal	Input Signal	Options	Design	Design Series NOTE: Not required when ordering.

Code	Description
3	DIN NG10 CETOP 5 NFPA D05

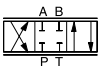
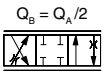
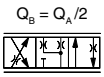
Code	Description
0	Spool/sleeve design
3	Spool/body design

Code	Input signal [1]	Function	Port	Options
F0	0...+/-10V	0...+10V > P-A	6 + PE	Potentiometer supply
G0	0...+/-20mA	0...+20mA > P-A	6 + PE	—
S0	4...20mA	12...20mA > P-A	6 + PE	—
W5 [2]	0...+/-10V 4...20mA	0...+10V > P-A 12...20mA > P-A	11 + PE	Potentiometer supply & command preset channel

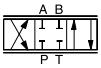
[1] Single solenoid always 0...+10V respectively 4...20 mA
[2] Factory set ± 10V on delivery

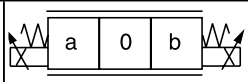
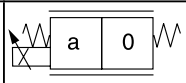
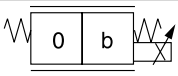
Code	Description
N	Nitrile
V	Fluorocarbon

D3FB*0: Spool/Sleeve Design

Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01M E01S		40 (10.6) 60 (15.9)
E02M E02S		40 (10.6) 60 (15.9)
B31M B31S		40 / 20 (10.6 / 5.3) 60 / 30 (15.9 / 7.9)
B32M B32S		40 / 20 (10.6 / 5.3) 60 / 30 (15.9 / 7.9)

D3FB*3: Spool/Body Design

Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01M E01S E01U		40 (10.6) 60 (15.9) 80 (21.2)
E02M E02S E02U		40 (10.6) 60 (15.9) 80 (21.2)

Code	Style
C	
E	
K	

Bolt Kit:
BK98 (4) 1/4-20x1.625 SHCS
BK385 (4) M6x40

Weight:
D3FB 7.2 kg (15.9 lbs.)

Please order plugs separately. See Accessories.

Parametrizing cable OBE => RS232
Item no. 40982923

A

General			
Design		Direct operated proportional DC valve	
Actuation		Proportional solenoid	
Size		NG10 / CETOP 5 / NFPA D05	
Mounting Interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA	
Mounting Position		Unrestricted	
Ambient Temperature	**[°C]**	-20...+60; (-4°F...+140°F)	
$MTTF_D$ Value (OBE)	**[years]**	150 (75)	
Vibration Resistance	**[g]**	10 Sinus 5...2000 Hz acc. IEC 68-2-6 30 Random noise 20...2000 Hz acc. IEC 68-2-36 15 Shock acc. IEC 68-2-27	
Hydraulic			
Maximum Operating Pressure		Ports P, A, B 350 Bar (5075 PSI); Port T 210 Bar (3045 PSI)	
Maximum Pressure Drop PABT / PBAT		350 Bar (5075 PSI)	
Fluid		Hydraulic oil as per DIN 51524...535, other on request	
Fluid Temperature	**[°C]**	-20...+60; (-4°F...+140°F)	
Viscosity **Permitted** **Recommended**	 **[cSt] / [mm²/s]** **[cSt] / [mm²/s]**	 20...380 (93...1761 SSU) 30...80 (139...371 SSU)	
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)	
Nominal Flow at Δp=5 Bar (72.5 PSI) per Control Edge *		**D3FB*0 (Spool/sleeve)**	**D3FB*3 (Spool/body)**
		40 LPM (10.6 GPM) / 60 LPM (15.9 GPM)	40 LPM (10.6 GPM) 60 LPM (15.9 GPM) / 80 LPM (21.2 GPM)
Leakage at 100 Bar (1450 PSI)	**[ml/min]**	<100	<100
Overlap	**[%]**	25, electrically normalized at 10 (see flow characteristics)	
Static / Dynamic			
Step Response at 100% Step	**[ms]**	40	
Hysteresis	**[%]**	<4	<5
Temperature Drift Solenoid Current	**[%/K]**	<0.02	
Electrical			
Duty Ratio	**[%]**	100 ED; CAUTION: Coil temperature up to 155°C (331°F)	
Protection Class		IP65 in accordance with EN60529 (plugged and mounted)	
Solenoid		**Code "K"**	**Code "J"**
Supply Voltage	**[V]**	12	24
Current Consumption	**[A]**	2.95	1.5
Resistance	**[Ohm]**	3.84	16.5
Solenoid Connection		Connector as per EN 175301-803	
Wiring Minimum	**[mm²]**	3x1.5 recommended	
Wiring Length Maximum	**[m]**	50 (164 ft.)	

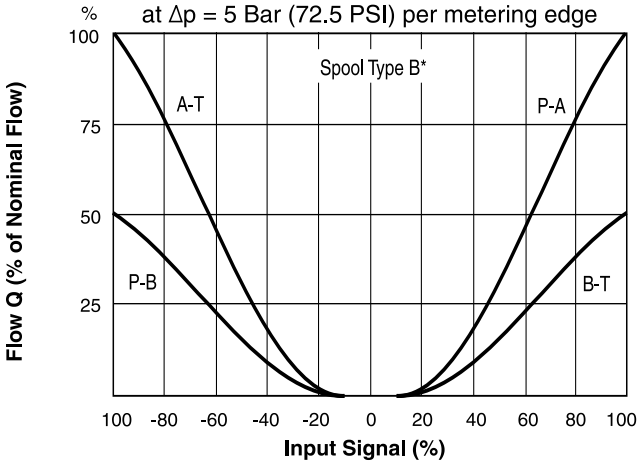
* Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

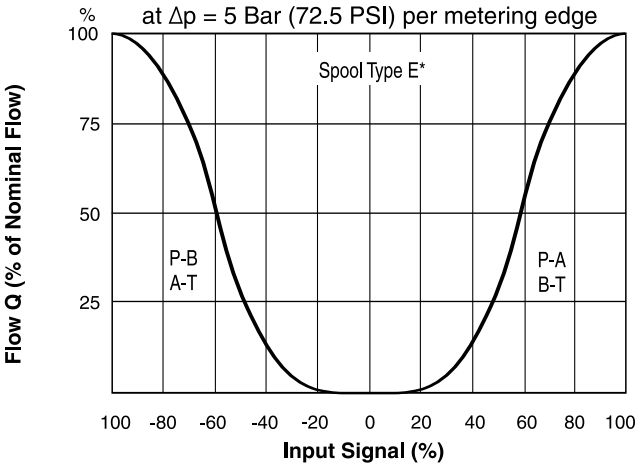
Continued on the next page

Electrical		
Duty Ratio	**[%]**	100
Protection Class		IP65 in accordance with EN 60529 (plugged and mounted)
Supply Voltage/Ripple **DC**	**[V]**	18...30, ripple < 5% eff., surge free
Current Consumption Maximum	**[A]**	3.5
Pre-fusing Medium Lag	**[A]**	4.0
Input Signal		
Codes F0 & W5 Voltage	**[V]**	+10...0...-10, ripple < 0.01 % eff., surge free, Ri = 100kOhm, 0...+10V => P -> A
Codes S0 & W5 Current	**[mA]**	4...12...20, ripple < 0.01 % eff., surge free, Ri = 200Ohm, 12...20mA => P -> A < 3.6 mA = enable off, > 3.8 mA = enable on (acc. to NAMUR NE43)
Code G0	**[mA]**	+20...0...-20, ripple < 0.01 % eff., surge free, Ri = 200Ohm, 0...+20mA => P -> A
Differential input max.		
Codes F0, G0 & S0	**[V]**	30 for terminal D and E against PE (terminal G) 11 for terminal D and E against 0V (terminal B)
Code W5	**[V]**	30 for terminal 4 and 5 against PE (terminal PE) 11 for terminal 4 and 5 against 0V (terminal 2)
Channel Recall Signal	**[V]**	0...2.5: off / 5...30: on / Ri = 100 kOhm
Adjustment Ranges:		
Minimum	**[%]**	0...50
Maximum	**[%]**	50...100
Ramp	**[s]**	0...32.5
Interface		RS 232, parametrizing connection 5pole
EMC		EN 61000-6-2, EN 61000-6-4
Central Connection		
Codes F0, G0 & S0		6 + PE acc. to EN 175201-804
Code W5		11 + PE acc. to EN 175201-804
Wiring Minimum		
Codes F0, G0 & S0	**[mm²]**	7 x 1.0 (AWG16) overall braid shield
Code W5	**[mm²]**	11 x 1.0 (AWG20) overall braid shield
Wiring Length Maximum	**[m]**	50 (164 ft.)

A

(Electrically set to opening point 10%)



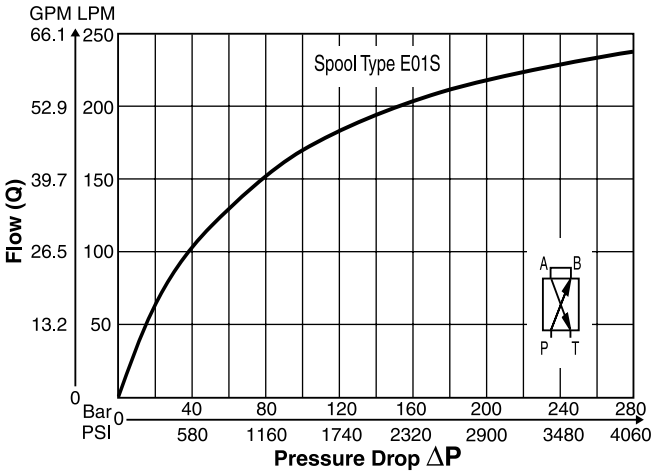


All performance curves measured with HLP46 at 50°C (122°F).

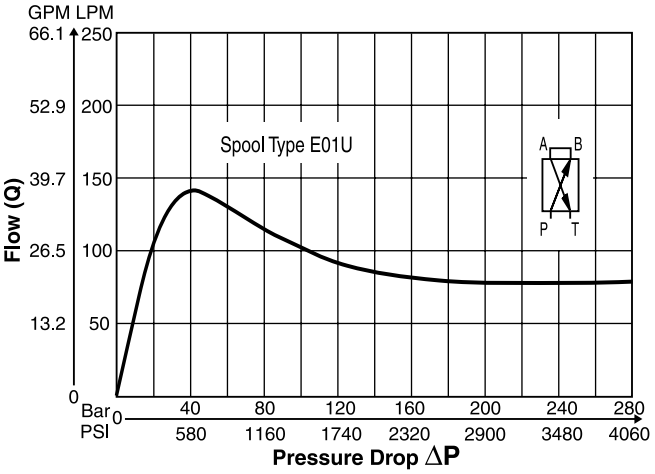
Functional Limits

100% command signal (symmetric flow). At asymmetric flow a reduced flow limit has to be considered – typically approx. 10% lower.

D3FB*0



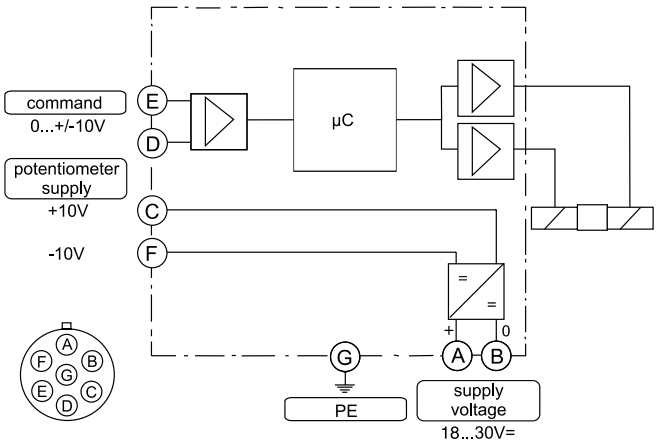
D3FB*3



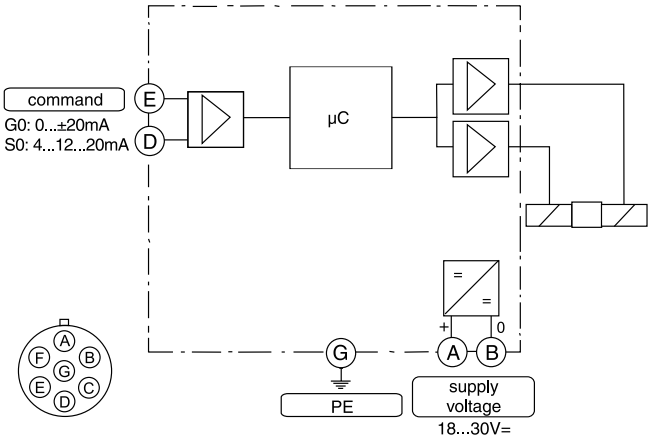
All performance curves measured with HLP46 at 50°C (122°F).

A

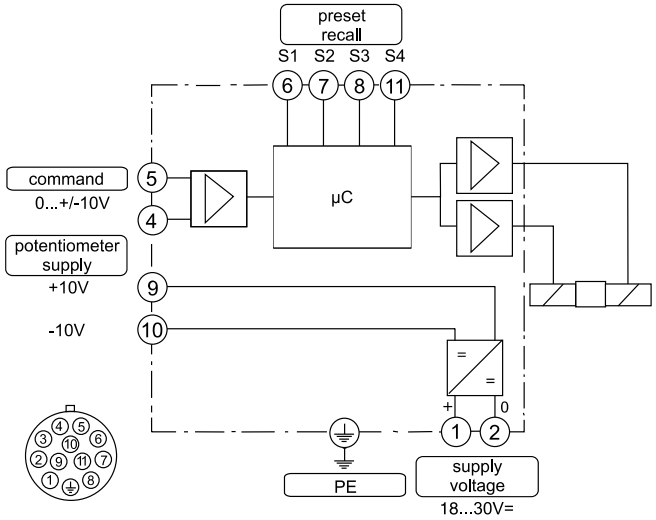
Code F0
6 + PE acc. to EN 175201-804



Code G0, S0
6 + PE acc. to EN 175201-804



Code W5
11 + PE acc. to EN 175201-804



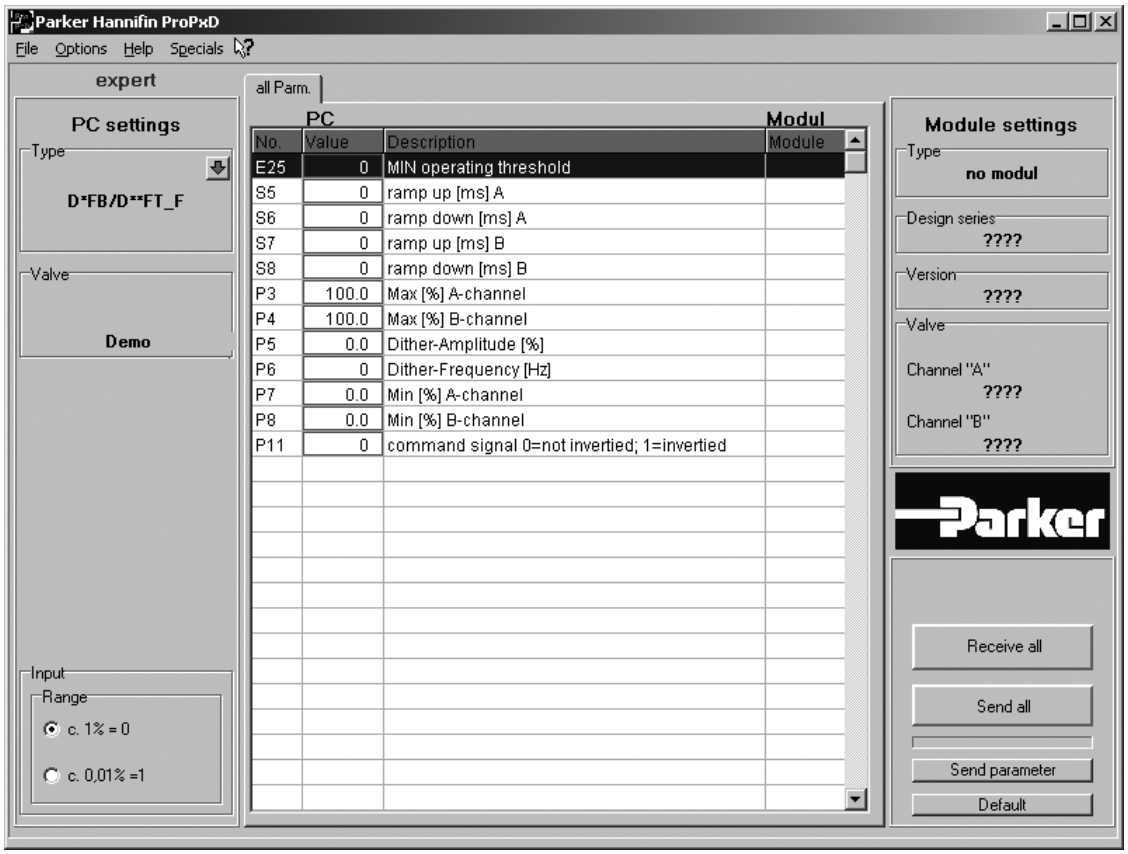
A

ProPxD Interface Program

The ProPxD software permits comfortable parameter setting for the module electronics. Via the clearly arranged entry mask the parameters can be noticed and modified. Storage of complete parameter sets is possible as well as printout or record as a text file for further documentation. Stored parameter sets may be loaded anytime and transmitted to other valves. Inside the electronics a nonvolatile memory stores the data with the option for recalling or modification.

Features

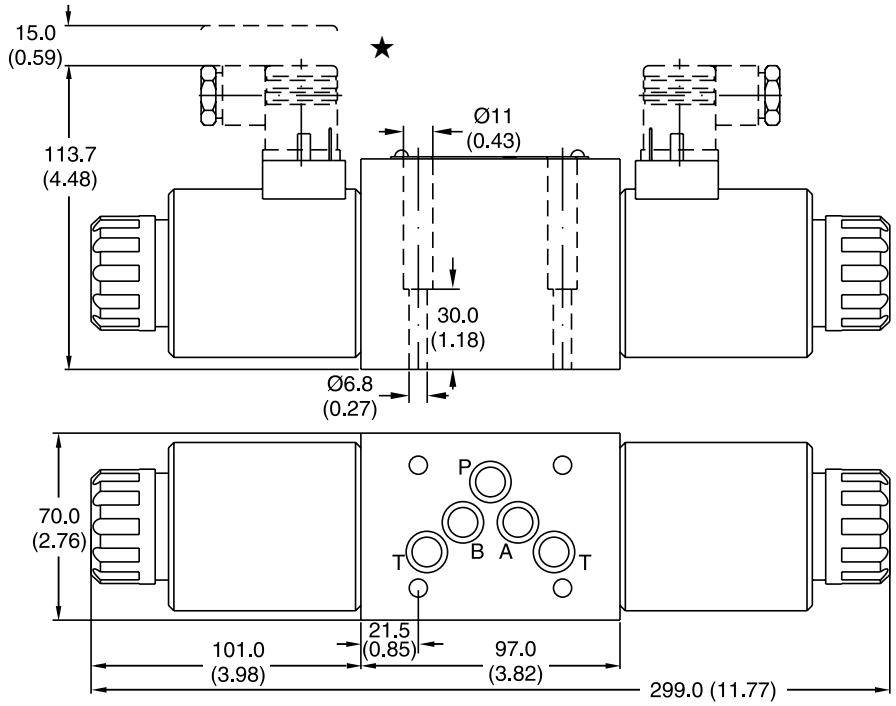
- Simple editing of all parameters.
- Storage and loading of optimized parameter adjustments.
- Executable with all Windows® operating systems from Windows® 95 upwards.
- Communication between PC and electronics via serial interface RS-232.
- Simple to use PC user software, free of charge: www.parker.com/euro_hcd – see "Software Downloads"



The parametrizing cable may be ordered under item no. 40982923.

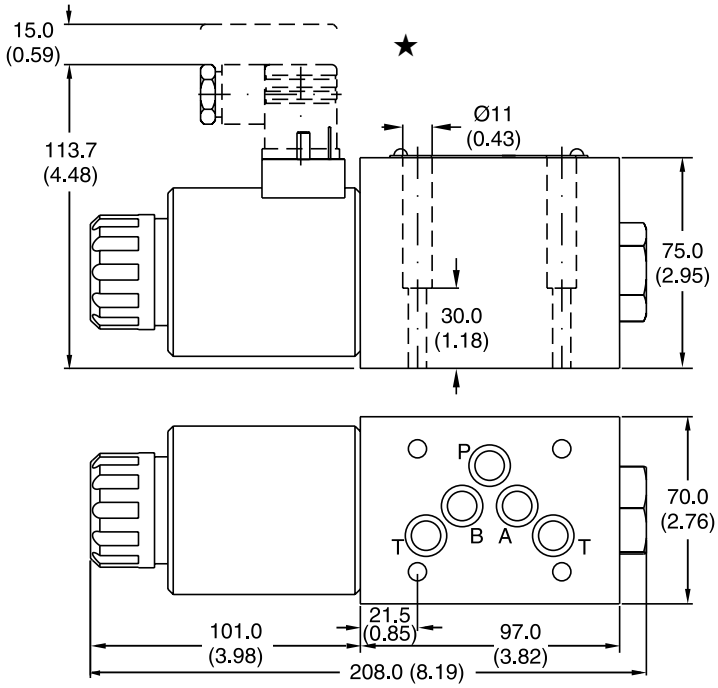
Inch equivalents for millimeter dimensions are shown in (**)

D3FB*C



D3FB*K

★ Order plugs separately.



Surface Finish	Kit			Seal Kit
R_{max}6.3 0.01/100	BK385 BK98	4x M6x40 DIN 912 12.9 4x 1/4-20x1.62	13.2 Nm (9.7 lb.-ft.) ±15 %	Nitrile: SK-D3FB Fluorocarbon: SK-D3FBV

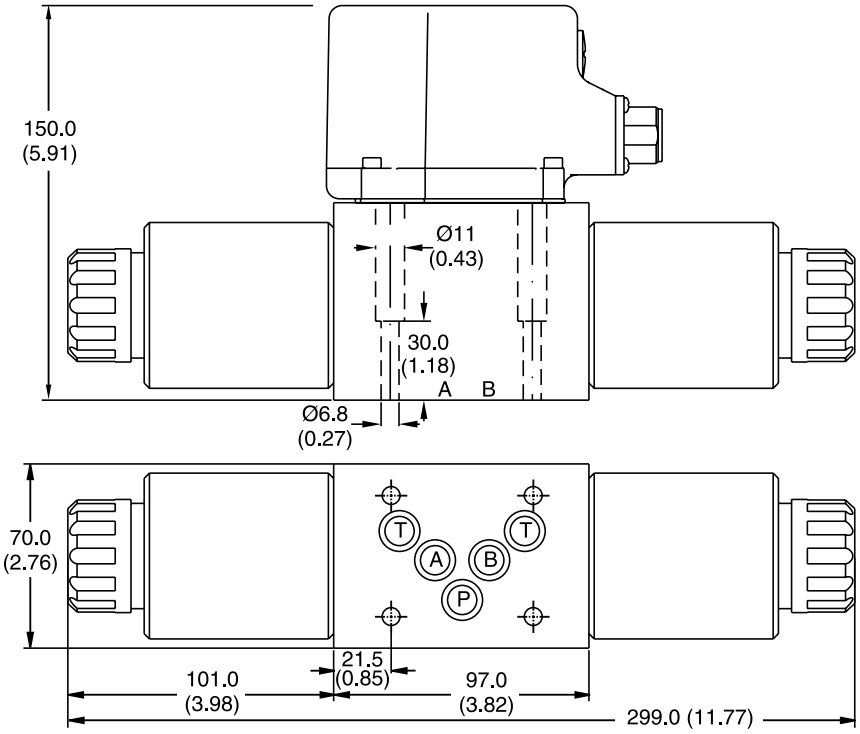
D3FB.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

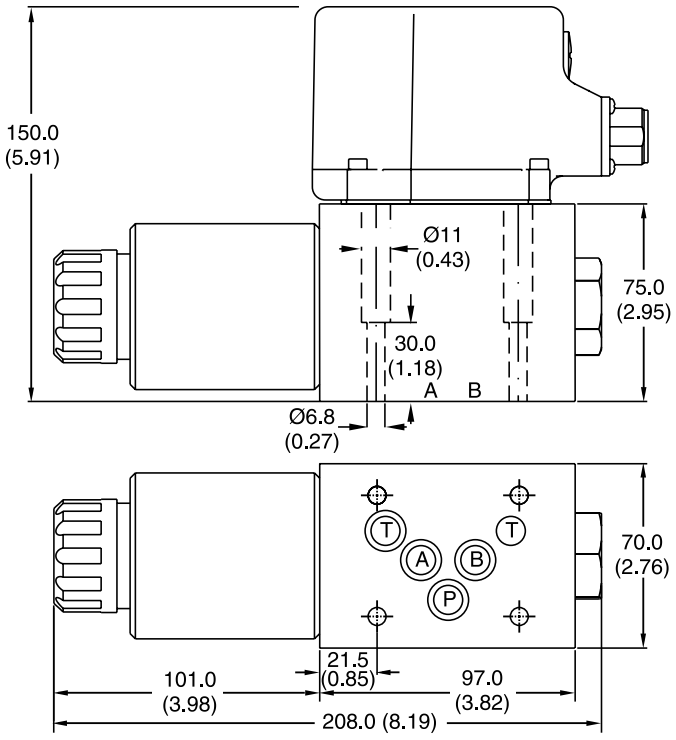
Inch equivalents for millimeter dimensions are shown in (**)

A

D3FB*C OBE



D3FB*E OBE



Surface Finish	Kit			Seal Kit
R_{max}6.3 ▱ 0.01/100	BK385 BK98	4x M6x40 DIN 912 12.9 4x 1/4-20x1.62	13.2 Nm (9.7 lb.-ft.) ±15 %	Nitrile: SK-D3FB Fluorocarbon: SK-D3FBV

D3FB.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

A

General Description

Series D*1FB pilot operated proportional directional valves come in 4 sizes:

D31FB NG10 (CETOP 5)
D41FB NG16 (CETOP 7)
D91FB NG25 (CETOP 8)
D111FB NG32 (CETOP 10)

The valves are available with and without onboard electronics (OBE).

D*1FB OBE:

The digital onboard electronics is situated in a robust metal housing, which allows the usage under rough environmental conditions.

The nominal values are factory set. The cable connection to a serial RS232 interface is available as an accessory.

D*1FB for external electronics:

The parameters can be saved, changed and duplicated in combination with the digital power amplifier PWD00A-400.

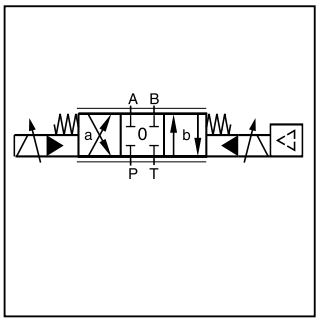
Series D*1FB valve parameters can be edited with the common ProPxD software for both versions.

The D*1FB valves work with barometric feedback of the main stage to the pressure reducing pilot valve. The pilot control pressure of 25 Bar (363 PSI) allows high flow rates of maximum of stability.

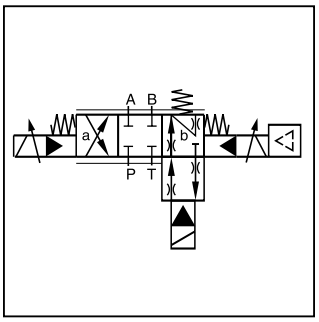
The innovative integrated regenerative function into the A-line (optional) allows new energy saving circuits for differential cylinders. The hybrid version can be switched between regenerative mode and standard mode at any time.

D91FB

D91FB OBE



D*1FB

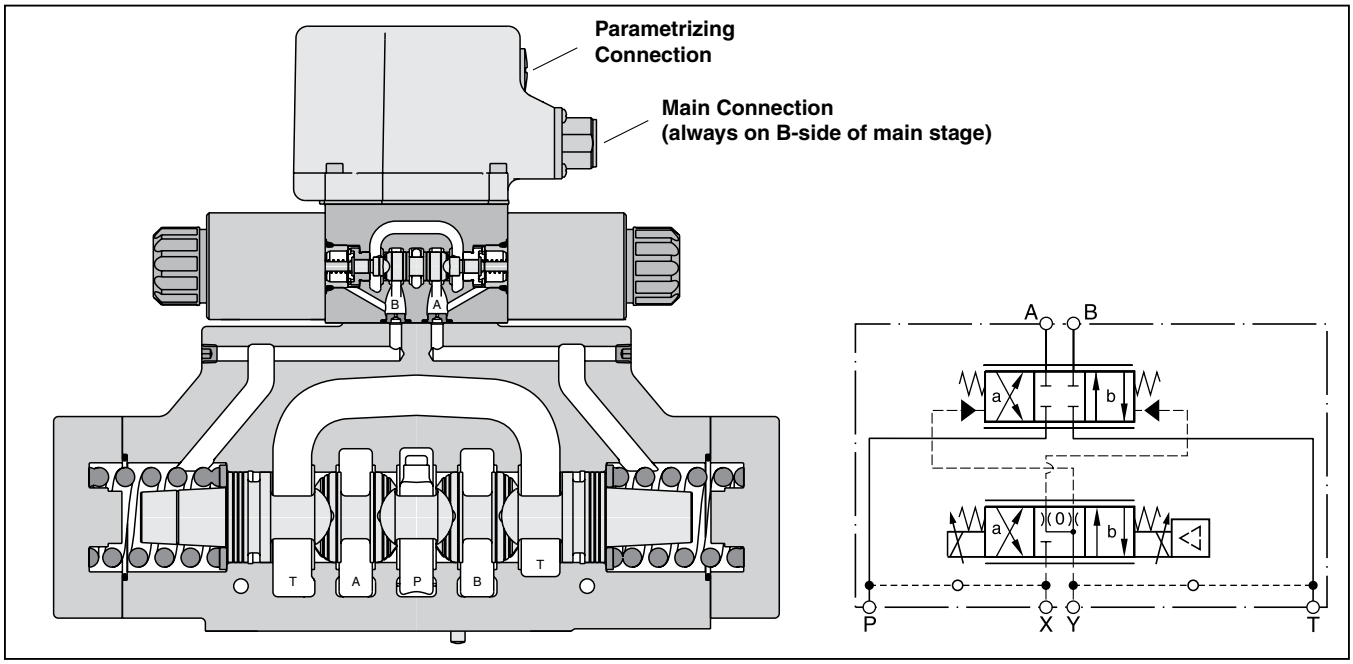


D*1FBZ

Features

- Progressive flow characteristics for precise adjustment of flow rate.
- High flow capacity.
- Digital onboard electronics.
- Center position monitoring optional.
- New: Switchable regenerative hybrid version.

D91FB OBE



D_1FB.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

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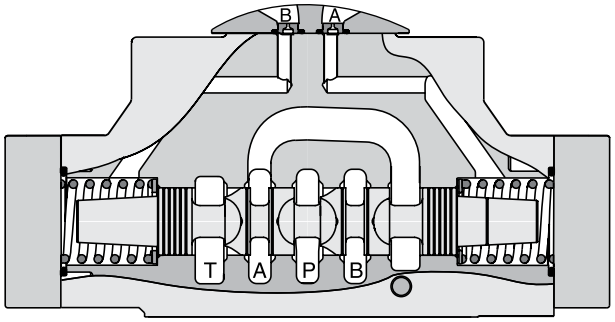
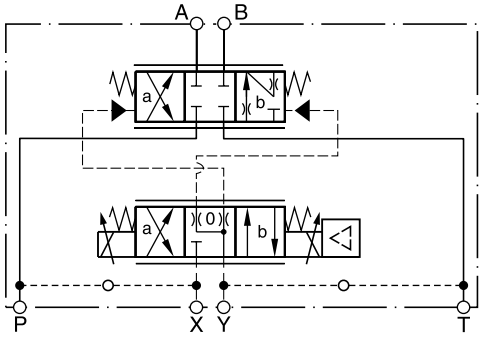
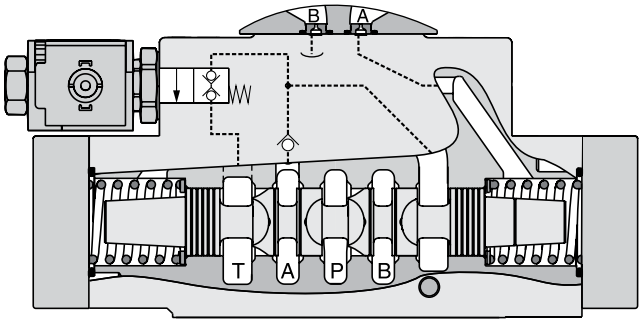
D*1FBR and D*1FBZ

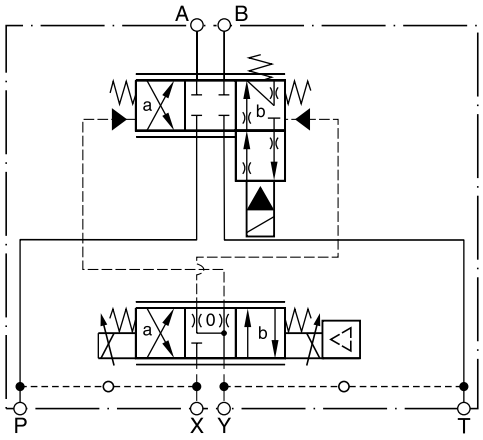
Regenerative Valve D*1FBR





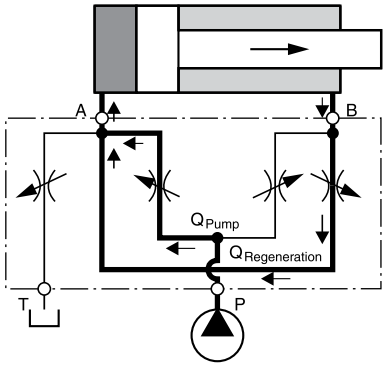
Hybrid Valve D*1FBZ





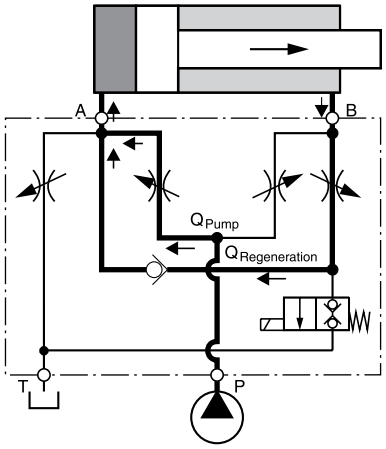
D*1FBR (Regenerative Valve)

Cylinder extending

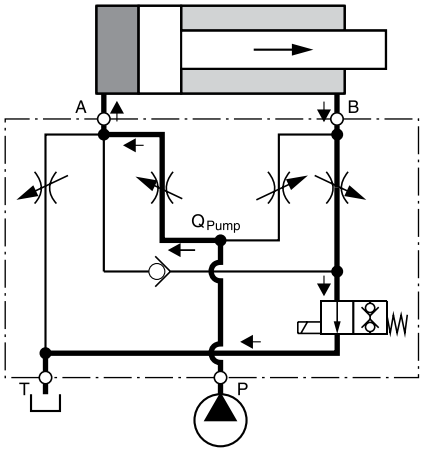


D*1FBZ (Hybrid Valve)

Cylinder extending
regenerative mode
(high speed)



Cylinder extending
standard mode
(high force)



Flow Rate in % of Nominal Flow

Size	Spool	Port					
		A-T	P-A	P-B	B-A (R-Valve)	B-A (Hybrid)	B-T (Hybrid)
D41FBR/Z	31/32	100%	50%	100%	50%	45%	20%
D91FBR/Z	31/32	100%	50%	100%	50%	50%	25%
D111FBR/Z	31/32	on request					

D		1	F	B			C						
Directional Control Valves	Size	NG6 Pilot	Flow Control	Dynamics Standard	Spool	Flow	Spool Position	Pilot Connection	Seal	Solenoid Voltage	Solenoid Connector	Valve Accessories	Design Series

NOTE: Not required when ordering.

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

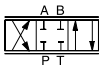
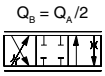
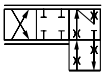
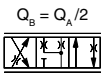
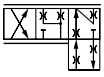
[1] For enlarged connections Ø 32 mm

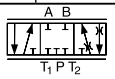
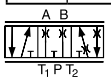
Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
0	Standard
8 [7]	Monitor Switch
L [8]	Hybrid valve 24V normally closed for spool type Z

[7] Not available with regenerative or hybrid function.

[8] See page page A35 for regenerative and hybrid spool information. (not available in D31FB)

Standard		NEW: Regenerative Function		NEW: Hybrid Function [2]	
Code	Spool Type	Code	Spool Type	Code	Spool Type
E01					
E02					
B31		R31		Z31	
B32		R32		Z32	

D31FB spool type: R31  R32 

[2] not available in D31FB.

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

Code	Description
W [5]	Connector as per DIN 43650 without plug
J [5] [6]	Connector DT04-2P "Deutsch"

[5] Please order plugs separately. See Accessories.

[6] Not available with hybrid function.

Code	Solenoid
K	12V / 2.5A
J	24V / 1.1A

Code	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge			
	D31	D41	D91	D111
B	—	100 [3] [4] (26.4)	—	—
C	75 [4] (19.8)	130 [3] [4] (34.3)	—	—
D	90 [4] (23.8)	—	—	—
E	120 (31.7)	—	250 [3] [4] (66.0)	—
F	—	200 (52.8)	—	—
H	—	—	400 (105.7)	—
L	—	—	—	1000 (264.2)

[3] Not available with spool type B31 und B32.

[4] Not available with regenerative or hybrid function.

Bolt Kits:

D31FB	BK98	(4) 1/4-20x1.625 SHCS
D41FB	BK160	(4) 3/8-16x2.5 SHCS (2) 1/4-20x2.5 SHCS
D91FB	BK228	(6) 1/2-13x3 SHCS
D111FB	BK150	(6) 3/4-10x3.5 SHCS

Weight:

D31FB	8.1 kg (17.9 lbs.)
D41FB	10.8 kg (23.8 lbs.)
D91FB	19.0 kg (41.9 lbs.)
D111FB	68.0 kg (149.9 lbs.)

D	□	1	F	B	□	□	C	□	□	□□	□	⌐ ⌐
Directional Control Valves	Size	NG6 Pilot	Flow Control	Onboard Electronics	Spool	Flow	Spool Position	Pilot Connection	Seal	Input Signal / Options	Valve Accessories	Design Series

NOTE: Not required when ordering.

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

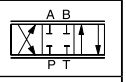
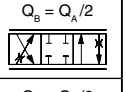
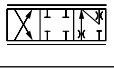
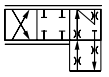
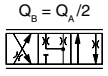
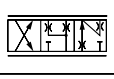
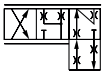
[1] With enlarged connections Ø 32 mm

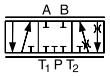
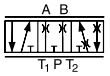
Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
0	Standard
8 [5]	Monitor Switch
L [6]	Hybrid valve 24V normally closed for spool type Z

[5] Not available with regenerative or hybrid function.

[6] See page page A35 for regenerative and hybrid spool information. (not available in D31FB)

Standard		NEW: Regenerative Function		NEW: Hybrid Function [2]	
Code	Spool Type	Code	Spool Type	Code	Spool Type
E01					
E02					
B31	$Q_B = Q_A/2$ 	R31		Z31	
B32	$Q_B = Q_A/2$ 	R32		Z32	

D31FB spool type: R31  R32 

[2] not available in D31FB.

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

Code	Input Signal	Function	Connection	Option
F0	0...±10V	0...+10V > P-B	6 + PE	Pot.-supply
G0	0...±20mA	0...+20mA > P-B	6 + PE	—
M0	0...±10V	0...+10V > P-A	6 + PE	Pot.-supply
S0	4...20mA	12...20mA > P-A	6 + PE	—
W5	0...±10V 4...20mA	0...+10V > P-A 12...20mA > P-A	11 + PE	Pot.-supply + Proset Commands

Code	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge			
	D31	D41	D91	D111
B	—	100 [3] [4] (26.4)	—	—
C	75 [4] (19.8)	130 [3] [4] (34.3)	—	—
D	90 [4] (23.8)	—	—	—
E	120 (31.7)	—	250 [3] [4] (66.0)	—
F	—	200 (52.8)	-	—
H	—-	—	400 (105.7)	—
L	—	—-	—	1000 (264.2)

[3] Not available with spool type B31 und B32.

[4] Not available with regenerative or hybrid function.

Bolt Kits:

D31FB	BK98	(4) 1/4-20x1.625 SHCS
D41FB	BK160	(4) 3/8-16x2.5 SHCS (2) 1/4-20x2.5 SHCS
D91FB	BK228	(6) 1/2-13x3 SHCS
D111FB	BK150	(6) 3/4-10x3.5 SHCS

Weight:

D31FB	8.4 kg (18.5 lbs.)
D41FB	11.1 kg (24.5 lbs.)
D91FB	19.3 kg (42.6 lbs.)
D111FB	68.3 kg (150.6 lbs.)

Please order plugs separately. See Accessories.

Parametrizing cable OBE => RS232
Item no. 40982923

D_1FB.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

A

General					
Design		Pilot operated DC valve			
Actuation		Proportional solenoid			
Size		**NG10 (CETOP 5)**	**NG16 (CETOP 7)**	**NG25 (CETOP 8)**	**NG32 (CETOP 10)**
Mounting Interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA			
Mounting Position		Unrestricted			
Ambient Temperature	**[°C]**	-20...+60; (-4°F...+140°F)			
$MTTF_D$ Value (OBE)	**[years]**	75 (50)			
Vibration Resistance	**[g]**	10 Sinus 5...2000 Hz acc. IEC 68-2-6 30 Random noise 20...2000 Hz acc. IEC 68-2-36 15 Shock acc. IEC 68-2-27			
Hydraulic					
Maximum Operating Pressure		Pilot Drain Internal: Ports P, A, B, X 350 Bar (5075 PSI); Port T, Y 185 Bar (2683 PSI) NG10: Port T, Y 15 Bar (218 PSI) Pilot Drain External: Ports P, A, B, T, X 350 Bar (5075 PSI); Port Y 185 Bar (2683 PSI) NG10: Port Y 15 Bar (218 PSI)			
Fluid		Hydraulic oil as per DIN 51524...535, other on request			
Fluid Temperature	**[°C]**	-20...+60; (-4°F...+140°F)			
Viscosity					
Permitted	**[cSt] / [mm²/s]**	20...380 (93...1761 SSU)			
Recommended	**[cSt] / [mm²/s]**	30...80 (139...371 SSU)			
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			
Nominal Flow at Δp=Bar (72.5 PSI) per Control Edge *		**D31FB**	**D41FB**	**D91FB**	**D111FB**
		75 LPM (19.8 GPM) 90 LPM (23.8 GPM) 120 LPM (31.7 GPM)	100 LPM (26.4 GPM) 130 LPM (34.4 GPM) 200 LPM (52.9 GPM)	250 LPM (66.1 GPM) 400 LPM (105.8 GPM)	1000 LPM (264.2 GPM)
Leakage at 100 Bar (1450 PSI)	**[ml/min]**	100	200	600	1000
Pilot Supply Pressure		Minimum 30 Bar (435 PSI) [+T/Y pressure]; Maximum 350 Bar (5075 PSI) Optimal Dynamics at 50 Bar (725 PSI)			
Pilot Flow at 100 Bar (1450 PSI)		<0.5 LPM (0.13 GPM)	<1.2 LPM (0.3 GPM)	<1.2 LPM (0.3 GPM)	<1.2 LPM (0.3 GPM)
Pilot Flow, Step Response		2 LPM (0.5 GPM)	1.9 LPM (0.5 GPM)	4.5 LPM (1.2 GPM)	18 LPM (4.8 GPM)
Static / Dynamic					
Step Response at 100% Step	**[ms]**	50	75	100	180
Hysteresis	**[%]**	<5			
Electrical					
Duty Ratio	**[%]**	100			
Protection Class		Standard (as per EN175301-803) IP65 in accordance with EN60529 (plugged and mounted) DT04-2P "Deutsch" IP69K (plugged and mounted)			
Solenoid		**Code "K"**		**Code "J"**	
Supply Voltage	**[V]**	12		24	
Current Consumption	**[A]**	2.5		1.1	
Resistance	**[Ohm]**	4.4		18.6	
Coil Insulation Class		F (155 °C); (331°F)			
Solenoid Connection		Connector as per EN 175301-803 (code W), DT04-2P "Deutsch" connector (code J). Solenoid identification as per ISO 9461.			
Wiring Minimum	**[mm²]**	3x1.5 (AWG 16) overall braid shield			
Wiring Length Maximum	**[m]**	50 (164 ft.)			

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

Continued on next page

D_1FB.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

Continued from previous page

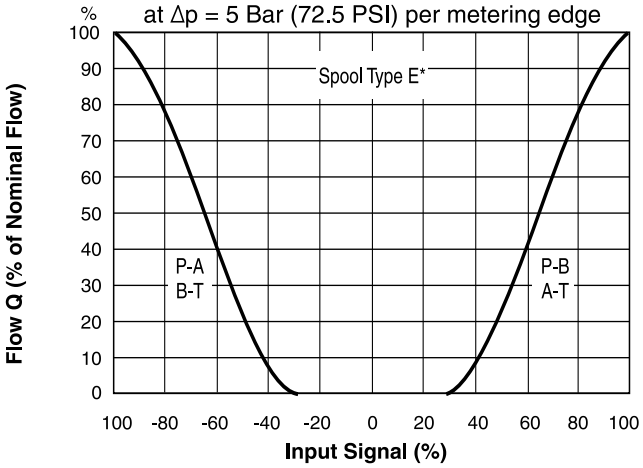
A

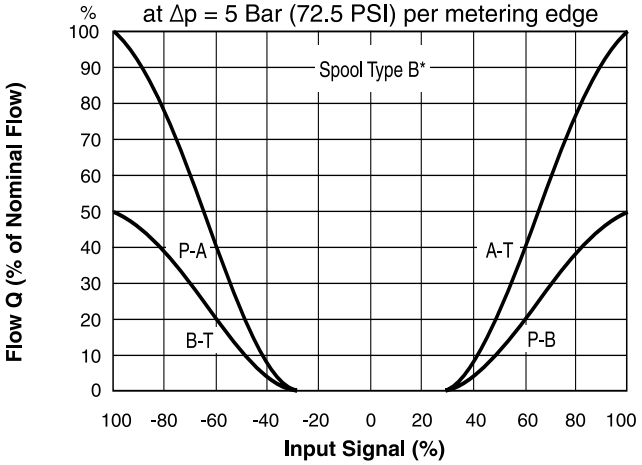
Electrical Monitor Switch (Offboard Electronics)		
Protection Class		IP65 in accordance with EN 60529 (plugged and mounted)
Ambient Temperature	**[°C]**	0...70; (32°F...158°F)
Supply Voltage/Ripple	**[V]**	18...42, ripple <10% eff.
Current Consumption without Load	**[mA]**	<30
Maximum Output Current per Channel, Ohmic	**[mA]**	400
Minimum Output Load per Channel, Ohmic	**[kOhm]**	100
Max. output drop at 0.2A **Max. output drop at 0.4A**	**[V]** **[V]**	<1.1 <1.6
EMV		EN 50081-1 / EN50082-2
Maximum tol. Ambient Field Strength	**[A/m]**	1200
Minimum Distance to next AC Solenoid	**[m]**	0.1 (0.2 ft.)
Interface		4+PE acc. IEC 61076-2-101 (M12)
Wiring Minimum	**[mm²]**	5x0.5 (AWG 20) overall braid shield
Wiring Length Maximum	**[m]**	50 (164 ft.)

Electrical (Onboard Electronics)		
Duty Ratio	**[%]**	100
Protection Class		IP65 in accordance with EN 60529 (plugged and mounted)
Supply Voltage/ripple DC	**[V]**	18...30, ripple < 5% eff., surge free
Current Consumption Maximum	**[A]**	2.0
Pre-fusing Medium Lag	**[A]**	2.5
Input Signal		
Codes F0, M0 & W5 Voltage	**[V]**	+10...0...-10, ripple < 0.01 % eff., surge free, Ri = 100kOhm, 0...+10V
Codes S0 & W5 Current	**[mA]**	4...12...20, ripple < 0.01 % eff., surge free, Ri = 200Ohm, 12...20mA < 3.6 mA = enable off, > 3.8 mA = enable on (acc. to NAMUR NE43)
Code G0	**[mA]**	+20...0...-20, ripple < 0.01 % eff., surge free, Ri = 200Ohm, 0...+20mA
Differential Input Maximum		
Codes F0, G0, M0 & S0	**[V]**	30 for terminal D and E against PE (terminal G) 11 for terminal D and E against 0V (terminal B)
Code W5	**[V]**	30 for terminal 4 and 5 against PE (terminal PE) 11 for terminal 4 and 5 against 0V (terminal 2)
Channel Recall Signal	**[V]**	0...2.5: off / 5...30: on / Ri = 100 kOhm
Adjustment Ranges:		
Minimum	**[%]**	0...50
Maximum	**[%]**	50...100
Ramp	**[s]**	0...32.5
Interface		RS 232, parametrizing connection 5pole
EMC		EN 61000-6-2, EN 61000-6-4
Central Connection		
Codes F0, G0 & S0		6 + PE acc. to EN 175201-804
Code W5		11 + PE acc. to EN 175201-804
Wiring Minimum		
Codes F0, G0 & S0	**[mm²]**	7 x 1.0 (AWG16) overall braid shield
Code W5	**[mm²]**	11 x 1.0 (AWG20) overall braid shield
Wiring Length Maximum	**[m]**	50 (164 ft.)

A

D*1FB Flow

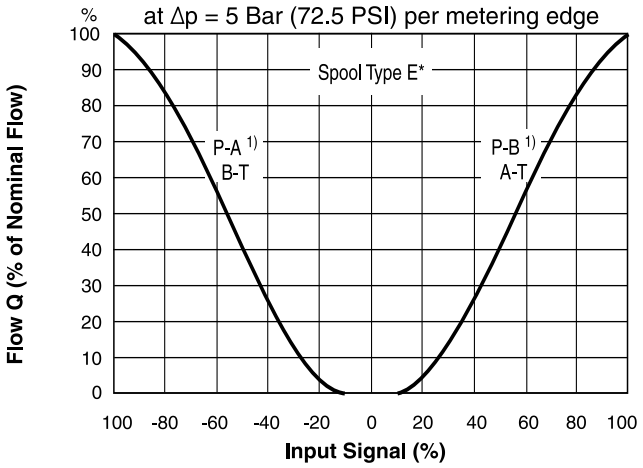


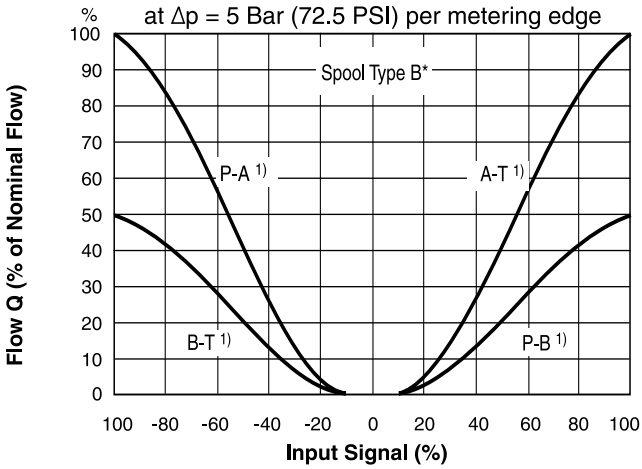


All performance curves measured with HLP46 at 50°C (122°F).

D*1FB OBE Flow

(Electrically set to opening point 10%)





All performance curves measured with HLP46 at 50°C (122°F).

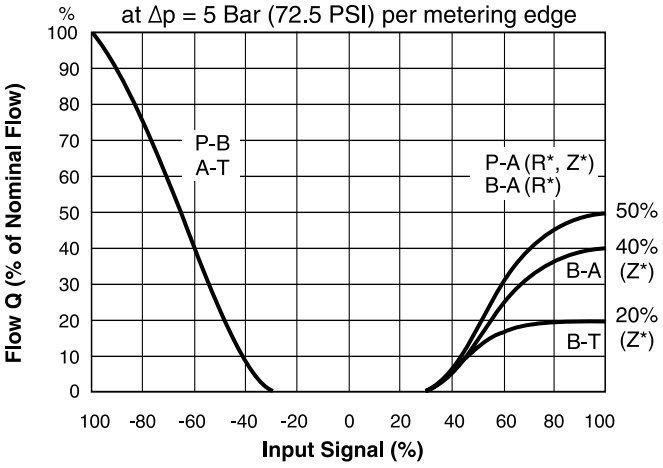
1) Flow direction depending on ordering code.

A

D*1FB R/Z (Regenerative and Hybrid)

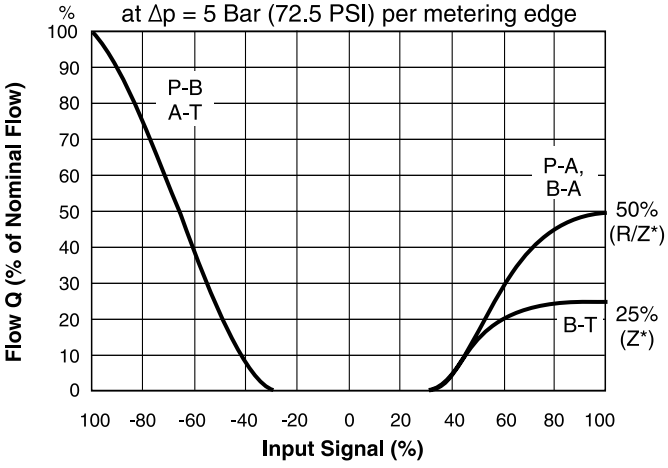
D41FB R/Z

Spool Code **R/Z31/32**



D91FB R/Z

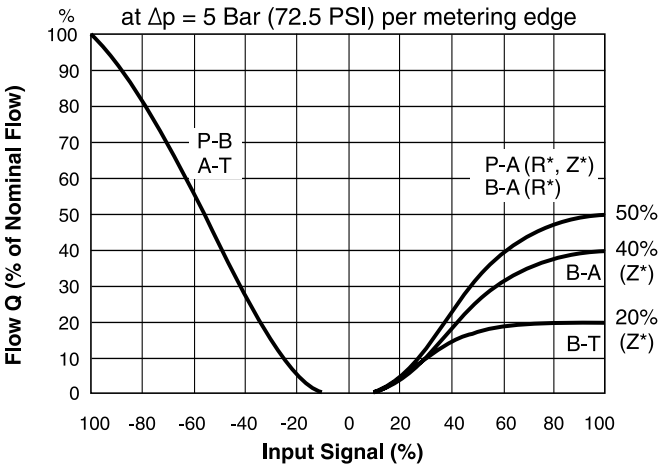
Spool Code **R/Z31/32**



All performance curves measured with HLP46 at 50°C (122°F).

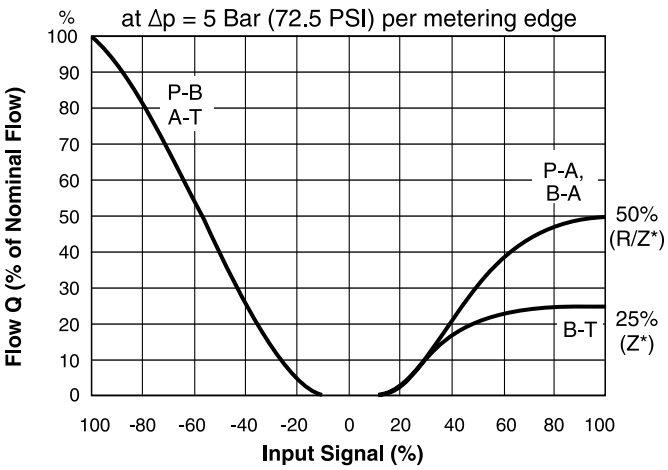
D41FB R/Z OBE

Spool Code **R/Z31/32**



D91FB R/Z OBE

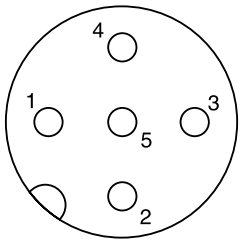
Spool Code **R/Z31/32**



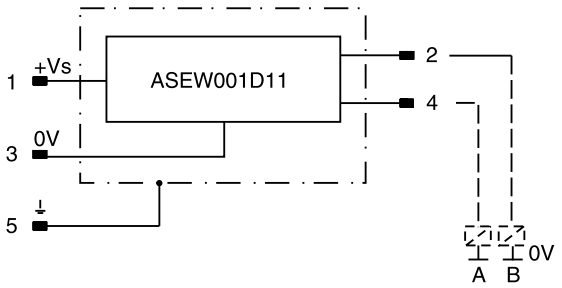
All performance curves measured with HLP46 at 50°C (122°F).

A

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

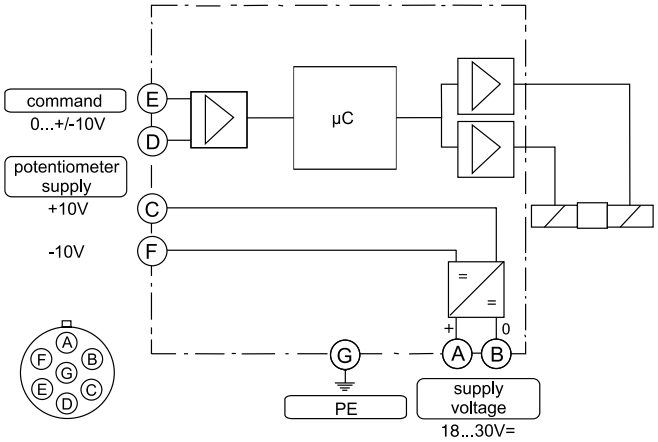
The neutral position is monitored. The signal changes after less than 10% of the spool stroke.

Electrical Monitor Switch

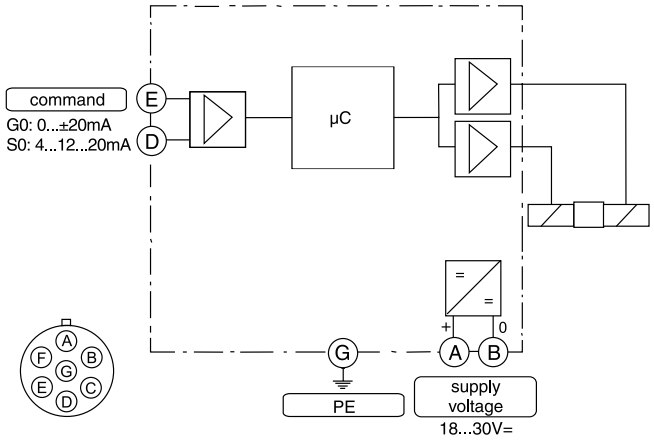
Protection Class		IP65 in accordance with EN 60529 (plugged and mounted)
Ambient Temperature	**[°C]**	0...70; (32°F...158°F)
Supply Voltage/Ripple	**[V]**	18...42, ripple < 10% eff.
Current Consumption without Load	**[mA]**	< 30
Maximum Output Current per Channel, Ohmic	**[mA]**	400
Minimum Output Load per Channel, Ohmic	**[kOhm]**	100
Maximum Output Drop at 0.2A	**[V]**	< 1.1
Maximum Output Drop at 0.4A	**[V]**	< 1.6
EMC		EN 50081-1 / EN50082-2
Maximum tol. Ambient Field Strength	**[A/m]**	1200
Minimum distance to next AC solenoid	**[m]**	0.1
Interface		4+PE acc. IEC 61076-2-101 (M12)
Wiring Minimum	**[mm²]**	5x0.5 (AWG 20) overall braid shield
Wiring Length Maximum	**[m]**	50 (164 ft.)

A

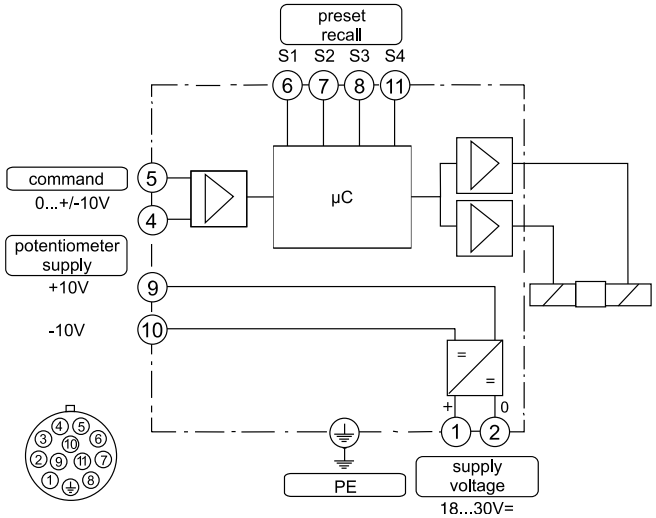
Code F0, M0
6 + PE acc. to EN 175201-804



Code G0, S0
6 + PE acc. to EN 175201-804



Code W5
11 + PE acc. to EN 175201-804



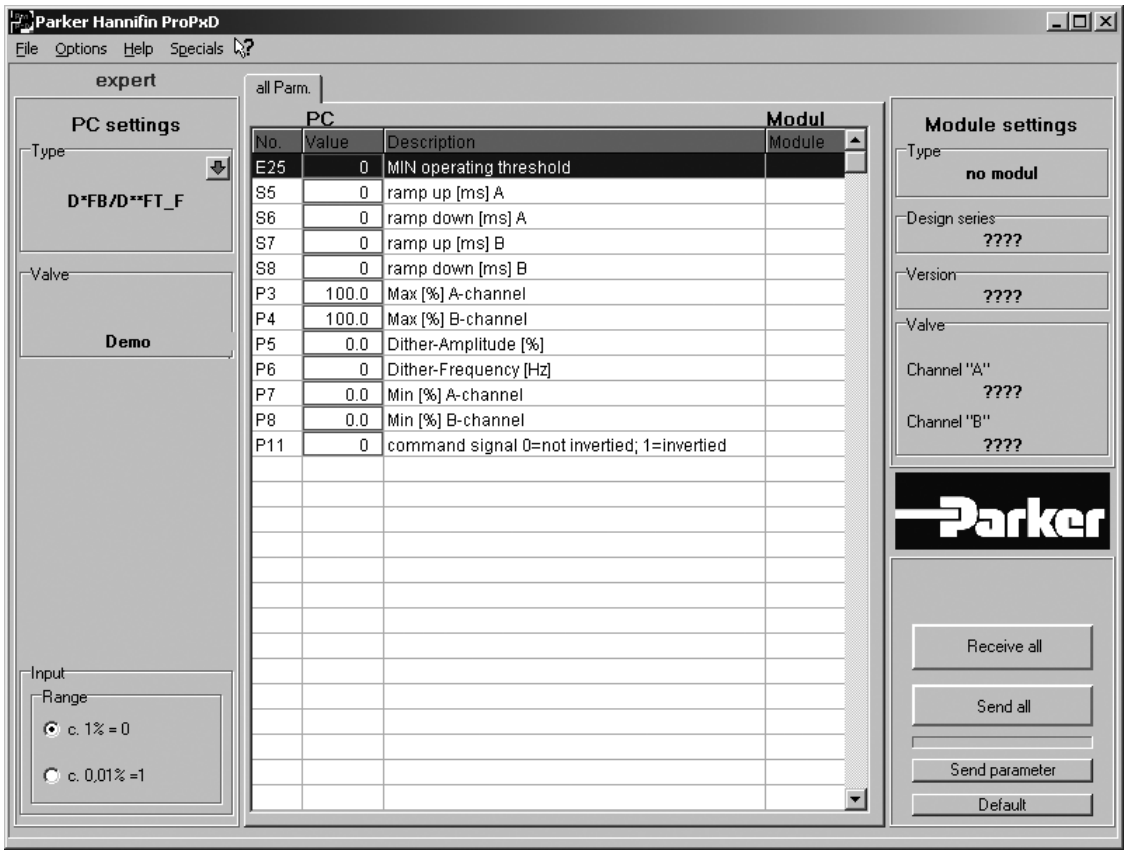
A

ProPxD Interface Program

The ProPxD software permits comfortable parameter setting for the module electronics. Via the clearly arranged entry mask the parameters can be noticed and modified. Storage of complete parameter sets is possible as well as printout or record as a text file for further documentation. Stored parameter sets may be loaded anytime and transmitted to other valves. Inside the electronics a nonvolatile memory stores the data with the option for recalling or modification.

Features

- Simple editing of all parameters.
- Storage and loading of optimized parameter adjustments
- Executable with all Windows® operating systems from Windows® 95 upwards.
- Communication between PC and electronics via serial interface RS-232.
- Simple to use PC user software, free of charge: www.parker.com/euro_hcd – see "Software Downloads"



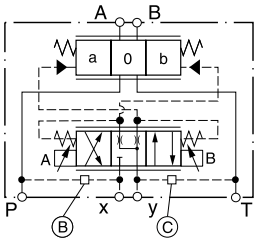
The parametrizing cable may be ordered under item no. 40982923.

A

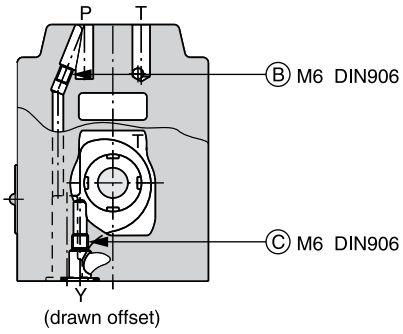
Pilot Flow — Pilot Oil Inlet (Supply) and Outlet (Drain)

○ **open,** ● **closed**

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

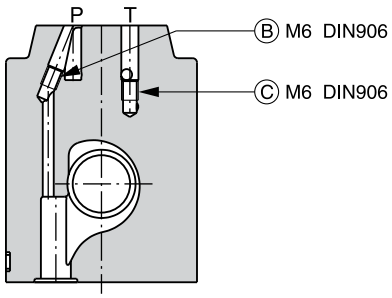


D31FBB/E

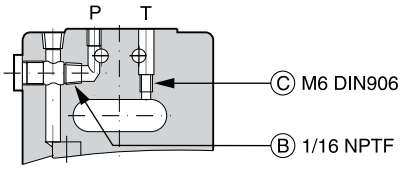


(drawn offset)

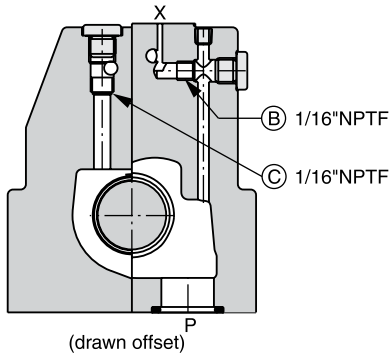
D31FBR



D41FBB/E

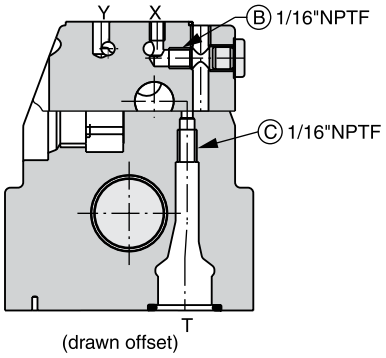


D41FBR



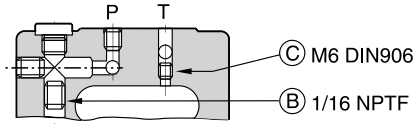
(drawn offset)

D41FBZ

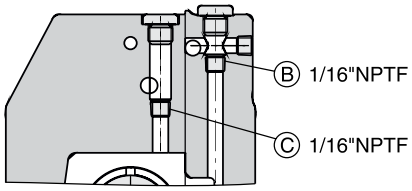


(drawn offset)

D91FBB/E

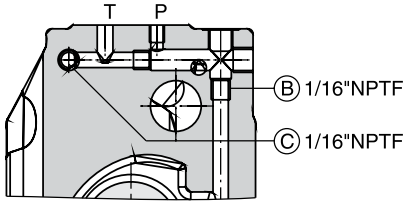


D91FBR

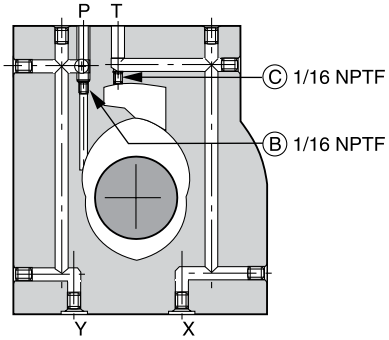


(drawn offset)

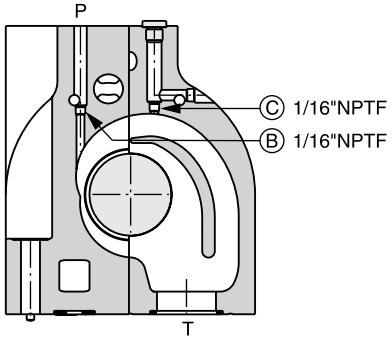
D91FBZ



D111FBB/E

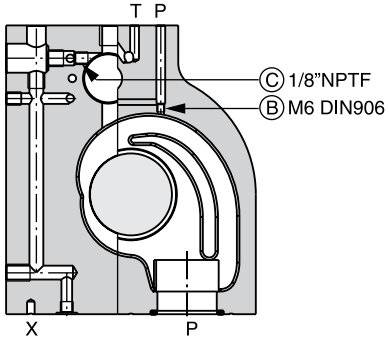


D111FBR



(drawn offset)

D111FBZ



(drawn offset)

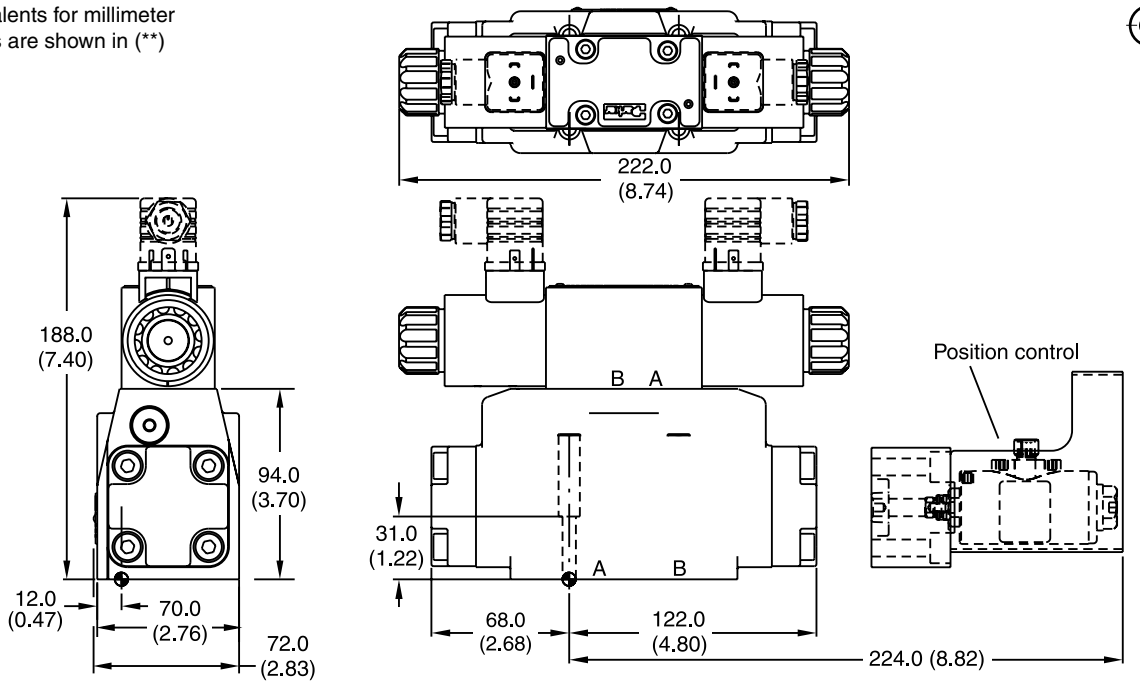
D_1FB.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

A

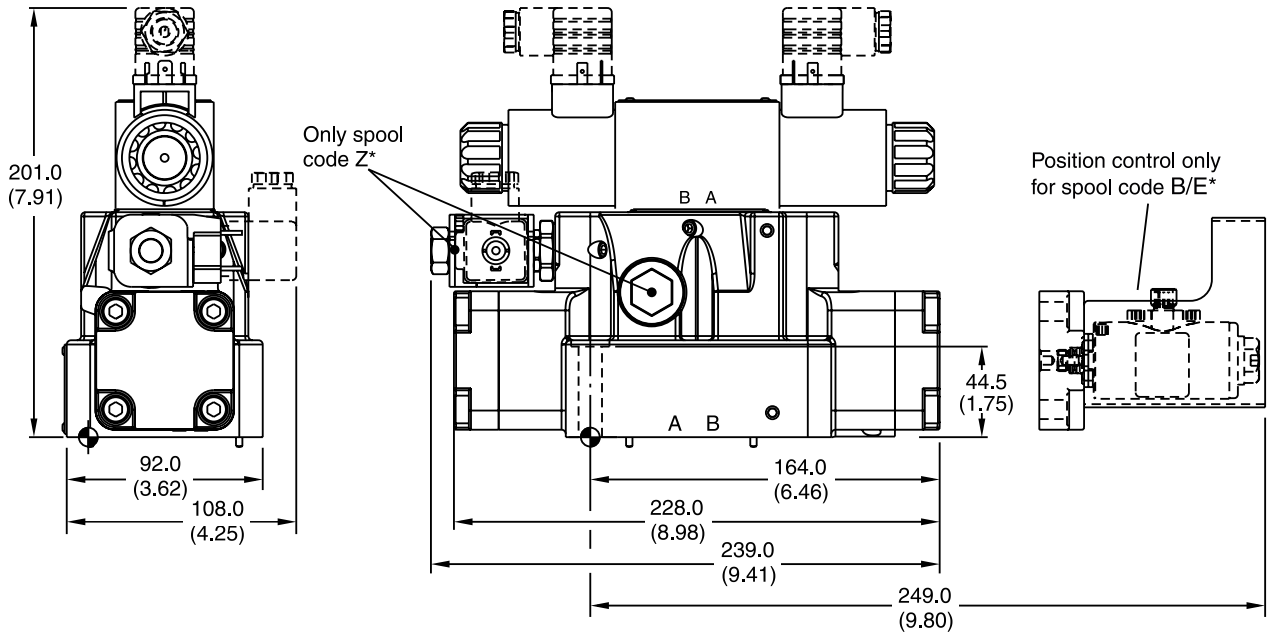
Inch equivalents for millimeter dimensions are shown in (**)

D31FB



Surface Finish	Kit			Seal Kit
R_{max}6.3 0.01/100	BK385 BK98	4x M6x40 DIN 912 12.9 4x 1/4-20x1.62	13.2 Nm (9.7 lb.-ft.) ±15 %	Nitrile: SK-D31FB Fluorocarbon: SK-D31FBV

D41FB



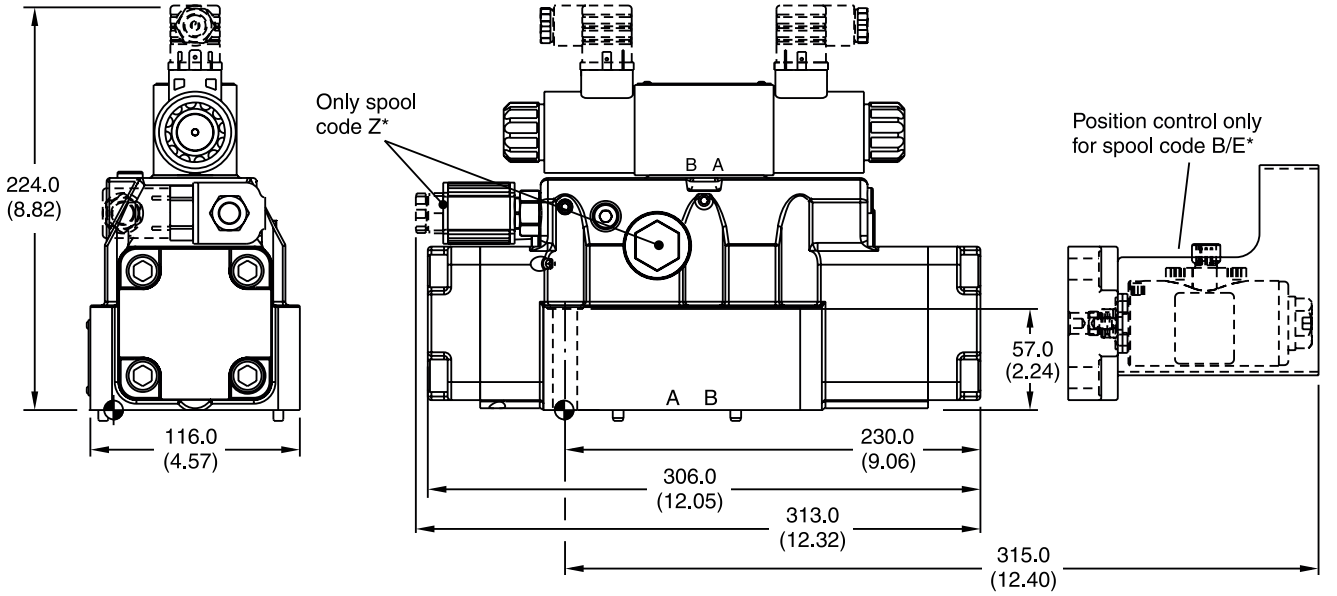
Surface Finish	Kit			Seal Kit
R_{max}6.3 0.01/100	BK320 BK160	2x M6x55 4x M10x60 DIN 912 12.9 4x 3/8-16x2.5 2x 1/4-20x2.5	13.2 Nm (9.7 lb.-ft.) 63 Nm (46.5 lb.-ft.) ±15 %	Nitrile: SK-D41FB Fluorocarbon: SK-D41FBV

D_1FB.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

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

D91FB

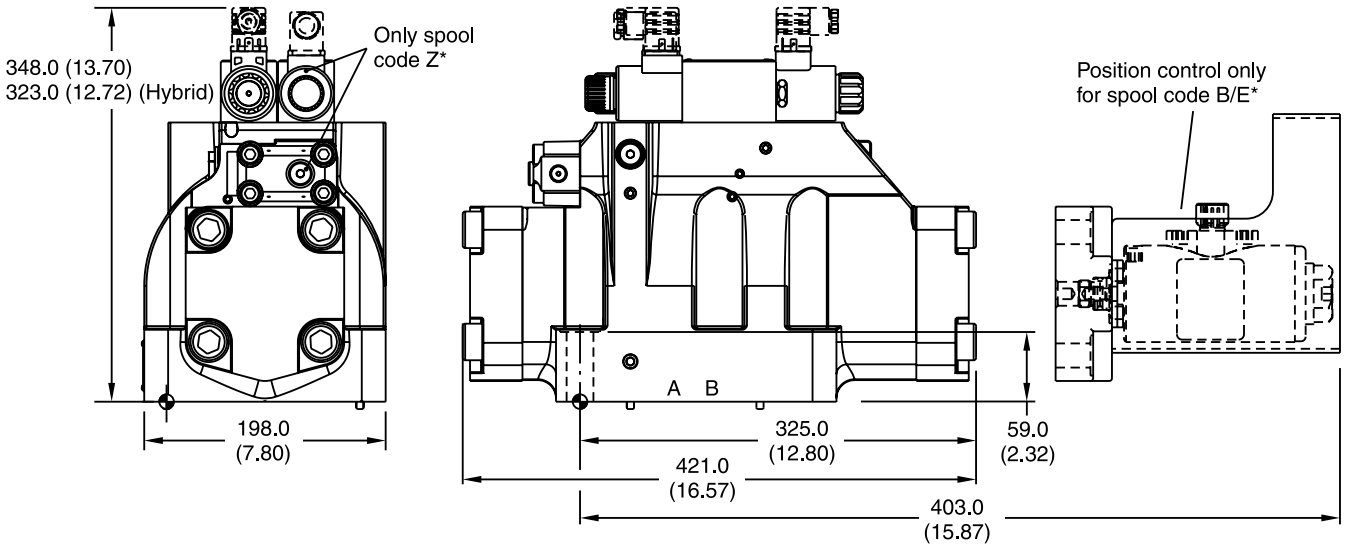


Surface Finish	Kit			Seal Kit
$R_{max}6.3$ 0.01/100	BK360 BK228	6x M12x75 DIN 912 12.9 6x 1/2-13x3.0	108 Nm (79.7 lb.-ft.) ±15 %	Nitrile: SK-D91FB Fluorocarbon: SK-D91FBV

A

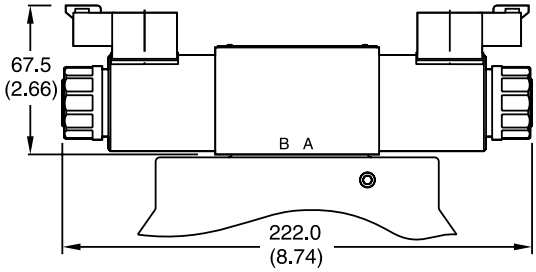
Inch equivalents for millimeter dimensions are shown in (**)

D111FB



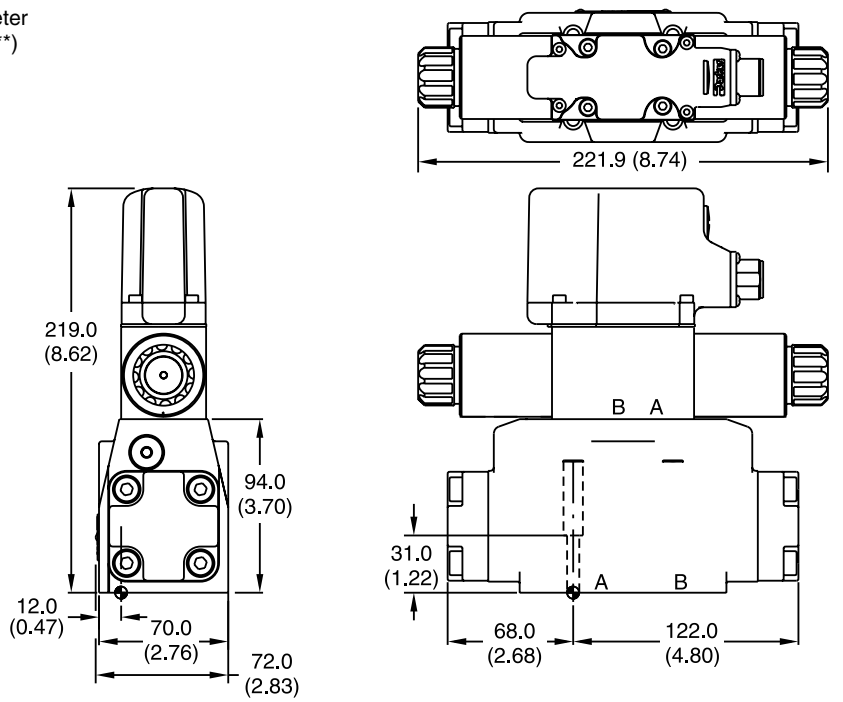
Surface Finish	Kit			Seal Kit
R_{max}6.3 0.01/100	BK386 BK150	6x M20x90 DIN 912 12.9 6x 3/4-10x3.5	517 Nm (373.9 lb.-ft.) ±15 %	Nitrile: SK-D111FB Fluorocarbon: SK-D111FBV

Dimension with DT04-2P "Deutsch" Connector



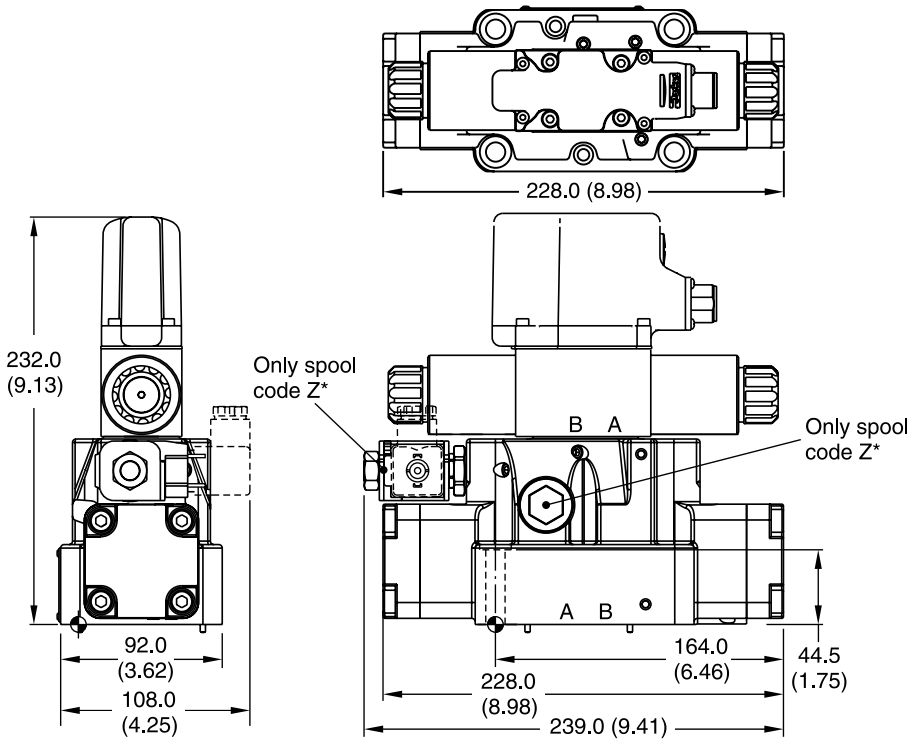
Inch equivalents for millimeter dimensions are shown in (**)

D31FB OBE



Surface Finish	Kit			Seal Kit
R_{max}6.3 ▱ 0.01/100	BK385 BK98	4x M6x40 DIN 912 12.9 4x 1/4-20x1.62	13.2 Nm (9.7 lb.-ft.) ±15 %	Nitrile: SK-D31FB Fluorocarbon: SK-D31FBV

D41FB OBE



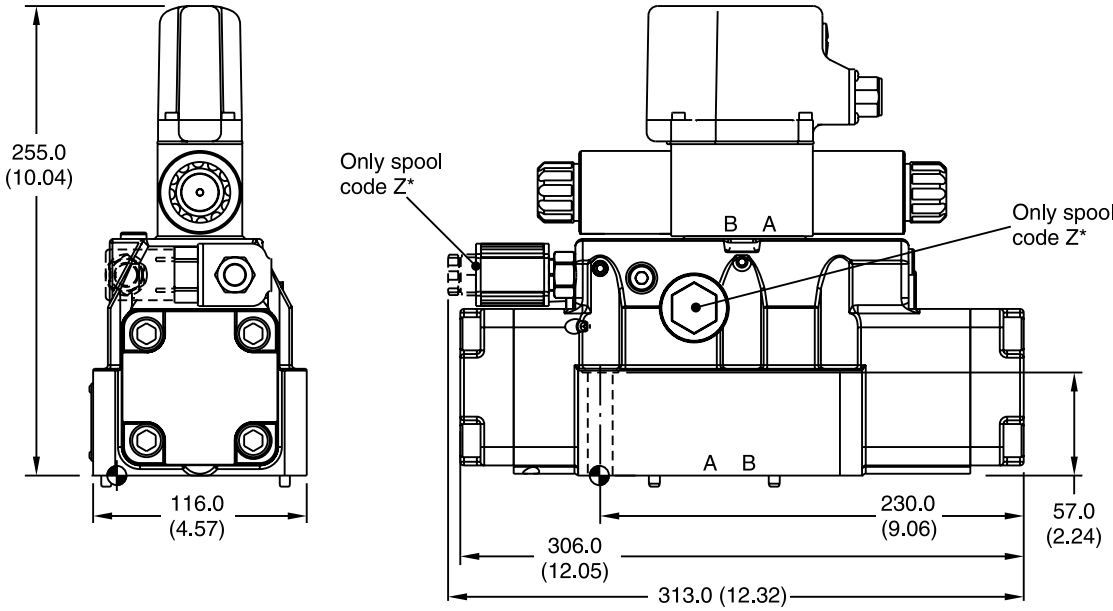
Surface Finish	Kit			Seal Kit
R_{max}6.3 ▱ 0.01/100	BK320 BK160	2x M6x55 4x M10x60 DIN 912 12.9 4x 3/8-16x2.5 2x 1/4-20x2.5	13.2 Nm (9.7 lb.-ft.) 63 Nm (46.5 lb.-ft.) ±15 %	Nitrile: SK-D41FB Fluorocarbon: SK-D41FBV

D_1FB.indd, dd

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

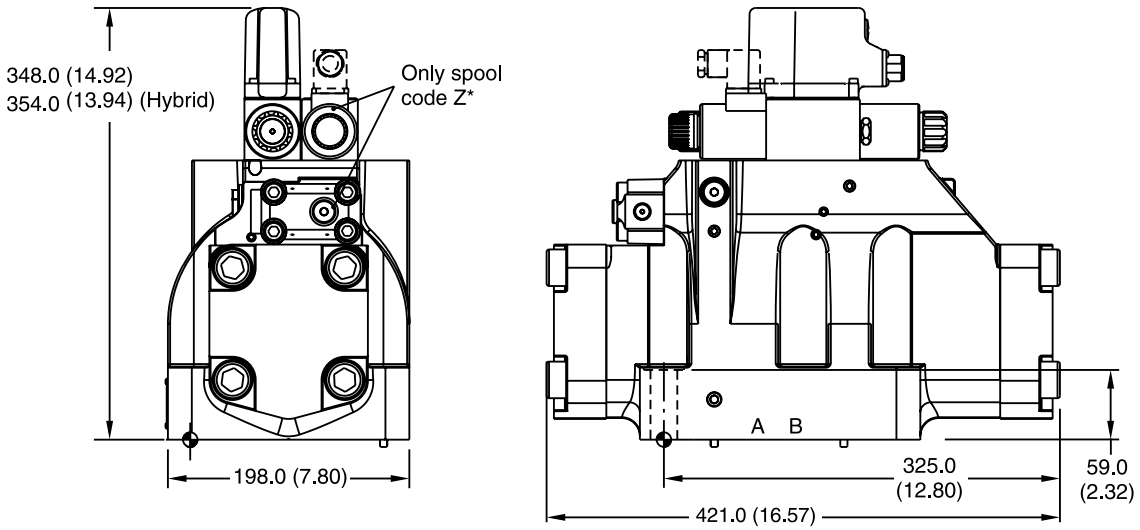
A

D91FB OBE



Surface Finish	Kit			Seal Kit
R_{max}6.3 ⏥ 0.01/100	BK360 BK228	6x M12x75 DIN 912 12.9 6x 1/2-13x3.0	108 Nm (79.7 lb.-ft.) ±15 %	Nitrile: SK-D91FB Fluorocarbon: SK-D91FBV

D111FB OBE



Surface Finish	Kit			Seal Kit
R_{max}6.3 ⏥ 0.01/100	BK386 BK150	6x M20x90 DIN 912 12.9 6x 3/4-10x3.5	517 Nm (373.9 lb.-ft.) ±15 %	Nitrile: SK-D111FB Fluorocarbon: SK-D111FBV

D_1FB.indd, dd

A

General Description

Series D1FB (NG6) and D3FB (NG10) proportional directional valves with CANopen interface are based on the series for standard digital electronics of the same name.

CANopen-Profile

CANopen Application Layer and Communication Layer
CiA DS - 301 Version 4.01

CANopen Layer Setting Services (LSS) and Protocols
CiA DS – 305 Version 2.0

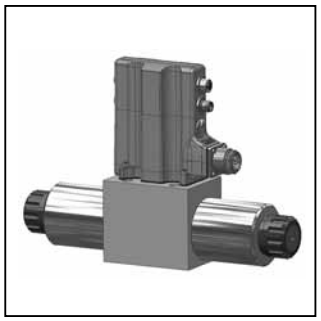
Device Profile in accordance with
CiA DSP – 408 Version 1.5.2

The baud rate and node ID can be set by dip switches or Layer Setting Service (LSS).

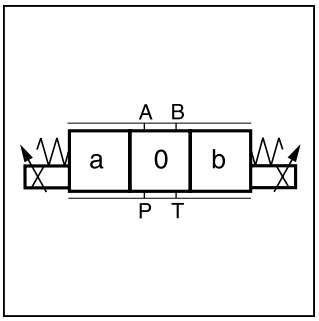
The valve parameters are factory set. Additionally the ProPxD software permits the editing of all parameters via the separate communication port. The software is also used for the valves with digital onboard electronics and the electronics modules. The cable for connection to a serial RS232 interface is available as accessory.

The digital onboard electronics is situated in a robust metal housing and can be used in rough environments.

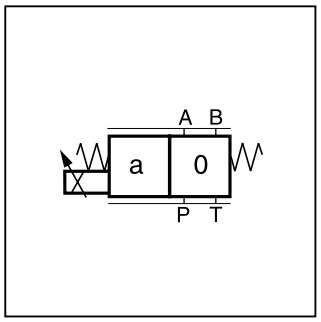
The series D1FB and D3FB are available with spool/sleeve design as well as with spool/body design.



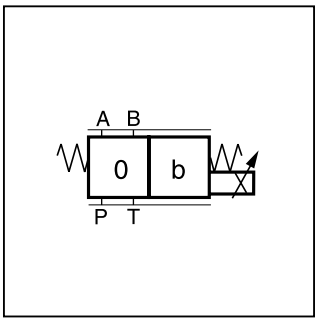
D3FB*C



D*FB*C



D*FB*E

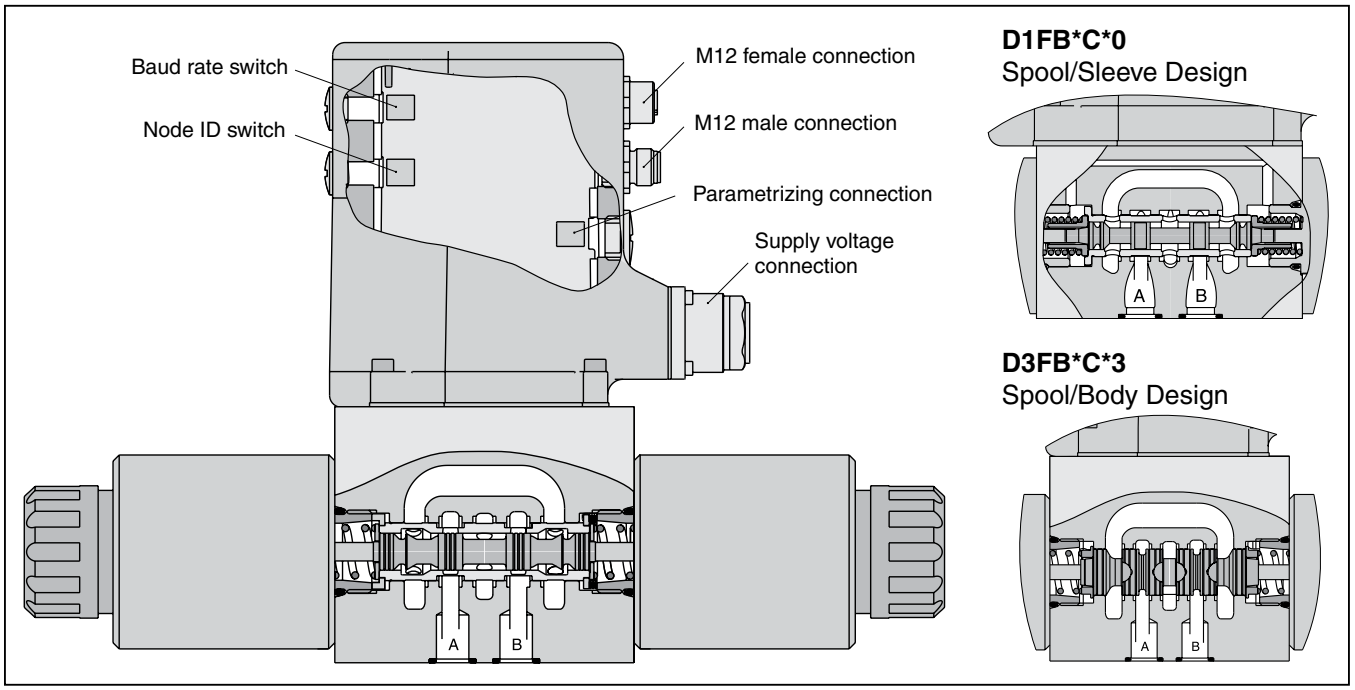


D*FB*K

Features

- CANopen interface.
- Spool/sleeve design and spool/body design.
- High repeatability from valve to valve.
- Low hysteresis.
- Manual override.
- Failsafe center position.

D3FB*C*0
Spool/Sleeve Design



D_FB with CANopen.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

A

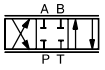
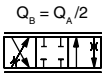
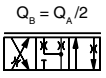
D	1	F	B			0		U	0		
Directional Control Valves	Size	Flow Control	Standard Dynamics Standard Repeatability	Spool	Style		Seal	Communication Interface CANopen DSP 408, 6 + PE, 1xM12 Male 1xM12 Female	Options	Design	Design Series NOTE: Not required when ordering.

Code	Description
1	DIN NG6 CETOP 3 NFPA D03

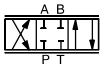
Code	Description
0	Spool/sleeve design
3	Spool/body design

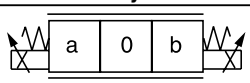
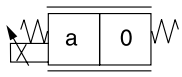
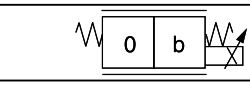
Code	Description
N	Nitrile
V	Fluorocarbon

D1FB*0: Spool/Sleeve Design

Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01H E01F E01C		20 (5.3) 12 (3.2) 6 (1.6)
E02H E02F E02C		20 (5.3) 12 (3.2) 6 (1.6)
E03H E03F E03C		20 (5.3) 12 (3.2) 6 (1.6)
B31H B31F		20/10 (5.3/2.6) 12/6 (3.2/1.6)
B32H B32F		20/10 (5.3/2.6) 12/6 (3.2/1.6)

D1FB*3: Spool/Body Design

Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01K E01H E01F		30 (7.9) 20 (5.3) 10 (2.6)
E02K E02H E02F		30 (7.9) 20 (5.3) 10 (2.6)

Code	Style
C	
E	
K	

Bolt Kit:

BK209	(4) 10-24x1.25 SHCS
BK375	4x M5x30

Weight:

D1FB	2.5 kg (5.5 lbs.)

Parametrizing cable OBE => RS232
Item no. 40982923

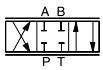
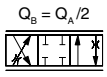
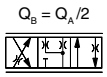
D	3	F	B			0		U	0		
Directional Control Valves	Size	Flow Control	Standard Dynamics Standard Repeatability	Spool	Style		Seal	Communication Interface CANopen DSP 408, 6 + PE, 1xM12 Male 1xM12 Female	Options	Design	Design Series NOTE: Not required when ordering.

Code	Description
3	DIN NG10 CETOP 5 NFPA D05

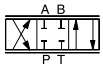
Code	Description
N	Nitrile
V	Fluorocarbon

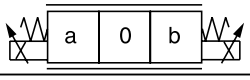
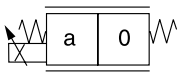
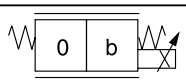
Code	Description
0	Spool/sleeve design
3	Spool/body design

D3FB*0: Spool/Sleeve Design

Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01M E01S		40 (10.6) 60 (15.9)
E02M E02S		40 (10.6) 60 (15.9)
B31M B31S		40 / 20 (10.6 / 5.3) 60 / 30 (15.9 / 7.9)
B32M B32S		40 / 20 (10.6 / 5.3) 60 / 30 (15.9 / 7.9)

D3FB*3: Spool/Body Design

Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01M E01S E01U		40 (10.6) 60 (15.9) 80 (21.2)
E02M E02S E02U		40 (10.6) 60 (15.9) 80 (21.2)

Code	Style
C	
E	
K	

Bolt Kit:

BK98	(4) 1/4-20x1.625 SHCS
BK385	4x M6x40

Weight:

D3FB	7.0 kg (15.4 lbs.)

Parametrizing cable OBE => RS232
Item no. 40982923

A

General			
Design	Direct operated proportional DC valve		
Actuation	Proportional solenoid		
Size	**NG6 / CETOP 3 / NFPA D03**		**NG10 / CETOP 5 / NFPA D05**
Mounting Interface	DIN 24340 / ISO 4401 / CETOP RP121 / NFPA		
Mounting Position	Unrestricted		
Ambient Temperature [°C]	-20...+60 (-4°F...+140°F)		
MTTF$_D$ Value (OBE) [years]	75		
Vibration Resistance [g]	10 Sinus 5...2000 Hz acc. IEC 68-2-6 30 Random noise 20...2000 Hz acc. IEC 68-2-36 15 Shock acc. IEC 68-2-27		
Hydraulic			
Maximum Operating Pressure	Ports P, A, B 350 Bar (5075 PSI); Port T 210 Bar (3045 PSI)		
Maximum Pressure Drop PABT / PBAT	350 Bar (5075 PSI)		
Fluid	Hydraulic oil as per DIN 51524...535, other on request		
Fluid Temperature [°C]	-20...+60 (-4°F...+140°F)		
Viscosity **Permitted [cSt] / [mm²/s]** **Recommended [cSt] / [mm²/s]**	 20...380 (93...1761 SSU) 30...80 (139...371 SSU)		
Filtration	ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)		
Nominal Flow at Δp=5 Bar (72.5 PSI) per Control Edge *	**D1FB*0**	**D1FB*3**	**D3FB*0/3**
	6 LPM (1.6 GPM) / 12 LPM (3.2 GPM) / 20 LPM (5.3 GPM)	10 LPM (2.6 GPM) / 20 LPM (5.3 GPM) / 30 LPM (7.9 GPM)	40 LPM (10.6 GPM) / 60 LPM (15.9 GPM) / 80 LPM (21.2 GPM)
Leakage at 100 Bar (1450 PSI) [ml/min]	<50 (3.0 cu. in.)	<60 (3.7 cu. in.)	<100 (6.1 cu. in.)
Overlap [%]	25, electrically normalized at 10 (see flow characteristics)		
Static / Dynamic			
Step Response at 100% Step [ms]	30	30	40
Hysteresis [%]	<4	<6	<5
Temperature Drift Solenoid Current [%/K]	<0.02		
Electrical			
Duty Ratio [%]	100		
Protection Class	IP65 in accordance with EN60529 (with correctly mounted plug-in connector)		
Supply Voltage/Ripple DC [V]	18...30, ripple < 5% eff., surge free		
Current Consumption Maximum [A]	2.0		3.0
Pre-fusing Medium Lag [A]	2.5		4.0
EMC	EN 61000-6-2, EN 61000-6-4		
Connection Supply Voltage	6 + PE acc. to EN 175201-804		
Connection CANopen	1 x Male M12x1: 5p 1 x Female M12x1: 5p acc. to IEC61076-2-101		
Wiring Supply Voltage Minimum [mm²]	3 x 1.0 (AWG16) overall braid shield		
Wiring Length Maximum [m]	50 (164 ft.)		
Wiring CANopen	acc. to CiA DS-301 Version 4 / Twisted pair cable acc. to ISO11898		

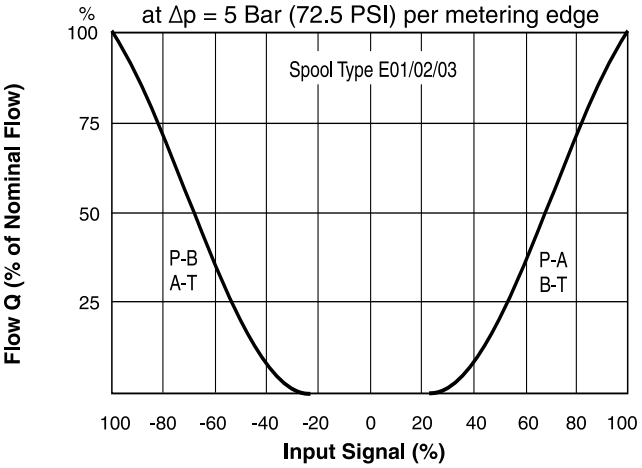
* Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

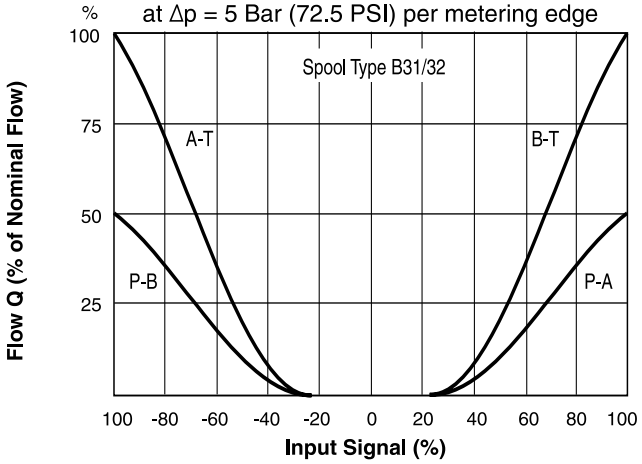
Continued on the next page

CANopen		
Profiles		Communication Layer CIA DS - 301 Version 4 Device Profile in accordance with CIA DS - 408 Version 1.5.2 Layer Setting Service CIA DS - 305 Version 2
Functionality		CANopen slave One PDO (Receive) One PDO (Transmit) One SDO (not useable for valve parameterizing) Emergency object Sync object Node guarding Life guarding Heartbeat time (producer/consumer) Minimum boot - up Node - ID - adjustment by DIP switch and LSS Baud Rate - adjustment by DIP switch and LSS
Parameterization		
Interface		RS 232, parametrizing cable order code 40982923
Interface Program		ProPxD (see www.parker.com/euro_hcd)
Adjustment Ranges		
	Minimum **[%]**	0...50
	Maximum **[%]**	50...100
	Ramp **[s]**	0...32.5

A

D1FB*0 Flow

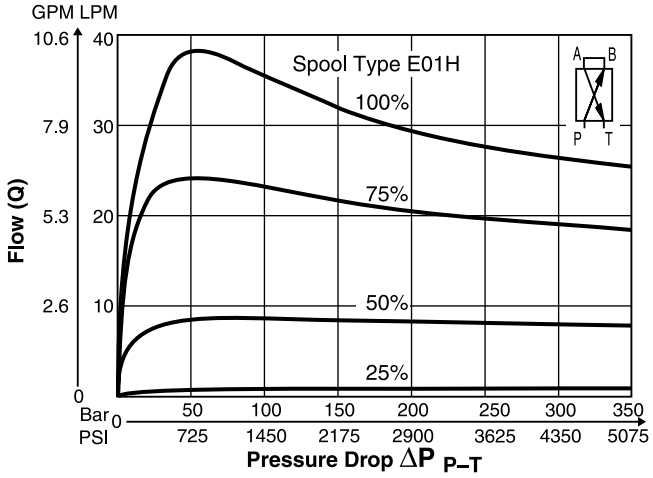




All performance curves measured with HLP46 at 50°C (122°F).

Flow Limit

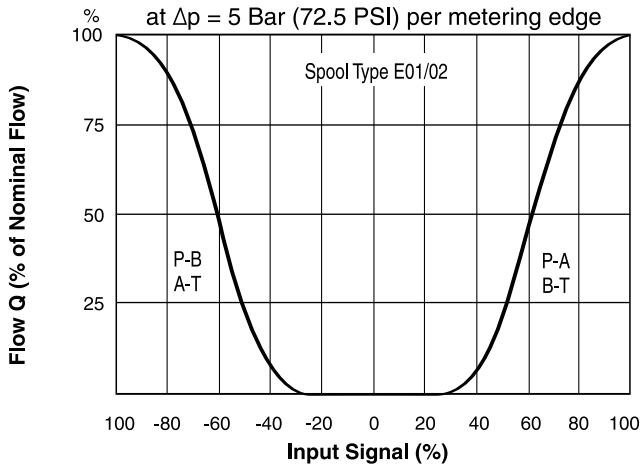
At 25%, 50%, 75% and 100% command signal (symmetric flow). At asymmetric flow a reduced flow limit has to be considered – typically approx. 10% lower.



All performance curves measured with HLP46 at 50°C (122°F).

A

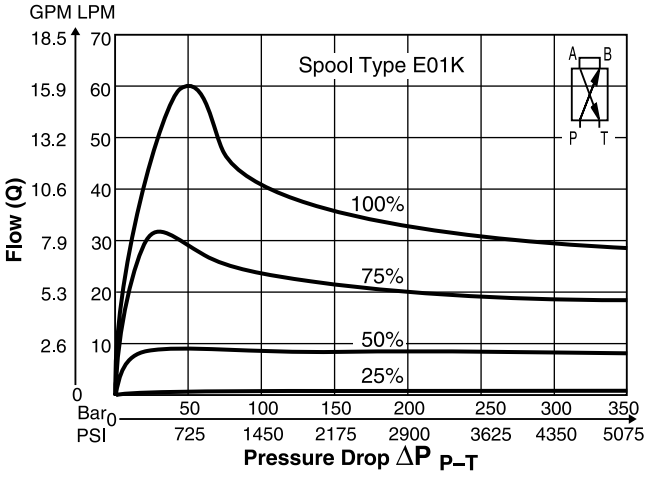
D1FB*3 Flow



All performance curves measured with HLP46 at 50°C (122°F).

Flow Limit

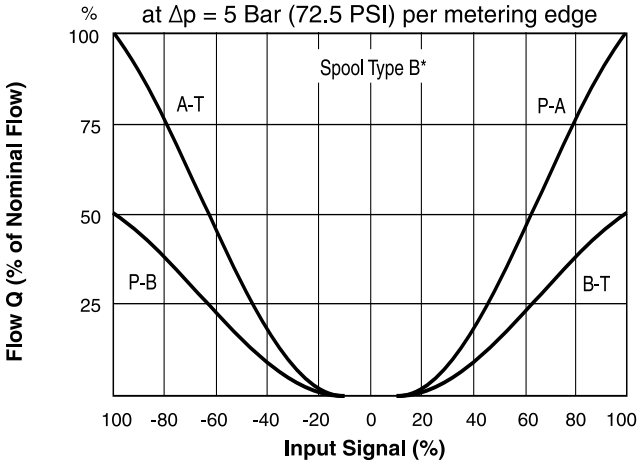
At 25%, 50%, 75% and 100% command signal (symmetric flow). At asymmetric flow a reduced flow limit has to be considered – typically approx. 10% lower.

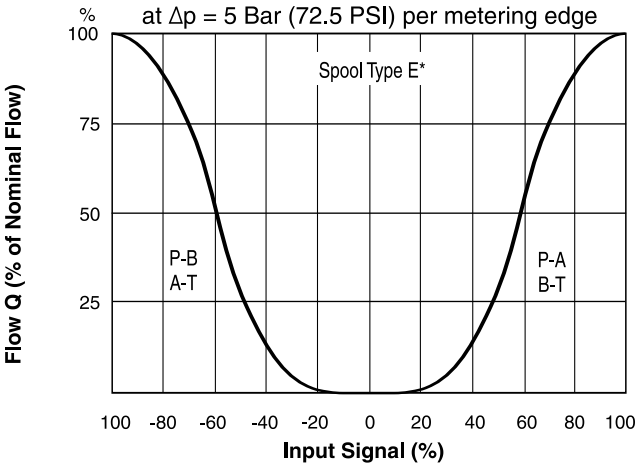


All performance curves measured with HLP46 at 50°C (122°F).

A

D3FB Flow



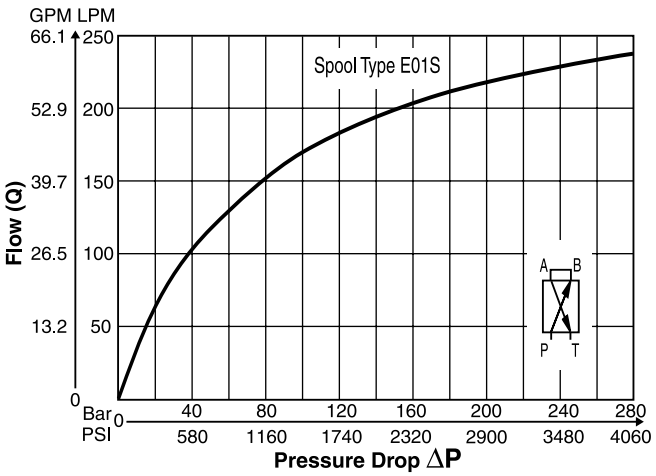


All performance curves measured with HLP46 at 50°C (122°F).

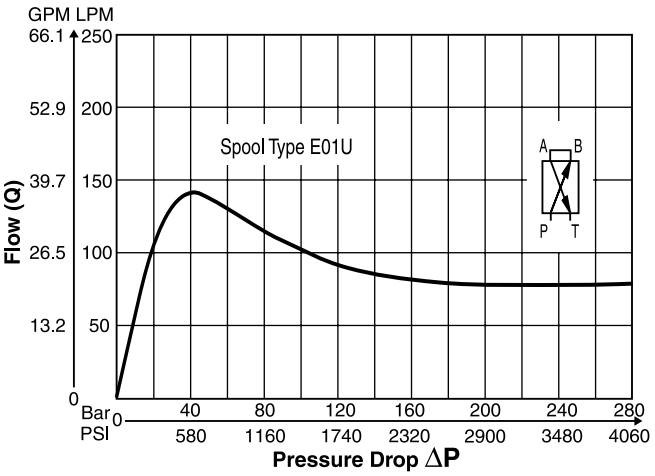
Flow Limit

100% command signal (symmetric flow). At asymmetric flow a reduced flow limit has to be considered – typically approx. 10% lower.

D3FB*0

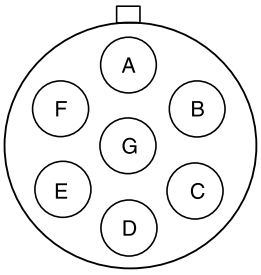


D3FB*3



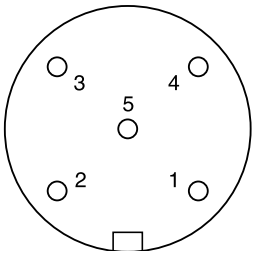
All performance curves measured with HLP46 at 50°C (122°F).

Supply Voltage Connection
6 + PE



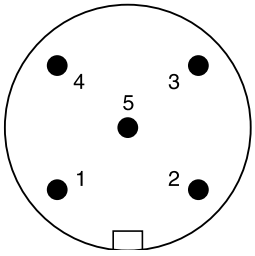
A Supply voltage 18...30V
B Supply voltage 0V
C hC
D hC
E hC
F hC
G PE

CANopen Connection



CAN in: M12, 5 pole male terminals.
Pin 1: CAN_SHLD
Pin 2: nc
Pin 3: CAN_GND
Pin 4: CAN_H
Pin 5: CAN_L

Shield is CAN_GND.

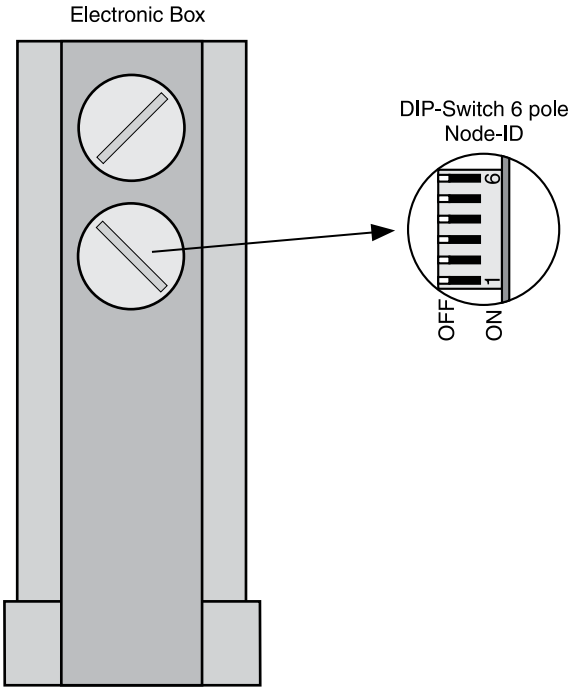


CAN out: M12, 5 pole female terminals.
Pin 1: CAN_SHLD
Pin 2: nc
Pin 3: CAN_GND
Pin 4: CAN_H
Pin 5: CAN_L

Shield is CAN_GND.

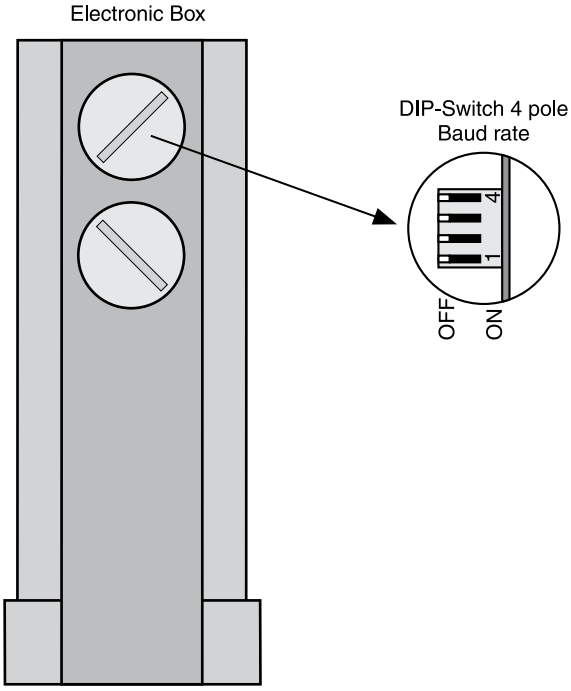
A

Node–ID Adjustment with DIP Switches



Node-ID	DIP Switch Setting					
	1	2	3	4	5	6
0 LSS -Priority	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**
1	**ON**	OFF	OFF	OFF	OFF	OFF
2	OFF	**ON**	OFF	OFF	OFF	OFF
3	**ON**	**ON**	OFF	OFF	OFF	OFF
…						
61	**ON**	OFF	**ON**	**ON**	**ON**	**ON**
62	OFF	**ON**	**ON**	**ON**	**ON**	**ON**
63	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**
	1	2	3	4	5	6
	Value					

Baud Rate Adjustment with DIP Switches



Baud Rate	DIP Switch Setting			
	1	2	3	4
0 LSS -Priority	**OFF**	**OFF**	**OFF**	Valve Parameterization and Diagnostics ON/OFF
10 kBit/s	**ON**	OFF	OFF	
20 kBit/s	OFF	**ON**	OFF	
50 kBit/s	**ON**	**ON**	OFF	
125 kBit/s	OFF	OFF	**ON**	
250 kBit/s	**ON**	OFF	**ON**	
500 kBit/s	OFF	**ON**	**ON**	
1 MBit/s	**ON**	**ON**	**ON**	

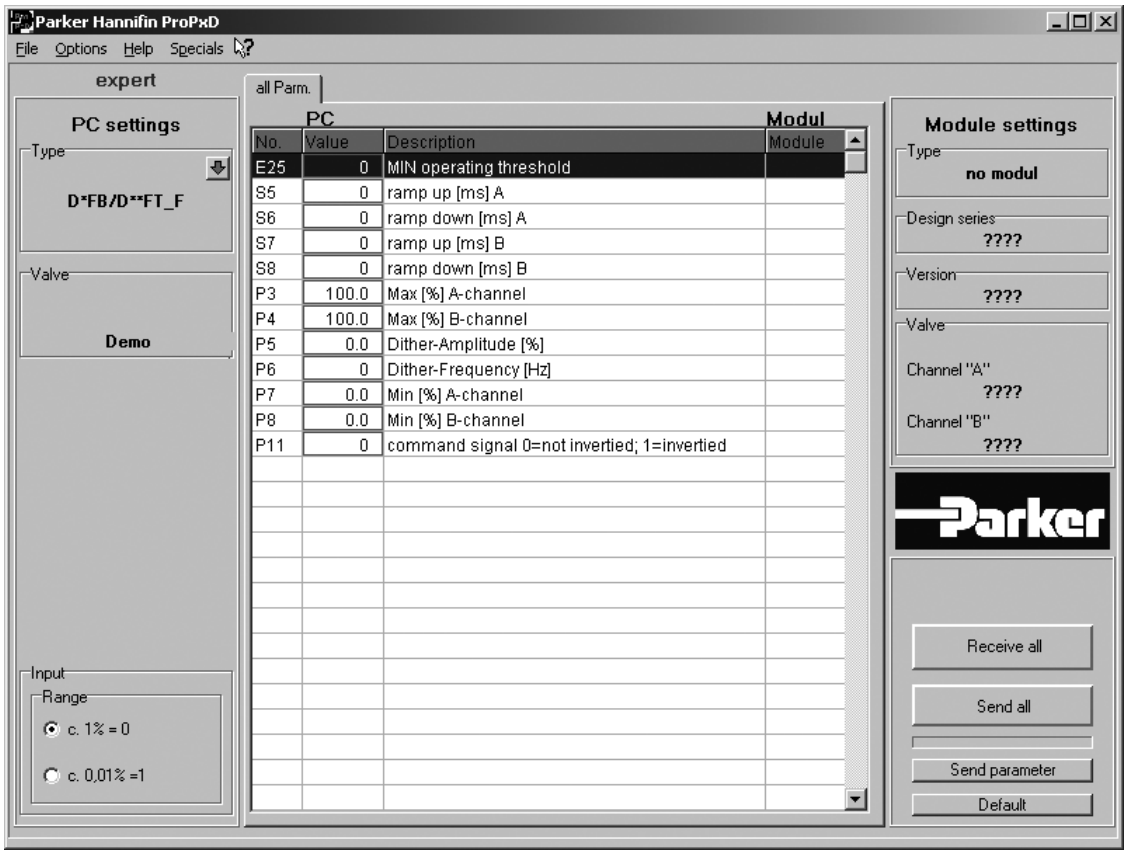
A

ProPxD Interface Program

The ProPxD software permits comfortable parameter setting for the module electronics. Via the clearly arranged entry mask the parameters can be noticed and modified. Storage of complete parameter sets is possible as well as printout or record as a text file for further documentation. Stored parameter sets may be loaded anytime and transmitted to other valves. Inside the electronics a nonvolatile memory stores the data with the option for recalling or modification.

Features

- Simple editing of all parameters.
- Storage and loading of optimized parameter adjustments.
- Executable with all Windows® operating systems from Windows® 95 upwards.
- Communication between PC and electronics via serial interface RS-232.
- Simple to use PC user software, free of charge: www.parker.com/euro_hcd – see "Software Downloads"

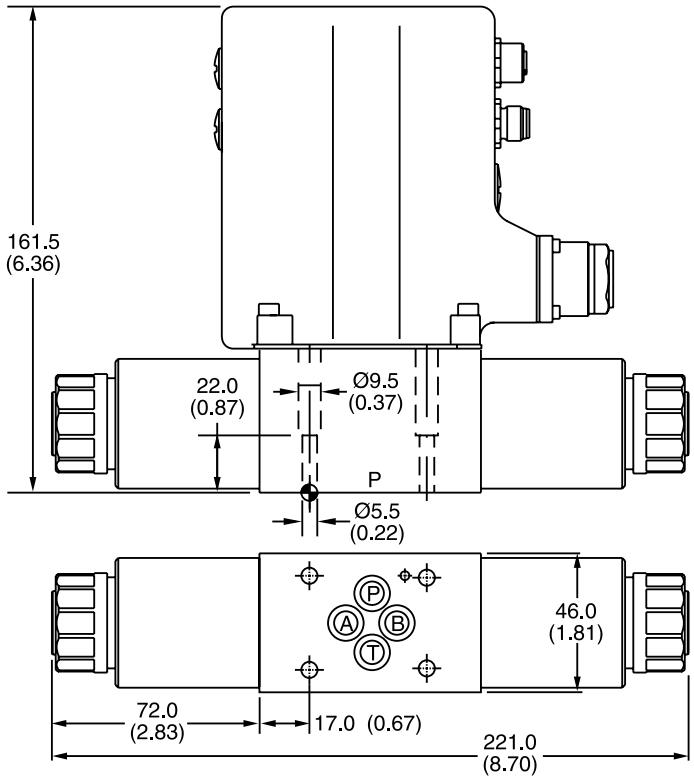


The parametrizing cable may be ordered under item no. 40982923.

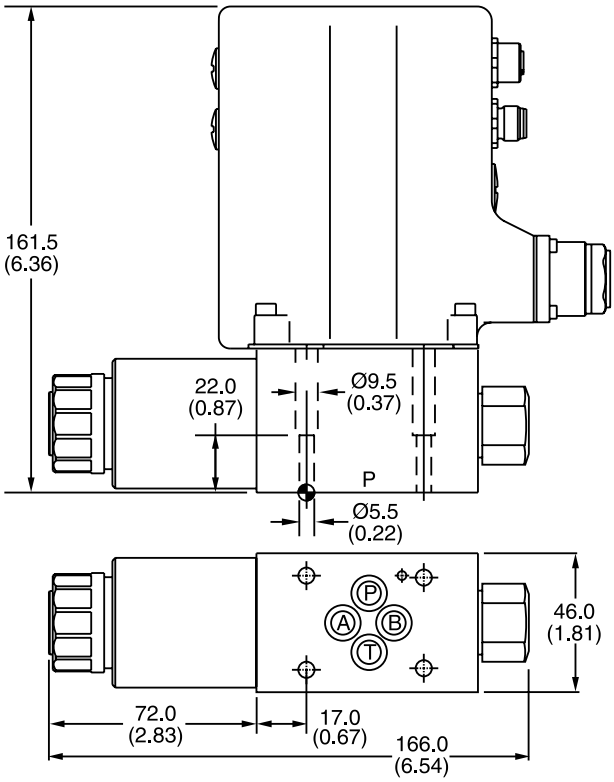
A

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

D1FB*C



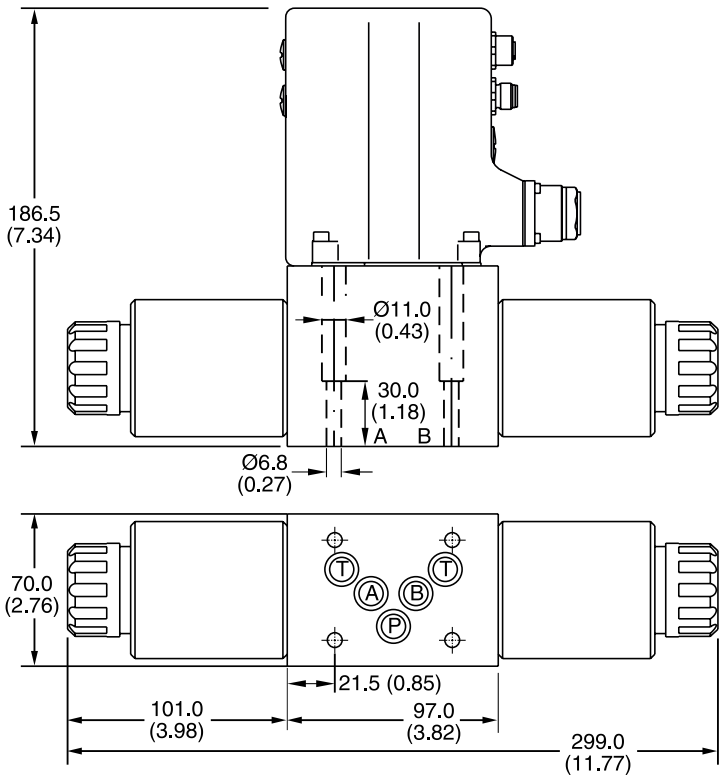
D1FB*E



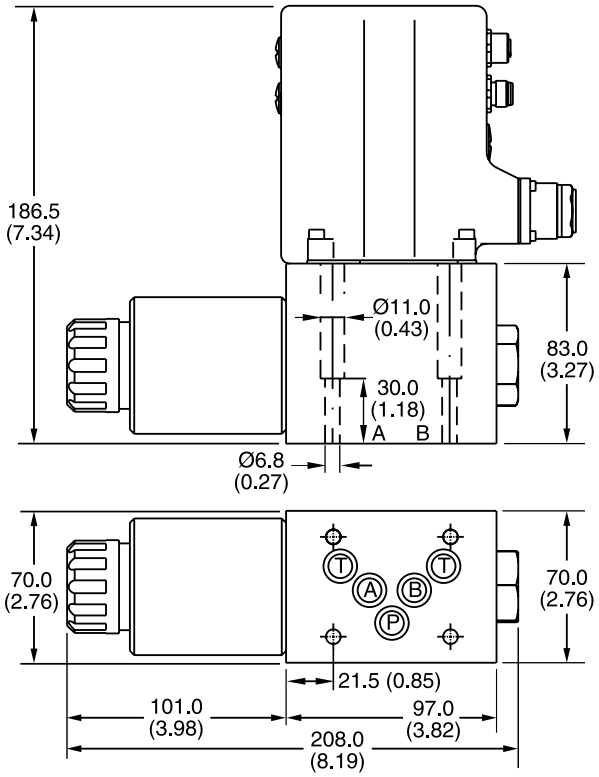
Surface Finish	Kit			Seal Kit
R_{max}6.3 ⏥ 0.01/100	BK375 BK209	4x M5x30 DIN 912 12.9 4x 10-24x1.25	7.6 Nm (5.6 lb.-ft.) ±15 %	Nitrile: SK-D1FB Fluorocarbon: SK-D1FBV

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

D3FB*C OBE



D3FB*E OBE



Surface Finish	Kit			Seal Kit
R_{max}6.3 ⏥ 0.01/100	BK385 BK98	4x M6x40 DIN 912 12.9 4x 1/4-20x1.62	13.2 Nm (9.7 lb.-ft.) ±15 %	Nitrile: SK-D3FB Fluorocarbon: SK-D3FBV

D_FB with CANopen.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

A

General Description

Series D*1FB*EE pilot operated proportional directional valves come in 4 sizes:

D31FB*EE NG10 (CETOP 5)

D41FB*EE NG16 (CETOP 7)

D91FB*EE NG25 (CETOP 8)

D111FB*EE NG32 (CETOP 10)

The D*1FB*EE series with explosion proof solenoids is based on the standard D*1FB series. The specific solenoid design allows the usage in hazardous environments. The explosion proof class is

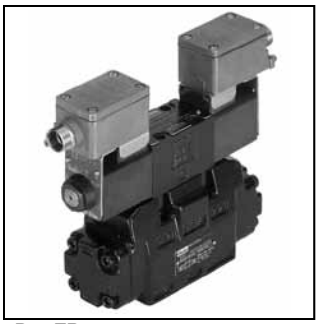
CE Ex II 2 G

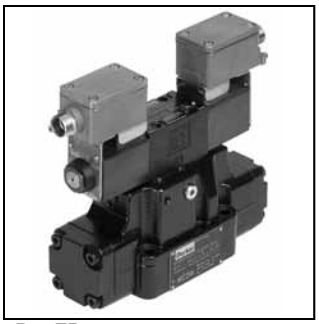
Ex mbe II T4

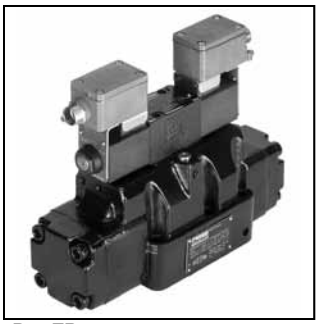
for use in zone 1 (conform to ATEX).

The parameters can be saved, changed and duplicated in combination with the digital power amplifier PWD00A-400 (to be used in an explosion proof cabinet or outside of the hazardous area).

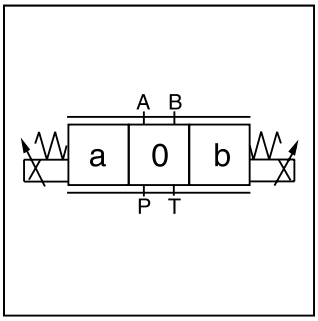
The valve parameters can be edited with the common ProPxD software.


D31FB


D41FB


D91FB

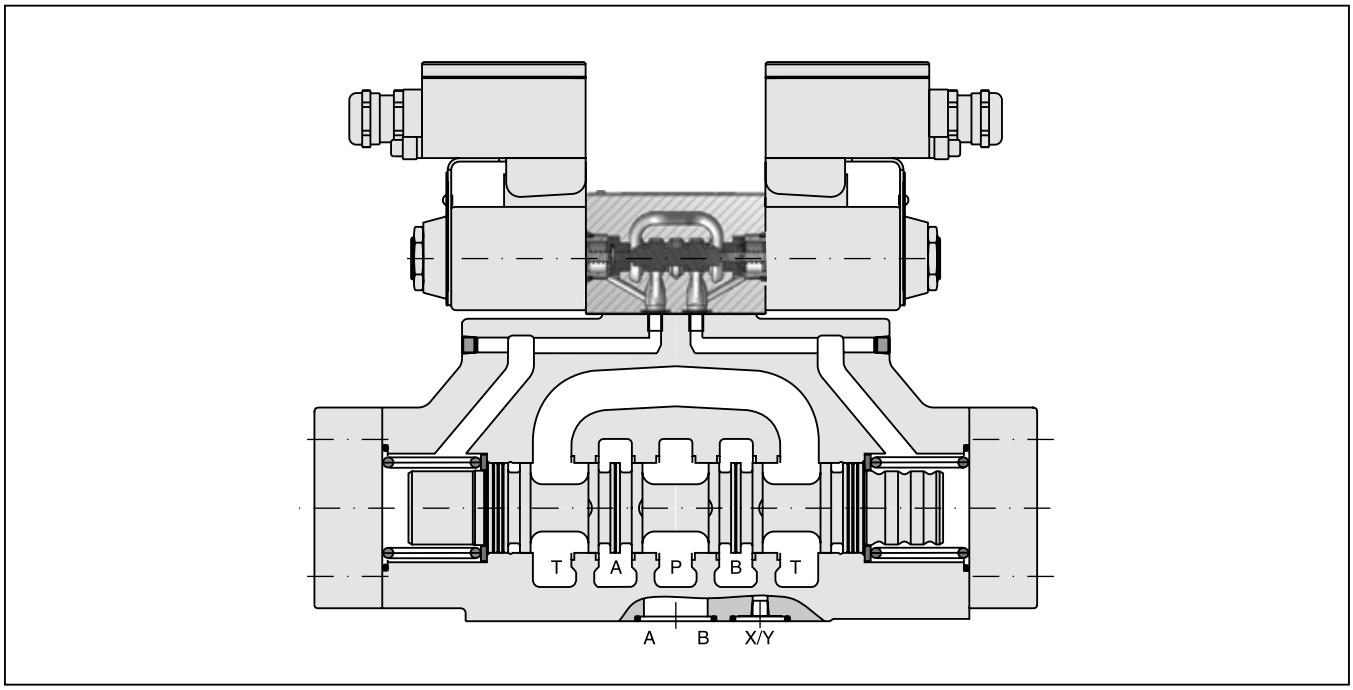

D111FB



Features

- Progressive flow characteristics for precise adjustment of flow rate
- High flow capacity

D91FB*EE

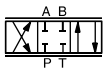
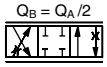
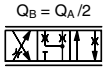


Ordering Information

D		1	F	B							E	0		EE
Directional Control Valves	Size	NG6 Pilot	Flow Control	Dynamics Standard	Spool	Flow	Spool Position	Pilot Connection	Seal	Solenoid Voltage	Explosion Proof	Valve Accessories	Design Series NOTE: Not required when ordering	Connection: Explosion Proof with Cable Glands Ex me II T4

Code	Description
3	NG10 / CETOP 5
4	NG16 / CETOP 7
9 [1]	NG25 / CETOP 8
11	NG32 / CETOP10

[1] With enlarged connections Ø 32 mm

Code	Spool Type
E01	
E02	
B31	
B32	

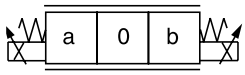
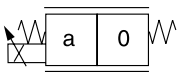
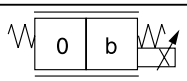
Code	Description
J	24V / 1.5A
K	24V / 2.3A

Code	Description
N	Nitrile
V	Fluorocarbon

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

Code	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge			
	D31	D41	D91	D111
B	-	100 [2] (26.4)	-	-
C	75 [2] (19.8)	130 [2] (34.3)	-	-
D	90 (23.8)	-	-	-
E	120 (31.7)	-	250 [2] (66.1)	-
F	-	200 (52.8)	-	-
H	-	-	400 (105.8)	-
L	-	-	-	1000 (264.2)

[2] Not for spool type B31 and B32

Code	Style
C	
E	
K	

Mounting Bolt Kits:

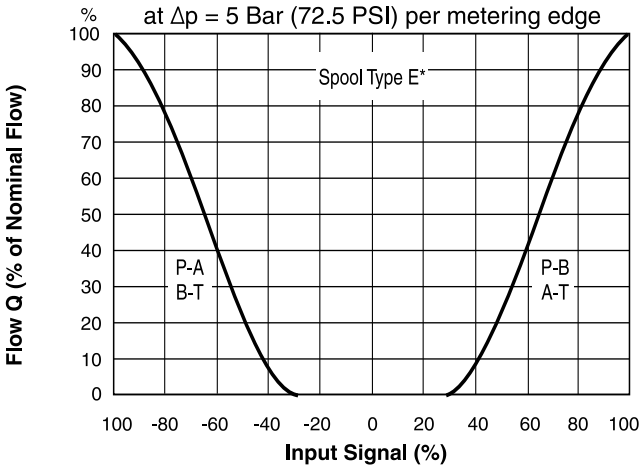
D31FB*EE	BK98
D41FB*EE	BK160
D91FB*EE	BK228
D111FB*EE	BK150

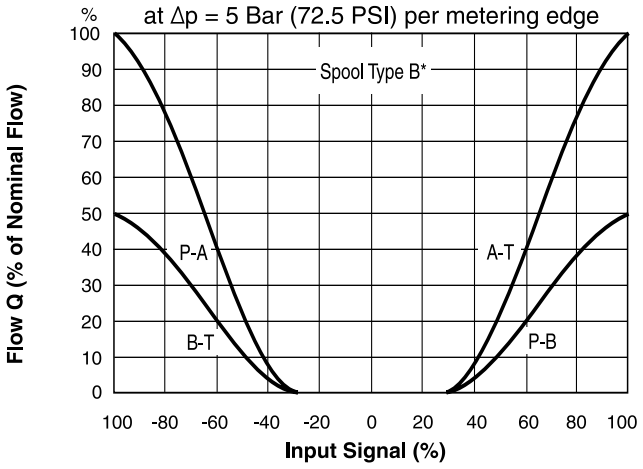
Weight:

D31FB*EE	9.4 kg (20.7 lbs.)
D41FB*EE	12.8 kg (28.2 lbs.)
D91FB*EE	20.3 kg (44.8 lbs.)
D111FB*EE	69.3 kg (152.8 lbs.)

Performance Curves

D*1FB Flow





All characteristic curves measured with HLP46 at 50°C (122°F).

D_1FB_EE.indd, dd

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Elyria, Ohio, USA

A

General					
Design		Pilot operated DC valve			
Actuation		Proportional solenoid			
Size		**NG10 (CETOP 5)**	**NG16 (CETOP 7)**	**NG25 (CETOP 8)**	**NG32 (CETOP 10)**
Mounting Interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA			
Mounting Position		unrestriced			
Ambient Temperature	**[°C]**	-20...+40; (-4°F...+104°F)			
$MTTF_D$ Value	**[years]**	75			
Vibration Resistance	**[g]**	10 Sinus 5...200Hz acc. IEC 68-2-6 30 Random noise 20...20Hz acc. IEC 68-2-36 15 Shock acc. IEC 68-2-27			
Hydraulic					
Maximum Operating Pressure		Pilot Drain Internal: Ports P, A, B, X 350 Bar (5075 PSI); Port T, Y 185 Bar (2683 PSI) NG10: Port T, Y 15 Bar (218 PSI) Pilot Drain External: Ports P, A, B, T, X 350 Bar (5075 PSI); Port Y 185 Bar (2683 PSI) NG10: Port Y 15 Bar (218 PSI)			
Fluid		Hydraulic oil as per DIN 51524...535, other on request			
Fluid temperature	**[°C]**	-20...+40; (-4°F...+104°F)			
Viscosity					
Permitted	**[cSt] / [mm²/s]**	20...380 (93...1761 SSU)			
Recommended	**[cSt] / [mm²/s]**	30...80 (139...371 SSU)			
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			
Nominal Flow at Δp=Bar (72.5 PSI) per Control Edge *		75 LPM (19.8 GPM) 90 LPM (23.8 GPM) 120 LPM (31.7 GPM)	100 LPM (26.4 GPM) 130 LPM (34.4 GPM) 200 LPM (52.9 GPM)	250 LPM (66.1 GPM) 400 LPM (105.8 GPM)	1000 LPM (264.2 GPM)
Leakage at 100 Bar	**[ml/min]**	100	200	600	1000
Pilot Supply Pressure		Minimum 30 Bar (435 PSI) [+T/Y presure]; Maximum 350 Bar (5075 PSI)) Optimal Dynamics at 50 Bar (725 PSI)			
Pilot flow at 100 Bar		<0.5 LPM (0.13 GPM)	<1.2	<1.2	<1.2
Pilot Flow, Step Response		2 LPM (0.5 GPM)	1.9 LPM (0.5 GPM)	4.5 LPM (1.2 GPM)	18 LPM (4.8 GPM)
Static / Dynamic					
Step Response at 100% Step	**[ms]**	50	75	100	180
Hysteresis	**[%]**	<5			
Electrical					
Duty Ratio	**[%]**	100			
Protection Class		CE Ex II 2 G , Ex mbe II T4, IP66 (plugged and mounted correctly)			
Solenoid	**Code**	**K**		**J**	
Supply Voltage	**[V]**	12		24	
Current Consumption	**[A]**	2.3		1.15	
Resistance	**[Ohm]**	3.7		14.8	
Solenoid Connection		Box with M20x1.5 entry for cableglands. Solenoid identificationas per ISO 9461.			
Wiring Minimum	**[mm²]**	3 x 1.5 recommended			
Wiring Length Maximum	**[m]**	50 (164 ft.) recommended			

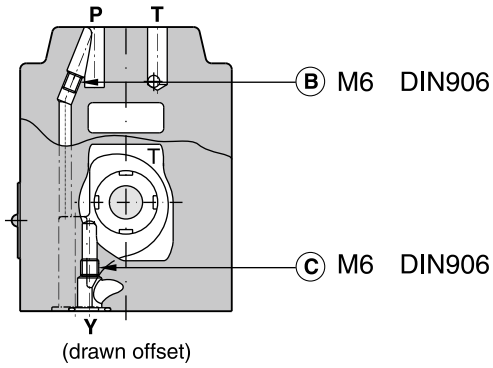
With electrical connections the protective conductor (PE ⏚) must be connected according to the relevant regulations.

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

A

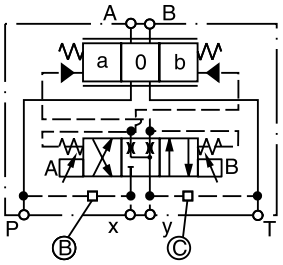
Pilot Flow
Pilot Oil Inlet (supply) and Outlet (drain)

D31FB

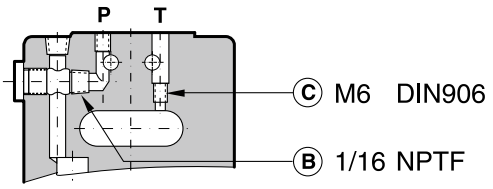


○ open, ● closed

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

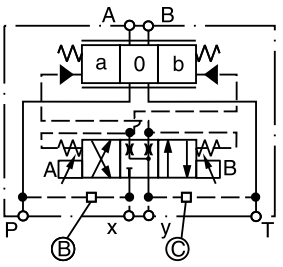


D41FB

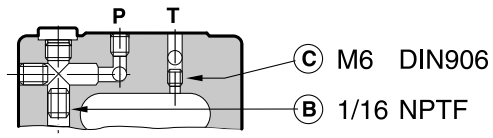


○ open, ● closed

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

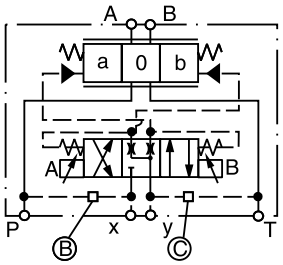


D91FB

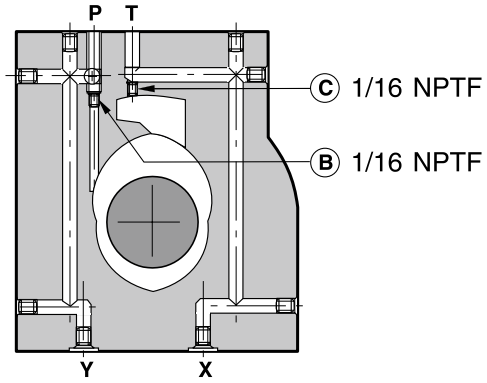


○ open, ● closed

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

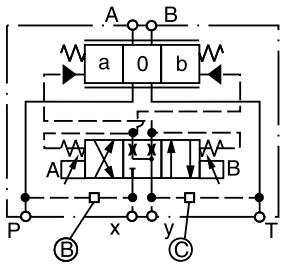


D111FB



○ open, ● closed

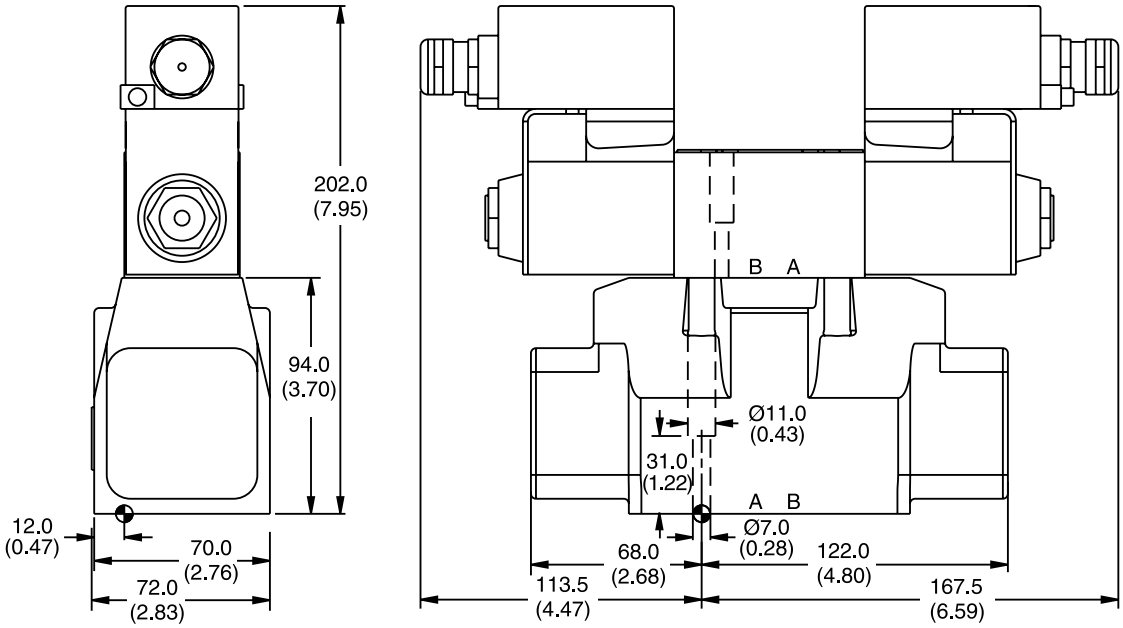
Pilot oil Inlet	Pilot oil Drain	B	C
internal	external	○	●
external	external	●	●
internal	internal	○	○
external	internal	●	○



A

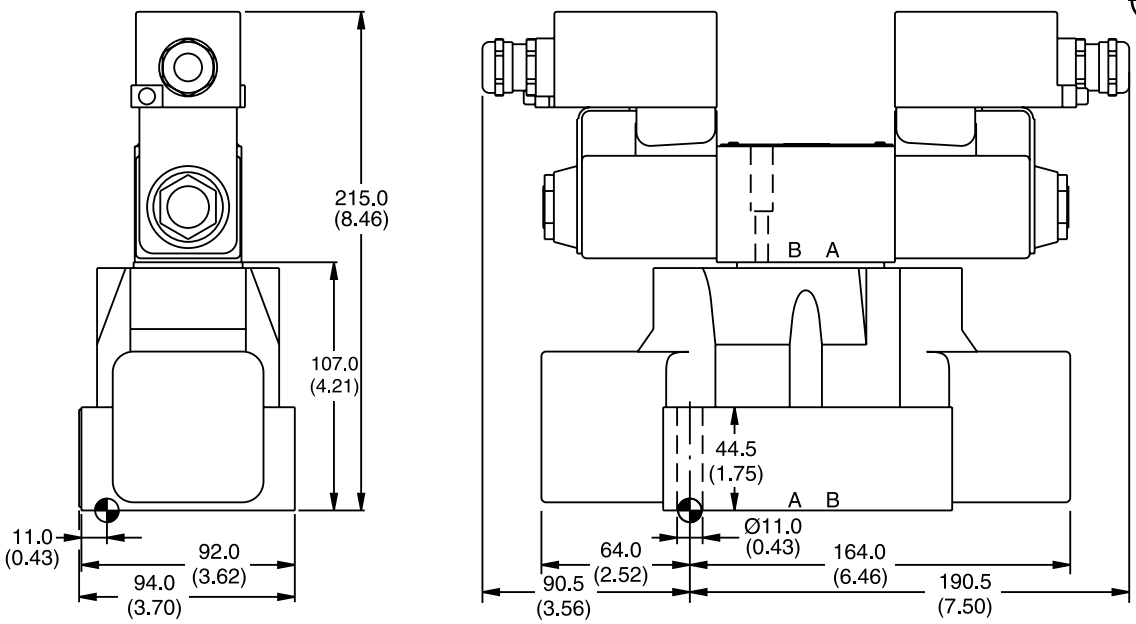
Inch equivalents for millimeter dimensions are shown in (**)

D31FB*EE



Surface Finish	Kit			Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK385 BK98	4x M6x40 DIN 912 12.9 4x 1/4-20x1.62	13.2 Nm (9.7 lb.-ft.) ±15 %	Nitrile: SK-D31FB Fluorocarbon: SK-D31FBV

D41FB*EE



Surface Finish	Kit			Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK320 BK160	2x M6x55 4x M10x60 DIN 912 12.9 4x 3/8-16x2.5 4X 3/8-16X2.5	13.2 Nm (9.7 lb.-ft.) 63 Nm (46.5 lb.-ft.) ±15 %	Nitrile: SK-D41FB Fluorocarbon: SK-D41FBV

D_1FB_EE.indd, dd

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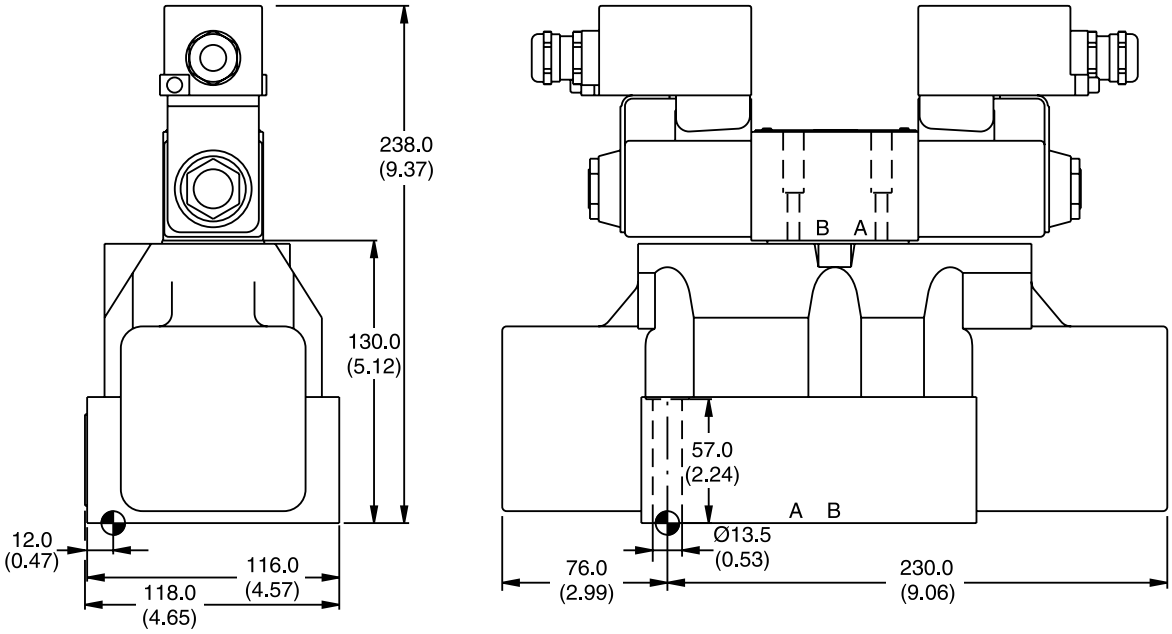
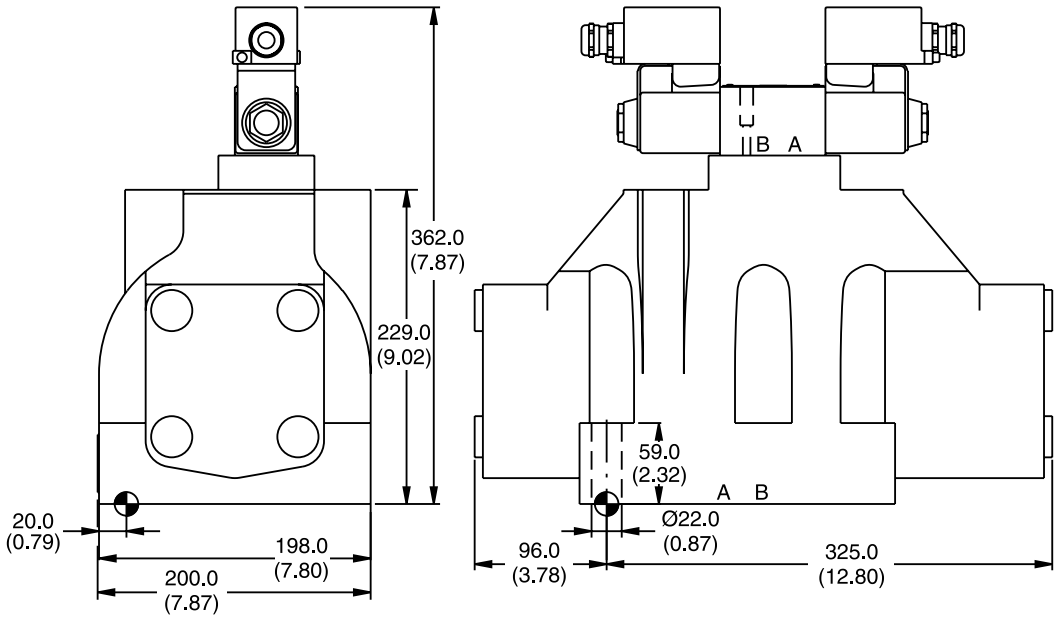
Inch equivalents for millimeter dimensions are shown in (**)

D91FB*EE



Surface Finish	Kit			Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK360 BK228	6x M12x75 DIN 912 12.9 6x 1/2-13x3.0	108 Nm (79.7 lb.-ft.) ±15 %	Nitrile: SK-D91FB Fluorocarbon: SK-D91FBV

D111FB*EE



Surface Finish	Kit			Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK386 BK150	6x M20x90 DIN 912 12.9 6x 3/4-10x3.5	517 Nm (373.9 lb.-ft.) ±15 %	Nitrile: SK-D111FB Fluorocarbon: SK-D111FBV

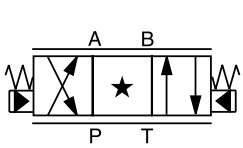
D_1FB_EE.indd, dd

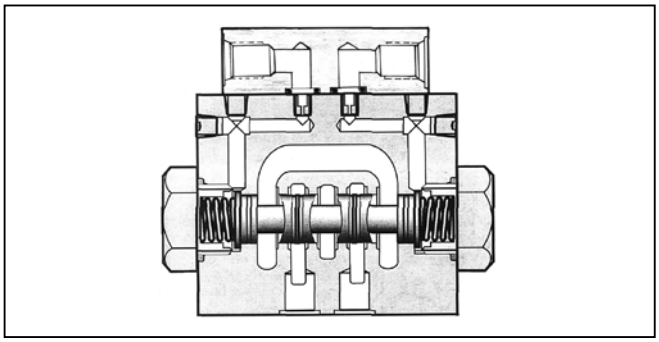
A

General Description

Series D*9FF main-stage, pilot operated, proportional directional control valves are operated with remote hydraulic hand controllers. Valves are available in sizes NG10 (CETOP 5), NG16 (CETOP 7), NG25 (CETOP 8) and NG32 (CETOP 10).

Typical applications include reproducible control of actuator speed in rapid/slow speed profiling, and smooth acceleration and deceleration performance.





Features

- Standard DIN/ISO/CETOP/NFPA interfaces.
- Progressive flow characteristics for improved low flow resolution.
- Spring centered main stage spool.
- 2:1 ratio spool options.

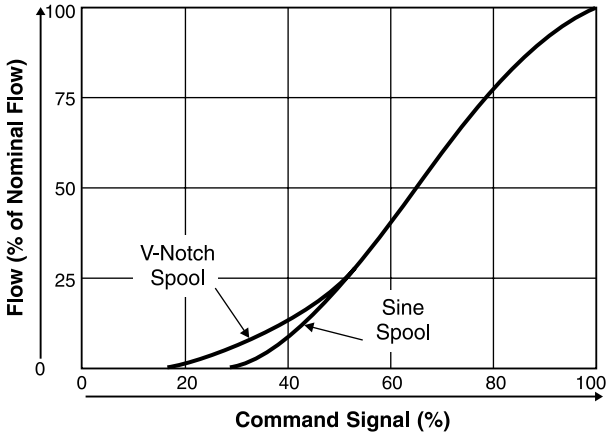
CE

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)		LPM (GPM)	75 (20)	200 (53)	400 (106)	1000 (264)
Pilot Flow – Continuous		LPM (GPM)	1.2 (0.3)	1.2 (0.3)	1.2 (0.3)	1.2 (0.3)
Step Response (time to reach 90% of a 100% step command)		ms	60	75	100	200
Hysteresis	%	<5				
Repeatability	%	<2				
Operating Pressure Port P, A, B, T	Bar (PSI)	345 (5000) max.				
Pilot Pressure Ranges	Bar (PSI)	0-25 (0-363 PSI)				
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)				
Ambient Operating Temperature		-50°C to +100°C (-58°F to +212°F)				

Performance Curves

D*9FF Flow Characteristics
at Δp = 5 Bar (72.5 PSI) per metering edge



D		9	F	F			C	2		
Directional Control Valve	Size	No Pilot	Flow Control	Remote Pilot	Spool Type	Flow	Style	Pilot Connection	Seal	Design Series

NOTE: Not required when ordering.

Code	Description
3	NG10/CETOP 5
4	NG16/CETOP 7
9	NG25/CETOP 8*
11	NG32/CETOP 10

* 32mm Ø ports

Code	Style
C	

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Pilot	Drain
2	External	External

Sine Spool Options - Spool Type and Flow Codes

Code		Sine
$Q_A=Q_B$	$Q_A>Q_B$ [1]	Spool Type
E01	B31	
E02	B32	

Code	Flow at Δp 5 Bar (72.5 PSI) per metering edge			
	D39 LPM (GPM)	D49 LPM (GPM)	D99 LPM (GPM)	D119 LPM (GPM)
C	75 (20)	–	–	–
F	–	200 (53)	–	–
H	–	–	400 (106)	_
L	_	_	_	1000 (264)

V-Notch Spool Options - Spool Type and Flow Codes

Code		V-Notch
$Q_A=Q_B$	$Q_A>Q_B$ [1]	Spool Type
E21	B41	
E22	B42	

Code	Flow at Δp 5 Bar (72.5 PSI) per metering edge			
	D39 LPM (GPM)	D49 LPM (GPM)	D99 LPM (GPM)	D119 LPM (GPM)
B	–	–	–	–
D	–	120 (32)	–	–
F	–	–	300 (79)	–
L	_	_	_	1000 (264)

1) Reduced Flow Rate on Port B, Nominal Flow Rate on Port A
Code A* for spool $Q_B>Q_A$ optional

Bolt Kits:

D39FF	BK98	(4) 1/4-20x1.62 SHCS
D49FF	BK160	(4) 3/8-16x2.5 SHCS (2) 1/4-20x2.5 SHCS
D99FF	BK228	(6) 1/2-13x3.0 SHCS
D119FF	BK150	(6) 3/4-10x3.5 SHCS

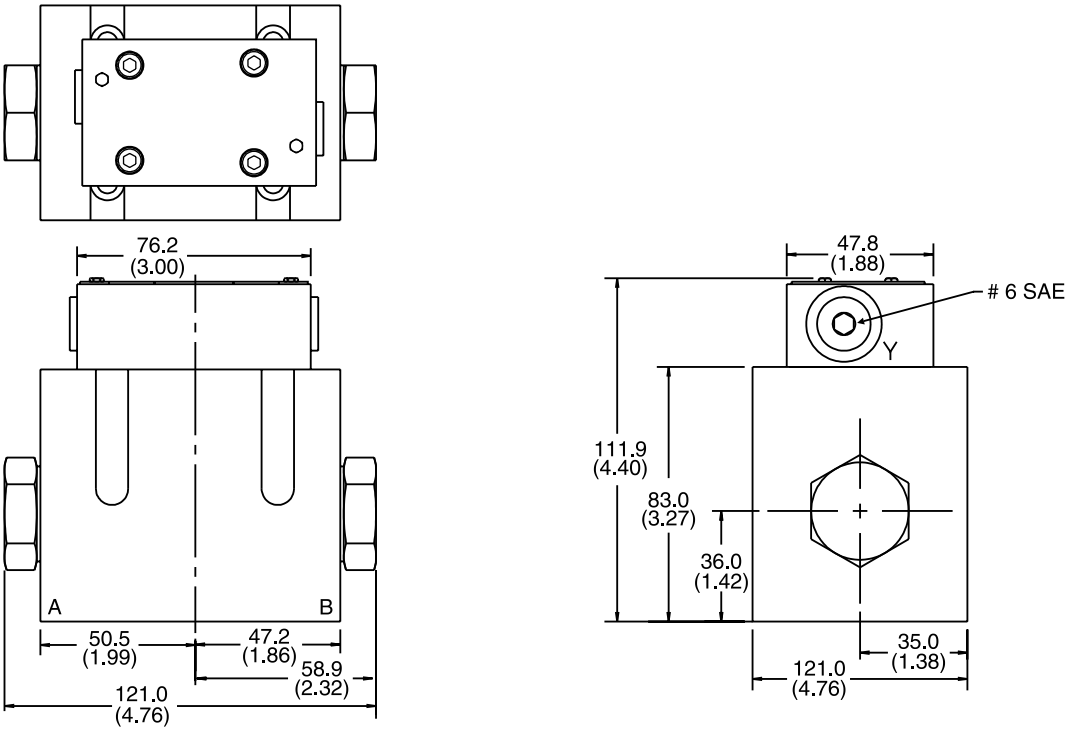
Weight:

D39FF	7.1 kg (16.0 lbs.)
D49FF	10.8 kg (25.0 lbs.)
D99FF	19.0 kg (42.0 lbs.)
D119FF	62.0 kg (136.0 lbs.)

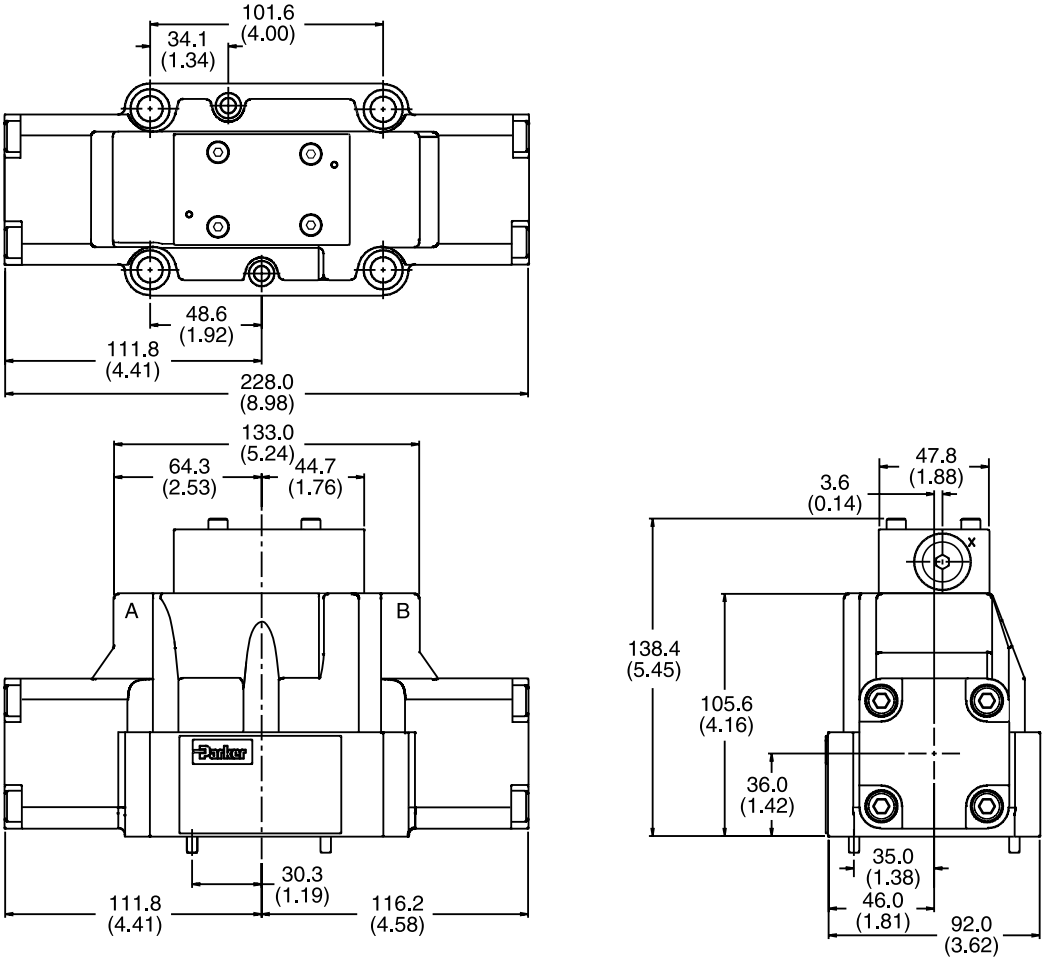
A

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

D39FF



D49FF



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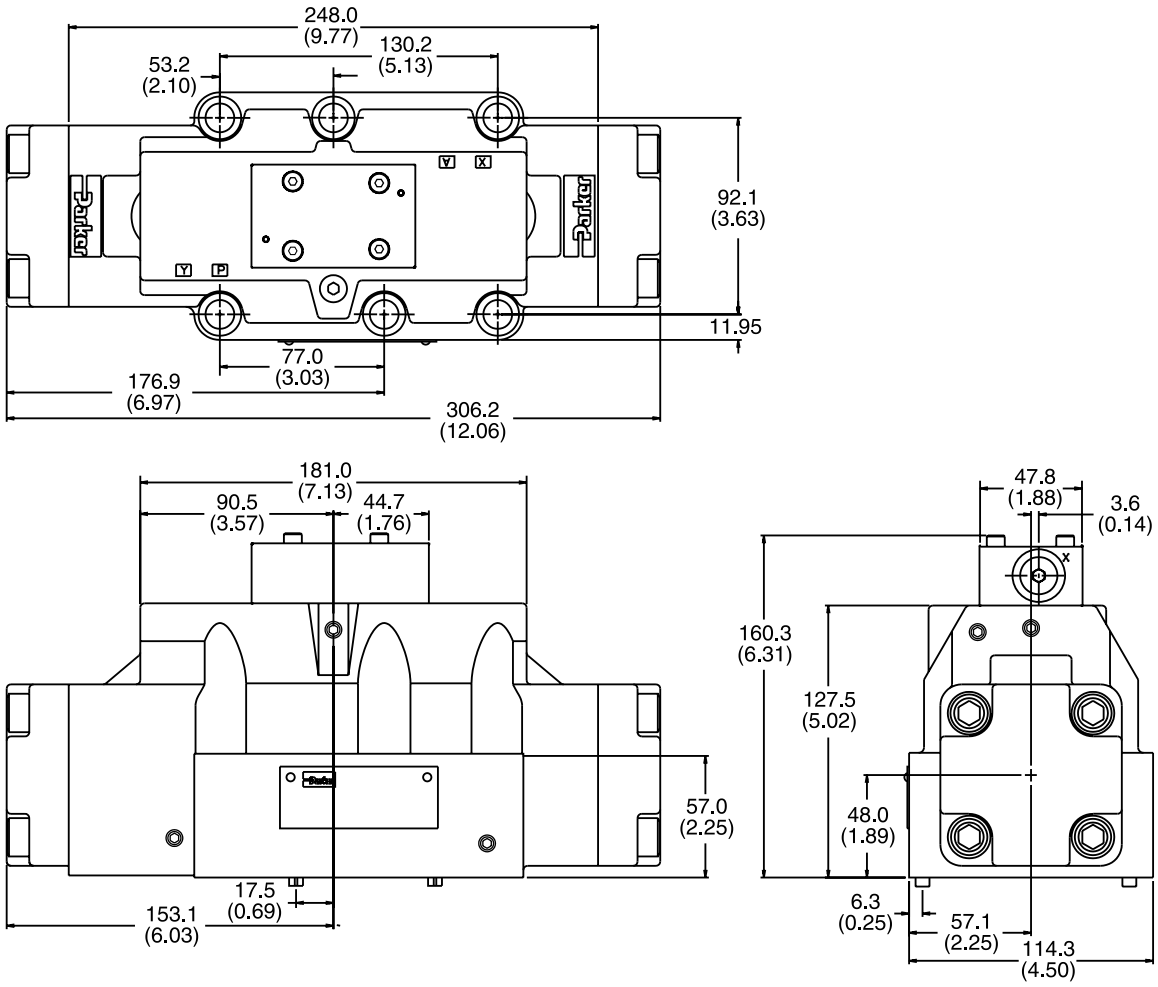
A

D99FF

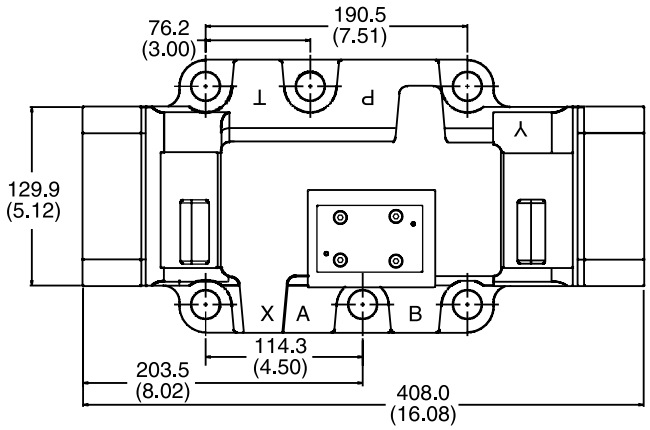
Inch equivalents for millimeter dimensions are shown in (**)

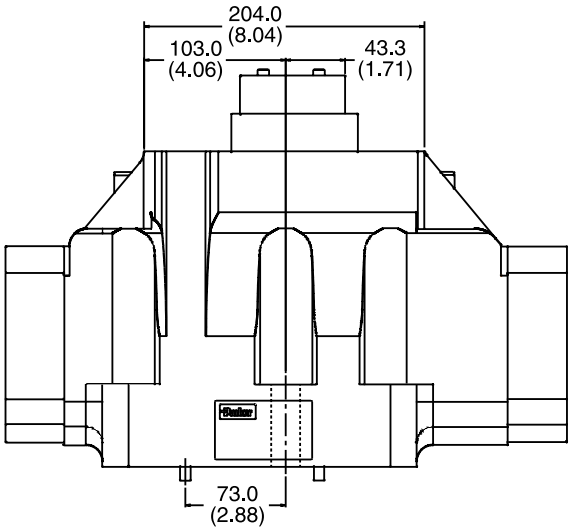


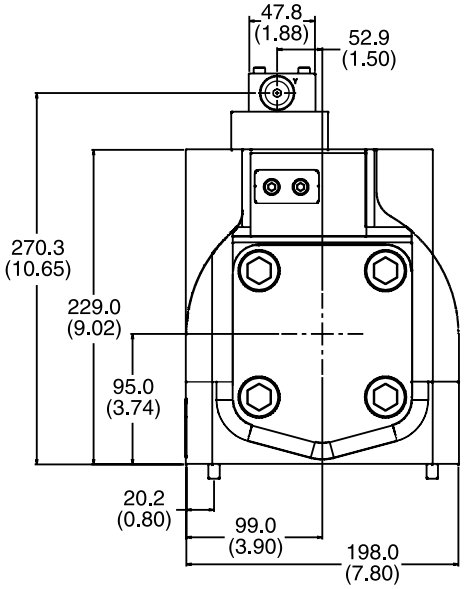
A

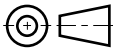
D119FF

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









A

Bolt Kits, Subplates, Mounting Interface

Interface	Valve	Bolt Kit	Qty	Size	Subplate(1)	Port Size	Port Location
NG10	D39F*	BK98	4	1/4-20 x 1.62"	SPD31D6NS35	3/4" NPTF	Bottom
CETOP 5		BK385	4	M6 x 40mm	SPD31D6NAS35	3/4" NPTF	Side
					SPD31D6SS35	#12 SAE	Bottom
					SPD31D6SAS35	#12 SAE	Side
NG16	D49F*	BK160	4	3/8-16 x 2.5"	SPD46SA	#12 SAE	Side
CETOP 7			2	1/4-20 x 2.25"			
		BK320	4	M10 x 60mm			
			2	M6 x 55mm			
NG25	D99F*	BK228	6	1/2-13 x 3"	SPD66NS35	3/4" NPTF	Bottom
CETOP 8		BK360	6	M12 x 75	SPD66NAS35	3/4" NPTF	Side
					SPD68NS35	1" NPTF	Bottom
					SPD68NAS35	1" NPTF	Side
					SPD610NS35	1 1/4" NPTF	Bottom
					SPD610NAS35	1 1/4" NPTF	Side
					SPD610SS35	#20 SAE	Bottom
					SPD610SAS35	#20 SAE	Side
NG32	D119F*	BK150	6	3/4-10 x 3.5"	SPD1010N35	1 1/4" NPTF	Bottom
CETOP 10		BK386	6	M20 x 90	SPD1012N35	1 1/2" NPTF	Bottom

(1) Ductile iron; maximum operating pressure: 350 Bar (5075 PSI). Refer to valve specificatons for actual recommended maximums.

Note: All subplates listed use SAE mounting bolt hardware. Refer to Catalog HY14-2500/US for metric options.

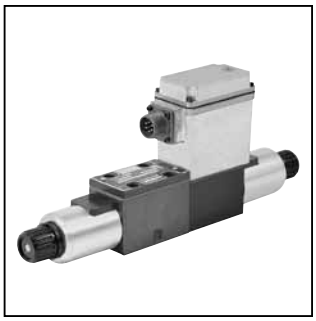
A

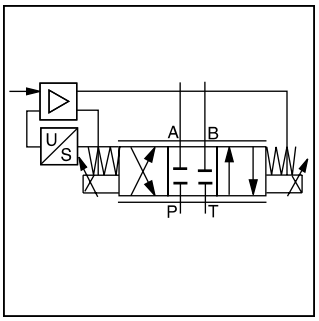
General Description

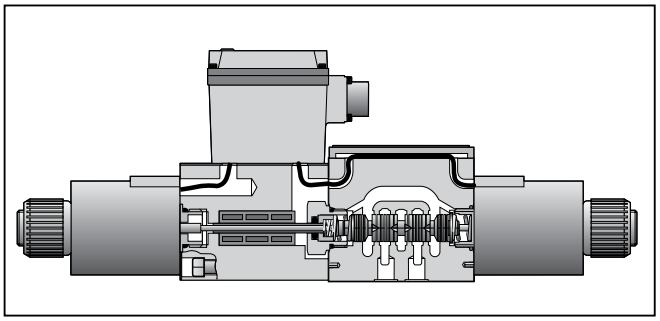
Series D*FX proportional directional control valves are direct operated solenoid valves with electronic spool position feedback, and on-board integrated control electronics. D*FX valves are user configurable to proportionally control flow in response to voltage or current command signals. Valves are 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: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

D_FX.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

A

D*FX

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

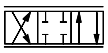
Code	Description
D1FX	NG6/CETOP 3
D3FX	NG10/CETOP 5

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			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*
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	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.

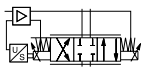
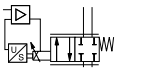
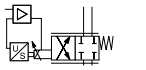
Weight:

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.

A

Application Guidelines

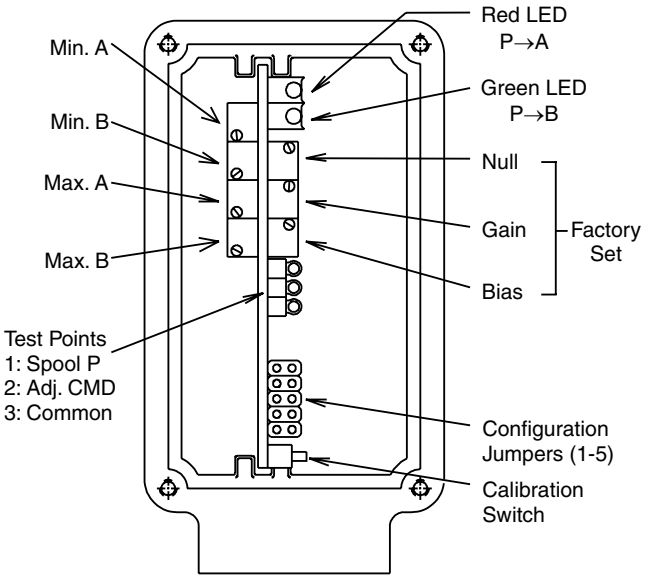
D*FX proportional valves are available in three control configurations. Option 'B' conforms to the industrial proportional valve standard and is interchangeable with most competitors' valves of this type. Options 'C' and 'D' are designed to simplify user application by providing specific features. Note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

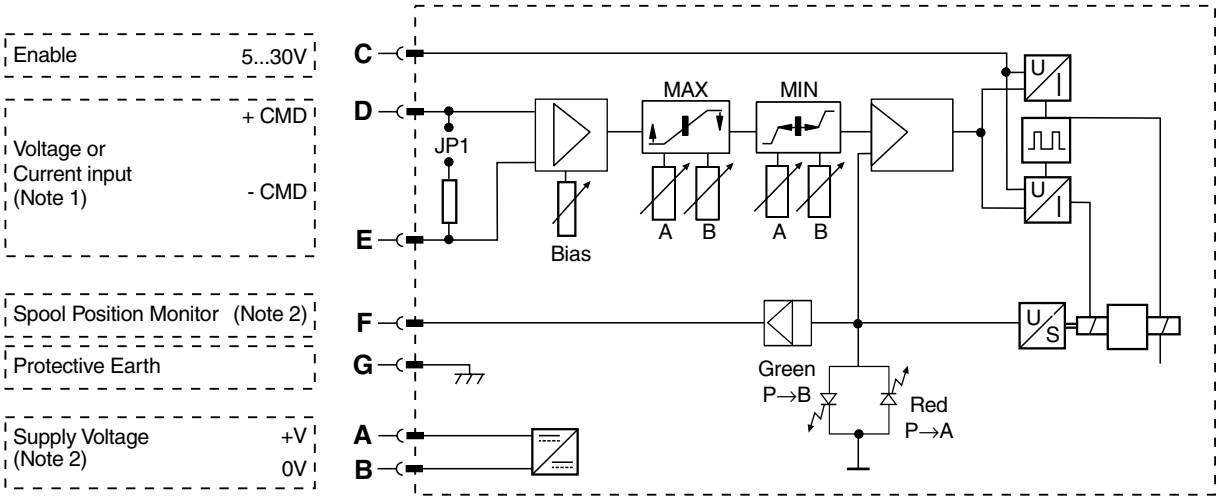
Refer to the Installation Guide for set-up, configuration, and application guidelines (packaged with each valve).

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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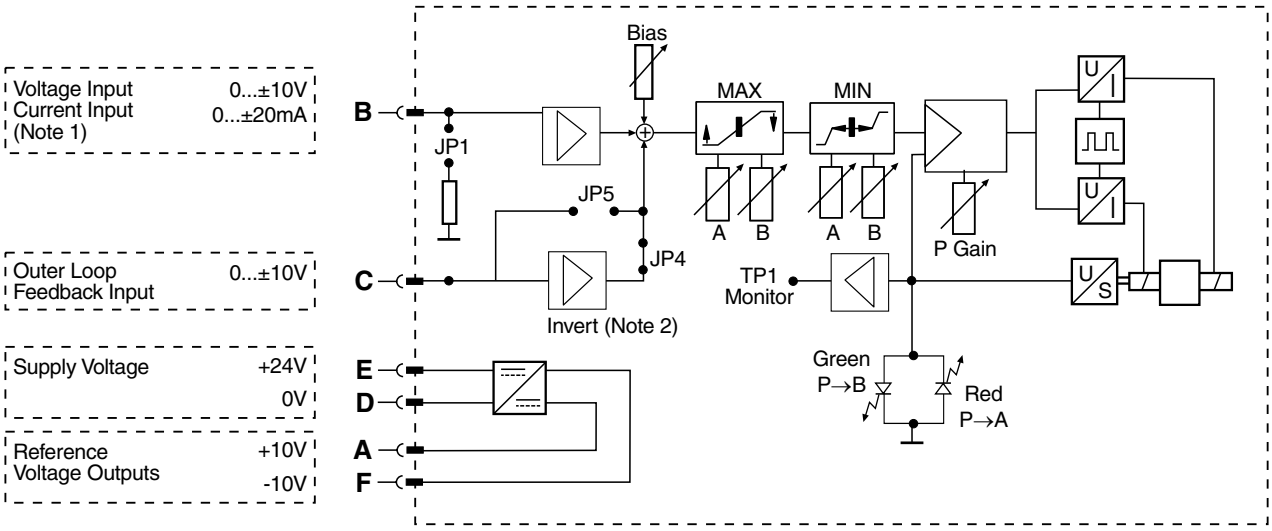
Design 'C' Option — User Configurable Analog Outer Closed Loop

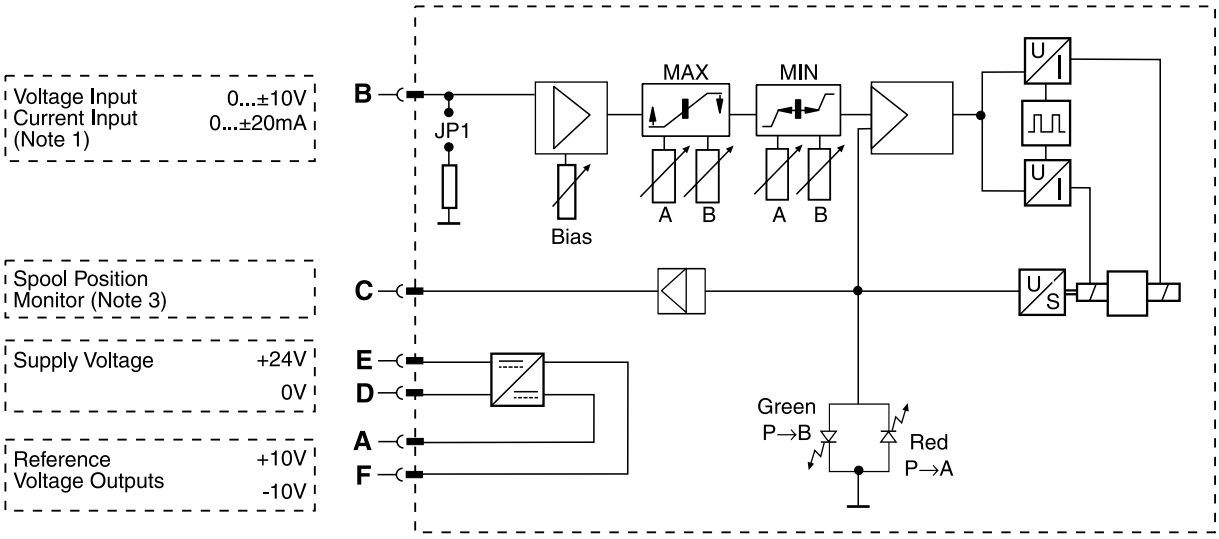
Electronic design option 'C' provides an additional analog closed outer loop function for user application. This feature can be used to control simple position control loops where analog resolution and a single proportional gain control are adequate. The design provides a single ended command input that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

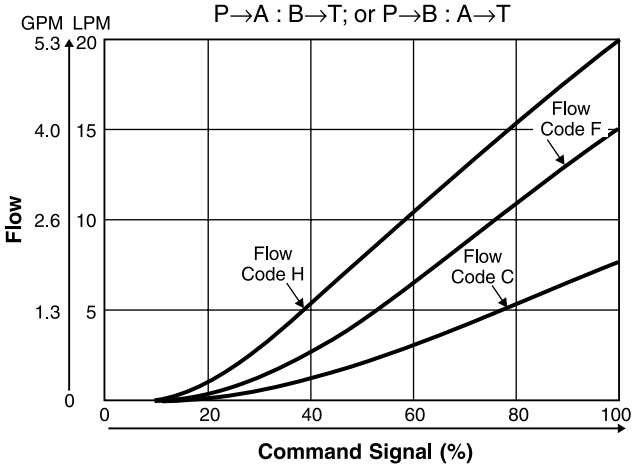
Electronic design option 'D' provides a single ended, bipolar command input that is user configurable as voltage or current. ±10 volt references are available for user supplied off-board command potentiometers. A spool position monitor output is also provided. To specify this option, refer to the Ordering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



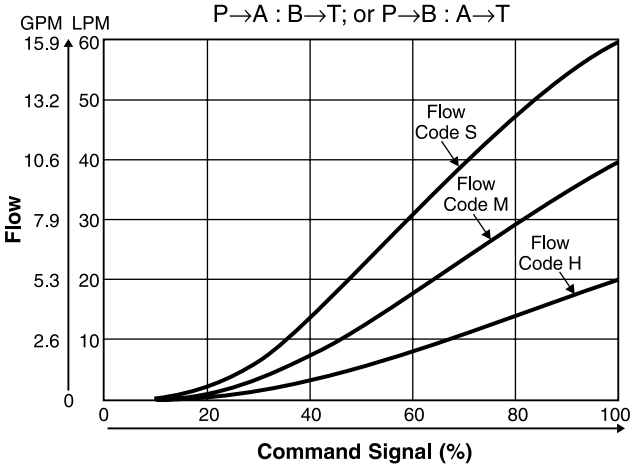
Note 1: Install jumper JP1 for current command input. Refer to Installation Bulletin 2583-M1/USA (D1FX).
Note 2: Refer to specifications.

A

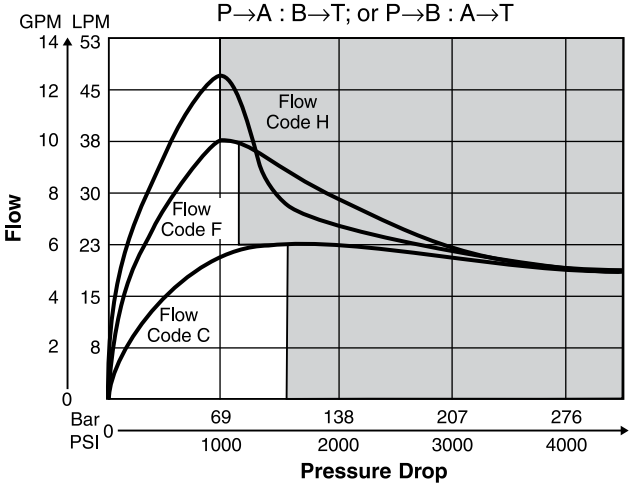
D1FX Flow Characteristics
at Δp = 5 Bar (72.5 PSI) per metering edge
P→A : B→T; or P→B : A→T



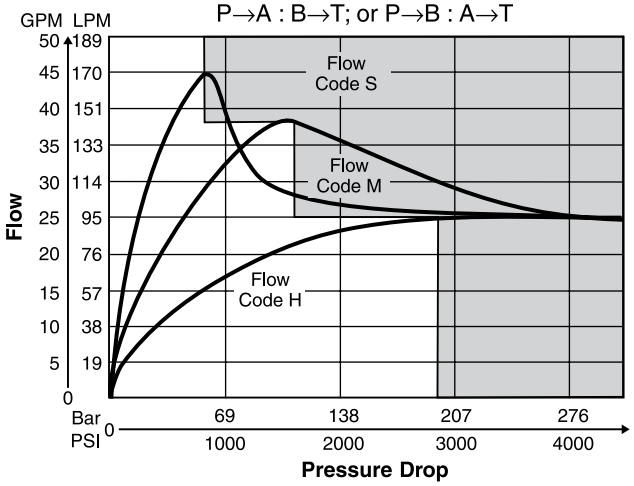
D3FX Flow Characteristics
at Δp = 5 Bar (72.5 PSI) per metering edge
P→A : B→T; or P→B : A→T



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

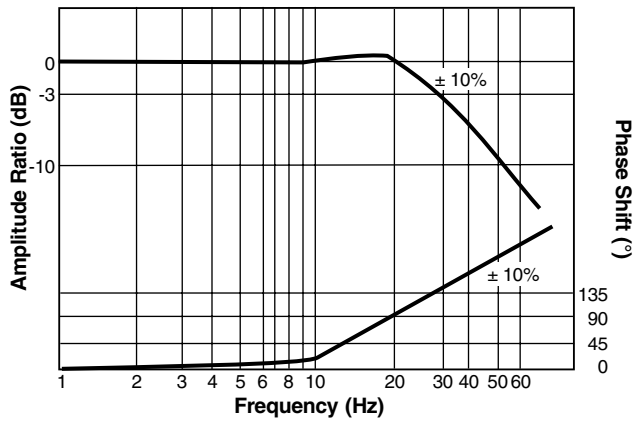


D3FX Operating Limits [1]
at 100% Command
P→A : B→T; or P→B : A→T

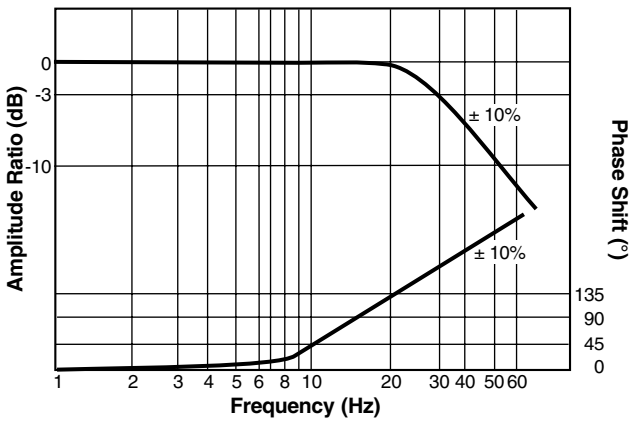


[1] Shaded area: Actual flow subject to the system load dynamics
Note: 81 and 82 spools - decrease limits by 15%

D1FX Frequency Response
at 10% Command, 50% Offset



D3FX Frequency Response
at 10% Command, 50% Offset



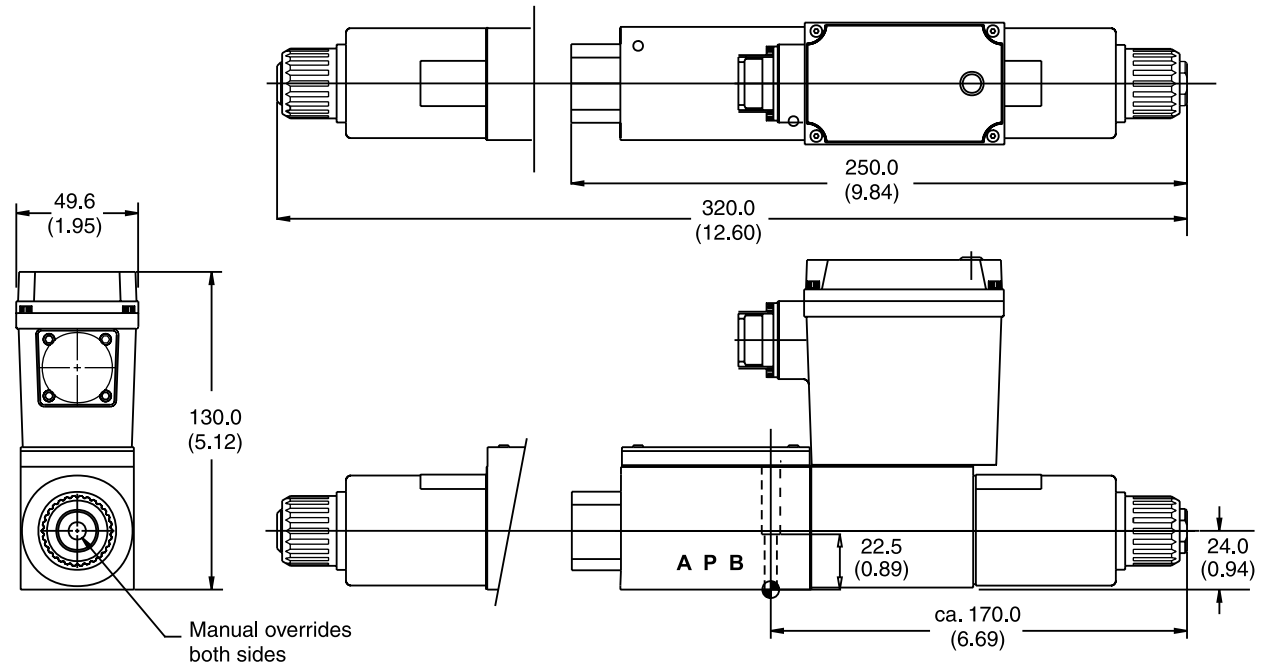
D_FX.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

A

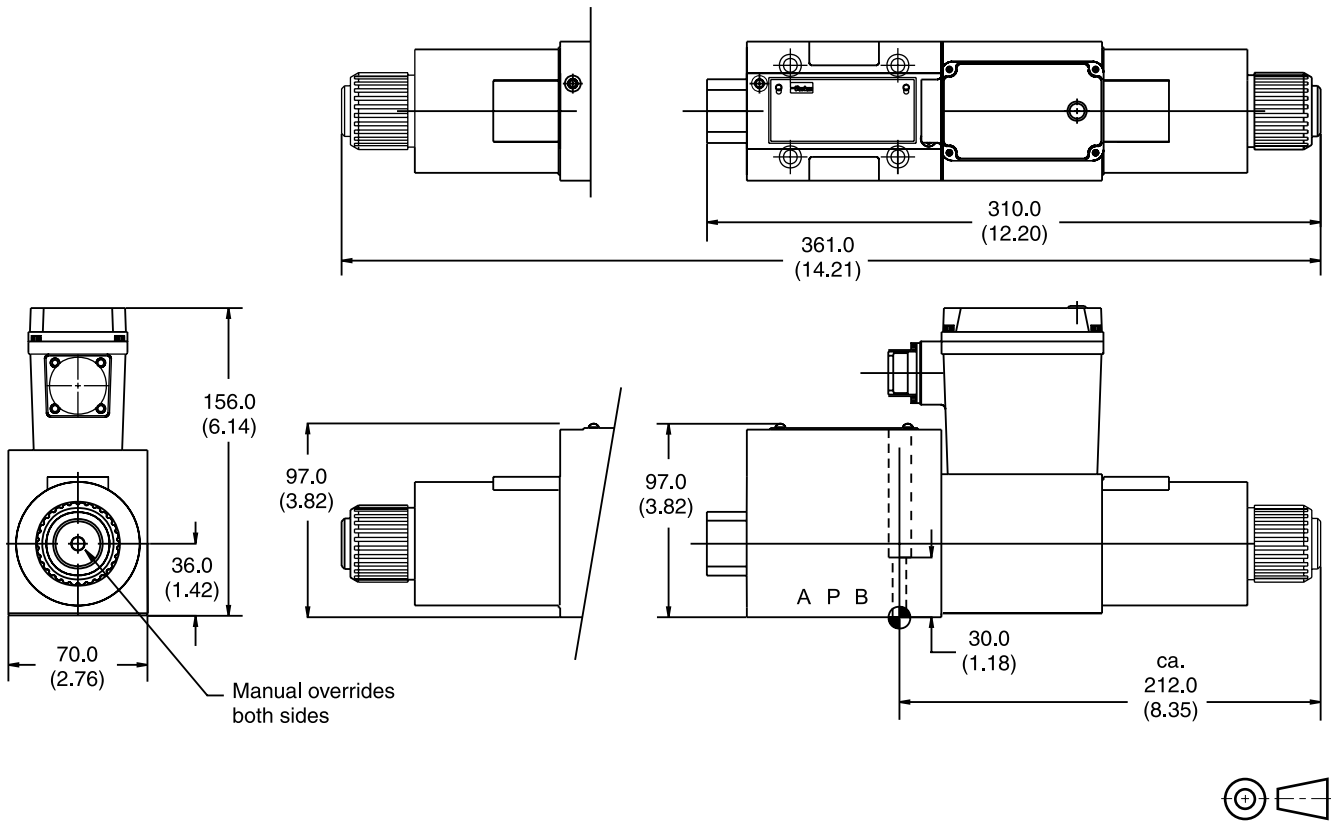
D1FX

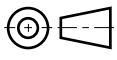
Inch equivalents for millimeter dimensions are shown in (**)



D3FX

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





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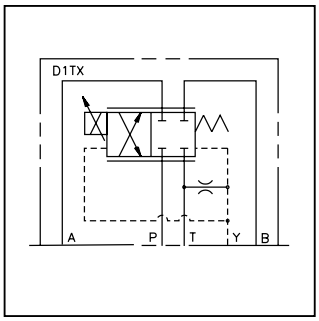
General Description

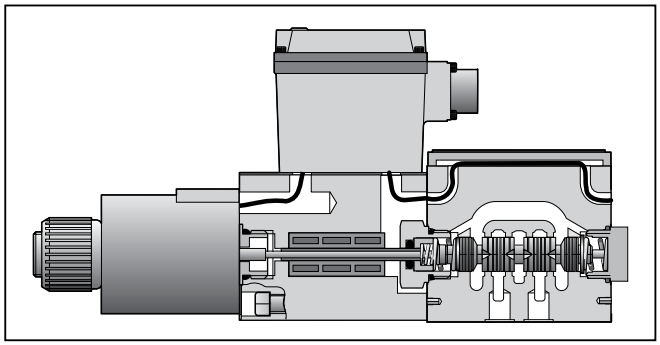
The D1TX throttle valve is designed to vary the amount of fluid flow in proportion to a variable input command signal. The valve will respond to voltage command signals of 0 to +10 VDC, or current command signals of 4-20 mA. The valve features on-board electronics and built-in spool position feedback for low hysteresis.



Operation

A minimum of 20 PSI must be maintained on the “Y or L” ports for proper operation. An external supply of 20 PSI or a 20 PSI check valve may be used for this purpose.

To simplify piping of the valve for the maximum flow output, order our flow conversion module, FCB03** which has the 20 PSI check valve already installed. This module converts all of the flow paths internally. Connect the “P” for supply pressure, “B” for outlet flow, and “Y or L” for drain line flow.



Features

- **Integral Electronics** — Eliminates the time consuming and often costly wiring between the valve and driver card. Provides a fully tested valve/driver package.
- **LVDT** — The spool position feedback provides low hysteresis.
- **Manual Override**
- **Diagnostic Indicator** — An LED confirms movement of the spool.
- **Rugged Construction** — Integral electronics are packaged in a rugged die cast aluminum enclosure to protect it from harsh environments.
- **Electrical Interface** — Standard MS style connector for interface to computers and PLC's.

Specifications

Interface	NFPA D03, CETOP 3
Maximum Pressure	207 Bar (3000 PSI)
Drain Line Pressure ("T" and "Y" or "L")	1.4 Bar (20 PSI) minimum 35 Bar (500 PSI) maximum
Flow	Up to 61 LPM (16 GPM) (Dual Ported)
Frequency Response	> 20 Hz with 10% CMD at 50% spool stroke
Step Response	Versions BJ, DJ: Full Shift, <60 mS Version DK: Full Shift, <70 mS
Repeatability	< 0.5% of spool stroke
Hysteresis	< 1.5%
Nominal Deadband	10%
Power Requirements	24 VDC @ 3 amps nom.** (BJ, DJ) Range 21 to 30 VDC regulated 12 VDC @ 3 amps nom. (DK)** Range 11.5 to 15 VDC regulated ****4 amp regulated power supply recommended**

Version	Command Signal	Input Impedance
BJ, DJ	0 to + 10 VDC Sgl. Coil	100 k ohms
DK	0 to + 5 VDC Sgl. Coil	100 k ohms
BJ, DJ	4 to 20 mA Command	499 ohms
DK	4 to 20 mA Command	249 ohms

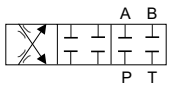
Operating Temp. Range (Ambient)	24 volt model: -20° to 60°C (-4° to 140°F) 12 volt model: -29° to 60°C (-20° to 140°F)
Spool Position Voltage	Version BJ, DJ: (-10 VDC) Version DK: (-5 VDC)
Reference Supply	+10 VDC @ 10 mA (BJ, DJ) +5 VDC @ 10 mA (DK)
Low Power Fault Protection	20 VDC (BJ, DJ) 11 VDC (DK)
Diagnostics	Red LED for spool position
Viscosity Range	75 - 600 SSU
Fluid Cleanliness	ISO Class 16/13, SAE Class 4 or better
Protection Class	Nema 4 (IP65)

D1T	X	E	01		E	9				0	0	
D03 Electrohydraulic Directional Flow Control Valve	Control Option	Equal Metering	Spool Type	Flow	Style	External Drain	Seal	Electronic Variations	Supply Voltage	Electronic Accessories	Valve Accessories	Design Series NOTE: Not required when ordering

Control Option

Code	
X	Integral LVDT & Control Electronics

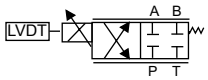
Spool Type

Code	Spool
01	

Flow

Code	Flow @ ΔP = 5 Bar (72.5 PSI) per metering edge
C	15 LPM (4.0 GPM)
F	30 LPM (7.9 GPM)

Style

Code	Description	Style
E	Uni-Directional	

External Drain

Code	Description
9	Plugged

Seal

Code	Description
N	Nitrile
V	Fluorocarbon

Electronic Variations

Code	Description
B	Euro Driver (7 pin MS) w/external shutdown
D	Standard Driver w/deadband eliminator & 6 pin MS

Supply Voltage

Code	Description
J	24 VDC
*K	12 VDC

* Only available in version 'D'

Electronic Accessories

Code	
0	

Valve Accessories

Code	
0	

Design Series

NOTE: Not required when ordering

Bolt Kit:
BK209 (4) 10-24x1.25 SHCS

Weight:
Single Solenoid 3.2 kg (7.0 lbs.)

FCB	03			
Flow Conversion Block	Size	Subplate Drain Port	Seal	

Size

Code	Description
03	D03

Subplate Drain Port

Code	Description
Y	"Y" Drain Port (standard)
L	"L" Drain Port (optional)

Seal

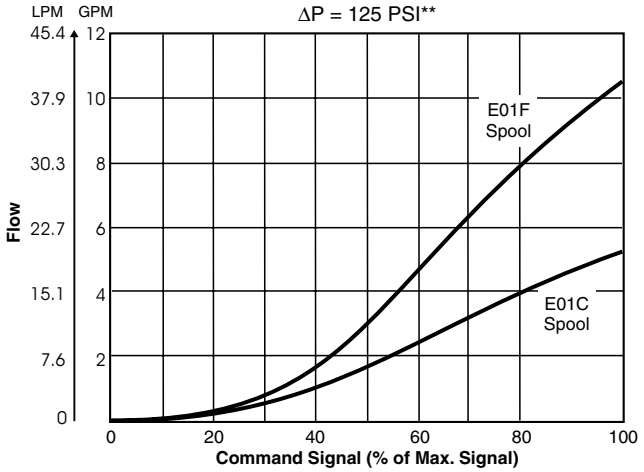
Code	Description
N	Nitrile
V	Fluorocarbon

Use Bolt Kit BK243 when including the FCB under the D1TX.

A

Performance Curves

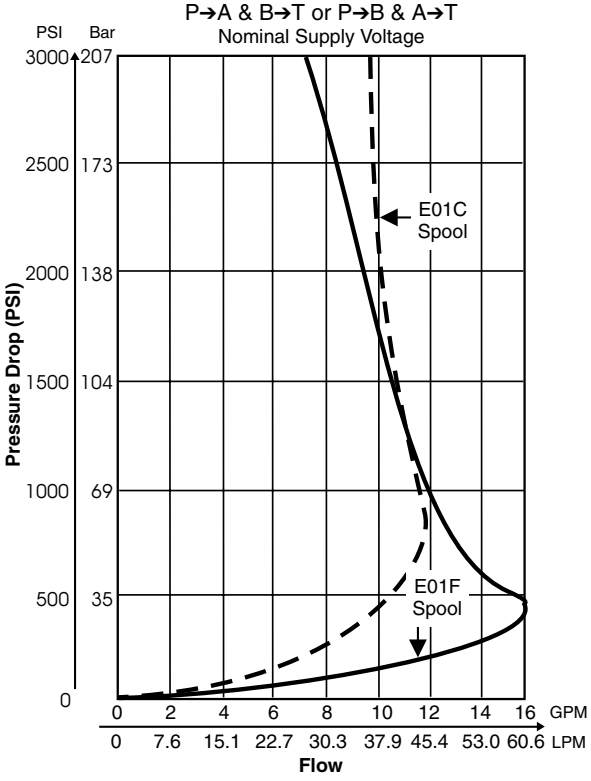
Flow vs. Input Command
Parallel Flow Path Connected*
ΔP = 125 PSI**



* Requires Flow Conversion Block FCB**

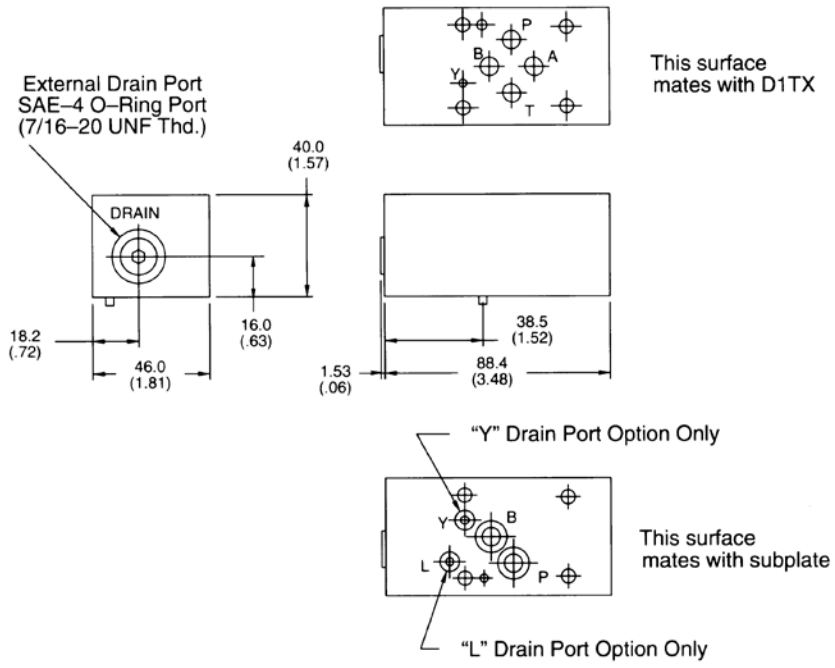
** Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

Operating Limits
Max. Pressure Drop/Flow Envelope
at 100% Command Signal
Parallel Flow Path*
P→A & B→T or P→B & A→T
Nominal Supply Voltage

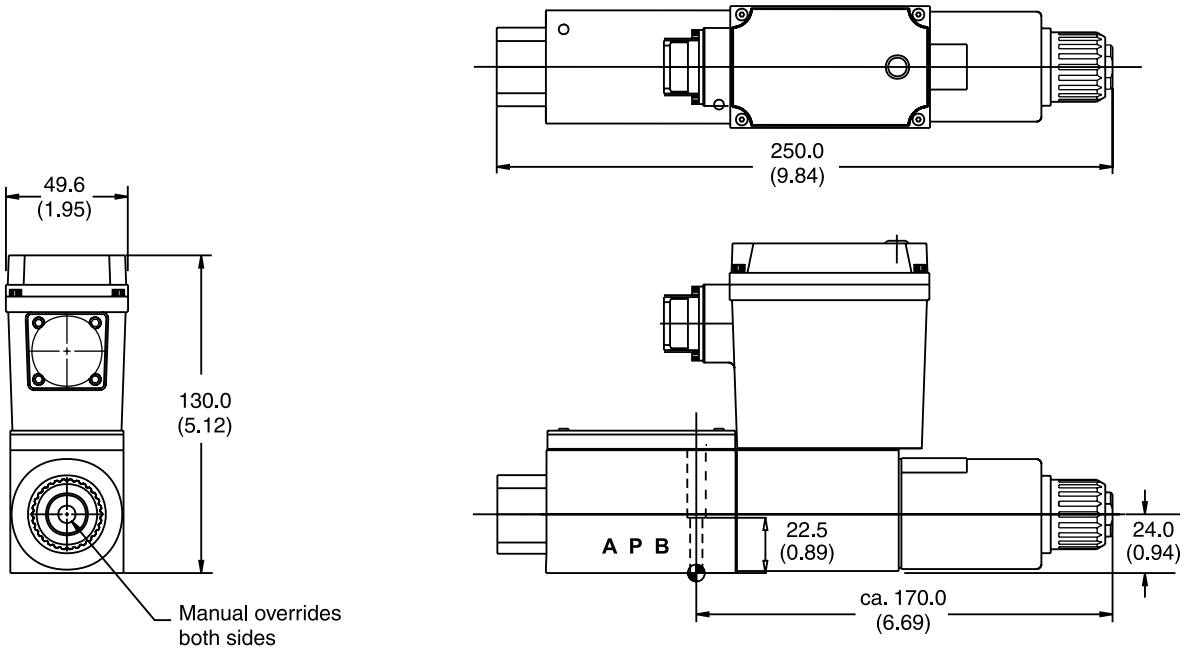


Flow Conversion Block FCB03

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

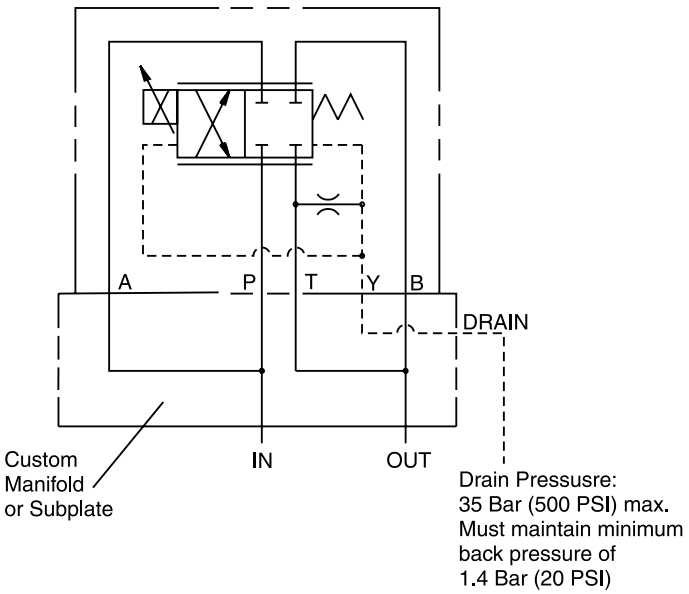


Inch equivalents for millimeter dimensions are shown in (**)

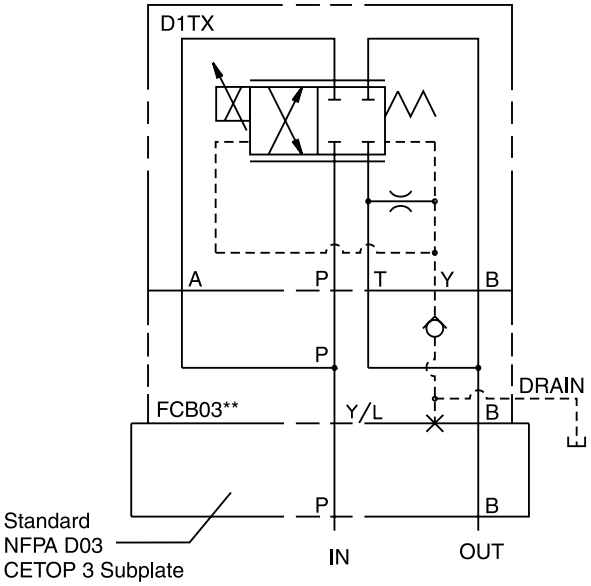


Hydraulic Connections

Parallel Flow Hydraulic
Connections for D1TX Valve



Parallel Flow Hydraulic Connections for
D1TX Valve with Flow Conversion Block



Mounting Surface

Surface must be flat within
0.10 (.0004) T.I.R. and
smooth within 32 micro-inch.

Torque bolts to 5.6 N.m.
(50 in.-lbs.)

COMBINATION	Required Ports					
	P	A	B	T	Y	L
D1TX valve alone	✓	✓	✓	✓	✓	
D1TX w/FCB03Y	✓		✓		✓*	
D1TX w/FCB03L	✓		✓			✓*

*Y & L port not required if external drain port (SAE-4) is used.

D1TX.indd, dd

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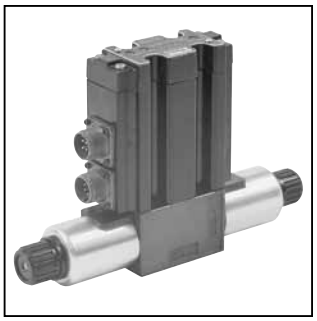
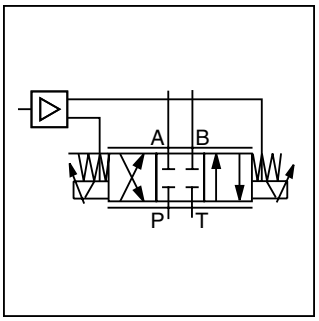
General Description

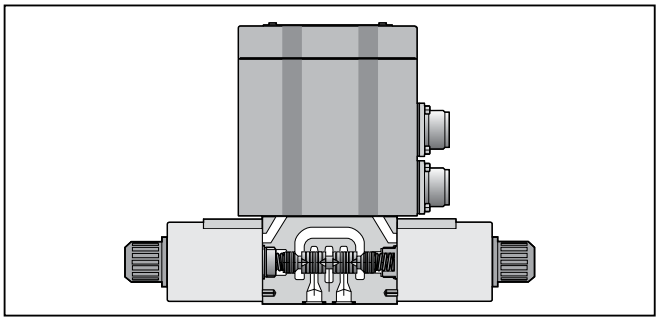
Series D**FL proportional directional control valves are packaged with an integrated microprocessor based open-loop motion profiler. The valve directly accepts electrical on/off logic signals which trigger simple motion profiles controlling actuator speed, acceleration, and deceleration.

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.

CE

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:

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

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

D_1FL.p65, dd

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Elyria, Ohio, USA

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D*FL | ☐ | ☐ | **C** | ☐ | ☐ | **J** | **0** | ☐ | ☐

Proportional Directional Control Valves with Intergrated Motion Control Electronics | Spool Type | Flow | Style | Seal | Electronic Variation | Supply Voltage | Electronic Accessories | Valve Accessories | Design Series

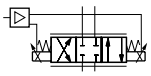
NOTE: Not required when ordering.

Code	Description
D1FL	NG6/CETOP 3
D3FL	NG10/CETOP 5

See Note 1.

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
J	24 VDC

Code	Style
C	

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

Code	Description
0	Standard
4	CSA Approved

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.

Code	Flow at Δp 5 Bar (72.5 PSI) per metering edge	
	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** | ☐ | ☐ | **C** | ☐ | ☐ | ☐ | **0** | ☐ | ☐

Pilot Operated Proportional Directional Control Valves with Intergrated Motion Control Electronics | Spool Type | Flow | Style | Pilot Connection | Seal | Electronic Variation | Electronic Accessories | Valve Accessories | Design Series

NOTE: Not required when ordering.

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

Code	Description
N	Nitrile
V	Fluorocarbon

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

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

Code	Description
0	Standard
2	Pilot Pressure Reducer[3]
4	CSA Approved

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

V-Notch Spools			
Code			Spool Type
$Q_A=Q_B$	$Q_A>Q_B$	$Q_B>Q_A$	
E21	B41	A41	
E22	B42	A42	

Code	Flow at Δp 5 Bar (72.5 PSI) per metering edge	
	D41FL LPM (GPM)	D91FL LPM (GPM)
D	100 (26.5)	–
F	–	200 (53)

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

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.

D_1FL.p65, dd

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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):

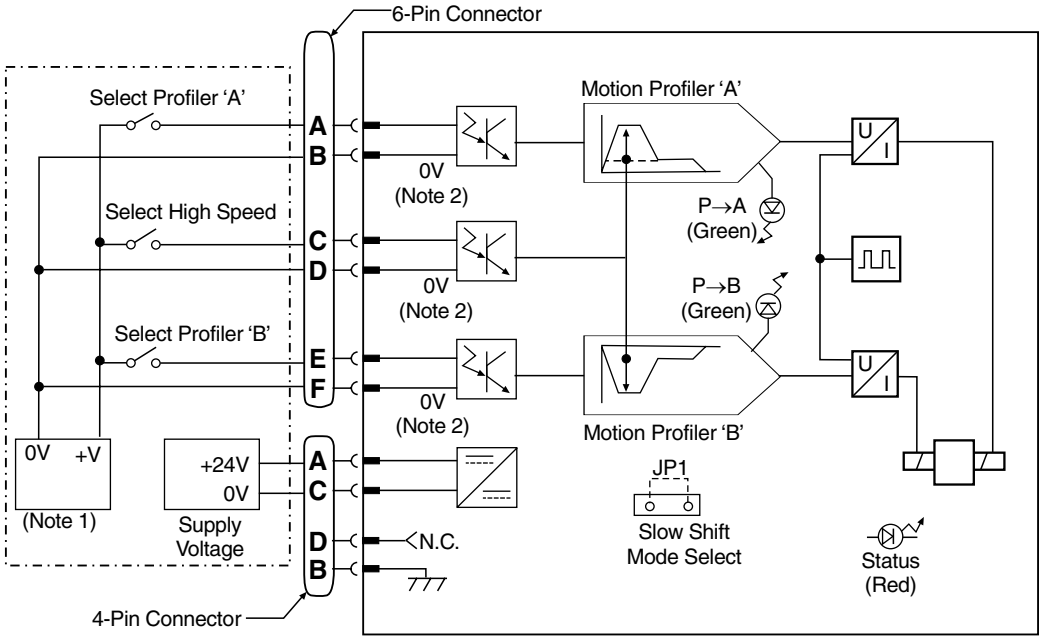
D1FL: Installation Guide Bulletin 2589-M2/USA

D3FL: Installation Guide Bulletin 2589-M3/USA

D41FL,
D91FL: Installation Guide Bulletin 2589-M1/USA

A

Block Diagram — Wiring

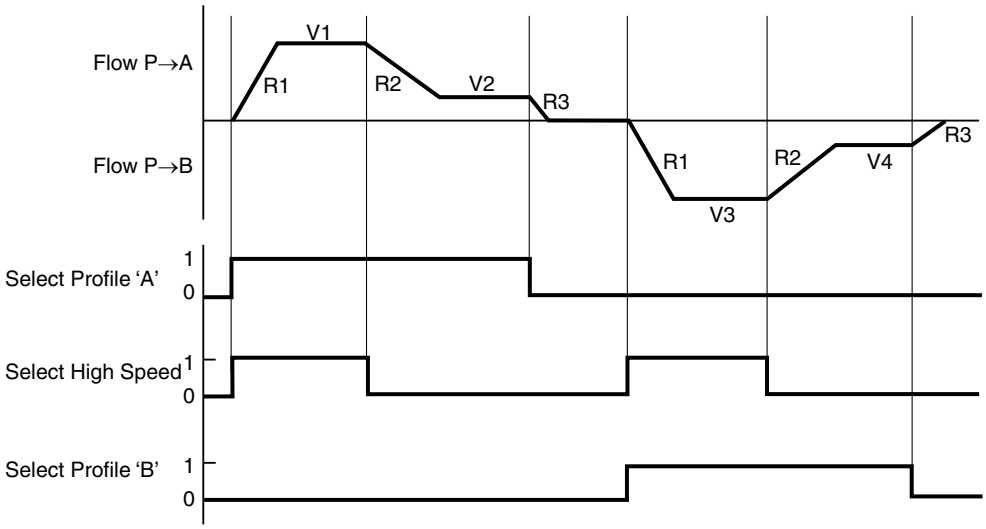


Notes:

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 ProfileA' 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.



D_1FL.p65, dd

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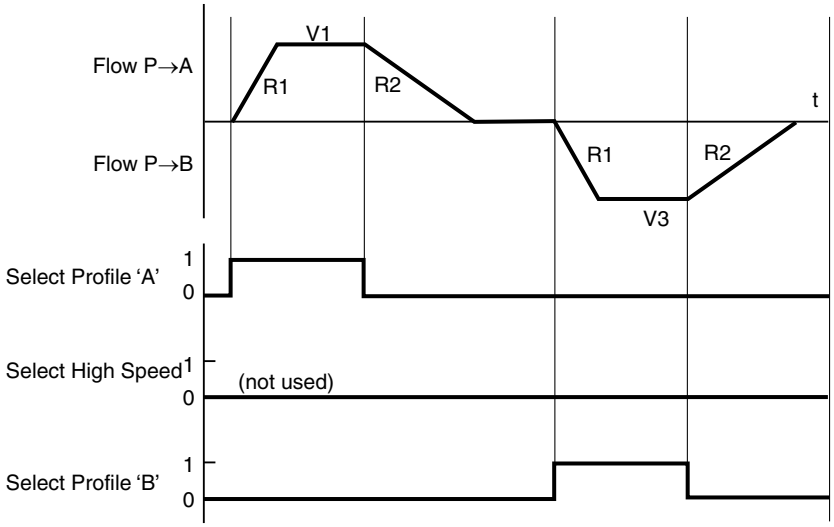
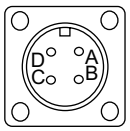
Interface — 'Slow Shift' mode (see timing diagram below)

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.

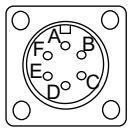


4-Pin Power Supply Plug



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

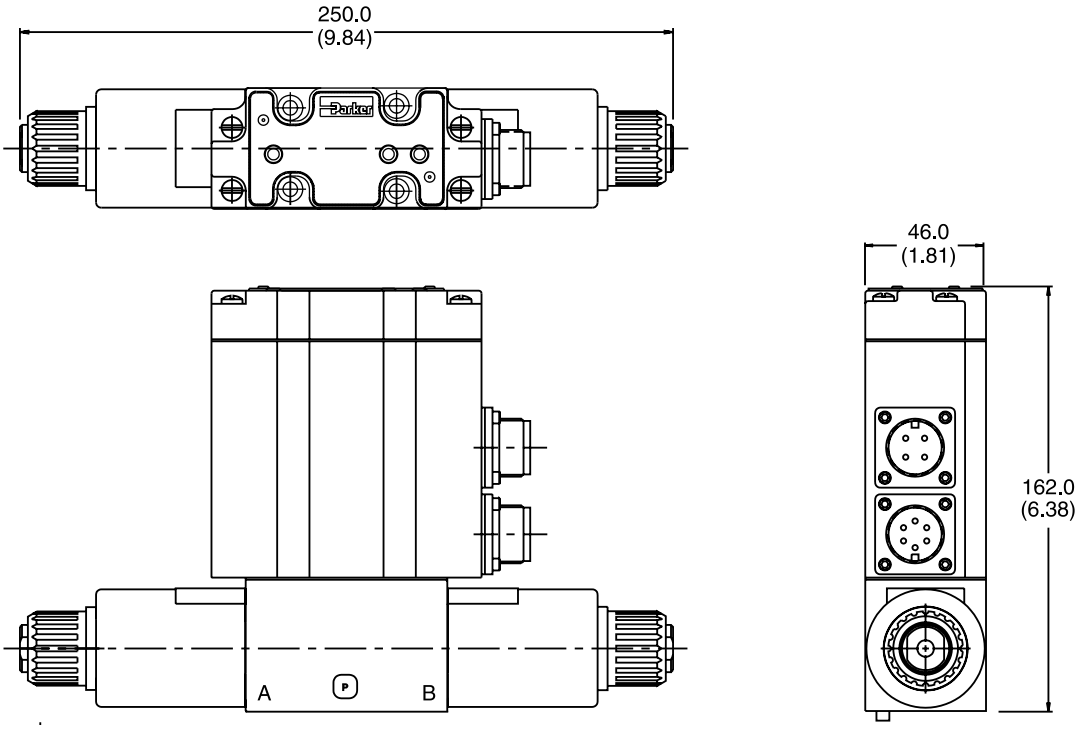
6-Pin Logic Input Plug



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)

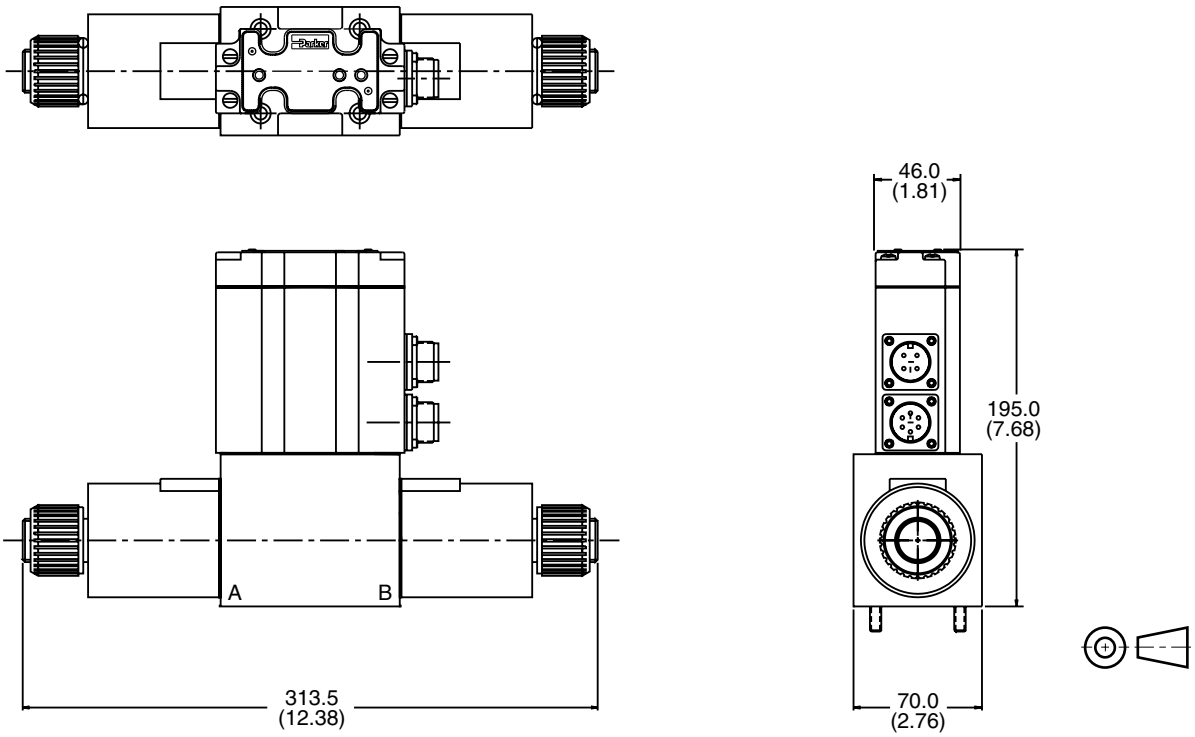
D1FL

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



D3FL

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

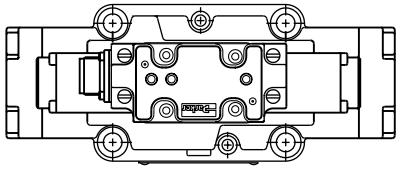


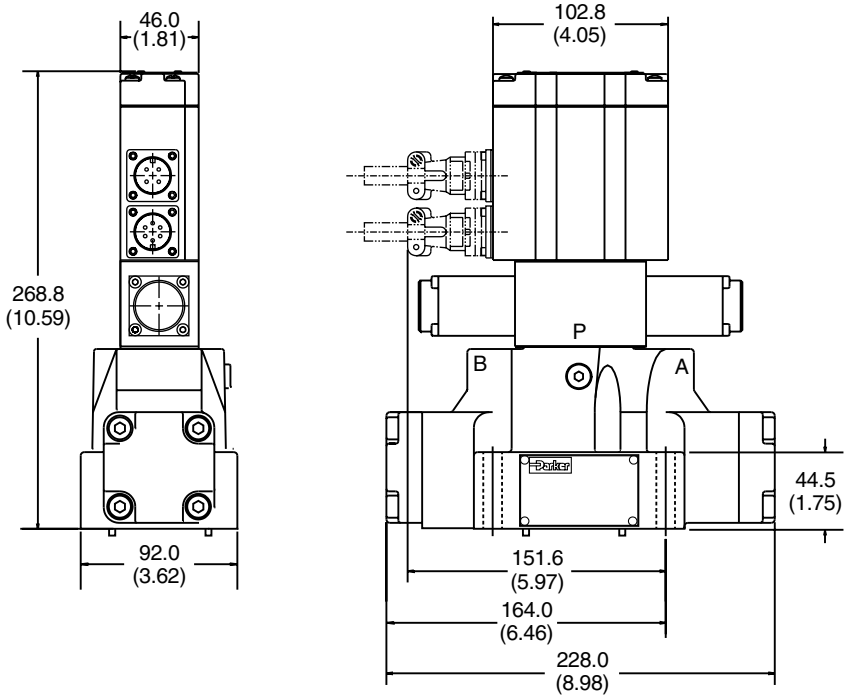
D_1FL.p65, dd

A

D41FL

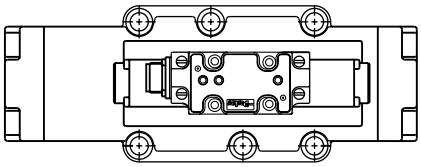
Inch equivalents for millimeter dimensions are shown in (**)

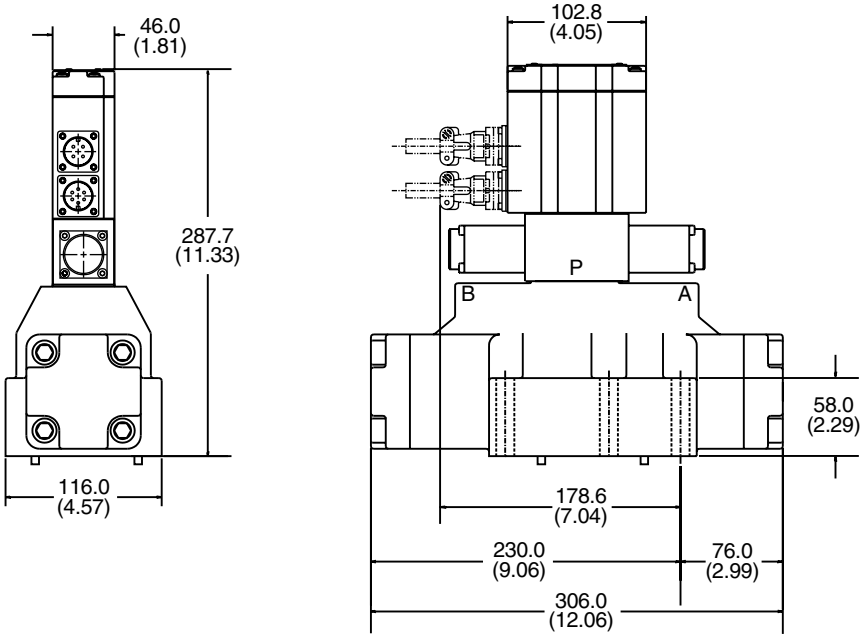


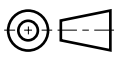


D91FL

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





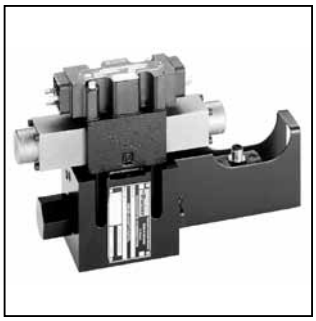


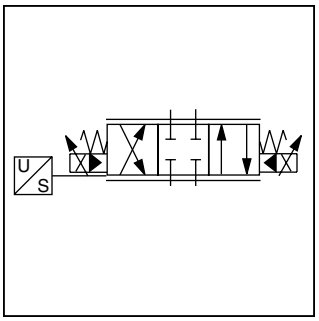
D_1FL.p65, dd

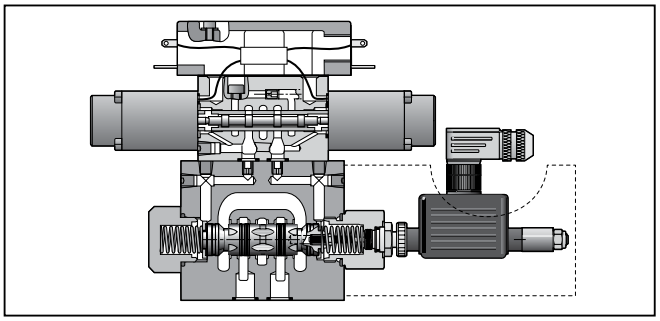
General Description

Series D*1FS proportional directional control valves are high performance, two stage pilot operated solenoid valves with electronic spool position feedback. Valves are controlled by 'PWD' Series DIN electronics. Valves are available in sizes NG10 (CETOP 5), NG16 (CETOP 7), NG25 (CETOP 8) and NG32 (CETOP 10).

D*1FS 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.

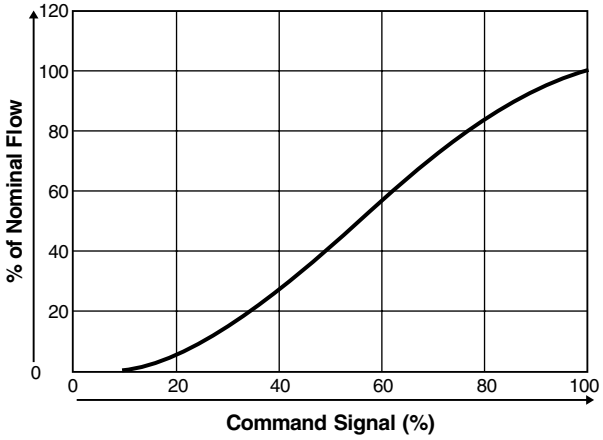






Performance Curve

Flow Characteristics
at 5 Bar (72.5 PSI) per metering edge
Typical flow curve



Features

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

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) LPM (GPM)	45 (12)	120 (32)	300/400 (79/106)	1000 (264)
Maximum Flow	389@ 1500 PSID	1208@ 2700 PSID	193@ 1500 PSID	
Step Response (time to reach 90% of a 100% step command) ms	35	60	80	200

Repeatability	%	<0.5	
Hysteresis	%	<0.5	
Pilot Flow Continuous	LPM (GPM)	<1.2 (0.3)	
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)	
Fluid Viscosity, Recommended		80 – 1000 SSU	

Fluid Cleanliness Level	ISO Class 16/13
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)
Electronic Driver Boards (refer to electronics section)	PWD Series Drivers
Mating Connector	
Solenoid (DIN 43650)	Part #692914 (black) Part #692915 (gray)
LVDT (M12, 5 pin)	included w/valve
Environmental Protection Class	NEMA 1 (IP54)

A

D		1	F	S							W		
Directional Control Valve	Size	Pilot Operated	Flow Control	With Spool Position Feedback	Spool Type	Flow	Pilot Connection	Seal	Solenoid Voltage	Solenoid Connection	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 ∅ 32mm ports

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
W	Socket connector DIN 43650 without plugs

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

Code	Description
L	6 VDC
X*	16 VDC

* For use with "EW" driver card

Code	Description
0	Std., no accessories
2	Pilot pressure reducer

V-Notch Spool Options - Spool Type and Flow Codes

Code $Q_A=Q_B$	Code $Q_A>Q_B$ [2)]	Spool Type
E01	B31	
E02	B32	

Code	Flow: LPM (GPM) at ∆p 5 Bar (72.5 PSI) per metering edge				
	D31	D41	D81	D91	D111
B	45 (12)	–	–	–	–
C	–	120 (32)	–	–	–
E	–	–	300 (79)	–	–
H	–	–	–	400 (106)	–
L	–	–	–	–	1000 (264)

2) Reduced flow rate on port B, nominal flow at port A
Code A* for spool $Q_B > Q_A$ optional

Weight:

D31FS	7.1 kg (15.7 lbs.)
D41FS	10.8 kg (23.8 lbs.)
D81/91FS	19.0 kg (41.9 lbs.)

Accessories

Refer to the Accessories section for bolt kits, subplates, connectors.

Driver Cards

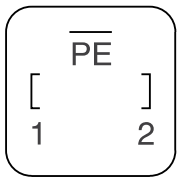
Refer to the Electronics section for driver cards and support electronics.

Mounting Interface

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

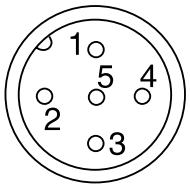
Wiring

Solenoid Coil



1 = coil connection
2 = coil connection
PE = ground potential

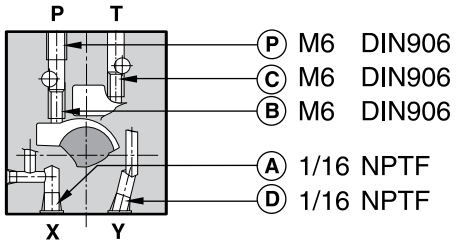
Spool position sensor (LVDT)



1 = output, spool position
2 = supply (+24V)
3 = GND (0V)
4 = not used
5 = protective ground

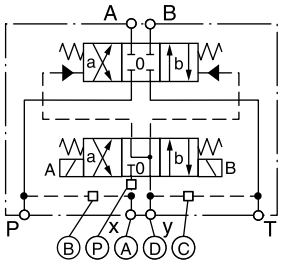
Pilot Connection

D31FS

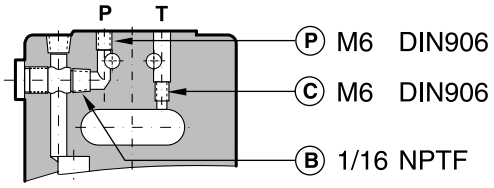


○ open, ● closed

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

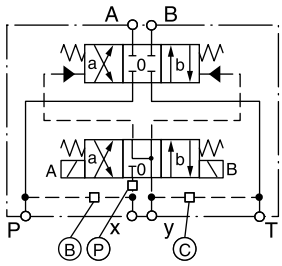


D41FS

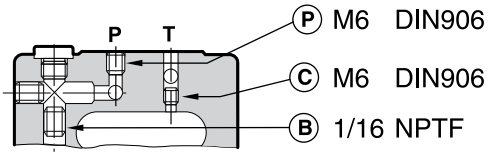


○ open, ● closed

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

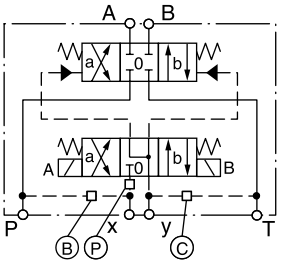


D91FS

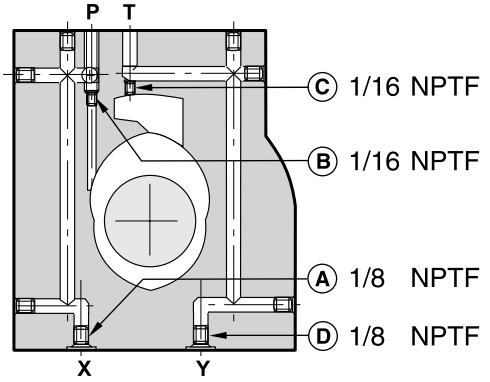


○ open, ● closed

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

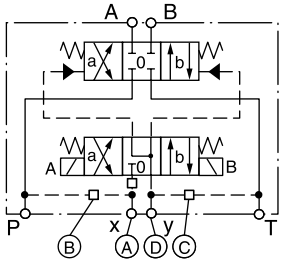


D111FS



○ open, ● closed

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



D_1FS.indd, dd

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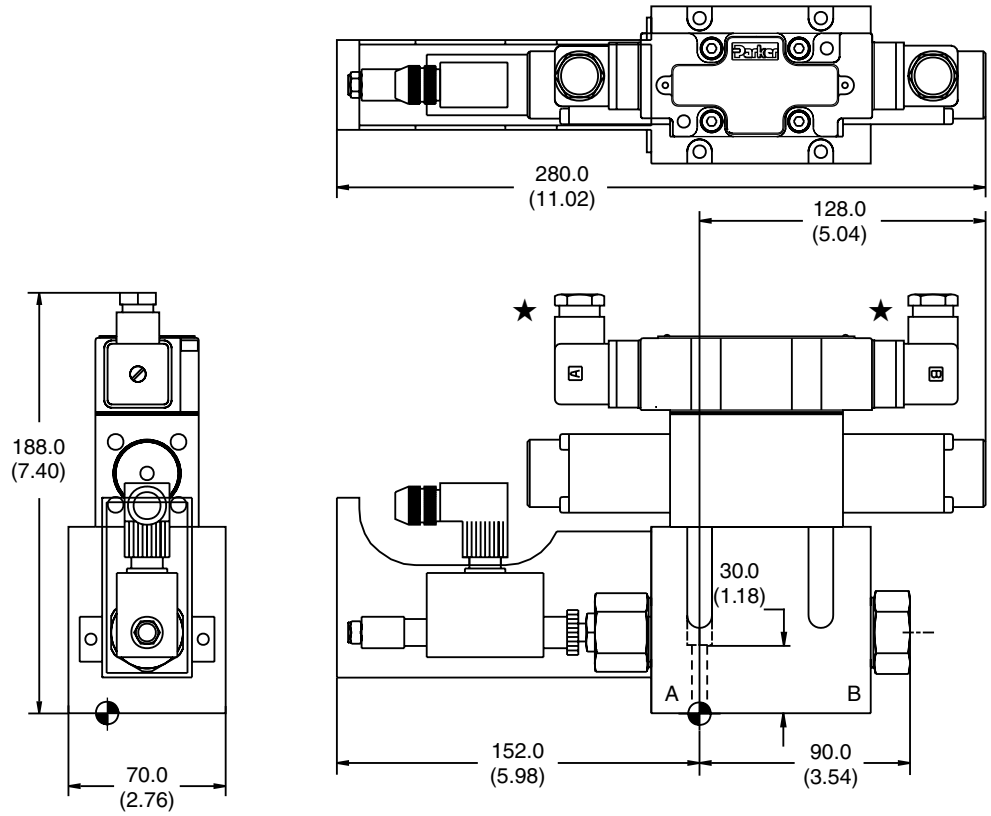
Elyria, Ohio, USA

A

D31FS

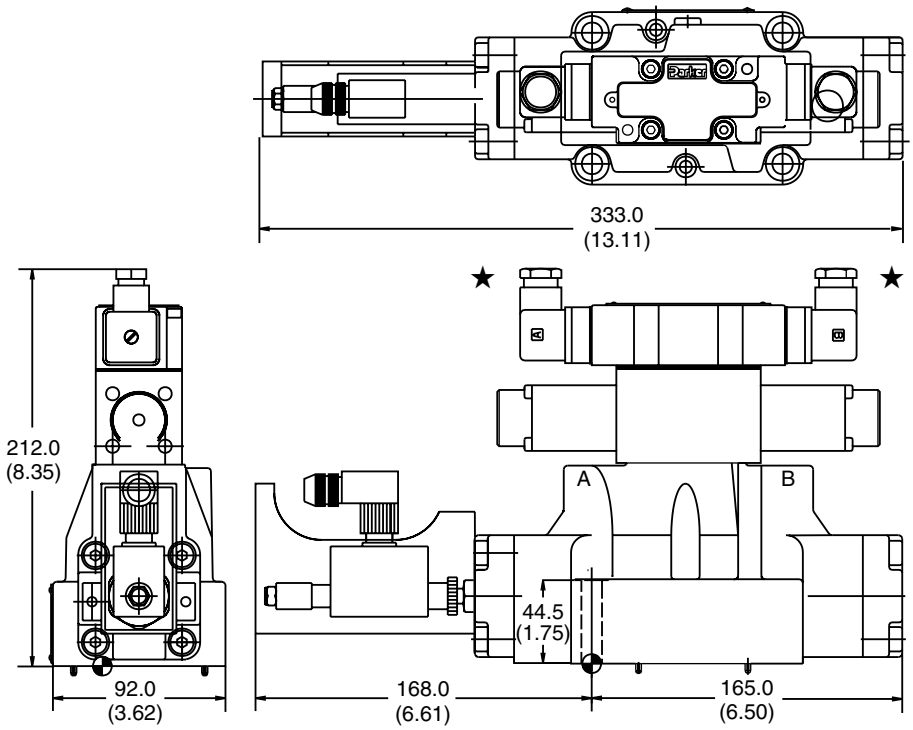
Inch equivalents for millimeter dimensions are shown in (**)



★ Order plugs separately.

D41FS

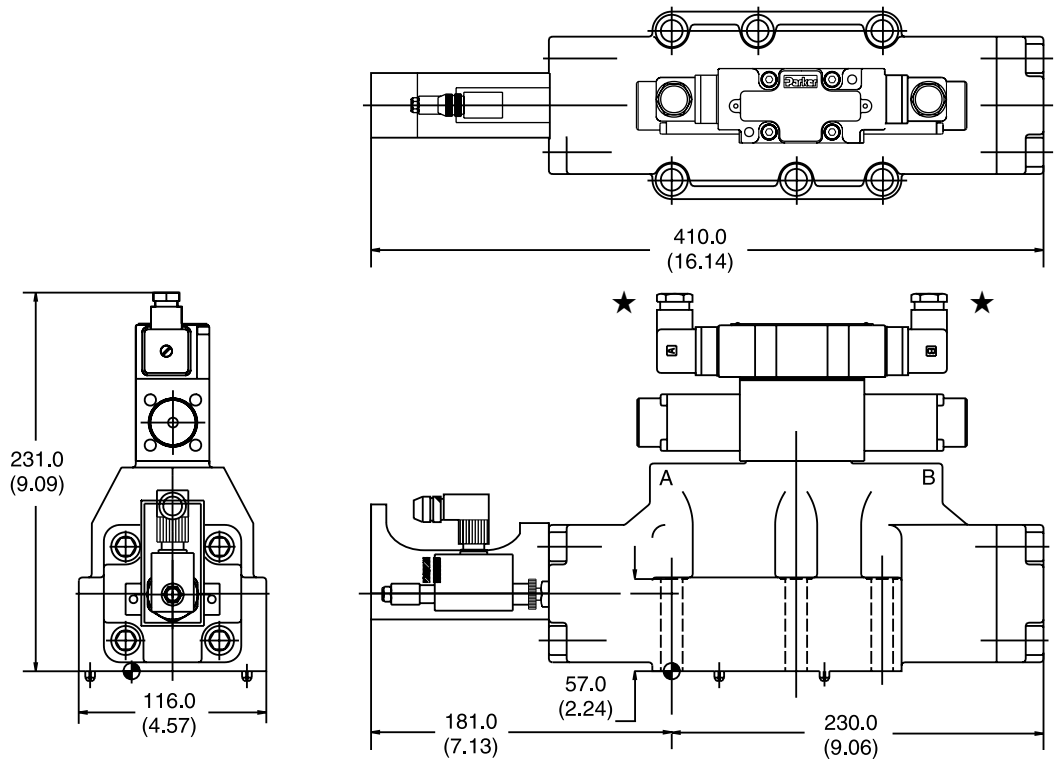
Inch equivalents for millimeter dimensions are shown in (**)



D_1FS.indd, dd

D81FS and D91FS

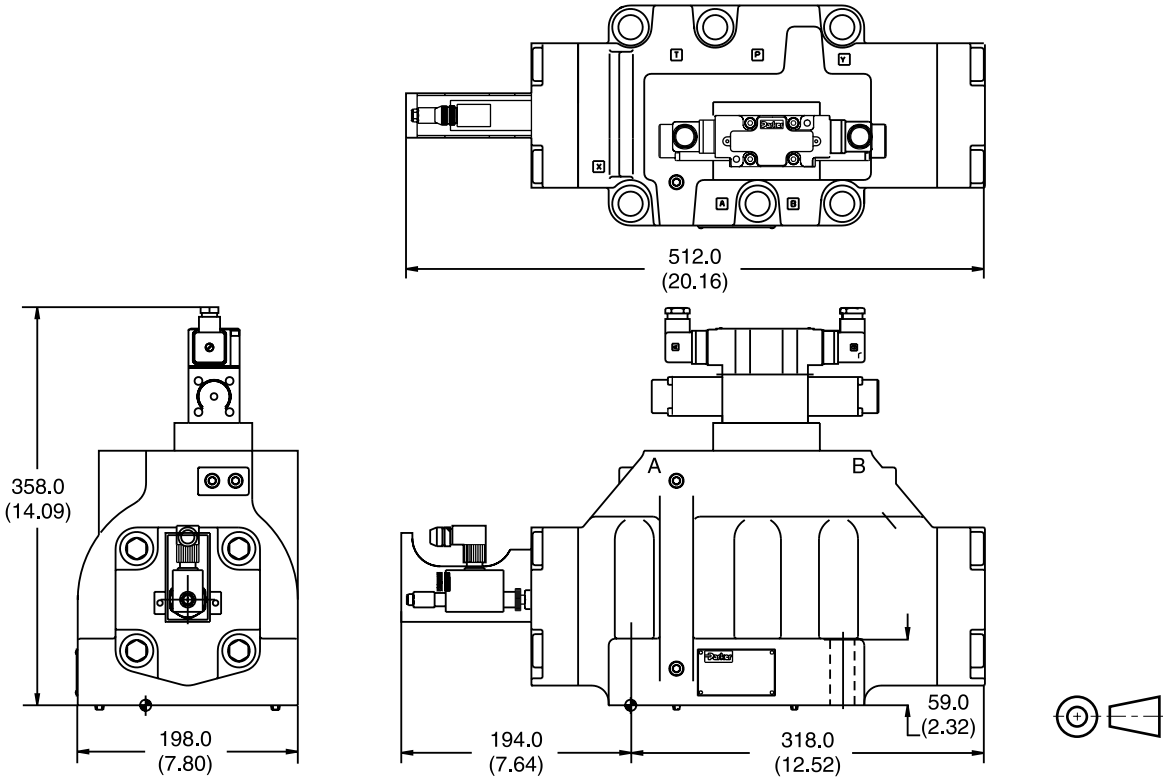
Inch equivalents for millimeter dimensions are shown in (**)



★ Order plugs separately.

D111FS

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



D_1FS.indd, dd

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Elyria, Ohio, USA

A

General Description

Series D*FH is a high response, proportional servovalve 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.

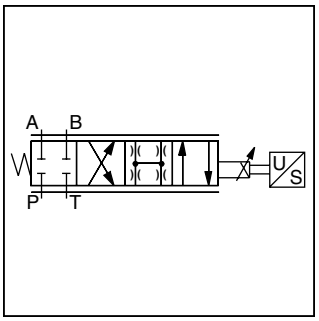
Operation

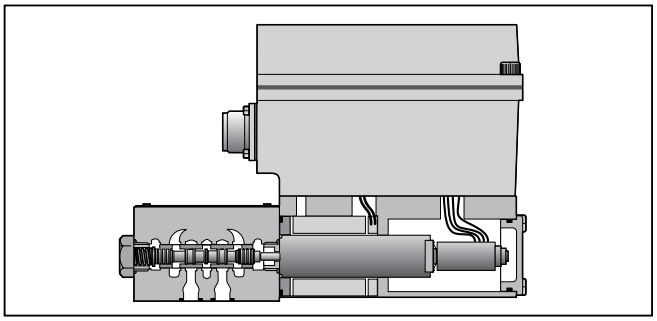
Series D*FH

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).

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
J	24 VDC

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

Code	Description
H	High Response
M	High Response, Dual Gain

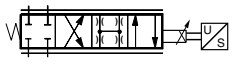
Code	Description
N	Nitrile
V	Fluorocarbon

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

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.

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	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.

A

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)

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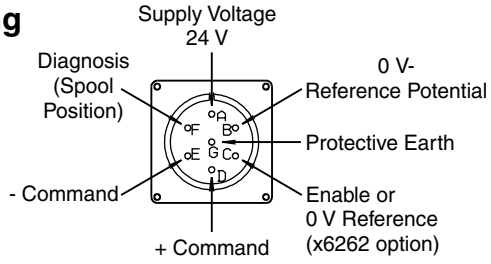
Wiring

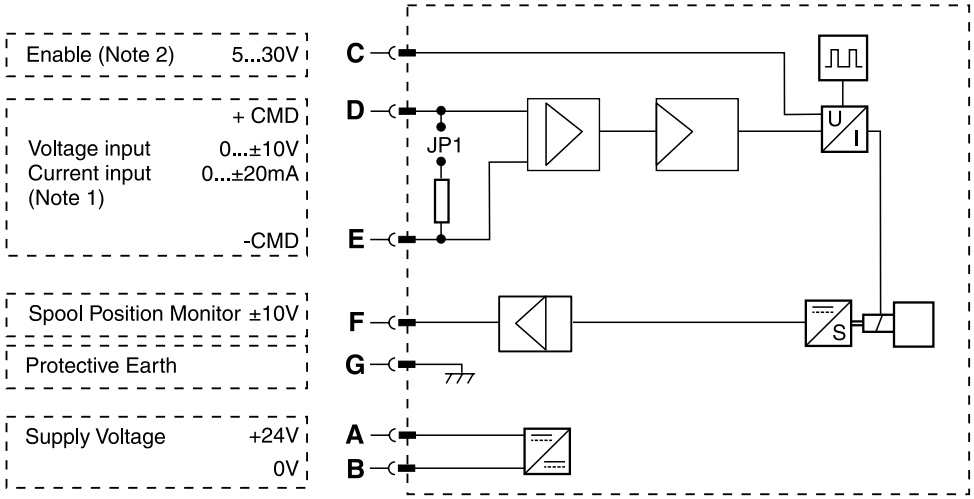


Installation Guidelines

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

Block Diagram

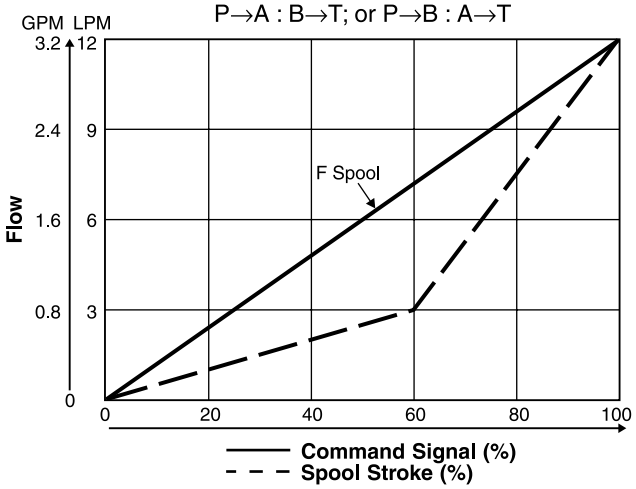


Note 1: Install jumper JP1 for current command input. Refer to installation guide Bul. HY14-2599-M1/US.
Note 2: Valves can be ordered with pin 'C' internally grounded to be interchangeable with some competitor products. Refer to Ordering Information page.

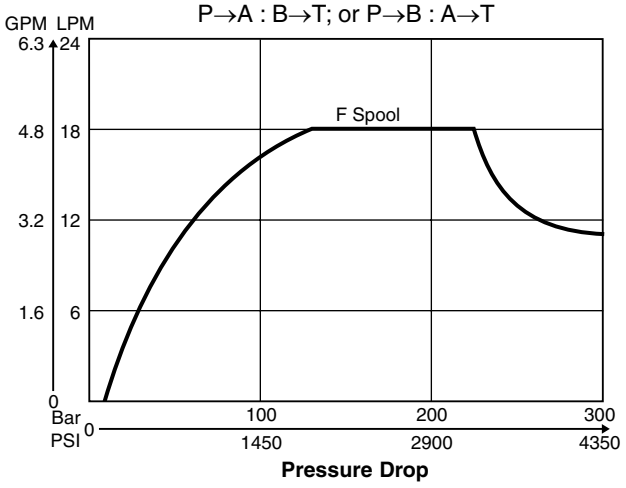
Performance Curves

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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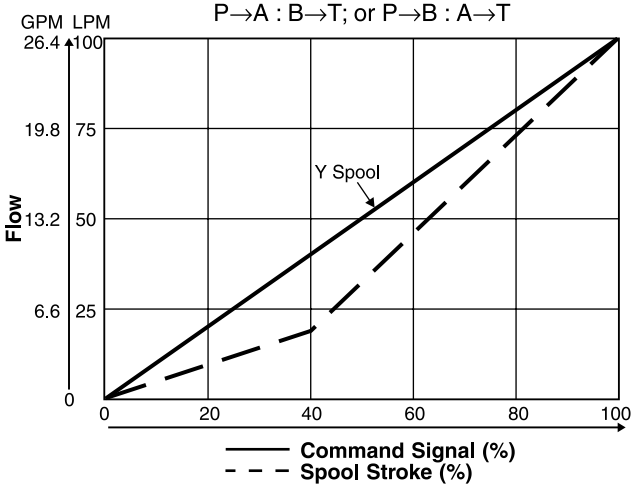
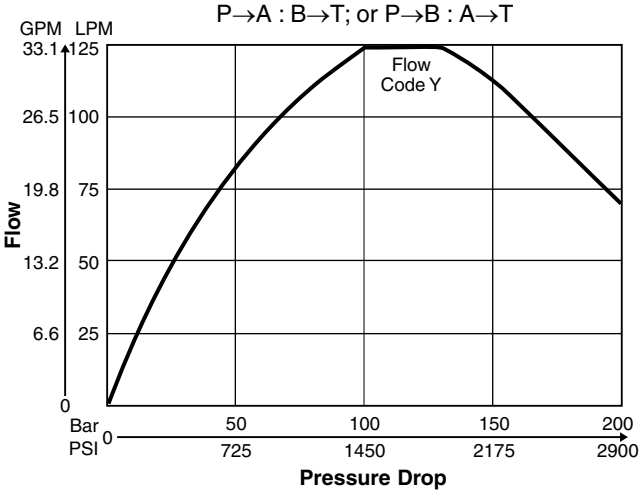
D3FM Flow Characteristics

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



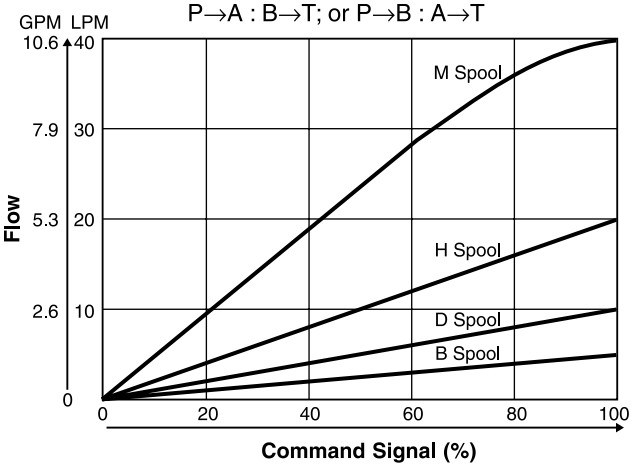
D3FM Operating Limits

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



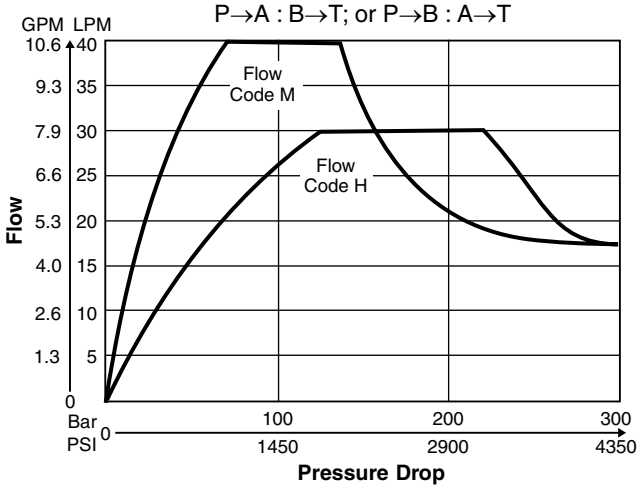
D1FH Flow Characteristics

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

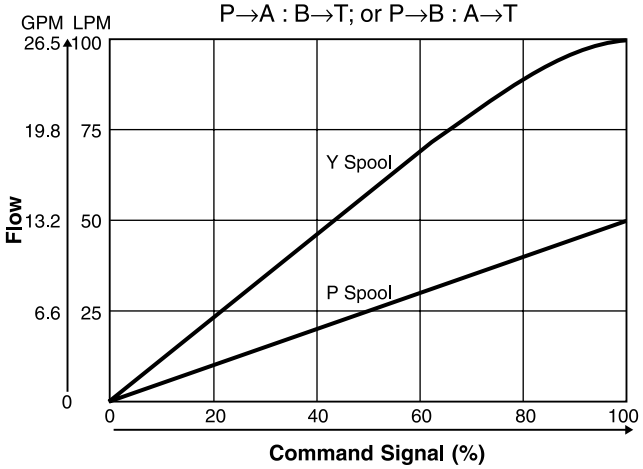


D1FH Operating Limits

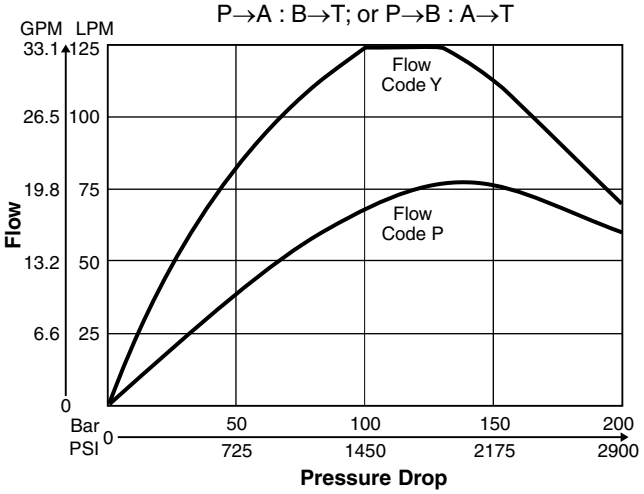
at 100% Command
P→A : B→T; or P→B : A→T



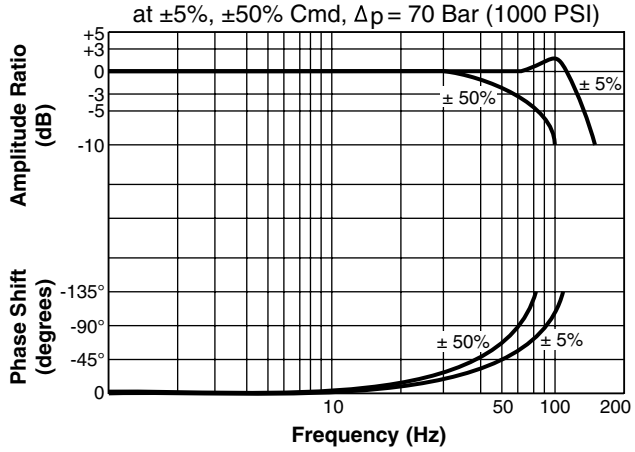
D3FH Flow Characteristics
at Δp = 35 Bar (500 PSI) per metering edge
P→A : B→T; or P→B : A→T



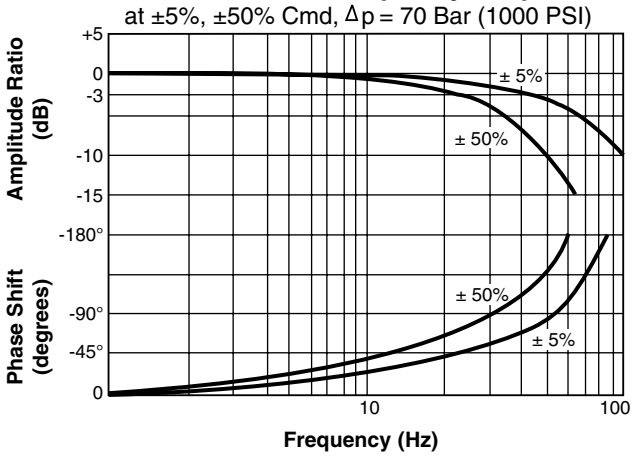
D3FH Operating Limits
at 100% Command
P→A : B→T; or P→B : A→T



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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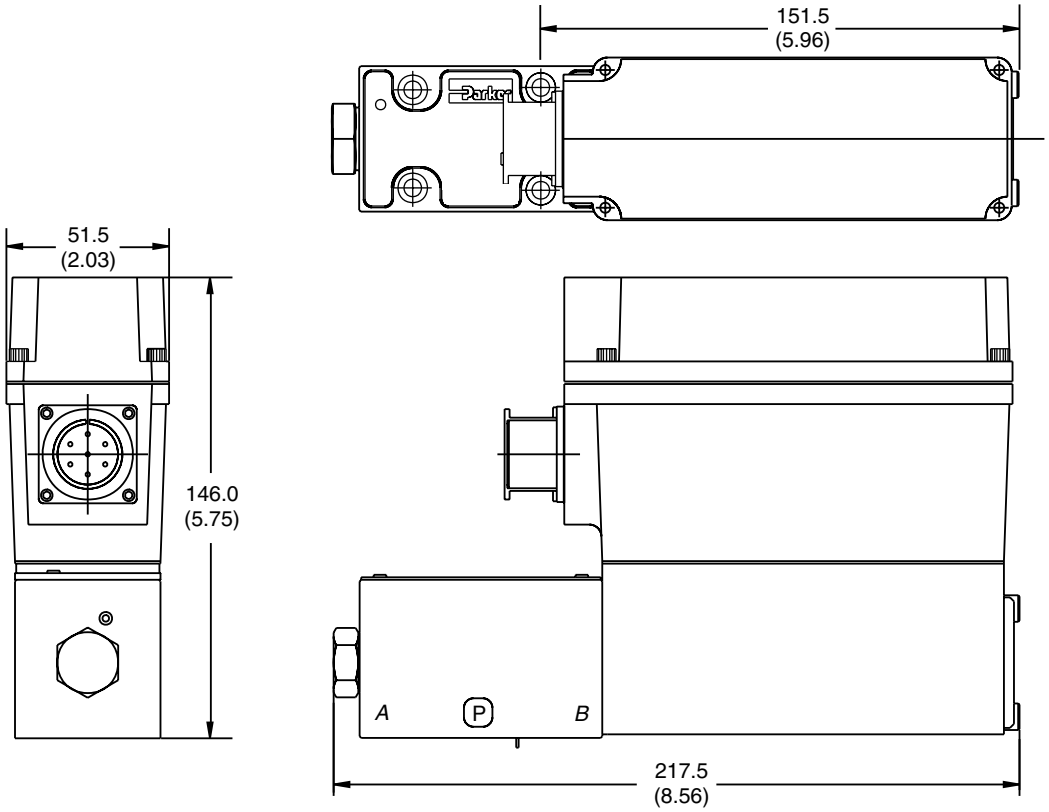
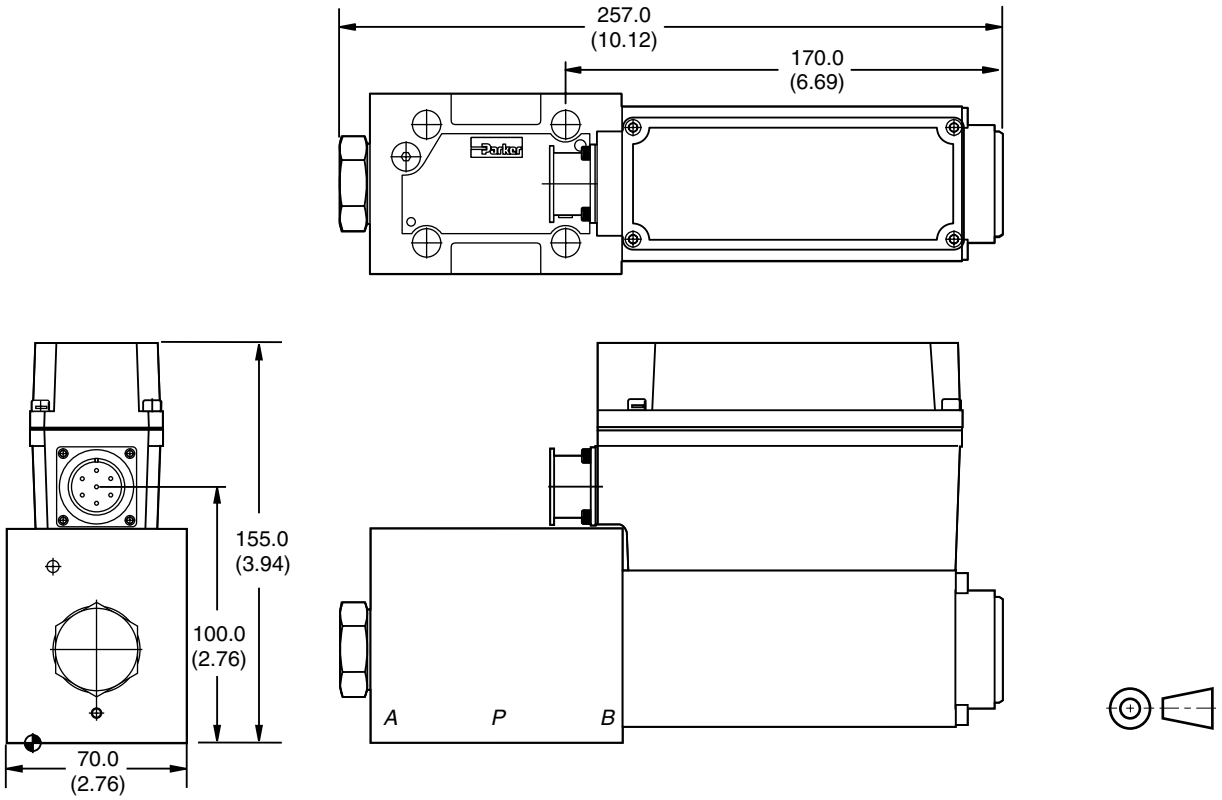
D1FH and D1FM

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



D3FH and D3FM

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



D_FH-D_FM.indd, dd

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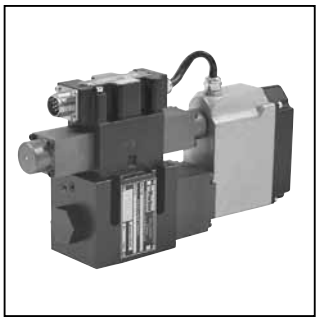
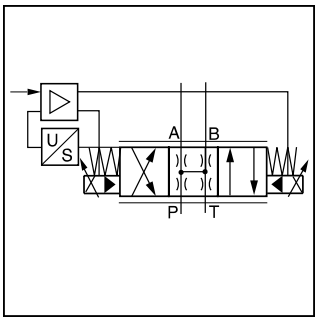
Elyria, Ohio, USA

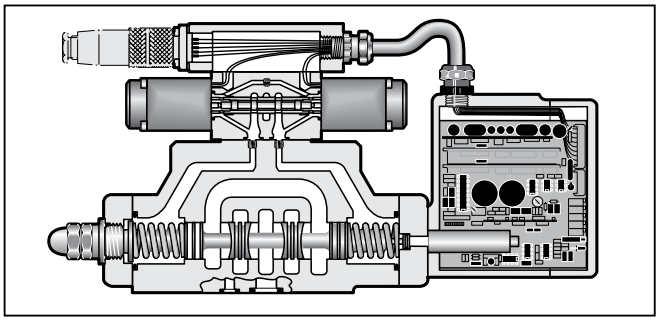
General Description

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 ∆p 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	

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

Code	Flow at ∆p 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)

Bolt Kit:		Weight:	
D31FH	BK98	D31FH	8.1 kg (17.9 lbs.)
D41FH	BK160	D41FH	11.6 kg (25.6 lbs.)
D81/91FH	BK228	D81/91FH	20.7 kg (45.6 lbs.)
D111FH	BK150	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.

D_1FH.p65, dd

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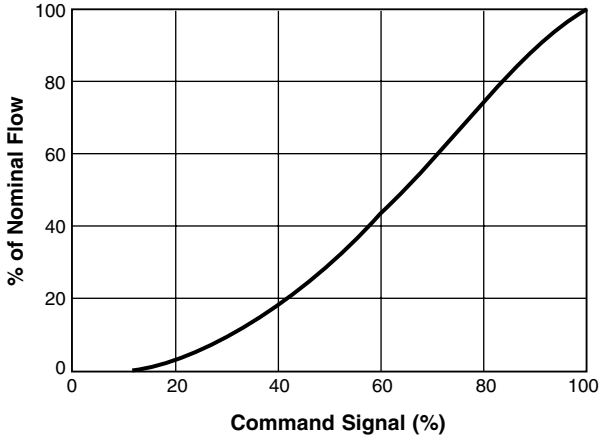
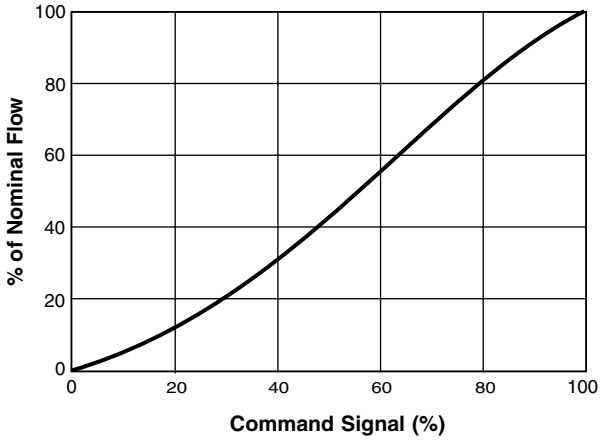
Note: Depending on the spool type selected, the actual flow characteristic may deviate from the typical flow curves as shown.

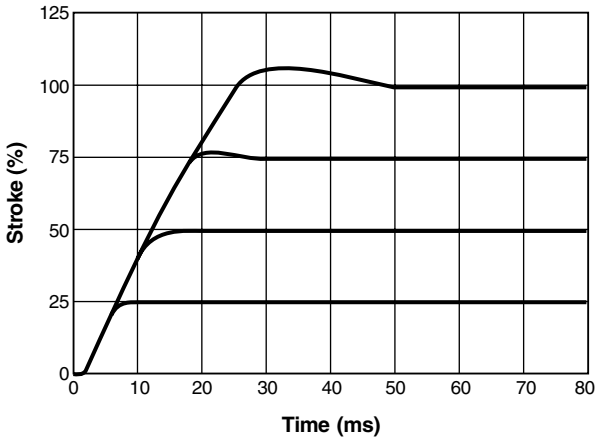
Flow Characteristics – Overlap Spools
Typical, at 5 Bar (72.5 PSI) per metering edge



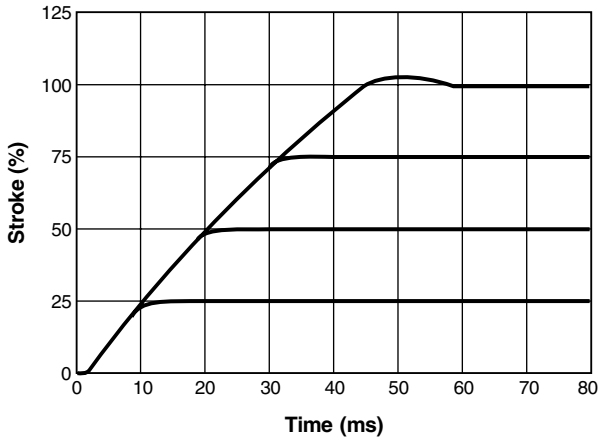
Flow Characteristics – Zero Lap Spools
Typical, at 5 Bar (72.5 PSI) per metering edge



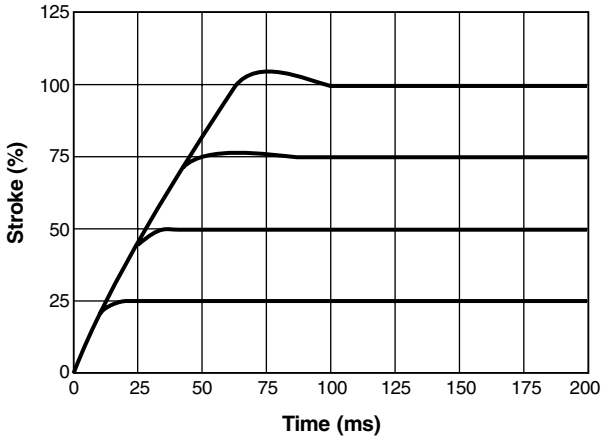
D31FH Step Response



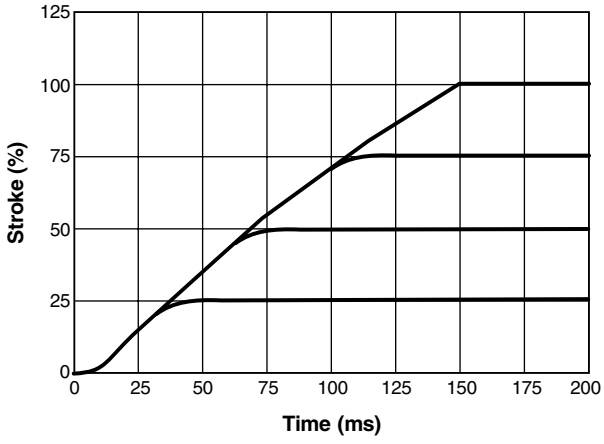
D41FH Step Response



D81FH and D91FH Step Response



D111FH Step Response



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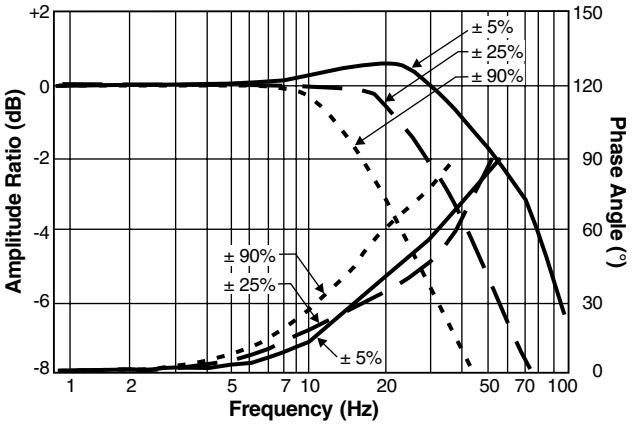
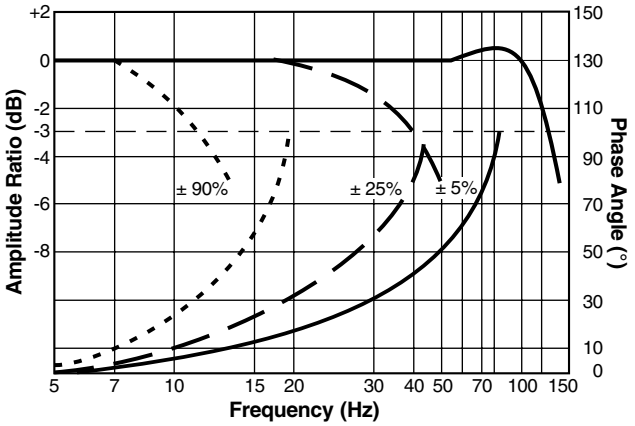
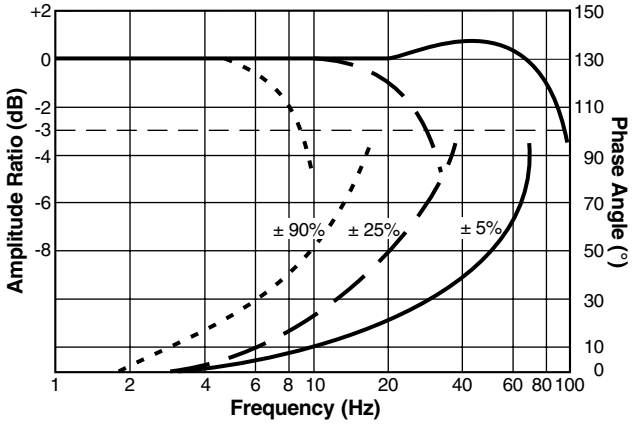
D31FH Frequency Response



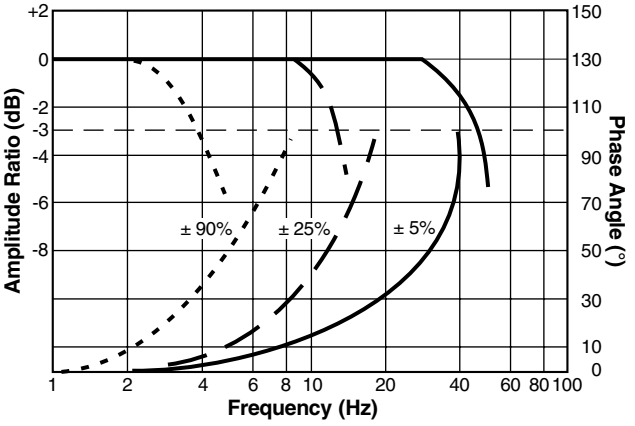
D41FH Frequency Response



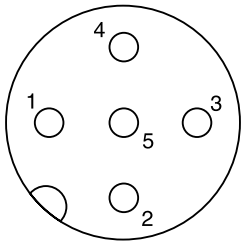
D81FH and D91FH Frequency Response



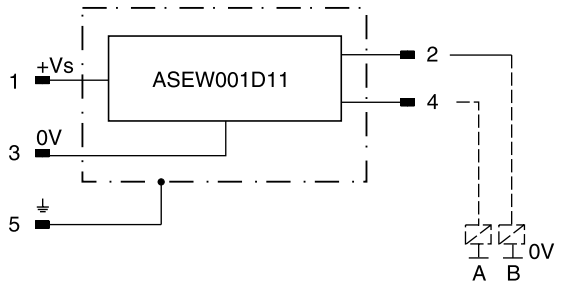
D111FH Frequency Response



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.

D_1FH.p65, dd

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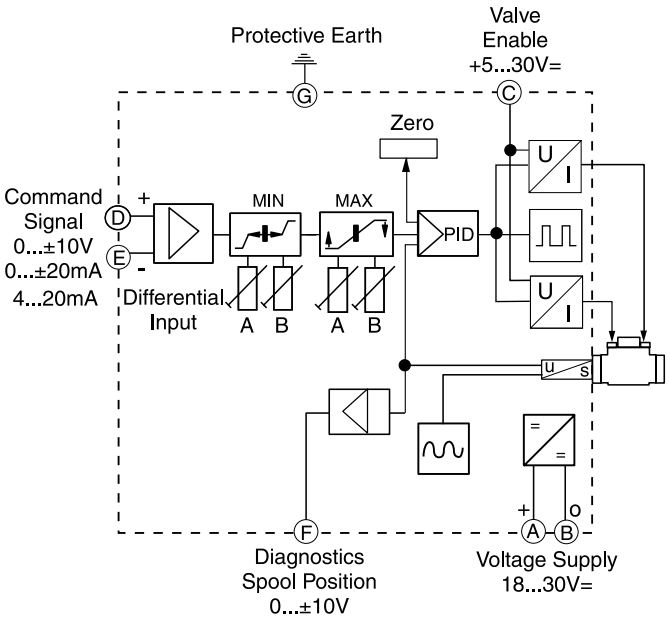
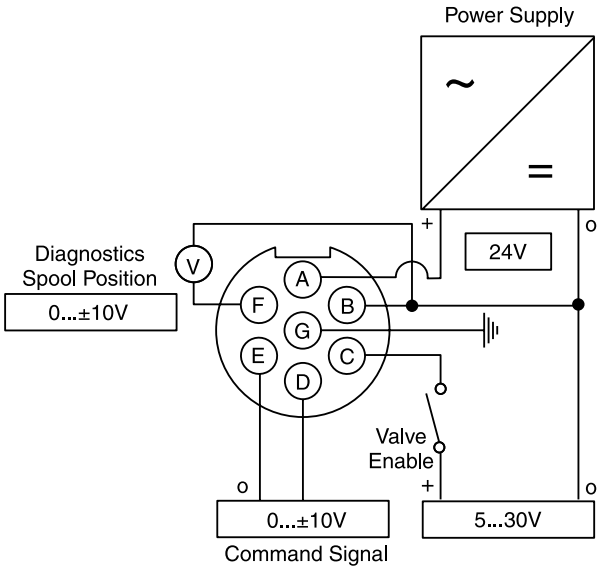
Function Diagram, Valve Electronics



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.

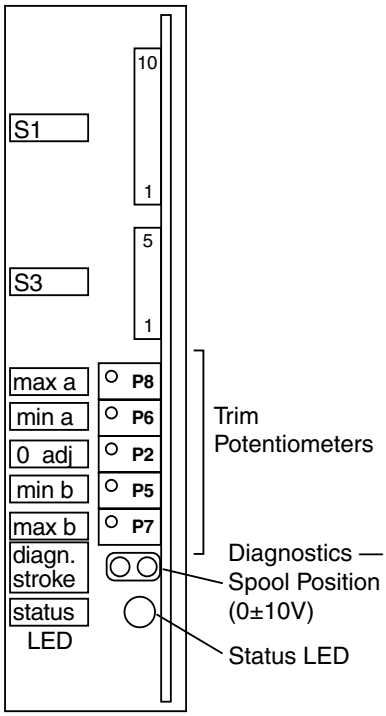
Display Color	Indicates
Green	Normal operation
Off	Supply voltage outside permissible range of 18 to 30 VDC
Red	Spool position error / Low pilot pressure

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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Elyria, Ohio, USA

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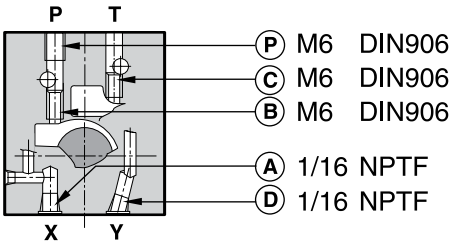
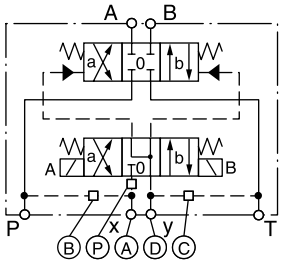
Pilot Flow
Oil Inlet (Supply) and Outlet (Drain)

D31FH

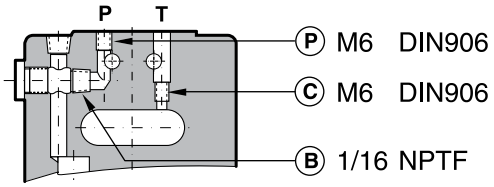


○ open, ● closed

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

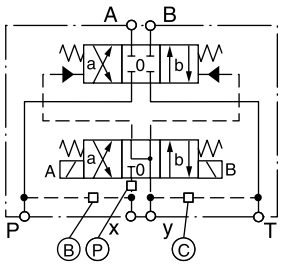


D41FH

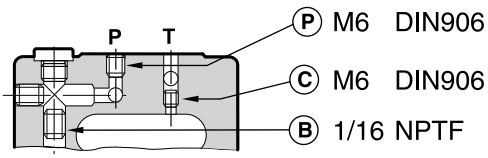


○ open, ● closed

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

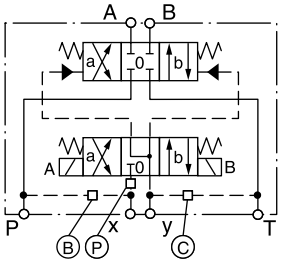


D81FH and D91FH

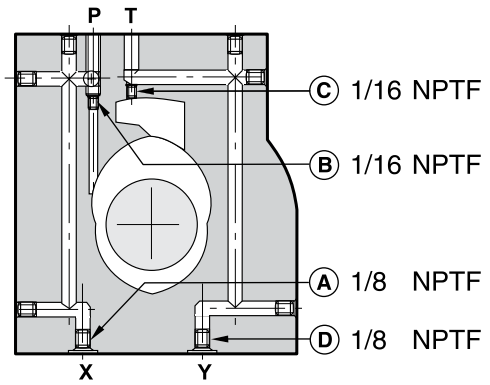


○ open, ● closed

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

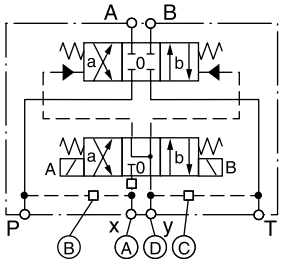


D111FH



○ open, ● closed

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



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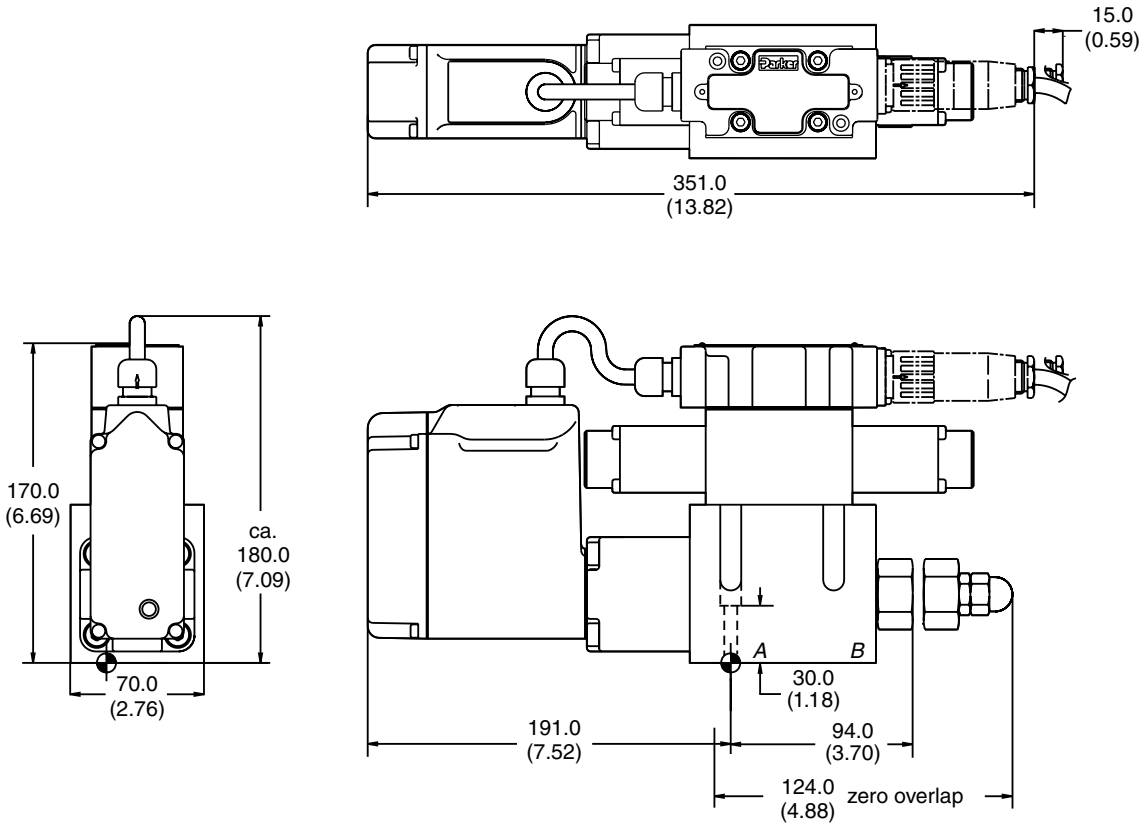
Elyria, Ohio, USA

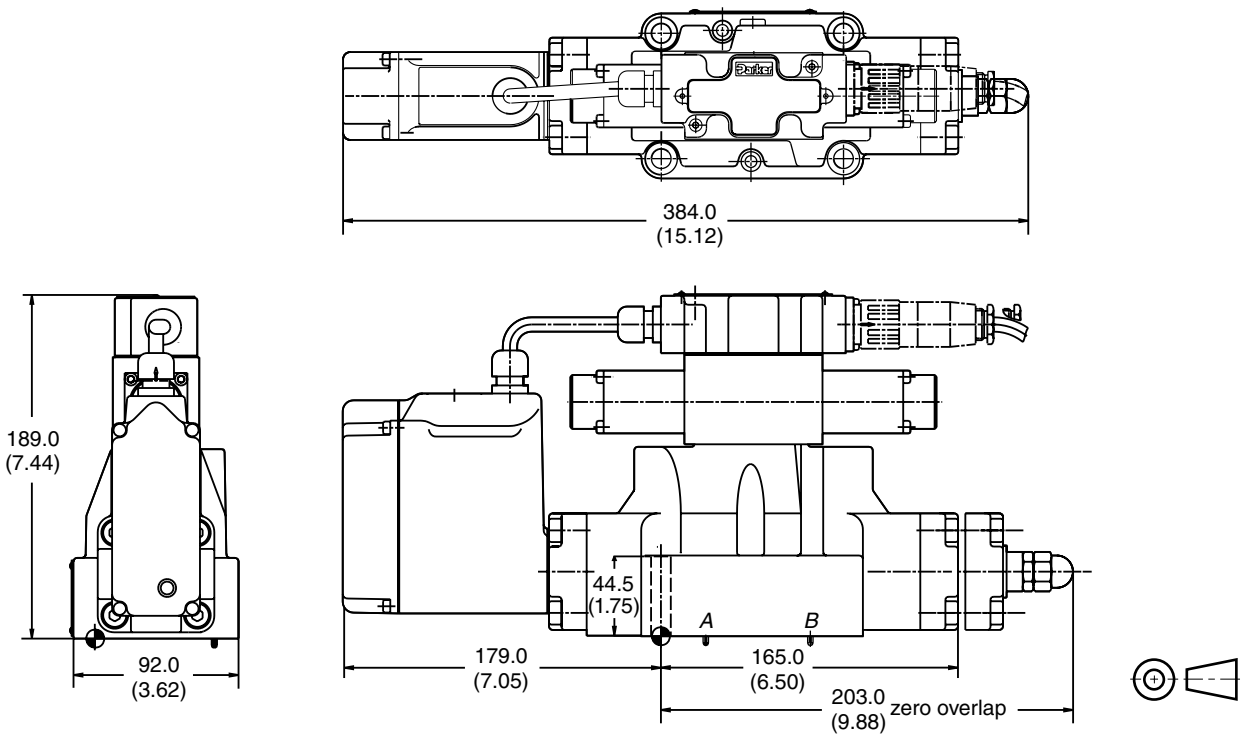
D31FH

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



D41FH

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



D_1FH.p65, dd

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Elyria, Ohio, USA

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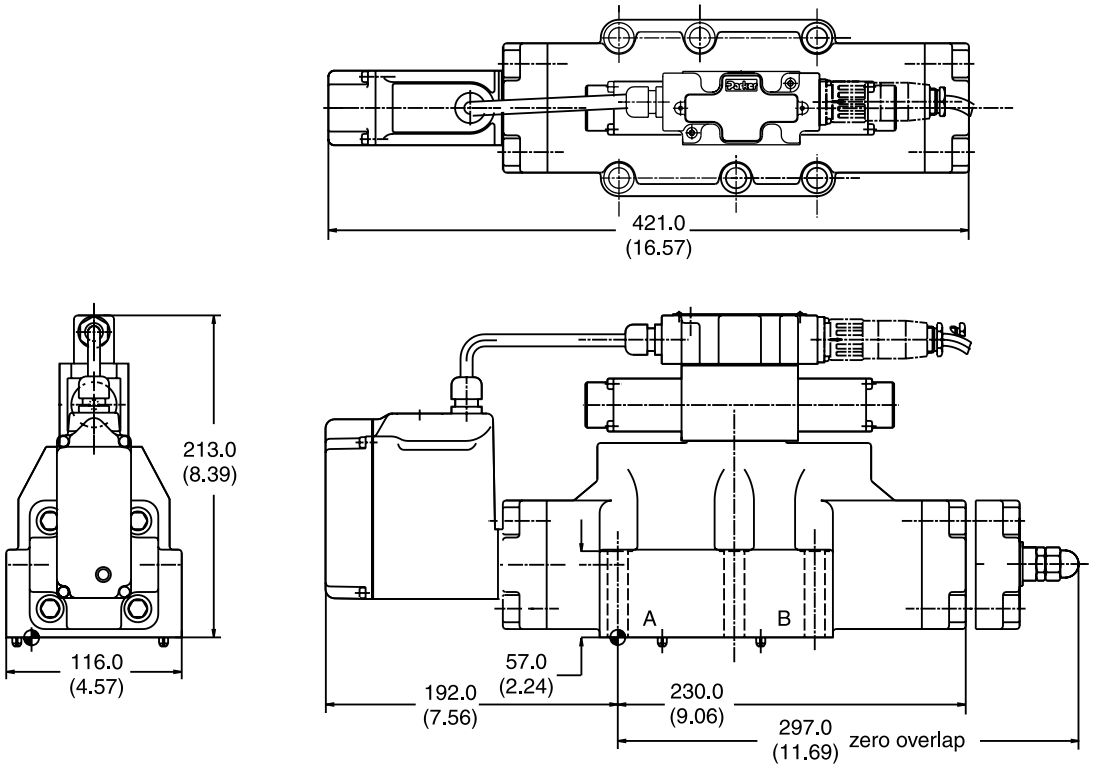
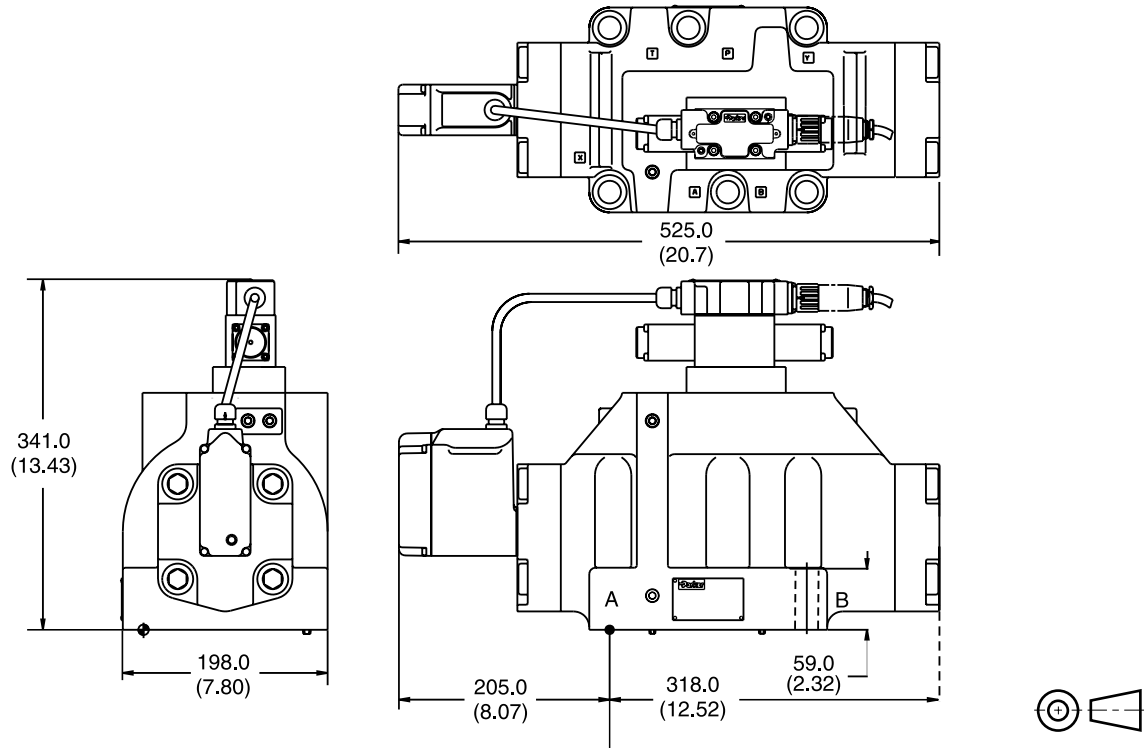
D81FH and D91FH

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



D111FH

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



D_1FH.p65, dd

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:

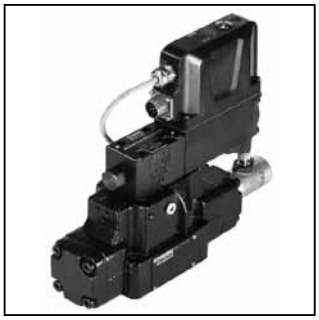
D31FE NG10 (CETOP 5)

D41FE NG16 (CETOP 7)

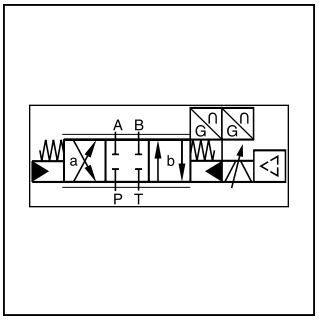
D91FE NG25 (CETOP 8) for port diam. up to 32 mm

D111FE NG32 (CETOP10)

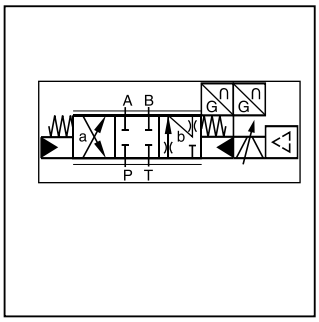
The innovative integrated regenerative function in the A-line (optional) allows new energy saving circuits with differential cylinders. The hybrid version can switch between regenerative mode and standard mode at any time.



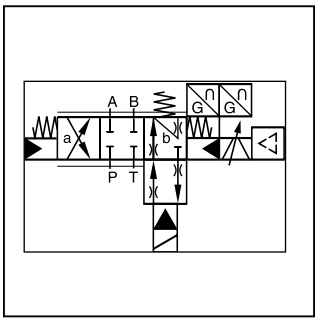
D41FE Standard



Standard D*1FE



NEW: A-Regeneration D*1FER

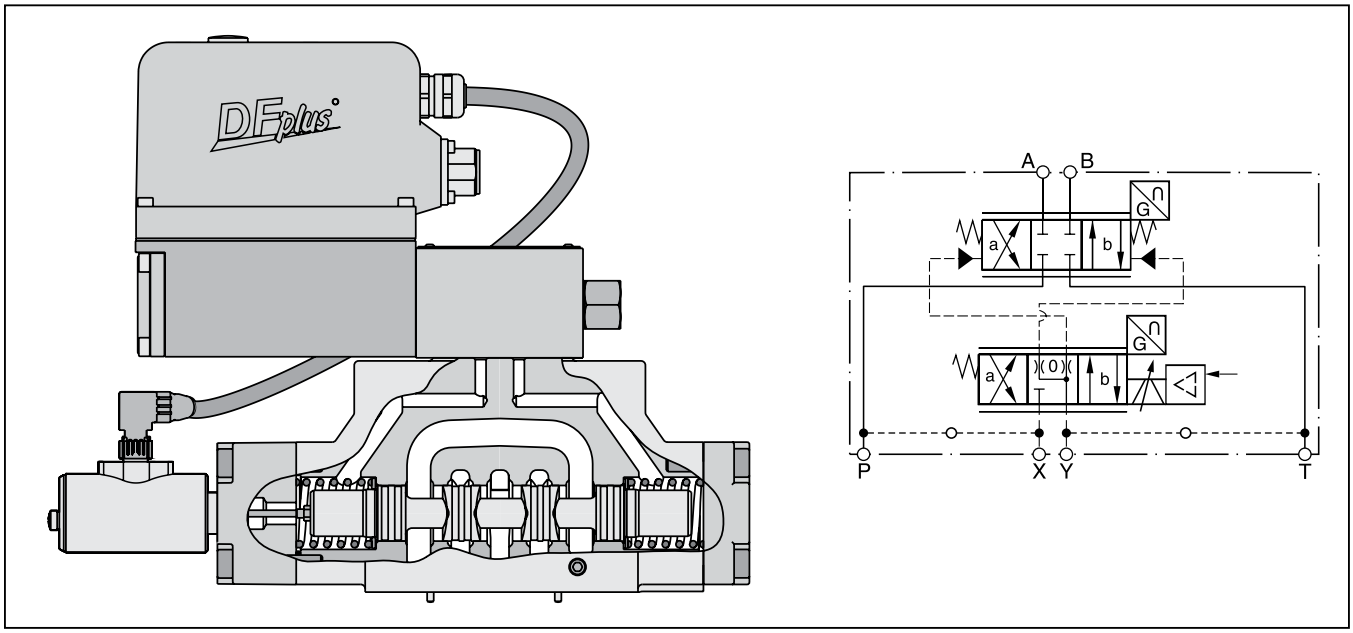


NEW: Hybrid D*1FEZ

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)



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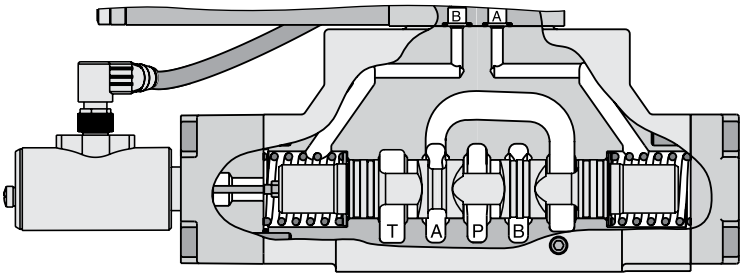
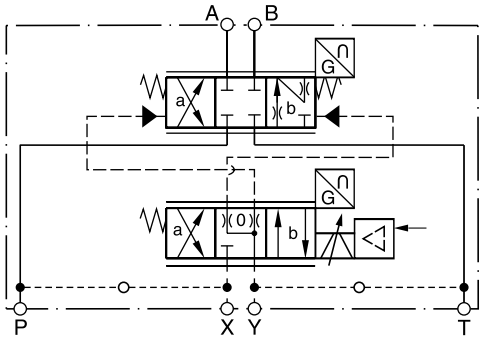
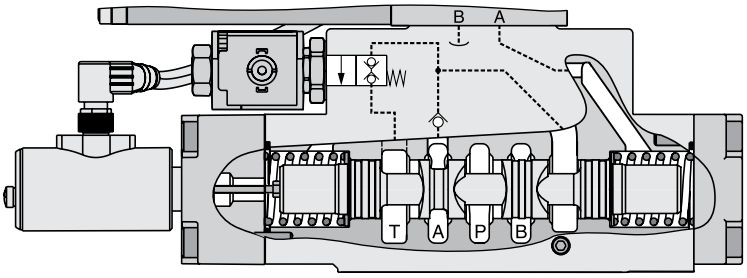
D*1FER and D*1FEZ

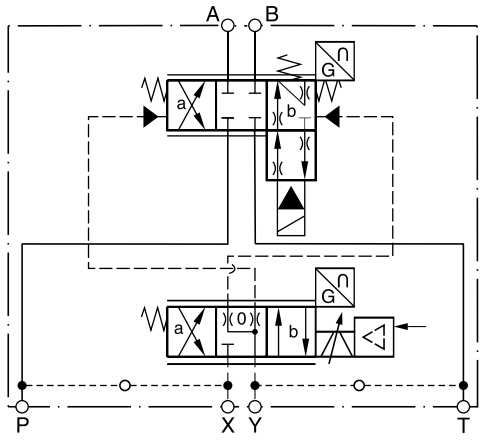
Regenerative Valve D*1FER





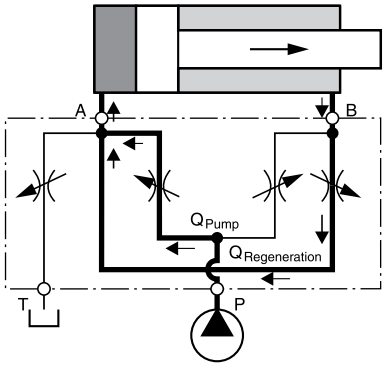
Hybrid Valve D*1FEZ





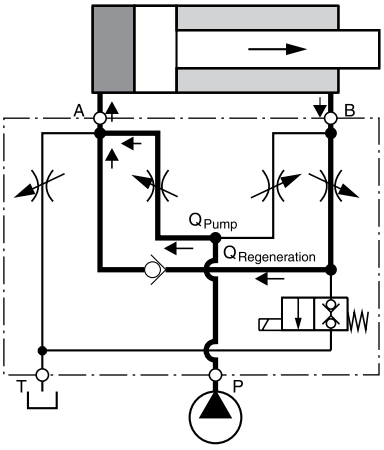
D*1FER (Regenerative Valve)

Cylinder extending

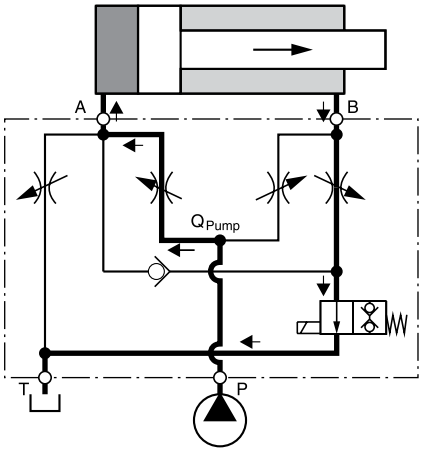


D*1FEZ (Hybrid Valve)

Cylinder extending
in regenerative mode (high speed)



Cylinder extending
in standard mode (high force)



Flow Rate in % of Nominal Flow

Size	Spool	Port					
		A-T	P-A	P-B	B-A (R-Valve)	B-A (Hybrid)	B-T (Hybrid)
D41FER/Z	31/32	100%	50%	100%	50%	40%	20%
D91FER/Z	31/32	100%	50%	100%	50%	50%	25%
D111FER/Z	31/32	on request					

D		1	F	E			C							
Directional Control Valves	Size	NG6 Pilot	Flow Control	High Response	Spool	Flow	Spool Position	Pilot Connection	Seal	Input Signal	Options	Hybrid Option	Design Series

NOTE: Not required when ordering.

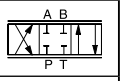
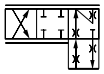
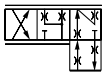
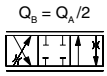
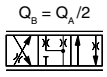
Code	Description
3	NG10 / CETOP 5
4	NG16 / CETOP 7
9 [1]	NG25 / CETOP 8
11	NG32 / CETOP 10

[1] With enlarged connections Ø 32 mm

Code	Description
N	Nitrile
V	Fluorocarbon
H	For HFC fluid

Code	Description
0	Standard for Spool Codes B, E, R
L [5]	Hybrid valve 24V normaly closed for spool type Z

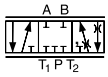
[5] See page page A114 for regenerative and hybrid spool information. (not available in D31FE).

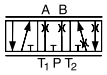
Standard		NEW: Regenerative Function [2]		NEW: Hybrid Function [4]	
Code	Spool Type	Code	Spool Type	Code	Spool type
E01		R31		Z31	
E02		R32		Z32	
B31					
B32					

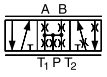
[2] Not available in D91FE.
[4] Not available in D31FE.

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

Code	Description
0	6+PE acc. EN175201-804
5	11+PE acc. EN175201-804
7	6+PE + Enable

D31FE spooltype: R31 

R32 

R61 

Code	Signal	Function
B	0...±10V	0...+10V P -> B
E	0...±20mA	0...+20mA P -> B
K	0...±10V	0...+10V P -> A
S	4...20mA	12...20mA P -> A

Code	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge			
	D31	D41	D91	D111
D	90 (24)	—	—	—
E	120 (32)	—	—	—
F	—	200 (53)	—	—
H	—	—	450 (119)	—
L	—	—	—	1000 (265)

Weight:

D31FE	11.3 kg (24.9 lbs.)
D41FE	14.2 kg (31.3 lbs.)
D91FE	23.5 kg (51.8 lbs.)
D111FE	64.5 kg (142.2 lbs.)

A

General					
Design		Proportional directional control valve, pilot operated			
Actuation		VCD® actuator			
Size		**NG10 (CETOP 5) D31**	**NG16 (CETOP 7) D41**	**NG25 (CETOP 8) D91**	**NG32 (CETOP 10) D111**
Mounting Interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA			
Mounting Position		Unrestricted			
Ambient Temperature	**[°C]**	-20...+60; (-4°F...+140°F)			
$MTTF_D$ Value	**[years]**	50			
Vibration Resistance	**[g]**	10 Sinus 5...2000 Hz acc. IEC 68-2-6 30 Random noise 20...2000 Hz acc. IEC 68-2-36 15 Shock acc. IEC 68-2-27			
Hydraulic					
Maximum Operating Pressure		Pilot Drain Internal: Ports P, A, B, X 350 Bar (5075 PSI); Port T, Y 35 Bar (507.5 PSI) Pilot Drain External: Ports P, A, B, T, X 350 Bar (5075 PSI); Port Y 35 Bar (507.5 PSI)			
Fluid		Hydraulic oil as per DIN 51524...535, other on request			
Fluid Temperature	**[°C]**	-20...+60; (-4°F...+140°F)			
Viscosity					
Permitted	**[cSt] / [mm²/s]**	20...380 (93...1761 SSU)			
Recommended	**[cSt] / [mm²/s]**	30...80 (139...371 SSU)			
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			
Nominal Flow at Δp=Bar (72.5 PSI) per Control Edge [1]	**LPM (GPM)**	120 (31.7)	200 (52.9)	400/450 (105.8/119.0)	1000 (264.2)
Max. Recommended Flow (Standard)	**LPM (GPM)**	250 (66.1)	600 (158.7)	1000 (264.2)	3000 (792.5)
Regenerative B-A / B-T		Depending on application, all flow curves			
Leakage at 100 Bar (1450 PSI)	**[ml/min]**	200 (12 cu. in.)	200 (12 cu. in.)	600 (37 cu. in.)	1000 (61 cu. in.)
Pilot	**[ml/min]**	<100 (6.1 cu. in.)	<100 (6.1 cu. in.)	<100 (6.1 cu. in.)	<100 (6.1 cu. in.)
Pilot Supply Pressure		20 Bar (290 PSI) 350 Bar (5075 PSI)			
Pilot Flow, Step Response @ 210 Bar		9 LPM (2.4 GPM)	10 LPM (2.6 GPM)	18 LPM (4.8 GPM)	30 LPM (7.9 GPM)
Static / Dynamic					
Step Resp. at 100% Stroke [2]	**[ms]**	13	19	24	60
Frequency Response					
Amplitude ±5% at 210 Bar (3045 PSI)	**[Hz]**	180	80	65	38
Phase ±5% at 210 Bar (3045 PSI)	**[Hz]**	130	100	75	64
Hysteresis	**[%]**	<0.1			
Sensitivity	**[%]**	<0.05			
Temperature Drift of Center Position	**[%K]**	<0.025			

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

[2] Measured with load [210 Bar (3045 PSI) pressure drop/two control edges].

Continued on next page

Continued from previous page

A

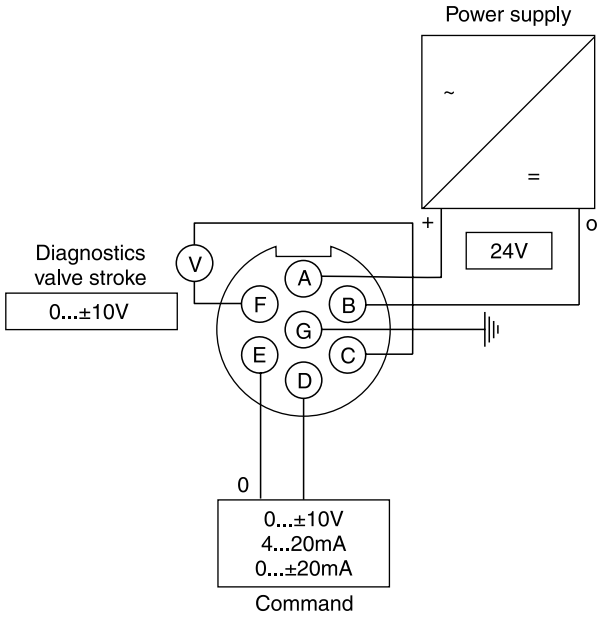
Electrical		
Duty Ratio	**[%]**	100
Protection Class		IP65 in accordance with EN 60529 (with correctly mounted plug-in connector)
Supply Voltage/Ripple	**[V]**	18...30, ripple < 5% eff., surge free
Current Consumption Maximum	**[A]**	3.5
Pre-fusing Medium Lag	**[A]**	4.0
Input Signal		
Code K (B) Voltage	**[V]**	+10...0...-10, ripple < 0.01 % eff., surge free, 0...+10 P–>A (P–>B)
Impedence	**kOhm**	100
Code E Voltage	**[mA]**	+20...0...-20 ripple < 0.01 % eff., surge free, 0...+20mA P–>B
Impedence	**Ohm**	250
Code S Current	**[mA]**	4...12...20, ripple < 0.01 % eff., surge free, 12...20mA P–>A
Impedence	**Ohm**	250
	[mA]	< 3.6 mA = enable off, > 3.8 mA = enable on (acc. to NAMUR NE43)
Input Capacitance Typ.	**[nF]**	1
Differential Input Maximum		
Code 0	**[V]**	30 for terminal D and E against PE (terminal G) 11 for terminal D and E against 0V (terminal B)
Code 5	**[V]**	30 for terminal 4 and 5 against PE (terminal ⏚) 11 for terminal 4 and 5 against 0V (terminal 2)
Code 7	**[V]**	30 for terminal D and E against PE (terminal G)
Enable Signal Code 5 / 7	**[V]**	5...30, Ri = 9 kOhm
Diagnostic Signal	**[V]**	+10...0...-10 / +ub, rated max. 5 mA
EMC		EN 61000-6-2, EN 61000-6-4
Electrical Connection		
Code 0 / 7		6 + PE acc. to EN 175201-804
Code 5		11 + PE acc. to EN 175201-804
Wiring Minimum		
Code 0 / 7	**[mm²]**	7 x 1.0 (AWG16) overall braid shield
Code 5	**[mm²]**	11 x 1.0 (AWG20) overall braid shield
Wiring Length Maximum	**[m]**	50 (164 ft.)

Electrical Specifications Hybrid Option				
Duty Ratio		100%		
Protection Class		IP65 in accordance with EN 60529 (with correctly mounted plug-in connector)		
		D41	**D91**	**D111**
Supply Voltage	**[V]**	24	24	24
Tolerance Supply Voltage	**%**	±10	±10	±10
Current Consumption	**[A]**	1.21	0.96	1.29
Power Consumption	**[W]**	29	23	31
Solenoid Connection		Connector as per EN 175301-803		
Wiring Minimum	**[mm²]**	3 x 1.5 recommended		
Wiring Length Maximum	**[m]**	50 (164 ft.) recommended		

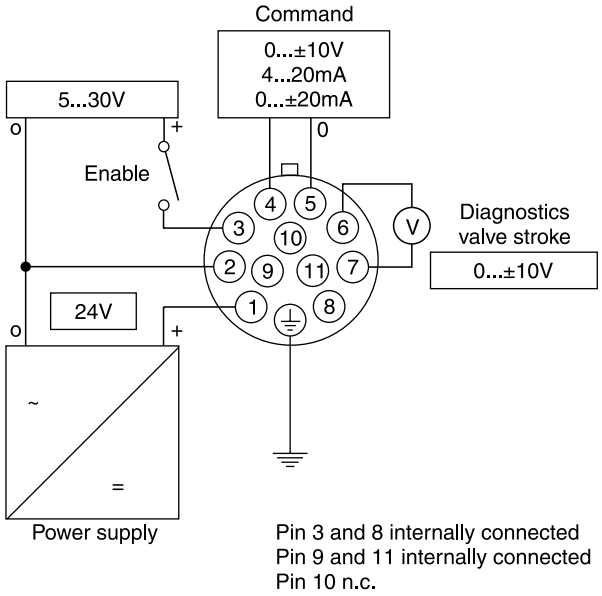
With electrical connections the protective conductor (PE ⏚) must be connected according to the relevant regulations.

A

Code 0
6 + PE acc. EN 175201-804

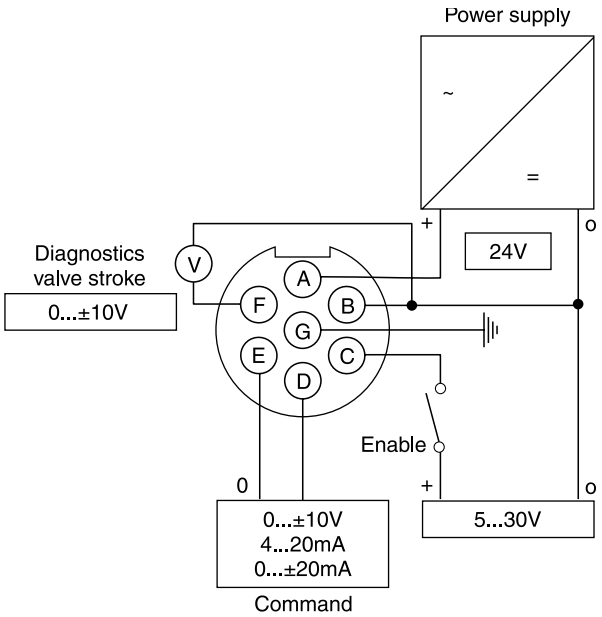


Code 5
11 + PE acc. EN 175201-804



Pin 3 and 8 internally connected
Pin 9 and 11 internally connected
Pin 10 n.c.

Code 7
6 + PE acc. EN 175201-804 + Enable

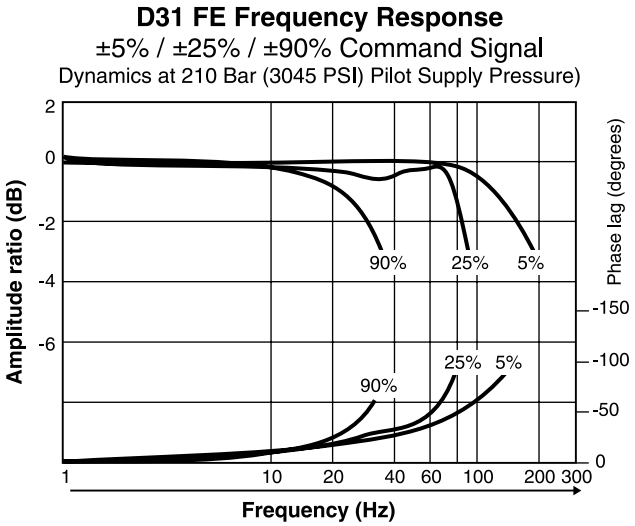


A

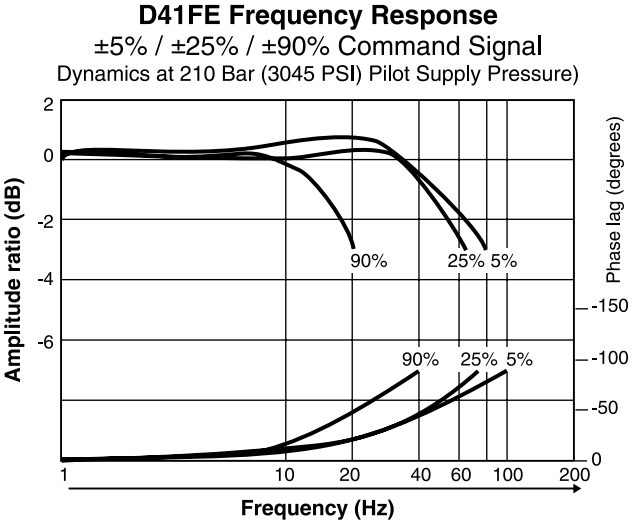
Frequency Response

±5% / ±25% / ±90% command signal
Dynamics at 210 bar pilot supply pressure

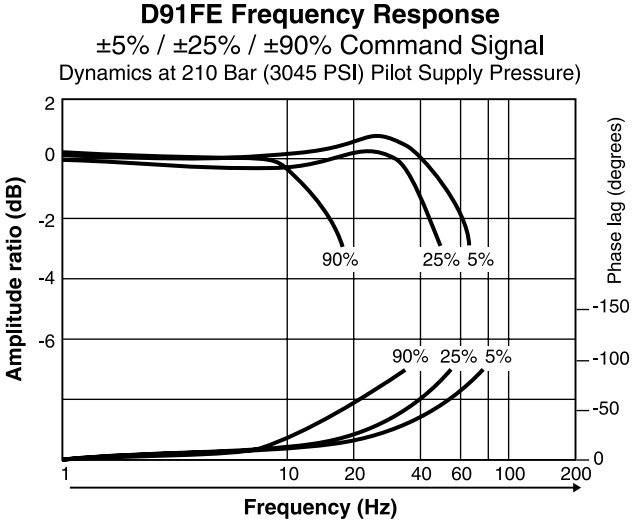
D31FE



D41FE



D91FE



D111FE

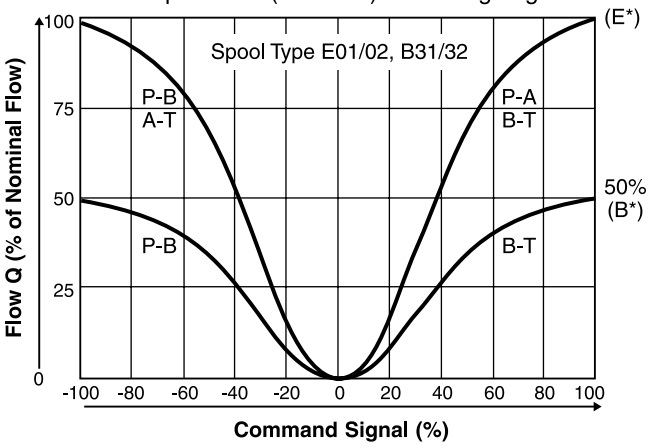
Spool Type R/Z* on request

All performance curves measured with HLP46 at 50°C (122°F).

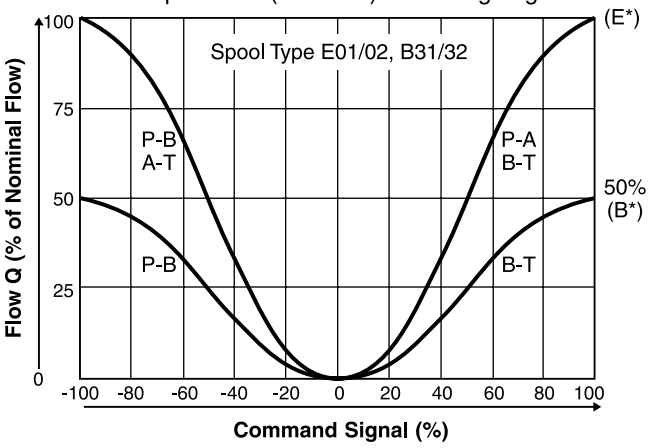
A

D*1FEB/E Flow

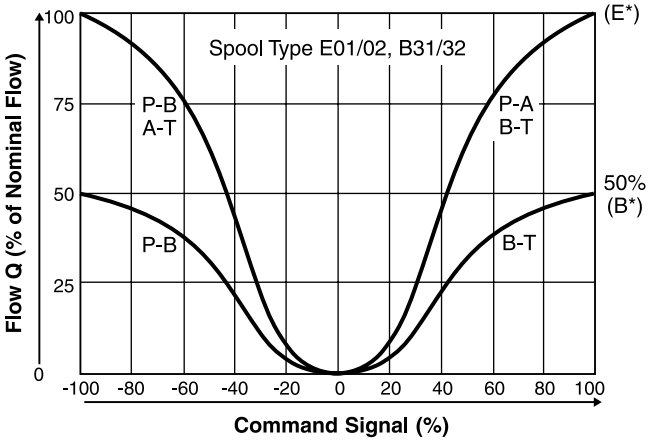
D31FE Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge



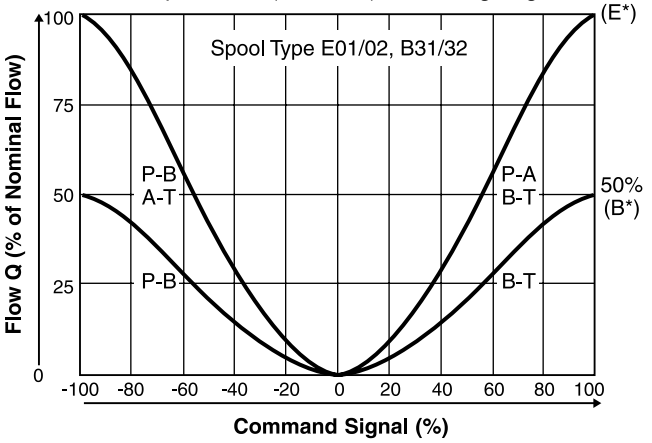
D41FE Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge



D91FE Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge



D111FE Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge



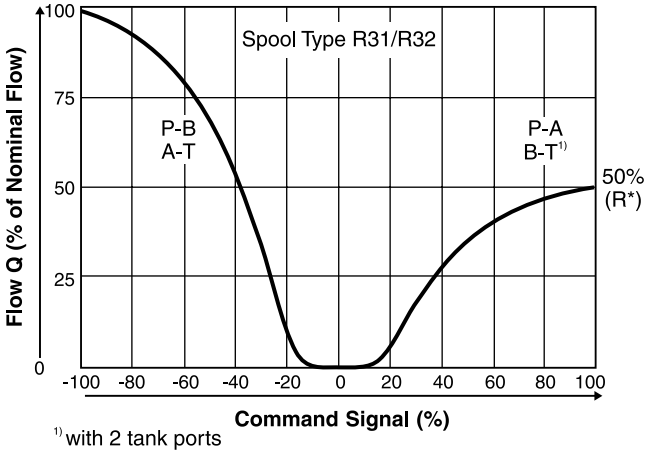
All performance curves measured with HLP46 at 50°C (122°F).

A

D*1FE R/Z Flow

D31FE R/Z

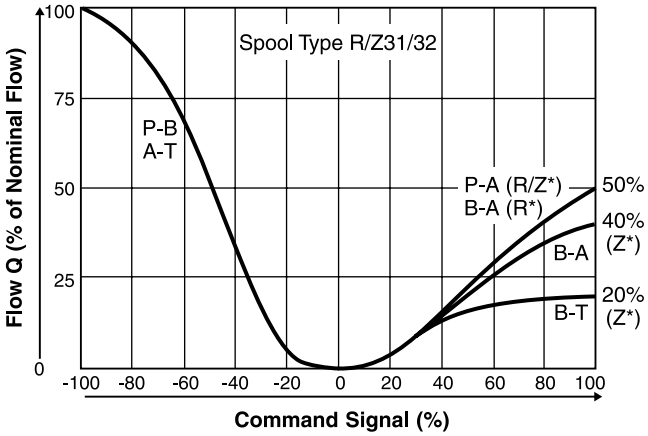
D31FE Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge



1) with 2 tank ports

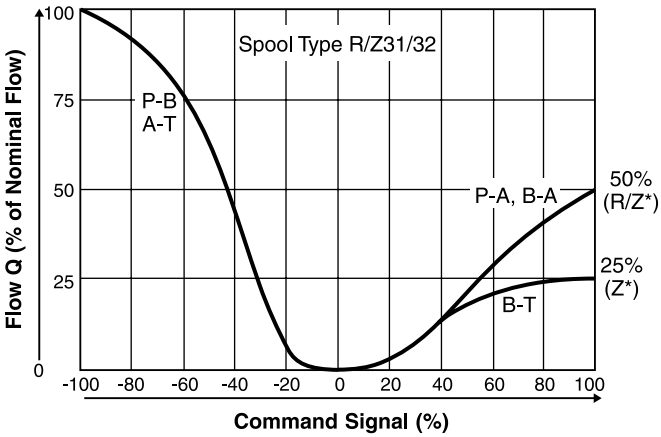
D41FE R/Z

D41FE Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge



D91FE R/Z OBE

D91FE Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge



D111FEB R/Z*

SpoolType R/Z* on request

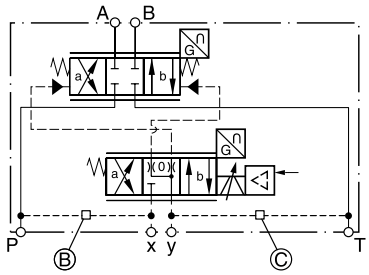
All performance curves measured with HLP46 at 50°C (122°F).

A

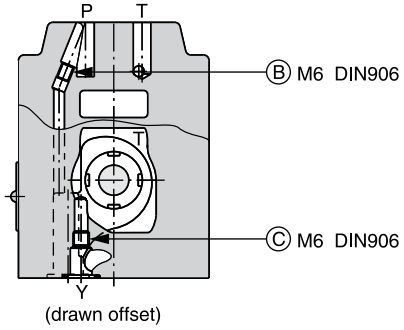
Pilot Flow — Pilot Oil Inlet (supply) and Outlet (drain)

○ open, ● closed

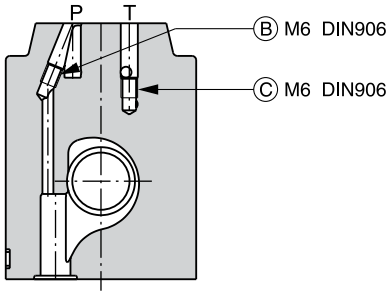
Pilot oil Inlet	Pilot oil Drain	B	C
internal	external	○	●
external	external	●	●
internal	internal	○	○
external	internal	●	○



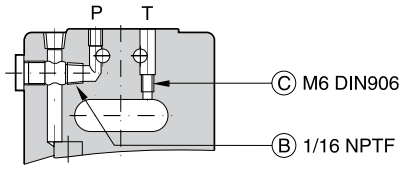
D31FEB/E



D31FER



D41FEB/E



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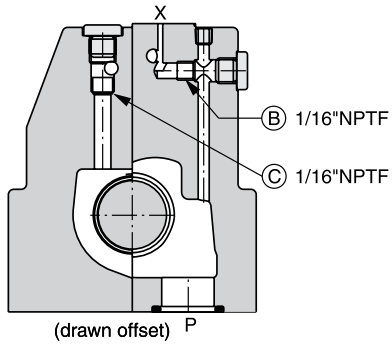
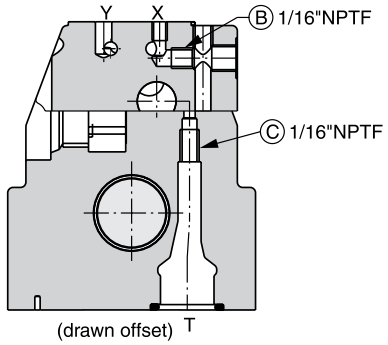
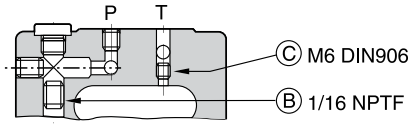


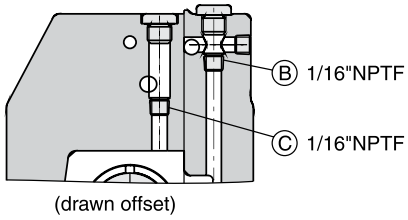
D41FEZ



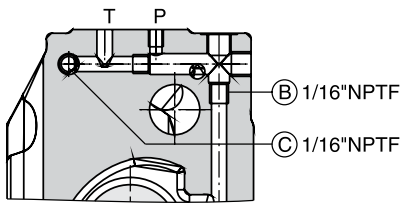
D91FEB/E



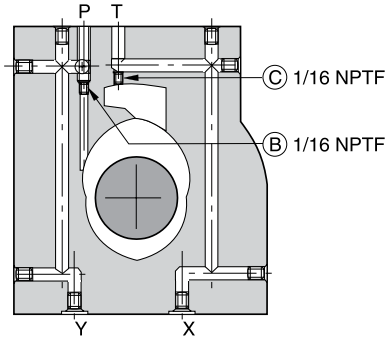
D91FER



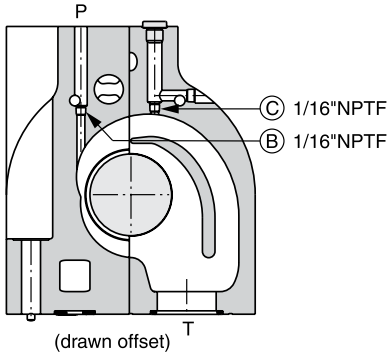
D91FEZ



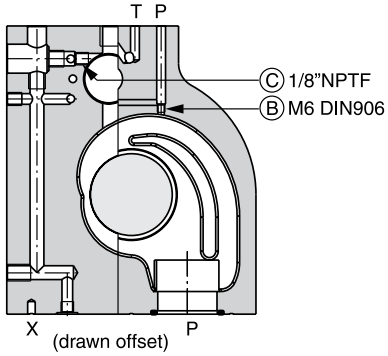
D111FEB/E



D111FER



D111FEZ



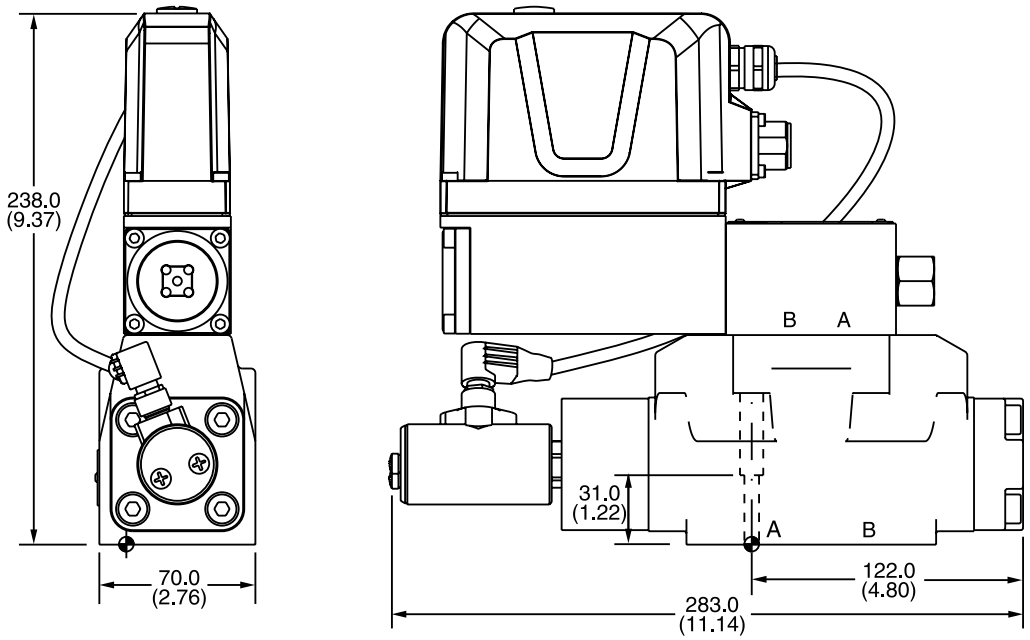
D_1FE.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

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

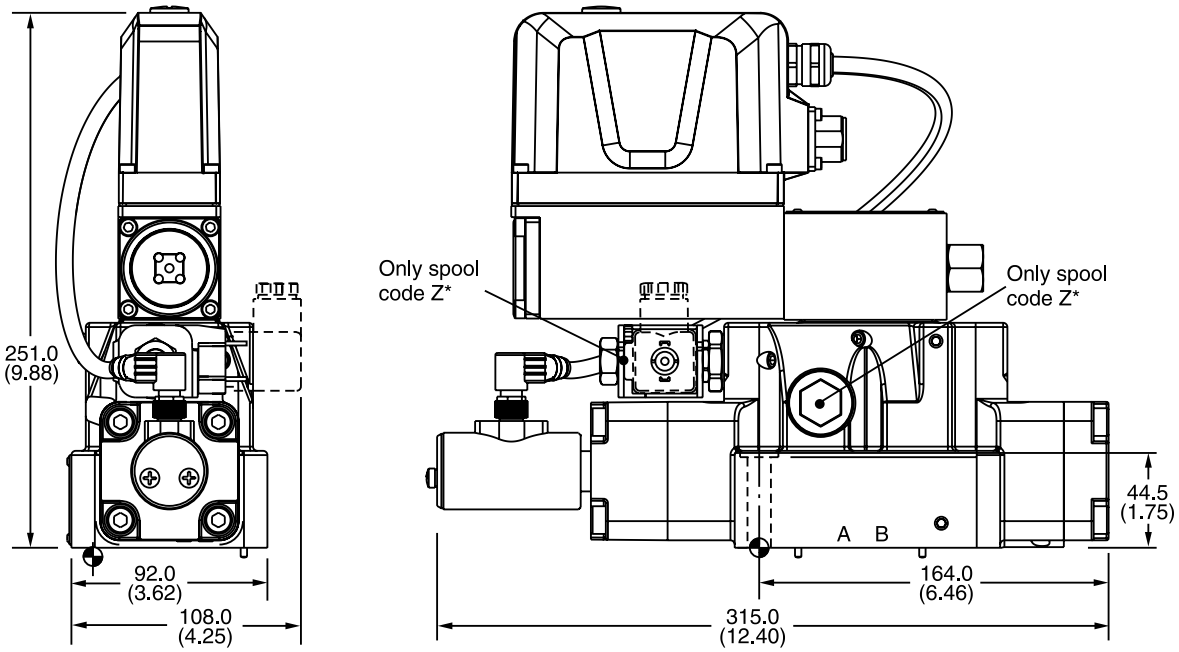
A

D31FE



Surface Finish	Kit			Seal Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK385 BK98	4x M6x40 DIN 912 12.9 4x 1/4-20x1.625	13.2 Nm (9.7 lb.-ft.) ±15 %	Nitrile: SK-D31FP Fluorocarbon: SK-D31FP-V

D41FE



Surface Finish	Kit			Seal Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK320 BK160	2x M6x55 4x M10x60 DIN 912 12.9 4x 3/8-16x2.5 2x 1/4-20x2.5	13.2 Nm (9.7 lb.-ft.) 63 Nm (46.5 lb.-ft.) ±15 %	Nitrile: SK-D41FP Fluorocarbon: SK-D41FP-V

D_1FE.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

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

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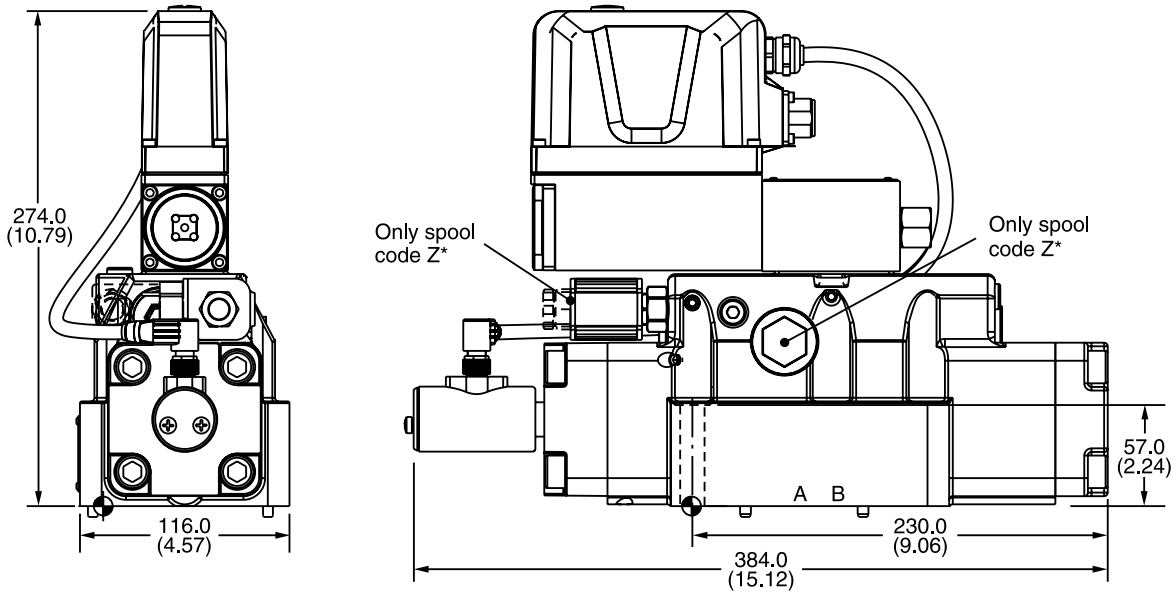
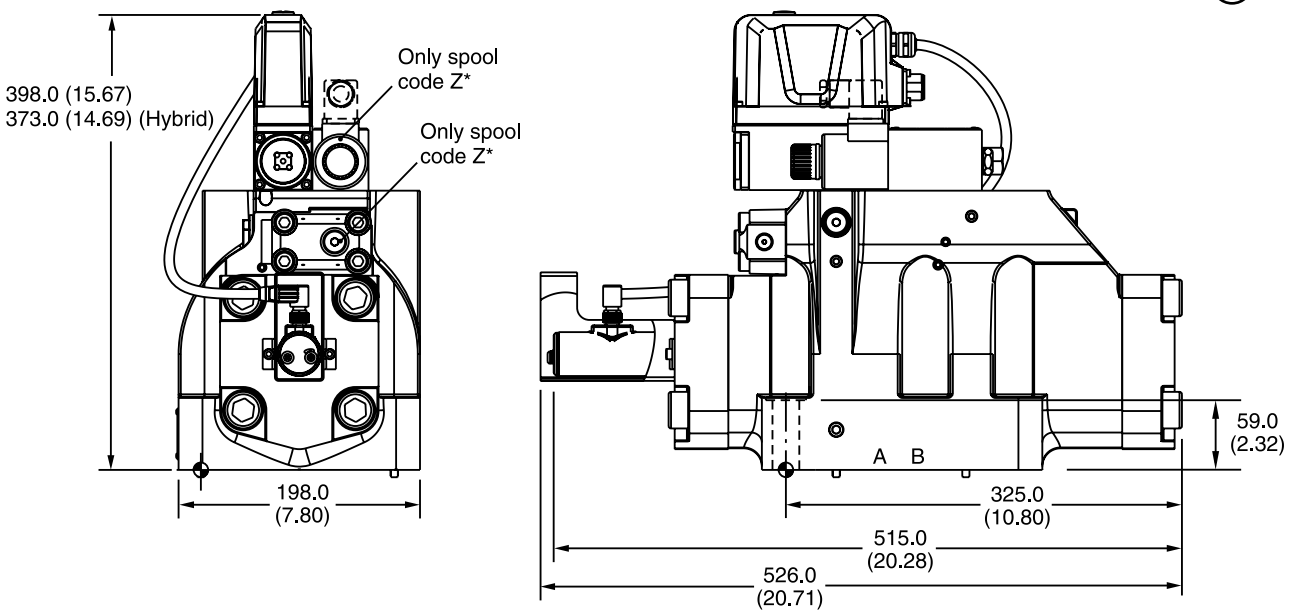
D91FE



Surface Finish	Kit			Seal Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK360 BK228	6x M12x75 DIN 912 12.9 6x 1/2-13x3.0	108 Nm (79.7 lb.-ft.) ±15 %	Nitrile: SK-D91FP Fluorocarbon: SK-D91FP-V

D111FE



Surface Finish	Kit			Seal Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK386 BK150	6x M20x90 DIN 912 12.9 6x 3/4-10x3.5	517 Nm (381.3 lb.-ft.) ±15 %	Nitrile: SK-D111FP Fluorocarbon: SK-D111FP-V

D_1FE.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

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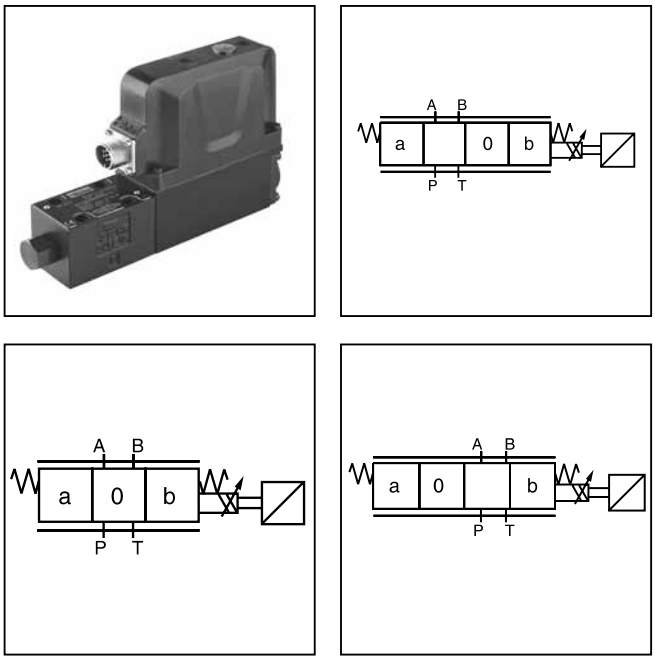
General Description

Series D1FP direct operated control NG6 (CETOP 3) valve features extremely high dynamics combined with maximum flow. It is used for high accuracy in positioning of a hydraulic axis, and for controlling force and velocity.

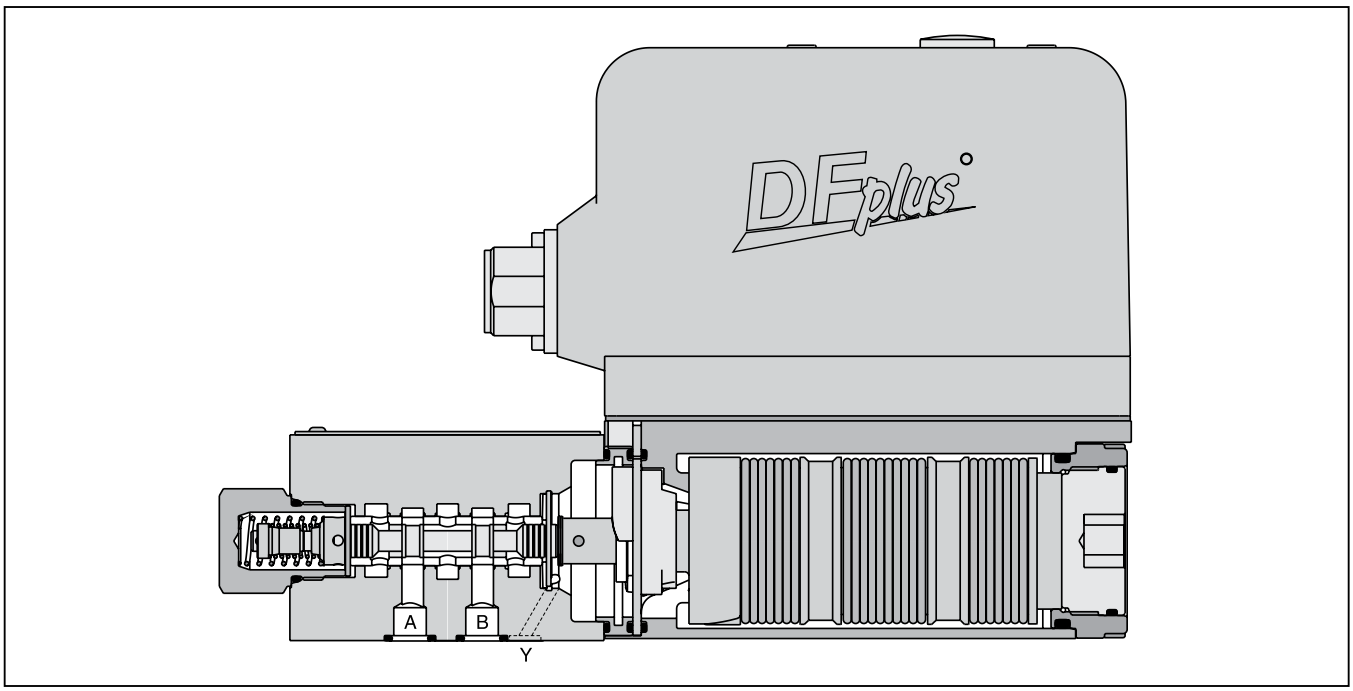
Driven by the new patented VCD® actuator, the D1FP reaches the frequency response of servovalves. Compared with solenoid driven valves, the D1FP can also be used in applications with pressure drops up to 350 Bar (5075 PSI) across the valve. Because of the high flow capability the D1FP can be a substitute for NG10 valves in some cases.

At power-down the spool moves in a defined position. All common input signals are available.



Features

- Servovalve dynamics:
  -3dB/350Hz at ±5% input signal
- Full flow capacity up to 350 Bar (5075 PSI) pressure drop through the valve.
- Maximum tank pressure 350 Bar (5075 PSI) with external drain Y-port.
- High flow.
- Defined spool positioning in case of loss of electric power supply.
- Defined spool positioning at power-down.
- Onboard electronics.



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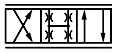
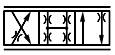
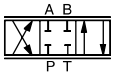
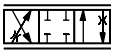
D	1	F	P	☐	☐	☐	9	☐	☐	☐	0	⌜ ⌝
Directional Control Valve	Size DIN NG6 CETOP 3 NFPA D03	Proportional Control	VCD	Spool Type		Spool Position on Power Down [1]	Y-Port Plugged [4]	Seal	Input Signal	Options	Spool/ Sleeve Design	Design Series NOTE: Not required when ordering.

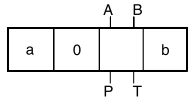
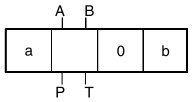
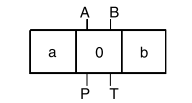
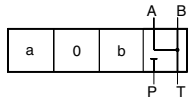
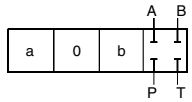
Code	Spool	Flow LPM (GPM) at Δp 35 Bar (508 PSI) per metering edge
Zerolap		
E50M E50H E50G E50F E50C E50B		40 (10.6) 25 (6.6) 16 (4.2) 12 (3.2) 6 (1.6) 3 (0.8)
B60M E60H E60G E60F E60C	$Q_B = Q_A/2$ 	40 (10.6) / 20 (5.3) 25 (6.6) / 12.5 (3.3) 16 (4.2) / 8 (2.1) 12 (3.2) / 6 (1.6) 6 (1.6) / 3 (0.8)
Underlap approximately -0.5%		
E55M E55H E55G E55F E55C E55B		40 (10.6) 25 (6.6) 16 (4.2) 12 (3.2) 6 (1.6) 3 (0.8)
Overlap 25%		
E01M E01H E01G E01F E01C E01B		40 (10.6) 25 (6.6) 16 (4.2) 12 (3.2) 6 (1.6) 3 (0.8)
B31M E31H E31G E31F E31C	$Q_B = Q_A/2$ 	40 (10.6) / 20 (5.3) 25 (6.6) / 12.5 (3.3) 16 (4.2) / 8 (2.1) 12 (3.2) / 6 (1.6) 6 (1.6) / 3 (0.8)
E02M E02H E02G E02F E02C E02B		40 (10.6) 25 (6.6) 16 (4.2) 12 (3.2) 6 (1.6) 3 (0.8)
B32M E32H E32G E32F E32C	$Q_B = Q_A/2$ 	40 (10.6) / 20 (5.3) 25 (6.6) / 12.5 (3.3) 16 (4.2) / 8 (2.1) 12 (3.2) / 6 (1.6) 6 (1.6) / 3 (0.8)

Please order plugs separately. See Accessories.

Code	Description
N	Nitrile
V	Fluorocarbon
H	For HFC Fluid

Code	Connection Type
0	6 + PE acc. EN175201-804
5	11 + PE acc. EN175201-804
7	6 + PE + Enable

Code	Signal	Flow Direction [5]
B	+/- 10V	0...+10V -> P-A
E	+/- 20mA	0...+20mA -> P-A
S	4...20mA	12...20mA -> P-A

Code	Spool Position on Power Down
A [2]	
B [2]	
C [3]	
H	
J	

[1] On power down the spool moves in a defined position. This cannot be guaranteed in case of single flow path on the control edge A→ T resp. B→ T with pressure drops above 120 Bar (1740 PSI) or contamination in the hydraulic fluid.

[2] Approximately 10% opening, only available with zerolap spools and underlap spools.

[3] Only available with overlap spools.

[4] Needs to be removed at tank pressure >35 Bar (507.5 PSI).

[5] Flow direction P→ A with Pin D > Pin E.

Bolt Kit:
BK209 (4) 10-24x1.25
BK375 (4) M5x30
Weight: 5.0 kg (11.0 lbs.)

General		
Design		Direct operated proportional DC valve
Actuation		VCD® actuator
Size		NG6 / CETOP 3 / NFPA D03
Mounting Interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA
Mounting Position		Unrestricted
Ambient Temperature	**[°C]**	-20...+50; (-4°F...+122°F)
MTTF$_D$ Value	**[years]**	75
Vibration Resistance	**[g]**	10 Sinus 5...2000 Hz acc. IEC 68-2-6 30 Random noise 20...2000 Hz acc. IEC 68-2-36 15 Shock acc. IEC 68-2-27
Hydraulic		
Maximum Operating Pressure		Ports P, A, B 350 Bar (5075 PSI) Port T max. 35 Bar (508 PSI), port Y max. 35 Bar (508 PSI) [1]
Fluid		Hydraulic oil as per DIN 51524...535, other on request
Fluid Temperature	**[°C]**	-20...+60; (-4°F...+140°F)
Viscosity		
Permitted	**[cSt] / [mm²/s]**	20...380 (93...1761 SSU)
Recommended	**[cSt] / [mm²/s]**	30...80 (139...371 SSU)
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)
Nominal Flow at Δp=35 Bar (508 PSI) per Control Edge [2]		3 LPM (0.08 GPM) / 6 LPM (1.6 GPM) / 12 LPM (3.2 GPM) / 25 LPM (6.6 GPM) / 40 LPM (10.6 GPM)
Flow Maximum		90 LPM (23.8 GPM) at Δp=350 Bar (5075 PSI) over two control edges
Leakage at 100 Bar (1450 PSI)	**[ml/min]**	<400 (zerolapped spool); <50 (overlapped spool)
Static / Dynamic		
Step Response at 100% Step [3]	**[ms]**	<3.5
Frequency Response (±5% signal) [3]	**[Hz]**	350 (amplitude ratio -3dB), 350 (phase lag -90°)
Hysteresis	**[%]**	<0.05
Sensitivity	**[%]**	<0.03
Temperature Drift	**[%/K]**	<0.025
Electrical		
Duty Ratio	**[%]**	100
Protection Class		IP65 in accordance with EN 60529 (plugged and mounted)
Supply Voltage/Ripple	**[V]**	DC 22 ... 30, ripple <5% eff., surge free
Current Consumption Maximum	**[A]**	3.5
Pre-Fusing	**[A]**	4.0 medium lag
Input Signal		
Voltage	**[V]**	10...0...-10, ripple <0.01% eff., surge free, 0...+10V P->A
Impedance	**[kOhm]**	100
Current	**[mA]**	20...0...-20, ripple <0.01% eff., surge free, 0...+20mA P->A
Impedance	**[Ohm]**	250
Current	**[mA]**	4...12...20, ripple <0.01% eff., surge free, 12...20mA P->A <3.6 mA = disable, >3.8 mA = according to NAMUR NE43
Impedance	**[Ohm]**	250
Differential Input Maximum		
Code 0	**[V]**	30 for terminal D and E against PE (terminal G)
Code 5 / 7	**[V]**	30 for terminal 4 and 5 against PE (terminal ⏚)
Enable Signal (Only Code 5 / 7)	**[V]**	5...30, Ri = 9 kOhm
Diagnostic Signal	**[V]**	+10...0...-10 / +Ub, rated max. 5mA
EMC		EN61000-6-2 / EN61000-6-4
Electrical Connection	**Code 0**	6 + PE acc. EN 175201-804
	Code 5	11 + PE acc. EN 175201-804
	Code 7	6 + PE + Enable
Wiring Miniimum		
Code 0	**[mm²]**	7x1.0 (AWG 18) overall braid shield
Code 5	**[mm²]**	12x1.0 (AWG 20) overall braid shield
Code 7	**[mm²]**	12x1.0 (AWG 18) overall braid shield
Wiring Length Maximum	**[m]**	50 (164 ft.)

[1] For applications with pT>35 Bar (508 PSI) the Y-port has to be connected and the plug in the Y-port has to be removed.

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

[3] Measured with load 100 Bar (1450 PSI) pressure drop/two control edges.

D1FP.indd, dd

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Elyria, Ohio, USA

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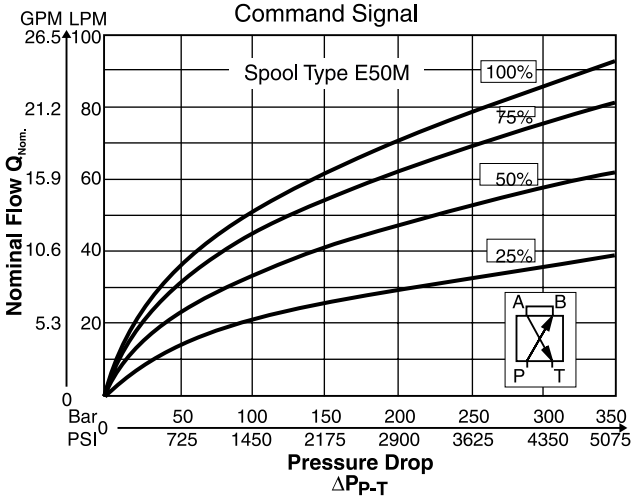
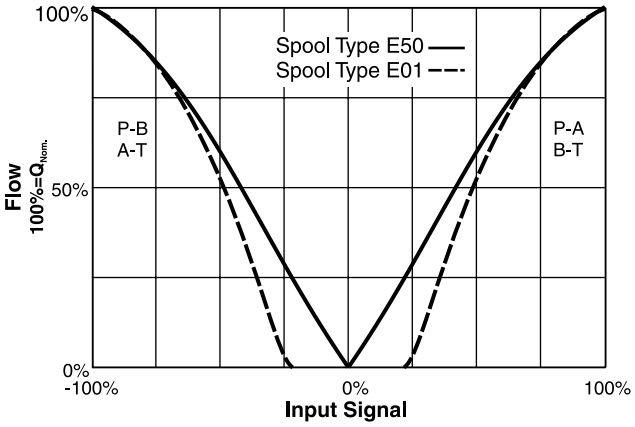
Functional Limit
at 25%, 50%, 75% and 100%
Command Signal

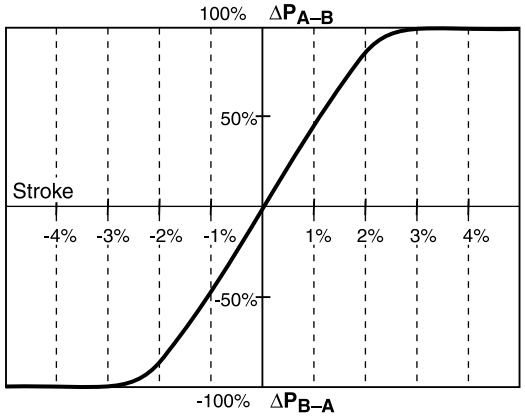


Spool Type **E01/E50**

Flow Curves
at Δp = 35 Bar (508 PSI) per metering edge

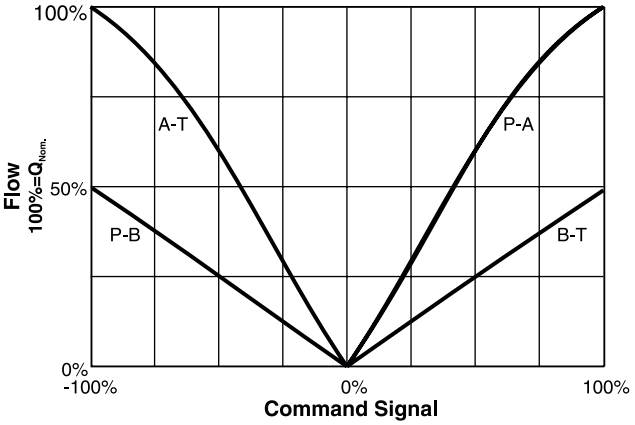


Pressure Gain

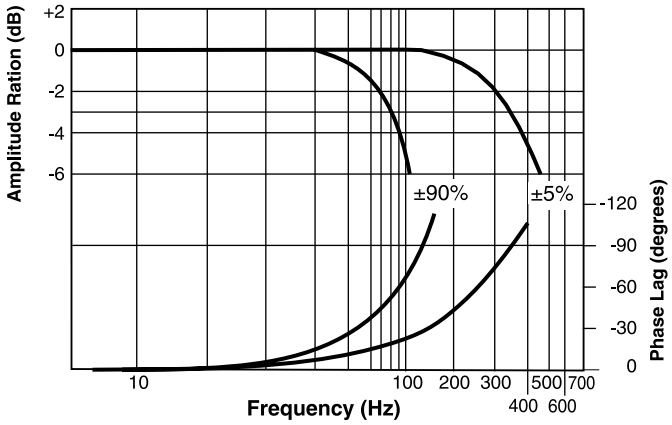


Spool Type **B60**

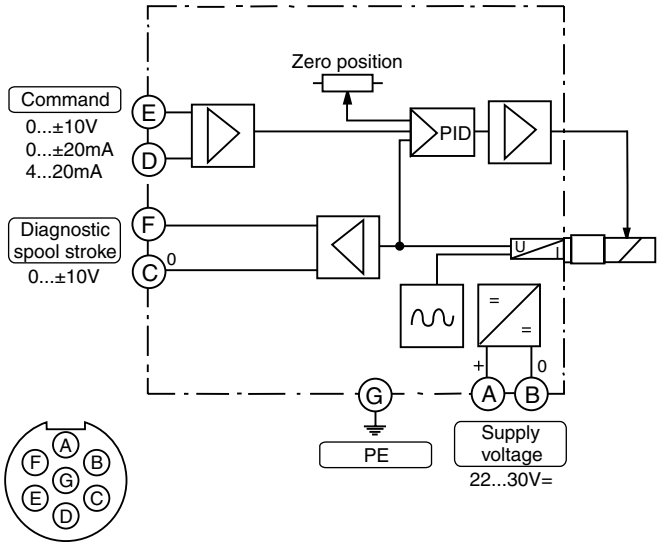
Flow Curves
at Δp = 35 Bar (508 PSI) per metering edge



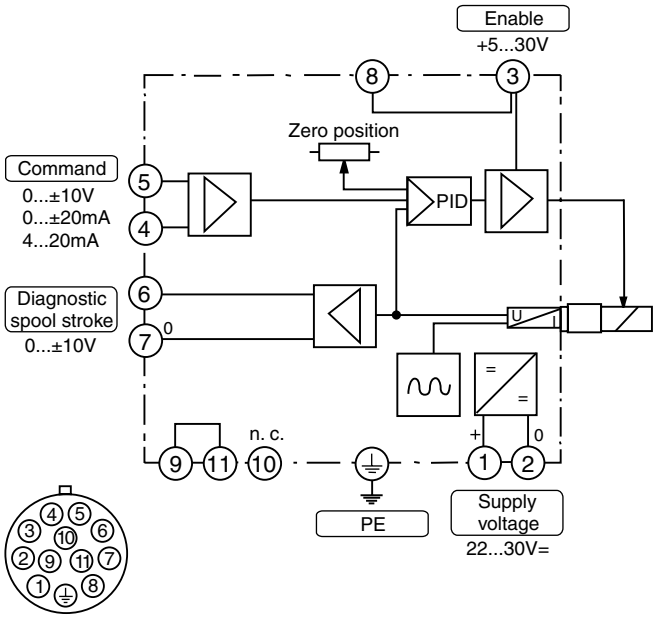
Frequency Response
±5% Command Signal
±90% Command Signal



Code 0
6 + PE acc. to EN 175201-804

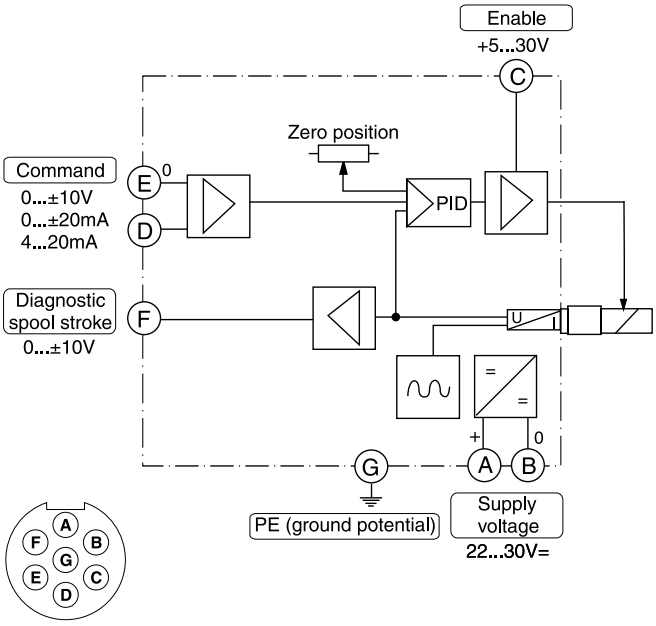


Code 5
11 + PE acc. to EN 175201-804



Note: When replacing another valve, verify Pin C is 0 V and not wired as an enable.

Code 7
6 + PE + Enable acc. to EN 175201-804



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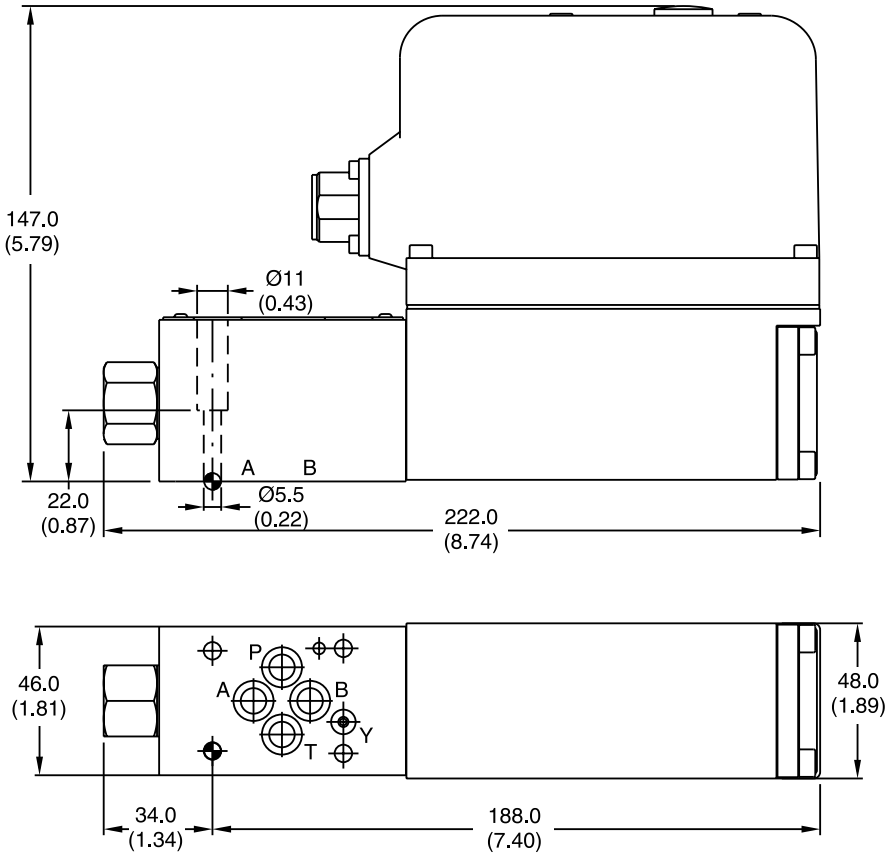
Inch equivalents for millimeter dimensions are shown in (**)



Surface Finish	Kit			Seal Kit
$R_{max}6.3$ 0.01/100	BK375 BK209	4x M5x30 DIN 912 12.9 4x 10-24x1.25	7.6 Nm (5.6 lb.-ft.) ±15 %	Nitrile: SK-D1FP Fluorocarbon: SK-D1FP-V for HFC Fluid: SK-D1FP-H

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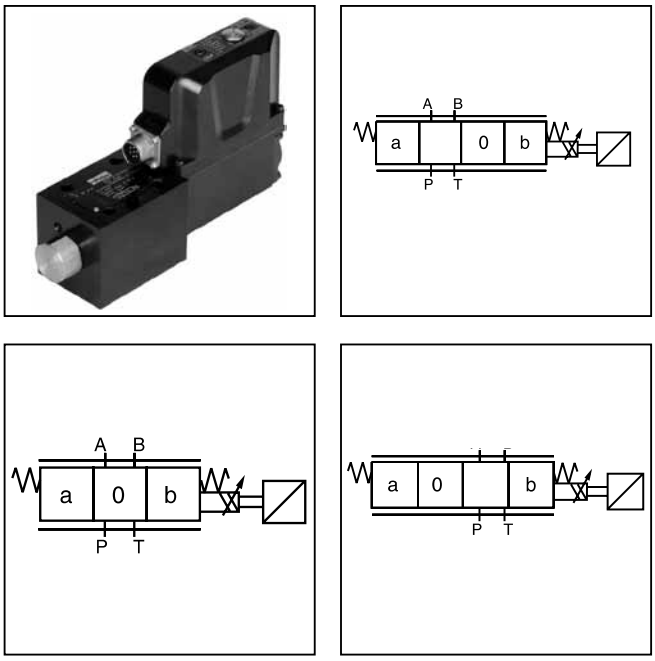
General Description

Series D3FP direct operated control NG10 (CETOP 5) valve features extremely high dynamics combined with maximum flow. It is used for high accuracy positioning of a hydraulic axis, and for controlling force and velocity.

Driven by the new patented VCD® actuator, the D3FP reaches the frequency response of servovalves.

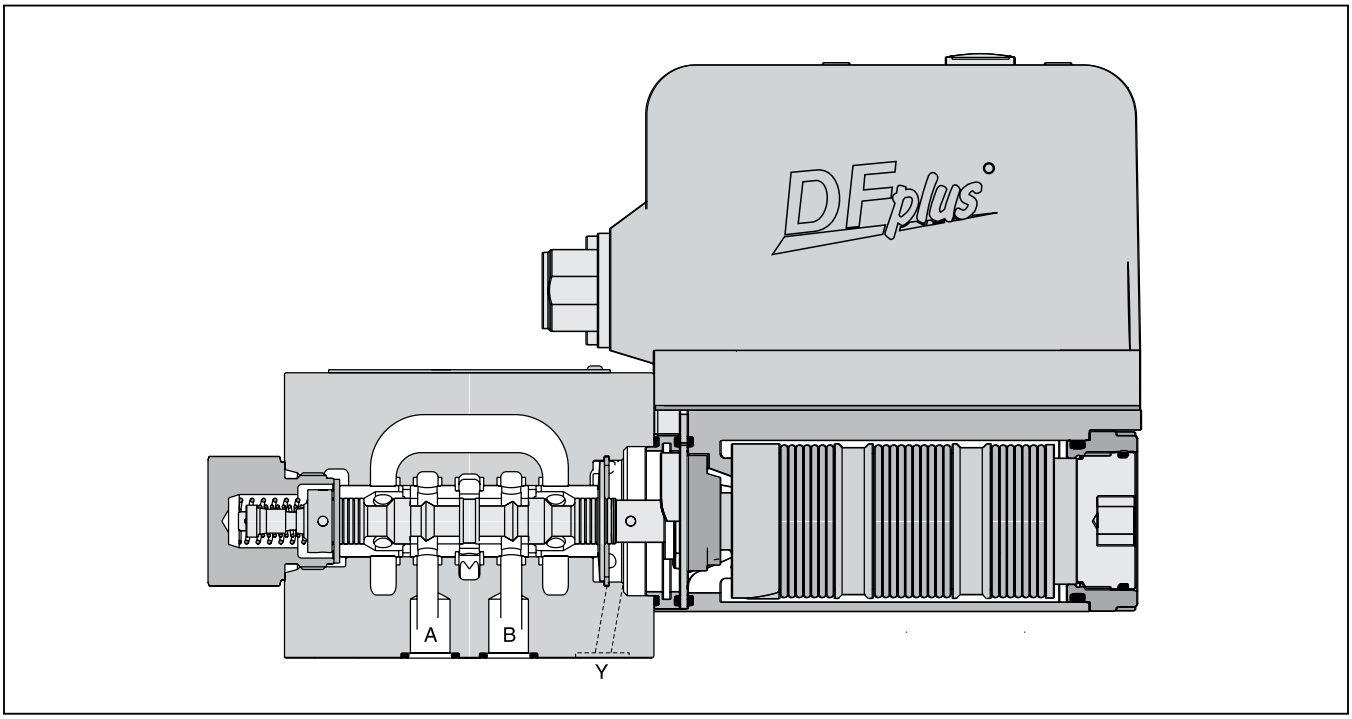
At power-down the spool moves in a defined position. All common input signals are available.



Features

- Extremely high dynamics.
- Maximum tank pressure 350 Bar (5075 PSI) with external drain Y-port.
- Defined spool positioning at power down.
- Onboard electronics.
- Spool/Sleeve design.

CE



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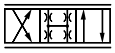
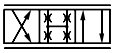
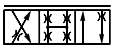
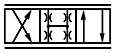
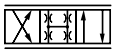
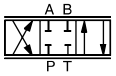
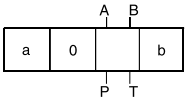
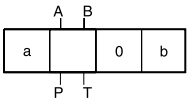
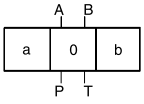
D	3	F	P	☐	☐	9	☐	☐	☐	0	⌜⌝
Directional Control Valve	Size DIN NG10 CETOP 5 NFPA D05	Proportional Control	VCD	Spool Type	Spool Position on Power Down [1]	Y-Port Plugged [4]	Seal	Input Signal	Options	Spool/ Sleeve Design	Design Series NOTE: Not required when ordering.

Code	Spool	Flow LPM (GPM) at Δp 35 Bar (508 PSI) per metering edge
Zerolap		
E50Y		100 (26.5)
E50P		50 (13.2)
B60Y	$Q_B = Q_A/2$ 	100 (26.5)
B60P	$Q_B = Q_A/2$ 	50 (13.2)
Underlap approximately -0.5%		
E55Y		100 (26.5)
E55P		50 (13.2)
Overlap 18%		
E01Y E01P		100 (26.5) 50 (13.2)
E02Y E02P		100 (26.5) 50 (13.2)

Code	Description
N	Nitrile
V	Fluorocarbon
H	For HFC Fluid

Code	Connection Type
0	6 + PE acc. EN175201-804
5	11 + PE acc. EN175201-804
7	6 + PE + Enable

Code	Spool Position on Power Down
A [2]	
B [2]	
C [3]	

Code	Signal	Flow Direction [5]
B	+/- 10V	0...+10V -> P-A
E	+/- 20mA	0...+20mA -> P-A
S	4...20mA	12...20mA -> P-A

[1] On power down the spool moves in a defined position. This cannot be guaranteed in case of single flow path on the control edge A→ T resp. B→ T with pressure drops above 120 Bar (1740 PSI) or contamination in the hydraulic fluid.

[2] Approximately 10% opening, only available with zerolap spools and underlap spools.

[3] Only available with overlap spools.

[4] Needs to be removed at tank pressure >35 Bar (507.5 PSI).

[5] Flow direction P→ A with Pin D > Pin E.

Please order plugs separately. See Accessories.

Bolt Kit:
BK98 (4) 1/4-20x1.62
BK385 (4) M6x40
Weight: 6.5 kg (14.3 lbs.)

General		
Design		Direct operated proportional DC valve
Actuation		VCD® actuator
Size		NG10 / CETOP 5 / NFPA D05
Mounting Interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA
Mounting Position		Unrestricted
Ambient Temperature	**[°C]**	-20...+50; (-4°F...+122°F)
$MTTF_D$ Value	**[years]**	75
Vibration Resistance	**[g]**	10 Sinus 5...2000 Hz acc. IEC 68-2-6 30 Random noise 20...2000 Hz acc. IEC 68-2-36 15 Shock acc. IEC 68-2-27
Hydraulic		
Maximum Operating Pressure		Ports P, A, B 350 Bar (5075 PSI) Port T max. 35 Bar (508 PSI), port Y max. 35 Bar (508 PSI) [1]
Fluid		Hydraulic oil as per DIN 51524...535, other on request
Fluid Temperature	**[°C]**	-20...+60; (-4°F...+140°F)
Viscosity		
Permitted	**[cSt] / [mm²/s]**	20...380 (93...1761 SSU)
Recommended	**[cSt] / [mm²/s]**	30...80 (139...371 SSU)
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)
Nominal Flow at Δp=35 Bar (508 PSI) per Control Edge [2]		50 LPM (13.2 GPM) / 100 LPM (26.5 GPM)
Flow Maximum		150 LPM (39.7 GPM)
Leakage at 100 Bar (1450 PSI)	**[ml/min]**	<400 (zerolap spool); <50 (overlap spool)
Static / Dynamic		
Step Response at 100% Step [3]	**[ms]**	<6
Frequency Response (±5% signal) [3]	**[Hz]**	350 (amplitude ratio -3dB), 350 (phase lag -90°)
Hysteresis	**[%]**	<0.05
Sensitivity	**[%]**	<0.03
Temperature Drift	**[%/K]**	<0.025
Electrical		
Duty Ratio	**[%]**	100
Protection Class		IP65 in accordance with EN 60529 (plugged and mounted)
Supply Voltage/Ripple	**[V]**	DC 22 ... 30, ripple <5% eff., surge free
Current Consumption Maximum	**[A]**	3.5
Pre-Fusing	**[A]**	4.0 medium lag
Input Signal		
Voltage	**[V]**	10...0...-10, ripple <0.01% eff., surge free, 0...+10V P->A
Impedance	**[kOhm]**	100
Current	**[mA]**	20...0...-20, ripple <0.01% eff., surge free, 0...+20mA P->A
Impedance	**[Ohm]**	250
Current	**[mA]**	4...12...20, ripple <0.01% eff., surge free, 12...20mA P->A <3.6 mA = disable, >3.8 mA = according to NAMUR NE43
Impedance	**[Ohm]**	250
Differential Input Maximum		
Code 0	**[V]**	30 for terminal D and E against PE (terminal G)
Code 5 / 7	**[V]**	30 for terminal 4 and 5 against PE (terminal ⏚)
Enable Signal (Only Code 5 / 7)	**[V]**	5...30, Ri = 9 kOhm
Diagnostic Signal	**[V]**	+10...0...-10 / +Ub, rated max. 5mA
EMC		EN61000-6-2 / EN61000-6-4
Electrical Connection	**Code 0**	6 + PE acc. EN 175201-804
	Code 5	11 + PE acc. EN 175201-804
	Code 7	6 + PE + Enable
Wiring Minimum **Code 0**	**[mm²]**	7x1.0 (AWG 18) overall braid shield
Code 5	**[mm²]**	12x1.0 (AWG 20) overall braid shield
Code 7	**[mm²]**	12x1.0 (AWG 18) overall braid shield
Wiring Length Maximum	**[m]**	50 (164 ft.)

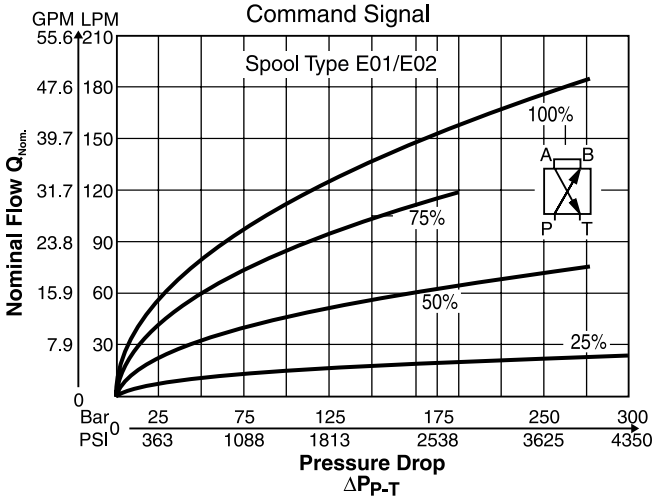
[1] For applications with pT>35 Bar (508 PSI) the Y-port has to be connected and the plug in the Y-port has to be removed.

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

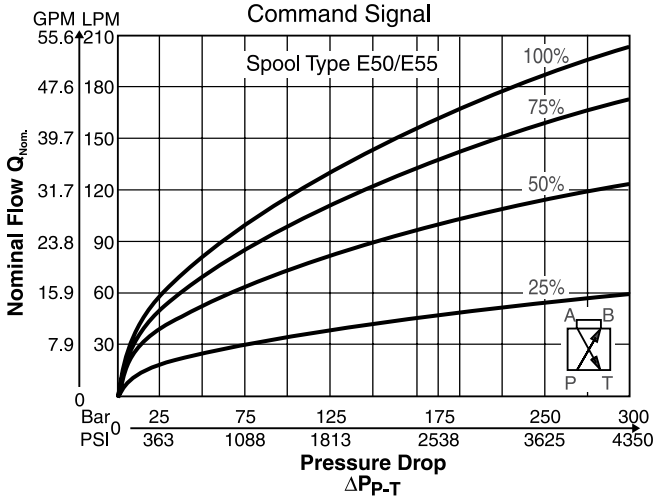
[3] Measured with load 100 Bar (1450 PSI) pressure drop/two control edges)

A

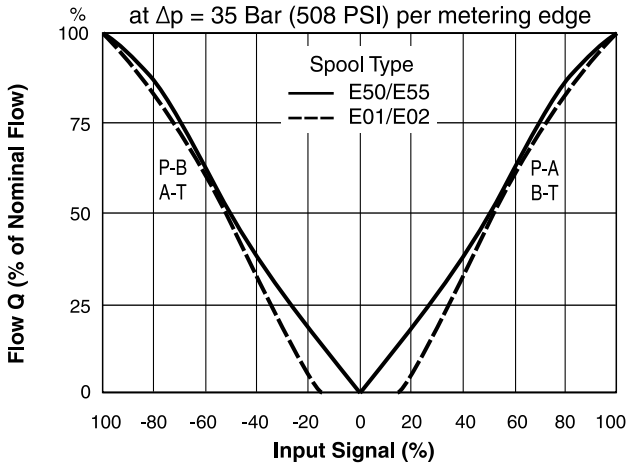
Functional Limit
at 25%, 50%, 75% and 100%
Command Signal



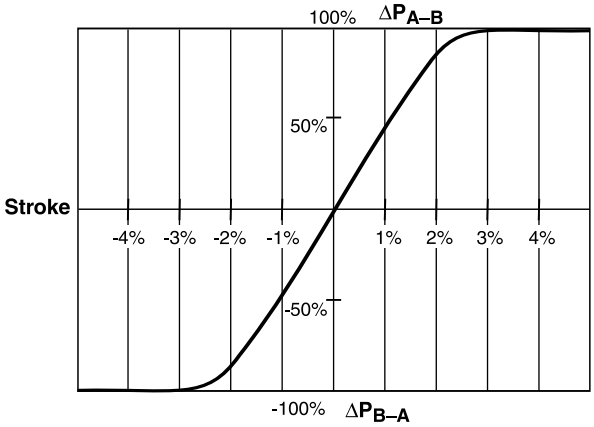
Functional Limit
at 25%, 50%, 75% and 100%
Command Signal



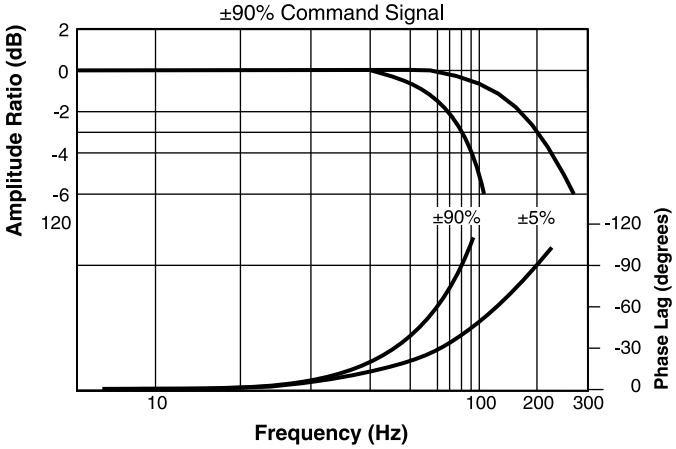
Flow Curves
at Δp = 35 Bar (508 PSI) per metering edge



Pressure Gain

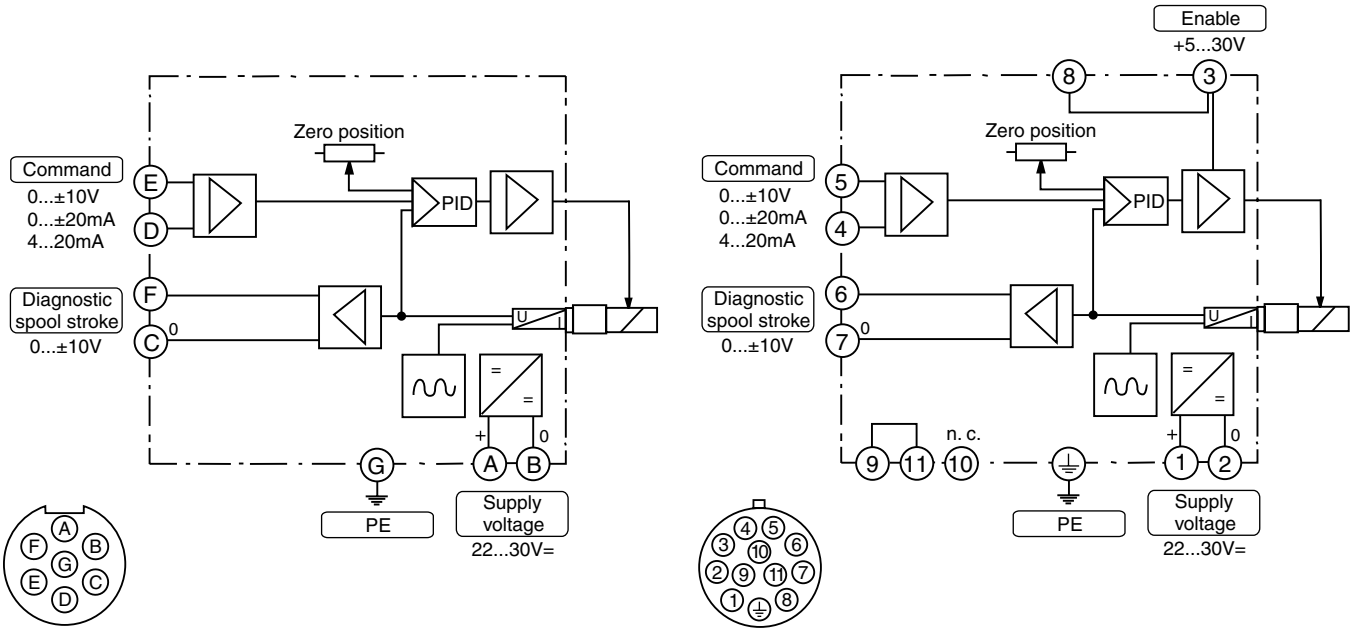


Frequency Response
±5% Command Signal
±90% Command Signal



D3FP.indd, dd

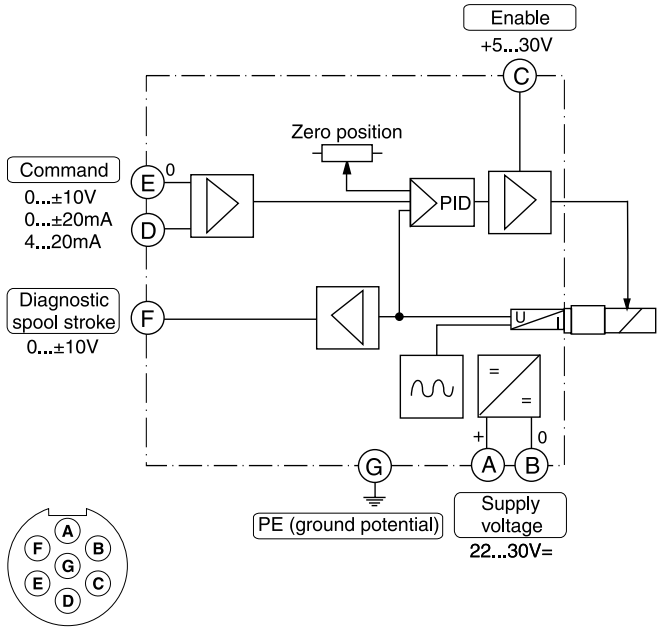
Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA



Note: When replacing another valve, verify Pin C is 0 V and not wired as an enable.

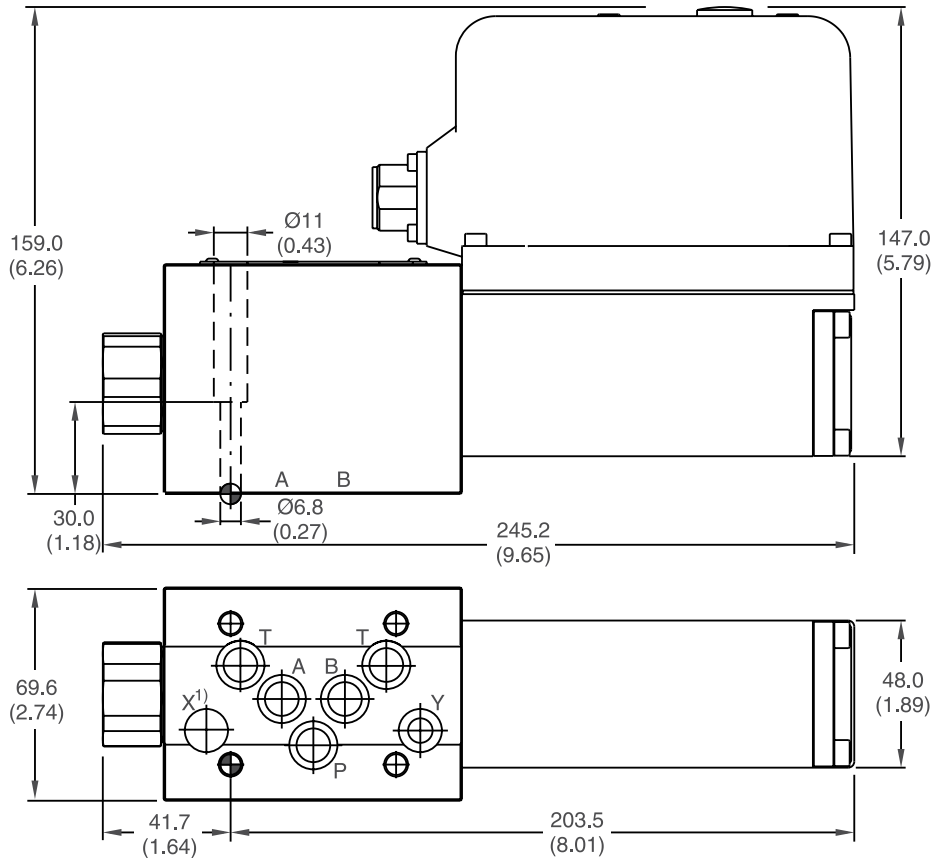
Code 7

6 + PE + Enable acc. to EN 175201-804



A

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



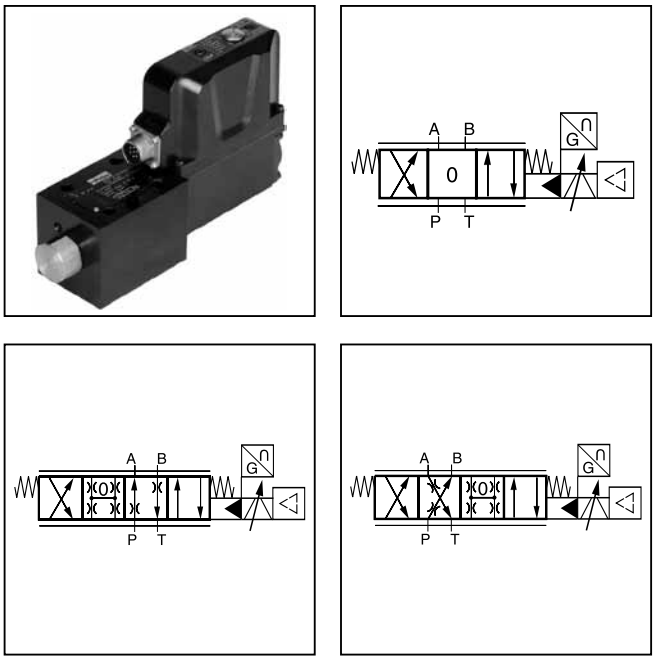
Surface Finish	Kit			Seal Kit
$R_{max}6.3$ 0.01/100	BK385 BK98	4x M6x40 DIN 912 12.9 4x 1/4-20x1.62	13.2 Nm (9.7 lb.-ft.) ±15 %	Nitrile: SK-D3FP Fluorocarbon: SK-D3FP-V for HFC Fluid: SK-D3FP-H

General Description

Series D30FP pilot operated control valve closes the gap between the direct operated D3FP valves and the conventional pilot operated D31FP valves.

Providing high flow capacity and practically no flow limits like D31FP in the envelope size of the D3FP.

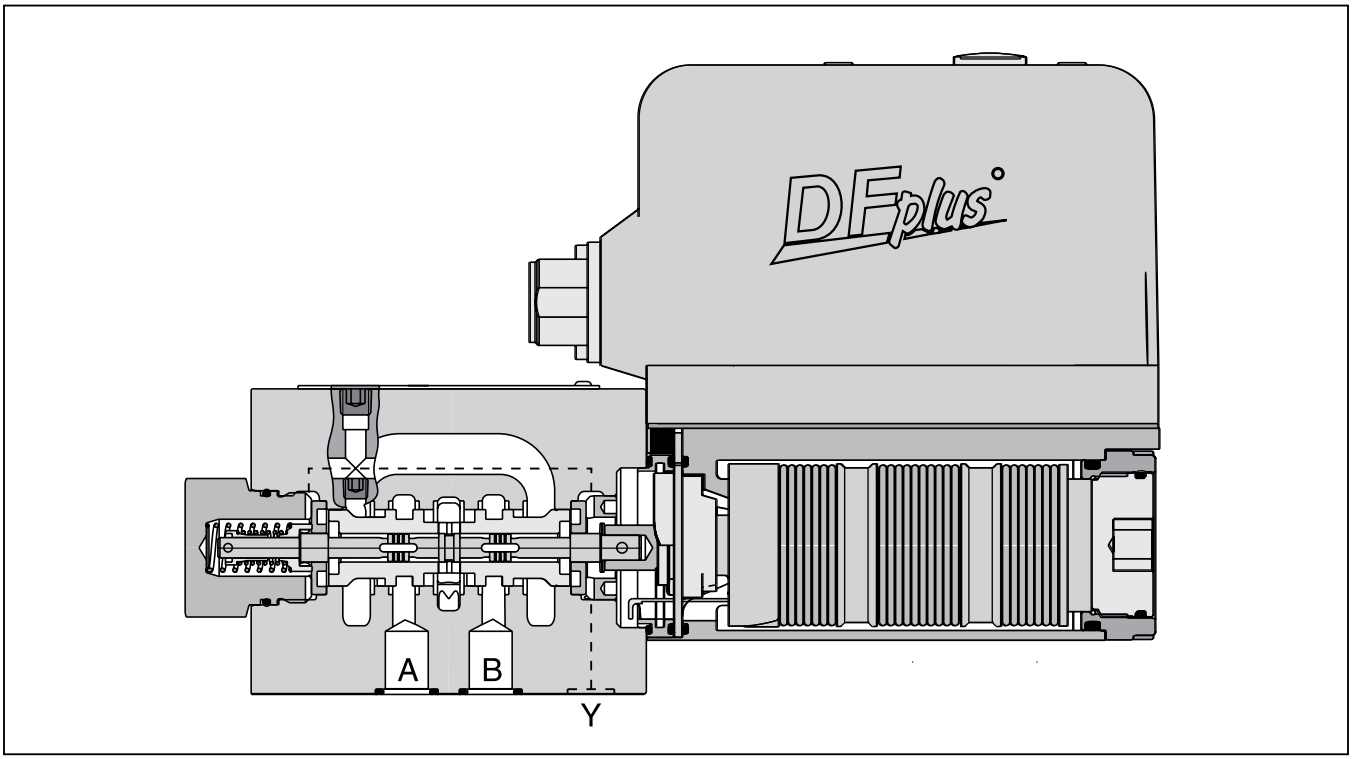
The valve works with the hydraulic follower principle, with a moving sleeve as main spool.



Features

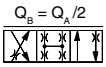
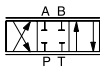
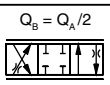
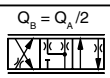
- Pilot operated with hydraulic follower sleeve.
- No flow limit up to 350 bar through the valve.
- Defined spool positioning at power down.

CE



A

D	30	F	P	☐	☐	☐	☐	☐	☐	3	⌜ ⌝
Directional Control Valve	Size DIN NG10 CETOP 5 NFPA D05	Proportional Control	VCD	Spool Type	Spool Position on Power Down	Pilot Connection	Seal	Input Signal	Options	Spool/ Sleeve Design	Design Series NOTE: Not required when ordering.

Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
Zerolap		
E50U		80 (21.2)
E60U		80 (21.2)
Overlap 18%		
E01U		80 (21.2)
E02U		80 (21.2)
B31U		80 (21.2)
B32U		80 (21.2)

Code	Description
N	Nitrile
V	Fluorocarbon

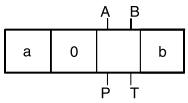
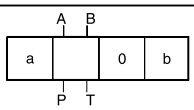
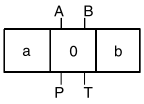
Code	Connection Type
0	6 + PE acc. EN175201-804
5	11 + PE acc. EN175201-804
7	6 + PE + Enable

Code	Inlet	Dain
1 [1]	Internal	External
4	Internal	Internal

[1] For tank pressure >35 Bar (508 PSI).

Code	Signal	Flow Direction [4]
B	+/- 10V	0...+10V -> P-A
E	+/- 20mA	0...+20mA -> P-A
S	4...20mA	12...20mA -> P-A

[4] Flow direction P→ A with Pin D > Pin E.

Code	Spool Position on Power Down
A [2]	
B [2]	
C [3]	

[2] Approximately 10% opening, only available with zerolap spools and underlap spools.

[3] Only available with overlap spools.

Please order plugs separately. See Accessories.

Bolt Kit:

BK98	(4)	1/4-20x1.62
BK385	(4)	M6x40

Weight: 6.5 kg (14.3 lbs.)

General		
Design		Pilot operated proportional DC valve
Actuation		VCD® actuator
Size		NG10 / CETOP 5 / NFPA D05
Mounting Interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA
Mounting Position		Unrestricted
Ambient Temperature	**[°C]**	-20...+50; (-4°F...+122°F)
$MTTF_D$ Value	**[years]**	50
Vibration Resistance	**[g]**	10 Sinus 5...2000 Hz acc. IEC 68-2-6 30 Random noise 20...2000 Hz acc. IEC 68-2-36 15 Shock acc. IEC 68-2-27
Hydraulic		
Maximum Operating Pressure		Ports P, A, B 350 Bar (5075 PSI) Port T 35 Bar (508 PSI) for internal drain, 315 Bar (4568 PSI) for external drain Port Y 35 Bar (508 PSI)
Fluid		Hydraulic oil as per DIN 51524...535, other on request
Fluid Temperature	**[°C]**	-20...+60; (-4°F...+140°F)
Viscosity		
Permitted	**[cSt] / [mm²/s]**	20...380 (93...1761 SSU)
Recommended	**[cSt] / [mm²/s]**	30...80 (139...371 SSU)
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)
Nominal Flow at Δp=5 Bar (72.5 PSI) per Control Edge [1]		80 LPM (21.2 GPM)
Flow Maximum		250 LPM (66.1 GPM)
Leakage at 100 Bar (1450 PSI)	**[ml/min]**	<1800 (zerolap spool); <1000 (overlap spool)
Pilot Supply Pressure		5 Bar (72.5 PSI)
Static / Dynamic		
Step Response at 100% Step [2]	**[ms]**	<7
Frequency Response (±5% signal) [2]	**[Hz]**	120 (amplitude ratio -3dB), 120 (phase lag -90°)
Hysteresis	**[%]**	<0.05
Sensitivity	**[%]**	<0.03
Temperature Drift	**[%/K]**	<0.025
Electrical		
Duty Ratio	**[%]**	100
Protection Class		IP65 in accordance with EN 60529 (with correctly mounted plug-in connector)
Supply Voltage/Ripple	**[V]**	DC 22 ... 30, ripple <5% eff., surge free
Current Consumption Maximum	**[A]**	3.5
Pre-Fusing	**[A]**	4.0 medium lag
Input Signal **Voltage**	**[V]**	10...0...-10, ripple <0.01% eff., surge free, 0...+10V P->A
Impedance	**[kOhm]**	100
Current	**[mA]**	20...0...-20, ripple <0.01% eff., surge free, 0...+20mA P->A
Impedance	**[Ohm]**	250
Current	**[mA]**	4...12...20, ripple <0.01% eff., surge free, 12...20mA P->A
Impedance		<3.6 mA = disable, >3.8 mA = according to NAMUR NE43
	[Ohm]	250
Differential Input Maximum		
Code 0	**[V]**	30 for terminal D and E against PE (terminal G)
Code 5 / 7	**[V]**	30 for terminal 4 and 5 against PE (terminal ⏚)
Enable Signal (Only Code 5 / 7)	**[V]**	5...30, Ri = 9 kOhm
Diagnostic Signal	**[V]**	+10...0...-10 / +Ub, rated max. 5mA
EMC		EN 50081-2 / EN50082-2
Electrical Connection	**Code 0**	6 + PE acc. EN 175201-804
	Code 5	11 + PE acc. EN 175201-804
	Code 7	6 + PE + Enable
Wiring Minimum **Code 0**	**[mm²]**	7 x 1.0 (AWG 18) overall braid shield
Code 5	**[mm²]**	12 x 1.0 (AWG 20) overall braid shield
Code 7	**[mm²]**	12 x 1.0 (AWG 18) overall braid shield
Wiring Length Maximum	**[m]**	50 (164 ft.)

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

2) Measured with load (100 Bar (1450 PSI) pressure drop/two control edges)

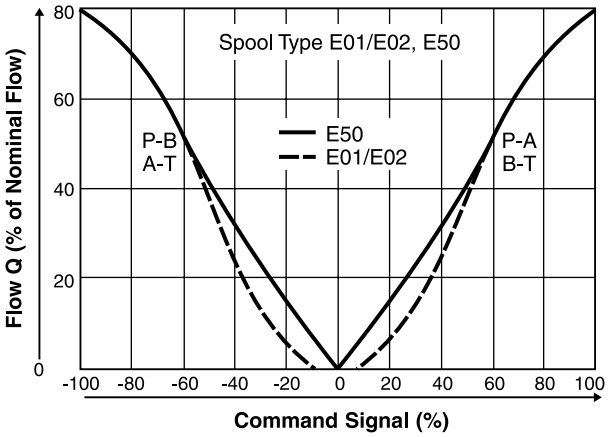
D30FP.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

A

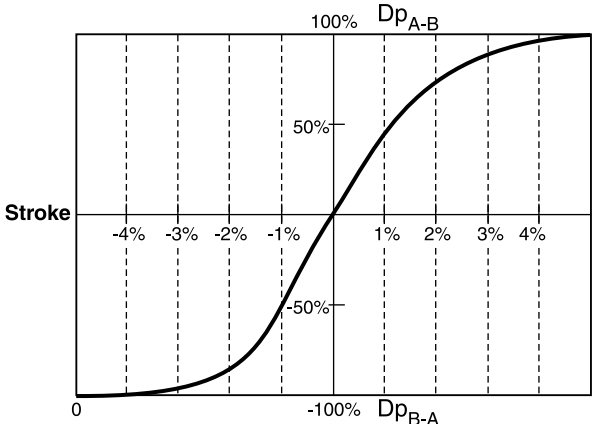
Flow

D30FP Flow Characteristics
at Dp = 5 Bar (72.5 PSI) / metering edge



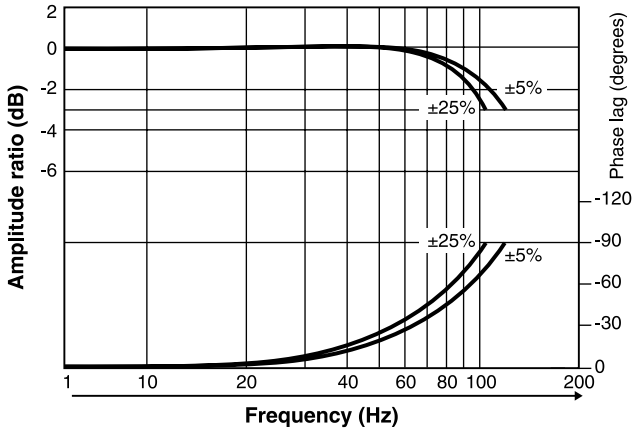
Pressure Gain

D30FP Pressure Gain



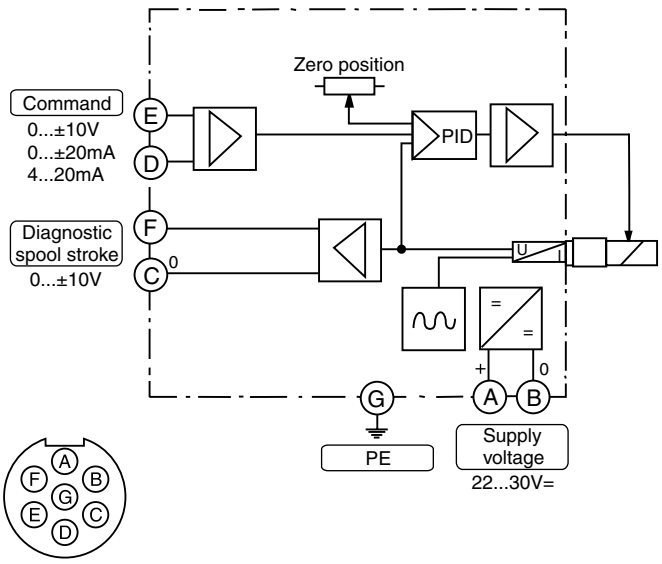
Frequency Response

D30FP Frequency Response
±5% / ±25% Command Signal

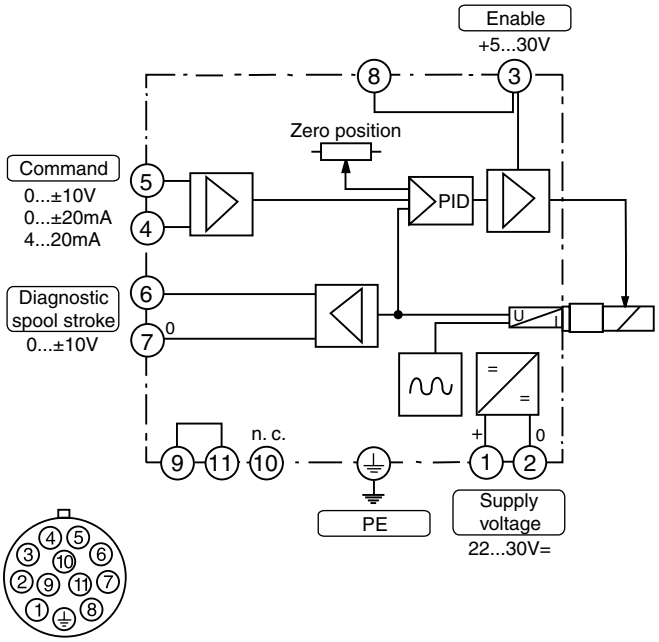


A

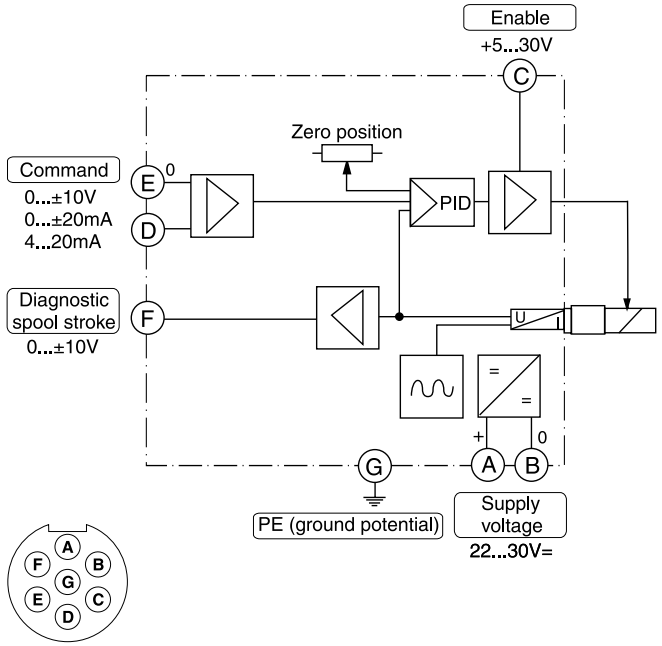
Code 0
6 + PE acc. to EN 175201-804



Code 5
11 + PE acc. to EN 175201-804

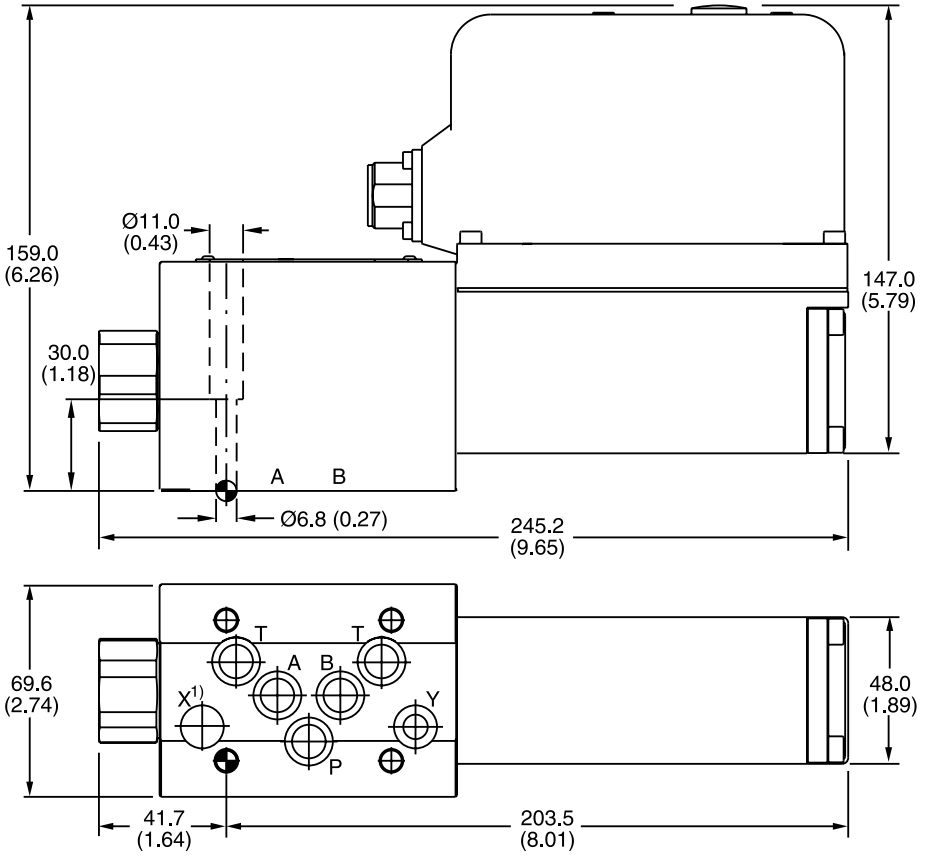


Code 7
6 + PE + Enable acc. to EN 175201-804



A

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



Surface Finish	Kit			Seal Kit
R_{max}6.3 0.01/100	BK385 BK98	4x M6x40 DIN 912 12.9 4x 1/4-20x1.62	13.2 Nm (9.7 lb.-ft.) ±15 %	Nitrile: SK-D3FP Fluorocarbon: SK-D3FP-V

A

General Description

Series D*1FP pilot operated servo proportional valves transfer the advantages of the Parker patented Voice Coil Drive (VCD®) to larger frame sizes for high flow rates. The high dynamic / high precision drive of the pilot valve allows the optimum control of the main spool and results in servo performance of the complete valve.

Series D*1FP is available in 5 sizes:

D31FP NG10 (CETOP 5)

D41FP NG16 (CETOP 7)

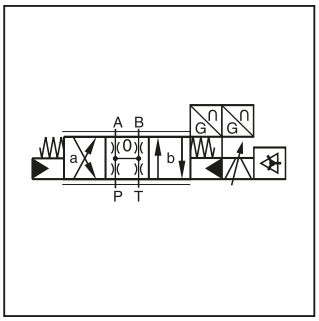
D91FP NG25 (CETOP 8)
for port diameter up to 32 mm (1.26 in.)

D111FP NG32 (CETOP 10)

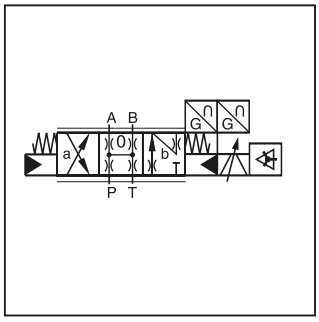
The power down mode works with a safe 4th position of the D1FP pilot valve. This ensures that the main stage is hydraulically balanced at power down and allows the main spool spring to center (for overlapped spools), or approximately 10% spring offset to spool position A or B (for zerolap spools).

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

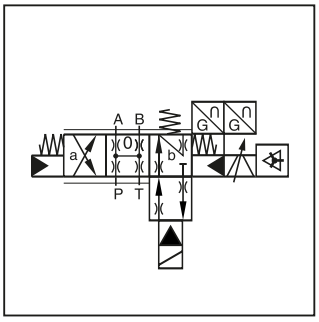
D41FP Standard



Standard D*1FPE



NEW: A-Regeneration D*1FPR



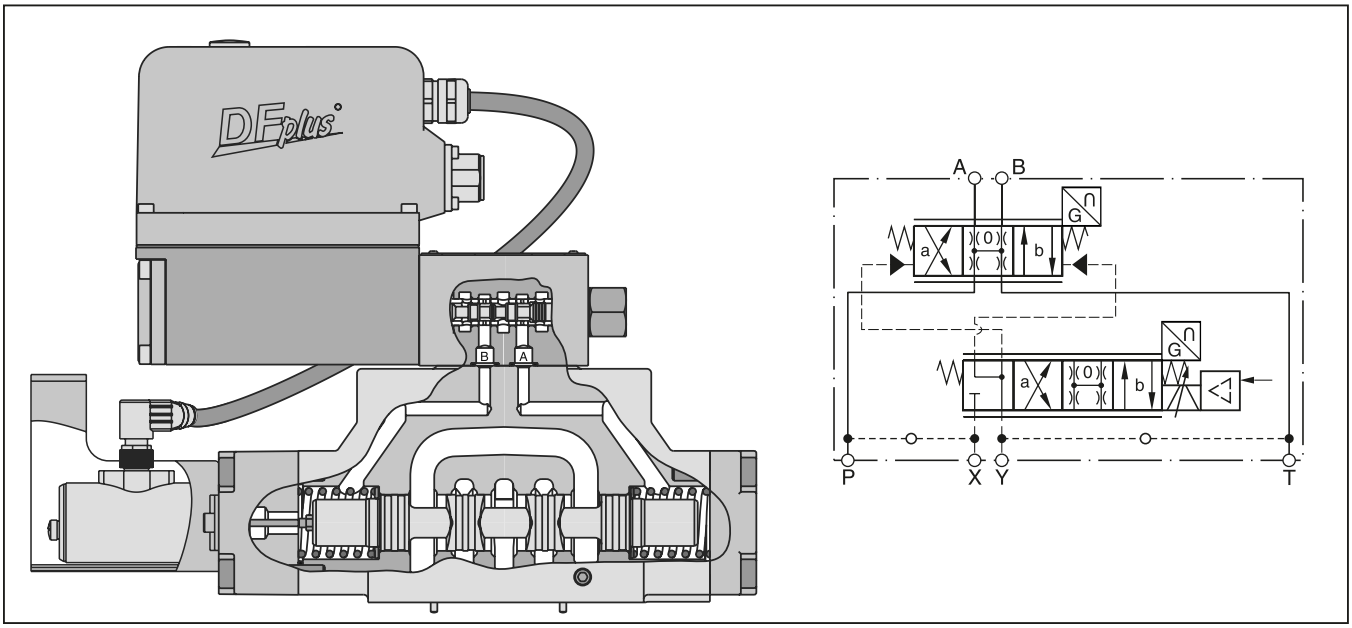
NEW: Hybrid D*1FPZ

Features

- High dynamics.
- High flow.
- Defined spool positioning at power-down – optional P-A/B-T or P-B/A-T or center position (for overlapped spools).
- Onboard electronics.
- Closed loop position – controlled pilot valve and main stage.
- **NEW:** Energy saving A-Regeneration.
- **NEW:** Switchable hybrid version.

CE

D41FPE52 (Standard)



D_1FP.indd, dd

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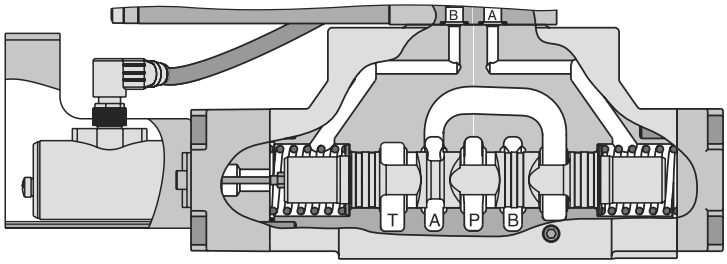
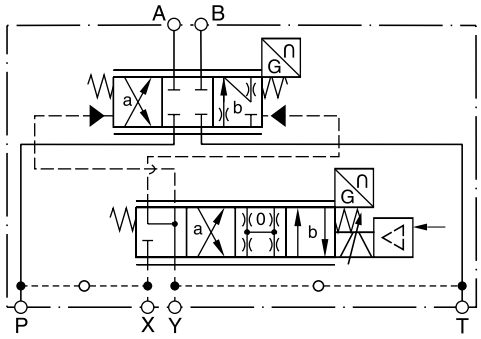
Elyria, Ohio, USA

A

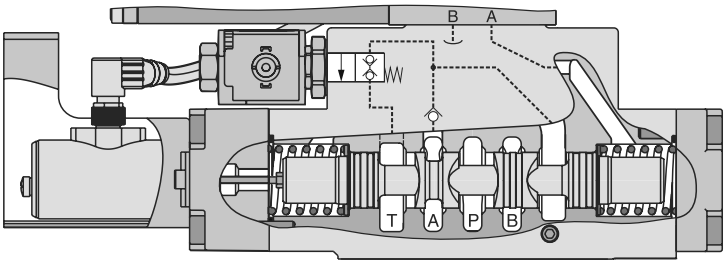
D*1FPR and D*1FPZ

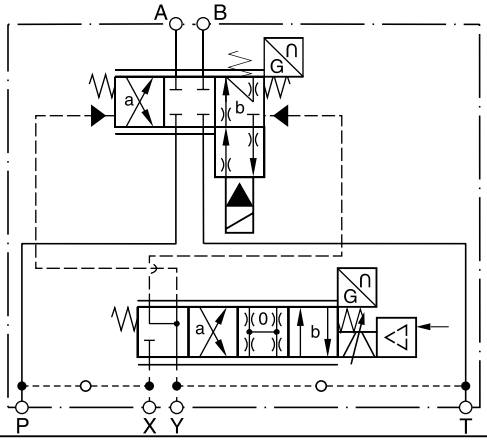
Regenerative Valve D*1FPR





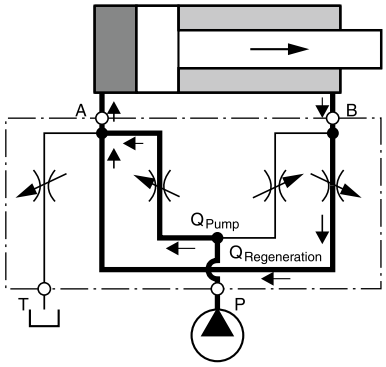
Hybrid Valve D*1FPZ





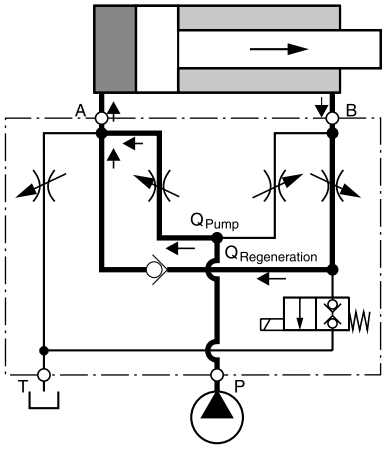
D*1FPR (Regenerative Valve)

Cylinder extending

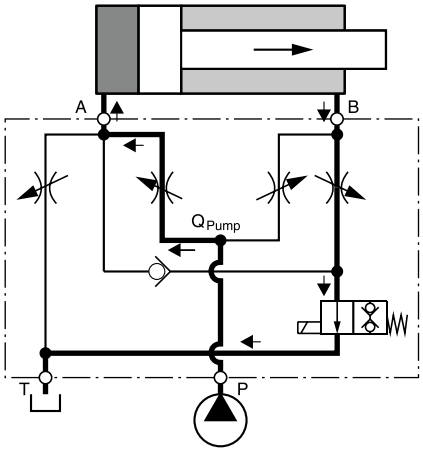


D*1FPZ (Hybrid Valve)

Cylinder extending
regenerative mode
(high speed)



Cylinder extending
standard mode
(high force)



Flow Rate in % of Nominal Flow

Size	Spool	Port					
		A-T	P-A	P-B	B-A (R-Valve)	B-A (Hybrid)	B-T (Hybrid)
D41FPR/Z	31/32/61	100%	50%	100%	50%	40%	20%
D91FPR/Z	31/32/61	100%	50%	100%	50%	50%	25%
D111FPR/Z	31/32/61	on request					

A

Ordering Information

D		1	F	P										
Directional Control Valve	Size	NG6 Pilot	Proportional Control	High Response	Spool Type	Flow	Spool Position on Power Down	Pilot Connections	Seal	Input Signal	Options	Hybrid Options	Design Series	NOTE: Not required when ordering.

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

[1] For enlarged connections Ø 32 mm

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

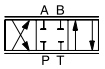
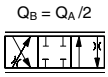
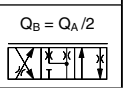
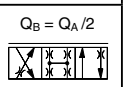
Code	Description
N	Nitrile
V	Fluorocarbon
H	For HFC fluid

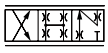
Code	Signal	Function
B	0...±10V	0...+10V P -> B
E	0...±20mA	0...+20mA P -> B
K	0...±10V	0...+10V P -> A
S	4...20mA	12...20mA P -> A

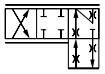
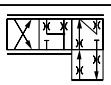
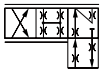
Code	Description
0	6+PE acc. EN175201-804
5	11+PE acc. EN175201-804
7	6+PE + Enable

Code	Description
0	Standard
L [6]	Hybrid valve 24V normally closed for spool type Z

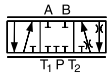
[6] See page A144 for regenerative and hybrid spool information. (not available in D31FP)

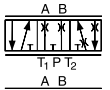
Standard	
Code	Spool Type
Overlap 10%	
E01	
E02	
B31	
B32	
Zerolap	
E52	
B61	

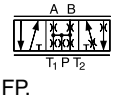
NEW: Regenerative Function [4]	
Code	Spool Type
Overlap 10%	
R31	
R32	
Zerolap	
R61	

NEW: Hybrid Function [5]	
Code	Spool Type
Overlap 10%	
Z31	
Z32	
Zerolap	
Z61	

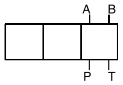
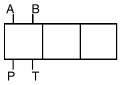
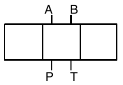
[4] Not available with D91FP.

D31FP spool style: R31 

R32 

R61 

[5] Not available in valve D31FP.

Code	Spool Position on Power Down
A [2]	
B [2]	
C [3]	

[2] Approx. 10% opening, only zerolap spools.

[3] Only overlap spools.

Code	Flow LPM (GPM) at Δp = 5 Bar (72.5 PSI) per metering edge			
	D31	D41	D91	D111
E	120 (32)	—	—	—
F	—	200 (53)	—	—
H	—	—	400 (106)	—
L	—	—	—	1000 (265)

Please order plugs separately. See Accessories.

Bolt Kit:

D31FP	BK98
D41FP	BK160
D91FP	BK228
D111FP	BK150

Weight:

D31FP	11.3 kg (24.9 lbs.)
D41FP	14.2 kg (31.3 lbs.)
D91FP	23.5 kg (51.8 lbs.)
D111FP	64.5 kg (142.2 lbs.)

D_1FP.indd, dd

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Hydraulic Valve Division
Elyria, Ohio, USA

A

General					
Size		**NG10 (CETOP 5)**	**NG16 (CETOP 7)**	**NG25 (CETOP 8)**	**NG32 (CETOP 10)**
Mounting		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA			
Mounting Position		Unrestricted			
Ambient Temperature Range		-20°C to +50°C (-4°F to +122°F)			
Hydraulic					
Maximum Operating Pressure		Internal Pilot Drain P, A, B, X: 350 Bar (5075 PSI); T, Y: 35 Bar (508 PSI) External Pilot Drain P, A, B, T, X: 350 Bar (5075 PSI); Y: 35 Bar (508 PSI)			
Fluid		Hydraulic oil as per DIN 51524 ... 51535, other on request			
Fluid Temperature		-20°C to +60°C (-4°F to +140°F)			
Viscosity **Permitted** **Recommended**		20 to 380 cSt / mm²/s (93 to 1761 SSU) 30 to 80 cSt / mm²/s (139 to 371 SSU)			
Filtration		ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			
Nominal Flow at Δp=5 Bar (72.5 PSI) per control edge [1]	**LPM (GPM)**	120 (32)	200 (53)	400 (106)	1000 (265)
Max. Recommended Flow	**LPM (GPM)**	250 (66)	600 (159)	1000 (265)	3000 (794)
Regenerative B-A /B-T		Depending on application, see flow curves			
Leakage at 100 Bar (1450 PSI) **Overlap Spool**	**LPM GPM)**	0.2 (0.05)	0.2 (0.05)	0.6 (0.16)	1 (0.26)
Zerolap Spool	**LPM (GPM)**	0.9 (0.24)	0.9 (0.24)	1 (0.26)	—
Pilot	**LPM (GPM)**	< 1 LPM (0.26 GPM)			
Pilot Supply Pressure		20 Bar (290 PSI) to 350 Bar (5075 PSI)			
Pilot Flow, Step Response at 210 Bar (3045 PSI)	**LPM (GPM)**	10 (2.6)	12 (3.2)	24 (6.3)	40 (10.6)
Static / Dynamic					
Step Response at 100% Stroke		10 ms	13 ms	19 ms	45 ms
Frequency Response ± 5% at 210 Bar (3045 PSI)	**Amplitude** **Phase**	28 Hz 118 HZ	95 Hz 95 Hz	95 Hz 90 Hz	40 Hz 75 Hz
Hysteresis		< 0.1%			
Sensitivity		< 0.05%			
Temperature Drift		< 0.025%			
Electrical					
Duty Ratio		100%			
Protection Class		IP65 in accordance with EN 60529 (plugged and mounted)			
Supply Voltage / Ripple		22...30V, ripple < 0.5% eff., surge free			
Current Consumption		3.5 A maximum			
Input Signal	**Voltage**	+10...0...-10V, ripple < 0.01% eff., surge free, 0...+10V P→A			
	Impedance	100k Ohm			
	Current	4...12...20 mA, ripple < 0.01% eff., surge free, 12...20 mA P→A < 3.6 mA = enable off, > 3.8 mA = enable on acc. NAMUR NE43			
	Impedance	250 Ohm			
	Input Capacitance	1 nF, typical			
Differential Input Maximum	**Code 0**	30V for terminal D and E against PE (terminal G) 11V for terminal D and E against 0V (terminal B)			
	Code 5	30V for terminal 4 and 5 against PE (terminal W) 11V for terminal 4 and 5 against 0V (terminal 2)			
	Code 7	30V for terminal D and E against PE (terminal G)			
Enable Signal	**Code 5 / 7**	5...30V, Ri = 9 kOhm			
Diagnostic Signal		+10...0...-10V / +Ub, rated maximum 5 mA			
Pre-fusing		4.0 A medium lag			
EMC		EN 61000-6-2, EN 61000-6-4			
Electrical Connection	**Code 0 / 7** **Code 5**	6 + PE acc. EN 175201-804 11 + PE acc. EN 175201-804			
Wiring Min. **Code 0 / 7** **Code 5**	**mm²** **mm²**	7 x 1.0 (AWG16) overall braid shield 11 x 1.0 (AWG20) overall braid shield			
Wiring Length		50m (164 ft.) maximum			

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

[2] Measured with load 210 Bar (3045 PSI) pressure drop; two control edges

D_1FP.indd, dd

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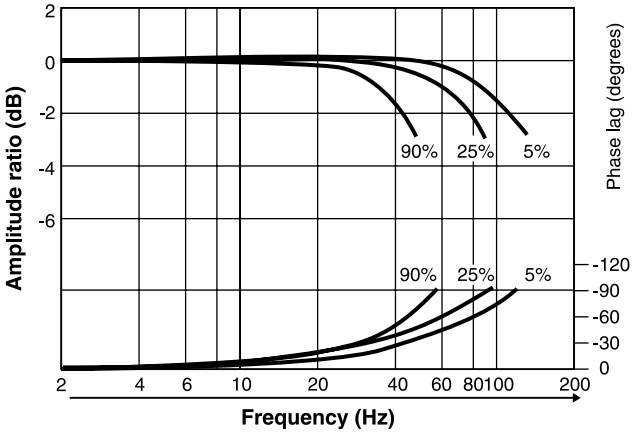
Hydraulic Valve Division
Elyria, Ohio, USA

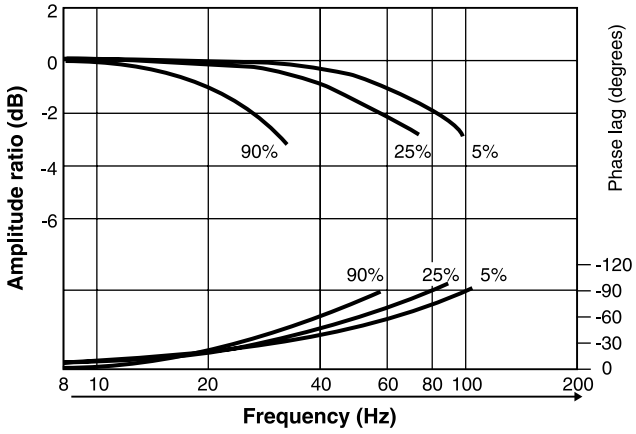
A

Frequency Response

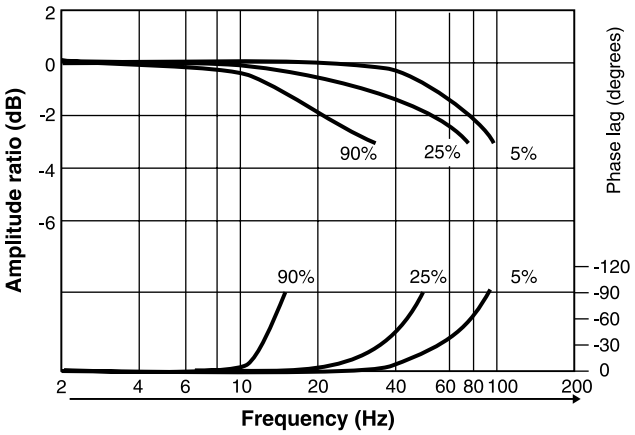
D31FP Frequency Response
±5% / ±25% / ±90% Command Signal
Dynamics at 210 Bar (3045 PSI) Pilot Supply Pressure



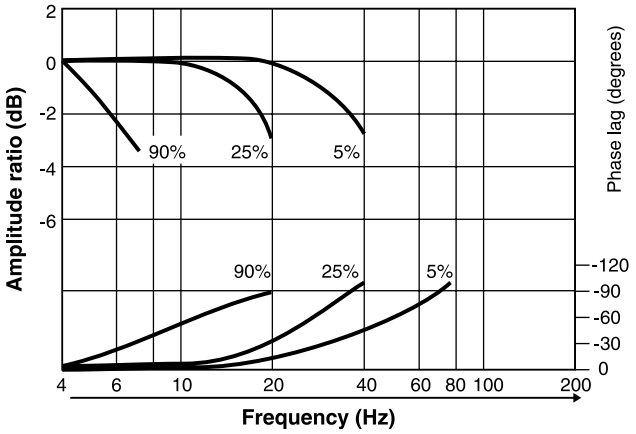
D41FP Frequency Response
±5% / ±25% / ±90% Command Signal
Dynamics at 210 Bar (3045 PSI) Pilot Supply Pressure



D91FP Frequency Response
±5% / ±25% / ±90% Command Signal
Dynamics at 210 Bar (3045 PSI) Pilot Supply Pressure

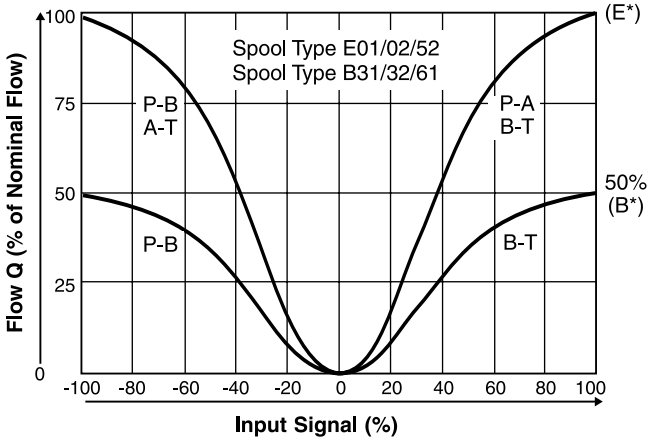


D111FP Frequency Response
±5% / ±25% / ±90% Command Signal
Dynamics at 210 Bar (3045 PSI) Pilot Supply Pressure

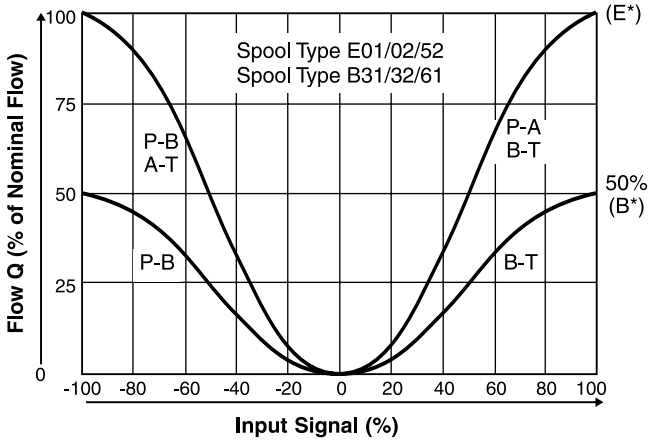


D*1FPB/E Flow

D31FP Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge



D41FP Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge



D_1FP.indd, dd

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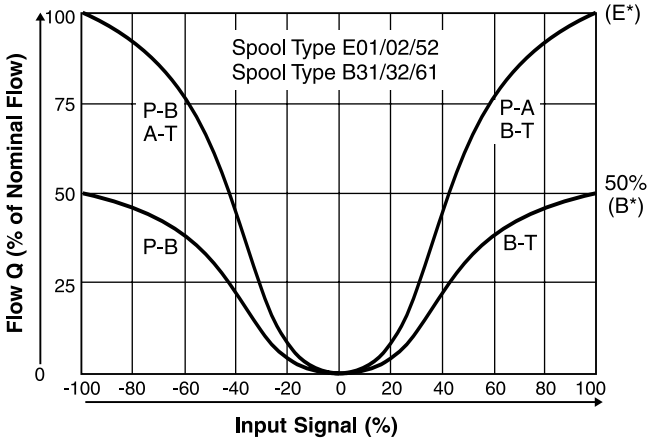
Elyria, Ohio, USA

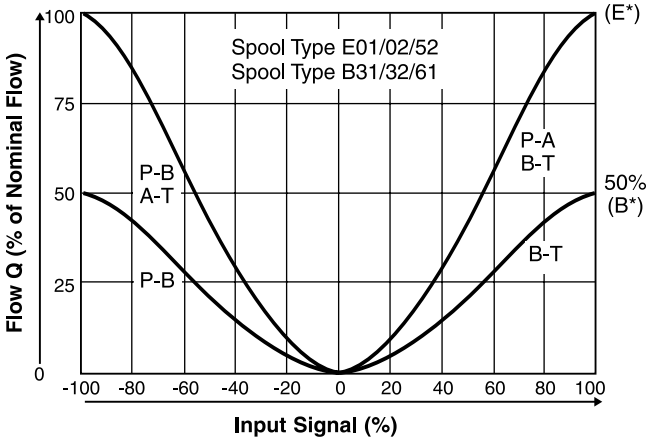
A

D*1FPB/E Flow

D91FP Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge

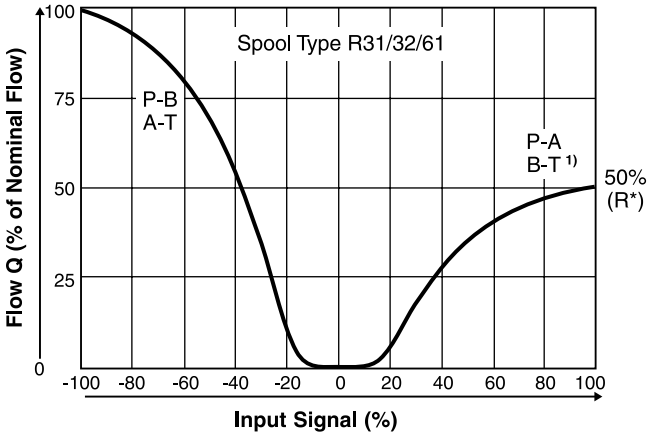


D111FP Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge



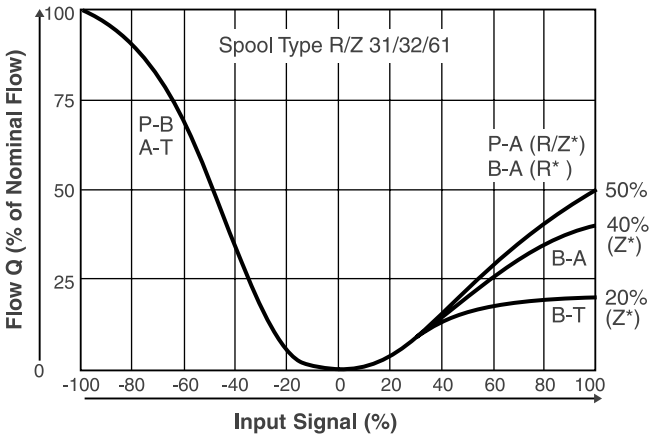
D*1FPR/Z Flow

D31FPR Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge

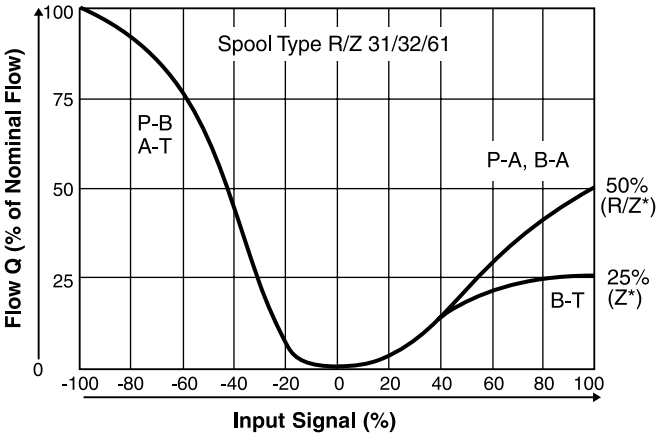


1) with 2 tank ports

D41FPR/Z Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge



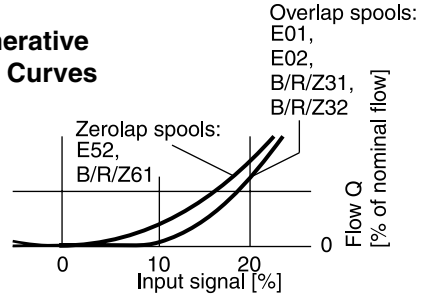
D91FPR/Z Flow Characteristics
at Δp = 5 Bar (72.5 PSI) / metering edge



D111FP R/Z *

Spool Type R/Z* on request

Detail:
Standard, Regenerative and Hybrid Flow Curves



D_1FP.indd, dd

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

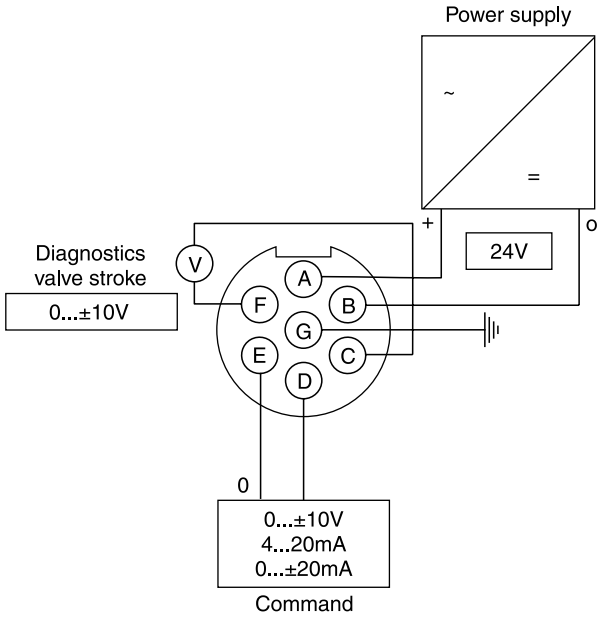
A

Electrical Characteristics Hybrid Option

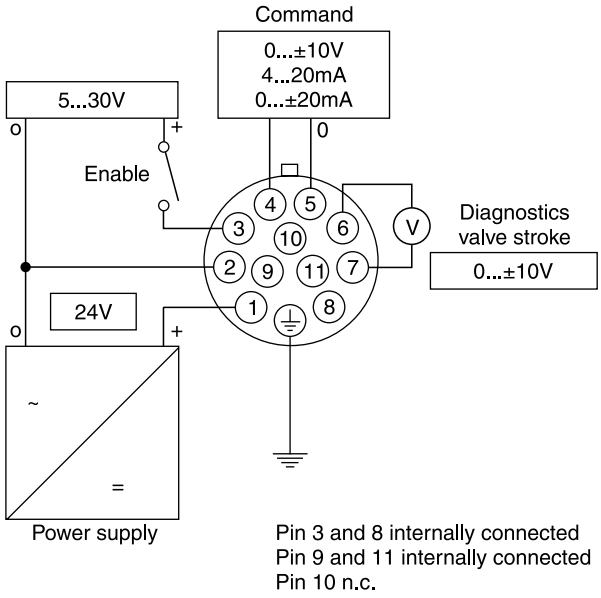
Duty Ratio		100%		
Protection Class		IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)		
		D41	**D91**	**D111**
Supply Voltage	**[V]**	24	24	24
Tolernace Supply Voltage	**[%]**	±10	±10	±10
Current Consumption	**[A]**	1.21	0.96	1.29
Power Consumption	**[W]**	29	23	31
Solenoid Connection		Connector as per EN 175301-803		
Wiring Minimum	**[mm²]**	3 x 1.5 recommended		
Wiring Length Maximum	**[m]**	50 (164 ft.) recommended		

With electrical connections the protective conductor (PE ⏚) must be connected according to the relevant regulations.

Code 0
6 + PE acc. EN 175201-804

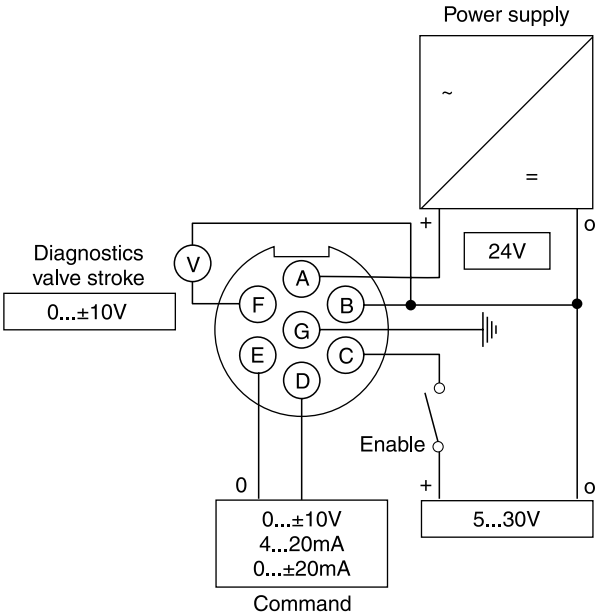


Code 5
11 + PE acc. EN 175201-804



Pin 3 and 8 internally connected
Pin 9 and 11 internally connected
Pin 10 n.c.

Code 7
6 + PE acc. EN 175201-804 + Enable



D_1FP.indd, dd

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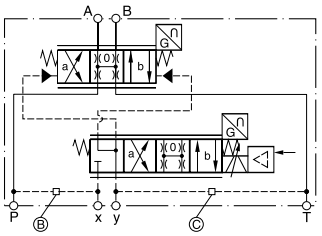
A

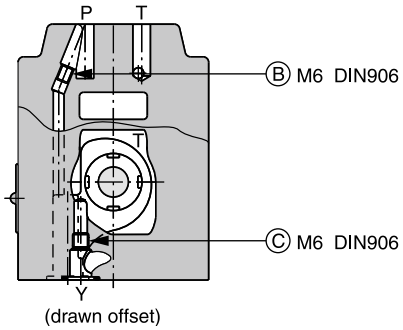
Pilot Flow — Pilot Oil Inlet (Supply) and Outlet (Drain)

○ open, ● closed

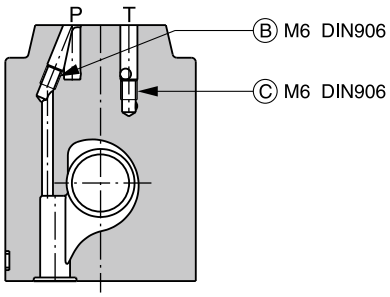
Pilot oil Inlet	Pilot oil Drain	B	C
internal	external	○	●
external	external	●	●
internal	internal	○	○
external	internal	●	○



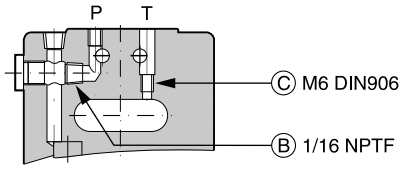
D31FPB/E



D31FPR



D41FPB/E



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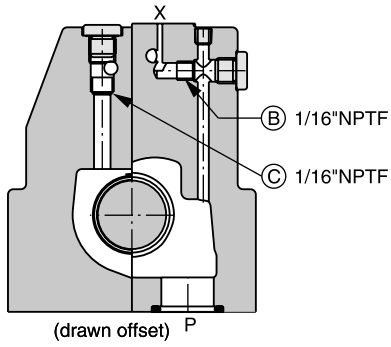
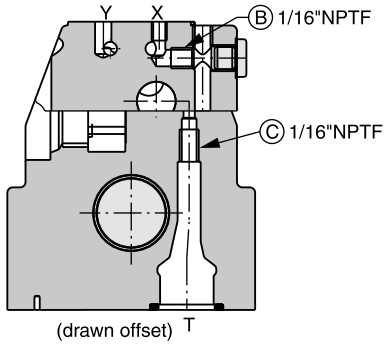
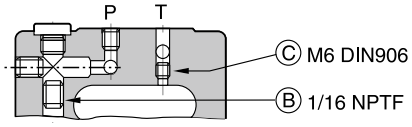


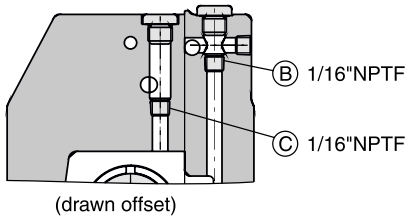
D41FPZ



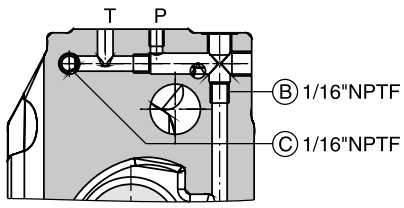
D91FPB/E



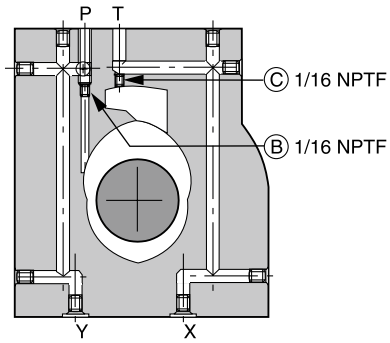
D91FPR



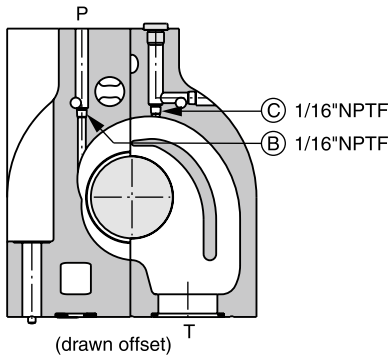
D91FPZ



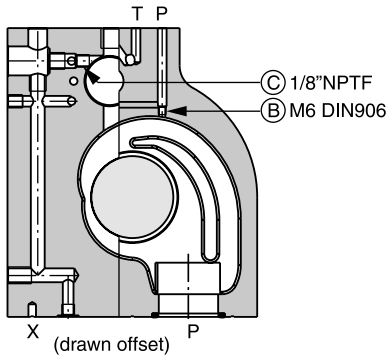
D111FPB/E



D111FPR



D111FPZ



D_1FP.indd, dd

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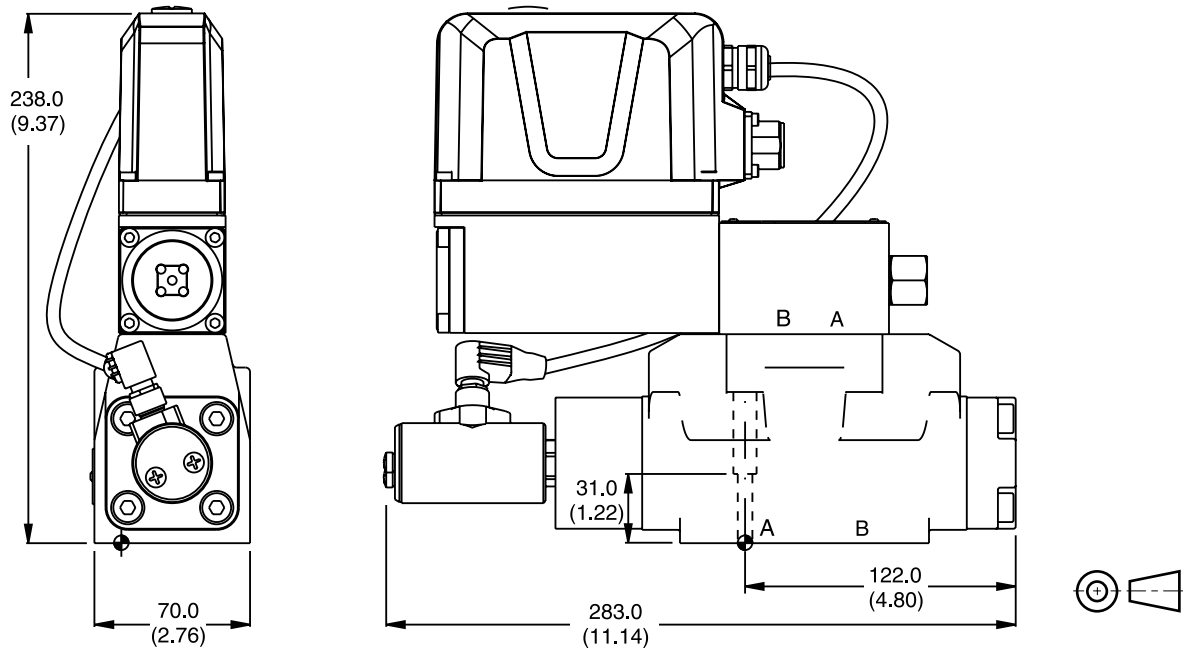
Elyria, Ohio, USA

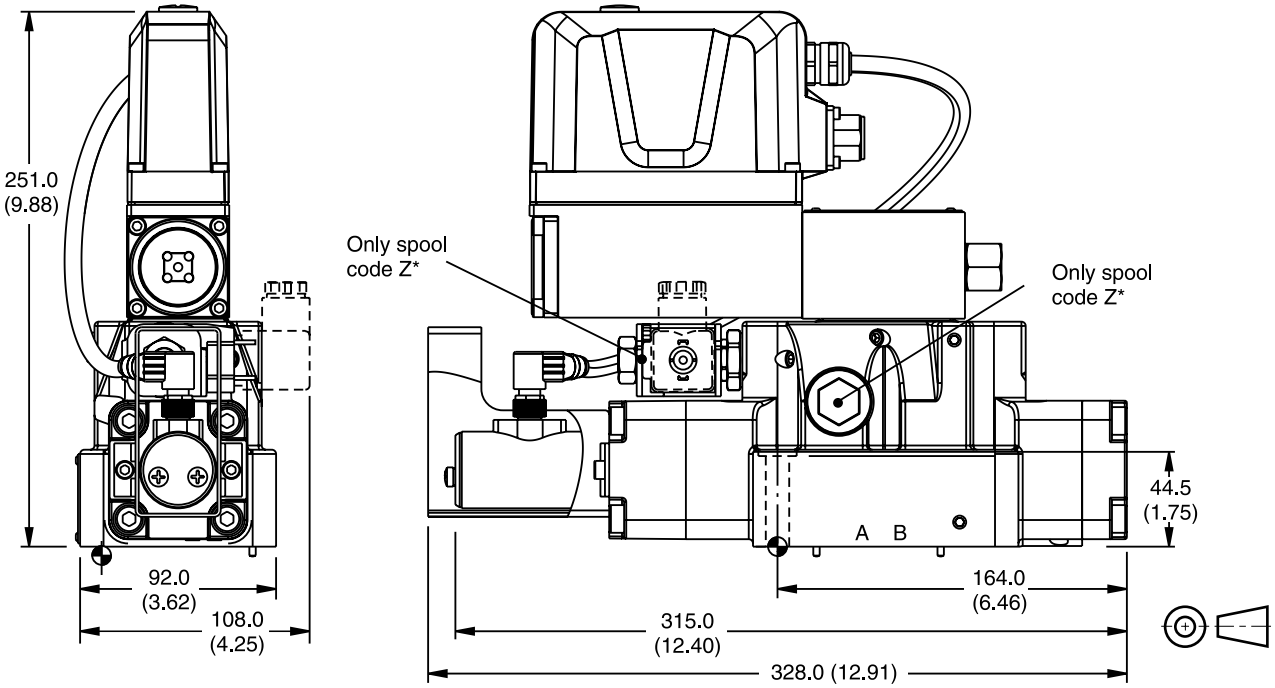
Inch equivalents for millimeter dimensions are shown in (**)

D31FP



Surface Finish	Kit			Seal Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK385 BK98	4x M6x40 DIN 912 12.9 4x 1/4-20x1.62	13.2 Nm (9.7 lb.-ft.) ±15 %	Nitrile: SK-D31FP Fluorocarbon: SK-D31FP-V

D41FP

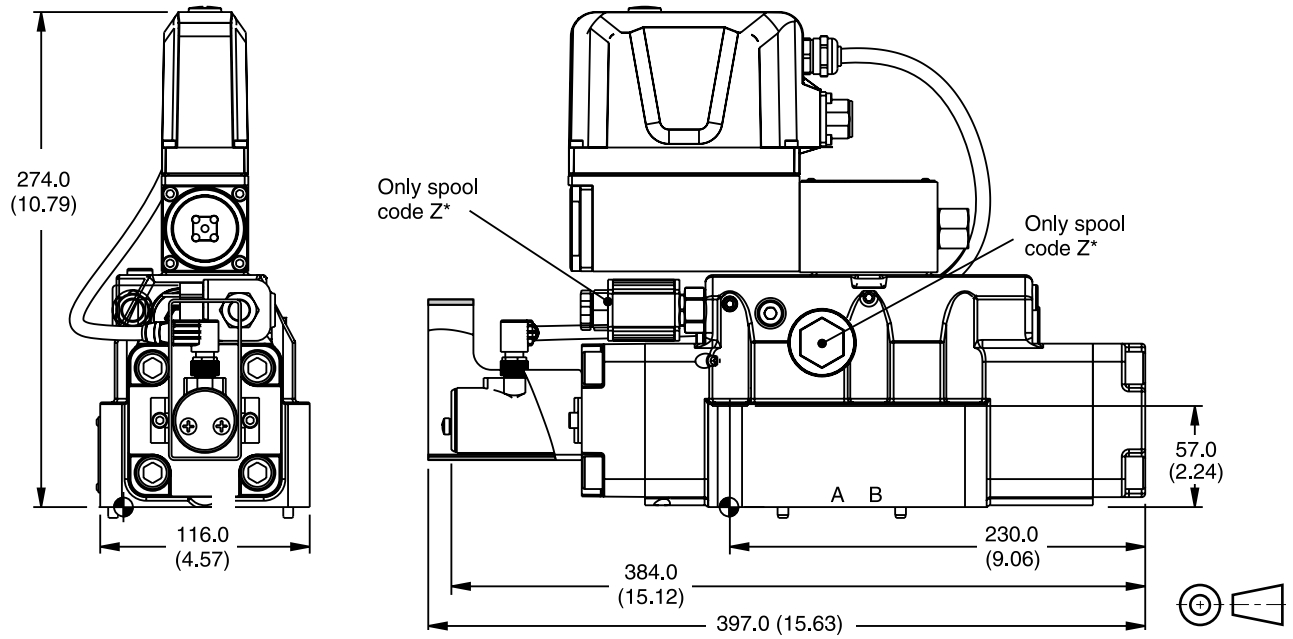


Surface Finish	Kit			Seal Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK320 BK160	2x M6x55 4x M10x60 DIN 912 12.9 4x 3/8-16x2.5 2x 1/4-20x2.5	13.2 Nm (9.7 lb.-ft.) 63 Nm (46.5 lb.-ft.) ±15 %	Nitrile: SK-D41FP Fluorocarbon: SK-D41FP-V

A

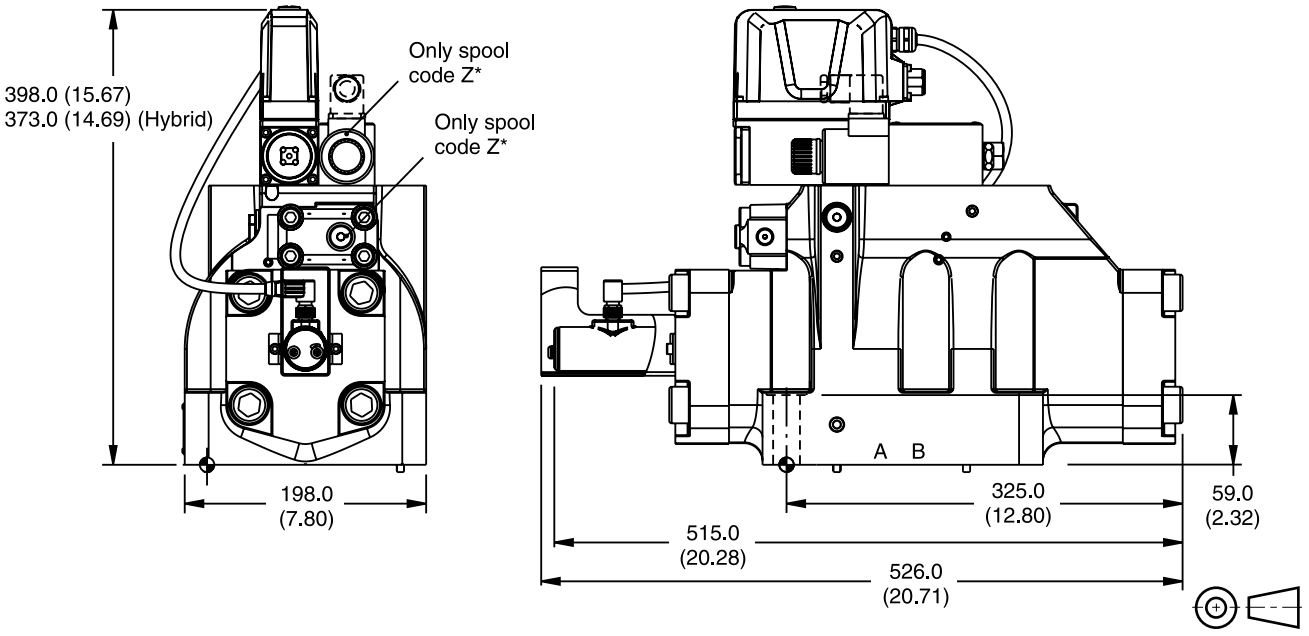
Inch equivalents for millimeter dimensions are shown in (**)

D91FP



Surface Finish	Kit			Seal Kit
R_{max}6.3 0.01/100	BK360 BK228	6x M12x75 DIN 912 12.9 6x 1/2-13x3.0	108 Nm (79.7 lb.-ft.) ±15 %	Nitrile: SK-D91FP Fluorocarbon: SK-D91FP-V

D111FP



Surface Finish	Kit			Seal Kit
R_{max}6.3 0.01/100	BK386 BK150	6x M20x90 DIN 912 12.9 6x 3/4-10x3.5	517 Nm (373.9 lb.-ft.) ±15 %	Nitrile: SK-D111FP Fluorocarbon: SK-D111FP-V

D_1FP.indd, dd

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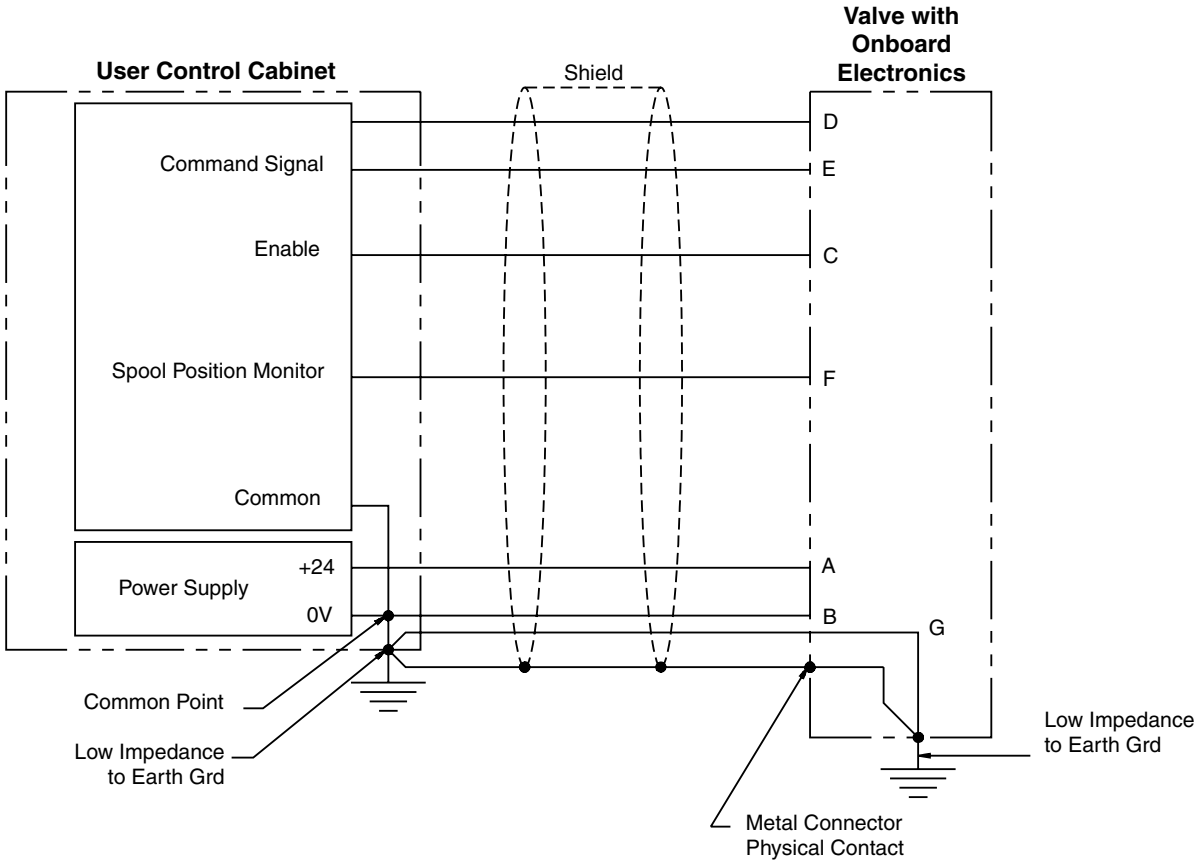
RFI/EMC Immunity for Valves with Integrated Electronics

Conformance to the CE RFI/EMC susceptibility and emissions regulations require valves with integrated electronics be properly wired and grounded. The wiring diagram below suggests proper practices, and should be used as a guide for wiring any new application. In some retrofit applications it may be necessary to significantly alter an existing wiring layout and grounding methods to achieve the desired RFI/EMC immunity and avoid ground loops. Note that an improperly wired application can render a system unusable.

Valves should be wired to the user control cabinet by shielded cable where the shield is grounded at both ends. These ground points must be very low impedance earth grounds, and proper wiring practices are required to avoid system ground loops. In some applications it may be necessary to install a low impedance ground strap between the valve or manifold and earth to achieve a proper ground.

Note that when assembling cable/connector assemblies, the shield must be in electrical contact with the connector shell to complete the shield circuit through the valve mating receptacle. (Refer to the Accessories section of this catalog for pre-assembled 'EHC' cable assemblies)

To minimize the exposure to RFI/EMC radiation, electronic equipment should be isolated from sources of high-energy electromagnetic radiation such as cables carrying high currents, radio transmitters, electrical load control centers and contactors.

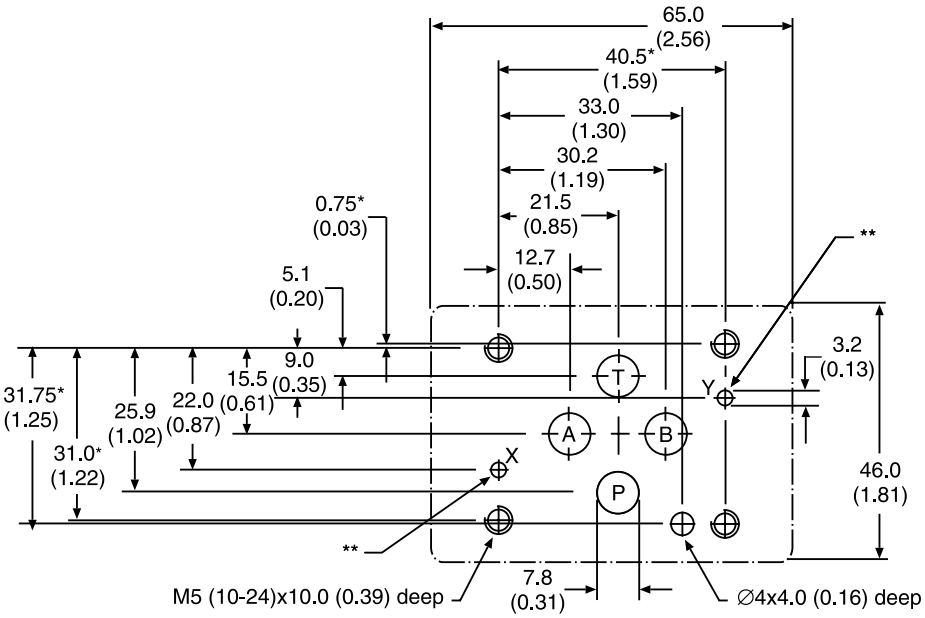


Note: PE on Functional Block Diagrams refers to "Potential Earth".

A

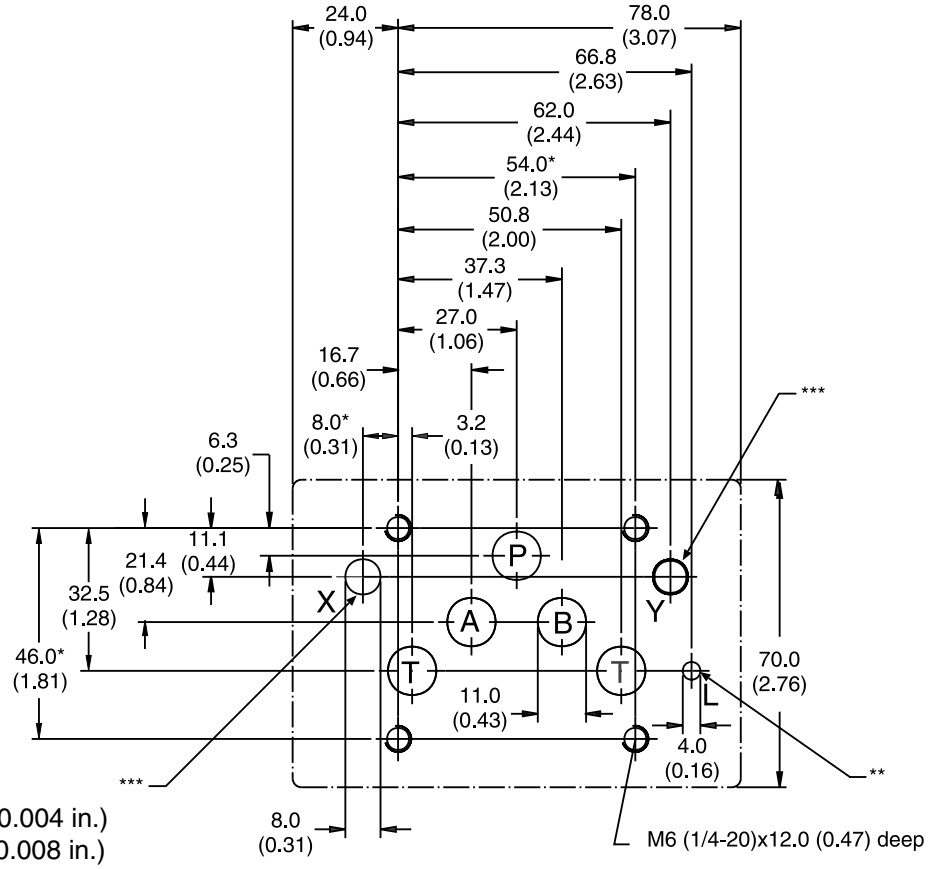
Size NG6 (NFPA/ISO/CETOP 3)

mounting pattern per DIN 24340-A6



Size NG10 (NFPA/ISO/CETOP 5HE)

mounting pattern per DIN 24340-A6



* Dimension tolerance ±0.1 mm (0.004 in.)
All other dimensions ±0.2 mm (0.008 in.)

** Port not used with valves in this catalog

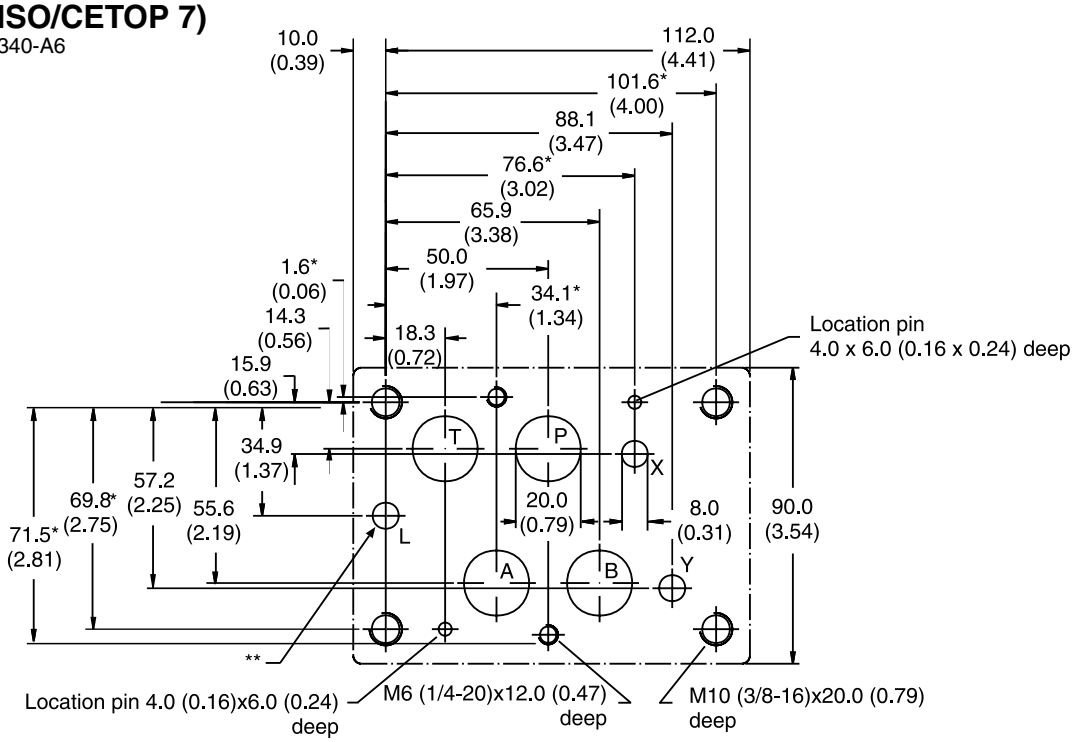
*** Ports only used for pilot operated valves

D_techinfo.indd, dd

A

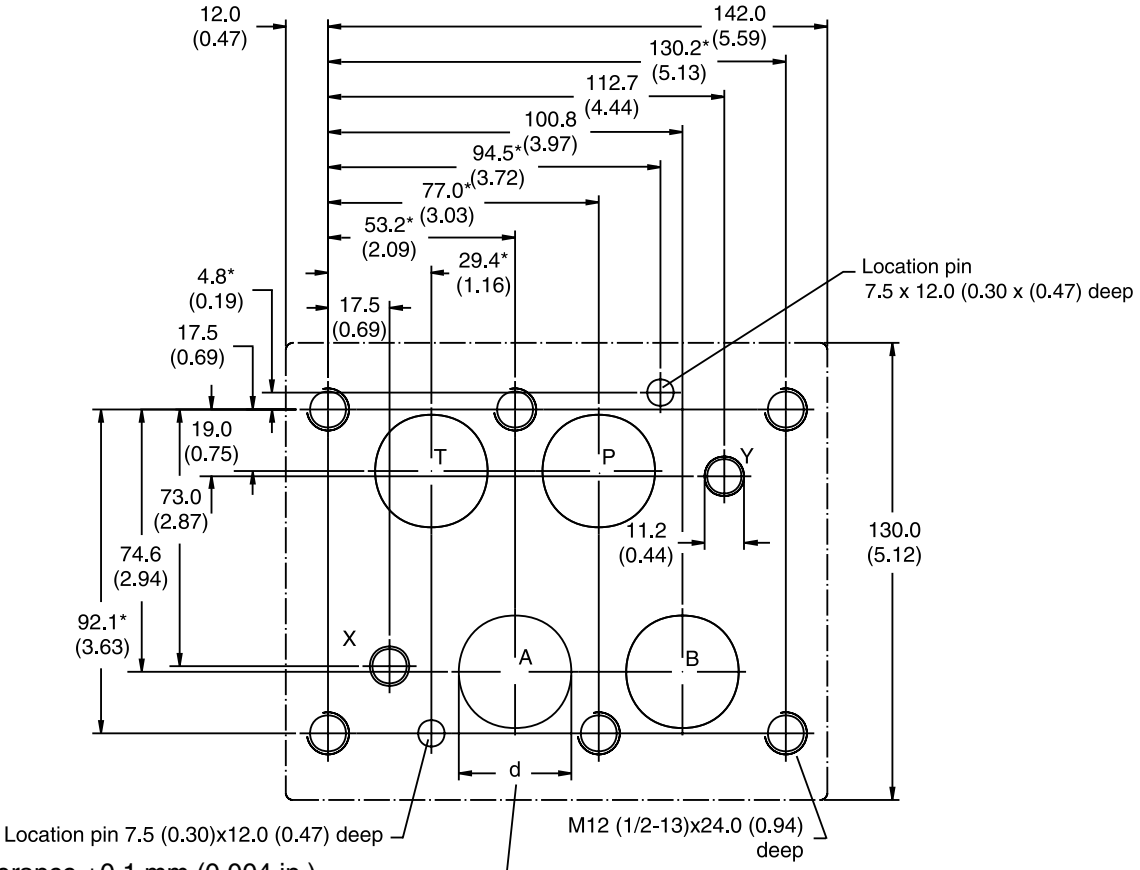
Size NG16 (NFPA/ISO/CETOP 7)

mounting pattern per DIN 24340-A6



Size NG25 (NFPA/ISO/CETOP 8)

mounting pattern per DIN 24340-A6



* Dimension tolerance ±0.1 mm (0.004 in.)
All other dimensions ±0.2 mm (0.008 in.)

** Port not used with valves in this catalog

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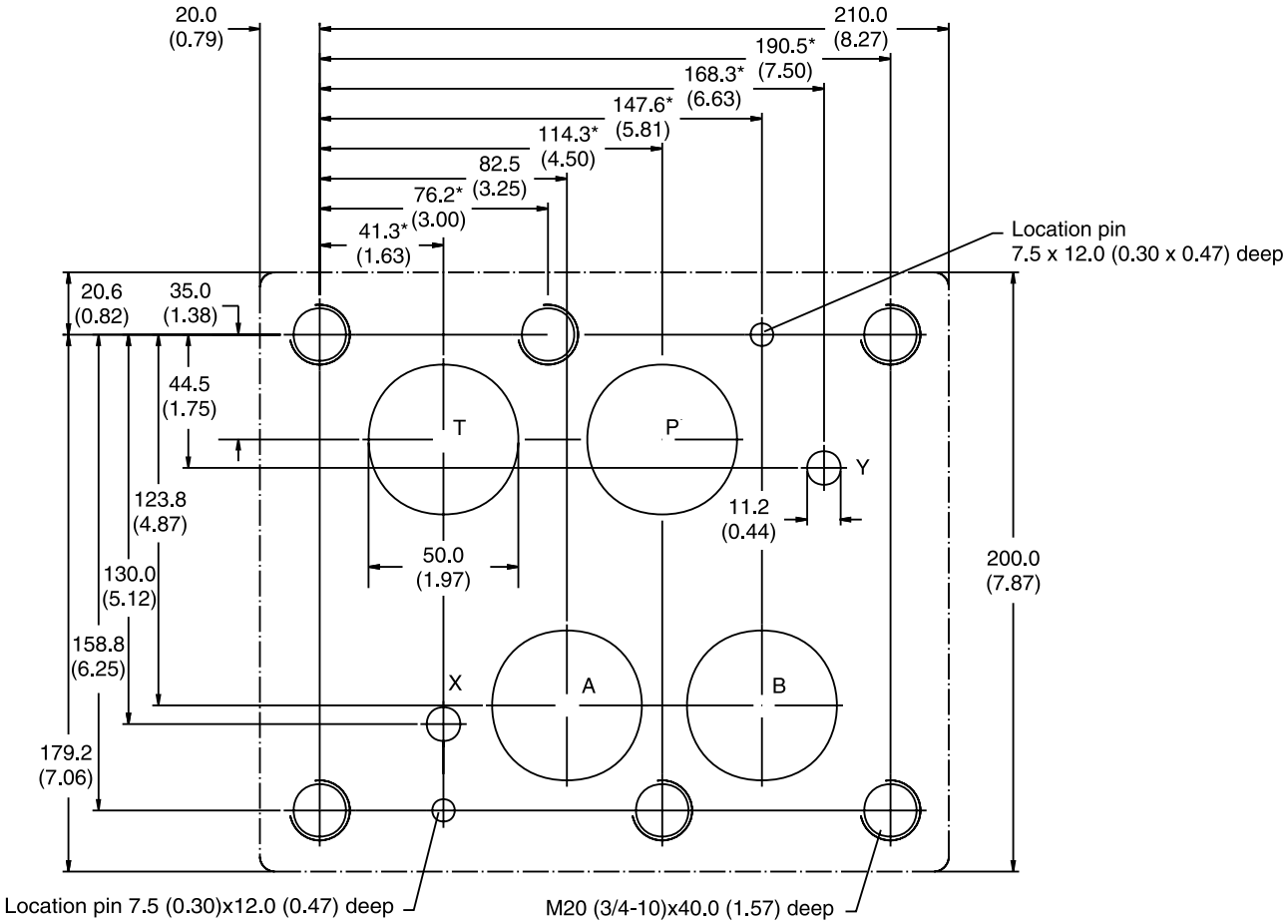
Elyria, Ohio, USA

A

Size NG32 (NFPA/ISO/CETOP 10)

mounting pattern per DIN 24340-A6



* Dimension tolerance ±0.1 mm (0.004 in.)
All other dimensions ±0.2 mm (0.008 in.)