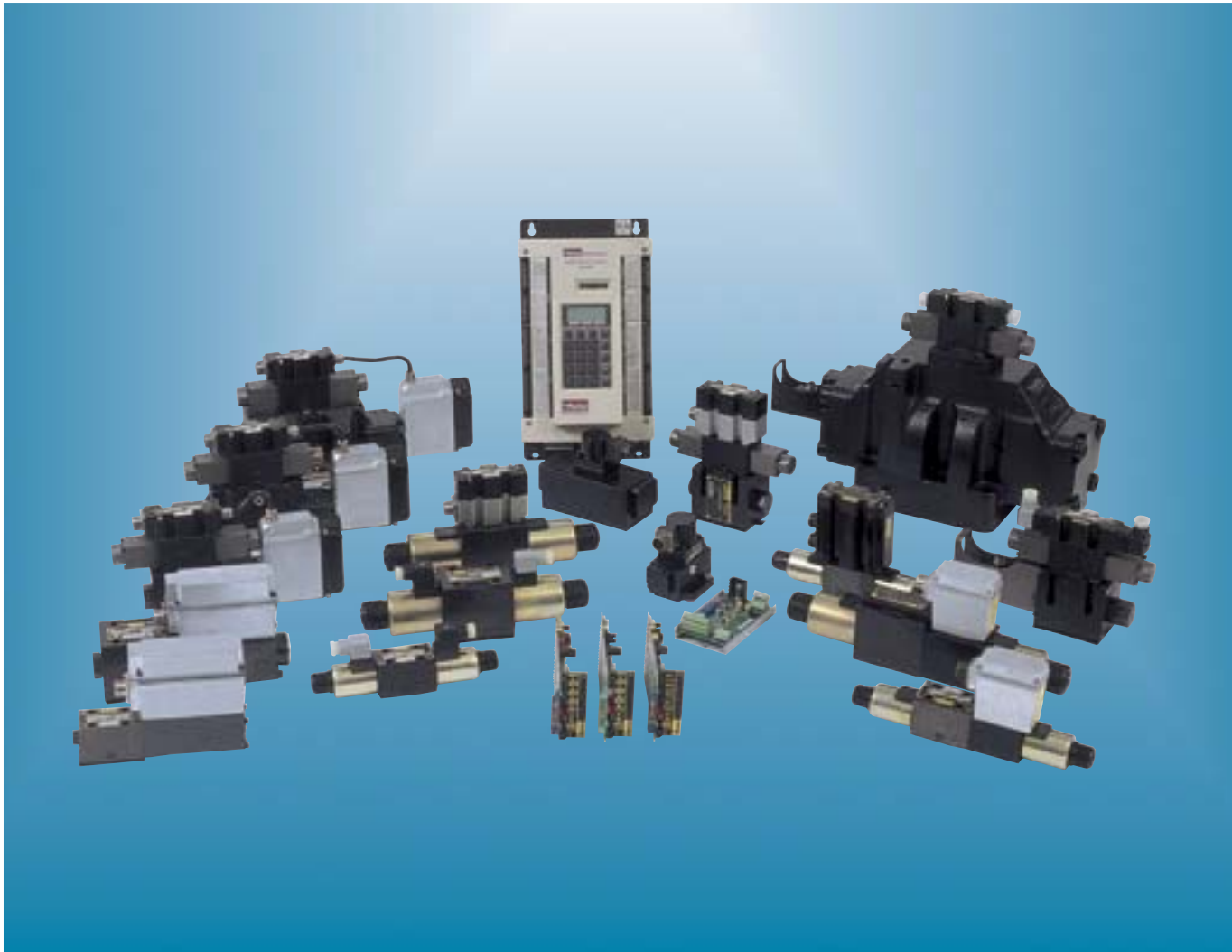




# ***Electrohydraulic Motion Control Products***

*Catalog HY14-2550/US*



**WARNING**

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Wherever in the world machinery is designed, manufactured or used, Parker is there to meet your hydraulic application requirements – with a broad selection of hydraulic components, worldwide availability and technical support, and above all — ***Parker Premier Customer Service.***

Arranged by product group, this catalog contains specifications, technical data,

reference materials, dimensions, and ordering information on the complete line.

When you are ready to order, call your local Parker Hydraulic distributor for fast delivery and service. Consult your Parker Hydraulic Sales Office for the location of the distributor serving your area (see listing at the back of this catalog).

**Proportional Directional Control Valves**

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D1FC	A41 - A45
D1FH	A46 - A52
D1FL	A23 - A29
D1FM	A46 - A52
D1FP	A61 - A66
D1FP*S	A67 - A72
D1FT	A2 - A8
D1FW	A2 - A8
D1FX	A30 - A35
D3FB	A18 - A22
D3FC	A41 - A45
D3FH	A46 - A52
D3FL	A23 - A29
D3FM	A46 - A52
D3FP	A73 - A76
D3FT	A2 - A8
D3FW	A2 - A8
D3FX	A30 - A35
D31FH	A53 - A60
D31FS	A36 - A40
D31FT	A9 - A17
D31FW	A9 - A17
D41FH	A53 - A60
D41FL	A23 - A29
D41FS	A36 - A40
D41FT	A9 - A17
D41FW	A9 - A17
D81FH	A53 - A60
D81FS	A36 - A40
D91FH	A53 - A60
D91FL	A23 - A29
D91FS	A36 - A40
D91FT	A9 - A17
D91FW	A9 - A17
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D111FS	A36 - A40
D* Mounting Interface	A78 - A80
D* Wiring	A77

**Proportional Pressure Control Valves**

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DW*E527P20	B32 - B36
DW*E527P40	B32 - B36
PC10M	B13 - B17
PC25M	B13 - B17
PC32M	B13 - B17
PE10M	B13 - B17
PE25M	B13 - B17
PE32M	B13 - B17
PE**M*W	B28 - B31
RE06M**T	B2 - B5
RE06M**W2	B18 - B21
RE10**T	B6 - B12
RE10**W	B22 - B27
RE25**T	B6 - B12
RE25**W	B22 - B27
RE32**T	B6 - B12
RE32**W	B22 - B27
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**Servovalves**

Series	Page
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BD30	C2 - C5, C9 - C11
DY01	C23 - C26
DY1S	C16 - C18
DY3H	C19 - C22
DY6H	C19 - C22
DY05	C27 - C30
DY10	C31 - C34
DY12	C35 - C38
DY15	C39 - C42
DY25	C43 - C46
DY45	C47 - C50
PH76	C12 - C15

**Electronics**

BD90	D40 - D42
BD95	D40 - D42
BD101	D58 - D59
ED101	D24 - D25
ED102	D26 - D27
ED104	D28 - D29
ET101	D30 - D31
ET102	D32 - D33
ET104	D34 - D35
ET105	D36 - D37
ET154	D38 - D39
EW01104	D9 - D10
EW101	D14 - D15
EW102	D16 - D17
EW104	D18 - D19
EZ150	D48 - D49
EZ154	D50 - D51
EZ155	D52 - D53
EZ595	D54 - D56
K Card Holder	D62
PCD00A-400	D20 - D23
PS15	D60
PS24	D61
PWD00A-400	D2 - D4
PWDXXA-40	D5 - D8
PW**404	D11 - D13
PZD00A-40	D44 - D47

**Digital Motion Controller**

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Connectors	F3
EHC cable assemblies	F2
Installation guides	F4
Subplates	F4

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Series	Description	Direct Operated	Pilot Operated	Spool Feedback	Integrated Electronics	Page
	[ size: NG ] [ size: ISO/CETOP ]	6 10 3 5	10 16 25 32 5 7 8 10			
D*FW	Std. Performance	• •				A2
D*FT	Std. Performance	• •			•	A2
D*1FW	Std. Performance		• • •			A9
D*1FT	Std. Performance		• • •		•	A9
D*FB	Std. Performance	• •				A18
D**FL	Std. Performance w/motion control	• •	• •		•	A23
D*FX	High Performance	• •		•	•	A30
D*1FS	High Performance		• • • •	•		A36
D*FC	High Performance	• •		•		A41
D*FH	Servo Performance	• •		•	•	A46
D*FM	Servo Performance w/dual gain	• •		•	•	A46
D*1FH	Servo Performance		• • • •	•	•	A53
D1FP	Servo Performance	•		•	•	A61
D3FP	Servo Performance			•	•	A73
Wiring Guidelines for RFI / EMC Immunity						A77
Mounting Interface Dimensions						A78

**General Description**

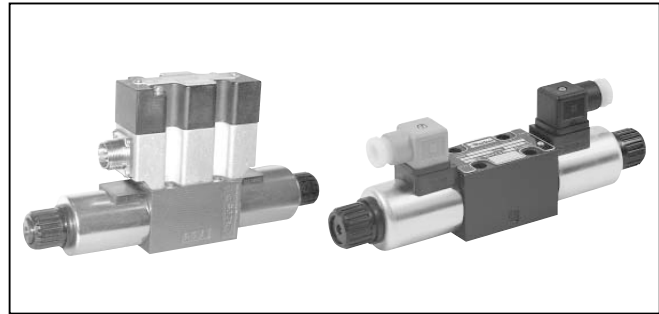
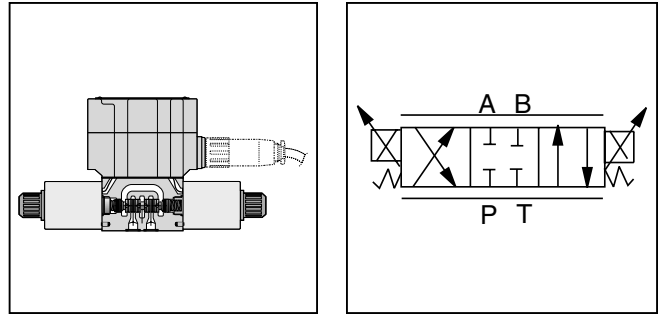
**A**

Series D\*FW and D\*FT direct operated proportional directional control solenoid valves are available with or without integrated control electronics. Valves are available in sizes NG6 (CETOP 3) and NG10 (CETOP 5).

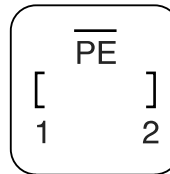
Typical applications include reproducible control of actuator speed in rapid/slow speed profiling, and smooth acceleration and deceleration performance.

**Features**

- Standard DIN/ISO/CETOP/NFPA interfaces.
- Optional integrated control electronics with ramp adjustment.
- Progressive flow characteristics for improved low flow resolution.
- Spring centered spool.
- Wide selection of spool options and flow capacity.



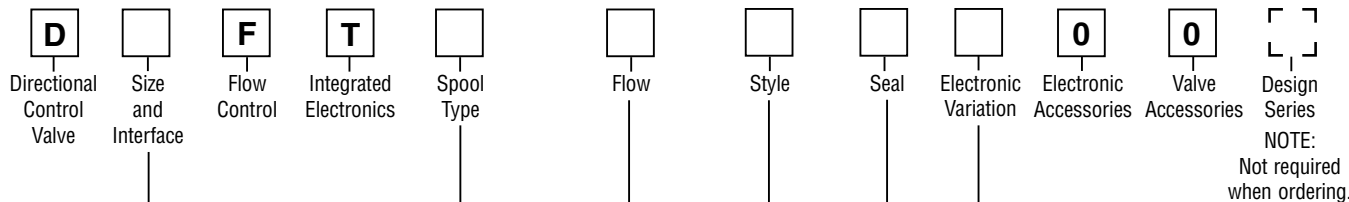
**Wiring D\*FW — Solenoid Coil**  
 (without integrated electronics)



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

**Specifications**

Interface DIN (NFPA/ISO/CETOP)			NG6 (3)	NG10 (5)
Flow Rating @10 Bar (150 PSI) Δp (P→A, B→T) (spool options up to)			20 (5.3)	60 (15.9)
Maximum Flow (refer to operating limit curves)			48 (12.5)	170 (45)
Step Response (time to reach 90% of a 100% step command)			100	165
Hysteresis	%	<8	Fluid Viscosity, Recommended	
Repeatability	%	<2	Fluid Temperature, Recommended	
Max. Operating Pressure	Port P, A, B	315 (4500)	Environmental Protection Class	
	Port T	35 (500)	NEMA 1 (IP54)	
Fluid Cleanliness Level		ISO Class 16/13	Ambient Operating Temperature	
			-20°C to +60°C (-4°F to +140°F)	



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

See Note 1.

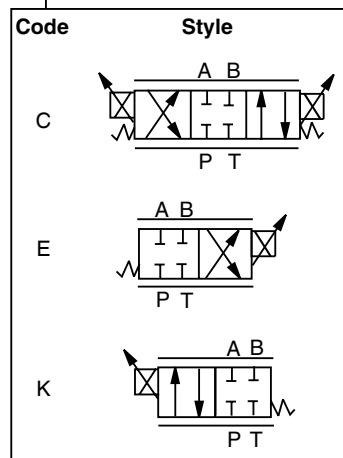
Code	Description
F	Voltage Input 0 ... ±10V (with reference outputs)
G	Current Input 0 ... ±20 mA

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

Refer to factory for ratio spool options.

\* Use E01 or E02 for new applications.

Code	Description
N	Nitrile
V	Fluorocarbon



Code	Flow at Δp 5 Bar (72.5 PSI) per metering edge	
	D1FT LPM (GPM)	D3FT 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.

**Weight:**

NG6	2.5 kg (5.5 lbs.)
NG10	6.8 kg (15.0 lbs.)

Note 1: NG10 (CETOP 5) 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.

Mating Connectors are not included in the delivery.

**Mounting Interface**

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

**Accessories**

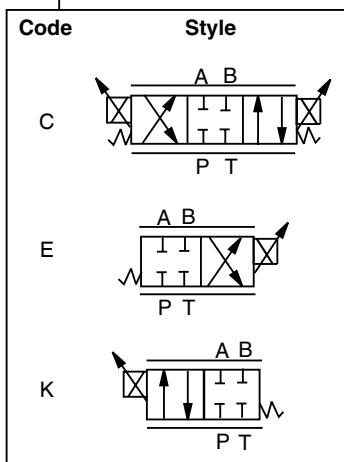
Refer to the Accessories section for bolt kits, subplates, connectors and pre-assembled cable assemblies.

**A**

<b>D</b>	<b>F</b>	<b>W</b>								<b>0</b>																																																		
Directional Control Valve	Flow Control	Open Loop	Spool Type	Flow	Style	Seal	Solenoid Voltage	Solenoid Accessories	Valve Accessories	Design Series																																																		
<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>NG6/CETOP 3</td> </tr> <tr> <td>3</td> <td>NG10/CETOP 5</td> </tr> </tbody> </table>		Code	Description	1	NG6/CETOP 3	3	NG10/CETOP 5	<table border="1"> <thead> <tr> <th colspan="2">Code</th> <th rowspan="2">Spool Type</th> </tr> <tr> <th>10%</th> <th>20%</th> </tr> </thead> <tbody> <tr> <td>E01</td> <td>E81*</td> <td></td> </tr> <tr> <td>E02</td> <td>E82*</td> <td></td> </tr> <tr> <td>E09</td> <td>-</td> <td></td> </tr> </tbody> </table> <p>Refer to factory for ratio spool options.                      * Use E01 or E02 for new applications.</p>		Code		Spool Type	10%	20%	E01	E81*		E02	E82*		E09	-		<table border="1"> <thead> <tr> <th colspan="2">Code</th> <th rowspan="2">Description</th> </tr> <tr> <th>J<sup>(2)</sup></th> <th>K</th> </tr> </thead> <tbody> <tr> <td>24 VDC</td> <td>12 VDC</td> <td></td> </tr> <tr> <td>M<sup>(2)</sup></td> <td>9 VDC</td> <td></td> </tr> </tbody> </table> <p>(2) Not for D3FW</p>		Code		Description	J <sup>(2)</sup>	K	24 VDC	12 VDC		M <sup>(2)</sup>	9 VDC		<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Standard<sup>(1)</sup></td> </tr> </tbody> </table> <p>(1) Metal can coils</p>		Code	Description	0	Standard <sup>(1)</sup>	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>C<sup>(2)</sup></td> <td>Coil Lead Wires in Conduit Box</td> </tr> <tr> <td>F<sup>(3)</sup></td> <td>Free Coil Lead Wires</td> </tr> <tr> <td>W<sup>(5)</sup></td> <td>Socket Connector DIN 43650 without Plug</td> </tr> </tbody> </table> <p>(2) Only for D1FW.                      (3) D1FW, 9V overmolded coil only.                      (4) Contact factory for custom lead wire and connector options in OEM quantities.                      (5) Not available 9V coil.</p>		Code	Description	C <sup>(2)</sup>	Coil Lead Wires in Conduit Box	F <sup>(3)</sup>	Free Coil Lead Wires	W <sup>(5)</sup>	Socket Connector DIN 43650 without Plug	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>N</td> <td>Nitrile</td> </tr> <tr> <td>V</td> <td>Fluorocarbon</td> </tr> </tbody> </table>		Code	Description	N	Nitrile	V	Fluorocarbon
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V	Fluorocarbon																																																											

Code	Flow at $\Delta p$ 5 Bar (72.5 PSI) per metering edge	
	D1FT LPM (GPM)	D3FT 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.



**Weight:**  
 NG6 2.5 kg (5.5 lbs.)  
 NG10 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, connectors and pre-assembled cable assemblies.





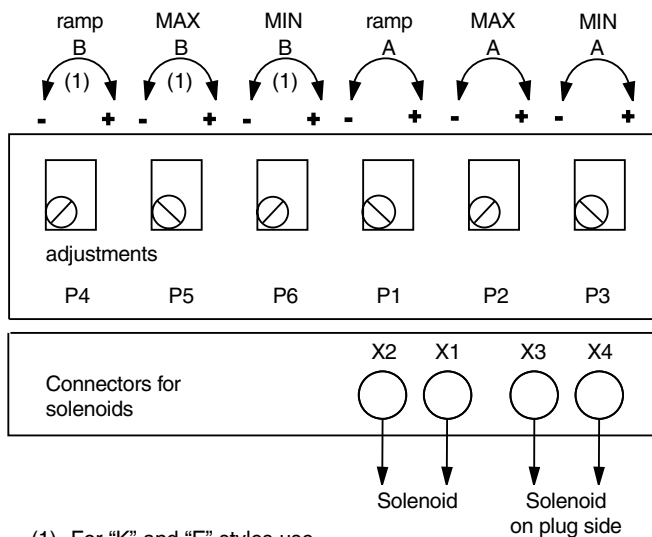
**Series D\*FW**  
 without integrated electronics

Interface DIN (NFPA/ISO/CETOP)	NG06 (03)			NG10 (05)
<b>Solenoid Order Code</b>	<b>J</b>	<b>K</b>	<b>M</b>	<b>K</b>
Nominal Resistance ohms	24	6	3.3	4
Nominal Current amps	0.9	1.8	2.5	2.5
Nominal Voltage voltage	24	12	9	12
<b>Environmental Protection Class</b>	NEMA 1 (IP54)			
<b>Mating Connectors — Solenoid (DIN 43650)</b>	Part #692914 (Black) Part #692915 (Gray)			

**Series D\*FT**  
 with integrated electronics

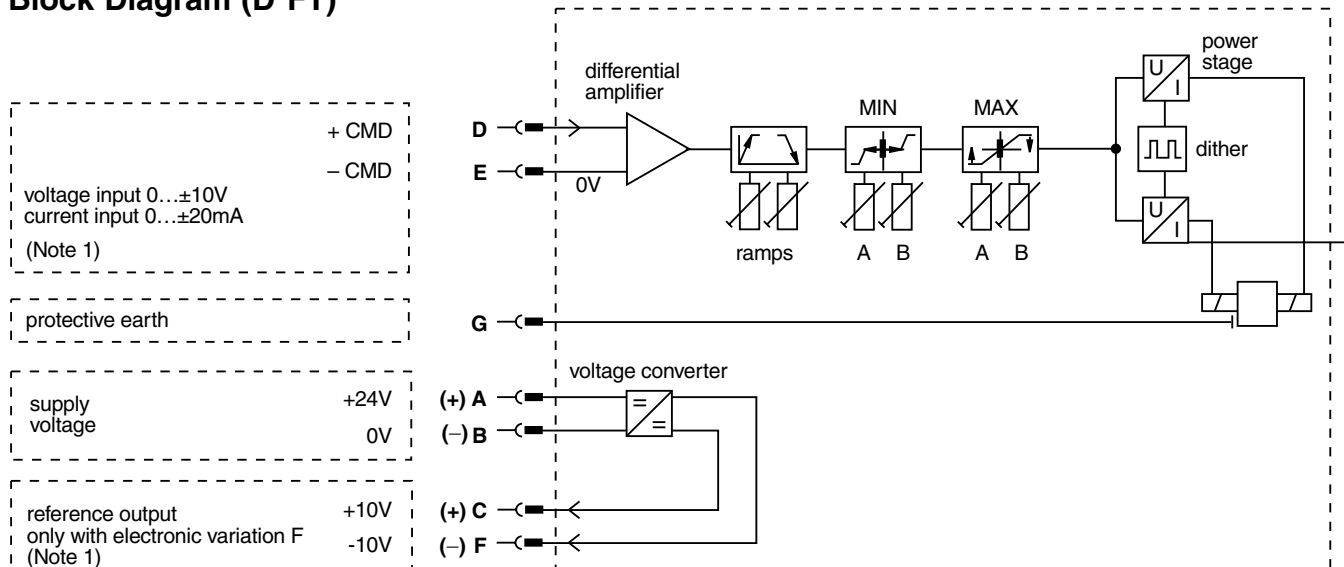
<b>Supply Voltage</b>	14.5 to 30 VDC
<b>Current</b> D1FT D3FT	3 amps 4 amps
<b>Command Signal</b> (impedance) [select by ordering code]	0 ± 10 VDC (100K) 0 ± 20 mA (500 ohms)
<b>Command Polarity</b> Pin 'D' more positive than 'E'; flow =	D1FT: P→A D3FT: P→B
<b>Ramp Time Adjustment</b>	0 to 3 seconds
<b>Reference Outputs</b> VDC (10 mA maximum)	+10 (pin C), -10 (pin F)
<b>Environmental Protection Class</b>	NEMA 1 (IP54)
<b>Mating Connector</b> (order separately) (7-pin CE)	Part #5004072

**Integrated Control Electronics (D\*FT)**  
 Arrangement of Potentiometers



(1) For "K" and "E" styles use these adjustments only

**Block Diagram (D\*FT)**



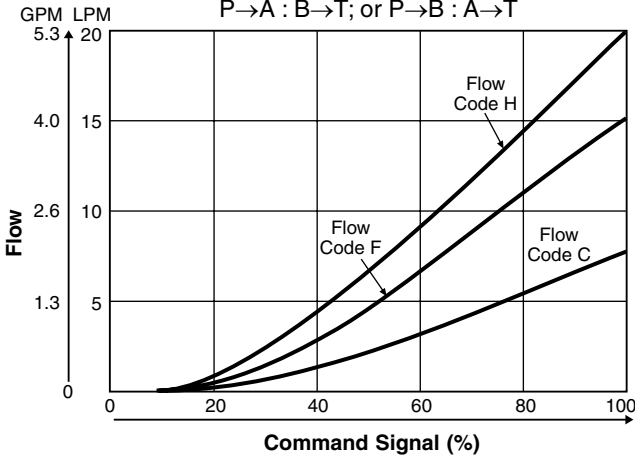
Note 1) Refer to ordering code page.

D\_FW-D\_FT.p65, dd



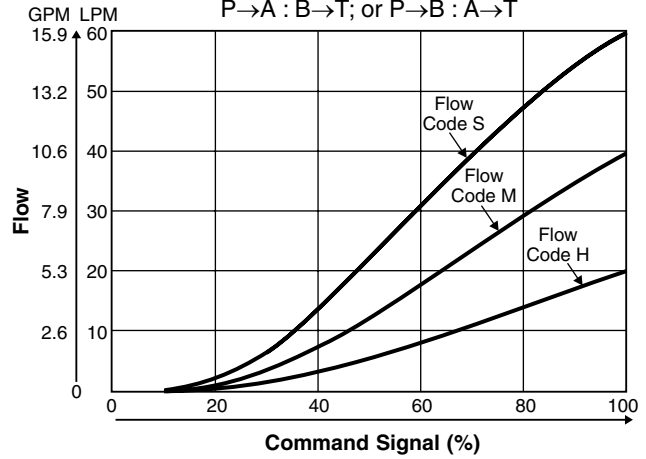
**D1FT Flow Characteristics**

at  $\Delta p = 5 \text{ Bar (72.5 PSI)}$  / metering edge  
 $P \rightarrow A : B \rightarrow T$ ; or  $P \rightarrow B : A \rightarrow T$



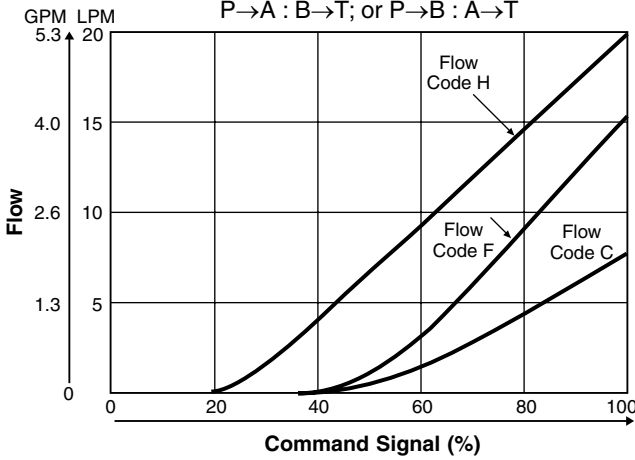
**D3FT Flow Characteristics**

at  $\Delta p = 5 \text{ Bar (72.5 PSI)}$  / metering edge  
 $P \rightarrow A : B \rightarrow T$ ; or  $P \rightarrow B : A \rightarrow T$



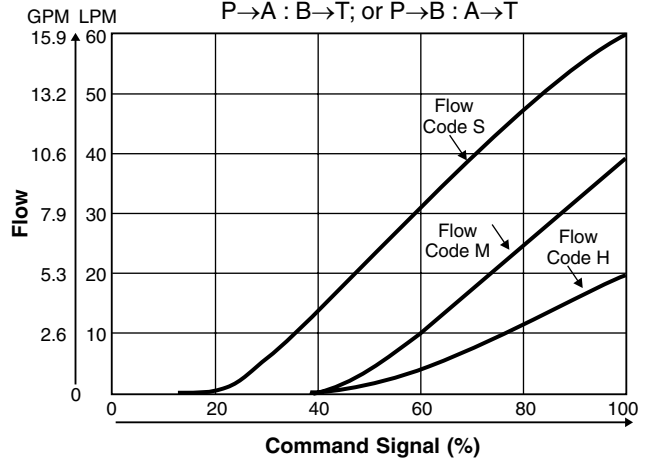
**D1FW Flow Characteristics**

at  $\Delta p = 5 \text{ Bar (72.5 PSI)}$  / metering edge  
 $P \rightarrow A : B \rightarrow T$ ; or  $P \rightarrow B : A \rightarrow T$



**D3FW Flow Characteristics**

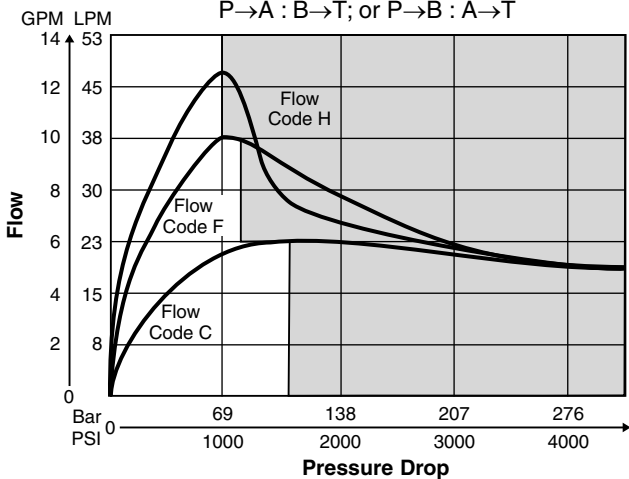
at  $\Delta p = 5 \text{ Bar (72.5 PSI)}$  / metering edge  
 $P \rightarrow A : B \rightarrow T$ ; or  $P \rightarrow B : A \rightarrow T$



**D1F\* Operating Limits 1)**

at 100% Command

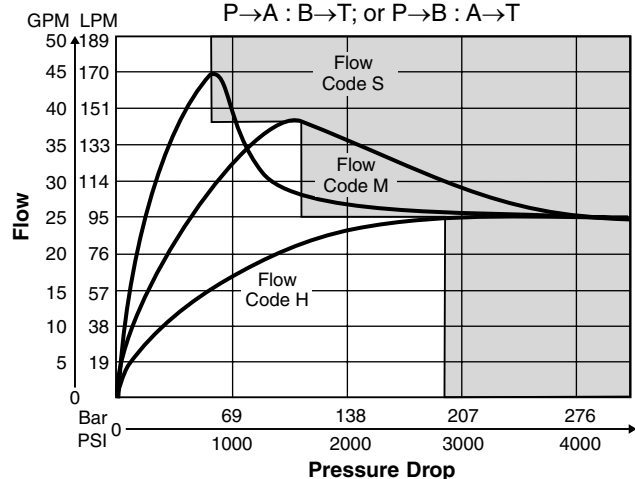
$P \rightarrow A : B \rightarrow T$ ; or  $P \rightarrow B : A \rightarrow T$



**D3F\* Operating Limits 1)**

at 100% Command

$P \rightarrow A : B \rightarrow T$ ; or  $P \rightarrow B : A \rightarrow T$

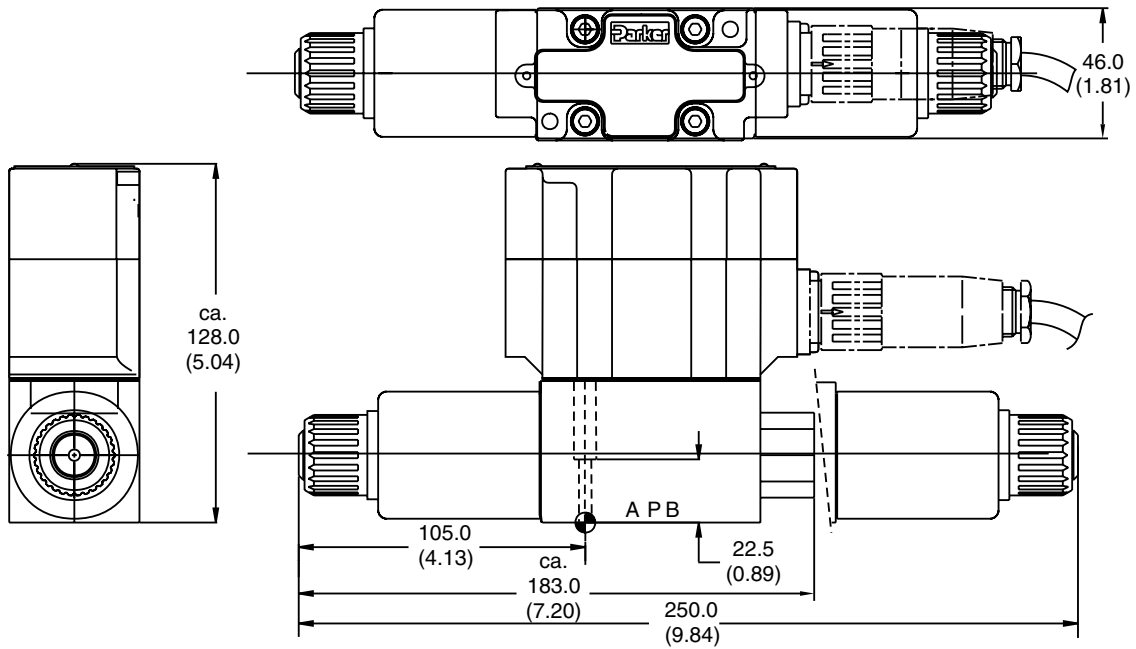


1) Shaded area: Actual flow subject to the system load dynamics

Note: 81 and 82 spools - decrease limits by 15%

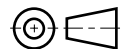
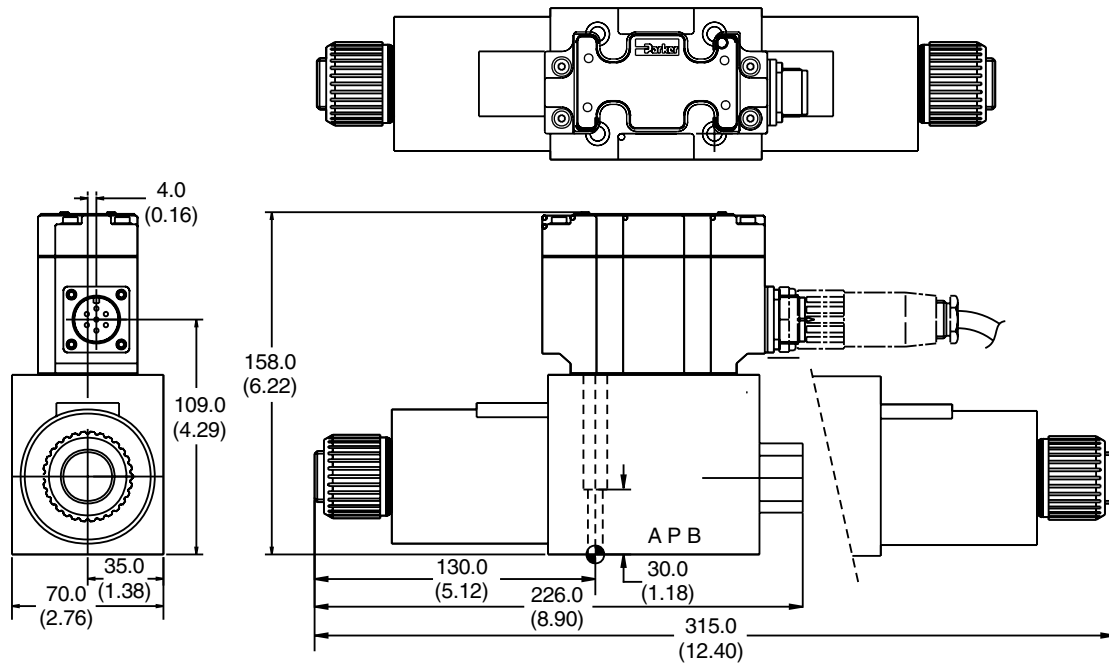
**D1FT**

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



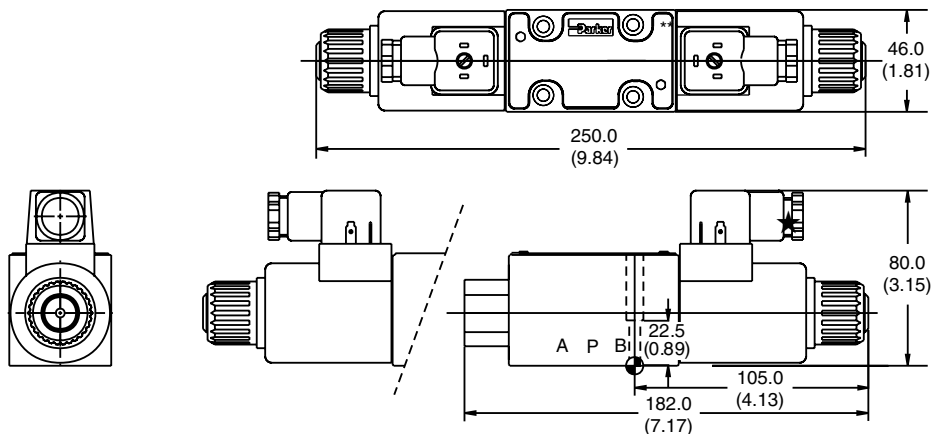
**D3FT**

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



**D1FW with Hirschmann Connectors**

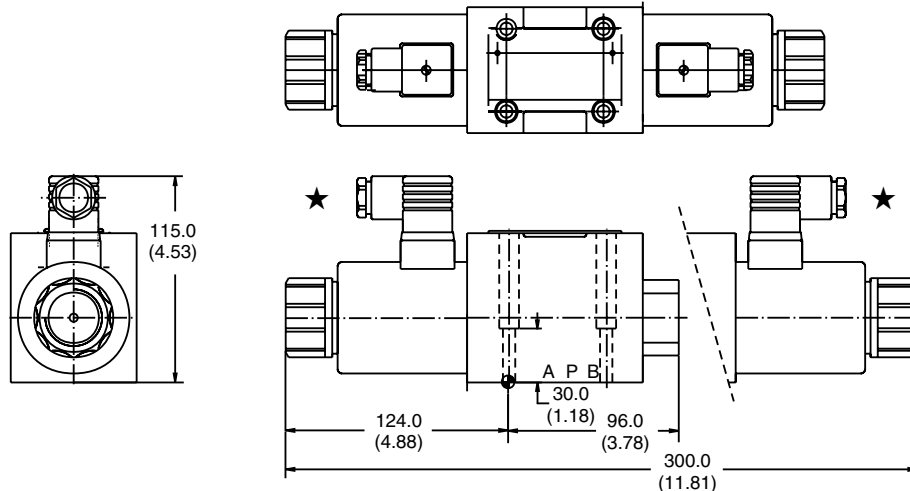
Inch equivalents for millimeter dimensions are shown in (\*\*)



**D3FW with Hirschmann Connectors**

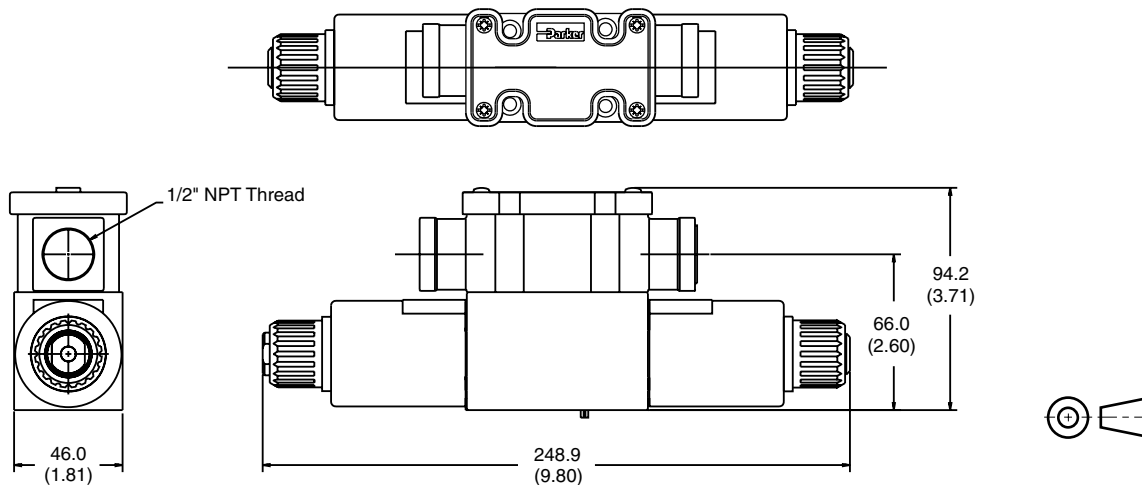
Inch equivalents for millimeter dimensions are shown in (\*\*)

★ Order plugs separately.



**D1FW with Conduit Box**

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

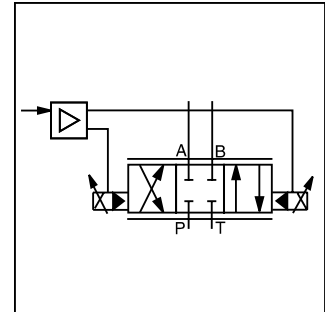
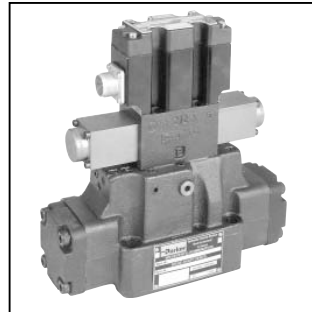




### General Description

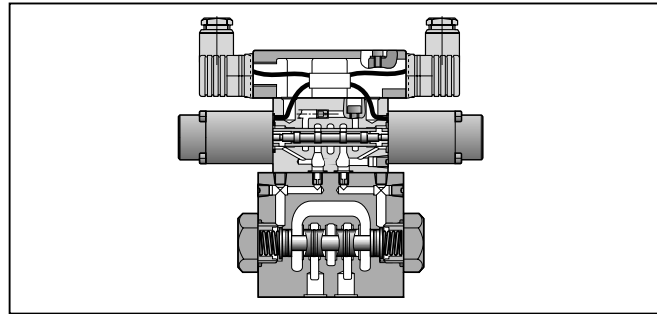
Series D\*1FW and D\*1FT two-stage pilot operated proportional directional control solenoid valves are available with or without integrated control electronics. Valves are available in sizes NG10 (CETOP 5), NG16 (CETOP 7) and NG25 (CETOP 8).

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.
- Optional integrated control electronics with ramp adjustment.
- Progressive flow characteristics for improved low flow resolution.
- Spring centered main stage spool.
- Wide selection of spool options and flow capacity.
- 2:1 ratio spool options.



### Specifications

Interface DIN (NFPA/ISO/CETOP)		NG10 (5)	NG16 (7)	NG25 (8)
Flow Rating @10 Bar (150 PSI) $\Delta p$ (P→A, B→T) (Spool options up to) LPM (GPM)		75 (20)	200 (53)	400 (106)
Pilot Flow — Continuous LPM (GPM)		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
Hysteresis %	<5	Fluid Cleanliness Level		ISO Class 16/13
Repeatability %	<2	Fluid Viscosity, Recommended		80 – 1000 SSU
Operating Pressure		Fluid Temperature, Recommended		0°C to +60°C (+32°F to +140°F)
Port P, A, B Bar (PSI)	345 (5000) max. 20 (290) min.	Ambient Operating Temperature		-20°C to +60°C (-4°F to +140°F)
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)			

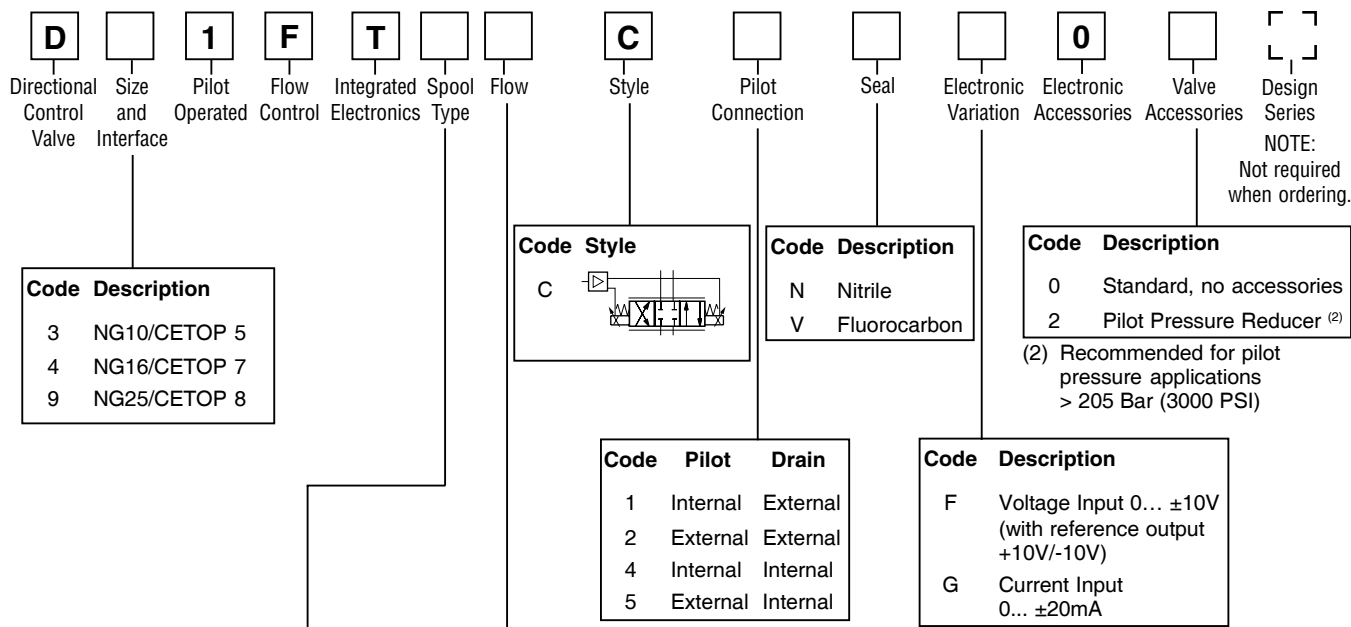
### Series D\*1FT with integrated electronics

Supply Voltage	14.5 to 30 VDC
Current	3 amps
Command Signal (impedance) (select by ordering code)	0 ± 10 VDC (100K) 0 ± 20 mA (500 ohms)
Command Polarity	Pin 'D' more positive than 'E'; flow P to B
Ramp Time Adjustment	0 to 3 seconds
Environmental Protection Class	NEMA 1 (IP54)
Mating Connector (order separately) (7-pin CE)	Part #5004072

### Series D\*1FW without integrated electronics

<b>Solenoid (order code "L")</b> Nominal Resistance Nominal Current Nominal Voltage	2.2 ohms 2.5 amps 6 volts
<b>Solenoid (order code "X")<sup>1)</sup></b> Nominal Resistance Nominal Current Nominal Voltage	9.8 ohms 1.3 amps 16 volts
<b>Environmental Protection Class</b>	NEMA 1 (IP54)
<b>Mating Connectors Solenoid (DIN 43650)</b>	Part # 692914 (black) Part # 692915 (gray)

1) For use with 24 volt based electronic driver cards.



**Sine Spool Options - Spool Type and Flow Codes**

Code		Sine Spool Type	Flow at Δp 5 Bar (72.5 PSI) per metering edge			
Q <sub>A</sub> =Q <sub>B</sub>	Q <sub>A</sub> >Q <sub>B</sub> <sup>1)</sup>		Code	D31 LPM (GPM)	D41 LPM (GPM)	D91 LPM (GPM)
E01	B31		C	75 (20)	-	-
E02	B32		F	-	200 (53)	-
			H	-	-	400 (106)

**V-Notch Spool Options - Spool Type and Flow Codes**

Code		V-Notch Spool Type	Flow at Δp 5 Bar (72.5 PSI) per metering edge			
Q <sub>A</sub> =Q <sub>B</sub>	Q <sub>A</sub> >Q <sub>B</sub> <sup>1)</sup>		Code	D31 LPM (GPM)	D41 LPM (GPM)	D91 LPM (GPM)
E21	B41		B	-	-	-
E22	B42		D	-	120 (32)	-
			F	-	-	300 (79)

1) Reduced Flow Rate on Port B, Nominal Flow Rate on Port A  
 Code A\* for spool Q<sub>B</sub>>Q<sub>A</sub> optional

**Weight:**  
 NG10 7.1 kg (16.0 lbs.)  
 NG16 10.8 kg (23.8 lbs.)  
 NG25 19.0 kg (42.0 lbs.)

Mating connector not included in delivery.

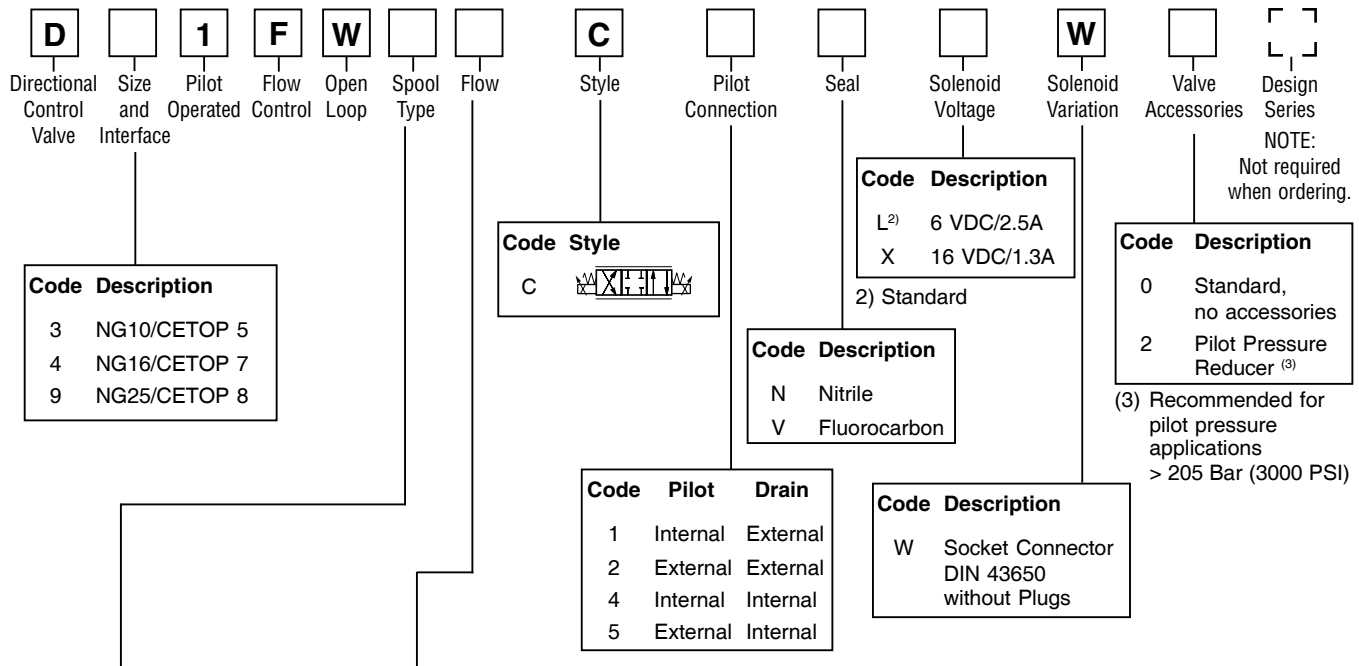
**Accessories**

Refer to the Accessories section for bolt kits, subplates, connectors and pre-assembled cable assemblies.

**Mounting Interface**

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





Sine Spool Options - Spool Type and Flow Codes						
Code		Sine	Code	Flow at $\Delta p$ 5 Bar (72.5 PSI) per metering edge		
$Q_A=Q_B$	$Q_A>Q_B$ <sup>1)</sup>	Spool Type		D31 LPM (GPM)	D41 LPM (GPM)	D91 LPM (GPM)
E01	B31		C	75 (20)	-	-
E02	B32		F	-	200 (53)	-
			H	-	-	400 (106)

V-Notch Spool Options - Spool Type and Flow Codes						
Code		V-Notch	Code	Flow at $\Delta p$ 5 Bar (72.5 PSI) per metering edge		
$Q_A=Q_B$	$Q_A>Q_B$ <sup>1)</sup>	Spool Type		D31 LPM (GPM)	D41 LPM (GPM)	D91 LPM (GPM)
E21	B41		B	-	-	-
E22	B42		D	-	120 (32)	-
			F	-	-	300 (79)

**Weight:**  
 NG10 7.1 kg (16.0 lbs.)  
 NG16 10.8 kg (25.0 lbs.)  
 NG25 19.0 kg (42.0 lbs.)

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

**Accessories**

Refer to the Accessories section for bolt kits, subplates, connectors and pre-assembled cable assemblies.

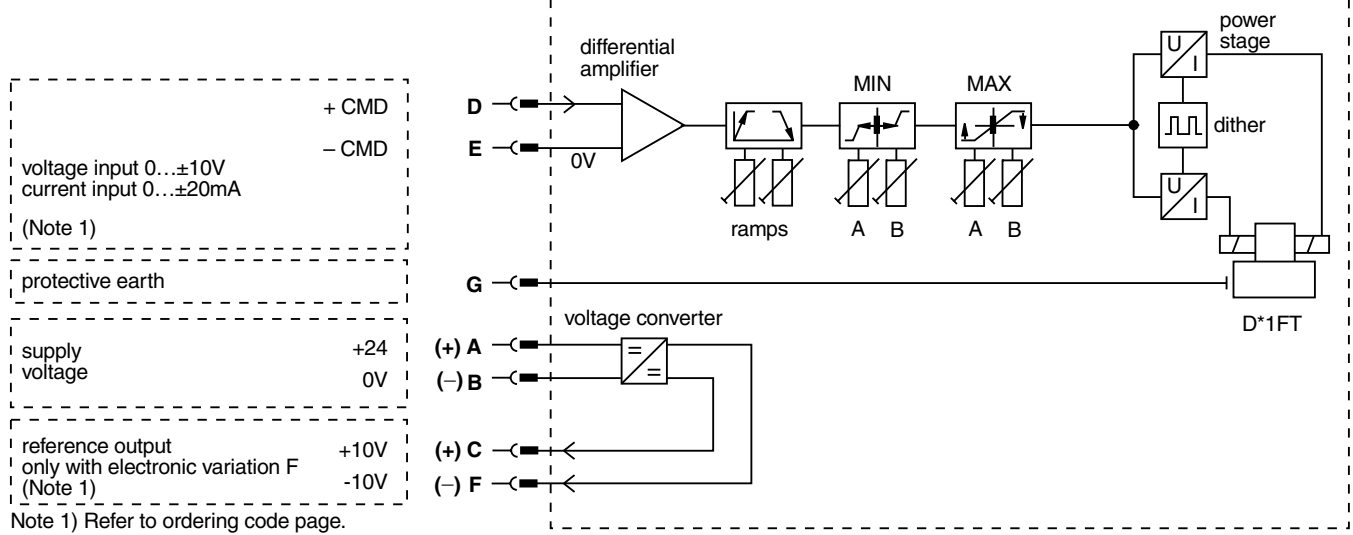
**Driver Cards**

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

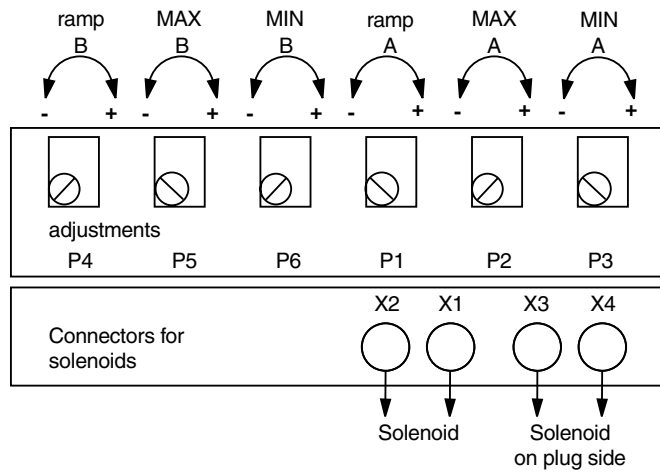
**Mounting Interface**

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

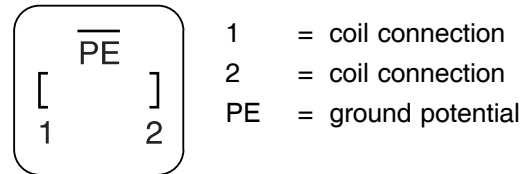
**Block Diagram (D\*1FT)**



**Integrated Control Electronics (D\*1FT)**  
**Arrangement of Potentiometers**

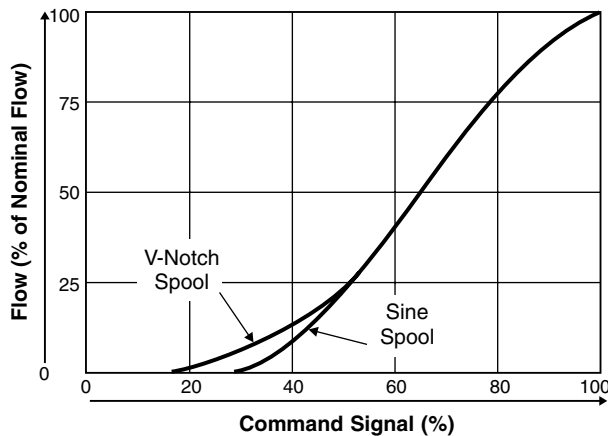


**Wiring D\*1FW — Solenoid Coil**  
 (without integrated electronics)

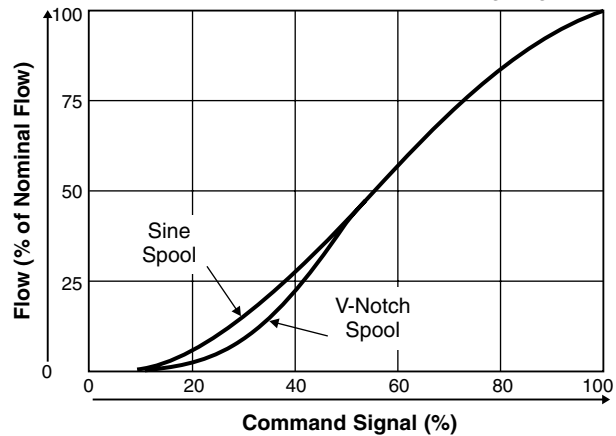


**Performance Curves**

**D\*1FW Flow Characteristics**  
 at  $\Delta p = 5$  Bar (72.5 PSI) / metering edge

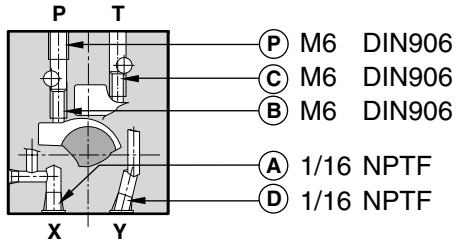


**D\*1FT Flow Characteristics**  
 (with integrated control electronics)  
 at  $\Delta p = 5$  Bar (72.5 PSI) / metering edge



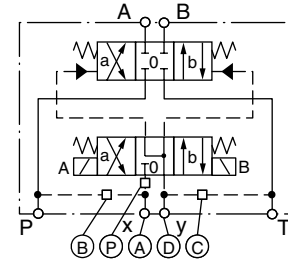
**Pilot Connection**

**D31F\***

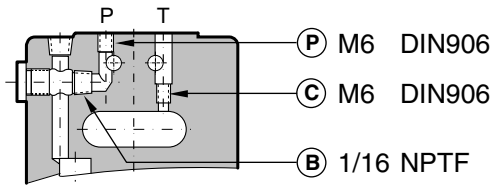


○ open, ● closed

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

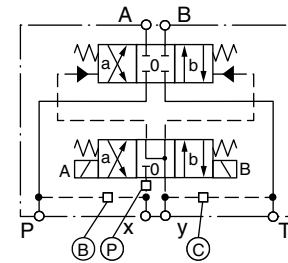


**D41F\***

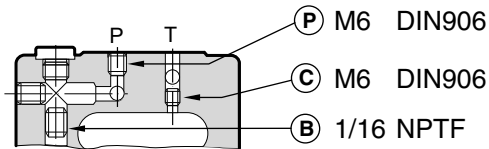


○ open, ● closed

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

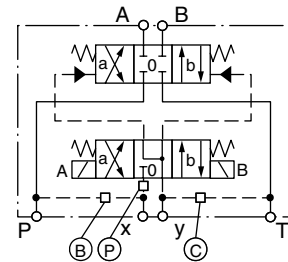


**D91F\***



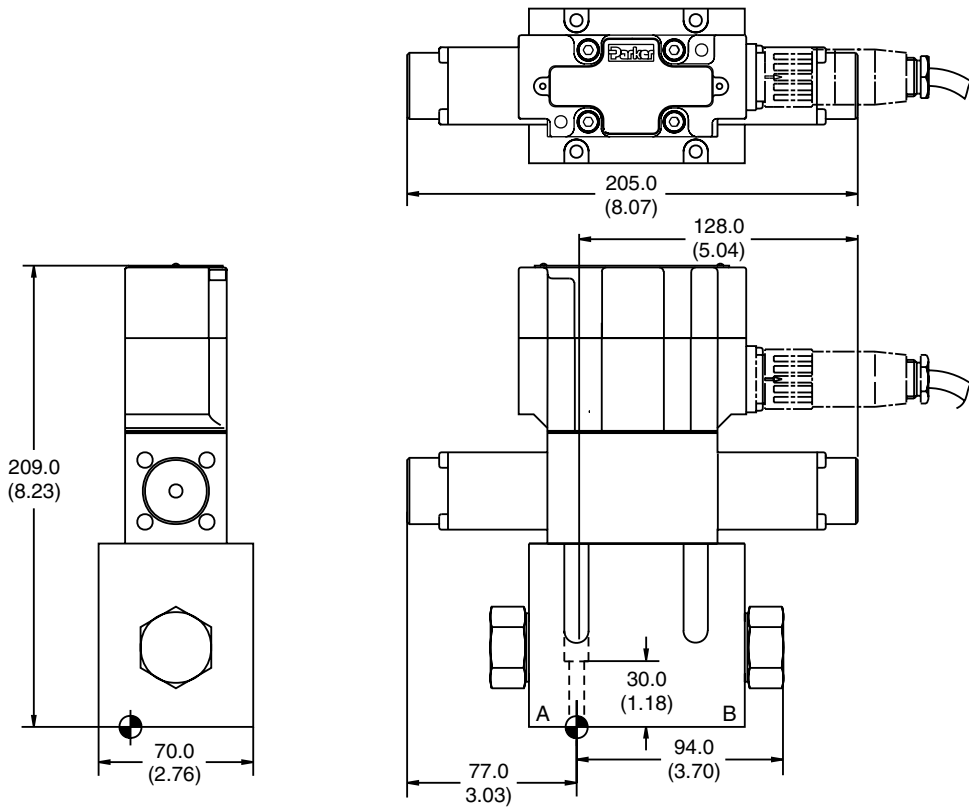
○ open, ● closed

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



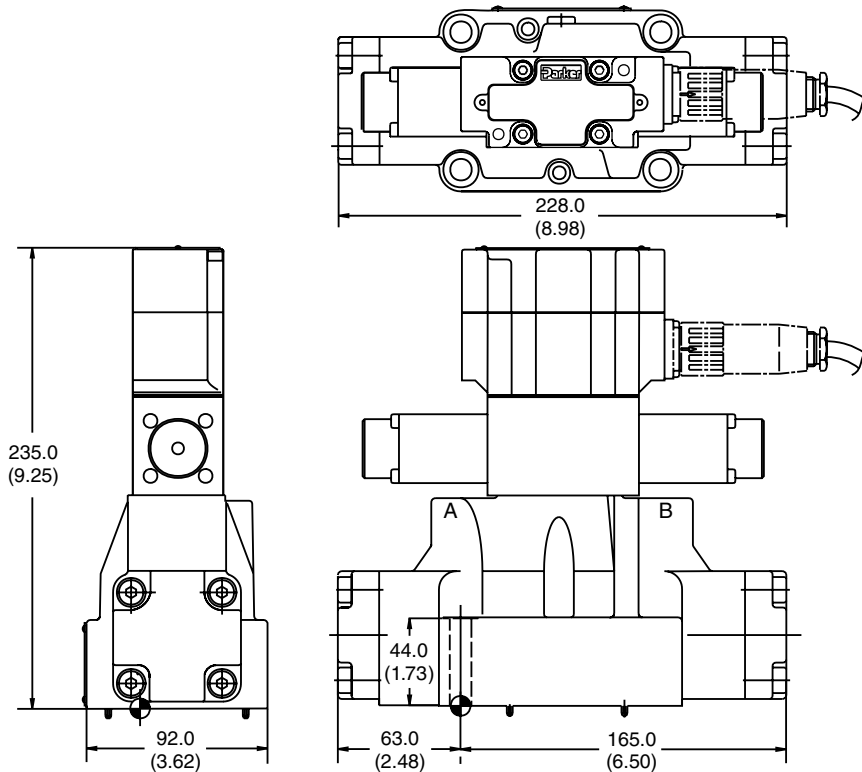
**D31FT**

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



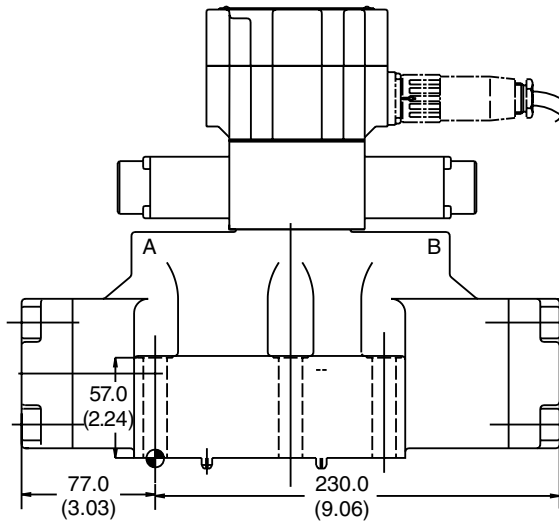
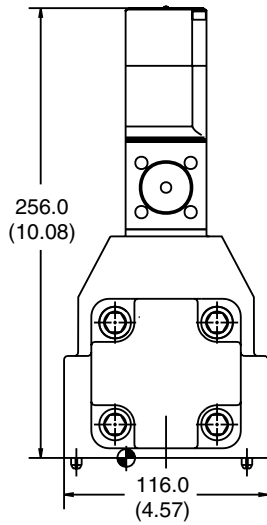
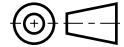
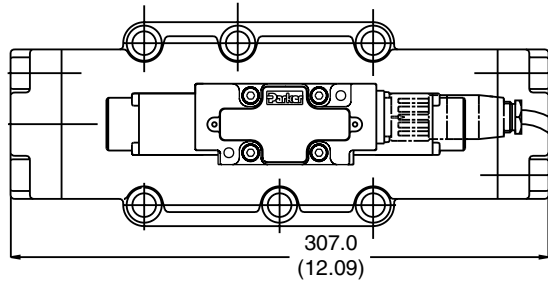
**D41FT**

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



**D91FT**

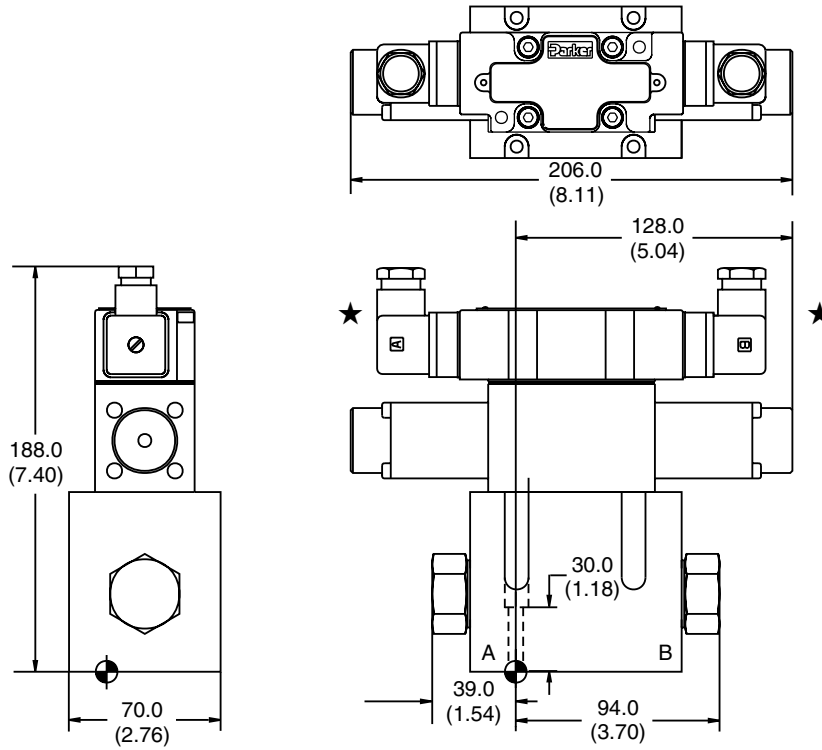
Inch equivalents for millimeter dimensions are shown in (\*\*)



**D31FW**

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

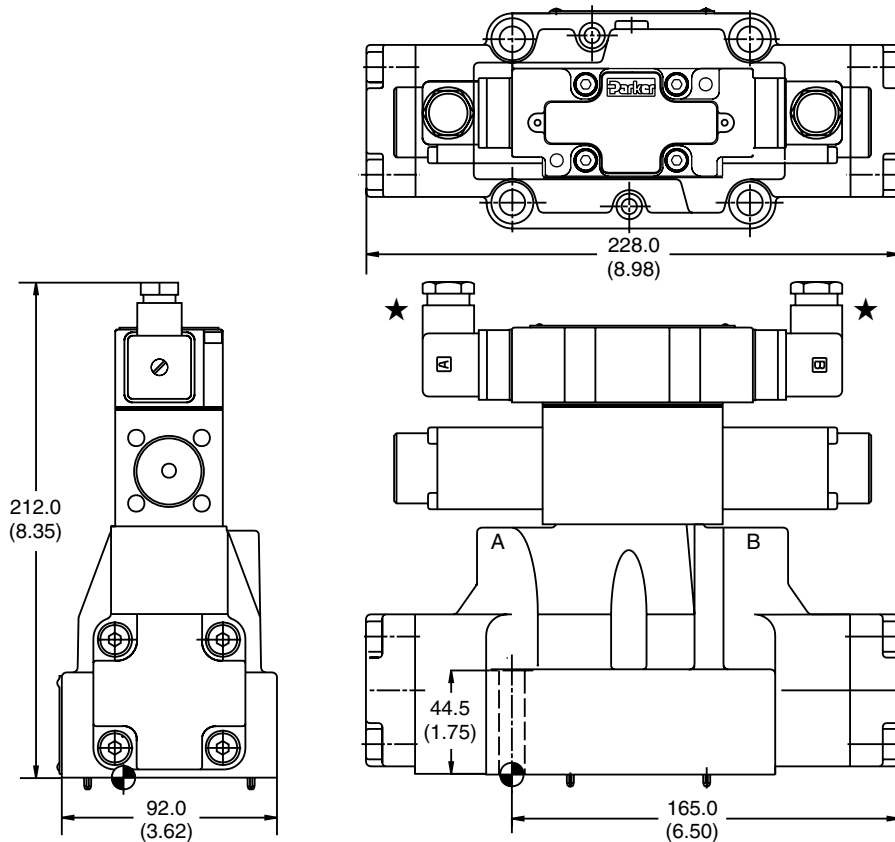
**A**



★ Order plugs separately.

**D41FW**

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

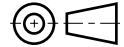
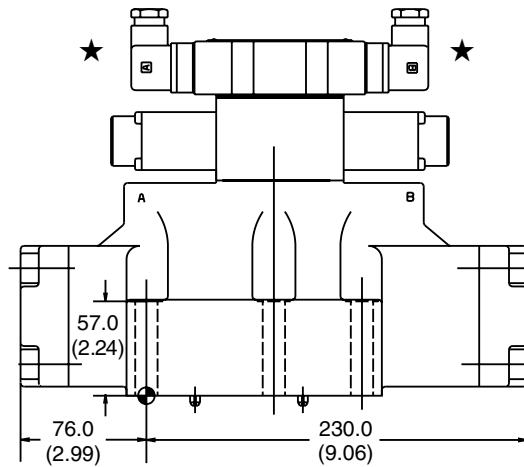
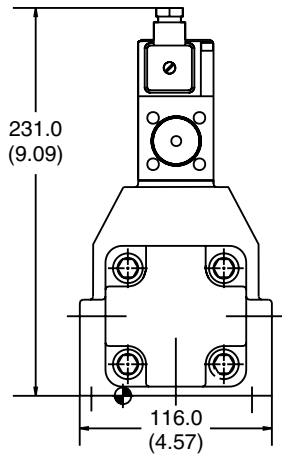
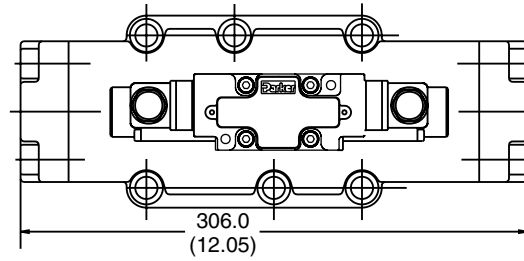




**D91FW**

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

**A**



★ Order plugs separately.

### General Description

Series D1FB and D3FB directional control valves of nominal sizes NG6 (CETOP 3) and NG10 (CETOP 5) respectively, provide variable flow rates.

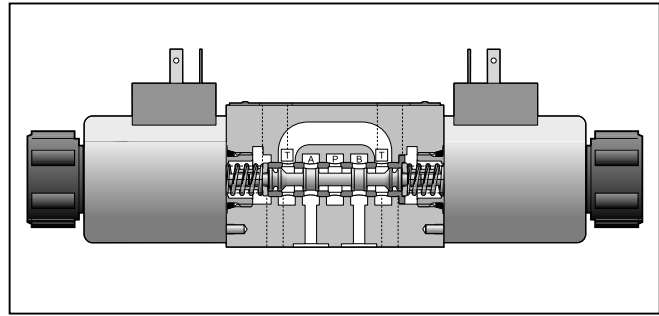
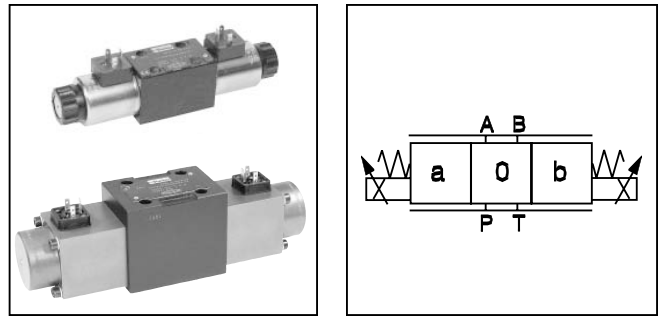
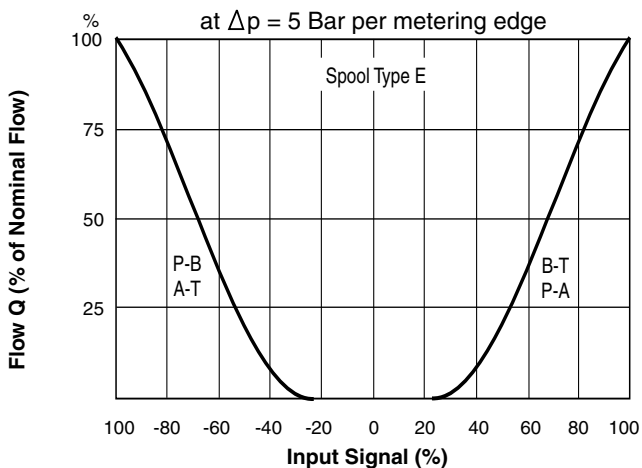
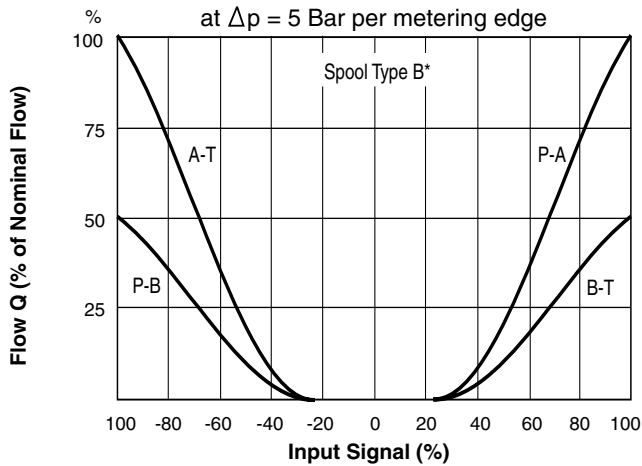
Due to a spool and sleeve combination with wire EDM window geometry the valves provide good repeatability from valve to valve. Series D1FB and D3FB valves are suited for standard applications particularly with regard to functions on identical machines, which need only to be adjusted once. In combination with the digital power amplifier PWD00A-400, the valve parameters can be saved, changed and duplicated.

### Features

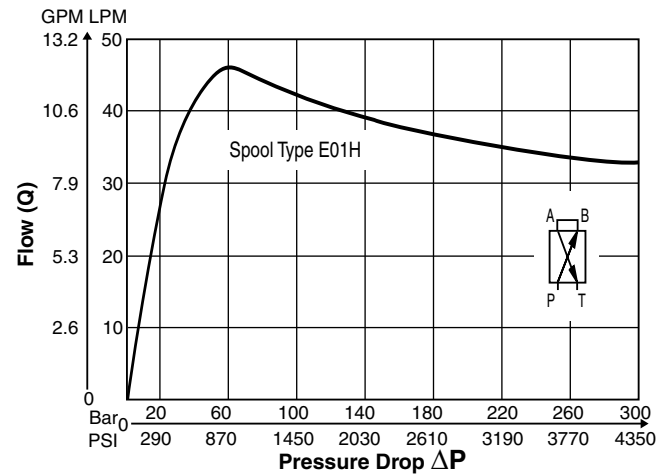
- Spool/sleeve designs.
- High repeatability from valve to valve.
- Low hysteresis.
- Manual override.

### Performance Curves

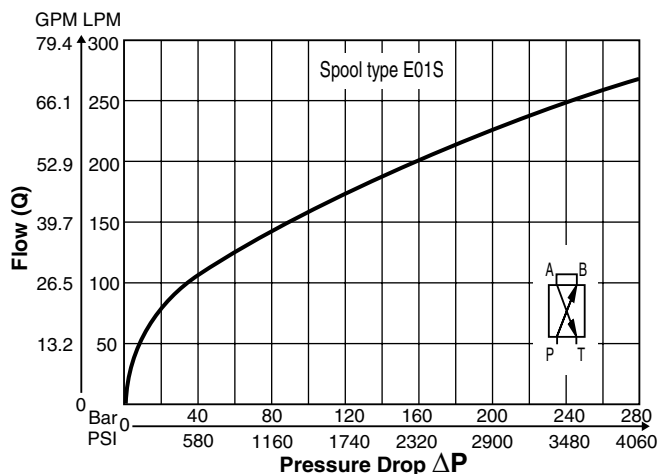
#### D1FB and D3FB



#### D1FB Flow Limit



#### D3FB Flow Limit



D\_FB.p65, dd



**Specifications**

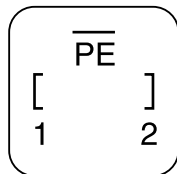
General			
<b>Design</b>	Direct-operated proportional Directional control valve	<b>Ambient Temperature Range</b>	-20°C to +60°C (-4°F to +140°F)
<b>Actuation</b>	Proportional Solenoid	<b>Vibration Resistance</b>	25 g acc. DIN IEC68, part 2-6
<b>Size</b>	D1FB: NG6 (CETOP 3) D3FB: NG10 (CETOP 5)	<b>Protection Class</b>	D1FB: IP65 acc. DIN 40050 (plugged and mounted) D3FB: IP54
<b>Mounting Interface</b>	DIN 24340 / ISO 4401 / CETOP RP121 / NFPA		
<b>Mounting Position</b>	Any		
Hydraulic			
<b>Operating Pressure Maximum</b>	D1FB: Ports P, A, B: 350 Bar (5075 PSI) Port T: 250 Bar (3625 PSI)  D3FB: Ports P, A, B, T: 350 Bar (5075 PSI)	<b>Viscosity Recommended</b>	30 to 80 cSt (140 to 370 SSU)
		<b>Filtration</b>	ISO 4406 (1999) 18/16/13 (acc. NAS 1683: 7)
		<b>Flow</b>	nominal at Δp=5 Bar per control edge* D1FB: 6 / 12 / 20 LPM (1.6 / 3.2 / 5.3 GPM) D3FB: 25 / 40 / 60 LPM (6.6 / 10.6 / 15.9 GPM)
<b>Fluid</b>	Hydraulic oil as per DIN 51524 to 535, other on request	<b>Leakage</b>	at 100 Bar (1450 PSI) D1FB: < 50 ml/min (3 in <sup>3</sup> /min) D3FB: < 100 ml/min (6 in <sup>3</sup> /min)
<b>Fluid Temperature</b>	-20°C to +60°C (-4°F to +140°F)		
<b>Viscosity Permitted</b>	20 to 380 cSt (97 to 1750 SSU)		
Electrical			
<b>Duty Ratio</b>	100%	<b>Resistance</b>	D1FB: 2.7 ohms D3FB: 1.8 ohms
<b>Supply Voltage</b>	9 VDC		
<b>Solenoid</b>	Code M	<b>Coil Insulation Class</b>	F [155°C (311°F)]
<b>Current Consumption</b>	D1FB: 2.7A D3FB: 3.4A	<b>Connection</b>	2+PE acc. EN 175301-801
		<b>Cable Specification</b>	3x1.5 (AWG 16) overall braid shield
<b>Power Consumption</b>	D1FB: 25 W D3FB: 31 W	<b>Cable Length</b>	50m (164 ft.)

\* Flow rate for different Δp per control edge:

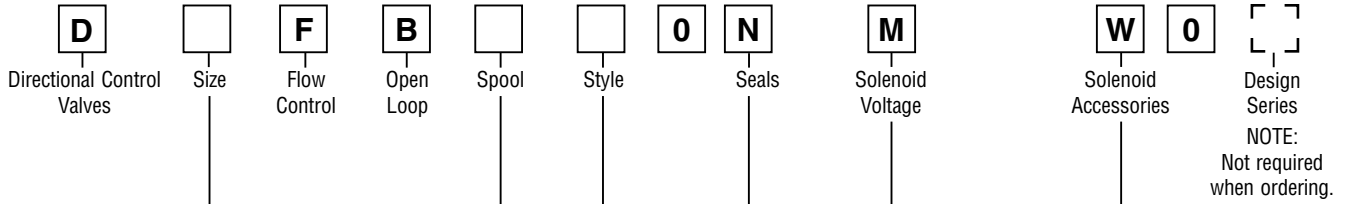
$$Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$$

**Plug**

**Solenoid coil**



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



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

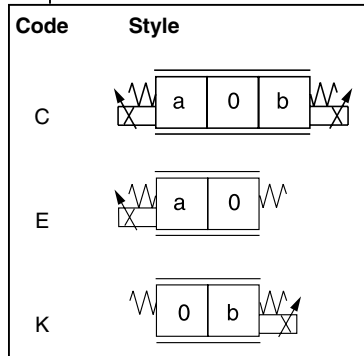
Code	Description
M	D1FB 9V/2.7A D3FB 9V/3.4A Other current on request

Code	Description
N	Nitrile Others available on request

Code	Description
W	Socket Connector DIN 43650 without Plug

**D1FB**

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)



**Weight:**  
 NG6 2.2 kg (4.9 lbs.)  
 NG10 6.5 kg (14.3 lbs.)

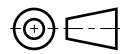
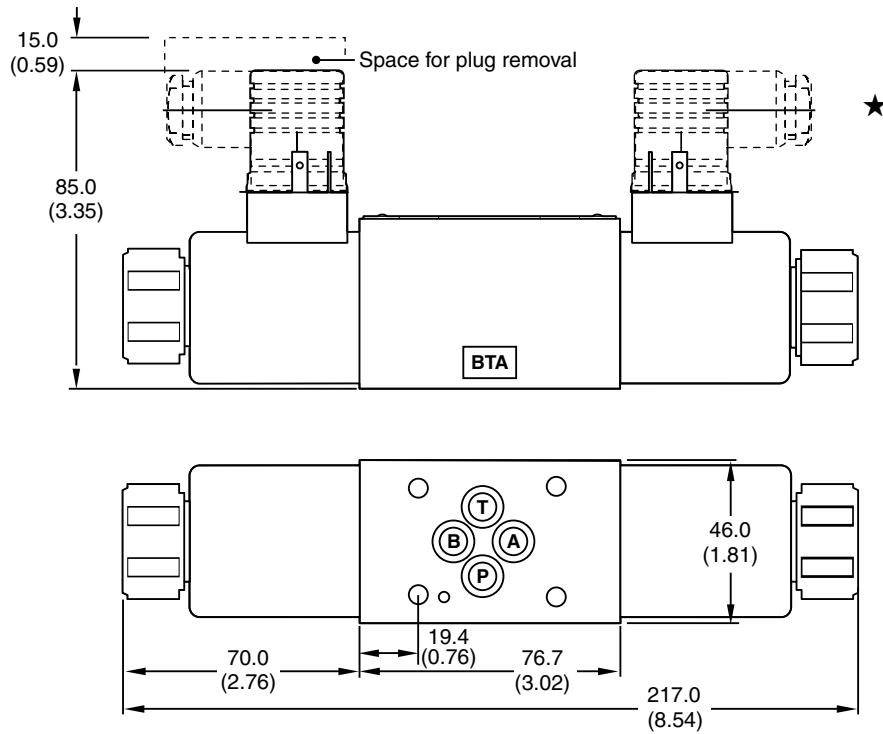
**D3FB**

Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01S E01M E01K		60 (15.9) 40 (10.6) 25 (6.6)
E02S E02M		60 (15.9) 40 (10.6)
E03S E03M		60 (15.9) 40 (10.6)
B31S B31M	 $Q_B = Q_A / 2$	60/30 (15.9/7.9) 40/20 (10.6/5.3)
B32S B32M	 $Q_B = Q_A / 2$	60/30 (15.9/7.9) 40/20 (10.6/5.3)

Please order plugs separately. See Accessories.

**D1FB\*C**

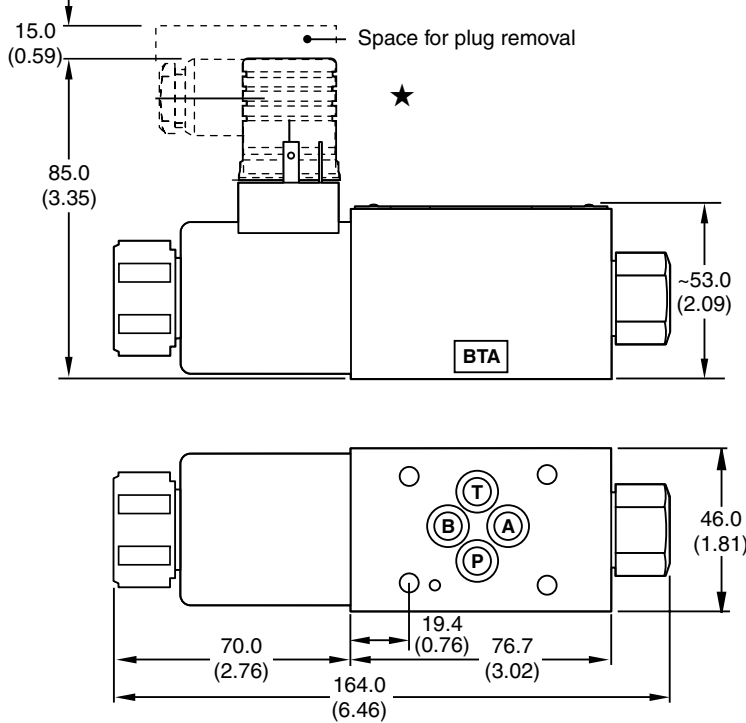
Inch equivalents for millimeter dimensions are shown in (\*\*)


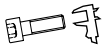


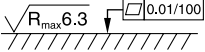


**D1FB\*K**

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

★ Order plugs separately.



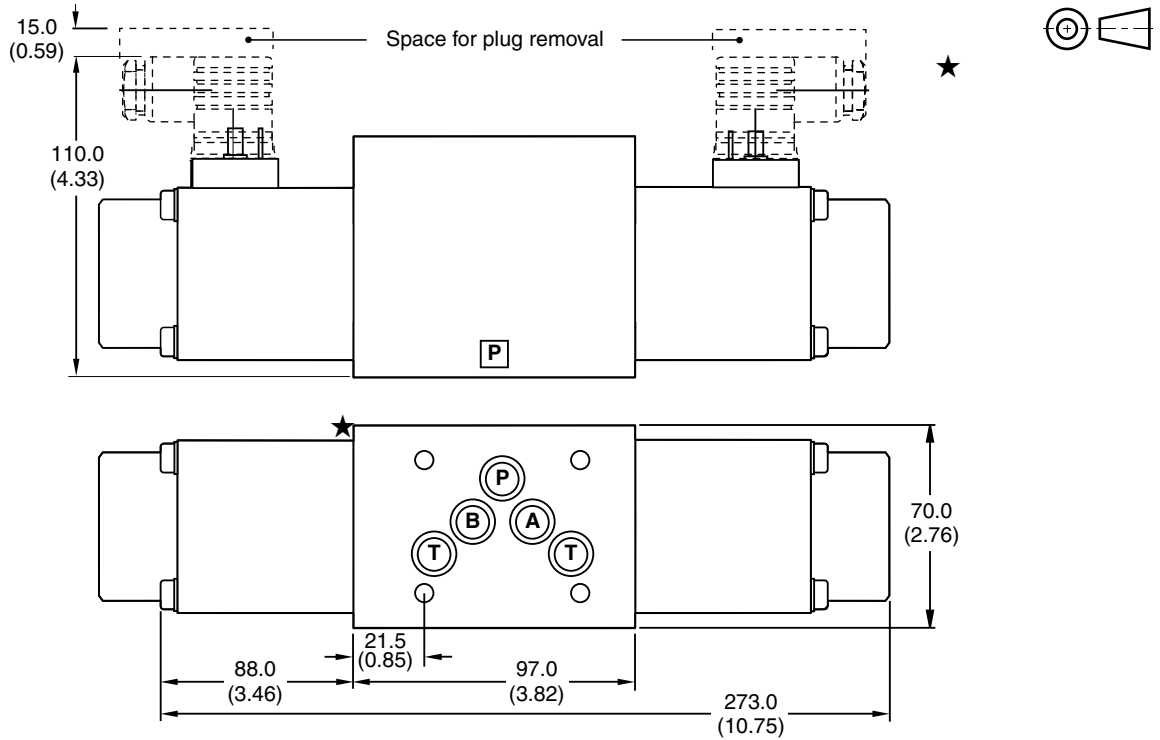
Surface finish	 Kit			 Kit NBR
	BK375	4x M5x30 DIN 912 12.9	6.8 Nm (5.0 lb.-ft.) ±15 %	SK-D1FB-N
	BK209	4x10-24x1.25"	6.8 Nm (5.0 lb.-ft.)	

D\_FB.p65, dd

**D3FB\*C**

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

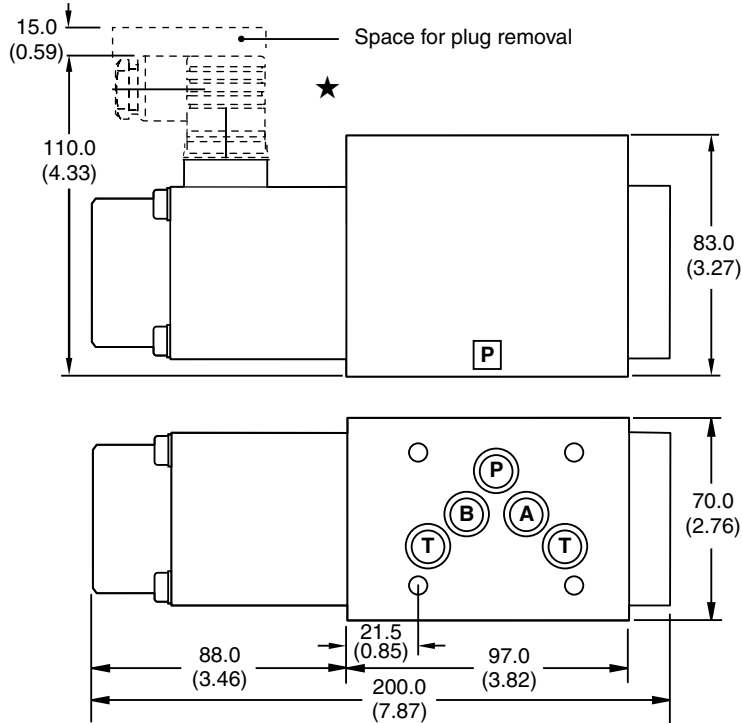
**A**





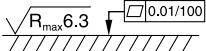


**D3FB\*K**

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

★ Order plugs separately.



Surface finish	 Kit			 Kit NBR
	BK385	4x M6x40 DIN 912 12.9	11 Nm (8.1 lb.-ft.) ±15 %	SK-D3FB-N
	BK98	4x 1/4-20x1.625"	11 Nm (8.1 lb.-ft.)	

### General Description

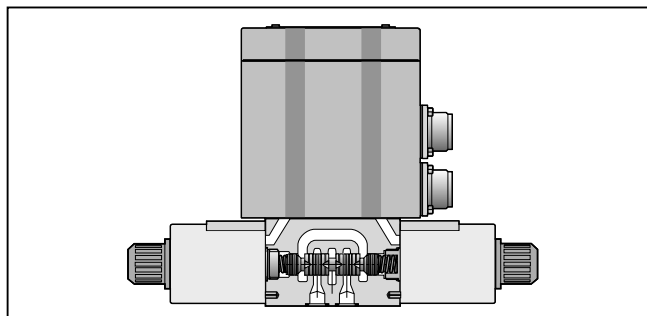
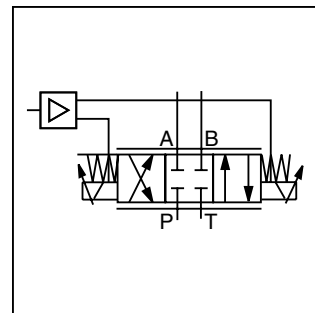
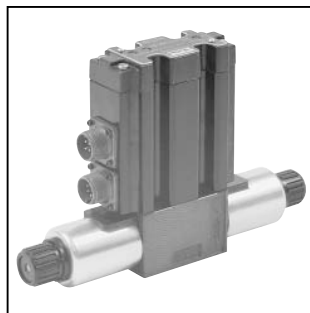
Series D\*\*FL proportional directional control valves are packaged with an integrated microprocessor based open-loop motion profiler. The valve directly accepts electrical on/off logic signals which trigger simple motion profiles controlling actuator speed, acceleration, and deceleration.

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.



### Specifications

Interface DIN (NFPA/ISO/CETOP)	NG6 (3)	NG10 (5)	NG16 (7)	NG25 (8)
<b>Flow Rating</b> @10 Bar (150 PSI) Δp (P→A, B→T) (spool options up to) <sup>1)</sup> LPM (GPM)	20 (5.3)	60 (15.9)	100 (26)	200 (53)
<b>Maximum Flow</b> (refer to operating limits curves) LPM (GPM)	30 (8)	118 (31)	144 (38)	372 (98)
<b>Pilot Flow</b>				
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)
<b>Operating Performance</b> (Refer to valve model)	D1FT	D3FT	D41FT	D91FT
<b>Operating Pressure</b>				
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)	
<b>Fluid Cleanliness Level</b>	ISO Class 16/13			
<b>Fluid Viscosity, Recommended</b>	80 – 1000 SSU			
<b>Fluid Temperature, Recommended</b>	0°C to +60°C (+32°F to +140°F)			
<b>Environmental Protection Class</b>	NEMA 4 (IP65)			
<b>Ambient Operating Temperature</b>	-20°C to +60°C (-20°F to +140°F)			

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

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



**A**

**D\*FL**  
 Proportional Directional Control Valves with Integrated Motion Control Electronics

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

**Spool Type**

Code		Spool Type
Q <sub>A</sub> =Q <sub>B</sub>	Q <sub>A</sub> >Q <sub>B</sub> <sup>1)</sup>	
E01	B31	
E02	B32	

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

**Flow**

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\*

**Style**

**Code Description**  
 C Nitrile  
 V Fluorocarbon

**Electronic Variation**

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

**Supply Voltage**

**Code Description**  
 J 24 VDC

**Electronic Accessories**

**Code Description**  
 0 Standard  
 4 CSA Approved

**Valve Accessories**

**Code Description**  
 0 Standard  
 4 CSA Approved

**Design Series**  
 NOTE: Not required when ordering.

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:**  
 NG6 3.2 kg (7.0 lbs.)  
 NG10 7.9 kg (17.5 lbs.)

**D\*\*FL**  
 Pilot Operated Proportional Directional Control Valves with Integrated Motion Control Electronics

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

**Spool Type**

Code			Spool Type
Q <sub>A</sub> =Q <sub>B</sub>	Q <sub>A</sub> >Q <sub>B</sub>	Q <sub>B</sub> >Q <sub>A</sub>	
E21	B41	A41	
E22	B42	A42	

**V-Notch Spools**

**Flow**

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)

**Style**

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

**Pilot Connection**

**Code Description**  
 N Nitrile  
 V Fluorocarbon

**Electronic Variation**

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

**Electronic Accessories**

**Code Description**  
 0 Standard  
 2 Pilot Pressure Reducer<sup>(3)</sup>  
 4 CSA Approved

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

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

**Accessories**  
 Refer to the Accessories section for bolt kits, subplates, connectors and pre-assembled cable assemblies.

**Weight:**  
 NG16 10.9 kg (24.0 lbs.)  
 NG25 19.1 kg (42.0 lbs.)

D\_FL.p65, dd



<b>Supply Voltage</b>	V	12 to 28	
<b>Maximum Current</b>	A	3.5	
<b>Motion Profile Adjustment</b> 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.	
<b>Test Points</b> 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.	
<b>Logic Interface</b> Ordering code field: Electrical variation (options available all valve sizes)		<b>W</b>	<b>T</b>
<b>Electrical Isolation</b>		DC Optical-Coupled	AC Optical-Coupled
<b>Polarity</b>		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.
<b>Input Impedance</b>	ohms	>2000	>2000
<b>Input Voltage, Absolute Max.</b>	V	28 VDC	130 VAC
<b>Logic "on" (1), Min. Voltage</b>	V	>9.6 VDC	>96 VAC
<b>Logic "on" (1), Current</b>	mA	3.2 mA	3.2 mA
<b>Logic "off" (0), Min. Voltage</b>	V	<6.0 VDC	<51 VAC
<b>Logic "off" (0), Current</b>	mA	3.2 mA	3.2 mA
<b>Mating Connectors</b> (order separately) <b>Power Supply Connector</b> <b>Logic Input Connector</b>		Part # 1210292 (4-pin MS) Part # MS3106E-14S-6S (6-pin MS)	

## Application Guidelines

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

Refer to **Interface and Motion Profile** diagrams on the following pages.

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

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

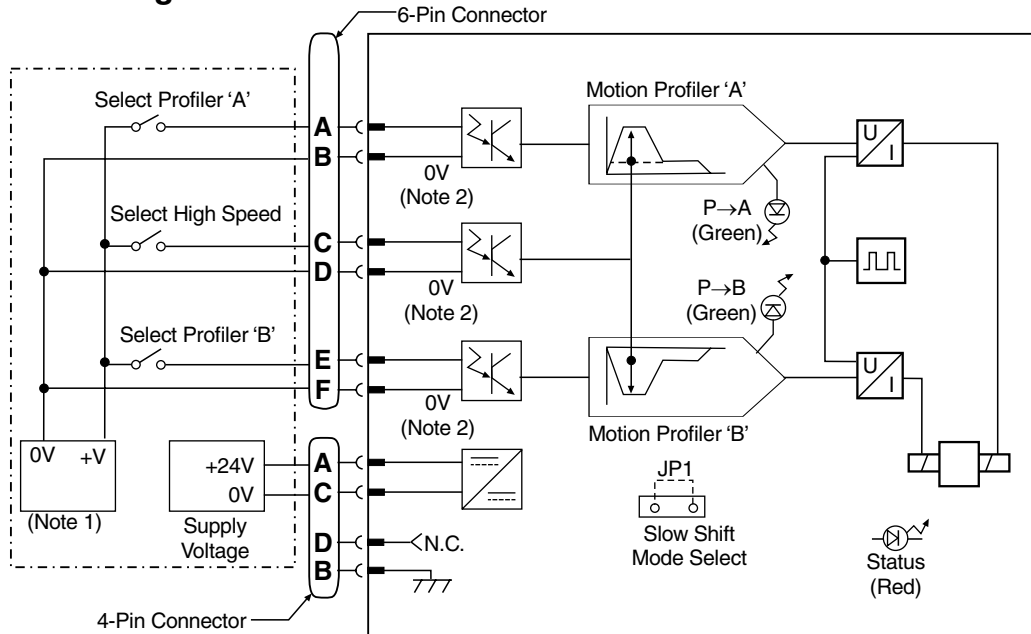
D1FL: Installation Guide Bulletin 2589-M2/USA

D3FL: Installation Guide Bulletin 2589-M3/USA

D41FL,

D91FL: Installation Guide Bulletin 2589-M1/USA

**Block Diagram**

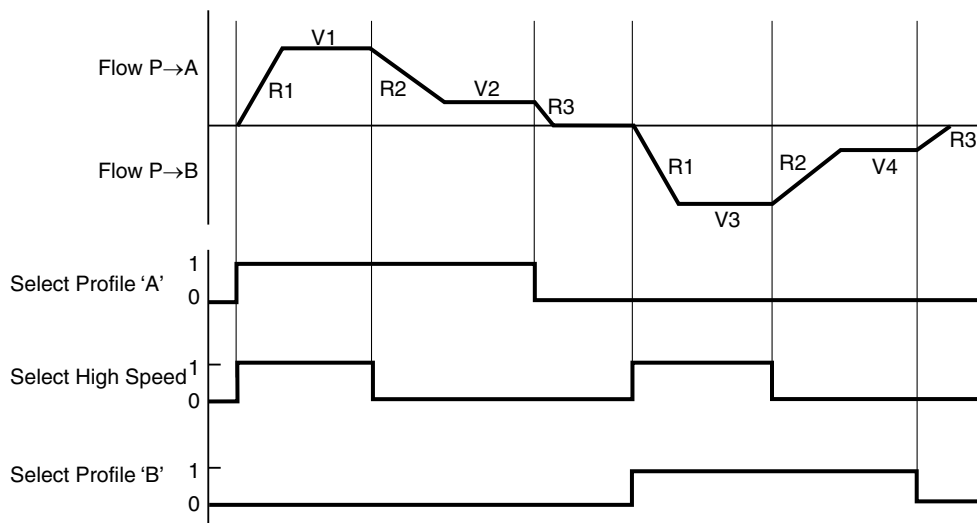


**Notes:**

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

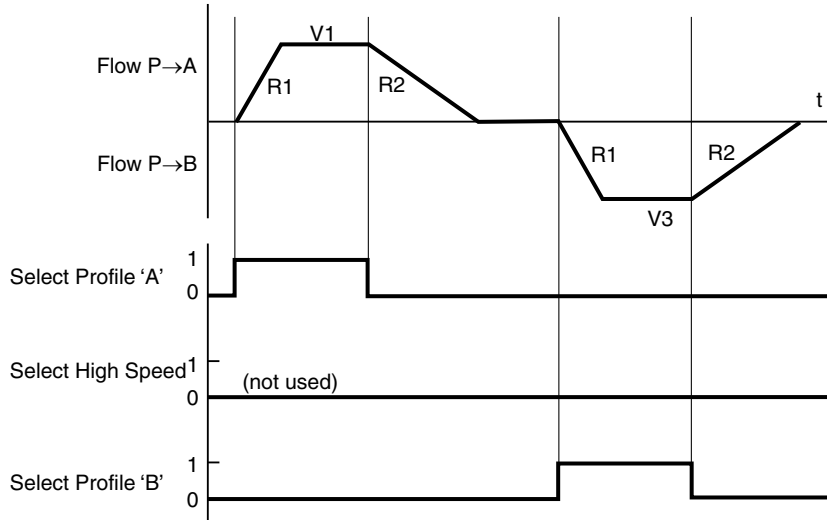
**Interface — ‘Motion Profiler’ mode (see timing diagram below)**

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



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

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



**4-Pin Power Supply Plug**

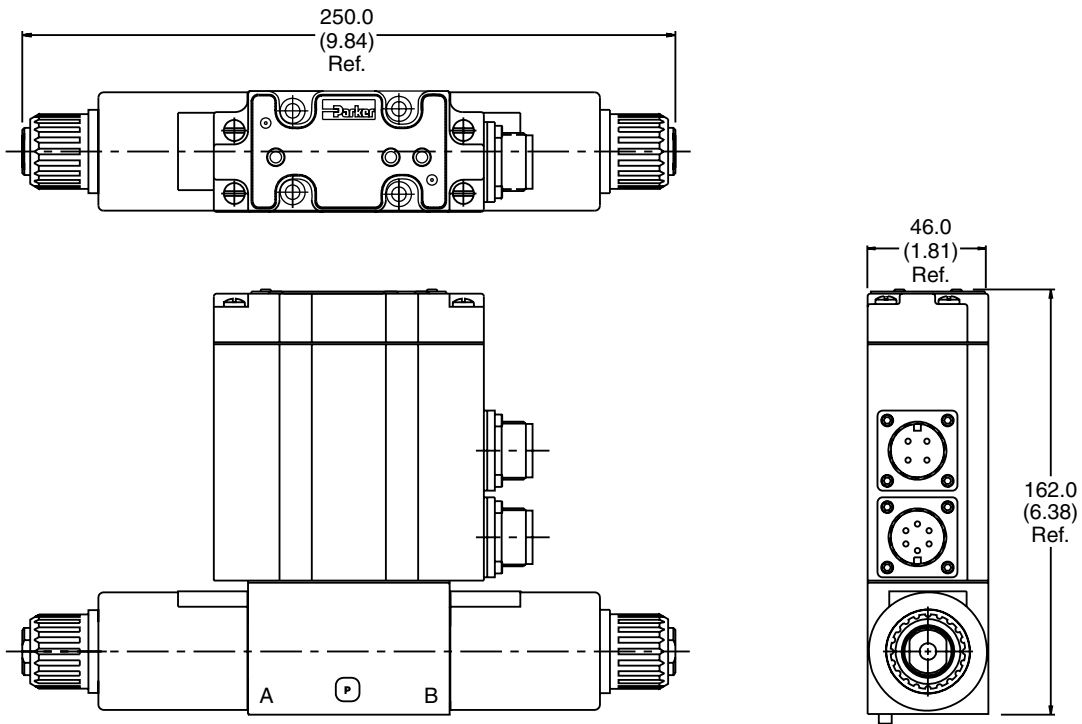
	Pin	Description
	A	Supply Voltage
	B	Protective Ground
	C	Supply 0V
	D	Not Used

**6-Pin Logic Input Plug**

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

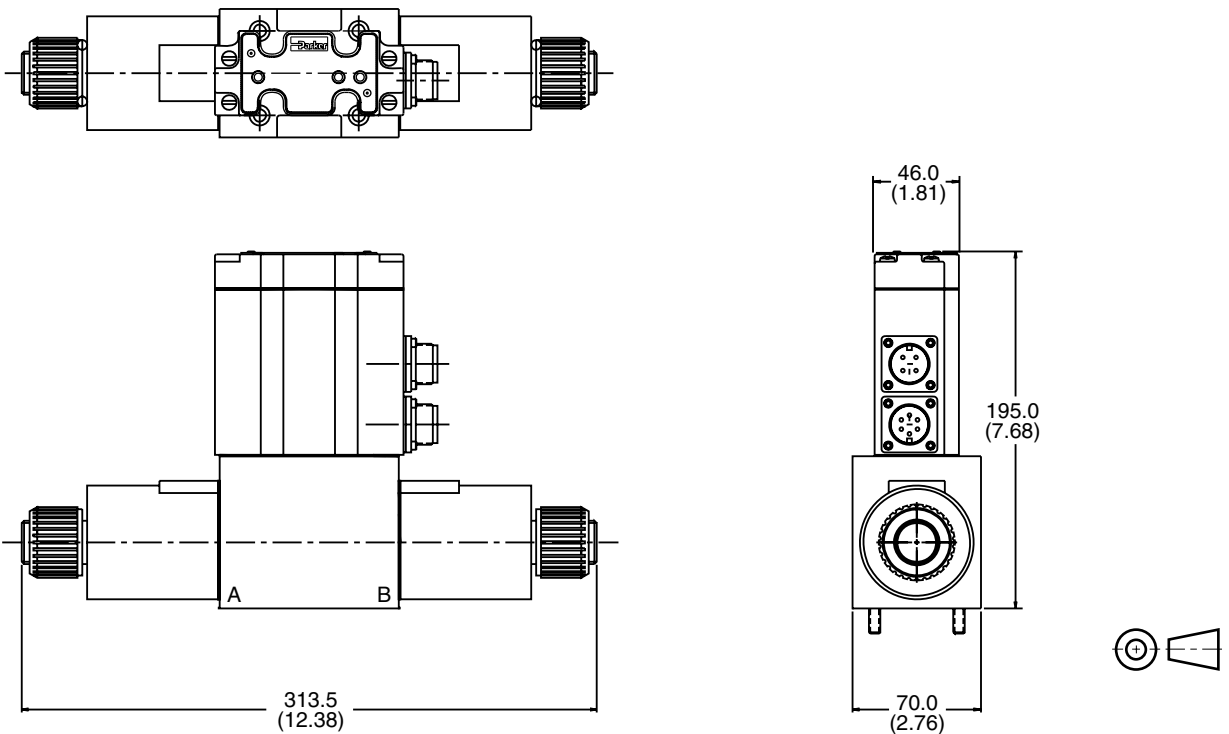
**D1FL**

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



**D3FL**

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

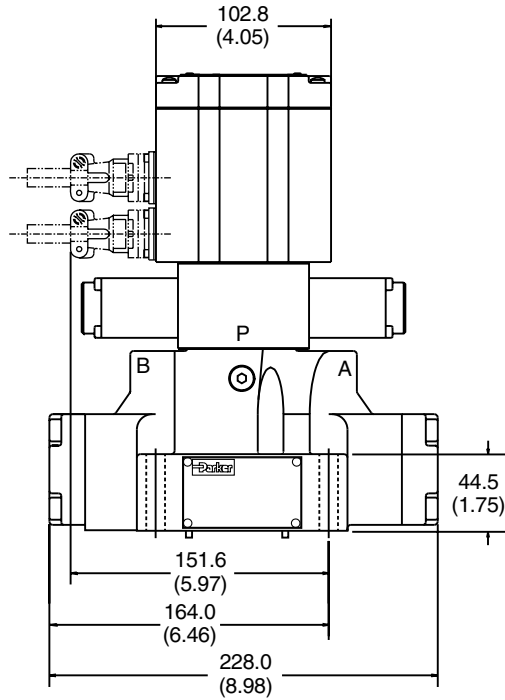
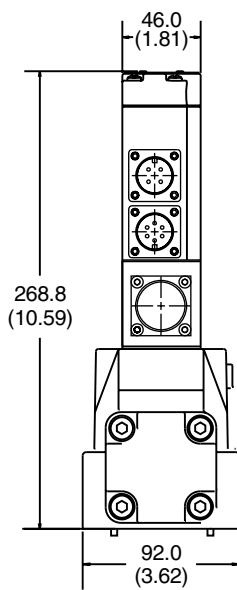
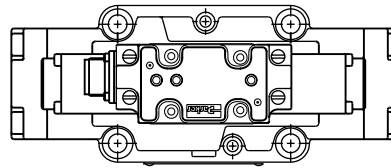


**Dimensions**

**Proportional Valves with Motion Profiling  
Series D41FL and D91FL**

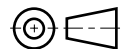
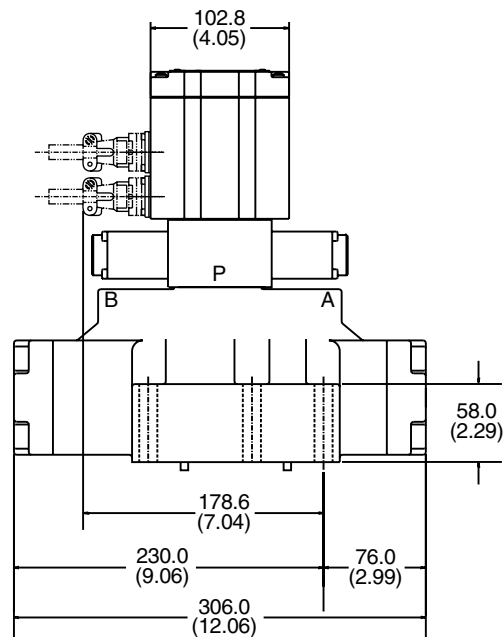
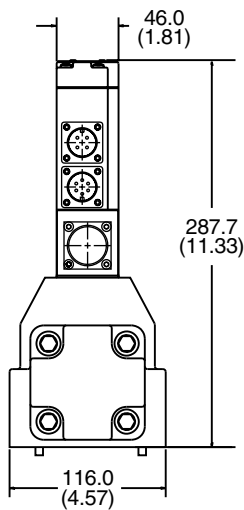
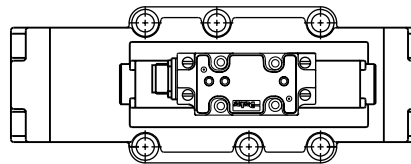
**D41FL**

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



**D91FL**

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



## General Description

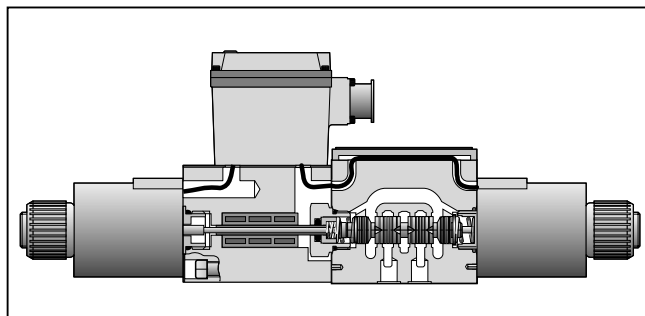
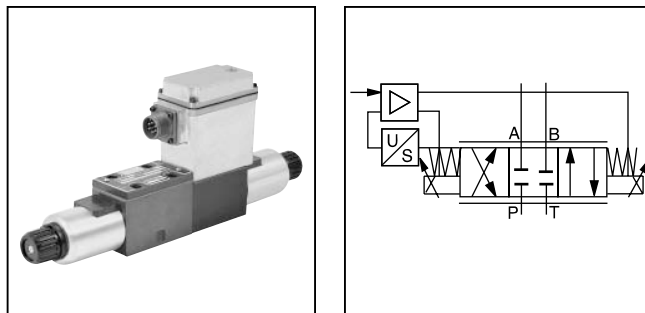
Series D\*FX proportional directional control valves are direct operated solenoid valves with electronic spool position feedback, and on-board integrated control electronics. D\*FX valves are user configurable to proportionally control flow in response to voltage or current command signals. Valves are 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  $\pm 10V$  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 (NFPA/ISO/CETOP)		NG6 (3)	NG10 (5)
Flow Rating @10 Bar (150 PSI) $\Delta p$ (P→A, B→T) (spool options up to) <sup>1)</sup>		LPM (GPM)	20 (5.3)
Maximum Flow		LPM (GPM)	60 (15.9)
Step Response (time to reach 90% of a 100% step command)		ms	47 (12.5)
Step Response			75
Hysteresis	%	<1.5	Command Signal (impedance) (select by ordering code) 24V Version 'J' 12V Version 'K'
Repeatability	%	<0.5	
Max. Operating Pressure			Command Polarity
Port P, A, B	Bar (PSI)	315 (4500)	
Port T		35 (500)	Pin 'D' more positive than 'E'; Flow P to A
Fluid Cleanliness Level		ISO Class 18/16/13	Spool Position Monitor
Fluid Viscosity, Recommended		75 – 600 SSU	
Fluid Temperature, Recommended		0°C to +60°C (+32°F to +140°F)	24V Version 'J' 12V Version 'K'
Ambient Operating Temperature		-20°C to +60°C (-20°F to +140°F)	Mating Connector
Electrical Power Requirements			
24V Version 'J': NG6 (03)		18 to 30 VDC, 3A	7-Pin CE for Electronic Design 'B'
24V Version 'J': NG10 (05)		18 to 30 VDC, 4A	6-Pin for Electronic Design 'C' & 'D'
12V Version 'K': NG06 (03) only		11.5 to 15 VDC, 4A	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:

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



**D\*FX**

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

Code	Nominal Size
D1FX	NG6/CETOP 3
D3FX	NG10/CETOP 5

Spool Type

Flow

Style

Seal

Electronic Design

Supply Voltage

Electronic Accessories

Valve Accessories

Design Series

NOTE:  
Not required when ordering.

Code			Spool Type
Q <sub>A</sub> =Q <sub>B</sub>	Q <sub>A</sub> >Q <sub>B</sub> *	Q <sub>B</sub> >Q <sub>A</sub> **	
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
J	24 VDC
K	12 VDC*

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

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

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

Code	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.

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	

Weight:	
NG6	3.4 kg (7.5 lbs.)
NG10	8.3 kg (18.3 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.

### Application Guidelines

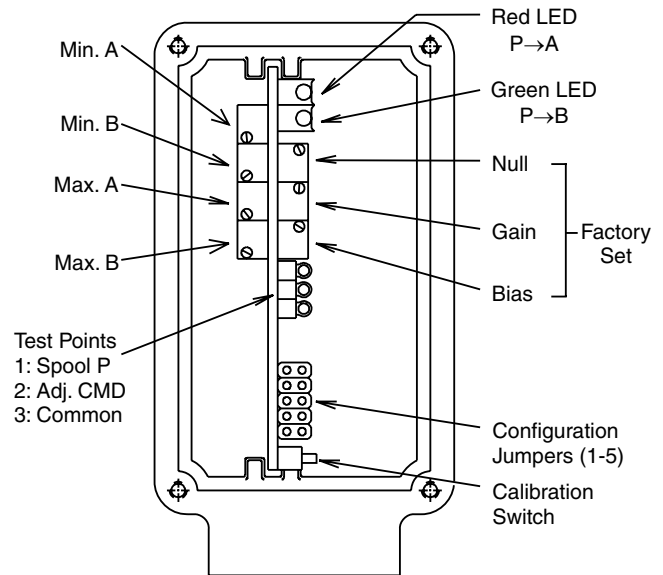
D\*FX proportional valves are available in three control configurations. Option 'B' conforms to the industrial proportional valve standard and is interchangeable with most competitors' valves of this type. Options 'C' and 'D' are designed to simplify user application by providing specific features. Note that the 'B' control option uses the industrial standard CE compliant 7-pin MS connector while options 'B' and 'C' use a 6-pin MS connector. Refer to the table below for connector pin-out assignments.

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

### Internal Adjustment

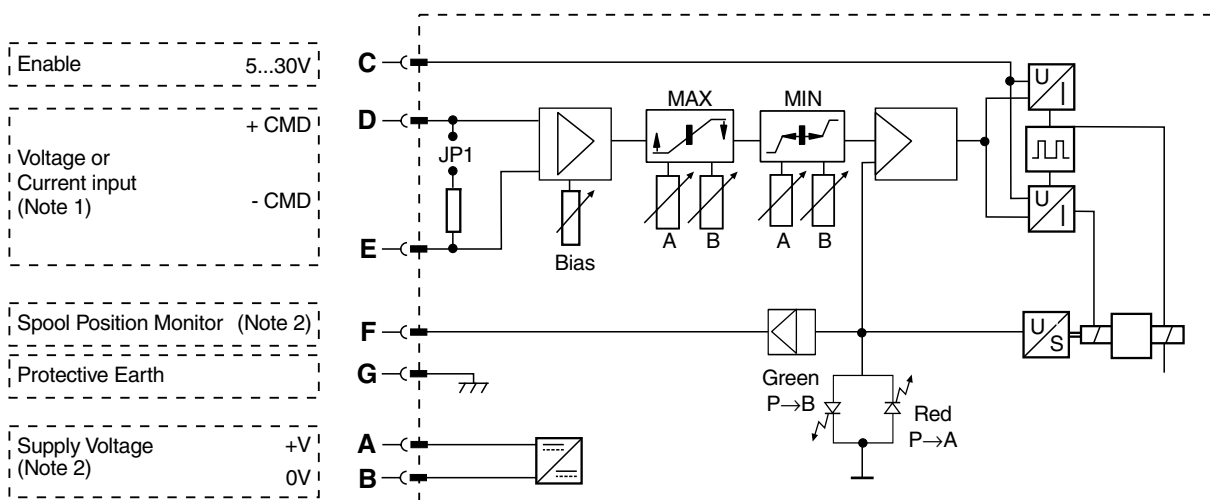
Refer to the Installation Guide for set-up, configuration, and application guidelines (packaged with each valve).

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.

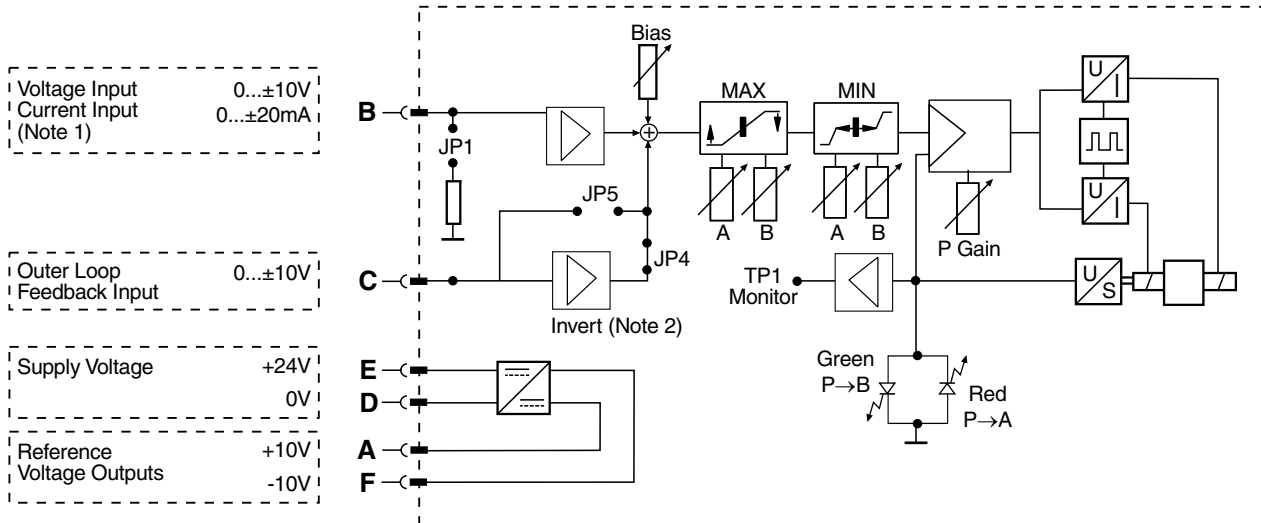


Note 1: Install jumper JP1 for current command input. Refer to Installation Bulletin 2583-M1/USA (D1FX).  
 Note 2: Refer to specifications.



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

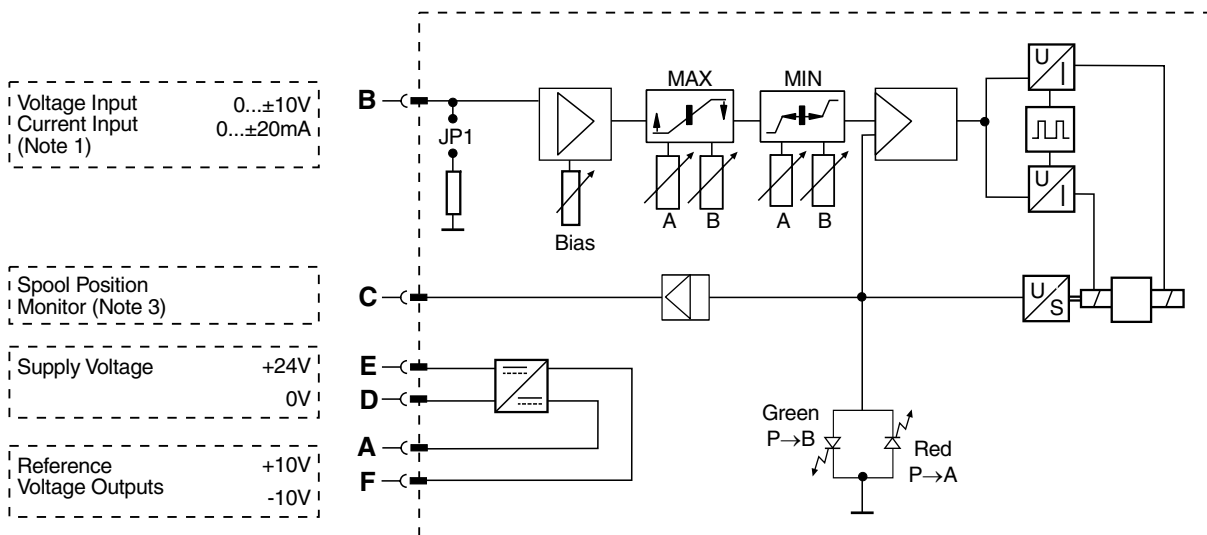
Electronic design option 'C' provides an additional analog closed outer loop function for user application. This feature can be used to control simple position control loops where analog resolution and a single proportional gain control are adequate. The design provides a single bipolar command input that is user configurable as voltage or current, and an outer loop feedback sensor voltage input.  $\pm 10$  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 Bipolar Command Input, with $\pm$ Volt Reference Output

Electronic design option 'D' provides a single bipolar command input that is user configurable as voltage or current.  $\pm 10$  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.

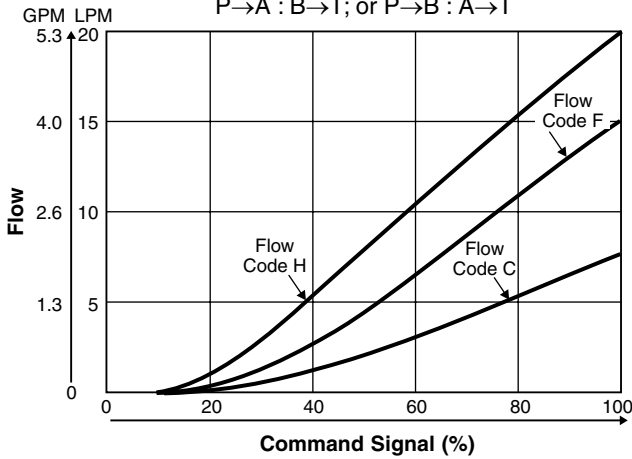


Note 1: Install jumper JP1 for current command input. Refer to Installation Bulletin 2583-M1/USA (D1FX).  
 Note 2: Install jumper JP4 to invert user outer loop feedback input signal.  
 Note 3: Refer to specifications.



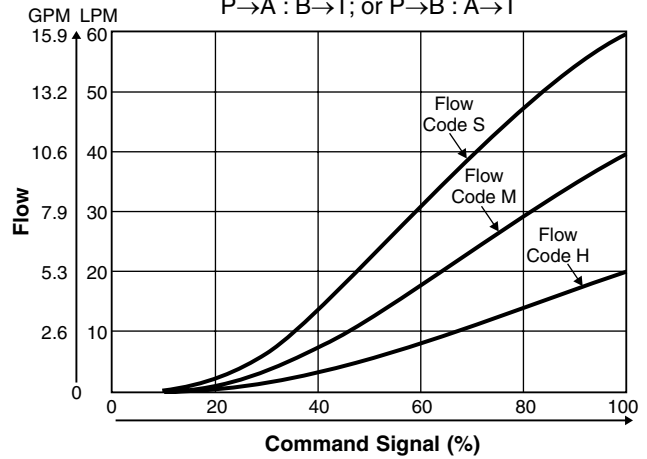
**D1FX Flow Characteristics**

at  $\Delta p = 5 \text{ Bar (72.5 PSI)}$  / metering edge  
 $P \rightarrow A : B \rightarrow T$ ; or  $P \rightarrow B : A \rightarrow T$



**D3FX Flow Characteristics**

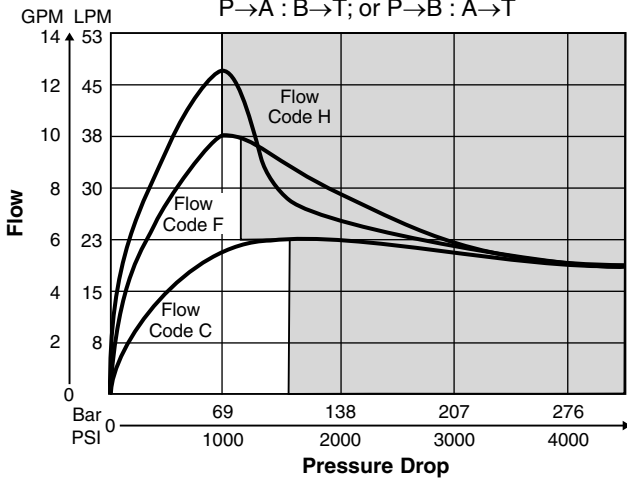
at  $\Delta p = 5 \text{ Bar (72.5 PSI)}$  / metering edge  
 $P \rightarrow A : B \rightarrow T$ ; or  $P \rightarrow B : A \rightarrow T$



**D1FX Operating Limits 1)**

at 100% Command

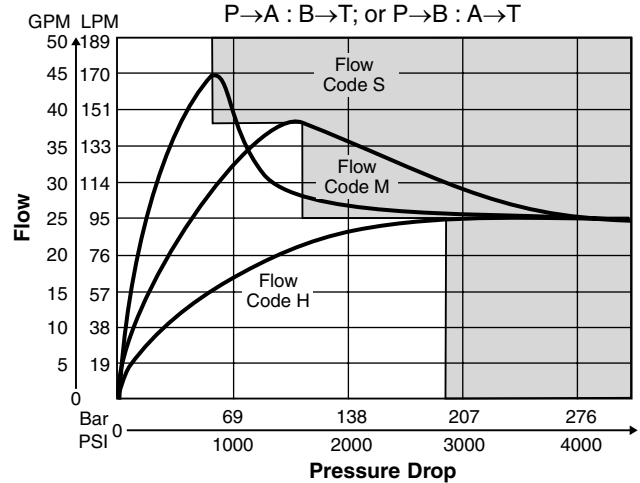
$P \rightarrow A : B \rightarrow T$ ; or  $P \rightarrow B : A \rightarrow T$



**D3FX Operating Limits 1)**

at 100% Command

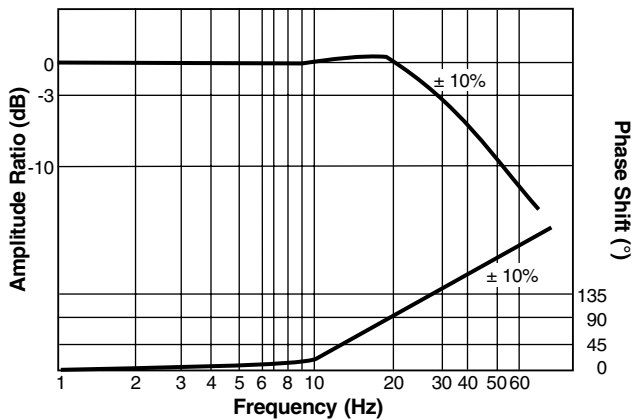
$P \rightarrow A : B \rightarrow T$ ; or  $P \rightarrow B : A \rightarrow T$



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

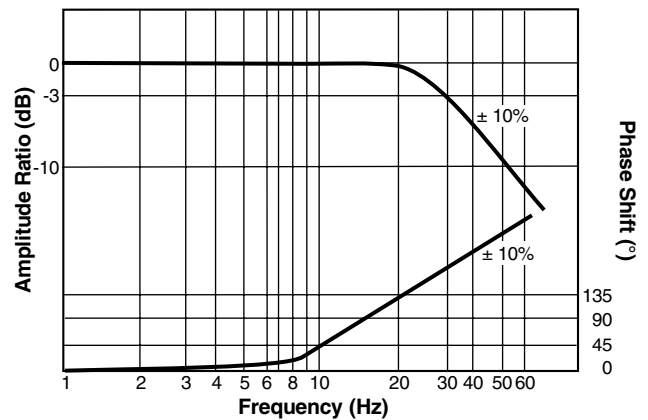
**D1FX Frequency Response**

at 10% Command, 50% Offset



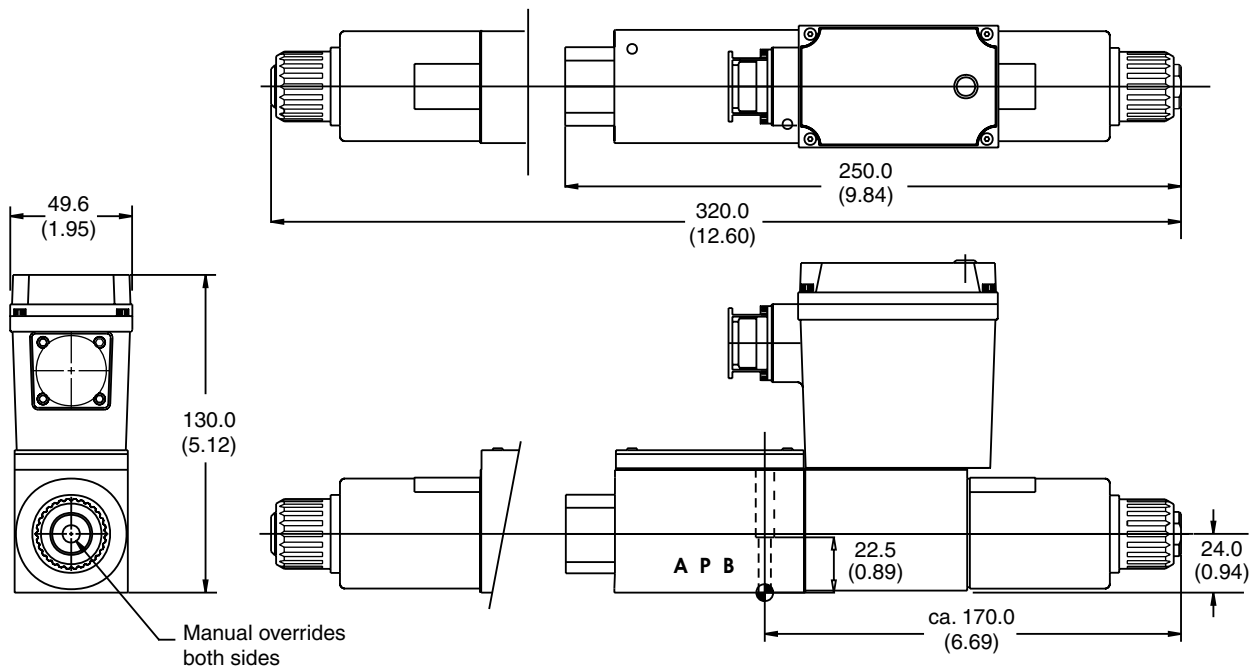
**D3FX Frequency Response**

at 10% Command, 50% Offset



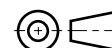
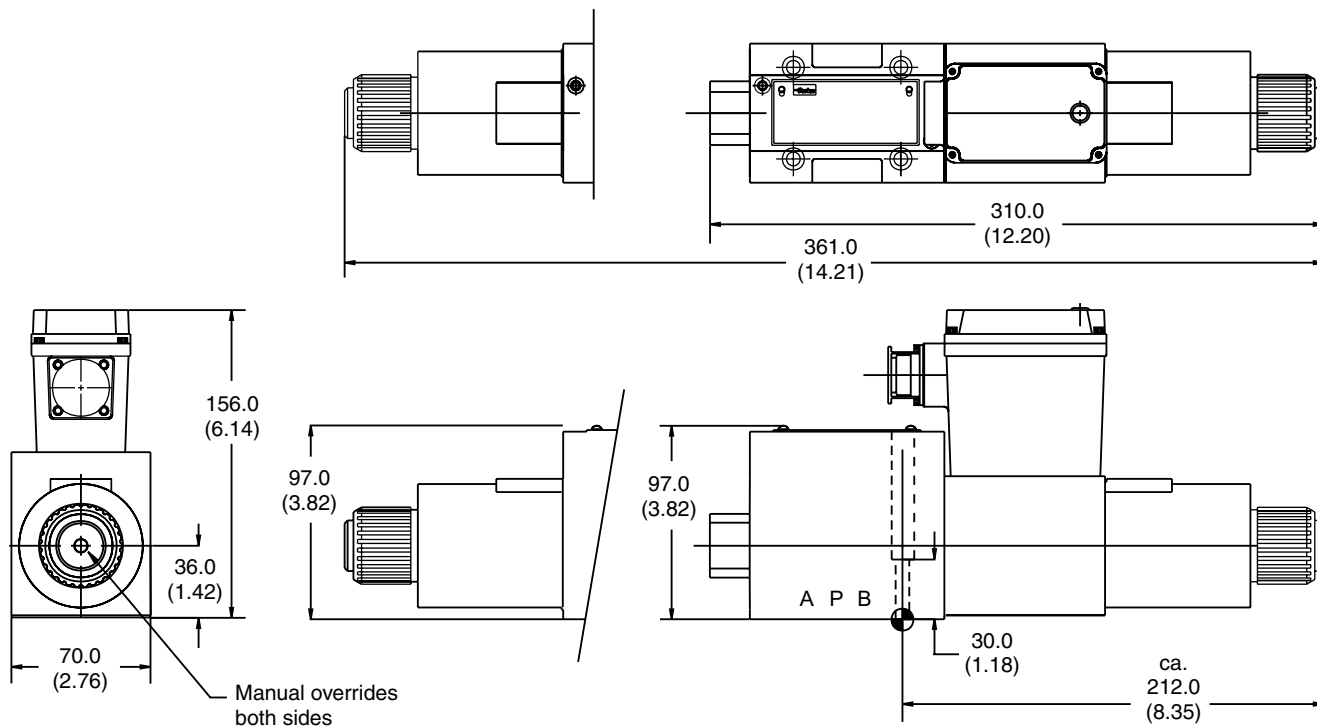
**D1FX**

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



**D3FX**

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



## General Description

**A**

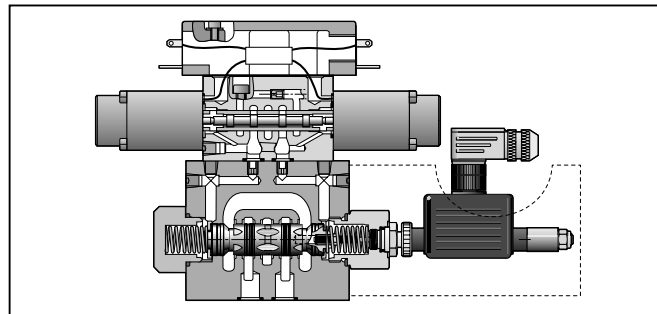
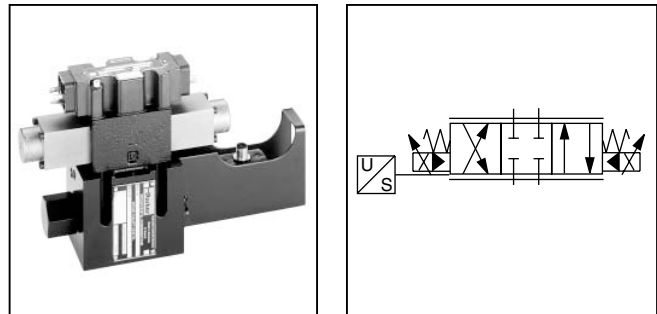
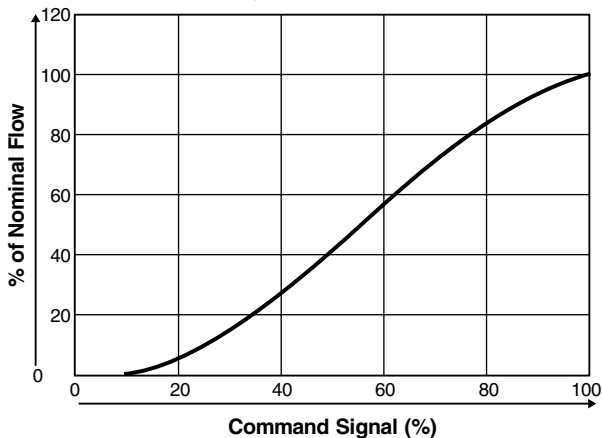
Series D\*1FS proportional directional control valves are high performance, two stage pilot operated solenoid valves with electronic spool position feedback. Valves are controlled by 'PWD' Series DIN electronics. Valves are available in sizes NG10 (CETOP 5), NG16 (CETOP 7), NG25 (CETOP 8) and NG32 (CETOP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

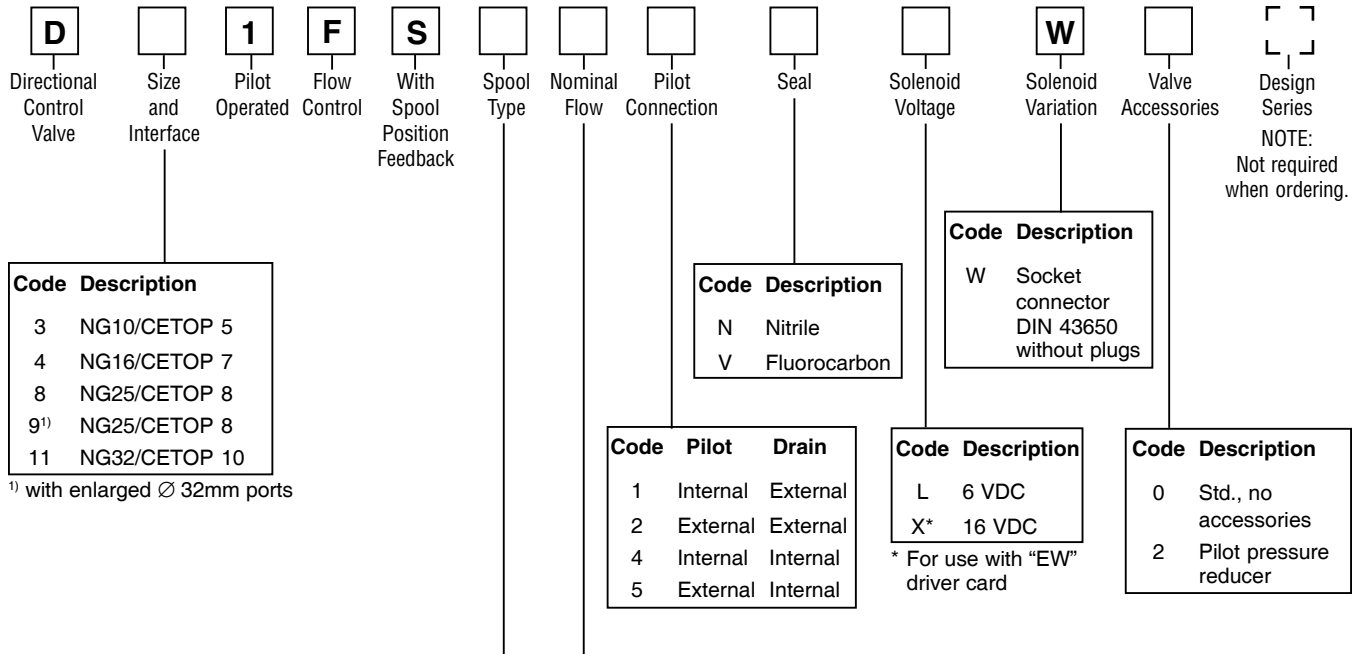


## Features

- 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 (NFPA/ISO/CETOP)		NG10 (5)	NG16 (7)	NG25 (8) D81/D91	NG32 (10)
<b>Flow Rating @10 Bar (150 PSI) <math>\Delta p</math> (P→A, B→T)</b>					
	LPM (GPM)	45 (12)	120 (32)	300/400 (79/106)	1000 (264)
<b>Step Response</b> (time to reach 90% of a 100% step command)		35	60	80	200
	ms				
<b>Repeatability</b>	%	<0.5		<b>Fluid Cleanliness Level</b>	
<b>Hysteresis</b>	%	<0.5		ISO Class 16/13	
<b>Pilot Flow</b>				<b>Fluid Temperature, Recommended</b>	
Continuous	LPM (GPM)	<1.2 (0.3)		0°C to +60°C (+32°F to +140°F)	
<b>Operating Pressure</b>				<b>Ambient Operating Temperature</b>	
Port P, A, B	Bar (PSI)	345 (5000) max.		-20°C to +60°C (-20°F to +140°F)	
Port P, internal pilot		20 (290) min.		<b>Electronic Driver Boards</b> (refer to electronics section)	
Port T, internal drain		10 (150) max.		PWD Series Drivers	
Port T, external drain		345 (5000) max.		<b>Mating Connector</b>	
Port Y, pilot drain		10 (150) max.		Solenoid (DIN 43650)	
Port X, external pilot		20-345 (290-5000)		LVDT (M12, 5 pin)	
<b>Fluid Viscosity, Recommended</b>		80 – 1000 SSU		<b>Environmental Protection Class</b>	
				NEMA 1 (IP54)	



V-Notch Spool Options - Spool Type and Flow Codes								
Code		Spool Type	Flow: LPM (GPM) at Δp 5 Bar per metering edge					
Q <sub>A</sub> =Q <sub>B</sub>	Q <sub>A</sub> >Q <sub>B</sub> <sup>2)</sup>		Code	D31	D41	D81	D91	D111
E01	B31		B	45 (12)	-	-	-	-
E02	B32		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<sub>B</sub> > Q<sub>A</sub> optional

**Weight:**

NG10	7.1 kg (15.7 lbs.)
NG16	10.8 kg (23.8 lbs.)
NG25	19.0 kg (41.9 lbs.)

**Accessories**

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

**Driver Cards**

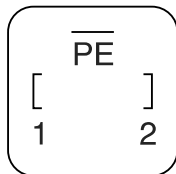
Refer to the Electronics section for driver cards and support electronics.

**Mounting Interface**

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

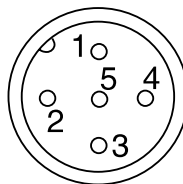
**Wiring**

**Solenoid Coil**



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

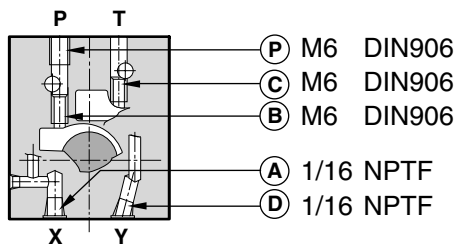
**Spool position sensor (LVDT)**



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

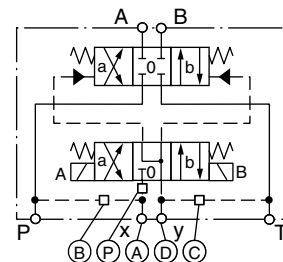
**Pilot Connection**

**D31FS**

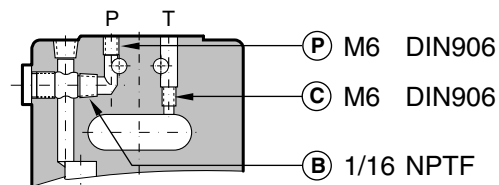


○ open, ● closed

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

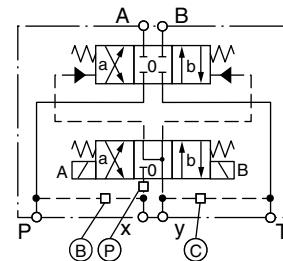


**D41FS**

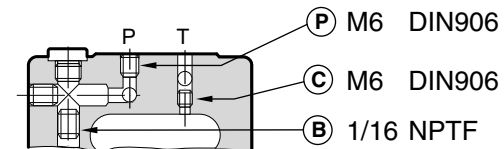


○ open, ● closed

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

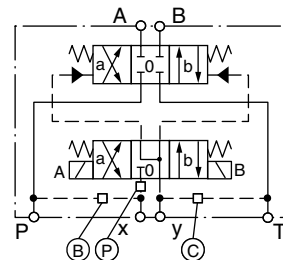


**D91FS**

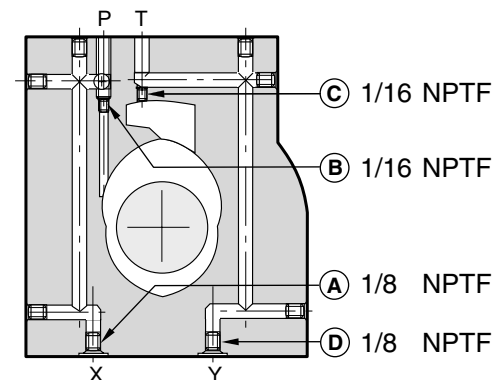


○ open, ● closed

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

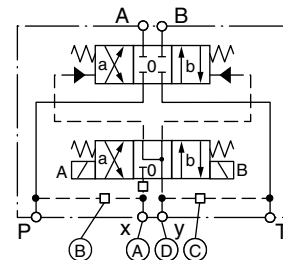


**D111FS**



○ open, ● closed

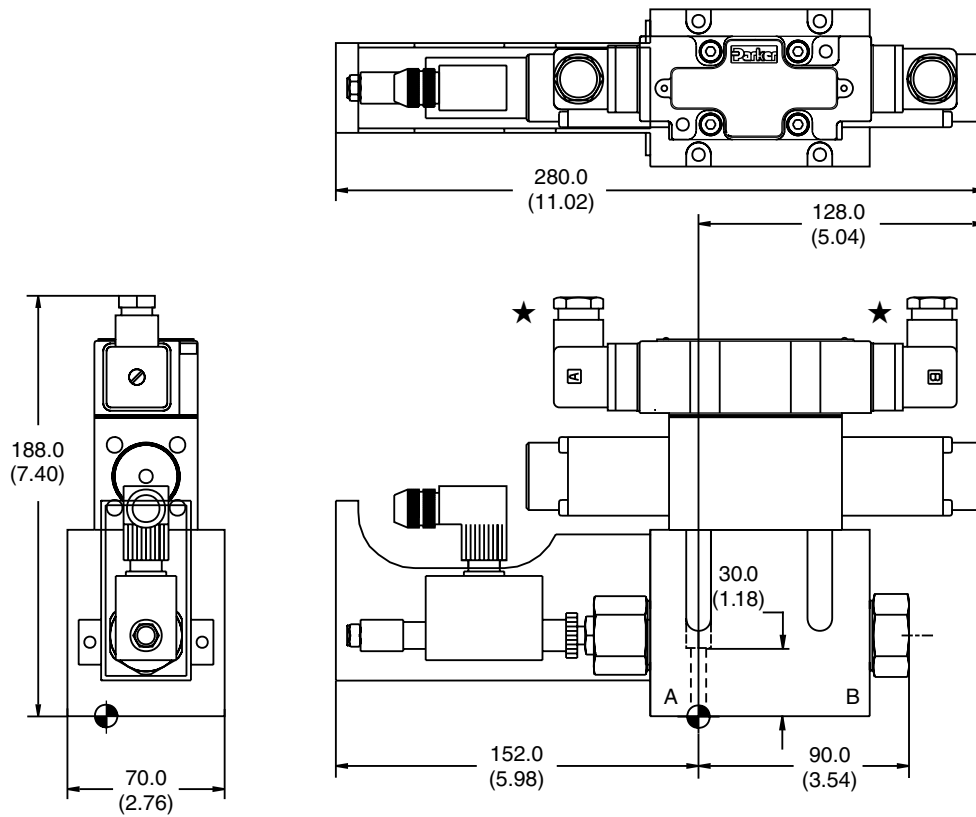
Pilot oil		A	B	C	D
Inlet	Drain				
internal	external	●	○	●	○
external	external	○	●	●	○
internal	internal	●	○	○	●
external	internal	○	●	○	●



D\_1FS.p65, dd

**D31FS**

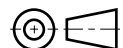
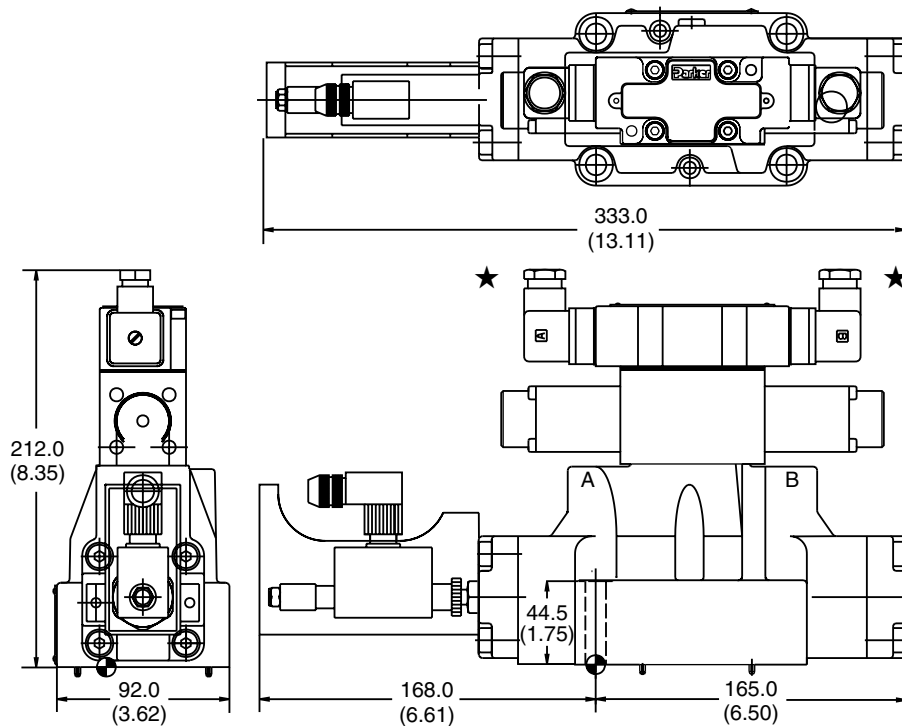
Inch equivalents for millimeter dimensions are shown in (\*\*)



★ Order plugs separately.

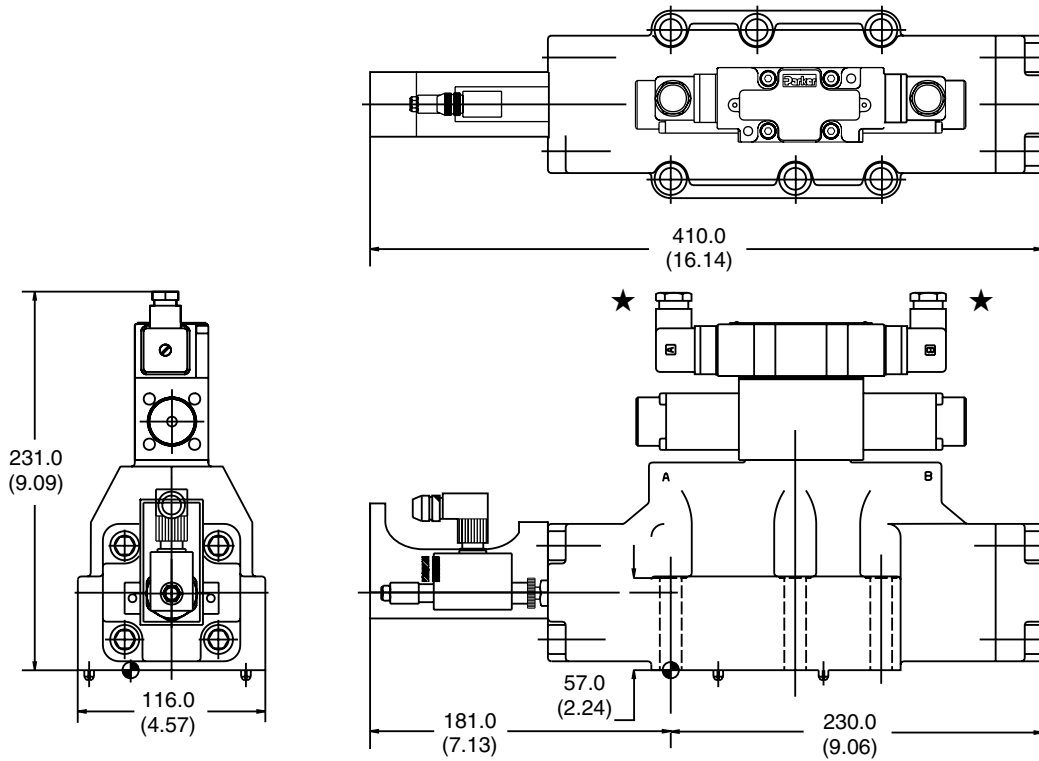
**D41FS**

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



**D81FS and D91FS**

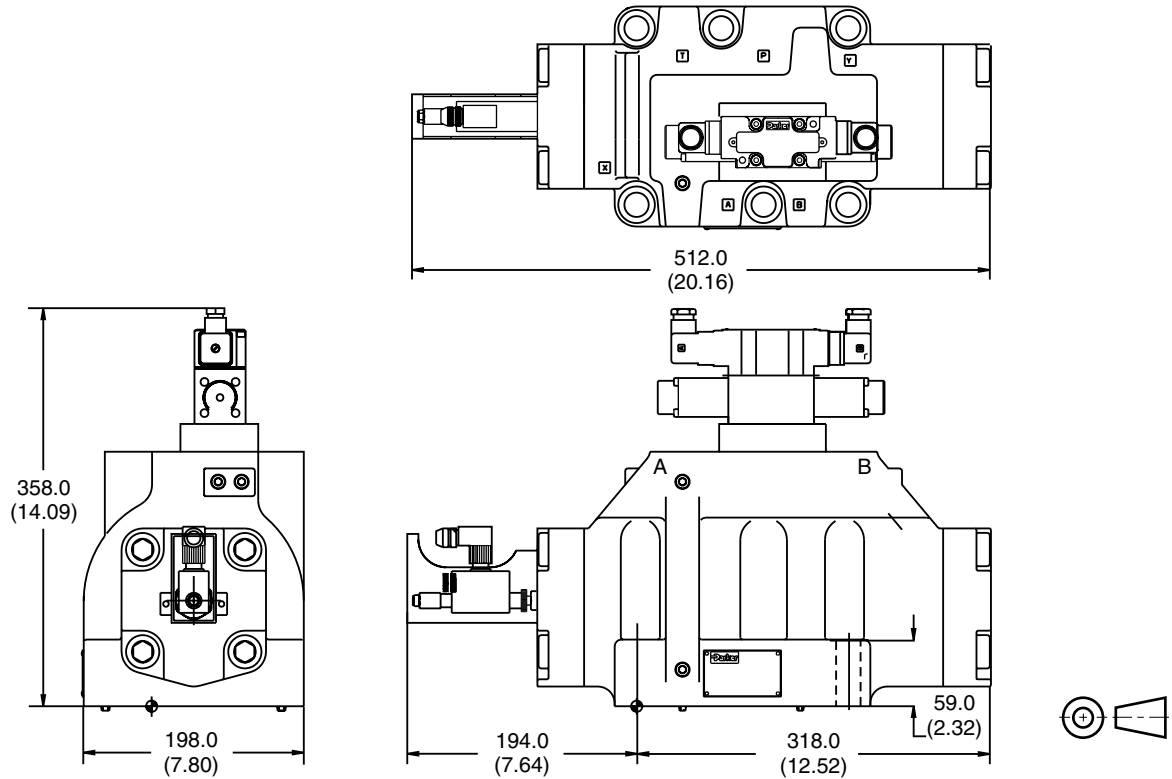
Inch equivalents for millimeter dimensions are shown in (\*\*)



★ Order plugs separately.

**D111FS**

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





### General Description

Series D1FC and D3FC directional control valves of nominal sizes NG6 (CETOP 3) and NG10 (CETOP 5) provide variable flow rates.

Due to a spool and sleeve combination, Series D1FC and D3FC valves provide good repeatability from valve to valve. With the addition of the spool position feedback, these valves have a higher level of control for position and velocity on systems requiring off-board electronics.

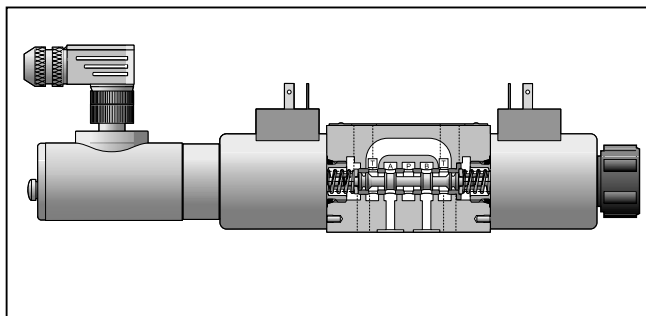
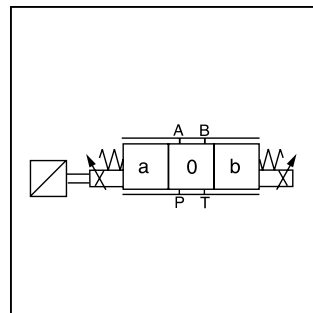
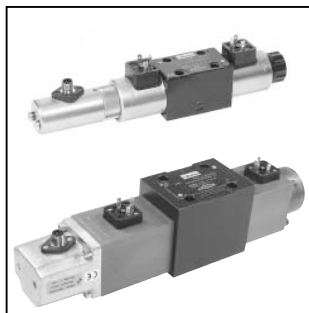
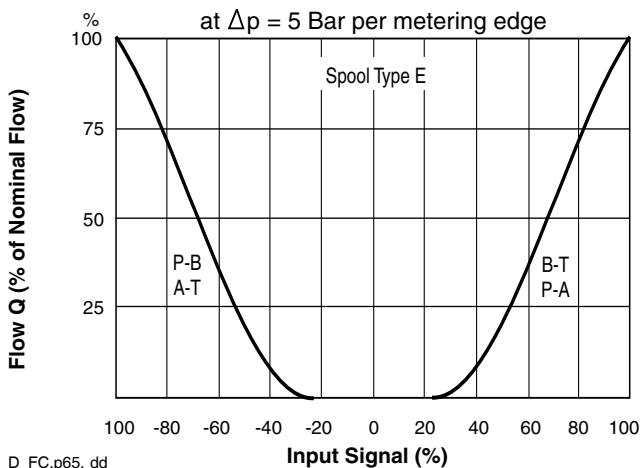
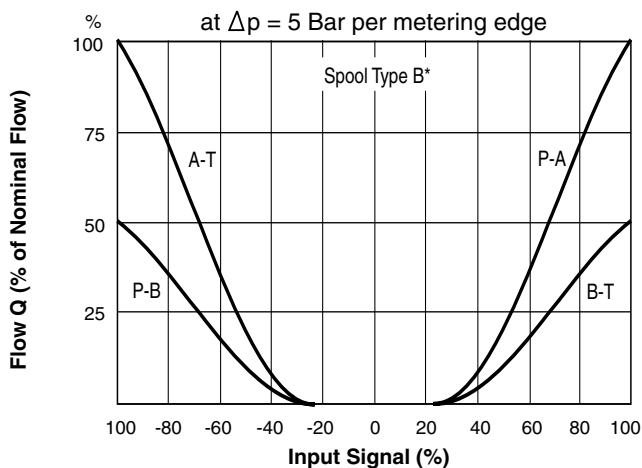
The valve repeatability in combination with the digital power amplifier PWDXXA-40\*, where valve parameters can be saved, changed and duplicated, result in faster installation on identical machines.

### Features

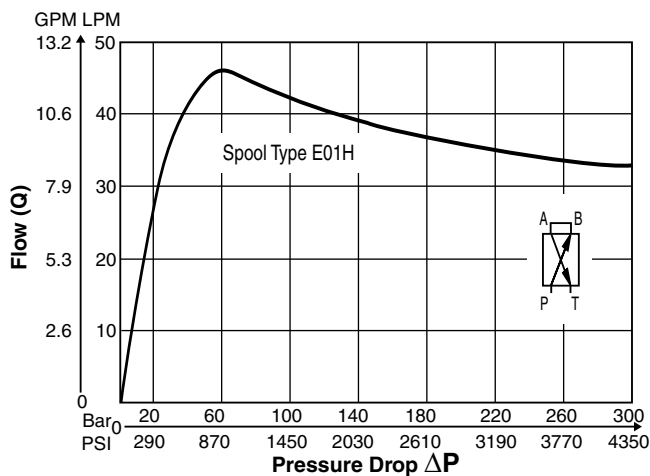
- Spool/sleeve designs.
- Spool position feedback.
- High repeatability from valve to valve.
- Very low hysteresis.
- Manual override.

### Performance Curves

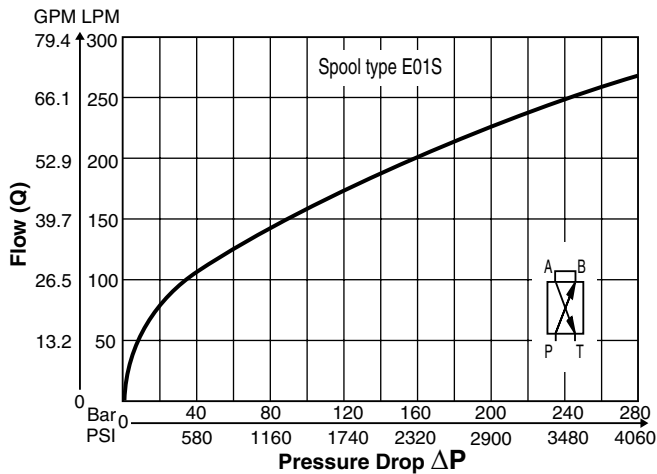
#### D1FC and D3FC



#### D1FC Flow Limit



#### D3FC Flow Limit

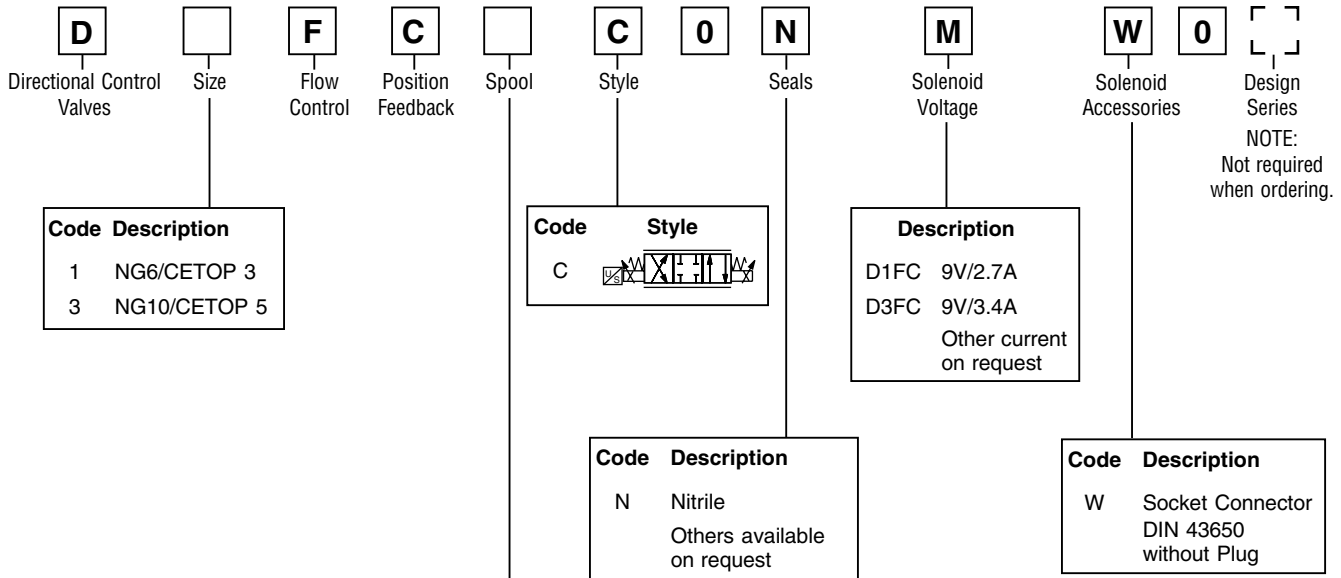




General			
<b>Design</b>	Direct-operated proportional Directional control valve	<b>Ambient Temperature Range</b>	-20°C to +60°C (-4°F to +140°F)
<b>Actuation</b>	Proportional Solenoid	<b>Vibration Resistance</b>	25 g acc. DIN IEC68, part 2-6
<b>Size</b>	D1FC: NG6 (CETOP 3) D3FC: NG10 (CETOP 5)	<b>Protection Class</b>	D1FC: IP65 acc. DIN 40050 (plugged and mounted) D3FC: IP54
<b>Mounting Interface</b>	DIN 24340 / ISO 4401 / CETOP RP121 / NFPA		
<b>Mounting Position</b>	Any		
Hydraulic			
<b>Operating Pressure Maximum</b>	D1FC: Ports P, A, B: 350 Bar (5075 PSI) Port T: 250 Bar (3625 PSI)	<b>Viscosity Recommended</b>	30 to 80 cSt (140 to 370 SSU)
	D3FC: Ports P, A, B, T: 350 Bar (5075 PSI)	<b>Filtration</b>	ISO 4406 (1999) 18/16/13 (acc. NAS 1683: 7)
<b>Fluid</b>	Hydraulic oil as per DIN 51524 to 535, other on request	<b>Flow</b>	nominal at Δp=5 Bar per control edge* D1FC: 6 / 12 / 20 LPM (1.6 / 3.2 / 5.3 GPM) D3FC: 25 / 40 / 60 LPM (6.6 / 10.6 / 15.9 GPM)
<b>Fluid Temperature</b>	-20°C to +60°C (-4°F to +140°F)		
<b>Viscosity Permitted</b>	20 to 380 cSt (97 to 1750 SSU)	<b>Leakage</b>	at 100 Bar (1450 PSI) D1FC: < 50 ml/min (3 in <sup>3</sup> /min) D3FC: < 100 ml/min (6 in <sup>3</sup> /min)
Static / Dynamic			
<b>Step Response @ 100%</b>	D1FC: <20 ms D3FC: <30 ms	<b>Hysteresis</b>	<0.3%
		<b>Sensitivity</b>	<0.1%
Electrical			
<b>Duty Ratio</b>	100%	<b>Coil Insulation Class</b>	F [155°C (311°F)]
<b>Supply Voltage</b>	9 VDC		
<b>Solenoid</b>	Code M	<b>Connection</b>	2+PE acc. EN 175301-801
<b>Current Consumption</b>	D1FC: 2.7A D3FC: 3.4A	<b>Cable Specification</b>	3x1.5 (AWG 16) overall braid shield
		<b>Cable Length</b>	50m (164 ft.)
<b>Resistance</b>	D1FC: 2.7 ohms D3FC: 1.8 ohms		
Electrical LVDT			
<b>Protection Class</b>	IP65	<b>Current Consumption</b>	<50 mA
<b>Ambient Temperature Range</b>	-20°C to +50°C (-4°F to +122°F)	<b>EMC</b>	EN 50081-1 / EN50082-2
<b>Supply Voltage/ Ripple</b>	18 VDC to 36 VDC, ripple <10% eff.	<b>Interface</b>	4+PE acc. IEC 61076-2-101 (M12)
		<b>Cable Specification</b>	4x0.5 (AWG 20) overall braid shield
		<b>Cable Length</b>	50m (164 ft.)

\* Flow rate for different Δp per control edge:

$$Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$$



**D1FC**

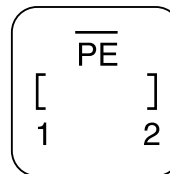
Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01H		20 (5.3)
E01F		12 (3.2)
E01C		6 (1.6)
E02H		20 (5.3)
E02F		12 (3.2)
E02C		6 (1.6)
E03H		20 (5.3)
E03F		12 (3.2)
E03C		6 (1.6)
$Q_B = Q_A / 2$		
B31H		20/10 (5.3/2.6)
B31F		12/6 (3.2/1.6)
$Q_B = Q_A / 2$		
B32H		20/10 (5.3/2.6)
B32F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

**Weight:**

NG6 2.2 kg (4.9 lbs.)  
 NG10 6.5 kg (14.3 lbs.)

**Plugs**

**Solenoid coil**

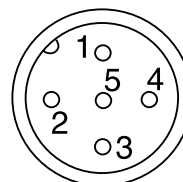


- 1 = coil connection
- 2 = coil connection
- PE = ground potential

**D3FC**

Code	Spool	Flow LPM (GPM) at Δp 5 Bar (72.5 PSI) per metering edge
E01S		60 (15.9)
E01M		40 (10.6)
E01K		25 (6.6)
E02S		60 (15.9)
E02M		40 (10.6)
E03S		60 (15.9)
E03M		40 (10.6)
$Q_B = Q_A / 2$		
B31S		60/30 (15.9/7.9)
B31M		40/20 (10.6/5.3)
$Q_B = Q_A / 2$		
B32S		60/30 (15.9/7.9)
B32M		40/20 (10.6/5.3)

**Spool position feedback**

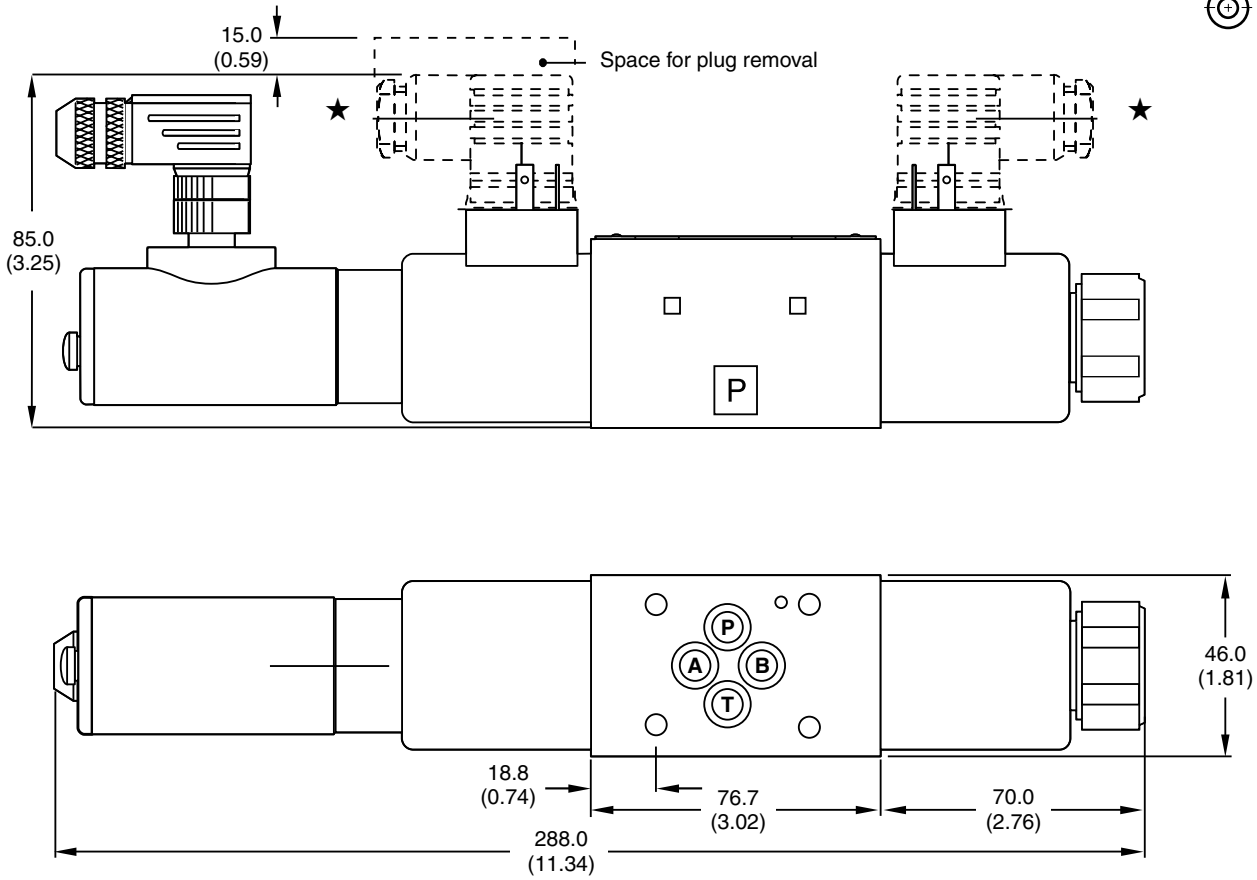


- 1 = output, actual spool position
- 2 = supply (18...36 VDC)
- 3 = GND (0V)
- 4 = not used
- 5 = PE





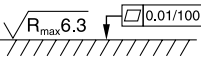
Please order plugs separately. See Accessories.

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

**A**



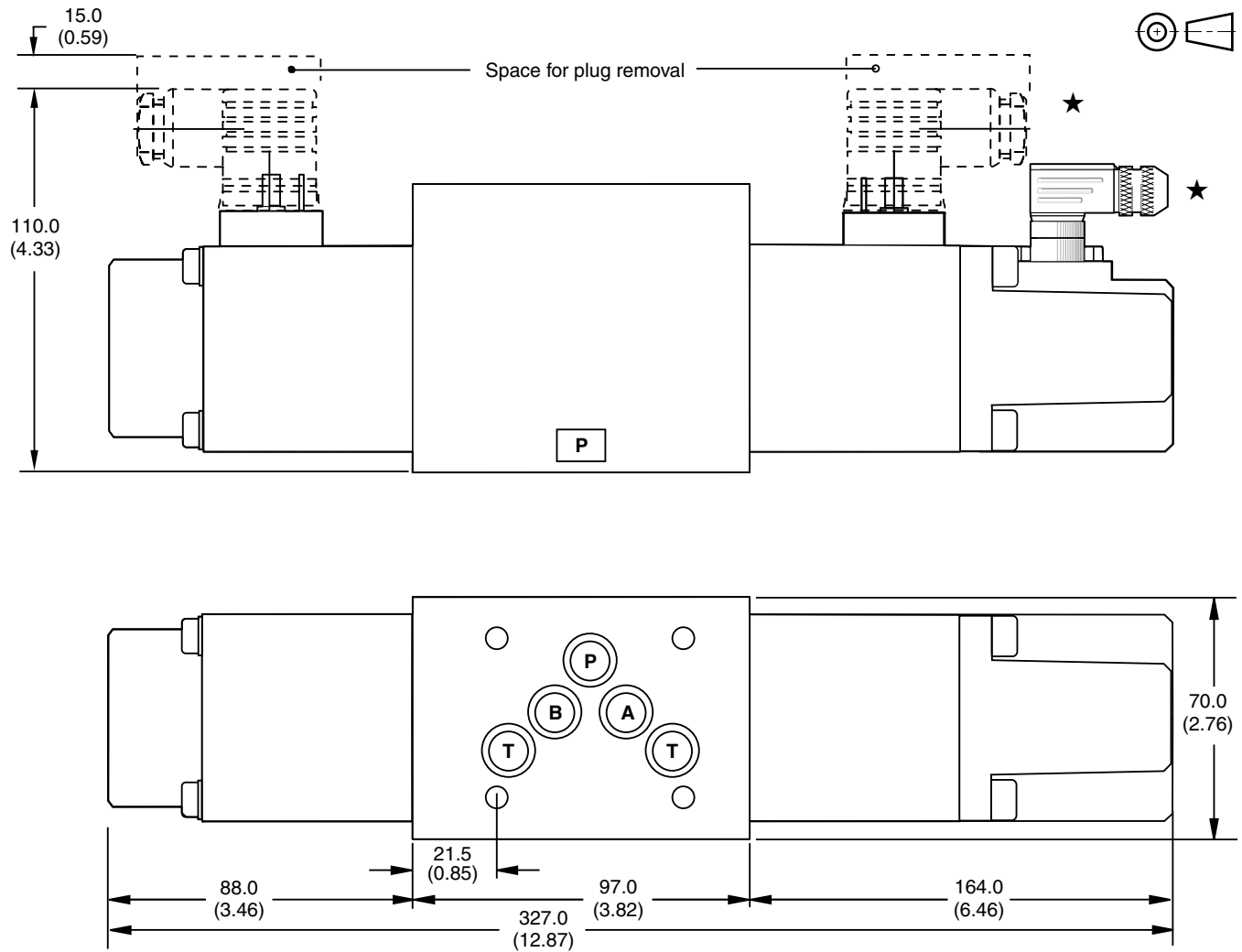
★ Order plugs separately.

Surface finish	 Kit			 Kit NBR
	BK375	4x M5x30 DIN 912 12.9	6.8 Nm (5.0 lb.-ft.) ±15 %	SK-D1FC-N
	BK209	4x10-24x1.25"	6.8 Nm (5.0 lb.-ft.)	





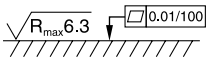
**Dimensions**

**Direct Operated Proportional DC Valves  
Series D3FC**

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



★ Order plugs separately.

Surface finish	 Kit			 Kit NBR
	BK385	4x M6x40 DIN 912 12.9	11 Nm (8.1 lb.-ft.) ±15 %	SK-D3FC-N
	BK98	4x1/4-20x1.625"	11 Nm (8.1 lb.-ft.)	



## General Description

A

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

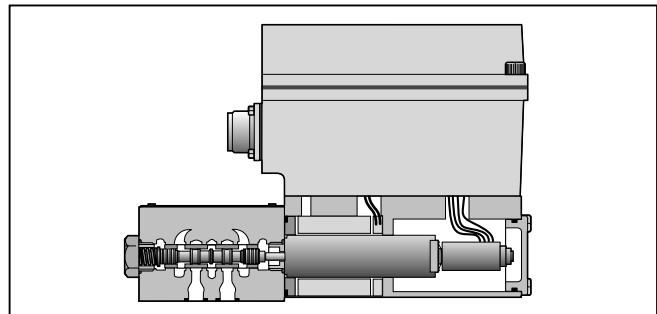
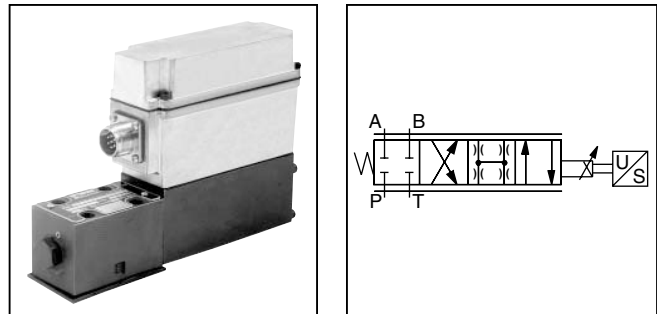
Series D\*FH valve uses a precision lapped spool and sleeve configured with four control positions. During normal operation, the valve will shift from the center position to either side providing flow out the 'A' or 'B' port. When the drive amplifier is disabled by either removing the enable or loss 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.

### 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).



## 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)

**Specifications**

	<b>D1FH, D1FM</b>	<b>D3FH, D3FM</b>
<b>Interface</b>	NFPA D03, CETOP 3, NG6	NFPA D05, CETOP 5, NG10
<b>Flow Rating</b> At 35 Bar DP (500 PSI) per metering edge	<sup>1)</sup> B spool 5 LPM (1.3 GPM) <sup>1)</sup> D spool 10 LPM (2.6 GPM) <sup>1)</sup> H spool 20 LPM (5.3 GPM) <sup>1,2)</sup> M spool 40 LPM (10.6 GPM) <sup>2)</sup> F spool 12 LPM (3.2 GPM)	<sup>1)</sup> P spool 50 LPM (13.2 GPM) <sup>1,2)</sup> Y spool 100 LPM (26.4 GPM)
<b>Frequency Response</b>	> 100 Hz (-3 dB at 5% signal)	> 45Hz (-3 dB at 5% signal)
<b>Step Response</b>	< 12 ms at 100% signal	< 25 ms at 100% signal
<b>Power Consumption</b>	40 VA max (See voltage supply)	60 VA max (See voltage supply)
<b>D1FH, D1FM, D3FH, D3FM</b>		
<b>Max. Operating Press.</b> Port P, A, B Port T	315 Bar (4500 PSI) 35 Bar (500 PSI)	<b>Operating Temp. Range (Ambient)</b> 0 to 60° C (32 to 140° F)
<b>Min. Tank Line Press.</b>	1.4 Bar (20 PSI)	<b>Fluid Cleanliness Level</b> ISO Class 15/12/10 (For longer life) ISO Class 16/14/11 (For normal operation)
<b>Typical Spool Overlap</b>	Zero Lap	<b>Voltage Supply</b> 24 VDC (21 VDC Min., 30 VDC Max.) Peak Current 4A (PS24 power supply recommended)
<b>Pressure Gain % of Change/1% Change in Command</b>	<sup>1)</sup> Typical 40% <sup>1)</sup> Minimum 25% <sup>2)</sup> Typical 90%	<b>Command Signals</b> ± 10 VDC at 100 K ohm input impedance ± 20 mA at 499 ohm input impedance
<b>Hysteresis</b>	< 0.5%	<b>Protection Class</b> IP65, NEMA 4 (As factory sealed)
<b>Repeatability</b>	< 0.5%	
<b>Viscosity Range</b>	17 to 65 cSt (75 to 300 SSU)	
<b>Fluids</b>	Mineral base hydraulic fluid	

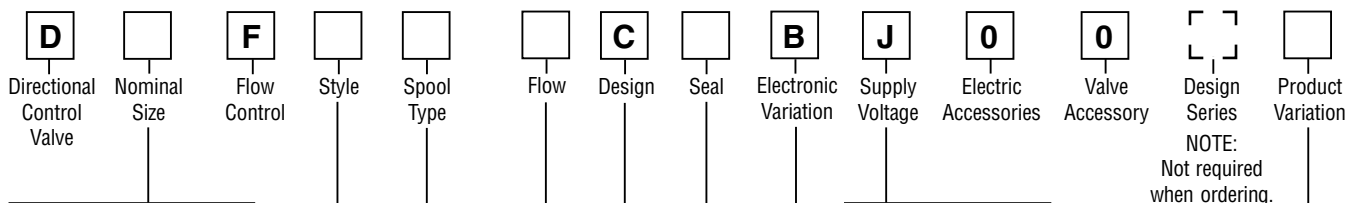
**Note:** 1) D\*FH only      2) D\*FM only

**Maximum Flow and Pressure Differential**

<b>Spool Code</b>		<b>Flow Code</b>						
		<b>B</b>	<b>D</b>	<b>F</b>	<b>H</b>	<b>M</b>	<b>P</b>	<b>Y</b>
<b>E50</b>	<b>Max ΔP Per Land</b>	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)
	<b>Max Flow</b>	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)
<b>E80</b>	<b>Max ΔP Per Land</b>	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)
	<b>Max Flow</b>	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)



**A**



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

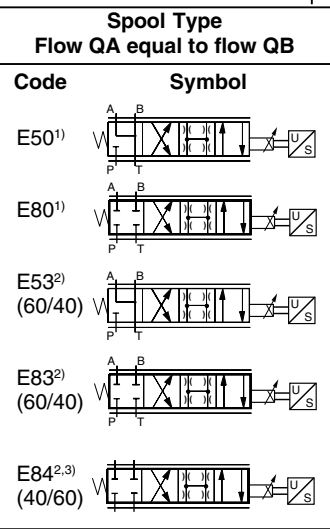
Code	Description
J	24 VDC

Code	Description
H	High Response
M	High Response, Dual Gain

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

Code	Description
N	Nitrile
V	Fluorocarbon

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)



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

Code	Description
C	Bi-directional, 4 way, with 4 <sup>th</sup> position on power down

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.

**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.

**Weight:**

NG6	3.7 kg (8.2 lbs.)
NG10	7.7 kg (17.0 lbs.)

**Mounting Interface**

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

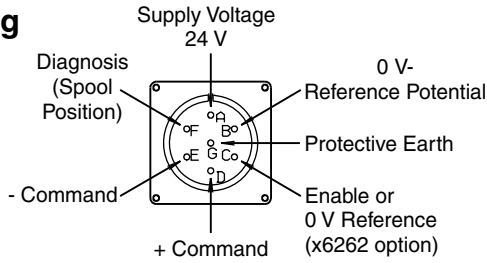
**Accessories**

Refer to the Accessories section for bolt kits, subplates, connectors and pre-assembled cable assemblies.





**Wiring**



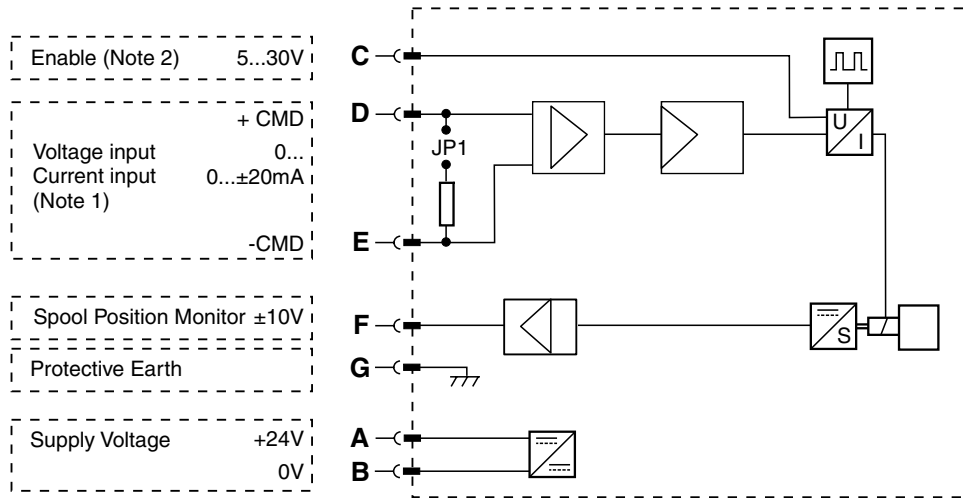
**Installation Guidelines**

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.

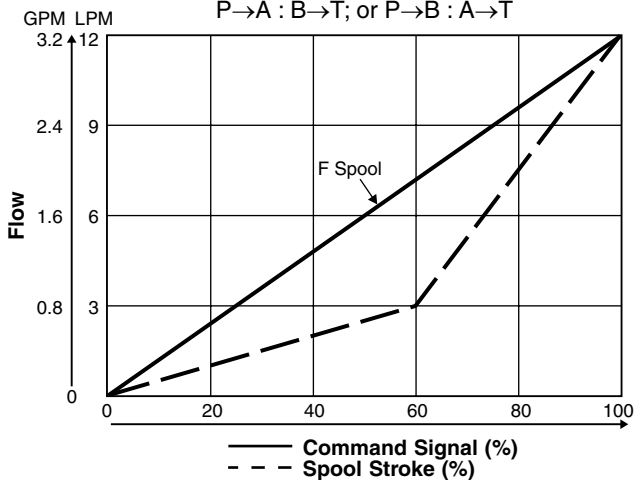
**Performance Curves**

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.

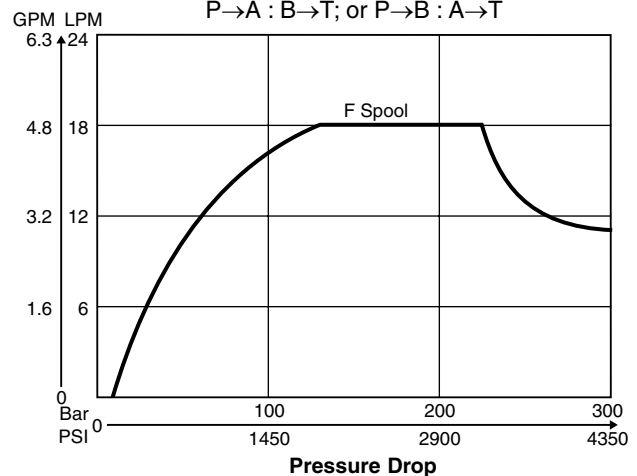
**D1FM Flow Characteristics**

at  $\Delta p = 35$  Bar (500 PSI) / metering edge  
 P→A : B→T; or P→B : A→T



**D1FM Operating Limits**

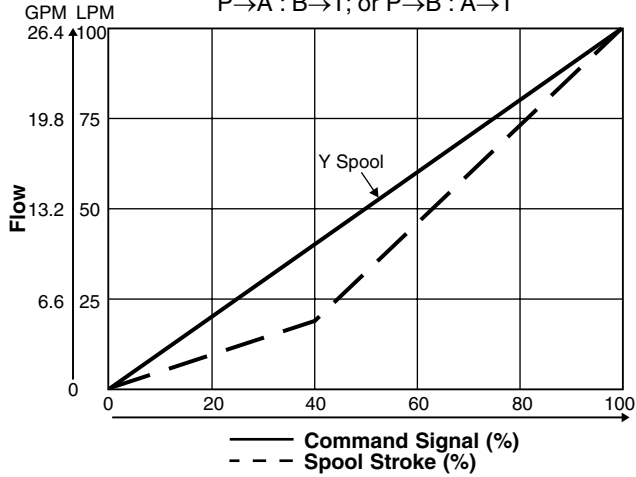
at 100% Command  
 P→A : B→T; or P→B : A→T





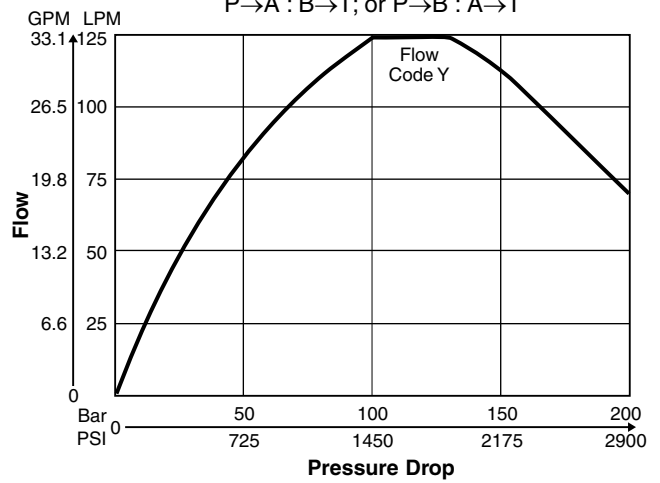
**D3FM Flow Characteristics**

at  $\Delta p = 35 \text{ Bar (500 PSI)}$  / metering edge  
 P→A : B→T; or P→B : A→T



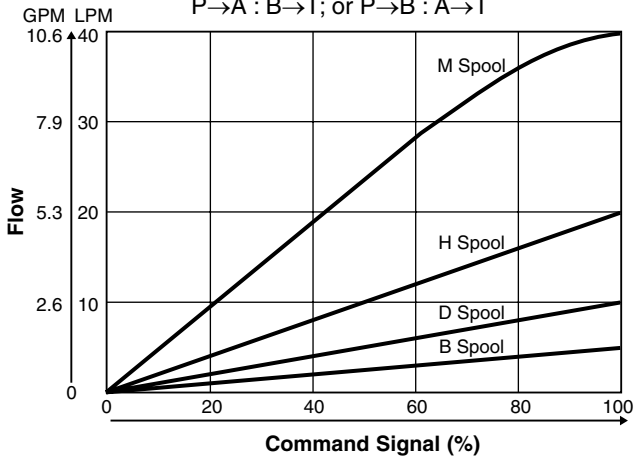
**D3FM Operating Limits**

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



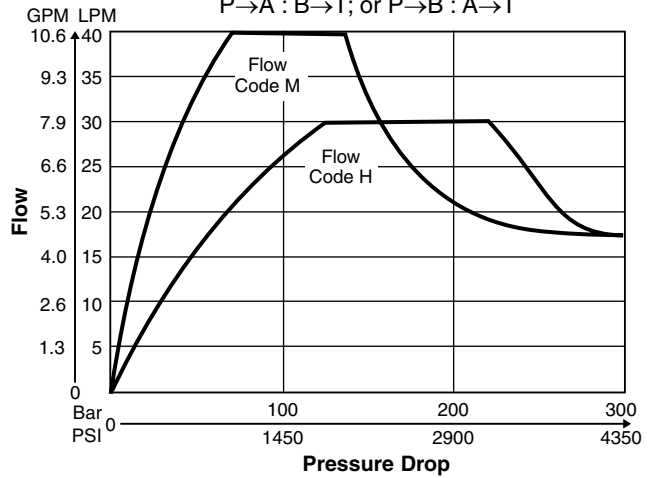
**D1FH Flow Characteristics**

at  $\Delta p = 35 \text{ Bar (500 PSI)}$  / metering edge  
 P→A : B→T; or P→B : A→T



**D1FH Operating Limits**

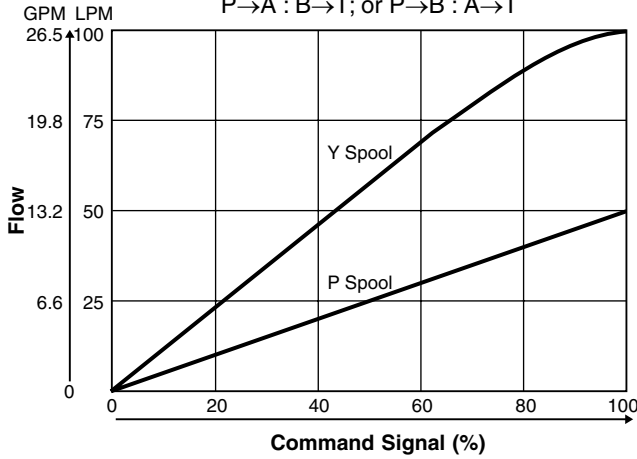
at 100% Command  
 P→A : B→T; or P→B : A→T





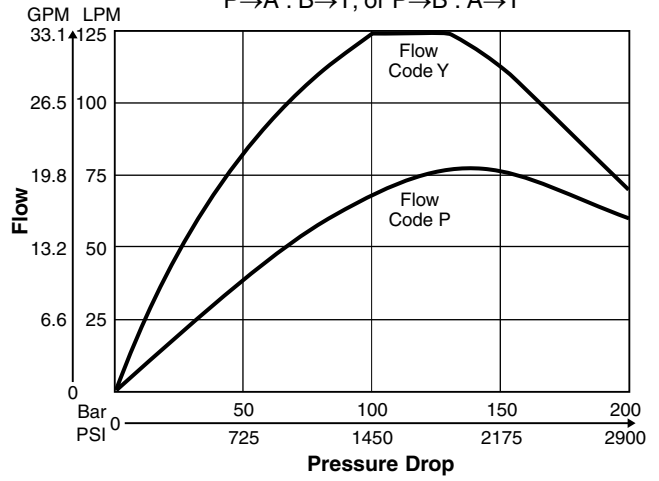
**D3FH Flow Characteristics**

at  $\Delta p = 35 \text{ Bar (500 PSI)}$  / metering edge  
 $P \rightarrow A : B \rightarrow T$ ; or  $P \rightarrow B : A \rightarrow T$



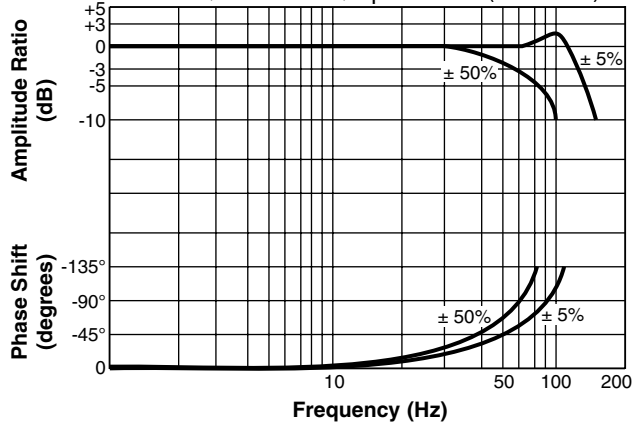
**D3FH Operating Limits**

at 100% Command  
 $P \rightarrow A : B \rightarrow T$ ; or  $P \rightarrow B : A \rightarrow T$



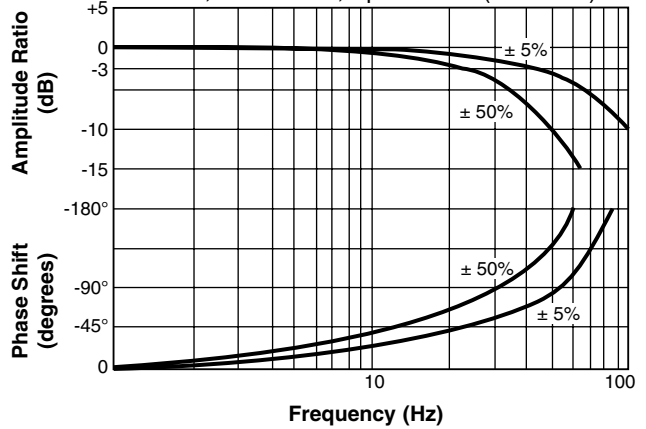
**D1FH and D1FM Frequency Response**

at  $\pm 5\%$ ,  $\pm 50\%$  Cmd,  $\Delta p = 70 \text{ Bar (1000 PSI)}$



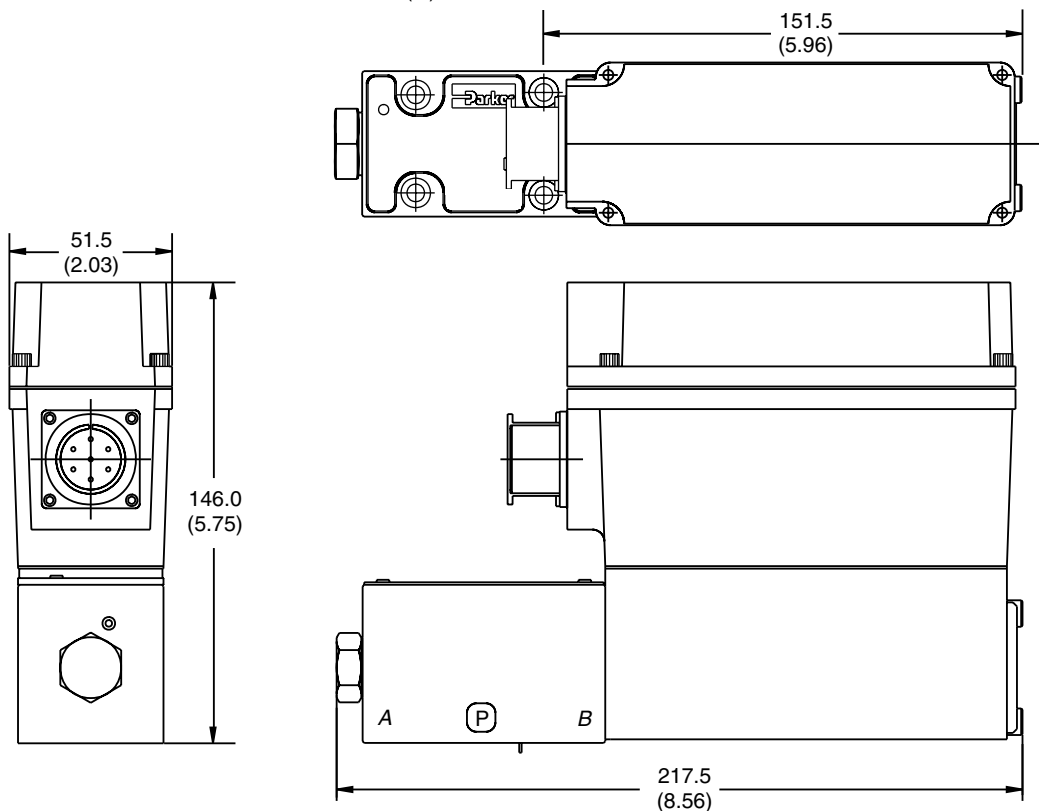
**D3FH and D3FM Frequency Response**

at  $\pm 5\%$ ,  $\pm 50\%$  Cmd,  $\Delta p = 70 \text{ Bar (1000 PSI)}$



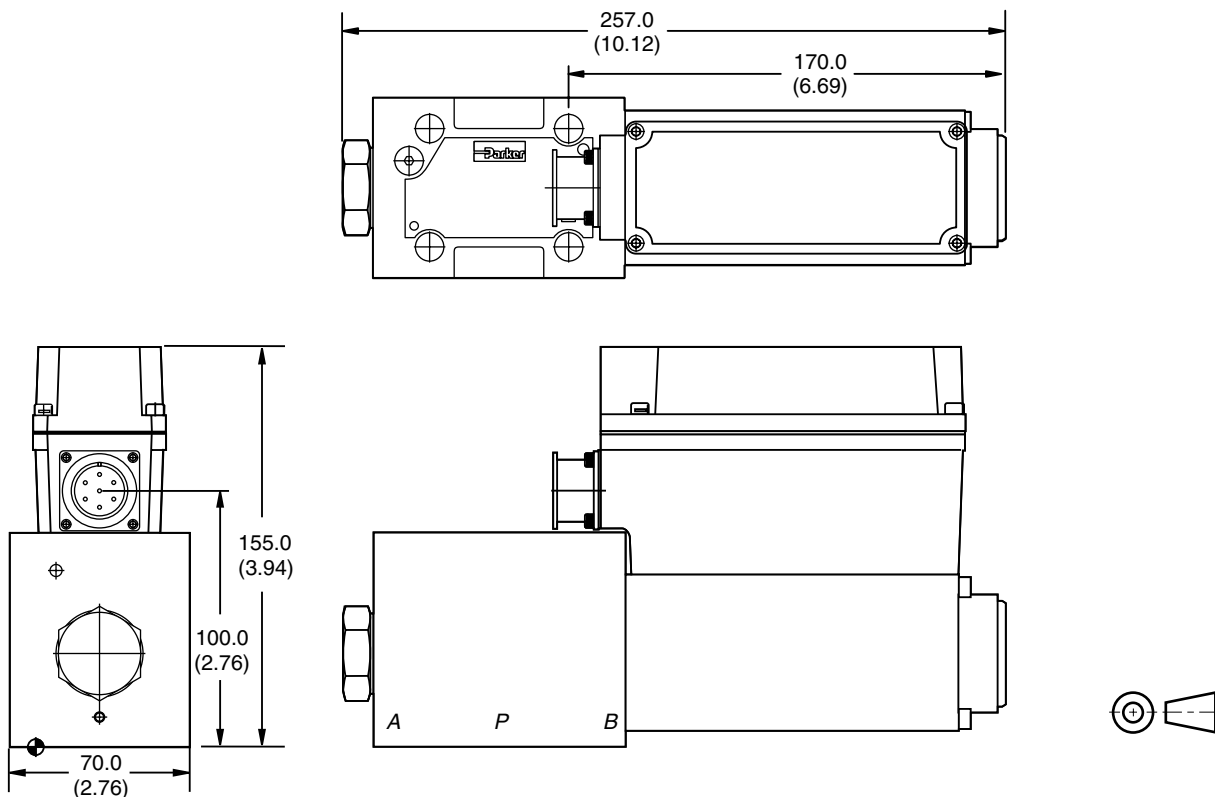
**D1FH and D1FM**

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



**D3FH and D3FM**

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



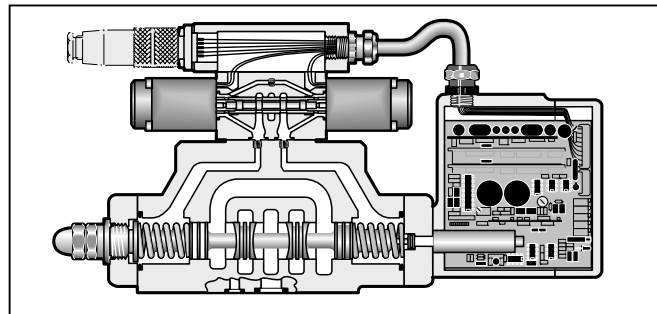
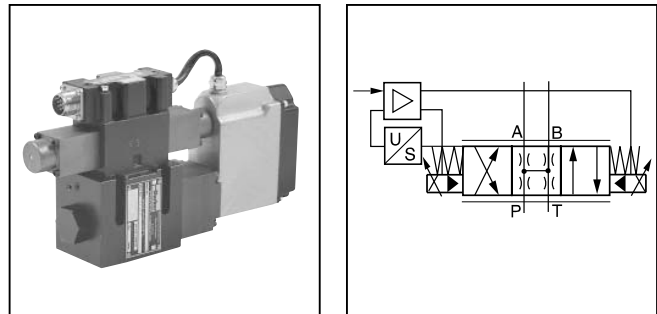
### General Description

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 selection of spool options, and flow capacity.
- 2:1 ratio spool options.



### Specifications

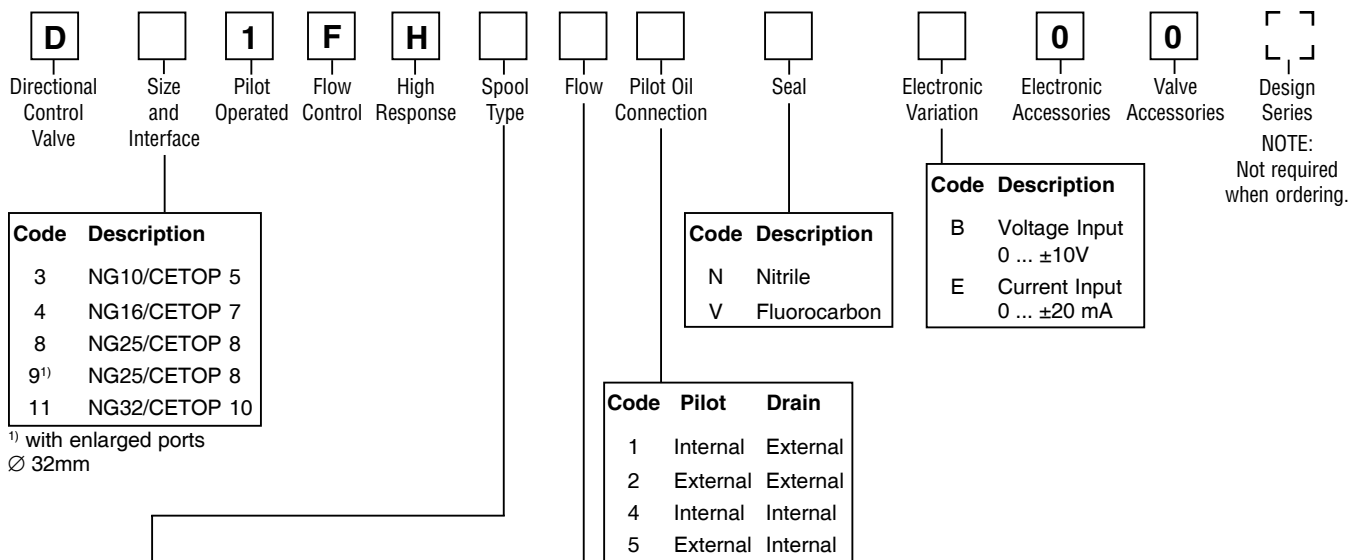
Interface DIN (NFPA/ISO/CETOP)		NG10 (5)	NG16 (7)	NG25 (8)	NG32 (10)
<b>Flow Rating</b> @ 10 Bar (150 PSI) Δp (P→A, B→T) (spool options up to) <sup>1)</sup>	LPM (GPM)	80 (21)	240 (63)	400 (106)	1000 (264)
<b>Pressure Gain</b> (Zero Lap Spool)	%	3.5 3.0	2.5 —		
<b>Maximum Flow</b> (spool options up to) <sup>1)</sup>	LPM (GPM)	170 (45)	420 (111)	900 (238)	2000 (528)
<b>Pilot Flow</b>					
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)
<b>Step Response</b> (time to reach 90% of a 100% step command) ms		25	45	65	150
<b>Hysteresis</b> %	<0.5	<b>Mating Connector</b> (order separately)		Part #5004072 (7-pin CE)	
<b>Repeatability</b> %	<0.5	<b>Fluid Cleanliness Level</b>		ISO Class 16/13	
<b>Operating Pressure</b>		<b>Fluid Viscosity, Recommended</b>		80 – 1000 SSU	
Port P, A, B Bar (PSI)	345 (5000) max.	<b>Fluid Temperature, Recommended</b>		0°C to +60°C (+32°F to +140°F)	
Port P, internal pilot	20 (290) min.	<b>Environmental Protection Class</b>		NEMA 4 (IP65)	
Port T, internal drain	10 (150) max.	<b>Ambient Operating Temperature</b>		-20°C to +60°C (-20°F to +140°F)	
Port T, external drain	345 (5000) max.	<b>Temperature Drift</b>		0.005%/°C (0.009%/°F)	
Port Y, pilot drain	10 (150) max.				
Port X, external pilot	20-345 (290-5000)				
<b>Electrical Power Requirements</b>	18 to 30 VDC, 2.2A				
<b>Command Signal (impedance)</b> (select by ordering code)	0 ± 10 VDC (100K ohm) 0 ± 20 mA (500 ohm)				
<b>Command Polarity</b>	Pin 'D' more positive than 'E' produces flow P to B				

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

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



**A**



Code			Spool Type
Q <sub>A</sub> =Q <sub>B</sub>	Q <sub>A</sub> >Q <sub>B</sub> <sup>1)</sup>	Q <sub>B</sub> >Q <sub>A</sub> <sup>2)</sup>	
			<b>Overlap Sine</b>
E01	B31	A31	
E02	B32	A32	
			<b>Zero Lap C-Notch</b>
E50 <sup>3)</sup>	B60 <sup>3)</sup>	A60 <sup>3)</sup>	
			<b>Zero Lap Sine</b>
E52 <sup>4)</sup>	B61 <sup>4)</sup>	A61 <sup>4)</sup>	

Code	Flow at Δp 5 Bar (72.5 PSI) per Metering Edge				
	C-Notch	Sine Notch Spools			
	D31 LPM (GPM)	D31 LPM (GPM)	D41 LPM (GPM)	D81/91 LPM (GPM)	D111 LPM (GPM)
A	20 (5.3) <sup>5)</sup> 33 (8.7) <sup>6)</sup>	55 (14.6)	-	-	-
B	-	-	105 (27.8)	-	-
C	32 (8.5) <sup>5)</sup> 55 (14.6) <sup>6)</sup>	80 (21)	140 (37)	-	-
E	-	-	190 (50)	250 (66)	-
F	-	-	240 (63)	310 (82)	-
H	-	-	-	400 (106)	500 (132)
L	-	-	-	-	1000 (264)

- 1) 2:1 Ratio: Reduced Flow Rate; Port B, Rated Flow Rate; Port A
- 2) 2:1 Ratio: Reduced Flow Rate; Port A, Rated Flow Rate; Port B
- 3) Only D31FH
- 4) Not Available D111FH

- 5) E50 Spool Only
- 6) B60 and A60 Spool Only

**Weight:**

NG10	8.1 kg (17.9 lbs.)
NG16	11.6 kg (25.6 lbs.)
NG25	20.7 kg (45.6 lbs.)
NG32	62.0 kg (137.0 lbs.)

V-Notch Spool Options - Spool Type and Flow Codes						
Code		V-Notch Spool Type	Flow at Δp 5 Bar (72.5 PSI) per metering edge			
Q <sub>A</sub> =Q <sub>B</sub>	Q <sub>A</sub> >Q <sub>B</sub> <sup>7)</sup>		Code	D31 LPM (GPM)	D41 LPM (GPM)	D81/D91 LPM (GPM)
E21	B41		B	-	-	-
E22	B42		D	-	120 (32)	-
			F	-	-	300 (79)

- 7) 2:1 Ratio: Reduced Flow Rate on Port B, Rated Flow Rate on Port A  
 Code A\* for spool Q<sub>B</sub>>Q<sub>A</sub> optional

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

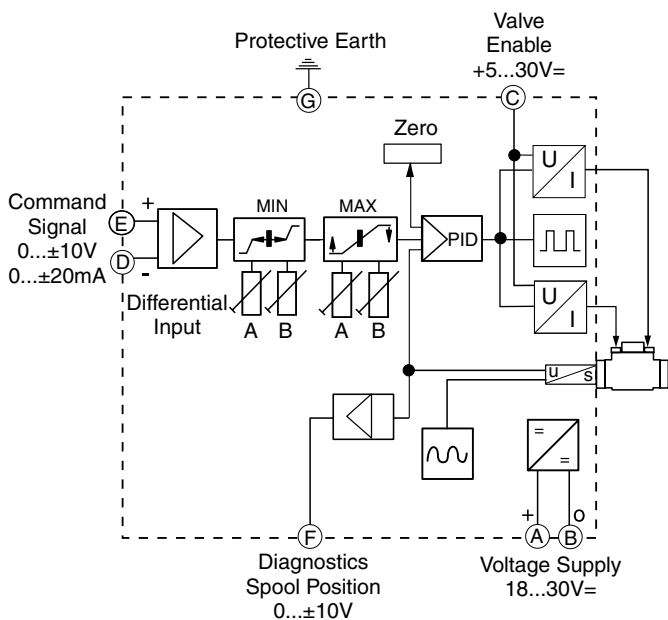
**Mounting Interface**

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

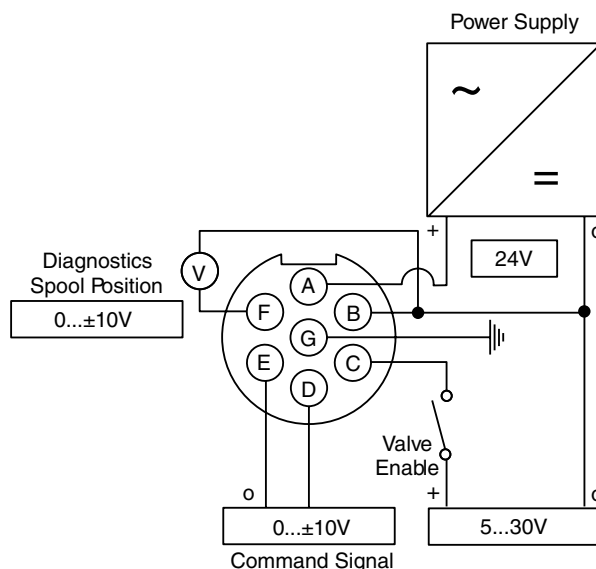
**Accessories**

Refer to the Accessories section for bolt kits, subplates, connectors and pre-assembled cable assemblies.

**Function Diagram, Valve Electronics**



**Wiring**



**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.

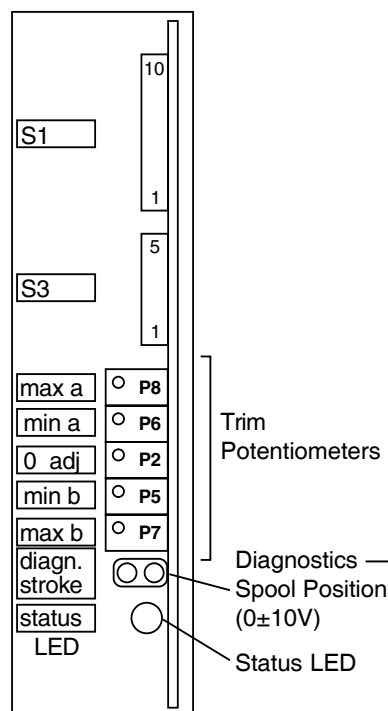
Display Color	Indicates
Green	Normal operation
Off	Supply voltage outside permissible range of 18 to 30 VDC
Red	Spool position error / Low pilot pressure

**Electronics Adjustment**

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

**Integrated Control Electronics**

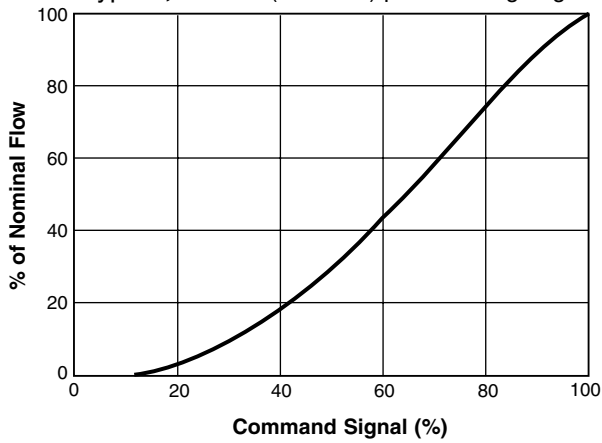
Arrangement of potentiometers, status LED, and internal valve spool monitor point.



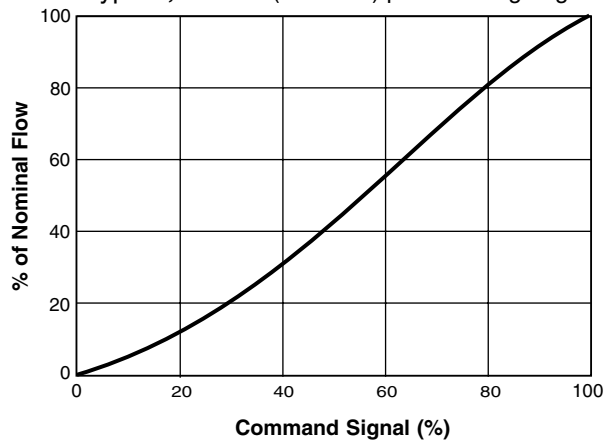
Note: Depending on the spool type selected, the actual flow characteristic may deviate from the typical flow curves as shown.

**A**

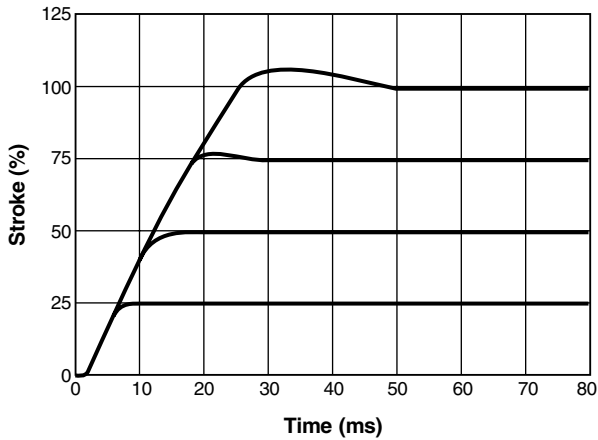
**Flow Characteristics – Overlap Spools**  
 Typical, at 5 Bar (72.5 PSI) per metering edge



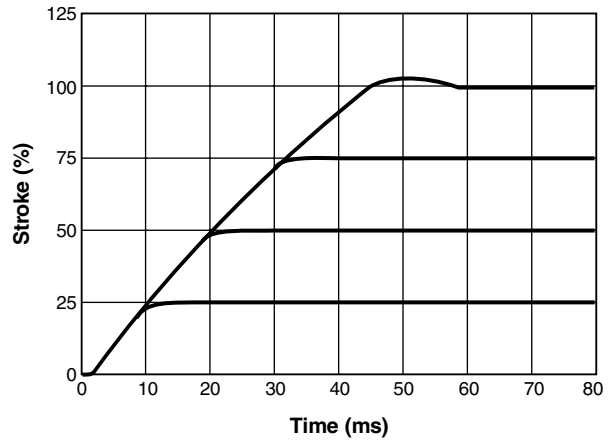
**Flow Characteristics – Zero Lap Spools**  
 Typical, at 5 Bar (72.5 PSI) per metering edge



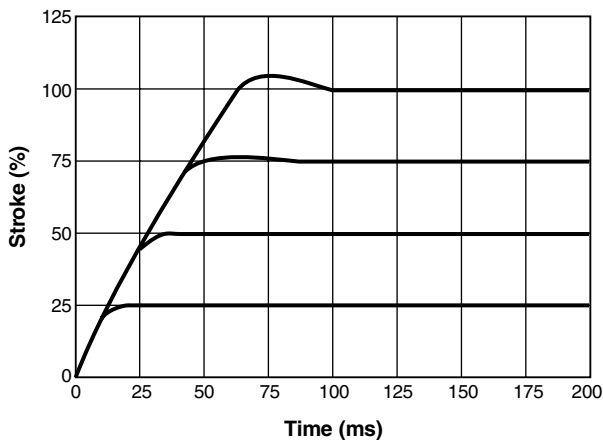
**D31FH Step Response**



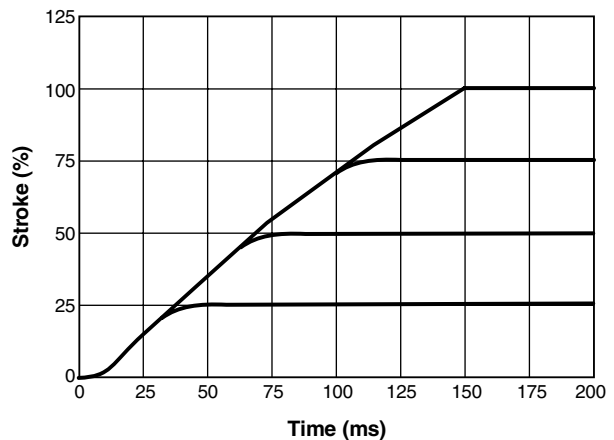
**D41FH Step Response**



**D81FH and D91FH Step Response**



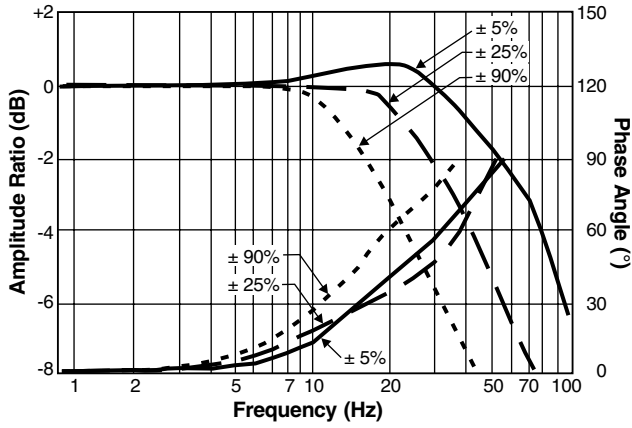
**D111FH Step Response**



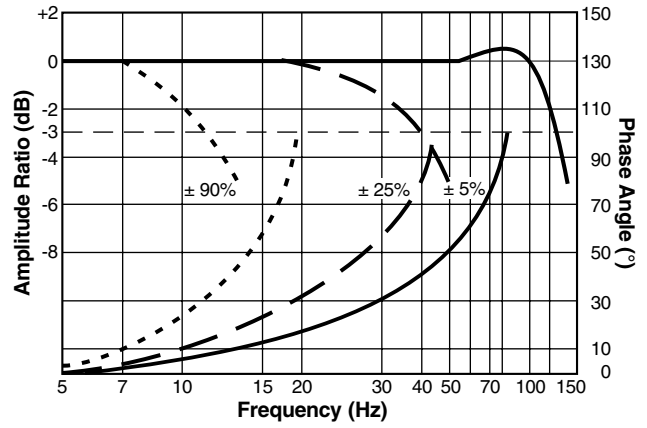




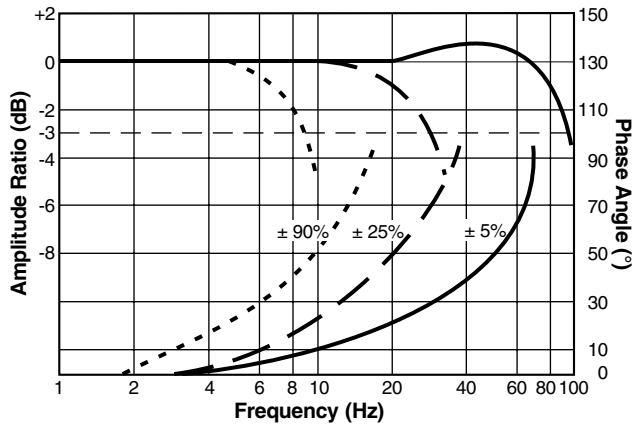
**D31FH Frequency Response**



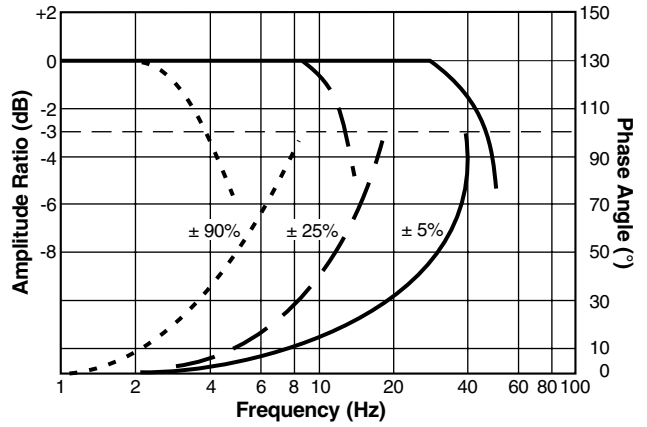
**D41FH Frequency Response**



**D81FH and D91FH Frequency Response**



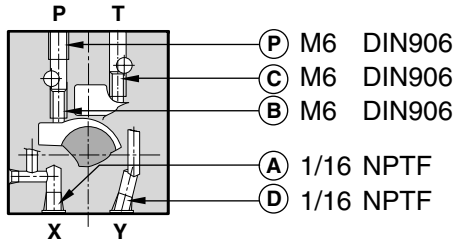
**D111FH Frequency Response**



**Pilot Connection**

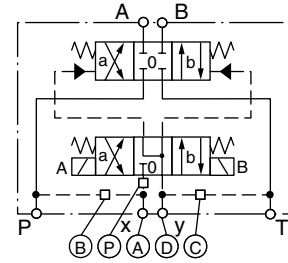
**D31FH**

**A**

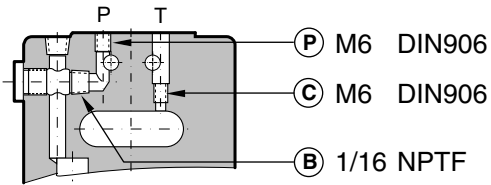


○ open, ● closed

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

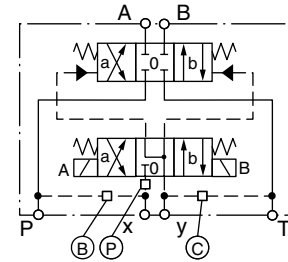


**D41FH**

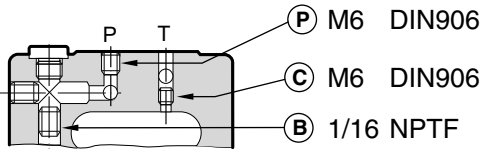


○ open, ● closed

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

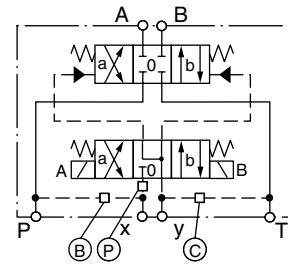


**D81FH and D91FH**

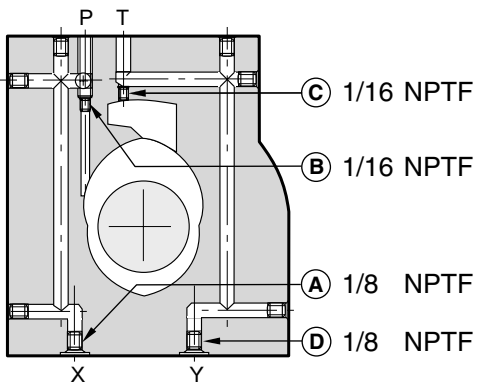


○ open, ● closed

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

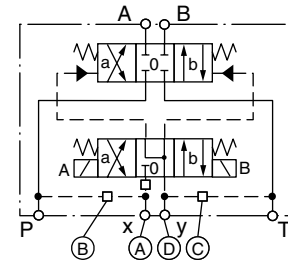


**D111FH**



○ open, ● closed

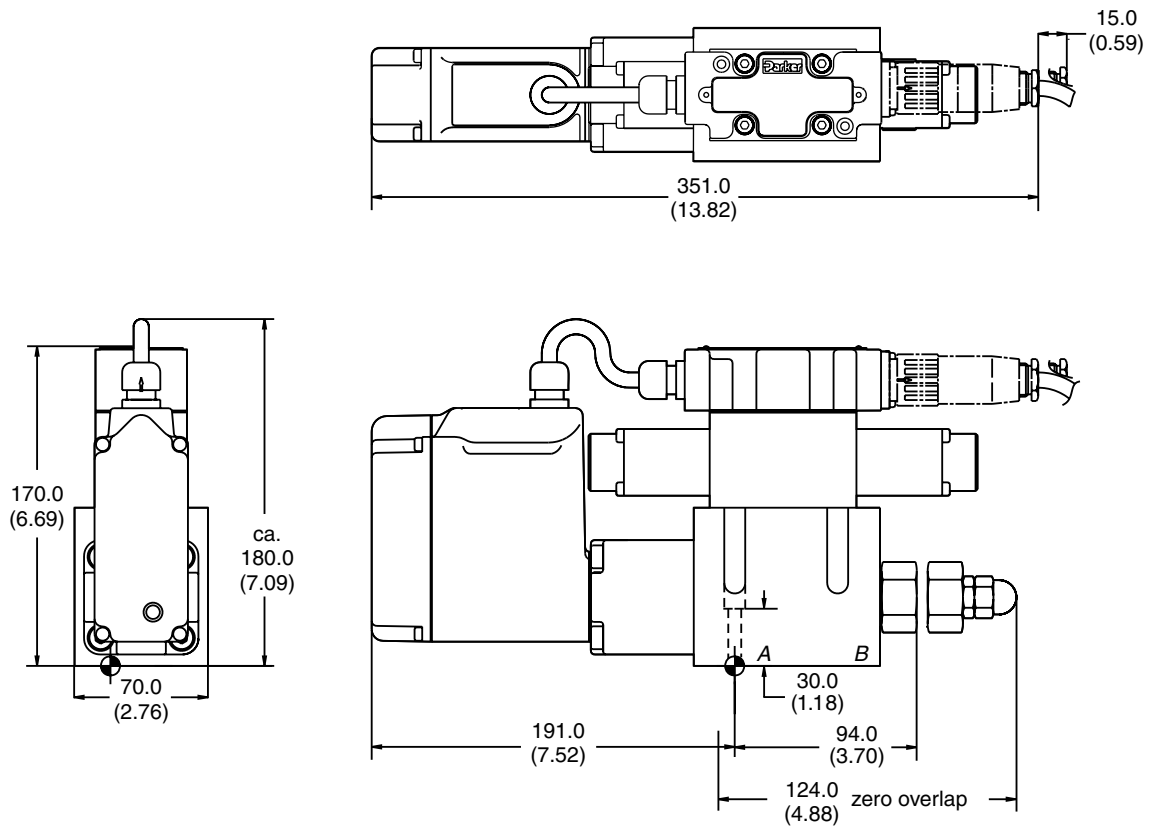
Pilot oil		A	B	C	D
Inlet	Drain				
internal	external	●	○	●	○
external	external	○	●	●	○
internal	internal	●	○	○	●
external	internal	○	●	○	●



D\_1FH.p65, dd

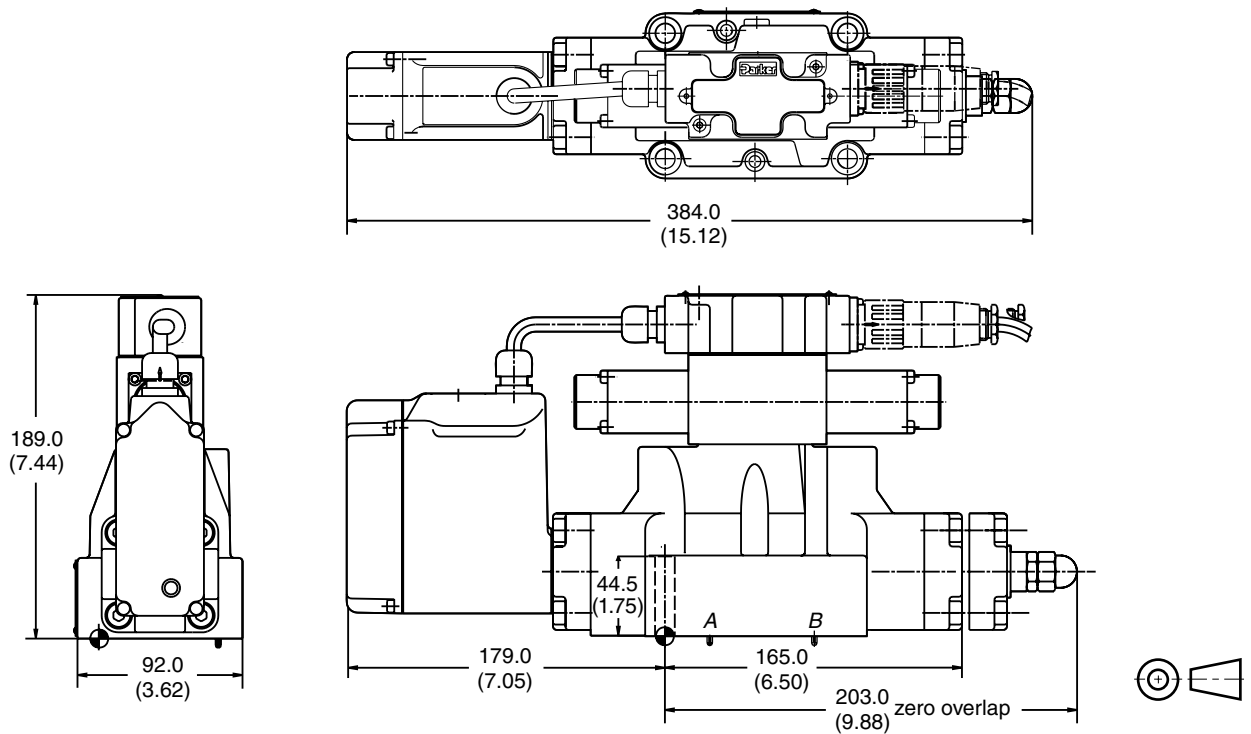
**D31FH**

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



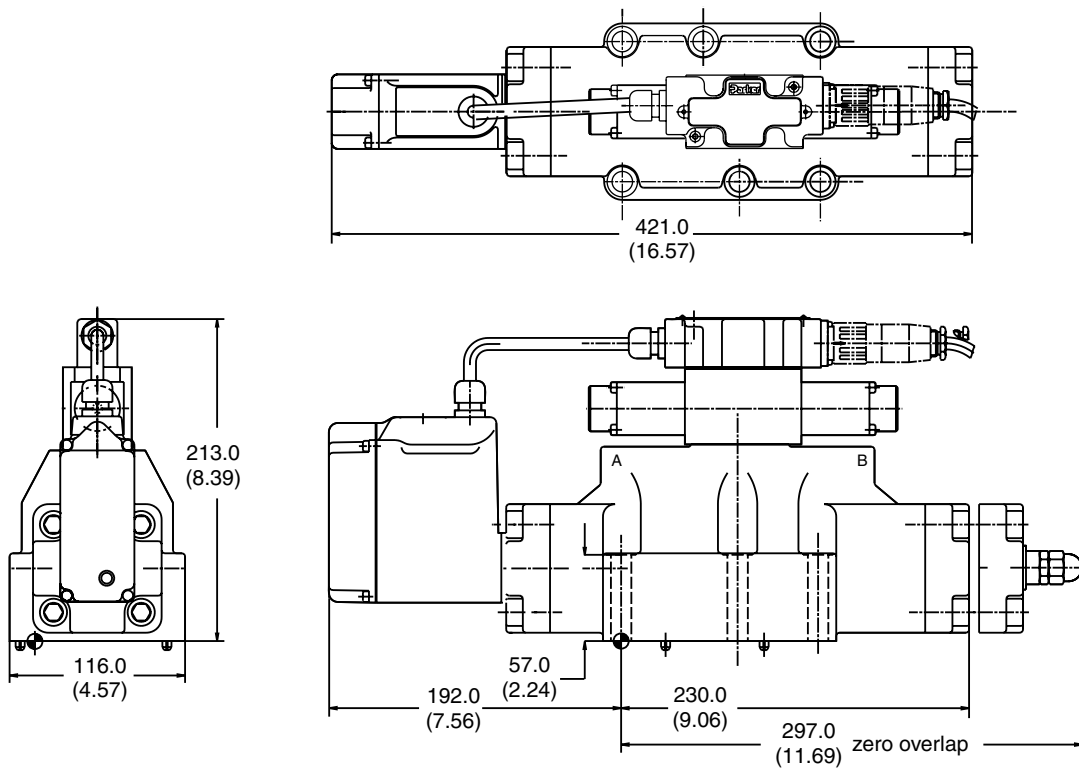
**D41FH**

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



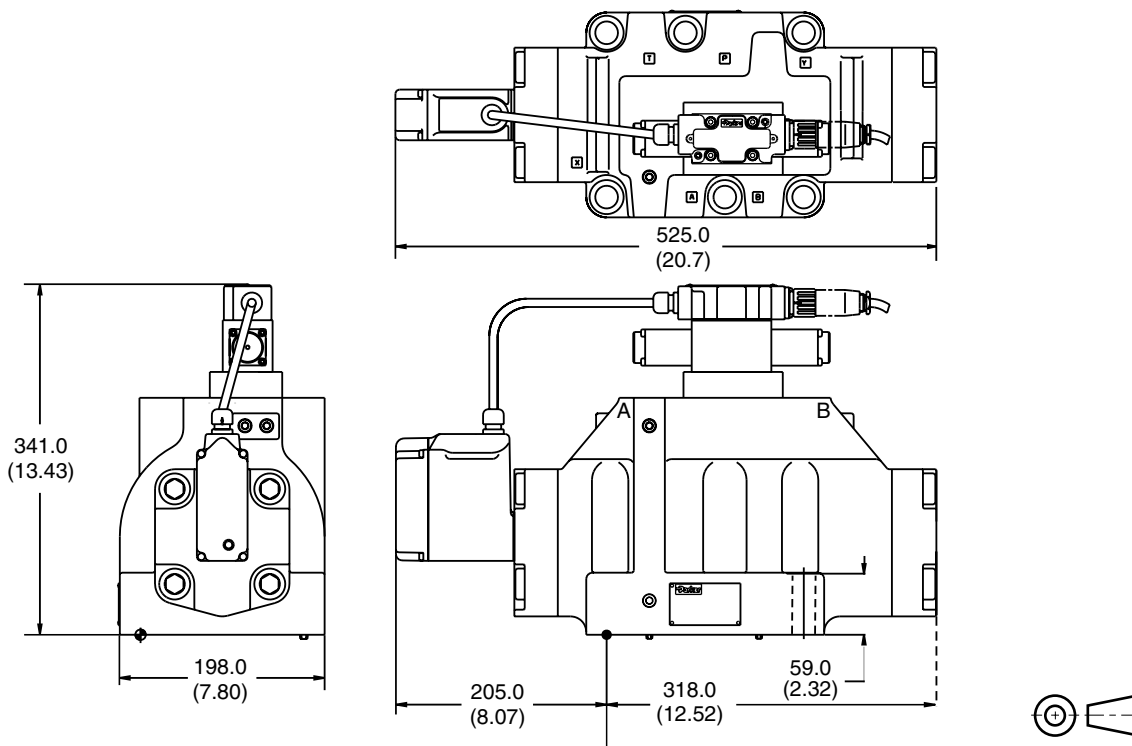
**D81FH and D91FH**

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



**D111FH**

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



**Parker VCD® — New Patented Valve-Drive Technology**

Parker has revolutionized the drive technology of high response control valves with VCD® technology.

In contrast to standard proportional solenoid drives, this technology actuates the spool (1) by using a moveable coil (2).

The spool is rigidly connected to the coil, which moves over a permanent magnetic cylinder (3) free of friction.

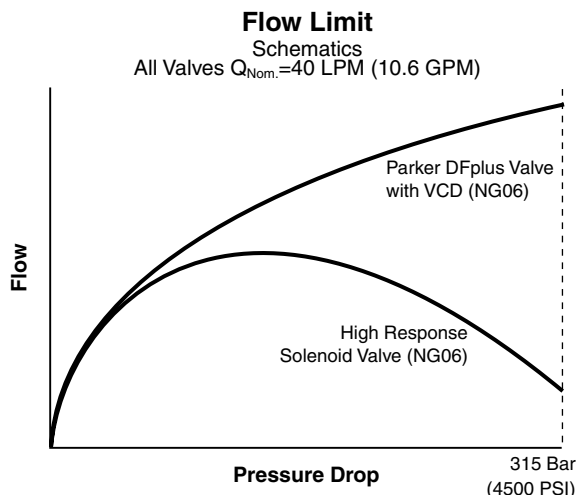
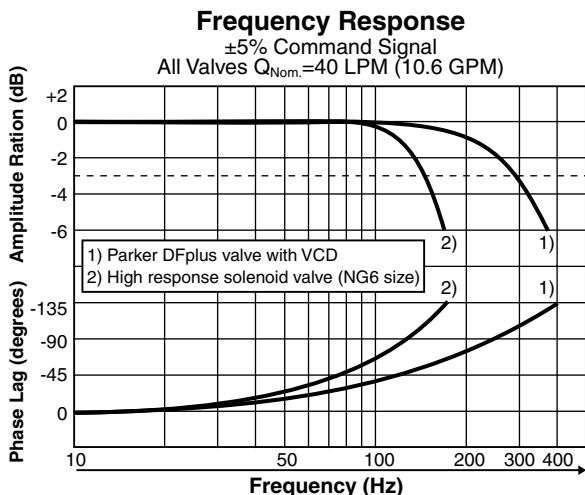
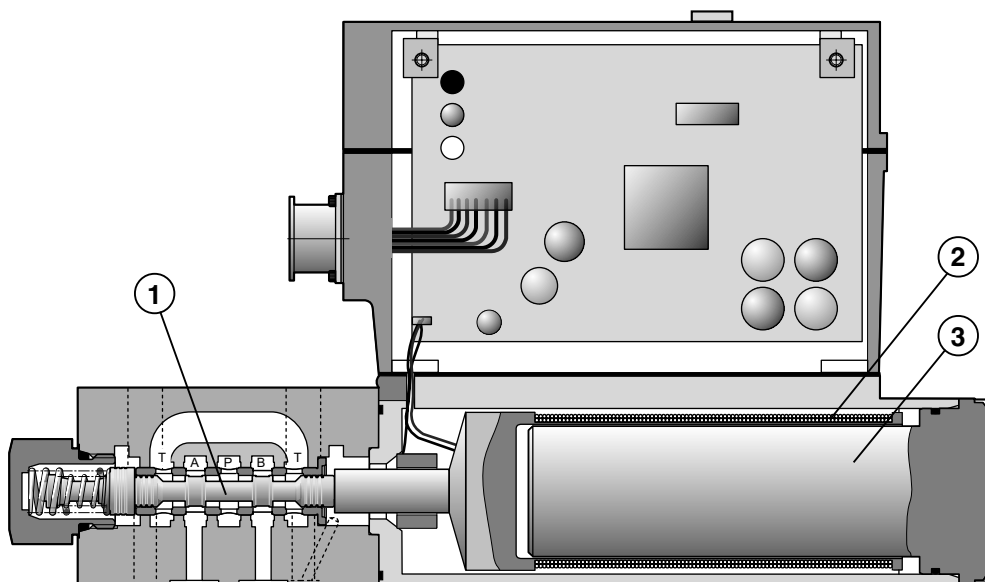
When the coil is energized, the spool is moved to the desired position. The spool position is fed back into the control electronics via a high resolution feedback system.

When the power supply is powered down, the spool is driven by a spring to a defined position.



**Advantages Compared to Traditional Valve Drives**

- **High Dynamics** — No active return spring required.
- **High Forces** — High force density provided by electromechanical drive.
- **Low Operation Expenses** — Maintenance free, no pilot supply oil required.



## General Description

Series D1FP direct operated control 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 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 315 Bar (4500 PSI) across the valve.

A loss of the power supply lets the spool move in a defined position. All common input signals are available.

## Features

- Servovalve dynamics (-90°/250Hz at ±5% input signal).
- Full flow capacity up to 315 Bar (4500 PSI) pressure drop through the valve.
- Maximum tank pressure 315 Bar (4500 PSI) with external drain Y-port.
- High flow.

## Specifications

### General

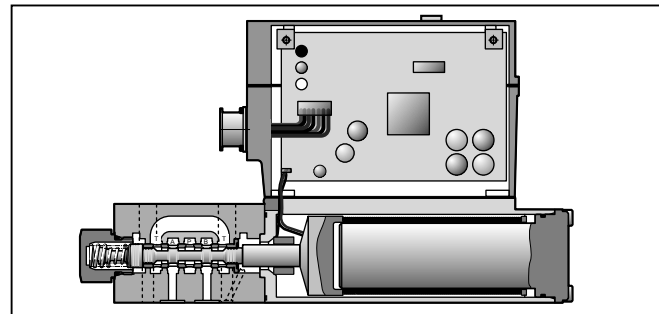
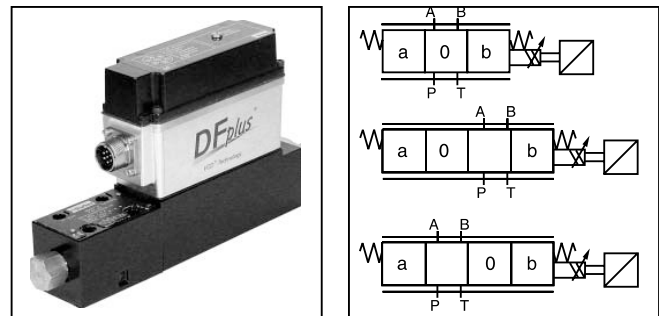
<b>Design</b>	Direct-operated, proportional directional control valve
<b>Actuation</b>	VCD® actuator
<b>Size</b>	NG6 (CETOP 3) / D03
<b>Mounting Interface</b>	DIN 24340, ISO 10372 Size 4, CETOP RP121, NFPA D03
<b>Mounting Position</b>	Any
<b>Ambient Temp.</b>	-20°C to +50°C (-4°F to +122°F)
<b>Vibration Resist.</b>	25g acc. DIN IEC68, part 2-6

### Static/Dynamic

<b>Step Response<sup>3)</sup></b>	<9 ms @ 100% step with rise and settling, <3.5 ms rise only
<b>Frequency Response (±5% signal)<sup>3)</sup></b>	300 (amplitude ratio -3dB), 250 (phase lag -90°)
<b>Hysteresis</b>	<0.05%
<b>Sensitivity</b>	<0.03%
<b>Temperature Drift</b>	<0.025%/°C

<sup>1)</sup> For applications with P<sub>T</sub>>35 Bar (500 PSI) the Y-port has to be used. Remove the plug in the Y-port of the valve and connect the Y-port to unpressurized tank.

<sup>2)</sup> Flow rate for different Δp per control edge:  $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta P_x}{\Delta P_{Nom.}}}$



- Defined spool positioning in case of loss of electric power supply.
- On-board electronics.



### Hydraulic

<b>Maximum Operating Pressure</b>	Ports P, A, B 315 Bar (4500 PSI); Port T 35 Bar (500 PSI); rated 315 Bar (4500 PSI) if external drain is used <sup>1)</sup>
<b>Fluid</b>	Hydraulic oil as per DIN 51524 to 51535, other on request
<b>Fluid Temp.</b>	-20°C to +50°C (-4°F to +122°F)
<b>Viscosity Permitted</b>	20 mm <sup>2</sup> /s to 380 mm <sup>2</sup> /s (90 to 1750 SSU)
<b>Viscosity Recommended</b>	30 mm <sup>2</sup> /s to 80 mm <sup>2</sup> /s (135 to 370 SSU)
<b>Minimum Fluid Cleanliness</b>	ISO 4406 (1999), 18/16/13 (acc. NAS 1683: 7)
<b>Recommended Fluid Cleanliness</b>	ISO 4406 (1999), 15/12/10
<b>Flow (Nominal at ΔP=35 Bar (500 PSI) per control edge<sup>2)</sup></b>	3 LPM (0.8 GPM), 6 (1.6 GPM), 12 LPM (3.2 GPM), 25 LPM (6.6 GPM), 40 LPM (10.6 GPM)
<b>Flow Maximum</b>	90 LPM (21.2 GPM) at Δp=315 Bar (4500 PSI) over two control edges
<b>Internal Leakage</b>	<400 ml/min (zero lapped spool); <50 ml/min (over lapped spool)

<sup>3)</sup> Measured with load. 100 Bar (1450 PSI) pressures drop/two control edges.



**D**  
 Directional Control Valve

**1**

**F**

**P**

**Spool Type**

**Spool Position on Power Down <sup>1)</sup>**

**9**

**N**  
 Seal

**Command Signal**

**Accessories**

**0**

**Design Series**

NOTE:  
 Not required when ordering.

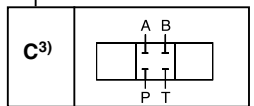
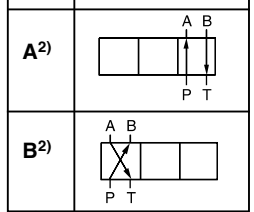
Code	Flow LPM (GPM) at $\Delta p$ 35 Bar (507 PSI) per Metering Edge	Spool
<b>Zerolap</b>		
<b>E50M</b>	40 LPM (10.6 GPM)	
<b>E50H</b>	25 LPM (6.6 GPM)	
<b>E50F</b>	12 LPM (3.2 GPM)	
<b>E50C</b>	6 LPM (1.6 GPM)	
<b>E50B</b>	3 LPM (0.8 GPM)	
<b>B60M</b>	40 LPM (10.6 GPM) 20 LPM (5.3 GPM)	$Q_B = Q_A / 2$ 

Code	Description
<b>N</b>	Nitrile Others available on request

Code	Connection Type
<b>0</b>	6 + PE acc. DIN 43563
<b>5</b>	11 + PE acc. DIN 41651

<b>Overlap 25%</b>		
<b>E01M</b>	40 LPM (10.6 GPM)	
<b>E01H</b>	25 LPM (6.6 GPM)	
<b>E01F</b>	12 LPM (3.2 GPM)	
<b>E01C</b>	6 LPM (1.6 GPM)	
<b>E01B</b>	3 LPM (0.8 GPM)	
<b>B31M</b>	40 LPM (10.6 GPM) 20 LPM (5.3 GPM)	$Q_B = Q_A / 2$ 
<b>E02M</b>	40 LPM (10.6 GPM)	
<b>E02H</b>	25 LPM (6.6 GPM)	
<b>B32M</b>	40 LPM (10.6 GPM) 20 LPM (5.3 GPM)	

**Code Spool Position on Power Down**



Code	Signal	Flow Direction <sup>4)</sup>
<b>B</b>	$\pm 10V$	0 to +10V $\rightarrow$ P-A
<b>E</b>	$\pm 20$ mA	0 to +20mA $\rightarrow$ P-A
<b>S</b>	4 to 20 mA	12 to +20mA $\rightarrow$ P-A

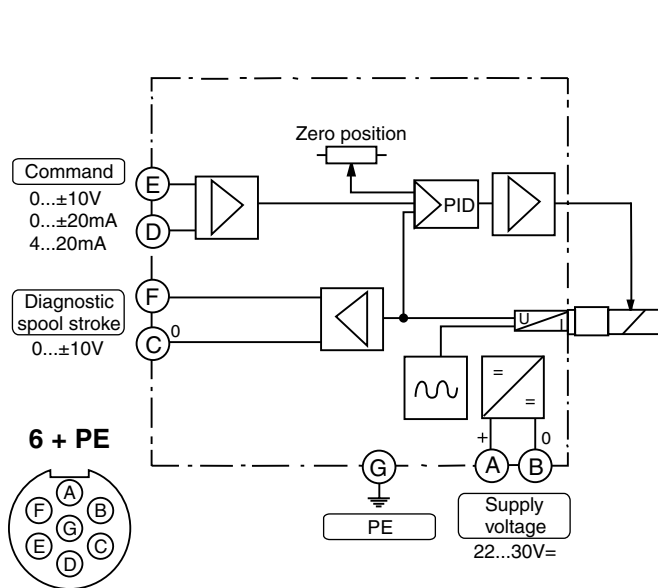
- 1) On power down the spool moves to a defined position. In case of single flow path on the control edge A  $\rightarrow$  T resp. B  $\rightarrow$  T with pressure drops above 120 Bar (1740 PSI) or contamination in the hydraulic fluid, this cannot be guaranteed.
- 2) Approximately 25% opening, only zero lapped spools.
- 3) Only for overlapped spools.
- 4) Flow direction P  $\rightarrow$  A with Pin D > Pin E.

**Weight:** 4.5 kg (9.9 lbs.)

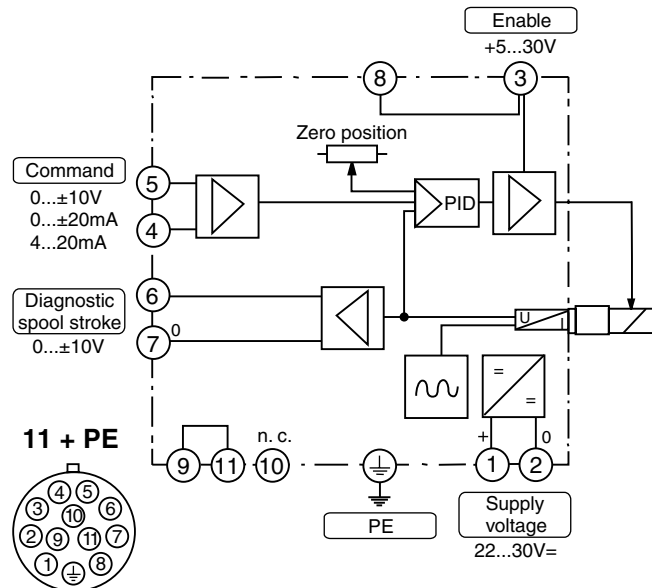
Please order mating connector separately.  
 See Accessories section.

**Block Diagrams**

**Code 0**



**Code 5**

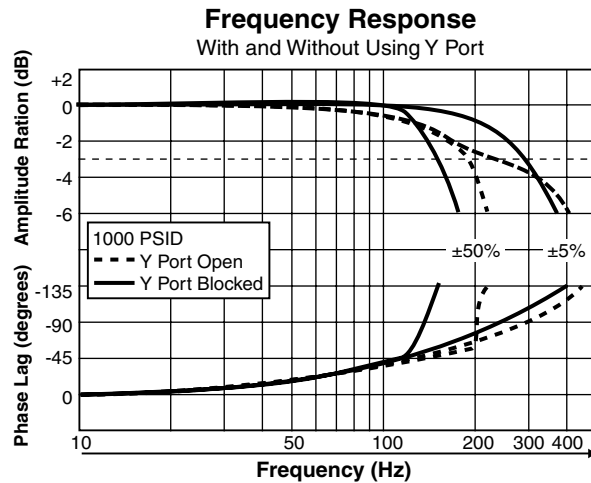
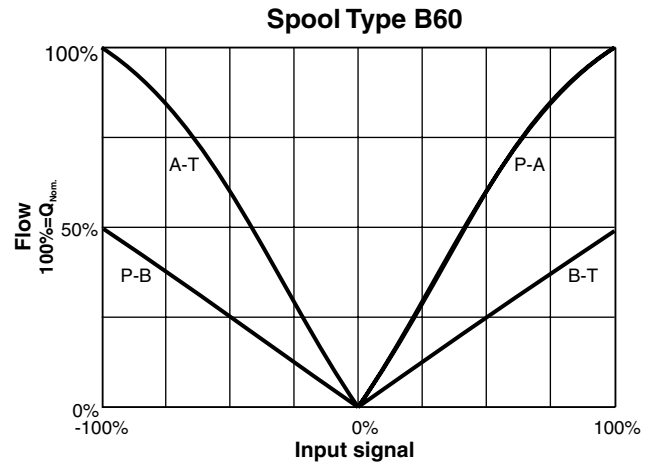
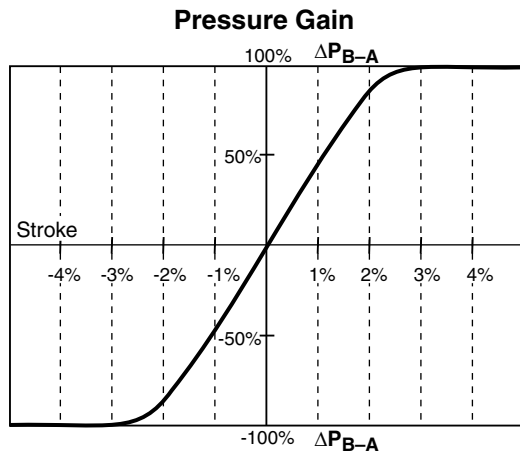
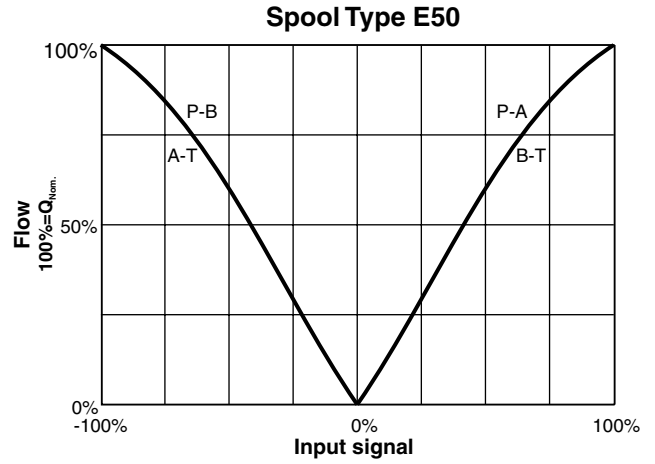
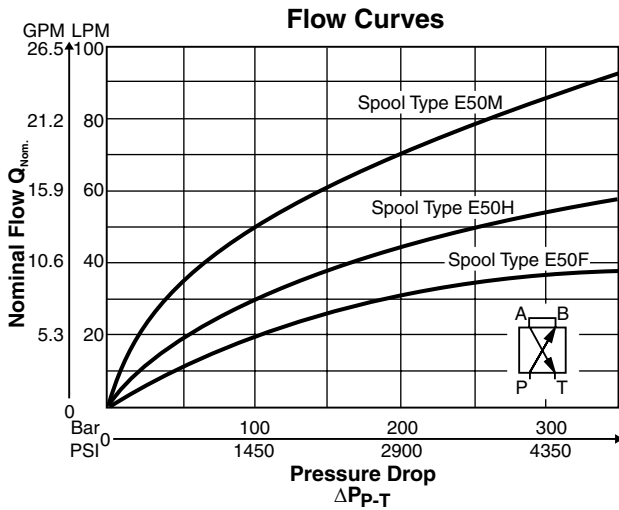


**Note:** When replacing another valve, verify Pin C is 0 V and not wired as an enable.

**Electrical Characteristics**

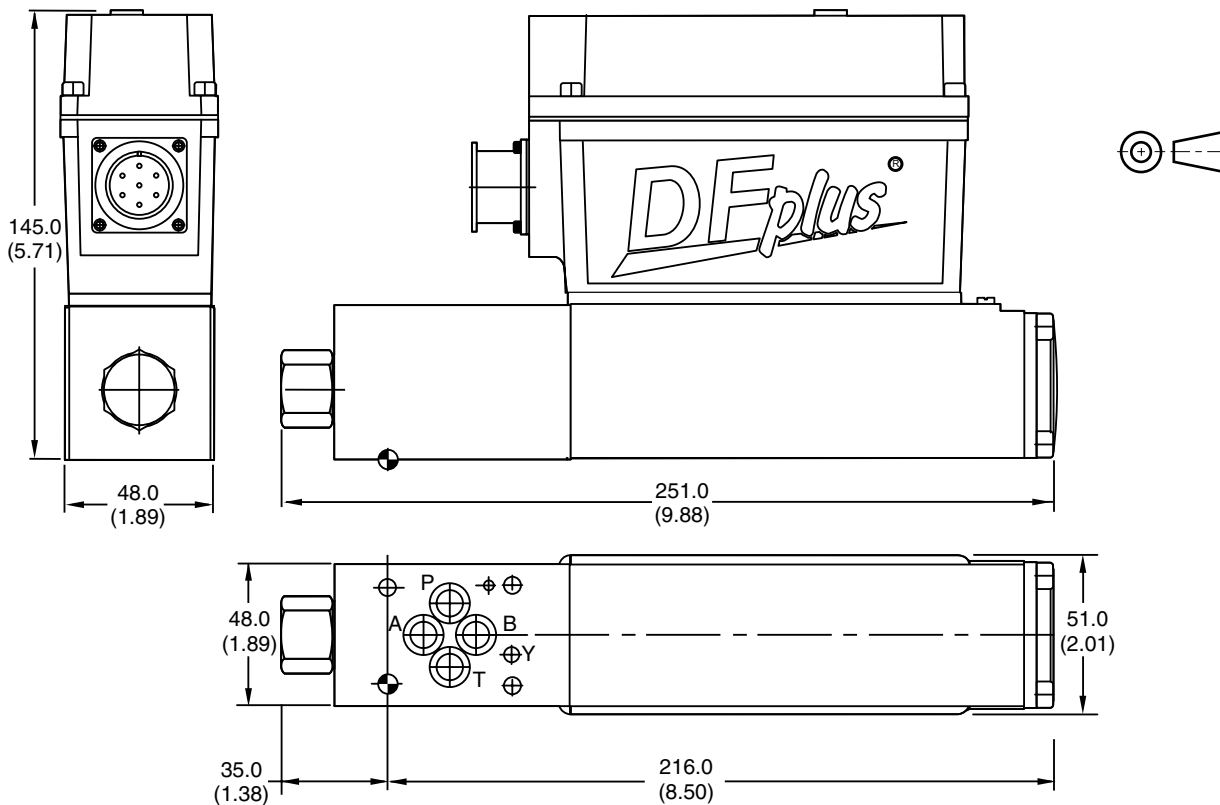
<b>Duty Ratio</b>	100%	<b>Differential Input Maximum</b>	30V for terminal D and E against PE
<b>Protection Class</b>	IP65	<b>Enable Signal (only code 5)</b>	5V to 30V, 9K ohm input impedance
<b>Supply Voltage/ Ripple</b>	22V to 30V, ripple <5% eff.	<b>Diagnostic Signal</b>	+10V to 0V to -10V rated max. 5 mA
<b>Current Consumption Max.</b>	3.5A	<b>Pre-fusing</b>	4.0A medium lag
<b>Switch-on Current Typical</b>	22A for 0.2 ms	<b>EMC</b>	EN 50081-2, EN50082-2
<b>Input Signal</b>	(Flow with Pin D > Pin E)	<b>Electrical Connection</b>	
Voltage	10V to 0V to -10V, ripple <0.01% eff., surge free, 0V to +10V P->A	Code 0	6 + PE acc. DIN 43563
Impedance	100K ohm	Code 5	11 + PE acc. DIN 41651
Current	20 mA to 0 mA to -20 mA, ripple <0.01% eff., surge free, 0 to +20 mA P->A	<b>Wiring Minimum</b>	
Impedance	250 ohm	Code 0	7x1.0 mm <sup>2</sup> (AWG 18) overall braid shield
Current	4 mA to 12 mA to 20 mA, ripple <0.01% eff., surge free, 12 to 20 mA P->A	Code 5	12x1.0 mm <sup>2</sup> (AWG 18) overall braid shield
Impedance	250 ohm	<b>Wiring Length Maximum</b>	50m (164 ft.)





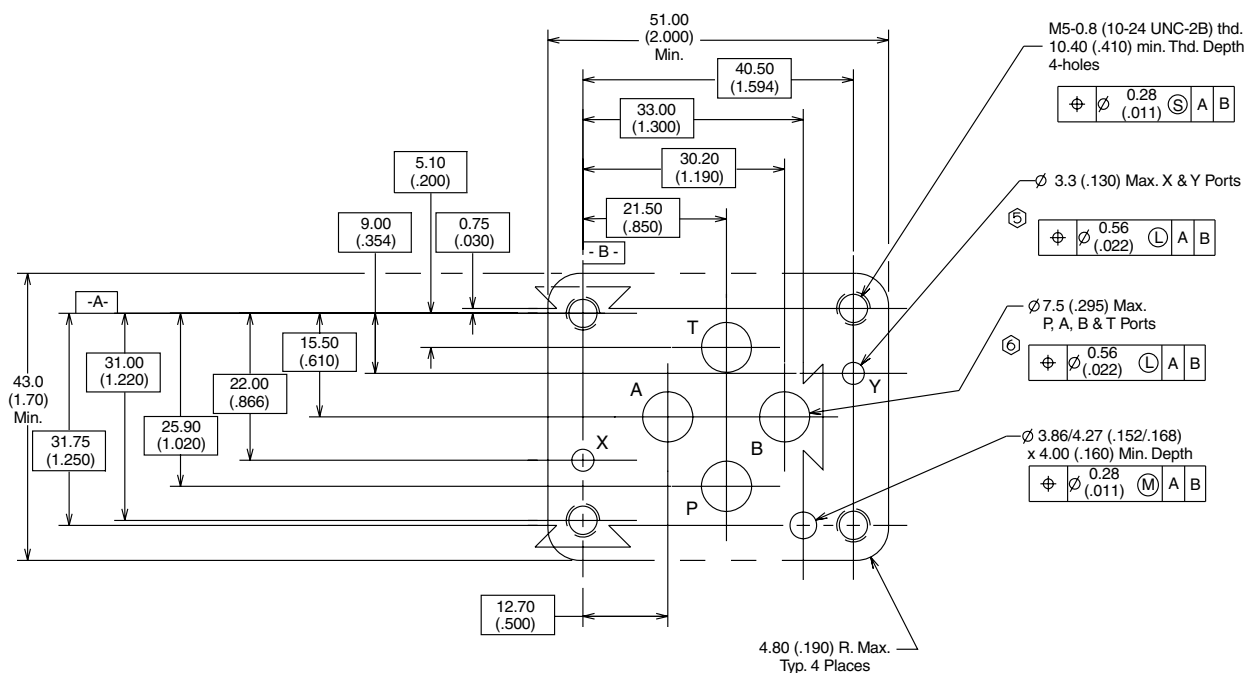
Inch equivalents for millimeter dimensions are shown in (\*\*)

**A**



Surface Finish	Kit	Wrench	Torque
	BK375	4 x M5x30 DIN 912 12.9	6.8 Nm (5.0 lb. ft.) ±15%
	BK209	4x10-24x1.25"	6.8 Nm (5.0 lb.-ft.)

**DIN 24340-A6, size NG6 / CETOP 3 / D03**



D1FP.p65, dd



## General Description

Series D1FP\*S direct operated control valve of the nominal size 04 (ISO 10372) shows extremely high dynamics combined with maximum flow. The valve mounting pattern is designed to replace servovalves of size 04 (ISO 10372) with the D1FP\*S.

Driven by the new patented VCD® technology, the D1FP\*S shows all advantages of the DFplus® Series as robustness, high dynamics and no flow limit up to 315 Bar† (4500 PSI). Additional features are low leakage and a defined spool position in case of loss of power supply.

Maintenance and contamination restrictions correspond to common solenoid driven valves and pilot supply is not required.

† Flow over two control edges.

## Features

- Servovalve size 04 (ISO 10372) mounting pattern (22.23 mm (0.875 in.) port circle.)
- Servovalve dynamics (-3db/300Hz with ±5% input signal).
- Low internal leakage.
- No flow limit up to 315 Bar (4500 PSI) pressure drop through the valve (flow over two control edges).

## Specifications

### General

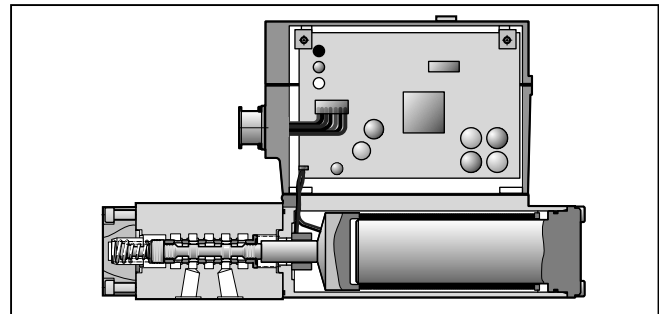
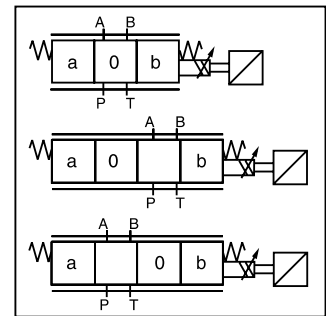
<b>Design</b>	Direct-operated, proportional directional control valve
<b>Actuation</b>	VCD® actuator
<b>Size</b>	ISO 10372 size 04
<b>Mounting Interface</b>	ISO 10372-04-04-0-92 (X Port used as Y unpressurized tank)
<b>Mounting Position</b>	Any
<b>Ambient Temp.</b>	-20°C to +50°C (-4°F to +122°F)
<b>Vibration Resist.</b>	25g acc. DIN IEC68, part 2-6

### Static/Dynamic

<b>Step Response<sup>3)</sup></b>	<9 ms @ 100% step with rise and settling, <3.5 ms rise only
<b>Frequency Response</b> (±5% signal) <sup>3)</sup>	300 (amplitude ratio -3dB), 250 (phase lag -90°)
<b>Hysteresis</b>	<0.05%
<b>Sensitivity</b>	<0.03%
<b>Temperature Drift</b>	<0.025%/°C

<sup>1)</sup> For applications with  $P_T > 35$  Bar (500 PSI) the Y-port has to be used. Remove the plug in the Y-port of the valve and connect the Y-port to unpressurized tank.

D1FP.p65, dd



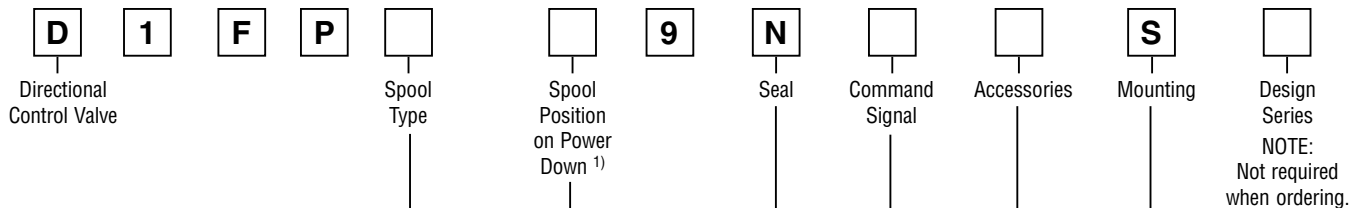
- Maximum tank pressure 315 Bar (4500 PSI) with external drain Y-port.
- High flow.
- Defined spool positioning in case of loss of electric power supply.
- On-board electronics.



### Hydraulic

<b>Maximum Operating Pressure</b>	Ports P, A, B 315 Bar (4500 PSI); Port T 35 Bar (500 PSI); rated 315 Bar (4500 PSI) if external drain is used <sup>1)</sup>
<b>Fluid</b>	Hydraulic oil as per DIN 51524 to 51535, other on request
<b>Fluid Temp.</b>	-20°C to +50°C (-4°F to +122°F)
<b>Viscosity Permitted</b>	20 mm <sup>2</sup> /s to 380 mm <sup>2</sup> /s (90 to 1750 SSU)
<b>Viscosity Recommended</b>	30 mm <sup>2</sup> /s to 80 mm <sup>2</sup> /s (135 to 370 SSU)
<b>Minimum Fluid Cleanliness</b>	ISO 4406 (1999), 18/16/13 (acc. NAS 1683: 7)
<b>Recommended Fluid Cleanliness</b>	ISO 4406 (1999), 15/12/10
<b>Flow</b> (Nominal at $\Delta P = 35$ Bar (500 PSI) per control edge <sup>2)</sup> )	3 LPM (0.8 GPM), 6 (1.6 GPM), 12 LPM (3.2 GPM), 25 LPM (6.6 GPM), 40 LPM (10.6 GPM)
<b>Flow Maximum</b>	90 LPM (21.2 GPM) at $\Delta p = 315$ Bar (4500 PSI) over two control edges)
<b>Internal Leakage</b>	<400 ml/min (zero lapped spool); <50 ml/min (over lapped spool)

<sup>2)</sup> Flow rate for different  $\Delta p$  per control edge:  $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta P_x}{\Delta P_{Nom.}}}$   
<sup>3)</sup> Measured with load. 100 Bar (1450 PSI) pressures drop/two control edges.



Code	Flow LPM (GPM) at Δp 35 Bar (507 PSI) per Metering Edge	Spool
<b>Zerolap</b>		
E50M	40 LPM (10.6 GPM)	
E50H	25 LPM (6.6 GPM)	
E50F	12 LPM (3.2 GPM)	
E50C	6 LPM (1.6 GPM)	
E50B	3 LPM (0.8 GPM)	
B60M	40 LPM (10.6 GPM)	$Q_B = Q_A / 2$ 
	20 LPM (5.3 GPM)	

<b>Overlap 25%</b>		
E01M	40 LPM (10.6 GPM)	
E01H	25 LPM (6.6 GPM)	
E01F	12 LPM (3.2 GPM)	
E01C	6 LPM (1.6 GPM)	
E01B	3 LPM (0.8 GPM)	
B31M	40 LPM (10.6 GPM)	$Q_B = Q_A / 2$ 
	20 LPM (5.3 GPM)	
E02M	40 LPM (10.6 GPM)	
E02H	25 LPM (6.6 GPM)	
B32M	40 LPM (10.6 GPM)	
	20 LPM (5.3 GPM)	

Code	Description
N	Nitrile Others available on request

Code	Description
S	ISO 10372 Size 04 (0.875" Port Circle)

Code	Spool Position on Power Down
A <sup>2)</sup>	
B <sup>2)</sup>	

Code	Connection
0	6 + PE acc. DIN 43563
5	11 + PE acc. DIN 41651

Code	Signal	Flow Direction <sup>4)</sup>
B	±10V	0 to +10V → P-A
E	±20 mA	0 to +20mA → P-A
S	4 to 20 mA	12 to +20mA → P-A

C <sup>3)</sup>	
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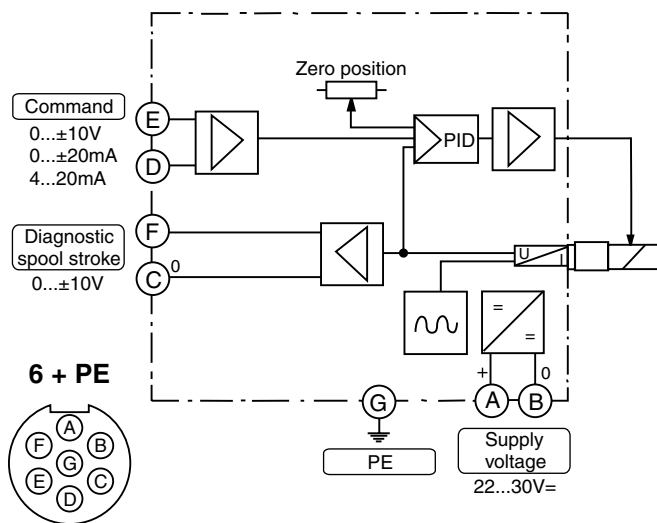
- 1) On power down the spool moves to a defined position. In case of single flow path on the control edge A→T resp. B→T with pressure drops above 120 Bar (1740 PSI) or contamination in the hydraulic fluid, this cannot be guaranteed.
- 2) Approximately 25% opening, only zero lapped spools.
- 3) Only for overlapped spools.
- 4) Flow direction P→ A with Pin D > Pin E.

**Weight:** 4.5 kg (9.9 lbs.)

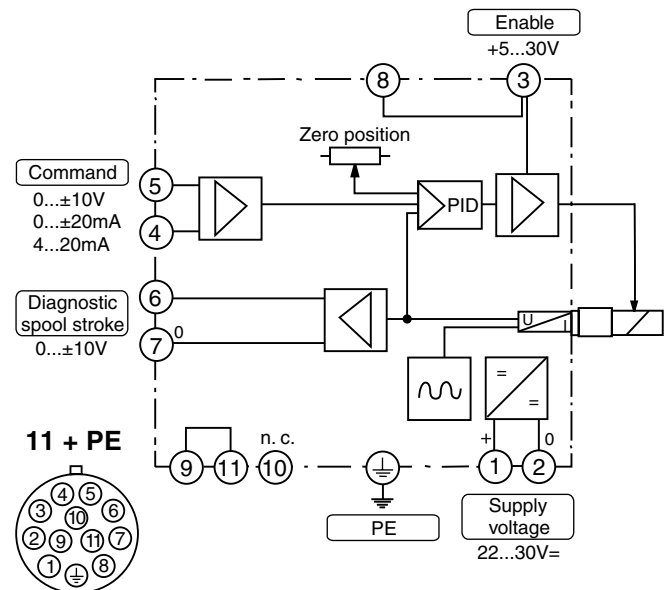
Please order mating connector separately.  
 See Accessories section.

**Block Diagrams**

**Code 0**



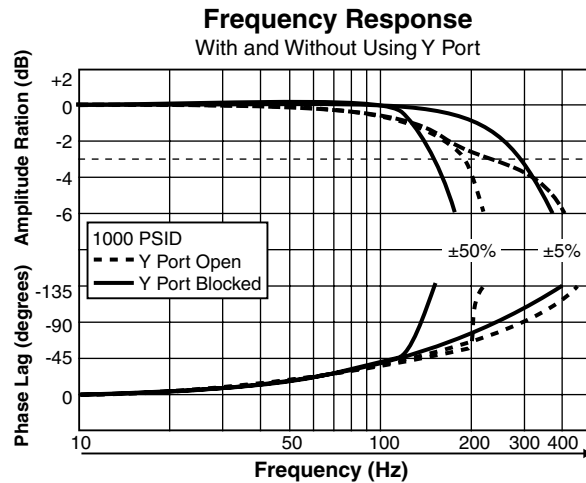
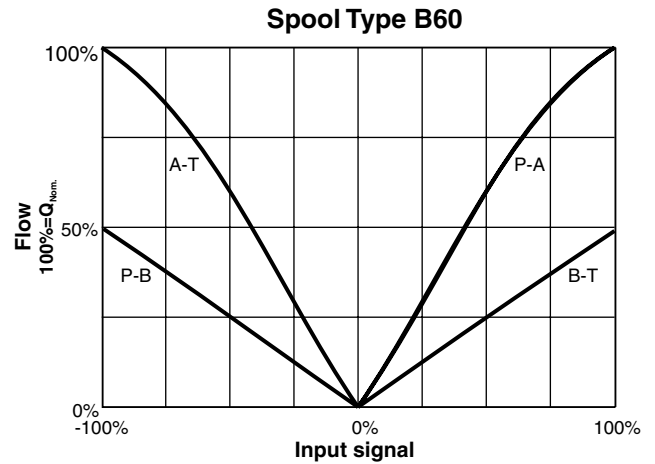
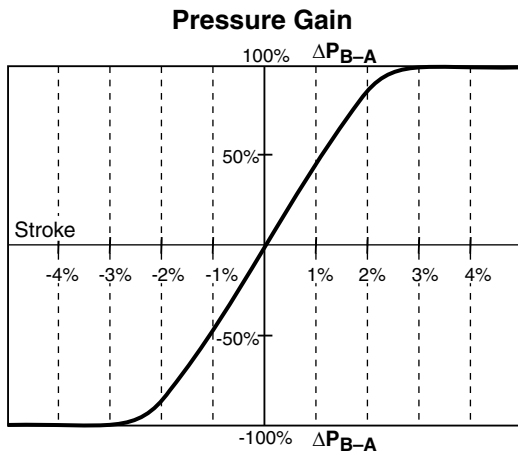
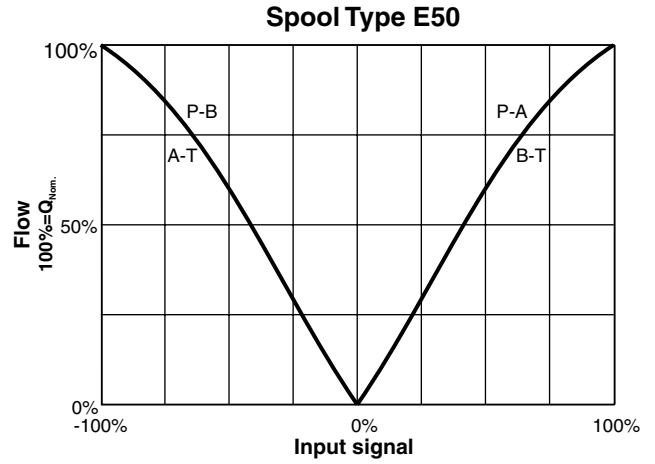
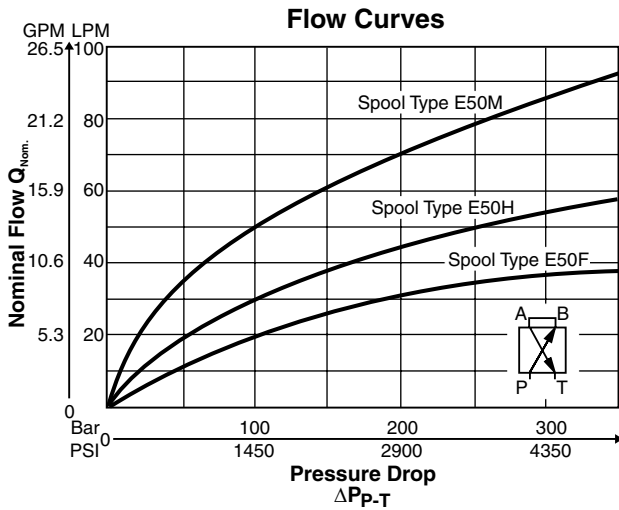
**Code 5**



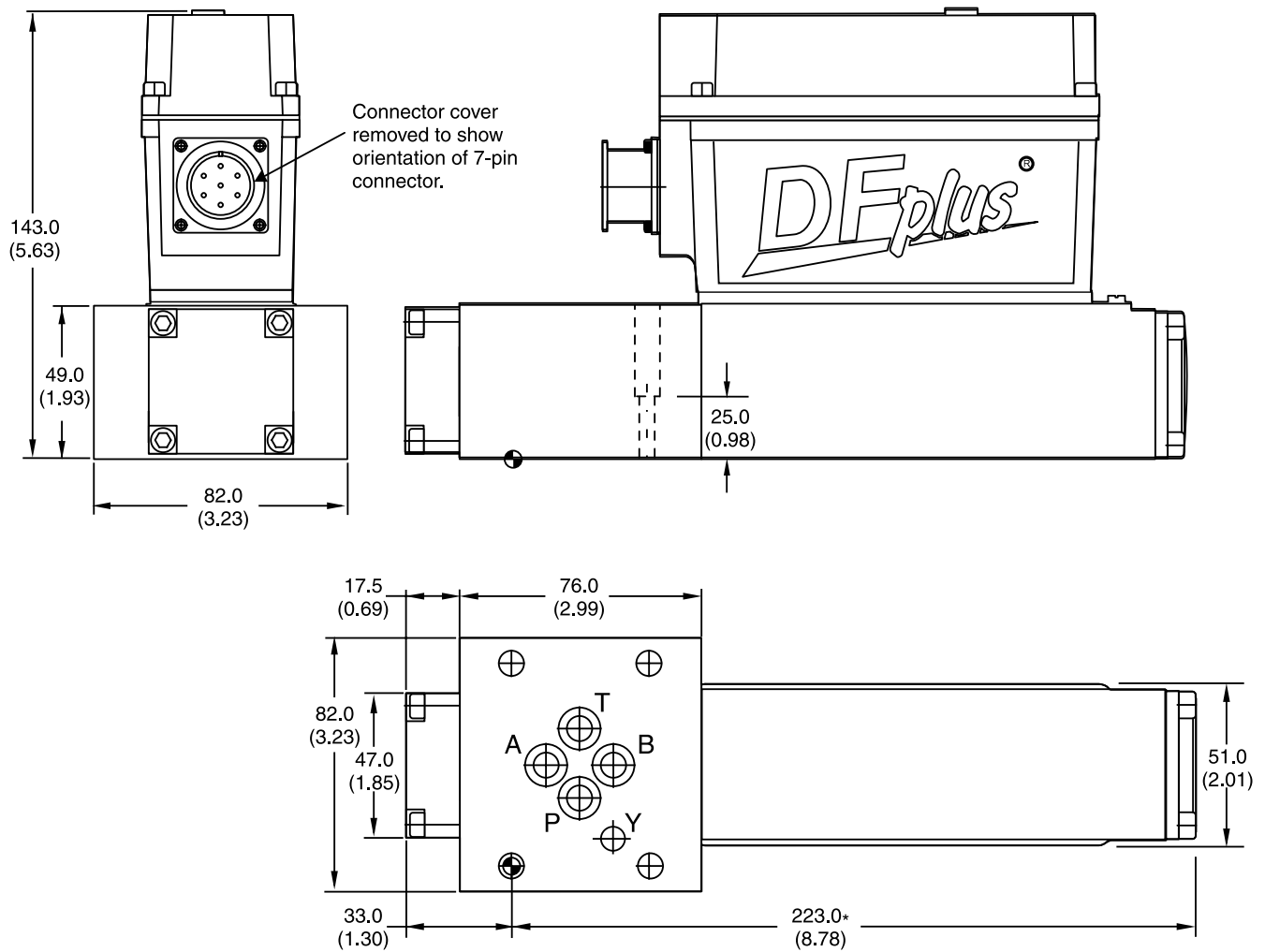
**Note:** When replacing another valve, verify Pin C is 0 V and not wired as an enable.

**Electrical Characteristics**

<b>Duty Ratio</b>	100%	<b>Differential Input Maximum</b>	30V for terminal D and E against PE
<b>Protection Class</b>	IP65	<b>Enable Signal (only code 5)</b>	5V to 30V, 9K ohm input impedance
<b>Supply Voltage/Ripple</b>	22V to 30V, ripple <5% eff.	<b>Diagnostic Signal</b>	+10V to 0V to -10V, rated max. 5 mA
<b>Current Consumption Max.</b>	3.5A	<b>Pre-fusing</b>	4.0A medium lag
<b>Switch-on Current Typical</b>	22A for 0.2 ms	<b>EMC</b>	EN 50081-2, EN50082-2
<b>Input Signal</b>	(Flow with Pin D > Pin E)	<b>Electrical Connection</b>	
Voltage	10V to 0V to -10V, ripple <0.01% eff., surge free, 0V to +10V P->A	Code 0	6 + PE acc. DIN 43563
Impedance	100K ohm	Code 5	11 + PE acc. DIN 41651
Current	20 mA to 0 mA to -20 mA, ripple <0.01% eff., surge free, 0 to +20 mA P->A	<b>Wiring Minimum</b>	
Impedance	250 ohm	Code 0	7x1.0 mm <sup>2</sup> (AWG 18) overall braid shield
Current	4 mA to 12 mA to 20 mA, ripple <0.01% eff., surge free, 12 to 20 mA P->A	Code 5	12x1.0 mm <sup>2</sup> (AWG 18) overall braid shield
Impedance	250 ohm	<b>Wiring Length Maximum</b>	50m (164 ft.)






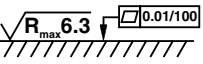
Inch equivalents for millimeter dimensions are shown in (\*\*)



\*Valve drive on opposite side on request.



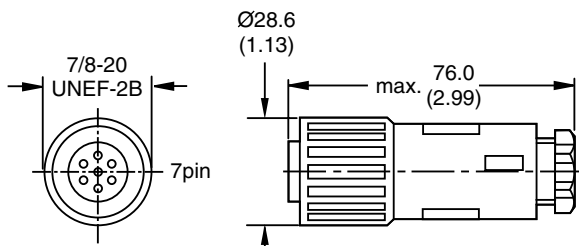
**Warning:** External drain port is in ISO external pilot location. Do not apply external pilot.

Surface Finish	 Kit		
	BK414	4 x M8x40 DIN 912 12.9	33 Nm ±15%
	BK116	4 x 5/16-18 x 1 3/4 long	24.3 lb.-ft.

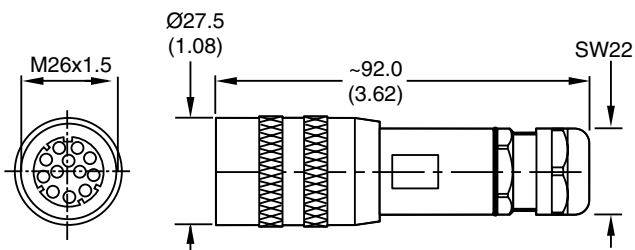


**Electrical Connectors**

**A**



DIN 43563 6 + PE: Part Number 5004072

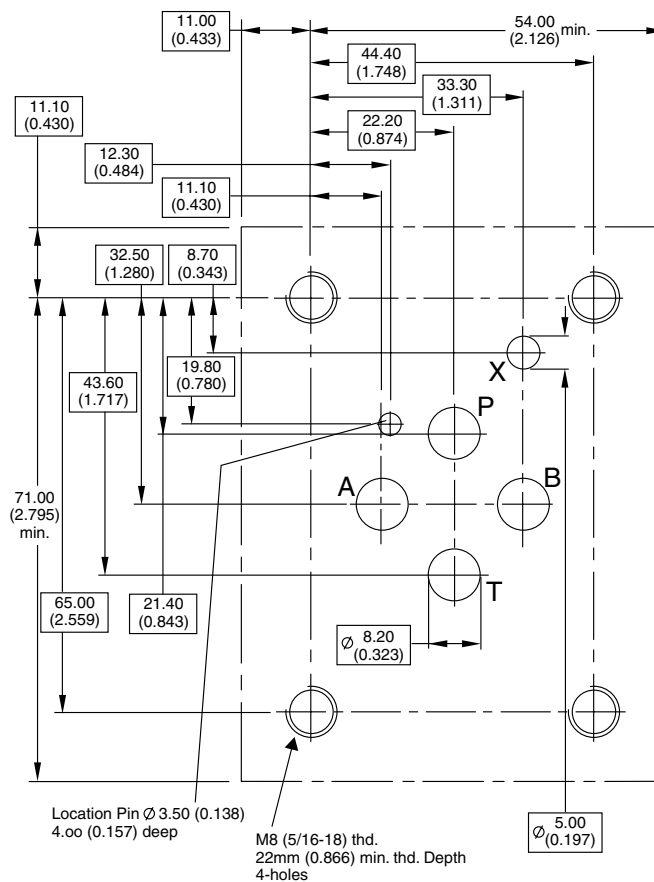


DIN 41651 11 + PE: Part Number 5004711

**NOTE:** The servovalve X-port is for external pilot pressure. The D1FP can use this port as a Y-port for external drain if T-port pressure will exceed 35 Bar (500 PSI).

**IMPORTANT:** If replacing a servovalve, make certain pressure is not applied to X-port.

**ISO 10372-04-04-0-92, size 04**





**General Description**

Series D3FP direct-operated control valve size NG10 (CETOP 5) shows extremely high dynamics combined with high flow. It is used for highest accuracy in positioning of hydraulic axis and controlling of pressure and velocity.

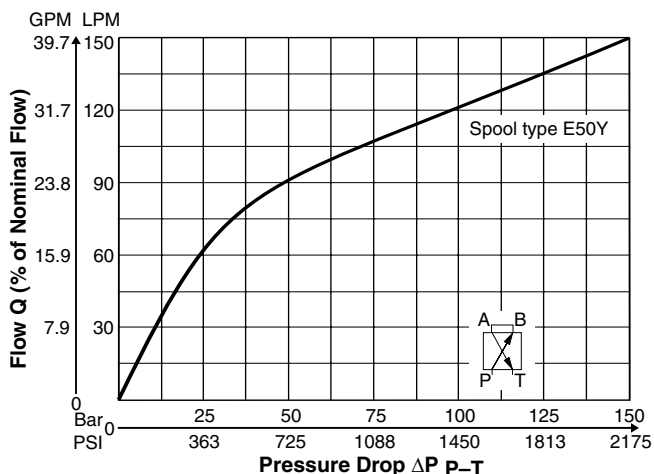
Driven by the new patented VCD® actuator the D3FP reaches the frequency response of real servovalves. A loss of power supply lets the spool move in a defined position. All common input signals are available.

**Features**

- Extremely high dynamics.
- Max. tank pressure 350 Bar (5075 PSI) (with external leakage port Y).
- Defined spool positioning in case of power supply breakdown.
- On-board electronics.
- Precision spool/sleeve design.

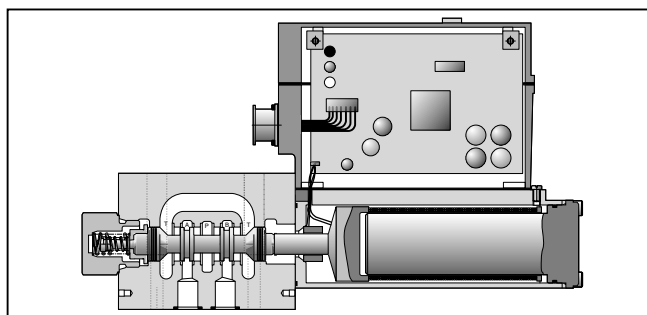
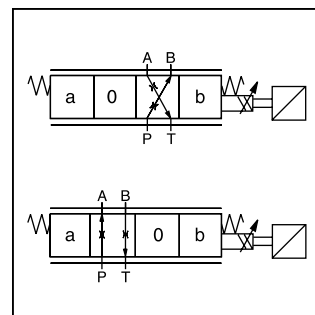
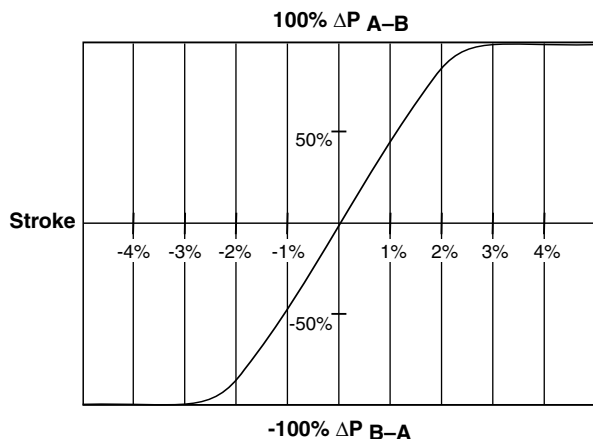
**Performance Curves**

**Operating Limit**

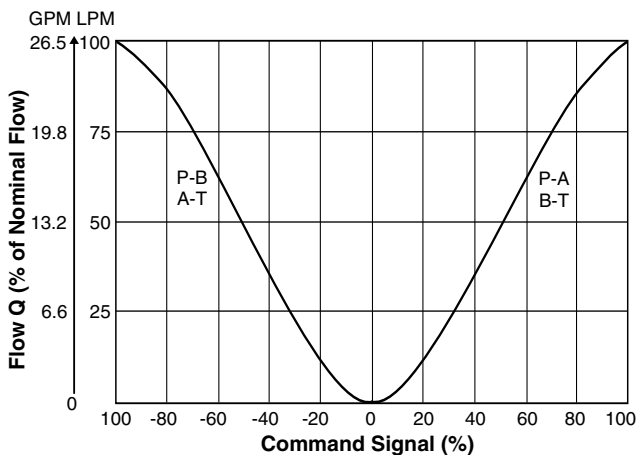


\* When exceeding the operating limits, the valve will shut down in a defined position (Code A, B concerning ordering code). Switch power supply off/on to re-enable the valve within the operating limits.

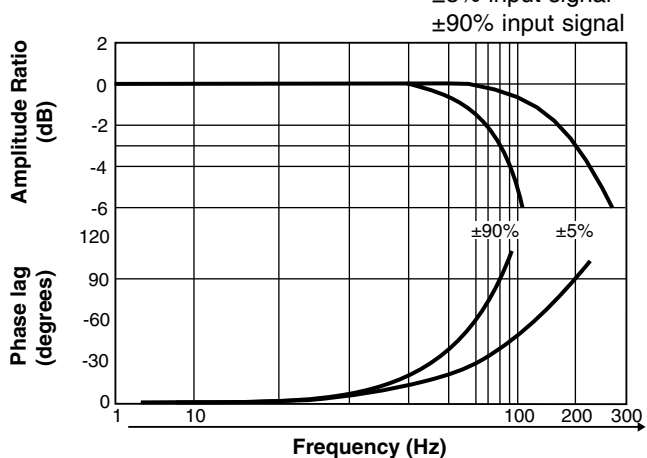
**Pressure Gain**



**Spool Type E50/E55**



**Frequency Response**



D3FP.p65, dd



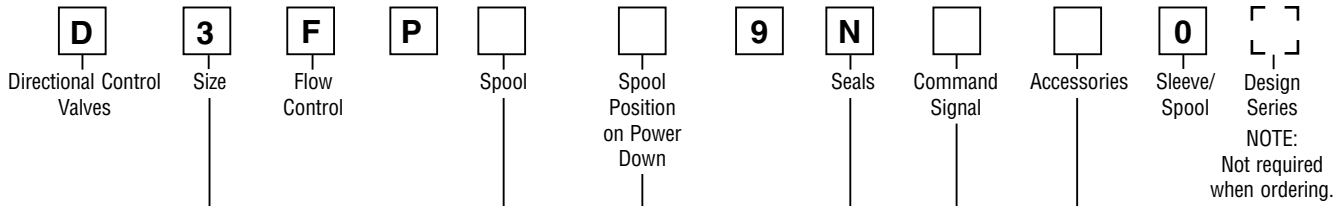


General			
<b>Design</b>	Direct operated proportional Directional control valve	<b>Mounting Position</b>	Any
<b>Actuation</b>	VCD® actuator	<b>Ambient Temperature Range</b>	-20°C to +50°C (-4°F to +122°F)
<b>Size</b>	NG10 (CETOP 5)	<b>Vibration Resistance</b>	25 g acc. DIN IEC68, part 2-6
<b>Mounting Interface</b>	DIN 24340 / ISO 4401 / CETOP RP121 / NFPA	<b>Protection Class</b>	IP65
Hydraulic			
<b>Operating Pressure Maximum</b>	Ports P, A, B: 350 Bar (5075 PSI) Port T: 35 Bar (507.5 PSI) 350 Bar (5075 PSI) discharged at Port Y <sup>1)</sup>	<b>Filtration</b>	ISO 4406 (1999) 18/16/13 (acc. NAS 1683: 7)
<b>Fluid</b>	Hydraulic oil as per DIN 51524 to 535, other on request	<b>Flow</b>	nominal at Δp=35 Bar (507.5 PSI) per control edge <sup>2)</sup> 50 / 100 LPM (13.2 / 26.5 GPM)
<b>Fluid Temperature</b>	-20°C to +50°C (-4°F to +122°F)	<b>Flow Maximum</b>	100 LPM (26.5 GPM) at Δp=70 Bar (1015 PSI) over two control edges
<b>Viscosity Permitted</b>	20 to 380 SSU	<b>Leakage</b>	at 100 Bar (1450 PSI) <400 ml/min (49 in <sup>3</sup> /min.)
<b>Viscosity Recommended</b>	30 to 80 SSU		
Static / Dynamic			
<b>Step Response @ 100%<sup>3)</sup></b>	<16 ms @ 100% step with rise and settling, <6 ms rise only	<b>Hysteresis</b>	<0.5%
<b>Frequency Response (±5% signal<sup>3)</sup></b>	200 Hz (amplitude ratio -3dB), 200 Hz (phase lag -90°)	<b>Sensitivity</b>	<0.3%
		<b>Temperature Drift</b>	<0.025%/°C
Electrical			
<b>Duty Ratio</b>	100%	<b>Differential Input Maximum</b>	30 VDC for Terminal D and E against PE
<b>Supply Voltage/Ripple</b>	22 VDC to 30 VDC, ripple <5% eff.	<b>Enable Signal (Code 5 Only)</b>	5 VDC to 30 VDC, R=9K ohm
<b>Current Consumption</b>	3.5A	<b>Diagnostic Signal</b>	+10...0...-10 VDC, rated max. 5 mA
<b>Switch-on Current Typical</b>	22A for 0.2 ms	<b>Prefusing</b>	4.0A medium lag
<b>Input Signal Voltage</b>	Flow with Pin D > Pin E 10...0...-10, ripple <0.01% eff., surge free, 0...+10V P->A	<b>EMC</b>	EN 50081-1 / EN50082-2
<b>Impedance</b>	100K ohm	<b>Interface</b>	Code 0: 6+PE acc. DIN 43563 Code 5: 11+PE acc. DIN 41651
<b>Current</b>	20...0...-20 mA, ripple <0.01% eff., surge free, 0...+20 mA P->A	<b>Cable Specification</b>	Code 0: 7x1.0 (AWG 18) overall braid shield Code 5: 12x1.0 (AWG 18) overall braid shield
<b>Impedance</b>	250 ohm	<b>Cable Length</b>	50m (164 ft.)
<b>Current</b>	4...12...20 mA, ripple <0.01% eff., surge free, 12...20 mA P->A		
<b>Impedance</b>	250 ohm		

<sup>1)</sup> For applications with p<sub>T</sub>>35 bar the Y-port has to be used. Remove the plug in the Y-port of the valve and connect the Y-port to unpressurized tank.

<sup>2)</sup> Flow rate for different Δp per control edge:  $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$  **Note:** Equation with Δp ≤35 Bar/edge

<sup>3)</sup> Measured with load (70 Bar (1015 PSI) pressure drop/two control edges)



**Code Description**  
 3 NG10/CETOP 5

**Code Connection**  
 0 6 + PE acc. EN175201-804  
 5 11 + PE acc. EN175201-804

**Code Description**  
 N Nitrile  
 Others available on request

Code	Spool	Flow LPM (GPM) at $\Delta p$ 35 Bar (507.5 PSI) per metering edge
<b>Zerolap 0 to +1%</b>		
E50Y		100 (26.5)
E50P		50 (13.2)
<b>Underlap approx. -0.5%</b>		
E55Y		100 (26.5)
E55P		50 (13.2)

Code	Signal	Flow
B	$\pm 10$ V	0...+10 V -> P-A
E	$\pm 20$ mA	0...+20 mA -> P-A
S	4...20 mA	12...20 mA -> P-A

**Weight:** 6.5 kg (14.3 lbs.)

Please order plugs separately. See Accessories.

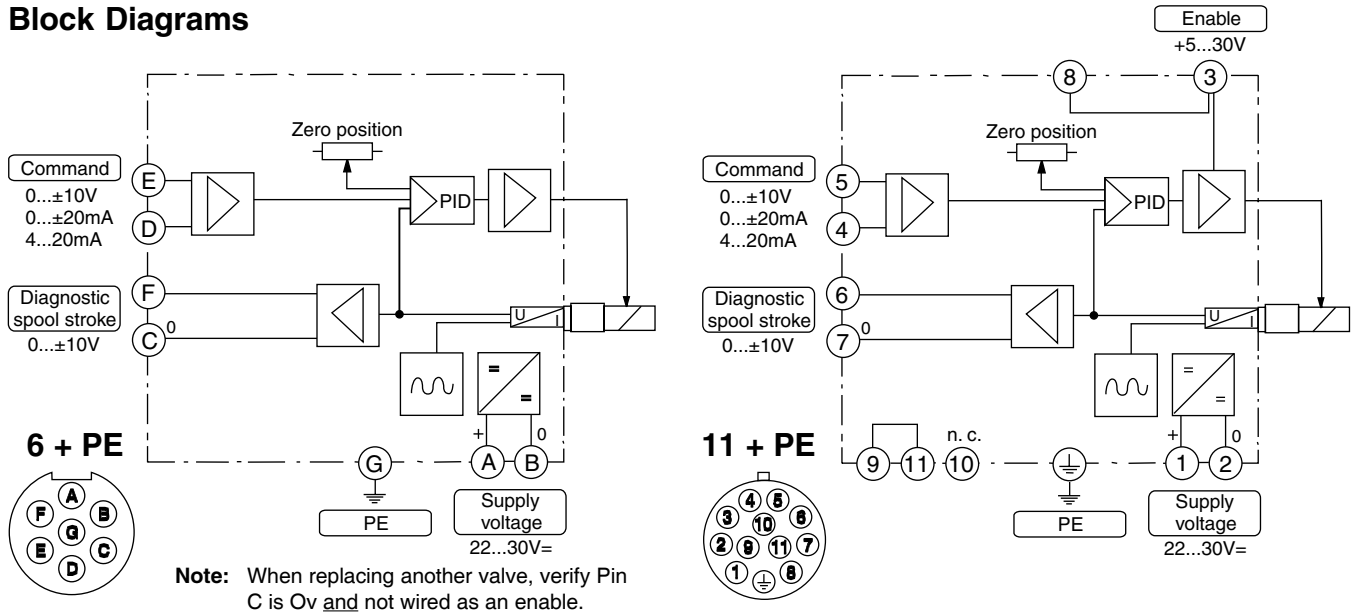
Code	Spool Position on Power Down <sup>1)</sup>
A <sup>2)</sup>	
B <sup>2)</sup>	

<sup>1)</sup> On power down the spool moves in a defined position. In case of contamination in the hydraulic fluid, this cannot be guaranteed.

<sup>2)</sup> approx. 25% opening.

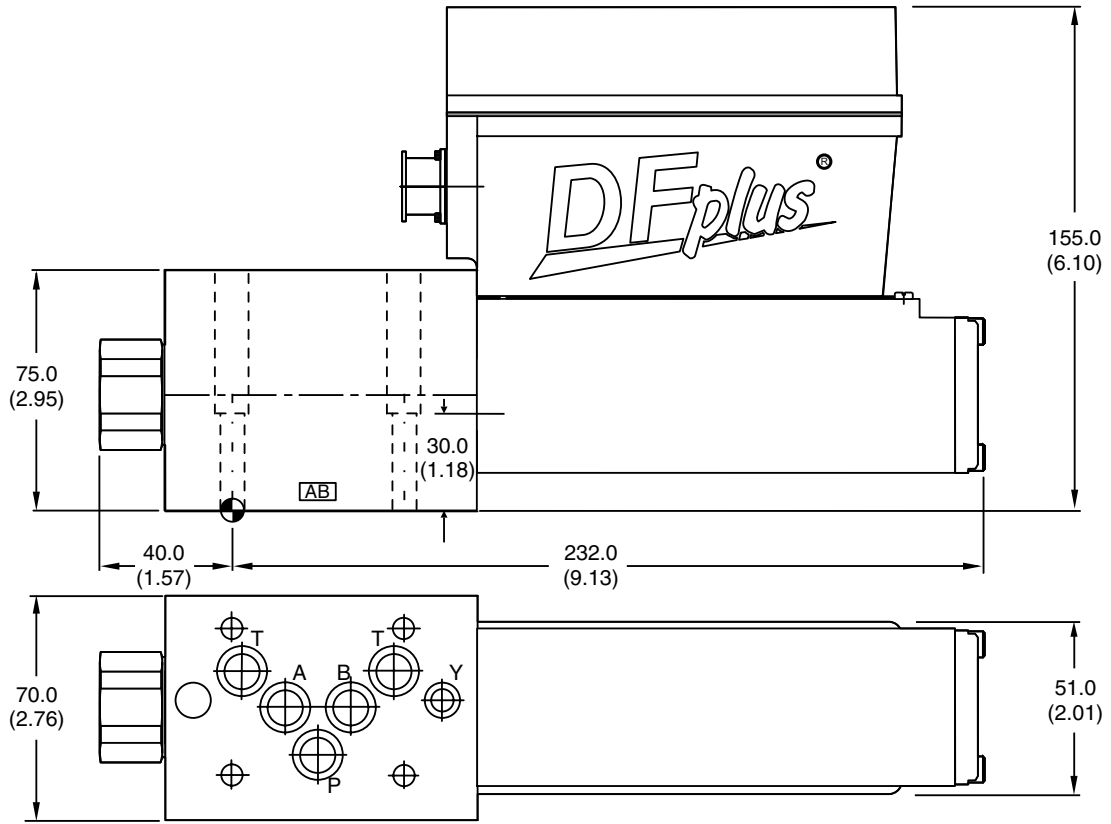
**Block Diagrams**

**A**



**Dimensions**

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



Surface finish	Kit	Kit	Kit
	BK360	4x M6x40 DIN 912 12.9	11 Nm (8.1 lb.-ft.) ±15 %
	BK98	4x1/4-20x1.625"	11 Nm (8.1 lb.-ft.)

D3FP.p65, dd



**RFI/EMC Immunity for valves with integrated electronics**

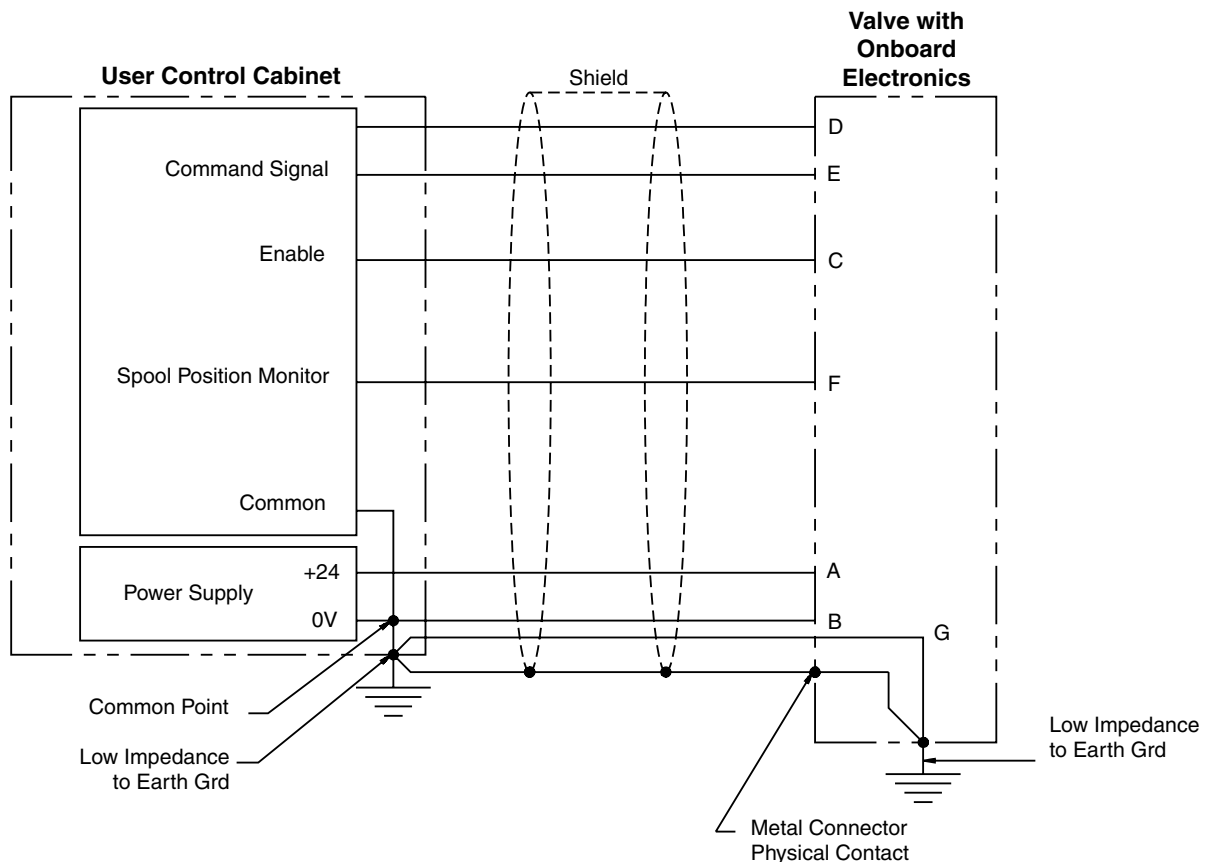
Conformance to the CE RFI/EMC susceptibility and emissions regulations require valves with integrated electronics be properly wired and grounded. The wiring diagram below suggests proper practices, and should be used as a guide for wiring any new application. In some retrofit applications it may be necessary 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)

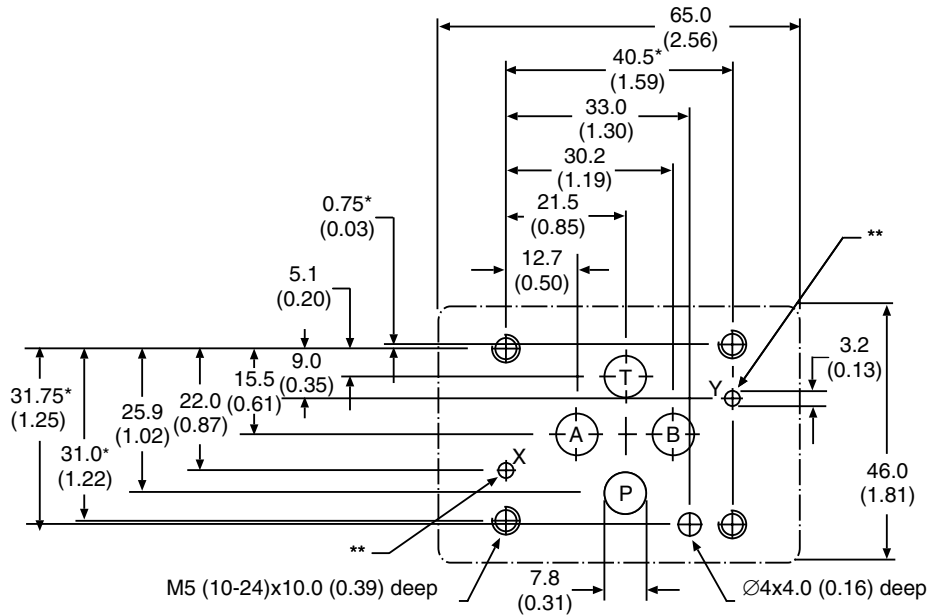
To minimize the exposure to RFI/EMC radiation, electronic equipment should be isolated from sources of high-energy electromagnetic radiation such as cables carrying high currents, radio transmitters, electrical load control centers and contactors.



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

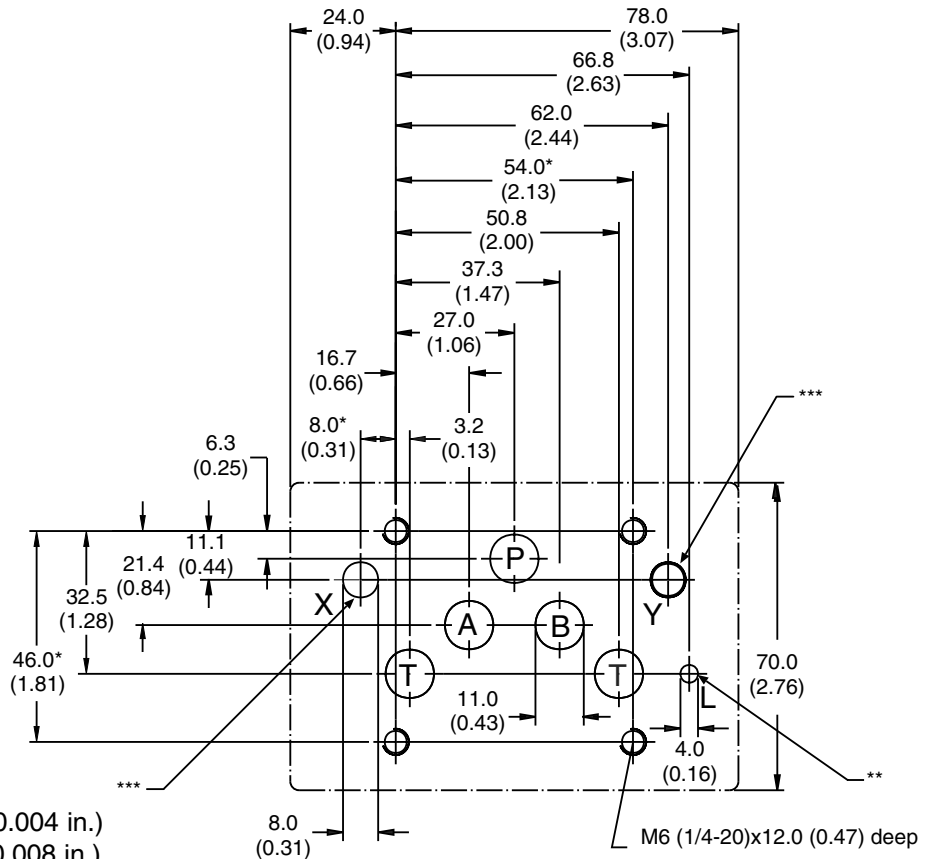
**Size NG6 (NFPA/ISO/CETOP 3)**

mounting pattern per DIN 24340-A6



**Size NG10 (NFPA/ISO/CETOP 5HE)**

mounting pattern per DIN 24340-A6



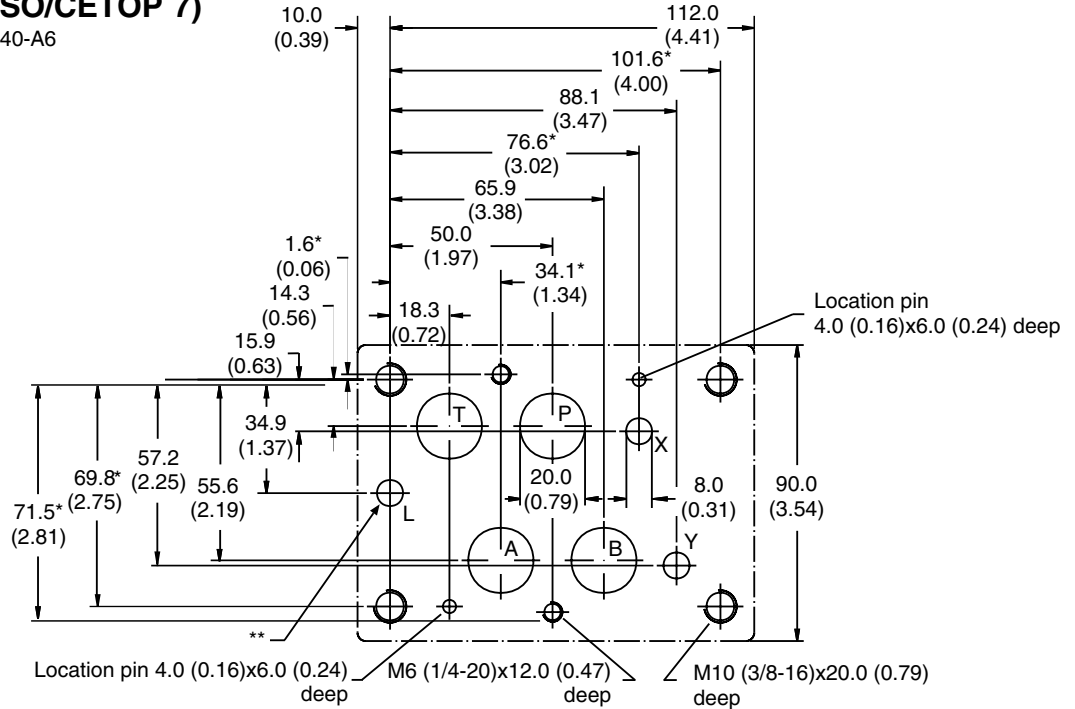
- \* Dimension tolerance  $\pm 0.1$  mm (0.004 in.)  
 All other dimensions  $\pm 0.2$  mm (0.008 in.)
- \*\* Port not used with valves in this catalog
- \*\*\* Ports only used for pilot operated valves

D\_techinfo.p65, dd



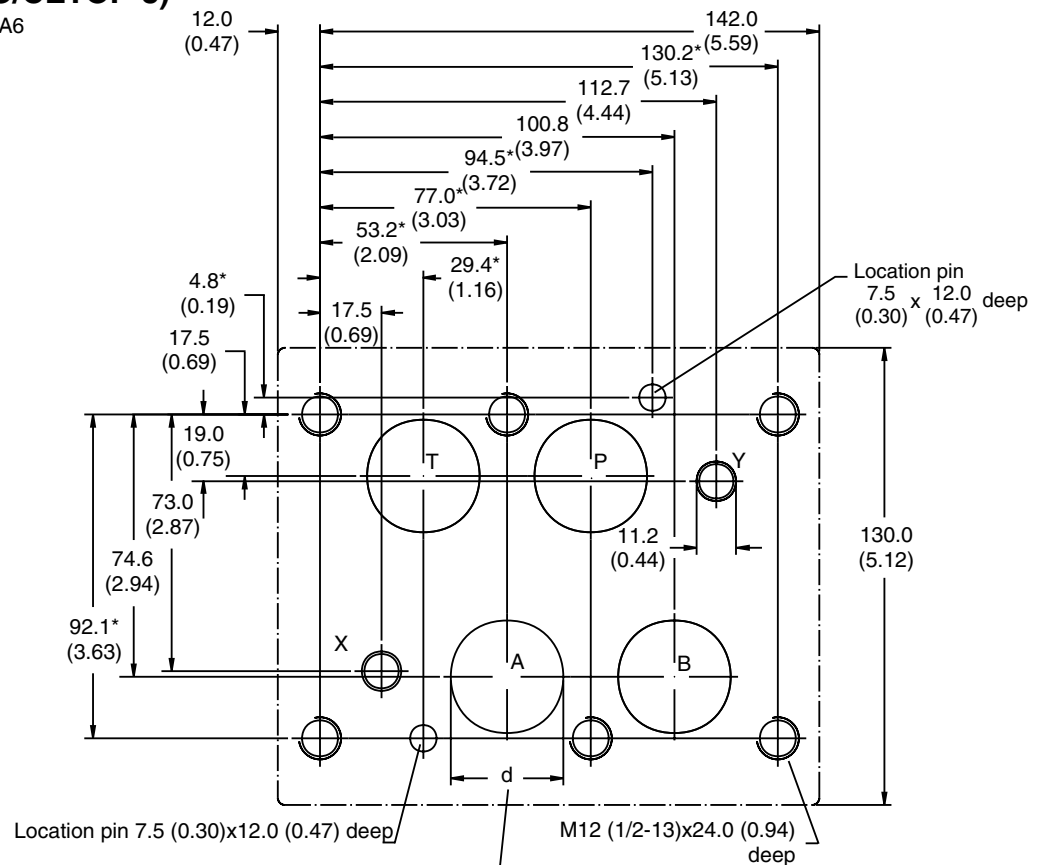
**Size NG16 (NFPA/ISO/CETOP 7)**

mounting pattern per DIN 24340-A6



**Size NG25 (NFPA/ISO/CETOP 8)**

mounting pattern per DIN 24340-A6



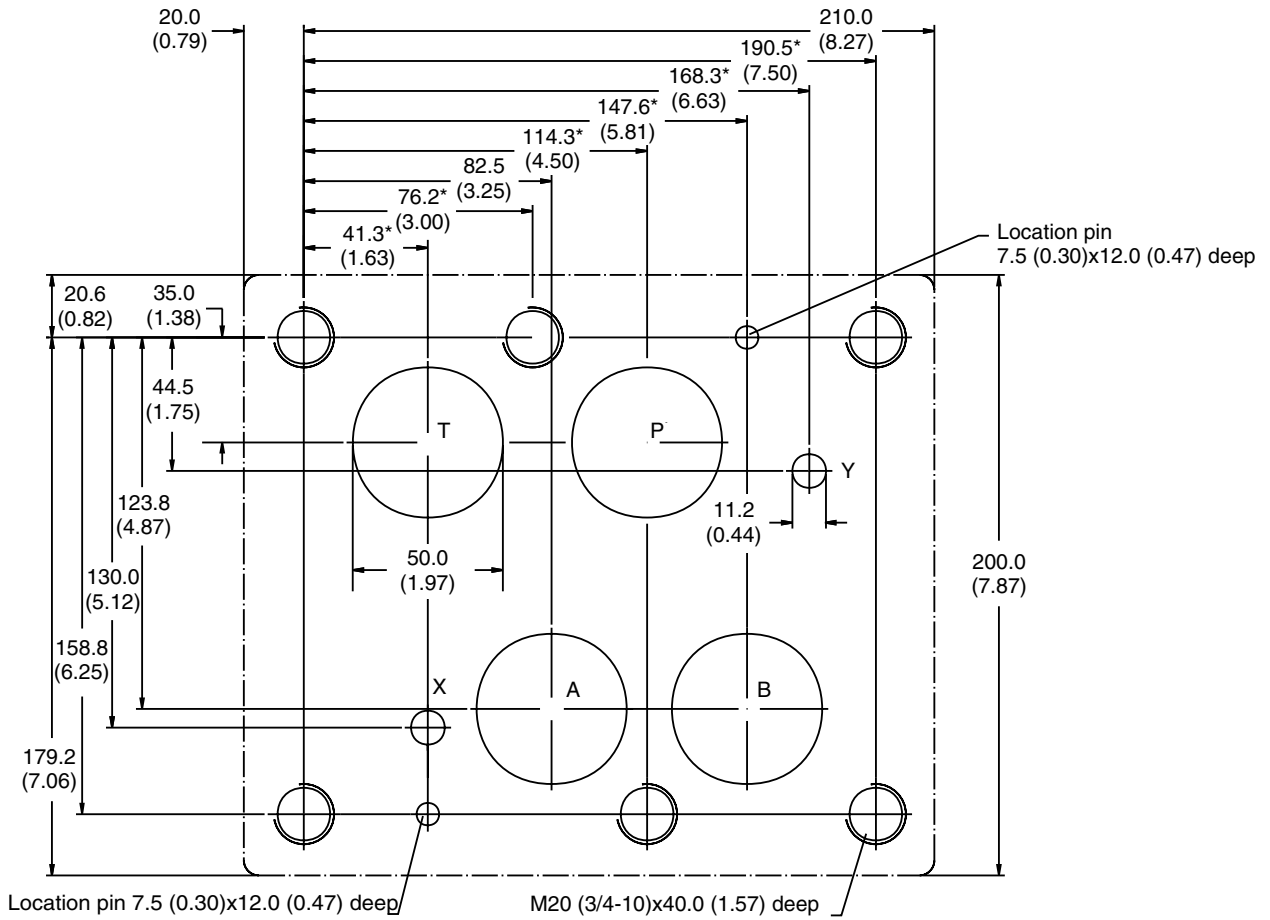
\* Dimension tolerance  $\pm 0.1$  mm (0.004 in.)  
 All other dimensions  $\pm 0.2$  mm (0.008 in.)  
 \*\* Port not used with valves in this catalog

d (A,B,T) series 8:  $\varnothing 27.0$  (1.06)  
 d (P) series 8:  $\varnothing 26.5$  (1.04)  
 d (P,A,B,T) series 9:  $\varnothing 32.0$  (1.26)



**Size NG32 (NFPA/ISO/CETOP 10)**

mounting pattern per DIN 24340-A6



\* Dimension tolerance  $\pm 0.1$  mm (0.004 in.)  
 All other dimensions  $\pm 0.2$  mm (0.008 in.)



**Contents**

Series	Description	Direct Operated	Pilot Operated	Page
	[ size: NG ] [ size: ISO/CETOP ]	6 3	6 10 25 32 3 5 8 10	
	<b><u>with Integrated Electronics</u></b>			
RE06M*T	Proportional Relief Valve	•		B2
RE*T	Proportional Relief Valve		• • •	B6
PE*T	Proportional Reducing Valve	PHASE OUT *	• • •	B13
PC*T	Proportional Reducing with Check Valve	PHASE OUT	• • •	B13
	<b><u>without Integrated Electronics</u></b>			
RE06M*W	Proportional Relief Valve	•		B18
RE*W	Proportional Relief Valve		• • •	B22
PE*W	Proportional Reducing Valve		• • •	B28
DWE	Proportional Reducing Valve	PHASE OUT *	• • •	B32
DWU	Proportional Reducing with Check Valve	PHASE OUT	• • •	B32
VBY*K	Pilot Operated Sequence Valve		• •	B37
VMY*06	Pilot Operated Pressure Reducing Valve		•	B43

**B**

\* Refer to PE\*W

### General Description

Series RE06M\*T proportional pressure relief valves are direct operated proportional solenoid valves with integral control electronics.

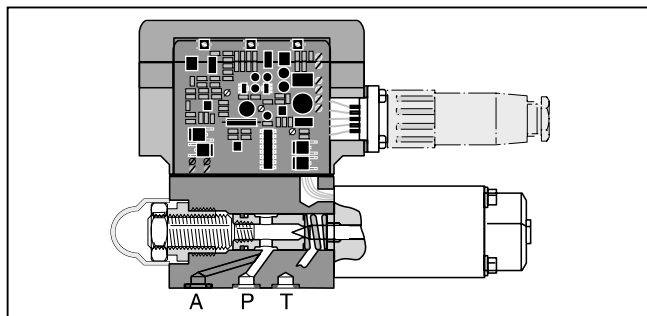
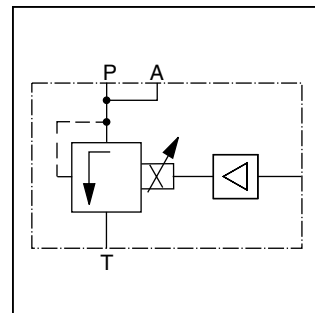
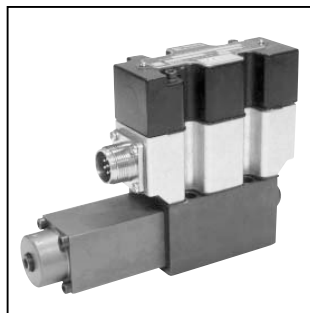
**B**

The power supply voltage and the input command signals are connected via a single seven-pin electrical plug connector. Input command signals can be in the range 0 to 10V or 0 to 20 mA, selected in the valve ordering code. Ramp times for increasing pressure and decreasing pressure can be independently set by two potentiometers.

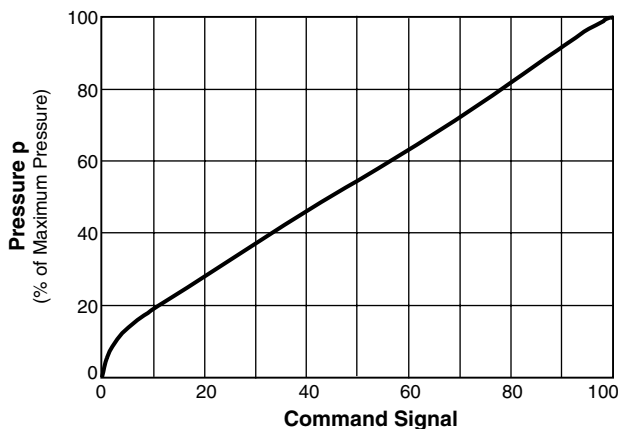
MIN and MAX potentiometers allow the setting of the minimum pressure value and the maximum pressure value. These can be adjusted to scale the pressure range to correspond to the full range of the command input signal. Control chokes are fitted in the pilot valve for the different pressure ranges.

### Features

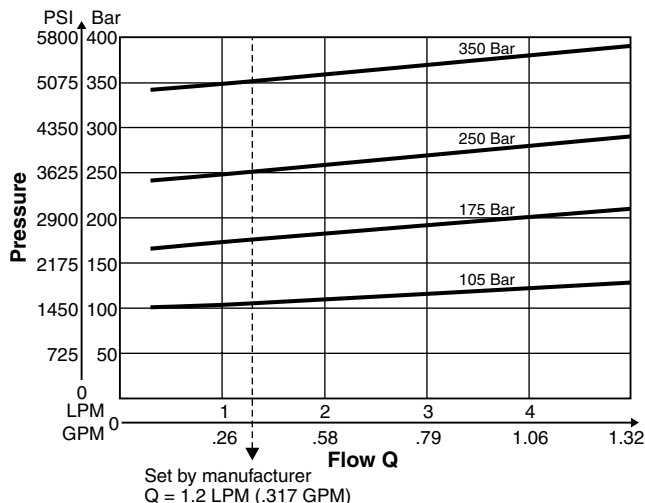
- Standard DIN/ISO interfaces.
- Integrated valve electronics.
- Adjustable electronic ramp control.



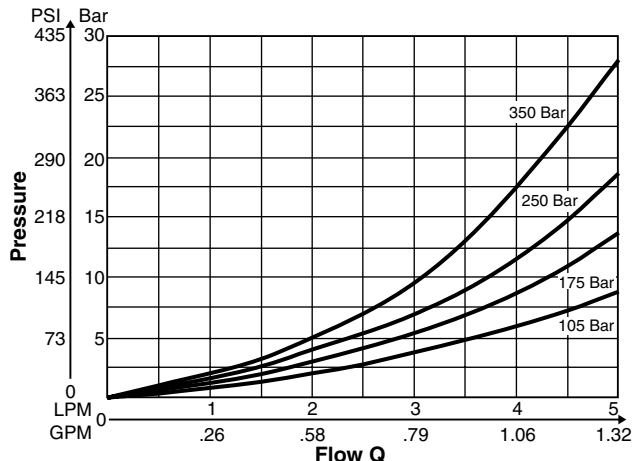
### Command/Pressure Curve



### P/Q Curves



### p<sub>min</sub>/Q Curves



RE06M\_T.p65, dd

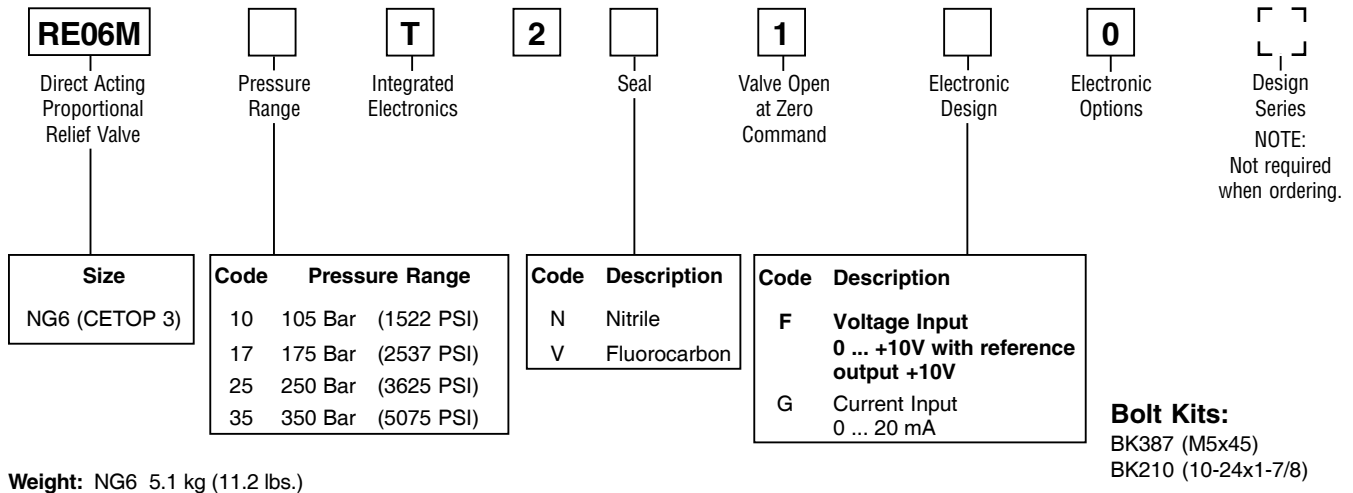


**Specifications**

<b>Interface</b>	DIN ISO/CETOP	NG6 3	<b>Current Consumption</b>	Amps	2.8 maximum
<b>Nominal Flow Q</b>	LPM (GPM)	Up to 3 (0.8)	<b>Command Signal</b> (Impedence) (Select by ordering code)		0 to 10V (10K ohm) 0 to +20mA (500 ohm)
<b>Weight</b>	kg (lbs.)	2.3 (5.1)	<b>Reference Output</b>		+10V, 10 mA max.
<b>Maximum Operating Pressure</b>	Bar (PSI)	Ports P, A; 350 (5075) Tank connection T: not pressurized	<b>Adjustment Range of the Ramp Time</b>		0 to 5s
<b>Adjustment Range</b>	Bar (PSI)	5 to 350 (72.5 to 5075)	<b>Ambient Temperature Range</b>		-40°C to +70°C (-40°F to +158°F)
<b>Mounting Pattern</b>		DIN 24340 Form D ISO 5781 and ISO 6264	<b>Recommended Cable</b>		18 gauge, shielded, up to 15m (50 ft.)
<b>Mounting Orientation</b>		Any	<b>Protection Class</b>		IP54 (NEMA 1)
<b>Supply Voltage Range</b>	VDC	14.5 to 30	<b>7-Pin Plug</b> (Main Connection)		5004072
<b>Ripple in the Supply Voltage</b>	%	5 maximum			



**Ordering Information**

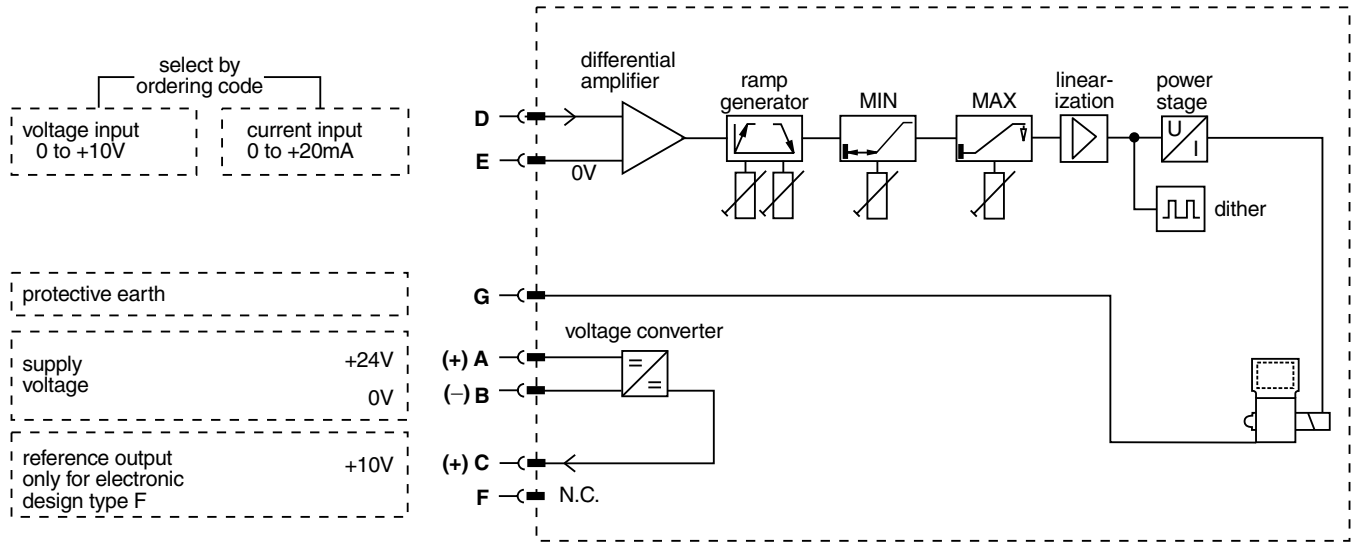


**Bold: Designates Tier I products and options.**

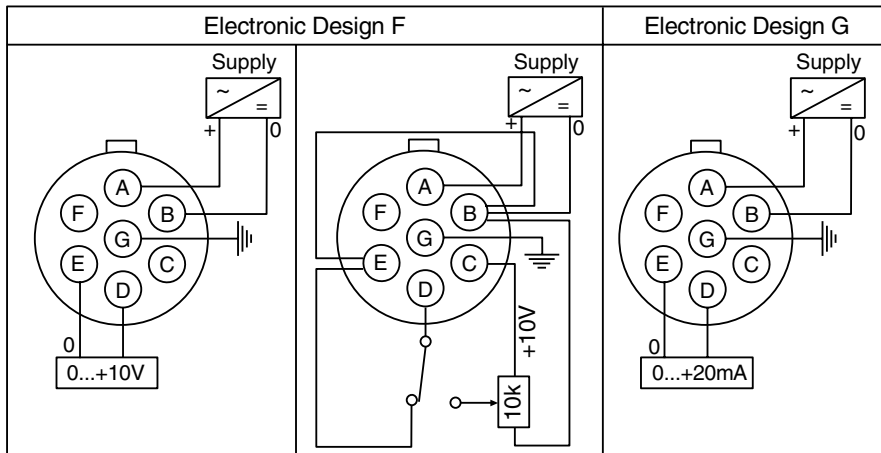
**Non-Bold: Designates Tier II products and options.  
 These products will have longer lead times.**

**Electronics Block Diagram**

**B**



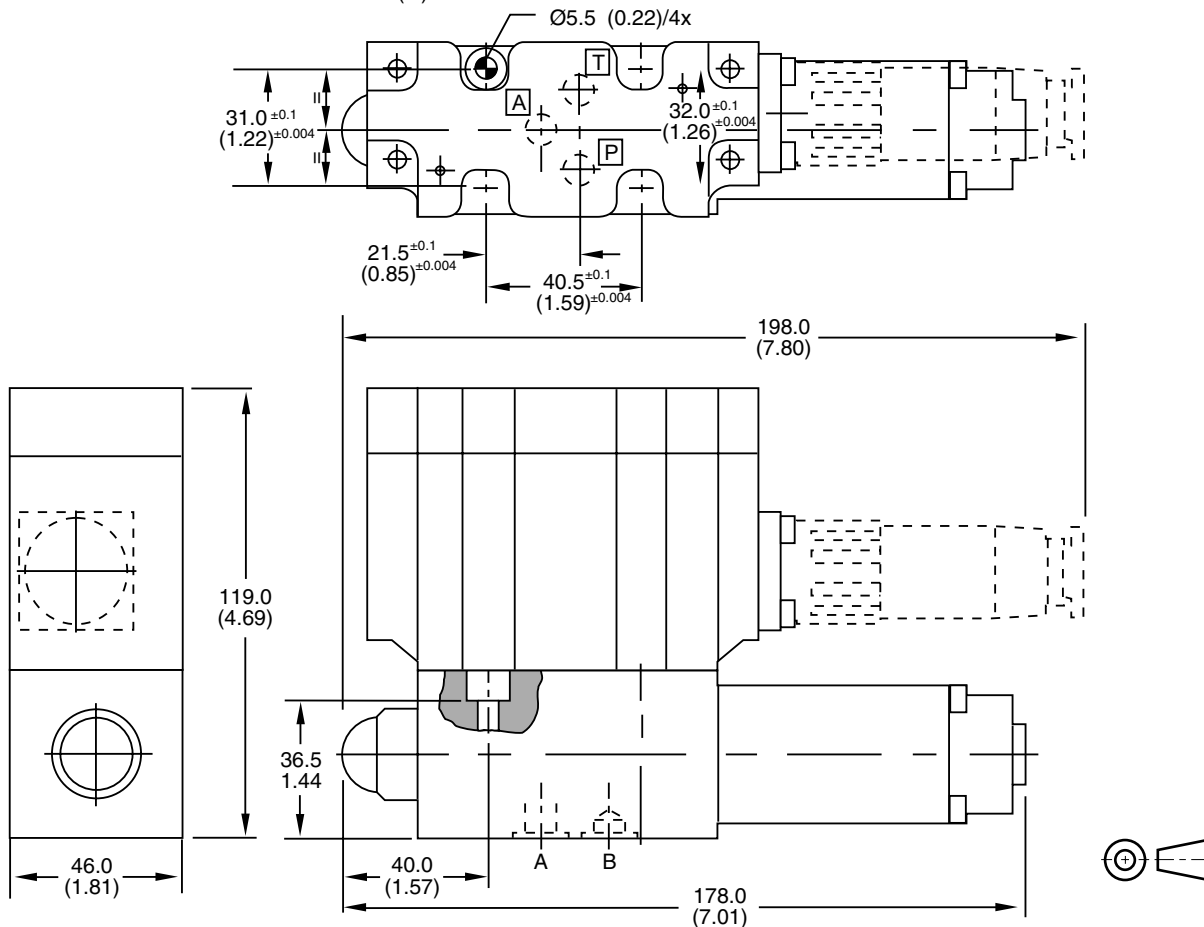
**Connector Wiring Diagram**




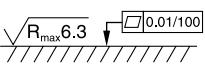


**Note:** As viewed when facing the connector assembled to valve.

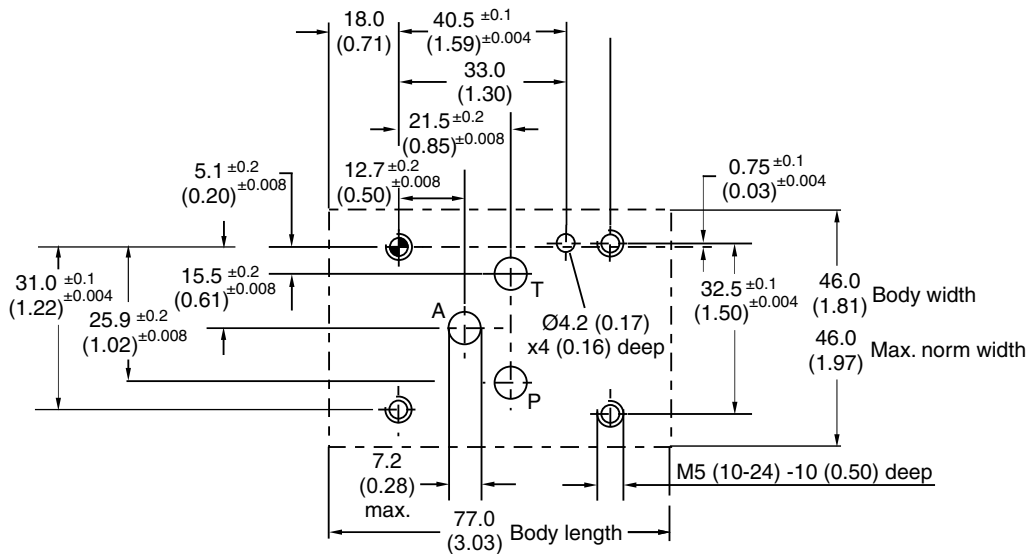
**Dimensions**

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



Surface finish	Bolt kit  DIN912 12.9		NBR  Kit	FPM
	BK387 4xM5x45 BK210 4x10-24x1.875	8.1 Nm	SK-RE06MNT	SK-RE06MVT

**Mounting Pattern ISO 6264-03-04-\*-97**



RE06M\_T.p65, dd



## General Description

Series RE\*T proportional pressure relief valves have a proportional solenoid operated pilot stage with integral control electronics and a DIN NG25 cartridge insert as the main stage.

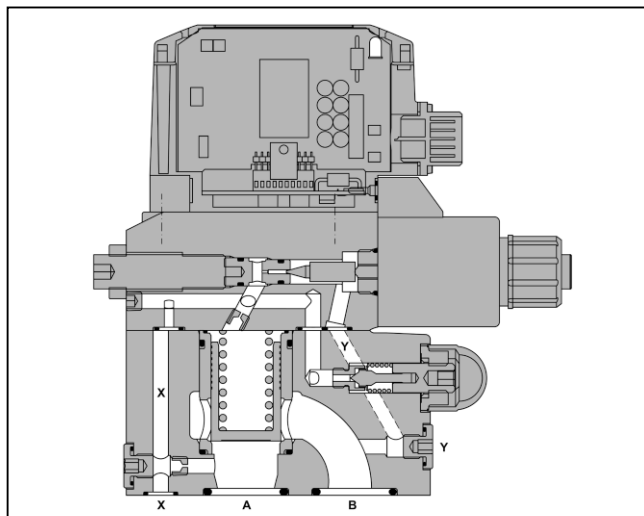
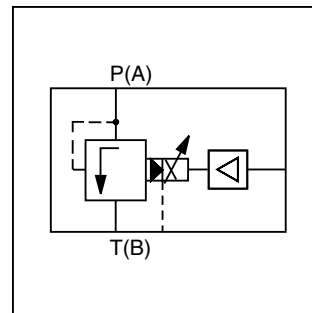
**B**

The power supply voltage and the input command signals are connected via a single seven-pin electrical plug connector. Input command signals can be in the range 0 to 10V or 0 to 20 mA, selected in the valve ordering code. Ramp times for increasing pressure and decreasing pressure can be independently set by two potentiometers.

MIN and MAX potentiometers allow the setting of the minimum pressure value and the maximum pressure value to correspond to the full range of the command input signal. Control chokes are fitted in the pilot valve for the different pressure ranges.

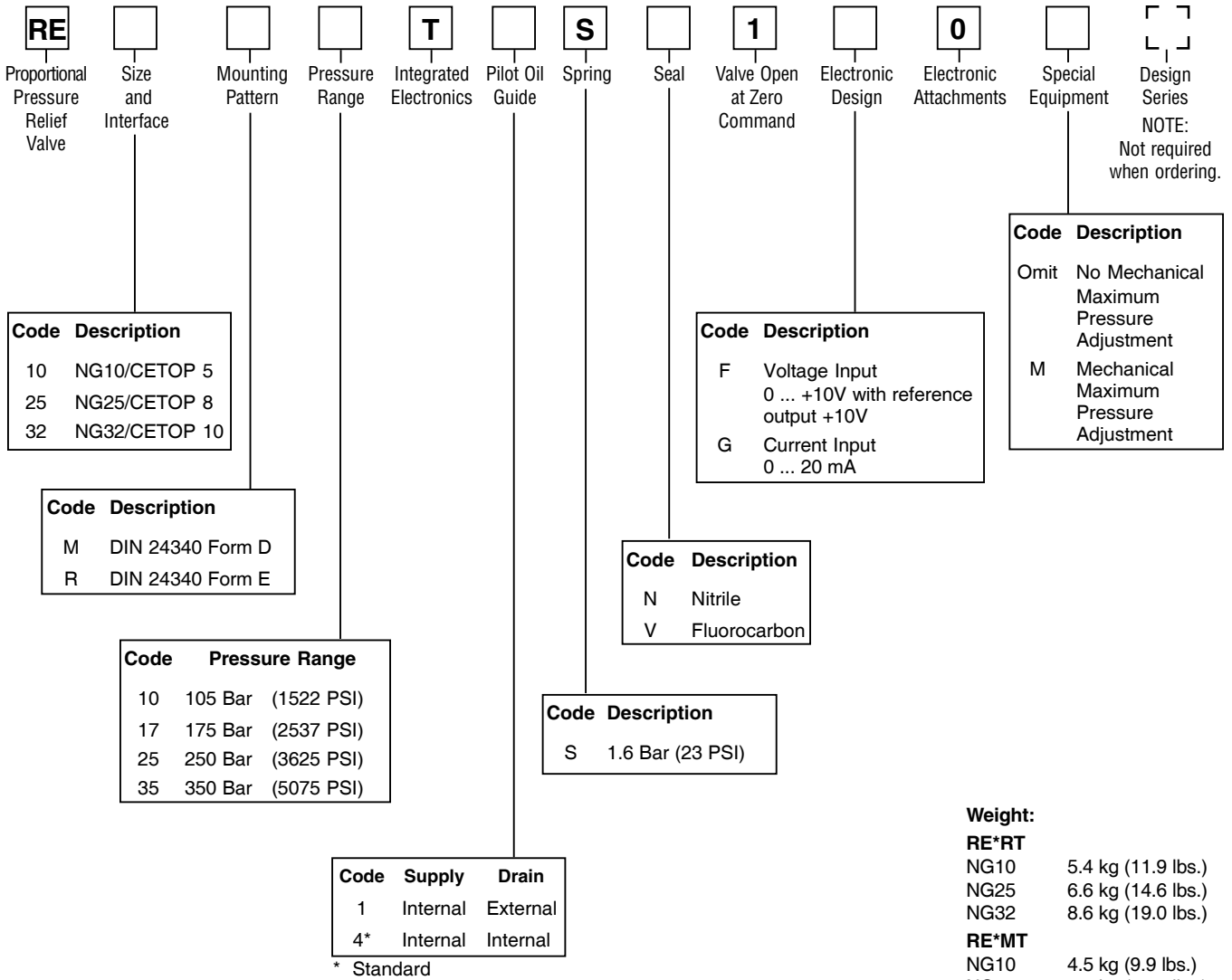
## Features

- Standard DIN/ISO interfaces.
- Mechanical maximum pressure adjustment.

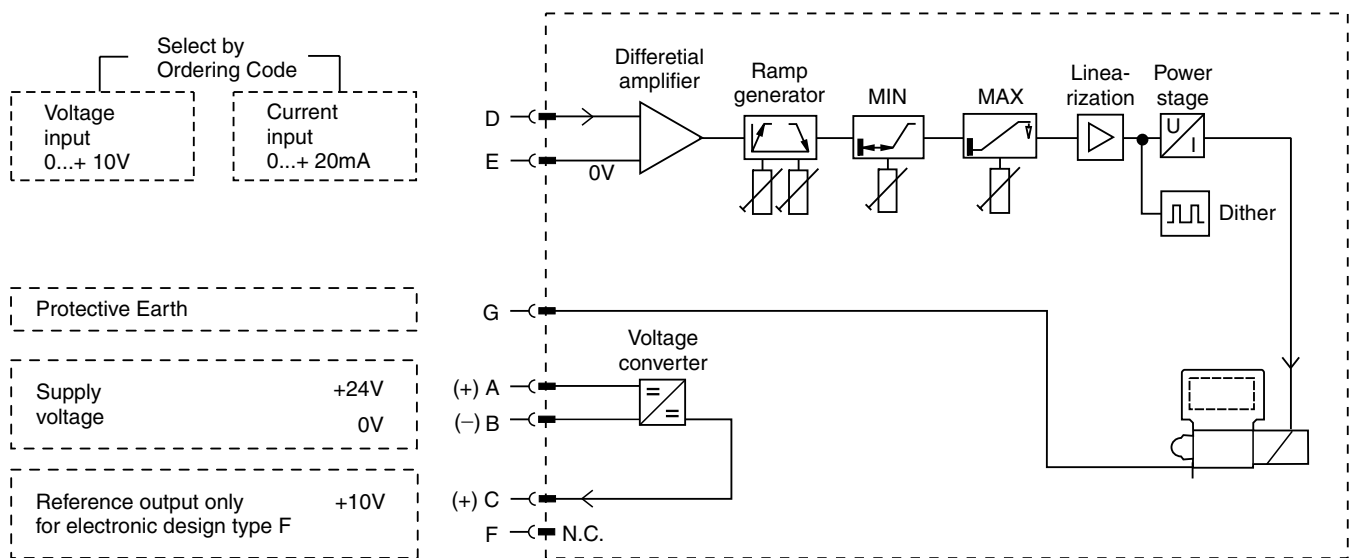


## Specifications

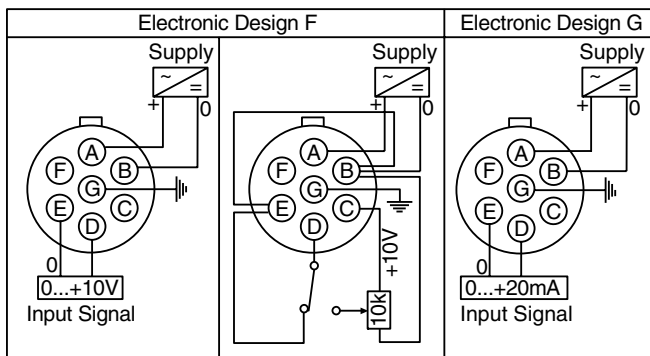
Interface		DIN CETOP	NG10 5	NG25 8	NG32 10
Nominal Flow	LPM (GPM)	RE*RT	Up to 250 (66)	Up to 500 (132)	Up to 650 (171)
		RE*MT	Up to 150 (39.6)	Up to 350 (92)	Up to 650 (171)
Adjustment Range	Bar (PSI)	10 to 350 (145 to 5075)		Reference Output	
Max. Operating Pressure	Port P, A, X T, Y	350 (5075) Not pressurized		Adjustment Range of the Ramp Times	
Mounting Orientation		Any		Ambient Temperature Range	
Supply Voltage Range	VDC	14.5 to 30		Recommended Cable	
Ripple in the Supply Voltage	%	5 maximum		18 Gauge, Shielded, up to 15M (50 ft.)	
Current Consumption	A	2.8 maximum		Protection Class	
Command Signal (Impedence) (Select by ordering code)		0 to 10V (10K ohm) 0 to +20 mA (500 ohm)		7-pin plug (main connection)	
				IP54 (NEMA 1)	
				5004072	



**Electronics Block Diagram**

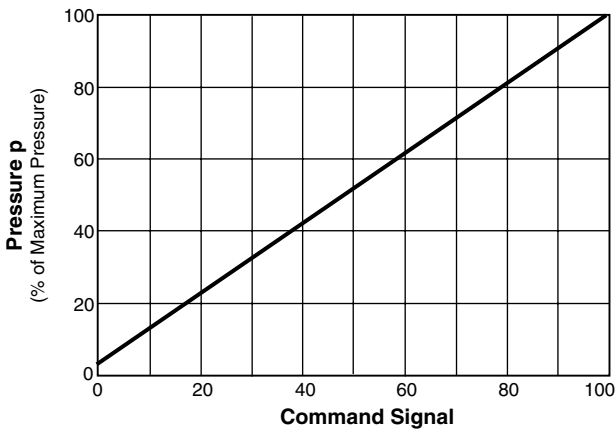


**Connector Wiring Diagram**

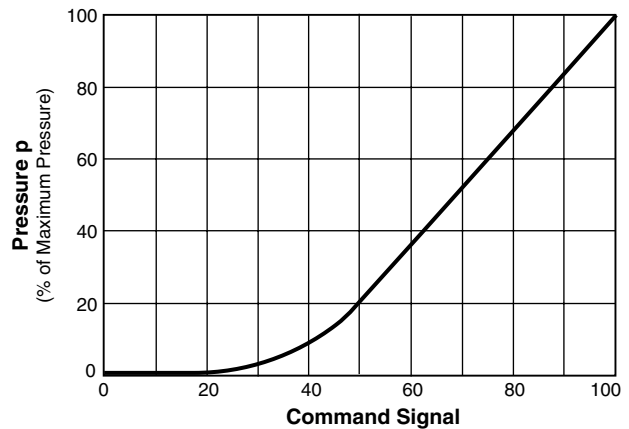


**Performance Curves**

**Command/Pressure Curve RE\*R\*T**

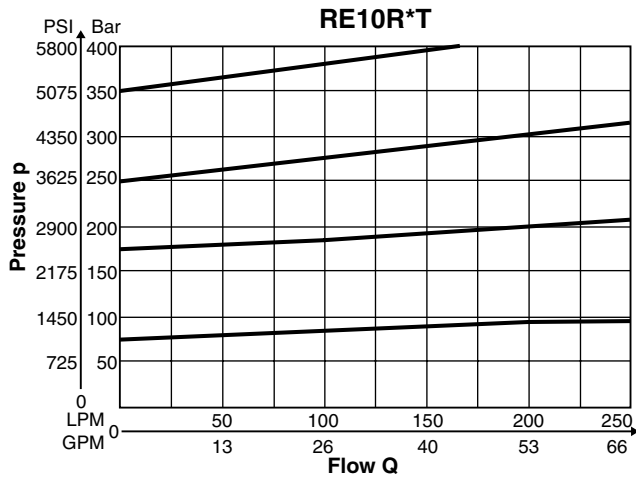


**Command/Pressure Curve RE\*M\*T**

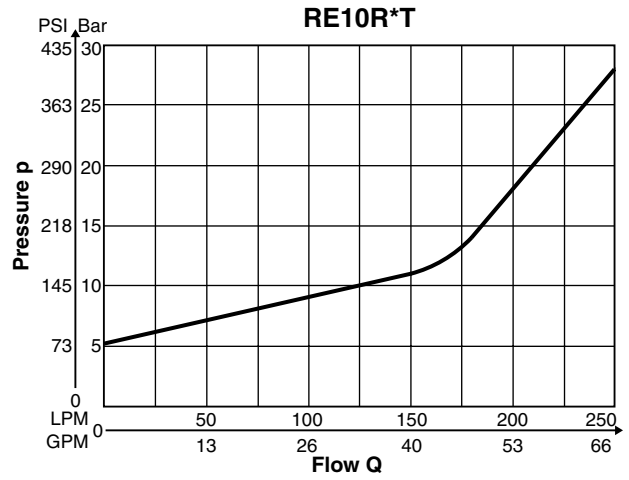




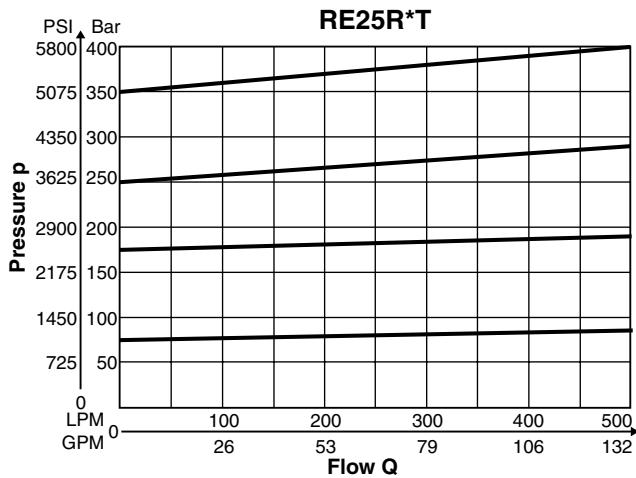
**p/Q Performance Curve RE\*R\*T 1)**



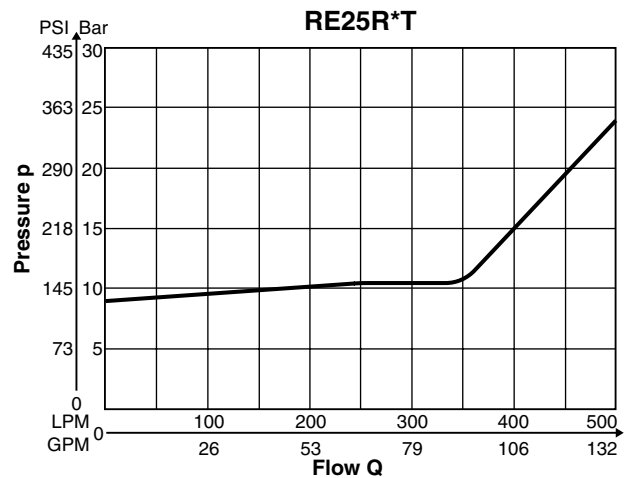
**Minimum Pressure Curve RE\*R\*T 1)**



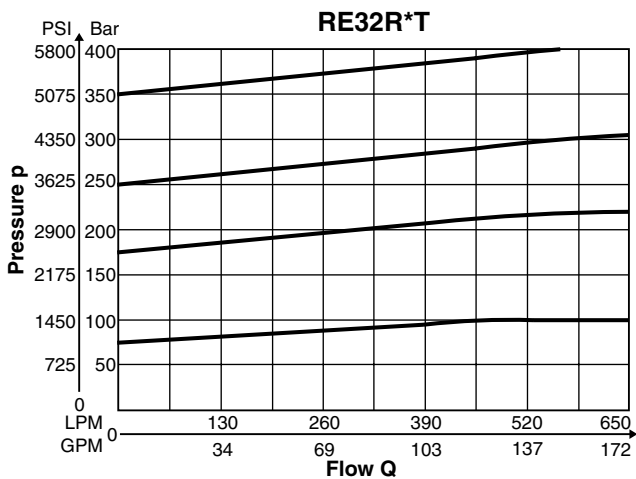
**p/Q Performance Curve RE\*R\*T 1)**



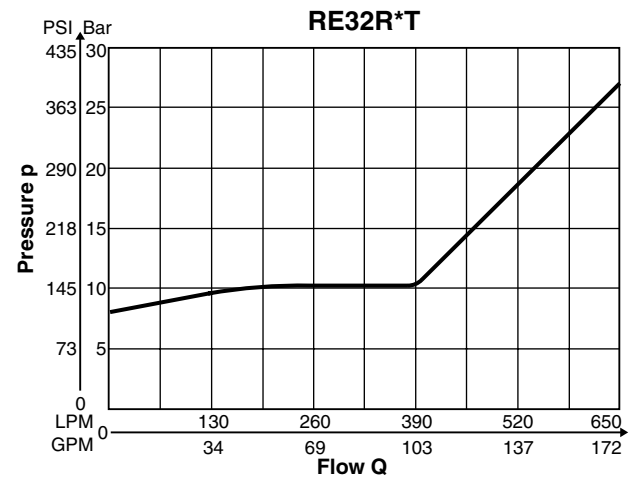
**Minimum Pressure Curve RE\*R\*T 1)**



**p/Q Performance Curve RE\*R\*T 1)**



**Minimum Pressure Curve RE\*R\*T 1)**

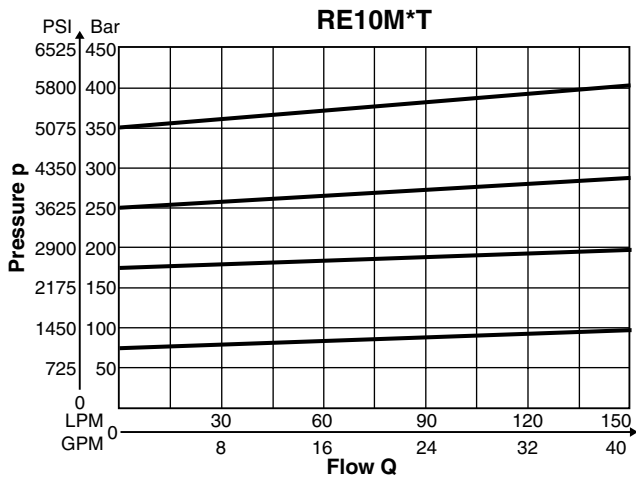


1) The performance curves are measured with external drain.  
 For internal drain the tank pressure has to be added to curve.

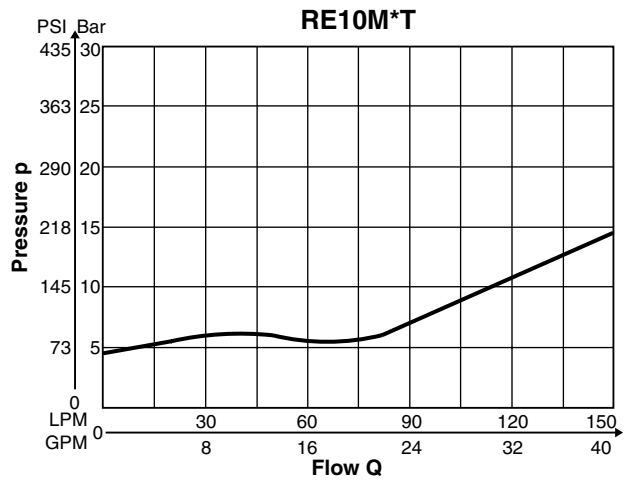


**B**

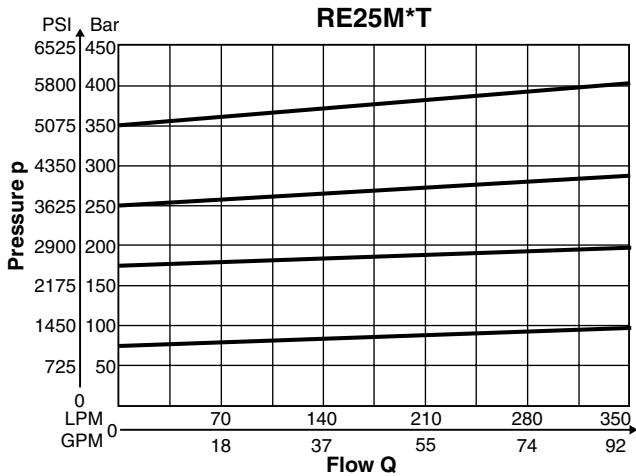
**p/Q Performance Curve RE\*M\*T 1)**



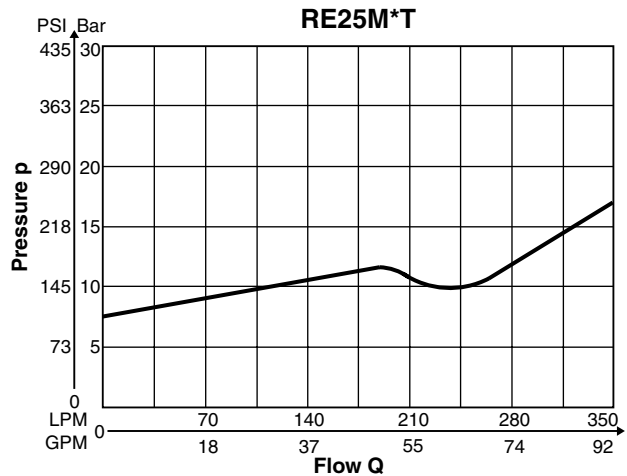
**Minimum Pressure Curve RE\*M\*T 1)**



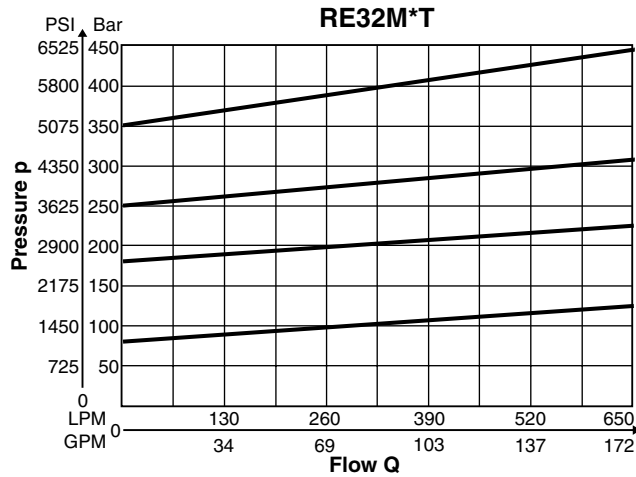
**p/Q Performance Curve RE\*M\*T 1)**



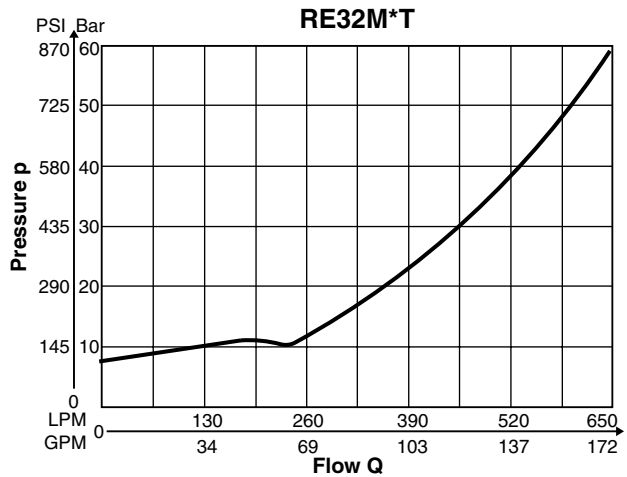
**Minimum Pressure Curve RE\*M\*T 1)**



**p/Q Performance Curve RE\*M\*T 1)**



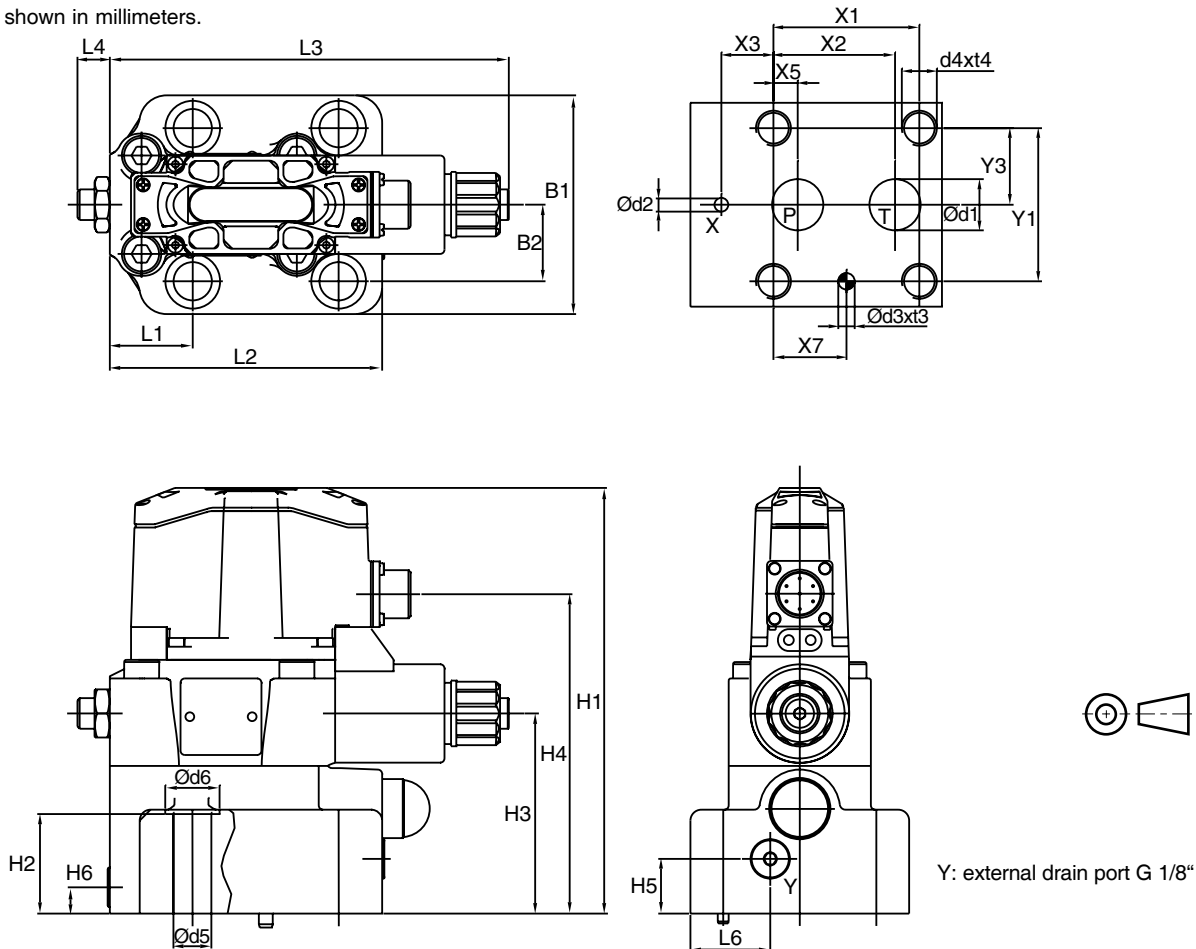
**Minimum Pressure Curve RE\*M\*T 1)**



1) The performance curves are measured with external drain.  
 For internal drain the tank pressure has to be added to curve.

**RE\*R\*T**

Dimensions are shown in millimeters.




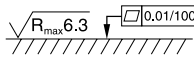


NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	6264-06-09-*-97	53.8	47.5	0	-	22.1	-	22.1	53.8	-	26.9	-	-	-
25	6264-08-13-*-97	66.7	55.6	23.8	-	11.1	-	33.4	70	-	35	-	-	-
32	6264-10-17-*-97	88.9	76.2	31.8	-	12.7	-	44.5	82.6	-	41.3	-	-	-

Tolerance at X and Y pin holes and screw holes ±0.1, at port holes ±0.2.

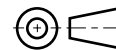
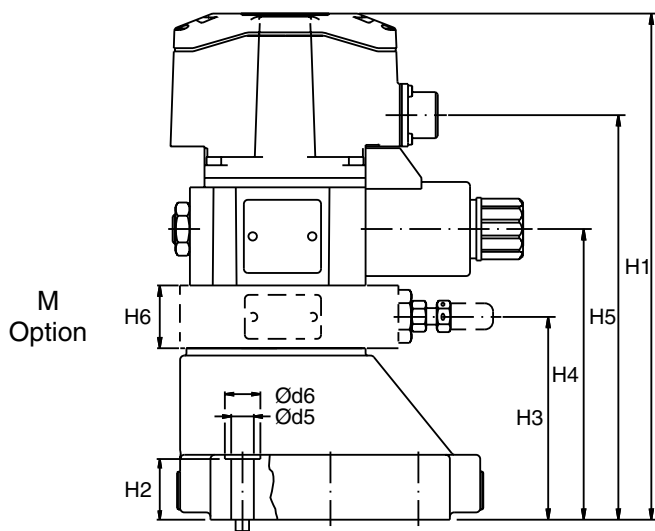
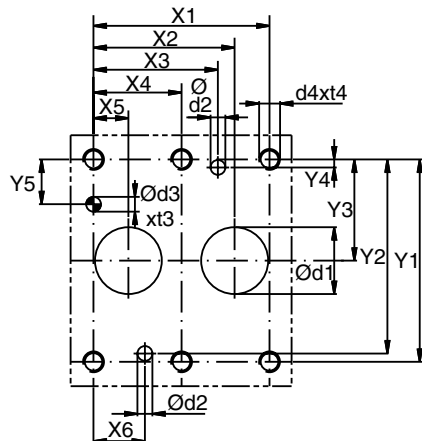
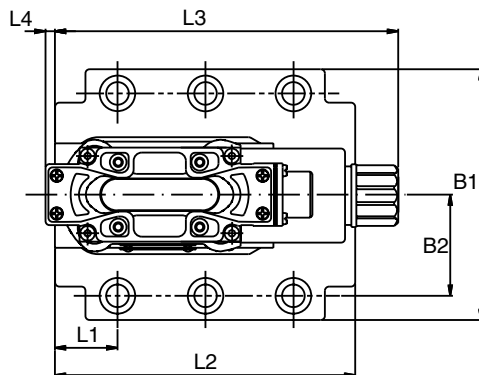
NG	ISO-code	B1	B2	H1	H2	H3	H4	H5	H6	L1	L2	L3	L4	L5	L6
10	6264-06-09-*-97	80	26.9	189.6	27	88	142.5	25	12	52.5	118.5	182.3	14.4	-	36.5
25	6264-08-13-*-97	100	35	193.1	45.5	91.5	146	25	12	37.9	124.5	182.3	14.4	-	36.5
32	6264-10-17-*-97	120	41.3	198.6	52	97	151.5	25	12	45	153	182.3	14.4	-	36.5

NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	6264-06-09-*-97	14.7	4.8	7.5	10	M12	20	13.5	20
25	6264-08-13-*-97	23.4	6.3	7.5	10	M16	27	17.5	25
32	6264-10-17-*-97	32	6.3	7.5	10	M18	28	20	30

NG	ISO-code	Bolt kit  DIN912 12.9		Kit 		Surface finish 
				NBR	FPM	
10	6264-06-09-*-97	BK-M12 x 45-4pcs	115 Nm ±15%	SK-RE10RN50	SK-RE10RV50	$\sqrt{R_{max} 6.3}$ $\square 0.01/100$
25	6264-08-13-*-97	BK-M16 x 70-4pcs	281 Nm ±15%	SK-RE25RN50	SK-RE25RV50	
32	6264-10-17-*-97	BK-M18 x 75-4pcs	398 Nm ±15%	SK-RE32RN50	SK-RE32RV50	

**RE\*M\*T**

Dimensions are shown in millimeters.




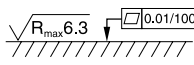


NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	6264-06-09-*-97	42.9	35.8	21.5	-	7.2	21.5	0	66.7	58.8	33.4	7.9	14.3	-
25	6264-08-13-*-97	60.3	49.2	39.7	-	11.1	20.6	0	79.4	73	39.7	6.4	15.9	-
32	6264-10-17-*-97	84.2	67.5	59.5	42.1	16.7	24.6	0	96.8	92.8	48.4	3.8	21.4	-

Tolerance at X and Y pin holes and screw holes ±0.1, at port holes ±0.2.

NG	ISO-code	B1	B2	H1	H2	H3	H4	H5	H6	L1	L2	L3	L4	L5	L6
10	6264-06-09-*-97	87.3	33.35	204.8	21	60	102	156.5	30	28.3	94.1	164.2	4.5	-	-
25	6264-08-13-*-97	105	39.7	231.3	29	86.5	128.5	183	30	34	126.1	164.2	4.5	-	-
32	6264-10-17-*-97	120	48.4	241.8	29	97	139	193.5	30	29.9	143.6	164.2	4.5	-	-

NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	6264-06-09-*-97	15	7	7.1	8	M10	16	10.8	17
25	6264-08-13-*-97	23.4	7.1	7.1	8	M10	18	10.8	17
32	6264-10-17-*-97	32	7.1	7.1	8	M10	20	10.8	17

NG	ISO-code	Bolt kit  DIN912 12.9		Kit 		Surface finish 
				NBR	FPM	
10	6264-06-09-*-97	BK-M10 x 35-4pcs	68 Nm	SK-RE10MN50	SK-RE10MV50	
25	6264-08-13-*-97	BK-M10 x 45-4pcs	68 Nm	SK-RE25MN50	SK-RE25MV50	
32	6264-10-17-*-97	BK-M10 x 45-6pcs	68 Nm	SK-RE32MN50	SK-RE32MV50	

**General Description**

Series PE and PC proportional pressure reducing valves have a proportional solenoid operated pilot stage and sliding spool main stage.

The power supply voltage and input command signals are connected via a single seven-pin electrical plug connector. Input command signals can be in the range 0 to 10V or 0 to 20mA, selected in the valve ordering code. Ramp times for increasing and decreasing pressure can be independently set by two potentiometers.

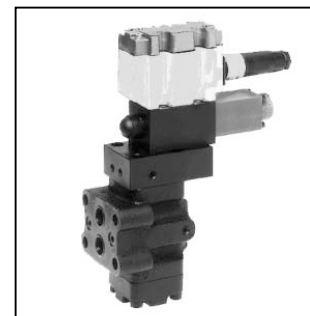
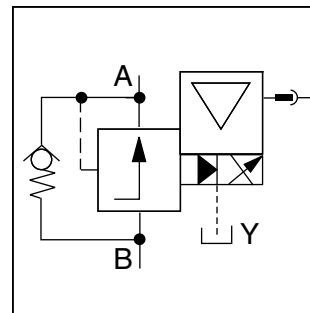
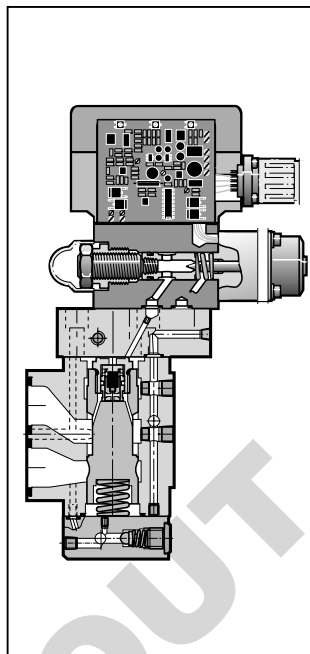
MIN and MAX potentiometers allow the setting of the minimum pressure and the maximum pressure. These can be adjusted to scale the pressure range to correspond to the full range of the command input signal.

**Features**

- Standard DIN/ISO interfaces.
- Integrated valve electronics.
- Optional reverse flow check valve.

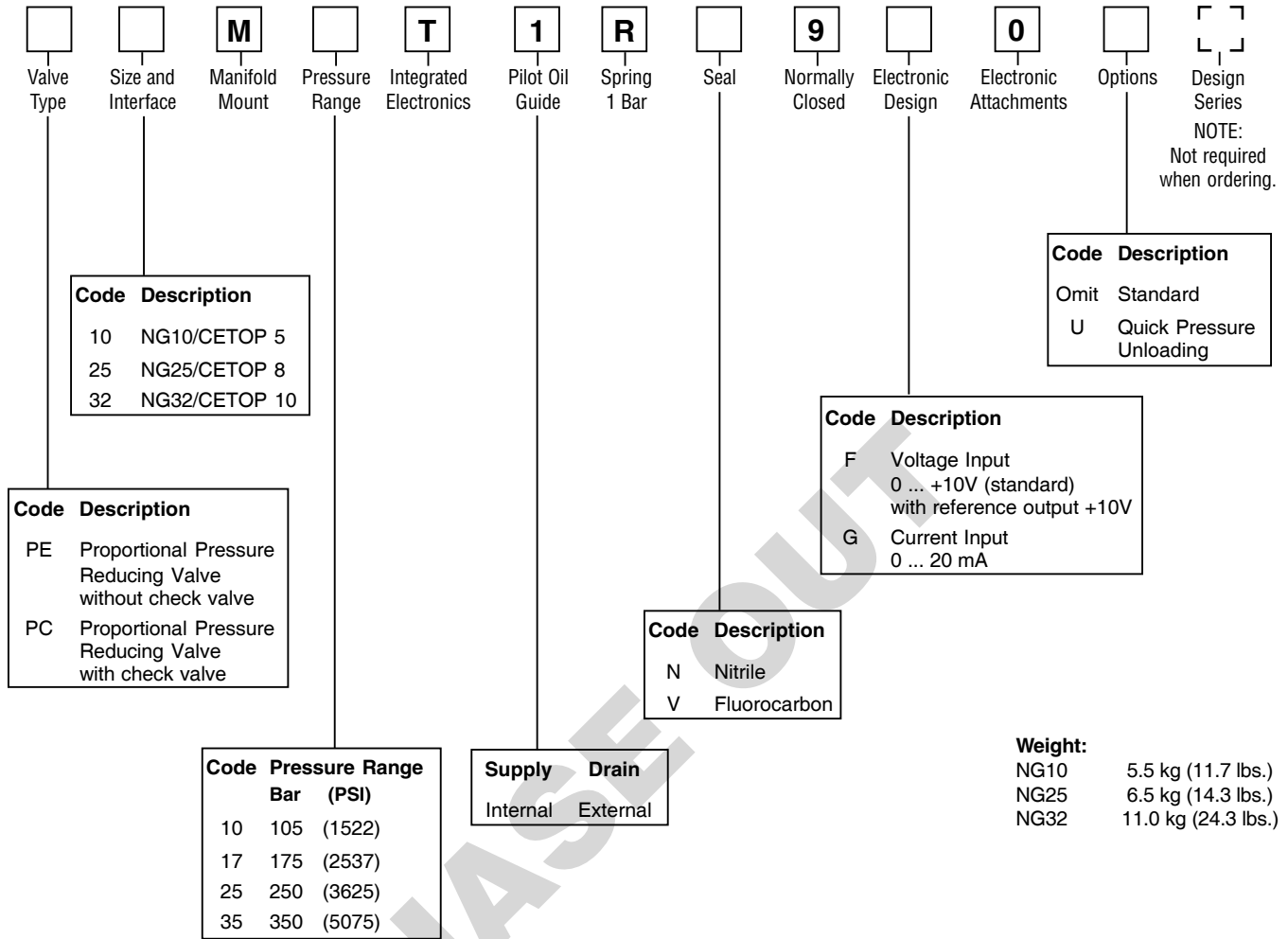
**Specifications**

Interface	DIN ISO/CETOP	NG10 5	NG25 8	NG32 10
Nominal Flow Q	LPM (GPM)	150 (40)	250 (66)	350 (92)
Weight	kg (lbs.)	5.5 (11.7)	6.5 (14.3)	11.0 (24.3)
Maximum Operating Pressure	Bar (PSI)	Pressure port A, B: 350 (5075); Tank connection Y: not pressurized	Command Signal (Impedence) (Select by ordering code)	0 to 10V (10K ohms) 0 to 20 mA (500 ohms)
			Reference Output	+10V/max. 10 mA
Adjustment Range	Bar (PSI)	10 to 350 (150 to 5075)	Adjustment Range of the Ramp Time	0 to 5 S
Mounting Pattern		DIN 24340 Form D ISO 5781 and ISO 6264	Ambient Temperature Range	-40°C to +70°C (-40°F to +158°F)
Mounting Orientation		Any	Recommended Cable	18 gauge, shielded, up to 15m (50 ft.)
Supply Voltage Range	VDC	14.5 to 30	Protection Class	IP54 (NEMA 1)
Ripple in the Supply Voltage	%	5 maximum	7-Pin Plug (Main Connection)	5004072
Current Consumption	Amps	2.8 maximum		



**B**

**B**

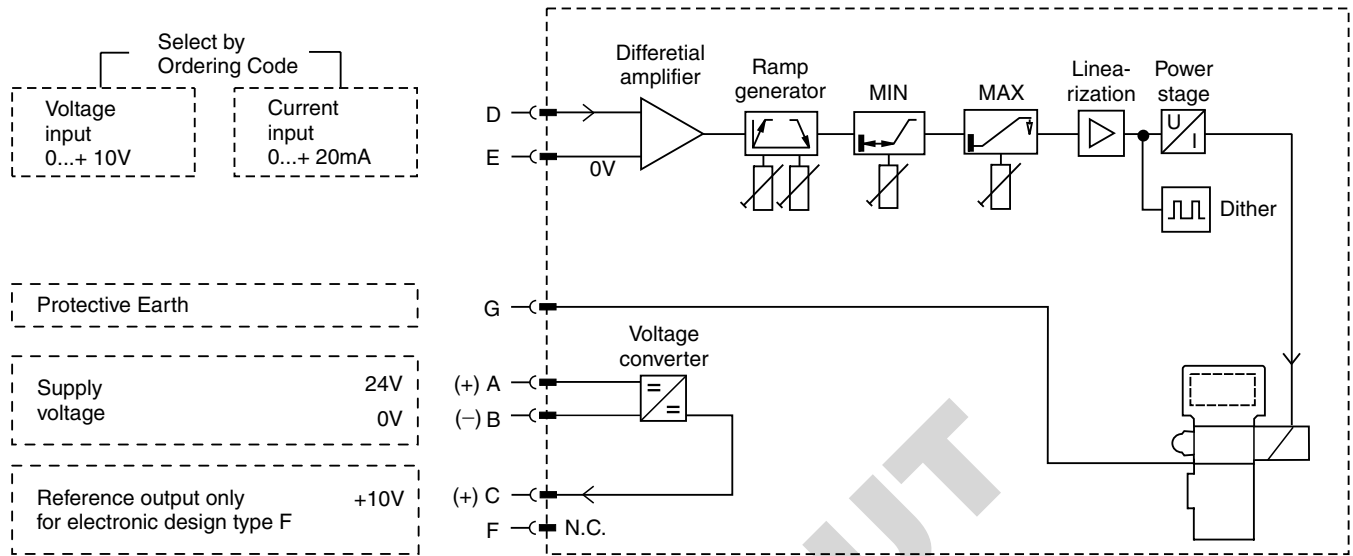


**Accessories**

Nominal Size	Subplate	Bolt Kit	Bolt (Quantity) Size	Tightening Torque (Nm)	Sealing Kits	
					Nitrile	Fluorocarbon
NG10	SPP3M6B910	BK389	(4x) M10x50	65	SK-PE10MN10	SK-PE10MV10
NG25	SPP6M8B910	BK485	(4x) M10x45	65	SK-PE25MN10	SK-PE25MV10
NG32	SPP10M12B910	BK390	(6x) M10x50	65	SK-PE32MN10	SK-PE32MV10

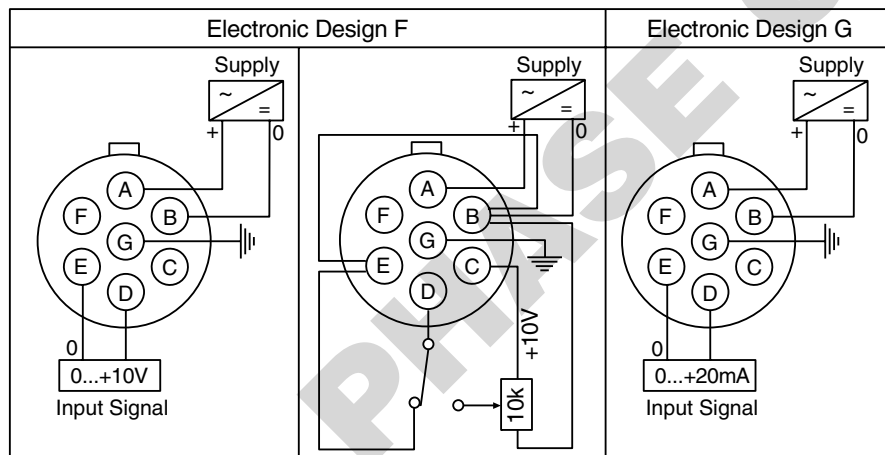
**For new applications:  
 PE\*T: Refer to PE\*W  
 PC\*T: Consult Factory**

**Electronics Block Diagram**



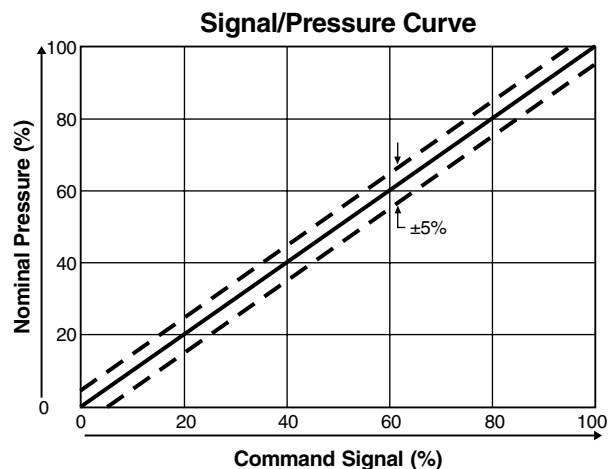
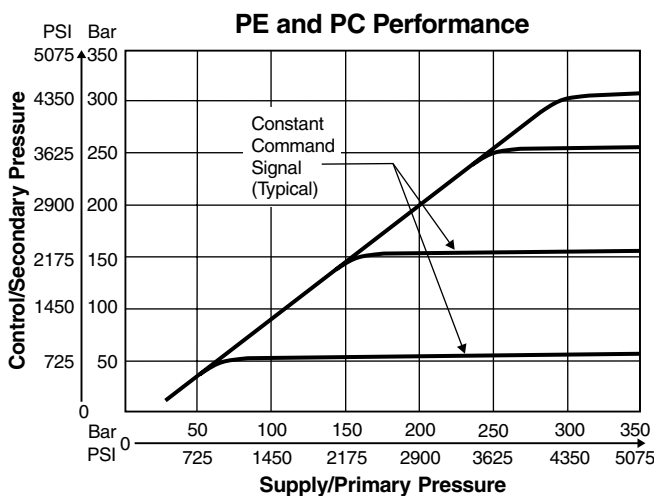
**B**

**Connector Wiring Diagram**



**Note:** As viewed when facing the connector assembled to valve.

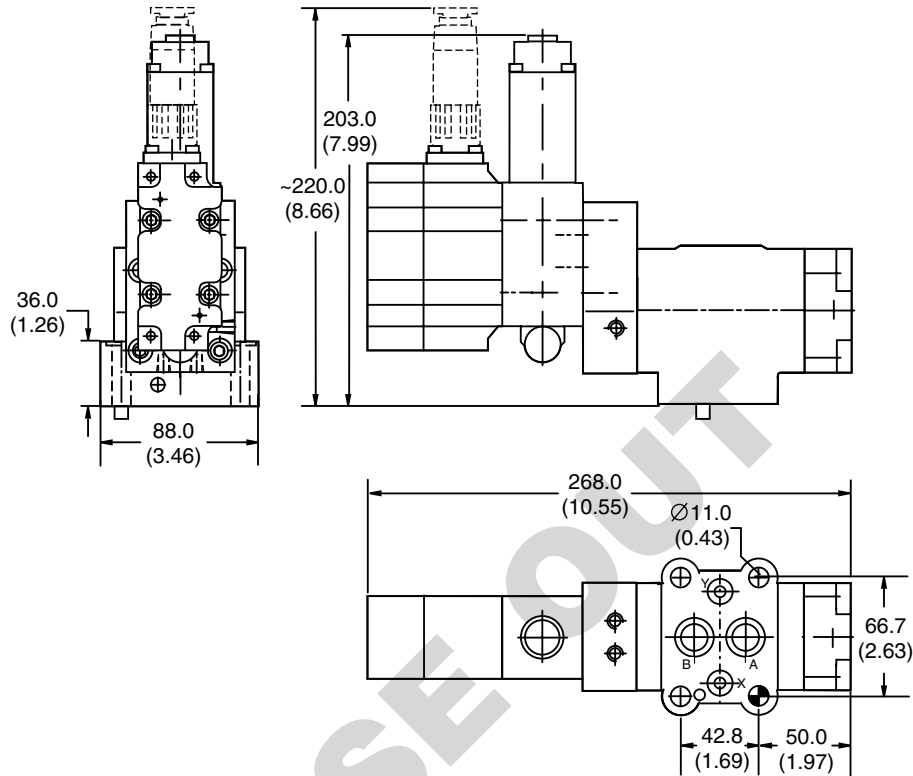
**Performance Curves**



PE-PC.p65, dd

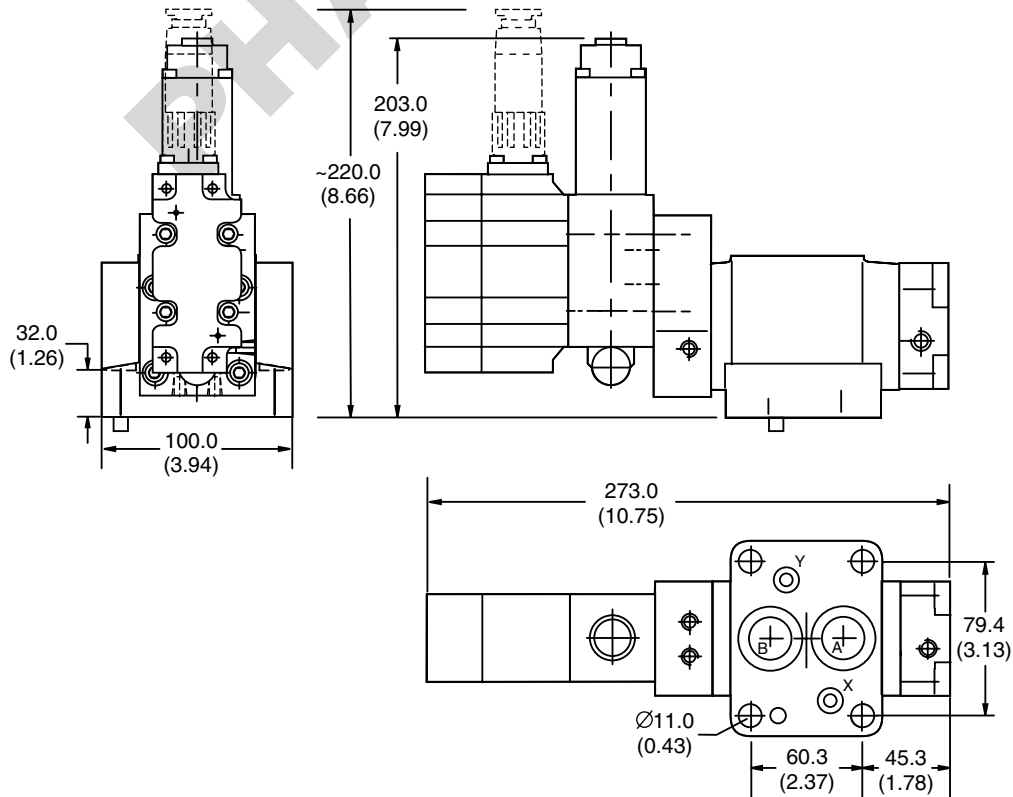
**PE and PC10M**

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



**PE and PC25M**

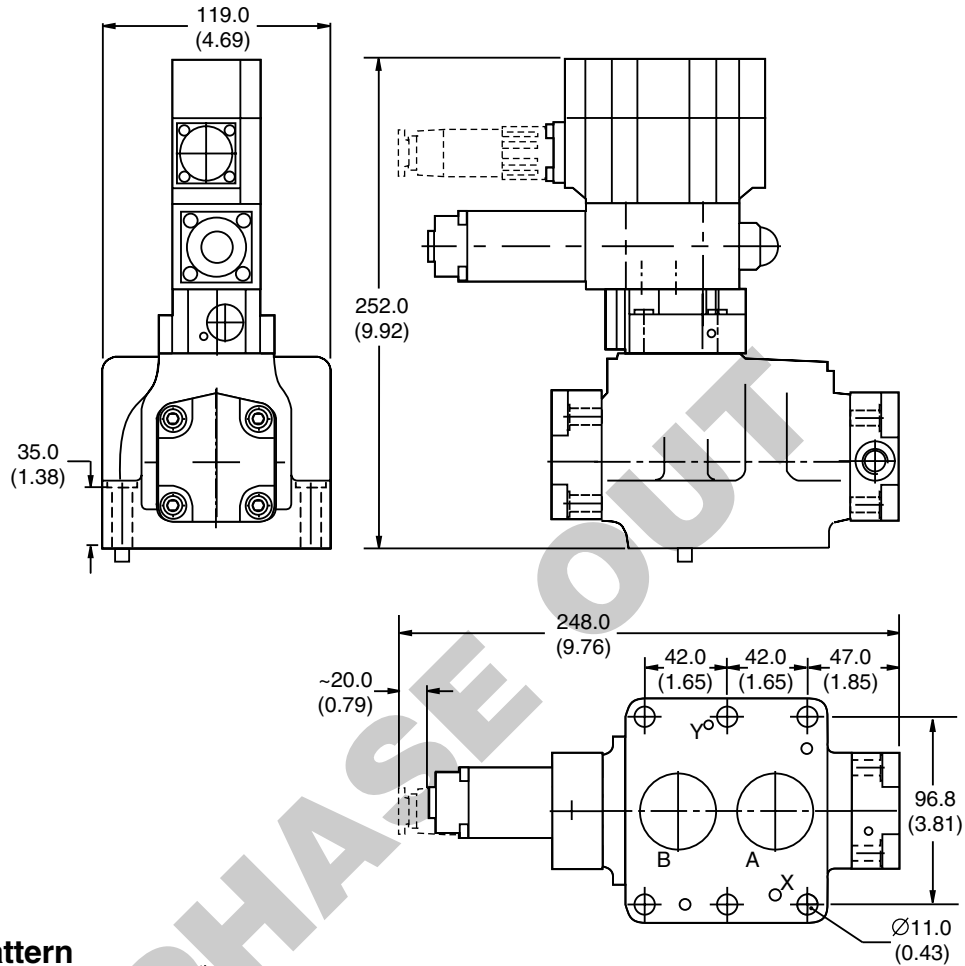
Inch equivalents for millimeter dimensions are shown in (\*\*)



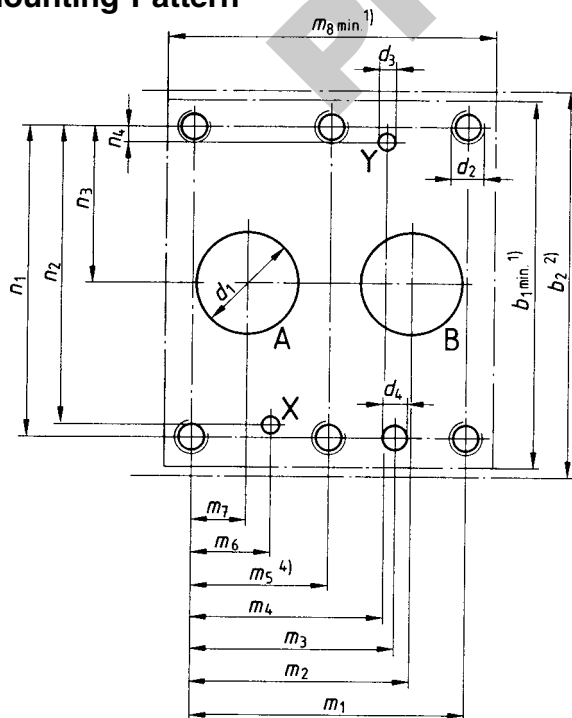


**Dimensions**

**PE and PC32M** Inch equivalents for millimeter dimensions are shown in (\*\*)



**Mounting Pattern**



Nominal Size	d1 max.	d2	d3 ±0.2	d4 H12	b1 min.	b2 max.	m1 ±0.2	m2 ±0.2	m3 ±0.2
10	14.7 (0.92)	M10	4.8 (0.19)	7.5 (0.30)	84.0 (3.31)	92.0 (3.62)	42.9 (1.69)	35.7 (1.41)	31.8 (1.25)
25	23.4 (0.92)	M10	4.8 (0.19)	7.5 (0.30)	97.0 (3.82)	105.0 (4.31)	60.3 (2.37)	49.2 (1.94)	44.5 (1.75)
32	32.0 (0.92)	M10	4.8 (0.19)	7.5 (0.30)	114.0 (4.49)	10.0 (0.39)	84.1 (3.31)	67.5 (2.66)	62.7 (2.47)

Nominal Size	m4 ±0.2	m5 ±0.2	m6 ±0.2	m7 min.	m8 min.	n1 ±0.2	n2 ±0.2	n3 ±0.2	n4 ±0.2
10	21.4 (0.84)	-	21.4 (0.84)	7.1 (0.28)	61.0 (2.40)	66.7 (2.63)	58.7 (2.31)	33.3 (1.31)	7.9 (0.31)
25	39.7 (1.56)	-	20.6 (0.81)	11.1 (0.44)	78.0 (3.07)	79.4 (3.13)	73.0 (2.87)	39.7 (1.56)	6.4 (0.25)
32	59.6 (2.35)	42.1 1.66	24.6 (0.97)	16.7 (0.66)	102.0 (4.02)	96.8 (3.81)	92.9 (3.66)	48.8 (1.92)	4.0 (0.16)

### General Description

Series RE06M\*W proportional relief valves are direct operated single solenoid valves. Control pressure is proportional to solenoid current when used in conjunction with a PCD00A-400 series or equivalent electronic driver card.

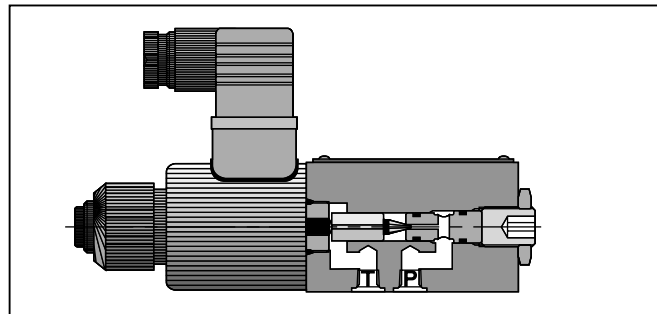
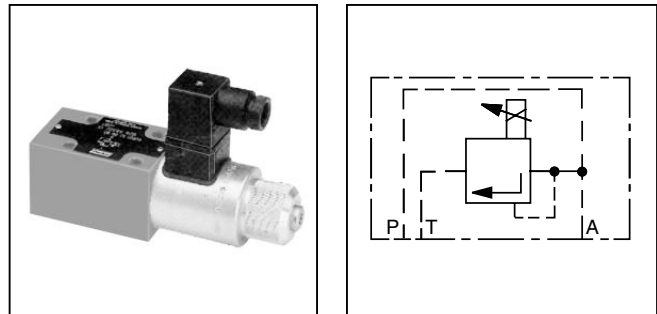
**B**

RE06\*W valve performance is characterized by very low hysteresis and excellent repeatability. Typical applications include precise control of hydraulic pressure with relatively low flow requirements and as a pilot for larger pressure control valves or as a variable pump pressure control.

The RE06\*W proportional relief valve supersedes and is a direct replacement for the DSA-P07 relief valve (select the "X" coil option). Note that a shorter bolt kit is required if field replacing a DSA-P07 valve (refer to ordering code page for appropriate Bolt kits).

### Features

- Standard DIN/ISO/CETOP/NFPA interface.
- Very low hysteresis.
- Excellent repeatability.
- Very low minimum pressure capability.
- Flows up to 5 LPM (1.3 GPM).
- Four pressure ranges available.



### Specifications

General		Hydraulic	
<b>Design</b>	Seated Valve	<b>Operating Pressure</b>	Ports P and A: up to 350 (5075) Port T: up to 210 (3045)
<b>Mounting Pattern</b>	DIN 24340, form A, ISO 6264/CETOP 3	<b>Pressure Range</b>	105, 175, 250, 350 (1522, 2538, 3625, 5075)
<b>Mounting Position</b>	As desired, horizontal mounting recommended	<b>Fluid Temperature</b>	Maximum 80°C (176°F)
<b>Mounting Style</b>	Subplate	<b>Fluid Viscosity, Recommended</b>	80-1000 SSU
<b>Ambient Temperature</b>	-20°C to 70°C (-4°F to +158°F)	<b>Fluid Cleanliness Level</b>	ISO Class 16/15
<b>Electrical</b>		<b>Flow Rate</b>	see performance curves
<b>Voltage</b>	VDC 12 (Coil "K"), 16 (Coil "X")	<b>Linearity</b>	2.8%
<b>Nominal Operating Maximum</b>	Amps 2.5 (Coil "K"), 1.3 (Coil "X")	<b>Repeatability</b>	< ±1%
<b>Coil Resistance</b>	4 Ohm at 20°C (68°F) (Coil K) 11.5 Ohm at 20°C (68°F) (Coil X)	<b>Hysteresis</b>	±1.5% of p <sub>max</sub>
<b>Duty Cycle</b>	100%	* Plug must be ordered separately	
<b>Electrical Connection</b>	Plug connector 692915* according to DIN 43650/2 pole + PE/Pg11		
<b>Protection Class</b>	IP65 (NEMA 4)		
<b>Amplifier Types</b>	PCD00A-400 Series		
<b>Dither - Recommended</b>	270Hz, 120 mA		

RE06\_W.p65, dd



**Ordering Information**

<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"><b>RE06M</b></div> <p>Proportional Pressure Relief Valve</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Pressure Range</p>	<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"><b>W</b></div> <p>Offboard Electronics</p>	<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"><b>2</b></div>	<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"><b>V</b></div> <p>Seal</p>	<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"><b>1</b></div> <p>Valve Open at Zero Command</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Solenoid Type</p>	<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"><b>W</b></div> <p>Electronic Connection</p>	<div style="border: 1px dashed black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Design Series NOTE: Not required when ordering.</p>																							
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Bolt Kit	Qty	Size																													
BK209	4	10-24 X 1.25"																													
BK375	4	M5 x 30mm																													

Weight: 1.8 kg (4.0 lbs.)

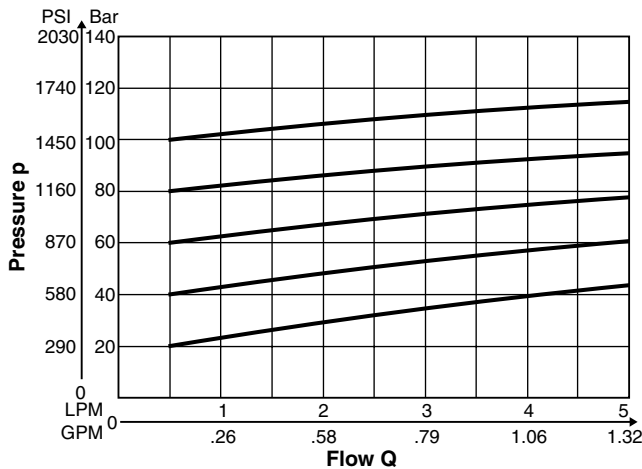
**Bold: Designates Tier I products and options.**

**Non-Bold: Designates Tier II products and options.**  
**These products will have longer lead times.**

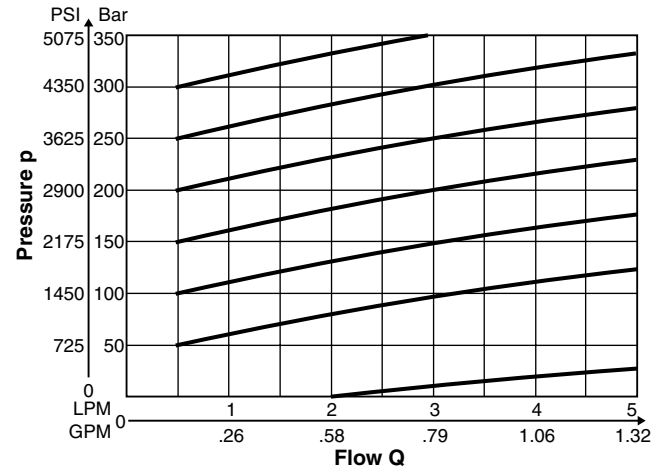
**Performance Curves**

**p/Q Curves**

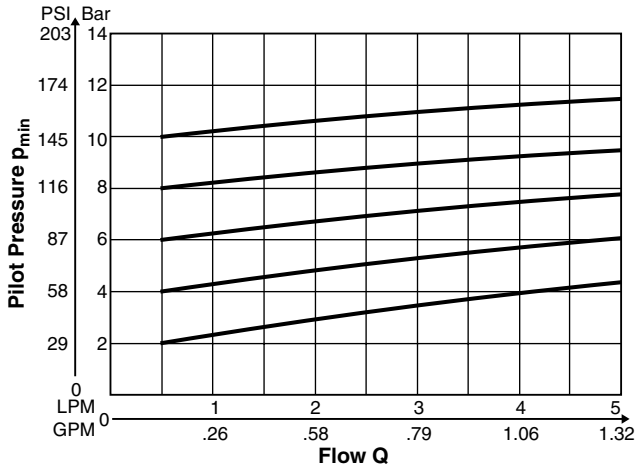
**Pressure Stage 105 Bar**



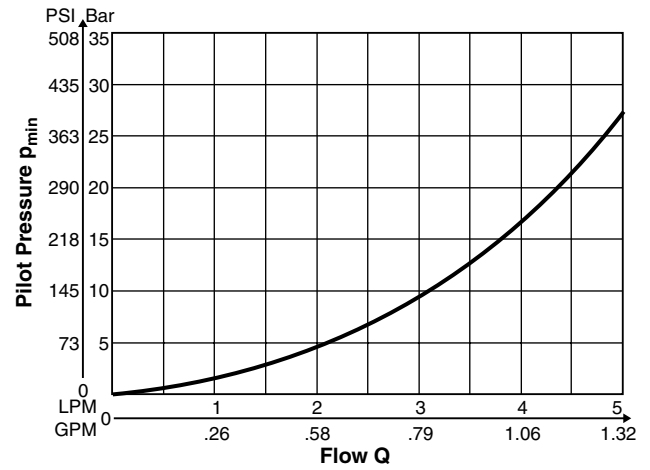
**Pressure Stage 350 Bar**



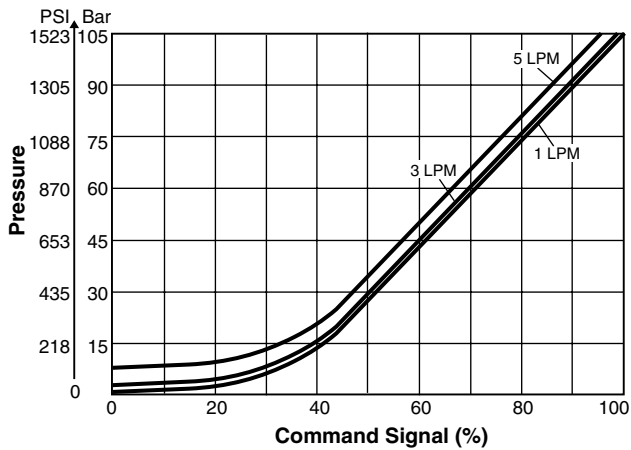
**$p_{min}/Q$  curves**  
**Pressure Stage 105 Bar**



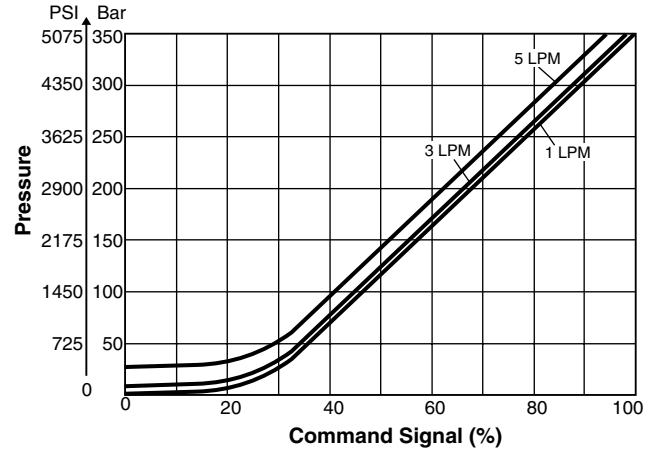
**Pressure Stage 350 Bar**



**$p_{set-voltage}$  Curves**  
**Pressure Stage 105 Bar**

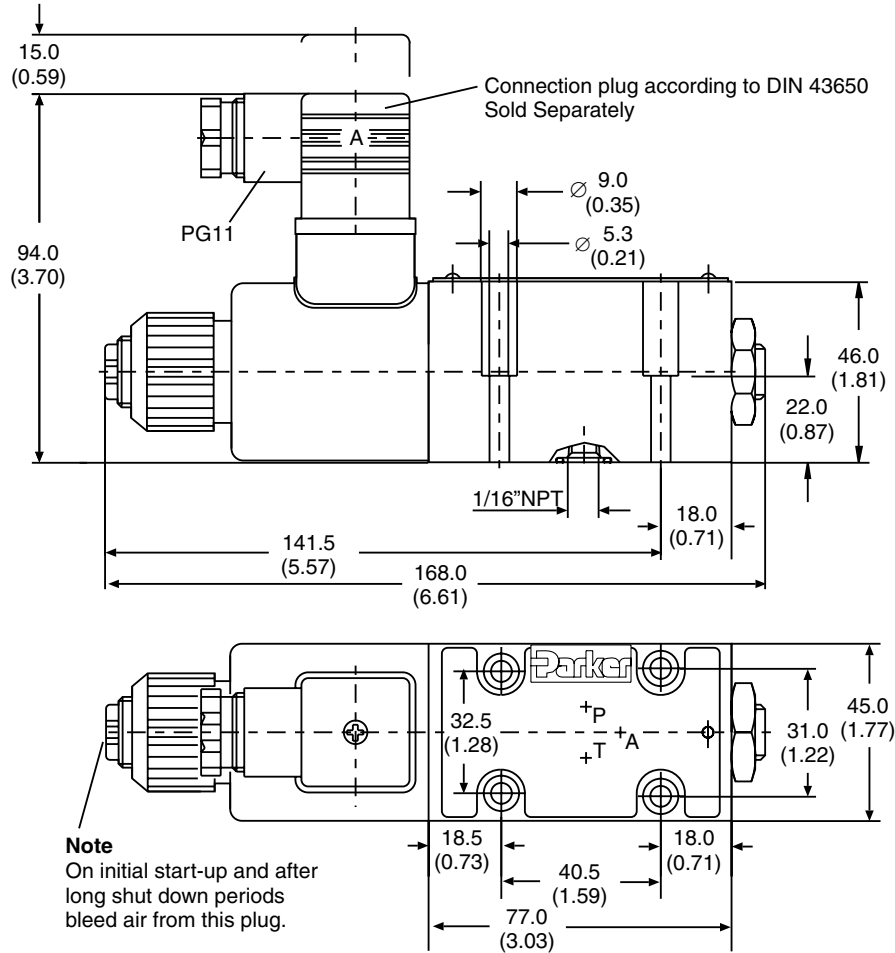


**Pressure Stage 350 Bar**



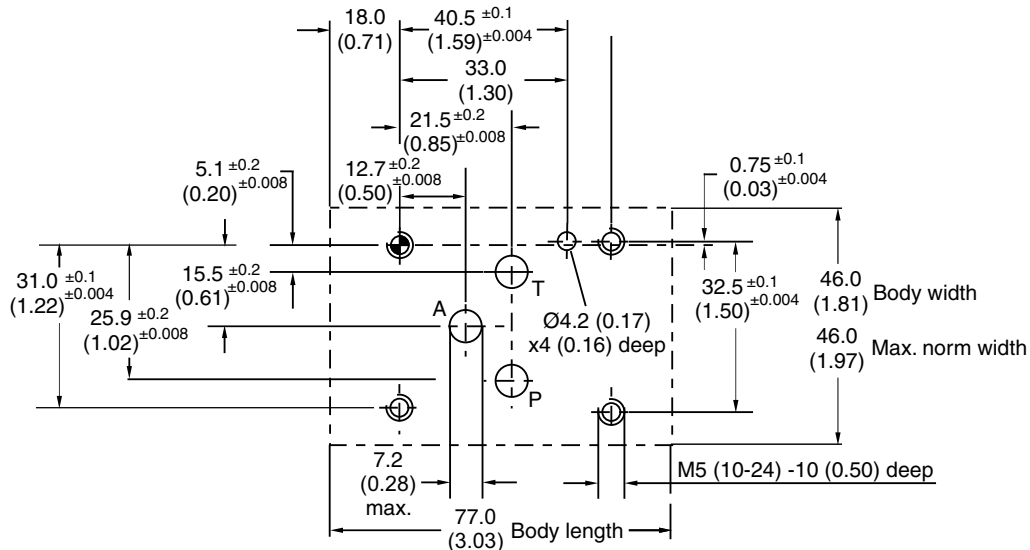
**Dimensions**

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



**B**

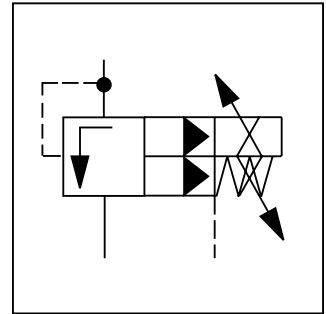
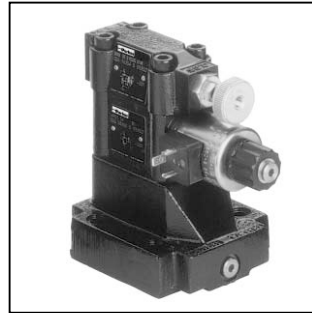
**Mounting Pattern ISO 6264-03-04-\*97**



**General Description**

Series RE\*W proportional pressure relief valves have a proportional solenoid operated pilot stage and DIN cartridge main stage.

Valves are controlled by off-board electronic driver modules. Refer to the electronics section for optional PCD00A-400 driver configurations.

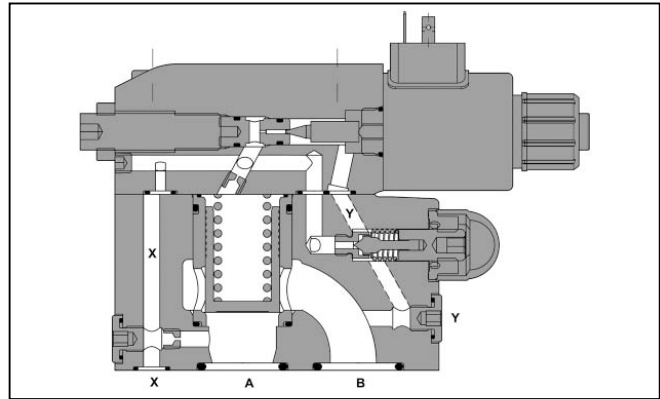


**Features**

- Standard DIN/ISO interfaces.
- Mechanical maximum pressure adjustment.

**Electronics Modules**

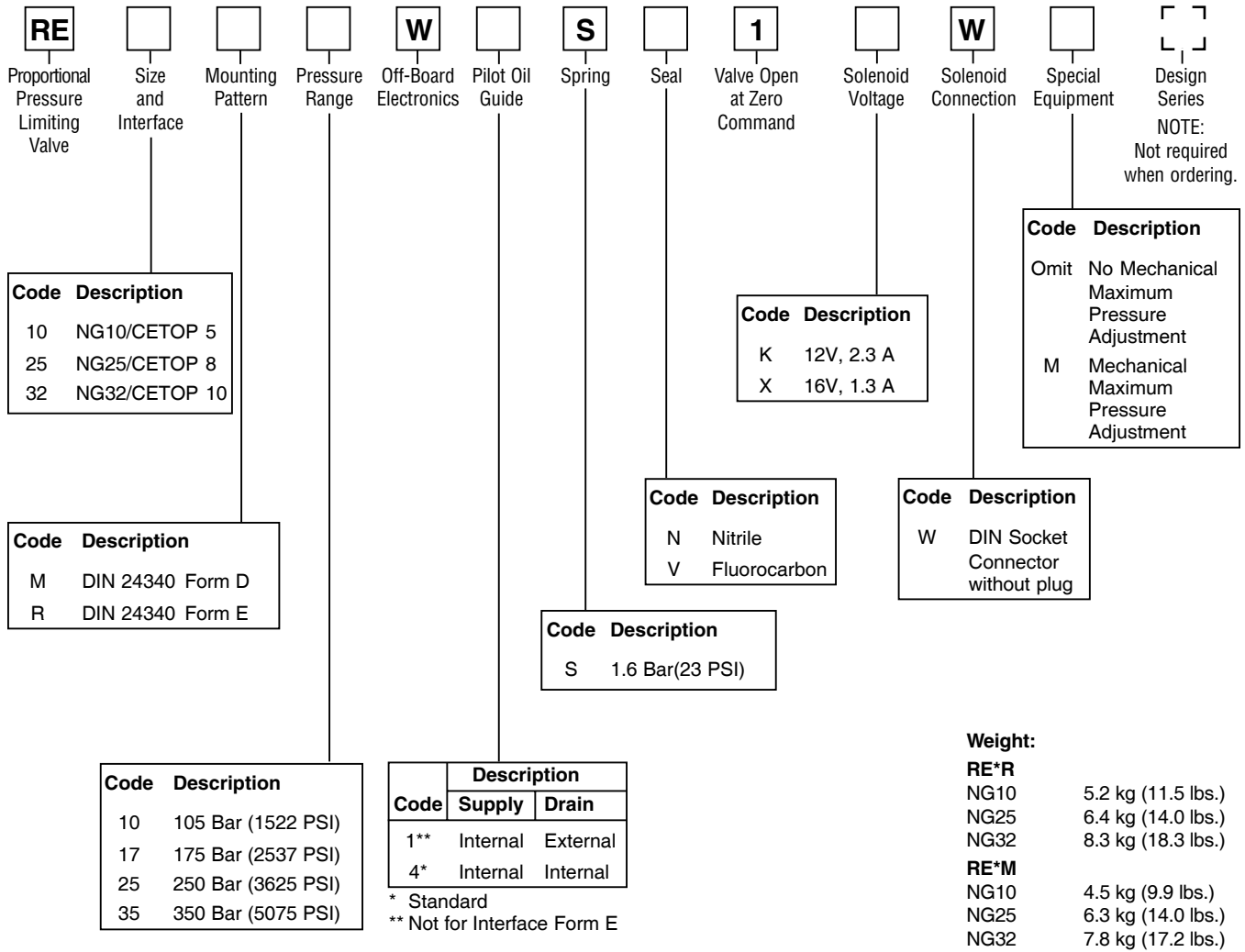
Refer to the Electronics Section for information on electronic driver modules.



**Specifications**

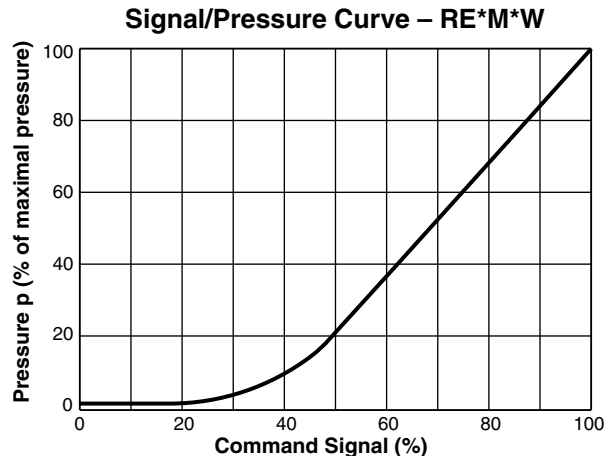
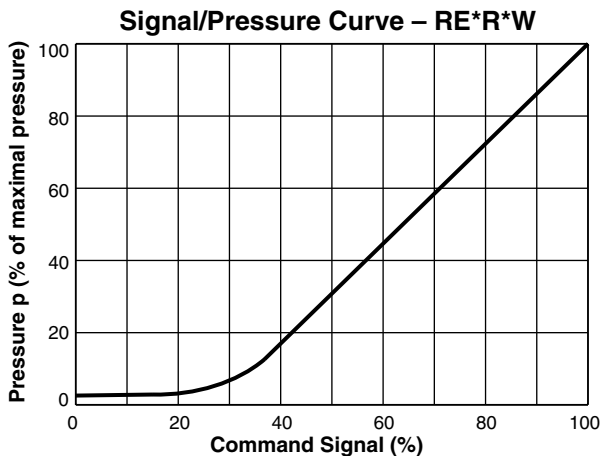
Interface	DIN CETOP	NG10 5	NG25 8	NG32 10
Nominal Flow	LPM (GPM)	up to 250 (66)	up to 500 (132)	up to 650 (172)
		up to 150 (40)	up to 350 (92)	up to 650 (172)
Maximum Operating Pressure	Bar (PSI)	Pressure port P, A, X: 350 (5075); T, Y: not pressurized		
Adjustment Range	Bar (PSI)	10 to 350 (145 to 5075)		
Mounting Pattern		DIN 24340 Form D or E, ISO 5781 and ISO 6264		
Mounting Orientation		Any		

**Ordering Information**

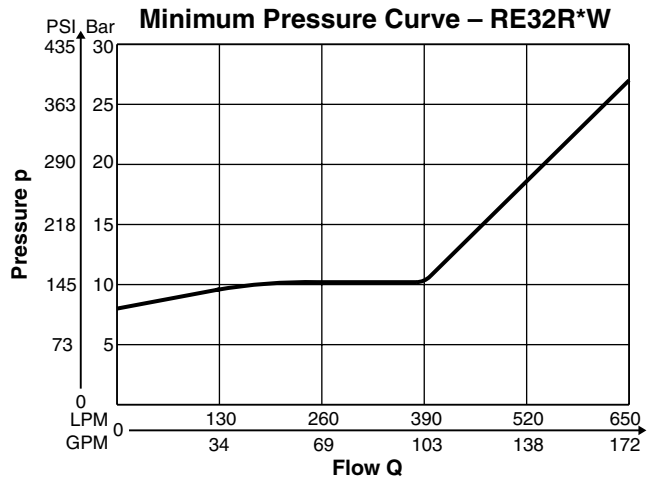
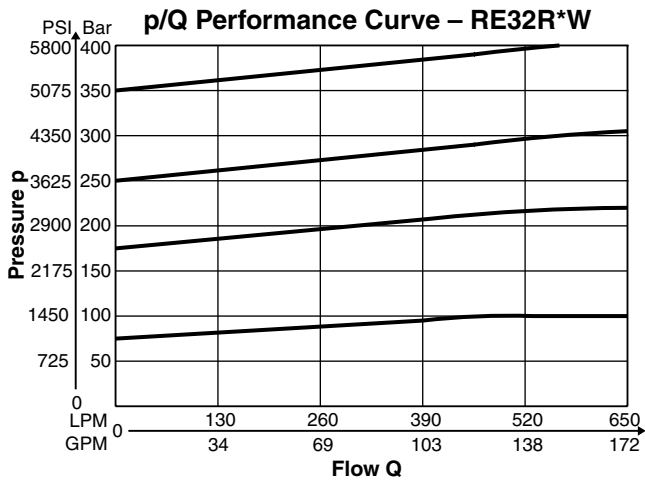
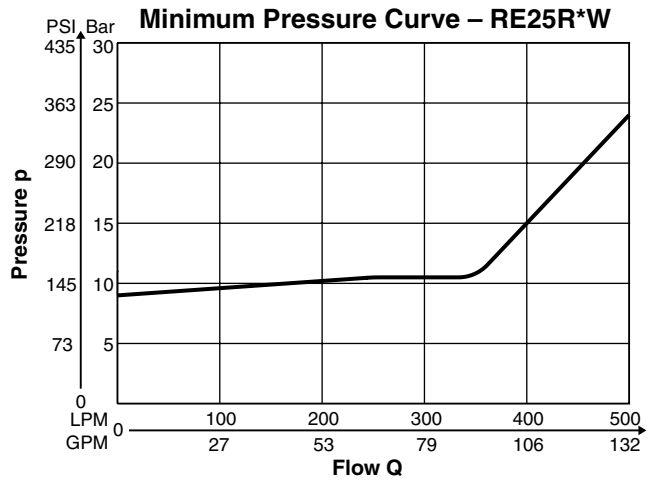
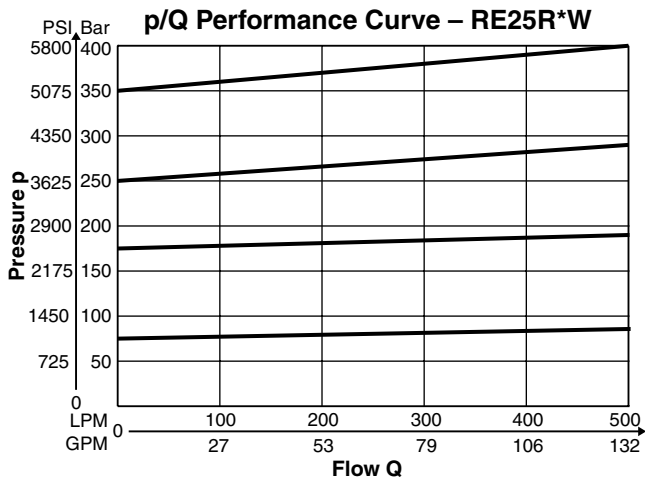
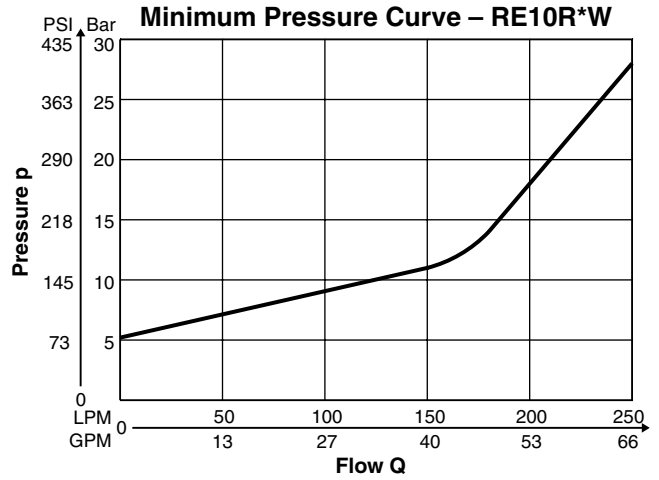
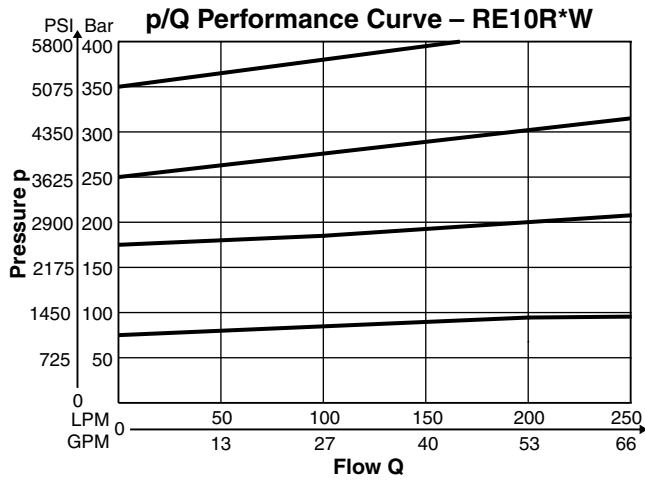


**Driver Electronics – PCD00A-400**

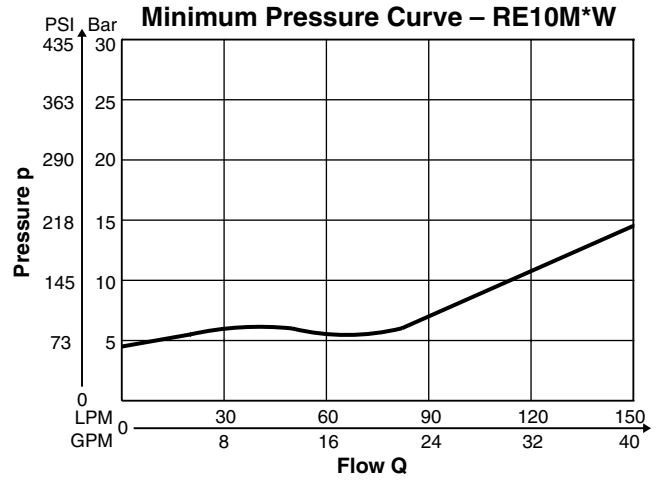
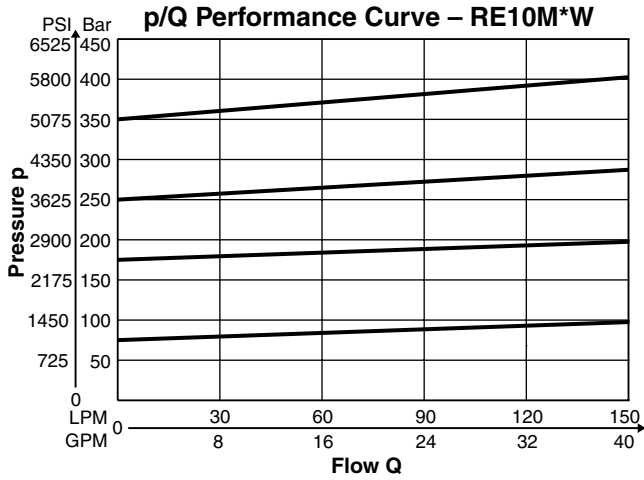
**Performance Curves**



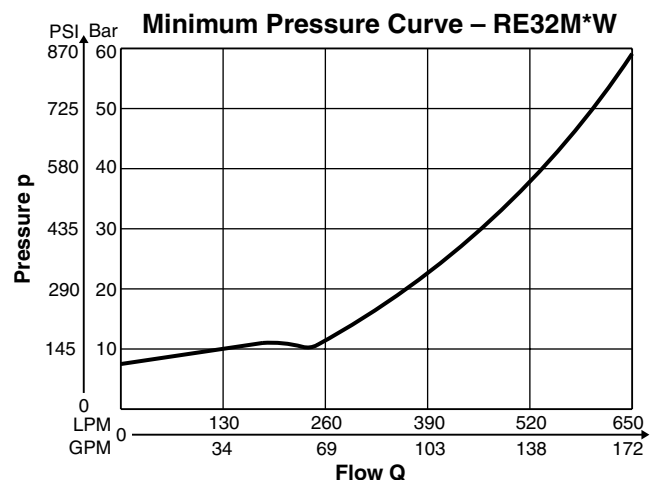
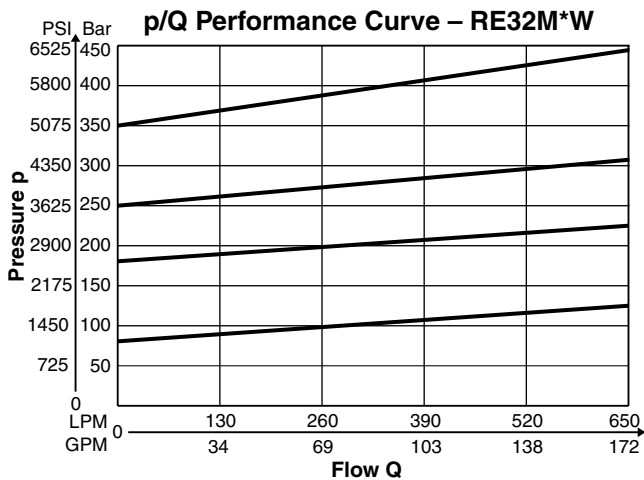
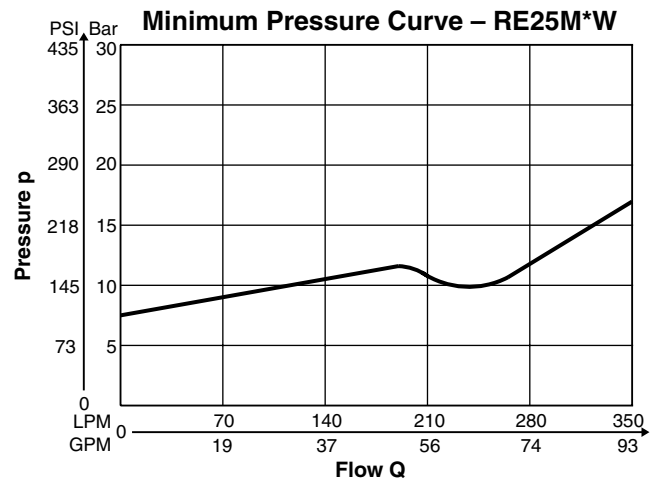
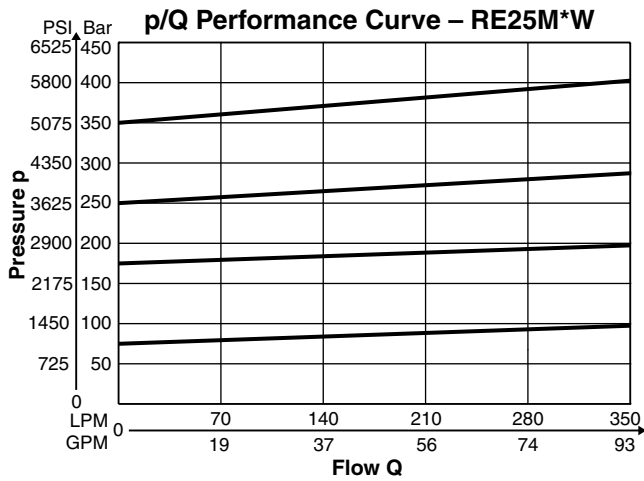
**B**





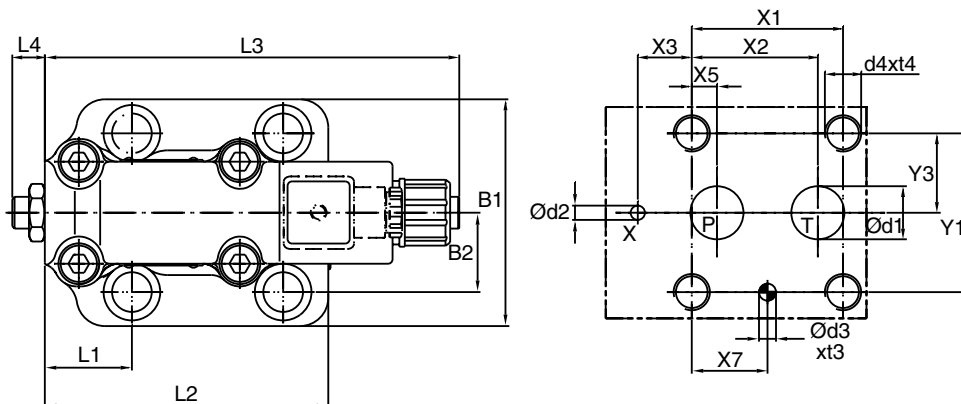


**B**

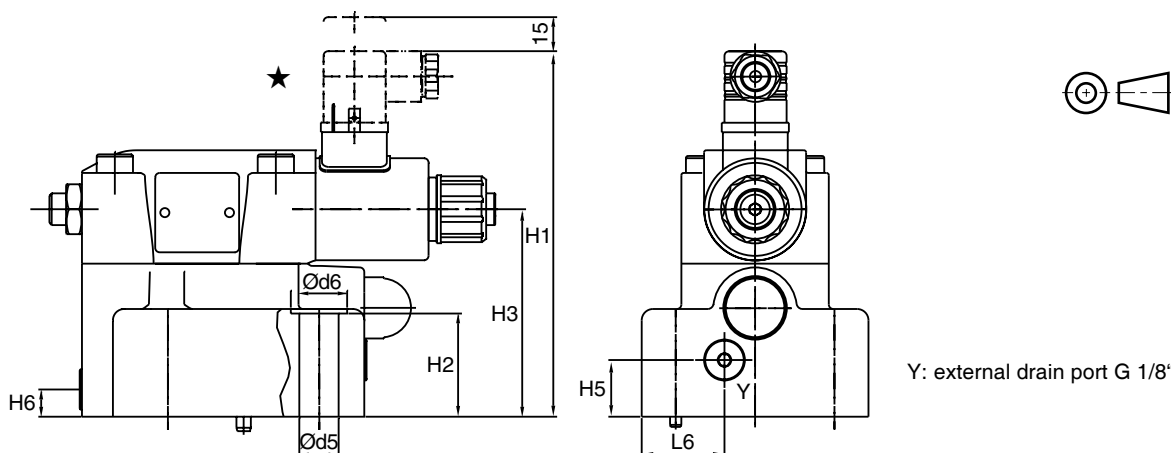


**RE\*R\*W**

Dimensions are shown in millimeters.



★ Order plugs separately.



Y: external drain port G 1/8"

NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	6264-06-09-*97	53.8	47.5	0	-	22.1	-	22.1	53.8	-	26.9	-	-	-
25	6264-08-13-*97	66.7	55.6	23.8	-	11.1	-	33.4	70	-	35	-	-	-
32	6264-10-17-*97	88.9	76.2	31.8	-	12.7	-	44.5	82.6	-	41.3	-	-	-

Tolerance at X and Y pin holes and screw holes ±0.1, at port holes ±0.2.

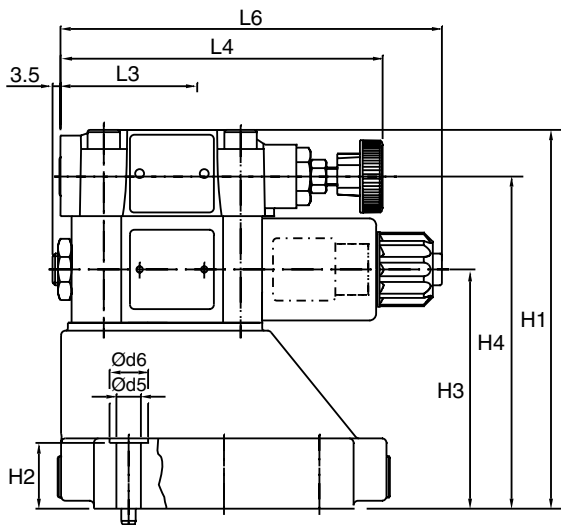
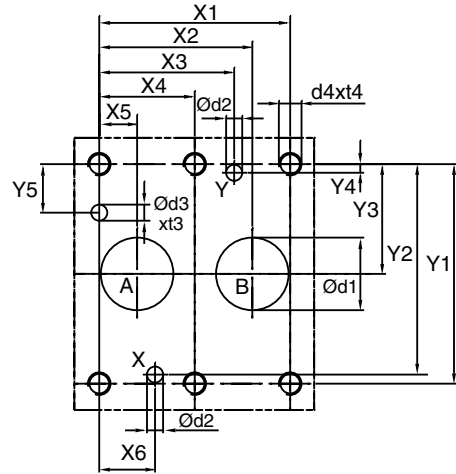
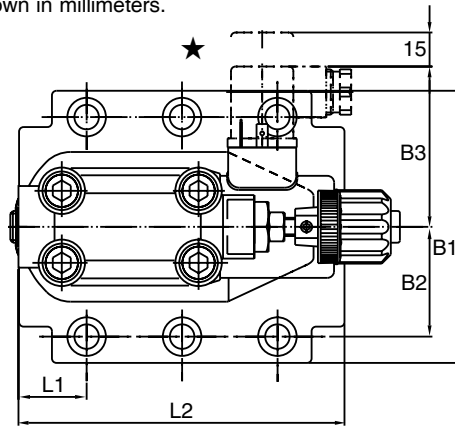
NG	ISO-code	B1	B2	H1	H2	H3	H4	H5	H6	L1	L2	L3	L4	L5	L6
10	6264-06-09-*97	80	26.9	158.7	27	88	-	25	12	52.5	118.5	182.3	14.4	-	36.5
25	6264-08-13-*97	100	35	161.2	45.5	91.5	-	25	12	37.9	124.5	182.3	14.4	-	36.5
32	6264-10-17-*97	120	41.3	166.7	52	97	-	25	12	45	153	182.3	14.4	-	36.5

NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	6264-06-09-*97	14.7	4.8	7.5	10	M12	20	13.5	20
25	6264-08-13-*97	23.4	6.3	7.5	10	M16	27	17.5	25
32	6264-10-17-*97	32	6.3	7.5	10	M18	28	20	30

NG	ISO-code	Bolt kit  DIN912 12.9		Kit		Surface finish
				NBR	FPM	
10	6264-06-09-*97	BK-M12 x 45-4pcs	115 Nm ±15%	SK-RE10RN50	SK-RE10RV50	$\sqrt{R_{max} 6.3}$ $\square 0.01/100$
25	6264-08-13-*97	BK-M16 x 70-4pcs	281 Nm ±15%	SK-RE25RN50	SK-RE25RV50	
32	6264-10-17-*97	BK-M18 x 75-4pcs	398 Nm ±15%	SK-RE32RN50	SK-RE32RV50	

**RE\*M\*W**

Dimensions are shown in millimeters.



★ Order plugs separately.



NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	6264-06-09-*97	42.9	35.8	21.5	-	7.2	21.5	0	66.7	58.8	33.4	7.9	14.3	-
25	6264-08-13-*97	60.3	49.2	39.7	-	11.1	20.6	0	79.4	73	39.7	6.4	15.9	-
32	6264-10-17-*97	84.2	67.5	59.5	42.1	16.7	24.6	0	96.8	92.8	48.4	3.8	21.4	-

Tolerance at X and Y pin holes and screw holes ±0.1, at port holes ±0.2.

NG	ISO-code	B1	B2	B3	H1	H2	H3	H4	H6	L1	L2	L3	L4	L5	L6
10	6264-06-09-*97	87.3	33.35	71	130	21	68.5	109.5	-	29	94.8	-	141	-	168.8
25	6264-08-13-*97	105	39.7	71	156.5	29	95	136	-	34.7	126.8	-	141	-	168.8
32	6264-10-17-*97	120	48.4	71	167	29	105.5	146.5	-	30.6	144.3	-	141	-	168.8

NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	6264-06-09-*97	15	7	7.1	8	M10	16	10.8	17
25	6264-08-13-*97	23.4	7.1	7.1	8	M10	18	10.8	17
32	6264-10-17-*97	32	7.1	7.1	8	M10	20	10.8	17

NG	ISO-code	Bolt kit  DIN912 12.9		Kit		Surface finish
				NBR	FPM	
10	6264-06-09-*97	BK-M10 x 35-4pcs	68 Nm	SK-RE10MN50	SK-RE10MV50	
25	6264-08-13-*97	BK-M10 x 45-4pcs	68 Nm	SK-RE25MN50	SK-RE25MV50	
32	6264-10-17-*97	BK-M10 x 45-6pcs	68 Nm	SK-RE32MN50	SK-RE32MV50	

## General Description

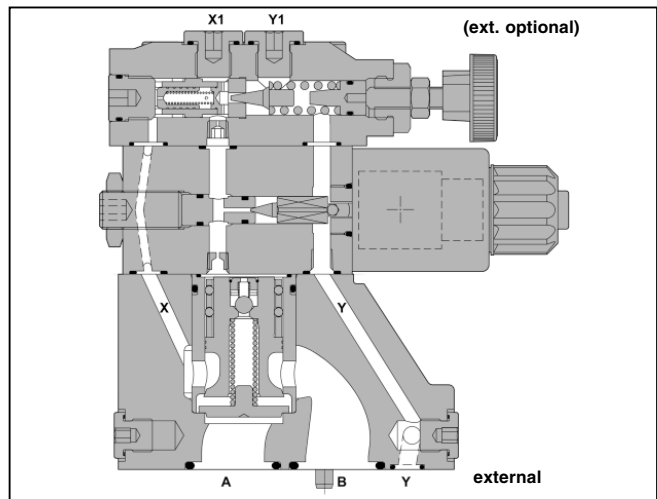
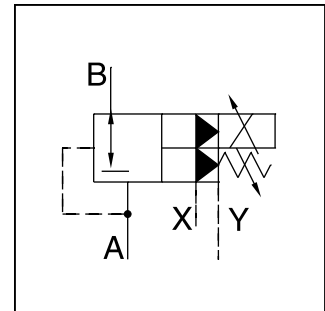
Series PE\*W pressure reducing valves have a proportional solenoid operated pilot stage and a spool cartridge main stage.

The control command signal is provided by external electronic modules.

**B**

## Specifications

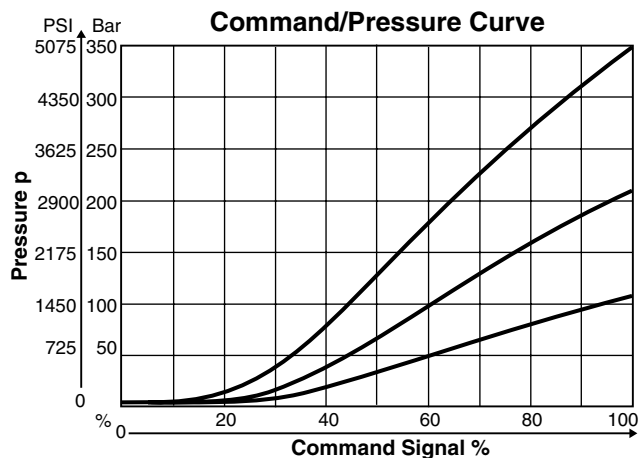
<b>Interface</b>	Subplate mounting acc. ISO 5781
<b>Mounting Position</b>	as desired, horizontal mounting preferred
<b>Ambient Hydraulic Temperature</b>	-20° to +80°C (-4° to +176°F)
<b>Maximum Operating Pressure</b>	Ports A and X 350 Bar (5075 PSI) connection B and Y depressurized
<b>Pressure Stages</b>	107 Bar (1552 PSI) 175 Bar (2538 PSI) 250 Bar (3625 PSI) 350 Bar (5075 PSI)
<b>Nominal Flow</b>	Size 10: 150 LPM (40 GPM) Size 25: 350 LPM (93 GPM) Size 32: 650 LPM (172 GPM)
<b>Fluid</b>	Hydraulic oil according to DIN 51524 through 51525
<b>Viscosity</b>	Recommended 30 to 50 mm <sup>2</sup> /S (180 to 230 SSU) Maximum 20 to 380 mm <sup>2</sup> /S (75 to 1850 SSU)
<b>Fluid Temperature</b>	Recommended 30° to +50°C (86° to +122°F) Maximum -20° to +70°C (-4° to +158°F)
<b>Permitted Contamination</b>	ISO 4406 (1999); 18/16/13
<b>Duty Cycle</b>	100% ED
<b>Protection Class</b>	IP54 at DIN 40050 (plugged and mounted)
<b>Nominal Voltage</b>	12 V
<b>Maximum Current</b>	2.3 amps
<b>Ambient Electrical Temperature</b>	-20° to +60°C (-4° to +140°F)
<b>Coil Resistance</b>	4 ohm at 20°C (68°F)
<b>Plug Connectors</b>	2 pole + PE / connector EN 175301-803 / cable Ø 8 to 10mm
<b>Power Amplifier</b>	PCD00A-400



## Features

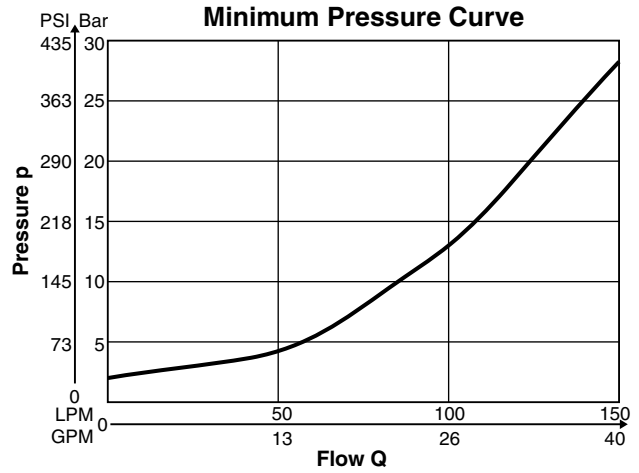
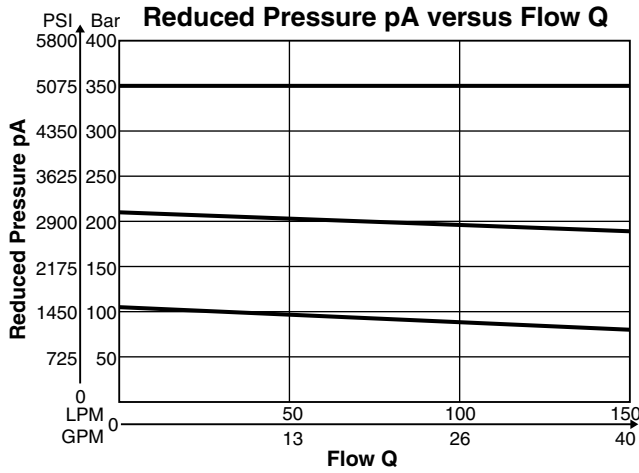
- Pilot-operated with proportional solenoid.
- Continuous adjustment by proportional solenoid.
- Subplate according to ISO 5731.
- Four pressure stages.
- Mechanical maximum pressure adjustment.

## Performance Curves

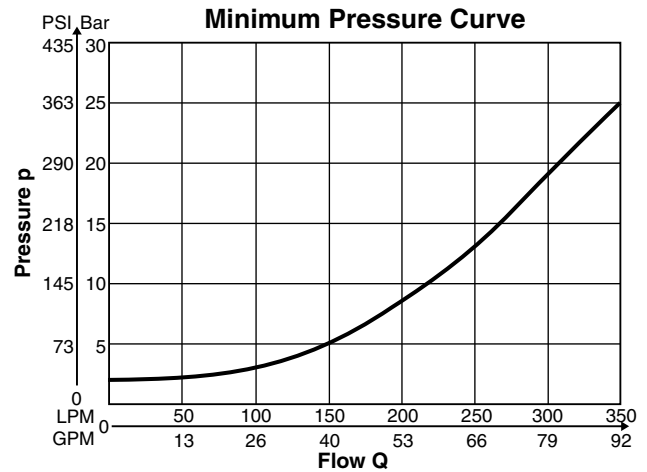
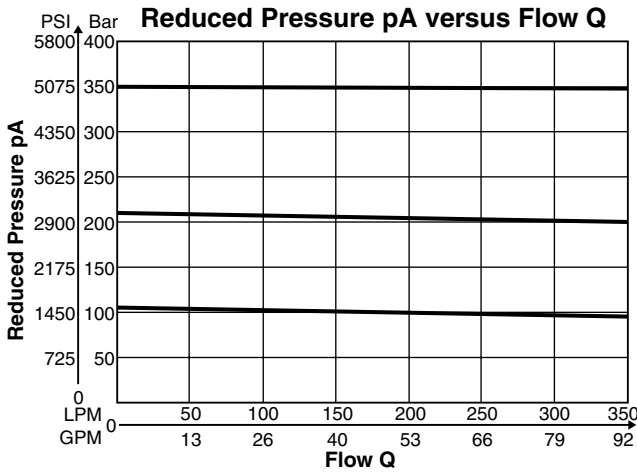


(Continued on the following page)

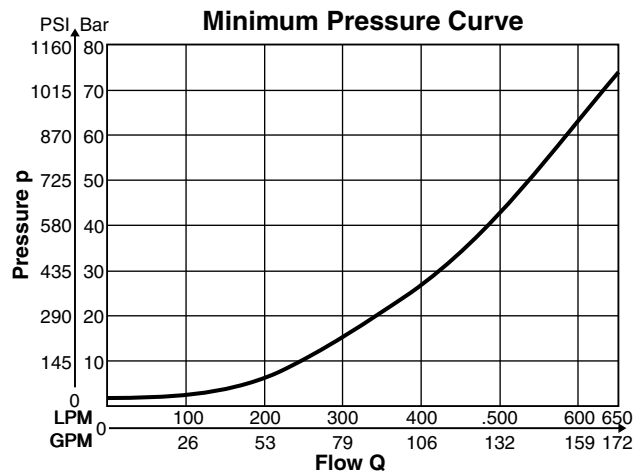
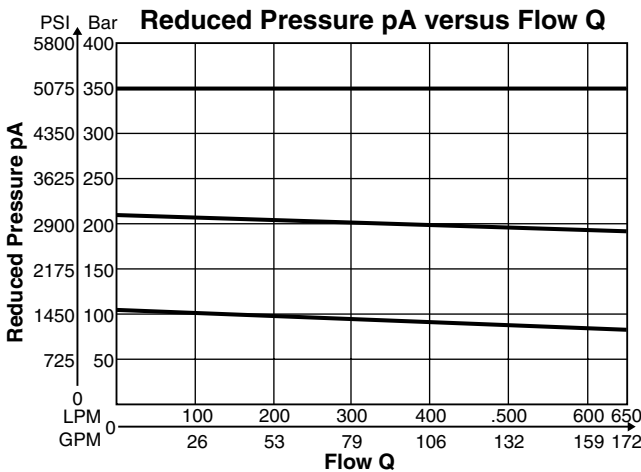
**Series PE10M**



**Series PE25M**



**Series PE32M**



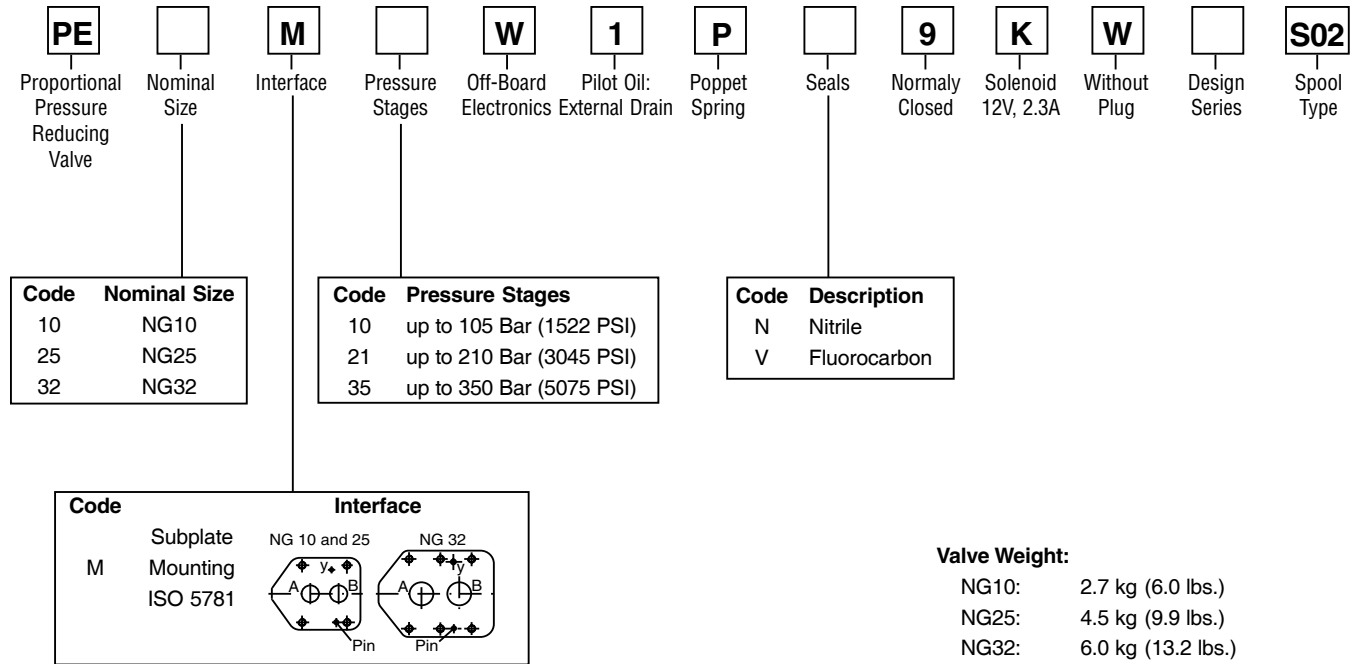
\*Measured at 350Bar (5076 PSI) primary pressure pB.

PE\_W.dd



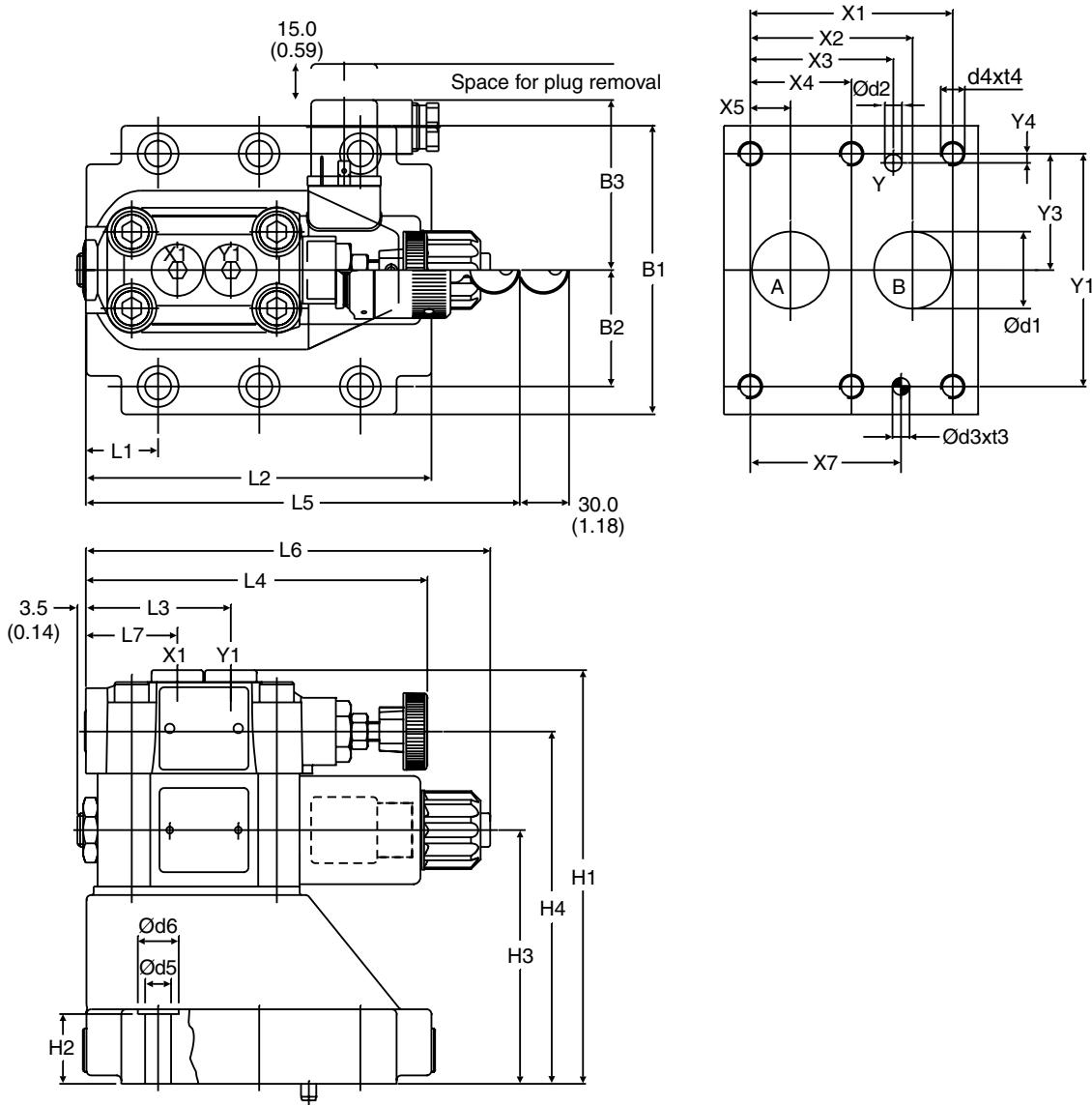
**B**

**B**



**Driver Electronics – PCD00A-400**

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



**B**

NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	5781-06-07-0-00	42.9	35.8	21.5	-	7.2	-	31.8	66.7	-	33.4	7.9	-	-
25	5781-08-10-0-00	60.3	49.2	39.7	-	11.1	-	44.5	79.4	-	39.7	6.4	-	-
32	5781-10-13-0-00	84.2	67.5	59.5	42.1	16.7	-	62.7	96.8	-	48.4	3.8	-	-

Tolerance for all dimensions ±0.2

NG	ISO-code	B1	B2	B3	H1	H2	H3	H4	L1	L2	L3	L4	L5	L6	L7
10	5781-06-07-0-00	87.3	33.35	71	134	21	68.5	109.5	29	94.8	60.8	141	181	168.8	38.6
25	5781-08-10-0-00	105	39.7	71	160.5	29	95	136	34.7	126.8	60.8	141	181	168.8	38.6
32	5781-10-13-0-00	120	48.4	71	171	29	105.5	146.5	30.6	144.3	60.8	141	181	168.8	38.6

NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	5781-06-07-0-00	15	7	7.1	8	M10	16	10.8	17
25	5781-08-10-0-00	23.4	7.1	7.1	8	M10	18	10.8	17
32	5781-10-13-0-00	32	7.1	7.1	8	M10	20	10.8	17

NG	ISO-code	Bolt kit  DIN912 12.9		Kit		Surface finish
				NBR	FPM	
10	5781-06-07-0-00	BK-M10 x 35-4pcs	68 Nm	SK-PE10MN50	SK-PE10MV50	$\sqrt{R_{max} 6.3}$ $\square 0.01/100$
25	5781-08-10-0-00	BK-M10 x 45-4pcs	68 Nm	SK-PE25MN50	SK-PE25MV50	
32	5781-10-13-0-00	BK-M10 x 45-6pcs	68 Nm	SK-PE32MN50	SK-PE32MV50	

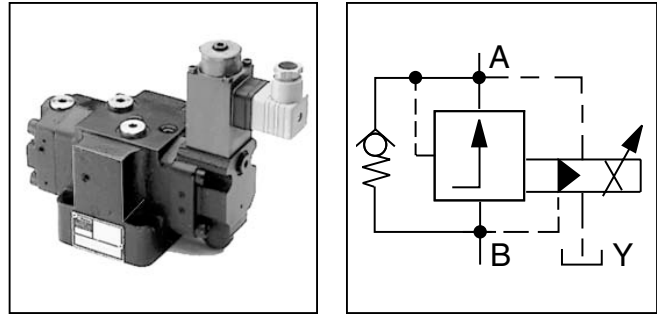
PE\_W.dd

**General Description**

Series DWE/DWU proportional pressure reducing valves have a proportional solenoid operated pilot stage and sliding spool main stage.

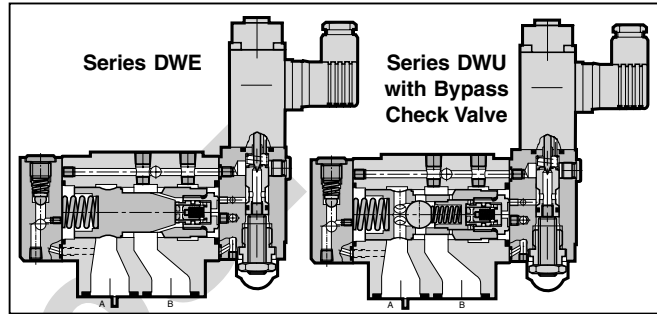
**B**

Valves are controlled by off-board electronic driver modules. Refer to the electronics section for optional driver configurations.



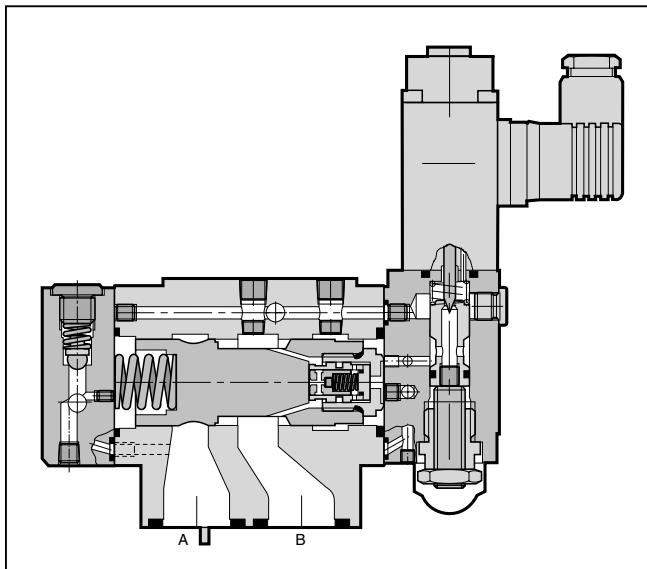
**Features**

- Standard DIN/ISO interfaces.
- Optional reverse flow check valve.



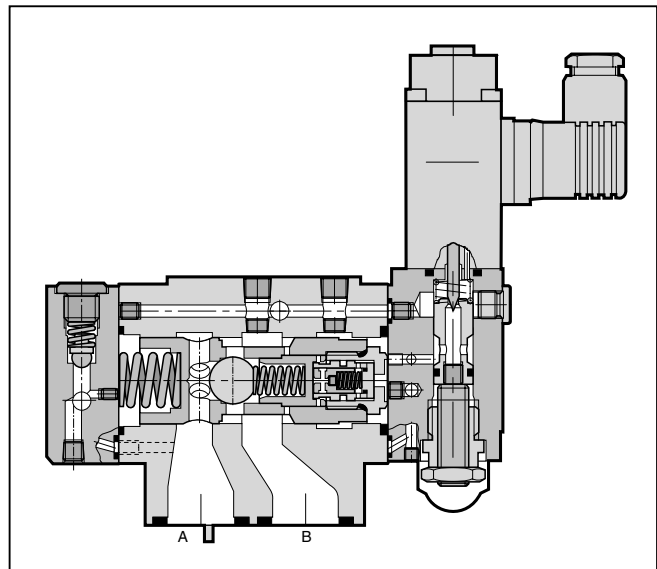
**Specifications**

Interface	DIN ISO/CETOP	NG10 5	NG25 8	NG32 10
Nominal Flow Q	LPM (GPM)	150 (40)	250 (66)	350 (93)
Weight	kg (lbs.)	5.2 (11.5)	6.3 (13.9)	9.3 (20.5)
Maximum Operating Pressure	Bar (PSI)	Pressure port P, A: 350 (5075); Tank connection Y: not pressurized		
Adjustment Range	Bar (PSI)	10 to 350 (150 to 5075)		
Mounting Pattern		DIN 24340 Form D, ISO 5781 and ISO 6264		
Mounting Orientation		Any		



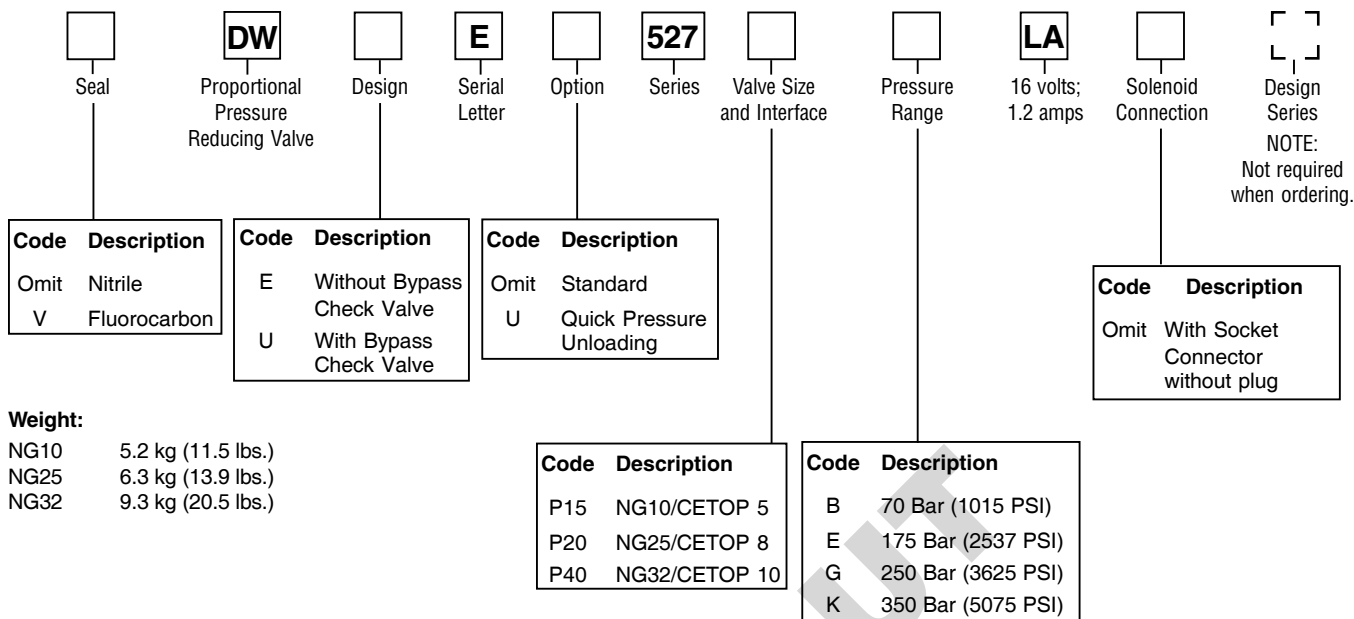
Series DWE

DWE-DWU.p65



Series DWU with Bypass Check Valve





**Weight:**

NG10 5.2 kg (11.5 lbs.)  
 NG25 6.3 kg (13.9 lbs.)  
 NG32 9.3 kg (20.5 lbs.)

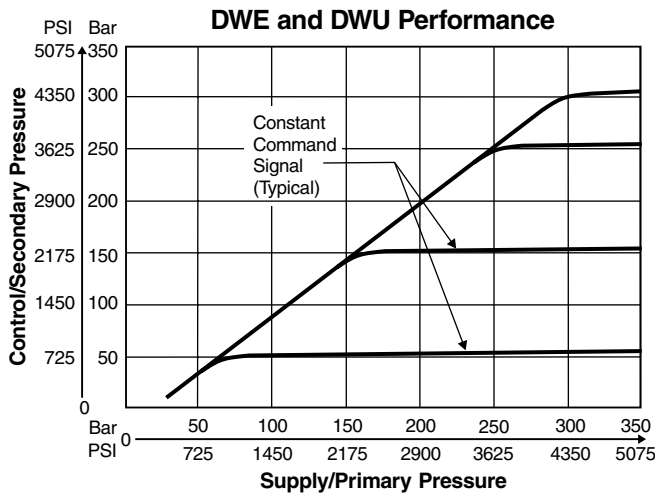
**Accessories**

Code	Nominal Size	Subplate	Bolt Kit	Bolt (Quantity) Size	Tightening Torque (Nm)	Sealing Kits		Plug DIN 43650 Design Type AF/PG11
						Nitrile	Fluorocarbon	
<b>P15</b>	NG10	SPP3M4B910	BK389	(4x) M10x50	65	SK-DWEE 5P15	SK-DWLC 5P15V	692915
<b>P20</b>	NG25	SPP6M8B910	BK485	(4x) M10x45	65	SK-DWEE 5P20	SK-DWLC 5P20V	692915
<b>P40</b>	NG32	SPP10M12B910	BK388	(6x) M10x50	65	SK-DWEE 5P40	SK-DWLC 5P40V	692915

**For new applications:  
 DWE: Refer to PE\*W  
 DWU: Consult Factory**



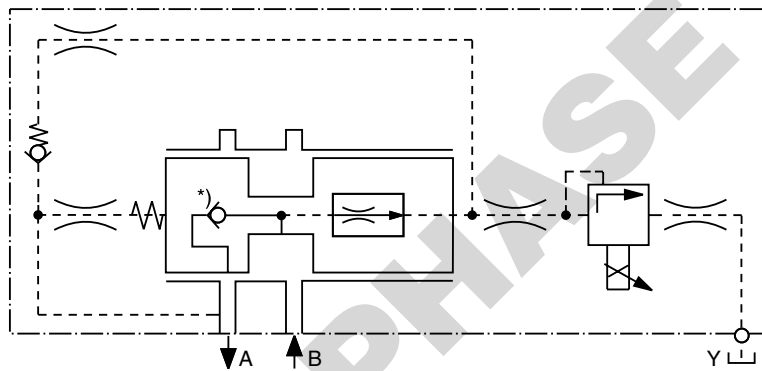
**Performance Curves**



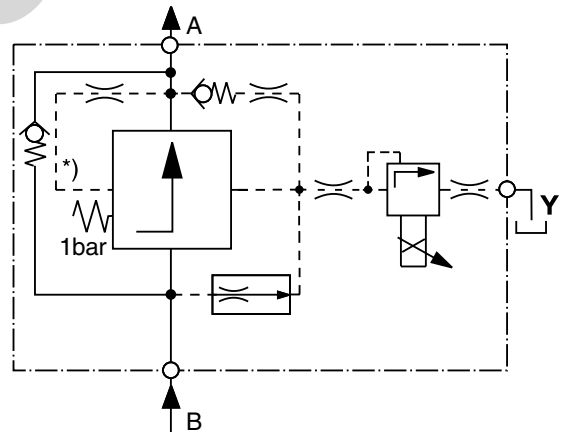
**Electronic Modules**

Refer to the Electronics Section for information on electronic driver modules.

**DWU Functional Diagram**



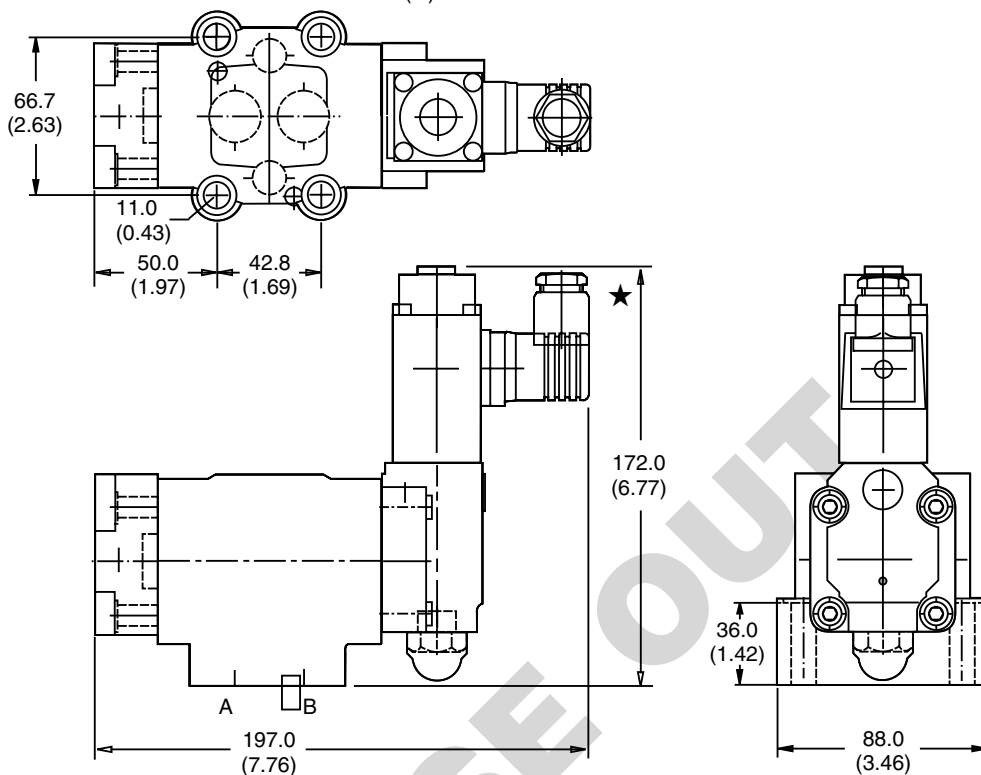
**DWU Symbol**



DWE functional diagram and symbol are the same as DWU without check valve as shown.

**DWE, DWU, Size NG10**

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

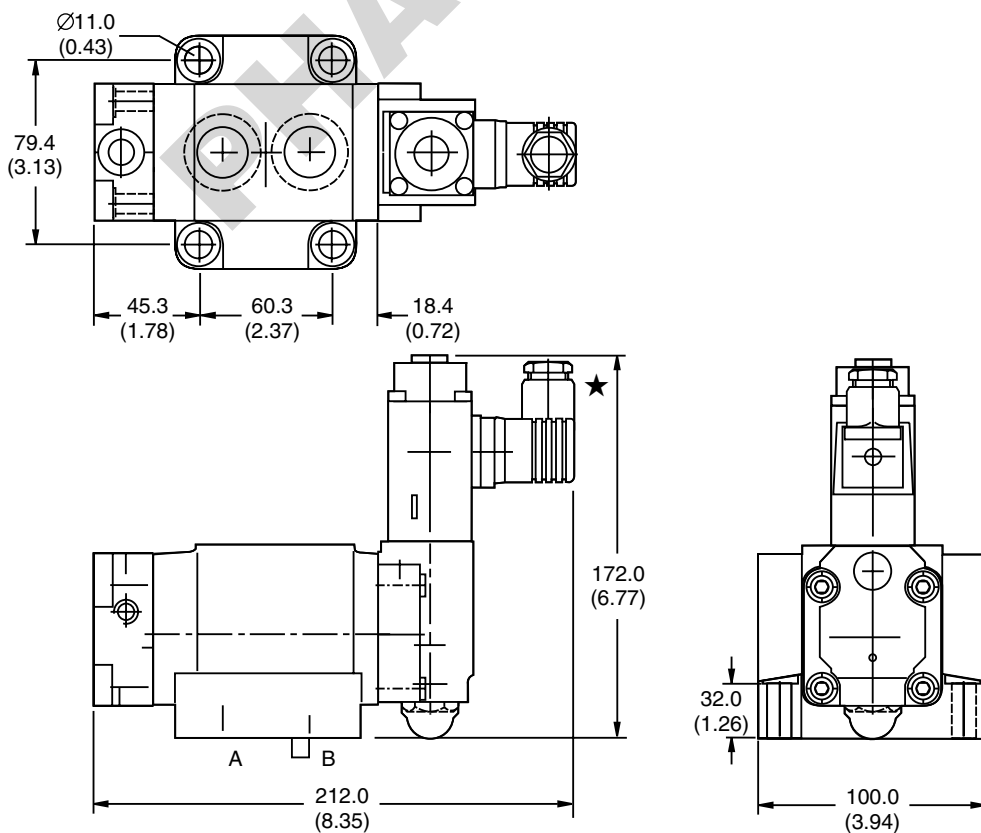


**B**

**DWE, DWU, Size NG25**

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

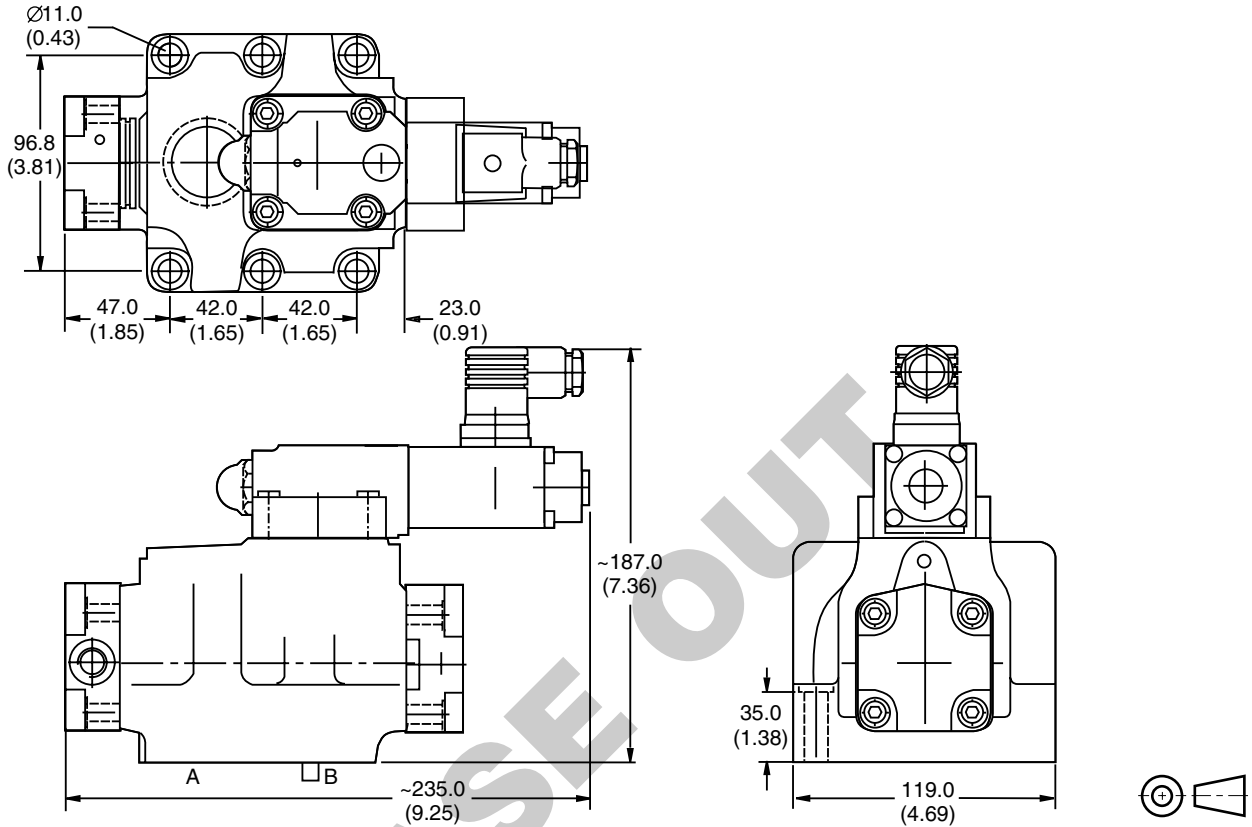
★ Order plugs separately.



Dimensions

DWE, DWU, Size NG32

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

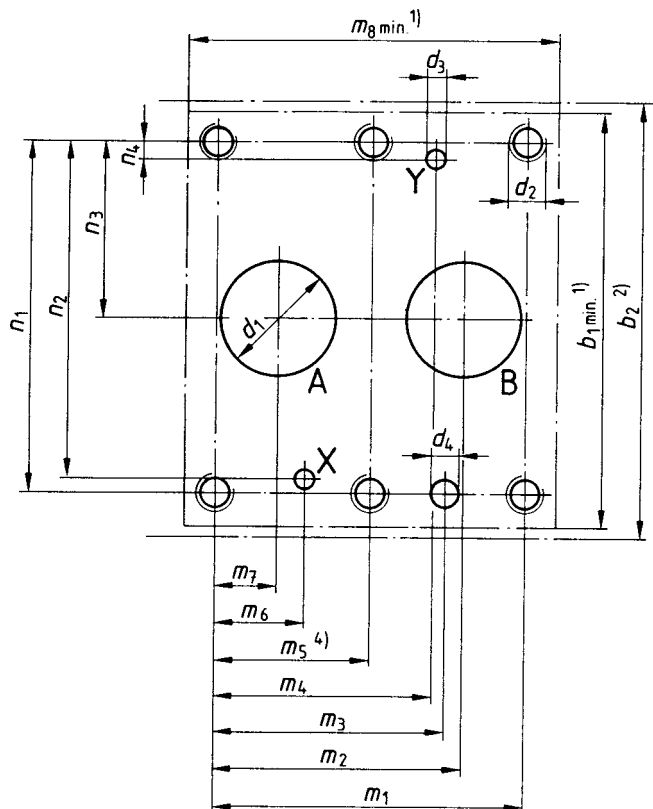


Mounting Pattern

Nominal Size	d1 max.	d2	d3 ±0.2	d4 H12	b1 min.	b2 max.
10 mm inches	14.7 (0.58)	M10 M10	4.8 (0.19)	7.5 (0.30)	84.0 (3.31)	92.0 (3.62)
25 mm inches	23.4 (0.92)	M10 M10	4.8 (0.19)	7.5 (0.30)	97.0 (3.82)	105.0 (4.31)
32 mm inches	32.0 (1.26)	M10 M10	4.8 (0.19)	7.5 (0.30)	114.0 (4.49)	122 (4.80)

Nominal Size	m1 ±0.2	m2 ±0.2	m3 ±0.2	m4 ±0.2	m5 ±0.2	m6 ±0.2
10 mm inches	42.9 (1.69)	35.7 (1.41)	31.8 (1.25)	21.4 (0.84)	-	21.4 (0.84)
25 mm inches	60.3 (2.37)	49.2 (1.94)	44.5 (1.75)	39.7 (1.56)	-	20.6 (0.81)
32 mm inches	84.1 (3.31)	67.5 (2.66)	62.7 (2.47)	59.6 (2.35)	42.1 1.66	24.6 (0.97)

Nominal Size	m7 min.	m8 min.	n1 ±0.2	n2 ±0.2	n3 ±0.2	n4 ±0.2
10 mm inches	7.1 (0.28)	61.0 (2.40)	66.7 (2.63)	58.7 (2.31)	33.3 (1.31)	7.9 (0.31)
25 mm inches	11.1 (0.44)	78.0 (3.07)	79.4 (3.13)	73.0 (2.87)	39.7 (1.56)	6.4 (0.25)
32 mm inches	16.7 (0.66)	102.0 (4.02)	96.8 (3.81)	92.9 (3.66)	48.8 (1.92)	4.0 (0.16)



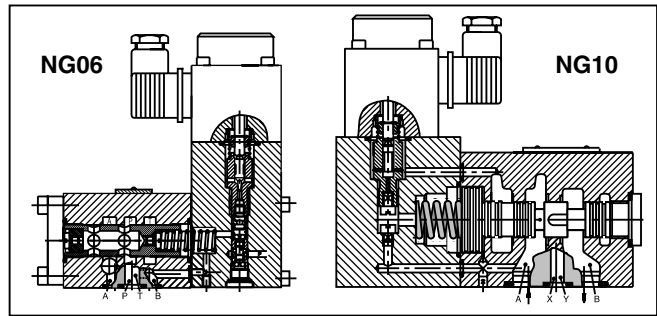
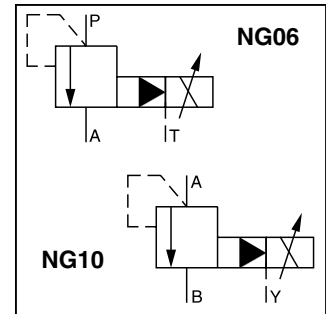
### General Description

Series VBY\*K pilot operated sequence valves feature proportional adjustment and an external drain. The external drain allows application as both a sequence valve and as a pressure relief valve.

These valves can also be used as a pressure relief valve. Please observe hydraulic connection.

### Features

- Proportional adjustment.
- Manifold mounting acc. to ISO 5781.
- External drain.
- Main stage spool type valve.
- Pilot stage seated type valve.



### Specifications

General		
Size	NG6	NG10
Design	Proportional Pressure Valve	
Mounting Pattern	ISO 5781	
Actuation	Proportional Solenoid	
Mounting Position	Any	
Ambient Temperature	-20°C to +70°C (-4°F to +158°F)	
Hydraulics		
Operating Pressure, Ports	P, A 315 Bar (4500 PSI) T depressurized	A, B 315 Bar (4500 PSI) Y depressurized
Flow	40 LPM (10.6 GPM)	160 LPM (42.3 GPM)
Adjustment Range	64, 100, 160, 210, 315 Bar (928, 1450, 2320, 3045, 4568 PSI)	
Pressure Medium	Hydraulic oil as per DIN 51 524 to 525	
Pressure Fluid Temperature	+30°C to +50°C (+86°F to +122°F) Recommended -20°C to +70°C (-4°F to +158°F) Maximum	
Viscosity Range	30 to 50 mm <sup>2</sup> /s (135 to 230 SSU) Recommended 20 to 380 mm <sup>2</sup> /s (90 to 1750 SSU) Maximum	
Max. Contamination Level	ISO 4406 (1999) 18/16/13	
Linearity	±3.5% at > 15% p <sub>nom</sub>	
Repeatability	<±2%	
Hysteresis	±1.5% to p <sub>max</sub>	
Response Time	<150 ms	<200 ms
Manufacturing Tolerance	±5% to p <sub>max</sub>	
Electrical		
Duty Cycle	100% ED	
Protection Class	IP54 at DIN 40050 (plugged and mounted)	
Nominal Voltage	12 VDC	
Max. current	2.7 A	
Coil Resistance	21 ohm at 20°C (68°F)	
Plug Connectors	2 pole + PE / connector EN 175301-803 / cable Ø 8 to 10mm	
Power Amplifier	PCD00A-400	

VBY\_K.p65 dd



**Ordering Information**

**VBYP**  
 Sequence Valve

Pressure Range

Code	Description
<b>064</b>	<b>64 Bar (928 PSI)</b>
100	100 Bar (1450 PSI)
<b>160</b>	<b>160 Bar (2320 PSI)</b>
210	210 Bar (3000 PSI)
315	315 Bar (4500 PSI)

**K**  
 Linear Solenoid

Code	Description
K	12 VDC, 2.7 A

Valve Size

Code	Description
06	NG6
10	NG10

Seal

Code	Description
<b>N</b>	<b>Nitrile</b>
V	Fluorocarbon

Design Series  
 NOTE:  
 Not required when ordering.

Weight: 5 kg (11.0 lbs.)

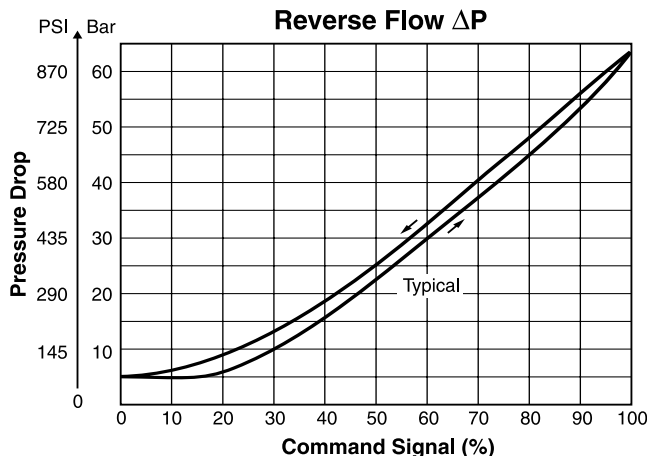
**Bold: Designates Tier I products and options.**

**Non-Bold: Designates Tier II products and options. These products will have longer lead times.**

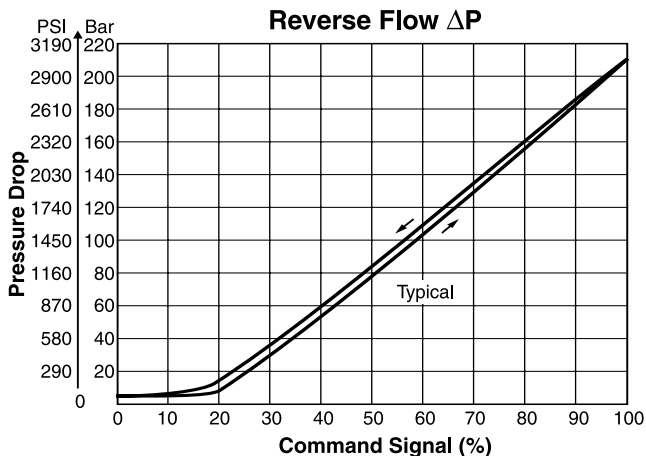
**Performance Curves - NG06**

Pressure Curves where  $p = f(U_{set})$

Setting Range max. 64 Bar (870 PSI)

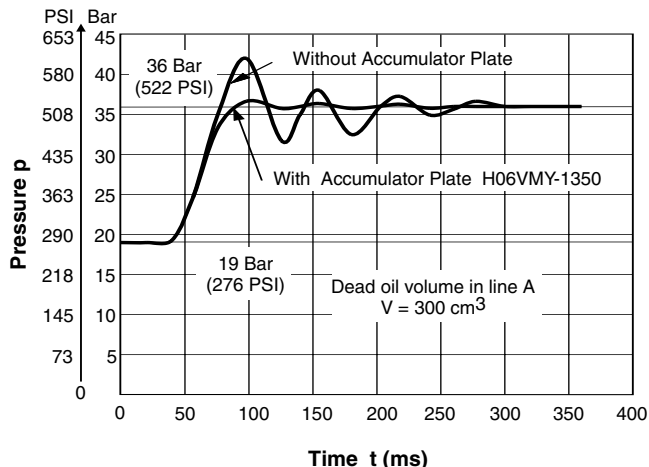
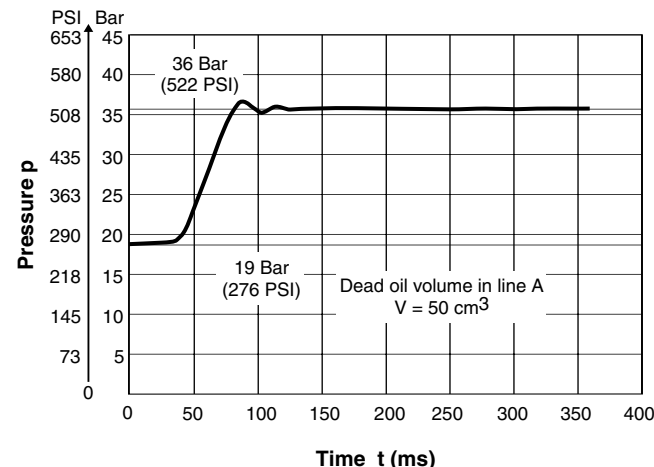


Setting Range max. 210 Bar (3045 PSI)



**Step Response Signal**

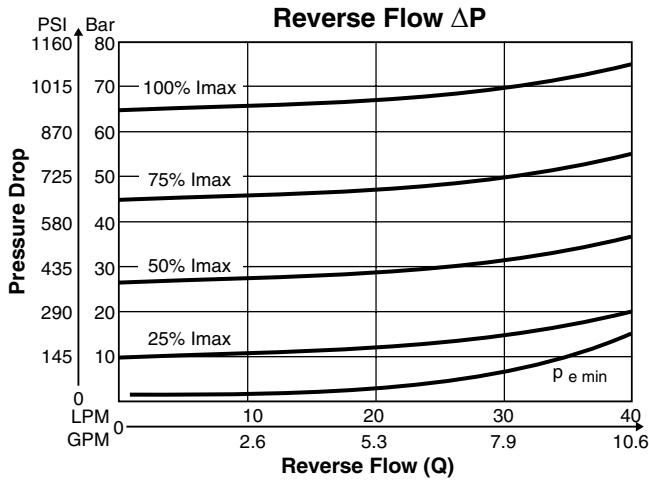
Setting Range max. 210 Bar (3045 PSI)



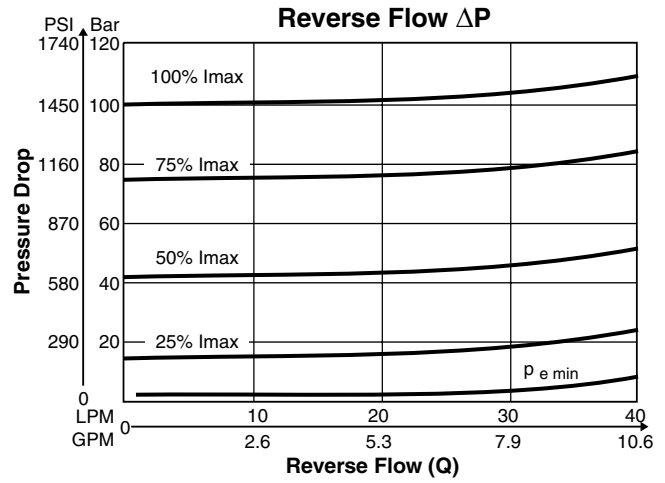
**NG06**

p/Q Performance Curves measured at  $t = 50^{\circ}\text{C}$  ( $122^{\circ}\text{F}$ ) and  $v = 36\text{mm}^2/\text{s}$

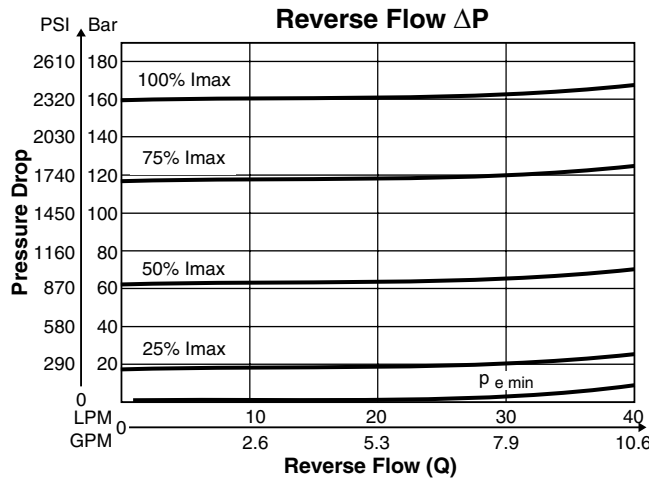
**Setting Range max. 64 Bar (870 PSI)**



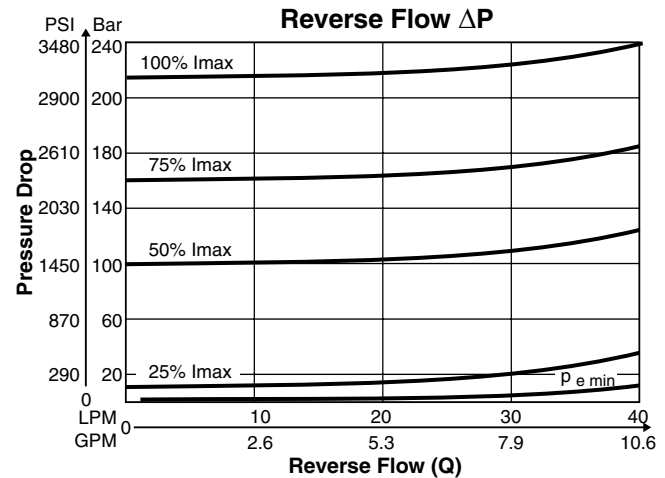
**Setting Range max. 100 Bar (1450 PSI)**



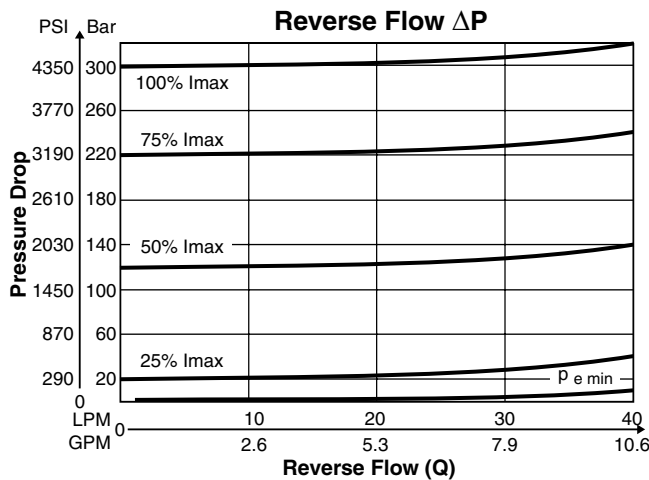
**Setting Range max. 160 Bar (2320 PSI)**



**Setting Range max. 210 Bar (3000 PSI)**



**Setting Range max. 315 Bar (4500 PSI)**



**Note:**  
 Accumulator Plate  
 H06 VMY - 1350  
 Height: 40 mm (1.58 in.)

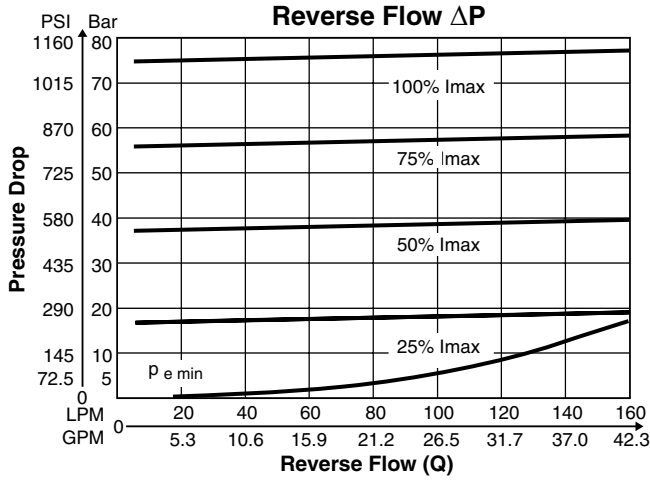


**B**

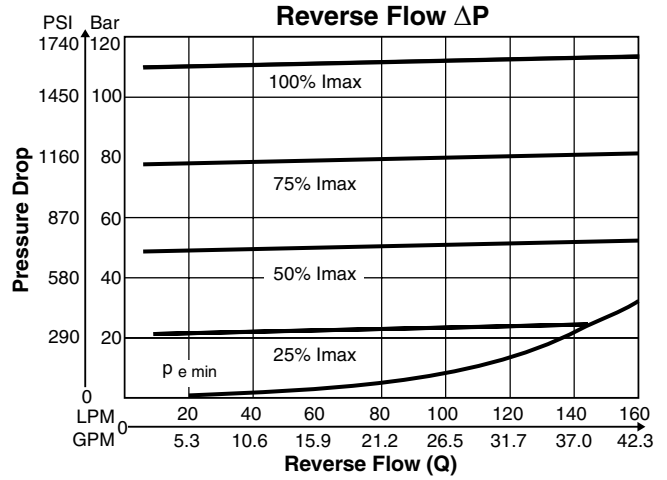
**NG10**

p/Q Performance Curves measured at  $t = 50^{\circ}\text{C}$  ( $122^{\circ}\text{F}$ ) and  $v = 36\text{mm}^2/\text{s}$

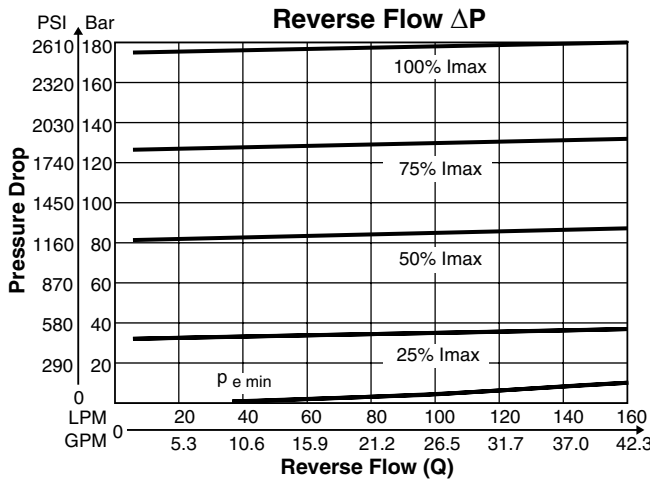
**Setting Range max. 64 Bar (870 PSI)**



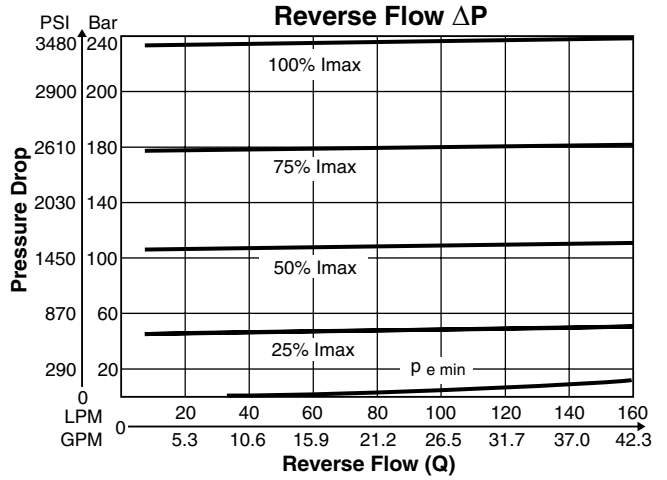
**Setting Range max. 100 Bar (1450 PSI)**



**Setting Range max. 160 Bar (2320 PSI)**



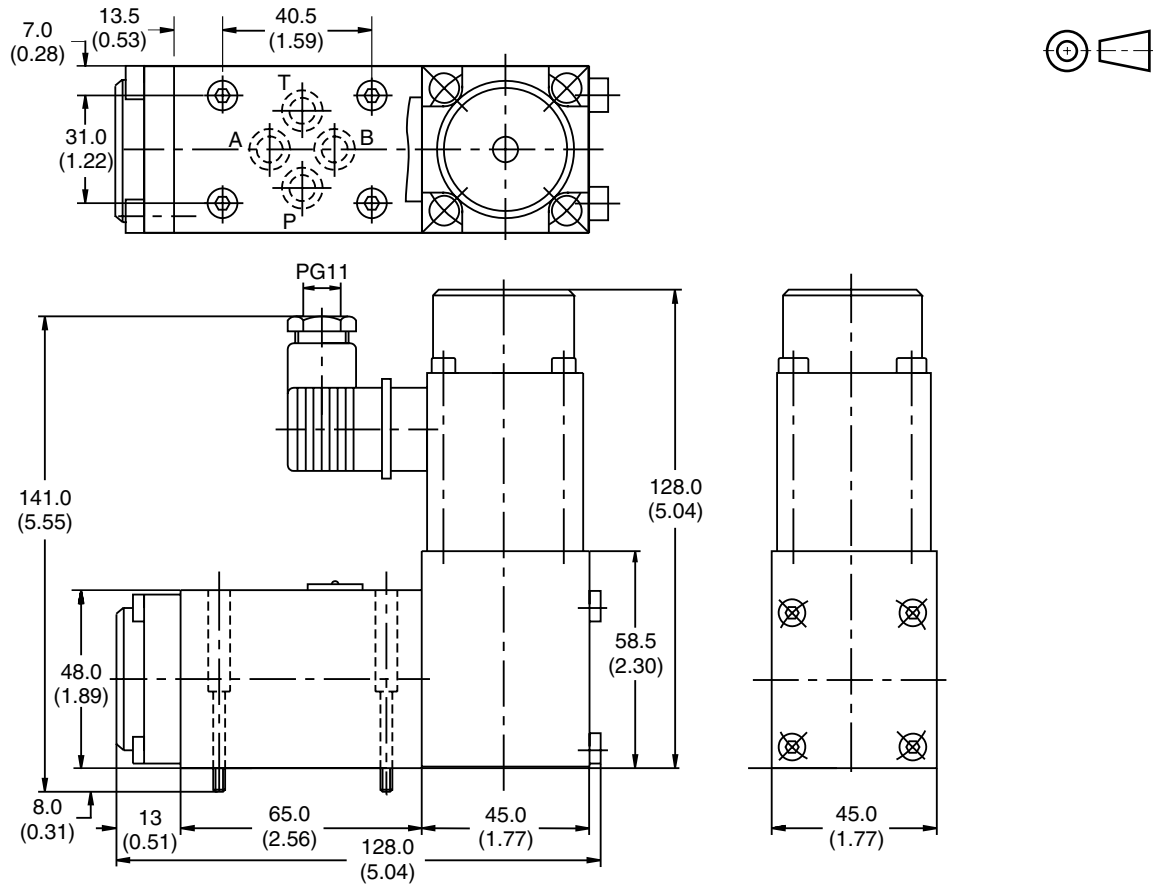
**Setting Range max. 210 Bar (3045 PSI)**





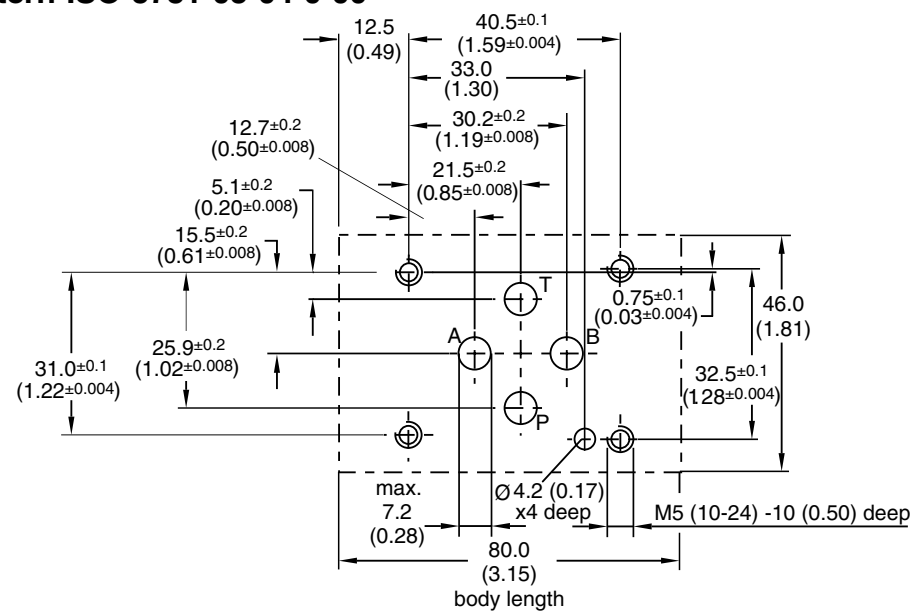
**Dimensions - NG6**

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



<b>Surface finish</b> 	<b>Bolt kit</b> <b>DIN912 12.9</b>	<b>7.5 Nm (5.5 lb.-ft.)</b>	<b>NBR</b> <b>Kit</b>	<b>FPM</b>
	BK375 4x-M5x30 BK209 4x10-24x1.25"		SK-VMY-L06-N	SK-VMY-L06-V

**Mounting Pattern ISO 5781-03-04-0-00**



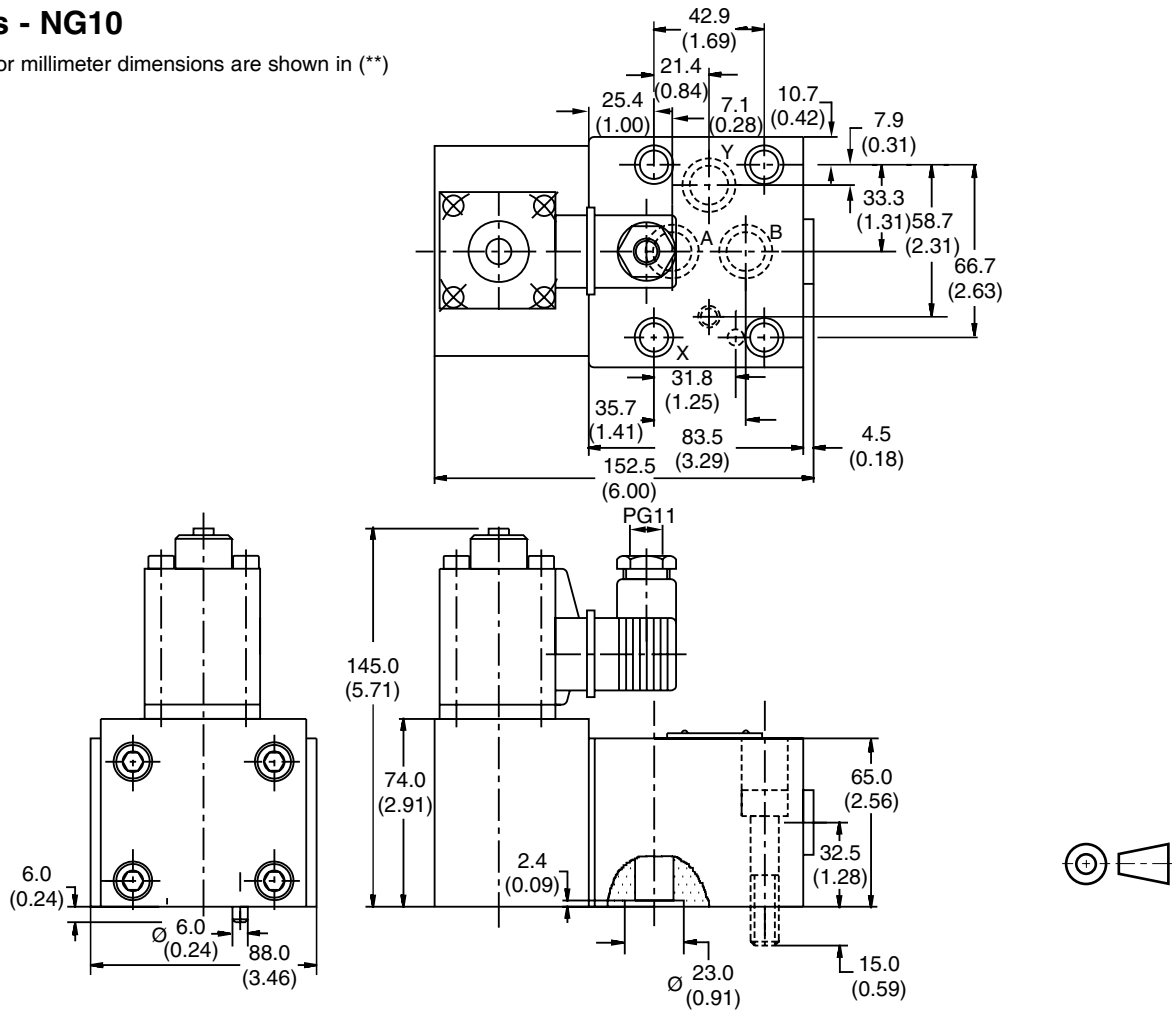
VBY\_K.p65 dd



**Dimensions - NG10**

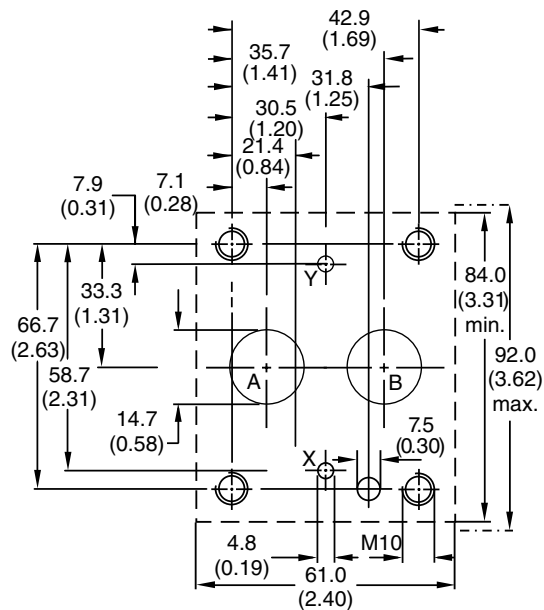
Inch equivalents for millimeter dimensions are shown in (\*\*)

**B**



<b>Surface finish</b> 	<b>Bolt kit</b> <b>DIN912 12.9</b>	<b>65 Nm (47.9 lb.-ft.)</b>	<b>Kit FPM</b>
	BK389 4xM10x50 BK153 4x3/8-16x2		SK-VB/VM-A10V

**Mounting Pattern ISO 5781-06-07-0-00**



**General Description**

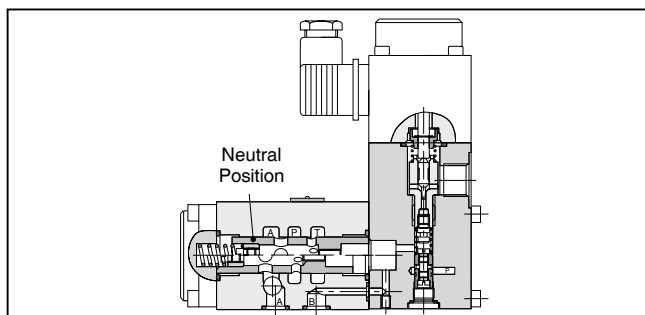
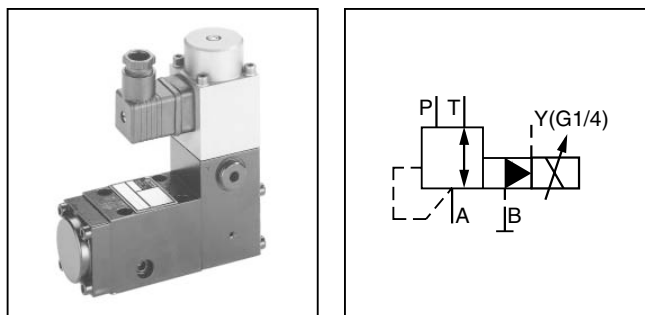
Series VMY\*06 valves consist of the main stage with valve spools and the pilot stage with the proportional solenoids. The desired pressure can be variably set corresponding to the command signal specified on the amplifier. The proportional solenoid converts the current of the amplifier into force on the valve poppet of the pilot stage.

In the pilot stage, there is a flow limiter which supplies the pilot valve with pressure-independent pilot oil flow from the pressure port P.

The proportional pressure reducing valves of the series VMY\*06 allow the variable adjustment of the reduced pressure from 0 bar up to  $p_{max}$ . Typical applications are pressure systems, test equipment, or counterweight systems. The electrical control of the valve takes place using the digital amplifier module PCD00A-400. Use in closed pressure control circuits is also possible. The valve is distinguished by its constancy.

**Features**

- Consistent performance.
- Variable adjustment.
- Pilot operated with proportional solenoid.
- Subplate according to ISO 5781.



**Function**

With the proportional solenoids de-energised the main spring forces the main spool into the neutral position. Port A is connected to port T. Thus the reduced pressure only depends on the back pressure in the external drain pipe and/or the tank pressure and can accordingly be reduced down to 0 bar. The pressure present in the P line delivers the pilot oil to the pilot stage via a flow control valve.

When the proportional solenoid is energised, the pilot pressure is increased in the pilot pressure area, and the main spool moves against the spring until the connection P - A opens. The regulation of the reduced pressure on connection A takes place by the constant comparison of the actual pressure and the reference pressure of the pilot stage.

**Ordering Information**

<b>VMY</b> Reducing Valve	□ Pressure Range	<b>K</b> Linear Solenoid	<b>06</b> Valve Size	□ Pilot Oil	<b>V</b> Seal	□ □ □ Design Series NOTE: Not required when ordering.	<b>P</b> High Pressure Channel																									
<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>064</b></td> <td><b>64 Bar (928 PSI)</b></td> </tr> <tr> <td><b>100</b></td> <td><b>100 Bar (1450 PSI)</b></td> </tr> <tr> <td><b>160</b></td> <td><b>160 Bar (2320 PSI)</b></td> </tr> <tr> <td><b>210</b></td> <td><b>210 Bar (3000 PSI)</b></td> </tr> <tr> <td><b>315</b></td> <td><b>315 Bar (4500 PSI)</b></td> </tr> </tbody> </table>		Code	Description	<b>064</b>	<b>64 Bar (928 PSI)</b>	<b>100</b>	<b>100 Bar (1450 PSI)</b>	<b>160</b>	<b>160 Bar (2320 PSI)</b>	<b>210</b>	<b>210 Bar (3000 PSI)</b>	<b>315</b>	<b>315 Bar (4500 PSI)</b>	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>06</b></td> <td><b>NG6</b></td> </tr> </tbody> </table>		Code	Description	<b>06</b>	<b>NG6</b>	<table border="1"> <thead> <tr> <th>Code</th> <th>Pilot</th> <th>Drain</th> </tr> </thead> <tbody> <tr> <td><b>N</b><sup>1)</sup></td> <td>Internal</td> <td>External<sup>2)</sup></td> </tr> <tr> <td><b>T</b></td> <td>Internal</td> <td>Internal</td> </tr> </tbody> </table>		Code	Pilot	Drain	<b>N</b> <sup>1)</sup>	Internal	External <sup>2)</sup>	<b>T</b>	Internal	Internal	<p><b>Weight:</b> 2.8 kg (6.2 lbs.)</p>	
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<b>T</b>	Internal	Internal																														

**Bold: Designates Tier I products and options.**

**Non-Bold: Designates Tier II products and options. These products will have longer lead times.**

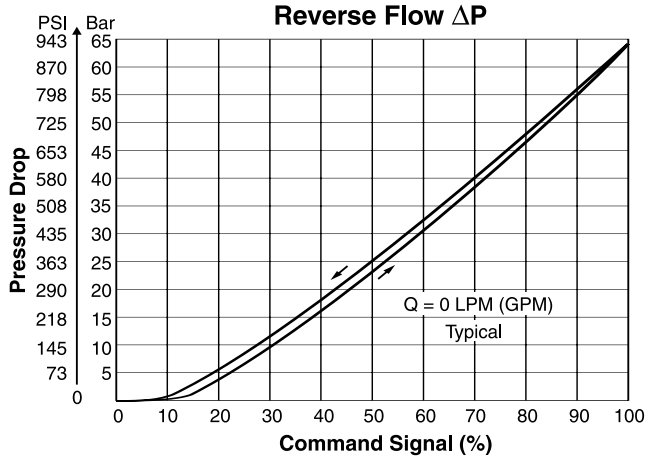


**B**

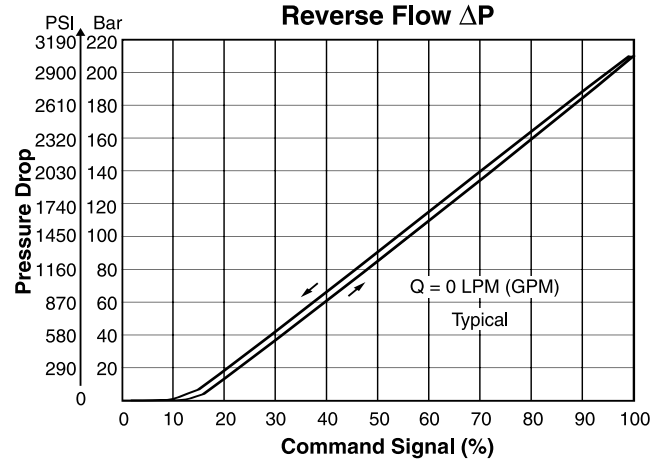
General	
Design	Proportional Reducing Valve
Size	NG6
Mounting Pattern	ISO 5781
Actuation	Proportional Solenoid
Mounting Position	Any
Ambient Temperature	-20°C to +70°C (-4°F to +158°F)
Hydraulics	
Operating Pressure, Ports	P, A and B 315 Bar (4500 PSI) T depressurized
Flow	40 LPM (10.6 GPM)
Adjustment Range	64, 100, 160, 210, 315 Bar (928, 1450, 2320, 3045, 4568 PSI)
Pressure Medium	Hydraulic oil as per DIN 51 524 to 525
Pressure Fluid Temperature	+30°C to +50°C (+86°F to +122°F) Recommended -20°C to +70°C (-4°F to +158°F) Maximum
Viscosity Range	30 to 50 mm <sup>2</sup> /s (135 to 230 SSU) Recommended 20 to 380 mm <sup>2</sup> /s (90 to 1750 SSU) Maximum
Max. Contamination Level	ISO 4406 (1999) 18/16/13
Linearity	See Performance Curves
Repeatability	<±2%
Hysteresis	±1.5% to p <sub>max</sub>
Response Time	<150 ms
Manufacturing Tolerance	±5% to p <sub>max</sub>
Electrical	
Duty Cycle	100% ED
Protection Class	IP54 at DIN 40050 (plugged and mounted)
Nominal Voltage	9 VDC
Maximum Current	2.5 A
Ambient Temperature	-20°C to +70°C (-4°F to +158°F)
Coil Resistance	2.1 ohm at 20°C (68°F)
Plug Connectors	2 pole + PE / connector EN 175301-803 / cable Ø 8 to 10mm
Power Amplifier	PCD00A-400

Pressure Curves where  $p = f(U_{set})$

**Setting Range max. 64 Bar (870 PSI)**



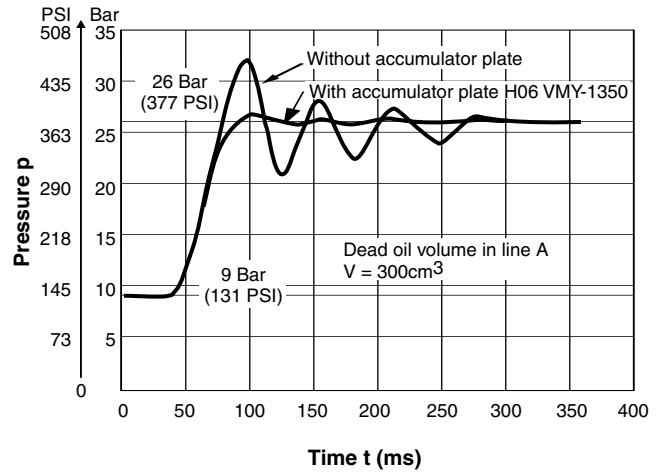
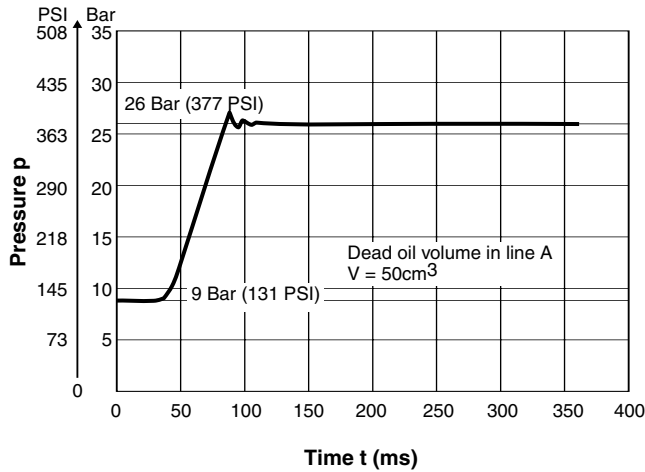
**Setting Range max. 210 Bar (3045 PSI)**



**B**

**Step Response**

Typical Curve



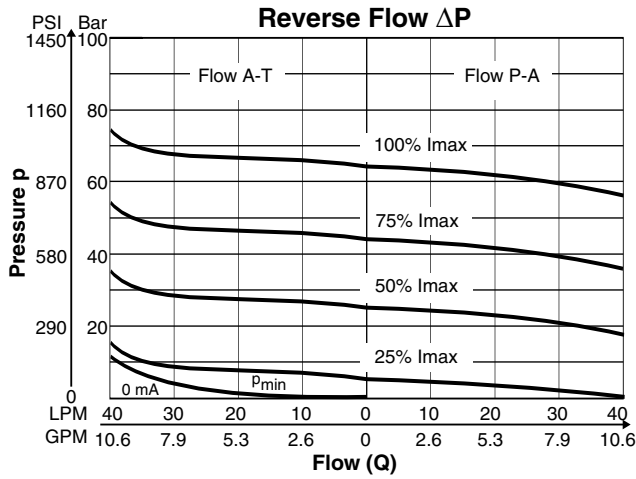
**Note:**

Accumulator Plate  
 H06 VMY - 1350  
 Height: 40 mm (1.58 in.)

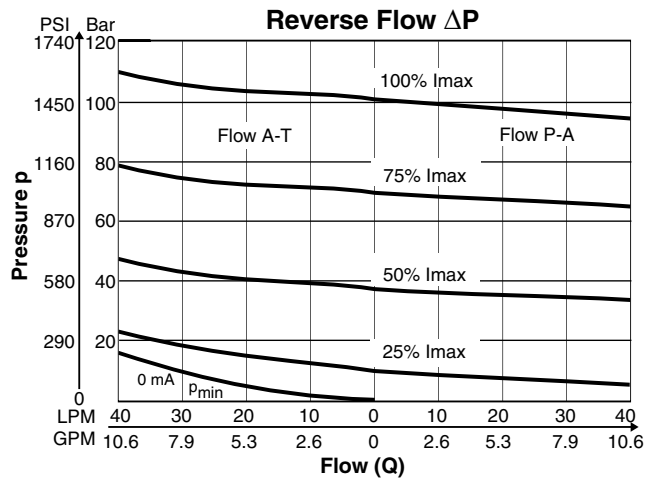


p/Q Performance Curves measured at  $t = 50^{\circ}\text{C}$  ( $122^{\circ}\text{F}$ ) and  $v = 35\text{mm}^2/\text{s}$

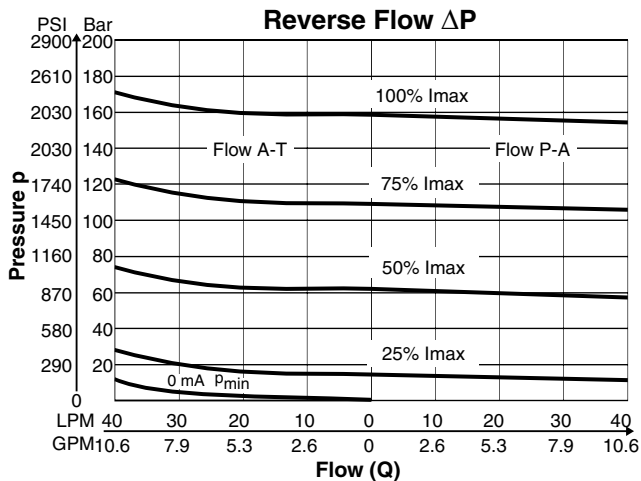
**Setting Range max. 64 Bar (870 PSI)**



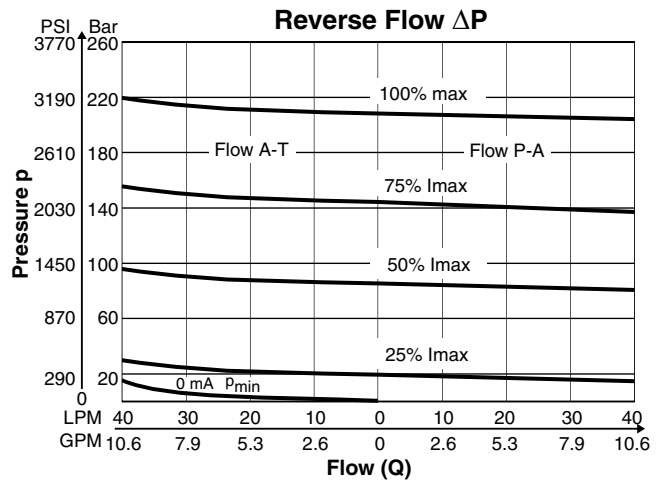
**Setting Range max. 100 Bar (1450 PSI)**



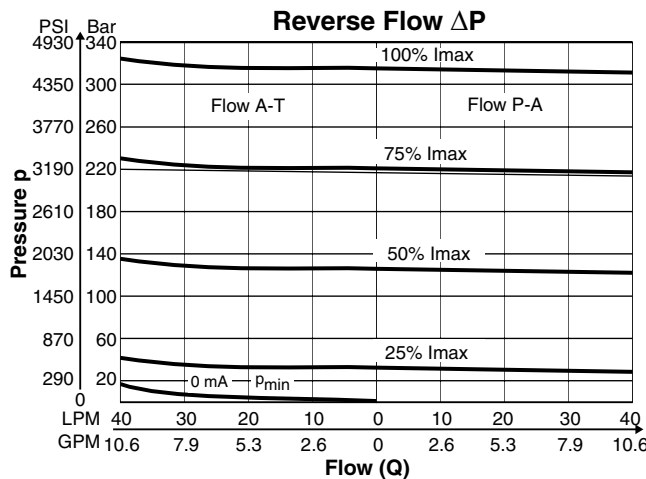
**Setting Range max. 160 Bar (2320 PSI)**



**Setting Range max. 210 Bar (3000 PSI)**

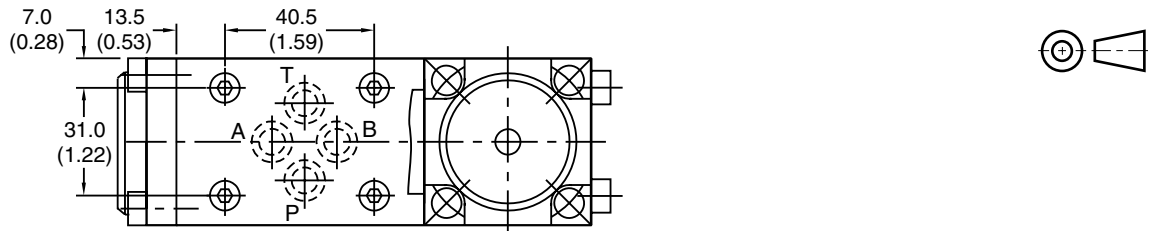


**Setting Range max. 315 Bar (4500 PSI)**

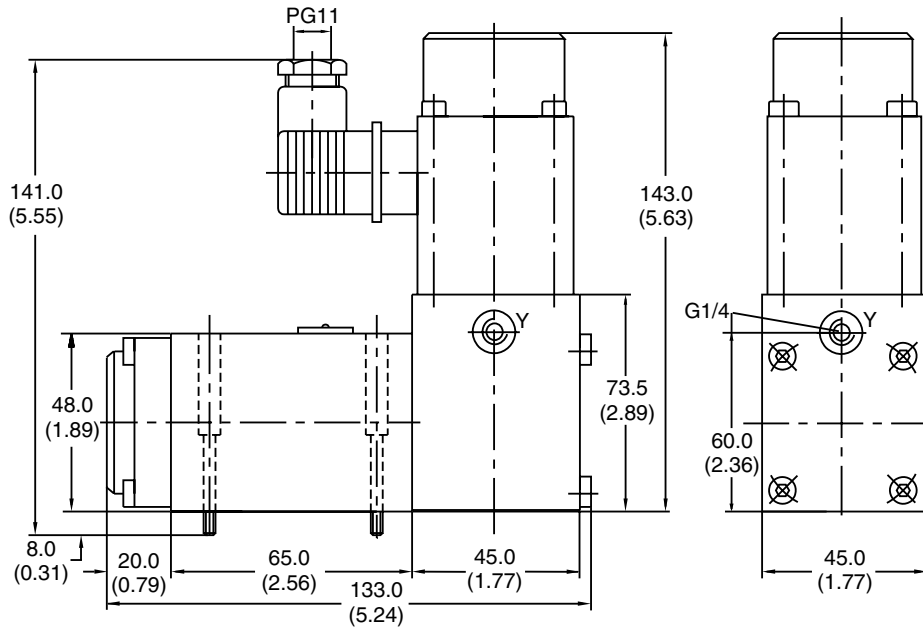


**Dimensions**

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

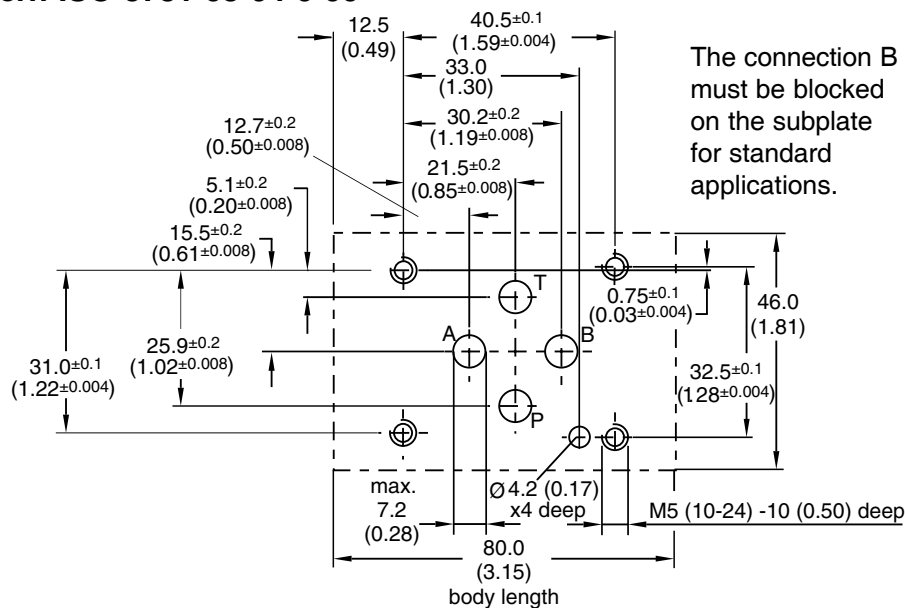


**B**



<b>Surface finish</b> 	<b>Bolt kit</b> <b>DIN912 12.9</b>		<b>Kit</b> <b>FPM</b>
	BK-M5x30-4pcs	7.5 Nm (5.5 lb.-ft.)	SK-VMY-L06-V

**Mounting Pattern ISO 5781-03-04-0-00**



**Contents**

Series	Description	Page
BD15 .....	Two-Stage Torque Motor Servovalve (up to 20 GPM) .....	C2 - C8
BD30 .....	Two-Stage Torque Motor Servovalve (up to 40 GPM) .....	C2 - C5, C9 - C11
PH76 .....	Two-Stage Torque Motor Servovalve (up to 15 GPM) .....	C12 - C15
DY1S .....	One-stage Torque Motor Servovalve (Pressure Control) .....	C16 - C18
DY3H/DY6H .....	Two-stage Torque Motor Servovalve (up to 6 GPM) .....	C19 - C22
DY01 .....	Two-stage Torque Motor Servovalve (up to 3 GPM) .....	C23 - C26
DY05 .....	Two-stage Torque Motor Servovalve (.25 to 5 GPM) .....	C27 - C30
DY10 .....	Two-stage Torque Motor Servovalve (7.5 to 10 GPM) .....	C31 - C34
DY12 .....	Two-stage Torque Motor Servovalve (12.5 to 15 GPM) .....	C35 - C38
DY15 .....	Two-stage Torque Motor Servovalve (15 to 25 GPM) .....	C39 - C42
DY25 .....	Two-stage Torque Motor Servovalve (25 to 30 GPM) .....	C43 - C46
DY45 .....	Two-stage Torque Motor Servovalve (40 to 60 GPM) .....	C47 - C50

**C**



**Description**

Series BD servovalves provide high resolution in the control of position, velocity and force in motion control applications.

**Features**

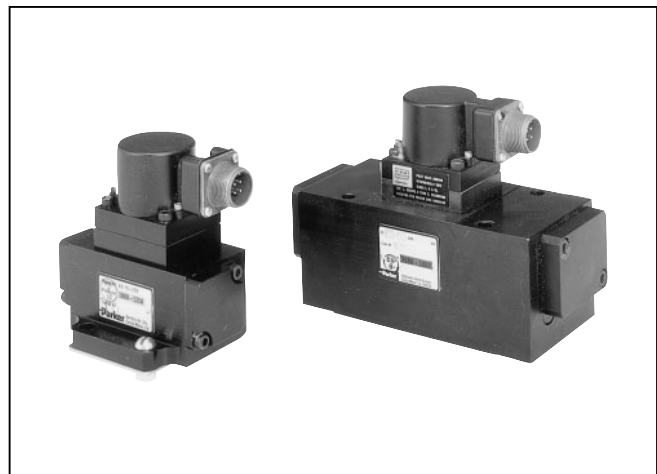
- Rugged reliable trouble-free operation.
- Reduced contaminant sensitivity.
- Linear flow gain characteristics.
- Intrinsically safe model available.
- Explosion proof model available.

**Operation**

When used in conjunction with Series BD90/95 and BD101 servo amplifiers or a motion controller, Series BD valves will provide accurate control of rotary and linear actuators.

**Specifications**

Rated Flow @ 1000 PSI ΔP	3.78–151 LPM (1.0 – 40 GPM)	
Linearity	≤ 5%	
Hysteresis	≤ 3%	
Threshold	≤ 0.5%	
Fluid	Mineral oil, 60–225 SSU, max. 1000 SSU	
Oper. Temp. (Ambient)	–1 to 106°C (30 to +225°F)	
Pressure Gain	3% of spool shift	
Null Shift with Temperature	< ± 2% per 38°C (100°F)	
Null Shift with Supply Pressure	< 2% per 69 Bar (1000 PSI)	
Quiescent Flow (Std. Spool Lap)	BD15 – 1.5–2.1 LPM (.40–.55 GPM) BD30 – 2.1–3.78 LPM (.55 – 1.0 GPM)	
Step Response Input	Model	Typical Step Response Input
	BD15	10 to 90%, 26 ms
	BD30	10 to 90%, 30 ms
<b>Pressure Ranges</b>		
For optimum performance, Parker Servo Valves are designed to operate within specific system supply pressure ranges.		
<u>System Supply Pressure</u>		
180–210 Bar (2600–3000 PSI)	48–66 Bar (700–950 PSI)	
138–172 Bar (2000–2500 PSI)	14–45 Bar (200–650 PSI)	
95–133 Bar (1400–1950 PSI)	0–210 Bar (0–3000 PSI)	
68–90 Bar (1000–1300 PSI)	External Pilot	
Filtration	SAE Class 3 or better, ISO Code 17/15/12	
Protection Class	NEMA 1 (IP54)	



**Flow–Load Characteristics**

Control flow to the load will change with load pressure and valve current as shown in figure 1. These characteristics closely follow the theoretical square–root relationship for sharp–edged orifices as illustrated in the equation below.

$$Q = K\sqrt{\Delta P}$$

- Q = Control flow, cubic inches/sec
- K = Valve constant
- ΔP = Valve pressure drop

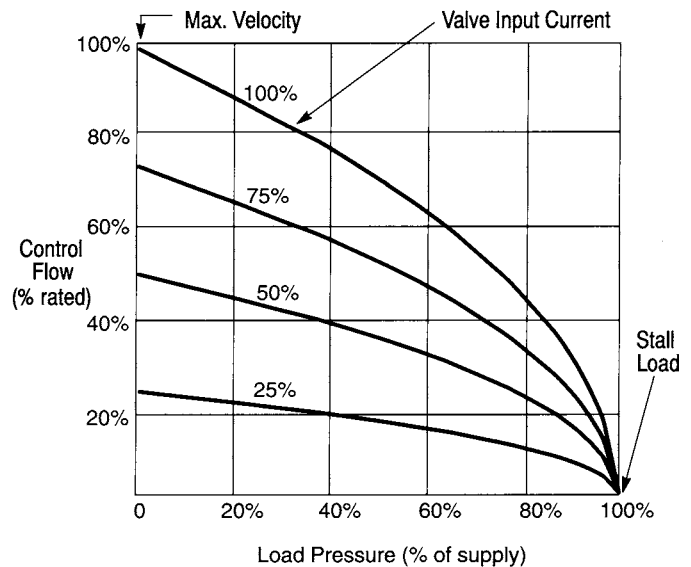


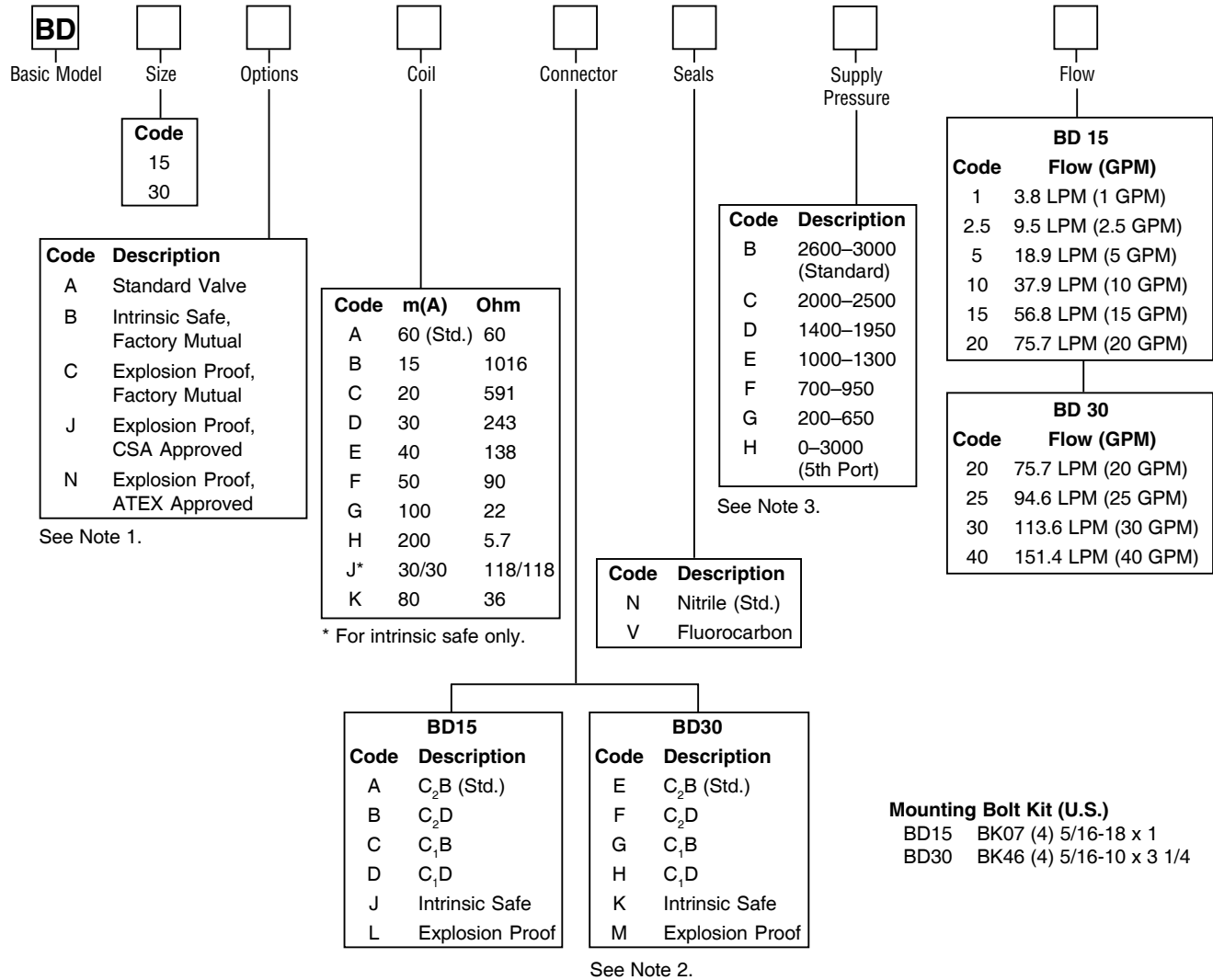
Figure 1. Change in flow with current and load pressure

**Quick Reference Data Chart**

Model	Flow Capacity @ 1000 PSID LPM (GPM)	Max. Pressure Rating	Max. Tank Pressure	Port Circle	Electrical Input (Std.) Single Coil	Coil Resistance (Std.) Each Coil	Weight
BD15	3.8, 9.5, 19, 37, 57, 76 (1, 2.5, 5, 10, 15, 20)	210 Bar (3000 PSI)	14 Bar (200 PSI)	.875	60 mA (Full Flow)	60 ohms	1.2 kg (2.6 lbs.)
BD30	76, 95, 113, 151 (20, 25, 30, 40)	210 Bar (3000 PSI)	14 Bar (200 PSI)	1.75	60 mA (Full Flow)	60 ohms	2.9 kg (6.3 lbs.)

BD.p65, dd





**Note 1: “B” Intrinsic Safe Option meets** Factory Mutual Intrinsically Safe Class I, II and III, Division 1 Groups A through G. Refer to Parker Bulletin 1452.

**“C” Explosion Proof meets:**  
 Factory Mutual Explosion Proof Class I, II, III, Division 1, Groups A through G

**“J” Explosion Proof meets:**  
 Canadian Standards Association Class I, Groups A through D  
 Class II, Groups E, F and G  
 Class III  
 Refer to Parker Bulletin 1451.

**“N” Explosion Proof meets:**  
 ATEX  $\text{Ex}$  II2G EExm II T3 T<sub>amb</sub> 45°C to -50°C  
 Request Parker Documentation Package: 1200074

**Note 2:** Connector Location & Flow Polarity (Standard connector over C<sub>2</sub> + to B = P to C<sub>1</sub> flow).  
 C<sub>2</sub>B = Connector over Port C<sub>2</sub> + to Pin B = P to C<sub>1</sub> flow.  
 C<sub>2</sub>D = Connector over Port C<sub>2</sub> + to Pin D = P to C<sub>1</sub> flow.  
 C<sub>1</sub>B = Connector over Port C<sub>1</sub> + to Pin B = P to C<sub>1</sub> flow.  
 C<sub>1</sub>D = Connector over Port C<sub>1</sub> + to Pin D = P to C<sub>1</sub> flow.

**Note 3:** Supply Pressure: Code “H” applies to 5th Port/External Pilot Option. This requires the use of a blank orifice “-00”. First stage pressure should be limited to 41.4 Bar (600 PSI) and no less than 27.6 Bar (400 PSI).  
 Servo valve rated flow at 1000 PSID ±10%.

**Accessories**

Model	Description	Model	Description
6522A11	1/16" Hex Allen Wrench	820089-1	BD30 Servovalve Shipping Container
810005-1	Orifice Filter	BD830008	BD90/95 Amplifier Board Shipping Container
810013-**	Valve Orifice Kit, Fluorocarbon		
810014-**	Valve Orifice Kit, Nitrile	810089-1	BD15 Servovalve Shipping Container
<b>**Dash #</b>	<b>Operating Pressure</b>	820000TF3	Filter Wrench
-16	180 – 210 Bar (2600 – 3000 PSI)	MS3106E-14S-2S	SV Mating Connector
-18	138 – 176 Bar (2000 – 2550 PSI)		
-20	96 – 134 Bar (1400 – 1950 PSI)		
-22	69 – 93 Bar (1000 – 1350 PSI)	1200127	Flushing valve for BD15
-33	48 – 66 Bar (700 – 950 PSI)		
-50	14 – 45 Bar (200 – 650 PSI)		
-00	0 – 210 Bar (0 – 3000 PSI) 5th Port	1200128	Flushing valve for BD30

**Adapters**

□  
Type of Adapter

Code	To Mount A _____	Onto A _____ Pattern
810092-1	BD15	BD30 (1.75)
810093-5	BD15	D05
810094-5	BD15	D03
810098-1	BD15	.937 Port Circle
810097-3	BD15	.785 Port Circle
810096-5	BD15	.625 Port Circle
820006-1	BD30	Moog 62-303B & Atchley 231
820007-1	BD30	D08
820091-1	BD30	BD15 (.875)
820092-1	BD30	2.00 Port Circle
Consult Factory	BD30	1.375
Consult Factory	BD15	D05H

□  
Seals

Code	Description
Omit	Nitrile
V	Fluorocarbon

**Subplates**

Valve Model	Subplate	Port Size	Location	Bolt Kit	Torque Specifications (Lubricated)
BD15	810090-3	SAE12	Side	BK07	17 ft. lbs.
BD30	820090-3	SAE16	Side	BK46	17 ft. lbs.

**Cables**

**EHC**  
 Electrohydraulic  
 Cable for BD  
 Series Valves

□  
Length

Code	Length
9	Length
15	in Feet

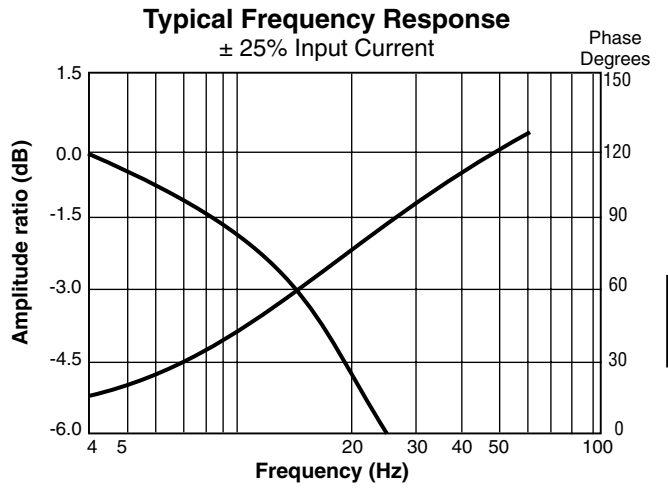
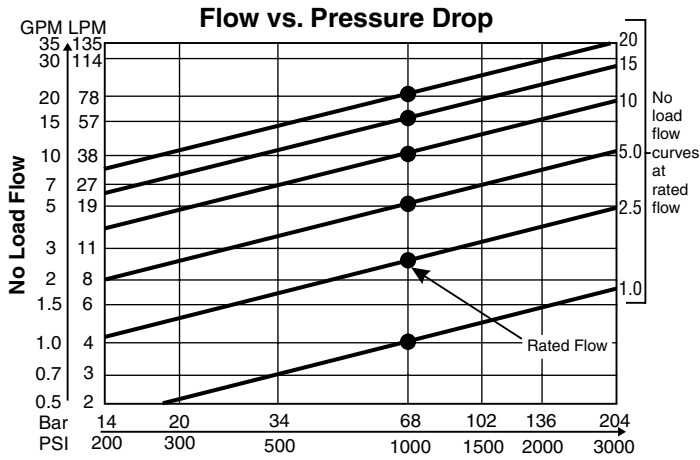
**4**  
Cable Type

Code	Description
4	4-wire, 20 awg. shielded Belden 9402)

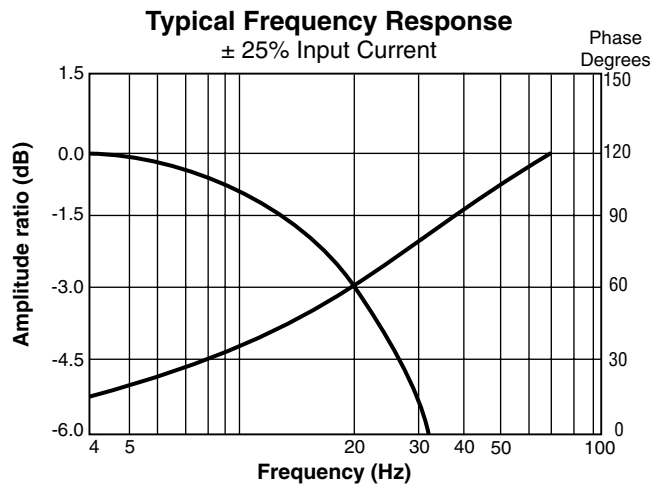
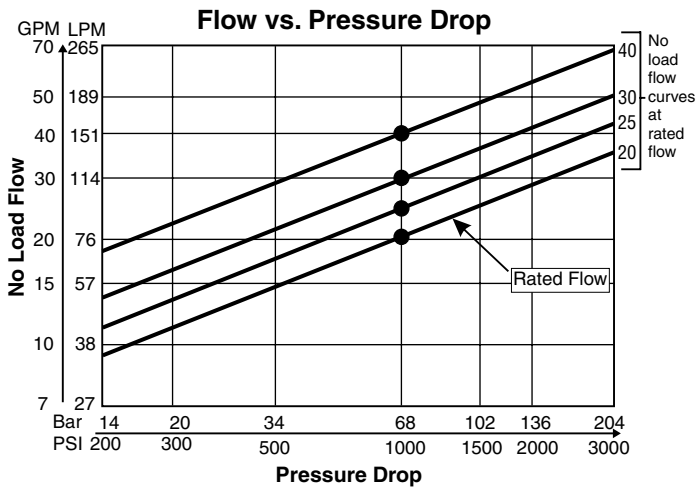
**S**  
Pin Orientation

Code	Description
S	BD Series

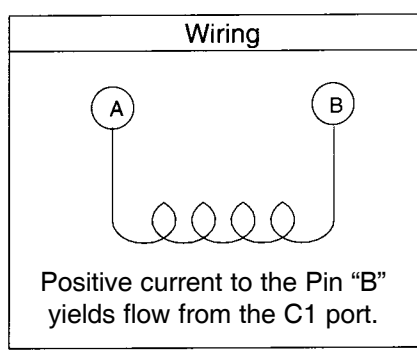
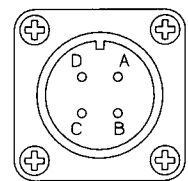
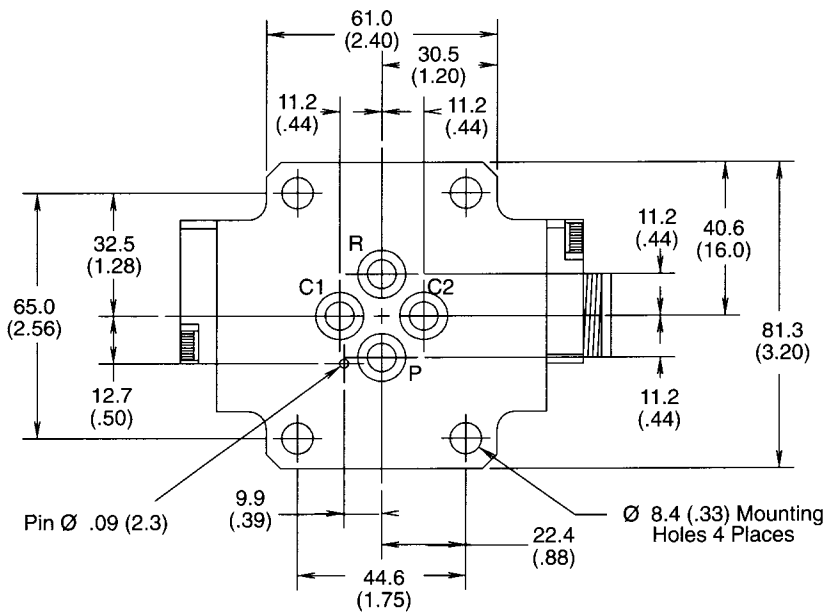
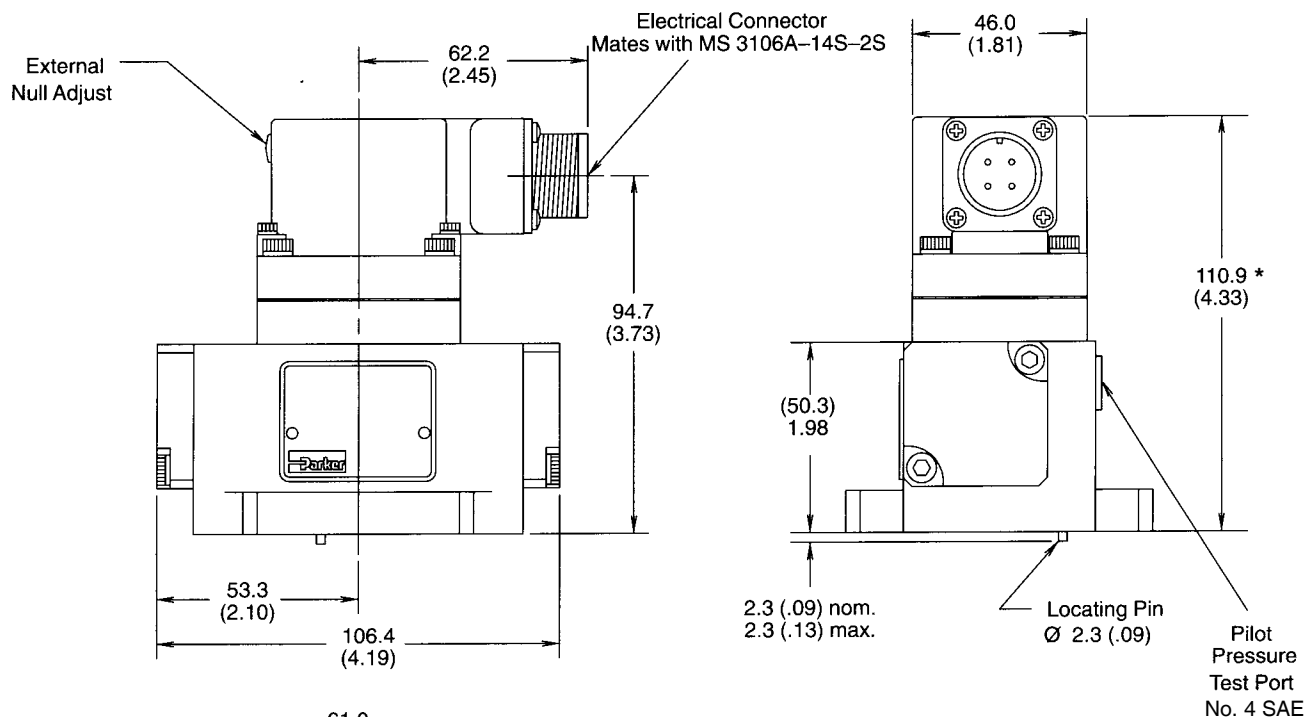
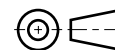
**Series BD15**



**Series BD30**



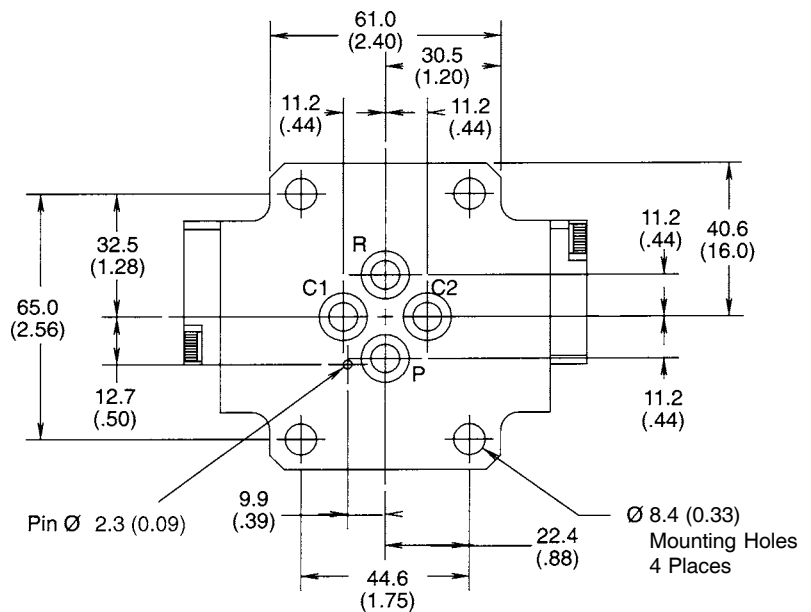
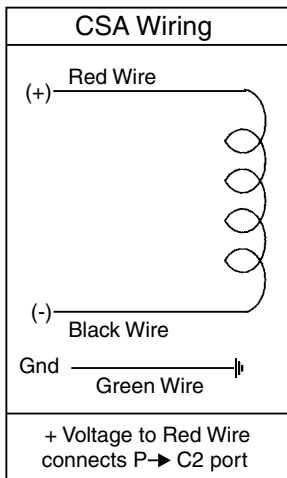
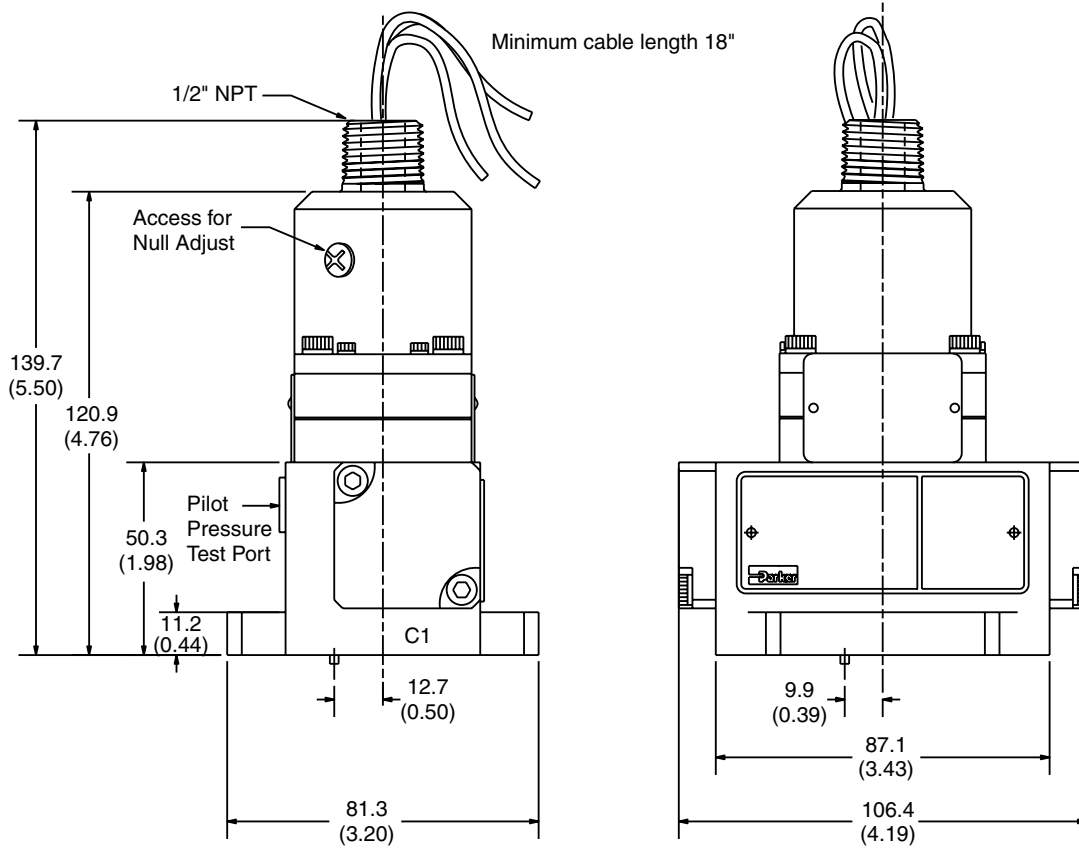
Inch equivalents for millimeter dimensions are shown in (\*\*)



Note: Valve mating surface to be flat within 0.002 TIR, and smooth to within 63 RMS

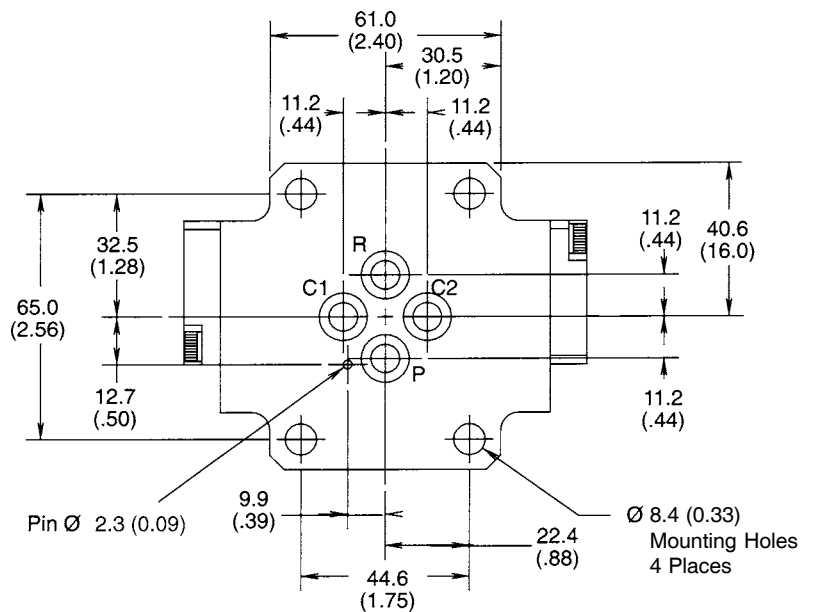
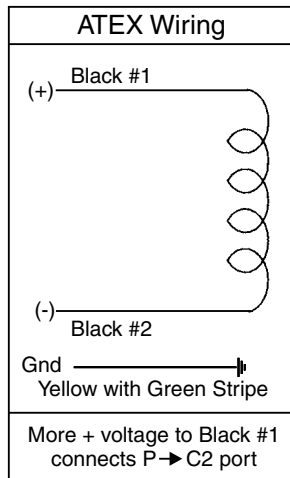
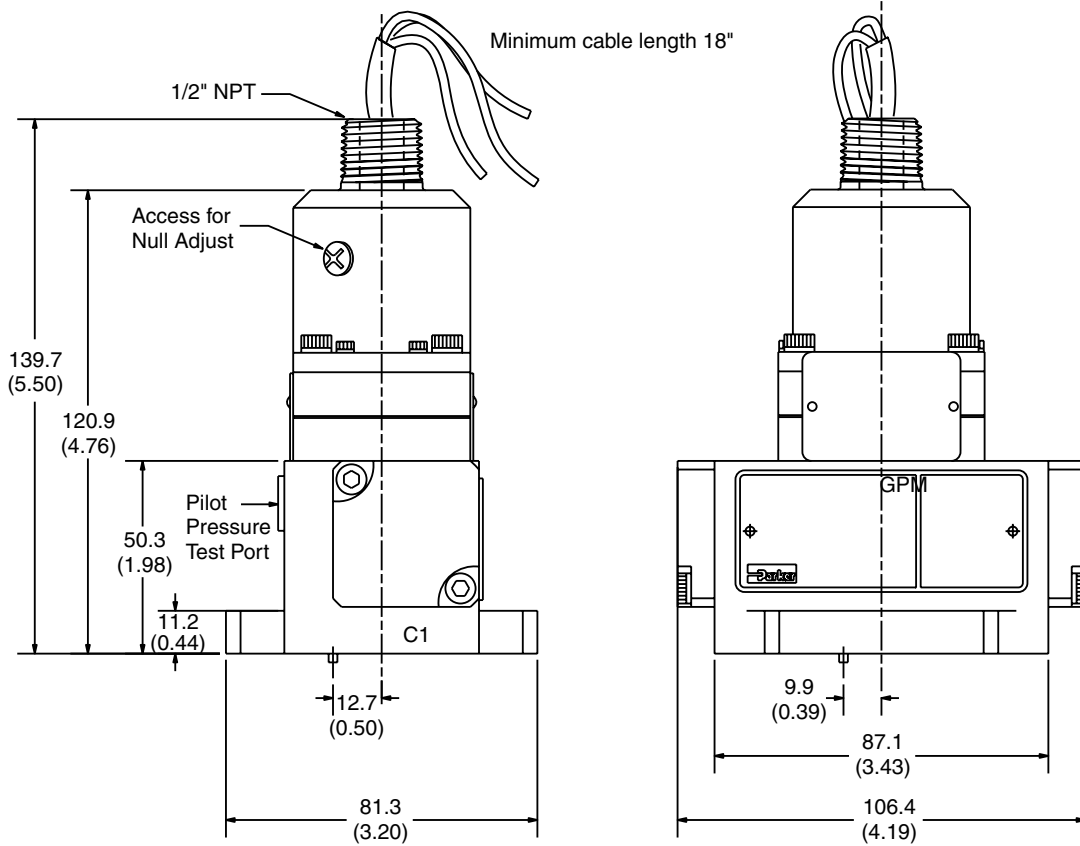
\* 140 (5.50) for BD15C; explosion proof, FM approved.  
Note: Vertically oriented 1/2 NPT threaded male conduit connection with lead wires (not as shown).

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



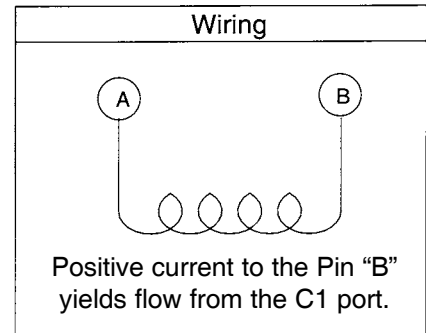
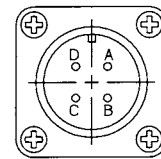
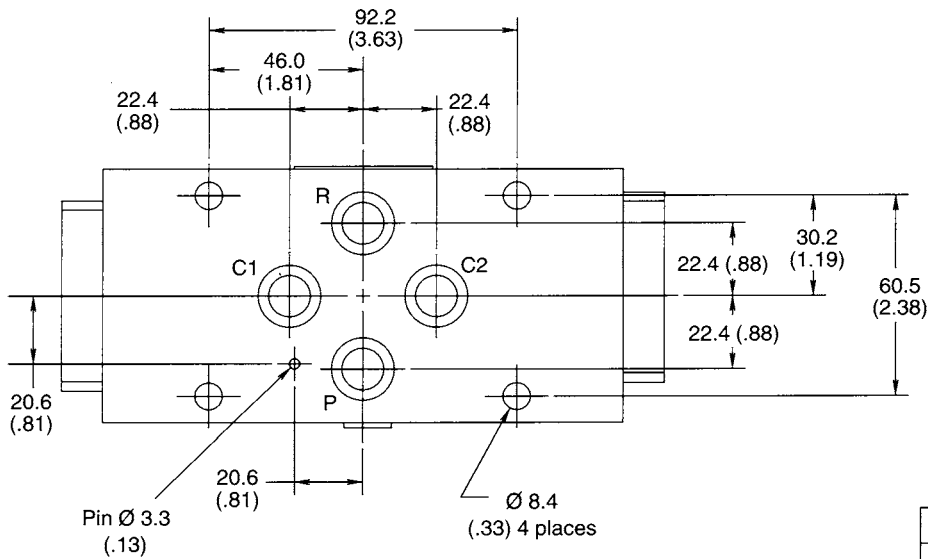
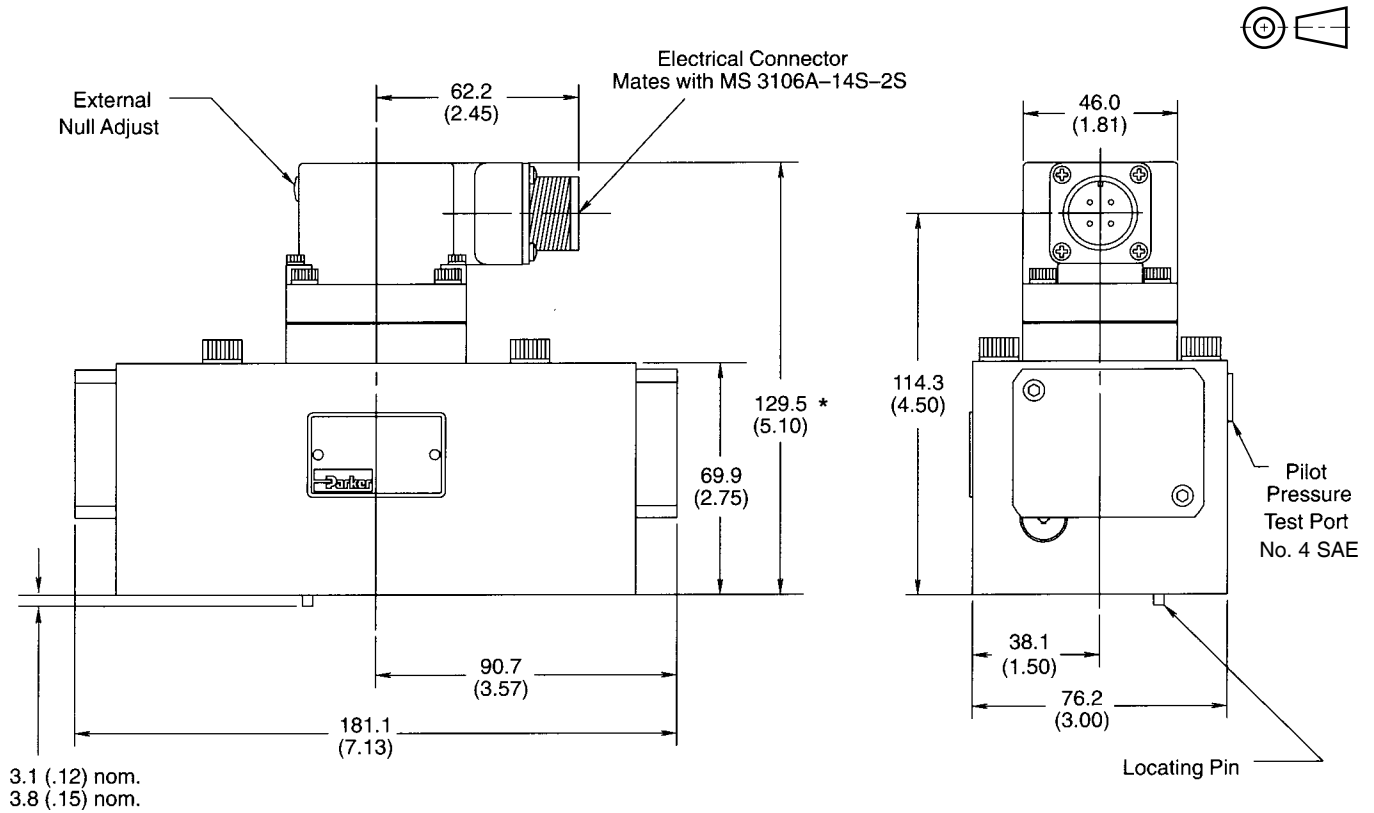
Note: Valve mating surface to be flat within 0.002 TIR, and smooth to within 63 RMS

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



Note: Valve mating surface to be flat within 0.002 TIR, and smooth to within 63 RMS

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

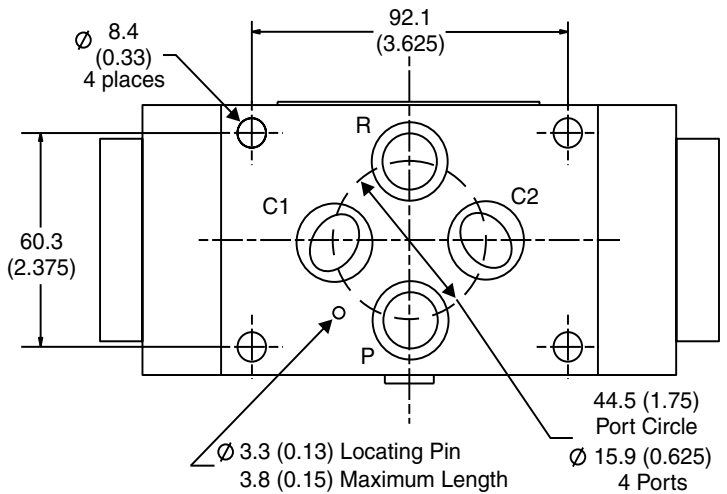
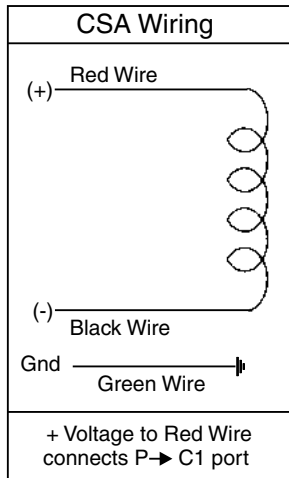
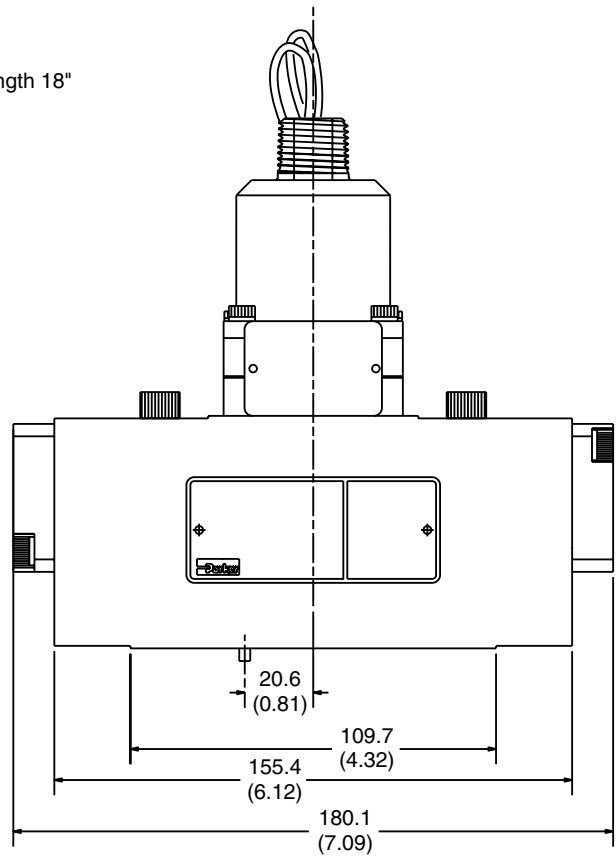
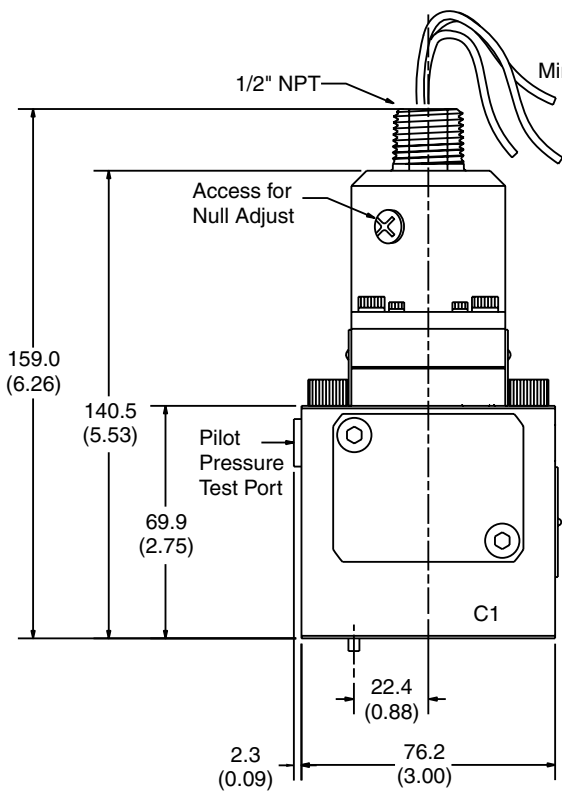


Note: Valve mating surface to be flat within 0.002 TIR, and smooth to within 63 RMS

\* 160 (6.25) for BD30C; explosion proof, FM approved.  
Note: Vertically oriented 1/2 NPT threaded male conduit connection with lead wires (not as shown).



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

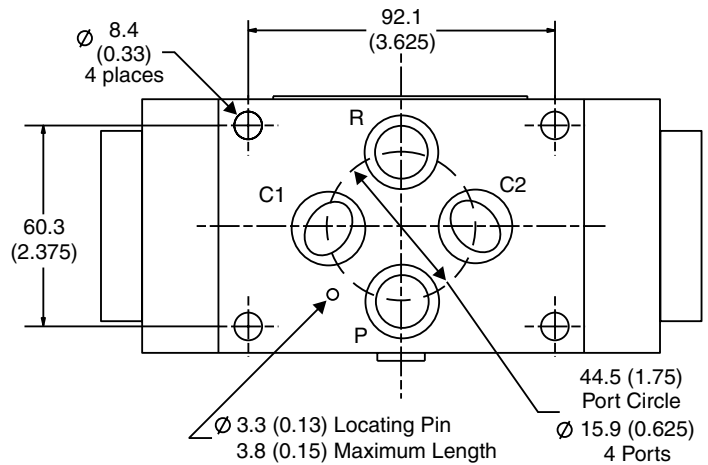
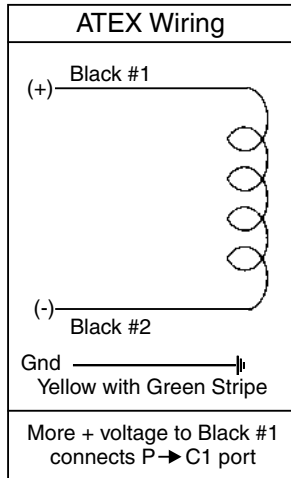
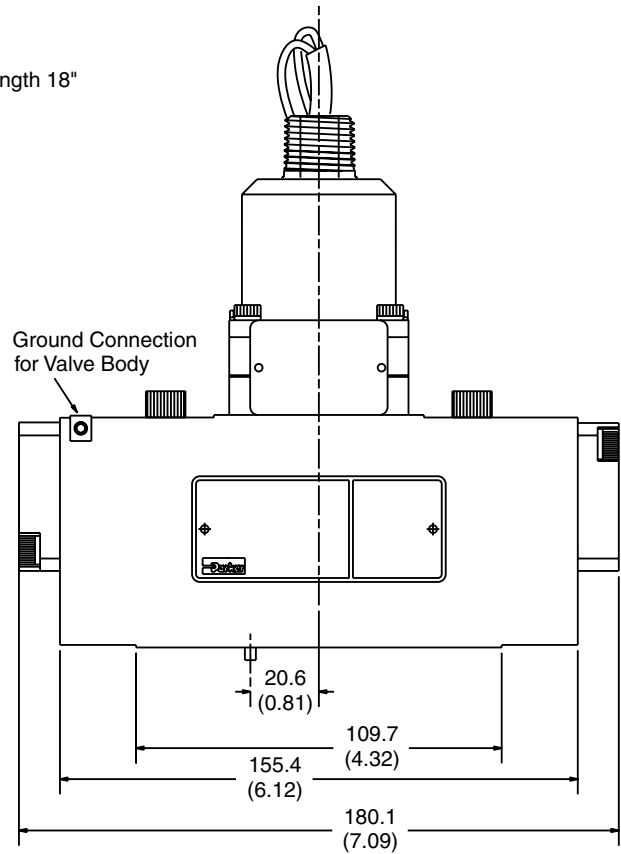
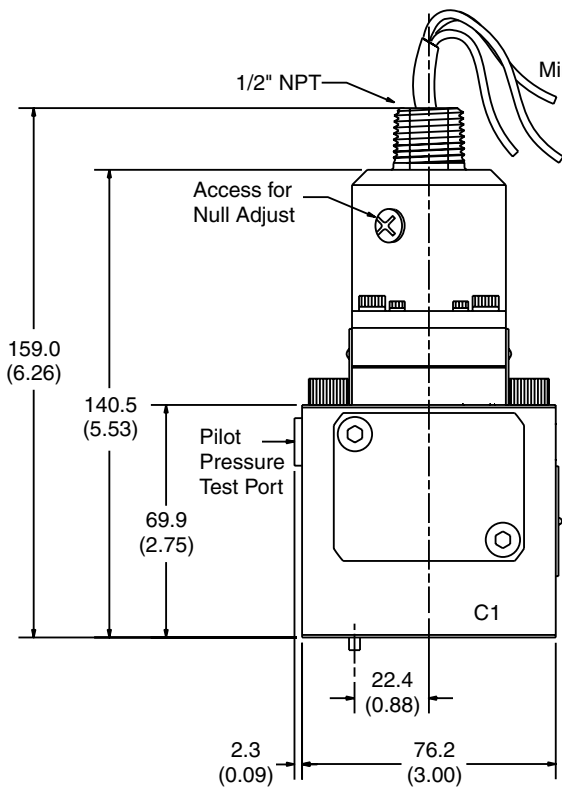


Note: Valve mating surface to be flat within 0.002 TIR, and smooth to within 63 RMS

**Dimensions**

**Series BD30, ATEX Version BD30N\*M**

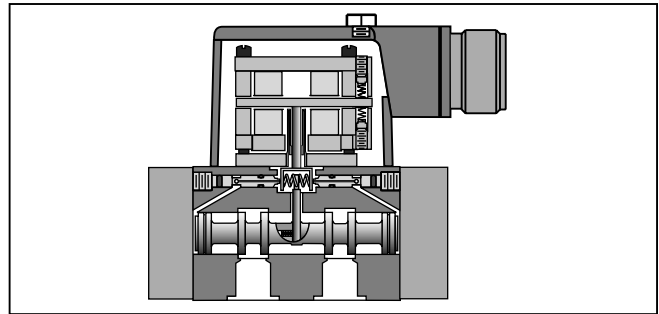
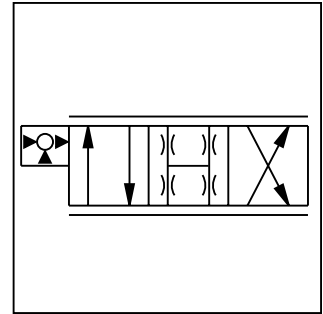
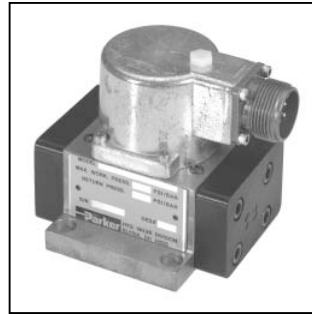
Inch equivalents for millimeter dimensions are shown in (\*\*)



Note: Valve mating surface to be flat within 0.002 TIR, and smooth to within 63 RMS

### General Description

Series PH76 servovalves are high performance, two stage valves, with a range of rated flows from 3.8 to 57 LPM (1 to 15 GPM). The pilot stage is a symmetrical double-nozzle and flapper, driven by a double air gap, dry torque motor. A low current signal to the torque motor pilot stage results in a proportional flow from the output stage. The output stage is a 4-way, sliding spool which provides a mechanical feedback using an exclusive “no ball glitch” design.



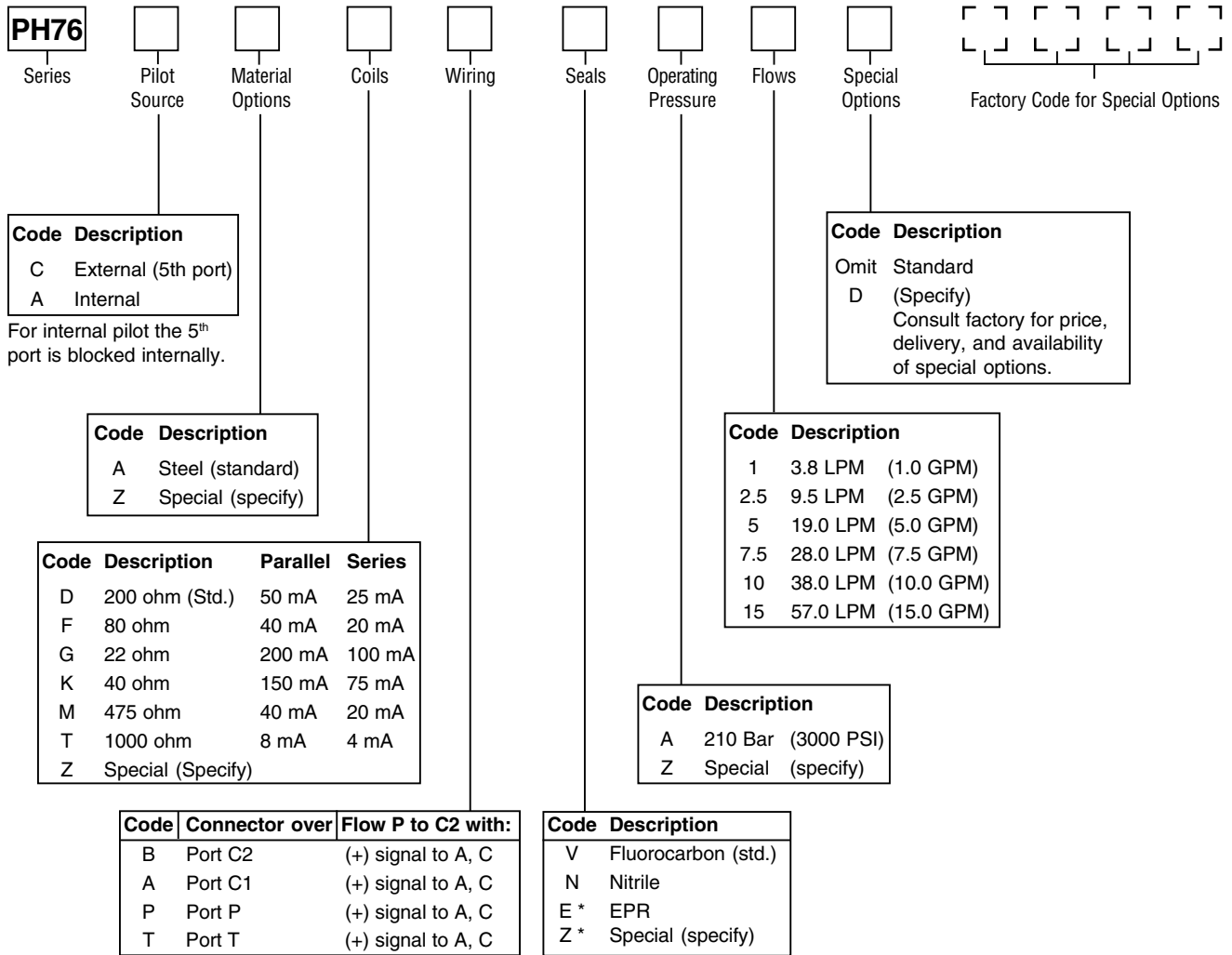
### C

### Features

- Built to survive tank port pressure spikes.
- No ball glitch.
- Tool steel spool and body.
- Optional 5<sup>th</sup> port for external pilot.
- ISO 10372 standard 22.23 mm (0.875 in) port circle.

### Specifications

<b>Flow Rating ±10%</b> @ 70 Bar (1000 PSID)	3.8, 9.5, 19, 28, 38, 57 LPM (1, 2.5, 5, 7.5, 10, 15 GPM)	<b>Threshold</b>	≤ 0.5%
<b>Supply Pressure</b>	10 – 210 Bar (145 – 3000 PSI)	<b>Null Shift</b> with temperature with pressure	≤ 2% per 55°C (100°F) ≤ 2% per 70 Bar (1000 PSI)
<b>Tank Port Pressure</b>	210 Bar (3000 PSI) Max. < 10 Bar (145 PSI) for best performance	<b>Pressure Gain</b> % change in pressure per 1% change in input command	30% minimum, 70% max.
<b>Null Leakage Flow</b> per 70 Bar (1000 PSID)	0.2 – 0.8 LPM (0.05 – 0.20 GPM)	<b>Step Response</b>	10 – 90%, < 6 ms
<b>Pilot Flow</b> @ 210 Bar (3000 PSID)	0.8 – 1.2 LPM (0.21 – 0.33 GPM)	<b>Fluid</b>	Mineral Oil, 60 – 225 SSU 1000 SSU maximum
<b>Input Command</b>	±50 mA std.	<b>Operating Temperature</b>	-1°C to +82°C (+30°F to +180°F)
<b>Frequency Response</b> @ 90° phase shift	> 90 Hz (See Performance Curves)	<b>Protection Class</b>	NEMA 4, IP65
<b>Non-Linearity</b>	≤ 10%	<b>Fluid Cleanliness</b>	ISO 4406 15/12 or better



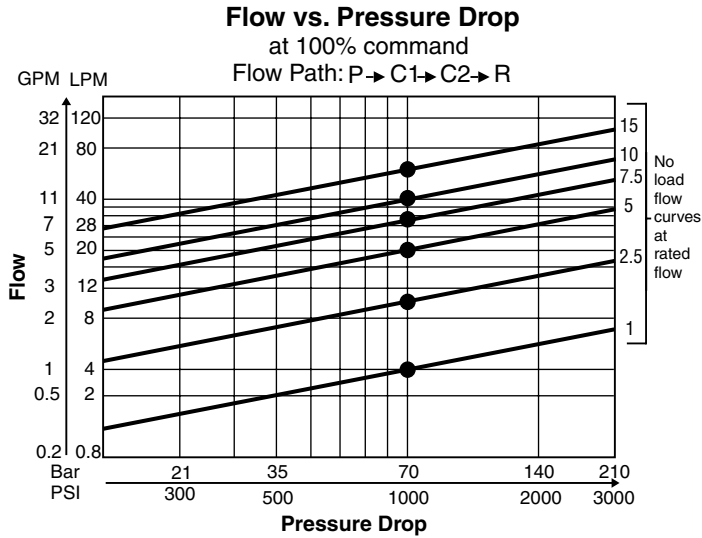
**Weight:** 1 kg (2.2 lb)  
**Cable with mating connector:** EHC154S  
**Mating connector:** MS3106E-14S-2S  
**Bolt kit:** Included with valve. BK07 (4) 5/16-18x1"  
**Flushing valve:** 1200127 (same for 4 or 5 port PH76 valve)  
**Subplate, 5 ports:** 1402303 (4) #12 SAE side ports, (1) #4 SAE side port  
**Subplate, 4 ports:** 810090-3 (4) #12 SAE side ports  
**Null adjust tool:** 27-0210  
**Driver cards:** 23-5030, 23-7030, BD90\*, BD95\* and BD101\*  
 When used in conjunction with Series BD90/95 and BD101 servo amplifiers or a motion controller, Series BD valves will provide accurate control of rotary and linear actuators.  
 \* For output currents >15 mA



Flushing valve is rated for 3000 psi operation.

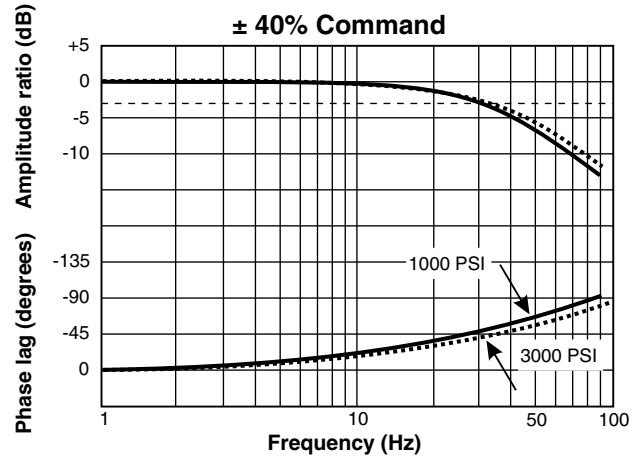
**Performance Curves**

Servo valve flow is proportional to the square root of the pressure drop through the valve. The nominal flow rating for the servo-valves is based upon a 70 Bar (1000 PSI) pressure drop.



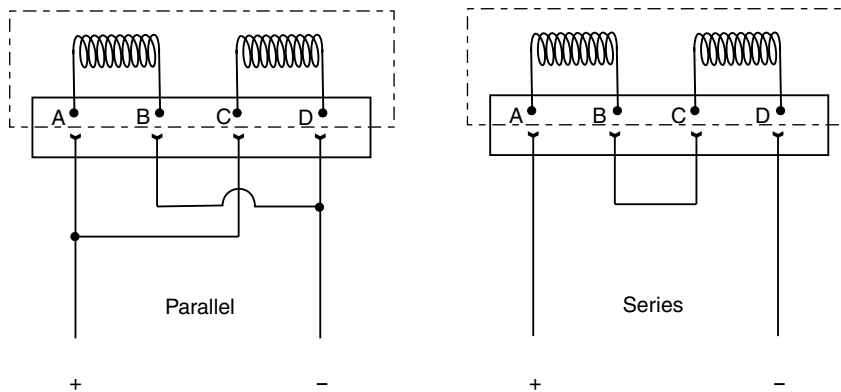
**Frequency Response**

The frequency response curves for the PH76 servovalves show no significant change for signal amplitudes between ±10% and ±40%. Frequency response is unaffected by changes in supply pressures above 70 Bar (1000 PSI).



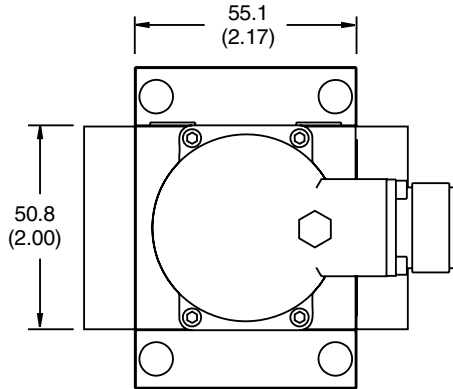
**Installation Wiring Options**

The PH76 servo valve has two coils. One is wired across pins A to B, the other across pins C to D. When connecting the valve to a drive amplifier, the user's external wiring may put the coils either in parallel or in series as needed. In either case, a positive voltage to pin A connects valve flow from ports P to C2 and ports C1 to R.



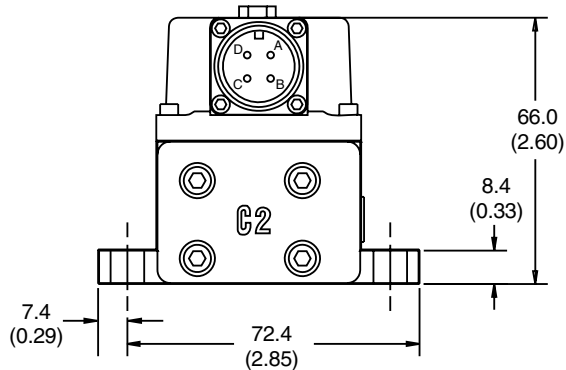
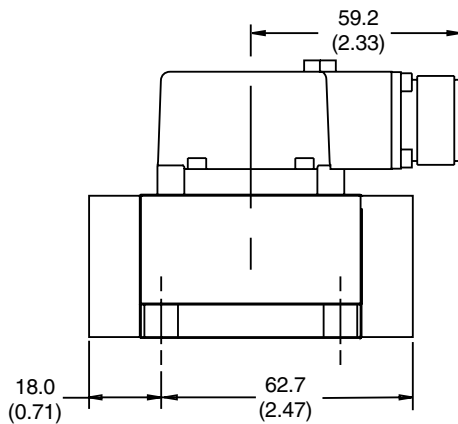
Polarity shown (+A, -B, +C, -D) connects flow from P to C2 port.

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



Connector shown over C2 port. See ordering information for other connector locations.

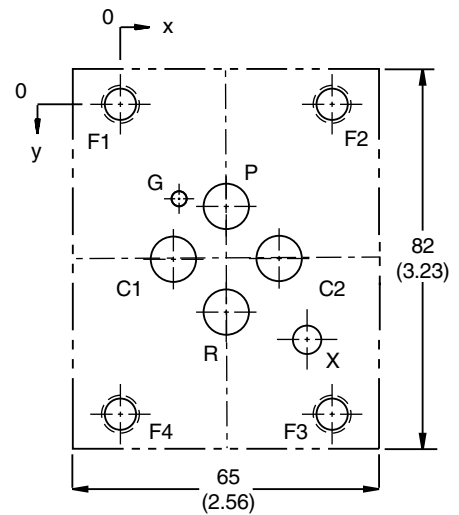
The connector location is factory set and is not field changeable.



**Mounting Surface Dimensions**

Metric Dimensions (millimeters)										± 0.1 mm
Axis	P	C1	R	C2	G	X	F1	F2	F3	F4
	∅ 8.2 max.	∅ 8.2 max.	∅ 8.2 max.	∅ 8.2 max.	∅ 3.5 max.	∅ 5	M8	M8	M8	M8
X	22.2	11.1	22.2	33.3	12.3	49.5	0	44.4	44.4	0
Y	21.4	32.5	43.6	32.5	19.8	39	0	0	65	65

U.S. Dimensions (inches)										± .004 in
Axis	P	C1	R	C2	G	X	F1	F2	F3	F4
	∅ 0.32 max.	∅ 0.32 max.	∅ 0.32 max.	∅ 0.32 max.	∅ 0.14 max.	∅ 0.2	5/16 - 18			
X	0.875	0.437	0.875	1.311	0.484	1.531	0	1.750	1.750	0.000
Y	0.846	1.280	1.717	1.280	0.780	1.950	0	0	2.562	2.562

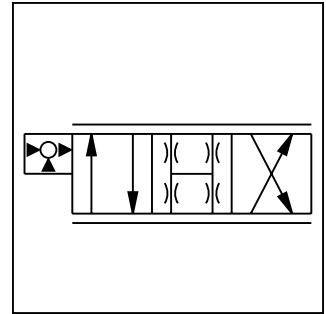
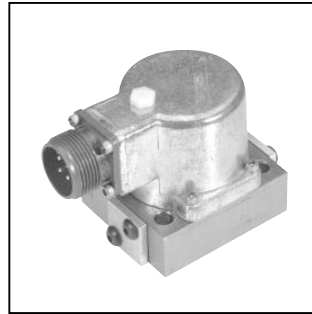


Minimum depth of G is 2 mm (0.08 in)  
 Recommended full thread depth for bolt holes 22 mm (0.87 in)  
 Surface roughness: Ra < 0.8 µm (0.031 in) as specified in ISO 468 and 1302  
 Surface flatness: 0.025 mm (0.001 in) as specified in ISO 1101



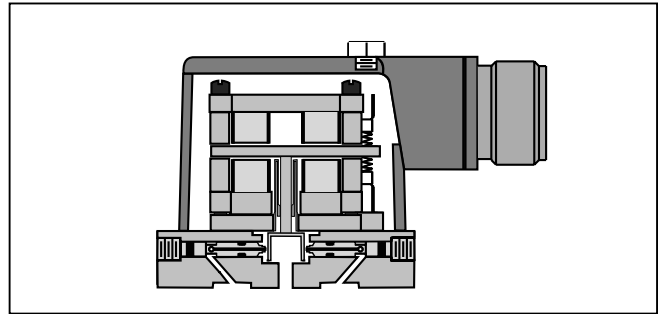
**General Description**

Series DY1S are open center, single stage differential pressure control valves. They are operated by a current driven torque motor. These valves controls the pressure difference between the two actuator ports, C1 and C2, by varying the resistance to flow through their nozzles.



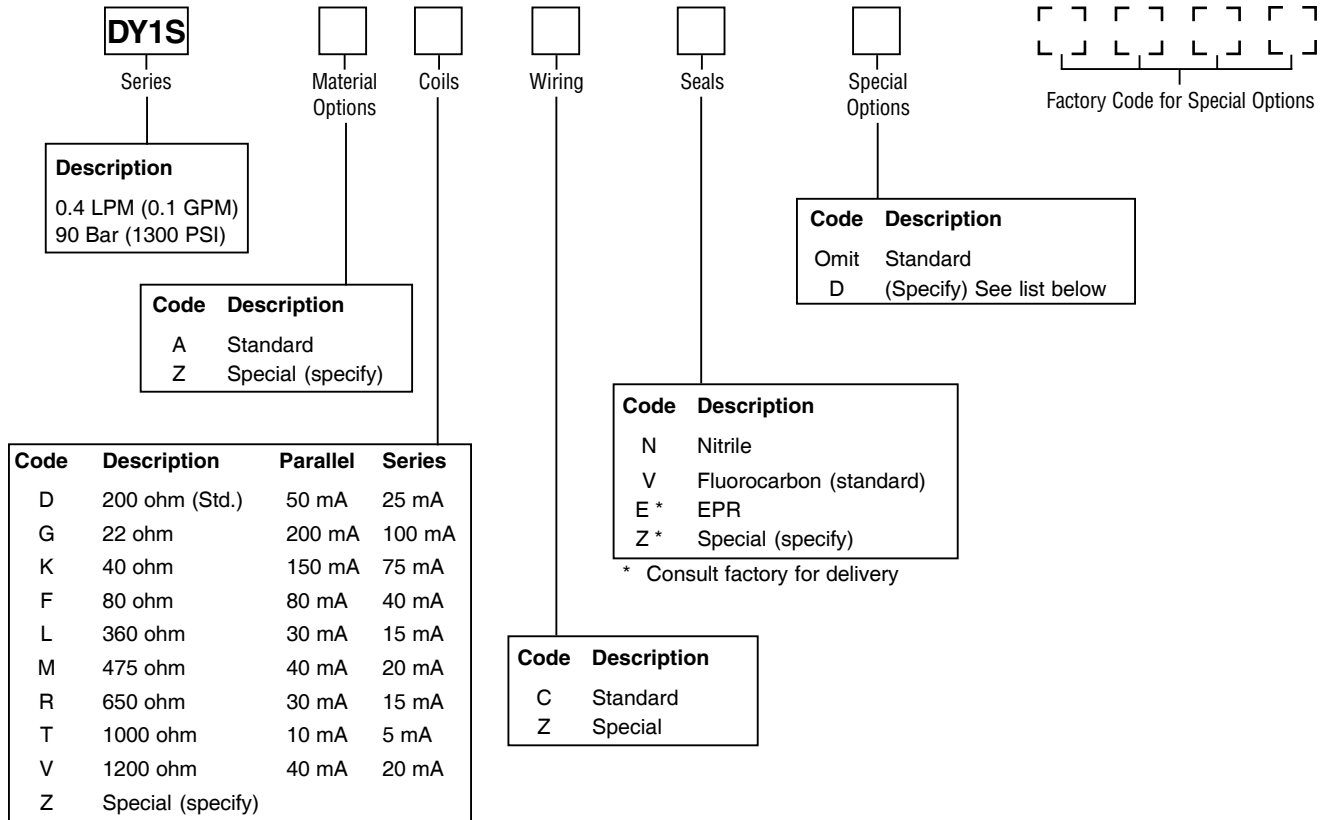
**Features**

- No mechanical wear points.
- High frequency response.
- Nozzle and flapper design.
- Versatile 21.59 mm (0.850 in.) port circle, can mount to standard 19.81 mm (0.780 in.) and 23.62 mm (0.930 in.) port circle patterns.



**Specifications**

<b>Flow Rating</b> @ 90 Bar (1300 PSI)	0.4 LPM (0.1 GPM)	<b>Null Shift</b> with temperature with pressure	≤ 2% per 55°C (100°F) ≤ 2% per 70 Bar (1000 PSI)
<b>Quiescent Flow</b> @ 90 Bar (1300 PSI)	1.3 – 1.9 LPM (0.3 – 0.5 GPM)	<b>Pressure Gain</b> % change in pressure per 1% change in input command	1% minimum
<b>Supply Pressure</b>	7 – 90 Bar (100 – 1300 PSI)	<b>Step Response</b>	10 – 90%, < 5 ms
<b>Tank Port Pressure</b>	90 Bar (1300 PSI) Max. < 10 Bar (145 PSI) for best performance	<b>Fluid</b>	Mineral Oil, 60 – 225 SSU 1000 SSU maximum
<b>Input Command</b>	±50 mA std.	<b>Operating Temperature</b>	-1°C to + 106°C (+30°F to +225°F)
<b>Frequency Response</b> @ 90° phase shift	> 100 Hz	<b>Protection Class</b>	NEMA 4, IP65
<b>Non-Linearity</b>	≤ 10%	<b>Filtration</b>	ISO 4406 15/12 or better
<b>Threshold</b>	≤ 0.5%		



**Accessories**

- Cable with Mating Connector:** EHC154S
  - Mating Connector:** MS3106E-14S-2S
  - Bolt Kit:** Included with valve
  - Flushing Valve:** 11-0500
  - Subplate:** 55-0100-2 SAE-6 Side ports
  - Null Adjust Tool:** 27-0210
  - Electronic Drivers:** 23-5030, 23-7030, BD90\*, BD95\* and BD101\*
- When used in conjunction with Series BD90/95 and BD101 servo amplifiers or a motion controller, Series BD valves will provide accurate control of rotary and linear actuators.
- \* For output currents >15 mA

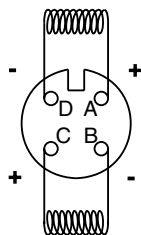
**Special Options:**

Consult factory for price, delivery and availability of special options.

- Special coil
- Special wiring
- Special seals

**Weight:** 0.5 kg (1.2 lbs.)

**Wiring Option C**  
**(Standard)**



Polarity shown connects P to C2 port.

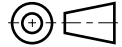
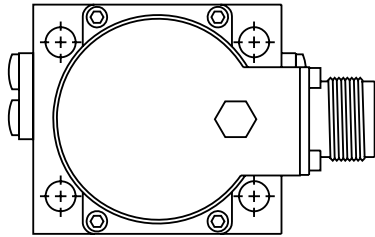


Flushing valve is rated for 3000 psi operation.

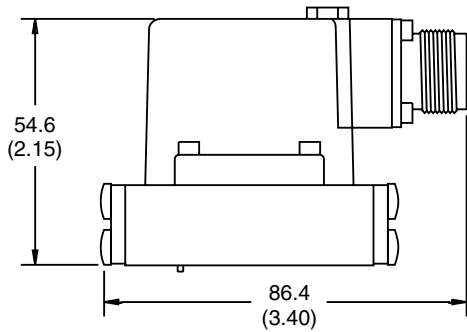


**Dimensions**

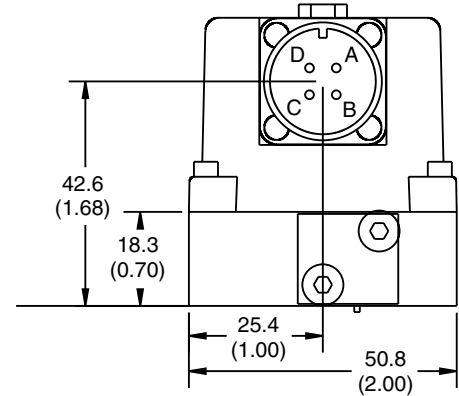
Inch equivalents for millimeter dimensions are shown in (\*\*)



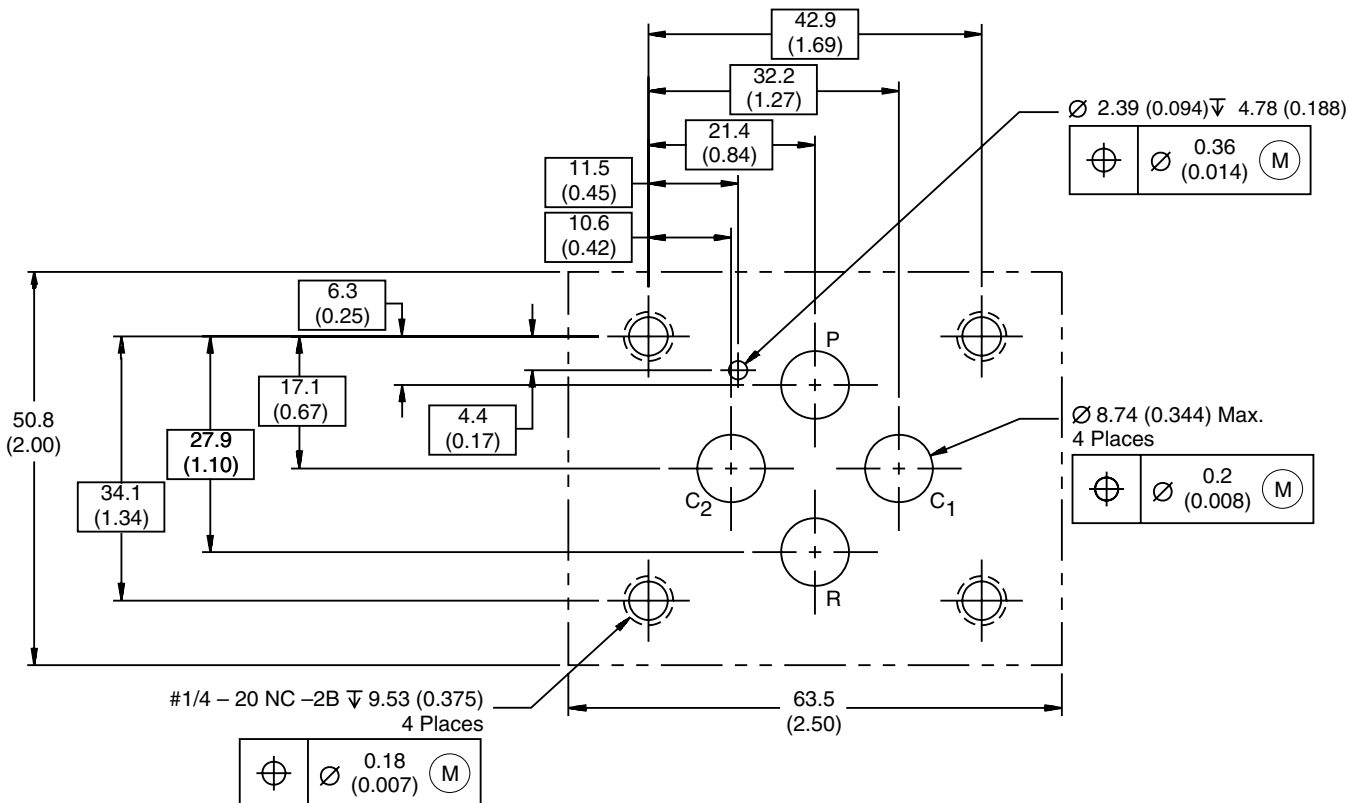
**C**



Connector over C1 port



**Mounting Interface**



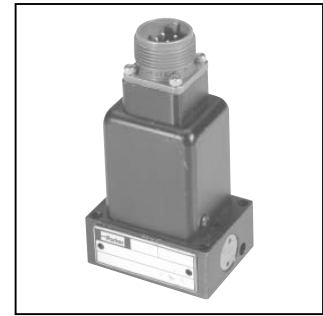
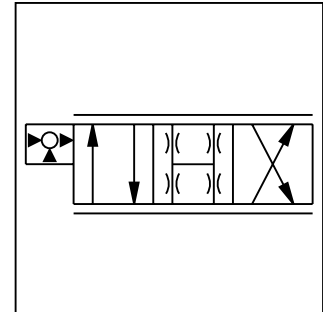
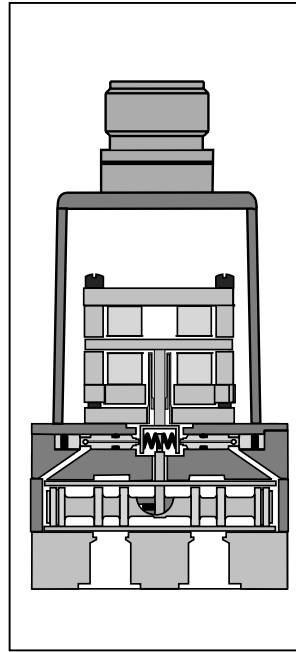
### General Description

Series DY3H and DY6H are two stage, 4-way, high frequency, closed center servovalves, with mechanical spool position feedback. These valves use a flapper and nozzle type, torque motor driven pilot stage to drive the sliding spool second stage. The unique rigid pin feedback design avoids ball glitch problems, which can occur in other types of servovalves.

The DY3H and DY6H offer a compact, lower cost alternative without sacrificing performance in systems operating at 105 Bar (1500 PSI) or less.

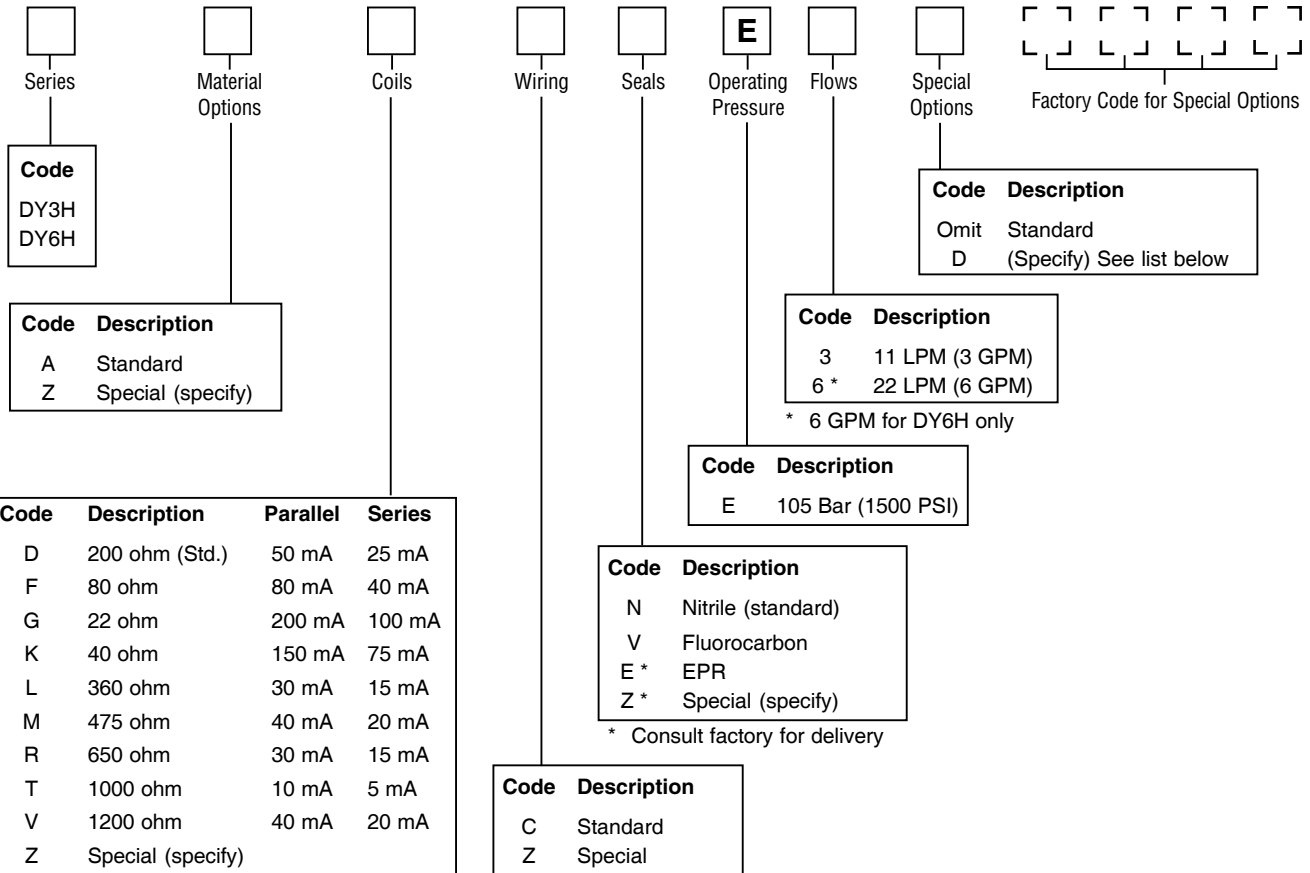
### Features

- Precision lapped spool and sleeve.
- No ball glitch.
- High frequency response.
- Nozzle and flapper design.
- Adapters available for mounting to D03 or ISO port patterns.



### Specifications

<b>Flow Rating</b> @ 70 Bar (1000 PSID)	11 and 22 LPM (3 and 6 GPM)	<b>Null Shift</b> with temperature with pressure	≤ 2% per 55°C (100°F)
<b>Supply Pressure</b>	10 – 105 Bar (145 – 1500 PSI)		≤ 2% per 70 Bar (1000 PSI)
<b>Leakage Flow</b> @ 70 Bar (1000 PSID)	1.3 – 1.9 LPM (0.3 – 0.5 GPM)	<b>Pressure Gain</b> % change in pressure per 1% change in input command	30% minimum, 70% maximum
<b>Tank Port Pressure</b>	105 Bar (1500 PSI) Max. < 10 Bar (145 PSI) for best performance	<b>Step Response</b>	10 – 90%, < 6 ms for DY3H < 8 ms for DY6H
<b>Input Command</b>	±50 mA std.	<b>Fluid</b>	Mineral Oil, 60 – 225 SSU 1000 SSU maximum
<b>Frequency Response</b> @ 90° phase shift	> 190 Hz (See Performance Curves)	<b>Operating Temperature</b>	-1°C to + 106°C (+30°F to +225°F)
<b>Non-Linearity</b>	≤ 10%	<b>Protection Class</b>	NEMA 4, IP65
<b>Threshold</b>	≤ 0.5%	<b>Filtration</b>	ISO 4406 15/12 or better



**Accessories**

- Cable with Mating Connector:** EHC154S
- Mating Connector:** MS3106E-14S-2S
- Bolt Kit:** Included with valve
- Flushing Valve:** 11-0300
- Subplate:** 55-0100-2 SAE-6 Side ports
- Null Adjust Tool:** 27-0210
- Electronic Drivers:** 23-5030, 23-7030, BD90\*, BD95\* and BD101\*

When used in conjunction with Series BD90/95 and BD101 servo amplifiers or a motion controller, Series BD valves will provide accurate control of rotary and linear actuators.

\* For output currents >15 mA

**Special Options:**

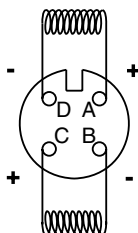
Consult factory for price, delivery and availability of special options.

- Special coil
- Special wiring
- Special seals

**Weight:**

- DY3H 0.34 kg (0.56 lbs.)
- DY6H 0.34 kg (0.56 lbs.)

**Wiring Option C**  
 (Standard)



Polarity shown connects P to C2 port.



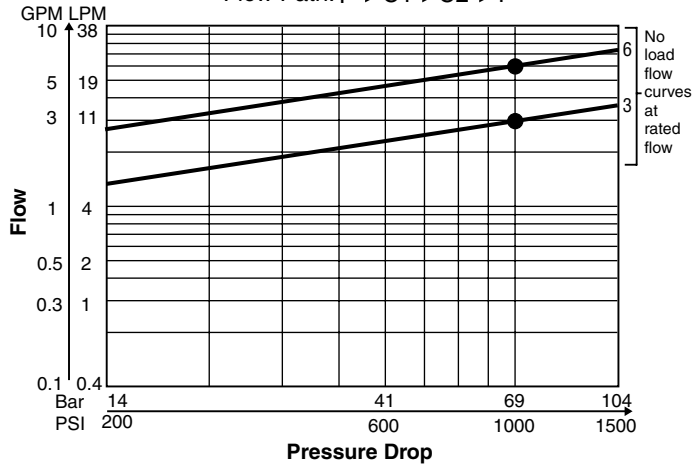
Flushing valve is rated for 3000 psi operation.

**Performance Curves**

**Flow vs. Pressure Drop**

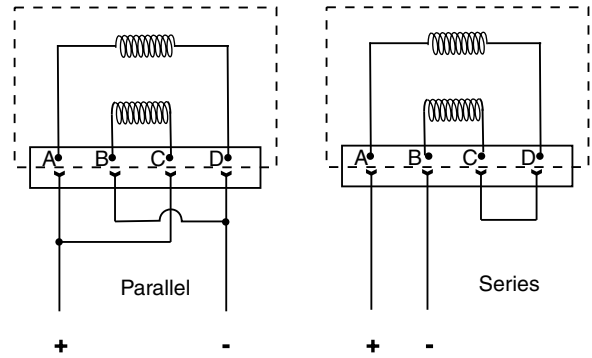
at 100% command

Flow Path: P → C1 → C2 → T



**Installation Wiring Options**

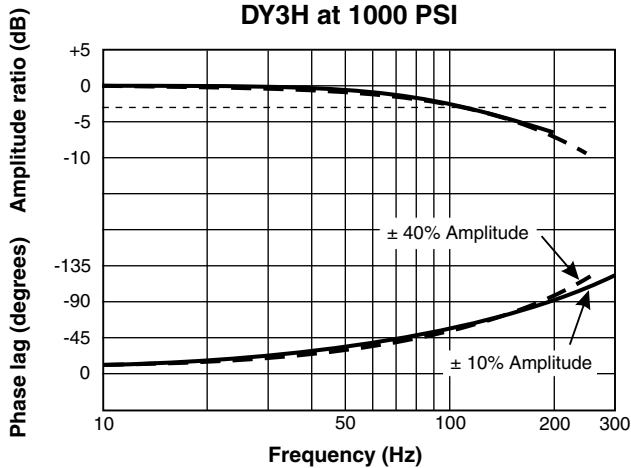
This servovalve has two coils. This illustration shows the internal wiring configurations for these valves. When connecting the valve to a drive amplifier, the user's external wiring may put the coils either in parallel or in series as needed. Refer to the illustration below and to the mounting pattern for this valve to insure proper control phasing.



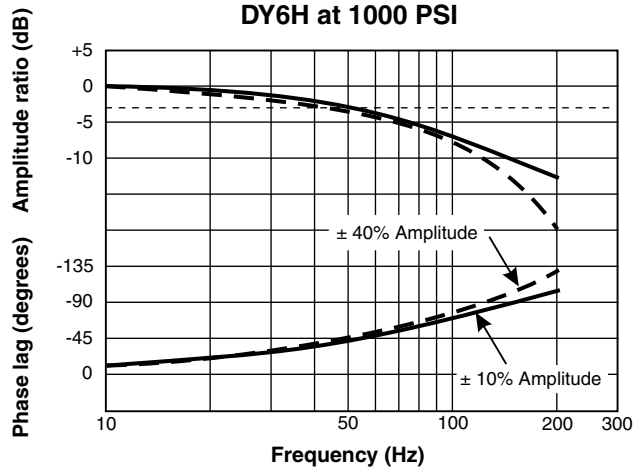
Polarity shown connects flow from P to C2 port.

**Frequency Response**

**DY3H at 1000 PSI**

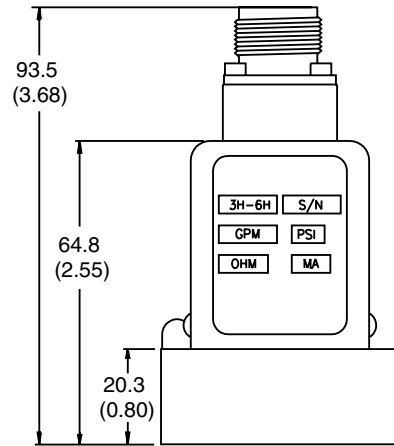
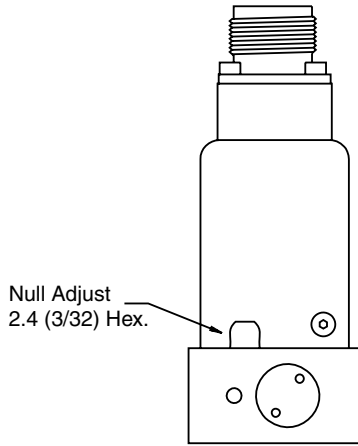
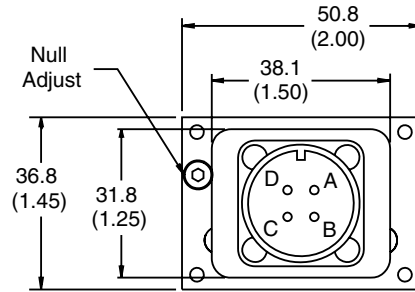
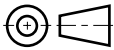


**DY6H at 1000 PSI**

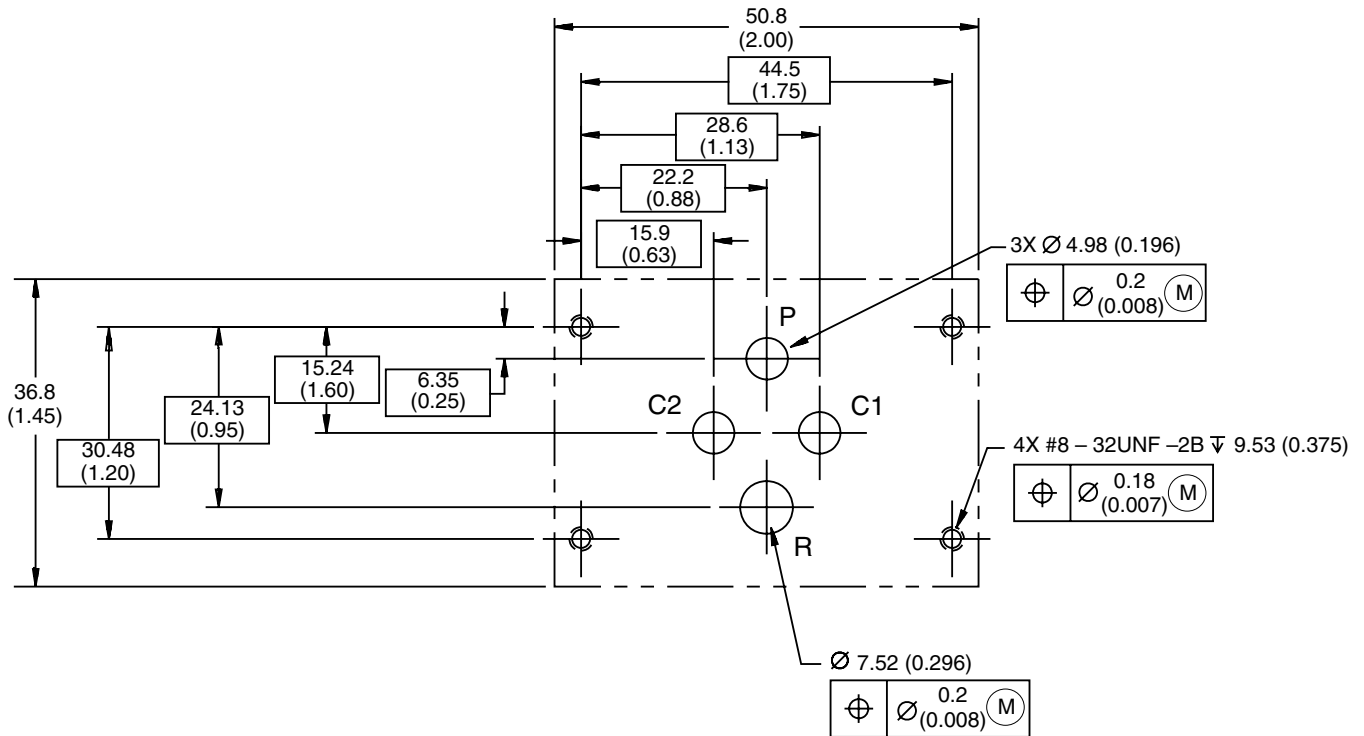


**Dimensions**

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



**Mounting Interface**



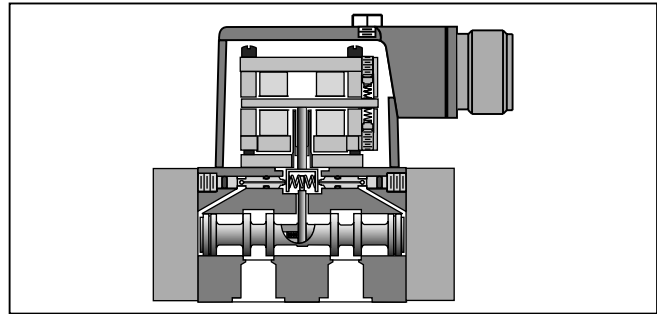
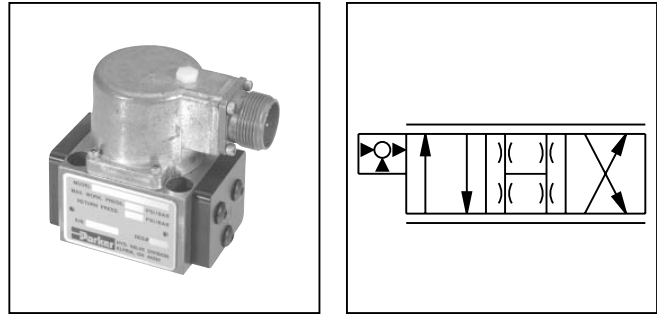
**General Description**

Series DY01 are two stage, 4-way, flapper and nozzle style servovalves. The DY01 servovalve combines a spool and sleeve construction, and a high frequency torque motor, for optimal performance. The unique rigid pin feedback design avoids ball glitch problems, which can occur in other types of servovalves. This valve is rated for 210 Bar (3000 PSI) standard, or can be built for 350 Bar (5000 PSI) service. The pressure ratings are the same for both the tool steel construction or the optional stainless steel spool and body.

The DY01 servovalve was specially designed for high precision flight simulator applications.

**Features**

- Precision lapped spool and sleeve.
- No ball glitch.
- Tool steel, or stainless steel, spool and body.
- Versatile 21.59 mm (0.850 in.) port circle, can mount to standard 19.81 mm (0.780 in.) and 23.62 mm (0.930 in.) port circle patterns.



**Specifications**

<b>Flow Rating</b> @ 70 Bar (1000 PSID)	3 and 11 LPM (1 and 3 GPM)	<b>Null Shift</b> with temperature with pressure	≤ 2% per 55°C (100°F) ≤ 2% per 70 Bar (1000 PSI)
<b>Supply Pressure</b>	10 – 210 Bar (145 – 3000 PSI) opt. 350 Bar (5000 PSI)	<b>Pressure Gain</b> % change in pressure per 1% change in input command	30% Minimum, 70% Maximum
<b>Leakage Flow</b> @ 70 Bar (1000 PSID)	0.42 – 0.95 LPM (0.11 – 0.25 GPM)	<b>Step Response</b>	10 – 90%, < 8 ms
<b>Tank Port Pressure</b>	210 Bar (3000 PSI) Max. < 10 Bar (145 PSI) for best performance	<b>Fluid</b>	Mineral Oil, 60 – 225 SSU 1000 SSU maximum
<b>Input Command</b>	±50 mA std.	<b>Operating Temperature</b>	-1°C to + 106°C (+30°F to +225°F)
<b>Frequency Response</b> @ 90° phase shift	> 180 Hz (See Performance Curves)	<b>Protection Class</b>	NEMA 4, IP65
<b>Non-Linearity</b>	≤ 10%	<b>Filtration</b>	ISO 4406 15/12 or better
<b>Threshold</b>	≤ 0.5%		

**DY01**

Series

Material Options

Coils

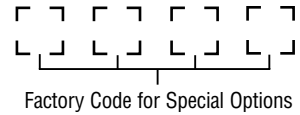
Wiring

Seals

Operating Pressure

Flows

Special Options



**Code Description**

- A Steel (standard)
- B Stainless Steel
- Z\* Special (specify)

\* Material selection does not affect operating pressure.

**Code Description**

- Omit Standard
- D (Specify) See list below

**Code Description**

- 1 3.8 LPM (1 GPM)
- 1.5 5.7 LPM (1.5 GPM)
- 3 11 LPM (3 GPM)

**Code Description**

- A 210 Bar (3000 PSI)
- B 350 Bar (5000 PSI)
- Z Special (specify)

Operating pressure is independent of material selection.

**Code Description**

- N Nitrile (standard)
- V Fluorocarbon
- E\* EPR
- Z\* Special (specify)

\* Consult factory for delivery

**Weight:** 1.0 kg (2.1 lbs.)

Code	Description	Parallel	Series
D	200 ohm (Std.)	50 mA	25 mA
F	80 ohm	80 mA	40 mA
G	22 ohm	200 mA	100 mA
K	40 ohm	150 mA	75 mA
L	360 ohm	30 mA	15 mA
M	475 ohm	40 mA	20 mA
R	750 ohm	30 mA	15 mA
T	1000 ohm	10 mA	5 mA
V	1200 ohm	40 mA	20 mA
Z	Special (specify)		

**Code Connector over: Flow P to C2 with:**

- C Port C1 (+) Signal to A, C
- D Port C1 (+) Signal to B, D
- Z Special (specify)

**Special Options:**

Consult factory for price, delivery and availability of special options.

- Special coil
- Special wiring
- Special seals
- Special flow rate
- Dual flow rate
- Dual gain
- Zener barriers

**Accessories**

**Cable with Mating Connector:** EHC154S

**Mating Connector:** MS3106E-14S-2S

**Bolt Kit:** Included with valve

**Flushing Valve:** 11-0500

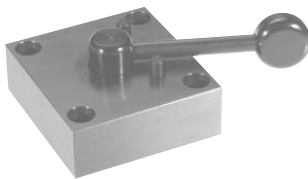
**Subplate:** 55-0100-8 SAE-8 Side ports

**Null Adjust Tool:** 27-0210

**Electronic Drivers:** 23-5030, 23-7030, BD90\*, BD95\* and BD101\*

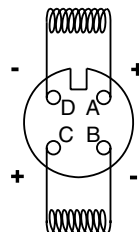
When used in conjunction with Series BD90/95 and BD101 servo amplifiers or a motion controller, Series BD valves will provide accurate control of rotary and linear actuators.

\* For output currents >15 mA



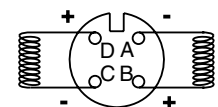
Flushing valve is rated for 3000 psi operation.

**Wiring Option C (Standard)**



Polarity shown connects P to C2 port.

**Wiring Option D**

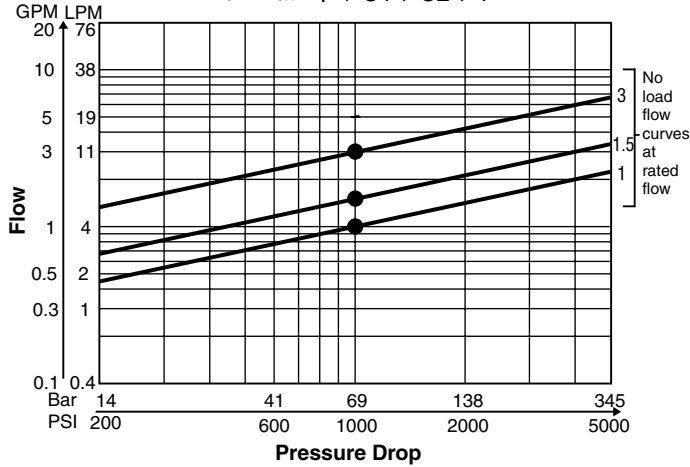


Moog, Atchley and Vickers standard.

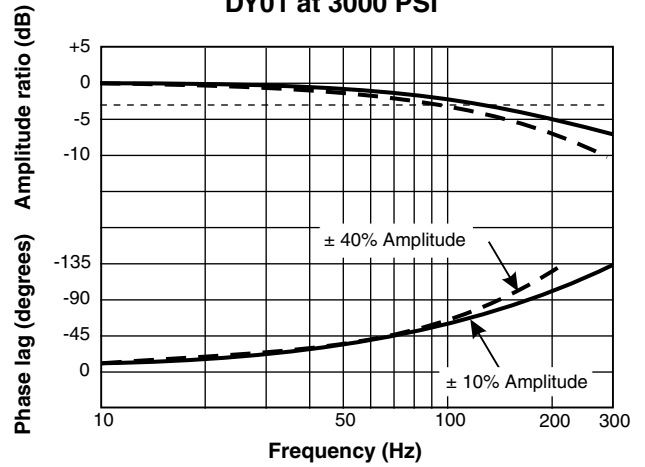
**Performance Curves**

**Frequency Response**

**DY01 Flow vs. Pressure Drop**  
 at 100% command  
 Flow Path: P → C1 → C2 → T



**DY01 at 3000 PSI**

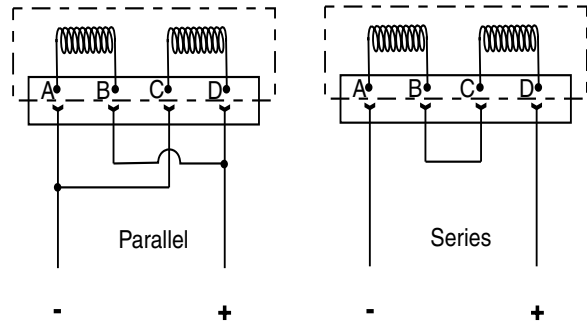
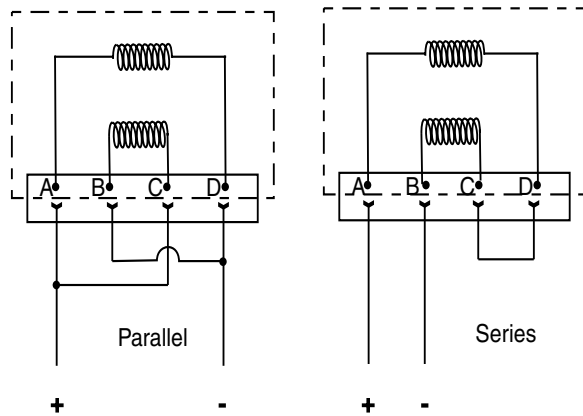


**Installation Wiring Options**

This servovalve has two coils. This illustration shows the internal wiring configurations for options C and D. When connecting the valve to a drive amplifier, the user's external wiring may put the coils either in parallel or in series as needed. Refer to the illustrations below and to the mounting pattern for this valve to insure proper control phasing.

**Option C**

**Option D**

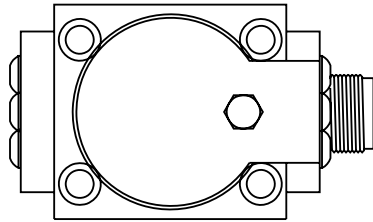
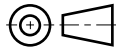


Polarity shown connects flow from P to C2 port.

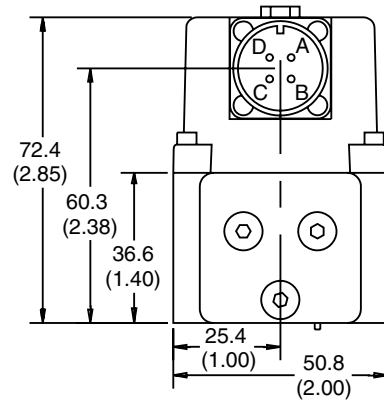
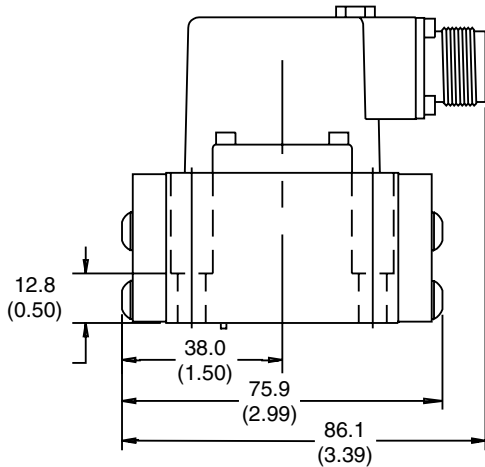


**Dimensions**

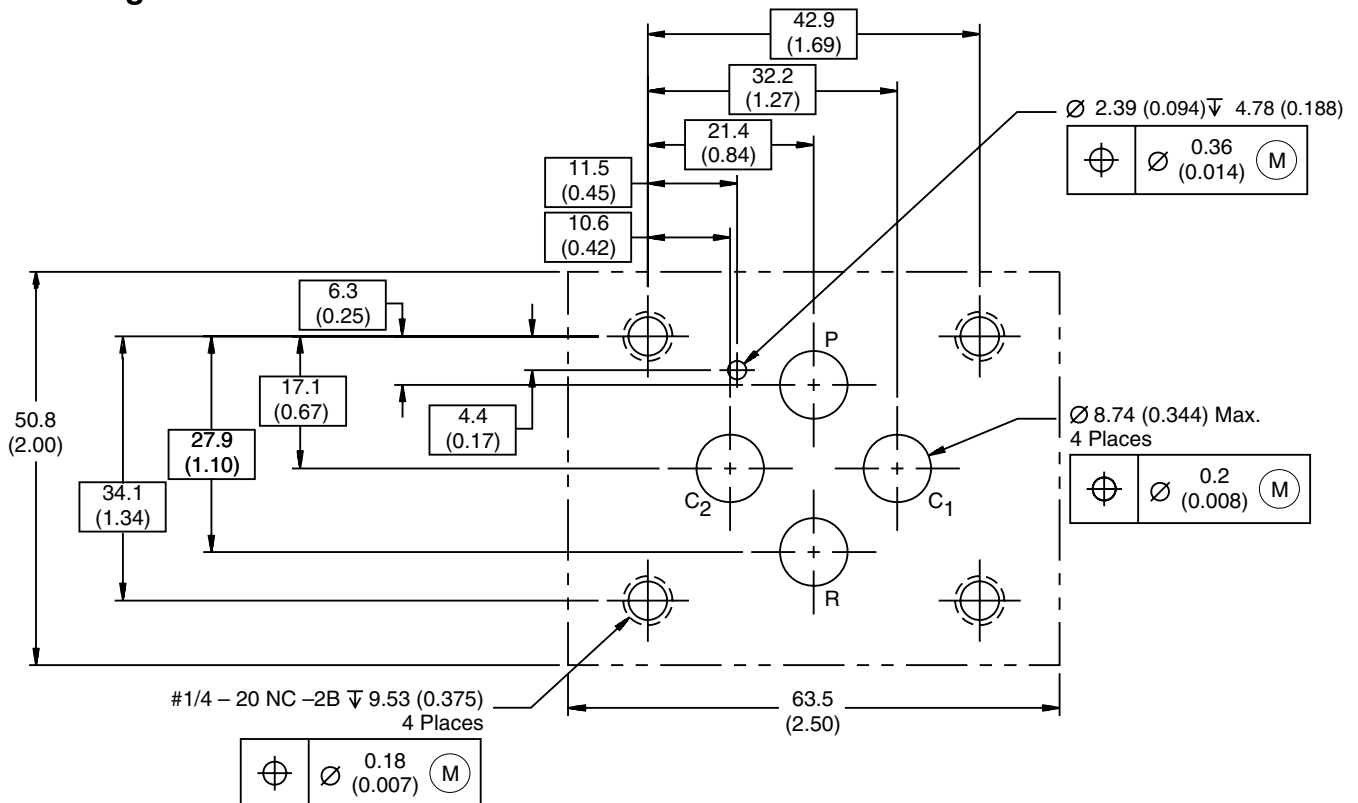
Inch equivalents for millimeter dimensions are shown in (\*\*)



Connector over port C1



**Mounting Interface**

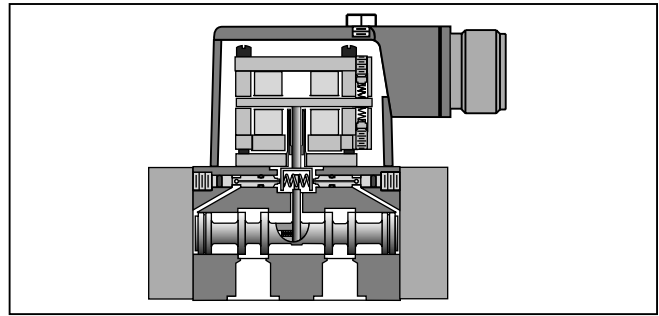
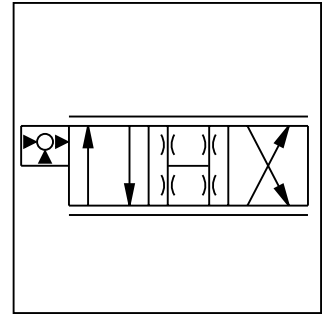
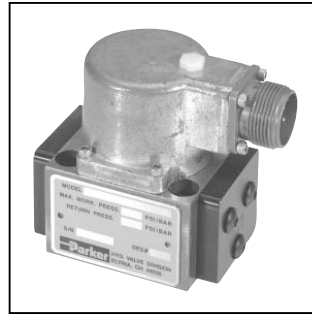


**General Description**

Series DY05 are two stage, 4-way, flapper and nozzle style servovalves. The DY05 has a wide range of flow ratings within a lower cost spool and body design. The unique rigid pin feedback design avoids ball glitch problems, which can occur in other types of servovalves. These valves are rated for 210 Bar (3000 PSI) standard, or can be built for 350 Bar (5000 PSI) service. The pressure ratings are the same for both the tool steel construction or the optional stainless steel spool and body.

**Features**

- Lapped spool and body.
- No ball glitch.
- Tool steel, or stainless steel, spool and body.
- Versatile 21.59 mm (0.850 in.) port circle, can mount to standard 19.81 mm (0.780 in.) and 23.62 mm (0.930 in.) port circle patterns.
- Survives high tank port pressures.



**Specifications**

<b>Flow Rating</b> @ 70 Bar (1000 PSID)	0.95, 1.9, 3.8, 9.5 and 19 LPM (0.25, 0.5, 1.0, 2.5 & 5 GPM)	<b>Null Shift</b> with temperature with pressure	≤ 2% per 55°C (100°F)
<b>Supply Pressure</b>	10 – 210 Bar (145 – 3000 PSI) opt. 350 Bar (5000 PSI)		≤ 2% per 70 Bar (1000 PSI)
<b>Leakage Flow</b> @ 70 Bar (1000 PSID)	0.42 – 0.95 LPM (0.11 – 0.25 GPM)	<b>Pressure Gain</b> % change in pressure per 1% change in input command	30% minimum, 70% maximum
<b>Tank Port Pressure</b>	210 Bar (3000 PSI) Max. < 10 Bar (145 PSI) for best performance	<b>Step Response</b>	10 – 90%, < 11 ms
<b>Input Command</b>	±50 mA std.	<b>Fluid</b>	Mineral Oil, 60 – 225 SSU 1000 SSU maximum
<b>Frequency Response</b> @ 90° phase shift	> 100 Hz (See Performance Curves)	<b>Operating Temperature</b>	-1°C to + 106°C (+30°F to +225°F)
<b>Non-Linearity</b>	≤ 10%	<b>Protection Class</b>	NEMA 4, IP65
<b>Threshold</b>	≤ 0.5%	<b>Filtration</b>	ISO 4406 15/12 or better

**DY05**

Series

Material Options

Coils

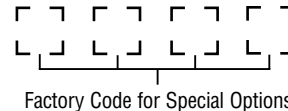
Wiring

Seals

Operating Pressure

Flows

Special Options



Code	Description
A	Steel (standard)
B	Stainless Steel
Z*	Special (specify)

\* Material selection does not affect operating pressure.

Code	Description
Omit	Standard
D	(Specify) See list below

Code	Description
0.25	0.95 LPM (0.25 GPM)
0.5	1.9 LPM (0.5 GPM)
1	3.8 LPM (1 GPM)
2.5	9.5 LPM (2.5 GPM)
5	19 LPM (5 GPM)

Code	Description	Parallel	Series
D	200 ohm (Std.)	50 mA	25 mA
F	80 ohm	80 mA	40 mA
G	22 ohm	200 mA	100 mA
K	40 ohm	150 mA	75 mA
L	360 ohm	30 mA	15 mA
M	475 ohm	40 mA	20 mA
R	750 ohm	30 mA	15 mA
T	1000 ohm	10 mA	5 mA
V	1200 ohm	40 mA	20 mA
Z	Special (specify)		

Code	Description
A	210 Bar (3000 PSI)
B	350 Bar (5000 PSI)
Z	Special (specify)

Operating pressure is independent of material selection.

**Weight:** 1.0 kg (2.1 lbs.)

Code	Description
N	Nitrile (standard)
V	Fluorocarbon
E*	EPR
Z*	Special (specify)

\* Consult factory for delivery

Code	Connector over:	Flow P to C2 with:
C	Port C1	(+) Signal to A, C
D	Port C1	(+) Signal to B, D
Z	Special (specify)	

**Special Options:**

Consult factory for price, delivery and availability of special options.

- Special coil
- Special wiring
- Special seals
- Special flow rate
- Dual flow rate
- Dual gain
- Zener barriers
- High frequency torque motor (Models 5, 10, 12 & 15 only)

**Accessories**

**Cable with Mating Connector:** EHC154S

**Mating Connector:** MS3106E-14S-2S

**Bolt Kit:** Included with Valve

**Flushing Valve:** 11-0500

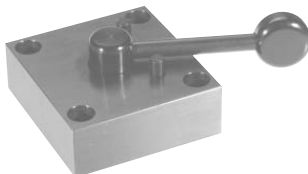
**Subplate:** 55-0100-8 SAE-8 Side ports

**Null Adjust Tool:** 27-0210

**Electronic Drivers:** 23-5030, 23-7030, BD90\*, BD95\*, and BD101\*

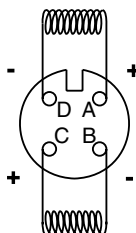
When used in conjunction with Series BD90/95 and BD101 servo amplifiers or a motion controller, Series BD valves will provide accurate control of rotary and linear actuators.

\* For output currents >15 mA



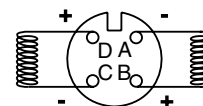
Flushing valve is rated for 3000 psi operation.

**Wiring Option C (Standard)**



Dyval and Pegasus standard.

**Wiring Option D**



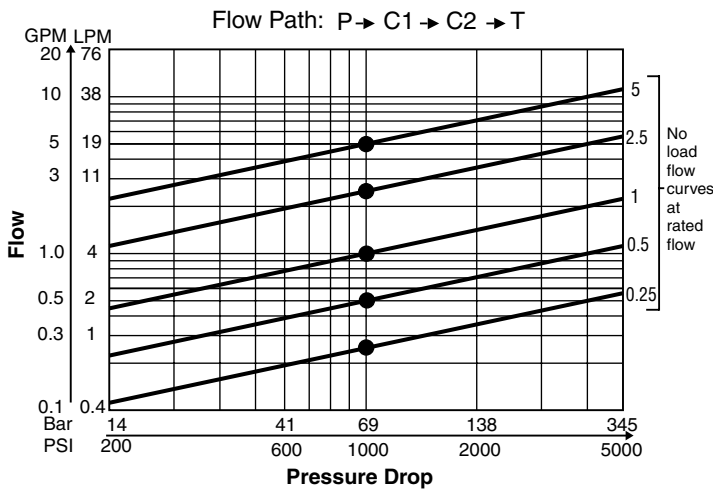
Moog, Atchley and Vickers standard.

In both cases, polarity shown connects P to C2 port.

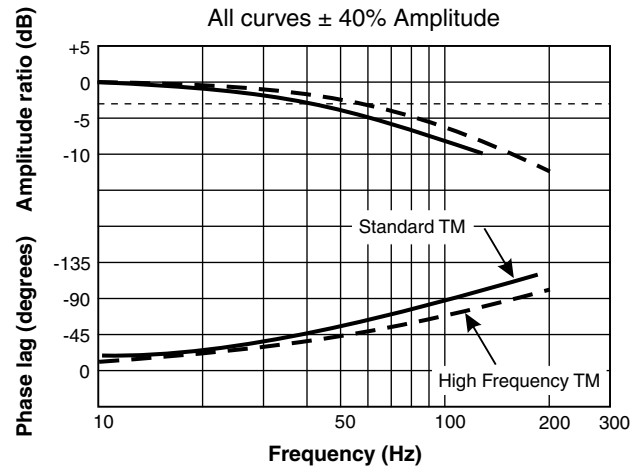
**Performance Curves**

**Frequency Response**

**DY05 Flow vs. Pressure Drop**  
 at 100% command



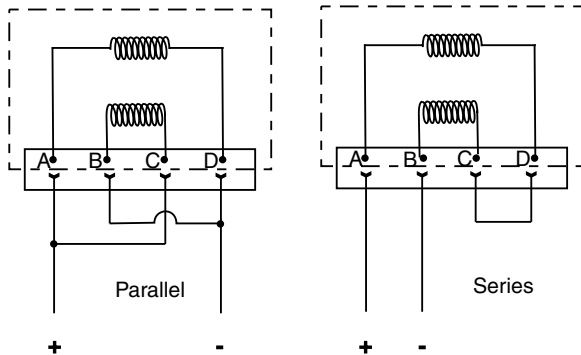
**DY05 at 3000 PSI**  
 All curves ± 40% Amplitude



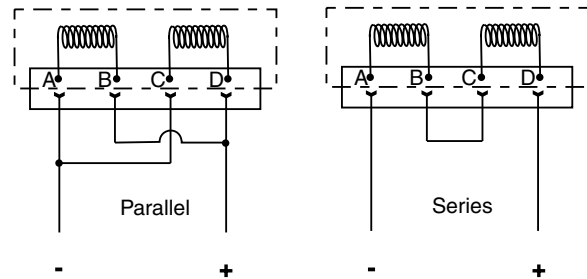
**Installation Wiring Options**

This servovalve has two coils. This illustration shows the internal wiring configurations for options C and D. When connecting the valve to a drive amplifier, the user's external wiring may put the coils either in parallel or in series as needed. Refer to the illustrations below and to the mounting pattern for this valve to insure proper control phasing.

**Option C**



**Option D**

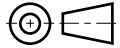
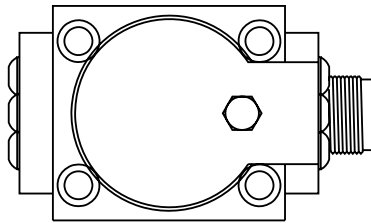


Polarity shown connects flow from P to C2 port.

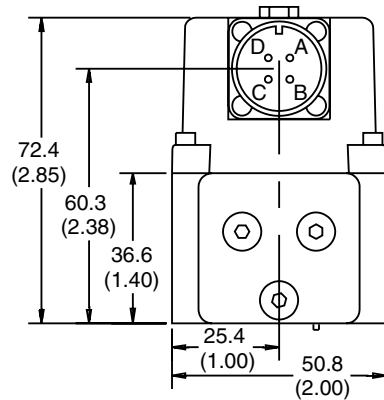
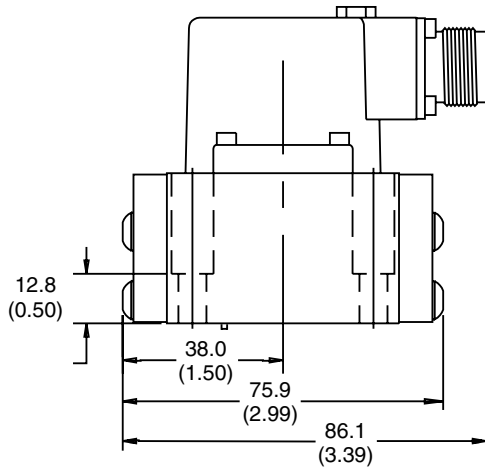


**Dimensions**

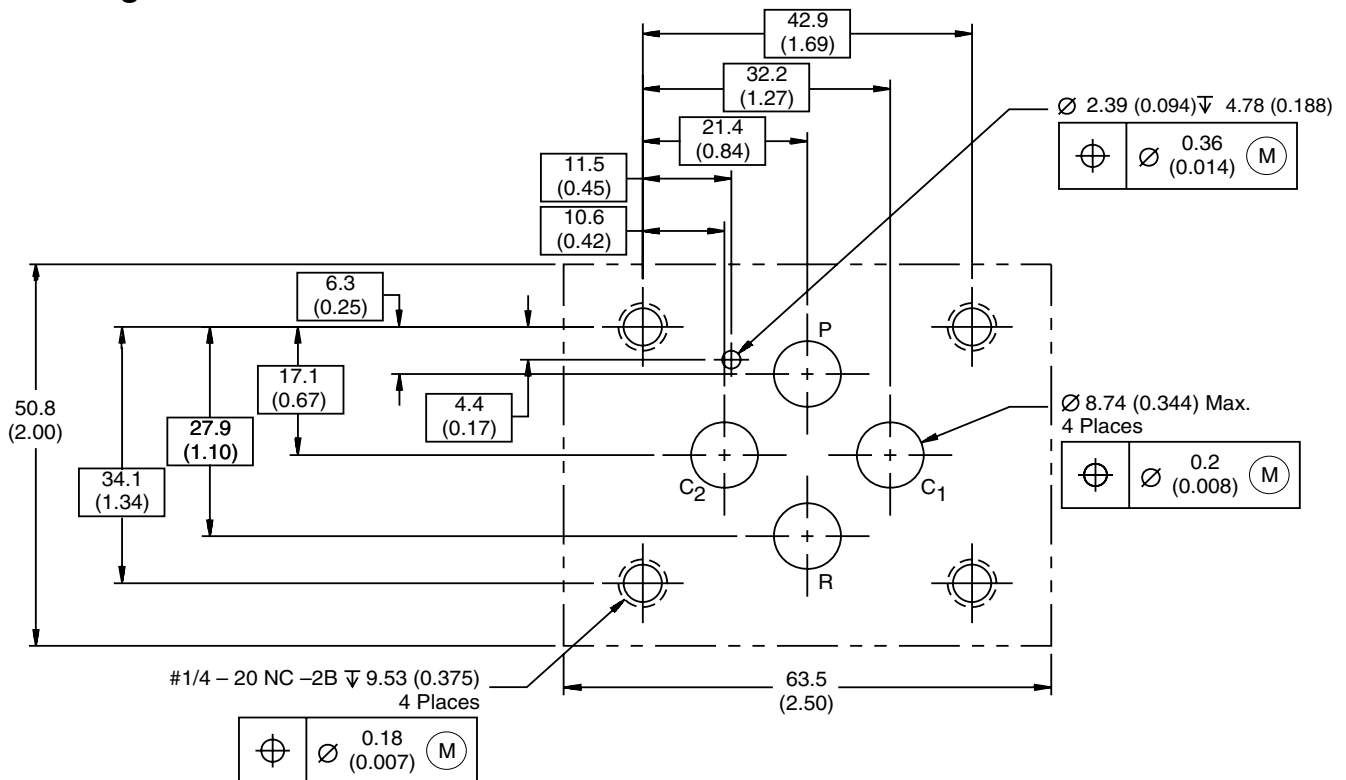
Inch equivalents for millimeter dimensions are shown in (\*\*)



Connector over port C1



**Mounting Interface**

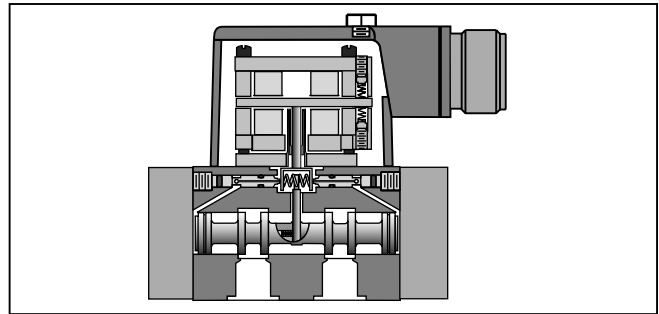
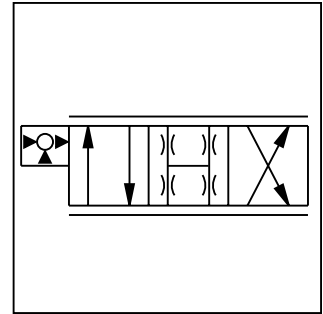
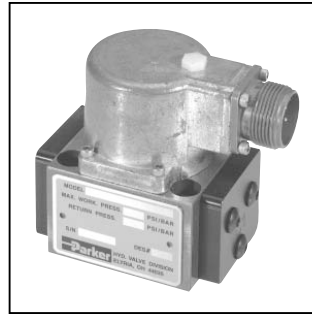


**General Description**

Series DY10 are two stage, 4-way, flapper and nozzle style servovalves. The DY10 is a higher flow version of the DY05. The unique rigid pin feedback design avoids ball glitch problems, which can occur in other types of servovalves. These valves are rated for 210 Bar (3000 PSI) standard, or can be built for 350 Bar (5000 PSI) service. The pressure ratings are the same for both the tool steel construction or the optional stainless steel spool and body.

**Features**

- Lapped spool and body.
- No ball glitch.
- Tool steel, or stainless steel, spool and body.
- Versatile 21.59 mm (0.850 in.) port circle, can mount to standard 19.81 mm (0.780 in.) and 23.62 mm (0.930 in.) port circle patterns.
- Survives high tank port pressures.



**Specifications**

<b>Flow Rating</b> @ 70 Bar (1000 PSID)	28 and 38 LPM (7.5 and 10 GPM)	<b>Null Shift</b> with temperature with pressure	≤ 2% per 55°C (100°F)
<b>Supply Pressure</b>	10 – 210 Bar (145 – 3000 PSI) opt. 350 Bar (5000 PSI)		≤ 2% per 70 Bar (1000 PSI)
<b>Leakage Flow</b> @ 70 Bar (1000 PSID)	0.57 – 1.1 LPM (0.15 – 0.3 GPM)	<b>Pressure Gain</b> % change in pressure per 1% change in input command	30% minimum, 70% maximum
<b>Tank Port Pressure</b>	210 Bar (3000 PSI) Max. < 10 Bar (145 PSI) for best performance	<b>Step Response</b>	10 – 90%, < 13 ms
<b>Input Command</b>	±50 mA std.	<b>Fluid</b>	Mineral Oil, 60 – 225 SSU 1000 SSU maximum
<b>Frequency Response</b> @ 90° phase shift	> 100 Hz (See Performance Curves)	<b>Operating Temperature</b>	-1°C to + 106°C (+30°F to +225°F)
<b>Non-Linearity</b>	≤ 10%	<b>Protection Class</b>	NEMA 4, IP65
<b>Threshold</b>	≤ 0.5%	<b>Filtration</b>	ISO 4406 15/12 or better

**DY10**

Series

Material Options

Coils

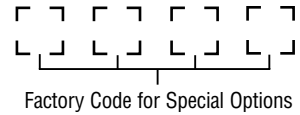
Wiring

Seals

Operating Pressure

Flows

Special Options



Code	Description
A	Steel (standard)
B	Stainless Steel
Z*	Special (specify)

\* Material selection does not affect operating pressure.

Code	Description
Omit	Standard
D	(Specify) See list below

Code	Description
7.5	28 LPM (7.5 GPM)
10	38 LPM (10 GPM)

Code	Description
A	210 Bar (3000 PSI)
B	350 Bar (5000 PSI)
Z	Special (specify)

Operating pressure is independent of material selection.

Code	Description	Parallel	Series
D	200 ohm (Std.)	50 mA	25 mA
F	80 ohm	80 mA	40 mA
G	22 ohm	200 mA	100 mA
K	40 ohm	150 mA	75 mA
L	360 ohm	30 mA	15 mA
M	475 ohm	40 mA	20 mA
R	750 ohm	30 mA	15 mA
T	1000 ohm	10 mA	5 mA
V	1200 ohm	40 mA	20 mA
Z	Special (specify)		

Code	Description
N	Nitrile (standard)
V	Fluorocarbon
E*	EPR
Z*	Special (specify)

\* Consult factory for delivery

**Weight:** 1.0 kg (2.1 lbs.)

Code	Connector over:	Flow P to C2 with:
C	Port C1	(+) Signal to A, C
D	Port C1	(+) Signal to B, D
Z	Special (specify)	

**Special Options:**

Consult factory for price, delivery and availability of special options.

- Special coil
- Special wiring
- Special seals
- Special flow rate
- Dual flow rate
- Dual gain
- Zener barriers
- High frequency torque motor (Models 5, 10, 12 & 15 only)

**Accessories**

**Cable with Mating Connector:** EHC154S

**Mating Connector:** MS3106E-14S-2S

**Bolt Kit:** Included with valve

**Flushing Valve:** 11-0500

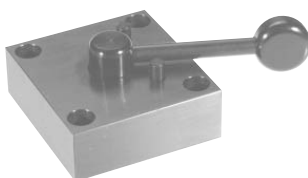
**Subplate:** 55-0100-8 SAE-8 Side ports

**Null Adjust Tool:** 27-0210

**Electronic Drivers:** 23-5030, 23-7030, BD90\*, BD95\* and BD101\*

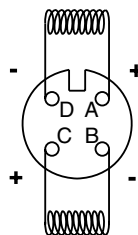
When used in conjunction with Series BD90/95 and BD101 servo amplifiers or a motion controller, Series BD valves will provide accurate control of rotary and linear actuators.

\* For output currents >15 mA



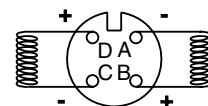
Flushing valve is rated for 3000 psi operation.

**Wiring Option C (Standard)**



Dyval and Pegasus standard.

**Wiring Option D**

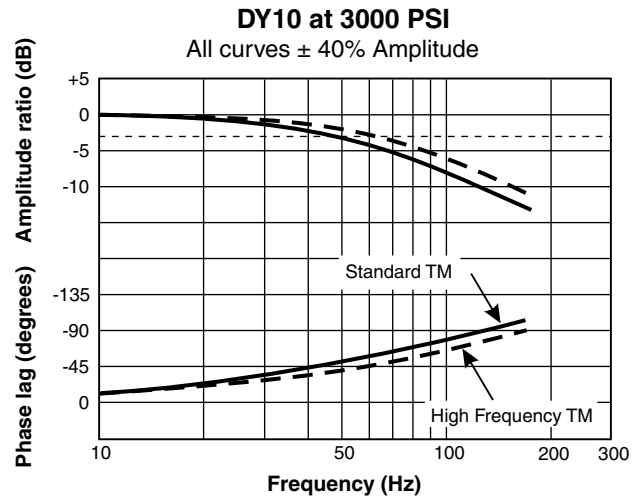
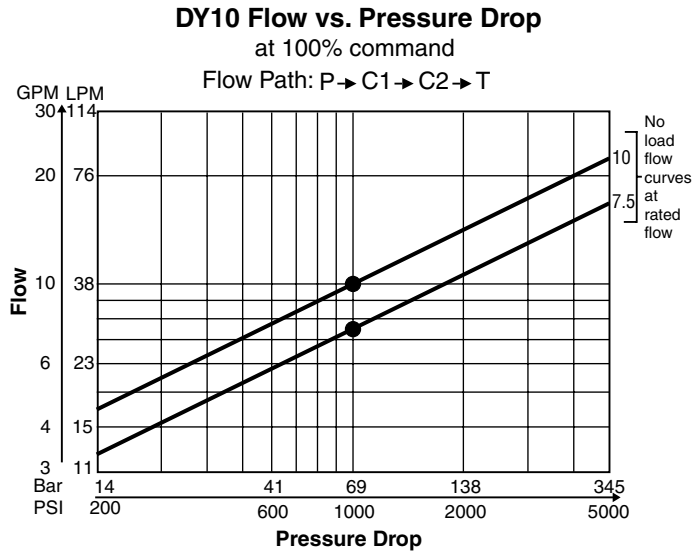


Moog, Atchley and Vickers standard.

In both cases, polarity shown connects P to C2 port.

**Performance Curves**

**Frequency Response**

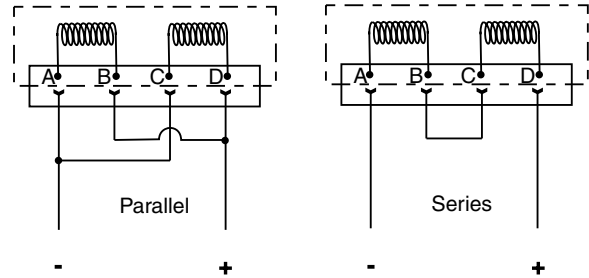
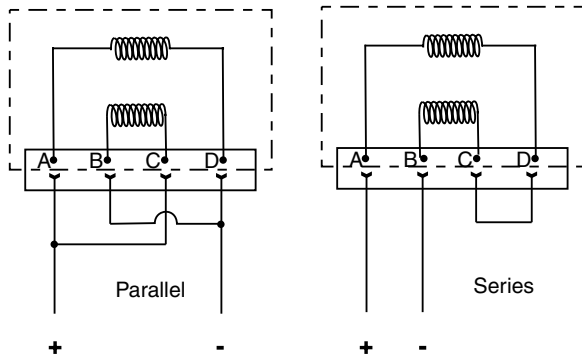


**Installation Wiring Options**

This servovalve has two coils. This illustration shows the internal wiring configurations for options C and D. When connecting the valve to a drive amplifier, the user's external wiring may put the coils either in parallel or in series as needed. Refer to the illustrations below and to the mounting pattern for this valve to insure proper control phasing.

**Option C**

**Option D**



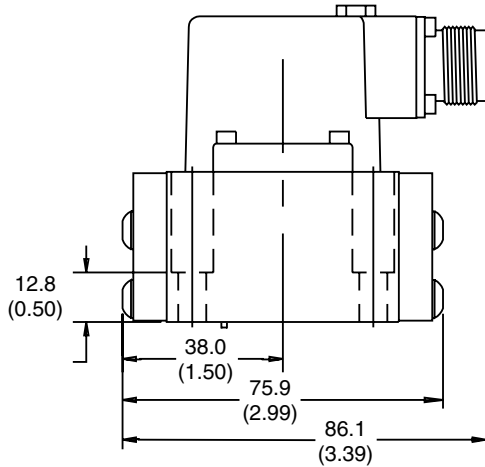
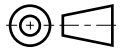
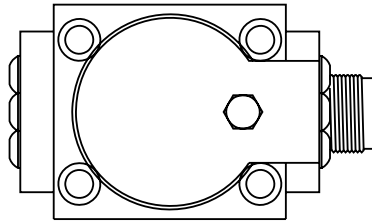
Polarity shown connects flow from P to C2 port.



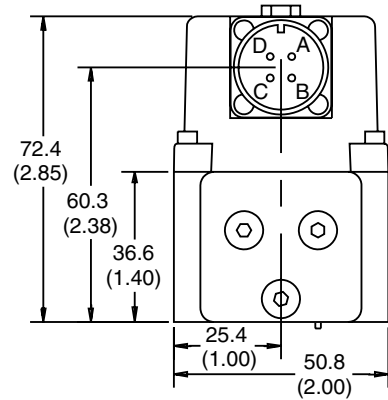


**Dimensions**

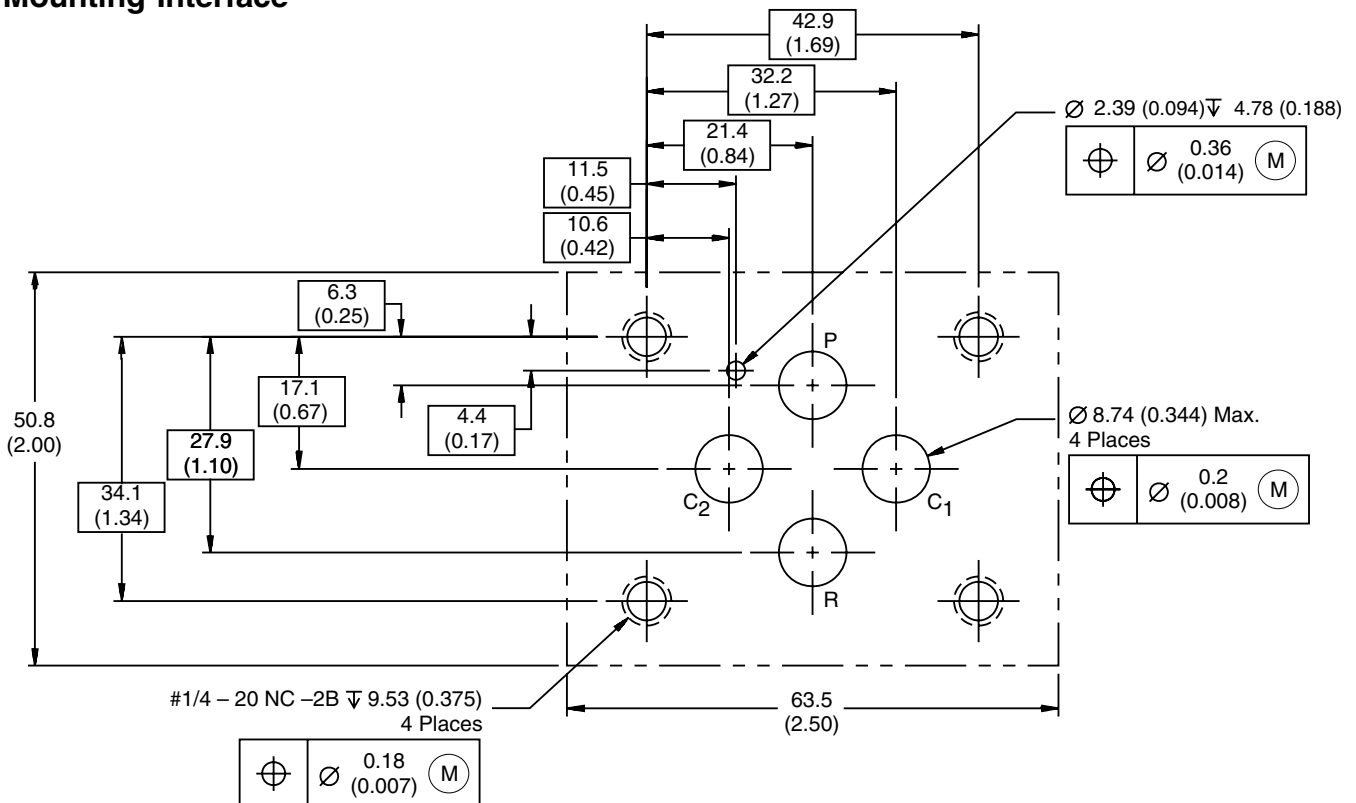
Inch equivalents for millimeter dimensions are shown in (\*\*)



Connector over port C1



**Mounting Interface**

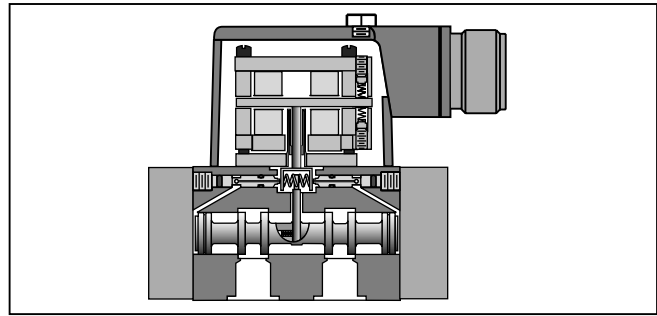
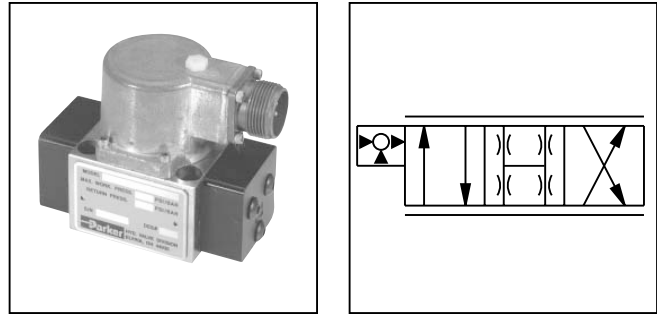


**General Description**

Series DY12 are two stage, 4-way, flapper and nozzle style servovalves. They have the same port pattern and body as the DY10 valve, but have a longer spool stroke for higher flow. The unique rigid pin feedback design avoids ball glitch problems, which can occur in other types of servovalves. These valves are rated for 210 Bar (3000 PSI) standard, or can be built for 350 Bar (5000 PSI) service. The pressure ratings are the same for both the tool steel construction or the optional stainless steel spool and body.

**Features**

- Lapped spool and body.
- No ball glitch.
- Tool steel, or stainless steel, spool and body.
- Nozzle and flapper design.
- Versatile 21.59 mm (0.850 in.) port circle, can mount to standard 19.81 mm (0.780 in.) and 23.62 mm (0.937 in.) port circle patterns.
- Survives high tank port pressures.



**Specifications**

<b>Flow Rating</b> @ 70 Bar (1000 PSID)	47 and 57 LPM (12.5 and 15 GPM)	<b>Null Shift</b> with temperature with pressure	≤ 2% per 55°C (100°F) ≤ 2% per 70 Bar (1000 PSI)
<b>Supply Pressure</b>	10 – 210 Bar (145 – 3000 PSI) opt. 350 Bar (5000 PSI)	<b>Pressure Gain</b> % change in pressure per 1% change in input command	30% minimum, 70% maximum
<b>Leakage Flow</b> @ 70 Bar (1000 PSID)	0.57 – 1.1 LPM (0.15 – 0.3 GPM)	<b>Step Response</b>	10 – 90%, < 13 ms
<b>Tank Port Pressure</b>	210 Bar (3000 PSI) Max. < 10 Bar (145 PSI) for best performance	<b>Fluid</b>	Mineral Oil, 60 – 225 SSU 1000 SSU maximum
<b>Input Command</b>	±50 mA std.	<b>Operating Temperature</b>	-1°C to + 106°C (+30°F to +225°F)
<b>Frequency Response</b> @ 90° phase shift	> 100 Hz (See Performance Curves)	<b>Protection Class</b>	NEMA 4, IP65
<b>Non-Linearity</b>	≤ 10%	<b>Filtration</b>	ISO 4406 15/12 or better
<b>Threshold</b>	≤ 0.5%		

**DY12**

Series

Material Options

Coils

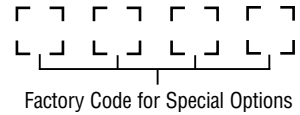
Wiring

Seals

Operating Pressure

Flows

Special Options



Code	Description
A	Steel (standard)
B	Stainless Steel
Z*	Special (specify)

\* Material selection does not affect operating pressure.

Code	Description
Omit	Standard
D	(Specify) See list below

Code	Description
12.5	47 LPM (12.5 GPM)
15	57 LPM (15 GPM)

Code	Description
A	210 Bar (3000 PSI)
B	350 Bar (5000 PSI)
Z	Special (specify)

Operating pressure is independent of material selection.

Code	Description	Parallel	Series
D	200 ohm (Std.)	50 mA	25 mA
F	80 ohm	80 mA	40 mA
G	22 ohm	200 mA	100 mA
K	40 ohm	150 mA	75 mA
L	360 ohm	30 mA	15 mA
M	475 ohm	40 mA	20 mA
R	750 ohm	30 mA	15 mA
T	1000 ohm	10 mA	5 mA
V	1200 ohm	40 mA	20 mA
Z	Special (specify)		

Code	Description
N	Nitrile (standard)
V	Fluorocarbon
E*	EPR
Z*	Special (specify)

\* Consult factory for delivery

**Weight:** 1.0 kg (2.1 lbs.)

Code	Connector over:	Flow P to C2 with:
C	Port C1	(+) Signal to A, C
D	Port C1	(+) Signal to B, D
Z*	Special (specify)	

**Special Options:**

Consult factory for price, delivery and availability of special options.

- Special coil
- Special wiring
- Special seals
- Special flow rate
- Dual flow rate
- Dual gain
- Zener barriers
- High frequency torque motor (Models 5, 10, 12 & 15 only)

**Accessories**

**Cable with Mating Connector:** EHC154S

**Mating Connector:** MS3106E-14S-2S

**Bolt Kit:** Included with valve

**Flushing Valve:** 11-0500

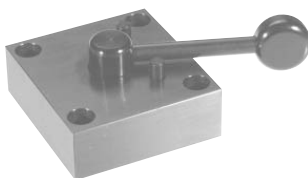
**Subplate:** 55-0100-8 SAE-8 Side ports

**Null Adjust Tool:** 27-0210

**Electronic Drivers:** 23-5030, 23-7030, BD90\*, BD95\* and BD101\*

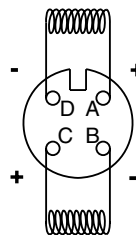
When used in conjunction with Series BD90/95 and BD101 servo amplifiers or a motion controller, Series BD valves will provide accurate control of rotary and linear actuators.

\* For output currents >15 mA



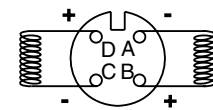
Flushing valve is rated for 3000 psi operation.

**Wiring Option C (Standard)**



Dyval and Pegasus standard.

**Wiring Option D**

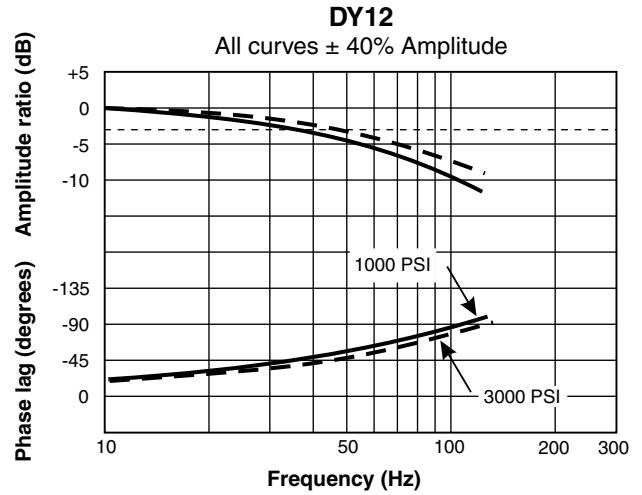
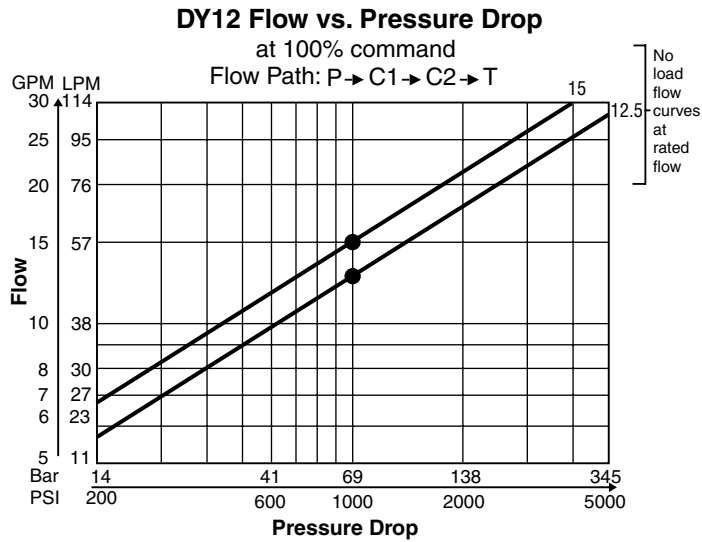


Moog, Atchley and Vickers standard.

In both cases, polarity shown connects P to C2 port.

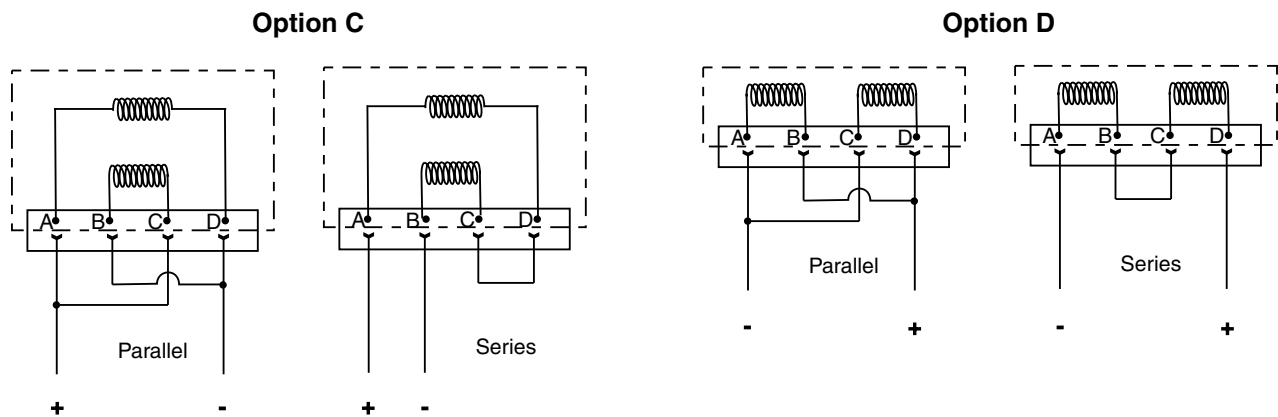
**Performance Curves**

**Frequency Response**



**Installation Wiring Options**

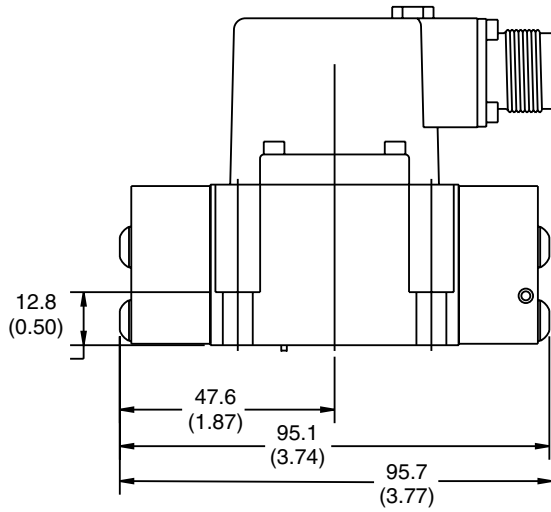
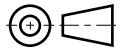
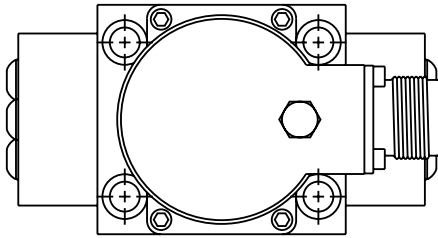
This servovalve has two coils. This illustration shows the internal wiring configurations for these valves. When connecting the valve to a drive amplifier, the user's external wiring may put the coils either in parallel or in series as needed. Refer to the illustration below and to the mounting pattern for this valve to insure proper control phasing.



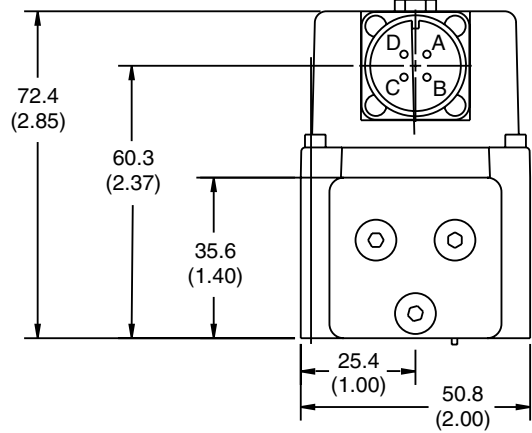
Polarity shown connects flow from P to C2 port.

**Dimensions**

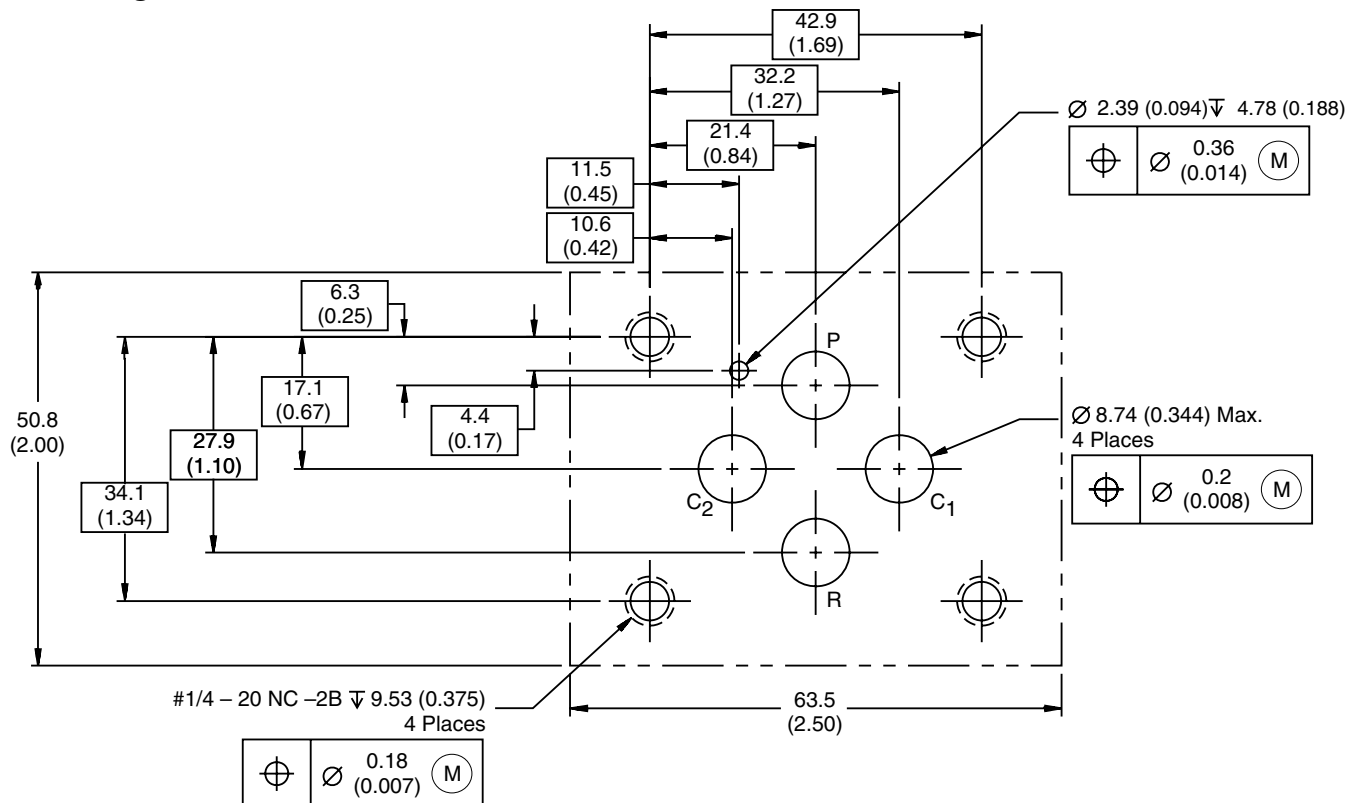
Inch equivalents for millimeter dimensions are shown in (\*\*)



Connector over C1 port



**Mounting Interface**

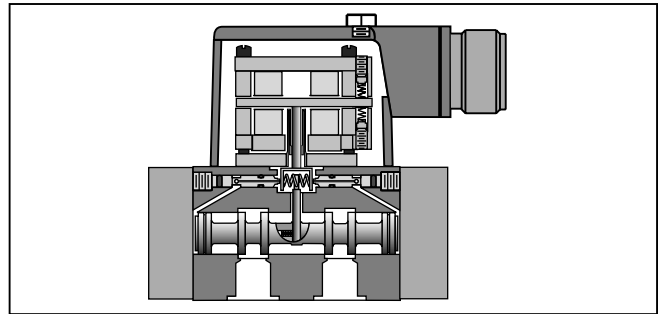
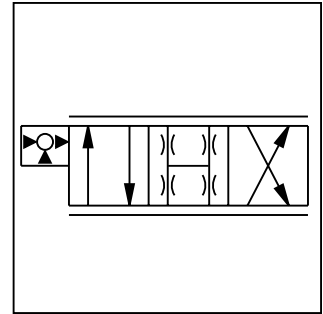
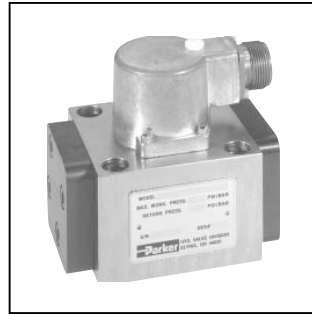


**General Description**

Series DY15 are two stage, 4-way, flapper and nozzle style servovalves. This valve is rated for 210 Bar (3000 PSI) standard, or can be built for 350 Bar (5000 PSI) service. The pressure ratings are the same for both the tool steel construction or the optional stainless steel spool and body.

**Features**

- Lapped spool and body.
- No ball glitch.
- Tool steel, or stainless steel, spool and body.
- Nozzle and flapper design.
- Unique port pattern (see next page).
- Survives high tank port pressures.



**Specifications**

<b>Flow Rating</b> @ 70 Bar (1000 PSID)	57, 75 and 95 LPM (15, 20 and 25 GPM)	<b>Null Shift</b> with temperature with pressure	≤ 2% per 55°C (100°F) ≤ 2% per 70 Bar (1000 PSI)
<b>Supply Pressure</b>	10 – 210 Bar (145 – 3000 PSI) opt. 350 Bar (5000 PSI)	<b>Pressure Gain</b> % change in pressure per 1% change in input command	30% minimum, 70% maximum
<b>Leakage Flow</b> @ 70 Bar (1000 PSID)	0.95 – 1.7 LPM (0.25 – 0.45 GPM)	<b>Step Response</b>	10 – 90%, < 18 ms < 18 ms up to 75 LPM (20 GPM) < 20 ms up to 95 LPM (25 GPM)
<b>Tank Port Pressure</b>	210 Bar (3000 PSI) Max. < 10 Bar (145 PSI) for best performance	<b>Fluid</b>	Mineral Oil, 60 – 225 SSU 1000 SSU maximum
<b>Input Command</b>	±50 mA std.	<b>Operating Temperature</b>	-1°C to + 106°C (+30°F to +225°F)
<b>Frequency Response</b> @ 90° phase shift	> 45 Hz (See Performance Curves)	<b>Protection Class</b>	NEMA 4, IP65
<b>Non-Linearity</b>	≤ 10%	<b>Filtration</b>	ISO 4406 15/12 or better
<b>Threshold</b>	≤ 0.5%		



**DY15**

Series

Material Options

Coils

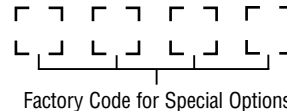
Wiring

Seals

Operating Pressure

Flows

Special Options



Code	Description
A	Steel (standard)
B	Stainless Steel
Z*	Special (specify)

\* Material selection does not affect operating pressure

Code	Description
Omit	Standard
D	(Specify) See list below

Code	Description
15	57 LPM (15 GPM)
20	76 LPM (20 GPM)
25	95 LPM (25 GPM)

Code	Description
A	210 Bar (3000 PSI)
B	350 Bar (5000 PSI)
Z	Special (specify)

Operating pressure is independent of material selection.

Code	Description	Parallel	Series
D	200 ohm (Std.)	50 mA	25 mA
F	80 ohm	80 mA	40 mA
G	22 ohm	200 mA	100 mA
K	40 ohm	150 mA	75 mA
L	360 ohm	30 mA	15 mA
M	475 ohm	40 mA	20 mA
R	750 ohm	30 mA	15 mA
T	1000 ohm	10 mA	5 mA
V	1200 ohm	40 mA	20 mA
Z	Special (specify)		

Code	Description
N	Nitrile (standard)
V	Fluorocarbon
E *	EPR
Z *	Special (specify)

\* Consult factory for delivery

**Weight:** 1.8 kg (3.9 lbs.)

Code	Connector over:	Flow P to C2 with:
C	Port C1	(+) Signal to A, C
D	Port C1	(+) Signal to B, D
Z	Special (specify)	

**Special Options:**

Consult factory for price, delivery and availability of special options.

- Special coil
- Special wiring
- Special seals
- Special flow rate
- Dual flow rate
- Dual gain
- Zener barriers
- High frequency torque motor (Models 5, 10, 12 & 15 only)

**Accessories**

**Cable with Mating Connector:** EHC154S

**Mating Connector:** MS3106E-14S-2S

**Bolt Kit:** Included with valve

**Flushing Valve:** 11-0600

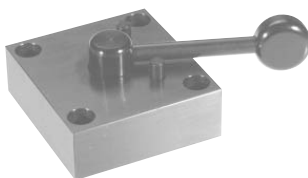
**Subplate:** 55-0300-2 SAE-16 Side ports

**Null Adjust Tool:** 27-0210

**Electronic Drivers:** 23-5030, 23-7030, BD90\*, BD95\* and BD101\*

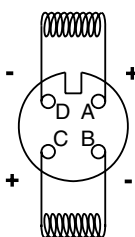
When used in conjunction with Series BD90/95 and BD101 servo amplifiers or a motion controller, Series BD valves will provide accurate control of rotary and linear actuators.

\* For output currents >15 mA



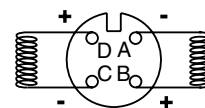
Flushing valve is rated for 3000 psi operation.

**Wiring Option C (Standard)**



Dyval and Pegasus standard.

**Wiring Option D**

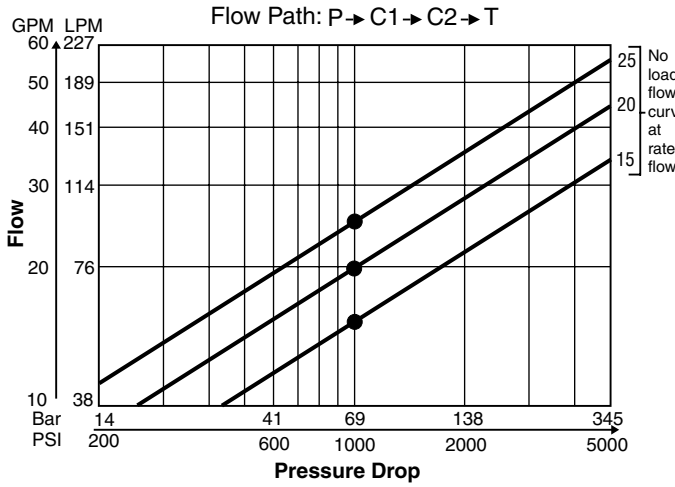


Moog, Atchley and Vickers standard.

In both cases, polarity shown connects P to C2 port.

**Performance Curves**

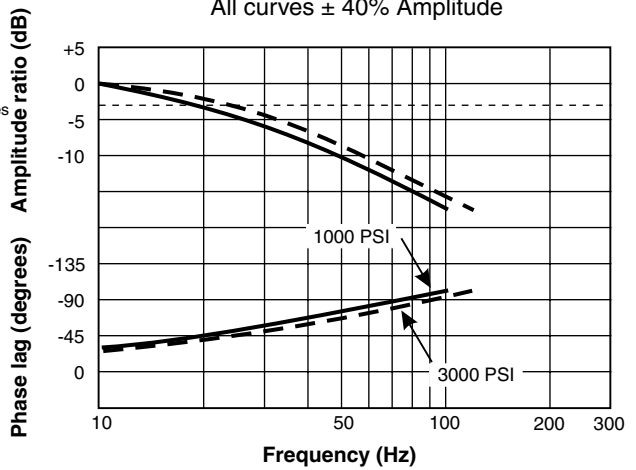
**DY15 Flow vs. Pressure Drop**  
 at 100% command



**Frequency Response**

**DY15**

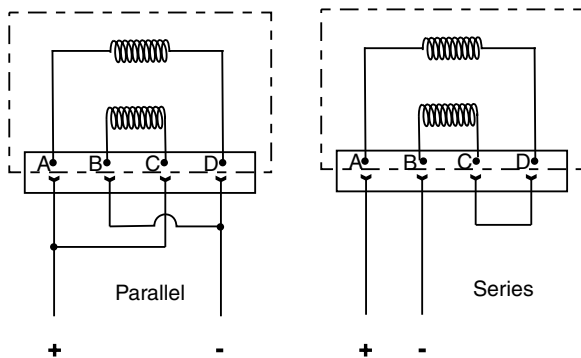
All curves ± 40% Amplitude



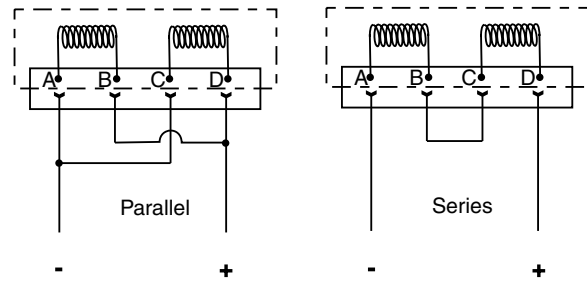
**Installation Wiring Options**

This servovalve has two coils. This illustration shows the internal wiring configurations for options C and D. When connecting the valve to a drive amplifier, the user's external wiring may put the coils either in parallel or in series as needed. Refer to the illustrations below and to the mounting pattern for this valve to insure proper control phasing.

**Option C**



**Option D**

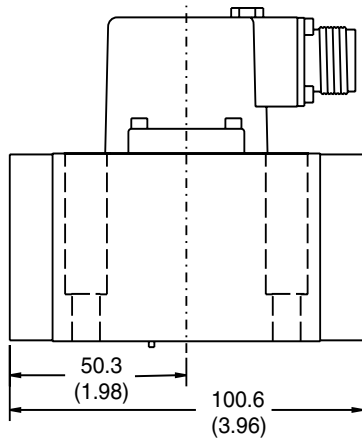
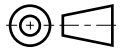
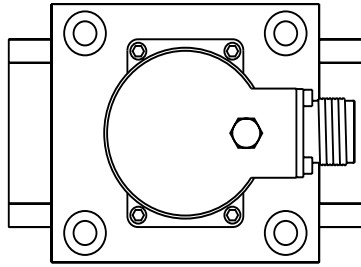


Polarity shown connects flow from P to C2 port.

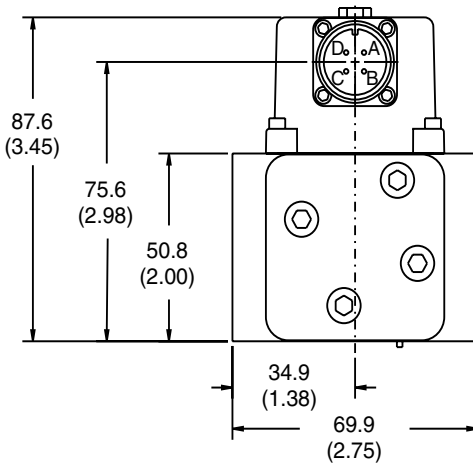


**Dimensions**

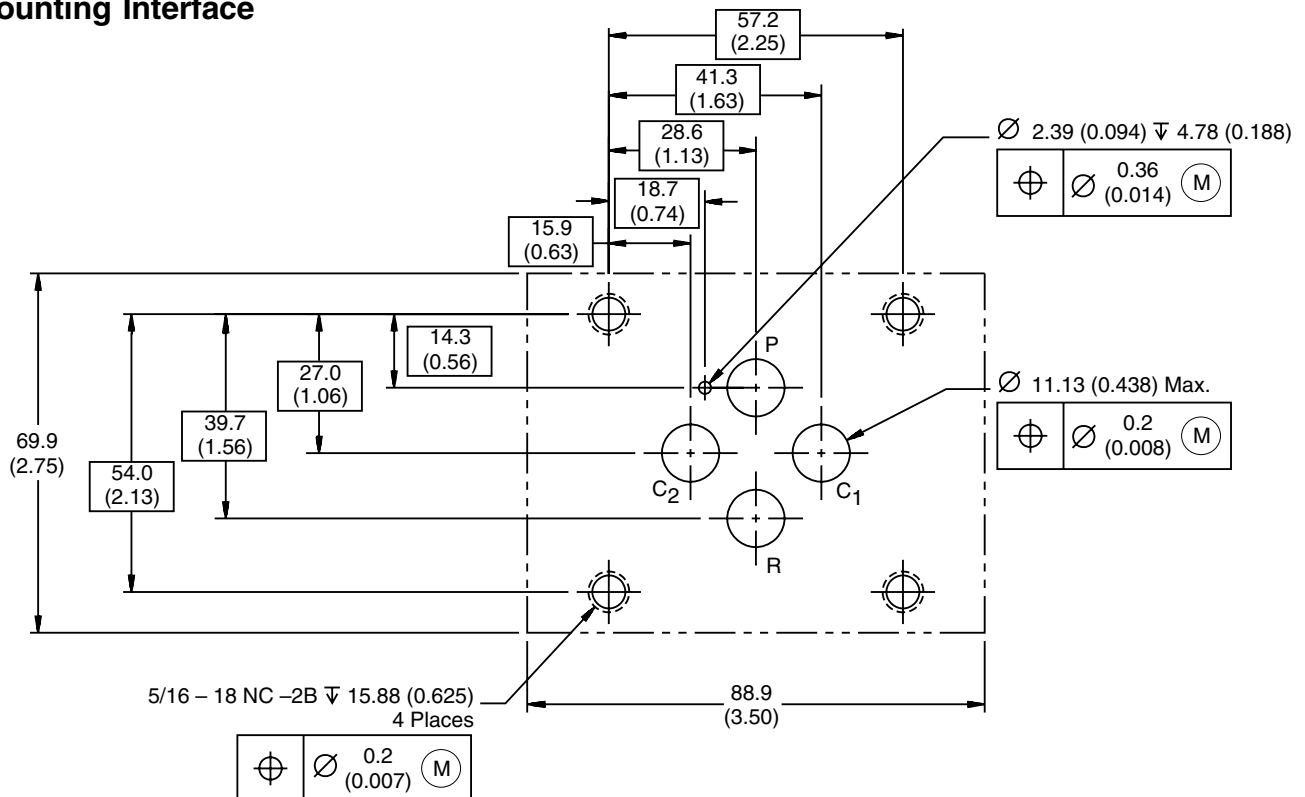
Inch equivalents for millimeter dimensions are shown in (\*\*)



Connector over port C1

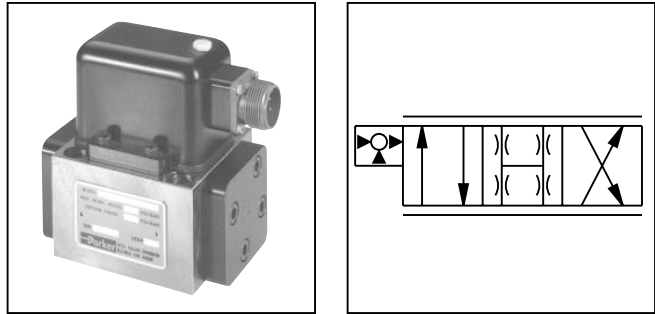


**Mounting Interface**



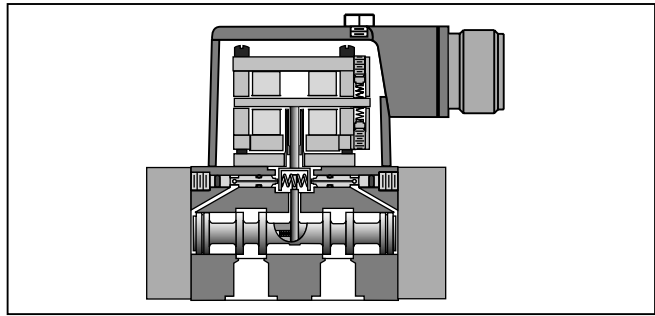
**General Description**

Series DY25 are two stage, 4-way, flapper and nozzle style servovalves. They have the same port pattern and body dimensions as the DY15, but use a higher force torque motor pilot. These valves are rated for 210 Bar (3000 PSI) standard, or can be built for 350 Bar (5000 PSI) service. The pressure ratings are the same for both the tool steel construction, and the optional stainless steel spool and body.



**Features**

- Lapped spool and body.
- No ball glitch.
- Tool steel, or stainless steel, spool and body.
- Nozzle and flapper design.
- Unique port pattern (see next page).
- Survives high tank port pressures.



**Specifications**

<b>Flow Rating</b> @ 70 Bar (1000 PSID)	57 and 75 LPM (25 and 30 GPM)	<b>Null Shift</b> with temperature with pressure	≤ 2% per 55°C (100°F) ≤ 2% per 70 Bar (1000 PSI)
<b>Supply Pressure</b>	10 – 210 Bar (145 – 3000 PSI) opt. 350 Bar (5000 PSI)		<b>Pressure Gain</b> % change in pressure per 1% change in input command
<b>Leakage Flow</b> @ 70 Bar (1000 PSID)	0.95 – 1.7 LPM (0.25 – 0.45 GPM)	<b>Step Response</b>	
<b>Tank Port Pressure</b>	210 Bar (3000 PSI) Max. < 10 Bar (145 PSI) for best performance		<b>Fluid</b>
<b>Input Command</b>	±50 mA std.	<b>Operating Temperature</b>	
<b>Frequency Response</b> @ 90° phase shift	> 35 Hz (See Performance Curves)		<b>Protection Class</b>
<b>Non-Linearity</b>	≤ 10%	<b>Filtration</b>	
<b>Threshold</b>	≤ 0.5%		

**DY25**

Series

Material Options

Coils

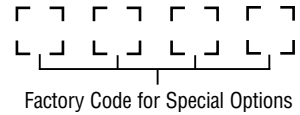
Wiring

Seals

Operating Pressure

Flows

Special Options



Code	Description
A	Steel (standard)
B	Stainless Steel
Z*	Special (specify)

\* Material selection does not affect operating pressure

Code	Description
Omit	Standard
D	(Specify) See list below

Code	Description
25	95 LPM (25 GPM)
30	114 LPM (30 GPM)

Code	Description	Parallel	Series
D	200 ohm (Std.)	50 mA	25 mA
F	80 ohm	80 mA	40 mA
G	22 ohm	200 mA	100 mA
K	40 ohm	150 mA	75 mA
R	750 ohm	30 mA	15 mA
Z	Special (specify)		

Code	Description
A	210 Bar (3000 PSI)
B	350 Bar (5000 PSI)
Z	Special (specify)

Operating pressure is independent of material selection.

Code	Connector over: Flow P to C2 with:
C	Port C1 (+) Signal to A, C
D	Port C1 (+) Signal to B, D
Z	Special (specify)

Code	Description
N	Nitrile (standard)
V	Fluorocarbon
E*	EPR
Z*	Special (specify)

\* Consult factory for delivery

**Weight:** 1.9 kg (4.2 lbs.)

**Special Options:**

Consult factory for price, delivery and availability of special options.

- Special coil
- Special wiring
- Special seals
- Special flow rate
- Dual flow rate
- Dual gain
- Zener barriers

**Accessories**

**Cable with Mating Connector:** EHC154S

**Mating Connector:** MS3106E-14S-2S

**Bolt Kit:** Included with valve

**Flushing Valve:** 11-0600

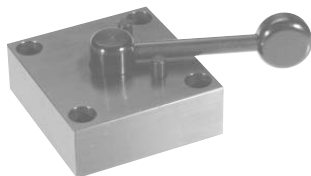
**Subplate:** 55-0300-2 SAE-16 Side ports

**Null Adjust Tool:** 27-0210

**Electronic Drivers:** 23-5030, 23-7030, BD90\*, BD95\*, and BD101\*

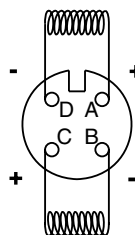
When used in conjunction with Series BD90/95 and BD101 servo amplifiers or a motion controller, Series BD valves will provide accurate control of rotary and linear actuators.

\* For output currents >15 mA



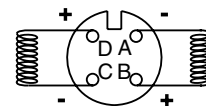
Flushing valve is rated for 3000 psi operation.

**Wiring Option C (Standard)**



Dyval and Pegasus standard.

**Wiring Option D**

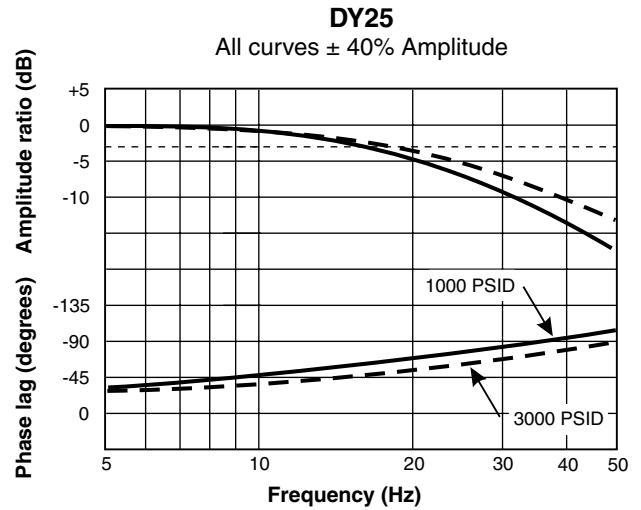
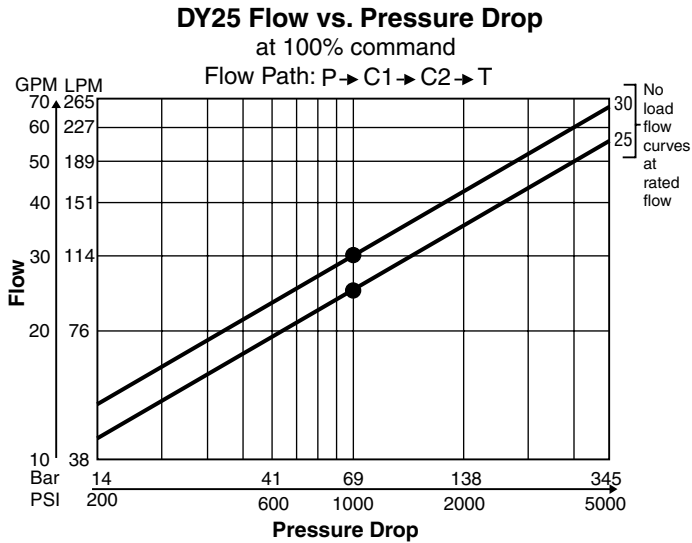


Moog, Atchley and Vickers standard.

In both cases, polarity shown connects P to C2 port.

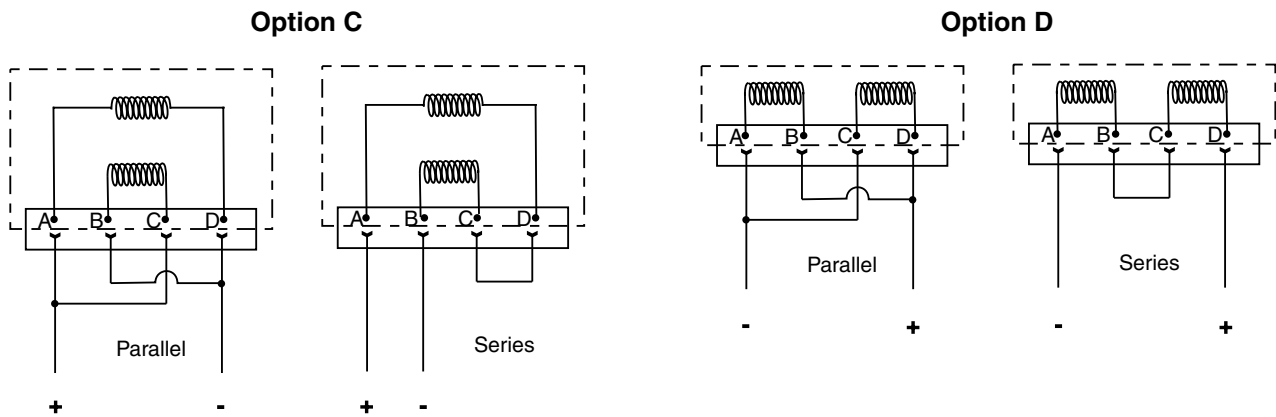
**Performance Curves**

**Frequency Response**



**Installation Wiring Options**

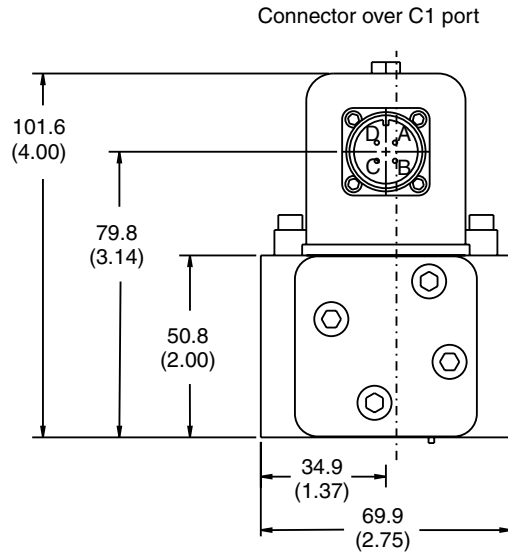
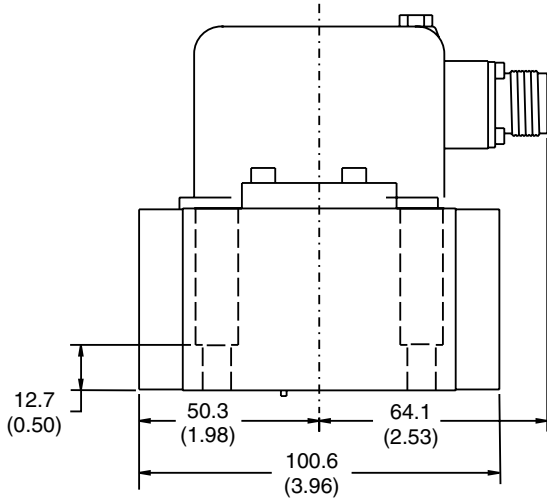
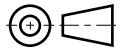
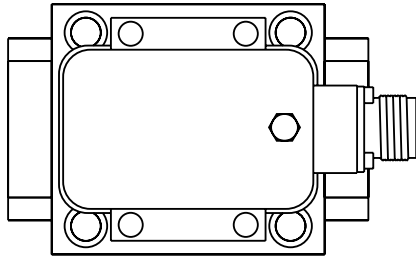
This servovalve has two coils. This illustration shows the internal wiring configurations for options C and D. When connecting the valve to a drive amplifier, the user's external wiring may put the coils either in parallel or in series as needed. Refer to the illustrations below and to the mounting pattern for this valve to insure proper control phasing.



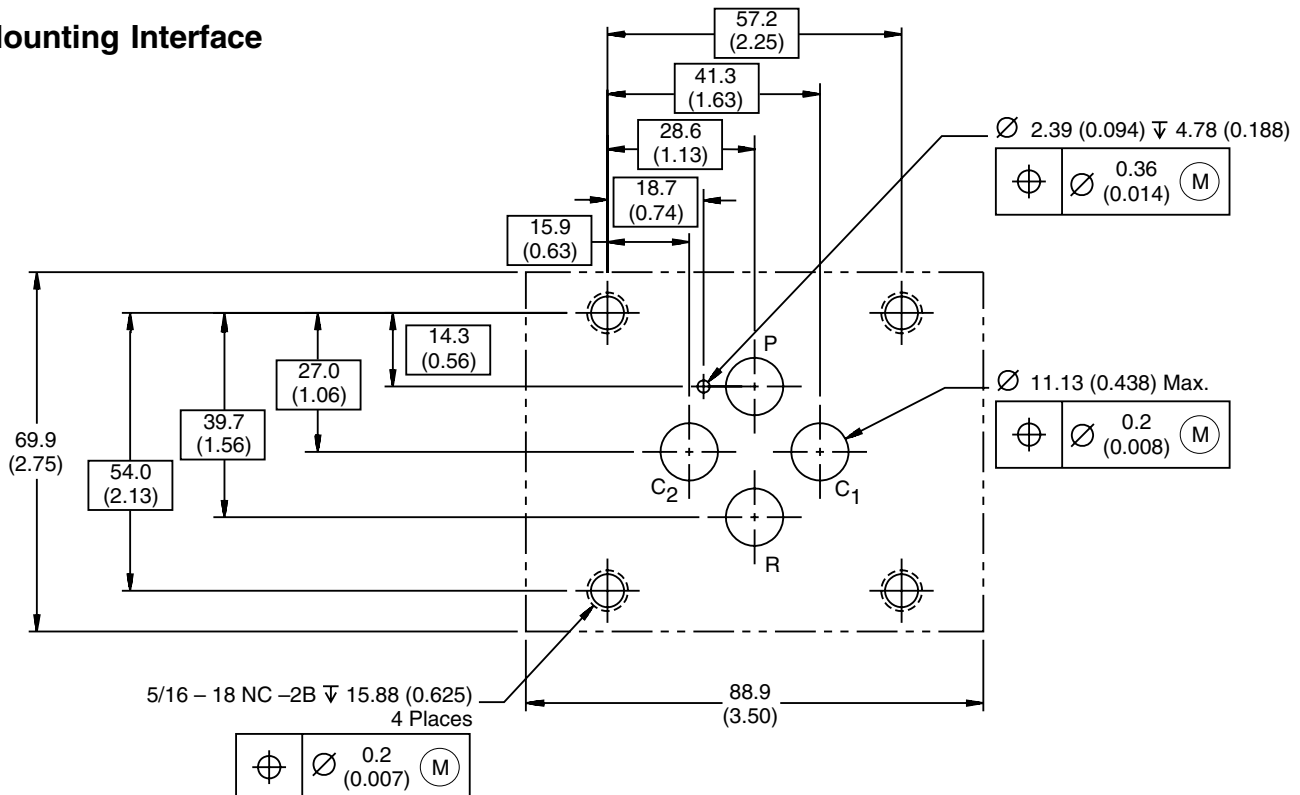
Polarity shown connects flow from P to C2 port.

**Dimensions**

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



**Mounting Interface**

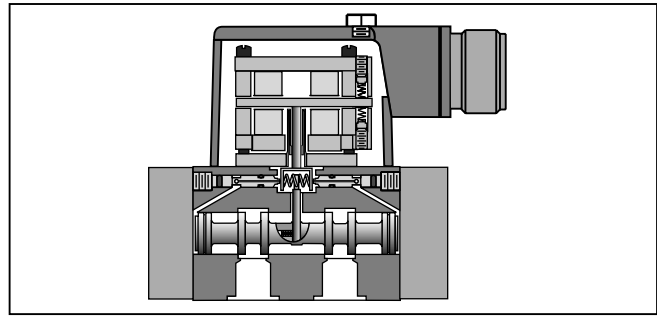
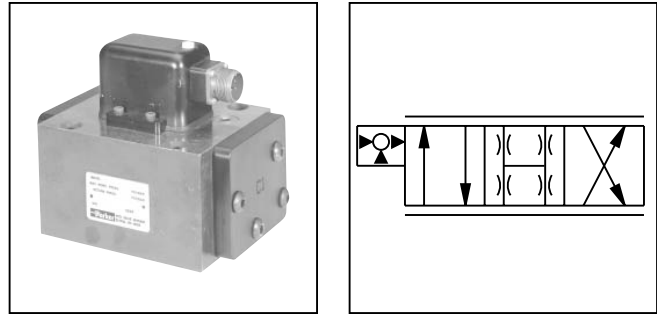


**General Description**

Series DY45 are two stage, 4-way, flapper and nozzle style servovalves. These valves are rated for 210 Bar (3000 PSI) standard, or can be built for 350 Bar (5000 PSI) service. The pressure ratings are the same for both the tool steel construction, and the optional stainless steel spool and body.

**Features**

- Lapped spool and body.
- No ball glitch.
- Tool steel, or stainless steel, spool and body.
- Nozzle and flapper design.
- Unique port pattern (see mounting pattern).
- Survives high tank port pressures.



**Specifications**

<b>Flow Rating</b> @ 70 Bar (1000 PSID)	150, 190 and 225 LPM (40, 50 and 60 GPM)	<b>Null Shift</b> with temperature with pressure	≤ 2% per 55°C (100°F) ≤ 2% per 70 Bar (1000 PSI)
<b>Supply Pressure</b>	10 – 210 Bar (145 – 3000 PSI) opt. 350 Bar (5000 PSI)	<b>Pressure Gain</b> % change in pressure per 1% change in input command	30% minimum, 70% maximum
<b>Leakage Flow</b> @ 70 Bar (1000 PSID)	1.3 – 2.7 LPM (0.35 – 0.70 GPM)	<b>Step Response</b>	10 – 90%, < 25 ms
<b>Tank Port Pressure</b>	210 Bar (3000 PSI) Max. < 10 Bar (145 PSI) for best performance	<b>Fluid</b>	Mineral Oil, 60 – 225 SSU 1000 SSU maximum
<b>Input Command</b>	±50 mA std.	<b>Operating Temperature</b>	-1°C to + 106°C (+30°F to +225°F)
<b>Frequency Response</b> @ 90° phase shift	> 30 Hz at ±10% amplitude	<b>Protection Class</b>	NEMA 4, IP65
<b>Non-Linearity</b>	≤ 10%	<b>Filtration</b>	ISO 4406 15/12 or better
<b>Threshold</b>	≤ 0.5%		



**DY45**

Series

Material Options

Coils

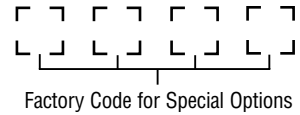
Wiring

Seals

Operating Pressure

Flows

Special Options



Code	Description
A	Steel (standard)
B	Stainless Steel
Z*	Special (specify)

\* Material selection does not affect operating pressure

Code	Description
Omit	Standard
D	(Specify) See list below

Code	Description
40	150 LPM (40 GPM)
50	190 LPM (50 GPM)
60	225 LPM (60 GPM)

Code	Description
A	210 Bar (3000 PSI)
B	350 Bar (5000 PSI)
Z	Special (specify)

Operating pressure is independent of material selection.

Code	Description	Parallel	Series
D	200 ohm (Std.)	50 mA	25 mA
F	80 ohm	80 mA	40 mA
G	22 ohm	200 mA	100 mA
K	40 ohm	150 mA	75 mA
R	750 ohm	30 mA	15 mA
Z	Special (specify)		

Code	Connector over:	Flow P to C2 with:
C	Port C1	(+) Signal to A, C
D	Port C1	(+) Signal to B, D
Z	Special (specify)	

Code	Description
N	Nitrile (standard)
V	Fluorocarbon
E*	EPR
Z*	Special (specify)

\* Consult factory for delivery

**Weight:** .3 kg (16.0 lbs.)

**Special Options:**

Consult factory for price, delivery and availability of special options.

- Special coil
- Special wiring
- Special seals
- Special flow rate
- Dual flow rate
- Dual gain
- Zener barriers

**Accessories**

**Cable with Mating Connector:** EHC154S

**Mating Connector:** MS3106E-14S-2S

**Bolt Kit:** Included with valve

**Flushing Valve:** 11-0700

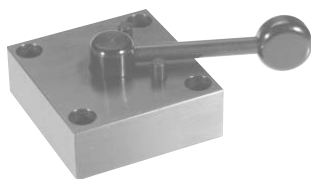
**Subplate:** 55-0200-2 SAE-24 Side ports

**Null Adjust Tool:** 27-0210

**Electronic Drivers:** 23-5030, 23-7030, BD90\*, BD95\* and BD101\*

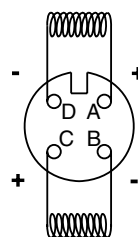
When used in conjunction with Series BD90/95 and BD101 servo amplifiers or a motion controller, Series BD valves will provide accurate control of rotary and linear actuators.

\* For output currents >15 mA



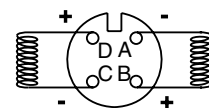
Flushing valve is rated for 3000 psi operation.

**Wiring Option C (Standard)**



Dyval and Pegasus standard.

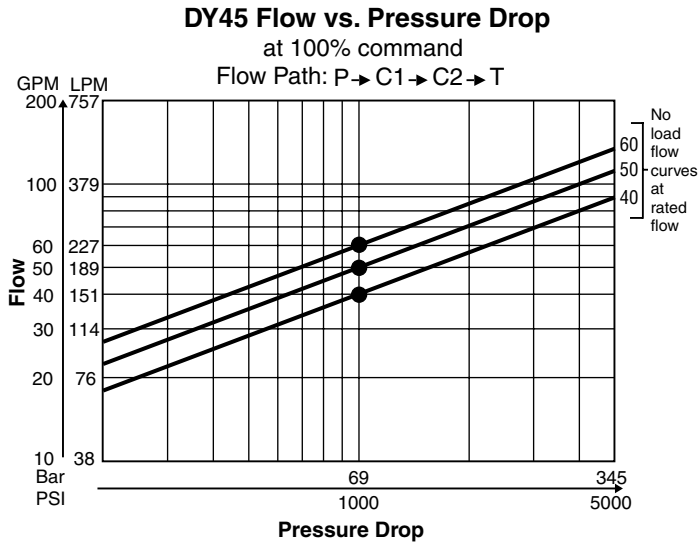
**Wiring Option D**



Moog, Atchley and Vickers standard.

In both cases, polarity shown connects P to C2 port.

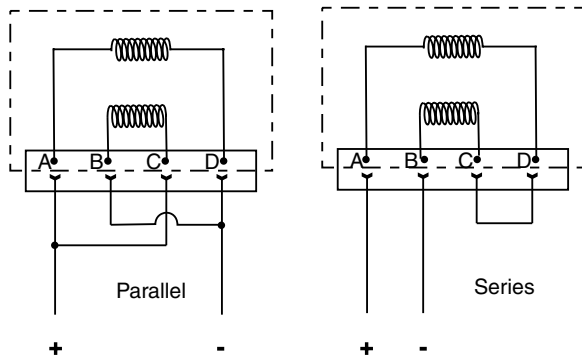
**Performance Curves**



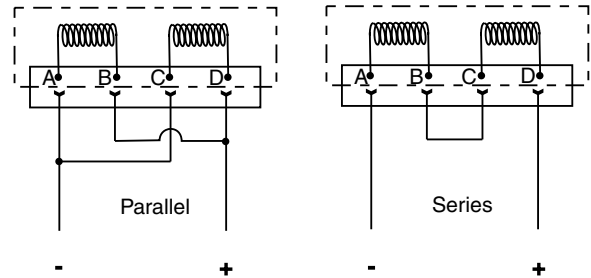
**Installation Wiring Options**

This servovalve has two coils. This illustration shows the internal wiring configurations for options C and D. When connecting the valve to a drive amplifier, the user's external wiring may put the coils either in parallel or in series as needed. Refer to the illustrations below and to the mounting pattern for this valve to insure proper control phasing.

**Option C**



**Option D**

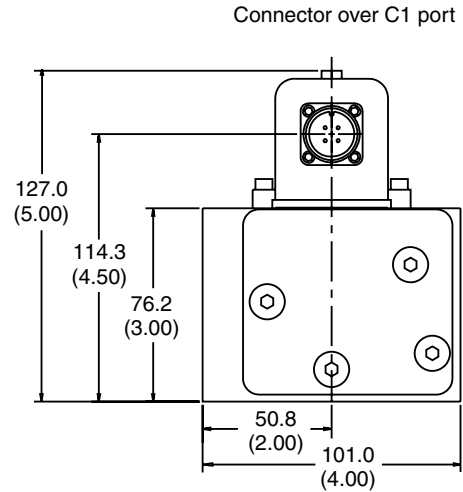
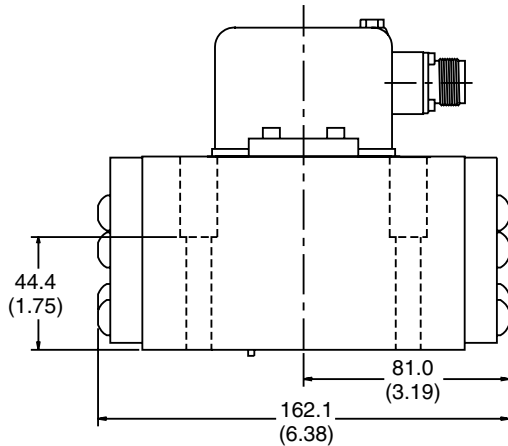
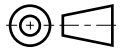
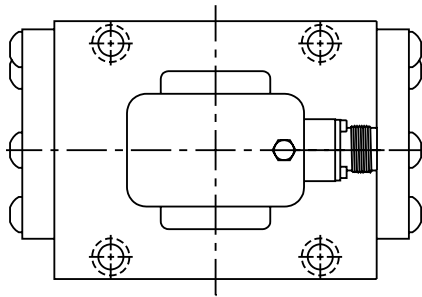


Polarity shown connects flow from P to C2 port.

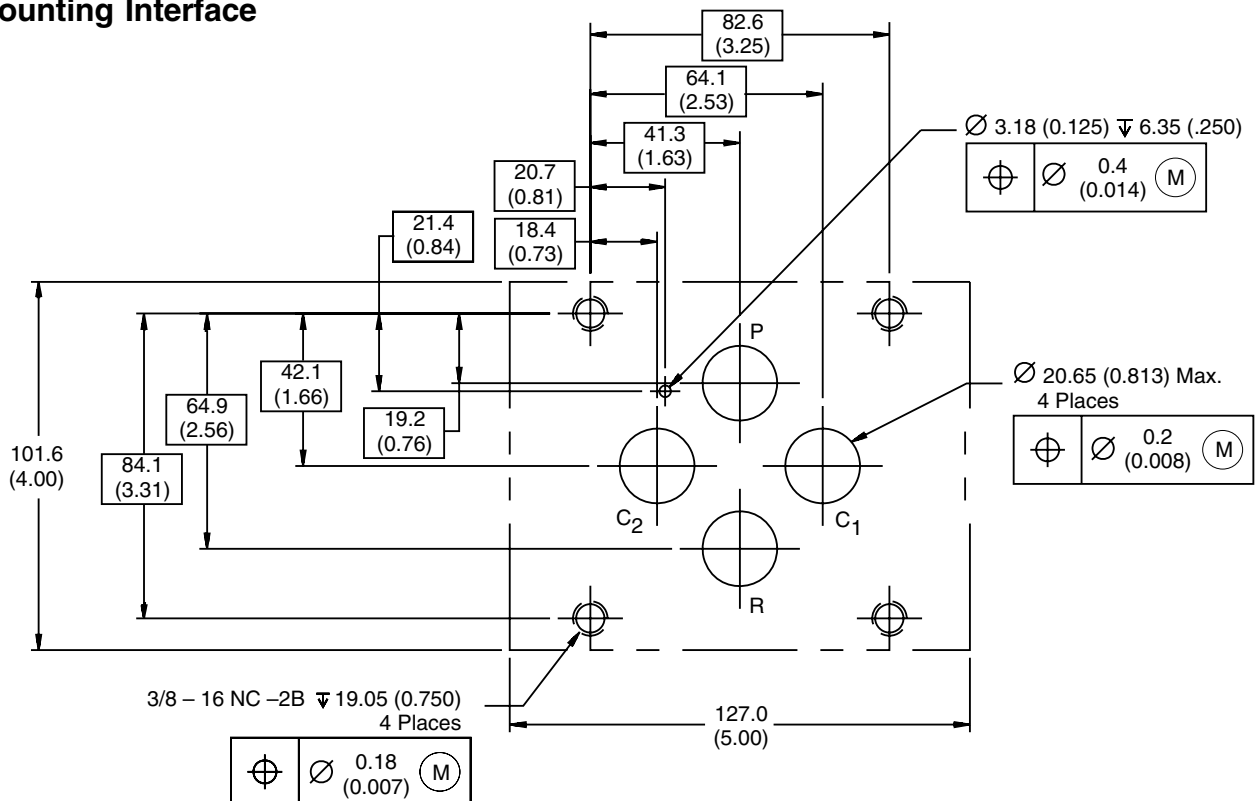


**Dimensions**

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



**Mounting Interface**



**Contents**

**Drivers – Proportional Directional Valves**

Series	Valve Application	Description	Page
PWD00A-400 .....	D**FW, D*FB, WLL, RLL ...	Programmable, Min, Max, Ramps, Setpoints .....	D2 - D4
PWDXXA-40* .....	D**FS, D*FC, RLL*R .....	Programmable, Feedback, Min, Max, Ramps .....	D5 - D8
EW01104 .....	D1FW .....	Adjustable; Min, Max, 2 ramps, 1 external ramp .....	D9 - D10
PW**404 .....	D*FW, D*1FW, WLL, RLL ..	Adjustable; Min, Max, 2 ramps .....	D11 - D13
EW101 .....	D**FS .....	Adjustable; 4 commands, 2 ramps .....	D14 - D15
EW102 .....	D**FS .....	Basic driver .....	D16 - D17
EW104 .....	D**FS .....	Adjustable; Min, Max, 2 ramps .....	D18 - D19

**Drivers – Proportional Pressure Control Valves**

Series	Valve Application	Description	Page
PCD00A-400 .....	VBY, VMY, RE*W, PE*W ..	Programmable, Min, Max, Ramp .....	D20 - D23
ED101 .....	DWE, DWU, RE*W .....	Adjustable; 4 commands, 2 ramps .....	D24 - D25
ED102 .....	DWE, DWU, RE*W .....	Basic driver .....	D26 - D27
ED104 .....	DWE, DWU, RE*W .....	Adjustable; Min, Max, 2 ramps .....	D28 - D29

**Drivers – Proportional Throttle Valves**

Series	Valve Application	Description	Page
PCD00A-400 .....	TDA, TEA .....	Programmable, Min, Max, Ramp .....	D20 - D23
ET101 .....	TDA .....	Adjustable; 4 commands, 2 ramps ("L" Solenoid) .....	D30 - D31
ET102 .....	TDA .....	Basic driver ("L" Solenoid) .....	D32 - D33
ET104 .....	TDA .....	Adjustable; Min, Max, 2 ramps ("L" Solenoid) .....	D34 - D35
ET105 .....	TDA .....	Adjustable; Min, Max ("L" Solenoid) .....	D36 - D37
ET154 .....	TDA, TEA .....	Adjustable, Min, Max ("M" Solenoid) .....	D38 - D39

**Drivers – Servovalves**

Series	Valve Application	Description	Page
BD90/95 .....	BD15/BD30/Dyval .....	Closed loop, dual PID, snap track .....	D40 - D42
BD101 .....	BD15/BD30/Dyval .....	Closed loop, PI, snap track .....	D58 - D59

**Auxiliary Function Cards**

Series	Valve Application	Description	Page
PZD00A-40* .....	all .....	Programmable, Signal Conditioning .....	D44 - D47
EZ150 .....	all .....	Adjustable; 6 commands, 7 ramps .....	D48 - D49
EZ154 .....	all .....	Adjustable; Min, Max, 2 ramps, 1 external ramp .....	D50 - D51
EZ155 .....	all .....	Adjustable; 4 commands, 2 ramps, 1 external ramp .....	D52 - D53
EZ595 .....	D*FP, D*FH, D*FX .....	Closed loop PID, DIN card .....	D54 - D56
BD101 .....	D*FP, D*FH, D*FX, BD** ...	Closed loop PI, snap track .....	D58 - D59

**Power Supplies**

Series	Valve Application	Description	Page
PS15 .....	all .....	±15 volt power supply .....	D60
PS24 .....	all .....	24 volt power supply .....	D61

<b>Card Holders</b> .....	all .....	DIN Card holders .....	D62
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## General Description

Series PWD00A-400 electronic module for driving open loop proportional valves is compact and easy to install with DIN rail mounting and plug-in terminals. The digital design allows for programmable parameters such as solenoid drive current, mins and maxs, and ramps. Profiles controlled by on-off logic signals can be configured through internal velocity setpoints and ramps. The module provides flexibility for different applications and repeatability from unit to unit. The module parameters are programmed with an RS-232 interface and user friendly software (ProPxD) with default values for the standard valves.

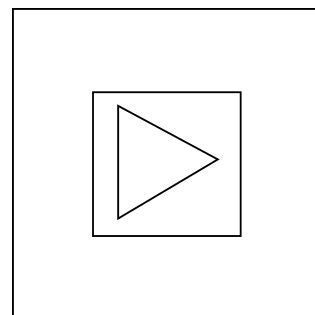
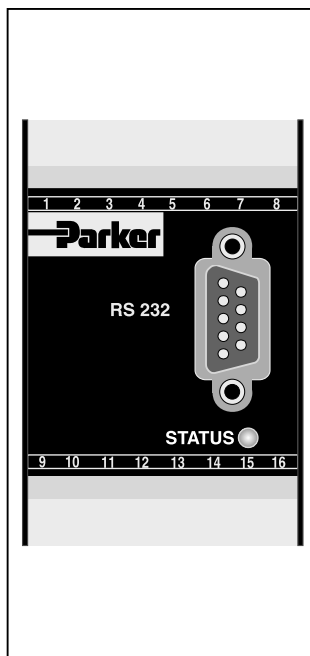
The PWD00A-400 module contains the functions required by typical open loop proportional valve applications (series D\*FB, D\*FW, D\*1FW, WLL, RLL valves).

## Features

- Programmable parameters.
- Analog or Profile Capability.
- RS-232 Interface.
- User friendly programming software.
- Plug-in terminals.

## Specifications

General			
<b>Model</b>	Module package for snap-on mounting on EN 50022 rail	<b>Mounting Position</b>	Any
<b>Package Material</b>	Polycarbonate	<b>Ambient Temperature Range</b>	-20°C to +60°C (-4°F to +140°F)
<b>Inflammability Class</b>	V2 to V0 acc. UL 94	<b>Protection Class</b>	IP 20 acc. DIN 40050
Electrical			
<b>Duty Ratio</b>	100%	<b>Channel Recall Signal</b>	Off – 0 to 5.0 VDC; On – 8.5 to 30 VDC; Ri = 30K ohm
<b>Supply Voltage</b>	18 VDC to 30 VDC, ripple < 5% eff., surge free (29 VDC to 30 VDC for 24V coils)	<b>Status Signal</b>	Off – 0 to 0.5 VDC; On – Supply Voltage; rated max. 15 mA
<b>Switch-on Current Typ.</b>	22A for 0.2 mS	<b>Adjustment Ranges</b>	<b>preset</b>
<b>Current Consumption Max.</b>	2.0A	Minimum	0 to 50%      0 to 1000
<b>Pre-fusing</b>	2.5A medium lag	Maximum	50 to 100%      0 to 1000
<b>Command Signal</b>	+10 to 0 to -10 VDC, ripple < 0.01 % eff., surge free, Ri = 150K ohm <b>Do not input a command greater than ±10 VDC.</b>	Ramp Time	0 to 32.5 s      0 to 32.5
<b>Input Signal Resolution</b>	0.025%	Zero Offset	+75 to -75%      +1000 to -1000
<b>Differential Input Voltage Maximum</b>	30V for terminals 5 and 6 against PE (terminal 8)	Current	0.8/3.5/2.7/1.8/1.3 A      0/1/2/3/4/5
<b>Enable Signal</b>	Off – 0 to 5.0 VDC; On – 8.5 to 30 VDC; Ri = 30K ohm	<b>Interface</b>	RS 232C, DSub 9p. male for null modem cable
		<b>EMC</b>	EN 50081-2, EN 50082-2
		<b>Connection</b>	Screw terminals 0.2 to 2.5 mm <sup>2</sup> , plug-in
		<b>Cable Specification</b>	16 AWG overall braid shield for supply voltage and solenoids 20 AWG overall braid shield for sensor and signal
		<b>Cable Length</b>	50m (164 ft.)

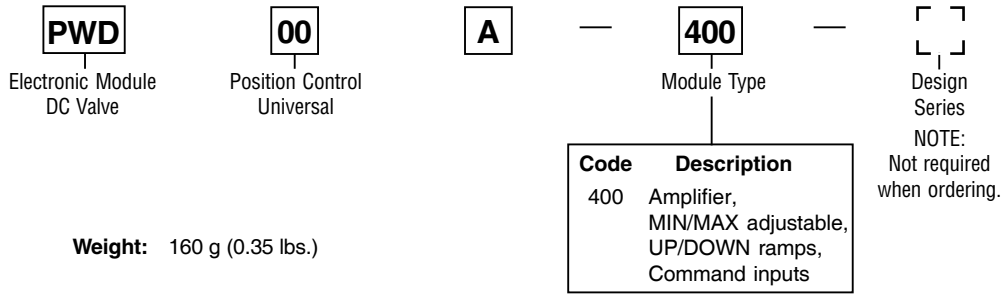


- Four independent ramps.
- Input Enable with Status indicator.
- Differential input on analog command.
- Compliant with European EMC Standards.

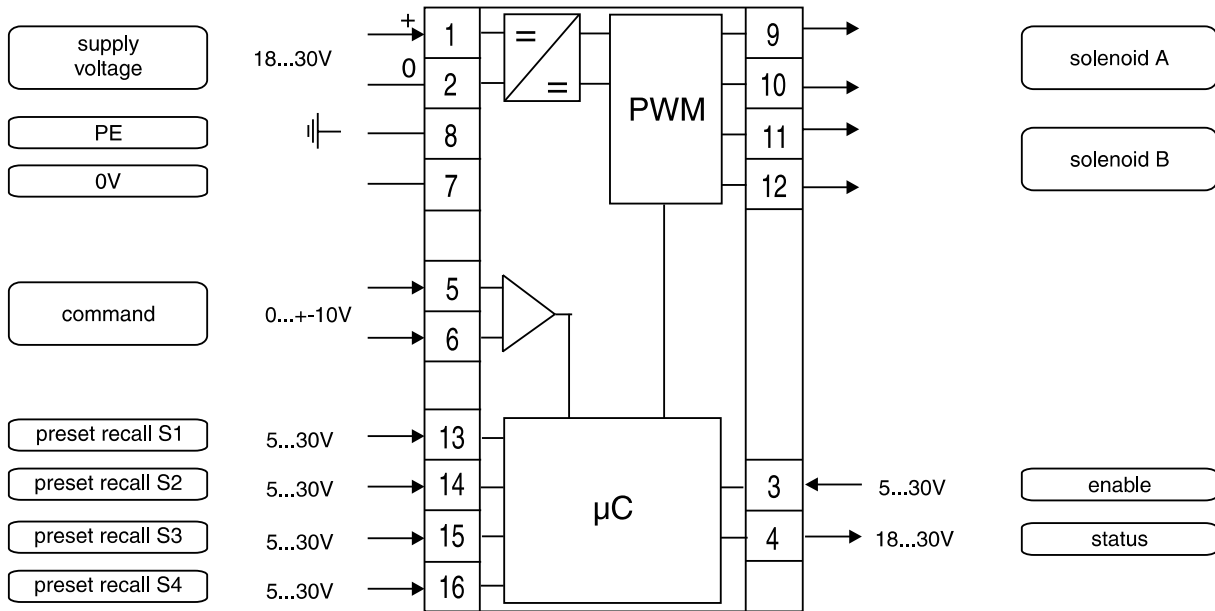


**D**

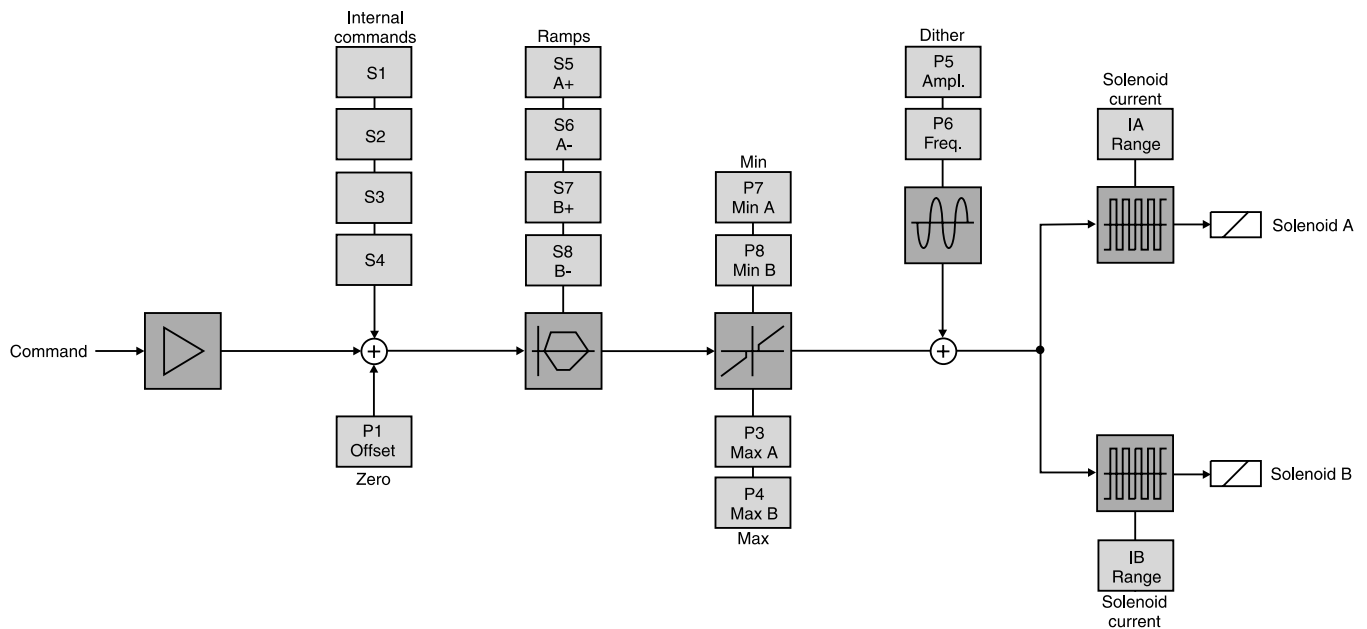
**Ordering Information**



**Block Diagram**

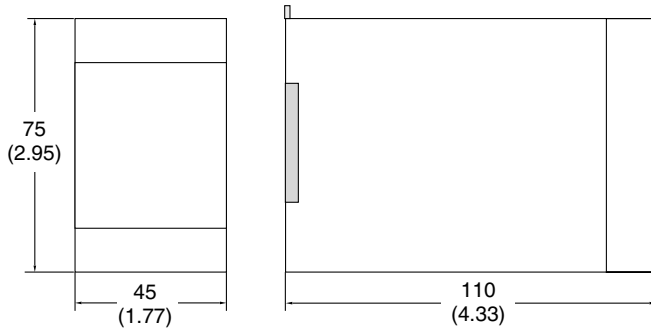


**Signal Flow Diagram**



**Dimensions**

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



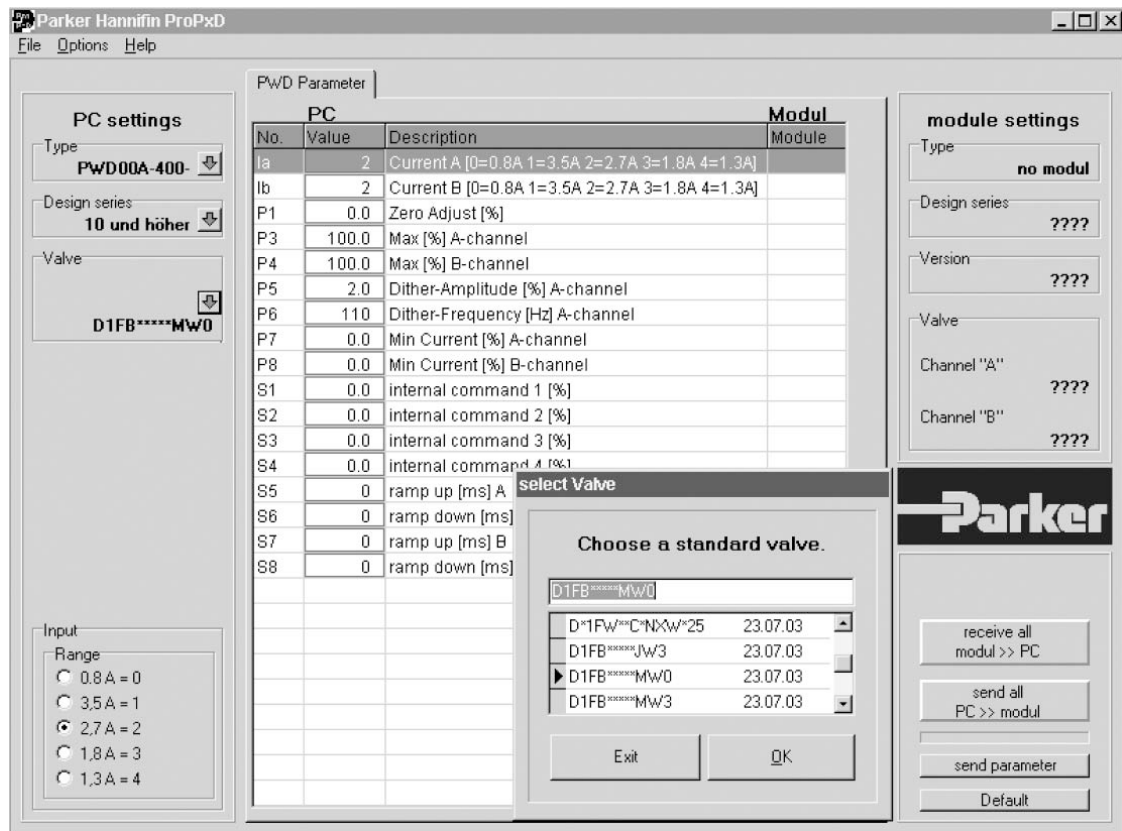
**ProPxD Interface Program**

The new ProPxD software permits user-friendly parameter setting for the electronic module series PCD, PWD and PZD.

Via the clearly arranged entry screen the parameters can be identified and modified. Storage of complete parameter sets to floppy or hard disk 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 the electronic module in the same manner as the default parameters which are available for all standard valve series. Inside the electronic a nonvolatile memory stores the data with the option for recalling or modification.

**Features**

- User-friendly editing of all parameters.
- Default values for standard valves.
- Identification and documentation of parameter sets.
- Executable with all actual Windows® operating systems from Windows® 95 upwards.
- Simple communication between PC and electronic via serial interface RS-323 and nullmodem cable.



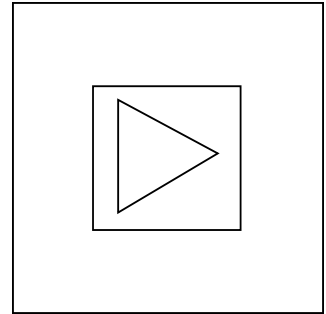
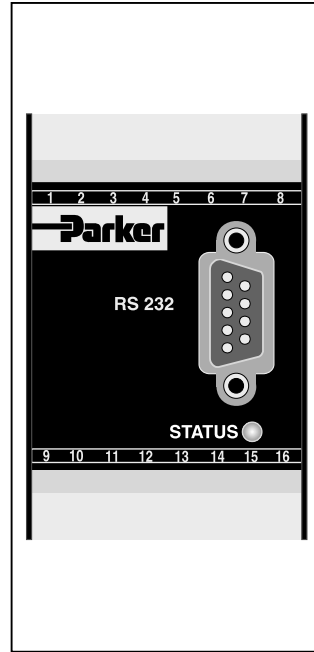
## General Description

Series PWDXXA-40\* electronic module for driving proportional valves with spool position feedback is compact and easy to install with DIN rail mounting and plug-in terminals. The digital design allows for programmable parameters such as solenoid drive current, mins, maxs, ramps and a range of position feedback signals. The module provides flexibility and repeatability from unit to unit. The module parameters are programmed with an RS-232 interface and user friendly software (ProPxD) with default values for standard valves.

The PWDXXA-40\* module contains the functions required by typical internal closed loop proportional valve applications (series D\*FC, D\*1FS, RLL\*R, WLL\*R and TEL valves).

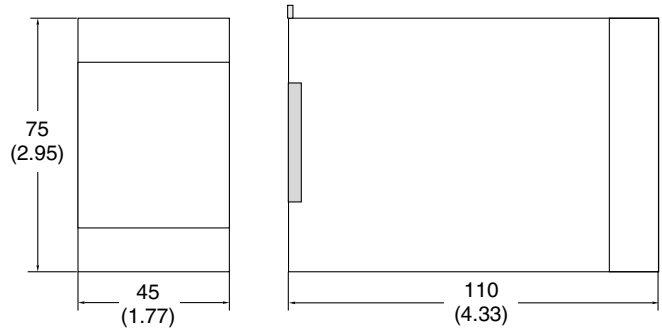
## Features

- Interface and tuning for spool position feedback.
- Programmable parameters.
- $\pm 10V$ ,  $\pm 20$  mA, 4-20 mA position transducer input.
- RS-232 Interface.
- User friendly programming software.
- Plug-in terminals.
- Four independent ramps.
- Input Enable with Status indicator.
- Differential command input.
- Compliant with European EMC Standards.



## Dimensions

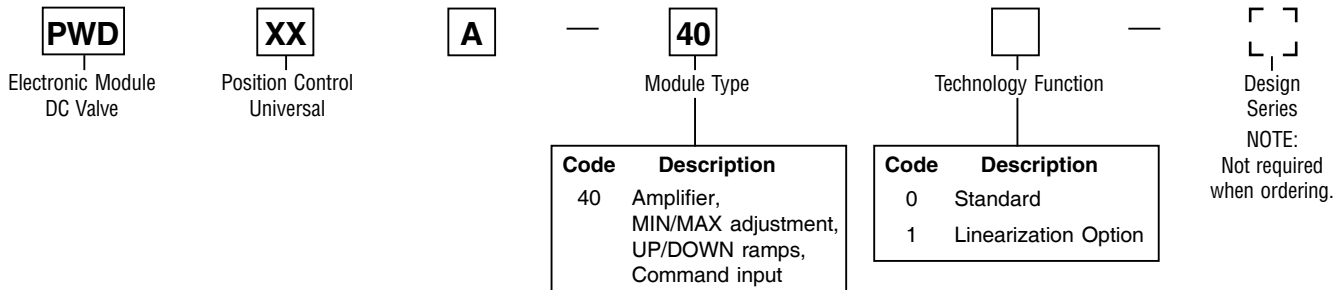
Inch equivalents for millimeter dimensions are shown in (\*\*)



**Specifications**

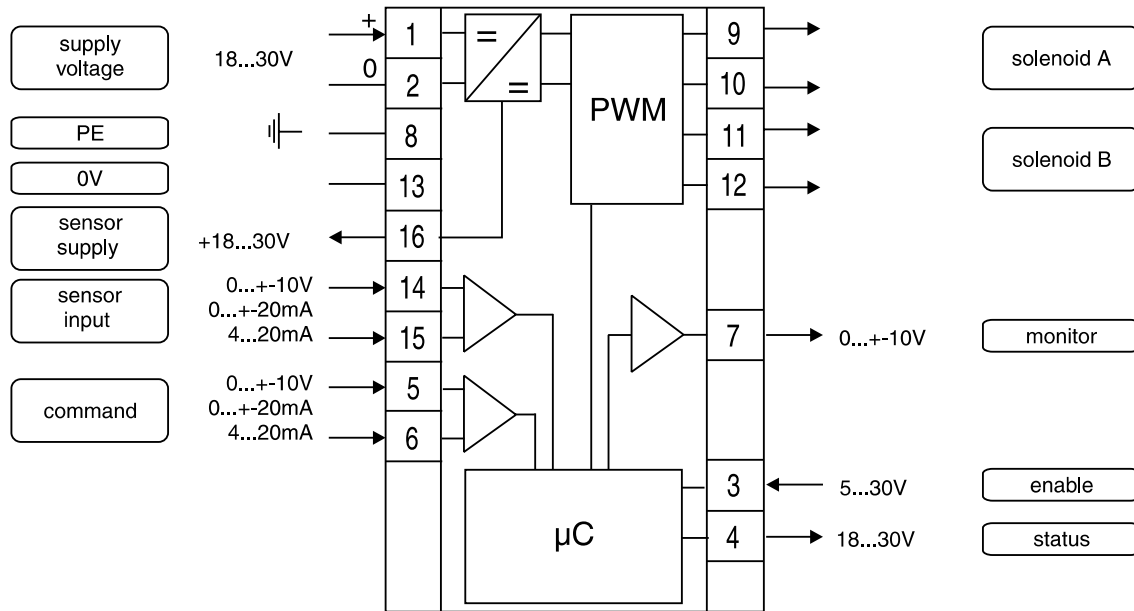
General			
<b>Model</b>	Module package for snap-on mounting on EN 50022 rail	<b>Mounting Position</b>	Any
<b>Package Material</b>	Polycarbonate	<b>Ambient Temperature Range</b>	-20°C to +60°C (-4°F to +140°F)
<b>Inflammability Class</b>	V2 to V0 acc. UL 94	<b>Protection Class</b>	IP 20 acc. DIN 40050
Electrical			
<b>Duty Ratio</b>	100%	<b>Status Signal</b>	Off – 0 to 0.5 VDC; On – Supply Voltage; rated max. 15 mA
<b>Supply Voltage</b>	18 VDC to 30 VDC, ripple < 5% eff., surge free	<b>Monitor Signal</b>	+10 to 0 to -10 VDC, rated max. 5 mA, signal resolution 0.4%
<b>Switch-on Current Typ.</b>	22A for 0.2 mS	<b>Adjustment Ranges</b>	Minimum 0 to 50%
<b>Current Consumption Max.</b>	2.0A		Maximum 50 to 100%
<b>Pre-fusing</b>	2.5A medium lag		Ramp Time 0 to 32.5 s
<b>Command Signal</b>	+10 to 0 to -10 VDC, ripple < 0.01 % eff., surge free, Ri = 100K ohm		Zero Offset +100 to -100%
	+20 to 0 to -20 mA, ripple < 0.01 % eff., surge free, Ri = 200K ohm		Current 1.3/2.7/3.5 A
	4 to 12 to 20 mA, ripple < 0.01 % eff., surge free, Ri = 200 ohm	Initial Current 0 to 25%	
<b>Input Signal Resolution</b>	0.025%	<b>Interface</b>	RS 232C, DSub 9p. male for null modem cable
<b>Differential Input Voltage Max.</b>	30V for terminals 5 and 6 against PE (terminal 8)	<b>EMC</b>	EN 50081-2, EN 50082-2
<b>Enable Signal</b>	Off – 0 to 2.5 VDC; On – 5 to 30 VDC; Ri = 30K ohm	<b>Connection</b>	Screw terminals 0.2 to 2.5 mm <sup>2</sup> , plug-in
<b>Cable Specification</b>		<b>Cable Length</b>	50m (164 ft.)
			16 AWG overall braid shield for supply voltage and solenoids
			20 AWG overall braid shield for sensor and signal
Options			
<b>Technology Function</b>	Code 1 – Software adjustable transfer function with 10 compensation points for linearization of valve behavior.		

**Ordering Information**

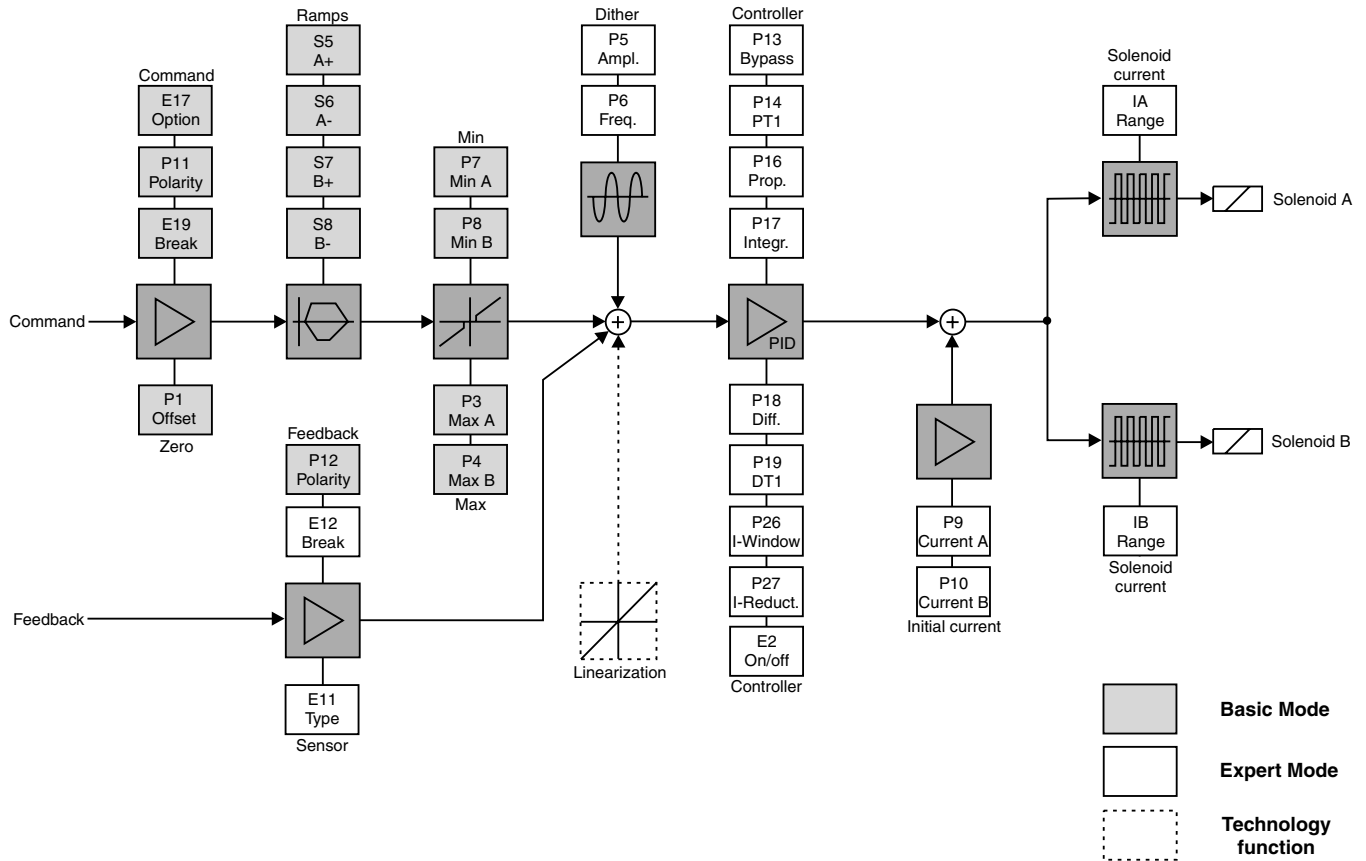


**Weight:** 160g (.35 lbs.)

**Block Diagram**



**Signal Flow Diagram**





### ProPxD Interface Program

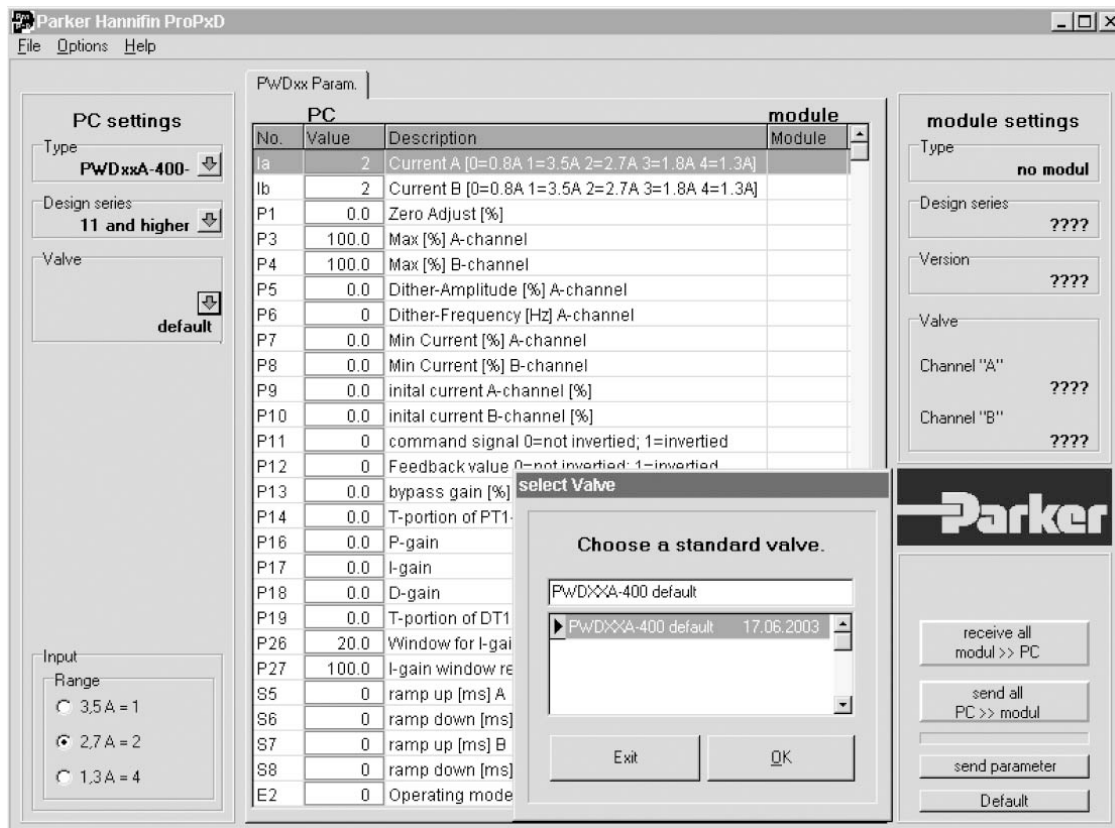
The new ProPxD software permits user-friendly parameter setting for the electronic module series PCD, PWD and PZD.

Via the clearly arranged entry screen the parameters can be identified and modified. Storage of complete parameter sets to floppy or hard disk 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 the electronic module in the same manner as the default parameters which are available for all standard valve series. Inside the electronic a nonvolatile memory stores the data with the option for recalling or modification.

### Features

- User-friendly editing of all parameters.
- Default values for standard valves.
- Identification and documentation of parameter sets.
- Executable with all actual Windows® operating systems from Windows® 95 upwards.
- Simple communication between PC and electronic via serial interface RS-323 and nullmodem cable.

**D**



### General Description

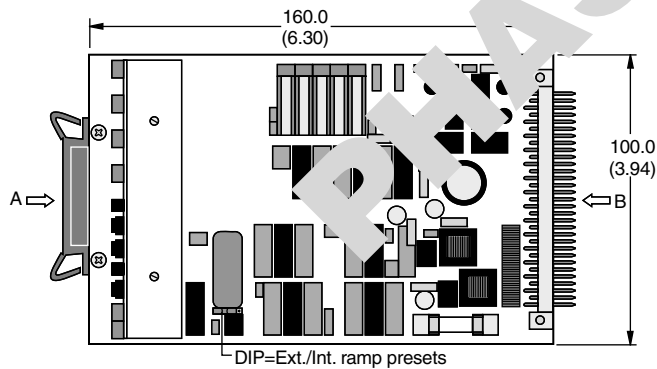
Series EW01104 electronic module is used to control non-feedback D1FW proportional directional valves. The module accepts a  $\pm 10$  volt command signal, and produces a proportionally linear output current used to drive the valve's proportional solenoid. Note that the linearity of the valve itself determines the linearity of the system. Refer to the specific valve data for actual linearity performance.

### Features

- Spool overlap range can be manipulated with MIN potentiometer, adjustable by feeding a constant set value of 0.2V.
- MAX limiting of spool stroke with full set value range. Can be set up after MIN has been set and feeding a constant set value of 10V.
- DIP — switch from internal ramp generation to external ramp supply.
- Pulsed low-loss amplifier power stage with supporting constant current control for constant, temperature-independent, solenoid forces.
- Dither generator with applied frequency to improve static characteristics.

### Dimensions

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



**For new applications:**  
**EW01104: Refer to PWD00A-400**

### Ordering Information

**EW**  
 Electronic Module  
 Directional Valve

**01**  
 Valve Size

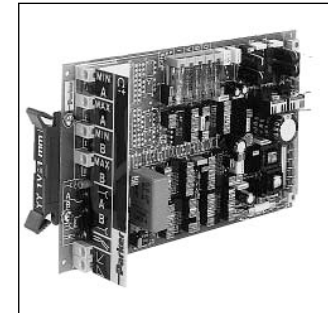
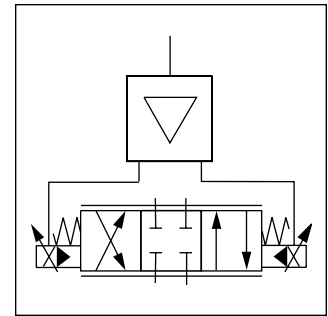
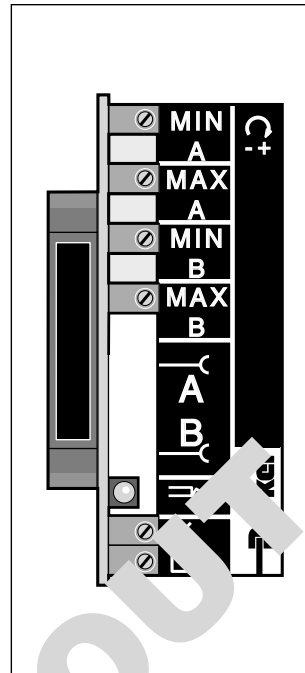
Valve Mounting		
Code	Size	Pattern
01	*D1FW	NG6

\*Solenoid K-12V

**104**  
 Module Type

Code	Description
104	Amplifier, adjustable, MIN/MAX-limiting, UP/DOWN ramps

**Design Series**  
 NOTE:  
 Not required when ordering.

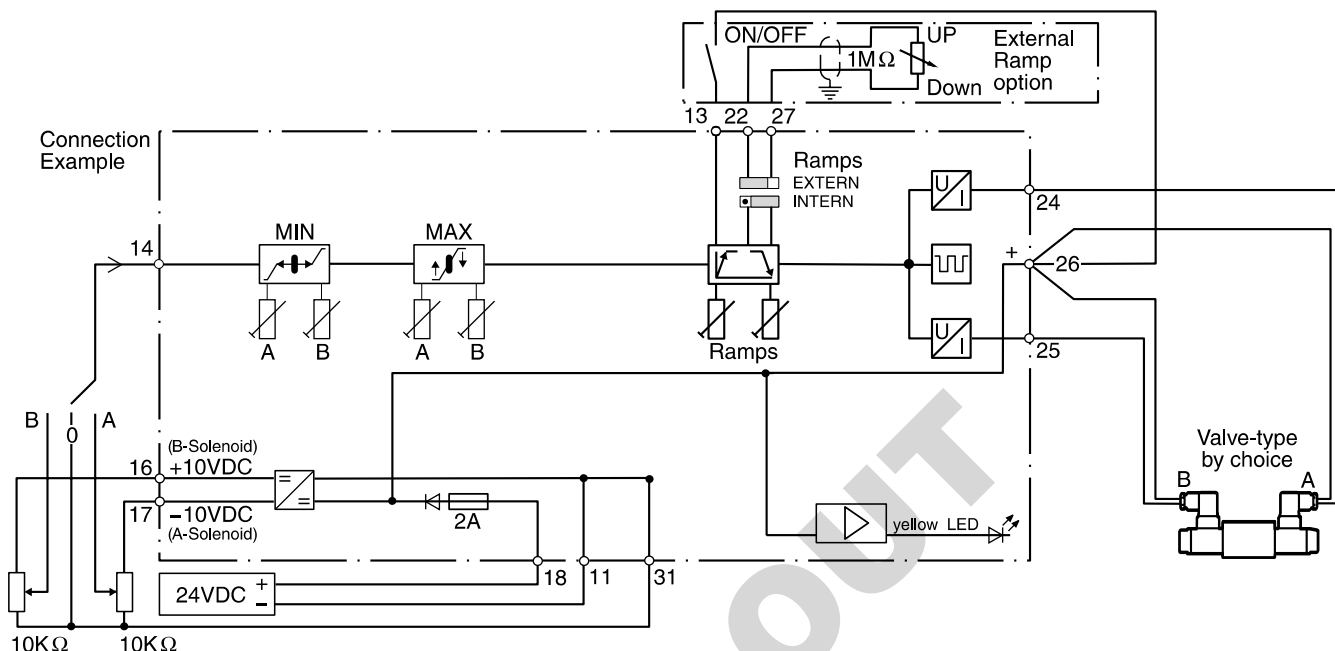


### Specifications

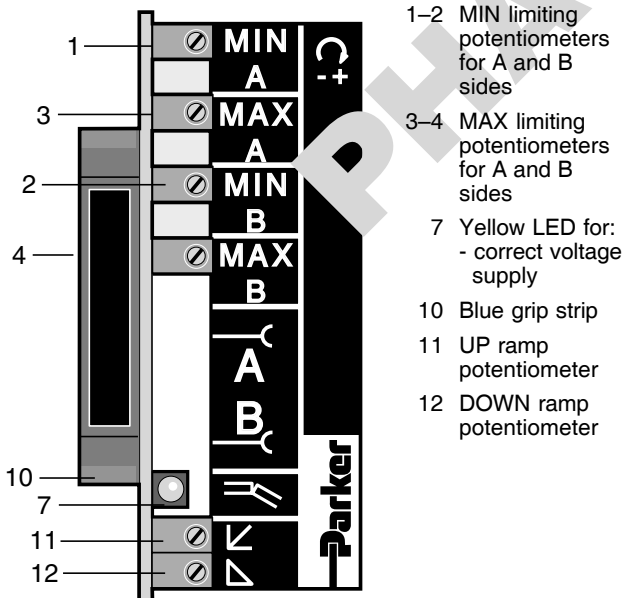
<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Command Signal</b>	0 to +10 VDC and 0 to -10 VDC
<b>Input Select Voltage</b>	5 to 30 VDC
<b>Power Required</b>	40 VA
<b>Reference Outputs</b>	$\pm 10$ VDC @ 10 mA
<b>Max. Solenoid Output Current</b>	1.8A
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	0-5 seconds adjustable
<b>Shielded Cable Connection</b>	Supply connections + valve: 1.5 sq. mm (16 AWG) Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	24 medium lag, DIN 41571



**Block Diagram**



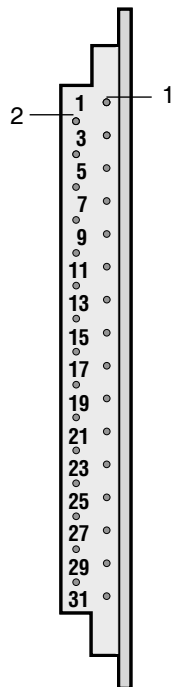
**Operating and Diagnostic Elements (Elevation A)**



**Notes:**

- Turn off the electrical power to this board whenever the hydraulic supply to the valve is not on.
- Always turn off the power to this board before removing it from the card holder.

**Connector (Elevation B)**



- 11 Reference potential 0V supply
- 13 Input ramp disable
- 14 Input command voltage 0...+/-10 VDC
- 16 Output +10V reference
- 17 Output -0V reference
- 18 Input 24 VDC supply
- 22 Input external ramp option
- 24 Output control solenoid B
- 25 Output control solenoid A
- 26 Output control solenoid A+B with possibility for external switch connection
- 27 Input external ramp option
- 31 Reference potential 0V set value

## General Description

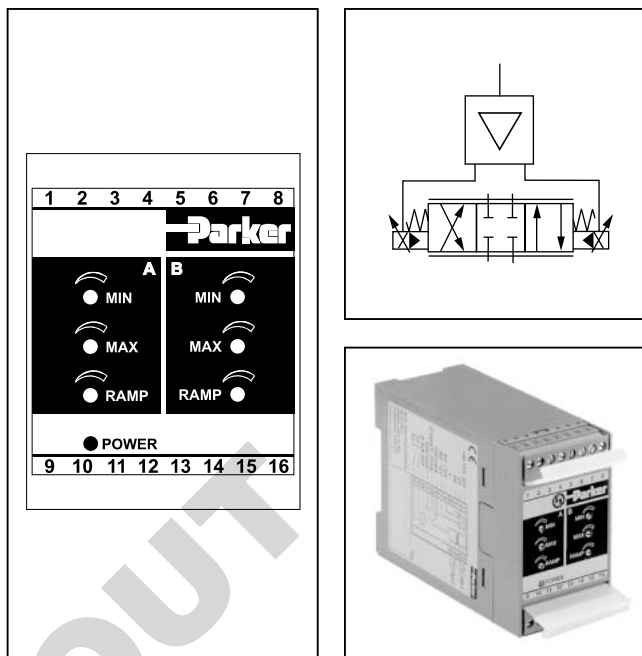
Series PW\*\*404 electronic module is used to control non-feedback D\*FW and D\*1FW proportional directional valves. The module accepts a  $\pm 10$  volt or a  $\pm 20$  mA command signal, and produces a proportionally linear output current used to drive the valve's proportional solenoid. There is also a soft shift mode where on-off signals can trigger the module to command the attached valve to smoothly shift to a predetermined command position.

## Features

- Driver for all D\*FW and D\*1FW proportional valves.
- Standard DIN rail package – EN 5022 rail mount.
- Differential command input (voltage or current).
- Adjustable Ramp generator.
- MIN adjustments for spool deadband compensation.
- MAX adjustments for maximum flow adjustment.
- Soft shift mode — user selectable.
- Detachable terminal strips.

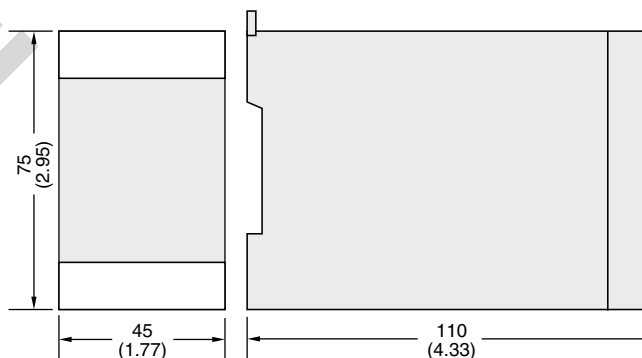
## Specifications

<b>Package</b>	DIN rail mount – EN 5022
<b>Power Supply</b>	30 VDC maximum, refer to “Valve Applications – Solenoid” for minimum voltage, 5% ripple max.
<b>Current Consumption</b>	3.5 amps max., 200 mA more than max. operating current. Refer to “Valve Applications — Solenoid” for rated solenoid current.
<b>Command Signal</b>	$0 \pm 10$ VDC or $0 \pm 20$ mA user selectable
<b>Command Polarity</b>	Pin '5' more positive than pin '6' energizes 'sol B' (pins 11, 12)
<b>Reference V. Outputs</b>	10 VDC and -10 VDC; $\pm 5\%$ , 10 mA max.
<b>Soft Shift Inputs</b> logic 'off' logic 'on'	0 to 5 VDC 11.5 to 30 VDC, 15 mA (max. load)
<b>Soft Shift Polarity</b>	Pin '15' triggers 'solenoid B' Pin '16' triggers 'solenoid A'



## Dimensions

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



<b>Max. Output Current</b>	See Ordering Information
<b>Dither Frequency @ Amplitude</b>	100 Hz @ 6% of rated current
<b>Ramp Time</b>	Adjustable; 0 to 3 seconds
<b>Ambient Temperature</b>	-20°C to 60°C (-20°F to 140°F)
<b>Electrical Connection</b>	Screw-in terminals, removable
<b>Shielded Cable</b>	Supply connections and solenoids 1.5 sq. mm (16 AWG) Command Signals: 0.5 sq. mm (20 AWG)
<b>Cable Length</b>	50 M (162 feet) max.
<b>Cable Capacitance</b>	130 pf/M between conductors, max.
<b>EMC Compatibility</b>	EN 50081-2, EN 50082-2, EN 55011, ENV 50140, EN61000-4-4, EN50204, EN61000-4-5, EN61000-4-2, EN61000-4-6



**Ordering Information**

**PW**  
 Packaged Module  
 DC Valves

**[ ]**  
 Maximum  
 Current

**A**

**404**  
 Module Type

**[ ]**  
 Design  
 Series

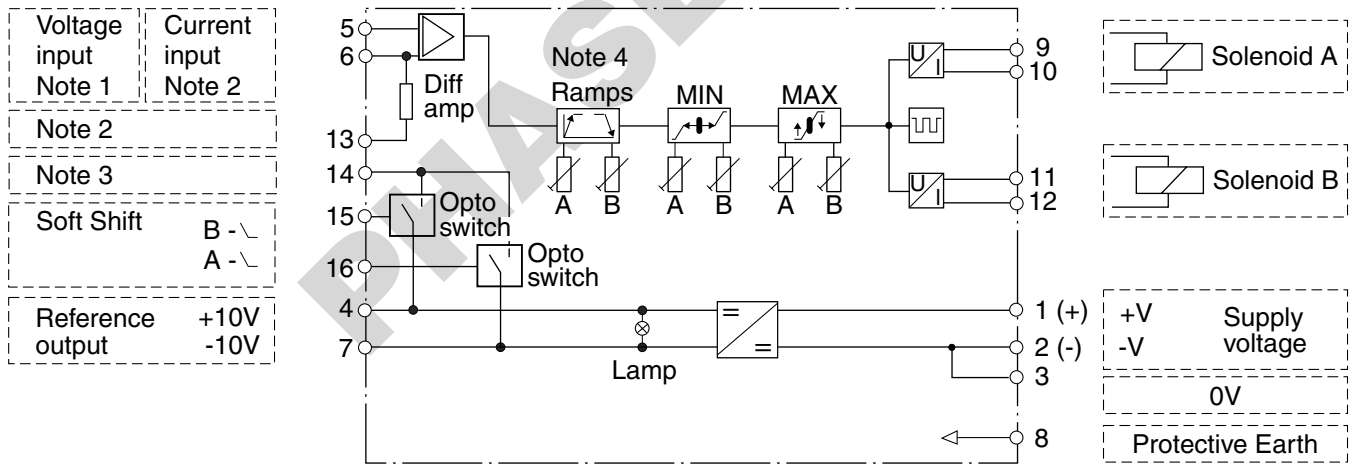
NOTE:  
 Not required  
 when ordering.

Code	Description
18	1.8A
25	2.5A
35	3.5A

Code	Description
404	Amplifier, adjustable, MIN/MAX-limiting, UP/DOWN ramps

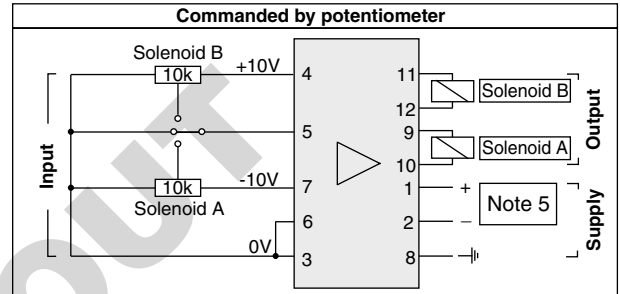
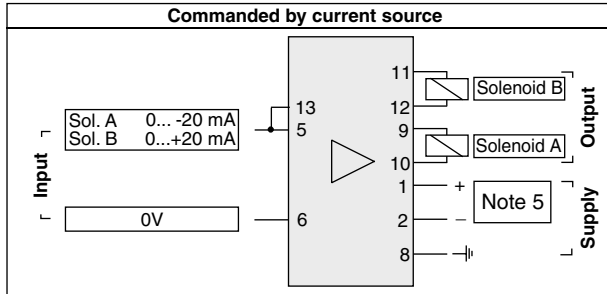
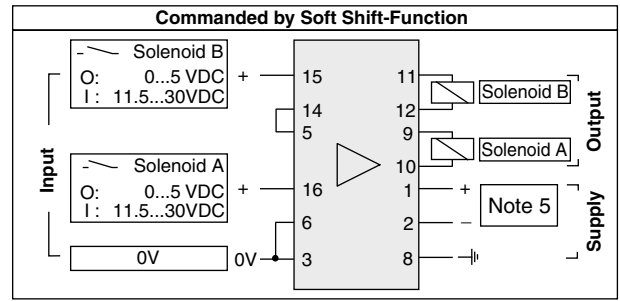
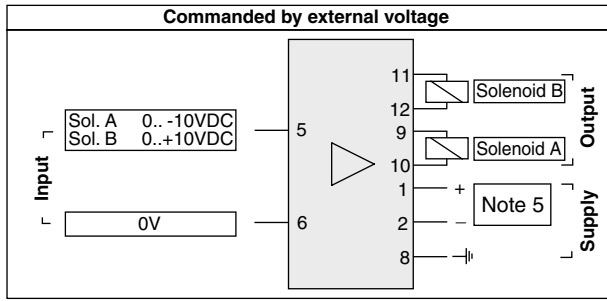
**For new applications:  
 PW\*\*404: Refer to PWD00A-400**

**Block Diagram**



- Note 1: For voltage command inputs ( $\pm 10V$ ), use pins 5 and 6. Refer to command polarity specifications.
- Note 2: For current command inputs ( $\pm 20$  mA), connect pins 5 and 13, and apply current command signal to pins 5 and 6. Refer to command polarity specifications.
- Note 3: For soft-shift mode, connect pins 5 and 14. "On" signal to pin 15 triggers "solenoid B"; "On" signal to pin 16 triggers "solenoid A". Adjust actuator speed with 'MAX' potentiometers, ramp times for soft shift with 'RAMP' potentiometers. Adjust 'MIN' potentiometers as required. Refer to specifications for required voltage levels.
- Note 4: There are two ramp potentiometers. Ramp A adjusts both the accel and decel rate for "solenoid A". Ramp B adjusts both the accel and decel rate for "solenoid B".

**Wiring Diagram**



Note 5: Refer to Power Supply specification.

**Valve Applications — Solenoid**

Series PW\*404 electronic module is used to control non-feedback one and two stage proportional valves. Refer to the chart below to determine the correct module current rating required for your valve application.

Valve Type	Code	Solenoid	Rated Current (amps)	PW Module (order code)	Supply Voltage Range (volts DC)
		Rated Voltage (volts)			
D1FW	K	12	1.8	PW18A-404	17.5 to 30
	M	9	2.5	PW25A-404	14.5 to 30
D3FW	K	12	2.5	PW25A-404	17.5 to 30
D*1FW	L	6	2.5	PW25A-404	11.5 to 30
	X	16	1.3	PW18A-404	21.5 to 30



### General Description

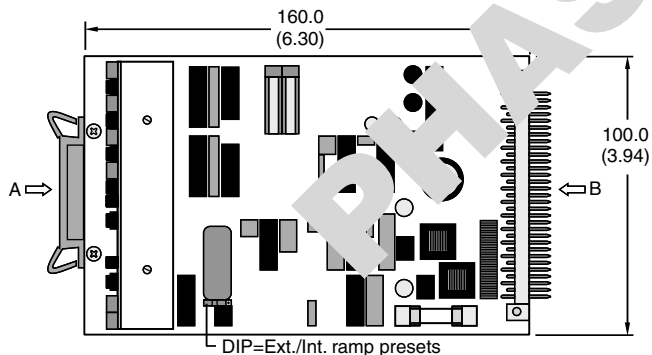
Series EW101 electronic module is used to control pilot operated D\*\*FS proportional directional valves with main stage spool position feedback. The module accepts up to 4 on/off input signals which select one of four speeds set by potentiometer adjustments on the card. Two ramp adjustments provide control of actuator acceleration and deceleration.

### Features

- Modulated valve-spool control by 4 selectable set values, adjustable from 0 to 100% and UP/DOWN ramp potentiometers.
- DIP-switch from internal ramp generation to external ramp setting.
- Pulsed low-loss amplifier power stage with supporting constant current control for consistent temperature-independent solenoid forces.
- Dither generator with applied frequency to improve static characteristics.
- Diagnosis of spool stroke by means of diagnostic sockets as well as LEDs for indicating working conditions.

### Dimensions

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



**For new applications:**  
**EW101: Refer to PWDXXA-400**

### Ordering Information

**EW**  
 Electronic Module  
 Directional Valve

Valve Size

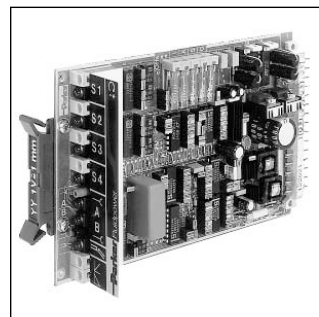
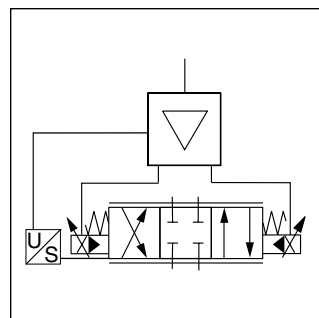
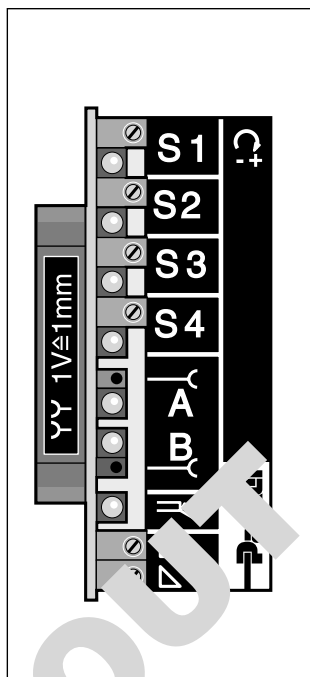
**101**  
 Module Type

Design Series

Code	Valve Size	Mounting Pattern	Valve Spool Stroke
10	D31FS	NG10	±5.0 mm (0.20 in.)
16	D41FS	NG16	±6.0 mm (0.24 in.)
25	D81FS	NG25	±9.3 mm (0.37 in.)
26	D91FS	NG25	±9.3 mm (0.37 in.)
32	D111FS	NG32	±15.0 mm (0.59 in.)

Code	Description
101	Amplifier, 4 Command Channels, UP/DOWN ramps

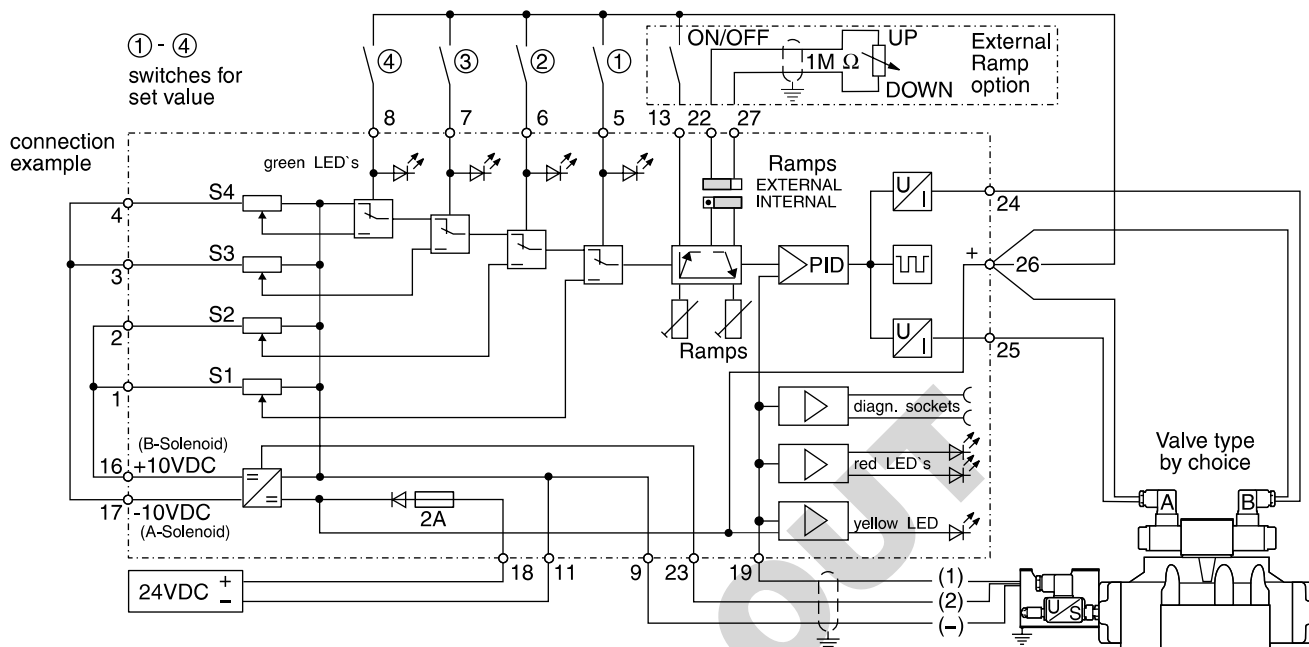
NOTE:  
 Not required when ordering.



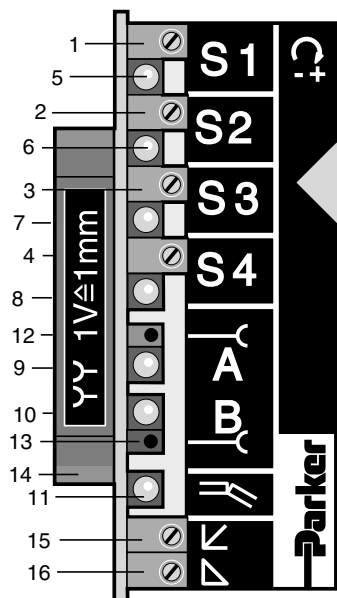
### Specifications

<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Command Signal</b>	0 to +10 VDC and 0 to -10 VDC
<b>Input Select Voltage</b>	5 to 30 VDC
<b>Power Required</b>	40 VA
<b>Reference Outputs</b>	±10 VDC @10 mA
<b>Max. Solenoid Output Current</b>	1.3A
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	0-5 seconds adjustable
<b>Shielded Cable Connection</b>	Supply connections + valve: 1.5 sq. mm (16 AWG) Transducer + Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	24 medium lag, DIN 41571/5x20 mm

**Block Diagram**



**Operating and Diagnostic Elements (Elevation A)**

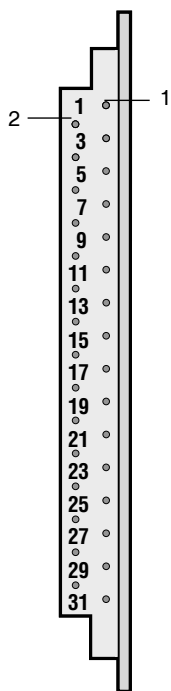


- 1-4 Set value potentiometer S1-S4
- 5-8 Green LED's for:  
- channel activity of the set value
- 9-10 Red LED's for:  
- Stroke direction indication
- 11 Yellow LED for:  
- correct voltage supply  
- correct transducer connection
- 12 Red socket for spool diagnostic
- 13 Black socket for spool diagnostic (0V potential)
- 14 Blue grip strip with reference information for measured values on the measuring sockets 15 UP ramp potentiometer
- 16 DOWN ramp potentiometer

**Notes:**

- Turn off the electrical power to this board whenever the hydraulic supply to the valve is not on.
- Always turn off the power to this board before removing it from the card holder.

**Connector (Elevation B)**



- 1 Input preselect direction, channel 1
- 2 Input preselect direction, channel 2
- 3 Input preselect direction, channel 3
- 4 Input preselect direction, channel 4
- 5 Input set value lock on, channel 1
- 6 Input set value lock on, channel 2
- 7 Input set value lock on, channel 3
- 8 Input set value lock on, channel 4
- 9 Reference potential 0V transducer
- 11 Reference potential 0V supply
- 13 Input ramp disable
- 16 Output +10V reference
- 17 Output -10V reference
- 18 Input 24 VDC supply
- 19 Input transducer signal
- 22 Input external ramp option
- 23 Output, transducer supply
- 24 Output control solenoid B
- 25 Output control solenoid A
- 26 Output common solenoid A+B with possibility for external switch connection
- 27 Input external amp option



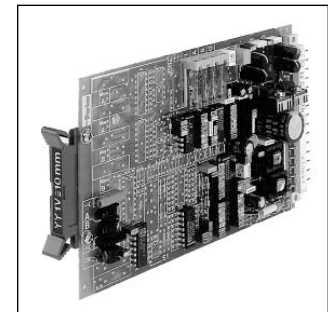
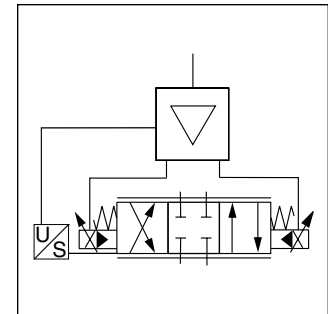
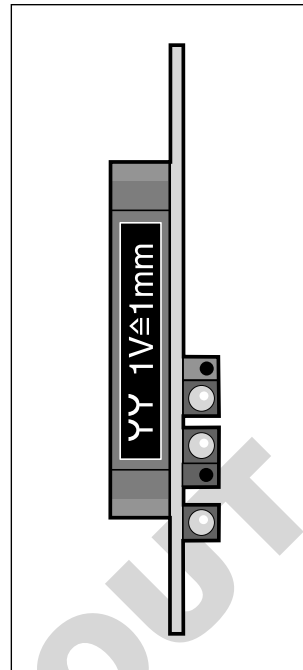


### General Description

Series EW102 electronic module is used to control pilot operated D\*\*FS proportional directional valves with main stage spool position feedback. The module accepts a  $\pm 10$  volt command signal where spool position is controlled by a closed loop PID circuit on the module.

### Features

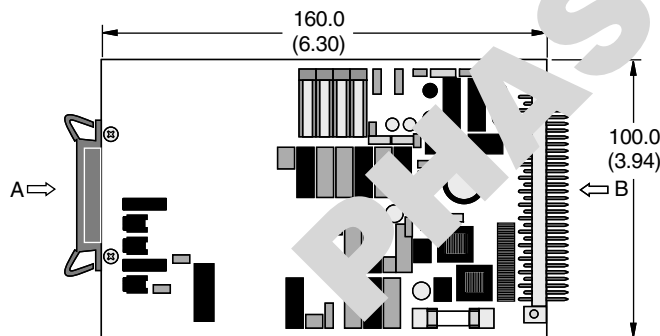
- Conversion of externally supplied (+/-) set value signals into appropriate valve spool strokes.
- Can be combined with EZ150 or external control program for signal processing.
- Pulsed low-loss amplifier power stage with supporting constant current control for consistent temperature-independent solenoid forces.
- Dither generator with applied frequency to improve static characteristics.
- Diagnosis of spool stroke by means of diagnostic sockets as well as LEDs for indicating working conditions.



**D**

### Dimensions

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

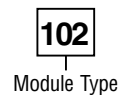
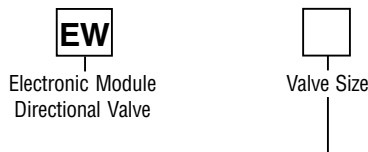


**For new applications:  
 EW102: Refer to PWDXXA-400**

### Specifications

<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Command Signal</b>	0 to $\pm 10$ VDC
<b>Power Required</b>	40 VA
<b>Reference Outputs</b>	$\pm 10$ VDC @ 10 mA
<b>Max. Solenoid Output Current</b>	1.3A
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	Not available
<b>Shielded Cable Connection</b>	Supply connections + valve: 1.5 sq. mm (16 AWG) Transducer + Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	24 medium lag, DIN 41571/5x20mm

### Ordering Information

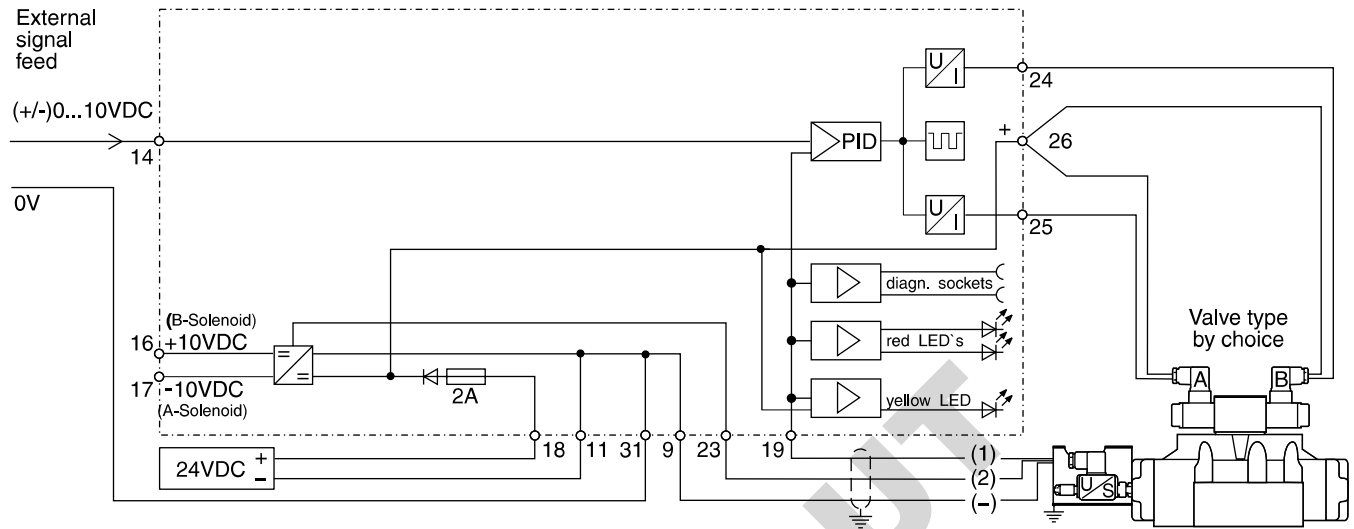


Code	Valve Size	Mounting Pattern	Valve Spool Stroke
10	D31FS	NG10	$\pm 5.0$ mm (0.20 in.)
16	D41FS	NG16	$\pm 6.0$ mm (0.24 in.)
25	D81FS	NG25	$\pm 9.3$ mm (0.37 in.)
26	D91FS	NG25	$\pm 9.3$ mm (0.37 in.)
32	D111FS	NG32	$\pm 15.0$ mm (0.59 in.)

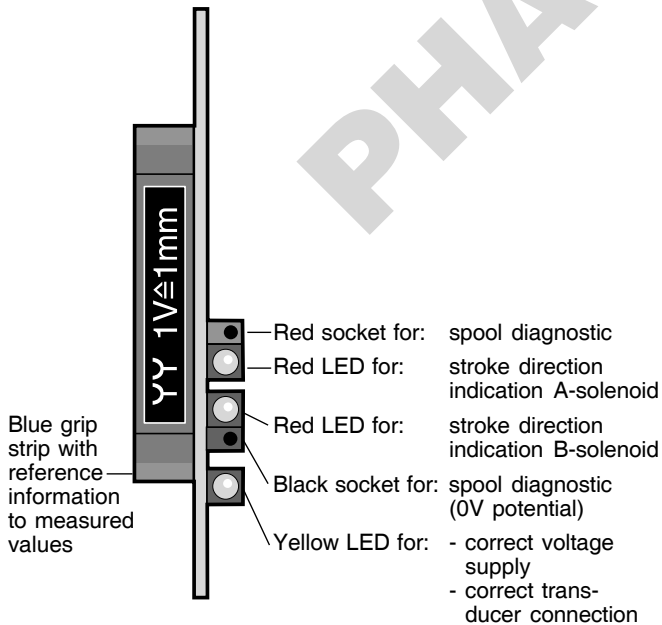
Code	Description
102	Amplifier — Basic

NOTE:  
 Not required when ordering.

**Block Diagram**



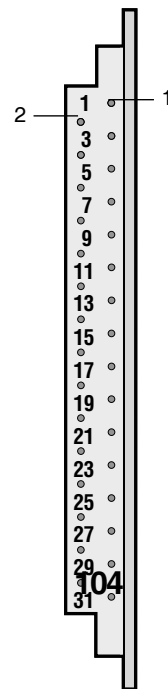
**Operating and Diagnostic Elements (Elevation A)**



**Notes:**

- Turn off the electrical power to this board whenever the hydraulic supply to the valve is not on.
- Always turn off the power to this board before removing it from the card holder.

**Connector (Elevation B)**



- 9 Reference potential 0V Transducer
- 11 Reference potential 0V supply
- 14 Input command voltage 0...±10 VDC
- 16 Output +10V reference
- 17 Output -10V reference
- 18 Input 24 VDC supply
- 19 Input transducer signal
- 11 Output transducer supply
- 24 Output control solenoid B
- 25 Output control solenoid A
- 26 Output common solenoid A+B
- 31 Reference potential 0V set value



### General Description

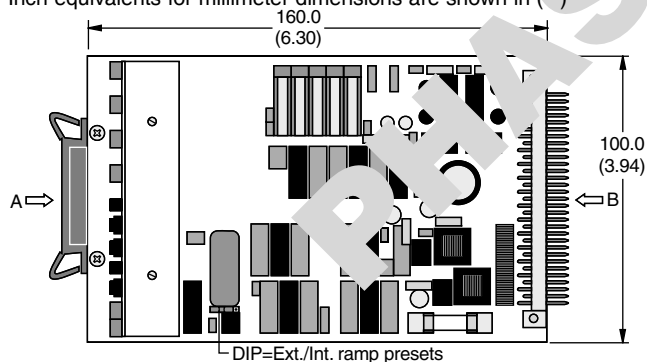
Series EW104 electronic module is used to control pilot operated D\*\*FS proportional directional valves with main stage spool position feedback. The module accepts a ±10 volt command signal where spool position is controlled by a closed loop PID circuit on the module.

### Features

- Spool overlap range can be manipulated with MIN potentiometer, adjustable by feeding a constant set value of 0.2V.
- MAX limiting of spool stroke with full set value range. Can be set up after MIN has been set and feeding a constant set value of 10V.
- DIP-switch from internal ramp generation to external ramp supply.
- Pulsed low-loss amplifier power stage with supporting constant current control for consistent temperature-independent solenoid forces.
- Dither generator with applied frequency to improve static characteristics.
- Diagnosis of spool stroke by means of measuring sockets as well as LEDs for indicating working conditions.

### Dimensions

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



**For new applications:**  
**EW104: Refer to PWDXXA-400**

### Ordering Information

**EW**  
 Electronic Module  
 Directional Valve

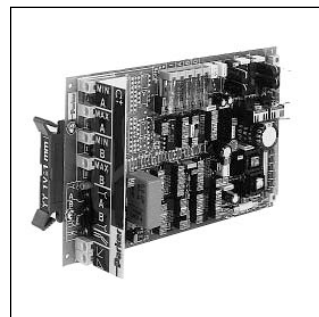
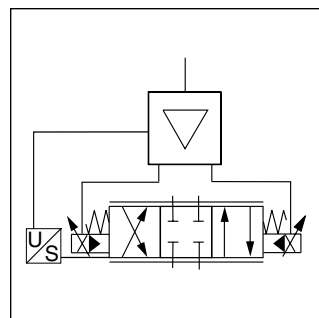
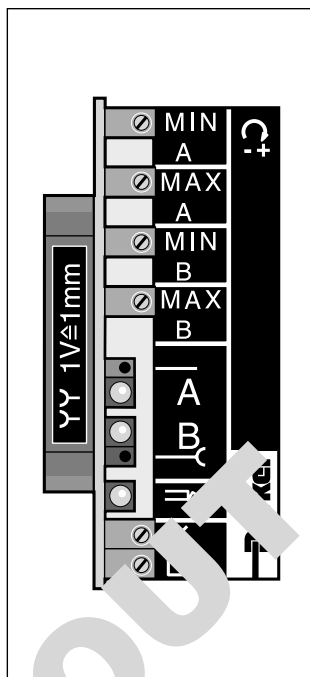
**Valve Size**

**104**  
 Module Type

**Design Series**  
 NOTE:  
 Not required when ordering.

Code	Valve Size	Mounting Pattern	Valve Spool Stroke
10	D31FS	NG10	±5.0 mm (0.20 in.)
16	D41FS	NG16	±6.0 mm (0.24 in.)
25	D81FS	NG25	±9.3 mm (0.37 in.)
26	D91FS	NG25	±9.3 mm (0.37 in.)
32	D111FS	NG32	±15.0 mm (0.59 in.)

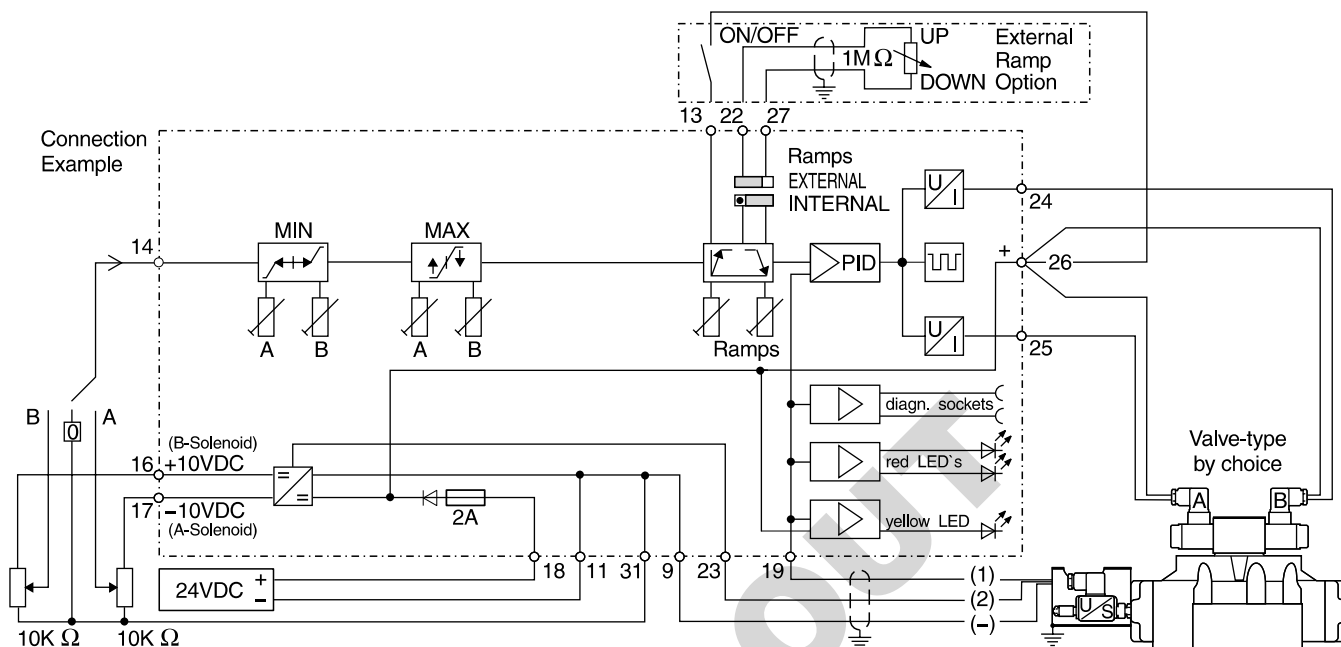
Code	Description
104	Amplifier, adjustable, MIN/MAX-limiting Up/Down ramps



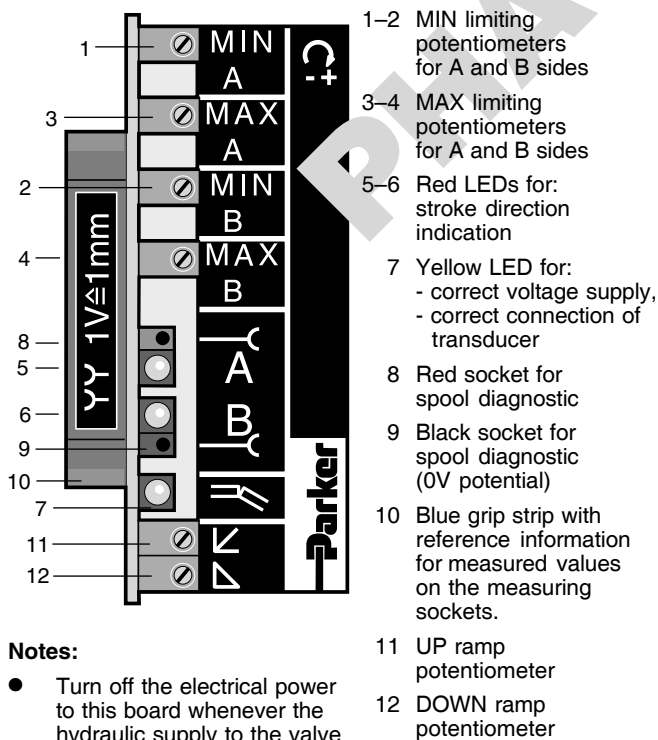
### Specifications

<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Command Signal</b>	0 to +10 VDC and 0 to -10 VDC
<b>Input Select Voltage</b>	5 to 30 VDC
<b>Power Required</b>	40 VA
<b>Reference Outputs</b>	±10 VDC @ 10 mA
<b>Max. Solenoid Output Current</b>	1.3A
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	0 to 5 seconds adjustable
<b>Shielded Cable Connection</b>	Supply connections + valve: 1.5 sq. mm (16 AWG) Transducer + Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	2A medium lag, DIN 41571/5x20 mm

**Block Diagram**



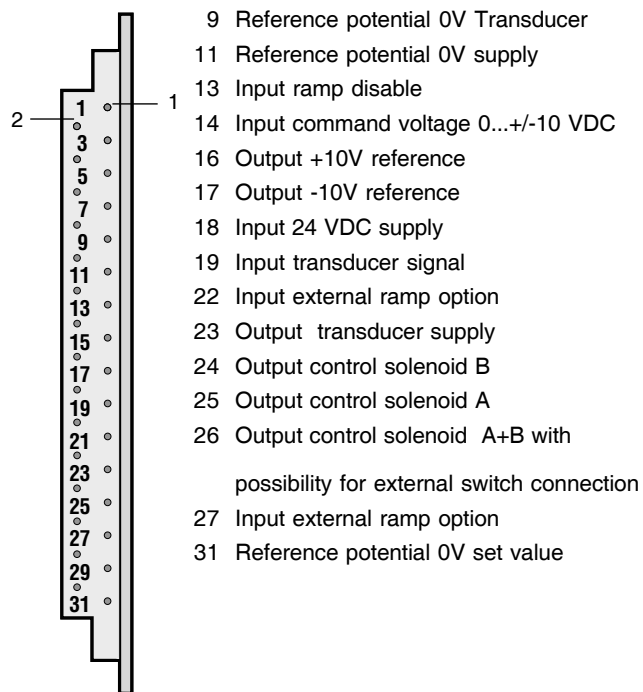
**Operating and Diagnostic Elements (Elevation A)**



**Notes:**

- Turn off the electrical power to this board whenever the hydraulic supply to the valve is not on.
- Always turn off the power to this board before removing it from the card holder.

**Connector (Elevation B)**



EW104.p65, dd



## General Description

Series PCD00A-400 electronic module for driving proportional pressure control and proportional throttle valves is compact and easy to install with DIN rail mounting and plug-in terminals. The module is designed to drive two coils independent of each other. The digital design allows for programmable parameters such as solenoid drive current, mins, maxs, ramps and setpoints. The module provides flexibility and repeatability from unit to unit. The module parameters are programmed with an RS-232 interface and user friendly software (ProPxD) with default values for standard valves.

The PCD00A-400 module contains the functions required by typical pressure control and throttle valve applications (series RE\*W, PE\*W, DSAE, VBY, VMY, TDA, and TEA valves).

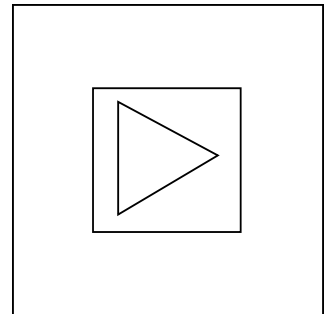
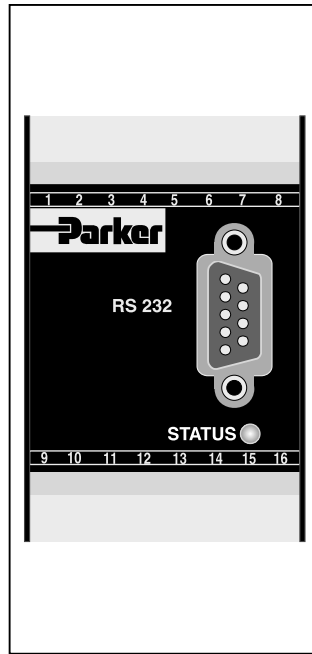
## Features

- Two independent valve drivers.
- Ramps, Setpoints, Mins, Maxs.
- 5 output current selections.
- Programmable parameters.
- RS-232 Interface.

## Specifications

General			
<b>Model</b>	Module package for snap-on mounting on EN 50022 rail	<b>Mounting Position</b>	Any
<b>Package Material</b>	Polycarbonate	<b>Ambient Temperature Range</b>	-20°C to +60°C (-4°F to +140°F)
<b>Inflammability Class</b>	V2 to V0 acc. UL 94	<b>Protection Class</b>	IP 20 acc. DIN 40050
Electrical			
<b>Duty Ratio</b>	100%	<b>Status Signal</b>	Off – 0 to 0.5 VDC; On – Us; rated max. 15 mA
<b>Supply Voltage</b>	18 VDC to 30 VDC, ripple < 5% eff., surge free* (29 VDC to 30 VDC for 24 V coils)	<b>Adjustment Ranges</b>	<b>preset</b>
<b>Switch-on Current Typ.</b>	22A for 0.2 mS	Minimum	0 to 50%      0 to 1000
<b>Current Consumption Max.</b>	5.0A	Maximum	50 to 100%      0 to 1000
<b>Pre-fusing</b>	6.3A medium lag	Ramp Time	0 to 32.5 s      0 to 32.5
<b>Command Signal</b>	0 to +10 VDC, ripple < 0.01 % eff., surge free, Ri = 150K ohm	Current	0.8/3.5/2.7/1.8/1.3 A      0/1/2/3/4/5
<b>Input Signal Resolution</b>	0.025%	<b>Interface</b>	RS 232C, DSub 9p. male for null modem cable
<b>Differential Input Voltage Max.</b>	30V for terminals 5 and 6 against PE (terminal 8)	<b>EMC</b>	EN 50081-2, EN 50082-2
<b>Enable Signal</b>	Off – 0 to 5.0 VDC; On – 8.5 to 30 VDC; Ri = 30K ohm	<b>Connection</b>	Screw terminals 0.2 to 2.5 mm <sup>2</sup> , plug-in
<b>Channel Recall Signal</b>	Off – 0 to 5.0 VDC; On – 8.5 to 30 VDC; Ri = 30K ohm	<b>Cable Specification</b>	16 AWG overall braid shield for supply voltage and solenoids 20 AWG overall braid shield for sensor and signal
		<b>Cable Length</b>	50m (164 ft.)

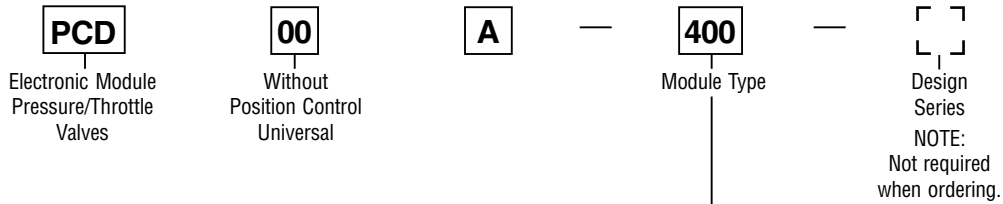
PCD00A-400.p65, dd



- User friendly programming software.
- Plug-in terminals.
- Compliant with European EMC Standards.

**D**

**Ordering Information**

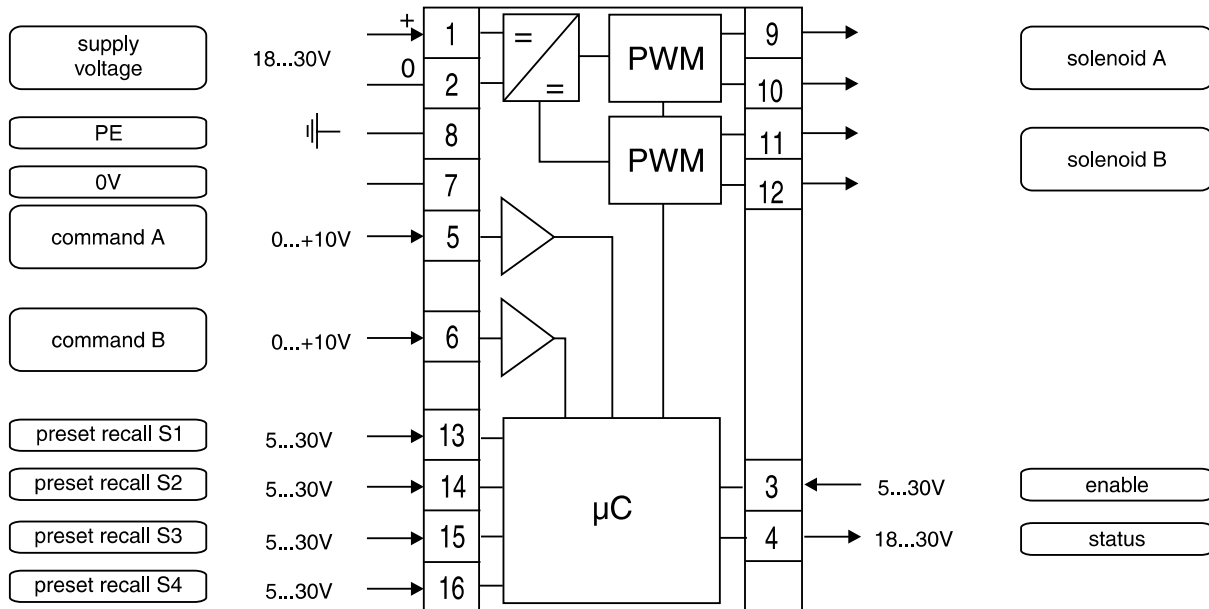


**Weight:** 160 g (0.35 lbs.)

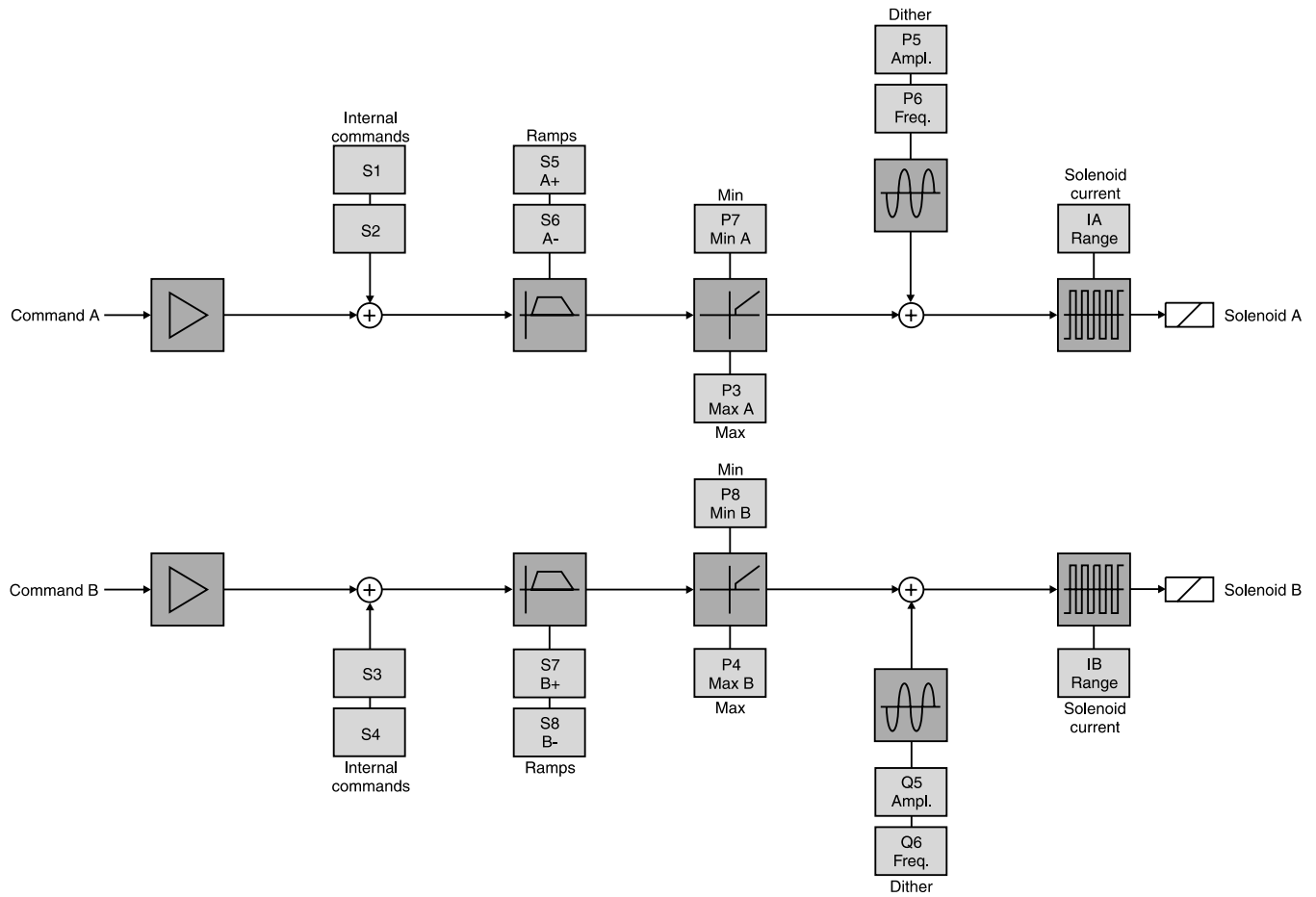
Code	Description
400	2 Amplifiers, MIN/MAX-adjustment, UP/DOWN ramps, Command inputs, 4 Command signal presets



**Block Diagram**

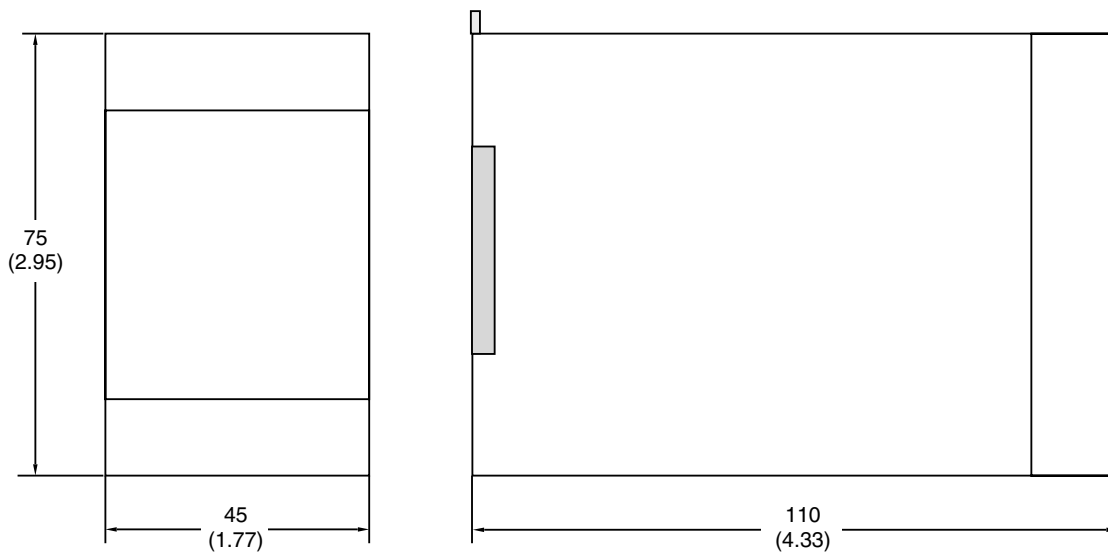


**Signal Flow Diagram**



**Dimensions**

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



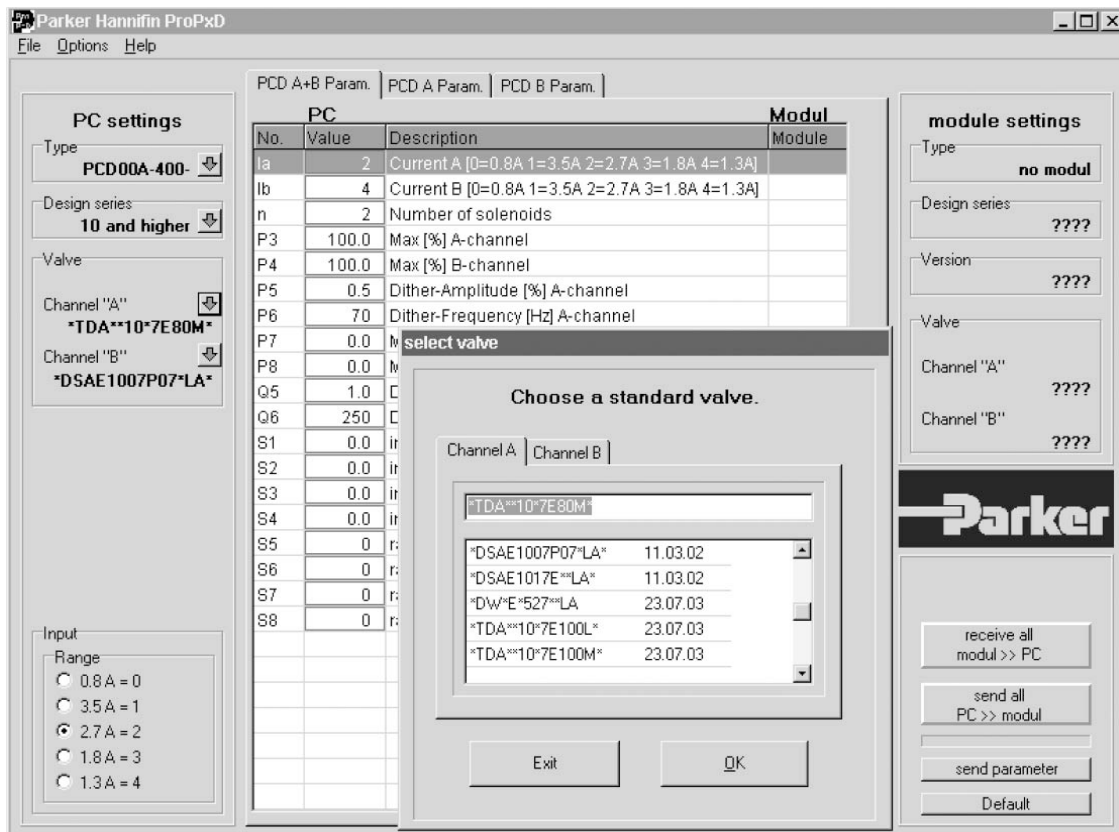
### ProPxD Interface Program

The new ProPxD software permits user-friendly parameter setting for the electronic module series PCD, PWD and PZD.

Via the clearly arranged entry screen the parameters can be identified and modified. Storage of complete parameter sets to floppy or hard disk 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 the electronic module in the same manner as the default parameters which are available for all standard valve series. Inside the electronic a nonvolatile memory stores the data with the option for recalling or modification.

### Features

- User-friendly editing of all parameters.
- Default values for standard valves.
- Identification and documentation of parameter sets.
- Executable with all actual Windows® operating systems from Windows® 95 upwards.
- Simple communication between PC and electronic via serial interface RS-323 and nullmodem cable.



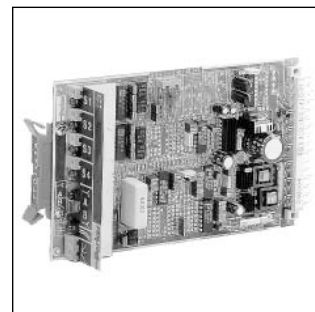
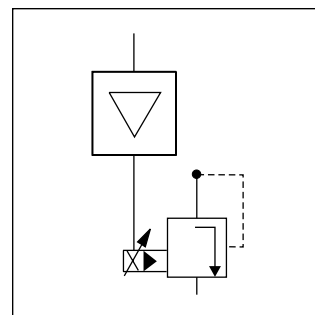
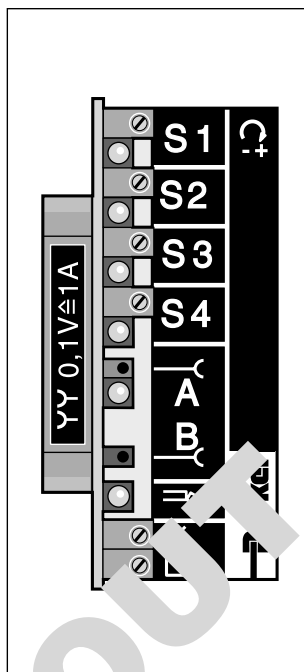


### General Description

Series ED101 electronic module is used to control DSA/DWE/DWU pressure control valves. The module accepts up to 4 on/off input signals which select one of four pressures set by potentiometer adjustments on the card. Two ramp adjustments provide smooth transition between selected pressures.

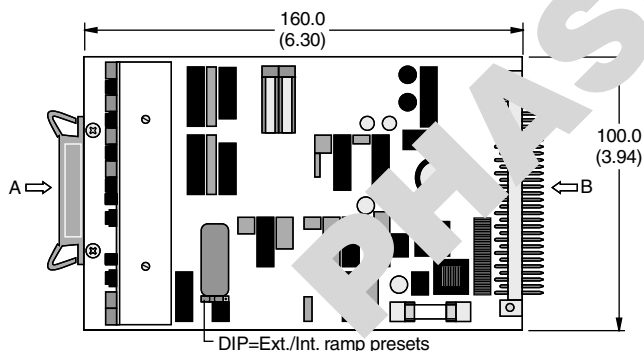
### Features

- Modulated output signals to the solenoid through 4 selectable set-values, and ramp potentiometer adjustable from 0 to 100%.
- DIP switch from internal ramp generation to external ramp setting.
- Pulsed low-loss amplifier power stage with supporting constant current control for constant temperature-independent solenoid forces.
- Dither generator with applied frequency to improve static characteristics.
- Diagnosis of spool stroke by means of diagnostic sockets as well as LEDs for indicating working conditions.



### Dimensions

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

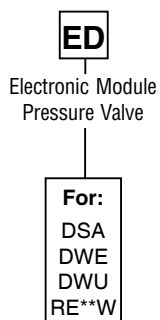


**For new applications:**  
**ED101: Refer to PCD00A-400**

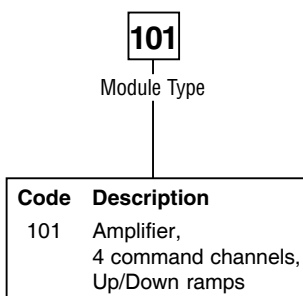
### Specifications

<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Power Required</b>	40 VA
<b>Command Signal</b>	0 to +10 VDC
<b>Input Select Voltage</b>	5 to 30 VDC
<b>Reference Outputs</b>	+10 VDC @10 mA
<b>Max. Solenoid Output Current</b>	1.3A with set value 10V
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	0 to 5 seconds adjustable
<b>Shielded Cable Connection</b>	Supply connections + valve: 1.5 sq. mm (16 AWG) Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	2A medium lag, DIN 41571/5x20 mm

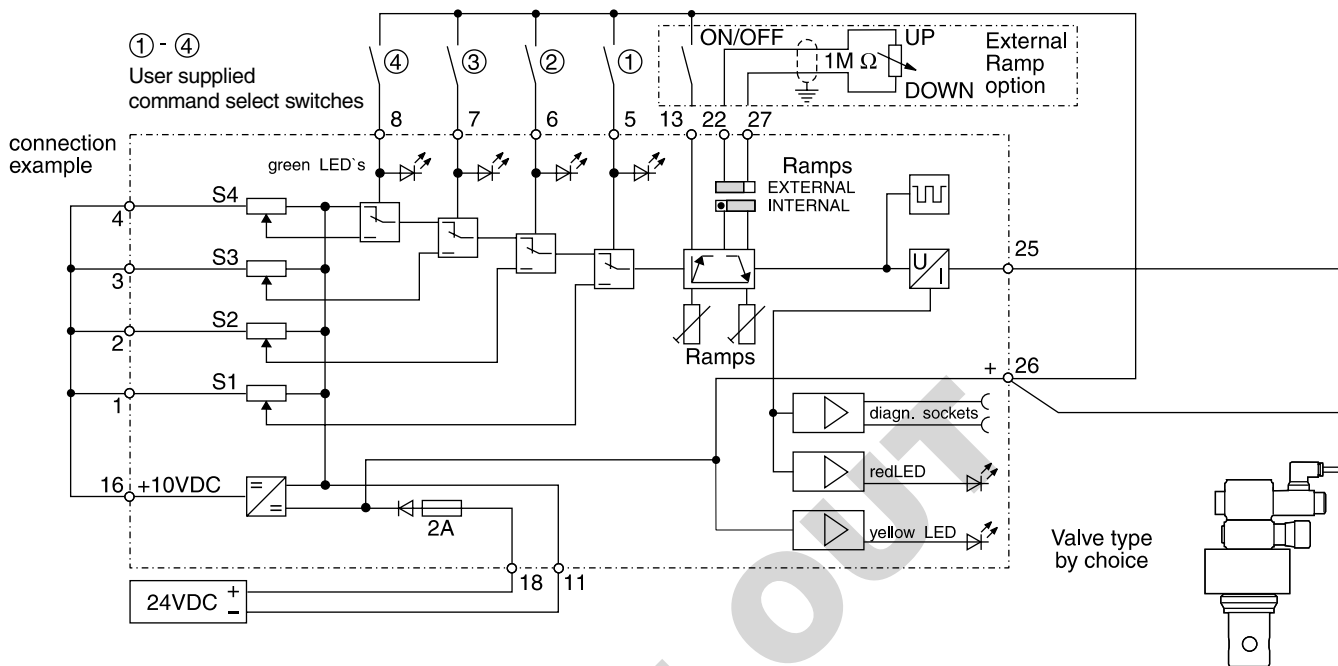
### Ordering Information



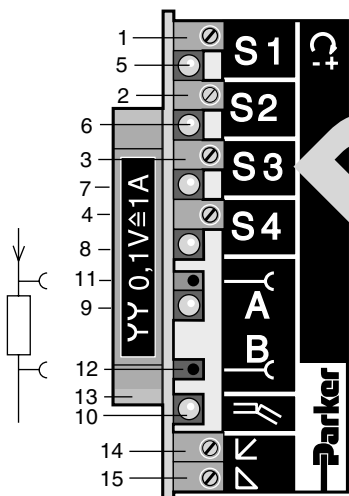
**00**



**Block Diagram**



**Operating and Diagnostic Elements (Elevation A)**



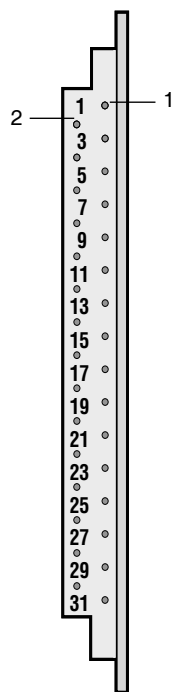
- 1-4 Set value potentiometer S1-S4
- 5-8 Green LEDs for:  
- channel activity of the set values
- 9 Red LED (A) for:  
- function indicator control solenoid (B not used here)
- 10 Yellow LED for:  
- correct voltage supply
- 11 Red socket for current diagnostic
- 12 Black socket for current diagnostic
- 13 Red grip strip with reference information for measured values on the diagnostic sockets
- 14 UP ramp potentiometer
- 15 DOWN ramp potentiometer

**Notes:**

- Turn off the electrical power to this board whenever the hydraulic supply to the valve is not on.
- Always turn off the power to this board before removing it from the card holder.

Only potential-free measuring equipment to be used

**Connector (Elevation B)**



- 1 Input preselection channel 1
- 2 Input preselection channel 2
- 3 Input preselection channel 3
- 4 Input preselection channel 4
- 5 Input set value lock on channel 1
- 6 Input set value lock on channel 2
- 7 Input set value lock on channel 3
- 8 Input set value lock on channel 4
- 11 Reference potential 0V supply
- 13 Input ramp disable
- 16 Output +10V reference
- 18 Input 24 VDC supply
- 22 Input ramp set external
- 25 Output control solenoid
- 26 Output control solenoid
- 27 Input external ramp option



### General Description

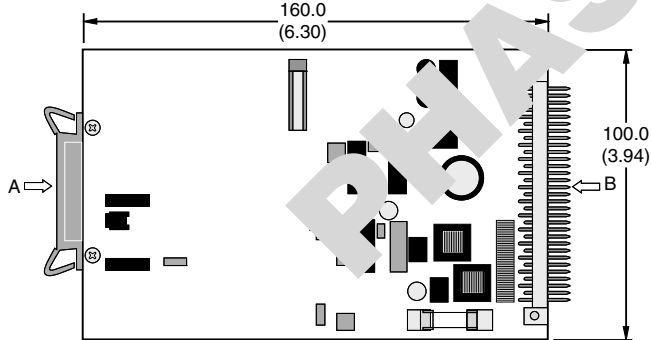
Series ED102 electronic module is used to control DSA/DWE/DWU pressure control valves. The module accepts a 0 to 10 volt command signal and produces a proportionally linear output current used to drive the valve's proportional solenoid. Note that the linearity of the valve itself determines the linearity of the system. Refer to the specific valve data for actual linearity performance.

### Features

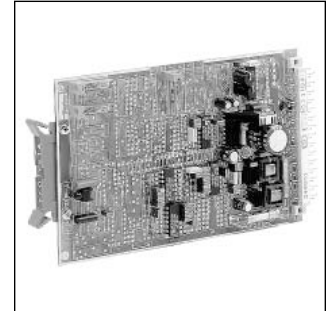
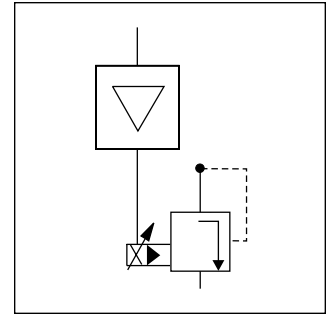
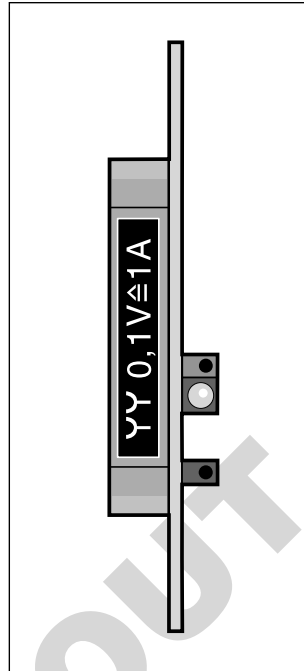
- Processing and amplification of the externally supplied positive set-values into output signals for the control solenoid.
- Can be combined with EZ150 or external programmable control.
- Pulsed amplifier power stage with constant current control.
- Dither generator with applied frequency to improve static characteristics.
- Diagnosis by means of diagnostic sockets as well as LEDs for indicating working conditions.

### Dimensions

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



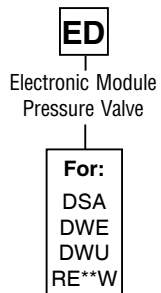
**For new applications:  
 ED102: Refer to PCD00A-400**



### Specifications

<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Power Required</b>	40 VA
<b>Command Signal</b>	0 to +10 VDC
<b>Reference Outputs</b>	+10 VDC @ 10 mA
<b>Max. Solenoid Output Current</b>	1.3A with set value 10V
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	0 to 5 seconds adjustable
<b>Shielded Cable Connection</b>	Supply connections + valve: 1.5 sq. mm (16 AWG) Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	2A medium lag, DIN 41571/5x20 mm

### Ordering Information



**00**

**102**

Module Type

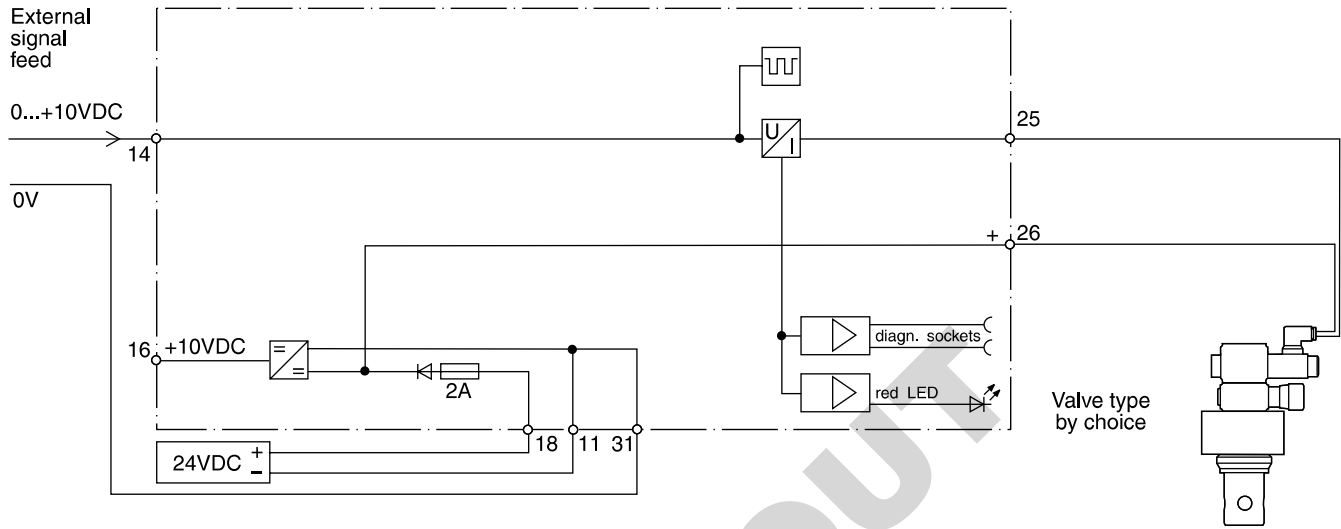
Code	Description
102	Amplifier — Basic



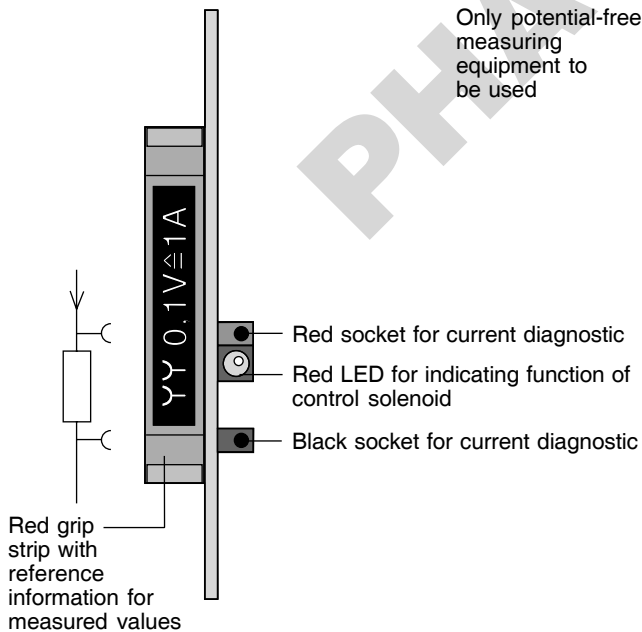
Design Series

NOTE:  
 Not required when ordering.

**Block Diagram**



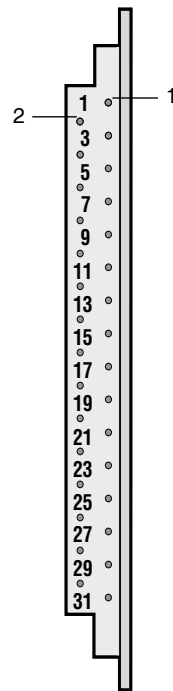
**Operating and Diagnostic Elements (Elevation A)**



**Notes:**

- Turn off the electrical power to this board whenever the hydraulic supply to the valve is not on.
- Always turn off the power to this board before removing it from the card holder.

**Connector (Elevation B)**



- 11 Reference potential 0V supply
- 14 Input command voltage 0...+10 VDC
- 16 Output +10V reference
- 18 Input 24 VDC supply
- 25 Output control solenoid
- 26 Output control solenoid
- 31 Reference potential 0V set value



### General Description

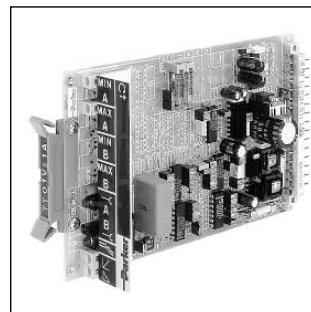
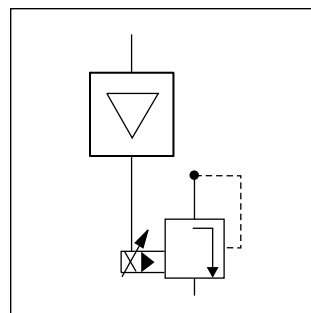
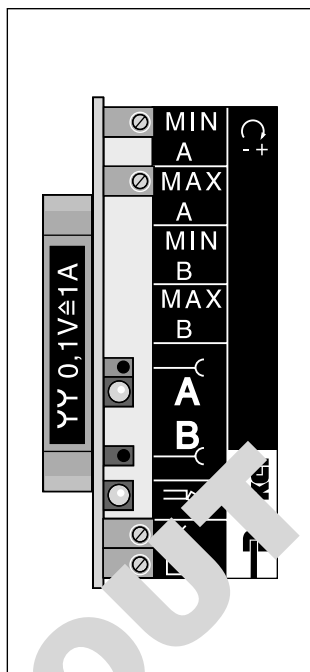
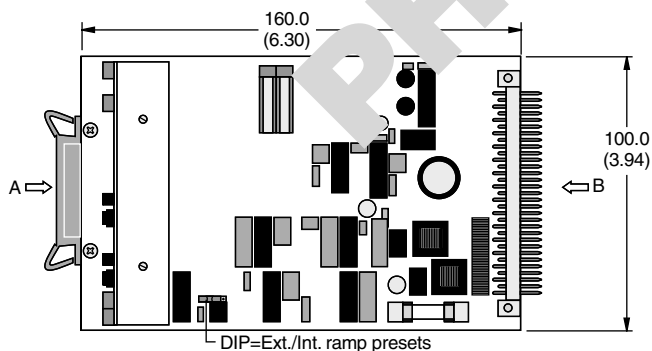
Series ED104 electronic module is used to control DSA/DWE/DWU pressure control valves. The module accepts a 0 to 10 volt command signal, and produces a proportionally linear output current used to drive the valve's proportional solenoid. Two ramp adjustments provide smooth transition between selected pressures. Note that the linearity of the valve itself determines the linearity of the system. Refer to the specific valve data for actual linearity performance.

### Features

- Processing and amplification of the externally supplied positive set-values into output signals for the control solenoid.
- Can be combined with EZ150 or external programmable control.
- DIP switch from internal ramp generation to external ramp setting.
- MIN/MAX limiters for matching the working range to the full set value range.
- Pulsed low-loss amplifier power stage with supporting constant current control for consistent, temperature-independent, solenoid forces.
- Dither generator with applied frequency to improve static characteristics.
- Diagnosis by means of diagnostic sockets as well as LEDs for indicating working conditions.

### Dimensions

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

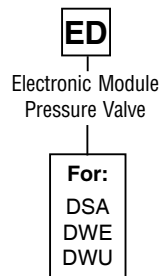


### Specifications

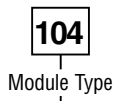
<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Command Signal</b>	0 to +10 VDC and 0 to -10 VDC
<b>Input Select Voltage</b>	5 to 30 VDC
<b>Power Required</b>	40 VA
<b>Reference Outputs</b>	+10 VDC 10 mA
<b>Max. Solenoid Output Current</b>	1.3A with set value 10V
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	0 to 5 seconds adjustable
<b>Shielded Cable Connection</b>	Supply connections + valve: 1.5 sq. mm (16 AWG) Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	2A medium lag, DIN 41571/5x20 mm

**For new applications:  
 ED104: Refer to PCD00A-400**

### Ordering Information



**00**

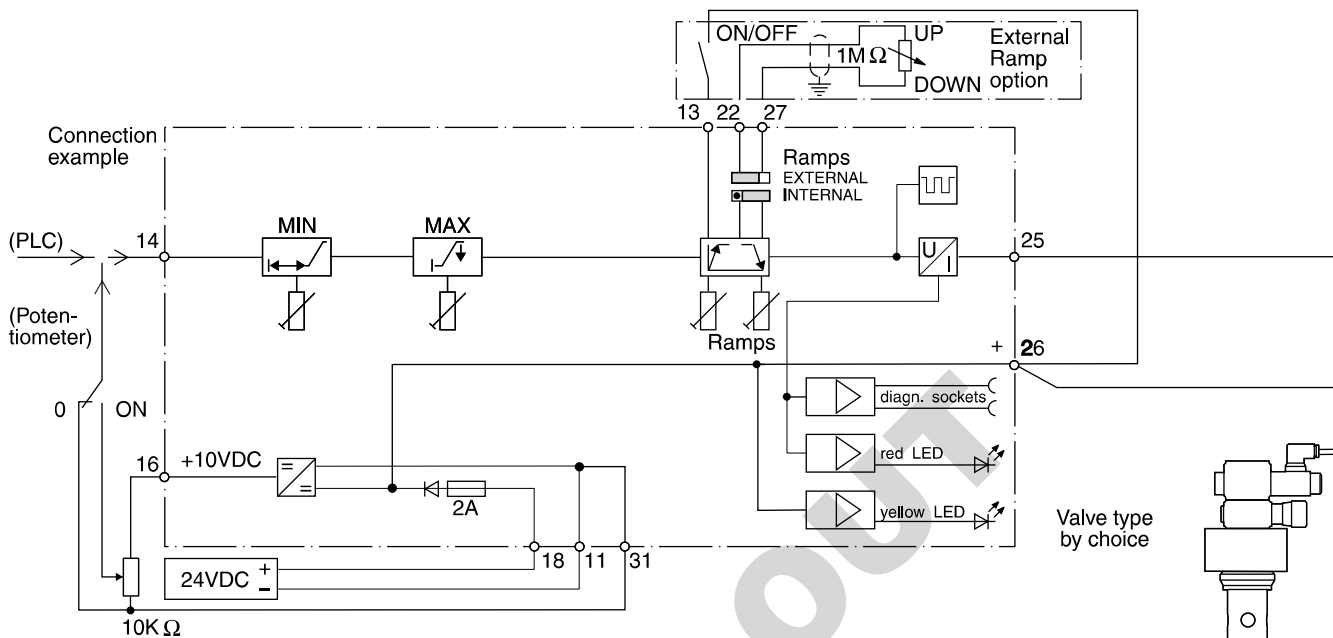


Code	Description
104	Amplifier, adjustable MIN/MAX-limits, Up/Down Ramps

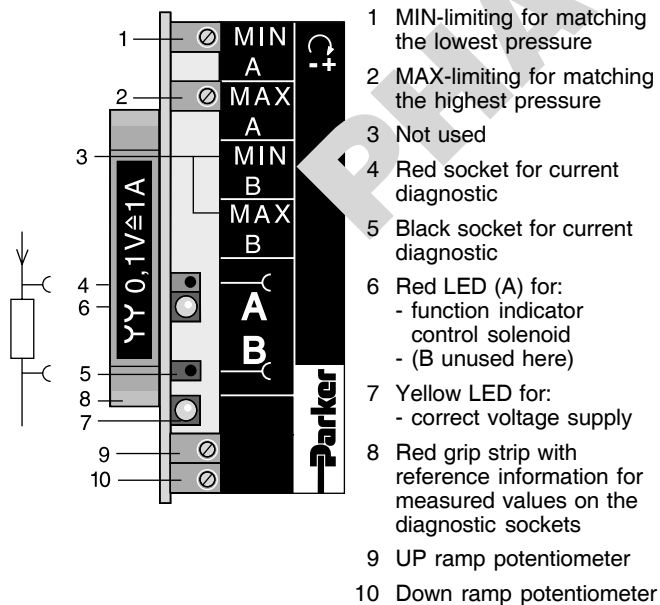
Design Series  
 NOTE:  
 Not required when ordering.

ED104.p65, dd

**Block Diagram**



**Operating and Diagnostic Elements (Elevation A)**

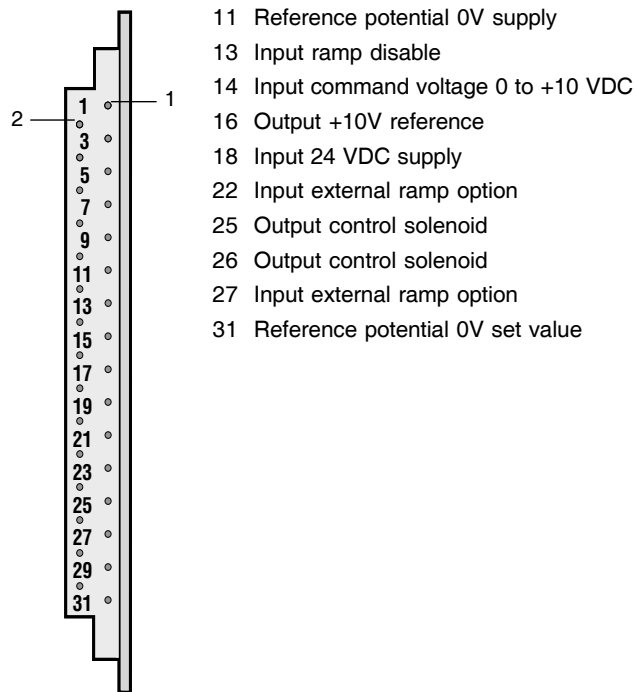


**Notes:**

- Turn off the electrical power to this board whenever the hydraulic supply to the valve is not on.
- Always turn off the power to this board before removing it from the card holder.

Only potential-free measuring equipment to be used

**Connector (Elevation B)**



### General Description

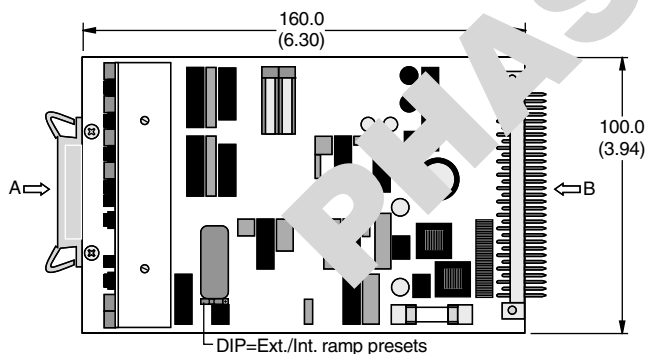
Series ET101 electronic module is used to control non-feedback TDA and TEA proportional throttle valves configured with the 'L' solenoid option. For valves configured with the 'M' solenoid option, refer to ET154. The module accepts up to 4 on/off input signals which select one of four speeds set by potentiometer adjustments on the card. Two ramp adjustments provide control of actuator acceleration and deceleration.

### Features

- Modulated output signals to the control solenoid through four selectable set-values and ramp potentiometers, adjustable from 0 to 100%.
- DIP switch from internal ramp generation to external ramp setting.
- Pulsed low loss amplifier power stage with supporting constant current control for constant, temperature-independent, solenoid forces.
- Dither generator with applied frequency to improve static characteristics.
- Diagnosis by means of diagnostic sockets as well as LEDs for indicating working conditions.

### Dimensions

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



**For new applications:**  
**ET101: Refer to PCD00A-400**

### Ordering Information

**ET**  
 Electronic Module  
 Pressure Valve

**□**  
 Valve Size

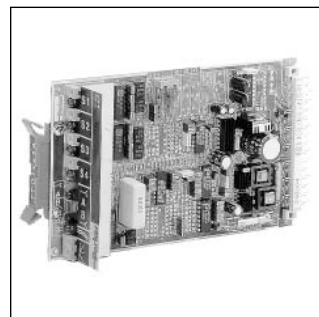
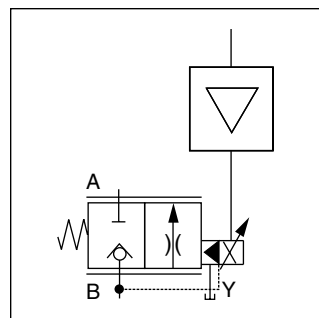
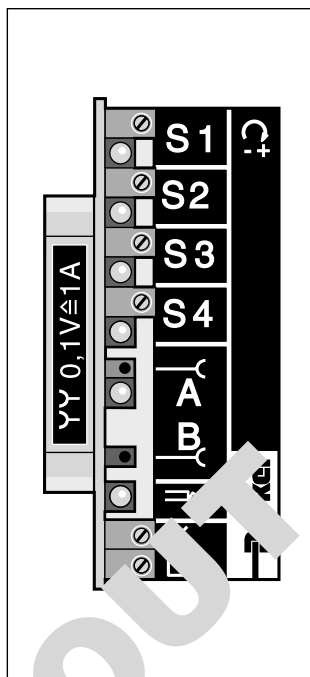
**101**  
 Module Type

**□ □**  
**□ □**  
 Design  
 Series

Code	Valve	Sol.
00	TDA...LAF E16 to E50	35mm
00	TEA...LAF E16 to E50	35mm
99	TDA...LAF E63 to E100	60mm
99	TEA...LAF E63 to E100	60mm

Code	Description
101	Amplifier, 4 command channels, Up/Down ramps for valves with 'L' solenoid option

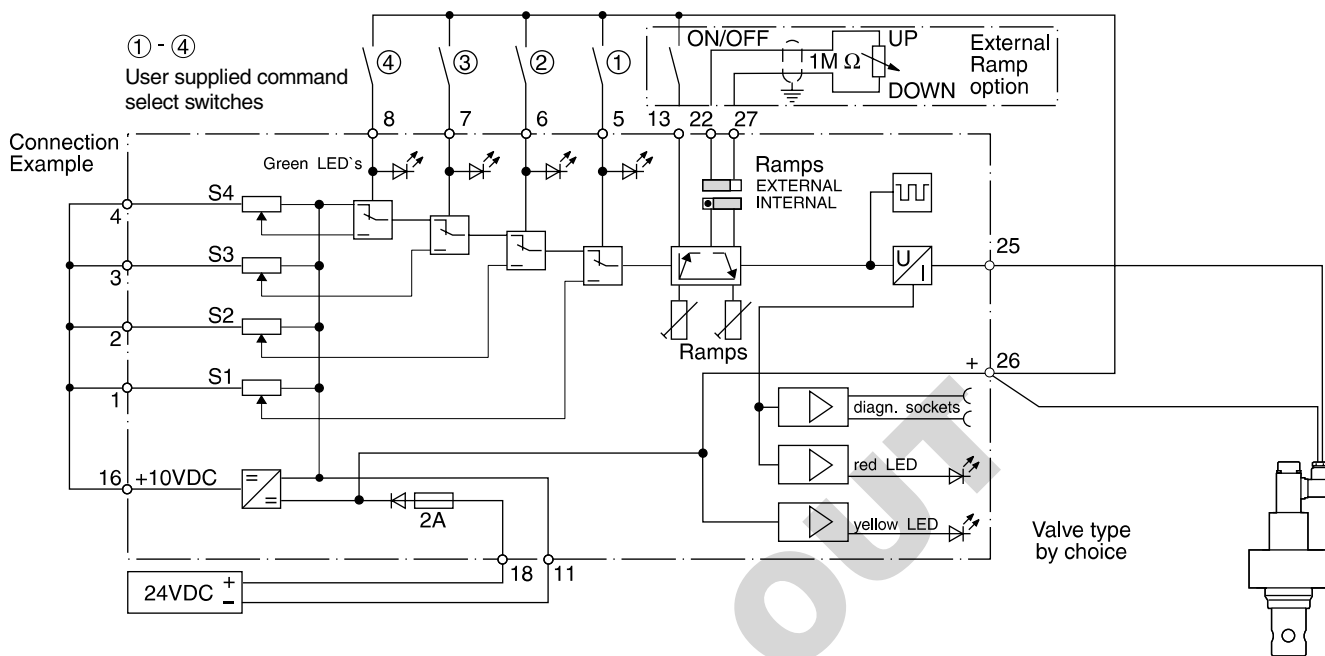
NOTE:  
 Not required when ordering.



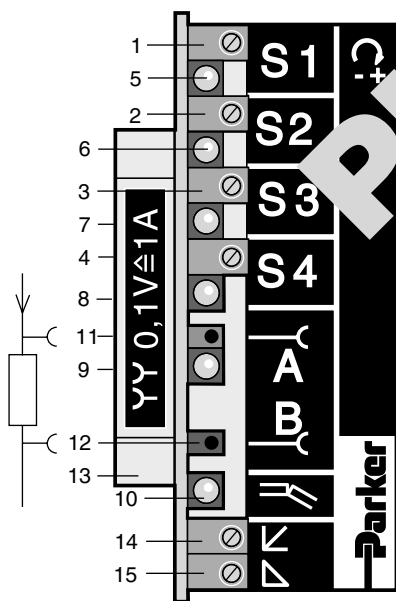
### Specifications

<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Power Required</b>	40 VA
<b>Command Signal</b>	0 to +10 VDC and 0 to -10 VDC
<b>Input Select Voltage</b>	5 to 30 VDC
<b>Reference Outputs</b>	+10 VDC 10 mA
<b>Max. Solenoid Output Current</b>	1.05A with set value 10V
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	0 to 5 seconds adjustable
<b>Shielded Cable Connection</b>	Supply connections + valve: 1.5 sq. mm (16 AWG) Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	2A medium lag, DIN 41571/5x20 mm

**Block Diagram**



**Operating and Diagnostic Elements (Elevation A)**



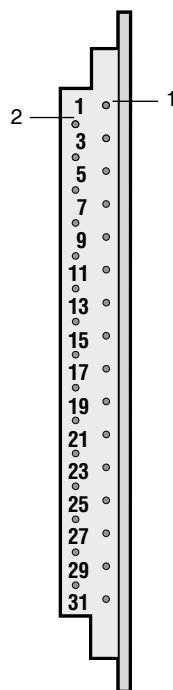
- 1-4 Set value potentiometers S1-S4
- 5-8 Green LED's for:  
- channel activity of the set values
- 9 Red LED (A) for:  
- function indicator control solenoid  
- (B not used)
- 10 Yellow LED for:  
- correct voltage supply
- 11 Red socket for current diagnostic
- 12 Black socket for current diagnostic
- 13 Green grip strip with reference information for measured values
- 14 UP ramp potentiometer
- 15 DOWN ramp potentiometer

**Notes:**

- Turn off the electrical power to this board whenever the hydraulic supply to the valve is not on.
- Always turn off the power to this board before removing it from the card holder.

Only potential-free measuring equipment to be used

**Connector (Elevation B)**



- 1 Input preselection channel 1
- 2 Input preselection channel 2
- 3 Input preselection channel 3
- 4 Input preselection channel 4
- 5 Input set value lock on channel 1
- 6 Input set value lock on channel 2
- 7 Input set value lock on channel 3
- 8 Input set value lock on channel 4
- 11 Reference potential 0V supply
- 13 Input ramp disable
- 16 Output +10V reference
- 18 Input 24 VDC supply
- 22 Input external ramp option
- 25 Output control solenoid
- 26 Output control solenoid
- 27 Input external ramp option





### General Description

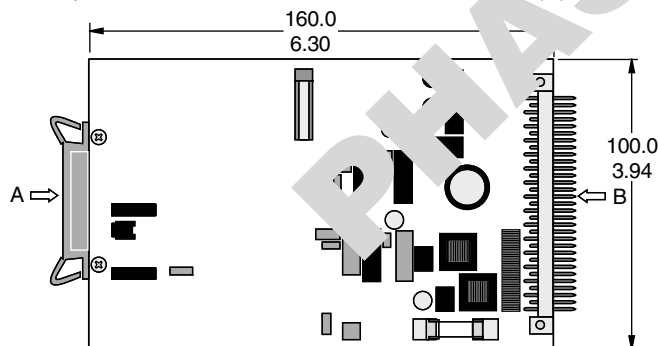
Series ET102 electronic module is used to control TDA and TEA proportional throttle valves configured with the 'L' solenoid option. For valves configured with the 'M' solenoid option, refer to ET154. The module accepts a 0 to 10 volt command signal, and produces a proportionally linear output current used to drive the valve's proportional solenoid. Note that the linearity of the valve itself determines the linearity of the system. Refer to the specific valve data for actual linearity performance.

### Features

- Processing and amplification of the externally supplied positive set-values into output signals for the control solenoid.
- Can be combined with EZ150 or external programmable control.
- Pulsed amplifier power stage with constant current control.
- Dither generator with applied frequency to improve static characteristics.
- Diagnosis by means of diagnostic sockets as well as light diodes for indicating working conditions.

### Dimensions

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



**For new applications:  
 ET102: Refer to PCD00A-400**

### Ordering Information

**ET**  
 Electronic Module  
 Pressure Valve

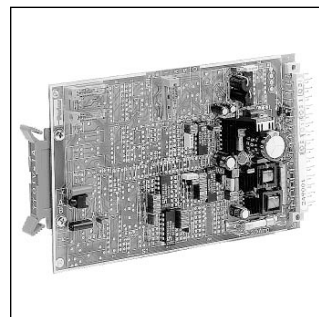
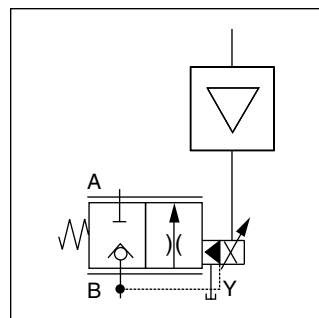
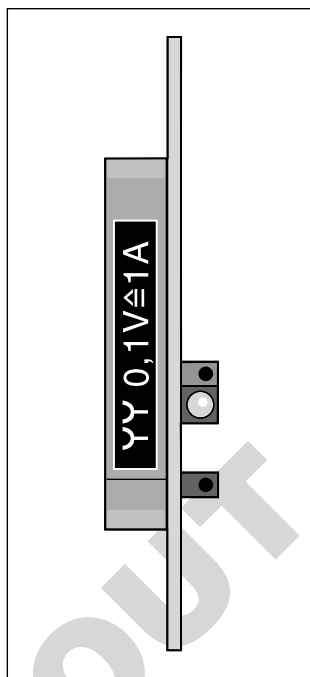
**□**  
 Valve Size

**102**  
 Module Type

**□ □**  
**□ □**  
 Design Series  
 NOTE:  
 Not required when ordering.

Code	Valve	Sol.
00	TDA...LAF E16 to E50	35mm
00	TEA...LAF E16 to E50	35mm
99	TDA...LAF E63 to E100	60mm
99	TEA...LAF E63 to E100	60mm

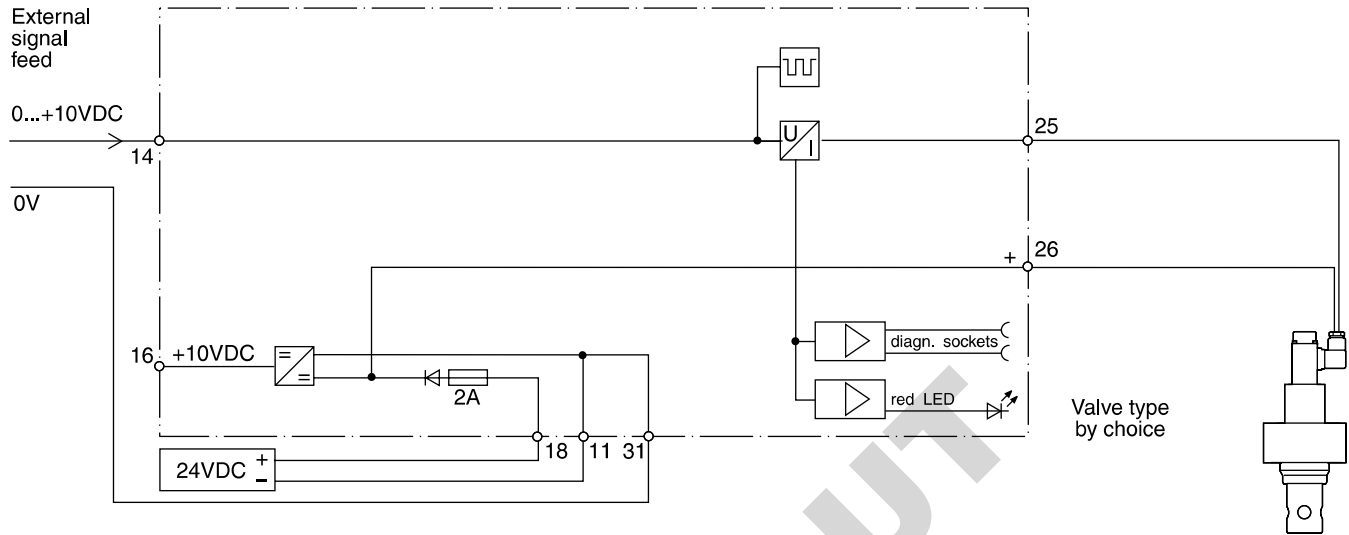
Code	Description
102	Amplifier — Basic for valves with 'L' solenoid option



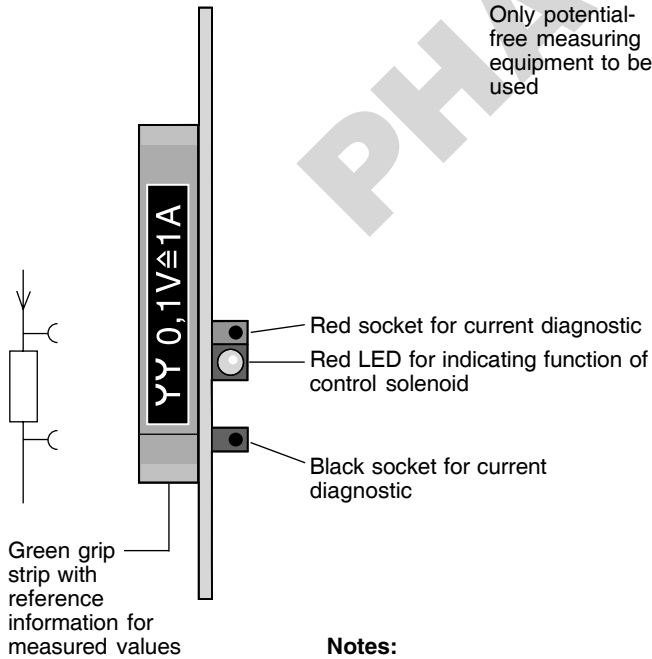
### Specifications

<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Power Required</b>	40 VA
<b>Command Signal</b>	0 to +10 VDC and 0 to -10 VDC
<b>Input Select Voltage</b>	5 to 30 VDC
<b>Reference Outputs</b>	+10 VDC 10 mA
<b>Max. Solenoid Output Current</b>	1.05A with set value 10V
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	Not available
<b>Shielded Cable Connections</b>	Supply connections + valve: 1.5 sq. mm (16 AWG) Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	2A medium lag, DIN 41571/5x20mm

**Block Diagram**

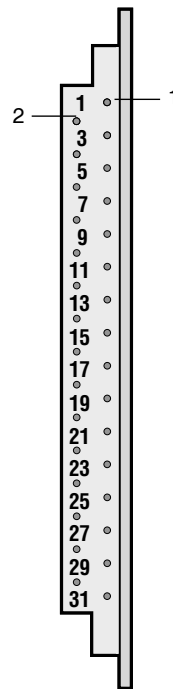


**Operating and Diagnostic Elements (Elevation A)**



- Notes:**
- Turn off the electrical power to this board whenever the hydraulic supply to the valve is not on.
  - Always turn off the power to this board before removing it from the card holder.

**Connector (Elevation B)**



- 11 Reference potential 0V supply
- 14 Input command voltage 0...+10VDC
- 16 Output +10V reference
- 18 Input 24 VDC supply
- 25 Output control solenoid
- 26 Output control solenoid
- 31 Reference potential 0V set value

### General Description

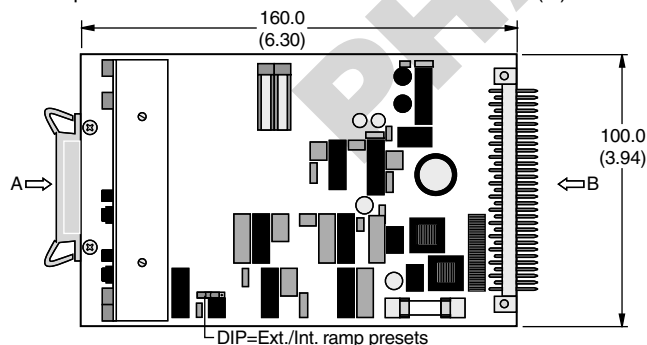
Series ET104 electronic module is used to control TDA and TEA proportional throttle valves configured with the 'L' solenoid option. For valves configured with the 'M' solenoid option, refer to driver card ET154. The module accepts a 0 to 10 volt command signal, and produces a proportionally linear output current used to drive the valve's proportional solenoid. Note that the linearity of the valve itself determines the linearity of the system. Refer to the specific valve data for actual linearity performance. Two ramp adjustments provide control of actuator acceleration and deceleration.

### Features

- Processing and amplification of the externally supplied positive set-values into output signals for the control solenoid.
- Can be combined with EZ150 or external programmable control.
- DIP switch from internal ramp generation to external ramp setting.
- MIN/MAX limiters for matching the working range to the full set value range.
- Pulsed low-loss amplifier power stage with supporting constant current control for constant, temperature-independent, solenoid forces.
- Dither generator with applied frequency to improve static characteristics.
- Diagnosis by means of diagnostic sockets as well as LEDs for indicating working conditions.

### Dimensions

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



**For new applications:  
 ET104: Refer to PCD00A-400**

### Ordering Information

**ET**  
 Electronic Module  
 Pressure Valve

**□**  
 Valve Size

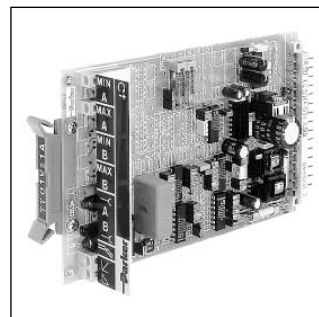
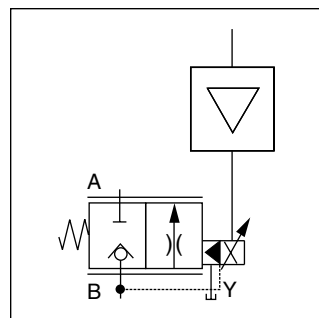
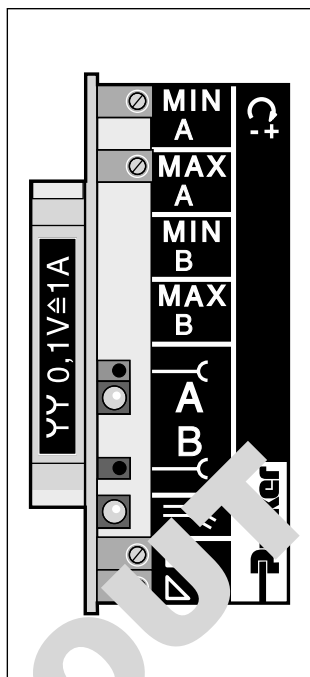
**104**  
 Module Type

**□ □**  
 Design Series

Code	Valve	Sol.
00	TDA...LAF E16 to E50	35mm
00	TEA...LAF E16 to E50	35mm
99	TDA...LAF E63 to E100	60mm
99	TEA...LAF E63 to E100	60mm

Code	Description
104	Amplifier, adjustable MIN/MAX limits, UP/DOWN ramps for valves with 'L' solenoid option

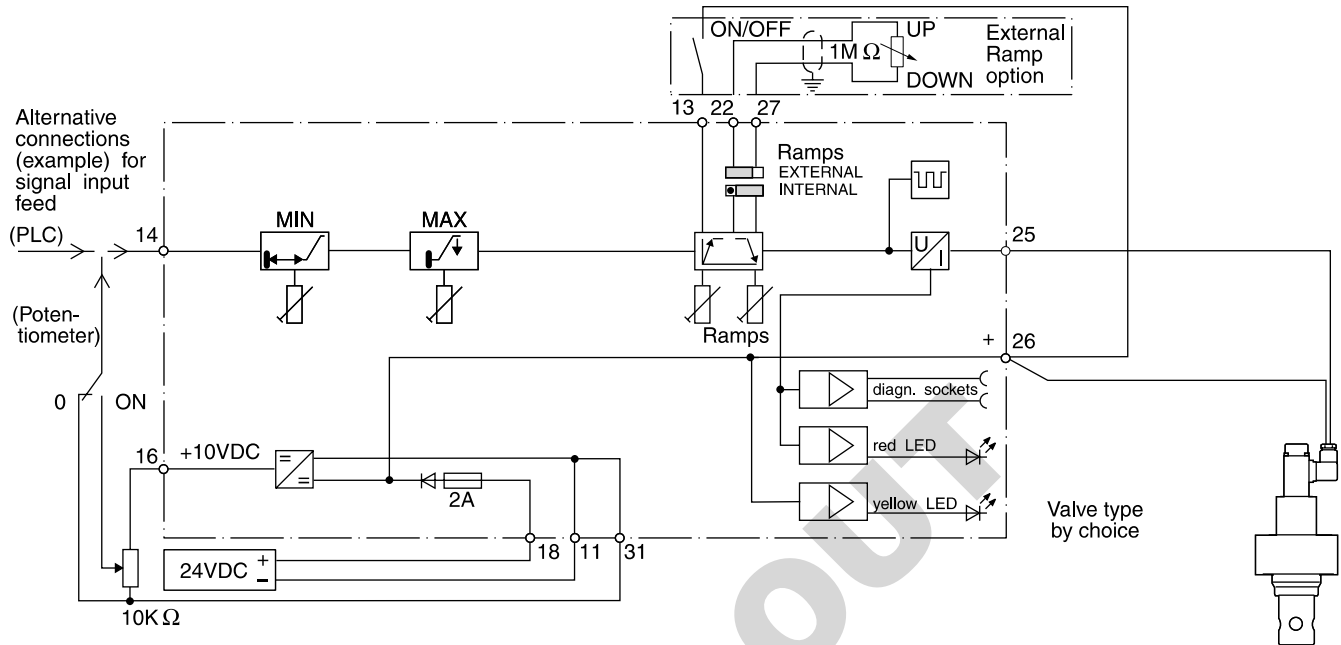
NOTE:  
 Not required when ordering.



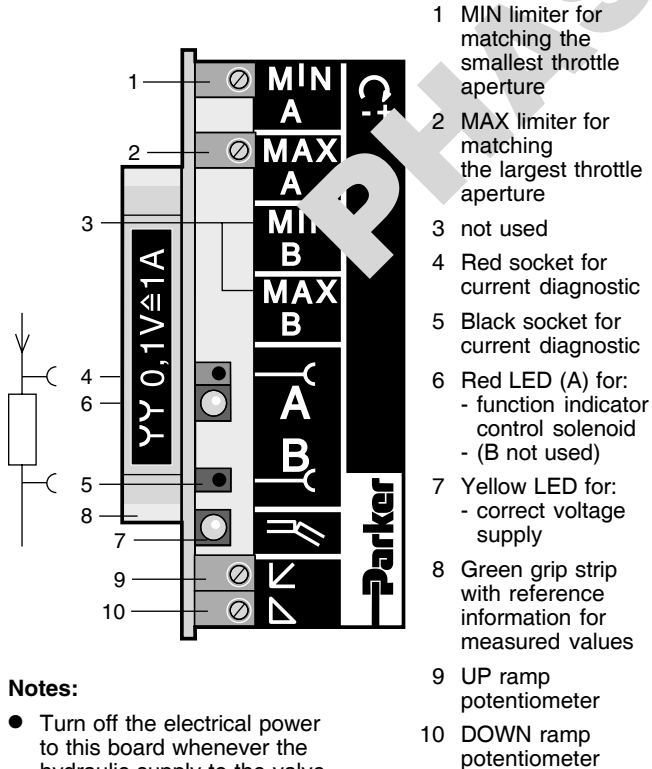
### Specifications

<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Power Required</b>	40 VA
<b>Command Signal</b>	0 to +10 VDC
<b>Input Select Voltage</b>	5 to 30 VDC
<b>Reference Outputs</b>	+10 VDC 10 mA
<b>Max. Solenoid Output Current</b>	1.05A with set value 10V
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	0 to 5 seconds adjustable
<b>Shielded Cable Connection</b>	Supply connections + valve: 1.5 sq. mm (16 AWG) Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	2A medium lag, DIN 41571/5x20 mm

**Block Diagram**



**Operating and Diagnostic Elements (Elevation A)**

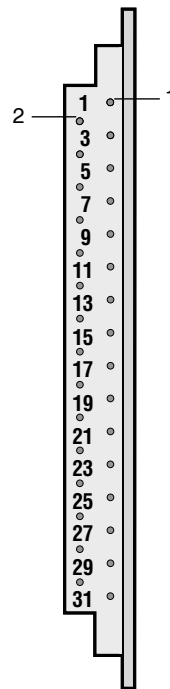


**Notes:**

- Turn off the electrical power to this board whenever the hydraulic supply to the valve is not on.
- Always turn off the power to this board before removing it from the card holder.

Only potential-free measuring equipment to be used

**Connector (Elevation B)**



- 11 Reference potential 0V supply
- 13 Input ramp disable
- 14 Input command voltage 0...+10 VDC
- 16 Output +10V reference
- 18 Input 24 VDC supply
- 22 Input external ramp option
- 25 Output control solenoid
- 26 Output control solenoid
- 27 Input external ramp option
- 31 Reference potential 0V set value



### General Description

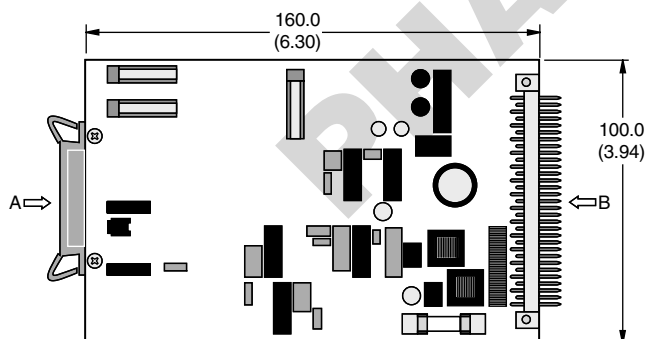
Series ET105 electronic module is used to control TDA and TEA proportional throttle valves configured with the 'L' solenoid option. For valves configured with the 'M' solenoid option, refer to ET154. The module accepts a 0 to 10 volt command signal, and produces a proportionally linear output current used to drive the valve's proportional solenoid. Note that the linearity of the valve itself determines the linearity of the system. Refer to the specific valve data for actual linearity performance.

### Features

- Processing and amplification of the externally supplied positive set-values into output signals for the control solenoid.
- Can be combined with EZ150 or external programmable control.
- MIN/MAX limiters for matching the working range to the full set value range.
- Pulsed low-loss amplifier power stage with supporting constant current control for constant, temperature-independent, solenoid forces.
- Dither generator with applied frequency to improve static characteristics.
- Diagnosis by means of diagnostic sockets as well as LEDs for indicating working conditions.

### Dimensions

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



**For new applications:  
 ET105: Refer to PCD00A-400**

### Ordering Information

**ET**  
 Electronic Module  
 Pressure Valve

**□**  
 Valve Size

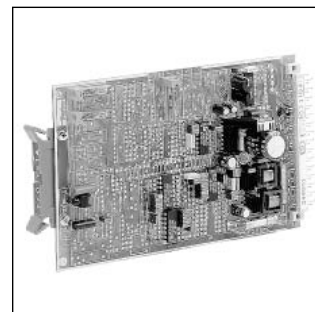
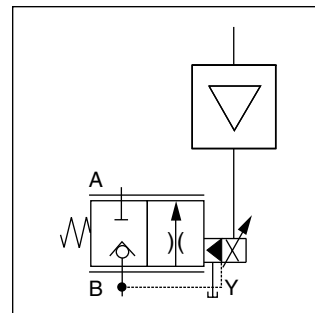
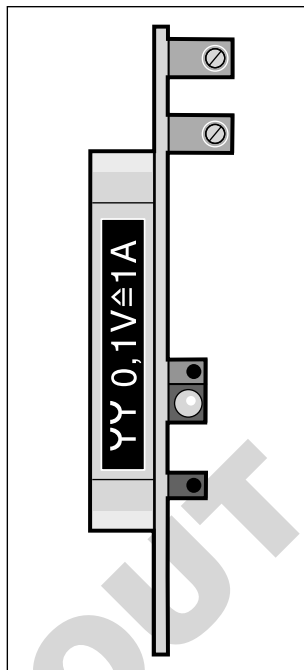
**105**  
 Module Type

**┌ ┐**  
**└ ┘**  
 Design  
 Series

Code	Valve	Sol.
00	TDA...LAF E16 to E50	35mm
00	TEA...LAF E16 to E50	35mm
99	TDA...LAF E63 to E100	60mm
99	TEA...LAF E63 to E100	60mm

Code	Description
105	Amplifier, adjustable MIN/MAX limits for valves with 'L' solenoid option

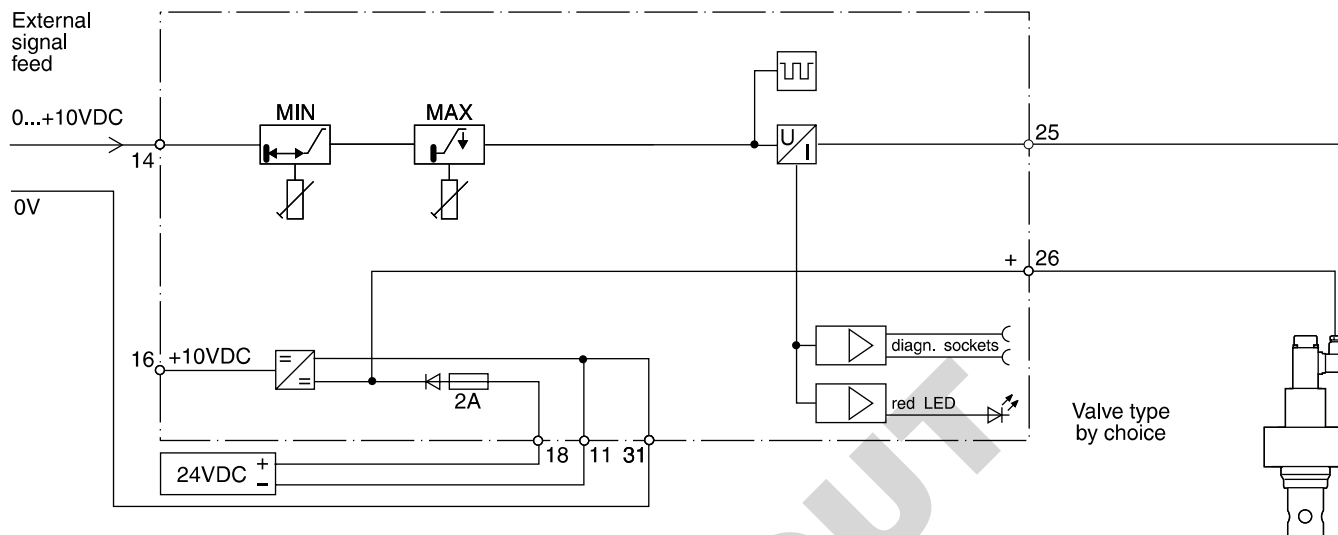
NOTE:  
 Not required when ordering.



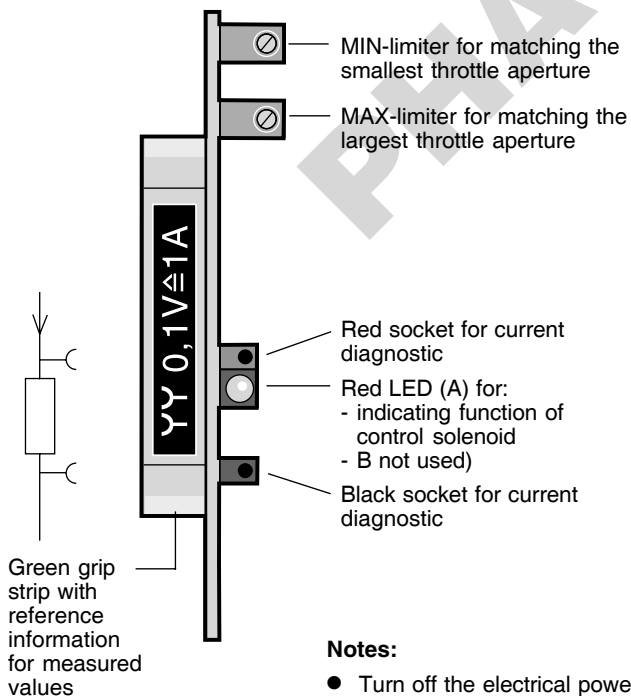
### Specifications

<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Power Required</b>	40 VA
<b>Command Signal</b>	0 to +10 VDC
<b>Reference Outputs</b>	+10 VDC 10 mA
<b>Max. Solenoid Output Current</b>	1.05A at 10V set value
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	Not available
<b>Shielded Cable Connection</b>	Supply connections + valve: 1.5 sq. mm (16 AWG) Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	2A medium lag, DIN 41571/5x20 mm

**Block Diagram**



**Operating and Diagnostic Elements (Elevation A)**



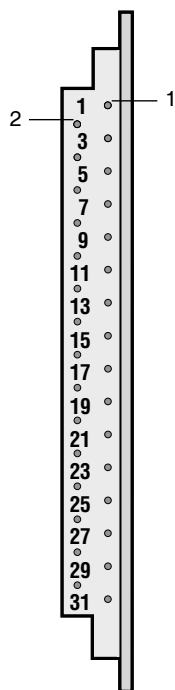
**Notes:**

- Turn off the electrical power to this board whenever the hydraulic supply to the valve is not on.
- Always turn off the power to this board before removing it from the card holder.

Only potential-free measuring equipment to be used

ET105.p65, dd

**Connector (Elevation B)**



- 11 Reference potential 0V supply
- 14 Input command voltage 0...+10 VDC
- 16 Output +10V reference
- 18 Input 24 VDC supply
- 25 Output control solenoid
- 26 Output control solenoid
- 31 Reference potential 0V set value



**General Description**

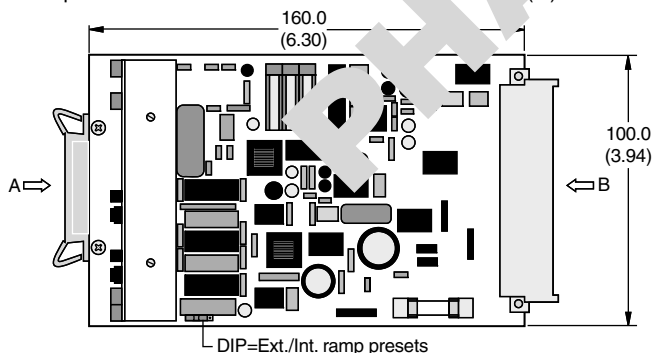
Series ET154 electronic module is used to control TDA and TEA proportional throttle valves configured with the 'M' solenoid option. For valves configured with the 'L' coil option, refer to driver card ET10\*. The module accepts a 0 to 10 volt command signal, and produces a proportionally linear output current used to drive the valve's proportional solenoid. Note that the linearity of the valve itself determines the linearity of the system. Refer to the specific valve data for actual linearity performance. Two ramp adjustments provide control of actuator acceleration and deceleration.

**Features**

- Processing and amplification of the externally supplied positive set-values into output signals for the control solenoid.
- Can be combined with EZ150 or external programmable control.
- MIN/MAX limiters for matching the working range to the full set value range.
- Pulsed low-loss and very fast amplifier power stage with supporting constant current control.
- Dither generator with applied frequency to improve static characteristics.
- Diagnosis by means of measuring sockets as well as LEDs for indicating working conditions.
- DIP switch from internal ramp generation to external ramp setting.

**Dimensions**

Inch equivalents for millimeter dimensions are shown in parentheses.



**For new applications:  
 ET154: Refer to PCD00A-400**

**Ordering Information**

**ET**  
 Electronic Module  
 Pressure Valve

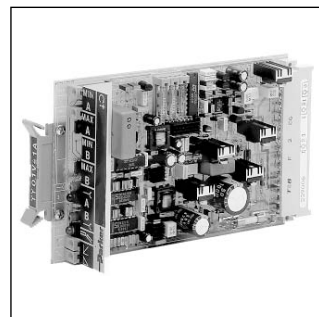
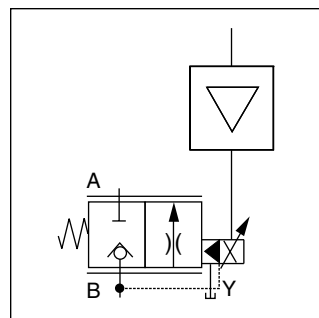
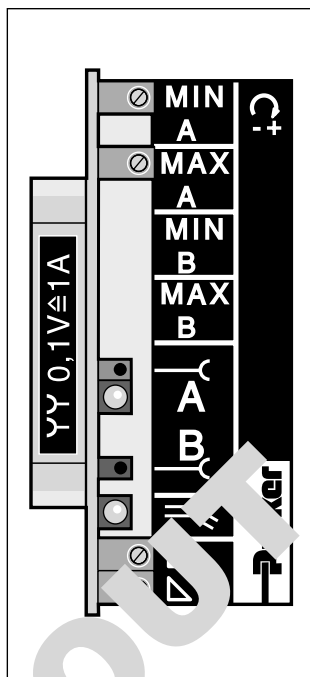
**□**  
 Valve Size

**154**  
 Module Type

**┌ ┐**  
**└ ┘**  
 Design Series  
 NOTE:  
 Not required when ordering.

Code	Valve	Sol.
00	TDA...MAF E16 to E50	35mm
00	TEA...MAF E16 to E50	35mm
99	TDA...MAF E63 to E100	60mm
99	TEA...MAF E63 to E100	60mm

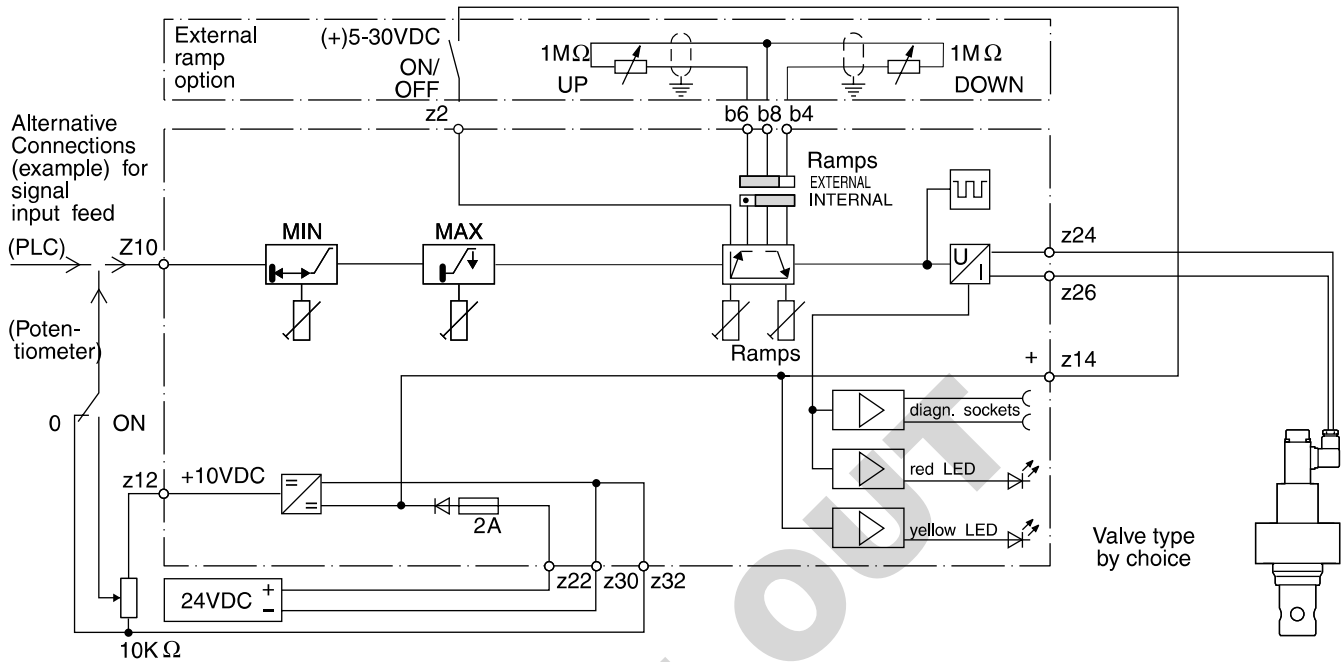
Code	Description
154	Amplifier, adjustable, MIN/MAX limits UP/DOWN ramps. For valves with 'M' solenoid option.



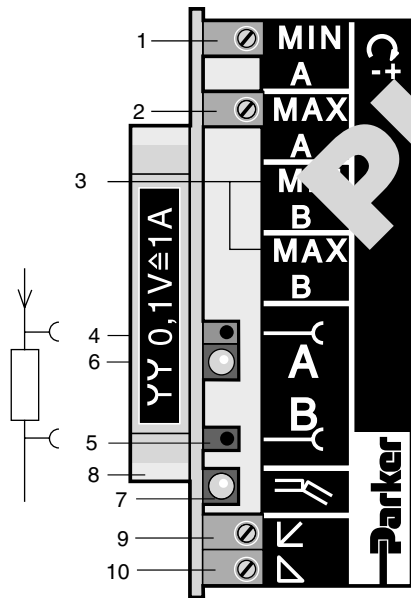
**Specifications**

<b>Connection</b>	48 Pole Male Connector, DIN 41612F
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Current Required</b>	3.5A max.
<b>Command Signal</b>	0 to +10 VDC
<b>Max. Solenoid Output Current</b>	2.6A at 10V set value
<b>Reference Output</b>	+10 VDC 10 mA
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	0-5 seconds adjustable
<b>Shielded Cable Connection</b>	Supply connections + valve: 1.5 sq. mm (16 AWG) Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	1.6A medium lag, DIN 41571/5x20 mm

**Block Diagram**



**Operating and Diagnostic Elements  
 (Elevation A)**



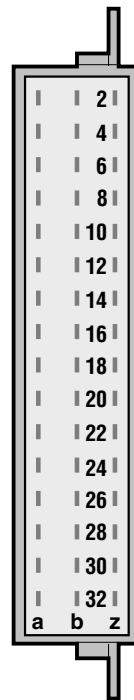
**Notes:**

- Turn off the electrical power to this board whenever the hydraulic supply to the valve is not on.
- Always turn off the power to this board before removing it from the card holder.

- 1 MIN-limiter for matching the smallest throttle aperture
- 2 MAX-limiter for matching the largest throttle aperture
- 3 (B-information are not used here)
- 4 Red socket for current diagnostic
- 5 Black socket for current diagnostic
- 6 Red LED (A) for:
  - function indicator control solenoid
  - (B not used)
- 7 Yellow LED for:
  - correct voltage supply
- 8 Green grip strip with reference information for measured values
- 9 UP ramp potentiometer
- 10 DOWN ramp potentiometer

Only potential-free measuring equipment to be used

**Connector  
 (Elevation B)**



- z2 Ramp disable
- z10 Input (+) 0...10V
- z12 Output (+) 10V reference
- z14 Output 24 VDC ramp disable
- z22 Input 24 VDC supply
- z24 Output control solenoid
- z26 Output control solenoid
- z30 Reference potential 0V set-value
- z32 Reference potential 0V supply





## General Description

Series BD90/95 servo amplifiers are high performance amplifiers designed to work with Series BD and DY servovalves. The amplifiers are packed with many desirable features that make them extremely versatile performers in motion control systems.

## Features

- **Voltage or Current Commands** — The user has the option of command input ranges of either  $\pm 14$  VDC or  $\pm 28$  mA.
- **Two Differential Input Feedback Amplifiers** — Both inner and outer loops have Proportional-Integral-Derivative gain.
- **Built-in Power Supply** — The BD90 has its own power supply with inputs rated at either 115 VAC or 230 VAC.
- **Dither Circuitry** — The user can select either the on-board 60 Hz dither circuit, or input his own external dither frequency.
- **Reference Power Supply** — A reference supply voltage of  $\pm 15$  VDC @ 350 mA, and  $\pm 10$  VDC @ 50 mA.
- **External Logic Shutdown** — Allows the user to shut down the output to the valve by applying an external voltage signal.
- **Convenient Mounting** — The BD90/95 mounts in a convenient standard "Snap-Trac" mount.
- **Plug-in Terminal Strips** — This feature makes it unnecessary to remove the wires from the terminal strip.

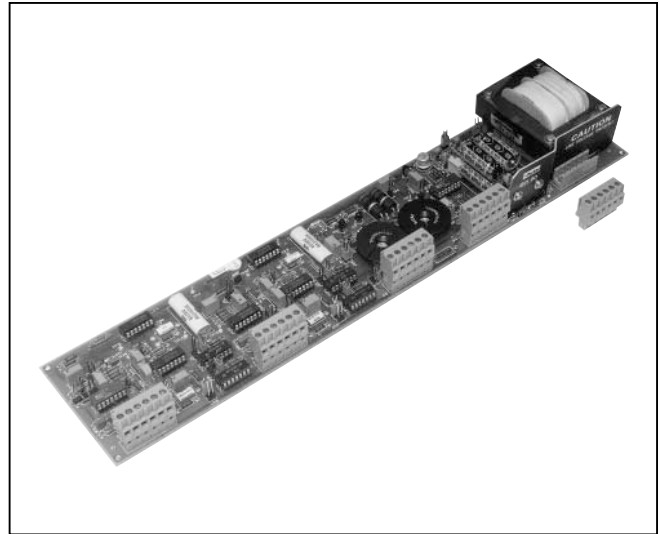
## Ordering Information

**BD**  
 Servo Amplifier  
 for BD Series and  
 DY (>15mA) Series  
 Servovalves

Input Power

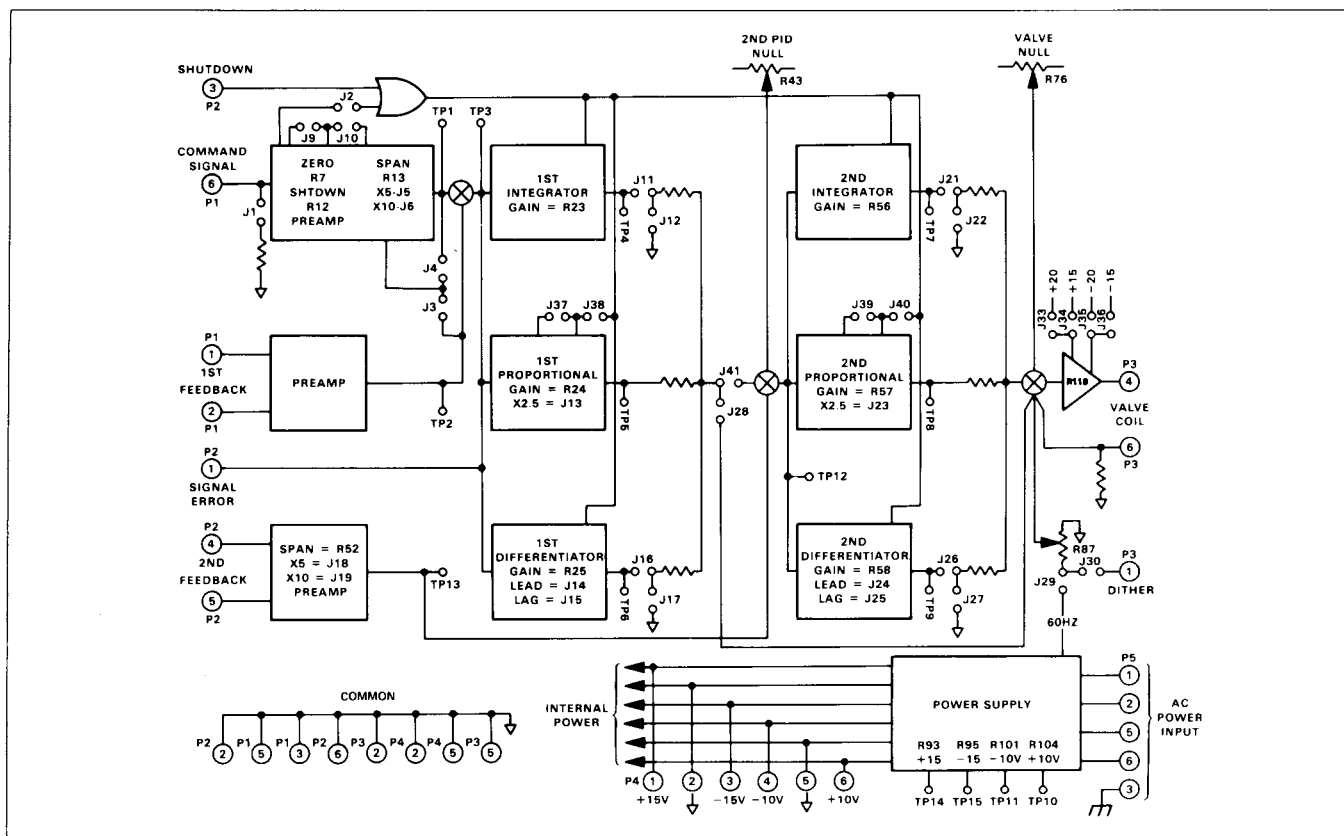
Code	Description
90	115 VAC
95*	$\pm 15$ VDC

\* For power supply, use #PS15, Bipolar, 15 VDC  
 BD90/95 Connector 1000177  
 Snap-Trac BD90 830007-15  
                   BD95 830007-11.25  
**Snap-Trac is included with delivery**

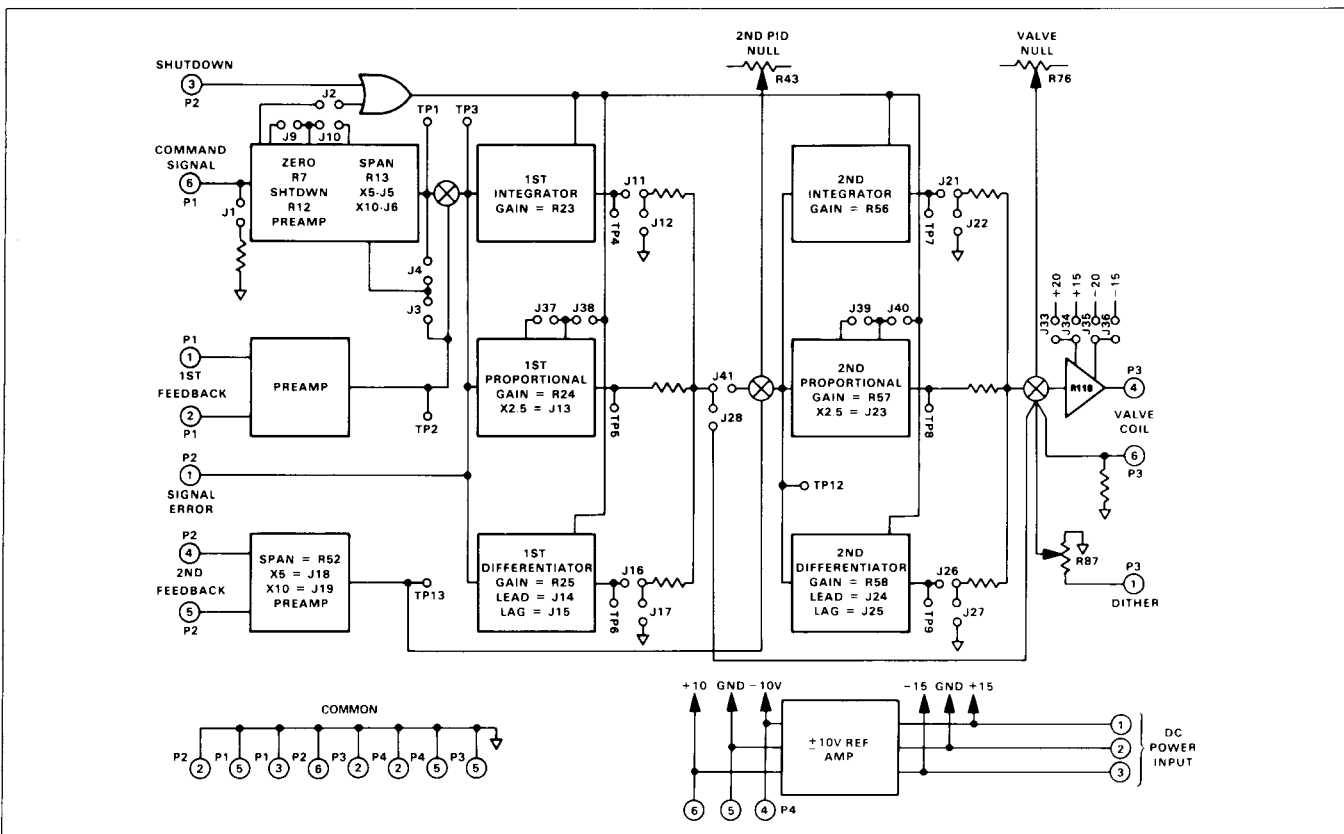


## Specifications

<b>Power Supply</b>	BD90 – 115 VAC or 230 VAC @ 30 VA, 50/60 Hz BD95 – $\pm 15$ VDC @ 350 mA
<b>Command Signal Range</b>	$\pm 14$ VDC, $\pm 28$ mA
<b>Input Impedance on Command Terminals</b>	100k ohm minimum
<b>Input Impedance on Feedback Terminals</b>	50K ohm minimum
<b>Current Output</b>	15 to 150 mA $I_{coil} \times R_{coil} \leq 12.5V$ (BD90: up to 200 mA with J33 and J35)
<b>Operating Temperature Range</b>	0°C to 70°C (32°F to 158°F)
<b>Reference Voltage</b>	$\pm 15$ VDC @ 350 mA
<b>Supplies</b>	$\pm 10$ VDC @ 50 mA
<b>External Logic Shutdown Voltage Required</b>	+4 to +10 VDC, sink input
<b>Shutdown Input Impedance</b>	10K ohm
<b>Protection Class</b>	Open, not rated



**BD90 Servo Amplifier**



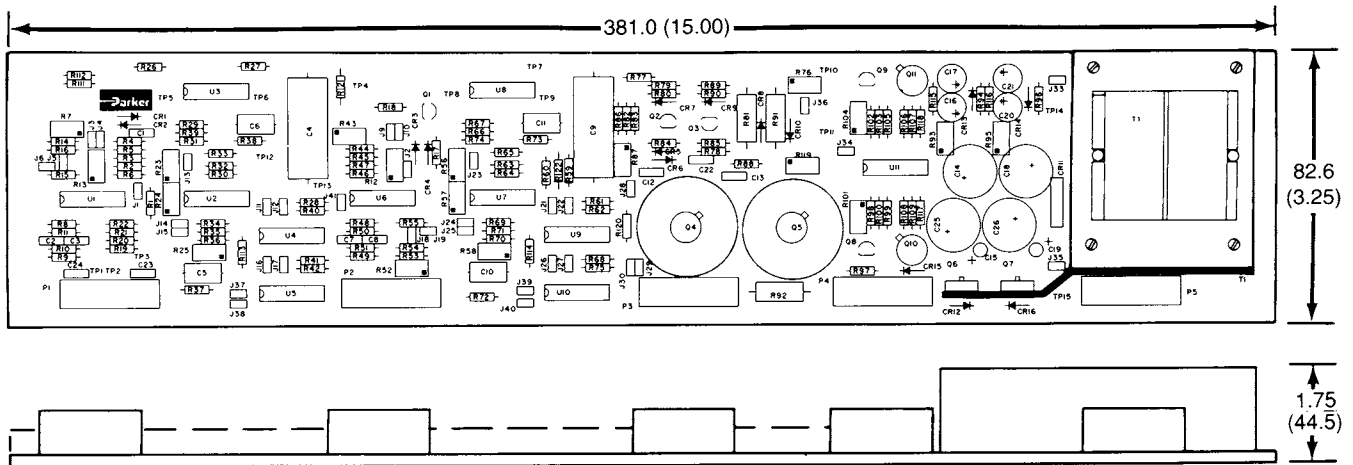
**BD95 Servo Amplifier**

BD90\_BD95.p65, dd

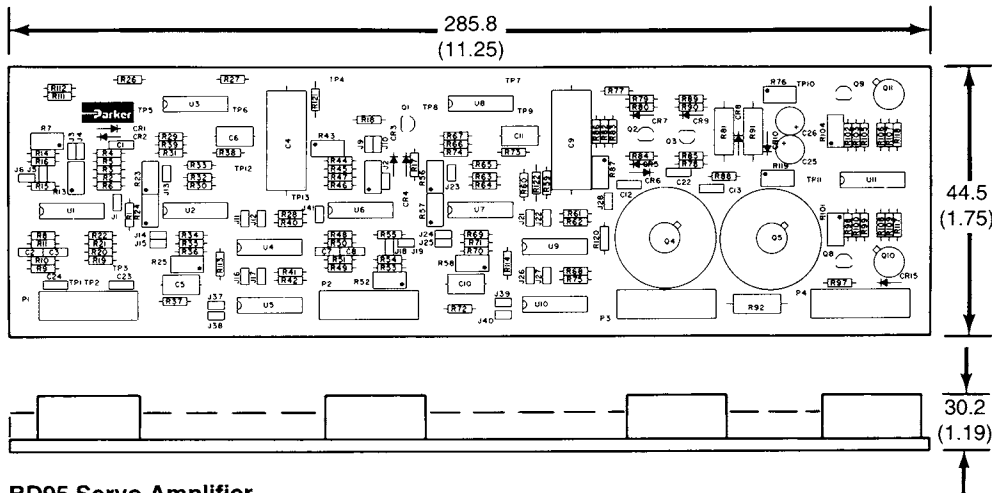


**Dimensions**

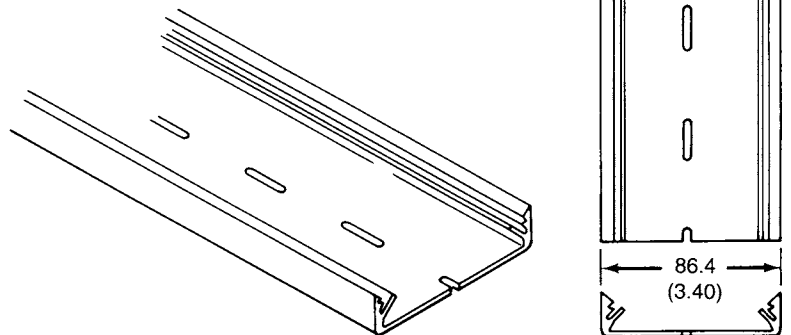
Inch equivalents for millimeter dimensions are shown in (\*\*)



**BD90 Servo Amplifier**



**BD95 Servo Amplifier**



Snap-Trac is included with delivery

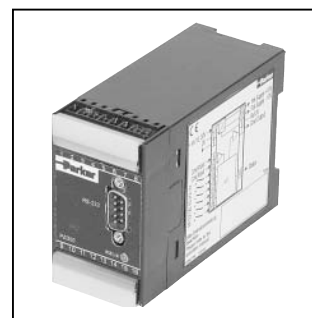
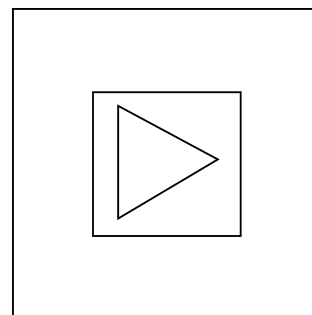
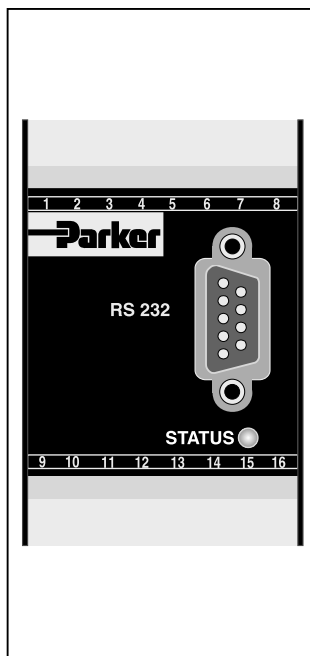
### General Description

Series PZD00A-40\* electronic modules provide options to enhance PWD, PCD driver modules and valves with onboard electronics. The modules are compact and easy to install with DIN rail mounting and plug-in terminals. The digital design allows for programmable parameters such as input signal conditioning, setpoints, ramps, mins, maxs, and command output options. The modules provide flexibility for different applications and repeatability from unit to unit. The module parameters are programmed with an RS-232 interface and user friendly software (ProPxD) with default values for the standard valves.

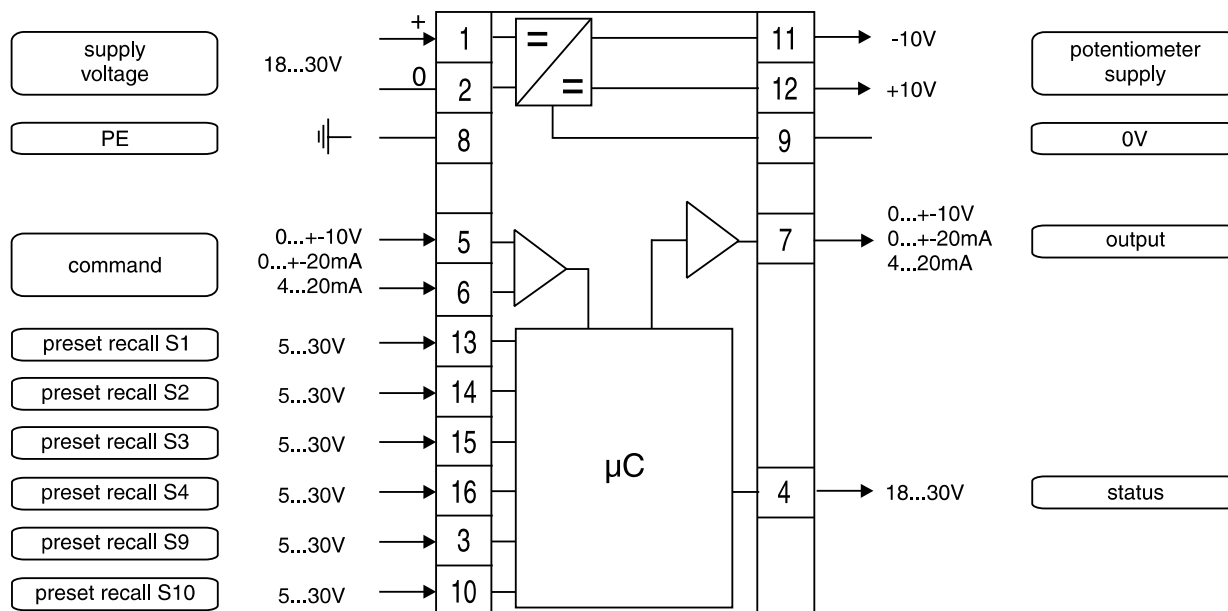
The PZD00A-40\* module contains the functions required by typical proportional valve applications (series D\*FP, D\*\*FH valves, PWD, PCD modules).

### Features

- Setpoints, ramp options, mins, maxs.
- Command output options.
- Programmable parameters.
- Reference voltages.
- RS-232 Interface.
- User friendly programming software.
- Plug-in terminals.
- Compliant with European EMC Standards.



### Block Diagram

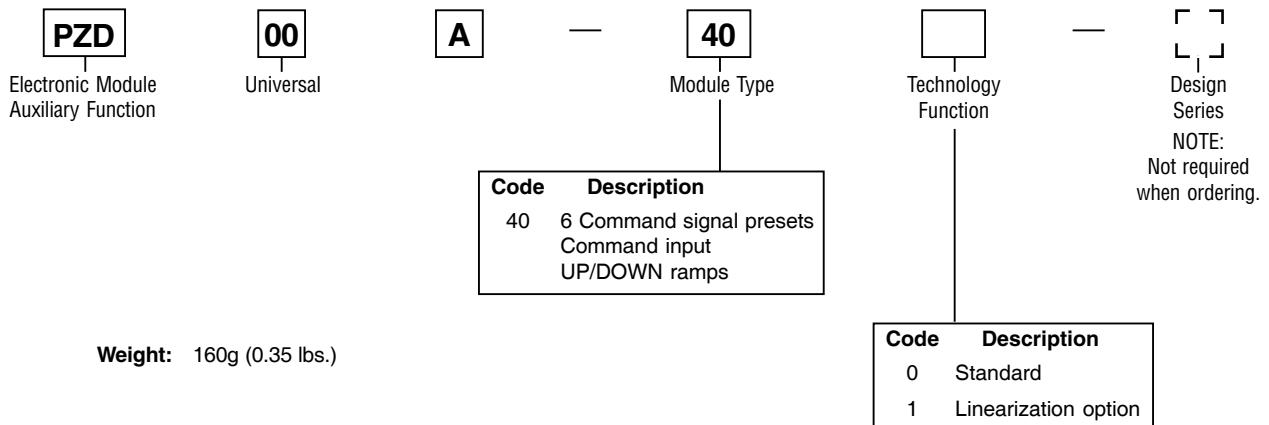


**Specifications**

General			
<b>Model</b>	Module package for snap-on mounting on EN 50022 rail	<b>Mounting Position</b>	Any
<b>Package Material</b>	Polycarbonate	<b>Ambient Temperature Range</b>	-20°C to +60°C (-4°F to +140°F)
<b>Inflammability Class</b>	V2 to V0 acc. UL 94	<b>Protection Class</b>	IP 20 acc. DIN 40050
Electrical			
<b>Duty Ratio</b>	100%	<b>Status Signal</b>	Off – 0 to 0.5 VDC; On – Supply Voltage; rated max. 15 mA
<b>Supply Voltage</b>	18 VDC to 30 VDC, ripple < 5% eff., surge free	<b>Output Signal</b>	+10 to 0 to -10 VDC, rated max. 15 mA +20 to 0 to -20 mA, Ro < 500 ohm 4 to 12 to 20 mA, Ro < 500 ohm
<b>Current Consumption Max.</b>	100 mA		
<b>Pre-fusing</b>	500 mA medium lag		
<b>Command Signal</b>	+10 to 0 to -10 VDC, ripple < 0.01 % eff., surge free, Ri = 100K ohm +20 to 0 to -20 mA, ripple < 0.01 % eff., surge free, Ri = 200K ohm 4 to 12 to 20 mA, ripple < 0.01 % eff., surge free, Ri = 200 ohm < 3.6 mA = output signal 0 V / 0 mA / 12 mA acc. to output option  > 3.8 mA = output signal on (acc. NAMUR NE43)	<b>Output Signal Resolution</b>	0.025%
		<b>Reference output</b>	+10 / -10, 2%, rated max. 15 mA
		<b>Adjustment Ranges</b>	Minimum 0 to 50% Maximum 50 to 100% Cmd Channels +100 to -100% Ramp Time 0 to 32.5 s Zero Offset +100 to -100%
		<b>Interface</b>	RS 232C, DSub 9p. male for null modem cable
<b>Input Signal Resolution</b>	0.025%	<b>EMC</b>	EN 50081-2, EN 50082-2
<b>Differential Input Voltage Max.</b>	30 VDC for terminals 5 and 6 against PE (terminal 8)	<b>Connection</b>	Screw terminals 0.2 to 2.5 mm <sup>2</sup> , disconnectable
<b>Channel Recall Signal</b>	Off – 0 to 2.5 VDC; On – 5 to 30 VDC; Ri = 100K ohm	<b>Cable Specification</b>	20 AWG overall braid shield
		<b>Cable Length</b>	50m (164 ft.)
Options			
<b>Technology Function</b>	Code 1: Software adjustable transfer function with 10 compensation points for linearization of valve behavior.		

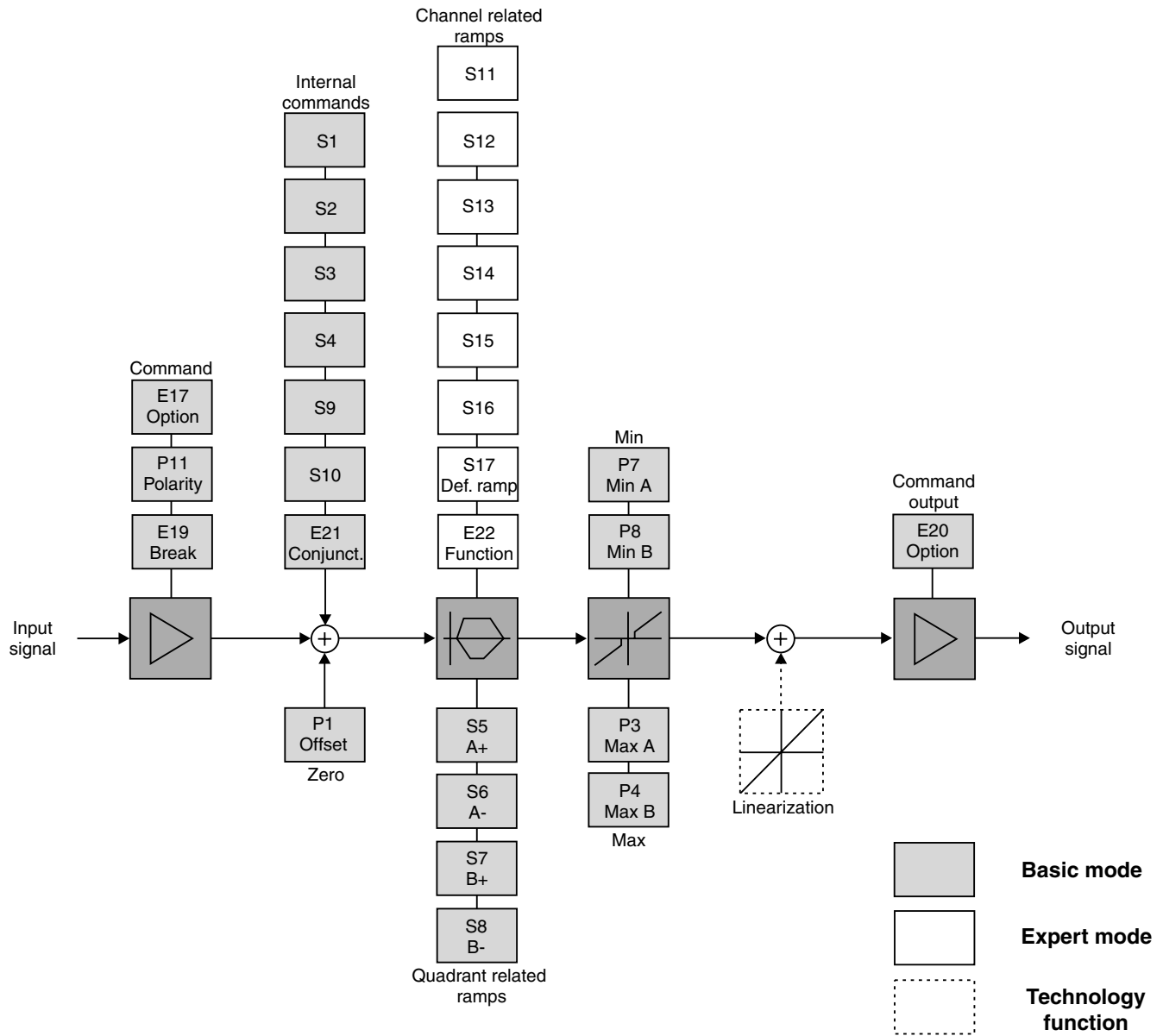


**Ordering Information**



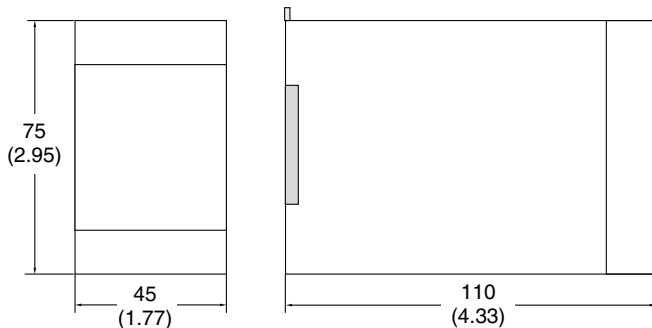
**Signal Flow Diagram**

**D**



**Dimensions**

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



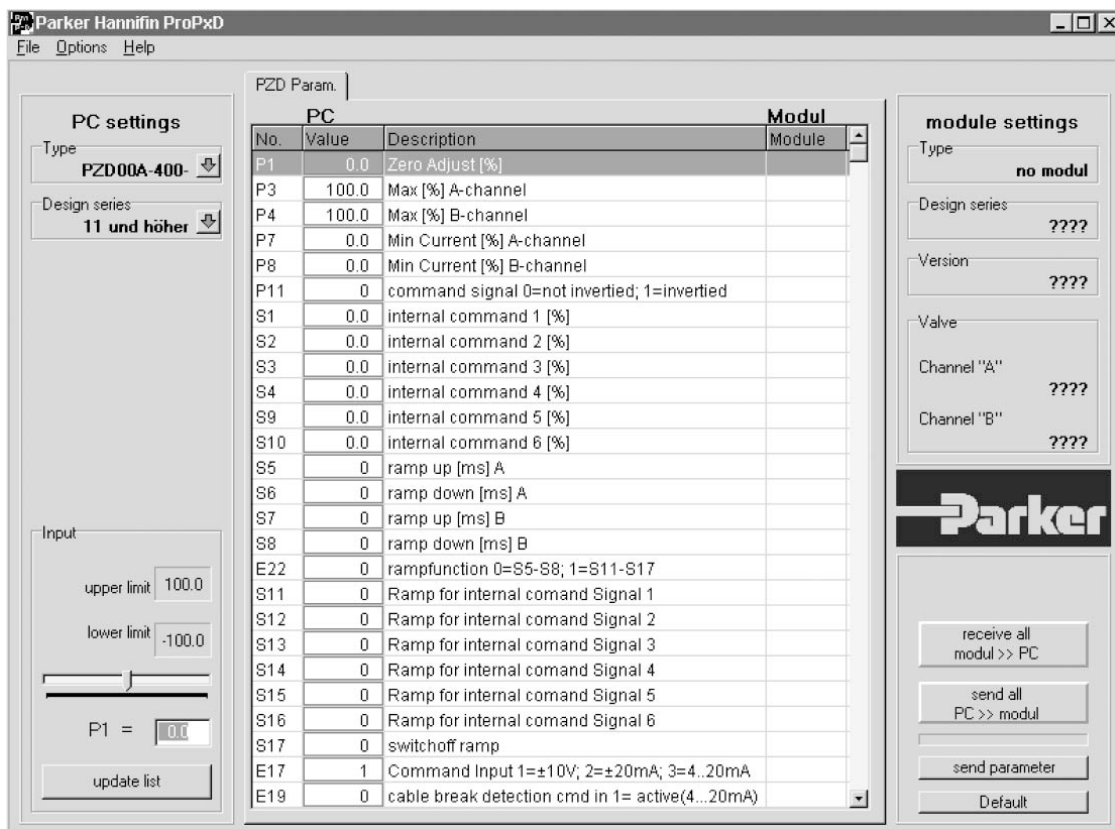
**ProPxD Interface Program**

The new ProPxD software permits user-friendly parameter setting for the electronic module series PCD, PWD and PZD.

Via the clearly arranged entry screen the parameters can be identified and modified. Storage of complete parameter sets to floppy or hard disk 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 the electronic module in the same manner as the default parameters which are available for all standard valve series. Inside the electronic a nonvolatile memory stores the data with the option for recalling or modification.

**Features**

- User-friendly editing of all parameters.
- Default values for standard valves.
- Identification and documentation of parameter sets.
- Executable with all actual Windows® operating systems from Windows® 95 upwards.
- Simple communication between PC and electronic via serial interface RS-323 and nullmodem cable.



### General Description

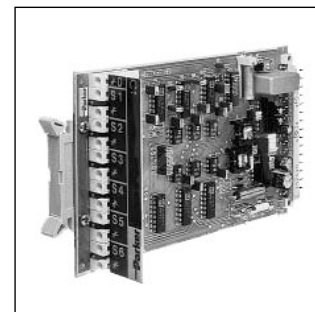
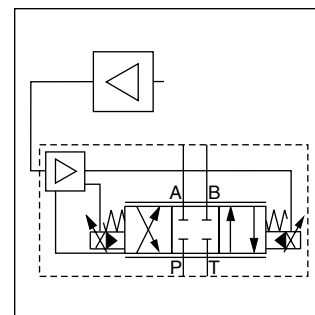
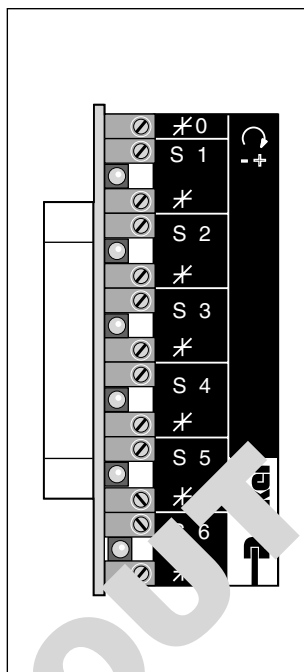
Series EZ150 electronic accessory module is a voltage command generator which can be used in conjunction with standard proportional valve control cards or directly with valves with integrated electronics. The module accepts up to 6 on/off input signals which select one of six voltage outputs set by potentiometer adjustments on the card. Six individually adjustable ramps are associated with each command.

### Features

- Outputs to the main card can be “modulated” with up to six call-up set-values and six ramp potentiometers adjustable from 0 to 100%.
- Adjustable default ramp 0 to 100%.
- Reference outputs +10V/-10V.
- LEDs for indicating working conditions.

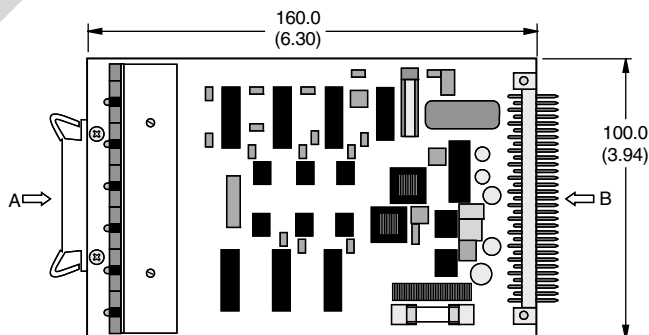
### Specifications

<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Power Required</b>	4 VA
<b>Command Signal</b>	0 to +10 VDC and 0 to -10 VDC
<b>Input Signal Voltage</b>	5 to 30 VDC
<b>Reference Outputs</b>	±10 VDC @10 mA
<b>Output</b>	0 to +10 V and 0 to -10 V/10 mA
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramps</b>	0-5 seconds adjustable
<b>Shielded Cable Connect.</b>	Supply connections: 0.5 sq. mm (20 AWG) Output and Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	2A medium lag, DIN 41571/5x20 mm



### Dimensions

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



**For new applications:  
EZ150: Refer to PZD00A-400**

### Ordering Information

**EZ**  
Electronic Module  
Auxiliary Card

**00**

For use with driver cards:  
**E\*102, E\*104, E\*105, E\*154;**  
**or valves with integrated**  
**electronics with voltage input:**  
**D\*FT, D\*FH, RE\*, D\*FX.**

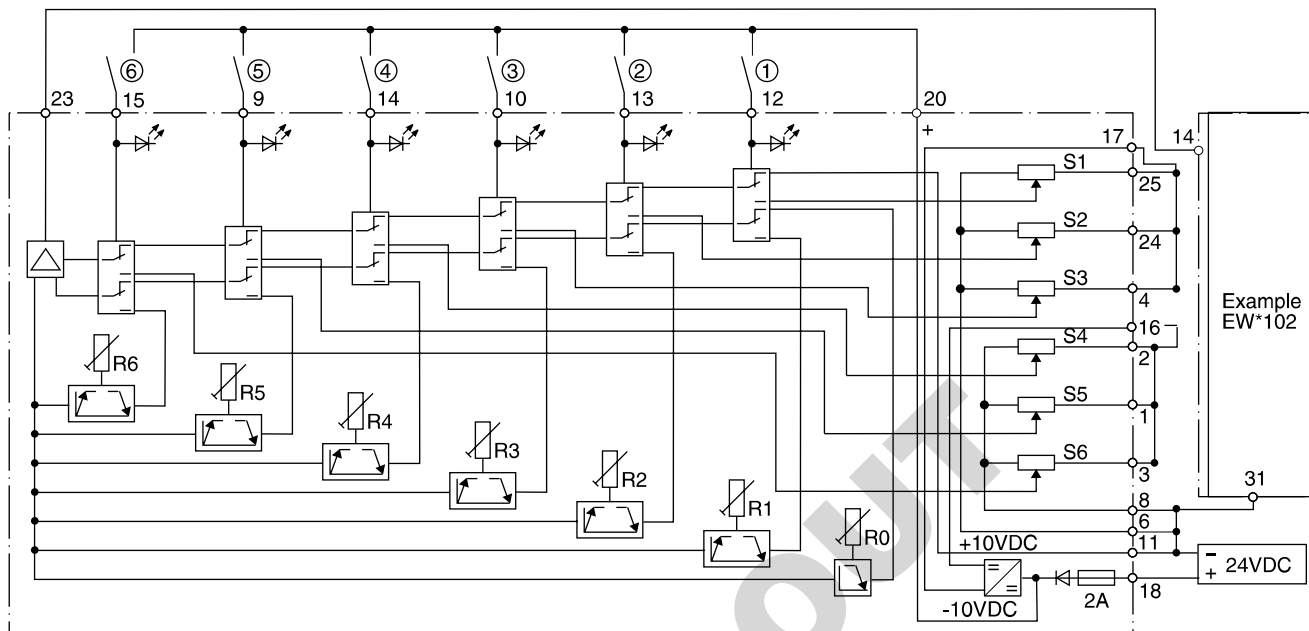
**150**  
Module Type

Code	Description
150	6 command channels, 6 ramps, 1 default ramp

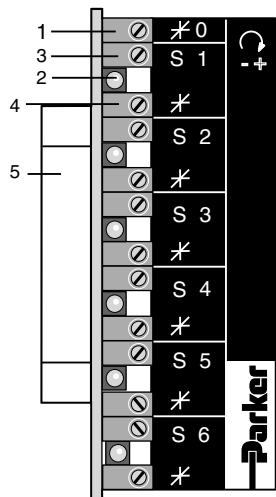
Design Series  
NOTE:  
Not required when ordering.



**Block Diagram**



**Operating and Diagnostic Elements (Elevation A)**

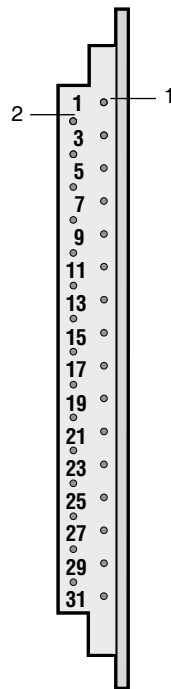


- 1 Default ramp, is active when all set-values have been switched-off.
- 2 6 Green LEDs as operating indicators for set value channels.
- 3 6 set value potentiometers S1-S6
- 4 6 Set value ramp potentiometers, which are activated, when switching set values. The ramp is activated when its associated set value is newly switched in. The ramp time is added to any ramp time of the main card.
- 5 Yellow grip strip (auxiliary card).

**Note:**

- Always turn off the power to this board before removing it from the card holder.

**Connector (Elevation B)**



- 1 Input preselect channel 5
- 2 Input preselected channel 4
- 3 Input preselect channel 6
- 4 Input preselected channel 3
- 6 Reference potential channel 1..3
- 8 Reference potential channel 4..6
- 9 Input set value lock-on Chan 5
- 10 Input set value lock-on chan 3
- 11 Reference potential 0V supply/output set value
- 12 Input set value lock-on chan 1
- 13 Input set value lock-on Chan 2
- 14 Input set value lock-on chan 4
- 15 Input set value lock-up Chan 6
- 16 Output +10V reference
- 17 Output -10V reference
- 18 Input 24 VDC supply
- 20 Output 24 VDC set value lock-on
- 23 Output set-value
- 24 Input preselected channel 2
- 25 Input preselected channel 1



### General Description

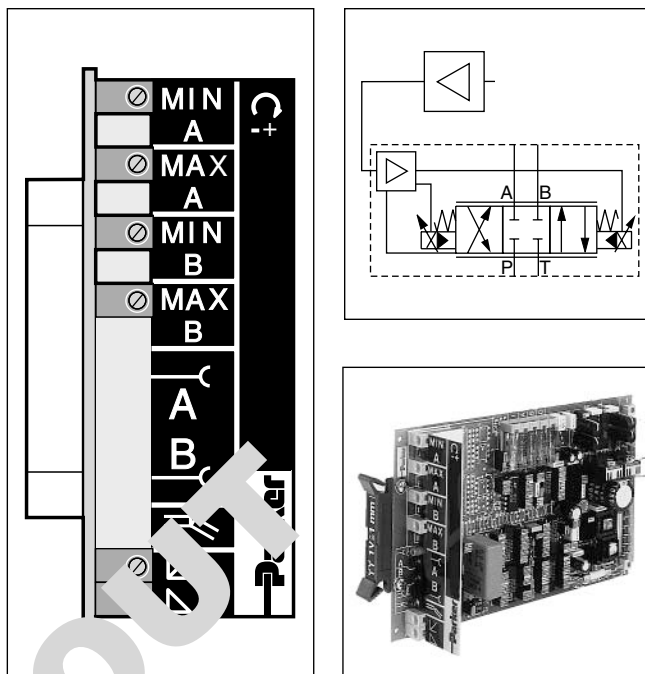
Series EZ154 electronic accessory module is a command signal conditioner which can be used in conjunction with standard proportional valve control cards or directly with valves with integrated electronics. The module accepts a  $\pm 10$  volt command signal, and provides two potentiometer adjustments each for 'MIN' (deadband compensation), 'MAX' (gain), and ramps.

### Features

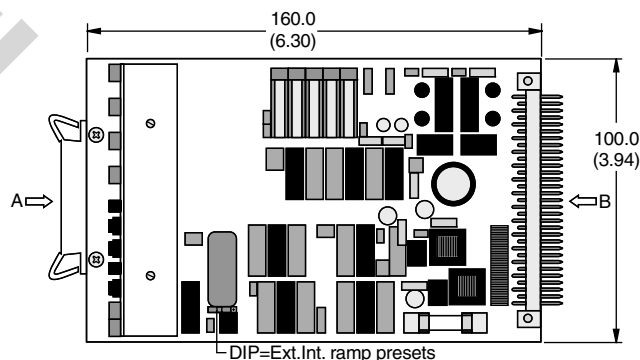
- Spool overlap range of the connected proportional valve can be manipulated with MIN potentiometer, adjustable by feeding a constant set value of appr. 0.2V.
- MAX-limiting of spool stroke with full set value range. Adjustable after MIN has been set and feeding a constant set value of 10V.
- DIP-switch from internal ramp generation to external ramp setting.

### Specifications

<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Power Required</b>	4 VA
<b>Command Signal</b>	0 to +10 VDC and 0 to -10 VDC
<b>Ramp Disable Voltage</b>	5 to 30 VDC
<b>Reference Outputs</b>	$\pm 10$ VDC @ 10 mA
<b>Output Voltage</b>	0 to $\pm 10$ V
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramp Time</b>	0-5 seconds adjustable
<b>Shielded Cable Connection</b>	Supply connections: 0.5 sq. mm (20 AWG) Output and Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	2A medium lag, DIN 41571/5x20 mm

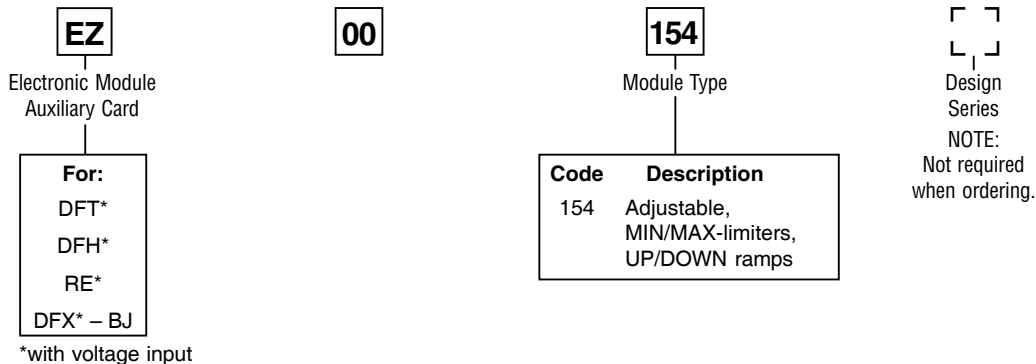


### Dimensions



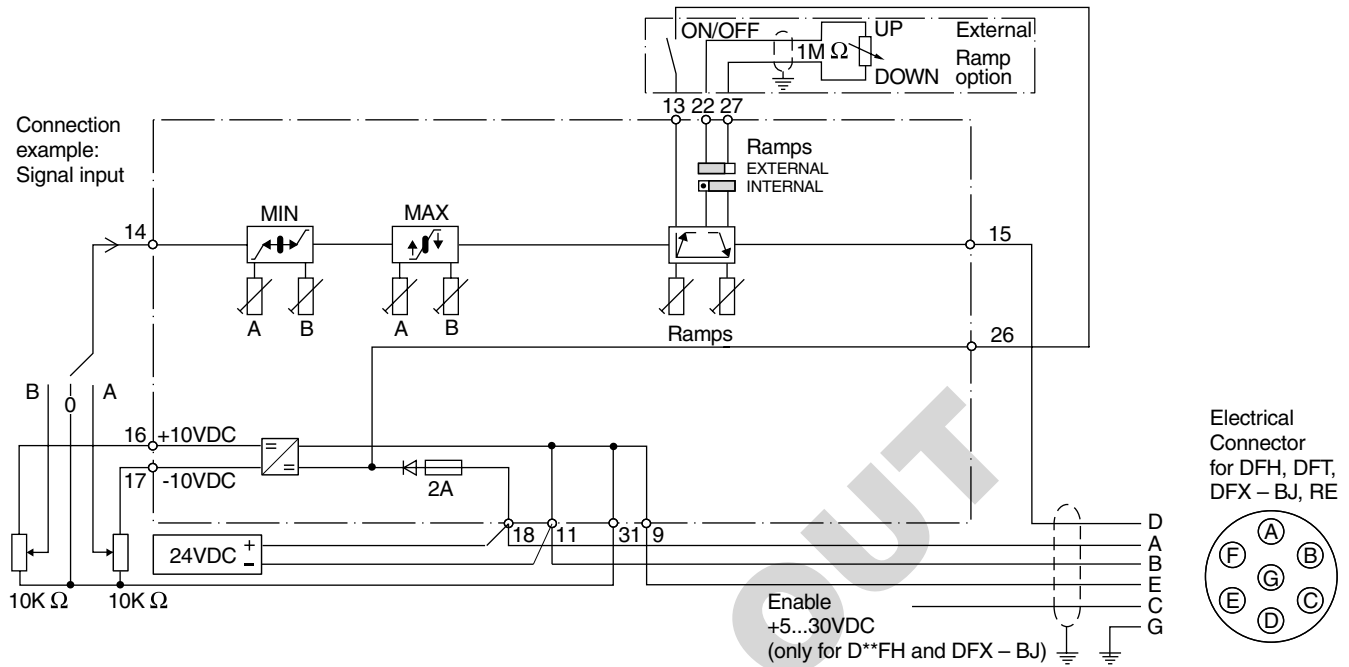
**For new applications:  
 EZ154: Refer to PZD00A-400**

### Ordering Information

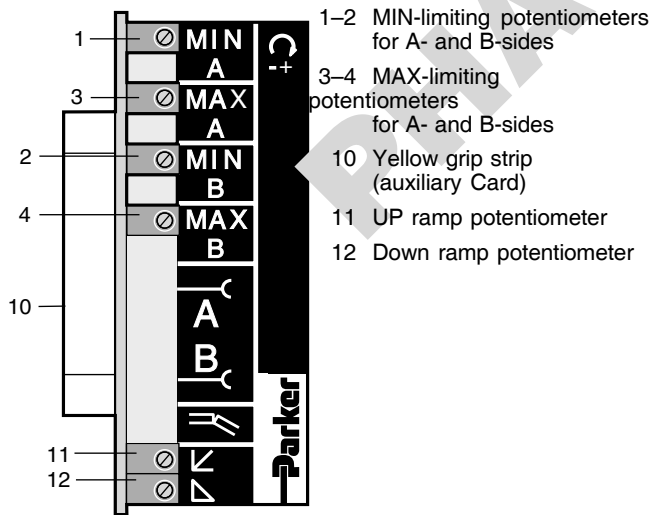


EZ154.p65, dd

**Block Diagram**



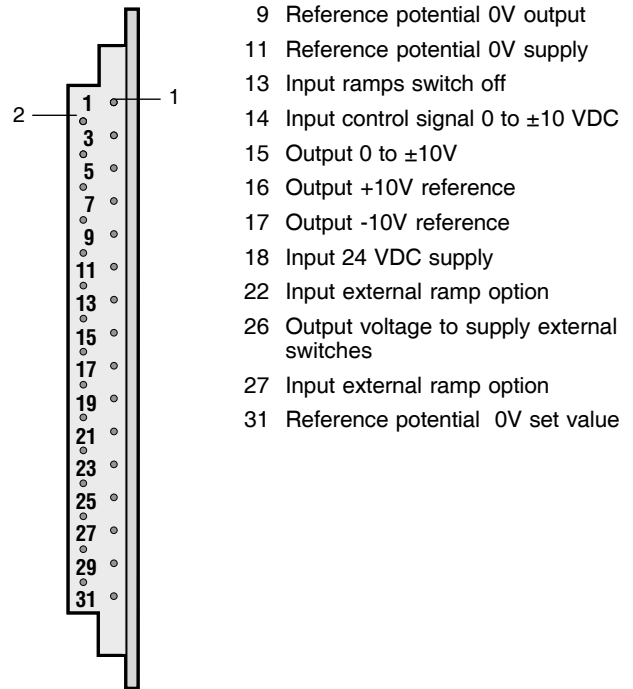
**Operating and Diagnostic Elements (Elevation A)**



**Note:**

- Always turn off the power to this board before removing it from the card holder.

**Connector (Elevation B)**



### General Description

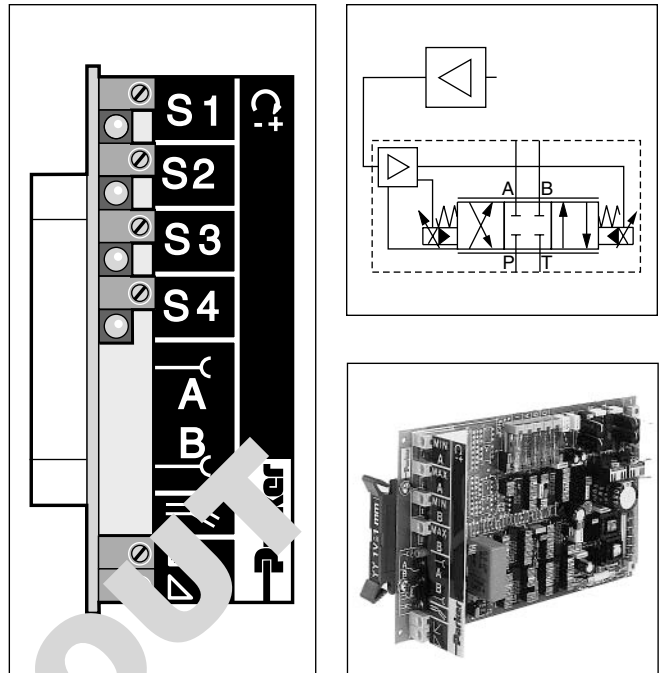
Series EZ155 electronic accessory module is a voltage command generator which can be used in conjunction with standard proportional valve control cards or directly with valves with integrated electronics. The module accepts up to 4 on/off input signals which select one of four voltage outputs set by potentiometer adjustments on the card. Two ramp adjustments provide control of actuator acceleration and deceleration.

### Features

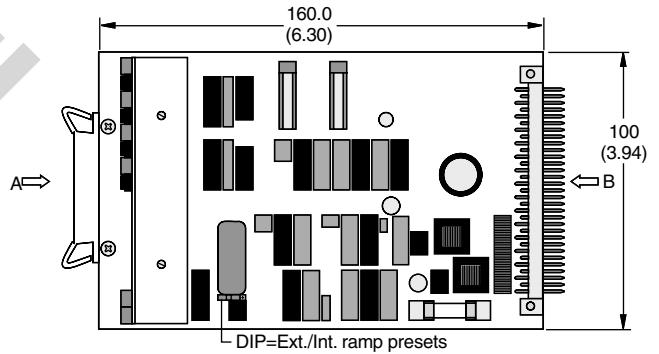
- Modulated output voltage by four selectable input values, adjustable from 0 to 100% and UP/DOWN ramp potentiometers.
- DIP-switch from internal ramp generation to external ramp setting.

### Specifications

<b>Connection</b>	31 Pole Male Connector, DIN 41617
<b>Power Supply</b>	Regulated: 18-26V Unregulated: 22-38V
<b>Power Required</b>	4 VA
<b>Command Signal</b>	0 to ±10 VDC
<b>Ramp Disable Voltage</b>	5 to 30 VDC
<b>Reference Outputs</b>	±10 VDC @ 10 mA
<b>Output Voltage</b>	0 to ±10 VDC
<b>Ambient Temp. Range</b>	0°C to +70°C (+32°F to +158°F), Standard Range
<b>Ramp Time</b>	0-5 seconds adjustable
<b>Shielded Cable Connection</b>	Supply connections: 0.5 sq. mm (20 AWG) Output and Command Signals: 0.5 sq. mm (20 AWG)
<b>Fuse</b>	2A medium lag, DIN 41571/5x20 mm

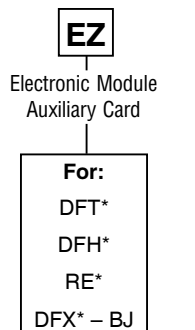


### Dimensions

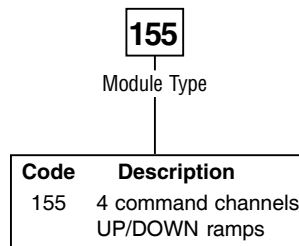


**For new applications:  
 EZ155: Refer to PZD00A-400**

### Ordering Information



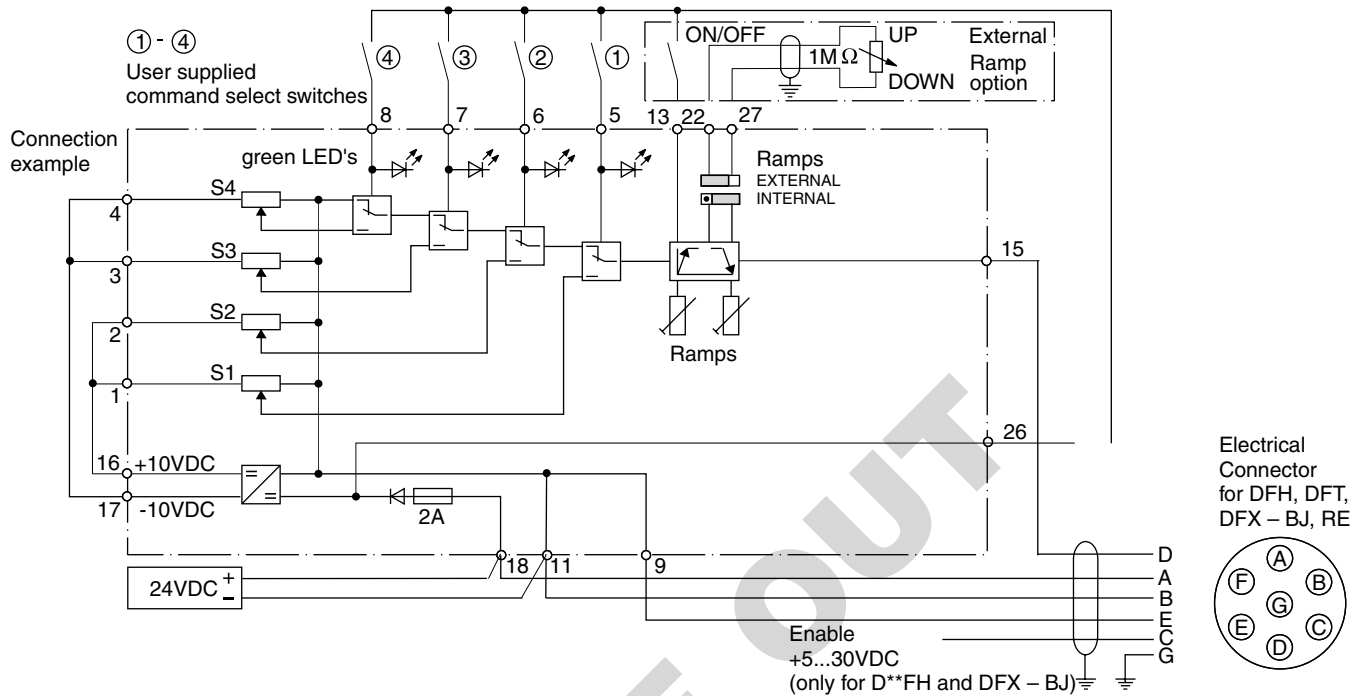
00



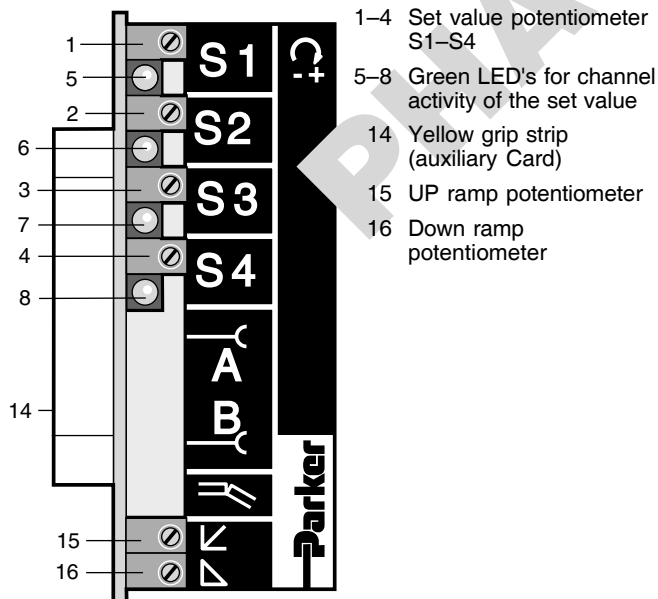
{ }  
{ }  
 Design Series  
 NOTE:  
 Not required when ordering.

\*with voltage input

**Block Diagram**



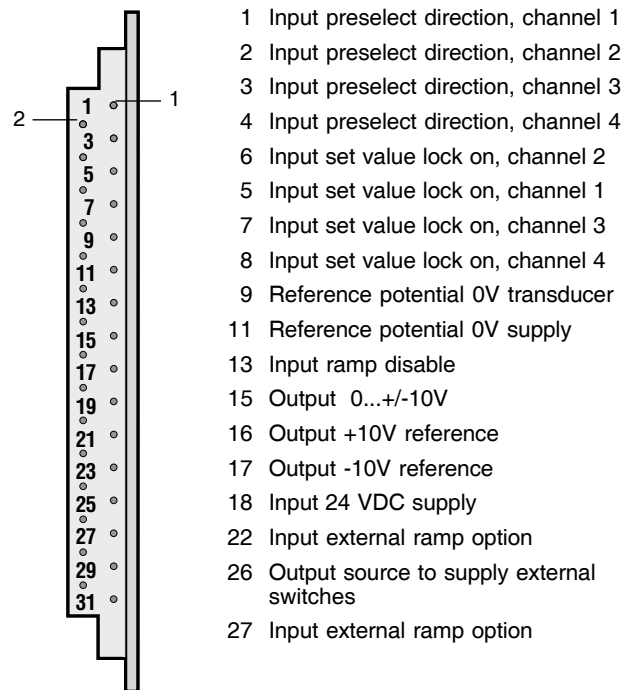
**Operating and Diagnostic Elements (Elevation A)**



**Note:**

- Always turn off the power to this board before removing it from the card holder.

**Connector (Elevation B)**



## General Description

Series EZ595 single loop servo amplifier is designed to enhance the performance of Parker Hannifin servo and proportional control devices in closed loop servo systems. The card has been designed to make servo loop tuning as straight forward as possible while retaining the essential dynamic compensation features of our more sophisticated servo amplifiers. The output of the EZ595 is a bipolar voltage signal scaled from 0 to  $\pm 10$  VDC. The card employs valve deadband control, as well as several logic and safety features to help optimize servo system design. It can be used as an input command to any of the following Parker EH control devices.

**D**

### Servo and Proportional Directional Control Valves:

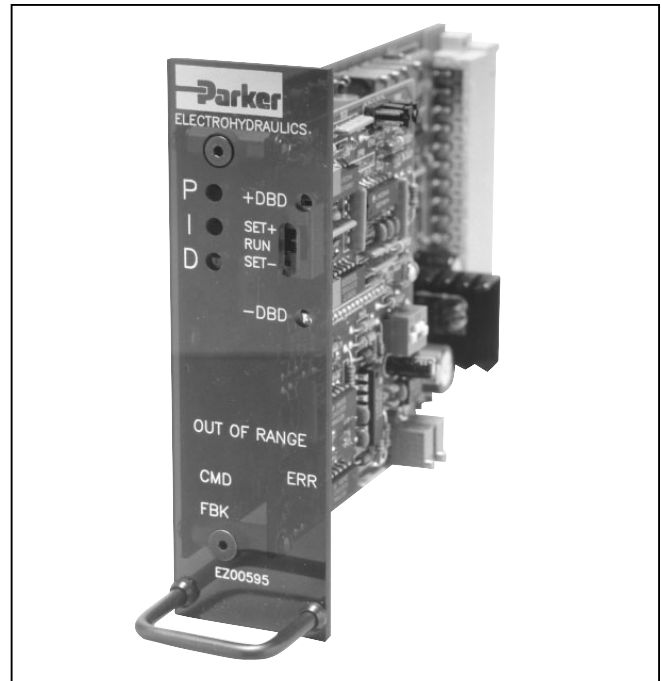
- D\*FH (with open loop on-board driver electronics)
- D1FX (with open loop on-board driver electronics)
- D\*FS (with PWDXXA-400 Driver)
- BD Series servovalve with BD101 Driver

### Proportional Flow Control Devices:

- TDA (with PCD00A-400 Driver)

## Specifications

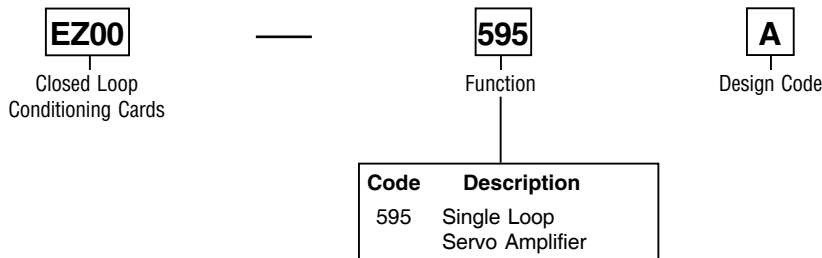
Power Supply Requirements	24 VDC @ 100 mA
Command Signal Range	$\pm 10$ VDC, 0 to 20 mA, 4 to 20 mA selectable
Feedback Signal Range	$\pm 10$ VDC, 0 to 20 mA, 4 to 20 mA selectable
Frequency Response	In excess of 1000 Hz
Output Signal Range	0 to $\pm 10$ VDC
Reference Voltage	$\pm 10$ VDC @ 10 mA
Input Impedance Command and Feedback	Voltage Input, 100K ohm Current Input, 499 ohm
Operating Temperature Range (Ambient)	0 to 70°C (32° to 158°F)
Mounting	DIN Style, 32 Pin, F
Protection Class	Open, not rated



## Features

- DIN rack mounted in 32 Pin form 'F' format.
- Optional voltage or current command and feedback signal compatibility.
- Differential input feedback amplifier circuit.
- $\pm 10$  VDC reference voltages @ 10 mA supplied for external pots.
- Out of range detection for command and feedback signals.
- LED front panel status indicators and diagnostics.
- PID gain control loop (user selectable).
- Separately adjustable gains for positive and negative output levels (for tuning with differential area cylinders).
- "Deadband eliminator" circuit to minimize electrical deadband in system due to spool overlap (Directional Valves) or coil threshold (Pressure Control & Throttle Valves).
- Buffered error signal read-out available for remote monitoring.
- Integrator shut-down feature selectable for low signal levels.

**Ordering Information**



**Accessories**

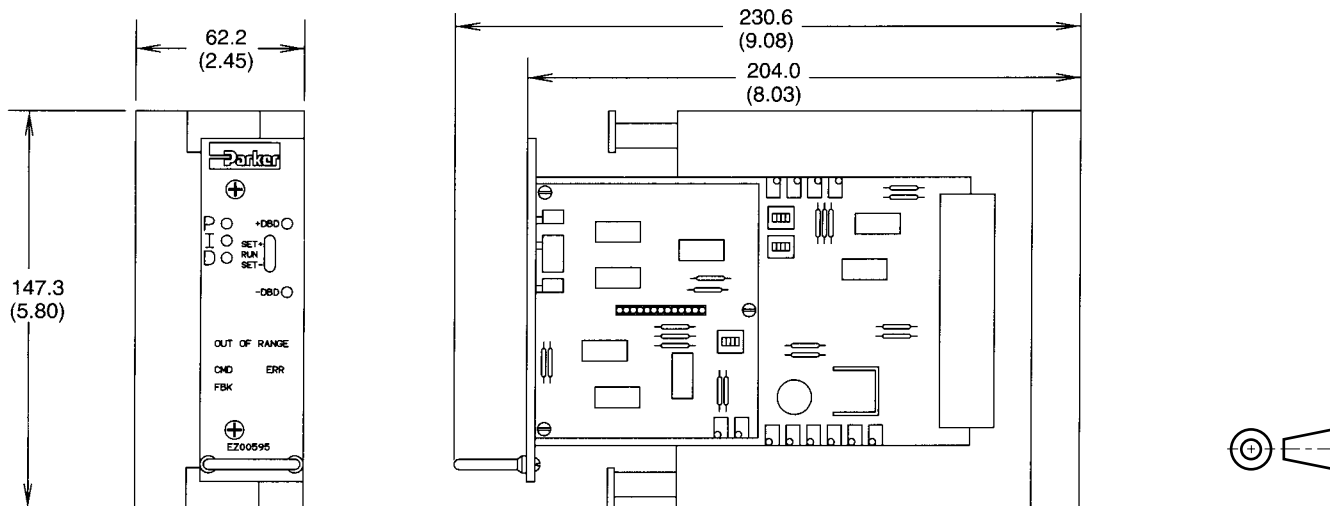
Code	Description
KH32F	32 Pin Card Holder
PS24	Power Supply, 24 VDC



**Dimensions**

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

Note: Board Dimensions w/o Cardholder  
 210 x 127 x 38mm (8.25" x 5" x 1.5")

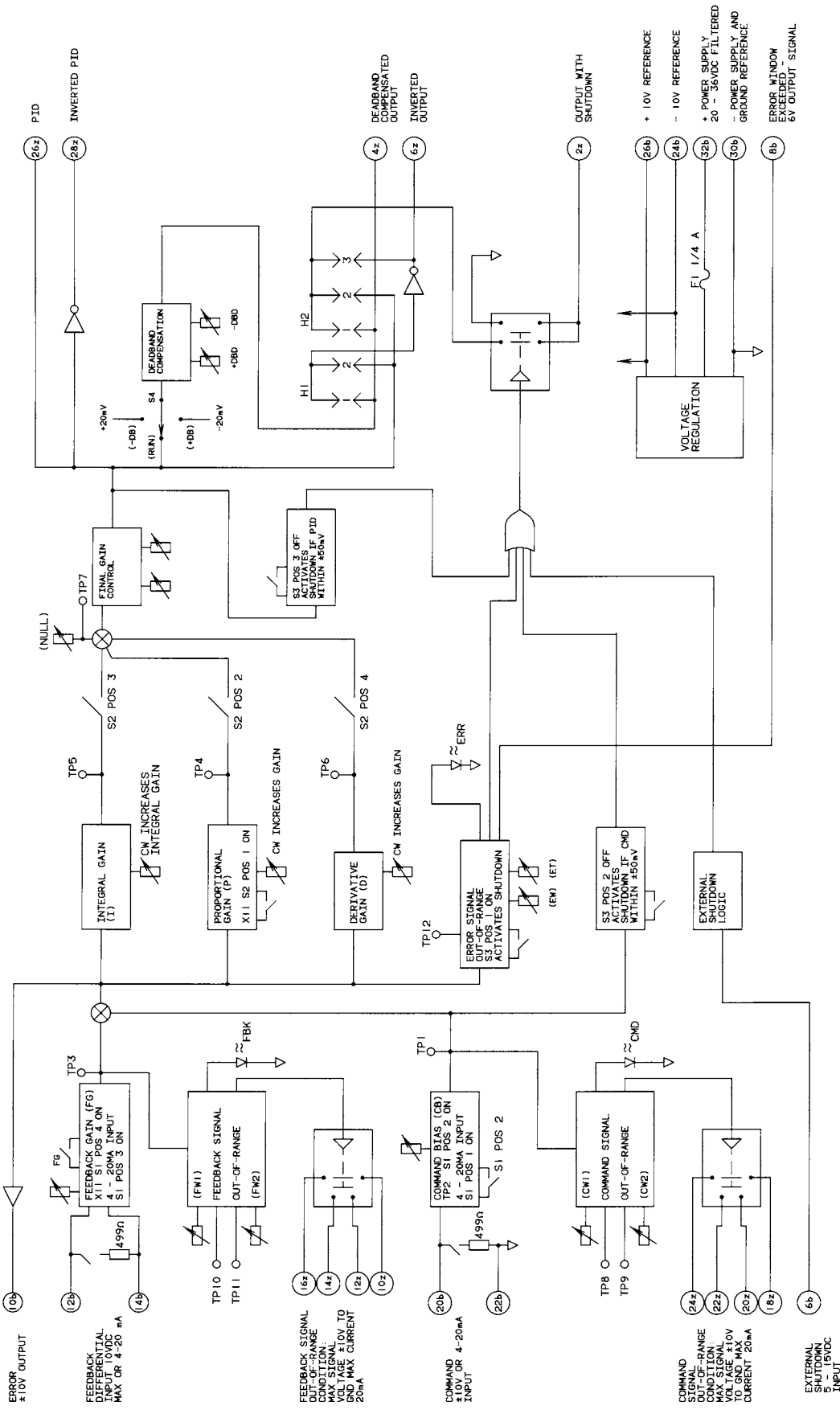


**Special Note**

It should be noted that, while the Parker single loop servo amplifier is designed to work with a wide range of control devices, these devices vary greatly in response characteristics and may be the limiting factors in total system performance. Careful analysis of your system requirements should be made prior to selecting any components for a closed loop system.

The successful design and startup of either a closed

loop positioning or velocity control system requires considerable forethought and a good understanding of the dynamics of the system and the load one is attempting to control. Closed loop feedback control is a broad topic and is the responsibility of the user to understand the limitations, hazards, and implications of these systems, as well as detailed tuning procedures required by some control schemes.



SPECIAL NOTE: CW ADJUSTMENT OF POTS INCREASES GAIN, COMPENSATION, AND ERROR LIMITS.



## General Description

Series BD101 is an accessory card designed to solve a variety of common system problems. It is available in both  $\pm 15$  VDC and 24 VDC versions.

This card can function as a current driver for the BD servo valves. Maximum current outputs of  $\pm 30$  mA,  $\pm 60$  mA,  $\pm 100$  mA and  $\pm 150$  mA are jumper configurable.

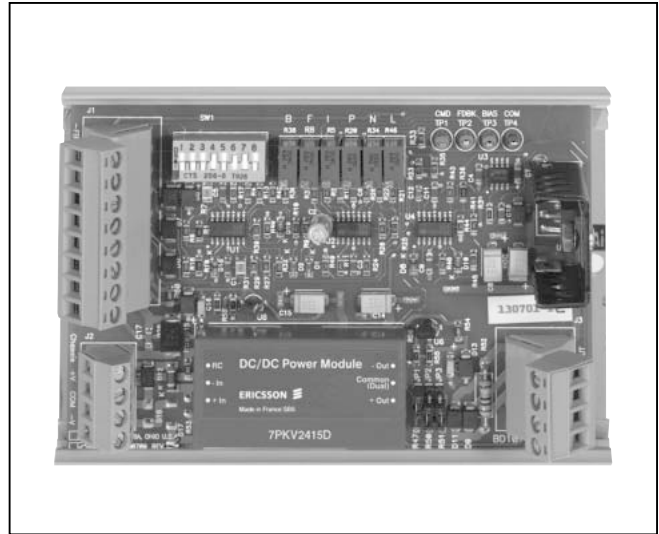
Closed loop options are switch selectable with integral and proportional control. Feedback scaling, input bias, and gain adjustments are provided. Outputs currents up to  $\pm 150$  mA or voltage output of  $\pm 10$  VDC are available.

Current command of  $\pm 20$  mA can be converted to  $\pm 10$  VDC.

**D**

## Features

- Open loop current driver for up to  $\pm 150$  mA.
- $\pm 20$  mA input to  $\pm 10$  VDC output option.
- Closed loop option with proportional and/or integral control.
- $\pm 10$  VDC reference voltages available.
- Available in  $\pm 15$  VDC and +24 VDC versions.
- Differential inputs provide better noise immunity.
- Scaling and bias available on input signals.



## Specifications

<b>Power Supply Input</b>	BD101-15 $\pm 15$ VDC @ 200 mA BD101-24 24 VDC Nominal (22-28 VDC) @ 250 mA
<b>CMD and FDBK Inputs</b>	Differential Inputs $\pm 10$ VDC max. 100K ohm input impedance
<b>Current</b>	$\pm 20$ mA max switch configurable 499 ohm input impedance
<b>Reference Voltages</b>	$\pm 10$ VDC @ 10 mA
<b>Current Output</b>	$\pm 30$ mA, $\pm 60$ mA, $\pm 100$ mA, or $\pm 150$ mA Fixed up to $\pm 150$ mA Adjustable Icoil Rcoil $\leq 12.5$ V
<b>Voltage Output</b>	$\pm 10$ VDC @ 10 mA 1000 ohm output impedance
<b>Operating Temperature Range (Ambient)</b>	BD101-15: 0°C to 70°C (32°F to 158°F) BD101-24: 0°C to 70°C (32°F to 158°F) ( $\leq 100$ mA load) 0°C to 55°C (32°F to 131°F) (> 100 mA load)
<b>Size</b>	82.6mm (3.25") wide x 127mm (5.00") long x 38.1mm (1.5") high
<b>Mounting</b>	Snap-Trac Parker PN 830007-5.25

**Ordering Information**

**BD**  
 Signal  
 Conditional Card

**101**  
 Style

Power Supply

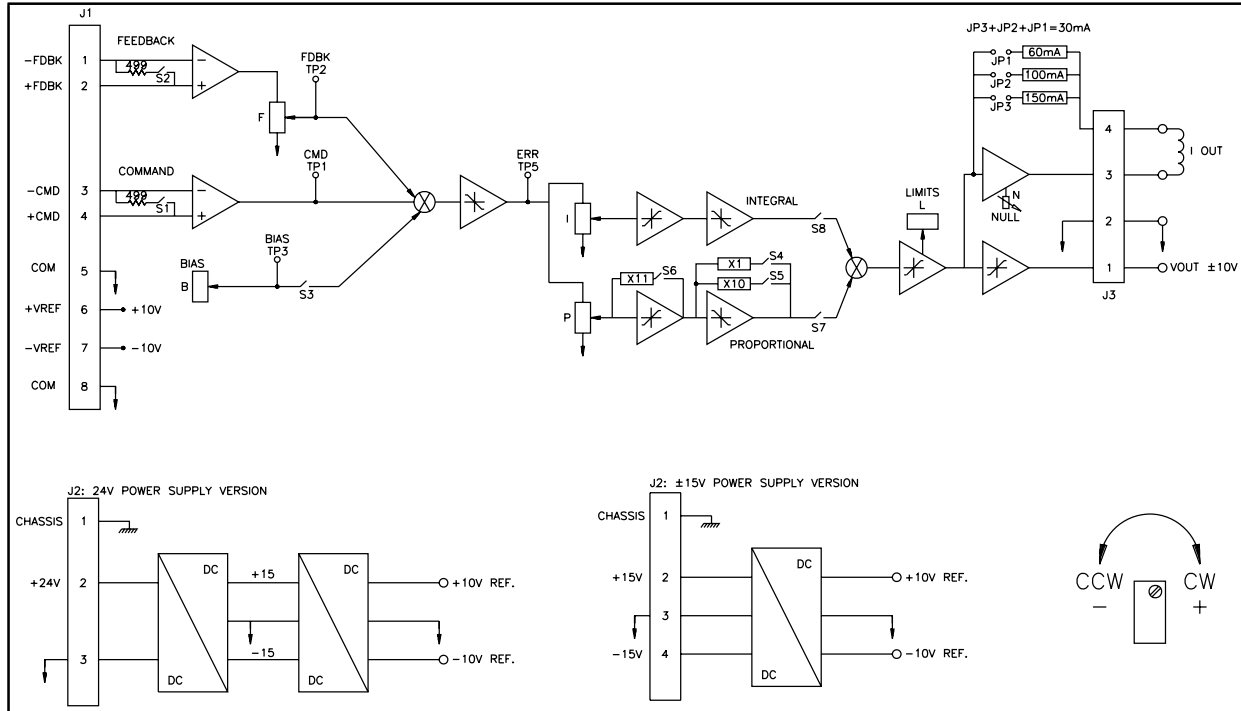
Design  
 Series

NOTE:  
 Not required  
 when ordering.

Note: Snap-Trac is included with delivery

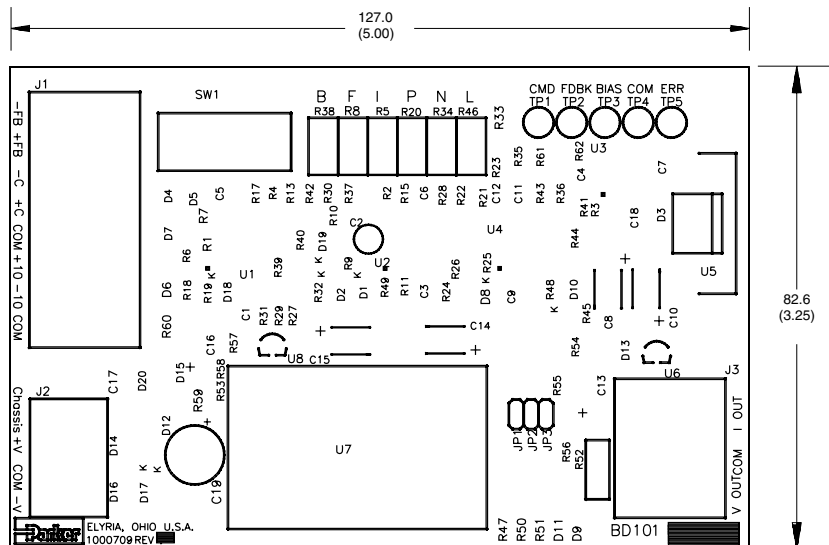
Code	Description
15	±15 VDC @ 200 mA
24	24 VDC nominal

**Functional Block Diagram**



**Dimensions**

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



BD101.p65, dd



**General Description**

Series PS15 power supplies convert AC input power to a filtered and regulated  $\pm 15$  volt and +5 volt DC output voltage. PS series power supplies are UL recognized and meet CSA standards.

These power supplies provide the power necessary to operate the following Electrohydraulic products:

- BD95, BD101-15
- Magnetostrictive transducers

**Operation**

Connect the supplied 5 ohm, 10 watt resistor across the +5 VDC output and common terminals (V1 and G1) if the 5 volt supply is not in use or the +5VDC load current is less than 750 ma.

**Specifications**

Input Power Requirements			
Voltage	85–132 VAC, 47–440 Hz, single phase		
Current	2.2 amps		
Inrush Current	25 amps		
Output Power Specifications			
Voltage	+15VDC	-15VDC	+5VDC
Maximum Current	1.2A	0.5A	5.0A
Voltage Regulation	$\pm 1\%$		
Maximum Power	50 watts		
Start-up Time	100 ms		
Efficiency	70%		
Operating Temp./ Humidity	0°C to +50°C (+32°F to +120°F), 30% - 90% RH		
Storage Temp./ Humidity	-20°C to +75°C (-4°F to +170°F)		
Physical Characteristics			
Size	36.0 x 176.0 x 93.0 (1.42" x 6.93" x 3.66")		
Mounting	Slotted mounting holes, or use tapped holes. Both 8–32 UNC or M4 size holes are provided. Mounting screws should not exceed 6mm.		

**Ordering Information**

**PS**

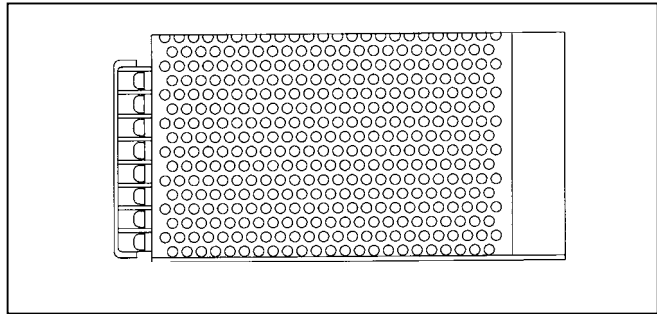
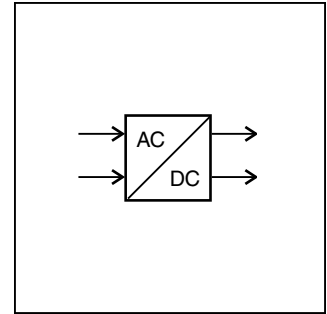
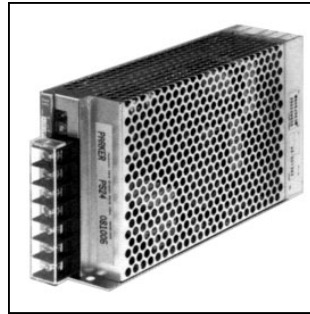
Power Supply

**15**

Voltage Output

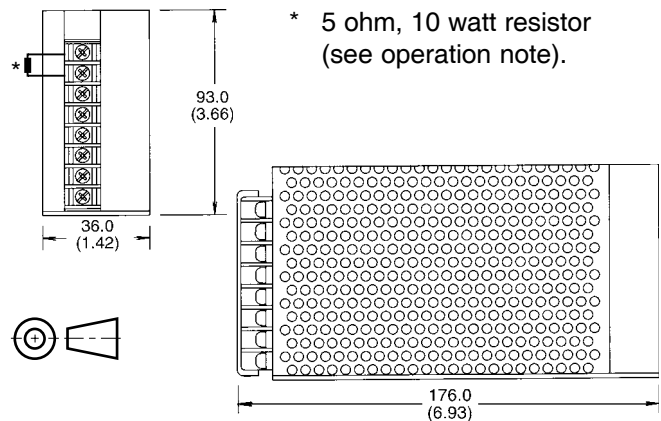
Code	Description
15	$\pm 15$ VDC Power Supply

Weight: 1.2 kg (5.1 lbs)



**Dimensions**

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



**Connector - Pinout**

- V1 ○ +5 VDC Output
- G1 ○ +5 VDC Common
- V2 ○ +15 VDC Output
- G2 ○  $\pm 15$  VDC Common
- V3 ○ -15 VDC Output
- FG ○ AC Ground
- L ○ AC Hot
- N ○ AC Neutral

**General Description**

Series PS24 power supplies convert AC input power to a filtered and regulated 24 volt DC output voltage. PS series power supplies are UL recognized and meet CSA standards.

These power supplies provide the power necessary to operate the following Electrohydraulic products:

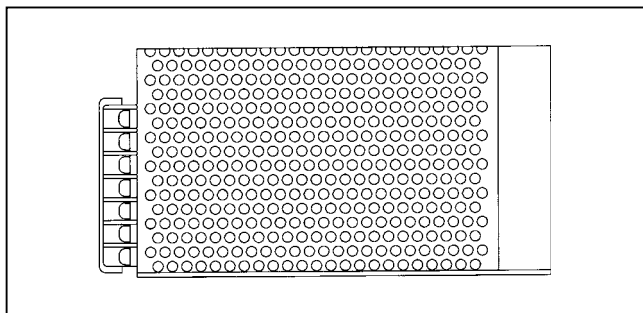
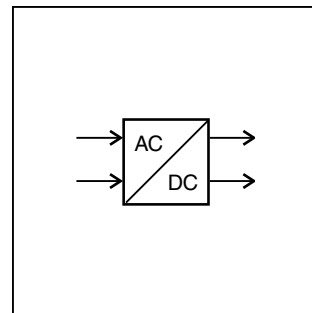
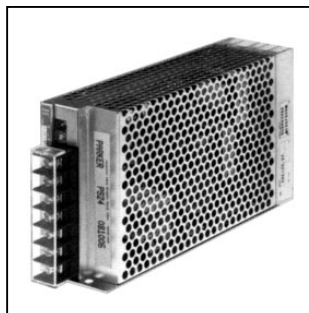
- D\*FT, D\*FX, D\*FL, D\*FH and RE\* valves
- EW, ED, ET and EZ driver cards

**Operation**

The PS24 power supplies have “sense” inputs to compensate for voltage drops due to long cable runs. A separate set of wires connected to the “S” terminals read the voltage at the load and direct the power supply to adjust the output voltage. Factory installed jumpers between the sense and power terminals should be removed when using this feature.

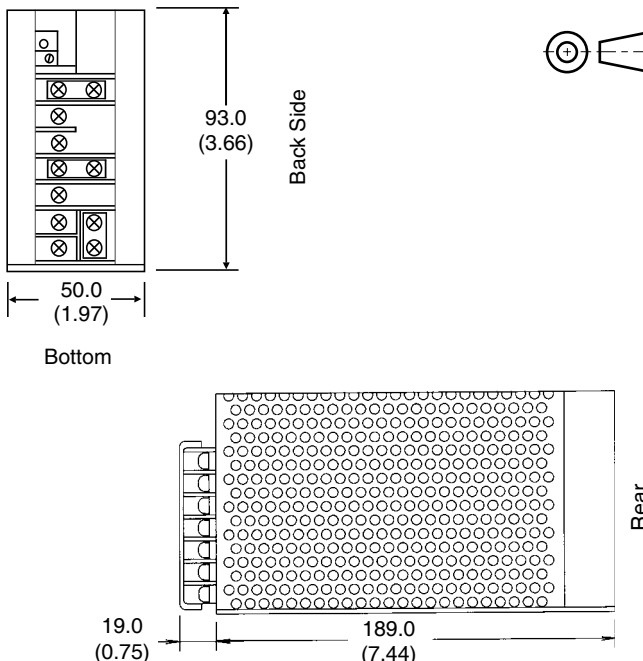
**Specifications**

Input Power Requirements	
<b>Voltage</b>	85–132 VAC, 47–440 Hz, single phase
<b>Current</b>	2.2 amps (110V), 1.2 amps (220V)
<b>Inrush Current</b>	25 amps (110V), 30 amps (220V)
Output Power Specifications	
<b>Voltage</b>	24 VDC, (adjustable range, 21.6 to 26.4 VDC) set to 24 VDC at the factory.
<b>Maximum Current</b>	4.5 amps maximum
<b>Voltage Regulation</b>	±.4%
<b>Maximum Power</b>	108 watts
<b>Start-up Time</b>	200 ms
<b>Efficiency</b>	84%
<b>Operating Temp./ Humidity</b>	-9°C to +49°C (+15°F to +120°F), 30% - 90% RH
<b>Storage Temp./ Humidity</b>	-20°C to +85°C (-4°F to +185°F) 20% - 90% RH
Physical Characteristics	
<b>Size</b>	50.0 x 208.0 x 93.0 (1.97" x 8.19" x 3.66")
<b>Mounting</b>	M4 tapped mounting holes; 2 located on back side, and 3 on bottom.



**Dimensions**

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



**Ordering Information**

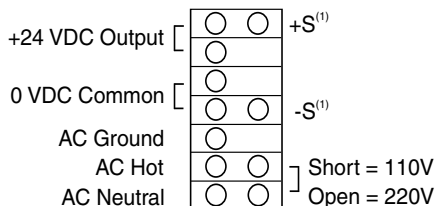
**PS**  
Power Supply

**24**  
Voltage Output

Code	Description
24	24 VDC, 4.5 amp, Power Supply

**Weight:** 1.2 kg (5.1 lbs)

**Connector - Pinout**



(1) Refer to Operation

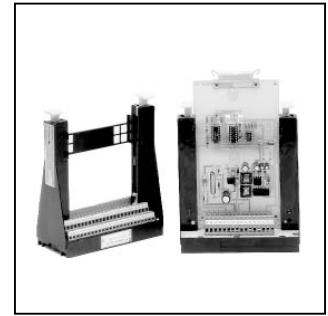
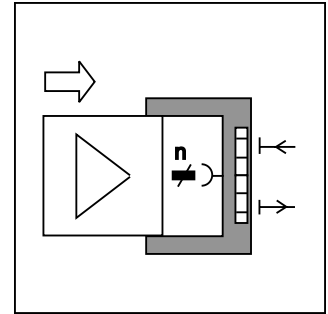
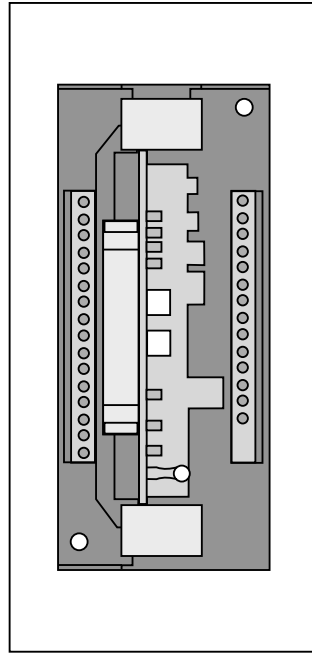


**General Description**

Card holders allow easy assembly and wiring of individual electronic driver card models EW, ED, EZ, and ET.

**Technical Data**

<b>Base-unit</b>	Fastened with screws or DIN rails 35mm
<b>Printed circuit board</b>	Carries the female connector and connection component for the terminal strip
<b>Terminals</b>	Screw terminals per DIN 41617 with wire prot. nominal cross-section AWG11, 5mm pitch
<b>Female connector (per order code)</b>	31 pole to DIN 41617, double row contacts.  15-, 48-, 96 pole to DIN 41612, 2 or 3 rows of contacts



**Ordering Code**

**K Card Holder**

For Driver card models:  
 EW 101, 102, 104  
 ED 101, 102, 104  
 ET 101, 102, 104, 105  
 EZ 150, 154, 155, 305

**Ordering Code**

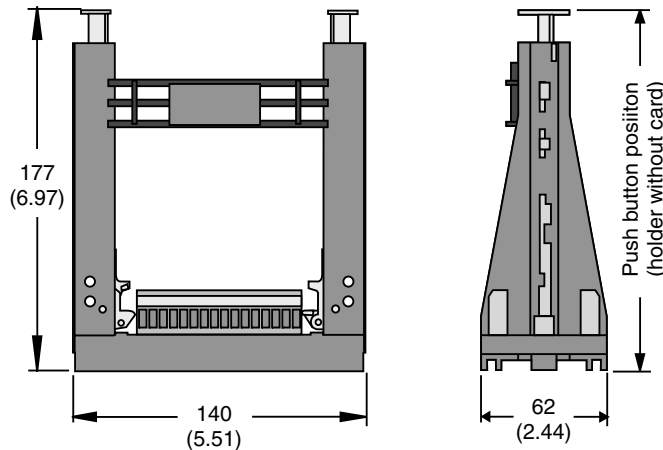
**KH32F**

For Driver card models:  
 ET 154  
 EZ 595

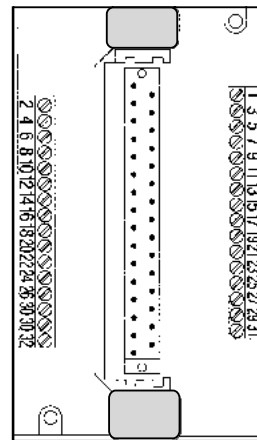
**Weight:** 0.5 kg (1.0 lbs)

**Dimensions**

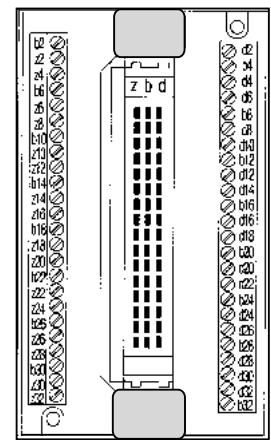
Inch equivalents for millimeter dimensions are shown in (\*\*)



**Terminal Locations**



Model K



Model KH32F

**Contents**

---

<b>Series</b>	<b>Description</b>	<b>Page</b>
PMC10 .....	Single Axis Motion Controller – Programmable .....	E2 - E4
PMC20 .....	Two Axes Motion Controller – Programmable .....	E2 - E4

PHASE OUT

**E**

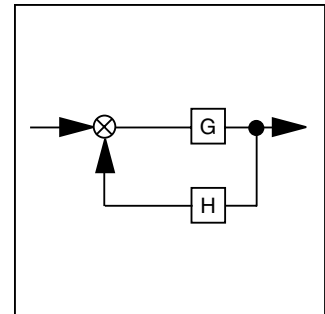
**Consult Factory**

## General Description

The PMC series digital closed loop motion controllers are available in one and two axes configurations, and can be ordered with either encoder or magnetostrictive feedback sensor interfaces. The PMC series controllers are stand-alone motion controllers requiring no additional components to implement up to two closed loop motion control axes per controller. Dual axes controllers can be programmed to operate either axis independently, coordinate both axes, or gear one axis to another.

A user friendly interface including a keypad and display are used to enter program steps, setup control parameters, monitor performance, and provide access to all available control functions.

The PMC motion controllers' output drivers can be configured to directly drive servo valves with current, or proportional valve interface electronics with voltage.



- #1 WAIT TIL INPUT 1
- #2 ACCEL 10.0 IN/SS
- #3 VELOCITY 5.0 IN/S
- #4 POSITION 22.0 IN
- #5 WAIT IN POS
- #6 END

## Features

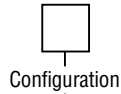
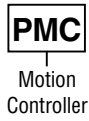
- Stand alone digital motion controller.
- One or two control axis versions available.
- Optional interfaces for encoder or magnetostrictive feedback transducers.
- User friendly programming interface.
- Natural language programming commands such as 'WAIT', 'REPEAT', 'RAMP'.
- Up to 8 programs per axis can be stored internally.
- Independent, interlocked or geared axes options.
- Programmable digital I/O: 10 inputs, 12 outputs.
- Valve output drivers can be set for current or voltage.

## Specifications

<b>Processor</b>	16-bit 80188 CPU
<b>Encoder Feedback Interface</b>	+5 or +12 VDC bipolar or unipolar; quadrature with marker; max. input rate =.5 mHz; software scaling for 1x, 2x or 4x.
<b>Magnetostrictive Feedback Interface</b>	Pulse width modulated with external interrogation (Temposonics or equivalent) (1)
<b>Control Algorithm</b>	Proportional, integral, derivative (PID), dbl. derivative (acceleration), and feed forward loop compensations — 2ms loop update time
<b>Servo Output</b>	Jumper selectable: ±10VDC differential, 0 to +10VDC, and ±5VDC single ended or differential, and ±50 mA. Other current outputs available by request.
<b>Input/Output</b>	14 input and 5 output dedicated functions; 10 inputs and 12 outputs user programmable; optical isolation – 7500 V
<b>Operator Panel</b>	20-key pad with 3 software-defined function keys
<b>Display</b>	4 lines by 16 character backlit LCD
<b>Serial Interface</b>	RS232, RS485 for 8 units in a multi-drop network, each with its own ID
<b>Power Requirements</b>	117 VAC ±10% (220 VAC available) 60 Hz, 1 amp continuous, 5 amp – inrush
<b>Operating Environment</b>	0°C to +50°C (+32°F to +122°F); 10% to 90% humidity, non-condensing
<b>Weight</b>	3.4 kg (7.5 lbs.)

(1) Temposonics is a trademark of MTS Corporation

**Ordering Information**



NOTE:  
 Not required  
 when ordering.

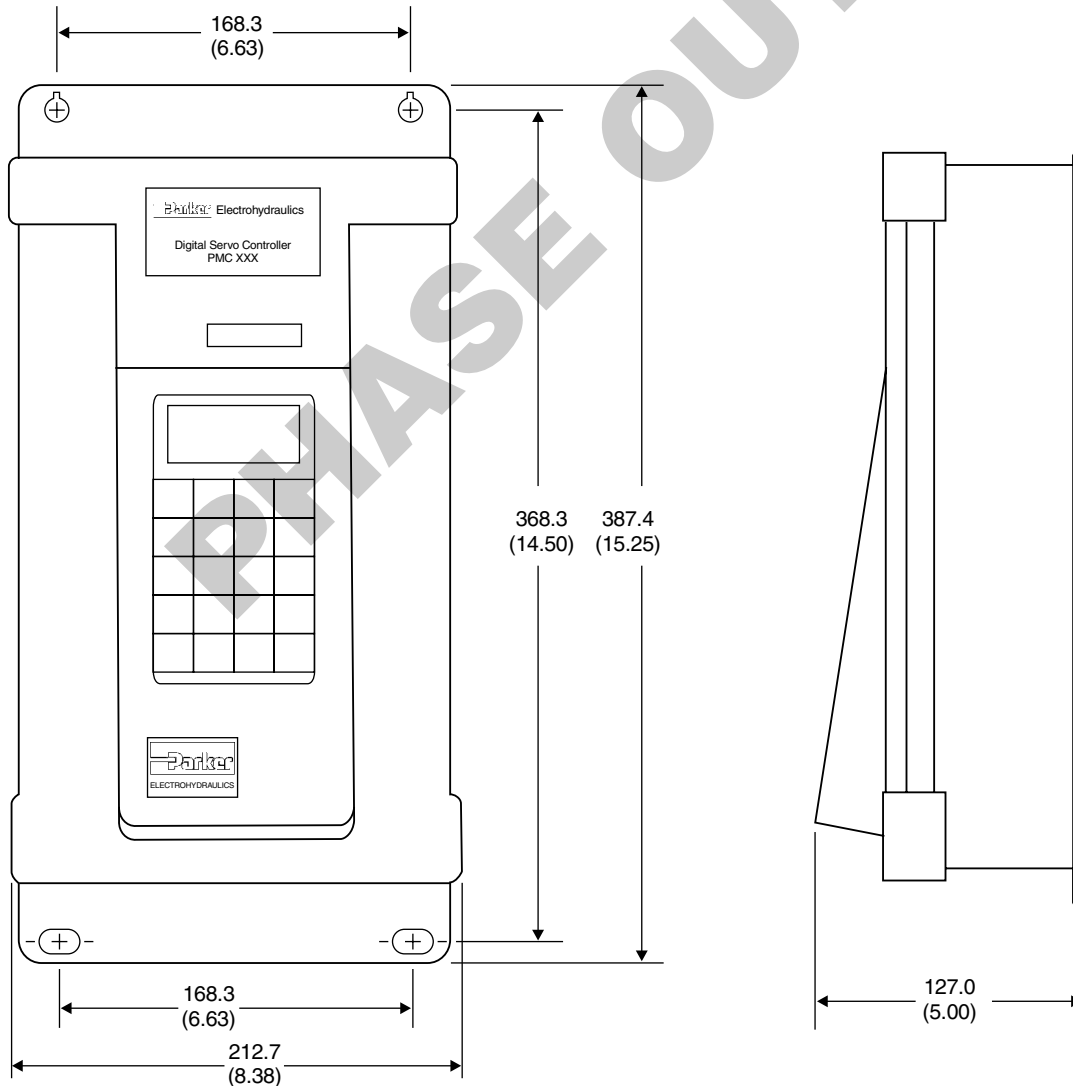
Code	Description
10T	Single Axis, Temposonics Feedback
20T	Dual Axis, Temposonics Feedback
10E	Single Axis, Encoder Feedback
20E	Dual Axis, Encoder Feedback
RK	Remote Kit

**Weight:**

PMC10T	3.4 kg (7.5 lbs.)
PMC20T	3.4 kg (7.5 lbs.)
PMC10E	3.4 kg (7.5 lbs.)
PMC20E	3.4 kg (7.5 lbs.)
RK	3.4 kg (7.5 lbs.)

**Dimensions**

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



**PMC10T/20T**





## Operation

A PMC series controller can be used in the following ways:

- Independently, as a stand-alone control system. In this mode, the controller can be programmed from the on-board keypad. The stored programs can then be run from the keypad or by an external switch or relay control. In addition, direct operator control is possible. An axis may be jogged or stepped from the keypad.
- With digital I/O connections to an external PLC (programmable logic controller). In this mode, stored programs are selected and started by the PLC. The PLC also has the ability to interact with the running program via the digital inputs and outputs.
- Integrated through the serial interface into a multiple controller system. In this mode, up to eight PMC controllers can be connected to a host device (such as a personal computer or PLC) for two-way communications.

## Interfacing

### Transducer Interface – Temposonics <sup>(1)</sup>

Each Temposonics transducer interface is designed to work with a 15 V Temposonics transducer. Each interface provides connections for plus and minus interrogate signals, plus and minus gate signals, +15 VDC, +5 VDC, and a ground for the shielded connections, all on one terminal strip.

## Digital I/O

The PMC provides 20 inputs and 16 outputs, which can be operated on internal or external power. The 20 inputs include the following:

<b>Run X</b>	Starts the currently selected program for Axis X.
<b>X Select 1, 2 and 4</b>	Selects a program for Axis X.
<b>Run Y</b>	Starts the currently selected program for Axis Y.
<b>Y Select 1, 2 and 4</b>	Selects a program for Axis Y.
<b>Interlock</b>	If off, stops the running program(s) and disables both axes.
<b>Access</b>	If off, allows operator to establish presets, run and monitor programs, but prevents operator access to programming and setup functions.

The remaining 10 inputs are user programmable. They can be used to tie external events to a running program. For example, if a “move next distance” switch for Axis X is connected to Input 1, then the program instruction WAIT TIL INPUT 1 can be used to make the running program stop at this point and wait for an operator response.

The PMC provides 16 outputs, including the following:

<b>X Ready</b>	Indicates that the X axis is not running a program and is clear of errors.
<b>Y Ready</b>	Indicates that the Y axis is not running a program and is clear of errors.
<b>Status</b>	Indicates that there are no errors on any axis. Twelve outputs are user programmable. They can be used to tie external events to a running program. For example, if Output 10 is connected to an LED, then the axis is at or beyond the specified position.

## Transducer Interface – Encoder

Each encoder transducer interface is designed to work with an incremental encoder requiring either +5 VDC or +12 VDC. The encoder may have either TTL or differential outputs. Each interface provides connections for A+, A-, B+, B-, Marker+, Marker-, +5 VDC (or +12 VDC) and a ground for the encoder, all on one terminal strip.

## Servo Interface

Each servo interface can be independently configured to drive current or voltage outputs. Jumper selectable configurations are ±10VDC differential, 0 to +10VDC and ±5VDC sgl. ended or differential, and ±50 mA. Other current outputs available by request.

## Communications

### Serial Communications

The standard RS232 serial interface allows programs and setup data to be sent to a printer or transferred to or from a personal computer or other external device. Alternatively, the RS232 interface allows two-way communications with an external host, such as a personal computer.

The RS485 serial communications mode (jumper selectable) allows a multi-drop configuration using a host plus up to eight PMC controllers, controlling up to 16 axes.

(1) Temposonics is a trademark of MTS Corporation

**Contents**

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<b>Description</b>	<b>Page</b>
<b>Installation Guides</b> .....	F4
<b>Accessories</b> .....	F2 - F4
EHC Cable Assemblies .....	F2
Connectors .....	F3
Bolt Kits/Subplates .....	F4

**F**

**General Description**

Supporting accessory products for proportional valves listed in this section include cable assemblies, connectors, bolt kits, and subplates. Valve drivers and power supplies can be found in the electronics section.

EHC cable assemblies are listed for specific valves, by function, and are supplied with an installed connector as specified at one end, pig-tails leads at the other.

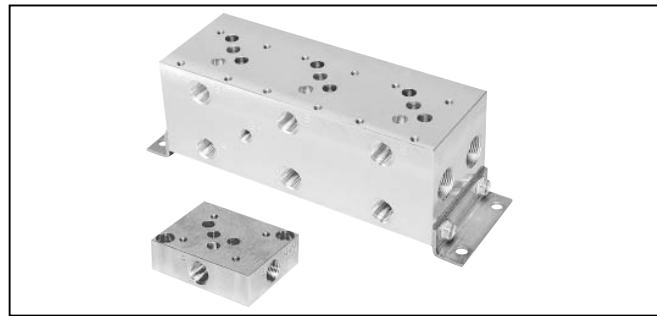
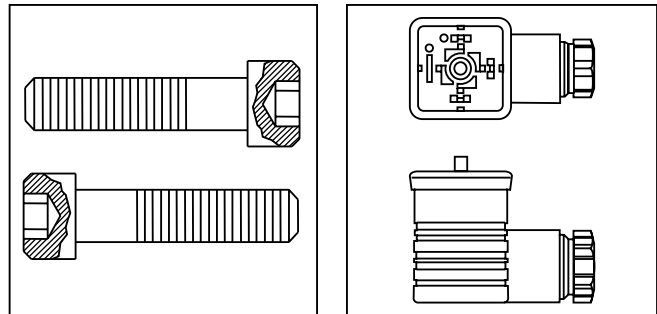
Note that all valves are not shipped with a mating connector. Mating connectors are listed by valve application.

Bolt kits and subplates are listed by valve application. Refer to catalog 2543/USA: Subplates and Manifolds for more options.

Installation guides are listed in this section for supplemental application information.

**Electronic Accessories**

Refer to the Electronics section for valve driver electronics, power supplies and accessories.



**EHC Cable Assemblies**

Valve Application	Connector		Function (3)	Model
	Option (1) (2)	Pins		
D*FH D*1FH D*FP D*FX ('B' ele. option) D*6FH	CE compliant, 'MS' style (Preferred)	7	Primary cable assembly	EHC158GE
D*FT D*1FT RE**T RE06*T	Plastic	7	Primary cable assembly	EHC158G
D*FX ('C' and 'D' ele. option)	'MS' Style	6	Primary cable assembly	EHC158
D*FL	Environmental 'MS' style	4	Power cable	EHC154LR
	Environmental 'MS' style	6	Logic I/O	EHC156R
	CE compliant 'MS' style	4	Power cable	EHC154LRE
	CE compliant 'MS' style	6	Logic I/O	EHC156RE
BD, DY	'MS' style	4	Primary cable assembly	EHC154S

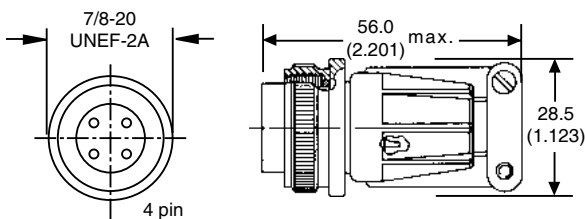
- Notes: (1) CE compliant connectors are environmental resistant. Plastic and standard 'MS' style are not.  
 (2) CE compliant cable assemblies must be used to meet CE, RFI and EMC susceptibility and emissions regulations.  
 (3) Cable length: 4.5 meters (15 feet) standard. Additional length options available, see price list.

**EHC Cable Assemblies Wire Color Assignments**

Pin	Cable Model – Wire Color					
	154LR 154LRE	156R 156RE	158	158G	158GE	154S
A	Red	Black	Orange	Red	Red	Black
B	Green	Red	Blue	Black	Black	Red
C	Black	White	Black	Yellow	Red/Bl	Green
D	White	Green	Grn/Yel	Blue	Blue	White
E	–	Orange	Red	Orange	Orange	–
F	–	Blue	White	White	White	–
G	–	–	–	Green	Green	–

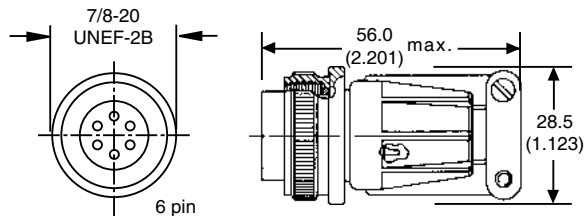
accessories.p65, dd

**Power Connector — D\*FL**



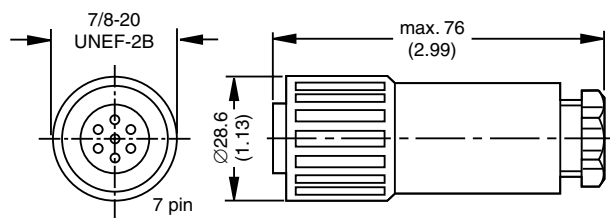
Description	Order Number
4 pin	1210292

**I/O Connector — D\*FL**



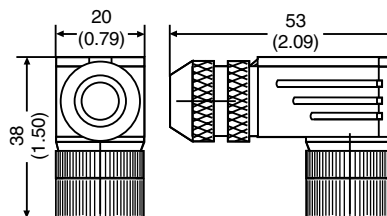
Description	Order Number
6 pin D*FL	MS3106E-14S-6S
Rubber Boot	801227
6 pin D*FX (ele. design A, C & D)	697561

**Primary Connector —  
 D\*FT, D\*FX (Ele. Design 'B'), D\*FH, D\*FM,  
 RE06\*T and RE\*\*T**



Description	Order Number
DIN 43563 6+PE	5004072

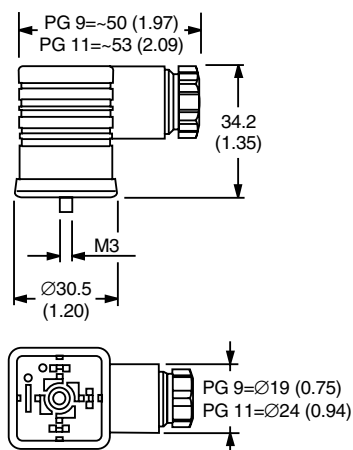
**LVDT Connector — D\*1FS**



Description	Order Number
M12 / 5 pin	5004109



**Solenoid Connector**



Description	Variation	Order Number
DIN 43650	Black	692914
DIN 43650	Grey	692915

Interface	Valve	Bolt Kit	Qty	Size	Subplate <sup>(1)</sup>	Port Size	Port Location
NG6 CETOP 3	D1F*	BK209	4	10-24 x 1.25"	SPD23NS35	3/8" NPTF	Bottom
		BK375	4	M5 x 30mm	SPD23NAS35	3/8" NPTF	Side
	RE06	BK210	4	10-24 x 1.875"	SPD26SS35 SPD26SAS35	#12 SAE #12 SAE	Bottom Side
NG10 CETOP 5	D3F*	BK98	4	1/4-20 x 1.625"	SPD31V6NS35	3/4" NPTF	Bottom
		BK385	4	M6 x 40mm	SPD31V6NAS35	3/4" NPTF	Side
					SPD31V6SS35	#12 SAE	Bottom
					SPD31V6SAS35	#12 SAE	Side
	D31F*	BK02	4	1/4-20 x 1.5"	SPD31V6NS35	3/4" NPTF	Bottom
		BK385	4	M6 x 40mm	SPD31V6NAS35 SPD31V6SS35 SPD31V6SAS35	3/4" NPTF #12 SAE #12 SAE	Side Bottom Side
D36F*	BK03 BK439	6 6	1/4-20 x 1.5" M6 x 40mm	1402190	#16 SAE	Side	
NG16 CETOP 7	D41F*	BK160	4	3/8-16 x 2.5"	SPD46SA	#12 SAE	Side
			2	1/4-20 x 2.25"			
		BK320	4	M10 x 60mm			
			2	M6 x 55mm			
	D46F*	BK153 BK440	6 6	3/8-16 x 2.0" M10 x 50mm	1402191	#20 SAE	Side
NG25 CETOP 8	D81F* D91F*	BK228	6	1/2-13 x 3"	SPD66NS35	3/4" NPTF	Bottom
		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
	D96F*	BK227 BK462	6 6	1/2-13 x 2.5" M12 x 60mm	1402192	#24 SAE	Side
NG32 CETOP 10	D111F*	BK150	6	3/4-10 x 3.5"	SPD1010N35	1 1/4" NPTF	Bottom
		BK386	6	M20 x 90	SPD1012N35	1 1/2" NPTF	Bottom

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

**Note:** All subplates listed use SAE mounting bolt hardware. Refer to catalog HY14-2543/US for metric options.

## Installation Guides

Valve	Installation Guide	Valve	Installation Guide	Valve	Installation Guide
BD15/30	Cat 1450 ISM	D111FS	Bul. 2562-M4/USA	D1FL	Bul. 2589-M2/USA
BD90/95	Bul. IG 1463-000/USA	D1FW	Bul. HY14-2563-M1/US	D3FL	Bul. 2589-M3/USA
BD101	Bul. HY14-1484-M1/US	D3FW	Bul. 2572-M1/USA	D*FM and D*FH	Bul. HY14-2599-M1/US
EW**104D	Bul. 2558-000/USA	D**FT	Bul. 2580-M1/USA	PCD00A	Bul. HY11-3236-M1/UK
EZ00595	Bul. IG 2561-000/USA	D1FX	Bul. 2583-M1/USA	PWDXXA	Bul. HY11-5715-602/UK
D31FS	Bul. 2562-M1/USA	D3FX	Bul. 2587-M1/USA	PZD00A	Bul. HY11-5715-603/UK
D41FS	Bul. 2562-M2/USA	D41FL and D91FL	Bul. 2589-M1/USA		
D81FS	Bul. 2562-M3/USA				

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<b>Textbooks/Course Components</b>	
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## Welcome to Parker's Involvement Training Program

The Training Department at Parker Hannifin was established in the early 1970's and is recognized today as the industry leader in the development and presentation of training materials and programs.

The Department's charter states that the primary focus of activity shall include all phases of technical training for hydraulic and pneumatic industries. The charter also states that this would be non-commercial and involve state-of-the-art methodology.

The Parker approach is one of involvement training. In its full scope, involvement training is one of active participation. This participation results in excellent student retention as well as providing a comfortable way of learning.

Parker Catalog 0200 details the Training Department's current offerings. This catalog is presented in two parts: Training Materials and Training Programs.

### Training Materials

The training materials section contains the following mixed media components:

- Textbooks/Course Components
- Reference Books
- Computer Software
- Video Tapes
- Trainer Stands
- CD-ROMs

Parker offers seven textbook and course combinations designed for both industrial and educational applications. Topics range from Basic Fluid Power to the specifics of Hydraulic and Pneumatic Technology.

All materials needed for a complete classroom curriculum are available. Textbooks can be purchased separately or in combination with any number of additional course components including workbooks, instructor guide, multiple choice exams, answer book, course certificates and, where appropriate, digital transparencies and relevant reference books.

Parker currently has six reference books available. Led by the *Design Engineer's Handbook, Vol. 1 - Hydraulics*, all of the books are valuable tools for any Design Reference Library, whether for individual use or as an accompaniment to the courses.

Additionally, course subject matter can be further enhanced with related computer software, video tapes and trainer stands.

Parker's computer-aided software represents a strong commitment to advanced training technology. The *Industrial Hydraulic Training CD*, featuring animation and video, is the leading hydraulic computer based training program in the industrial market place.

The video tape library contains 14 complete modules for self-paced one-on-one or group learning activities. Both hydraulic and pneumatic training programs are available.

Parker's portable hydraulic, pneumatic trainer stands provide students with valuable hands-on experience. All training stands feature industrial grade components and provide "Real World" applications of principles and circuitry.

### Training Programs

In addition to training materials, Parker offers an ongoing schedule of classroom educational programs. The current list of classes includes ten 3-5 day programs. Each class is led by a Parker certified instructor(s). Students are provided all necessary materials to attain course certification.

Classes are held in strategic locations across North America and Europe. Download current training schedule for a complete list of scheduled class locations.

**Course fees cover all class room expenses. Meals, transportation and lodging are not included.** However, Parker will be glad to assist you with lodging arrangements.

For the latest information on training materials or programs, please contact:

Parker Hannifin Corporation  
Training Department  
6035 Parkland Blvd.  
Cleveland, OH 44124-4141  
Tel: (216) 896-2495  
Fax: (216) 514-6738  
E-mail: [mctrain@parker.com](mailto:mctrain@parker.com)

or visit our website at:  
[www.parker.com/training](http://www.parker.com/training)

*The following section gives a brief overview of the training materials and classes with a hydraulic or electrohydraulic emphasis.*

## INDUSTRIAL HYDRAULIC TECHNOLOGY



### **Industrial Hydraulic Technology**

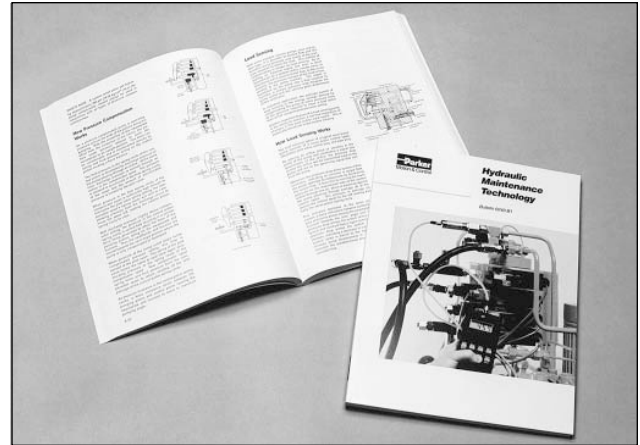
**2nd Edition, Bulletin 0232-B1  
ISBN 1-55769-025-1**

The *Industrial Hydraulic Technology* textbook is designed to introduce a student to hydraulics as it relates to industrial machinery. The 330-page text is organized into fifteen chapters which include:

*The Physical World of a Machine*  
*Hydraulic Transmission of Force and Energy*  
*Petroleum Base Hydraulic Fluid*  
*Fire Resistant Hydraulic Fluid*  
*Operation at the Suction Side of a Pump*  
*Hydraulic Actuators*  
*Control of Hydraulic Energy*  
*Check Valves, Accumulators and Cylinders*  
*Flow Control Valves*  
*Directional Control Valves*  
*Pressure Control Valves*  
*Pilot Operated Pressure Control Valves*  
*Hydraulic Pumps*  
*Hydraulic Motors*  
*Reservoirs, Coolers and Filters*

- Circuit illustrations are in six-color to aid the student in visualizing what is happening in a circuit.
- Each chapter incorporates an exercise reviewing the lesson's main points.

## HYDRAULIC MAINTENANCE TECHNOLOGY



### **Hydraulic Maintenance Technology**

**Bulletin 0240-B1  
ISBN 1-55769-019-7**

The *Hydraulic Maintenance Technology* textbook provides detailed maintenance and troubleshooting information for the user of industrial hydraulic equipment. The 148-page text contains ten chapters which include:

*Hydraulic Maintenance Introduction*  
*Hydraulic Graphic Symbology*  
*Power Unit Maintenance*  
*Pump Maintenance*  
*Pressure Control Valve Maintenance*  
*Directional Control Valve Maintenance*  
*Flow Control Valve and Check Valve Maintenance*  
*Cylinders, Motors and Accumulator Maintenance*  
*Leakage Elimination in Hydraulic Systems*  
*Fluids and Filter Maintenance*

- Contains troubleshooting charts with lists of common problems, causes and possible remedies.
- This text is also a valuable reference for designers of industrial hydraulic equipment



## FLUID POWER BASICS



### **Fluid Power Basics**

**Bulletin 0239-B1**  
**ISBN 1-55769-029-4**

The *Fluid Power Basics* textbook is designed to introduce students to hydraulics and pneumatics as it relates to industrial machinery. The 174-page text is organized into fifteen chapters which include:

**G**

*The Physical World of a Machine*  
*Force Transmission Through a Fluid*  
*Energy Transmission Using a Hydraulic System*  
*Control of Hydraulic Energy*  
*Energy Transmission Using a Pneumatic System*  
*Control of Pneumatic Energy*  
*Hydraulic Pumps and Compressors*  
*Check Valves, Cylinders and Motors*  
*Flow Control Valves*  
*Directional Control Valves*  
*Simple Pressure Control Valves*  
*Pilot Operated Pressure Control Valves*  
*Hydraulic Fluid Conditioning*  
*Air Preparation*  
*Fluid Conductors and Connectors*

- Each chapter incorporates an exercise reviewing the lesson's main points.

## FILTRATION TECHNOLOGY



### **Filtration Technology, 2nd Edition**

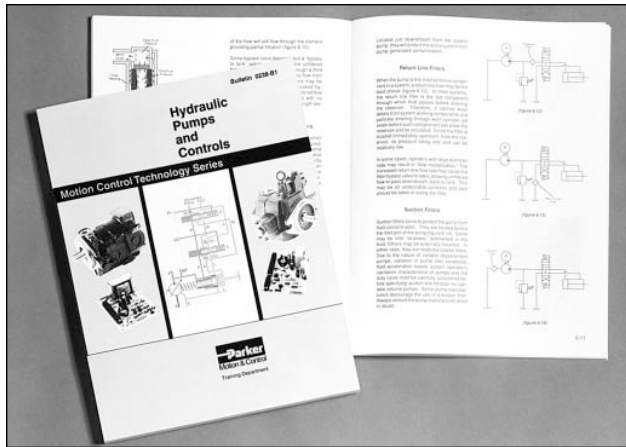
**Bulletin 0247-B1 (Softcover)**  
**ISBN 1-55769-030-8**

**Bulletin 0250-B1 (Hardcover, Not Shown)**  
**ISBN 1-55769-033-2**

*Filtration Technology* is a must as a fundamental introduction to industrial filtration. The text covers topics such as fluids, contaminants, media selection and more. It is helpful to all personnel concerned with OSHA, safety and quality issues. This 250-page text is organized into twelve chapters which include:

*Introduction to Industrial Filtration Technology*  
*Fluids and Contaminants*  
*Contamination Dynamics*  
*Fluid and Filter Analysis*  
*Hydraulic Fluid Filter Selection*  
*Water Absorption in Hydraulic and Lubricating Oils*  
*Filter and Media Selection for Single-pass Systems*  
*Fuel Filtraion*  
*Process Filtration Systems*  
*Compressed Air and Gas Filtration*  
*Coolant Filtration*

## HYDRAULIC PUMPS & CONTROLS



### Hydraulic Pumps & Controls

**Bulletin 0238-B1**

**ISBN 1-55769-031-6**

Hydraulic Pumps and Controls is a comprehensive text covering relevant pump topics from basic pump construction and operation to multiple controls, horsepower control and electronic pump controls. The book also contains sections on filtration and troubleshooting. This 185-page, multi-colored text is organized into nine chapters which include:

*Pressure Compensation*  
*Load Sensing Theory of Operation*  
*Input Power and Inlet Conditions*  
*Electrohydraulic Pump Control*  
*Troubleshooting*  
*Remote Compensation*  
*Horsepower (Torque) Limiting Control*  
*Hydraulic Filtration*  
*Energy Conservation*

For information on Course Components, refer to Catalog 0200.

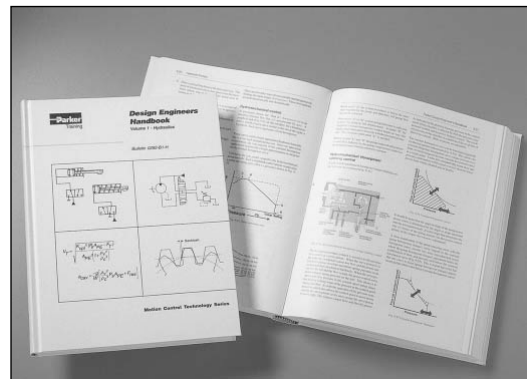
## Reference Books

### Design Engineers Handbook

**Bulletin 0292-B1 Volume 1 - Hydraulics**

**ISBN 1-55769-018-9**

To satisfy the demand for a simple and practical treatment of hydraulics and pneumatics, including components and system connectors, Parker Hannifin Corporation has published a one volume, 520-page text entitled *Design Engineers Handbook, Vol 1. - Hydraulics*. The information contained in this text is organized to assist the machine designer and manufacturer, as well as service and maintenance personnel. It should prove to be equally valuable to the college and vocational school student preparing to enter any of these fields.

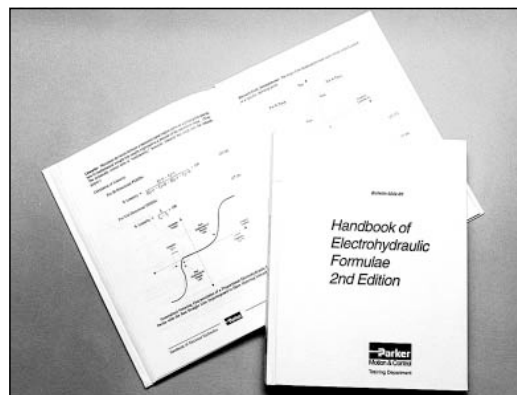


- Each section includes design data, reference material, charts and diagrams.

### **Handbook of Electrohydraulic Formulae, 2nd Edition**

**Bulletin 0242-B1**  
**ISBN 1-55769-034-0**

This handbook, written for technicians, engineers and designers, contains 25 chapters of commonly used formulas for the design of electrohydraulic motion control systems. All of the necessary information is centralized, making the design of electrohydraulic motion control systems easier. There is no other text available that offers this accessibility or breadth and depth of information.



## **G**

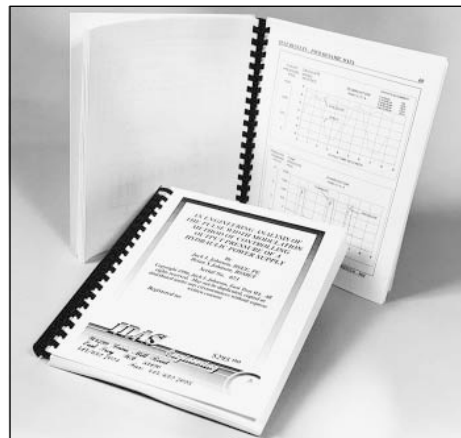
### **An Engineering Analysis of the Pulse Width Modulation**

**Bulletin 0244**

This research report contains over 100 pages of detailed engineering information and data regarding the design and evaluation of the pulse width modulation (PWM) method of controlling hydraulic pump outlet pressure. PWM offers a very efficient way for making regulated pressure power units using fixed displacement pumps instead of the more expensive, conventional pressure compensated pumps.

The report contains scores of graphical responses, representing hundreds of hours of labs and data analysis time. Concise Conclusions sections help the reader to quickly summarize the results and apply them immediately. A complete section is dedicated to Design Methodology so that users can learn the details needed to properly design and construct the power units.

Also included is a background on motion control and constant pressure. In addition, authors discuss equipment and principles of operation as well as the



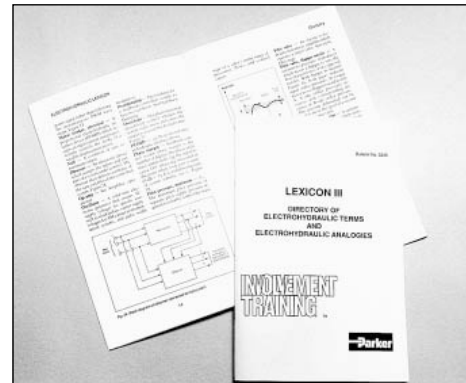
method of investigation used.

*An Engineering Analysis of the Pulse Width Modulation* is a must for anyone who uses, specifies, designs or builds hydraulic power units!

**Lexicon III****Bulletin 0245**

The Lexicon III is a detailed bulletin of electrohydraulic terms and analogies. The book is laid out into two easy-to-use sections – a glossary of terms and a section on understanding electrohydraulic analogies. Many of the areas are represented by graphs and diagrams to further identify in detail the terms and analogies of electrohydraulics.

The author conveniently includes a chart of the SI prefixes, the Handy Conversions Factors Table and a listing of the Greek Letters. This bulletin is a must-have for engineers, students and anyone interested in electrohydraulics.

**Video Tapes****Industrial Hydraulic Technology****Bulletin 0299-T1**

The *Industrial Hydraulic Technology* course material is available utilizing an audiovisual tape training method. With all the training information stored on cassette tapes, the training sessions can be repeated as often as necessary, allowing each student to acquire the technical knowledge at his or her own pace.

The various tapes focus on enabling the user to interpret and read schematics, obtain a working knowledge of components that make up hydraulic systems and advance to trouble shooting techniques. (Refer to page 4 to see specific chapters covered).

- Video tapes are available in Beta, VHS or PAL.
- Individual chapters are also available.

**Includes:**

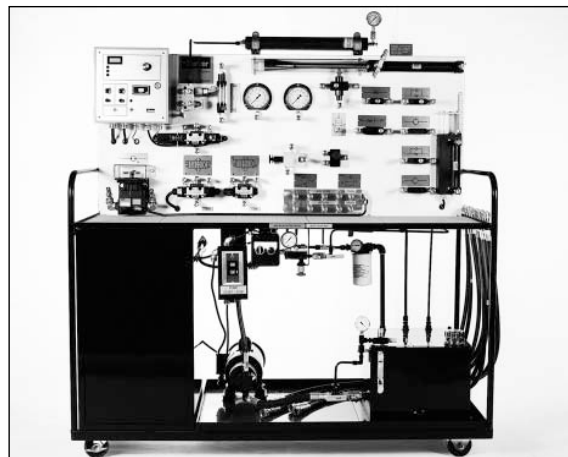
- 14 Video Tapes
- 1 Textbook
- 1 Instructor's Guide

## Portable Hydraulic Trainer

Based on Parker's long term experience in designing, manufacturing and servicing fluidpower components worldwide, the Portable Hydraulic Trainer is designed to be a tool for learning hydraulic technology principles and circuitry. It has been engineered for ruggedness, portability and ease of operation. The unit is completely self-contained and operates on standard 115 Volt AC single phase outlet electrical power.

The components on the trainer are all industrial grade components used in industry every day. This "real world" approach allows the student to learn what those components look like as well as how they operate.

All necessary connections are made with hoses and quick disconnects. No tools are required to arrange circuits. Simply plug in the components needed to arrange a circuit. In addition, all the hoses are stored in a rack to avoid misplacing "loose" components.



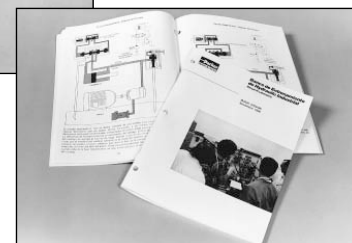
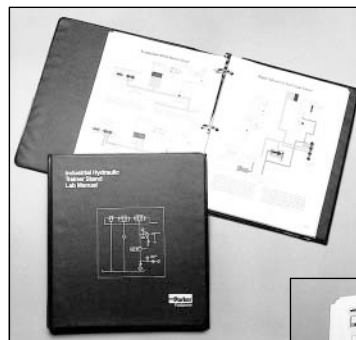
**For detailed information, see Bulletin 0203 online at [www.parker.com/training](http://www.parker.com/training) - click on Download Files**

Also available with the following options:

- **Electrohydraulic option** provides an introduction to both open loop and closed loop electrohydraulic systems.
- **Pneumatic option** transforms the hydraulic trainer into a complete fluidpower training stand.

## Bulletin 0249

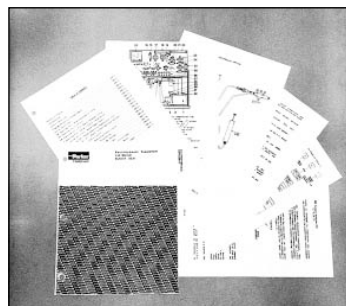
In order to aid the student in understanding hydraulic components and systems operation, Parker has developed this comprehensive lab manual for the Model HTU-00 Portable Hydraulic Trainer Stand. This manual contains circuit problems and demonstrations designed for use with the Parker trainer. These exercises are intended to supplement text material covered in the classroom. References are made in this manual to Parker textbook, Industrial Hydraulic Technology (page L3).



## EHD Supplement

*Bulletin 0231*

Contains exercises using the Electrohydraulic Option Kit (P/N 875279) on the Parker Portable Hydraulic Trainer Stand.



**Also available in Spanish!**  
*Bulletin 0229-B9*

## Industrial Hydraulic Technology 1 & 2



Parker Hannifin's **INDUSTRIAL HYDRAULIC TECHNOLOGY 1 & 2** (I.H.T. 1 & 2) are completely integrated three-day programs during which you discuss and work with fundamental fluid power principles and formulas, and actually experience the functional characteristics of the complete spectrum of hydraulic components.

You will be studying and using pumps, flow valves, pressure valves, directional valves, hydraulic motors, filters, cylinders and accumulators. And, because its divisions actually manufacture and market all of these products, Parker Hannifin is uniquely qualified to give you an in-depth practical knowledge of how to best use them in your field. You will receive

the broadest and deepest exposure possible during a three-day period.

At least a fourth of the time you will be working at the Parker Hannifin hydraulic systems simulators. These units were designed and built by Parker Hannifin expressly for this program. They supply you with all the necessary components – valves, pumps, motors, cylinders, filters, power units, hoses and gauges – to hook up to working hydraulic circuits and then check flows, pressures and velocity. Unlike most other training apparatus, the Parker Hannifin simulators operate at pressures up to 500 psi so that you can closely simulate real system conditions.

The balance of your time will be devoted to classroom sessions. But, these too, are designed for maximum interest and involvement. There is plenty of lively discussion, questions, answers and practical problem solving.

## Hydraulic Pumps & Controls



In **HYDRAULIC PUMPS & CONTROLS** (H.P.C.), students learn a logical procedure for designing circuits, not just from the standpoint to make them work, but to make them work efficiently. This is accomplished by approaching the entire design with a view towards power transmission and ultimate circuit efficiency, concentrating on the power unit. Various variable volume pressure compensated pumps and numerous pump controls are examined in detail.

An important result of this new Parker design method is that the student can always obtain a very efficient circuit, making it possible for a group of designers to develop very similar circuits for each set of mechanical

requirements. The only variance will be in the sequential logic and the appearance, which depends upon which components are selected. This results in less expense to operate and maintain circuits.

Course attendees will have ample opportunity to practice their newly acquired skills. Approximately 40% of the class time is spent in the training lab utilizing Parker hydraulic power units and trainer stands. This familiarization with typical styles of variable volume pressure compensated pumps and their controls ties together the lecture material and the design problems. Students will also benefit from the instructor's many years of industrial fluid power experience.

To get the most from this course, it is necessary to establish prerequisites for attendance. This assures that everyone participating has approximately equal knowledge of fluid power and can work at a compatible pace.

## Introduction to Electrohydraulics



The **INTRODUCTION TO ELECTROHYDRAULICS (E.H.D.)** course is designed for the individual who requires an increased understanding of the rapidly emerging field of electrohydraulic proportional control valves and the electronics used to operate these valves. The individual must have completed the **INDUSTRIAL HYDRAULIC TECHNOLOGY** and **HYDRAULIC COMPONENT SIZING** courses or equivalent. Basic DC theory knowledge is helpful but not necessary as the topic is covered in the course.

In this five-day course we present fundamental electronic theory applicable to electrohydraulic proportional valve; help participants

understand how electrohydraulic proportional valves operate; examine in detail a typical circuit board used with a typical electrohydraulic proportional valve.

Approximately 30% of the class time is spent in the lab where the individual is familiarized with lab instrumentation, and various circuits on the printed circuit board are examined in detail.

## Hydraulic Component Sizing



**HYDRAULIC COMPONENT SIZING (H.C.S.)** is ideally suited for the new designer and the maintenance and service individual who needs that important step beyond fundamental circuit design; the step that provides a more comprehensive understanding of efficient power transmission.

This program, using standard formulas and catalog data creates a benchmark that allows the student to objectively analyze the quality of the circuit in terms of efficiency and energy conservation. You will learn how to overcome problem areas and also become aware of the proper conditions for selecting components such as pressure compensated valves and fixed versus compensated pumps.

Parker Hannifin has written a special textbook for this course, which you will use during the program as the basis for your discussions and practical problem solving.

Since **HYDRAULIC COMPONENT SIZING** is an analytical course, we want to insure that all participants have a solid relatively equal background in basic fluid power technology. Completion of Parker Hannifin's **INDUSTRIAL HYDRAULIC TECHNOLOGY** course is an ideal foundation for understanding and further pursuing the maximum energy savings approach that is key to the **HYDRAULIC COMPONENT SIZING** subject matter.

## Electrohydraulic Feedback Systems

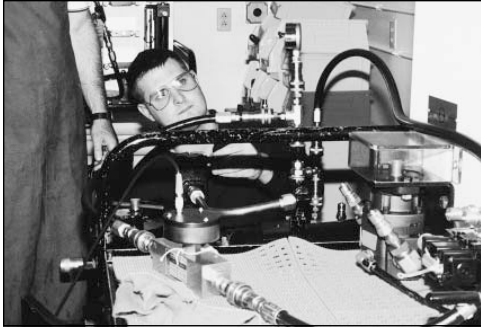


Parker's **ELECTROHYDRAULIC FEEDBACK SYSTEMS (E.F.S.)** course is designed for engineering oriented individuals requiring an in-depth understanding of electrohydraulic feedback control systems. Attendees should have completed the Parker **INTRODUCTION TO ELECTROHYDRAULICS** prior to attending this advanced course.

The following topics are covered in this course: servo valve sizing, basic positional servo valve systems, position transducers, speed transducers, frequency response curves, transfer functions and speed control loops.

Approximately 20% of the class time spent is in the lab working with various feedback control systems to gain a better understanding of their operating characteristics.

## Hydraulic Maintenance Technology

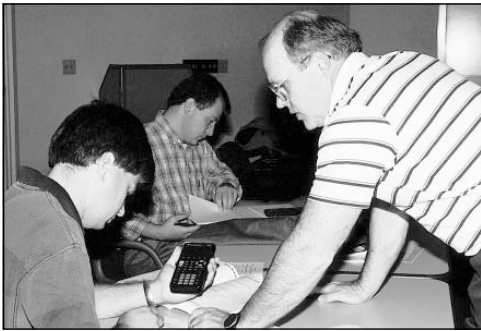


**HYDRAULIC MAINTENANCE TECHNOLOGY (H.M.T.)** is ideally suited for maintenance personnel, engineers, first line supervisors and anyone desiring an in-depth understanding and appreciation of hydraulic system component operation and troubleshooting techniques. Participants should have completed the **INDUSTRIAL HYDRAULIC TECHNOLOGY** course or equivalent.

The topics covered in this four-day program are graphic symbols of hydraulic components in which we utilize the International Standards Organization (ISO) System; troubleshooting common hydraulic components such as pumps, cylinders, valves, rotary actuators, hydraulic motors; hose and tube fittings maintenance and assembly; and maintenance of fluid power systems.

There is plenty of “hands on” in this particular course. Everyone will get a chance to take apart and reassemble various pumps and valves as well as other typical hydraulic components.

## Cartridge Valve Systems



**CARTRIDGE VALVE SYSTEMS (C.V.S.)** is an integrated three-day course where the student will work with and discuss the principles, applications, formulae, and functional characteristics of “insert” or “DIN” style cartridge valves.

The student will learn the practical aspects of “insert” and “screw-in” style cartridge valves as they apply to industrial machinery. Principles of operation, functional characteristics, and typical applications for these valves are presented. The student also uses performance characteristics and fluid power formulae in realistic design problems. Valves studied include spool and poppet types, pilot operated valves, direct acting types, and multistage valves, as well as proportional styles.

**CARTRIDGE VALVE SYSTEM** is recommended for maintenance personnel, technicians and engineering personnel. It is also suitable for sales and non-technical personnel who want to increase their knowledge and understanding of cartridge valve systems.

Parker’s **CARTRIDGE VALVE SYSTEMS** course integrates classroom sessions with lab activities to give the student practical knowledge and skills that can be used in a workplace setting. In the labs, students get “hands-on” experience with typical valves and the circuits which utilize them.

## Mobile Hydraulic Technology



**MOBILE HYDRAULIC TECHNOLOGY (M.H.T.)** is a 4-day course on hydraulic principles as they apply to mobile equipment (loggers, waste hauling trucks, cranes, etc.).

Such topics as basic mobile circuitry, hydrostatic transmissions and power beyond are discussed throughout the course. Components – directional control valves, pumps and steering systems – are also covered. Labs include a demo on a wheel motor driving a rubber tire.

**MOBILE HYDRAULIC TECHNOLOGY** is recommended for maintenance technicians and engineering. Sales and non-technical personnel wishing to increase their understanding of mobile hydraulics would find this class helpful.



## Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any such items, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

**1. Terms and Conditions of Sale:** All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

**2. Payment:** Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

**3. Delivery:** Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

**4. Warranty:** Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.**

**5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.**

**6. Changes, Reschedules and Cancellations:** Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

**7. Special Tooling:** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter,

discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

**8. Buyer's Property:** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property, Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

**9. Taxes:** Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

**10. Indemnity For Infringement of Intellectual Property Rights:** Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

**11. Force Majeure:** Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

**12. Entire Agreement/Governing Law:** The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

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## Parker Hydraulics International Sales Offices

### North America

#### Hydraulics Group Headquarters

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Fax: 248-577-4890

#### Parker Hannifin Canada

##### Motion & Control Division – Milton

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Ontario Canada L9T 3G9  
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Fax: 905-876-0788

##### Motion & Control Division – Montreal

2001 rue de l'aviation  
Dorval, Quebec, H9P 2X6  
Tel: 514-684-3000  
Fax: 514-684-4191

##### Motion & Control Division – Calgary

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Apodaca, N.L. C.P. 66600, Mexico  
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##### Parker Hannifin de México

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Toluca, Mex C.P. 50100  
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Fax: 52 722 2799308

### Mobile Sales

#### Mobile Systems Division

595 Schelter Road  
Suite 100  
Lincolnshire, IL 60069 USA  
Tel: 847-821-1500  
Fax: 847-821-7600

#### Pacific Region

8460 Kass Drive  
Buena Park, CA 90621  
Tel: 714-228-2510  
Fax: 714-228-2511

#### Great Plains Region

931 Alice Court  
St. Charles, IL 60174 USA  
Tel: 630-377-0271  
Fax: 630-377-0271

#### Midwest Region

4494 32nd Street  
Grinnell, IA 50112 USA  
Tel: 641-236-3694  
Fax: 641-236-8884

#### Southern Region

2300 Bush Circle  
Carrollton, TX 75007 USA  
Tel: 972-307-2949  
Fax: 972-307-9410

#### Eastern Region

100 Corporate Drive  
Lebanon, NJ 08833 USA  
Tel: 610-330-0970  
Fax: 925-396-6481

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### Industrial Sales

#### Great Lakes Region

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Fairlawn, OH 44333 USA  
Tel: 330-670-2680  
Fax: 330-670-2681

#### Southern Region

1225 Old Alpharetta Road Suite 290  
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Tel: 770-619-9767  
Fax: 770-619-9806

#### Chicago Region

1163 E. Ogden Avenue  
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Fax: 866-473-9274

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(continued on next page)



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## **Parker Hannifin Corporation**

### **About Parker Hannifin Corporation**

Parker Hannifin is a leading global motion-control company dedicated to delivering premier customer service. A Fortune 500 corporation listed on the New York Stock Exchange (PH), our components and systems comprise over 1,400 product lines that control motion in some 1,000 industrial and aerospace markets. Parker is the only manufacturer to offer its customers a choice of hydraulic, pneumatic, and electromechanical motion-control solutions. Our Company has the largest distribution network in its field, with over 7,500 distributors serving nearly 400,000 customers worldwide.

### **Parker's Charter**

To be a leading worldwide manufacturer of components and systems for the builders and users of durable goods. More specifically, we will design, market and manufacture products controlling motion, flow and pressure. We will achieve profitable growth through premier customer service.

### **Product Information**

North American customers seeking product information, the location of a nearby distributor, or repair services will receive prompt attention by calling the Parker Product Information Center at our toll-free number: 1-800-C-PARKER (1-800-272-7537). In Europe, call 00800-C-PARKER-H (00800-2727-5374).

**The Aerospace Group** is a leader in the development, design, manufacture and servicing of control systems and components for aerospace and related high-technology markets, while achieving growth through premier customer service.



**The Climate & Industrial Controls Group** designs, manufactures and markets system-control and fluid-handling components and systems to refrigeration, air-conditioning and industrial customers worldwide.



**The Fluid Connectors Group** designs, manufactures and markets rigid and flexible connectors, and associated products used in pneumatic and fluid systems.



**The Seal Group** designs, manufactures and distributes industrial and commercial sealing devices and related products by providing superior quality and total customer satisfaction.



**The Hydraulics Group designs,** produces and markets a full spectrum of hydraulic components and systems to builders and users of industrial and mobile machinery and equipment.



**The Filtration Group** designs, manufactures and markets quality filtration and clarification products, providing customers with the best value, quality, technical support, and global availability.

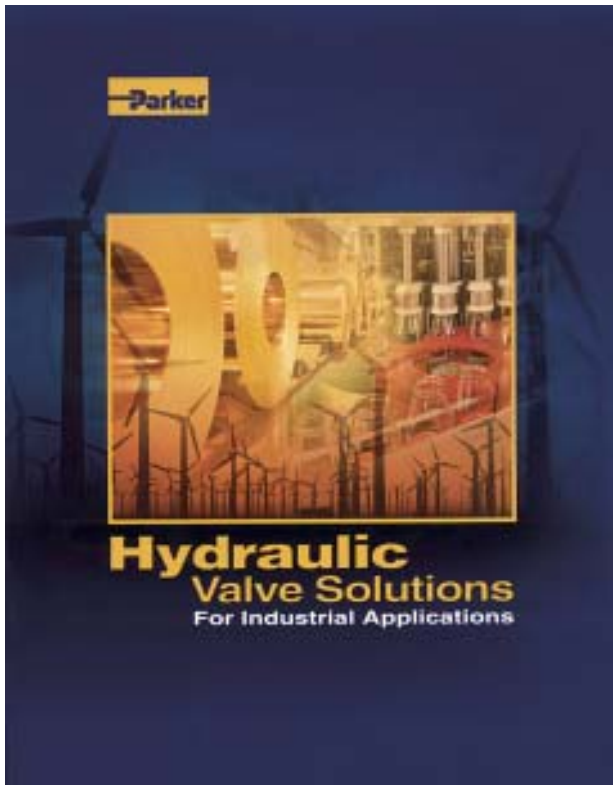


**The Automation Group** is a leading supplier of pneumatic and electromechanical components and systems to automation customers worldwide.



**The Instrumentation Group** is a global leader in the design, manufacture and distribution of high-quality critical flow components for worldwide process instrumentation, ultra-high-purity, medical and analytical applications.





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For the latest hydraulic valve information  
[www.parker.com/hydraulicvalve](http://www.parker.com/hydraulicvalve)

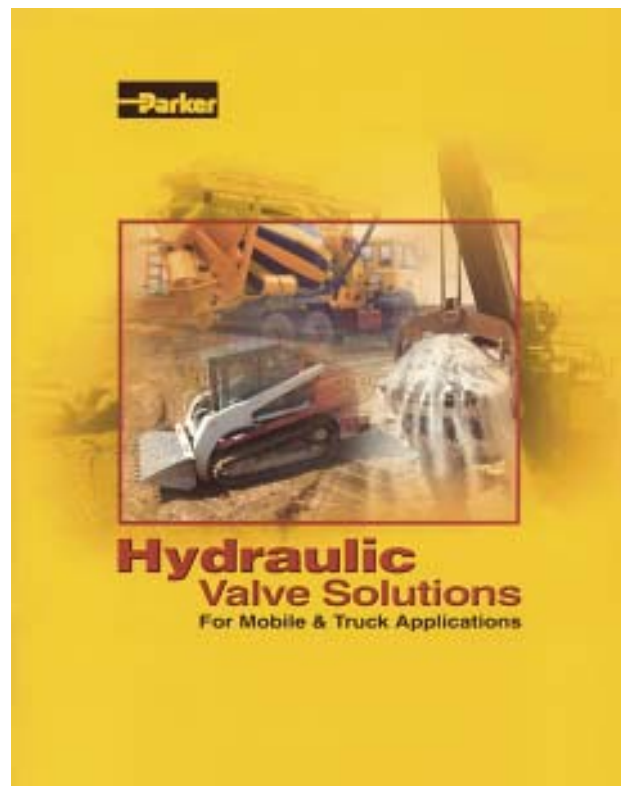
To locate your nearest hydraulic valve distributor  
[www.parker.com/hyd/distloc](http://www.parker.com/hyd/distloc)

For North America, Europe and the rest of the world  
regional offices, see Parker Hydraulics International  
Sales Offices at the back of this catalog.



*Parker Hydraulic Valve wants to keep you informed. Listed below are connection opportunities for you to resource additional information or speak directly with the industry's most knowledgeable hydraulic valve professionals.*

To order literature or locate a distributor by phone  
**1-800-C-Parker**



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**Parker Hannifin Corporation**  
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