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# Industrial Hydraulic Valves

Directional Control, Pressure Control, Sandwich,  
Subplates & Manifolds, Accessories

Catalog MSG14-2500/US

July 2021



ENGINEERING YOUR SUCCESS.

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**SAFETY GUIDE**

For safety information, see Safety Guide SG HY14-1000 at [www.parker.com/safety](http://www.parker.com/safety) or call 1-800-CParker.

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**Parker Hannifin Corporation**  
Hydraulic Valve Division  
Elyria, Ohio, USA

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**Directional Control Valves****A**

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**Sandwich Valves****B**

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**Subplates and Manifolds****C**

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**Pressure Control Valves****D**

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**Flow Control and Check Valves****E**

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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. Contact Parker Hannifin, Hydraulic Valve Division for the location of the distributor serving your area (see the back cover for contact information).

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**Position Paper of HCD  
regarding  
machinery directive 2006/42/EG  
DIN EN ISO 13849**

**A**

Products made by the Hydraulic Controls Division (HCD) of Parker Hannifin GmbH are excluded from the scope of the machinery directive following the „VDMA Position Paper on the Implementation of the Machinery Directive 2006/42/EC in the Fluid Power Industry“ (Rev. 23.06.2010).

The only exceptions are products that comply to the definition of a safety component, defined in article 2 c) of the machinery directive.

All HCD products are designed and manufactured considering the basic as well as the proven safety principles according to EN 13849-2:2012, so that the machines in which the products are incorporated meet the essential health- and safety requirements.

Components that fall within the scope of DIN EN ISO 13849-1, *Safety of machinery – Safety related components of controls – part 1: General principles for design* do not necessarily have to be placed on the market as safety components in accordance with the machinery directive. A component that is placed on the market but not as a safety component does not necessarily provide a lower safety level.

Confirmations for components to be proven components, e. g. for validation of hydraulic systems, can only be provided after an analysis of the specific application, as the fact to be a proven component mainly depends on the specific application.

MTTF<sub>d</sub> values for our products are part of the technical data within our catalogue.

B10<sub>d</sub>, DC and CCF values depend on cycle time, running time and system design. Therefore they can only be provided application specific.

**A**

## Position Paper Machinery Directive 2006/42/EG “safety components”

Parker Hannifin GmbH confirms, that our safety components comply with the machinery directive 2006/42/EC, as long as they are used as intended. The EC Declaration of conformity includes possible conformity to other directives as well.

Safety components are:

### Pressure relief valves according to directive 97/23/EG

Type R4V\*V , R4V\*W  
Type R6V\*V, R6V\*W  
Type DSDU 578 P20E TÜV  
Type DSDU 1078 E\*E TÜV

#### Intended usage:

Pilot operated pressure relief valves to limit a maximum pressure, pre-adjusted unchangeable to this maximum pressure.

The intended usage is provided as long as the valves are integrated into the system as follows:

- P-port connected directly to the point where the pressure should be limited
- T-port connected directly to tank without any backpressure

Size of the valve and the pipes have to be matched to the maximum possible flow and pressure.

### Clamping valves according to EN 201:2010

#### 2-way-slip in cartridges

Direct operated directional control valves NG6  
Direct operated directional control valves NG10  
Pilot operated directional control valves NG10  
Pilot operated directional control valves NG16  
Pilot operated directional control valves NG25

Type C10C1 E-SC, C10C3 E-SC  
Type C13-DEC 107-SC, C18-DEC 107-SC  
Type D1VW\*-SC, D1DW\*-SC;  
Type D3W\*-SC, D3DW\*-SC  
Type D31DW\*-SC  
Type D41VW\*-SC  
Type D81VW\*-SC, D91VW\*-SC

#### Intended usage:

For hydraulically operated clamping units of injection molding machines according to the manufacturer's declaration of incorporation.

### Press controls according to DIN EN 693:2011

Press control NG06  
Press control NG10  
Press control NG16  
Press control NG25  
Press control NG50

Type PADZ2780.3xx-SC  
Type PADZ2781.3xx-SC  
Type PADZ2782.3xx-SC  
Type PADZ2783.3xx-SC  
Type PADZ2784.3xx-SC

Press control NG10  
Press control NG16  
Press control NG25

Typ PPCC10\*-SC  
Typ PPCC16\*-SC  
Typ PPCC25\*-SC

#### Intended usage:

To be incorporated into hydraulic presses according to DIN EN 693:2011.

Declaration of conformity is valid from 29.12.2009 for all new above listed products. For earlier delivered products conformity is not possible to declare.

The declaration of product conformity does not include a declaration of conformity for the machinery in which our product is incorporated. The conformity for the machinery only can be declared by the person who places the machinery on the market inside the EU for the first time.

If the listed components are incorporated in already used machinery (placed on the market before 1995) and if they do not change the function of this machinery significantly, the machinery must not be put into operation until the conformity of the machinery to national regulations, especially safety regulations, is declared.

If the function of the machinery is changed significantly, conformity to the machinery directive 2006/42/EC has to be declared.

A declaration of conformity according to machinery directive 2006/42/EC for other Parker products has to be proved depending on the special application.

## Application

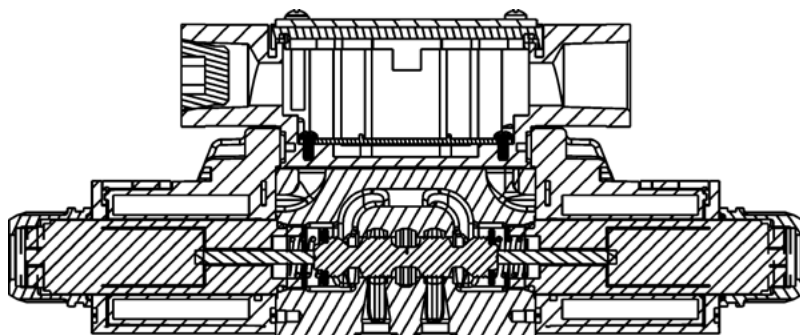
Series D1V hydraulic directional control valves are high performance, direct operated 4-way valves. They are available in 2 or 3-position styles. They are manifold mounted valves, which conform to NFPA's D03, CETOP 3 mounting pattern. These valves were designed for industrial and mobile hydraulic applications which require high cycle rates, long life and high efficiency.

## Operation

Series D1V directional control valves consist of a 4-chamber style body, and a case hardened sliding spool. The spool is directly shifted by a variety of operators including: solenoid, lever, cam, air or oil pilots.

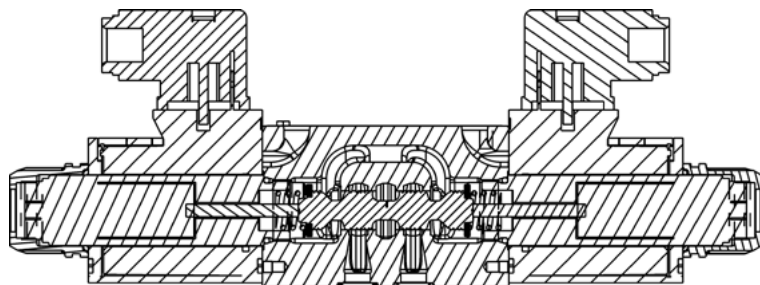
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### D1VW Solenoid Operated Plug-In Conduit Box Style



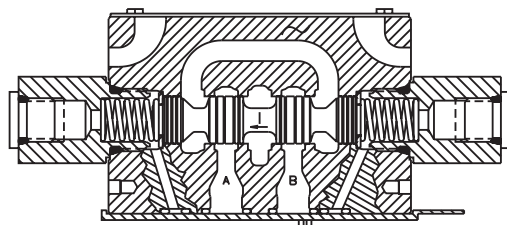
- Easy access mounting bolts.
- Waterproof NEMA 4, IP67.
- No tools required for coil removal.
- 15 standard spool styles available.
- Four electrical connection options.
- Lights included (CSA approval and CE approval).
- Easy coil replacement.
- Plug-In design offered with lights & other options.

### D1VW Solenoid Operated Hirschmann (DIN) Style



- DIN Style (43650) Hirschmann.
- 15 spool styles available.
- No tools required for coil removal.
- Easy coil replacement.
- AC & DC lights available. (CSA approval and CE approval).

### D1VP Oil Pilot Operated



- Subplate pilot or end cap pilot option.
- Pilot pressure: 15.2 Bar (220 PSI) to 207 Bar (3000 PSI).

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

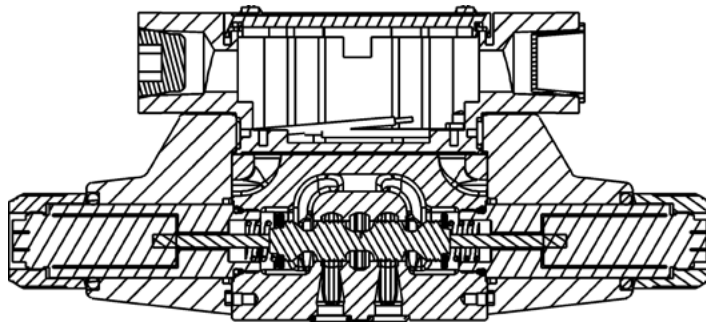
**Electrical Connections**

Series D1V valves may be configured in all popular electrical configurations including:

Plug-in Conduit Box	Explosion Proof	Dual Spade (DC only)
DESINA (DC only)	Hirschmann (DIN)	Wire Lead Conduit Box
Deutsch (DC only)	Metri-Pack (DC only)	

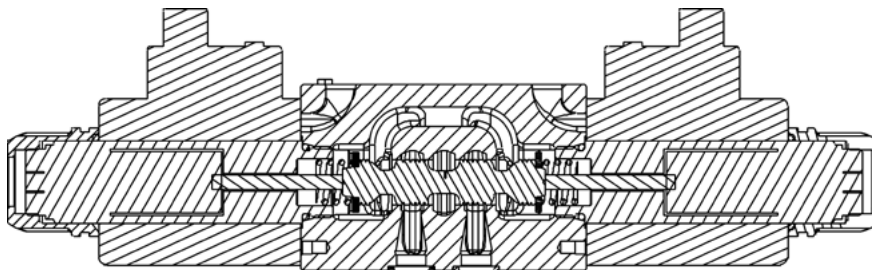
**A**

**D1VW Solenoid Operated Wire Lead Conduit Box Style**



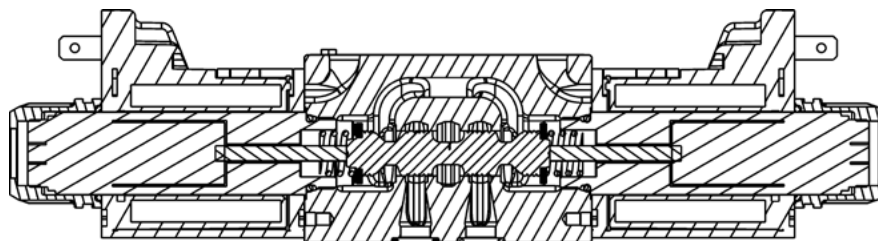
- Easy access mounting bolts.
- Waterproof NEMA 4, IP67.
- No tools required for coil removal.
- 15 spool styles available.
- No lights available

**D1VW Solenoid Operated DESINA Style**



- Surge suppression standard.
- 15 standard spool available.
- No tools required for spool removal.
- Easy coil replacement.
- Wired to DESINA Spec (VDMA).
- Lights included.

**D1VW Solenoid Operated Dual Spade Style**



- Dual spade connection (SAE Style 1B).
- Easy coil replacement.
- 15 standard spool styles available.
- 12 VDC, 30 watt only.

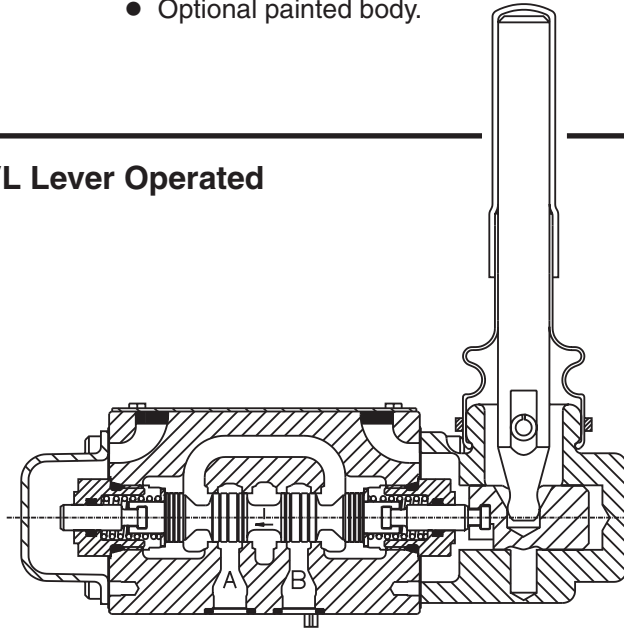


**Features**

- Easy access mounting bolts.
- 345 Bar (5000 PSI) pressure rating.
- Flows to 22 GPM depending on spool.
- Choice of five operator styles.
- Rugged four land spools.
- Low pressure drop.
- Phosphate finished body.
- Optional proportional spool available.
- Optional painted body.

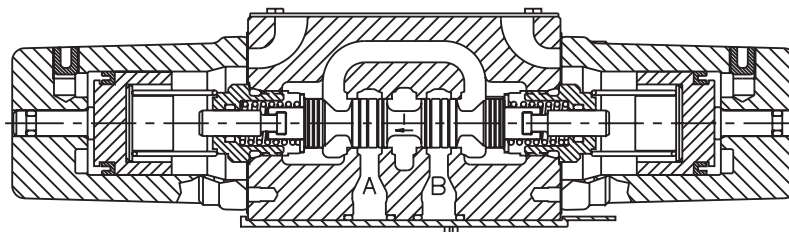
**D1VL Lever Operated**

- Spring return or detent styles available.
- Heavy duty handle design.



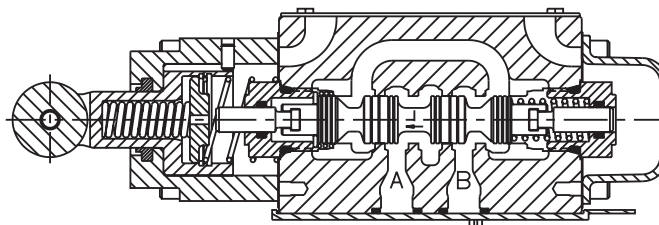
**D1VA Air Operated**

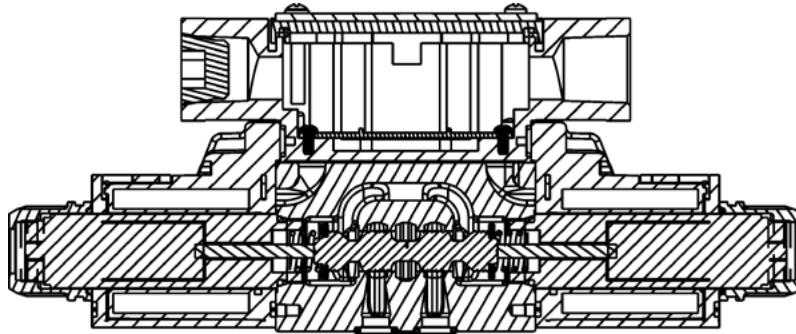
- Low pilot pressure required – 4.1 Bar (60 PSI) minimum.



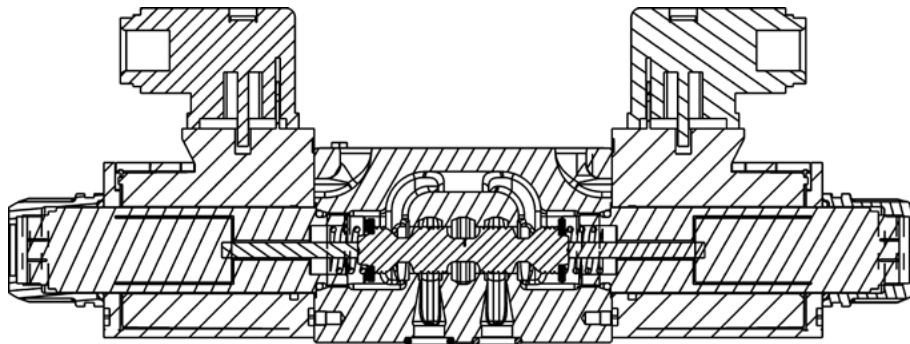
**D1VC Cam Operated**

- Choice of 2 cam roller positions (D1VC and D1VD).
- Two styles available (D1VC and D1VG).
- Short stroke option.



**A****D1VW AC Input Solenoid Operated Soft Shift**

- 3 standard orifice sizes available.
- 15 spool styles available.
- AC Rectified or DC input.

**D1VW DC Solenoid Operated Soft Shift**





**Standard Spool Reference Data**

Model	Spool Symbol	Maximum Flow, LPM (GPM) 350 Bar (5000 PSI) w/o Malfunction		
		High Watt DC	Low Watt AC	Low Watt DC
D1V*001		78 (20)	49 (13)	37 (10)
D1V*002		78 (20)	45 (12)	68 (18)
D1V*003		70 (18)	30 (8)	34 (9)
D1V*004		37 (10)	30 (8)	49 (13)
D1V*006		78 (20)	49 (13)	52 (14)
D1V*007		45 (12)	18 (5)	18 (5)
D1V*008		49 (13)	45 (12)	37 (10)
D1V*009		58 (15)	45 (12)	45 (12)
D1V*011		58 (16)	30 (8)	37 (10)
D1V*015		79 (21)	30 (8)	34 (9)
D1V*020		78 (20)	45 (12)	75 (20)
D1V*026		37 (10)	11 (3)	7 (2)
D1V*030		70 (18)	18 (5)	75 (20)
D1V*081		32 (9)	26 (7)	30 (8)
D1V*082		32 (9)	26 (7)	34 (9)

Center or De-energized position is indicated by P, A, B & T port notation.



**D1VA, D1VP, D1VC, D1VL Reference Data**

Model	Spool Symbol	Maximum Flow, LPM (GPM) 350 Bar (5000 PSI) w/o Malfunction	Model	Spool Symbol	Maximum Flow, LPM (GPM) 350 Bar (5000 PSI) w/o Malfunction
D1V*001		83 (22)	D1V*020 #		53 (14)
D1V*002		83 (22)	D1V*026 #		11 (3)
D1V*004		45 (12)	D1V*030 #		19 (5)
D1V*008		45 (12)	D1V*081		30 (8)
D1V*009		57 (15)	D1V*082		30 (8)

Center or De-energized position is indicated by A, B, P & T port notation.  
 # D1VP only.

**Manaplug – Electrical Mini Plug**

- EP336-30 3 Pin Plug
- EP316-30 5 Pin Plug (Double Solenoid)
- EP31A-30 5 Pin Plug (Single Solenoid)

**Desina – 12 mm Connector**

5004109

**Electrical Cords – Mini Plug**

- EC 3 Conductor, 6 ft.
- EC3 3 Conductor, 3 ft.
- EC12 3 Conductor, 12 ft.
- EC5 5 Conductor, 6 ft.
- EC53 5 Conductor, 3 ft.
- EC512 5 Conductor, 12 ft.

**Hirschmann – Female Connector**

- 692915 Gray (Solenoid A)
- 692914 Black (Solenoid B)

Quantity Required		
A,C,D	B,E,F	H,K,M
1	–	1
1	1	–

**Hirschmann – Female Connector-Rectified (48-240 VAC)**

- 1301053 Gray (Solenoid A)
- 1301054 Black (Solenoid B)

1	–	1
1	1	–

**Hirschmann – Female Connector-Rectified w/Lights (100-240 VAC)**

1300712

2	1	1
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**Hirschmann – Female Connector w/Lights (Note Voltages)**

- 694935 6-48 VAC or VDC
- 694936 48-120 VDC, 100-240 VAC

2	1	1
2	1	1



**Solenoid Ratings**

<b>Insulation System</b>	Class F
<b>Allowable Deviation from rated voltage</b>	-10% to +10% for DC and AC rectified coils -5% to +5% for AC Coils
<b>Armature</b>	Wet pin type
<b>CSA File Number</b>	LR60407
<b>Environmental Capability</b>	DC Solenoids meet NEMA 4 and IP67 when properly wired and installed. Contact HVD for AC coil applications.

**Explosion Proof Solenoid Ratings\***

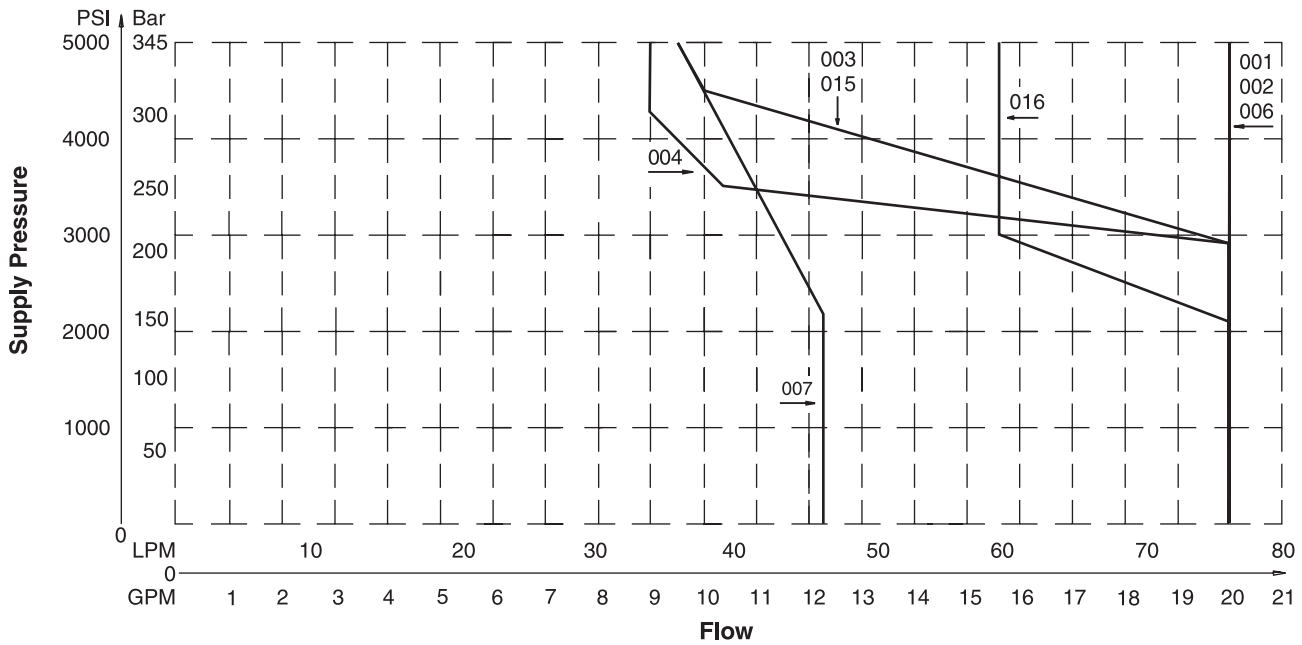
<b>U.L. &amp; CSA (EU)</b>	Class I, Div 1 & 2, Groups C & D Class II, Div 1 & 2, Groups E, F & G As defined by the N.E.C.
<b>ATEX (ED)</b>	Complies with ATEX requirements for: Ex d IIB Gb; EN60079-0:2012, EN60079-1:2007
<b>ATEX, IECEx &amp; CSA/US (ER, ET) (Tri-rated)</b>	Complies with IEC 60079-0:2011, IEC 60079-1:2007, IEC 60079-31:2013; Ex d IIC Gb; Ex tb IIIC Db IP66; IECEx BAS 14.0164X  ATEX: EN60079-0, EN60079-1, EN60079-31; CE 1180 Ex II 2G BASEEFA08ATEX0041X CSA 22.2 No. 60079-0:07, 60079-1:07 and UL 60079-0:05, UL 60079-1:05; CSA listed to US and Canada Safety Standards. File 08-CSA-1932102  CSA Ex d IIC, AEx d IIC for Class I Zone 1; Class I Div 1 Grp. C & D; Class II Div 1 Grp. E, F & G

\* Allowable Voltage Deviation ±10%.

Code		Voltage	In Rush Amps Amperage	In Rush VA	Holding Amps @ 3 mm	Watts	Resistance
Voltage Code	Power Code						
D	Omit	120 VDC	N/A	N/A	0.26 Amps	30 W	528.00 Ohms
E	F	24 VAC	4.8 AMPS	120 VA	2.07 Amps	21 W	1.29 Ohms
J	L	24 VDC	N/A	N/A	0.44 Amps	10 W	51.89 Ohms
J	Omit	24 VDC	N/A	N/A	1.32 Amps	30 W	17.27 Ohms
K	L	12 VDC	N/A	N/A	0.88 Amps	10 W	12.97 Ohms
K	Omit	12 VDC	N/A	N/A	2.64 Amps	30 W	4.32 Ohms
Q	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	0.77 Amps	30 W	19.24 Ohms
QD	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	.77 Amps	30 W	19.24 Ohms
T	Omit	240/60 VAC	0.83 Amps	199 VA	0.30 Amps	30 W	120.40 Ohms
T	Omit	220/50 VAC	0.87 Amps	191 VA	0.34 Amps	30 W	120.40 Ohms
T	F	240/60 VAC, Low Watt	0.70 Amps	168 VA	0.22 Amps	21 W	145.00 Ohms
T	F	220/50 VAC, Low Watt	0.75 Amps	165 VA	0.26 Amps	23 W	145.00 Ohms
U	Omit	98 VDC	N/A	N/A	0.31 Amps	30W	288.00 Ohms
Y	Omit	120/60 VAC	1.7 Amps	204 VA	0.60 Amps	30 W	28.20 Ohms
Y	Omit	110/50 VAC	1.7 Amps	187 VA	0.68 Amps	30 W	28.20 Ohms
Y	F	120/60 VAC, Low Watt	1.40 Amps	168 VA	0.42 Amps	21 W	36.50 Ohms
Y	F	110/50 VAC, Low Watt	1.50 Amps	165 VA	0.50 Amps	23 W	36.50 Ohms
<b>Explosion Proof Solenoids</b>							
Y		120/60 VAC	1.60 Amps	192 VA	0.58 Amps	27 W	33.50 Ohms
J		24 VDC	N/A	N/A	1.38 Amps	33 W	17.33 Ohms
<b>Explosion Proof Solenoids (German)</b>							
J		24 VDC	N/A	N/A	1.0 Amps	24 W	24 Ohms
<b>ER &amp; ET Explosion Proof Solenoids</b>							
J		24 VDC	N/A	N/A	0.54 Amps	13 W	44.30 Ohms
Y		120/60 VAC	N/A	N/A	0.16 Amps	17 W	667.00 Ohms



**D1V Shift Limits, DC & AC Rectified 30 Watt**



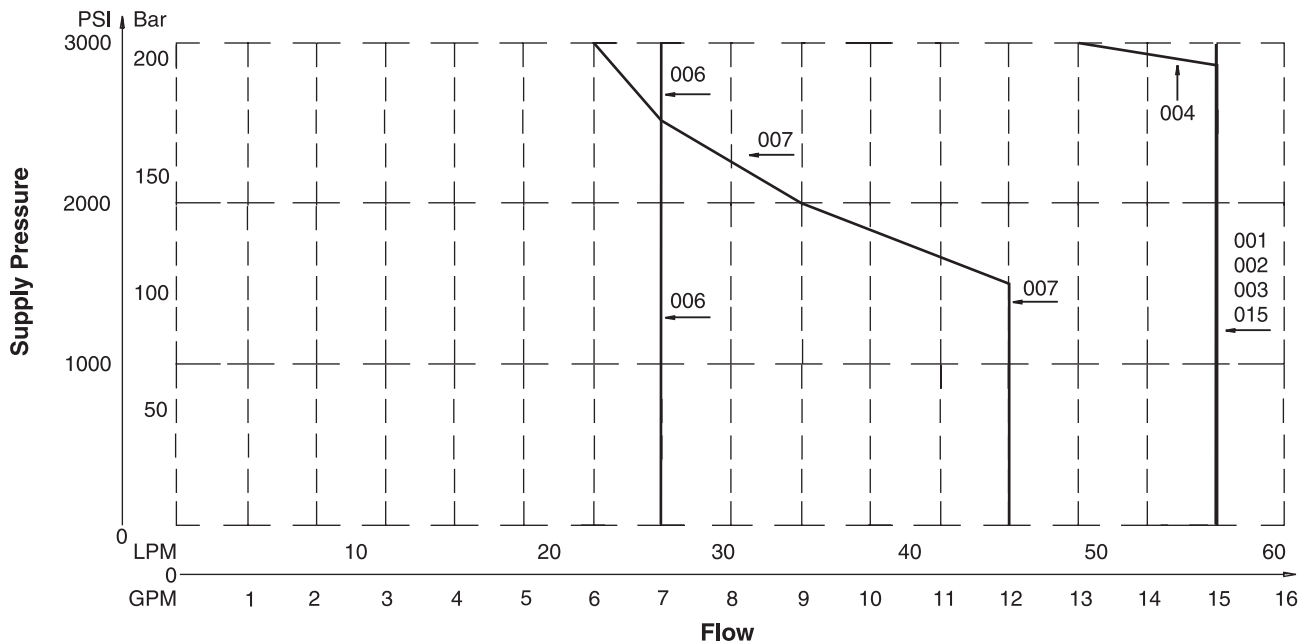
**Example:**

Determine the maximum allowable flow of a Series D1V valve (#004 spool) at 138 Bar (2000 PSI) supply pressure. Locate the curve marked "004". At 138 Bar (2000 PSI) supply pressure, the maximum flow is 57 LPM (15 GPM). At 207 Bar (3000 PSI), the flow is 49 LPM (13 GPM).

**Important Notes for Switching Limit Charts**

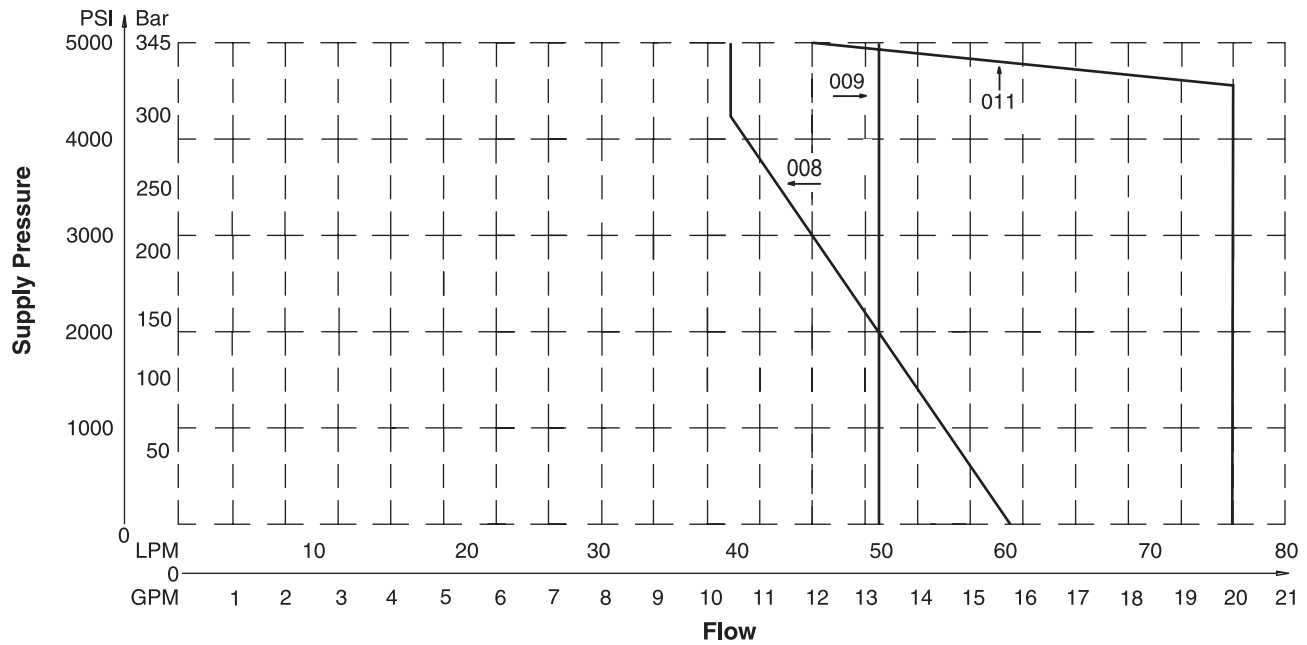
1. For F & M style valves, reduce flow to 70% of that shown.
2. Shift limits charted for equal flow A and B ports. Unequal A and B port flows may reduce shift limits.
3. These charts do not show explosion proof performance. Consult factory for explosion proof duty.
4. Blocking A or B ports will reduce flow by 70%.

**D1VW\*\*\*\*\*L Shift Limits**





**D1V Shift Limits, DC & AC Rectified 30 Watt**



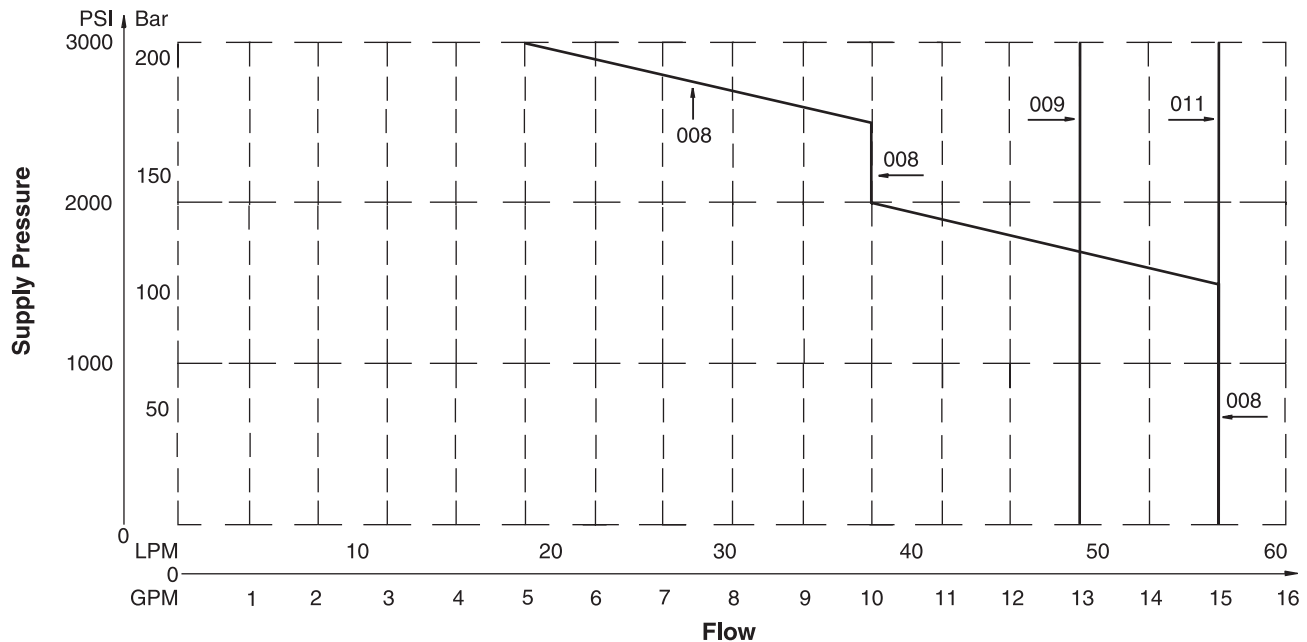
**Example:**

Determine the maximum allowable flow of a Series D1V valve (#008 spool) at 83 Bar (1200 PSI) supply pressure. Locate the curve marked "008". At 83 Bar (1200 PSI) supply pressure, the maximum flow is 57 LPM (15 GPM). At 207 Bar (3000 PSI), the flow is 19 LPM (5 GPM).

**Important Notes for Switching Limit Charts**

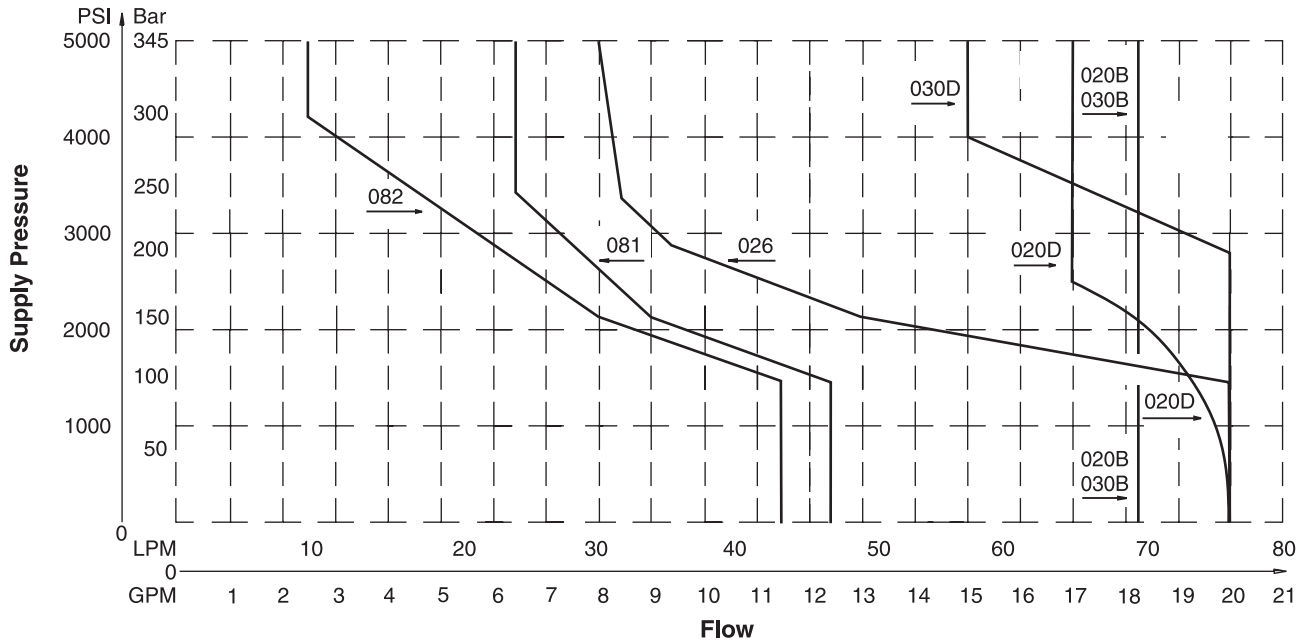
1. For F & M style valves, reduce flow to 70% of that shown.
2. Shift limits charted for equal flow A and B ports. Unequal A and B port flows may reduce shift limits.
3. These charts do not show explosion proof performance. Consult factory for explosion proof duty.
4. Blocking A or B ports will reduce flow by 70%.

**D1VW\*\*\*\*\*L Shift Limits**



**D1V Shift Limits, DC & AC Rectified 30 Watt**

**A**



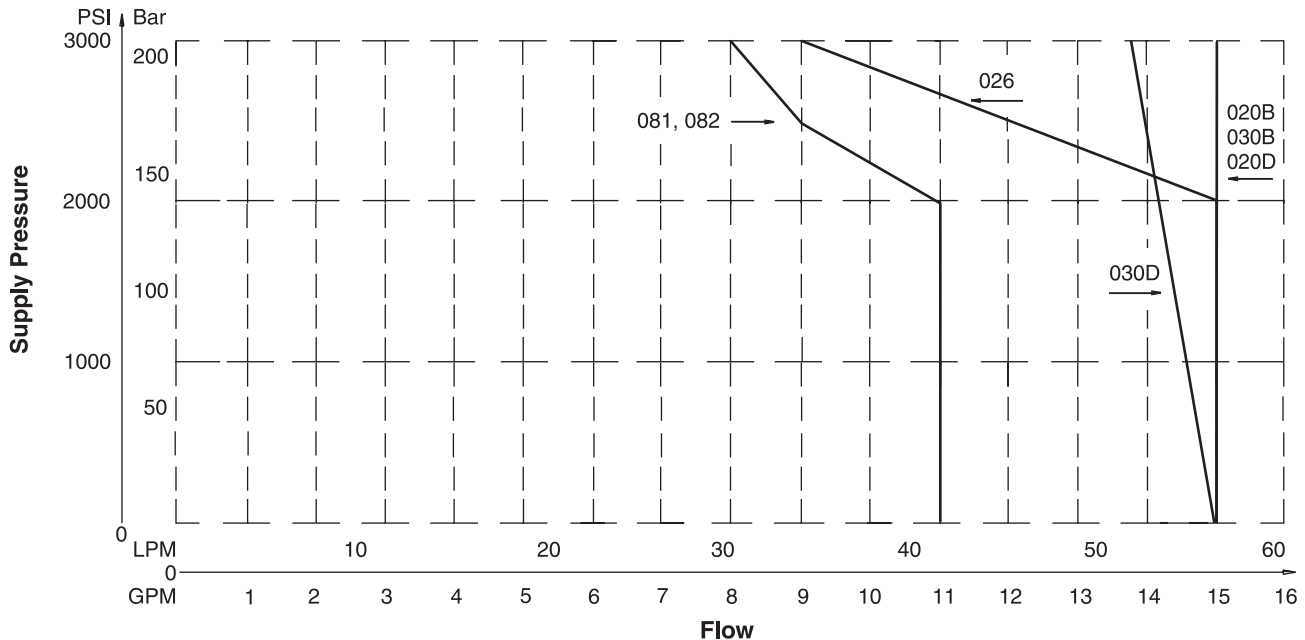
**Example:**

Determine the maximum allowable flow of a Series D1V valve (#081 spool) at 83 Bar (1200 PSI) supply pressure. Locate the curve marked "081". At 83 Bar (1200 PSI) supply pressure, the maximum flow is 42 LPM (11 GPM). At 138 Bar (2000 PSI), the flow is 42 LPM (11 GPM).

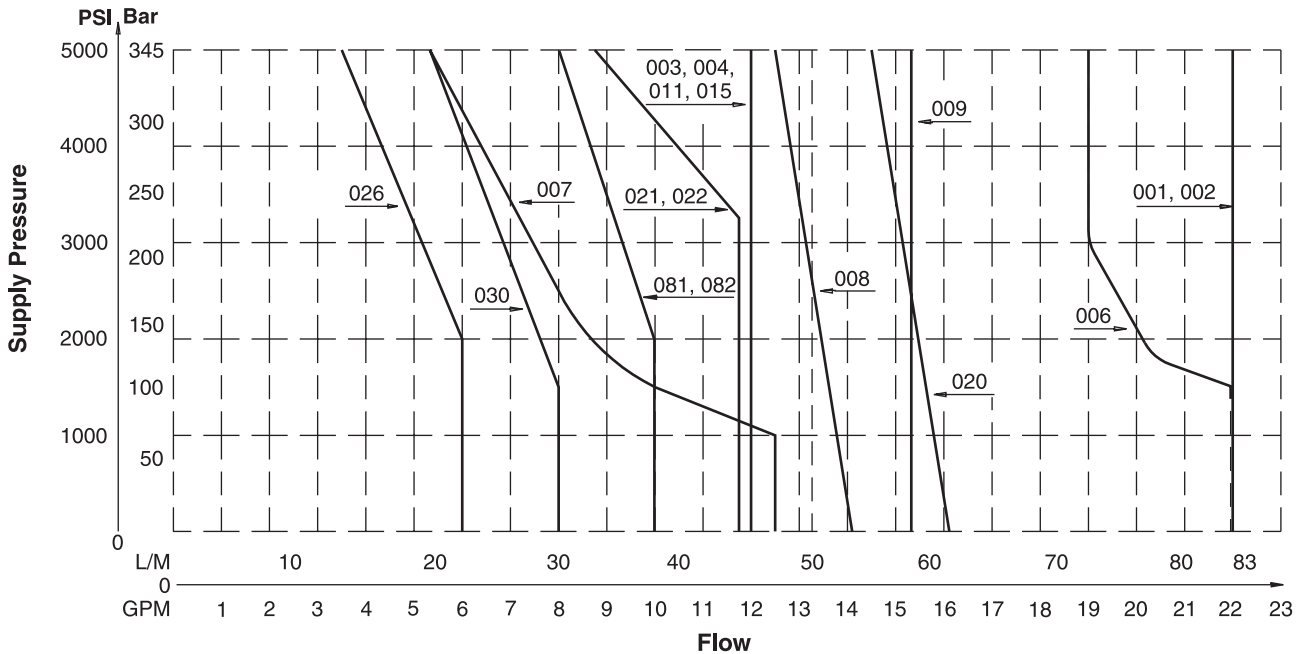
**Important Notes for Switching Limit Charts**

1. For F & M style valves, reduce flow to 70% of that shown.
2. Shift limits charted for equal flow A and B ports. Unequal A and B port flows may reduce shift limits.
3. These charts do not show explosion proof performance. Consult factory for explosion proof duty.
4. Blocking A or B ports will reduce flow by 70%.

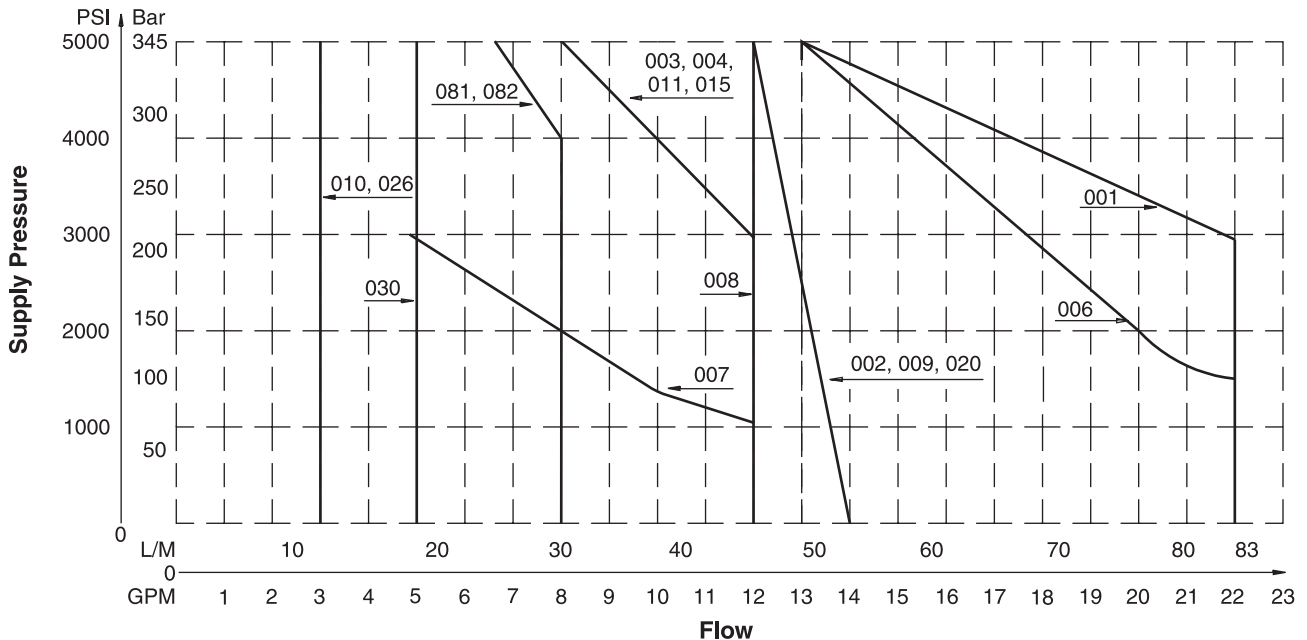
**D1VW\*\*\*\*\*L Shift Limits**



**D1V Shift Limits, AC 30 Watt**



**D1VW\*\*\*\*F Shift Limits, AC**



**Example:**

Determine the maximum allowable flow of a Series D1V valve (#009 spool) at 83 Bar (1200 PSI) supply pressure. Locate the curve marked "009". At 83 Bar (1200 PSI) supply pressure, the maximum flow is 75 LPM (20 GPM). At 207 Bar (3000 PSI), the flow is 68 LPM (18 GPM).

**Important Notes for Switching Limit Charts**

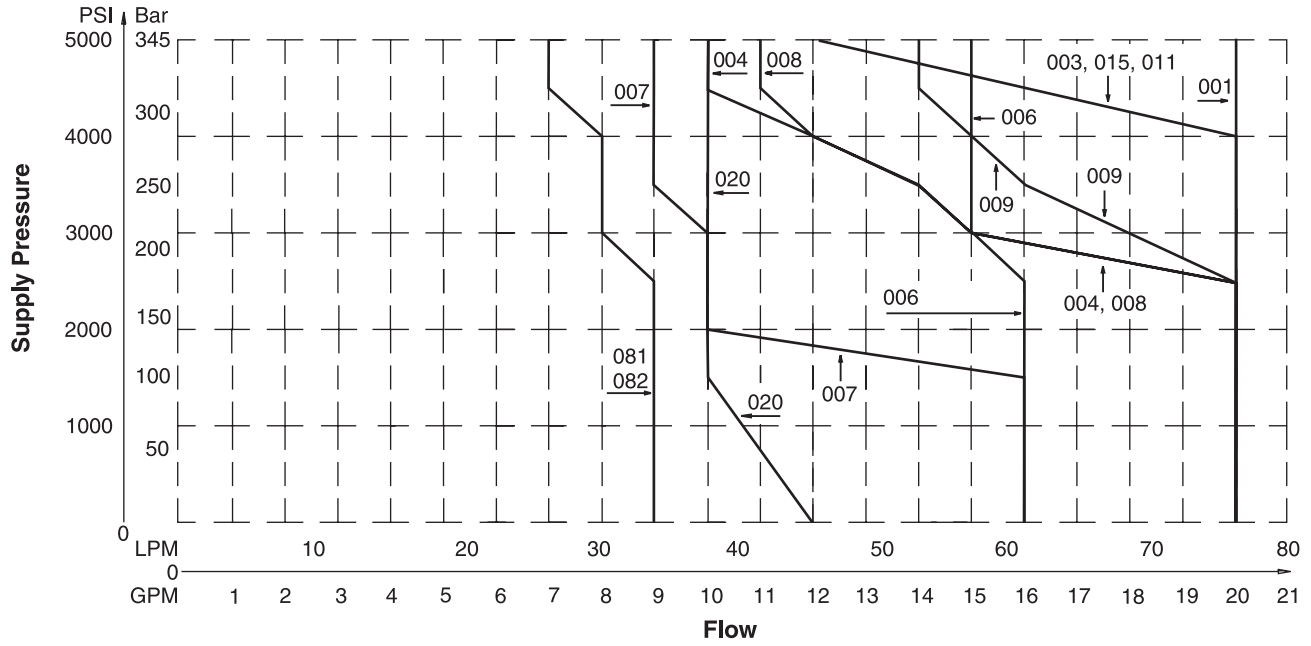
1. For F & M style valves, reduce flow to 70% of that shown.
2. Shift limits charted for equal flow A and B ports. Unequal A and B port flows may reduce shift limits.
3. These charts do not show explosion proof performance. Consult factory for explosion proof duty.
4. Blocking A or B ports will reduce flow by 70%.



**Soft Shift Limit Curves**

**A**

**DC Power Supply**







**Pressure Drop vs. Flow, High Watt**

The table to the right provides the flow vs. pressure drop curve reference for standard and high performance D1V Series valves by spool type.

The chart below demonstrates graphically the pressure drop characteristics of the standard D1VW\*\*\*\*F and the high performance D1V. The low watt coil and other design features of the standard D1VW\*\*\*\*F accommodate a maximum flow of 50 LPM (13 GPM) at 345 Bar (5000 PSI).

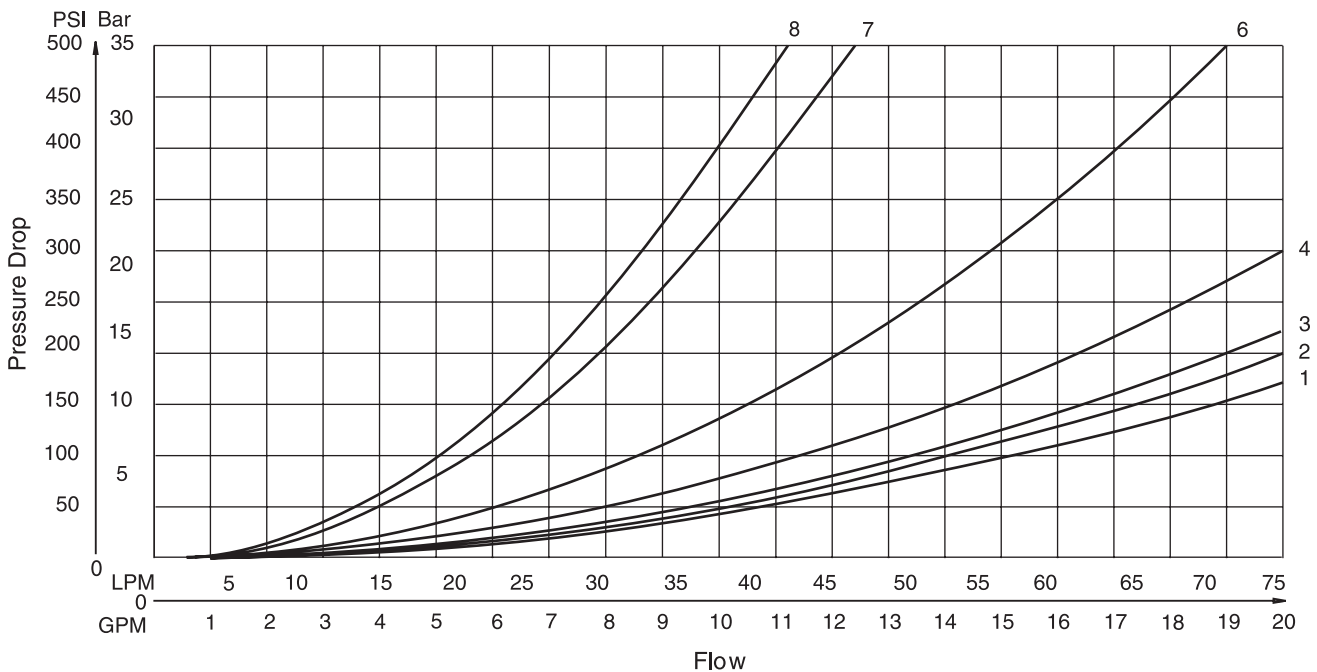
**D1VW Pressure Drop Reference Chart – 30 Watt Coil**

Spool No.	Curve Number										
	Shifted				Center Condition						
	P-A	P-B	B-T	A-T	(P-T)	(B-A)	(A-B)	(P-A)	(P-B)	(A-T)	(B-T)
001	3	3	2	2	-	-	-	-	-	-	-
002	2	2	1	1	2	1	1	1	1	1	1
003	2	2	1	1	-	-	-	-	-	1	-
004	2	2	1	1	-	-	-	-	-	2	2
006	2	2	1	1	-	6	6	6	6	-	-
007	2	3	1	1	4	-	1	-	-	-	-
008	5	5	5	5	5	-	-	-	-	-	-
009	4	4	4	4	4	-	-	-	-	-	-
011	3	3	1	1	-	-	-	-	-	8	8
015	2	2	1	1	-	-	-	-	-	-	1
020	4	4	2	2	-	-	-	-	-	-	-
026	4	4	-	-	-	-	-	-	-	-	-
030	2	2	1	1	-	-	-	-	-	-	-
081	7	7	8	8	-	-	-	-	-	-	-
082	7	7	8	8	-	-	-	-	-	-	-

**Viscosity Correction Factor**

Viscosity (SSU)	75	150	200	250	300	350	400	Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change per chart. Pressure drops charted for equal flow A and B ports. Unequal A and B port flows may decrease shift limits.
% of ΔP (Approx.)	93	111	119	126	132	137	141	

**Performance Curves – 30 Watt Coil**



**A**

**Pressure Drop vs. Flow, Low Watt**

The table to the right provides the flow vs. pressure drop curve reference for 10 watt D1V Series valves by spool type.

The chart below demonstrates graphically the pressure drop characteristics of the standard D1VW\*\*\*\*L and the high performance D1V. The low watt coil and other design features of the standard D1VW\*\*\*\*L accommodate a maximum flow of 50 LPM (13 GPM) at 345 Bar (5000 PSI).

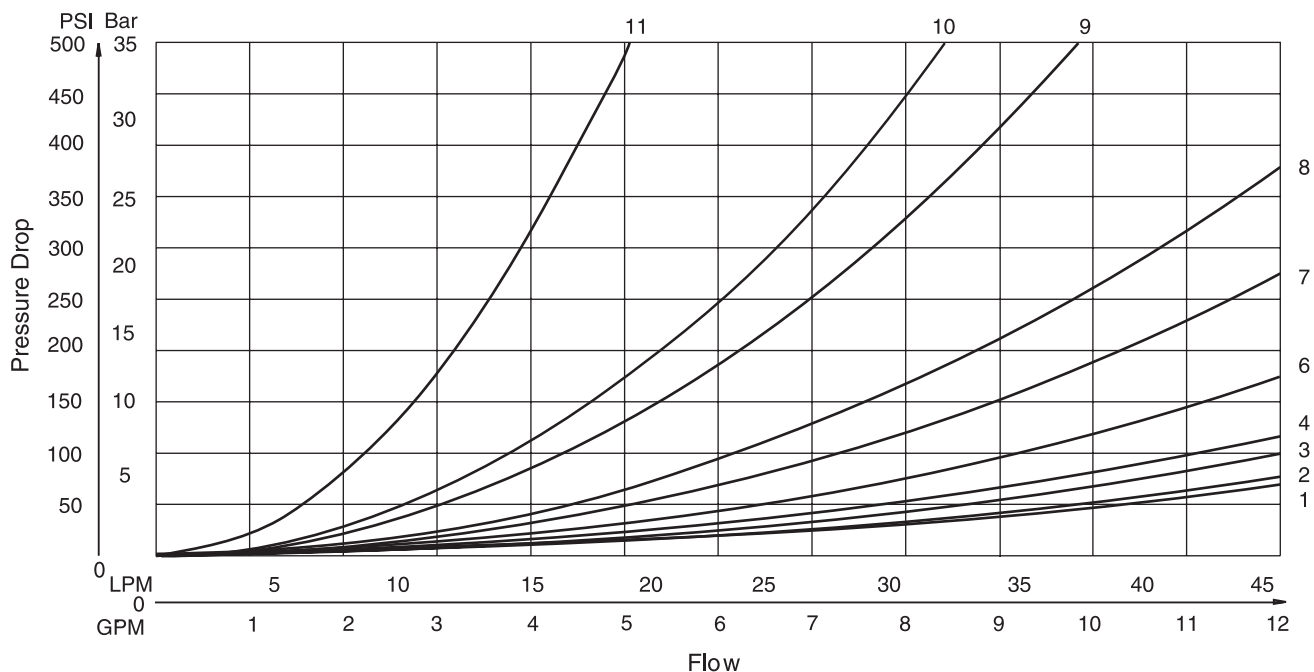
**D1VW Pressure Drop Reference Chart – 10 Watt Coil**

Spool No.	Curve Number										
	Shifted				Center Condition						
	P-A	P-B	B-T	A-T	(P-T)	(B-A)	(A-B)	(P-A)	(P-B)	(A-T)	(B-T)
001	3	3	2	2	-	-	-	-	-	-	-
002	2	2	1	1	2	2	2	2	2	1	1
003	3	3	2	1	-	-	-	-	-	4	-
004	3	3	1	1	-	-	-	-	-	6	6
006	3	3	1	1	-	8	8	7	7	-	-
007	3	3	1	1	5	-	4	-	-	-	1
008	5	5	6	6	7	-	-	-	-	-	-
009	6	6	6	6	5	-	-	-	-	-	-
011	3	3	1	1	-	-	-	-	-	11	11
015	3	3	1	2	-	-	-	-	-	-	4
020	7	7	4	4	-	-	-	-	-	-	-
026	6	6	-	-	-	-	-	-	-	-	-
030	2	2	1	1	-	-	-	-	-	-	-
081	9	9	10	10	-	-	-	-	-	-	-
082	10	10	10	10	-	-	-	-	-	-	-

**Viscosity Correction Factor**

Viscosity (SSU)	75	150	200	250	300	350	400	Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change per chart.
% of ΔP (Approx.)	93	111	119	126	132	137	141	

**Performance Curves – 10 Watt Coil**





### General Description

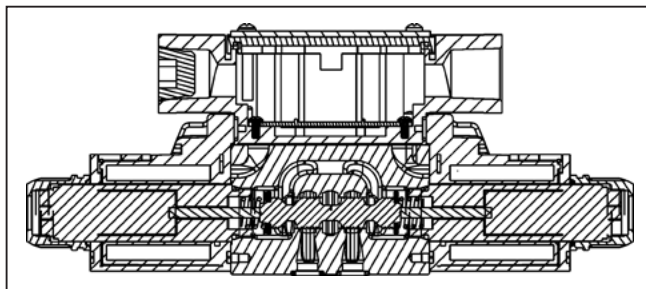
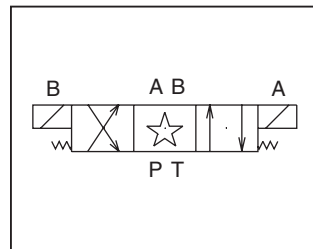
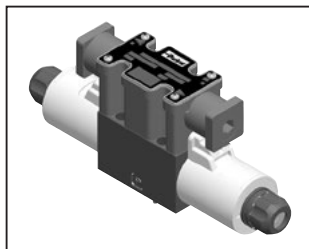
Series D1VW directional control valves are high performance, 4-chamber, direct operated, wet armature solenoid controlled, 3 or 4-way valves. They are available in 2 or 3-position and conform to NFPA's D03, CETOP 3 mounting patterns.

### Features

- Soft shift available.
- Thirteen standard spool styles available (for other spools – Consult Factory).
- Two proportional spools.
- DC surge suppression.
- Seven electrical connection options.
- AC & DC lights available (CSA approval for solenoids and lights).
- Internally ground.
- Easy access mounting bolts.
- Waterproof (meets NEMA 4, up to IP69 on some models).
- Explosion proof.
- CSA approvals. CE approvals and Dual Rated approvals available.

### Specifications

<b>Mounting Pattern</b>	NFPA D03, CETOP 3, NG 6
<b>Mounting Interface</b>	DIN 24340-A6 ISO 4401-AB-03-4-A CETOP R35H 4.2-4-03, NFPA D03
<b>Maximum Pressure</b>	P, A, B 345 Bar (5000 PSI) Standard 207 Bar (3000 PSI) 10 Watt CSA  276 Bar (4000 PSI) Tank: 103 Bar (1500 PSI) AC only 207 Bar (3000 PSI) DC/AC Rectified Standard 207 Bar (3000 PSI) AC Optional CSA  103 Bar (1500 PSI)



- U.L. recognized coils standard, expect Expl Pf.
- No tools required for coil removal.
- AC rectified coils.

<b>Leakage Rates*</b> <b>100 SSU @</b> <b>49°C (120°F)</b>	Maximum Allowable: 19.7 cc (1.2 Cu. in.) per Minute/Land @ 69 Bar (1000 PSI)*
	73.8 cc (4.5 Cu. in.) per Minute/Land @ 207 Bar (3000 PSI)*
*#008 and #009 Spools may exceed these rates. Consult Factory	Typical: 4.9 cc (0.3 Cu. in.) per Minute/Land @ 69 Bar (1000 PSI)* 26.2 cc (1.6 Cu. in.) per Minute/Land @ 345 Bar (5000 PSI)

### Response Time

Response time (milliseconds) at 345 Bar (5000 PSI) is 32 LPM (8.5 GPM).

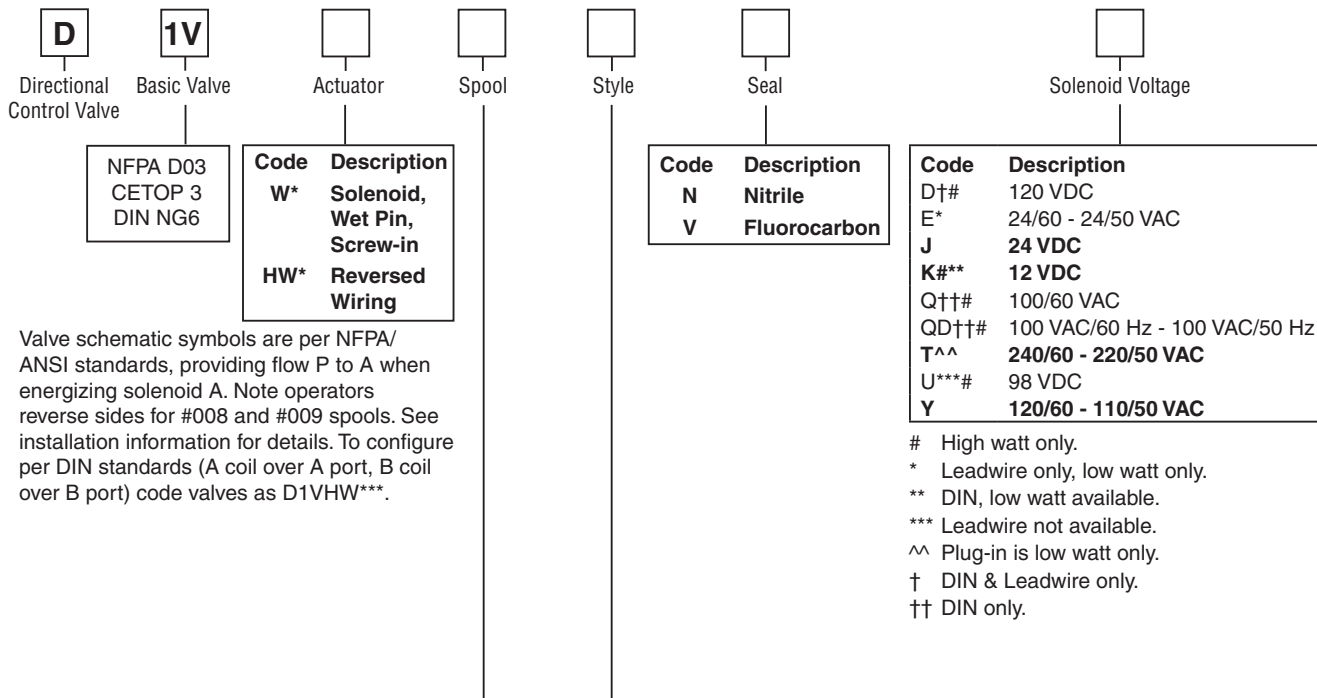
Solenoid Type	Pull-In	Drop-Out
AC	13	20
DC 10 Watt	61	22
DC 30 Watt	51	21

Soft Shift	Orifice Size	Voltage	Spool Center Condition					
			Closed		Open		2-Position	
			Energize	De-Energize	Energize	De-Energize	Energize	De-Energize
S2	0.020	AC	175 ms	700 ms	600 ms	800 ms	150 ms	200 ms
		DC	200 ms	650 ms	700 ms	650 ms	175 ms	225 ms
S3	0.030	AC	150 ms	400 ms	500 ms	600 ms	100 ms	150 ms
		DC	125 ms	325 ms	550 ms	550 ms	100 ms	100 ms
S4	0.040	AC	125 ms	300 ms	450 ms	500 ms	100 ms	100 ms
		DC	100 ms	250 ms	500 ms	450 ms	75 ms	60 ms

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**A**



\* Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing solenoid A. Note operators reverse sides for #008 and #009 spools. See installation information for details. To configure per DIN standards (A coil over A port, B coil over B port) code valves as D1VHW\*\*\*.

# High watt only.  
 \* Leadwire only, low watt only.  
 \*\* DIN, low watt available.  
 \*\*\* Leadwire not available.  
 ^^ Plug-in is low watt only.  
 † DIN & Leadwire only.  
 †† DIN only.

Code	Symbol	Code	Symbol
001		011	
002		015	
003		020*	
004		026*	
006		030**	
007		081†	
008*, 009**		082†	

\* 008, 020 & 026 spools have closed crossover.  
 \*\* 009 & 030 spools have open crossover.  
 † Only DC or AC rectified.

**Valve Weight:**

Single Solenoid 1.36 kg (3.0 lbs.)  
 Double Solenoid 1.6 kg (3.5 lbs.)

**Standard Bolt Kit:** BK209

**Metric Bolt Kit:** BKM209

**Seal Kit:**

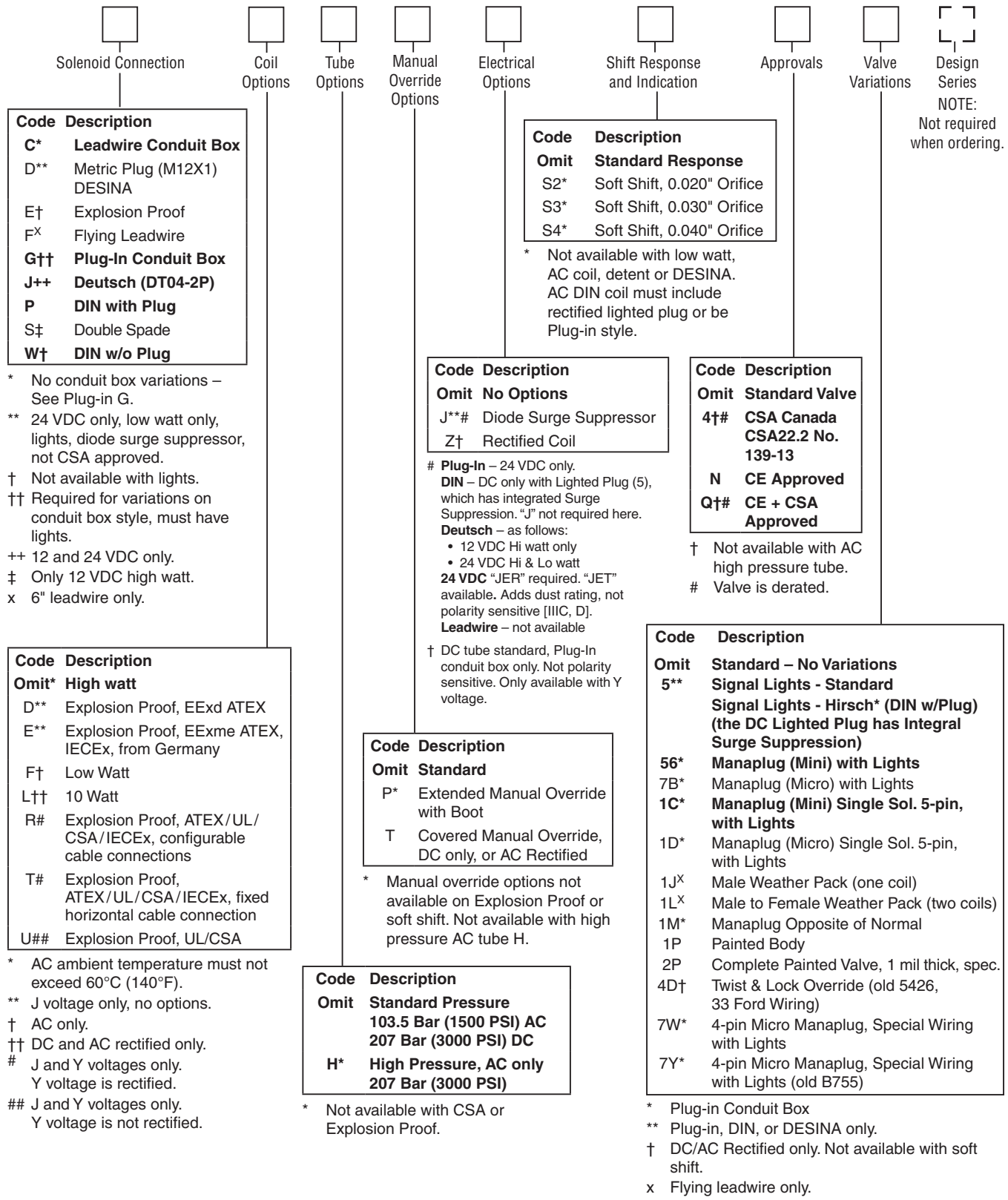
Nitrile SKD1VWN91  
 Fluorocarbon SKD1VWV91

Code	Description	Symbol
A*	Double solenoid, 2 position, no springs.	
B**	Single solenoid, 2 position, spring offset. P to A and B to T in offset position.	
C	Double solenoid, 3 position, spring centered.	
D††	Double solenoid, 2 position, detent.	
E	Single solenoid, 2 position, spring centered. P to B and A to T when energized.	
F‡	Single solenoid, 2 position. Spring offset, energized to center. Position spool spacer on A side. P to A and B to T in spring offset position.	
H**	Single solenoid, 2 position, spring offset. P to B and A to T in offset position.	
K	Single solenoid, 2 position, spring centered. P to A and B to T when energized.	
M‡	Single solenoid, 2 position, spring offset, energized to center position. Spool spacer on B side. P to B and A to T in spring offset position.	

\* 020 spool only.  
 \*\* 020, 026 and 030 spools only.  
 † 020 and 030 spools only. High watt only.  
 ‡ High Watt only.

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

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



**CAUTION: Manaplug Micro = M12X1 Connection, 4 or 5 pin**  
**Manaplug Mini = 7/8-16 UN-2A Connection**

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

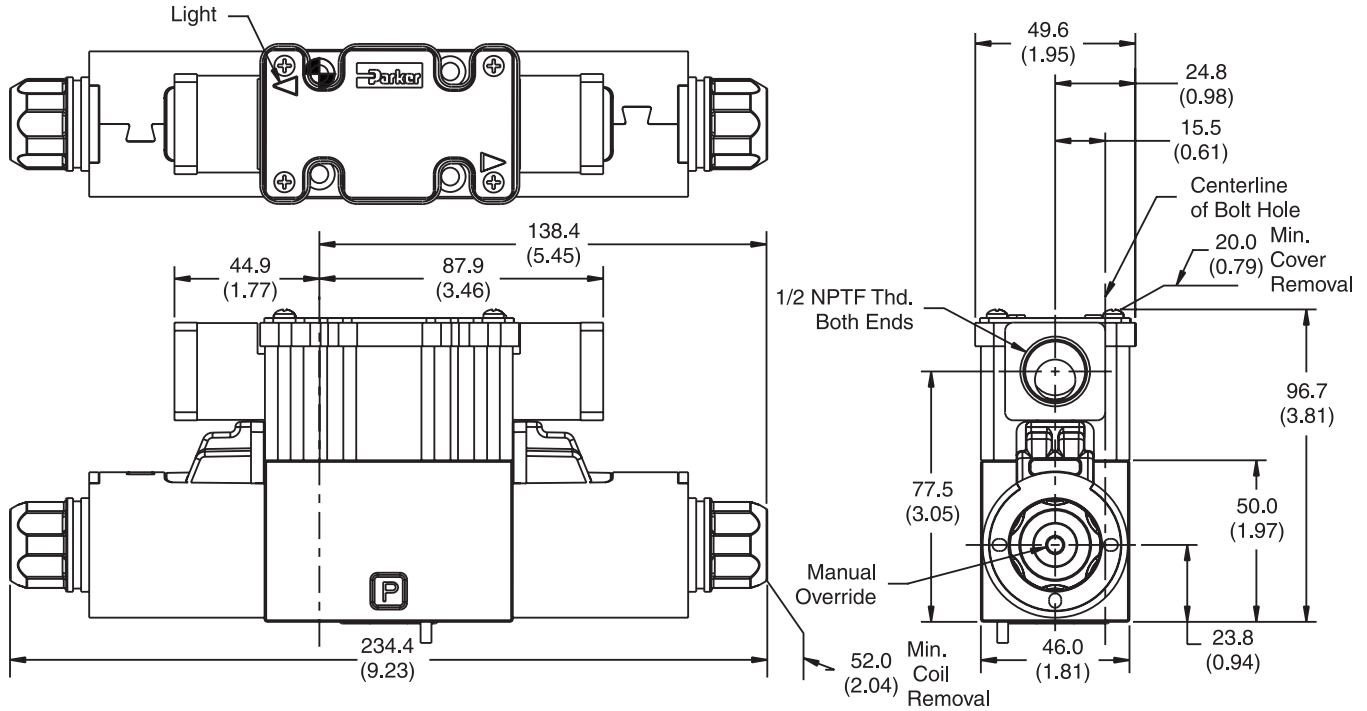


**Dimensions**

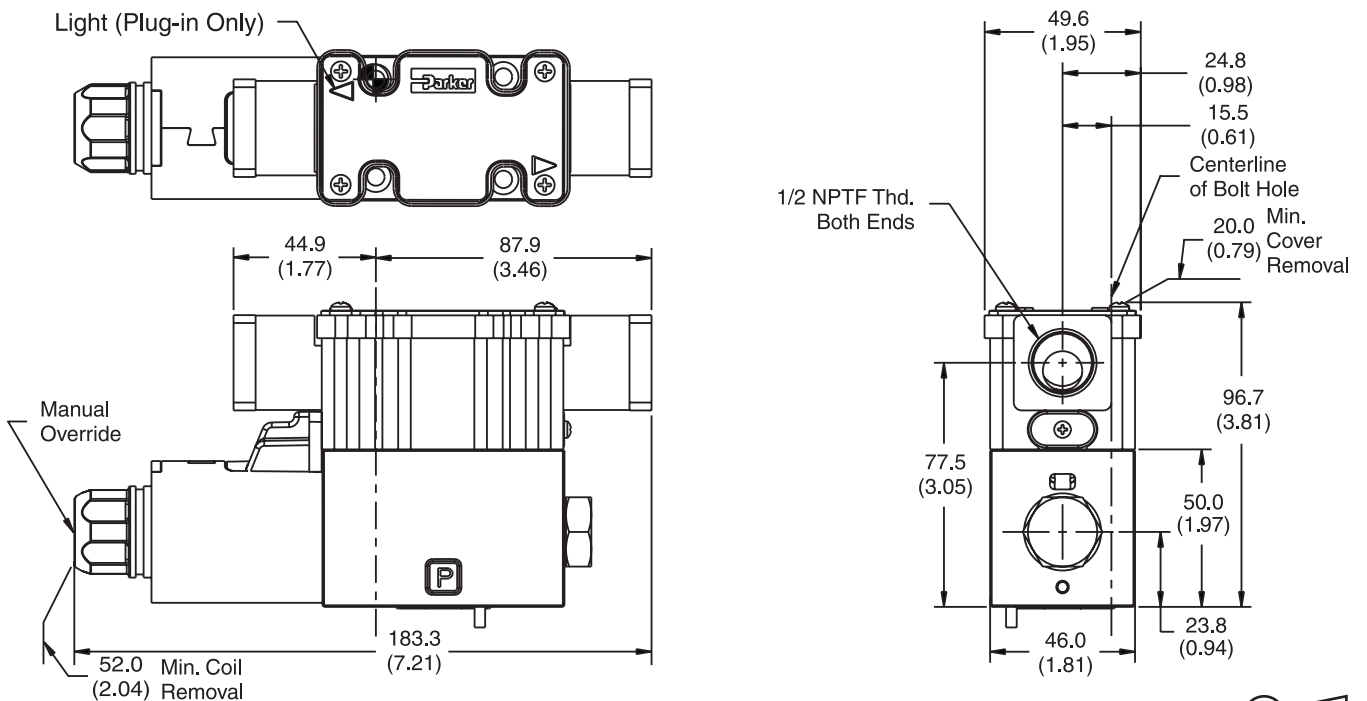
Inch equivalents for millimeter dimensions are shown in (\*\*)

**A**

**DC Plug-In Conduit Box Connector, with Lights, Double Solenoid**



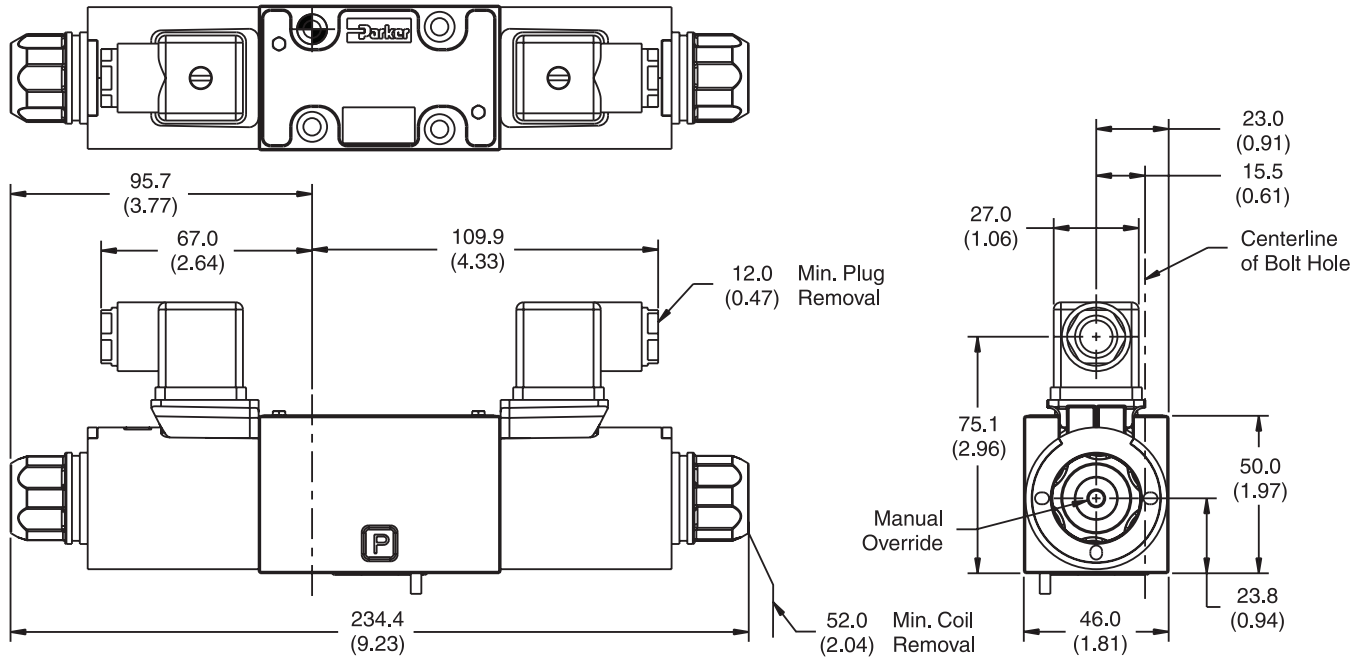
**DC Plug-In or Leadwire Conduit Box Connector, with or without Lights, Single Solenoid**



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

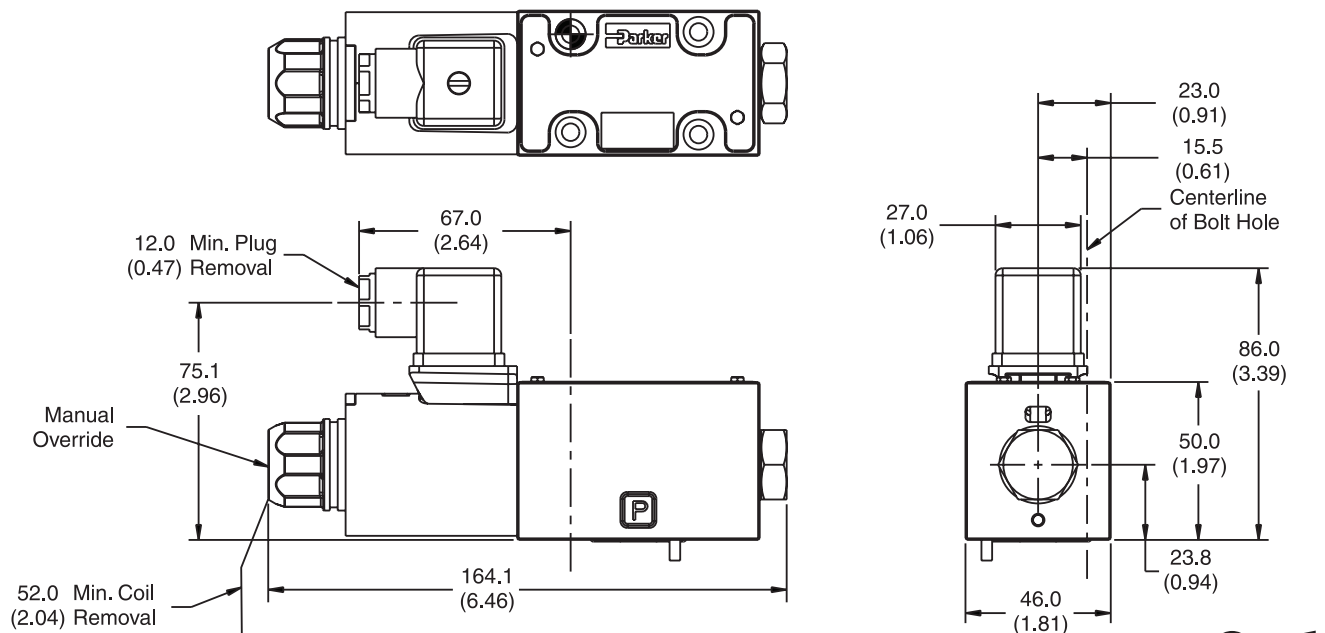
**DC DIN with Plug Connector, Double Solenoid  
“P” Option Shown**

**A**



**Note:** 22.0 mm (0.87") from bottom of bolt hole counterbore to bottom of valve.

**DC DIN Connector, Single Solenoid  
“P” Option Shown**



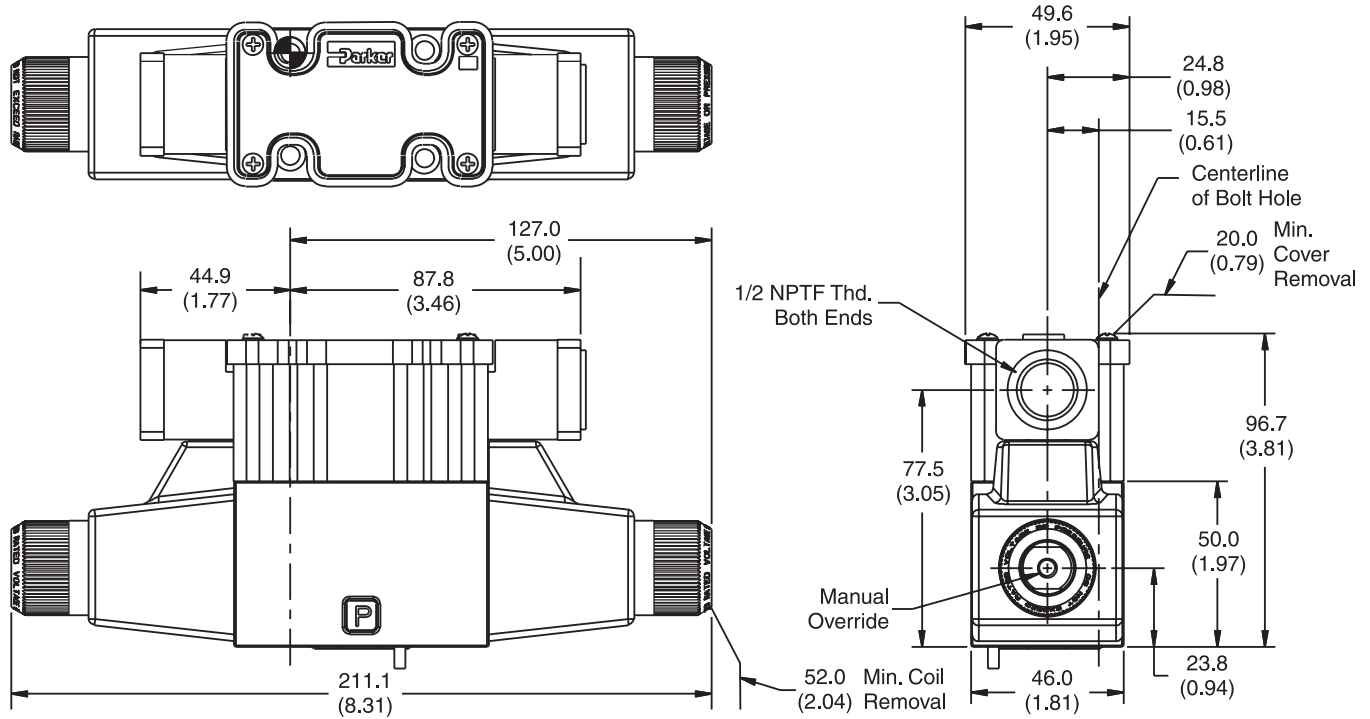
**Note:** 22.0 mm (0.87") from bottom of bolt hole counterbore to bottom of valve.

Dimensions

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

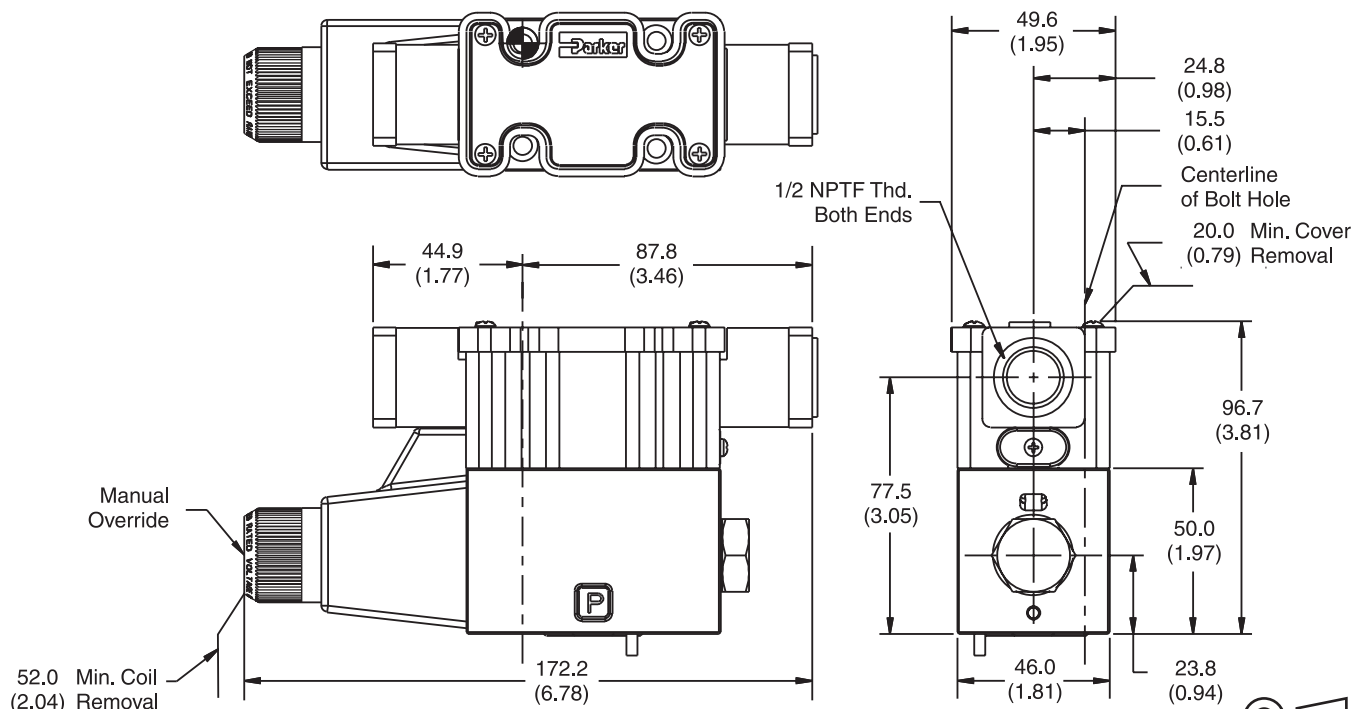
**A**

**AC Leadwire Conduit Box Connector, without Lights, Double Solenoid, "C" Option**



Note: 22.0 mm (0.87") from bottom of bolt hole counterbore to bottom of valve.

**AC Leadwire Conduit Box Connector, without Lights, Single Solenoid, "C" Option**



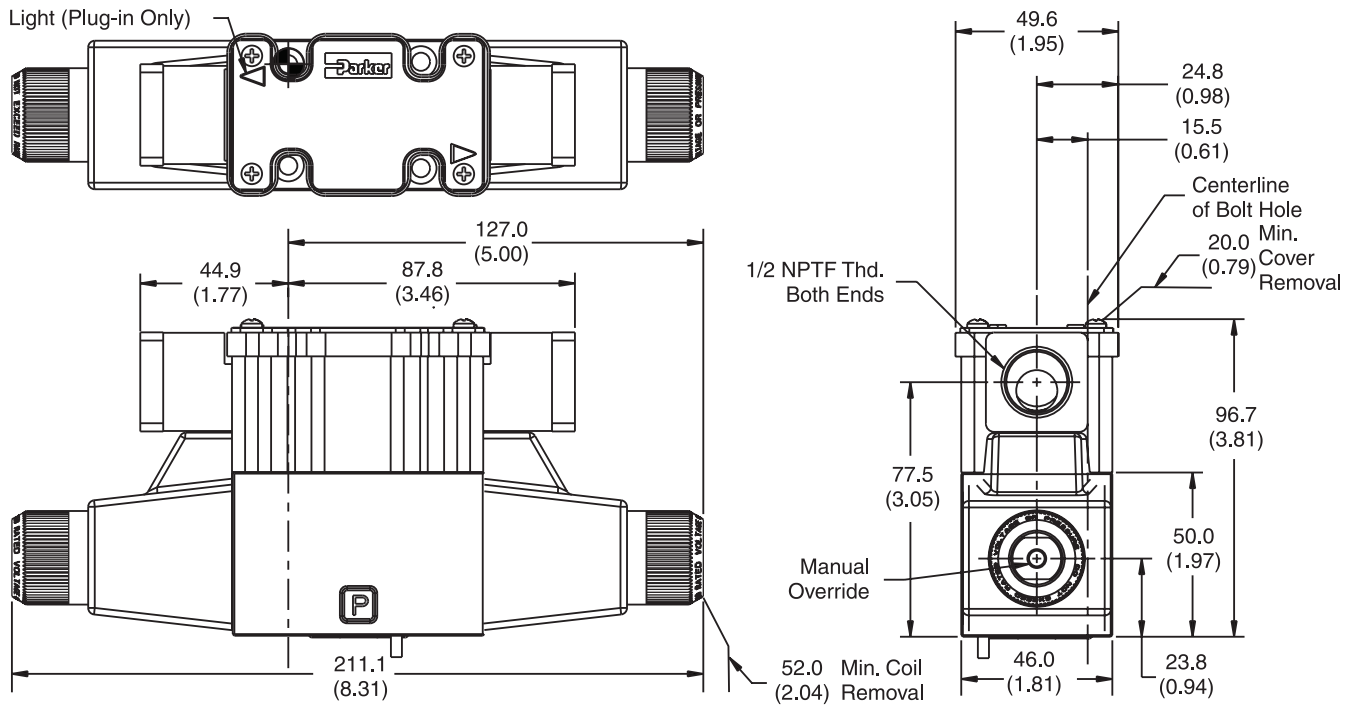
Note: 22.0 mm (0.87") from bottom of bolt hole counterbore to bottom of valve.



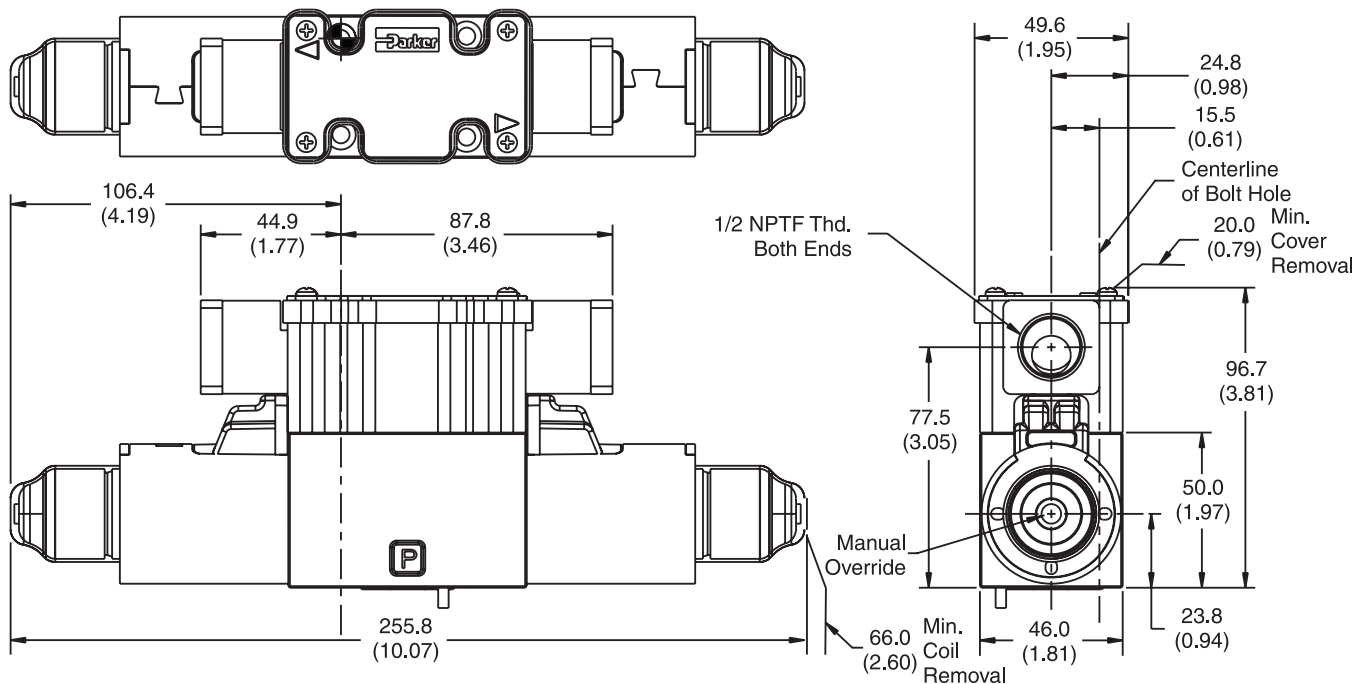
Dimensions

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

AC Plug-in Conduit Box Connector,  
with Lights, Double Solenoid, "G" Option



DC Plug-in or Leadwire Conduit Box Connector, with or without  
Lights and Extended Manual Override Tubes, Double Solenoid

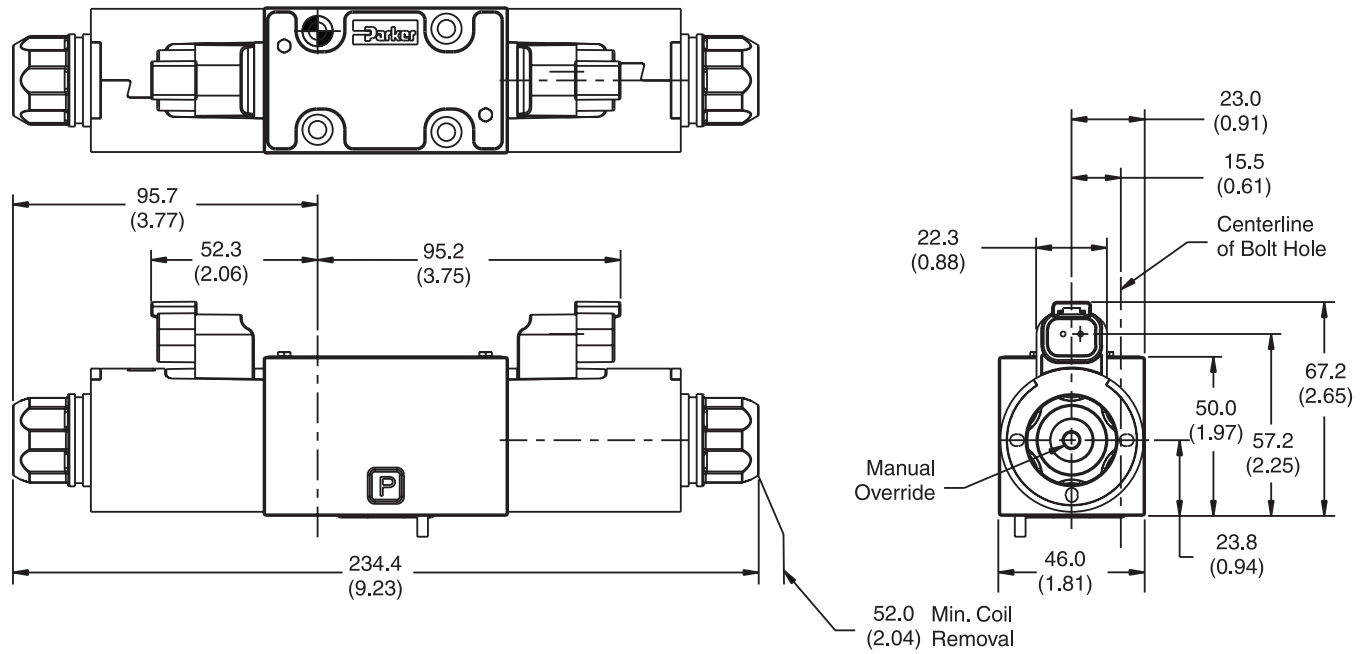


**Dimensions**

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

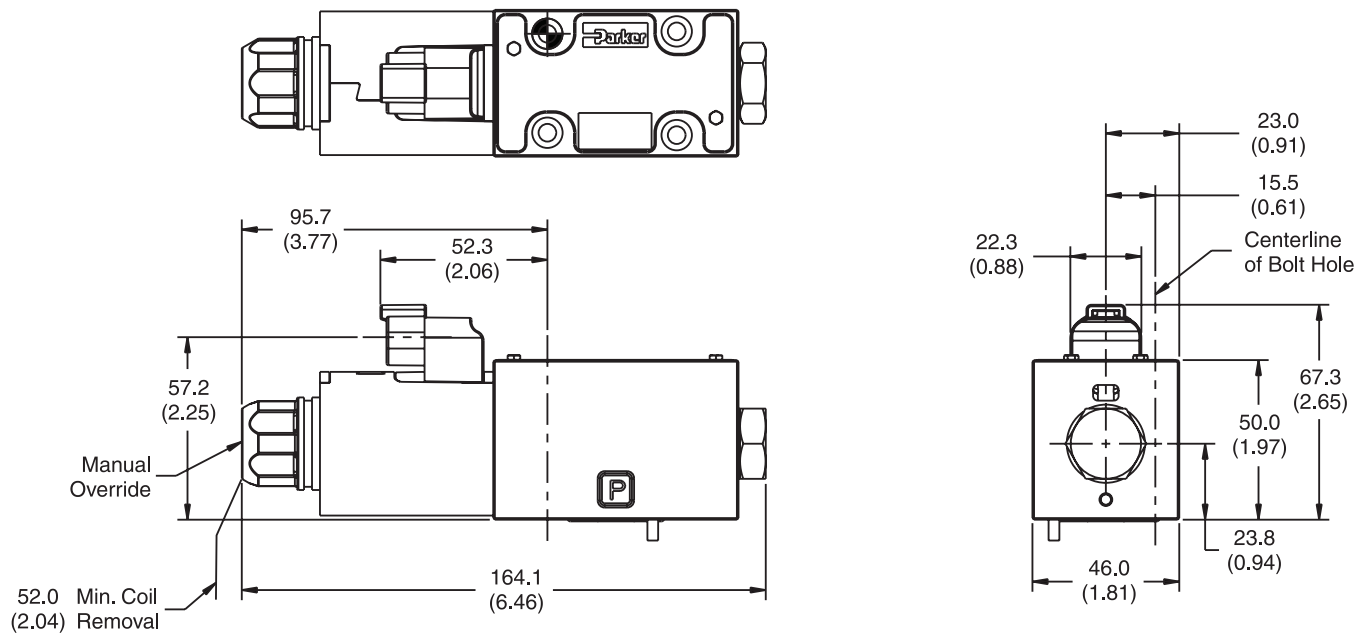
**A**

**DC Deutsch Connector, Double Solenoid (DT04-2P)**



**Note:** 22.0 mm (0.87") from bottom of bolt hole counterbore to bottom of valve.

**DC Deutsch Connector, Single Solenoid**



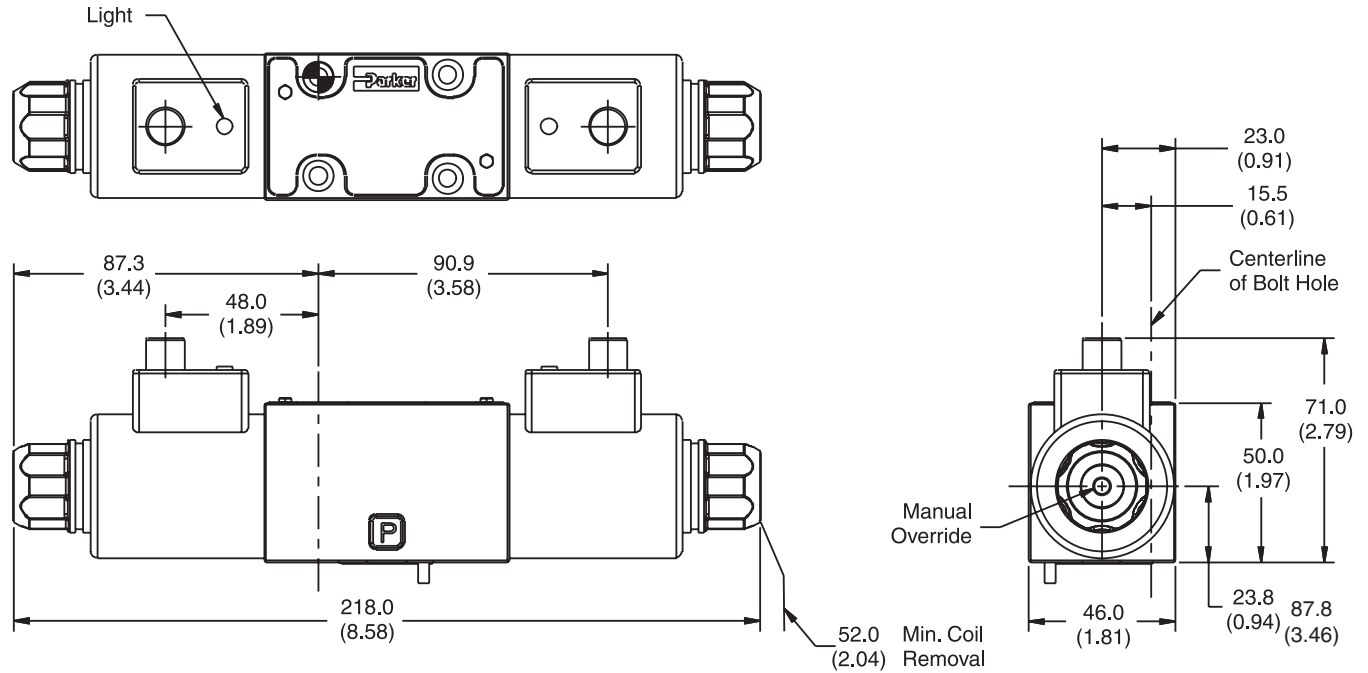
**Note:** 22.0 mm (0.87") from bottom of bolt hole counterbore to bottom of valve.



**Dimensions**

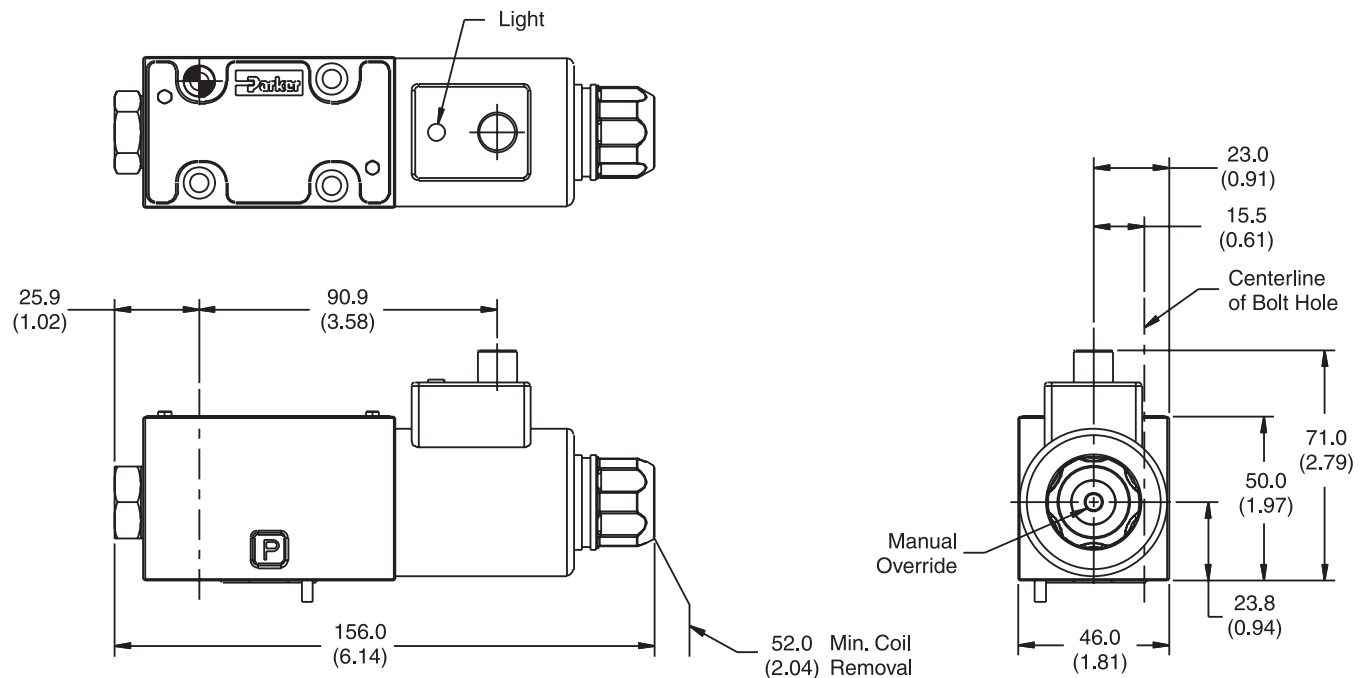
Inch equivalents for millimeter dimensions are shown in (\*\*)

**DC Desina Connector, Double Solenoid**



**Note:** 22.0 mm (0.87") from bottom of bolt hole counterbore to bottom of valve.

**DC Desina Connector, Single Solenoid**



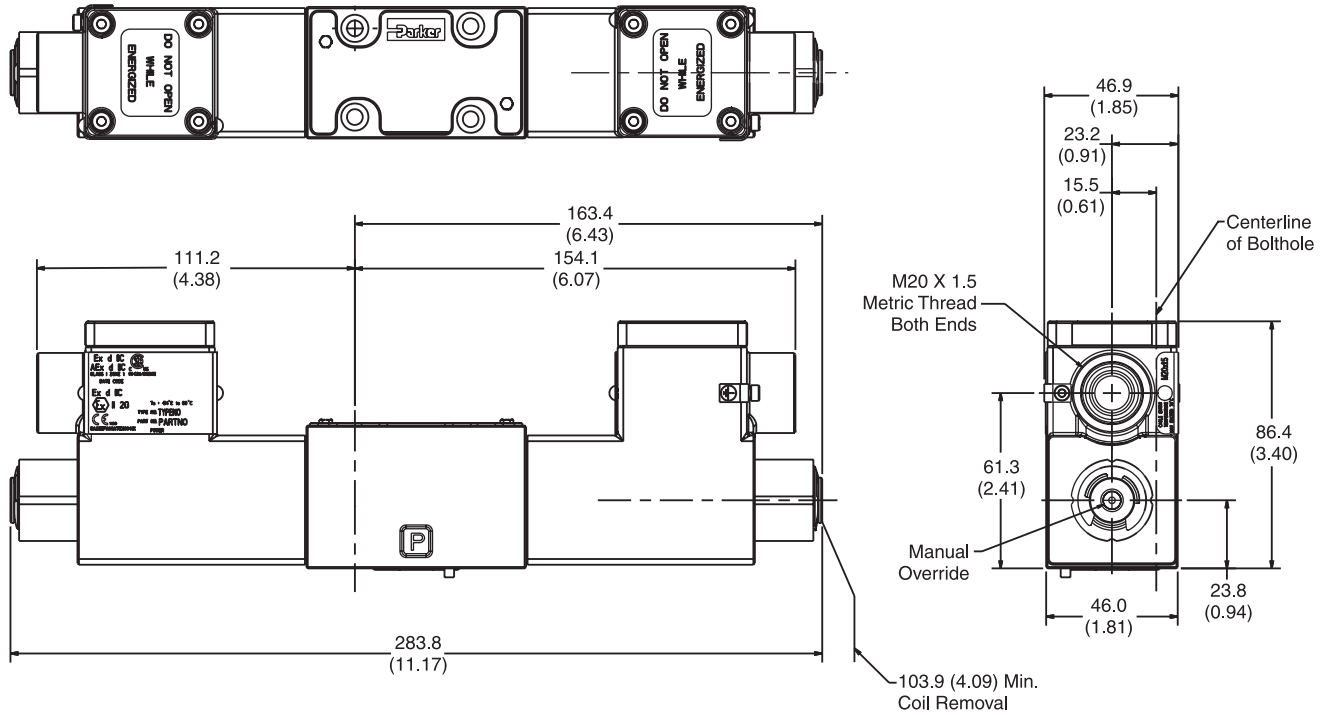
**Note:** 22.0 mm (0.87") from bottom of bolt hole counterbore to bottom of valve.



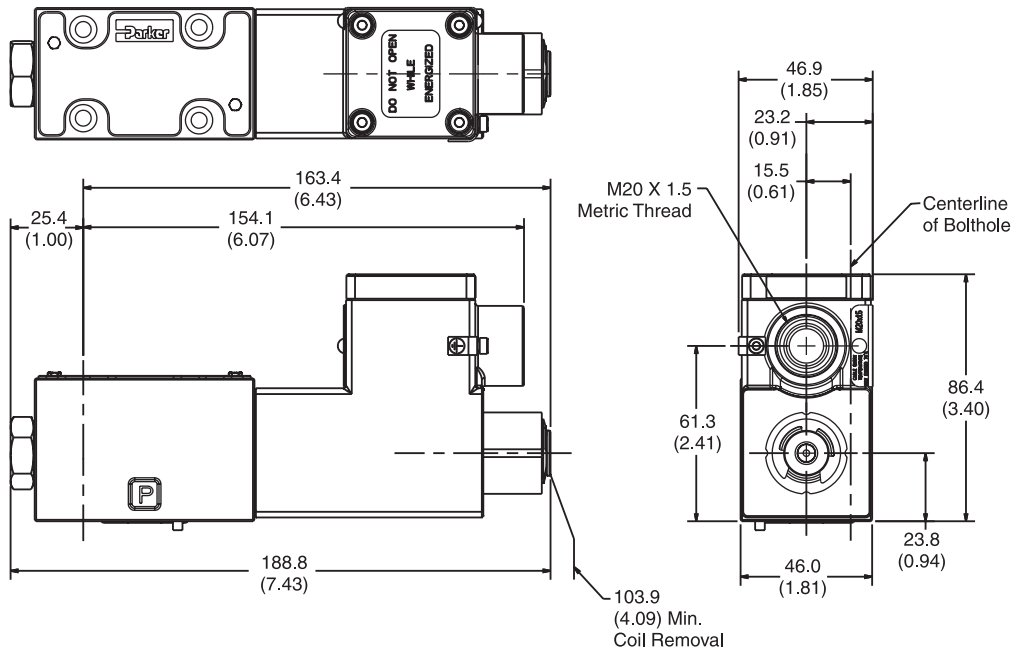
Inch equivalents for millimeter dimensions are shown in (\*\*)

**A**

**Explosion Proof, Ex d IIC ATEX/CSA/IECEX, Double Solenoid**



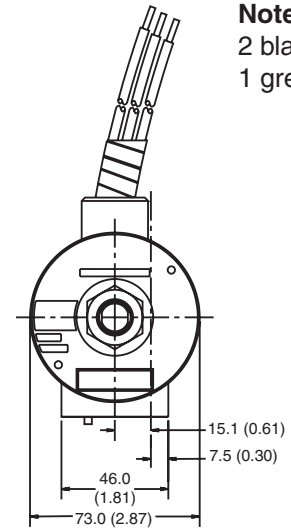
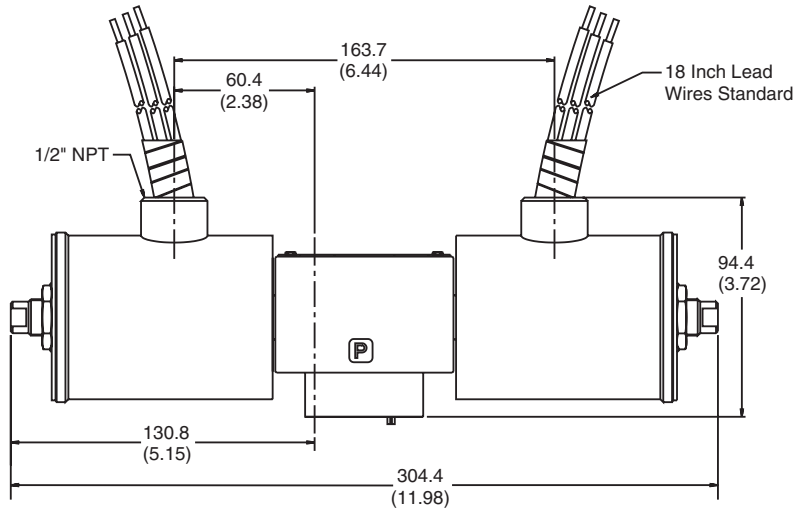
**Explosion Proof, Ex d IIC ATEX/CSA/IECEX, Single Solenoid**



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

**Explosion Proof U.L. & C.S.A., Double Solenoid**

**A**

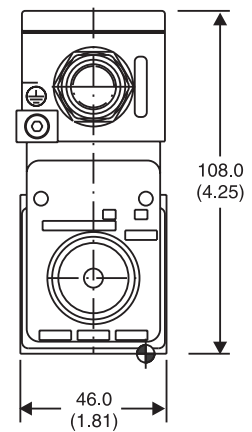
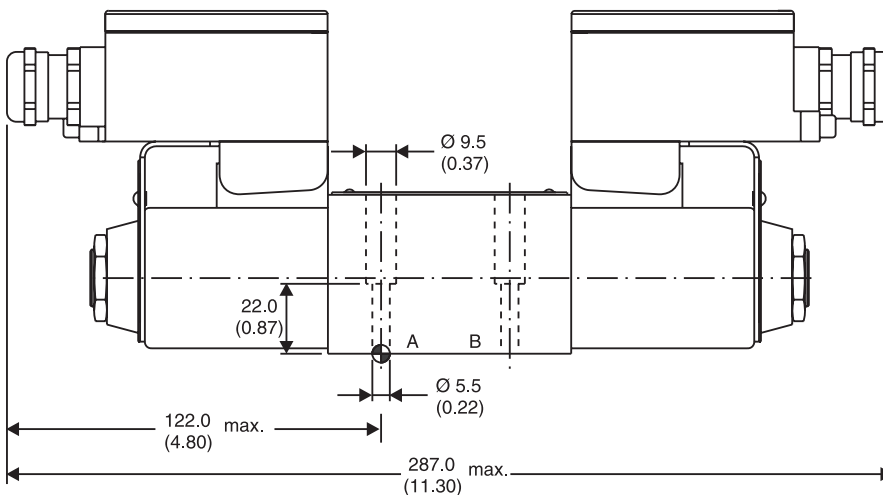


**Note:**  
2 black wires  
1 green wire

**Note:** 41.0 mm (1.62") from bottom of bolt hole counterbore to bottom of valve.



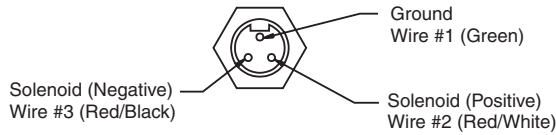
**Explosion Proof, EExme ATEX, Double Solenoid, from Germany**





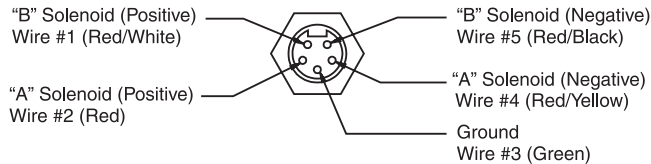
**Manaplug (Options 56 & 1C)**

- Interface – Brad Harrison Plug
- 3-Pin for Single Solenoid
- 5-Pin for Double Solenoid



**3-Pin Manaplug (Mini) with Lights**

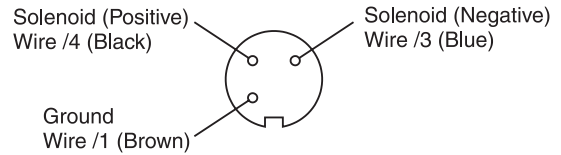
Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Mini) with Lights**

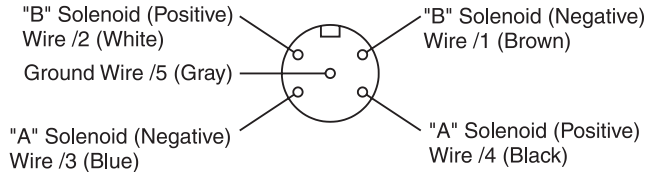
Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Micro Connector Options (7B & 1D)**



**3-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid



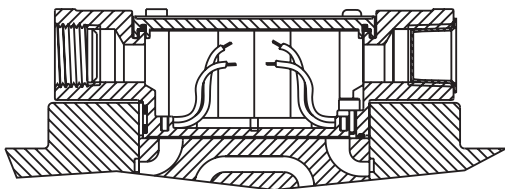
**5-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Pins are as seen on valve (male pin connectors)**

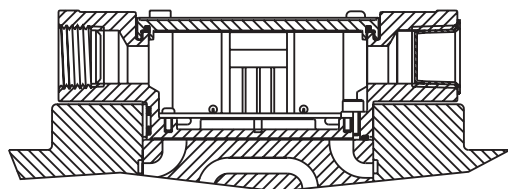
**Conduit Box Option C**

- No Wiring Options Available



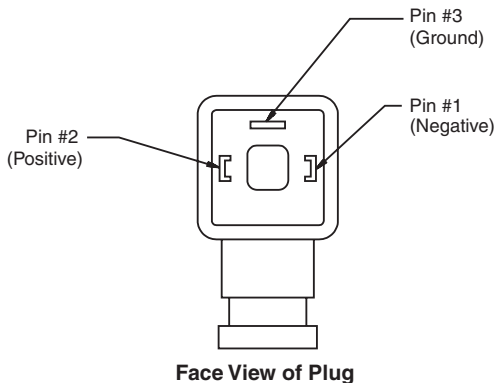
**Signal Lights (Option 5) — Plug-in Only**

- LED Interface
- Meets Nema 4/IP67



**Hirschmann Plug with Lights (Option P5)**

**ISO 4400/DIN 43650 Form "A"**



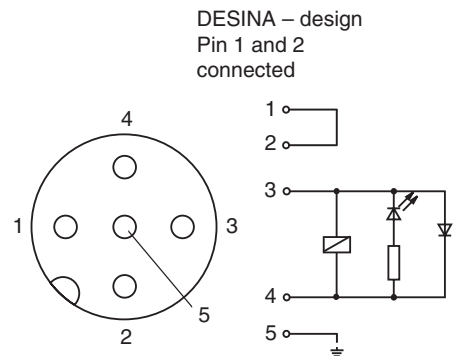
Face View of Plug

**Pins are as seen on valve (male pin connectors)**

**DESINA Connector (Option D)**

**M12 Pin Assignment Standard**

- 1 = Not used
- 2 = Not used
- 3 = 0V
- 4 = Signal (24 V)
- 5 = Earth Ground



DESINA – design  
Pin 1 and 2  
connected



### Mounting Bolt Kits

**Bolt Kits for use with D1V Directional Control Valves, ER and ET Explosion Proof & Sandwich Valves (D1V\*-94 Design back to 82 Design Valves)**

		Number of Sandwich Valves @40 mm (1.58") thickness									
		0		1		2		3		4	
Number of Sandwich Valves at 40.0 mm (1.57") Thickness	0	BK209	1.25 in.	BK243	2.88 in.	BK225	4.38 in.	BK244	6.00 in.	BK245	7.50 in.
		BKM209	30 mm	BKM243	70 mm	BKM225	110 mm	BKM244	150 mm	BKM245	190 mm
	1	BK246	3.00 in.	BK247	4.62 in.	BK248	6.12 in.	BK249	7.75 in.		
		BKM246	75 mm	BKM247	115 mm	BKM248	155 mm	BKM249	195 mm		
	2	BK250	4.75 in.	BK251	6.38 in.	BK252	7.88 in.				
		BKM250	120 mm	BKM251	160 mm	BKM252	200 mm				
	3	BK253	6.50 in.	BK254	8.12 in.						
		BKM102	170 mm	BKM254	205 mm						
	4	BK103	8.25 in.								
		BKM103	210 mm								

**Note:** All bolts are SAE Grade 8, 10-24 UNC 2A thread (Metric-M5-0.8)  
Torque to 5.6 Nm (50 in-Lb).

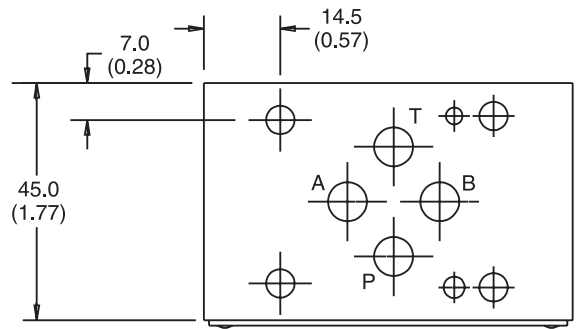
**Bolt Kits for use with D1V Directional Control Valves with Explosion Proof Coils & Sandwich Valves (D1V\*-94 Design back to 82 Design) Except ER and ET Coils**

		Number of Sandwich Valves @40 mm (1.58") thickness									
		0		1		2		3		4	
Number of Sandwich Valves at 40.0 mm (1.57") Thickness	0	BK50	2.00 in.	BK211	3.63 in.	BK101	5.12 in.	BK102	6.75 in.	BK103	8.25 in.
		BKM50	50 mm	–	BKM101	130 mm	BKM102	170 mm	BKM103	210 mm	
	1	BK51	3.75 in.	BK212	5.37 in.	BK105	6.87 in.	BK106	7.75 in.		
		BKM51	95 mm	–	BKM105	180 mm	BKM106	195 mm			
	2	BK52	5.50 in.	BK213	7.13 in.	BK108	8.62 in.				
		BKM52	140 mm	–	BKM108	220 mm					
	3	BK53	7.25 in.	BK214	8.87 in.						
		BKM53	185 mm	–							
	4	BK54	9.00 in.								
		BKM54	230 mm								

**Note:** All bolts are SAE Grade 8, 10-24 UNC 2A thread (Metric-M5-0.8)  
Torque to 5.6 Nm (50 in-Lb).

### Sandwich Valve Dimensional Data

For additional technical information about Sandwich valves, refer to the Sandwich Valve Section of this Catalog.







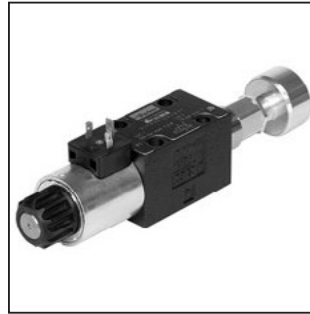
**General Description**

Series D1VW Inductive Control Valves are direct operated directional valves with inductive position control and are typically used in safety relevant applications. The start or end position can be monitored. The position control is available for single and double solenoid valves.

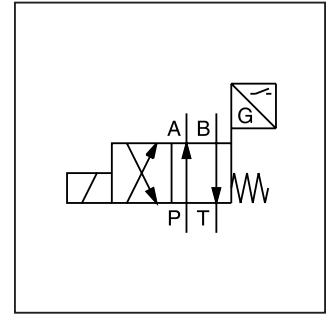
The fail-safe position of the directional valve during power failure is the spring offset or center position.

Detailed information on the machine directive is available in the position papers (see pages A3 and A4).

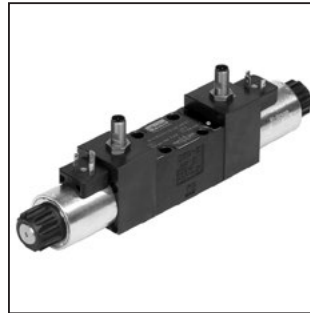
**Note: The adjustment of the position control is factory set and sealed. Replacement and repairs can only be made by the manufacturer.**



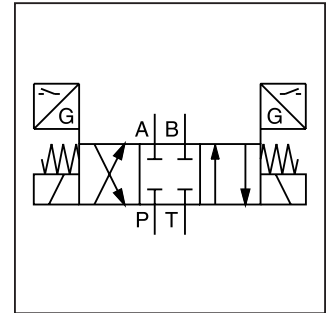
D1VW\*B



D1VW\*B

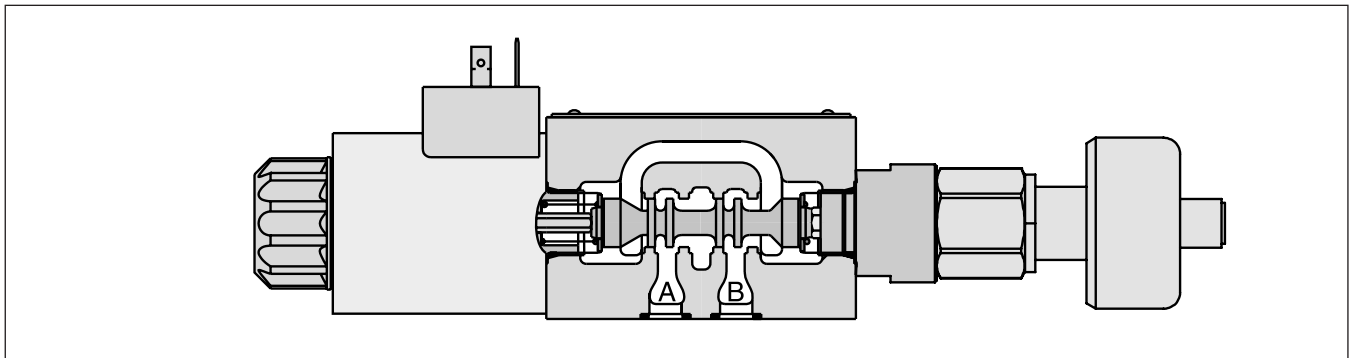


D1VW\*C

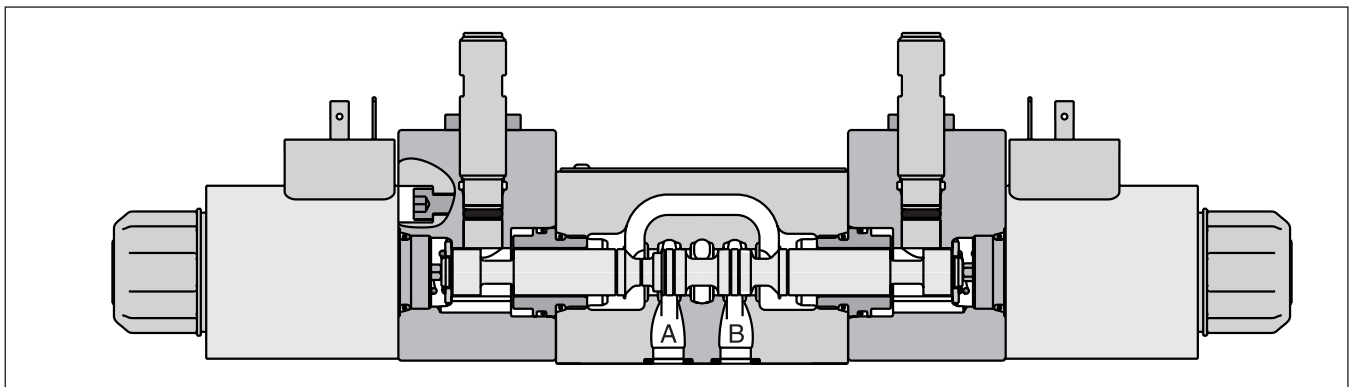


D1VW\*C

**D1VW\*B**



**D1VW\*C**

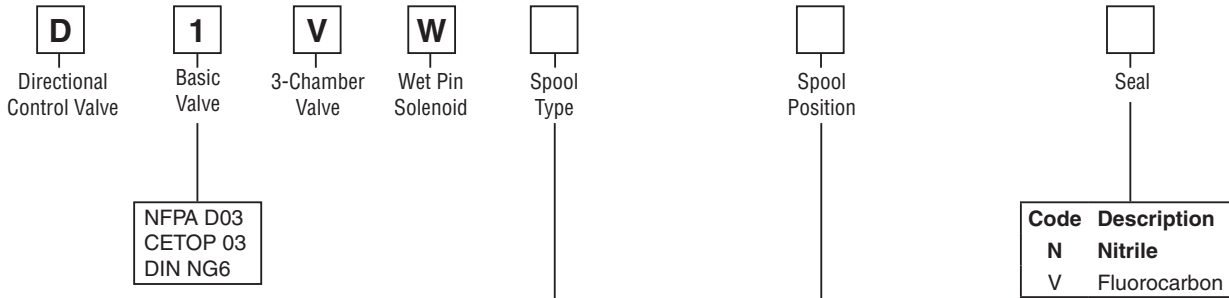


**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



D1VW with Position Control, Single Solenoid Valve

**A**



3-Position Spools	
Code	Spool Type
	a 0 b
<b>001</b>	
<b>002</b>	
003*	
<b>004</b>	
005	
015**	
016	
076	
078	

2-Position Spools	
Code	Spool Type
	a b
<b>020</b>	
026†	
030†	

\* Only available for spool position "E" and "F".  
 \*\* Only available for spool position "K" and "M".  
 † Only available for spool position "B" and "H".

3-Position Spools		
Code	Spool Position	
<b>E</b>	 Operated in position "a".	<b>2 positions.</b> Spring offset in position "0".
<b>F</b>	 Spring offset in position "b".	2 positions. Operated in position "0".
<b>K</b>	 Operated in position "b".	<b>2 positions.</b> Spring offset in position "0".
<b>M</b>	 Spring offset in position "a".	2 positions. Operated in position "0".

2-Position Spools		
Code	Spool Position	
<b>B</b>	 Operated in position "a".	<b>2 positions.</b> Spring offset in position "b". Operated in position "a".
<b>H</b>	 Operated in position "b".	<b>2 positions.</b> Spring offset in position "a". Operated in position "b".

**Weight:**

Single Solenoid: 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.**



Solenoid Voltage



Connector as per EN 175301-803, without plug (Please order plug separately. See Series D1V Technical Information.)



Manual Override



Position Control\*



Design Series  
NOTE:  
Not required when ordering.

Code	Description
K	12 VDC
<b>J</b>	<b>24 VDC</b>
U*	98 VDC
G*	205 VDC

\* To be used in combination with rectifier plugs at 120VAC / 230VAC power supply. (Please order plug separately. See Series D1V Technical Information.)

Code	Description
<b>Omit</b>	<b>Standard</b>
T*	No Override

\* For hydraulic presses according to the safety regulations EN 693, solenoid option "T" (without manual override) and accessories "I4N" or "I5N" (start position monitored) are required.

Code	Position Control	Spool Position
I2N	End position monitored side B	E, F, B (Solenoid on a-side)
<b>I5N**</b>	<b>Start position monitored side B</b>	
I1N	End position monitored side A	K, M, H (Solenoid on b-side)
<b>I4N**</b>	<b>Start position monitored side A</b>	

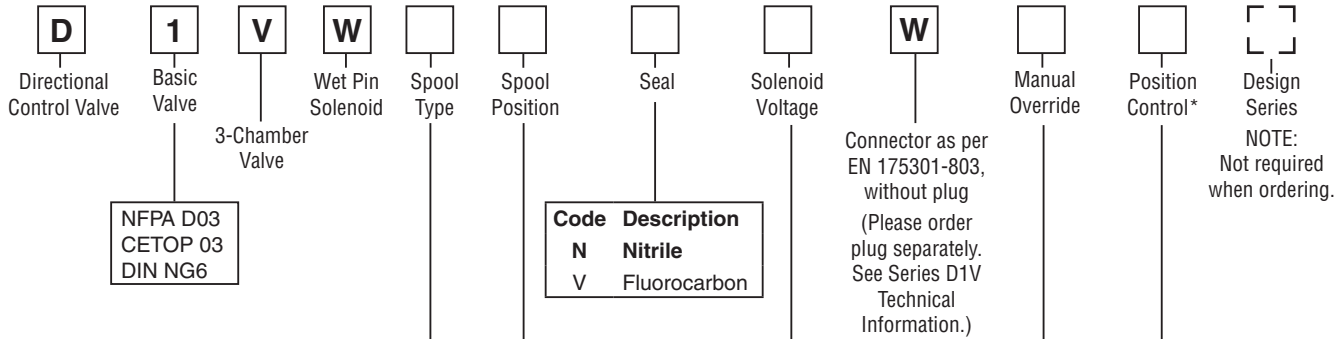
\* Please order female connector M12 x 1 separately. See Accessories, Female Connector M12x1 (order no. 5004109).

\*\* For hydraulic presses according to the safety regulations EN 693, solenoid option "T" (without manual override) and accessories "I4N" or "I5N" (start position monitored) are required.

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

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

**D1VW with Position Control, Double Solenoid Valve**



NFPA D03  
 CETOP 03  
 DIN NG6

Code	Description
N	Nitrile
V	Fluorocarbon

Connector as per EN 175301-803, without plug (Please order plug separately. See Series D1V Technical Information.)

NOTE: Not required when ordering.

3-Position Spools	
Code	Spool Type
	a 0 b
001	
002	
003*	
004	
015*	

2-Position Spools	
Code	Spool Type
	a b
020	

\* Only for position control I6N.

Code	Description
K	12 VDC
J	24 VDC
U*	98 VDC
G*	205 VDC

\* To be used in combination with rectifier plugs at 120VAC / 230VAC power supply. (Please order plug separately. See Series D1V Technical Information.)

Code	Description
Omit	Standard
T*	No Override

\* For hydraulic presses according to the safety regulations EN 693, solenoid option "T" (without manual override) and accessory "I6N" (start position) is required.

3-Position Spools	
Code	Spool Position
C	 3 positions. Spring offset in position "0". Operated in position "a" or "b".

2-Position Spools	
Code	Spool Position
D*	 2 positions. Operated in position "a" or "b". No center or offset position.

\* Only for position control I3N.

Code	Position Control	Spool Position
I3N	End positions	C, D
I6N**	Start positions	C

\* Please order plug M12 x 1 separately. Straight plug recommended — no defined position possible for angled plug.  
 \*\* For hydraulic presses according to the safety regulations EN 693, solenoid option "T" (without manual override) and accessory "I6N" (start position) is required.

**Weight:**  
 Double Solenoid: 3.8 kg (8.4 lbs.)

General					
Design	Directional Spool Valve				
Actuation	Solenoid				
Size	NG06 / CETOP 03 / NFPA D03				
Mounting Interface	DIN 24340 A6 / ISO 4401 / NFPA D03 / CETOP RP 121-H				
Mounting Position	Unrestricted, preferably horizontal				
Ambient Temperature	[°C]	-20...+60; (-4°F...+140°F)			
MTTF <sub>D</sub> Value	[years]	150			
Hydraulic					
Maximum Operating Pressure	P, A, B: 350 Bar (5045 PSI); T: 210 Bar (3045 PSI)				
Fluid	Hydraulic oil in accordance with DIN 51524				
Fluid Temperature	[°C]	-20 ... +70 (-4°F...+158°F)			
Viscosity Permitted	[cSt]/[mm <sup>2</sup> /s]	2.8...400 (13...1854 SSU)			
Recommended	[cSt]/[mm <sup>2</sup> /s]	30...80 (139...371 SSU)			
Filtration	ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)				
Flow Maximum	80 LPM (21 GPM) See shift limits				
Leakage at 50 Bar (725 PSI) (per flow path)	[ml/min]	Up to 10 (0.003 GPM) (depending on spool)			
Static / Dynamic					
Step Response at 95%	[ms]	Energized: 32; De-energized: 40			
Electrical					
Duty Ratio	100% ED; CAUTION: coil temperature up to 150°C (302°F) possible				
Max. Switching Frequency	15,000 switchings per hour				
Protection Class	IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)				
	Code	K	J	U	G
Supply Voltage	[V]	12	24	98	205
Tolerance Supply Voltage	[%]	±10	±10	±10	±10
Current Consumption	[A]	2.72	1.29	0.33	0.13
Power Consumption	[W]	32.7	31	31.9	28.2
Solenoid Connection	Connector as per EN 175301-803, solenoid identification as per ISO 9461.				
Wiring Minimum	[mm <sup>2</sup> ]	3 x 1.5 recommended			
Wiring Length Maximum	[m]	50 (164 ft.) recommended			

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

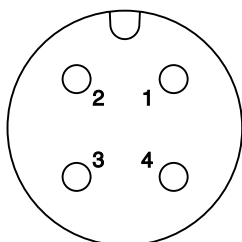
## Single Solenoid Valves

### Electrical Specifications of Position Control as per IEC 61076-2-101 (M12x1)

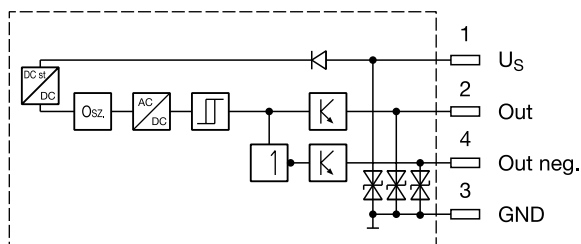
Protection Class		IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)
Ambient Temperature	[°C]	-20...+60; (-4°F...140°F)
Supply Voltage / Ripple	[V]	24 ≤10%
Tolerance Supply Voltage	[%]	±20
Polarity Protection	[V]	300
Current Consumption without Load	[mA]	≤ 20
Switching Hysteresis	[mm]	<0.06
Max. Output Current per Channel, Ohmic	[mA]	250
Min. Distance to Next AC Solenoid	[m]	0.1 (0.33 ft.)
Interface		M12x1 to IEC 61076-2-101
Wiring Minimum	[mm <sup>2</sup> ]	5 x 0.25 braided shield recommended
Wiring Length Maximum	[m]	50 (164 ft.) recommended
CE Conform		EN 61000-4-2/EN 61000-4-4/EN 61000-4-6 <sup>1)</sup> /ENV 50140/ENV 50240

1) Only guaranteed with screened cable and female connector.

## M12 Pin Assignment



- 1 U<sub>S</sub> 19.2...28.8V
- 2 Out B: normally open
- 3 0V
- 4 Out A: normally closed



Outputs: Open collector

## Definitions

Start position monitored:

The valve is de-energized. The inductive switch gives a signal at the moment the spool leaves the spring offset position (below 15% spool stroke).

At the switching point the spool is located within the closed position. It is secured so that only the flow paths of the offset position are granted.

The switch can only be located on the opposite side of the solenoid for direct operated valves. Please order plug M12x1 separately. See Accessories, plug M12x1 (part no.: 5004109).

End position monitored:

The inductive switch gives a signal before the end position is reached. (above 85% spool stroke).

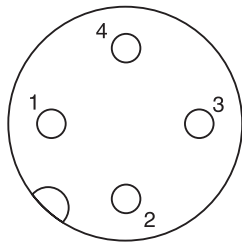
**Double Solenoid Valves**

**Electrical Specifications of Position Control as per IEC 61076-2-101 (M12x1)**

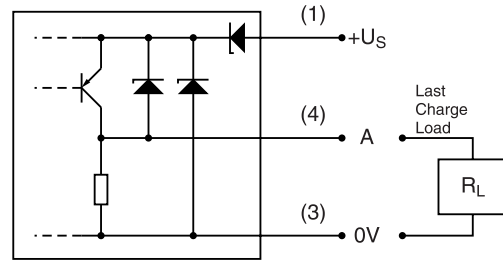


Protection Class	IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)
Ambient Temperature	[°C] -20...+60; (-4°F...140°F)
Supply Voltage $U_s$ / Ripple	[V] 10...30 / $\pm 10\%$
Current Consumption without Load	[mA] $\leq 10$
Max. Output Current per Channel, Ohmic	[mA] 200
Min. Output Load per Channel, Ohmic	[kOhm] 100
Max. Output Drop at 0.2A	[V] $\leq 2$
EMC	EN61000-6-4 / EN61000-6-2
Min. Distance to Next AC Solenoid	[m] $> 0.1$ (0.33 ft.)
Interface	M12x1 acc. to IEC 61076-2-101
Wiring Minimum	[mm <sup>2</sup> ] 3 x 0.14 braided shield recommended
Wiring Length Maximum	[m] 50 (164 ft.) recommended

**M12 Pin Assignment**



- 1  $U_s$  10...30V
- 2 Not connected
- 3 0V
- 4 Out A: normally open



**Definitions**

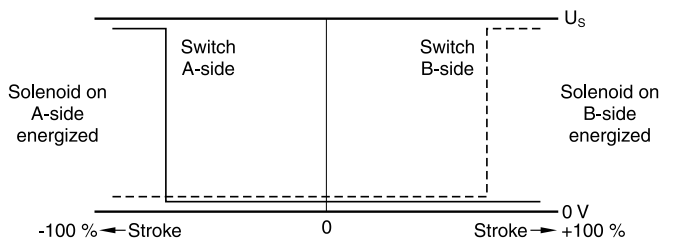
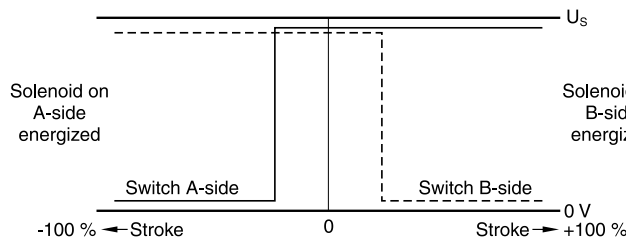
Start position monitored:

The valve is de-energized. The inductive switch gives a signal at the moment the spool leaves the center position (below 15% spool stroke).

At the switching point the spool is located within the closed position. It is secured so that only the flow paths of the offset position are granted.

End position monitored:

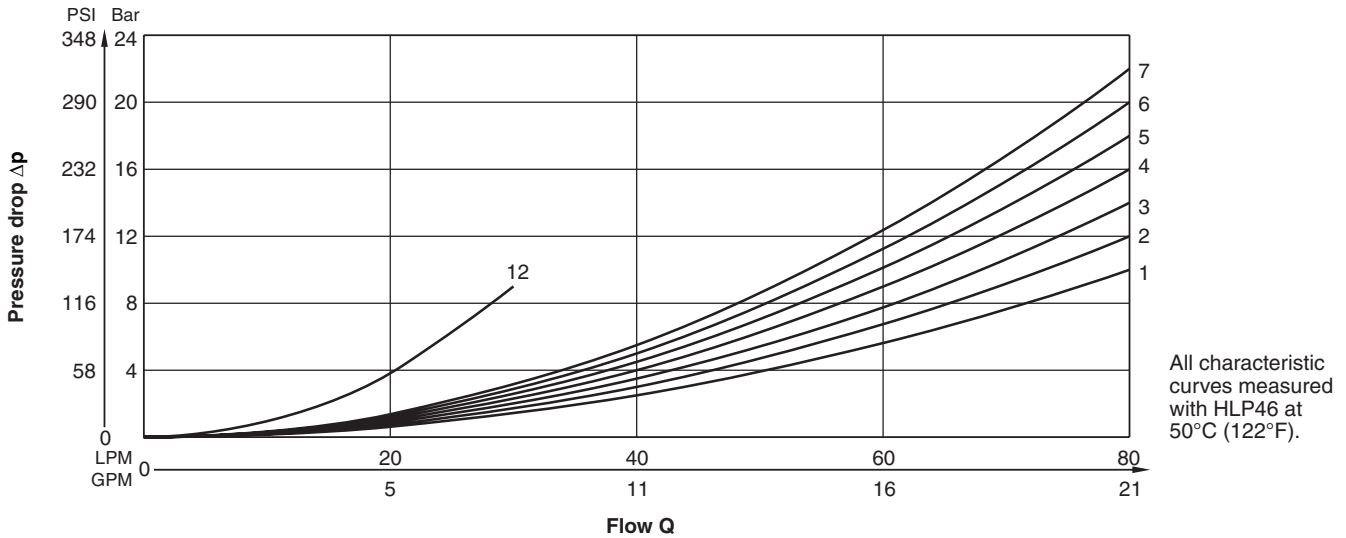
The inductive switch gives a signal before the end position is reached (above 85% spool stroke).



Please order plug M12 x 1 separately. Straight plug recommended – no defined position possible for angled plug.

**Performance Curves**

The flow curve diagram shows the flow versus pressure drop curves for all spool types.

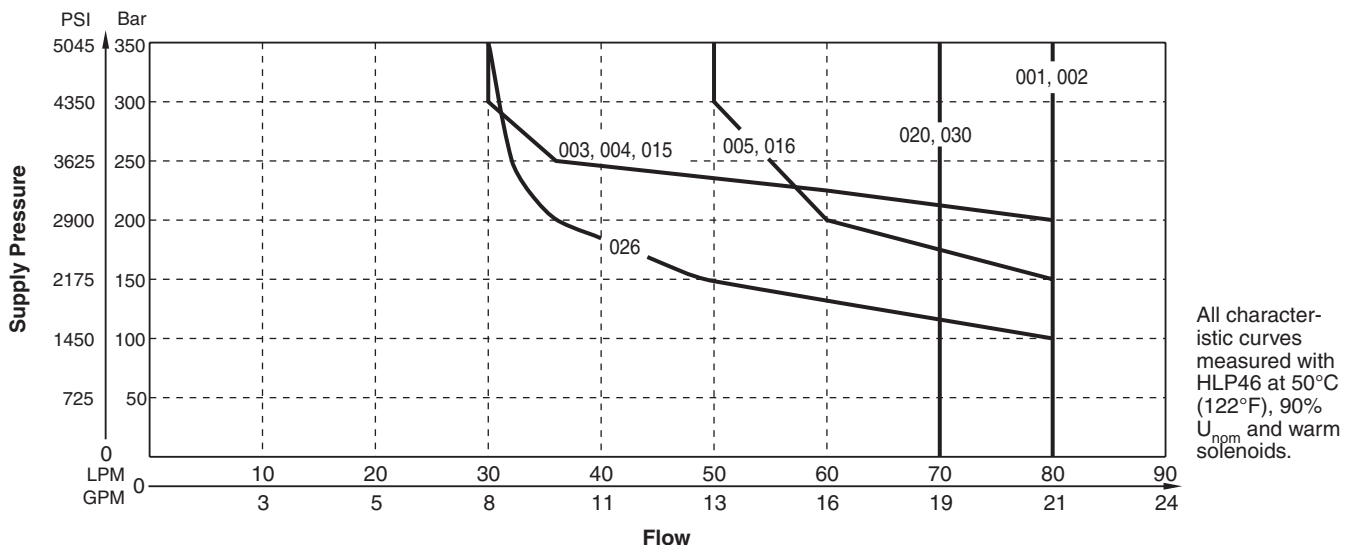


The relevant curve number for each spool type, operating position and flow direction is given in the table below.

Spool	Position "b"		Position "a"		Position "0"				
	P-A	B-T	P-B	A-T	P-A	P-B	A-T	B-T	P-T
001	2	2	2	2	-	-	-	-	-
002	1	4	1	4	1	1	5	5	2
003	3	4	3	6	-	-	7	-	-
004	2	3	2	3	-	-	7	7	-
005	2	2	2	2	12	-	-	-	-
015	3	6	3	4	-	-	-	7	-
016	2	2	2	2	-	12	-	-	-
020 B	4	4	2	3	-	-	-	-	-
026 B	4	-	4	-	-	-	-	-	-
030 B	2	3	1	2	-	-	-	-	-

**Shift Limit Diagram**

The diagram below specifies the shift limits. Valves with spool position "F" or "M" can only be operated up to 70% of the limits. The specifications apply to a viscosity of 40mm<sup>2</sup>/s and balanced flow conditions. The shift limits can be considerably lower at unbalanced flow conditions. To avoid flow rates beyond the shift limits, a plug-in orifice can be inserted in the P-port.

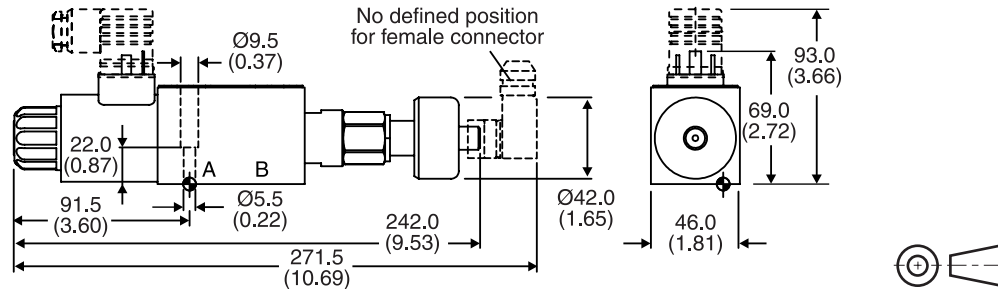




Inch equivalents for millimeter dimensions are shown in (\*\*)

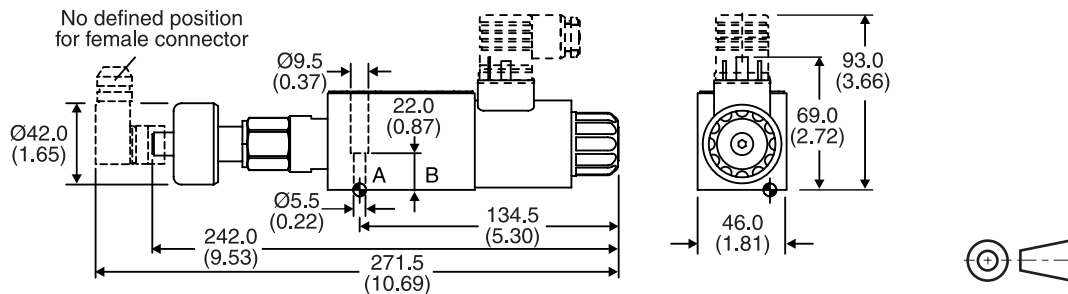
**Interface EN 175301-803, DC solenoid, with plug M12x1<sup>1)</sup>**

**Styles B, E, F**



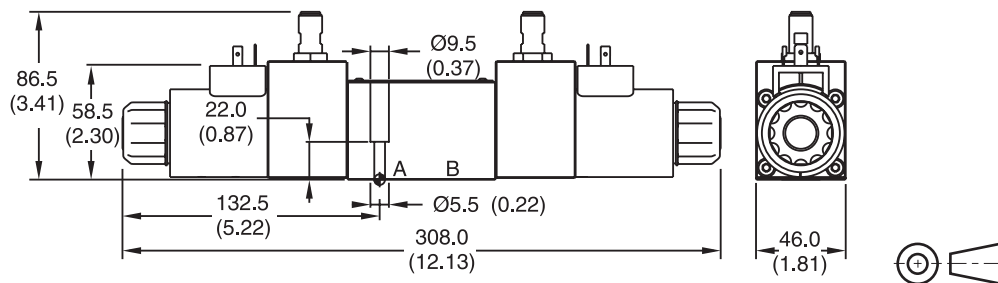
<sup>1)</sup> Please order plug M12x1 separately. See Accessories (part no.: 5004109).

**Styles H, K, M**



**Interface EN 175301-803, DC solenoid, without plug M12x1<sup>2)</sup>**

**Styles C, D**



<sup>2)</sup> Please order plug M12x1 separately. Straight plug recommended – no defined position possible for angled plug.

Surface Finish	Kit			Seal Kit
	BK375	4x M5x30 ISO 4762-12.9	7.6 Nm (0.6 lb.-ft.) ±15%	<b>Nitrile: SK-D1VW-N-91</b> Fluorocarbon: SK-D1VW-V-91

The space necessary to remove the plug per EN 175301-803, design type AF is at least 15 mm (0.59").

The torque for the screw M3 of the plug has to be 0.5 to 0.6 Nm (0.37 to 0.44 lb.-ft.).

The space necessary to remove the M12x1 female connector is at least 22mm (0.87").

**The adjustment of the position control is factory set and sealed.  
Replacement and repairs can only be undertaken by the manufacturer.**

**A**

**General Description**

Series D1VA and D1VP directional control valves are high performance, 4 and 5-chamber, direct operated, air and oil pilot controlled, 3 or 4-way valves. They are available in 2 or 3-position and conform to NFPA's D03, CETOP 3 mounting patterns.

**Features**

- Low pilot pressure required.  
 D1VA – 4.1 Bar (60 PSI) minimum  
 D1VP – 15.2 Bar (220 PSI) minimum

**Air Operated**

**Shift Volume.** The air pilot chamber requires a volume of 1.8 cc (.106 in.<sup>3</sup>) for complete shift from center to end.

**Pilot Piston.** The pilot piston area is 506 mm<sup>2</sup> (.785 in.<sup>2</sup>). Pilot piston stroke is 3.4mm (.135 in.).

**Response Time.** Response time will vary with pilot line size, pilot line length, pilot pressure, air control valve shift time and air valve flow capacity (Cv).

**Oil Operated**

**Shift Volume.** The hydraulic pilot chamber requires a volume of 0.7 cc (.042 in.<sup>3</sup>) for complete shift from center to end.

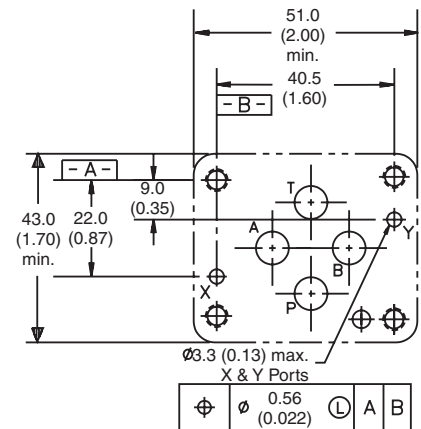
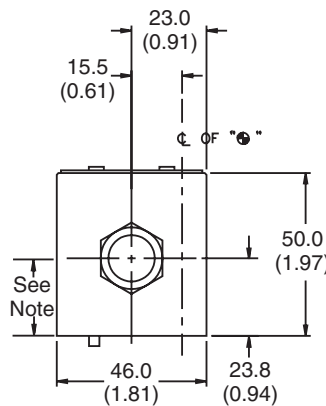
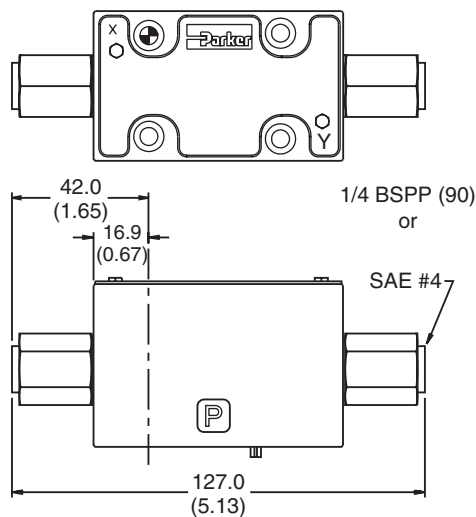
**Pilot Piston.** The hydraulic piston area is 198 mm<sup>2</sup> (.307 in.<sup>2</sup>). Pilot piston stroke is 3.4mm (.135 in.).

**Response Time.** Response time will vary with pilot line size, pilot line length, pilot pressure, pilot valve shift time and oil valve flow capacity (GPM).

**Dimensions**

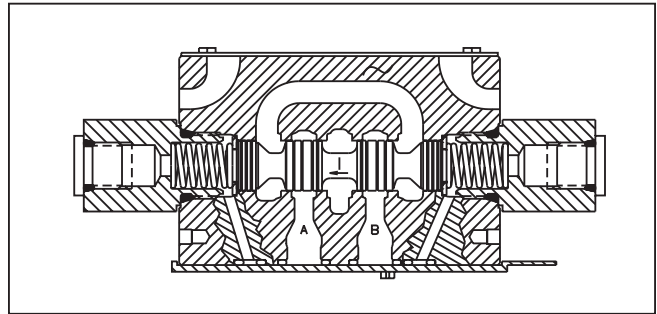
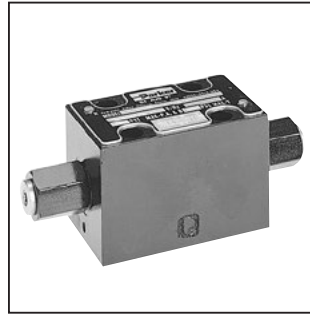
Inch equivalents for millimeter dimensions are shown in (\*\*)

**Oil Operated D1VP, Single and Double Pilot**



**Note:** 22.0 mm (0.87") from bottom of bolt hole counterbore to bottom of valve.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**Specifications**

<b>Mounting Pattern</b>	NFPA D03, CETOP 3, NG 6
<b>Maximum Pressure</b>	Operating: 345 Bar (5000 PSI) Tank Line: D1VA 34 Bar (500 PSI) D1VP 207 Bar (3000 PSI)
<b>Maximum Flow</b>	See Reference Data
<b>Pilot Pressure</b>	D1VA: Air Minimum 4.1 Bar (60 PSI) Air Maximum 10.2 Bar (150 PSI) D1VP: Oil Minimum 15.2 Bar (220 PSI) Oil Maximum 207 Bar (3000 PSI)



**D**  
 Directional Control Valve

**1V**  
 Basic Valve

NFPA D03  
 CETOP 3

**P**  
 Actuator

Oil Operator

Spool

Style

Seal

Variations

Design Series

NOTE:  
 Not required when ordering.

Code	Description
<b>Omit</b>	<b>Standard</b>
4F	Heavy Duty Detent
90	BSPB Threads

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

Code	Symbol
<b>001</b>	
<b>002</b>	
<b>004</b>	
<b>008*</b>	
<b>009**</b>	
<b>020*</b>	
<b>030**</b>	
<b>081</b>	
<b>082</b>	

\* 008 and 020 spools have closed crossover.  
 \*\* 009 and 030 spools have open crossover.

Code	Description	Symbol
<b>B#</b>	<b>Single operator, two position spring offset. P to A and B to T in offset position.</b>	
<b>C</b>	<b>Double operator, three position, spring centered.</b>	
<b>D</b>	<b>Double operator, two position, detent.</b>	
<b>E#</b>	Two position, spring centered. P to B and A to T in shifted position.	
<b>H#</b>	<b>Single operator, two position, spring offset. P to B and A to T in offset position.</b>	
<b>K#</b>	Two position, spring centered. P to A and B to T in shifted position.	

# D available with 020 and 030 spools only.  
 B & H available with 020 and 030 spools only.  
 E & K not available with 020 and 030 spools.

This condition varies with spool code.

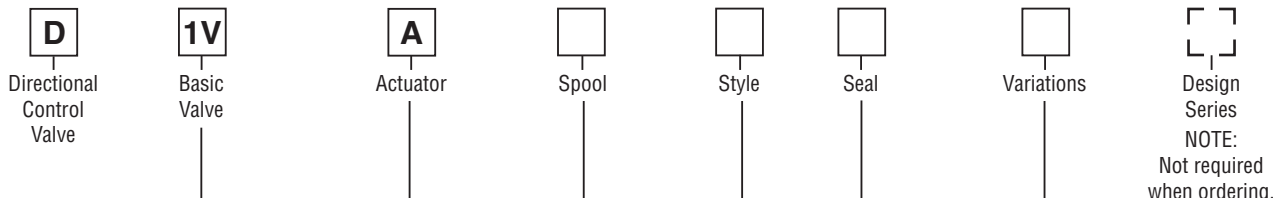
Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when actuating operator X. Note operators reverse sides for #008 and #009 spools. See installation information for details.

**Valve Weight:** 1.90 kg (4.2 lbs.)  
**Standard Bolt Kit:** BK209 10–24x1.25  
**Metric Bolt Kit:** BKM209 M5–0.8x30 mm  
**Seal Kit:**  
 Nitrile SKD1VP  
 Fluorocarbon SKD1VPV

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

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

**A**



NFPA D03  
 CETOP 3

Air  
 Operator

Code	Description
Omit	Standard
90	1/4 BSPF Threads

Code	Symbol
001	
002	
004	
008*	
009**	
081	
082	

\* 008 spool has closed crossover.  
 \*\* 009 spool has open crossover.

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator A. Note operators reverse sides for #008 and #009 spools. See installation information for details.

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description	Symbol
B	Single operator, two position spring offset. P to A and B to T in offset position.	
C	Double operator, three position, spring centered.	
D	Double operator, two position, detent.	
E	Two position, spring centered. P to B and A to T in shifted position.	
H	Single operator, two position, spring offset. P to B and A to T in offset position.	
K	Two position, spring centered. P to A and B to T in shifted position.	

This condition varies with spool code.

- Valve Weight:** 1.60 kg (3.5 lbs.)
- Standard Bolt Kit:** BK209 10–24x1.25
- Metric Bolt Kit:** BKM209 M5–0.8x30 mm  
Grade 8 bolts required
- Seal Kit:**
  - Nitrile SKD1VA
  - Fluorocarbon SKD1VAV

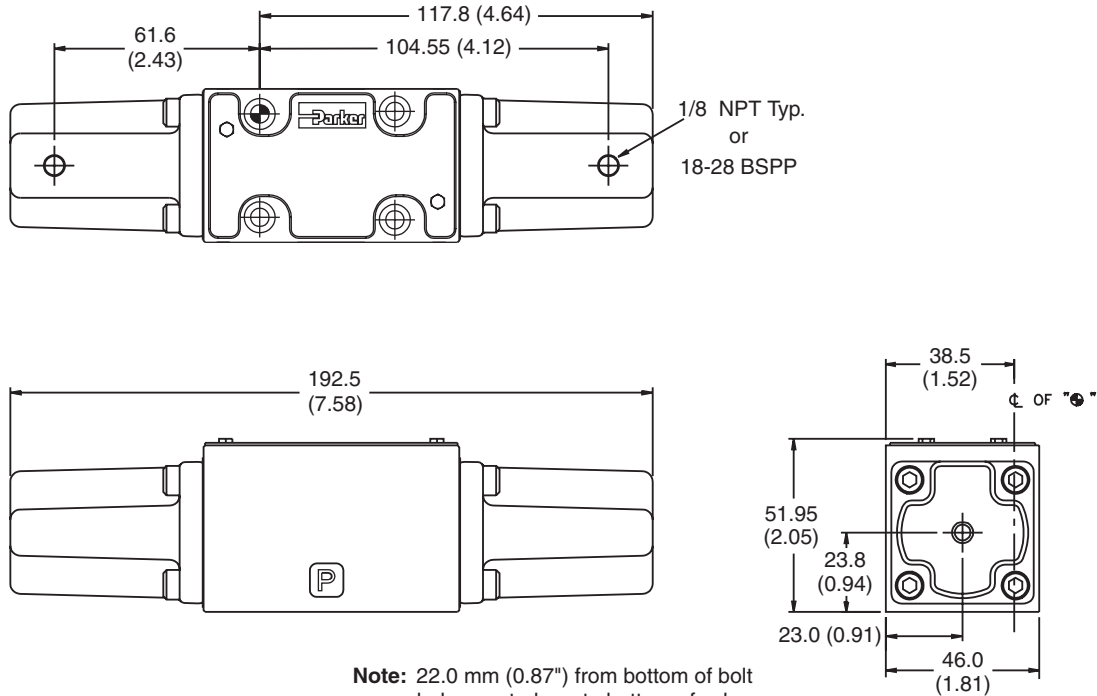
**Bold: Designates Tier I products and options.**

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

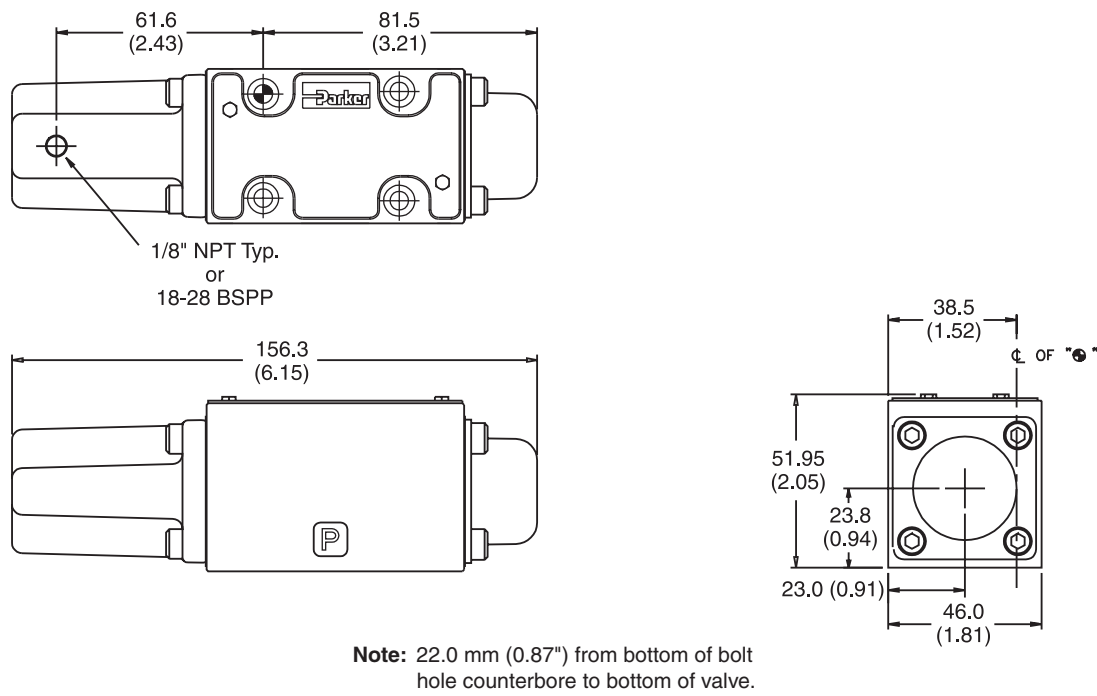


Inch equivalents for millimeter dimensions are shown in (\*\*)

**Air Operated D1VA, Double Pilot**



**Air Operated D1VA, Single Pilot**





### General Description

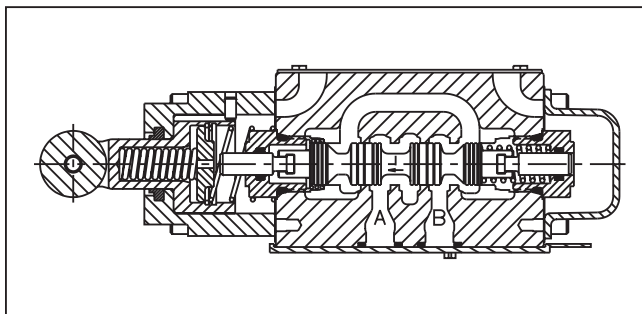
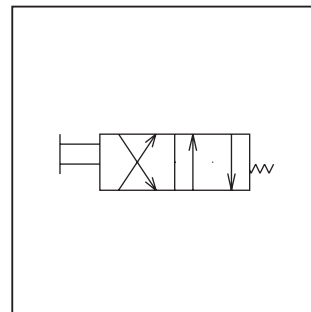
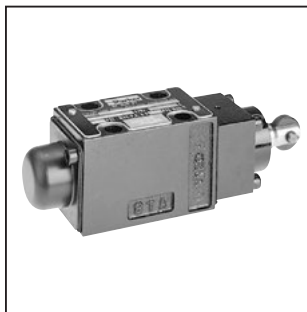
Series D1VC, D1VD and D1VG directional control valves are high performance, 4-chamber, direct operated, cam controlled, 4-way valves. They are available in 2-position and conform to NFPA's D03, CETOP 3 mounting patterns.

### Features

- Choice of 2 cam roller positions (D1VC and D1VD)
- Two styles available (D1VC and D1VG)
- Short stroke option

### Specifications

<b>Mounting Pattern</b>	NFPA D03, CETOP 3, NG 6
<b>Maximum Pressure</b>	Operating: 345 Bar (5000 PSI) Tank Line: 34 Bar (500 PSI)
<b>Nominal Flow</b>	32 LPM (8.5 GPM)
<b>Maximum Flow</b>	See Reference Data
<b>Force Required to Shift</b>	D1VC, D1VD: 107 N (24 lbs.) D1VG: 36 N (8 lbs.)
<b>Maximum Cam Angle</b>	30°



### Ordering Information

<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">D</div> <p>Directional Control Valve</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">1V</div> <p>Basic Valve</p> <div style="border: 1px solid black; padding: 2px; width: 80px; margin: 5px auto; text-align: center;">             NFPA D03 CETOP 3         </div>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Actuator</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Spool</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Style</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Seal</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Variations</p>	<div style="border: 1px dashed black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Design Series</p> <p>NOTE: Not required when ordering.</p>
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<table border="1" style="width: 100%;"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>C</td> <td>Cam (90° to mounting surface)</td> </tr> <tr> <td>D</td> <td>Cam parallel to mounting surface</td> </tr> <tr> <td>G</td> <td>Cam Lever</td> </tr> </tbody> </table>	Code	Description	C	Cam (90° to mounting surface)	D	Cam parallel to mounting surface	G	Cam Lever	<table border="1" style="width: 100%;"> <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	<table border="1" style="width: 100%;"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Omit</td> <td>Standard</td> </tr> <tr> <td>P05</td> <td>Short Stroke</td> </tr> </tbody> </table>	Code	Description	Omit	Standard	P05	Short Stroke
Code	Description																					
C	Cam (90° to mounting surface)																					
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Omit	Standard																					
P05	Short Stroke																					

Code	Description	Symbol
001		
002		
004		
008*		
009†		
081		
082		

Code	Description	Symbol
B	Two position, spring offset operator at "A" port end.	
H	Two position, spring offset operator at "B" port end.	

\* 008 spool has closed crossover.  
 † 009 spool has open crossover.

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

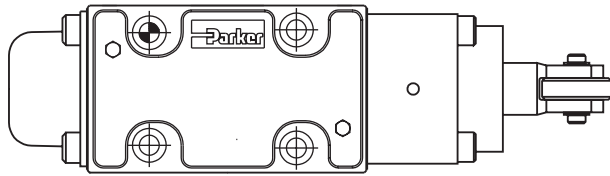
**Non-Bold: Designates Tier II products and options. These products will have longer lead times.**

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

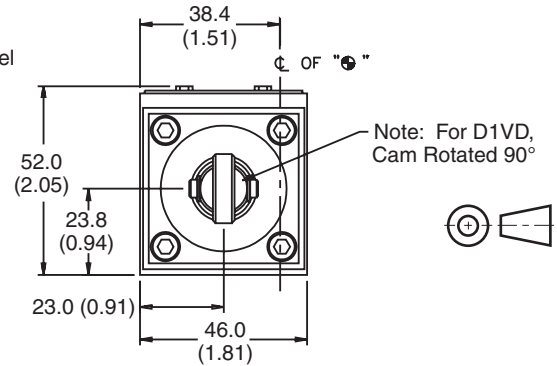
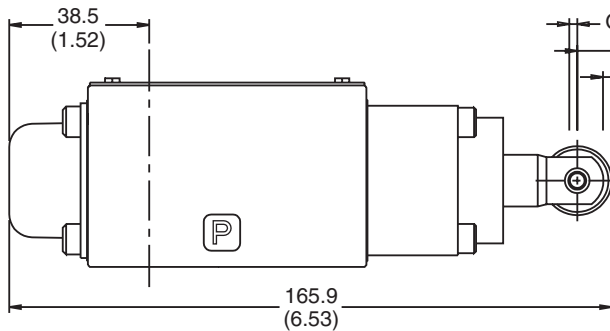


Inch equivalents for millimeter dimensions are shown in (\*\*)

**Cam Operated D1VC and D1VD**



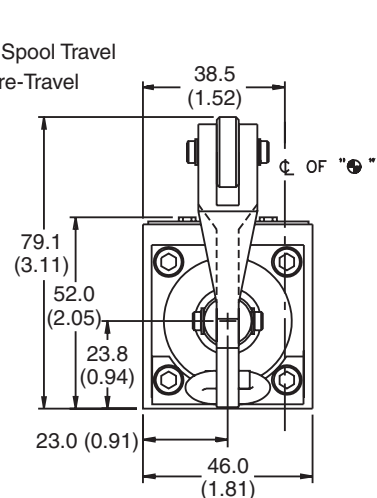
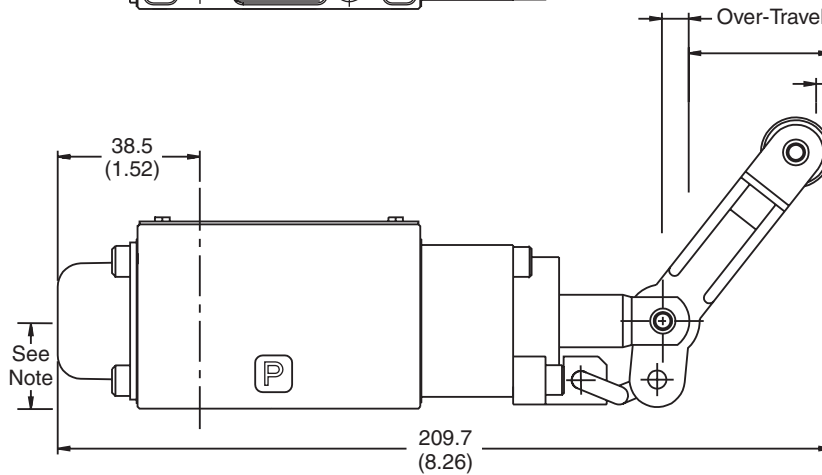
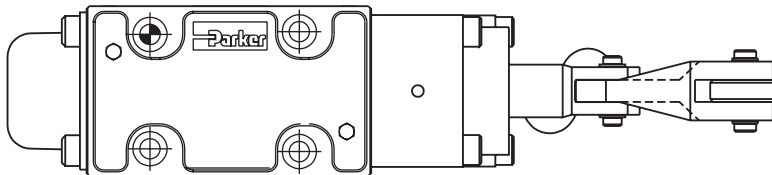
Valve Type	Pre-Travel	Full Spool Travel	Over-Travel
Standard Valve	2.00 (0.079)	9.06 (0.357)	2.03 (0.080)
P05 Short Stroke	0 (0)	7.06 (0.278)	4.03 (0.159)



**Note:** 22.0 mm (0.87") from bottom of bolt hole counterbore to bottom of valve.

**Cam Lever Operated D1VG**

Valve Type	Pre-Travel	Full Spool Travel	Over-Travel
Standard Valve	6.95 (0.27)	39.63 (1.56)	10.00 (0.39)
P05 Short Stroke	0 (0)	30.12 (1.19)	18.40 (0.72)



**Note:** 22.0 mm (0.87") from bottom of bolt hole counterbore to bottom of valve.

**A**

**General Description**

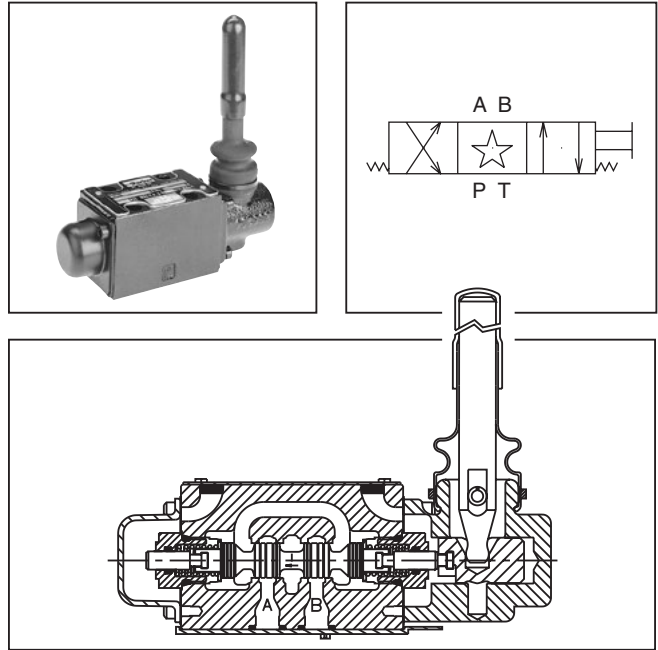
Series D1VL directional control valves are high-performance, 4-chamber, direct operated, lever controlled, 4-way valves. They are available in 2 or 3-position and conform to NFPA's D03, CETOP 3 mounting patterns.

**Features**

- Spring return or detent styles available
- Heavy duty handle design

**Specifications**

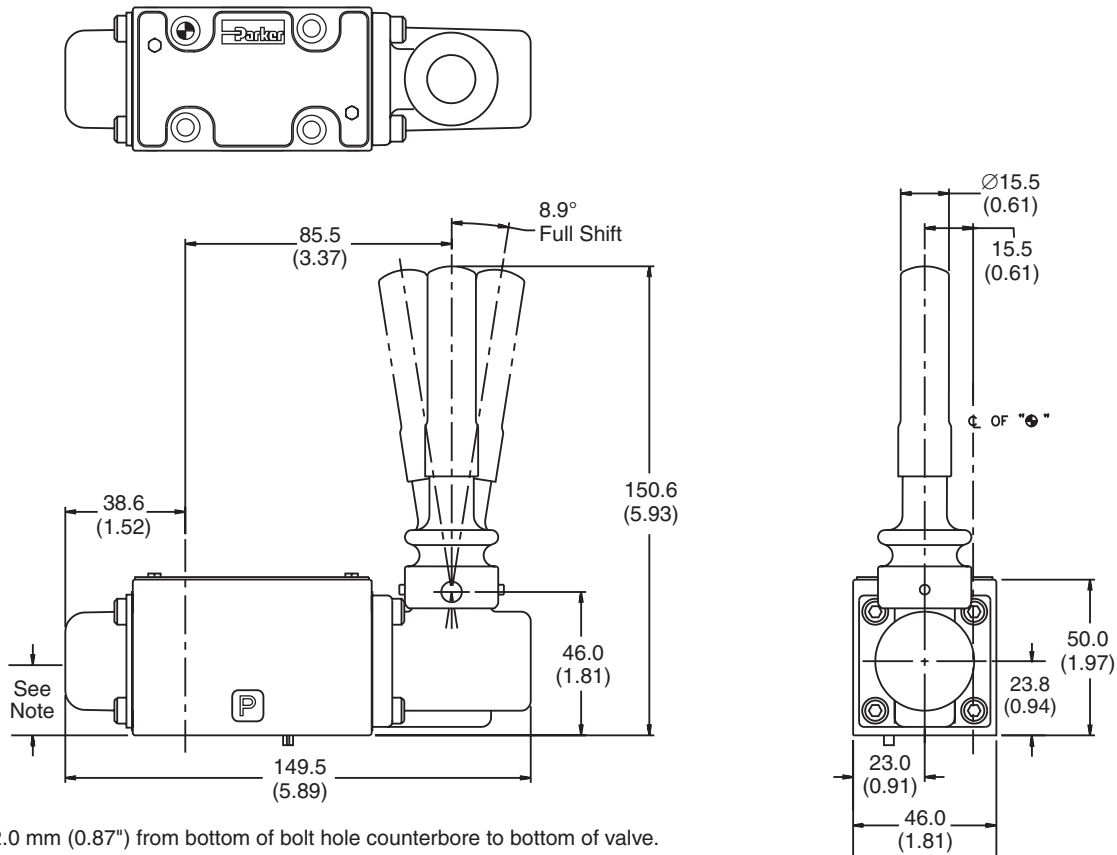
<b>Mounting Pattern</b>	NFPA D03, CETOP 3, NG 6
<b>Maximum Pressure</b>	Operating: 345 Bar (5000 PSI) Tank Line: 34 Bar (500 PSI)
<b>Maximum Flow</b>	See Reference Data
<b>Force Required to Shift Lever Operator</b>	25 N (5.6 lbs)



**Dimensions**

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

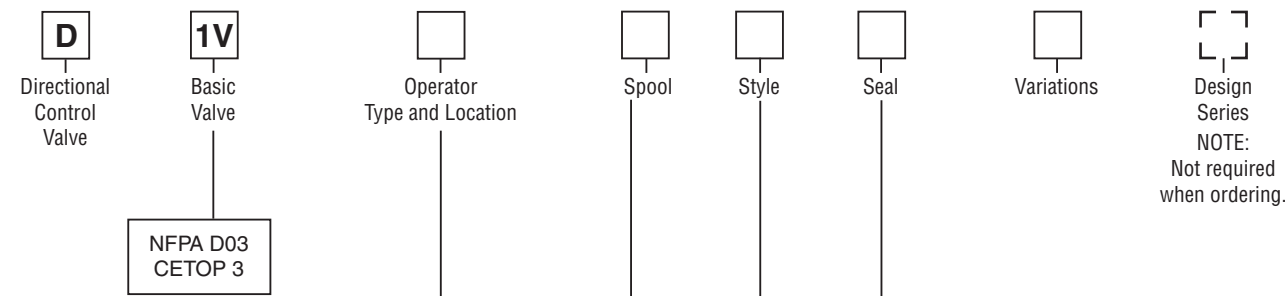
**Lever Operated D1VL**



**Note:** 22.0 mm (0.87") from bottom of bolt hole counterbore to bottom of valve.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).





Code	Operator Type	Operator Location (A or B Port End) For Valve Style						
		B	C	D	E	H	K	N
L	Lever (Standard)	B	B	B	A	B	B	B
LB	Lever (Alternate)	A	A	A	N/A	A	N/A	A

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Symbol
001	
002	
004	
008*	
009†	
081*	
082	

Code	Description	Symbol
B	Two position, spring offset. P to A and B to T in offset position.	
C	Three position, spring centered.	
D	Two position, detent.	
E	Two position, spring centered. P to B and A to T in shifted position.	
H	Two position, spring offset. P to B and A to T in offset position.	
K	Two position, spring centered. P to A and B to T in shifted position.	
N	Three position, detent.	

\* 008 and 081 spools have closed crossover.  
 † 009 has open crossover.

This condition varies with spool code.

Valve schematic symbols are per NFFPA/ANSI standards, providing flow P to A when energizing operator A. Note flow paths reverse sides for #008 and #009 spools in three position valves.

**Valve Weight:** 1.60 kg (3.5 lbs.)  
**Standard Bolt Kit:** BK209 10–24x1.25  
**Metric Bolt Kit:** BKM209 M5–0.8x30 mm Grade 8 bolts required

Seal Kit:  
 Nitrile SKD1VL  
 Fluorocarbon SKD1VLV

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

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

**A****Fluid Recommendations**

Premium quality hydraulic oil with a viscosity range between 32-54 cst. (150-250 SSU) at 38°C (100°F) is recommended. The absolute operation viscosity range is from 16-220 cst. (80-1000 SSU). Oil should have maximum anti-wear properties and rust and oxidation treatments.

**Fluids and Seals**

Valves using synthetic, fire-resistant fluids require special seals. When phosphate ester or its blends are used, FLUOROCARBON seals are required. Water-glycol, (95/5) water-in-oil emulsions, and petroleum oil may be used with NITRILE seals.

**Temperature Recommendation**

Recommended oil temperature:

-29°C to +71°C (-20°F to +160°F)

Ambient temperature:

AC High Watt ambient temperature cannot exceed 60°C (140°F).

DC High Watt, DC Low Watt and AC Low Watt ambient temperature cannot exceed 71°C (160°F).

**Filtration**

For maximum valve and system component life, the system should be protected at a contamination level not to exceed 125 particles greater than 10 microns per milliliter of fluid. (SAE Class 4 or better, ISO Code 16/13).

**Tank Line Surges**

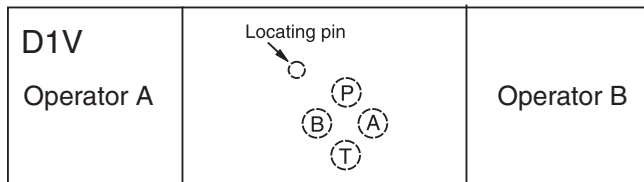
If several valves are piped with a common tank line, flow surges in the line may cause unexpected spool shift. Detent style valves are most susceptible to this. Separate tank lines should be used when line surges are expected in an application.

**Recommended Mounting Position**

Valve Type	Recommended Mounting Position
Detent (Solenoid)	Horizontal
Spring Centered	Unrestricted
Spring Offset	Unrestricted

**Silting**

Silting can cause any sliding spool valve to stick and not spring return, if held shifted under pressure for long periods of time. The valve should be cycled periodically to prevent sticking.

**Flow Path Data**

\*Note: On valves with 008 or 009 spool, A and/or B operators reverse sides. Flow paths remain the same as viewed from top of valve.

**Single Pass Operation**

Valve flow ratings are for double pass operation (with equal flow in both paths). When using these components in single pass applications, flow capabilities may be reduced. Consult your local Parker representative for details.

**Double Solenoid.** With solenoid "A" energized, flow path is P→A and B→T. When solenoid "B" is energized, flow path is P→B and A→T. The center condition on a spring-centered valve exists when both coils are de-energized, or during a complete shift, as the spool passes through center.

**Detent and Spring Offset.** The center condition exists on detent and spring offset valves only during spool crossover. To shift and hold a detented spool, only a momentary energizing of the solenoid is necessary. The minimum duration of the signal is approximately 0.1 seconds for DC voltages. This position will be held provided the spool center line is in a horizontal plane, and no shock or vibration is present to displace the spool.

**Single Solenoid.** Spring offset valves can be ordered in styles B, E, F, H, K and M. Flow path data for the various styles are described in the order chart.

**Electrical Failure**

Should electric power fail, spring offset and spring centered valves will shift to the spring held position. Detented valves will stay in the last position held before power failure. If main flow does not fail or stop simultaneously, machine actuators may continue to function in an undesirable manner or sequence.

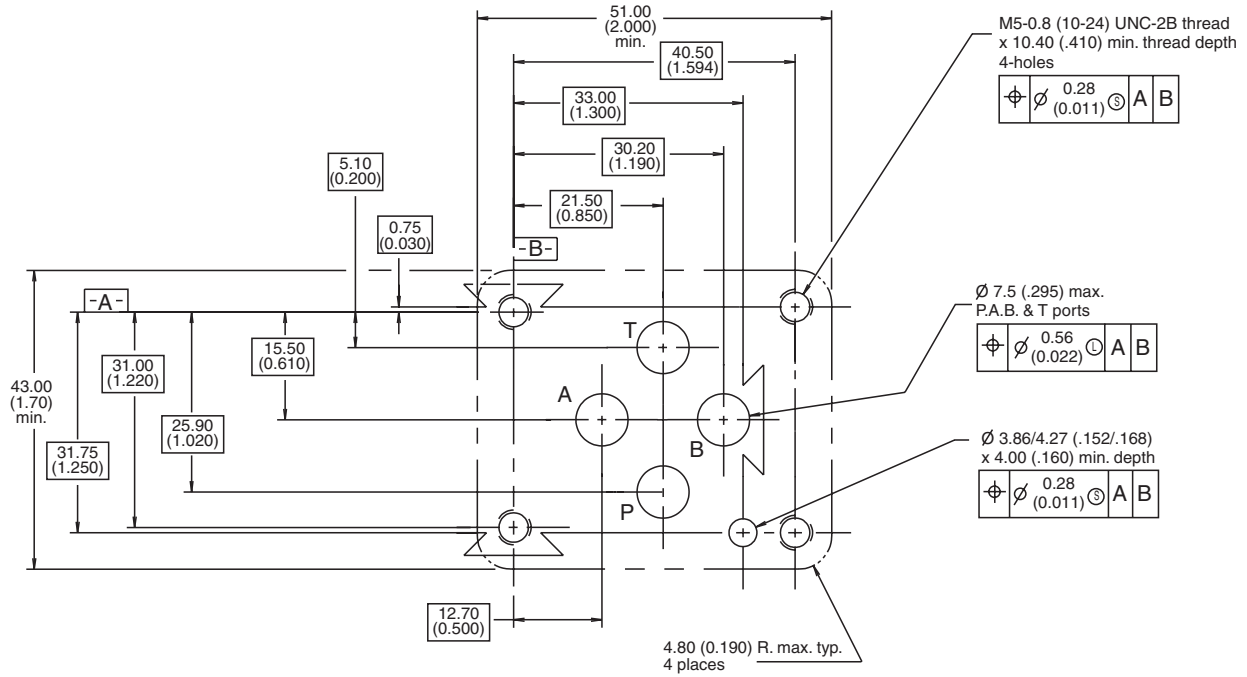
**Torque Specifications**

Torque values recommended for the bolts which mount the valve to the manifold or subplate are as follows:

#10-24 thread (M5-0.8) torque 5.6 Nm (50 in-lbs).

**Mounting Pattern — NFPA D03, CETOP 3, NG 6**

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



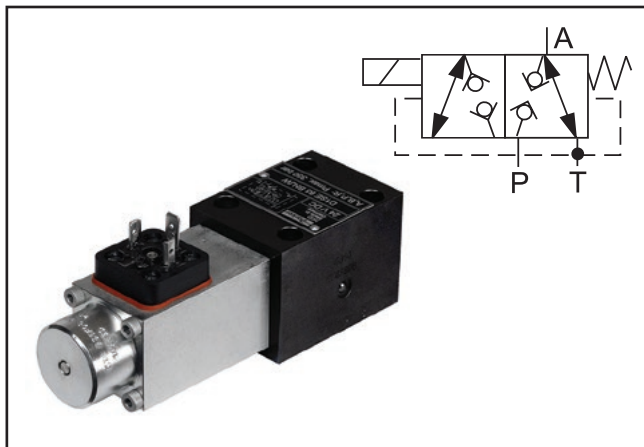


### General Description

Series D1SE directional control valves are equipped with a wet pin armature solenoid, drain-free, tapered poppet valve and compatible with the standards DIN NG6, CETOP 3, and NPPA D03. Due to the 3/2 way design, port A is either connected with P or discharged in the tank. The neutral position (solenoid not activated) is taken automatically by a return spring. This position remains until the solenoid is energized.

The valve poppet including activation lever and armature of the solenoid are located in the pressurized oil chamber of connection T. The valve poppet is designed such that there can be no differential area in its axial operational direction (opening, closing). Thus it is statically pressure-balanced so that the valve can be switched in both flow directions even under pressure.

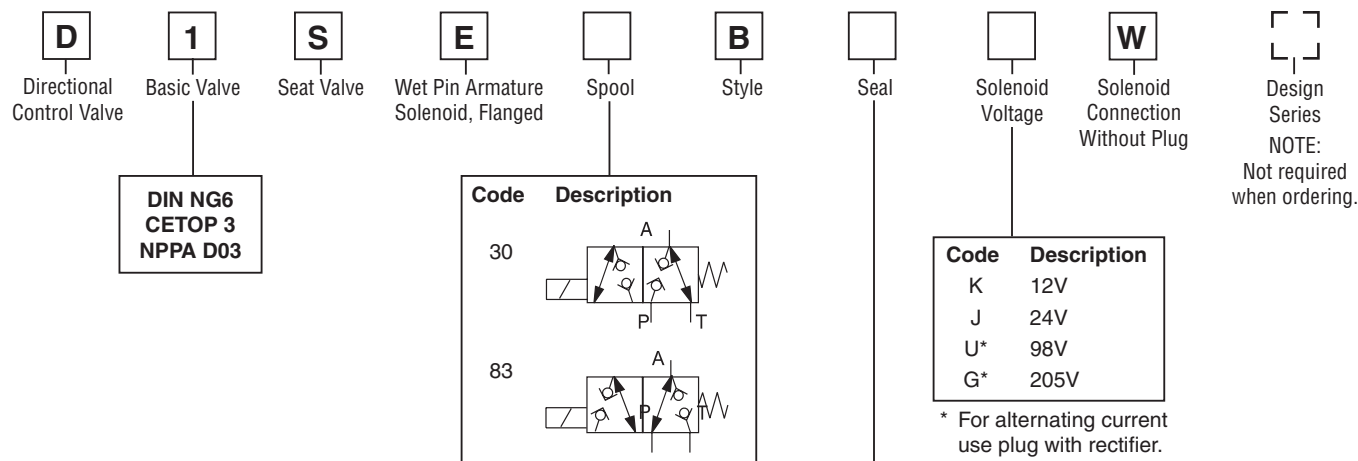
The unit has an all-steel design, the important functional inner parts are hardened, the poppet and seat are ground.



### Features

- Low leakage poppet design.
- Fits NPPA D03 mounting.
- Pressure balanced.

### Ordering Information



### Coils for repair

Voltage	Ordering Code
12V	7329700 - 12V
24V	7329700 - 24V
98V	7329700 - 98V
205V	7329700 - 205V

Code	Description
N	Nitrile
V	Fluorocarbon

**Weight:** 0.8 kg (1.76 lbs)

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

**Non-Bold:** Designates Tier II products and options.

**These products will have longer lead times.**

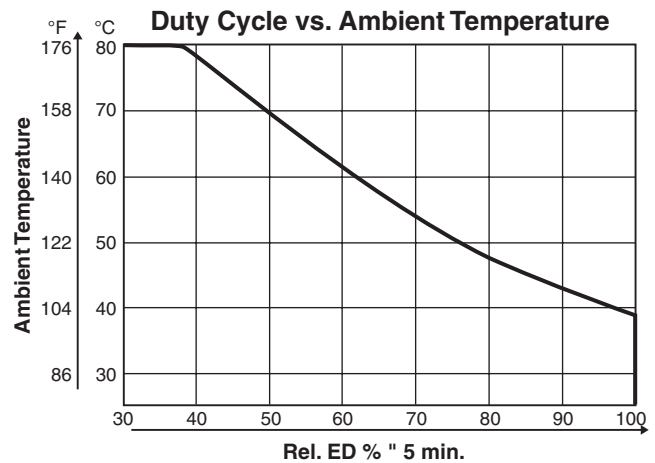
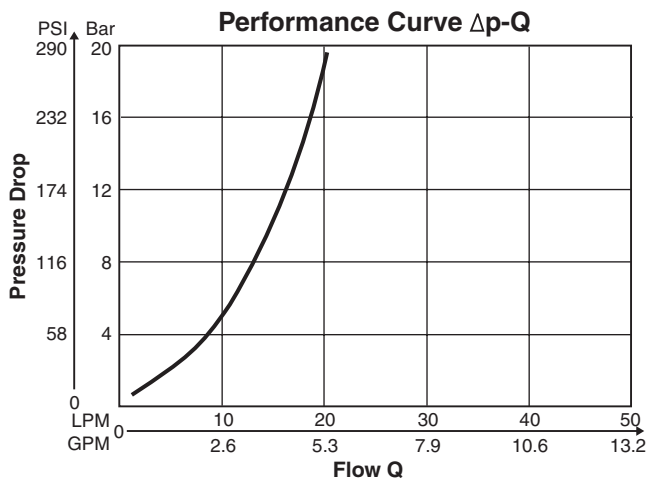
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



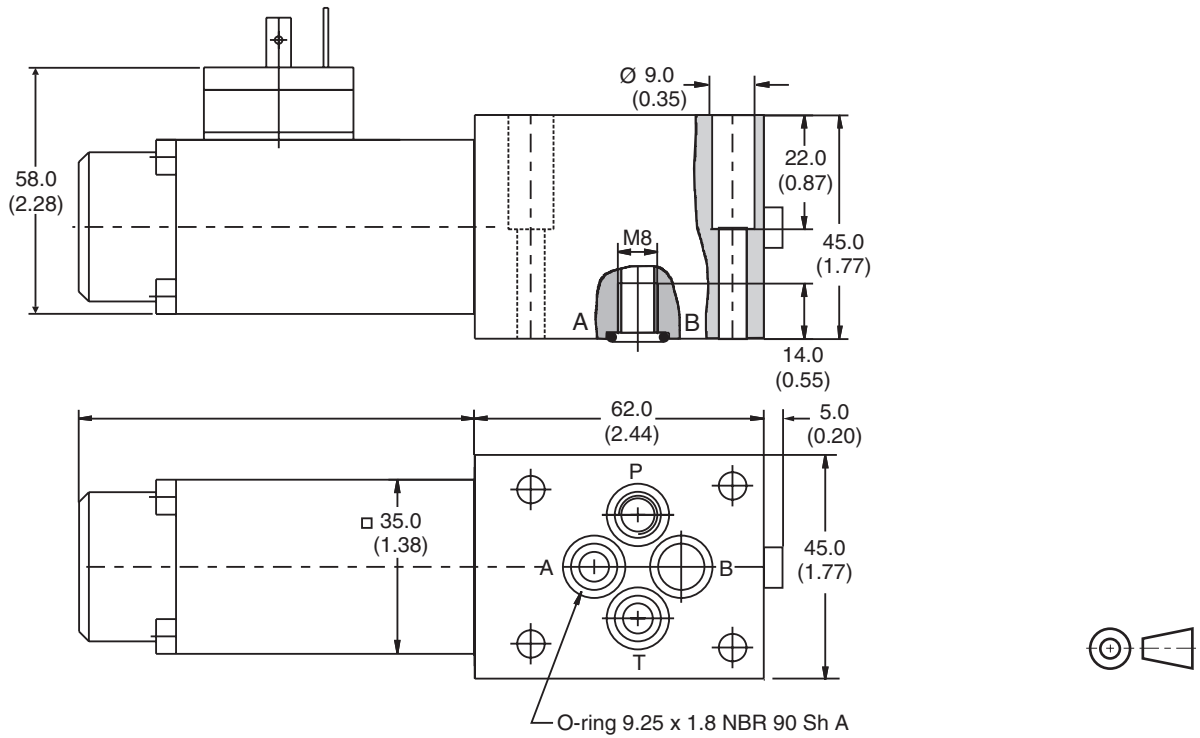
General		Static / Dynamic			
<b>Design</b>	Directional poppet valve	<b>Step Response</b>	Energized: approx. 50 ms De-energized: approx. 60 ms		
<b>Actuation</b>	Solenoid	<b>Electrical Characteristics</b>			
<b>Size</b>	DIN NG6 / CETOP 3 / NFPA D03				
<b>Mounting Interface</b>	DIN 24340 A6 / ISO 4401 / CETOP RP 121-H / NFPA D03	<b>Duty Ratio</b>	See Diagram		
<b>Mounting Position</b>	Unrestricted	<b>Max. Switching Frequency</b>	2000 1/h		
<b>Ambient Temperature</b>	-25°C to +50°C (-13°F to +122°F), observe permissible duty cycle	<b>Protection Class</b>	IP 65 in accordance with DIN 40050 (plugged and mounted)		
<b>Hydraulic</b>		<b>Code</b>	K	J	U* G*
<b>Max. Operating Pressure</b>	350 Bar (5075 PSI) (P, A, and T)	<b>Supply Voltage</b>	12 VDC	24 VDC	98 VDC 205 VDC
<b>Fluid</b>	Hydraulic oil in accordance with DIN 51524 / 51525	<b>Tolerance Supply Voltage</b>	±10%	±10%	±10% ±10%
<b>Fluid Temperature</b>	-25°C to +70°C (-13°F to +158°F)	<b>Current Consumption</b>	1.95A	1.1A	0.25A 0.13A
<b>Viscosity Permitted Recommended</b>	10...500 cSt / mm <sup>2</sup> /s (46...2318 SSU) 30...80 cSt / mm <sup>2</sup> /s (139...371 SSU)	<b>Power Consumption</b>	23.4 W	26.4 W	24.3 W 26.6 W
<b>Filtration</b>	ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)	<b>Solenoid Connection</b>	Connector as per EN 175301-803		
<b>Internal Leakage</b>	3-5 DPM per seat	<b>Min. Wiring</b>	3 x 1.5 mm <sup>2</sup> recommended		
<b>Maximum Flow</b>	20 LPM (5.28 GPM) (at Δp = 10 bar)	<b>Max. Wiring Length</b>	50m (164') recommended		

\* For a silicon bridge rectifier, set up apart from unit for connecting to a 50 or 60 Hz power supply, 110 V~(98=) or 230V~ (205V=).  
 With electrical connections the protective conductor (PE ↓) must be connected according to the relevant regulations.

### Performance Curves



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



Surface Finish	Kit			Seal Kit
	BK375	4x M5x30 DIN 912 12.9	6.8 Nm $\pm$ 15%	Nitrile: SK-D1SE-70 Fluorocarbon: SK-D1SE-V70

The space necessary to remove the plug per DIN 43650, design type AF is at least 15 mm (0.59").  
The torque for the screw M3 of the plug has to be 0.5 Nm (0.37 lb.-ft.) to 0.6 Nm (0.44 lb.-ft.).

## Application

Series D3 hydraulic directional control valves are high performance, direct operated 4-way valves, available in 2 or 3-position. They are manifold mounted which conform to NFPA's D05, CETOP 5, ISO NG10 mounting patterns. These valves were designed for industrial and mobile hydraulic applications which require high cycle rates, long life and high efficiency.

## Operation

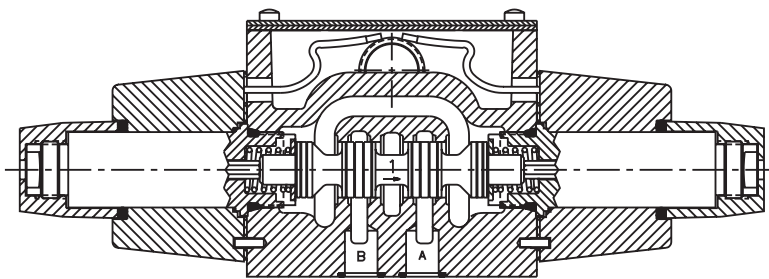
Series D3 directional control valves consist of a 4-chamber style body, and a case hardened sliding spool. The spool is directly shifted by a variety of operators including: solenoid, lever, cam, or air pilot.

## Features

- Easy access mounting bolts.
- 345 Bar (5000 PSI) pressure rating.
- Flows to 40 GPM depending on spool.
- Choice of four operator styles.
- Rugged four land spools.
- Low pressure drop.
- Phosphate finish body.
- CSA approved, and UL recognized coils standard.
- Proportional spool available.

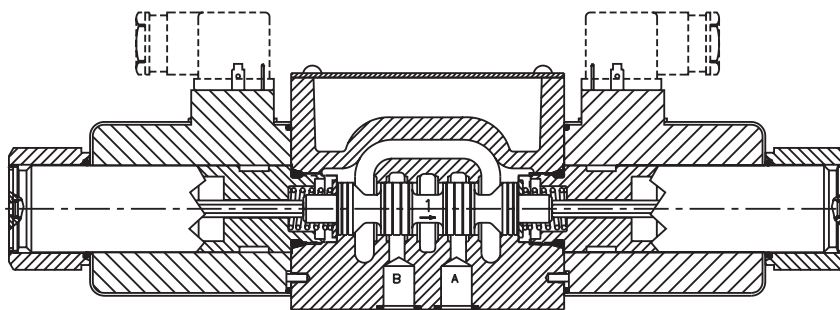
A

### D3W Solenoid Operated Conduit Cavity Style



- Wired in cavity.
- Easy access mounting bolts.
- 16 spool styles available.
- Three electrical connection options.
- AC and DC lights available.
- CSA approved.
- Available in low-watt DC version.

### D3W Solenoid Operated Hirschmann (DIN) Style

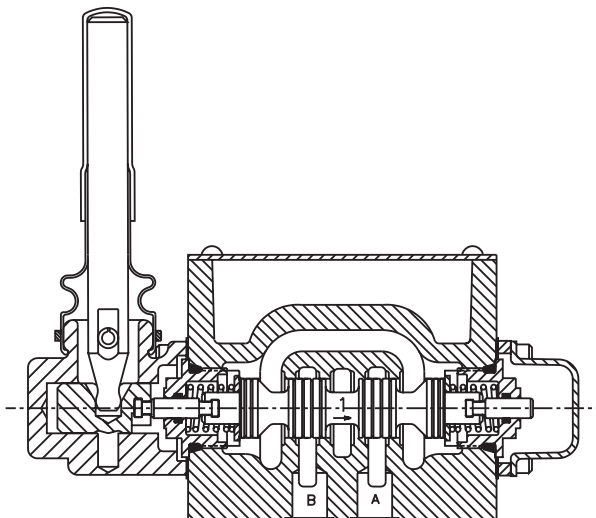


- DIN Style (43650) Hirschmann.
- 16 spool styles available.
- No tools required for coil removal.
- Easy coil replacement.
- AC and DC lights available.
- CSA approved.
- Available in low-watt DC version.

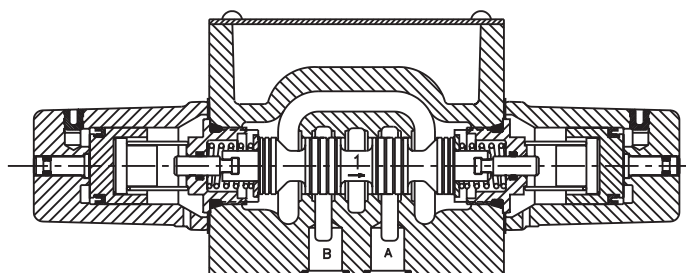
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**A****D3L Lever Operated**

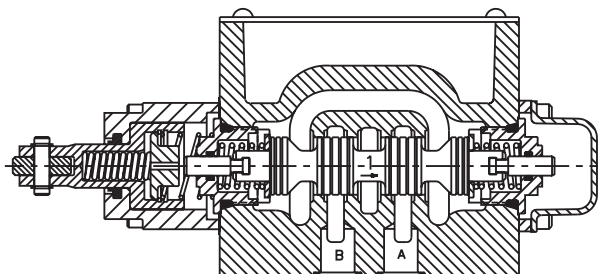
- Spring return or detent styles available.
- Heavy duty handle design.
- High flow, low pressure drop design.

**D3A Air Operated**

- Low pilot pressure required – 4.1 Bar (60 PSI) minimum.
- High flow, low pressure drop design.

**D3C Cam Operated**

- Choice of 2 cam roller positions (D3C and D3D).
- Short stroke option.
- High flow, low pressure drop design.



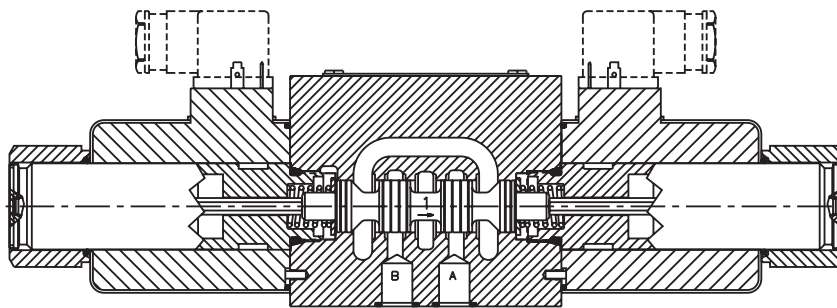


**Application**

Series D3DW hydraulic directional control valves are high performance, direct operated 4-way valves, available in 2 or 3-position. They are manifold mounted which conform to NFPA's D05, CETOP 5, ISO NG10 mounting pattern. These valves were designed for industrial and mobile hydraulic applications which require high cycle rates, long life and high efficiency.

**Operation**

Series D3DW directional control valves consist of a 5-chamber style body, and a case hardened sliding spool.

**A****D3DW Solenoid Operated Hirschmann (DIN) Style**

- Easy access mounting bolts.
- No tools required for coil removal.
- 16 spool styles available.
- Signal lights available.
- CSA approved.

**D3 Spool Reference Data**

**A**

Model	Spool Symbol	Maximum Flow, LPM (GPM) 350 Bar (5000 PSI) w/o Malfunction			Model	Spool Symbol	Maximum Flow, LPM (GPM) 350 Bar (5000 PSI) w/o Malfunction		
		D3W	D3W*F†	D3DW			D3W	D3W*F†	D3DW
D3*001		150 (40)	78 (20)	130 (33)	D3*011		115 (30)	59# (15)	130 (33)
D3*002		150 (40)	78 (20)	115 (30)	D3*015		150 (40)	78 (20)	120 (31)
D3*003		150 (40)	78 (20)	120 (31)	D3*016		150 (40)	78 (20)	130 (33)
D3*004		150 (40)	59 (15)	130 (33)	D3*020		150 (40)	78 (20)	130 (33)
D3*005		150 (40)	78 (20)	130 (33)	D3*026		115 (30)	N/A	75 (19)
D3*006		150 (40)	78 (20)	130 (33)	D3*030		39 (10)	59# (15)	75 (19)
D3*008		50‡ (13)	59# (15)	39 (10)	D3*081		115† (30)	N/A	130 (33)
D3*009		39 (10)	59# (15)	75 (19)	D3*082		115† (30)	N/A	130 (33)

Center or De-energized position is indicated by P, A, B & T port notation.  
 † 3000 PSI Max. ‡ 2900 PSI Max. # 1500 PSI Max.

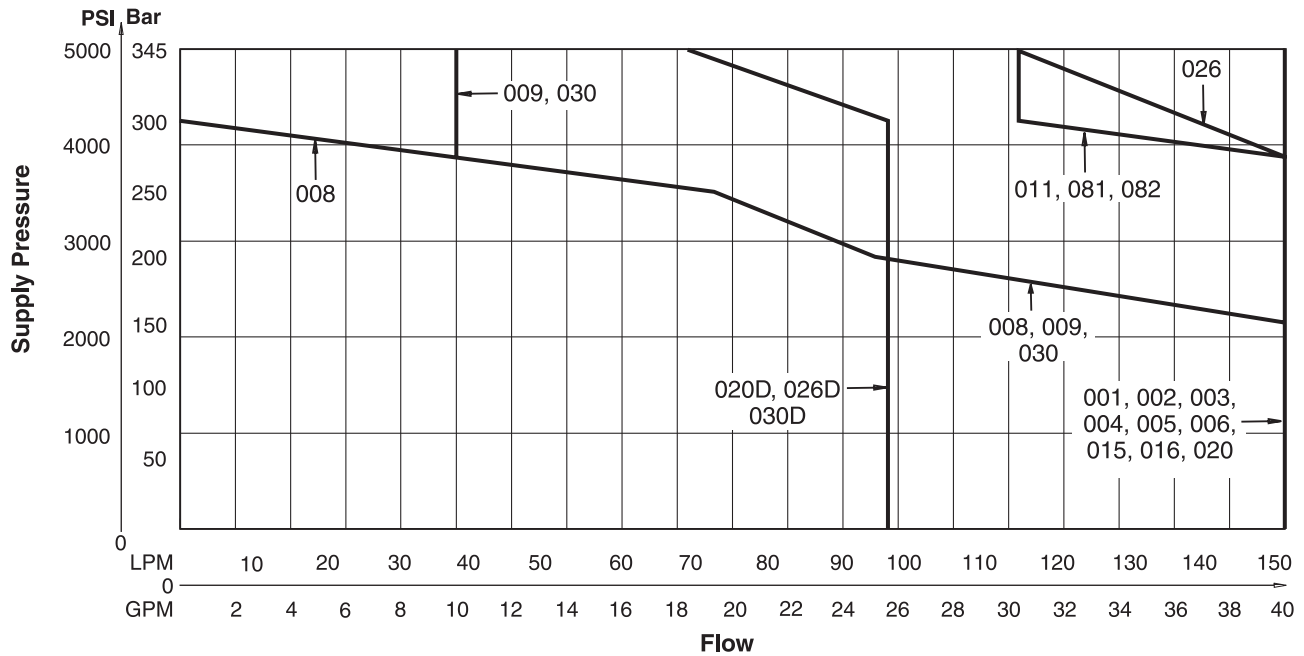
**D3A, D3C, D3L Spool Reference Data (Four Chamber Body Only)**

Model	Spool Symbol	Maximum Flow, LPM (GPM) 350 Bar (5000 PSI) w/o Malfunction		Model	Spool Symbol	Maximum Flow, LPM (GPM) 350 Bar (5000 PSI) w/o Malfunction	
		D3W	D3W			D3W	D3W
D3*001		150 (40)		D3*020		150 (40)	
D3*002		150 (40)		D3*030		39 (10)	
D3*004		150 (40)		D3*081		115 (30)	
D3*008		50 (13)		D3*082		115 (30)	
D3*009		39 (10)					

Center or De-energized position is indicated by A, B, P & T port notation.



**D3W-30/32 DC and AC Rectified Shift Limits**

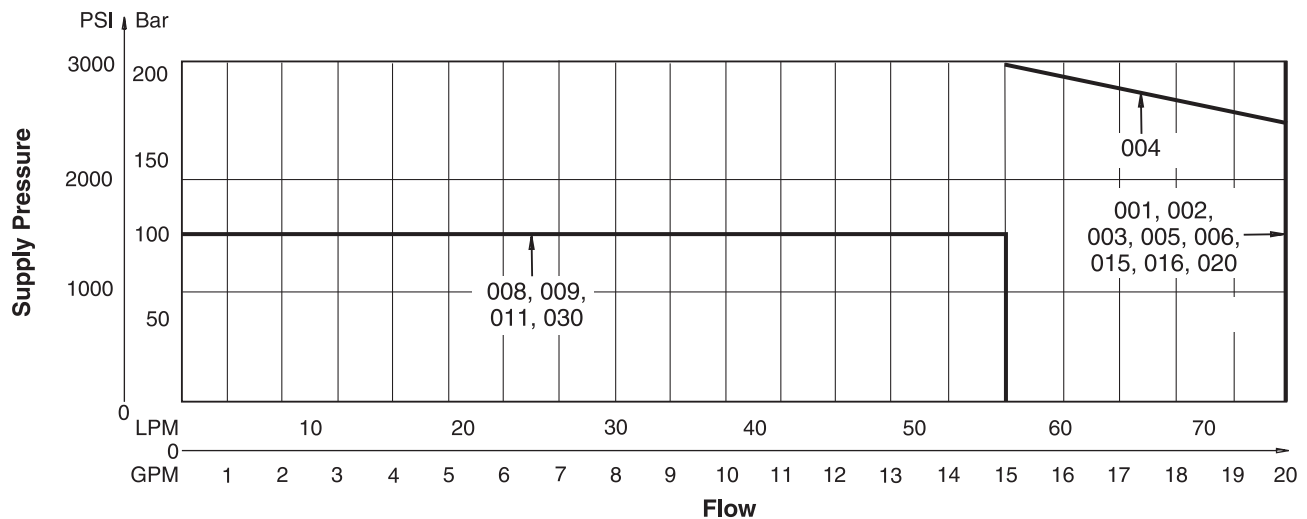


**Example:**

Determine the maximum allowable flow of a D3W Series valve (20D) at 150 Bar (2175 PSI) supply pressure. Locate the curve marked “20D”. At 150 Bar (2175 PSI) supply pressure, the maximum flow is 98 LPM (25 GPM). At 345 Bar (5000 PSI), the flow is 72 LPM (18.5 GPM).

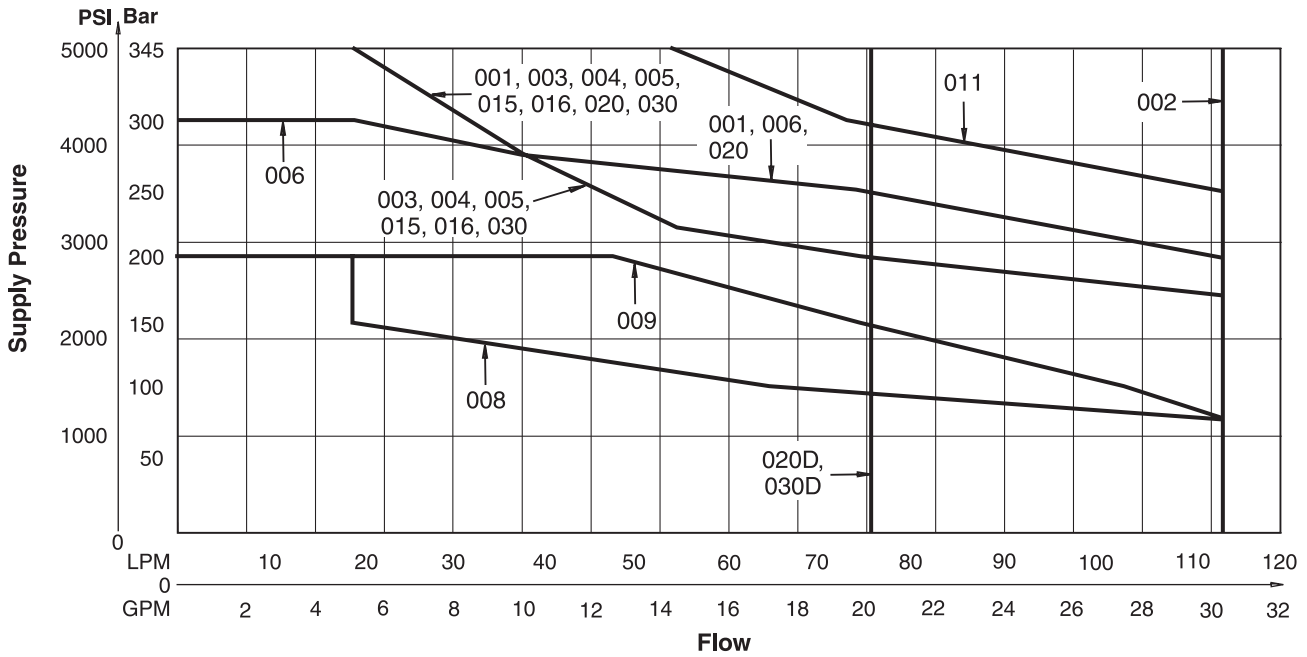
- Important Notes for Switching Limit Charts**
1. For F & M style valves, reduce flow to 70% of that shown.
  2. Shift limits charted for equal flow A and B ports. Unequal A and B port flows may reduce shift limits.
  3. These charts do not show explosion proof performance. Consult factory for explosion proof duty.
  4. Blocking A and B ports will reduce flow to 70% of that shown.

**D3W-30/32 Low Watt DC and AC Rectified Shift Limits**

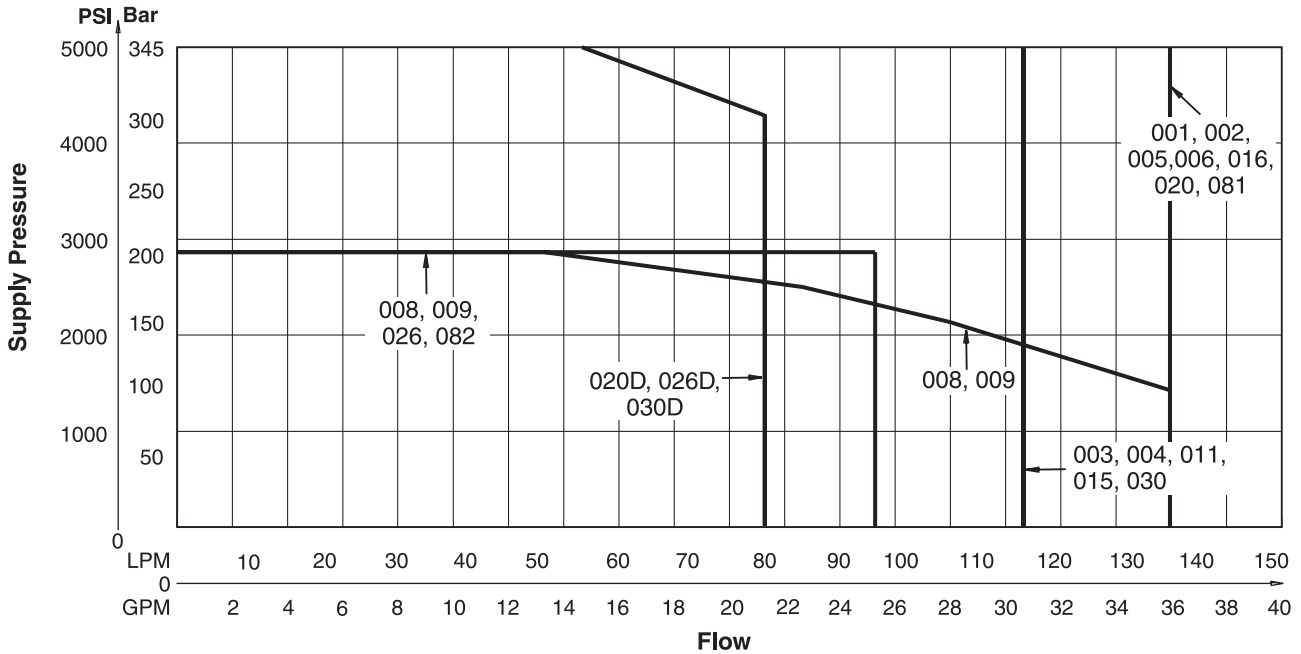


**D3W-30/32 AC Shift Limits**

**A**



**D3W-30/32 Soft Shift Limits (High Watt Coil Only)**

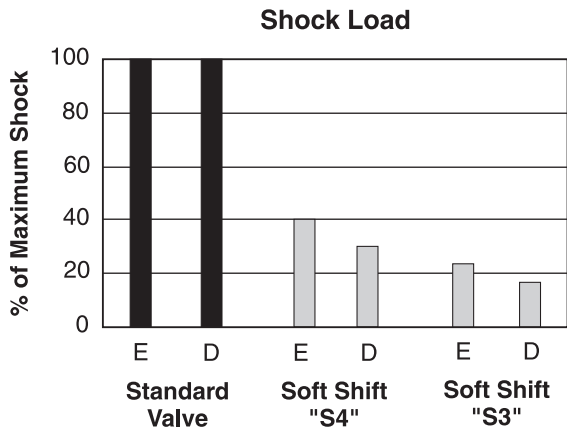


**Important Notes for Switching Limit Charts**

1. For F & M style valves, reduce flow to 70% of that shown.
2. Shift limits charted for equal flow A and B ports. Unequal A and B port flows may reduce shift limits.
3. These charts do not show explosion proof performance. Consult factory for explosion proof duty.
4. Blocking A and B ports will reduce flow to 70% of that shown.



**D3W-30/32 Soft Shift Response**



E = Energize  
 D = De-energize

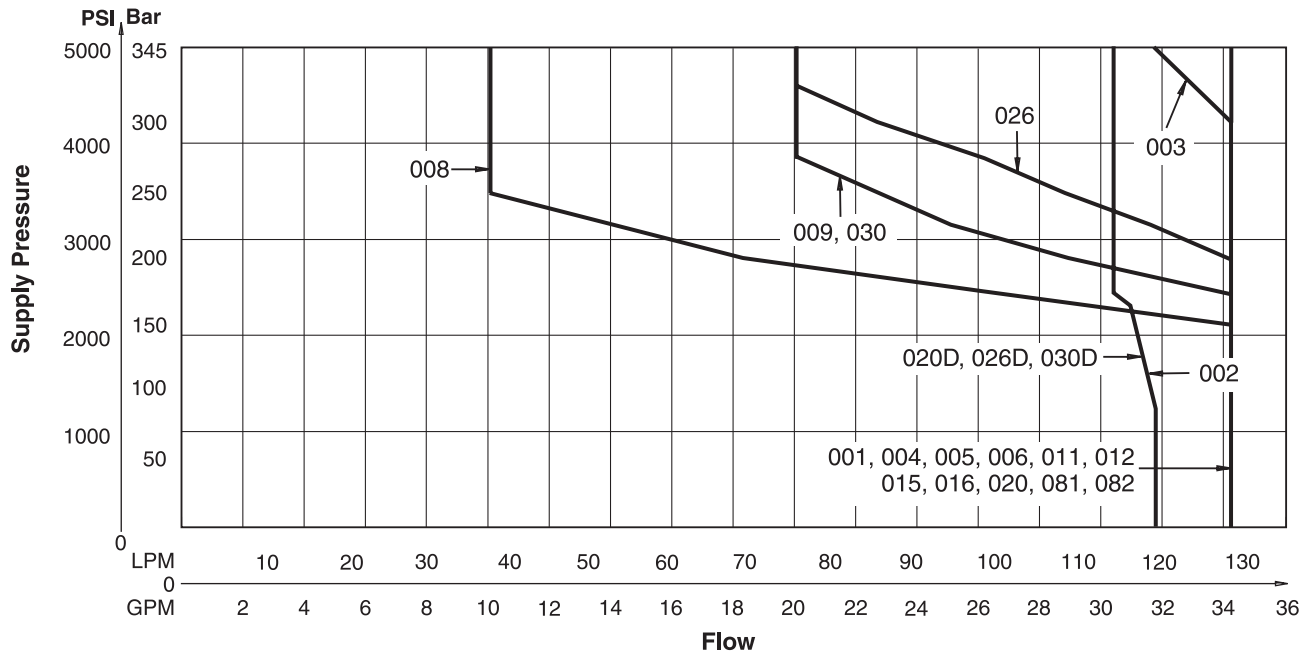
**Response Time\***

Signal to 95% spool stroke measured at 172 Bar (2500 PSI) and 65 LPM (17 GPM).

Soft Shift Option	Energize	De-energize
S3	400	650
S4	320	550

\* For reference only. Response time varies with flow, pressure and oil viscosity.

**D3DW-40/41 Shift Limits**



**Important Notes for Switching Limit Charts**

1. For F & M style valves, reduce flow to 70% of that shown.
2. Shift limits charted for equal flow A and B ports. Unequal A and B port flows may reduce shift limits.
3. These charts do not show explosion proof performance. Consult factory for explosion proof duty.
4. Blocking A and B ports will reduce flow to 70% of that shown.

**Pressure Drop vs. Flow**

**D3W and D3DW Pressure Drop Reference Chart**

**A**

The table shown provides flow vs. pressure drop curve reference for D3 Series valves by spool type.

The chart below demonstrates graphically the performance characteristics of the D3. The low watt coil and other design features of the standard D3W\*\*\*\*F accommodate a maximum flow of 78 LPM (20 GPM) at 207 Bar (3000 PSI).

Spool No.	Curve Number										
	Shifted				Center Condition						
	P-A	P-B	B-T	A-T	(P-T)	(B-A)	(A-B)	(P-A)	(P-B)	(A-T)	(B-T)
001	5	5	2	2	-	-	-	-	-	-	-
002	4	4	1	1	2	3	3	3	3	1	1
003	5	5	2	3	-	-	-	-	-	1	-
004	4	4	3	3	-	-	-	-	-	1	1
005	6	5	2	2	-	-	-	2	-	-	-
006	6	6	2	2	-	4	4	2	2	-	-
008	8	8	7	7	6	-	-	-	-	-	-
009	5	5	4	4	7	-	-	-	-	-	-
011	5	5	2	2	-	-	-	-	-	10	10
015	5	5	3	2	-	-	-	-	-	-	1
016	5	6	2	2	-	-	-	-	2	-	-
020	5	5	2	2	-	-	-	-	-	-	-
026	5	5	-	-	-	-	-	-	-	-	-
030	5	5	2	2	-	-	-	-	-	-	-

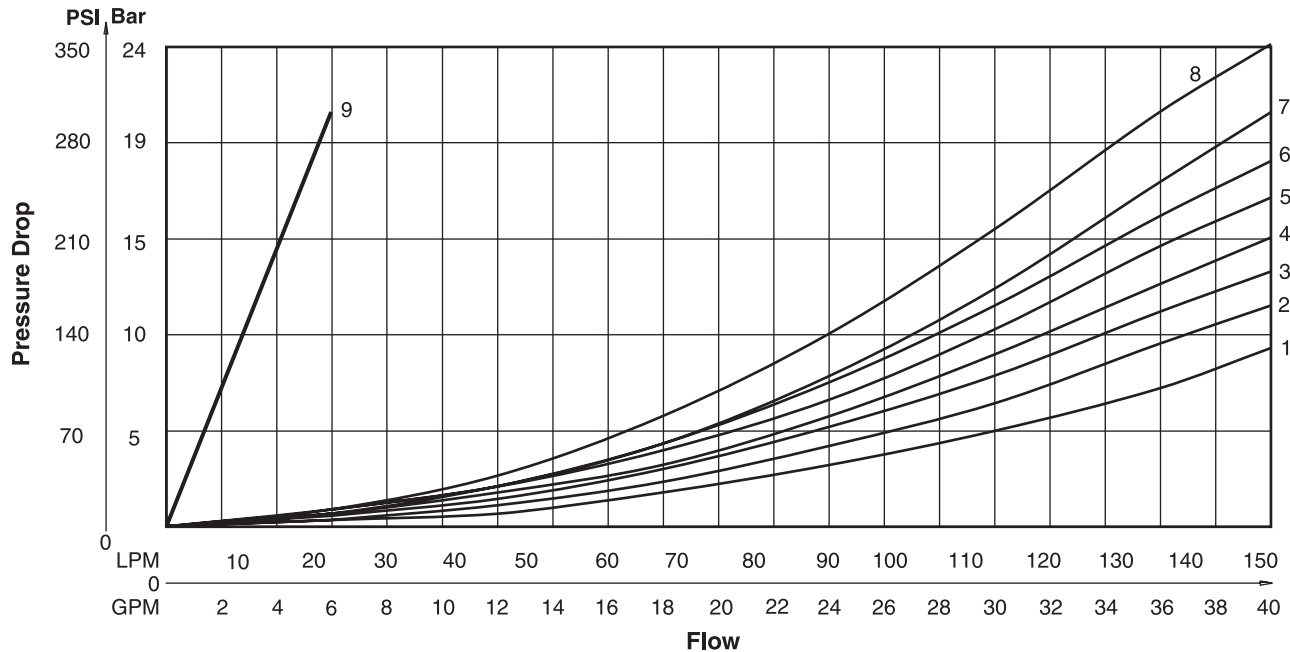
**Note:**  
 For 081 and 082 spools, consult factory.

**Viscosity Correction Factor**

Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (Approx.)	93	111	119	126	132	137	141

Curves were generated using 100 SSU hydraulic oil.  
 For any other viscosity, pressure drop will change per chart.

**Performance Curves**



## General Description

Series D3W directional control valves are high-performance, 4-chamber, direct operated, wet armature, solenoid controlled, 3 or 4-way valves. They are available in 2 or 3-position and conform to NFPA's D05, CETOP 5 mounting patterns.

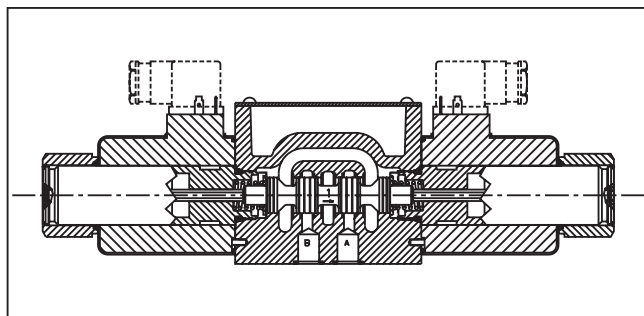
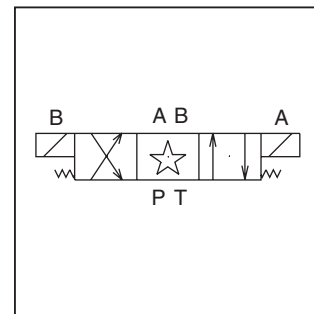
## Features

- Worldwide, high flow, low pressure drop design.
- Soft shift available.
- 16 spools available including proportional.
- DC surge suppression available to protect electrical equipment.
- Three electrical connection options.
- AC & DC lights available.
- Easy access mounting bolts.
- Explosion proof availability.
- CSA approved.
- No tools required for coil removal.
- Rectified coils available for high flow AC applications.



## Response Time (ms)

Signal to 95% spool stroke measured at 172 Bar (2500 PSI) and 75 LPM (20 GPM)


Solenoid Type	m sec
AC Energize	21
AC De-energize	35
DC Energize	110
DC De-energize	85



## Specifications

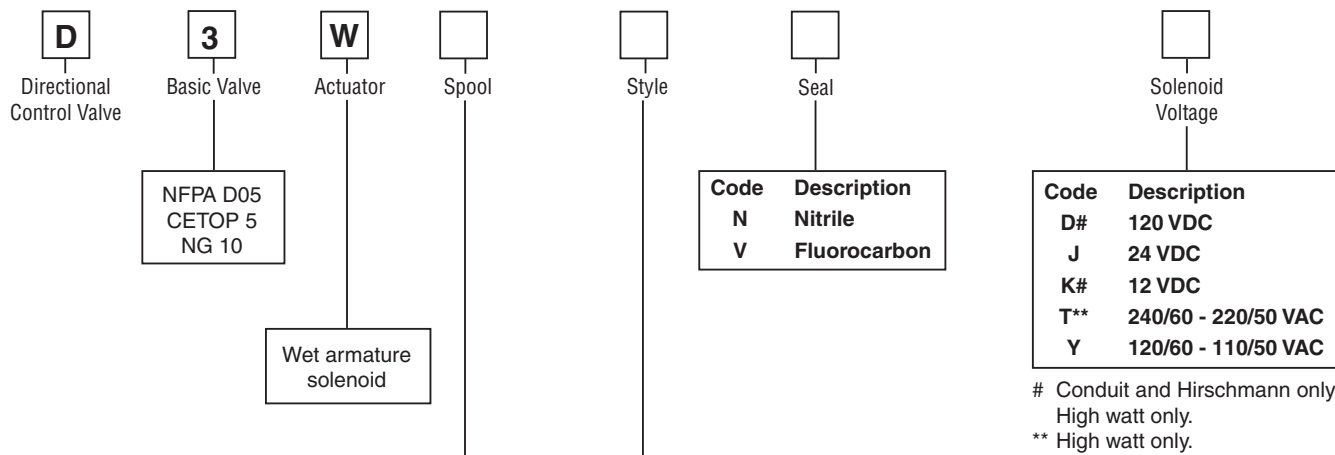
<b>Interface</b>	NFPA D05, CETOP 5, NG 10
<b>Max. Operating Pressure</b>	P, A, B: 345 Bar (5000 PSI) Standard CSA  207 Bar (3000 PSI)  Tank: 103 Bar (1500 PSI) AC Standard 207 Bar (3000 PSI) AC Optional DC/AC Rectified Standard CSA  103 Bar (1500 PSI)
<b>CSA File Number</b>	LR060407
<b>Leakage Rates 100 SSU @ 49°C (120°F)</b>	Maximum Allowable: 19.6 cc (0.38 Cu. in.) per Minute/ Land @ 69 Bar (1000 PSI)*  35 cc (2.19 Cu. in.) per Minute/ Land @ 207 Bar (3000 PSI)*

\* #008 and #009 Spools may exceed these rates, consult factory

 **WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**D3W without Position Control**

**A**



Code	Symbol	Code	Symbol
001		015	
002		016	
003		020*	
004		026*†	
005		030**	
006		081†	
008*, 009**		082†	
011			

Code	Description	Symbol
B*	Single solenoid, 2 position, spring offset. P to A and B to T in offset position.	
C	Double solenoid, 3 position, spring centered.	
D**†	Double solenoid, 2 position, detent.	
E	Single solenoid, 2 position, spring centered. P to B and A to T when energized.	
F**	Single solenoid, 2 position. Spring offset, energized to center. Position spool spacer on A side. P to A and B to T in spring offset position.	
H*	Single solenoid, 2 position, spring offset. P to B and A to T in offset position.	
K	Single solenoid, 2 position, spring centered. P to A and B to T when energized.	
M**	Single solenoid, 2 position, spring offset, energized to center position. Spool spacer on B side. P to B and A to T in spring offset position.	

\* 008, 020, & 026 spools have closed crossover.  
 \*\* 009 & 030 spool have open crossover.  
 † Available only with high-watt rectified AC coils or high-watt DC coils.  
 †† Styles C, E, F, K & M only. Not available with explosion proof coils.

\* Only spools 020, 026 & 030. This condition varies with spool code.  
 \*\* High Watt only.  
 † Only spools 020 & 030.

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing solenoid A. Note operators reverse sides for #8 and #9 spools. See installation information for details.

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

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





Solenoid Connection

Code	Description
<b>C+*</b>	<b>Conduit Cavity</b>
<b>K</b>	<b>Conduit Box</b>
<b>J†*</b>	<b>Deutsch (DT04-2P)</b>
<b>P</b>	<b>Hirschmann w/Plug</b>
<b>W*</b>	<b>Hirschmann w/o Plug</b>
<b>E*</b>	<b>Explosion Proof</b>

\* Lights not available.  
 + No conduit cavity variations. See K conduit box option.  
 † 24 VDC voltage only. High Watt only.

Solenoid/Tube Options

Code	Description
<b>Omit</b>	<b>Standard Tube</b>
<b>P*</b>	<b>Extended Manual Override</b>

\* Manual override options not available on explosion proof or soft shift. Not available with high pressure AC tube "H".

Manual Override Options

Electrical Options

Shift Response

Code	Description
<b>Omit</b>	<b>Standard Valve</b>
<b>S3*</b>	<b>Soft Shift, 0.030" Orifice</b>
<b>S4*</b>	<b>Soft Shift, 0.040" Orifice</b>

\* High watt coil only. Not compatible with D Style. Not available with Detent. DC or AC rectified.

Approvals

Code	Description
<b>Omit</b>	<b>Standard</b>
<b>4*</b>	<b>CSA Approved</b>
<b>N*#</b>	<b>CE Approved</b>

\* Consult Factory for available options.  
 # YC and TC only. Conduit box not allowed at this time.

Variations

Design Series

NOTE: Not required when ordering.

Options	Coil	Tube Rating	
		AC	DC/AC Rectified
<b>Omit</b>	<b>High Watt</b>	<b>103.5 Bar (1500 PSI)</b>	<b>207 Bar (3000 PSI)</b>
<b>F*#</b>	Low Watt	n/a	207 Bar (3000 PSI)
<b>H</b>	<b>High Watt</b>	<b>207 Bar (3000 PSI)</b>	<b>n/a</b>
<b>D‡†</b>	Explosion Proof, EExd ATEX		
<b>U**X†</b>	Explosion Proof, UL/CSA		

\* Availability varies based on Solenoid Voltage: Available with J Hirschmann style only. Available with J and Y (Rectified) leadwire style only.  
 # Not available with soft shift or with F and M style valves.  
 ‡ DED only DC available.  
 \*\* YEU only AC available.  
 X DEU & JEU only DC available.  
 † Explosion proof coils are 60 Hz only.

Code	Description
<b>Omit</b>	<b>No Option</b>
<b>V#</b>	<b>Varistor Surge Suppressor</b>
<b>Z<sup>X</sup></b>	<b>AC Rectified</b>

# 24 VDC voltage only with Leadwire C & K options. High and low watt available.  
 X 240 VAC DIN only, high-watt only. Not available with Explosion Proof. Y voltage available with leadwire, High and Low watt. Y voltage, DIN and high watt only.

Code	Description
<b>Omit</b>	<b>Standard Valve</b>
<b>5</b>	<b>Signal Lights</b>
<b>6</b>	<b>Manaplug, Brad Harrison Mini</b>
<b>56</b>	<b>Manaplug (Mini) with Lights</b>
57	Manaplug (Micro) with Lights (M12x1)
<b>1C</b>	<b>Manaplug (Mini) Single Sol. 5-Pin w/Lights</b>
1M	Manaplug Opposite Normal
1P	Painted Body
2P	Complete Painted Valve, 1 mil thick, spec. (Check factory for availability)

**Mounting Bolt Kits**

UNC Bolt Kits for use with D3W Directional Control Valves & Sandwich Valves					
		Number of Sandwich Valves @ 2.00" (50 mm) thickness			
		0	1	2	3
D3W Standard:	BK98	BK141	BK142	BK143	
	1.62"	3.50"	5.50"	7.50"	
Metric:	BKM98	BKM141	BKM142	BKM143	
	40 mm	90 mm	140 mm	190 mm	
D3W with explosion proof coils	BK144	BK61	BK62	BK63	
	2.37"	4.25"	6.25"	8.25"	
Metric:	BKM144	BKM61	BKM62	BKM63	
	60 mm	110 mm	160 mm	210 mm	

NOTE: All bolts are SAE grade 8, 1/4-20 UNC-2A thread, torque to 16 Nm (12 ft-lbs)

**Valve Weight:**

Single Solenoid:  
 AC 4.3 kg (9.5 lbs.)  
 DC 5.3 kg (11.6 lbs.)  
 Double Solenoid:  
 AC 5.0 kg (11.0 lbs.)  
 DC 7.3 kg (16.0 lbs.)

**Seal Kit:**

Nitrile SKD3W  
 Fluorocarbon SKD3WV

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

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

**A**

**Solenoid Ratings\*\***

Insulation	Class H	
Allowable Deviation from rated voltage	DC, AC Rect	-10% to +10%
	AC	-5% to +5%
Armature	Wet pin type	

\*\* 24VDC Solenoids leadwire coils available with TVS Diode surge suppression. Leadwire length 6" from coil face.

**D3W\*\*\*\*F Solenoid Electrical Characteristics†**

Solenoid Code	Nominal Volts/Hz	In Rush Amps	Holding Amps	Watts
JF	24 VDC	–	0.75	18

† Based on nominal voltage @ 22°C (72°F)

**D3W Solenoid Electrical Characteristics†**

Solenoid Code	Nominal Volts/Hz	In Rush VA	Holding VA	Nominal Watts (Ref)
Y	120/60	298	95	32
	110/50	294	102	
T	240/60	288	96	32
	220/50	288	101	
K	12 VDC	–	3.00†	36
J	24 VDC	–	1.50†	36
D	120 VDC	–	0.30†	36

† DC holding amps.

**D3W Rectified AC Solenoid Electrical Characteristics†**

Solenoid Code	Nominal Volts/Hz	In Rush Amps	Holding Amps	Watts
Y	120/60	–	.37	36
	110/50	–	.37	
T	240/60	–	.18	36
	220/50	–	.18	
YF	120/60	–	.18	18
	110/50	–	.18	
TF	240/60	–	.09	18
	220/50	–	.09	

† Based on nominal voltage @ 22°C (72°F)

**Explosion Proof Solenoids**

**Explosion Proof Solenoid Ratings**

<b>U.L. /CSA (EU)</b>	Class I, Div. 1 & 2, Groups C & D Class II, Div 1 & 2, Groups E, F & G As defined by the N.E.C.
<b>ATEX</b>	Complies with ATEX requirements for: Exd, Group IIB; EN50014: 1999+ Amds 1 & 2, EN50018: 200

**Electrical Characteristics\* ED and EU†**

Solenoid Code	Nominal Volts/Hz	In Rush VA	Holding VA	Nominal Watts (Ref)
Y	120/60	266	82	36
J	24 VDC	–	1.50†	36
D	120 VDC	–	0.30†	36

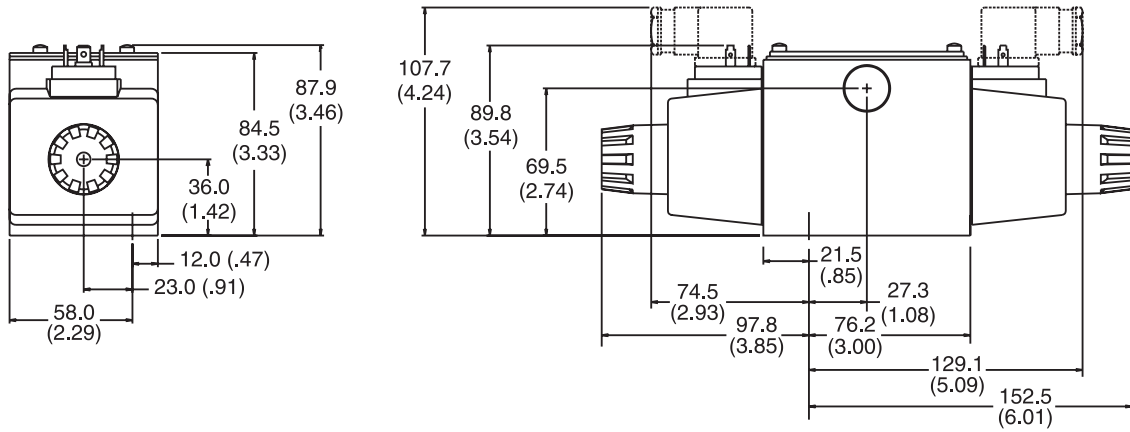
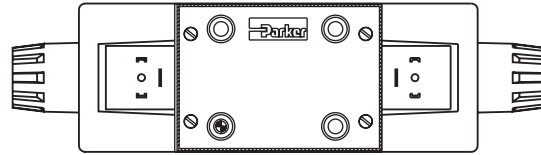
\* Dual frequency not available on explosion proof coils.

† DC holding amps.

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

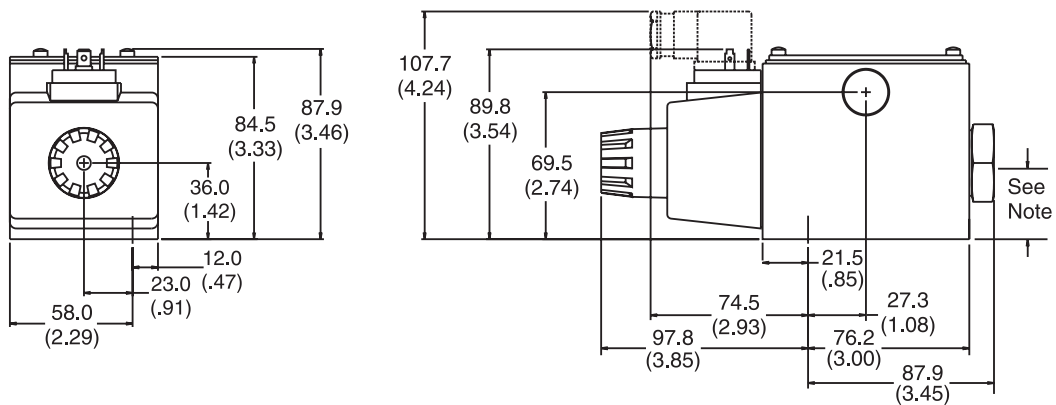
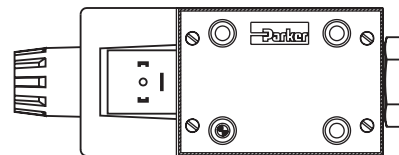
**Hirschmann, Double AC Solenoid**

**A**



**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

**Hirschmann, Single AC Solenoid**

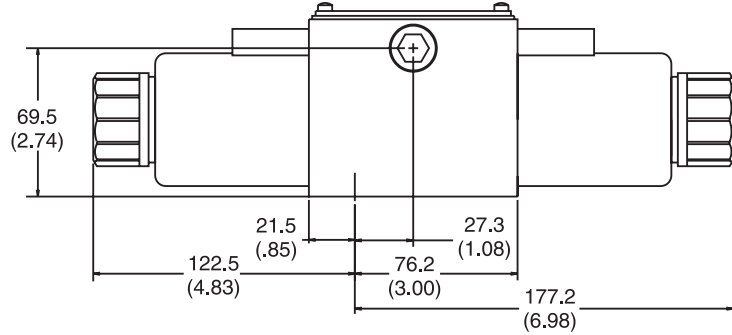
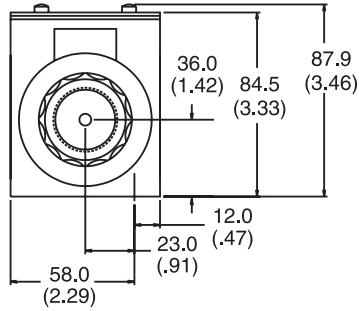
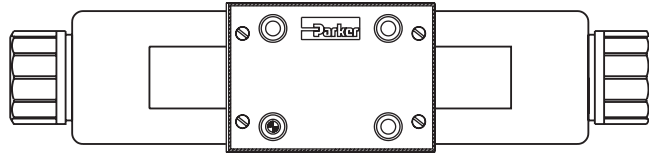


**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

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

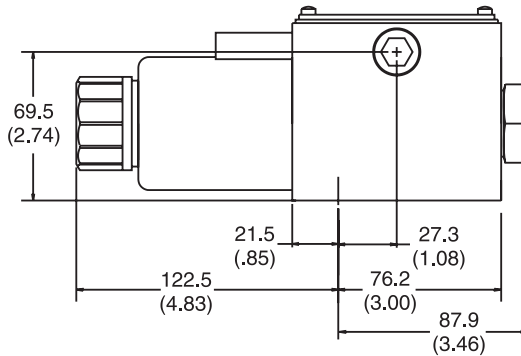
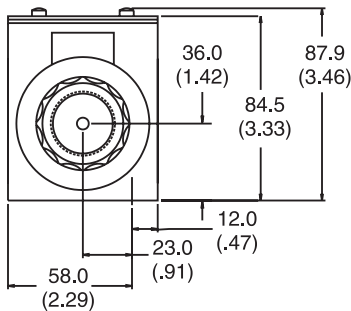
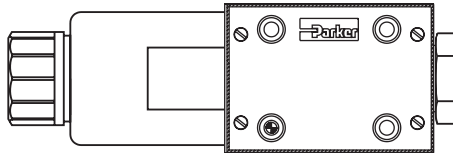
**A**

**Conduit Cavity, Double DC Solenoid**



**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

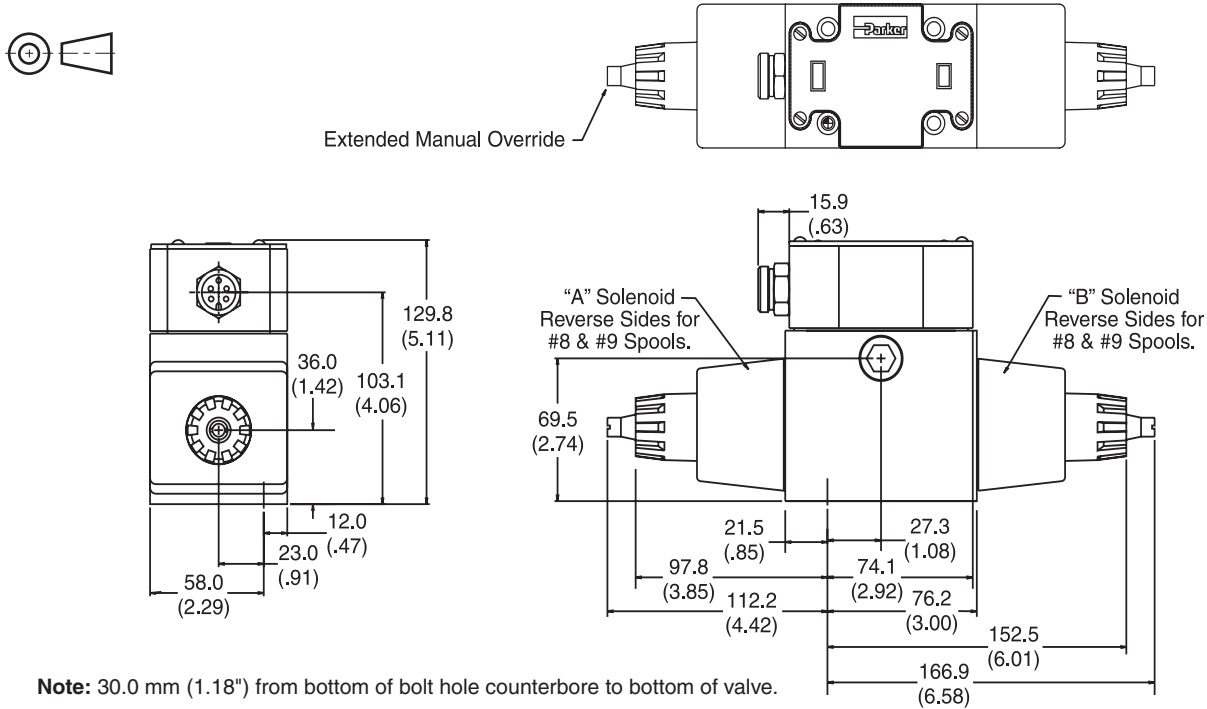
**Conduit Cavity, Single DC Solenoid**



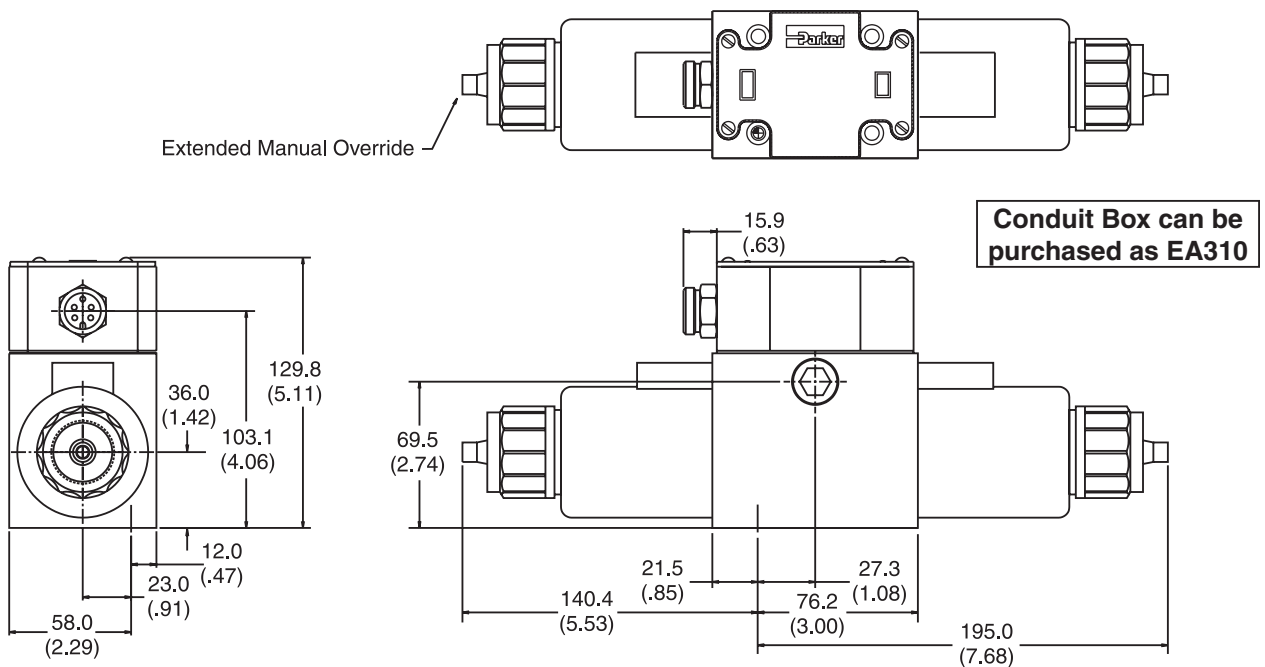
**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

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

**Conduit Box, Single AC Solenoid  
with Variation 6 (Manaplug) & Variation P (Extended Manual Override)**



**Conduit Box, Double DC Solenoid  
with Variation 6 (Manaplug) & Variation P (Extended Manual Override)**



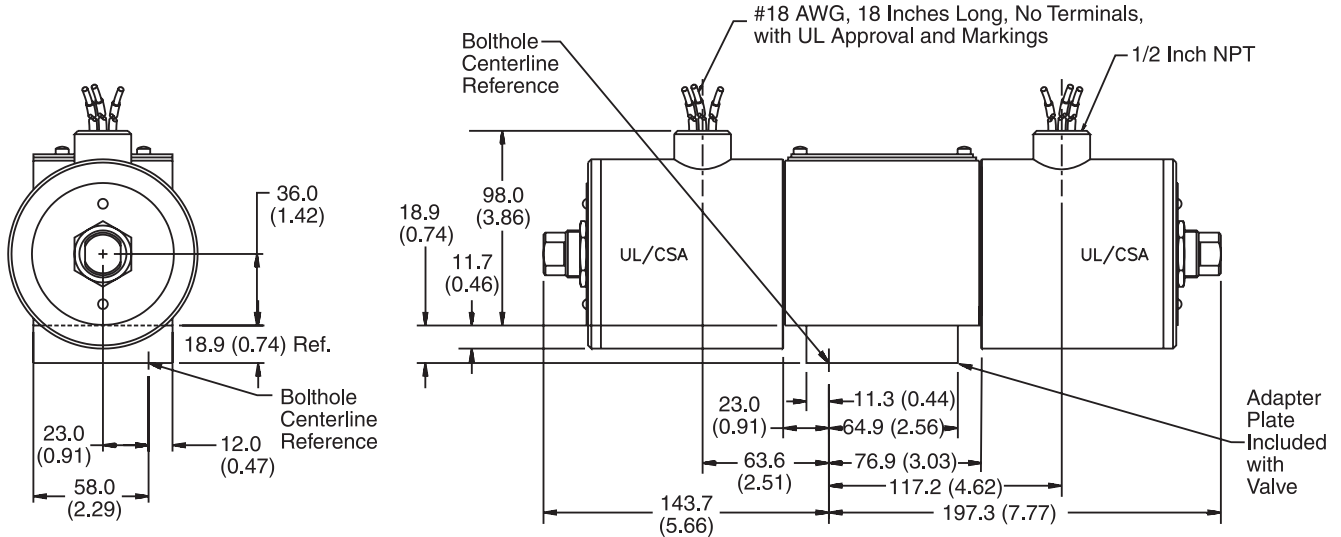
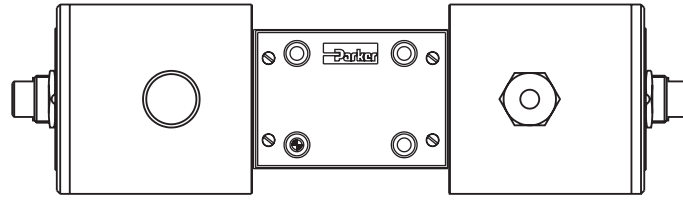
Inch equivalents for millimeter dimensions are shown in (\*\*)

**A**

**Explosion Proof U.L. & CSA, Double Solenoid**

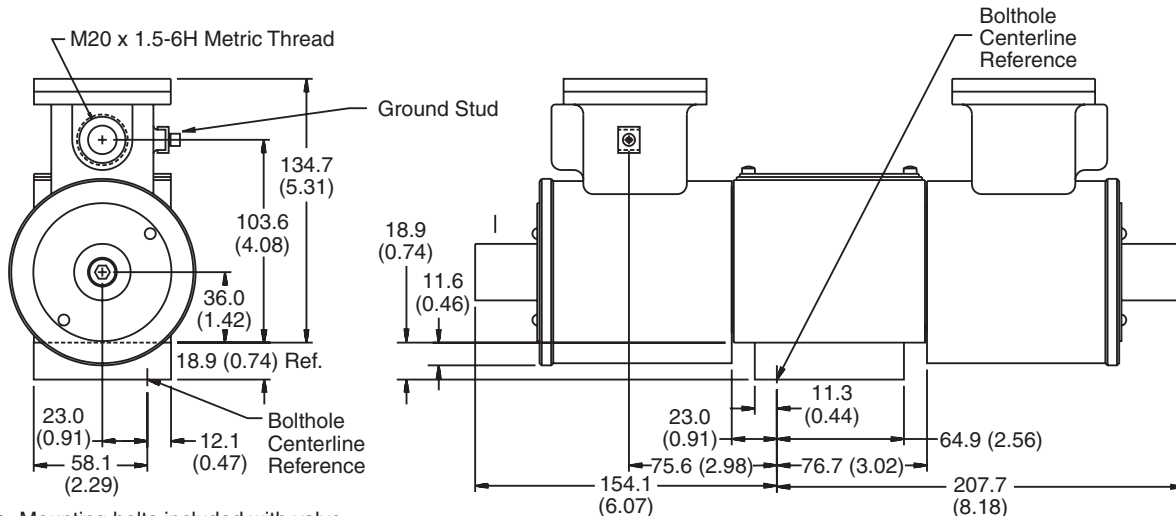
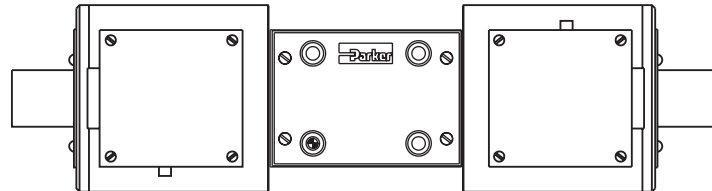


Note:  
2 Black Wires  
1 Green Wire



Note: Mounting bolts included with valve.

**Explosion Proof ATEX, Double Solenoid**



Note: Mounting bolts included with valve.



**Conduit Box**

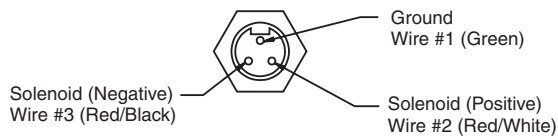
**(connection option K)**

- Interface – 152.4 cm (6.0 inch) lead wires, 18 awg.
- Meets NEMA 4 and IP65

**Manaplug**

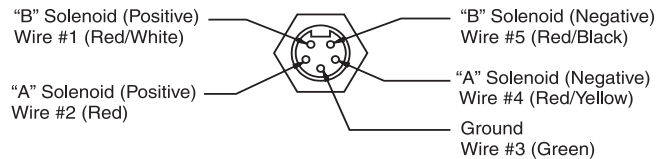
**(valve variations 6, 56, 1A, 1C)**

- Interface – Brad Harrison Plug
- 3-Pin for Single Solenoid
- 5-Pin for Double Solenoid



**3-Pin Manaplug (Mini) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid

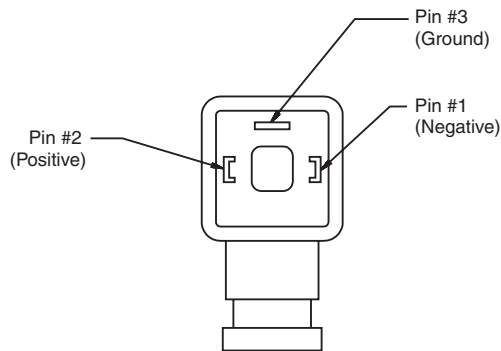


**5-Pin Manaplug (Mini) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid  
 Double Solenoid Valves – Installed Over "A" Solenoid  
 ("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Pins are as seen on valve (male pin connectors)**

**Hirschmann Plug with Lights (P5)**

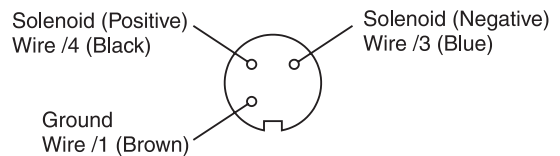


**Face View of Plug**

Conforms to DIN43650, ISO4400, Form A 3-Pin

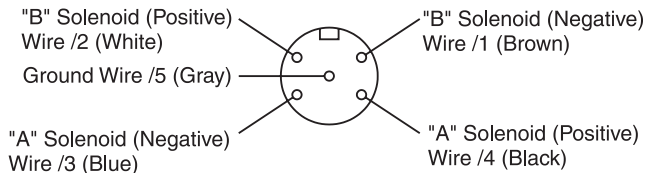
**Manaplug - Micro Connector**

**(valve variations 7, 57, 1B, 1D)**



**3-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid  
 Double Solenoid Valves – Installed Over "A" Solenoid  
 ("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Pins are as seen on valve (male pin connectors)**





**General Description**

Series D3W Inductive Control Valves are direct operated directional valves with inductive position control and are typically used in safety relevant applications. The start or end position can be monitored. The position control is available for single and double solenoid valves.

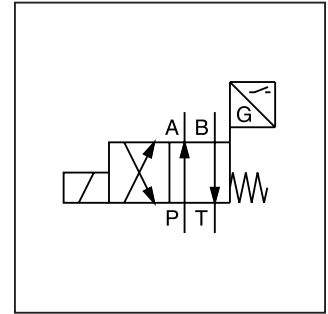
The fail-safe position of the directional valve during power failure is the spring offset position.

Detailed information on the machine directive is available in the position papers (see pages A3 and A4).

**Note: The adjustment of the position control is factory set and sealed. Replacement and repairs can only be made by the manufacturer.**



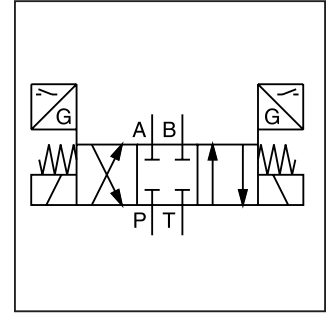
D3W\*B



D3W\*B

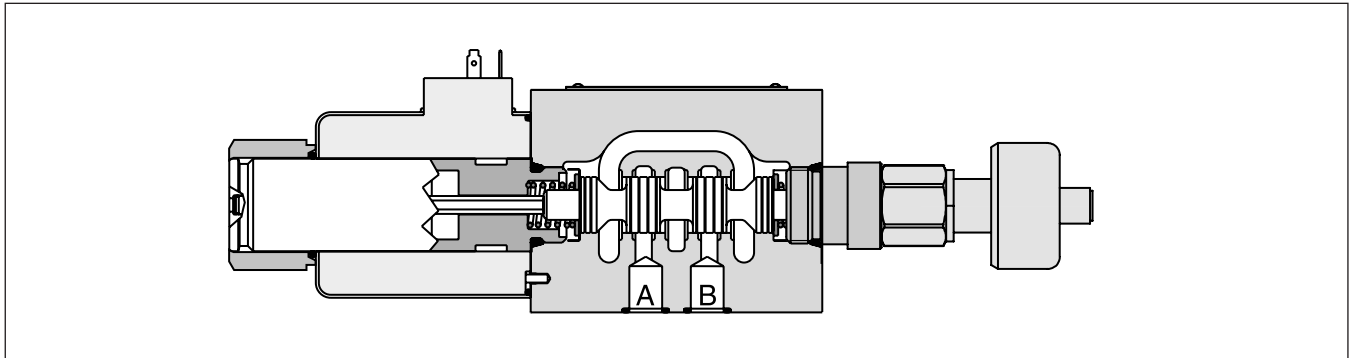


D3W\*C

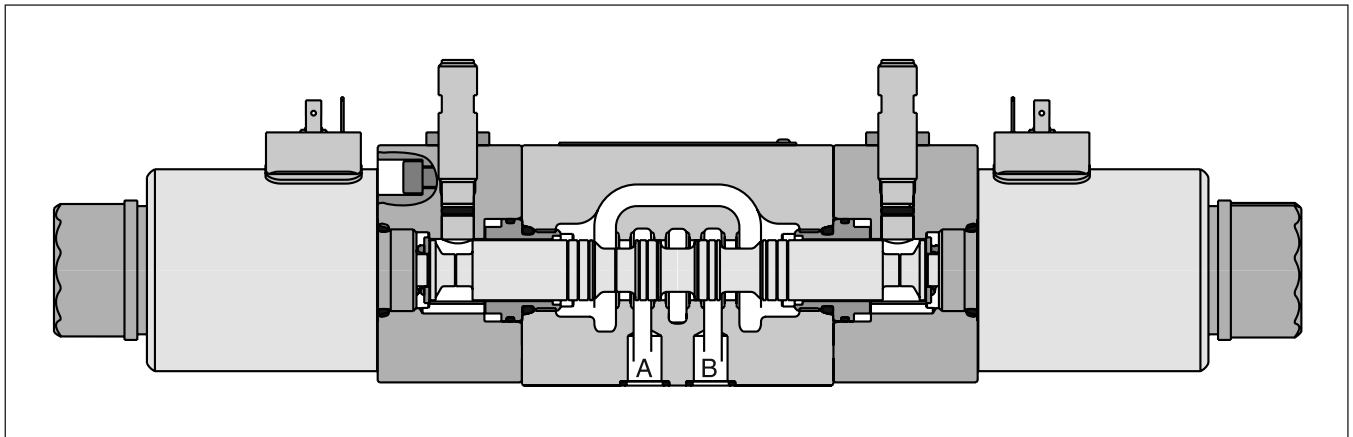


D3W\*C

**D3W\*B**



**D3W\*C**

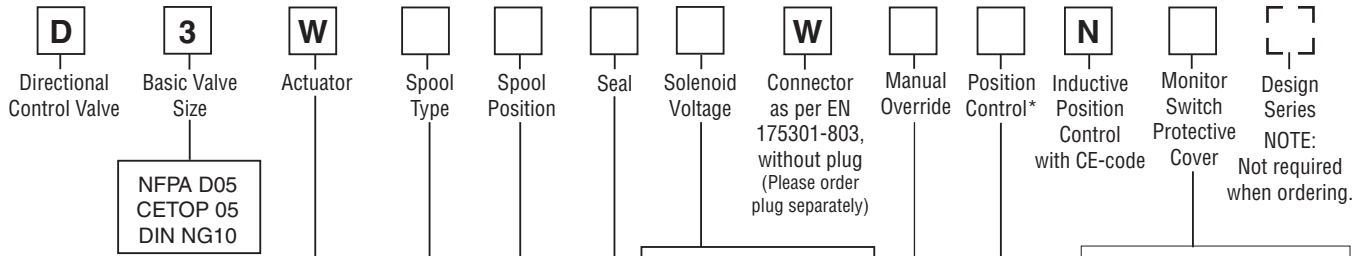


**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**D3W with Position Control, Single Solenoid Valve**

**A**



NFPA D05  
 CETOP 05  
 DIN NG10

Wet pin  
 solenoid

Code	Description
K	12 VDC
J	24 VDC
U*	98 VDC
G*	205 VDC

\* To be used in combination with rectifier plugs at 120 VAC / 230 VAC power supply.

Code	Description
Omit	No Cover
4B	Monitor Switch Protective Cover

Code	Symbol
<b>3 Position Spools</b>	
001	
002	
003*	
004	
005**	
015**	
016*	
021*	
022**	
<b>2 Position Spools</b>	
020	
026	
030	

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description	Symbol
<b>3 Position Spools</b>		
E	2 positions. Spring offset in position 0. Operated in position a.	
F	2 positions. Spring offset in position b. Operated in position 0.	
K	2 positions. Spring offset in position 0. Operated in position b.	
M	2 positions. Spring offset in position a. Operated in position 0.	
<b>2 Position Spools</b>		
B	2 positions. Spring offset in position b. Operated in position a.	
H	2 positions. Spring offset in position a. Operated in position b.	

Code	Position Control	Spool Position
I2	End position monitored side B	E, F, B (Solenoid on a-side)
15**	Start position monitored side B	
I1	End position monitored side A	K, M, H (Solenoid on b-side)
14**	Start position monitored side A	

\* Please order female connector M12x1 separately (see accessories, female connector M12x1 (order no.: 5004109).

\*\* For hydraulic presses according to the safety regulations EN 693, solenoid option T (without manual override) and accessories I4 or I5 (start position monitored) are required.

Code	Description
Omit	Manual Override (Standard)
T*	Without Manual Override

\* For hydraulic presses according to the safety regulations EN 69 3, solenoid option T (without manual override) and accessories I4 or I5 (start position monitored) are required.

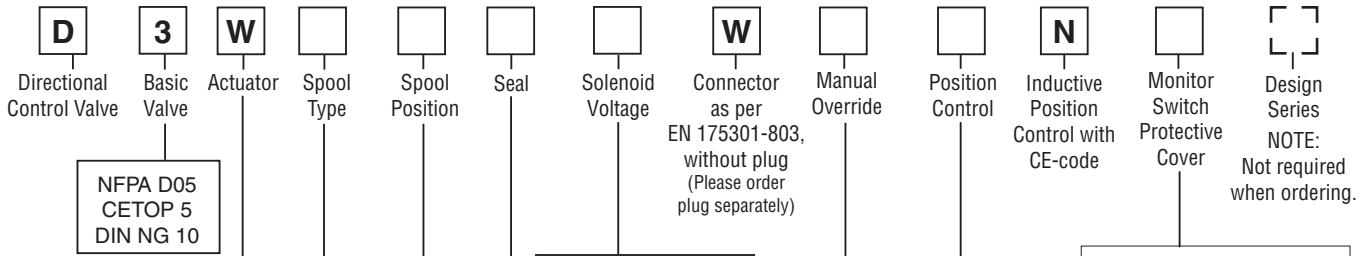
\* Only available for spools K & M.  
 \*\* Only available for spools E & F.

**Standard Bolt Kit:** BK98  
**Metric Bolt Kit:** BKM98  
**Seal Kit:**  
 Nitrile SKD3W  
 Fluorocarbon SKD3WV

**Valve Weight:**  
 Single Solenoid:  
 AC 4.3 kg (9.5 lbs.)  
 DC 5.3 kg (11.6 lbs.)



**D3W with Position Control, Double Solenoid Valve**



NFPA D05  
 CETOP 5  
 DIN NG 10

Wet pin  
 solenoid

Code	Description
K	12 VDC
J	24 VDC
U*	98 VDC
G*	205 VDC

\* To be used in combination with rectifier plugs at 120 VAC and 230 VAC power supply.

Code	Description
Omit	No Cover
4B	Monitor Switch Protective Cover

Code	Symbol
<b>3 Position Spools</b>	
001	
002	
004	
<b>2 Position Spools</b>	
020*	
026*	

\* Only available for end position control code 13.

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description	Spool Position
I3	End positions	C, D
I6*	Start positions	

\* For hydraulic presses according to the safety regulations EN 693, solenoid option T (without manual override) and accessory I6 (start positions) is required.

Code	Description
Omit	Manual Override (Standard)
T*	Without Manual Override

\* For hydraulic presses according to the safety regulations EN 693, solenoid option T (without manual override) and accessory I6 (start positions) is required.

Code	Description	Symbol
<b>3 Position Spools</b>		
C	3 positions. Spring offset in position 0. Operated in position a or b.	
<b>2 Position Spools</b>		
D	2 positions. Spring offset in position a. Operated in position b.	

- Standard Bolt Kit:** BK98  
**Metric Bolt Kit:** BKM98  
**Seal Kit:**  
 Nitrile SKD3W  
 Fluorocarbon SKD3WV

- Valve Weight:**  
 Double Solenoid:  
 AC 5.0 kg (11.0 lbs.)  
 DC 7.3 kg (16.0 lbs.)



A

General					
Design	Directional Spool Valve				
Actuation	Solenoid				
Size	NG10 / CETOP 05 / NFPA D05				
Mounting Interface	DIN 24340 A10 / ISO 4401 / NFPA D05 / CETOP RP 121-H				
Mounting Position	Unrestricted, preferably horizontal				
Ambient Temperature	[°C]	-20...+60; (-4°F...+140°F)			
MTTF <sub>D</sub> Value	[years]	150			
Hydraulic					
Maximum Operating Pressure	P, A, B: 350 Bar (5045 PSI); T: 210 Bar (3045 PSI)				
Fluid	Hydraulic oil in accordance with DIN 51524				
Fluid Temperature	[°C]	-20 ... +70 (-4°F...+158°F)			
Viscosity Permitted	[cSt]/[mm <sup>2</sup> /s]	2.8...400 (13...1854 SSU)			
Recommended	[cSt]/[mm <sup>2</sup> /s]	30...80 (139...371 SSU)			
Filtration	ISO 4406 (1999); 18/16/13				
Flow Maximum	150 LPM (40 GPM) See shift limits				
Leakage at 50 Bar (725 PSI) (per flow path)	[ml/min]	Up to 20 (0.005 GPM) (depending on spool)			
Static / Dynamic					
Step Response at 95%	[ms]	Energized: 105; De-energized: 85			
Electrical					
Duty Ratio	100% ED; CAUTION: coil temperature up to 150°C (302°F) possible				
Max. Switching Frequency	10,000 switchings per hour				
Protection Class	IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)				
	Code	K	J	U	G
Supply Voltage / Ripple	[V]	12	24	98	205
Tolerance Supply Voltage	[%]	±10	±10	±10	±10
Current Consumption	[A]	3	1.5	0.35	0.18
Power Consumption	[W]	36	36	34	36
Solenoid Connection	Connector as per EN 175301-803, solenoid identification as per ISO 9461.				
Wiring Minimum	[mm <sup>2</sup> ]	3 x 1.5 recommended			
Wiring Length Maximum	[m]	50 (164 ft.) recommended			

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

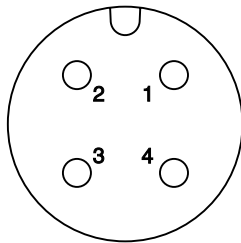
## Single Solenoid Valves

### Electrical Specifications of Position Control as per IEC 61076-2-101 (M12x1)

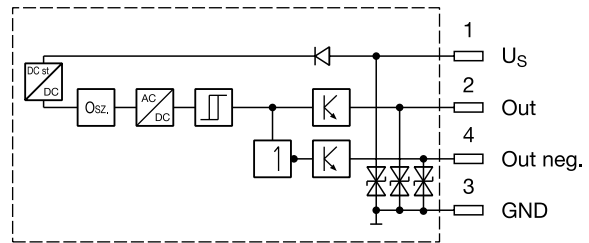
Supply Voltage / Ripple	[VDC]	24 $\leq$ 10%
Tolerance Supply Voltage	[%]	$\pm$ 20
Polarity Protection	[V]	300
Current Consumption without Load	[mA]	$\leq$ 20
Switching Hysteresis	[mm]	<0.06
Max. Output Current per Channel, Ohmic	[mA]	250
Ambient Temperature	[°C]	-20...+60 (-4°F...+140°F)
Protection Class		IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)
Min. Distance to Next AC Solenoid	[m]	0.1 (0.33 ft.)
Interface		M12x1 to IEC 61076-2-101
CE Conform		EN 61000-4-2 / EN 61000-4-4 / EN 61000-4-6* / ENV 50140 / ENV 50204

\* 1) Only guaranteed with screened cable and female connector.

## M12 Pin Assignment



- 1  $U_S$  19.2...28.8V
- 2 Out B: normally open
- 3 0V
- 4 Out A: normally closed



Outputs: Open collector

## Definitions

Start position monitored:

The valve is de-energized. The inductive switch gives a signal at the moment the spool leaves the spring offset position (below 15% spool stroke).

At the switching point the spool is located within the closed position. It is secured so that only the flow paths of the offset position are granted.

The switch can only be located on the opposite side of the solenoid for direct operated valves. Please order plug M12x1 separately. See Accessories, plug M12x1 (part no.: 5004109).

End position monitored:

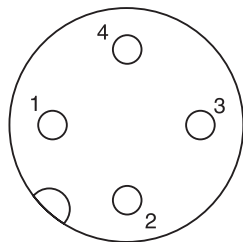
The inductive switch gives a signal before the end position is reached. (above 85% spool stroke).

## Double Solenoid Valves

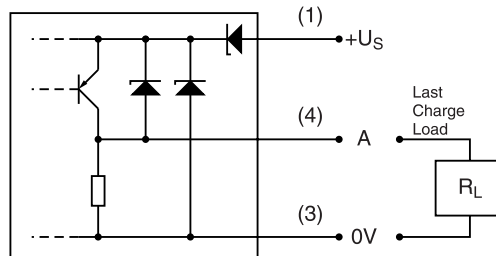
### Electrical Specifications of Position Control as per IEC 61076-2-101 (M12x1)

<b>Protection Class</b>	IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)
<b>Ambient Temperature</b> [°C]	-20...+60; (-4°F...140°F)
<b>Supply Voltage <math>U_S</math>/ Ripple</b> [V]	10...30 / $\pm 10\%$
<b>Current Consumption without Load</b> [mA]	$\leq 10$
<b>Max. Output Current per Channel, Ohmic</b> [mA]	200
<b>Min. Output Load per Channel, Ohmic</b> [kOhm]	100
<b>Max. Output Drop at 0.2A</b> [V]	$\leq 2$
<b>EMC</b>	EN61000-6-4 / EN61000-6-2
<b>Min. Distance to Next AC Solenoid</b> [m]	$> 0.1$ (0.33 ft.)
<b>Interface</b>	M12x1 acc. to IEC 61076-2-101
<b>Wiring Minimum</b> [mm <sup>2</sup> ]	3 x 0.14 brad shield recommended
<b>Wiring Length Maximum</b> [m]	50 (164 ft.) recommended

### M12 Pin Assignment



- 1  $U_S$  10...30V
- 2 Not connected
- 3 0V
- 4 Out A: normally open

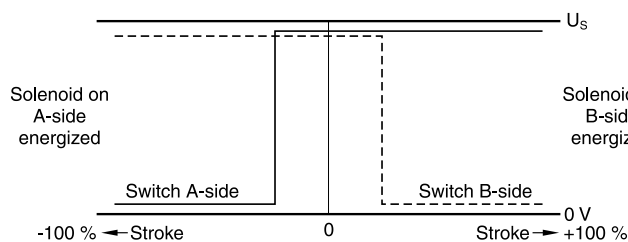


### Definitions

Start position monitored:

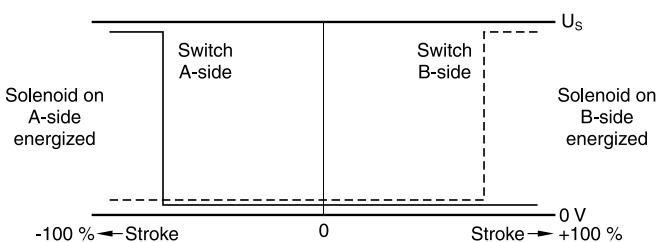
The valve is de-energized. The inductive switch gives a signal at the moment the spool leaves the center position (below 15% spool stroke).

At the switching point the spool is located within the closed position. It is secured so that only the flow paths of the offset position are granted.



End position monitored:

The inductive switch gives a signal before the end position is reached (above 85% spool stroke).

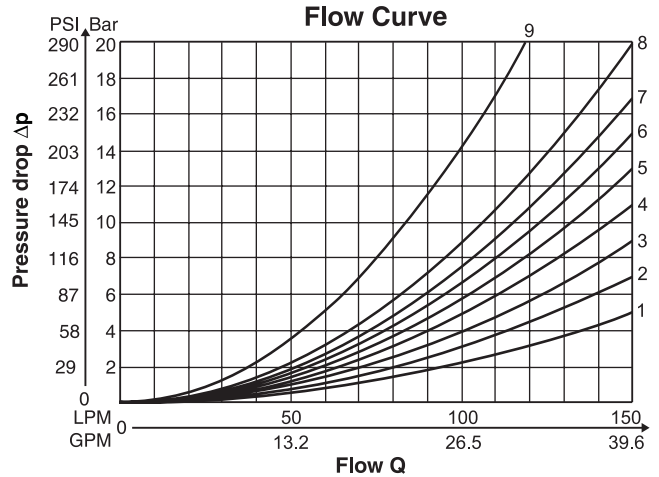


Please order plug M12x1 separately. Straight plug recommended – no defined position possible for angled plug.

**Performance Curves**

The flow curve diagram shows the flow versus pressure drop curves for all spool types. The relevant curve number for each spool type, operating position, and flow direction is given in the table below.

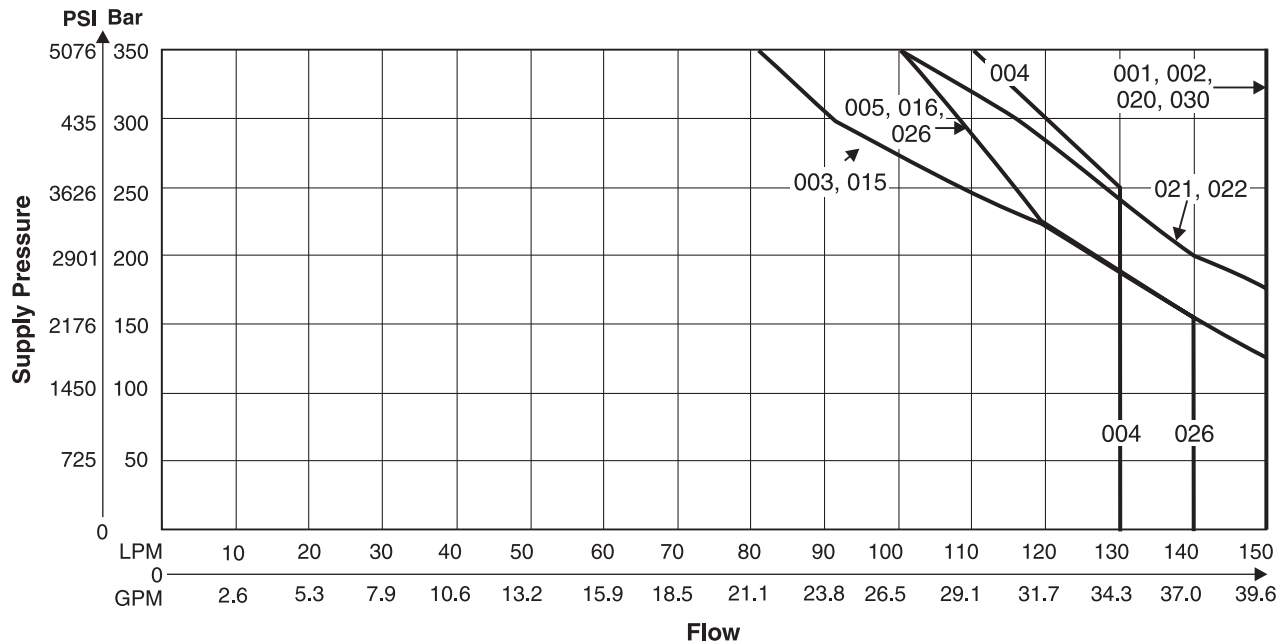
Spool	Position "b"		Position "a"		Position "0"					
	P-A	B-T	P-B	A-T	P-A	P-B	A-T	B-T	P-T	A-B
001	6	5	6	6	-	-	-	-	-	-
002	3	5	3	3	1	1	4	5	1	6
003	2	2	3	1	-	-	3	-	-	-
004	5	4	4	4	-	-	8	8	-	9
005	2	2	2	2	3	-	-	-	-	-
015	2	1	2	2	-	-	-	3	-	-
016	2	2	1	2	-	2	-	-	-	-
020	6	6	5	7	-	-	-	-	-	-
026B	5	-	5	-	-	-	-	-	-	-
030	4	5	3	5	-	-	-	-	-	-
Spool	Position "b"			Position "a"						
	P-A	P-B	A-B	P-B	A-T	-				
021	2	4	8	3	2	-				
Spool	P-A	B-T	-	P-A	P-B	A-B				
	022	3	2	-	3	2	8			



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

**Shift Limit Diagram**

The diagram below specifies the shift limits. Valves with spool position "F" or "M" can only be operated up to 70% of the limits. The specifications apply to a viscosity of 40mm<sup>2</sup>/s and balanced flow conditions. The shift limits can be considerably lower at unbalanced flow conditions. To avoid flow rates beyond the shift limits, a plug-in orifice can be inserted in the P-port.



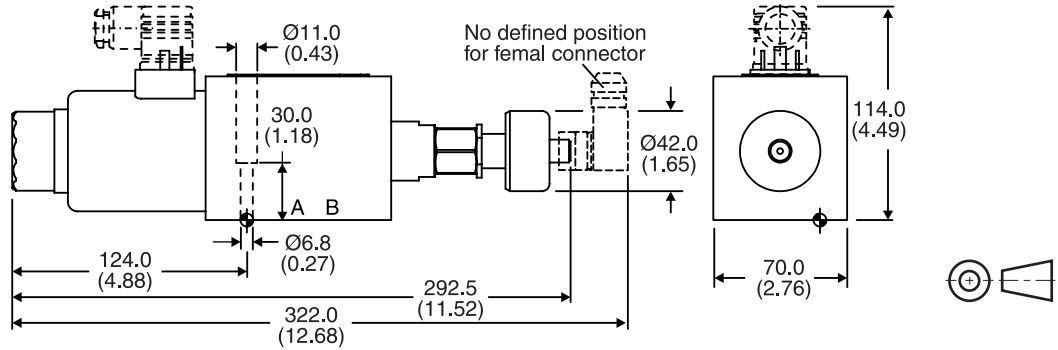
All characteristic curves measured with HLP46 at 50°C (122°F), 90% U<sub>nom</sub> and warm solenoids.

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

**A**

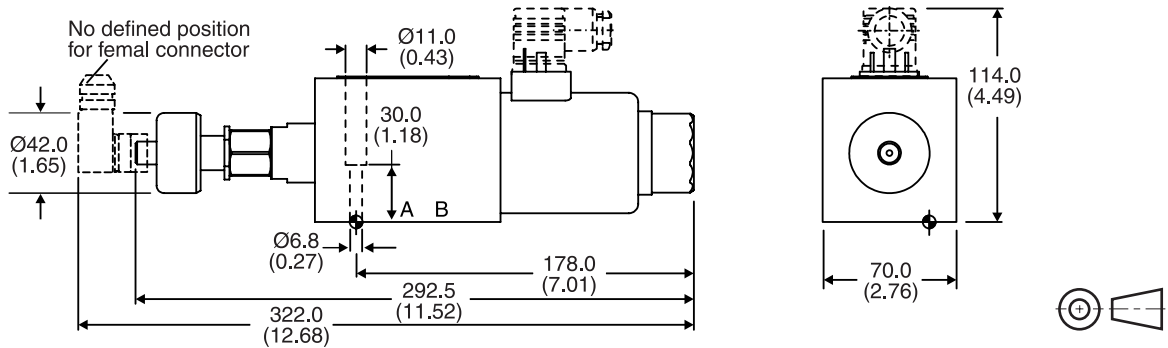
**Interface EN 175301-803, DC solenoid, with plug M12x1<sup>1)</sup>**

**Styles B, E, F**



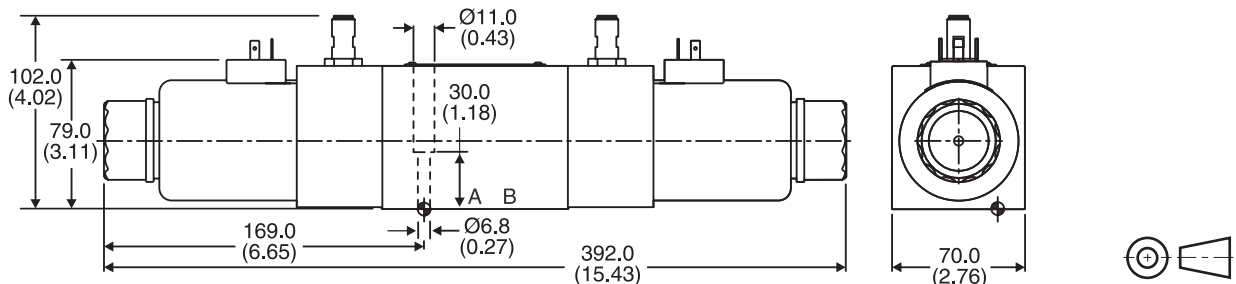
<sup>1)</sup> Please order plug M12x1 separately. See Accessories (part no.: 5004109).

**Styles H, K, M**



**Interface EN 175301-803, DC solenoid, without plug M12x1<sup>2)</sup>**

**Styles C, D**



<sup>2)</sup> Please order plug M12 x 1 separately. Straight plug recommended – no defined position possible for angled plug.

Surface Finish	Kit			Seal Kit
	BK385	4x M6x40 ISO 4762-12.9	13.2 Nm (9.7 lb.-ft.) ±15%	<b>Nitrile: SK-D3W-30</b> Fluorocarbon: SK-D3WV-30

The space necessary to remove the plug per EN 175301-803, design type AF is at least 15 mm (0.59").

The torque for the screw M3 of the plug has to be 0.5 to 0.6 Nm (0.37 lb.-ft. to 0.44 lb.-ft.).

The space necessary to remove the M12x1 female connector is at least 22mm (0.87").

**The adjustment of the position control is factory set and sealed.  
Replacement and repairs can only be undertaken by the manufacturer.**





## General Description

Series D3DW directional control valves are high performance, 5-chamber, direct operated, wet armature, solenoid controlled, 3 or 4-way valves. They are available in 2 or 3-position and conform to NFPA's D05, CETOP 5 mounting patterns.

## Features

- 16 spools available including proportional.
- DC surge suppression available to protect electrical equipment.
- Easy access mounting bolts.
- CSA approved.
- No tools required for coil removal.
- High pressure tank line capability.
- Monitor switch available.

## Response Time (ms)

Signal to 95% spool stroke measured at 175 Bar (2500 PSI) and 75 LPM (20 GPM)

Solenoid Type	Pull-In	Drop-Out
DC	110	85

## Solenoid Ratings\*\*

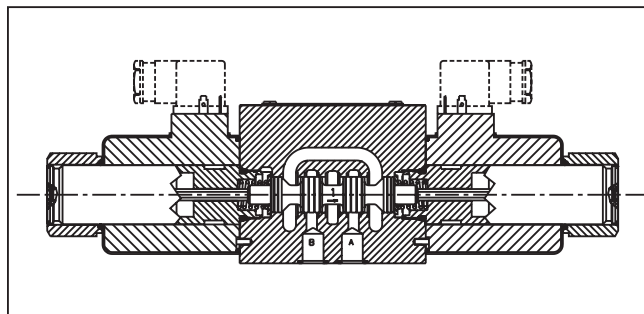
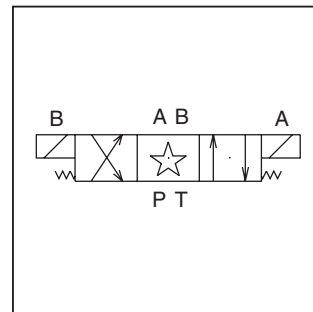
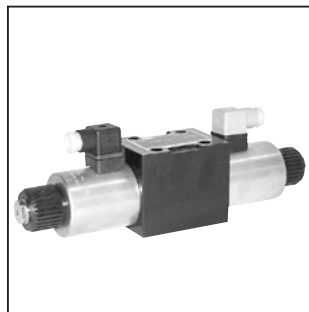
Insulation	Class H
Allowable Deviation from rated voltage	DC only -10% to +15%
Armature	Wet pin type

\*\* DC Solenoids available with optional molded metal oxide varistor (MOV) for surge suppression.

## D3DW Solenoid Electrical Characteristics

Solenoid Code	Nominal Volts	In Rush Amps	Holding Amps	Nominal Watts (Ref)
K	12 VDC	–	3.00	36
J	24 VDC	–	1.50	36
D	120 VDC	–	0.30	36
Y*	120/60 110/50	–	0.37	36
T*	240/60 220/50	–	0.18	36

\* AC input rectified to DC



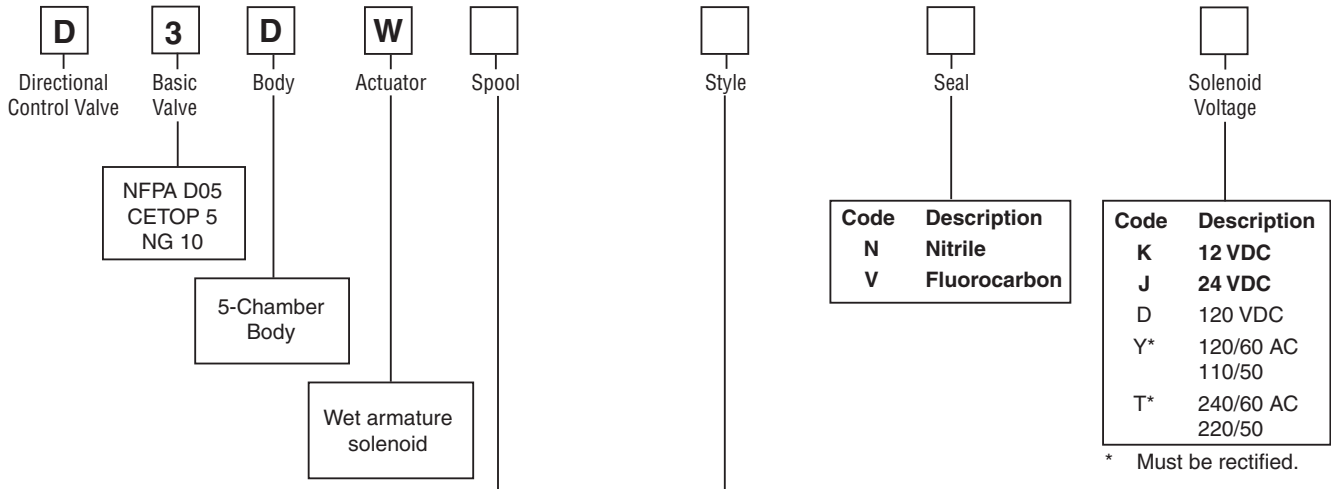
## Specifications

Interface	NFPA D05, CETOP 5, NG 10
Max. Operating Pressure	P, A, B: 345 Bar (5000 PSI) Standard CSA  207 Bar (3000 PSI)  Tank: 207 Bar (3000 PSI) Standard CSA  103 Bar (1500 PSI)
Maximum Flow	See Spool Reference Chart
Leakage Rates 100 SSU @ 49°C (120°F)	Maximum Allowable: 19.7 cc (1.2 Cu. in.) per Minute/ Land @ 69 Bar (1000 PSI)*  73.8 cc (4.5 Cu. in.) per Minute/ Land @ 207 Bar (3000 PSI)*  Typical: 4.9 cc (0.3 Cu. in.) per Minute/ Land @ 69 Bar (1000 PSI)*  26.2 cc (1.6 Cu. in.) per Minute/ Land @ 345 Bar (5000 PSI)

\* #008 and #009 Spools may exceed these rates, consult factory.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**A**



Code	Symbol	Code	Symbol
001		011	
002		012	
003		014	
004		015	
005		016	
006		020*	
007		030**	
008*, 009**		081† ††	
010		082† ††	

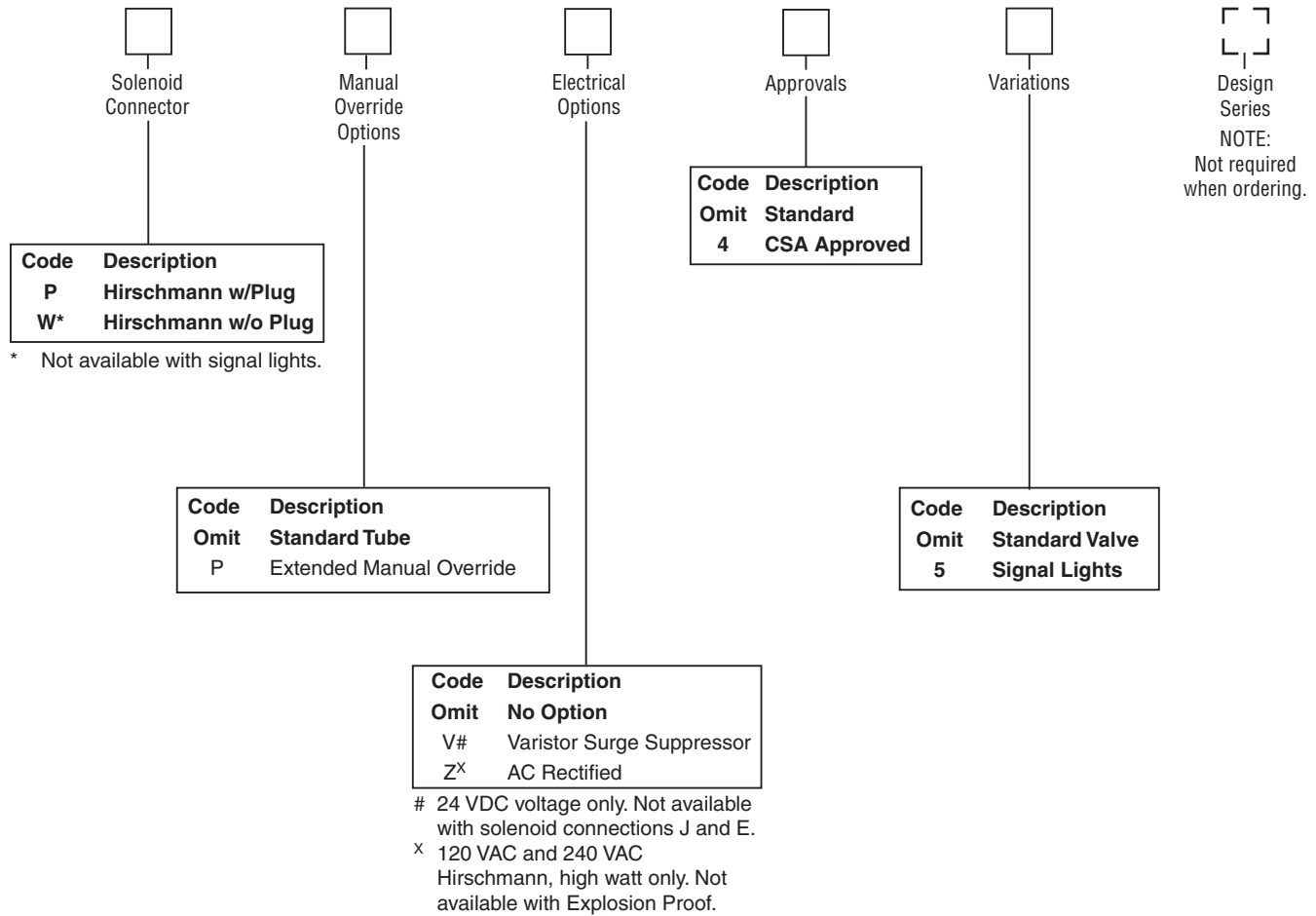
Code	Description	Symbol
B*	Single solenoid, 2 position, spring offset. P to A and B to T in offset position.	
C	Double solenoid, 3 position, spring centered.	
D*	Double solenoid, 2 position, detent.	
E	Single solenoid, 2 position, spring centered. P to B and A to T when energized.	
F	Single solenoid, 2 position. Spring offset, energized to center. Position spool spacer on A side. P to A and B to T in spring offset position.	
H*	Single solenoid, 2 position, spring offset. P to B and A to T in offset position.	
K	Single solenoid, 2 position, spring centered. P to A and B to T when energized.	
M	Single solenoid, 2 position, spring offset, energized to center position. Spool spacer on B side. P to B and A to T in spring offset position.	

\* 008 & 020 spools have closed crossover.  
 \*\* 009 & 030 spools have open crossover.  
 † Available only with high-watt rectified AC coils or high-watt DC coils.  
 †† Spring centered versions C, E, F, K & M only.

\* Only spools 020 & 030. This condition varies with spool code.

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

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



**Mounting Bolt Kits**

UNC Bolt Kits for use with D3DW Directional Control Valves & Sandwich Valves					
		Number of Sandwich Valves @ 2.00" (50 mm) thickness			
		0	1	2	3
D3DW	Standard:	BK98 1.62"	BK141 3.50"	BK142 5.50"	BK143 7.50"
	Metric:	BKM98 40 mm	BKM141 90 mm	BKM142 140 mm	BKM143 190 mm

**NOTE:**All bolts are SAE grade 8, 1/4-20 UNC-2A thread, torque to 16 Nm (12 ft-lbs).

**Valve Weight:**

Single Solenoid 5.3 kg (11.6 lbs.)  
 Double Solenoid 7.3 kg (16.0 lbs.)

**Seal Kit:**

Nitrile SKD3DW  
 Fluorocarbon SKD3DWV

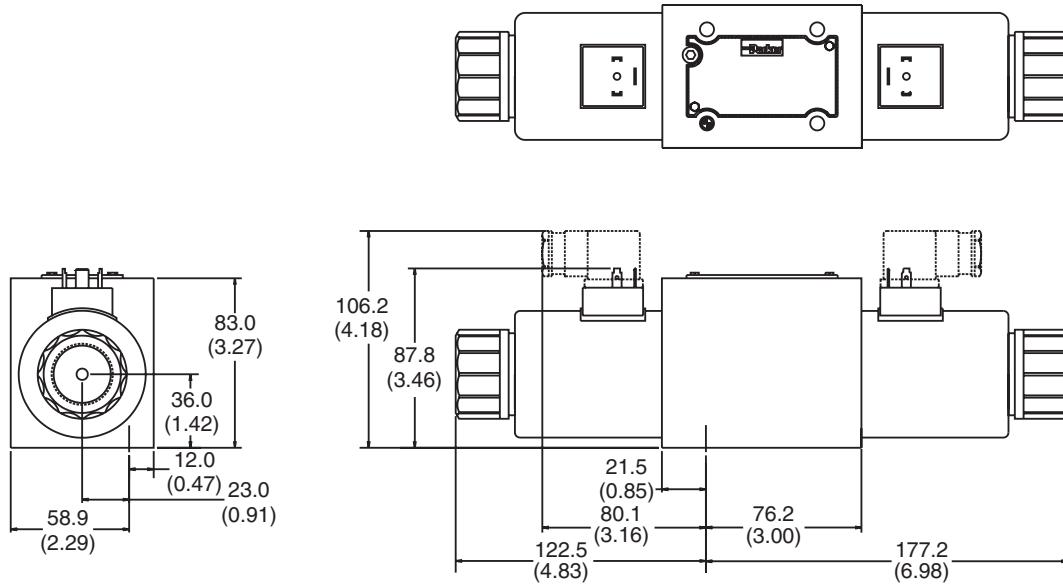
**Bold: Designates Tier I products and options.**

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

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

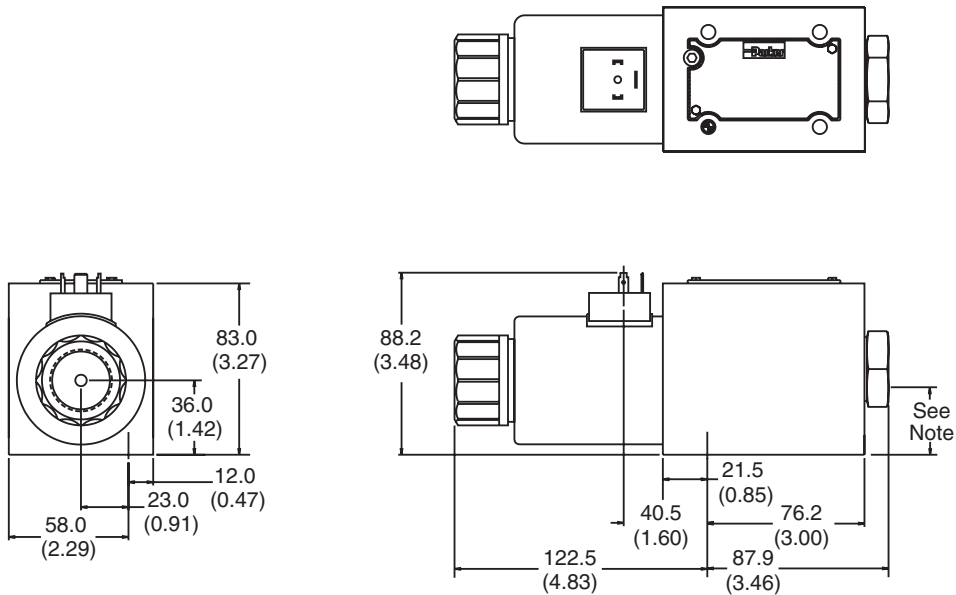
**A**

**Hirschmann, Double DC Solenoid**



**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

**Hirschmann, Single DC Solenoid**



**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.



### General Description

Series D3A directional control valves are high performance, 4-chamber, direct operated, air pilot controlled, 4-way valves. They are available in 2 or 3-position and conform to NFPA's D05/CETOP 5 mounting patterns.

### Features

- Low pilot pressure required – 4.1 Bar (60 PSI) minimum.
- High flow, low pressure drop design.

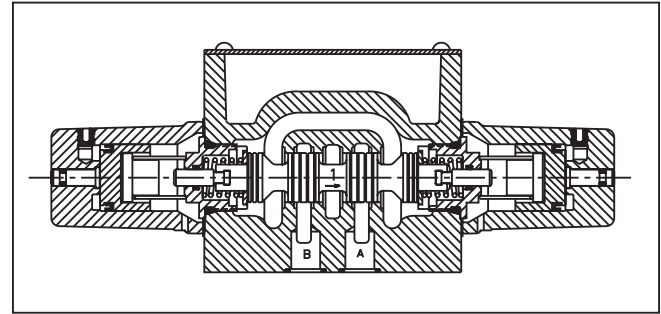
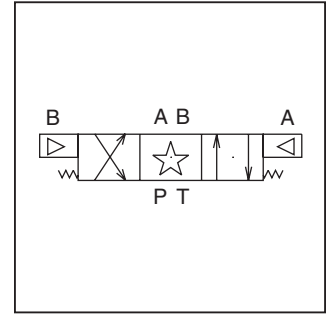
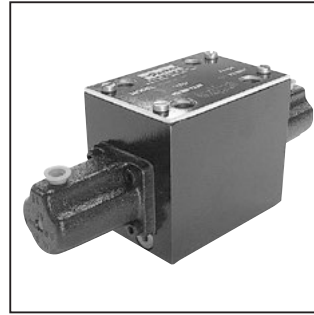
### Specifications

<b>Mounting Pattern</b>	NFPA D05, CETOP 5, NG 10
<b>Maximum Pressure</b>	Operating: 345 Bar (5000 PSI) Tank Line: 34 Bar (500 PSI)
<b>Maximum Flow</b>	See Spool Reference Chart
<b>Pilot Pressure</b>	Air Minimum 4.1 Bar (60 PSI) Air Maximum 6.9 Bar (100 PSI)

### Air Operated

**Shift Volume.** The air pilot chamber requires a volume of 1.8 cc (.106 in.<sup>3</sup>) for complete shift from center to end.

**Pilot Piston.** The pilot piston area is 506 mm<sup>2</sup> (.785 in.<sup>2</sup>). Pilot piston stroke is 3.4 mm (.135 in.).



### Response Time\* (ms)

Signal to 95% spool stroke measured at 172 Bar (2500 PSI) and 75 LPM (20 GPM)

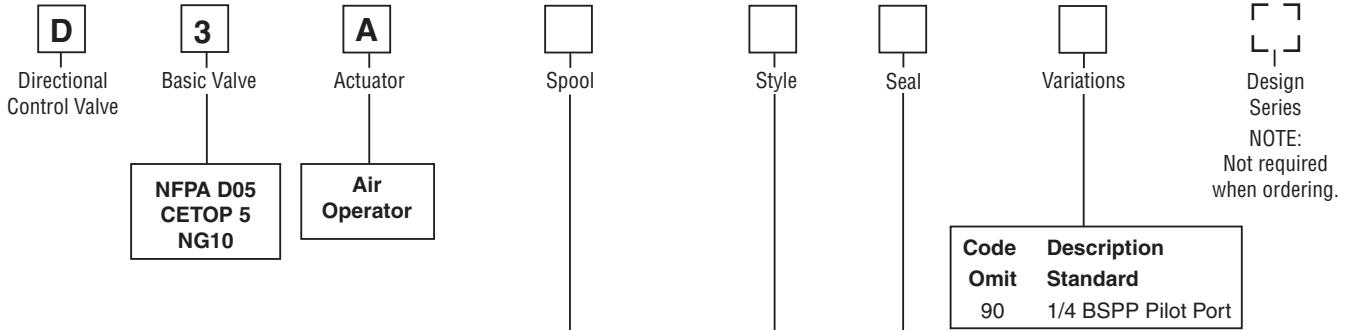
Pilot Pressure	Pull-In	Drop-Out
60 PSI	23.0 ms	23.0 ms
100 PSI	19.0 ms	38.0 ms

\* Chart is for reference only. Response time will vary with pilot line size, length, air pressure and air valve flow capacity (Cv).



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**A**



Code	Symbol	Code	Symbol
001		020*	
002		030†	
004		081	
008*		082	
009†			

\* 008 and 020 spools have closed crossover.  
 † 009 and 030 are open crossover.

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator A. Note operators reverse sides for #8 and #9 spools. See installation information for details.

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description	Symbols
<b>B #</b>	<b>Single operator, two position spring offset.</b> P to A and B to T in offset position.	
<b>C</b>	<b>Double operator, three position, spring centered.</b>	
<b>D #</b>	<b>Double operator, two position, detent.</b>	
<b>E</b>	Two position, spring centered. P to B and A to T in shifted position.	
<b>H #</b>	<b>Single operator, two position, spring offset. P to B and A to T in offset position.</b>	
<b>K</b>	Two position, spring centered. P to A and B to T in shifted position.	

# B, D & H styles available with 020 and 030 spools only.

Indicates air pilot.

This condition varies with spool code.

**Mounting Bolt Kits**

UNC Bolt Kits for use with D3A Directional Control Valves & Sandwich Valves					
		Number of Sandwich Valves @ 2.00" (50 mm) thickness			
		0	1	2	3
D3A	Standard:	BK98 1.62"	BK141 3.50"	BK142 5.50"	BK143 7.50"
	Metric:	BKM98 40 mm	BKM141 90 mm	BKM142 140 mm	BKM143 190 mm

NOTE: All bolts are SAE grade 8, 1/4-20 UNC-2A thread, torque to 16 Nm (12 ft-lbs).

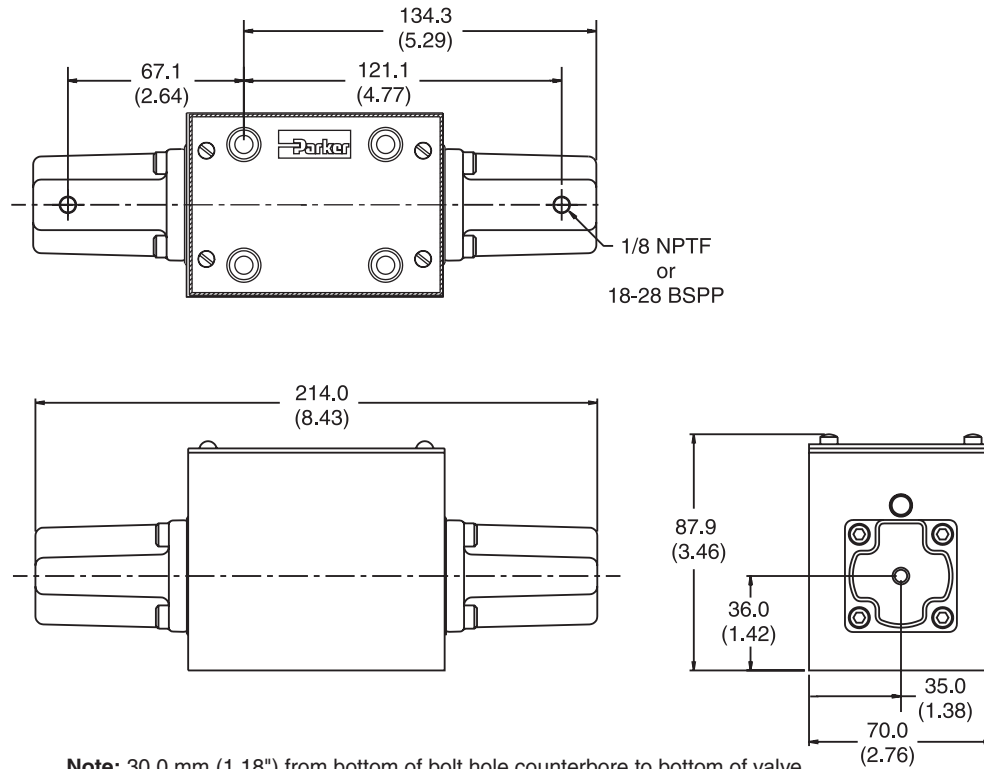
**Valve Weight:** 4.1 kg (9 lbs.)  
**Seal Kit:**  
 Nitrile SKD3A  
 Fluorocarbon SKD3AV

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

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

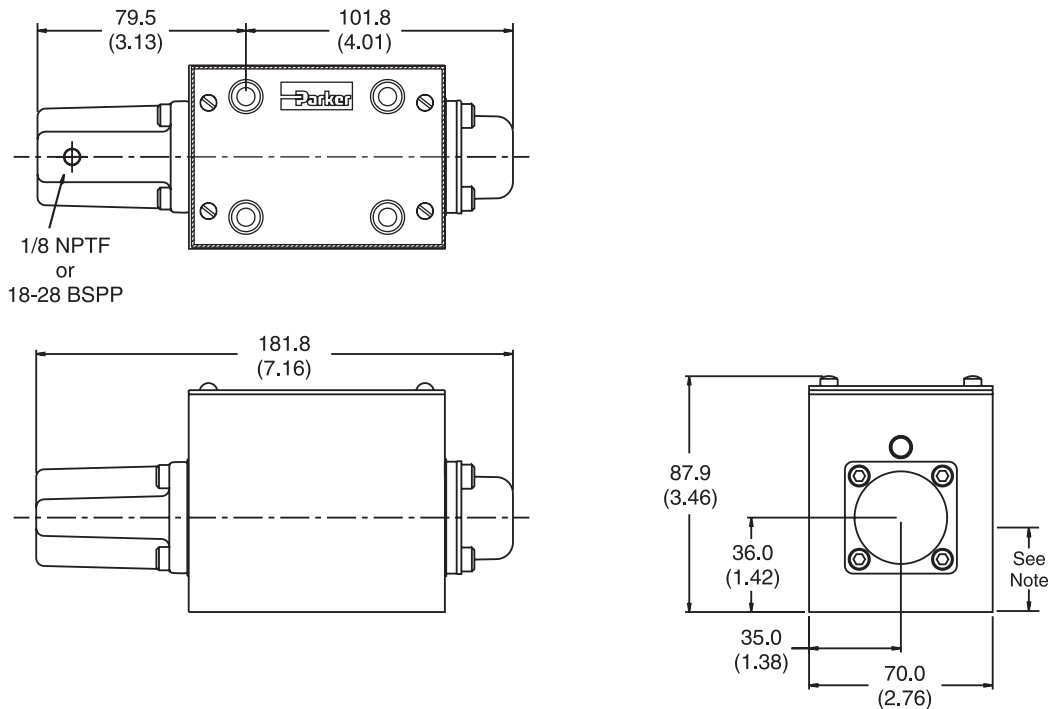
Inch equivalents for millimeter dimensions are shown in (\*\*)

**Air Operated, Double Pilot**



**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

**Air Operated, Single Pilot**



**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.



**A**

**General Description**

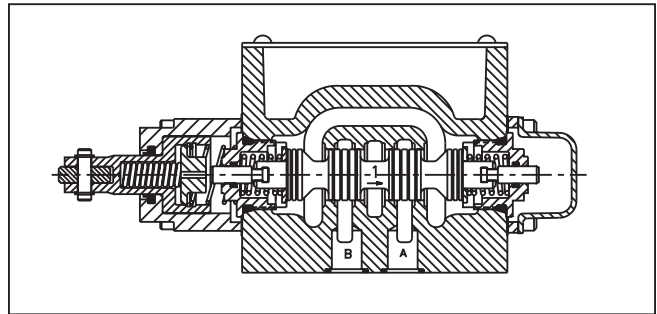
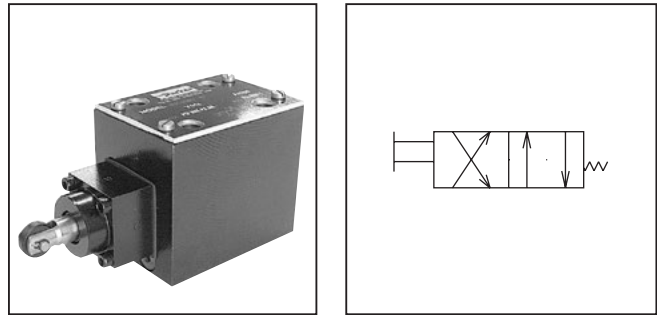
Series D3C and D3D directional control valves are high performance, 4-chamber, direct operated, cam controlled, 3 or 4-way valves. They are available in 2-position and conform to NFPA's D05, CETOP 5 mounting patterns.

**Features**

- Choice of 2 cam roller positions (D3C and D3D).
- Short stroke option.
- High flow, low pressure drop design.

**Specifications**

<b>Mounting Pattern</b>	NFPA D05, CETOP 5, NG 10
<b>Maximum Pressure</b>	Operating: 345 Bar (5000 PSI) Tank Line: 34 Bar (500 PSI)
<b>Maximum Flow</b>	See Spool Reference Chart
<b>Force Required to Shift</b>	235 N (53 lbs.)
<b>Maximum Cam Angle</b>	30°



**Ordering Information**

<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;">D</div> <p>Directional Control Valve</p>	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;">3</div> <p>Basic Valve</p> <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: 80px;"> <p>NFPA D05 CETOP 5 NG10</p> </div>	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;"></div> <p>Actuator</p>	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;"></div> <p>Spool</p>	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;"></div> <p>Style</p>	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;"></div> <p>Seal</p> <table border="1" style="margin: 5px auto; width: 100px;"> <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	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;"></div> <p>Variations</p> <table border="1" style="margin: 5px auto; width: 100px;"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Omit</td> <td>Standard</td> </tr> <tr> <td>B5</td> <td>Short Stroke</td> </tr> </tbody> </table>	Code	Description	Omit	Standard	B5	Short Stroke	<div style="border: 1px dashed black; padding: 2px; width: 20px; margin: 0 auto;"></div> <p>Design Series</p> <p>NOTE: Not required when ordering.</p>												
Code	Description																														
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V	Fluorocarbon																														
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Omit	Standard																														
B5	Short Stroke																														
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### Mounting Bolt Kits

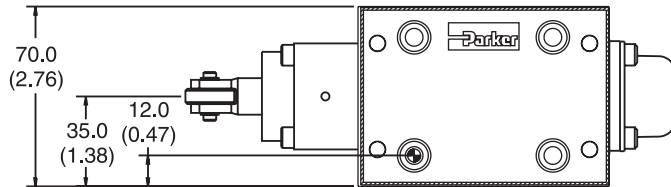
UNC Bolt Kits for use with D3C & D3D Directional Control Valves & Sandwich Valves					
		Number of Sandwich Valves @ 2.00" (50 mm) thickness			
		0	1	2	3
D3C, D3D	Standard:	BK98 1.62"	BK141 3.50"	BK142 5.50"	BK143 7.50"
	Metric:	BKM98 40 mm	BKM141 90 mm	BKM142 140 mm	BKM143 190 mm

**NOTE:**All bolts are SAE grade 8, 1/4-20 UNC-2A thread, torque to 16 Nm (12 ft-lbs)

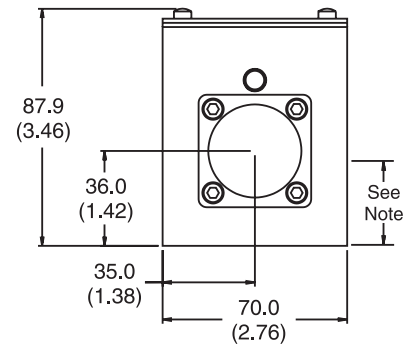
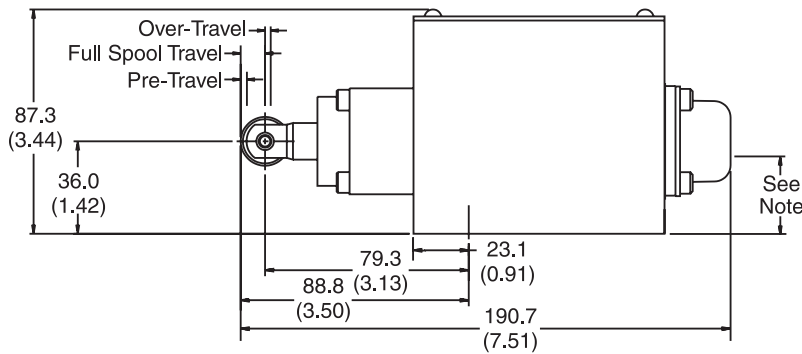
### Dimensions

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

### Cam Operated



Valve Type	Pre-Travel	Full Spool Travel	Over-Travel
Standard Valve	1.75 (0.07)	5.75 (0.23)	2.03 (0.08)
B5 Short Stroke	0 (0)	4.00 (0.16)	2.03 (0.08)



**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.



**A**

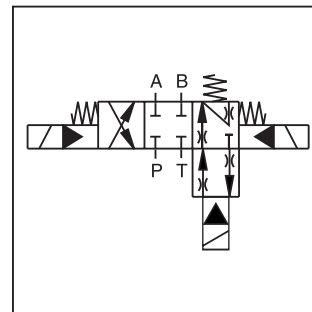
## General Description

Series D3DWR direct operated regenerative and hybrid directional control valve has an innovative integrated regenerative function in the A-line allowing energy saving circuits with differential cylinders. The hybrid version can switch between regenerative mode and standard mode.

## Features

- Energy saving A-regeneration
- Switchable hybrid version

## Specifications



**Further literature about the opportunities of energy savings and more functional details of the integrated regeneration is available on request.**

General			
Design	Directional Spool Valve		
Actuation	Solenoid		
Size	NG10		
Mounting Interface	DIN 24340 A10 / ISO 4401 / NFPA D05		
Mounting Position	Unrestricted, preferably horizontal		
Ambient Temperature	[°C]	-25...+60; (-13°F...+140°F)	
MTTF <sub>D</sub> Value	[years]	150	
Hydraulic			
Maximum Operating Pressure	Pilot drain internal: P, A, B 350 Bar (5076 PSI); T 210 Bar (3045 PSI) Option 9 <sup>1)</sup> : P, A, B, T 350 Bar (5076 PSI); X, Y 210 Bar (3045 PSI)		
Fluid	Hydraulic oil in accordance with DIN 51524		
Fluid Temperature	[°C]	-20 ... +70 (-4°F...+158°F); Nitrile: -25...+70; (-13°F...+158°F)	
Viscosity Permitted	[cSt]/[mm <sup>2</sup> /s]	2.8...400 (13...1854 SSU)	
	Recommended	[cSt]/[mm <sup>2</sup> /s] 30...80 (139...371 SSU)	
Filtration	ISO 4406 (1999); 18/16/13		
Flow Maximum	150 LPM (40 GPM)		
Leakage at 50 Bar (725 PSI) (per flow path)	[ml/min]	0...20 (0...0.01 GPM) (depending on spool)	
Static / Dynamic			
Step Response at 95% DC Solenoids @ 65 LPM (17 GPM) Pilot Pressure 175 Bar (2538 PSI)	[ms]	Energized	De-energized
		105	85
Electrical			
Duty Ratio	100% ED; CAUTION: coil temperature up to 150°C (302°F) possible		
Protection Class	IP 65 in accordance with EN 60529 (plugged and mounted)		
Supply Voltage / Ripple	[V]	24	
Tolerance Supply Voltage	[%]	±10	
Current Consumption	Hold	[A]	1.5
Current Consumption	In Rush	[A]	1.5
Power Consumption	Hold	[W]	36
Power Consumption	In Rush	[W]	36
Solenoid Connection	Connector as per EN 175301-803, solenoid identification as per ISO 9461		
Wiring Minimum	[mm <sup>2</sup> ]	3 x 1.5 recommended	
Wiring Length Minimum	[m]	50 (164 ft.) recommended	

With electrical connections, the protective conductor (PE  $\downarrow$ ) must be connected according to the relevant regulations.

<sup>1)</sup> Bolts are not designed for simultaneous loading of all ports with maximum pressure. The total pressure profile must be adapted to the tensile strength of the bolts.

**⚠ WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Ordering Information**

<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">D</div> <p style="text-align: center;">Directional Control Valve</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">3D</div> <p style="text-align: center;">Basic Valve</p> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto; text-align: center;">DIN NG10</div>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">W</div> <p style="text-align: center;">Actuator Solenoid Wet Pin</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> <p style="text-align: center;">Spool</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">C</div> <p style="text-align: center;">Style</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> <p style="text-align: center;">Pilot Supply and Drain</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> <p style="text-align: center;">Seal</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">J</div> <p style="text-align: center;">Solenoid Voltage 24VDC</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">W</div> <p style="text-align: center;">Connector as per EN 175301-803, without connector (please order plug separately)</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> <p style="text-align: center;">Manual Override Options</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> <span style="font-size: 2em; margin-right: 5px;">A</span> </div> <p style="text-align: center;">Design Series</p> <p style="text-align: center;">NOTE: Not required when ordering.</p>
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Regenerative Function <sup>1)</sup>	
Code	Symbol
R01	
R04	
R81	
R82	

1) For regenerative and hybrid function please refer to solutions with sandwich and adapter plates A10-1664, A10-1665L, H10-1662 and H10-166L.

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
Omit	Standard
9	For high pressure in the connection T1 (tank) or T2 (regenerative function), the connection X and Y can be used as drain port

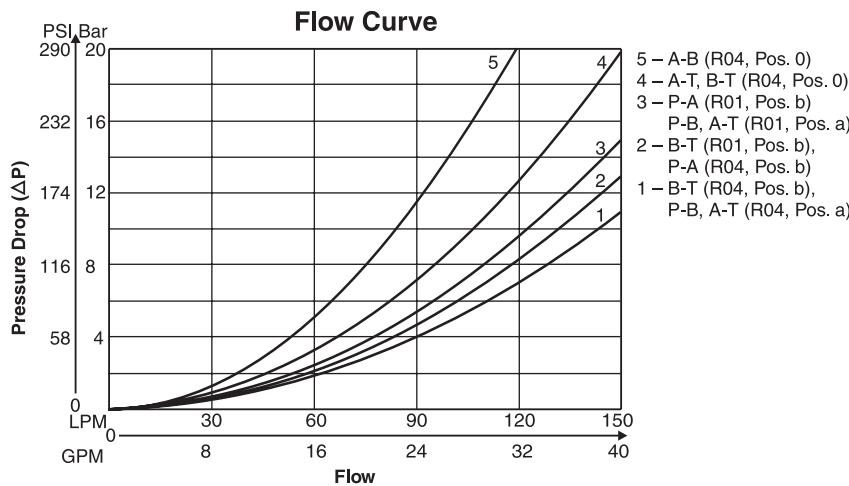
  

Code	Description
C	<p><b>3 positions.</b>  <b>Spring offset in position "0".</b>  <b>Operated in position "a" or "b".</b></p>

**Weight:** 6.3 kg (13.9 lbs.)  
**Bolt Kit:** BK385  
**Seal Kit:** Nitrile – SK-D3W-30  
 Fluorocarbon – SK-D3W-V-30

**Performance Curves**

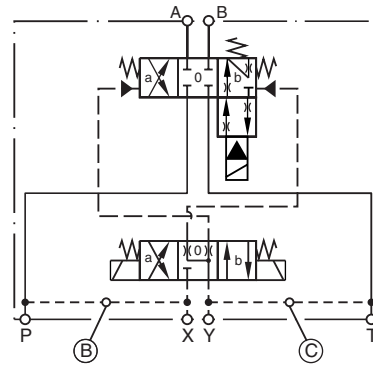
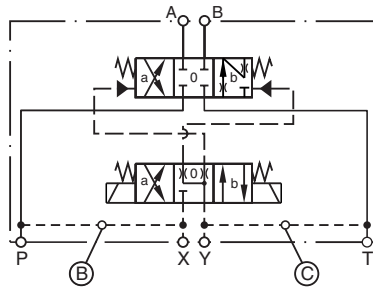


**Pilot Oil Inlet (Supply) and Outlet (Drain)**

**A**

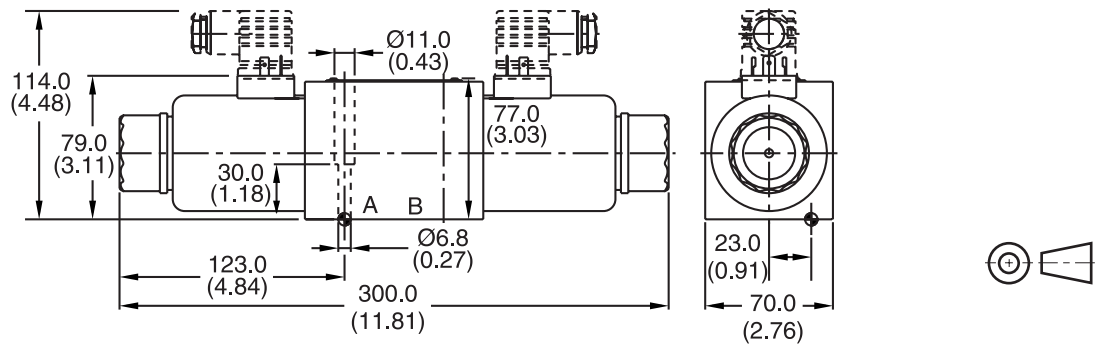
○ open, ● closed

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



**Dimensions**

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



<b>Surface Finish</b>	<b>Kit</b>			<b>Seal</b> ○ <b>Kit</b>
	BK385	4x M6x40 ISO 4762-12.9	13.2 Nm ± 15%	<b>Nitrile: SK-D3W-30</b> Fluorocarbon: SK-D3W-V-30

The space necessary to remove the plug per DIN 43650, design type AF is at least 15 mm (0.59").  
 The torque for the screw M3 of the plug has to be 0.5 Nm (0.37 lb.-ft.) to 0.6 Nm (0.44 lb.-ft.).

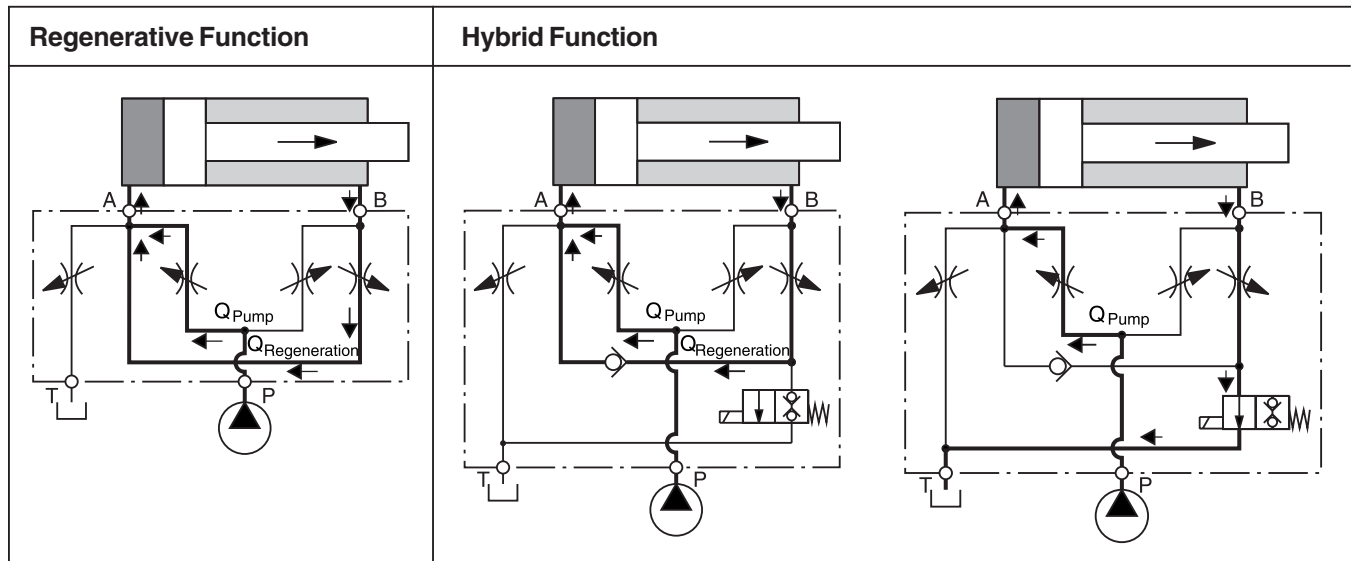
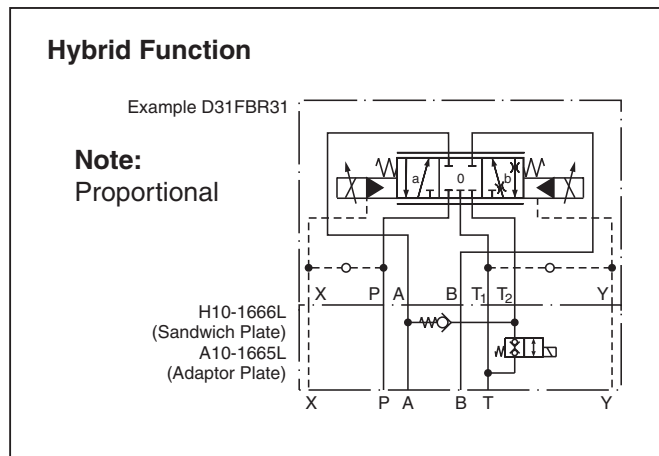
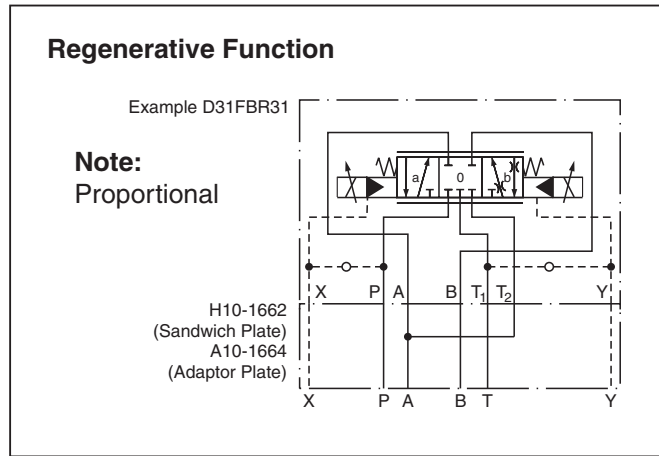
**A**

**General Description**

Adapter plates for regenerative and hybrid functions with Series D31NWR directional control valve. The adapter plate comes as either a sandwich valve (H10) or in a subplate version (A10).

**Features**

- The valve comes without tank bridge and is shown in Series D31NWR.
- Port T1 is used as single tank port of the valves. Port T2 is separated from port T1 and is used for regeneration into the A port.
- The circuit conception can be integrated into the manifold block.



NEW Energy saving A-regeneration and switchable hybrid version for NG10 valves.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

A

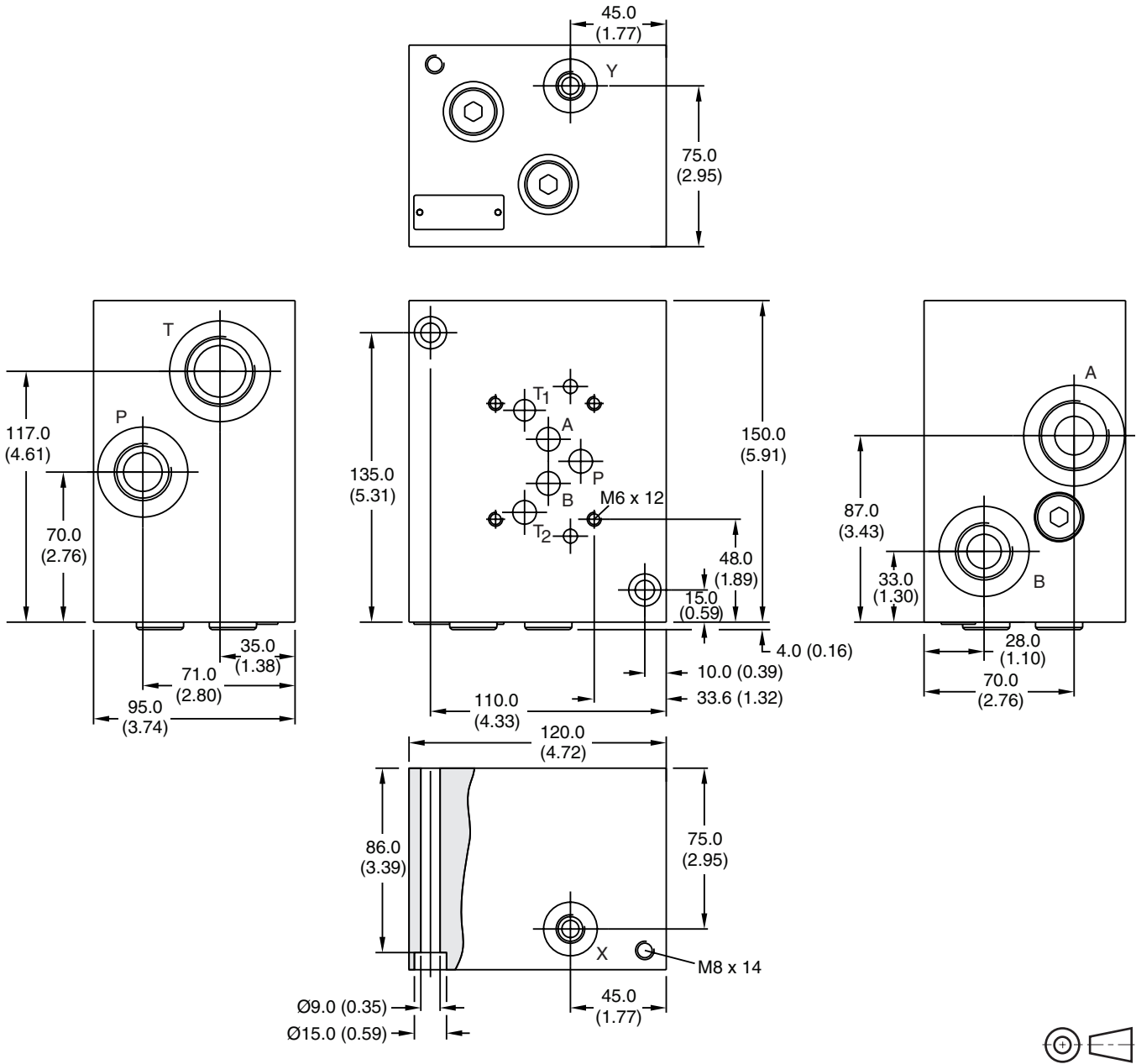
General				
Actuation	Solenoid – A10-1665L and H10-1666L			
Size	DIN NG10 / CETOP 5H			
Mounting interface	DIN 24340 A10 / ISO 4401 / CETOP RP 121-H / NFPA D05			
Mounting Position	Unrestricted			
Ambient Temperature	[°C]	-25...+50 (-13°F...+122°F)		
MTTF <sub>D</sub> Value	[years]	150		
Weight		A10-1664	A10-1665L	H10-1662
		11.9 kg (26.5 lbs.)	14.4 kg (31.8 lbs.)	2.8 kg (6.2 lbs.)
				H10-1666L
				4.9 kg (10.8 lbs.)
Hydraulic				
Maximum Operating pressure	[Bar]	350 (5045 GPM)		
Fluid	Hydraulic oil in accordance with DIN 51524 / 51525			
Fluid temperature	[°C]	-25...+70 (-13°F...+158°F)		
Viscosity	Permitted	[cSt] / [mm <sup>2</sup> /s]	2.8...400 (13...1854 SSU)	
	Recommended	[cSt] / [mm <sup>2</sup> /s]	30...80 (139...371 SSU)	
Filtration	ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)			
Maximum Flow	A10: 150 LPM (39.7 GPM); H10: 250 (66.1 GPM)			
	Regeneration B-A	95 LPM (25.1 GPM)		
	Regeneration B-T	A10: 75 LPM (19.8 GPM)		
Electrical				
Duty Ratio	100%			
Protection Class	IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)			
Supply Voltage	[V]	24		
Tolerance Supply Voltage	[%]	±10		
Current Consumption	[A]	1.21		
Power Consumption	[W]	29		
Solenoid Connection	Connector as per EN 175301-803			
Wiring Minimum	[mm <sup>2</sup> ]	3 x 1.5 recommended		
Wiring Length Maximum	[m]	50 (164 ft.) recommended		

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

**Mounting Interface acc. DIN 24340-A10, CETOP 5H / NG10 for A-regeneration**

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

**A**

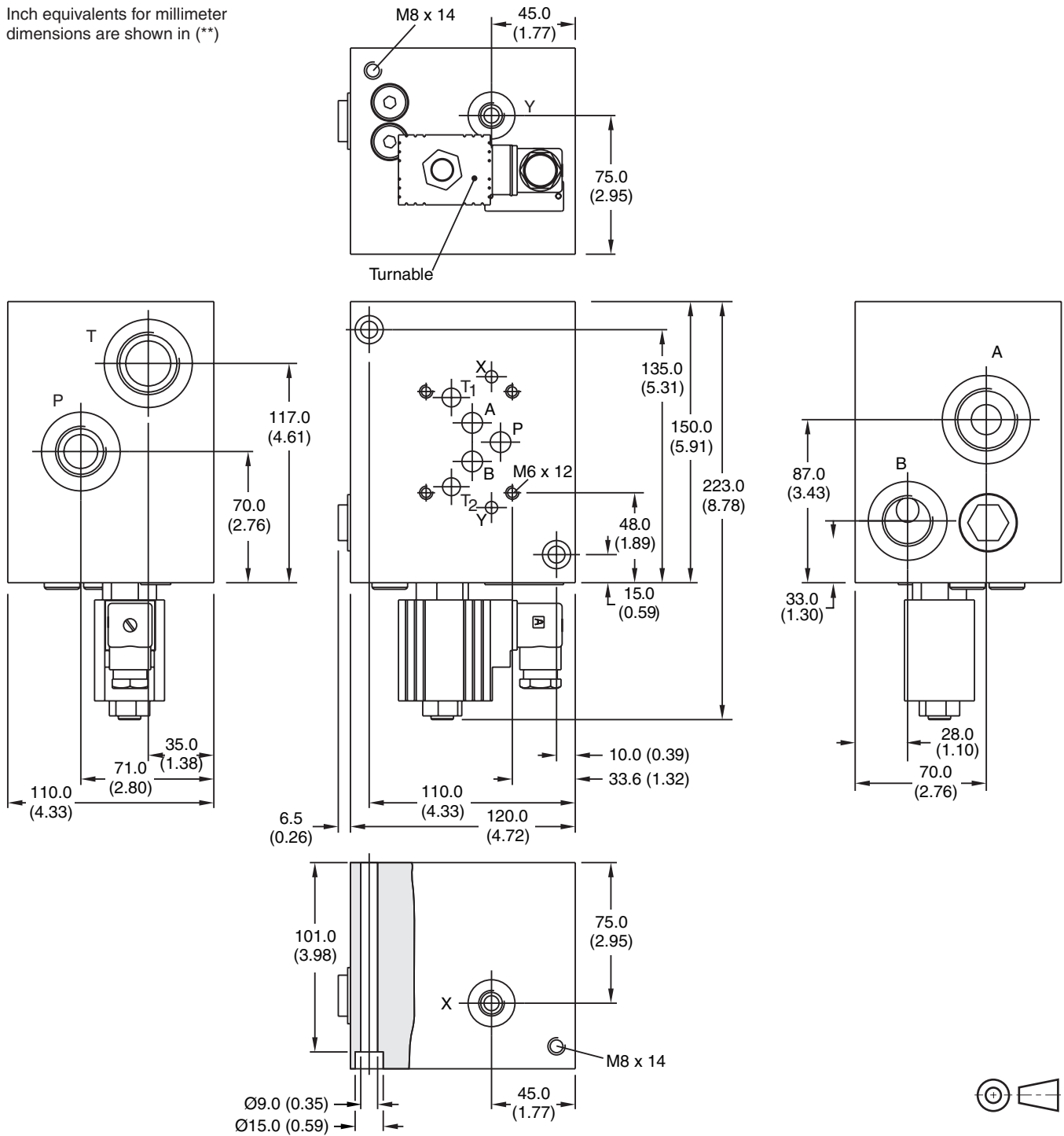


Symbol	Ordering Code	Port
<p>X P A B T<sub>1</sub> T<sub>2</sub> Y Valve Side</p> <p>X P A B T Y</p>	<b>A10-1664</b>	A, T = G1 B, P = G3/4 X, Y = G1/4

**Mounting Interface acc. DIN 24340-A10, CETOP 5H / NG10 for Hybrid Function**

**A**

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



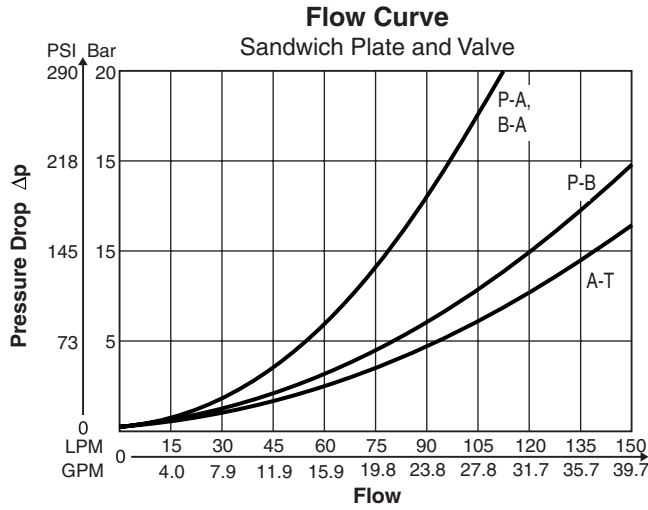
Symbol	Ordering Code	Port	Seal Kit
	<b>A10-1665L</b>	A, T = G1 B, P = G3/4 X, Y = G1/4	Nitrile: SK-A10-1665



**Mounting Interface acc. DIN 24340-A10, CETOP 5H / NG10 for A-regeneration**

**Performance Curves**

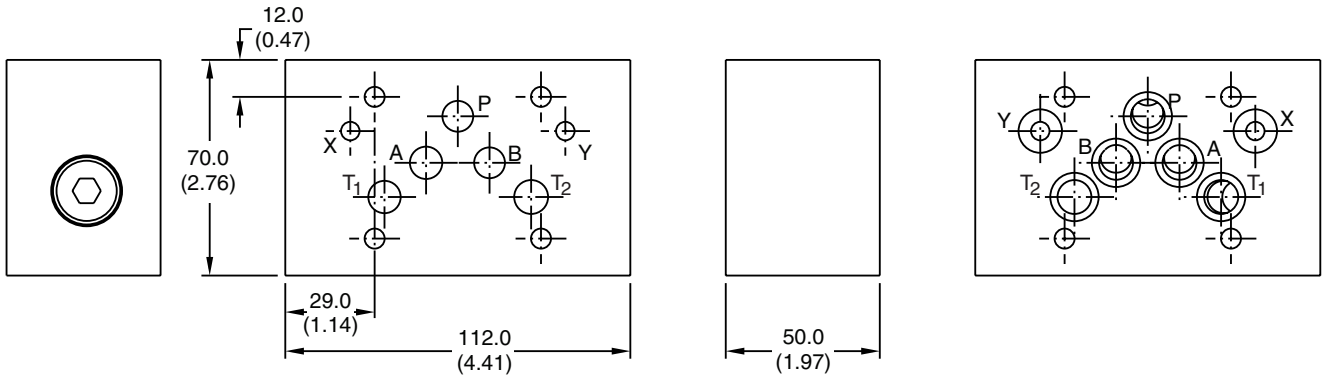
**D31FP/FE/FB/VW\***



Measured with Spool Z31 at command signal 100%.

**Dimensions**

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



Symbol	Ordering Code	Kit	Kit	Torque	Seal  Kit
	<b>H10-1662</b> (O-rings included in delivery)	BK412	4x M6x90 DIN 912 12.9	13.2 Nm (9.7 lb.-ft.) ±15%	Nitrile: SK-H10-1662

**Mounting Interface acc. DIN 24340-A10, CETOP 5H / NG10 for Hybrid Function**

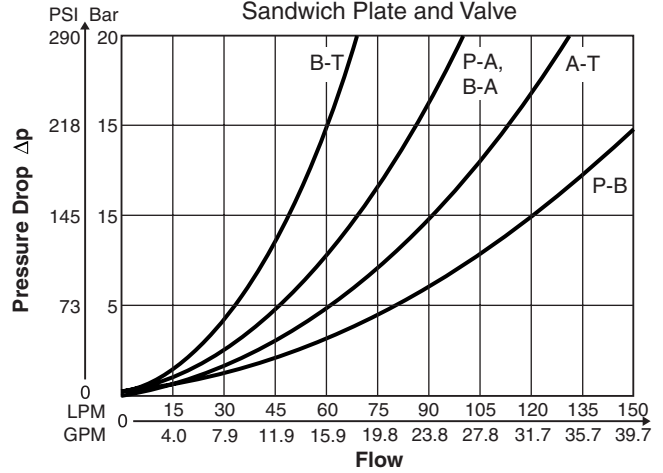
**A**

**Performance Curves**

**D31FP/FE/FB/VW\***

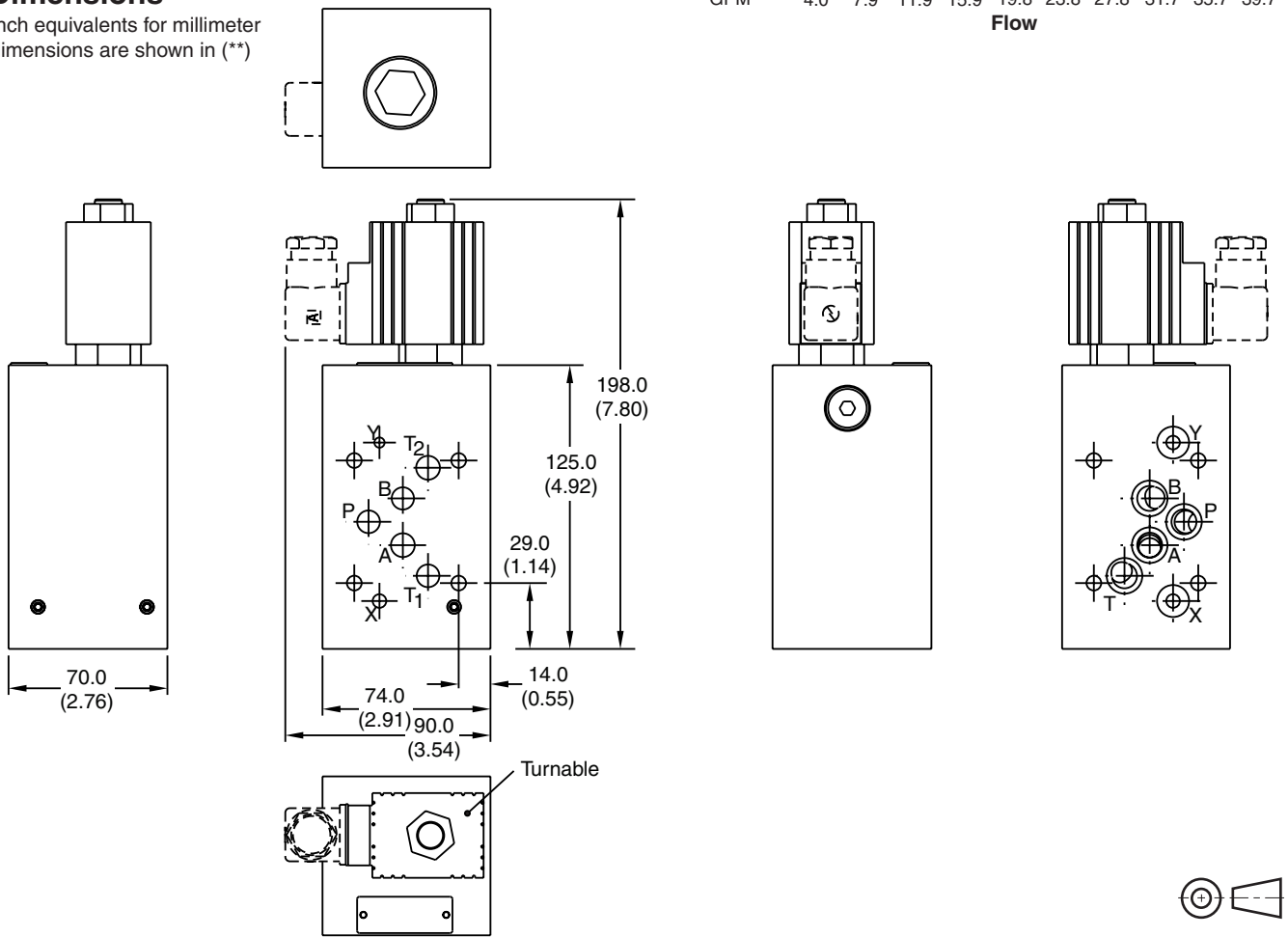
**Flow Curve**

Sandwich Plate and Valve



**Dimensions**

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



Symbol	Ordering Code	Kit	4x M6x110 DIN 912 12.9	13.2 Nm (9.7 lb.-ft.) ±15%	Seal  Kit
	<b>H10-1666L</b> (O-rings included in delivery)	BK528			Nitrile: SK-H10-1666

### General Description

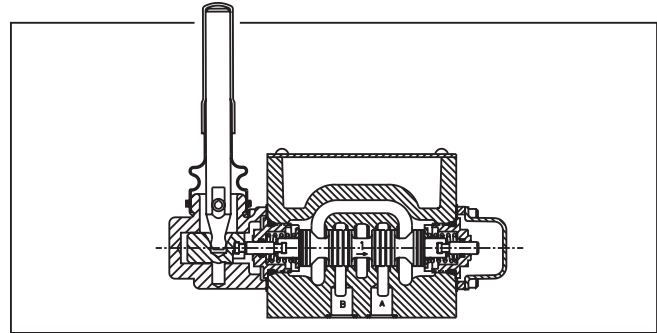
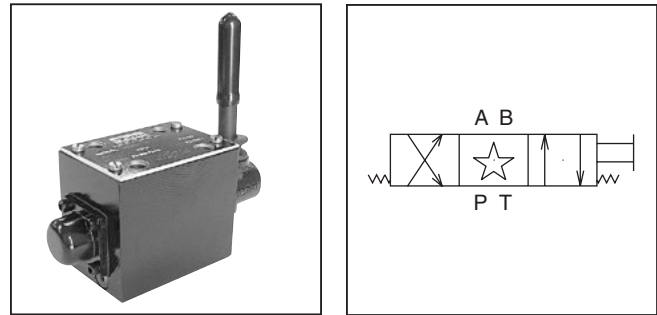
Series D3L directional control valves are high performance, 4-chamber, direct operated, lever controlled, 4-way valves. They are available in 2 or 3-position and conform to NFPA's D05, CETOP 5 mounting patterns.

### Features

- Spring return or detent styles available.
- High flow, low pressure drop design.
- Heavy duty handle design.

### Specifications

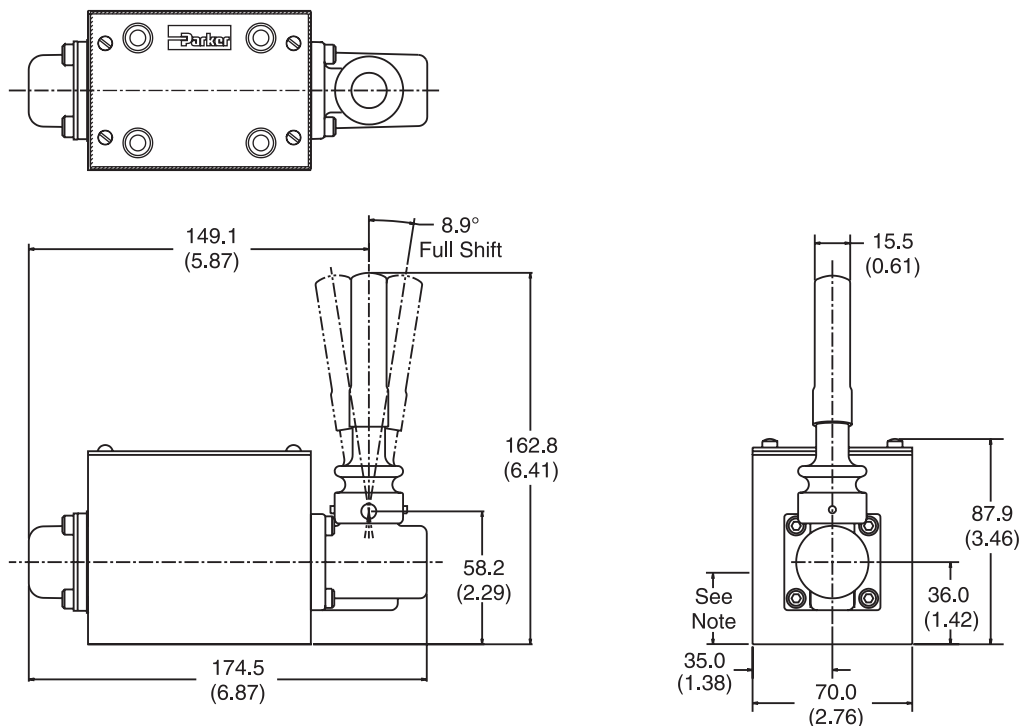
<b>Mounting Pattern</b>	NFPA D05, CETOP 5, NG 10
<b>Maximum Pressure</b>	Operating: 345 Bar (5000 PSI) Tank Line: 34 Bar (500 PSI)
<b>Maximum Flow</b>	See Spool Reference Chart
<b>Force Required to Shift Lever Operator</b>	173 N (39 lbs.)



### Dimensions

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

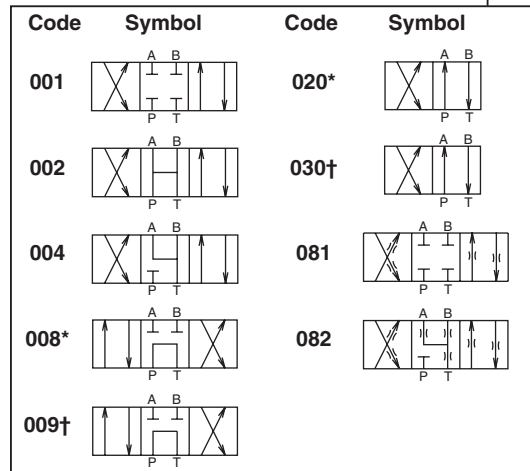
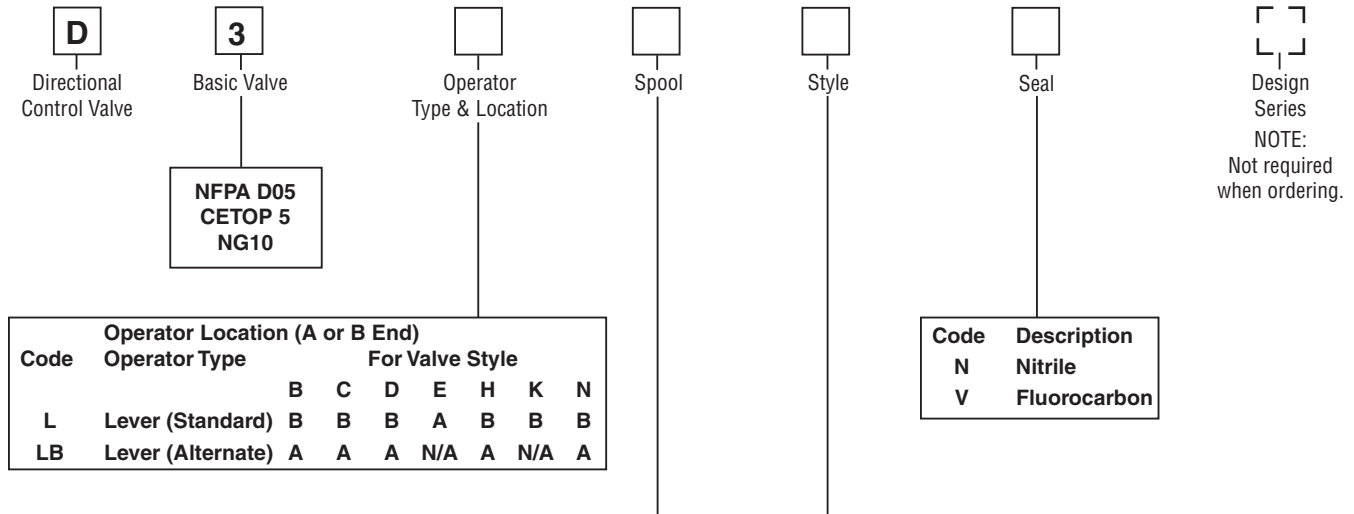
### Lever Operated D3L



**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

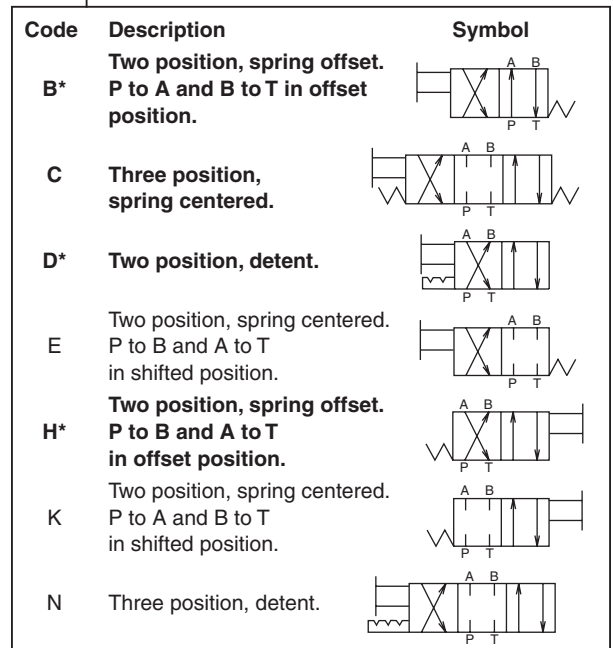
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**A**



\* 008 and 020 spools have closed crossover.  
 † 009 and 030 are open crossover.

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator A. Note operators reverse sides for #8 and #9 spools. See installation information for details.



\* 020 and 030 spools only.

This condition varies with spool code.

**Mounting Bolt Kits**

UNC Bolt Kits for use with D3L Directional Control Valves & Sandwich Valves					
		Number of Sandwich Valves @ 2.00" (50 mm) thickness			
		0	1	2	3
D3L	Standard:	BK98 1.62"	BK141 3.50"	BK142 5.50"	BK143 7.50"
	Metric:	BKM98 40 mm	BKM141 90 mm	BKM142 140 mm	BKM143 190 mm

**Valve Weight:** 3.6 kg (8 lbs.)  
**Seal Kit:**  
 Nitrile SKD3L  
 Fluorocarbon SKD3LV

**NOTE:** All bolts are SAE grade 8, 1/4-20 UNC-2A thread, torque to 16 Nm (12 ft-lbs).

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

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

## Fluid Recommendations

Premium quality hydraulic oil with a viscosity range between 32-54 cSt (150-250 SSU) at 38°C (100°F) is recommended. The absolute operation viscosity range is from 16-220 cSt (80-1000 SSU). Oil should have maximum anti-wear properties and rust and oxidation treatments.

## Fluids and Seals

Valves using synthetic, fire-resistant fluids require special seals. When phosphate ester or its blends are used, FLUOROCARBON seals are required. Water-glycol, water-in-oil emulsions, and petroleum oil may be used with NITRILE seals.

## Temperature Recommendation

Recommended oil temperature:  
-29°C to +71°C (-20°F to +160°F)

## Filtration

For maximum valve and system component life, the system should be protected at a contamination level not to exceed 125 particles greater than 10 microns per milliliter of fluid. (SAE Class 4 or better, ISO Code 16/13).

## Tank Line Surges

If several valves are piped with a common tank line, flow surges in the line may cause unexpected spool shift. Detent style valves are most susceptible to this. Separate tank lines should be used when line surges are expected in an application.

## Recommended Mounting Position

Valve Type	Recommended Mounting Position
Detent (Solenoid)	Horizontal
Spring Offset	Unrestricted
Spring Centered	Unrestricted

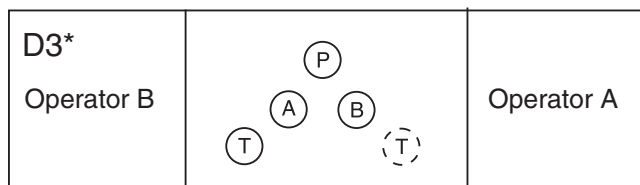
## Silting

Silting can cause any sliding spool valve to stick and not spring return, if held shifted under pressure for long periods of time. The valve should be cycled periodically to prevent sticking.

## Single Pass Operation

Valve flow ratings are for double pass operation (with equal flow in both paths). When using these components in single pass applications, flow capabilities may be reduced. Consult your local Parker representative for details.

## Flow Path Data



\*Note: On valves with 008 or 009 spool, A and/or B operators reverse sides. Flow paths remain the same as viewed from top of valve.

**Double Solenoid.** With solenoid “A” energized, flow path is P→A and B→T. When solenoid “B” is energized, flow path is P→B and A→T. The center condition on a spring-centered valve exists when both coils are de-energized, or during a complete shift, as the spool passes through center.

**Detent and Spring Offset.** The center condition exists on detent and spring offset valves only during spool crossover. To shift and hold a detented spool, only a momentary energizing of the solenoid is necessary. The minimum duration of the signal is approximately 0.13 seconds for both AC and DC voltages. This position will be held provided the spool center line is in a horizontal plane, and no shock or vibration is present to displace the spool.

**Single Solenoid.** Spring offset valves can be ordered in six styles: B, E, F, H, K and M. Flow path data for the various styles are described in the order chart.

### Lever Operated (on B end)

Pull lever away from valve      P→A; B→T  
Push lever toward valve      P→B; A→T

Note: Reverse with a #8 or #9 spool.

## Electrical Failure

Should electric power fail, spring offset and spring centered valves will shift to the spring held position. Detented valves will stay in the last position held before power failure. If main flow does not fail or stop simultaneously, machine actuators may continue to function in an undesirable manner or sequence.

## Loss of Pilot Pressure (D3A)

Should a loss of pilot pressure occur, spring offset and spring centered valves will shift to the spring held position. Detented valves will remain in the last position held. If main hydraulic flow does not simultaneously stop, machine actuators may continue to function in an undesirable manner or sequence.

## Torque Specifications

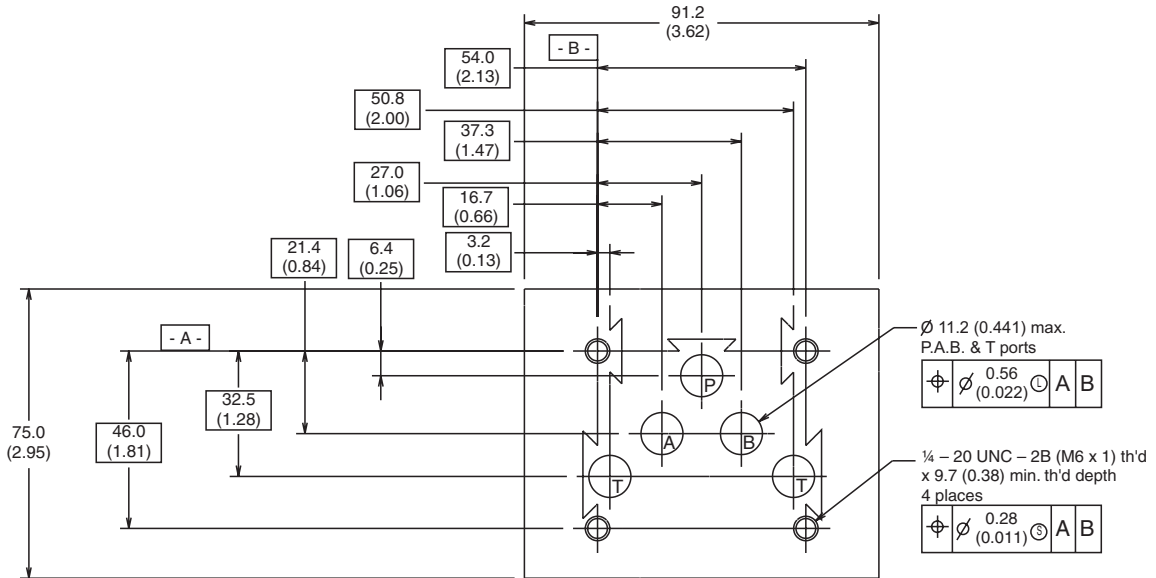
Torque values recommended for the bolts which mount the valve to the manifold or subplate are as follows:

1/4-20 thread (M6x1) torque 16.0 Nm (12 ft-lbs).

**A**

**Mounting Pattern — NFPA, D05, CETOP 5, NG 10**

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



**Notes**


**A**

**A**

**Application**

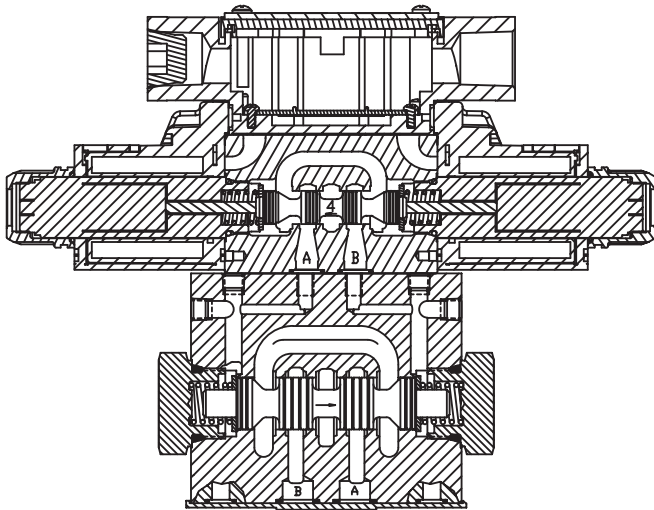
Series D31 hydraulic directional control valves are high performance, solenoid controlled, pilot operated, 2-stage, 4-way valves. They are available in 2 or 3-position styles and are manifold mounted. These valves conform to NFPA's D05H, CETOP 5 and can also be manufactured to an NFPA DO5HE, CETOP 5H configuration.

**Operation**

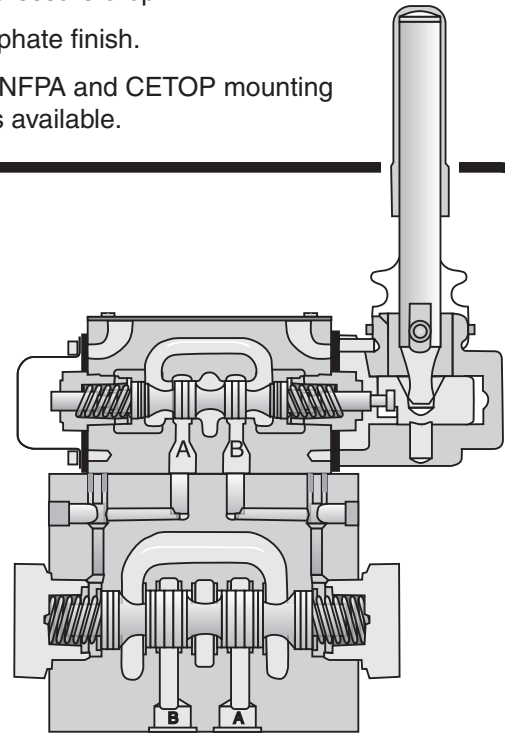
Series D31 directional valves consist of a 5-chamber style main body, a case hardened sliding spool, and a pilot valve or pilot operators (hydraulic or pneumatic).

**Features**

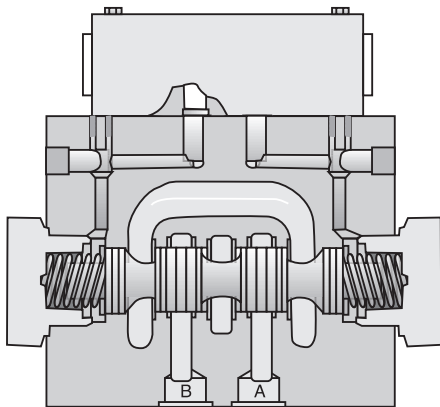
- Easy access mounting bolts.
- 345 Bar (5000 PSI) pressure rating.
- Flows to 175 LPM (45 GPM) depending on spool.
- Choice of four operator styles.
- Rugged four land spools.
- Low pressure drop.
- Phosphate finish.
- Both NFPA and CETOP mounting styles available.



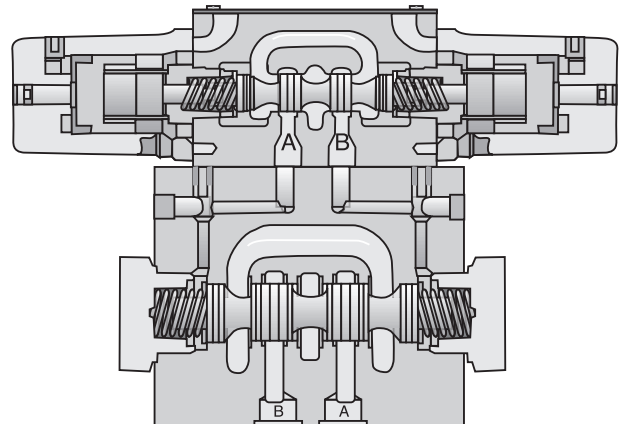
**D31\*W Solenoid Operated Plug-In Conduit Box**



**D31\*L Lever Operated**



**D3\*P Oil Pilot Operated**



**D31\*A Air Pilot Operated**

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).







### General Description

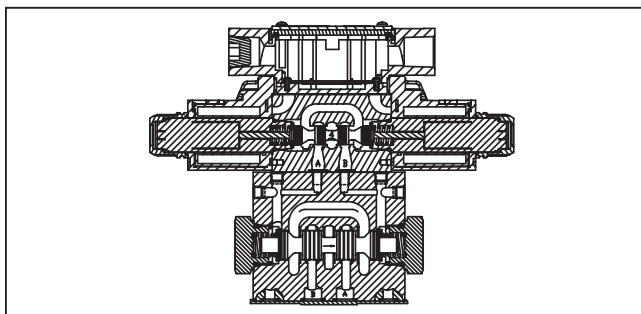
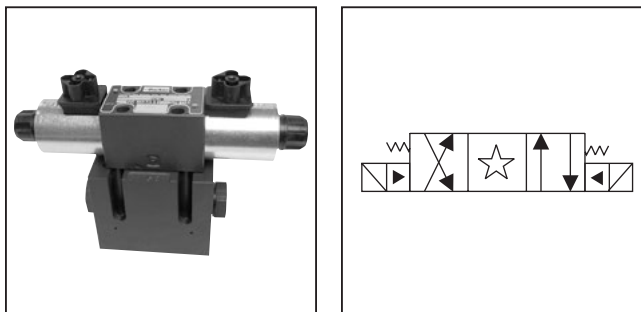
Series D31 directional control valves are 5-chamber, pilot operated, solenoid controlled valves. The valves are suitable for manifold or subplate mounting.

### Features

- **World design** – Available worldwide.
- **Mounting bolts below center line of spool** – Minimizes spool binding.
- **Five chamber style** – Eliminates pressure spikes in tubes, increasing valve life.
- **High pressure and flow ratings** – Increased performance options in a compact valve.

### Specifications

<b>Mounting Pattern</b>	NFPA D05H, CETOP 5 NFPA D05HE, CETOP 5H
<b>Max. Operating Pressure</b>	345 Bar (5000 PSI) Standard 207 Bar (3000 PSI) 10 Watt CSA  207 Bar (3000 PSI)
<b>Max. Tank Line Pressure</b>	Internal Drain Model: 103 Bar (1500 PSI) AC Std. 207 Bar (3000 PSI) DC Std./AC Opt. External Drain Model: 207 Bar (3000 PSI) CSA  103 Bar (1500 PSI)
<b>Max. Drain Pressure</b>	103 Bar (1500 PSI) AC only 207 Bar (3000 PSI) DC Std./AC Opt. CSA  103 Bar (1500 PSI)
<b>Min. Pilot Pressure</b>	6.9 Bar (100 PSI)
<b>Max. Pilot Pressure</b>	345 Bar (5000 PSI) Standard CSA  207 Bar (3000 PSI)
<b>Nominal Flow</b>	76 Liters/Min (20 GPM)
<b>Maximum Flow</b>	See Switching Limit Charts



**A**

### Response Time

Response time (milliseconds)  
 at 345 Bar (5000 PSI) is 76 LPM (20 GPM)

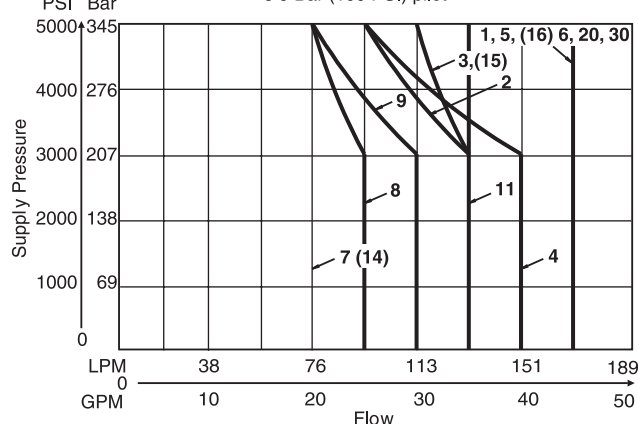
Solenoid Type	Pilot Pressure	Pull-In	Drop-Out
DC	500	40	50
	1000	36	50
	2000	34	50
AC	500	20	33
	1000	18	33
	2000	13	33

### Switching Limit Charts

For Styles B, C, E, H and K

**D Style – external drain only (For internal drain see note below)**

6.9 Bar (100 PSI) pilot

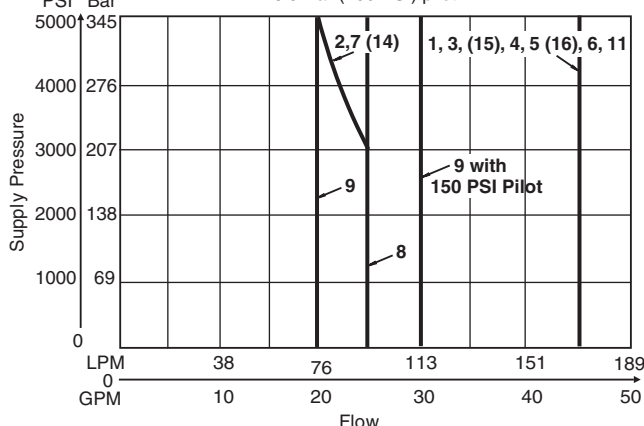


Note: Internal Drain  
 1, 4 spools – 113 LPM (30 GPM) max., 7 spool – per curve  
 All others – 95 LPM (25 GPM) max.

For Styles F and M – external drain only

**(For internal drain see note below)**

6.9 Bar (100 PSI) pilot



Note: Internal Drain  
 1, 4 spools – 113 LPM (30 GPM) max., 2, 9 & 14 spools – per curve  
 All others – 95 LPM (25 GPM) max.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**A**

<div style="border: 1px solid black; padding: 2px; width: 20px; height: 20px; margin: 0 auto; text-align: center; font-weight: bold;">D</div> <p>Directional Control Valve</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Basic Valve</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Actuator</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Spool</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Style</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Pilot Supply and Drain</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Seal</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Solenoid Voltage</p>
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Code	Description
31D	NFPA D05HE, CETOP 5H, DIN NG10, D03 Pilot, ISO Port
31V	NFPA D05H, CETOP 5, D03 Pilot, NFPA Port Not available with Position Control.

Code	Description
W#	Solenoid, Wet Pin, Screw-in
HW#	Reversed Wiring

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
1*	Internal Pilot, External Drain
2*	External Pilot, External Drain
4#	Internal Pilot, Internal Drain
5	External Pilot, Internal Drain

Code	Description
D†#	120 VDC
E*	24/60 - 24/50 VAC
J	24 VDC
K##	12 VDC
Q††#	100/60 VAC
QD††#	100 VAC/60 Hz - 100 VAC/50 Hz
T^^	240/60 - 220/50 VAC
U***	98 VDC
Y	120/60 - 110/50 VAC

# Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing solenoid A. Note operators reverse sides for #008 and #009 spools. See installation information for details. To configure per DIN standards (A coil over A port, B coil over B port) code valves as D31VHW\*\*\*.

\* F and M style available only with external drain.

# Not available with 002, 008, 009 or 014 spools.

# High watt only.  
 \* Leadwire only, low watt only.  
 \*\* DIN, low watt available.  
 \*\*\* Leadwire not available.  
 ^^ Plug-in is low watt only.  
 † DIN & Leadwire only.  
 †† DIN only.

Code	Symbol#	Code	Symbol#
001		012	
002		015	
003		020*	
004		030**	
006		081	
008*, 009**		082	
011			

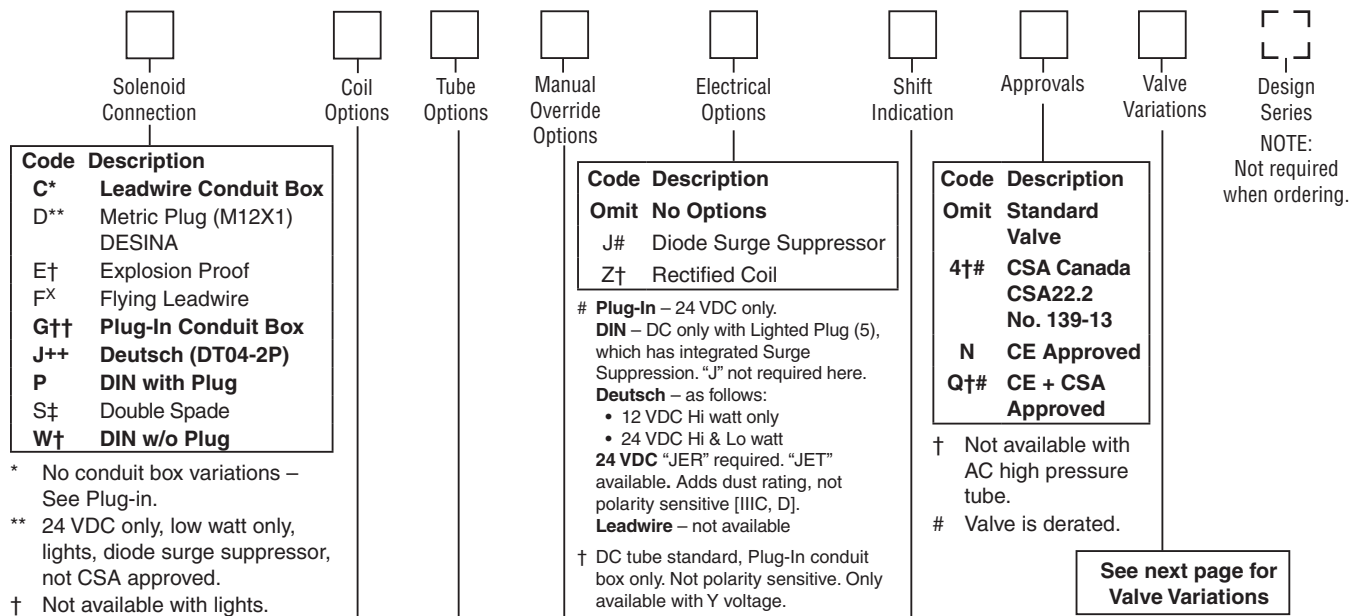
\* 008 & 020 spools have closed crossover.  
 \*\* 009 & 030 spools have open crossover.

Code	Description	Symbol
<b>B*</b>	<b>Single solenoid, 2 position, spring offset. P to A and B to T in offset position.</b>	
<b>C</b>	<b>Double solenoid, 3 position, spring centered.</b>	
<b>D*</b>	<b>Double solenoid, 2 position, detent.</b>	
E	Single solenoid, 2 position, spring centered. P to B and A to T when energized.	
F†	Single solenoid, 2 position. Spring offset, energized to center. Spacer on A side. P to A and B to T in spring offset position.	
<b>H*</b>	<b>Single solenoid, 2 position, spring offset. P to B and A to T in offset position.</b>	
K	Single solenoid, 2 position, spring centered. P to A and B to T when energized.	
M†	Single solenoid, 2 position, spring offset, energized to center position. Spacer on B side. P to B and A to T in spring offset position.	

\* 020 and 030 spools only. This condition varies with spool code.  
 † High watt only.

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

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



Code	Description
<b>C*</b>	<b>Leadwire Conduit Box</b>
<b>D**</b>	Metric Plug (M12X1) DESINA
<b>E†</b>	Explosion Proof
<b>F<sup>x</sup></b>	Flying Leadwire
<b>G††</b>	<b>Plug-In Conduit Box</b>
<b>J++</b>	<b>Deutsch (DT04-2P)</b>
<b>P</b>	<b>DIN with Plug</b>
<b>S‡</b>	Double Spade
<b>W†</b>	<b>DIN w/o Plug</b>

\* No conduit box variations – See Plug-in.  
 \*\* 24 VDC only, low watt only, lights, diode surge suppressor, not CSA approved.  
 † Not available with lights.  
 †† Required for variations on conduit box style, must have lights.  
 ++ 12 and 24 VDC only.  
 ‡ Only 12 VDC high watt.  
 x 6" leadwire only.

Code	Description
<b>Omit</b>	<b>No Options</b>
<b>J#</b>	Diode Surge Suppressor
<b>Z†</b>	Rectified Coil

# **Plug-In** – 24 VDC only.  
**DIN** – DC only with Lighted Plug (5), which has integrated Surge Suppression. "J" not required here.  
**Deutsch** – as follows:  
 • 12 VDC Hi watt only  
 • 24 VDC Hi & Lo watt  
**24 VDC "JER"** required. "JET" available. Adds dust rating, not polarity sensitive [IIC, D].  
**Leadwire** – not available  
 † DC tube standard, Plug-In conduit box only. Not polarity sensitive. Only available with Y voltage.

Code	Description
<b>Omit</b>	<b>Standard Valve</b>
<b>4†#</b>	<b>CSA Canada CSA22.2 No. 139-13</b>
<b>N</b>	<b>CE Approved</b>
<b>Q†#</b>	<b>CE + CSA Approved</b>

† Not available with AC high pressure tube.  
 # Valve is derated.

**See next page for Valve Variations**

Code	Description
<b>Omit</b>	<b>Standard</b>
<b>P*</b>	Extended Manual Override with Boot
<b>T</b>	Covered Manual Override, DC only, or AC Rectified

\* Manual override options not available on Explosion Proof or soft shift. Not available with high pressure AC tube H.

Code	Spool Position	Position Control
Omit	All	Standard response
I3N	C	End position monitored, side A and B
I6N		Start position monitored, side A and B
I2N	C, B, E, F (all spools)	End position monitored, side B
I5N	C, K, M (spool 9)	Start position monitored, side B
I1N	C, H, K, M (all spools)	End position monitored, side A
I4N		Start position monitored, side A

Note: The plug M12 x 1 for the position control is included. The monitor switch has to be located on the side to which the spool moves from the spring offset position. For 4/3-way valves two switches are required. Not CSA approved. Not available with 'F' or 'M' styles. **DC DIN, high watt coils only. Not available on D31VW.**

Code	Description
<b>Omit*</b>	<b>High watt</b>
<b>D**</b>	Explosion Proof, EExd ATEX
<b>E**</b>	Explosion Proof, EExme ATEX, IECEX, from Germany
<b>F†</b>	Low Watt
<b>L††</b>	10 Watt
<b>R#</b>	Explosion Proof, ATEX/UL/CSA/IECEX, configurable cable connection
<b>T#</b>	Explosion Proof ATEX/CSA/IECEX, fixed horizontal cable connection
<b>U##</b>	Explosion Proof, UL/CSA

\* AC ambient temperature must not exceed 60°C (140°F).  
 \*\* J voltage only, no options.  
 † AC only.  
 †† DC and AC rectified only.  
 # J and Y voltages only. Y voltage is rectified.  
 ## J and Y voltages only. Y voltage is not rectified.

Code	Description
<b>Omit</b>	<b>Standard Pressure 103.5 Bar (1500 PSI) AC 207 Bar (3000 PSI) DC</b>
<b>H*</b>	<b>High Pressure, AC only 207 Bar (3000 PSI)</b>

\* Not available with CSA or Explosion Proof.

**Valve Weight:**  
 Double Solenoid 5.4 kg (12.0 lbs.)  
**Seal Kit:**  
 Nitrile SKD31VWN91  
 Fluorocarbon SKD31VWV91

**Mounting Bolt Kits**

UNC Bolt Kits for use with D31*W Directional Control Valves & Sandwich Valves					
		Number of Sandwich Valves @ 2.00" (50 mm) thickness			
		0	1	2	3
D31*W	Standard:	BK98 1.62"	BK141 3.50"	BK142 5.50"	BK143 7.50"
	Metric:	BKM98 40 mm	BKM141 90 mm	BKM142 140 mm	BKM143 190 mm

NOTE: All bolts are SAE grade 8. Standard bolts are 1/4-20 UNCA thread. Metric bolts are M6-1.0 thread. Torque to 16 Nm (12 ft-lbs).

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

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



**Valve Variations**

**A**

**OPTIONS ARE NOT AVAILABLE ON MONITOR SWITCH VALVES.**

Code	Description
5*	<b>Signal Lights – Standard</b>
	<b>Signal Lights – Hirsch. (DIN with Plug) (the DC Lighted Plug has Integral Surge Suppression)</b>
7B**	Manaplug – Brad Harrison (12x1) Micro with Lights
56**	<b>Manaplug (Mini) with Lights</b>
20	<b>Fast Response</b>
1C**	<b>Manaplug (Mini) Single Sol. 5-pin, with Lights</b>
1D**	Manaplug (Micro) Single Sol. 5-pin, with Lights
1G**	Manaplug (Mini) Single Sol. 5-pin, with Stroke Adjust 'A' & 'B' End and Lights
1H**	Manaplug (Micro) Single Sol. 5-pin, with Stroke Adjust 'A' & 'B' End and Lights
1M**	Manaplug Opposite Normal
1P	Painted Body
1R	Stroke Adjust 'A' & 'B' End with Pilot Choke Meter In
3A	<b>Pilot Choke Meter Out</b>
3B	<b>Pilot Choke Meter In</b>
3C	<b>Pilot Pressure Reducer</b>
3D	Stroke Adjust 'B' End
3E	Stroke Adjust 'A' End
3F	Stroke Adjust 'A' & 'B' End
3G*	<b>Pilot Choke Meter Out with Lights</b>
3H*	<b>Pilot Choke Meter In with Lights</b>
3J*	Pilot Pressure Reducer with Lights
3K	Pilot Choke Meter Out with Stroke Adjust 'A' & 'B' End
3L**	Pilot Choke Meter Out, Stroke Adjust 'A' & 'B' End with Lights and Manaplug — Brad Harrison Mini
3M	Pilot Choke Meter Out, Pilot Pressure Reducer, Stroke Adjust 'A' & 'B' End
3R	Pilot Choke Meter Out & Pilot Pressure Reducer
3S**	Lights, Mini Manaplug, Pilot Choke Meter Out
7Y**	M12x1 Manaplug (4-pin), Special Wiring, and Lights

\* DESINA, plug-in conduit box, and DIN with plug styles only.

\*\* Must have plug-in style conduit box.

**D31 Series  
 Pressure Drop vs. Flow**

The chart below provides the flow vs. pressure drop curve reference for the D31 Series valves by spool type.

**Example:**

Find the pressure drop at 76 LPM (20 GPM) for a D31 with a number 1 spool. To the right of spool number 1, locate the number 3 in the P-A column, and 2 in the B-T column.

Using the graph at the bottom, locate curves 2 and 3 and read the pressure drop values. Total pressure drop through the valve is the sum of the two values.

*Note: Pressure drops should be checked for all flow paths, especially when using non-symmetrical spools (003, 005, 007, 014, 015 and 016) and unbalanced actuators.*

**D31 Pressure Drop Reference Chart**

Spool No.	Curve Number										
	Shifted				Center Condition						
	P-A	P-B	B-T	A-T	(P-T)	(B-A)	(A-B)	(P-A)	(P-B)	(A-T)	(B-T)
001	3	3	2	1	-	-	-	-	-	-	-
002	3	3	1	1	3	3	3	4	4	1	1
003	3	3	1	1	-	-	-	-	-	3	-
004	3	3	1	1	-	-	-	-	-	1	1
006	3	3	1	1	-	5	7	6	5	-	-
008	3	3	1	1	7	-	-	-	-	-	-
009	9	9	6	7	5	-	-	-	-	-	-
011	3	2	1	1	-	-	-	-	-	8	8
012	4	4	2	2	-	-	-	-	-	-	-
015	3	2	4	1	-	-	-	-	-	-	4
020	5	4	-	2	2	-	-	-	-	-	-
030	4	3	-	1	1	-	-	-	-	-	-
081	7	7	7	6	-	-	-	-	-	-	-
082	7	6	7	6	-	-	-	-	-	-	-

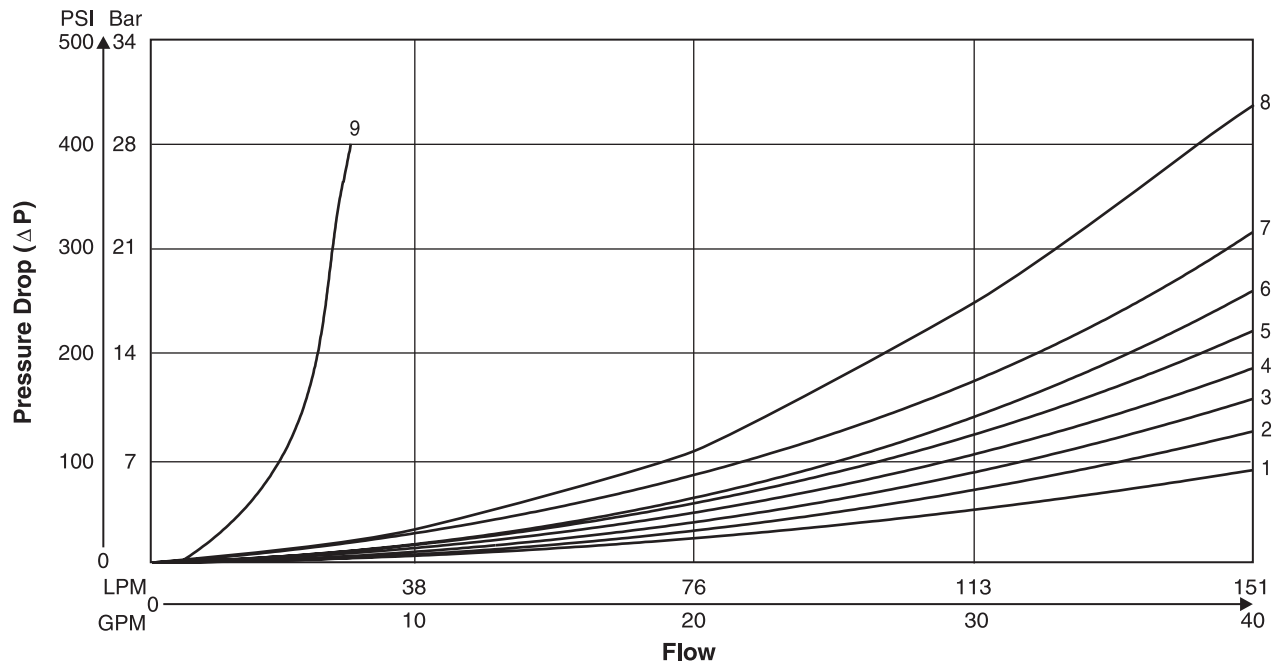


**Viscosity Correction Factor**

Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (Approx.)	93	111	119	126	132	137	141

Curves were generated using 100 SSU hydraulic oil.  
 For any other viscosity, pressure drop will change per chart.

**Performance Curves**



**A**

**Solenoid Ratings**

<b>Insulation System</b>	Class F
<b>Allowable Deviation from rated voltage</b>	-10% to +10% for DC and AC rectified coils -5% to +5% for AC Coils
<b>Armature</b>	Wet pin type
<b>CSA File Number</b>	LR60407
<b>Environmental Capability</b>	DC Solenoids meet NEMA 4 and IP67 when properly wired and installed. Contact HVD for AC coil applications.

**Explosion Proof Solenoid Ratings\***

<b>U.L. &amp; CSA (EU)</b>	Class I, Div 1 & 2, Groups C & D Class II, Div 1 & 2, Groups E, F & G As defined by the N.E.C.
<b>ATEX (ED)</b>	Complies with ATEX requirements for: Ex d IIB Gb; EN60079-0:2012, EN60079-1:2007
<b>ATEX, IECEx &amp; CSA/US (ER, ET) (Tri-rated)</b>	Complies with IEC 60079-0:2011, IEC 60079-1:2007, IEC 60079-31:2013; Ex d IIC Gb; Ex tb IIIC Db IP66; IECEx BAS 14.0164X  ATEX: EN60079-0, EN60079-1, EN60079-31; CE 1180 Ex II 2G BASEEFA08ATEX0041X  CSA 22.2 No. 60079-0:07, 60079-1:07 and UL 60079-0:05, UL 60079-1:05; CSA listed to US and Canada Safety Standards. File 08-CSA-1932102  CSA Ex d IIC, AEx d IIC for Class I Zone 1; Class I Div 1 Grp. C & D; Class II Div 1 Grp. E, F & G

\* Allowable Voltage Deviation ±10%.

Code		Voltage	In Rush Amps Amperage	In Rush VA	Holding Amps @ 3 mm	Watts	Resistance
Voltage Code	Power Code						
D	Omit	120 VDC	N/A	N/A	0.26 Amps	30 W	528.00 Ohms
E	F	24 VAC	4.8 AMPS	120 VA	2.07 Amps	21 W	1.29 Ohms
J	L	24 VDC	N/A	N/A	0.44 Amps	10 W	51.89 Ohms
J	Omit	24 VDC	N/A	N/A	1.32 Amps	30 W	17.27 Ohms
K	L	12 VDC	N/A	N/A	0.88 Amps	10 W	12.97 Ohms
K	Omit	12 VDC	N/A	N/A	2.64 Amps	30 W	4.32 Ohms
Q	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	0.77 Amps	30 W	19.24 Ohms
QD	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	.77 Amps	30 W	19.24 Ohms
T	Omit	240/60 VAC	0.83 Amps	199 VA	0.30 Amps	30 W	120.40 Ohms
T	Omit	220/50 VAC	0.87 Amps	191 VA	0.34 Amps	30 W	120.40 Ohms
T	F	240/60 VAC, Low Watt	0.70 Amps	168 VA	0.22 Amps	21 W	145.00 Ohms
T	F	220/50 VAC, Low Watt	0.75 Amps	165 VA	0.26 Amps	23 W	145.00 Ohms
U	Omit	98 VDC	N/A	N/A	0.31 Amps	30W	288.00 Ohms
Y	Omit	120/60 VAC	1.7 Amps	204 VA	0.60 Amps	30 W	28.20 Ohms
Y	Omit	110/50 VAC	1.7 Amps	187 VA	0.68 Amps	30 W	28.20 Ohms
Y	F	120/60 VAC, Low Watt	1.40 Amps	168 VA	0.42 Amps	21 W	36.50 Ohms
Y	F	110/50 VAC, Low Watt	1.50 Amps	165 VA	0.50 Amps	23 W	36.50 Ohms
<b>Explosion Proof Solenoids</b>							
Y		120/60 VAC	1.60 Amps	192 VA	0.58 Amps	27 W	33.50 Ohms
J		24 VDC	N/A	N/A	1.38 Amps	33 W	17.33 Ohms
<b>Explosion Proof Solenoids (German)</b>							
J		24 VDC	N/A	N/A	1.0 Amps	24 W	24 Ohms
<b>ER &amp; ET Explosion Proof Solenoids</b>							
J		24 VDC	N/A	N/A	0.54 Amps	13 W	44.30 Ohms
Y		120/60 VAC	N/A	N/A	0.16 Amps	17 W	667.00 Ohms

**Electrical Specifications**

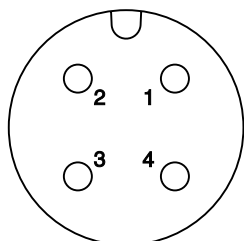
**Electrical Characteristics of Position Control as per IEC 61076-2-101 (M12x1)**

Supply Voltage	[VDC]	24
Tolerance Supply Voltage	[%]	±20
Polarity Protection	[V]	300
Current Consumption without Load	[mA]	≤ 20
Switching Hysteresis	[mm]	<0.06
Max. Output Current per Channel, Ohmic	[mA]	250
Ambient Temperature	[°C]	-20...+60 (-4°F...+140°F)
Protection Class		IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)
Min. Distance to Next AC Solenoid	[m]	0.1 (0.33 ft.)
Interface		M12x1 to IEC 61076-2-101
CE Conform		EN 61000-4-2 / EN 61000-4-4 / EN 61000-4-6* / ENV 50140 / ENV 50204

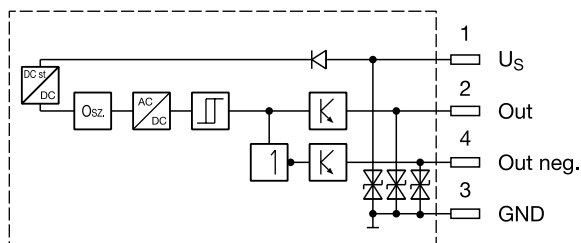
\* Only guaranteed with screened cable and female connector.



**M12 Pin Assignment**



- 1  $U_s$  19.2...28.8 V
- 2 Out B: normally open
- 3 0V
- 4 Out A: normally closed



Outputs: Open collector

**Definitions**

Start position monitored:

The valve is de-energized. The inductive switch gives a signal at the moment when the spool leaves the spring offset position (below 15% spool stroke).

At the switching point the spool is located within the closed position. It is secured that only the flow paths of the offset position are granted.

Please order plug M12x1 separately (see accessories, plug M12x1 (part no.: 5004109)).

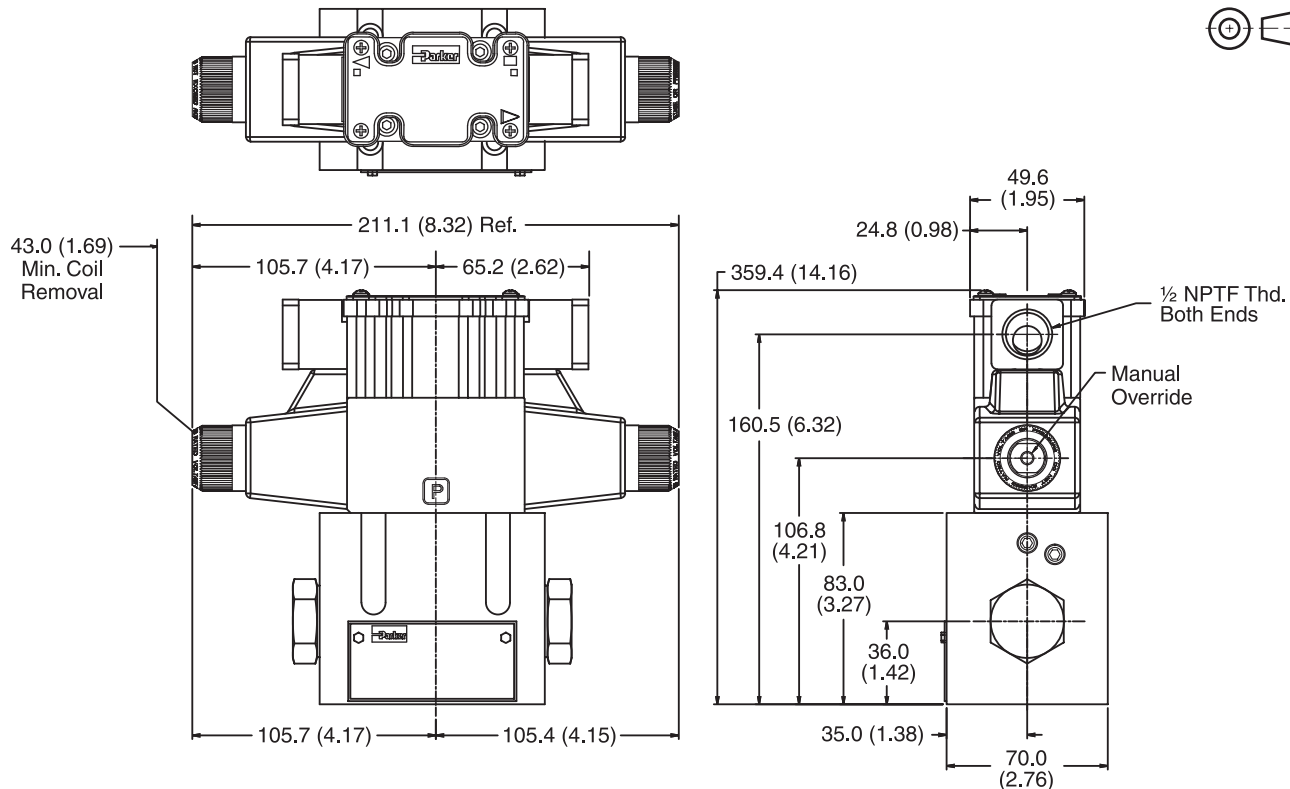
End position monitored:

The inductive switch gives a signal before the end position is reached (above 85% spool stroke).

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

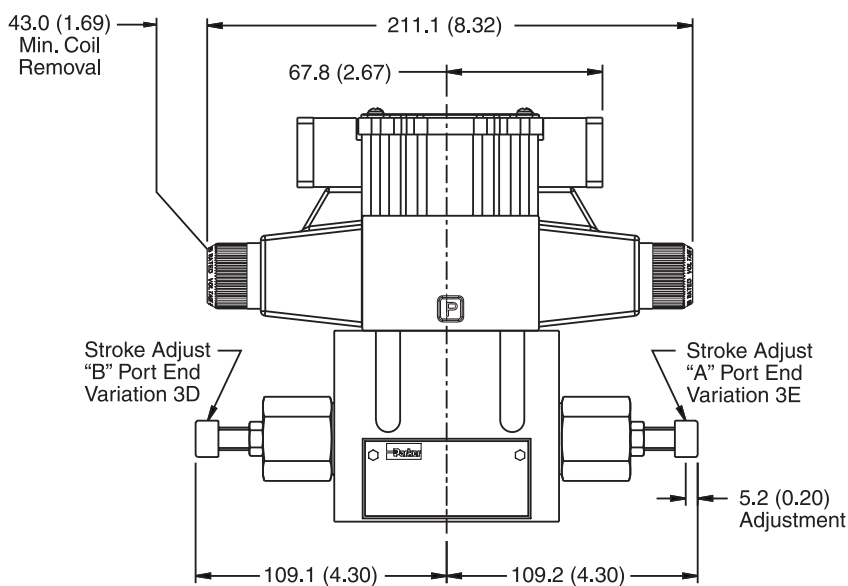
**A**

**Conduit Box, Double AC Solenoid**



**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

**Conduit Box and Stroke Adjust, Double AC Solenoid**



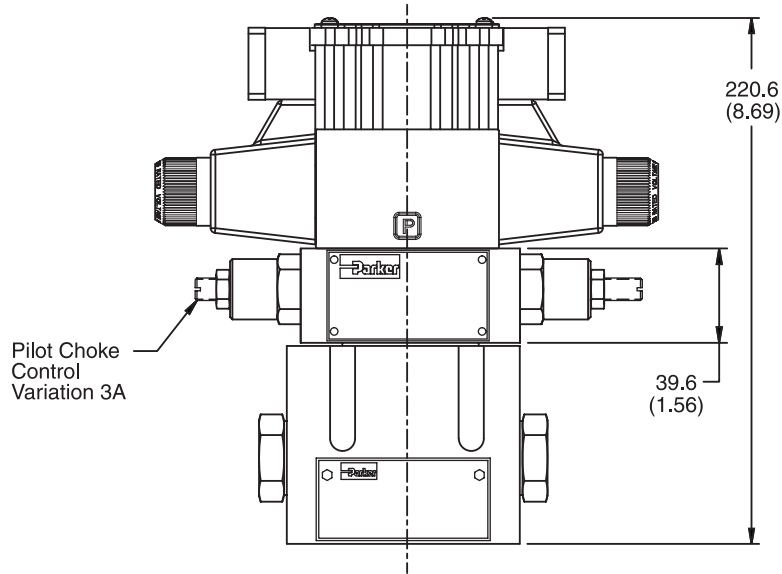
**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.



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

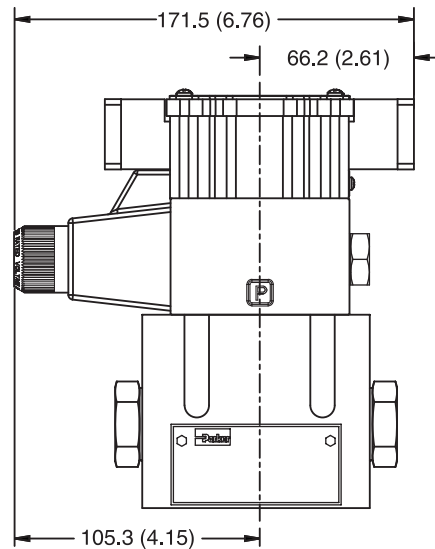
**Conduit Box and Pilot Choke Control, Double AC Solenoid**

**A**



**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

**Conduit Box, Single AC Solenoid**

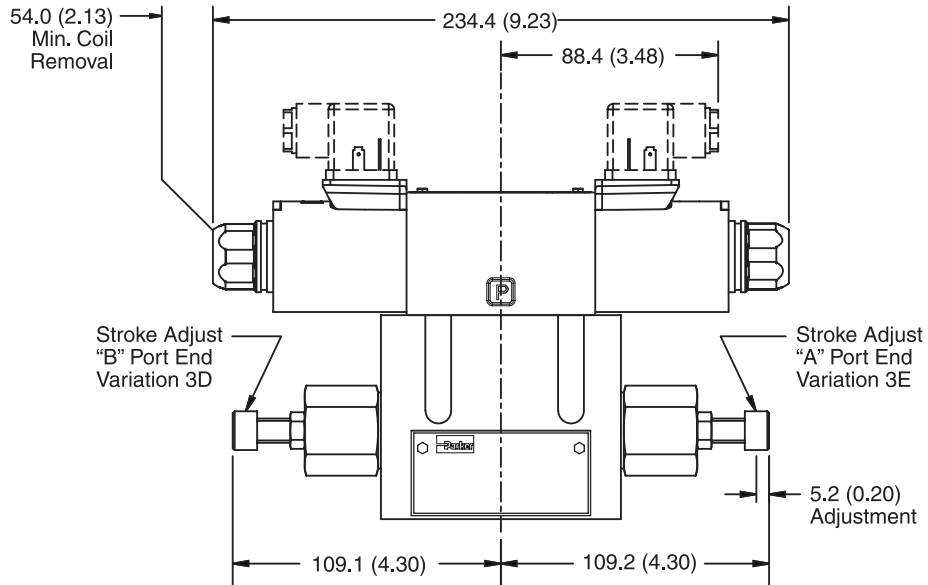


**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

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

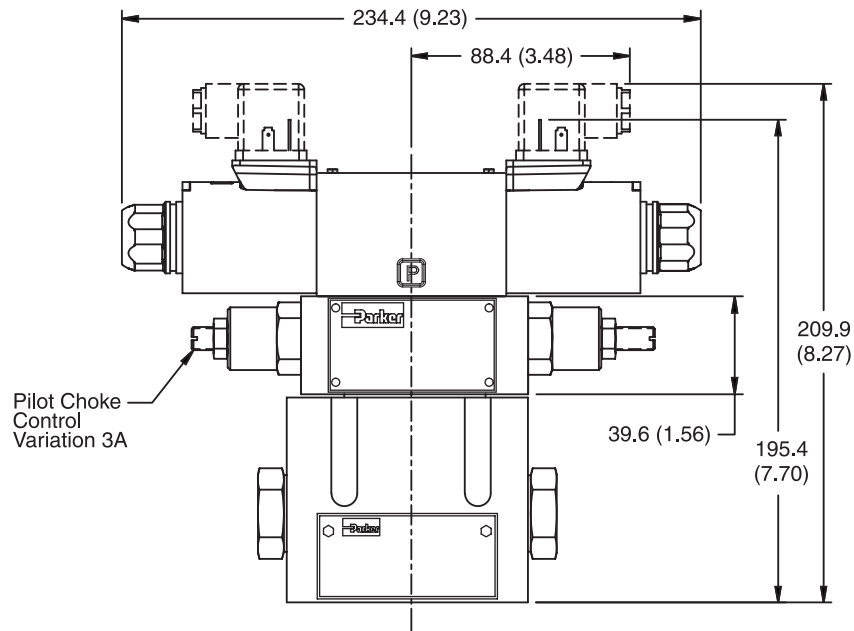
**A**

**Hirschmann and Stroke Adjust, Double DC Solenoid**



**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

**Hirschmann and Pilot Choke Control, Double DC Solenoid**



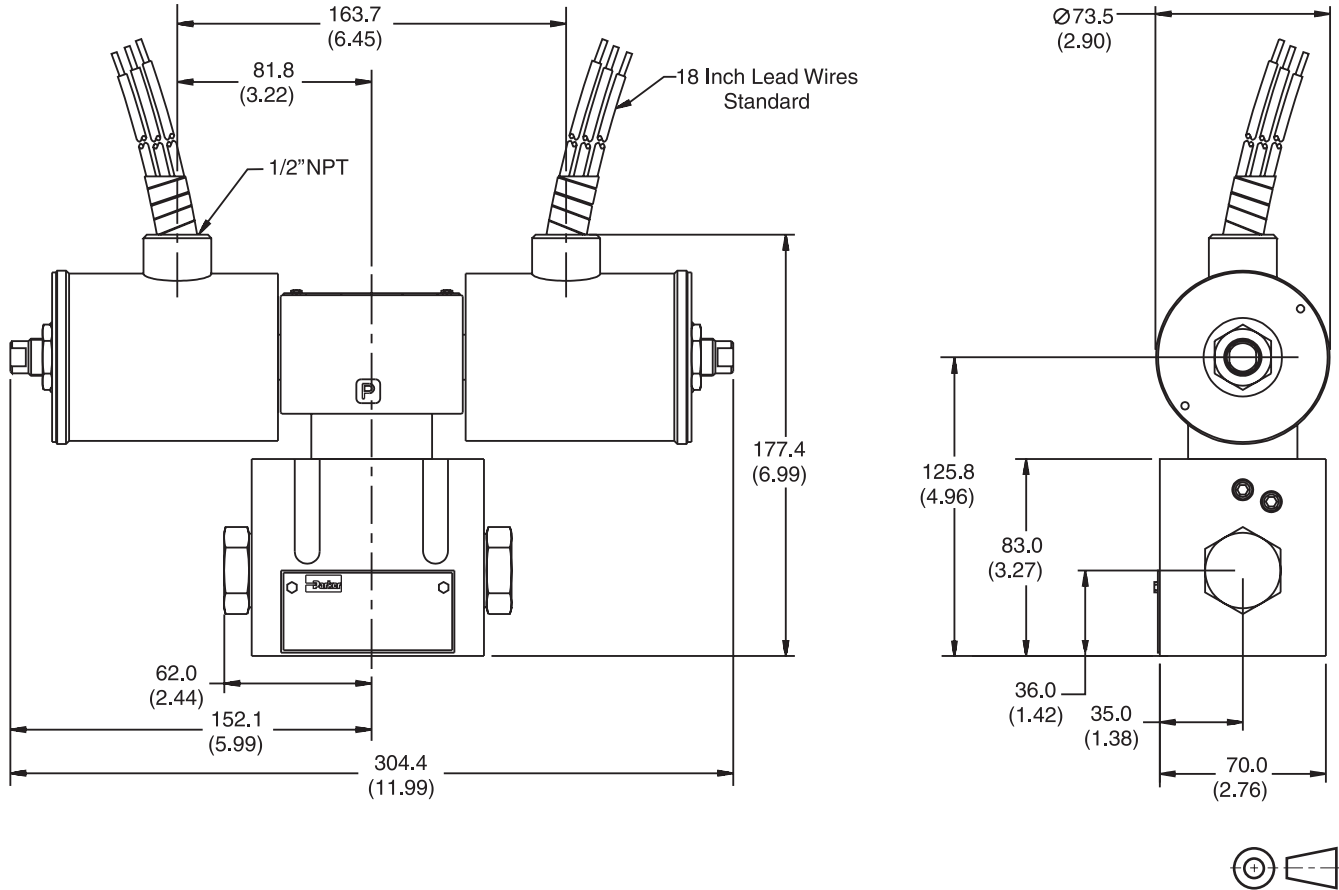
**Note:** 30.0 mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

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

**Explosion Proof U.L. and C.S.A. Approved, Double Solenoid**



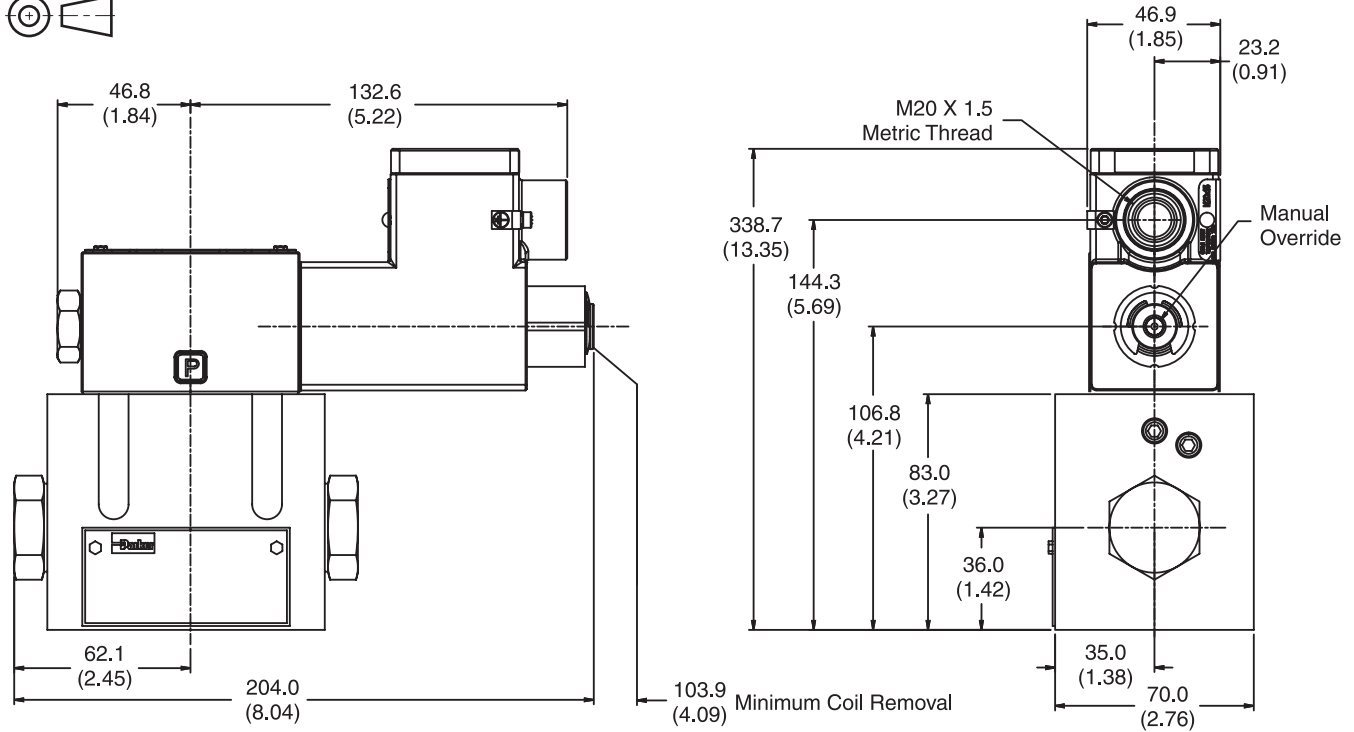
Note:  
2 Black Wires  
1 Green Wire



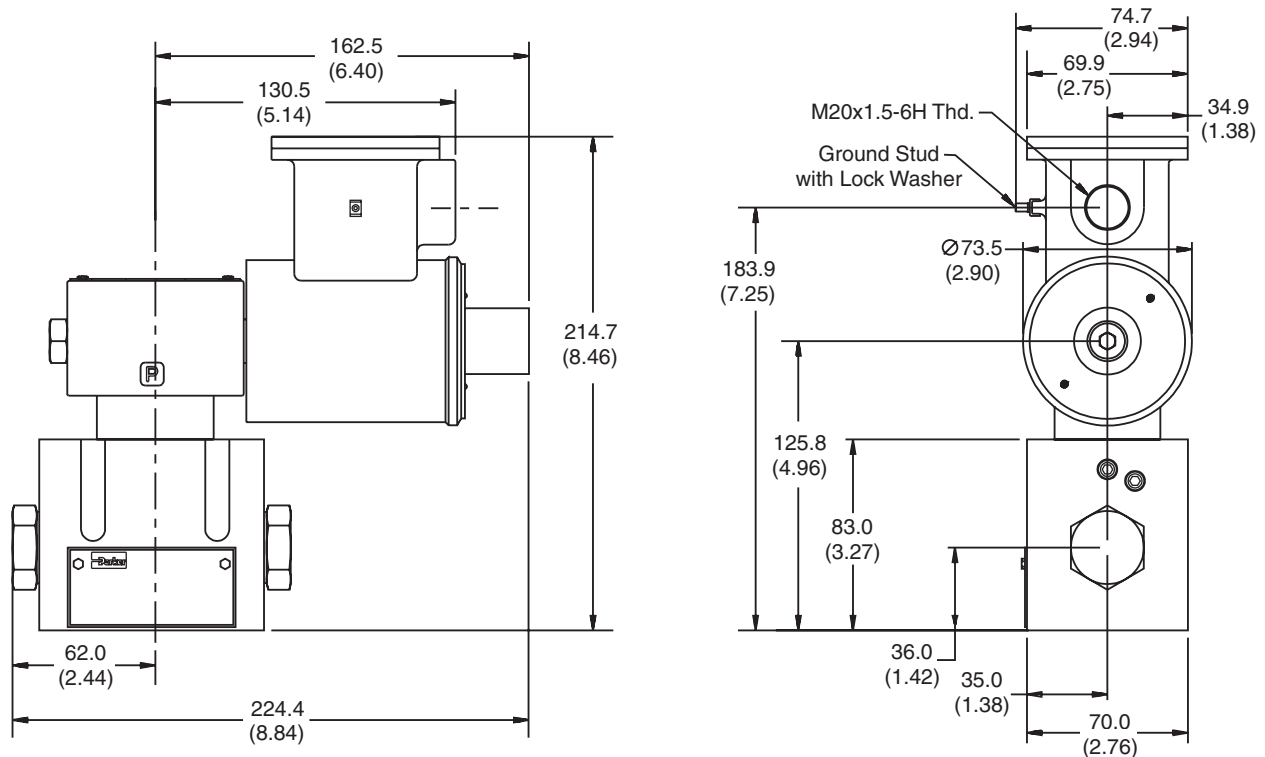
Inch equivalents for millimeter dimensions are shown in (\*\*)

**A**

**Explosion Proof, EX d IIC ATEX/CSA/IECEX Single Solenoid**



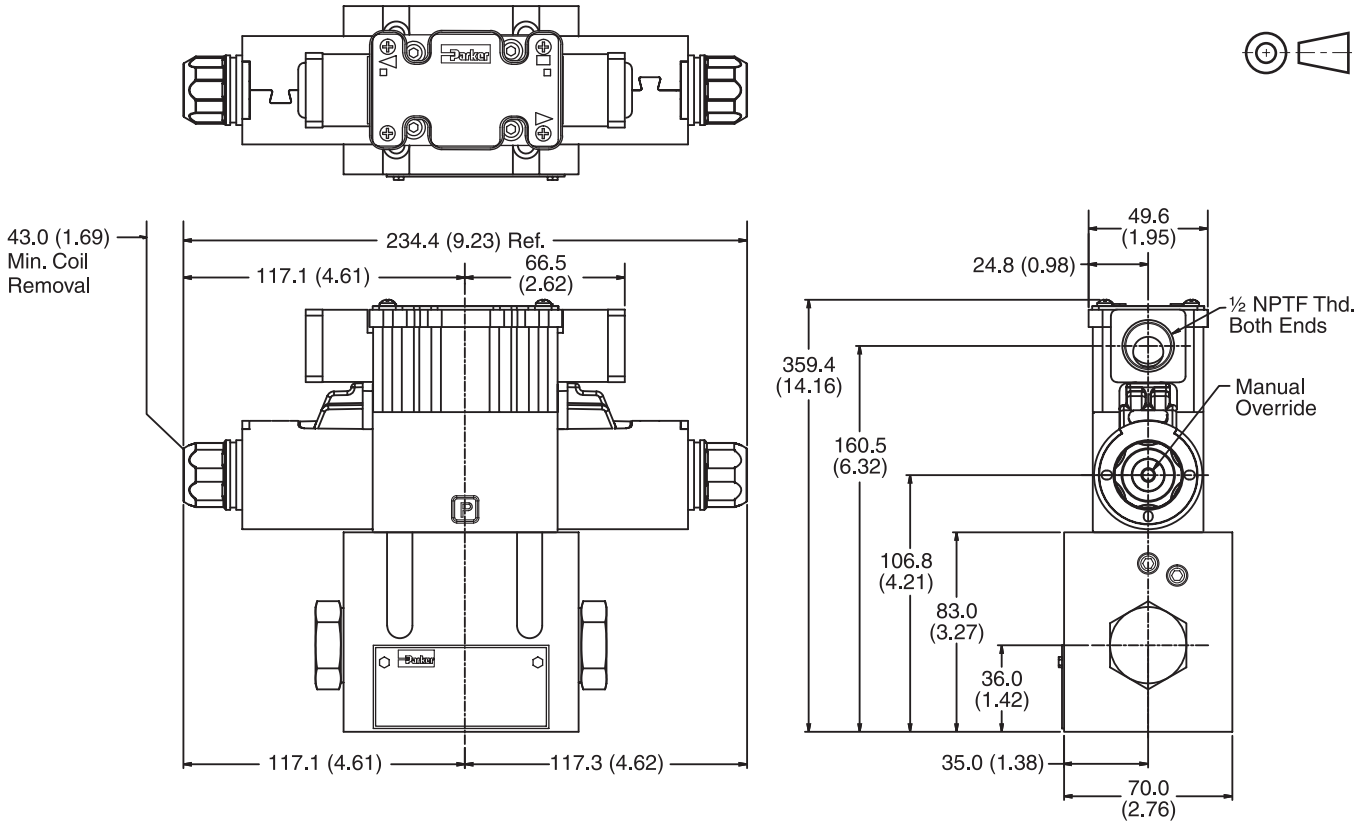
**Explosion Proof, EExd ATEX, Single Solenoid**



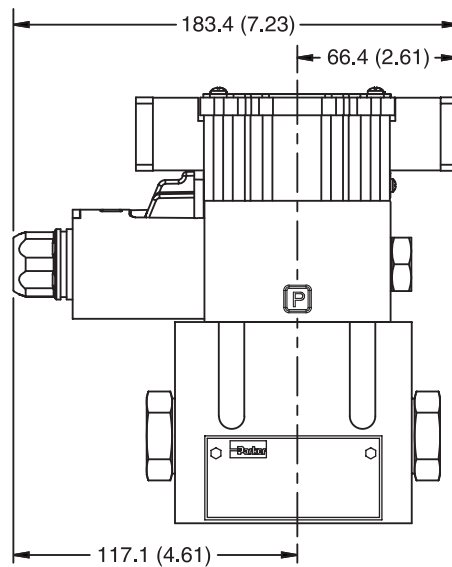
Inch equivalents for millimeter dimensions are shown in (\*\*)

**Plug-in Conduit Box, Double DC Solenoid**

**A**



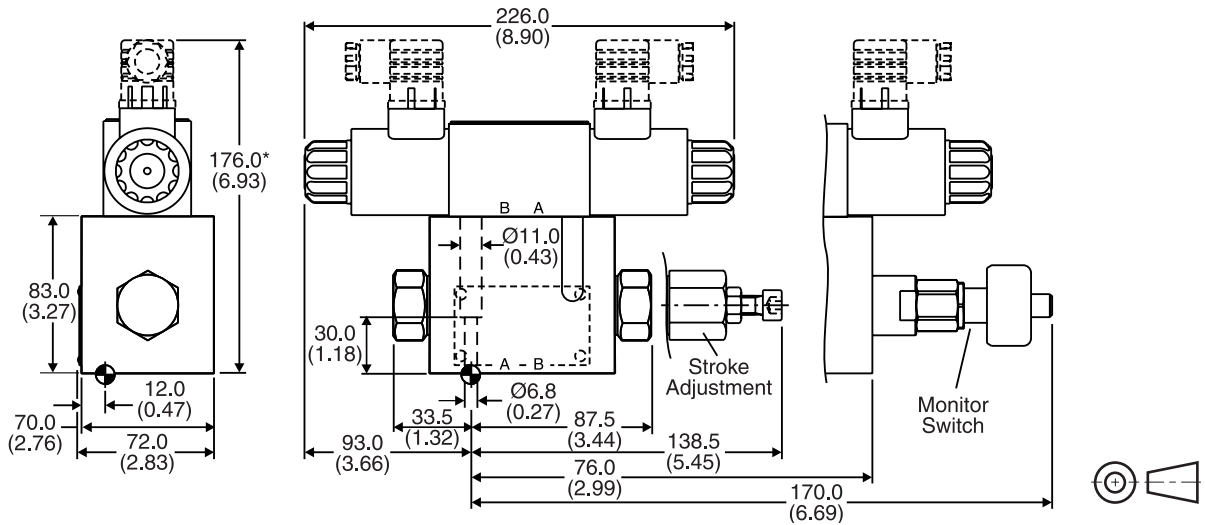
**Plug-in Conduit Box, Single DC Solenoid**



**Dimensions**

**Directional Control Valves  
Series D31DW**

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



\* For each sandwich plate, please add +40mm (1.58") (pressure reducing valve, choke valve meter-in/-out),

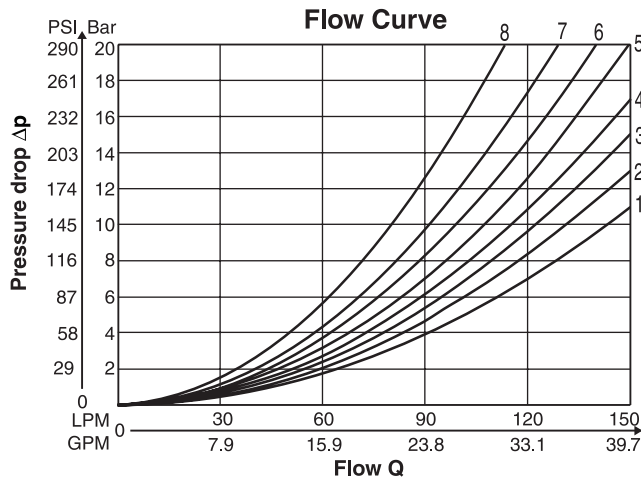
\* For each sandwich plate, please add +40mm (1.58") (pressure reducing valve, choke valve meter-in/-out),

Surface Finish	Kit			Seal Kit
	BK385	4x M6x40 ISO 4762-12.9	13.2 Nm (9.7 lb.-ft.) ±15%	<b>Nitrile: SK-D31NW-N-91</b> Fluorocarbon: SK-D31NW-V-91

The space necessary to remove the plug per DIN 43650, design type AF is at least 15 mm (0.59").  
The torque for the screw M3 of the plug has to be 0.5 Nm to 0.6 Nm (0.37 lb.-ft. to 0.44 lb.-ft.).

**Performance Curves**

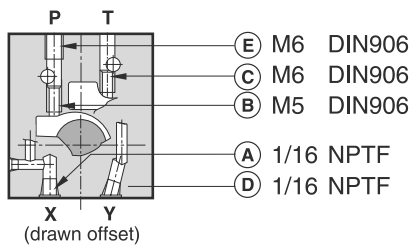
The flow curve diagrams show the flow versus pressure drop curves for all spool types. The relevant curve number for each spool type, operating position and flow direction is given in the table below.



All characteristic curves measured with HLP46 at 50°C.

Spool Code	Curve Number				
	P-A	P-B	P-T	A-T	B-T
001	4	4	—	3	3
002	2	3	3	3	4
003	2	4	—	1	2
004	4	3	—	2	3
005	1	4	—	2	3
006	2	3	—	3	4
007	4	2	5	2	2
009	2	2	8	5	6
011	3	2	—	3	3
014	2	4	5	2	3
015	4	2	—	2	2
016	4	1	—	1	2
020	4	4	—	4	4
021	3	4	—	2	—
022	5	2	—	—	4
026	3	3	—	—	—
030	4	3	—	3	3
031	3	4	—	1	—
032	5	2	—	—	2
081	6	6	—	7	7
082	7	6	—	5	7

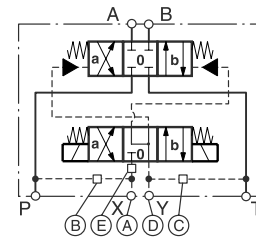
**Pilot Oil Inlet (Supply) and Outlet (Drain)**



○ open, ● closed

Pilot oil		A	B	C	D	E
Inlet	Outlet					
internal	external	●	○	●	○	Orifice Ø1.2
external	external	○	●	●	○	Orifice Ø1.2
internal	internal	●	○	○	●	Orifice Ø1.2
external	internal	○	●	○	●	Orifice Ø1.2

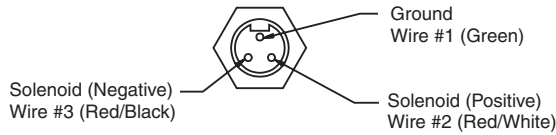
All orifice sizes for standard valves



**A**

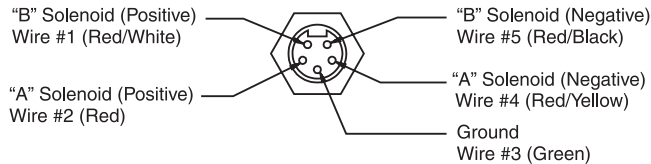
**Manaplug (Options 6, 56, 1A & 1C)**

- Interface – Brad Harrison Plug
- 3-Pin for Single Solenoid
- 5-Pin for Double Solenoid



**3-Pin Manaplug (Mini) with Lights**

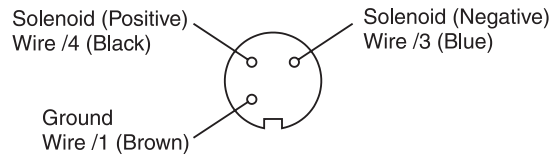
Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Mini) with Lights**

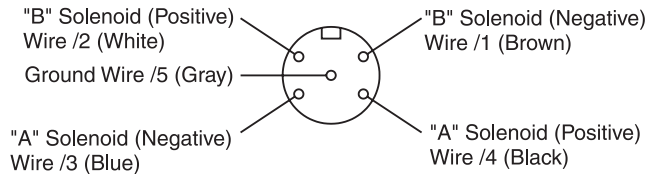
Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Micro Connector Options (7A, 7B, 1B & 1D)**



**3-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Pins are as seen on valve (male pin connectors)**

**Manaplug – Electrical Mini Plug**

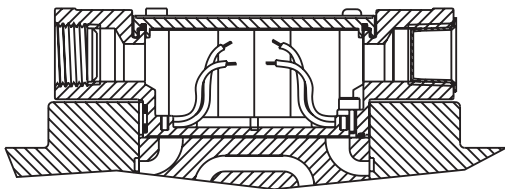
- EP336-30 3 Pin Plug
- EP316-30 5 Pin Plug (Double Solenoid)
- EP31A-30 5 Pin Plug (Single Solenoid)

**Manaplug – Electrical Micro Plug**

- EP337-30 3 Pin Plug
- EP317-30 5 Pin Plug (Double Solenoid)
- EP31B-30 5 Pin Plug (Single Solenoid)

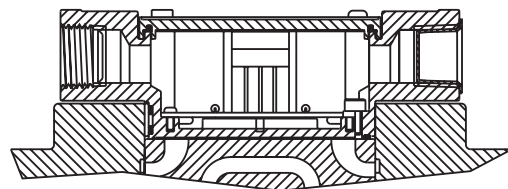
**Conduit Box Option C**

- No Wiring Options Available



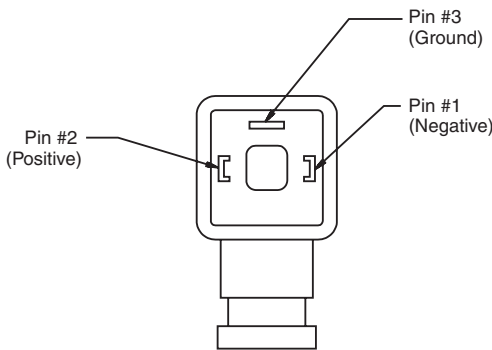
**Signal Lights (Option 5) — Plug-in Only**

- LED Interface
- Meets Nema 4/IP67



**Hirschmann Plug with Lights (Option P5)**

**ISO 4400/DIN 43650 Form "A"**



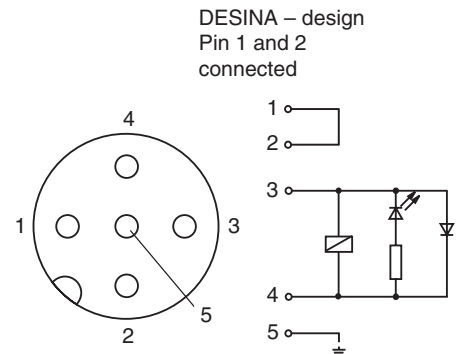
Face View of Plug

**Pins are as seen on valve (male pin connectors)**

**DESINA Connector (Option D)**

**M12 pin assignment Standard**

- 1 = Not used
- 2 = Not used
- 3 = 0V
- 4 = Signal (24 V)
- 5 = Earth Ground



DESINA – design  
Pin 1 and 2  
connected

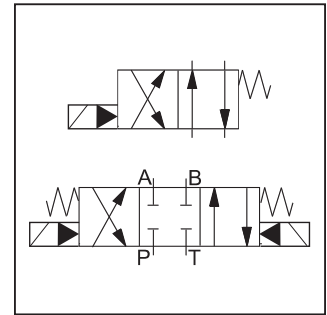
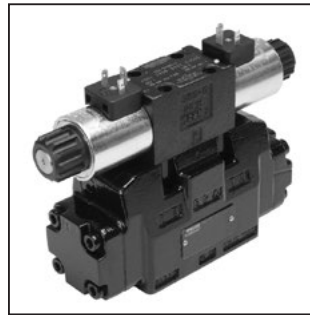


**General Description**

Series D31NW valves are piloted by a D1VW valve. The valves can be ordered with position control.

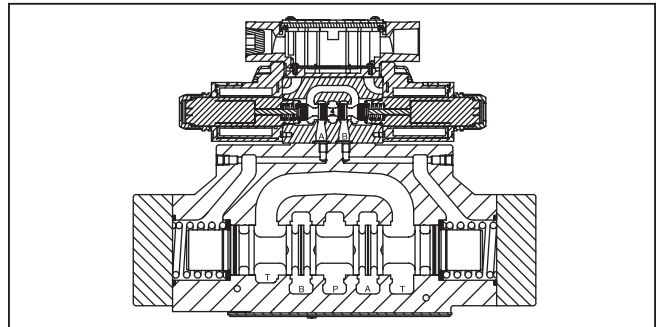
The minimum pilot pressure must be ensured for all operating conditions of the directional valve.

Additionally spools with a P to T connection in the de-energized position need an external pressure supply (external inlet) or an integral check valve.



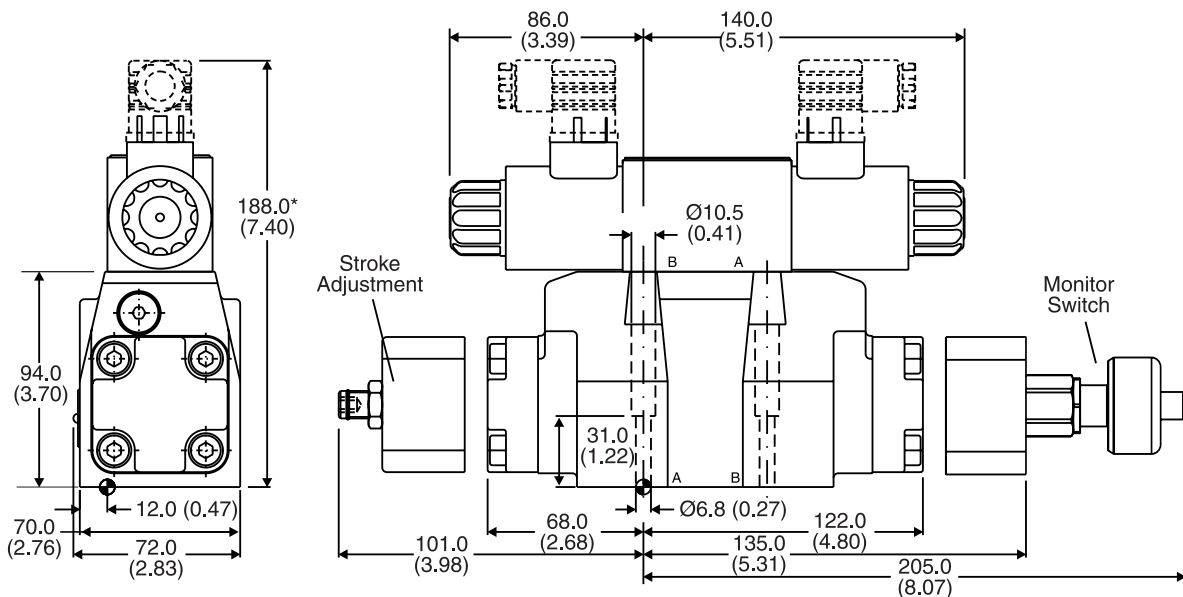
**Features**

- **World design** – Available worldwide.
- **Mounting bolts below center line of spool** – Minimizes spool binding.
- **Five chamber style** – Eliminates pressure spikes in tubes, increasing valve life.
- **High pressure and flow ratings** – Increased performance options in a compact valve.



**Dimensions**

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



\* For each sandwich plate, please add +40mm (1.58") (pressure reducing valve, choke valve meter-in/-out),

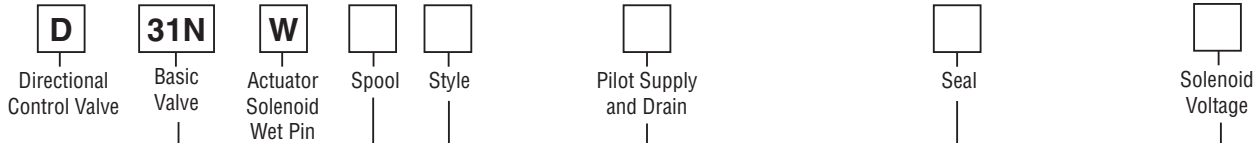
Surface Finish	Kit			Seal Kit
$\sqrt{R_{max}6.3}$ $\square 0.01/100$	BK385	4x M6x40 ISO 4762-12.9	13.2 Nm (9.7 lb.-ft.) ±15%	Nitrile: SK-D31NW-N-91 Fluorocarbon: SK-D31NW-V-91

The space necessary to remove the plug per DIN 43650, design type AF is at least 15 mm (0.59"). The torque for the screw M3 of the plug has to be 0.5 Nm (0.37 lb.-ft.) to 0.6 Nm (0.44 lb.-ft.).

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**A**



NFPA D05HE  
 CETOP 5H  
 DIN NG10  
 D03 Pilot, High flow

Code	Description
<b>1</b>	<b>Internal Pilot External Drain</b>
<b>2</b>	<b>External Pilot External Drain</b>
<b>4*</b>	<b>Internal Pilot Internal Drain</b>
<b>5</b>	<b>External Pilot Internal Drain</b>

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

Code	Description
D†#	120 VDC
E*	24/60 - 24/50 VAC
<b>J</b>	<b>24 VDC</b>
<b>K##</b>	<b>12 VDC</b>
Q††#	100/60 VAC
QD††#	100 VAC/60 Hz - 100 VAC/50 Hz
T^^	240/60 - 220/50 VAC
U***	98 VDC
<b>Y</b>	<b>120/60 - 110/50 VAC</b>

\* Not available with 002, 009 and 030 spools.

3-Position Spools	
Code	Spool Type
	a 0 b
<b>001</b>	
002	
003	
<b>004</b>	
005†	
006†	
009**	
011	
015	
016†	
021	
022	

3-Position Spools		
Code	All 3-Position Spools	
<b>C</b>		<b>3 positions.</b> Spring offset in position "0". Operated in position "a" or "b".
	<b>Standard</b>	<b>Spool Type 009</b>
<b>E</b>		2 positions. Spring offset in position "0".
	Operated in position "a".	Operated in position "b".
<b>F</b>		2 positions. Operated in position "0".
	Spring offset in position "b".	Spring offset in position "a".
<b>K</b>		2 positions. Spring offset in position "0".
	Operated in position "b".	Operated in position "a".
<b>M</b>		2 positions. Operated in position "0".
	Spring offset in position "a".	Spring offset in position "b".
<b>R</b>		2 positions, detent. Operated in position "0" or "b".
	No center in offset position.	No center in offset position.
<b>S</b>		2 positions, detent. Operated in position "0" or "a". No center in offset position.
	No center in offset position.	No center in offset position.

2-Position Spools	
Code	Spool Type
	a b
<b>020*</b>	
030**	

2-Position Spools		
Code	Spool Position	
<b>B*</b>		<b>Spring offset in position "b".</b> <b>Operated in position "a".</b>
<b>D</b>		Detent, operated in position "a" or "b". No center or offset position.
<b>H</b>		Spring offset in position "a". Operated in position "b".

# High watt only.  
 \* Leadwire only, low watt only.  
 \*\* DIN, low watt available.  
 \*\*\* Leadwire not available.  
 ^^ Plug-in is low watt only.  
 † DIN & Leadwire only.  
 †† DIN only.

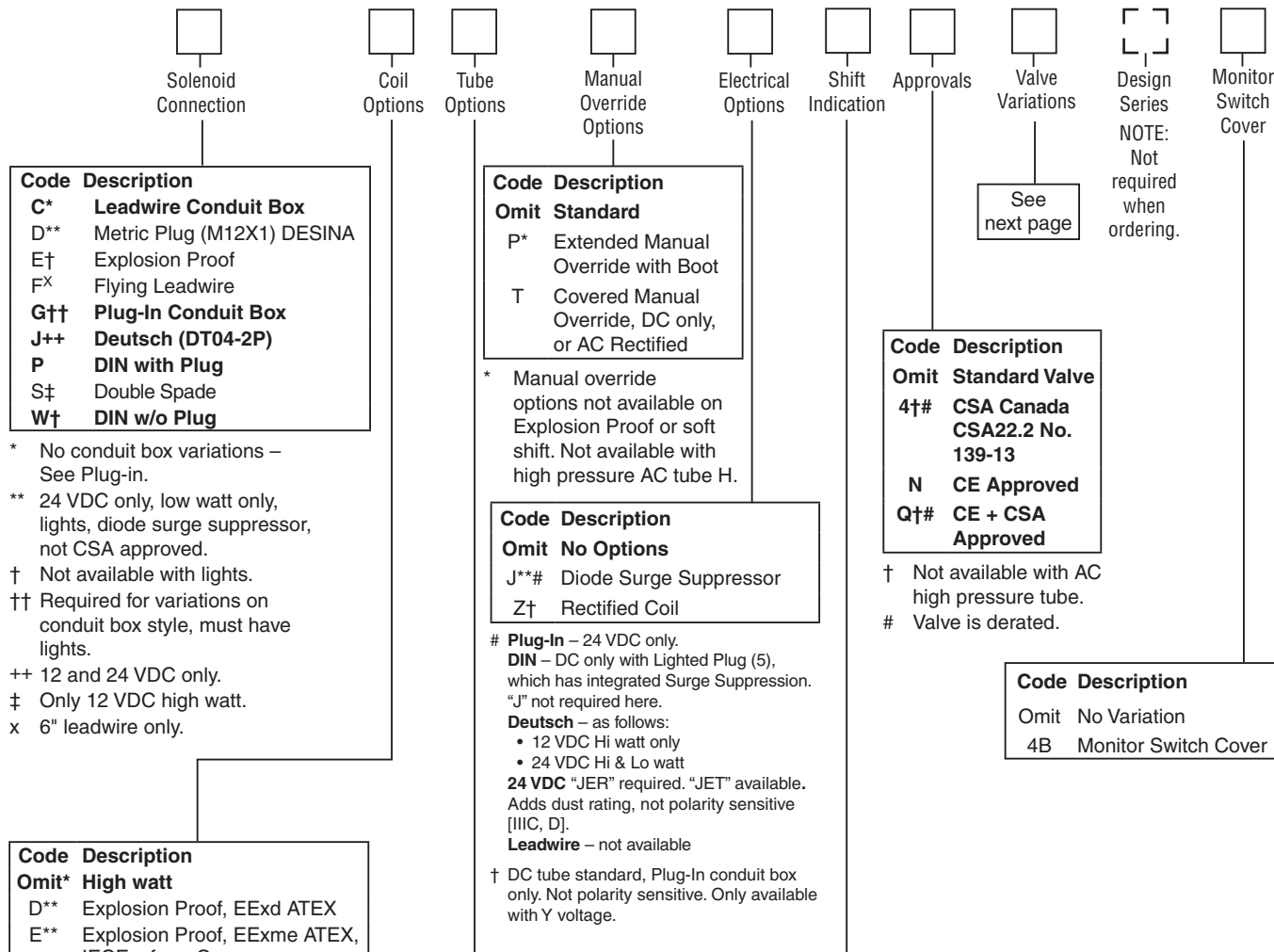
\* 020 spool has closed crossover.  
 \*\* 009 & 030 spools have open crossover.  
 † Not available with monitor switch.

**Weight:**  
 Single Solenoid: 7.6 kg (16.8 lbs.)  
 Double Solenoid: 8.1 kg (17.9 lbs.)

\* 020 & 030 spools only.

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

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



Code	Description
<b>C*</b>	<b>Leadwire Conduit Box</b>
D**	Metric Plug (M12X1) DESINA
E†	Explosion Proof
F <sup>x</sup>	Flying Leadwire
<b>G††</b>	<b>Plug-In Conduit Box</b>
<b>J++</b>	<b>Deutsch (DT04-2P)</b>
<b>P</b>	<b>DIN with Plug</b>
S‡	Double Spade
<b>W†</b>	<b>DIN w/o Plug</b>

\* No conduit box variations – See Plug-in.  
 \*\* 24 VDC only, low watt only, lights, diode surge suppressor, not CSA approved.  
 † Not available with lights.  
 †† Required for variations on conduit box style, must have lights.  
 ++ 12 and 24 VDC only.  
 ‡ Only 12 VDC high watt.  
 x 6" leadwire only.

Code	Description
<b>Omit</b>	<b>Standard</b>
P*	Extended Manual Override with Boot
T	Covered Manual Override, DC only, or AC Rectified

\* Manual override options not available on Explosion Proof or soft shift. Not available with high pressure AC tube H.

Code	Description
<b>Omit</b>	<b>No Options</b>
J**#	Diode Surge Suppressor
Z†	Rectified Coil

# **Plug-In** – 24 VDC only.  
**DIN** – DC only with Lighted Plug (5), which has integrated Surge Suppression. "J" not required here.  
**Deutsch** – as follows:  
 • 12 VDC Hi watt only  
 • 24 VDC Hi & Lo watt  
**24 VDC** "JER" required. "JET" available. Adds dust rating, not polarity sensitive [III, D].  
**Leadwire** – not available  
 † DC tube standard, Plug-In conduit box only. Not polarity sensitive. Only available with Y voltage.

Code	Description
<b>Omit</b>	<b>Standard Valve</b>
4†#	CSA Canada CSA22.2 No. 139-13
N	CE Approved
Q†#	CE + CSA Approved

† Not available with AC high pressure tube.  
 # Valve is derated.

Code	Description
<b>Omit</b>	<b>No Variation</b>
4B	Monitor Switch Cover

Code	Description
<b>Omit*</b>	<b>High watt</b>
D**	Explosion Proof, EExd ATEX
E**	Explosion Proof, EExme ATEX, IECEx, from Germany
F†	Low Watt
L††	10 Watt
R#	Explosion Proof, ATEX/UL/CSA/IECEx, configurable cable connection
T#	Explosion Proof ATEX/UL/CSA/IECEx, fixed horizontal cable connection
U##	Explosion Proof, UL/CSA

\* AC ambient temperature must not exceed 60°C (140°F).  
 \*\* J voltage only, no options.  
 † AC only.  
 †† DC and AC rectified only.  
 # J and Y voltages only. Y voltage is rectified.  
 ## J and Y voltages only. Y voltage is not rectified.

Code	Description
<b>Omit</b>	<b>Standard Pressure</b>
	<b>103.5 Bar (1500 PSI) AC</b>
	<b>207 Bar (3000 PSI) DC</b>
<b>H*</b>	<b>High Pressure, AC only</b>
	<b>207 Bar (3000 PSI)</b>

\* Not available with CSA or Explosion Proof.

Code	Spool Position	Position Control
Omit	All	Standard response
I3N	C	End position monitored, side A and B
I6N		Start position monitored, side A and B
I2N	C, B, E, F (all spools)	End position monitored, side B
I5N	C, K, M (spool 9)	Start position monitored, side B
I1N	C, H, K, M (all spools)	End position monitored, side A
I4N	C, E, F (spool 9)	Start position monitored, side A

Note: The plug M12 x 1 for the position control is included. The monitor switch has to be located on the side to which the spool moves from the spring offset position. For 4/3-way valves two switches are required.  
 Not CSA approved.  
 Not available with 'F' or 'M' styles.  
**DC DIN, high watt coils only.**

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

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



**Valve Variations**

**A**

**OPTIONS ARE NOT AVAILABLE ON MONITOR SWITCH VALVES.**

Code	Description
5*	<b>Signal Lights – Standard</b>
	<b>Signal Lights – Hirsch. (DIN with Plug) (the DC Lighted Plug has Integral Surge Suppression)</b>
7B**	Manaplug – Brad Harrison (12x1) Micro with Lights
56**	<b>Manaplug (Mini) with Lights</b>
1C**	<b>Manaplug (Mini) Single Sol. 5-pin, with Lights</b>
1D**	Manaplug (Micro) Single Sol. 5-pin, with Lights
1M**	Manaplug Opposite Normal
1R	Stroke Adjust 'A' & 'B' End with Pilot Choke Meter In
3A	<b>Pilot Choke Meter Out</b>
3B	<b>Pilot Choke Meter In</b>
3C	<b>Pilot Pressure Reducer</b>
3D	Stroke Adjust 'B' End
3E	Stroke Adjust 'A' End
3F	Stroke Adjust 'A' & 'B' End
3G*	<b>Pilot Choke Meter Out with Lights</b>
3H*	<b>Pilot Choke Meter In with Lights</b>
3J*	Pilot Pressure Reducer with Lights
3K	Pilot Choke Meter Out with Stroke Adjust 'A' & 'B' End
3L**	Pilot Choke Meter Out, Stroke Adjust 'A' & 'B' End with Lights and Manaplug — Brad Harrison Mini
3M	Pilot Choke Meter Out, Pilot Pressure Reducer, Stroke Adjust 'A' & 'B' End
3R	Pilot Choke Meter Out & Pilot Pressure Reducer
3S**	Lights, Mini Manaplug, Pilot Choke Meter Out
7Y**	M12x1 Manaplug (4-pin), Special Wiring, and Lights

\* DESINA, plug-in conduit box, and DIN with plug styles only.

\*\* Must have plug-in style conduit box.

**Solenoid Ratings**

<b>Insulation System</b>	Class F
<b>Allowable Deviation from rated voltage</b>	-10% to +10% for DC and AC rectified coils -5% to +5% for AC Coils
<b>Armature</b>	Wet pin type
<b>CSA File Number</b>	LR60407
<b>Environmental Capability</b>	DC Solenoids meet NEMA 4 and IP67 when properly wired and installed. Contact HVD for AC coil applications.

**Explosion Proof Solenoid Ratings\***

<b>U.L. &amp; CSA (EU)</b>	Class I, Div 1 & 2, Groups C & D Class II, Div 1 & 2, Groups E, F & G As defined by the N.E.C.
<b>ATEX (ED)</b>	Complies with ATEX requirements for: Ex d IIB Gb; EN60079-0:2012, EN60079-1:2007
<b>ATEX, IECEx &amp; CSA/US (ER, ET) (Tri-rated)</b>	Complies with IEC 60079-0:2011, IEC 60079-1:2007, IEC 60079-31:2013; Ex d IIC Gb; Ex tb IIIC Db IP66; IECEx BAS 14.0164X  ATEX: EN60079-0, EN60079-1, EN60079-31; CE 1180 Ex II 2G BASEEFA08ATEX0041X  CSA 22.2 No. 60079-0:07, 60079-1:07 and UL 60079-0:05, UL 60079-1:05; CSA listed to US and Canada Safety Standards. File 08-CSA-1932102  CSA Ex d IIC, AEx d IIC for Class I Zone 1; Class I Div 1 Grp. C & D; Class II Div 1 Grp. E, F & G



\* Allowable Voltage Deviation ±10%.

Code		Voltage	In Rush Amps Amperage	In Rush VA	Holding Amps @ 3 mm	Watts	Resistance
Voltage Code	Power Code						
D	Omit	120 VDC	N/A	N/A	0.26 Amps	30 W	528.00 Ohms
E	F	24 VAC	4.8 AMPS	120 VA	2.07 Amps	21 W	1.29 Ohms
J	L	24 VDC	N/A	N/A	0.44 Amps	10 W	51.89 Ohms
J	Omit	24 VDC	N/A	N/A	1.32 Amps	30 W	17.27 Ohms
K	L	12 VDC	N/A	N/A	0.88 Amps	10 W	12.97 Ohms
K	Omit	12 VDC	N/A	N/A	2.64 Amps	30 W	4.32 Ohms
Q	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	0.77 Amps	30 W	19.24 Ohms
QD	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	.77 Amps	30 W	19.24 Ohms
T	Omit	240/60 VAC	0.83 Amps	199 VA	0.30 Amps	30 W	120.40 Ohms
T	Omit	220/50 VAC	0.87 Amps	191 VA	0.34 Amps	30 W	120.40 Ohms
T	F	240/60 VAC, Low Watt	0.70 Amps	168 VA	0.22 Amps	21 W	145.00 Ohms
T	F	220/50 VAC, Low Watt	0.75 Amps	165 VA	0.26 Amps	23 W	145.00 Ohms
U	Omit	98 VDC	N/A	N/A	0.31 Amps	30W	288.00 Ohms
Y	Omit	120/60 VAC	1.7 Amps	204 VA	0.60 Amps	30 W	28.20 Ohms
Y	Omit	110/50 VAC	1.7 Amps	187 VA	0.68 Amps	30 W	28.20 Ohms
Y	F	120/60 VAC, Low Watt	1.40 Amps	168 VA	0.42 Amps	21 W	36.50 Ohms
Y	F	110/50 VAC, Low Watt	1.50 Amps	165 VA	0.50 Amps	23 W	36.50 Ohms
<b>Explosion Proof Solenoids</b>							
Y		120/60 VAC	1.60 Amps	192 VA	0.58 Amps	27 W	33.50 Ohms
J		24 VDC	N/A	N/A	1.38 Amps	33 W	17.33 Ohms
<b>Explosion Proof Solenoids (German)</b>							
J		24 VDC	N/A	N/A	1.0 Amps	24 W	24 Ohms
<b>ER &amp; ET Explosion Proof Solenoids</b>							
J		24 VDC	N/A	N/A	0.54 Amps	13 W	44.30 Ohms
Y		120/60 VAC	N/A	N/A	0.16 Amps	17 W	667.00 Ohms

A

General				
Design	Directional Spool Valve			
Actuation	Solenoid			
Size	NG10			
Mounting Interface	DIN 24340 A10 / ISO 4401 / NFPA D05 / CETOP RP 121-H			
Mounting Position	Unrestricted, preferably horizontal			
Ambient Temperature	[°C]	-25...+50; (-13°F...+122°F) (without inductive position control)		
	[°C]	0...+50; (+32°F...+122°F) (with inductive position control)		
MTTF <sub>D</sub> Value	[years]	75		
Hydraulic				
Maximum Operating Pressure	Pilot drain internal: P, A, B, X 315 Bar (4568 PSI); T, Y 140 Bar (2030 PSI) Pilot drain external: P, A, B, T, X 315 Bar (4568 PSI); Y 140 Bar (2030 PSI)			
Fluid	Hydraulic oil in accordance with DIN 51524 / 51525			
Fluid Temperature	[°C]	-25 ... +70 (-13°F...+158°F)		
Viscosity Permitted	[cSt]/[mm <sup>2</sup> /s]	2.8...400 (13...1854 SSU)		
Recommended	[cSt]/[mm <sup>2</sup> /s]	30...80 (139...371 SSU)		
Filtration	ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)			
Flow Maximum	170 LPM (45 GPM)			
Leakage at 350 Bar (per flow path)	[ml/min]	72...422 (0.2...0.11 GPM) (depending on spool)		
Minimum Pilot Supply Pressure	7 Bar (102 PSI)			
Static / Dynamic				
Step Response at 85%		Energized	De-energized	
DC Solenoids	Pilot Pressure			
	50 Bar & 100 Bar	[ms]	470	390
	250 Bar & 350 Bar	[ms]	320	390
AC Solenoids	Pilot Pressure			
	50, 100, 250 & 350 Bar	[ms]	30 / 50	375

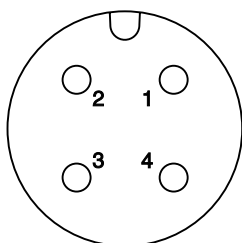
## Single Solenoid Valves

### Electrical Specifications of Position Control as per IEC 61076-2-101 (M12x1)

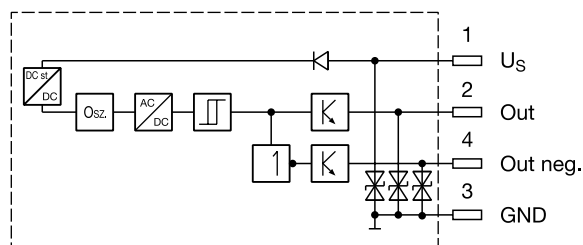
Protection Class		IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)
Ambient Temperature	[°C]	-20...+60; (-4°F...140°F)
Supply Voltage / Ripple	[V]	24 ≤10%
Tolerance Supply Voltage	[%]	±20
Polarity Protection	[V]	300
Current Consumption without Load	[mA]	≤ 20
Switching Hysteresis	[mm]	<0.06
Max. Output Current per Channel, Ohmic	[mA]	250
Min. Distance to Next AC Solenoid	[m]	0.1 (0.33 ft.)
Interface		M12x1 to IEC 61076-2-101
Wiring Minimum	[mm <sup>2</sup> ]	5 x 0.25 braided shield recommended
Wiring Length Maximum	[m]	50 (164 ft.) recommended
CE Conform		EN 61000-4-2/EN 61000-4-4/EN 61000-4-6 <sup>1</sup> /ENV 50140/ENV 50240

1) Only guaranteed with screened cable and female connector.

## M12 Pin Assignment



- 1 U<sub>S</sub> 19.2...28.8V
- 2 Out B: normally open
- 3 0V
- 4 Out A: normally closed



Outputs: Open collector

## Definitions

Start position monitored:

The valve is de-energized. The inductive switch gives a signal at the moment the spool leaves the spring offset position (below 15% spool stroke).

At the switching point the spool is located within the closed position. It is secured so that only the flow paths of the offset position are granted.

The switch can only be located on the opposite side of the solenoid for direct operated valves. Please order plug M12x1 separately. See Accessories, plug M12x1 (part no.: 5004109).

End position monitored:

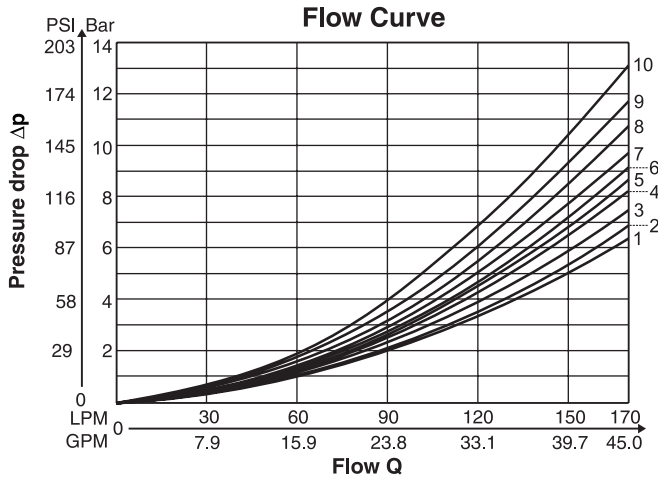
The inductive switch gives a signal before the end position is reached. (above 85% spool stroke).



**Performance Curves**

**A**

The flow curve diagram shows the flow versus pressure drop curves for all spool types. The relevant curve number for each spool type, operating position and flow direction is given in the table below.

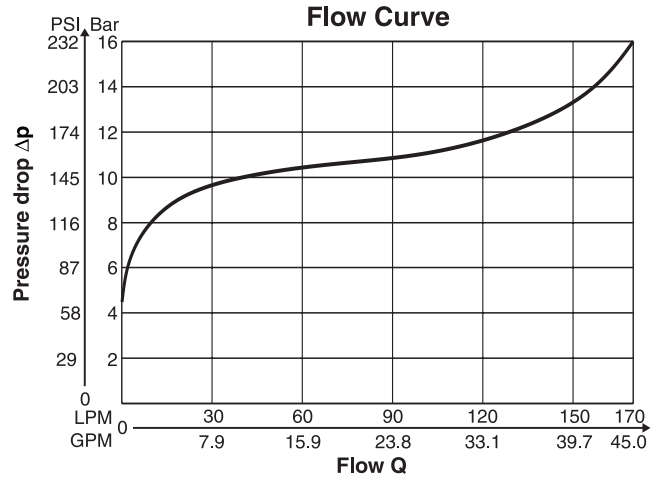


All characteristic curves measured with HLP46 at 50°C.

Spool Code	Curve Number				
	P-A	P-B	P-T	A-T	B-T
001	3	3	—	2	5
002	3	3	7	4	3
003	2	3	—	4	4
004	2	3	—	4	4
005	2	4	—	1	4
006	8	9	—	7	9
007	—	—	—	—	—
009	4	6	6	4	10
011	3	3	—	2	4
014	—	—	—	—	—
015	2	2	—	1	4
016	4	3	—	2	4
020	6	4	—	3	6
021	—	7	—	8	—
022	4	—	—	9	—
026	—	—	—	—	—
030	5	3	—	2	5
031	—	—	—	—	—
032	—	—	—	—	—
081	—	—	—	—	—
082	—	—	—	—	—

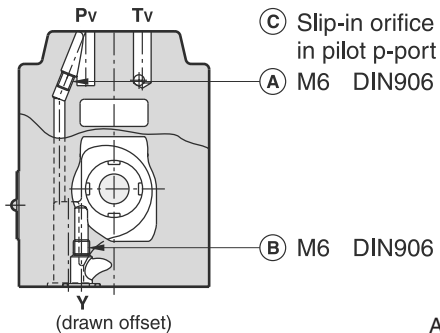
**Integral Check Valve in the P port**

Mounting an integral check valve in the P port is necessary to build up pilot pressure for valves with P to T connection and internal pilot oil supply. The pressure difference at the integral check valve (see performance curves) is to be added to all flow curves of the P-port of the main valve.



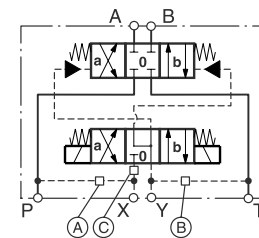
All characteristic curves measured with HLP46 at 50°C.

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



○ open, ● closed

Pilot oil		A	B	C
Inlet	Outlet			
internal	external	○	●	Orifice $\varnothing$ 1.0
external	external	●	●	Orifice $\varnothing$ 1.0
internal	internal	○	○	Orifice $\varnothing$ 1.0
external	internal	●	○	Orifice $\varnothing$ 1.0



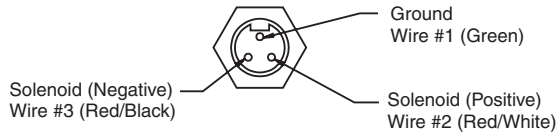
All orifice sizes for standard valves





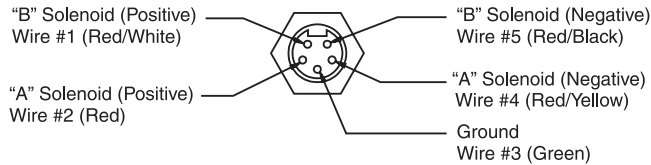
**Manaplug (Options 6, 56, 1A & 1C)**

- Interface – Brad Harrison Plug
- 3-Pin for Single Solenoid
- 5-Pin for Double Solenoid



**3-Pin Manaplug (Mini) with Lights**

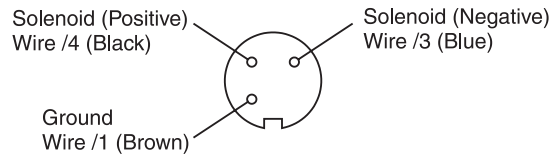
Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Mini) with Lights**

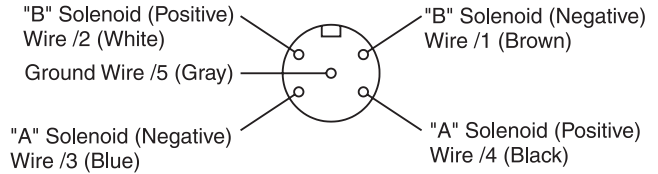
Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Micro Connector Options (7A, 7B, 1B & 1D)**



**3-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Pins are as seen on valve (male pin connectors)**

**Manaplug – Electrical Mini Plug**

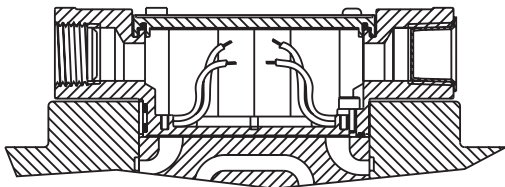
- EP336-30** 3 Pin Plug
- EP316-30** 5 Pin Plug (Double Solenoid)
- EP31A-30** 5 Pin Plug (Single Solenoid)

**Manaplug – Electrical Micro Plug**

- EP337-30** 3 Pin Plug
- EP317-30** 5 Pin Plug (Double Solenoid)
- EP31B-30** 5 Pin Plug (Single Solenoid)

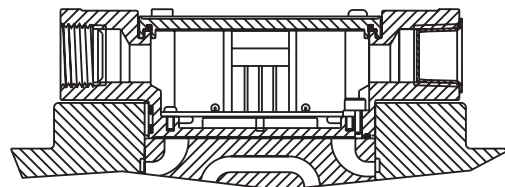
**Conduit Box Option C**

- No Wiring Options Available



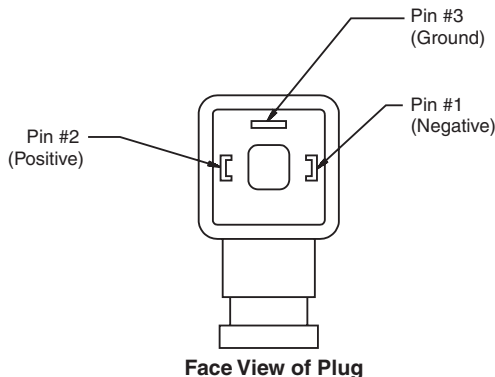
**Signal Lights (Option 5) — Plug-in Only**

- LED Interface
- Meets Nema 4/IP67



**Hirschmann Plug with Lights (Option P5)**

ISO 4400/DIN 43650 Form "A"

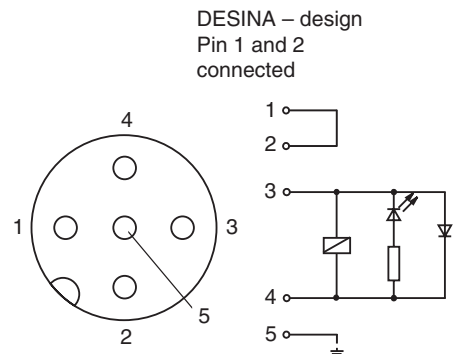


**Pins are as seen on valve (male pin connectors)**

**DESINA Connector (Option D)**

**M12 pin assignment  
Standard**

- 1 = Not used
- 2 = Not used
- 3 = 0V
- 4 = Signal (24 V)
- 5 = Earth Ground



### General Description

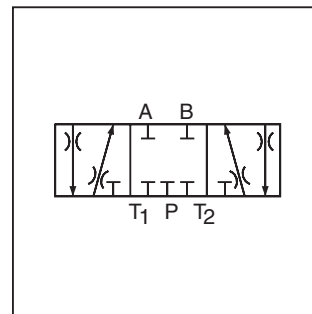
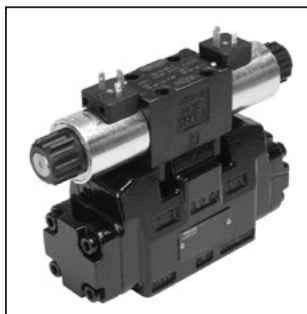
**A**

Series D31NWR directional control valve when combined with adapter blocks, provides a fulltime regenerative function, or a hybrid version that can switch between regen and conventional 4-way function.

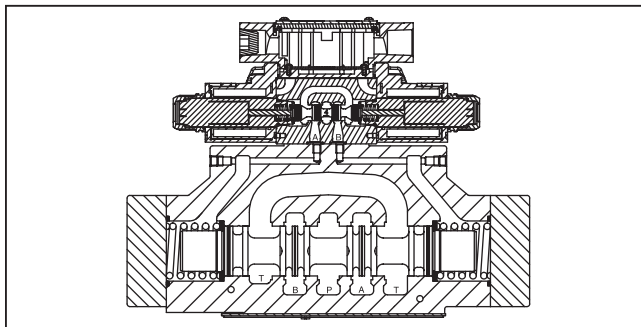
### Features

- Energy saving A-regeneration optionally integrated
- Switchable hybrid version

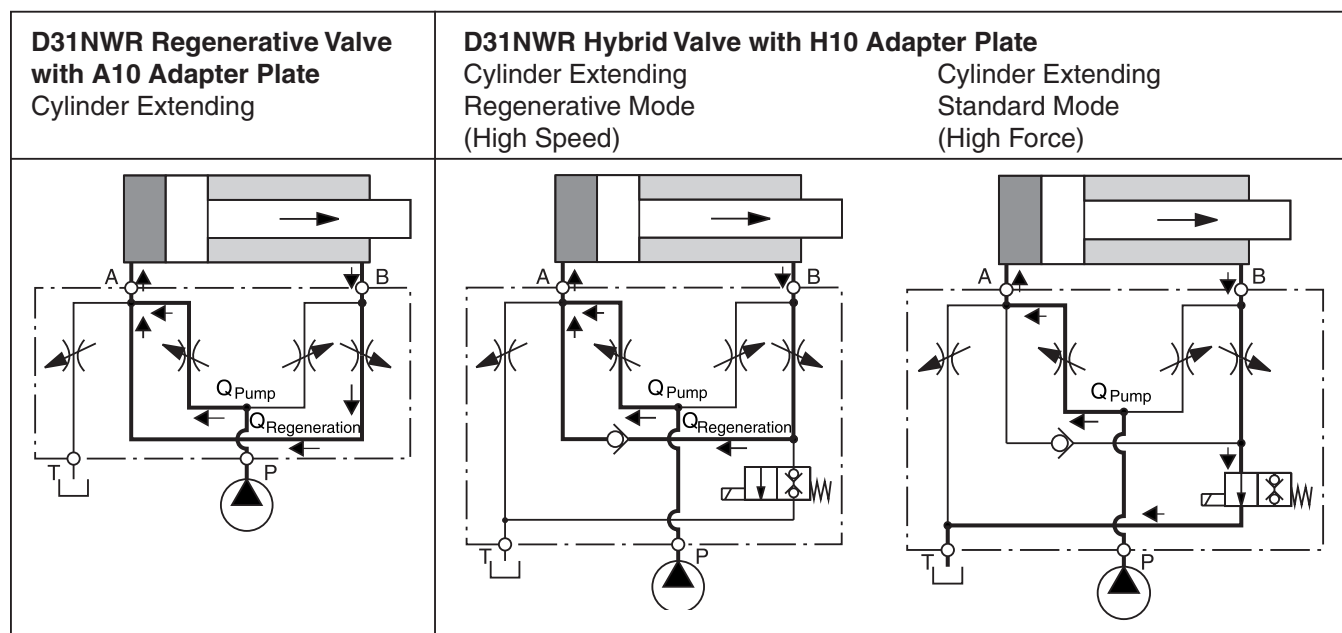
**Further literature about the opportunities of energy savings and more functional details of the integrated regeneration is available on request.**



D31NWR shown



D31NWR shown



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Ordering Information**

<b>D</b>	<b>31N</b>	<b>W</b>	<b>R</b>		<b>C</b>			<b>J</b>	<b>W</b>																																		
Directional Control Valve	Basic Valve	Actuator Solenoid Wet Pin	Regenerative	Spool	Style	Pilot Supply and Drain	Seal	Solenoid Voltage 24VDC	Connector as per EN 175301-803, without connector (please order plug separately)	Manual Override Options	Valve Variations	Design Series																															
<p>NFPA D05HE                  CETOP 5H                  DIN NG10                  D03 Pilot, High flow</p>		<table border="1"> <thead> <tr> <th>Code</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>01</td> <td></td> </tr> <tr> <td>04</td> <td></td> </tr> <tr> <td>81</td> <td></td> </tr> <tr> <td>82</td> <td></td> </tr> </tbody> </table>		Code	Symbol	01		04		81		82		<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>1</b></td> <td><b>Internal Pilot External Drain</b></td> </tr> <tr> <td>2</td> <td>External Pilot External Drain</td> </tr> <tr> <td><b>4</b></td> <td><b>Internal Pilot Internal Drain</b></td> </tr> <tr> <td>5</td> <td>External Pilot Internal Drain</td> </tr> </tbody> </table>		Code	Description	<b>1</b>	<b>Internal Pilot External Drain</b>	2	External Pilot External Drain	<b>4</b>	<b>Internal Pilot Internal Drain</b>	5	External Pilot Internal Drain	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>N</b></td> <td><b>Nitrile</b></td> </tr> <tr> <td>V</td> <td>Fluorocarbon</td> </tr> </tbody> </table>		Code	Description	<b>N</b>	<b>Nitrile</b>	V	Fluorocarbon	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>Omit</b></td> <td><b>Standard</b></td> </tr> <tr> <td>T</td> <td>No override</td> </tr> </tbody> </table>		Code	Description	<b>Omit</b>	<b>Standard</b>	T	No override	<p>NOTE: Not required when ordering.</p>	
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**Weight:**  
 8.1 kg (17.9 lbs.)

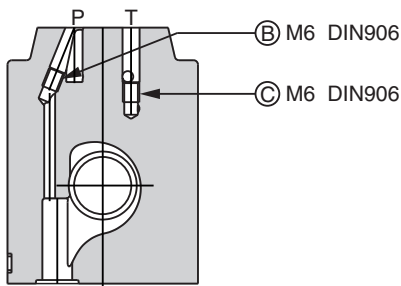
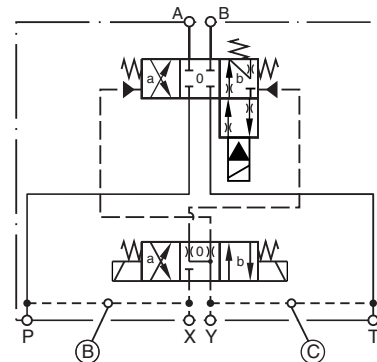
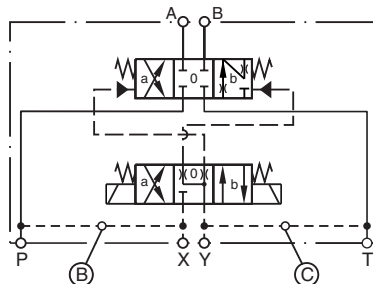
**Bold: Designates Tier I products and options.**

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

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

○ open, ● closed

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



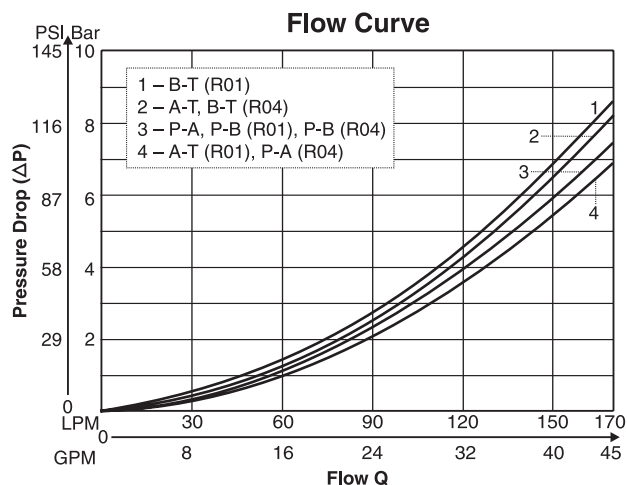
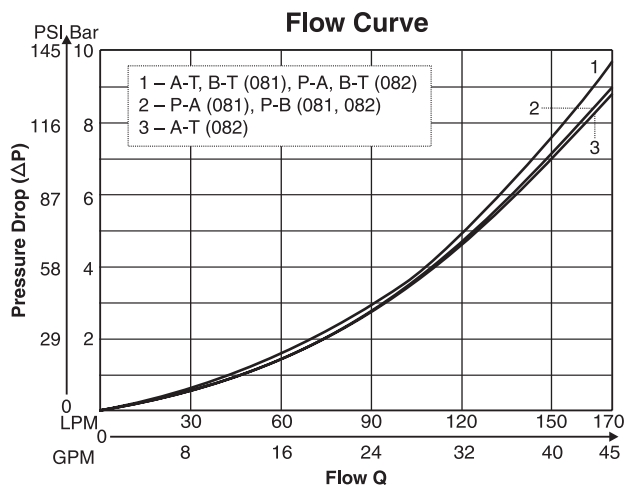
## Specifications

**A**

General			
Design	Directional Spool Valve		
Actuation	Solenoid		
Size	NG10		
Mounting Interface	DIN 24340 A10 / ISO 4401 / NFPA D05 / CETOP RP 121-H		
Mounting Position	Unrestricted, preferably horizontal		
Ambient Temperature	[°C]	-25...+50; (-13°F...+122°F)	
MTTF <sub>D</sub> Value	[years]	75	
Hydraulic			
Maximum Operating Pressure	Pilot drain internal: P, A, B, X 315 Bar (4568 PSI); T, Y 140 Bar (2030 PSI) Pilot drain external: P, A, B, T, X 315 Bar (4568 PSI); Y 140 Bar (2030 PSI)		
Fluid	Hydraulic oil in accordance with DIN 51524 / 51525		
Fluid Temperature	[°C]	-25 ... +70 (-13°F...+158°F)	
Viscosity Permitted	[cSt]/[mm <sup>2</sup> /s]	2.8...400 (13...1854 SSU)	
Recommended	[cSt]/[mm <sup>2</sup> /s]	30...80 (139...371 SSU)	
Filtration	ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)		
Flow Maximum	170 LPM (45 GPM)		
Leakage at 350 Bar (5075 PSI) (per flow path)	[ml/min]	72...422 (0.2...0.11 GPM) (depending on spool)	
Minimum Pilot Supply Pressure	7 Bar (102 PSI)		
Static / Dynamic			
Step Response at 95%		Energized	De-energized
DC Solenoids Pilot Pressure			
50 & 100 Bar (725 & 1450 PSI)	[ms]	50	60
250 & 350 Bar (3625 & 5075 PSI)	[ms]	50	50
Electrical			
Duty Ratio	100% ED; CAUTION: coil temperature up to 150°C (302°F) possible		
Protection Class	IP 65 in accordance with EN 60529 (plugged and mounted)		
Supply Voltage / Ripple	[V]	24	
Tolerance Supply Voltage	[%]	±10	
Current Consumption Hold	[A]	1.29	
Current Consumption In Rush	[A]	1.29	
Power Consumption Hold	[W]	31	
Power Consumption In Rush	[W]	31	
Solenoid Connection	Connector as per EN 175301-803, solenoid identification as per ISO 9461		
Wiring Minimum	[mm <sup>2</sup> ]	3 x 1.5 recommended	
Wiring Length Minimum	[m]	50 (164 ft.) recommended	

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

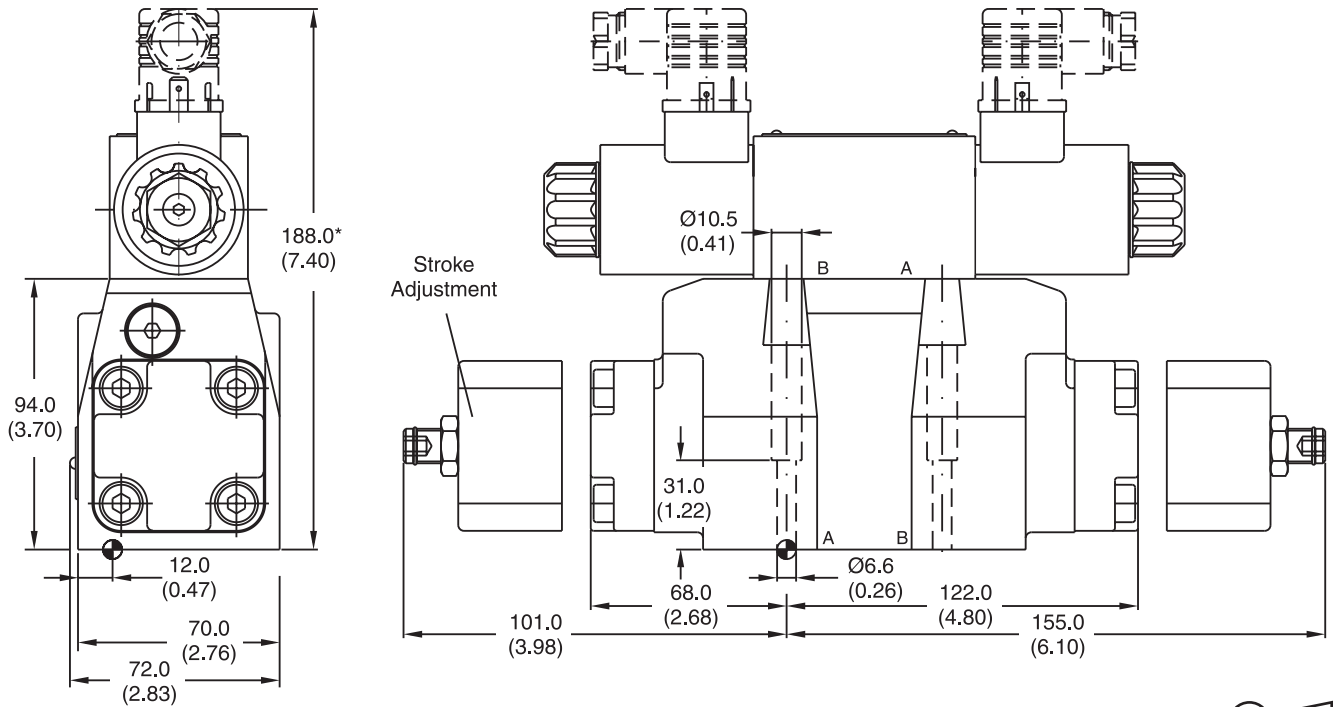
## Performance Curve



**Regenerative and Hybrid Function with Additional Plate  
H10-1666L / H10-1662 / A10-1664 / A10-1666L**



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



\* Please add for each sandwich plate +40 mm (1.58") (pressure reducing valve, pilot choke valve meter-in/-out).

Surface Finish	Kit			Seal Kit
	BK385	4x M6x40 DIN 912 12.9	13.2 Nm (9.7 lb.-ft.)	<b>Nitrile: SK-D31NW-N-91</b> Fluorocarbon: SK-D31NW-V-91

The space necessary to remove the plug per DIN 43650, design type AF is at least 15 mm (0.59").  
The torque for the screw M3 of the plug has to be 0.5 Nm (0.37 lb.-ft.) to 0.6 Nm (0.44 lb.-ft.).

**A**

**General Description**

Adapter plates for regenerative and hybrid functions with Series D31NWR directional control valve. The adapter plate comes as either a sandwich valve (H10) or in a subplate version (A10).

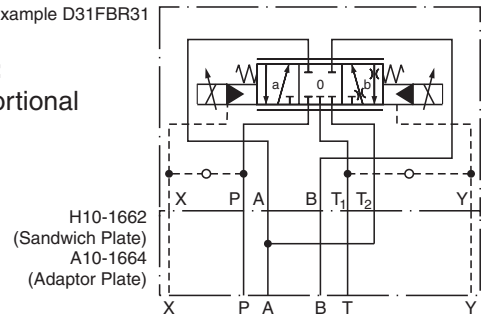
**Features**

- The valve comes without tank bridge and is shown in Series D31NWR section.
- Port T1 is used as single tank port of the valves. Port T2 is separated from port T1 and is used for regeneration into the A port.
- The circuit conception can be integrated into the manifold block.

**Regenerative Function**

Example D31FBR31

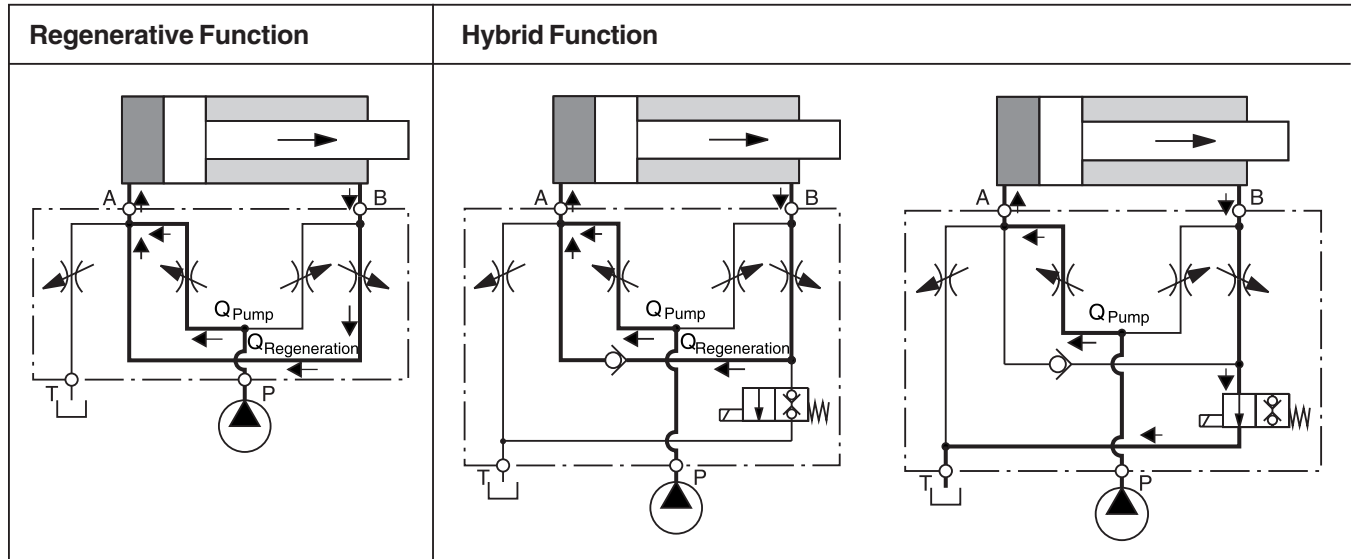
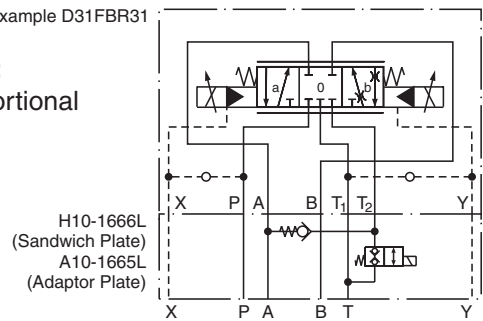
**Note:**  
Proportional



**Hybrid Function**

Example D31FBR31

**Note:**  
Proportional



NEW Energy saving A-regeneration and switchable hybrid version for NG10 valves.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

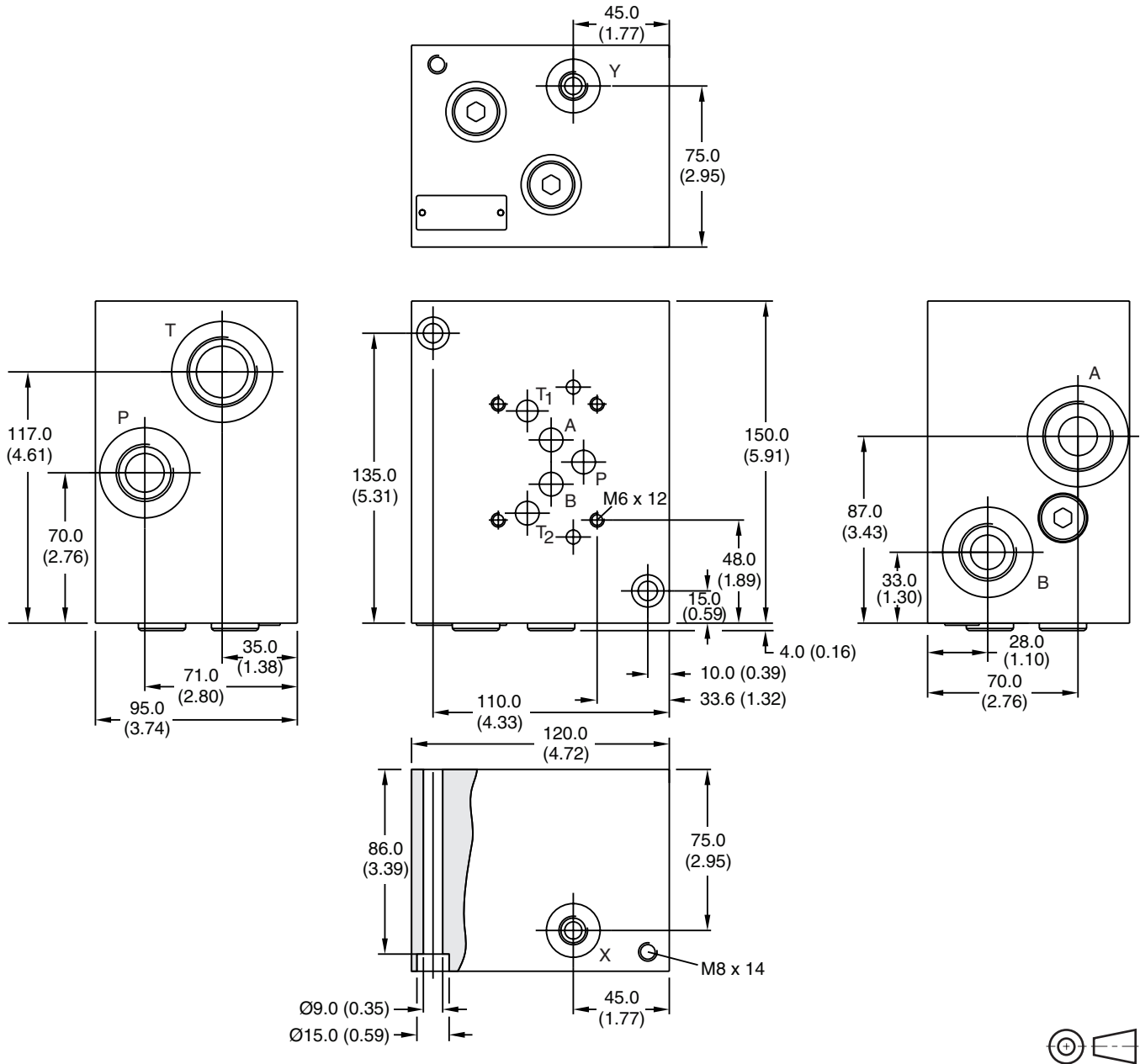
General				
Actuation	Solenoid – A10-1665L and H10-1666L			
Size	DIN NG10 / CETOP 5H			
Mounting interface	DIN 24340 A10 / ISO 4401 / CETOP RP 121-H / NFPA D05			
Mounting Position	Unrestricted			
Ambient Temperature	[°C]	-25...+50 (-13°F...+122°F)		
MTTF <sub>D</sub> Value	[years]	150		
		A10-1664	A10-1665L	H10-1662
Weight		11.9 kg (26.5 lbs.)	14.4 kg (31.8 lbs.)	2.8 kg (6.2 lbs.)
				H10-1666L
				4.9 kg (10.8 lbs.)
Hydraulic				
Maximum Operating pressure	[Bar]	350 (5045 GPM)		
Fluid	Hydraulic oil in accordance with DIN 51524 / 51525			
Fluid temperature	[°C]	-25...+70 (-13°F...+158°F)		
Viscosity	Permitted	[cSt] / [mm <sup>2</sup> /s]	2.8...400 (13...1854 SSU)	
	Recommended	[cSt] / [mm <sup>2</sup> /s]	30...80 (139...371 SSU)	
Filtration	ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)			
Maximum Flow	A10: 150 LPM (39.7 GPM); H10: 250 (66.1 GPM)			
	Regeneration B-A	95 LPM (25.1 GPM)		
	Regeneration B-T	A10: 75 LPM (19.8 GPM)		
Electrical				
Duty Ratio	100%			
Protection Class	IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)			
Supply Voltage	[V]	24		
Tolerance Supply Voltage	[%]	±10		
Current Consumption	[A]	1.21		
Power Consumption	[W]	29		
Solenoid Connection	Connector as per EN 175301-803			
Wiring Minimum	[mm <sup>2</sup> ]	3 x 1.5 recommended		
Wiring Length Maximum	[m]	50 (164 ft.) recommended		

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

**Mounting Interface acc. DIN 24340-A10, CETOP 5H / NG10 for A-regeneration**

**A**

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

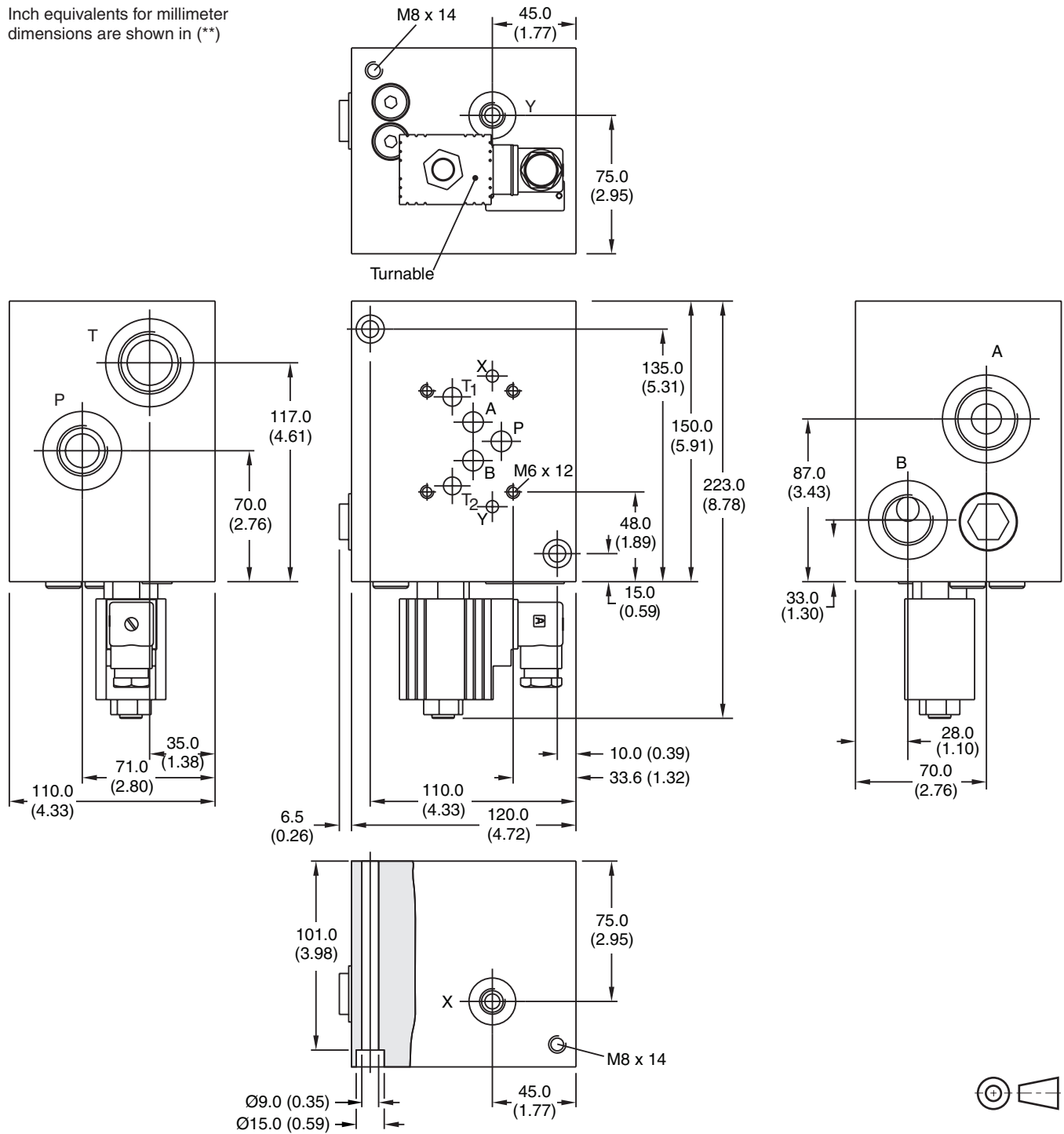


Symbol	Ordering Code	Port
	<b>A10-1664</b>	A, T = G1 B, P = G3/4 X, Y = G1/4



**Mounting Interface acc. DIN 24340-A10, CETOP 5H / NG10 for Hybrid Function**

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



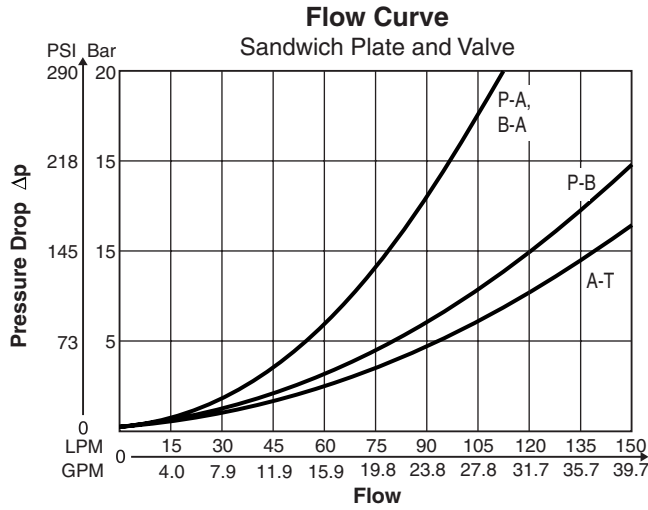
Symbol	Ordering Code	Port	Seal Kit
<p>X P A B T<sub>1</sub> T<sub>2</sub> Y Valve Side</p> <p>X P A B T Y</p>	<b>A10-1665L</b>	A, T = G1 B, P = G3/4 X, Y = G1/4	Nitrile: SK-A10-1665

**Mounting Interface acc. DIN 24340-A10, CETOP 5H / NG10 for A-regeneration**

**A**

**Performance Curves**

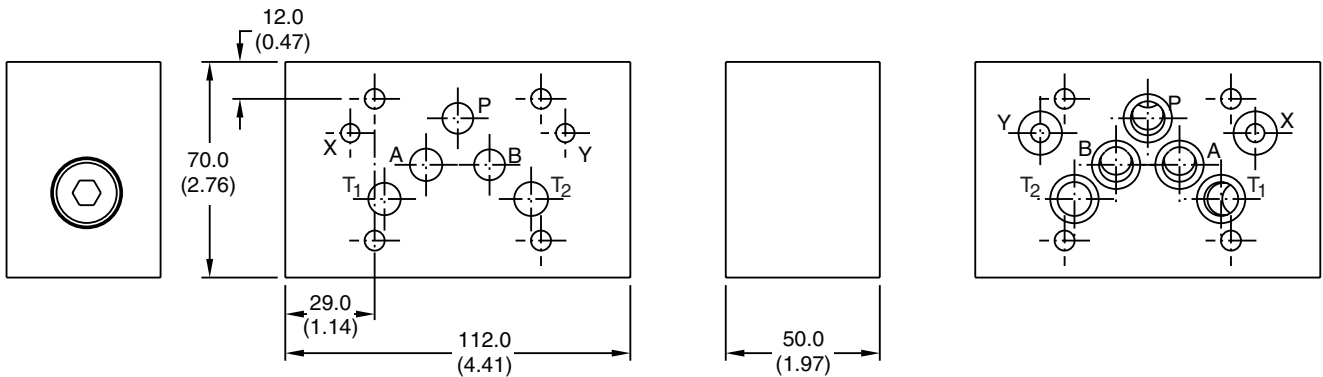
**D31FP/FE/FB\***



Measured with Spool Z31 at command signal 100%.

**Dimensions**

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

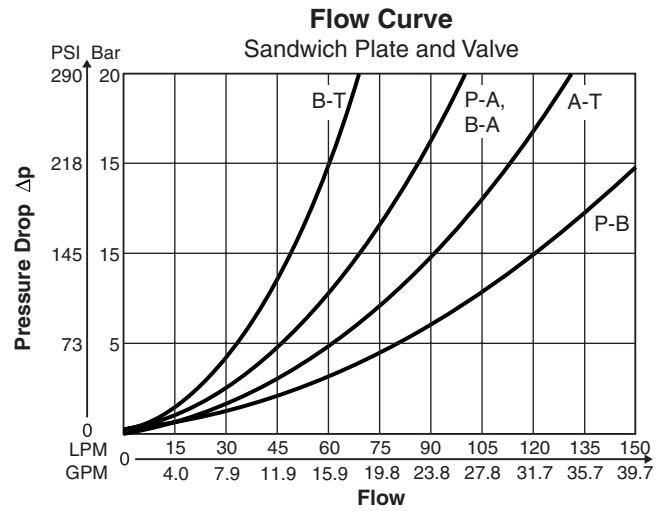


Symbol	Ordering Code	Kit	Kit	Kit	Seal  Kit
	<b>H10-1662</b> (O-rings included in delivery)	BK412	4x M6x90 DIN 912 12.9	13.2 Nm (9.7 lb.-ft.) ±15%	Nitrile: SK-H10-1662

**Mounting Interface acc. DIN 24340-A10, CETOP 5H / NG10 for Hybrid Function**

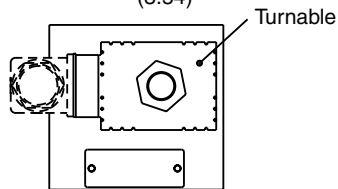
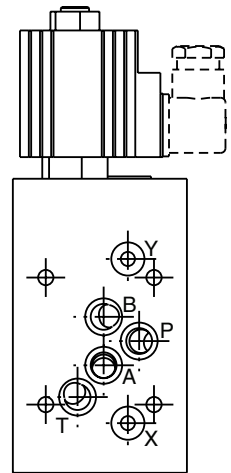
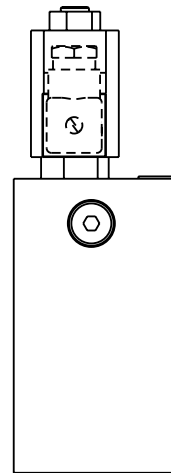
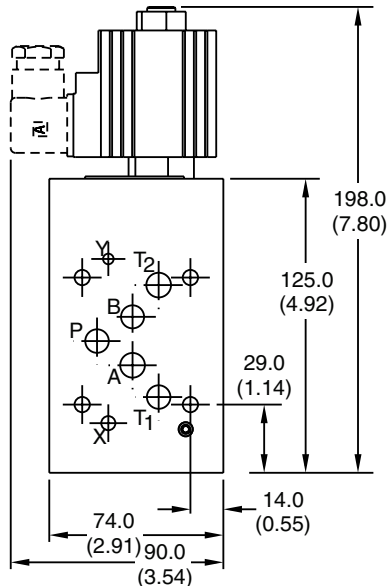
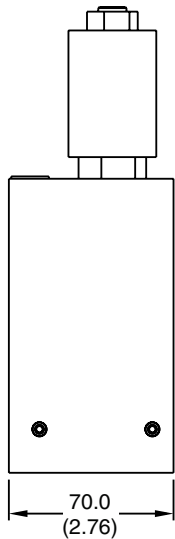
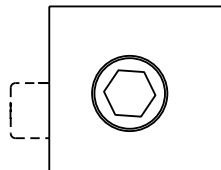
**Performance Curves**

**D31FP/FE/FB\***



**Dimensions**

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



Symbol	Ordering Code	Kit	4x M6x110 DIN 912 12.9	13.2 Nm (9.7 lb.-ft.) ±15%	Seal  Kit
	<b>H10-1666L</b> (O-rings included in delivery)	BK528			Nitrile: SK-H10-1666

A

### General Description

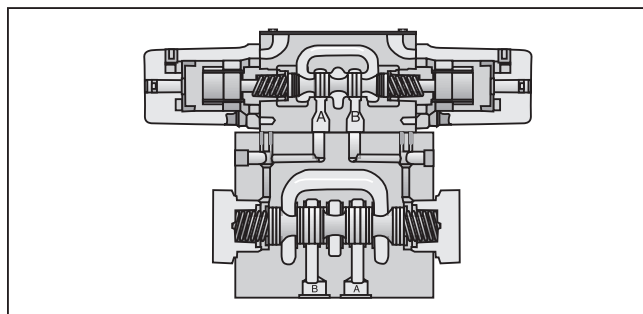
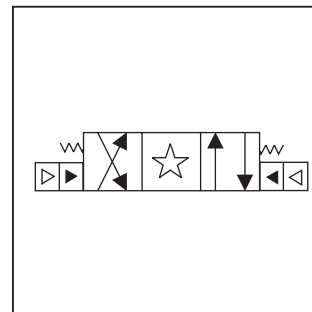
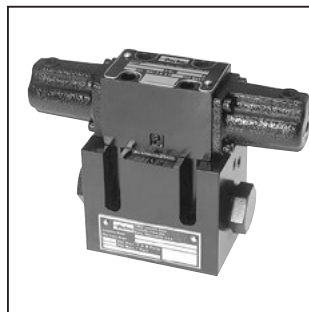
Series D31\*A directional control valves are 5-chamber, air pilot operated valves. The valves are suitable for manifold or subplate mounting.

### Features

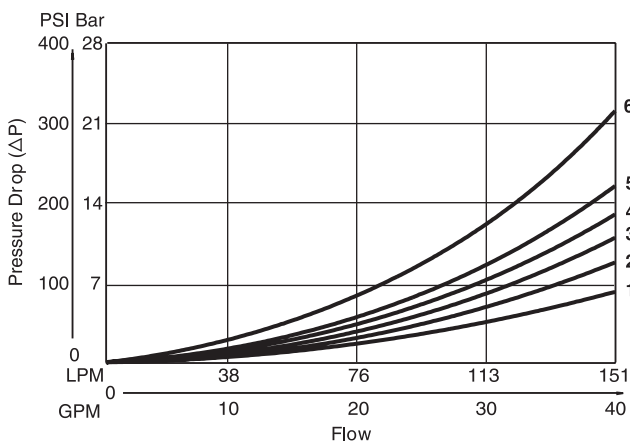
- **World design** – Available worldwide.
- **Mounting bolts below center line of spool** – Minimizes spool binding.
- **Five chamber style** – Eliminates pressure spikes in tubes, increasing valve life.
- **High pressure and flow ratings** – Increased performance options in a compact valve.

### Specifications

<b>Mounting Pattern</b>	NFPA D05H , CETOP 5 NFPA D05HE, CETOP 5H
<b>Max. Operating Pressure</b>	345 Bar (5000 PSI)
<b>Max. Tank Line Pressure</b>	Internal Drain Model: 34 Bar (500 PSI) External Drain Model: 207 Bar (3000 PSI)
<b>Max. Drain Pressure</b>	34 Bar (500 PSI)
<b>Maximum Flow</b>	See Switching Limit Charts
<b>Pilot Pressure</b>	Air Min: 3.4 Bar (50 PSI) Air Max: 10.2 Bar (150 PSI)
<b>Response Time</b>	Varies with pilot line size and length, pilot pressure, pilot valve shift time & flow capacity (GPM)



### Pressure Drop Chart



VISCOSITY CORRECTION FACTOR							
Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (Approx.)	93	111	119	126	132	137	141

Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change as per chart.

### D31VA Pressure Drop Reference Chart – Curve Number

Spool No.	Shifted				Center Condition							
	P-A	P-B	B-T	A-T	(P-T)	(B-A)	(A-B)	(P-A)	(P-B)	(A-T)	(B-T)	
001	3	3	2	1	–	–	–	–	–	–	–	
002	3	3	1	1	3	3	3	4	4	1	1	
004	3	3	1	1	–	–	–	–	–	1	1	
009	3	3	1	1	6	–	–	–	–	–	–	
020	5	4	2	2	–	–	–	–	–	–	–	
030	4	3	1	1	–	–	–	–	–	–	–	

### D31VA Pressure Drop vs. Flow

The chart to the left provides the flow vs. pressure drop curve reference for the D31VA Series valves by spool type.

**Example:** Find the pressure drop at 76 LPM (20 GPM) for a D31VA with a number 001 spool. To the right of spool number 001, locate the number 3 in the P-A column, and 2 in the B-T column.

Using the top graph, locate curves 2 and 3 and read the pressure drop values. Total pressure drop through the valve is the sum of the two values.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**Ordering Information**

<b>D</b>	Directional Control Valve	<b>A</b>	Air Operated Pilot		Spool		Style		Pilot Supply and Drain		Seal		Valve Variations		Design Series
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**NOTE:** Not required when ordering.

Code	Description
31D	NFPA D05HE, CETOP 5H (ISO)
31V	NFPA D05H, CETOP 5

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
1	Int. pilot/Ext. drain
2	Ext. pilot/Ext. drain
4#	Int. pilot/Int. drain
5	Ext. pilot/Int. drain

# Not available with 002, 008 & 009 spools.

Code	Description	Symbol
<b>B†</b>	<b>Single operator, 2 position, spring offset. P to A and B to T in offset position.</b>	
<b>C</b>	<b>Double operator, 3 position, spring centered.</b>	
<b>D†</b>	<b>Double operator, 2 position, detent.</b>	
E	Single operator, 2 position, spring centered. P to B and A to T when energized.	
<b>H†</b>	<b>Single operator, 2 position, spring offset. P to B and A to T in offset position.</b>	
K	Single operator, 2 position, spring centered. P to A and B to T when energized.	

† Only spools 020 and 030.

This condition varies with spool code.

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator A. Note operators reverse sides for #008 and #009 spools. See installation information for details.

**Valve Weight:**  
 Double Operator  
 5.7 kg (12.7 lbs.)

**Standard Bolt Kit:**  
 BK98

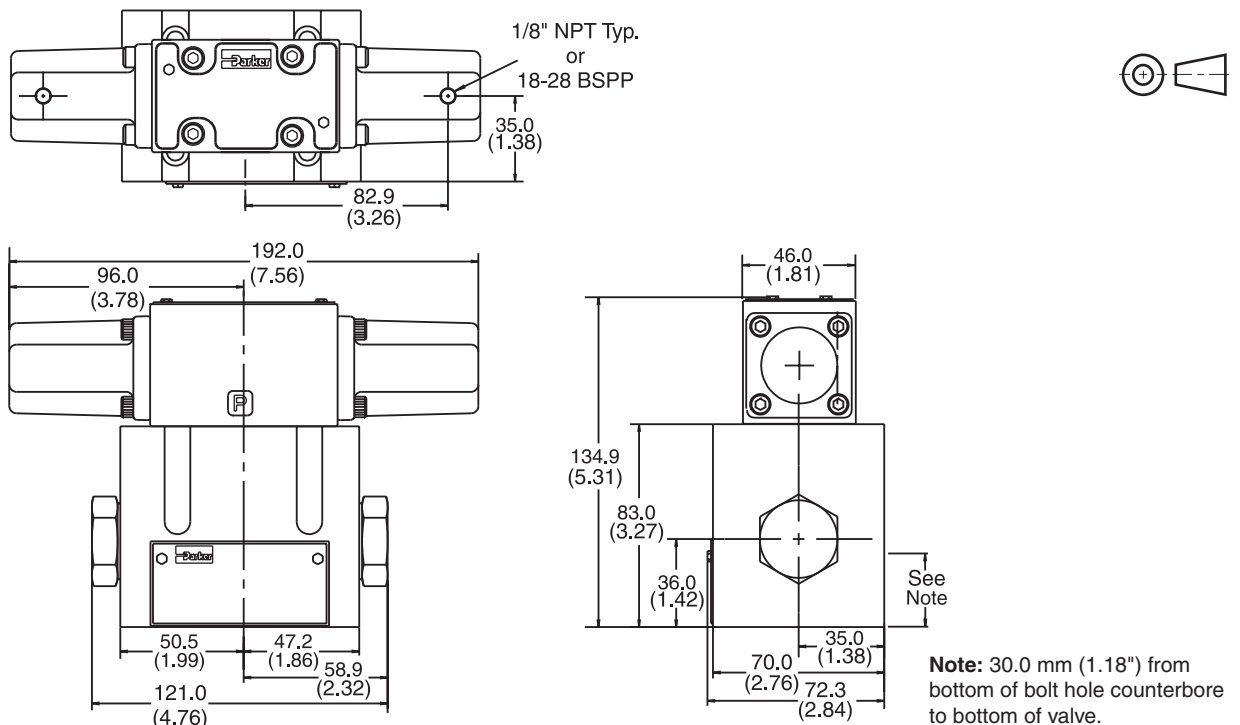
**Metric Bolt Kit:**  
 BKM98

† 008 and 020 spools have closed crossover.  
 \* 009 and 030 spools have open crossover.

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

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

**Dimensions – Air Operated** Inch equivalents for millimeter dimensions are shown in (\*\*)



## General Description

**A**

Series D31\*L directional control valves are 5-chamber, pilot operated, lever controlled valves. The valves are suitable for manifold or subplate mounting.

## Features

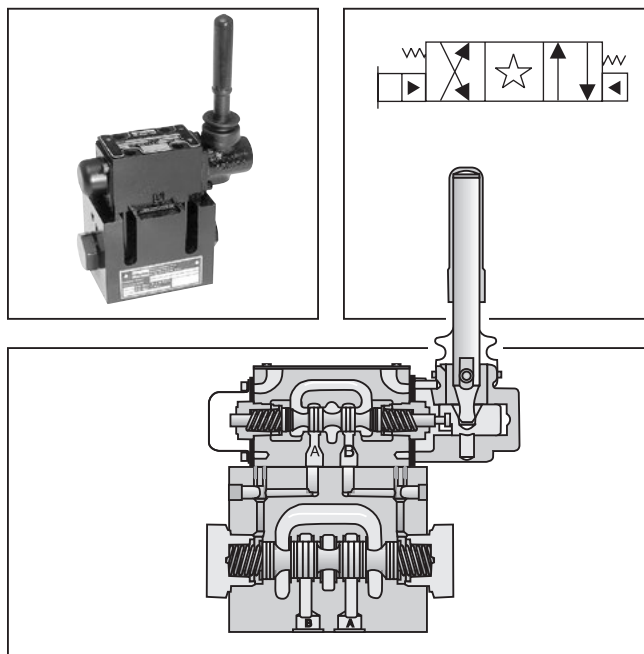
- **World design** – Available worldwide.
- **Mounting bolts below center line of spool** – Minimizes spool binding.
- **Five chamber style** – Eliminates pressure spikes in tubes, increasing valve life.
- **High pressure and flow ratings** – Increased performance options in a compact valve.

## Specifications

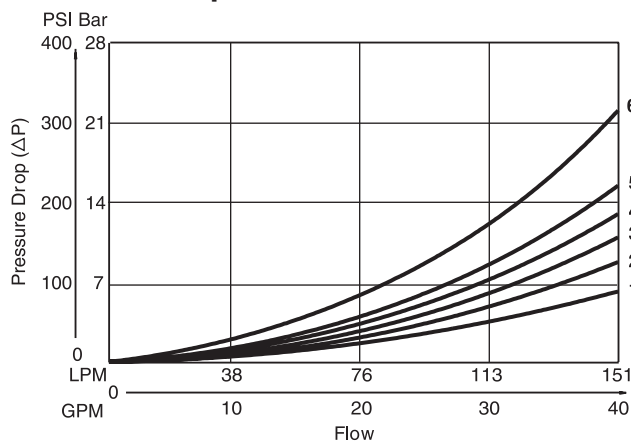
<b>Mounting Pattern</b>	NFPA D05H , CETOP 5 NFPA D05HE, CETOP 5H
<b>Max. Operating Pressure</b>	345 Bar (5000 PSI)
<b>Max. Tank Line Pressure</b>	Internal Drain Model: 34 Bar (500 PSI) External Drain Model: 207 Bar (3000 PSI)
<b>Maximum Flow</b>	See Switching Limit Charts
<b>Pilot Pressure</b>	Oil Min 6.9 Bar (100 PSI) Oil Max 345 Bar (5000 PSI)
<b>Max. Drain Pressure</b>	34 Bar (500 PSI)
<b>Response Time</b>	Varies with pilot line size and length, pilot pressure, pilot valve shift time & flow capacity (GPM)

Spool No.	Shifted				Center Condition							
	P-A	P-B	B-T	A-T	(P-T)	(B-A)	(A-B)	(P-A)	(P-B)	(A-T)	(B-T)	
001	3	3	2	1	–	–	–	–	–	–	–	
002	3	3	1	1	3	3	3	4	4	1	1	
004	3	3	1	1	–	–	–	–	–	1	1	
009	3	3	1	1	6	–	–	–	–	–	–	
020	5	4	2	2	–	–	–	–	–	–	–	
030	4	3	1	1	–	–	–	–	–	–	–	

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



## Pressure Drop Chart



### VISCOSITY CORRECTION FACTOR

Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (Approx.)	93	111	119	126	132	137	141

Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change as per chart.

## D31VL Pressure Drop vs. Flow

The chart to the left provides the flow vs. pressure drop curve reference for the D31VL Series valves by spool type.

**Example:** Find the pressure drop at 76 LPM (20 GPM) for a D31VL with a number 001 spool. To the right of spool number 001, locate the number 3 in the P-A column, and 2 in the B-T column.

Using the top graph, locate curves 2 and 3 and read the pressure drop values. Total pressure drop through the valve is the sum of the two values.



**Ordering Information**

<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto; display: flex; align-items: center; justify-content: center; font-weight: bold;">D</div> Directional Control Valve	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> Basic Valve	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto; display: flex; align-items: center; justify-content: center; font-weight: bold;">L</div> Lever Operated Pilot	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> Spool	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> Style	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> Pilot Supply and Drain	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> Seal	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> Valve Variations	<div style="border: 1px dashed black; width: 20px; height: 20px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; width: 10px; height: 10px;"></div> </div> Design Series NOTE: Not required when ordering.
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Code	Description
31D	NFPA D05HE, CETOP 5H (ISO)
31V	NFPA D05H, CETOP 5

Code	Description
1	Int. pilot/Ext. drain
2	Ext. pilot/Ext. drain
4#	Int. pilot/Int. drain
5	Ext. pilot/Int. drain

# Not available with 002, 008 & 009 spools.

Code	Description	Symbol
001		
002		
004		
008**		
009*		
020**		
030*		

Code	Description	Symbol
B†	Sgl. operator, 2 position, spring offset. P to A and B to T in offset position.	
C	Dbl. operator, 3 position, spring centered.	
D†	Dbl. operator, 2 position, detent.	
E	Sgl. operator, 2 position, spring centered. P to B and A to T in shifted position.	
H†	Sgl. operator, 2 position, spring offset. P to B and A to T in offset position.	
K	Sgl. operator, 2 position. Spring centered. P to A and B to T in shifted position.	

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator A. Note operators reverse sides for #008 and #009 spools. See installation information for details.

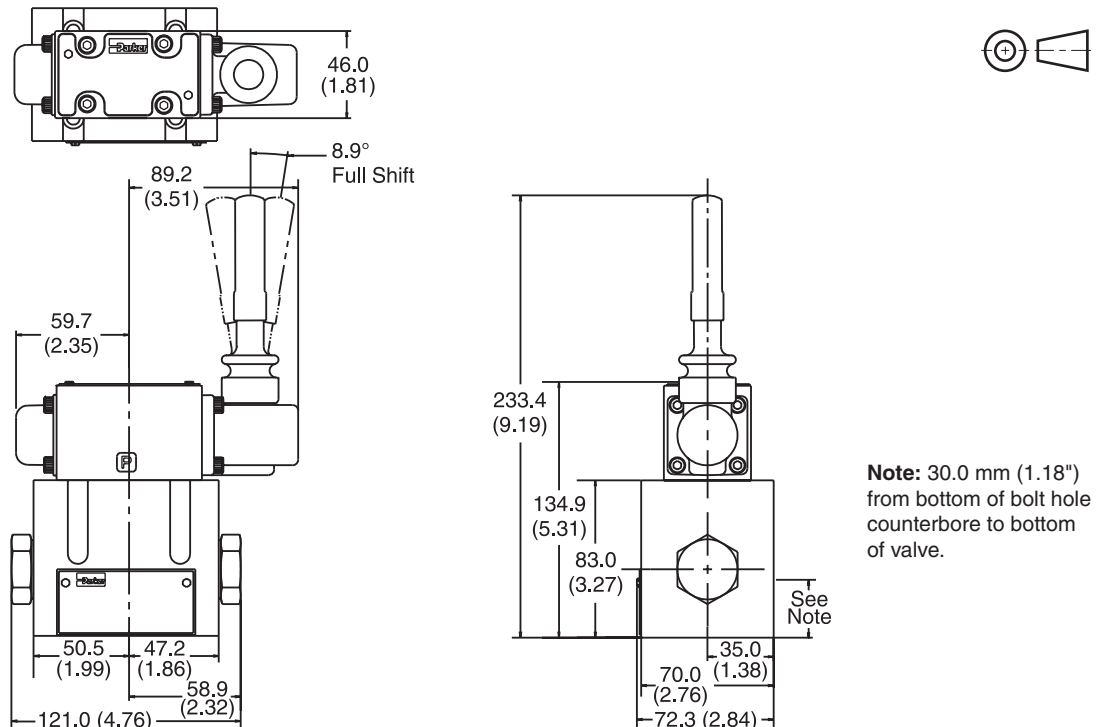
\* 009 and 030 spools have open crossover.  
 \*\* 008 and 020 spools have closed crossover.

**Valve Weight:** 5.4 kg (12.0 lbs.)  
**Standard Bolt Kit:** BK98  
**Metric Bolt Kit:** BKM98

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

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

**Dimensions – Lever Operated** Inch equivalents for millimeter dimensions are shown in (\*\*)



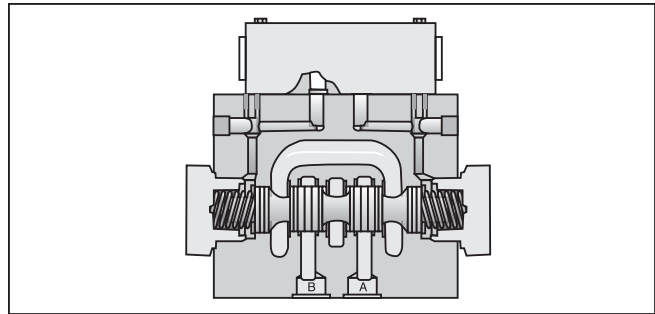
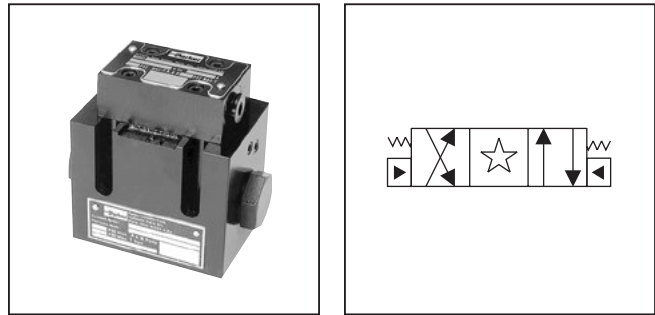


**General Description**

Series D3\*P directional control valves are 5-chamber, oil pilot operated valves. The valves are suitable for manifold or subplate mounting.

**Features**

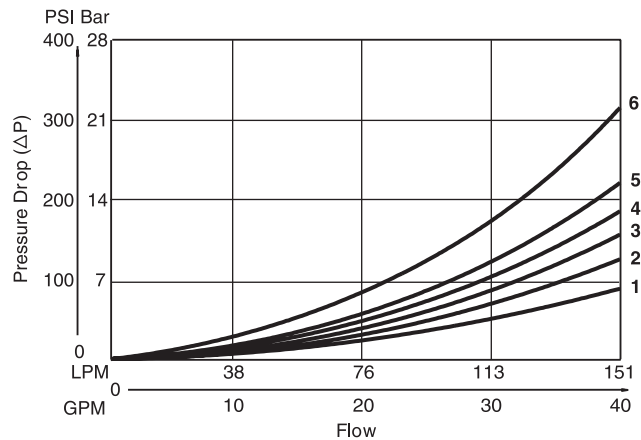
- **World design** – Available worldwide.
- **Mounting bolts below center line of spool** – Minimizes spool binding.
- **High pressure and flow ratings** – Increased performance options in a compact valve.



**Specifications**

<b>Mounting Pattern</b>	NFPA D05H , CETOP 5 NFPA D05HE, CETOP 5H
<b>Max. Operating Pressure</b>	345 Bar (5000 PSI)
<b>Max. Tank Line Pressure</b>	207 Bar (3000 PSI)
<b>Pilot Pressure</b>	Oil Min: 6.9 Bar (100 PSI) Oil Max: 345 Bar (5000 PSI)
<b>Response Time</b>	Varies with pilot line size and length, pilot pressure, pilot valve shift time & flow capacity (GPM)

**Pressure Drop Chart**



D3P Pressure Drop Reference Chart – Curve Number											
Spool No.	Shifted				Center Condition						
	P-A	P-B	B-T	A-T	(P-T)	(B-A)	(A-B)	(P-A)	(P-B)	(A-T)	(B-T)
1	3	3	2	1	–	–	–	–	–	–	–
2	3	3	1	1	3	3	3	4	4	1	1
4	3	3	1	1	–	–	–	–	–	1	1
9	3	3	1	1	6	–	–	–	–	–	–
20	5	4	2	2	–	–	–	–	–	–	–
30	4	3	1	1	–	–	–	–	–	–	–

VISCOSITY CORRECTION FACTOR							
Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (Approx.)	93	111	119	126	132	137	141

Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change as per chart.

**D3P Pressure Drop vs. Flow**

The chart to the left provides the flow vs. pressure drop curve reference for the D3P Series valves by spool type.

**Example:** Find the pressure drop at 76 LPM (20 GPM) for a D3P with a number 1 spool. To the right of spool number 1, locate the number 3 in the P-A column, and 2 in the B-T column.

Using the top graph, locate curves 2 and 3 and read the pressure drop values. Total pressure drop through the valve is the sum of the two values.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).







**Ordering Information**

<b>D</b> Directional Control Valve	<b>P</b> Hydraulic Pilot	<b>Code</b> <b>Description</b> 3D NFPA D05HE, CETOP 5H 3 NFPA D05H, CETOP 5	<b>Code</b> <b>Description</b> N Nitrile V Fluorocarbon	<b>Code</b> <b>Description</b> 7 Pilot Choke – Meter Out 8 Stroke Adj. 'B' End 9 Stroke Adj. 'A' End 60 Pilot Choke – Meter In 89 Stroke Adj. 'A' & 'B' Ends
Basic Valve	Spool	<b>Code</b> <b>Description</b> 001 002 004 008** 009*	<b>Code</b> <b>Description</b> 2 Ext. pilot/Ext. drain 5# Ext. pilot/Int. drain	
	Style	<b>Code</b> <b>Description</b> 020** 030*	<b>Code</b> <b>Description</b> # Available on "B" style only.	
	Pilot Supply and Drain		<b>Code</b> <b>Description</b> B† Single operator, 2 position, spring offset. P to A and B to T in offset position. C Double operator, 3 position, spring centered. H† Single operator, 2 position, spring offset. P to B and A to T in offset position.	<b>Code</b> <b>Description</b> † Only spools 20 and 30.
	Seal		<b>Code</b> <b>Description</b> † Only spools 20 and 30.	<b>Code</b> <b>Description</b> This condition varies with spool code.
	Valve Variations		<b>Code</b> <b>Description</b> B† Single operator, 2 position, spring offset. P to A and B to T in offset position. C Double operator, 3 position, spring centered. H† Single operator, 2 position, spring offset. P to B and A to T in offset position.	<b>Code</b> <b>Description</b> This condition varies with spool code.

**Valve Weight:**  
 Single Operator 1.4 kg (3.0 lbs.)  
 Double Operator 1.6 kg (3.5 lbs.)

**Standard Bolt Kit:** BK98  
**Metric Bolt Kit:** BKM28  
**Seal Kit:**  
 Nitrile SKD3P  
 Fluorocarbon SKD3PV

† Only spools 20 and 30. This condition varies with spool code.

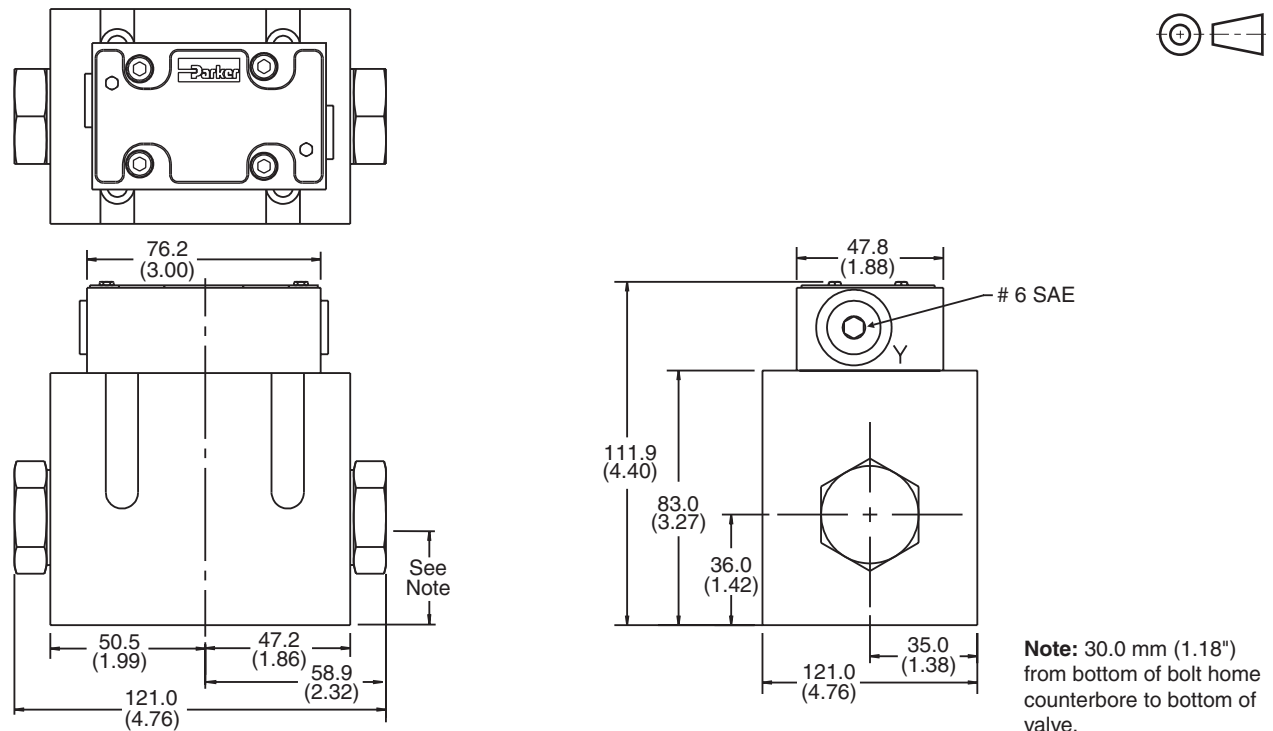
Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator X. Note operators reverse sides for #8 and #9 spool. See installation information for details.

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

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

**Dimensions – Oil Operated**

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



**A**

FOR MAXIMUM VALVE RELIABILITY, ADHERE TO THE FOLLOWING INSTALLATION INFORMATION.

The following is important installation information which applies to all directional control valves described in this catalog.

**Mounting Position**

- Detent – Horizontal
- Spring Offset – Unrestricted
- Spring Centered – Unrestricted

**Fluid Recommendations**

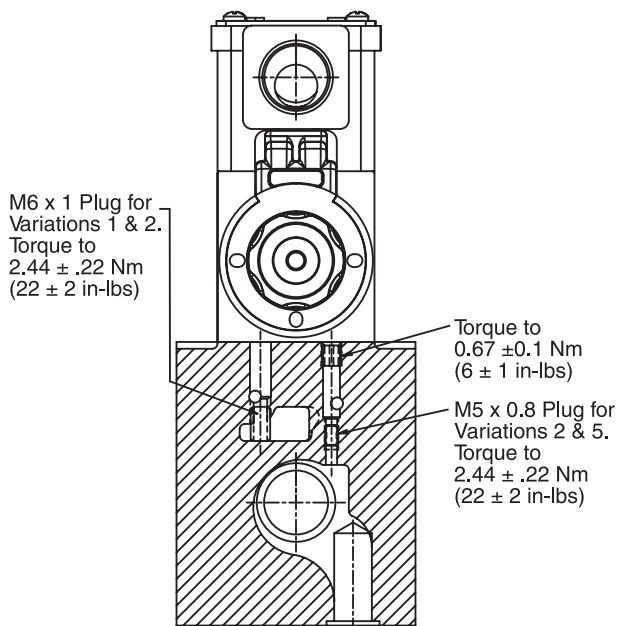
Premium quality hydraulic oil with a viscosity range between 32-54 cst. (150-250 SSU) At 38°C (100°F) is recommended. The absolute operating viscosity range is from 16-220 cst. (80-1000 SSU). Oil should have maximum anti-wear properties and rust and oxidation treatment.

**Fluids and Seals**

Valves using synthetic, fire-resistant fluids require special seals. When phosphate esters or its blends are used, FLUOROCARBON seals are required. Water-glycol, water-in-oil emulsions and petroleum oil may be used with STANDARD seals.

**Filtration**

For maximum valve and system component life, the system should be protected from contamination at a level not to exceed 125 particles greater than 10 microns per milliliter of fluid (SAE class 4/ISO 16/13).



**Silting**

Silting can cause any sliding spool valve to stick and not spring return if held under pressure for long periods of time. The valve should be cycled periodically to prevent sticking.

**Special Installations**

Consult your Parker representative for any application requiring the following:

- Pressure above rating.
- Fluid other than those specified.
- Oil temperature above 71.1°C (160°F).
- Flow path other than normal.

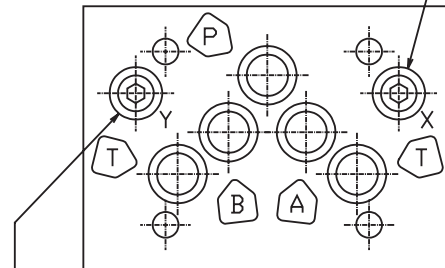
**Mounting Patterns**

Series	NFPA	Size
D31V*, D3P	D05H, CETOP 5	3/8"
D31D*, D3DP, D31NW	D05HE, CETOP 5H	3/8"

**Torque Specifications**

The recommended torque values for the bolts which mount the valve to the manifold or subplate are as follows: 16.3 Nm (12 ft-lb).

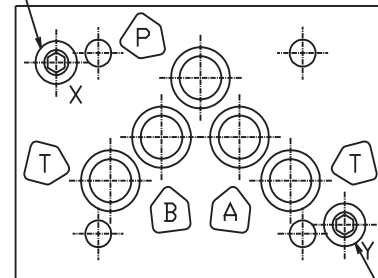
1/16 Pipe Plug for Variations 1 & 4  
Torque to: 11.67 ± 1.67 Nm (105 ± 15 in-lbs)



1/16 Pipe Plug for Variations 4 & 5  
Torque to: 11.67 ± 1.67 Nm (105 ± 15 in-lbs)

**NFPA D05HE, CETOP 5H Pattern D31DW**

1/16 Pipe Plug for Variations 1 & 4  
Torque to: 11.67 ± 1.67 Nm (105 ± 15 in-lbs)



1/16 Pipe Plug for Variations 4 & 5  
Torque to: 11.67 ± 1.67 Nm (105 ± 15 in-lbs)

**NFPA D05H, CETOP 5 Pattern D31VW**

**SERIES D31\*W, D31\*A, D31\*L  
PILOT OPERATED,  
DIRECTIONAL CONTROL VALVES**

**Tank and Drain Line Surges**

If several valves are piped with a common tank or drain line, flow surges in the line may cause an unexpected spool shift. No spring style valves are most susceptible to this. Separate tank and drain lines should be piped in installations where line surges are expected.

**Electrical Failure or  
Loss of Pilot Pressure (D31\*A)**

Should electric power fail or loss of pilot pressure occur, spring offset and spring centered valves will shift to the spring held position. Detented valves will stay in the last position held before power failure. If main flow does not fail or stop at the same time power fails, machine actuators may continue to function in an undesirable manner or sequence.

**Electrical Characteristics  
(Detented Spool)**

Only a momentary energizing of the solenoid is necessary to shift and hold a detented spool. Minimum duration of the signal is 0.1 seconds for DC voltages. For AC voltages the response time is 0.06 seconds. Spool position will be held provided the spool centerline is in a horizontal plane, and no shock or vibration is present to displace the spool.

**Pilot/Drain Characteristics**

**Pilot Pressure:** 6.9 to 345 Bar (100 to 5000 PSI)

**External:** An oil source sufficient to maintain minimum pilot pressure must be connected to the “X” port of the main body. When using the external pilot variation, an

M5 x 0.8 x 6mm long set screw must be present in the main body pilot passage. (For details see Dimension pages.) This plug will be furnished in valves ordered with pilot code 2 or 5.

**Internal:** Flow is internally ported from the pressure port of the main valve body to the “P” port of the pilot valve. The pressure developed at the “P” port of the pilot valve must be 100 PSI (6.9 Bar) minimum at all times.

If the valve center condition allows flow from pressure to tank, 100 PSI (6.9 Bar) back pressure must be developed in the tank line to ensure sufficient pilot force at “P”. The “X” port in subplate must be plugged when using internal pilot variation (1/16 NPT).

**Pilot Valve Drain:**

Maximum pressure 102 Bar (1500 PSI), 207 Bar (3000 PSI) optional.

**External:** When using an external drain, an M6 x 1 x 10 mm long set screw must be present in the main body drain passage. (For details see Dimension pages.) This plug will be furnished in valves ordered with drain code 1 or 2.

Drain flow from the pilot valve is at the “Y” port of the main body and must be piped directly to tank. Maximum drain line pressure is 102 Bar (1500 PSI), 207 Bar (3000 PSI) optional. Any drain line back pressure is additive to the pilot pressure requirement.

**Internal:** Drain flow from the pilot valve is internally connected to the main valve tank port. Tank and drain pressure are then identical so tank line pressure should not exceed 102 Bar (1500 PSI), 207 Bar (3000 PSI) optional. Any tank line back pressure is also additive to the pilot pressure requirement. If flow surges (a cause of pressure surges) are anticipated in the tank line, an external drain variation is recommended. The “Y” port in subplate must be plugged when using internal drain variations.

**D31\*W, D31\*A, D31\*L Flow Paths**

Style Code	Description	No Solenoid/Operator Energized	Solenoid/Operator A Energized	Solenoid/Operator B Energized
B	Spring Offset	P→A and B→T	—	P→B and A→T
C	Spring Centered	Centered	P→A and B→T	P→B and A→T
D	Detented	Last Position Held	P→A and B→T	P→B and A→T
E	Spring Centered	Centered	—	P→B and A→T
F†	Spring Offset, Shift to Center	P→A and B→T	—	Centered
H	Spring Offset	P→B and A→T	P→A and B→T	—
K	Spring Centered	Centered	P→A and B→T	—
M†	Spring Offset, Shift to Center	P→B and A→T	Centered	—

† D31\*W only.

**A**

**SERIES D3P, D3DP PILOT OPERATED  
 DIRECTIONAL CONTROL VALVES**

**Tank and Drain Line Surges**

If several valves are piped with a common tank or drain line, flow surges in the line may cause an unexpected spool shift. Separate tank and drain lines should be piped in installations where line surges are expected.

**Loss of Pilot Pressure**

Should oil pilot pressure fail, spring offset and spring centered valves will shift to the spring held position. Detented valves will stay in the last position held before power failure. If main flow does not fail or stop at the same time power fails, machine actuators may continue to function in an undesirable manner or sequence.

**Mounting Pattern**

D3P valves may be mounted on a standard D05 pattern subplate or manifold only if the “X” and “Y” ports are externally connected to the pilot block on top of the main body. All other mounting styles require a D05H or D05HE pattern which incorporates ports for the “X” and “Y” pilot and drain passages. Location of these ports can be found on the Recommended Mounting Surface pages in this section.

**Pilot Drain Characteristics**

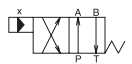
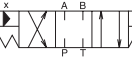

Pilot Pressure: 6.9 to 345 Bar (100 to 5000 PSI)

Direct pilot operated valves use the “X” and “Y” ports to supply pilot oil directly to the ends of the spool, providing spool shifting force. A block mounted on top of the valve body is internally cored to make the necessary connections. Thus when “X” is pressurized, “Y” is used as a drain; and when “Y” is pressurized, “X” becomes the drain.

Any back pressure in these lines when they are being used as a drain is additive to the pilot pressure requirement.

**Internal Drain:** On spring offset models, only the “X” port is pressurized, as the spring returns the spool to its at rest position. On these models, “Y” may be internally drained through the main tank passage in the valve.

**D3P Flow Path/Pilot Pressure**

Style Code	Description	“X” & “Y” De-Pressurized	“X” Port Pressurized	“Y” Port Pressurized	Special Notes	Recommended Control Valve For Pilot Oil
B	Two Position Spring Offset	P→A, B→T	P→A, B→T	P→B, A→T	“X” Port may be pressurized to assist spring in returning spool to offset position (ext. only)	
C	Three Position Spring Centered	Center	P→A, B→T	P→B, A→T	Flow paths will be reversed on valves with tandem center (8) spools	
H	Two-Position Spring Offset	P→B, A→T	P→A, B→T	P→B, A→T	“Y” Port may be pressurized to assist spring in returning spool to offset position	

**Series D31VW, D31VA, D31VL, D3P**  
**Subplate Mounting**  
**NFPA D05H, CETOP 5**



**Recommended Mounting Surface**

Surface must be flat within .102 mm (0.0004 inch) T.I.R and smooth within 812.8 micro-meters (32 micro-inch). Torque bolts to 16.3 Nm (12 ft-lbs).

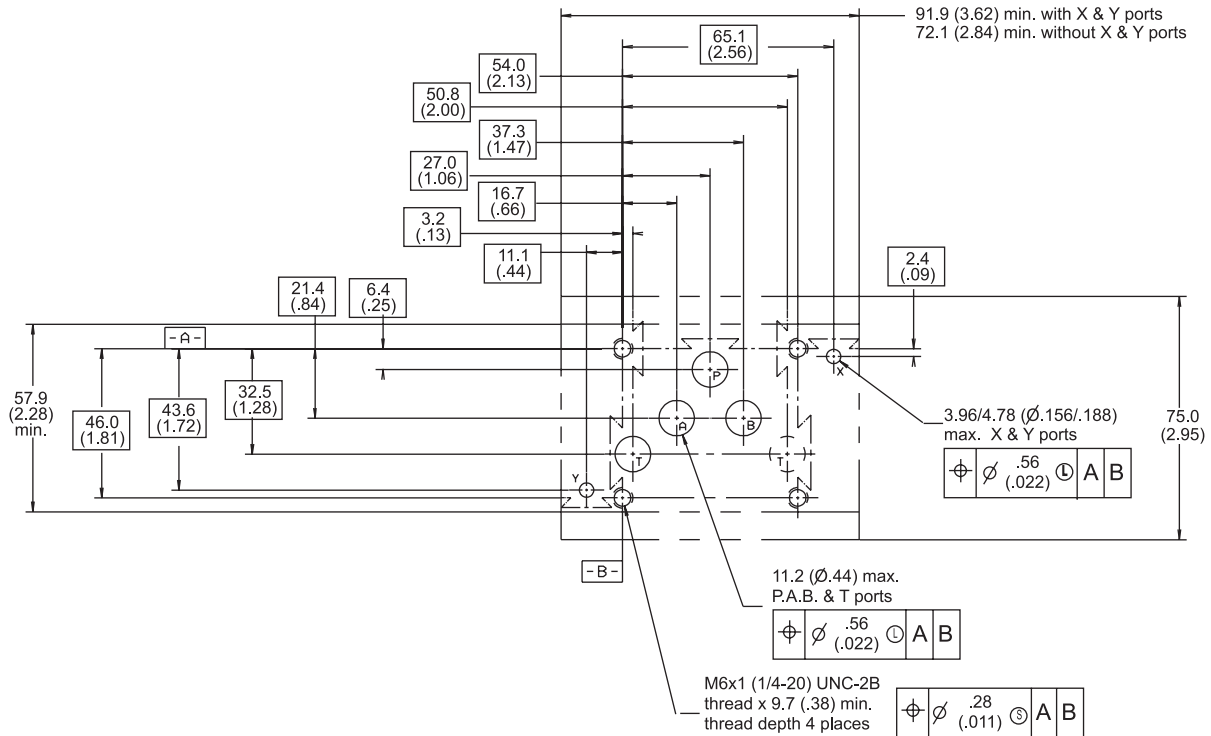
***For maximum valve reliability, adhere to the following installation information.***

**Mounting Position**

Valve Type	Mounting Position
Detent (Solenoid)	Horizontal
Spring Offset	Unrestricted
Spring Centered	Unrestricted

**Mounting Pattern — NFPA D05H, CETOP 5**

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



**Series D31DW, D31DA, D31DL, D3DP, D31NW**  
**Subplate Mounting**  
**NFPA D05HE, CETOP 5H**

**A**

**Recommended Mounting Surface**

Surface must be flat within .102 mm (0.0004 inch) T.I.R. and smooth within 812.8 micro-meters (32 micro-inch). Torque bolts to 16.3 Nm (12 ft-lbs).

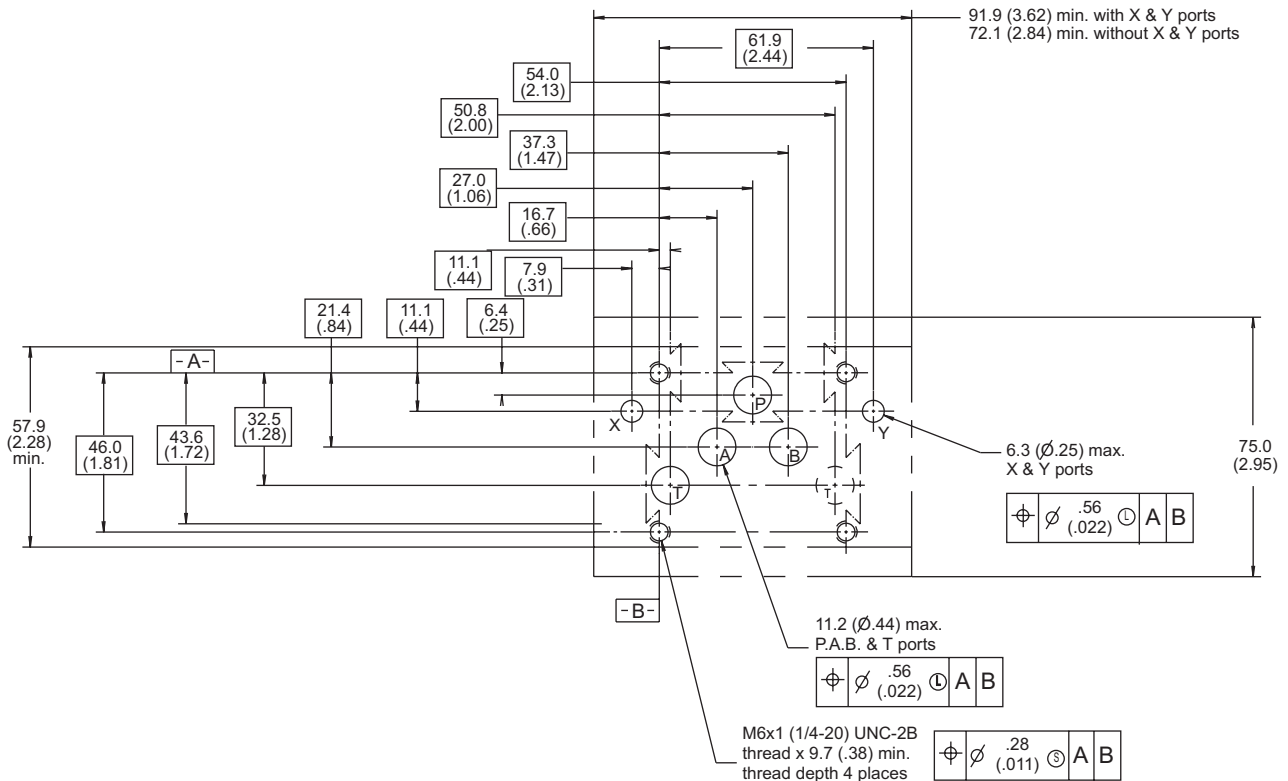
***For maximum valve reliability, adhere to the following installation information.***

**Mounting Position**

Valve Type	Mounting Position
Detent (Solenoid)	Horizontal
Spring Offset	Unrestricted
Spring Centered	Unrestricted

**Mounting Pattern — NFPA D05HE, CETOP 5H**

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





**A****Application**

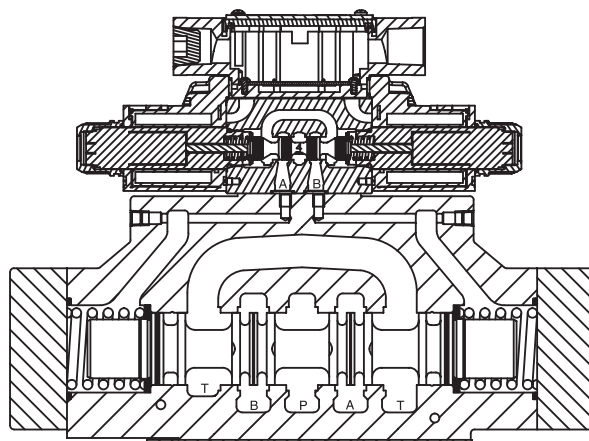
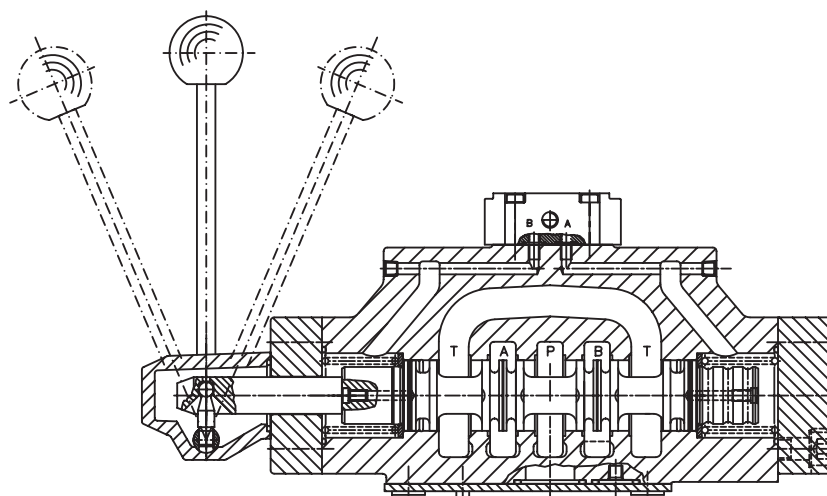
Series D41 hydraulic directional control valves are high performance, solenoid controlled, pilot operated, 2-stage, 4-way valves. They are available in 2 or 3 position styles and are manifold mounted. These valves conform to NFPA's D07, CETOP 7 mounting patterns.

**Operation**

Series D41 directional valves consist of a 5-chamber style main body, a case hardened sliding spool, and a pilot valve or oil pilot operator.

**Features**

- Easy access mounting bolts.
- 345 Bar (5000 PSI) pressure rating.
- Flows to 300 LPM (79.4 GPM) depending on spool.
- Choice of three operator styles.
- Rugged four land spools.
- Low pressure drop.
- Phosphate finish.

**D41VW Solenoid Operated Plug-In Conduit Box****D4L Lever Operated**

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

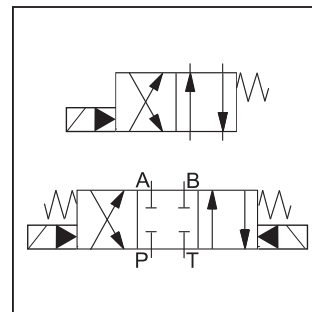


### General Description

Series D41VW valves are piloted by a D1VW valve. The valves can be ordered with position control.

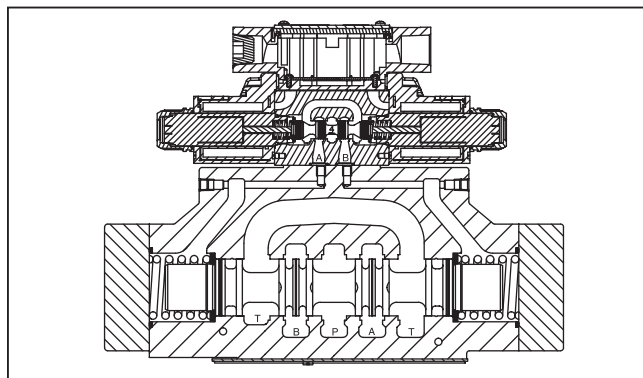
The minimum pilot pressure must be ensured for all operating conditions of the directional valve.

Additionally spools with a P to T connection in the de-energized position need an external pressure supply (external inlet) or an integral check valve.



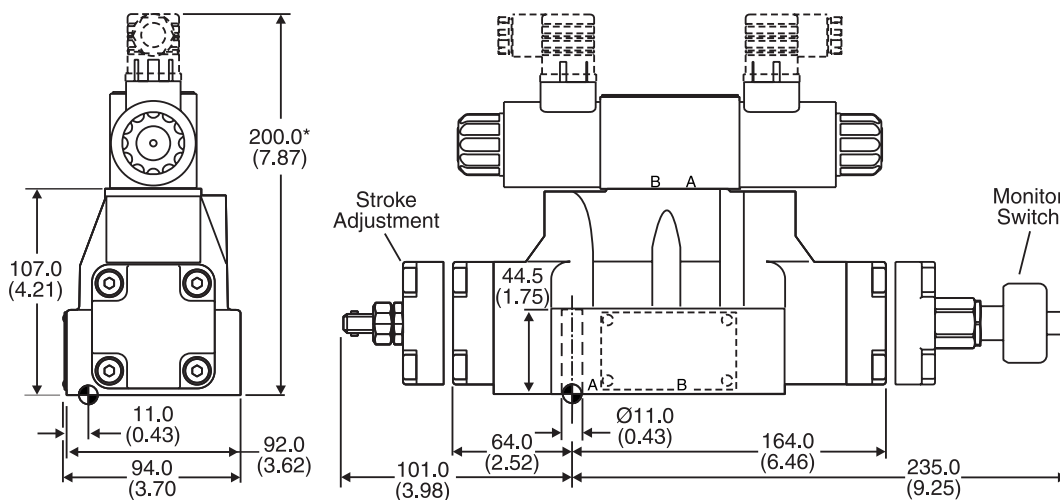
### Features

- **World design** – Available worldwide.
- **Mounting bolts below center line of spool** – Minimizes spool binding.
- **Five chamber style** – Eliminates pressure spikes in tubes, increasing valve life.
- **High pressure and flow ratings** – Increased performance options in a compact valve.



### Dimensions

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



\* Please add for each sandwich plate +40 mm (1.58") (pressure reducing valve, pilot choke valve meter-in/-out).

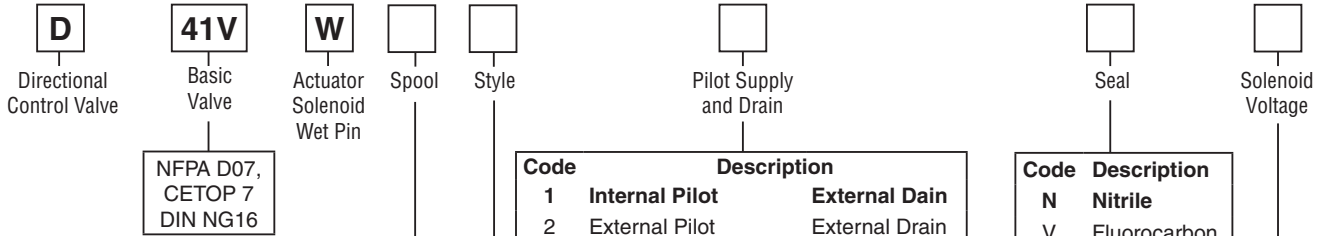


Surface Finish	Kit	Kit	Kit	Seal Kit
$\sqrt{R_{max}6.3}$ $\downarrow$ $\square 0.01/100$	BK320	4x M10x60 2x M6x55 ISO 4762-12.9	63 Nm (46.5 lb.-ft.) 13.2 Nm (9.7 lb.-ft.) ±15%	<b>Nitrile: SK-D41VW-N-91</b> Fluorocarbon: SK-D41VW-V-91

The space necessary to remove the plug per EN 175301-803, design type AF is at least 15 mm (0.59"). The torque for the screw M3 of the plug has to be 0.5 Nm (0.37 lb.-ft.) to 0.6 Nm (0.44 lb.-ft.).

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**A**



Code	Description
<b>1</b>	<b>Internal Pilot External Drain</b>
2	External Pilot External Drain
3	Internal w/ Check External Drain
<b>4*</b>	<b>Internal Pilot Internal Drain</b>
5	External Pilot Internal Drain
6	Internal Pilot w/ Check Internal Drain

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

\* Not available with 002, 009, or 030 spools.

3-Position Spools	
Code	Spool Type
	a 0 b
<b>001</b>	
002	
003	
<b>004</b>	
006†	
009**	
011	
015	
021	
022	

2-Position Spools	
Code	Spool Type
	a b
<b>020*</b>	
030**	

† Not available with Monitor Switch.  
 \* 020 spool has closed crossover.  
 \*\* 090 & 030 spools have an open crossover

3-Position Spools		
Code	All 3-Position Spools	
<b>C</b>		<b>3 positions. Spring offset in position "0". Operated in position "a" or "b".</b>
	<b>Standard</b>	<b>Spool Type 009</b>
E		
	Operated in position "a".	Operated in position "b".
F		
	Spring offset in position "b".	Spring offset in position "a".
K		
	Operated in position "b".	Operated in position "a".
M		
	Spring offset in position "a".	Spring offset in position "b".
R		
	No center in offset position.	No center in offset position.
S		
	No center in offset position.	No center in offset position.

Code	Description
D†#	120 VDC
E*	24/60 - 24/50 VAC
<b>J</b>	<b>24 VDC</b>
<b>K#**</b>	<b>12 VDC</b>
Q††#	100/60 VAC
QD††#	100 VAC/60 Hz - 100 VAC/50 Hz
T^^	<b>240/60 - 220/50 VAC</b>
U***#	98 VDC
<b>Y</b>	<b>120/60 - 110/50 VAC</b>

# High watt only.  
 \* Leadwire only, low watt only.  
 \*\* DIN, low watt available.  
 \*\*\* Leadwire not available.  
 ^^ Plug-in is low watt only.  
 † DIN & Leadwire only.  
 †† DIN only.

2-Position Spools		
Code	Spool Position	
<b>B*</b>		<b>Spring offset in position "b". Operated in position "a".</b>
D		Detent, operated in position "a" or "b". No center or offset position.
H		Spring offset in position "a". Operated in position "b".

**Weight:**  
 Single Solenoid: 9.7 kg (21.4 lbs.)  
 Double Solenoid: 10.3 kg (22.7 lbs.)

\* 020 & 030 spools only.

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

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



Solenoid Connection

Coil Options

Tube Options

Manual Override Options

Electrical Options

Shift Indication

Approvals

Valve Variations

Design Series

Monitor Switch Cover

NOTE:  
Not required when ordering.

Code	Description
<b>C*</b>	<b>Leadwire Conduit Box</b>
D**	Metric Plug (M12X1) DESINA
E†	Explosion Proof
F <sup>x</sup>	Flying Leadwire
<b>G††</b>	<b>Plug-In Conduit Box</b>
<b>J++</b>	<b>Deutsch (DT04-2P)</b>
<b>P</b>	<b>DIN with Plug</b>
S‡	Double Spade
<b>W†</b>	<b>DIN w/o Plug</b>

- \* No conduit box variations – See Plug-in.
- \*\* 24 VDC only, low watt only, lights, diode surge suppressor, not CSA approved.
- † Not available with lights.
- †† Required for variations on conduit box style, must have lights.
- ++ 12 and 24 VDC only.
- ‡ Only 12 VDC high watt.
- x 6" leadwire only.

Code	Description
<b>Omit</b>	<b>No Options</b>
J#	Diode Surge Suppressor
Z†	Rectified Coil

- # **Plug-In** – 24 VDC only. **DIN** – DC only with Lighted Plug (5), which has integrated Surge Suppression. "J" not required here. **Deutsch** – as follows:
  - 12 VDC Hi watt only
  - 24 VDC Hi & Lo watt**24 VDC "JER"** required. "JET" available. Adds dust rating, not polarity sensitive [IIC, D]. **Leadwire** – not available
- † DC tube standard, Plug-In conduit box only. Not polarity sensitive. Only available with Y voltage.

See next page

Code	Description
<b>Omit</b>	<b>Standard Valve</b>
<b>4†#</b>	<b>CSA Canada CSA22.2 No. 139-13</b>
<b>N</b>	<b>CE Approved</b>
<b>Q†#</b>	<b>CE + CSA Approved</b>

- † Not available with AC high pressure tube.
- # Valve is derated.

Code	Description
<b>Omit</b>	<b>No Variation</b>
4B	Monitor Switch Cover

Code	Description
<b>Omit*</b>	<b>High watt</b>
D**	Explosion Proof, EExd ATEX
E**	Explosion Proof, EExme ATEX, IECEx, from Germany
F†	Low Watt
L††	10 Watt
R#	Explosion Proof, ATEX/UL/CSA/IECEX, configurable cable connection
T#	Explosion Proof ATEX/UL/CSA/IECEX, fixed horizontal cable connection
U##	Explosion Proof, UL/CSA

- \* AC ambient temperature must not exceed 60°C (140°F).
- \*\* J voltage only, no options.
- † AC only.
- †† DC and AC rectified only.
- # J and Y voltages only. Y voltage is rectified.
- ## J and Y voltages only. Y voltage is not rectified.

Code	Spool Position	Position Control
<b>Omit</b>	All	Standard response
I3N	C	End position monitored, side A and B
I6N		Start position monitored, side A and B
I2N	C, B, E, F (all spools)	End position monitored, side B
I5N	C, K, M (spool 9)	Start position monitored, side B
I1N	C, H, K, M (all spools)	End position monitored, side A
I4N	C, E, F (spool 9)	Start position monitored, side A

Note: The plug M12 x 1 for the position control is included. The monitor switch has to be located on the side to which the spool moves from the spring offset position. For 4/3-way valves two switches are required. Not CSA approved.  
**DC DIN, high watt coils only.**

Code	Description
<b>Omit</b>	<b>Standard</b>
P*	Extended Manual Override with Boot
T	Covered Manual Override, DC only, or AC Rectified

- \* Manual override options not available on Explosion Proof or soft shift. Not available with high pressure AC tube H.

Code	Description
<b>Omit</b>	<b>Standard Pressure</b>
	<b>103.5 Bar (1500 PSI) AC</b>
	<b>207 Bar (3000 PSI) DC</b>
<b>H*</b>	<b>High Pressure, AC only</b>
	<b>207 Bar (3000 PSI)</b>

- \* Not available with CSA or Explosion Proof.

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

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



**Valve Variations**

**A**

**OPTIONS ARE NOT AVAILABLE ON MONITOR SWITCH VALVES.**

Code	Description
<b>5*</b>	<b>Signal Lights – Standard</b>
	<b>Signal Lights – Hirsch. (DIN with Plug) (the DC Lighted Plug has Integral Surge Suppression)</b>
7B**	Manaplug – Brad Harrison (12x1) Micro with Lights
<b>56**</b>	<b>Manaplug (Mini) with Lights</b>
<b>1C**</b>	<b>Manaplug (Mini) Single Sol. 5-pin, with Lights</b>
1D**	Manaplug (Micro) Single Sol. 5-pin, with Lights
1M**	Manaplug Opposite Normal
1R	Stroke Adjust 'A' & 'B' End with Pilot Choke Meter In
<b>3A</b>	<b>Pilot Choke Meter Out</b>
<b>3B</b>	<b>Pilot Choke Meter In</b>
<b>3C</b>	<b>Pilot Pressure Reducer</b>
3D	Stroke Adjust 'B' End
3E	Stroke Adjust 'A' End
3F	Stroke Adjust 'A' & 'B' End
<b>3G*</b>	<b>Pilot Choke Meter Out with Lights</b>
<b>3H*</b>	<b>Pilot Choke Meter In with Lights</b>
3J*	Pilot Pressure Reducer with Lights
3K	Pilot Choke Meter Out with Stroke Adjust 'A' & 'B' End
3L**	Pilot Choke Meter Out, Stroke Adjust 'A' & 'B' End with Lights and Manaplug — Brad Harrison Mini
3M	Pilot Choke Meter Out, Pilot Pressure Reducer, Stroke Adjust 'A' & 'B' End
3R	Pilot Choke Meter Out & Pilot Pressure Reducer
3S**	Lights, Mini Manaplug, Pilot Choke Meter Out
7Y**	M12x1 Manaplug (4-pin), Special Wiring, and Lights

\* DESINA, plug-in conduit box, and DIN with plug styles only.

\*\* Must have plug-in style conduit box.

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

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

**Solenoid Ratings**

<b>Insulation System</b>	Class F
<b>Allowable Deviation from rated voltage</b>	-10% to +10% for DC and AC rectified coils -5% to +5% for AC Coils
<b>Armature</b>	Wet pin type
<b>CSA File Number</b>	LR60407
<b>Environmental Capability</b>	DC Solenoids meet NEMA 4 and IP67 when properly wired and installed. Contact HVD for AC coil applications.

**Explosion Proof Solenoid Ratings\***

<b>U.L. &amp; CSA (EU)</b>	Class I, Div 1 & 2, Groups C & D Class II, Div 1 & 2, Groups E, F & G As defined by the N.E.C.
<b>ATEX (ED)</b>	Complies with ATEX requirements for: Ex d IIB Gb; EN60079-0:2012, EN60079-1:2007
<b>ATEX, IECEx &amp; CSA/US (ER, ET) (Tri-rated)</b>	Complies with IEC 60079-0:2011, IEC 60079-1:2007, IEC 60079-31:2013; Ex d IIC Gb; Ex tb IIIC Db IP66; IECEx BAS 14.0164X  ATEX: EN60079-0, EN60079-1, EN60079-31; CE 1180 Ex II 2G BASEEFA08ATEX0041X  CSA 22.2 No. 60079-0:07, 60079-1:07 and UL 60079-0:05, UL 60079-1:05; CSA listed to US and Canada Safety Standards. File 08-CSA-1932102  CSA Ex d IIC, AEx d IIC for Class I Zone 1; Class I Div 1 Grp. C & D; Class II Div 1 Grp. E, F & G



\* Allowable Voltage Deviation ±10%.

Code		Voltage	In Rush Amps Amperage	In Rush VA	Holding Amps @ 3 mm	Watts	Resistance
Voltage Code	Power Code						
D	Omit	120 VDC	N/A	N/A	0.26 Amps	30 W	528.00 Ohms
E	F	24 VAC	4.8 AMPS	120 VA	2.07 Amps	21 W	1.29 Ohms
J	L	24 VDC	N/A	N/A	0.44 Amps	10 W	51.89 Ohms
J	Omit	24 VDC	N/A	N/A	1.32 Amps	30 W	17.27 Ohms
K	L	12 VDC	N/A	N/A	0.88 Amps	10 W	12.97 Ohms
K	Omit	12 VDC	N/A	N/A	2.64 Amps	30 W	4.32 Ohms
Q	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	0.77 Amps	30 W	19.24 Ohms
QD	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	.77 Amps	30 W	19.24 Ohms
T	Omit	240/60 VAC	0.83 Amps	199 VA	0.30 Amps	30 W	120.40 Ohms
T	Omit	220/50 VAC	0.87 Amps	191 VA	0.34 Amps	30 W	120.40 Ohms
T	F	240/60 VAC, Low Watt	0.70 Amps	168 VA	0.22 Amps	21 W	145.00 Ohms
T	F	220/50 VAC, Low Watt	0.75 Amps	165 VA	0.26 Amps	23 W	145.00 Ohms
U	Omit	98 VDC	N/A	N/A	0.31 Amps	30W	288.00 Ohms
Y	Omit	120/60 VAC	1.7 Amps	204 VA	0.60 Amps	30 W	28.20 Ohms
Y	Omit	110/50 VAC	1.7 Amps	187 VA	0.68 Amps	30 W	28.20 Ohms
Y	F	120/60 VAC, Low Watt	1.40 Amps	168 VA	0.42 Amps	21 W	36.50 Ohms
Y	F	110/50 VAC, Low Watt	1.50 Amps	165 VA	0.50 Amps	23 W	36.50 Ohms
<b>Explosion Proof Solenoids</b>							
Y		120/60 VAC	1.60 Amps	192 VA	0.58 Amps	27 W	33.50 Ohms
J		24 VDC	N/A	N/A	1.38 Amps	33 W	17.33 Ohms
<b>Explosion Proof Solenoids (German)</b>							
J		24 VDC	N/A	N/A	1.0 Amps	24 W	24 Ohms
<b>ER &amp; ET Explosion Proof Solenoids</b>							
J		24 VDC	N/A	N/A	0.54 Amps	13 W	44.30 Ohms
Y		120/60 VAC	N/A	N/A	0.16 Amps	17 W	667.00 Ohms

**A**

General			
<b>Design</b>		Directional Spool Valve	
<b>Actuation</b>		Solenoid	
<b>Size</b>		NG16	
<b>Mounting Interface</b>		DIN 24340 A16 / ISO 4401 / NFPA D07 / CETOP RP 121-H	
<b>Mounting Position</b>		Unrestricted, preferably horizontal	
<b>Ambient Temperature</b>		[°C]	-25...+50; (-13°F...+122°F) (without inductive position control)
		[°C]	0...+50; (+32°F...+122°F) (with inductive position control)
<b>MTTF<sub>D</sub> Value</b>		[years]	75
Hydraulic			
<b>Maximum Operating Pressure</b>		Pilot drain internal: P, A, B, X 350 Bar (5075 PSI); T, Y 105 Bar (1523 PSI) Pilot drain external: P, A, B, T, X 350 Bar (5075 PSI); Y 105 Bar (1523 PSI) 10 Watt 207 Bar (3000 PSI)	
<b>Fluid</b>		Hydraulic oil in accordance with DIN 51524 / 51525	
<b>Fluid Temperature</b>		[°C]	-25 ... +70 (-13°F...+158°F)
<b>Viscosity Permitted</b>		[cSt]/[mm <sup>2</sup> /s]	2.8...400 (13...1854 SSU)
<b>Recommended</b>		[cSt]/[mm <sup>2</sup> /s]	30...80 (139...371 SSU)
<b>Filtration</b>		ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)	
<b>Flow Maximum</b>		300 LPM (79.4 GPM)	
<b>Leakage at 350 Bar (per flow path)</b>		[ml/min]	up to 200 (0.05 GPM) (depending on spool)
<b>Operating Pressure Integral Check Valve</b>		See p/Q Diagram	
<b>Minimum Pilot Supply Pressure</b>		5 Bar (73 PSI)	
Static / Dynamic			
<b>Step Response at 85%</b>		Energized	
		De-energized	
<b>DC Solenoids</b>	<b>Pilot Pressure</b>		
	50 Bar	[ms]	95
	100 Bar	[ms]	75
	250 Bar & 350 Bar	[ms]	60
<b>AC Solenoids</b>	<b>Pilot Pressure</b>		
	50 Bar	[ms]	75
	100 Bar	[ms]	65
	250 Bar & 350 Bar	[ms]	40



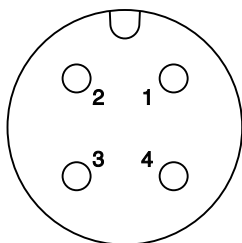
## Single Solenoid Valves

### Electrical Specifications of Position Control as per IEC 61076-2-101 (M12x1)

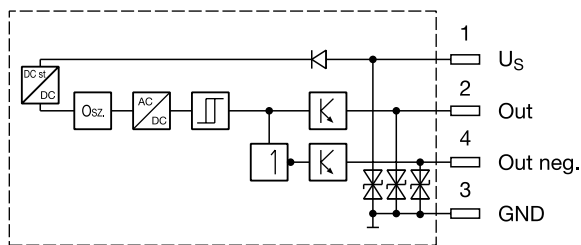
Protection Class		IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)
Ambient Temperature	[°C]	-20...+60; (-4°F...140°F)
Supply Voltage / Ripple	[V]	24 ≤10%
Tolerance Supply Voltage	[%]	±20
Polarity Protection	[V]	300
Current Consumption without Load	[mA]	≤ 20
Switching Hysteresis	[mm]	<0.06
Max. Output Current per Channel, Ohmic	[mA]	250
Min. Distance to Next AC Solenoid	[m]	0.1 (0.33 ft.)
Interface		M12x1 to IEC 61076-2-101
Wiring Minimum	[mm <sup>2</sup> ]	5 x 0.25 braided shield recommended
Wiring Length Maximum	[m]	50 (164 ft.) recommended
CE Conform		EN 61000-4-2/EN 61000-4-4/EN 61000-4-6 <sup>1)</sup> /ENV 50140/ENV 50240

1) Only guaranteed with screened cable and female connector.

### M12 Pin Assignment



- 1 U<sub>S</sub> 19.2...28.8V
- 2 Out B: normally open
- 3 0V
- 4 Out A: normally closed



Outputs: Open collector

### Definitions

Start position monitored:

The valve is de-energized. The inductive switch gives a signal at the moment the spool leaves the spring offset position (below 15% spool stroke).

At the switching point the spool is located within the closed position. It is secured so that only the flow paths of the offset position are granted.

The switch can only be located on the opposite side of the solenoid for direct operated valves. Please order plug M12x1 separately. See Accessories, plug M12x1 (part no.: 5004109).

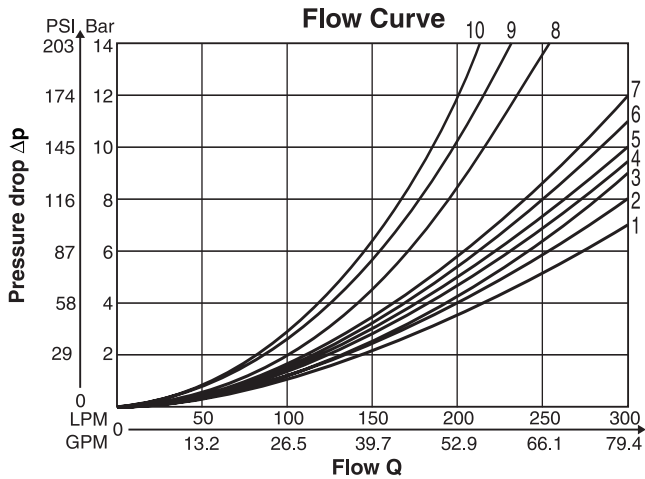
End position monitored:

The inductive switch gives a signal before the end position is reached. (above 85% spool stroke).

**Performance Curves**

**A**

The flow curve diagram shows the flow versus pressure drop curves for all spool types. The relevant curve number for each spool type, operating position and flow direction is given in the table below.

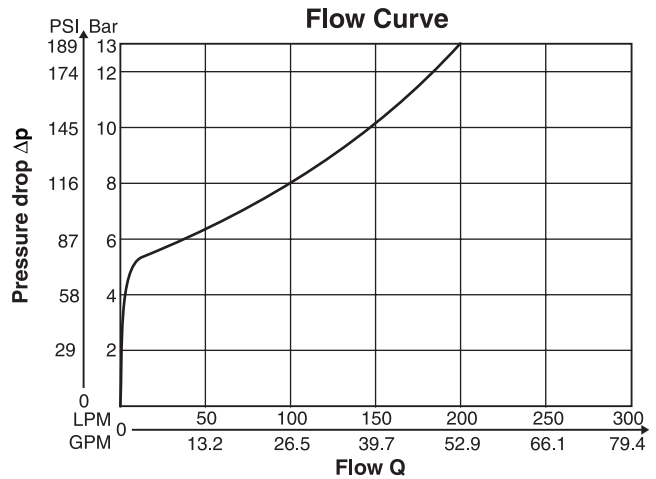


All characteristic curves measured with HLP46 at 50°C.

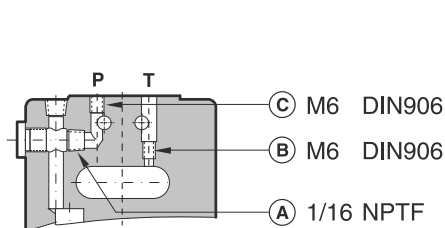
Spool Code	Curve Number				
	P-A	P-B	P-T	A-T	B-T
001	1	1	—	4	5
002	1	2	6	4	6
003	1	2	—	5	6
004	1	1	—	5	5
005	2	2	—	3	5
006	1	2	—	3	6
007	1	1	6	4	5
009	2	9	8	7	10
011	1	1	—	4	5
014	1	1	6	4	5
015	1	2	—	4	6
016	2	2	—	3	5
020	3	5	—	3	5
021	2	8	—	2	—
022	8	2	—	—	3
026	3	5	—	—	—
030	2	3	—	6	7
031	—	—	—	—	—
032	—	—	—	—	—
054	2	3	—	6	7
081	—	—	—	—	—
082	—	—	—	—	—

**Integral Check Valve in the P port**

Mounting an integral check valve in the P port is necessary to build up pilot pressure for valves with P to T connection and internal pilot oil supply. The pressure difference at the integral check valve (see performance curves) is to be added to all flow curves of the P-port of the main valve.

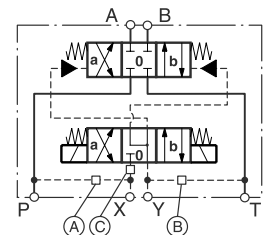


**Pilot Oil Inlet (Supply) and Outlet (Drain)**



○ open, ● closed

Pilot oil Inlet	Outlet	A	B	C
		internal	external	○
external	external	●	●	Orifice Ø1.5
internal	internal	○	○	Orifice Ø1.5
external	internal	●	○	Orifice Ø1.5



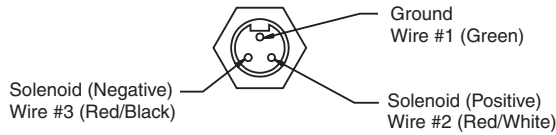
All orifice sizes for standard valves





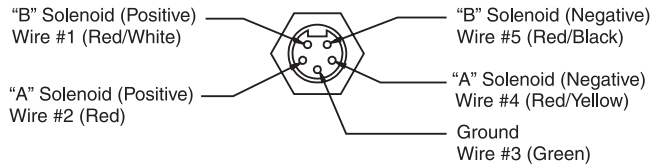
**Manaplug (Options 6, 56, 1A & 1C)**

- Interface – Brad Harrison Plug
- 3-Pin for Single Solenoid
- 5-Pin for Double Solenoid



**3-Pin Manaplug (Mini) with Lights**

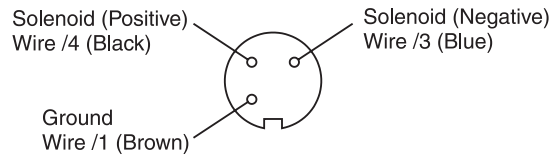
Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Mini) with Lights**

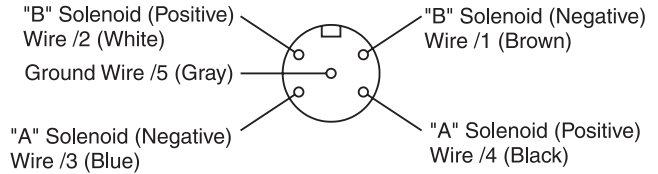
Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Micro Connector Options (7A, 7B, 1B & 1D)**



**3-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Pins are as seen on valve (male pin connectors)**

**Manaplug – Electrical Mini Plug**

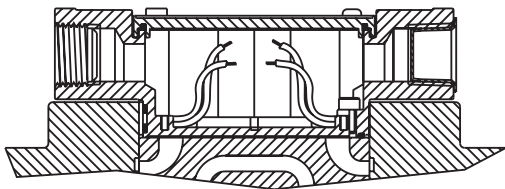
- EP336-30 3 Pin Plug
- EP316-30 5 Pin Plug (Double Solenoid)
- EP31A-30 5 Pin Plug (Single Solenoid)

**Manaplug – Electrical Micro Plug**

- EP337-30 3 Pin Plug
- EP317-30 5 Pin Plug (Double Solenoid)
- EP31B-30 5 Pin Plug (Single Solenoid)

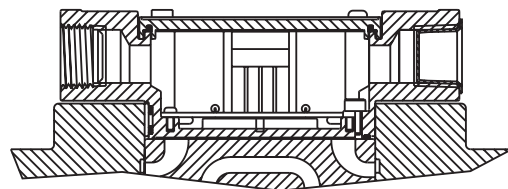
**Conduit Box Option C**

- No Wiring Options Available



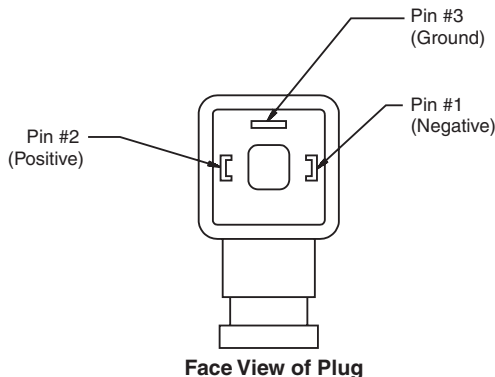
**Signal Lights (Option 5) — Plug-in Only**

- LED Interface
- Meets Nema 4/IP67



**Hirschmann Plug with Lights (Option P5)**

ISO 4400/DIN 43650 Form "A"

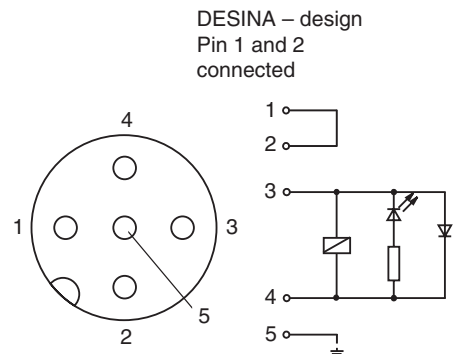


**Pins are as seen on valve (male pin connectors)**

**DESINA Connector (Option D)**

**M12 pin assignment  
Standard**

- 1 = Not used
- 2 = Not used
- 3 = 0V
- 4 = Signal (24 V)
- 5 = Earth Ground



### General Description

**A**

Series D41VWR and D41VWZ are regenerative and hybrid directional control valves (NG16).

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

### Features

- Energy saving A-regeneration optionally integrated.
- Switchable hybrid version.

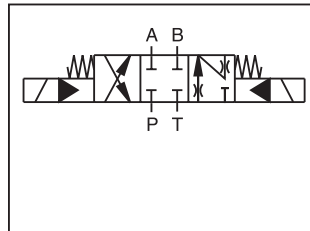
Further literature about the opportunities of energy savings and more functional details of the integrated regeneration is available on request.



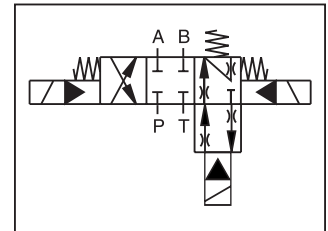
D41VWR



D41VWZ

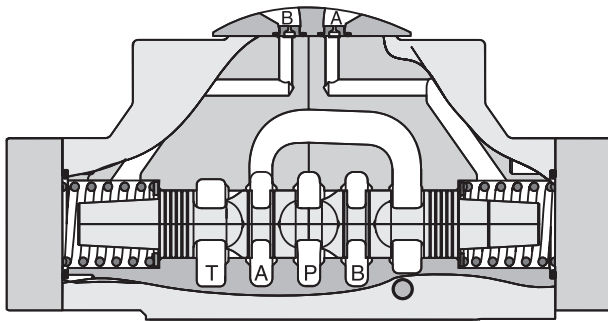


Regenerative D41VWR

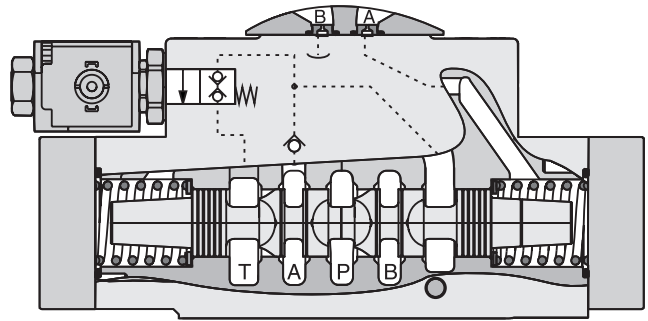


Hybrid D41VWZ

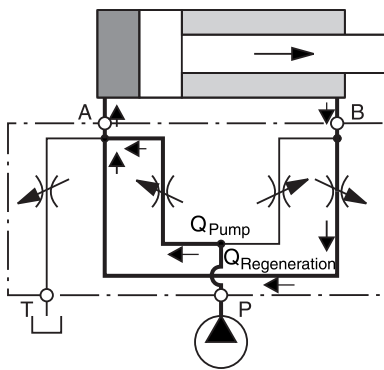
### Regenerative Valve D41VWR



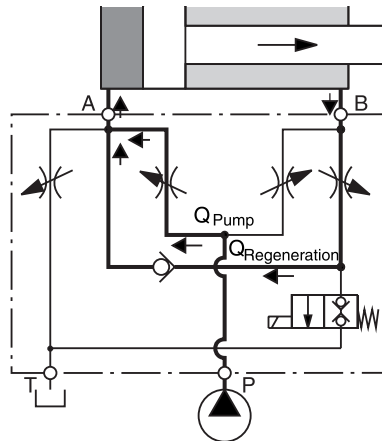
### Hybrid Valve D41VWZ



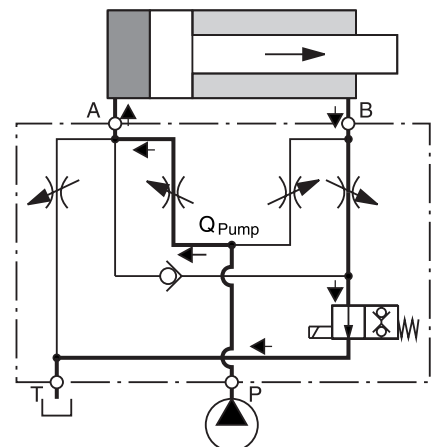
### D41VWR Regenerative Valve Cylinder Extending



### D41VWZ Hybrid Valve Cylinder Extending Regenerative Mode (High Speed)

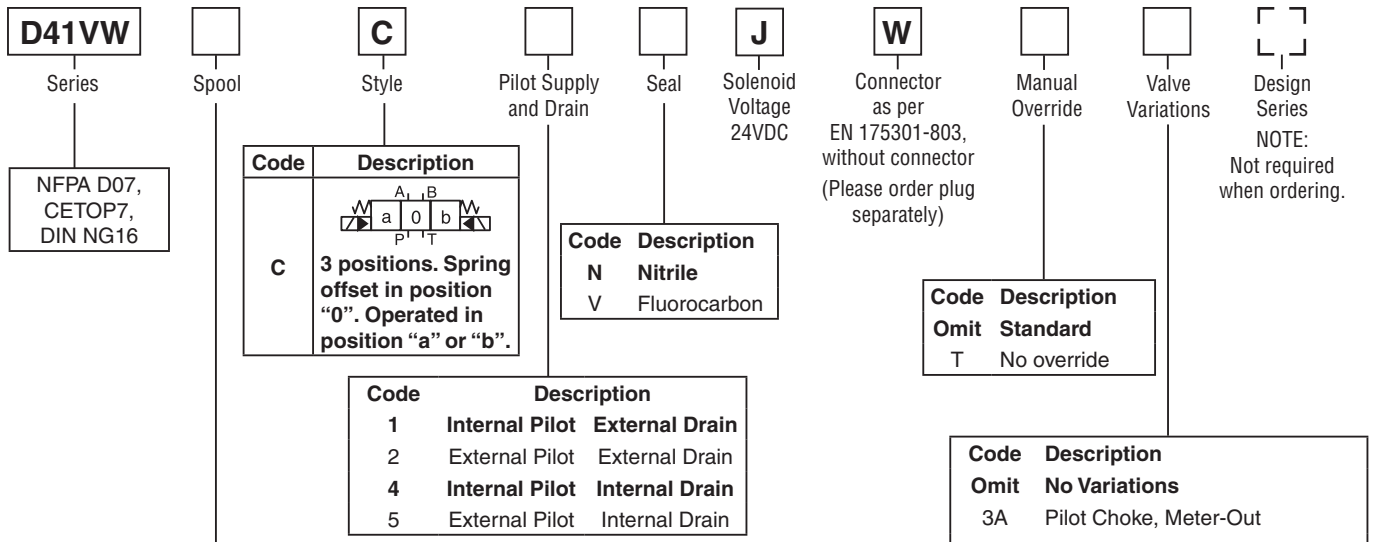


### Cylinder Extending Standard Mode (High Force)



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Ordering Information**



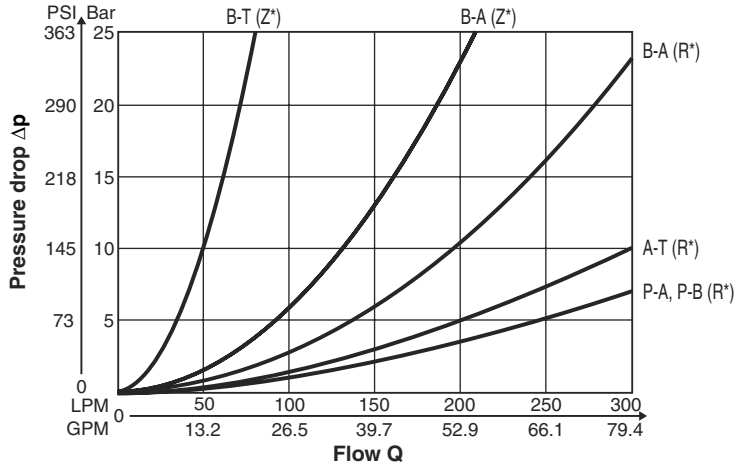
Regenerative Function			Hybrid Function		
Code	Spool Type		Code	Spool Type	
	a	b 0		a	b 0
R01			Z01		
R04			Z04		
R81			Z81		
R82			Z82		

**Weight:**  
 D41VWR, D41DWZ 10.3 kg (22.7 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**



Flow curves measured with Spool R01, R04, Z01, Z04

A

General		
Design	Directional Spool Valve	
Actuation	Solenoid	
Size	NG16 / CETOP7 / D07	
Mounting Interface	DIN 24340 A16 / ISO 4401 / NFPA D07 / CETOP RP 121-H	
Mounting Position	Unrestricted, preferably horizontal	
Ambient Temperature	[°C]	-25...+50; (-13°F...+122°F)
MTTF <sub>D</sub> Value	[years]	75
Hydraulic		
Maximum Operating Pressure	Pilot drain internal: P, A, B, X 350 Bar (5075 PSI); T, Y 105 Bar (1523 PSI) Pilot drain external: P, A, B, T, X 350 Bar (5075 PSI); Y 105 Bar (1523 PSI)	
Fluid	Hydraulic oil in accordance with DIN 51524 / 51525	
Fluid Temperature	[°C]	-25 ... +70 (-13°F...+158°F)
Viscosity Permitted	[cSt]/[mm <sup>2</sup> /s]	2.8...400 (13...1854 SSU)
Viscosity Recommended	[cSt]/[mm <sup>2</sup> /s]	30...80 (139...371 SSU)
Filtration	ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)	
Flow Maximum	300 LPM (79.4 GPM)	
Leakage at 350 Bar (5075 PSI) (per flow path)	[ml/min]	Up to 200 (0.05 GPM) (depending on spool)
Minimum Pilot Supply Pressure	5 Bar (73 PSI)	
Static / Dynamic		
Step Response at 95% DC Solenoids	Pilot Pressure	Energized
	50 Bar (725 PSI) [ms]	95
	100 Bar (1450 PSI) [ms]	75
	250 & 350 Bar (3625 & 5075 PSI) [ms]	60
		De-energized
		65
		65
		65
Electrical		
Duty Ratio	100% ED; CAUTION: coil temperature up to 150°C (302°F) possible	
Protection Class	IP 65 in accordance with EN 60529 (plugged and mounted)	
Supply Voltage / Ripple	[V]	24
Tolerance Supply Voltage	[%]	±10
Current Consumption	Hold [A]	1.29
Current Consumption	In Rush [A]	1.29
Power Consumption	Hold [W]	31
Power Consumption	In Rush [W]	31
Solenoid Connection	Connector as per EN 175301-803, solenoid identification as per ISO 9461	
Wiring Minimum	[mm <sup>2</sup> ]	3 x 1.5 recommended
Wiring Length Minimum	[m]	50 (164 ft.) recommended

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

#### Electrical Specifications Hybrid Option

Duty Ratio	100%	
Protection Class	IP 65 in accordance with EN 60529 (plugged and mounted)	
Supply Voltage	[V]	24
Tolerance Supply Voltage	[%]	±10
Current Consumption	[A]	1.21
Power Consumption	[W]	29
Solenoid Connection	Connector as per EN 175301-803	
Wiring Minimum	[mm <sup>2</sup> ]	3 x 1.5 recommended
Wiring Length Maximum	[m]	50 (164 ft.) recommended

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

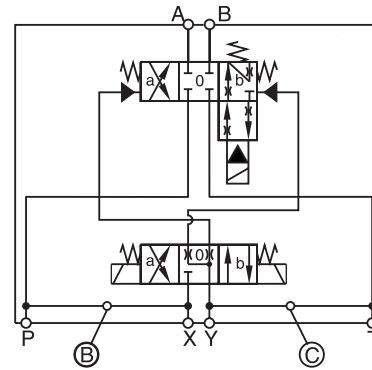
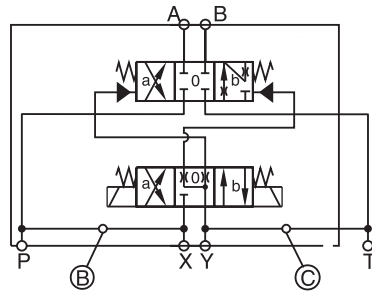


**Pilot Flow**

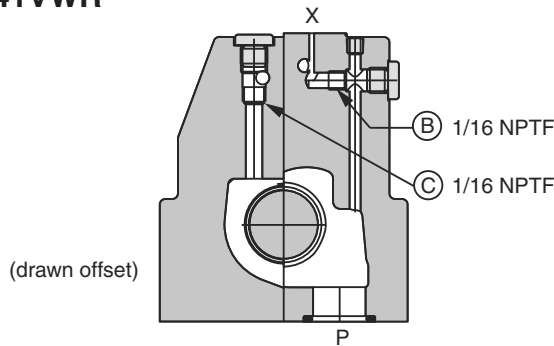
**Pilot Oil Inlet (Supply) and Outlet (Drain)**

○ open, ● closed

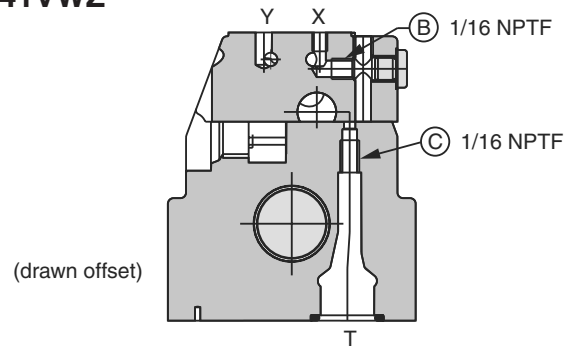
Pilot Oil Inlet	Pilot Oil Outlet	B	C
internal	external	○	●
external	external	●	●
internal	internal	○	○
external	internal	●	○



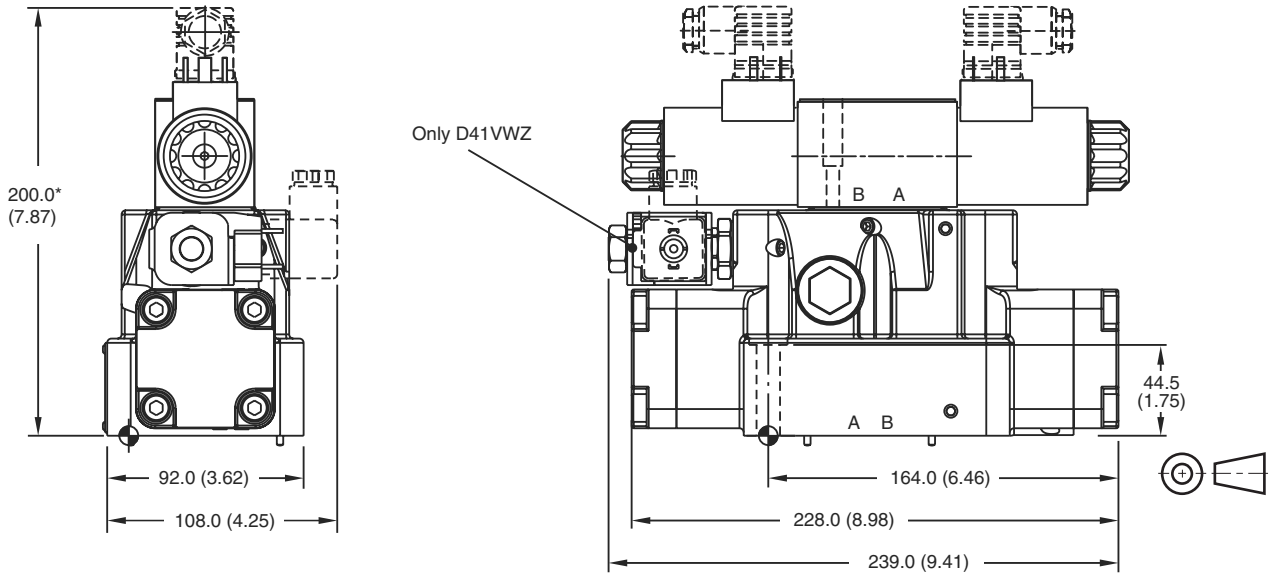
**D41VWR**



**D41VWZ**



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



\* Please add for each sandwich plate +40mm (1.58") (pressure reducing valve, pilot choke valve meter-in/-out).

Surface Finish	Kit	Kit	Kit	Seal Kit
	BK320	4x M10x60 2x M6x55	63 Nm (46.5 lb.-ft.)	<b>Nitrile: SK-D41VW-N-91</b> Fluorocarbon: SK-D41VW-V-91
	BK160	4x 3/8-16x2.5 2x 1/4-20x2.25 DIN 912 12.9	13.2 Nm (9.7 lb.-ft.) ±15%	

The space necessary to remove the plug per DIN 43650, design type AF is at least 15mm (0.59").  
 The torque for the screw M3 of the plug has to be 0.5 Nm (0.37 lb.-ft.) to 0.6 Nm (0.44 lb.-ft.).

**A**

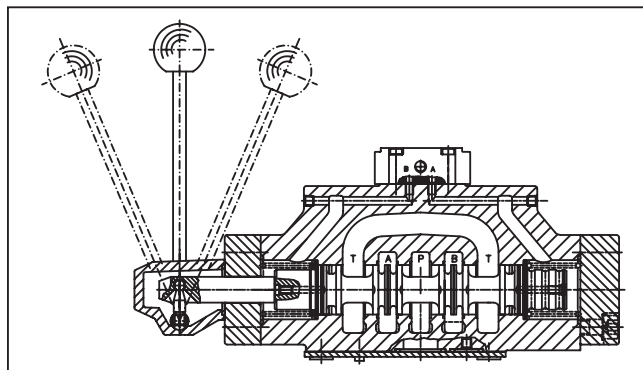
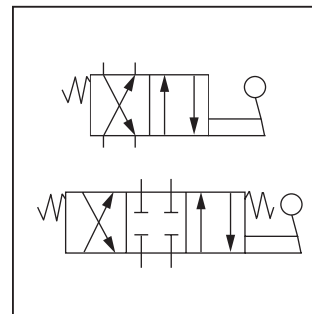
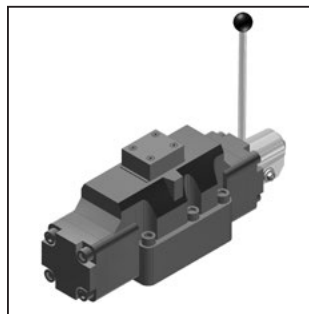
## General Description

Series D4L valves are 5 chamber, directional control valves and are available in 2 or 3-position styles. They are operated by a hand lever which is directly connected to the spool.

The hand lever can be located either on the A or B side. Spring offset and detent designs are available.

## Features

- Low force required to shift spool.
- Hardened spools provide long life.
- Low pressure drop design.



## Specifications

General		
<b>Design</b>		Directional spool valve
<b>Actuation</b>		Lever
<b>Size</b>		NG16
<b>Mounting interface</b>		DIN 24340 A16, ISO 4401, NFPA D07, CETOP RP 121-H
<b>Mounting Position</b>		Unrestricted, preferably horizontal
<b>Ambient Temperature</b>	[°C]	-25...+50; (-13°F...+122°F)
Hydraulic		
<b>Maximum Operating Pressure</b>		External Drain: P, A, B, T 350 Bar (5075 PSI); X, Y 10 Bar (145 PSI) Internal Drain: P, A, B 350 Bar (5075 PSI); T, X, Y 10 Bar (145 PSI)
<b>Fluid</b>		Hydraulic oil in accordance with DIN 51524 / 51525
<b>Fluid Temperature</b>	[°C]	-25 ... +70; (-13°F...+158°F)
<b>Viscosity Permitted</b>	[cSt] / [mm²/s]	2.8...400 (13...1854 SSU)
<b>Recommended</b>	[cSt] / [mm²/s]	30...80 (139...371 SSU)
<b>Filtration</b>		ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)
<b>Maximum Flow</b>		300 LPM (79.4 GPM)
<b>Leakage at 350 Bar (per flow path)</b>	[ml/min]	up to 200 (0.05 GPM) (depending on spool)

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**D**  
 Directional Control Valve

**4**  
 Basic Valve  
 NFPA D07,  
 CETOP 7  
 DIN NG16

Actuator

Spool

Style

Pilot  
 Supply and Drain

Seal

Design Series  
 NOTE:  
 Not required when ordering.

Code	Actuation
L	Lever Side B
LB	Lever Side A

Code	Description
2*	External Pilot External Drain
5**	External Pilot Internal Drain

\* Pressure T-port > 10 bar  
 \*\* Pressure T-port < 10 bar

3 Position Spools	
Code	Spool Type
	a 0 b
001	
002	
003	
004	
006	
007	
009	
011	
014	
015	

2 Position Spools	
Code	Spool Type
	a b
020	
030	

3 Position Spools		
Code	All 3 Position Spools	
C		3 positions. Spring offset in position "0". Operated in position "a" or "b".
	<b>Standard</b>	<b>Spool Type 9</b>
E	 Operated in position "a".	 Operated in position "b".
F	 Operated in position "0".	 Operated in position "0".
K	 Operated in position "b".	 Operated in position "a".
M	 Operated in position "0".	 Operated in position "0".
N	 No center in offset position.	 No center in offset position.
R	 No center in offset position.	 No center in offset position.
S	 No center in offset position.	 No center in offset position.

2 Position Spools		
Code	Spool Position	
B		Spring offset in position "b". Operated in position "a".
D		Detent, operated in position "a" or "b". No center or offset position.
H		Spring offset in position "a". Operated in position "b".

Weight: 9.0 kg (19.8 lbs.)

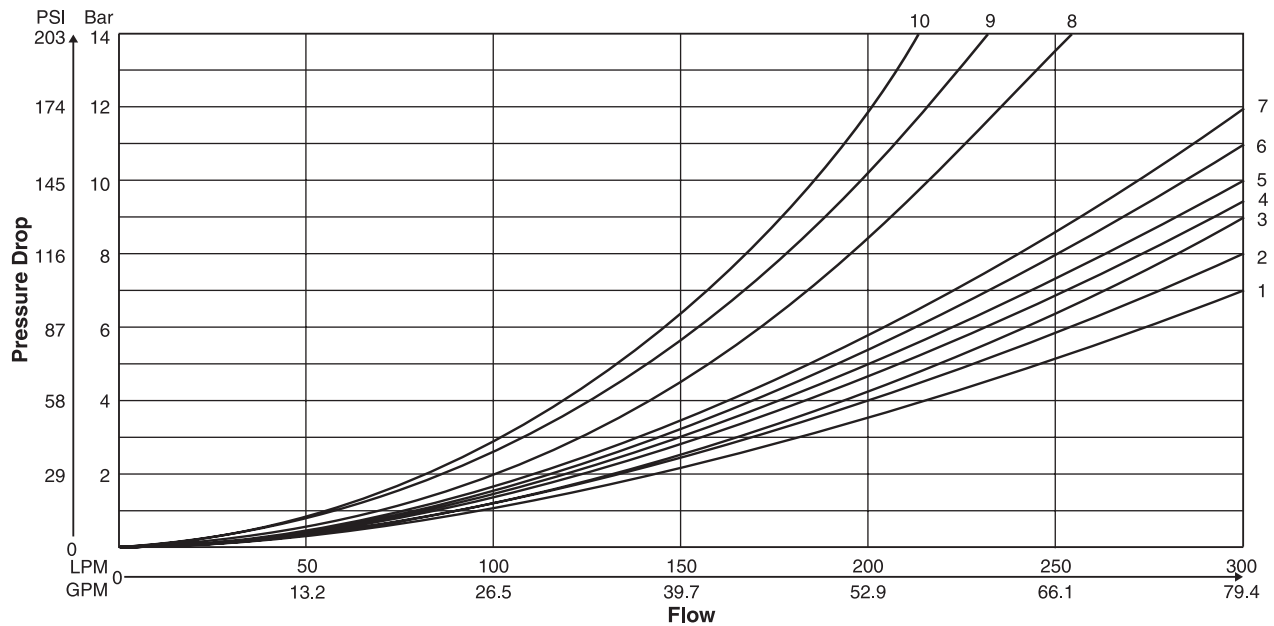


The flow curve diagram shows the flow versus pressure drop curves for all spool types. The relevant curve number for each spool type, operating position and flow direction is given in the table below.

**A**

Spool Code	Curve Number				
	P-A	P-B	P-T	A-T	B-T
001	1	1	–	4	5
002	1	2	6	4	6
003	1	2	–	5	6
004	1	1	–	5	5
006	1	2	–	3	6
007	1	1	6	4	5
009	2	9	8	7	10
011	1	1	–	4	5
014	1	1	6	5	4
015	2	1	–	6	5
020	3	5	–	3	5
030	2	3	–	6	7

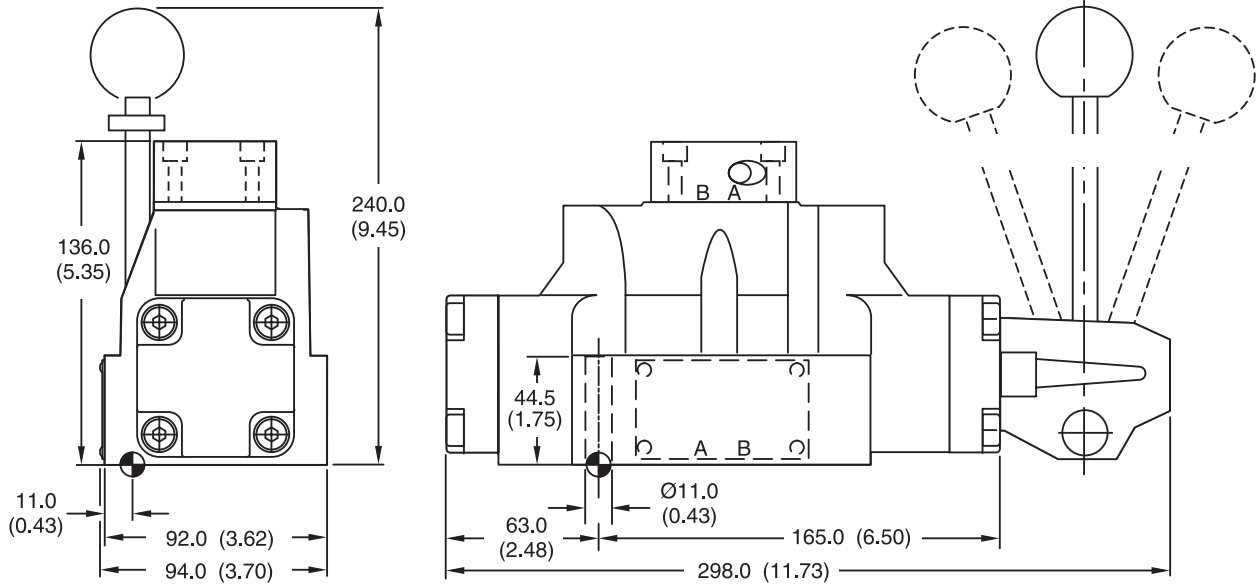
All characteristic curves measured with HLP46 at 50°C.



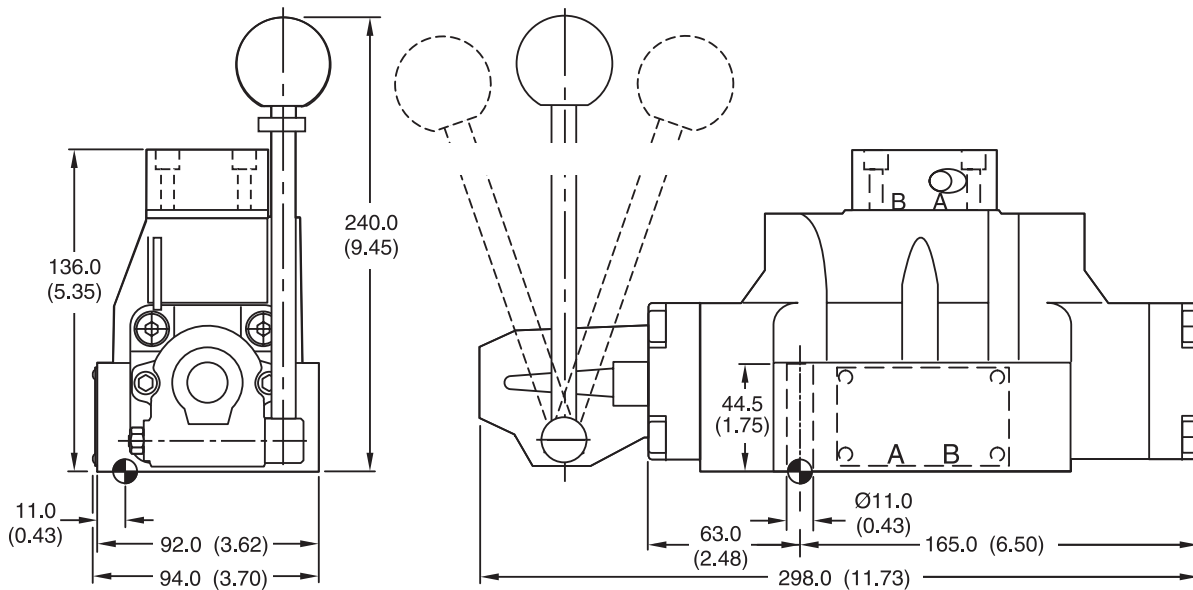


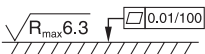
Inch equivalents for millimeter dimensions are shown in (\*\*)

**D4L**



**D4LB**



Surface Finish	Kit			Seal Kit
	BK320	4x M10x60 2x M6x55 DIN 912 12.9	63 Nm (46.5 lb.-ft.) 13.2 Nm (9.7 lb.-ft.) ±15%	Nitrile: SK-D4LN60 Fluorocarbon: SK-D4LV60

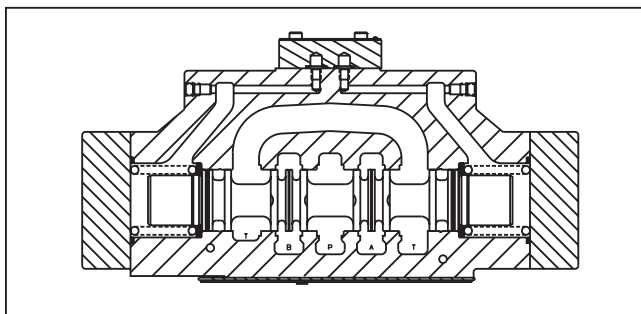
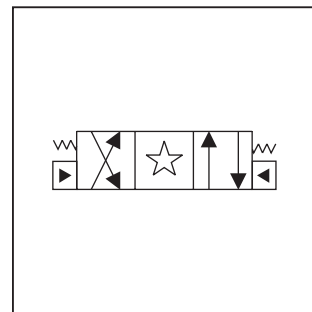
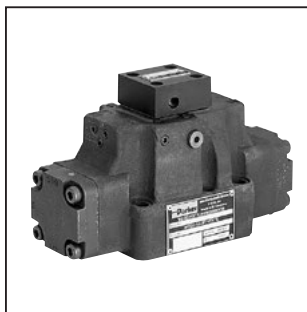
**A**

## General Description

Series D4P directional control valves are 5-chamber pilot operated valves. They are available in 2 or 3-position styles. These manifold mounted valves conform to NFPA's D07, CETOP 7 and NG16.

## Features

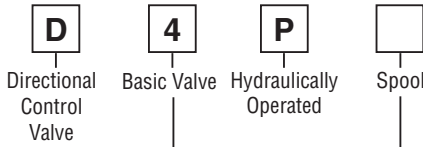
- Low pressure drop design.
- Hardened spools for long life.



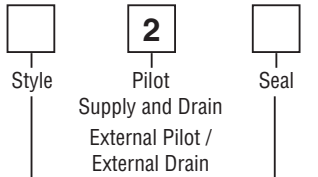
## Specifications

General		
Design		Directional spool valve
Actuation		Hydraulic
Size		NG16
Mounting interface		DIN 24340 A16, ISO 4401, NFPA D07, CETOP RP 121-H
Mounting Position		Unrestricted, preferably horizontal
Ambient Temperature	[°C]	-25...+50 (-13°F...+122°F)
MTTF <sub>D</sub> value		150 years
Hydraulic		
Maximum Operating Pressure		External Drain: P, A B, T 350 Bar (5075 PSI); X, Y 350 Bar (5075 PSI)
Fluid		Hydraulic oil in accordance with DIN 51524 / 51525
Fluid Temperature	[°C]	-25 ... +70 (-13°F...+158°F)
Viscosity Permitted	[cSt]/[mm <sup>2</sup> /s]	2.8...400 (13...1850 SSU)
Recommended	[cSt]/[mm <sup>2</sup> /s]	30...80 (139...371 SSU)
Filtration		ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)
Maximum Flow		300 LPM (79.4 GPM)
Leakage at 350 Bar (per flow path)	[ml/min]	up to 200 (0.05 GPM) (depending on spool)
Pilot Supply Pressure	Minimum Maximum	5 Bar (73 PSI) 350 Bar (5075 PSI)
Static / Dynamic		
Step Response		The response times depend on the pilot oil pressure and on the speed of the increase/decrease of the pilot pressure.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



NFPA D07,  
 CETOP 7  
 DIN NG16



Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description	Code	Description
Omit	Standard Valve	9	Stroke Adjust A End
7	Pilot Choke, Meter-Out	60	Pilot Choke, Meter-In
8	Stroke adjust B End	89	Stroke Adjust A and B Ends

3 Position Spools	
Code	Spool Type
001	
002	
003	
004	
005	
006	
007	
009	
011	
014	
015	
016	
021	
022	
054	
081	
082	

2 Position Spools	
Code	Spool Type
020	
026	
030	

3-Position Spools		
Code	All 3-Position Spools	
<b>C</b>		<b>3 positions.</b> Spring offset in position "0". Operated in position "a" or "b".
	<b>Standard</b>	<b>Spool Type 009</b>
<b>E</b>	 Operated in position "a".	 Operated in position "b".
<b>F</b>	 Spring offset in position "b".	 Spring offset in position "a".
<b>K</b>	 Operated in position "b".	 Operated in position "a".
<b>M</b>	 Spring offset in position "a".	 Spring offset in position "b".
<b>R</b>	 No center in offset position.	 No center in offset position.
<b>S</b>	 No center in offset position.	 No center in offset position.

2-Position Spools		
Code	Spool Position	
<b>B*</b>		<b>Spring offset in position "b".</b> <b>Operated in position "a".</b>
<b>D</b>		Detent, operated in position "a" or "b". No center or offset position.
<b>H</b>		Spring offset in position "a". Operated in position "b".

Weight: 9.0 kg (19.8 lbs.)

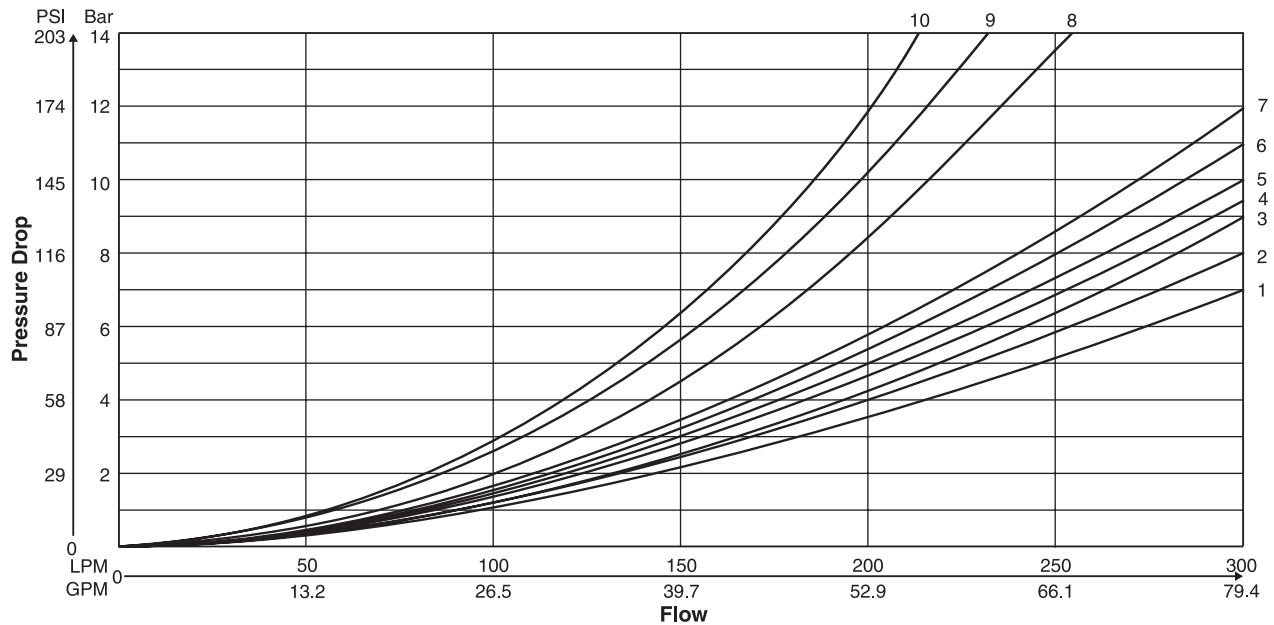
\* 020 & 030 spools only.



The flow curve diagram shows the flow versus pressure drop curves for all spool types. The relevant curve number for each spool type, operating position and flow direction is given in the table below.

**A**

Spool Code	Curve Number				
	P-A	P-B	P-T	A-T	B-T
001	1	1	–	4	5
002	1	2	6	4	6
003	1	2	–	5	6
004	1	1	–	5	5
005	2	2	–	3	5
006	1	2	–	3	6
007	1	1	6	4	5
009	2	9	8	7	10
011	1	1	–	4	5
014	1	1	6	4	5
015	1	2	–	4	6
016	2	2	–	3	5
020	3	5	–	3	5
021	2	8	–	2	–
022	8	2	–	–	3
026	3	5	–	–	–
030	2	3	–	6	7
054	2	3	–	6	7

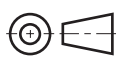
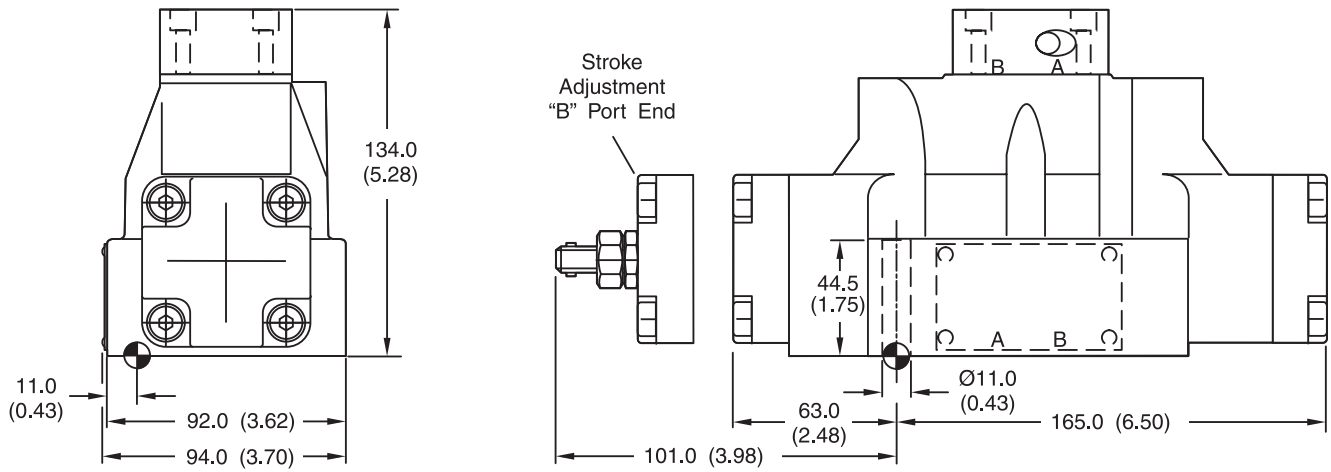


**Dimensions**

**Directional Control Valves  
Series D4P**

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

**A**



Surface Finish	Kit			Seal Kit
	BK320	4x M10x60 2x M6x55 DIN 912 12.9	63 Nm (46.5 lb.-ft.) 13.2 Nm (9.7 lb.-ft.) ±15%	<b>Nitrile: SK-D41VW-N-91</b> Fluorocarbon: SK-D41VW-V-91

**A**

FOR MAXIMUM VALVE RELIABILITY, ADHERE TO THE FOLLOWING INSTALLATION INFORMATION.

The following is important installation information which applies to all directional control valves described in this catalog.

### Mounting Position

Detent – Horizontal  
Spring Offset – Unrestricted  
Spring Centered – Unrestricted

### Fluid Recommendations

Premium quality hydraulic oil with a viscosity range between 32-54 cSt. (150-250 SSU) At 38°C (100°F) is recommended. The absolute operating viscosity range is from 16-220 cSt. (80-1000 SSU). Oil should have maximum anti-wear properties and rust and oxidation treatment.

### Fluids and Seals

Valves using synthetic, fire-resistant fluids require special seals. When phosphate esters or its blends are used, FLUOROCARBON seals are required. Water-glycol, water-in-oil emulsions and petroleum oil may be used with STANDARD seals.

### Filtration

For maximum valve and system component life, the system should be protected from contamination at a level not to exceed 125 particles greater than 10 microns per milliliter of fluid (SAE class 4/ISO 16/13).

### Silting

Silting can cause any sliding spool valve to stick and not spring return if held under pressure for long periods of time. The valve should be cycled periodically to prevent sticking.

### Special Installations

Consult your Parker representative for any application requiring the following:

- Pressure above rating.
- Fluid other than those specified.
- Oil temperature above 71.1°C (160°F).
- Flow path other than normal.

### Mounting Patterns

Series	NFPA	CETOP
D41V	D07	7

### Torque Specifications

The recommended torque values for the bolts which mount the valve to the manifold or subplate are as follows:

63 Nm (46.5 ft-lbs) M10  
13.2 Nm (9.7 ft-lbs) M6 1/4-20.

### Tank and Drain Line Surges

If several valves are piped with a common tank or drain line, flow surges in the line may cause an unexpected spool shift. Detent style valves are most susceptible to this. Separate tank and drain lines should be piped in installations where line surges are expected.

### Electrical Characteristics (Detented Spool)

Only a momentary energizing of the solenoid is necessary to shift and hold a detented spool. Minimum duration of the signal is 0.1 seconds for DC voltages. For AC voltages the response time is 0.06 seconds. Spool position will be held provided the spool centerline is in a horizontal plane, and not shock or vibration is present to displace the spool.

### Electrical Failure or Loss of Pilot Pressure

Should electric power fail or loss of pilot pressure occur, spring offset and spring centered valves will shift to the spring held position. Detented valves will stay in the last position held before power failure. If main flow does not fail or stop at the same time power fails, machine actuators may continue to function in an undesirable manner or sequence.

### Pilot/Drain Characteristics

#### Pilot Pressure:

5 to 345 Bar (73 to 5000 PSI)

6.9 Bar (100 PSI) for spools 002, 007, 009 & 014

**External:** An oil source sufficient to maintain minimum pilot pressure must be connected to the “X” port of the main body. When using the external pilot variation, a 1/16” pipe plug must be present in the main body pilot passage. (For details see Technical pages.) This plug will be furnished in valves ordered with pilot code 2, 3, 5 or 6.

**Internal:** Flow is internally ported from the pressure port of the main valve body to the “P” port of the pilot valve. The pressure developed at the “P” port of the pilot valve must be 5.0 Bar (73 PSI) minimum at all times or 6.9 Bar (100 PSI) for spools 002, 007, 009 & 014.

**Integral Check:** Valves using internal pilot and internal drain with an open center spool (spools 2, 7 & 9) can be ordered with an integral check valve in the pressure port of the main valve codes 3 & 6. Pilot oil will be internally ported from the upstream side of this check to the “P” port of the pilot valve, ensuring sufficient pilot pressure. A 1/16” pipe plug will be present in the main body. The “X” port in the subplate must be plugged when using the integral check.

**Pilot Valve Drain:** Maximum pressure 102 Bar (1500 PSI) AC optional, 207 Bar (3000 PSI) DC standard.

**External:** When using an external drain, a M6 x 1 x 6mm long set screw must be present in the main body drain passage. (For details see Technical pages.) This plug will be furnished in valves ordered with drain code 1, 2 or 3.

Drain flow from the pilot valve is at the “Y” port of the main body and must be piped directly to tank. Maximum drain line pressure is 102 Bar (1500 PSI), AC optional, 207 Bar (3000 PSI) DC standard. Any drain line back pressure is additive to the pilot pressure requirement.

**Internal:** Drain flow from the pilot valve is internally connected to the main valve tank port. Tank and drain pressure are then identical so tank line pressure should not exceed 102 Bar (1500 PSI), AC optional, 207 Bar (3000 PSI) DC standard. Any tank line back pressure is also additive to the pilot pressure requirement. If flow surges (a cause of pressure surges) are anticipated in the tank line, an external drain variation is recommended. The “Y” port in the subplate must be plugged when using an internal drain.

### D41V\* Flow Paths

Style Code	Description	No Solenoid/Operator Energized	Solenoid/Operator A Energized	Solenoid/Operator B Energized
B	Spring Offset	P→A and B→T	–	P→B and A→T
C	Spring Centered	Centered	P→A and B→T	P→B and A→T
D	Detented	Last Position Held	P→A and B→T	P→B and A→T
E	Spring Centered	Centered	–	P→B and A→T
F	Spring Offset, Shift to Center	P→A and B→T	–	Centered
H	Spring Offset	P→B and A→T	P→A and B→T	–
K	Spring Centered	Centered	P→A and B→T	–
M	Spring Offset, Shift to Center	P→B and A→T	Centered	–

**A**

**Tank and Drain Line Surges**

If several valves are piped with a common tank or drain line, flow surges in the line may cause an unexpected spool shift. Detent style valves are most susceptible to this. Separate tank and drain lines should be piped in installations where line surges are expected.

**Loss of Pilot Pressure**

Should a loss of pilot pressure occur, spring offset and spring centered valves will shift to the spring held position. No spring valves will stay in the last position held. If main hydraulic flow does simultaneously stop, machine actuators may continue to function in an undesirable manner or sequence.

**Pilot Drain Characteristics**

**Pilot Pressure:**

5 to 350 Bar (73 to 5000 PSI)  
 6.9 Bar (100 PSI) for spool configurations 2, 7, 9 & 14

Direct pilot operated valves use the “X” and “Y” ports to supply pilot oil directly to the ends of the spool, providing spool shifting force. A block mounted on top of the valve body is internally cored to make the necessary connections. Thus when “X” is pressurized, “Y” is used as a drain; and when “Y” is pressurized, “X” becomes the drain.

Any back pressure in these lines when they are being used as a drain is additive to the pilot pressure requirement.

**Internal Drain:** On spring offset models, only the “X” port is pressurized, as the spring returns the spool to its at rest position. On these models, “Y” may be internally drained through the main tank passage in the valve.

**Flow Path/Pilot Pressure**

Style Code	Description	“X” & “Y” De-Pressurized	“X” Port Pressurized	“Y” Port Pressurized	Special Notes	Recommended Control Valve For Pilot Oil
B	Two Position Spring Offset	P→A, B→T	P→A, B→T	P→B, A→T	“X” Port may be pressurized to assist spring in returning spool to offset position (ext. only)	
C	Three Position Spring Centered	Center	P→A, B→T	P→B, A→T	Flow paths will be reversed on valves with tandem center (9) spool	
H	Two-Position Spring Offset	P→B, A→T	P→A, B→T	P→B, A→T	“Y” Port may be pressurized to assist spring in returning spool to offset position	





## Subplate Mounting

### NFPA D07, CETOP 7 & NG16

#### Recommended Mounting Surface

Surface must be flat within .102 mm (0.0004 inch) T.I.R and smooth within 812.8 micro-meters (32 micro-inch). Torque bolts to 135.6 Nm (100 ft-lbs).

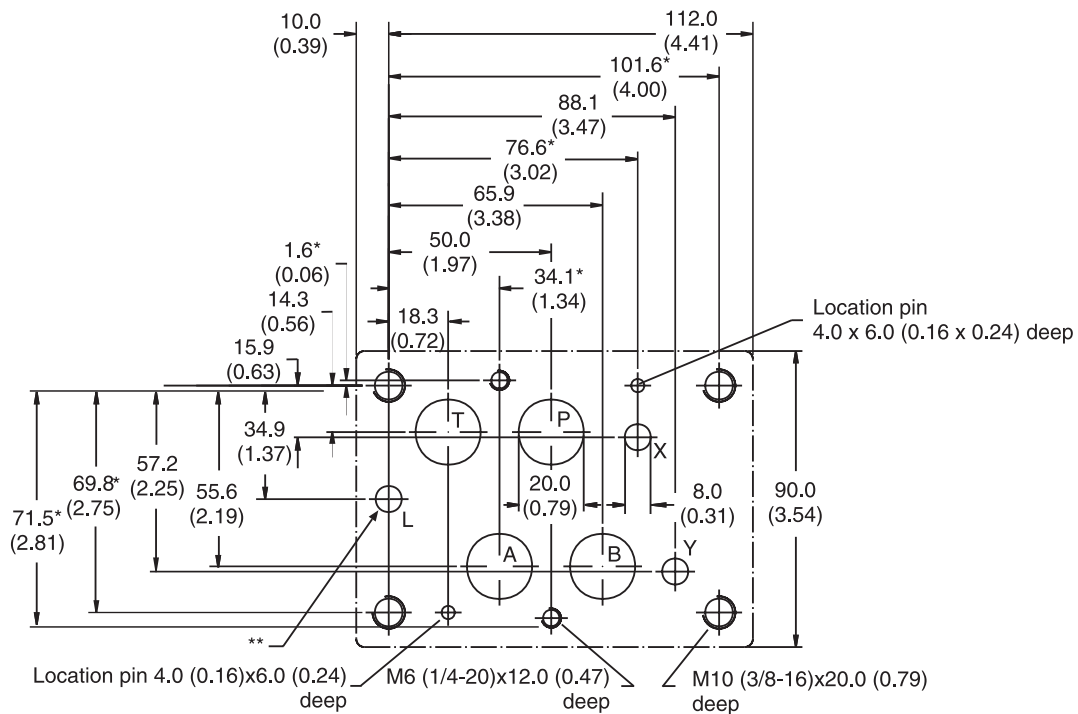
#### Mounting Position

Valve Type	Mounting Position
Detent (Solenoid)	Horizontal
Spring Offset	Unrestricted
Spring Centered	Unrestricted

**For maximum  
 valve reliability,  
 adhere to the following  
 installation information.**

### Mounting Pattern — NFPA D07, CETOP 7 & NG16

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



Note: With \* marked dimensions  $\pm 0.1$  mm. All other dimensions  $\pm 0.2$  mm.

**A**

**Application**

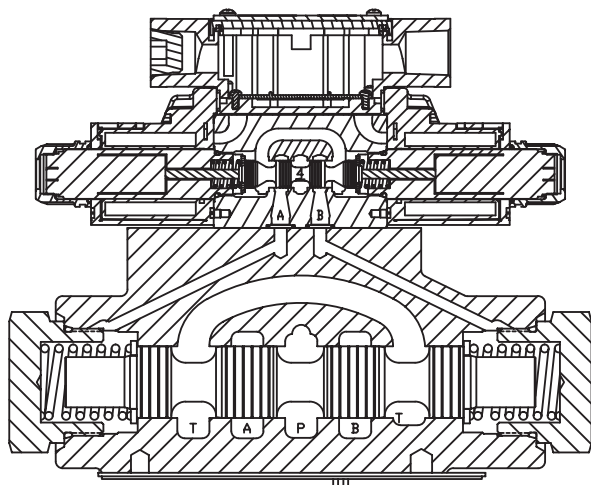
Series D6 hydraulic directional control valves are high performance, solenoid controlled, pilot operated, 2-stage, 4-way valves. They are available in 2 or 3-position styles. These valves are manifold mounted, and conform to NFPA's D08, CETOP 8 mounting patterns.

**Operation**

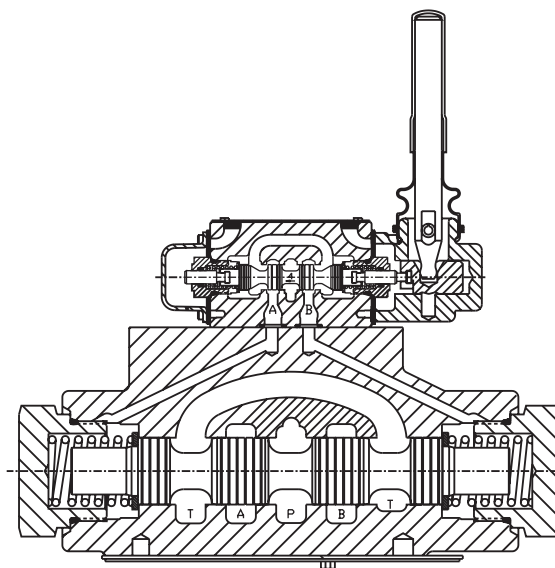
Series D61 directional valves consist of a 5-chamber style main body, a case hardened sliding spool, and a pilot valve or pilot operators (hydraulic or pneumatic).

**Features**

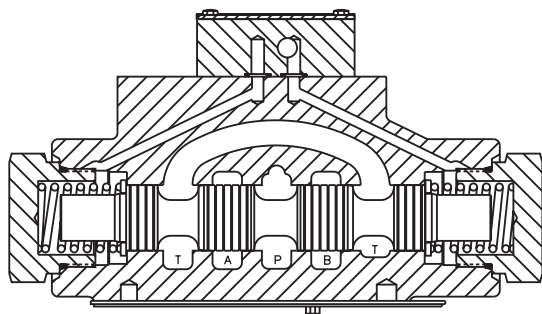
- Easy access mounting bolts.
- 210 Bar (3000 PSI) pressure rating.
- Flows to 380 LPM (100 GPM) depending on spool.
- Choice of four operator styles.
- Rugged four land spools.
- Low pressure drop.
- Phosphate finish.



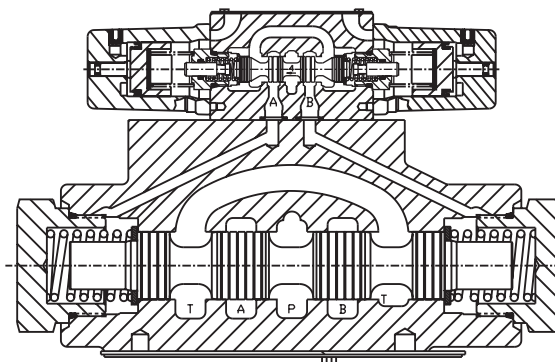
**D61\*W Solenoid Operated Plug-in Conduit Box**



**D61\*L Lever Operated**



**D61\*P Oil Pilot Operated**



**D61\*A Air Pilot Operated**

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## General Description

Series D61VW directional control valves are 5-chamber, pilot operated, solenoid controlled valves. They are available in 2 or 3-position styles. These valves are manifold or subplate mounted, and conform to NFPA's D08, CETOP 8 mounting patterns.





## Operation

Series D61VW pilot operated valves are standard with low shock spools and pilot orifice. The orifice can be removed if a faster shift is required. It is recommended, however, that all systems operating above 138 Bar (2000 PSI) use the standard valve to avoid severe shock.

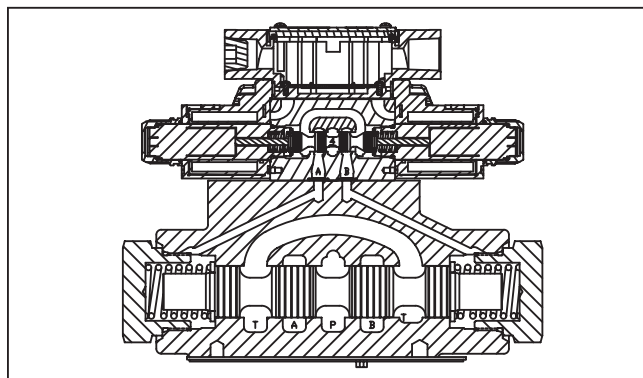
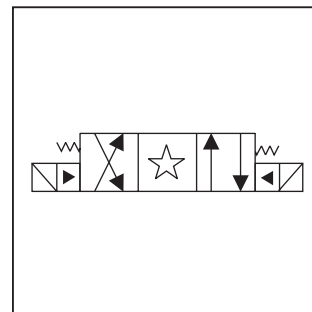
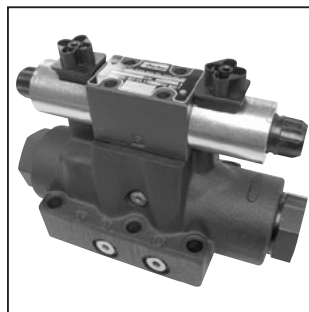
## Features

- Low pressure drop design.
- Hardened spools provide long life.
- Fast response option available.
- Explosion proof availability.
- Wide variety of voltages and electrical connection options.
- No tools required for coil removal.

## Specifications

<b>Mounting Pattern</b>	NFPA D08 CETOP 8, NG25
<b>Maximum Operating Pressure</b>	205 Bar (3000 PSI) Standard CSA  205 Bar (3000 PSI)
<b>Maximum Tank Line Pressure</b>	Internal Drain Model: 102 Bar (1500 PSI) AC Only 205 Bar (3000 PSI) DC Std./ AC Optional External Drain Model: 205 Bar (3000 PSI) CSA  102 Bar (1500 PSI)
<b>Maximum Drain Pressure</b>	102 Bar (1500 PSI) AC Standard 205 Bar (3000 PSI) DC Standard/ AC Optional CSA  102 Bar (1500 PSI)
<b>Minimum Pilot Pressure</b>	5.1 Bar* (75 PSI)
<b>Maximum Pilot Pressure</b>	205 Bar (3000 PSI) Standard CSA  205 Bar (3000 PSI)
<b>Nominal Flow</b>	189 LPM (50 GPM)
<b>Maximum Flow</b>	See Reference Data Chart

\* 6.9 Bar (100 PSI) for spool configurations 008 & 009.



## Response Time

Response times (milliseconds) are measured at 205 Bar (3000 PSI) and 195 LPM (50 GPM) with various pilot pressures as indicated.

Solenoid Type	Pilot Pressure	Pull-In		Drop-Out	
		Std	Fast	Std	Fast
DC	500	130	100	80	80
	1000	90	90	80	80
	2000	80	80	80	80
AC	500	80	40	72	72
	1000	40	40	72	72
	2000	30	30	72	72

Because of the high drain line pressure transients generated during shifting, use of the fast response option is not recommended for pilot pressures exceeding 138 Bar (2000 PSI).

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**A**



**NFPA D08, CETOP 8,  
 DIN NG25  
 Low Flow, D03 Pilot**

Code	Description
<b>W*</b>	<b>Solenoid, Wet Pin, Screw-in</b>
<b>HW*</b>	<b>Reversed Wiring</b>

\* Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing solenoid A. Note operators reverse sides for #008 and #009 spools. See installation information for details. To configure per DIN standards (A coil over A port, B coil over B port) code valves as D61VHW\*\*\*.

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

Code	Description
<b>1</b>	<b>Internal Pilot, External Drain</b>
<b>2</b>	<b>External Pilot, External Drain</b>
<b>3**</b>	<b>Internal Pilot w/Check, External Drain</b>
<b>4*</b>	<b>Internal Pilot, Internal Drain</b>
<b>5</b>	<b>External Pilot, Internal Drain</b>
<b>6**</b>	<b>Internal Pilot w/Check Internal Drain</b>

\* Not available with 008 & 009 spools.  
 \*\* #3 and #6 bodies cannot be converted to other styles. Other pilot versions cannot be converted to styles 3 and 6.

Code	Description
<b>D†#</b>	<b>120 VDC</b>
<b>E*</b>	<b>24/60 - 24/50 VAC</b>
<b>J</b>	<b>24 VDC</b>
<b>K***</b>	<b>12 VDC</b>
<b>Q††#</b>	<b>100/60 VAC</b>
<b>QD††#</b>	<b>100 VAC/60 Hz - 100 VAC/50 Hz</b>
<b>T^^</b>	<b>240/60 - 220/50 VAC</b>
<b>U***#</b>	<b>98 VDC</b>
<b>Y</b>	<b>120/60 - 110/50 VAC</b>

# High watt only.  
 \* Leadwire only, low watt only.  
 \*\* DIN, low watt available.  
 \*\*\* Leadwire not available.  
 ^^ Plug-in is low watt only.  
 † DIN & Leadwire only.  
 †† DIN only.

Code	Symbol	Code	Symbol
<b>001</b>		<b>011</b>	
<b>003</b>		<b>012</b>	
<b>004</b>		<b>015</b>	
<b>005</b>		<b>016</b>	
<b>006</b>		<b>021</b>	
<b>008*</b>			
<b>009**</b>			

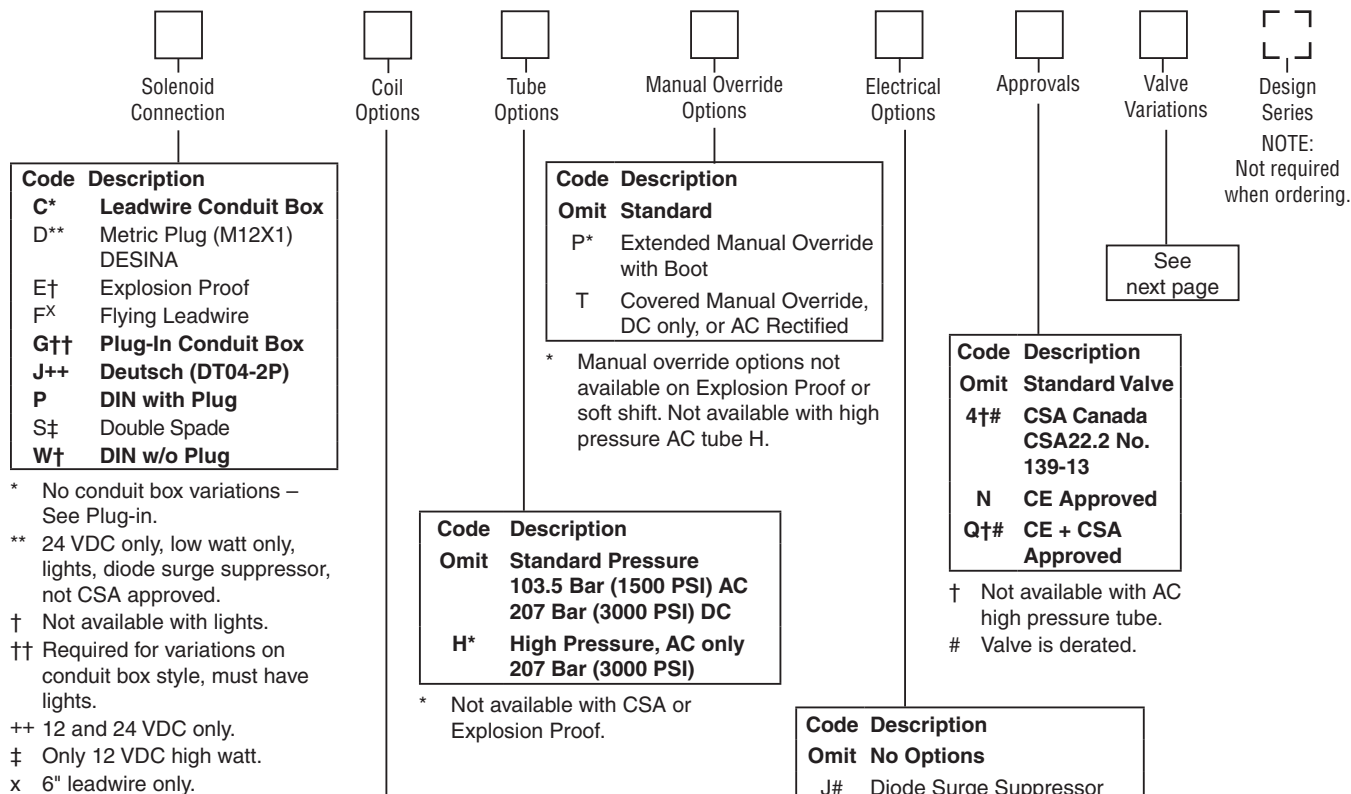
\* 008 spool has closed crossover.  
 \*\* 009 spool has open crossover.

Code	Description	Symbol
<b>B*</b>	<b>Single solenoid, 2 position, spring offset. P to A and B to T in offset position.</b>	
<b>C</b>	<b>Double solenoid, 3 position, spring centered.</b>	
<b>D*</b>	<b>Double solenoid, 2 position, detent.</b>	
<b>E</b>	<b>Single solenoid, 2 position, spring centered. P to B and A to T when energized.</b>	
<b>F**</b>	<b>Single solenoid, 2 position, spring offset, energized to center. Position spool spacer on A side. P to A and B to T in spring offset position.</b>	
<b>H*</b>	<b>Single solenoid, 2 position, spring offset. P to B and A to T in offset position.</b>	
<b>K</b>	<b>Single solenoid, 2 position, spring centered. P to A and B to T when energized.</b>	
<b>M**</b>	<b>Single solenoid, 2 position, spring offset, energized to center position. Spool spacer on B side. P to B and A to T in spring offset position.</b>	

\* Available with 001, 004, 011 and 012 spools only.  
 \*\* High watt coil only.

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

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



\* No conduit box variations – See Plug-in.  
 \*\* 24 VDC only, low watt only, lights, diode surge suppressor, not CSA approved.  
 † Not available with lights.  
 †† Required for variations on conduit box style, must have lights.  
 ++ 12 and 24 VDC only.  
 ‡ Only 12 VDC high watt.  
 x 6" leadwire only.

**Code Description**  
**Omit Standard Pressure**  
 103.5 Bar (1500 PSI) AC  
 207 Bar (3000 PSI) DC  
**H\* High Pressure, AC only**  
 207 Bar (3000 PSI)

\* Not available with CSA or Explosion Proof.

**Code Description**  
**Omit\* High watt**  
 D\*\* Explosion Proof, EExd ATEX  
 E\*\* Explosion Proof, EExme ATEX, IECEX, from Germany  
 F† Low Watt  
 L†† 10 Watt  
 R# Explosion Proof, ATEX/UL/CSA/IECEX, configurable cable connection  
 T# Explosion Proof, ATEX/UL/CSA/IECEX, fixed horizontal cable connection  
 U## Explosion Proof, UL/CSA

\* AC ambient temperature must not exceed 60°C (140°F).  
 \*\* J voltage only, no options.  
 † AC only.  
 †† DC and AC rectified only.  
 # J and Y voltages only. Y voltage is rectified.  
 ## J and Y voltages only. Y voltage is not rectified.

**Valve Weight:**  
 Double Solenoid 12.1 kg (26.6 lbs.)

**Seal Kit:**  
 Nitrile SKD61VWN91  
 Fluorocarbon SKD61VWV91

**Code Description**  
**Omit No Options**  
 J# Diode Surge Suppressor  
 Z† Rectified Coil

# **Plug-In** – 24 VDC only.  
**DIN** – DC only with Lighted Plug (5), which has integrated Surge Suppression. "J" not required here.  
**Deutsch** – as follows:  
 • 12 VDC Hi watt only  
 • 24 VDC Hi & Lo watt  
**24 VDC "JER"** required. "JET" available. Adds dust rating, not polarity sensitive [IIIC, D].  
**Leadwire** – not available  
 † DC tube standard, Plug-In conduit box only. Not polarity sensitive. Only available with Y voltage.

**Mounting Bolt Kits**

UNC Bolt Kits for use with D6 and D8 Directional Control Valves & Sandwich Valves				
	Number of Sandwich Valves @ 2.75" (70mm) thickness			
	0	1	2	3
D6	BK227 2.50"	BK121 5.25"	BK122 8.00"	BK123 10.75"
D6 plus tapping plate	BK161 3.50"	BK170 6.25"	BK171 9.00"	BK172 11.75"
D8	BK228 3.00"	BK131 5.75"	BK132 8.50"	BK133 11.25"
D8 plus tapping plate	BK173 4.00"	BK174 6.75"	BK175 9.50"	BK114 12.125"

**Note:** All bolts are SAE grade 8, 1/2-13 UNC-3A thread, torque to 133 N.m. (100 ft.-lbs.)

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

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



**Valve Variations**

**A**

<b>Code</b>	<b>Description</b>
<b>5*</b>	<b>Signal Lights – Standard</b>
	<b>Signal Lights – Hirsch. (DIN with plug) (the DC Lighted Plug has Integral Surge Supression)</b>
7B**	Manaplug – Brad Harrison (12x1) Micro with lights
<b>56**</b>	<b>Manaplug (Mini) with Lights</b>
<b>20</b>	<b>Fast Response</b>
<b>1C**</b>	<b>Manaplug (Mini) Single Sol. 5-pin, with Lights</b>
1D**	Manaplug (Micro) Single Sol. 5-pin, with Lights
1M**	Manaplug Opposite Normal
1P	Painted Body
1R	Stroke Adjust 'A' & 'B' End with Pilot Choke Meter In
<b>3A</b>	<b>Pilot Choke Meter Out</b>
<b>3B</b>	<b>Pilot Choke Meter In</b>
<b>3C</b>	<b>Pilot Pressure Reducer</b>
3D	Stroke Adjust 'B' End
3E	Stroke Adjust 'A' End
3F	Stroke Adjust 'A' & 'B' End
<b>3G*</b>	<b>Pilot Choke Meter Out with Lights</b>
<b>3H*</b>	<b>Pilot Choke Meter In with Lights</b>
3J*	Pilot Pressure Reducer with Lights
3K	Pilot Choke Meter Out with Stroke Adjust 'A' & 'B' End
3L**	Pilot Choke Meter Out, Stroke Adjust 'A' & 'B' End with Lights and Manaplug — Brad Harrison Mini
3M	Pilot Choke Meter Out, Pilot Pressure Reducer, Stroke Adjust 'A' & 'B' End
3R	Pilot Choke Meter Out & Pilot Pressure Reducer
3S**	Lights, Mini Manaplug, Pilot Choke Meter Out
7Y**	M12x1 Manaplug (4-pin), Special Wiring, and Lights

\* DESINA, plug-in conduit box, and DIN with plug styles only.

\*\* Must have plug-in style conduit box.



**Reference Data**

Model	Spool Symbol	Maximum Flow, LPM (GPM) 207 Bar (3000 PSI) w/o Malfunction	Model	Spool Symbol	Maximum Flow, LPM (GPM) 207 Bar (3000 PSI) w/o Malfunction
D61V*001		390 (100)	D61V*009		312 (80)
D61V*003		390 (100)	D61V*011		390 (100)
D61V*004		390 (100)	D61V*012		137 (35)
D61V*005		390 (100)	D61V*015		390 (100)
D61V*006		390 (100)	D61V*016		390 (100)
D61V*008		312 (80)			

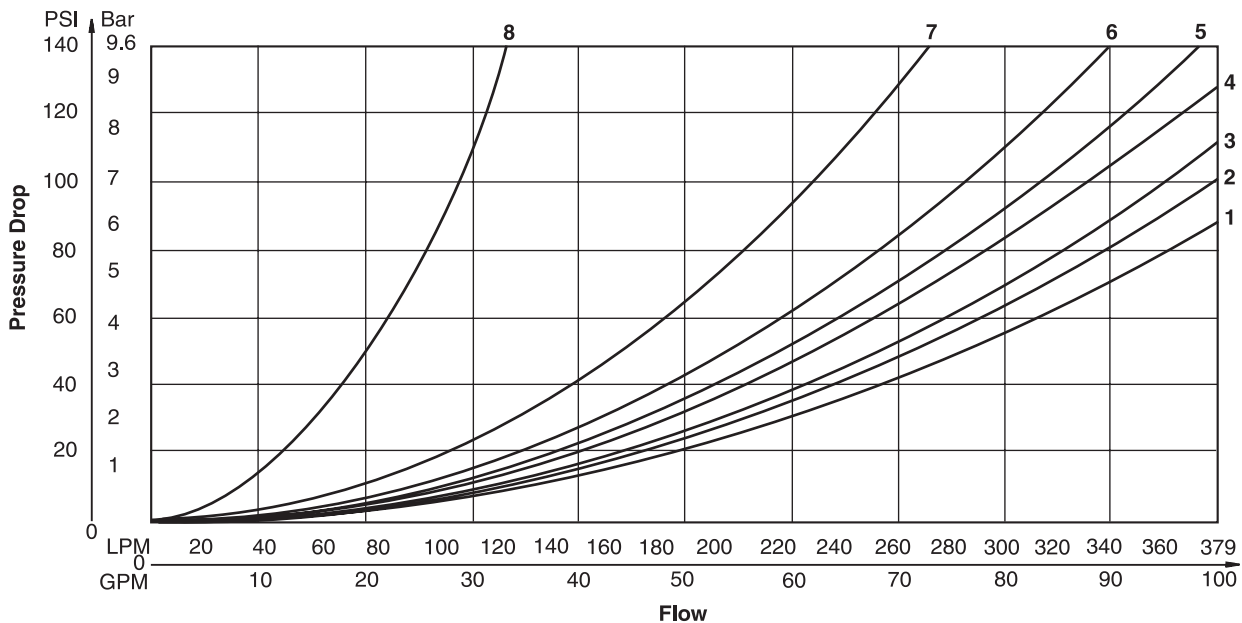
**D61V\* Series Pressure Drop Chart**

The following chart provides the flow vs. pressure drop curve reference for the Series D61V valves by spool type.

VISCOSITY CORRECTION FACTOR							
Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (Approx.)	93	111	119	126	132	137	141
Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change as per chart.							

D61VW Pressure Drop Reference Chart -- Curve Number					
Spool No.	P-A	P-B	P-T	A-T	B-T
001	3	3	—	1	2
003	3	3	—	4	2
004	3	3	—	4	5
005	3	4	—	1	2
006	4	4	—	1	2
008/009	3	3	7	4	6
011	3	3	—	1	2
012	3	3	8	4	5
015	3	3	—	2	4
016	4	3	—	2	1

**Performance Curves**



**A**

**Solenoid Ratings**

<b>Insulation System</b>	Class F
<b>Allowable Deviation from rated voltage</b>	-10% to +10% for DC and AC rectified coils -5% to +5% for AC Coils
<b>Armature</b>	Wet pin type
<b>CSA File Number</b>	LR60407
<b>Environmental Capability</b>	DC Solenoids meet NEMA 4 and IP67 when properly wired and installed. Contact HVD for AC coil applications.

**Explosion Proof Solenoid Ratings\***

<b>U.L. &amp; CSA (EU)</b>	Class I, Div 1 & 2, Groups C & D Class II, Div 1 & 2, Groups E, F & G As defined by the N.E.C.
<b>ATEX (ED)</b>	Complies with ATEX requirements for: Ex d IIB Gb; EN60079-0:2012, EN60079-1:2007
<b>ATEX, IECEx &amp; CSA/US (ER, ET) (Tri-rated)</b>	Complies with IEC 60079-0:2011, IEC 60079-1:2007, IEC 60079-31:2013; Ex d IIC Gb; Ex tb IIIC Db IP66; IECEx BAS 14.0164X  ATEX: EN60079-0, EN60079-1, EN60079-31; CE 1180 Ex II 2G BASEEFA08ATEX0041X  CSA 22.2 No. 60079-0:07, 60079-1:07 and UL 60079-0:05, UL 60079-1:05; CSA listed to US and Canada Safety Standards. File 08-CSA-1932102  CSA Ex d IIC, AEx d IIC for Class I Zone 1; Class I Div 1 Grp. C & D; Class II Div 1 Grp. E, F & G

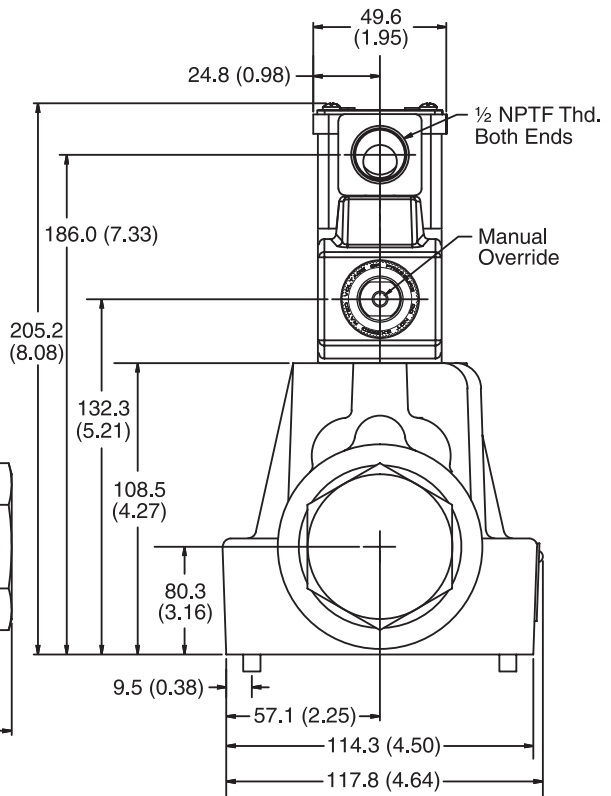
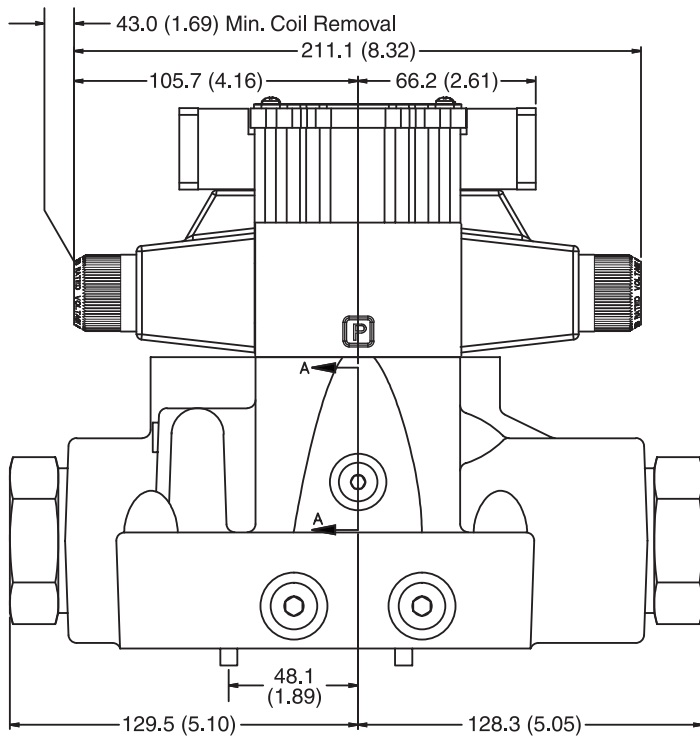
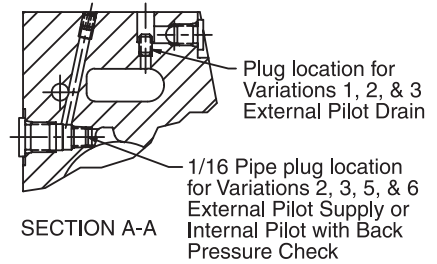
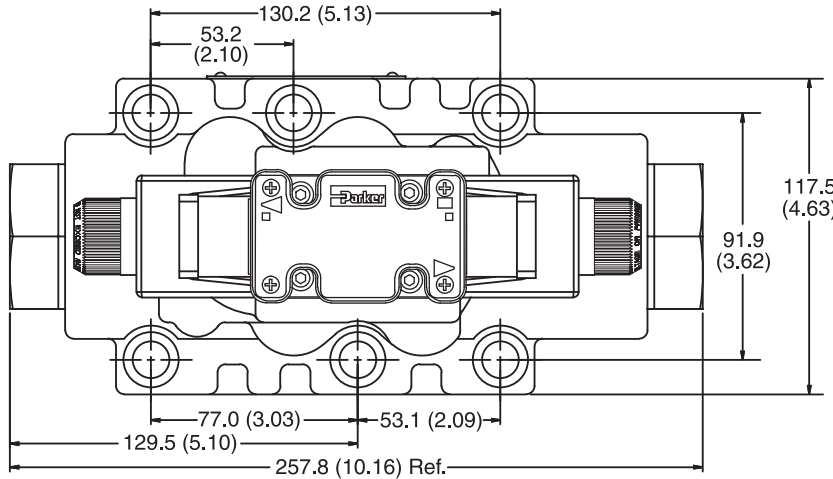
\* Allowable Voltage Deviation ±10%.

Code		Voltage	In Rush Amps Amperage	In Rush VA	Holding Amps @ 3 mm	Watts	Resistance
Voltage Code	Power Code						
D	Omit	120 VDC	N/A	N/A	0.26 Amps	30 W	528.00 Ohms
E	F	24 VAC	4.8 AMPS	120 VA	2.07 Amps	21 W	1.29 Ohms
J	L	24 VDC	N/A	N/A	0.44 Amps	10 W	51.89 Ohms
J	Omit	24 VDC	N/A	N/A	1.32 Amps	30 W	17.27 Ohms
K	L	12 VDC	N/A	N/A	0.88 Amps	10 W	12.97 Ohms
K	Omit	12 VDC	N/A	N/A	2.64 Amps	30 W	4.32 Ohms
Q	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	0.77 Amps	30 W	19.24 Ohms
QD	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	.77 Amps	30 W	19.24 Ohms
T	Omit	240/60 VAC	0.83 Amps	199 VA	0.30 Amps	30 W	120.40 Ohms
T	Omit	220/50 VAC	0.87 Amps	191 VA	0.34 Amps	30 W	120.40 Ohms
T	F	240/60 VAC, Low Watt	0.70 Amps	168 VA	0.22 Amps	21 W	145.00 Ohms
T	F	220/50 VAC, Low Watt	0.75 Amps	165 VA	0.26 Amps	23 W	145.00 Ohms
U	Omit	98 VDC	N/A	N/A	0.31 Amps	30W	288.00 Ohms
Y	Omit	120/60 VAC	1.7 Amps	204 VA	0.60 Amps	30 W	28.20 Ohms
Y	Omit	110/50 VAC	1.7 Amps	187 VA	0.68 Amps	30 W	28.20 Ohms
Y	F	120/60 VAC, Low Watt	1.40 Amps	168 VA	0.42 Amps	21 W	36.50 Ohms
Y	F	110/50 VAC, Low Watt	1.50 Amps	165 VA	0.50 Amps	23 W	36.50 Ohms
<b>Explosion Proof Solenoids</b>							
Y		120/60 VAC	1.60 Amps	192 VA	0.58 Amps	27 W	33.50 Ohms
J		24 VDC	N/A	N/A	1.38 Amps	33 W	17.33 Ohms
<b>Explosion Proof Solenoids (German)</b>							
J		24 VDC	N/A	N/A	1.0 Amps	24 W	24 Ohms
<b>ER &amp; ET Explosion Proof Solenoids</b>							
J		24 VDC	N/A	N/A	0.54 Amps	13 W	44.30 Ohms
Y		120/60 VAC	N/A	N/A	0.16 Amps	17 W	667.00 Ohms



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

Plug-in Conduit Box, Double AC Solenoid



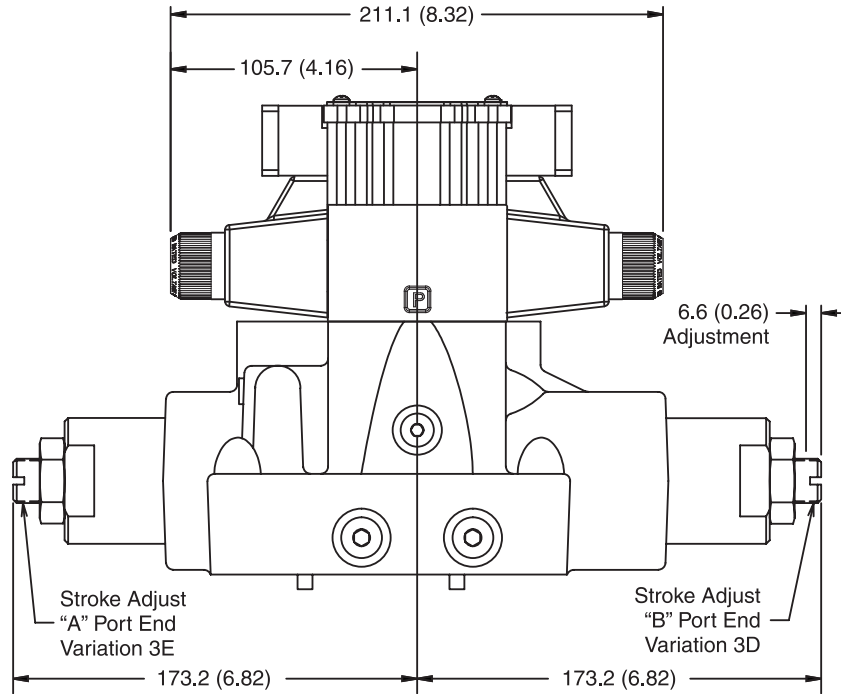
Note: 41.9mm (1.65") from bottom of bolt hole counterbore to bottom of valve.



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

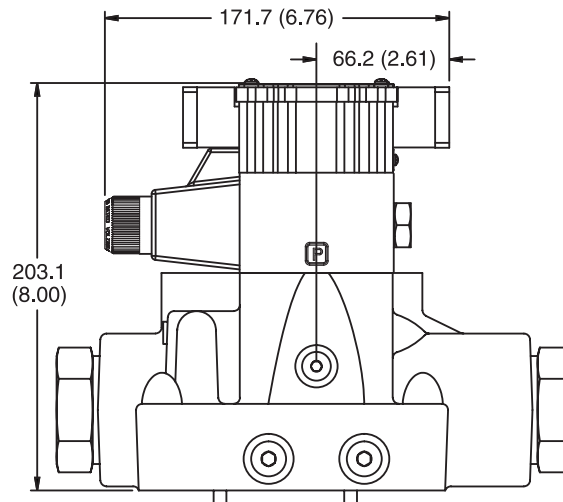
**A**

**Plug-in Conduit Box and Stroke Adjust, Double AC Solenoid**



**Note:** 41.9mm (1.65") from bottom of bolt hole counterbore to bottom of valve.

**Plug-in Conduit Box, Single AC Solenoid**



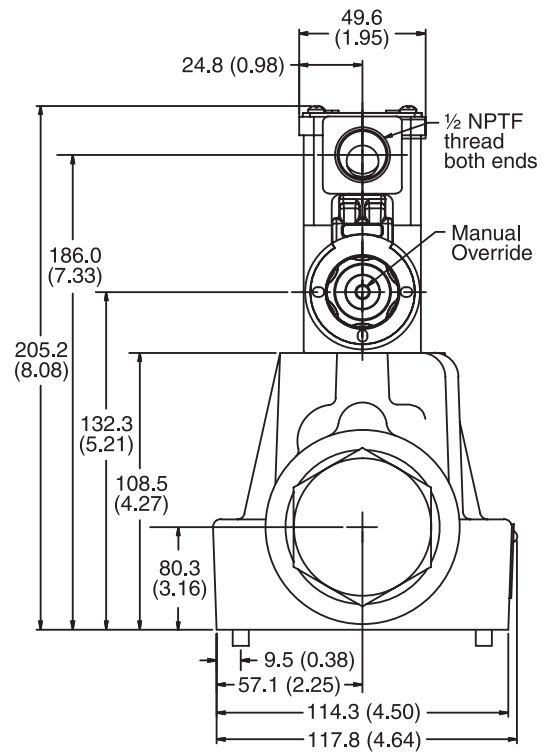
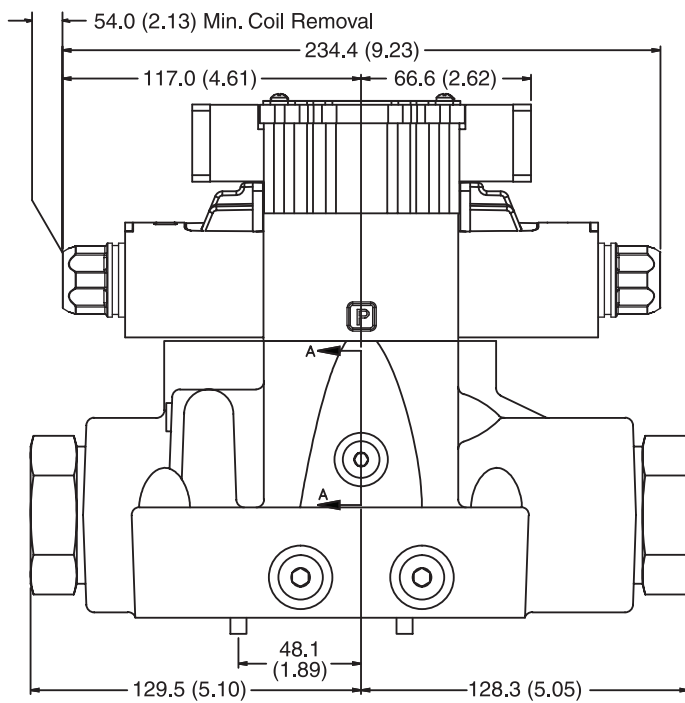
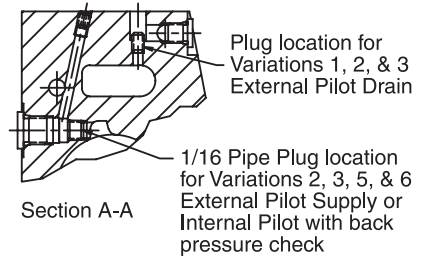
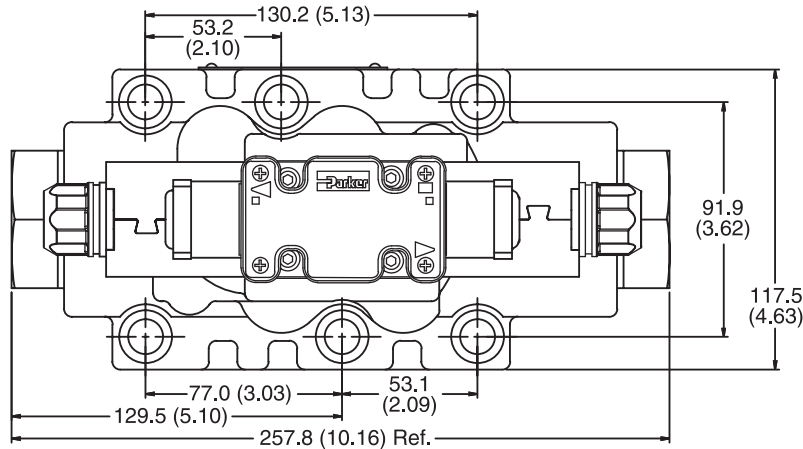
**Note:** 41.9mm (1.65") from bottom of bolt hole counterbore to bottom of valve.

Dimensions

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

Plug-in Conduit Box, Double DC Solenoid

A



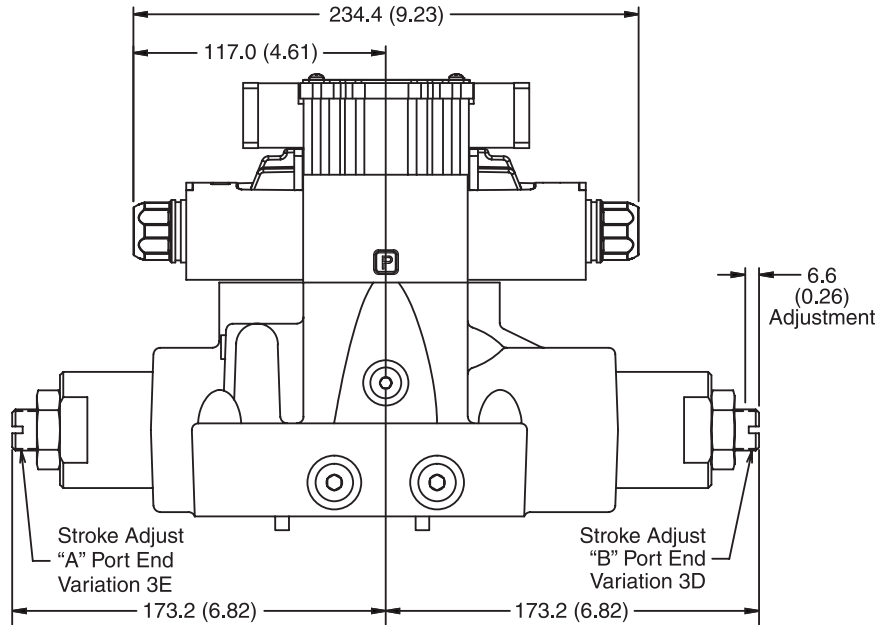
Note: 41.9mm (1.65") from bottom of bolt hole counterbore to bottom of valve.



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

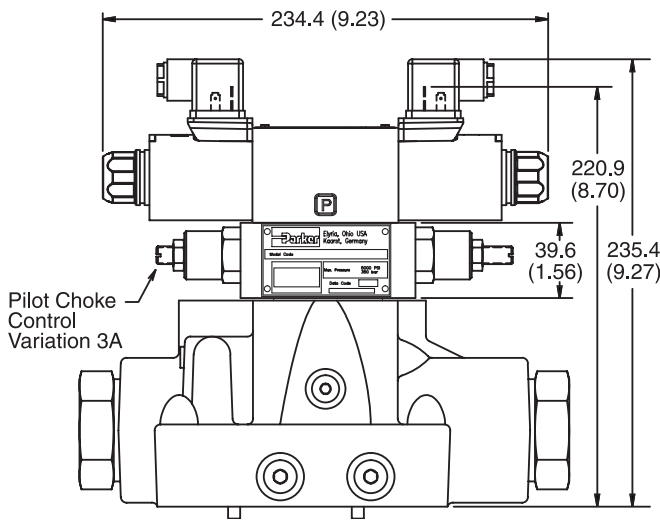
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**Plug-in Conduit Box and Stroke Adjust, Double DC Solenoid**

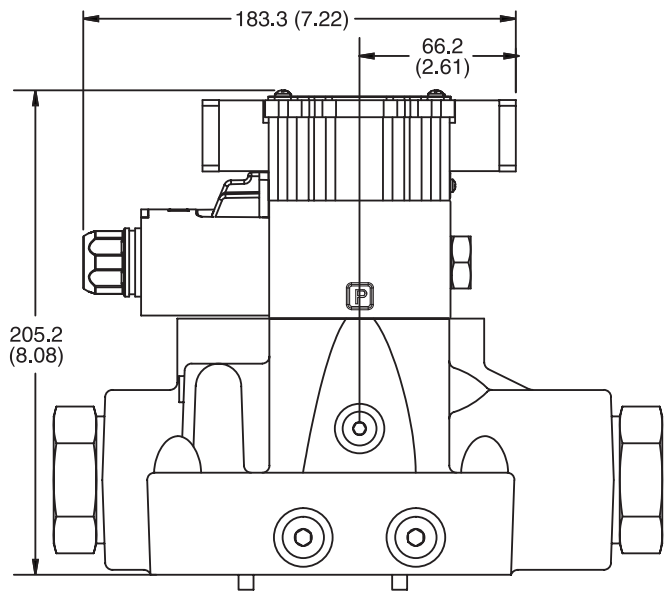


**Note:** 41.9mm (1.65") from bottom of bolt hole counterbore to bottom of valve.

**Hirschmann and Pilot Choke Control, Double DC Solenoid**



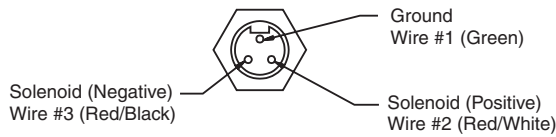
**Plug-in Conduit Box, Single DC Solenoid**





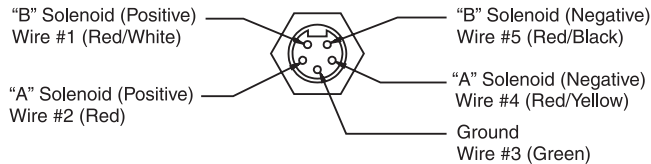
**Manaplug (Options 6, 56, 1A & 1C)**

- Interface – Brad Harrison Plug
- 3-Pin for Single Solenoid
- 5-Pin for Double Solenoid



**3-Pin Manaplug (Mini) with Lights**

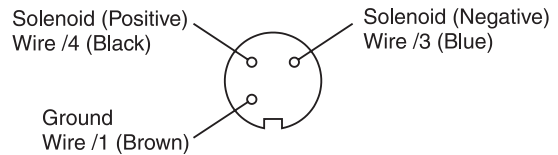
Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Mini) with Lights**

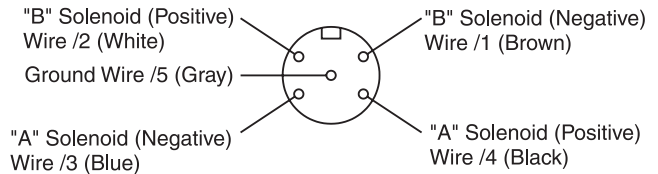
Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Micro Connector Options (7A, 7B, 1B & 1D)**



**3-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Pins are as seen on valve (male pin connectors)**

**Manaplug – Electrical Mini Plug**

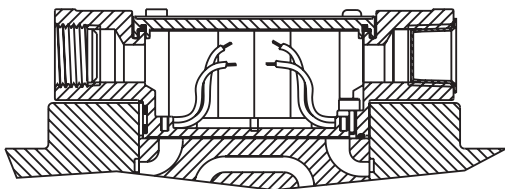
- EP336-30 3 Pin Plug
- EP316-30 5 Pin Plug (Double Solenoid)
- EP31A-30 5 Pin Plug (Single Solenoid)

**Manaplug – Electrical Micro Plug**

- EP337-30 3 Pin Plug
- EP317-30 5 Pin Plug (Double Solenoid)
- EP31B-30 5 Pin Plug (Single Solenoid)

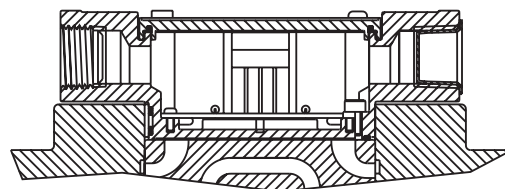
**Conduit Box Option C**

- No Wiring Options Available

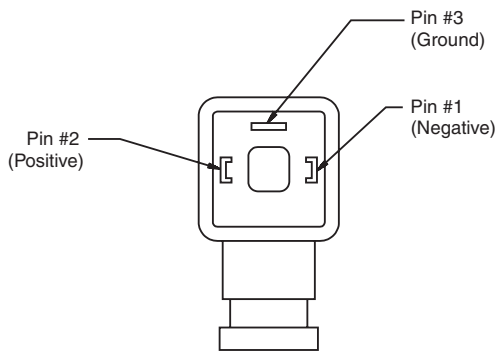


**Signal Lights (Option 5) — Plug-in Only**

- LED Interface
- Meets Nema 4/IP67



**Hirschmann Plug with Lights (Option P5)  
ISO 4400/DIN 43650 Form "A"**



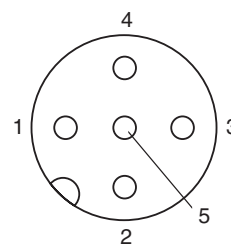
Face View of Plug

**Pins are as seen on valve (male pin connectors)**

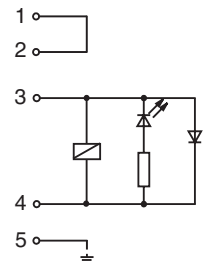
**DESINA Connector (Option D)**

**M12 pin assignment  
Standard**

- 1 = Not used
- 2 = Not used
- 3 = 0V
- 4 = Signal (24 V)
- 5 = Earth Ground



DESINA – design  
Pin 1 and 2  
connected



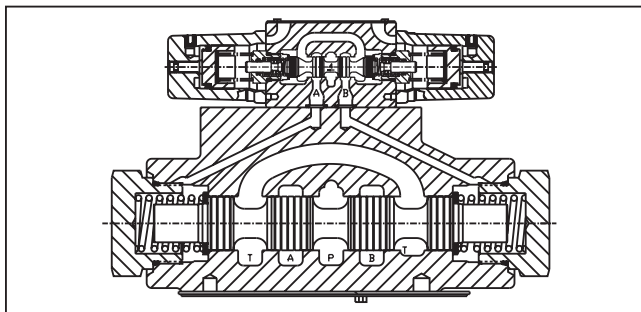
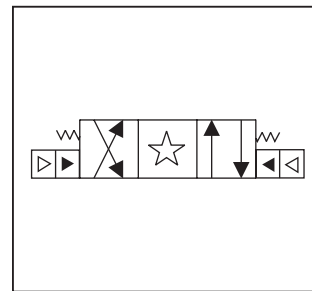
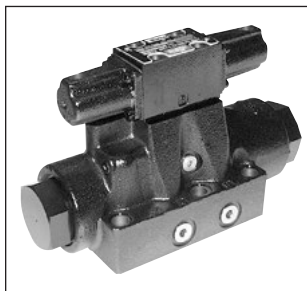
**A**

**General Description**

Series D61VA directional control valves are 5-chamber, air pilot operated valves. They are available in 2 or 3-position styles. These valves are manifold or sub-plate mounted, and conform to NFPA's D08, CETOP 8 mounting patterns.

**Specifications**

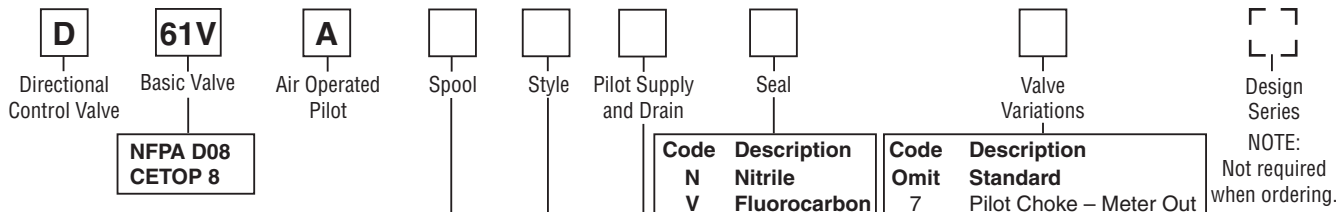
<b>Mounting Pattern</b>	NFPA D08, CETOP 8, NG25
<b>Max. Oper. Pressure</b>	207 Bar (3000 PSI)
<b>Max. Tank Pressure</b>	Internal Drain Model: 34 Bar (500 PSI) External Drain Model: 207 Bar (3000 PSI)
<b>Max. Drain Pressure</b>	34 Bar (500 PSI)
<b>Maximum Flow</b>	See Reference Data
<b>Pilot Pressure</b>	Air Min. 3.4 Bar (50 PSI) Air Max. 10.2 Bar (150 PSI)
<b>Response Time</b>	Varies with pilot line size and length, pilot pressure, pilot valve shift time & flow capacity (GPM)



**Features**

- Low pressure drop.
- Fast response option available.
- Hardened spools provide long life.

**Ordering Information**



Code	Symbol	Code	Symbol
001		011	
004		012	
008*			
009**			

\* 008 spool has closed crossover.  
 \*\* 009 spool has open crossover.

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator A. Note operators reverse sides for 008 and 009 spools. See installation information for details.

- Valve Weight:** 12.4 kg (27.3 lbs.)  
**Standard Bolt Kit:** BK227  
**Metric Bolt Kit:** BKM227  
**Seal Kit:** Nitrile SKD61VA  
 Fluorocarbon SKD61VAV

Code	Description
N	Nitrile
V	Fluorocarbon
1	Int. pilot/Ext. drain
2	Ext. pilot/Ext. drain
4#	Int. pilot/Int. drain
5	Ext. pilot/Int. drain

# Not available with 008 & 009 spools.

Code	Description
Omit	Standard
7	Pilot Choke – Meter Out
8	Stroke Adj. 'B' End
9	Stroke Adj. 'A' End
60	Pilot Choke – Meter In
89	Stroke Adj. 'A' & 'B' Ends
90	1/4 BSPP Threads

NOTE:  
 Not required when ordering.

Code	Description	Symbol
<b>B*</b>	<b>Single operator, 2 position, spring offset. P to A and B to T in offset position.</b>	
<b>C</b>	<b>Double operator, 3 position, spring centered.</b>	
<b>D*</b>	<b>Double operator, 2 position, detent.</b>	
<b>E</b>	Single operator, 2 position, spring offset to center. P to B and A to T in shifted position.	
<b>H*</b>	<b>Single operator, 2 position, spring offset. P to B and A to T in offset position.</b>	
<b>K</b>	Single operator, 2 position. Spring offset to center. P to A and B to T in shifted position.	

This condition varies with spool code.

\* Not available on 008 and 009 spools.

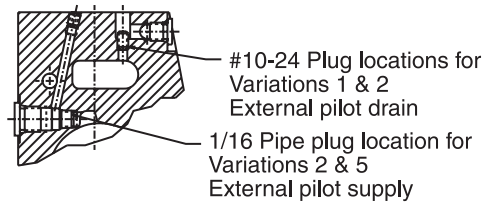
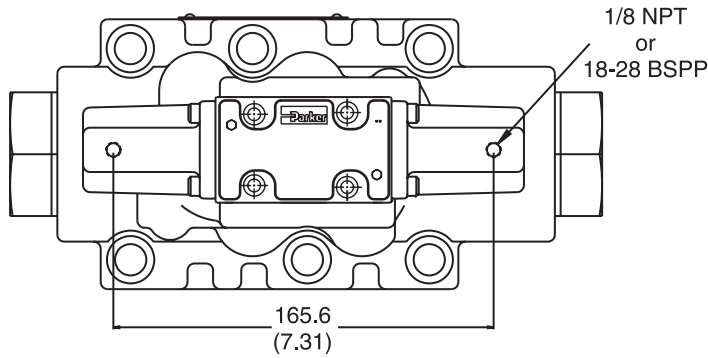
**Bold: Designates Tier I products and options.**

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

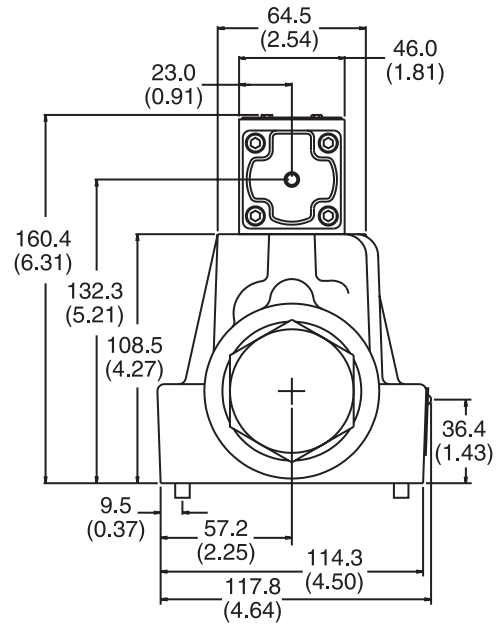
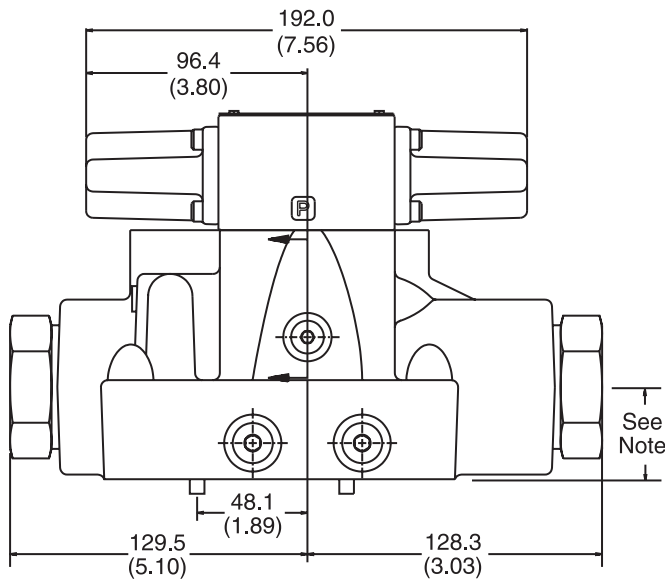
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



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



SECTION A-A



**Note:** 41.9mm (1.65") from bottom of bolt hole counterbore to bottom of valve.



**A**

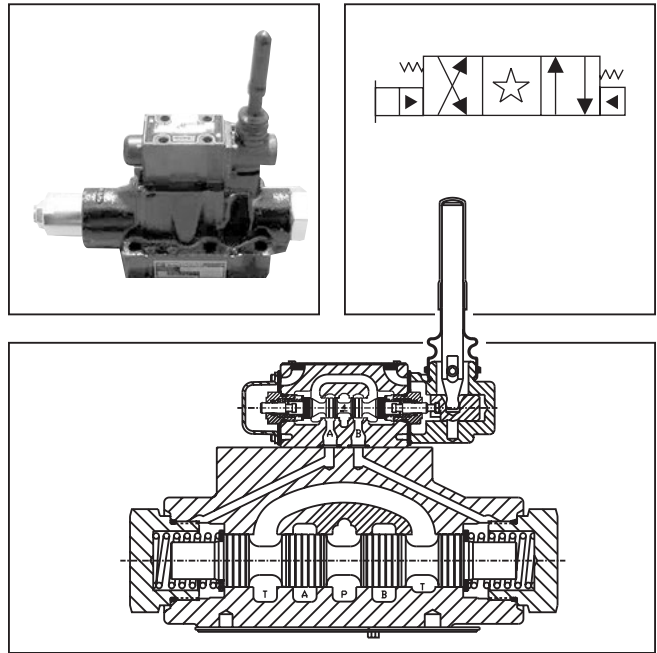
**A**

**General Description**

Series D61VL directional control valves are 5-chamber, lever operated valves. They are available in 2 and 3-position styles. They are manifold or sub-plate mounted valves, which conform to NFPA's D08, CETOP 8 mounting patterns.

**Specifications**

<b>Mounting Pattern</b>	NFPA D08, CETOP 8, NG25
<b>Max. Oper. Pressure</b>	207 Bar (3000 PSI)
<b>Max. Tank Pressure</b>	Internal Drain Model: 34 Bar (500 PSI) External Drain Model: 207 Bar (3000 PSI)
<b>Max. Drain Pressure</b>	34 Bar (500 PSI)
<b>Maximum Flow</b>	See Reference Data
<b>Pilot Pressure</b>	Oil Min. 6.9 Bar (100 PSI) Oil Max. 207 Bar (3000 PSI)
<b>Response Time</b>	Varies with pilot line size and length, pilot pressure, pilot valve shift time & flow capacity (GPM)



**Ordering Information**

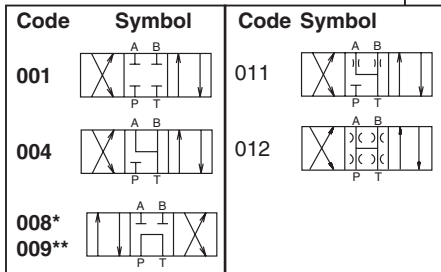
<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">D</div> Directional Control Valve	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">61V</div> Basic Valve <div style="border: 1px solid black; padding: 2px; width: 100px; margin: 0 auto; text-align: center;">NFPA D08 CETOP 8</div>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">L</div> Lever Operated Pilot	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> Spool	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> Style	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> Pilot Supply and Drain	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> Seal	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> Valve Variations	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> Design Series NOTE: Not required when ordering.
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Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
1	Int. pilot/Ext. drain
2	Ext. pilot/Ext. drain
4#	Int. pilot/Int. drain
5	Ext. pilot/Int. drain

Code	Description	Code	Description
7	Pilot Choke – Meter Out	Omit	Standard
8	Stroke Adj. 'B' End		
9	Stroke Adj. 'A' End		
60	Pilot Choke – Meter In		
89	Stroke Adj. 'A' & 'B' Ends		
90	1/4 BSPG Threads		

# Not available with 008 & 009 spools.



\* 008 spool has closed crossover.  
 \*\* 009 spool has open crossover.

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator A. See installation information for details.

**Valve Weight:** 12.1 kg (26.7 lbs.)  
**Standard Bolt Kit:** BK227  
**Metric Bolt Kit:** BKM227  
**Seal Kit:**  
 Nitrile SKD61VL  
 Fluorocarbon SKD61VLV

Code	Description	Symbol
<b>B*</b>	<b>Single operator, 2 position, spring offset. P to A and B to T in offset position.</b>	
<b>C</b>	<b>Double operator, 3 position, spring centered.</b>	
<b>D*</b>	<b>Double operator, 2 position, detent.</b>	
<b>E</b>	Single operator, 2 position, spring centered. P to B and A to T in shifted position.	
<b>H*</b>	<b>Single operator, 2 position, spring offset. P to B and A to T in offset position.</b>	
<b>K</b>	Single operator, 2 position. Spring centered. P to A and B to T in shifted position.	

\*Available with 001, 004, 011 & 012.

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

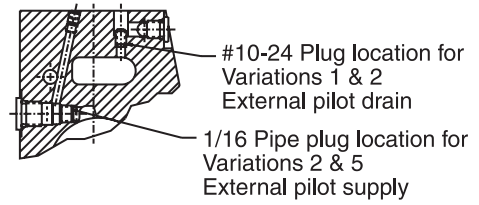
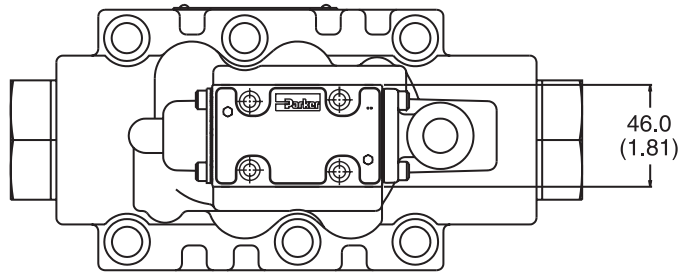
**Non-Bold: Designates Tier II products and options. These products will have longer lead times.**

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

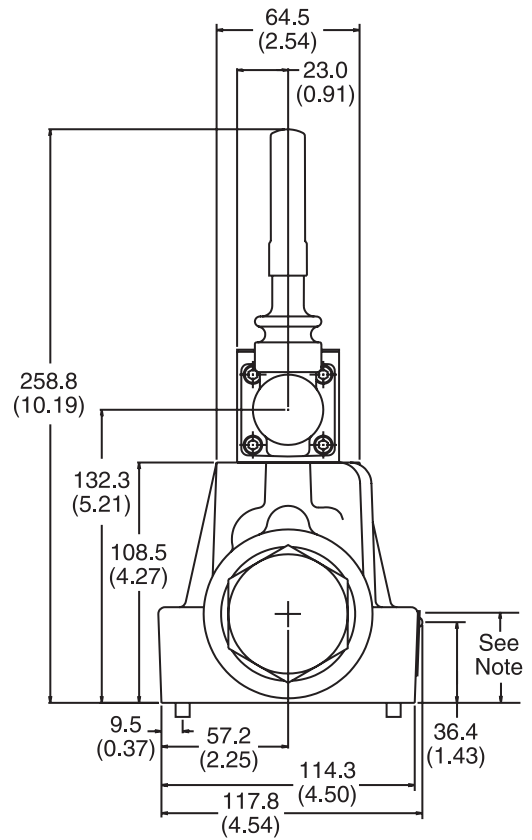
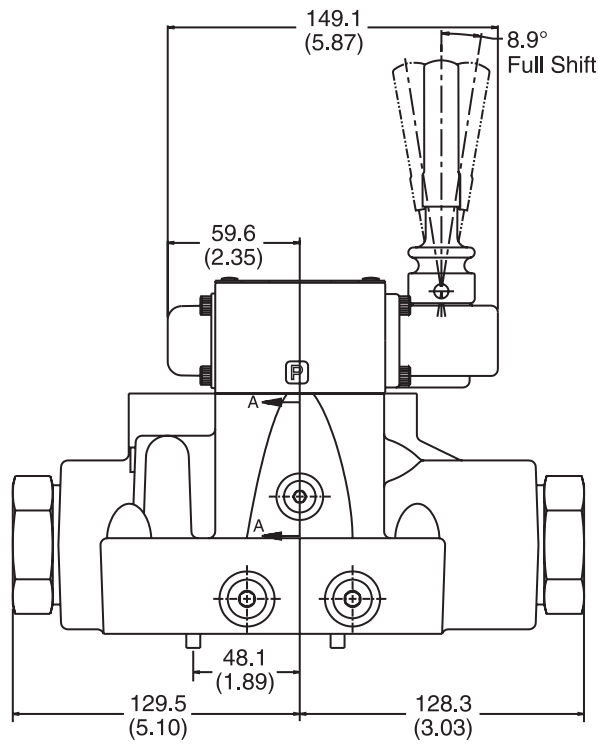




Inch equivalents for millimeter dimensions are shown in (\*\*)



SECTION A-A



**Note:** 41.9mm (1.65") from bottom of bolt counterbore.



**A**



**General Description**

Series D6P directional control valves are 5-chamber, pilot operated valves. They are available in 2 or 3-position styles. These valves are manifold or subplate mounted, and conform to NFPA's D08, CETOP 8 mounting patterns.

**Features**

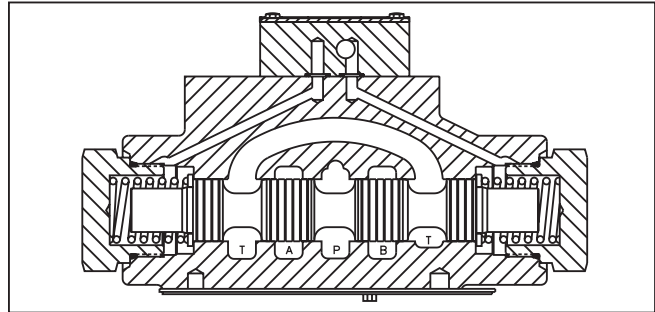
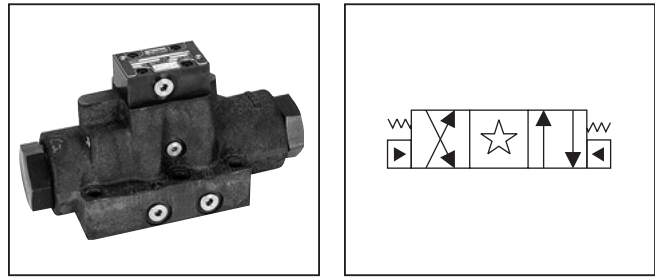
- Low pressure drop design.
- Hardened spools provide long life.
- Fast response option available.

**Specifications**

<b>Mounting Pattern</b>	NFPA D08, CETOP 8, NG25
<b>Max. Operating Press.</b>	207 Bar (3000 PSI)
<b>Max. Tank Line Press.</b>	207 Bar (3000 PSI)
<b>Max. Drain Pressure</b>	207 Bar (3000 PSI)
<b>Min. Pilot Pressure</b>	5.1 Bar* (75 PSI)
<b>Max. Pilot Pressure</b>	207 Bar (3000 PSI)
<b>Nominal Flow</b>	189 Liters/Min (50 GPM)
<b>Maximum Flow</b>	See Reference Chart

\* 6.9 Bar (100 PSI) for 2, 8, 9 & 12 spools

For flow path, pilot drain and pilot pressure details, see Installation Information.



**Response Time**

Response time will vary with pilot line size, pilot line length, pilot pressure shift time and flow capacity of the control valve.

**Shift Volume**

The pilot chamber requires a volume of 0.54 in<sup>3</sup> for center to end and 1.08 in<sup>3</sup> for end to end.

**Ordering Information**

<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">D</div> Directional Control Valve	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">6</div> Basic Valve <div style="border: 1px solid black; padding: 2px; width: 80px; margin: 0 auto; text-align: center;">NFPA D08 CETOP 8</div>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">P</div> Hydraulic Pilot	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> Spool	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> Style	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> Pilot Supply and Drain	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> Seal	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> Valve Variations	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"></div> Design Series NOTE: Not required when ordering.
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<table border="1" style="width: 100%;"> <thead> <tr> <th>Code</th> <th>Symbol</th> <th>Code</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>001</td> <td></td> <td>011</td> <td></td> </tr> <tr> <td>004</td> <td></td> <td>012</td> <td></td> </tr> <tr> <td>008*</td> <td></td> <td></td> <td></td> </tr> <tr> <td>009**</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>* 008 spool has closed crossover.            ** 009 spool has open crossover.</p>	Code	Symbol	Code	Symbol	001		011		004		012		008*				009**				<table border="1" style="width: 100%;"> <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> <table border="1" style="width: 100%;"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>Ext. Pilot — Ext. Drain</td> </tr> <tr> <td>5#</td> <td>Ext. Pilot — Int. Drain</td> </tr> </tbody> </table> <p># Available in "B" &amp; "H" styles only.</p>	Code	Description	N	Nitrile	V	Fluorocarbon	Code	Description	2	Ext. Pilot — Ext. Drain	5#	Ext. Pilot — Int. Drain	<table border="1" style="width: 100%;"> <thead> <tr> <th>Code</th> <th>Description</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>B*</td> <td>Single operator, 2 position, spring offset. P to A and B to T in offset position.</td> <td></td> </tr> <tr> <td>C</td> <td>Double operator, 3 position, spring centered.</td> <td></td> </tr> <tr> <td>H*</td> <td>Single operator, 2 position, spring offset. P to B and A to T in offset position.</td> <td></td> </tr> </tbody> </table> <p>* Not available with 008 &amp; 009 spools.</p>	Code	Description	Symbol	B*	Single operator, 2 position, spring offset. P to A and B to T in offset position.		C	Double operator, 3 position, spring centered.		H*	Single operator, 2 position, spring offset. P to B and A to T in offset position.	
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Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator X. Note operators reverse sides for 008 and 009 spools. See installation information for details.

**Valve Weight:** 11.0 kg (24.2 lbs.)  
**Standard Bolt Kit:** BK227  
**Metric Bolt Kit:** BKM227

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

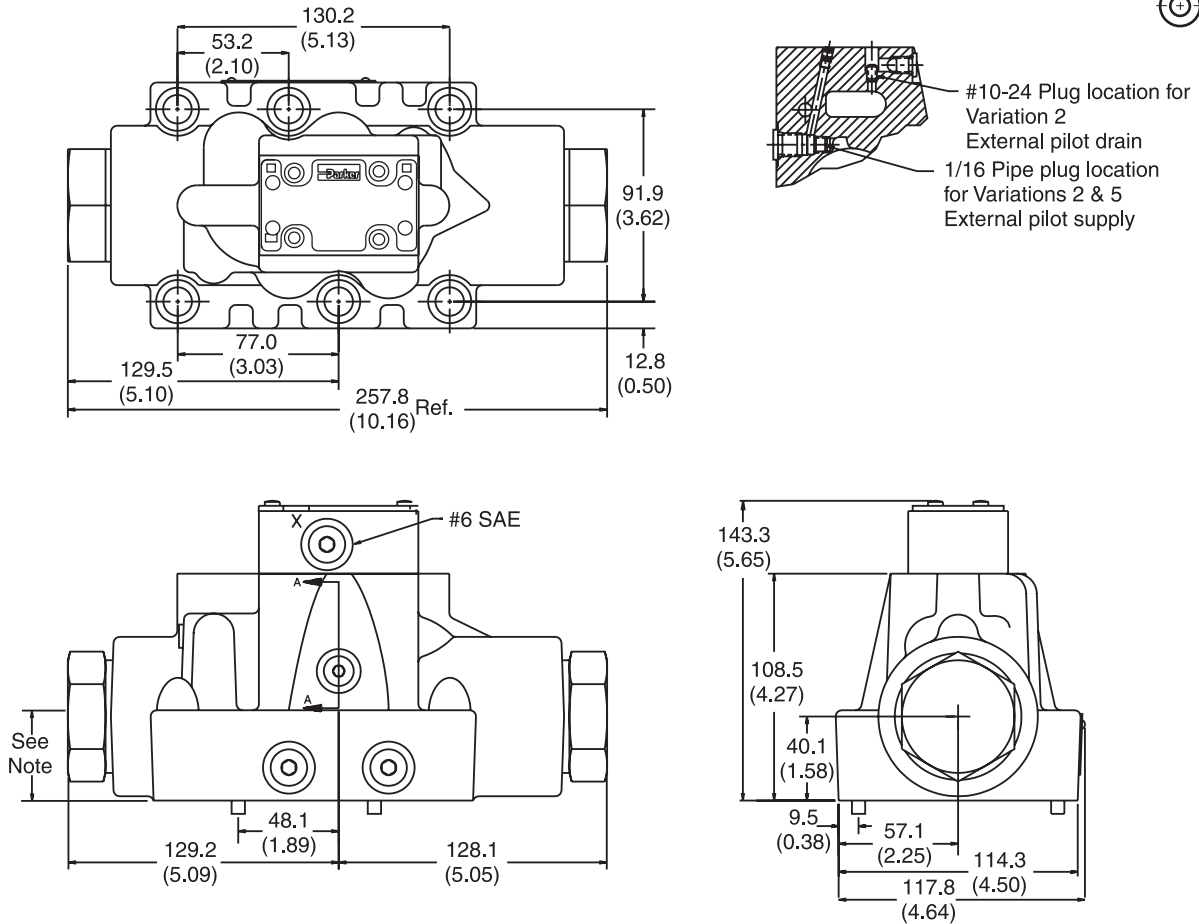
**Non-Bold: Designates Tier II products and options. These products will have longer lead times.**

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



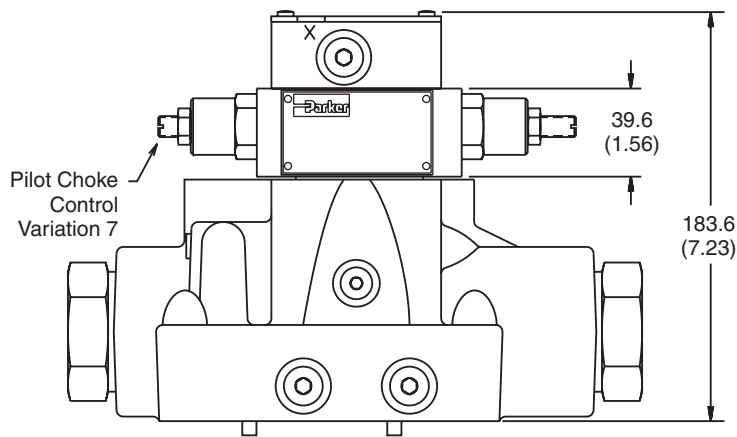
Inch equivalents for millimeter dimensions are shown in (\*\*)

**Standard Pilot Operated**



**Note:** 41.9mm (1.65") from bottom of bolt hole counterbore to bottom of valve.

**Pilot Operated with Pilot Choke Control**



**Note:** 41.9mm (1.65") from bottom of bolt hole counterbore to bottom of valve.

**A**

FOR MAXIMUM VALVE RELIABILITY, ADHERE TO THE FOLLOWING INSTALLATION INFORMATION.

The following is important installation information which applies to all directional control valves described in this catalog.

### Mounting Position

Detent – Horizontal  
Spring Offset – Unrestricted  
Spring Centered – Unrestricted

### Fluid Recommendations

Premium quality hydraulic oil with a viscosity range between 32-54 cSt. (150-250 SSU) At 38°C (100°F) is recommended. The absolute operating viscosity range is from 16-220 cSt. (80-1000 SSU). Oil should have maximum anti-wear properties and rust and oxidation treatment.

### Fluids and Seals

Valves using synthetic, fire-resistant fluids require special seals. When phosphate esters or its blends are used, FLUOROCARBON seals are required. Water-glycol, water-in-oil emulsions and petroleum oil may be used with STANDARD seals.

### Filtration

For maximum valve and system component life, the system should be protected from contamination at a level not to exceed 125 particles greater than 10 microns per milliliter of fluid (SAE class 4/ISO 16/13).

### Silting

Silting can cause any sliding spool valve to stick and not spring return if held under pressure for long periods of time. The valve should be cycled periodically to prevent sticking.

### Special Installations

Consult your Parker representative for any application requiring the following:

- Pressure above rating.
- Fluid other than those specified.
- Oil temperature above 71.1°C (160°F).
- Flow path other than normal.

### Mounting Patterns

Series	NFPA	Size
D61V*, D6P	D08, CETOP 8	3/4"

### Torque Specifications

The recommended torque values for the bolts which mount the valve to the manifold or subplate are as follows: 135.6 Nm (100 ft-lbs).

**Series D61VW, D61VA, D61VL****Tank and Drain Line Surges**

If several valves are piped with a common tank or drain line, flow surges in the line may cause an unexpected spool shift. Detent style valves are most susceptible to this. Separate tank and drain lines should be piped in installations where line surges are expected.

**Electrical Characteristics (Detented Spool)**

Only a momentary energizing of the solenoid is necessary to shift and hold a detented spool. Minimum duration of the signal is 0.1 seconds for DC voltages. For AC voltages the response time is 0.06 seconds. Spool position will be held provided the spool centerline is in a horizontal plane, and not shock or vibration is present to displace the spool.

**Electrical Failure or Loss of Pilot Pressure (D61VA)**

Should electric power fail or loss of pilot pressure occur, spring offset and spring centered valves will shift to the spring held position. Detented valves will stay in the last position held before power failure. If main flow does not fail or stop at the same time power fails, machine actuators may continue to function in an undesirable manner or sequence.

**Pilot/Drain Characteristics****Pilot Pressure:**

5.1 to 207 Bar (75 to 3000 PSI)  
6.9 Bar (100 PSI) for spools 008 & 009

**External:** An oil source sufficient to maintain minimum pilot pressure must be connected to the “X” port of the main body. When using the external pilot variation, a 1/16" pipe plug must be present in the main body pilot passage. (For details see Dimension pages.) This plug will be furnished in valves ordered with pilot code 2, 3, 5 or 6.

**Internal:** Flow is internally ported from the pressure port of the main valve body to the “P” port of the pilot valve. The pressure developed at the “P” port of the pilot valve must be 5.1 Bar (75 PSI) minimum at all times or 6.9 Bar (100 PSI) for spools 002, 007, 008, 009 & 014.

**Integral Check:** Valves using internal pilot and internal drain with an open center spool (spools 008 & 009) can be ordered with an integral check valve in the pressure port of the main valve codes 3 & 6. Pilot oil will be internally ported from the upstream side of this check to the “P” port of the pilot valve, ensuring sufficient pilot pressure. A 1/16" pipe plug will be present in the main body. The “X” port in the subplate must be plugged when using the integral check.

**Pilot Valve Drain:**

Maximum pressure 102 Bar (1500 PSI), 207 Bar (3000 PSI) optional.

**External:** When using an external drain, a 10 x 24 x 0.31 long set screw must be present in the main body drain passage. (For details see Dimension pages.) This plug will be furnished in valves ordered with drain code 1, 2 or 3.

Drain flow from the pilot valve is at the “Y” port of the main body and must be piped directly to tank. Maximum drain line pressure is 102 Bar (1500 PSI), 207 Bar (3000 PSI) optional. Any drain line back pressure is additive to the pilot pressure requirement.

**Internal:** Drain flow from the pilot valve is internally connected to the main valve tank port. Tank and drain pressure are then identical so tank line pressure should not exceed 102 Bar (1500 PSI), 207 Bar (3000 PSI) optional. Any tank line back pressure is also additive to the pilot pressure requirement. If flow surges (a cause of pressure surges) are anticipated in the tank line, an external drain variation is recommended. The “Y” port in the subplate must be plugged when using an internal drain.

**D61V\* Flow Paths**

Style Code	Description	No Solenoid/Operator Energized	Solenoid/Operator A Energized	Solenoid/Operator B Energized
B	Spring Offset	P→A and B→T	–	P→B and A→T
C	Spring Centered	Centered	P→A and B→T	P→B and A→T
D	Detented	Last Position Held	P→A and B→T	P→B and A→T
E	Spring Centered	Centered	–	P→B and A→T
F†	Spring Offset, Shift to Center	P→A and B→T	–	Centered
H	Spring Offset	P→B and A→T	P→A and B→T	–
K	Spring Centered	Centered	P→A and B→T	–
M†	Spring Offset, Shift to Center	P→B and A→T	Centered	–

† D61VW only.

**A**

**Series D6P**

**Tank and Drain Line Surges**

If several valves are piped with a common tank or drain line, flow surges in the line may cause an unexpected spool shift. Detent style valves are most susceptible to this. Separate tank and drain lines should be piped in installations where line surges are expected.

**Loss of Pilot Pressure**

Should a loss of pilot pressure occur, spring offset and spring centered valves will shift to the spring held position. No spring valves will stay in the last position held. If main hydraulic flow does simultaneously stop, machine actuators may continue to function in an undesirable manner or sequence.

**Pilot Drain Characteristics**

**Pilot Pressure:**

5.1 to 207 Bar (75 to 3000 PSI)  
6.9 Bar (100 PSI) for spools 8, 9 & 12

Direct pilot operated valves use the “X” and “Y” ports to supply pilot oil directly to the ends of the spool, providing spool shifting force. A block mounted on top of the valve body is internally cored to make the necessary connections. Thus when “X” is pressurized, “Y” is used as a drain; and when “Y” is pressurized, “X” becomes the drain.

Any back pressure in these lines when they are being used as a drain is additive to the pilot pressure requirement.

**Internal Drain:** On spring offset models, only the “X” port is pressurized, as the spring returns the spool to its at rest position. On these models, “Y” may be internally drained through the main tank passage in the valve.

**Flow Path/Pilot Pressure**

Style Code	Description	“X” & “Y” De-Pressurized	“X” Port Pressurized	“Y” Port Pressurized	Special Notes	Recommended Control Valve For Pilot Oil
B	Two Position Spring Offset	P→A, B→T	P→A, B→T	P→B, A→T	“X” Port may be pressurized to assist spring in returning spool to offset position (ext. only)	
C	Three Position Spring Centered	Center	P→A, B→T	P→B, A→T	Flow paths will be reversed on valves with tandem center (8) spools	
H	Two-Position Spring Offset	P→B, A→T	P→A, B→T	P→B, A→T	“Y” Port may be pressurized to assist spring in returning spool to offset position	

**Subplate Mounting**

**NFPA D08, CETOP 8 & NG 25**



**Recommended Mounting Surface**

Surface must be flat within .102 mm (0.0004 inch) T.I.R and smooth within 812.8 micro-meters (32 micro-inch). Torque bolts to 135.6 Nm (100 ft-lbs).

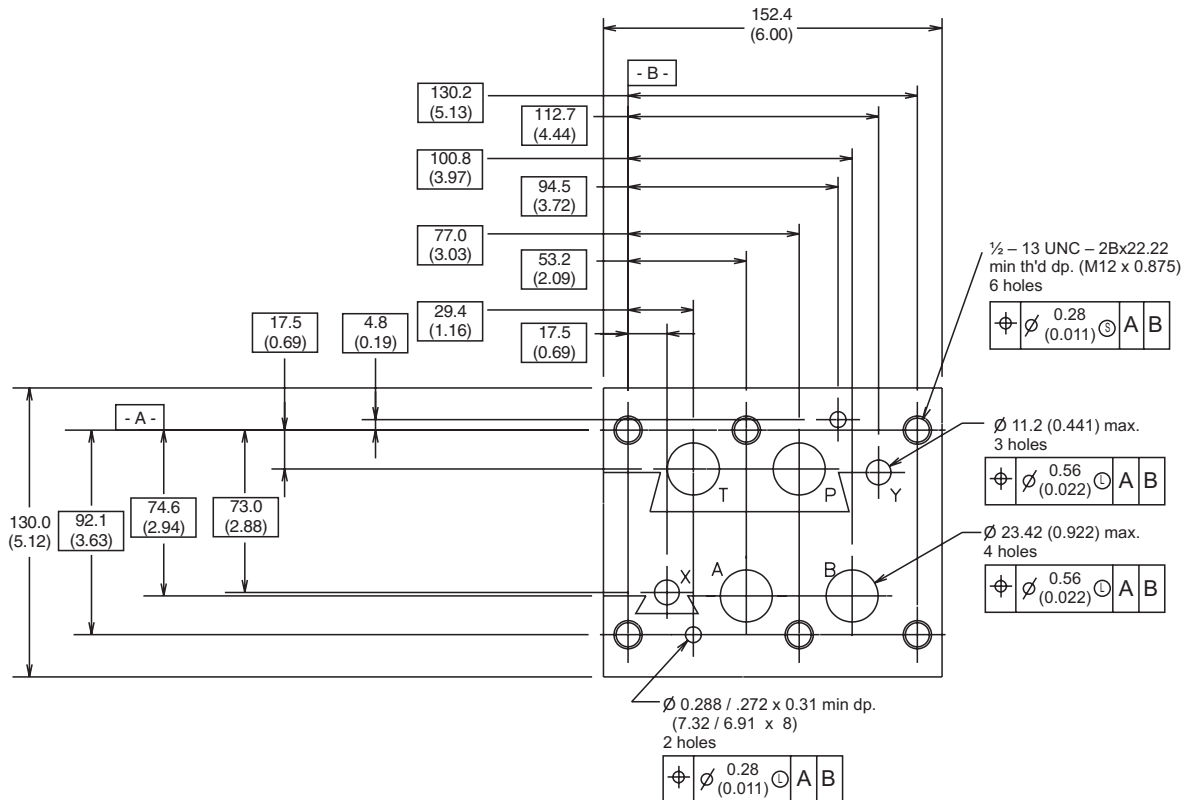
***For maximum valve reliability, adhere to the following installation information.***

**Mounting Position**

Valve Type	Mounting Position
Detent (Solenoid)	Horizontal
Spring Offset	Unrestricted
Spring Centered	Unrestricted

**Mounting Pattern — NFPA D08, CETOP 8 & NG 25**

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



A

## Application

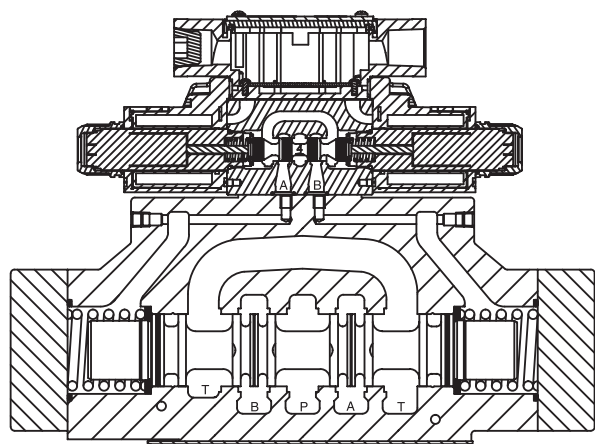
Series D81 hydraulic directional control valves are high performance, solenoid controlled, pilot operated, 2-stage, 4-way valves. They are available in 2 or 3-position styles and are manifold mounted. These valves conform to NFPA's D08, CETOP 8 mounting pattern.

## Operation

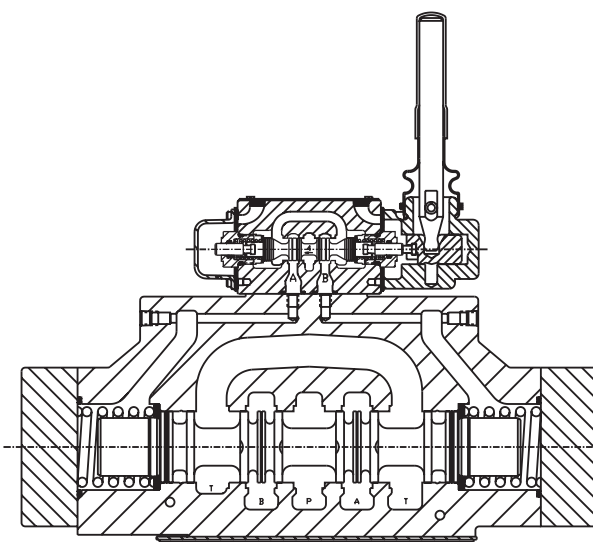
Series D81 directional valves consist of a 5-chamber style main body, a case hardened sliding spool, and a pilot valve or pilot operators (hydraulic or pneumatic).

## Features

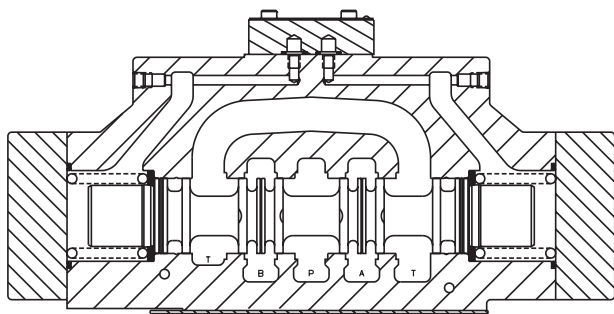
- Easy access mounting bolts.
- 345 Bar (5000 PSI) pressure rating.
- Flows to 622 LPM (160 GPM) depending on spool.
- Choice of four operator styles.
- Rugged four land spools.
- Low pressure drop.
- Phosphate finish.



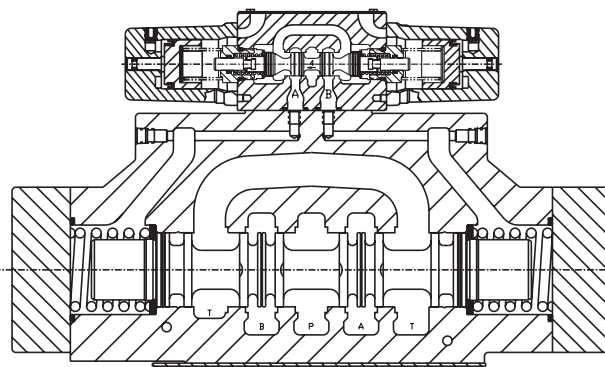
D81VW Solenoid Operated Plug-in Conduit Box



D81VL Lever Operated



D8P Oil Pilot Operated



D81VA Air Pilot Operated

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



## General Description

Series D81VW directional control valves are 5-chamber, pilot operated, solenoid controlled valves. They are available in 2 or 3-position styles. These valves are manifold or subplate mounted, and conform to NFPA's D08, CETOP 8 mounting pattern.





## Operation

Series D81VW pilot operated valves are standard with low shock spools and pilot orifice. The orifice can be removed if a faster shift is required. It is recommended, however, that all systems operating above 138 Bar (2000 PSI) use the standard valve to avoid severe shock.


## Features

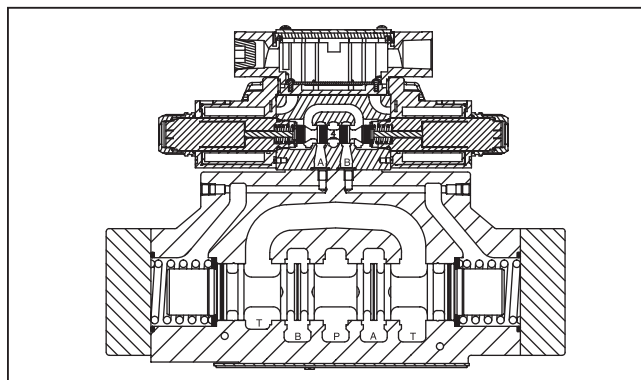
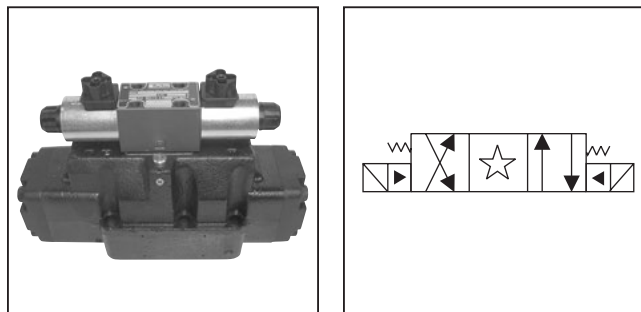
- Low pressure drop design.
- Hardened spools provide long life.
- Fast response option available.
- Wide variety of voltages and electrical connection options.
- Explosion proof availability.
- No tools required for coil removal.

## Specifications

<b>Mounting Pattern</b>	NFPA D08, CETOP 8, NG25
<b>Maximum Operating Pressure</b>	345 Bar (5000 PSI) Standard 207 Bar (3000 PSI) 10 Watt  CSA  207 Bar (3000 PSI)
<b>Maximum Tank Line Pressure</b>	Internal Drain Model: 103 Bar (1500 PSI) AC Only 207 Bar (3000 PSI) DC Std., AC Optional  External Drain Model: 345 Bar (5000 PSI)  CSA  103 Bar (1500 PSI)
<b>Maximum Drain Pressure</b>	103 Bar (1500 PSI) AC Only 207 Bar (3000 PSI) DC Std., AC Optional  CSA  103 Bar (1500 PSI)
<b>Minimum Pilot Pressure</b>	5.1 Bar* (75 PSI)
<b>Maximum Pilot Pressure</b>	345 Bar (5000 PSI) Standard CSA  207 Bar (3000 PSI)
<b>Nominal Flow</b>	302 LPM (80 GPM)

\* 6.9 Bar (100 PSI) for spool configurations 002, 007, 008, 009 & 014.

 **WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



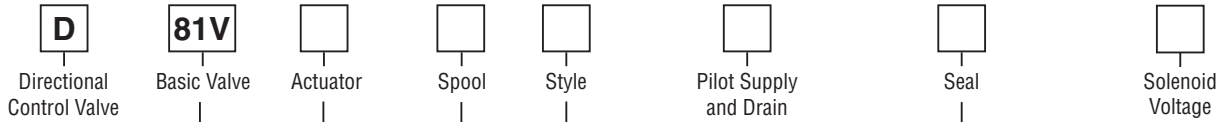
## Response Time

Response times (milliseconds) are measured at 345 Bar (5000 PSI) and 300 LPM (80 GPM) with various pilot pressures as indicated.

Solenoid Type	Pilot Pressure	Pull-In		Drop-Out	
		Std	Fast	Std	Fast
DC	500	140	100	70	70
	1000	125	90	76	76
	2000	100	70	70	70
AC	500	100	60	60	60
	1000	85	50	60	60
	2000	60	30	60	60

Because of the high drain line pressure transients generated during shifting, use of the fast response option is not recommended for pilot pressures exceeding 138 Bar (2000 PSI).

**A**



NFPA D08  
 CETOP 8  
 DIN NG25  
 High Flow, D03 Pilot

Code	Description
W	Solenoid, Wet Pin, Screw-in
HW*	Reversed Wiring

\* To configure per DIN standards (A coil over A port, B coil over B port) code valves as D81VHW\*\*\*.

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing solenoid A. Note operators reverse sides for #008 and #009 spools. See installation information for details. To configure per DIN standards (A coil over A port, B coil over B port) code valves as D81VHW\*\*\*.

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
1	Internal Pilot, External Drain
2	External Pilot, External Drain
3	Internal Pilot w/Check, External Drain
4*	Internal Pilot, Internal Drain
5	External Pilot, Internal Drain
6	Internal Pilot w/Check, Internal Drain

\* Not available with 002, 008, 009 & 030 spools.

Code	Description
D†#	120 VDC
E*	24/60 - 24/50 VAC
J	24 VDC
K#**	12 VDC
Q††#	100/60 VAC
QD††#	100 VAC/60 Hz - 100 VAC/50 Hz
T^^	240/60 - 220/50 VAC
U***#	98 VDC
Y	120/60 - 110/50 VAC

# High watt only.  
 \* Leadwire only, low watt only.  
 \*\* DIN, low watt available.  
 \*\*\* Leadwire not available.  
 ^^ Plug-in is low watt only.  
 † DIN & Leadwire only.  
 †† DIN only.

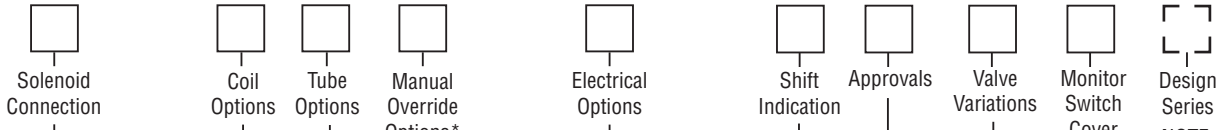
Code	Symbol	Code	Symbol
001		012	
002		015	
003		016	
004		020*	
006		030**	
008*, 009**		081†	
011		082†	

\* 008, 020 & 026 spools have closed crossover.  
 \*\* 009 & 030 spools have open crossover.  
 † DC or AC rectified only.

Code	Description	Symbol
B*	Single solenoid, 2 position, spring offset. P to A and B to T in offset position.	
C	Double solenoid, 3 position, spring centered.	
D*	Double solenoid, 2 position, detent.	
E	Single solenoid, 2 position, spring centered. P to B and A to T when energized.	
F**	Single solenoid, 2 position, spring offset, energized to center. Position spool spacer on A side. P to A and B to T in spring offset position.	
H*	Single solenoid, 2 position, spring offset. P to B and A to T in offset position.	
K	Single solenoid, 2 position, spring centered. P to A and B to T when energized.	
M**	Single solenoid, 2 position, spring offset, energized to center position. Spool spacer on B side. P to B and A to T in spring offset position.	

\* Available with 020 and 030 spools only.  
 \*\* High watt coil only.

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



Code	Description
<b>C*</b>	<b>Leadwire Conduit Box</b>
D**	Metric Plug (M12X1) DESINA
E†	Explosion Proof
F <sup>x</sup>	Flying Leadwire
<b>G††</b>	<b>Plug-In Conduit Box</b>
<b>J++</b>	<b>Deutsch (DT04-2P)</b>
<b>P</b>	<b>DIN with Plug</b>
S‡	Double Spade
<b>W†</b>	<b>DIN w/o Plug</b>

- \* No conduit box variations – See Plug-in.
- \*\* 24 VDC only, low watt only, lights, diode surge suppressor, not CSA approved.
- † Not available with lights.
- †† Required for variations on conduit box style, must have lights.
- ++ 12 and 24 VDC only.
- ‡ Only 12 VDC high watt.
- x 6" leadwire only.

Code	Description
<b>Omit*</b>	<b>High watt</b>
D**	Explosion Proof, EExd ATEX
E**	Explosion Proof, EExme ATEX, IECEX, from Germany
F†	Low Watt
L	10 Watt
R#	Explosion Proof, ATEX/UL/CSA/IECEX, configurable cable connection
T#	Explosion Proof, ATEX/UL/CSA/IECEX, fixed horizontal cable connection
U##	Explosion Proof, UL/CSA

- \* AC ambient temperature must not exceed 60°C (140°F).
- \*\* J voltage only, no options.
- † AC only.
- # J and Y voltages only. Y voltage is rectified.
- ## J and Y voltages only. Y voltage is not rectified.

**Valve Weight:**  
 Double Solenoid 19.6 kg (43.2 lbs.)

**Seal Kit:**  
 Nitrile SKD81VWN91  
 Fluorocarbon SKD81VWV91

Code	Description
<b>Omit</b>	<b>No Options</b>
J#	Diode Surge Suppressor
Z†	Rectified Coil

- # **Plug-In** – 24 VDC only. **DIN** – DC only with Lighted Plug (5), which has integrated Surge Suppression. "J" not required here.
- Deutsch** – as follows:
  - 12 VDC Hi watt only
  - 24 VDC Hi & Lo watt
- 24 VDC "JER"** required. "JET" available. Adds dust rating, not polarity sensitive [IIIC, D].
- Leadwire** – not available
- † DC tube standard, Plug-In conduit box only. Not polarity sensitive. Only available with Y voltage.

Code	Description
<b>Omit</b>	<b>Standard</b>
P*	Extended Manual Override with Boot
T	Covered Manual Override, DC only, or AC Rectified

- \* Manual override options not available on Explosion Proof or soft shift. Not available with high pressure AC tube H.

Code	Description
<b>Omit</b>	<b>Standard Pressure</b>
	103.5 Bar (1500 PSI) AC
	207 Bar (3000 PSI) DC
<b>H*</b>	<b>High Pressure, AC only</b>
	207 Bar (3000 PSI)

- \* Not available with CSA or Explosion Proof.

See next page

Code	Description
<b>Omit</b>	<b>No Variation</b>
4B	Monitor Switch Cover

Code	Description
<b>Omit</b>	<b>Standard Valve</b>
4†#	CSA Canada CSA22.2 No. 139-13
<b>N</b>	<b>CE Approved</b>
<b>Q†#</b>	<b>CE + CSA Approved</b>

- † Not available with AC high pressure tube.
- # Valve is derated.

Code	Spool Position	Position Control
<b>Omit</b>	All	Standard response
I3N	C	End position monitored, side A and B
I6N		Start position monitored, side A and B
I2N	C, B, E, F (all spools)	End position monitored, side B
I5N	C, K, M (spool 9)	Start position monitored, side B
I1N	C, H, K, M (all spools)	End position monitored, side A
I4N	C, E, F (spool 9)	Start position monitored, side A

Note: The plug M12 x 1 for the position control is included. The monitor switch has to be located on the side to which the spool moves from the spring offset position. For 4/3-way valves two switches are required. Not CSA approved. **DC DIN, high watt coils only.**

**Mounting Bolt Kits**

UNC Bolt Kits for use with D6 and D8 Directional Control Valves & Sandwich Valves				
	Number of Sandwich Valves @ 2.75" (70mm) thickness			
	0	1	2	3
D6	BK227 2.50"	BK121 5.25"	BK122 8.00"	BK123 10.75"
D6 plus tapping plate	BK161 3.50"	BK170 6.25"	BK171 9.00"	BK172 11.75"
D8	BK228 3.00"	BK131 5.75"	BK132 8.50"	BK133 11.25"
D8 plus tapping plate	BK173 4.00"	BK174 6.75"	BK175 9.50"	BK114 12.125"

Note: All bolts are SAE grade 8, 1/2-13 UNC-3A thread, torque to 133 N.m. (100 ft.-lbs.)

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

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



Valve Variations

**A**

**OPTIONS ARE NOT AVAILABLE ON MONITOR SWITCH VALVES.**

Code	Description
5*	Signal Lights – Standard Signal Lights – Hirsch. (DIN with Plug) (the DC Lighted Plug has Integral Surge Suppression)
7B**	Manaplug – Brad Harrison (12x1) Micro with Lights
56**	Manaplug (Mini) with Lights
20	Fast Response
1C**	Manaplug (Mini) Single Sol. 5-pin, with Lights
1D**	Manaplug (Micro) Single Sol. 5-pin, with Lights
1M**	Manaplug Opposite Normal
1P	Painted Body
1R	Stroke Adjust 'A' & 'B' End with Pilot Choke Meter In
3A	Pilot Choke Meter Out
3B	Pilot Choke Meter In
3C	Pilot Pressure Reducer
3D	Stroke Adjust 'B' End
3E	Stroke Adjust 'A' End
3F	Stroke Adjust 'A' & 'B' End
3G*	Pilot Choke Meter Out with Lights
3H*	Pilot Choke Meter In with Lights
3J*	Pilot Pressure Reducer with Lights
3K	Pilot Choke Meter Out with Stroke Adjust 'A' & 'B' End
3L**	Pilot Choke Meter Out, Stroke Adjust 'A' & 'B' End with Lights and Manaplug — Brad Harrison Mini
3M	Pilot Choke Meter Out, Pilot Pressure Reducer, Stroke Adjust 'A' & 'B' End
3R	Pilot Choke Meter Out & Pilot Pressure Reducer
3S**	Lights, Mini Manaplug, Pilot Choke Meter Out
7Y**	M12x1 Manaplug (4-pin), Special Wiring, and Lights

\* DESINA, plug-in conduit box, and DIN with plug styles only.

\*\* Must have plug-in style conduit box.

Reference Data

Model	Spool Symbol	Maximum Flow, LPM (GPM) 345 Bar (5000 PSI) w/o Malfunction
D81V*001		624 (160)
D81V*002		624 (160)
D81V*003		624 (160)
D81V*004		624 (160)
D81V*006		624 (160)
D81V*008 D61V*009		312 (80)
D81V*011		624 (160)
D81V*012		312 (80)
D81V*015		624 (160)
D81V*016		624 (160)
D81V*020 D81V*030		624 (160)

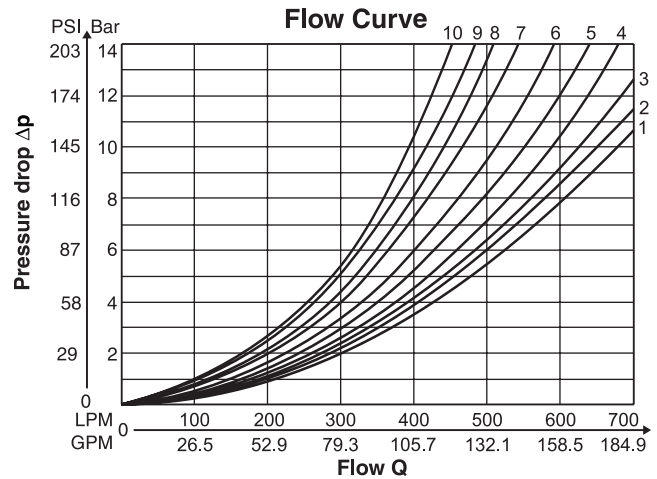
**D81V\* Series Pressure Drop Chart**

The following chart provides the flow vs. pressure drop curve reference for the Series D81V\* valve by spool type.

VISCOSITY CORRECTION FACTOR							
Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (Approx.)	93	111	119	126	132	137	141
Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change as per chart.							

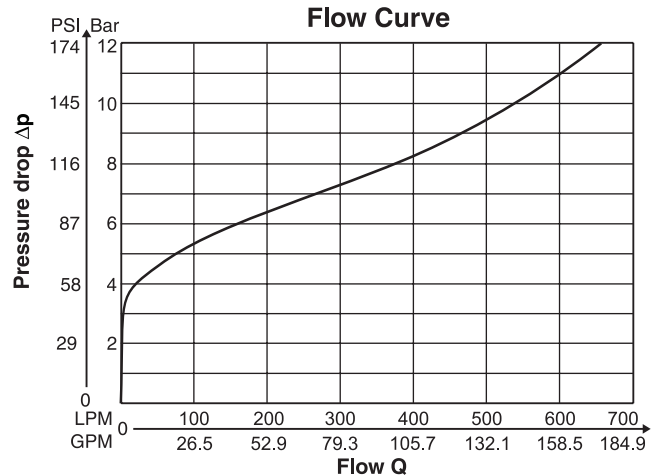
Spool Code	Curve Number				
	P-A	P-B	P-T	A-T	B-T
001	3	2	-	3	5
002	2	1	1	3	5
003	4	2	-	3	6
004	4	3	-	3	5
005	1	2	-	4	5
006	2	2	-	4	6
007	3	1	7	3	5
009	4	8	9	4	10
011	3	2	-	3	5
014	1	2	8	3	5
015	3	3	-	4	5
016	3	3	-	4	5
020	6	5	-	6	8
021	5	10	-	3	-
022	10	5	-	-	5
026	6	5	-	-	-
030	3	2	-	3	5
054	4	3	-	3	5

**D81VW Performance Curves**



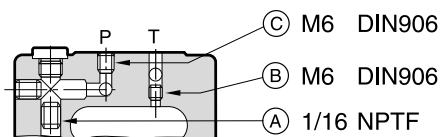
**Integral Check Valve in the P Port**

Mounting an integral check valve in the P port is necessary to build up pilot pressure for valves with P to T connection and internal pilot oil supply. The pressure difference at the integral check valve (see performance curves) is to be added to all flow curves of the P-port of the main valve.



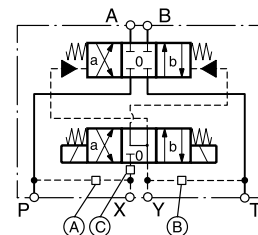
All characteristic curves measured with HLP46 at 50°C.

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



○ open, ● closed

Pilot oil		A	B	C
Inlet	Outlet	A	B	C
internal	external	○	●	Orifice Ø1.5
external	external	●	●	Orifice Ø1.5
internal	internal	○	○	Orifice Ø1.5
external	internal	●	○	Orifice Ø1.5



All orifice sizes for standard valves

**A**

**Solenoid Ratings**

<b>Insulation System</b>	Class F
<b>Allowable Deviation from rated voltage</b>	-10% to +10% for DC and AC rectified coils -5% to +5% for AC Coils
<b>Armature</b>	Wet pin type
<b>CSA File Number</b>	LR60407
<b>Environmental Capability</b>	DC Solenoids meet NEMA 4 and IP67 when properly wired and installed. Contact HVD for AC coil applications.

**Explosion Proof Solenoid Ratings\***

<b>U.L. &amp; CSA (EU)</b>	Class I, Div 1 & 2, Groups C & D Class II, Div 1 & 2, Groups E, F & G As defined by the N.E.C.
<b>ATEX (ED)</b>	Complies with ATEX requirements for: Ex d IIB Gb; EN60079-0:2012, EN60079-1:2007
<b>ATEX, IECEx &amp; CSA/US (ER, ET) (Tri-rated)</b>	Complies with IEC 60079-0:2011, IEC 60079-1:2007, IEC 60079-31:2013; Ex d IIC Gb; Ex tb IIIC Db IP66; IECEx BAS 14.0164X  ATEX: EN60079-0, EN60079-1, EN60079-31; CE 1180 Ex II 2G BASEEFA08ATEX0041X  CSA 22.2 No. 60079-0:07, 60079-1:07 and UL 60079-0:05, UL 60079-1:05; CSA listed to US and Canada Safety Standards. File 08-CSA-1932102  CSA Ex d IIC, AEx d IIC for Class I Zone 1; Class I Div 1 Grp. C & D; Class II Div 1 Grp. E, F & G

\* Allowable Voltage Deviation ±10%.

Code		Voltage	In Rush Amps Amperage	In Rush VA	Holding Amps @ 3 mm	Watts	Resistance
Voltage Code	Power Code						
D	Omit	120 VDC	N/A	N/A	0.26 Amps	30 W	528.00 Ohms
E	F	24 VAC	4.8 AMPS	120 VA	2.07 Amps	21 W	1.29 Ohms
J	L	24 VDC	N/A	N/A	0.44 Amps	10 W	51.89 Ohms
J	Omit	24 VDC	N/A	N/A	1.32 Amps	30 W	17.27 Ohms
K	L	12 VDC	N/A	N/A	0.88 Amps	10 W	12.97 Ohms
K	Omit	12 VDC	N/A	N/A	2.64 Amps	30 W	4.32 Ohms
Q	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	0.77 Amps	30 W	19.24 Ohms
QD	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	.77 Amps	30 W	19.24 Ohms
T	Omit	240/60 VAC	0.83 Amps	199 VA	0.30 Amps	30 W	120.40 Ohms
T	Omit	220/50 VAC	0.87 Amps	191 VA	0.34 Amps	30 W	120.40 Ohms
T	F	240/60 VAC, Low Watt	0.70 Amps	168 VA	0.22 Amps	21 W	145.00 Ohms
T	F	220/50 VAC, Low Watt	0.75 Amps	165 VA	0.26 Amps	23 W	145.00 Ohms
U	Omit	98 VDC	N/A	N/A	0.31 Amps	30W	288.00 Ohms
Y	Omit	120/60 VAC	1.7 Amps	204 VA	0.60 Amps	30 W	28.20 Ohms
Y	Omit	110/50 VAC	1.7 Amps	187 VA	0.68 Amps	30 W	28.20 Ohms
Y	F	120/60 VAC, Low Watt	1.40 Amps	168 VA	0.42 Amps	21 W	36.50 Ohms
Y	F	110/50 VAC, Low Watt	1.50 Amps	165 VA	0.50 Amps	23 W	36.50 Ohms
<b>Explosion Proof Solenoids</b>							
Y		120/60 VAC	1.60 Amps	192 VA	0.58 Amps	27 W	33.50 Ohms
J		24 VDC	N/A	N/A	1.38 Amps	33 W	17.33 Ohms
<b>Explosion Proof Solenoids (German)</b>							
J		24 VDC	N/A	N/A	1.0 Amps	24 W	24 Ohms
<b>ER &amp; ET Explosion Proof Solenoids</b>							
J		24 VDC	N/A	N/A	0.54 Amps	13 W	44.30 Ohms
Y		120/60 VAC	N/A	N/A	0.16 Amps	17 W	667.00 Ohms

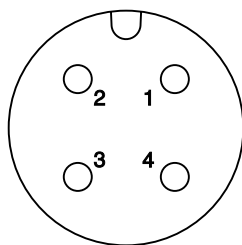
## Single Solenoid Valves

### Electrical Specifications of Position Control as per IEC 61076-2-101 (M12x1)

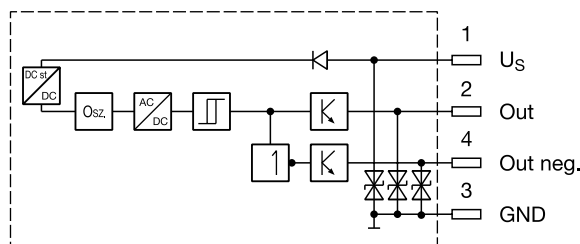
Protection Class		IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)
Ambient Temperature	[°C]	-20...+60; (-4°F...140°F)
Supply Voltage / Ripple	[V]	24 ≤10%
Tolerance Supply Voltage	[%]	±20
Polarity Protection	[V]	300
Current Consumption without Load	[mA]	≤ 20
Switching Hysteresis	[mm]	<0.06
Max. Output Current per Channel, Ohmic	[mA]	250
Min. Distance to Next AC Solenoid	[m]	0.1 (0.33 ft.)
Interface		M12x1 to IEC 61076-2-101
Wiring Minimum	[mm <sup>2</sup> ]	5 x 0.25 braided shield recommended
Wiring Length Maximum	[m]	50 (164 ft.) recommended
CE Conform		EN 61000-4-2/EN 61000-4-4/EN 61000-4-6 <sup>1)</sup> /ENV 50140/ENV 50240

1) Only guaranteed with screened cable and female connector.

## M12 Pin Assignment



- 1 U<sub>S</sub> 19.2...28.8V
- 2 Out B: normally open
- 3 0V
- 4 Out A: normally closed



Outputs: Open collector

## Definitions

Start position monitored:

The valve is de-energized. The inductive switch gives a signal at the moment the spool leaves the spring offset position (below 15% spool stroke).

At the switching point the spool is located within the closed position. It is secured so that only the flow paths of the offset position are granted.

The switch can only be located on the opposite side of the solenoid for direct operated valves. Please order plug M12x1 separately. See Accessories, plug M12x1 (part no.: 5004109).

End position monitored:

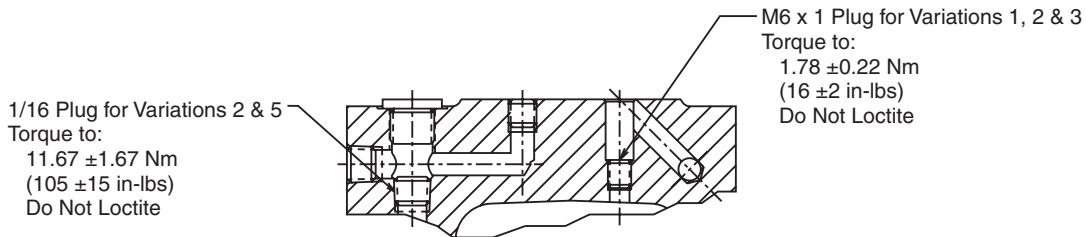
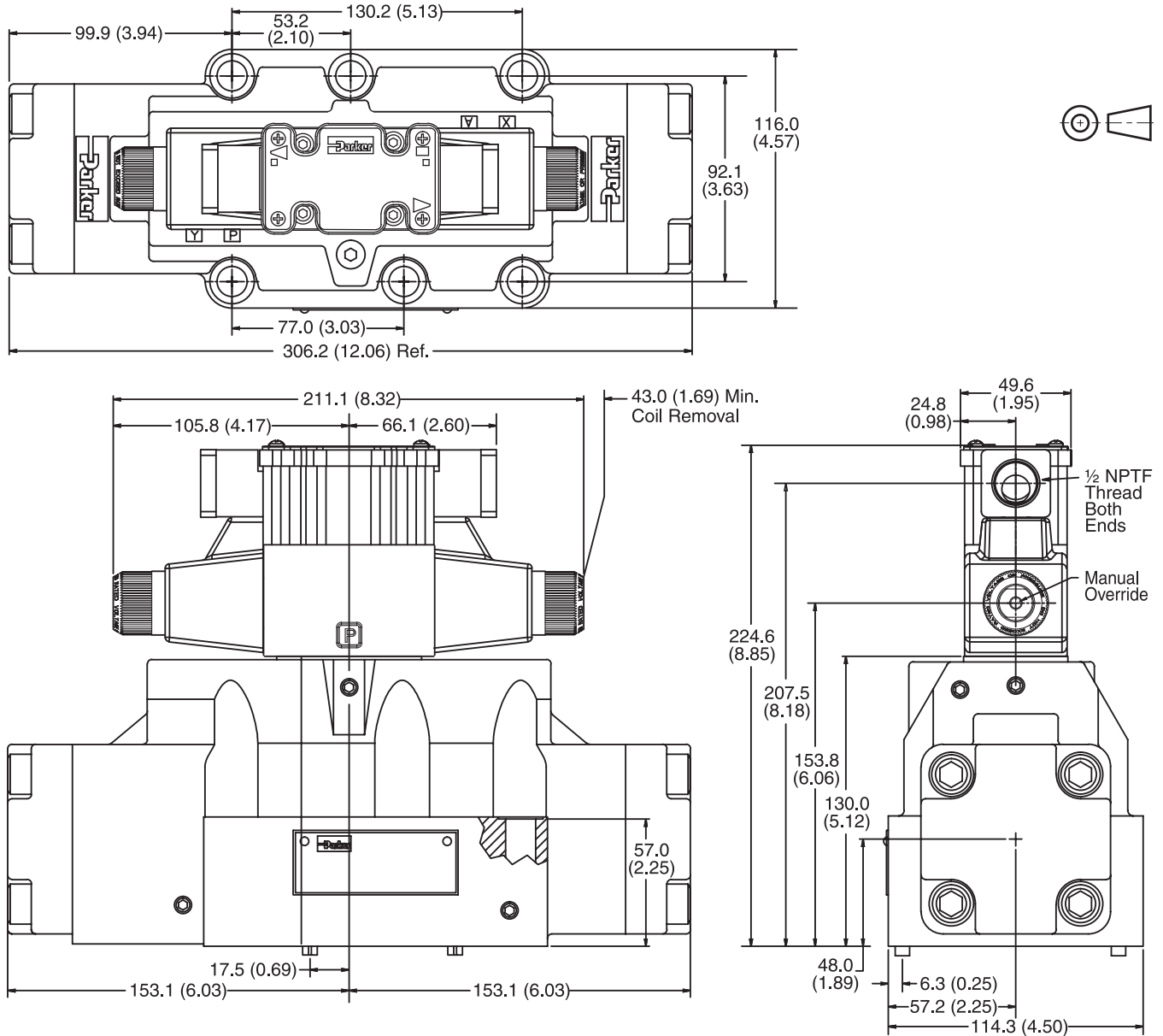
The inductive switch gives a signal before the end position is reached. (above 85% spool stroke).

Dimensions

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

**A**

**Plug-in Conduit Box, Double AC Solenoid**

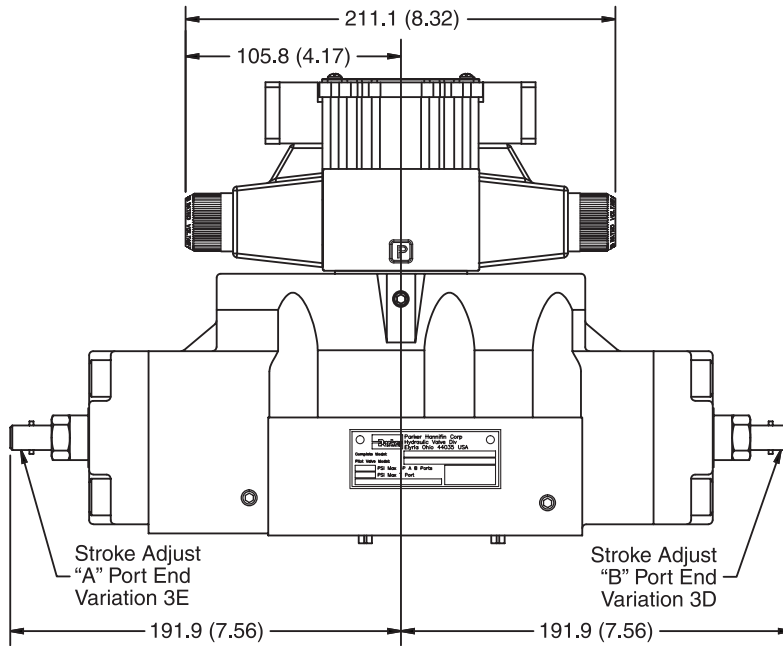


**Note:** 57mm (2.24") from bottom of bolt hole counterbore to bottom of valve.



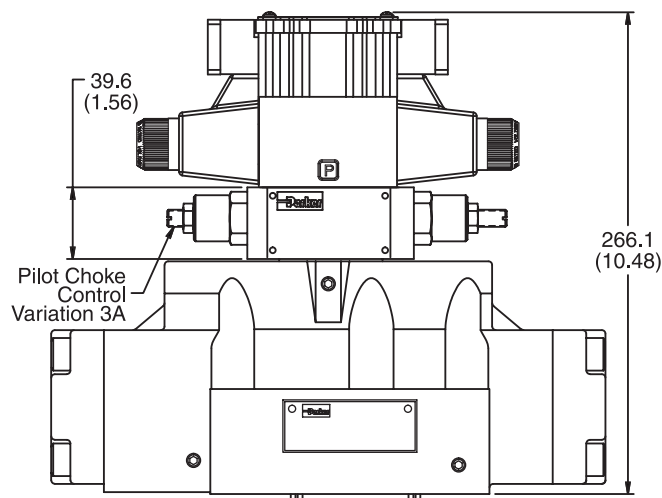
Inch equivalents for millimeter dimensions are shown in (\*\*)

**Conduit Box and Stroke Adjust, Double AC Solenoid**

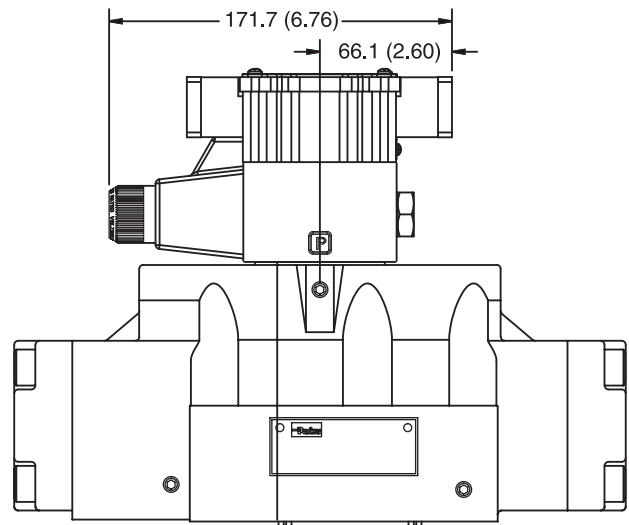


**Note:** 57mm (2.24") from bottom of bolt hole counterbore to bottom of valve.

**Conduit Box and Pilot Choke Control,  
Double AC Solenoid**



**Conduit Box, Single AC Solenoid**



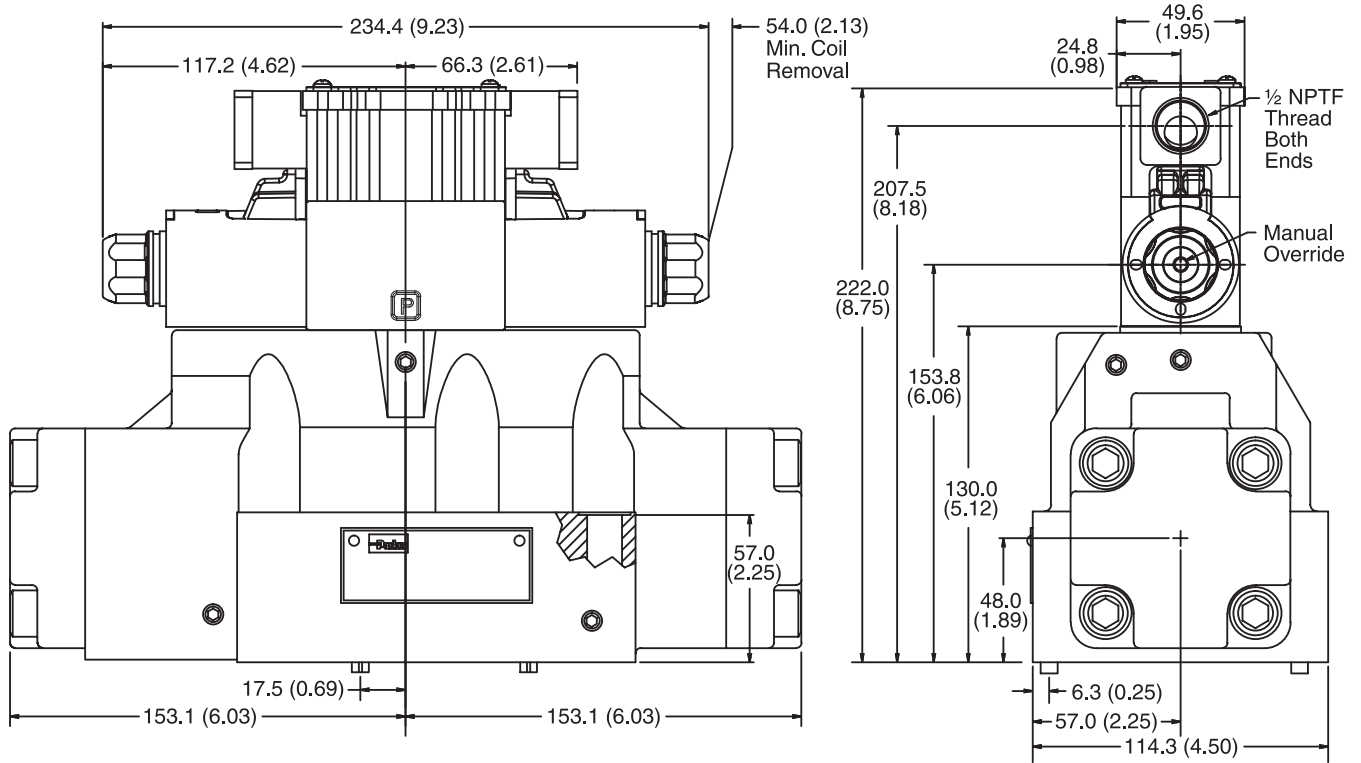
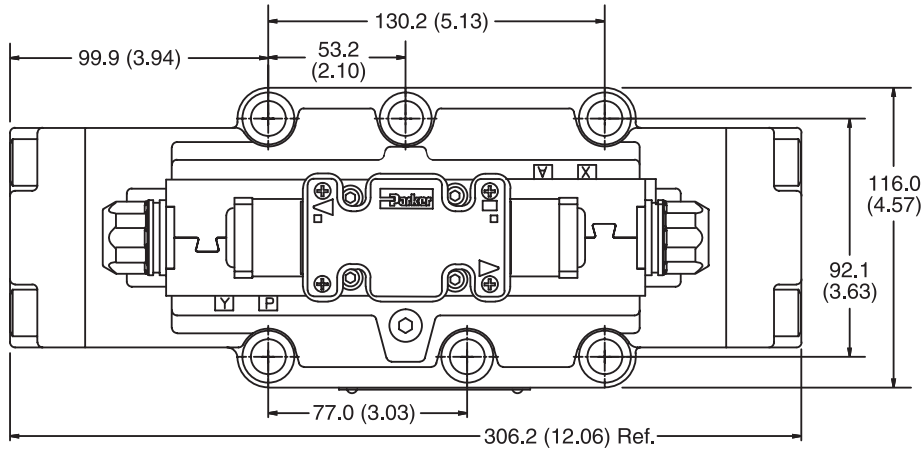
**Dimensions**

**Series D81V**

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

**A**

**Plug-In Conduit Box, Double DC Solenoid**



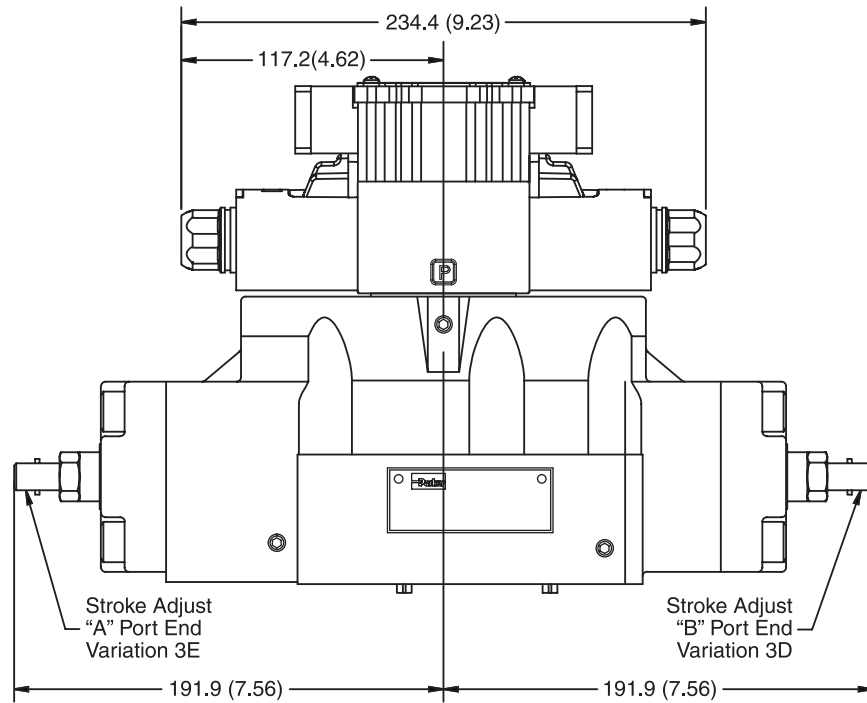
**Note:** 57mm (2.24") from bottom of bolt hole counterbore to bottom of valve.



**Dimensions**

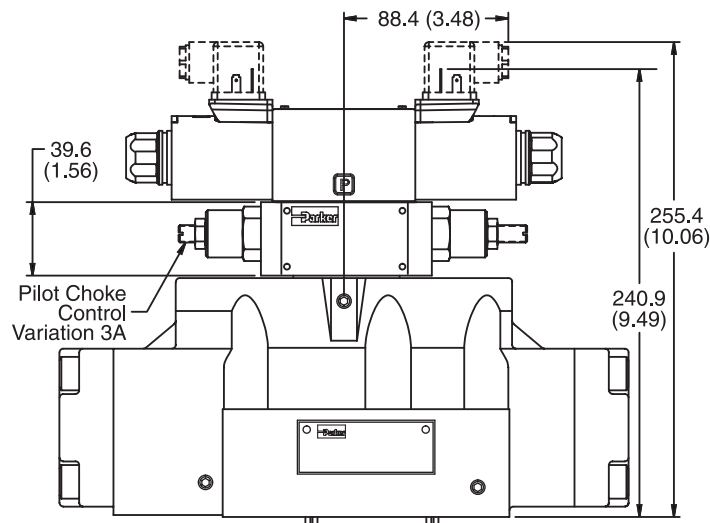
Inch equivalents for millimeter dimensions are shown in (\*\*)

**Plug-In Conduit Box and Stroke Adjust, Double DC Solenoid**

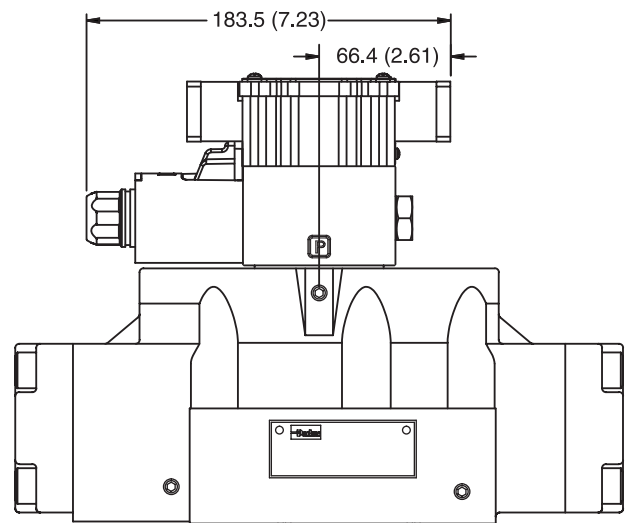


**Note:** 57mm (2.24") from bottom of bolt hole counterbore to bottom of valve.

**Hirschmann and Pilot Choke Control, Double DC Solenoid**



**Plug-In Conduit Box, Single DC Solenoid**

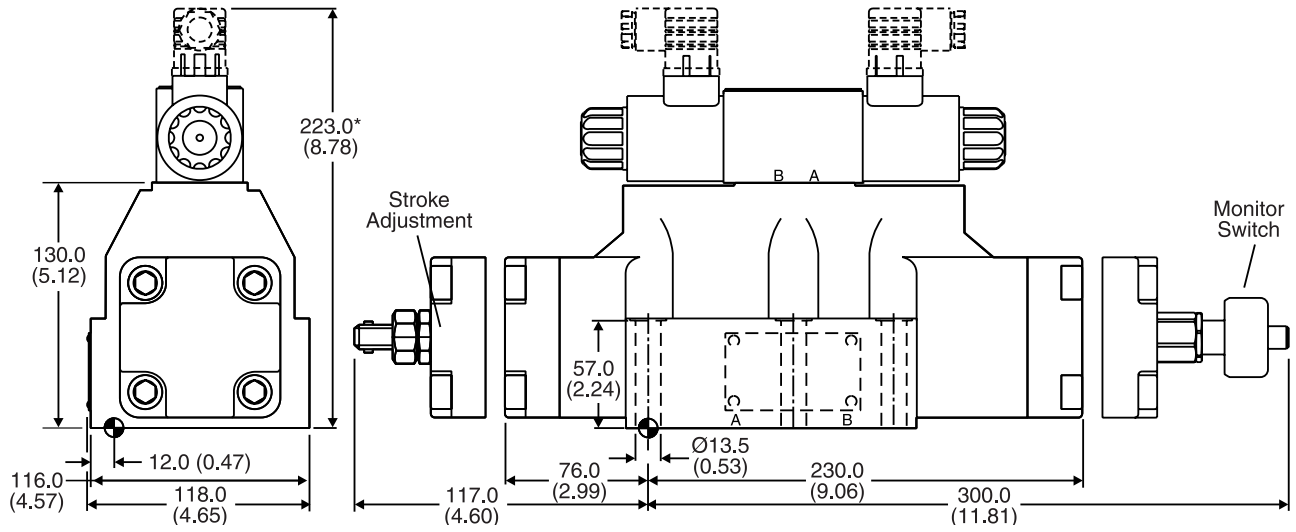


Dimensions

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

**A**

**Series D81VW**



\* For each sandwich plate, please add +40mm (1.58") (pressure reducing valve, choke valve meter-in/-out),



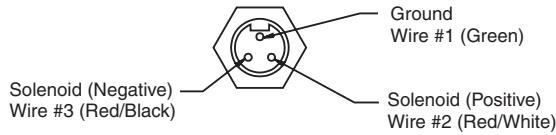
Surface Finish	Kit			Seal Kit
	BK360	6x M12x75 ISO 4762-12.9	108 Nm (79.7 lb.-ft.) ±15%	Nitrile: SK-D81VW-N-91 Fluorocarbon: SK-D81VW-V-91

The space necessary to remove the plug per DIN 43650, design type AF is at least 15 mm (0.59").  
The torque for the screw M3 of the plug has to be 0.5 Nm (0.37 lb.-ft.) to 0.6 Nm (0.44 lb.-ft.).



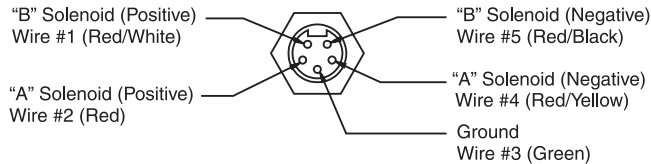
**Manaplug (Options 56 & 1C)**

- Interface – Brad Harrison Plug
- 3-Pin for Single Solenoid
- 5-Pin for Double Solenoid



**3-Pin Manaplug (Mini) with Lights**

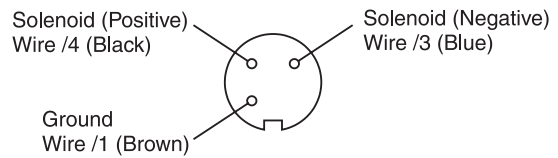
Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Mini) with Lights**

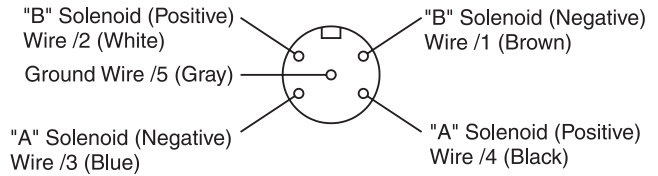
Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Micro Connector Options (7B & 1D)**



**3-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid



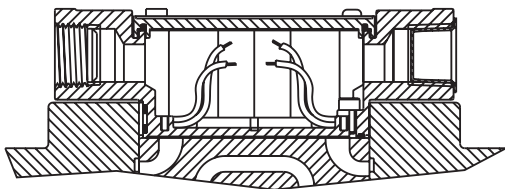
**5-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Pins are as seen on valve (male pin connectors)**

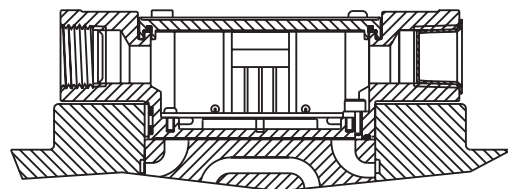
**Conduit Box Option C**

- No Wiring Options Available



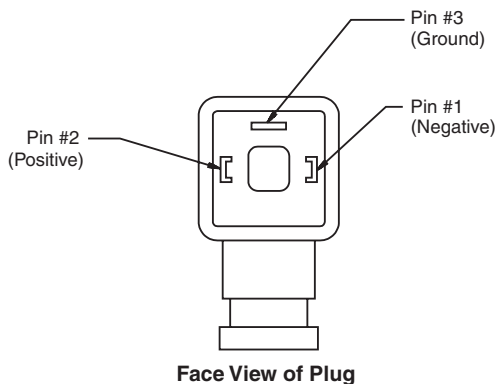
**Signal Lights (Option 5) — Plug-in Only**

- LED Interface
- Meets Nema 4/IP67



**Hirschmann Plug with Lights (Option P5)**

ISO 4400/DIN 43650 Form "A"

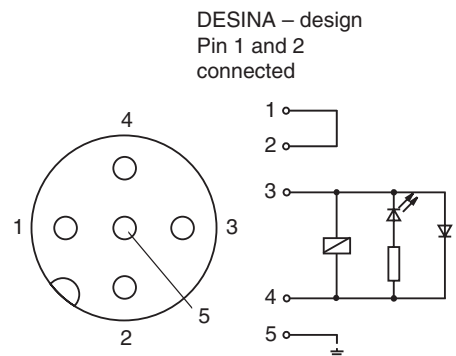


Face View of Plug

**DESINA Connector (Option D)**

**M12 pin assignment  
Standard**

- 1 = Not used
- 2 = Not used
- 3 = 0V
- 4 = Signal (24 V)
- 5 = Earth Ground



DESINA – design  
Pin 1 and 2  
connected

**Pins are as seen on valve (male pin connectors)**

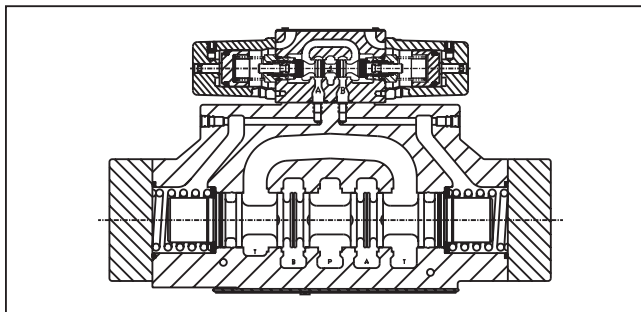
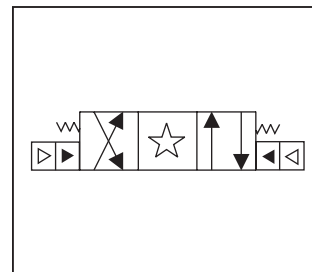
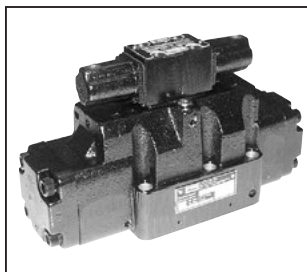
**A**

### General Description

Series D81VA directional control valves are 5-chamber, air pilot operated valves. They are available in 2 or 3-position styles. These valves are manifold or sub-plate mounted, and conform to NFPA's D08, CETOP 8 mounting pattern.

### Specifications

<b>Mounting Pattern</b>	NFPA D08 , CETOP 8, NG25
<b>Max. Operating Press.</b>	345 Bar (5000 PSI)
<b>Max. Tank Line Pressure</b>	Internal Drain Model: 34 Bar (500 PSI) External Drain Model: 207 Bar (3000 PSI)
<b>Max. Drain Pressure</b>	34 Bar (500 PSI)
<b>Maximum Flow</b>	See Switching Limit Charts
<b>Pilot Pressure</b>	Air Min 3.4 Bar (50 PSI) Air Max 10.2 Bar (150 PSI)
<b>Response Time</b>	Varies with pilot line size and length, pilot pressure, pilot valve shift time & flow capacity (GPM)



### Features

- Low pressure drop design.
- Fast response option available.
- Hardened spools provide long life.

### Ordering Information

<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">D</div> <p>Directional Control Valve</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">81V</div> <p>Basic Valve</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">A</div> <p>Air Operated Pilot</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"> </div> <p>Spool</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"> </div> <p>Style</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"> </div> <p>Pilot Supply and Drain</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"> </div> <p>Seal</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"> </div> <p>Valve Variations</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"> </div> <p>Design Series</p>																																						
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Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator A. Note operators reverse sides for 009 spool. See installation information for details.

**Valve Weight:** Single Operated  
19.9 kg (43.9 lbs.)

**Standard Bolt Kit:** BK228

**Metric Bolt Kit:** BKM228

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

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

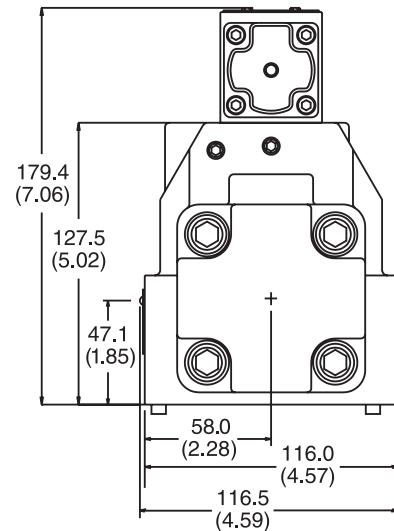
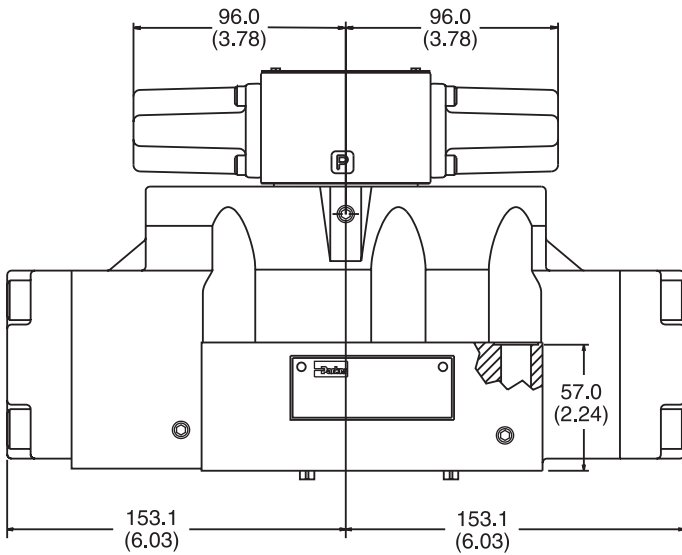
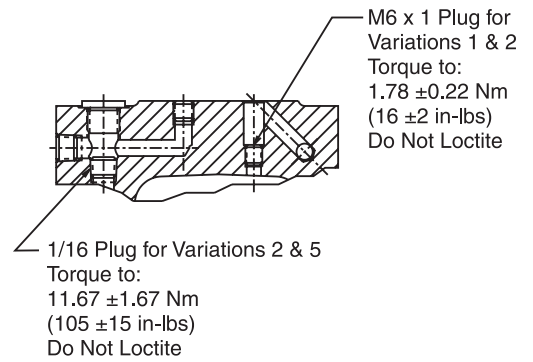
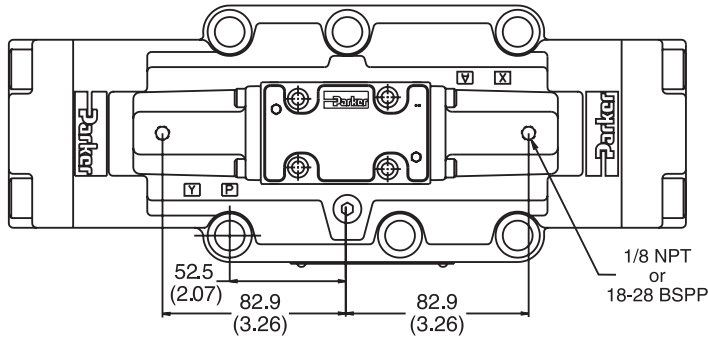
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



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

**Air Operated**

**A**



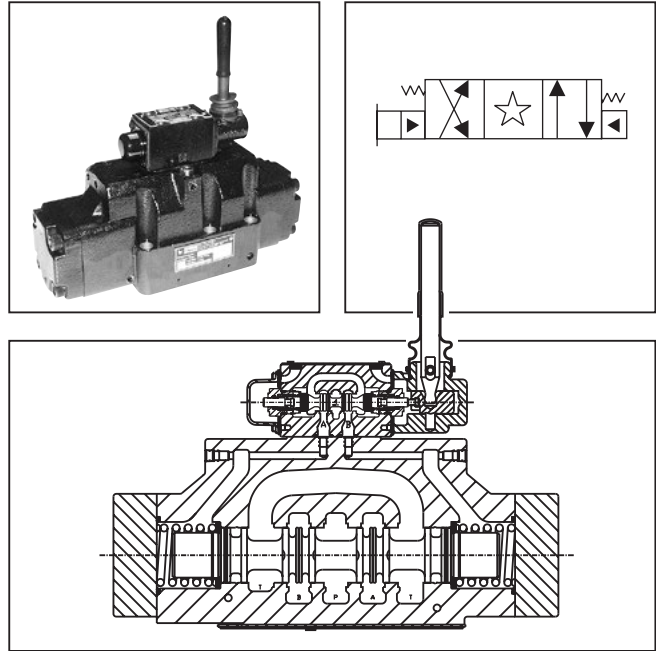
**Note:** 57mm (2.24") from bottom of bolt hole counterbore to bottom of valve.

**General Description**

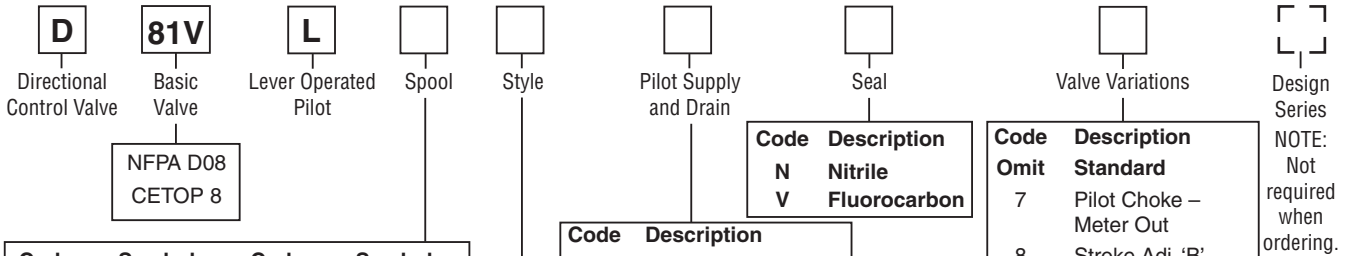
Series D81VL directional control valves are 5-chamber, lever operated valves. They are available in 2 or 3-position styles. These valves are manifold or sub-plate mounted, and conform to NFPA's D08, CETOP 8 mounting pattern.

**Specifications**

<b>Mounting Pattern</b>	NFPA D08, CETOP 8, NG25
<b>Max. Oper. Press.</b>	350 Bar (5000 PSI)
<b>Max. Tank Line Pressure</b>	Internal Drain Model 34 Bar (500 PSI) External Drain Model 350 Bar (5000 PSI)
<b>Max. Drain Press.</b>	34 Bar (500 PSI)
<b>Max. Flow</b>	See Reference Data Charts
<b>Pilot Pressure</b>	Oil Min 6.9 Bar (100 PSI) Oil Max 350 Bar (5000 PSI)
<b>Response Time</b>	Varies with pilot line size and length, pilot pressure, pilot valve shift time & flow capacity (GPM)



**Ordering Information**



Code	Symbol	Code	Symbol
001		011	
002		012	
004		020*	
008*		030**	
009**			

\* 008 & 020 spools have closed crossover.  
 \*\* 009 & 030 spools have open crossover.

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator A. Note operators reverse sides for 009 spool. See installation information for details.

**Valve Weight:** 19.6 kg (43.2 lbs.)  
**Standard Bolt Kit:** BK228  
**Metric Bolt Kit:** BKM228

Code	Description
1	Int. pilot/Ext. drain
2	Ext. pilot/Ext. drain
4#	Int. pilot/Int. drain
5	Ext. pilot/Int. drain

# Not available with 002, 008, 009 & 030 spools.

Code	Description	Symbol
<b>B†</b>	<b>Sgl. operator, 2 position, spring offset. P to A and B to T in offset position.</b>	
<b>C</b>	<b>Dbl. operator, 3 position, spring centered.</b>	
<b>D†</b>	<b>Dbl. operator, 2 position, detent.</b>	
<b>E</b>	Sgl. operator, 2 position, spring centered. P to B and A to T in shifted position.	
<b>H†</b>	<b>Sgl. operator, 2 position, spring offset. P to B and A to T in offset position.</b>	
<b>K</b>	Sgl. operator, 2 position. Spring centered. P to A and B to T in shifted position.	

This condition varies with spool code.  
 † Available with 020 & 030 spools only.

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

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

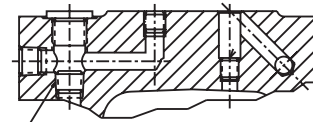
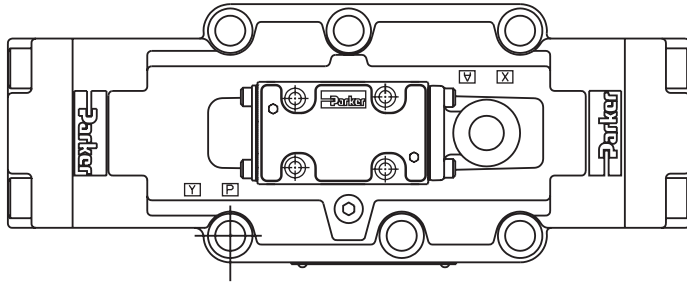
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



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

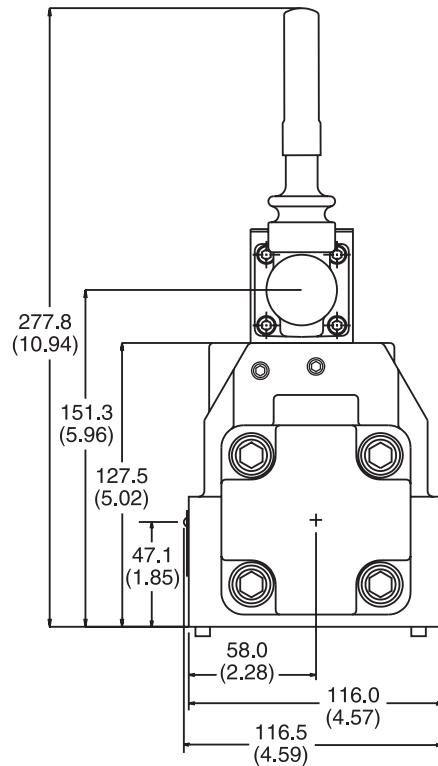
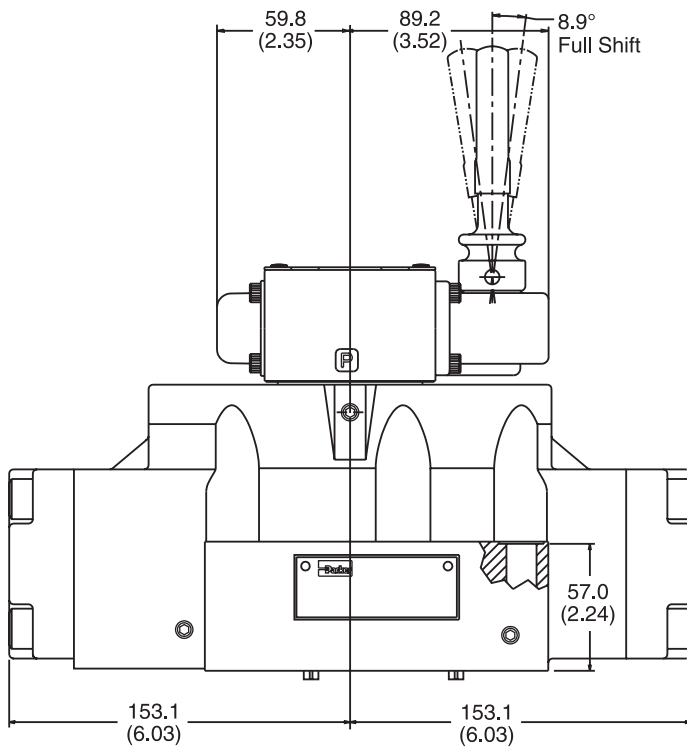
**Lever Operated**

**A**



M6 x 1 Plug for Variations 1 & 2  
Torque to:  
1.78 ±0.22 Nm  
(16 ±2 in-lbs)  
Do Not Loctite

1/16 Plug for Variations 2 & 5  
Torque to:  
11.67 ±1.67 Nm  
(105 ±15 in-lbs)  
Do Not Loctite



**Note:** 57mm (2.24") from bottom of bolt hole counterbore to bottom of valve.

**A**

## General Description

Series D8P directional control valves are 5-chamber, pilot operated valves. They are available in 2 or 3-position styles. These valves are manifold or sub-plate mounted, and conform to NFPA's D08, CETOP 8 mounting pattern.

## Features

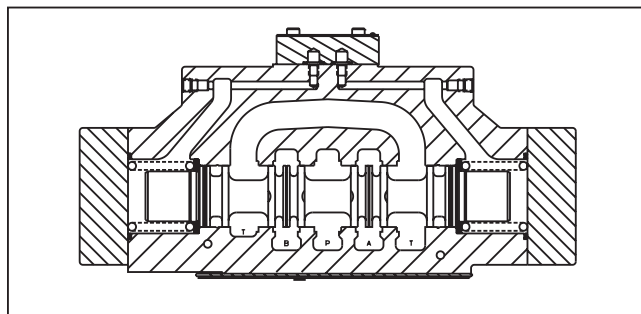
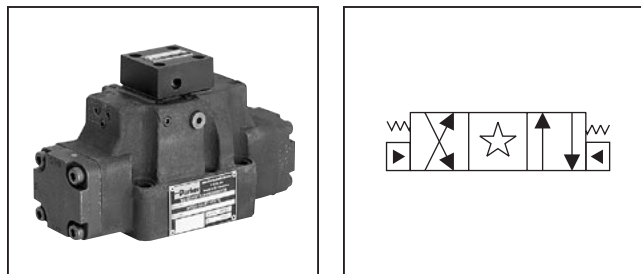
- Low pressure drop design.
- Hardened spools provide long life.

## Specifications

<b>Mounting Pattern</b>	NFPA D08, CETOP 8, NG25
<b>Max. Operating Pressure</b>	345 Bar (5000 PSI)
<b>Max. Tank Line Pressure</b>	345 Bar (5000 PSI)
<b>Max. Drain Pressure</b>	345 Bar (5000 PSI)
<b>Min. Pilot Pressure</b>	5.1 Bar* (75 PSI)
<b>Max. Pilot Pressure</b>	345 Bar (5000 PSI)
<b>Nominal Flow</b>	302 LPM (80 GPM)
<b>Max. Flow</b>	See Reference Data Chart

\* 6.9 Bar (100 PSI) for 2, 8, 9 & 12 spools

For flow path, pilot drain and pilot pressure details, see Installation Information.



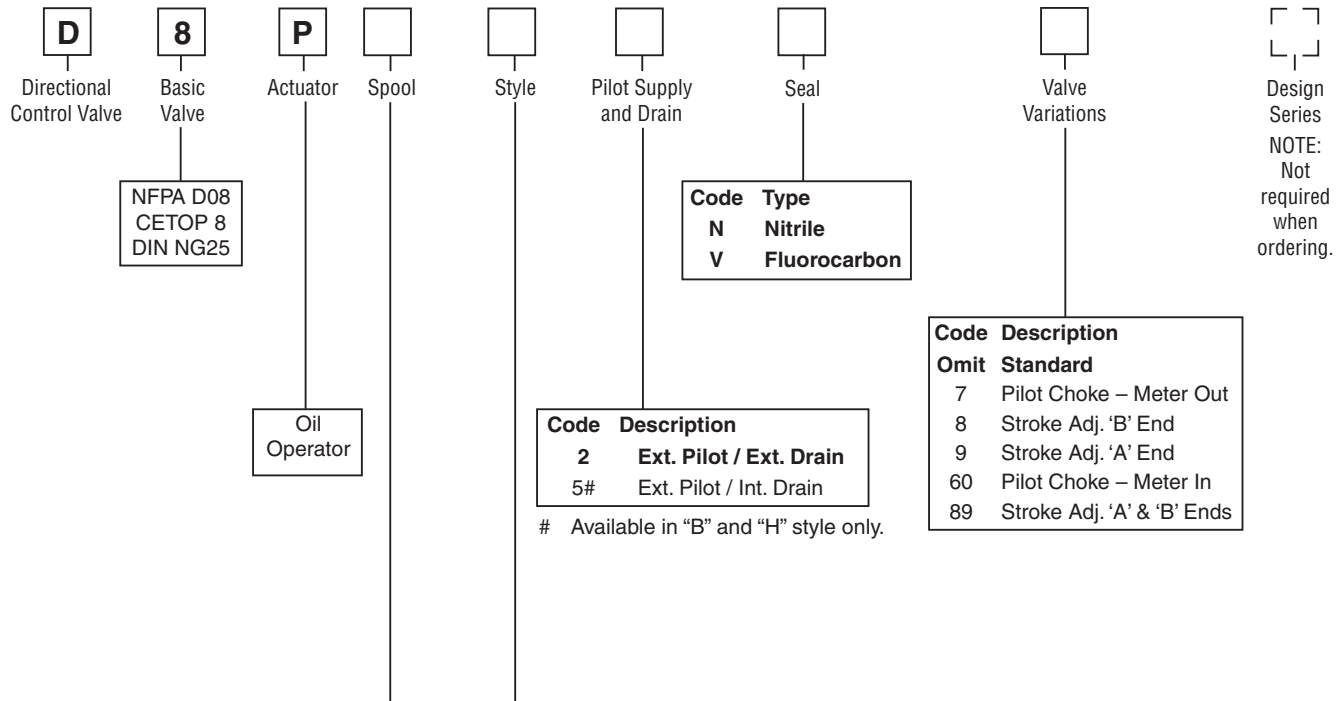
## Response Time

Response time will vary with pilot line size, pilot line length, pilot pressure shift time and flow capacity of the control valve.

## Shift Volume

The pilot chamber requires a volume of 1.35 in<sup>3</sup> (22.1 cc) for center to end.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



Design Series  
 NOTE: Not required when ordering.

Code	Symbol	Code	Symbol
001		011	
002		012	
004		020*	
007		030**	
009**			

\* 20 spool has closed crossover.  
 \*\* 9 & 30 spools have open crossover.

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator X. Note operators reverse sides for #9 spool. See installation information for details.

Code	Description	Symbol
<b>B†</b>	<b>Sgl. operator, 2 position, spring offset. P to A and B to T in offset position.</b>	
<b>C</b>	<b>Dbl. operator, 3 position, spring centered.</b>	
<b>H†</b>	<b>Sgl. operator, 2 position, spring offset. P to B and A to T in offset position.</b>	

† Available with 020 & 030 spools only.

This condition varies with spool code.

**Valve Weight:** 18.9 kg (41.7 lbs.)  
**Standard Bolt Kit:** BK228  
**Metric Bolt Kit:** BKM228

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

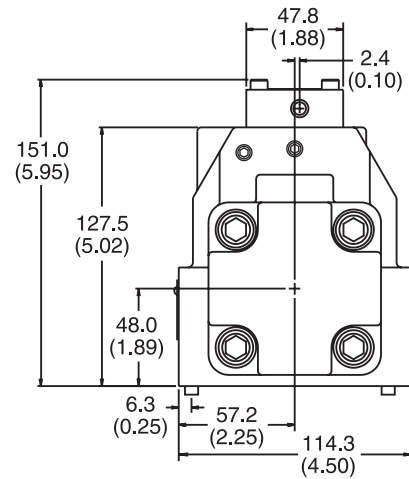
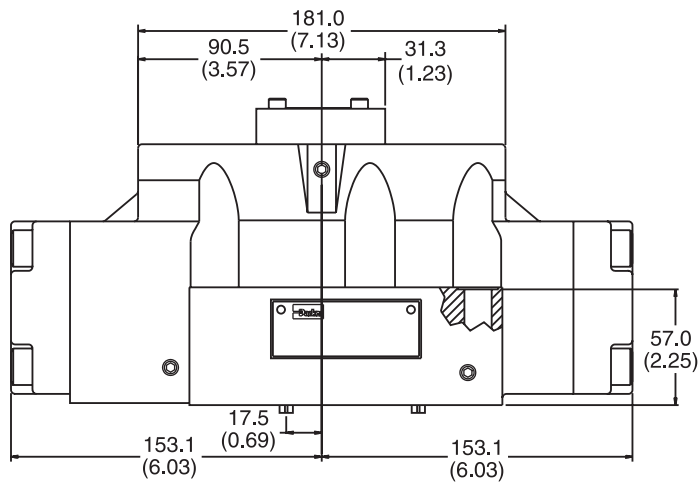
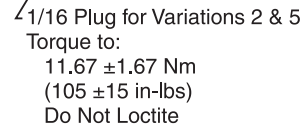
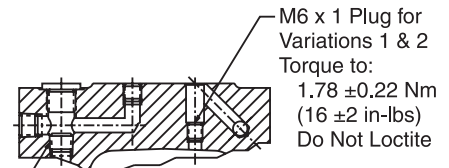
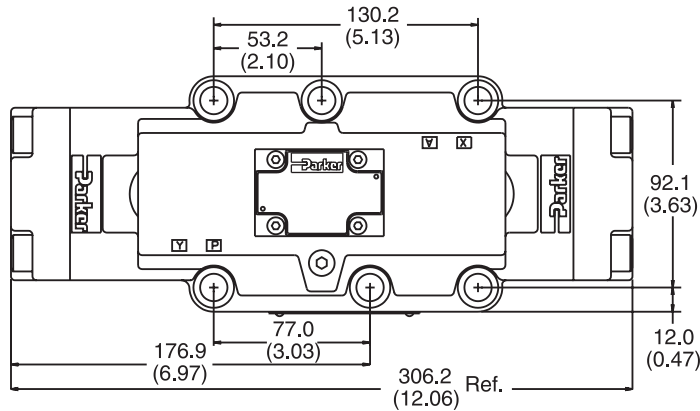
**Non-Bold: Designates Tier II products and options. These products will have longer lead times.**

Dimensions

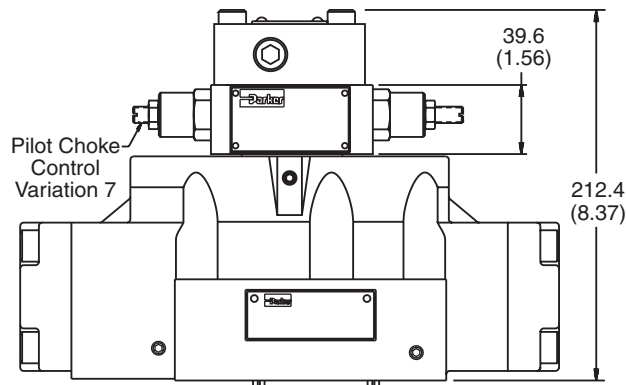
Inch equivalents for millimeter dimensions are shown in (\*\*)

A

Standard Pilot Operated



Pilot Operated with Pilot Choke Control



Note: 57mm (2.24") from bottom of bolt hole counterbore to bottom of valve.

**Installation Information**

FOR MAXIMUM VALVE RELIABILITY, ADHERE TO THE FOLLOWING INSTALLATION INFORMATION.

The following is important installation information which applies to all directional control valves described in this catalog.

**Mounting Position**

Detent – Horizontal  
Spring Offset – Unrestricted  
Spring Centered – Unrestricted

**Fluid Recommendations**

Premium quality hydraulic oil with a viscosity range between 32-54 cSt. (150-250 SSU) At 38°C (100°F) is recommended. The absolute operating viscosity range is from 16-220 cSt. (80-1000 SSU). Oil should have maximum anti-wear properties and rust and oxidation treatment.

**Fluids and Seals**

Valves using synthetic, fire-resistant fluids require special seals. When phosphate esters or its blends are used, FLUOROCARBON seals are required. Water-glycol, water-in-oil emulsions and petroleum oil may be used with STANDARD seals.

**Filtration**

For maximum valve and system component life, the system should be protected from contamination at a level not to exceed 125 particles greater than 10 microns per milliliter of fluid (SAE class 4/ISO 16/13).

**Silting**

Silting can cause any sliding spool valve to stick and not spring return if held under pressure for long periods of time. The valve should be cycled periodically to prevent sticking.

**Special Installations**

Consult your Parker representative for any application requiring the following:

- Pressure above rating.
- Fluid other than those specified.
- Oil temperature above 71.1°C (160°F).
- Flow path other than normal.

**Mounting Patterns**

Series	NFPA	CETOP
D81V*, D8P	D08	3/4"

**Torque Specifications**

The recommended torque values for the bolts which mount the valve to the manifold or subplate are as follows: 135.6 Nm (100 ft-lbs).

**A**

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**Series D81VW, D81VA, D81VL****Tank and Drain Line Surges**

If several valves are piped with a common tank or drain line, flow surges in the line may cause an unexpected spool shift. Detent style valves are most susceptible to this. Separate tank and drain lines should be piped in installations where line surges are expected.

**Electrical Characteristics (Detented Spool)**

Only a momentary energizing of the solenoid is necessary to shift and hold a detented spool. Minimum duration of the signal is 0.1 seconds for DC voltages. For AC voltages the response time is 0.06 seconds. Spool position will be held provided the spool centerline is in a horizontal plane, and not shock or vibration is present to displace the spool.

**Electrical Failure or Loss of Pilot Pressure (D81V or D81VA)**

Should electric power fail or loss of pilot pressure occur, spring offset and spring centered valves will shift to the spring held position. Detented valves will stay in the last position held before power failure. If main flow does not fail or stop at the same time power fails, machine actuators may continue to function in an undesirable manner or sequence.

**Pilot/Drain Characteristics****Pilot Pressure:**

5.1 to 345 Bar (75 to 5000 PSI)  
6.9 Bar (100 PSI) for spools 002, 007, 008, 009 & 014

**External:** An oil source sufficient to maintain minimum pilot pressure must be connected to the "X" port of the main body. When using the external pilot variation, a 1/16" pipe plug must be present in the main body pilot passage. (For details see Dimension pages.) This plug will be furnished in valves ordered with pilot code 2, 3, 5 or 6.

**Internal:** Flow is internally ported from the pressure port of the main valve body to the "P" port of the pilot valve. The pressure developed at the "P" port of the pilot valve must be 5.1 Bar (75 PSI) minimum at all times or 6.9 Bar (100 PSI) for spools 002, 007, 008, 009 & 014.

**Integral Check:** Valves using internal pilot and internal drain with an open center spool (spools 2, 7, 8 & 9) can be ordered with an integral check valve in the pressure port of the main valve codes 3 & 6. Pilot oil will be internally ported from the upstream side of this check to the "P" port of the pilot valve, ensuring sufficient pilot pressure. A 1/16" pipe plug will be present in the main body. The "X" port in the subplate must be plugged when using the integral check.

**Pilot Valve Drain:** Maximum pressure 102 Bar (1500 PSI) AC optional, 207 Bar (3000 PSI) DC standard.

**External:** When using an external drain, a M6 x 1 x 6mm long set screw must be present in the main body drain passage. (For details see Dimension pages.) This plug will be furnished in valves ordered with drain code 1, 2 or 3.

Drain flow from the pilot valve is at the "Y" port of the main body and must be piped directly to tank. Maximum drain line pressure is 102 Bar (1500 PSI), AC optional, 207 Bar (3000 PSI) DC standard. Any drain line back pressure is additive to the pilot pressure requirement.

**Internal:** Drain flow from the pilot valve is internally connected to the main valve tank port. Tank and drain pressure are then identical so tank line pressure should not exceed 102 Bar (1500 PSI) AC optional, 207 Bar (3000 PSI) DC standard. Any tank line back pressure is also additive to the pilot pressure requirement. If flow surges (a cause of pressure surges) are anticipated in the tank line, an external drain variation is recommended. The "Y" port in the subplate must be plugged when using an internal drain.

**D81V\* Flow Paths**

Style Code	Description	No Solenoid/Operator Energized	Solenoid/Operator A Energized	Solenoid/Operator B Energized
B	Spring Offset	P→A and B→T	–	P→B and A→T
C	Spring Centered	Centered	P→A and B→T	P→B and A→T
D	Detented	Last Position Held	P→A and B→T	P→B and A→T
E	Spring Centered	Centered	–	P→B and A→T
F†	Spring Offset, Shift to Center	P→A and B→T	–	Centered
H	Spring Offset	P→B and A→T	P→A and B→T	–
K	Spring Centered	Centered	P→A and B→T	–
M†	Spring Offset, Shift to Center	P→B and A→T	Centered	–

† D81VW only.



### Series D8P

#### Tank and Drain Line Surges

If several valves are piped with a common tank or drain line, flow surges in the line may cause an unexpected spool shift. Detent style valves are most susceptible to this. Separate tank and drain lines should be piped in installations where line surges are expected.

#### Loss of Pilot Pressure

Should a loss of pilot pressure occur, spring offset and spring centered valves will shift to the spring held position. No spring valves will stay in the last position held. If main hydraulic flow does simultaneously stop, machine actuators may continue to function in an undesirable manner or sequence.

#### Pilot Drain Characteristics

##### Pilot Pressure:

5.1 to 350 Bar (75 to 5000 PSI)  
6.9 Bar (100 PSI) for spools 2, 7, 8, 9 & 14

Direct pilot operated valves use the “X” and “Y” ports to supply pilot oil directly to the ends of the spool, providing spool shifting force. A block mounted on top of the valve body is internally cored to make the necessary connections. Thus when “X” is pressurized, “Y” is used as a drain; and when “Y” is pressurized, “X” becomes the drain.

Any back pressure in these lines when they are being used as a drain is additive to the pilot pressure requirement.

**Internal Drain:** On spring offset models, only the “X” port is pressurized, as the spring returns the spool to its at rest position. On these models, “Y” may be internally drained through the main tank passage in the valve.

#### Flow Path/Pilot Pressure

Style Code	Description	“X” & “Y” De-Pressurized	“X” Port Pressurized	“Y” Port Pressurized	Special Notes	Recommended Control Valve For Pilot Oil
B	Two Position Spring Offset	P→A, B→T	P→A, B→T	P→B, A→T	“X” Port may be pressurized to assist spring in returning spool to offset position (ext. only)	
C	Three Position Spring Centered	Center	P→A, B→T	P→B, A→T	Flow paths will be reversed on valves with tandem center (9) spools	
H	Two-Position Spring Offset	P→B, A→T	P→A, B→T	P→B, A→T	“Y” Port may be pressurized to assist spring in returning spool to offset position	

**Subplate Mounting**  
**NFPA D08, CETOP 8 & NG25**



**Recommended Mounting Surface**

Surface must be flat within .102 mm (0.0004 inch) T.I.R and smooth within 812.8 micro-meters (32 micro-inch). Torque bolts to 135.6 Nm (100 ft-lbs).

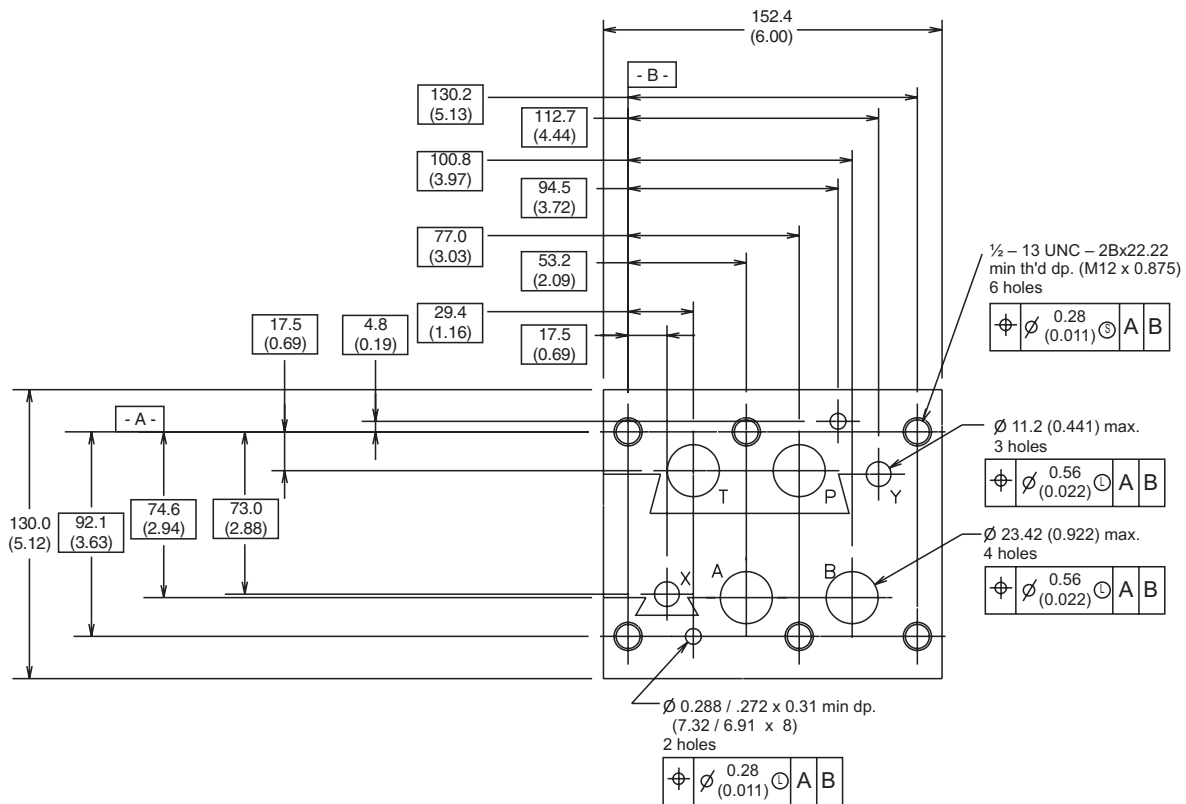
**Mounting Position**

Valve Type	Mounting Position
Detent (Solenoid)	Horizontal
Spring Offset	Unrestricted
Spring Centered	Unrestricted

***For maximum valve reliability, adhere to the following installation information.***

**Mounting Pattern — NFPA D08, CETOP 8 & NG25**

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





## General Description

Series D91VW directional control valves are 5-chamber, pilot operated, solenoid controlled valves. They are available in 2 or 3-position styles. These valves are manifold or subplate mounted, and conform to NFPA's D08, CETOP 8 mounting pattern.





## Operation

Series D91VW pilot operated valves are standard with low shock spools and pilot orifice. The orifice can be removed if a faster shift is required. It is recommended, however, that all systems operating above 138 Bar (2000 PSI) use the standard valve to avoid severe shock.


## Features

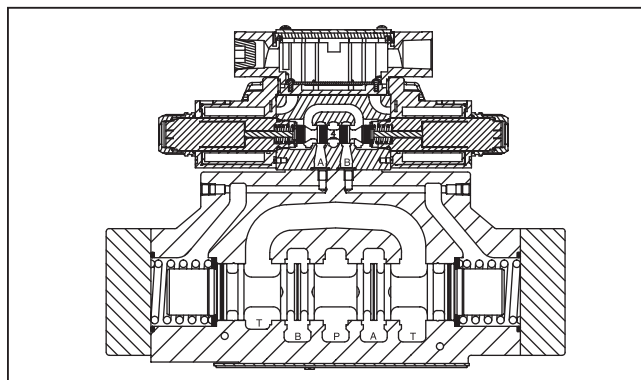
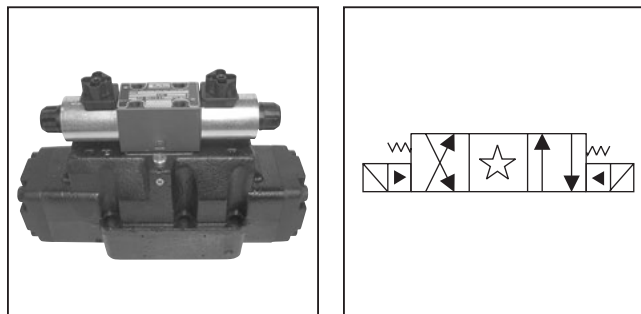
- Low pressure drop design.
- Hardened spools provide long life.
- Fast response option available.
- Wide variety of voltages and electrical connection options.
- Explosion proof availability.
- No tools required for coil removal.

## Specifications

<b>Mounting Pattern</b>	NFPA D08, CETOP 8, NG25
<b>Maximum Operating Pressure</b>	345 Bar (5000 PSI) Standard 207 Bar (3000 PSI) 10 Watt  CSA  207 Bar (3000 PSI)
<b>Maximum Tank Line Pressure</b>	Internal Drain Model: 103 Bar (1500 PSI) AC Only 207 Bar (3000 PSI) DC Std., AC Optional  External Drain Model: 345 Bar (5000 PSI)  CSA  103 Bar (1500 PSI)
<b>Maximum Drain Pressure</b>	103 Bar (1500 PSI) AC Only 207 Bar (3000 PSI) DC Std., AC Optional  CSA  103 Bar (1500 PSI)
<b>Minimum Pilot Pressure</b>	5.1 Bar* (75 PSI)
<b>Maximum Pilot Pressure</b>	345 Bar (5000 PSI) Standard CSA  207 Bar (3000 PSI)
<b>Nominal Flow</b>	302 LPM (80 GPM)

\* 6.9 Bar (100 PSI) for spool configurations 002, 007, 008, 009 & 014.

 **WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



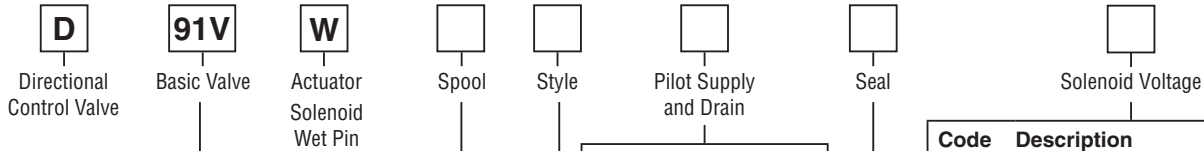
## Response Time

Response times (milliseconds) are measured at 345 Bar (5000 PSI) and 300 LPM (80 GPM) with various pilot pressures as indicated.

Solenoid Type	Pilot Pressure	Pull-In		Drop-Out	
		Std	Fast	Std	Fast
DC	500	140	100	70	70
	1000	125	90	76	76
	2000	100	70	70	70
AC	500	100	60	60	60
	1000	85	50	60	60
	2000	60	30	60	60

Because of the high drain line pressure transients generated during shifting, use of the fast response option is not recommended for pilot pressures exceeding 138 Bar (2000 PSI).

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NFPA D08  
 CETOP 8  
 DIN NG25  
 High Flow, D03 Pilot

Code	Description
<b>1</b>	<b>Internal Pilot, External Drain</b>
<b>2</b>	<b>External Pilot, External Drain</b>
<b>4*</b>	<b>Internal Pilot, Internal Drain</b>
<b>5</b>	<b>External Pilot, Internal Drain</b>

\* Not available with 002, 008, 009 & 030 spools.

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

Code	Description
D†#	120 VDC
E*	24/60 - 24/50 VAC
<b>J</b>	<b>24 VDC</b>
<b>K##</b>	<b>12 VDC</b>
Q††#	100/60 VAC
QD††#	100 VAC/60 Hz - 100 VAC/50 Hz
T^^	<b>240/60 - 220/50 VAC</b>
U***	98 VDC
<b>Y</b>	<b>120/60 - 110/50 VAC</b>

# High watt only.  
 \* Leadwire only, low watt only.  
 \*\* DIN, low watt available.  
 \*\*\* Leadwire not available.  
 ^^ Plug-in is low watt only.  
 † DIN & Leadwire only.  
 †† DIN only.

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing solenoid A. Note operators reverse sides for #008 and #009 spools. See installation information for details. To configure per DIN standards (A coil over A port, B coil over B port) code valves as D81VHW\*\*\*.

Code	Symbol
001	
002	
003	
004	
006	
008*, 009**	
011	
012	
015	
016	
020*	
030**	
081	
082	

\* 008, 020 & 026 spools have closed crossover.  
 \*\* 009 & 030 spools have open crossover.

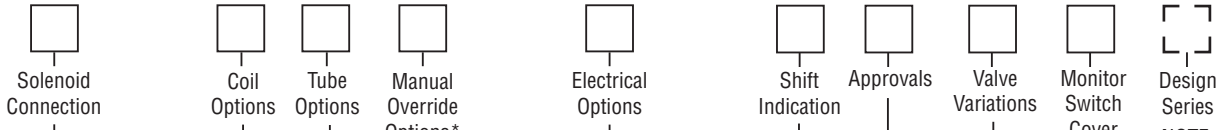
3-Position Spools			
Code	All 3-Position Spools		
<b>C</b>		<b>3 positions.</b> <b>Spring offset in position "0".</b> <b>Operated in position "a" or "b".</b>	
	<b>Standard</b>	<b>Spool Type 009</b>	
<b>E</b>	 Operated in position "a".	 Operated in position "b".	2 positions. Spring offset in position "0".
<b>F</b>	 Spring offset in position "b".	 Spring offset in position "a".	2 positions. Operated in position "0".
<b>K</b>	 Operated in position "b".	 Operated in position "a".	2 positions. Spring offset in position "0".
<b>M</b>	 Spring offset in position "a".	 Spring offset in position "b".	2 positions. Operated in position "0".
<b>R</b>	 No center in offset position.	 No center in offset position.	2 positions, detent. Operated in position "0" or "b".
<b>S</b>	 No center in offset position.	 No center in offset position.	2 positions, detent. Operated in position "0" or "a".

2-Position Spools		
Code	Spool Position	
<b>B*</b>		<b>Spring offset in position "b".</b> <b>Operated in position "a".</b>
<b>D</b>		Detent, operated in position "a" or "b". No center or offset position.
<b>H</b>		Spring offset in position "a". Operated in position "b".

\* 020 & 030 spools only.

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

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



Code	Description
<b>C*</b>	<b>Leadwire Conduit Box</b>
D**	Metric Plug (M12X1) DESINA
E†	Explosion Proof
F <sup>x</sup>	Flying Leadwire
<b>G††</b>	<b>Plug-In Conduit Box</b>
<b>J++</b>	<b>Deutsch (DT04-2P)</b>
<b>P</b>	<b>DIN with Plug</b>
S‡	Double Spade
<b>W†</b>	<b>DIN w/o Plug</b>

- \* No conduit box variations – See Plug-in.
- \*\* 24 VDC only, low watt only, lights, diode surge suppressor, not CSA approved.
- † Not available with lights.
- †† Required for variations on conduit box style, must have lights.
- ++ 12 and 24 VDC only.
- ‡ Only 12 VDC high watt.
- x 6" leadwire only.

Code	Description
<b>Omit*</b>	<b>High watt</b>
D**	Explosion Proof, EExd ATEX
E**	Explosion Proof, EExme ATEX, IECEX, from Germany
F†	Low Watt
L	10 Watt
R#	Explosion Proof, ATEX/UL/CSA/IECEX, configurable cable connection
T#	Explosion Proof, ATEX/UL/CSA/IECEX, fixed horizontal cable connection
U##	Explosion Proof, UL/CSA

- \* AC ambient temperature must not exceed 60°C (140°F).
- \*\* J voltage only, no options.
- † AC only.
- # J and Y voltages only. Y voltage is rectified.
- ## J and Y voltages only. Y voltage is not rectified.

**Valve Weight:**  
 Double Solenoid 19.6 kg (43.2 lbs.)

**Seal Kit:**  
 Nitrile SKD81VWN91  
 Fluorocarbon SKD81VWV91

Code	Description
<b>Omit</b>	<b>No Options</b>
J#	Diode Surge Suppressor
Z†	Rectified Coil

- # **Plug-In** – 24 VDC only. **DIN** – DC only with Lighted Plug (5), which has integrated Surge Suppression. "J" not required here.
- Deutsch** – as follows:
  - 12 VDC Hi watt only
  - 24 VDC Hi & Lo watt
- 24 VDC "JER"** required. "JET" available. Adds dust rating, not polarity sensitive [IIIC, D].
- Leadwire** – not available
- † DC tube standard, Plug-In conduit box only. Not polarity sensitive. Only available with Y voltage.

Code	Description
<b>Omit</b>	<b>Standard</b>
P*	Extended Manual Override with Boot
T	Covered Manual Override, DC only, or AC Rectified

- \* Manual override options not available on Explosion Proof or soft shift. Not available with high pressure AC tube H.

Code	Description
<b>Omit</b>	<b>Standard Pressure</b>
	103.5 Bar (1500 PSI) AC
	207 Bar (3000 PSI) DC
<b>H*</b>	<b>High Pressure, AC only</b>
	207 Bar (3000 PSI)

- \* Not available with CSA or Explosion Proof.

See next page

Code	Description
<b>Omit</b>	<b>No Variation</b>
4B	Monitor Switch Cover

Code	Description
<b>Omit</b>	<b>Standard Valve</b>
4†#	CSA Canada CSA22.2 No. 139-13
<b>N</b>	<b>CE Approved</b>
<b>Q†#</b>	<b>CE + CSA Approved</b>

- † Not available with AC high pressure tube.
- # Valve is derated.

Code	Spool Position	Position Control
<b>Omit</b>	All	Standard response
I3N	C	End position monitored, side A and B
I6N		Start position monitored, side A and B
I2N	C, B, E, F (all spools)	End position monitored, side B
I5N	C, K, M (spool 9)	Start position monitored, side B
I1N	C, H, K, M (all spools)	End position monitored, side A
I4N	C, E, F (spool 9)	Start position monitored, side A

Note: The plug M12 x 1 for the position control is included. The monitor switch has to be located on the side to which the spool moves from the spring offset position. For 4/3-way valves two switches are required. Not CSA approved. **DC DIN, high watt coils only.**

**Mounting Bolt Kits**

UNC Bolt Kits for use with D6 and D8 Directional Control Valves & Sandwich Valves				
	Number of Sandwich Valves @ 2.75" (70mm) thickness			
	0	1	2	3
D6	BK227 2.50"	BK121 5.25"	BK122 8.00"	BK123 10.75"
D6 plus tapping plate	BK161 3.50"	BK170 6.25"	BK171 9.00"	BK172 11.75"
D8	BK228 3.00"	BK131 5.75"	BK132 8.50"	BK133 11.25"
D8 plus tapping plate	BK173 4.00"	BK174 6.75"	BK175 9.50"	BK114 12.125"

Note: All bolts are SAE grade 8, 1/2-13 UNC-3A thread, torque to 133 N.m. (100 ft.-lbs.)

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



**Valve Variations**

**A** **OPTIONS ARE NOT AVAILABLE ON MONITOR SWITCH VALVES.**

Code	Description
5*	<b>Signal Lights – Standard</b> Signal Lights – Hirsch. (DIN with Plug) (the DC Lighted Plug has Integral Surge Suppression)
7B**	Manaplug – Brad Harrison (12x1) Micro with Lights
56**	<b>Manaplug (Mini) with Lights</b>
20	<b>Fast Response</b>
1C**	<b>Manaplug (Mini) Single Sol. 5-pin, with Lights</b>
1D**	Manaplug (Micro) Single Sol. 5-pin, with Lights
1M**	Manaplug Opposite Normal
1P	Painted Body
1R	Stroke Adjust 'A' & 'B' End with Pilot Choke Meter In
3A	<b>Pilot Choke Meter Out</b>
3B	<b>Pilot Choke Meter In</b>
3C	<b>Pilot Pressure Reducer</b>
3D	Stroke Adjust 'B' End
3E	Stroke Adjust 'A' End
3F	Stroke Adjust 'A' & 'B' End
3G*	<b>Pilot Choke Meter Out with Lights</b>
3H*	<b>Pilot Choke Meter In with Lights</b>
3J*	Pilot Pressure Reducer with Lights
3K	Pilot Choke Meter Out with Stroke Adjust 'A' & 'B' End
3L**	Pilot Choke Meter Out, Stroke Adjust 'A' & 'B' End with Lights and Manaplug — Brad Harrison Mini
3M	Pilot Choke Meter Out, Pilot Pressure Reducer, Stroke Adjust 'A' & 'B' End
3R	Pilot Choke Meter Out & Pilot Pressure Reducer
3S**	Lights, Mini Manaplug, Pilot Choke Meter Out
7Y**	M12x1 Manaplug (4-pin), Special Wiring, and Lights

\* DESINA, plug-in conduit box, and DIN with plug styles only.

\*\* Must have plug-in style conduit box.

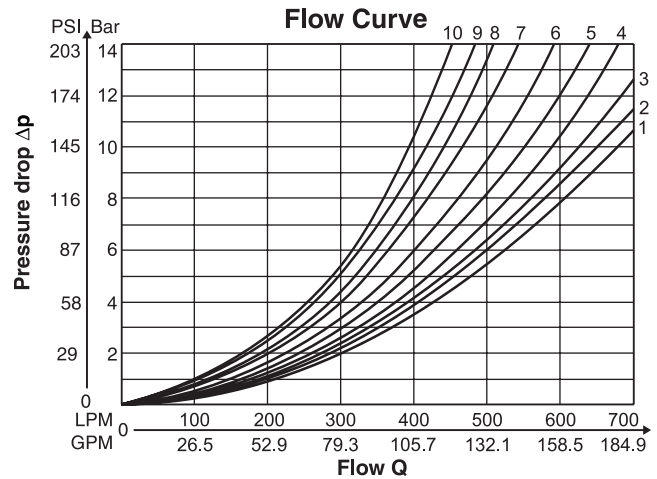
**Series Pressure Drop Chart**

The following chart provides the flow vs. pressure drop curve reference for the Series D91V\* valve by spool type.

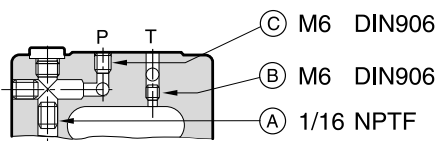
VISCOSITY CORRECTION FACTOR							
Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (Approx.)	93	111	119	126	132	137	141
Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change as per chart.							

Spool Code	Curve Number				
	P-A	P-B	P-T	A-T	B-T
001	3	2	-	3	5
002	2	1	1	3	5
003	4	2	-	3	6
004	4	3	-	3	5
005	1	2	-	4	5
006	2	2	-	4	6
007	3	1	7	3	5
009	4	8	9	4	10
011	3	2	-	3	5
014	1	2	8	3	5
015	3	3	-	4	5
016	3	3	-	4	5
020	6	5	-	6	8
021	5	10	-	3	-
022	10	5	-	-	5
026	6	5	-	-	-
030	3	2	-	3	5
054	4	3	-	3	5

**Performance Curves**



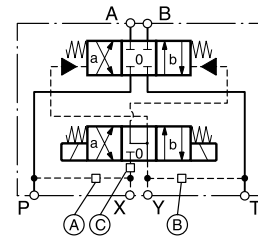
**Pilot Oil Inlet (Supply) and Outlet (Drain)**



○ open, ● closed

Pilot oil		A	B	C
Inlet	Outlet			
internal	external	○	●	Orifice Ø1.5
external	external	●	●	Orifice Ø1.5
internal	internal	○	○	Orifice Ø1.5
external	internal	●	○	Orifice Ø1.5

All orifice sizes for standard valves



**A**

**Solenoid Ratings**

<b>Insulation System</b>	Class F
<b>Allowable Deviation from rated voltage</b>	-10% to +10% for DC and AC rectified coils -5% to +5% for AC Coils
<b>Armature</b>	Wet pin type
<b>CSA File Number</b>	LR60407
<b>Environmental Capability</b>	DC Solenoids meet NEMA 4 and IP67 when properly wired and installed. Contact HVD for AC coil applications.

**Explosion Proof Solenoid Ratings\***

<b>U.L. &amp; CSA (EU)</b>	Class I, Div 1 & 2, Groups C & D Class II, Div 1 & 2, Groups E, F & G As defined by the N.E.C.
<b>ATEX (ED)</b>	Complies with ATEX requirements for: Ex d IIB Gb; EN60079-0:2012, EN60079-1:2007
<b>ATEX, IECEx &amp; CSA/US (ER, ET) (Tri-rated)</b>	Complies with IEC 60079-0:2011, IEC 60079-1:2007, IEC 60079-31:2013; Ex d IIC Gb; Ex tb IIIC Db IP66; IECEx BAS 14.0164X  ATEX: EN60079-0, EN60079-1, EN60079-31; CE 1180 Ex II 2G BASEEFA08ATEX0041X  CSA 22.2 No. 60079-0:07, 60079-1:07 and UL 60079-0:05, UL 60079-1:05; CSA listed to US and Canada Safety Standards. File 08-CSA-1932102  CSA Ex d IIC, AEx d IIC for Class I Zone 1; Class I Div 1 Grp. C & D; Class II Div 1 Grp. E, F & G

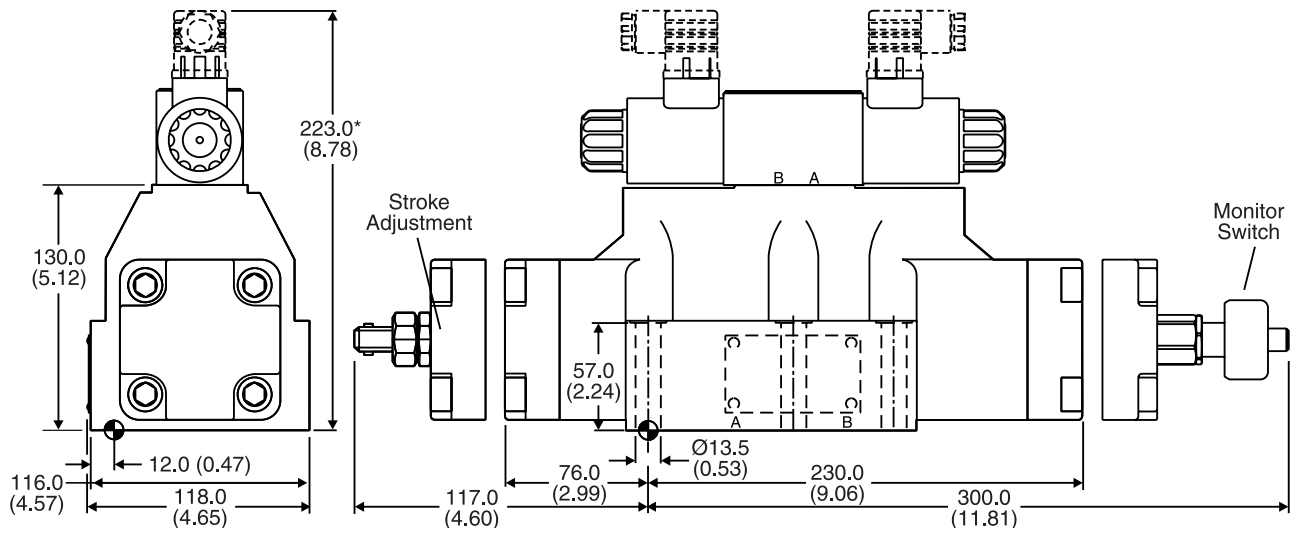
\* Allowable Voltage Deviation ±10%.

Code		Voltage	In Rush Amps Amperage	In Rush VA	Holding Amps @ 3 mm	Watts	Resistance
Voltage Code	Power Code						
D	Omit	120 VDC	N/A	N/A	0.26 Amps	30 W	528.00 Ohms
E	F	24 VAC	4.8 AMPS	120 VA	2.07 Amps	21 W	1.29 Ohms
J	L	24 VDC	N/A	N/A	0.44 Amps	10 W	51.89 Ohms
J	Omit	24 VDC	N/A	N/A	1.32 Amps	30 W	17.27 Ohms
K	L	12 VDC	N/A	N/A	0.88 Amps	10 W	12.97 Ohms
K	Omit	12 VDC	N/A	N/A	2.64 Amps	30 W	4.32 Ohms
Q	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	0.77 Amps	30 W	19.24 Ohms
QD	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	.77 Amps	30 W	19.24 Ohms
T	Omit	240/60 VAC	0.83 Amps	199 VA	0.30 Amps	30 W	120.40 Ohms
T	Omit	220/50 VAC	0.87 Amps	191 VA	0.34 Amps	30 W	120.40 Ohms
T	F	240/60 VAC, Low Watt	0.70 Amps	168 VA	0.22 Amps	21 W	145.00 Ohms
T	F	220/50 VAC, Low Watt	0.75 Amps	165 VA	0.26 Amps	23 W	145.00 Ohms
U	Omit	98 VDC	N/A	N/A	0.31 Amps	30W	288.00 Ohms
Y	Omit	120/60 VAC	1.7 Amps	204 VA	0.60 Amps	30 W	28.20 Ohms
Y	Omit	110/50 VAC	1.7 Amps	187 VA	0.68 Amps	30 W	28.20 Ohms
Y	F	120/60 VAC, Low Watt	1.40 Amps	168 VA	0.42 Amps	21 W	36.50 Ohms
Y	F	110/50 VAC, Low Watt	1.50 Amps	165 VA	0.50 Amps	23 W	36.50 Ohms
<b>Explosion Proof Solenoids</b>							
Y		120/60 VAC	1.60 Amps	192 VA	0.58 Amps	27 W	33.50 Ohms
J		24 VDC	N/A	N/A	1.38 Amps	33 W	17.33 Ohms
<b>Explosion Proof Solenoids (German)</b>							
J		24 VDC	N/A	N/A	1.0 Amps	24 W	24 Ohms
<b>ER &amp; ET Explosion Proof Solenoids</b>							
J		24 VDC	N/A	N/A	0.54 Amps	13 W	44.30 Ohms
Y		120/60 VAC	N/A	N/A	0.16 Amps	17 W	667.00 Ohms

**Dimensions**





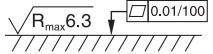
**Directional Control Valves  
Series D91VW**

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



\* For each sandwich plate, please add +40mm (1.58") (pressure reducing valve, choke valve meter-in/-out),



Surface Finish	 Kit	 Kit	 Kit	Seal  Kit
	BK360	6x M12x75 ISO 4762-12.9	108 Nm (79.7 lb.-ft.) ±15%	Nitrile: SK-D81VW-N-91 Fluorocarbon: SK-D81VW-V-91

The space necessary to remove the plug per DIN 43650, design type AF is at least 15 mm (0.59").  
The torque for the screw M3 of the plug has to be 0.5 Nm (0.37 lb.-ft.) to 0.6 Nm (0.44 lb.-ft.).

### General Description

**A**

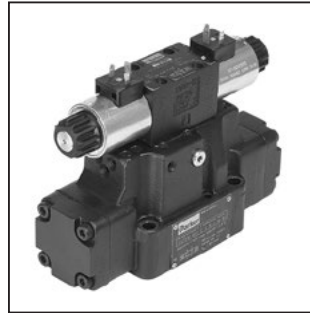
Series D91VWR and D91VWZ are regenerative and hybrid directional control valves (NG25).

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

### Features

- Energy saving A-regeneration optionally integrated.
- Switchable hybrid version.

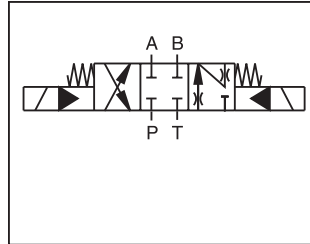
**Further literature about the opportunities of energy savings and more functional details of the integrated regeneration is available on request.**



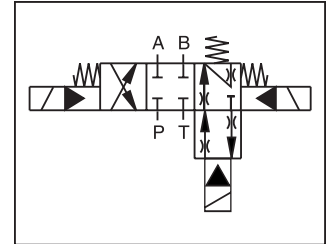
D41VWR (shown)



D41VWZ (shown)

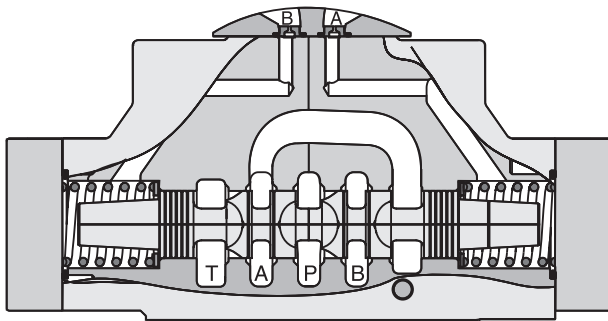


Regenerative D91VWR

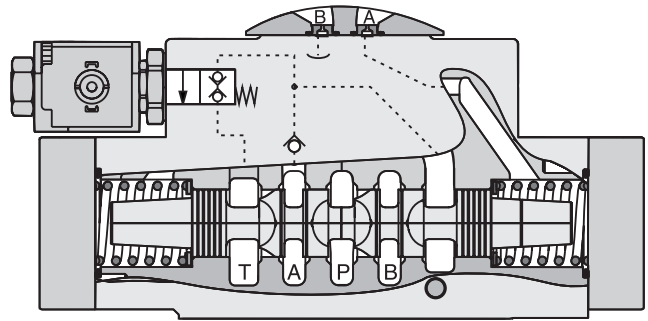


Hybrid D91VWZ

### Regenerative Valve D91VWR

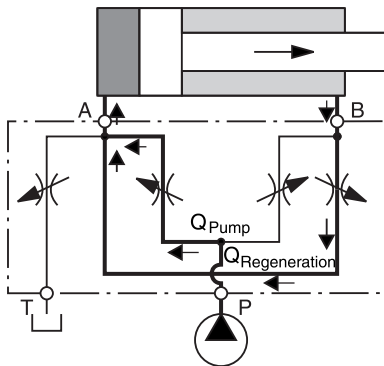


### Hybrid Valve D91VWZ



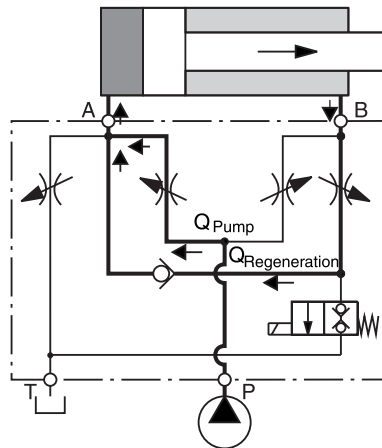
### D91VWR Regenerative Valve

Cylinder Extending

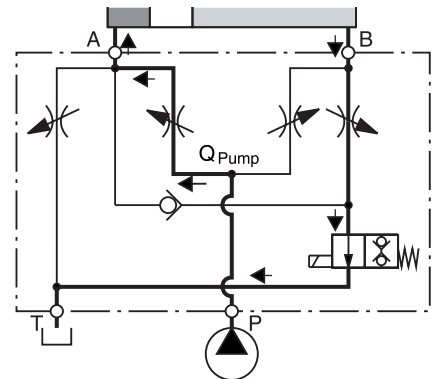


### D91VWZ Hybrid Valve

Cylinder Extending  
 Regenerative Mode  
 (High Speed)



Cylinder Extending  
 Standard Mode  
 (High Force)



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**Ordering Information**

**D91VW**

Series

NFPA D08,  
CETOP 8  
DIN NG25  
32mm

Spool Type

**C**

Style

Code	Description
<b>C</b>	<b>3 positions. Spring offset in position "0". Operated in position "a" or "b".</b>

Pilot Supply and Drain

Code	Description
<b>1</b>	<b>Internal Pilot External Drain</b>
<b>2</b>	External Pilot External Drain
<b>4</b>	<b>Internal Pilot Internal Drain</b>
<b>5</b>	External Pilot Internal Drain

Seal

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

**J**

Solenoid Voltage 24VDC

**W**

Connector as per EN 175301-803, without connector (Please order plug separately)

Code	Description
<b>Omit</b>	<b>Standard</b>
<b>T</b>	No manual override

Manual Override

Valve Variations

Code	Description
<b>Omit</b>	<b>No Variations</b>
<b>3A</b>	Pilot Choke, Meter-Out
<b>3B</b>	Pilot Choke, Meter-In
<b>3C</b>	Pilot Pressure Reducer
<b>3D</b>	Stroke Adjustment "B" End
<b>3E</b>	Stroke Adjustment "A" End
<b>3F</b>	Stroke Adjustment "A" & "B" End
<b>3R</b>	Pilot Choke Meter-Out & Pressure Reducer
<b>1T</b>	Pilot Choke Meter-In & Pressure Reducer

Design Series

NOTE: Not required when ordering.

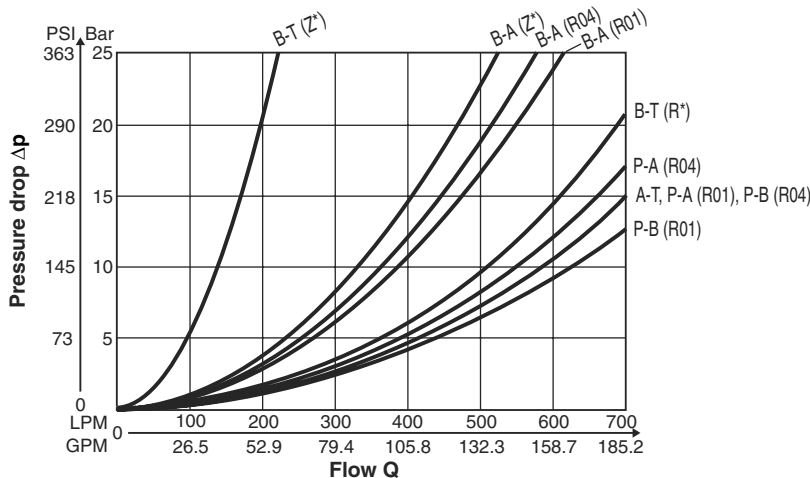
**Weight:**  
D91VWR, D91DWZ 18.6 kg (41.0 lbs.)

Regenerative Function			Hybrid Function		
Code	Spool Type		Code	Spool Type	
	a	b 0		a	b 0
R01			Z01		
R04			Z04		
R81			Z81		
R82			Z82		

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

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

**Performance Curves**



Flow curves measured with Spool R01, R04, Z01, Z04



A

General			
Design	Directional Spool Valve		
Actuation	Solenoid		
Size	NG25 / CETOP8 / D08		
Mounting Interface	DIN 24340 A25 / ISO 4401 / NFPA D08 / CETOP RP 121-H		
Mounting Position	Unrestricted, preferably horizontal		
Ambient Temperature	[°C]	-25°...+50° (-13°F...+122°F)	
MTTF <sub>D</sub> Value	[years]	75	
Hydraulic			
Maximum Operating Pressure	Pilot drain internal: P, A, B, X 350 Bar (5075 PSI); T, Y 105 Bar (1523 PSI) Pilot drain external: P, A, B, T, X 350 Bar (5075 PSI); Y 105 Bar (1523 PSI)		
Fluid	Hydraulic oil in accordance with DIN 51524 / 51525		
Fluid Temperature	[°C]	-25°... +70° (-13°F...+158°F)	
Viscosity Permitted	[cSt]/[mm <sup>2</sup> /s]	2.8...400 (13...1854 SSU)	
Recommended	[cSt]/[mm <sup>2</sup> /s]	30...80 (139...371 SSU)	
Filtration	ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)		
Flow Maximum	700 LPM (185.2 GPM)		
Leakage at 350 Bar (5075 PSI) (per flow path)	[ml/min]	up to 800 (0.21 GPM) (depending on spool)	
Minimum Pilot Supply Pressure	5 Bar (73 PSI)		
Static / Dynamic			
Step Response at 95%		Energized	De-energized
DC Solenoids	Pilot Pressure		
	50 Bar (725 PSI)	[ms] 150	170
	100 Bar (1425 PSI)	[ms] 110	170
	250 Bar (3625 PSI)	[ms] 90	170
	350 Bar (5075 PSI)	[ms] 85	170
Electrical			
Duty Ratio	100% ED; CAUTION: coil temperature up to 150°C (302°F) possible		
Protection Class	IP 65 in accordance with EN 60529 (plugged and mounted)		
Supply Voltage / Ripple	[V]	24	
Tolerance Supply Voltage	[%]	±10	
Current Consumption	Hold	[A]	1.29
Current Consumption	In Rush	[A]	1.29
Power Consumption	Hold	[W]	31
Power Consumption	In Rush	[W]	31
Solenoid Connection	Connector as per EN 175301-803, solenoid Identification as per ISO 9461		
Wiring Minimum	[mm <sup>2</sup> ]	3 x 1.5 recommended	
Wiring Length Minimum	[m]	50 (164 ft.) recommended	

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

#### Electrical Specifications Hybrid Option

Duty Ratio	100%		
Protection Class	IP 65 in accordance with EN 60529 (plugged and mounted)		
Supply Voltage	[V]	24	
Tolerance Supply Voltage	[%]	±10	
Current Consumption	[A]	0.96	
Power Consumption	[W]	23	
Solenoid Connection	Connector as per EN 175301-803		
Wiring Minimum	[mm <sup>2</sup> ]	3 x 1.5 recommended	
Wiring Length Maximum	[m]	50 (164 ft.) recommended	

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

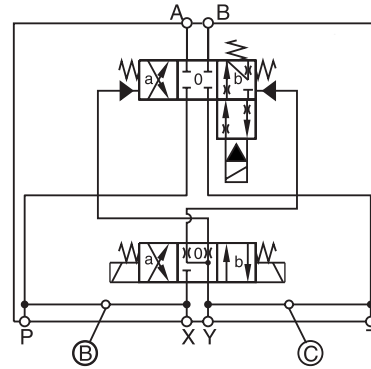
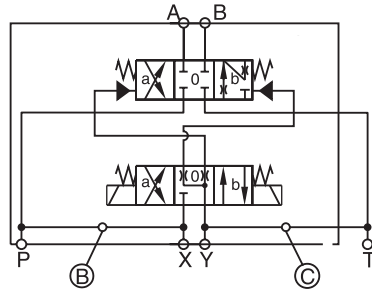


**Pilot Flow**

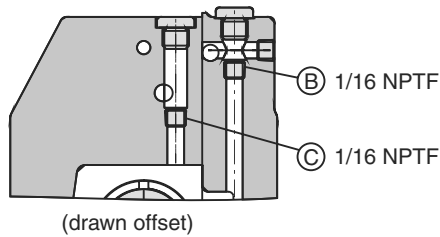
**Pilot Oil Inlet (Supply) and Outlet (Drain)**

○ open, ● closed

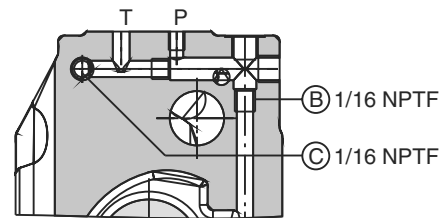
Pilot Oil Inlet	Pilot Oil Outlet	B	C
internal	external	○	●
external	external	●	●
internal	internal	○	○
external	internal	●	○



**D91VWR**

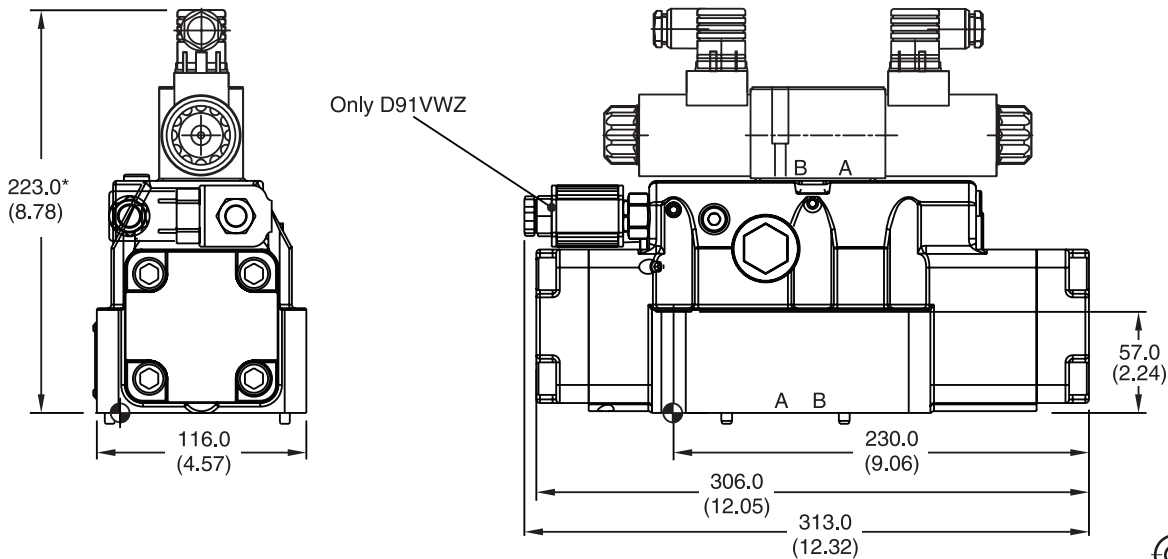


**D91VWZ**



**Dimensions**

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



\* Please add for each sandwich plate +40mm (1.58") (pressure reducing valve, pilot choke valve meter-in/-out).

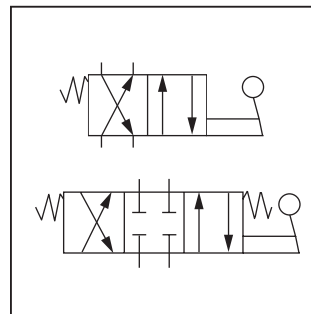
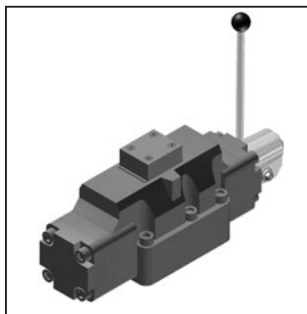
Surface Finish	Kit	Kit	Kit	Seal Kit
	BK360	4x M10x60 2x M6x55 DIN 912 12.9	63 Nm (46.5 lb.-ft.) 13.2 Nm (9.7 lb.-ft.) ±15%	<b>Nitrile: SK-D91VW-N-91</b> Fluorocarbon: SK-D91VW-V-91

The space necessary to remove the plug per DIN 43650, design type AF is at least 15mm (0.59").  
 The torque for the screw M3 of the plug has to be 0.5 Nm (0.37 lb.-ft.) to 0.6 Nm (0.44 lb.-ft.).

**A**

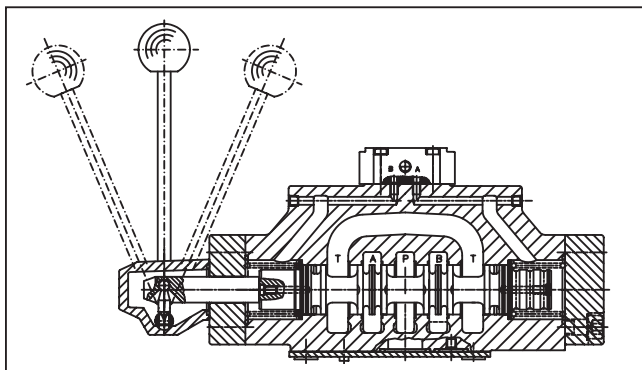
## General Description

Series D9L directional control valves are 5-chamber, 4 way, 2 or 3-position valves. They are operated by a hand lever which is directly connected to the spool. The hand lever can be located either on the A or B side. Spring offset and detent designs are available.



## Features

- Streamlined internal channels ensure minimum pressure drop at maximum flow.
- Hardened spools provide long life.



## Specifications

General		Hydraulic (cont.)	
<b>Actuation</b>	Lever	<b>Fluid</b>	Hydraulic oil in accordance with DIN 51524 / 51525
<b>Size</b>	NG25	<b>Fluid Temperature</b>	-25°C to +70°C (-13°F to +158°F)
<b>Mounting Interface</b>	DIN 24340 A25 ISO 4401 NFPA D08 CETOP RP 121-H	<b>Viscosity Permitted</b>	2.8 to 400 cSt / mm <sup>2</sup> /s (13 to 1854 SSU)
<b>Mounting Position</b>	Unrestricted, preferably horizontal	<b>Viscosity Recommended</b>	30 to 80 cSt / mm <sup>2</sup> /s (139 to 371 SSU)
<b>Ambient Temperature</b>	-25°C to +50°C (-13°F to +122°F)	<b>Filtration</b>	ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)
<b>Hydraulic</b>		<b>Maximum Flow</b>	700 LPM (185.2 GPM)
<b>Maximum Operating Pressure</b>	<b>External Drain</b> P, A, B, T 350 Bar (5075 PSI) X, Y 10 Bar (145 PSI)  <b>Internal Drain</b> P, A, B 350 Bar (5075 PSI) T, X, Y 10 Bar (145 PSI)	<b>Leakage at 350 Bar (5075 PSI)</b>	up to 800 ml per minute (per flow path) (depending on spool)

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**D**  
 Directional Control Valve

**9**  
 Basic Valve

NFPA D08  
 CETOP 8  
 DIN NG25  
 32 mm

Actuator

Spool

Style

Pilot Supply and Drain

Seal



Design Series  
 NOTE:  
 Not required when ordering.

Code	Actuation
L	Lever Side B
LB	Lever Side A

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
2*	External Pilot External Drain
5**	External Pilot Internal Drain

\* Pressure T-port < 10 bar  
 \*\* Pressure T-port > 10 bar

Code	Symbol	Code	Symbol
001		009	
002		014	
003		015	
004		020	
007		030	

Code	Description	Symbol
B*	Single operator, 2 position, spring offset.	
C	Double operator, 3 position, spring centered.	
D*	Double operator, 2 position, detent.	
E	Single operator, 2 position, spring centered.	
H*	Single operator, 2 position, spring offset.	
K	Single operator, 2 position, spring centered.	
N	Double operator, 3 position, detent.	

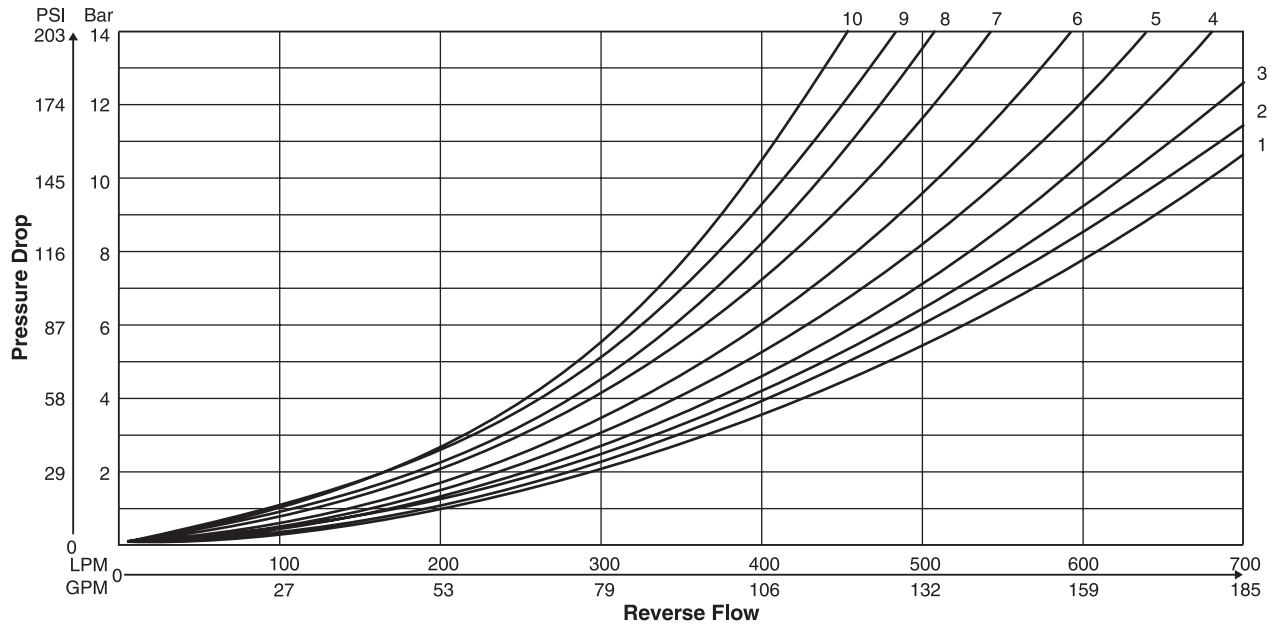
\* Only available with 020 and 030 spools

**Weight:** 17.0 kg (37.5 lbs.)

The flow curve diagram shows the flow versus pressure drop curves for all spool types. The relevant curve number for each spool type, operating position and flow direction is given in the table below.

**A**

Spool Code	Curve Number				
	P-A	P-B	P-T	A-T	B-T
001	3	2	—	3	5
002	2	1	1	3	5
003	4	2	—	3	6
004	4	3	—	3	5
007	3	1	7	3	5
009	4	8	9	4	10
014	1	3	7	5	3
015	2	4	—	5	3
020	6	5	—	6	8
030	3	2	—	3	5

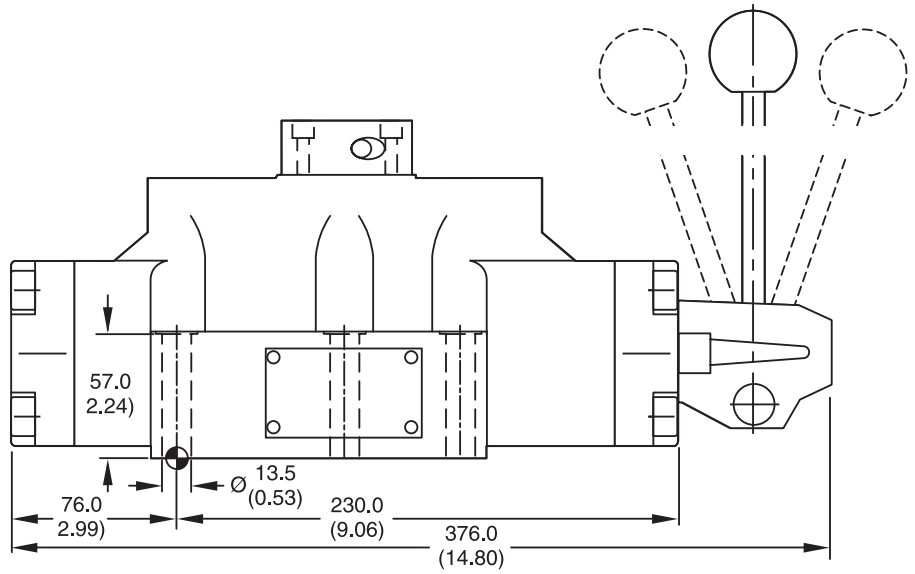
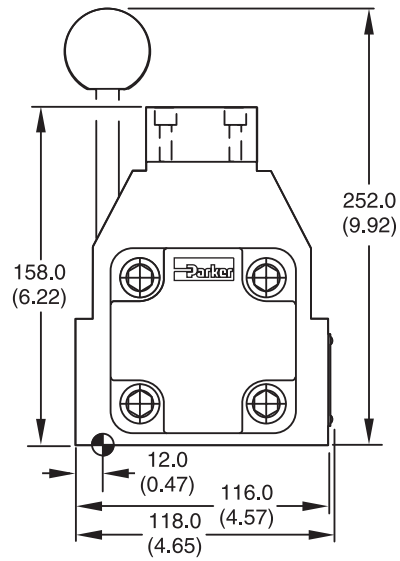


**Dimensions**

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

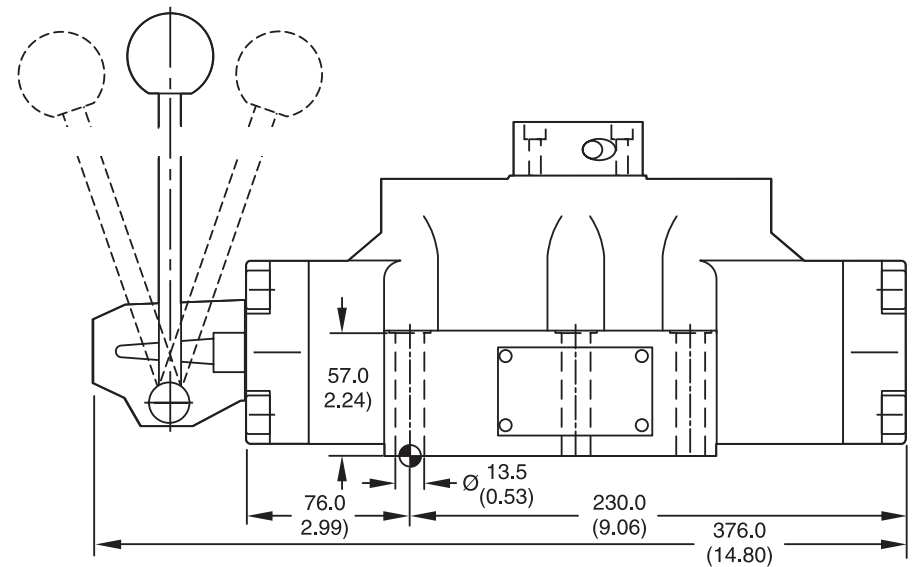
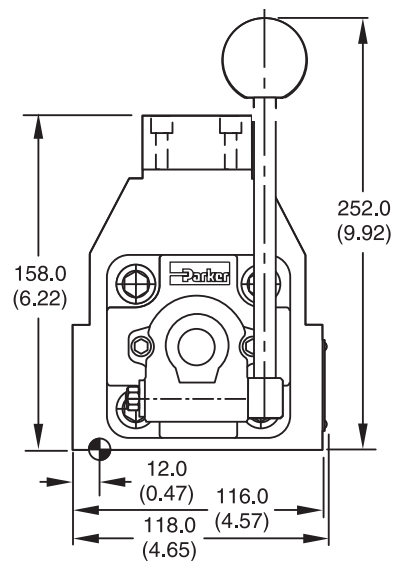






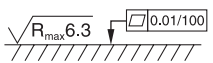
**D9L**



**A**

**D9LB**



Surface Finish	 Kit			Seal  Kit
$\sqrt{R_{max}6.3}$ 	BK360	6x M5x75 DIN 912 12.9	108 Nm ±15%	Nitrile: SK-D9LN Fluorocarbon: SK-D9LV

**A****Application**

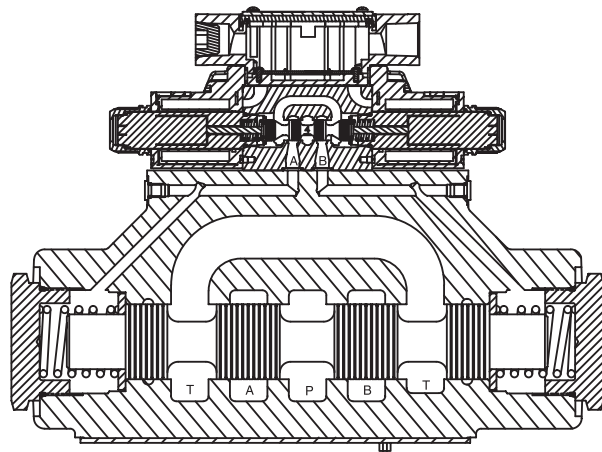
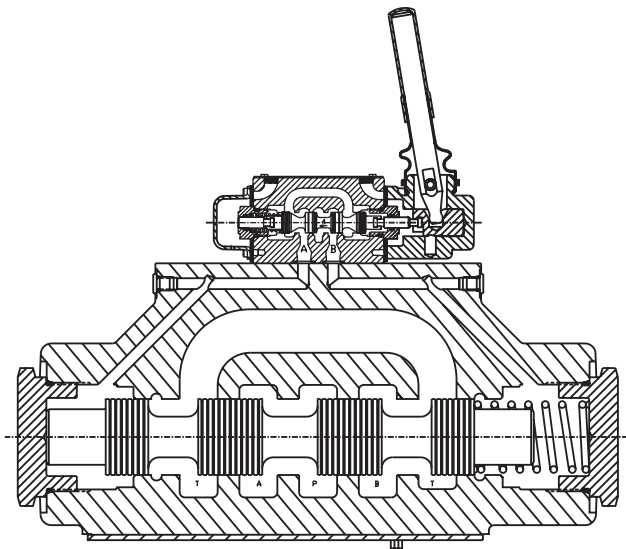
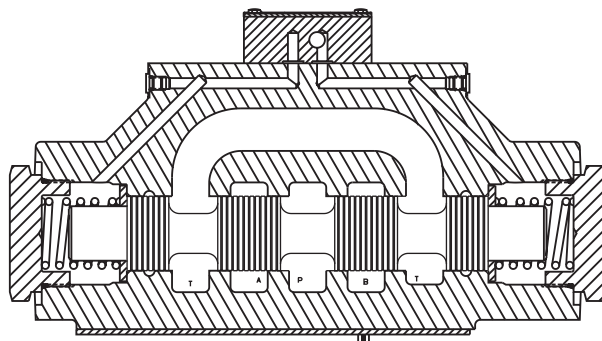
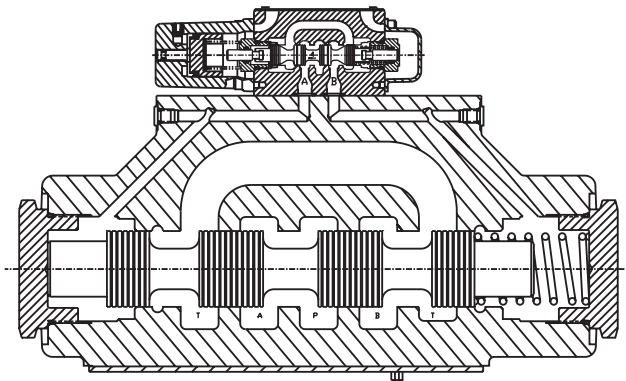
Series D101 hydraulic directional control valves are high performance, solenoid controlled, pilot operated, 2-stage, 4-way valves. They are available in 2 or 3-position styles and are manifold mounted. These valves conform to NFPA's D10, CETOP 10 mounting pattern.

**Operation**

Series D101 directional valves consist of a 5-chamber style main body, a case hardened sliding spool, and a pilot valve or pilot operators (hydraulic or pneumatic).

**Features**

- Easy access mounting bolts.
- 210 Bar (3000 PSI) pressure rating.
- Flows to 950 LPM (250 GPM) depending on spool.
- Choice of four operator styles.
- Rugged four land spools.
- Low pressure drop.
- Phosphate finish.

**D101VW Solenoid Operated Plug-in Conduit Box****D101VL Lever Operated****D101P Oil Pilot Operated****D101VA Air Pilot Operated**

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



## General Description

Series D101V directional control valves are 5-chamber, pilot operated, solenoid controlled valves. They are available in 2 or 3-position styles. These valves are manifold or subplate mounted, and conform to NFPA's D10, CETOP 10 mounting pattern.





## Operation

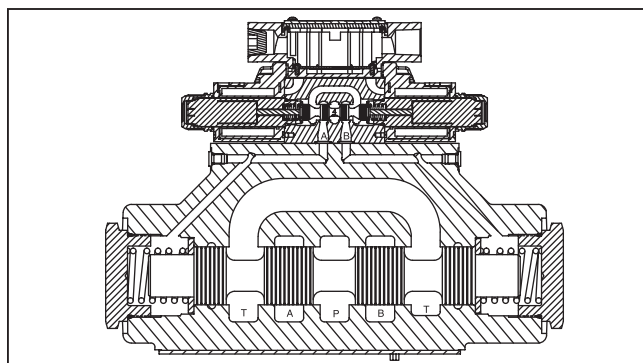
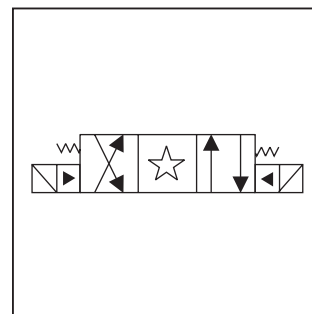
Series D101V pilot operated valves are standard with low shock spools and pilot orifice. The orifice can be removed if a faster shift is required. However, it is recommended that all systems operating above 138 Bar (2000 PSI) use the standard valve to avoid severe shock.

## Features

- Low pressure drop design.
- Hardened spools provide long life.
- Fast response option available.
- Wide variety of voltages and electrical connection options.
- Explosion proof availability.
- No tools required for coil removal.

## Specifications

<b>Mounting Pattern</b>	NFPA D10, CETOP 10, NG32
<b>Maximum Operating Pressure</b>	207 Bar (3000 PSI) Standard CSA  207 Bar (3000 PSI)
<b>Maximum Tank Line Pressure</b>	Internal Drain Model: 102 Bar (1500 PSI) AC Only 207 Bar (3000 PSI) DC Standard/AC Optional  External Drain Model: 207 Bar (3000 PSI)  CSA  102 Bar (1500 PSI)
<b>Maximum Drain Pressure</b>	102 Bar (1500 PSI) AC Only 207 Bar (3000 PSI) DC Standard/AC Optional  CSA  102 Bar (1500 PSI)
<b>Minimum Pilot Pressure</b>	4.4 Bar (65 PSI)
<b>Maximum Pilot Pressure</b>	207 Bar (3000 PSI) Standard CSA  207 Bar (3000 PSI)
<b>Nominal Flow</b>	378 LPM (100 GPM)
<b>Maximum Flow</b>	See Reference Chart



## Response Time

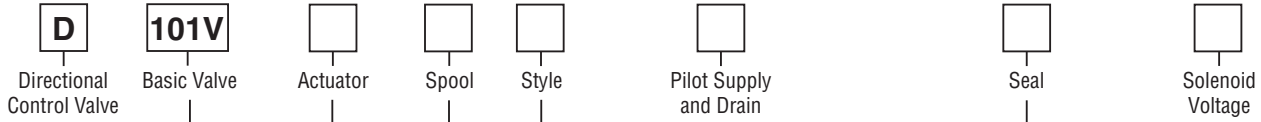
Response times (milliseconds) are measured at 205 Bar (3000 PSI) and 416 LPM (110 GPM) with various pilot pressures as indicated.

Solenoid Type	Pilot Pressure	Pull-In		Drop-Out	
		Std	Fast	Std	Fast
DC	500	180	170	195	195
	1000	130	125	195	195
	2000	100	95	195	195
AC	500	140	130	185	185
	1000	90	85	185	185
	2000	60	55	185	185

Because of the high drain line pressure transients generated during shifting, use of the fast response option is not recommended for pilot pressures exceeding 205 Bar (2000 PSI).

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**A**



**NFPA D10  
 CETOP 10  
 DIN NG32  
 D03 Pilot**

Code	Description
<b>W</b>	<b>Solenoid, Wet Pin, Screw-in</b>
<b>HW*</b>	<b>Reversed Wiring</b>

\* To configure per DIN standards (A coil over A port, B coil over B port) code valves as D81VHW\*\*\*.

Code	Description
<b>1</b>	<b>Internal Pilot, External Drain</b>
<b>2</b>	<b>External Pilot, External Drain</b>
<b>3</b>	Internal Pilot w/Check, External Drain
<b>4#</b>	<b>Internal Pilot, Internal Drain</b>
<b>5</b>	<b>External Pilot, Internal Drain</b>
<b>6</b>	Internal Pilot w/Check, Internal Drain

# Not available with 002, 007, 008 and 009 spools.

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

Code	Description
<b>D†#</b>	120 VDC
<b>E*</b>	24/60 - 24/50 VAC
<b>J</b>	<b>24 VDC</b>
<b>K##</b>	<b>12 VDC</b>
<b>Q††#</b>	100/60 VAC
<b>QD††#</b>	100 VAC/60 Hz - 100 VAC/50 Hz
<b>T^^</b>	<b>240/60 - 220/50 VAC</b>
<b>U***</b>	98 VDC
<b>Y</b>	<b>120/60 - 110/50 VAC</b>

# High watt only.  
 \* Leadwire only, low watt only.  
 \*\* DIN, low watt available.  
 \*\*\* Leadwire not available.  
 ^^ Plug-in is low watt only.  
 † DIN & Leadwire only.  
 †† DIN only.

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing solenoid A. Note operators reverse sides for #008 and #009 spools. See installation information for details. To configure per DIN standards (A coil over A port, B coil over B port) code valves as D101VHW\*\*\*.

Code	Symbol	Code	Symbol
001		005	
002		006	
003		008*	
004		009**	
		011	

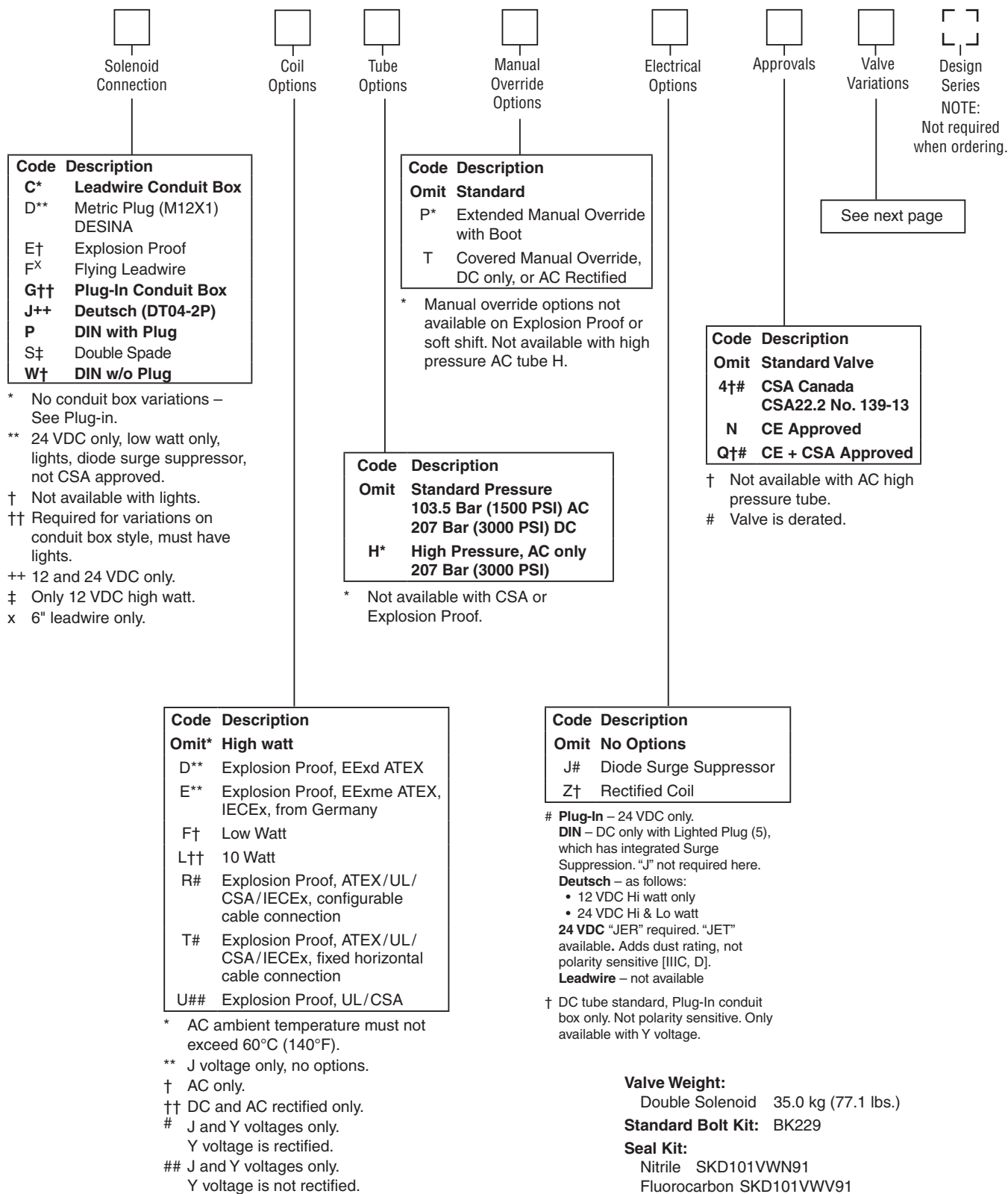
\* 008 spool has closed crossover.  
 \*\* 009 spool has open crossover.

Code	Description	Symbol
<b>B*</b>	<b>Single solenoid, 2 position, spring offset. P to A and B to T in offset position.</b>	
<b>C</b>	<b>Double solenoid, 3 position, spring centered.</b>	
<b>D*</b>	<b>Double solenoid, 2 position, detent.</b>	
<b>E</b>	Single solenoid, 2 position, spring centered. P to B and A to T when energized.	
<b>F</b>	Single solenoid, 2 position, spring offset, energized to center. Position spool spacer on A side. P to A and B to T in spring offset position.	
<b>H*</b>	<b>Single solenoid, 2 position, spring offset. P to B and A to T in offset position.</b>	
<b>K</b>	Single solenoid, 2 position, spring centered. P to A and B to T when energized.	
<b>M</b>	Single solenoid, 2 position, spring offset, energized to center position. Spool spacer on B side. P to B and A to T in spring offset position.	

\* Available with 001, 002, 004 and 011 spools only.

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

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



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

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

## Valve Variations

**A**

Code	Description
<b>5*</b>	<b>Signal Lights – Standard</b>
	<b>Signal Lights – Hirsch. (DIN with Plug)</b> <b>(the DC Lighted Plug has Integral Surge Suppression)</b>
7B**	Manaplug – Brad Harrison (12x1) Micro with Lights
<b>56**</b>	<b>Manaplug (Mini) with Lights</b>
<b>20</b>	<b>Fast Response</b>
<b>1C**</b>	<b>Manaplug (Mini) Single Sol. 5-pin, with Lights</b>
1D**	Manaplug (Micro) Single Sol. 5-pin, with Lights
1M**	Manaplug Opposite Normal
1P	Painted Body
1R	Stroke Adjust 'A' & 'B' End with Pilot Choke Meter In
<b>3A</b>	<b>Pilot Choke Meter Out</b>
<b>3B</b>	<b>Pilot Choke Meter In</b>
<b>3C</b>	<b>Pilot Pressure Reducer</b>
3D	Stroke Adjust 'B' End
3E	Stroke Adjust 'A' End
3F	Stroke Adjust 'A' & 'B' End
<b>3G*</b>	<b>Pilot Choke Meter Out with Lights</b>
<b>3H*</b>	<b>Pilot Choke Meter In with Lights</b>
3J*	Pilot Pressure Reducer with Lights
3K	Pilot Choke Meter Out with Stroke Adjust 'A' & 'B' End
3L**	Pilot Choke Meter Out, Stroke Adjust 'A' & 'B' End with Lights and Manaplug — Brad Harrison Mini
3M	Pilot Choke Meter Out, Pilot Pressure Reducer, Stroke Adjust 'A' & 'B' End
3R	Pilot Choke Meter Out & Pilot Pressure Reducer
3S**	Lights, Mini Manaplug, Pilot Choke Meter Out
7Y**	M12x1 Manaplug (4-pin), Special Wiring, and Lights

\* DESINA, plug-in conduit box, and DIN with plug styles only.

\*\* Must have plug-in style conduit box.

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

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



**Reference Data**

Model	Spool Symbol	Maximum Flow, LPM (GPM) 205 Bar (3000 PSI) w/o Malfunction	Model	Spool Symbol	Maximum Flow, LPM (GPM) 205 Bar (3000 PSI) w/o Malfunction
D101V*001		946 (250)	D101V*006		946 (250)
D101V*002		946 (250)	D101V*007		303 (80)
D101V*003		946 (250)	D101V*008 D101V*009		492 (130)
D101V*004		946 (250)	D101V*011		946 (250)
D101V*005		946 (250)			

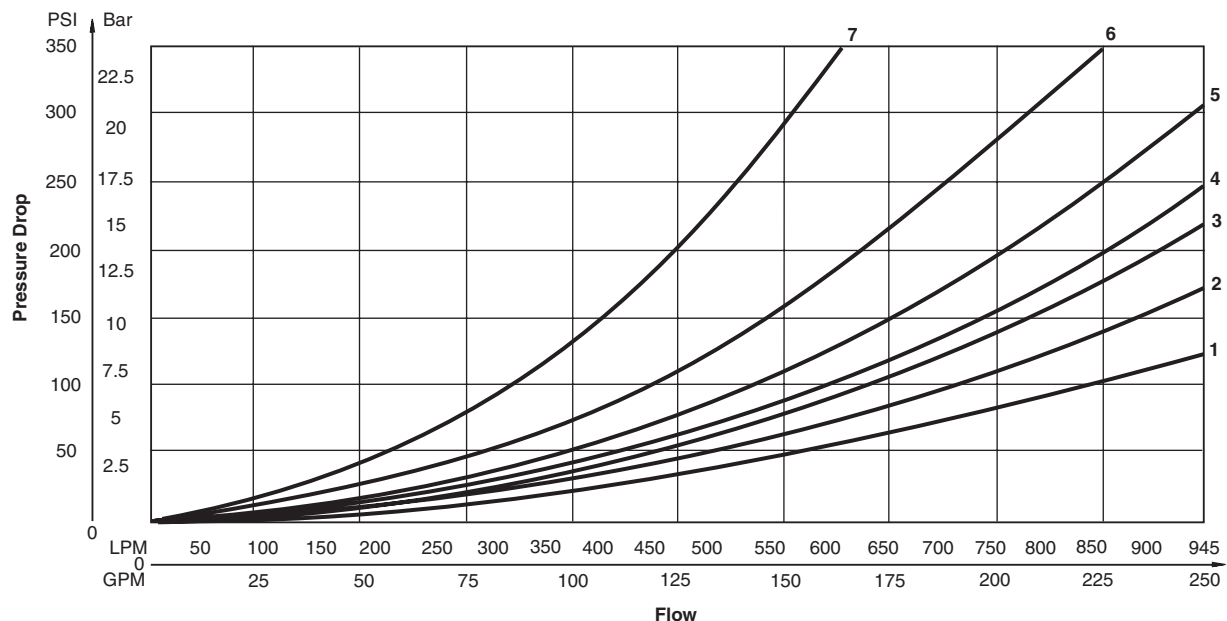
**D101VW Series Pressure Drop Chart**

The following chart provides the flow vs. pressure drop curve reference for the Series D101VW valve by spool type.

VISCOSITY CORRECTION FACTOR							
Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (Approx.)	93	111	119	126	132	137	141
Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change as per chart.							

D101VW Pressure Drop Reference Chart -- Curve Number					
Spool No.	P-A	P-B	P-T	A-T	B-T
001	4	4	-	2	3
002	3	3	3	1	2
003	4	4	-	1	3
004	4	4	-	1	2
005	3	4	-	2	3
006	3	3	-	2	3
007	4	3	7	2	2
008/009	5	5	6	2	3
011	4	4	-	2	3

**Performance Curves**



**A**

**Solenoid Ratings**

<b>Insulation System</b>	Class F
<b>Allowable Deviation from rated voltage</b>	-10% to +10% for DC and AC rectified coils -5% to +5% for AC Coils
<b>Armature</b>	Wet pin type
<b>CSA File Number</b>	LR60407
<b>Environmental Capability</b>	DC Solenoids meet NEMA 4 and IP67 when properly wired and installed. Contact HVD for AC coil applications.

**Explosion Proof Solenoid Ratings\***

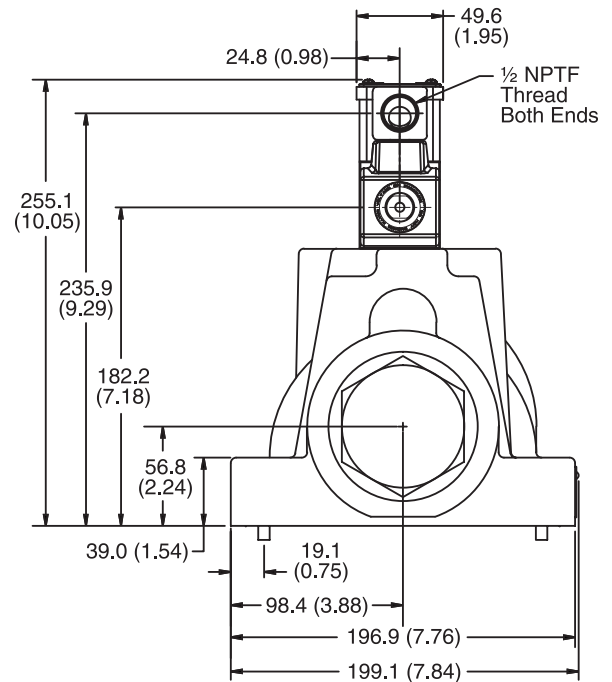
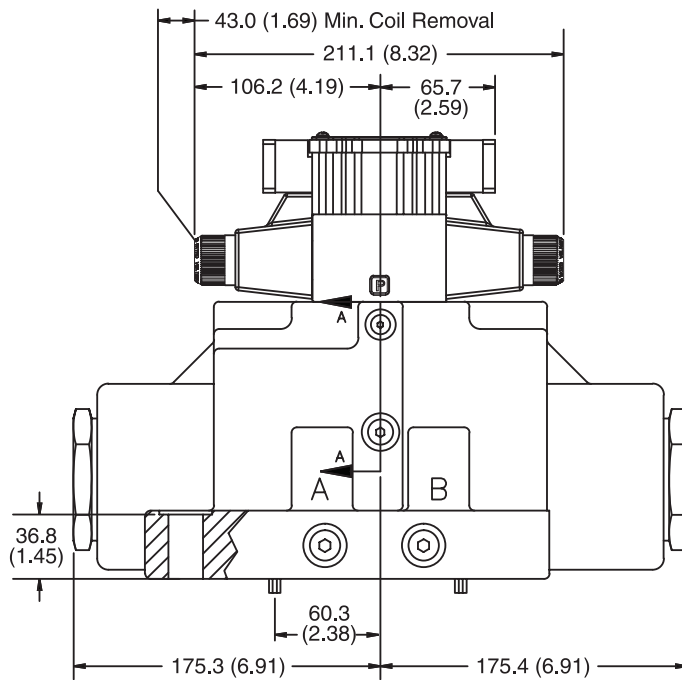
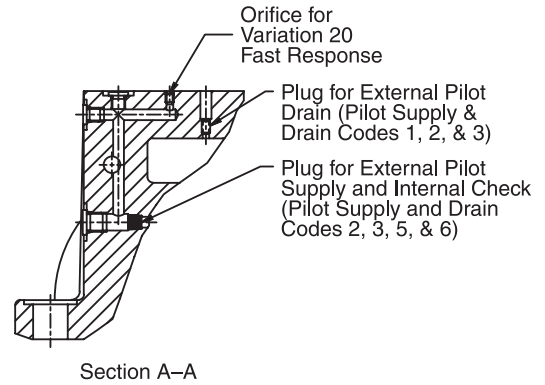
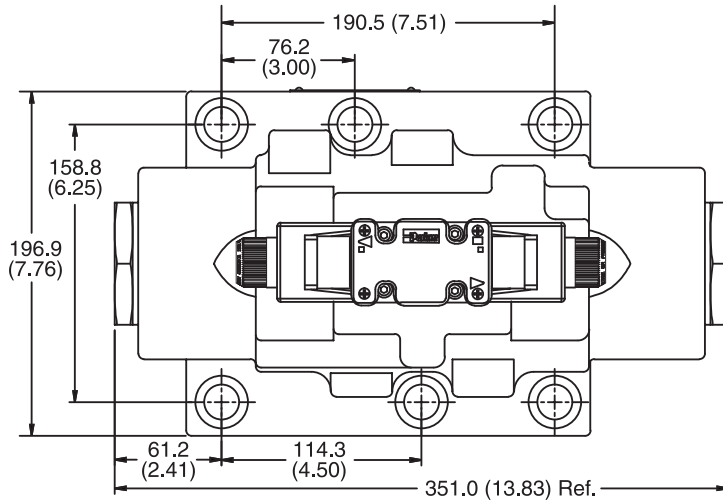
<b>U.L. &amp; CSA (EU)</b>	Class I, Div 1 & 2, Groups C & D Class II, Div 1 & 2, Groups E, F & G As defined by the N.E.C.
<b>ATEX (ED)</b>	Complies with ATEX requirements for: Ex d IIB Gb; EN60079-0:2012, EN60079-1:2007
<b>ATEX, IECEx &amp; CSA/US (ER, ET) (Tri-rated)</b>	Complies with IEC 60079-0:2011, IEC 60079-1:2007, IEC 60079-31:2013; Ex d IIC Gb; Ex tb IIIC Db IP66; IECEx BAS 14.0164X  ATEX: EN60079-0, EN60079-1, EN60079-31; CE 1180 Ex II 2G BASEEFA08ATEX0041X  CSA 22.2 No. 60079-0:07, 60079-1:07 and UL 60079-0:05, UL 60079-1:05; CSA listed to US and Canada Safety Standards. File 08-CSA-1932102  CSA Ex d IIC, AEx d IIC for Class I Zone 1; Class I Div 1 Grp. C & D; Class II Div 1 Grp. E, F & G

\* Allowable Voltage Deviation ±10%.

Code		Voltage	In Rush Amps Amperage	In Rush VA	Holding Amps @ 3 mm	Watts	Resistance
Voltage Code	Power Code						
D	Omit	120 VDC	N/A	N/A	0.26 Amps	30 W	528.00 Ohms
E	F	24 VAC	4.8 AMPS	120 VA	2.07 Amps	21 W	1.29 Ohms
J	L	24 VDC	N/A	N/A	0.44 Amps	10 W	51.89 Ohms
J	Omit	24 VDC	N/A	N/A	1.32 Amps	30 W	17.27 Ohms
K	L	12 VDC	N/A	N/A	0.88 Amps	10 W	12.97 Ohms
K	Omit	12 VDC	N/A	N/A	2.64 Amps	30 W	4.32 Ohms
Q	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	0.77 Amps	30 W	19.24 Ohms
QD	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	.77 Amps	30 W	19.24 Ohms
T	Omit	240/60 VAC	0.83 Amps	199 VA	0.30 Amps	30 W	120.40 Ohms
T	Omit	220/50 VAC	0.87 Amps	191 VA	0.34 Amps	30 W	120.40 Ohms
T	F	240/60 VAC, Low Watt	0.70 Amps	168 VA	0.22 Amps	21 W	145.00 Ohms
T	F	220/50 VAC, Low Watt	0.75 Amps	165 VA	0.26 Amps	23 W	145.00 Ohms
U	Omit	98 VDC	N/A	N/A	0.31 Amps	30W	288.00 Ohms
Y	Omit	120/60 VAC	1.7 Amps	204 VA	0.60 Amps	30 W	28.20 Ohms
Y	Omit	110/50 VAC	1.7 Amps	187 VA	0.68 Amps	30 W	28.20 Ohms
Y	F	120/60 VAC, Low Watt	1.40 Amps	168 VA	0.42 Amps	21 W	36.50 Ohms
Y	F	110/50 VAC, Low Watt	1.50 Amps	165 VA	0.50 Amps	23 W	36.50 Ohms
<b>Explosion Proof Solenoids</b>							
Y		120/60 VAC	1.60 Amps	192 VA	0.58 Amps	27 W	33.50 Ohms
J		24 VDC	N/A	N/A	1.38 Amps	33 W	17.33 Ohms
<b>Explosion Proof Solenoids (German)</b>							
J		24 VDC	N/A	N/A	1.0 Amps	24 W	24 Ohms
<b>ER &amp; ET Explosion Proof Solenoids</b>							
J		24 VDC	N/A	N/A	0.54 Amps	13 W	44.30 Ohms
Y		120/60 VAC	N/A	N/A	0.16 Amps	17 W	667.00 Ohms

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

Plug-in Conduit Box, Double AC Solenoid



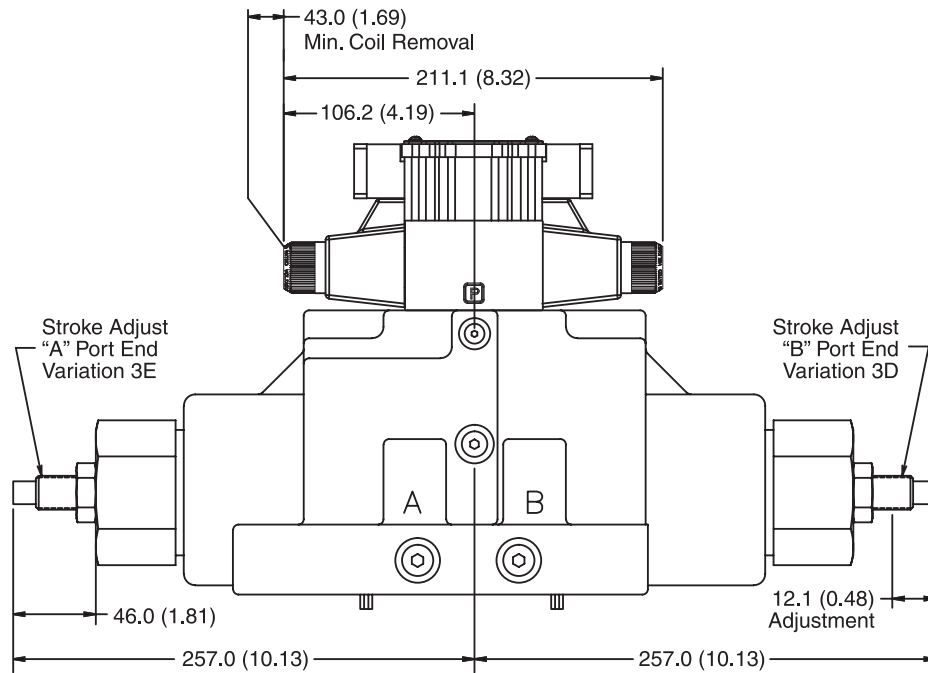
**Note:** 36.83mm (1.45") from bottom of bolt hole counterbore to bottom of valve.

**Dimensions**

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

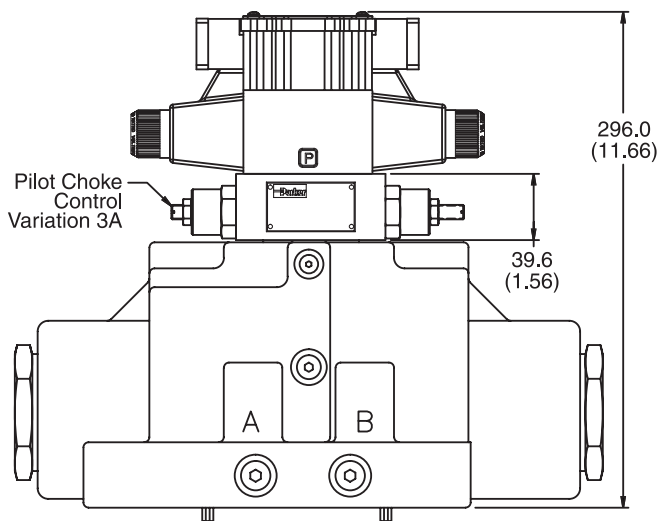
**A**

**Conduit Box and Stroke Adjust, Double AC Solenoid**



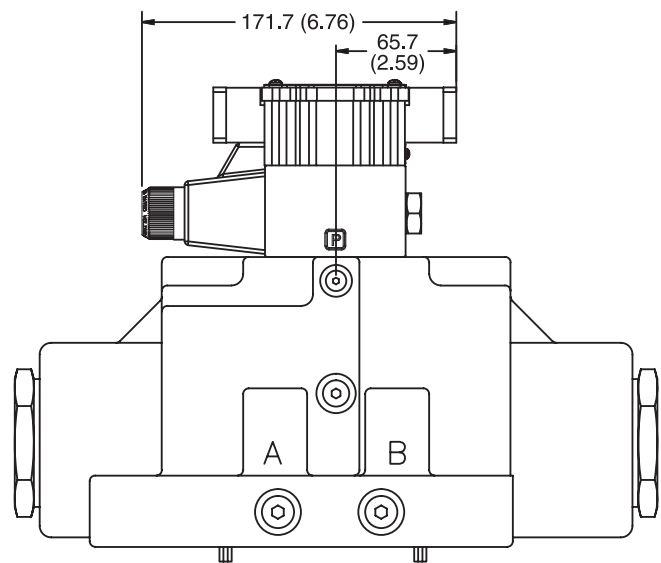
**Note:** 36.83mm (1.45") from bottom of bolt hole counterbore to bottom of valve.

**Conduit Box and Pilot Choke Control, Double AC Solenoid**



**Note:** 36.83mm (1.45") from bottom of bolt hole counterbore to bottom of valve.

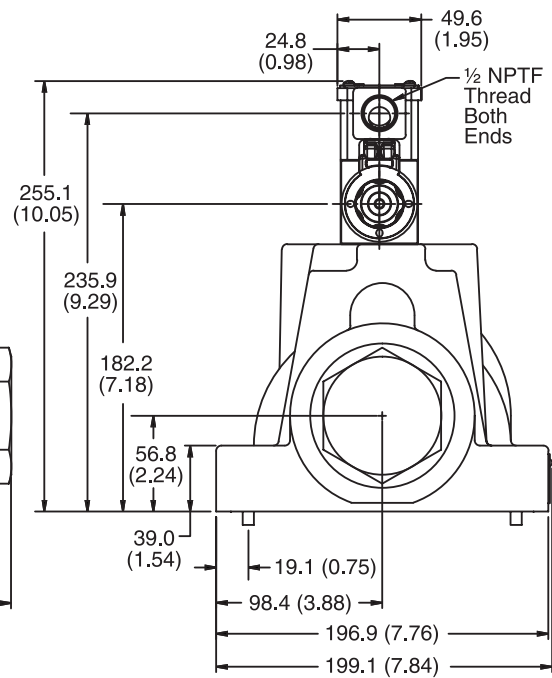
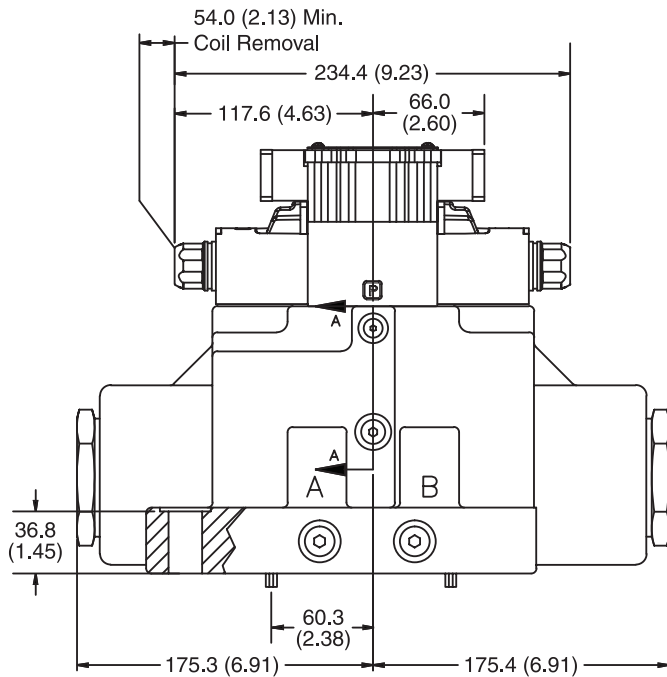
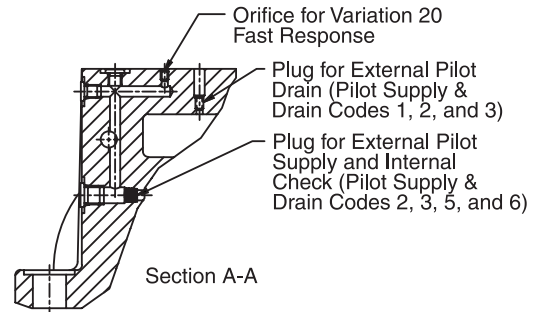
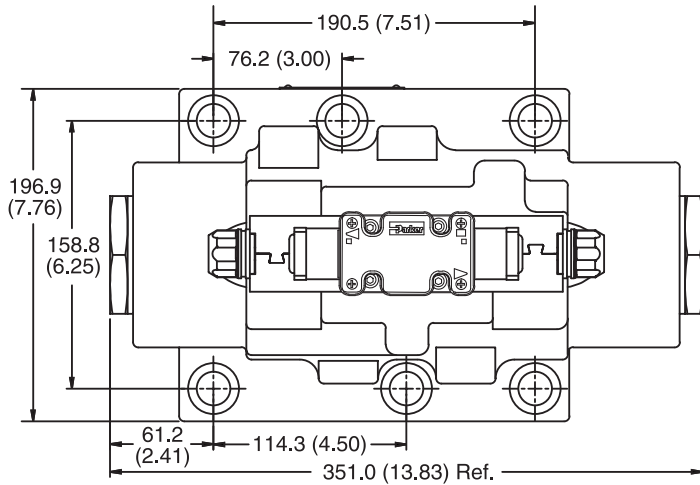
**Conduit Box, Single AC Solenoid**





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

**Plug-in Conduit Box, Double DC Solenoid**

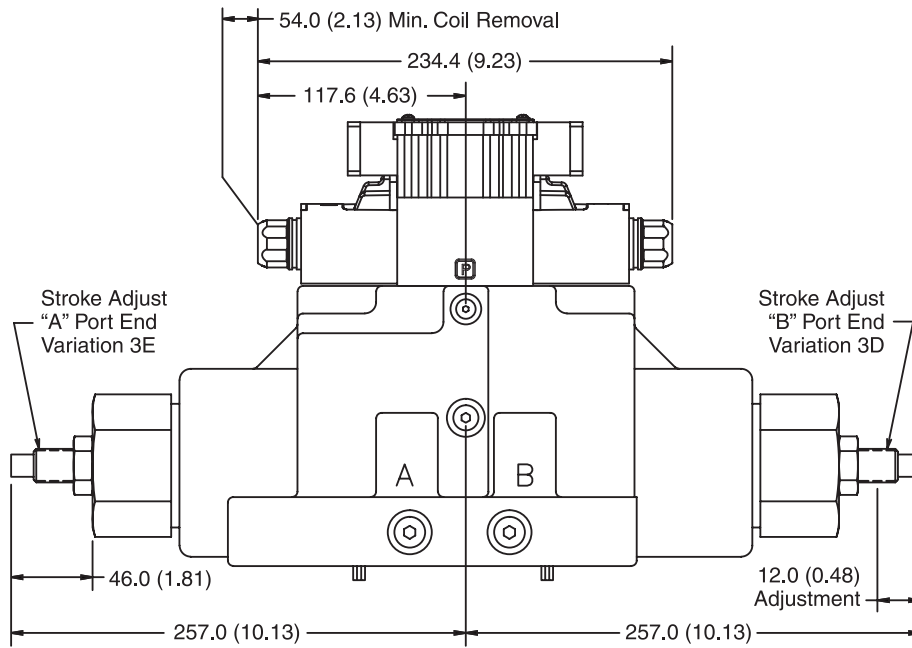


**Note:** 36.83mm (1.45") from bottom of bolt hole counterbore to bottom of valve.

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

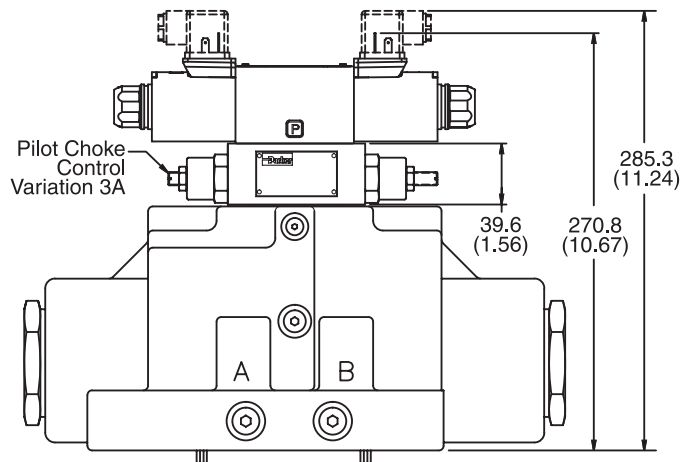
**A**

**Plug-in Conduit Box and Stroke Adjust, Double DC Solenoid**



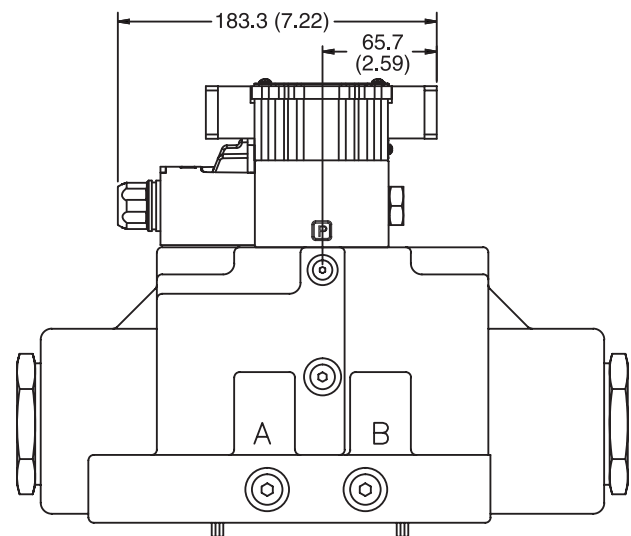
**Note:** 36.83mm (1.45") from bottom of bolt hole counterbore to bottom of valve.

**Hirschmann and Pilot Choke Control,  
Double DC Solenoid**



**Note:** 36.83mm (1.45") from bottom of bolt hole counterbore to bottom of valve.

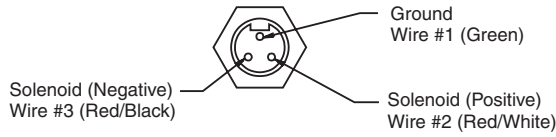
**Plug-in Conduit Box, Single DC Solenoid**





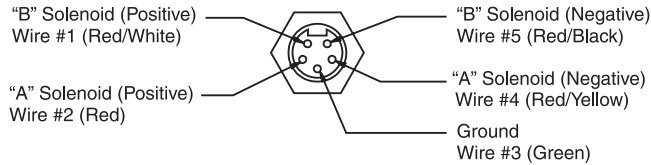
**Manaplug (Options 6, 56, 1A & 1C)**

- Interface – Brad Harrison Plug
  - 3-Pin for Single Solenoid
  - 5-Pin for Double Solenoid



**3-Pin Manaplug (Mini) with Lights**

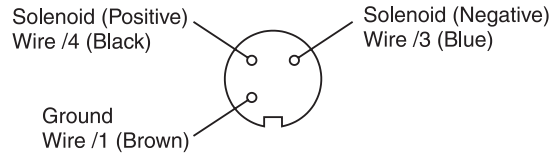
Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Mini) with Lights**

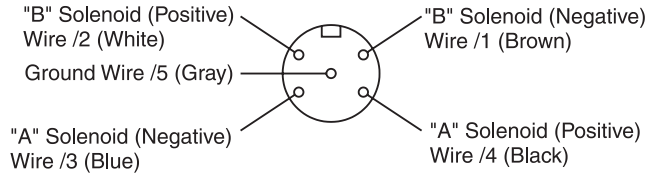
Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Micro Connector Options (7A, 7B, 1B & 1D)**



**3-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid



**5-Pin Manaplug (Micro) with Lights**

Single Solenoid Valves – Installed Opposite Side of Solenoid  
Double Solenoid Valves – Installed Over "A" Solenoid  
("A" and "B" Solenoids Reversed for #8 and #9 Spools)

**Pins are as seen on valve (male pin connectors)**

**Manaplug – Electrical Mini Plug**

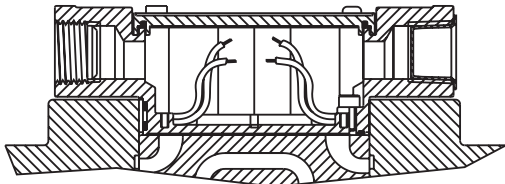
- EP336-30 3 Pin Plug
- EP316-30 5 Pin Plug (Double Solenoid)
- EP31A-30 5 Pin Plug (Single Solenoid)

**Manaplug – Electrical Micro Plug**

- EP337-30 3 Pin Plug
- EP317-30 5 Pin Plug (Double Solenoid)
- EP31B-30 5 Pin Plug (Single Solenoid)

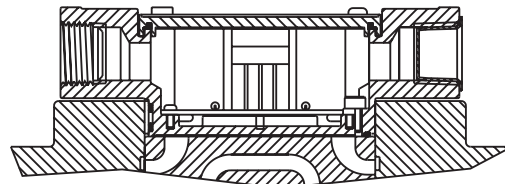
**Conduit Box Option C**

- No Wiring Options Available

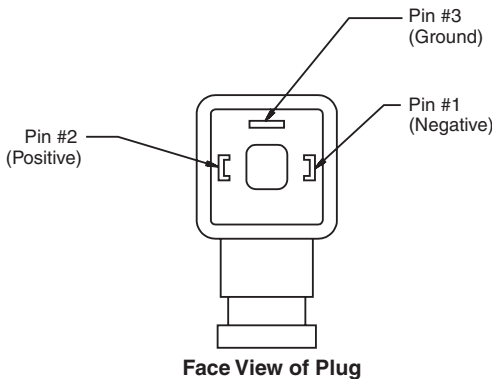


**Signal Lights (Option 5) — Plug-in Only**

- LED Interface
- Meets Nema 4/IP67



**Hirschmann Plug with Lights (Option P5)  
ISO 4400/DIN 43650 Form "A"**

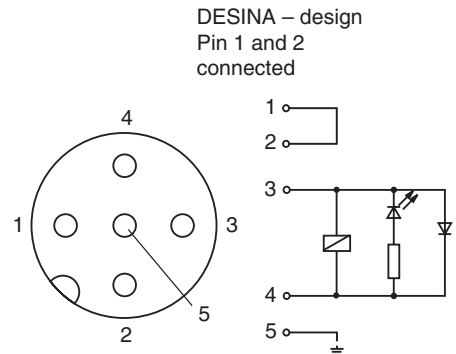


Face View of Plug

**Pins are as seen on valve (male pin connectors)**

**DESINA Connector (Option D)  
M12 pin assignment  
Standard**

- 1 = Not used
- 2 = Not used
- 3 = 0V
- 4 = Signal (24 V)
- 5 = Earth Ground

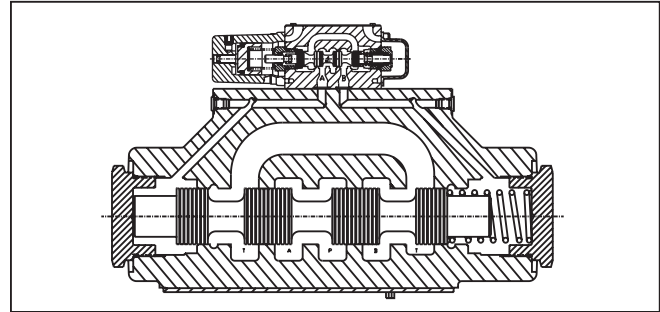
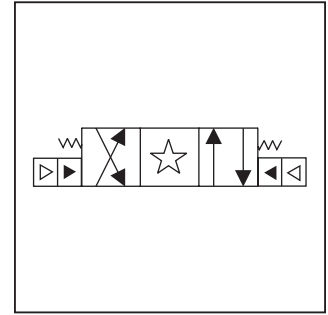
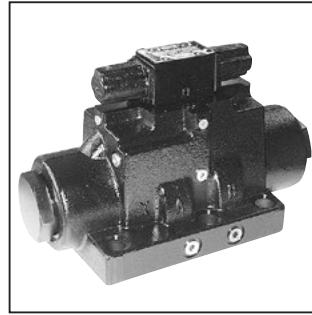


### General Description

Series D101VA directional control valves are 5-chamber, air pilot operated valves. They are available in 2 or 3-position styles. These valves are manifold or subplate mounted, and conform to NFPA's D10, CETOP 10 mounting pattern.

### Specifications

<b>Mounting Pattern</b>	NFPA D10, CETOP 10, NG32
<b>Max. Operating Pressure</b>	207 Bar (3000 PSI)
<b>Max. Tank Pressure</b>	Internal Drain Model: 34 Bar (500 PSI) External Drain Model: 207 Bar (3000 PSI)
<b>Max. Drain Pressure</b>	34 Bar (500 PSI)
<b>Maximum Flow</b>	See Reference Chart
<b>Pilot Pressure</b>	Air Min 3.4 Bar (50 PSI) Air Max 10.2 Bar (150 PSI)
<b>Response Time</b>	Varies with pilot line size and length, pilot pressure, pilot valve shift time & flow capacity (GPM)



### Features

- Low pressure drop design.
- Hardened spools provide long life.

### Ordering Information

<b>D</b> Directional Control Valve	<b>101V</b> Basic Valve NFPA D10 CETOP 10	<b>A</b> Air Operated Pilot	□ Spool	□ Style	□ Pilot Supply and Drain	□ Seal	□ Valve Variations	□ Design Series NOTE: Not required when ordering.
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<p>Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator A. Note operators reverse sides on #8 and #9 spools. See installation information for details.</p>	<table border="1"> <thead> <tr> <th>Code</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td>001</td> <td></td> </tr> <tr> <td>002</td> <td></td> </tr> <tr> <td>004</td> <td></td> </tr> <tr> <td>008*</td> <td></td> </tr> <tr> <td>009**</td> <td></td> </tr> <tr> <td>011</td> <td></td> </tr> </tbody> </table> <p>* 008 spool has closed crossover.                  ** 009 spool has open crossover.</p>	Code	Symbol	001		002		004		008*		009**		011		<table border="1"> <thead> <tr> <th>Code</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>N</td> <td>Nitrile</td> </tr> <tr> <td>V</td> <td>Fluorocarbon</td> </tr> </tbody> </table>	Code	Type	N	Nitrile	V	Fluorocarbon	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>1</b></td> <td><b>Int. pilot/Ext. drain</b></td> </tr> <tr> <td><b>2</b></td> <td><b>Ext. pilot/Ext. drain</b></td> </tr> <tr> <td><b>4#</b></td> <td><b>Int. pilot/Int. drain</b></td> </tr> <tr> <td><b>5</b></td> <td><b>Ext. pilot/Int. drain</b></td> </tr> </tbody> </table> <p># Not available with 002, 008 &amp; 009 spools.</p>	Code	Description	<b>1</b>	<b>Int. pilot/Ext. drain</b>	<b>2</b>	<b>Ext. pilot/Ext. drain</b>	<b>4#</b>	<b>Int. pilot/Int. drain</b>	<b>5</b>	<b>Ext. pilot/Int. drain</b>	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> <th>Symbol</th> </tr> </thead> <tbody> <tr> <td><b>B†</b></td> <td><b>Sgl. operator, 2 position, spring offset. P to A and B to T in offset position.</b></td> <td></td> </tr> <tr> <td><b>C</b></td> <td><b>Dbl. operator, 3 position, spring centered.</b></td> <td></td> </tr> <tr> <td><b>H†</b></td> <td><b>Sgl. operator, 2 position, spring offset. P to B and A to T in offset position.</b></td> <td></td> </tr> </tbody> </table>	Code	Description	Symbol	<b>B†</b>	<b>Sgl. operator, 2 position, spring offset. P to A and B to T in offset position.</b>		<b>C</b>	<b>Dbl. operator, 3 position, spring centered.</b>		<b>H†</b>	<b>Sgl. operator, 2 position, spring offset. P to B and A to T in offset position.</b>		<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>7</td> <td>Pilot Choke – Meter Out</td> </tr> <tr> <td>8</td> <td>Stroke Adj. 'B' End</td> </tr> <tr> <td>9</td> <td>Stroke Adj. 'A' End</td> </tr> <tr> <td>60</td> <td>Pilot Choke – Meter In</td> </tr> <tr> <td>89</td> <td>Stroke Adj. 'A' &amp; 'B' Ends</td> </tr> <tr> <td>90</td> <td>1/4 BSPP Threads</td> </tr> </tbody> </table>	Code	Description	7	Pilot Choke – Meter Out	8	Stroke Adj. 'B' End	9	Stroke Adj. 'A' End	60	Pilot Choke – Meter In	89	Stroke Adj. 'A' & 'B' Ends	90	1/4 BSPP Threads
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<b>Valve Weight:</b> 35.3 kg (77.8 lbs.)	<b>Standard Bolt Kit:</b> BK229	<b>Metric Bolt Kit:</b> BKM229
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† Available with 001, 002, 004 & 011 spools only.

□ This condition varies with spool code.

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

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

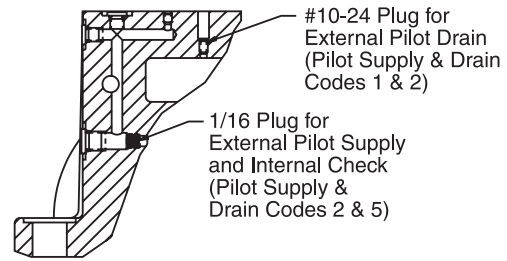
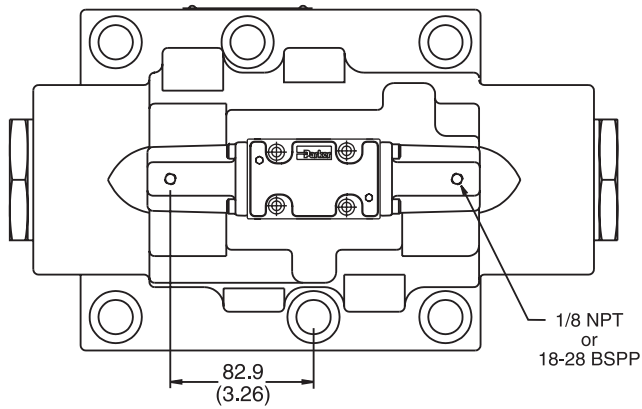
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Dimensions**

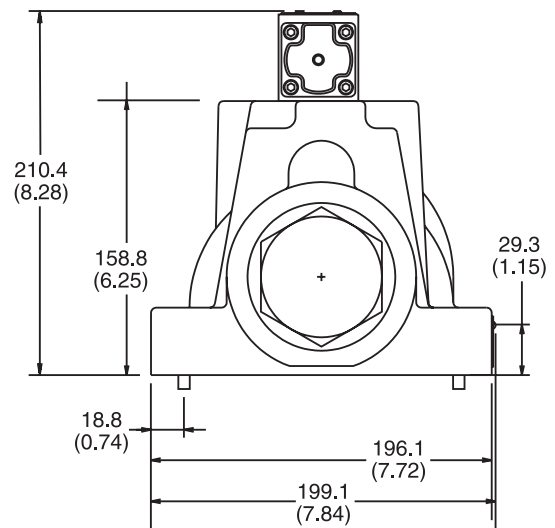
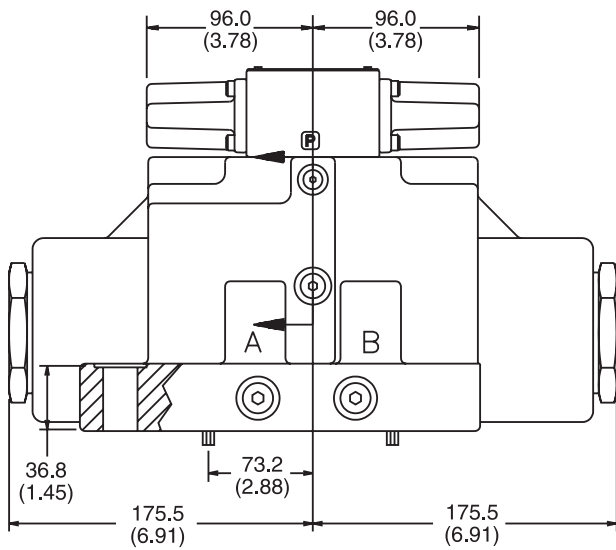
Inch equivalents for millimeter dimensions are shown in (\*\*)

**Air Operated**

**A**



Section A-A



**Note:** 36.83mm (1.45") from bottom of bolt hole counterbore to bottom of valve.

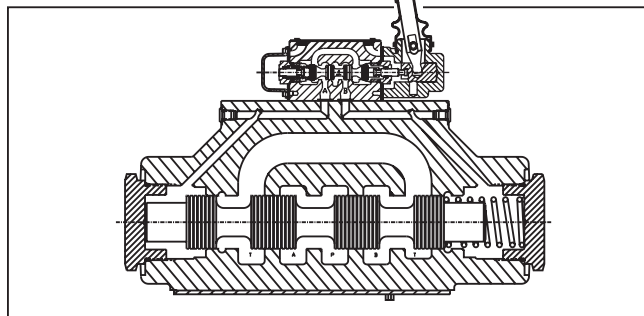
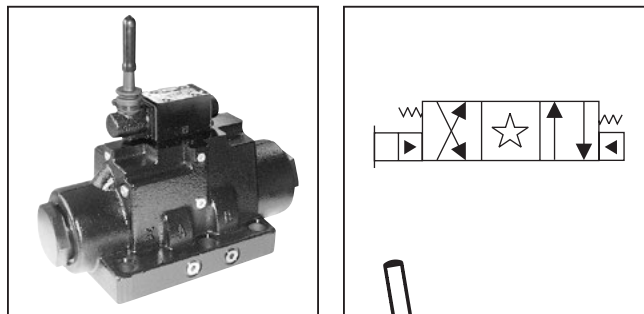


### General Description

Series D101VL directional control valves are 5-chamber, lever operated valves. They are available in 2 or 3-position styles. These valves are manifold or subplate mounted, and conform to NFPA's D10, CETOP 10 mounting pattern.

### Specifications

<b>Mounting Pattern</b>	NFPA D10, CETOP 10, NG32
<b>Max. Operating Pressure</b>	207 Bar (3000 PSI)
<b>Max. Tank Pressure</b>	Internal Drain Model: 34 Bar (500 PSI) External Drain Model: 207 Bar (3000 PSI)
<b>Max. Drain Pressure</b>	34 Bar (500 PSI)
<b>Maximum Flow</b>	See Reference Chart
<b>Pilot Pressure</b>	Oil Min 6.9 Bar (100 PSI) Oil Max 207 Bar (300 PSI)
<b>Response Time</b>	Varies with pilot line size and length, pilot pressure, pilot valve shift time & flow capacity (GPM)



### Ordering Information

<b>D</b> Directional Control Valve	<b>101V</b> Basic Valve	<b>L</b> Lever Operated Pilot	□ Spool	□ Style	□ Pilot Supply and Drain	□ Seal	□ Valve Variations	□ Design Series
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NFPA D10  
CETOP 10

Code	Symbol
001	
002	
004	
008*	
009**	
011	

\* 008 spool has closed crossover.  
\*\* 009 spool has open crossover.

Code	Type
N	Nitrile
V	Fluorocarbon

Code	Description
7	Pilot Choke – Meter Out
8	Stroke Adj. 'B' End
9	Stroke Adj. 'A' End
60	Pilot Choke – Meter In
89	Stroke Adj. 'A' & 'B' Ends

# Not available with 002, 008 & 009 spools.

Code	Supply — Drain
1	Int. pilot/Ext. drain
2	Ext. pilot/Ext. drain
4#	Int. pilot/Int. drain
5	Ext. pilot/Int. drain

Code	Description	Symbol
<b>B†</b>	<b>Sgl. operator, 2 position, spring offset. P to A and B to T in offset position.</b>	
<b>C</b>	<b>Dbl. operator, 3 position, spring centered.</b>	
<b>H†</b>	<b>Sgl. operator, 2 position, spring offset. P to B and A to T in offset position.</b>	

† Available with 001, 002, 004 & 011 spools only.

NOTE: Not required when ordering.

This condition varies with spool code.

**Valve Weight:** 35.0 kg (77.2 lbs.)  
**Standard Bolt Kit:** BK229  
**Metric Bolt Kit:** BKM229

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

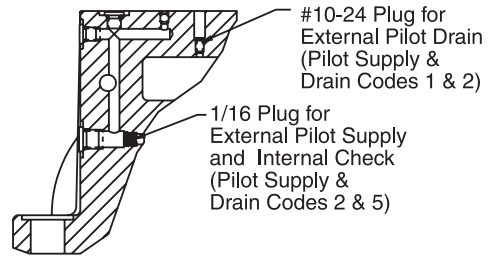
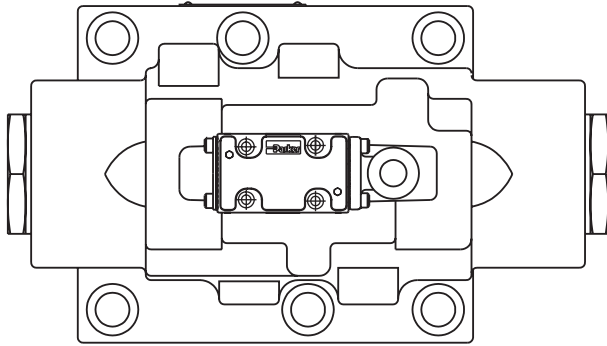
**Non-Bold: Designates Tier II products and options. These products will have longer lead times.**

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

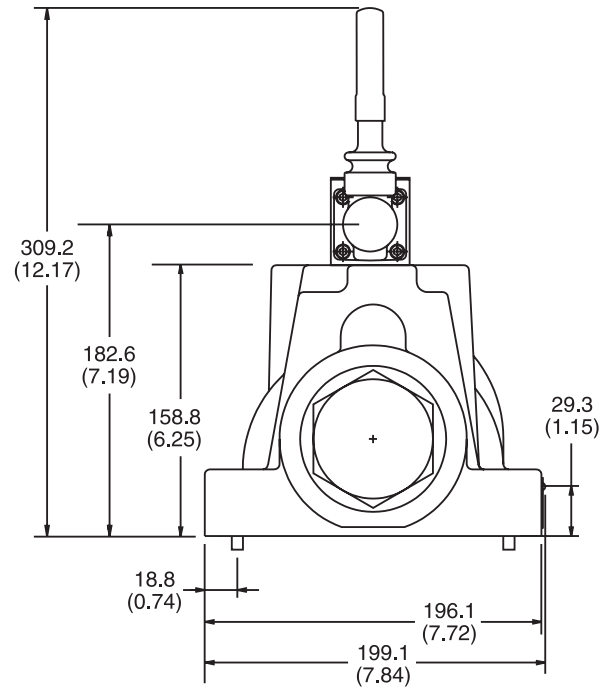
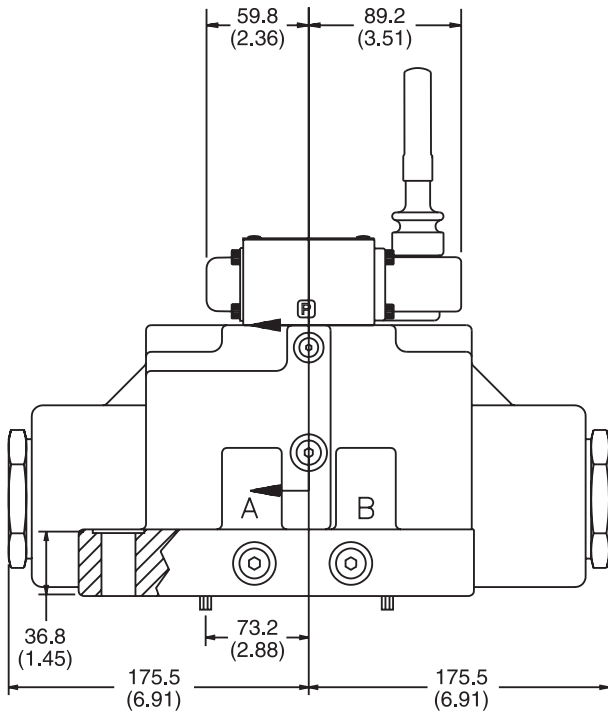
Inch equivalents for millimeter dimensions are shown in (\*\*)

**Lever Operated**

**A**



Section A-A



**Note:** 36.83mm (1.45") from bottom of bolt hole counterbore to bottom of valve.

**A**

### General Description

Series D10P directional control valves are 5-chamber, pilot operated valves. They are available in 2- or 3-position styles. These valves are manifold or subplate mounted, and conform to NFPA's D10, CETOP 10 mounting pattern.

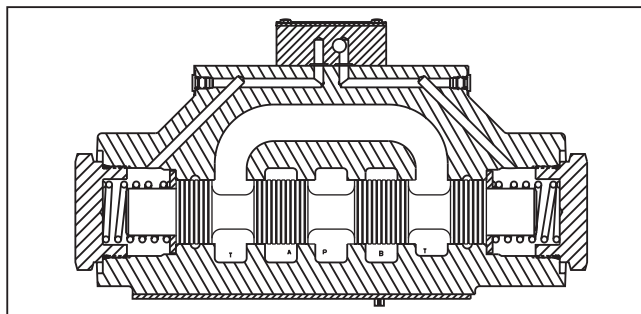
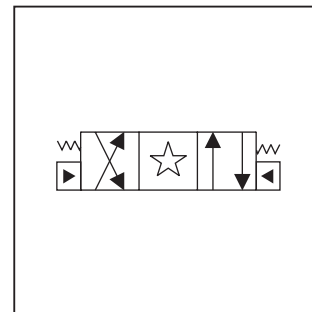
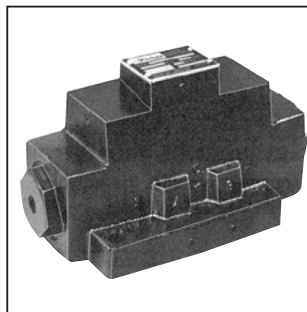
### Features

- Low pressure drop design.
- Hardened spools provide long life.

### Specifications

<b>Mounting Pattern</b>	NFPA D10, CETOP 10, NG32
<b>Max. Operating Pressure</b>	207 Bar (3000 PSI)
<b>Max. Tank Line Pressure</b>	207 Bar (3000 PSI)
<b>Max. Drain Pressure</b>	207 Bar (3000 PSI)
<b>Min. Pilot Pressure</b>	4.4 Bar (65 PSI)
<b>Max. Pilot Pressure</b>	207 Bar (3000 PSI)
<b>Nominal Flow</b>	378 LPM (100 GPM)
<b>Maximum Flow</b>	See Reference Chart

For flow path, pilot drain and pilot pressure details, see Installation Information.



### Response Time

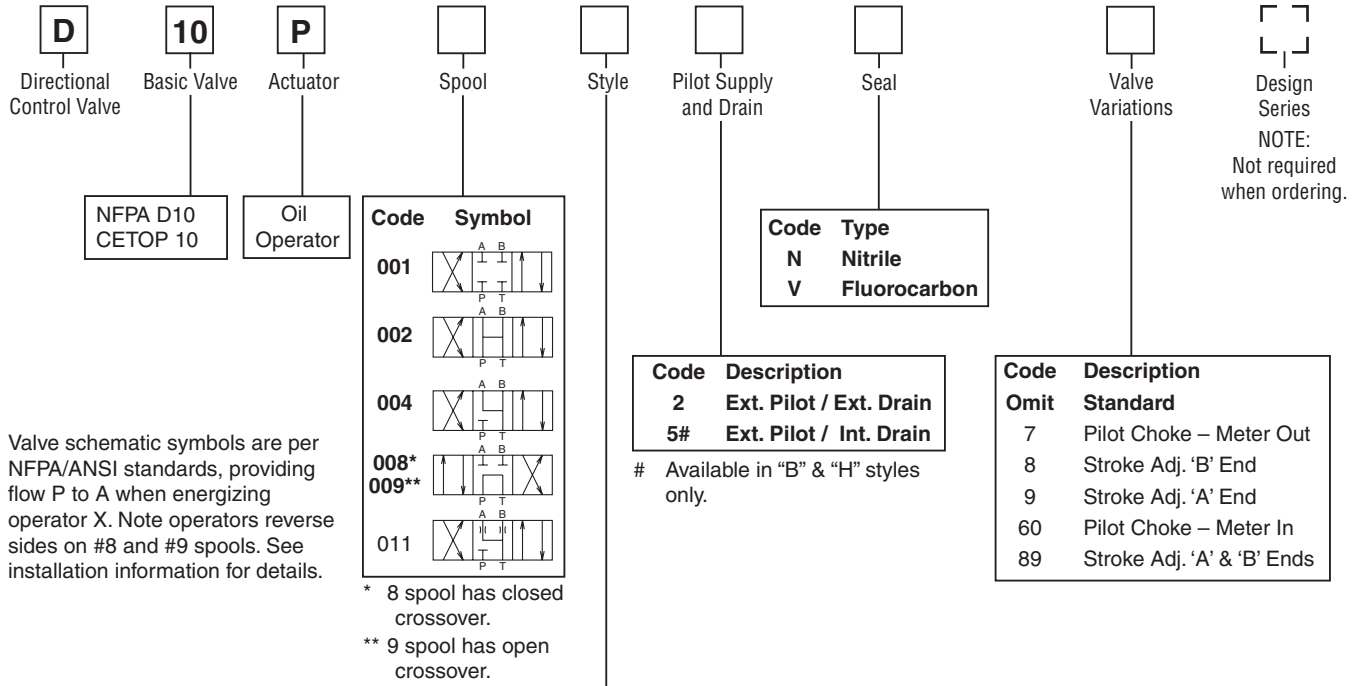
Response time will vary with pilot line size, pilot line length, pilot pressure shift time and flow capacity of the control valve.

### Shift Volume

The pilot chamber requires a volume of 1.51 in<sup>3</sup> (24.75 cc) for center to end.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).





NFPA D10  
CETOP 10

Oil Operator

Code	Symbol
001	
002	
004	
008*	
009**	
011	

Code	Type
N	Nitrile
V	Fluorocarbon

Code	Description
2	Ext. Pilot / Ext. Drain
5#	Ext. Pilot / Int. Drain

Code	Description
Omit	Standard
7	Pilot Choke – Meter Out
8	Stroke Adj. 'B' End
9	Stroke Adj. 'A' End
60	Pilot Choke – Meter In
89	Stroke Adj. 'A' & 'B' Ends

Valve schematic symbols are per NFPA/ANSI standards, providing flow P to A when energizing operator X. Note operators reverse sides on #8 and #9 spools. See installation information for details.

\* 8 spool has closed crossover.  
 \*\* 9 spool has open crossover.

# Available in "B" & "H" styles only.

Code	Description	Symbol
<b>B†</b>	<b>Sgl. operator, 2 position, spring offset. P to A and B to T in offset position.</b>	
<b>C</b>	<b>DbL. operator, 3 position, spring centered.</b>	
<b>H†</b>	<b>Sgl. operator, 2 position, spring offset. P to B and A to T in offset position.</b>	

† Available with 001, 002, 004 & 011 spools only.

This condition varies with spool code.

**Valve Weight:** 34.3 kg (75.7 lbs.)  
**Standard Bolt Kit:** BK229  
**Metric Bolt Kit:** BKM229

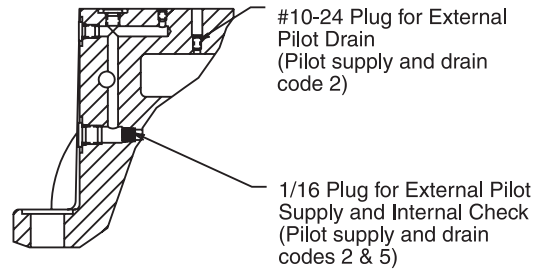
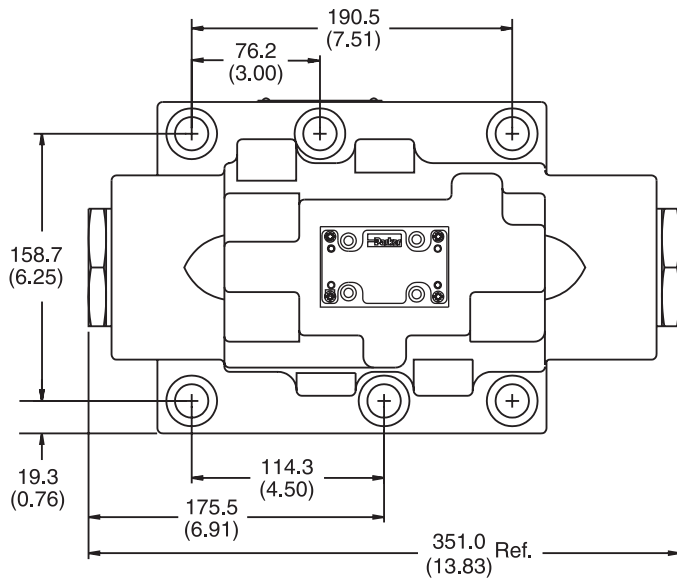
**Bold: Designates Tier I products and options.**

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

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

**A**

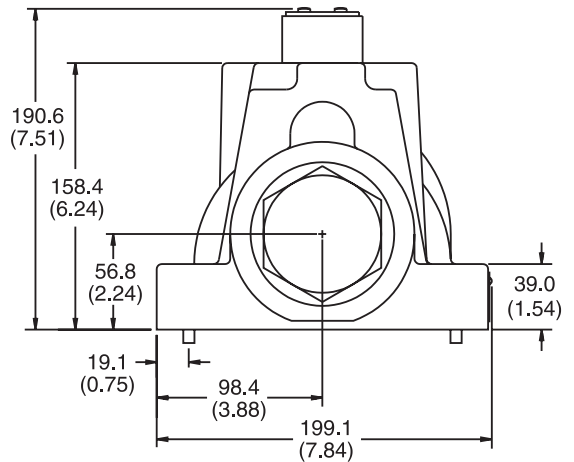
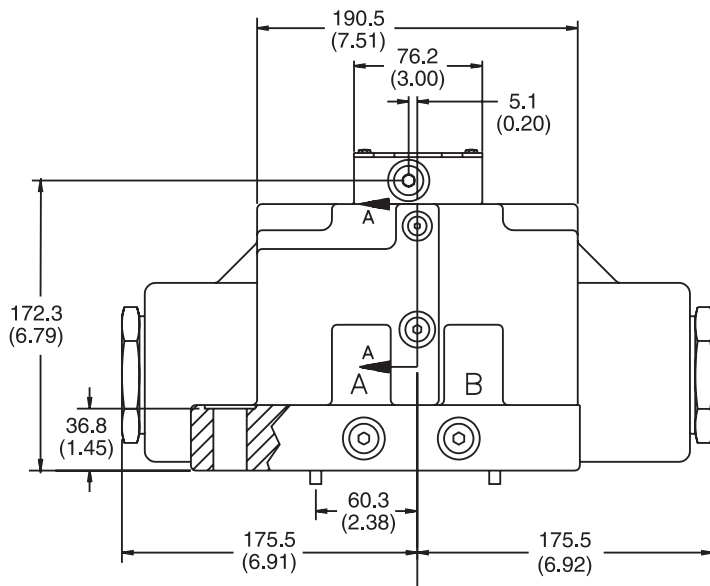
**Standard Pilot Operated**



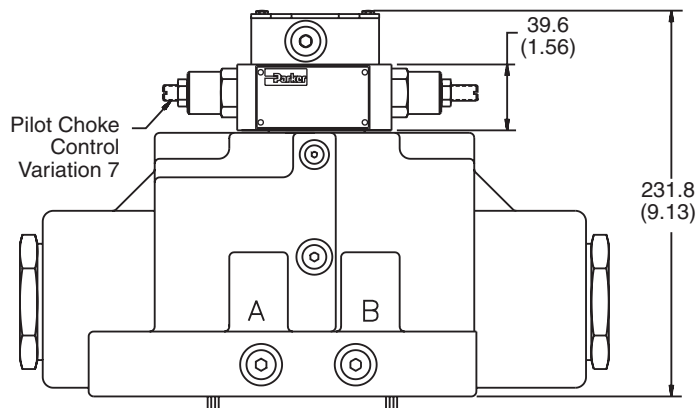
Section A-A



**Note:** 36.83mm (1.45") from bottom of bolt hole counterbore to bottom of valve.



**Pilot Operated with Pilot Choke Control**



**Note:** 36.83mm (1.45") from bottom of bolt hole counterbore to bottom of valve.

FOR MAXIMUM VALVE RELIABILITY, ADHERE TO THE FOLLOWING INSTALLATION INFORMATION.

The following is important installation information which applies to all directional control valves described in this catalog.

### Mounting Position

Detent – Horizontal  
Spring Offset – Unrestricted  
Spring Centered – Unrestricted

### Fluid Recommendations

Premium quality hydraulic oil with a viscosity range between 32-54 cSt (150-250 SSU) At 38°C (100°F) is recommended. The absolute operating viscosity range is from 16-220 cSt (80-1000 SSU). Oil should have maximum anti-wear properties and rust and oxidation treatment.

### Fluids and Seals

Valves using synthetic, fire-resistant fluids require special seals. When phosphate esters or its blends are used, FLUOROCARBON seals are required. Water-glycol, water-in-oil emulsions and petroleum oil may be used with STANDARD seals.

### Filtration

For maximum valve and system component life, the system should be protected from contamination at a level not to exceed 125 particles greater than 10 microns per milliliter of fluid (SAE class 4/ISO 16/13).

### Silting

Silting can cause any sliding spool valve to stick and not spring return if held under pressure for long periods of time. The valve should be cycled periodically to prevent sticking.

### Special Installations

Consult your Parker representative for any application requiring the following:

- Pressure above rating.
- Fluid other than those specified.
- Oil temperature above 71.1°C (160°F).
- Flow path other than normal.

### Mounting Patterns

Series	NFPA	Size
D101V*, D10P	D10	1-1/4"

### Torque Specifications

The recommended torque values for the bolts which mount the valve to the manifold or subplate are as follows: 406.8 Nm (300 ft-lbs).

**A****Series D101VW, D101VA, D101VL****Tank and Drain Line Surges**

If several valves are piped with a common tank or drain line, flow surges in the line may cause an unexpected spool shift. Detent style valves are most susceptible to this. Separate tank and drain lines should be piped in installations where line surges are expected.

**Electrical Characteristics (Detented Spool)**

Only a momentary energizing of the solenoid is necessary to shift and hold a detented spool. Minimum duration of the signal is 0.1 seconds for DC voltages. For AC voltages the response time is 0.06 seconds. Spool position will be held provided the spool centerline is in a horizontal plane, and not shock or vibration is present to displace the spool.

**Electrical Failure or Loss of Pilot Pressure (D101VA)**

Should electric power fail or loss of pilot pressure occur, spring offset and spring centered valves will shift to the spring held position. Detented valves will stay in the last position held before power failure. If main flow does not fail or stop at the same time power fails, machine actuators may continue to function in an undesirable manner or sequence.

**Pilot/Drain Characteristics**

**Pilot Pressure:** 4.4 to 207 Bar (65 to 3000 PSI)

**External:** An oil source sufficient to maintain minimum pilot pressure must be connected to the "X" port of the main body. When using the external pilot variation, a 1/16" pipe plug must be present in the main body pilot passage. (For details see Dimension pages.) This plug will be furnished in valves ordered with pilot code 2, 3, 5 or 6.

**Internal:** Flow is internally ported from the pressure port of the main valve body to the "P" port of the pilot valve. The pressure developed at the "P" port of the pilot valve must be 4.4 Bar (65 PSI) minimum at all times.

**Integral Check:** Valves using internal pilot and internal drain with an open center spool (spools 2, 7, 8 & 9) can be ordered with an integral check valve in the pressure port of the main valve codes 3 & 6. Pilot oil will be internally ported from the upstream side of this check to the "P" port of the pilot valve, ensuring sufficient pilot pressure. A 1/16" pipe plug will be present in the main body. The "X" port in the subplate must be plugged when using the integral check.

**Pilot Valve Drain:** Maximum pressure 102 Bar (1500 PSI) AC standard, 207 Bar (3000 PSI) AC optional/DC standard.

**External:** When using an external drain, a 10 x 24 x 0.31 long set screw must be present in the main body drain passage. (For details see Dimension pages.) This plug will be furnished in valves ordered with drain code 1, 2 or 3.

Drain flow from the pilot valve is at the "Y" port of the main body and must be piped directly to tank. Maximum drain line pressure is 102 Bar (1500 PSI) AC standard, 207 Bar (3000 PSI) AC optional/DC standard. Any drain line back pressure is additive to the pilot pressure requirement.

**Internal:** Drain flow from the pilot valve is internally connected to the main valve tank port. Tank and drain pressure are then identical so tank line pressure should not exceed 102 Bar (1500 PSI) AC standard, 207 Bar (3000 PSI) DC standard/AC optional. Any tank line back pressure is also additive to the pilot pressure requirement. If flow surges (a cause of pressure surges) are anticipated in the tank line, an external drain variation is recommended. The "Y" port in the subplate must be plugged when using an internal drain.

Style Code	Description	No Solenoid/Operator Energized	Solenoid/Operator A Energized	Solenoid/Operator B Energized
B	Spring Offset	P→A and B→T	–	P→B and A→T
C	Spring Centered	Centered	P→A and B→T	P→B and A→T
D	Detented	Last Position Held	P→A and B→T	P→B and A→T
E	Spring Centered	Centered	–	P→B and A→T
F†	Spring Offset, Shift to Center	P→A and B→T	–	Centered
H	Spring Offset	P→B and A→T	P→A and B→T	–
K	Spring Centered	Centered	P→A and B→T	–
M†	Spring Offset, Shift to Center	P→B and A→T	Centered	–

† D101VW only.



**Tank and Drain Line Surges**

If several valves are piped with a common tank or drain line, flow surges in the line may cause an unexpected spool shift. Detent style valves are most susceptible to this. Separate tank and drain lines should be piped in installations where line surges are expected.

**Loss of Pilot Pressure**

Should a loss of pilot pressure occur, spring offset and spring centered valves will shift to the spring held position. No spring valves will stay in the last position held. If main hydraulic flow does simultaneously stop, machine actuators may continue to function in an undesirable manner or sequence.

**Pilot Drain Characteristics**

**Pilot Pressure:**

4.4 to 207 Bar (65 to 3000 PSI)

Direct pilot operated valves use the “X” and “Y” ports to supply pilot oil directly to the ends of the spool, providing spool shifting force. A block mounted on top of the valve body is internally cored to make the necessary connections. Thus when “X” is pressurized, “Y” is used as a drain; and when “Y” is pressurized, “X” becomes the drain.

Any back pressure in these lines when they are being used as a drain is additive to the pilot pressure requirement.

**Internal Drain:** On spring offset models, only the “X” port is pressurized, as the spring returns the spool to its at rest position. On these models, “Y” may be internally drained through the main tank passage in the valve.

**Flow Path/Pilot Pressure**

Style Code	Description	“X” & “Y” De-Pressurized	“X” Port Pressurized	“Y” Port Pressurized	Special Notes	Recommended Control Valve For Pilot Oil
B	Two Position Spring Offset	P→A, B→T	P→A, B→T	P→B, A→T	“X” Port may be pressurized to assist spring in returning spool to offset position (ext. only)	
C	Three Position Spring Centered	Center	P→A, B→T	P→B, A→T	Flow paths will be reversed on valves with tandem center (8 & 9) spools	
H	Two-Position Spring Offset	P→B, A→T	P→A, B→T	P→B, A→T	“Y” Port may be pressurized to assist spring in returning spool to offset position	

**Subplate Mounting**  
**NFPA D10, CETOP 10 & NG 32**

**A**

**Recommended Mounting Surface**

Surface must be flat within .102 mm (0.0004 inch) T.I.R and smooth within 812.8 micro-meters (32 micro-inch). Torque bolts to 406.8 Nm (300 ft-lbs).

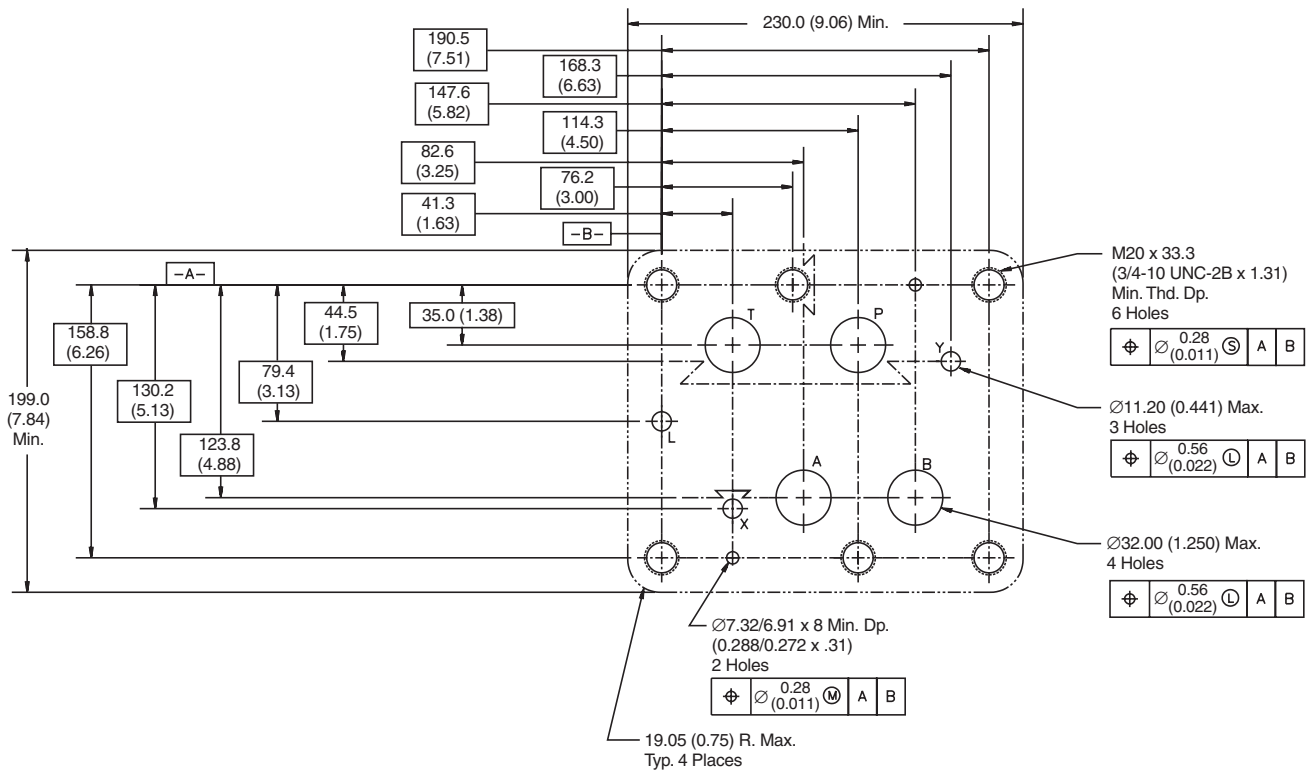
**Mounting Position**

Valve Type	Mounting Position
Detent (Solenoid)	Horizontal
Spring Offset	Unrestricted
Spring Centered	Unrestricted

**For maximum valve reliability, adhere to the following installation information.**

**Mounting Pattern — NFPA D10, CETOP 10 & NG32**

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



## General Description

Series D111VW valves are piloted by a D1VW valve. The valves can be ordered with position control.

The minimum pilot pressure must be ensured for all operating conditions of the directional valve.

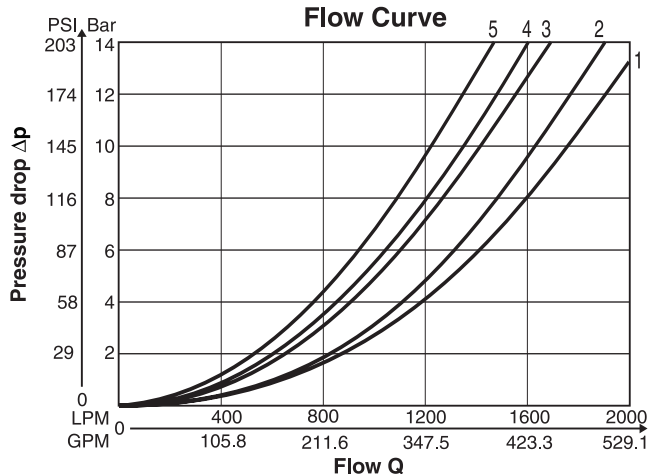
Additionally spools with a P to T connection in the de-energized position need an external pressure supply (external inlet).

## Features

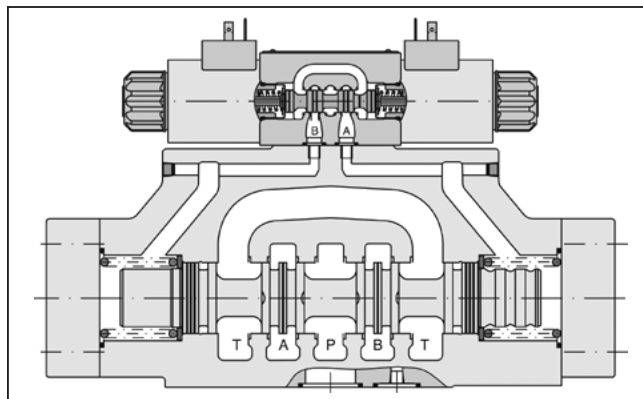
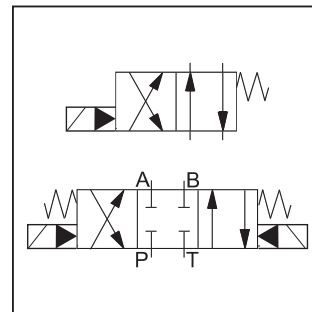
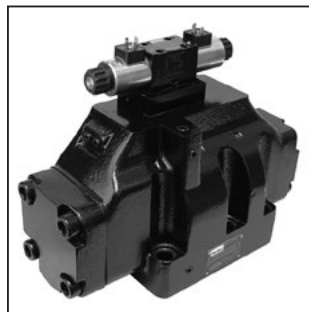
- Low pressure drop design.
- Hardened spools provide long life.
- Wide variety of voltages and electrical connection options.
- Explosion proof availability.
- No tools required for coil removal.

## Performance Curves

The flow curve diagram shows the flow versus pressure drop curves for all spool types. The relevant curve number for each spool type, operating position and flow direction is given in the table below.



All characteristic curves measured with HLP46 at 50°C.

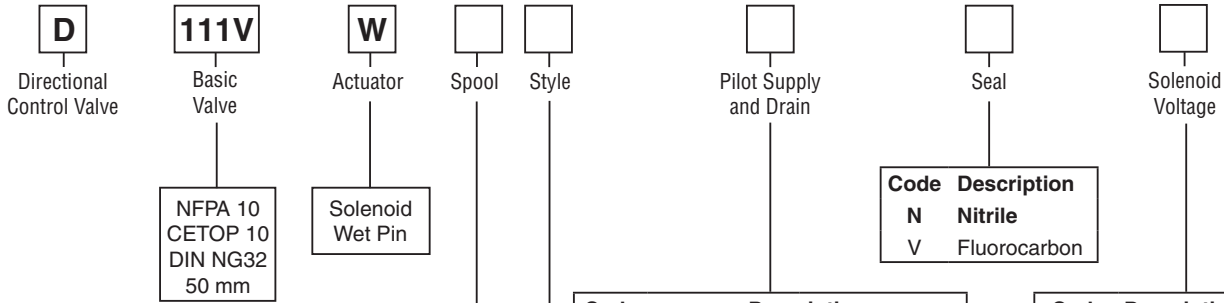


**A**

Spool Code	Curve Number				
	P-A	P-B	P-T	A-T	B-T
001	5	5	—	4	1
002	5	5	5	4	1
003	—	—	—	—	—
004	5	5	—	4	1
005	—	—	—	—	—
006	—	—	—	—	—
007	—	—	—	—	—
009	3	3	2	3	1
011	—	—	—	—	—
014	—	—	—	—	—
015	—	—	—	—	—
016	—	—	—	—	—
020	5	5	—	3	1
021	—	—	—	—	—
022	—	—	—	—	—
026	—	—	—	—	—
030	5	5	—	4	1
054	5	5	—	4	1

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**A**



Code	Description
<b>1</b>	<b>Internal Pilot External Drain</b>
2	External Pilot External Drain
<b>4*</b>	<b>Internal Pilot Internal Drain</b>
5	External Pilot Internal Drain

Code	Description
<b>J</b>	<b>24 VDC</b>
<b>K</b>	<b>12 VDC</b>
<b>T</b>	<b>240/60 - 220/50 VAC</b>
U	98 VDC
<b>Y</b>	<b>120/60 - 110/50 VAC</b>

\* Not for spools 002, 009 & 030.

3-Position Spools	
Code	Spool Type
	a 0 b
<b>001</b>	
002	
004	
009**	
054	
081	
082	

2-Position Spools	
Code	Spool Type
	a b
<b>020*</b>	
030*	

\* 020 spool has open crossover.  
 \*\*009 & 030 spools have closed crossovers.

3-Position Spools		
Code	All 3-Position Spools	
<b>C</b>		<b>3 positions.</b> Spring offset in position "0". Operated in position "a" or "b".
	Standard	Spool Type 009*
<b>E</b>		2 positions. Spring offset in position "0". Operated in position "a".
<b>F</b>		2 positions. Spring offset in position "0". Operated in position "b".
<b>K</b>		2 positions. Spring offset in position "0". Operated in position "a".
<b>M</b>		2 positions. Spring offset in position "0". Operated in position "b".

2-Position Spools		
Code	Spool Position	
<b>B*</b>		Spring offset in position "b". Operated in position "a".
<b>H*</b>		Spring offset in position "a". Operated in position "b".

\* 020 & 030 spools only.

**Weight:**

Single Solenoid: 67.4 kg (148.6 lbs.)

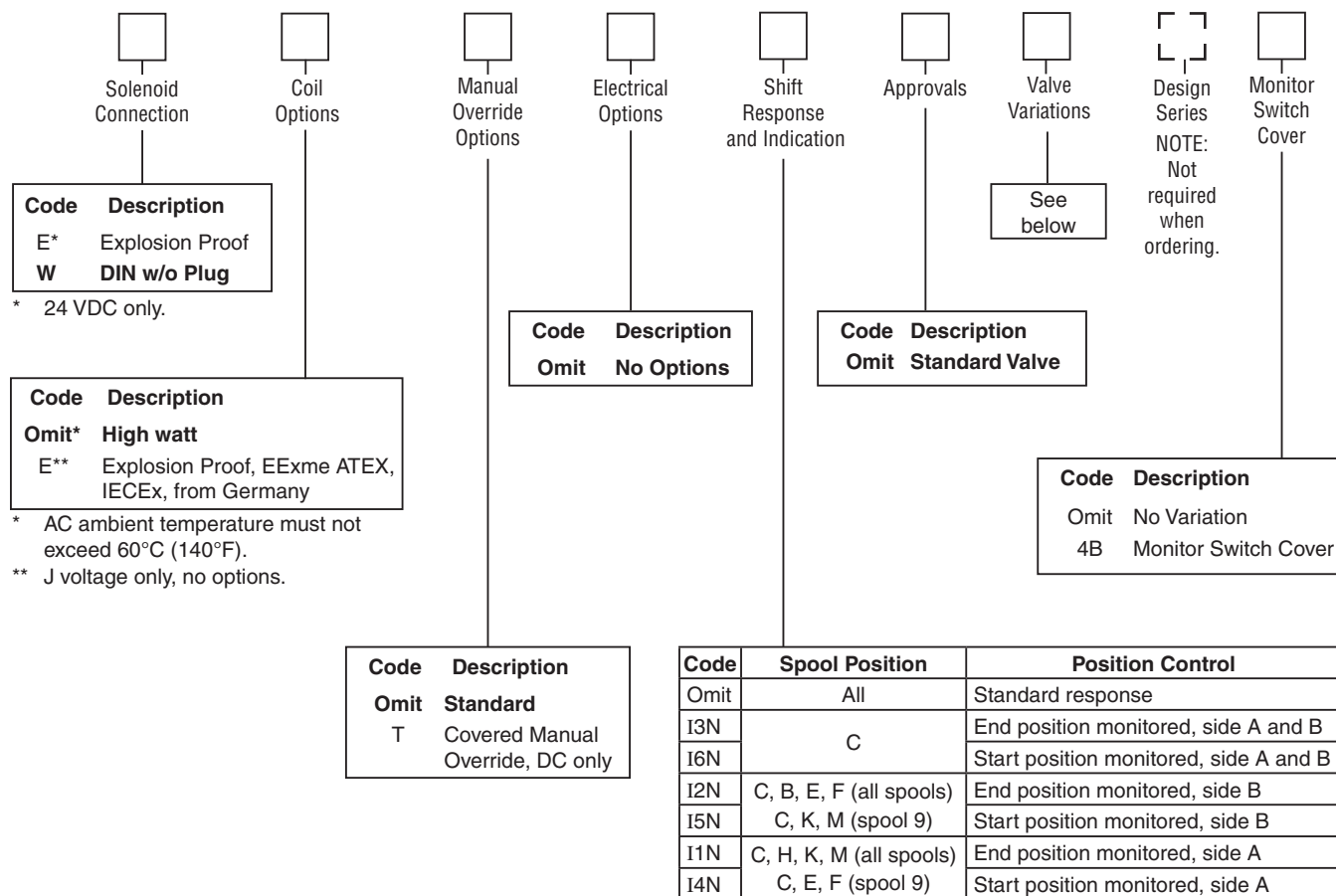
Double Solenoid: 68.0 kg (149.9 lbs.)

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

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







Note: The plug M12 x 1 for the position control is included. The monitor switch has to be located on the side to which the spool moves from the spring offset position. For 4/3-way valves two switches are required.  
 Not CSA approved.  
 Not available with 'F' or 'M' styles.  
 Not available with Explosion Proof solenoid connection.  
**DC DIN, high watt coils only.**

**Valve Variations**

**OPTIONS ARE NOT AVAILABLE ON MONITOR SWITCH VALVES.**

Code	Description
Omit	Standard without accessories
3A	Pilot Choke Meter Out
3B	Pilot Choke Meter In
3C	Pilot Pressure Reducer
3R	Pilot Choke Meter Out & Pilot Pressure Reducer
1T	Pilot Choke Meter In & Pilot Pressure Reducer

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

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



### Solenoid Ratings

<b>Insulation System</b>	Class F
<b>Allowable Deviation from rated voltage</b>	-10% to +10% for DC and AC rectified coils -5% to +5% for AC Coils
<b>Armature</b>	Wet pin type
<b>CSA File Number</b>	LR60407
<b>Environmental Capability</b>	DC Solenoids meet NEMA 4 and IP67 when properly wired and installed. Contact HVD for AC coil applications.

### Explosion Proof Solenoid Ratings\*

<b>ATEX (EE)</b>	Complies with ATEX requirements for: EExme ATEX, IECEX, from Germany
------------------	--

\* Allowable Voltage Deviation ±10%.

Code		Voltage	In Rush Amps Amperage	In Rush VA	Holding Amps @ 3 mm	Watts	Resistance
Voltage Code	Power Code						
J	Omit	24 VDC	N/A	N/A	1.32 Amps	30 W	17.27 Ohms
K	Omit	12 VDC	N/A	N/A	2.64 Amps	30 W	4.32 Ohms
T	Omit	240/60 VAC	0.83 Amps	199 VA	0.30 Amps	30 W	120.40 Ohms
T	Omit	220/50 VAC	0.87 Amps	191 VA	0.34 Amps	30 W	120.40 Ohms
U	Omit	98 VDC	N/A	N/A	0.31 Amps	30W	288.00 Ohms
Y	Omit	120/60 VAC	1.7 Amps	204 VA	0.60 Amps	30 W	28.20 Ohms
Y	Omit	110/50 VAC	1.7 Amps	187 VA	0.68 Amps	30 W	28.20 Ohms
<b>Explosion Proof Solenoids (German)</b>							
J		24 VDC	N/A	N/A	1.0 Amps	24 W	24 Ohms

General		
Design	Directional Spool Valve	
Actuation	Solenoid	
Size	NG32	
Mounting Interface	DIN 24340 A32 / ISO 4401 / NFPA D10 / CETOP RP 121-H	
Mounting Position	Unrestricted, preferably horizontal	
Ambient Temperature	[°C]	-25...+50; (-13°F...+122°F) (without inductive position control)
	[°C]	0...+50; (+32°F...+122°F) (with inductive position control)
MTTF <sub>D</sub> Value	[years]	75
Hydraulic		
Maximum Operating Pressure	Pilot drain internal: P, A, B, X 350 Bar (5075 PSI) T, Y 102 Bar (1500 PSI) AC only, 207 Bar (3000 PSI) DC/AC optional Pilot drain external: P, A, B, T, X 350 Bar (5075 PSI) Y 102 Bar (1500 PSI) AC only, 207 Bar (3000 PSI) DC/AC optional	
Fluid	Hydraulic oil in accordance with DIN 51524 / 51525	
Fluid Temperature	[°C]	-25 ... +70; (-13°F...+158°F)
Viscosity Permitted	[cSt]/[mm <sup>2</sup> /s]	2.8...400 (13...1854 SSU)
Recommended	[cSt]/[mm <sup>2</sup> /s]	30...80 (139...371 SSU)
Filtration	ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)	
Flow Maximum	2000 LPM (529.1 GPM)	
Leakage at 350 Bar (per flow path)	[ml/min]	up to 5000 (1.32 GPM) depending on spool
Minimum Pilot Supply Pressure	5 Bar (73 PSI)	
Static / Dynamic		
Step Response at 95%		Energized                      De-energized
DC Solenoids	Pilot Pressure	
	50 Bar [ms]	470                      390
	100 Bar [ms]	320                      390
	250 Bar [ms]	210                      390
	350 Bar [ms]	200                      390
AC Solenoids	Pilot Pressure [ms]	
	50 Bar [ms]	450                      375
	100 Bar [ms]	300                      375
	250 Bar [ms]	190                      375
	350 Bar [ms]	180                      375

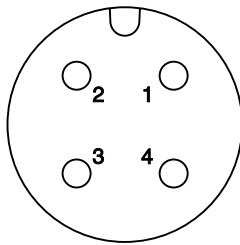
## Single Solenoid Valves

### Electrical Specifications of Position Control as per IEC 61076-2-101 (M12x1)

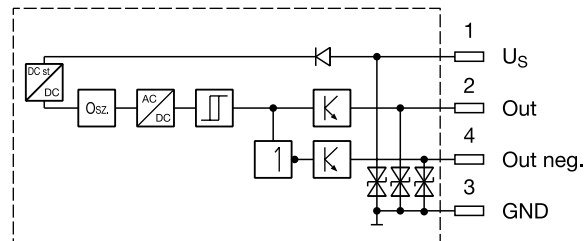
<b>Protection Class</b>	IP 65 in accordance with EN 60529 (with correctly mounted plug-in connector)		
<b>Ambient Temperature</b>	[°C]	-20...+60; (-4°F...140°F)	
<b>Supply Voltage / Ripple</b>	[V]	24 ≤10%	
<b>Tolerance Supply Voltage</b>	[%]	±20	
<b>Polarity Protection</b>	[V]	300	
<b>Current Consumption without Load</b>	[mA]	≤ 20	
<b>Switching Hysteresis</b>	[mm]	<0.06	
<b>Max. Output Current per Channel, Ohmic</b>	[mA]	250	
<b>Min. Distance to Next AC Solenoid</b>	[m]	0.1 (0.33 ft.)	
<b>Interface</b>	M12x1 to IEC 61076-2-101		
<b>Wiring Minimum</b>	[mm <sup>2</sup> ]	5 x 0.25 braided shield recommended	
<b>Wiring Length Maximum</b>	[m]	50 (164 ft.) recommended	
<b>CE Conform</b>	EN 61000-4-2/EN 61000-4-4/EN 61000-4-6 <sup>1)</sup> /ENV 50140/ENV 50240		

1) Only guaranteed with screened cable and female connector.

### M12 Pin Assignment



- 1 U<sub>S</sub> 19.2...28.8V
- 2 Out B: normally open
- 3 0V
- 4 Out A: normally closed



Outputs: Open collector

### Definitions

Start position monitored:

The valve is de-energized. The inductive switch gives a signal at the moment the spool leaves the spring offset position (below 15% spool stroke).

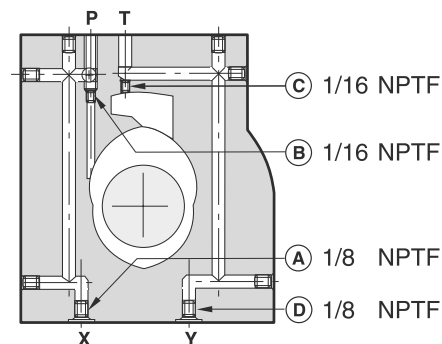
At the switching point the spool is located within the closed position. It is secured so that only the flow paths of the offset position are granted.

The switch can only be located on the opposite side of the solenoid for direct operated valves. Please order plug M12x1 separately. See Accessories, plug M12x1 (part no.: 5004109).

End position monitored:

The inductive switch gives a signal before the end position is reached. (above 85% spool stroke).

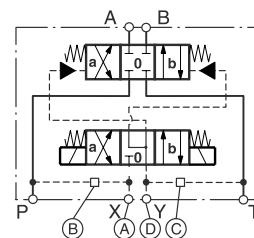
### Pilot Oil Inlet (Supply) and Outlet (Drain)



○ open, ● closed

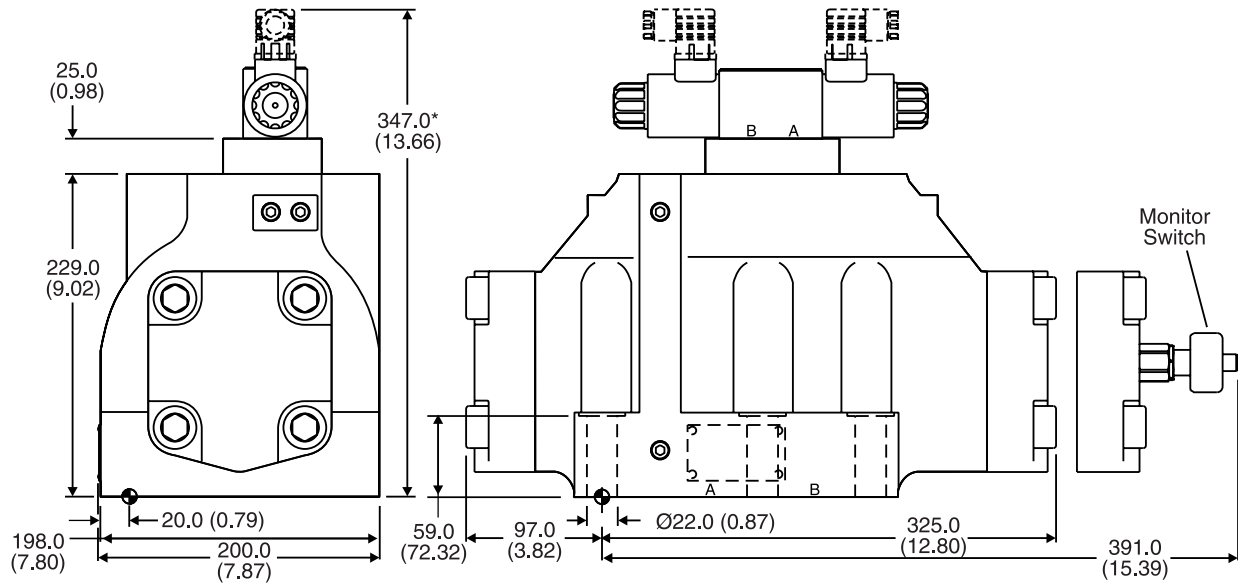
Pilot oil		A	B	C	D
Inlet	Outlet				
internal	external	○	Orifice Ø1.5 ●	○	○
external	external	Orifice Ø1.5	●	●	○
internal	internal	○	Orifice Ø1.5	○	○
external	internal	Orifice Ø1.5	●	○	○

All orifice sizes for standard valves



**Dimensions**

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



\* Please add for each sandwich plate +40mm (1.58") (pressure reducing valve, pilot choke meter-in/-out).



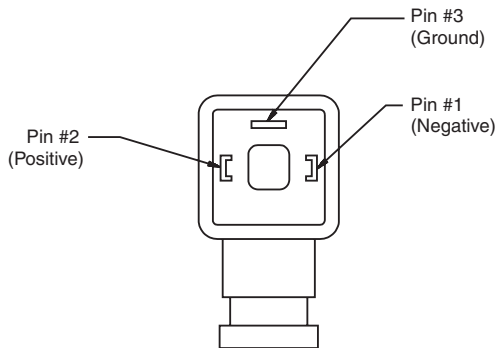
Surface Finish	Kit			Seal Kit
	BK386	6x M20x90 DIN 912 12.9	517 Nm (381.3 lb.-ft.)	<b>Nitrile: SK-D111VW-N-91</b> Fluorocarbon: SK-D111VW-V-91

The space necessary to remove the plug per DIN 43650, design type AF is at least 15 mm (0.59 in.).

The torque for the screw M3 of the plug has to be 0.5 Nm (3.7 lb.-ft. ) to 0.6 Nm (4.4 lb.-ft).

**Accessories**

**Hirschmann Plug with Lights (Option P5)**  
**ISO 4400/DIN 43650 Form "A"**



Face View of Plug

**A**

FOR MAXIMUM VALVE RELIABILITY, ADHERE TO THE FOLLOWING INSTALLATION INFORMATION.

The following is important installation information which applies to all directional control valves described in this catalog.

### Mounting Position

Detent – Horizontal  
Spring Offset – Unrestricted  
Spring Centered – Unrestricted

### Fluid Recommendations

Premium quality hydraulic oil with a viscosity range between 32-54 cSt (150-250 SSU) At 38°C (100°F) is recommended. The absolute operating viscosity range is from 16-220 cSt (80-1000 SSU). Oil should have maximum anti-wear properties and rust and oxidation treatment.

### Fluids and Seals

Valves using synthetic, fire-resistant fluids require special seals. When phosphate esters or its blends are used, FLUOROCARBON seals are required. Water-glycol, water-in-oil emulsions and petroleum oil may be used with STANDARD seals.

### Filtration

For maximum valve and system component life, the system should be protected from contamination at a level not to exceed 125 particles greater than 10 microns per milliliter of fluid (SAE class 4/ISO 16/13).

### Silting

Silting can cause any sliding spool valve to stick and not spring return if held under pressure for long periods of time. The valve should be cycled periodically to prevent sticking.

### Special Installations

Consult your Parker representative for any application requiring the following:

- Pressure above rating.
- Fluid other than those specified.
- Oil temperature above 71.1°C (160°F).
- Flow path other than normal.

### Mounting Patterns

Series	NFPA	Size
D111V*, D10P	D10	1-1/4"

### Torque Specifications

The recommended torque values for the bolts which mount the valve to the manifold or subplate are as follows: 406.8 Nm (300 ft-lbs).

**Tank and Drain Line Surges**

If several valves are piped with a common tank or drain line, flow surges in the line may cause an unexpected spool shift. Detent style valves are most susceptible to this. Separate tank and drain lines should be piped in installations where line surges are expected.

**Electrical Characteristics (Detented Spool)**

Only a momentary energizing of the solenoid is necessary to shift and hold a detented spool. Minimum duration of the signal is 0.1 seconds for DC voltages. For AC voltages the response time is 0.06 seconds. Spool position will be held provided the spool centerline is in a horizontal plane, and not shock or vibration is present to displace the spool.

**Electrical Failure or Loss of Pilot Pressure**

Should electric power fail or loss of pilot pressure occur, spring offset and spring centered valves will shift to the spring held position. Detented valves will stay in the last position held before power failure. If main flow does not fail or stop at the same time power fails, machine actuators may continue to function in an undesirable manner or sequence.

**Pilot/Drain Characteristics**

**Pilot Pressure:** 5 to 345 Bar (73 to 5000 PSI)

**External:** An oil source sufficient to maintain minimum pilot pressure must be connected to the “X” port of the main body. When using the external pilot variation, a 1/16" pipe plug must be present in the main body pilot passage. (For details see Technical pages.) This plug will be furnished in valves ordered with pilot code 2 or 5.

**Internal:** Flow is internally ported from the pressure port of the main valve body to the “P” port of the pilot valve. The pressure developed at the “P” port of the pilot valve must be 5 Bar (73 PSI) minimum at all times.

**Pilot Valve Drain:** Maximum pressure 102 Bar (1500 PSI) AC standard, 207 Bar (3000 PSI) AC optional/DC standard.

**External:** When using an external drain, a 10 x 24 x 0.31 long set screw must be present in the main body drain passage. (For details see Technical pages.) This plug will be furnished in valves ordered with drain code 1 or 2.

Drain flow from the pilot valve is at the “Y” port of the main body and must be piped directly to tank. Maximum drain line pressure is 102 Bar (1500 PSI) AC standard, 207 Bar (3000 PSI) AC optional/DC standard. Any drain line back pressure is additive to the pilot pressure requirement.

**Internal:** Drain flow from the pilot valve is internally connected to the main valve tank port. Tank and drain pressure are then identical so tank line pressure should not exceed 102 Bar (1500 PSI) AC standard, 207 Bar (3000 PSI) DC standard/AC optional. Any tank line back pressure is also additive to the pilot pressure requirement. If flow surges (a cause of pressure surges) are anticipated in the tank line, an external drain variation is recommended. The “Y” port in the subplate must be plugged when using an internal drain.

Style Code	Description	No Solenoid/Operator Energized	Solenoid/Operator A Energized	Solenoid/Operator B Energized
B	Spring Offset	P→A and B→T	–	P→B and A→T
C	Spring Centered	Centered	P→A and B→T	P→B and A→T
D	Detented	Last Position Held	P→A and B→T	P→B and A→T
E	Spring Centered	Centered	–	P→B and A→T
F	Spring Offset, Shift to Center	P→A and B→T	–	Centered
H	Spring Offset	P→B and A→T	P→A and B→T	–
K	Spring Centered	Centered	P→A and B→T	–
M	Spring Offset, Shift to Center	P→B and A→T	Centered	–

**Subplate Mounting**



**NFPA D10, CETOP 10 & NG 32**

**Recommended Mounting Surface**

Surface must be flat within .102 mm (0.0004 inch) T.I.R and smooth within 812.8 micro-meters (32 micro-inch). Torque bolts to 406.8 Nm (300 ft-lbs).

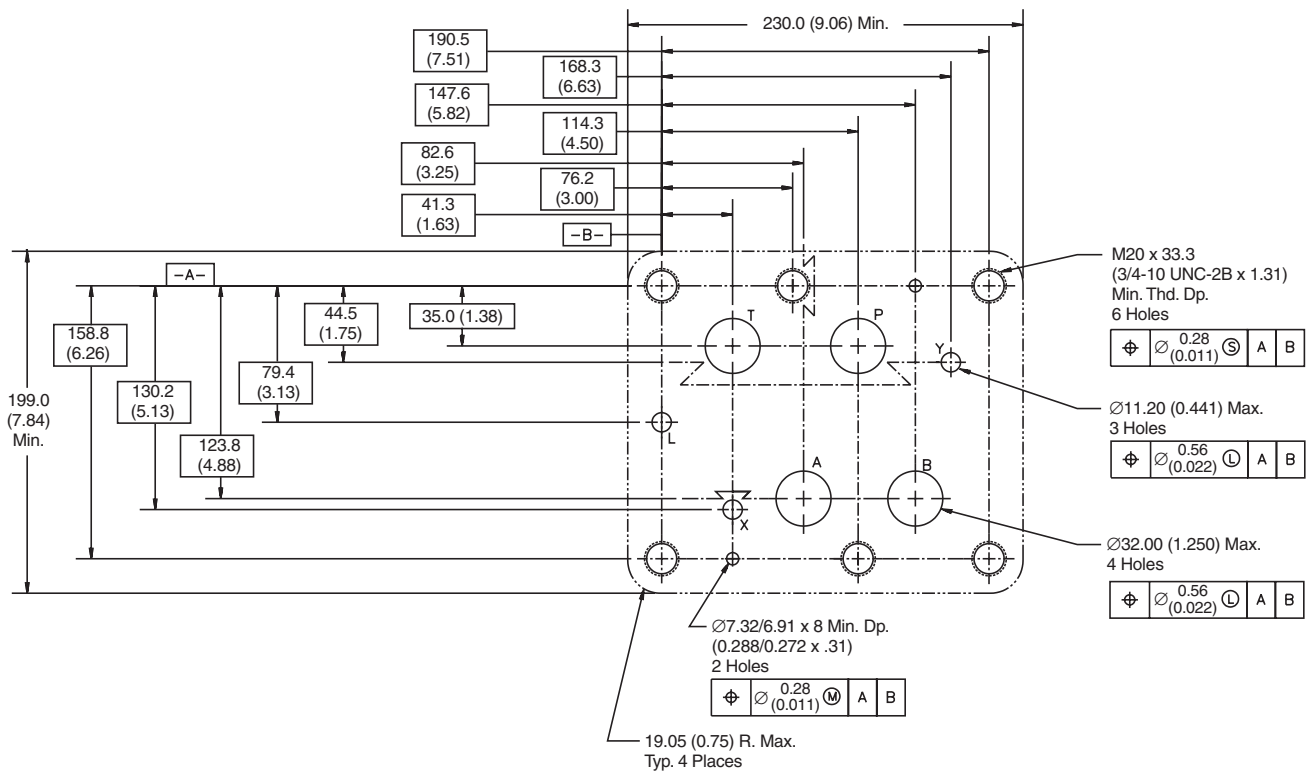
***For maximum valve reliability, adhere to the following installation information.***

**Mounting Position**

Valve Type	Mounting Position
Detent (Solenoid)	Horizontal
Spring Offset	Unrestricted
Spring Centered	Unrestricted

**Mounting Pattern — NFPA D10, CETOP 10 & NG32**

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





**A**

**General Description**

Series D111VWR and D111VWZ are regenerative and hybrid directional control valves (NG32).

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

**Features**

- Energy saving A-regeneration optionally integrated.
- Switchable hybrid version.

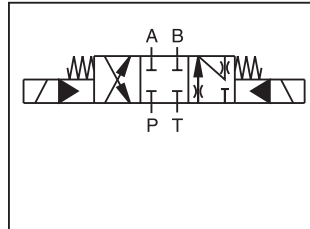
**Further literature about the opportunities of energy savings and more functional details of the integrated regeneration is available on request.**



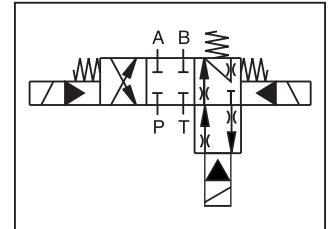
D41VWR (shown)



D41VWZ (shown)

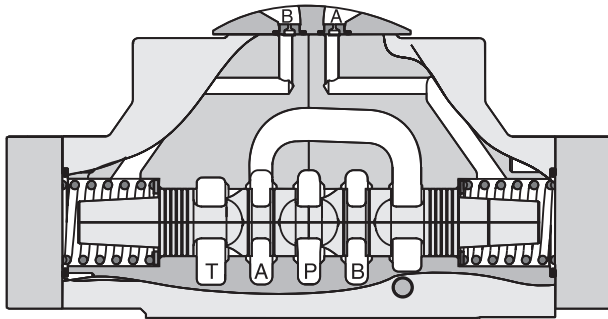


Regenerative D111VWR

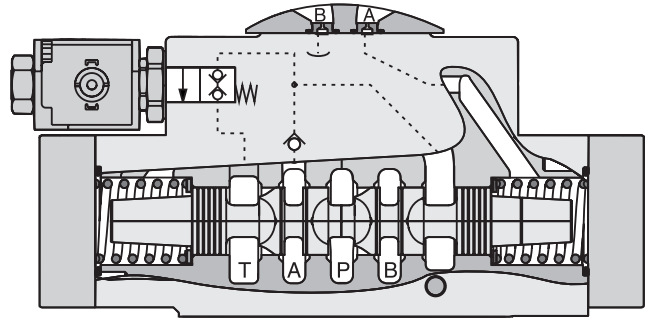


Hybrid D111VWZ

**Regenerative Valve D111VWR**

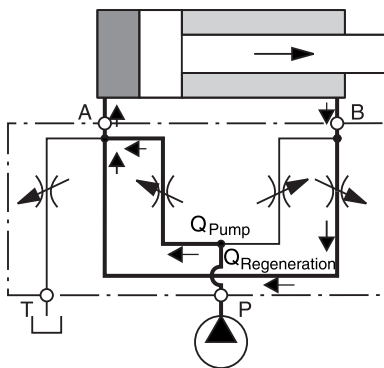


**Hybrid Valve D111VWZ**



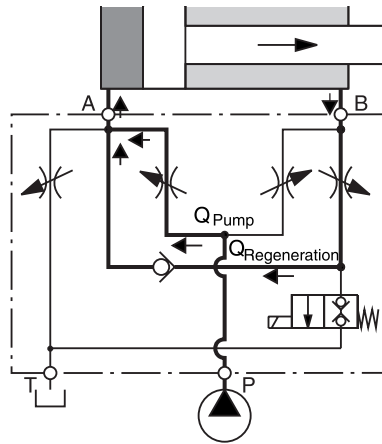
**D111VWR Regenerative Valve**

Cylinder Extending

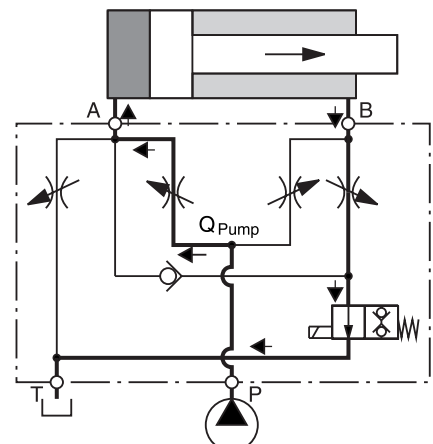


**D111VWZ Hybrid Valve**

Cylinder Extending  
 Regenerative Mode  
 (High Speed)



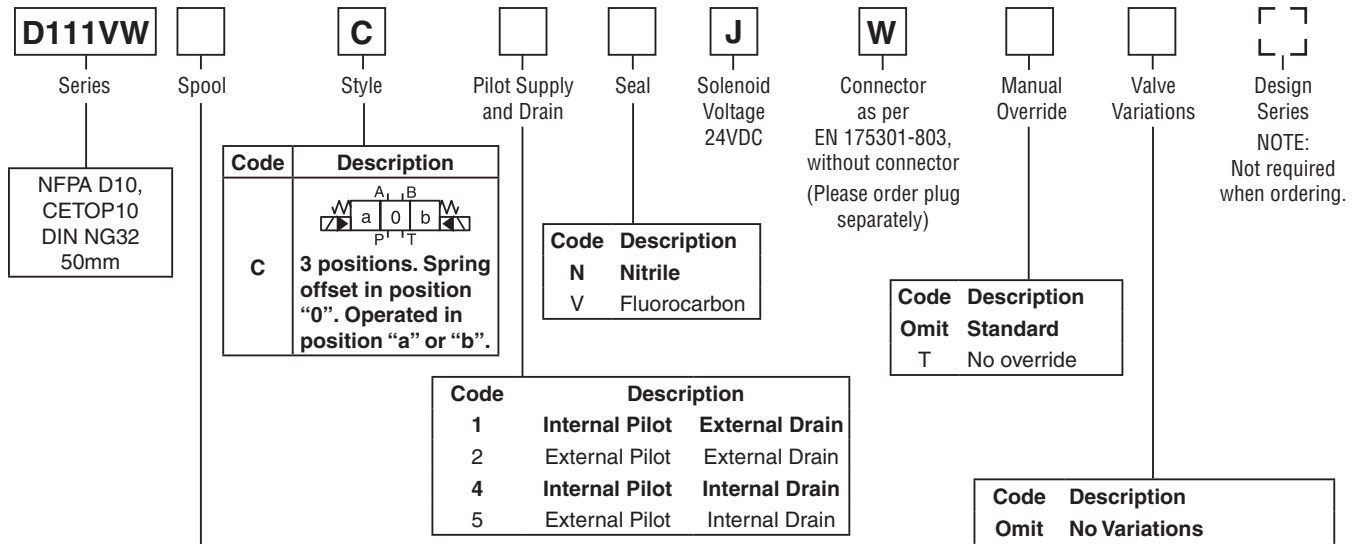
Cylinder Extending  
 Standard Mode  
 (High Force)



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Ordering Information**

**A**



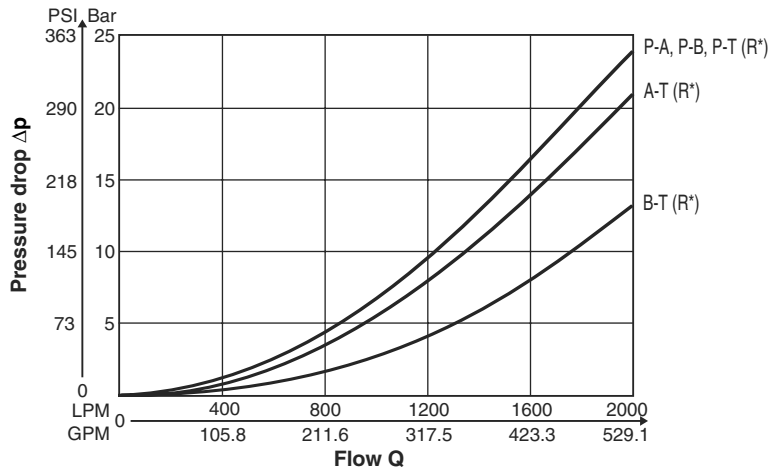
Regenerative Function			Hybrid Function		
Code	Spool Type		Code	Spool Type	
	a	b 0		a	b 0
R01			Z01		
R04			Z04		
R81			Z81		
R82			Z82		

**Weight:**  
 D111VWR, D111DWZ 68.0 kg (149.9 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**



Flow curves measured with Spool R01, R04.  
 Spool Z\* on request

General		
Design	Directional Spool Valve	
Actuation	Solenoid	
Size	NG32 / CETOP10 / D10	
Mounting Interface	DIN 24340 A32 / ISO 4401 / NFPA D10 / CETOP RP 121-H	
Mounting Position	Unrestricted, preferably horizontal	
Ambient Temperature	[°C]	-25...+50; (-13°F...+122°F)
MTTFD Value	[years]	75
Hydraulic		
Maximum Operating Pressure	Pilot drain internal: P, A, B, X 350 Bar (5075 PSI); T, Y 105 Bar (1523 PSI) Pilot drain external: P, A, B, T, X 350 Bar (5075 PSI); Y 105 Bar (1523 PSI)	
Fluid	Hydraulic oil in accordance with DIN 51524 / 51525	
Fluid Temperature	[°C]	-25 ... +70 (-13°F...+158°F)
Viscosity Permitted		2.8...400 (13...1854 SSU)
[cSt]	/[mm <sup>2</sup> /s]	30...80 (139...371 SSU)
Recommended	/[mm <sup>2</sup> /s]	
[cSt]		
Filtration	ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)	
Flow Maximum	2000 LPM (529.1 GPM)	
Leakage at 350 Bar (5075 PSI) (per flow path)	[ml/min]	up to 5000 (1.32 GPM) (depending on spool)
Minimum Pilot Supply Pressure	5 Bar (73 PSI)	
Static / Dynamic		
Step Response at 95%		
DC Solenoids		Energized
Pilot Pressure		De-energized
50 Bar (725 PSI)	[ms]	470
100 Bar (1450 PSI)	[ms]	320
250 Bar (3625 PSI)	[ms]	210
350 Bar (5075 PSI)	[ms]	200
390		
390		
390		
390		
Electrical		
Duty Ratio	100% ED; CAUTION: coil temperature up to 150°C (302°F) possible	
Protection Class	IP 65 in accordance with EN 60529 (plugged and mounted)	
Supply Voltage / Ripple	[V]	24
Tolerance Supply Voltage	[%]	±10
Current Consumption Hold	[A]	1.29
Current Consumption In Rush	[A]	1.29
Power Consumption Hold	[W]	31
Power Consumption In Rush	[W]	31
Solenoid Connection	Connector as per EN 175301-803, Solenoid identification as per ISO 9461	
Wiring Minimum	[mm <sup>2</sup> ]	3 x 1.5 recommended
Wiring Length Minimum	[m]	50 (164 ft.) recommended

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

#### Electrical Specifications Hybrid Option

Duty Ratio	100%	
Protection Class	IP 65 in accordance with EN 60529 (plugged and mounted)	
Supply Voltage	[V]	24
Tolerance Supply Voltage	[%]	±10
Current Consumption	[A]	1.29
Power Consumption	[W]	31
Solenoid Connection	[A/m]	Connector as per EN 175301-803
Wiring Minimum	[mm <sup>2</sup> ]	3 x 1.5 recommended
Wiring Length Maximum	[m]	50 (164 ft.) recommended

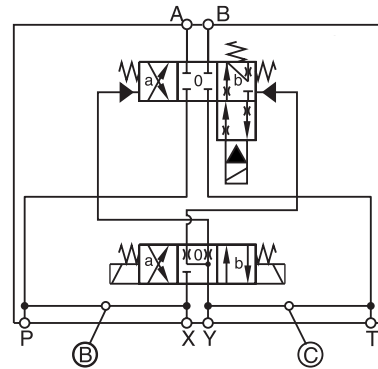
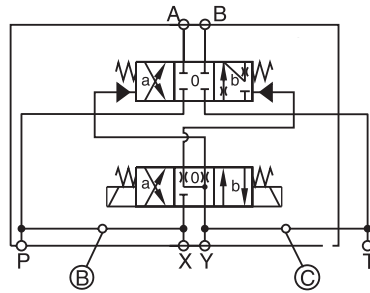
With electrical connections the protective conductor (PE ≍ ) must be connected according to the relevant regulations.

**Pilot Flow**

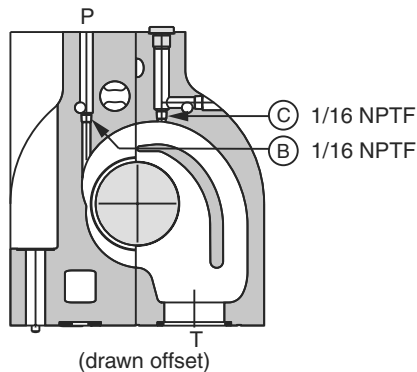
**Pilot Oil Inlet (Supply) and Outlet (Drain)**

○ open, ● closed

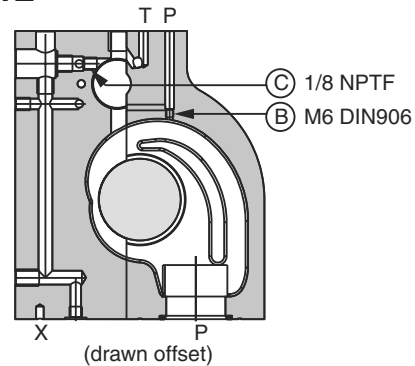
Pilot Oil Inlet	Pilot Oil Outlet	B	C
internal	external	○	●
external	external	●	●
internal	internal	○	○
external	internal	●	○



**D111VWR**

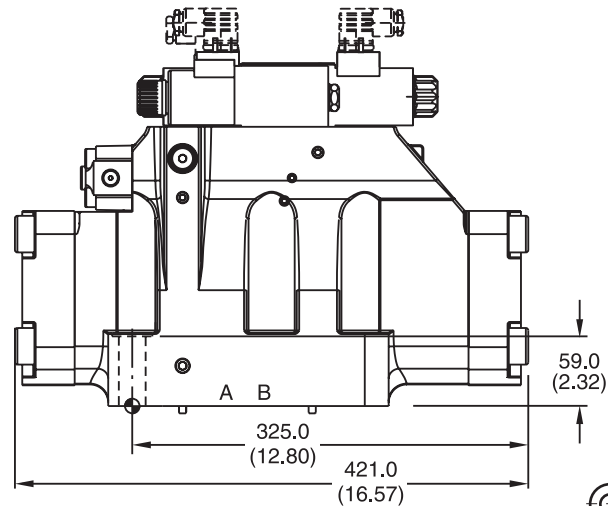
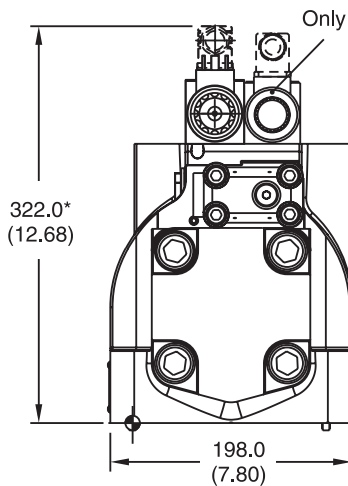


**D111VWZ**



**Dimensions**

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



\* Please add for each sandwich plate +40mm (1.58") (pressure reducing valve, pilot choke valve meter-in/-out).

Surface Finish	Kit	Kit	Kit	Seal Kit
	BK386	6x M20x90 DIN 912 12.9	517 Nm (381.3 lb.-ft.) ±15%	<b>Nitrile: SK-D111VW-N-91</b> Fluorocarbon: SK-D111VW-V-91

The space necessary to remove the plug per DIN 43650, design type AF is at least 15mm (0.59").  
 The torque for the screw M3 of the plug has to be 0.5 Nm (0.37 lb.-ft.) to 0.6 Nm (0.44 lb.-ft.).

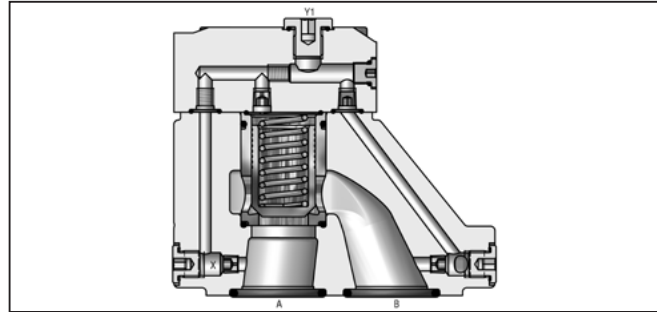
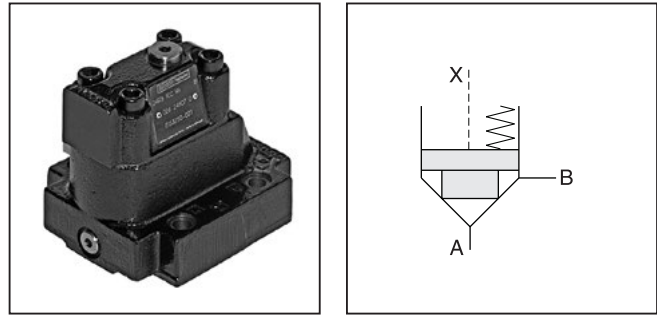
**General Description**

Series D4S seat valves are designed for directional control functions. A large variety of poppets, springs and covers – including shuttle valves, stroke limiters, solenoid valves (VV01) and position control – allow to design individual hydraulic solutions for nominal flow up to 600 LPM (158.7 GPM).

A complete program is offered under the Parker brand: subplate mounted valves (D4S), SAE flange valves (D5S), pipe mounted valves (D4S), slip-in cartridges (CAR - on request).

**Features**

- Subplate mounting acc. to ISO 5781.
- Leak-free seat valve design.
- Numerous pilot options.
- 6 poppet types.
- 3 sizes (NG10, 25, 32).



**A**

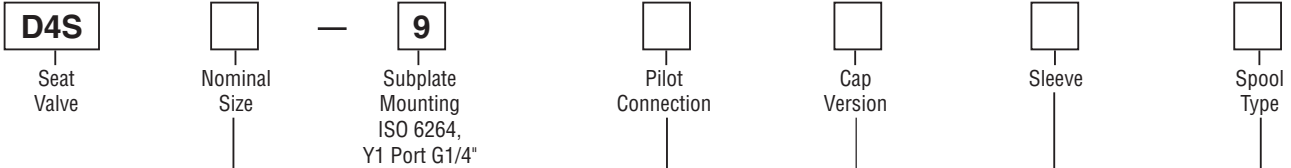
**Selection of Cartridges**

Sleeve 1, Poppet 1	Sleeve 1, Poppet 2	Sleeve 1, Poppet 4	Sleeve 3, Poppet 4	Sleeve 3, Poppet A	Sleeve 3, Poppet B/C
Z	Z	Z	Z	Z	Z
A	A	A	A	A	A
1 : 1.05 $A_A = 0.95 A_C$ $A_B = 0.05 A_C$ 15° chamfer	1 : 1.05 $A_A = 0.95 A_C$ $A_B = 0.05 A_C$ 15° chamfer orifice	1 : 1.05 $A_A = 0.95 A_C$ $A_B = 0.05 A_C$ 45° chamfer	1 : 1.67 $A_A = 0.6 A_C$ $A_B = 0.4 A_C$ 45° chamfer	1 : 1.67 $A_A = 0.6 A_C$ $A_B = 0.4 A_C$ 45° chamfer safety spool	1 : 1.67 $A_A = 0.6 A_C$ $A_B = 0.4 A_C$ 45° chamfer throttle spool

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

Ordering Information, Performance Curves Series D4S

**A**



Code	Description
03	NG10
06	NG25
10	NG32

Code	Pilot Oil Line in Body	A-X B-Y	
		A-X	B-Y
1	Internal from A	●	○
2	External from X	●	○
A <sup>1)</sup>	Internal from A	●	●
B <sup>1)</sup>	External from X	●	●
C	Internal from A + B	●	●
D	Internal from B	●	●
G	External from Y	●	●

Code	Description
1	AA=95%, AB=5%
3	AA=60%, AB=40%

<sup>1)</sup> With VV01 only.

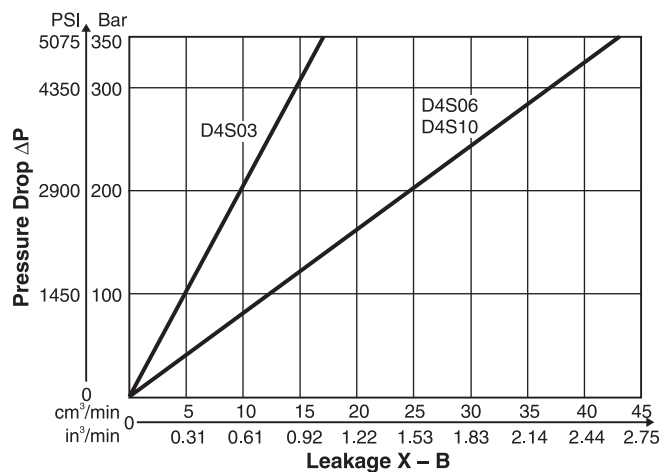
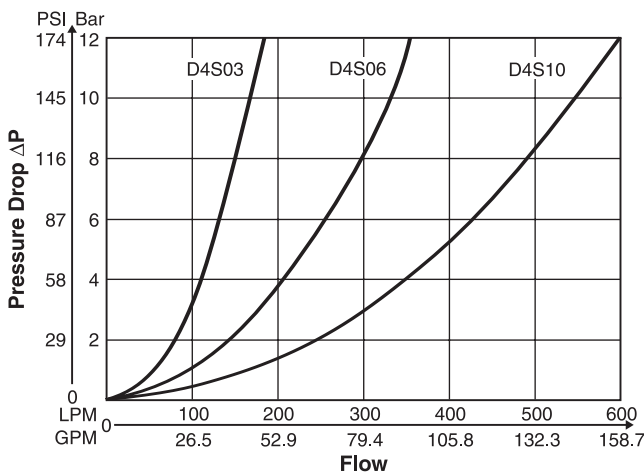
Code	Ports	X	Y	Z	X-Y	Y1	VV01
<b>Standard</b>							
1	Pilot Oil = Pilot Drain	○	●	●	○	●	—
C	Pilot Oil = Pilot Drain	●	○	●	○	●	—
<b>With Solenoid Valve (VV01)</b>							
2	External PD from cap	○	○	●	●	○	●
5	External to subplate	○	○	●	●	●	○
6	Internal pilot drain	○	○	●	●	●	○
<b>With Stroke Limiter (not for D4S03)</b>							
3	Pilot Oil = Pilot Drain	●	●	—	—	—	—
4	Pilot Oil = Pilot Drain	●	●	—	—	—	—

**Key:** ○ Open Bore ● Closed Bore ● Orifice Ø 1.2  
**Note:** Combination examples provided on pages A227-A229.

Code	Size	Poppet Type	Sleeve
1	03, 06, 10	With closed bottom and 15° chamfer (pZ max. = pA +20 Bar (290 PSI))	1
2	03	With 0.8 dia. orifice at the bottom and 15° chamfer	1
	06, 10	With 1.2 dia. orifice at the bottom and 15° chamfer	1
4	03, 06, 10	With closed bottom and 45° chamfer	1, 3
A*	06, 10	Safety spool (for end position control only)	3
B*	06, 10	Throttle spool, 10° chamfer	3
C*	06, 10	Throttle spool, 3° chamfer	3

\* Springs 2, 3 and 6 only.

**Performance Curves**



All characteristic curves measured with HLP46 at 50°C.



Spring

Switching Type

Solenoid Voltage

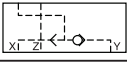
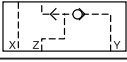
**B**  
Design Series

Seal

Options

Code	Description
Omit	Standard w/o vent function
G0R	12V
G0Q	24V
GAR	98V
GAG	205V
W30	110V 50Hz / 120V 60Hz
W31	230V 50Hz / 240V 60Hz

Code	Description
1	Nitrile
5	Fluorocarbon

Code	Description	
Omit	Standard without Vent Function	
09	VV01 with Manual Override	De-energized; power comp. open
10	VV01 without Manual Override	power comp. open
11	VV01 with Manual Override	De-energized; power comp. closed
12	VV01 without Manual Override	power comp. closed
CA	Shuttle Valve	
DA	Shuttle Valve	
CB	VV01 Code 09 and Shuttle Valve Code CA	
CD	VV01 Code 11 and Shuttle Valve Code CA	
DB	VV01 Code 09 and Shuttle Valve Code DA	
DD	VV01 Code 11 and Shuttle Valve Code DA	
BH	VV01 Code 10 and Shuttle Valve Code CA and Position Control* with Amplifier	
BK	VV01 Code 12 and Shuttle Valve Code CA and Position Control* with Amplifier	
BN	VV01 Code 10 and Shuttle Valve Code DA and Position Control* with Amplifier	
BQ	VV01 Code 12 and Shuttle Valve Code DA and Position Control* with Amplifier	
BC	VV01 Code 10 and Position Control* with Amplifier	
BE	VV01 Code 12 and Position Control* with Amplifier	
BA	Position Control* with Amplifier	
BF	Position Control* with Amplifier and Shuttle Valve Code CA	
BL	Position Control* with Amplifier and Shuttle Valve Code DA	

Code	Description
Omit	Standard
013*	Cover for End Position Control

\* Switching type must be B option.

**Weight:**

D4S03	2.7 kg (6.0 lbs)
D4S06	4.5 kg (9.9 lbs)
D4S10	6.0 kg (13.2 lbs)

\* Position control for D4S06/10 only.  
 Spring 2 or 4. Spool A and sleeve 3.  
 Valve open: Proximity Switch damped.

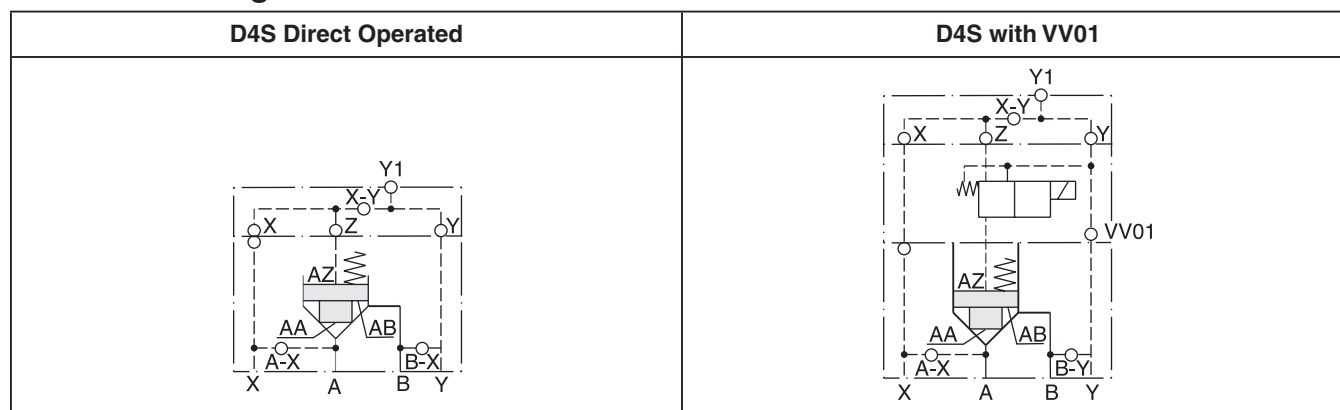
Code	Spring — Approx. Cracking Pressure in Bar (PSI)					
	Sleeve Code 1			Sleeve Code 3		
	A -> B		A -> B		B -> A	
	D4S03	D4S06/10	D4S03	D4S06/10	D4S03	D4S06/10
1	2.8 (40.6)	3.5 (50.8)	6.5 (94.3)	6.5 (94.3)	9.5 (137.8)	11.0 (159.5)
2	0.5 (7.3)	0.5 (7.3)	1.0 (14.5)	1.0 (14.5)	1.5 (21.8)	1.7 (24.7)
3	0.3 (4.4)	0.3 (4.4)	0.6 (8.7)	0.6 (8.7)	0.9 (13.1)	1.0 (14.5)
4	2.2 (31.9)	2.2 (31.9)	4.0 (58.0)	3.5 (50.8)	5.5 (79.8)	6.0 (87.0)
5	—	9.0 (130.5)	—	16.0 (232.0)	—	28.0 (406.0)
6	1.2 (17.4)	1.2 (17.4)	2.0 (29.0)	2.2 (31.9)	3.0 (43.5)	3.8 (55.1)
7	3.0 (43.5)	—	8.0 (116.0)	—	12.0 (174.0)	—

## Specifications

**A**

General							
<b>Size</b>		<b>03</b>		<b>06</b>		<b>10</b>	
<b>Mounting</b>	Subplate according to ISO 6264						
<b>Mounting Position</b>	Unrestricted						
<b>Ambient Temperature Range</b>	-20°C to +50°C (-4°F to +122°F)						
<b>MTTF<sub>D</sub></b>	150 years						
Hydraulic							
<b>Maximum Operating Pressure</b>	<b>Ports A, B</b>	up to 350 Bar (5075 PSI)		up to 350 Bar (5075 PSI)		up to 350 Bar (5075 PSI)	
	<b>Port Y with VV01</b>	140 Bar (2030 PSI)		140 Bar (2030 PSI)		140 Bar (2030 PSI)	
<b>Nominal Flow</b>	180 LPM (47.6 GPM)		360 LPM (95.2 GPM)		600 LPM (158.7 GPM)		
<b>Fluid</b>	Hydraulic oil as per DIN 51524 ... 51525						
<b>Fluid Temperature</b>	-20°C to +80°C (-4°F to +176°F)						
<b>Viscosity</b>	<b>Permitted</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU)					
	<b>Recommended</b>	30 cSt / mm <sup>2</sup> /s (139 SSU)					
<b>Filtration</b>	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)						
Electrical (Solenoid)							
<b>Duty Ratio</b>	100%						
<b>Response Time</b>	Energized / De-energized AC 20/18 ms, DC 46/27 ms						
<b>Protection Class</b>	IP65 in accordance with EN60529 (plugged and mounted)						
	<b>Code</b>	<b>G0R</b>	<b>G0Q</b>	<b>GAR</b>	<b>GAG</b>	<b>W30</b>	<b>W31</b>
<b>Supply Voltage</b>		12V	24V	98V	205V	110V at 50Hz/ 120V at 60 Hz	220V at 50Hz/ 240V at 60Hz
<b>Tolerance Supply Voltage</b>		+5 to -10	+5 to -10	+5 to -10	+5 to -10	+5 to -10	+5 to -10
<b>Power Consumption, Hold</b>	<b>[W]</b>	31	31	31	31	78	78
<b>Power Consumption, In Rush</b>	<b>[W]</b>	31	31	31	31	264	264
<b>Max. Switching Frequency</b>	<b>[1/h]</b>	AC up to 7200; DC up to 16,000 switchings/hour					
<b>Solenoid Connection</b>	Connector as per EN175301-803						
<b>Protection Class</b>	IP65 in accordance with EN 60529 (plugged and mounted)						
<b>Coil Insulation Class</b>	H (180°C) (356°F)						

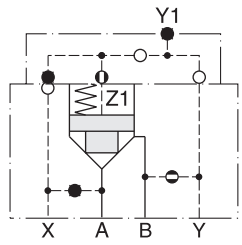
## D4S Pilot Configuration



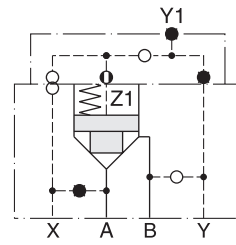




**D4S Direct Operated Examples**

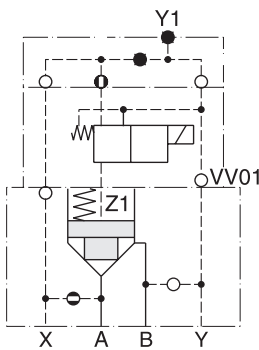


D4S...DC  
 Pilot oil Y = internal from B

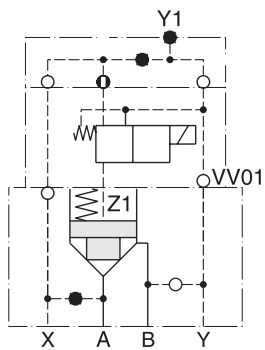


D4S...21  
 Pilot oil X = external

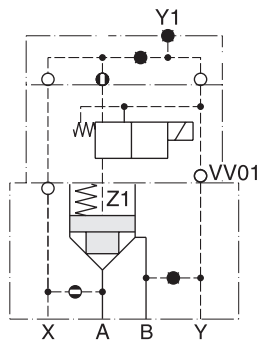
**D4S with VV01 Examples**



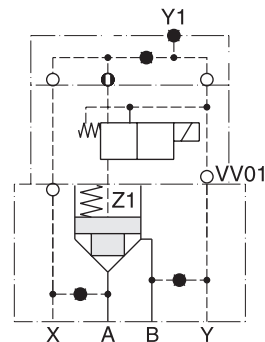
D4S...16...  
 09 } with VV01  
 10 }  
 11 }  
 12 }  
 Pilot oil X = internal from A  
 Drain Y = internal to B



D4S...26...  
 09 } with VV01  
 10 }  
 11 }  
 12 }  
 Pilot oil X = external  
 Drain Y = internal to B



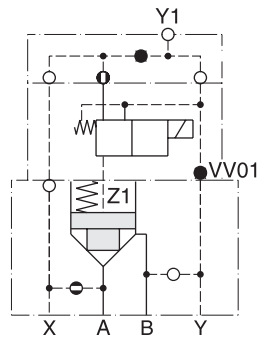
D4S...A5...  
 09 } with VV01  
 10 }  
 11 }  
 12 }  
 Pilot oil X = internal from A  
 Drain Y = external to subplate



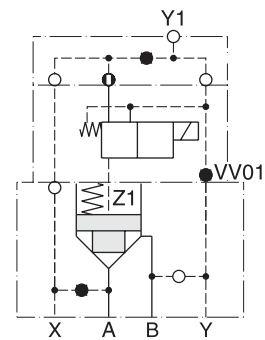
D4S...B5...  
 09 } with VV01  
 10 }  
 11 }  
 12 }  
 Pilot oil X = external  
 Drain Y = external to subplate



**D4S with VV01 Examples**

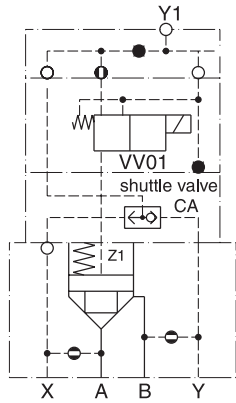


D4S...-12... } with VV01  
 09  
 10  
 11  
 12  
 Pilot oil X = internal from A  
 Drain Y1 = external out of the cap

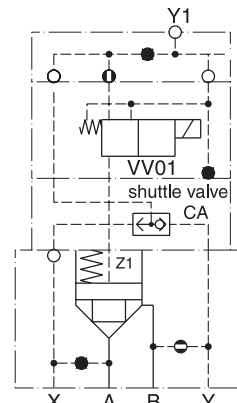


D4S...-22... } with VV01  
 09  
 10  
 11  
 12  
 Pilot oil X = external  
 Drain Y1 = external out of the cap

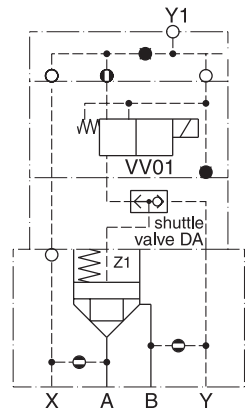
**D4S with Shuttle Valve Examples**



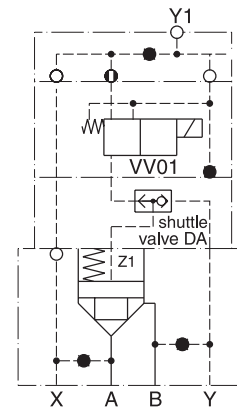
D4S...-C2... } with shuttle valve CA  
 CB } and VV01  
 CD }  
 Pilot oil = internal from A and B  
 Drain Y1 = external out of the cap



D4S...-D2... } with shuttle valve CA  
 CB } and VV01  
 CD }  
 Pilot oil = internal from B and  
 external from X  
 Drain Y1 = external out of the cap



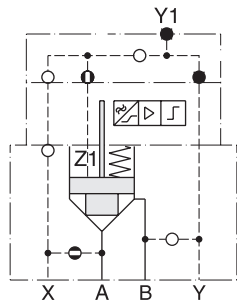
D4S...-C2... } with shuttle valve DA  
 DB } and VV01  
 DD }  
 Pilot oil = internal from A and B  
 (B-A = Check valve function)  
 Drain Y1 = external out of the cap



D4S...-B2... } with shuttle valve DA  
 DB } and VV01  
 DD }  
 Pilot oil = external from X and Y  
 Drain Y1 = external out of the cap

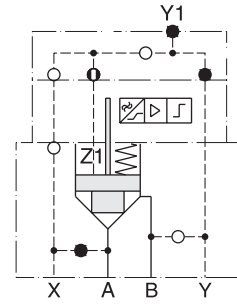


**D4S with Position Control Examples**



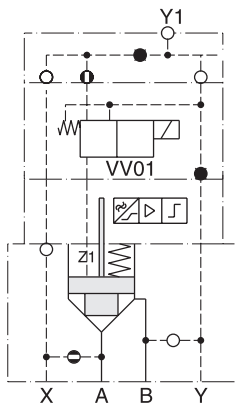
D4S.-.113A.BA  
 (with position control)

Pilot oil X = internal from A



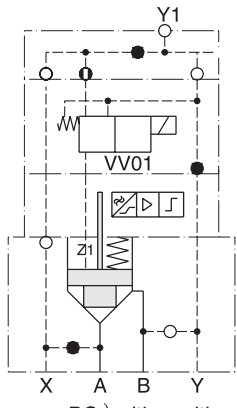
D4S.-.213A.BA  
 (with position control)

Pilot oil X = external



D4S.-.123A. BC } with position control  
 BE } and VV01

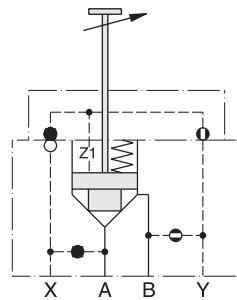
Pilot oil X = internal from A  
 Drain Y1 = external out of the cap



D4S.-.223A. BC } with position control  
 BE } and VV01

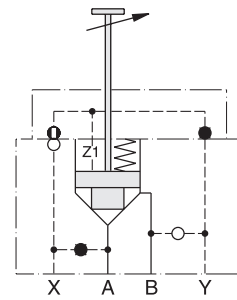
Pilot oil X = external  
 Drain Y1 = external out of the cap

**D4S with Stroke Limiter Examples**



D4S.-.D434. with stroke limiter  
 Pilot oil Y = internal from B

Note: for D4S06 and D4S10 only

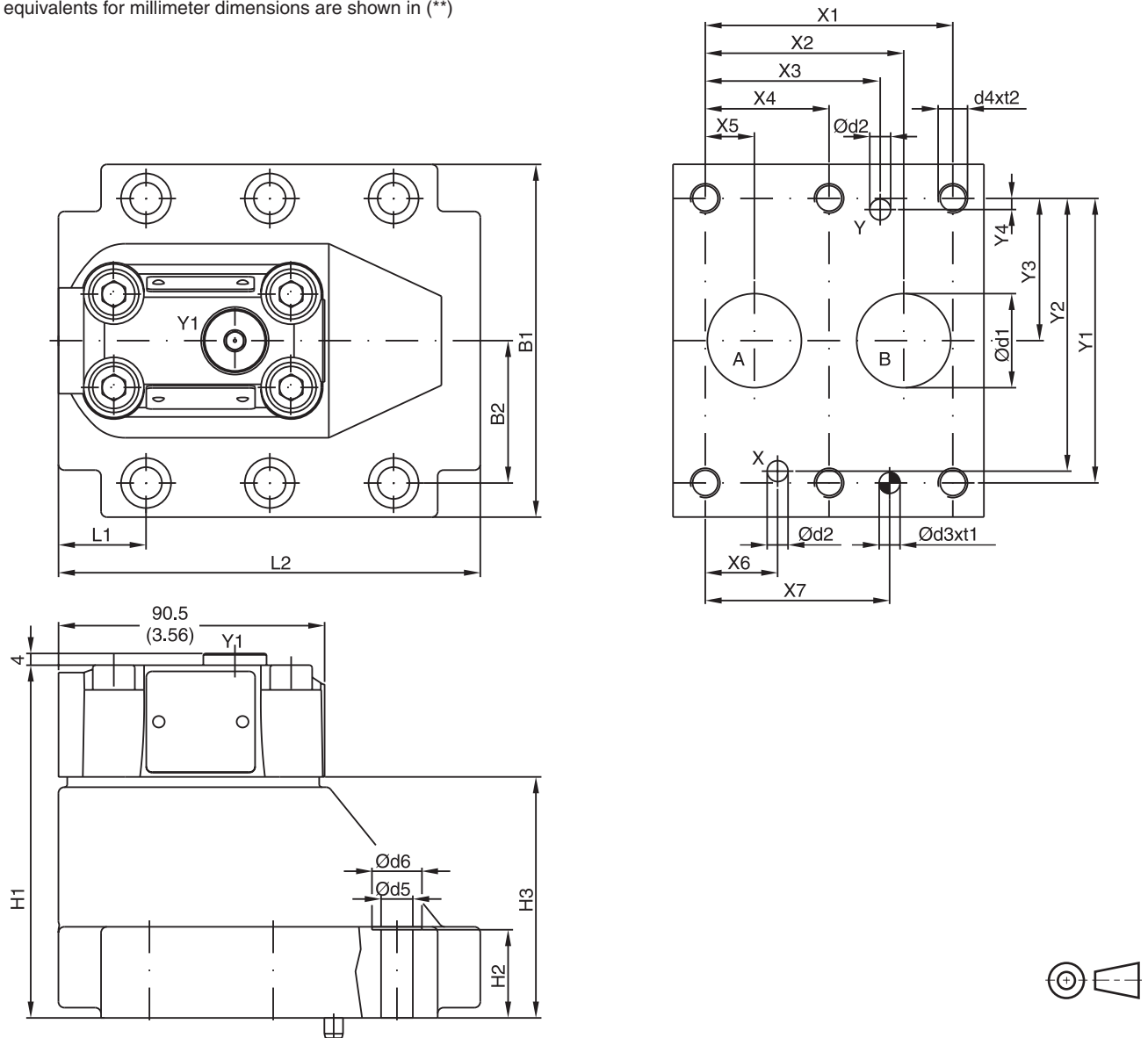


D4S.-.233B. with stroke limiter  
 Pilot oil X = external

Note: for D4S06 and D4S10 only

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

**A**



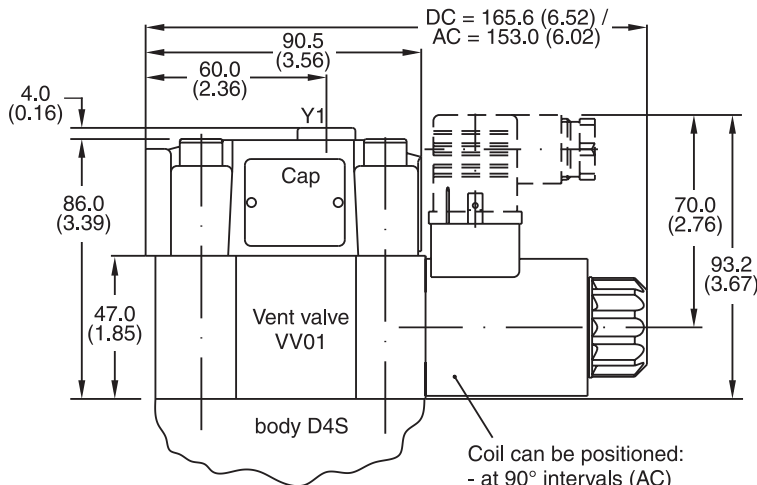
NG	ISO-code	X1	X2	X3	X4	X5	X6	X7	Y1	Y2	Y3	Y4
10	6264-06-09-*-97	42.9 (1.69)	35.8 (1.41)	21.5 (0.85)	-	7.2 (0.28)	21.5 (0.85)	31.8 (1.25)	66.7 (2.63)	58.8 (2.31)	33.4 (1.31)	7.9 (0.31)
25	6264-08-13-*-97	60.3 (2.37)	49.2 (1.94)	39.7 (1.56)	-	11.1 (0.44)	20.6 (0.81)	44.5 (1.75)	79.4 (3.13)	73.0 (2.87)	39.7 (1.56)	6.4 (0.25)
32	6264-10-17-*-97	84.2 (3.31)	67.5 (2.66)	59.5 (2.34)	42.1 (1.66)	16.7 (0.66)	24.6 (0.97)	62.7 (2.47)	96.8 (3.81)	92.8 (3.65)	48.4 (1.91)	3.8 (0.15)

NG	ISO-code	B1	B2	H1	H2	H3	L1	L2	D1	D2	D3	t1	D4	t2	D5	D6
10	6264-06-09-*-97	87.3 (3.44)	33.35 (1.31)	83.0 (3.27)	21.0 (0.83)	45.0 (1.77)	29.0 (1.14)	94.8 (3.73)	15.0 (0.59)	7.0 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	16.0 (0.63)	10.8 (0.43)	17.0 (0.67)
25	6264-08-13-*-97	105.0 (4.13)	39.7 (1.56)	109.5 (4.31)	29.0 (1.14)	71.5 (2.81)	34.7 (1.37)	126.8 (4.99)	23.4 (0.92)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	18.0 (0.71)	110.8 (4.33)	17.0 (0.67)
32	6264-10-17-*-97	120.0 (4.72)	48.4 (1.91)	120.0 (4.72)	29.0 (1.14)	82.0 (3.23)	30.6 (1.20)	144.3 (5.68)	32.0 (1.26)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	20.0 (0.79)	10.8 (0.43)	17.0 (0.67)

NG	ISO-code	Bolt Kit			Seal Kit		Surface Finish		
					Nitrile	Fluorocarbon			
10	6264-06-07-*-97	BK 505	4x M10 x 35	DIN 912	12.9	63 Nm	S26-58507-0	S26-58507-5	
25	6264-08-11-*-97	BK 485	4x M10 x 45	DIN 912	12.9	(46.5 lb.-ft.)	S26-58475-0	S26-58475-5	
32	6264-10-15-*-97	BK 506	6x M10 x 45	DIN 912	12.9	±15%	S26-58508-0	S26-58508-5	

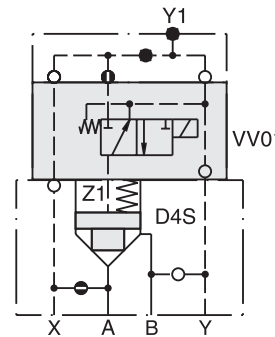
Inch equivalents for millimeter dimensions are shown in (\*\*)

**D4S with VV01**



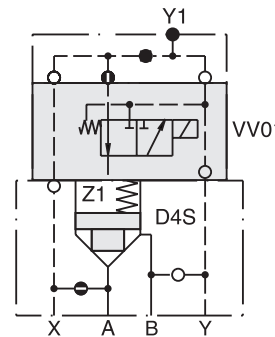
VV01 Seal Kits	
Nitrile	Fluorocarbon
DC Solenoid	
S26-58515-0	S26-58515-5
AC Solenoid	
S26-35237-0	S26-35237-5

Coil can be positioned:  
- at 90° intervals (AC)  
- in any position (DC)



with manual override | without manual override

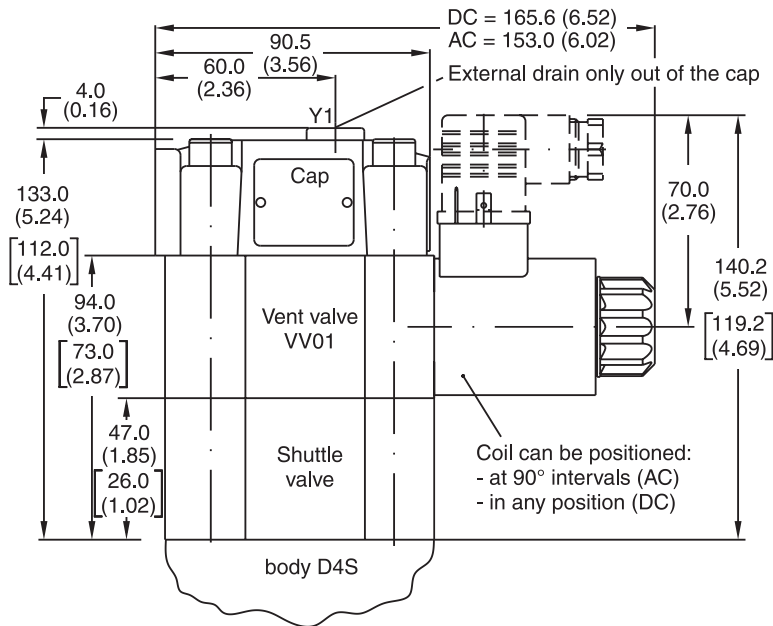
D4S.-..... 09/10  
Solenoid energized:  
D4S blocked  
Solenoid de-energized:  
Flow from A-B or B-A



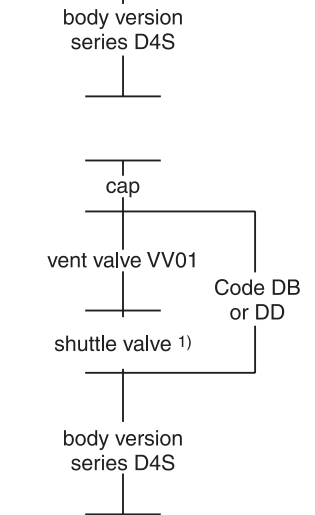
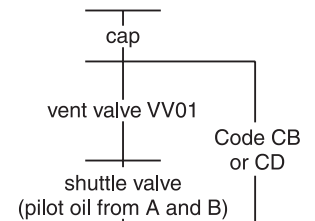
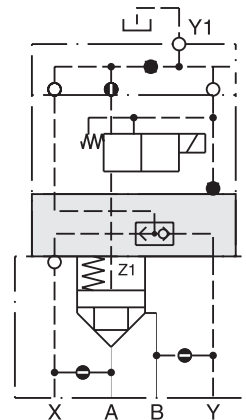
with manual override | without manual override

D4S.-..... 11/12  
Solenoid energized:  
Flow from A-B or B-A  
Solenoid de-energized:  
D4S Blocked

**D4S with Shuttle Valve**



Coil can be positioned:  
- at 90° intervals (AC)  
- in any position (DC)



Dimensions in brackets [ ] are for version VV01 with shuttle valve code DB or DD.

**Note:** Shuttle valves only use in connection with vent valve VV01.

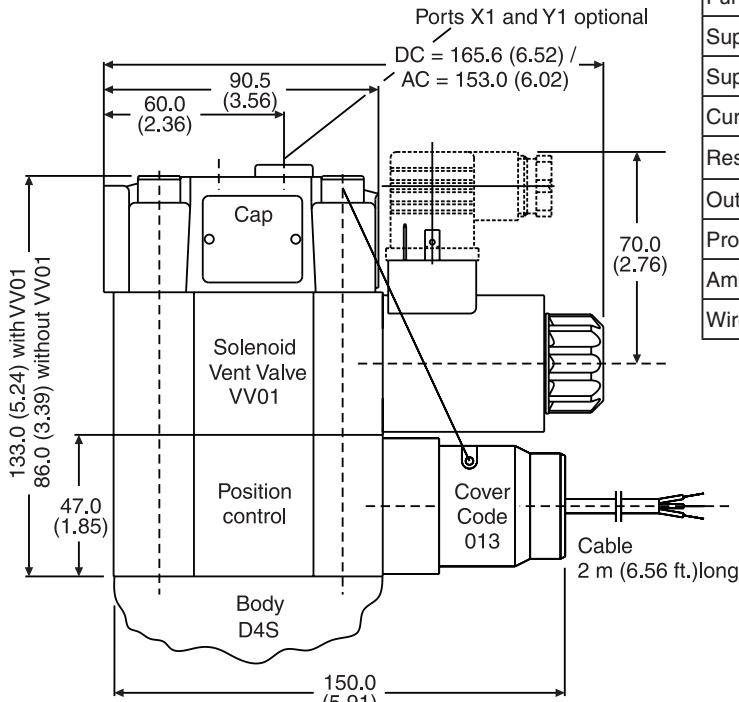
1) pilot oil from A and B,  
from B to A check valve function



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

**A**

**Dimensions D4S Position Control**



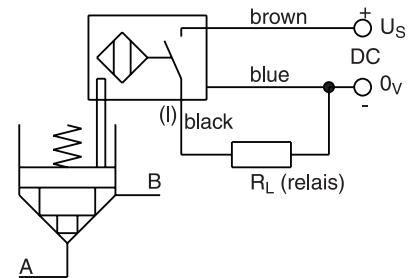
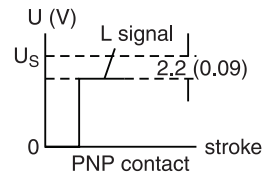
**Position Control by Proximity Switch (incl. Amplifier)**

Valve open: proximity switch activated.  
This proximity switch is pressure proof and has no wearing parts.

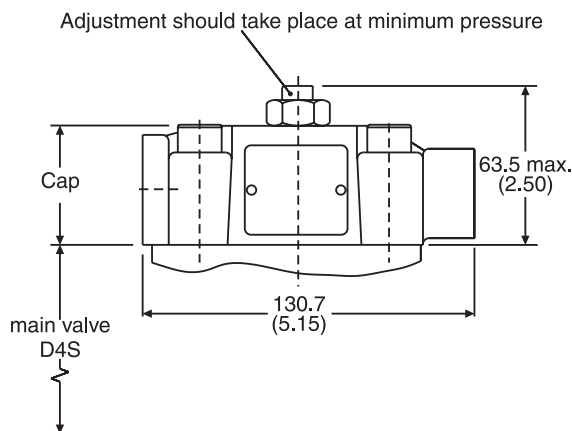
Note: Position control for D4S06 and D4S10 only.

**Technical Information (proximity switch)**

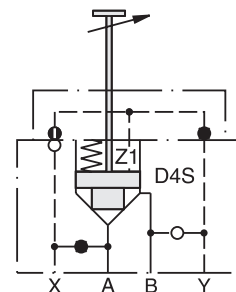
Function		PNP, contact
Supply voltage (Us)	[VDC]	10...30
Supply voltage ripple	[%]	≤ 10
Current consumption	[mA]	max. 8
Residual voltage L-signal	[V]	U <sub>S</sub> - 2.2 at I <sub>max</sub>
Output current (I)	[mA]	≤ 200
Protection class		IP67
Ambient temperature	[C°]	-25...+70; (-13°F...+158° F)
Wire cross section	[mm <sup>2</sup> ]	3 x 0.5



**Dimensions D4S Stroke Limiter**



Example: D4S<sub>10</sub><sup>06</sup>-.23-3B.



**Note:** Stroke limiter not for use with D4S03, vent valve VV01, shuttle valve and position control.

**General Description**

Series D4S seat valves are designed for directional control functions. A large variety of poppets, springs and covers – including shuttle valves, stroke limiters, solenoid valves (VV01) and position control – allow to design individual hydraulic solutions for nominal flow up to 600 LPM (158.7 GPM).

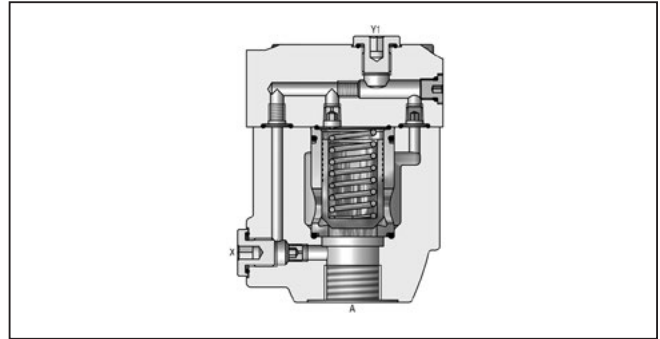
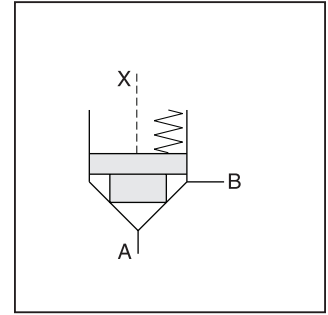
A complete program is offered under the Parker brand: subplate mounted valves (D4S ), SAE flange valves (D5S), pipe mounted valves (D4S), slip-in cartridges (CAR – on request).

**Features**

- Leak-free seat valve design.
- 2 body designs
  - L-body (2-port); T-body (3-port)
- Numerous pilot options.
- 6 poppet types.
- 4 port sizes
  - G 1/2", G 1" for T-body; G 3/4", G 1 1/2" for L-body .



D4S10 L-Body



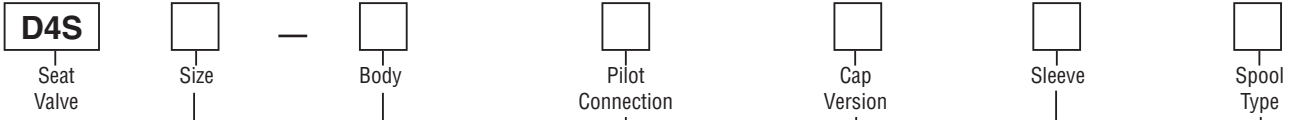
D4S06 L-Body

**Selection of Cartridges**

Sleeve 1, Poppet 1	Sleeve 1, Poppet 2	Sleeve 1, Poppet 4	Sleeve 3, Poppet 4	Sleeve 3, Poppet A	Sleeve 3, Poppet B/C
1 : 1.05 $A_A = 0.95 A_C$ $A_B = 0.05 A_C$ 15° chamfer	1 : 1.05 $A_A = 0.95 A_C$ $A_B = 0.05 A_C$ 15° chamfer orifice	1 : 1.05 $A_A = 0.95 A_C$ $A_B = 0.05 A_C$ 45° chamfer	1 : 1.67 $A_A = 0.6 A_C$ $A_B = 0.4 A_C$ 45° chamfer	1 : 1.67 $A_A = 0.6 A_C$ $A_B = 0.4 A_C$ 45° chamfer safety spool	1 : 1.67 $A_A = 0.6 A_C$ $A_B = 0.4 A_C$ 45° chamfer throttle spool

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

Ordering Information, Performance Curves Series D4S (Inline Mounted)



Code	Description
03	NG10 (CAR4 build-in)
06	NG25 (CAR2 build-in)
10	NG32 (CAR2 build-in)

Code	Pilot Oil Line in Body	A-X	B-Y
1	Internal from A	●	○
2	External from X	●	○

Code	Description
1	AA=95%, AB=5%
3	AA=60%, AB=40%

Code	Body	Ports
6	D4S03 T-body D4S06 T-body	A, B = G1/2"; X, Y1 = G1/4" A, B = G1"; X, Y1 = G1/4"
D	D4S06 L-body D4S10 L-body	A, B = G3/4"; X, Y1 = G1/4" A, B = G1 1/4"; X, Y1 = G1/4"

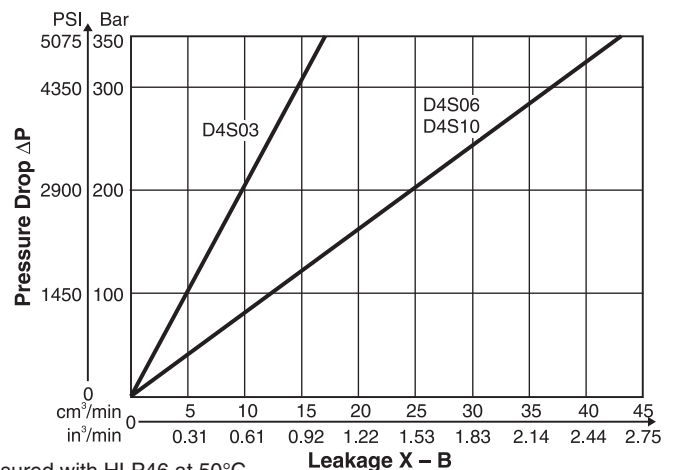
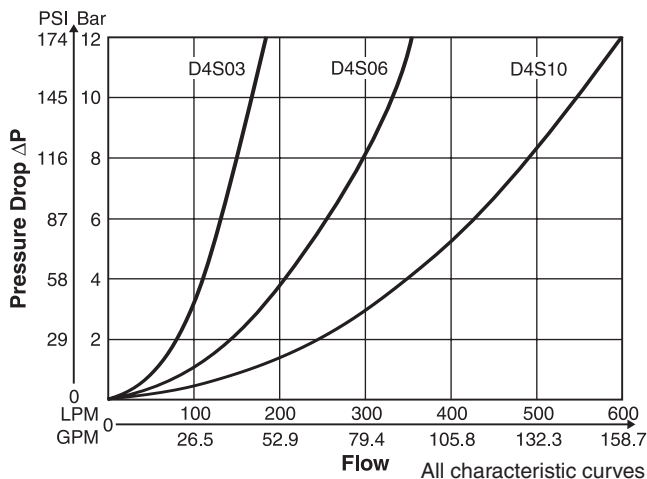
Code	Ports	X	Y	Z	X-Y	Y1	VV01
<b>Standard</b>							
1	Pilot Oil = Pilot Drain	○	●	●	○	●	—
C	Pilot Oil = Pilot Drain	●	○	●	○	●	—
<b>With Solenoid Valve (VV01)</b>							
2	External PD from cap	○	○	●	●	○	●
6	Internal pilot drain	○	○	●	●	●	○
<b>With Stroke Limiter (not for D4S03)</b>							
3	Pilot Oil = Pilot Drain	●	●	—	—	—	—
4	Pilot Oil = Pilot Drain	●	●	—	—	—	—

Key: ○ Open Bore ● Closed Bore ● Orifice Ø 1.2  
 Note: Combination examples provided on pages A227-A229.

Code	Size	Poppet Type	Sleeve
1	03, 06, 10	With closed bottom and 15° chamfer (pZ max. = pA +20 Bar (290 PSI))	1
2	03	With 0.8 dia. orifice at the bottom and 15° chamfer	1
	06, 10	With 1.2 dia. orifice at the bottom and 15° chamfer	1
4	03, 06, 10	With closed bottom and 45° chamfer	1, 3
A*	06, 10	Safety spool (for end position control only)	3
B*	06, 10	Throttle spool, 10° chamfer	3
C*	06, 10	Throttle spool, 3° chamfer	3

\* Springs 2, 3 and 6 only.

Performance Curves







Spring

Switching Type

Solenoid Voltage

**B**  
Design Series

Seal

Options

Code	Description
Omit	Standard w/o vent function
G0R	12V
G0Q	24V
GAR*	98V
GAG*	205V
W30	110V 50Hz / 120V 60Hz
W31	230V 50Hz / 240V 60Hz

\* To be used in combination with rectifier plugs at 120 VAC / 230 VAC power supply.

Code	Description
1	Nitrile
5	Fluorocarbon

Code	Description
Omit	Standard
013	Cover for End Position Control

Code	Description	
Omit	Standard without Vent Function	
09	VV01 with Manual Override	De-energized; open
10	VV01 without Manual Override	
11	VV01 with Manual Override	De-energized; closed
12	VV01 without Manual Override	
CA	Shuttle Valve	
DA	Shuttle Valve	
CB	VV01 Code 09 and Shuttle Valve Code CA	
CD	VV01 Code 11 and Shuttle Valve Code CA	
DB	VV01 Code 09 and Shuttle Valve Code DA	
DD	VV01 Code 11 and Shuttle Valve Code DA	
BH*	VV01 Code 10 and Shuttle Valve Code CA and Position Control with Amplifier	
BK*	VV01 Code 12 and Shuttle Valve Code CA and Position Control with Amplifier	
BN*	VV01 Code 10 and Shuttle Valve Code DA and Position Control with Amplifier	
BQ*	VV01 Code 12 and Shuttle Valve Code DA and Position Control with Amplifier	
BC*	VV01 Code 10 and Position Control with Amplifier	
BE*	VV01 Code 12 and Position Control with Amplifier	
BA*	Position Control with Amplifier	
BF*	Position Control with Amplifier and Shuttle Valve Code CA	
BL*	Position Control with Amplifier and Shuttle Valve Code DA	

\* Position control for D4S06/10 only.  
 Spring 2 or 4. Spool A and sleeve 3.  
 Valve open: Proximity Switch damped.

**Weight:**

D4S03 T-body	3.2 kg (7.1 lbs)
D4S06 Tbody	6.6 kg (14.6 lbs)
D4S06 L-body	3.3 kg (7.3 lbs)
D4S10 L-body	5.6 kg (12.3 lbs)

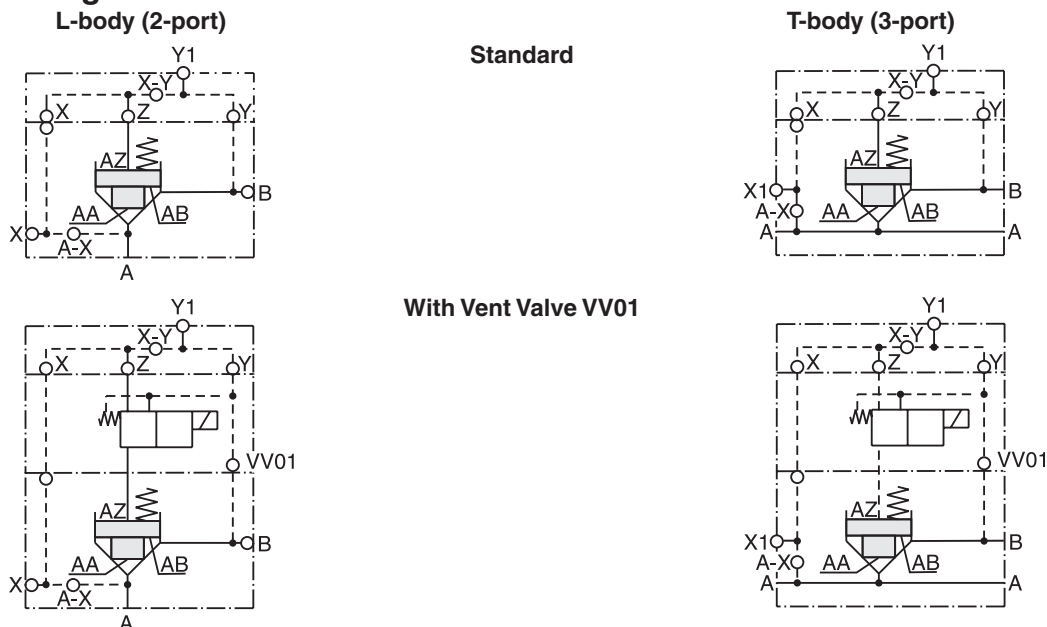
Code	Spring — Approx. Cracking Pressure in Bar (PSI)					
	Sleeve Code 1		Sleeve Code 3			
	A > B		A > B		B > A	
	D4S03	D4S06/10	D4S03	D4S06/10	D4S03	D4S06/10
1	2.8 (40.6)	3.5 (50.8)	6.5 (94.3)	6.5 (94.3)	9.5 (137.8)	11.0 (159.5)
2	0.5 (7.3)	0.5 (7.3)	1.0 (14.5)	1.0 (14.5)	1.5 (21.8)	1.7 (24.7)
3	0.3 (4.4)	0.3 (4.4)	0.6 (8.7)	0.6 (8.7)	0.9 (13.1)	1.0 (14.5)
4	2.2 (31.9)	2.2 (31.9)	4.0 (58.0)	3.5 (50.8)	5.5 (79.8)	6.0 (87.0)
5	—	9.0 (130.5)	—	16.0 (232.0)	—	28.0 (406.0)
6	1.2 (17.4)	1.2 (17.4)	2.0 (29.0)	2.2 (31.9)	3.0 (43.5)	3.8 (55.1)
7	3.0 (43.5)	—	8.0 (116.0)	—	12.0 (174.0)	—

## Specifications

**A**

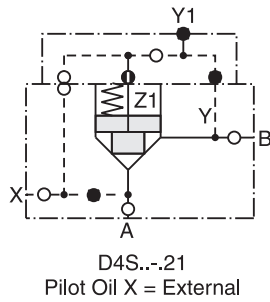
General							
<b>Design</b>	T-body			L-body			
<b>Size</b>	03 (1/2")		06 (1")		06 (3/4")		10 (1 1/4")
<b>Mounting</b>	Threaded body						
<b>Mounting Position</b>	Unrestricted						
<b>Ambient Temperature Range</b>	[°C]	-20 to +50 (-4°F to +122°F)					
<b>MTTF<sub>D</sub></b>	[years]	150					
Hydraulic							
<b>Maximum Operating Pressure</b>	<b>Ports A, B</b>	up to 350 Bar (5075 PSI)					
	<b>Port Y</b>	140 Bar (2030 PSI) with VV01					
<b>Nominal Flow</b>	180 LPM (47.6 GPM)		360 LPM (95.2 GPM)		360 LPM (95.2 GPM)		600 LPM (158.7 GPM)
<b>Fluid</b>	Hydraulic oil as per DIN 51524 ... 51525						
<b>Fluid Temperature</b>	[°C]	-20 to +80 (-4°F to +176°F)					
<b>Viscosity Permitted</b>	<b>cSt / mm<sup>2</sup>/s</b>	10 to 650 (46 to 3013 SSU)					
<b>Recommended</b>	<b>cSt / mm<sup>2</sup>/s</b>	30 to 80 (139 to 371 SSU)					
<b>Filtration</b>	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)						
Electrical (Solenoid)							
<b>Duty Ratio</b>	100%						
<b>Response Time</b>	Energized / De-energized AC 20/18 ms, DC 46/27 ms						
	<b>Code</b>	<b>G0R</b>	<b>G0Q</b>	<b>GAR</b>	<b>GAG</b>	<b>W30</b>	<b>W31</b>
<b>Supply Voltage</b>	[V]	12	24	98	205	110 at 50Hz/ 120 at 60 Hz	220 at 50Hz/ 240 at 60Hz
<b>Tolerance Supply Voltage</b>	[%]	+5 to -10	+5 to -10	+5 to -10	+5 to -10	+5 to -10	+5 to -10
<b>Power Consumption, Hold</b>	[W]	31	31	31	31	78	78
<b>Power Consumption, In Rush</b>	[W]	31	31	31	31	264	264
<b>Max. Switching Frequency</b>	[1/h]	AC up to 7200; DC up to 16,000 switchings/hour					
<b>Solenoid Connection</b>	Connector as per EN175301-803						
<b>Protection Class</b>	IP65 in accordance with EN 60529 (plugged and mounted)						
<b>Coil Insulation Class</b>	H (180°C) (356°F)						

## D4S Pilot Configuration

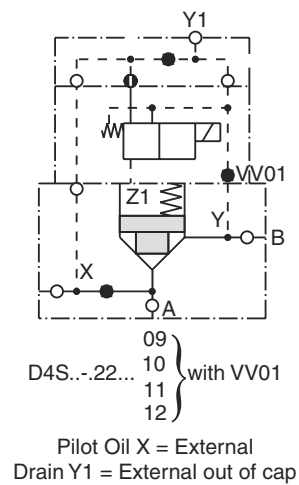
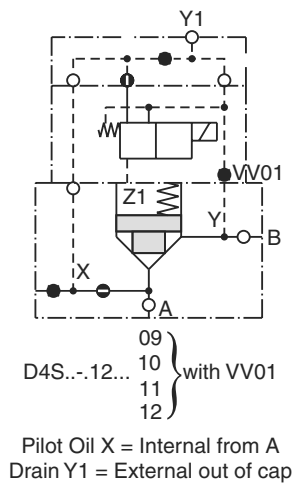
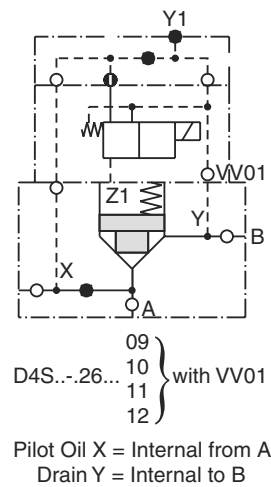
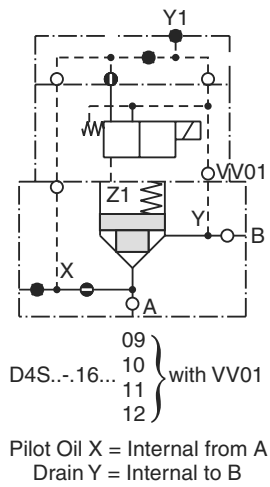




**D4S Direct Operated Example**

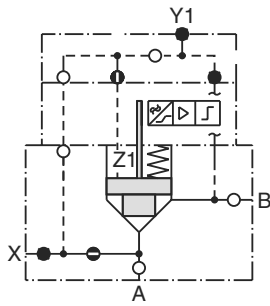


**D4S with Solenoid Valve VV01 Examples**



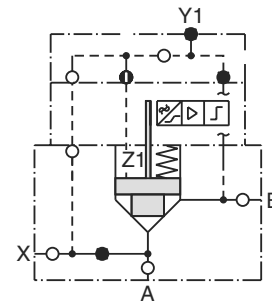
**D4S with Position Control Examples**

**A**



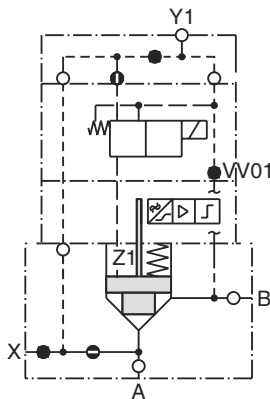
D4S...113A.BA  
 (with Position Control)

Pilot Oil X = Internal from A



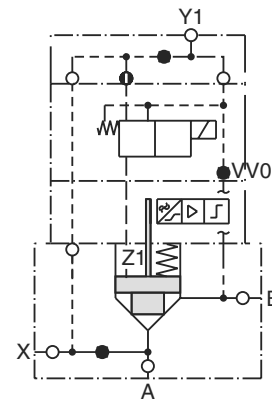
D4S...213A.BA  
 (with Position Control)

Pilot Oil X = External



D4S...123A. BC } with Position Control  
 BE } and VV01

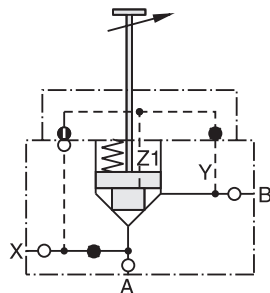
Pilot Oil X = Internal from A  
 Drain Y1 = External out of Cap



D4S...223A. BC } with Position Control  
 BE } and VV01

Pilot Oil X = External  
 Drain Y1 = External out of Cap

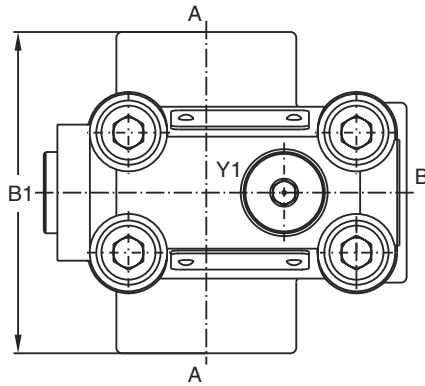
**D4S with Stroke Limiter Example**



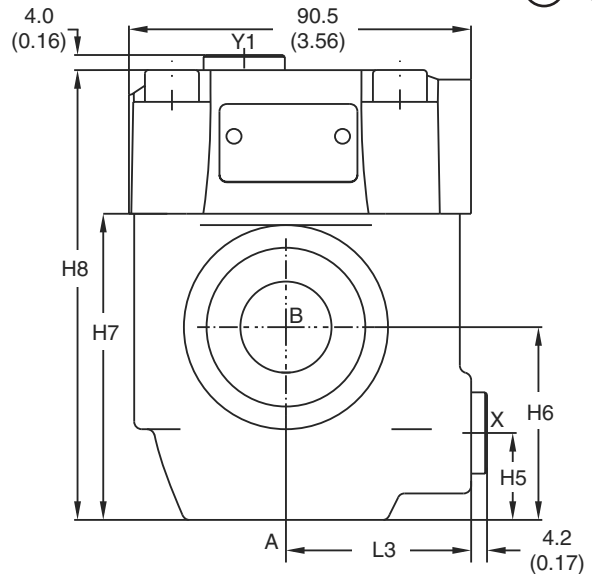
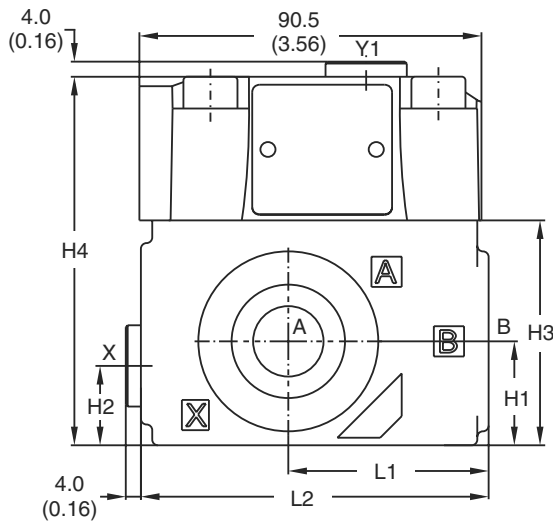
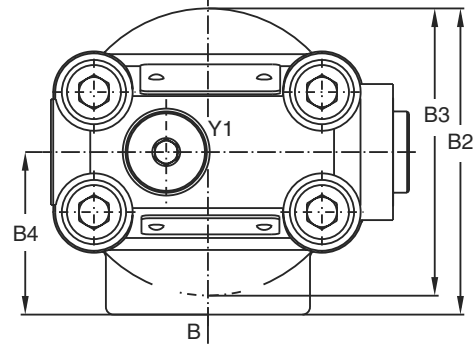
D4S...233B. with Stroke Limiter  
 Pilot Oil X = External  
 (Note: for D4S06 and D4S10 only)

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

**D4S 03/06 T-body**



**D4S 06/10 L-body**



Size	L1	L2	B1	H1	H2	H3	H4
03 (T-body)	53.0 (2.09)	92.0 (3.62)	85.0 (3.35)	27.5 (1.08)	21.0 (0.83)	59.5 (2.34)	97.5 (3.84)
06 (T-body)	66.5 (2.62)	117.5 (4.63)	136.0 (5.35)	38.0 (1.50)	28.0 (1.10)	93.0 (3.66)	131.0 (5.16)

Size	L3	B2	B3	B4	H5	H6	H7	H8
06 (L-body)	49.0 (1.93)	81.0 (3.19)	76.0 (2.99)	43.0 (1.69)	23.0 (0.91)	51.0 (2.01)	81.0 (3.19)	119.0 (4.69)
10 (L-body)	49.8 (1.96)	120.7 (4.75)	85.6 (3.37)	77.8 (3.06)	38.1 (1.50)	50.8 (2.00)	96.0 (3.78)	134.0 (5.28)

Ports	Function	Port Size			
		D4S03 T-body	D4S06 T-body	D4S06 L-body	D4S10 L-body
A	Inlet or Outlet	G1/2"	G1"	G3/4"	G1 1/4"
B	Outlet or Inlet	G1/2"	G1"	G3/4"	G1 1/4"
X1	External Pilot Port	G1/4"			
Y1	External Drain*	G1/4"			

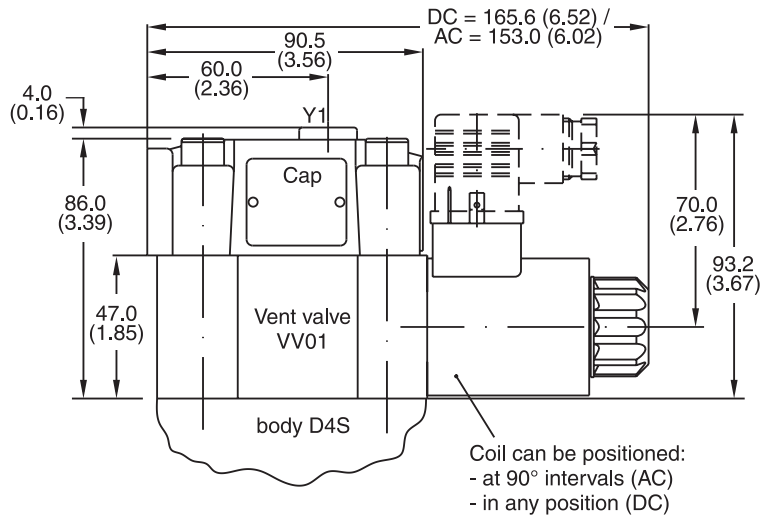
\* With VV01 only.

Seal Kits		
Size	Nitrile	Fluorocarbon
03	S26-58507-0	S26-58507-5
06	S26-58475-0	S26-58475-5
10	S26-38508-0	S26-38508-5

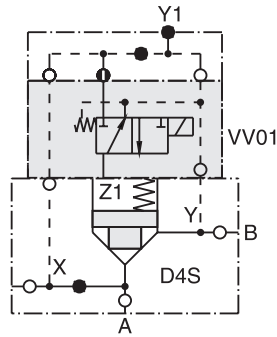
Inch equivalents for millimeter dimensions are shown in (\*\*)

**D4S with VV01**

**A**

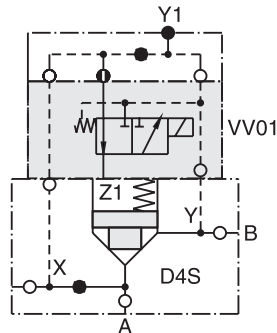


VV01 Seal Kits	
Nitrile	Fluorocarbon
DC Solenoid	
S26-58515-0	S26-58515-5
AC Solenoid	
S26-35237-0	S26-35237-5



with manual override      without manual override

D4S... 09/10  
Solenoid energized:  
D4S blocked  
Solenoid de-energized:  
Flow from A-B or B-A

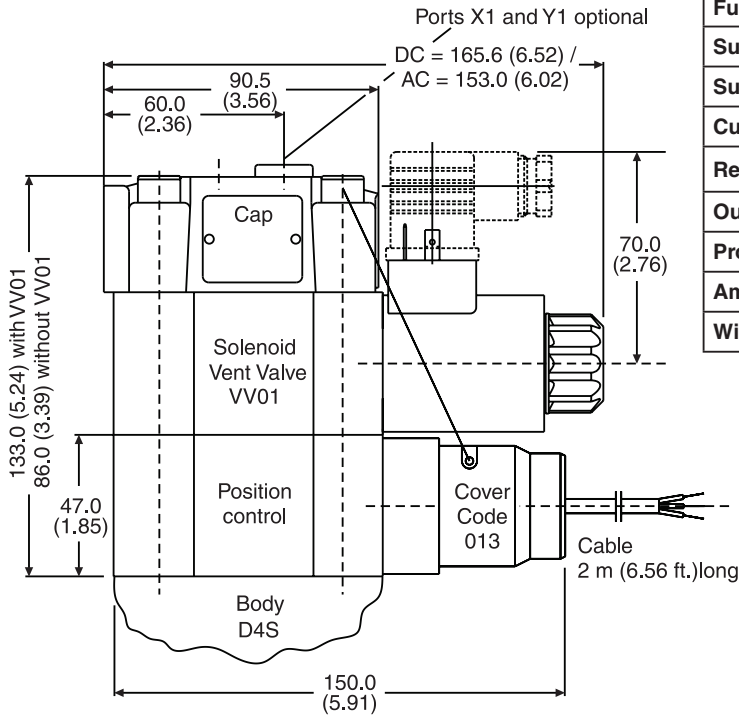


with manual override      without manual override

D4S... 11/12  
Solenoid energized:  
Flow from A-B or B-A  
Solenoid de-energized:  
D4S Blocked

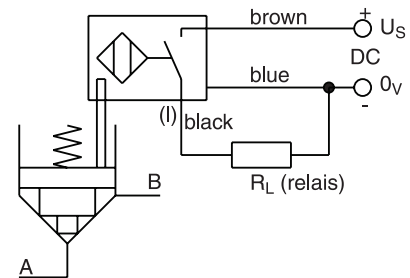
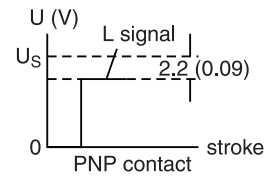
Inch equivalents for millimeter dimensions are shown in (\*\*)

**D4S Position Control**



**Technical Information (proximity switch)**

Function		PNP, contact
Supply voltage (Us)	[VDC]	10...30
Supply voltage ripple	[%]	≤ 10
Current consumption	[mA]	max. 8
Residual voltage L-signal	[V]	$U_S - 2.2$ at $I_{max}$
Output current (I)	[mA]	≤ 200
Protection class		IP67
Ambient temperature	[C°]	-25...+70; (-13°F...+158° F)
Wire cross section	[mm <sup>2</sup> ]	3 x 0.5

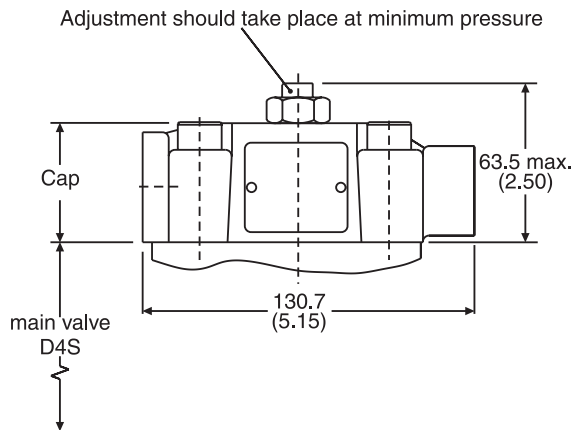


**Position Control by Proximity Switch (incl. Amplifier)**

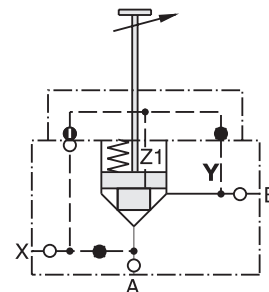
Valve open: proximity switch activated.  
This proximity switch is pressure proof and has no wearing parts.

Note: Position control for D4S06 and D4S10 only.

**D4S Stroke Limiter**



Example: D4S<sub>10</sub><sup>06</sup>-233B.



**Note:** Stroke limiter not for use with D4S03, vent valve VV01, shuttle valve and position control.





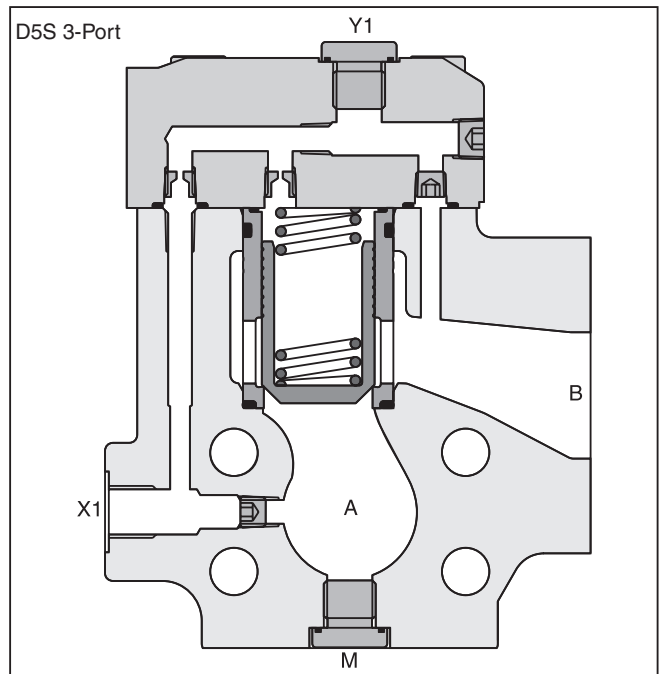
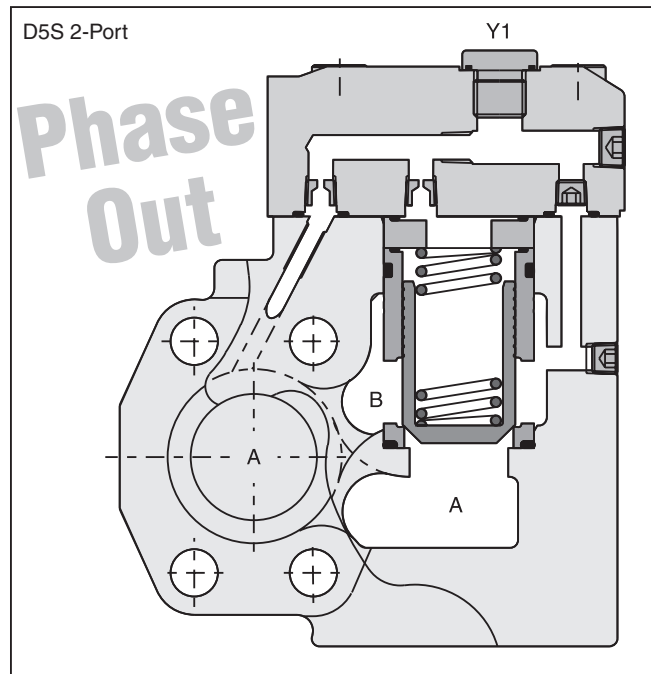
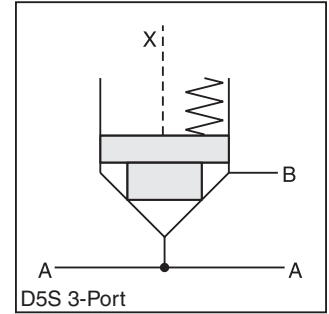
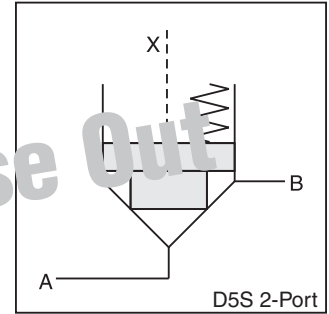


**General Description**

Series D5S seat valves are designed for directional control functions. They enable individual hydraulic solutions for nominal flow up to 800 LPM (211.6 GPM) due to a large variety of poppets, springs and covers, including shuttle valves, stroke limiters, solenoid valves (VV01) and position control.

**Features**

- Leak-free seat valve design.
- 2- and 3-port bodies.  
*Note: 2-port bodies are being phased out.*
- SAE61 flange.
- Numerous pilot options.
- 6 poppet types.
- 4 sizes (SAE 3/4", 1", 1 1/4", 1 1/2").



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**A**

**A**

**D5S**  
 Seat Valve

Size

Body

Pilot Body Configuration

Pilot Cap

Sleeve

Spool Type

Code	Description
06	SAE 3/4"
08	SAE 1"
10	SAE 1-1/4"
12*	SAE 1-1/2"

\* D5S 3-Port only

Code	Body	Ports
9	3-Port	Seat entry, A; X1, Y1, M = SAE 4
1	2-Port	Seat entry, A; X1, Y1, M = SAE 4
2	2-Port	Annular entry, B; X1, Y1, M = SAE 4

Code	Pilot Oil Line in Body
1	Internal from A
2	Internal from B
3	Internal from A and B
4	External from X1
5	Internal from B, External from X1

Code	Description
1	AA=95%, AB=5%
3	AA=60%, AB=40%

Note: All 2-Port bodies are being phased out.

Code	Body	Ports	X	Y	Z	X-Y	X1	Y1	VV01
<b>Standard</b>									
1	2 and 3-Port	Pilot Oil = Pilot Drain	●	●	●	○	-	●	-
2	2 and 3-Port	Pilot Oil = Pilot Drain	●	●	●	○	-	●	-
3	2-Port	Pilot Oil = Pilot Drain	●	●	●	○	○	●	-
<b>With Solenoid Valve (VV01)</b>									
4	2 and 3-Port	Internal to B	●	○	●	●	-	●	○
5	2-Port	Internal to B	●	○	●	●	○	●	○
6	2 and 3-Port	External Out of Cap	●	○	●	●	-	○	●
7	2-Port	External Out of Cap	●	○	●	●	○	○	●
<b>With Stroke Limiter (not for D5S06)</b>									
A	2 and 3-Port	Pilot Oil = Pilot Drain	●	●	●	-	●	-	-
B	2 and 3-Port	Pilot Oil = Pilot Drain	●	●	-	-	●	-	-
C	2-Port	Pilot Oil = Pilot Drain	●	●	●	-	○	-	-

Code	Size	Poppet Type	Sleeve
1	06, 08, 10, 12	With closed bottom and 15° chamfer (pZ max. = pA +20 Bar (290 PSI))	1
2	06	With 0.8 dia. orifice at the bottom and 15° chamfer	1
	08, 10	With 1.2 dia. orifice at the bottom and 15° chamfer	1
4	06, 08, 10, 12	With closed bottom and 45° chamfer	1, 3
A*	08, 10, 12	Safety spool (for end position control only)	3
B*	08, 10, 12	Throttle spool, 10° chamfer	3
C*	08, 10, 12	Throttle spool, 3° chamfer	3

Key: ○ Open Bore ● Closed Bore ● Orifice ∅ 1.2  
 Note: Combination examples provided on pages A238-A242.

\* Springs 2, 3 and 6 only.



Code	Description
Omit	Standard w/o vent function
G0R	12V
G0Q	24V
GAR	98V
GAG	205V
W30	110V 50Hz / 120V 60Hz
W31	220V 50Hz / 240V 60Hz

Code	Description
1	Nitrile
5	Fluorocarbon

Code	Description
Omit	Standard
013	Position Control with Protection

Code	Description	
omit	Standard without Vent Function	
09	VV01 with Manual Override	De-energized; power comp. open
10	VV01 without Manual Override	De-energized; power comp. closed
11	VV01 with Manual Override	De-energized; power comp. open
12	VV01 without Manual Override	De-energized; power comp. closed
CA	Shuttle Valve	
DA	Shuttle Valve	
CB	VV01 Code 09 and Shuttle Valve Code CA	
CD	VV01 Code 11 and Shuttle Valve Code CA	
DB	VV01 Code 09 and Shuttle Valve Code DA	
DD	VV01 Code 11 and Shuttle Valve Code DA	
BH	VV01 Code 10 and Shuttle Valve Code CA and Position Control* with Amplifier	
BK	VV01 Code 12 and Shuttle Valve Code CA and Position Control* with Amplifier	
BN	VV01 Code 10 and Shuttle Valve Code DA and Position Control* with Amplifier	
BQ	VV01 Code 12 and Shuttle Valve Code DA and Position Control* with Amplifier	
BC	VV01 Code 10 and Position Control* with Amplifier	
BE	VV01 Code 12 and Position Control* with Amplifier	
BA	Position Control* with Amplifier	
BF	Position Control* with Amplifier and Shuttle Valve Code CA	
BL	Position Control* with Amplifier and Shuttle Valve Code DA	

Weight:	D5S 2-Port	D5S 3-Port
D5S06	3.6 kg (7.9 lbs)	3.4 kg (7.5 lbs)
D5S08	4.1 kg (9.0 lbs)	4.4 kg (9.7 lbs)
D5S10	5.4 kg (11.9 lbs)	5.0 kg (11.0 lbs)
D5S12	–	7.8 kg (17.2 lbs)

\* Position control for D5S08/10 only.  
 Spring 2 or 4. Spool A and sleeve 3.

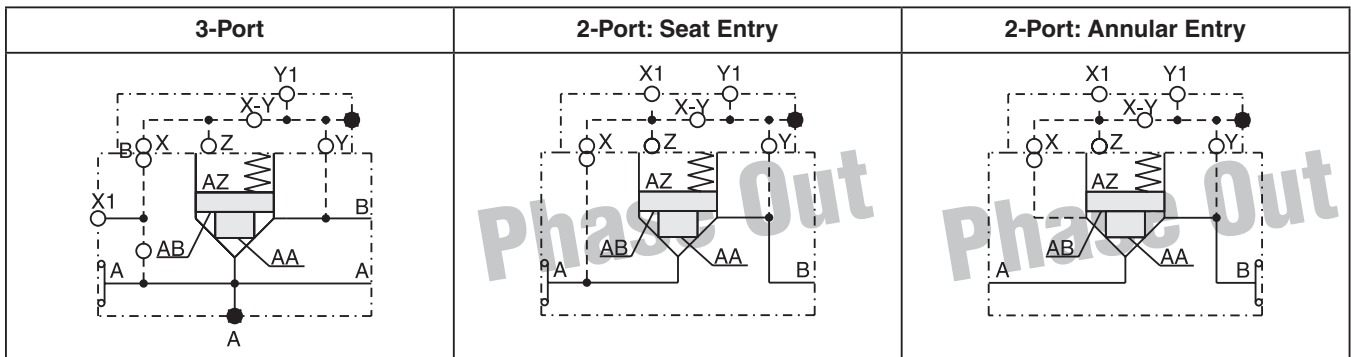
Code	Spring — Approx. Cracking Pressure in Bar (PSI)					
	Sleeve Code 1			Sleeve Code 3		
	A -> B		A -> B		B -> A	
	D5S06	D5S08/12	D5S06	D5S08/12	D5S06	D5S08/12
1	2.8 (40.6)	3.5 (50.8)	6.5 (94.3)	6.5 (94.3)	9.5 (137.8)	11.0 (159.5)
2	0.5 (7.3)	0.5 (7.3)	1.0 (14.5)	1.0 (14.5)	1.5 (21.8)	1.7 (24.7)
3	0.3 (4.4)	0.3 (4.4)	0.6 (8.7)	0.6 (8.7)	0.9 (13.1)	1.0 (14.5)
4	2.2 (31.9)	2.2 (31.9)	4.0 (58.0)	3.5 (50.8)	5.5 (79.8)	6.0 (87.0)
5	–	9.0 (130.5)	–	16.0 (232.0)	–	28.0 (406.0)
6	1.2 (17.4)	1.2 (17.4)	2.0 (29.0)	2.2 (31.9)	3.0 (43.5)	3.8 (55.1)
7	3.0 (43.5)	–	8.0 (116.0)	–	12.0 (174.0)	–

**A**

**Specifications**

General		06	08	10	12	
<b>Size</b>						
<b>Mounting</b>		Flanged according to SAE 61				
<b>Mounting Position</b>		Unrestricted				
<b>Ambient Temperature Range</b>		-20°C to +50°C (-4°F to +122°F)				
<b>Hydraulic</b>						
<b>Maximum Operating Pressure</b>	<b>SAE 61 Ports A, B</b>	350 Bar (5075 PSI)	350 Bar (5075 PSI)	280 Bar (4060 PSI)	210 Bar (3045 PSI)	
	<b>Port Y1</b>	30 Bar (435 PSI)	30 Bar (435 PSI)	30 Bar (435 PSI)	30 Bar (435 PSI)	
<b>Nominal Flow</b>		180 LPM (47.6 GPM)	360 LPM (95.2 GPM)	600 LPM (158.7 GPM)	800 LPM (211.6 GPM)	
<b>Fluid</b>		Hydraulic oil as per DIN 51524 ... 51525				
<b>Fluid Temperature</b>		-20°C to +80°C (-4°F to +176°F)				
<b>Viscosity</b>	<b>Permitted Recommended</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU) 30 cSt / mm <sup>2</sup> /s (139 SSU)				
<b>Filtration</b>		ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)				
<b>Electrical (Solenoid)</b>						
<b>Duty Ratio</b>		100%				
<b>Response Time</b>		Energized / De-energized AC 20/18ms, DC 46/27 ms				
<b>Protection Class</b>		IP65 in accordance with EN60529 (plugged and mounted)				
	<b>Code</b>	<b>G0R</b>	<b>G0Q</b>	<b>GAR</b>	<b>GAG</b>	<b>W30</b> <b>W31</b>
<b>Supply Voltage</b>		12V	24V	98V	205V	110V at 50Hz 120V at 60 Hz      220V at 50Hz/ 240V at 60Hz
<b>Tolerance Supply Voltage</b>		+5 to -10	+5 to -10	+5 to -10	+5 to -10	±5 to -10      ±5 to -10
<b>Power Consumption</b>	<b>Hold</b>	31W	31W	31W	31W	78W      78W
	<b>In Rush</b>	31W	31W	31W	31W	264W      264W
<b>Maximum Switching Frequency</b>		AC up to 7200; DC up to 16,000 switchings/hour				
<b>Solenoid Connection</b>		Connector as per EN175301-803				
<b>Protection Class</b>		IP65 in accordance with EN 60529 (plugged and mounted)				
<b>Coil Insulation Class</b>		H (180°C) (356°F)				

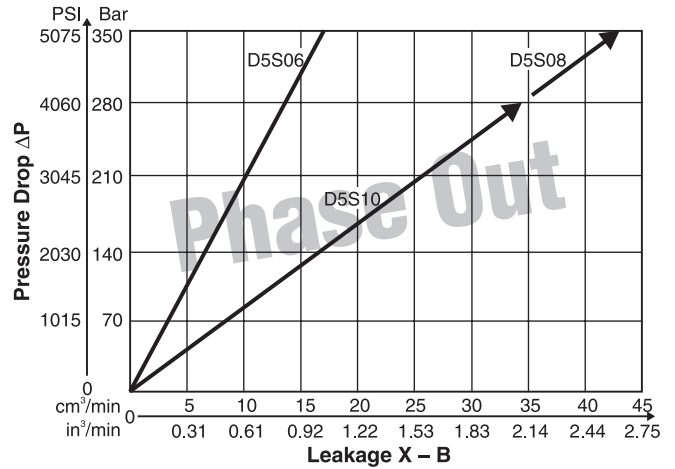
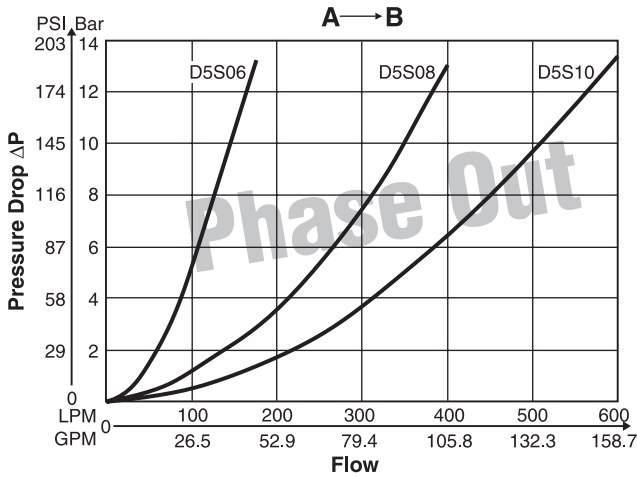
**D5S Pilot Configuration**



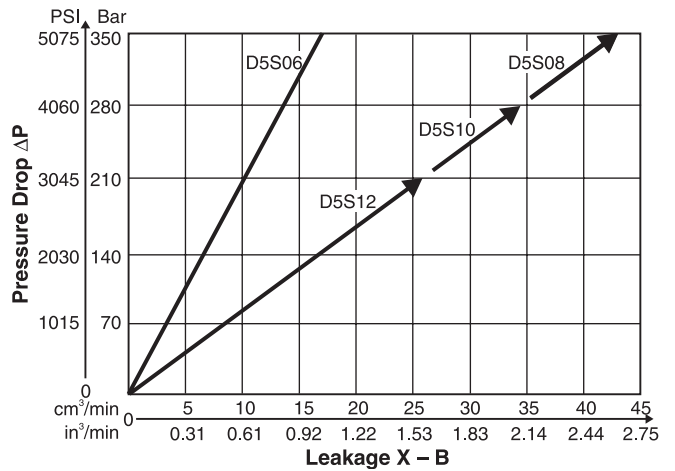
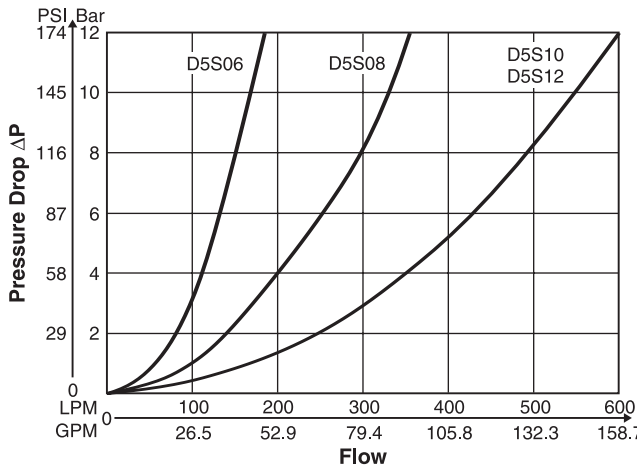
Note: 2-port bodies are being phased out.

**Performance Curves**

**D5S 2-Port\*** Note: 2-port bodies are being phased out.



**D5S 3-Port\***



\*Fluid viscosity 38cSt at 50°C (122°F)

**Selection of Cartridges**

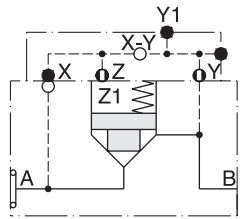
Sleeve 1, Poppet 1	Sleeve 1, Poppet 2	Sleeve 1, Poppet 4	Sleeve 3, Poppet 4	Sleeve 3, Poppet A	Sleeve 3, Poppet B/C
1 : 1.05 $A_A = 0.95 A_C$ $A_B = 0.95 A_C$ 15° chamfer	1 : 1.05 $A_A = 0.95 A_C$ $A_B = 0.95 A_C$ 15° chamfer orifice	1 : 1.05 $A_A = 0.95 A_C$ $A_B = 0.95 A_C$ 45° chamfer	1 : 1.67 $A_A = 0.6 A_C$ $A_B = 0.4 A_C$ 45° chamfer	1 : 1.67 $A_A = 0.6 A_C$ $A_B = 0.4 A_C$ 45° chamfer safety spool	1 : 1.67 $A_A = 0.6 A_C$ $A_B = 0.4 A_C$ 45° chamfer throttle spool



**A**

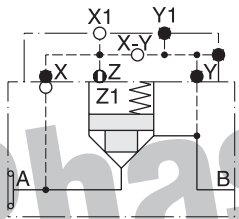
**D5S 2-Port Examples** *Note: 2-port bodies are being phased out.*

**Seat Entry**



D5S...-722

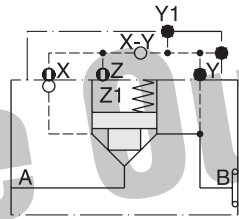
Pilot oil: internal from B



D5S...-743

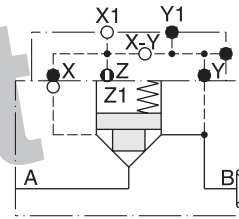
Pilot oil: external from X1

**Annular Entry**



D5S...-821

Pilot oil: internal from B

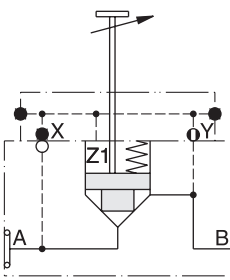


D5S...-843

Pilot oil: external from X1

**Stroke Limiter D5S 2-Port Examples**

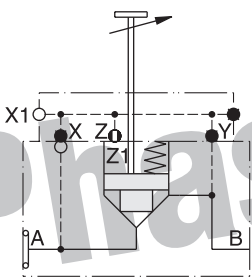
**Seat Entry**



D5S08-72B

10

Pilot oil: internal from B

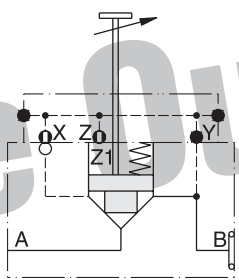


D5S08-74C

10

Pilot oil: external from X1

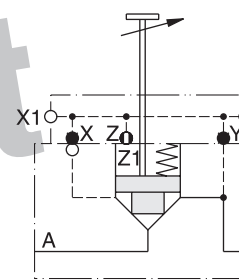
**Annular Entry**



D5S08-82A

10

Pilot oil: internal from B

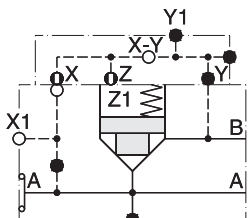


D5S08-84C

10

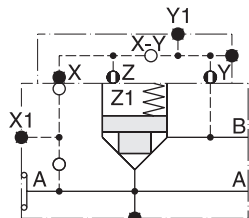
Pilot oil: external from X1

**D5S 3-Port Examples**



D5S...-541

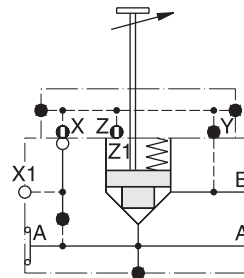
Pilot oil: external from X1



D5S...-522

Pilot oil: internal from B

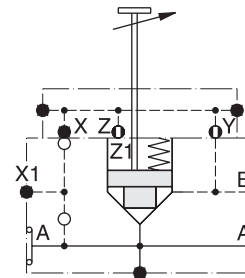
**Stroke Limiter D5S 3-Port Examples**



D5S08-54A

10

Pilot oil: external from X1



D5S08-52B

10

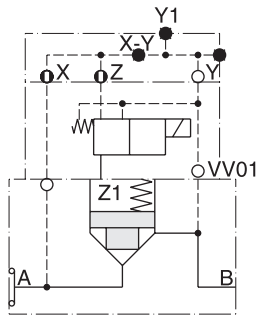
Pilot oil: internal from B

**D5S 2-Port with Solenoid Valve VV01 Examples** *Note: 2-port bodies are being phased out.*

**Seat Entry**

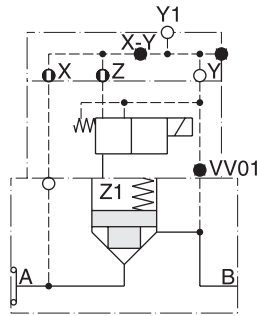
**Annular Entry**

**A**



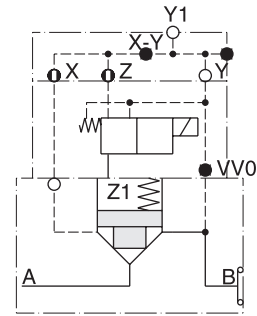
D5S..-714...09  
 10  
 11  
 12

Pilot oil: internal from A  
 Pilot drain: internal to B



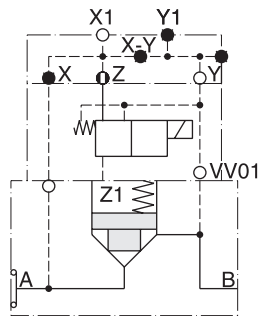
D5S..-716...09  
 10  
 11  
 12

Pilot oil: internal from A  
 Pilot drain: external out of Y1



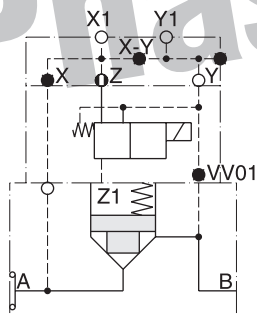
D5S..-826...09  
 10  
 11  
 12

Pilot oil: internal from B  
 Pilot drain: external out of Y1



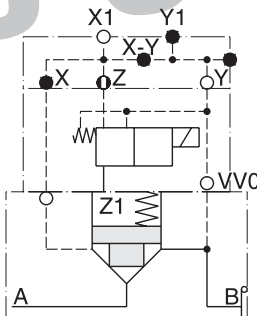
D5S..-745...09  
 10  
 11  
 12

Pilot oil: internal from X1  
 Pilot drain: internal to B



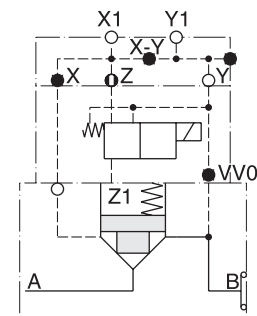
D5S..-747...09  
 10  
 11  
 12

Pilot oil: internal from X1  
 Pilot drain: external out of Y1



D5S..-845...09  
 10  
 11  
 12

Pilot oil: internal from X1



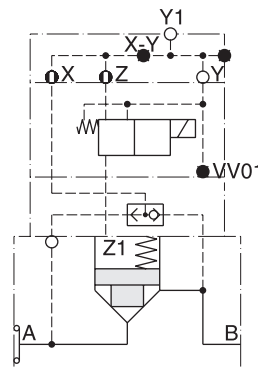
D5S..-847...09  
 10  
 11  
 12

Pilot oil: internal from X1  
 Pilot drain: external out of Y1

**D5S 2-Port with Solenoid Valve VV01 and Shuttle Valve Examples** *Note: 2-port bodies are being phased out.*

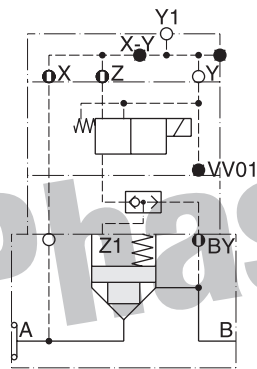
**Seat Entry**

**Annular Entry**



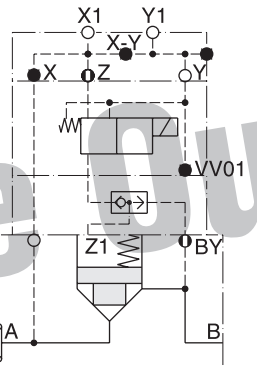
D5S..-736...CB  
 CD

Pilot oil: internal from A +  
 internal from B  
 Pilot drain: external out of Y1



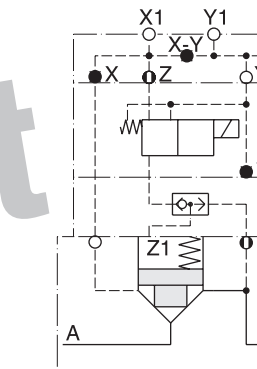
D5S..-736...DB  
 DD

Pilot oil: internal from A +  
 internal from B  
 Pilot drain: external out of Y1



D5S..-757...DB  
 DD

Pilot oil: external from X1 +  
 internal from B  
 Pilot drain: external out of Y1

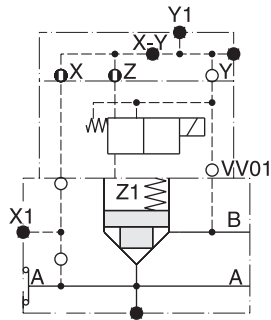


D5S..-857...DB  
 DD

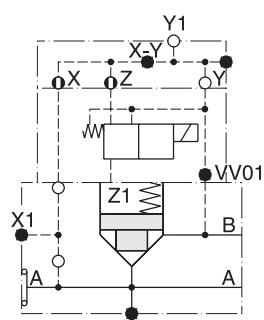
Pilot oil: external from X1 +  
 internal from B  
 Pilot drain: external out of Y1

**D5S 3-Port with Solenoid Valve VV01 Examples**

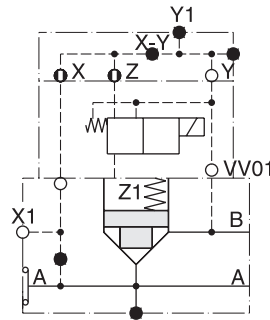
**A**



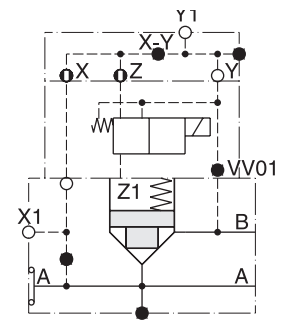
D5S ..-514...09  
 10  
 11  
 12  
 Pilot oil: internal from A  
 Pilot drain: internal to B



D5S ..-516...09  
 10  
 11  
 12  
 Pilot oil: internal from A  
 Pilot drain: external out of Y1

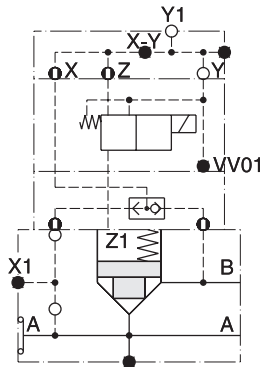


D5S ..-544...09  
 10  
 11  
 12  
 Pilot oil: external from X1  
 Pilot drain: internal to B

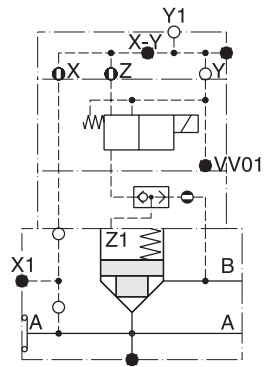


D5S ..-546...09  
 10  
 11  
 12  
 Pilot oil: external from X1  
 Pilot drain: external out of Y1

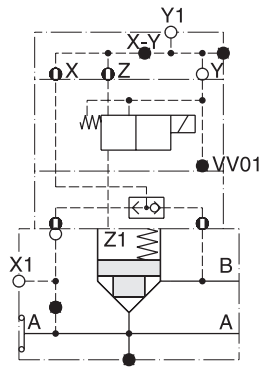
**D5S 3-Port with Solenoid Valve VV01 and Shuttle Valve Examples**



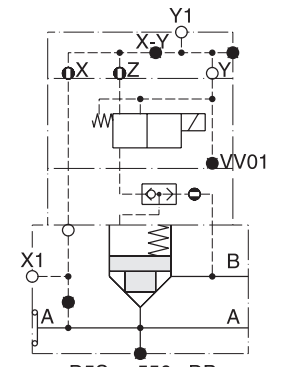
D5S ..-536...CB  
 CD  
 Pilot oil: internal from A +  
 internal from B  
 Pilot drain: external out of Y1



D5S ..-536...DB  
 DD  
 Pilot oil: internal from A +  
 internal from B  
 Pilot drain: external out of Y1



D5S ..-556...CB  
 CD  
 Pilot oil: internal from X1 +  
 internal from B  
 Pilot drain: external out of Y1



D5S ..-556...DB  
 DD  
 Pilot oil: external from X1 +  
 internal from B  
 Pilot drain: external out of Y1



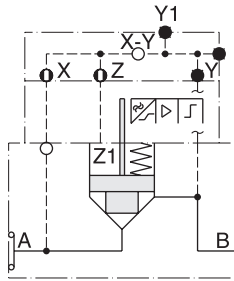
**D5S 2-Port Position Control Examples**

Note: 2-port bodies are being phased out.

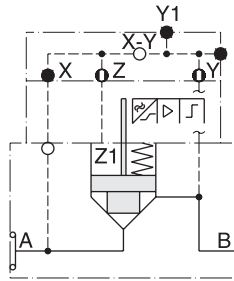
**Seat Entry**

**Annular Entry**

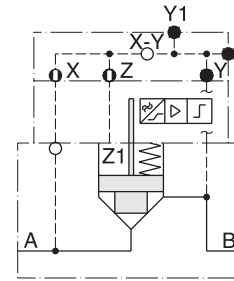
**A**



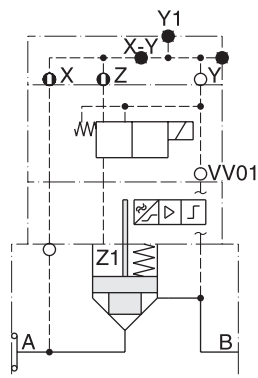
D5S08-7113A.BA  
 D5S10  
 Pilot oil: internal from A



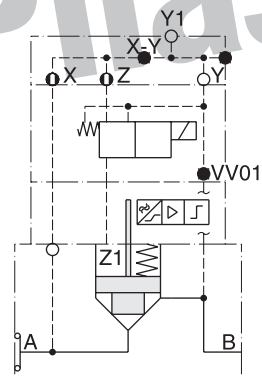
D5S08-7223A.BA  
 D5S10  
 Pilot oil: internal from B



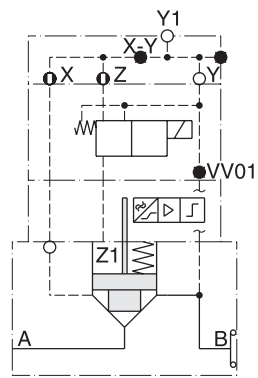
D5S08-8213A.BA  
 D5S10  
 Pilot oil: internal from B



D5S08-7143A.BC  
 D5S10 BE  
 Pilot oil: internal from A  
 Pilot drain: internal to B



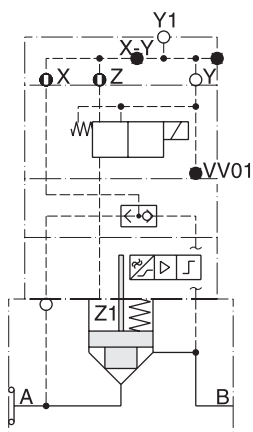
D5S08-7163A.BC  
 D5S10 BE  
 Pilot oil: internal from A  
 Pilot drain: external out of Y1



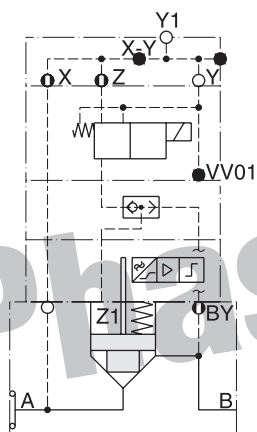
D5S08-8263A.BC  
 D5S10 BE  
 Pilot oil: internal from B  
 Pilot drain: external out of Y1

**Seat Entry**

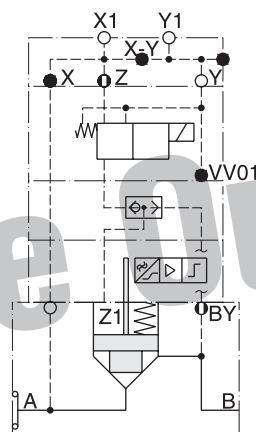
**Annular Entry**



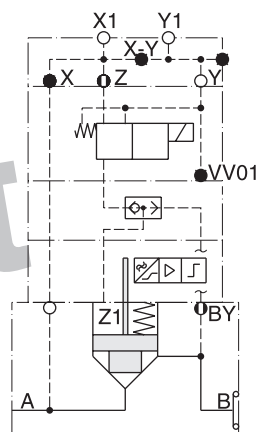
D5S ..-736...BH  
 BK  
 Pilot oil: internal from A +  
 internal from B  
 Pilot drain: external out of Y1



D5S ..-736...BN  
 BQ  
 Pilot oil: internal from A +  
 internal from B  
 Pilot drain: external out of Y1



D5S ..-757...BN  
 BQ  
 Pilot oil: external from X1 +  
 internal from B  
 Pilot drain: external out of Y1

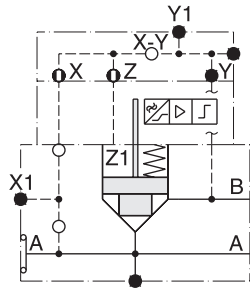


D5S ..-857...BN  
 BQ  
 Pilot oil: external from X1 +  
 internal from B  
 Pilot drain: external out of Y1

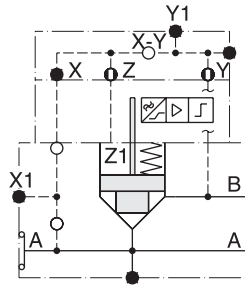
**D5S 3-Port Position Control Examples**

**A**

**Seat Entry**

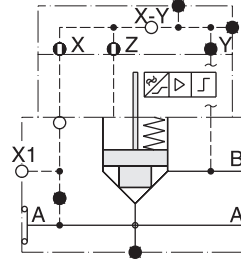


D5S08-5113A.BA  
 10  
 12  
 Pilot oil: internal from A

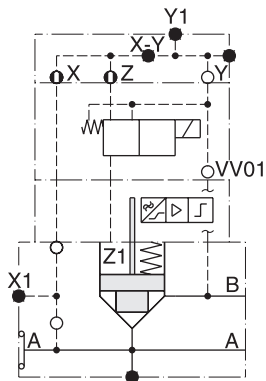


D5S08-5223A.BA  
 10  
 12  
 Pilot oil: internal from B

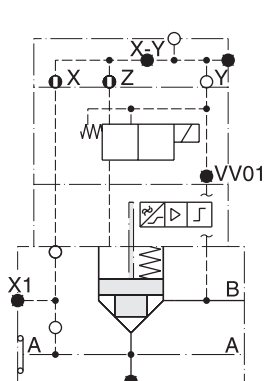
**Annular Entry**



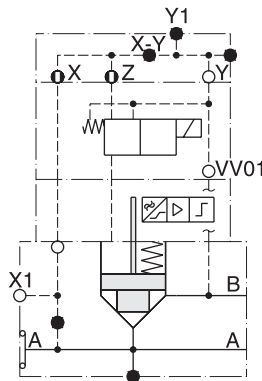
D5S08-5213A.BA  
 10  
 12  
 Pilot oil: external from X1



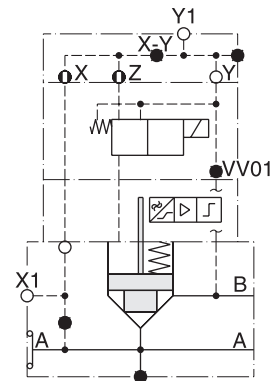
D5S08-5143A.BC  
 10 BE  
 12  
 Pilot oil: internal from A  
 Pilot drain: internal to B



D5S08-5163A.BC  
 10 BE  
 12  
 Pilot oil: internal from A  
 Pilot drain: external out of Y1

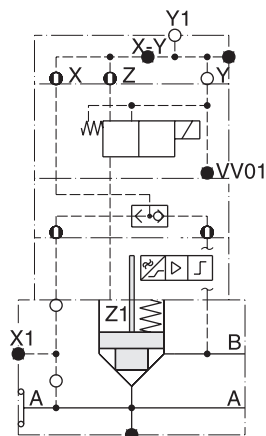


D5S08-5443A.BC  
 10 BE  
 12  
 Pilot oil: external from X1  
 Pilot drain: internal to B

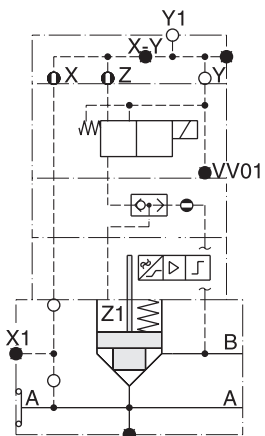


D5S08-5463A.BC  
 10 BE  
 12  
 Pilot oil: external from X1  
 Pilot drain: external out of Y1

**Seat Entry**

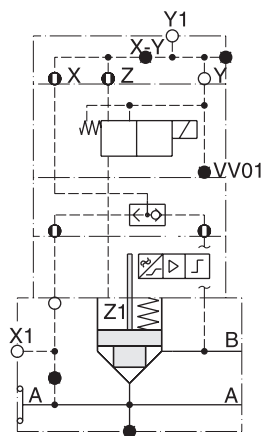


D5S08-5363A.BH  
 10 BE  
 12  
 Pilot oil: internal from A +  
 internal from B  
 Pilot drain: external out of Y1

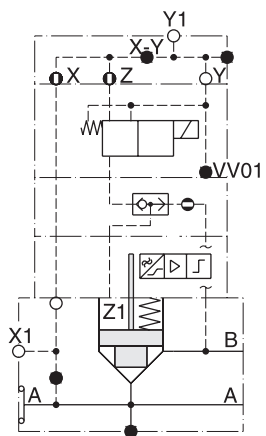


D5S08-5363A.BN  
 10 BQ  
 12  
 Pilot oil: internal from A +  
 internal from B  
 Pilot drain: external out of Y1

**Annular Entry**

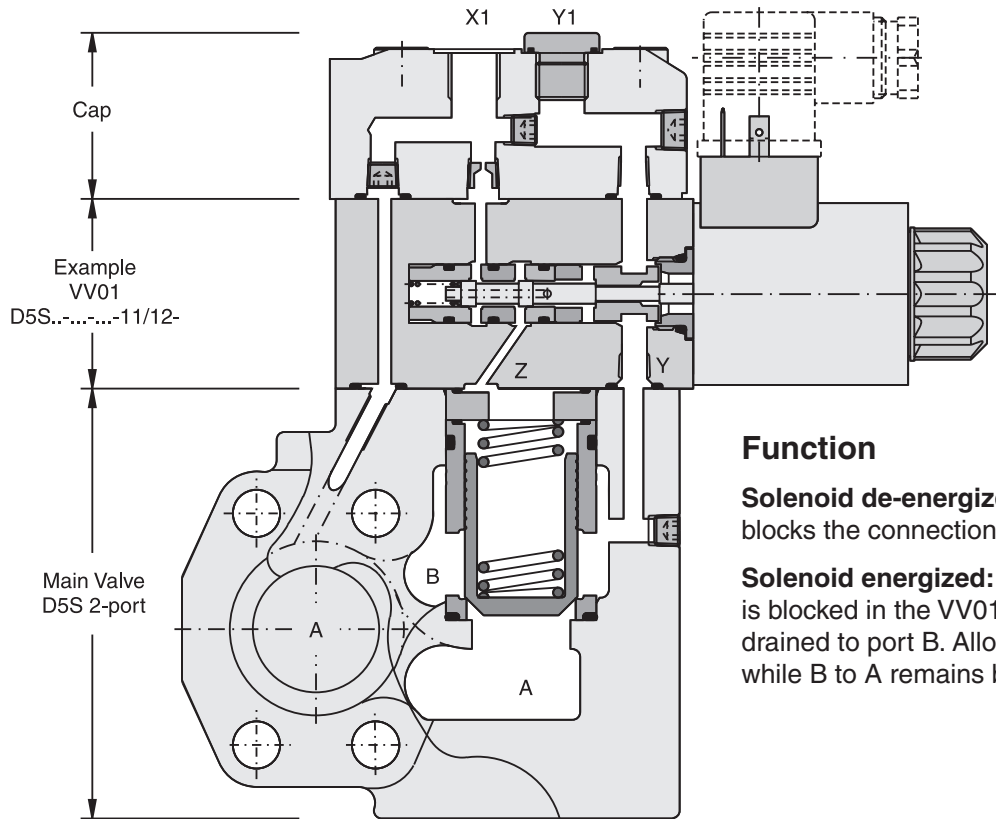


D5S08-5563A.BH  
 10 BK  
 12  
 Pilot oil: external from X1 +  
 internal from B  
 Pilot drain: external out of Y1



D5S08-5563A.BN  
 10 BQ  
 12  
 Pilot oil: external from X1 +  
 internal from B  
 Pilot drain: external out of Y1

**Example Pilot Oil External from X1, Pilot Drain Internal Out of B with Vent Valve**



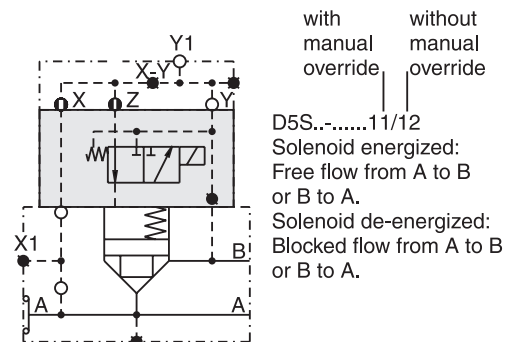
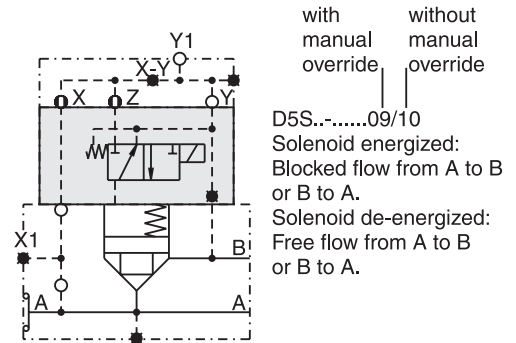
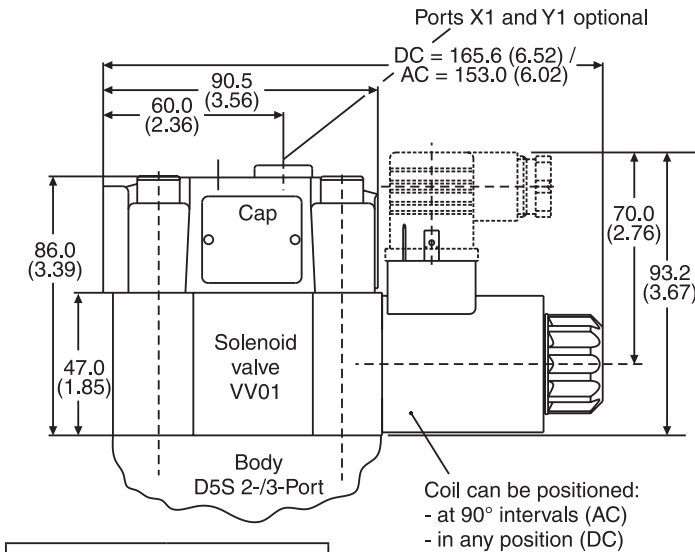
**Function**

**Solenoid de-energized:** Pilot oil from X1 to Z blocks the connection from A to B or B to A.

**Solenoid energized:** Pilot pressure from X1 is blocked in the VV01. The oil in Z is internally drained to port B. Allowing flow from A to B, while B to A remains blocked.

**Dimensions — D5S with VV01**

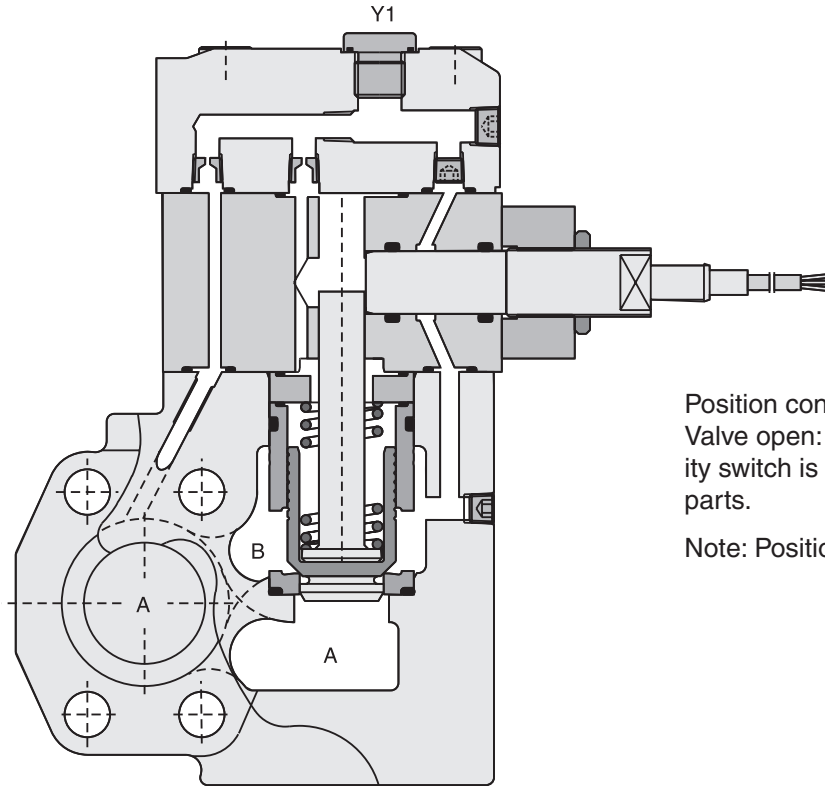
Inch equivalents for millimeter dimensions are shown in (\*\*)



VV01 Seal Kits	
Nitrile	Fluorocarbon
<b>DC Solenoid</b>	
S26-58515-0	S26-58515-5
<b>AC Solenoid</b>	
S26-35237-0	S26-35237-5

**Example Pilot Oil External from X1, Pilot Drain Internal Out of B with Position Control**

**A**

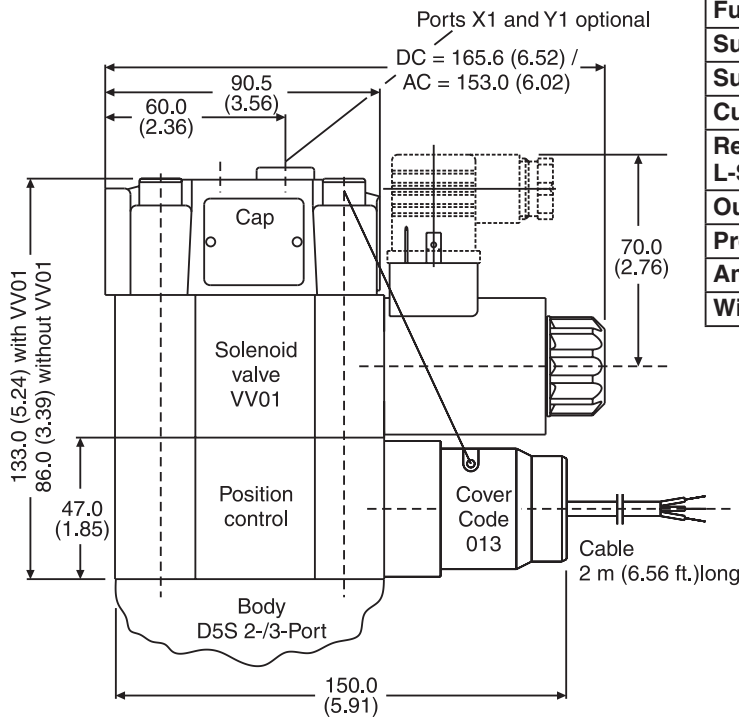


Position control by proximity switch (incl. amplifier). Valve open: proximity switch activated. This proximity switch is pressure proof and has no wearing parts.

Note: Position control for D5S08 and D5S10 only.

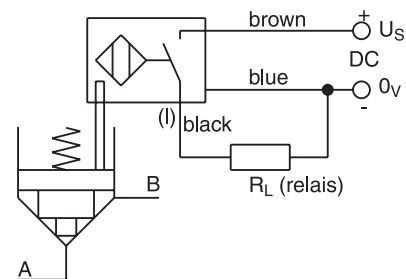
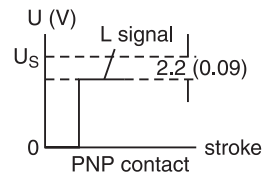
**Dimensions — D5S with Position Control**

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



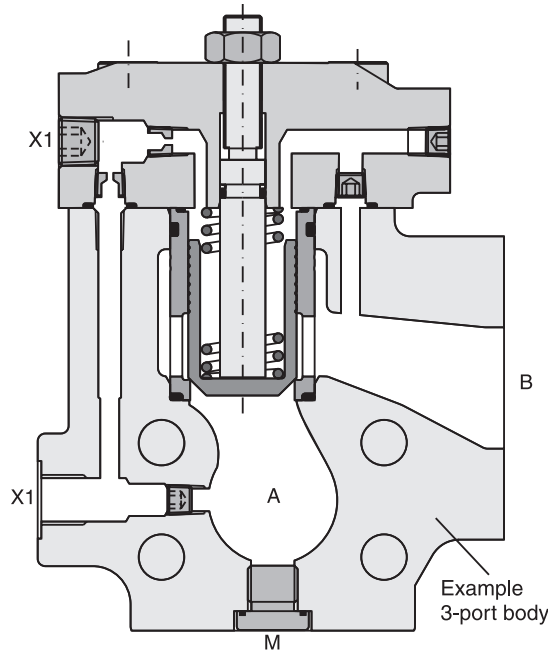
**Technical Data (Proximity Switch)**

<b>Function</b>	PNP, contact
<b>Supply Voltage</b>	10 - 30VDC
<b>Supply Voltage Ripple</b>	≤10%
<b>Current Consumption</b>	8mA Maximum
<b>Residual Voltage L-Signal</b>	$U_S - 2.2V$ at $I_{max}$
<b>Output Current</b>	≤200 mA
<b>Protection Class</b>	IP67
<b>Ambient Temperature</b>	-25°C to +70°C (-13°F to +158°F)
<b>Wire Cross Section</b>	3 x 0.5 mm <sup>2</sup>



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

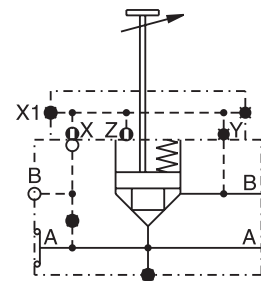
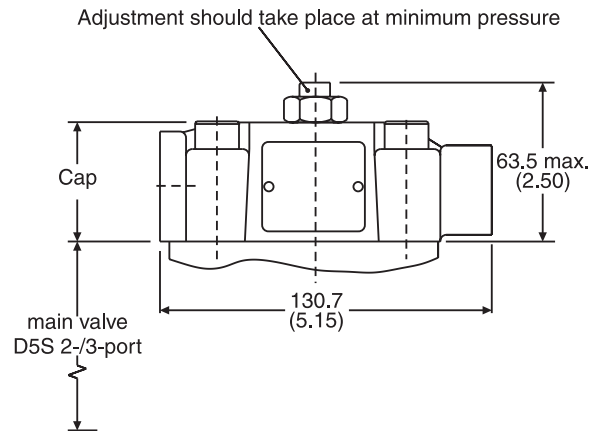
**D5S Stroke Limiter**



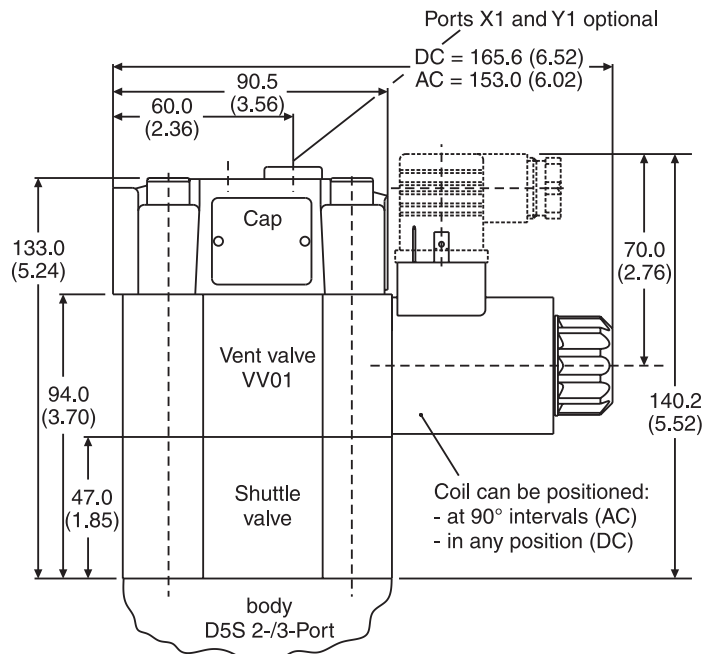
X1 = external pilot-oil (optional)

**Note:** Stroke limiter not for use with D5S06, solenoid valve VV01, shuttle valve and position control.

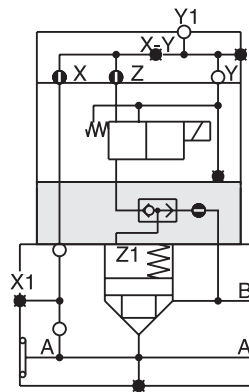
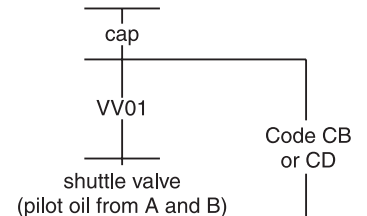
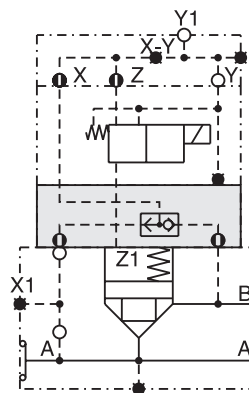
**D5S Stroke Limiter Dimensions**



**D5S with Shuttle Valve Dimensions**



Shuttle valve only in connection with vent valve VV01.



1) pilot oil from A and B, from B to A check valve function



**Dimensions**

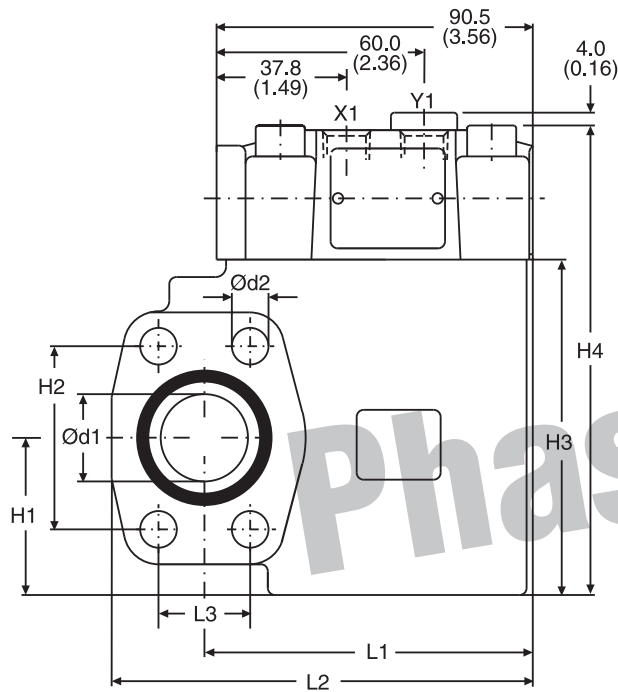
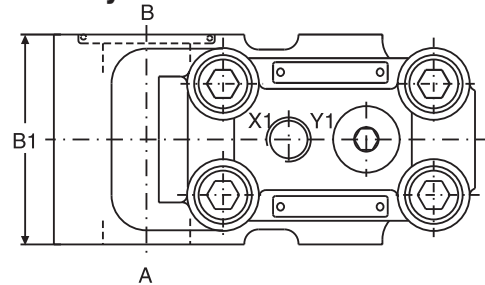
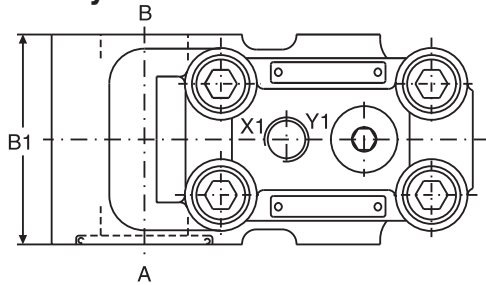
Inch equivalents for millimeter dimensions are shown in (\*\*)

**A**

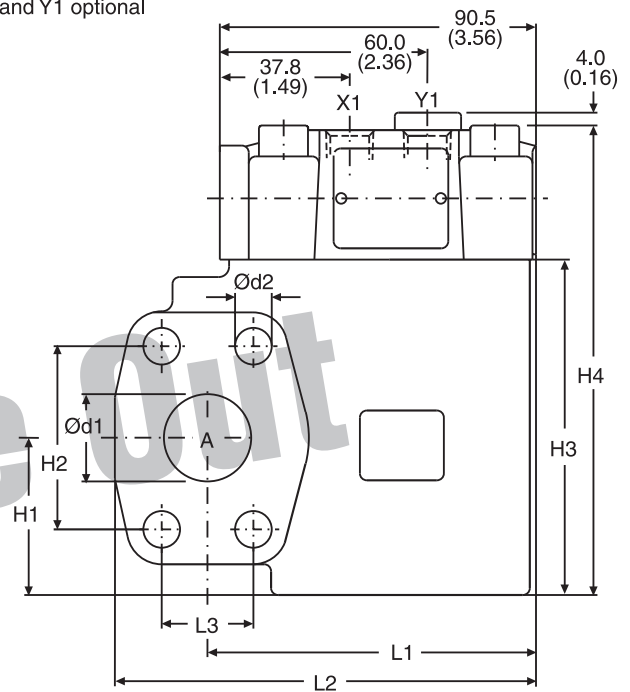
**2-Port** Note: 2-port bodies are being phased out.

**Seat Entry**

**Annular Entry**



Ports X1 and Y1 optional



**Seal Kits**

Size	Nitrile	Fluorocarbon
06	S16-91850-0	S16-91850-5
08	S16-91851-0	S16-91851-5
10	S16-91852-0	S16-91852-5

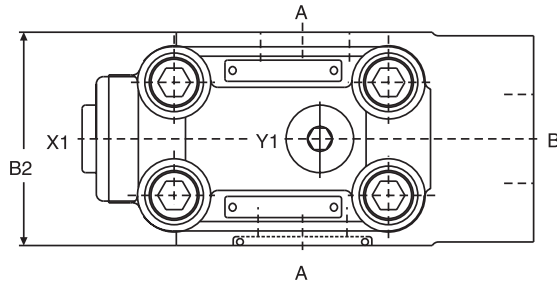
Size	I1	I2	I3	b1	h1	h2	h3	h4	d1	d2
06	77.0 (3.03)	101.0 (3.98)	22.2 (0.87)	60.0 (2.36)	37.0 (1.46)	47.6 (1.87)	90.0 (3.54)	127.6 (5.02)	19.0 (0.75)	10.5 (0.41)
08	94.0 (3.70)	120.5 (4.74)	26.2 (1.03)	60.0 (2.36)	45.0 (1.77)	52.4 (2.06)	96.0 (3.78)	133.6 (5.26)	25.0 (0.98)	10.5 (0.41)
10	94.0 (3.70)	128.0 (5.04)	30.2 (1.19)	75.0 (2.95)	48.0 (1.89)	58.7 (2.31)	109.0 (4.29)	146.6 (5.77)	32.0 (1.26)	12.5 (0.49)

Ports	Function	Port size		
		D5S06	D5S08	D5S10
A	Inlet or outlet	3/4" SAE 61	1" SAE 61	1-1/4" SAE 61
B	Outlet or inlet	3/4" SAE 61	1" SAE 61	1-1/4" SAE 61
X1	External pilot port	SAE 4		
Y1	External pilot drain			

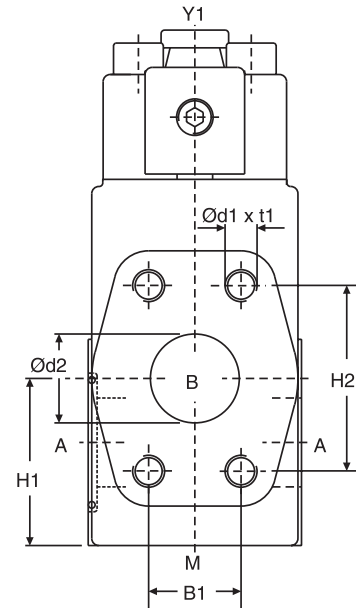
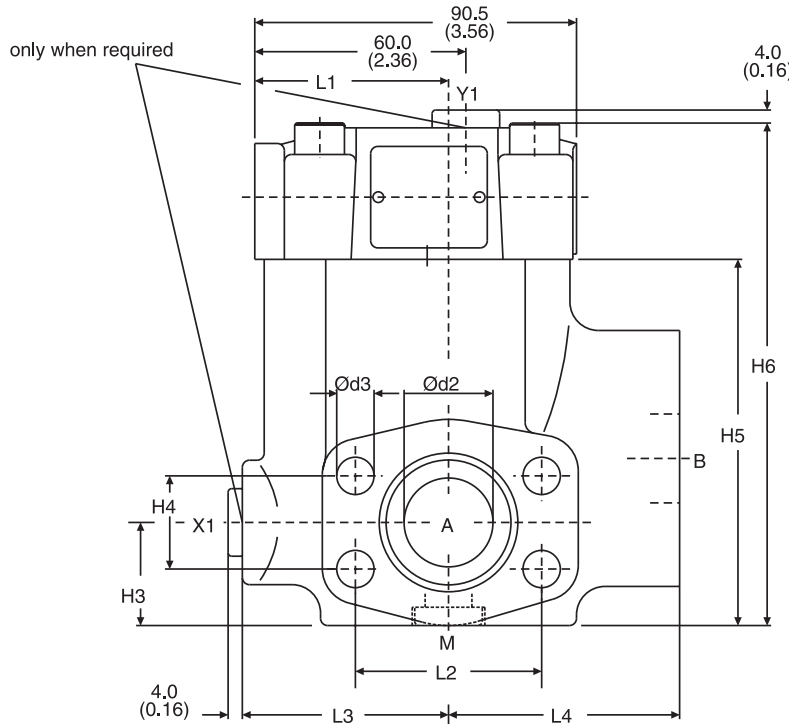


Inch equivalents for millimeter dimensions are shown in (\*\*)

**3-Port**



Seal Kits		
Size	Nitrile	Fluorocarbon
06	S16-91850-0	S16-91850-5
08	S16-91851-0	S16-91851-5
10	S16-91852-0	S16-91852-5
12	S26-27421-0	S26-27421-5



Size	I1	I2	I3	I4	b1	b2	h1	h2	h3	h4	h5	h6	d1	t1	d2	d3
06	49.0 (1.93)	47.6 (1.87)	56.0 (2.20)	63.0 (2.48)	22.2 (0.87)	60.0 (2.36)	41.0 (1.61)	47.6 (1.87)	28.0 (1.10)	22.2 (0.87)	82.0 (3.23)	119.0 (4.69)	3/8" UNC	20.0 (0.79)	19.0 (0.75)	10.5 (0.41)
08	55.0 (2.17)	52.4 (2.06)	58.0 (2.28)	65.0 (2.56)	26.2 (1.03)	60.0 (2.36)	47.0 (1.85)	52.4 (2.06)	29.0 (1.14)	26.2 (1.03)	103.0 (4.06)	141.0 (5.55)	3/8" UNC	23.0 (0.91)	25.0 (0.98)	10.5 (0.41)
10	57.0 (2.24)	58.7 (2.31)	64.0 (2.52)	61.0 (2.40)	30.2 (1.19)	75.0 (2.95)	65.0 (2.56)	58.7 (2.31)	36.0 (1.42)	30.2 (1.19)	113.0 (4.45)	150.0 (5.91)	7/16" UNC	22.0 (0.87)	32.0 (1.26)	12.5 (0.49)
12	37.0 (1.46)	69.8 (2.75)	55.0 (2.17)	93.0 (3.66)	35.7 (1.41)	80.0 (3.15)	73.0 (2.87)	69.8 (2.75)	72.0 (2.83)	35.7 (1.41)	140.0 (5.51)	178.0 (7.01)	1/2" UNC	27.0 (1.06)	38.0 (1.50)	13.5 (0.53)

Ports	Function	Port size			
		D5S06	D5S08	D5S10	D5S12
A (2x)	Inlet or outlet	3/4" SAE 61	1" SAE 61	1 1/4" SAE 61	1 1/2" SAE 61
B	Outlet or inlet	3/4" SAE 61	1" SAE 61	1 1/4" SAE 61	1 1/2" SAE 61
X1*	External pilot port	SAE 4			
Y1	External pilot drain				
M	Pressure gauge				

\* closed when supplied.







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**Introduction**

**Series CM, CPOM, FM, PRDM, PRM, RM, Z\*\***

Sandwich valves provide a variety of check, flow control, pressure relief and pressure reducing functions in a compact NFPA D03, D05, D07 and D08 sandwich style valve. The NFPA D03 valve body conforms to the ISO 40 mm (1.57") thickness. These valves are mounted between directional control valves and their mounting surface.

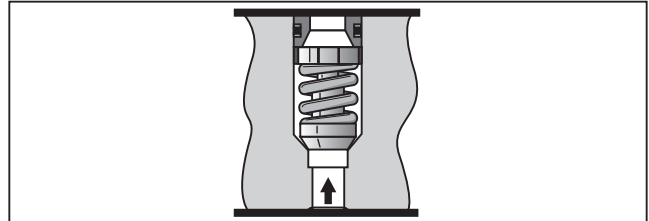
The NFPA D03 Sandwich valves may also be used in conjunction with Parker's Cartpak Series of sandwich valves which offer a wide variety of additional functions including relief, pressure reducing/relieving, load check, back pressure check, needle, flow control, pressure compensated flow control, crossover, relief and directional valves.



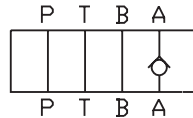
**Check Valves**

**Series CM, ZRV**

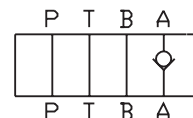
- Valve bodies are manufactured from steel which provide extra strength and durability for longer life. Internal hardened steel components also provide longer life.
- Positive shut-off is provided by a fully guided poppet and allows full flow in the unchecked position.
- Parker CM, ZRV sandwich style check valves can be used either on the 'P', 'A', 'B', 'T' port or combination.
- Large internal flow paths allow high flow at low pressure drop.



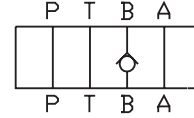
**CM\*AA**



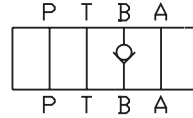
**CM\*AAF**



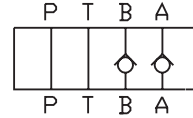
**CM\*BB**



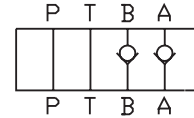
**CM\*BBF**



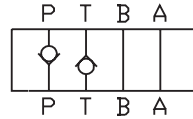
**CM\*DD**



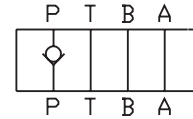
**CM\*DDF**



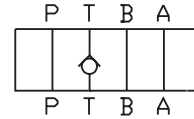
**CM\*PT**



**CM\*PP, ZRV-P**



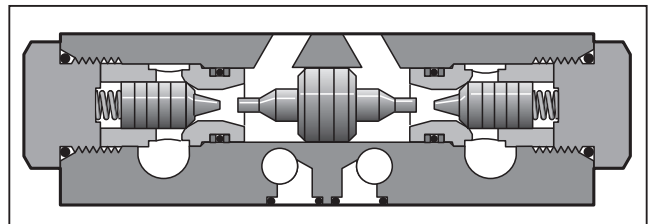
**CM\*TT, ZRV-T**



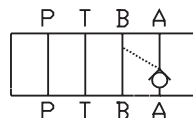
**P.O. Check Valves**

**Series CPOM, ZRE**

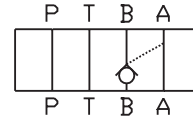
- Parker CPOM, ZRE sandwich style, pilot operated check valves can be provided in either single or double configurations.
- The pilot operated checks may be positioned in 'A' port or 'B' port; or both 'A' and 'B' ports.
- Valve bodies are manufactured from steel which provide extra strength and durability for longer life. Internal hardened steel components also provide longer life.
- Large internal flow paths allow high flow at low pressure drop.



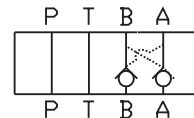
**CPOM\*AA, ZRE-A**



**CPOM\*BB, ZRE-B**



**CPOM\*DD, ZRE-AB**



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

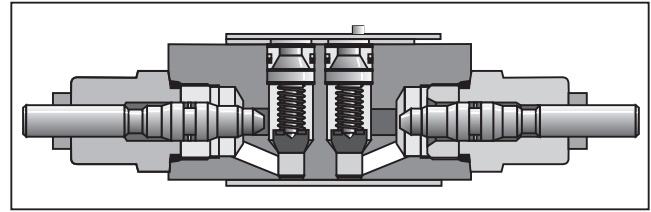
**Flow Control Valves**

**Series FM, ZRD**

- Parker FM, ZRD sandwich style flow control valves can be provided in either single or double configurations.

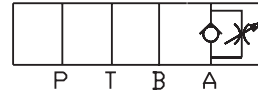
The flow controls may be positioned in 'P' port, 'A' port, 'B' port, or both 'A' and 'B' ports.

- Valve bodies are manufactured from steel which provide extra strength and durability for longer life. Internal hardened steel components also provide longer life.
- Two step needles (standard) provide fine adjustment for the first three turns and course adjustment for the last three turns. Fine metering needles are available as an option on D03 and D05 valves.
- Large bypass checks allow high flow at a low pressure drop.
- Reversible (invert 180°) for meter-in or meter-out (D03 & D05 only).



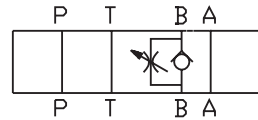
**FM\*AA, ZRD-AA**

(Meter Out)



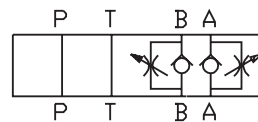
**FM\*BB, ZRD-BA**

(Meter Out)



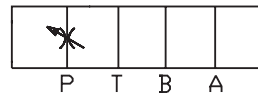
**FM\*DD, ZRD-ABA**

(Meter Out)



**FM\*PP**

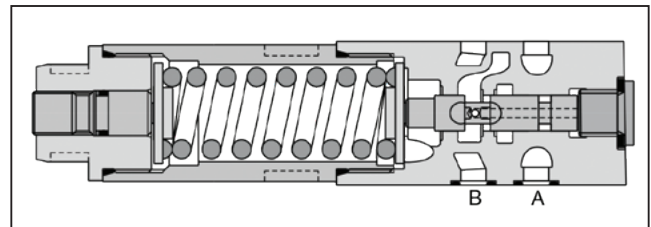
(Meter Out)



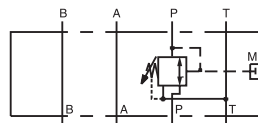
**Pressure Reducing Valves**

**Series PRDM**

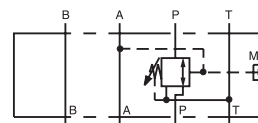
- PRDM sandwich valves have three-way design for pressure relieving of the secondary side.
- The direct operated, cushioned piston design results in fast response, low leakage and minimal hysteresis.
- PRDM sandwich valves may be selected to reduce pressure in the 'P' port, 'A' port or 'B' port.
- Up to nine pressure adjustment ranges are available with maximum pressure settings.
- PRDM2 is NG06 (CETPO 03)  
PRDM3 is NG10 (CETOP05)
- Adjustment options include: internal hex screw, hand knob or internal hex with keylock.



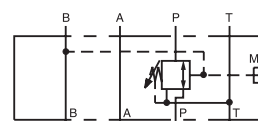
**PRDM\*PP**



**PRDM\*AA**



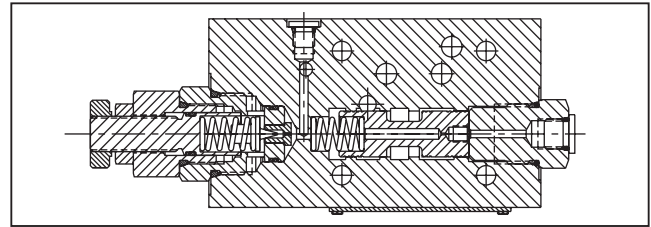
**PRDM\*BB**



**Pressure Reducing Valves**

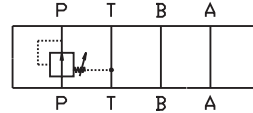
**Series PRM, ZDR**

- Parker PRM, ZDR sandwich style pressure reducing valves can be used to reduce pressure on the 'P' port, the 'A' port, or the 'B' port.
- Three pressure adjustment options available: slotted screw, knob and locking knob.
- Valve bodies are manufactured from steel which provide extra strength and durability for longer life. Internal hardened steel components also provide longer life.

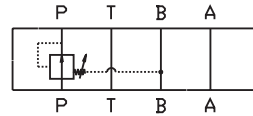


**B**

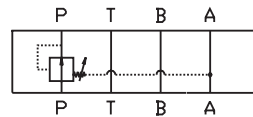
**PRM\*AA, ZDR-A**



**PRM\*BB, ZDR-B**



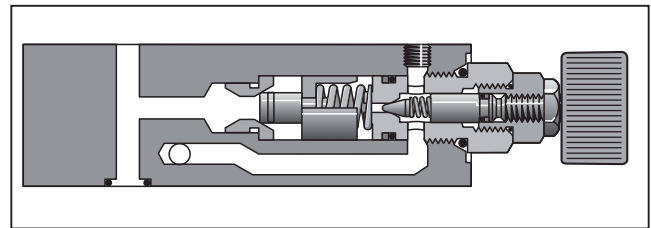
**PRM\*PP, ZDR-P**



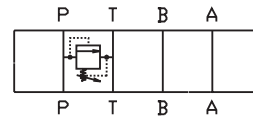
**Pressure Relief Valves**

**Series RM, ZDV**

- Parker RM, ZDV sandwich style relief valve is a 'P' port to 'T' port relief.
- Valve bodies are manufactured from steel which provide extra strength and durability for longer life. Internal hardened steel components also provide longer life.
- Three pressure adjustment options available: slotted screw, knob and locking knob.



**RM\*PT, ZDV-P**



**General Description**

Series CM check valves provide an integral, full flow check valve in the pressure 'P' port, 'A' port, 'B' port, or the tank 'T' port of the directional valve. Reverse flow is blocked. The CM2 and CM3 sizes offer a combination P&T check version.

**B**

**Features**

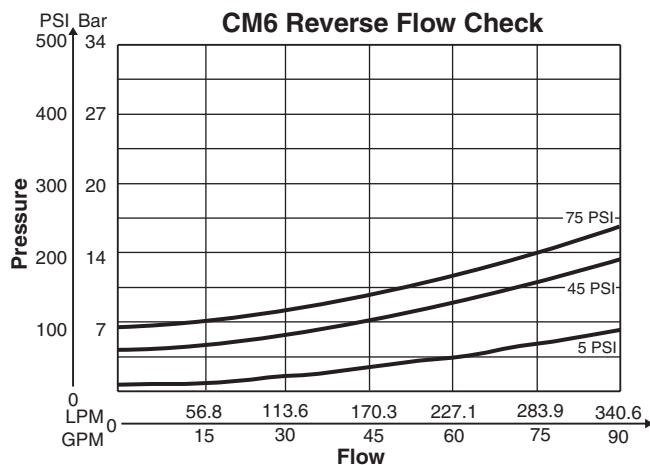
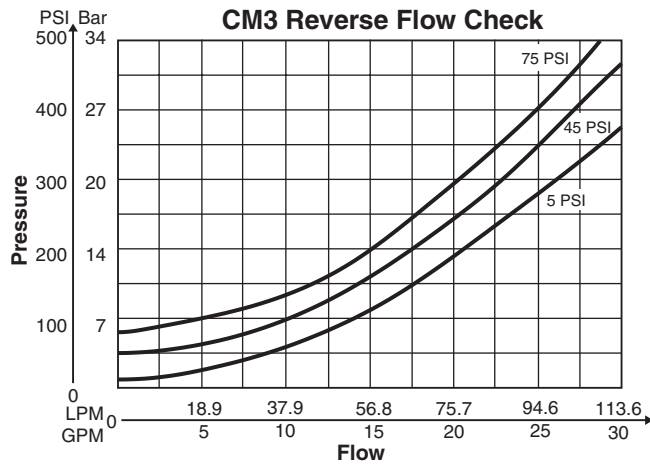
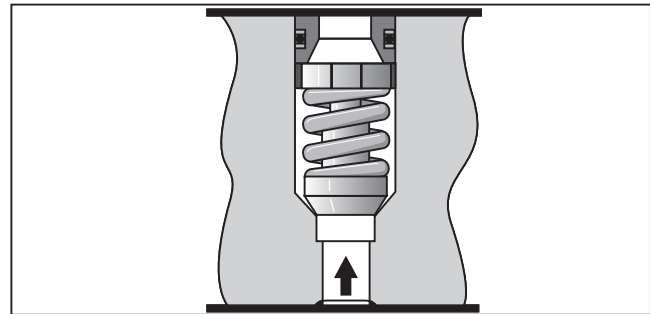
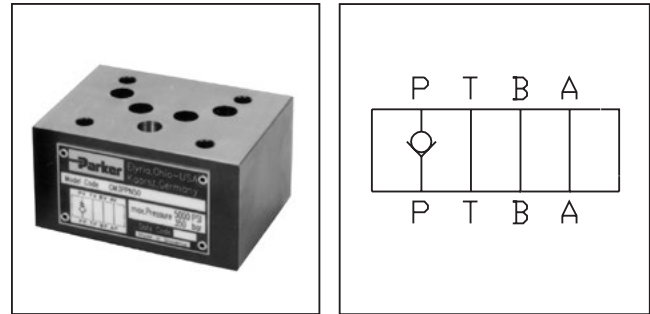
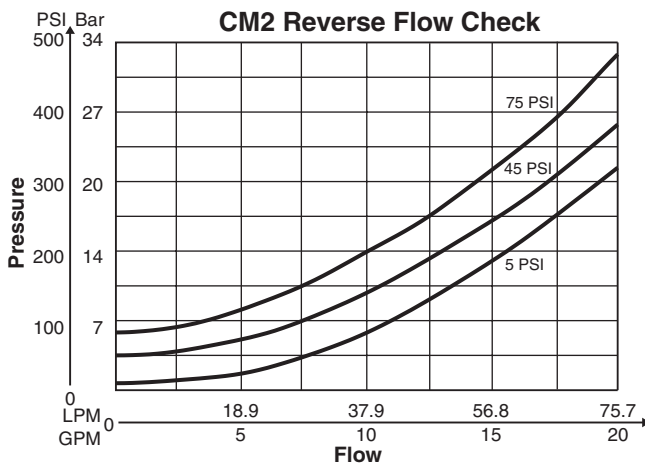
- Valve bodies are manufactured from steel which provides extra strength and durability for longer life. Internal hardened steel components also provide longer life.
- Positive shut-off is provided by a fully guided poppet and allows full flow in the unchecked position.
- Parker CM sandwich style check valves can be used either on the 'P', 'A', 'B', 'T' ports, or combinations.
- Large internal flow paths allow high flow at low pressure drop.

**Specifications**

	CM2	CM3	CM6
<b>Mounting Pattern</b>	NFPA D03, CETOP 3, NG6	NFPA D05, CETOP 5, NG10	NFPA D08, CETOP 8, NG25
<b>Maximum Pressure</b>	345 Bar (5000 PSI)	345 Bar (5000 PSI)	345 Bar (5000 PSI)
<b>Maximum Flow</b>	76 LPM (20 GPM)	113 LPM (30 GPM)	340 LPM (90 GPM)
<b>Cracking Pressure</b>	0.3 Bar (5 PSI), 3 Bar* (45 PSI), 5 Bar* (75 PSI)	0.3 Bar (5 PSI), 3 Bar* (45 PSI), 5 Bar* (75 PSI)	0.3 Bar (5 PSI)

\* Optional

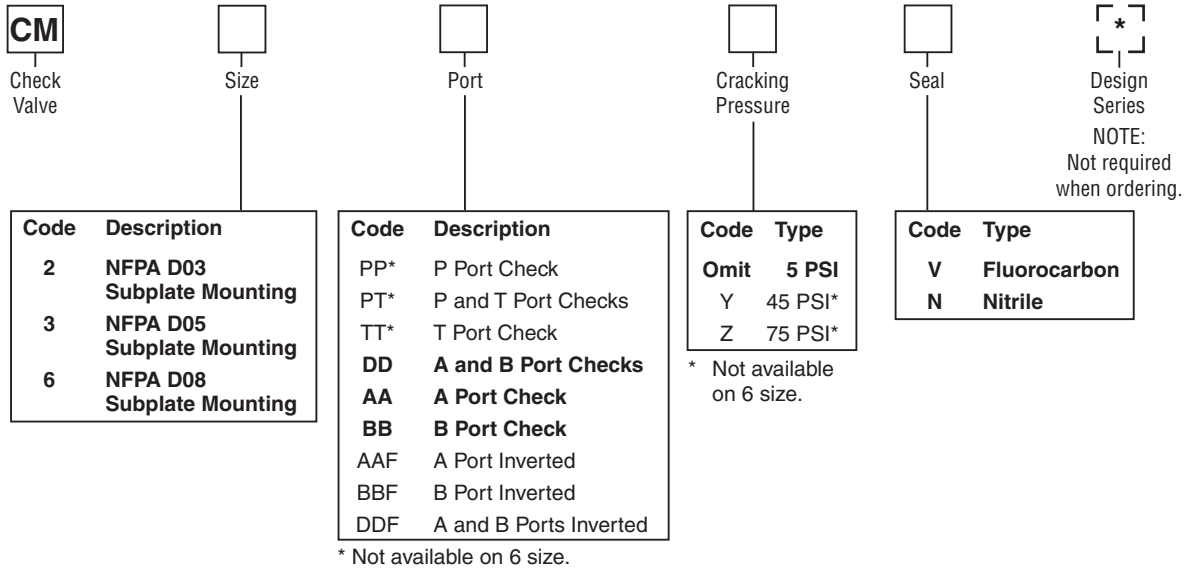
**Performance Curves**



VISCOSITY CORRECTION FACTOR							
Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (Approx.)	93	111	119	126	132	137	141

Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change per chart.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



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

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

**Manapak Bolt Kits**

Size "2"				Size "3"			
No. of Sandwich	Sandwich & Valve Combination	Bolt Kit	Bolt Length mm (in)	No. of Sandwich	Sandwich & Valve Combination	D3W-30 D3DW & D31*W*	Bolt Length mm (in)
1	Sandwich & D1	BK243	73.2 (2.88)	1	Sandwich & D3	BK141	88.9 (3.50)
2	Sandwich & D1	BK225	111.3 (4.38)	2	Sandwich & D3	BK142	139.7 (5.50)
3	Sandwich & D1	BK244	152.4 (6.00)	3	Sandwich & D3	BK143	190.5 (7.50)
4	Sandwich & D1	BK245	190.5 (7.50)				

Bolt Kits must be ordered separately. \*D31VW with internal pilot and internal drain only.

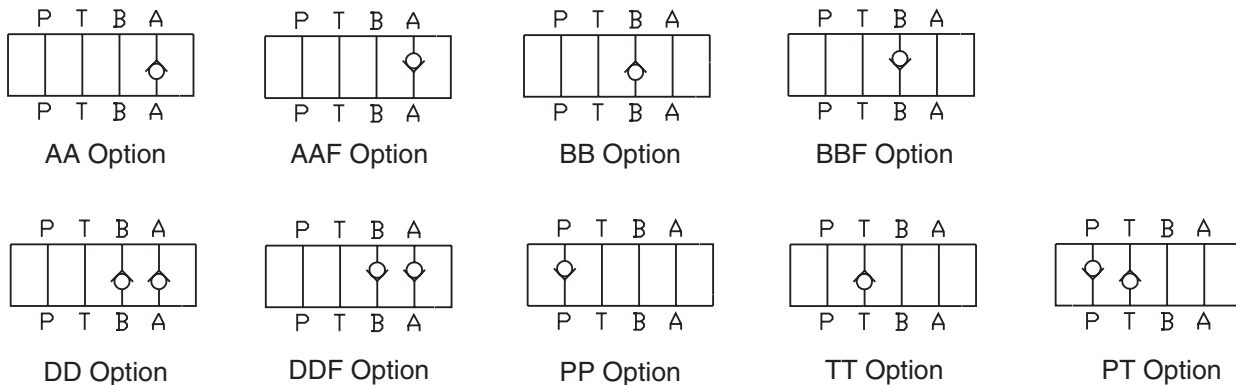
Size "6"				
Sandwich & Valve Combination	Bolt Kit	Description	Qty/Kit	Torque IN-LBS
1 Sandwich & D6*VW Valve	BK121	1/2 - 13 x 5.25	6	80
2 Sandwich & D6*VW Valve	BK122	1/2 - 13 x 8.00	6	80
3 Sandwich & D6*VW Valve	BK123	1/2 - 13 x 10.75	6	80
4 Sandwich & D6*VW Valve	BK124	1/2 - 13 x 13.50	6	80

**Unit Weight:**

- CM2 0.8 kg (1.7 lbs.)
- CM3 1.8 kg (3.9 lbs.)
- CM6 7.7 kg (17 lbs.)

**Note:** Bolt Kits must be ordered separately.

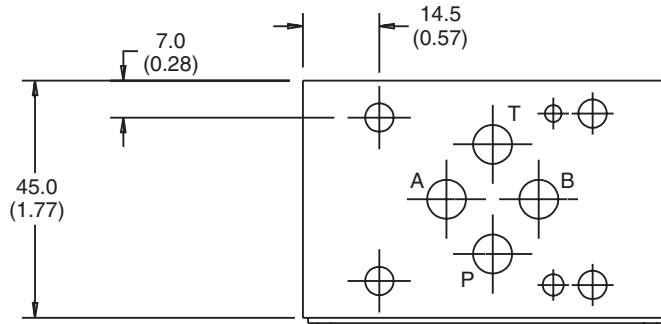
**Schematics**



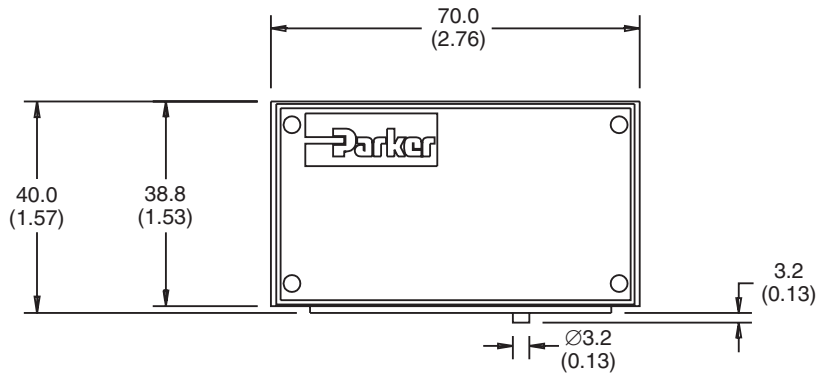
**Dimensions**

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

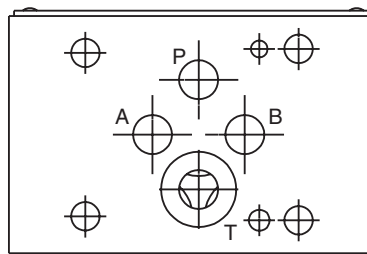
**B**



**Top View**



**Face View**



SHOWN WITHOUT O-RING PLATE

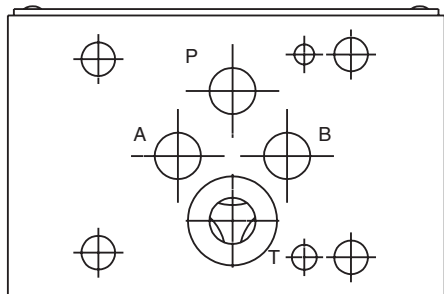
**Bottom View**



Note: Transfer the locating pin to the hole on the opposite side of the valve body for 'T' port option.  
(Invert body 180°)

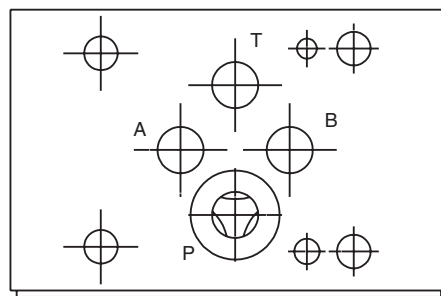


**Bottom Views**

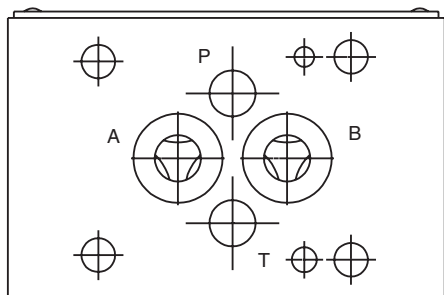


**TT**

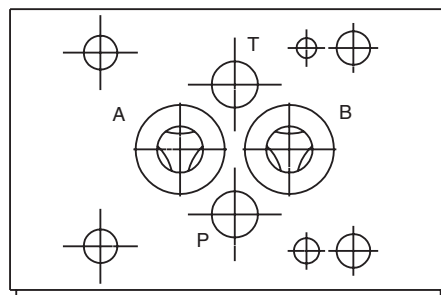
**Top Views**



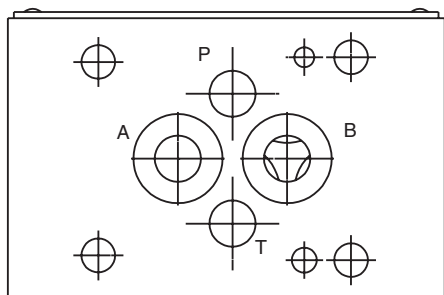
**PP/PT**



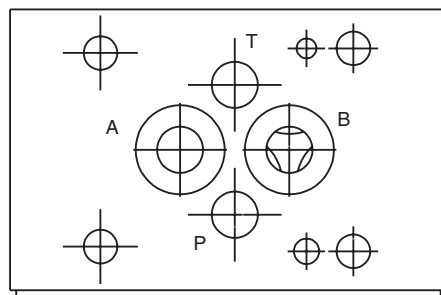
**DD**



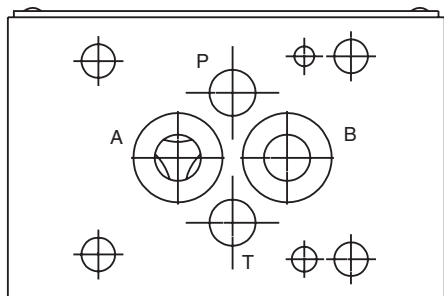
**DDF**



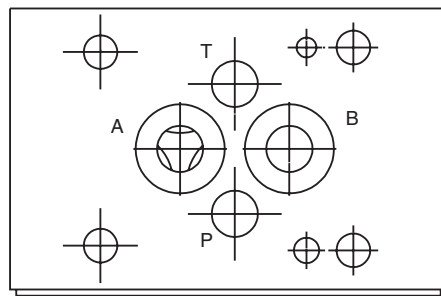
**BB**



**BBF**



**AA**



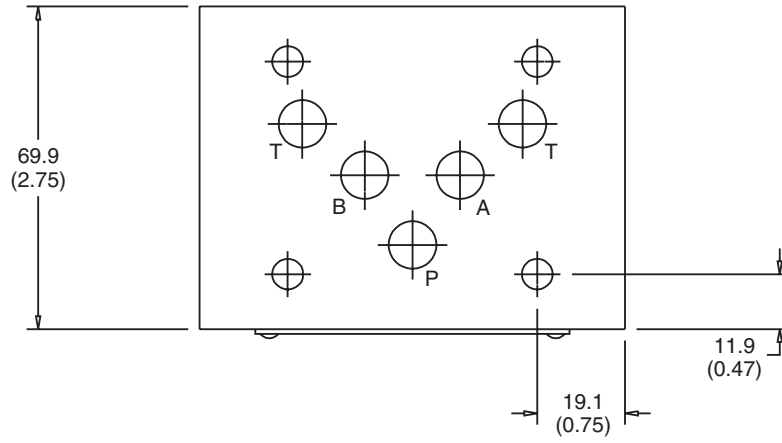
**AAF**

**B**

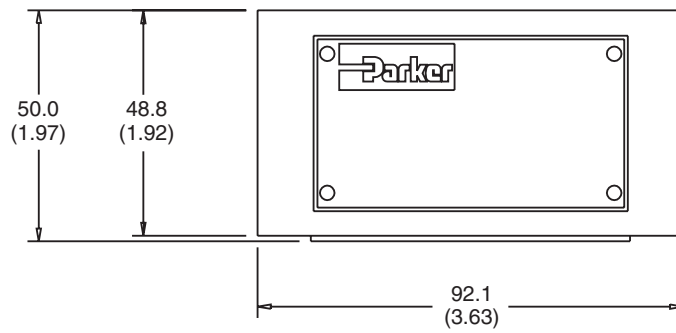
**Dimensions**

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

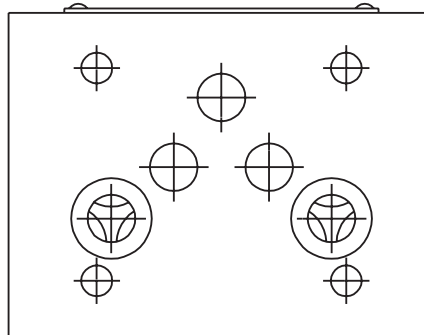
**B**



**Top View**



**Face View**



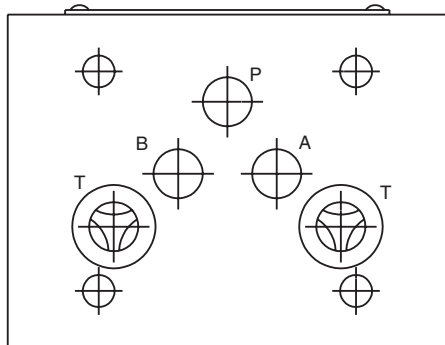
SHOWN WITHOUT O-RING PLATE

**Bottom View**

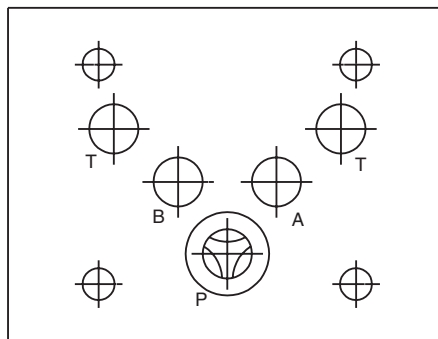


**Bottom Views**

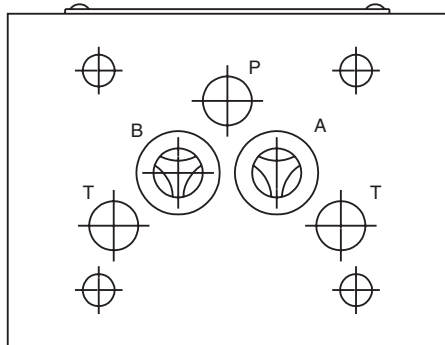
**Top Views**



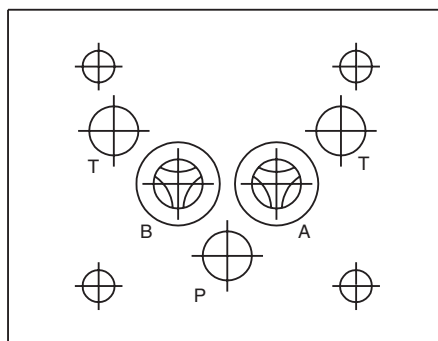
**TT**



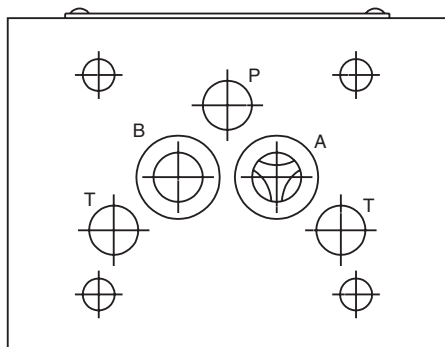
**PP/PT**



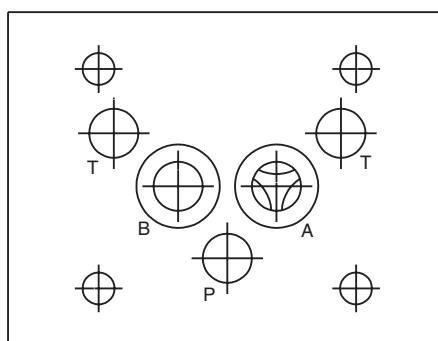
**DD**



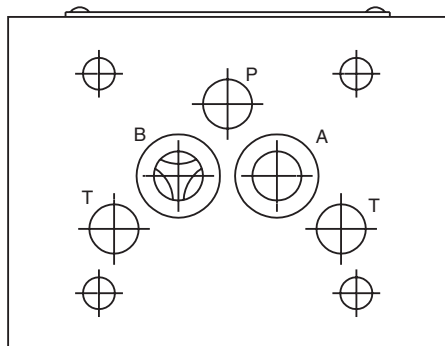
**DDF**



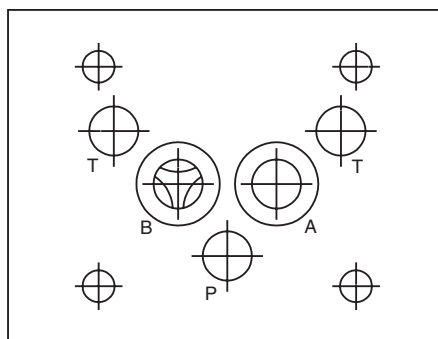
**AA**



**AAF**



**BB**

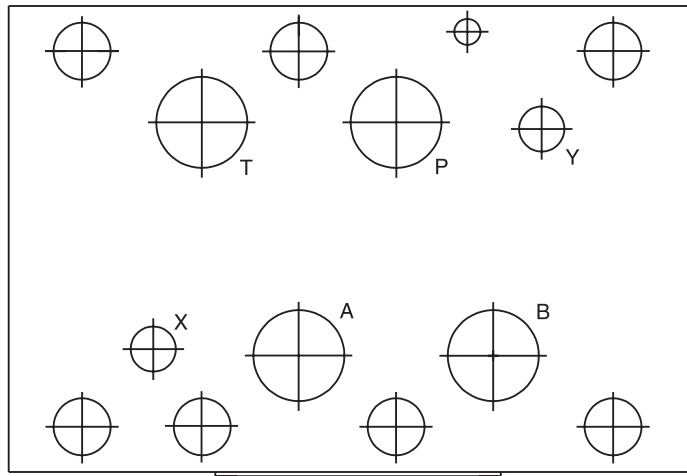


**BBF**

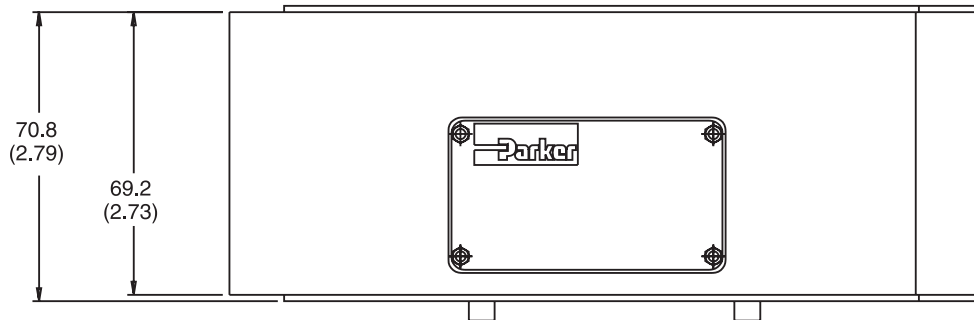
**B**

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

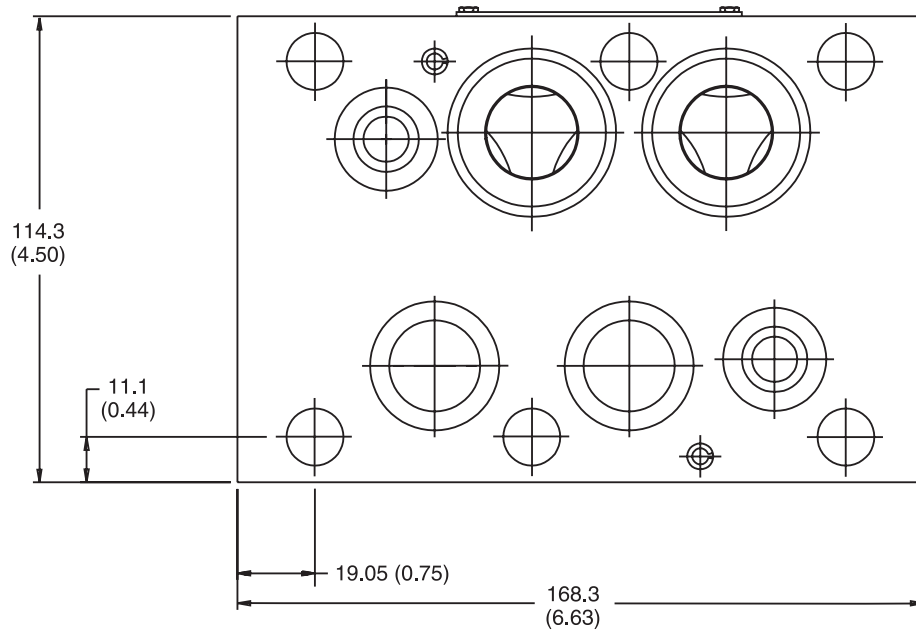
**B**



**Top View**



**Face View**

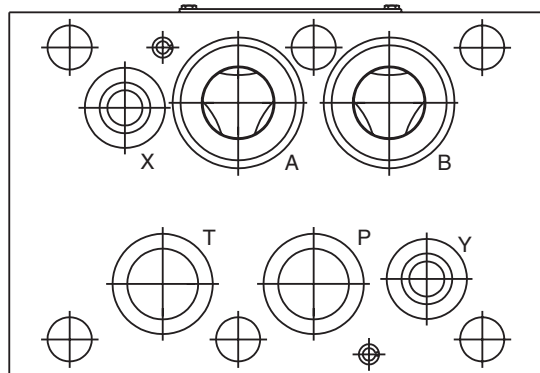


**Bottom View**

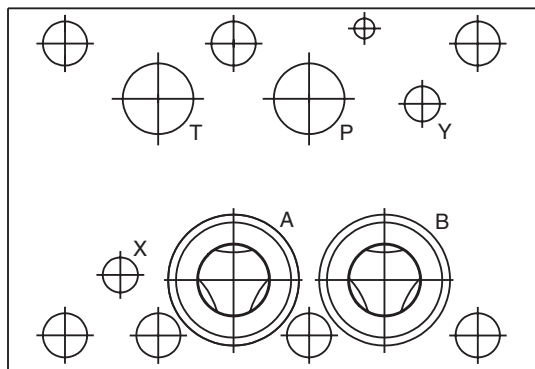


Bottom Views

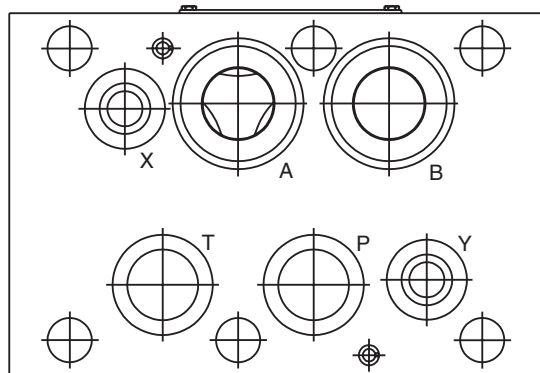
Top Views



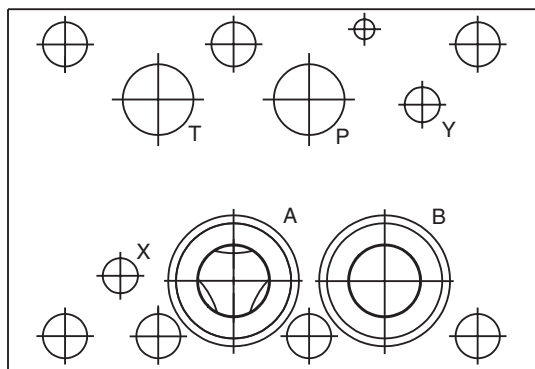
DD



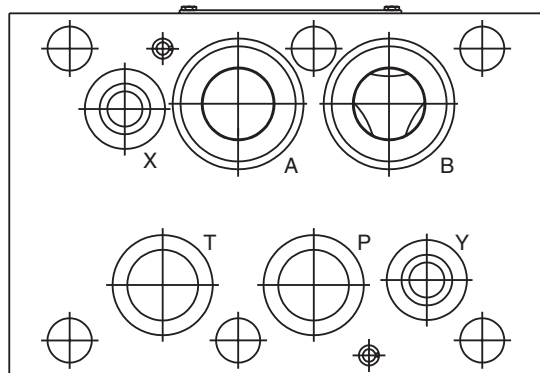
DDF



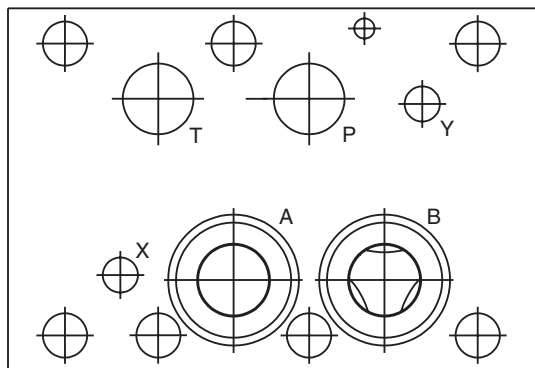
AA



AAF



BB



BBF

**B**

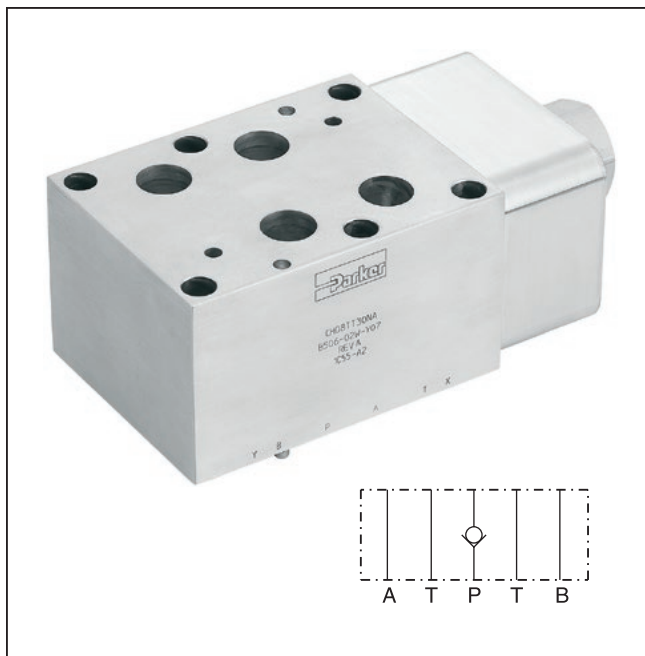
## General Description

Series CH check valves provide free flow in one direction and blocked flow in the reverse direction. The check can be located in the P port or in the T port.

## B

### Features

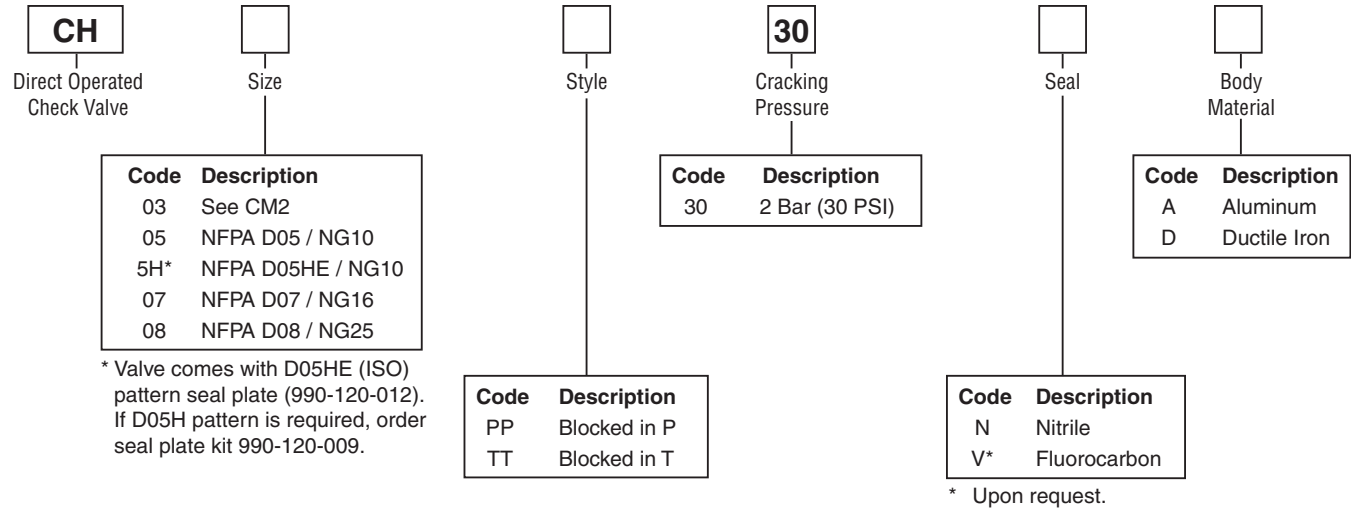
- Cracking pressure 2.0 Bar (30 PSI).
- Sizes:
  - CH05 – NFPA D05 / NG10 / CETOP 5
  - CH5H – NFPA D05HE / NG10 / CETOP 5H
  - CH07 – NFPA D07 / NG16 / CETOP 7
  - CH08 – NFPA D08 / NG25 / CETOP 8



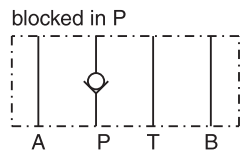
## Specifications

General				
Size	D05 / NG10	D05HE / NG10	D07 / NG16	D08 / NG25
Mounting Position	Unrestricted			
Ambient Temperature Range	-20°C to +50°C (-4°F to +122°F)			
Hydraulic				
Maximum Operating Pressure	Aluminum Body – up to 207 Bar (3000 PSI); Ductile Iron Body – up to 345 Bar (5000 PSI)			
Nominal Flow	151 LPM (40 GPM)	151 LPM (40 GPM)	303 LPM (80 GPM)	606 LPM (160 GPM)
Leakage	< 1 DPM	< 1 DPM	< 1 DPM	< 1 DPM
Fluid Temperature	-20°C to +80°C (-4°F to +176°F)			
Viscosity	Permitted 10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU) Recommended 30 cSt / mm <sup>2</sup> /s (139 SSU)			
Filtration	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			

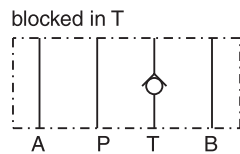
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**CH\*\*PP**



**CH\*\*TT**

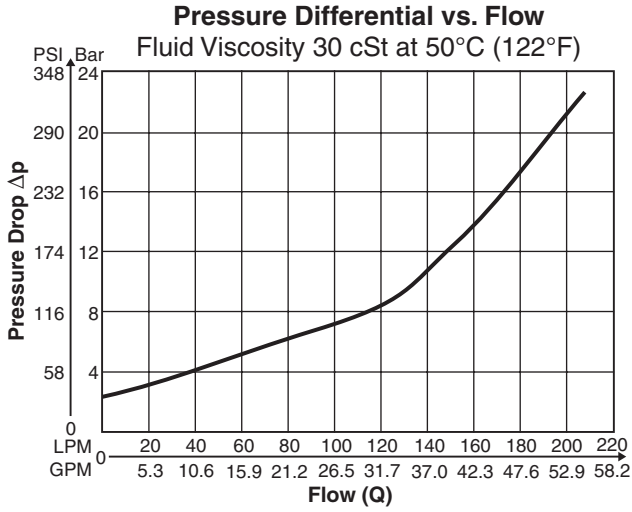


**Weight:**

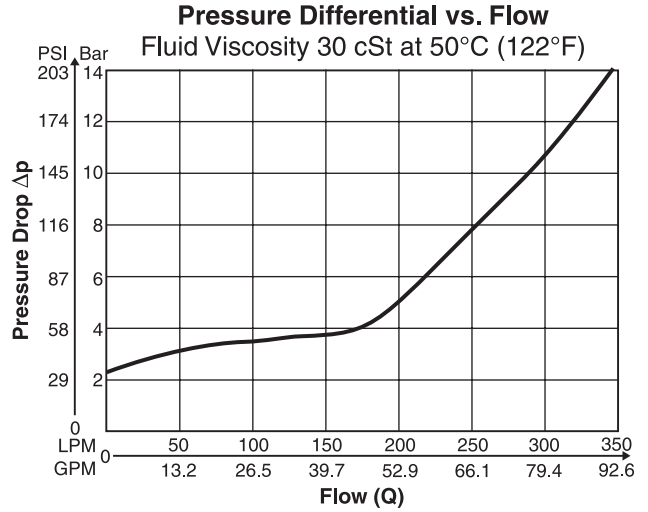
Size	CH**PP30NA	CH**PP30ND	CH**TT30NA	CH**TT30ND
CH05, CH5H	0.8 kg (1.9 lbs.)	1.9 kg (4.2 lbs.)	0.8 kg (1.9 lbs.)	1.9 kg (4.2 lbs.)
CH07	2.2 kg (4.9 lbs.)	4.9 kg (10.9 lbs.)	2.7 kg (6.0 lbs.)	6.2 kg (13.7 lbs.)
CH08	4.7 kg (10.4 lbs.)	10.8 kg (23.8 lbs.)	5.3 kg (11.7 lbs.)	12.4 kg (27.3 lbs.)

**B**

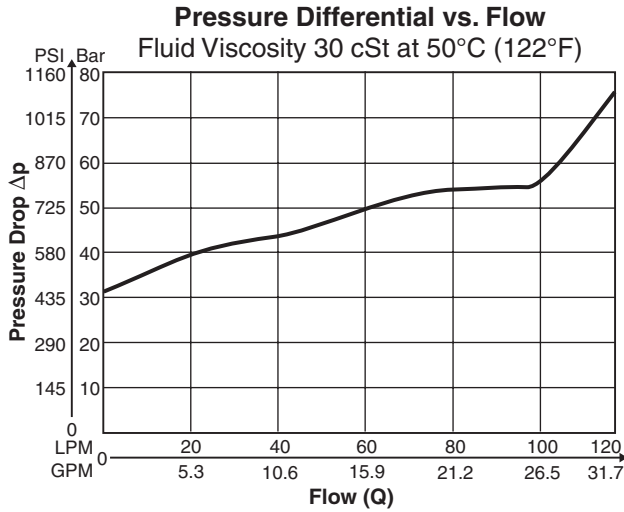
**CH05/CH5H**



**CH07**



**CH08**



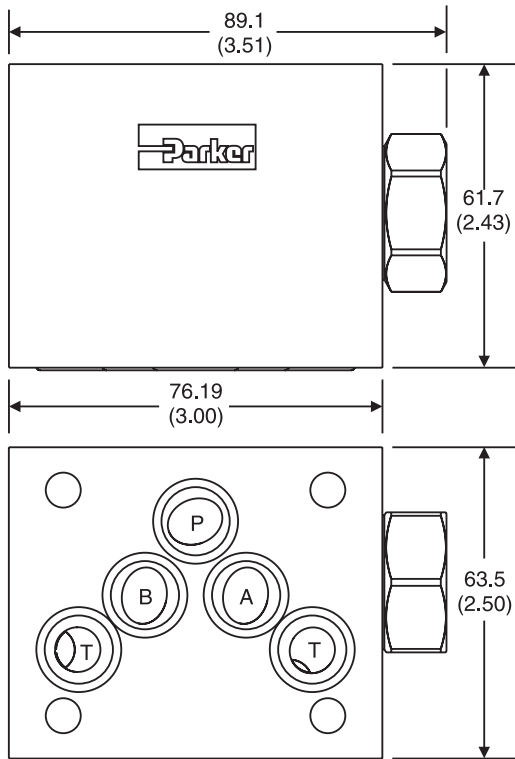


**Dimensions**

**Sandwich Valves  
Series CH05, CH5H**

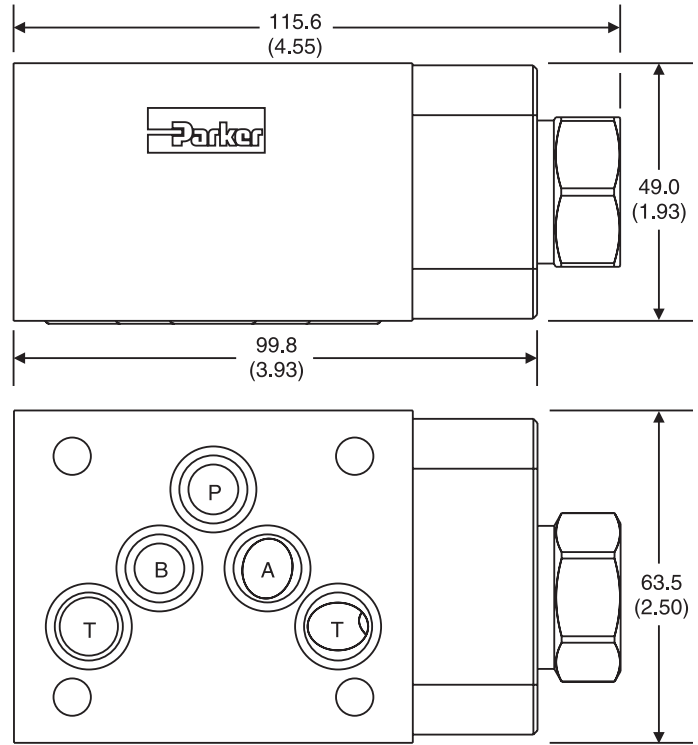
**CH05PP**

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



**CH05TT**

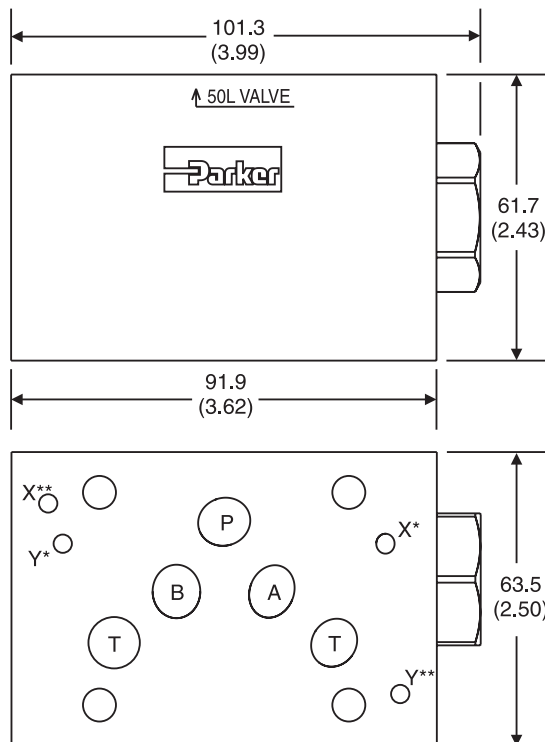
Inch equivalents for millimeter dimensions are shown in (\*\*)



**B**

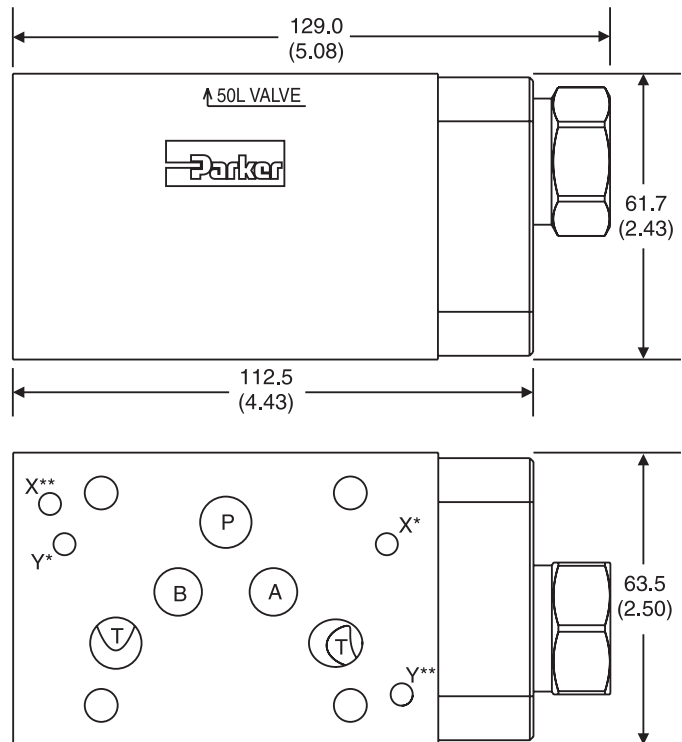
**CH5HPP**

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



**CH5HTT**

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



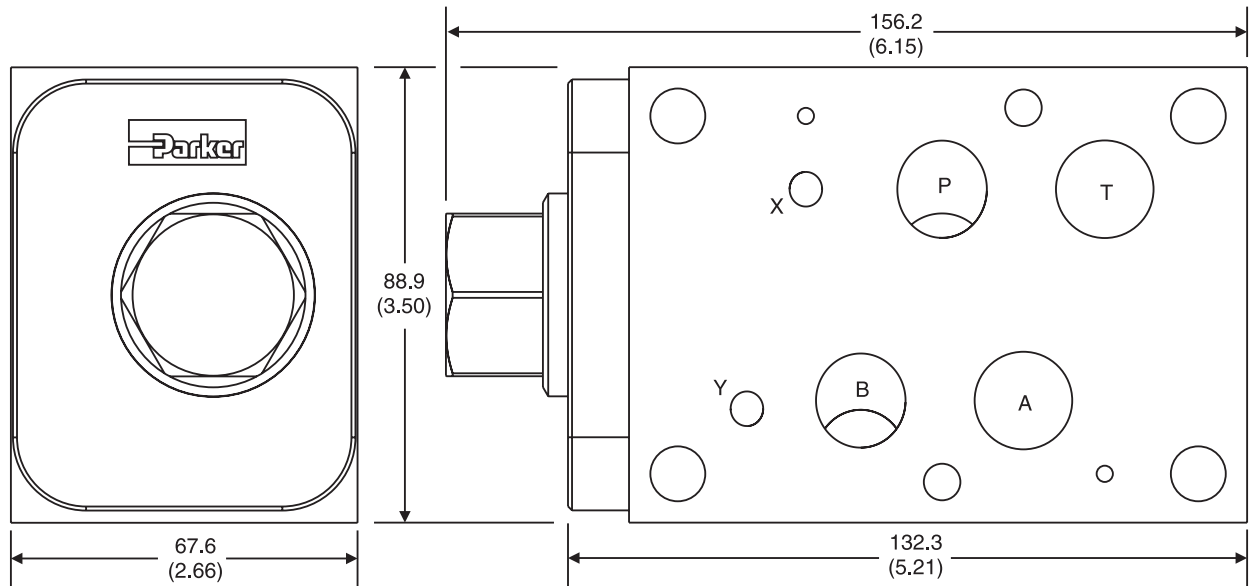
\* D05HE (Standard) Valve comes with D05HE (ISO) pattern seal plate (990-120-012).  
 \*\* D05H If D05H pattern is required, order seal plate kit 990-120-009.

\* D05HE (Standard) Valve comes with D05HE (ISO) pattern seal plate (990-120-012).  
 \*\* D05H If D05H pattern is required, order seal plate kit 990-120-009.



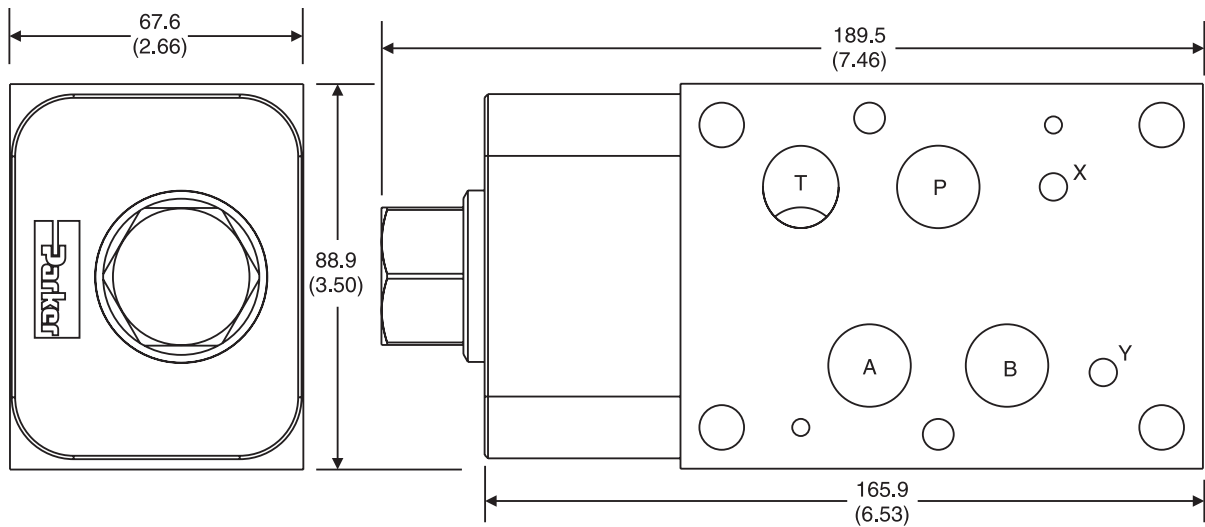
**CH07PP** – Inch equivalents for millimeter dimensions are shown in (\*\*)

**B**

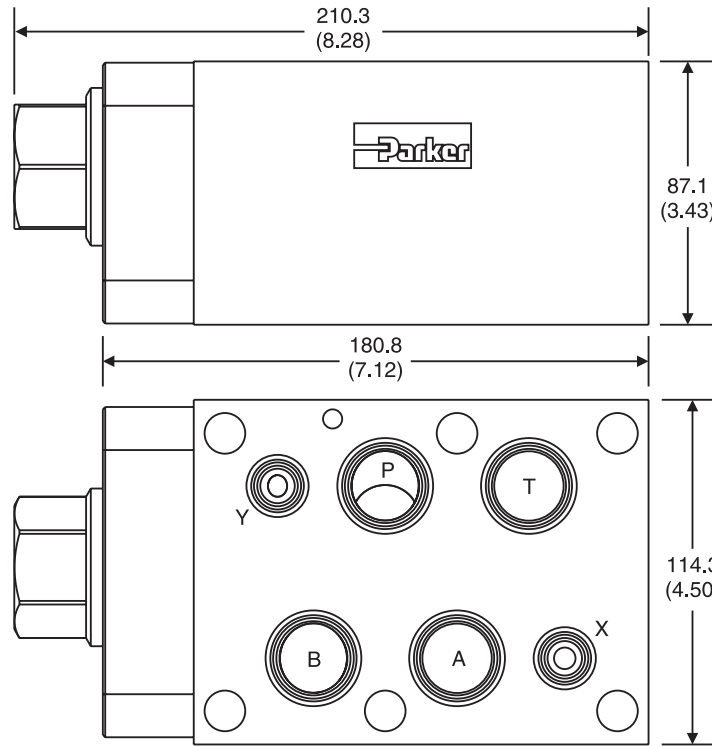


**CH07TT** – Inch equivalents for millimeter dimensions are shown in (\*\*)

**Note:** This is a top view.

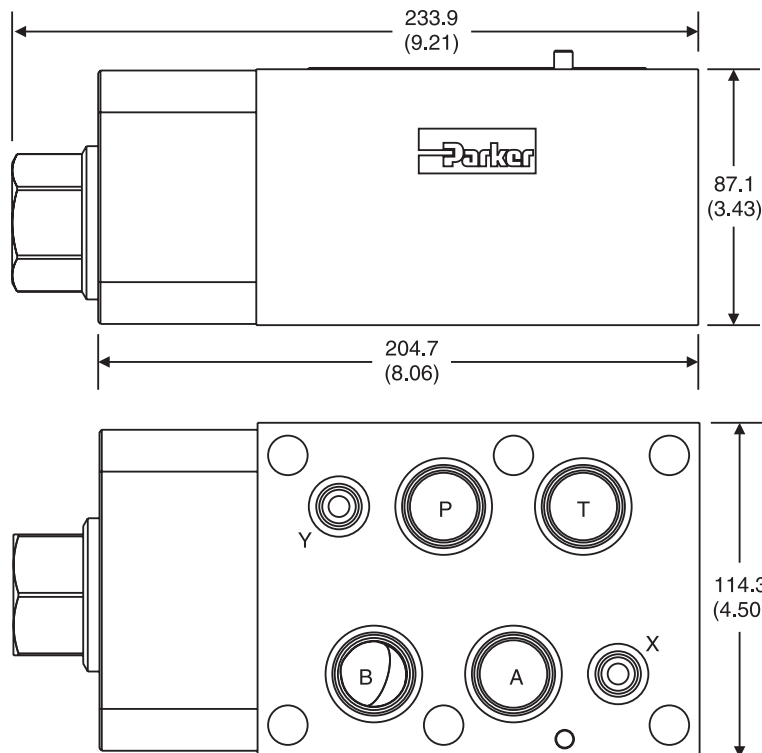


**CH08PP** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**B**

**CH08TT** – Inch equivalents for millimeter dimensions are shown in (\*\*)



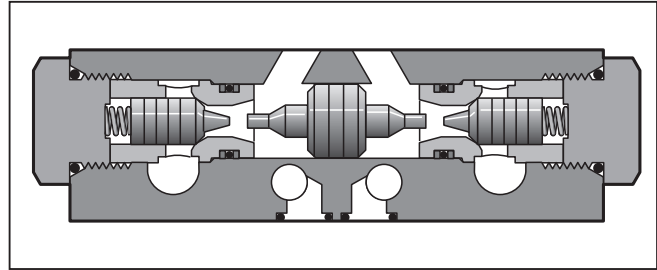
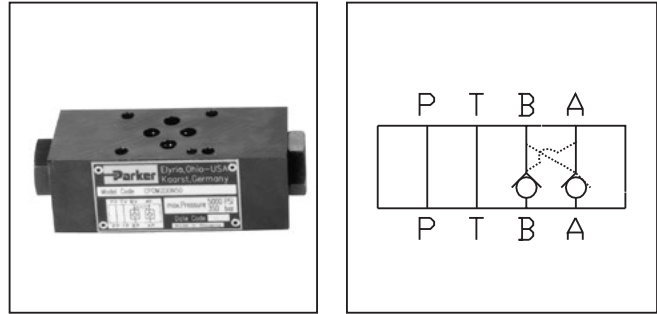
**General Description**

Series CPOM double pilot operated check valves block leakage from the actuator ports to tank when the directional valve is in the center position.

**NOTE:** For maximum response and shut off, a directional valve with both cylinder ports drained to tank in the center position is recommended for use with sandwich double pilot operated check valves.

**Features**

- Sandwich style, pilot operated check valves can be provided in either single or double configurations.
- The pilot operated checks may be positioned in A port or B port; or both A and B ports.
- Valve bodies are manufactured from steel providing extra strength and durability for longer life. Internal hardened steel components also provide longer life.
- Positive shut-off is provided by a hardened poppet and cage assembly.
- Large internal flow paths allow high flow at low pressure drop.



**Ordering Information**

<b>CPOM</b> Pilot Operated Check Valve	Size	Poppet Style	Cracking Pressure	Seal	Design Series NOTE: Not required when ordering.																														
<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>2</b></td> <td><b>NFPA D03, CETOP3, NG6 Subplate Mounting</b></td> </tr> <tr> <td><b>3</b></td> <td><b>NFPA D05, CETOP5, NG10 Subplate Mounting</b></td> </tr> <tr> <td><b>6</b></td> <td><b>NFPA D08, CETOP8, NG25 Subplate Mounting</b></td> </tr> </tbody> </table>	Code	Description	<b>2</b>	<b>NFPA D03, CETOP3, NG6 Subplate Mounting</b>	<b>3</b>	<b>NFPA D05, CETOP5, NG10 Subplate Mounting</b>	<b>6</b>	<b>NFPA D08, CETOP8, NG25 Subplate Mounting</b>		<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>AA</b></td> <td><b>A Port Only</b></td> </tr> <tr> <td><b>BB</b></td> <td><b>B Port Only</b></td> </tr> <tr> <td><b>DD</b></td> <td><b>Double Poppet A and B Ports</b></td> </tr> </tbody> </table>	Code	Description	<b>AA</b>	<b>A Port Only</b>	<b>BB</b>	<b>B Port Only</b>	<b>DD</b>	<b>Double Poppet A and B Ports</b>	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>Omit</b></td> <td><b>0.3 Bar (5 PSI)</b></td> </tr> <tr> <td><b>Y*</b></td> <td><b>3.1 Bar (45 PSI)</b></td> </tr> <tr> <td><b>Z*</b></td> <td><b>5.2 Bar (75 PSI)</b></td> </tr> </tbody> </table> <p>* Size 2 only.</p>	Code	Description	<b>Omit</b>	<b>0.3 Bar (5 PSI)</b>	<b>Y*</b>	<b>3.1 Bar (45 PSI)</b>	<b>Z*</b>	<b>5.2 Bar (75 PSI)</b>	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>N</b></td> <td><b>Nitrile</b></td> </tr> <tr> <td><b>V</b></td> <td><b>Fluorocarbon</b></td> </tr> </tbody> </table>	Code	Description	<b>N</b>	<b>Nitrile</b>	<b>V</b>	<b>Fluorocarbon</b>	
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<b>CPOM</b> Pilot Operated Check Valve	<b>4</b> Size NFPA D07 CETOP7 NG16	Poppet Style	<b>HT</b> Pilot Ratio 13:1	<b>V</b> Seal Fluorocarbon	Design Series NOTE: Not required when ordering.								
		<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>AA</b></td> <td><b>A Port Only</b></td> </tr> <tr> <td><b>BB</b></td> <td><b>B Port Only</b></td> </tr> <tr> <td><b>DD</b></td> <td><b>A and B Ports</b></td> </tr> </tbody> </table>	Code	Description	<b>AA</b>	<b>A Port Only</b>	<b>BB</b>	<b>B Port Only</b>	<b>DD</b>	<b>A and B Ports</b>			<p><b>Weight:</b></p> <p>CPOM2 0.8 kg (1.7 lbs.)          CPOM3 4.4 kg (9.6 lbs.)          CPOM4 7.7 kg (16.8 lbs.)          CPOM6 9.5 kg (21.0 lbs.)</p>
Code	Description												
<b>AA</b>	<b>A Port Only</b>												
<b>BB</b>	<b>B Port Only</b>												
<b>DD</b>	<b>A and B Ports</b>												

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

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

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

Technical Information

Specifications

	CPOM2	CPOM3	CPOM4	CPOM6
Mounting Pattern	NFPA D03, CETOP 3, NG6	NFPA D05, CETOP 5, NG10	NFPA D07, CETOP 7, NG16	NFPA D08, CETOP 8, NG25
Maximum Pressure	345 Bar (5000 PSI)	345 Bar (5000 PSI)	345 Bar (5000 PSI)	205 Bar (3000 PSI)
Maximum Flow	53 LPM (14 GPM) @ 21 Bar (305 PSI) Pressure Drop	76 LPM (20 GPM) @ 11 Bar (155 PSI) Pressure Drop	200 LPM (53 GPM) @ 11 Bar (155 PSI) Pressure Drop	227 LPM (60 GPM) @ 24 Bar (350 PSI) Pressure Drop
Cracking Pressure	1.0 Bar (15 PSI)	0.3 Bar (5 PSI)	2.0 Bar (29 PSI)	0.4 Bar (6 PSI)
Pilot Ratio	3:1	3:1	13:1	3:1
Leakage	5 DPM	5 DPM	Consult Factory	5 DPM

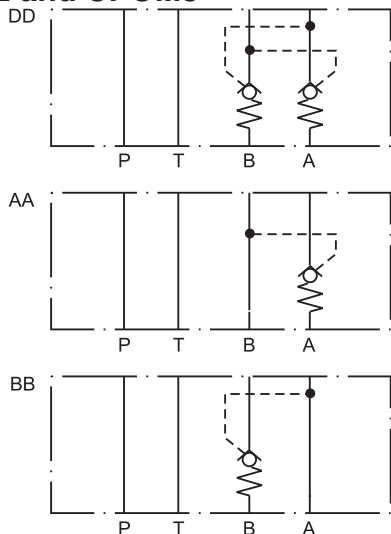


Bolt Kits

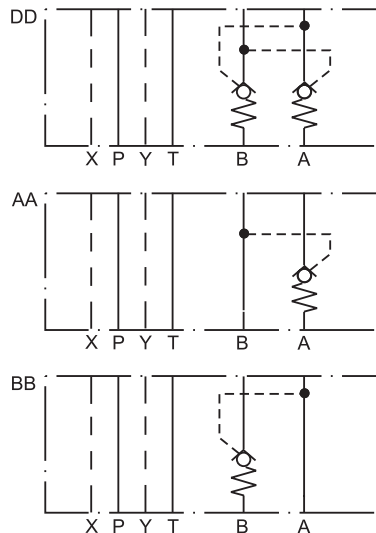
Size 2				Size 3			
No. of Sandwich	Sandwich & Valve Combination	Bolt Kit	Bolt Length mm (in)	No. of Sandwich	Sandwich & Valve Combination	D3W-30 D3DW & Bolt Length D31*W* mm (in)	
1	Sandwich & D1	BK243	73.2 (2.88)	1	Sandwich & D3	BK141	88.9 (3.50)
2	Sandwich & D1	BK225	111.3 (4.38)	2	Sandwich & D3	BK142	139.7 (5.50)
3	Sandwich & D1	BK244	152.4 (6.00)	3	Sandwich & D3	BK143	190.5 (7.50)
4	Sandwich & D1	BK245	190.5 (7.50)	* D31VW with internal pilot and internal drain only.			
Size 4				Size 6			
No. of Sandwich	Sandwich & Valve Combination	Bolt Length mm		No. of Sandwich	Sandwich & Valve Combination	Bolt Kit	Bolt Length mm (in)
1	Sandwich & D4	4x M10 x 140 2x M6 x 135		1	Sandwich & D6	BK121	133.4 (5.25)
2	Sandwich & D4	4x M10 x 220 2x M6 x 215		2	Sandwich & D6	BK122	203.2 (8.00)
3	Sandwich & D4	4x M10 x 300 2x M10 x 295		3	Sandwich & D6	BK123	273.1 (10.75)
				4	Sandwich & D6	BK124	342.9 (13.5)

Bolt Kits must be ordered separately.

Schematics  
CPOM2 and CPOM3

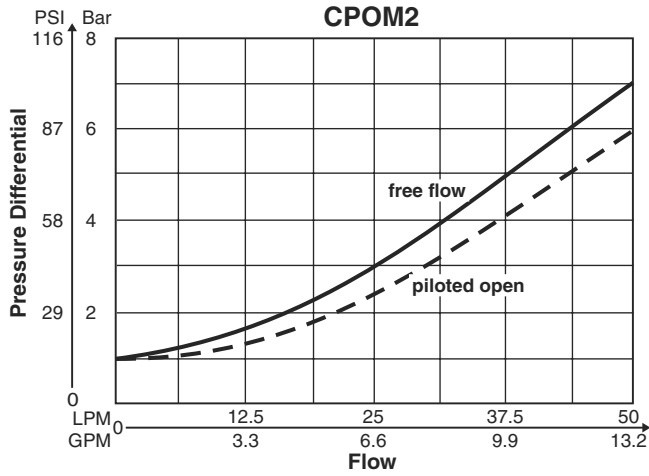


Schematics  
CPOM4 and CPOM6

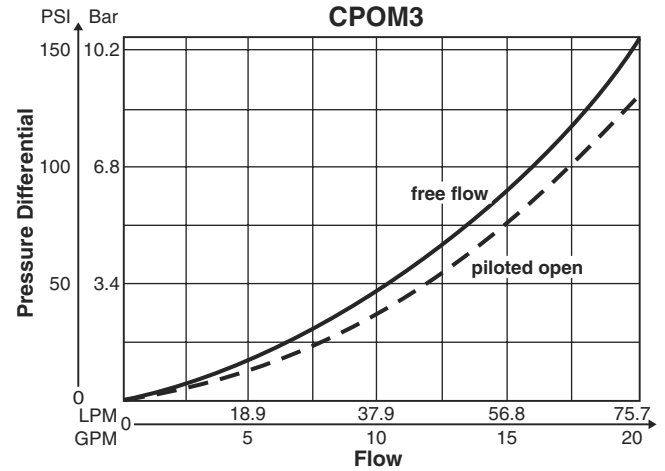


**B**

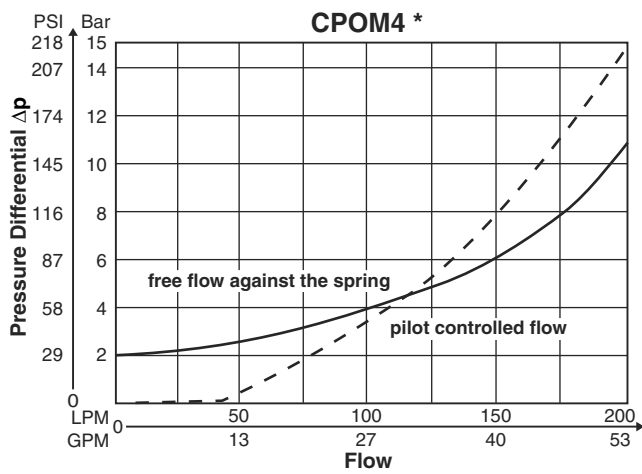
**CPOM2**



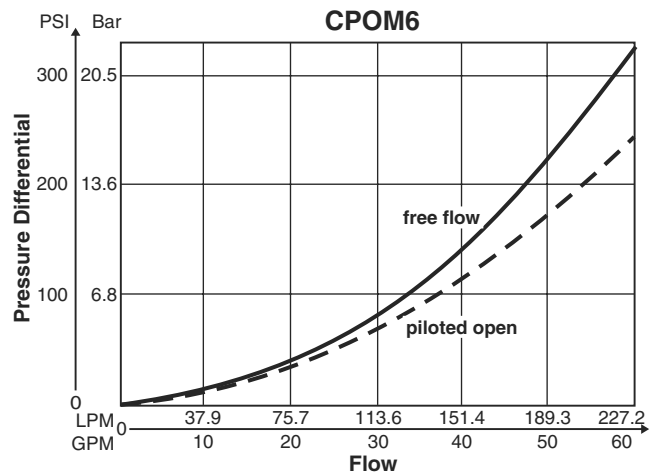
**CPOM3**



**CPOM4**



**CPOM6**



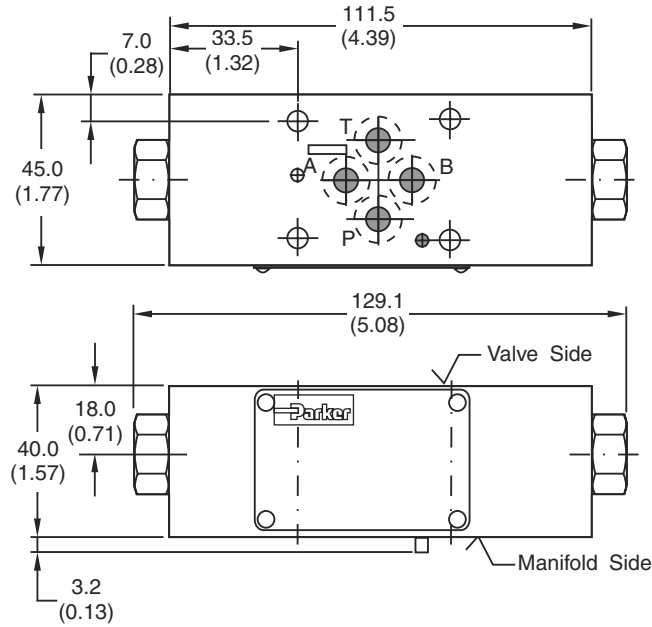
\* Curves measured with ISO 46 fluid at 50°C (122°F).

Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change as per chart.	Viscosity Correction Factor							
	Viscosity (SSU)	75	150	200	250	300	350	400
	Percentage of $\Delta P$ (Approx.)	93	111	119	126	132	137	141

**Dimensions**

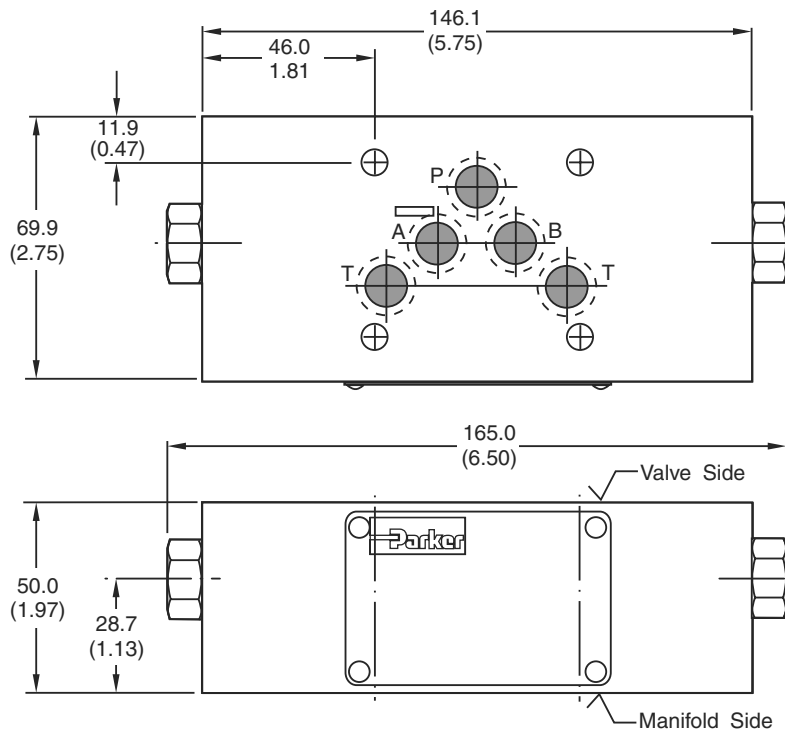
Inch equivalents for millimeter dimensions are shown in (\*\*)

**CPOM2**



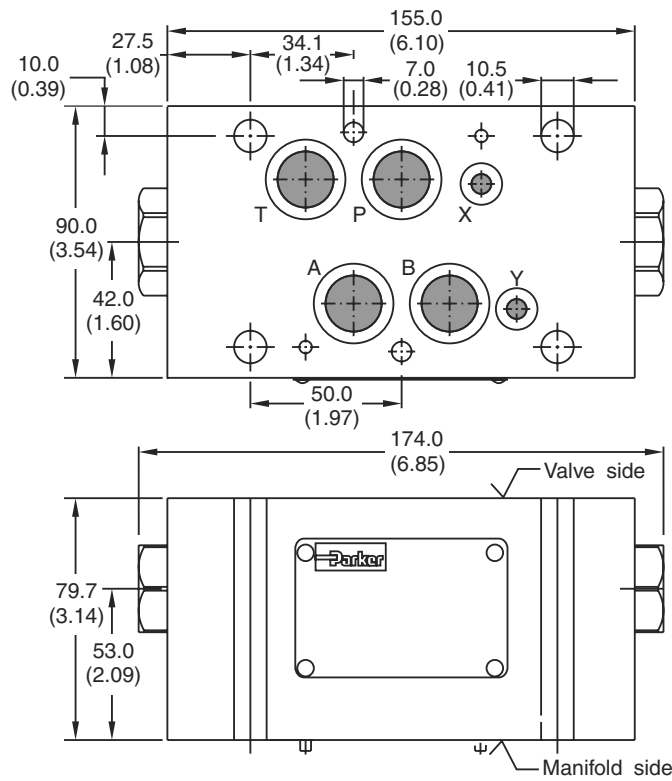
**B**

**CPOM3**

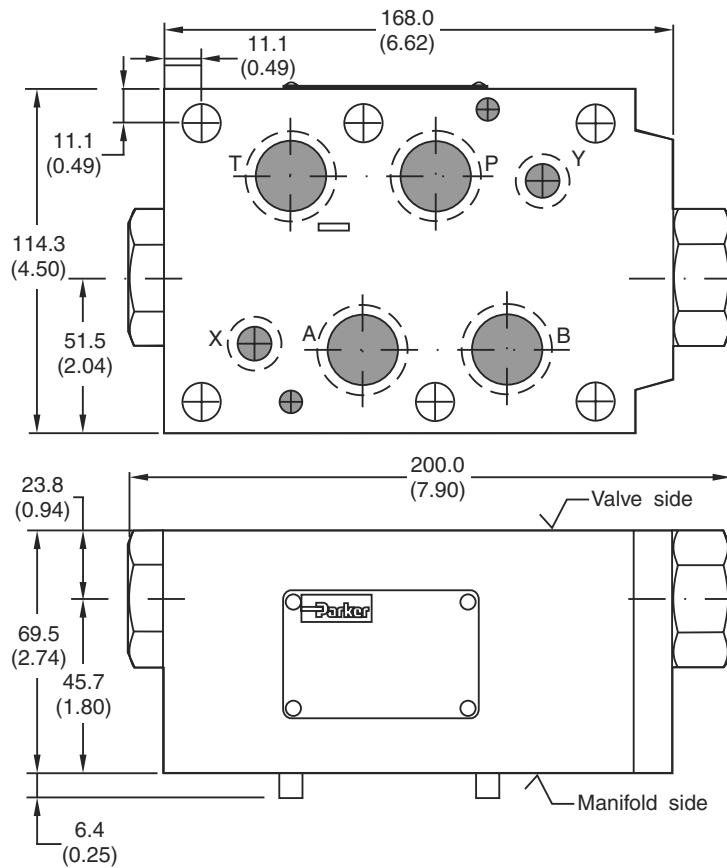


Inch equivalents for millimeter dimensions are shown in (\*\*)

**CPOM4**



**CPOM6**



**B**



### General Description.

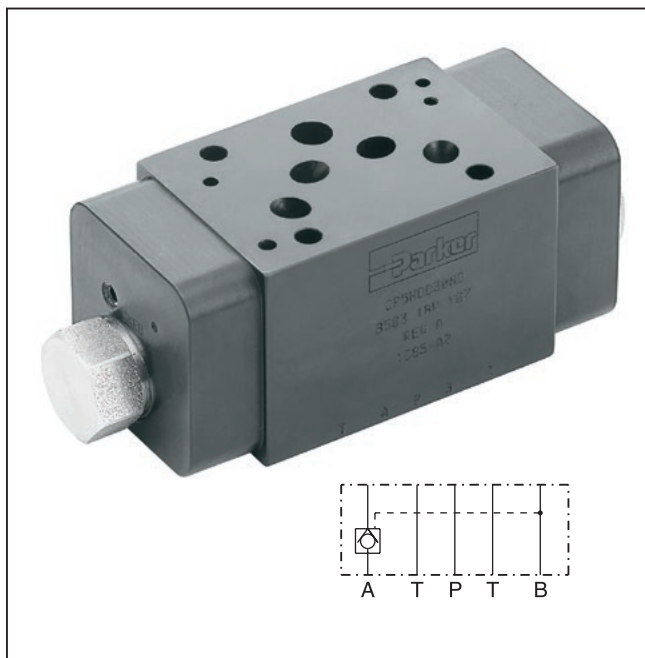
Series CP pilot operated check valves are designed for maximum flow rates.

The valves are typically used in combination with spool type directional control valves to ensure leak free positioning of the actuator.

The inlet flow is free while the outlet flow is blocked. Pressure in the inlet line opens the check valve and allows free outlet flow.

### Features

- High life time.
- Check function in A, B or A + B.
- Sizes:
  - CP05 – NFPA D05 / NG10 / CETOP 5
  - CP5H – NFPA D05HE / NG10 / CETOP 5H
  - CP07 – NFPA D07 / NG16 / CETOP 7
  - CP08 – NFPA D08 / NG25 / CETOP 8



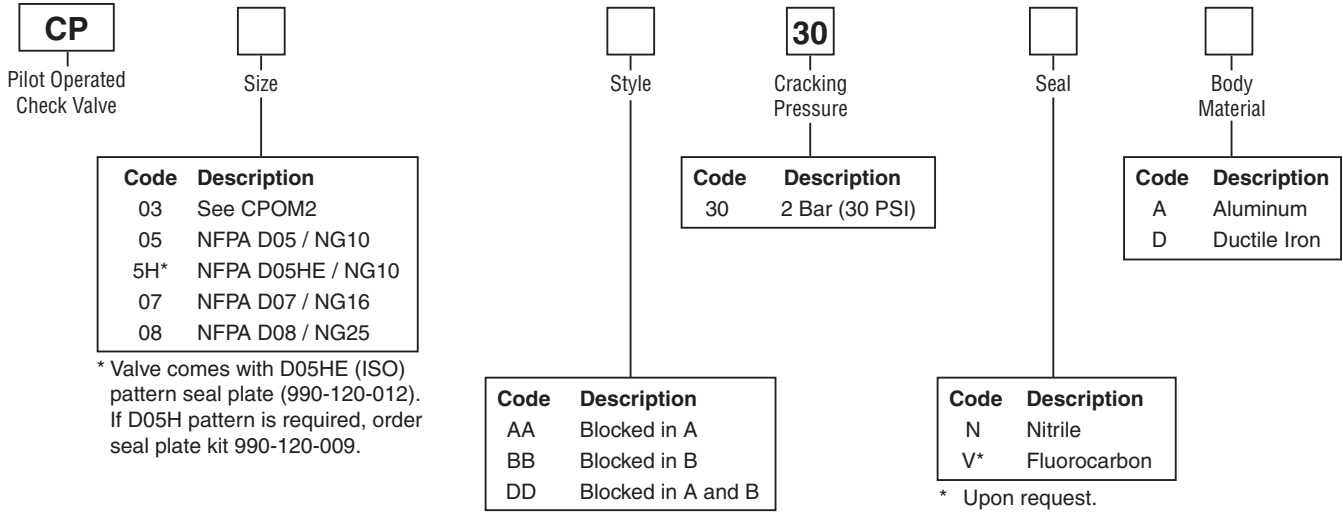
**B**

### Specifications

General				
Size	D05 / NG10	D05HE / NG10	D07 / NG16	D08 / NG25
Mounting Position	Unrestricted			
Ambient Temperature Range	-20°C to +50°C (-4°F to +122°F)			
Hydraulic				
Maximum Operating Pressure	Aluminum Body – up to 207 Bar (3000 PSI); Ductile Iron Body – up to 345 Bar (5000 PSI)			
Nominal Flow	114 LPM (30 GPM)	114 LPM (30 GPM)	227 LPM (60 GPM)	454 LPM (120 GPM)
Leakage	1 DPM	1 DPM	1 DPM	1 DPM
Cracking Pressure	30 ± 0.2 Bar (3 PSI)			
Pilot Ratio	3:1	3:1	3:1	3:1
Fluid Temperature	-20°C to +80°C (-4°F to +176°F)			
Viscosity	Permitted 10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU) Recommended 30 cSt / mm <sup>2</sup> /s (139 SSU)			
Filtration	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			

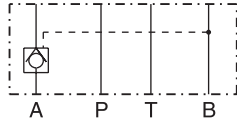
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**B**



**CP\*\*AA**

blocked in A



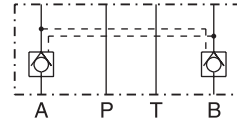
**CP\*\*BB**

blocked in B



**CP\*\*DD**

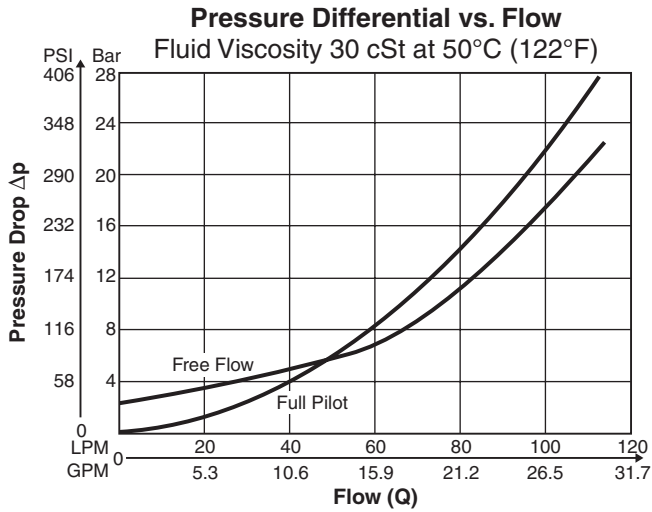
blocked in A and B



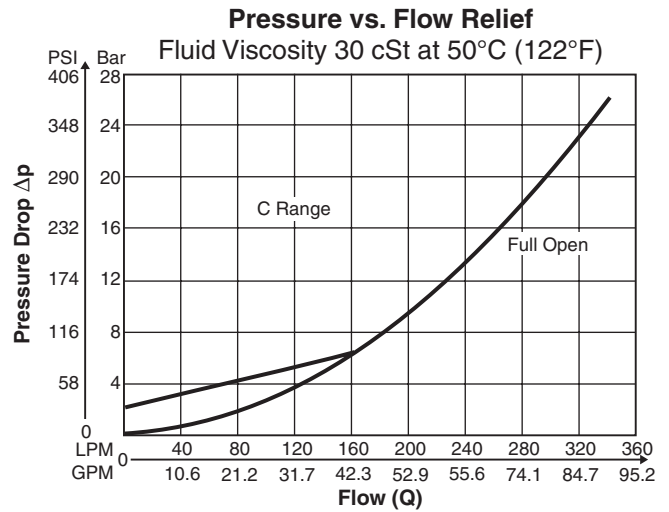
**Weight:**

Size	CP**AA30NA	CP**AA30ND	CP**BB30NA	CP**BB30ND	CP**DD30NA	CP**DD30ND
CP05, CP5H	0.8 kg (1.8 lbs.)	1.7 kg (3.8 lbs.)	0.8 kg (1.8 lbs.)	1.7 kg (3.8 lbs.)	1.3 kg (2.9 lbs.)	2.7 kg (5.9 lbs.)
CP07	2.4 kg (5.4 lbs.)	5.3 kg (11.8 lbs.)	2.4 kg (5.3 lbs.)	5.2 kg (11.6 lbs.)	3.5 kg (7.6 lbs.)	7.2 kg (15.8 lbs.)
CP08	5.2 kg (11.4 lbs.)	11.6 kg (25.6 lbs.)	5.8 kg (12.7 lbs.)	13.1 kg (29 lbs.)	7.6 kg (16.7 lbs.)	15.9 kg (35.1 lbs.)

**CP05/CP5H**

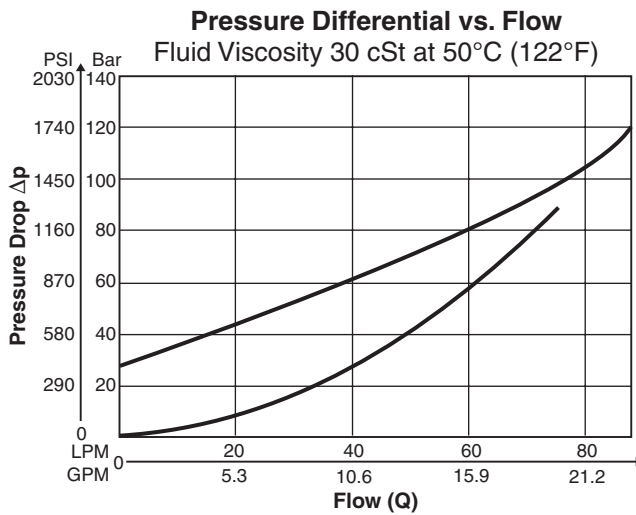


**CP07**



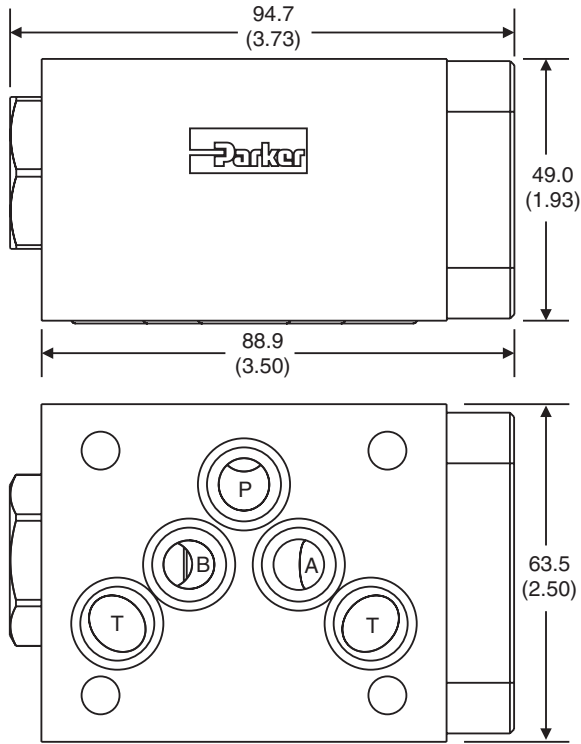
**B**

**CP08**



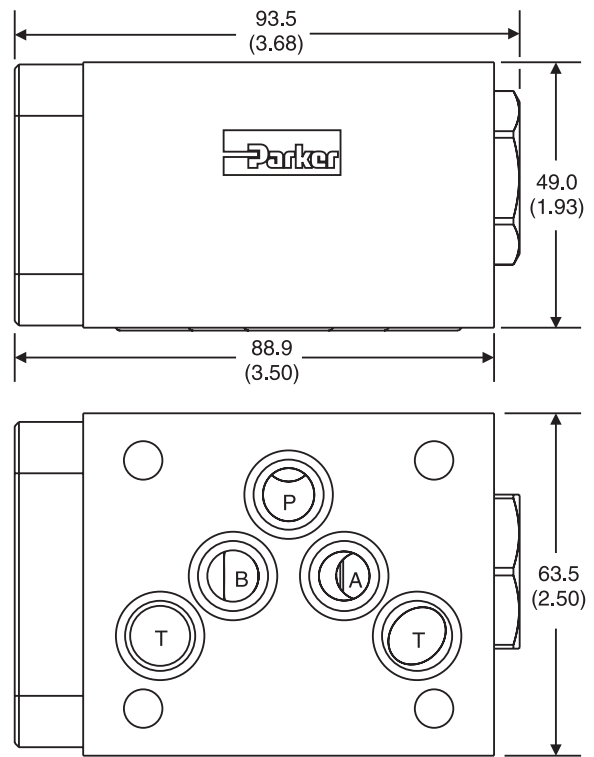
**CP05AA**

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

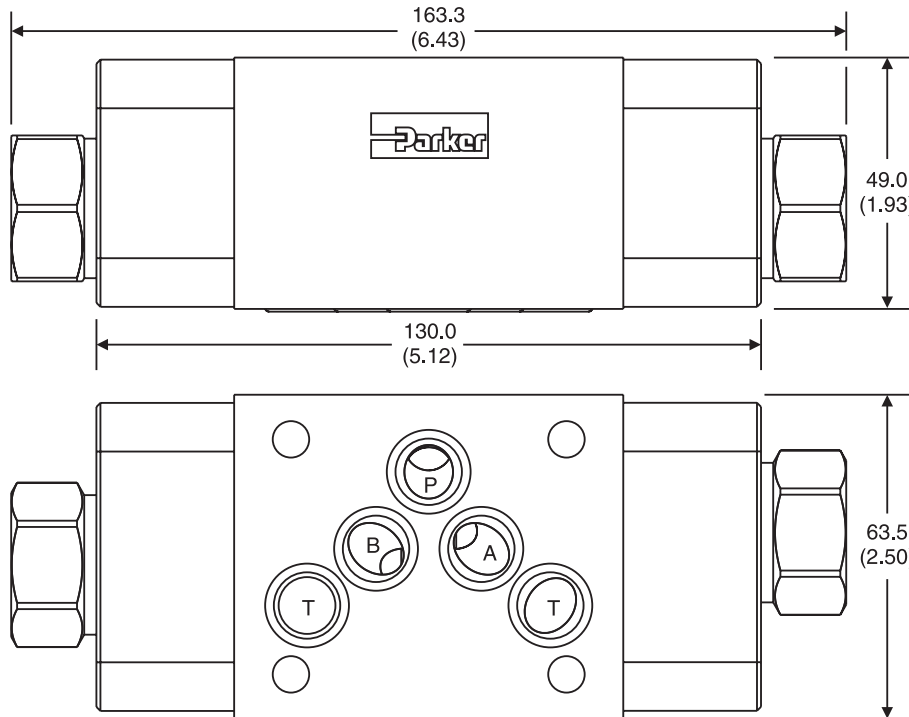


**CP05BB**

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



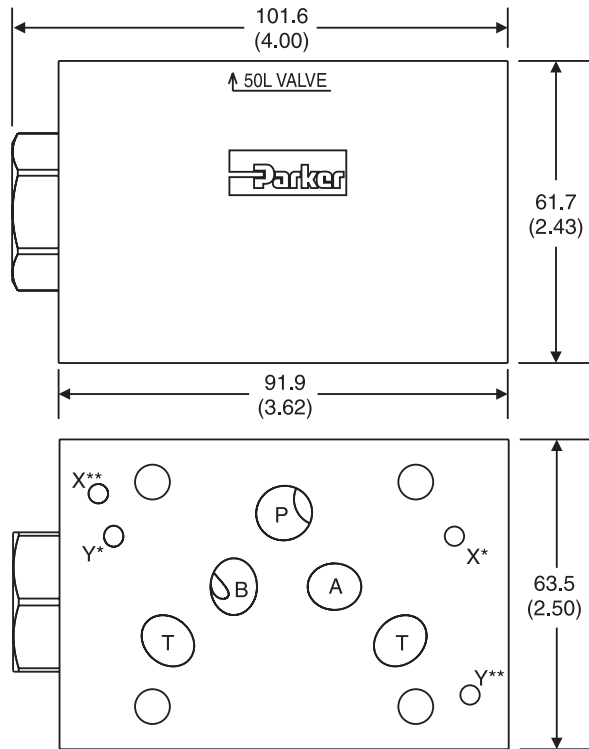
**CP05DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**B**

**CP5HAA**

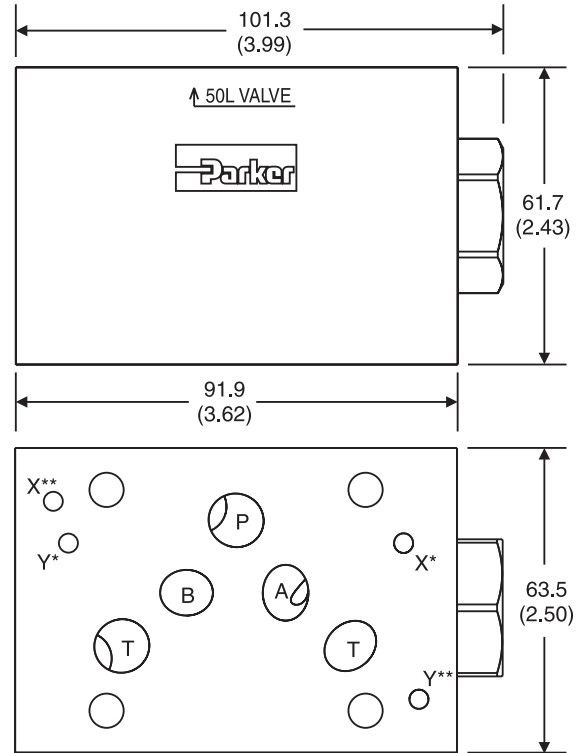
Inch equivalents for millimeter dimensions are shown in (\*\*)



\* D05HE (Standard)  
\*\* D05H

**CP5HBB**

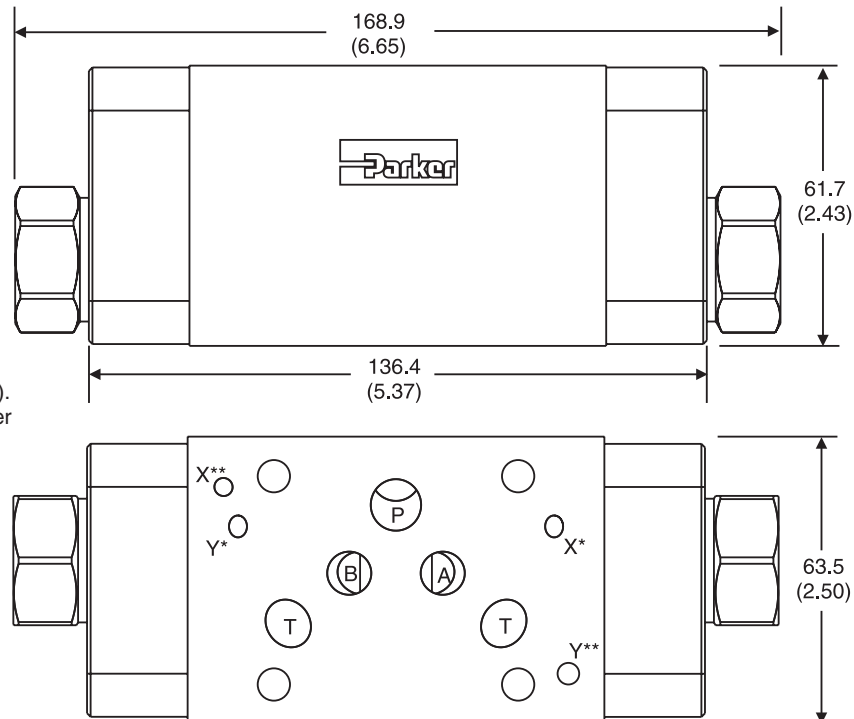
Inch equivalents for millimeter dimensions are shown in (\*\*)



\* D05HE (Standard)  
\*\* D05H

Valve comes with D05HE (ISO) pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.

**CP5HDD** – Inch equivalents for millimeter dimensions are shown in (\*\*)



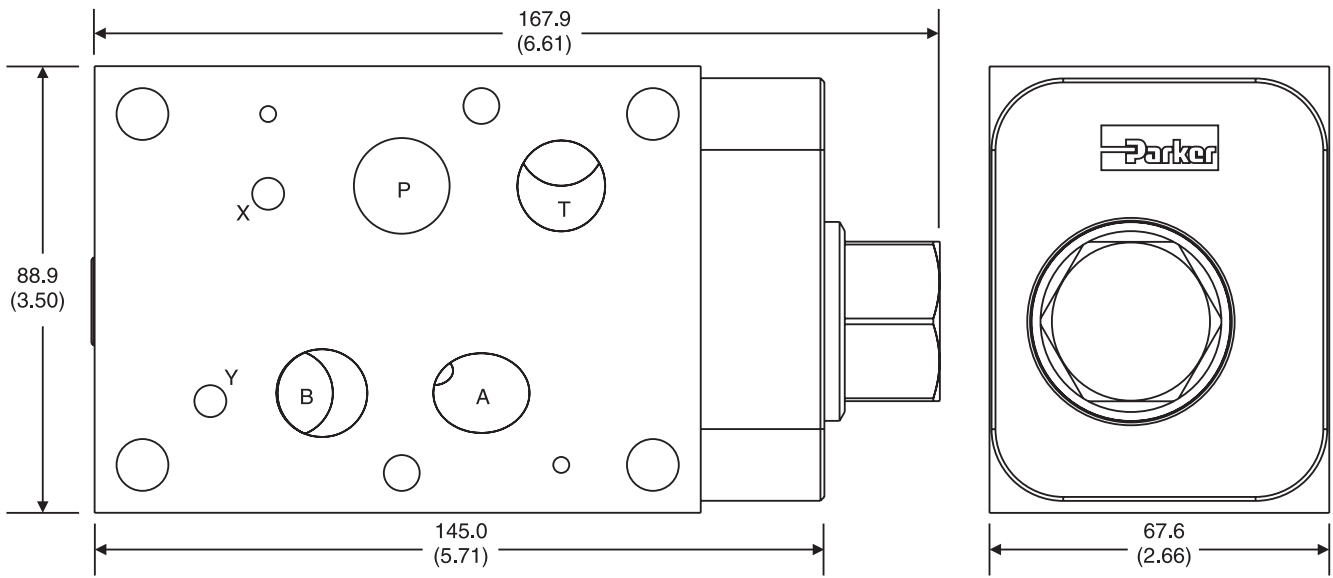
Valve comes with D05HE (ISO) pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.

\* D05HE (Standard)  
\*\* D05H

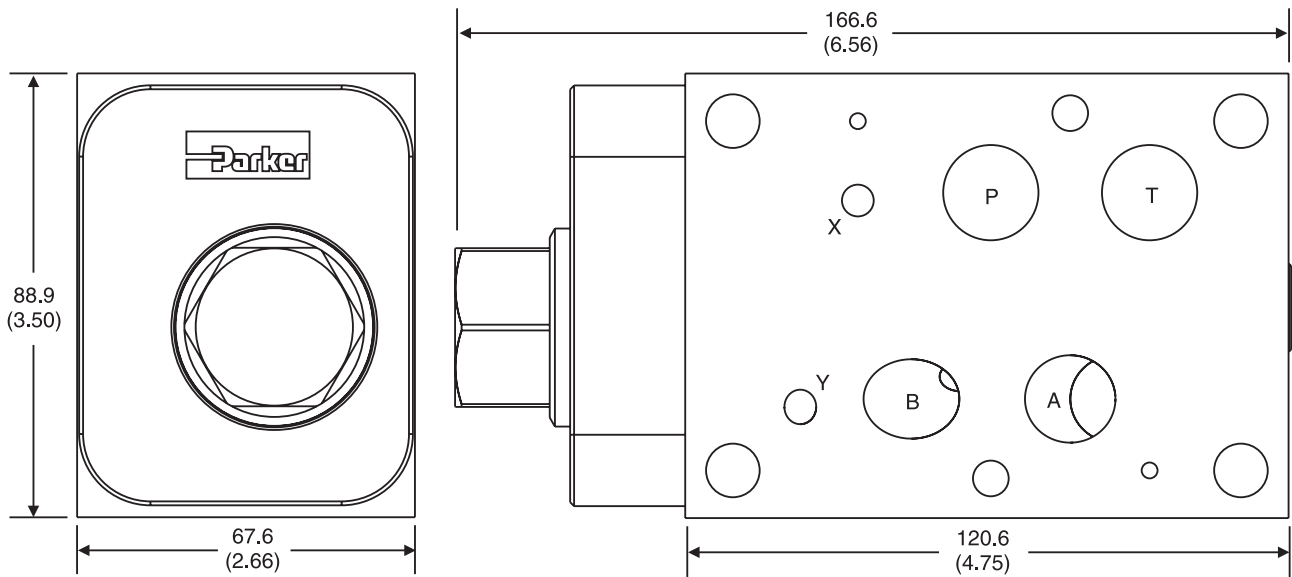


**B**

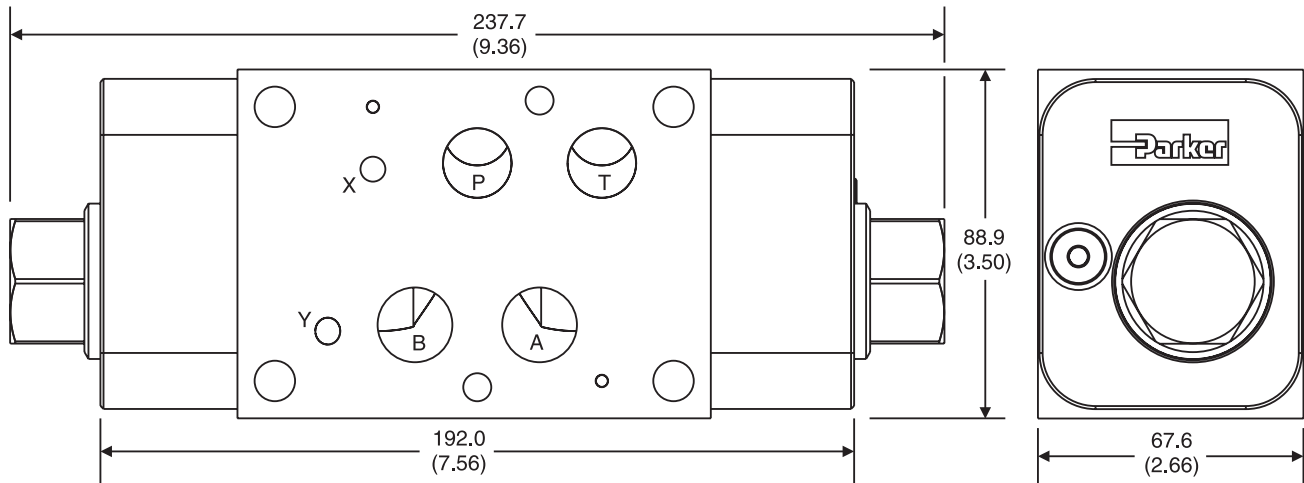
**CP07AA** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**CP07BB** – Inch equivalents for millimeter dimensions are shown in (\*\*)

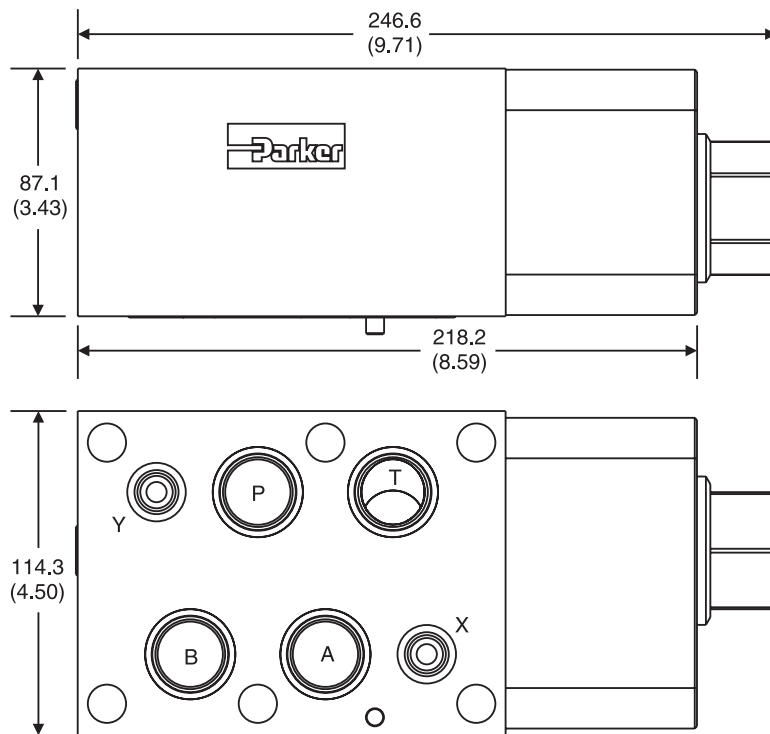


**CP07DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)

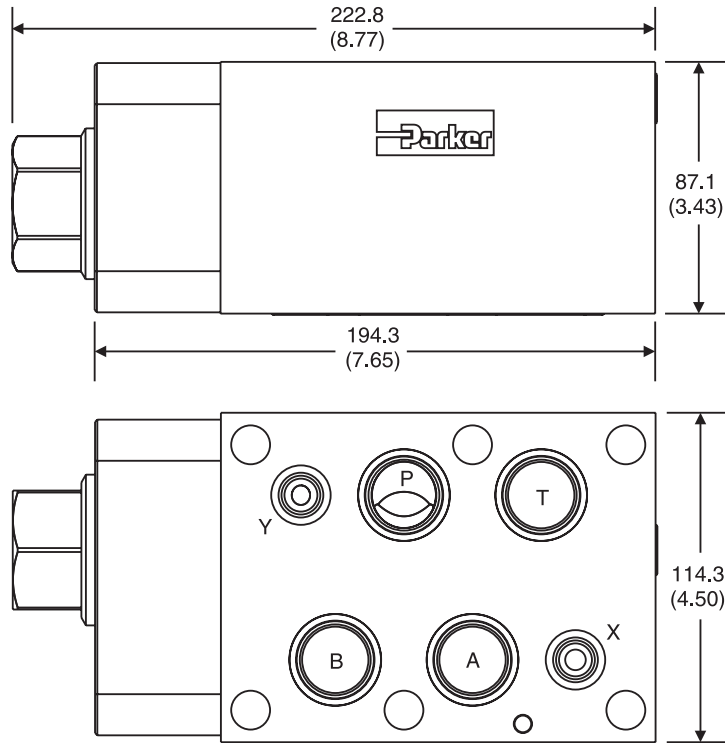


**B**

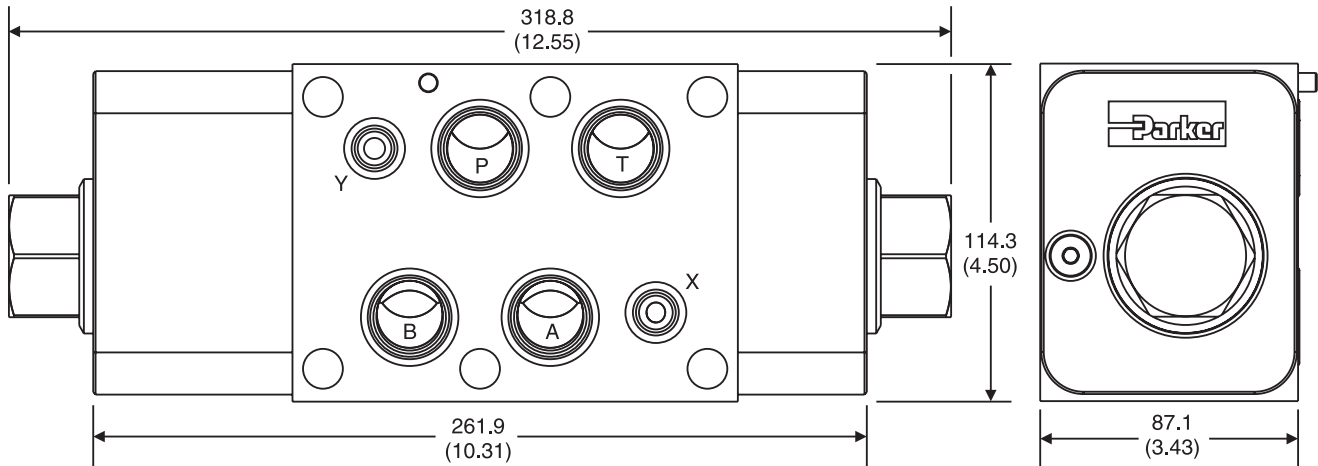
**CP08AA** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**CP08BB** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**CP08DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)



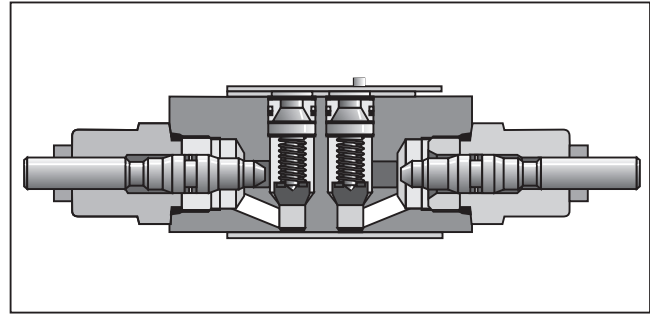
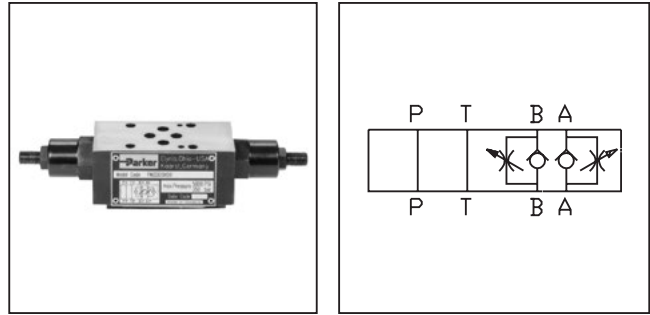


### General Description

Series FM double flow control valves permit free flow from the directional valve to the actuator and adjustable independent flow regulation in each return line from the actuator (meter-out). The FM2 and FM3 have a seal plate and can be inverted for meter-in applications (see installation drawing for flow direction).

### Features

- FM style flow control valves can be provided in either single or double configurations.
- The flow controls may be positioned in 'A' port, 'B' port, both 'A' and 'B' ports or 'P' port.
- Valve bodies are manufactured from steel providing extra strength and durability for longer life. Internal hardened steel components also provide longer life.
- Two step needles provide fine adjustment for the first few turns and course adjustment for the last few turns. Standard and fine adjustment needles available.
- Large bypass checks allow high flow at a low pressure drop.
- Valve is reversible (invert 180°) for meter-in or meter-out applications (FM2 and FM3 only).
- Adjustment options include Allen hex or hand knob.



### Specifications

	FM2	FM3	FM6
<b>Mounting Pattern</b>	NFPA D03, CETOP 3, NG 6	NFPA D05, CETOP 5, NG 10	NFPA D08, CETOP 8, NG 25
<b>Maximum Pressure</b>	345 Bar (5000 PSI)	345 Bar (5000 PSI)	205 Bar (3000 PSI)
<b>Maximum Flow</b>	76 LPM (20 GPM)	113 LPM (30 GPM)	341 LPM (90 GPM)
<b>Cracking Pressure</b>	0.3 Bar (5 PSI)	0.3 Bar (5 PSI)	0.3 Bar (5 PSI)

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**B**

**FM**

Flow Valve Control

Size

Meter Option

Needles

Adjustment

Seal

Design Series

NOTE:  
 Not required when ordering.

Code	Description
2	NFPA D03 Subplate Mounting
3	NFPA D05 Subplate Mounting
6*	NFPA D08 Subplate Mounting

\* FM6 - Meter out only

Code	Type
N	Nitrile
V	Fluorocarbon

Code	Type
K	Knob
S	Allen Hex

Code	Description
AA	Single Function A Port Only
BB	Single Function B Port Only
DD	A and B Ports Dual Function
PP**	Single Function P Port

\*\* Not available on size 6.

Code	Description
Omit	Standard
D*	Fine Meter

\* D needle is the standard needle in valves used as pilot chokes. Not available on size 6.

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

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

**Sandwich Bolt Kits**

Size "2"				Size "3"			
No. of Sandwich	Sandwich & Valve Combination	Bolt Kit	Bolt Length mm (in)	No. of Sandwich	Sandwich & Valve Combination	D3W-30 D3DW & D31*W*	Bolt Length mm (in)
1	Sandwich & D1	BK243	73.2 (2.88)	1	Sandwich & D3	BK141	88.9 (3.50)
2	Sandwich & D1	BK225	111.3 (4.38)	2	Sandwich & D3	BK142	139.7 (5.50)
3	Sandwich & D1	BK244	152.4 (6.00)	3	Sandwich & D3	BK143	190.5 (7.50)
4	Sandwich & D1	BK245	190.5 (7.50)				

\* D31VW with internal pilot and internal drain only.

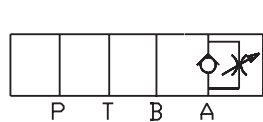
Size "6"			
No. of Sandwich	Sadnwich & Valve Combination	Bolt Kit	Bolt Length mm (in)
1	Sandwich & D6	BK121	133.4 (5.25)
2	Sandwich & D6	BK122	203.2 (8.00)
3	Sandwich & D6	BK123	273.1 (10.75)
4	Sandwich & D6	BK124	342.9 (13.5)

**Unit Weight:**

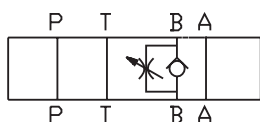
FM2 1.7 kg (3.8 lbs.)  
 FM3 2.4 kg (5.2 lbs.)  
 FM6 7.9 kg (17.5 lbs.)

Bolt Kits must be ordered separately.

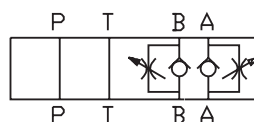
**Schematics**



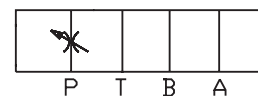
AA Option



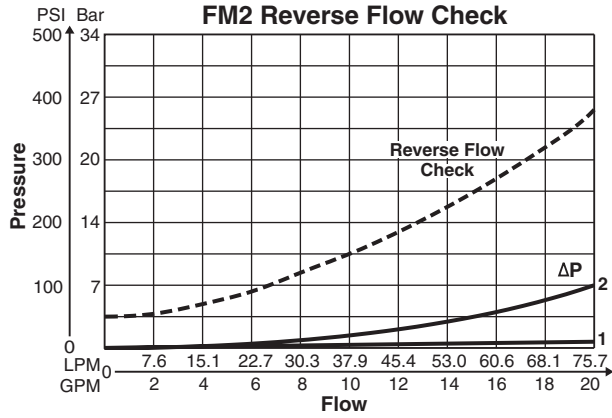
BB Option



DD Option



PP Option

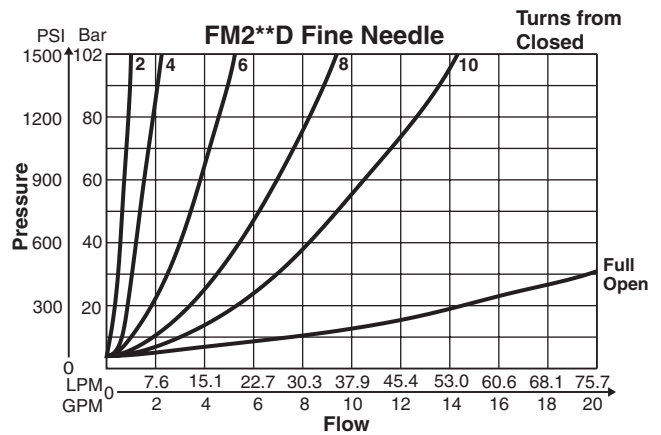
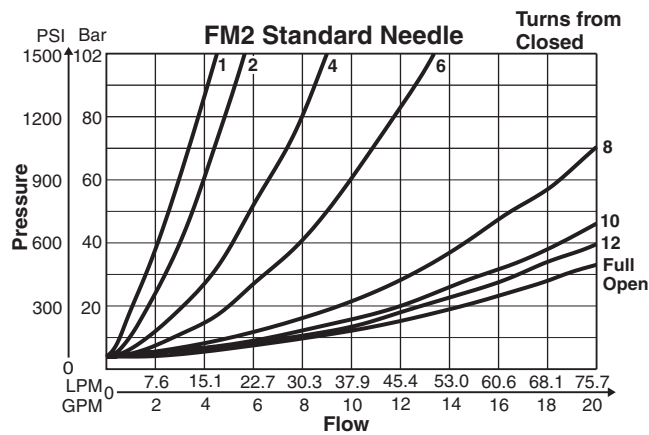


**Pressure Drop Reference Chart**

	P	A	B	T
PP	*	2	2	1
DD	1	*	*	1
AA	1	*	1	1
BB	1	1	*	1

\* See specific flow vs. turns

**B**

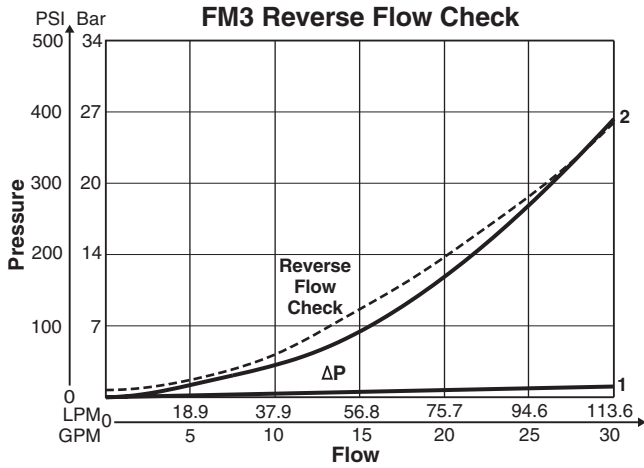


Curves were generated using 100 SSU hydraulic oil @49°C (120°F). For any other viscosity, pressure drop will change as per chart.

**Viscosity Correction Factor**

Viscosity (SSU)	75	150	200	250	300	350	400
Percentage of ΔP (Approx.)	93	111	119	126	132	137	141

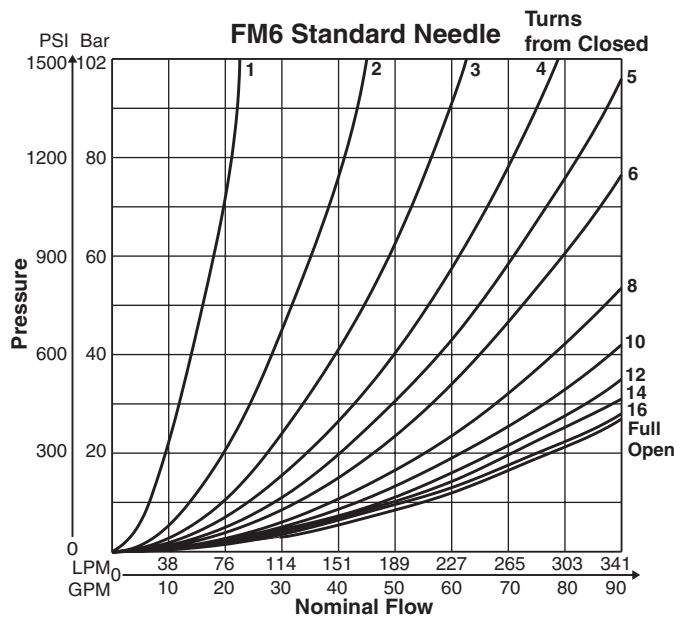
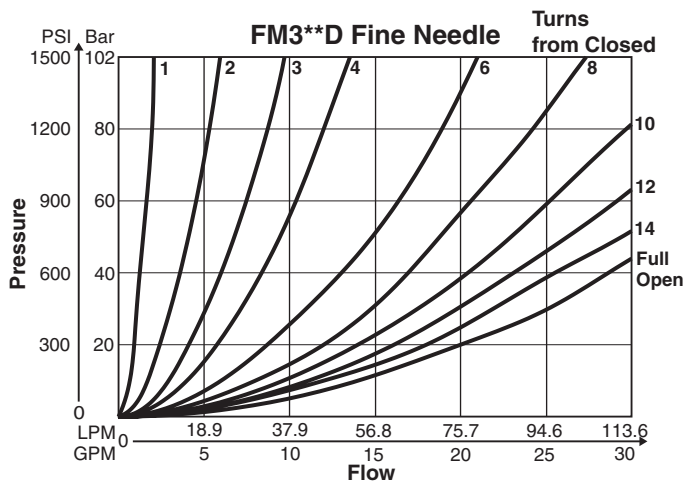
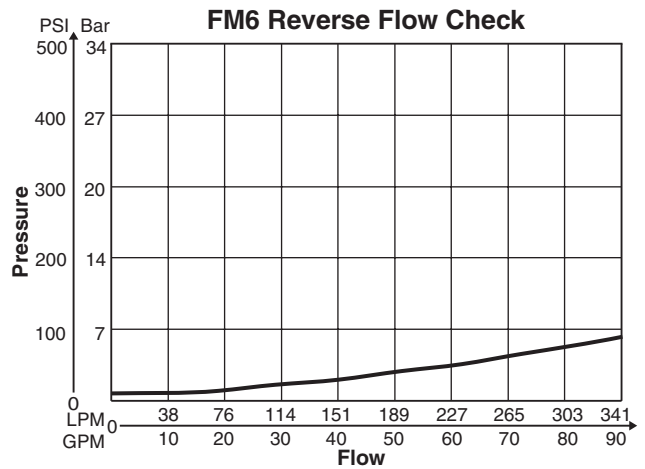
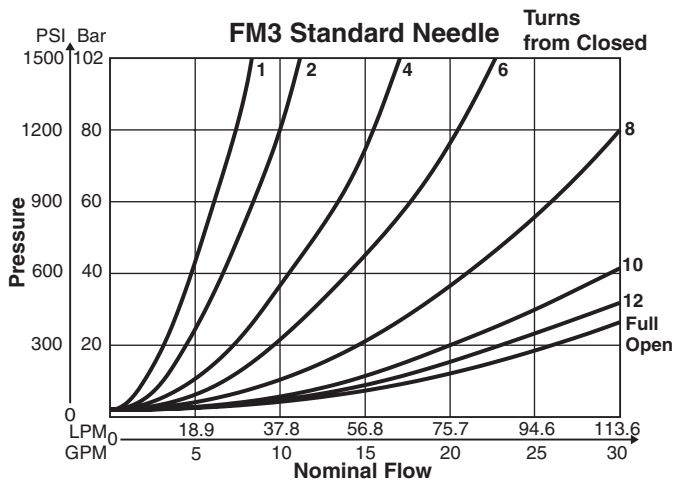
**B**



**Pressure Drop Reference Chart**

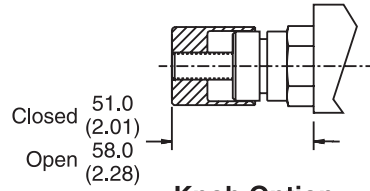
	P	A	B	T
PP	*	2	2	1
DD	1	*	*	1
AA	1	*	1	1
BB	1	1	*	1

\* See specific flow vs. turns chart

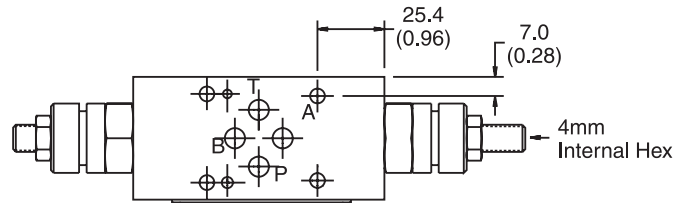


Inch equivalents for millimeter dimensions are shown in (\*\*)

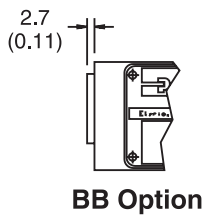
**B**



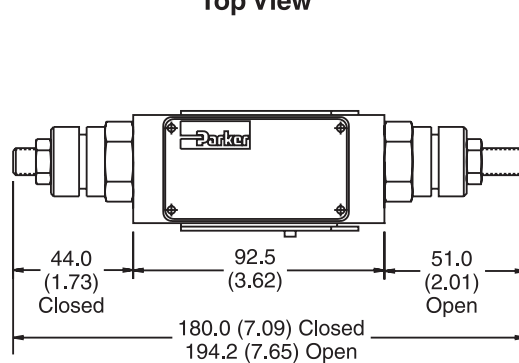
**Knob Option**



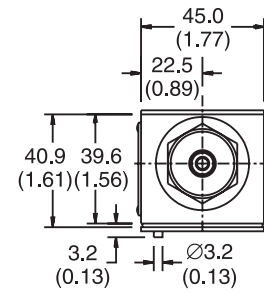
**Top View**



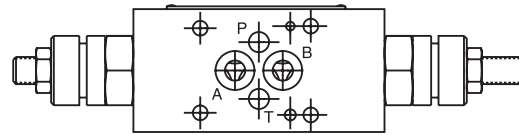
**BB Option**



**Face View**



**End View**



SHOWN WITHOUT O-RING PLATE

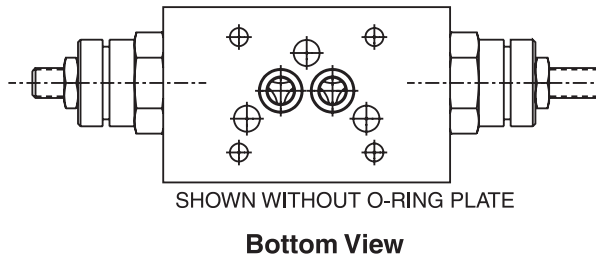
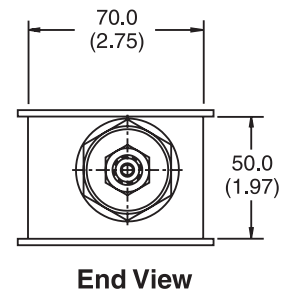
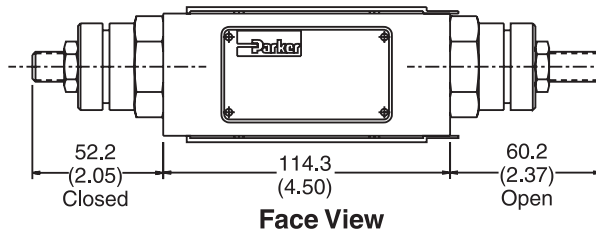
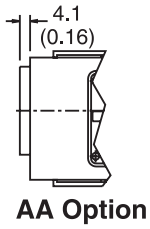
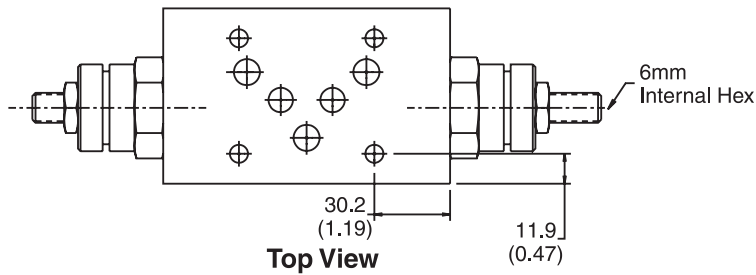
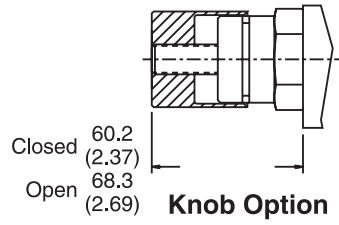
**Bottom View**

Note: For meter-in option, invert body 180°.



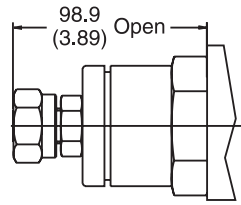
Inch equivalents for millimeter dimensions are shown in (\*\*)

**B**

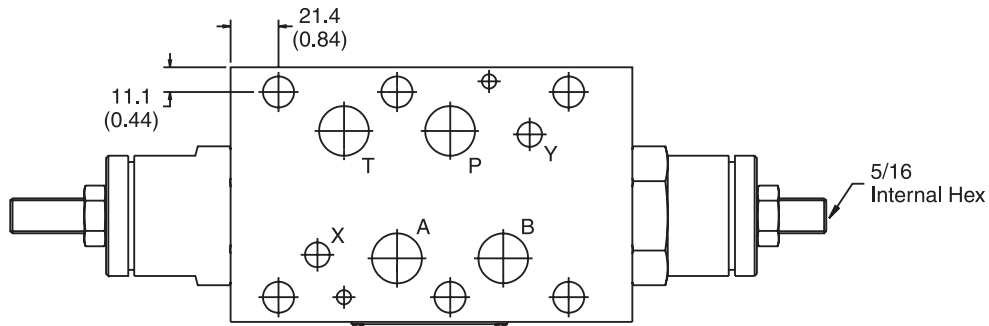


Note: For meter-in option, invert body 180°.

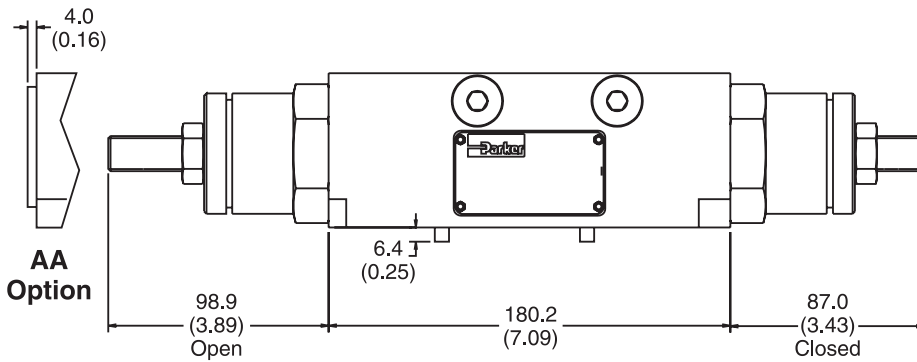
Inch equivalents for millimeter dimensions are shown in (\*\*)



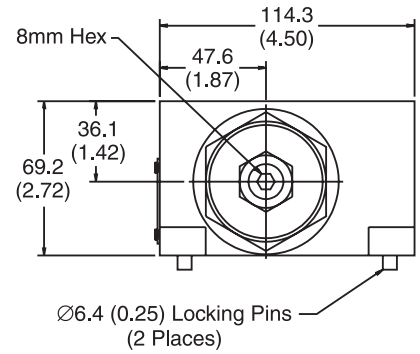
**Knob Option**



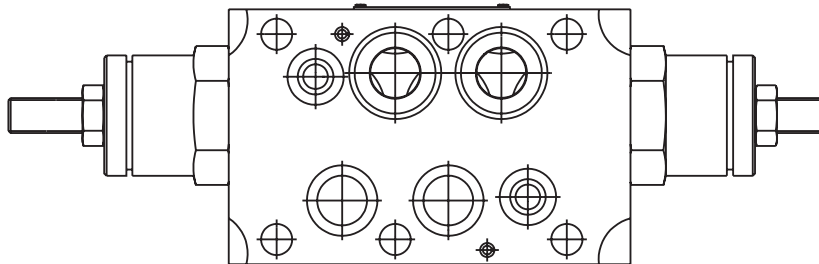
**Top View**



**Face View**



**End View**



**Bottom View**



**B**

## General Description

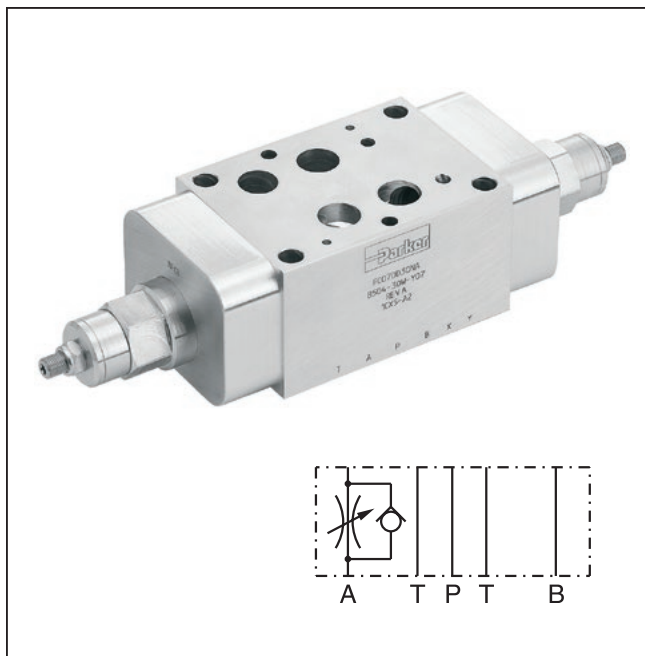
Series FC, FD throttle check valves are designed for maximum flow rates.

The throttle check function is located in ports A and B. Meter-in or meter-out functionality can be selected by model code.

**B**

## Features

- High flow capacity.
- Various functional arrangements.
- Sizes:
  - FC05, FD05 – NFPA D05 / NG10 / CETOP 5
  - FC05H, FD5H – NFPA D05HE / NG10 / CETOP 5H
  - FC07, FD07 – NFPA D07 / NG16 / CETOP 7
  - FC08, FD08 – NFPA D08 / NG25 / CETOP 8

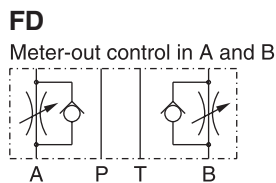
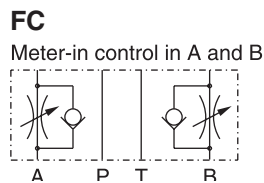
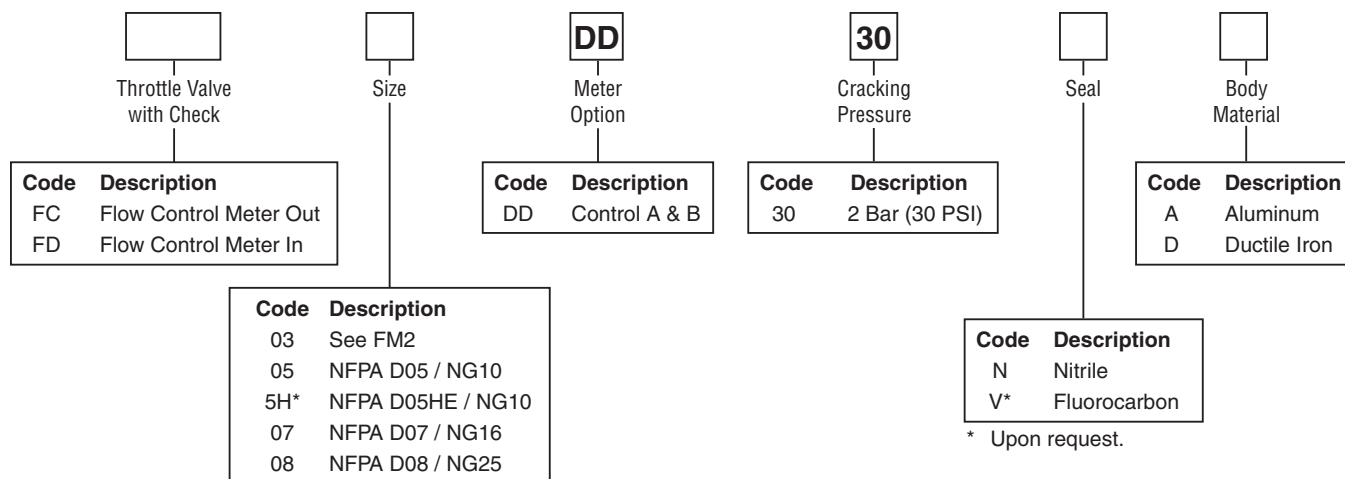


## Specifications

General		D05 / NG10	D05HE / NG10	D07 / NG16	D08 / NG25
<b>Size</b>					
<b>Mounting Position</b>	Unrestricted				
<b>Ambient Temperature Range</b>	-20°C to +50°C (-4°F to +122°F)				
Hydraulic					
<b>Maximum Operating Pressure</b>	Aluminum Body – up to 207 Bar (3000 PSI); Ductile Iron Body – up to 345 Bar (5000 PSI)				
<b>Nominal Flow</b>		95 LPM (25 GPM)	95 LPM (25 GPM)	227 LPM (60 GPM)	454 LPM (120 GPM)
<b>Leakage</b>		< 5 DPM	< 5 DPM	< 5 DPM	< 5 DPM
<b>Cracking Pressure</b>	30 ± 0.2 Bar (3 PSI)				
<b>Fluid Temperature</b>	-20°C to +80°C (-4°F to +176°F)				
<b>Viscosity</b>	<b>Permitted</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU)			
	<b>Recommended</b>	30 cSt / mm <sup>2</sup> /s (139 SSU)			
<b>Filtration</b>	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)				

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).





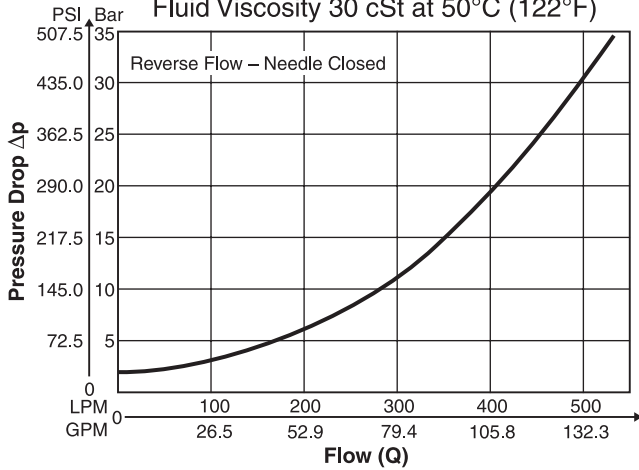
**Weight:**

Size	FC**DD30NA, FD**DD30NA	FC**DD30ND, FD**DD30ND
FC05, FC5H, FD05, FD5H	1.3 kg (2.9 lbs.)	2.6 kg (5.7 lbs.)
FC07	3.4 kg (7.6 lbs.)	6.9 kg (15.3 lbs.)
FC08	7.1 kg (15.7 lbs.)	14.7 kg (32.5 lbs.)

**B**

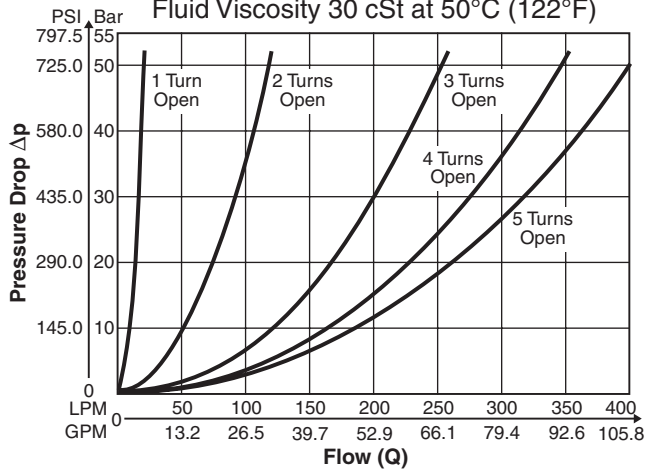
**FC05/FC5H, FD05/FD5H**

**Pressure Differential vs. Free Flow**  
 Fluid Viscosity 30 cSt at 50°C (122°F)



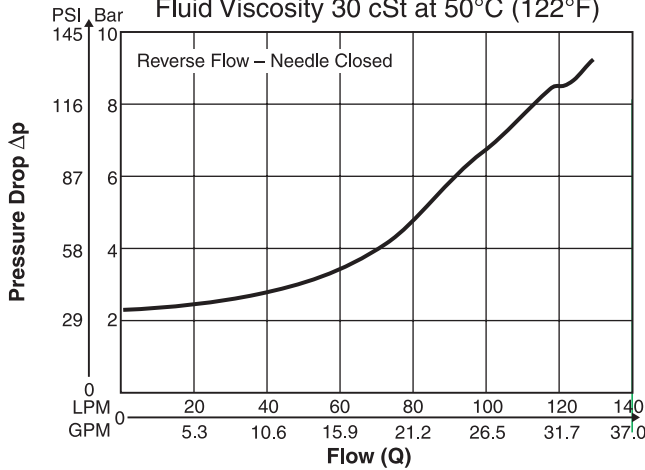
**FC05/FC5H, FD05/FD5H**

**Pressure Differential vs. Metered Flow**  
 Fluid Viscosity 30 cSt at 50°C (122°F)



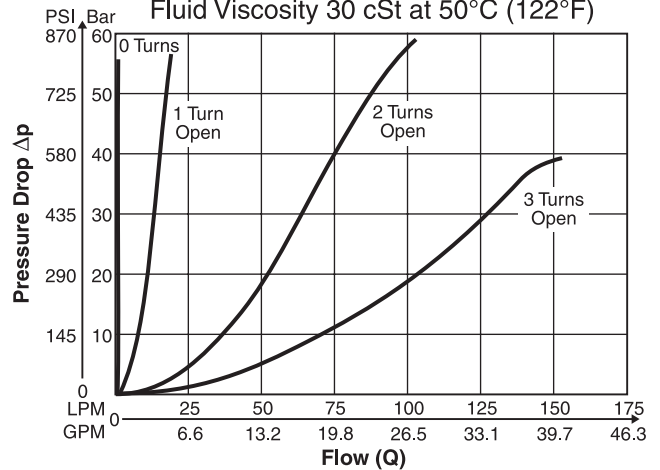
**FC07, FD07**

**Pressure Differential vs. Free Flow**  
 Fluid Viscosity 30 cSt at 50°C (122°F)



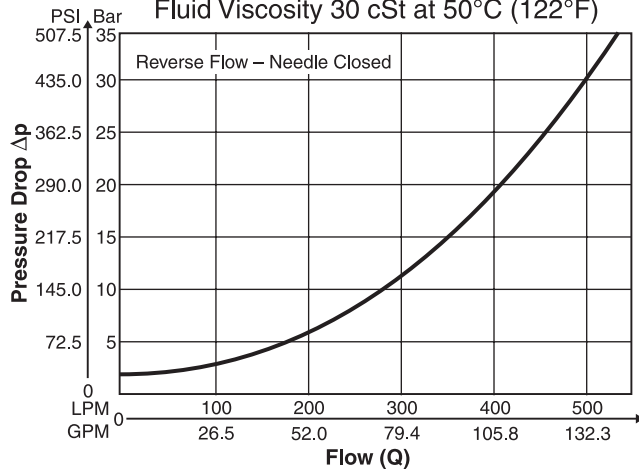
**FC07, FD07**

**Pressure Differential vs. Metered Flow**  
 Fluid Viscosity 30 cSt at 50°C (122°F)



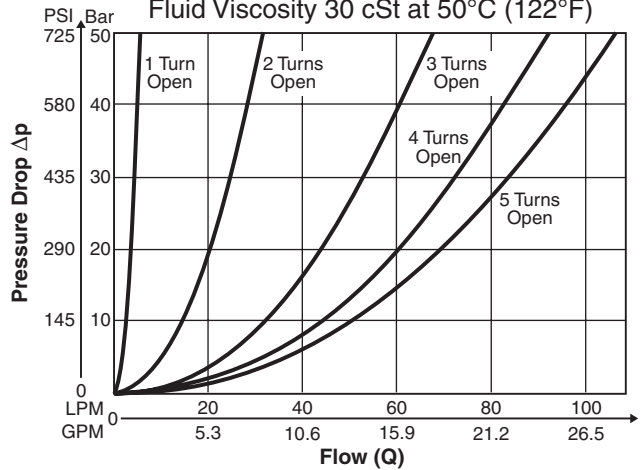
**FC08, FD08**

**Pressure Differential vs. Free Flow**  
 Fluid Viscosity 30 cSt at 50°C (122°F)

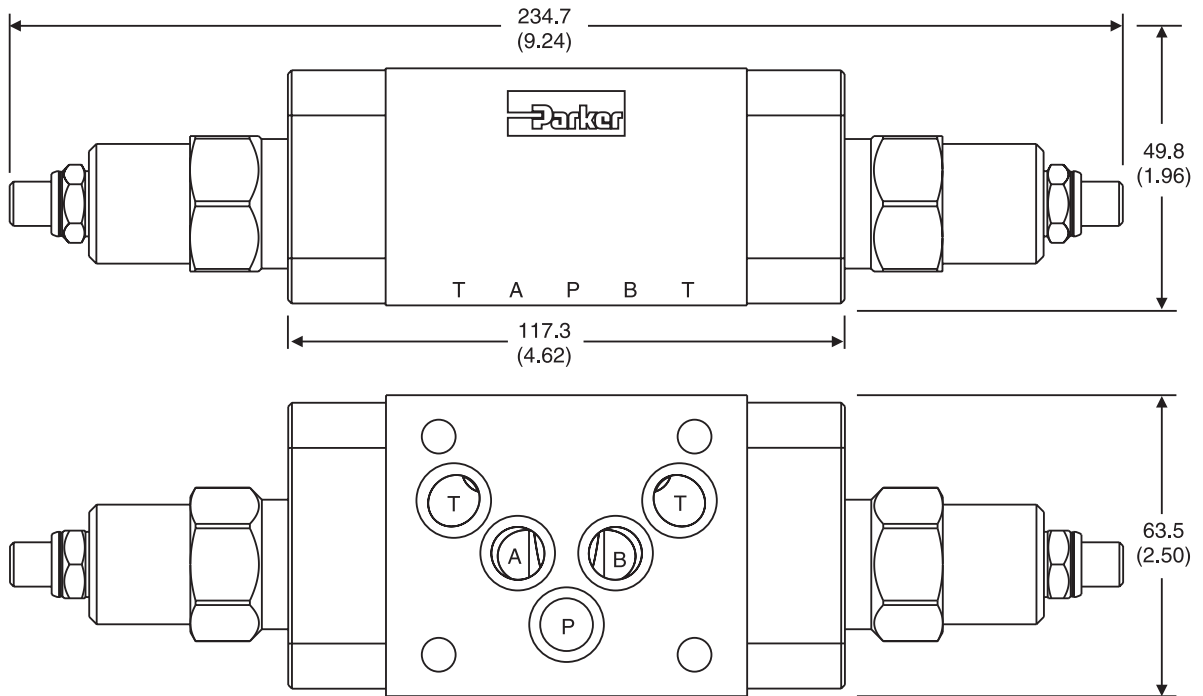


**FC08, FD08**

**Pressure Differential vs. Metered Flow**  
 Fluid Viscosity 30 cSt at 50°C (122°F)

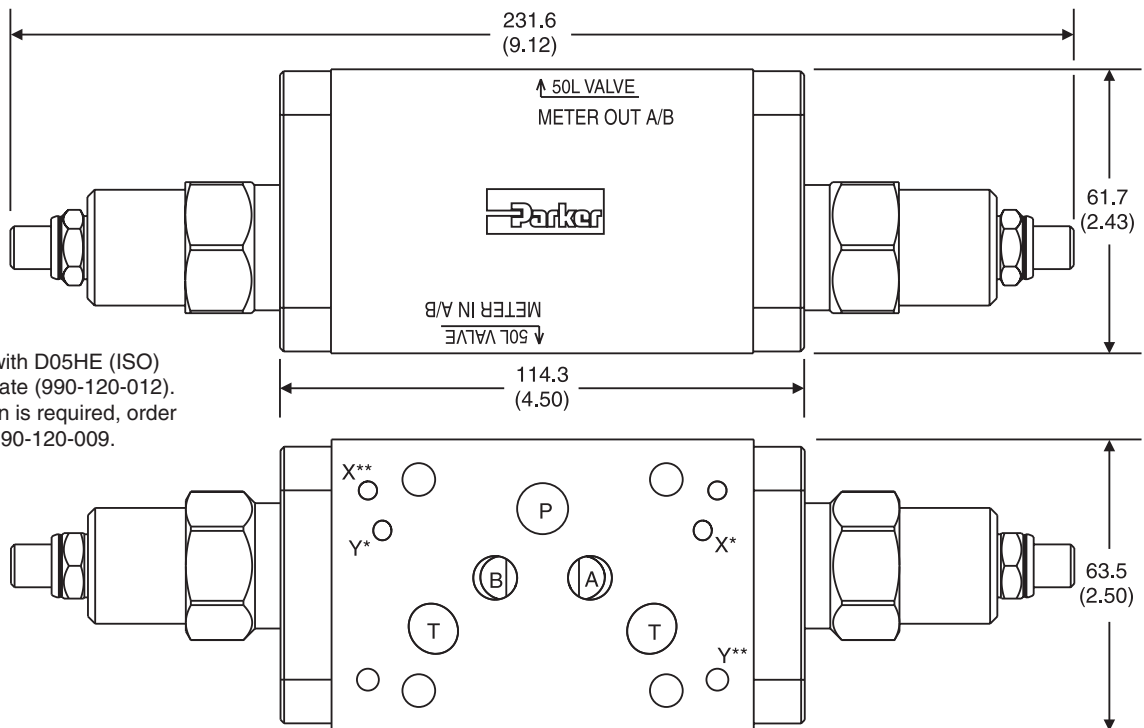


**FC05DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**B**

**FC5HDD** – Inch equivalents for millimeter dimensions are shown in (\*\*)



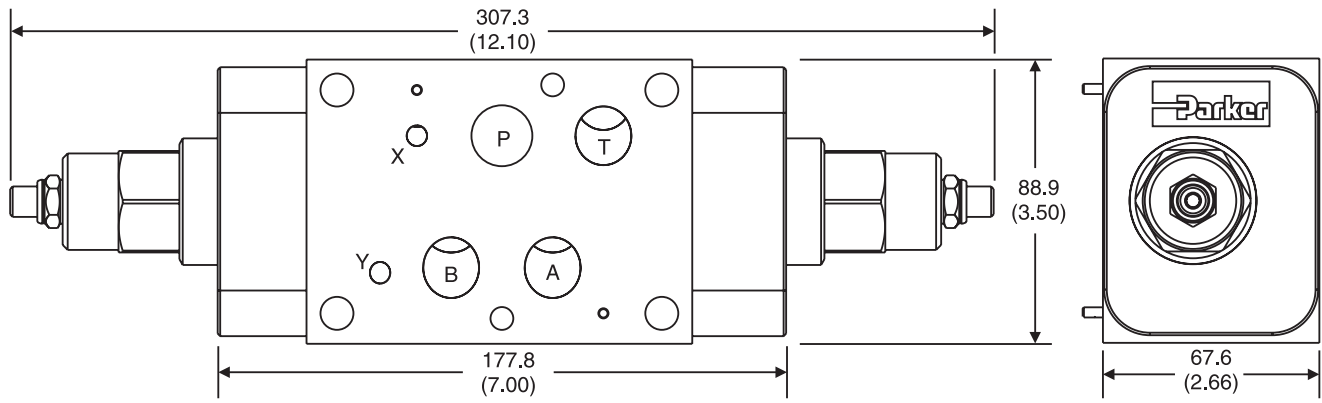
Valve comes with D05HE (ISO) pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.

- \* D05HE (Standard)
- \*\* D05H

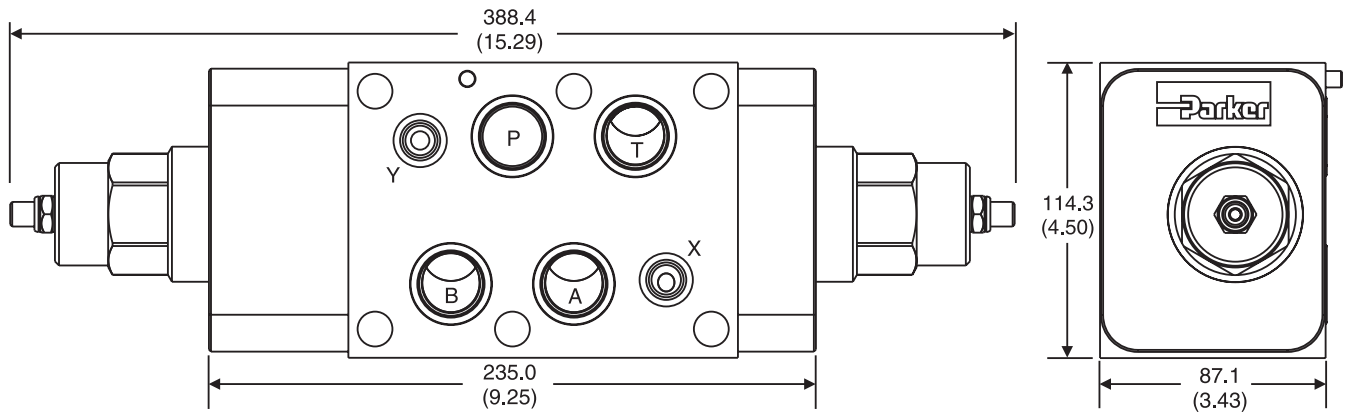


**FC07DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)

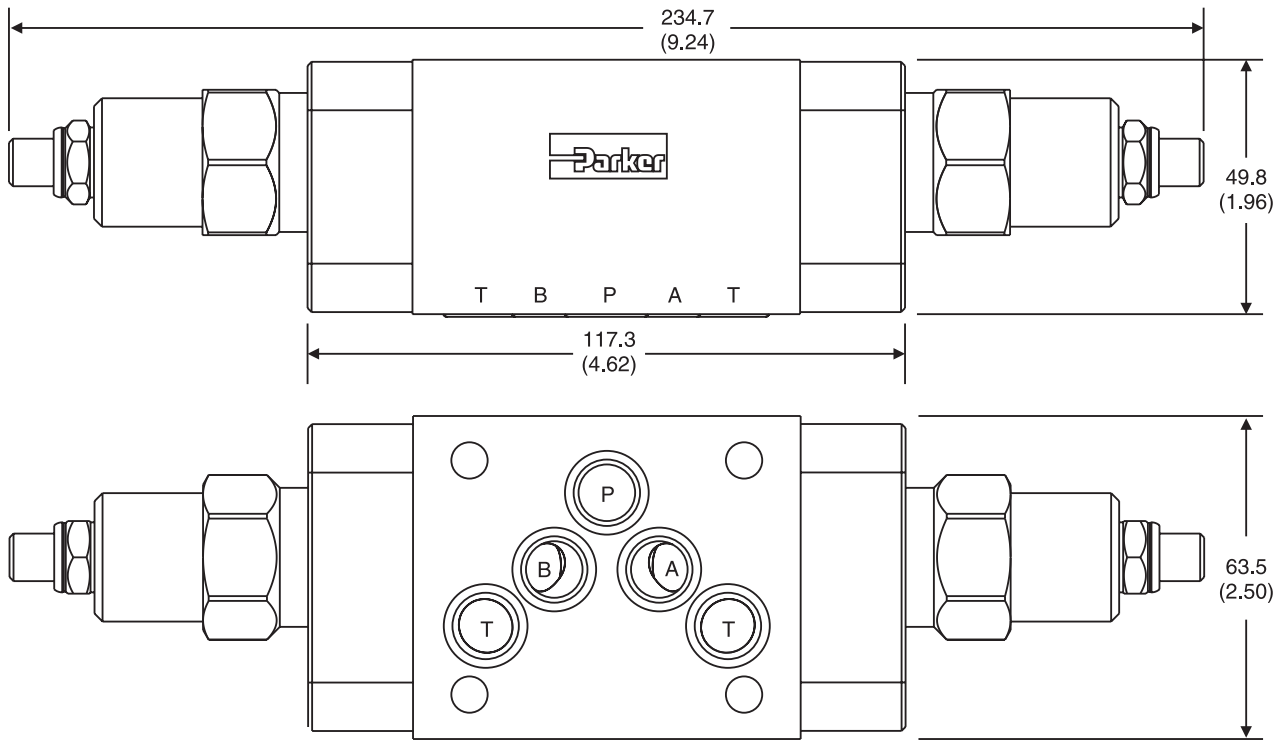
**B**



**FC08DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)

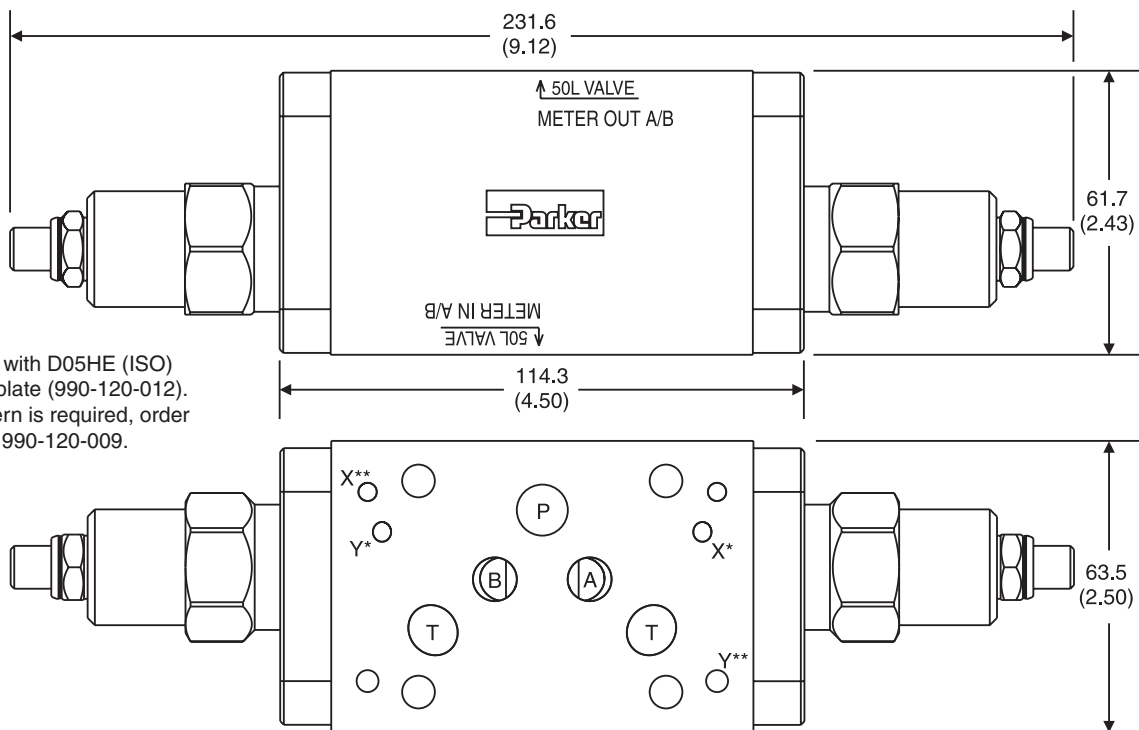


**FD05DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**B**

**FD5HDD** – Inch equivalents for millimeter dimensions are shown in (\*\*)



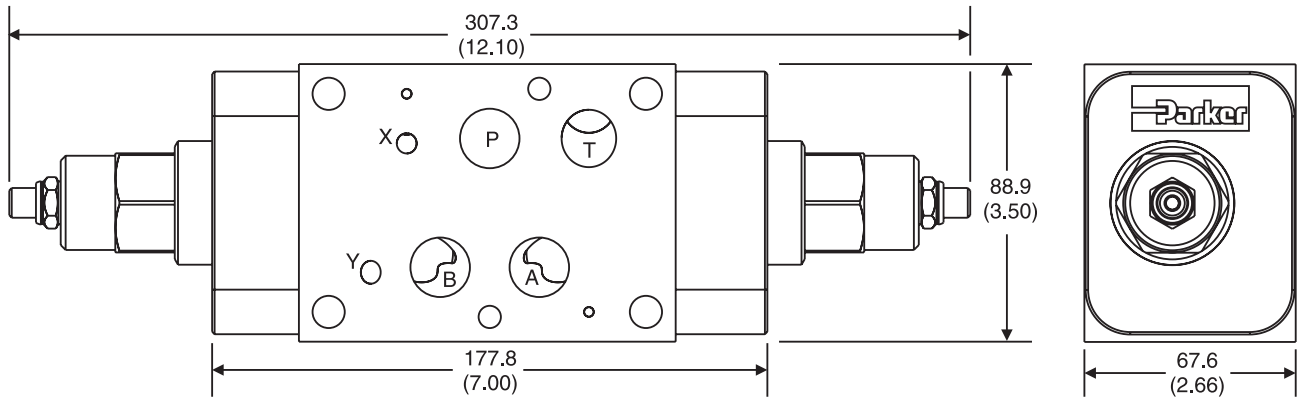
Valve comes with D05HE (ISO) pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.

- \* D05HE (Standard)
- \*\* D05H

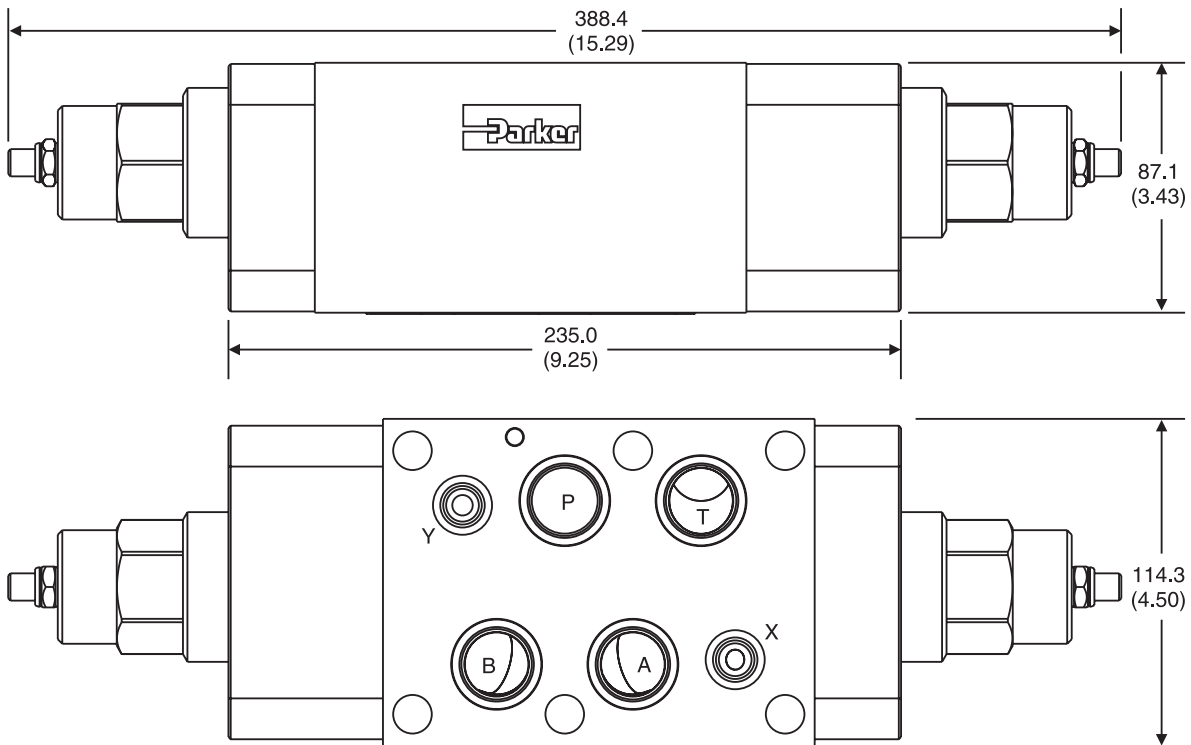


**FD07DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)

**B**



**FD08DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)



## General Description

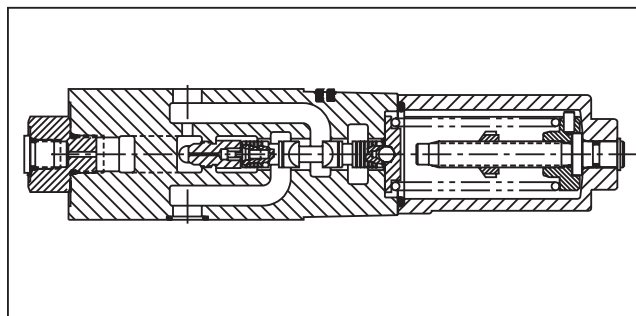
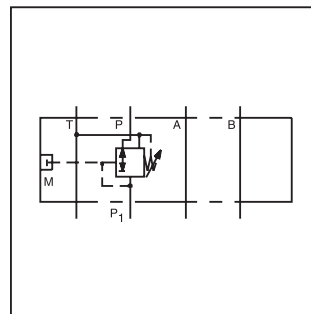
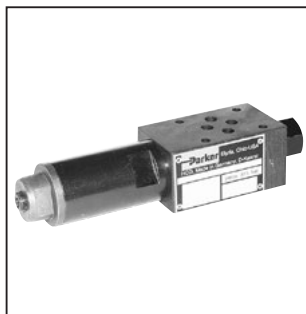
Series PRDM are direct operated pressure reducing valves that are used to regulate pressure in one area of a hydraulic circuit at a predetermined level below normal system pressure. Additionally, an integral pressure relieving function for the secondary reduced pressure circuit is incorporated into the design.

## Operation

These valves are “normally open” devices that allow fluid to flow through the controlled port during their non-actuated or “at rest” condition. When downstream pressure exceeds the value set by the spring force, the control piston moves off its seat, closing off the flow path and thus reducing the fluid passing through from the main system. The cushioned piston modulates to maintain the preset pressure in this branch of the hydraulic circuit. If, due to external forces, the pressure continues to rise in this branch circuit, the piston will keep moving against the spring force allowing fluid to be drained to tank, thereby limiting maximum pressure to the valve’s setting.

## Features

- PRDM sandwich valves may be selected to reduce pressure in the 'P' port, 'A' port or 'B' port.
- The direct operated, cushioned piston design results in fast response, low leakage and minimal hysteresis.
- Up to nine pressure adjustment ranges are available with maximum pressure settings.
- Adjustment options include: internal hex screw, hand knob or internal hex with keylock.
- Fluorocarbon seals are available.
- Available gage port connections include SAE, NPT, Metric and BSPP.



**B**

## Specifications

	PRDM2	PRDM3																				
<b>Mounting Pattern</b>	NFPA D03, CETOP 3, NG6	NFPA D05, CETOP 5, NG10																				
<b>Maximum Operating Pressure P, A, B</b>	350 Bar (5000 PSI)	315 Bar (4560 PSI)																				
<b>T</b>	10 Bar (145 PSI)	10 Bar (145 PSI)																				
<b>Max. Flow</b>	40 LPM (10.5 GPM)	80 LPM (21 GPM)																				
<b>Maximum Leakage P-A</b>	15 ml/min (1.0 cu. in.)																					
<b>Pressure Range</b>	<table border="0"> <tr> <td><b>Code</b></td> <td><b>Range</b></td> </tr> <tr> <td>01</td> <td>1.0 to 14 Bar (15 to 200 PSI)</td> </tr> <tr> <td>02*</td> <td>1.5 to 25 Bar (22 to 363 PSI)</td> </tr> <tr> <td>05**</td> <td>2 to 50 Bar (29 to 725 PSI)</td> </tr> <tr> <td>06*</td> <td>1.5 to 64 Bar (22 to 928 PSI)</td> </tr> <tr> <td>10**</td> <td>4 to 100 Bar (58 to 1450 PSI)</td> </tr> <tr> <td>15**</td> <td>6 to 150 Bar (87 to 2175 PSI)</td> </tr> <tr> <td>16*</td> <td>3 to 160 Bar (44 to 2320 PSI)</td> </tr> <tr> <td>21</td> <td>8 to 210 Bar (116 to 3045 PSI)</td> </tr> <tr> <td>35*</td> <td>10 to 315 Bar (147 to 4560 PSI)</td> </tr> </table>		<b>Code</b>	<b>Range</b>	01	1.0 to 14 Bar (15 to 200 PSI)	02*	1.5 to 25 Bar (22 to 363 PSI)	05**	2 to 50 Bar (29 to 725 PSI)	06*	1.5 to 64 Bar (22 to 928 PSI)	10**	4 to 100 Bar (58 to 1450 PSI)	15**	6 to 150 Bar (87 to 2175 PSI)	16*	3 to 160 Bar (44 to 2320 PSI)	21	8 to 210 Bar (116 to 3045 PSI)	35*	10 to 315 Bar (147 to 4560 PSI)
<b>Code</b>	<b>Range</b>																					
01	1.0 to 14 Bar (15 to 200 PSI)																					
02*	1.5 to 25 Bar (22 to 363 PSI)																					
05**	2 to 50 Bar (29 to 725 PSI)																					
06*	1.5 to 64 Bar (22 to 928 PSI)																					
10**	4 to 100 Bar (58 to 1450 PSI)																					
15**	6 to 150 Bar (87 to 2175 PSI)																					
16*	3 to 160 Bar (44 to 2320 PSI)																					
21	8 to 210 Bar (116 to 3045 PSI)																					
35*	10 to 315 Bar (147 to 4560 PSI)																					
<b>Viscosity Range</b>	12 to 230 cSt / mm <sup>2</sup> /s (56 to 1066 SSU)																					
<b>Filtration</b>	ISO Code 18/16/13 or Better																					

\* PRDM2 only

\*\* PRDM3 only.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**B**

**PRDM**  
 Pressure Reducing/Relieving

Size

Port Reduction

Pressure Range

Adjustment

Seal

Gage Port

Design Series  
 NOTE: Not required when ordering.

Code	Description
2	NFPA D03 Subplate Mounting
3	NFPA D05 Subplate Mounting

Code	Type
N	Nitrile
V	Fluorocarbon

Code	Type
N	1/4" NPT
S	SAE #4 (UNF-2B 7/16-20) Adapter in PRDM3
M	Metric
G	1/4" BSPP

Code	Description
PP	P Port Only
AA	A Port Only
BB	B Port Only

Code	Type
L	Hex w/Key Lock
S	Internal Hex Screw Adj.
K	Knob

Code	Description
01	1.0 to 14 Bar (15 to 200 PSI)
02*	1.5 to 25 Bar (22 to 363 PSI)
05**	2.0 to 50 Bar (29 to 714 PSI)
06*	1.5 to 64 Bar (22 to 928 PSI)
10**	4 to 100 Bar (57 to 1429 PSI)
15**	6 to 150 Bar (86 to 2147 PSI)
16*	3 to 160 Bar (44 to 2320 PSI)
21	8 to 210 Bar (114 to 3000 PSI)
35*	10 to 315 Bar (147 to 4560 PSI)

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

**Sandwich Bolt Kits**

Size "2"				Size "3"			
No. of Sandwich	Sandwich & Valve Combination	Bolt Kit	Bolt Length mm (in)	No. of Sandwich	Sandwich & Valve Combination	D3W-30 D3DW & D31*W*	Bolt Length mm (in)
1	Sandwich & D1	BK243	73.2 (2.88)	1	Sandwich & D3	BK141	88.9 (3.50)
2	Sandwich & D1	BK225	111.3 (4.38)	2	Sandwich & D3	BK142	139.7 (5.50)
3	Sandwich & D1	BK244	152.4 (6.00)	3	Sandwich & D3	BK143	190.5 (7.50)
4	Sandwich & D1	BK245	190.5 (7.50)				

\* D31VW with internal pilot and internal drain only.

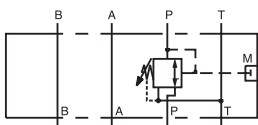
Bolt Kits must be ordered separately.

**Weights:**

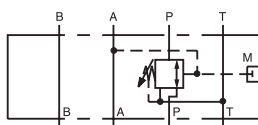
PRDM2 1.3 kg (2.9 lbs.)

PRDM3 2.6 kg (5.8 lbs.)

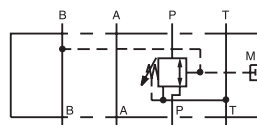
**Schematics**



PP Option



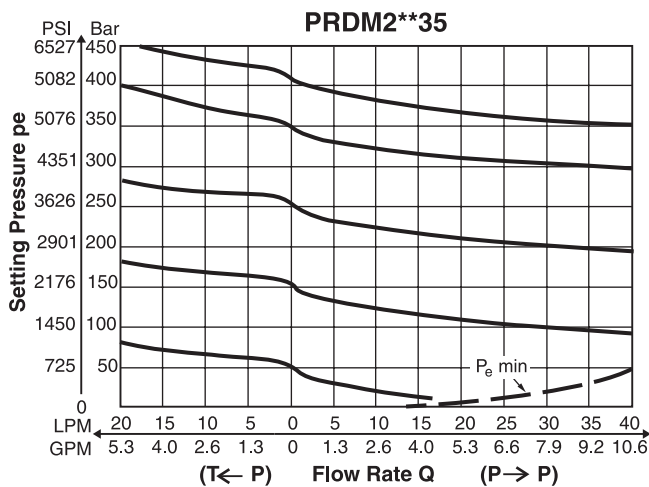
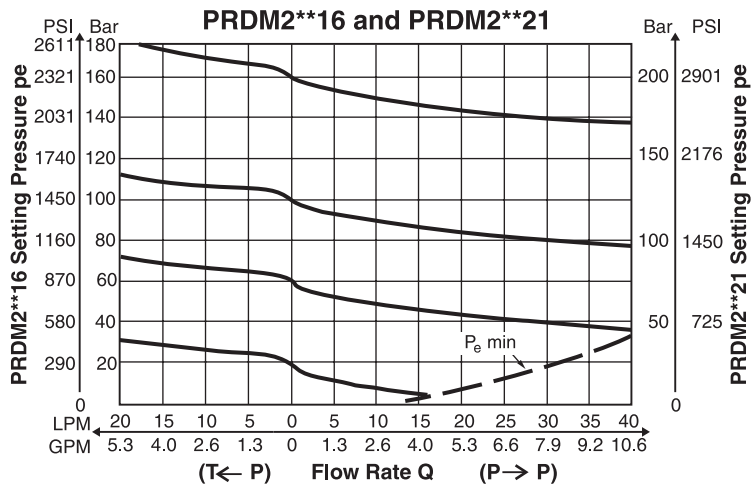
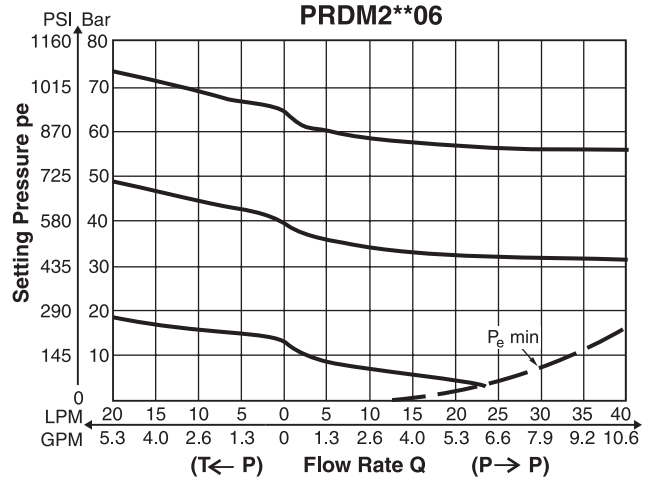
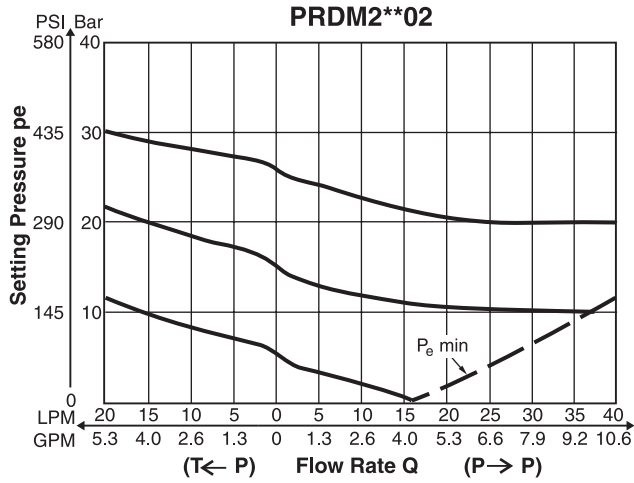
AA Option



BB Option

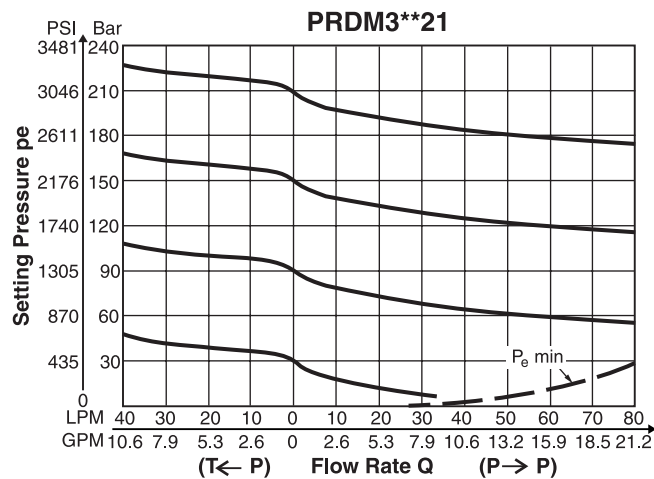
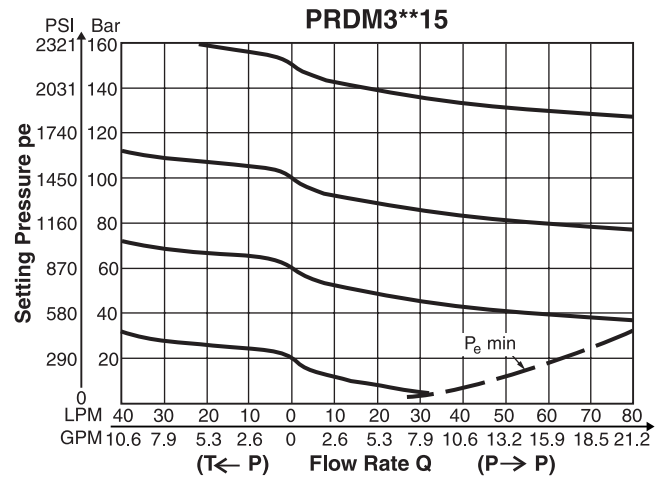
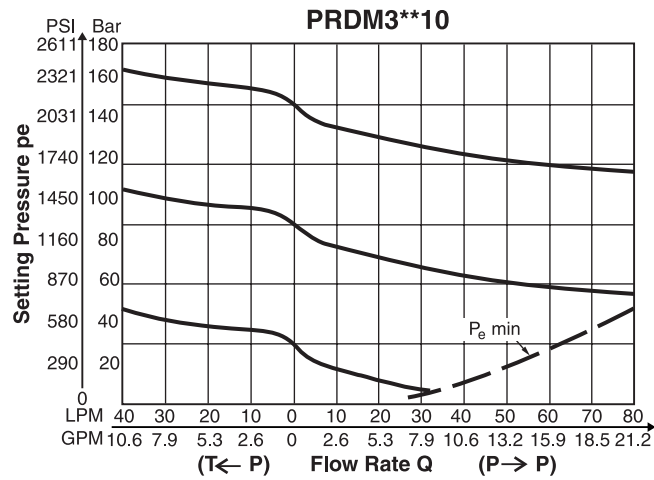
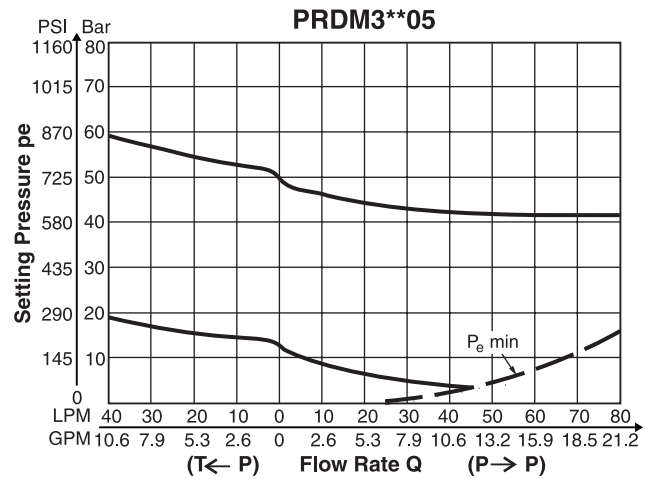
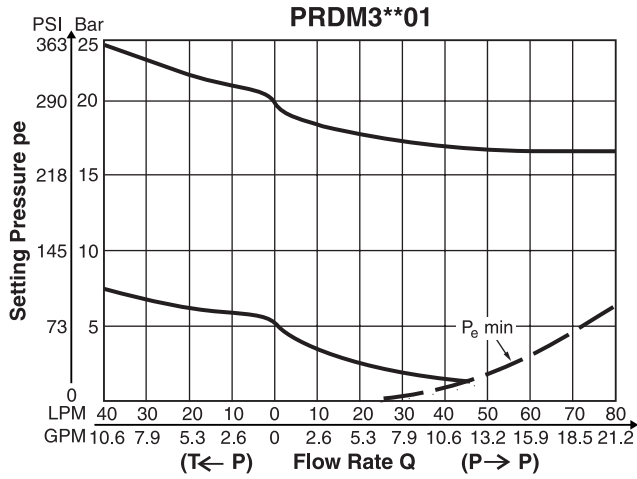


**B**



**NOTE: Lowest pressure setting dependent upon system resistance.**

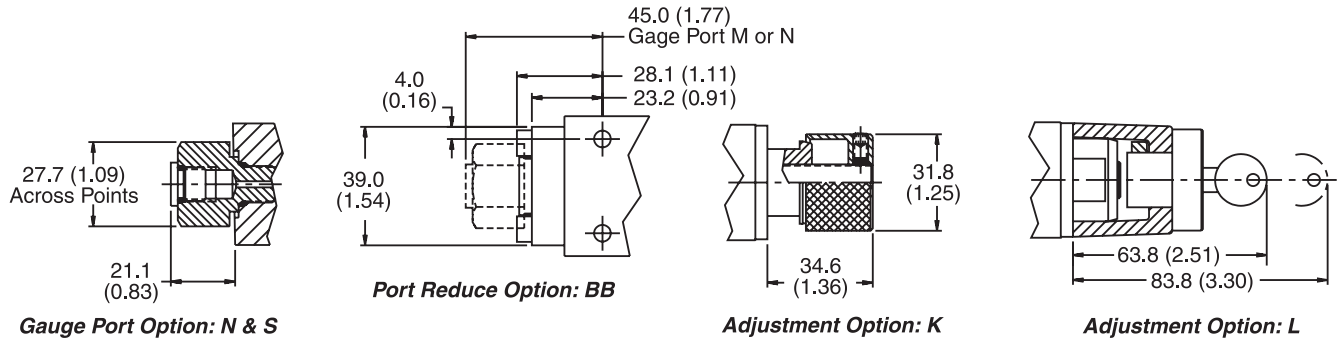
**B**



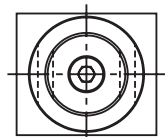
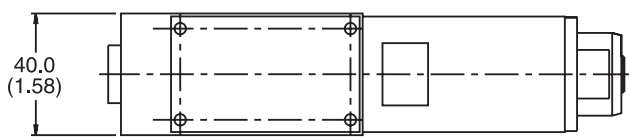
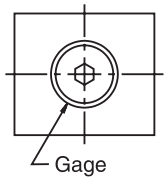
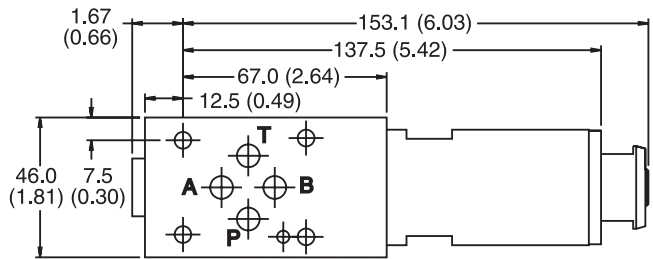
**NOTE: Lowest pressure setting dependent upon system resistance.**

**PRDM2**

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

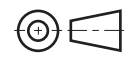
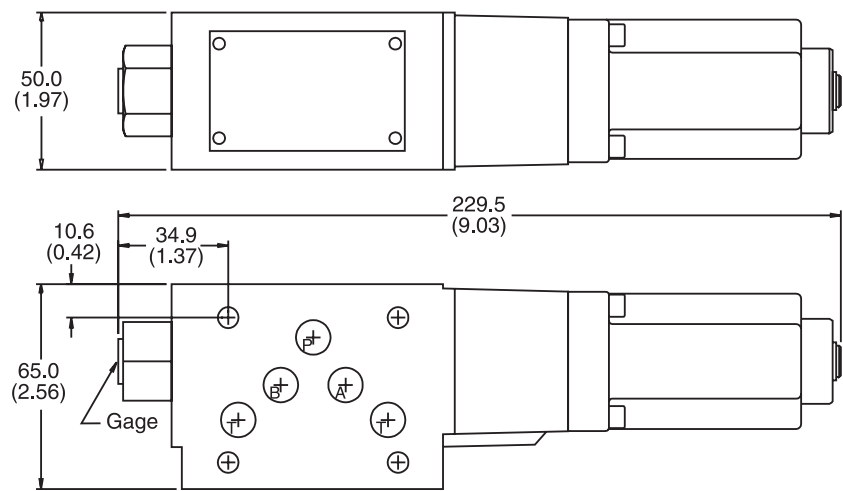


**B**



**PRDM3**

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



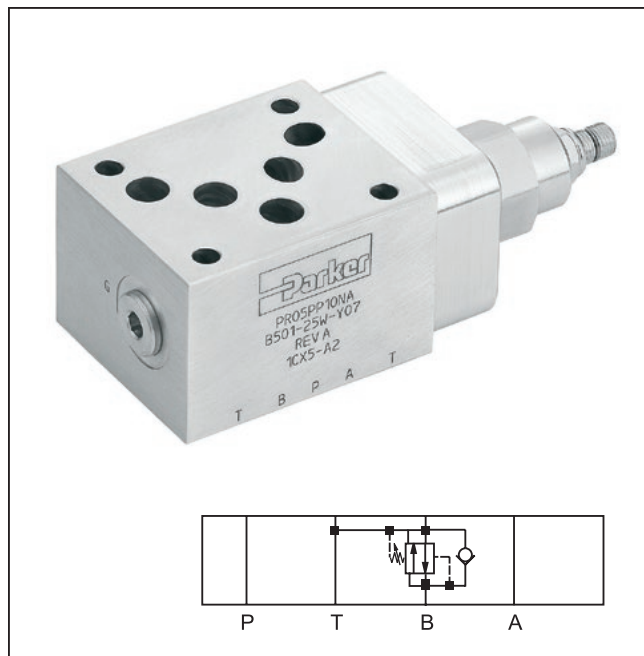
## General Description

Series PR pilot operated pressure reducing/relieving valves are used to regulate pressure in one area of a circuit at a set pressure below the normal system pressure. An integral relieving function limits the secondary circuit pressure. Options are A port control, B port control and P port control. The A & B valves feature a reverse flow check.

**B**

## Features

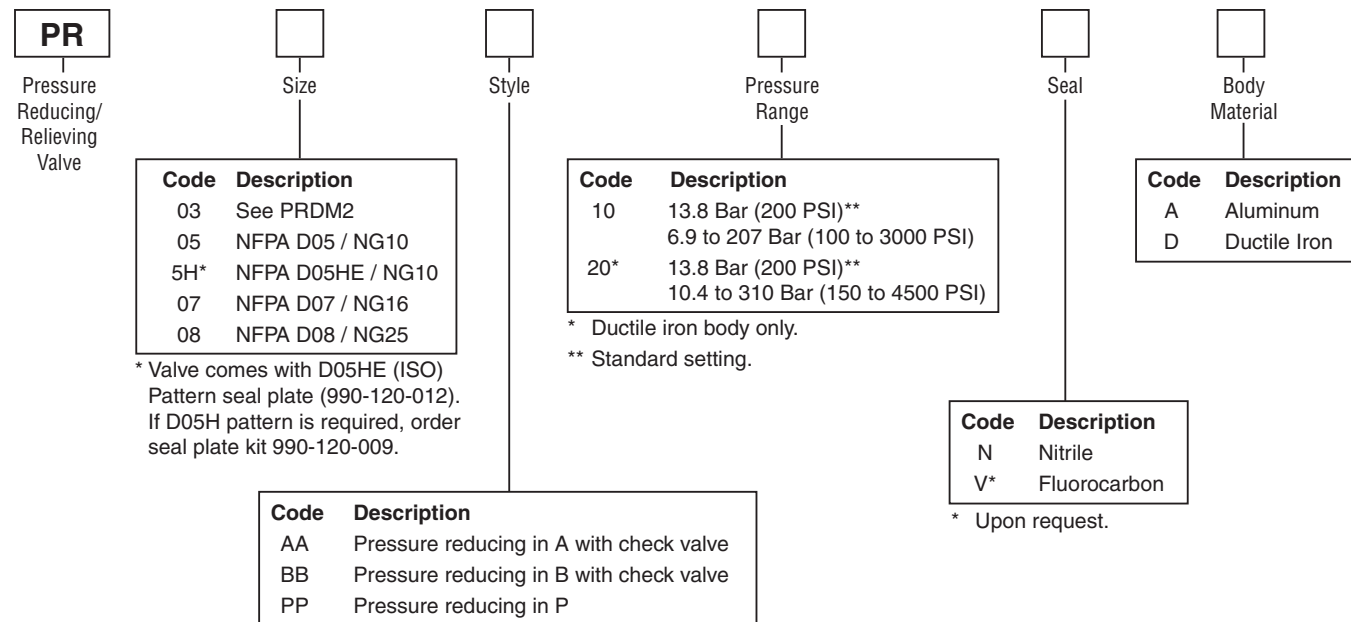
- High flow capacity.
- Sizes:
  - PR05 – NFPA D05 / NG10 / CETOP 5
  - PR5H – NFPA D05HE / NG10 / CETOP 5H
  - PR07 – NFPA D07 / NG16 / CETOP 7
  - PR08 – NFPA D08 / NG25 / CETOP 8
- With integral return flow check valve on A & B port models.



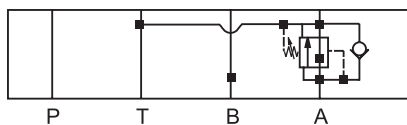
## Specifications

General				
<b>Size</b>	<b>D05 / NG10</b>	<b>D05HE / NG10</b>	<b>D07 / NG16</b>	<b>D08 / NG25</b>
<b>Mounting Position</b>	Unrestricted			
<b>Ambient Temperature Range</b>	-20°C to +50°C (-4°F to +122°F)			
Hydraulic				
<b>Maximum Operating Pressure</b>	Aluminum Body – up to 207 Bar (3000 PSI); Ductile Iron Body – up to 345 Bar (5000 PSI)			
<b>Nominal Flow</b>	76 LPM (20 GPM)	76 LPM (20 GPM)	303 LPM (80 GPM)	303 LPM (80 GPM)
<b>Adjustment Screw Hex Size</b>	5/32	5/32	5/32	5/32
<b>Fluid Temperature</b>	-20°C to +80°C (-4°F to +176°F)			
<b>Viscosity</b>	<b>Permitted</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU)		
	<b>Recommended</b>	30 cSt / mm <sup>2</sup> /s (139 SSU)		
<b>Filtration</b>	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			

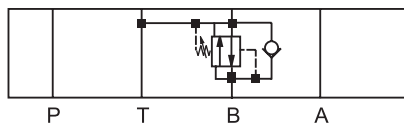
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



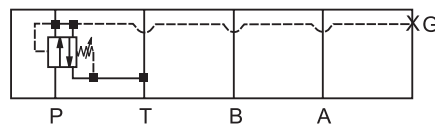
**PR\*\*AA**



**PR\*\*BB**



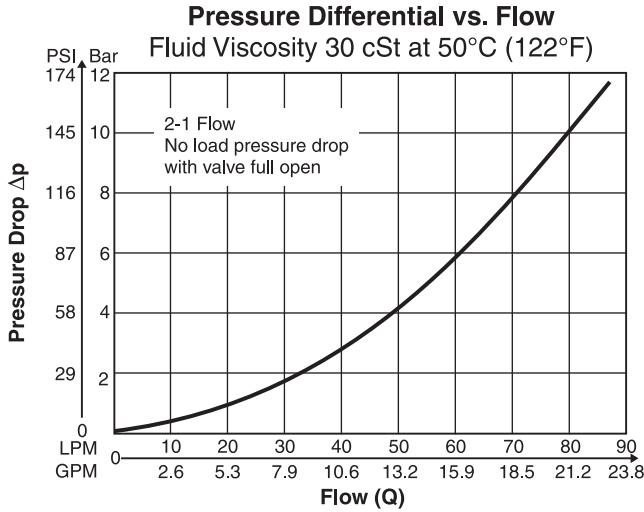
**PR\*\*PP**



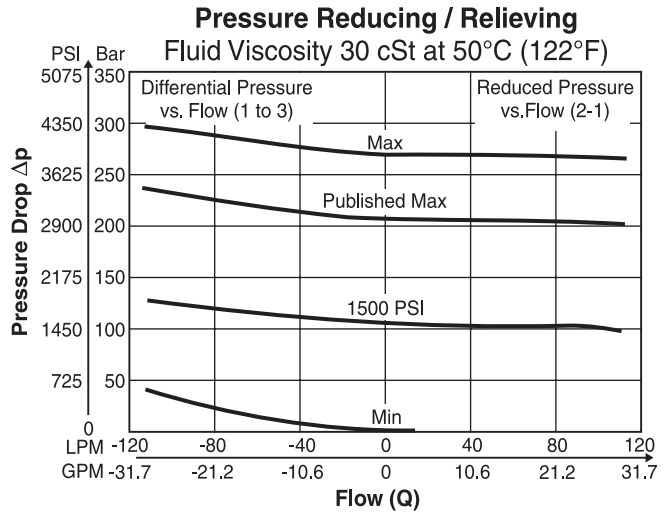
**Weight:**

Size	PR**AA30NA	PR**AA30ND	PR**BB30NA	PR**BB30ND	PR**PP30NA	PR**PP30ND
PR05, PR5H	1.4 kg (3.1 lbs.)	2.8 kg (6.2 lbs.)	1.4 kg (3.1 lbs.)	2.8 kg (6.2 lbs.)	0.9 kg (2.1 lbs.)	2.0 kg (4.4 lbs.)
PR07	2.9 kg (6.4 lbs.)	5.8 kg (12.9 lbs.)	2.9 kg (6.4 lbs.)	5.7 kg (12.6 lbs.)	3.9 kg (8.5 lbs.)	7.8 kg (17.1 lbs.)
PR08	4.9 kg (10.8 lbs.)	9.2 kg (20.4 lbs.)	4.9 kg (10.8 lbs.)	11.2 kg (24.7 lbs.)	5.3 kg (11.6 lbs.)	11.7 kg (25.7 lbs.)

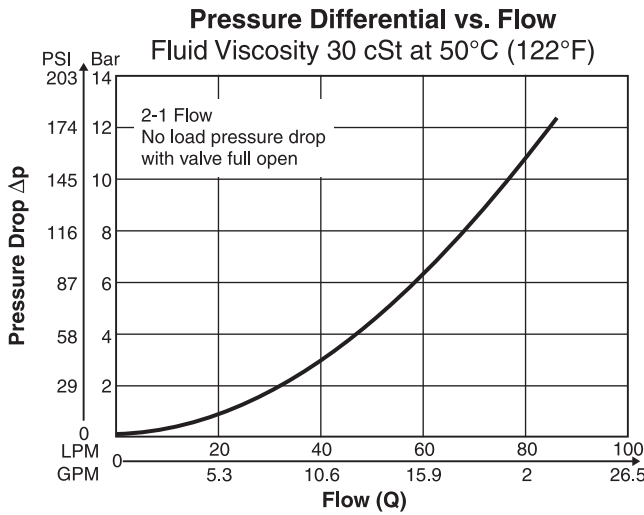
**PR05\*10\*A and PR5H\*10\*A**



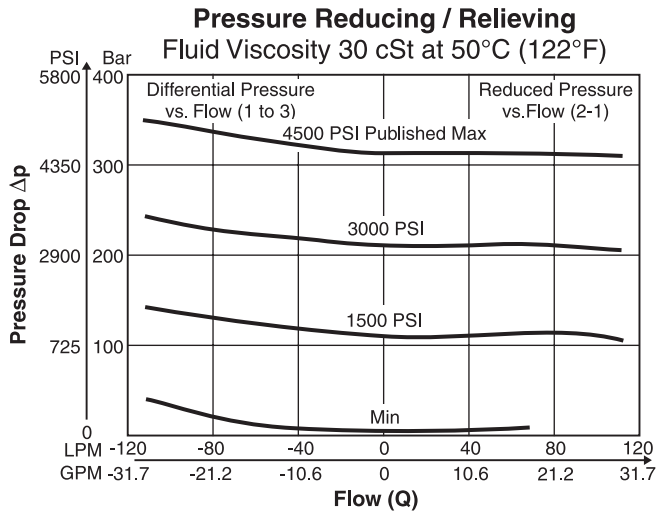
**PR05\*10\*A and PR5H\*10A**



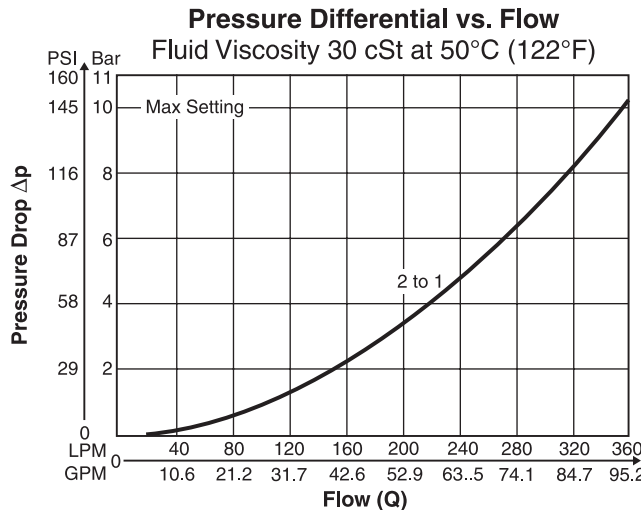
**PR05\*20\*D and PR5H\*20\*D**



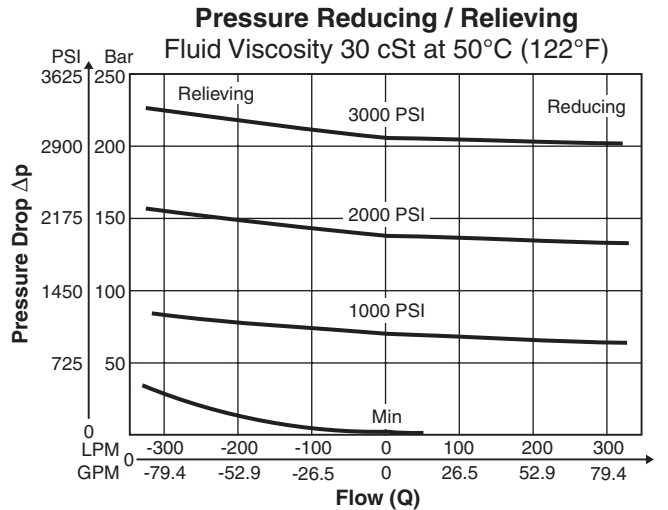
**PR05\*20\*D and PR5H\*20\*D**



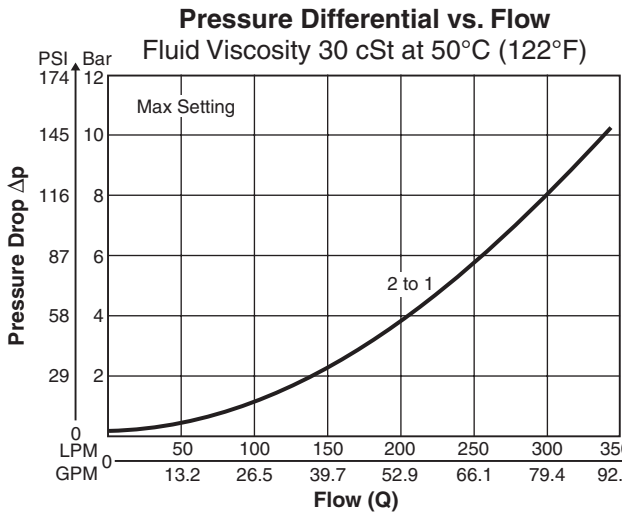
**PR07\*10\*A**



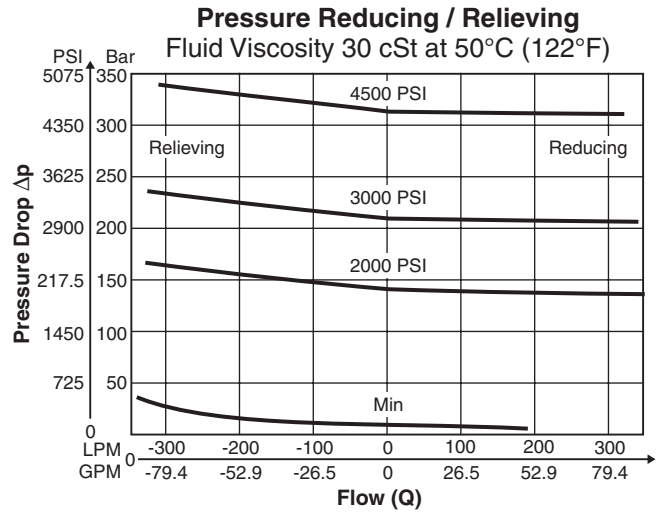
**PR07\*10\*A**



**PR07\*20\*D**

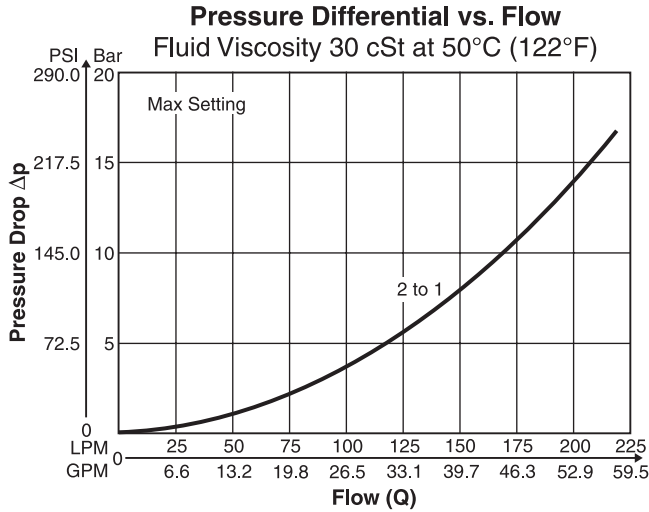


**PR07\*20\*D**

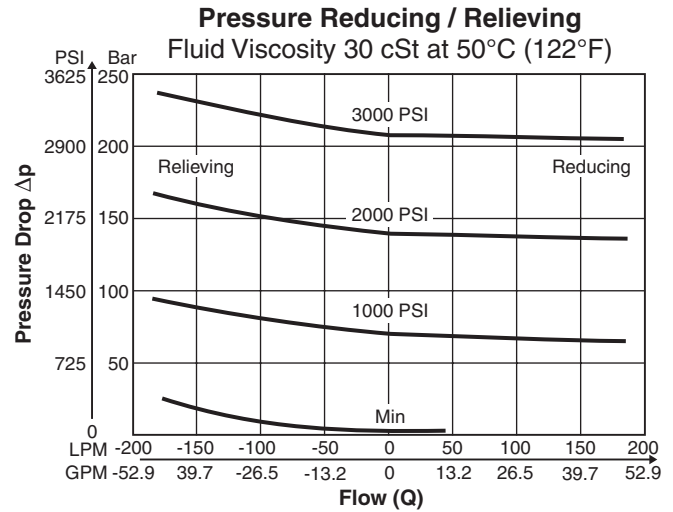


**B**

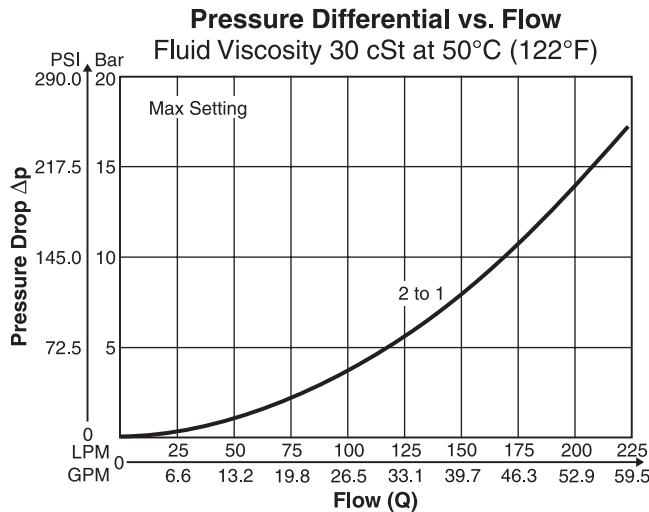
**PR08\*10\*A**



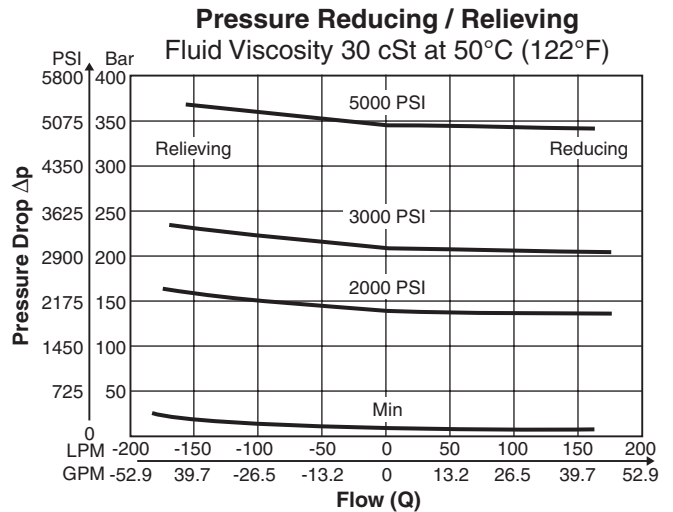
**PR08\*10\*A**



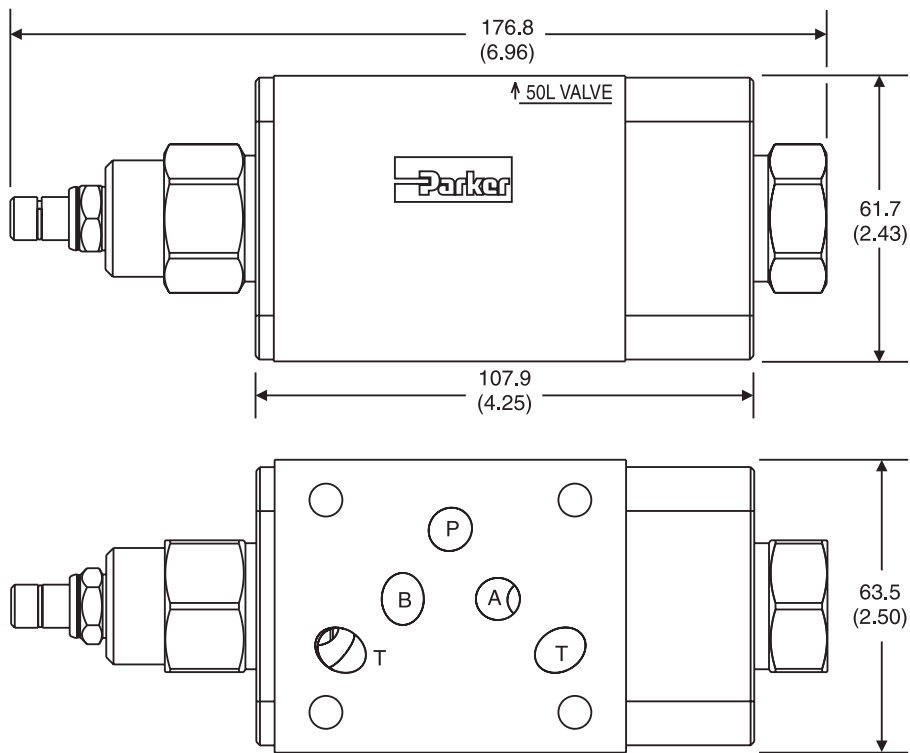
**PR08\*20\*D**



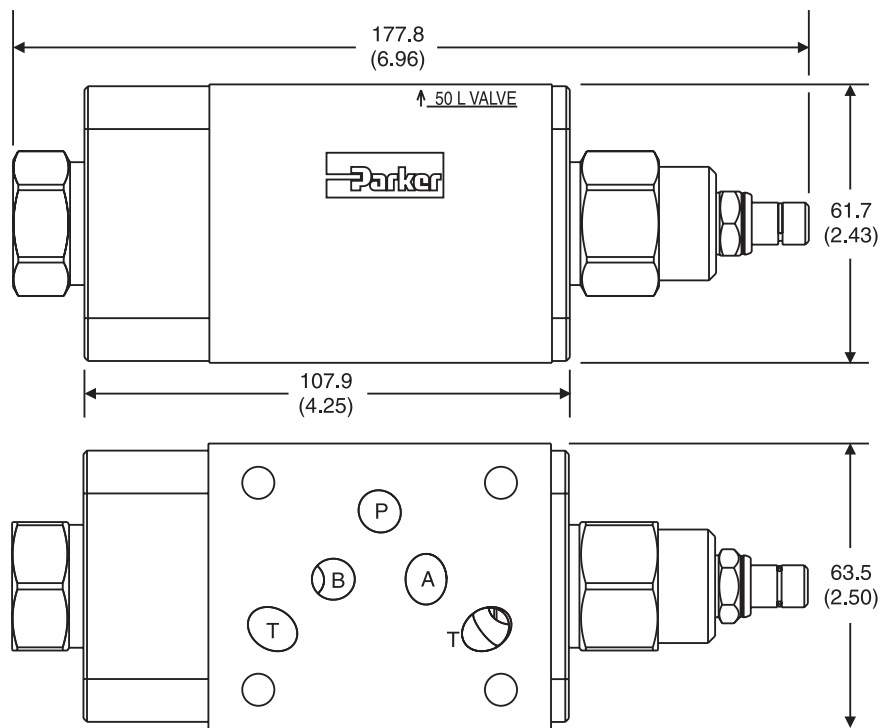
**PR08\*20\*D**



**PR05AA** – Inch equivalents for millimeter dimensions are shown in (\*\*)

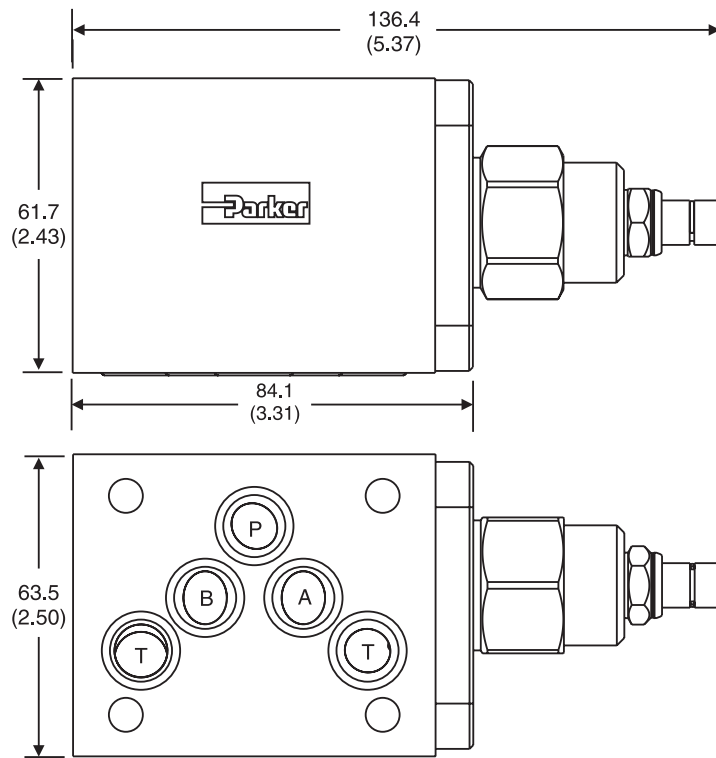


**PR05BB** – Inch equivalents for millimeter dimensions are shown in (\*\*)



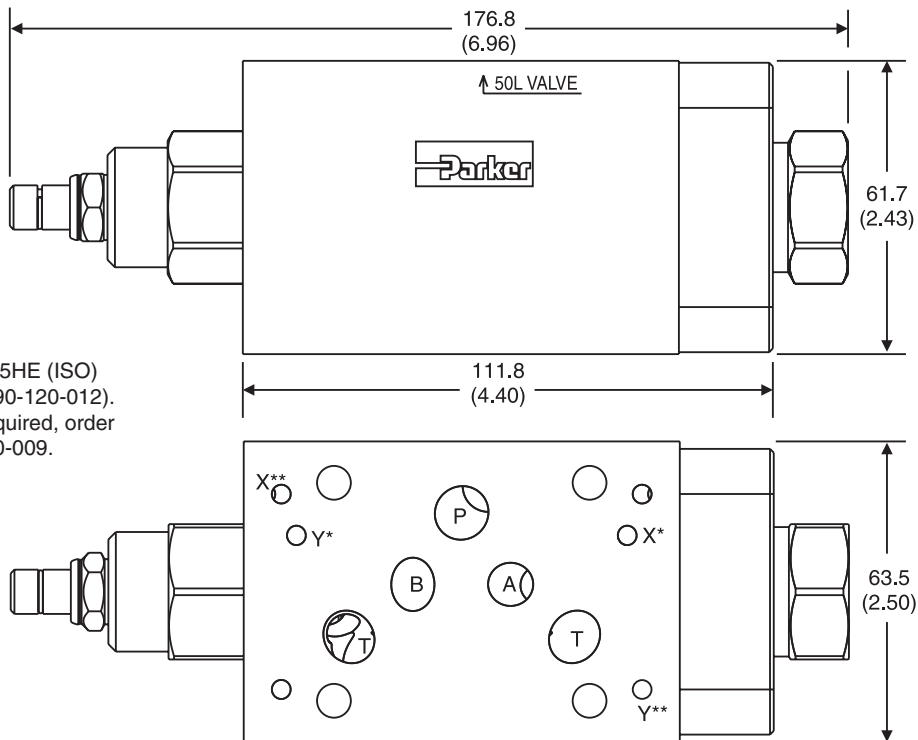


**PR05PP** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**B**

**PR5HAA** – Inch equivalents for millimeter dimensions are shown in (\*\*)



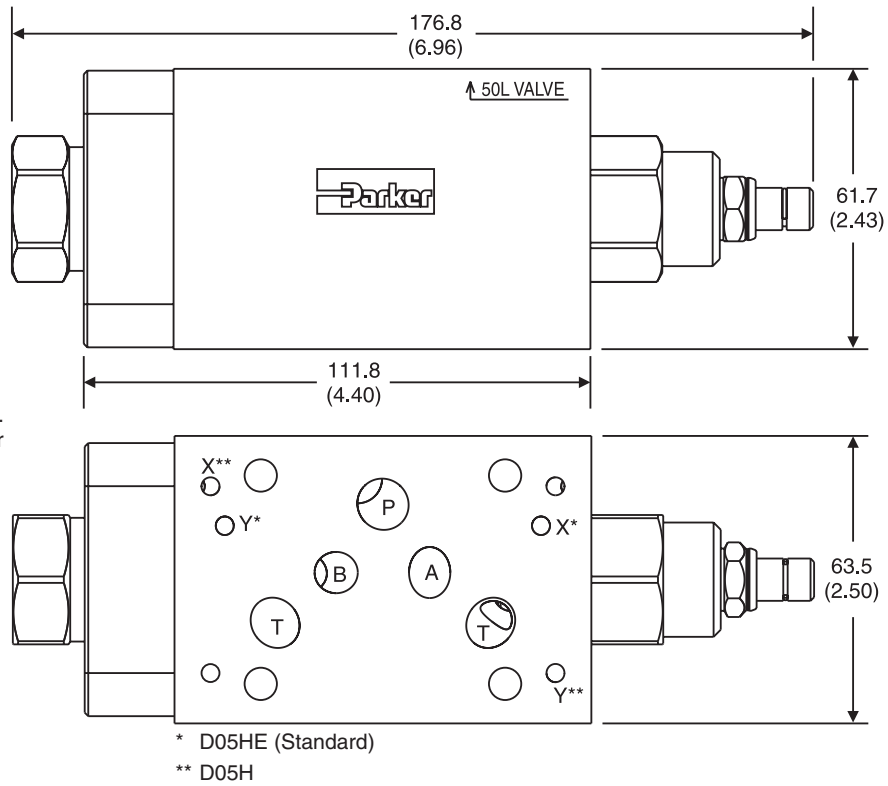
Valve comes with D05HE (ISO) Pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.

\* D05HE (Standard)  
\*\* D05H



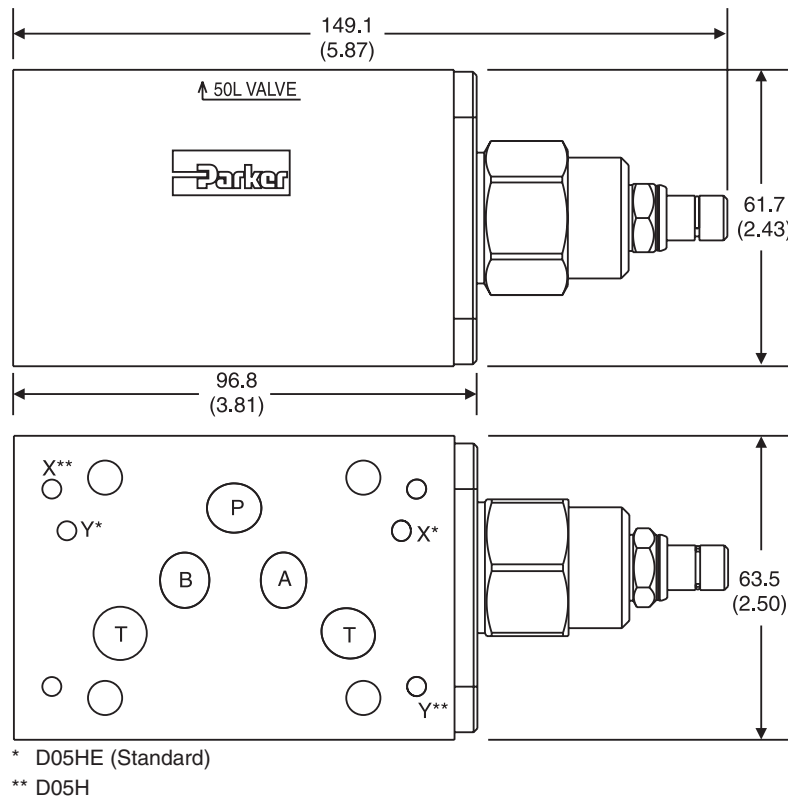
**PR5HBB** – Inch equivalents for millimeter dimensions are shown in (\*\*)

**B**



Valve comes with D05HE (ISO) Pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.

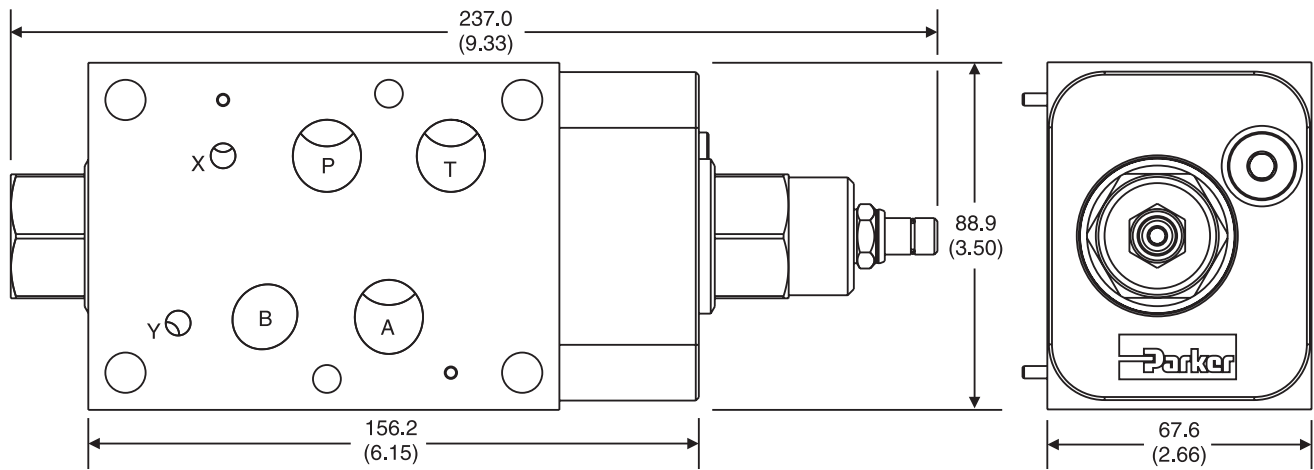
**PR5HPP** – Inch equivalents for millimeter dimensions are shown in (\*\*)



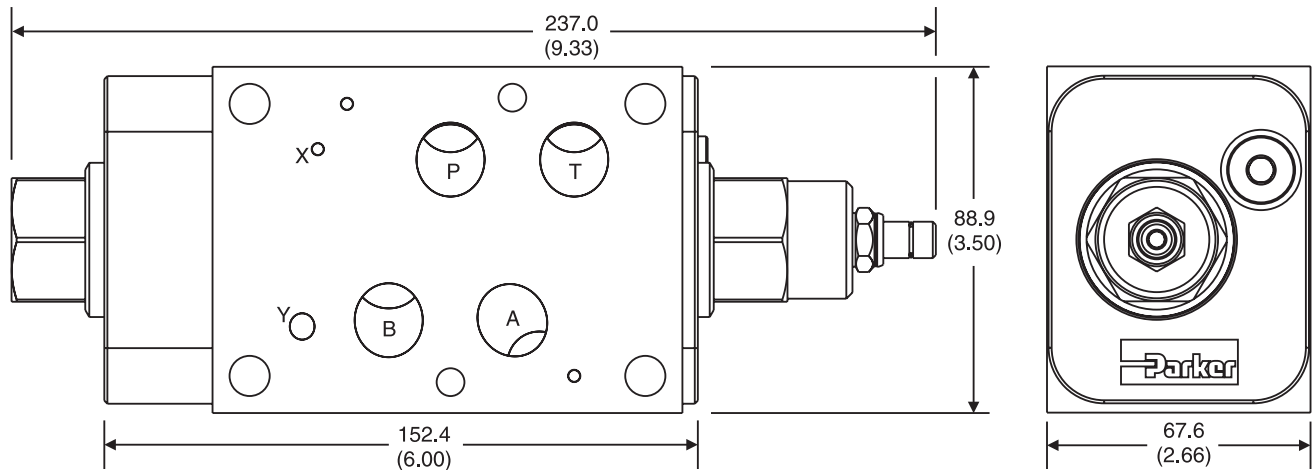
Valve comes with D05HE (ISO) Pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.



**PR07AA** – Inch equivalents for millimeter dimensions are shown in (\*\*)

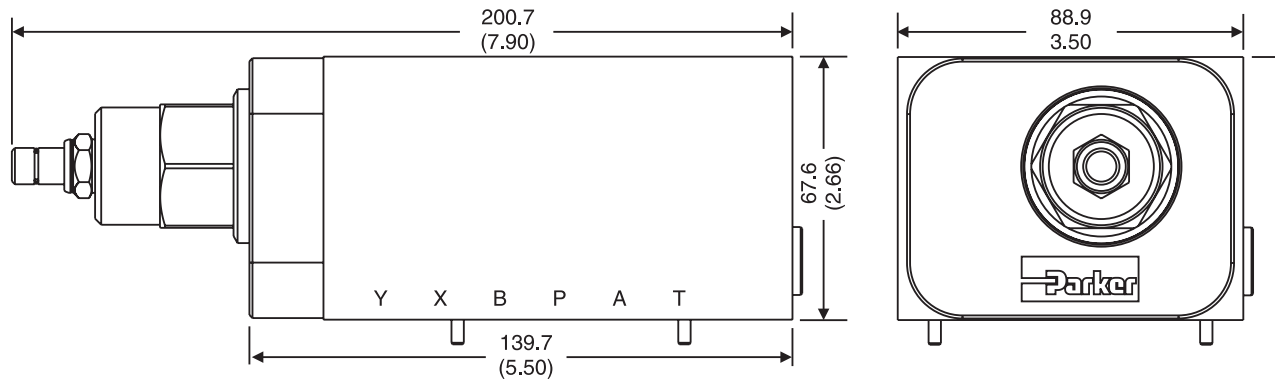


**PR07BB** – Inch equivalents for millimeter dimensions are shown in (\*\*)

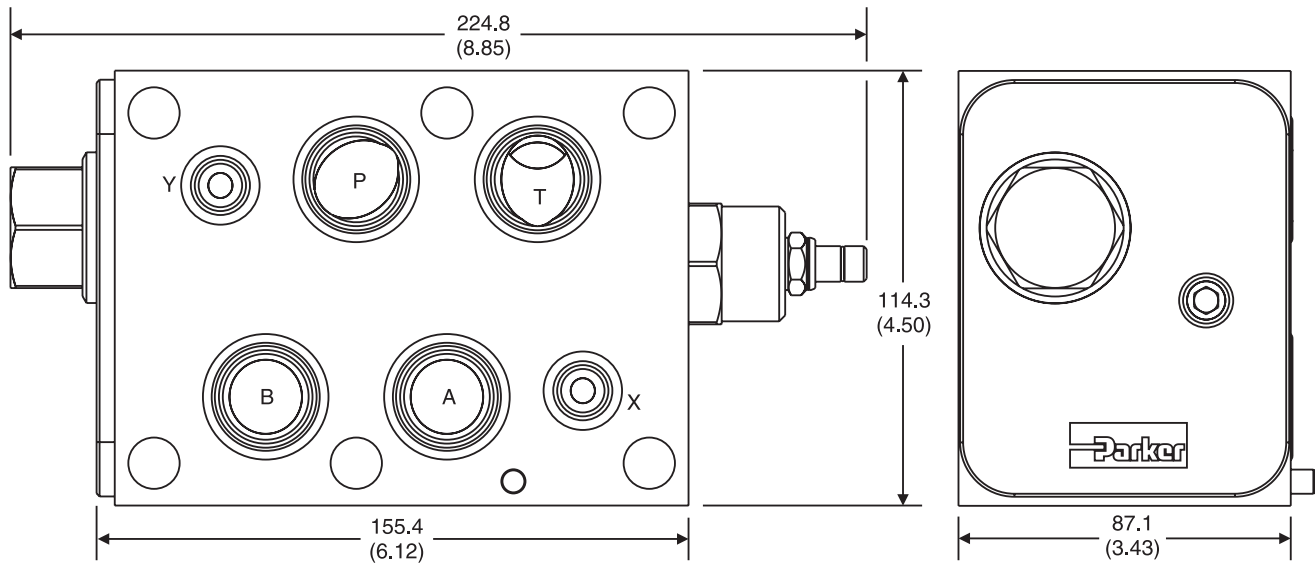


**PR07PP** – Inch equivalents for millimeter dimensions are shown in (\*\*)

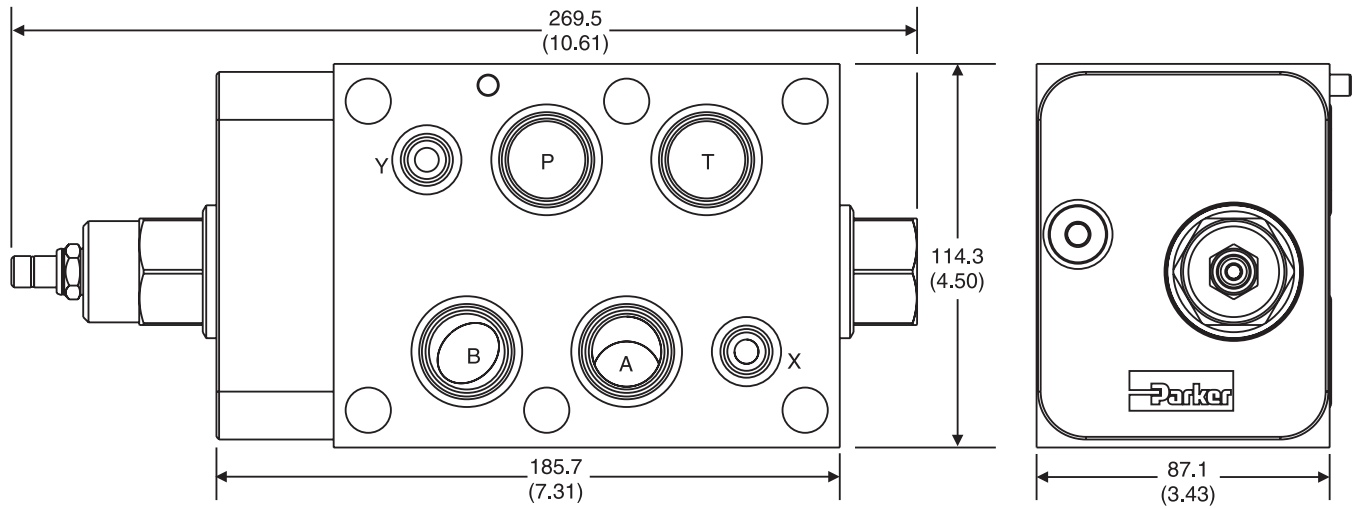
**B**



**PR08AA** – Inch equivalents for millimeter dimensions are shown in (\*\*)

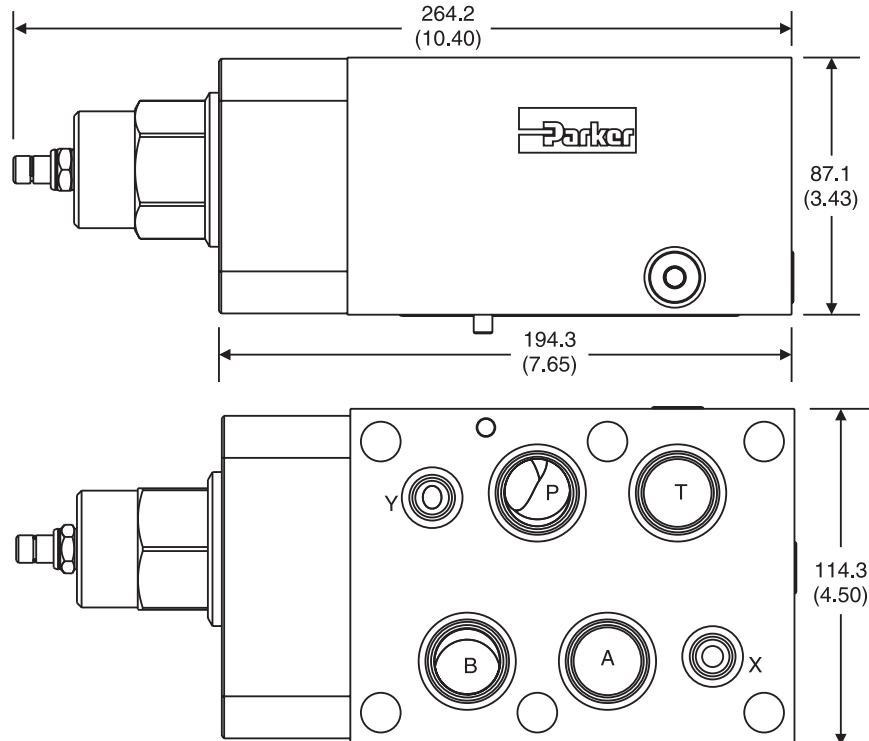


**PR08BB** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**B**

**PR08PP** – Inch equivalents for millimeter dimensions are shown in (\*\*)



## General Description

Series PRM reducing valves are used to regulate pressure in one area of a circuit below normal system pressure. This style valve is well suited to perform this function as it mounts directly below the directional control valve.

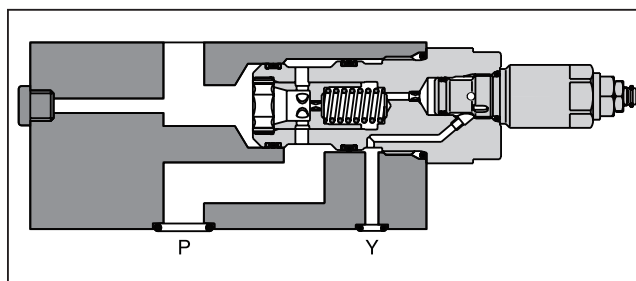
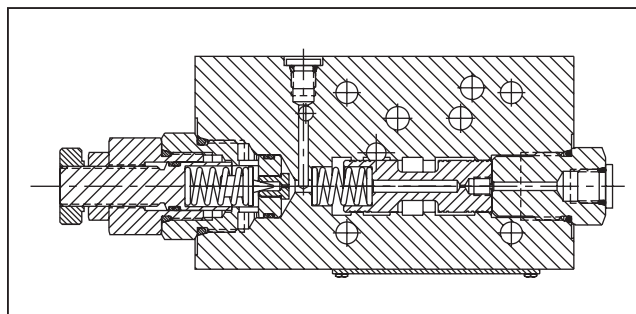
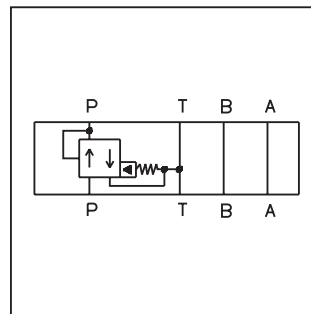
**B**

## Operation

These are "normally open" valves that allow fluid to pass through the controlled port during typical operation. When downstream pressure rises above the value set by an adjustable spring force, the control pilot opens and allows the main spool to move from a full open position. The main spool modulates to maintain the desired "reduced pressure" downstream of the valve. The PRM3 also has a relieving mode.

## Features

- PRM sandwich style pressure reducing valves allow for easy configuration of stack systems and can be used to reduce pressure on the 'P' port, the 'A' port, or the 'B' port.
- Four pressure adjustment options are available: slotted screw, hexagon socket screw (PRM4), knob and locking knob. (PRM6 only)
- Valve bodies are manufactured from steel which provide extra strength and durability for longer life. Internal hardened steel components also provide longer life.



## Specifications

	PRM3	PRM4	PRM6		PRM3 / PRM4 / PRM6
<b>Mounting Pattern</b>	NFPA D05, CETOP 5, NG 10	CETOP 07, NG 16	NFPA D08, CETOP 8, NG 25	<b>Filtration</b>	ISO 4406 (1999); 18/16/13 (meet NAS 1638:7)
<b>Minimum Pressure</b>	10 Bar (150 PSI) with rated flow, 150 SSU oil, and fluid temperature of 38°C (100°F). <sup>1</sup>			<b>Venting</b>	Connecting the vent port to tank allows the reducing valve to divert flow at minimum pressure.
<b>Maximum Pressure</b>	345 Bar (5000 PSI)	345 Bar (5000 PSI)	345 Bar (5000 PSI)	<b>Remote Control</b>	Remote control valve connected to the vent port can be used to control the pressure. <sup>2</sup>
<b>Minimum Flow</b>	3.78 LPM (1 GPM)		3.78 LPM (1 GPM)	<b>Drain Line</b>	Drain line from pilot valve is internally connected to the tank port. Tank line pressure is thus added to the valve setting. <sup>3</sup>
<b>Maximum Flow</b>	64 LPM (17 GPM)		189 LPM (50 GPM)		
<b>Pressure Range</b>	Code	Pressure Range			
	07	10 to 70 Bar (150 - 1000 PSI)			
	17	10 to 175 Bar (150-2500 PSI)			
	25	10 to 250 Bar (150 - 3500 PSI)			
	35	10 to 350 Bar (150 - 5000 PSI)			

<sup>1</sup> Change in flow, temperature or fluid (SSU) rating will affect valve minimum pressure.

<sup>2</sup> Set main valve pressure 10 Bar (150 PSI) higher than remote pilot.

<sup>3</sup> It is important that the drain line connection be taken into consideration when determining the minimum valve setting.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**PRM**  
Pressure Reducing Valve

Code	Description
3	NFFPA D05
4	NFFPA D07
6	NFFPA D08

Size

Pressure Reducing

Pressure Range

Adjustment

Seal

Gauge Port

Drain

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

		Available Models		
Code	Description	PRM3	PRM4	PRM6
AA	A Port Only	✓		
AP	Connection A			✓
PA	Connection P			✓
PA	Function in P, Reduced Pressure in A		✓	
PB	Function in P, Reduced Pressure in B		✓	
PP	P Port Only	✓		
PP	Function in P, Reduced Pressure in P		✓	

Code	Type
N*	Nitrile
V	Fluorocarbon

\* PRM3 only.

Code	Type
Omit*	SAE
S**	SAE
N**	NPT
M**	Metric
G†	1/4 BSPP

\* PRM4 only.  
 \*\* PRM3 only.  
 † PRM6 only.

Code	Type
K*	Turning Knob
L**	Cylinder Lock
S†	Screw Adj.

\* PRM3 and PRM6 only.  
 \*\* PRM6 only.  
 † PRM3 and PRM4 only.

Code	Type
Omit	Internal
Y*	External

\* PRM3 only.

**Unit Weight:**

PRM3 3.0 kg (6.6 lbs.)  
 PRM4 5.0 kg (11.0 lbs.)  
 PRM6 5.6 kg (12.5 lbs.)

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

Code	Description
07	10 to 70 Bar (150 to 1000 PSI)
17*	10 to 175 Bar (150 to 2500 PSI)
25	10 to 250 Bar (150 to 3500 PSI)
35**	10 to 345 Bar (150 to 5000 PSI)

\* PRM3 and PRM6. \*\* PRM3 and PRM4.



**Bolt Kits**

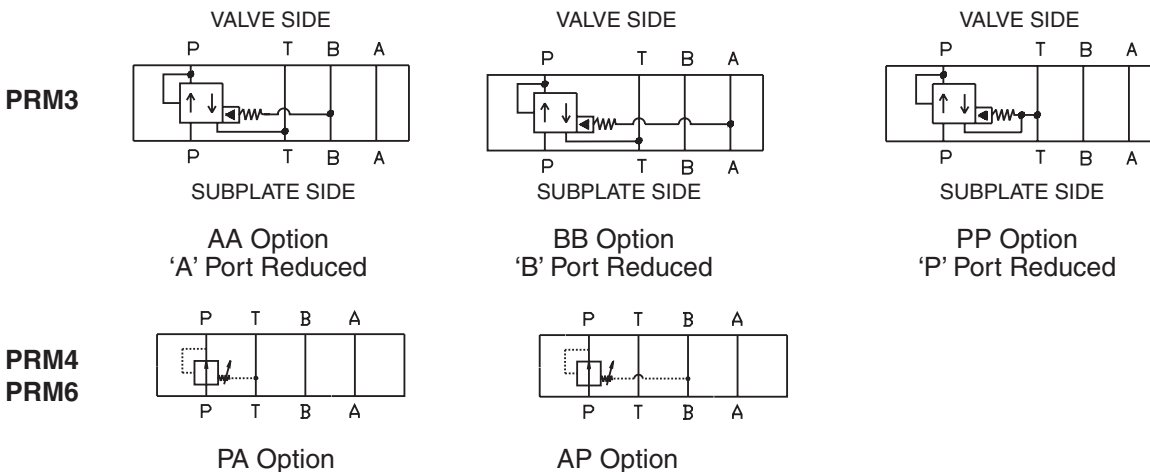
Size 3				Size 4			Size 6			
No. of Sand-wich	Sandwich & Valve Combination	D3W-30 D3DW & D31*W*	Bolt Length mm (in)	No. of Sand-wich	Sandwich & Valve Combination	Bolt Length mm	No. of Sand-wich	Sandwich & Valve Combination	D3W-30 D3DW & D31*W*	Bolt Length mm (in)
1	Sandwich & D3	BK141	88.9 (3.50)	1	Sandwich & D4	4x M10 x 140 2x M6 x 135	1	Sandwich & D6	BK121	133.4 (5.25)
2	Sandwich & D3	BK142	139.7 (5.50)				2	Sandwich & D6	BK122	203.2 (8.00)
3	Sandwich & D3	BK143	190.5 (7.50)				3	Sandwich & D6	BK123	273.1 (10.75)
				3	Sandwich & D4	4x M10 x 300 2x M10 x 295	4	Sandwich & D6	BK124	342.9 (13.5)

\* D31VW with internal pilot and internal drain only.

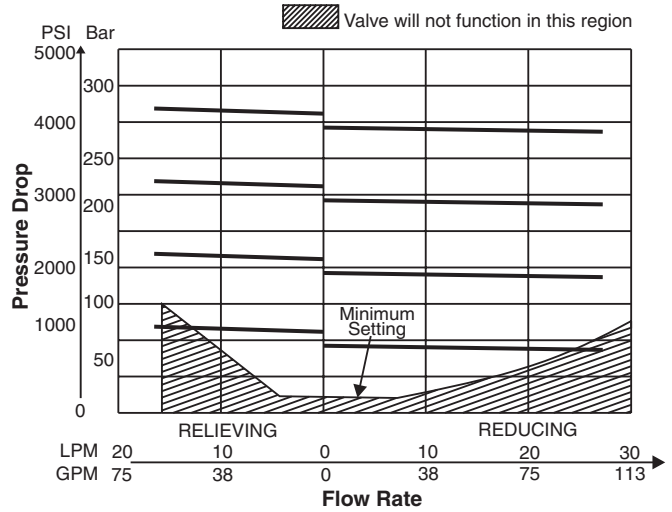
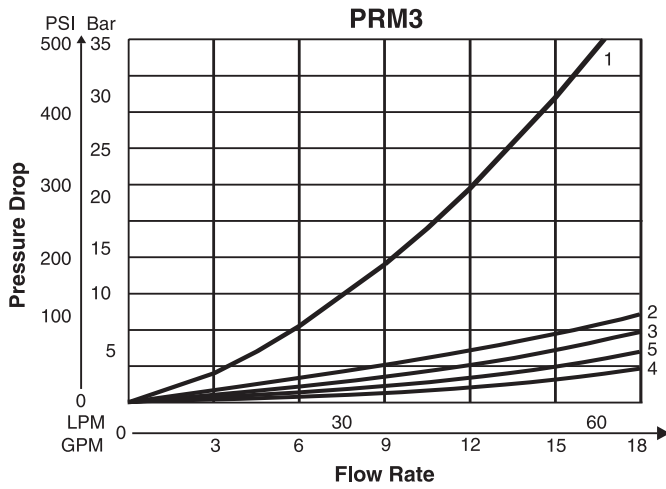
Bolt Kits must be ordered separately.

**Schematics**

Bolt Kits must be ordered separately.



**B**

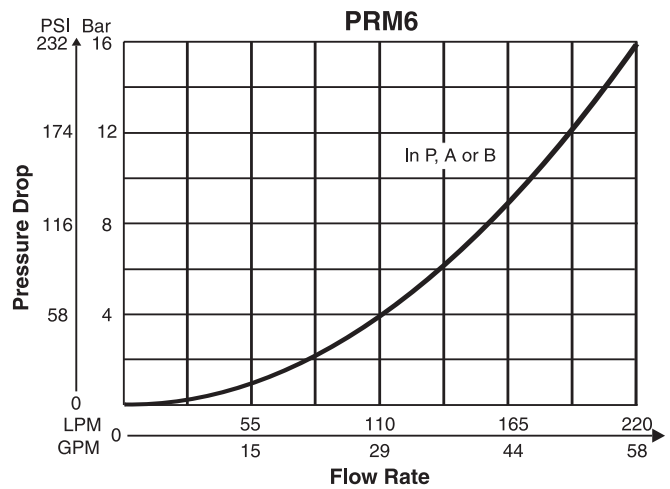
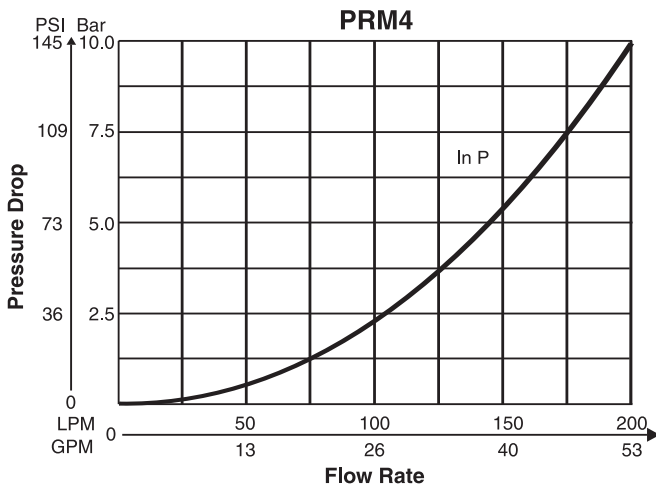


Mode	Flow Path			
	P → P	A → A	B → B	T → T
PP	1	2	3	4
AA	1	2	3	5
BB	1	2	3	5

Viscosity Correction Factor							
Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (approx.)	93	111	119	126	132	137	141

Curves were generated using 100 SSU hydraulic oil.  
 For any other viscosity, pressure drop will change per chart.

**NOTE: Lowest pressure setting dependent upon system resistance.**



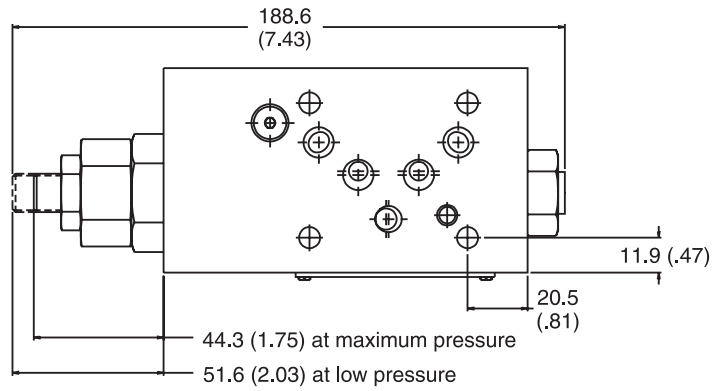
All characteristic curves measured with HLP46 at 50°C (122°F).



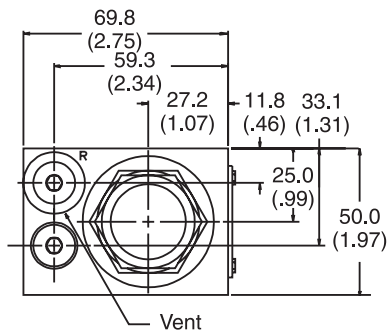
**PRM3AA**

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

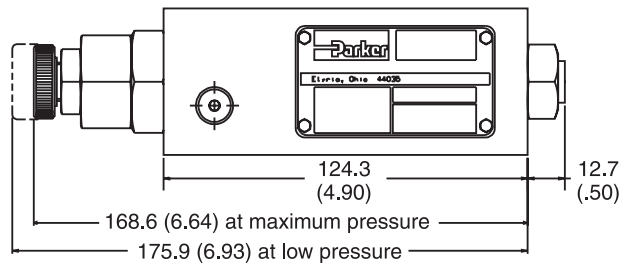
**B**



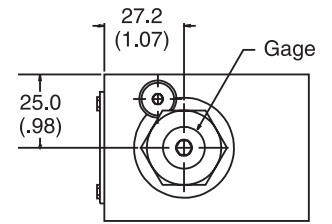
**Top View**



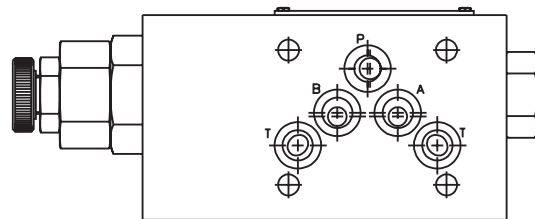
**End View**



**Face View**



**End View**



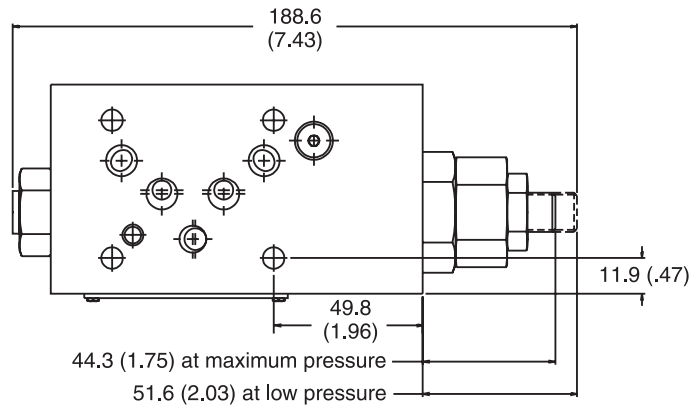
**Bottom View**



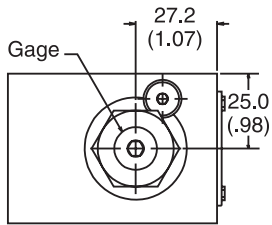
**PRM3BB**

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

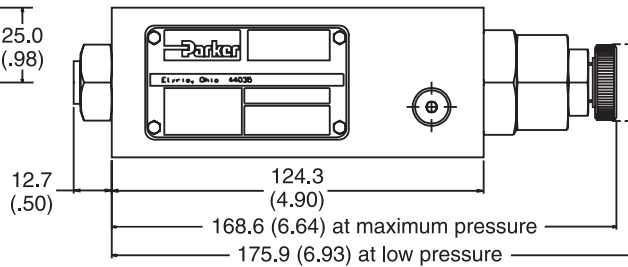
**B**



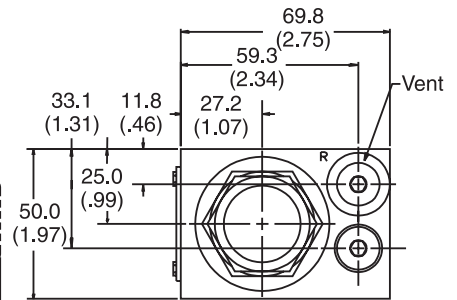
**Top View**



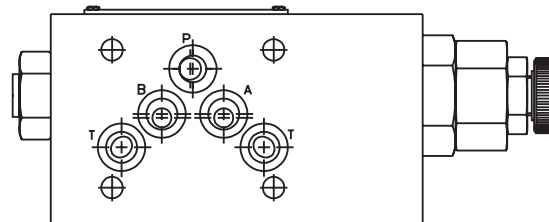
**End View**



**Face View**



**End View**



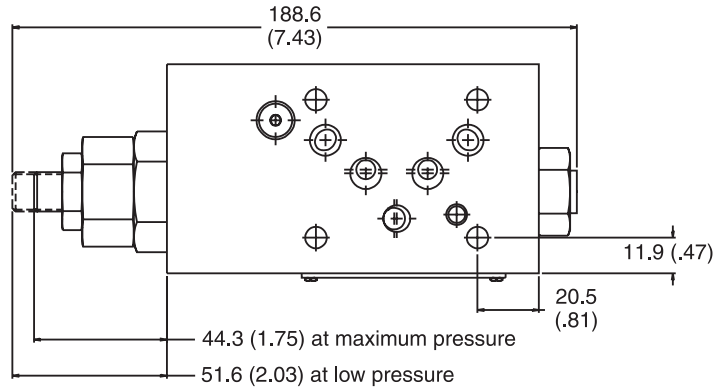
**Bottom View**



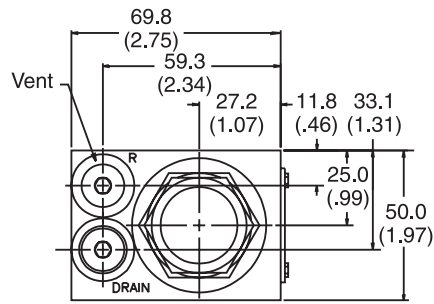
**PRM3PP**

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

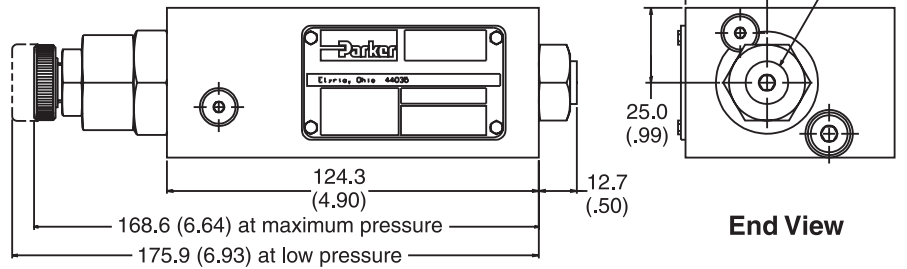
**B**



**Top View**

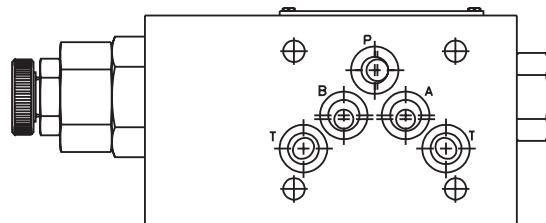


**End View**



**Face View**

**End View**



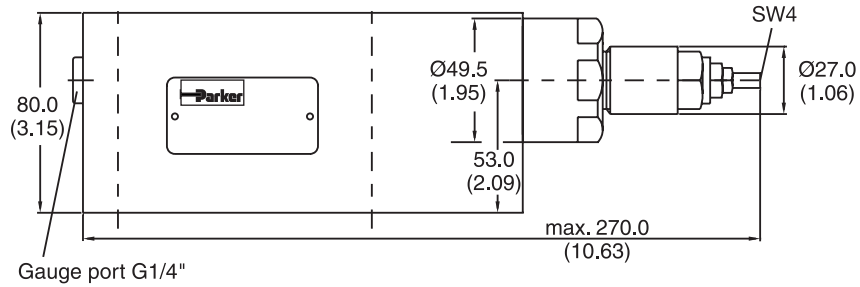
**Bottom View**



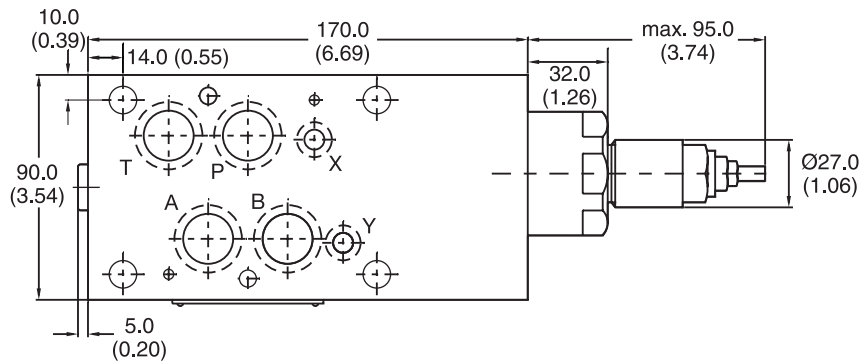
**PRM4**

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

**B**



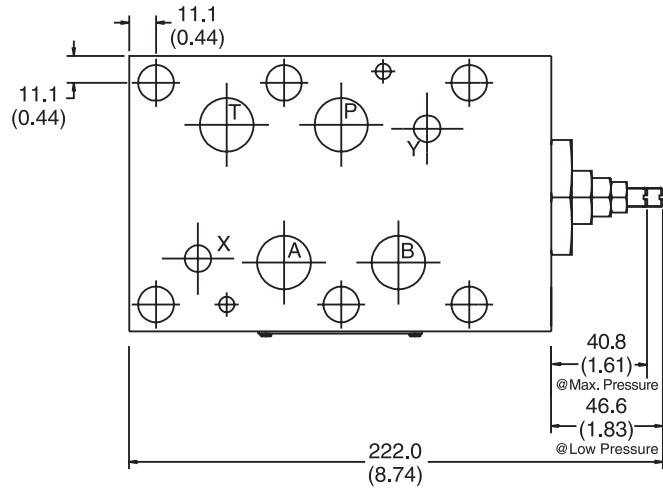
**Face View**



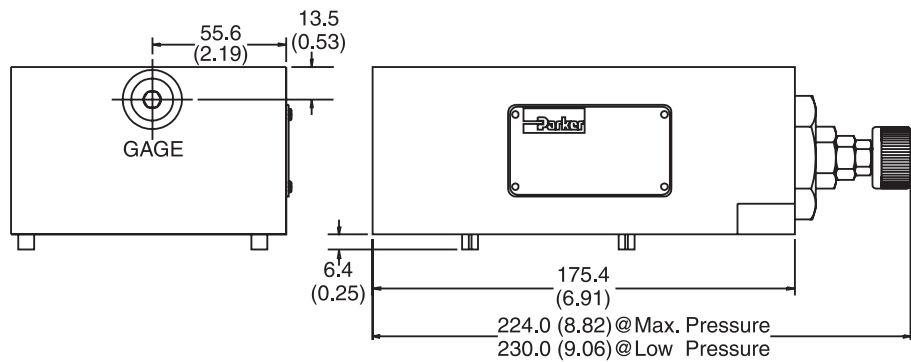
**Top View**

**PRM6**

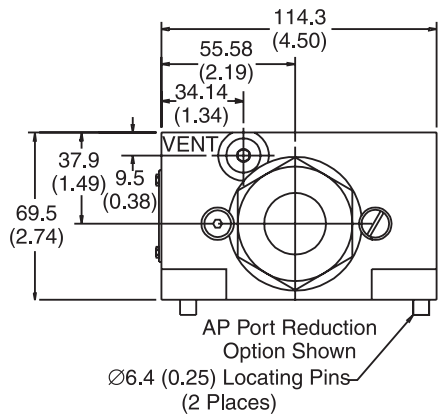
Inch equivalents for millimeter dimensions are shown in (\*\*)



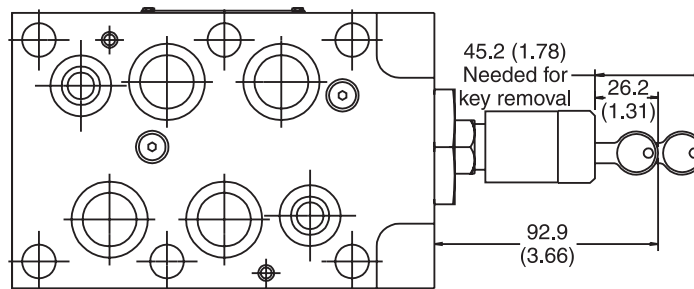
**Top View**



**Face View**



**End View**



**Bottom View**



**B**

## General Description

Series RDM pressure relief valves are direct operated piston type valves with low hysteresis. They can be used as P-T relief or as T-T controlled counter balance valve. The valve body is equipped with a pressure gauge port.

**B**

## Function

For PT, pressure is relieved from P to T at the adjusted value.

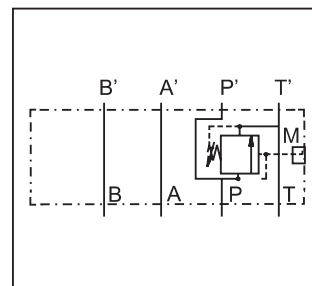
For TT, pressure is relieved from T to T at the adjusted pressure.

## Features

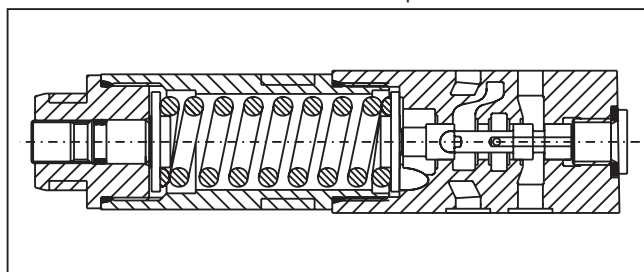
- The direct operated, cushioned piston design results in fast response, low leakage and minimal hysteresis.
- Up to 5 pressure adjustment ranges are available with maximum pressure settings of:
  - For RDM2 – 25, 64, 160, 210, 350 Bar (363, 928, 2320, 3045, 5075 PSI)
  - For RDM3 – 19, 50, 100, 150, 210 Bar (276, 725, 1450, 2175, 3045 PSI)
- Adjustment modes:
  - Slotted head with lock nut
  - Key lock
  - Knob
- RDM2 – NG06 (CETOP3)  
 RDM3 – NG10 (CETOP5)



RDM2



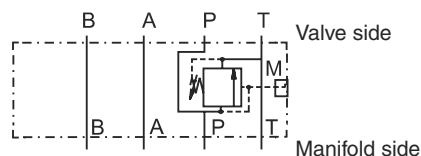
Example PT



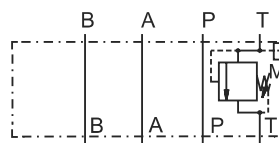
RDM2

## Schematics

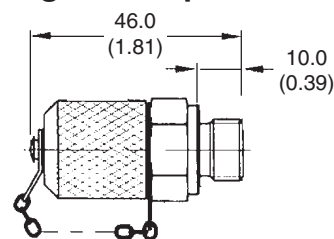
### RDM\*PT



### RDM\*TT



### Gauge Port Option C



## Specifications

General		
Series	<b>RDM2</b>	<b>RDM3</b>
Size	D03, CETOP3, NG6	D05, CETOP5, NG10
Mounting	NFPA, CETOP RP121, DIN 24340, ISO 4401	
MTTF <sub>D</sub> Value	150 years	
Ambient Temperature	-20°C ... +50°C (-4°F...+122°F)	
Hydraulic		
Maximum Operating Pressure	Port P, A, B: 350 Bar (5075 PSI) Port T: 50 Bar (725 PSI)	Port P, A, B: 315 Bar (4495 PSI) Port T: 10 Bar (145 PSI)
Fluid	Hydraulic oil according to DIN 51524...525	
Fluid Temperature	-20°C ... +80°C (-4°F...+176°F)	
Viscosity Range	12...230 cSt / mm <sup>2</sup> /s (13...1854 SSU)	
Filtration	ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)	
Max. Flow – Maximum Leakage P - A 5ml/min (0.001 GPM)	40 LPM (11 GPM)	80 LPM (21 GPM)

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**RDM**  
 Direct Operated Relief Valve

Size

Code	Description
2	NFPA D03, CETOP3, NG6
3	NFPA D05, CETOP5, NG10

Pressure Relief

Code	Description
PT	P to T
TT *	T to T

\* RDM2 only, maximum 160 Bar (2320 PSI)

Pressure Range

Code	Description – RDM2	Code	Description – RDM3
02	1.5 to 25 Bar (22 to 363 PSI)	01	1.5 to 19 Bar (22 to 276 PSI)
<b>06</b>	<b>1.5 to 64 Bar (22 to 928 PSI)</b>	05	1.5 to 50 Bar (22 to 725 PSI)
<b>16</b>	<b>3 to 160 Bar (44 to 2320 PSI)</b>	10	3 to 100 Bar (44 to 1450 PSI)
<b>21</b>	<b>3 to 210 Bar (44 to 3045 PSI)</b>	15	3 to 150 Bar (44 to 2175 PSI)
35	5 to 350 Bar (73 to 5075 PSI)	21	3 to 210 Bar (44 to 3045 PSI)

Adjustment

Code	Description
S	Hexagon Socket
L	Key Lock
K	Knob *

\* RDM2 only.

**V**  
 Seal Fluorocarbon

Gauge Port

Code	Description
G *	G 1/4
C	Coupling M16

\* Standard in housing.



Design Series  
 NOTE:  
 Not required when ordering.



**Weight:**

RDM2 1.3 kg (2.9 lbs.)

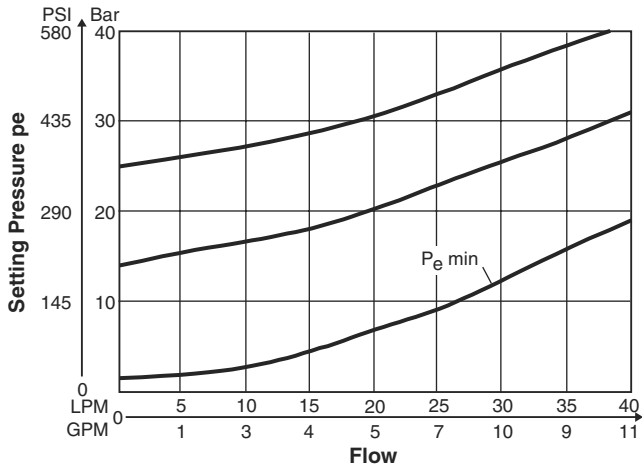
RDM3 2.6 kg (5.8 lbs.)

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

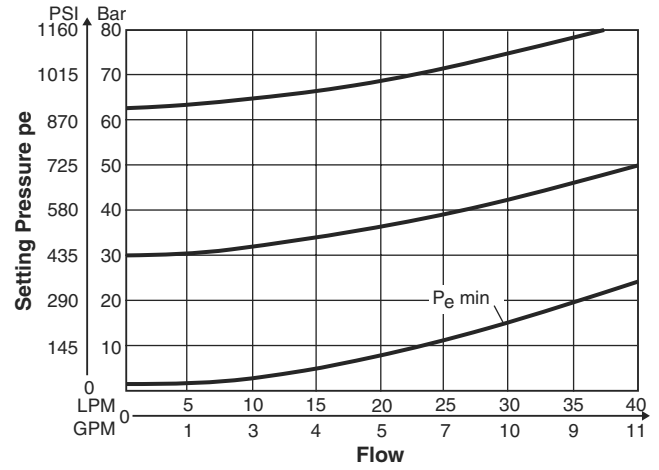
**Non-Bold: Designates Tier II products and options. These products will have longer lead times.**

**B**

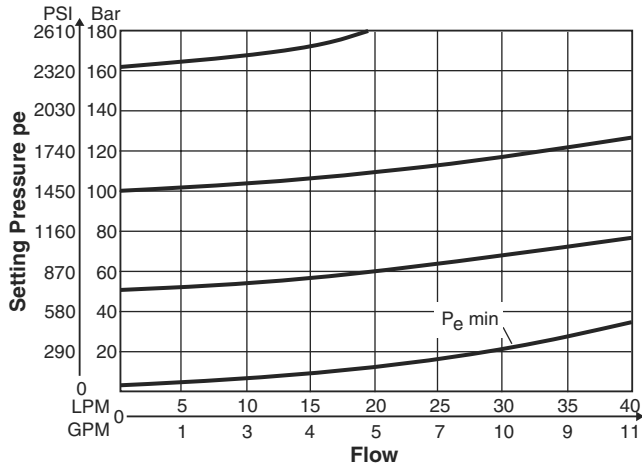
**RDM2 02**



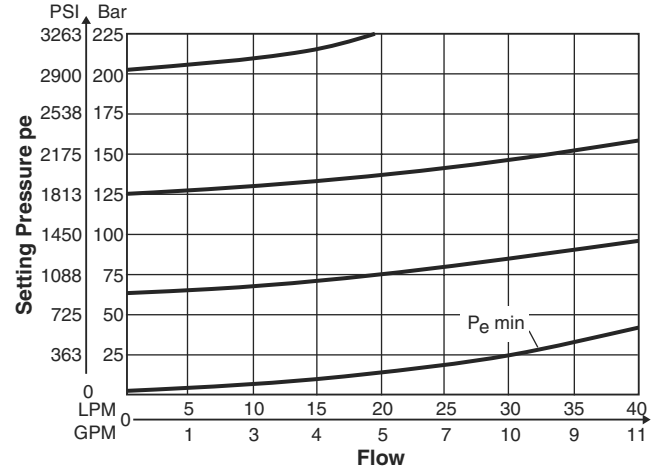
**RDM2 06**



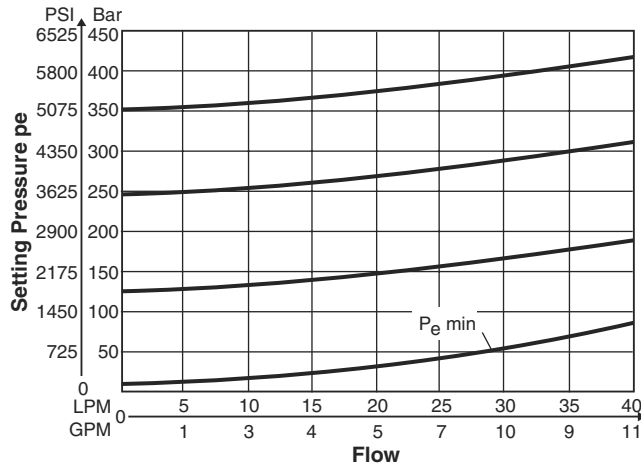
**RDM2 16**



**RDM2 21**



**RDM2 35**

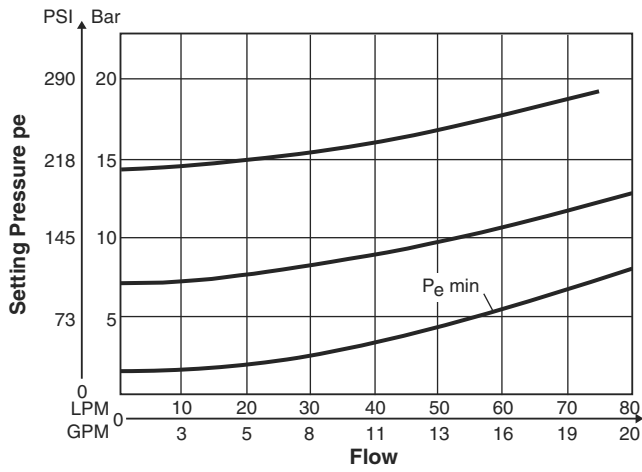


All performance curves measured with HLP46 at 50°C (122°F).

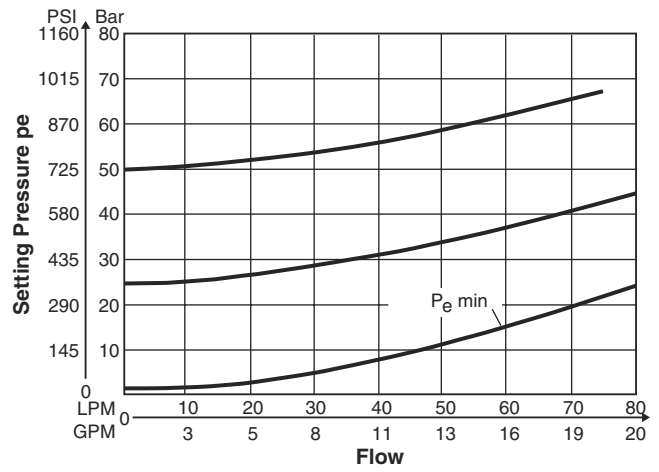


**B**

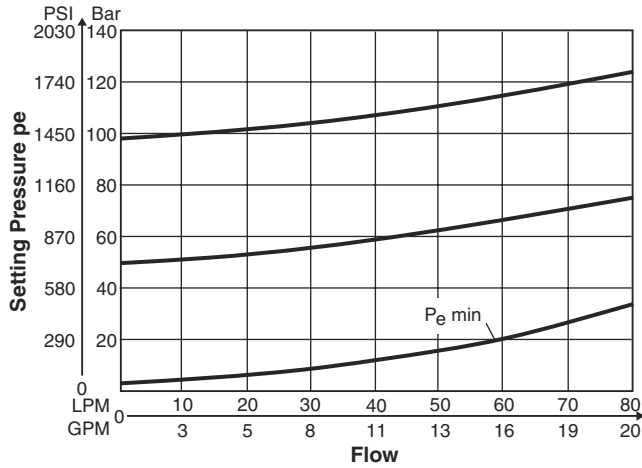
**RDM3 01**



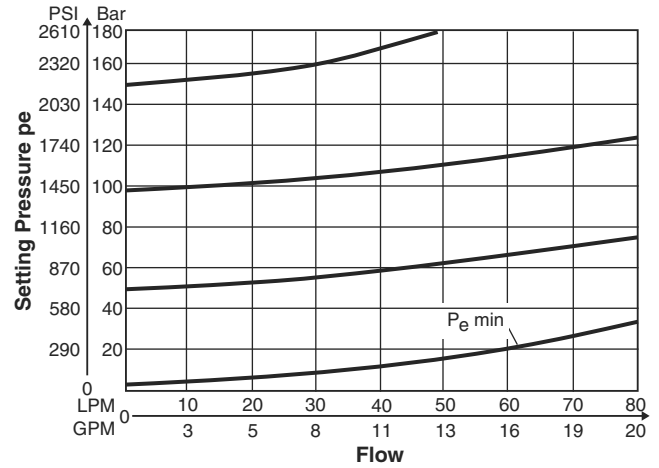
**RDM3 05**



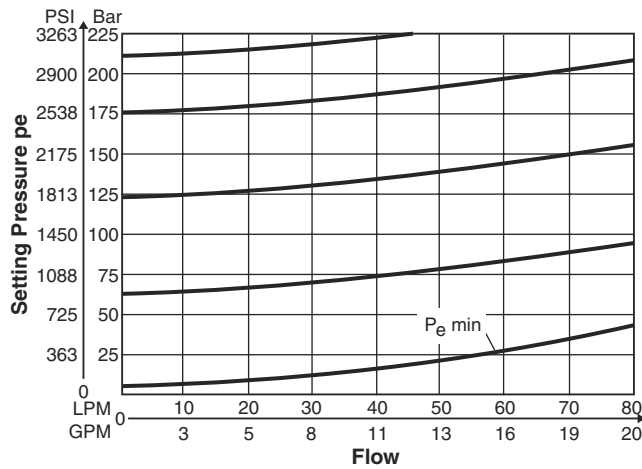
**RDM3 10**



**RDM3 15**



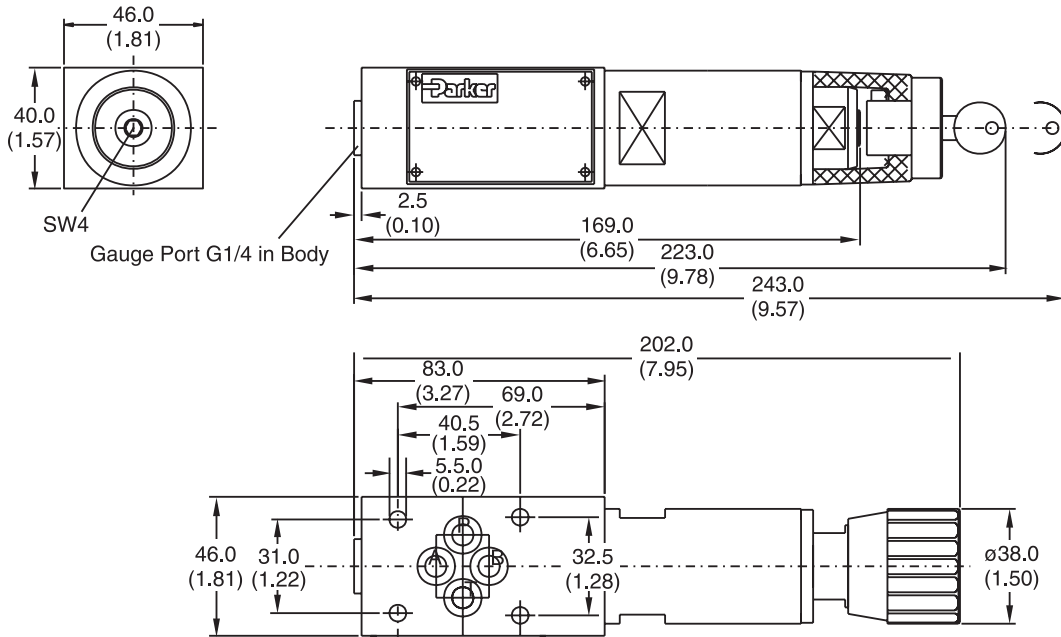
**RDM3 21**



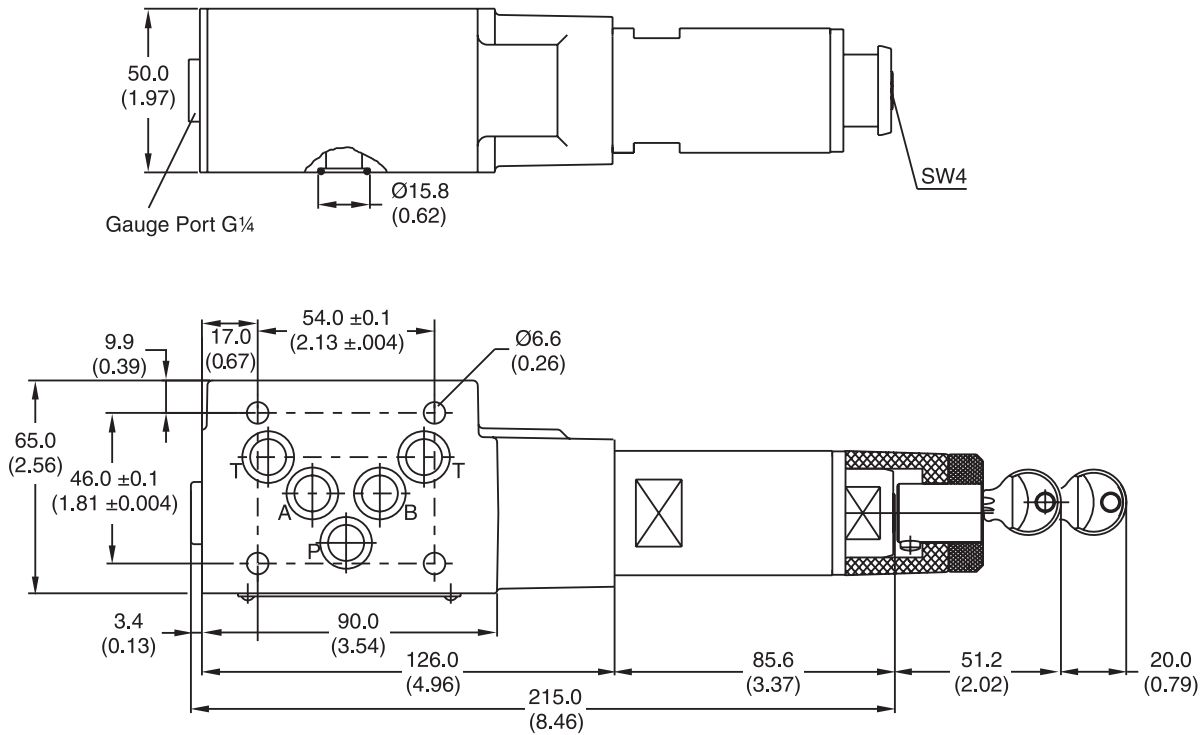
All performance curves measured with HLP46 at 50°C (122°F).

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

**RDM2**



**RDM3**



Seal Kit		
Seal	RDM2	RDM3
V	SK-RDM2-V	SK-RDM3-V



## General Description

Series RM relief valves limit system pressure by opening to tank when system pressure reaches the valve setting. With D03 size, they can also be configured to limit the 'A' or 'B' work port pressures independently.

## Features

- RM sandwich style relief valves can be used to limit pressure in the 'P' port, 'A' port, or 'B' port.
- Valve bodies are manufactured from steel which provide extra strength and durability for longer life. Internal hardened steel components also provide longer life.
- Three pressure adjustment options are available: slotted screw, knob and locking knob.
- SAE Gage Port

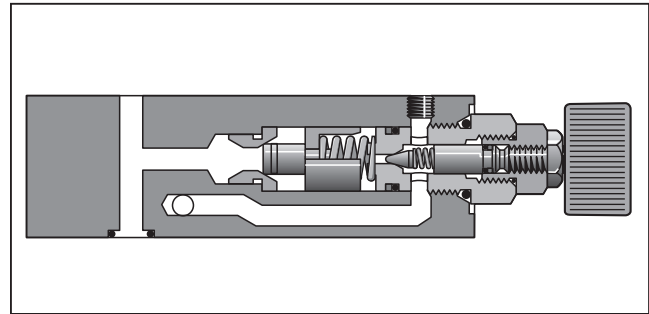
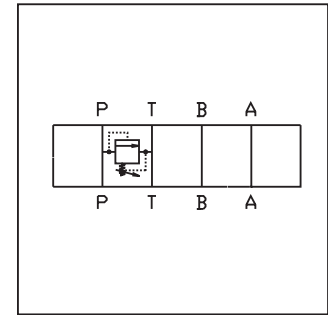
## Specifications

	RM2	RM3	RM6										
<b>Mounting Pattern</b>	NFPA D03, CETOP 3, NG 6	NFPA D05, CETOP 5, NG 10	NFPA D08, CETOP 8, NG 25										
<b>Minimum Pressure</b>	10 Bar (150 PSI) with rated flow, 150 SSU oil, and fluid temperature of 38°C (100°F). <sup>1</sup>												
<b>Maximum Pressure</b>	350 Bar (5000 PSI)	350 Bar (5000 PSI)	350 Bar (5000 PSI)										
<b>Minimum Flow</b>	3.78 LPM (1 GPM)	3.78 LPM (1 GPM)	3.78 LPM (1 GPM)										
<b>Maximum Flow</b>	53 LPM (14 GPM)	76 LPM (20 GPM)	341 LPM (90 GPM)										
<b>Pressure Range</b>	<table border="0"> <tr> <td>Code</td> <td>Pressure Range</td> </tr> <tr> <td>07</td> <td>10 to 70 Bar (150 - 1000 PSI)</td> </tr> <tr> <td>17</td> <td>10 to 175 Bar (150 - 2500 PSI)</td> </tr> <tr> <td>25</td> <td>10 to 250 Bar (150 - 3500 PSI)</td> </tr> <tr> <td>35</td> <td>10 to 350 Bar (150 - 5000 PSI)</td> </tr> </table>			Code	Pressure Range	07	10 to 70 Bar (150 - 1000 PSI)	17	10 to 175 Bar (150 - 2500 PSI)	25	10 to 250 Bar (150 - 3500 PSI)	35	10 to 350 Bar (150 - 5000 PSI)
Code	Pressure Range												
07	10 to 70 Bar (150 - 1000 PSI)												
17	10 to 175 Bar (150 - 2500 PSI)												
25	10 to 250 Bar (150 - 3500 PSI)												
35	10 to 350 Bar (150 - 5000 PSI)												
<b>Filtration</b>	ISO 4406 (1999); 18/16/13 (meet NAS 1638:7)												
<b>Venting</b>	Connecting the vent port to tank allows the relief valve to divert flow at minimum pressure. <sup>2</sup>												
<b>Remote Control</b>	Remote control valve connected to the vent port can be used to control the pressure. <sup>3</sup>												

<sup>1</sup> Change in flow, temperature or fluid (SSU) rating will affect valve minimum pressure.

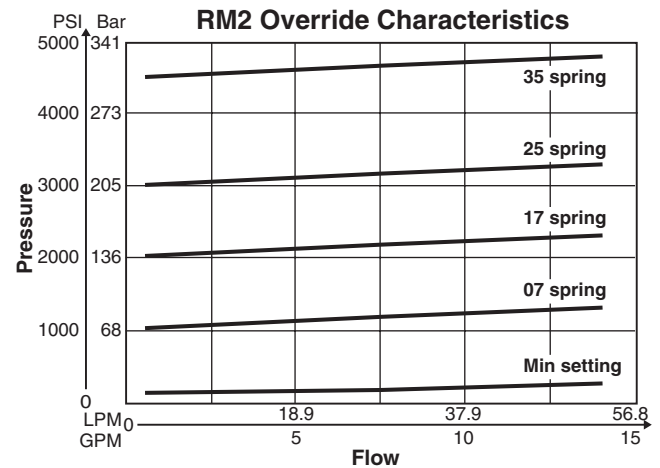
<sup>2</sup> Not available on Model RM2.

<sup>3</sup> Set main valve pressure 10 Bar (150 PSI) higher than remote pilot.



**B**

## Performance Curves



VISCOSITY CORRECTION FACTOR							
Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (Approx.)	93	111	119	126	132	137	141

Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change per chart.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**B**

<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;"><b>RM</b></div> <p>Relief Valve</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Size</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Port Option</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Pressure Range</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Adjustment</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Seal</p>	<div style="border: 1px dashed black; padding: 2px; width: 30px; height: 30px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> <span style="font-size: 12px;">*</span> </div> <p>Design Series</p> <p>NOTE: Not required when ordering.</p>
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Code	Description
<b>2</b>	<b>NFPA D03 Subplate Mounting</b>
<b>3</b>	<b>NFPA D05 Subplate Mounting</b>
<b>6</b>	<b>NFPA D08 Subplate Mounting</b>

Code	Description
<b>PT</b>	<b>Relief P to T</b>
AT*	Relief A to T
BT*	Relief B to T

\* RM2 only.

Code	Description
<b>07</b>	<b>10 to 70 Bar (150 to 1000 PSI)</b>
<b>17</b>	<b>10 to 175 Bar (150 to 2500 PSI)</b>
<b>25</b>	<b>10 to 250 Bar (150 to 3500 PSI)</b>
<b>35</b>	<b>10 to 350 Bar (150 to 5000 PSI)</b>

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

Code	Type
<b>K</b>	<b>Knob</b>
L	Locking Knob
<b>S</b>	<b>Slotted Screw with Jam Nut</b>

**Unit Weight:**

RM2	.95 kg (2.1 lbs.)
RM3	3.0 kg (6.6 lbs.)
RM6	5.9 kg (13.0 lbs.)

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

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

**Sandwich Bolt Kits**

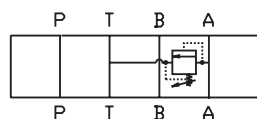
Size "2"				Size "3"			
No. of Sandwich	Sandwich & Valve Combination	Bolt Kit	Bolt Length mm (in)	No. of Sandwich	Sandwich & Valve Combination	D3W-30 D3DW & D31*W*	Bolt Length mm (in)
1	Sandwich & D1	BK243	73.2 (2.88)	1	Sandwich & D3	BK141	88.9 (3.50)
2	Sandwich & D1	BK225	111.3 (4.38)	2	Sandwich & D3	BK142	139.7 (5.50)
3	Sandwich & D1	BK244	152.4 (6.00)	3	Sandwich & D3	BK143	190.5 (7.50)
4	Sandwich & D1	BK245	190.5 (7.50)	* D31VW with internal pilot and internal drain only.			

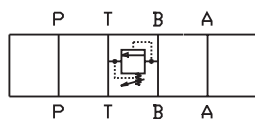
Size "6"			
No. of Sandwich	Sandwich & Valve Combination	Bolt Kit	Bolt Length mm (in)
1	Sandwich & D6	BK121	133.4 (5.25)
2	Sandwich & D6	BK122	203.2 (8.00)
3	Sandwich & D6	BK123	273.1 (10.75)
4	Sandwich & D6	BK124	342.9 (13.5)

Bolt Kits must be ordered separately.

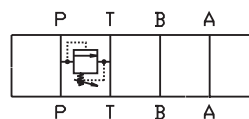
**Schematics**



AT Option

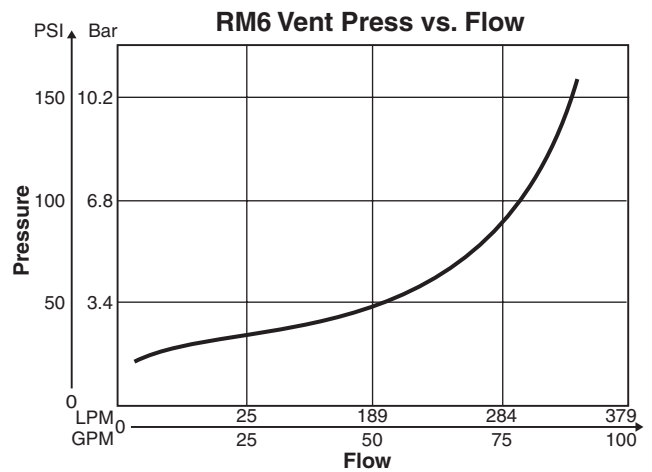
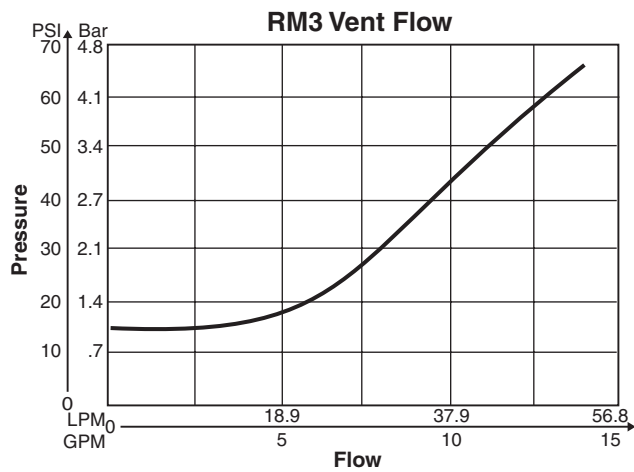
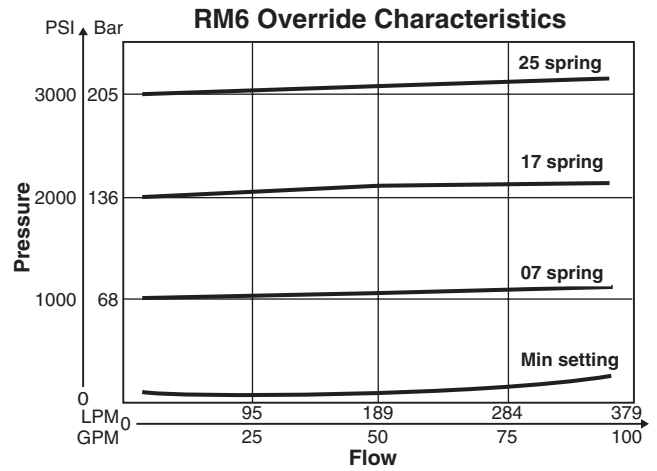
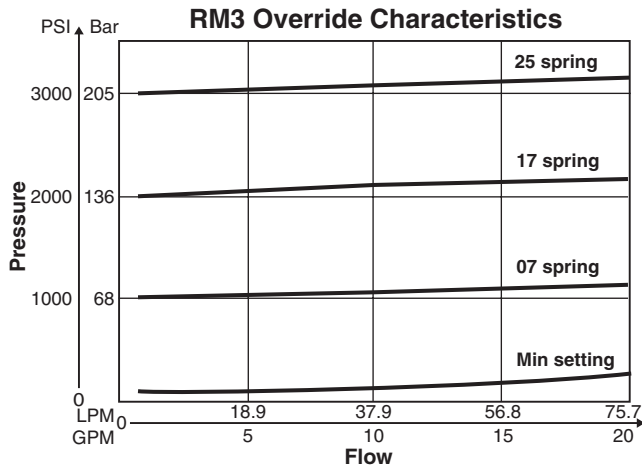


SUBPLATE SIDE  
 BT Option



PT Option

**B**

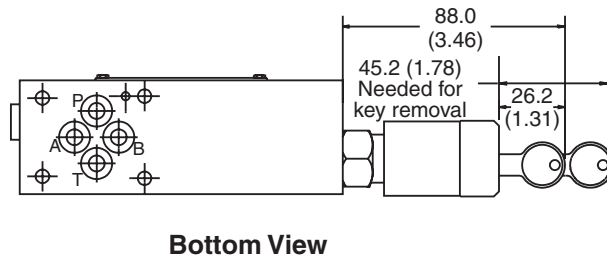
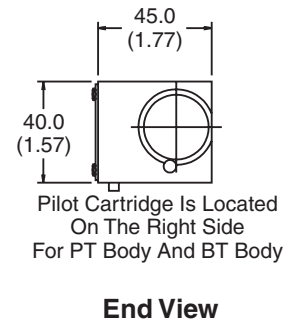
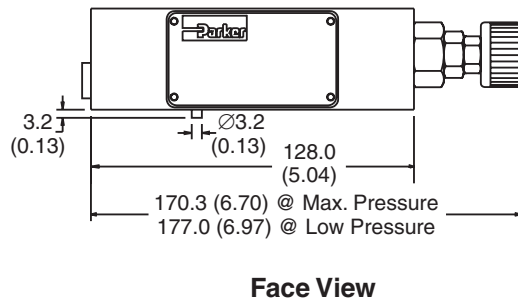
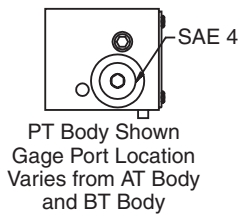
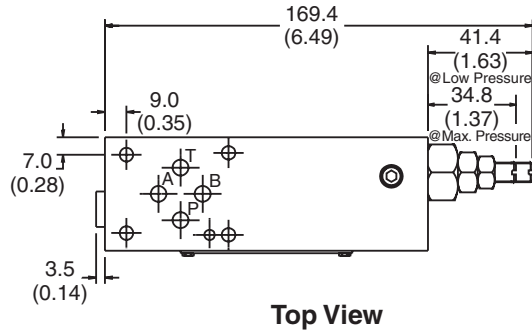


VISCOSITY CORRECTION FACTOR							
Viscosity (SSU)	75	150	200	250	300	350	400
% of ΔP (Approx.)	93	111	119	126	132	137	141
Curves were generated using 100 SSU hydraulic oil. For any other viscosity, pressure drop will change per chart.							

**Dimensions**

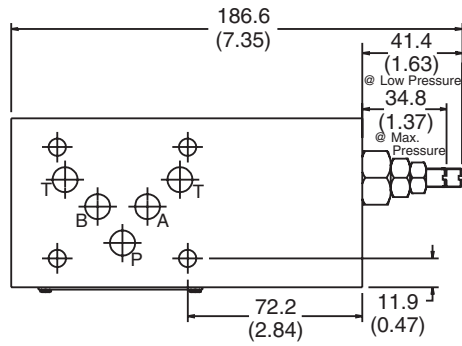
Inch equivalents for millimeter dimensions are shown in (\*\*)

**B**

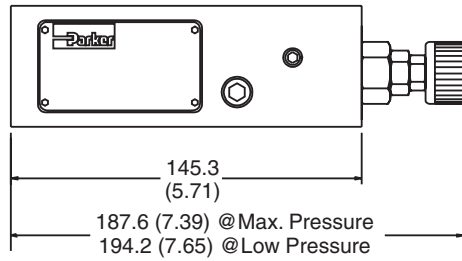
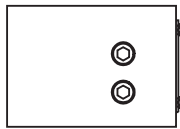


Inch equivalents for millimeter dimensions are shown in (\*\*)

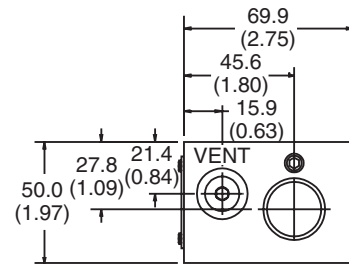
**B**



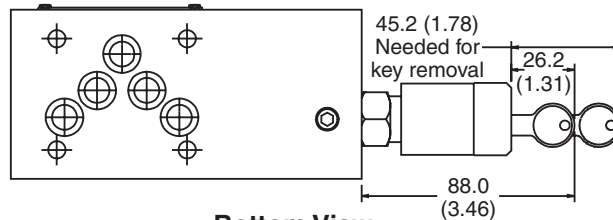
**Top View**



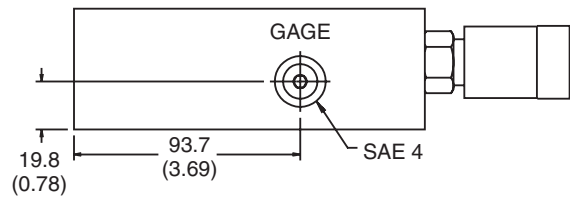
**Face View**



**End View**



**Bottom View**

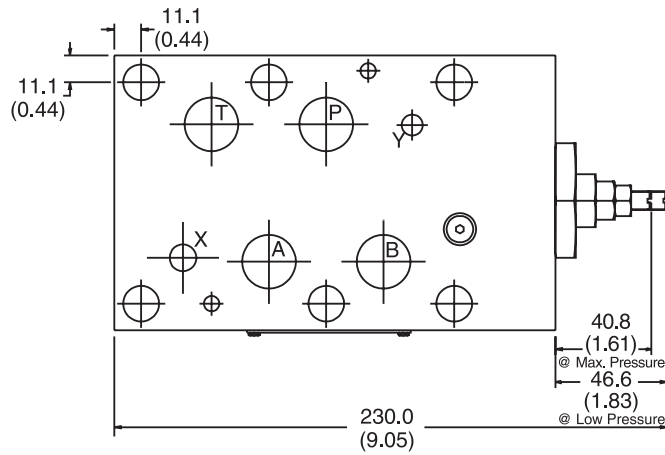


**Back View**

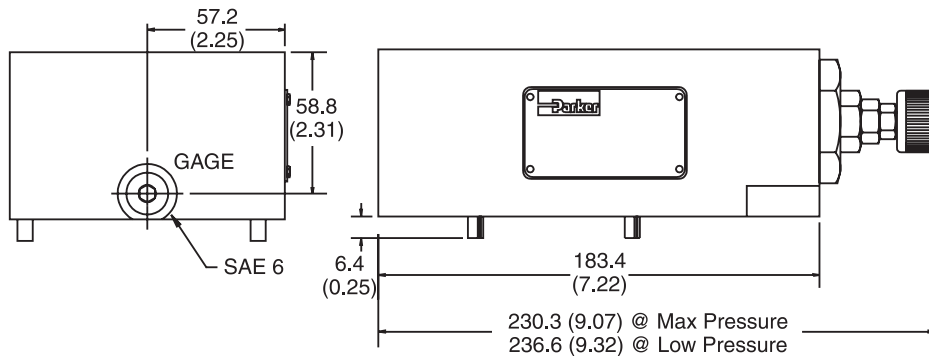


Inch equivalents for millimeter dimensions are shown in (\*\*)

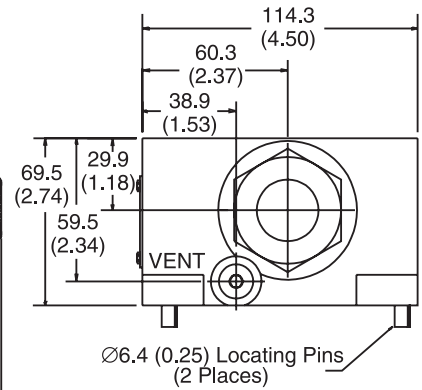
**B**



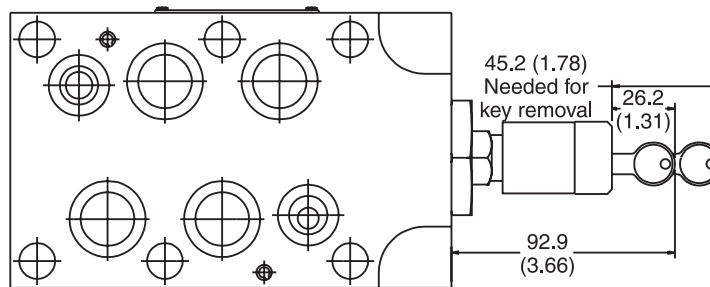
**Top View**



**Face View**



**End View**



**Bottom View**



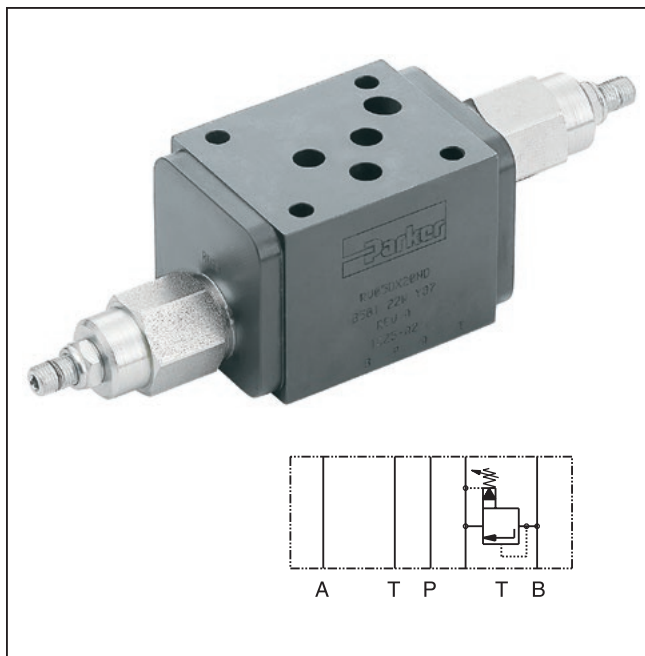


## General Description

Series RV direct acting, pressure relief valves are designed to limit pressure in various parts of a hydraulic circuit. The relief valve function options are P to T, A to T, B to T or A & B to T. Another option is for A to B & B to A crossover relief functions.

## Features

- High flow capacity.
- Pressure function in P, A, B or A + B.
- Sizes:
  - RV05 – NFPA D05 / NG10 / CETOP 5
  - RV5H – NFPA D05HE / NG10 / CETOP 5H
  - RV07 – NFPA D07 / NG16 / CETOP 7
  - RV08 – NFPA D08 / NG25 / CETOP 8



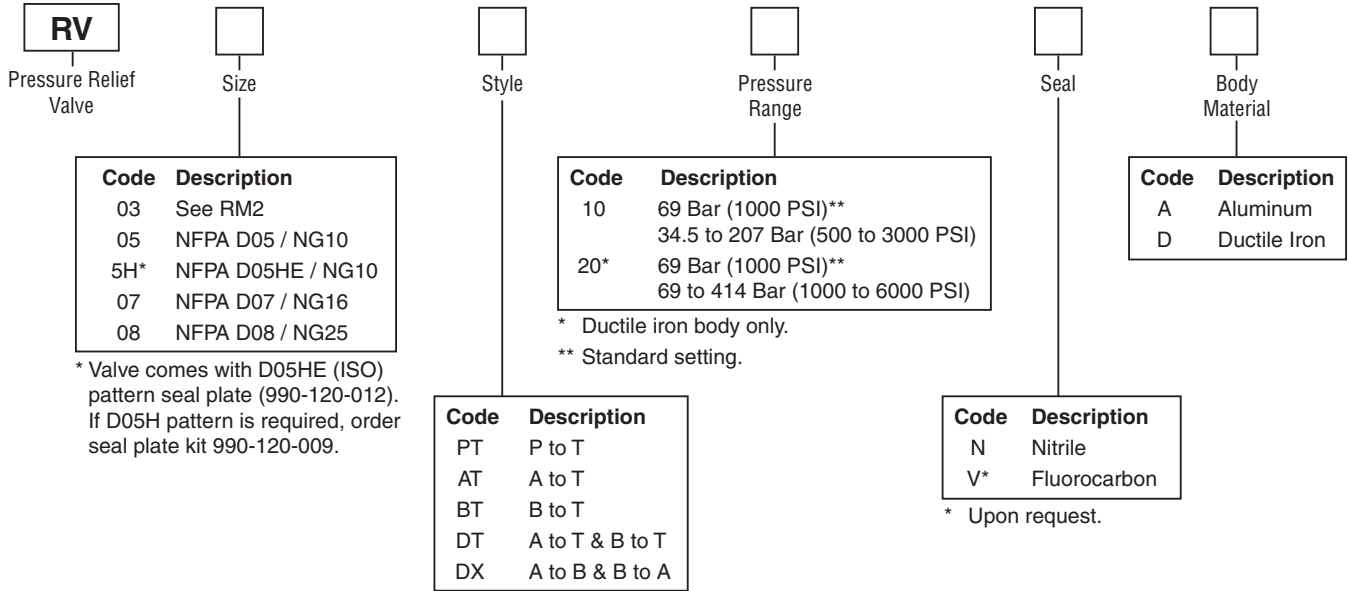
**B**

## Specifications

General				
Size	D05 / NG10	D05HE / NG10	D07 / NG16	D08 / NG25
Mounting Position	Unrestricted			
Ambient Temperature Range	-20°C to +50°C (-4°F to +122°F)			
Hydraulic				
Maximum Operating Pressure	Aluminum Body – up to 207 Bar (3000 PSI); Ductile Iron Body – up to 345 Bar (5000 PSI)			
Nominal Flow	189 LPM (50 GPM)	189 LPM (50 GPM)	189 LPM (50 GPM)	378 LPM (100 GPM)
Leakage	10 DPM	10 DPM	10 DPM	10 DPM
Reseat Pressure	> 90% Setting			
Adjustment Screw Hex Size	5/32	5/32	5/32	5/32
Fluid Temperature	-20°C to +80°C (-4°F to +176°F)			
Viscosity	Permitted 10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU) Recommended 30 cSt / mm <sup>2</sup> /s (139 SSU)			
Filtration	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			

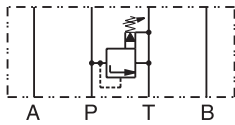
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**B**



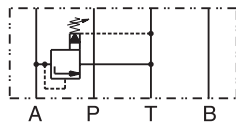
**RV\*\*PT**

Pressure control P-T



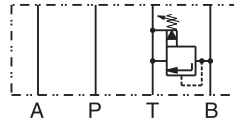
**RV\*\*AT**

Pressure control A-T



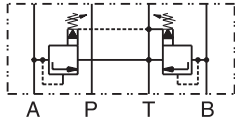
**RV\*\*BT**

Pressure control B-T



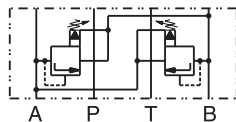
**RV\*\*DT**

Pressure control A-T & B-T



**RV\*\*DX**

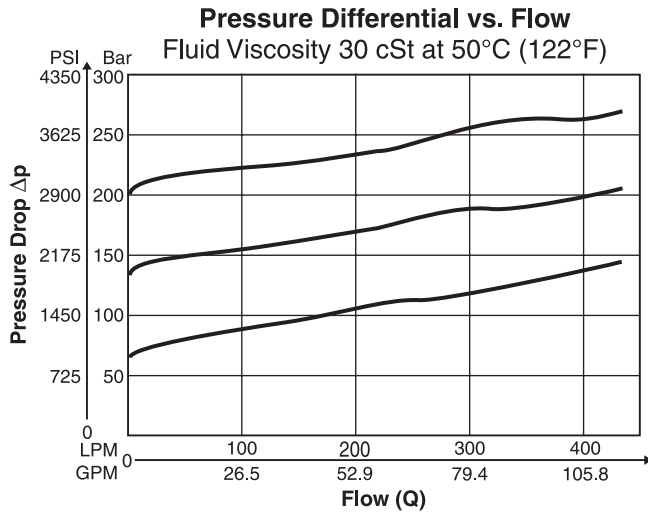
Pressure control A-B & B-A



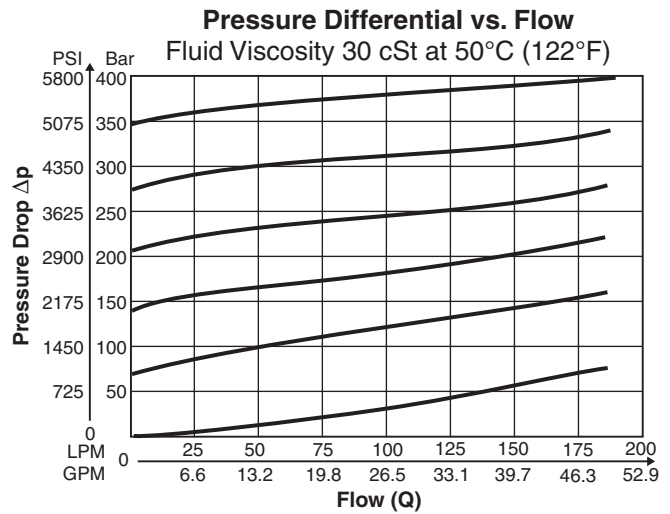
**Weight:**

Size	RV**AT30NA	RV**AT30ND	RV**BT30NA	RV**BT30ND	RV**DT30NA	RV**DT30ND	RV**DX30NA	RV**DX30ND	RV**PT30NA	RV**PT30ND
RV05, RV5H	1.0 kg (2.2 lbs.)	2.2 kg (4.8 lbs.)	1.0 kg (2.2 lbs.)	2.2 kg (4.8 lbs.)	1.2 kg (2.6 lbs.)	2.1 kg (4.7 lbs.)	1.4 kg (3 lbs.)	2.6 kg (5.7 lbs.)	1.0 kg (2.2 lbs.)	2.2 kg (4.8 lbs.)
RV07	1.7 kg (3.7 lbs.)	3.6 kg (7.9 lbs.)	1.5 kg (3.3 lbs.)	3.2 kg (7.2 lbs.)	2.6 kg (5.7 lbs.)	5.6 kg (12.3 lbs.)	2.1 kg (4.7 lbs.)	4.5 kg (10.0 lbs.)	1.5 kg (3.3 lbs.)	3.3 kg (7.2 lbs.)
RV08	3.9 kg (8.6 lbs.)	9.1 kg (20 lbs.)	3.8 kg (8.5 lbs.)	9 kg (19.7 lbs.)	5.6 kg (12.3 lbs.)	12.4 kg (27.4 lbs.)	4.4 kg (9.6 lbs.)	9.2 kg (20.3 lbs.)	3.9 kg (8.6 lbs.)	9.1 kg (20 lbs.)

**RV05\*10\*A, RV5H\*10\*A, RV07\*10\*A**

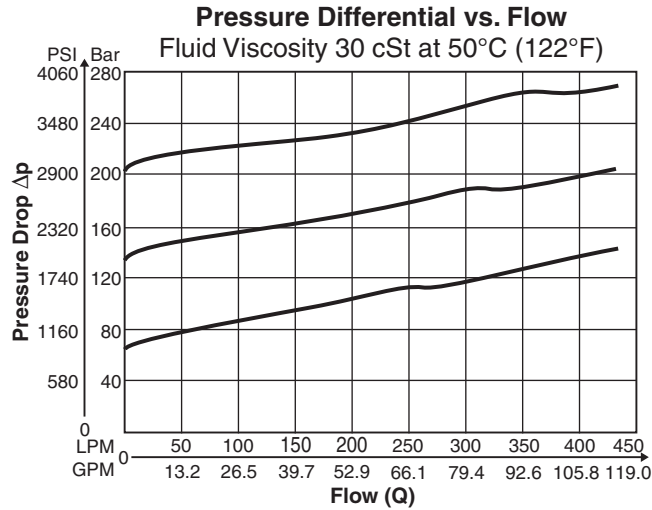


**RV05\*20\*D, RV5H\*20\*D, RV07\*20\*D**

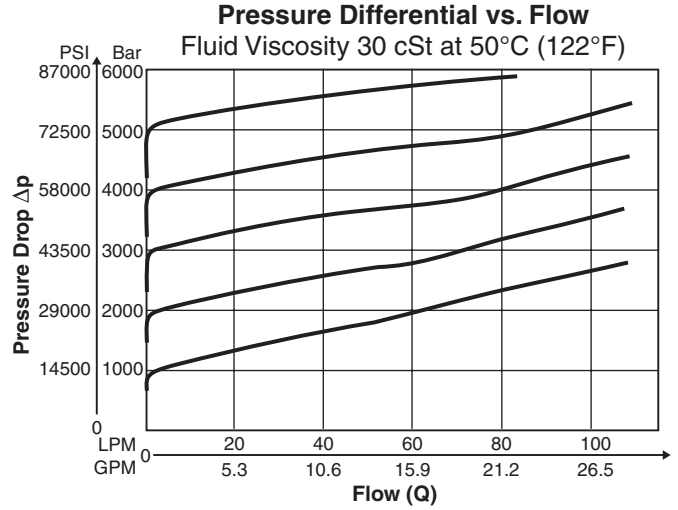


**B**

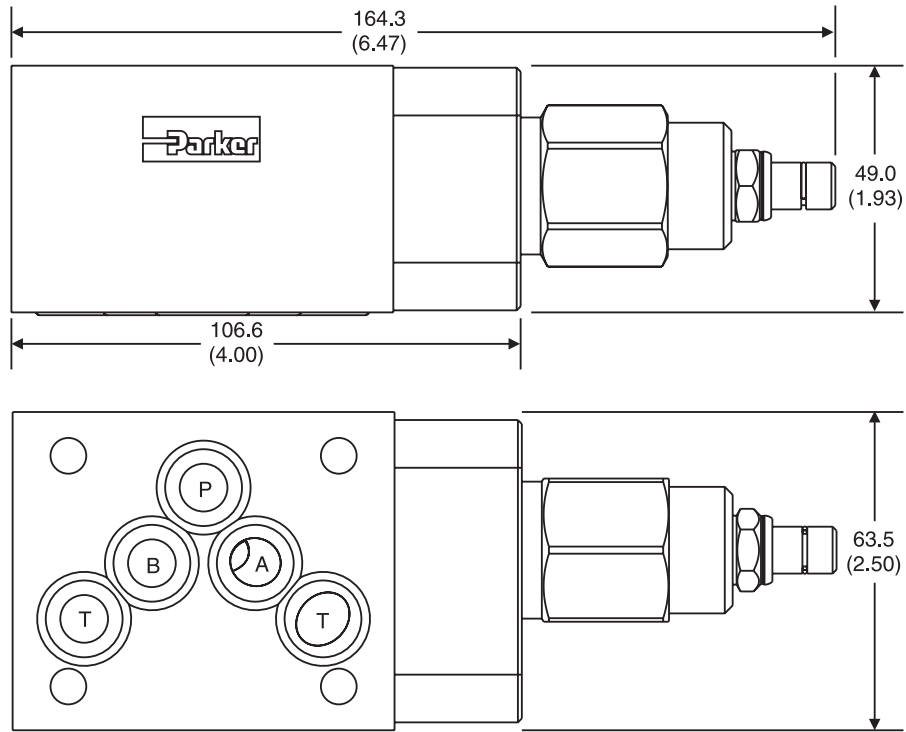
**RV08\*10\*A**



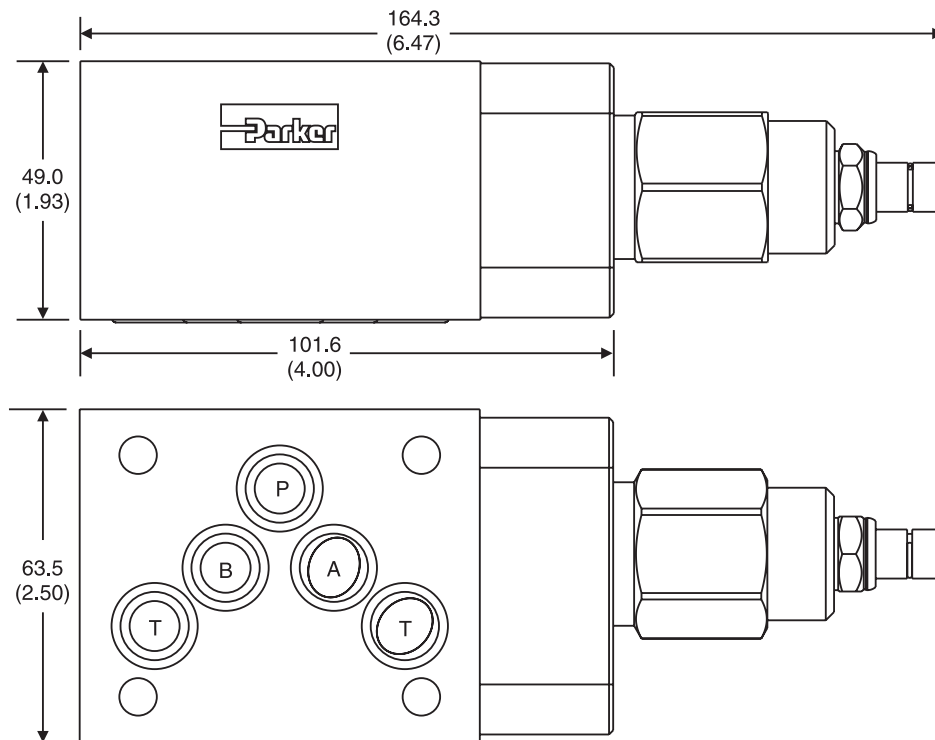
**RV08\*20\*D**



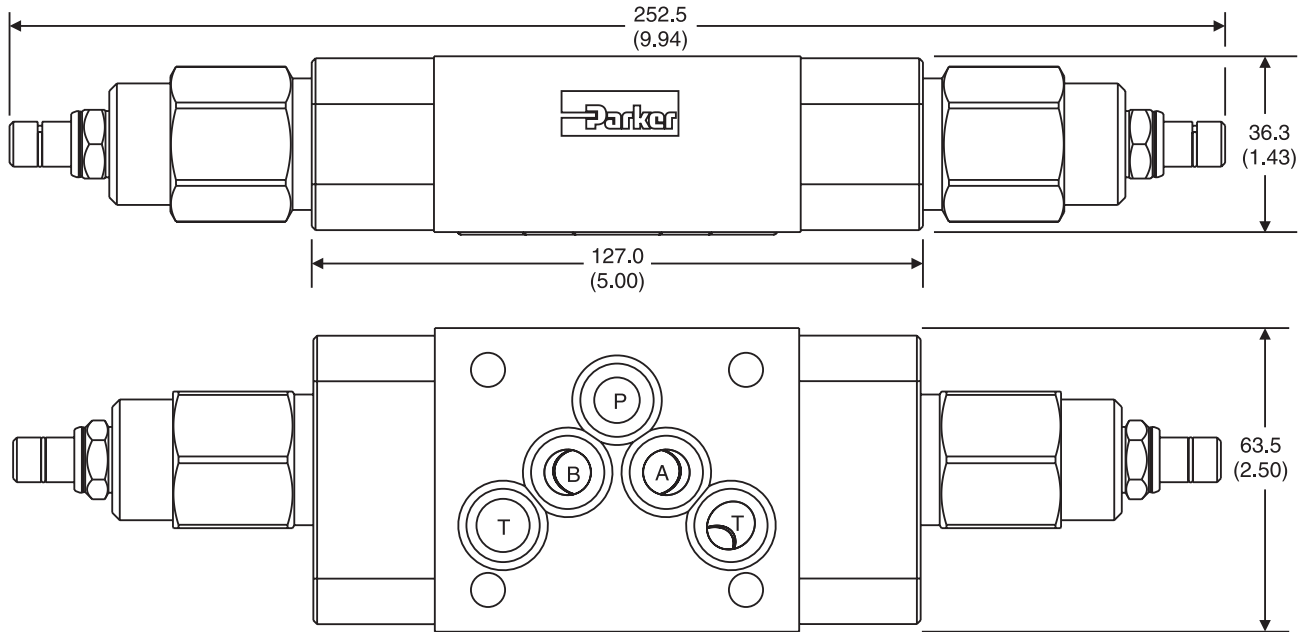
**RV05AT** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**RV05BT** – Inch equivalents for millimeter dimensions are shown in (\*\*)

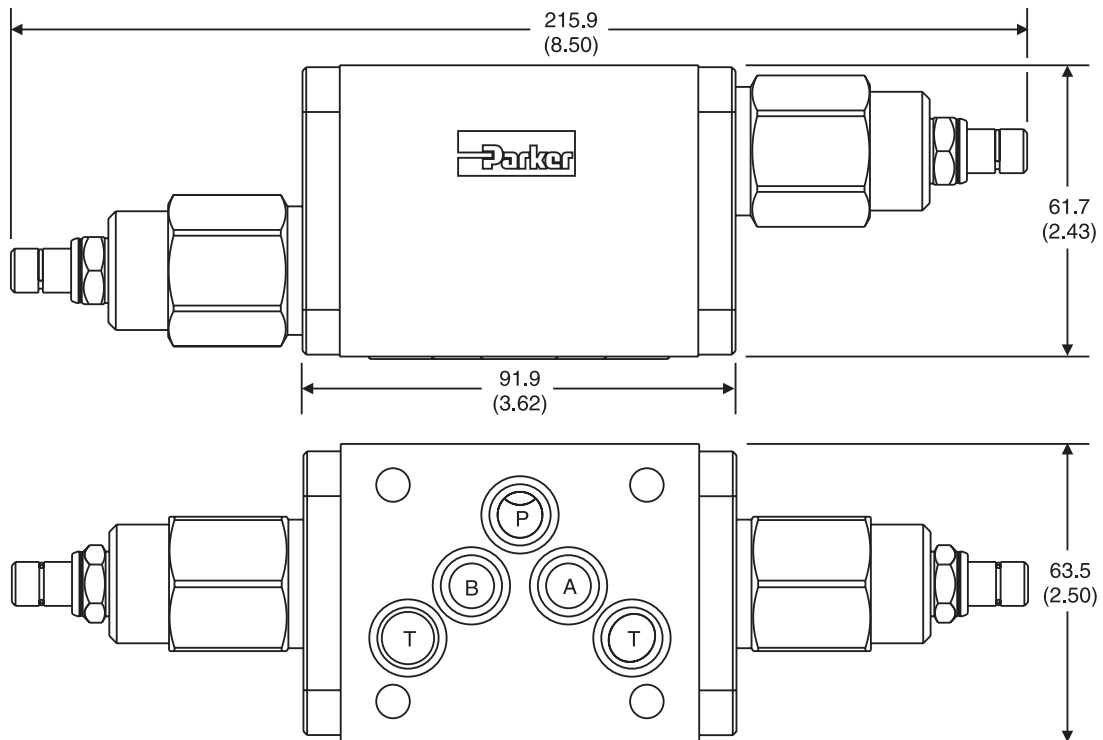


**RV05DT** – Inch equivalents for millimeter dimensions are shown in (\*\*)

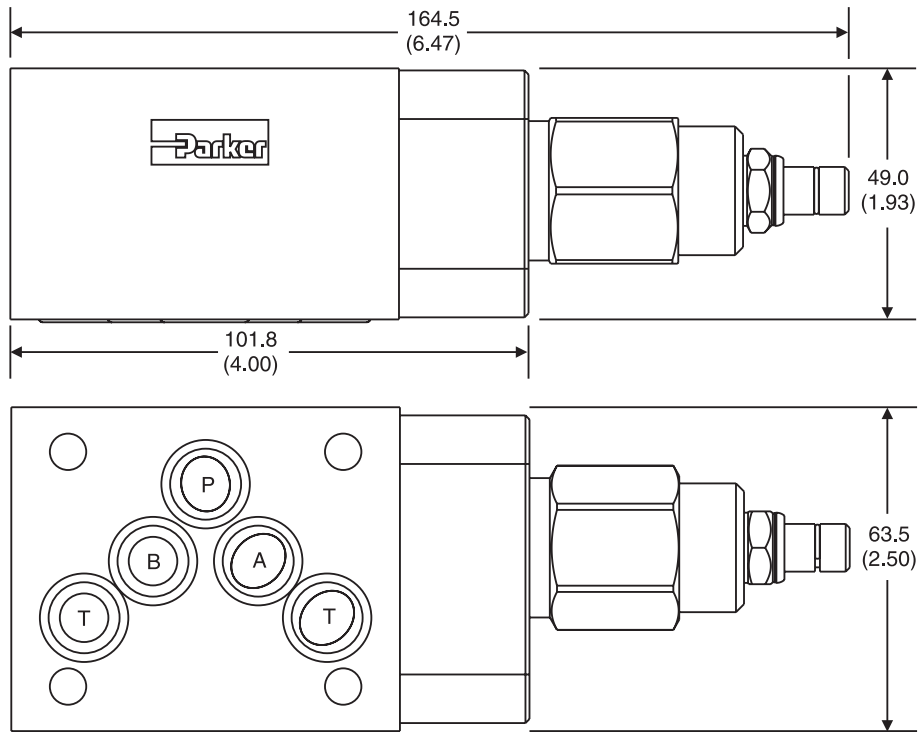


**B**

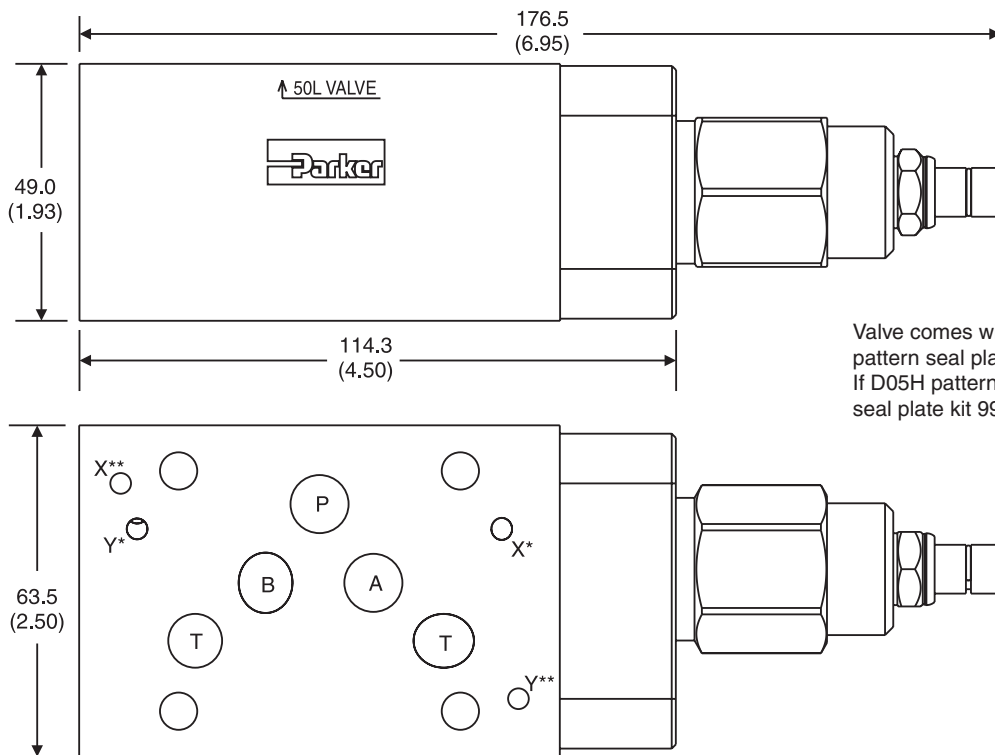
**RV05DX** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**RV05PT** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**RV5HAT** – Inch equivalents for millimeter dimensions are shown in (\*\*)

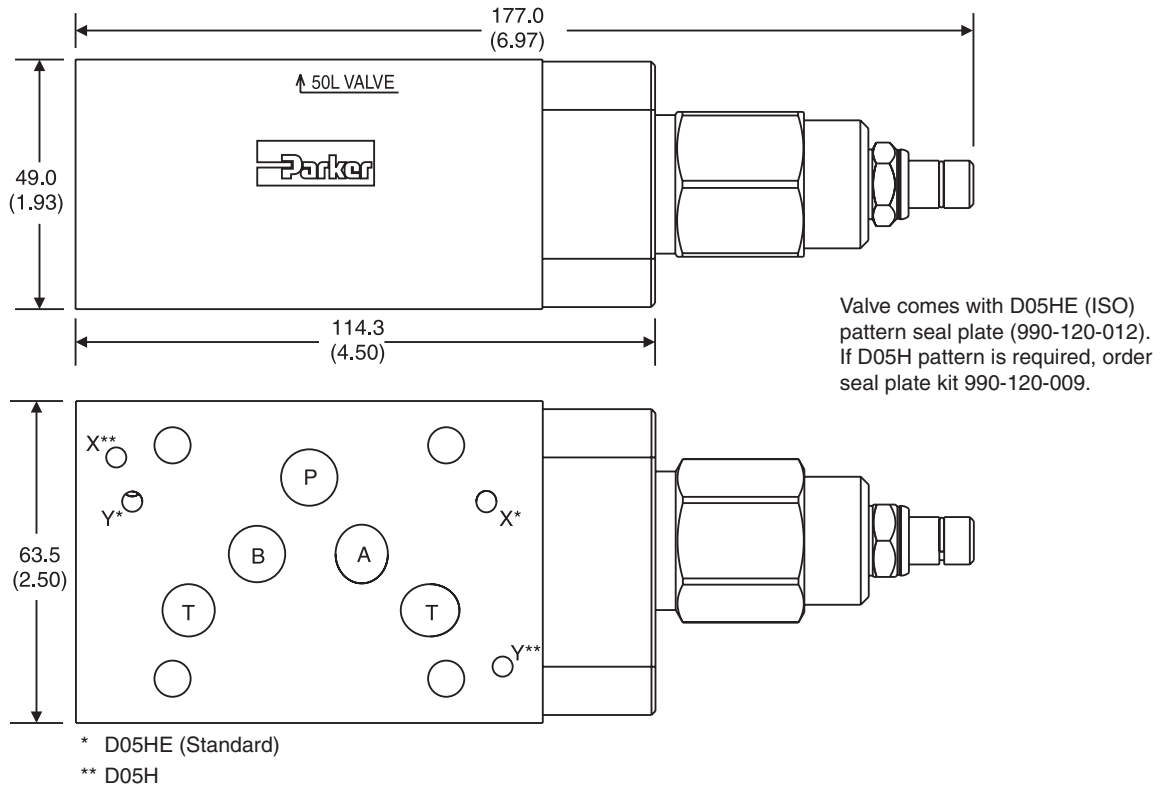


Valve comes with D05HE (ISO) pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.

\* D05HE (Standard)  
\*\* D05H

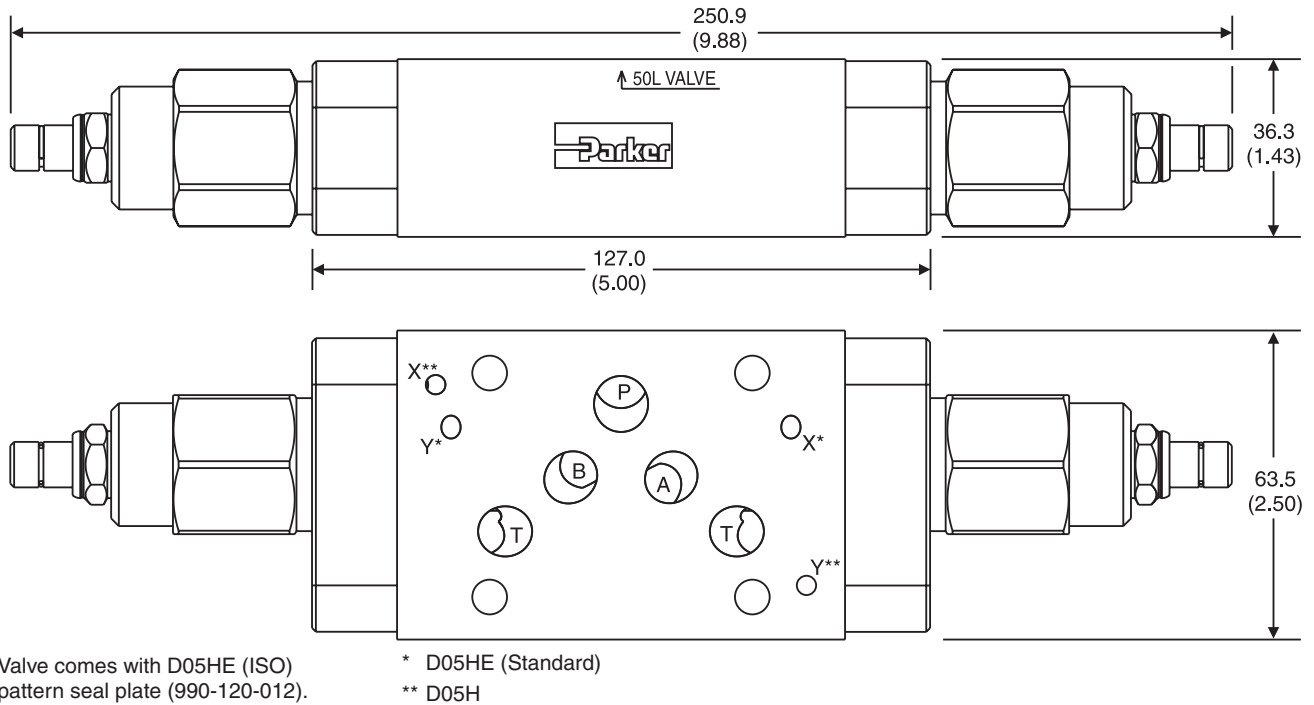


**RV5HBT** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**B**

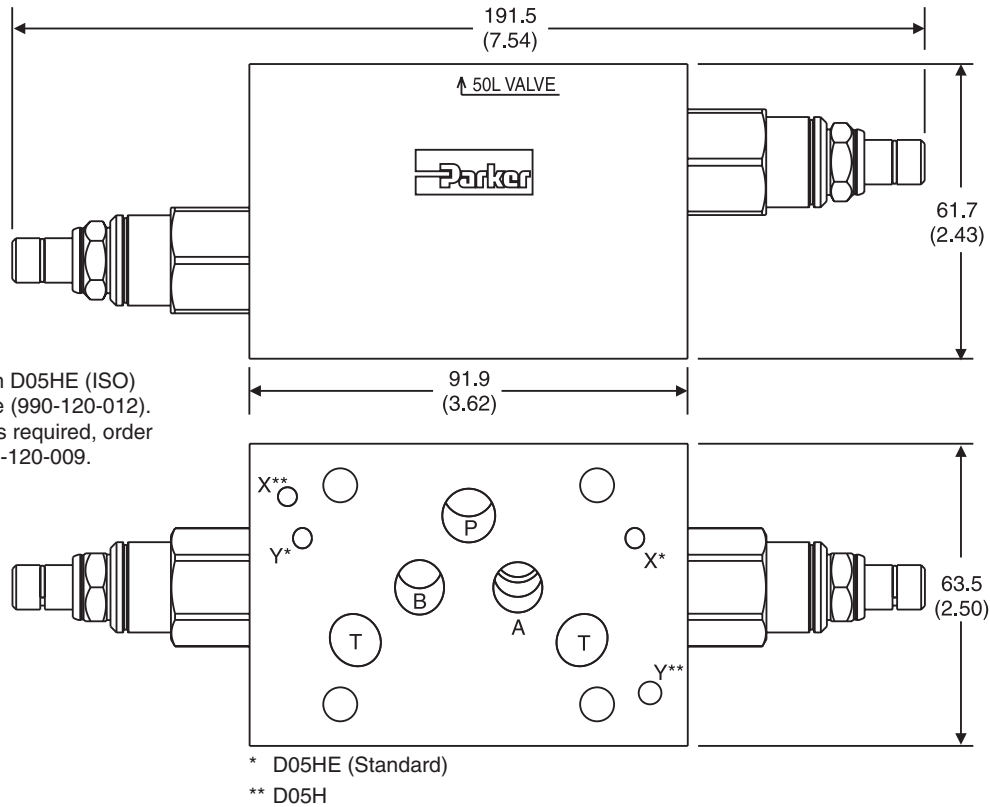
**RV5HDT** – Inch equivalents for millimeter dimensions are shown in (\*\*)



Dimensions

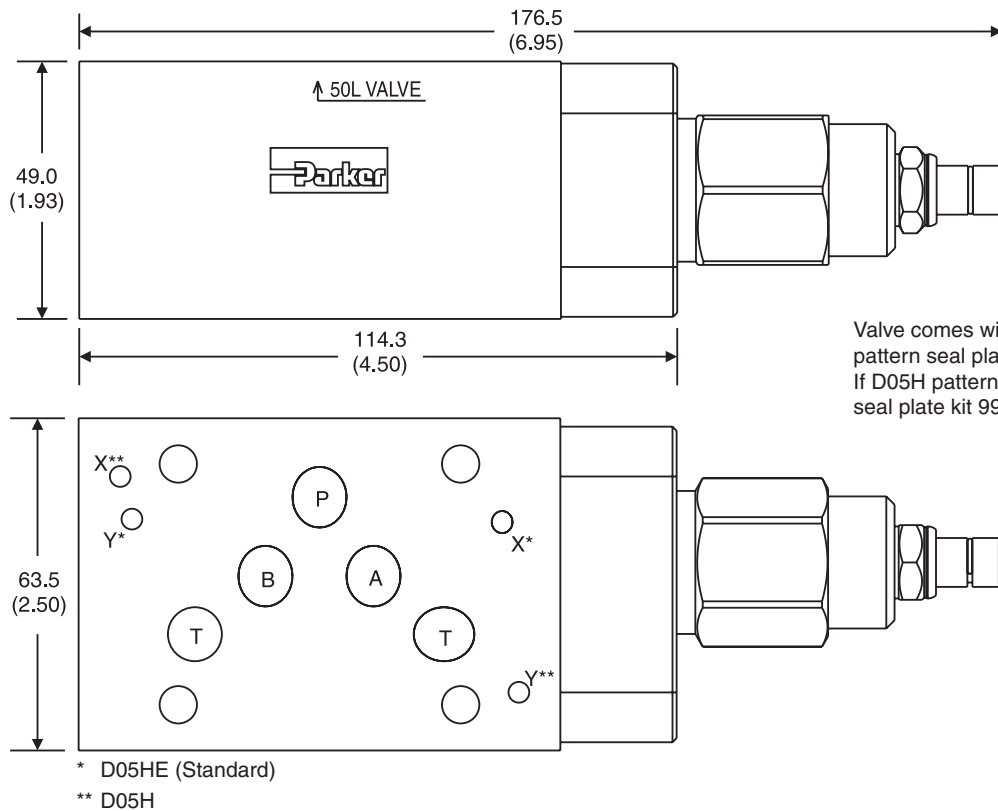
**RV5HDX** – Inch equivalents for millimeter dimensions are shown in (\*\*)

**B**



Valve comes with D05HE (ISO) pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.

**RV5HPT** – Inch equivalents for millimeter dimensions are shown in (\*\*)



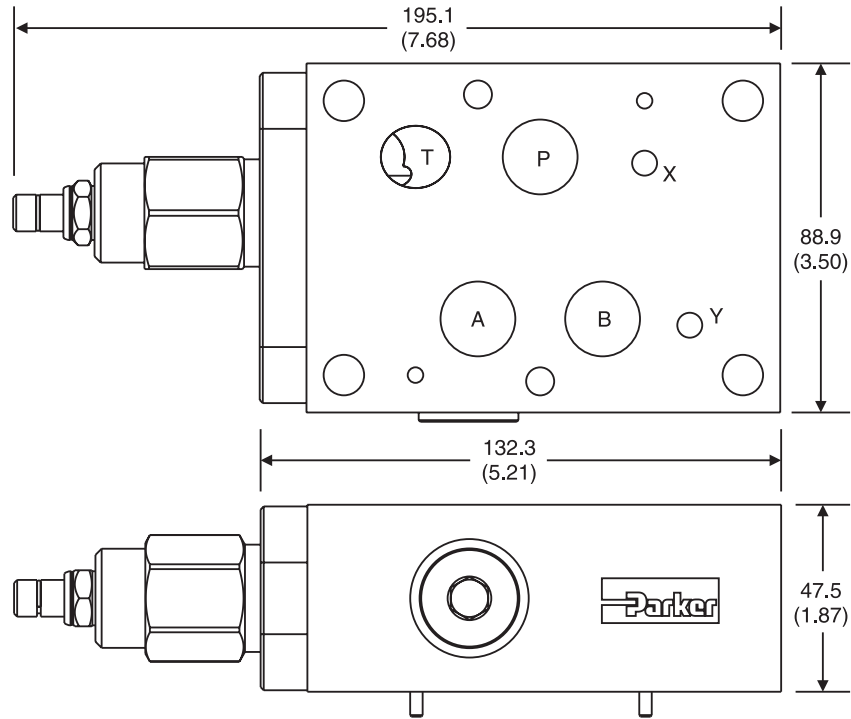
Valve comes with D05HE (ISO) pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.





**RV07AT** – Inch equivalents for millimeter dimensions are shown in (\*\*)

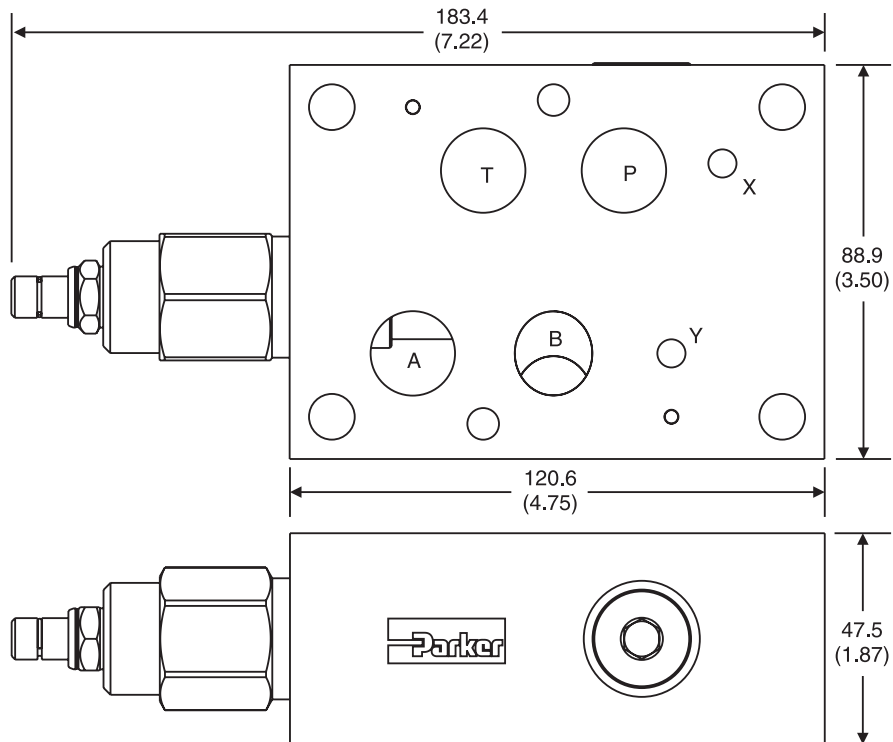
**Note:** This is a top view.



**B**

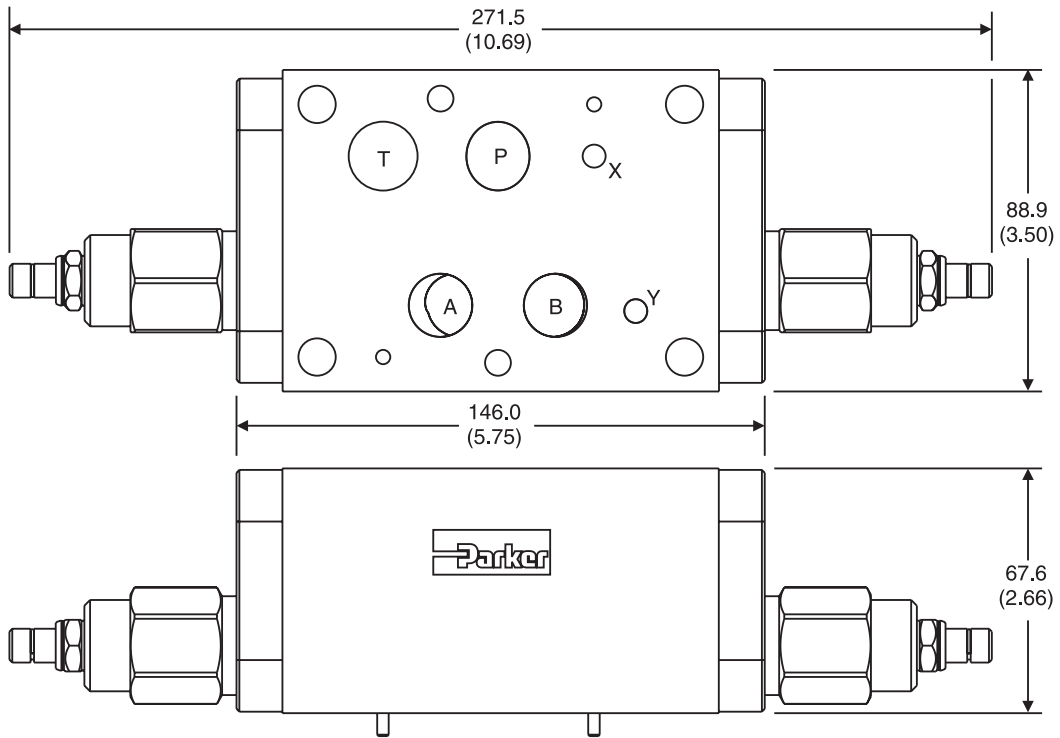
**RV07BT** – Inch equivalents for millimeter dimensions are shown in (\*\*)

**Note:** This is a top view.

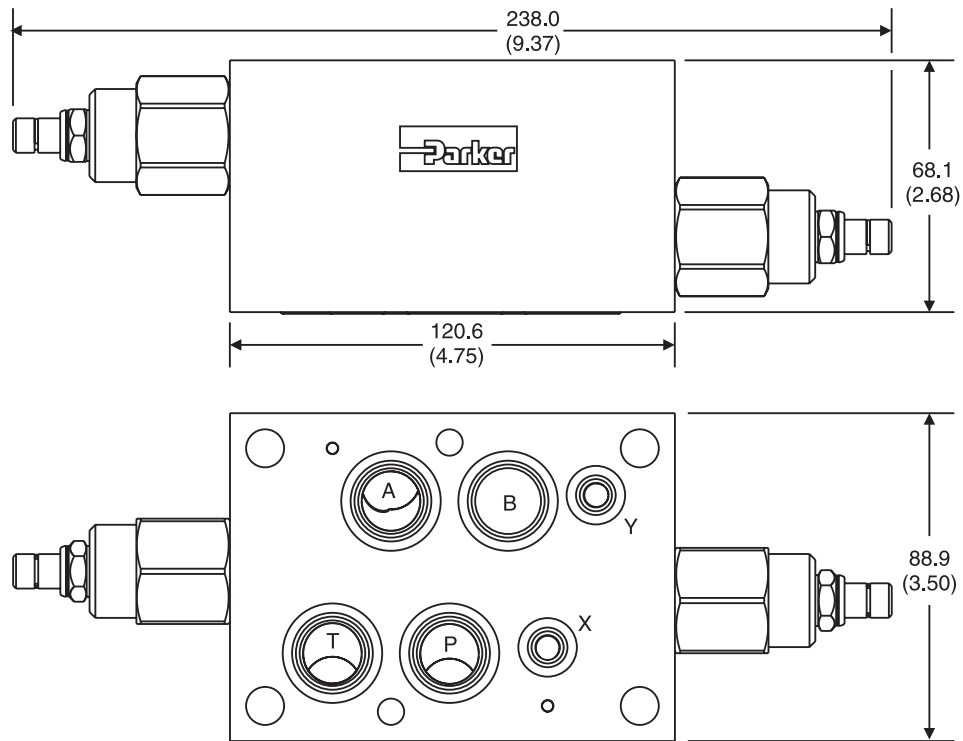


**RV07DT** – Inch equivalents for millimeter dimensions are shown in (\*\*)

**Note:** This is a top view.



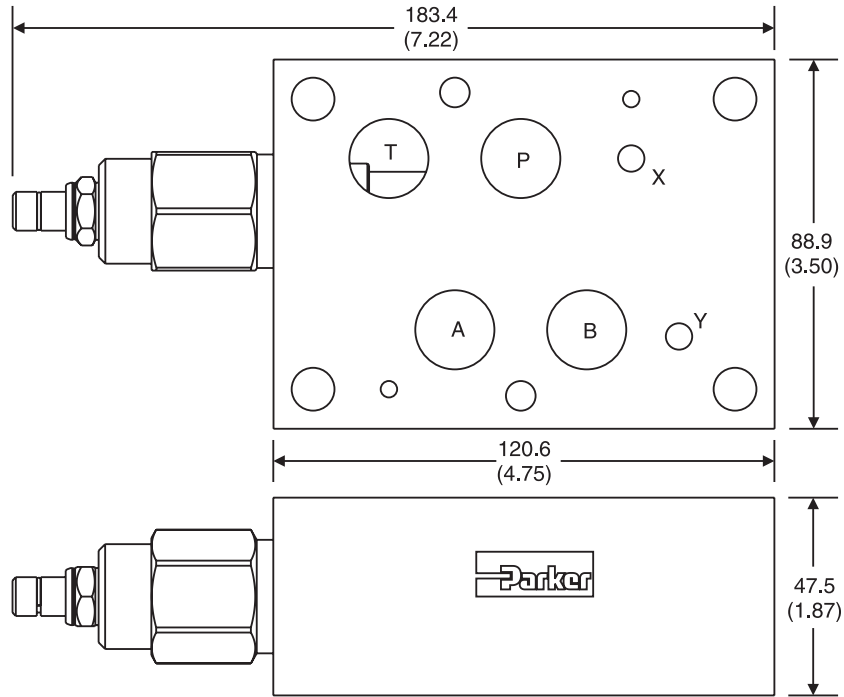
**RV07DX** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**B**

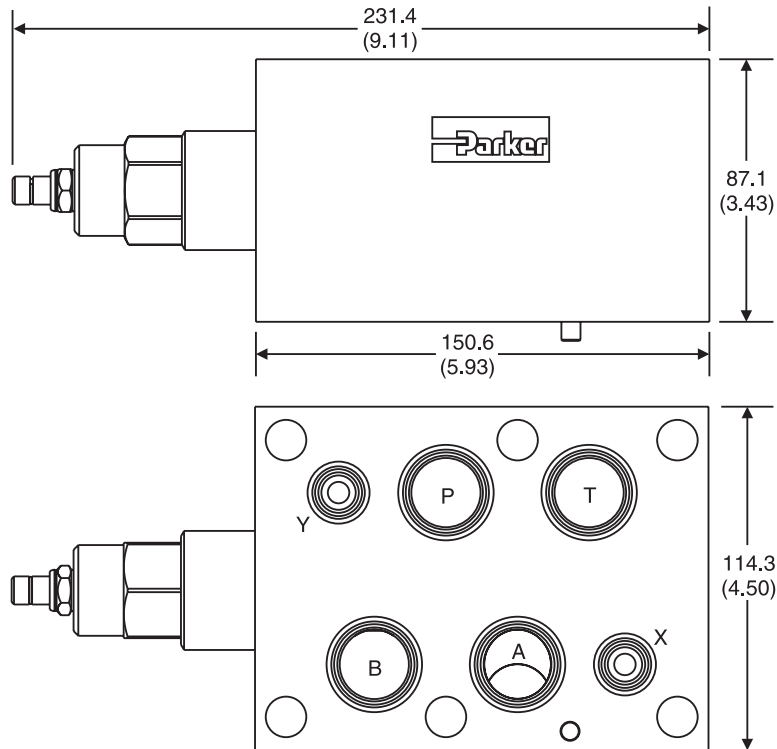
**RV07PT** – Inch equivalents for millimeter dimensions are shown in (\*\*)

**Note:** This is a top view.

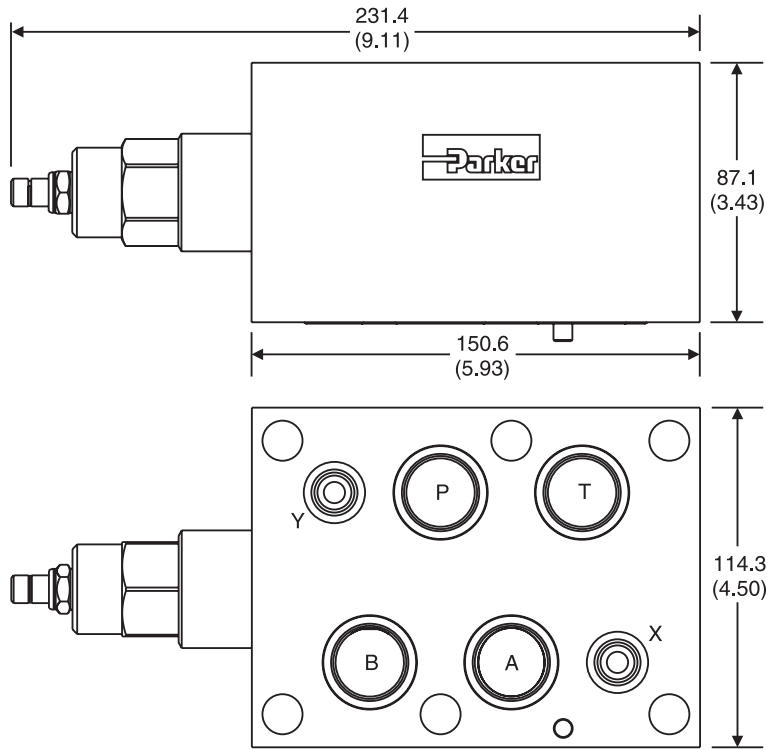


**B**

**RV08AT** – Inch equivalents for millimeter dimensions are shown in (\*\*)



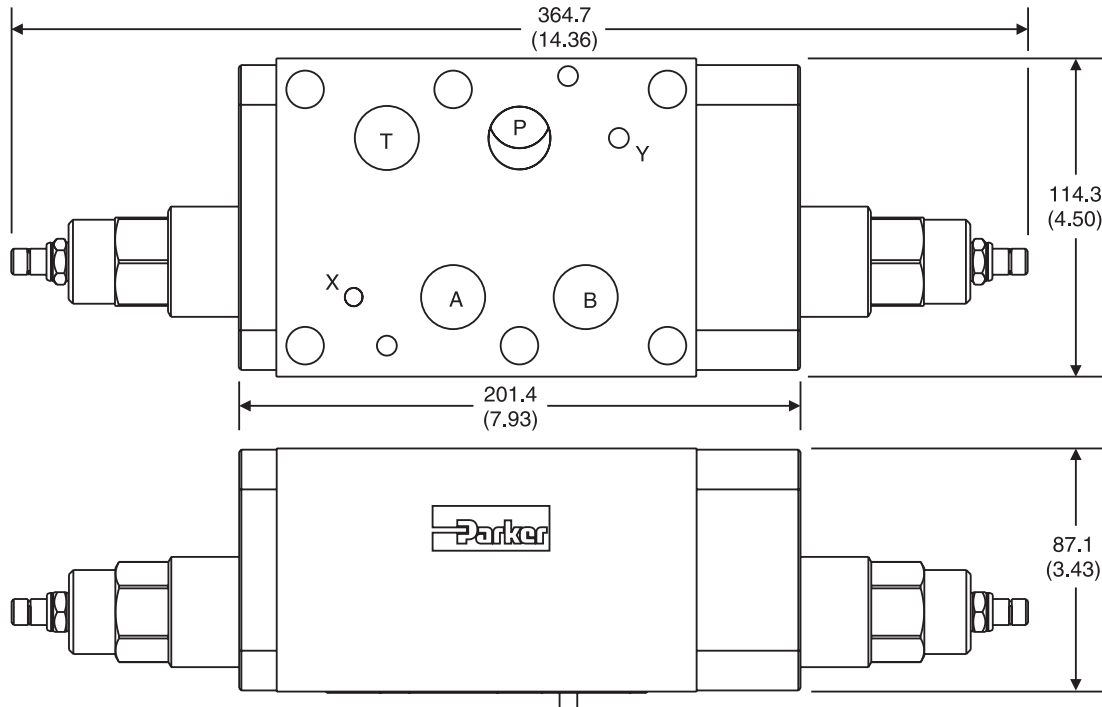
**RV08BT** — Inch equivalents for millimeter dimensions are shown in (\*\*)



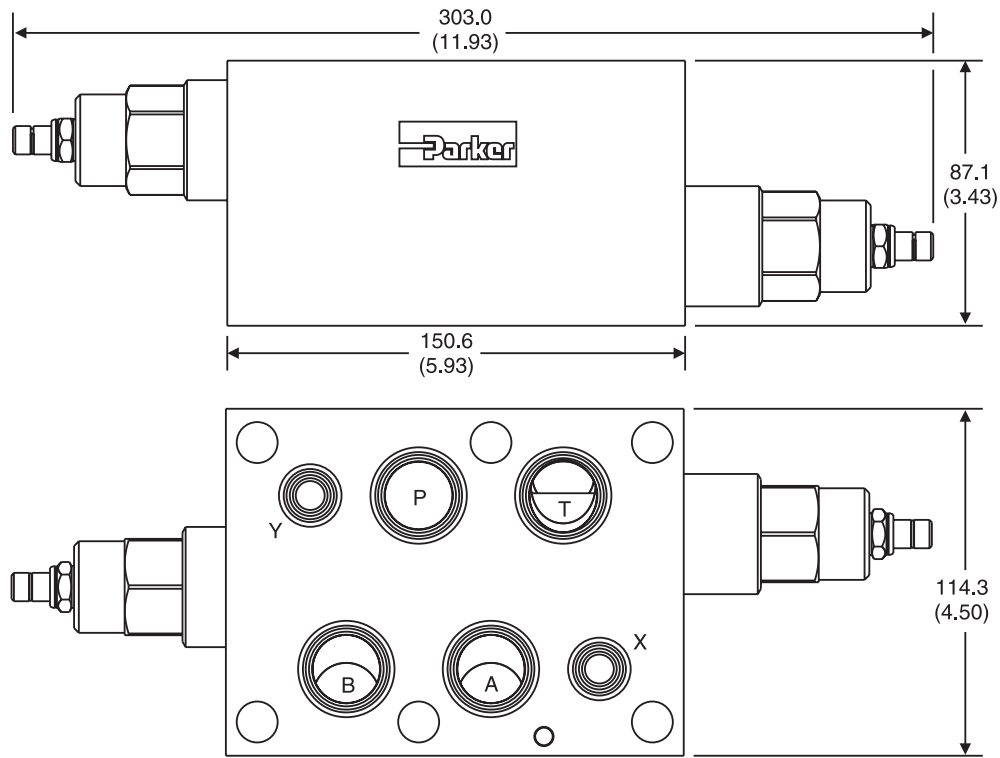
**B**

**RV08DT** — Inch equivalents for millimeter dimensions are shown in (\*\*)

**Note:** This is a top view.

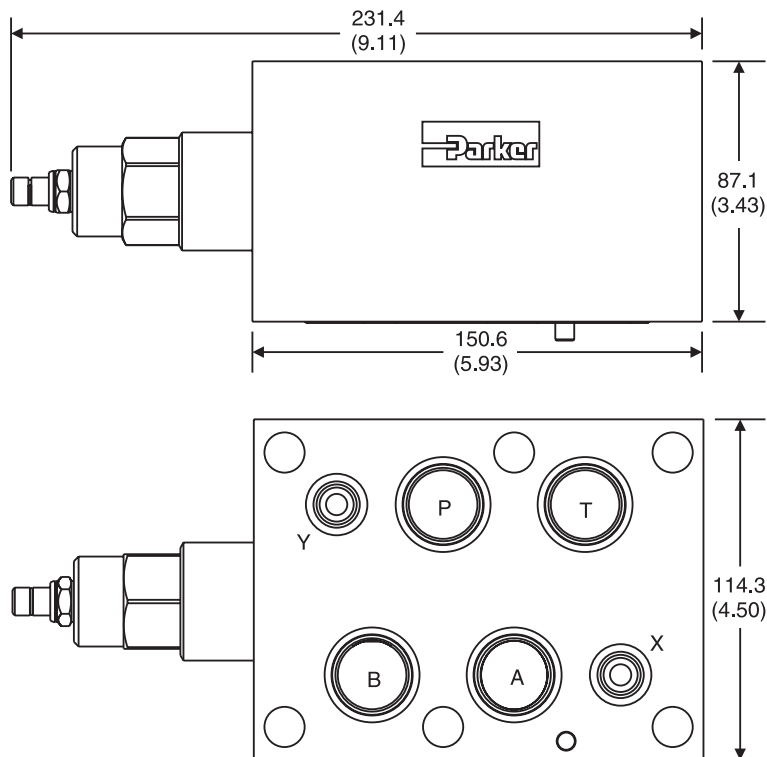


**RV08DX** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**B**

**RV08PT** – Inch equivalents for millimeter dimensions are shown in (\*\*)

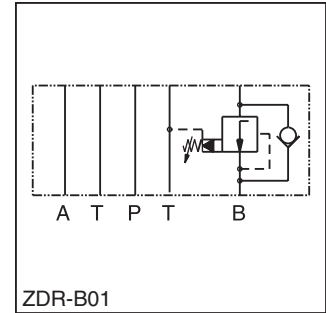


## General Description

Series ZDR pilot operated pressure reducing valves are designed for maximum flow rates.

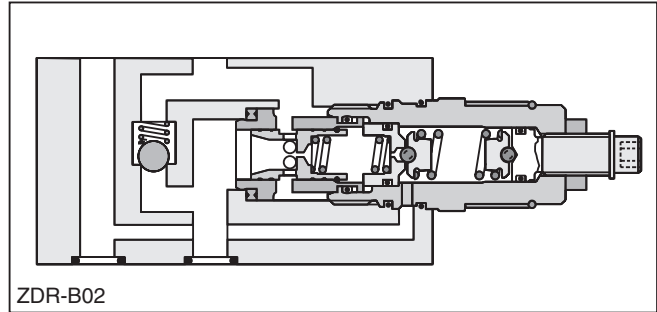
The reducing function can be located in the ports P, A or B. The sizes NG06 and NG10 are equipped with an integral return flow check valve (reducing function in A or B).

**B**



## Features

- High flow capacity.
- Sizes::
  - ZDR01 – NFPA D03 / NG6 / CETOP 3
  - ZDR02 – NFPA D05 / NG10 / CETOP 5
- With integral return flow check valve.



## Specifications

General		
<b>Size</b>	<b>NG6</b>	<b>NG10</b>
<b>Mounting Interface</b>	DIN 24340 A6 ISO 4401 NFPA D03 CETOP RP 121	DIN 24340 A10 ISO 4401 NFPA D05 CETOP RP 121
<b>Mounting Position</b>	Unrestricted	
<b>Ambient Temperature Range</b>	-20°C to +50°C (-4°F to +122°F)	
Hydraulic		
<b>Maximum Operating Pressure</b>	up to 350 Bar (5075 PSI); ZDR-AR / BR up to 315 Bar (4568 PSI)	
<b>Nominal Flow</b>	80 LPM (21.2 GPM)	120 LPM (31.7 GPM)
<b>Pilot Oil</b>	0.2 LPM (0.1 GPM)	0.3 LPM (0.1 GPM)
<b>Fluid</b>	Hydraulic oil as per DIN 51524 ... 51525	
<b>Fluid Temperature</b>	-20°C to +80°C (-4°F to +176°F)	
<b>Viscosity</b>	<b>Permitted</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU)
	<b>Recommended</b>	30 cSt / mm <sup>2</sup> /s (139 SSU)
<b>Filtration</b>	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)	

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Ordering Information**

<b>ZDR</b> Pressure Reducing Valve	<b>Port Option</b>	<b>Size</b>	<b>Pressure Range</b>	<b>S0</b> Hexagon Screw with Lock Nut	<b>D</b> Design Series	<b>Seal</b>
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Code	Description
01	NFPA D03 / NG6
02	NFPA D05 / NG10

Code	Description
1	up to 100 Bar (1450 PSI)
5*	up to 350 Bar (5075 PSI)

\* AR/BR 315 Bar (4568 PSI)

Code	Description
1	Nitrile
5	Fluorocarbon

Code	Size	Description
P	01/02	Pressure reducing in P with pressure gauge port M
AR	01/02	Pressure reducing in A with check valve
BR	01/02	Pressure reducing in B with check valve

Weight: ZDR-P	ZDR-AR/BR
ZDR*01 1.6 kg (3.5 lbs.)	1.8 kg (4.0 lbs.)
ZDR*02 2.9 kg (6.4 lbs.)	3.0 kg (6.6 lbs.)



**ZDR01**

Pressure reducing in P with pressure gauge port M

Series  
ZDRP011S0D1  
ZDRP015S0D1

Pressure reducing in A with check valve

Series  
ZDRAR011S0-D1  
ZDRAR015S0-D1

Pressure reducing in B with check valve

Series  
ZDRBR011S0D1  
ZDRBR015S0D1

1 = 7 ... 140 Bar (102 ... 1450 PSI)  
 5 = 7 ... 315 Bar (102 ... 4568 PSI)

**ZDR02**

Pressure reducing at P with pressure gauge port M

Series  
ZDRP021S0D1  
ZDRP025S0D1

Pressure reducing at A (with check valve)

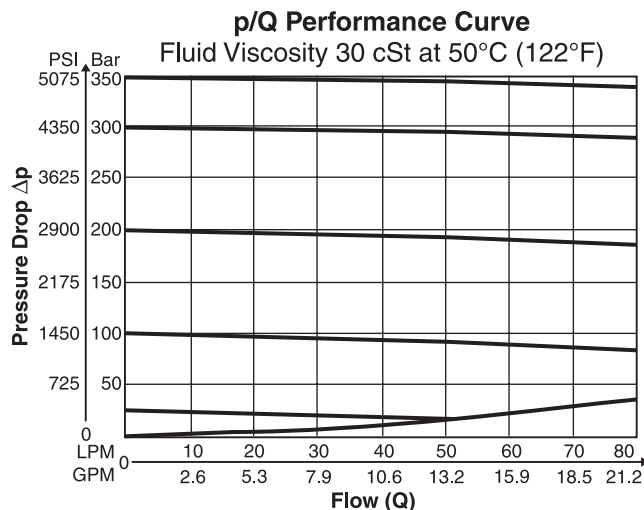
Series  
ZDRAR021S0D1  
ZDRAR025S0D1

Pressure reducing at B (with check valve)

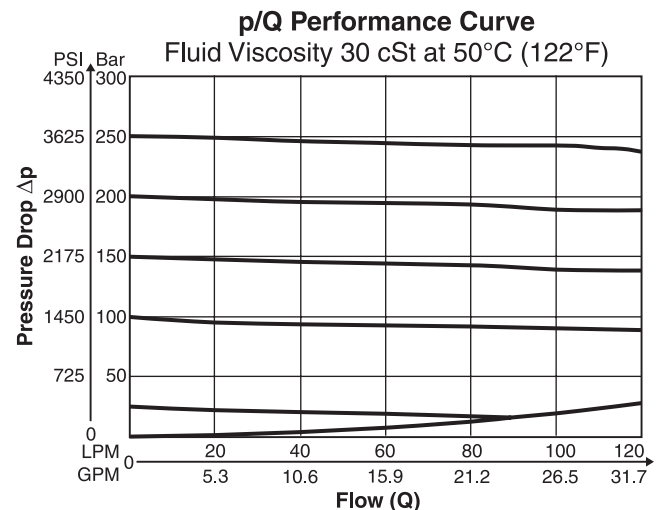
Series  
ZDRBR021S0D1  
ZDRBR025S0D1

**Performance Curves**

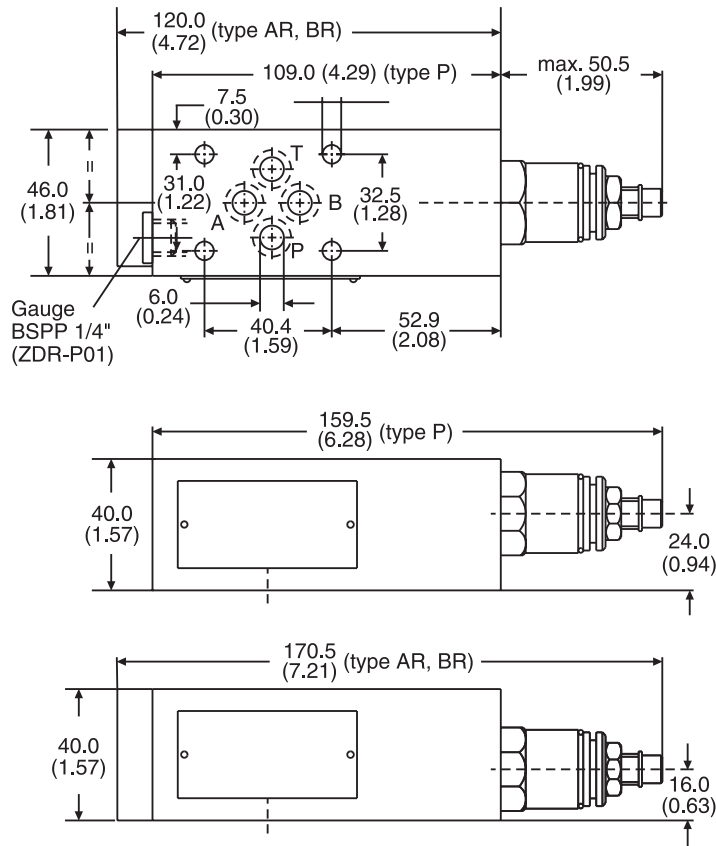
**ZDR-P/AR/BR01**



**ZDR-P/AR/BR02**

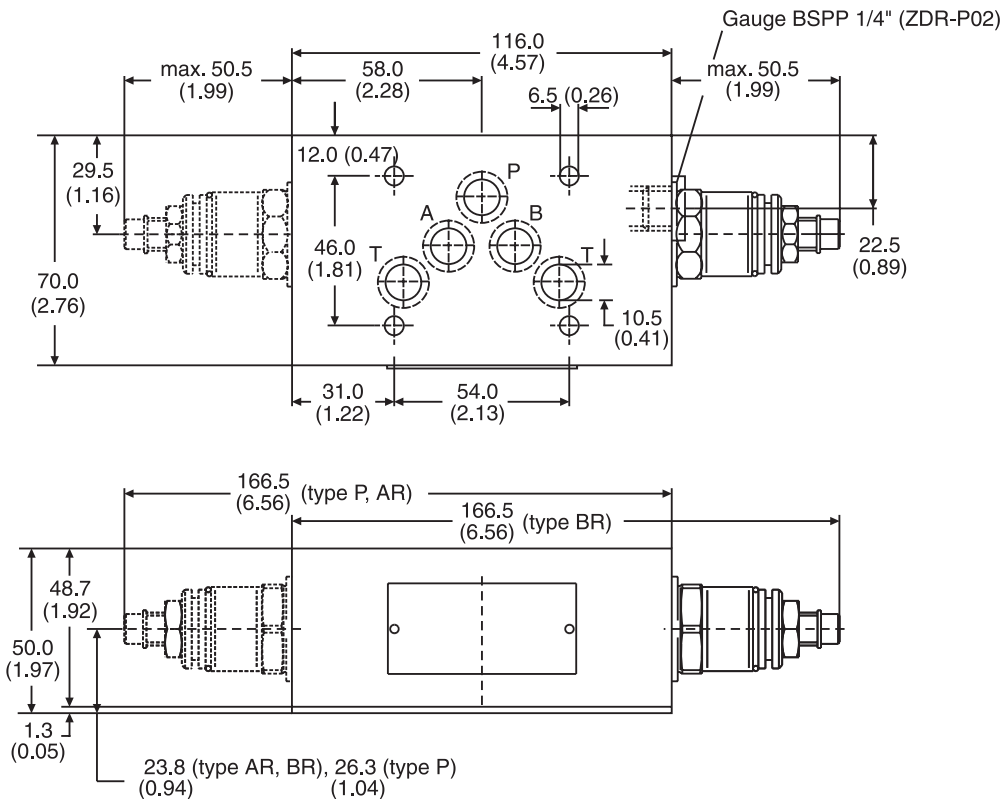


**ZDR01** — Inch equivalents for millimeter dimensions are shown in (\*\*)



Seal Kit	
Seal	Order Code
1	098-91184-0
5	098-91185-0
Complete Cartridge	
Seal	Order Code
1	098-91102-0
5	098-91103-0

**ZDR02** — Inch equivalents for millimeter dimensions are shown in (\*\*)



Seal Kit	
Seal	Order Code
1	098-91182-0
5	098-91183-0
Complete Cartridge	
Seal	Order Code
1	098-91102-0
5	098-91103-0

**B**

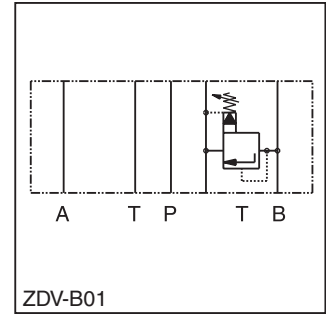


**General Description**

Series ZDV pilot operated pressure relief valves are designed for maximum flow rates.

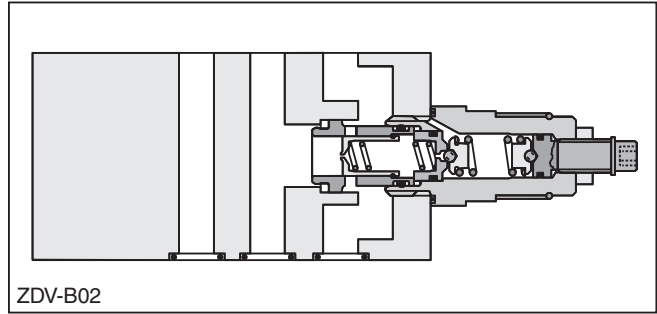
The relief function can be located between P and T, A and T, B and T or A and T + B and T for typical pressure relief functions.

For a pre-charge function the ZDV can be ordered with pressure function between A and B + B and A.



**Features**

- High flow capacity.
- Pressure function in P, A, B or A + B.
- Sizes:
  - ZDV01 – NFPA D03 / NG6 / CETOP 3
  - ZDV02 – NFPA D05 / NG10 / CETOP 5



**Ordering Information**

<b>ZDV</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<b>S0</b>	<b>D</b>	<input type="checkbox"/>																		
Pressure Relief Valve	Port Option	Size	Pressure Range	Hexagon Screw with Lock Nut	Design Series	Seal																			
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr><th>Code</th><th>Description</th></tr> </thead> <tbody> <tr><td>01</td><td>NFPA D03 / NG6</td></tr> <tr><td>02</td><td>NFPA D05 / NG10</td></tr> </tbody> </table>	Code	Description	01	NFPA D03 / NG6	02	NFPA D05 / NG10	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr><th>Code</th><th>Description</th></tr> </thead> <tbody> <tr><td>1</td><td>up to 70 Bar (1015 PSI)</td></tr> <tr><td>5</td><td>*Size Code 01: up to 350 Bar (5075 PSI) Size Code 02: up to 315 Bar (4568 PSI)</td></tr> </tbody> </table> <p>* Size Code 01, Port Code ABS – 315 Bar (4568 PSI)</p>	Code	Description	1	up to 70 Bar (1015 PSI)	5	*Size Code 01: up to 350 Bar (5075 PSI) Size Code 02: up to 315 Bar (4568 PSI)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr><th>Code</th><th>Description</th></tr> </thead> <tbody> <tr><td>1</td><td>Nitrile</td></tr> <tr><td>5</td><td>Fluorocarbon</td></tr> </tbody> </table>	Code	Description	1	Nitrile	5	Fluorocarbon			
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Code	Size	Description																							
P	01/02	P – T																							
A	01/02	A – T																							
B	01/02	B – T																							
AB	01/02	A – T & B – T																							
ABS	01/02	A – B & B – A																							
					<p><b>Weight: One Cartridge</b></p> <p>ZDV*01 1.6 kg (3.5 lbs.)                  ZDV*02 3.0 kg (6.6 lbs.)</p>	<p><b>Two Cartridges</b></p> <p>2.5 kg (5.5 lbs.)                  3.7 kg (8.2 lbs.)</p>																			

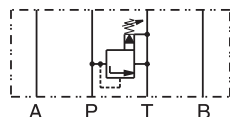
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**B**

**Ordering Information**

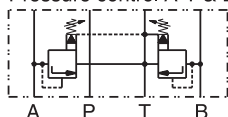
**ZDV01**

Pressure control P-T



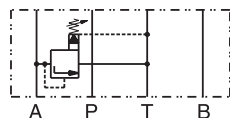
Series  
 ZDVP011S0D1  
 ZDVP015S0D1

Pressure control A-T & B-T



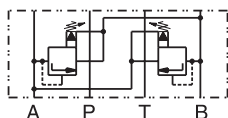
Series  
 ZDVAB011S0D1  
 ZDVAB015S0D1

Pressure control A-T



Series  
 ZDVA011S0D1  
 ZDVA015S0D1

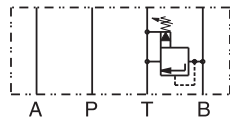
Pressure control A-B & B-A



Series  
 ZDVABS011S0D1  
 ZDVABS015S0D1

1 = 7 ... 70 Bar (102 ... 1015 PSI)  
 5 = 7 ... 315 Bar (102 ... 4568 PSI)

Pressure control B-T

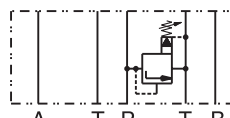


Series  
 ZDVB011S0D1  
 ZDVB015S0D1

1 = 7 ... 70 Bar (102 ... 1015 PSI)  
 5 = 7 ... 350 Bar (102 ... 5075 PSI)

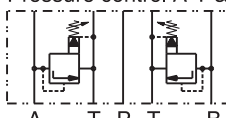
**ZDV02**

Pressure control P-T



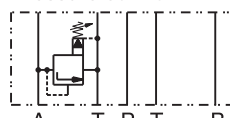
Series  
 ZDVP021S0D1  
 ZDVP025S0D1

Pressure control A-T & B-T



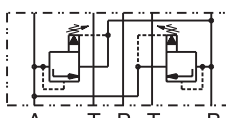
Series  
 ZDVAB021S0D1  
 ZDVAB025S0D1

Pressure control A-T



Series  
 ZDVA021S0D1  
 ZDVA025S0D1

Pressure control A-B & B-A



Series  
 ZDVABS021S0D1  
 ZDVABS025S0D1

Pressure control B-T



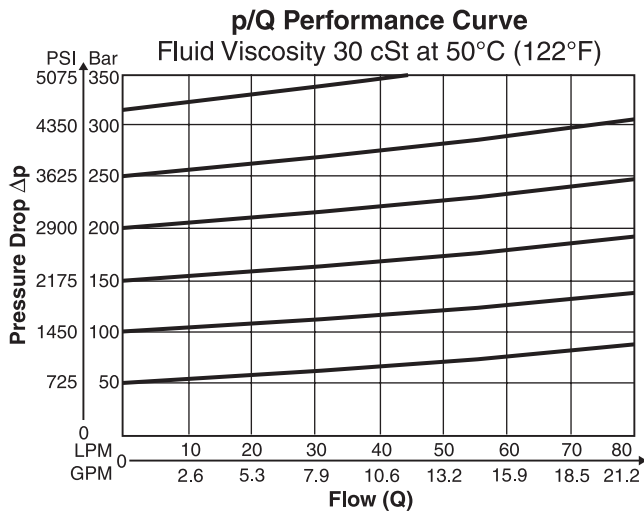
Series  
 ZDVB021S0D1  
 ZDVB025S0D1

**Specifications**

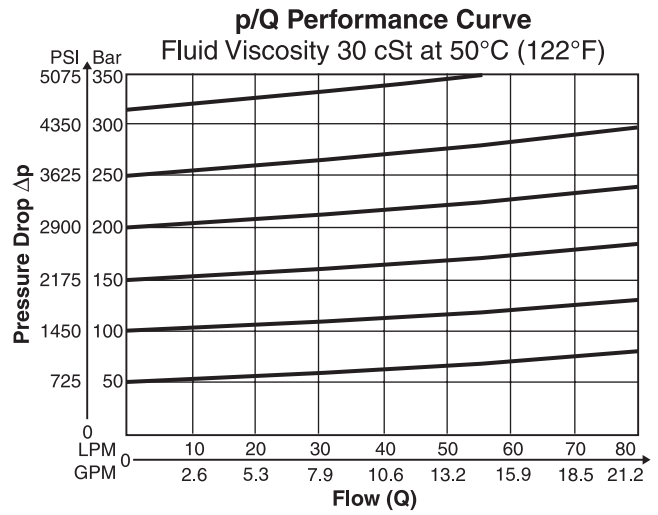
General		NG6	NG10
Size			
Mounting		DIN 24340 A6 ISO 4401 NFFA D03 CETOP RP 121	DIN 24340 A10 ISO 4401 NFFA D05 CETOP RP 121
Mounting Position		Unrestricted	
Ambient Temperature Range		-20° to +50°C (-4°F to +122°F)	
Hydraulic			
Maximum Operating Pressure		up to 350 Bar (5075 PSI); ZDV*ABS up to 315 Bar (4568 PSI)	
Nominal Flow		80 LPM (21.2 GPM)	140 LPM (37.0 GPM)
Fluid		Hydraulic oil as per DIN 51524 ... 51525	
Fluid Temperature		-20° to +80°C (-4°F to +176°F)	
Viscosity	Permitted Recommended	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU) 30 cSt / mm <sup>2</sup> /s (139 SSU)	
Filtration		ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)	

**B**

**ZDV-P/A/B/ABS01**

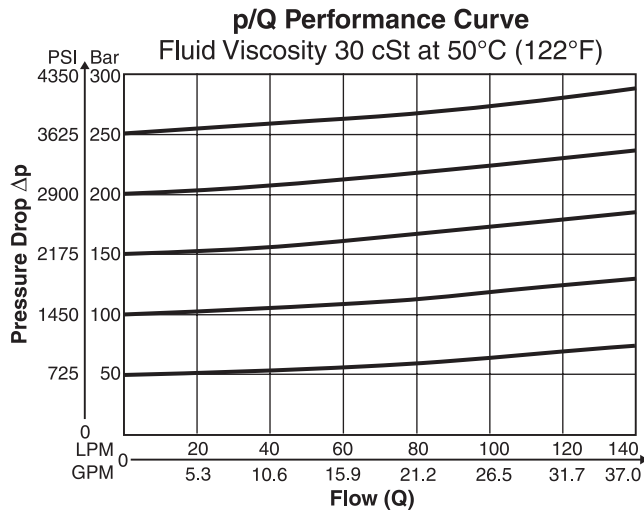


**ZDV-AB01**

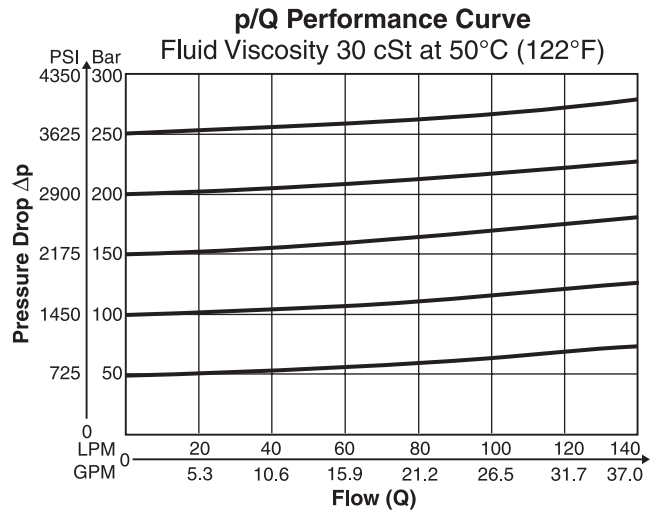


**B**

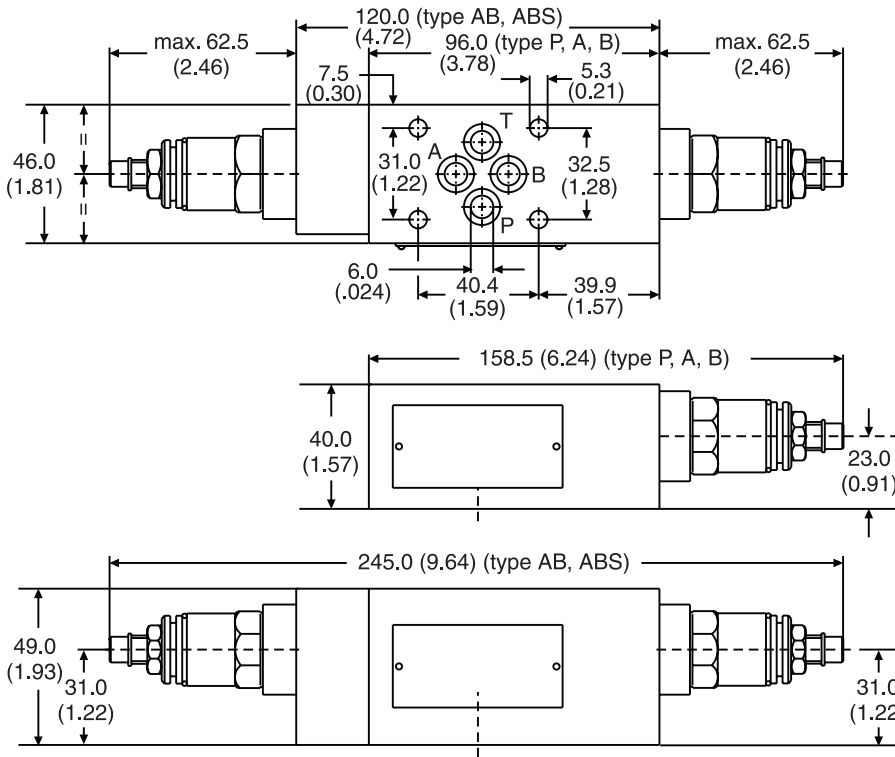
**ZDV-P/A/B/AB02**



**ZDV-ASB02**

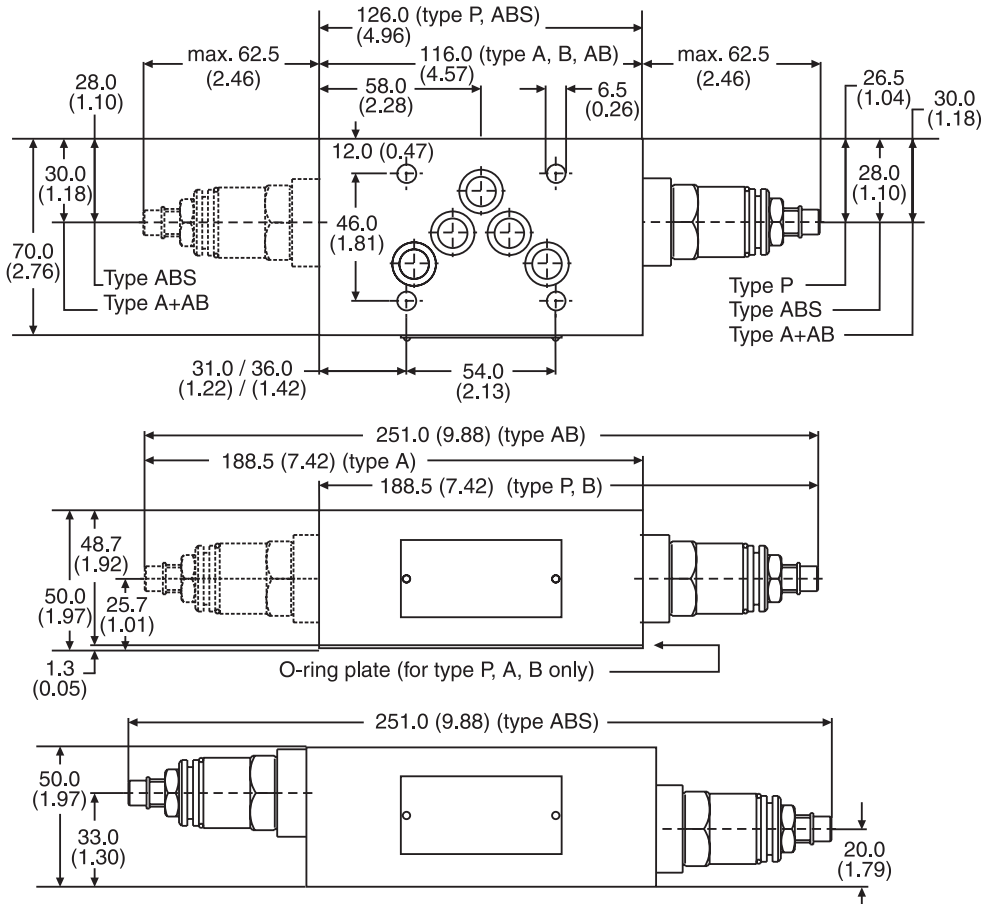


**ZDV01** – Inch equivalents for millimeter dimensions are shown in (\*\*)



Seal Kit	
Seal	Order Code
1	098-91182-0
5	098-91183-0
Complete Cartridge	
Seal	Order Code
1	098-91116-0
5	098-91117-0

**ZDV02** – Inch equivalents for millimeter dimensions are shown in (\*\*)



Seal Kit	
Seal	Order Code
1	098-91076-0
5	098-91077-0
Complete Cartridge	
Seal	Order Code
1	098-91116-0
5	098-91117-0

### General Description

Series ZNS counterbalance valve controls the actuator movement at overrunning loads.

The return flow from the actuator is piloted and controlled by the inlet flow to the actuator, ensuring a cavitation-free lowering of the load.

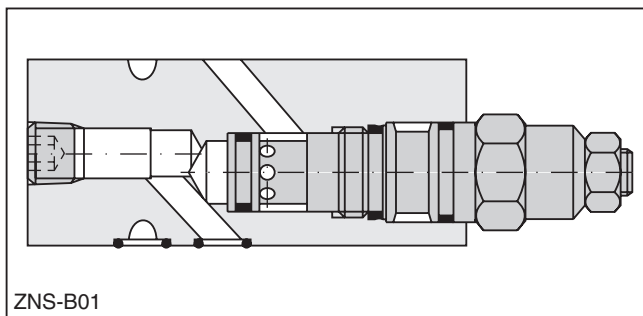
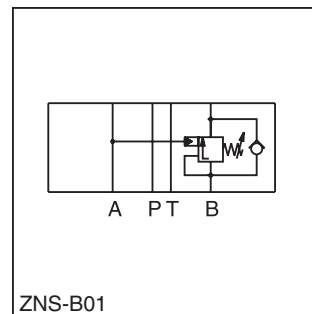
The counterbalance valve operates as a pressure relief valve. The setting pressure is lowered by the pressure in the inlet line. To ensure safe load holding the setting pressure should be approximately 30% higher than the max. load pressure.

### Features

- Controlled movement loads.
- Load holding via leak-free poppet valve.
- Secondary relief protection for the actuator.
- Sizes:

ZNS\*01 – NFPA D03 / NG6 / CETOP 3

ZNS\*02 – NFPA D05 / NG10 / CETOP 5



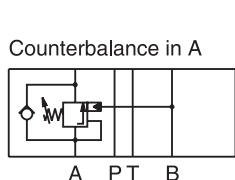
**B**

### Ordering Information

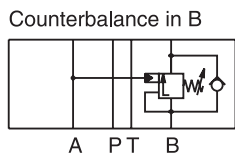
<b>ZNS</b> Counterbalance Valve	<input type="checkbox"/> Port Option	<input type="checkbox"/> Size	<input type="checkbox"/> Pressure Range	<b>S0</b> Hexagon Screw with Lock Nut	<b>D</b> Design Series	<input type="checkbox"/> Seal																										
<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>in A</td> </tr> <tr> <td>B</td> <td>in B</td> </tr> <tr> <td>AB</td> <td>in A and B</td> </tr> </tbody> </table>	Code	Description	A	in A	B	in B	AB	in A and B		<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>NFPA D03 / NG6</td> </tr> <tr> <td>02</td> <td>NFPA D05 / NG10</td> </tr> </tbody> </table>	Code	Description	01	NFPA D03 / NG6	02	NFPA D05 / NG10	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>70 to 175 Bar (1015 to 2538 PSI)</td> </tr> <tr> <td>5*</td> <td>140 to 350 Bar (2030 to 5075 PSI)</td> </tr> </tbody> </table>	Code	Description	2	70 to 175 Bar (1015 to 2538 PSI)	5*	140 to 350 Bar (2030 to 5075 PSI)			<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Nitrile</td> </tr> <tr> <td>5</td> <td>Fluorocarbon</td> </tr> </tbody> </table>	Code	Description	1	Nitrile	5	Fluorocarbon
Code	Description																															
A	in A																															
B	in B																															
AB	in A and B																															
Code	Description																															
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Code	Description																															
1	Nitrile																															
5	Fluorocarbon																															

\* ZNS02 to 315 Bar (4568 PSI)

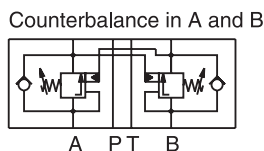
Weight:	1 cartridge	2 cartridges
ZNS*01	1.3 kg (2.9 lbs.)	3.0 kg (6.6 lbs.)
ZNS*02	1.6 kg (3.5 lbs.)	3.9 kg (8.6 lbs.)



**ZNS01**  
 Series  
 ZNSA012S0D1  
 ZNSA015S0D1



Series  
 ZNSB011S0D1  
 ZNSB015S0D1



Series  
 ZNSAB011S0D1  
 ZNSAB015S0D1

2 = 70 ... 175 Bar (1015 ... 2538 PSI)  
 5 = 140 ... 350 Bar (2030 ... 5075 PSI)

**ZNS02**  
 Series  
 ZNSA022S0D1  
 ZNSA025S0D1

Series  
 ZNSB021S0D1  
 ZNSB025S0D1

Series  
 ZNSAB021S0D1  
 ZNSAB025S0D1

2 = 70 ... 175 Bar (1015 ... 2538 PSI)  
 5 = 140 ... 315 Bar (2030 ... 4568 PSI)

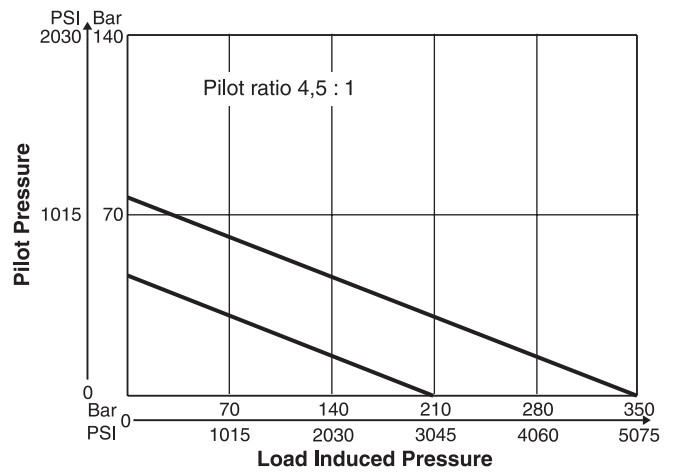
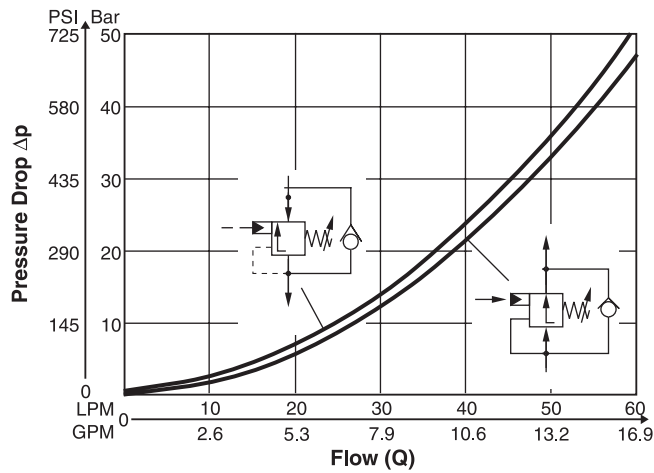
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## Specifications

General		
Size	NG6	NG10
Mounting Interface	DIN 24340 A6 ISO 4401 NFFPA D03	DIN 24340 A10 ISO 4401 NFFPA D05
Mounting Position	Unrestricted	
Ambient Temperature Range	-20°C to +50°C (-4°F to +122°F)	
Hydraulic		
Maximum Operating Pressure	350 Bar (5075 PSI)	315 Bar (4568 PSI)
Pressure Range	175 Bar (2538 PSI), 350 Bar (5075 PSI)	
Pilot Ratio	4.5 : 1	
Leakage	On request	
Nominal Flow	60 LPM (15.9 GPM)	120 LPM (31.7 GPM)
Opening Pressure	0.3 LPM (0.1 GPM)	0.3 LPM (0.1 GPM)
Fluid	Hydraulic oil as per DIN 51524 ... 51525	
Fluid Temperature	-20°C to +80°C (-4°F to +176°F)	
Viscosity	Permitted Recommended	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU) 30 cSt / mm <sup>2</sup> /s (139 SSU)
Filtration	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)	

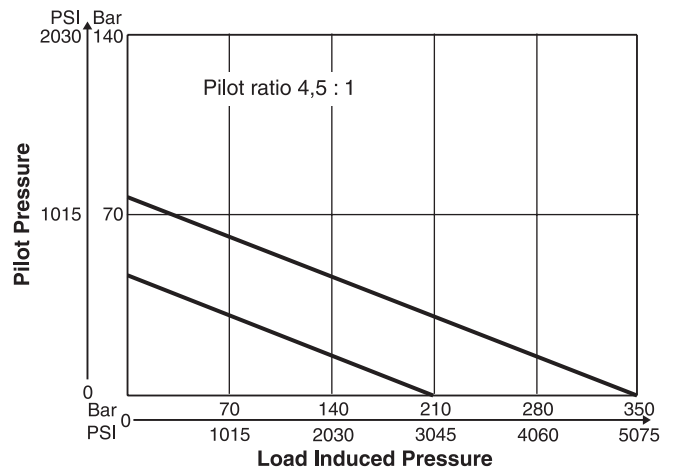
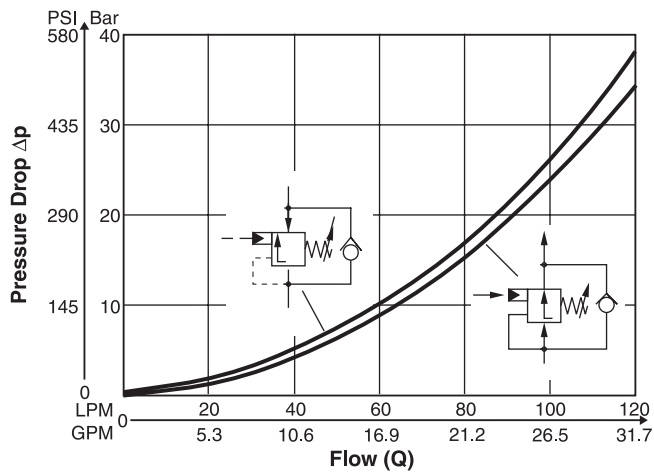
B

**ZNS01**



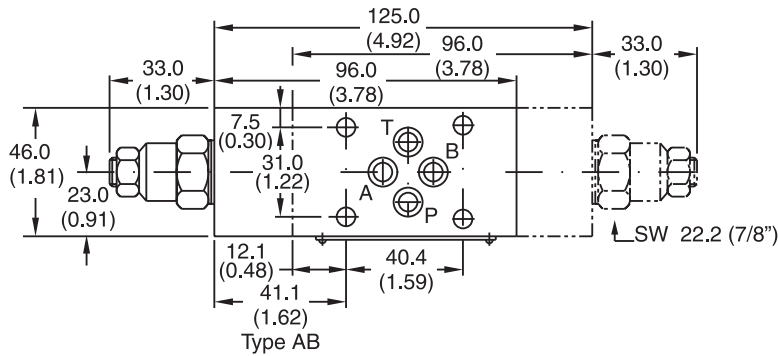
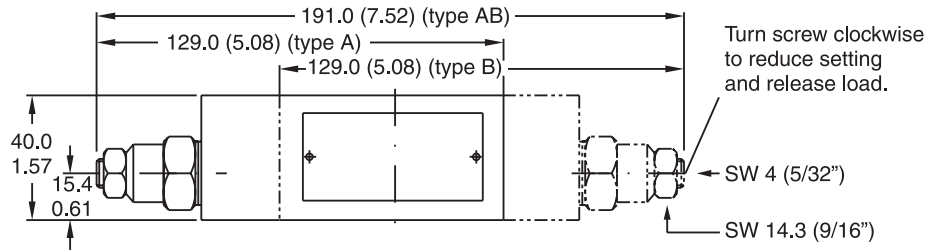
**B**

**ZNS02**



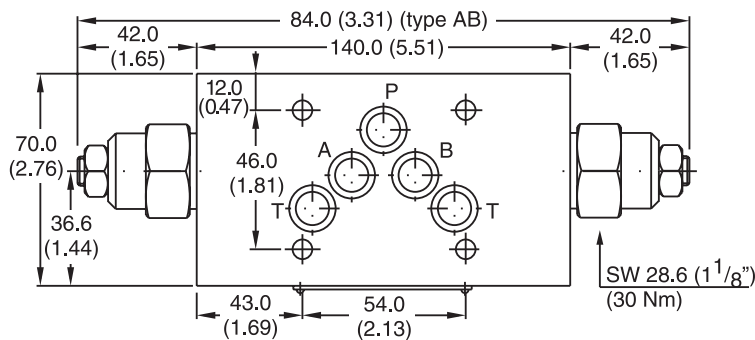
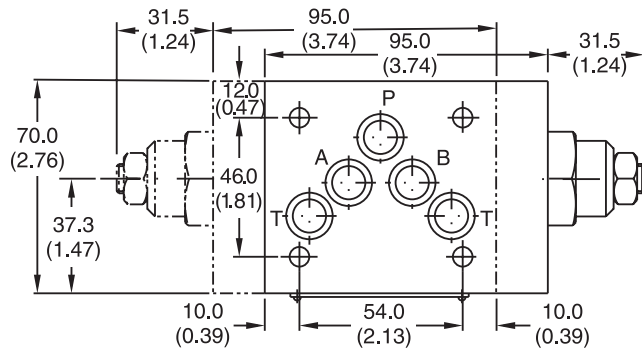
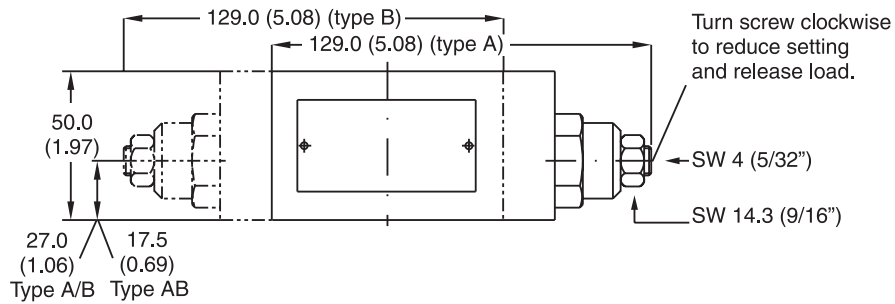
All characteristic curves measured with HLP46 at 50°C (122°F).

**ZNS01** – Inch equivalents for millimeter dimensions are shown in (\*\*)



Seal Kit	
Seal	Order Code
1	098-91153-0
5	098-91154-0
Complete Cartridge	
Seal	Order Code
1	517-01017-2
5	517-00448-8

**ZNS02** – Inch equivalents for millimeter dimensions are shown in (\*\*)



Seal Kit	
Seal	Order Code
1	098-91155-0
5	098-91183-0
Complete Cartridge	
Seal	Order Code
1	517-00449-8
5	517-00450-8

**B**



## General Description

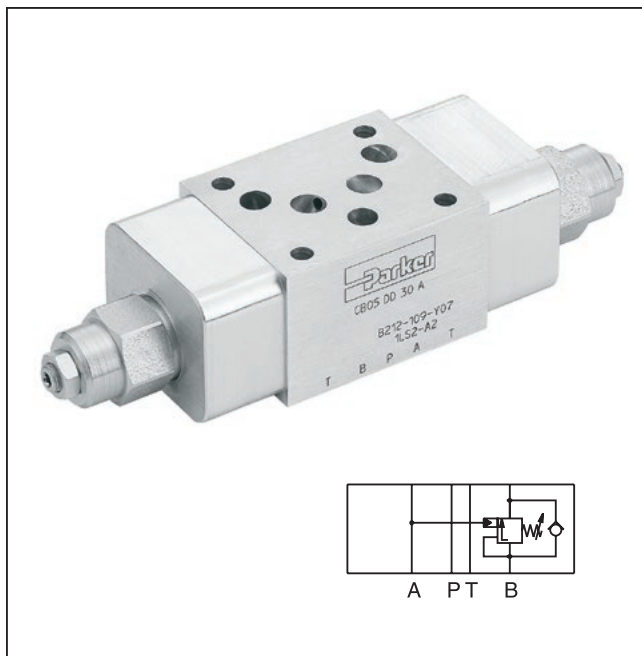
Series CB counterbalance valve controls the actuator movement with overrunning loads.

The return flow from the actuator is piloted and controlled by the inlet flow to the actuator, ensuring a cavitation-free lowering of the load.

The counterbalance valve operates as a pressure relief valve. The setting pressure is lowered by the pressure in the inlet line. To ensure safe load holding the setting pressure should be approximately 30% higher than the max. load pressure.

## Features

- Controlled movement loads.
- Load holding via leak-free poppet valve.
- Secondary relief protection for the actuator.
- Sizes:
  - CB03 – NFPA D03 / NG6 / CETOP 3
  - CB05 – NFPA D05 / NG10 / CETOP 5
  - CB5H – NFPA D05HE / NG10 / CETOP 5H
  - CB07 – NFPA D07 / NG16 / CETOP 7
  - CB08 – NFPA D08 / NG25 / CETOP 8



**B**

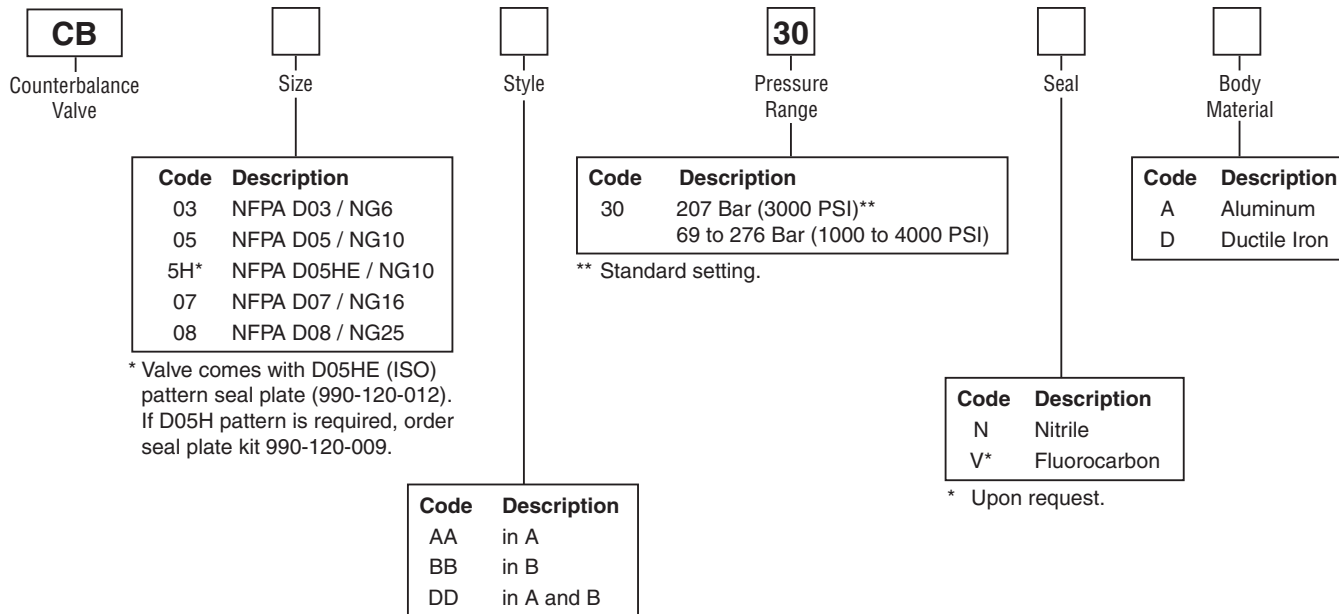
## Specifications

General					
<b>Size</b>	<b>D03 / NG6</b>	<b>D05 / NG10</b>	<b>D05HE / NG10</b>	<b>D07 / NG16</b>	<b>D08 / NG25</b>
<b>Mounting Position</b>	Unrestricted				
<b>Ambient Temperature Range</b>	-20°C to +50°C (-4°F to +122°F)				
Hydraulic					
<b>Maximum Operating Pressure*</b>	Aluminum Body – up to 207 Bar (3000 PSI); Ductile Iron Body – up to 345 Bar (5000 PSI)				
<b>Nominal Flow</b>	57 LPM (15 GPM)	114 LPM (30 GPM)	114 LPM (30 GPM)	227 LPM (60 GPM)	454 LPM (120 GPM)
<b>Leakage</b>	5 DPM	5 DPM	5 DPM	5 DPM	5 DPM
<b>Reseat Pressure</b>	85% of set pressure				
<b>Pilot Ratio</b>	3:1	3:1	3:1	3:1	3:1
<b>Adjustment Screw Hex Size</b>	5/32	5/32	5/32	5/32	5/32
<b>Fluid Temperature</b>	-20°C to +80°C (-4°F to +176°F)				
<b>Viscosity</b>	<b>Permitted</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU)			
	<b>Recommended</b>	30 cSt / mm <sup>2</sup> /s (139 SSU)			
<b>Filtration</b>	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)				

\* Counterbalance valves should be set at least 1.3 times the maximum load induced pressure.

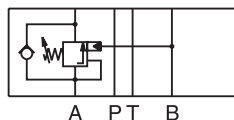
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**B**



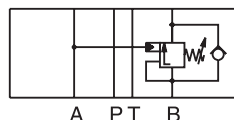
**CB\*\*AA**

Counterbalance in A



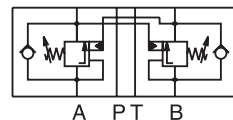
**CB\*\*BB**

Counterbalance in B



**CB\*\*DD**

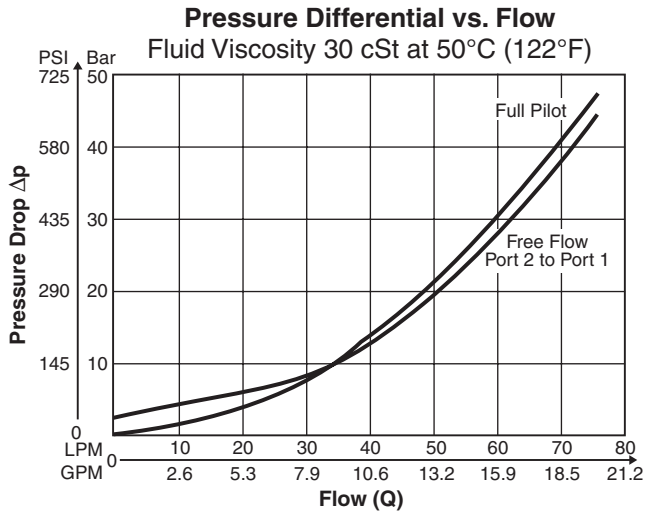
Counterbalance in A and B



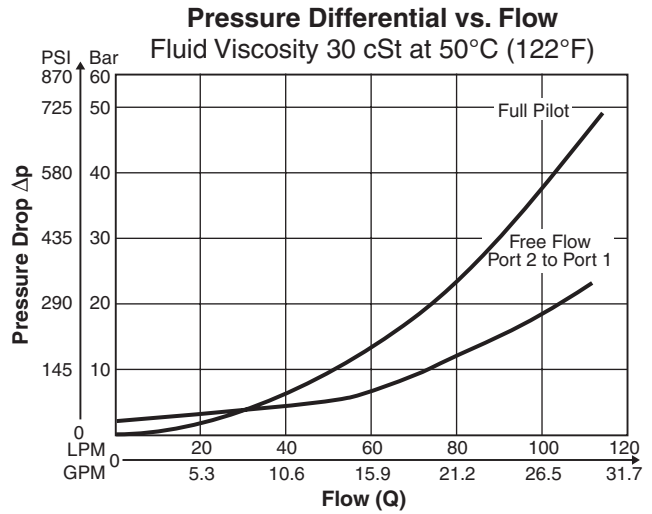
**Weight:**

Size	CB**AA30NA	CB**AA30ND	CB**BB30NA	CB**BB30ND	CB**DD30NA	CB**DD30ND
CB03	0.3 kg (0.8 lbs.)	1.1 kg (2.4 lbs.)	0.5 kg (1.1 lbs.)	1.1 kg (2.4 lbs.)	0.8 kg (1.7 lbs.)	1.5 kg (3.2 lbs.)
CB05, CB5H	1.0 kg (2.3 lbs.)	2.2 kg (4.9 lbs.)	1.0 kg (2.3 lbs.)	2.2 kg (4.9 lbs.)	1.5 kg (3.2 lbs.)	2.9 kg (6.4 lbs.)
CB07	2.5 kg (5.6 lbs.)	4.8 kg (10.6 lbs.)	2.5 kg (5.5 lbs.)	5.3 kg (11.8 lbs.)	3.6 kg (8 lbs.)	7.3 kg (16.2 lbs.)
CB08	5.3 kg (11.7 lbs.)	11.8 kg (25.9 lbs.)	5.9 kg (13.1 lbs.)	13.3 kg (29.3 lbs.)	7.9 kg (17.4 lbs.)	16.2 kg (35.8 lbs.)

**CB03\***

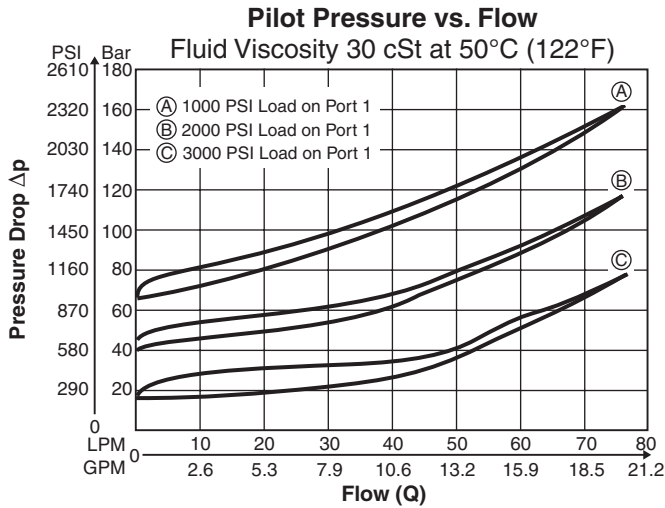


**CB05/CB5H**

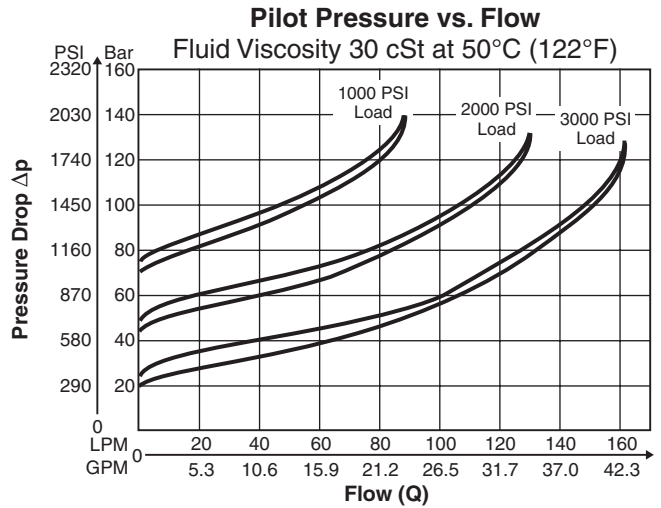


**B**

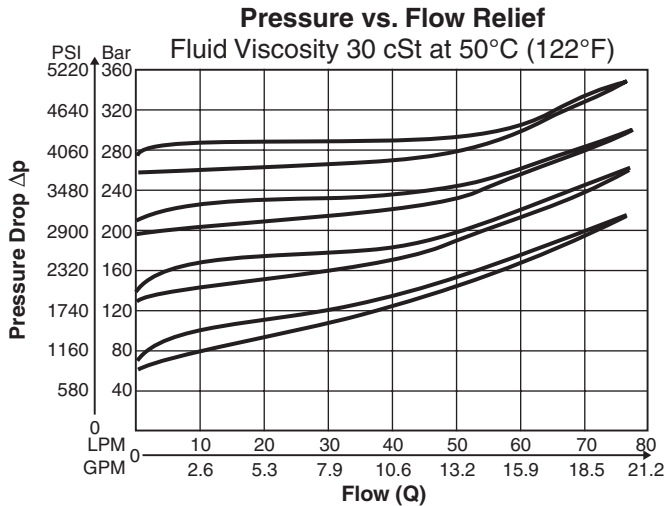
**CB03\***



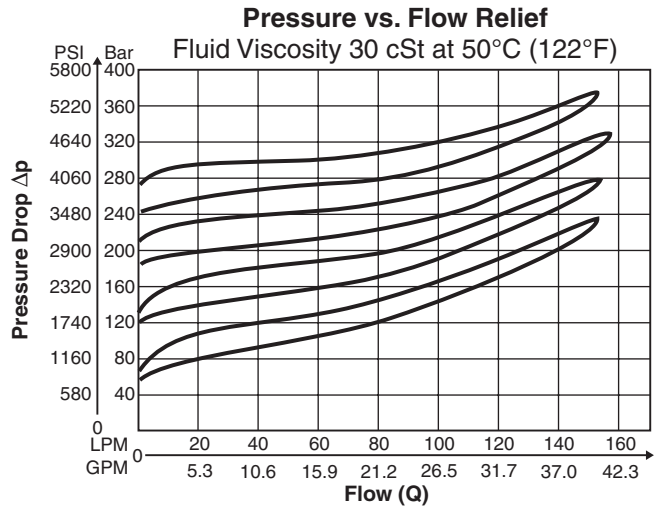
**CB05/CB5H**



**CB03\***

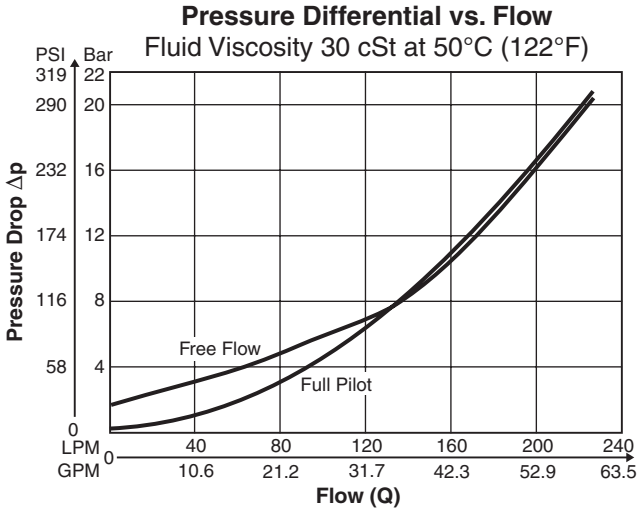


**CB05/CB5H**

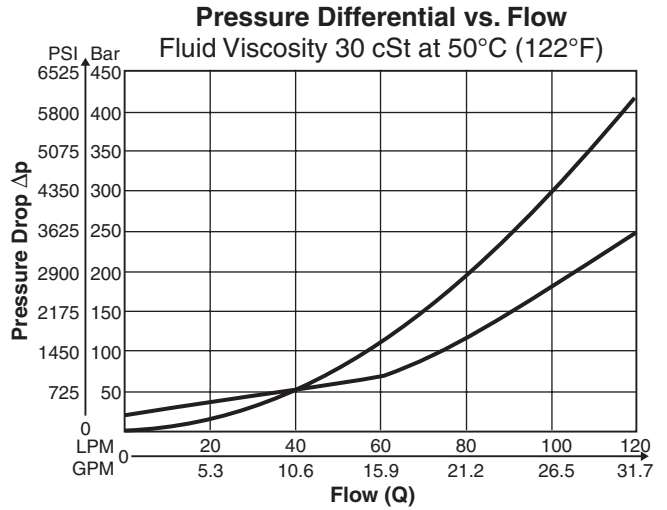


**B**

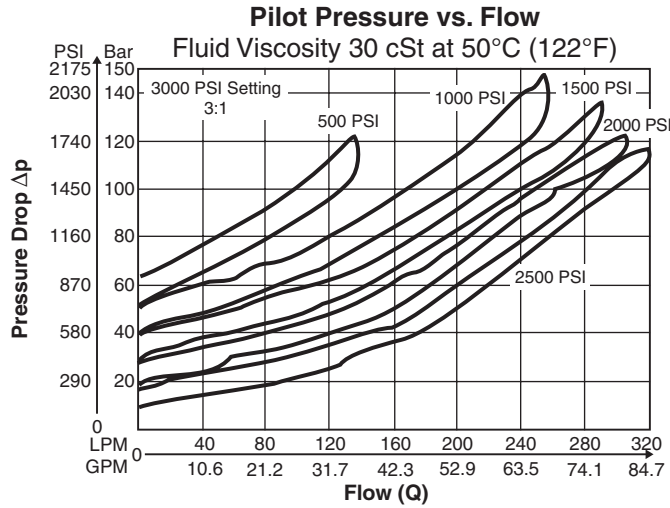
**CB07\***



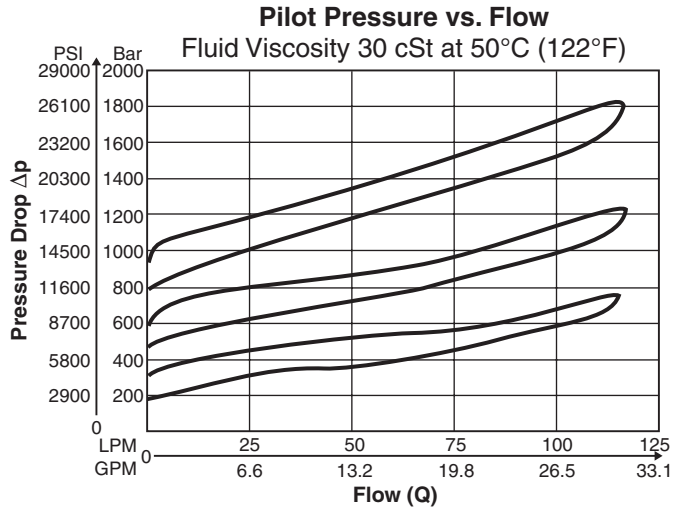
**CB08\***



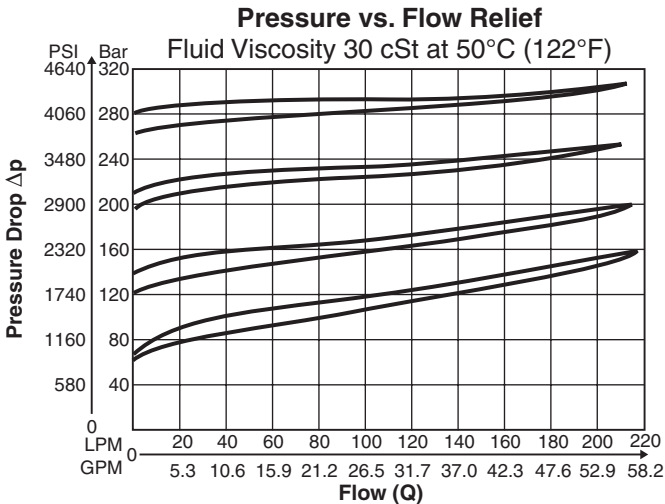
**CB07\***



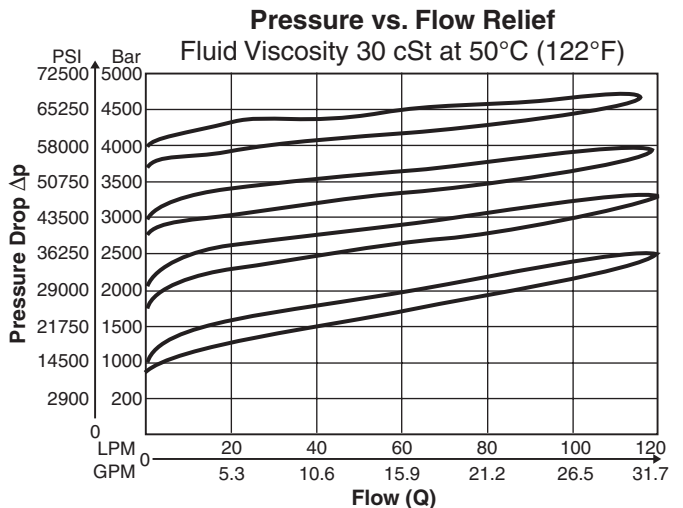
**CB08\***



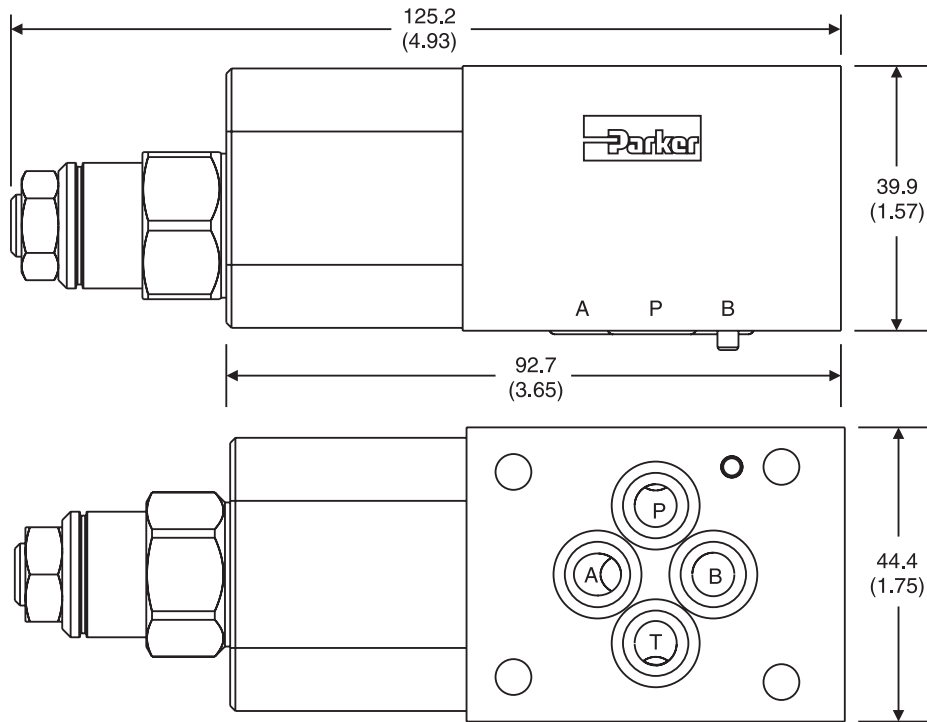
**CB07\***



**CB08\***

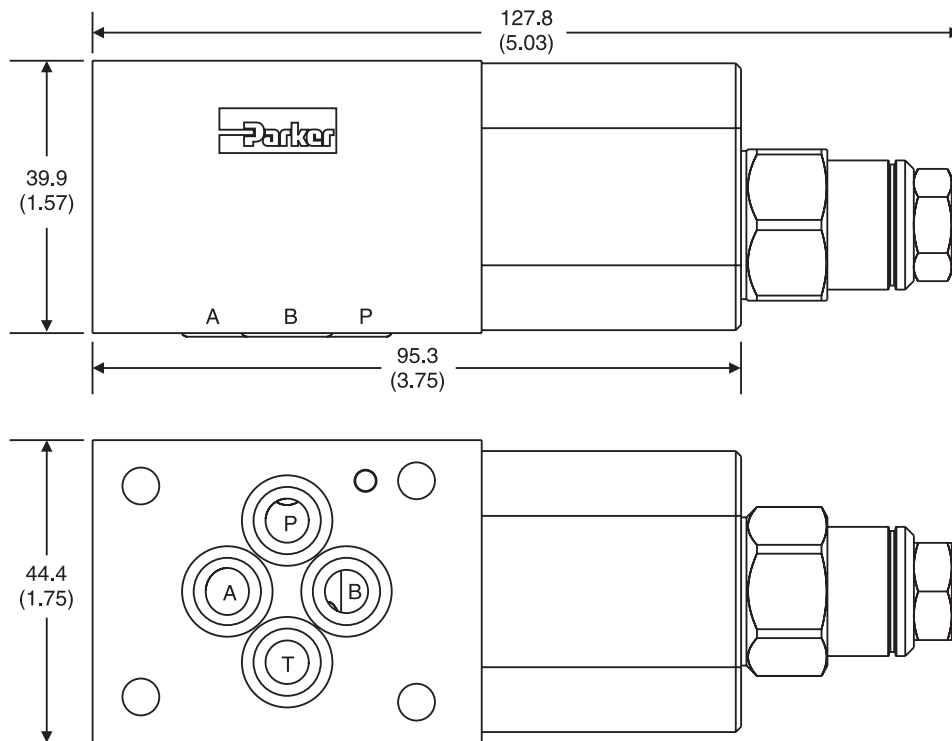


**CB03AA** – Inch equivalents for millimeter dimensions are shown in (\*\*)



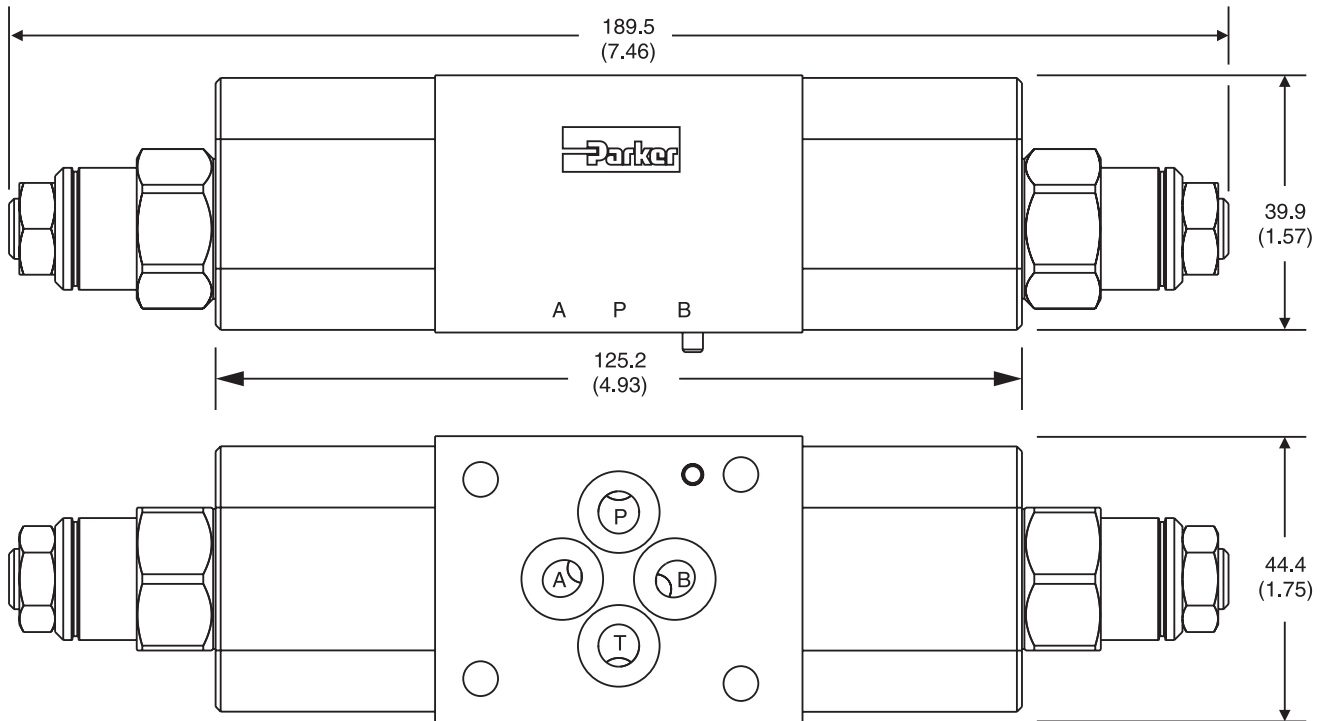
**B**

**CB03BB** – Inch equivalents for millimeter dimensions are shown in (\*\*)

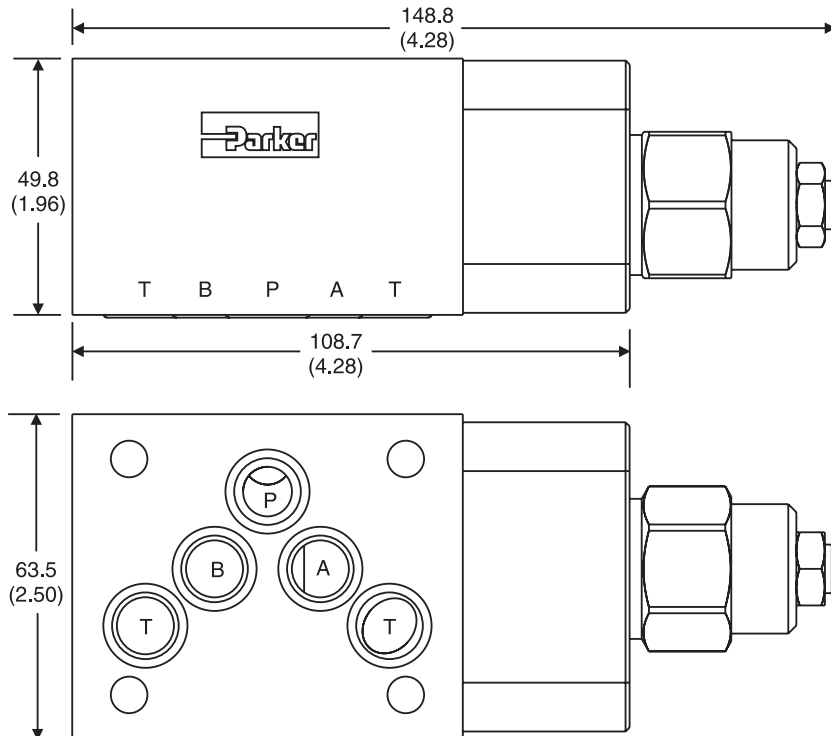


**CB03DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)

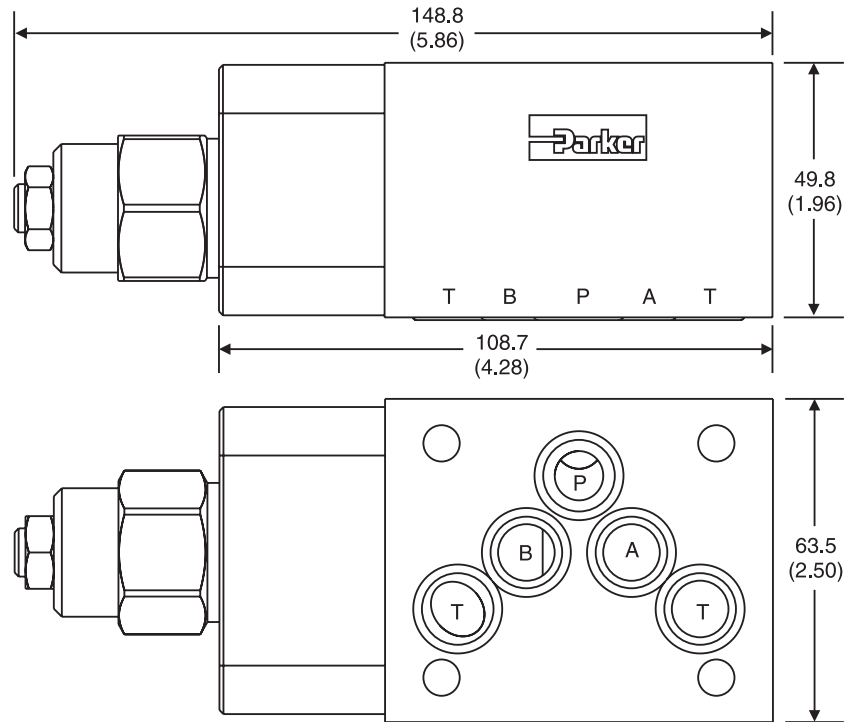
**B**



**CB05AA** – Inch equivalents for millimeter dimensions are shown in (\*\*)

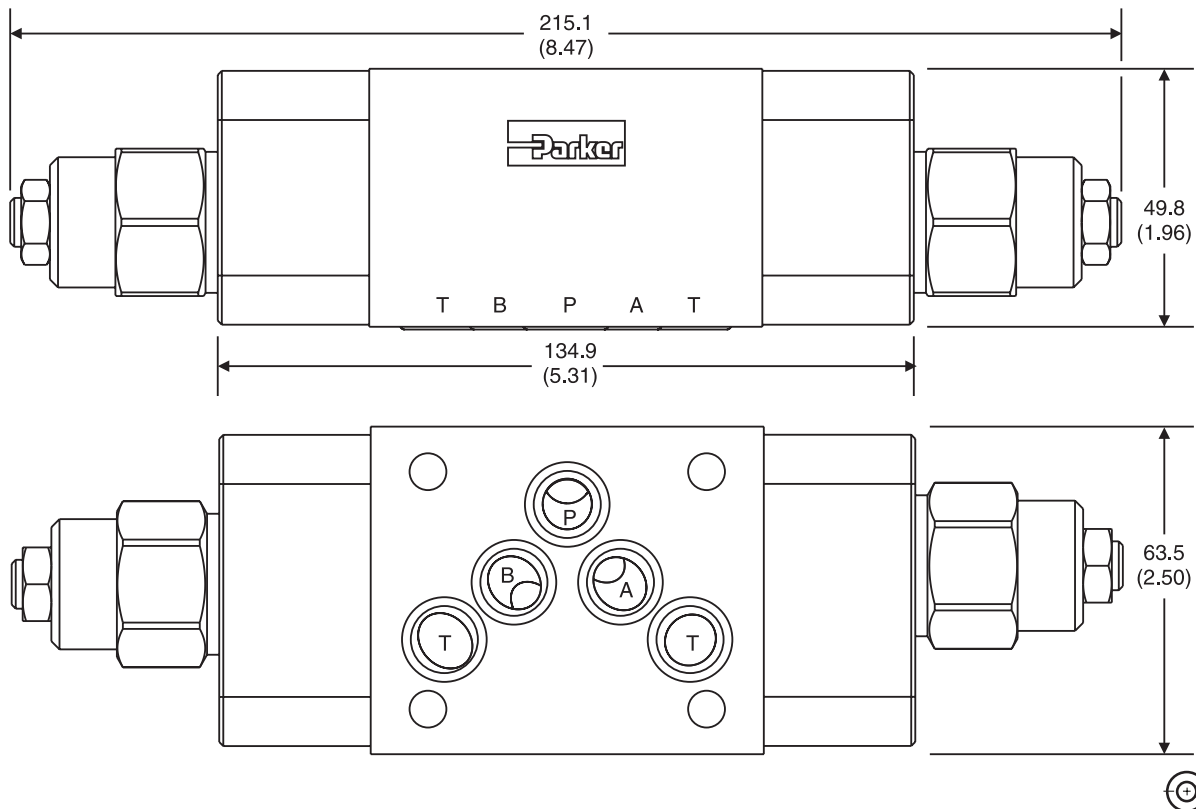


**CB05BB** – Inch equivalents for millimeter dimensions are shown in (\*\*)

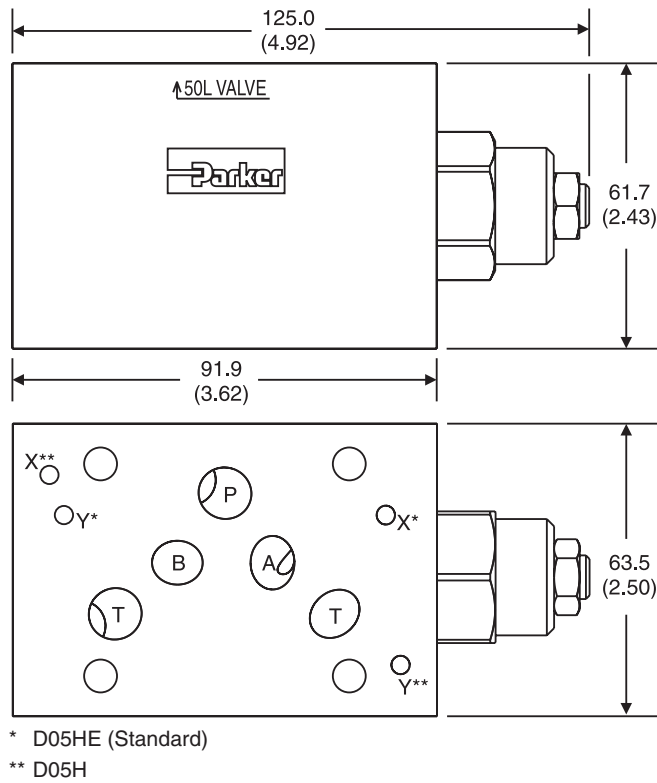


**B**

**CB05DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)

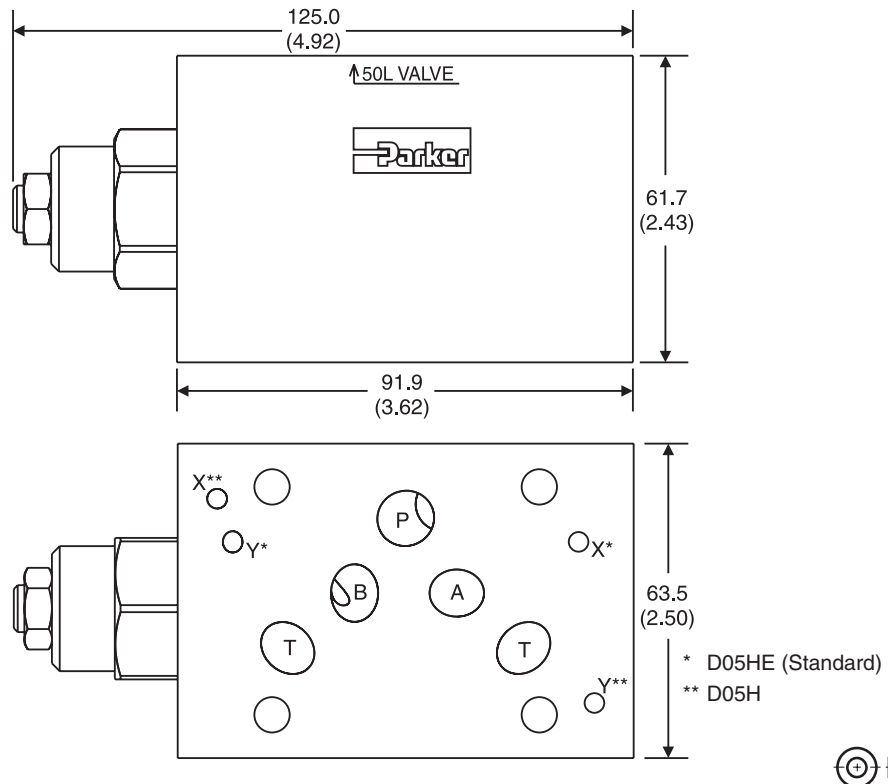


**CB5HAA** — Inch equivalents for millimeter dimensions are shown in (\*\*)



Valve comes with D05HE (ISO) Pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.

**CB5HBB** — Inch equivalents for millimeter dimensions are shown in (\*\*)

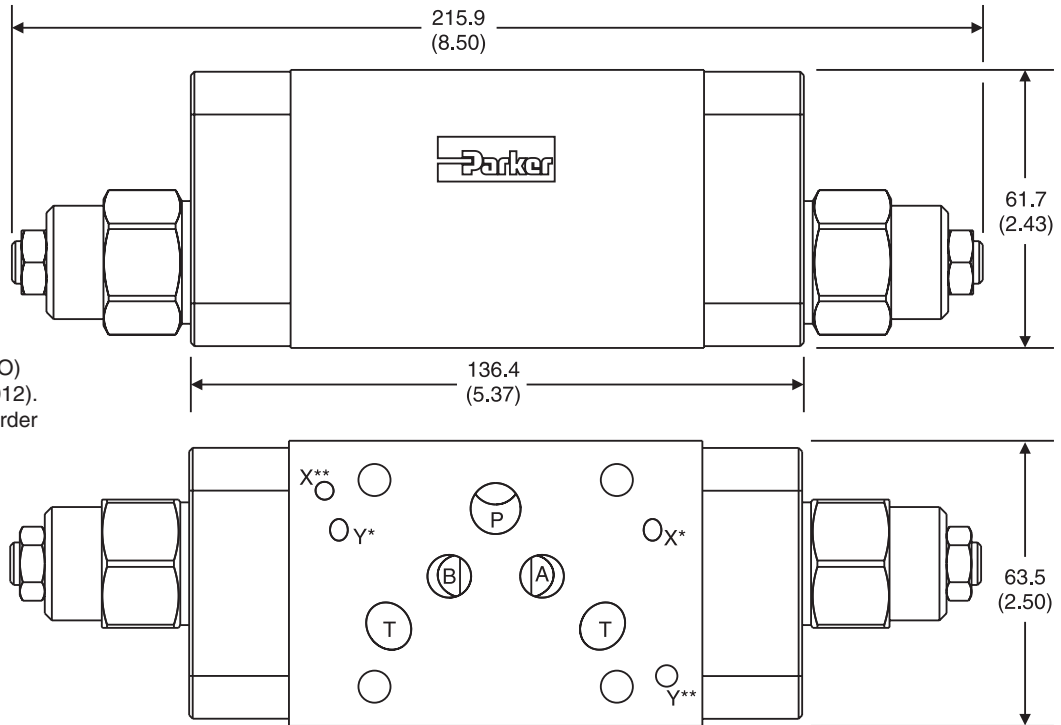


Valve comes with D05HE (ISO) Pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.





**CB5HDD** – Inch equivalents for millimeter dimensions are shown in (\*\*)

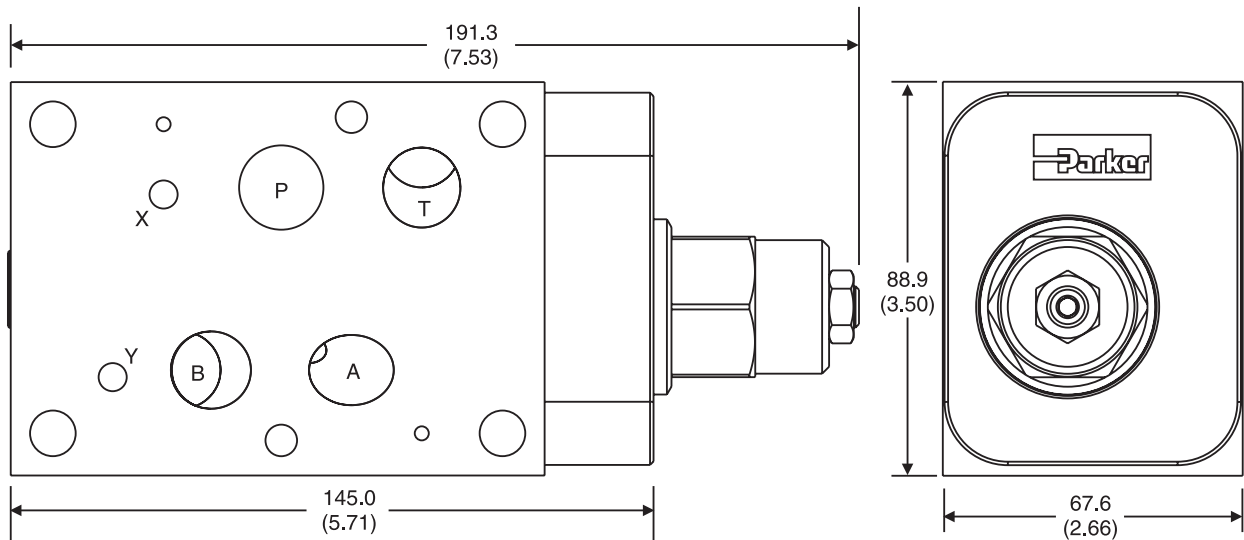


**B**

Valve comes with D05HE (ISO) Pattern seal plate (990-120-012). If D05H pattern is required, order seal plate kit 990-120-009.

\* D05HE (Standard)  
\*\* D05H

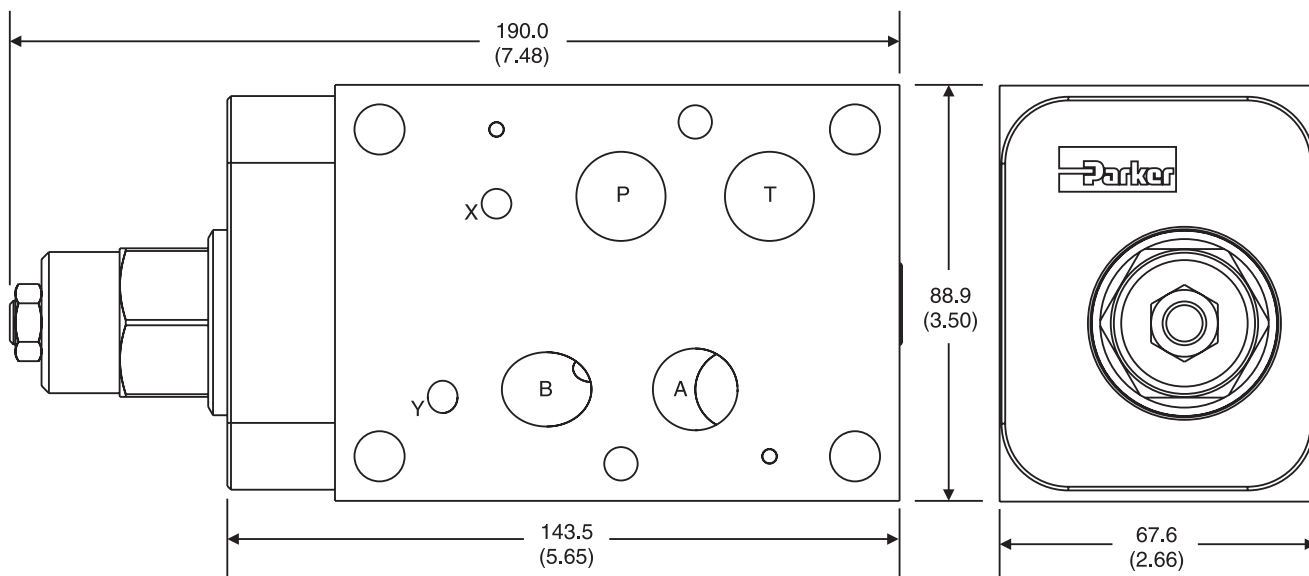
**CB07AA** – Inch equivalents for millimeter dimensions are shown in (\*\*)



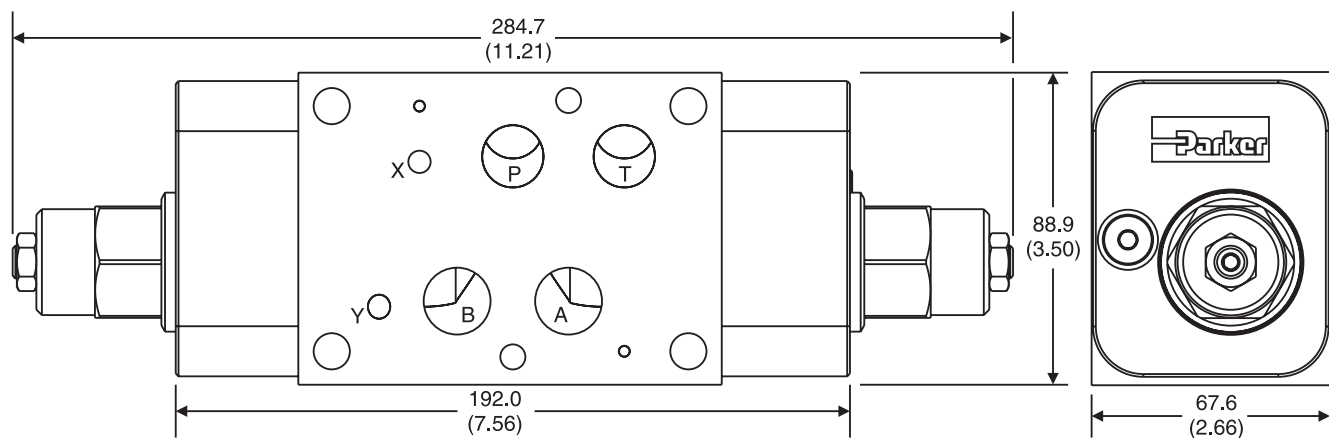
**Dimensions**

**CB07BB** – Inch equivalents for millimeter dimensions are shown in (\*\*)

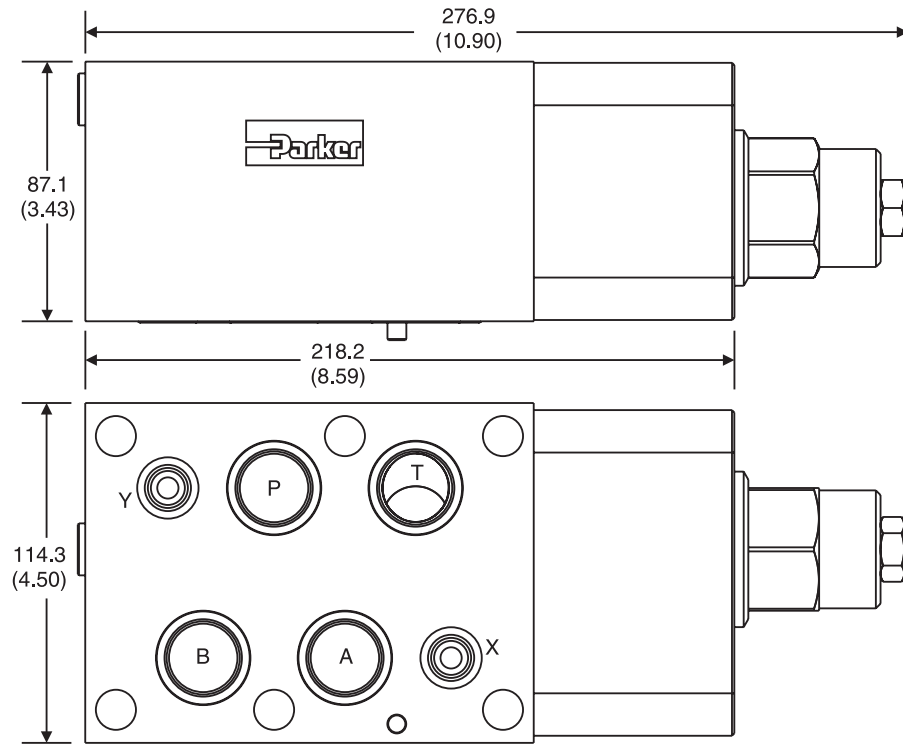
**B**



**CB07DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)

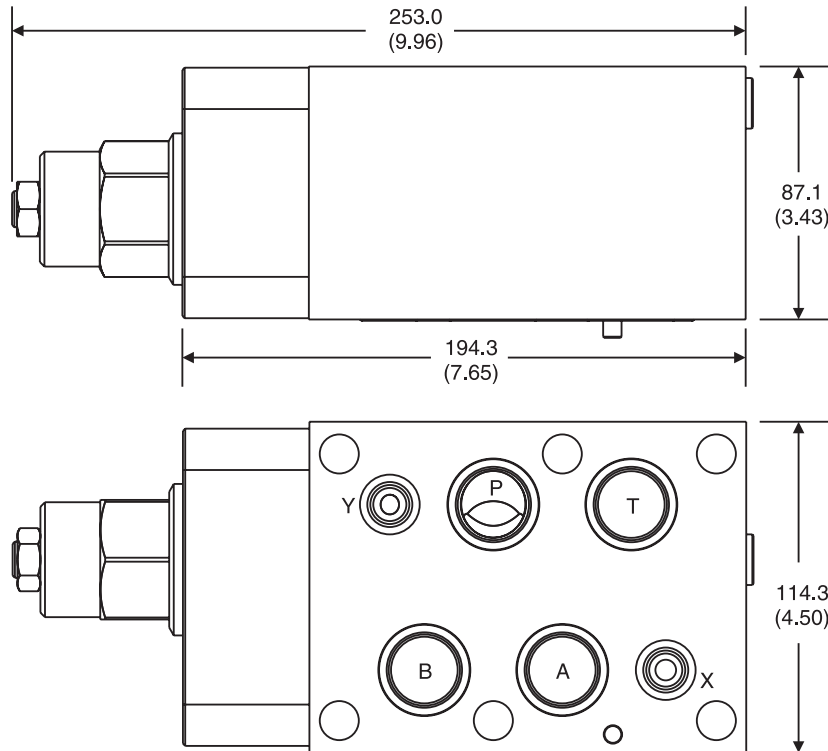


**CB08AA** – Inch equivalents for millimeter dimensions are shown in (\*\*)



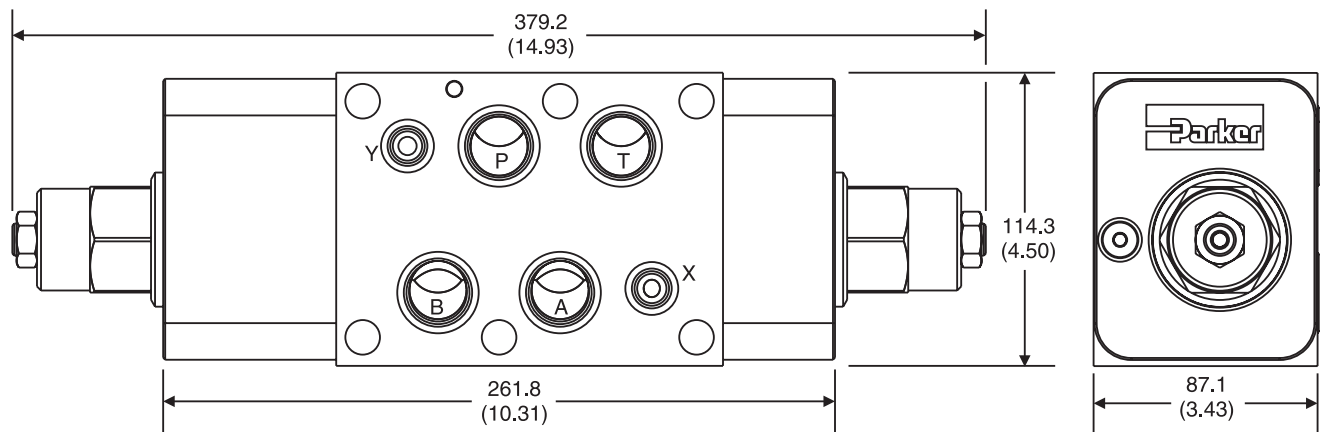
**B**

**CB08BB** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**CB08DD** – Inch equivalents for millimeter dimensions are shown in (\*\*)

**B**

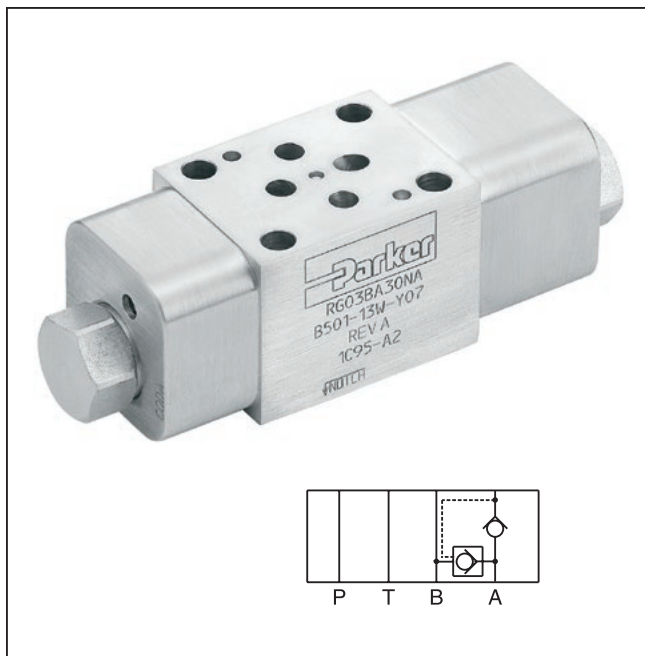


## General Description

Series RG is a full time regenerative valve assembly that allows a double-acting, single rod cylinder to be extended more rapidly using the same pump flow. To achieve this, oil from the rod end of the cylinder is added to the flow to the cap end, increasing the rate of extension.

## Features

- High life time.
- Cracking pressure 2.0 Bar (30 PSI).
- Sizes:
  - RG03 – NFFA D03 / NG6 / CETOP 3
  - RG05 – NFFA D05 / NG10 / CETOP 5
  - RG07 – NFFA D07 / NG16 / CETOP 7
  - RG08 – NFFA D08 / NG25 / CETOP 8



**B**

## Specifications

General				
Size	D03 / NG6	D05 / NG10	D07 / NG16	D08 / NG25
Mounting Position	Unrestricted			
Ambient Temperature Range	-20°C to +50°C (-4°F to +122°F)			
Hydraulic				
Maximum Operating Pressure	Aluminum Body – up to 207 Bar (3000 PSI); Ductile Iron Body – up to 345 Bar (5000 PSI)			
Nominal Flow*	38 LPM (10 GPM)	95 LPM (25 GPM)	189 LPM (50 GPM)	303 LPM (80 GPM)
Leakage	< 1 DPM	< 1 DPM	< 1 DPM	< 1 DPM
Fluid Temperature	-20°C to +80°C (-4°F to +176°F)			
Viscosity	Permitted Recommended 10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU) 30 cSt / mm <sup>2</sup> /s (139 SSU)			
Filtration	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			

\* Nominal flow value refers to pump flow or regeneration flow from rod side, whichever is larger.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Ordering Information**

**RG**

Full Time  
 Regeneration  
 Valve

Size

Code	Description
03	NFPA D03 / NG6
05*	NFPA D05 / NG10
07	NFPA D07 / NG16
08	NFPA D08 / NG25

\* D05HE (ISO) pattern is not available.

**BA**

Style

Code	Description
BA	Regeneration flow from B to A

**30**

Cracking  
 Pressure

Code	Description
30	2 Bar (30 PSI)

Seal

Code	Description
N	Nitrile
V*	Fluorocarbon

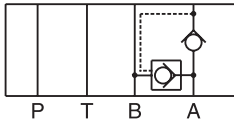
\* Upon request.

Body  
 Material

Code	Description
A	Aluminum
D	Ductile Iron

**B**

**RG\*\*BA**

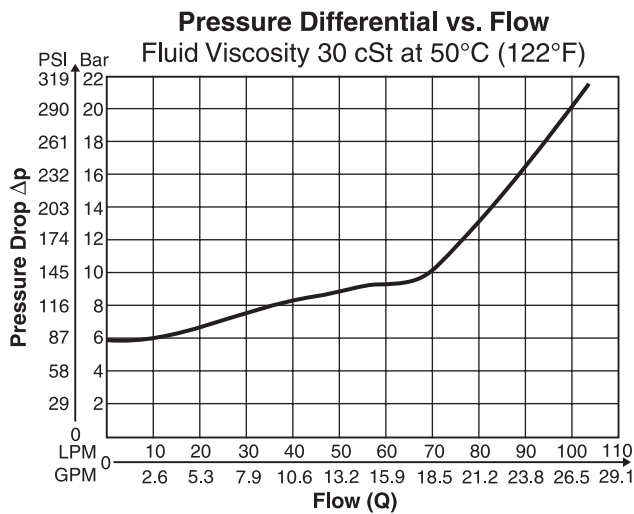


**Weight:**

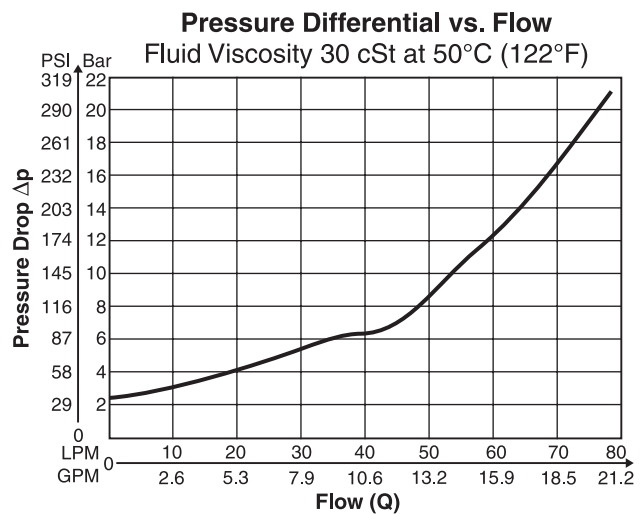
Size	RG*****NA	RG*****ND
RG03	0.8 kg (1.7 lbs)	1.6 kg (3.5 lbs)
RG05, RG5H	1.5 kg (3.3 lbs)	3.1 kg (6.9 lbs)
RG07	2.9 kg (6.5 lbs)	5.9 kg (13.1 lbs)
RG08	6.4 kg (14.1 lbs)	13.1 kg (28.8 lbs)

**Performance Curves**

**RG03\*30\*A**



**RG03\*30\*D**



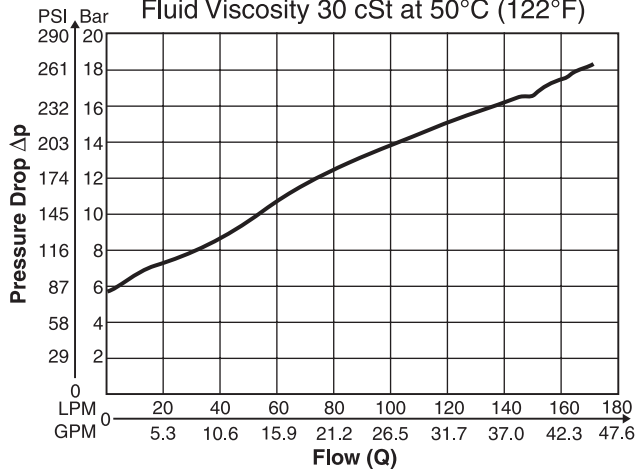
(Continued on next page.)

(Continued from previous page.)

**RG05\*30\*A, RG5H\*30\*A**

**Pressure Differential vs. Flow**

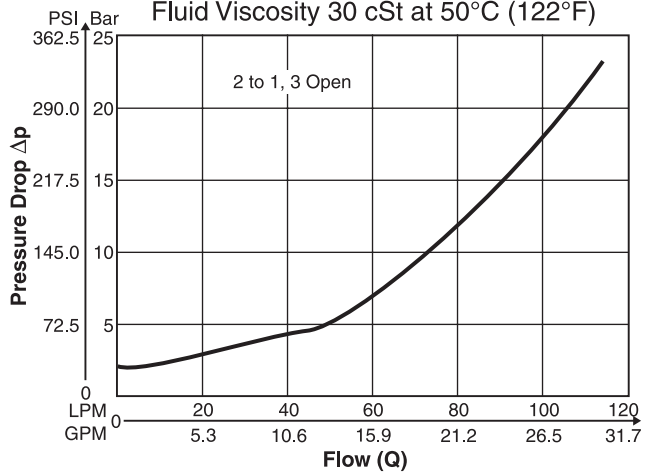
Fluid Viscosity 30 cSt at 50°C (122°F)



**RG05\*30\*D, RG5H\*30\*D**

**Pressure Differential vs. Flow**

Fluid Viscosity 30 cSt at 50°C (122°F)

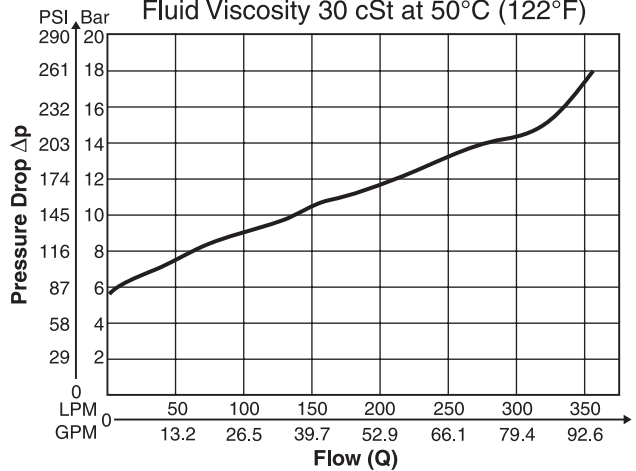


**B**

**RG07\*30\*A**

**Pressure Differential vs. Flow**

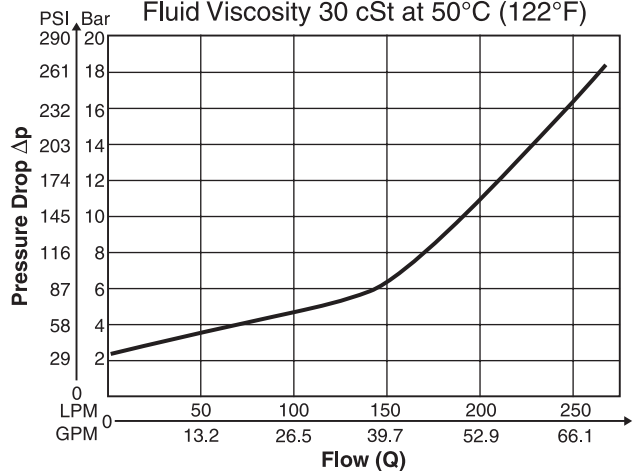
Fluid Viscosity 30 cSt at 50°C (122°F)



**RG07\*30\*D**

**Pressure Differential vs. Flow**

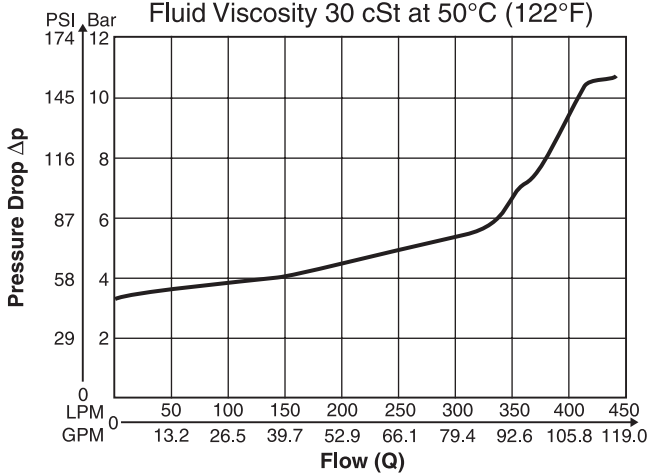
Fluid Viscosity 30 cSt at 50°C (122°F)



**RG08\*30\*A**

**Pressure Differential vs. Flow**

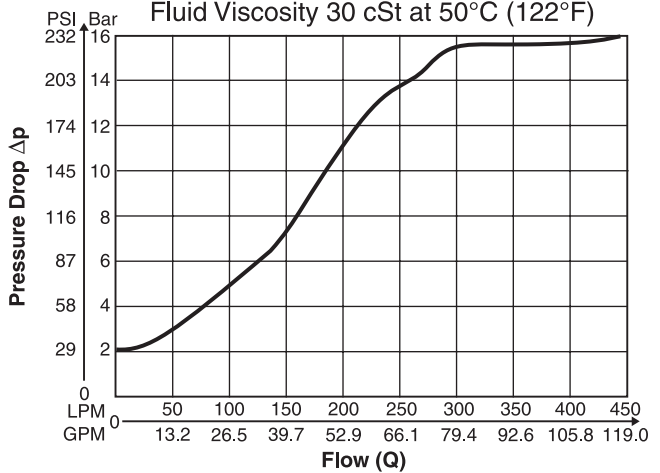
Fluid Viscosity 30 cSt at 50°C (122°F)



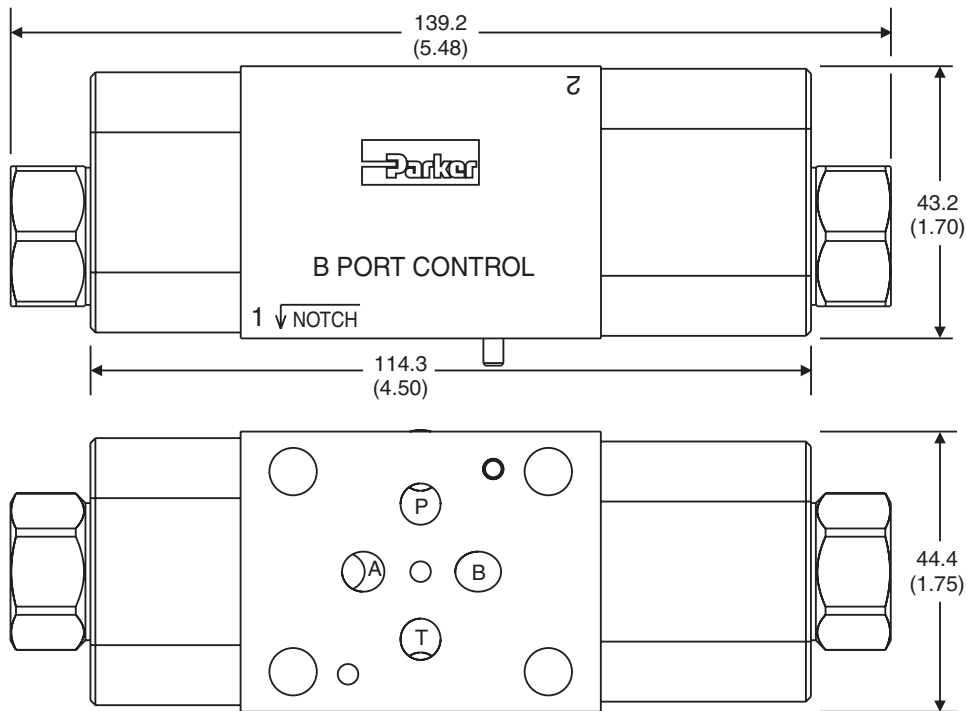
**RG08\*30\*D**

**Pressure Differential vs. Flow**

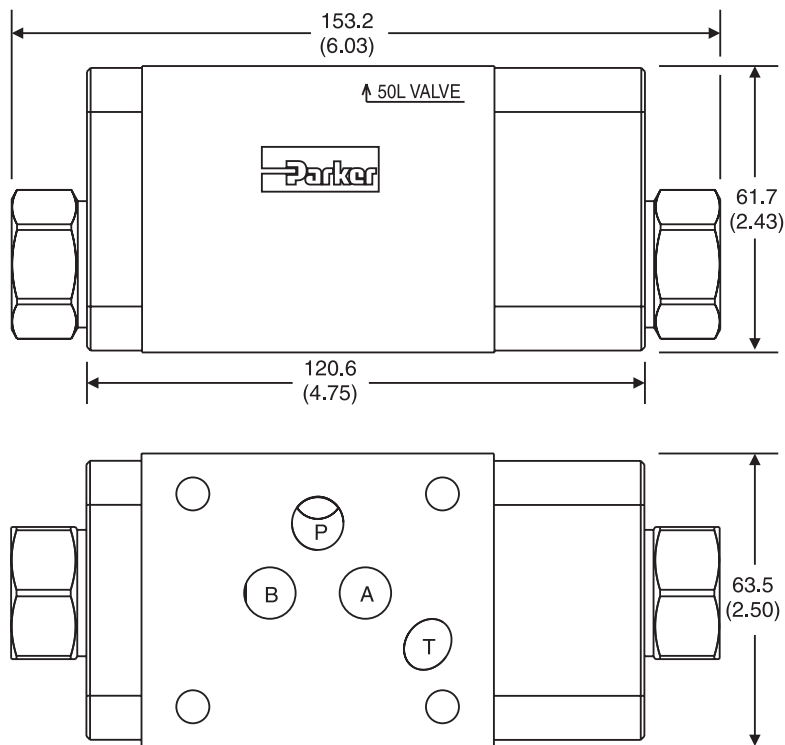
Fluid Viscosity 30 cSt at 50°C (122°F)



**RG03BA** – Inch equivalents for millimeter dimensions are shown in (\*\*)



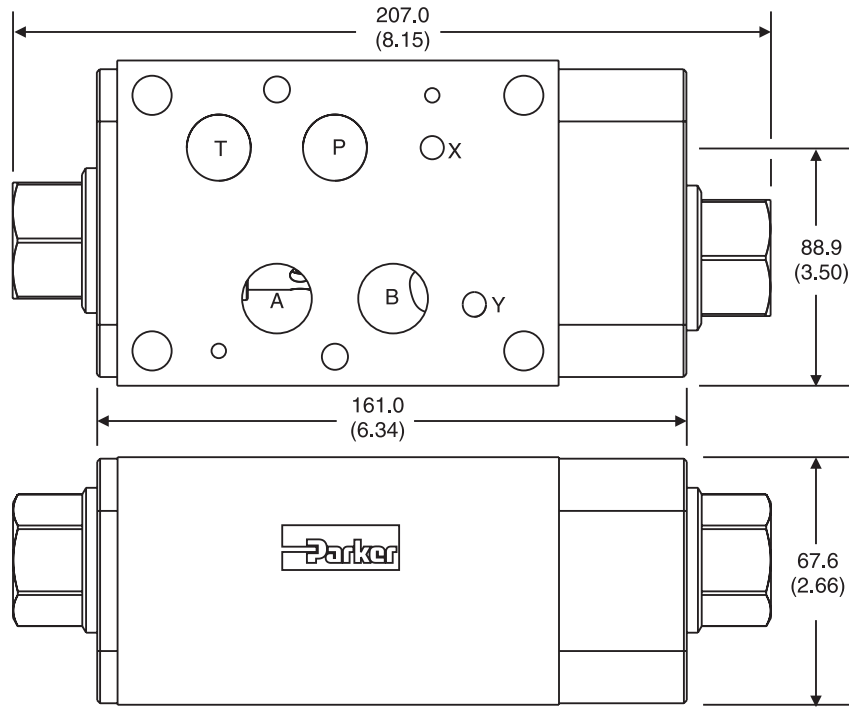
**RG05BA** – Inch equivalents for millimeter dimensions are shown in (\*\*)





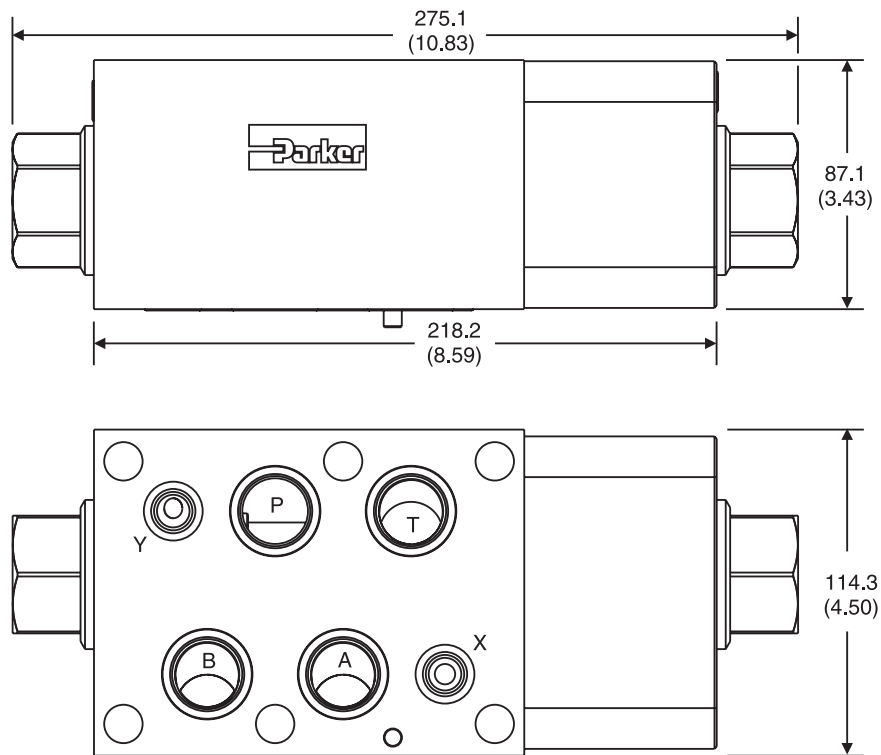
**RG07BA** – Inch equivalents for millimeter dimensions are shown in (\*\*)

**Note:** This is a top view.



**B**

**RG08BA** – Inch equivalents for millimeter dimensions are shown in (\*\*)



## General Description

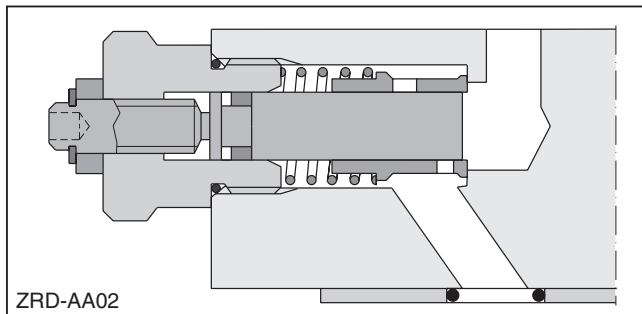
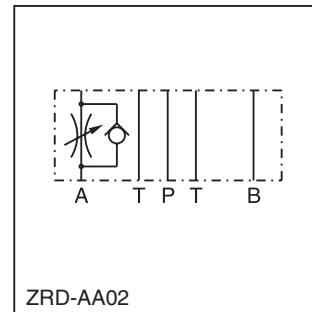
Series ZRD throttle check valves are designed for maximum flow rates.

The throttle check function can be located in port A or B as well as in A + B. Meter-in or meter-out functionality can be selected by model code.

A low flow / high resolution version in NFPA 03 / NG6 for sensitive shifting time adjustment of pilot operated directional control valves is available on request.

## Features

- High flow capacity.
- Various functional arrangements.
- Sizes:
  - ZRD01 – NFPA D03 / NG6 / CETOP 3
  - ZRD02 – NFPA D05 / NG10 / CETOP 5



## Specifications

General		
<b>Size</b>	<b>NG6</b>	<b>NG10</b>
<b>Mounting</b>	DIN 24340 A6 ISO 4401 NFPA D03 CETOP RP 121	DIN 24340 A10 ISO 4401 NFPA D05 CETOP RP 121 5
<b>Mounting Position</b>	Unrestricted	
<b>Ambient Temperature</b>	-20°C to +50°C (-4°F to +122°F)	
Hydraulic		
<b>Max. Operating Pressure</b>	350 Bar (5075 PSI)	
<b>Nominal Flow</b>	80 LPM (21.2 GPM)	160 LPM (42.3 GPM)
<b>Leakage</b>	—	—
<b>Cracking Pressure</b>	—	—
<b>Fluid</b>	Hydraulic oil as per DIN 51524 ... 51525	
<b>Fluid Temperature</b>	-20°C to +80°C (-4°F to +176°F)	
<b>Viscosity</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU)	
<b>Permitted Recommended</b>	30 cSt / mm <sup>2</sup> /s (139 SSU)	
<b>Filtration</b>	ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)	

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**ZRD**  
 Throttle Valve  
 with Check

**Meter Option**

**Size**

**SO**  
 Hexagon  
 Screw with  
 Lock Nut

**D**  
 Design  
 Series

**Seal**

Code	Description
AA	Meter-out Control in A
AZ	Meter-in Control in A
BA	Meter-out Control in B
BZ	Meter-in Control in B
ABA	Meter-out Control in A and B
ABZ	Meter-in Control in A and B

Code	Description
01	NFPA D03 / NG6
02	NFPA D05 / NG10

Code	Description
1	Nitrile
5	Fluorocarbon

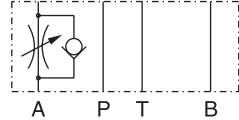


**Weight: 1 Cartridge**  
 ZRD\*01 1.2 kg (2.6 lbs)  
 ZRD\*02 2.8 kg (6.2 lbs.)

**2 Cartridges**  
 1.3 kg (2.9 lbs)  
 2.9 kg (6.4 lbs.)

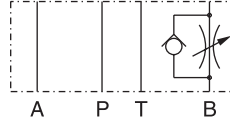
**ZRD01**

Meter-in control in A



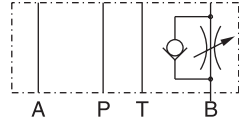
Series  
 ZRDAZ01S0D1

Meter-out control in B



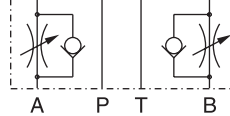
Series  
 ZRDBA01S0D1

Meter-in control in B



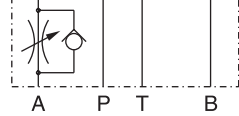
Series  
 ZRDBZ01S0D1

Meter-in control in A and B



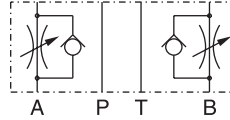
Series  
 ZRDABZ01S0D1

Meter-out control in A



Series  
 ZRDAA01S0D1

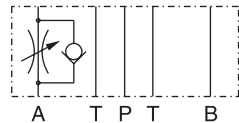
Meter-out control in A and B



Series  
 ZRDABA01S0D1

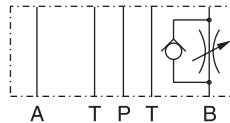
**ZRD02**

Meter-in control in A



Series  
 ZRDAZ02S0D1

Meter-out control in B



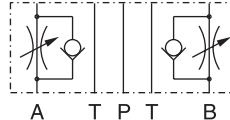
Series  
 ZRDBA02S0D1

Meter-in control in B



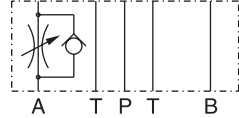
Series  
 ZRDBZ02S0D1

Meter-in control in A and B



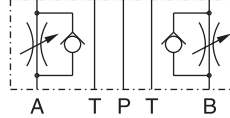
Series  
 ZRDABZ02S0D1

Meter-out control in A



Series  
 ZRDAA02S0D1

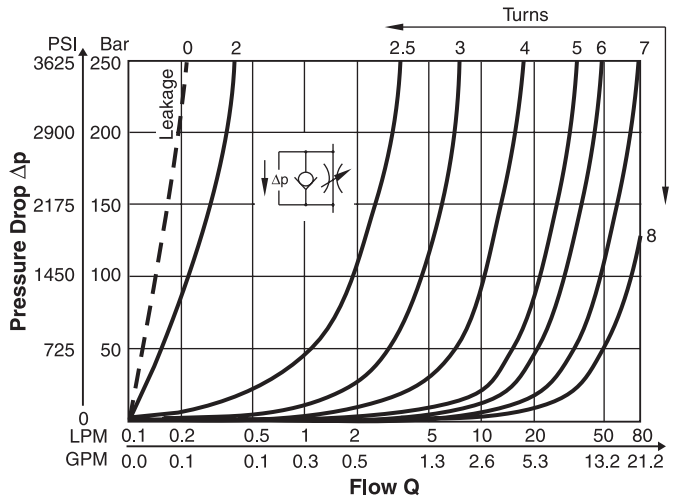
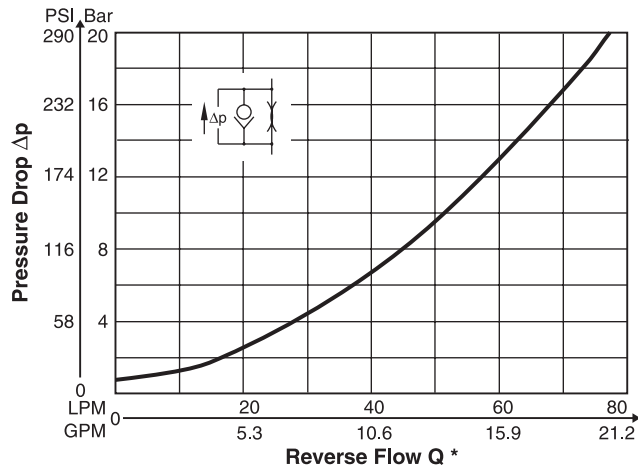
Meter-out control in A and B



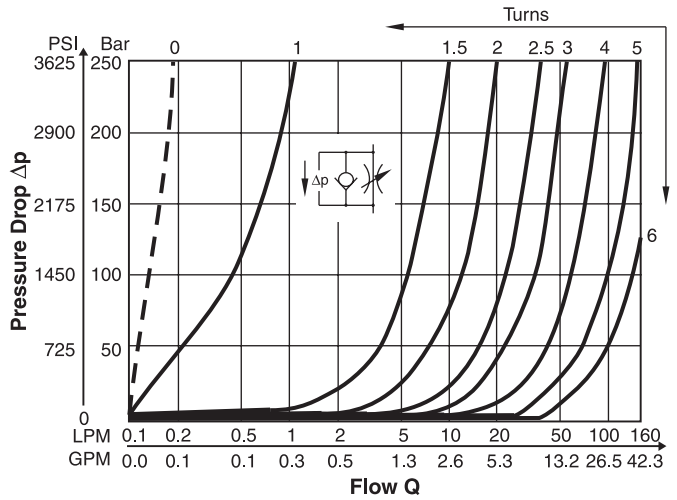
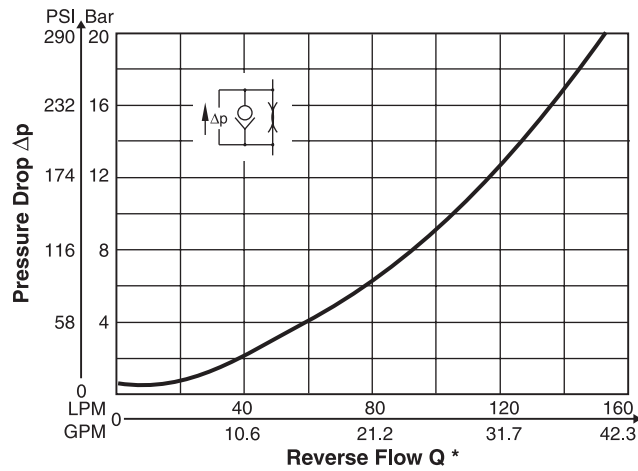
Series  
 ZRDABA02S0D1

**p/Q Performance Curves**

**ZRD01**



**ZRD02**

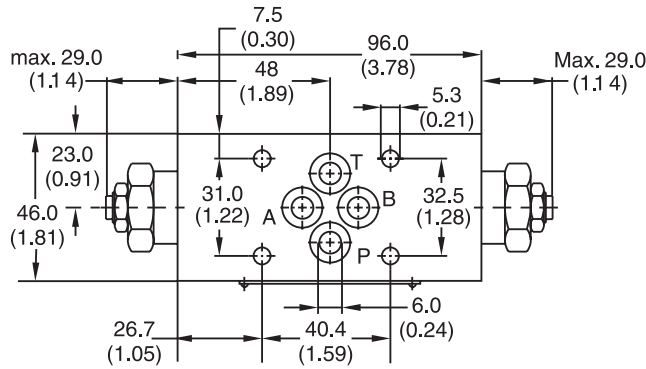


\* Throttle closed

Fluid Viscosity 30 cSt @ 50°C (122°F)

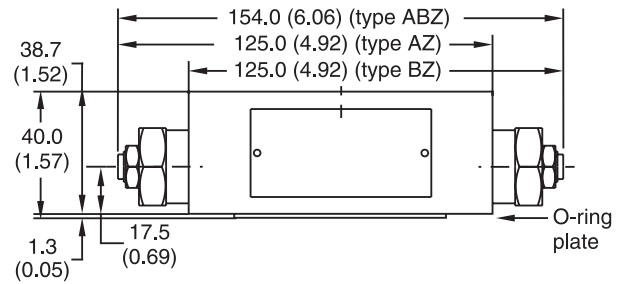
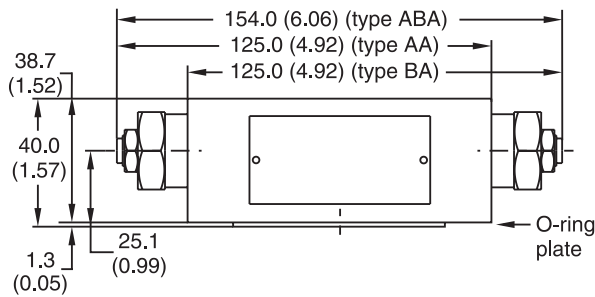
**ZRD01**

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



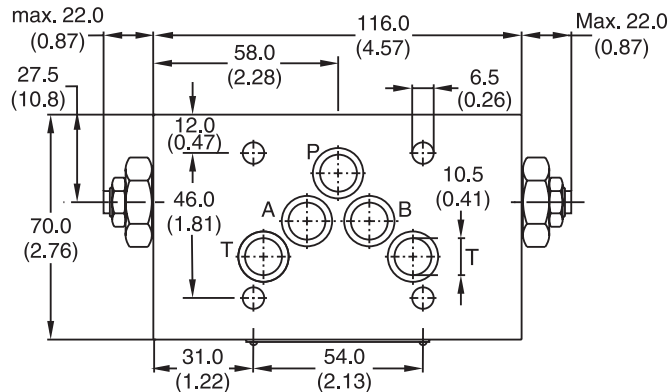
Seal Kit	
Seal	Order Code
1	098-91096-0
5	098-91097-0
Complete Cartridge	
Order Code	
098-91119-0	
O-ring Plate	
Order Code	
S26-27553-0	

**B**

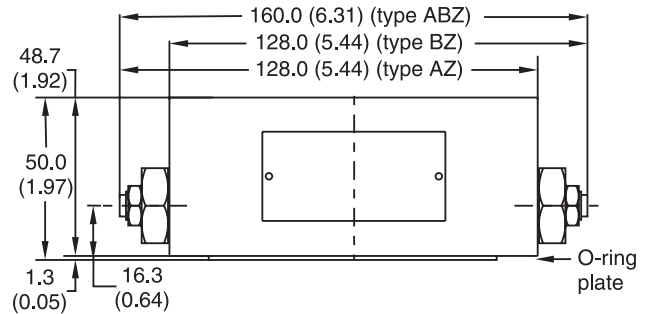
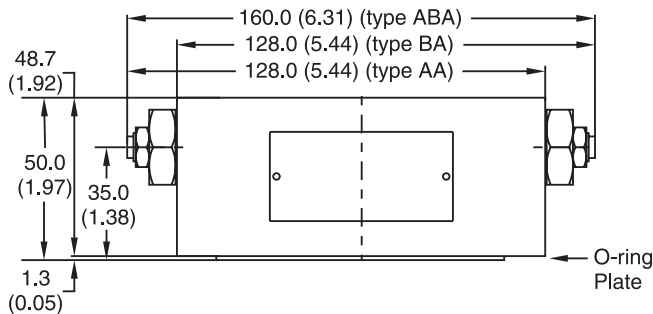


**ZRD02**

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



Seal Kit	
Seal	Order Code
1	098-91098-0
5	098-91099-0
Complete Cartridge	
Order Code	
098-91120-0	
O-ring Plate	
Order Code	
S16-85742-0	



**General Description.**

Series ZRE pilot operated check valves are designed for maximum flow rates and long life time.

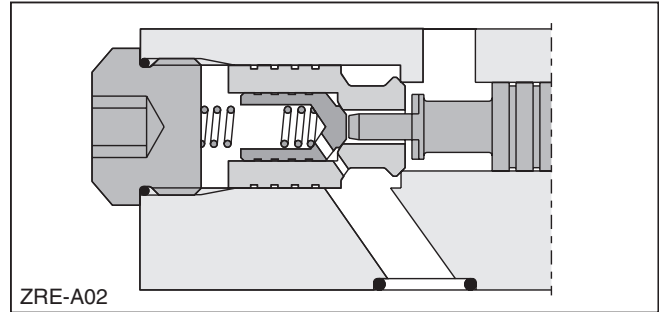
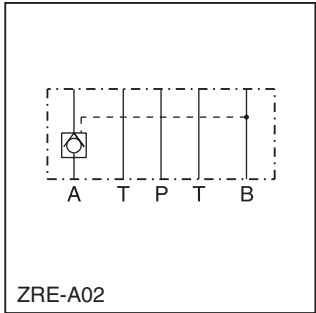
The valves are typically used in combination with spool type directional control valves to ensure leak free positioning of the actuator.

The inlet flow is free while the outlet flow is blocked. Pressure in the inlet line opens the check valve and allows free outlet flow.

**B**

**Features**

- High life time.
- Check function in A, B or A + B.
- Sizes:
  - ZRE01 – NFPA D03 / NG6 / CETOP 3
  - ZRE02 – NFPA D05 / NG10 / CETOP 5

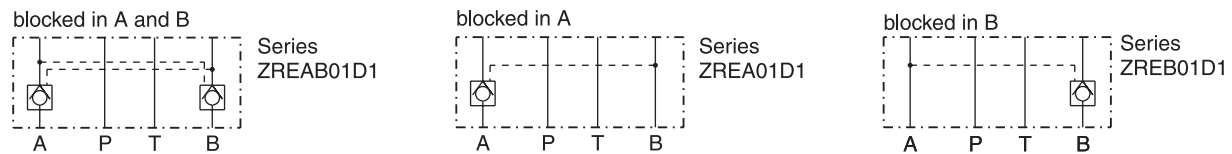


**Ordering Information**

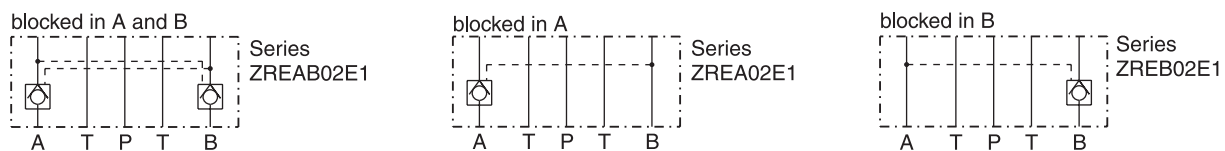
<b>ZRE</b>	□	□	□	□																										
Pilot Operated Check Valve	Port Option	Size	Design Series	Seal																										
<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Blocked in A</td> </tr> <tr> <td>B</td> <td>Blocked in B</td> </tr> <tr> <td>AB</td> <td>Blocked in A and B</td> </tr> </tbody> </table>	Code	Description	A	Blocked in A	B	Blocked in B	AB	Blocked in A and B	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>NFPA D03 / NG6</td> </tr> <tr> <td>02</td> <td>NFPA D05 / NG10</td> </tr> </tbody> </table>	Code	Description	01	NFPA D03 / NG6	02	NFPA D05 / NG10	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>D</td> <td>Size 01</td> </tr> <tr> <td>E</td> <td>Size 02</td> </tr> </tbody> </table>	Code	Description	D	Size 01	E	Size 02	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Nitrile</td> </tr> <tr> <td>5</td> <td>Fluorocarbon</td> </tr> </tbody> </table>	Code	Description	1	Nitrile	5	Fluorocarbon	
Code	Description																													
A	Blocked in A																													
B	Blocked in B																													
AB	Blocked in A and B																													
Code	Description																													
01	NFPA D03 / NG6																													
02	NFPA D05 / NG10																													
Code	Description																													
D	Size 01																													
E	Size 02																													
Code	Description																													
1	Nitrile																													
5	Fluorocarbon																													

**Weight:**  
 ZRE\*01 1.2 kg (2.6 lbs)  
 ZRE\*02 3.1 kg (6.8 lbs.)

**ZRE01**



**ZRE02**



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Specifications**

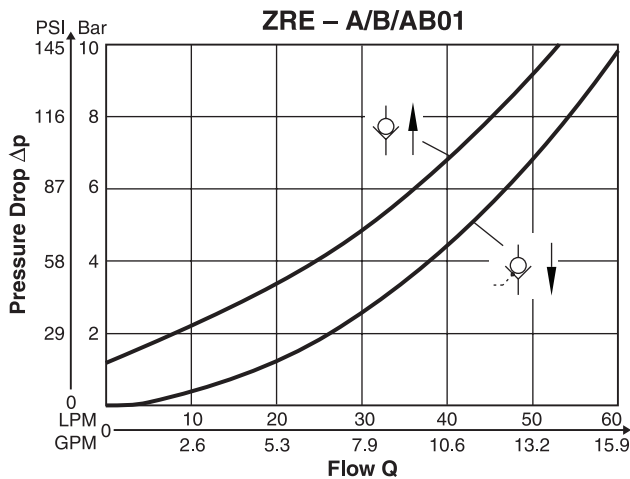
General		
<b>Size</b>	<b>NG6</b>	<b>NG10</b>
<b>Mounting Interface</b>	DIN 24340 A6 ISO 4401 NFFA D03 CETOP RP 121	DIN 24340 A10 ISO 4401 NFFA D05 CETOP RP 121 5
<b>Mounting Position</b>	Unrestricted	
<b>Ambient Temperature</b>	-20°C to +50°C (-4°F to +122°F)	
Hydraulic		
<b>Max. Operating Pressure</b>	350 Bar (5075 PSI)	
<b>Nominal Flow</b>	60 LPM (15.9 GPM)	120 LPM (31.7 GPM)
<b>Opening Ratio (Pilot Cone/Main Cone)</b>	1:6	1:6
<b>Cracking Pressure</b>	1.2 Bar (17.4 PSI)	2.0 Bar (29.0 PSI)
<b>Fluid</b>	Hydraulic oil in accordance with DIN 51524 ... 51525	
<b>Fluid Temperature</b>	-20°C to +80°C (-4°F to +176°F)	
<b>Viscosity</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU)	
<b>Permitted</b>	30 cSt / mm <sup>2</sup> /s (139 SSU)	
<b>Recommended</b>		
<b>Filtration</b>	ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)	

**B**

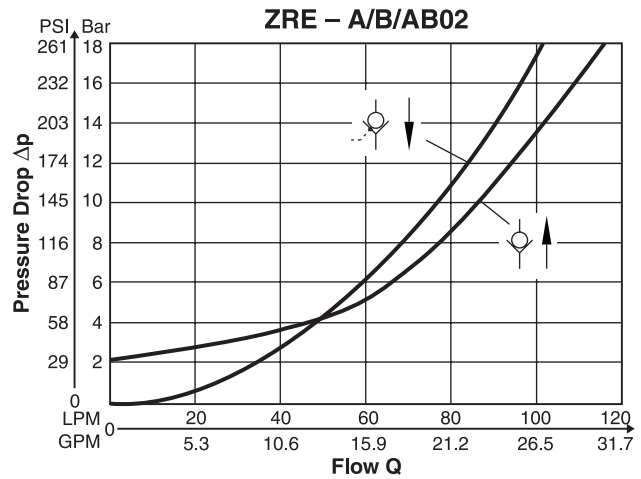
**Performance Curves**

**p/Q**

**ZRE01**



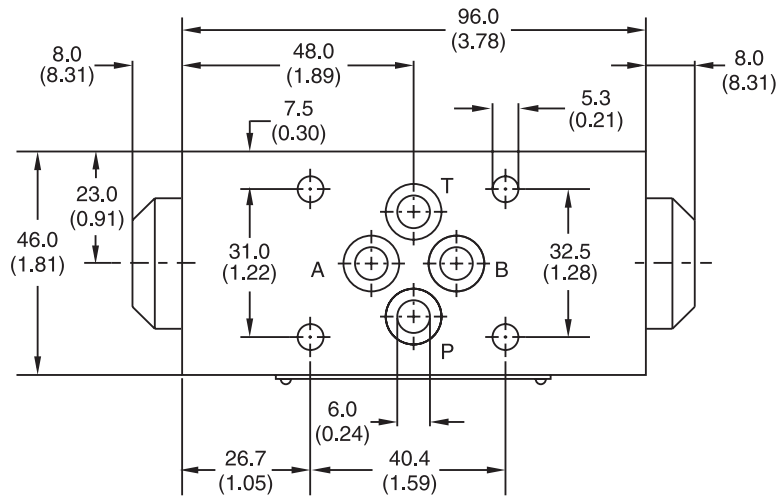
**ZRE02**



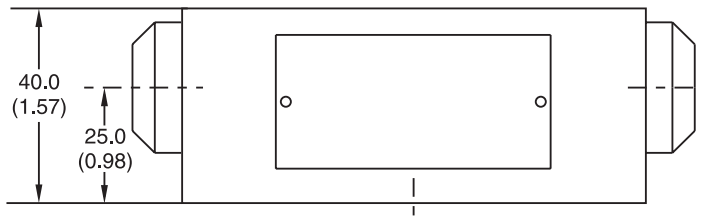
Fluid Viscosity 30 cSt at 50°C (122°F).

**ZRE01**

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

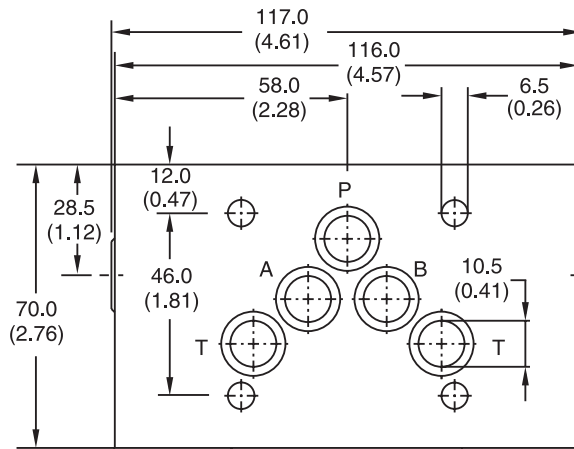


Seal Kit	
Seal	Order Code
1	098-91088-0
5	098-91089-0

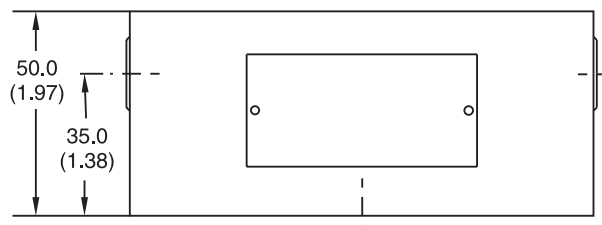


**ZRE02**

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



Seal Kit	
Seal	Order Code
1	098-91090-0
5	098-91091-0





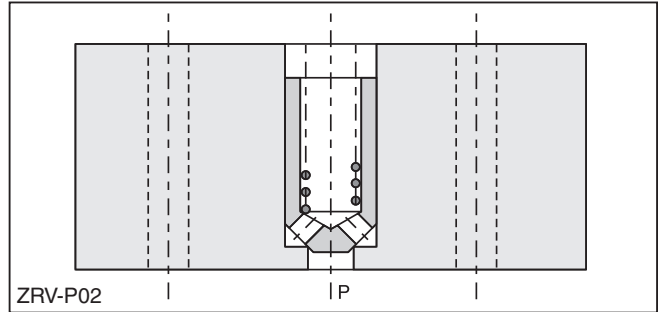
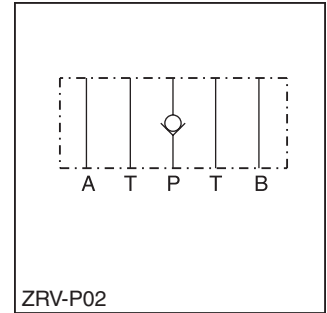
**General Description**

Series ZRV direct operated check valves have a cartridge type insert to provide zero leakage and high life time.

The check function can be located in the P-port or in the T-port.

**Features**

- Leakage-free seat.
- High life time.
- Cracking pressure 0.5 Bar (7.25 PSI).
- Sizes:
  - ZRV01 – NFPA D03 / NG6 / CETOP 3
  - ZRV02 – NFPA D05 / NG10 / CETOP 5



**B**

**Ordering Information**

**ZRV**  
 Direct Operated  
 Check Valve

Port  
 Option

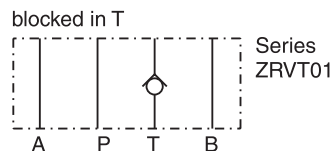
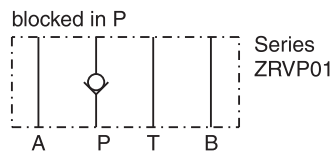
Size

Code	Description
P	Blocked in P
T	Blocked in T

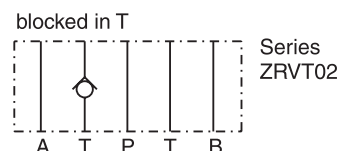
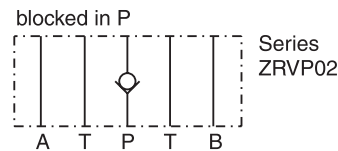
Code	Description
01	NFPA D03 / NG6
02	NFPA D05 / NG10

**Weight:**  
 ZRV\*01 0.7 kg (1.5 lbs)  
 ZRV\*02 2.0 kg (4.4 lbs.)

**ZRV01**



**ZRV02**



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

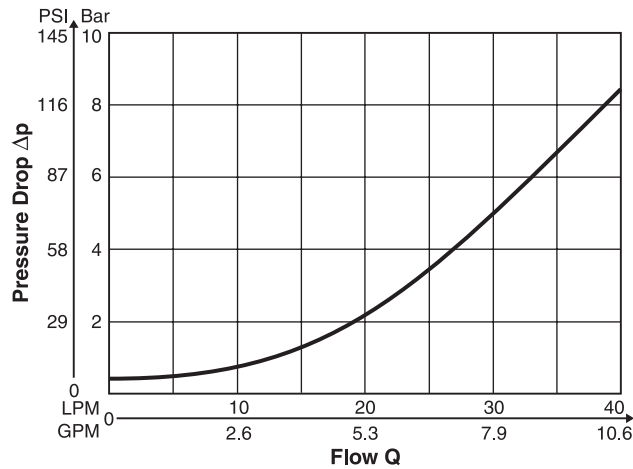
**Specifications**

**B**

General		
<b>Size</b>	<b>NG6</b>	<b>NG10</b>
<b>Mounting Interface</b>	DIN 24340 A6 ISO 4401 NFFPA D03 CETOP RP 121	DIN 24340 A10 ISO 4401 NFFPA D05 CETOP RP 121 5
<b>Mounting Position</b>	Unrestricted	
<b>Ambient Temperature</b>	-20°C to +50°C (-4°F to +122°F)	
Hydraulic		
<b>Max. Operating Pressure</b>	350 Bar (5075 PSI)	
<b>Nominal Flow</b>	40 LPM (10.6 GPM)	100 LPM (26.5 GPM)
<b>Cracking Pressure</b>	0.5 Bar (7.25 PSI)	0.5 Bar (7.25 PSI)
<b>Fluid</b>	Hydraulic oil as per DIN 51524 ... 51525	
<b>Fluid Temperature</b>	-20°C to +80°C (-4°F to +176°F)	
<b>Viscosity</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU)	
<b>Permitted</b>	30 cSt / mm <sup>2</sup> /s (139 SSU)	
<b>Recommended</b>		
<b>Filtration</b>	ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)	

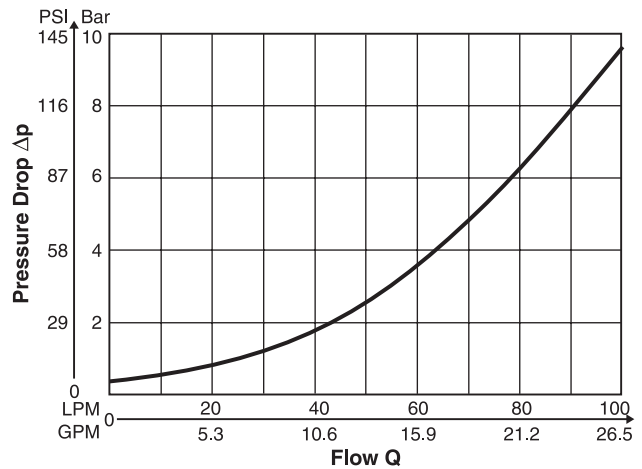
**p/Q Performance Curves**

**ZRV P/T01**



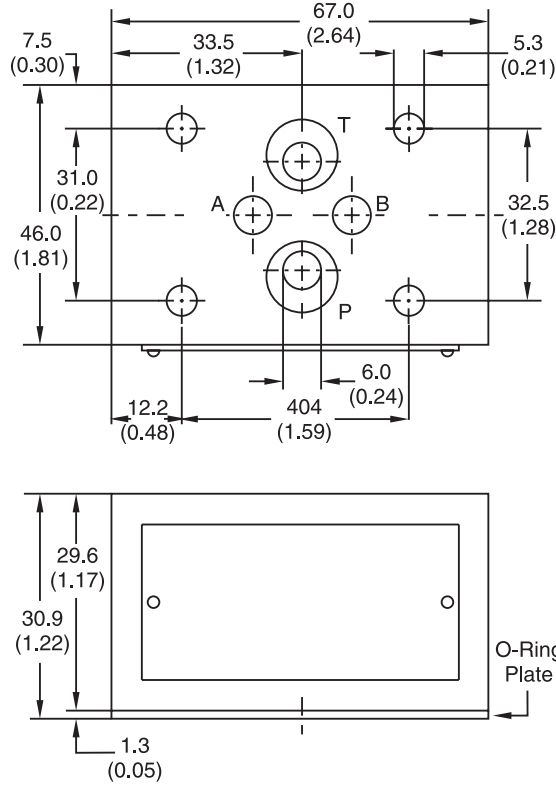
Fluid Viscosity 30 cSt at 50°C (122°F)

**ZRV P/T02**



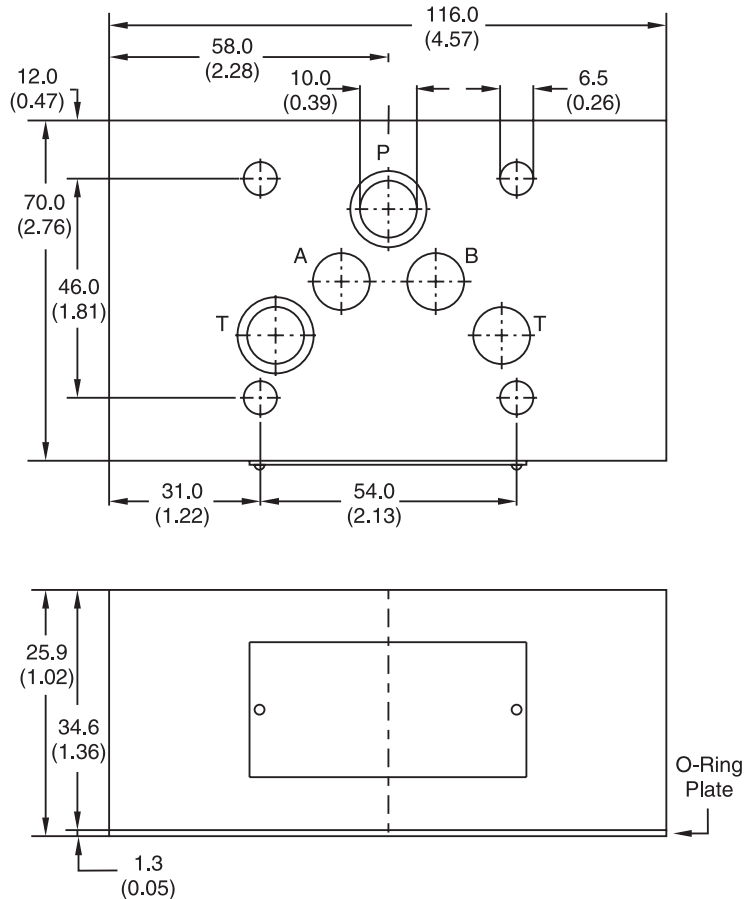
Fluid Viscosity 30 cSt at 50°C (122°F)

**ZRV01** – Inch equivalents for millimeter dimensions are shown in (\*\*)



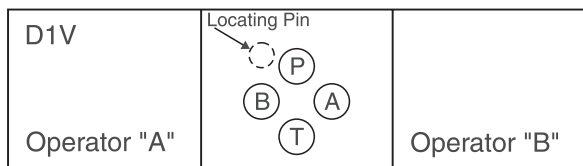
**B**

**ZRV02** – Inch equivalents for millimeter dimensions are shown in (\*\*)



**B****CAUTION:****Sandwich Installation**

Prior to installation of Sandwich valves, please review flow paths. Due to the reversibility of the DO3 size, incorrect installation will alter the hydraulic circuit. Care must be taken during installation to insure that the Sandwich is installed in compliance with the hydraulic schematic. Please consult with your Parker representative with any questions that may arise.

**Pressure Ratings**

Unless otherwise specified, all Parker Sandwich valves have continuous duty pressure rating as shown in this catalog.

**Special Requirements**

Consult your Parker representative for factory recommendations on such situations as:

- Installations that will operate at pressures higher than published catalog ratings.
- Use of hydraulic fluids which do not meet our recommended specifications.
- Operations where fluid temperature will exceed 121°C (250°F).

**Recommended Mounting Surface**

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

**System Cleanliness**

Any hydraulic system that includes Parker valves should be carefully protected against dirt and fluid contamination. Life of the valves, as well as of all other components, will be greatly lengthened. Operation will be smoother and more precise. Maintenance and repairs will be reduced. Lost production because of low pressure and flow will be minimized. Fluid contamination should be maintained to less than 500 particles larger than 10 micrometers per milliliter of fluid (SAE class 4 or better/ISO Code 16/13).

**Hydraulic Fluids**

Parker recommends using top-quality hydraulic fluids having a viscosity range of 32 to 54 cSt (150 to 250 SSU) at 38°C (100°F). The absolute viscosity range should be 16 to 220 cSt (80 to 1000 SSU). Fluids should have highest anti-wear characteristics and be treated to avoid rust and oxidation.

**Seals**

When used with water-glycol, water/oil emulsions, and high-grade petroleum base hydraulic fluids, Parker standard nitrile seals are suitable.

When using phosphate ester fluids or their blends, specify Parker optional seals made of fluorocarbon. Synthetic fire-resistant fluids require special seal materials which your Parker representative can recommend.

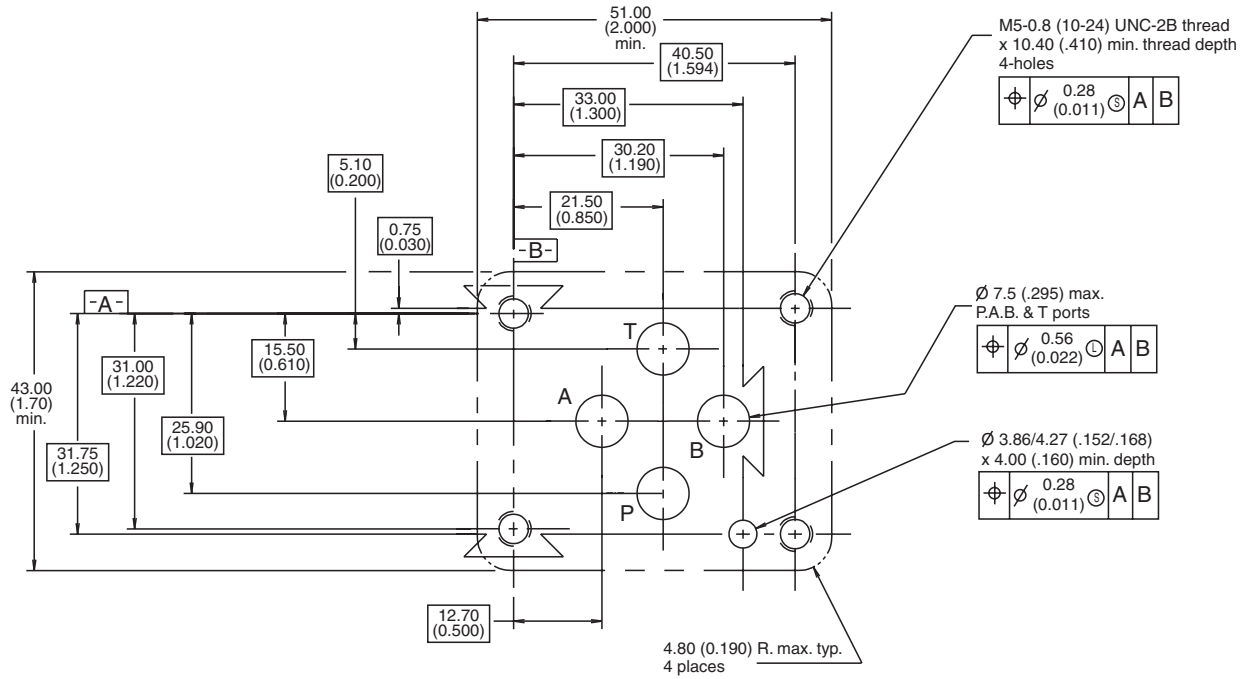
**Torque Specifications**

The recommended torque valves are for the bolts which mount the valve to the manifold or subplate are as follows:

Size	Torque Valve
D03	5.7 N.m. (50 in.-lbs.)
D05	16.3 N.m. (12 ft.-lbs.)
D07	63.0 N.m. (46.5 ft.-lbs.)
D08	108.5 N.m. (80 ft.-lbs.)

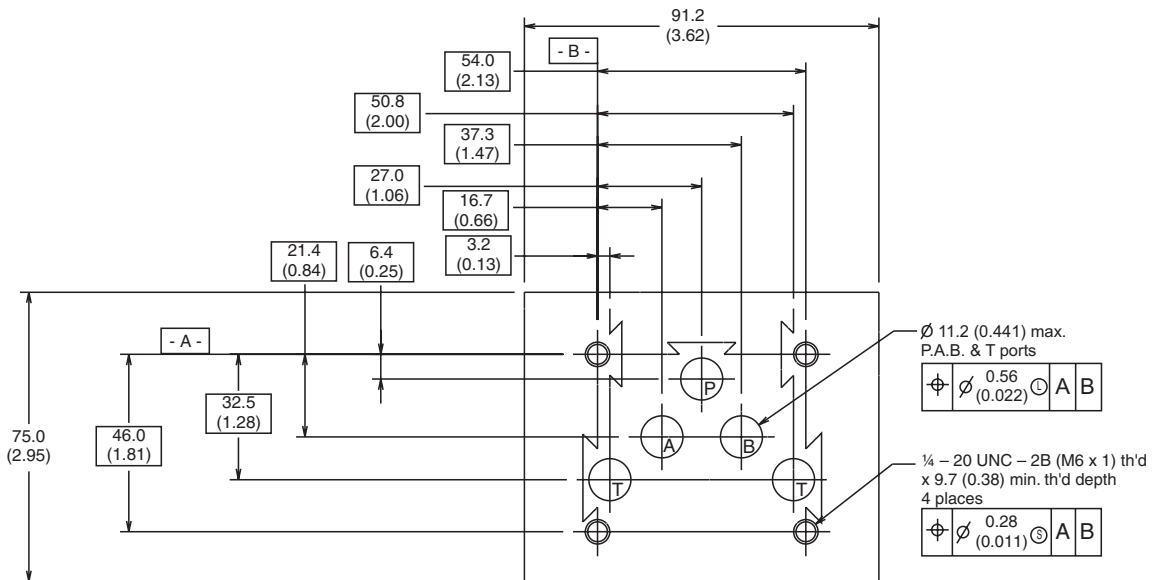
**Mounting Pattern – NFPA D03, CETOP 3 & NG6**

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



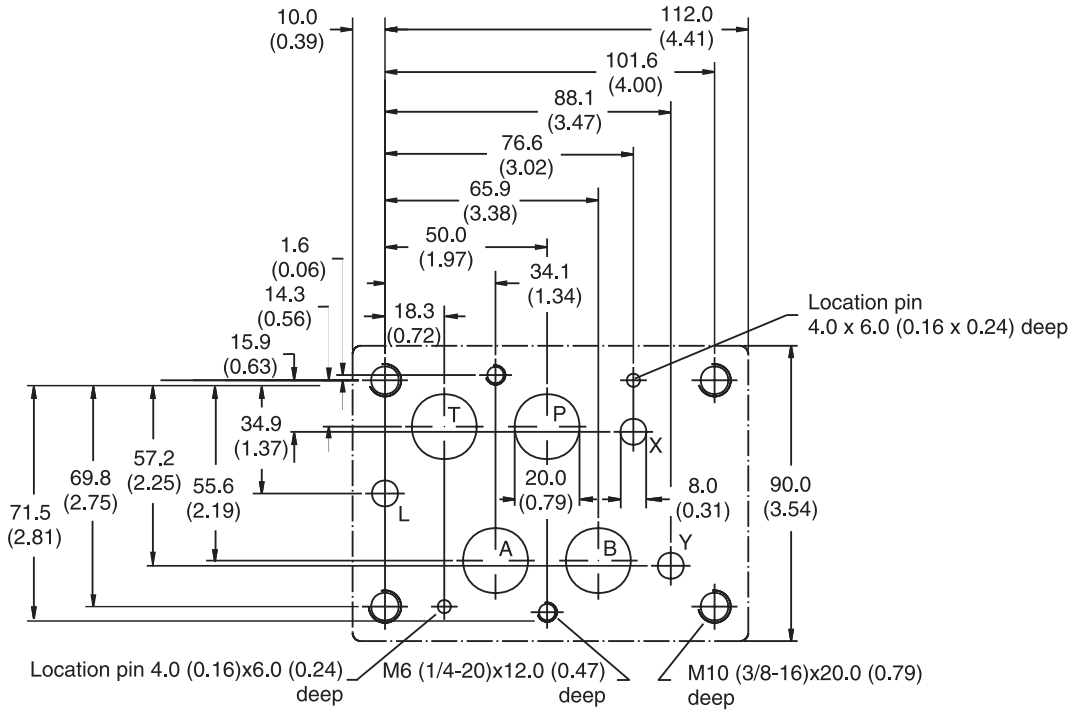
**Mounting Pattern – NFPA D05, CETOP 5 & NG10**

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



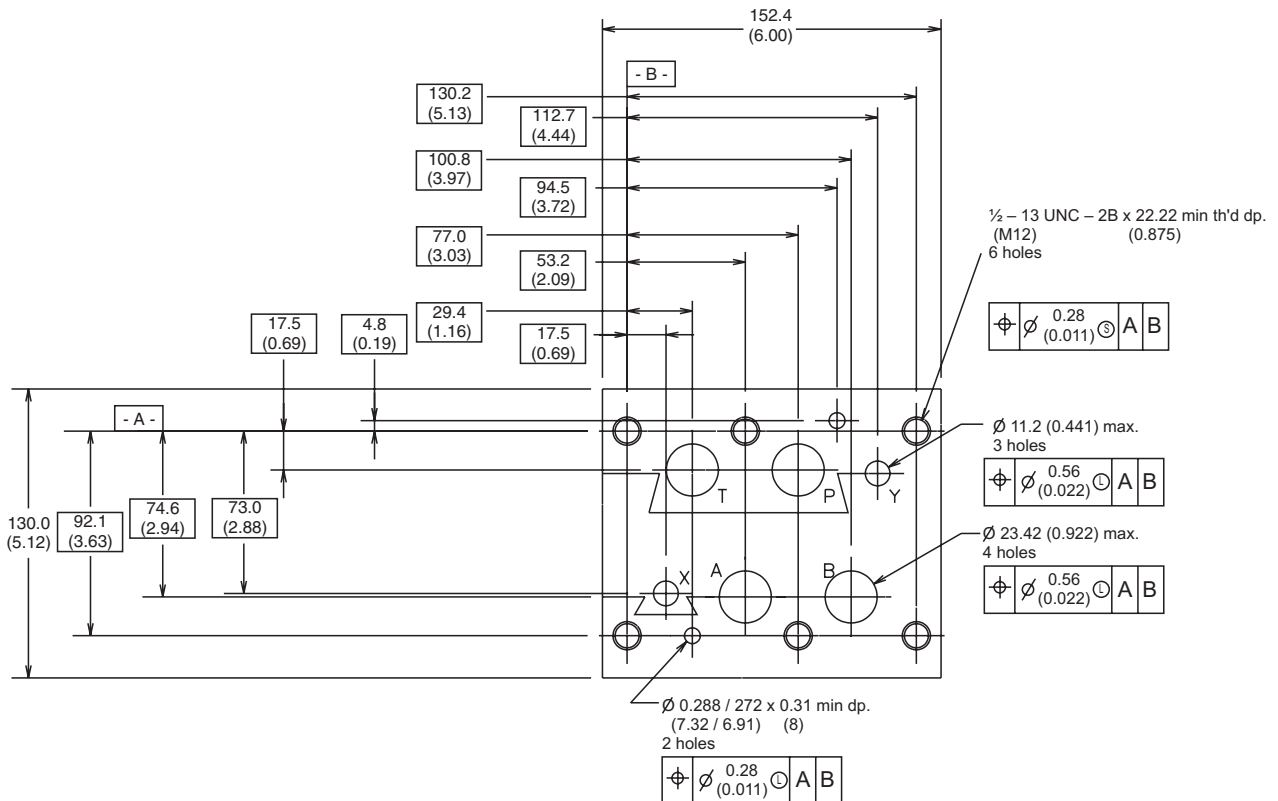
**Mounting Pattern – NFPA D07, CETOP 7 & NG16**

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



**Mounting Pattern – NFPA D08, CETOP 8 & NG25**

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



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    U1 ..... C38

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**General Description**

Series D1V directional control valve subplates provide easy transition from NFPA and CETOP mounting patterns to common plumbing connections. Five different thread types are available for use in any application.

Manifolds provide a single location to mount several valves in a compact and manageable array for operating multiple machines or functions.

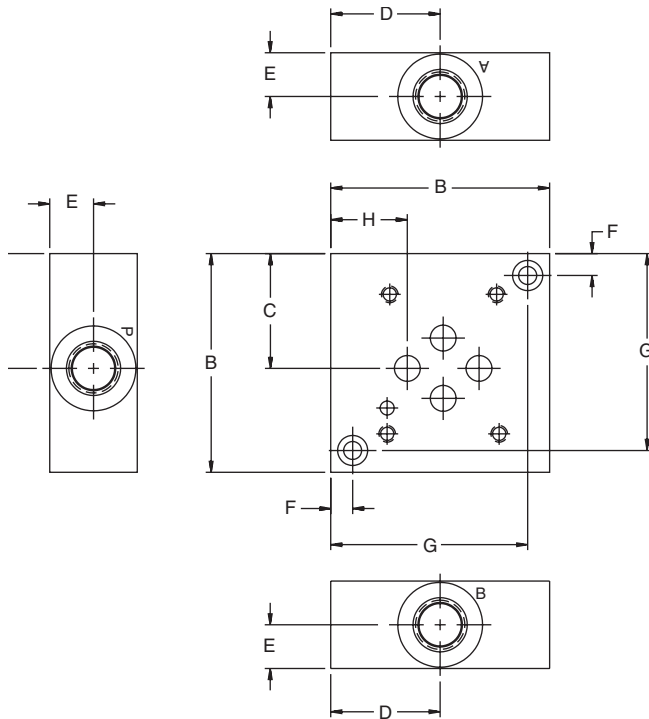
**C**

**Features**

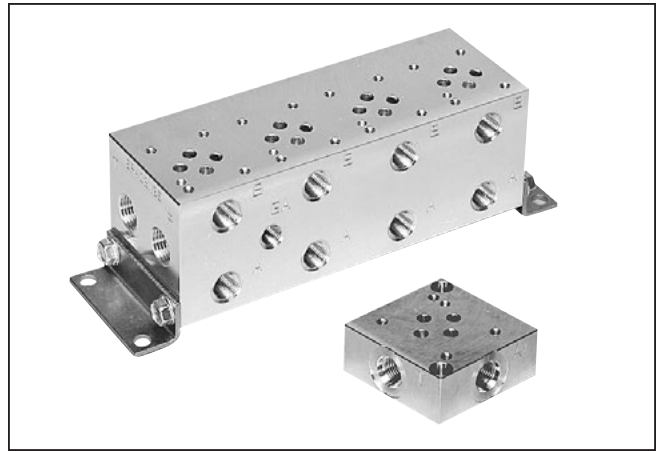
- **Aluminum or steel available** — Flexibility for applying to different system pressures
- **NPT and SAE thread options available** — Flexibility to plumb into existing systems
- **Multiple port sizes available** — Eliminates need for reducers and expanders at subplate connection

**Side Ported Subplate — NFPA D03**

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



See Mounting Bolt Kits for bolt information.



**Operation**

Series D1V subplates and manifolds consist of an NFPA valve mounting surface and corresponding connections for each valve port. Various port sizes and thread type are available. Cover plates, crossover and tapping plates are also available.



Port Size	A	B	C	D	E	F	G	H
2*	25.4 (1.00)	63.5 (2.50)	33.3 (1.31)	31.8 (1.25)	12.7 (.50)	6.4 (.25)	57.2 (2.25)	22.4 (.88)
3*	25.4 (1.00)	63.5 (2.50)	33.3 (1.31)	31.8 (1.25)	12.7 (.50)	6.4 (.25)	57.2 (2.25)	22.4 (.88)
4*	38 (1.50)	88.9 (3.50)	46.0 (1.81)	45.2 (1.78)	19.1 (.75)	6.4 (.25)	82.5 (3.25)	35.1 (1.38)
6*	44.5 (1.75)	101.6 (4.00)	52.3 (2.06)	51.6 (2.03)	22.4 (.88)	9.7 (.38)	92.2 (3.63)	41.4 (1.63)

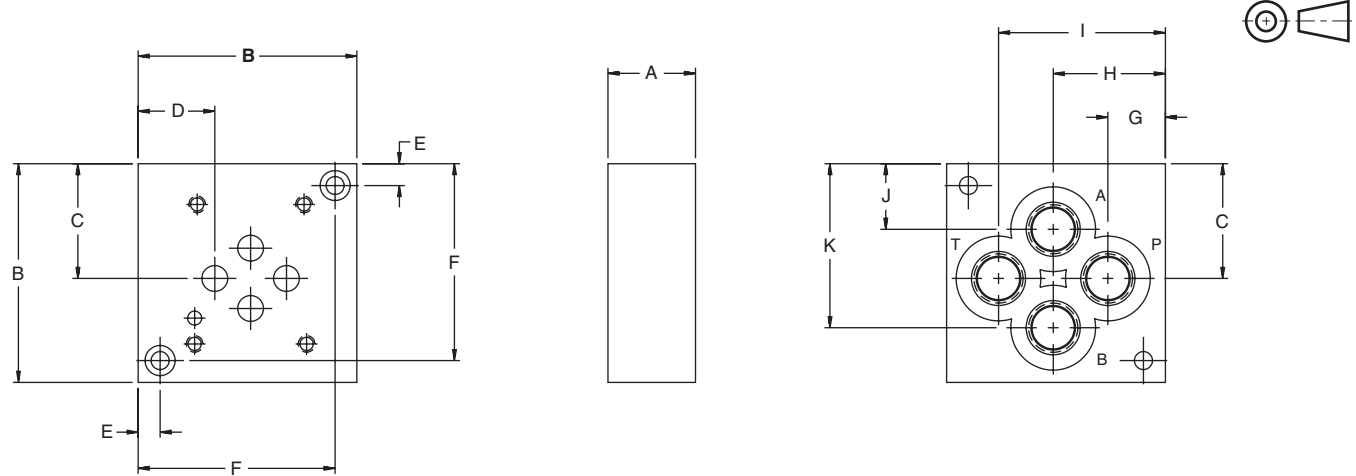
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**Series D1V**

**Bottom Ported Subplate — NFPA D03**

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



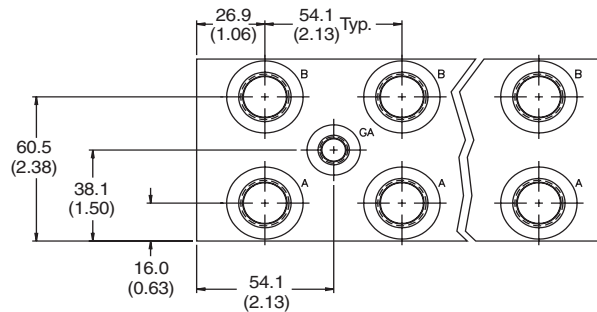
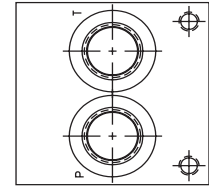
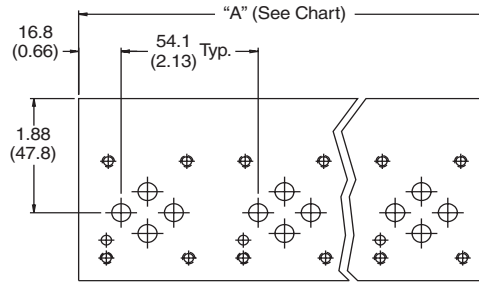
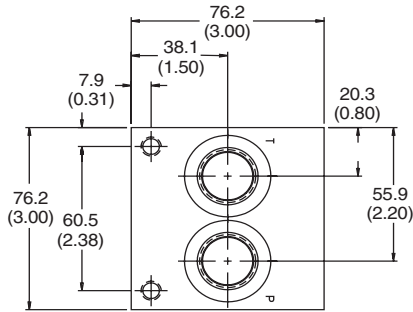
Port Size	A	B	C	D	E	F	G	H	I	J	K
2*	25.4 (1.00)	63.5 (2.50)	33.3 (1.31)	22.4 (.88)	6.4 (.25)	57.2 (2.25)	16.8 (.66)	32.5 (1.28)	48.5 (1.91)	19.1 (.75)	47.8 (1.88)
3*	25.4 (1.00)	63.5 (2.50)	33.3 (1.31)	22.4 (.88)	6.4 (.25)	57.2 (2.25)	15.0 (.59)	32.5 (1.28)	50.0 (1.97)	17.5 (.69)	49.3 (1.94)
4*	38.1 (1.50)	88.9 (3.50)	46.0 (1.81)	35.1 (1.38)	6.4 (.25)	82.6 (3.25)	17.5 (.69)	45.2 (1.78)	71.4 (2.81)	19.1 (.75)	71.4 (2.81)
6*	38.1 (1.50)	114.3 (4.50)	58.7 (2.31)	47.8 (1.88)	9.7 (.38)	104.9 (4.13)	23.9 (.94)	57.9 (2.28)	90.4 (3.56)	23.9 (.94)	90.4 (3.56)

See Mounting Bolt Kits for bolt information.

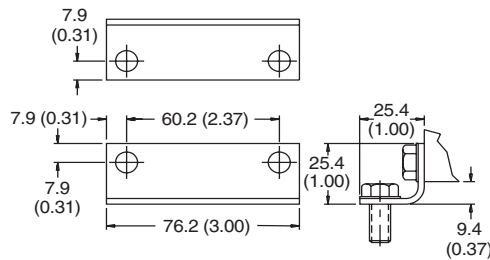


**Series D1V**  
**Manifold — NFPA D03**

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



Note: Gage port not available on single station manifold.

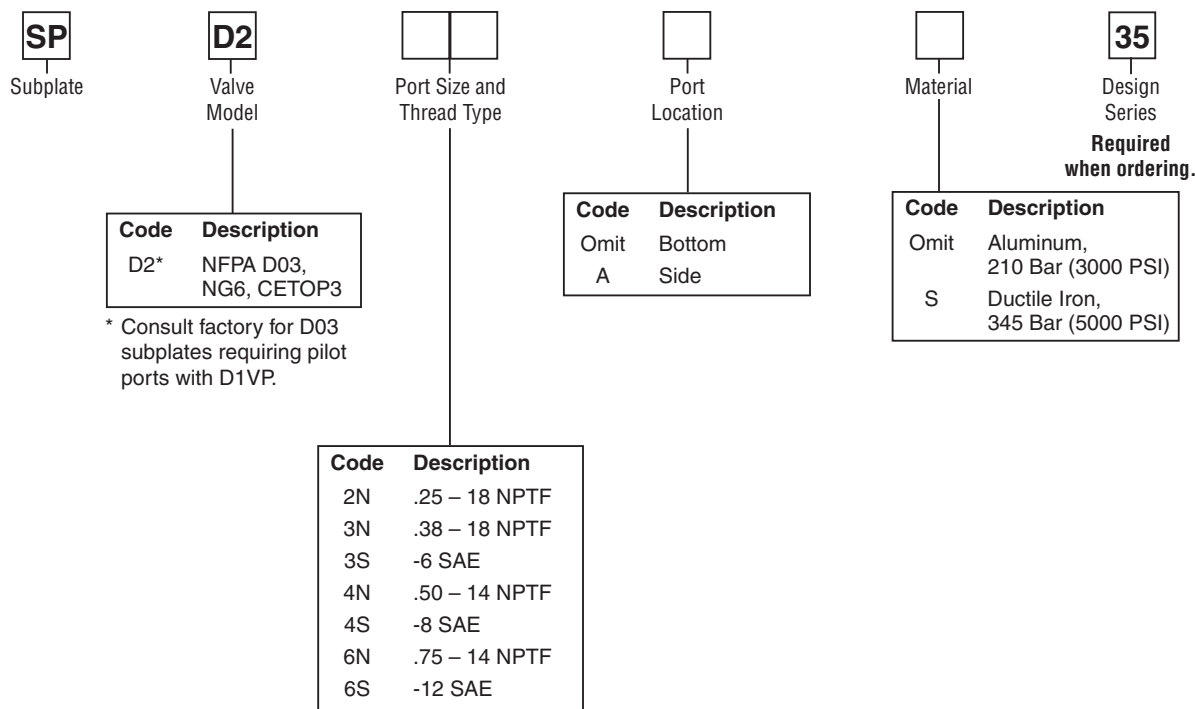


**Mounting Hardware**  
(See Ordering Information for Mounting Hardware details)

No. Stations	1	2	3	4	5	6	7	8
"A" Length mm (inch)	54.1 (2.13)	108.0 (4.25)	162.1 (6.38)	215.9 (8.50)	270.0 (10.63)	323.9 (12.75)	378.0 (14.88)	431.8 (17.00)
Wgt., Alum, kg (lbs.)	1.4 (3)	1.8 (4)	2.7 (6)	3.6 (8)	4.1 (9)	5.0 (11)	5.4 (12)	6.4 (14)
Wgt., Iron, kg (lbs.)	2.3 (5)	4.1 (9)	5.9 (13)	7.7 (17)	9.5 (21)	11.8 (26)	13.6 (30)	15.4 (34)

See Mounting Bolt Kits for bolt information.

**Series D1V Subplates**



**Note:** 35 Design Series subplates conform to NFFPA mounting pattern specifications, but may be dimensionally different from previous design series.

**Mounting Bolt Kits**

UNC Bolt Kits for use with D1V Directional Control Valves & Sandwich Valves (D1V*-91 Design, Solenoid Operated)					
	Number of Sandwich Valves @ 1.58" (40mm) thickness				
	0	1	2	3	4
D1V-91	BK209 1.25"	BK243 2.88"	BK225 4.38"	BK244 6.00"	BK245 7.50"
D1V-91 Plus Tapping Plate	BK176 2.25"	BK56 3.81"	BK212 5.38"	BK107 7.00"	BK106 8.50"

**Note:** All bolts are SAE grade 8, 10-24 UNC-2A thread, torque to 5.6 N.m. (50 in.-lbs.)

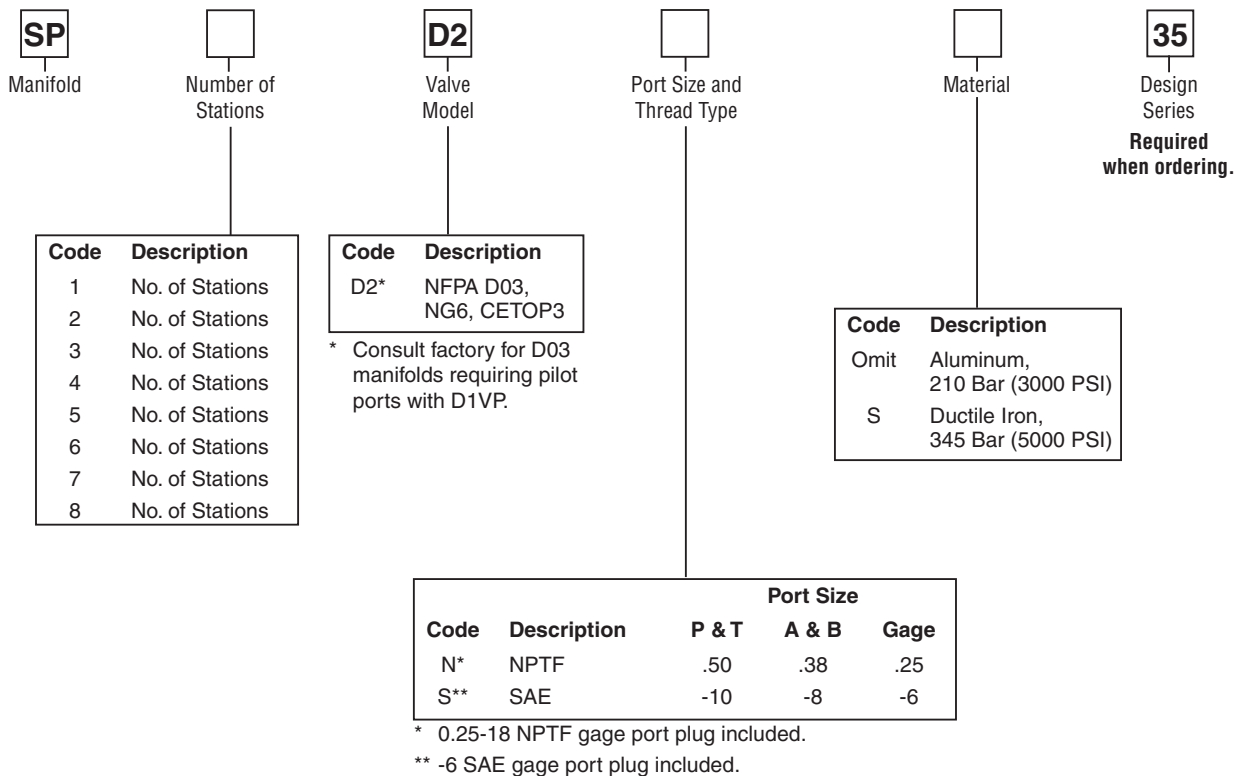
**Mounting Hardware**  
 supplied with subplate includes:

Subplates	Mounting Hardware	Qty.
SPD22N**	.25-20 UNC x	2
SPD23N**	.88 LG. SHCS	
SPD23S**		
SPD24N**	.25-20 UNC x	2
SPD24S**	1.5 LG. SHCS	
SPD26N*	.38-16 UNC x	2
SPD26S*	1.50 LG. SHCS	
SPD26NA*	.38-16 UNC x	2
SPD26SA*	1.75 LG. SHCS	

Valve mounting threads:  
 #10-24 UNC x 0.63 DP.  
 Used for SAE and NPTF ports.  
 Metric M5-0.8mm ISO 6H x 16 DP.  
 Used for BSPP, BSPT and ISO ports.



**Series D1V Manifolds**



**Note:** 35 Design Series manifolds conform to NFPA mounting pattern specifications, but may be dimensionally different from previous design series.

**Mounting Bolt Kits**

UNC Bolt Kits for use with D1V Directional Control Valves & Sandwich (D1V*-91 Design, Solenoid Operated)					
	Number of Sandwich @ 1.58" (40mm) thickness				
	0	1	2	3	4
D1V-91	BK209 1.25"	BK243 2.88"	BK225 4.38"	BK244 6.00"	BK245 7.50"
D1V-91 Plus Tapping Plate	BK176 2.25"	BK56 3.81"	BK212 5.38"	BK107 7.00"	BK106 8.50"

Mounting hardware supplied with manifold includes:  
 (2) steel brackets  
 For SAE and NPTF ports: (8) 5/16-18 UNC x .63 hex washer cap screws.  
 Valve mounting threads:  
 #10-24 UNC x 0.63 DP. Used for SAE and NPTF ports.

**Note:** All bolts are SAE grade 8, 10-24 UNC-2A thread, torque to 5.6 N.m. (50 in.-lbs.)

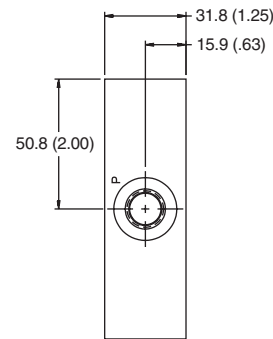
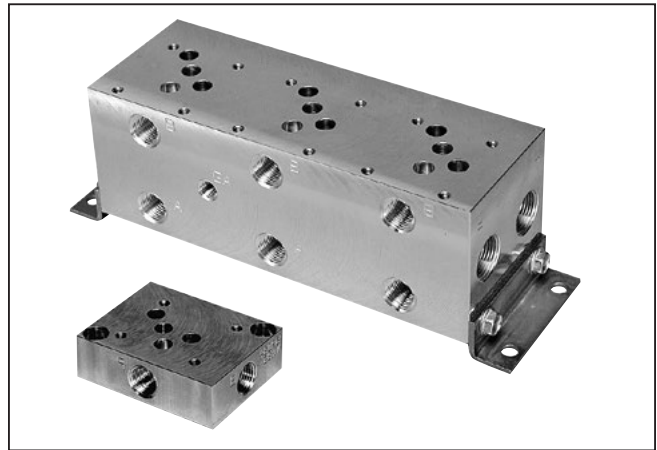
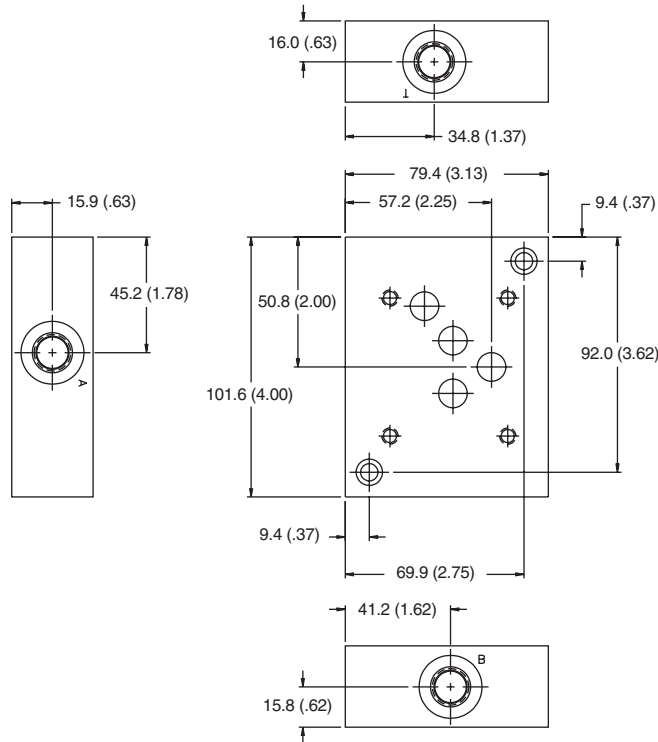
No. Stations	1	2	3	4	5	6	7	8
Wgt., Alum, kg (lbs.)	1.4 (3)	1.8 (4)	2.7 (6)	3.6 (8)	4.1 (9)	5.0 (11)	5.4 (12)	6.4 (14)
Wgt., Iron, kg (lbs.)	2.3 (5)	4.1 (9)	5.9 (13)	7.7 (17)	9.5 (21)	11.8 (26)	13.6 (30)	15.4 (34)

**Features**

- **Aluminum or steel available** — Flexibility for applying to different system pressures
- **NPT and SAE thread options available** — Flexibility to plumb into existing systems
- **Multiple port sizes available** — Eliminates need for reducers and expander at subplate connection

**Side Ported Subplate — NFPA D05**

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

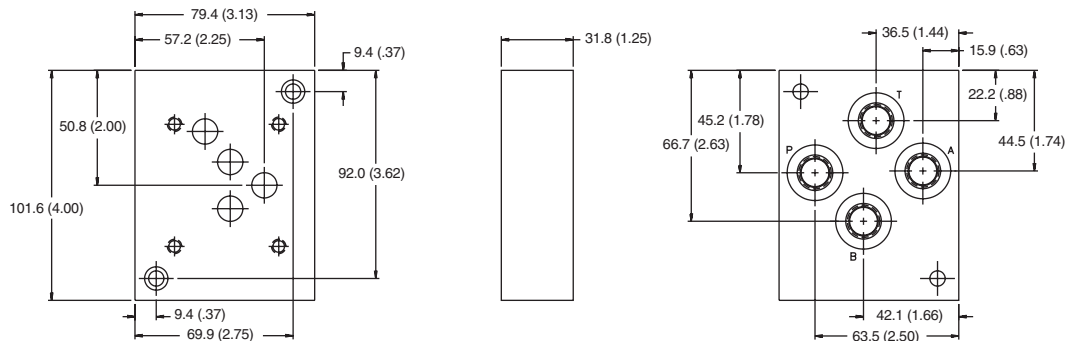


See Mounting Bolt Kits for bolt information.



**Bottom Ported Subplate — NFPA D05**

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



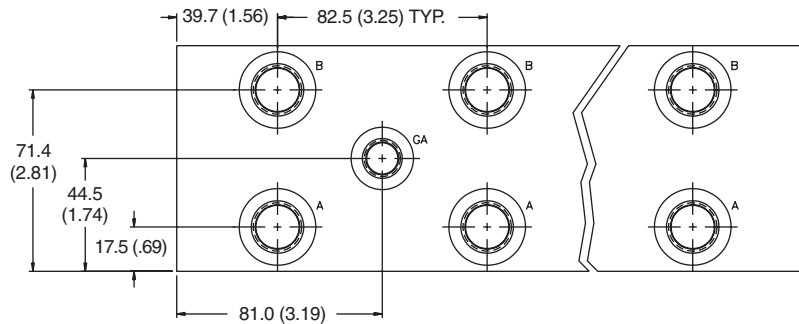
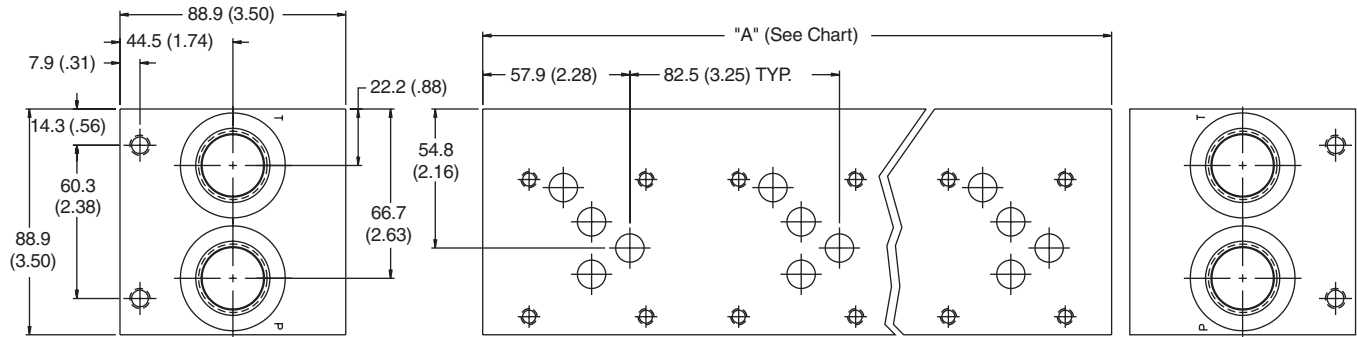
See Mounting Bolt Kits for bolt information.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

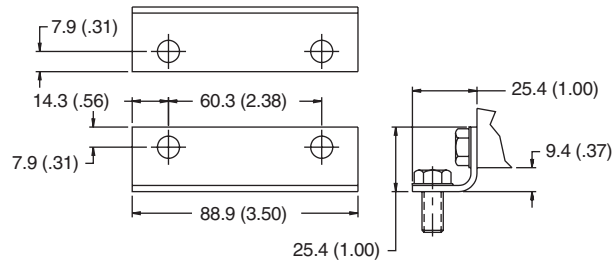
Series D3A, D3DW, D3L and D3W

Manifold — NFPA D05

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



Note: Gage port not available on single station manifold.



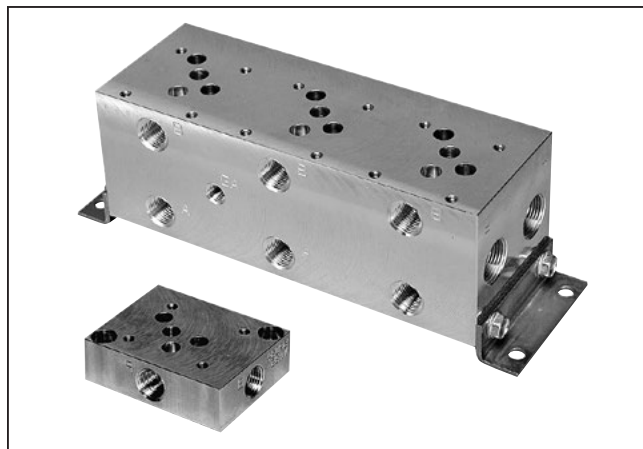
Mounting Hardware  
(See Ordering Information for Mounting Hardware details)

No. Stations	1	2	3	4	5	6
"A" Length, mm (in)	82.6 (3.25)	165.1 (6.50)	247.7 (9.75)	330.2 (13.00)	412.8 (16.25)	495.3 (19.50)
Weight, Alum. kg (lbs.)	1.8 (4)	3.6 (8)	5.0 (11)	6.4 (14)	7.9 (17)	9.6 (21)
Weight, Iron kg (lbs.)	4.1 (9)	7.7 (17)	11.8 (26)	15.4 (34)	20.1 (43)	23.3 (51)

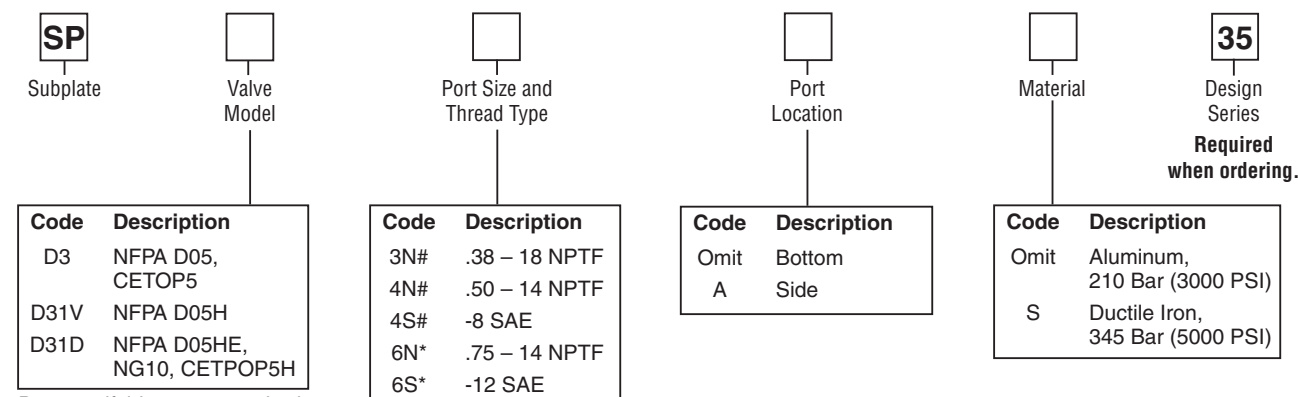
See Mounting Bolt Kits for bolt information.

### Features

- **Aluminum or steel available** — Flexibility for applying to different system pressures
- **NPT and SAE thread options available** — Flexibility to plumb into existing systems
- **Multiple port sizes available** — Eliminates need for reducers and expander at subplate connection
- **Parallel or series circuit applications** — Flexibility for different circuits



### Series D3 and D31 Subplates



D31 manifolds come standard with high flow capability. For flows over 20 GPM use D31V or D31D subplate. It will have X and Y ports.

# Sizes 3\* and 4\* ports available on SPD3 (NFPA D05) only.  
 \* Size 6\* port available on SPD31 (NFPA D05H and D05HE) only.

### Mounting Hardware supplied with subplate includes:

Subplates	Mounting Hardware	Qty.
SPD33N**	.38-16 UNC x	2
SPD34N**	1.25 LG. SHCS	
SPD34S**		
SPD31*6N**	.38-16 UNC x	2
SPD31*6S**	1.75 LG. SHCS	
SPD3H6N**		
SPD3H6S**		

Valve mounting threads:  
 0.25-20 UNC x 0.75 DP.  
 Used for SAE and NPTF ports.

**Note:** 35 Design Series subplates conform to NFPA mounting pattern specifications, but may be dimensionally different from previous design series.

### Mounting Bolt Kits

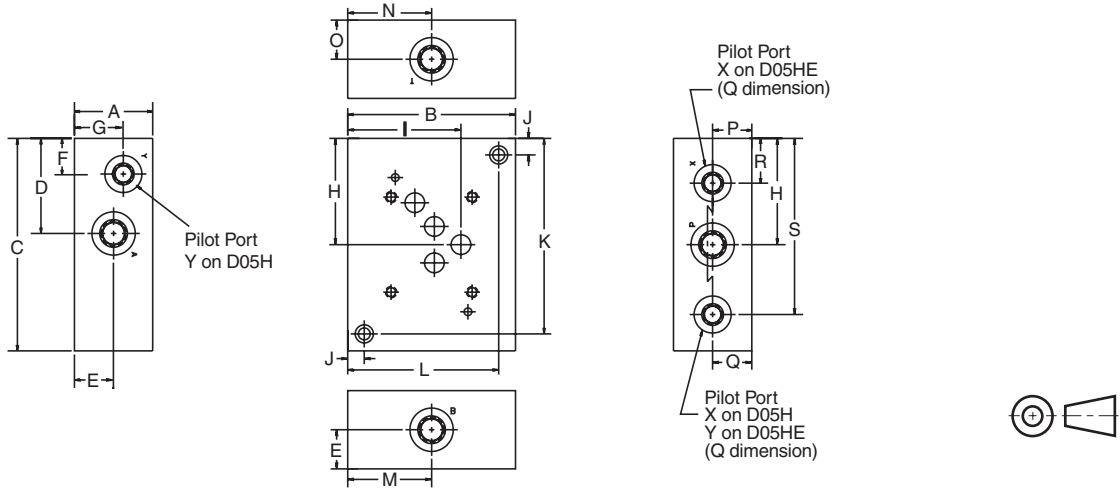
UNC Bolt Kits for use with D3W, D3, D31VW, D31DW Directional Control Valves & Sandwich Valves				
	Number of Sandwich Valves @2.00" (50mm) thickness			
	0	1	2	3
D3-32, D31VW-91, D31DW-91, D3P	BK98 1.625"	BK141 3.50"	BK142 5.50"	BK143 7.50"
D3-32, D31VW-91, D31DW-91, D3P plus tapping plate	BK166 2.50"	BK167 4.50"	BK168 6.50"	BK169 8.50"

**Note:** All bolts are SAE grade 8, 1/4-20 UNC-2A thread, torque to 16 N.m. (12 ft.-lbs.)

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Side Ported Subplate —**  
**NFPA D05, D05H and D05HE**

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



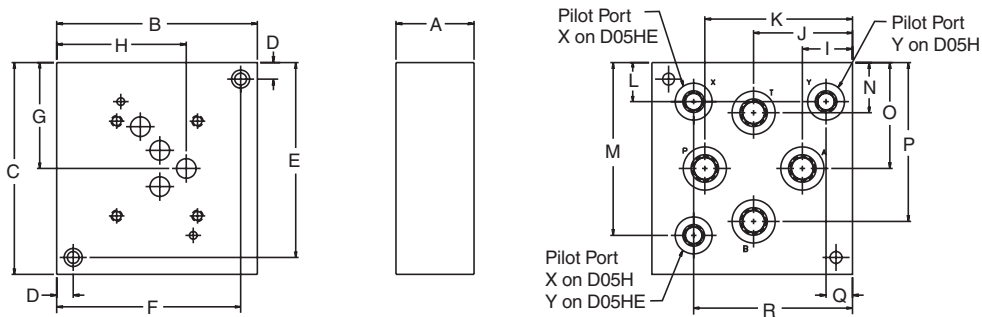
Dimensions	A	B	C	D	E	F*	G*	H	I	J	K	L	M	N	O	P	Q*	R*	S*
SPD31V**A*	44.5 (1.75)	95.3 (3.75)	120.7 (4.75)	54.1 (2.13)	22.4 (0.88)	20.6 (0.81)	22.4 (0.88)	60.2 (2.37)	64.3 (2.53)	9.7 (0.38)	111.0 (4.37)	85.9 (3.38)	47.8 (1.88)	47.8 (1.88)	22.4 (0.88)	22.4 (0.88)	22.4 (0.88)	—	100.1 (3.94)
SPD31D**A*	44.5 (1.75)	95.3 (3.75)	120.7 (4.75)	54.1 (2.13)	22.4 (0.88)	—	—	60.2 (2.37)	64.3 (2.53)	9.7 (0.38)	111.0 (4.37)	85.9 (3.38)	47.8 (1.88)	47.8 (1.88)	22.4 (0.88)	22.4 (0.88)	11.2 (0.44)	25.4 (1.00)	100.1 (3.94)

See Mounting Bolt Kits for bolt information.

\* Not available with high flow option.

**Bottom Ported Subplate — NFPA D05, D05H and D05HE**

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



Dimension	A	B	C	D	E	F	G	H	I	J	K	L*	M*	N	O	P	Q*	R*
SPD31V***	44.5 (1.75)	114.3 (4.50)	120.7 (4.75)	9.7 (0.38)	111.3 (4.38)	104.9 (4.13)	60.2 (2.37)	73.9 (2.91)	28.4 (1.12)	56.4 (2.22)	84.1 (3.31)	22.4 (0.88)	98.6 (3.88)	28.7 (1.13)	60.5 (2.38)	90.4 (3.56)	15.0 (0.59)	90.4 (3.56)
SPD31D***	44.5 (1.75)	114.3 (4.50)	120.7 (4.75)	9.7 (0.38)	111.3 (4.38)	104.9 (4.13)	60.2 (2.37)	73.9 (2.91)	28.4 (1.12)	56.4 (2.22)	84.1 (3.31)	20.6 (0.81)	100.1 (3.94)	28.7 (1.13)	60.5 (2.38)	90.4 (3.56)	—	88.9 (3.50)

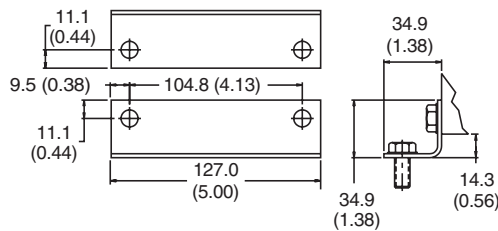
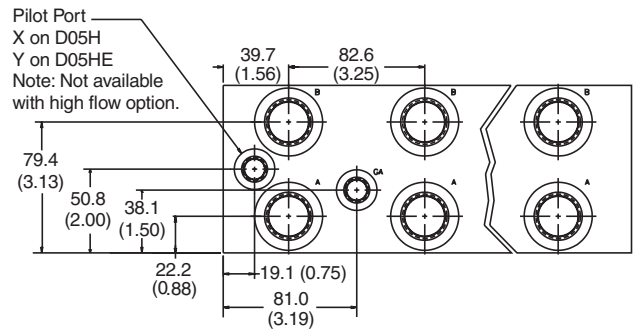
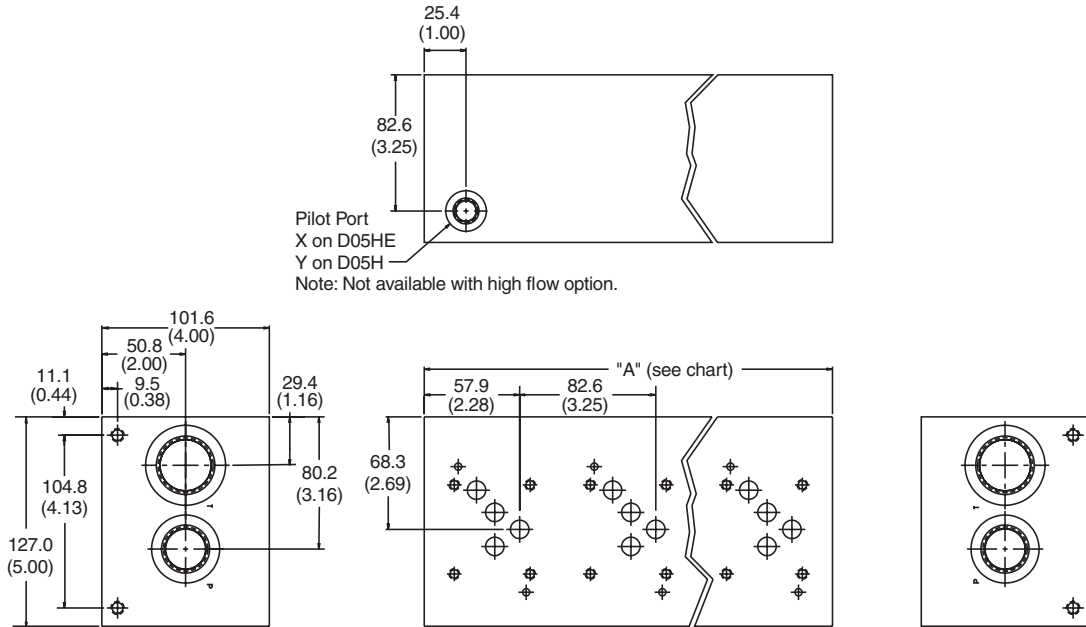
See Mounting Bolt Kits for bolt information.

\* Not available with high flow option.



**Series D3P and High Flow**  
**Manifold — NFPA D05, D05H and D05HE**

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



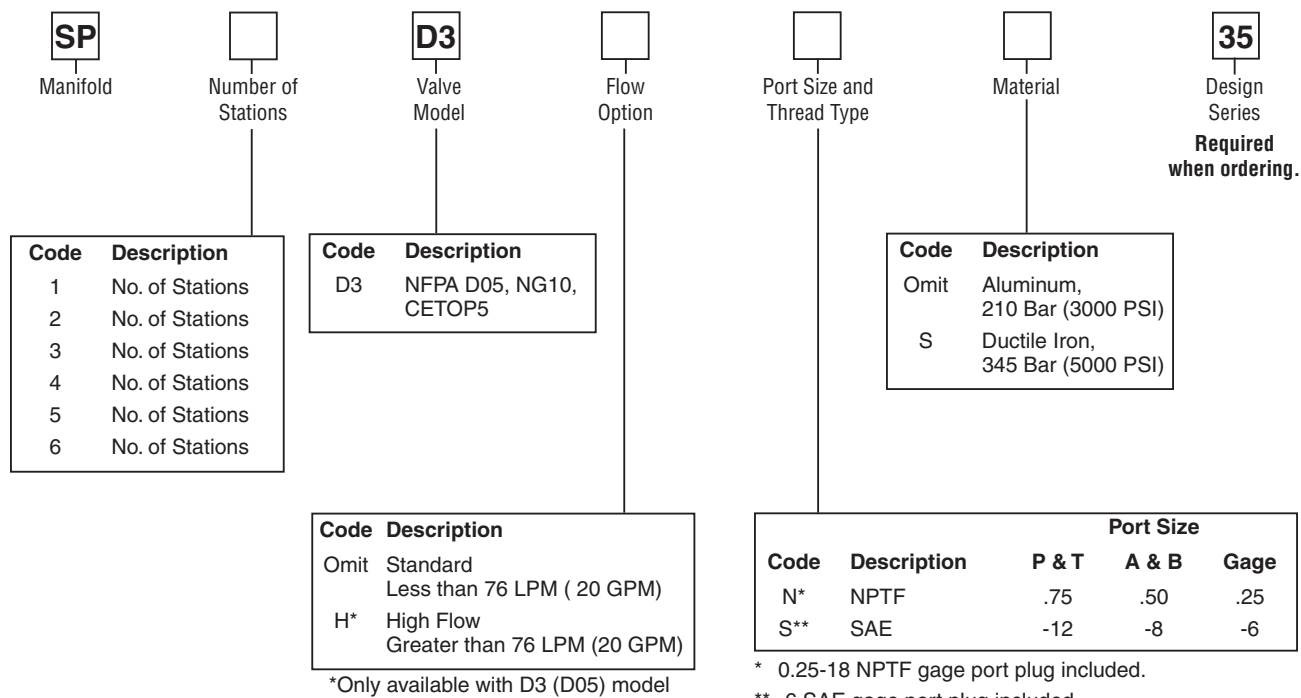
**Mounting Hardware**  
 (See Ordering Information for Mounting Hardware details)

No. of Stations	1	2	3	4	5	6
"A" Length	82.6	165.1	247.7	330.2	412.8	495.3
mm (inch)	(3.25)	(6.50)	(9.75)	(13.00)	(16.25)	(19.50)
Weight Alum.	15.4	26.5	37.5	48.5	59.5	72.8
kg (lbs.)	(7.00)	(12.00)	(17.00)	(22.00)	(27.00)	(33.00)
Weight Iron	41.9	83.8	125.7	165.4	187.4	249.2
kg (lbs.)	(19.00)	(38.00)	(57.00)	(75.00)	(85.00)	(113.00)

See Mounting Bolt Kits for bolt information.



**Series D3 Manifolds**



Mounting hardware supplied with manifold includes:  
 (2) steel brackets  
 For SAE and NPTF ports:  
 (8) 5/16-18 UNC x .63 hex washer cap screws

Valve mounting threads:  
 0.25-20 UNC x 0.75 DP.  
 Used for SAE and NPTF ports.

**Note:** 35 Design Series manifolds conform to NFPA mounting pattern specifications, but may be dimensionally different from previous design series.

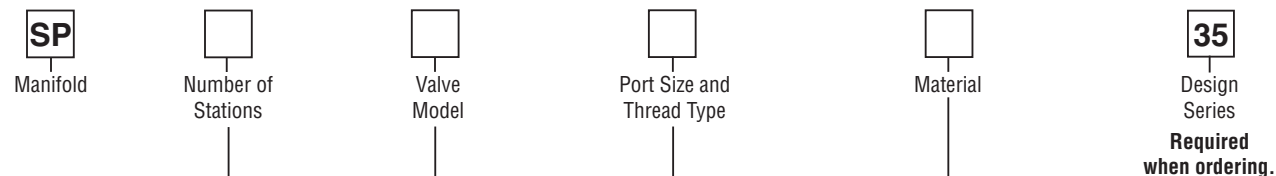
No. Stations	1	2	3	4	5	6
Wgt., Alum, kg (lbs.)	1.8 (4)	3.7 (8)	5.0 (11)	6.4 (14)	7.8 (17)	9.6 (21)
Wgt., Iron, kg (lbs.)	4.1 (9)	7.8 (17)	11.9 (26)	15.6 (34)	19.7 (43)	23.3 (51)

**Mounting Bolt Kits**

UNC Bolt Kits for use with D3W and D3 Directional Control Valves & Sandwich Valves				
	Number of Sandwich Valves @2.00" (50mm) thickness			
	0	1	2	3
D3-32	BK98 1.625"	BK141 3.50"	BK142 5.50"	BK143 7.50"
D3-32 plus tapping plate	BK166 2.50"	BK167 4.50"	BK168 6.50"	BK169 8.50"

**Note:** All bolts are SAE grade 8, 1/4-20 UNC-2A thread, torque to 16 N.m. (12 ft.-lbs.)

**Series D31 and D3P Manifolds**



Code	Description
1	No. of Stations
2	No. of Stations
3	No. of Stations
4	No. of Stations
5	No. of Stations
6	No. of Stations

Code	Description
D31V	NFPA D05H, D3P
D31D	NFPA D05HE, NG10, CETOP5H

D31 manifolds come standard with high flow capability.

Code	Description
Omit	Aluminum, 210 Bar (3000 PSI)
S	Ductile Iron, 345 Bar (5000 PSI)

Code	Description	Port Size			
		P, A, B	T	X, Y	Gage
N*	NPTF	.75	1.00	.38	.25
S**	SAE	-12	-16	-6	-6

\* 0.25-18 NPTF gage port plug included.

\*\* -6 SAE gage port plug included.

Mounting hardware supplied with manifold includes:

- (2) steel brackets
- For SAE and NPTF ports:
- (8) 3/8-16 UNC x .88 HHCS
- and (8) .38 SAE N series washers

Valve mounting threads:

- 0.25-20 UNC x 0.75 DP.
- Used for SAE and NPTF ports.

**Note:** 35 Design Series manifolds conform to NFPA mounting pattern specifications, but may be dimensionally different from previous design series.

No. Stations	1	2	3	4	5	6
Wgt., Alum, kg (lbs.)	3.2 (7)	5.5 (12)	7.8 (17)	10.1 (22)	12.3 (27)	15.1 (33)
Wgt., Iron, kg (lbs.)	8.7 (19)	17.4 (38)	26.1 (57)	34.3 (75)	38.9 (85)	51.7 (113)

**Mounting Bolt Kits**

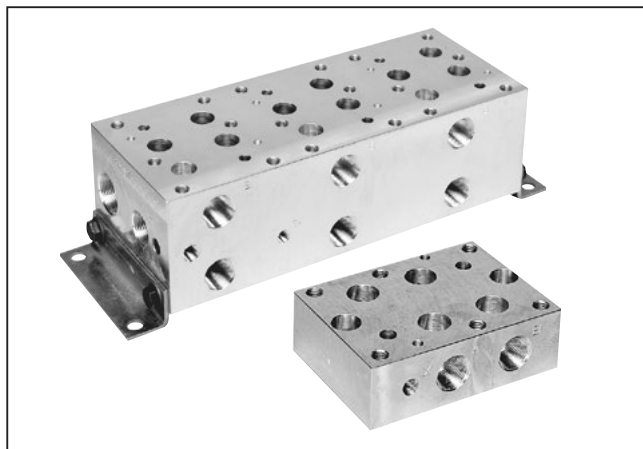
UNC Bolt Kits for use with D3P, D31VW and D31DW Directional Control Valves & Sandwich Valves (D31V*-91 Design, Solenoid Operated)				
	Number of Sandwich Valves @ 2.00" (50mm) thickness			
	0	1	2	3
D31VW-91, D3P D31DW-91	BK98 1.625"	BK141 3.50"	BK142 5.50"	BK143 7.50"
D31VW-91, D3P D31DW-91 plus tapping plate	BK166 2.50"	BK167 4.50"	BK168 6.50"	BK169 8.50"

**Note:** All bolts are SAE grade 8, 1/4-20 UNC-2A thread, torque to 16 N.m. (12 ft.-lbs.)



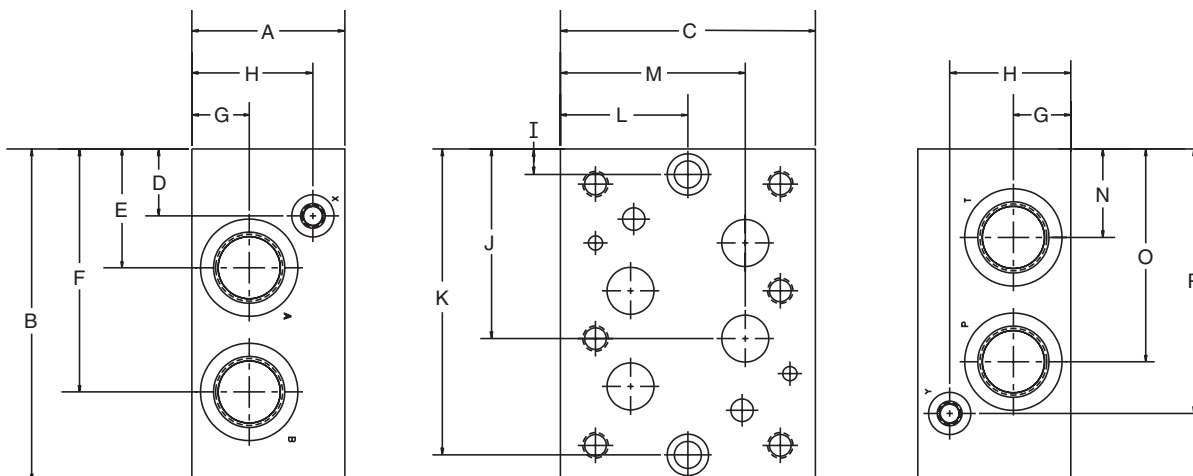
**Features**

- **Aluminum or steel available** — Flexibility for applying to different system pressures
- **NPT and SAE thread options available** — Flexibility to plumb into existing systems
- **Multiple port sizes available** — Eliminates need for reducers and expander at subplate connection



**Side Ported Subplate — NFPA D08**

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

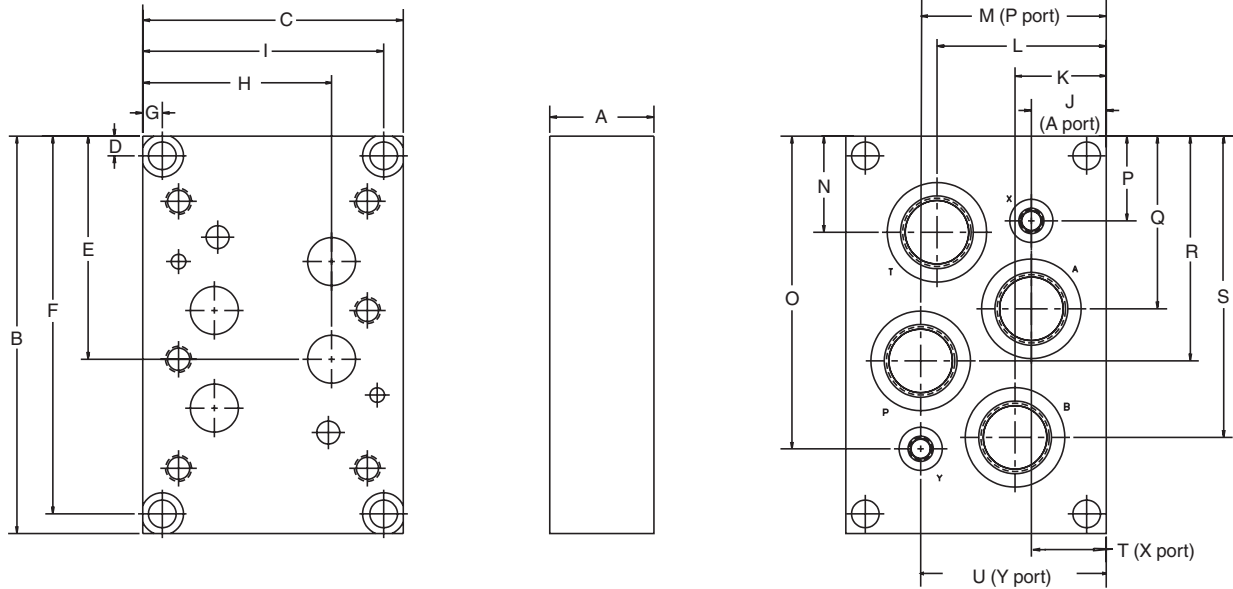


Size	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
SPD68*A*	50.8	155.7	114.3	30.2	64.3	115.1	25.4	25.4	12.7	89.7	142.7	57.2	85.9	40.4	91.2	125.5
SPD66NA*	(2.00)	(6.13)	(4.50)	(1.19)	(2.53)	(4.53)	(1.00)	(1.00)	(0.50)	(3.53)	(5.62)	(2.25)	(3.38)	(1.59)	(3.59)	(4.94)
SPD610*A*	76.2	165.1	127.0	33.3	59.2	121.2	28.7	60.5	12.7	94.5	152.4	63.5	92.2	43.9	105.9	131.8
	(3.00)	(6.50)	(5.00)	(1.31)	(2.33)	(4.77)	(1.13)	(2.38)	(0.50)	(3.72)	(6.00)	(2.50)	(3.63)	(1.73)	(4.17)	(5.19)

See Mounting Bolt Kits for bolt information.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Series D6 and D8**  
**Bottom Ported Subplate — NFPA D08**  
 Inch equivalents for millimeter dimensions are shown in (\*\*)



Size	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
SPD68**	38.1	155.7	117.6	12.7	89.7	142.7	58.7	87.4	—	30.2	30.2	87.4	87.4	42.2	125.5	30.2	65.8	89.7	113.5	31.8	85.9
SPD66N*	(1.50)	(6.13)	(4.63)	(0.50)	(3.53)	(5.62)	(2.31)	(3.44)	—	(1.19)	(1.19)	(3.44)	(3.44)	(1.66)	(4.94)	(1.19)	(2.59)	(3.53)	(4.47)	(1.25)	(3.38)
SPD610**	50.8	193.8	127.0	9.7	108.7	184.2	9.7	92.2	117.6	36.6	44.5	82.6	90.4	46.7	152.4	41.4	84.1	109.5	146.8	36.6	90.4
	(2.00)	(7.63)	(5.00)	(0.38)	(4.28)	(7.25)	(0.38)	(3.63)	(4.63)	(1.44)	(1.75)	(3.25)	(3.56)	(1.84)	(6.00)	(1.63)	(3.31)	(4.31)	(5.78)	(1.44)	(3.56)

See Mounting Bolt Kits for bolt information.

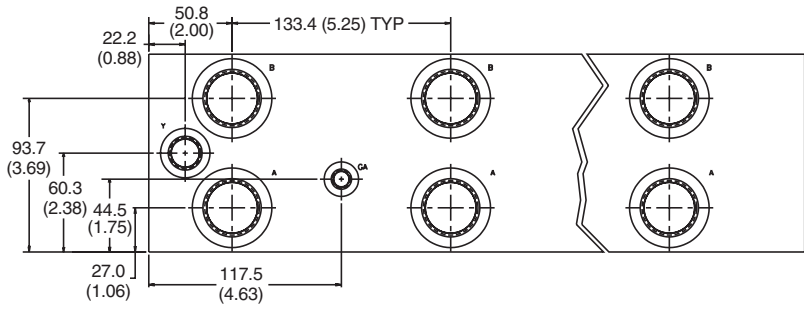
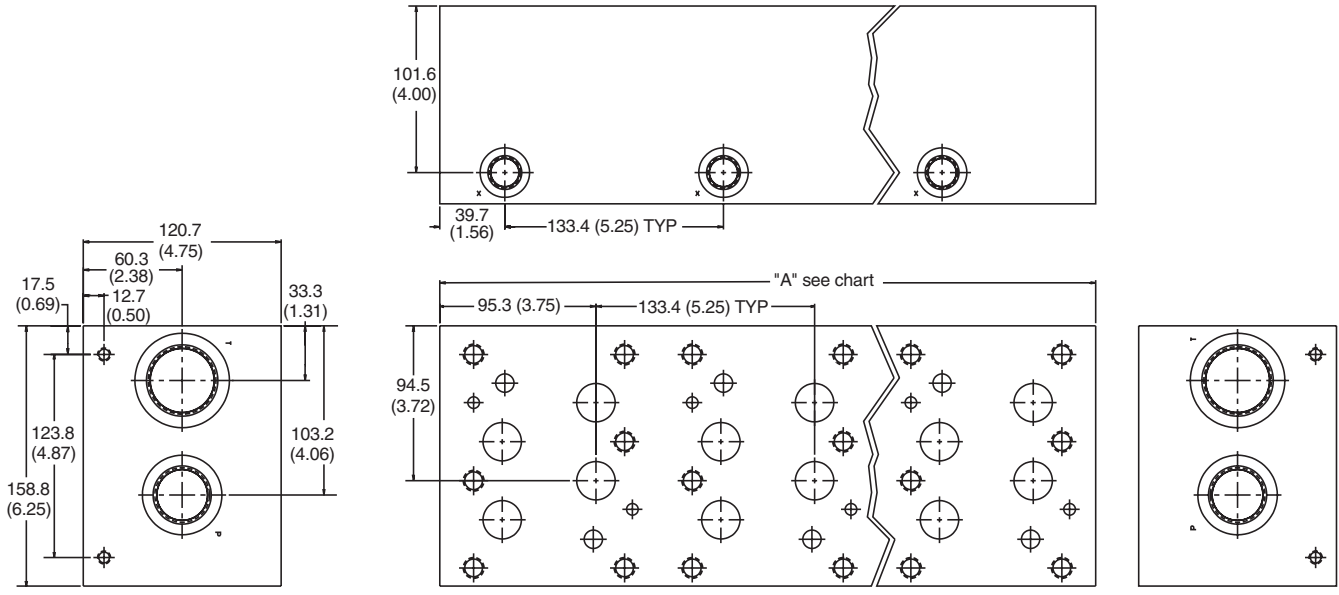


Dimensions

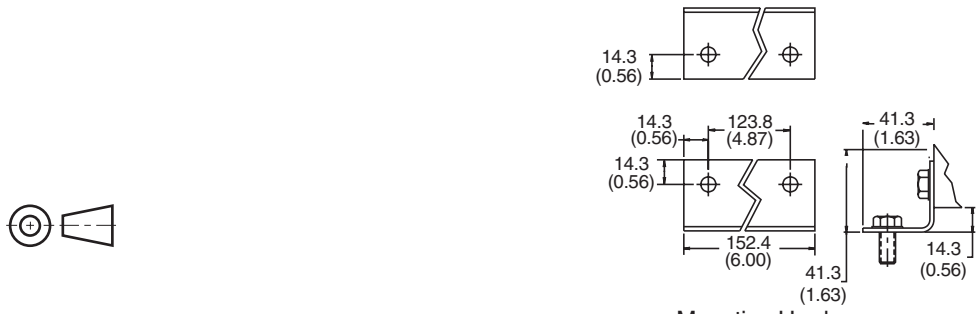
Series D6 and D8  
Manifold — NFPA D08

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

C



Note: Gage port not available on single station manifold.

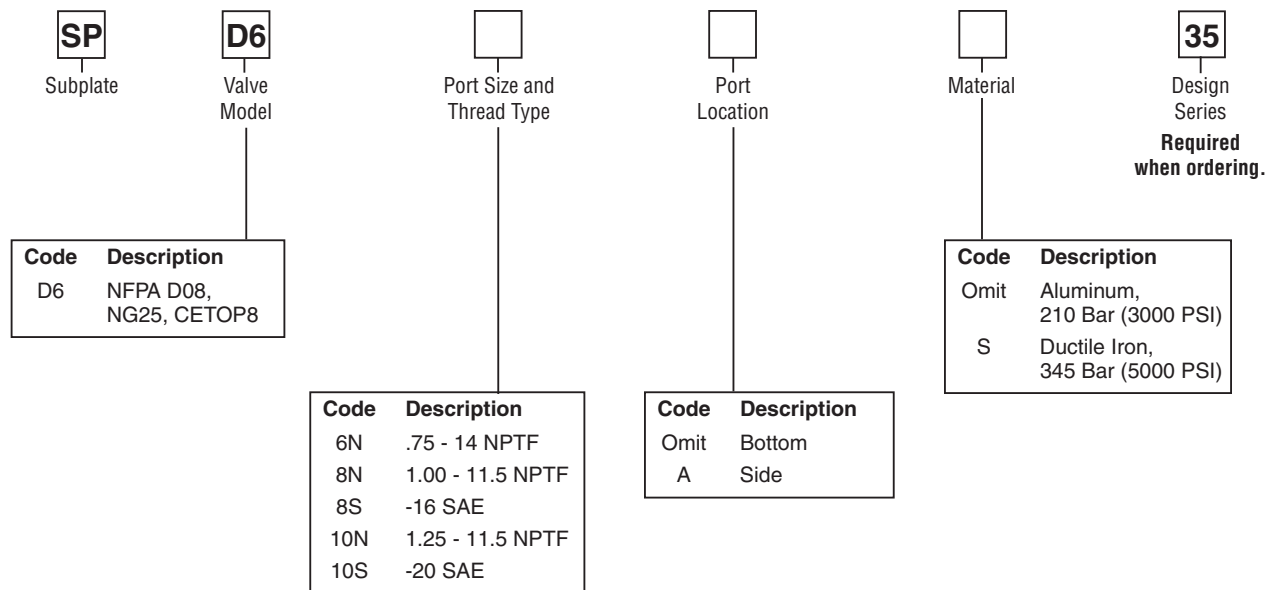


Mounting Hardware  
(See Ordering Information for Mounting Hardware details)

No. of Stations	1	2	3	4	5
"A" Length mm (inch)	133.35 (5.25)	266.7 (10.50)	400.05 (15.75)	533.4 (21.00)	666.75 (26.25)
Weight Alum. kg (lbs.)	5 (12)	11 (24)	16 (35)	22 (49)	28 (61)
Weight Iron kg (lbs.)	20 (45)	41 (90)	62 (136)	82 (181)	103 (226)

See Mounting Bolt Kits for bolt information.

**Series D6 and D8 Subplates**



**Mounting Hardware**  
supplied with subplate includes:

Subplates	Mounting Hardware	Qty.
SPD66NA*	.50-13 UNC x	2
SPD68NA*	1.75 LG. SHCS	
SPD68SA*		
SPD610NA*	.50-13 UNC x	2
SPD610SA*	3.00 LG. SHCS	
SPD66N*	.50-13 UNC x	2
SPD68N*	1.50 LG. SHCS	
SPD68S*		
SPD610N*	.38-16 UNC x	4
SPD610S*	2.00 LG. SHCS	

Valve mounting threads:  
0.50-13 UNC x 1.19 DP.  
Used for SAE and NPTF ports.

**Note:** 35 Design Series subplates conform to NFPA mounting pattern specifications, but may be dimensionally different from previous design series.

**Mounting Bolt Kits**

UNC Bolt Kits for use with D6 and D8 Directional Control Valves & Sandwich Valves				
	Number of Sandwich Valves @ 2.75" (70mm) thickness			
	0	1	2	3
D6	BK227 2.50"	BK121 5.25"	BK122 8.00"	BK123 10.75"
D6 plus tapping plate	BK161 3.50"	BK170 6.25"	BK171 9.00"	BK172 11.75"
D8	BK228 3.00"	BK131 5.75"	BK132 8.50"	BK133 11.25"
D8 plus tapping plate	BK173 4.00"	BK174 6.75"	BK175 9.50"	BK114 12.125"

**Note:** All bolts are SAE grade 8, 1/2-13 UNC-3A thread, torque to 133 N.m. (100 ft.-lbs.)

**Series D6 and D8 Manifolds**

**SP**

Manifold

Number of Stations

**D6**

Valve Model

Port Size and Thread Type

Material

**35**

Design Series

**Required when ordering.**

Code	Description
1	No. of Stations
2	No. of Stations
3	No. of Stations
4	No. of Stations
5	No. of Stations

Code	Description
D6	NFPA D08, NG25, CETOP8

Code	Description
Omit	Aluminum, 210 Bar (3000 PSI)
S	Ductile Iron, 345 Bar (5000 PSI)

Code	Description	Port Size					Gage
		P, A, B	T	Y	X (opt.)		
N*	NPTF	1.00	1.25	.38	.25	.25	
S**	SAE	-16	-20	-8	-4	-6	

Mounting hardware supplied with manifold includes:

- (2) steel brackets
- For SAE and NPTF ports:
- (8) 1/2-13 UNC x 1.00 HHCS
- (8) .50 SAE N Series washers

Valve mounting threads:  
 0.50-13 UNC x 1.19 DP.  
 Used for SAE and NPTF ports.

- \* 0.25-18 NPT gage port plug included.
- \*\* -6 SAE gage port plug included.

**Note:** 35 Design Series manifolds conform to NFPA mounting pattern specifications, but may be dimensionally different from previous design series.

No. Stations	1	2	3	4	5
Wgt., Alum, kg (lbs.)	5.5 (12)	11.0 (24)	16.0 (35)	22.4 (49)	27.9 (61)
Wgt., Iron, kg (lbs.)	20.6 (45)	41.1 (90)	62.2 (136)	82.7 (181)	103.3 (226)

**Mounting Bolt Kits**

UNC Bolt Kits for use with D6 and D8 Directional Control Valves & Sandwich				
	Number of Sandwich @ 2.75" (70mm) thickness			
	0	1	2	3
D6	BK227 2.50"	BK121 5.25"	BK122 8.00"	BK123 10.75"
D6 plus tapping plate	BK161 3.50"	BK170 6.25"	BK171 9.00"	BK172 11.75"
D8	BK228 3.00"	BK131 5.75"	BK132 8.50"	BK133 11.25"
D8 plus tapping plate	BK173 4.00"	BK174 6.75"	BK175 9.50"	BK114 12.125"

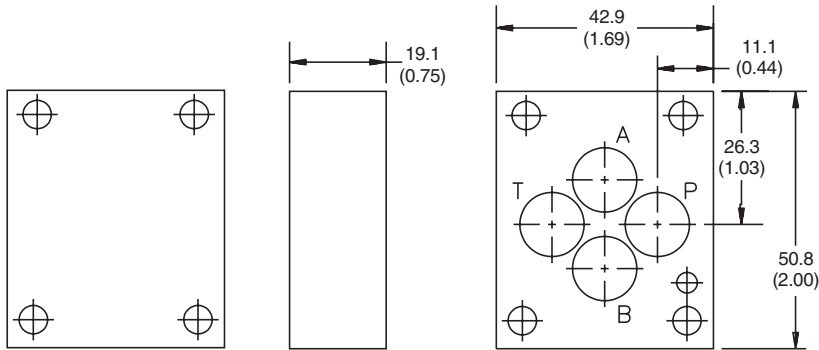
**Note:** All bolts are SAE grade 8, 1/2-13 UNC-3A thread, torque to 133 N.m. (100 ft.-lbs.)



**Dimensions**

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

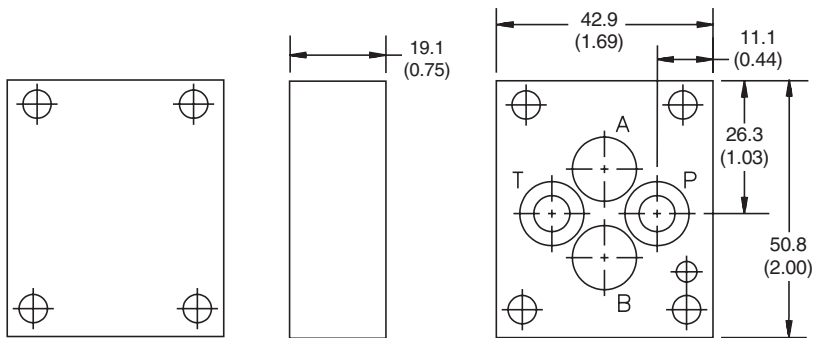
**Cover Plate — NFPA D03**



**Note:**  
Mounting hardware supplied with cover plate.  
Includes:  
2-012V-7 O-ring, Qty. 4  
∅0.12 x .25 long locating pin, Qty. 1  
10-24 UNC x 1.00 long SHCS, Qty. 4 (SPD2C1EN) or  
M5-0.8 x 25 mm long SHCS, Qty. 4 (SPD2C1MN)

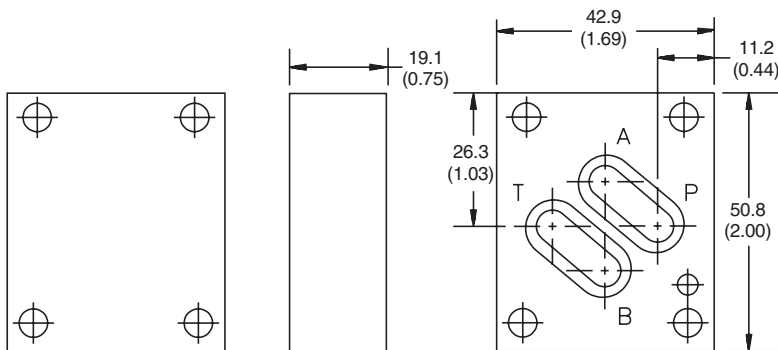


**Crossover Plate, P→T ports — NFPA D03**



**Note:**  
Mounting hardware supplied with crossover plate.  
Includes:  
2-012V-7 O-ring, Qty. 4  
∅0.12 x .25 long locating pin, Qty. 1  
10-24 UNC x 1.00 long SHCS, Qty. 4 (SPD2D1EN) or  
M5-0.8 x 25 mm long SHCS, Qty. 4 (SPD2D1MN)

**Crossover Plate, P→A and B→T ports — NFPA D03**



**Note:**  
Mounting hardware supplied with cover plate.  
Includes:  
2-016V-7 O-ring, Qty. 2  
∅0.12 x .25 long locating pin, Qty. 1  
10-24 UNC x 1.00 long SHCS, Qty. 4 (SPD2A1EN) or  
M5-0.8 x 25 mm long SHCS, Qty. 4 (SPD2A1MN)

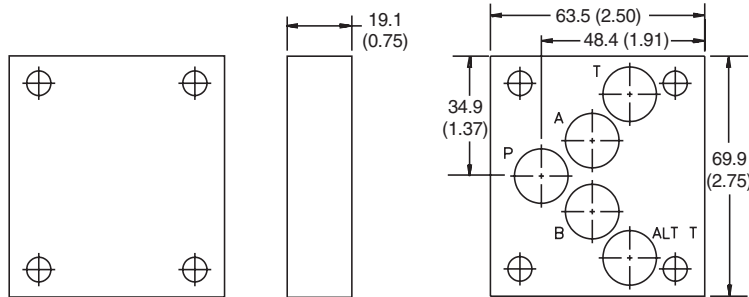
**Dimensions**

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

**Cover Plate — NFPA D05**



**C**



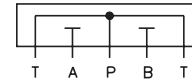
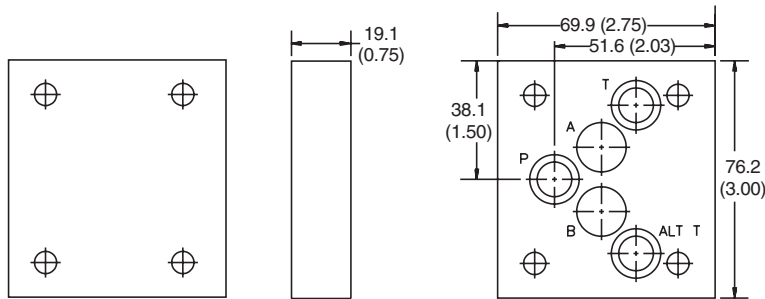
**Note:**

Mounting hardware supplied with cover plate.

Includes:

- 2-014V-7 O-ring, Qty. 5
- 0.25-20 UNC x 1.25 long SHCS, Qty. 4 (SPD3C1EN) or
- M6-1.0 x 30 mm long SHCS, Qty. 4 (SPD3C1MN)

**Crossover Plate, P → T ports — NFPA D05**



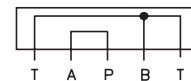
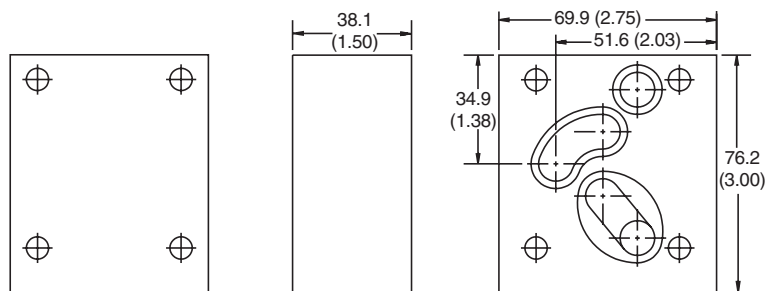
**Note:**

Mounting hardware supplied with crossover plate.

Includes:

- 2-014V-7 O-ring, Qty. 5
- 0.25-20 UNC x 1.25 long SHCS, Qty. 4 (SPD3D1EN) or
- M6-1.0 x 30 mm long SHCS, Qty. 4 (SPD3D1MN)

**Crossover Plate, P → A and B → T ports — NFPA D05**



**Note:**

Mounting hardware supplied with crossover plate.

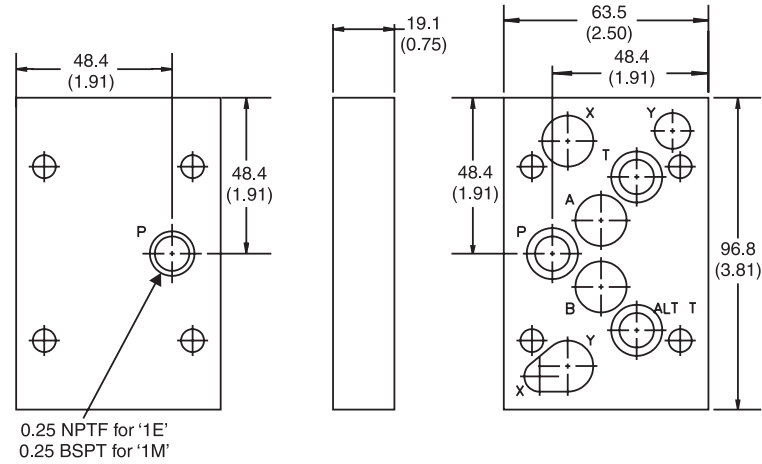
Includes:

- 2-014V-7 O-ring, Qty. 1
- 2-022V-7 +O-ring, Qty. 2
- 0.25-20 UNC x 2.00 long SHCS, Qty. 4 (SPD3A1EN) or
- M6-1.0 x 50 mm long SHCS, Qty. 4 (SPD3A1MN)

**Dimensions**

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

**Cover Plate — NFPA D05H**



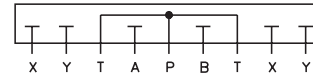
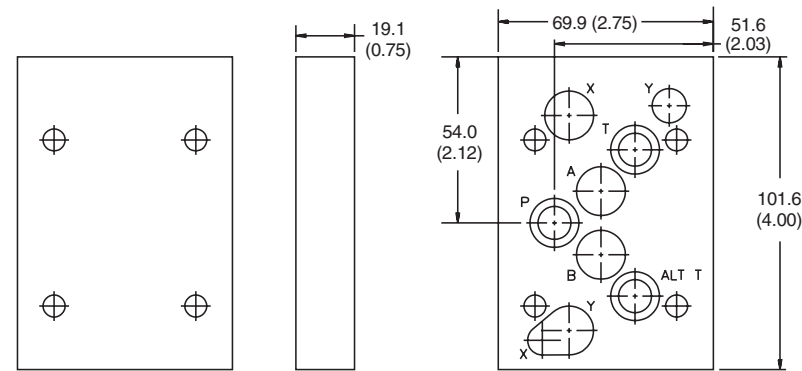
**Note:**

Mounting hardware supplied with cover plate.

Includes:

- 2-011V-7 O-ring, Qty. 1
- 2-014V-7 O-ring, Qty. 6
- 2-016V-7 O-ring, Qty. 1
- 0.25-18 NPTF plug, Qty. 1 (SPD31VC1EN only)
- 0.25-20 UNC x 1.25 long SHCS, Qty. 4 (SPD31VC1EN) or
- M6-1.0 x 30 mm long SHCS, Qty. 4 (SPD31VC1MN)

**Crossover Plate, P→T ports — NFPA D05H**



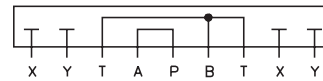
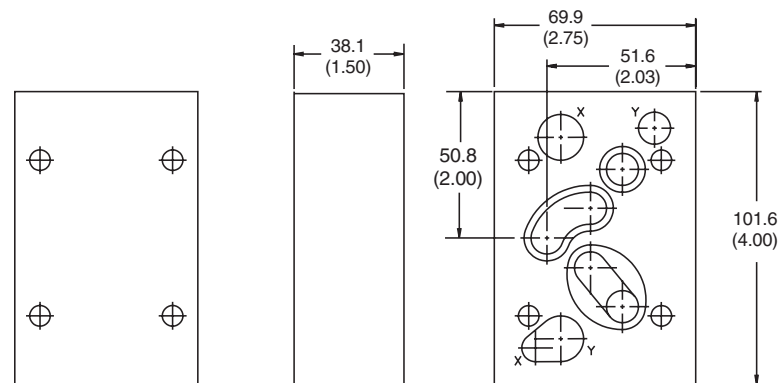
**Note:**

Mounting hardware supplied with crossover plate.

Includes:

- 2-011V-7 O-ring, Qty. 1
- 2-014V-7 O-ring, Qty. 6
- 2-016V-7 O-ring, Qty. 1
- 0.25-20 UNC x 1.25 long SHCS, Qty. 4 (SPD31VD1EN) or
- M6-1.0 x 30 mm long SHCS, Qty. 4 (SPD31VD1MN)

**Crossover Plate, P→A and B→T ports — NFPA D05H**



**Note:**

Mounting hardware supplied with crossover plate.

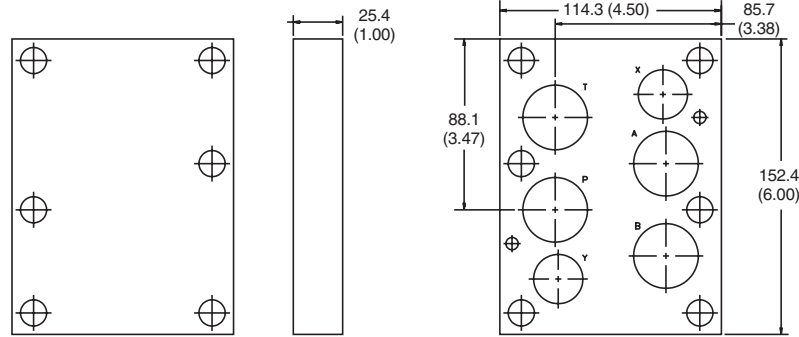
Includes:

- 2-011V-7 O-ring, Qty. 1
- 2-014V-7 O-ring, Qty. 2
- 2-016V-7 O-ring, Qty. 1
- 2-022V-7 O-ring, Qty. 2
- 0.25-20 UNC x 2.00 long SHCS, Qty. 4 (SPD31VA1EN) or
- M6-1.0 x 50 mm long SHCS, Qty. 4 (SPD31VA1MN)

Dimensions

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

Cover Plate — NFPA D08



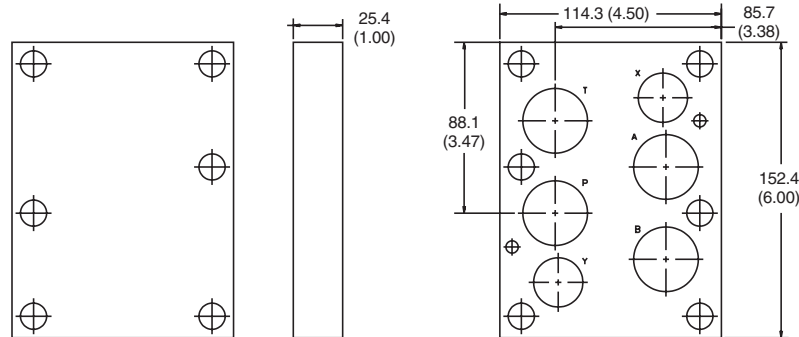
Note:

Mounting hardware supplied with cover plate.

Includes:

- 2-210V-7 O-ring, Qty. 2
- 2-215V-7 O-ring, Qty. 4
- 0.50-13 UNC x 1.75 long SHCS, Qty. 6 (SPD6C1EN) or M12-1.75 x 45 mm long SHCS, Qty. 6 (SPD6C1MN)
- 0.25 x 0.50 long locating pins, Qty. 2

Crossover Plate, P → T ports — NFPA D08



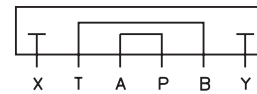
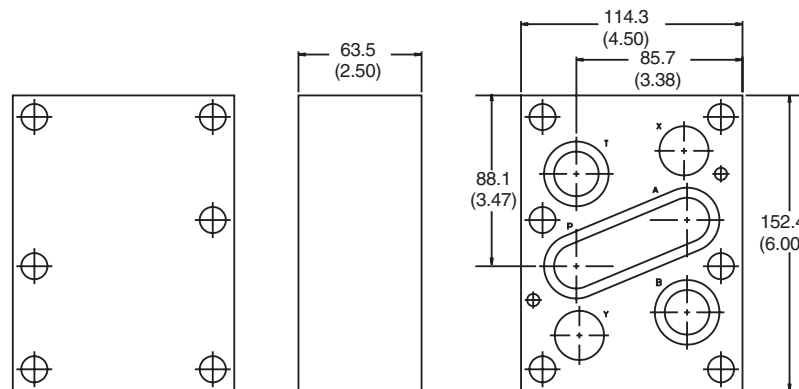
Note:

Mounting hardware supplied with cover plate.

Includes:

- 2-210V-7 O-ring, Qty. 2
- 2-215V-7 O-ring, Qty. 4
- 0.50-13 UNC x 1.75 long SHCS, Qty. 6 (SPD6C1EN) or M12-1.75 x 45 mm long SHCS, Qty. 6 (SPD6C1MN)
- 0.25 x 0.50 long locating pins, Qty. 2

Crossover Plate, P → A and B → T ports — NFPA D08



Note:

Mounting hardware supplied with crossover plate.

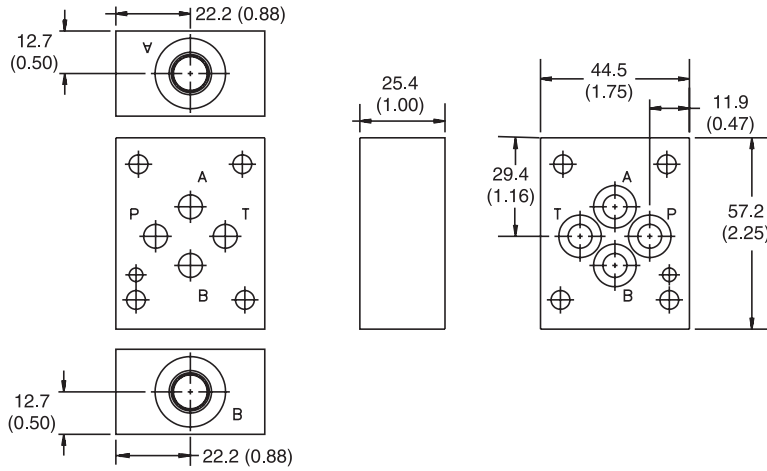
Includes:

- 2-210V-7 O-ring, Qty. 2
- 2-215V-7 O-ring, Qty. 2
- 2-231V-7 O-ring, Qty. 1
- 0.50-13 UNC x 3.50 long SHCS, Qty. 6 (SPD6A1EN) or M12-1.75 x 90 mm long SHCS, Qty. 6 (SPD6A1MN)
- 0.25 x 0.50 long locating pins, Qty. 2

**Dimensions**

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

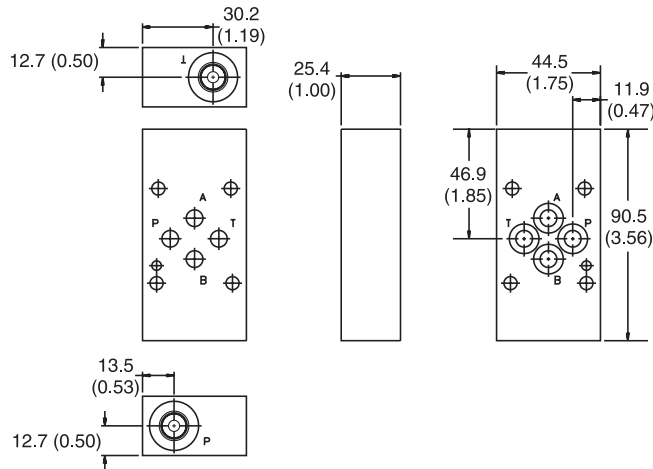
**Tapping Plate, A and B ports — NFPA D03**



**Note:**  
Interface seal kit provided with tapping plate.  
Includes:  
2-012V-7 O-ring, Qty. 4  
∅0.12 x .25 long locating pin, Qty. 1  
0.25-18 NPTF Plug, Qty. 1 (NPTF port only)  
-4 SAE Hex Socket Plug, Qty., 1 (SAE port only)

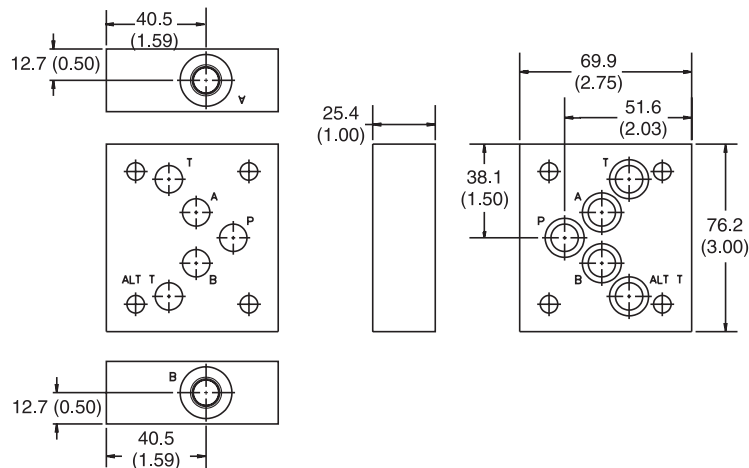


**Tapping Plate, P and T ports — NFPA D03**



**Note:**  
Interface seal kit provided with tapping plate.  
Includes:  
2-012V-7 O-ring, Qty. 4  
∅0.12 x .25 long locating pin, Qty. 1  
0.25-18 NPTF Plug, Qty. 1 (NPTF port only)  
-4 SAE Hex Socket Plug, Qty., 1 (SAE port only)

**Tapping Plate, A and B ports — NFPA D05**

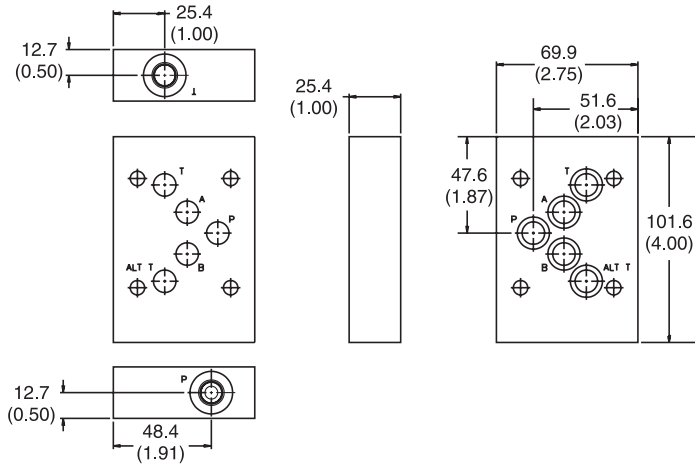


**Note:**  
Interface seal kit provided with tapping plate.  
Includes:  
2-014V-7 O-ring, Qty. 5  
0.25-18 NPTF Plug, Qty. 1 (NPTF port only)  
-4 SAE Hex Socket Plug, Qty., 1 (SAE port only)

**Dimensions**

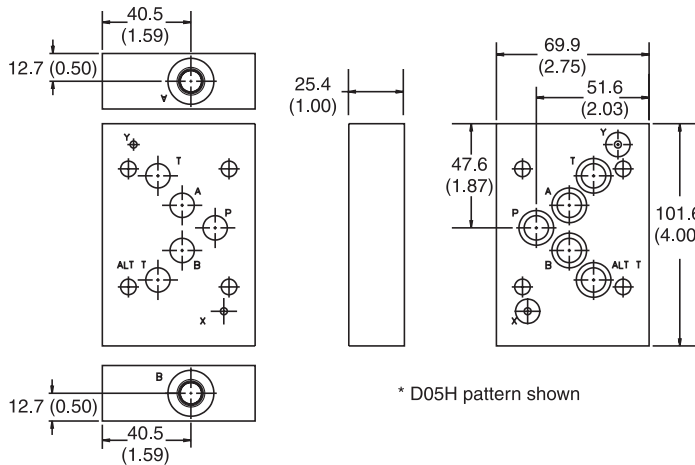
Inch equivalents for millimeter dimensions are shown in (\*\*)

**Tapping Plate, P and T ports — NFPA D05**



**Note:**  
 Interface seal kit provided with tapping plate.  
 Includes:  
 2-014V-7 O-ring, Qty. 5  
 0.25-18 NPTF Plug, Qty. 1 (NPTF port only)  
 -4 SAE Hex Socket Plug, Qty., 1 (SAE port only)

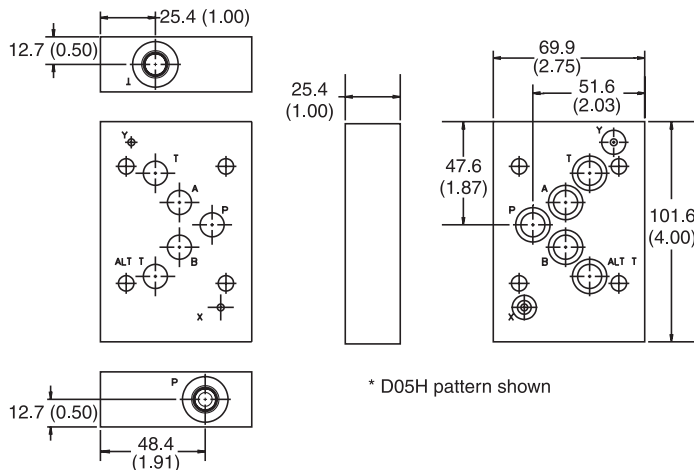
**Tapping Plate, A and B ports — NFPA D05H and D05HE (E)**



\* D05H pattern shown

**Note:**  
 Interface seal kit provided with tapping plate.  
 Includes:  
 SPD31VT2\*W\* :  
 2-011V-7 O-ring, Qty. 2  
 2-014V-7 O-ring, Qty. 5  
 SPD31DT2\*W\*:  
 2-014V-7 O-ring, Qty. 7  
 0.25-18 NPTF Plug, Qty. 1 (NPTF port only)  
 -4 SAE Hex Socket Plug, Qty., 1 (SAE port only)

**Tapping Plate, P and T ports — NFPA D05H and D05HE**



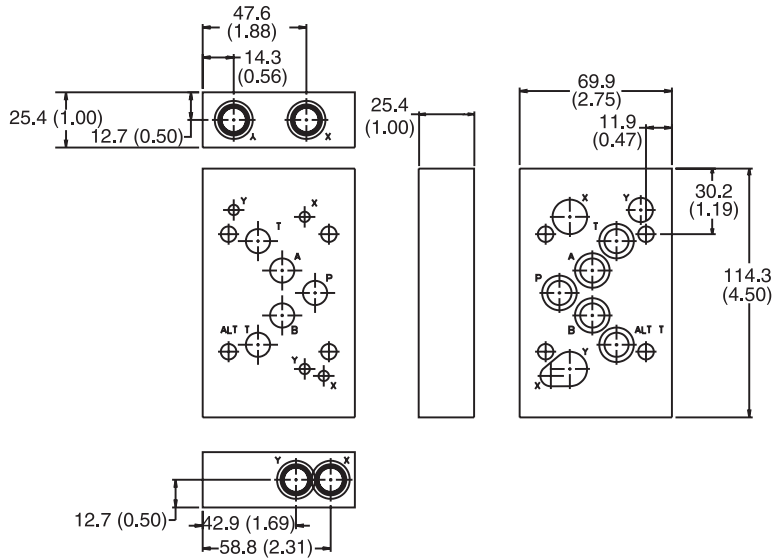
\* D05H pattern shown

**Note:**  
 Interface seal kit provided with tapping plate.  
 Includes:  
 SPD31VT2\*P\*:  
 2-011V-7 O-ring, Qty. 2  
 2-014V-7 O-ring, Qty. 5  
 SPD31DT2\*P\*:  
 2-014V-7 O-ring, Qty. 7  
 0.25-18 NPTF Plug, Qty. 1 (NPTF port only)  
 -4 SAE Hex Socket Plug, Qty., 1 (SAE port only)

**Dimensions**

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

**Tapping Plate, X and Y ports — NFPA D05H and D05HE**



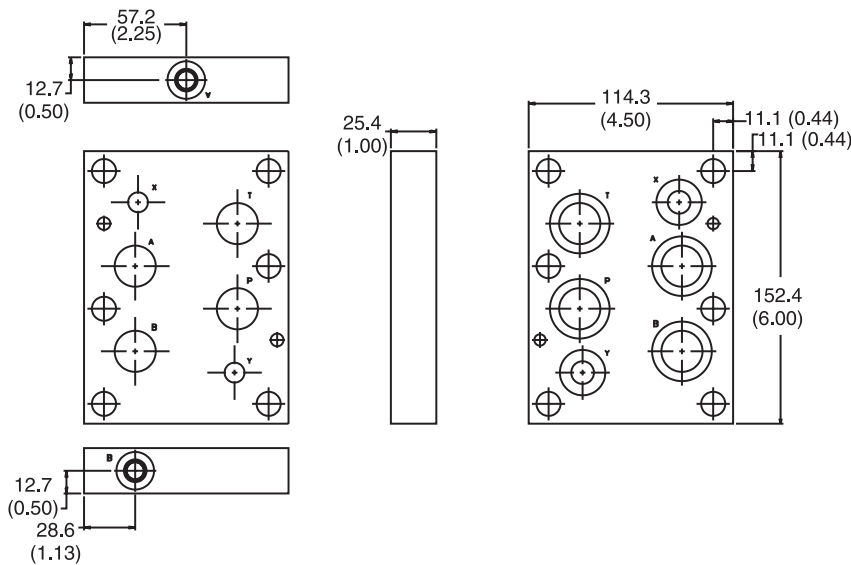
**Note:**

Interface seal kit provided with tapping plate.

Includes:

- 2-011V-7 O-ring, Qty. 1
- 2-014V-7 O-ring, Qty. 6
- 2-016V-7 O-ring, Qty. 1
- 0.25-18 NPTF Plug, Qty. 3 (NPTF port only)
- 4 SAE Hex Socket Plug, Qty. 3 (SAE port only)

**Tapping Plate, A and B ports — NFPA D08**



**Note:**

Interface seal kit provided with tapping plate.

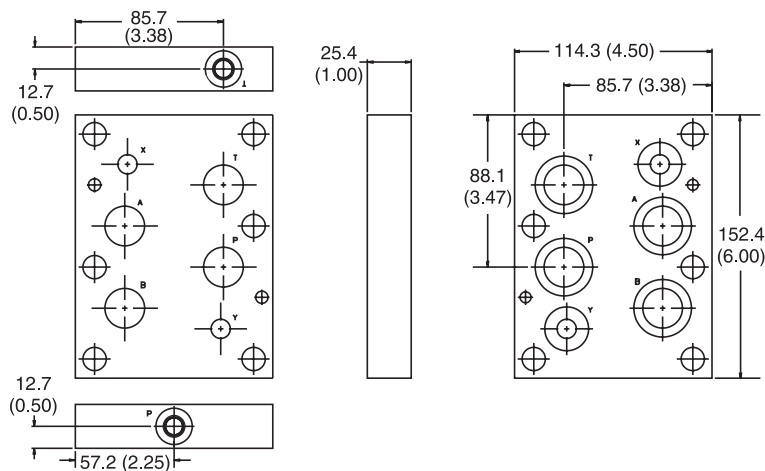
Includes:

- 2-210V-7 O-ring, Qty. 2
- 2-215V-7 O-ring, Qty. 4
- ∅.25 x .50 long locating pin, Qty. 2
- 0.25-18 NPTF Plug, Qty. 1 (NPTF port only)
- 4 SAE Hex Socket Plug, Qty. 1 (SAE port only)

**Dimensions**

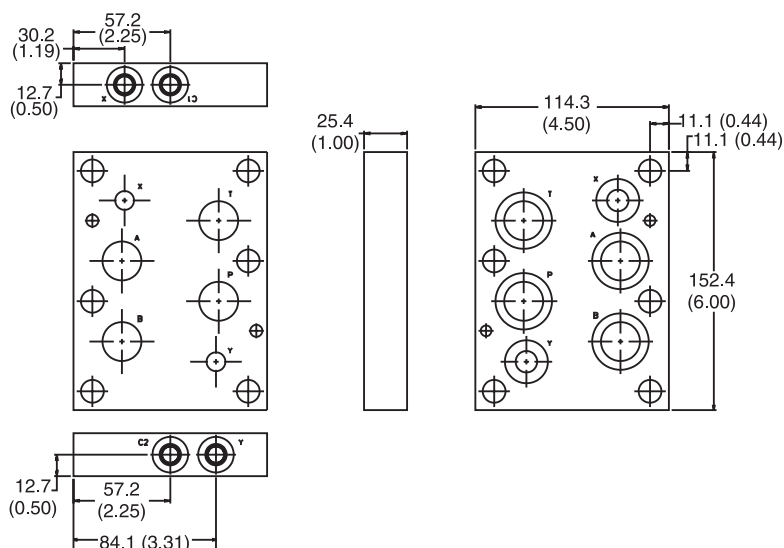
Inch equivalents for millimeter dimensions are shown in (\*\*)

**Tapping Plate, P and T ports — NFPA D08**



**Note:**  
 Interface seal kit provided with tapping plate.  
 Includes:  
 2-210V-7 O-ring, Qty. 2  
 2-215V-7 O-ring, Qty. 4  
 Ø.25 x .50 long locating pin, Qty. 2  
 0.25-18 NPTF Plug, Qty. 1 (NPTF port only)  
 -4 SAE Hex Socket Plug, Qty. 1 (SAE port only)

**Tapping Plate, X and Y ports — NFPA D08**

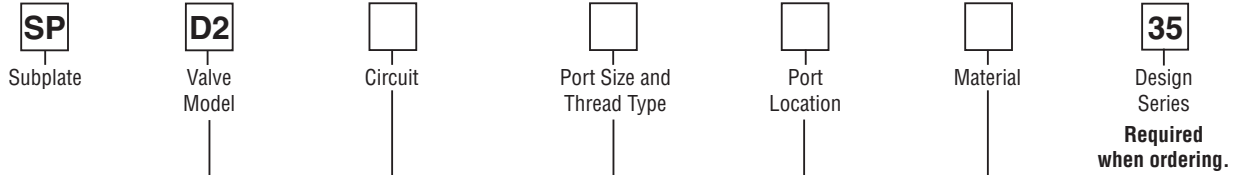


**Note:**  
 Interface seal kit provided with tapping plate.  
 Includes:  
 2-210V-7 O-ring, Qty. 2  
 2-215V-7 O-ring, Qty. 4  
 Ø.25 x .50 long locating pin, Qty. 2  
 0.25-18 NPTF Plug, Qty. 3 (NPTF port only)  
 -4 SAE Hex Socket Plug, Qty. 3 (SAE port only)



**Ordering Information**

**Series D1V Tapping and Cover Plates**



Code	Description
D2	NFPA D03, NG6, CETOP3

Code	Description
A	Crossover plate P to A, B to T
C	Parallel Circuit Cover plate
D	Series Circuit Crossover plate P to T, A and B blocked
T	Tapping plate

Code	Description
Omit	Aluminum, 210 Bar (3000 PSI)
S	Ductile Iron, 345 Bar (5000 PSI)

Code	Description
N	Cover Plate
P*	P and T Ports
W*	A and B Ports

\* Tapping plates only.

Code	Description
2N*	0.25-18 NPTF ANSI B1.20.3
2S*	-4 SAE ISO 11926; SAE 1926
1M**	Metric Mounting Bolts (M5-0.8 x 25mm long)
1E**	English Mounting Bolts (UNC 10-24 x 1.00 long)

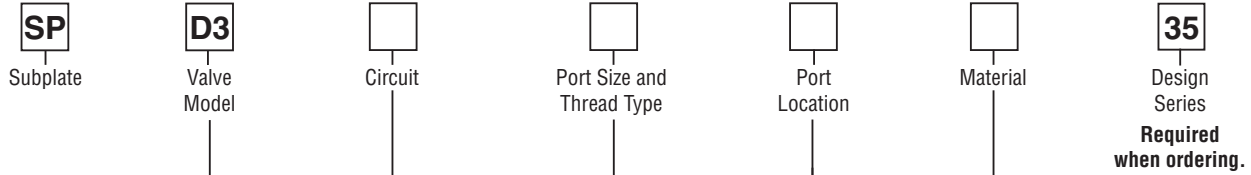
\* Tapping plate only.

\*\* Cover and crossover plate only.



Ordering Information

Series D3 Tapping and Cover Plates



Code	Description
D3	NFPA D05, NG10, CETOP5

Code	Description
A	Crossover plate P to A, B to T
C	Parallel Circuit Cover plate
D	Series Circuit Crossover plate P to T, A and B blocked
T	Tapping plate

Code	Description
Omit	Aluminum, 210 Bar (3000 PSI)
S	Ductile Iron, 345 Bar (5000 PSI)

Code	Description
N	Cover Plate
P*	P and T Ports
W*	A and B Ports

\* Tapping plates only.

Code	Description
2N*	0.25-18 NPTF ANSI B1.20.3
2S*	-4 SAE ISO 11926; SAE 1926
1M**	Metric Mounting Bolts (M6-1.0 x 30mm lg. SHCS Circuits 'C' and 'D' only) (M6-1.0 x 50mm lg. SHCS Circuit 'A' Only)
1E**	English Mounting Bolts (UNC .25-20 x 1.25 lg. SHCS Circuits 'C' and 'D' only) (UNC .25-20 x 2.00 lg. SHCS Circuit 'A' Only)

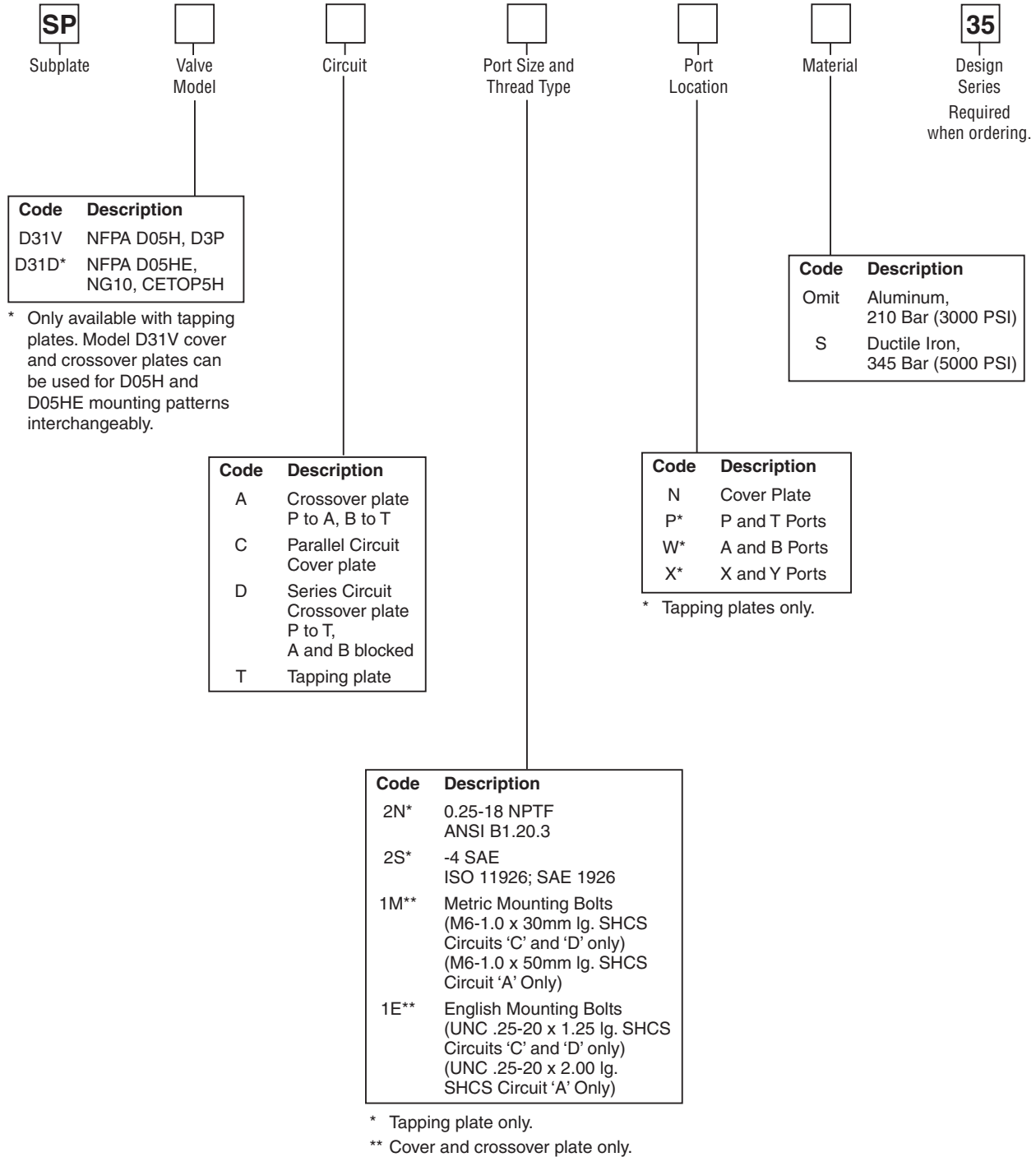
\* Tapping plate only.

\*\* Cover and crossover plate only.

C

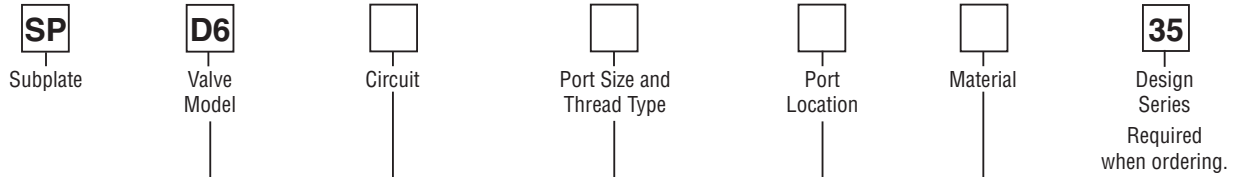
**Ordering Information**

**Series D31 Tapping and Cover Plates**



**Ordering Information**

**Series D6 and D8 Tapping and Cover Plates**



Code	Description
D6	NFPA D08, NG25, CETOP8

Code	Description
A	Crossover plate P to A, B to T
C	Parallel circuit Cover plate
D	Series circuit Crossover plate P to T, A and B blocked
T	Tapping plate

Code	Description
Omit	Aluminum, 210 Bar (3000 PSI)
S	Ductile Iron, 345 Bar (5000 PSI)

Code	Description
N	Cover Plate
P*	P and T Ports
W*	A and B Ports
X*	X and Y Ports

\* Tapping plates only.

Code	Description
2N*	0.25-18 NPTF ANSI B1.20.3
2S*	-4 SAE ISO 11926; SAE 1926
1M**	Metric Mounting Bolts (M12-1.75 x 45mm lg. SHCS Circuit 'C' only) (M12-1.75 x 60mm lg. SHCS Circuit 'D' only) (M12-1.75 x 90mm lg. SHCS Circuit 'A' only)
1E**	English Mounting Bolts (UNC .50-13 x 1.75 lg. SHCS Circuit 'C' only) (UNC .50-13 x 2.25 lg. SHCS Circuit 'D' only) (UNC .50-13 x 3.50 lg. SHCS Circuit 'A' only)

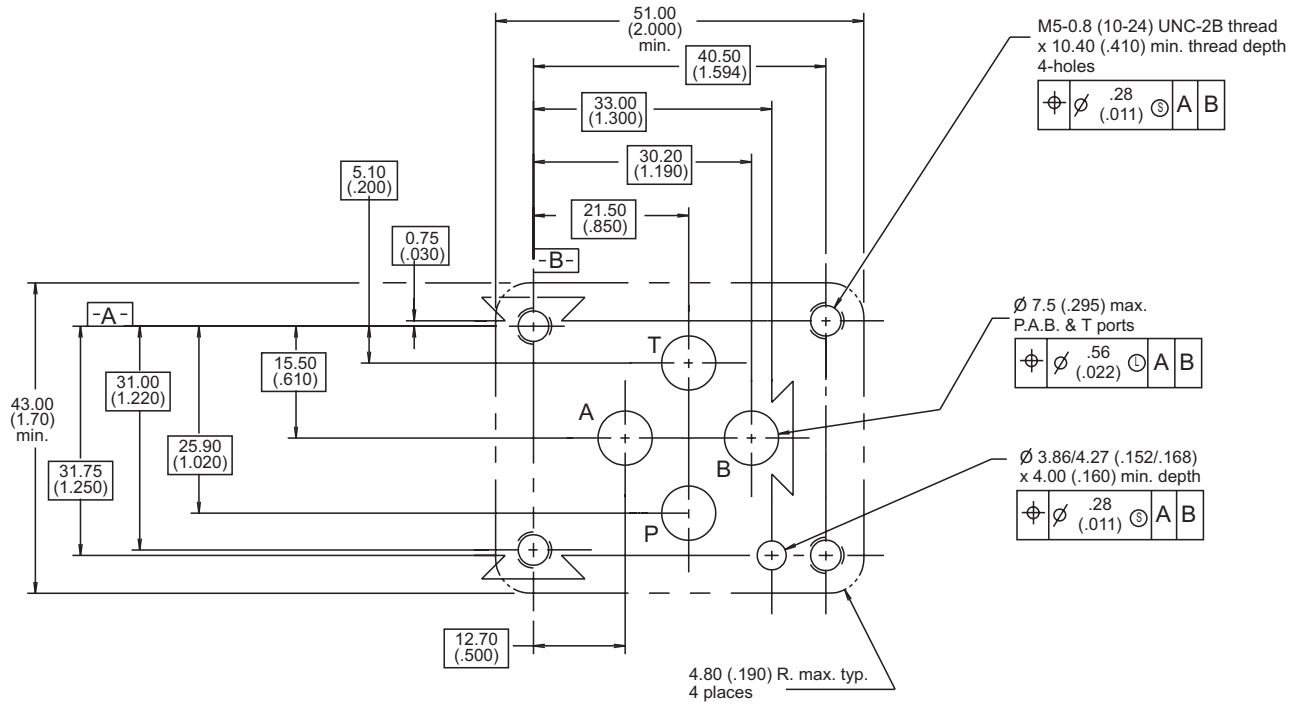
\* Tapping plate only.

\*\* Cover and crossover plate only.

**C**

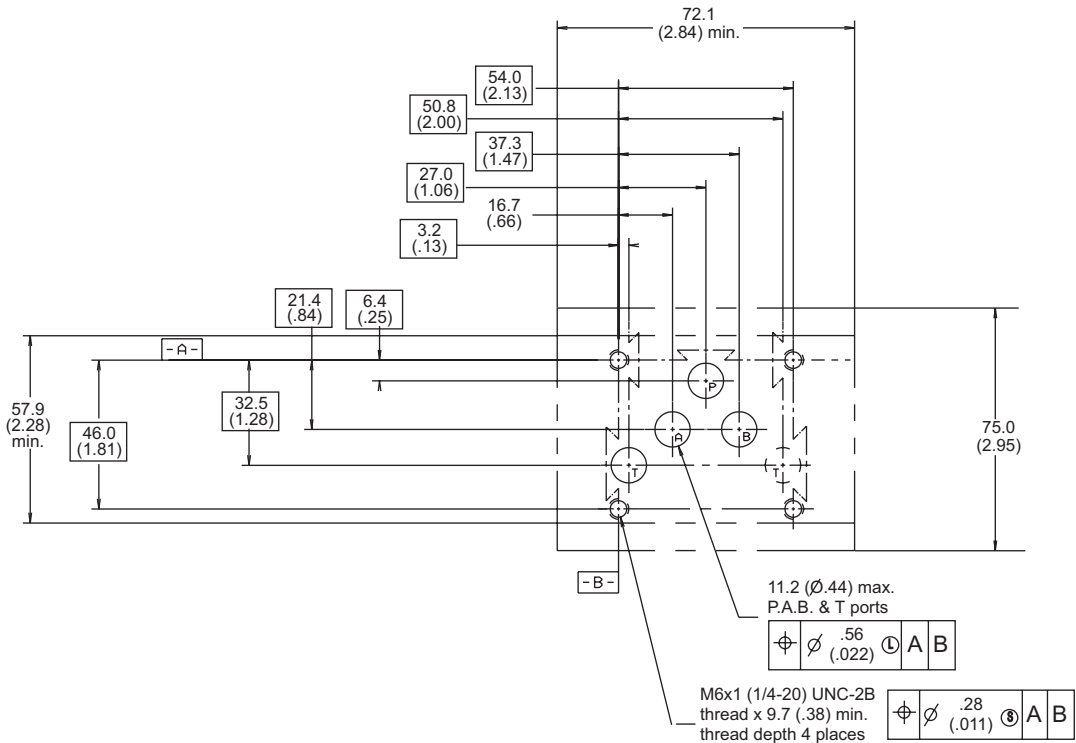
**Mounting Pattern — NFPA D03, NG6, CETOP 3**

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



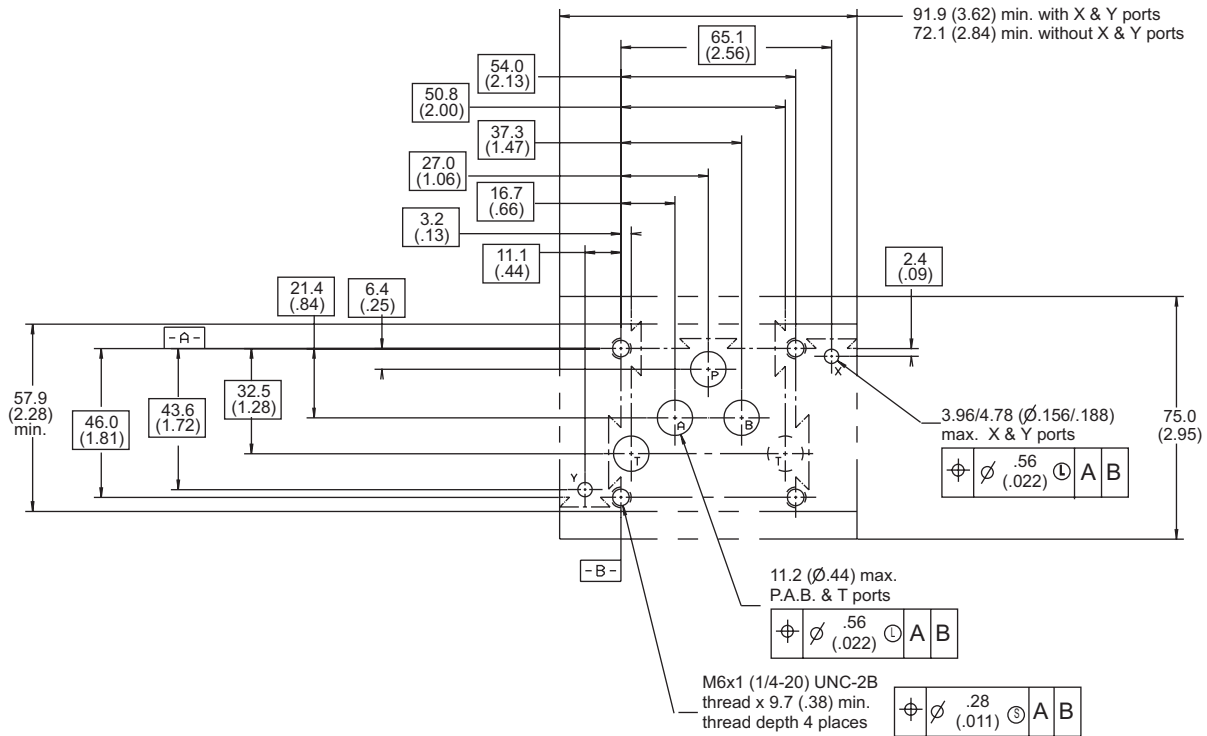
**Mounting Pattern — NFPA D05, NG5, CETOP 5**

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



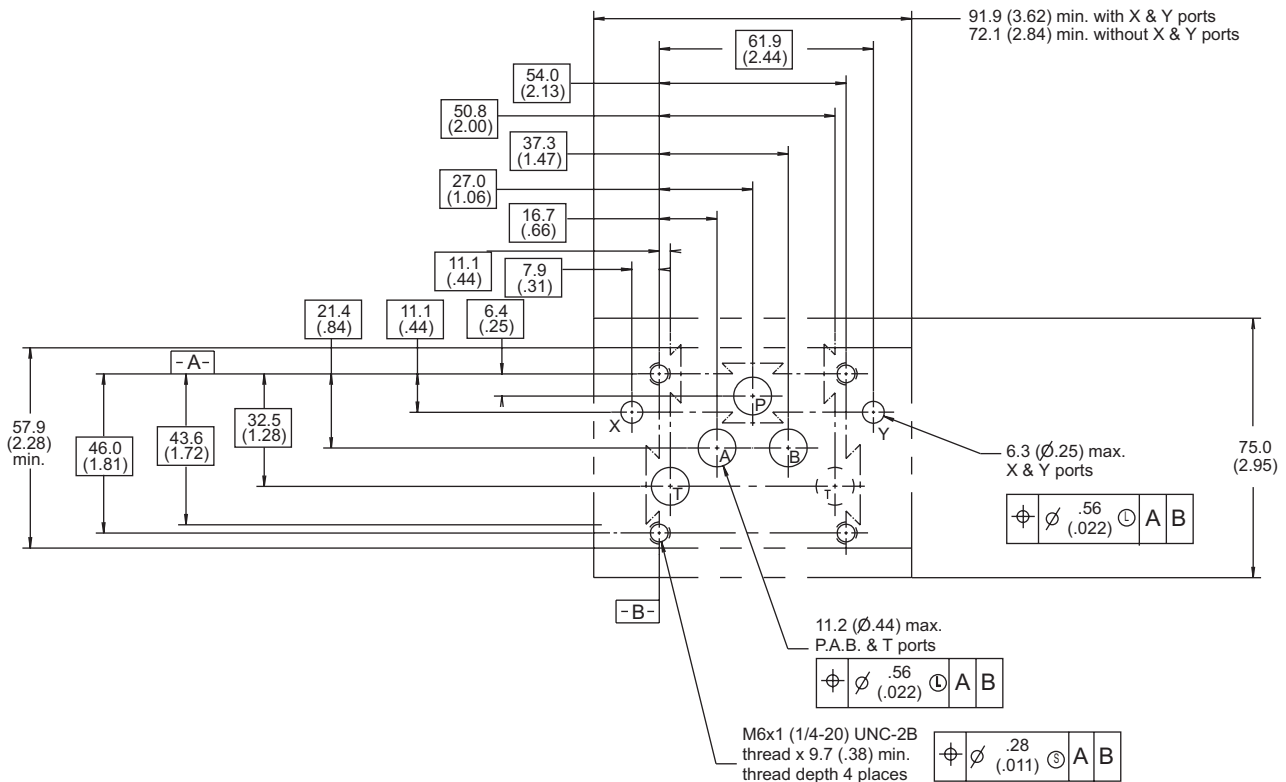
**Mounting Pattern — NFPA D05H, NG10, CETOP 5H**

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



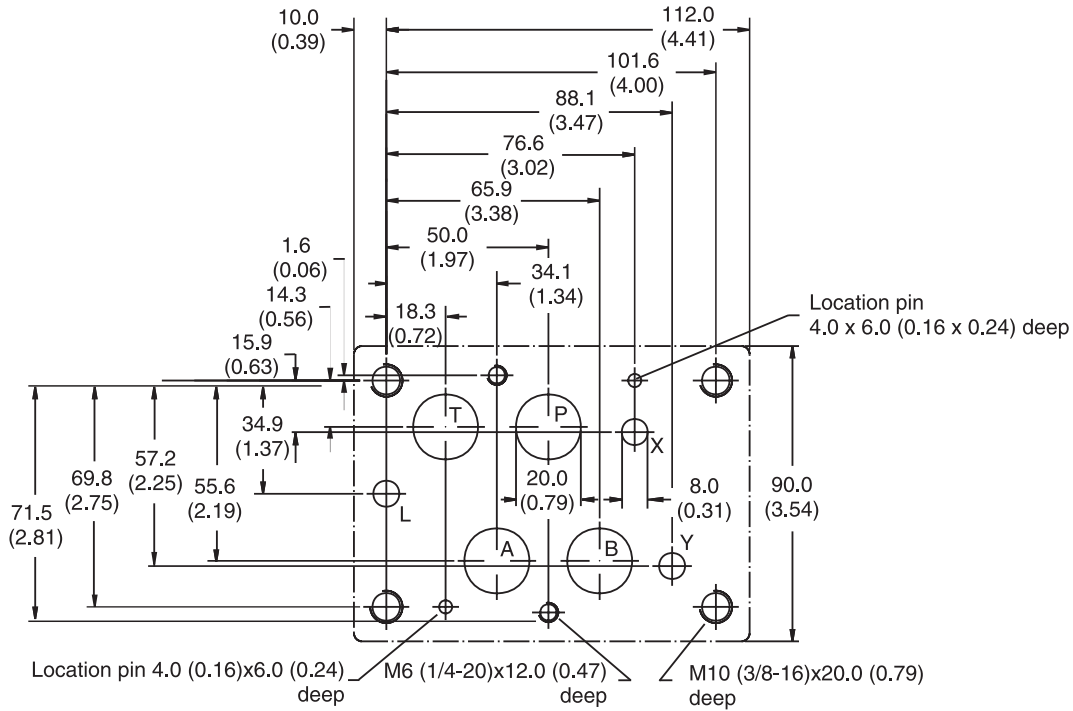
**Mounting Pattern — NFPA D05HE, NG10, CETOP 5H**

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



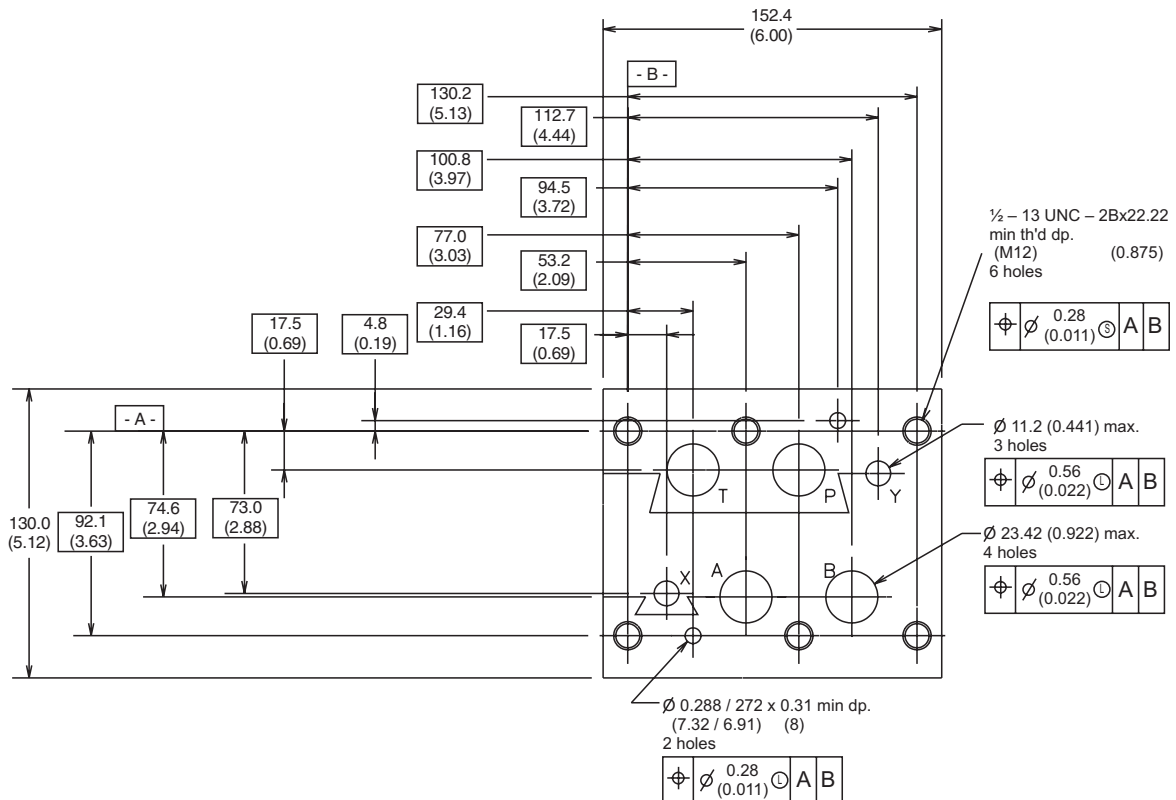
**Mounting Pattern — NFPA D07, NG16, CETOP 7**

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



**Mounting Pattern — NFPA D08, NG25, CETOP 8**

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



### General Description

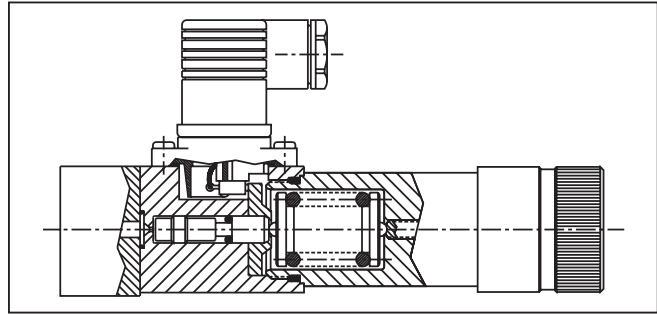
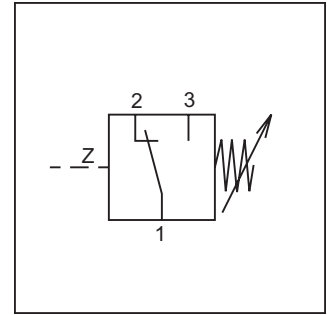
Series PSB electrohydraulic pressure switches are high performance devices that provide an electrical signal when sensed pressure rises above or falls below the selected setting. Maximum operating pressure is 315 Bar (4560 PSI) for all models.

### Operation

Sensed pressure acts against a piston and spring plate assembly that is opposed by an adjustable spring force. When the pressure against the piston exceeds that of the adjustable spring, the plate moves and actuates a microswitch. The desired operating pressure is adjusted via a setscrew or hand knob. A tamper resistant keylock option is also available with the setscrew type adjuster. The electric element is a high quality micro switch with snap-action contact. Three terminals permit application as "on", "off" or "change-over" switch. The electric connection is made with a 3-pole plug-in connector to DIN 43650 with ground. The plug-in connector is also available with an indicator light.

### Features

- **Four Separate Adjustable Pressure Range Options** — Enables operator to precisely select the desired pressure setting.
- **Hydraulically Dampened Piston** — Provides accurate response and extended service life.
- **Flange Type Mounting Style** — Provides great flexibility for mounting with manifolds, sandwich plates or direct line connections.
- **Optional Keylock Adjustment** — Prevents tampering or unauthorized adjustments in critical applications.
- **Robust Cast Iron Construction** — A rugged, yet compact, product designed to provide long service life in demanding applications.
- **IP 65 (Nema 4) Class Electrical Protection** — Maintains integrity against moisture in spray or splashdown situations.



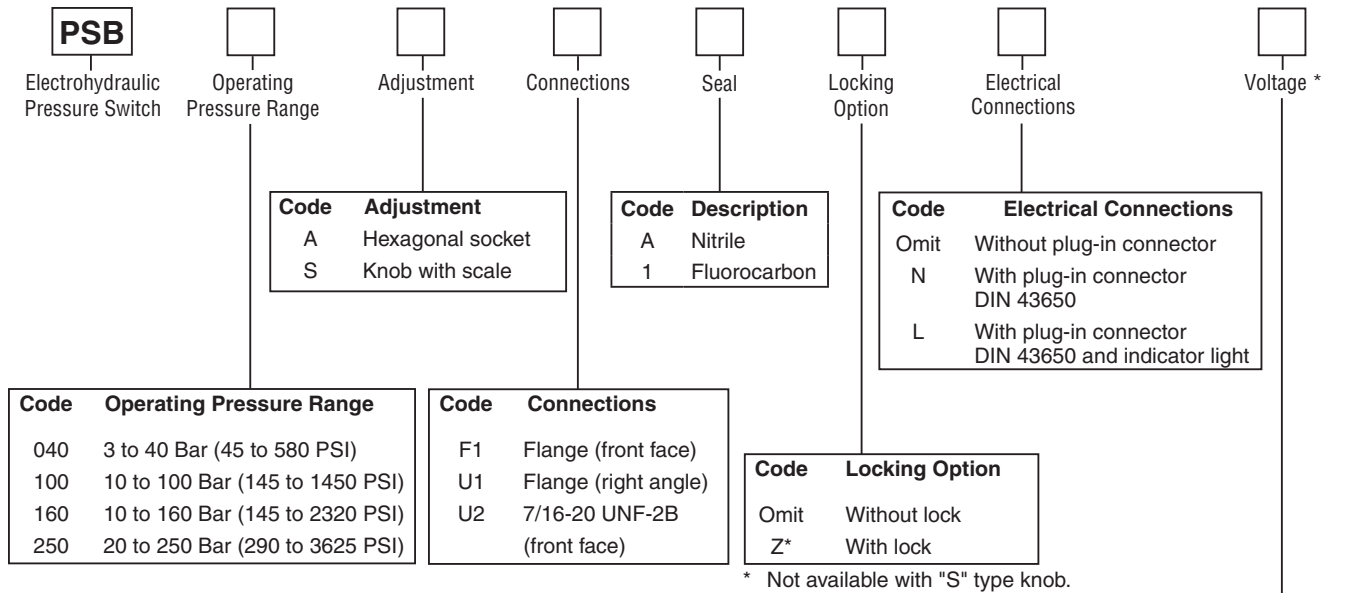
### Specifications

<b>Type</b>	Plunger type switch
<b>Mounting</b>	Flange mounting or fitted to a level face
<b>Mounting Position</b>	No restrictions
<b>Operating Pressure</b>	Maximum 315 Bar (4560 PSI)
<b>Actuating Pressure Differential</b>	See performance curves
<b>Duty Cycle</b>	Maximum 1/s
<b>Operating Temp. Range (Ambient)</b>	0 to 80° C (32 to 176° F)
<b>Viscosity Range</b>	12 to 400 cSt / mm <sup>2</sup> /s (56 to 1854 SSU)
<b>Filtration</b>	Recommend ISO 4406 Code, 18/16/13 or better
<b>Electrical Connection</b>	Plug-in connector to DIN 43650
<b>Insulation</b>	IP 65 (Nema 4)
<b>Contact Load Carrying Capacity</b>	5 A at 250 VAC; 1 A at 50 VDC; .02 A at 250 VDC

Note: For inductive DC loads a diode should be used to increase service life.

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).





**Weight:** 1.0 kg (2.2 lbs.)

**Mounting Bolts**  
 (2 each required)

	F1	U1/U2
Inch	10 x 353 (10-24 x 2.50)	10 x 218 (10-24 x 2.00)
Metric	M5 x 60	M5 x 50

Code	Voltage
G024	Plug-in connector w/light, 24VDC
W115	Plug-in connector w/light, 115VAC
W230	Plug-in connector w/light, 230VAC

\* Only for the Code "L" Models.

**Sandwich Plate to NG6, NFPA D03 Pattern**

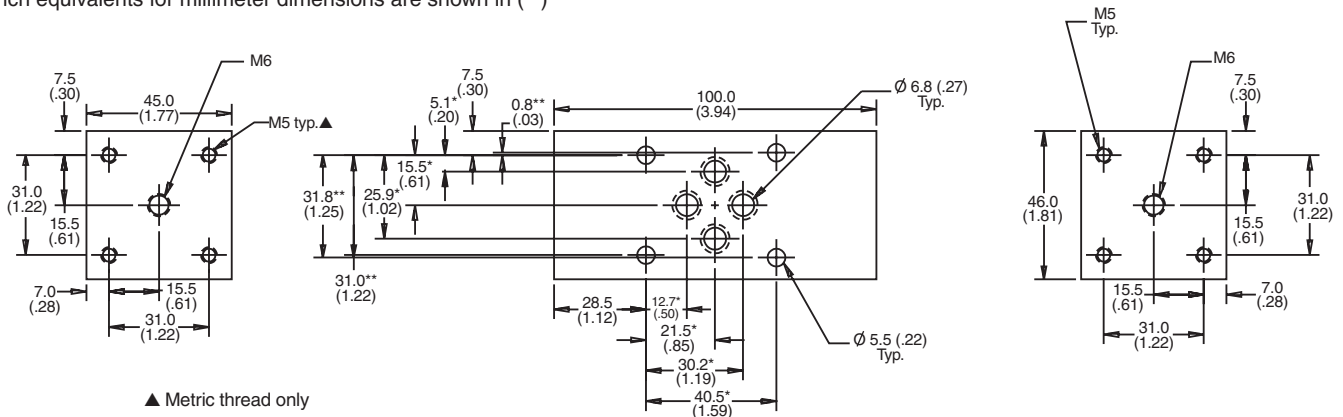
Allows PSB switches to be used in stacking assemblies with Sandwich style valves.



**H06PSB-993 -- Pressure switch to P connection**

**H06PSB-994 -- Pressure switch to A or B or A and B connection**

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



▲ Metric thread only

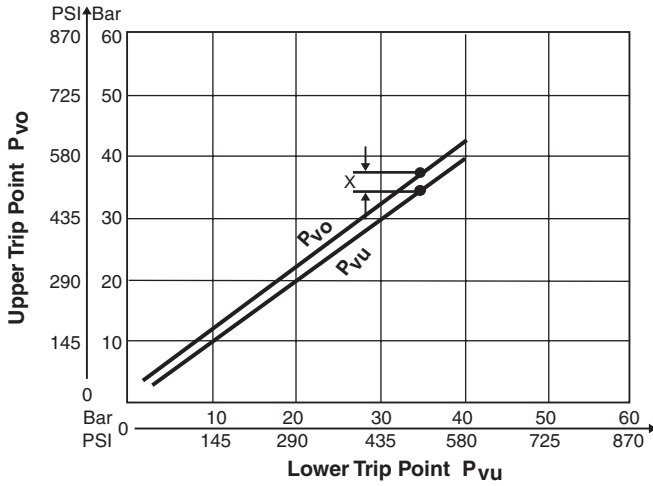
Note:  
 \* Tolerance on these dimensions +/- 0.2  
 \*\* Tolerance on these dimensions +/- 0.1



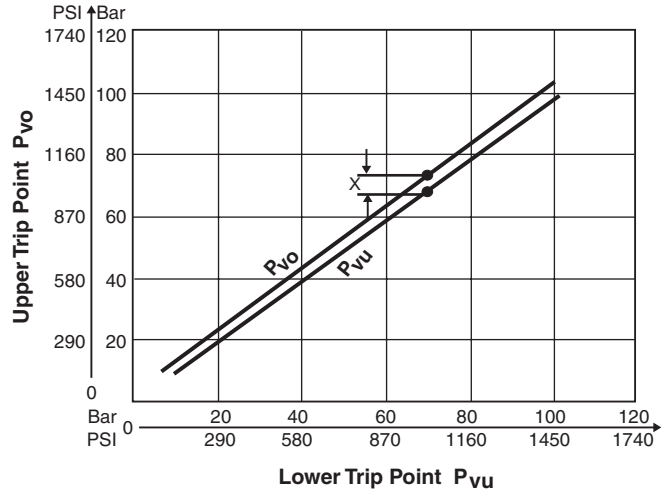
**Performance Curves**

**C**

**PSB 040**

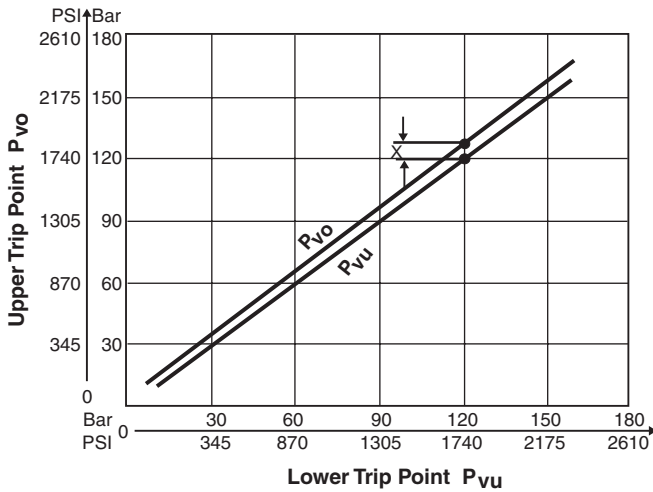


**PSB 100**

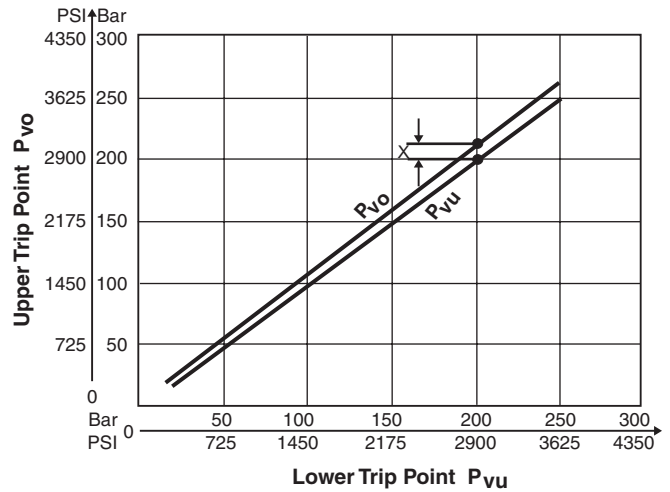


X = Switching Pressure Difference

**PSB 160**

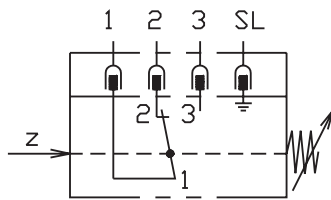


**PSB 250**

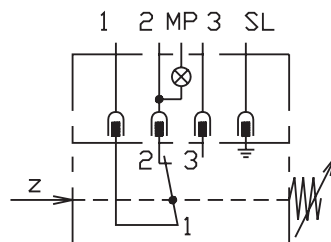


X = Switching Pressure Difference

**Electrical Connections**



Connection 'N'

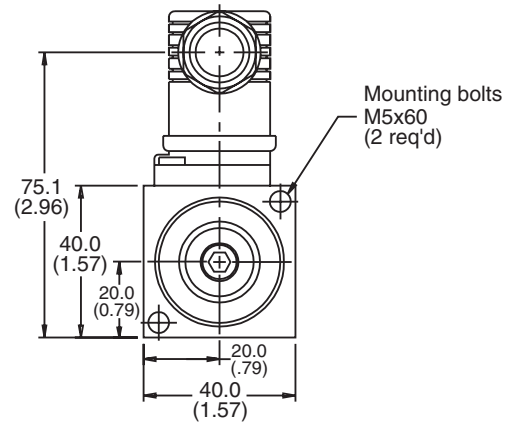
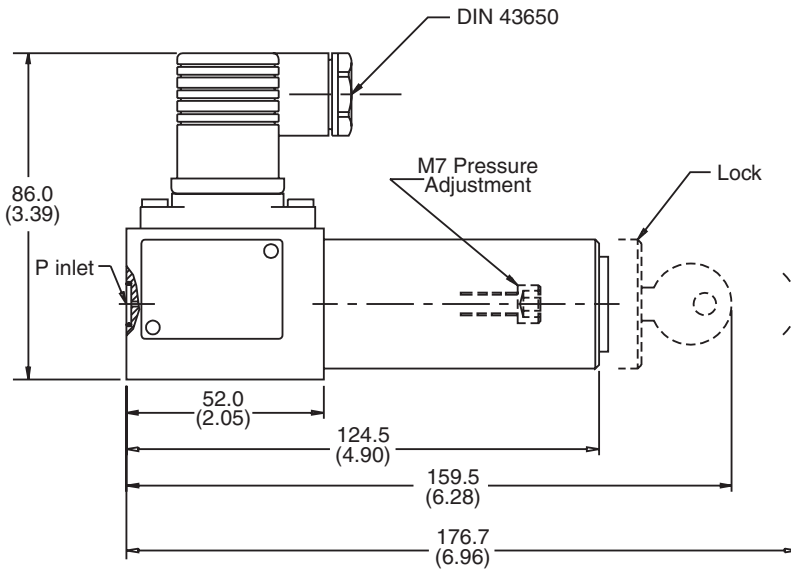
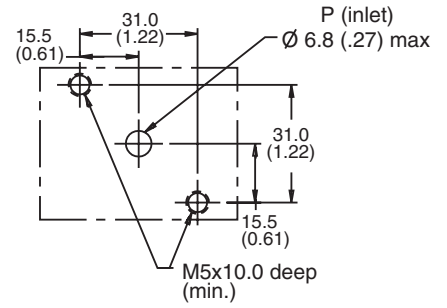
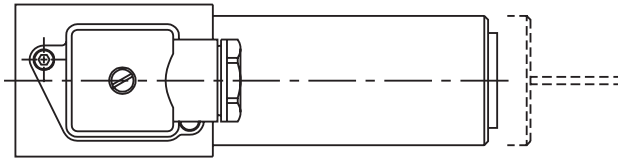


Connection 'L'

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

**F1**

**Mounting Pattern**

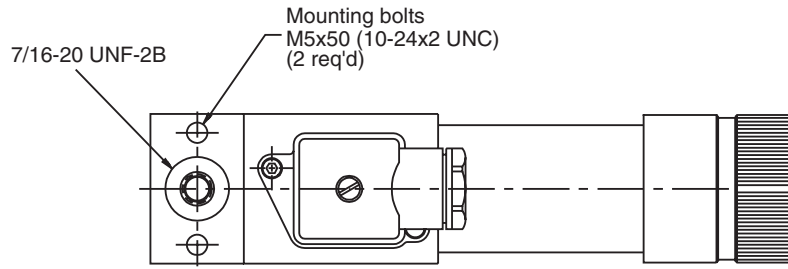


**Dimensions**

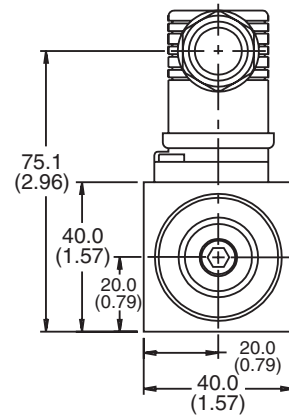
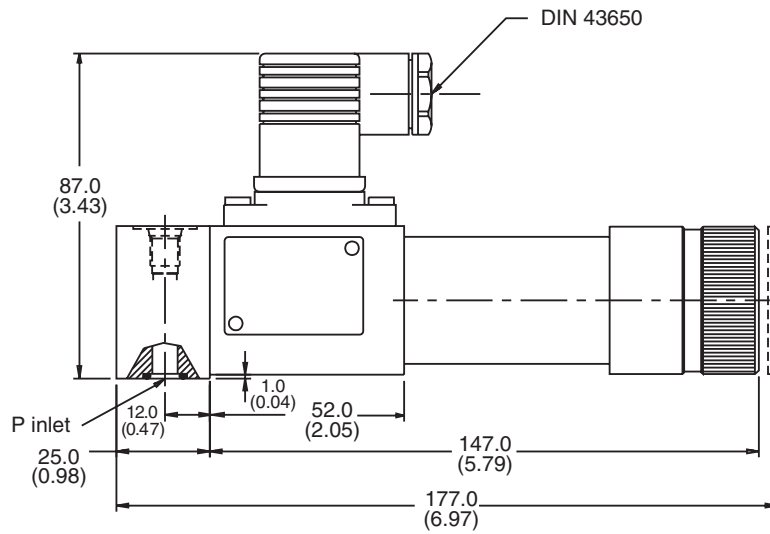
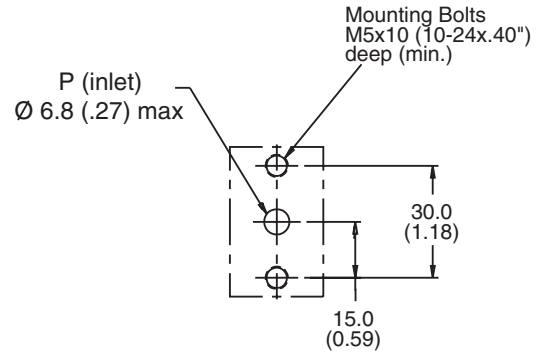
**Series PSB**

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

**U1**

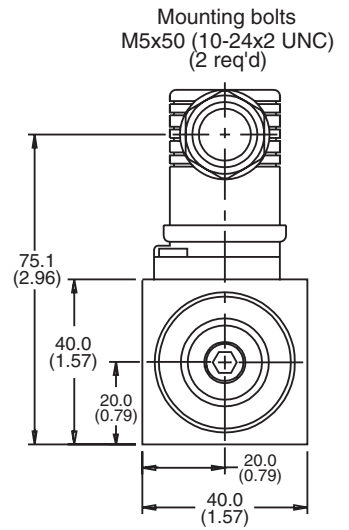
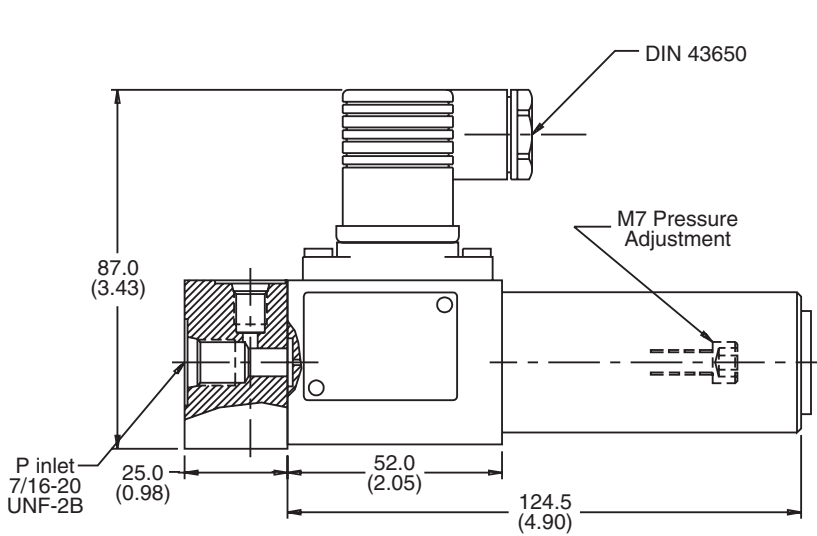
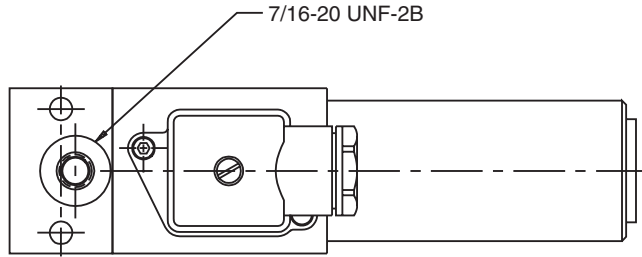


**Mounting Pattern**



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

**U2**





**Contents**

<b>Series R4V*5, R6V*5</b> .....	Pressure Relief with Vent Function, Subplate Mounted .....	D3
	Replaces Series R*R, R*M	<b>PHASE OUT</b>
	Replaces Series RS*R, RS*M	<b>PHASE OUT</b>
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Specifications .....		D6
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Dimensions .....		D8 - D15
<b>Series R4V/R6V (TÜV)</b> .....	Pilot Operated Pressure Relief Valve .....	D17
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Ordering Information .....		D18
Specifications .....		D19
Performance Curves .....		D20 - D23
Dimensions .....		D24 - D29
<b>Series VS</b> .....	Pressure Relief, Direct Operated, Subplate Mounted .....	D30
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Dimensions .....		D32
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<b>Series VM</b> .....	Pressure Reducing, Direct Operated, Subplate Mounted .....	D50
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Specifications .....		D51
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Dimensions .....		D53 - D54
<b>Series R4S</b> .....	Sequence, Pilot Operated, Subplate Mounted .....	D55
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Specifications, Performance Curves .....		D56
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Continued on next page

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	Specifications .....	D75
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<b>Series R5U</b> .....	Unloading, Pilot Operated, SAE Flange .....	D79
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**D**

**Phase Out**  
2-part bodies



## General Description

Series R4V\*5 and R6V\*5 pressure relief valves feature a manual adjustment pilot stage which controls a seated type main stage.

A vent function with a solenoid operated directional valve is available for circulation at minimum pressure.

## Features

- Pilot operated with manual adjustment
- 2 interfaces:
  - Subplate, ISO 6264 (DIN 24340 Form D) with VV01 vent valve (R4V)
  - Subplate, ISO 6264 (DIN 24340 Form E) with CETOP 03 vent valve (R6V)
- 3 pressure ranges
- 3 adjustment modes:
  - Hand knob
  - Acorn nut with lead seal
  - Key lock
- Remote control via port X

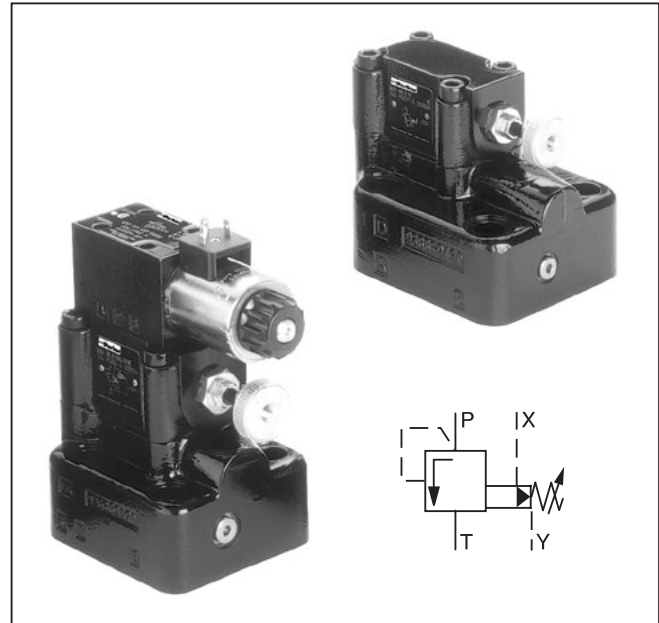
## Function

System pressure in port P is applied via the X gallery to the spring loaded cone in the pilot head. The pilot head controls the pressure in the Z area on top of the main cartridge which is additionally kept close by the main spring.

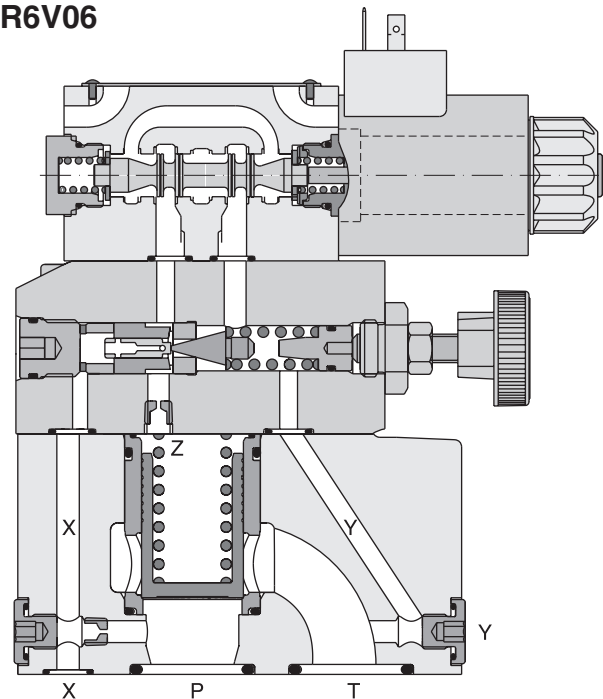
If the pilot pressure exceeds the setting pressure the pilot cone opens and thus limits the pilot pressure.

When the system pressure exceeds the pilot pressure plus the spring force, the main cartridge opens to port T and limits the pressure in port P to the adjusted level.

Additionally to the relief function, a solenoid operated vent valve connects the Z area to tank. This allows oil circulation from P to T at minimum pressure drop. The vent valve can either be a standard CETOP 03 valves (mounting form E) or a sandwich unit (mounting form D). For both types the vent position can be either at the energized or de-energized solenoid.

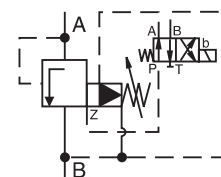
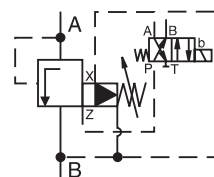


## R6V06



Code 1

Code 9



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

<b>R</b>		<b>V</b>		<b>5</b>										
Pressure Relief Valve	Interface	Relief Function	Size	Maximum Pressure 350 Bar (5075 PSI)	Drain Port	Pressure Range	Adjustment	Pilot Oil Drain Line	Vent Valve Function	Solenoid Voltage	Design Series	Seal	Modifications	

Code	Description
03	NG10
06	NG25
10	NG32

Code	Interface	Drain	Aux Port
3	R4V	Y-port	NPT
9	R4V	Y-port	BSP
9	R6V	Y-port	BSP

Code	Description
1	up to 105 Bar (1523 PSI)
3	up to 210 Bar (3045 PSI)
5	up to 350 Bar (5075 PSI)

Code	Description
1	Hand Knob (Standard)
3	Acorn Nut with Lead Seal
4	Key Lock

Code	Description
G0R	12V
G0Q	24V
GAR	98V
GAG	205V
W30	110V / 50 Hz 120V / 60 Hz
W31	230V / 50 Hz 240V / 60 Hz

Code	Description
09	Solenoid not activated unpress. circulation
11	Solenoid activated unpress. circulation

Code	Description
0*	Internal
1*	External from Subplate
2	External from Valve Body (Y-port)

Code	Description
031 <sup>2)</sup>	Vent Function w/ Slow Unloading
VFM <sup>3)</sup>	Vent Function w/ Slow Unloading

2) R4V only  
3) R6V only

Code	Description
1	Nitrile
5	Fluorocarbon

Code	Description
A	R4V
B	R6V

Code	Description
4	Subplate Mounting ISO 6264
6	Subplate Mounting ISO 6264

\* Only with drain port 3.

**Weight:**

R4V03	4.4 kg (9.7 lbs.)
R4V06	6.2 kg (13.7 lbs.)
R4V10	7.7 kg (17.0 lbs.)
R6V03	5.9 kg (13.0 lbs.)
R6V06	7.2 kg (15.9 lbs.)
R6V10	9.2 kg (20.3 lbs.)

<b>R</b>		<b>V</b>		<b>5</b>							
Pressure Relief Valve	Interface	Relief Function	Size	Maximum Pressure 350 Bar (5075 PSI)	Drain Port	Pressure Range	Adjustment	Pilot Oil Drain Line	Design Series	Seal	Options Check with Factory

Code	Description
03	NG10
06	NG25
10	NG32

Code	Interface	Drain	Aux Port
3	R4V	Y-port	NPT
9	R4V	Y-port	BSP
9	R6V	Y-port	BSP

Code	Description
1	up to 105 Bar (1523 PSI)
3	up to 210 Bar (3045 PSI)
5	up to 350 Bar (5075 PSI)

Code	Description
1	Hand Knob 32mm dia. (Standard)
3	Acorn Nut with Lead Seal
4	Key Lock

Code	Description
A	R4V
B	R6V

Code	Description
0 <sup>1)</sup>	Internal
1 <sup>1)</sup>	External from Subplate
2	External from Valve Body (Y-port)

1) Only with drain port 3

Code	Description	
4	Subplate Mounting ISO 6264	
6		



**Weight:**

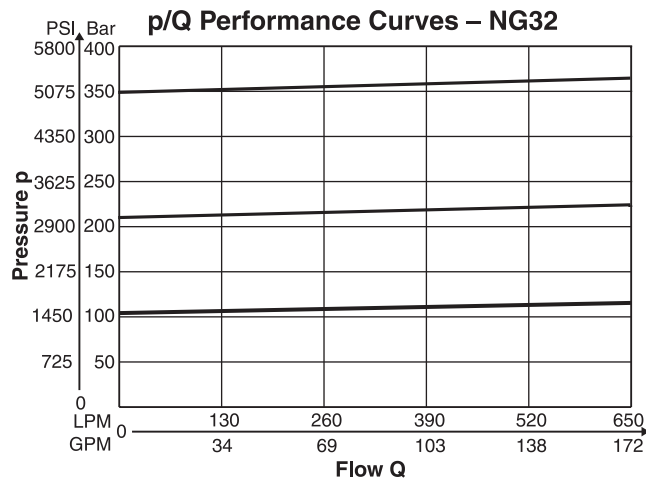
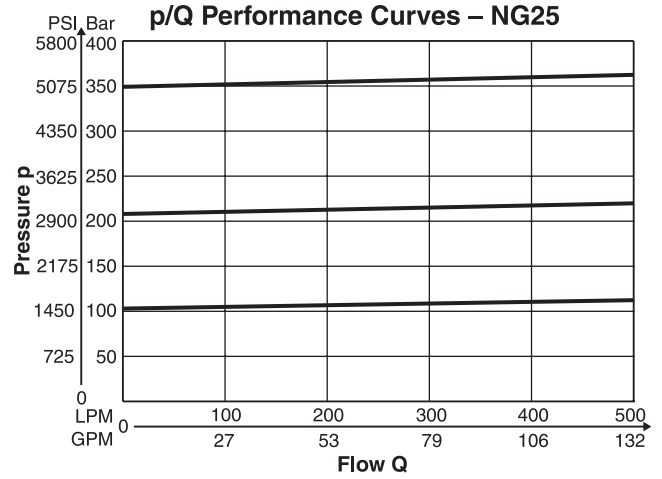
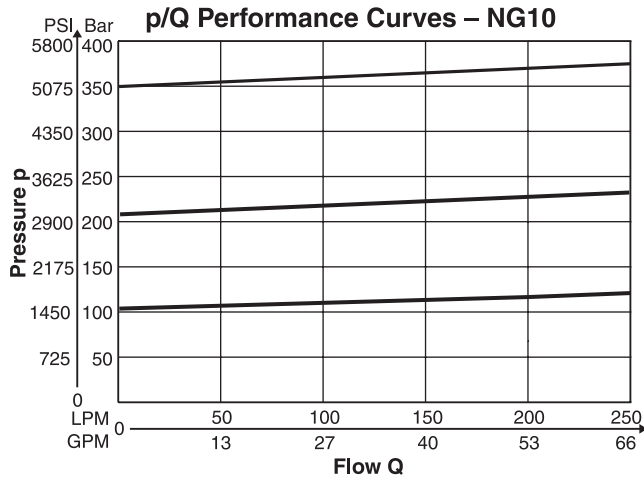
R4V03	2.7 kg (6.0 lbs.)
R4V06	4.5 kg (9.9 lbs.)
R4V10	6.0 kg (13.2 lbs.)
R6V03	4.5 kg (9.9 lbs.)
R6V06	5.8 kg (12.8 lbs.)
R6V10	7.8 kg (17.2 lbs.)

## R4V and R6V

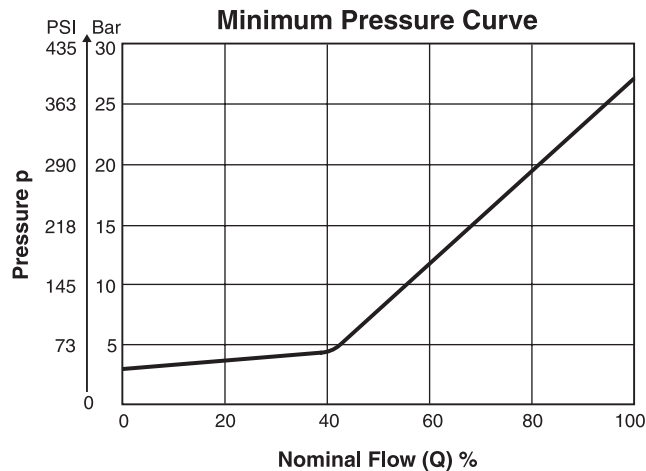
General					
Size		NG10	NG25	NG32	
Interface		Subplate mounting acc. ISO 6264 (DIN 24340)			
Mounting Position		As desired, horizontal mounting preferred			
Ambient Temperature		-20°C to +80°C (-4°F to +176°F)			
Hydraulic					
Operating Pressure		Ports P or A and X up to 350 Bar (5075 PSI), Port T or B and Y depressurized			
Pressure Range		105, 210, 350 Bar (1523, 3045, 5075 PSI)			
Nominal Flow	Series R4V	150 LPM (39.7 GPM)	350 LPM (92.6 GPM)	650 LPM (172.0 GPM)	
	Series R6V	250 LPM (66.1 GPM)	500 LPM (132.3 GPM)	650 LPM (172.0 GPM)	
Fluid		Hydraulic oil according to DIN 51524 ... 51525			
Viscosity	Recommended Permitted	30 to 50 cSt / mm <sup>2</sup> /s (139 to 232 SSU) 20 to 380 cSt / mm <sup>2</sup> /s (93 to 1761 SSU)			
Fluid Temperature	Recommended Maximum	+30°C to +50°C (+86°F to +122°F) -20°C to +70° (-4°F to +158°F)			
Filtration		ISO 4406 (1999), 18/16/13			

## R4V and R6V with Vent Function

General							
Size		NG10	NG25	NG32			
Interface		Subplate mounting acc. ISO 6264 (DIN 24340)					
Mounting Position		As desired, horizontal mounting preferred					
Ambient Temperature		-20°C to +80°C (-4°F to +176°F)					
Hydraulic							
Operating Pressure		Ports P or A and X up to 350 Bar (5075 PSI), Port T or B and Y depressurized					
Pressure Range		105, 210, 350 Bar (1523, 3045, 5075 PSI)					
Nominal Flow	Series R4V	150 LPM (39.7 GPM)	350 LPM (92.6 GPM)	650 LPM (172.0 GPM)			
	Series R6V	250 LPM (66.1 GPM)	500 LPM (132.3 GPM)	650 LPM (172.0 GPM)			
Fluid		Hydraulic oil according to DIN 51524 ... 51525					
Viscosity	Recommended Permitted	30 to 50 cSt / mm <sup>2</sup> /s (139 to 232 SSU) 20 to 380 cSt / mm <sup>2</sup> /s (93 to 1761 SSU)					
Fluid Temperature		-20°C to +70° (-4°F to +158°F)					
Filtration		ISO 4406 (1999), 18/16/13					
Electrical (solenoid)							
Duty Cycle		100% ED CAUTION: Coil temperature up to 180°C (356°F)					
Solenoid Connector		Connector acc. to EN 175301-803					
Protection Class		IP65 in accordance with EN 60529 (plugged and mounted)					
	Code	G0R	G0Q	GAR	GAG	W30	W31
Supply Voltage		12V	24V	98V	205V	110 at 50Hz 120 at 60Hz	230 at 50Hz 240 at 60Hz
Supply Tolerance		+5...-10	+5...-10	+5...-10	+5...-10	+5...-10	+5...-10
Power Consumption	Hold	31W	31W	31W	31W	78W	78W
	In Rush	31W	31W	31W	31W	264W	264W
Switching Frequency		16,000 (DC), 7200 (AC) switchings/hour maximum					
Wiring Minimum		3 x 1.5 mm <sup>2</sup> Recommended					
Wiring Length Maximum		50 m (164 ft.) Recommended					

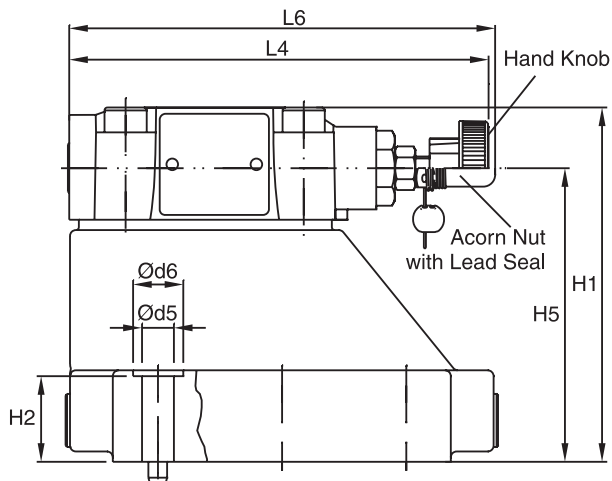
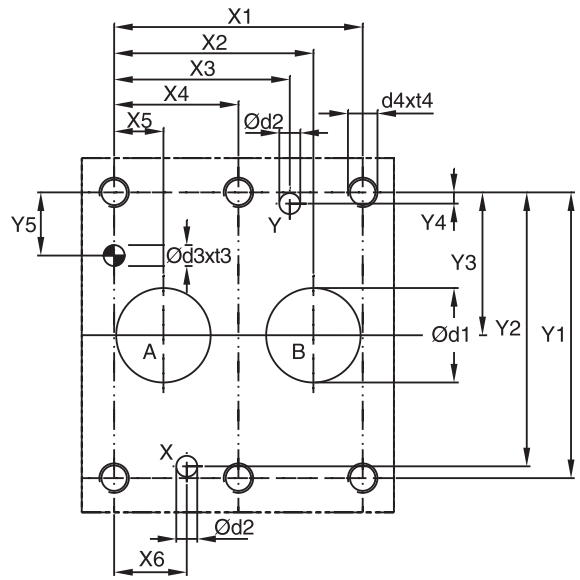
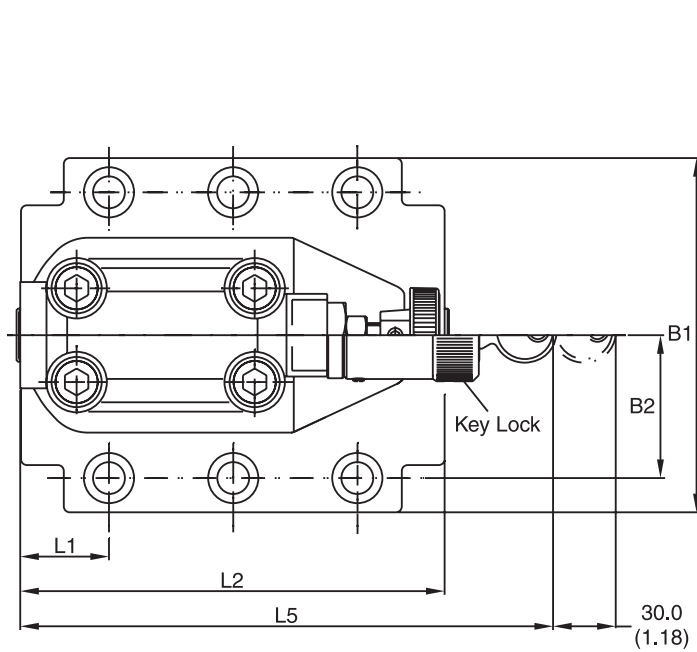


The performance curves are measured with external drain.  
 For internal drain the tank pressure has to be added to curve.



**D**

D



**Dimensions**



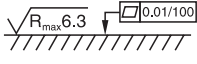
Inch equivalents for millimeter dimensions are shown in (\*\*)

NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	6264-06-07-*-97	42.9 (1.69)	35.8 (1.41)	21.5 (0.85)	–	7.2 (0.28)	21.5 (0.85)	0.0 (0.00)	66.7 (2.63)	58.8 (2.31)	33.4 (1.31)	7.9 (0.31)	14.3 (0.56)	–
25	6264-08-11-*-97	60.3 (2.37)	49.2 (1.94)	39.7 (1.56)	–	11.1 (0.44)	20.6 (0.81)	0.0 (0.00)	79.4 (3.13)	73.0 (2.87)	39.7 (1.56)	6.4 (0.25)	15.9 (0.63)	–
32	6264-10-15-*-97	84.2 (3.31)	67.5 (2.66)	59.5 (2.34)	42.1 (1.66)	16.7 (0.66)	24.6 (0.97)	0.0 (0.00)	96.8 (3.81)	92.8 (3.65)	48.4 (1.91)	3.8 (0.15)	21.4 (0.84)	–

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	6264-06-07-*-97	87.3 (3.44)	33.4 (1.31)	83.0 (3.27)	21.0 (0.83)	–	–	62.5 (2.46)	–	29.0 (1.14)	94.8 (3.73)	–	143.0 (5.63)	181.0 (7.13)	144.8 (5.76)
25	6264-08-11-*-97	105.0 (4.13)	39.7 (1.56)	109.5 (4.31)	29.0 (1.14)	–	–	89.0 (3.50)	–	34.7 (1.37)	126.8 (4.99)	–	143.0 (5.63)	181.0 (7.13)	144.8 (5.76)
32	6264-10-15-*-97	120.0 (4.72)	48.4 (1.91)	120.0 (4.72)	29.0 (1.14)	–	–	99.5 (3.92)	–	30.6 (1.20)	144.3 (5.68)	–	143.0 (5.63)	181.0 (7.13)	144.8 (5.76)

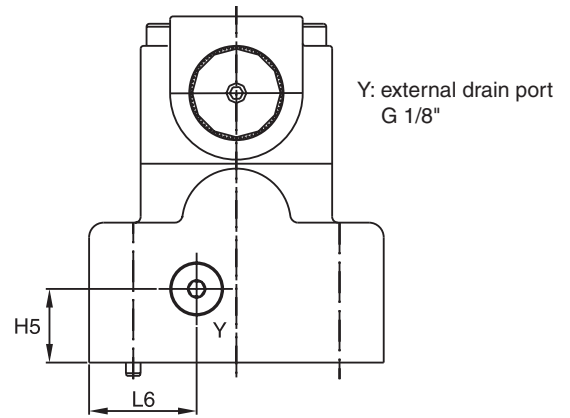
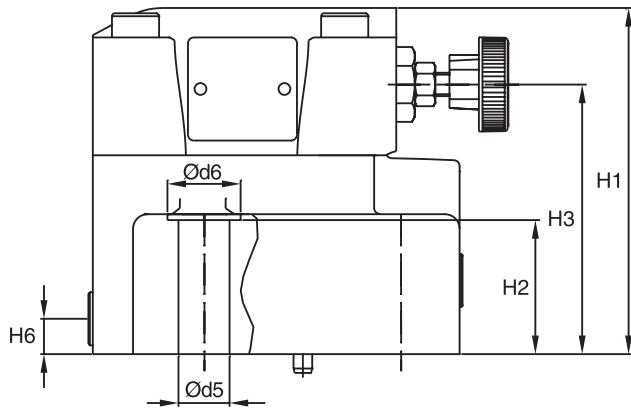
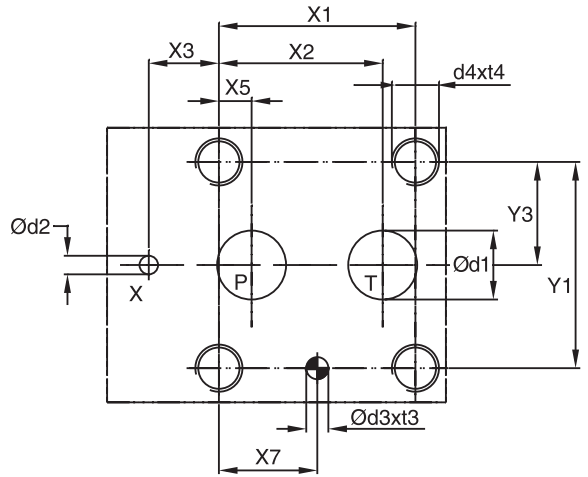
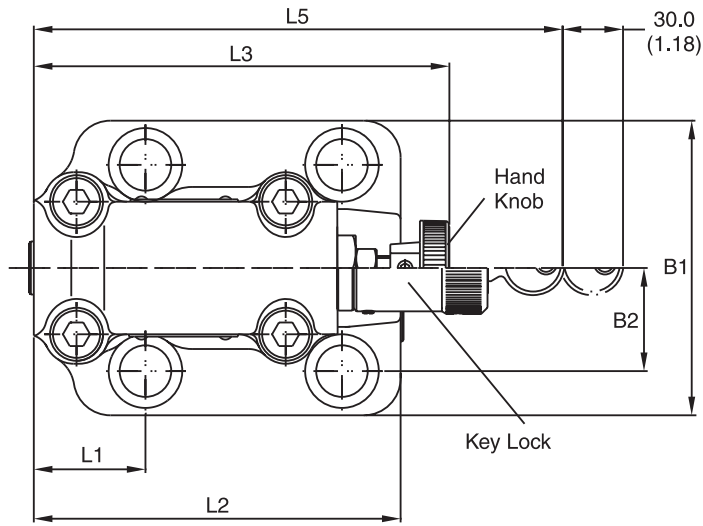
NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	6264-06-07-*-97	15.0 (0.59)	7.0 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	16.0 (0.63)	10.8 (0.43)	17.0 (0.67)
25	6264-08-11-*-97	23.4 (0.92)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	18.0 (0.71)	10.8 (0.43)	17.0 (0.67)
32	6264-10-15-*-97	32.0 (1.26)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	20.0 (0.79)	10.8 (0.43)	17.0 (0.67)

NG	ISO-code	Bolt Kit			Seal Nitrile	Kit Fluorocarbon	Surface Finish
10	6264-06-07-*-97	BK505	4xM10 x 35-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58507-0	S26-58507-5	
25	6264-08-11-*-97	BK485	4xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58475-0	S26-58475-5	
32	6264-10-15-*-97	BK506	6xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58508-0	S26-58508-5	

NG	ISO-code	Subplate	Size
10	6264-06-07-*-97	SPP3M6B910	A, B = 3/4" BSPP x, y = 1/4" BSPP
25	6264-08-11-*-97	SPP6M8B910	A, B = 1" BSPP x, y = 1/4" BSPP
32	6264-10-15-*-97	SPP10M12B910	A, B = 1 1/2" BSPP x, y = 1/4" BSPP



D







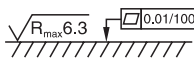
Inch equivalents for millimeter dimensions are shown in (\*\*)

NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	6264-06-09-*-97	53.8 (2.12)	47.5 (1.87)	0.0 (0.00)	-	22.1 (0.87)	-	22.1 (0.87)	53.8 (2.12)	-	26.9 (1.06)	-	-	-
25	6264-08-13-*-97	66.7 (2.63)	55.6 (2.19)	23.8 (0.94)	-	11.1 (0.44)	-	33.4 (1.31)	70.0 (2.76)	-	35.0 (1.38)	-	-	-
32	6264-10-17-*-97	88.9 (3.50)	76.2 (3.00)	31.8 (1.25)	-	12.7 (0.50)	-	44.5 (1.75)	82.6 (3.25)	-	41.3 (1.63)	-	-	-

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	80.0 (3.15)	26.9 (1.06)	114.0 (4.49)	27.0 (1.06)	88.0 (3.46)	-	25.0 (0.98)	25.0 (0.98)	52.5 (2.07)	118.5 (4.67)	141.0 (5.55)	-	180.0 (7.09)	29.5 (1.16)
25	6264-08-13-*-97	100.0 (3.94)	35.0 (1.38)	117.5 (4.63)	45.5 (1.79)	91.5 (3.60)	-	25.0 (0.98)	12.0 (0.47)	37.9 (1.49)	124.5 (4.90)	141.0 (5.55)	-	180.0 (7.09)	36.5 (1.44)
32	6264-10-17-*-97	120.0 (4.72)	41.3 (1.63)	123.0 (4.83)	52.0 (2.05)	97.0 (3.82)	-	25.0 (0.98)	13.5 (0.53)	45.0 (1.77)	153.0 (6.02)	141.0 (5.55)	-	180.0 (7.09)	36.5 (1.83)

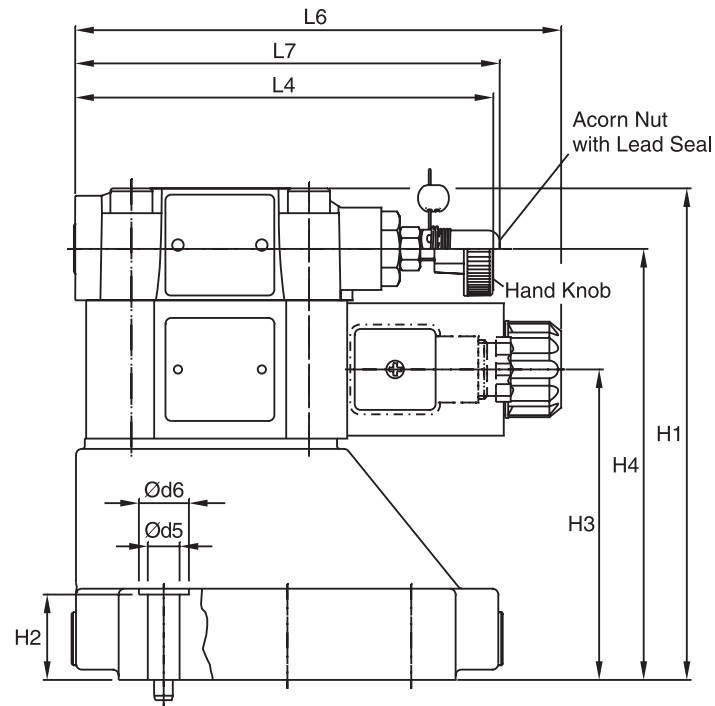
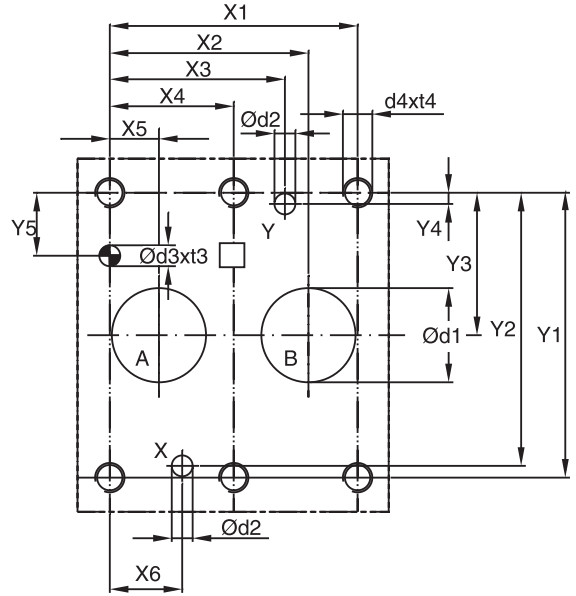
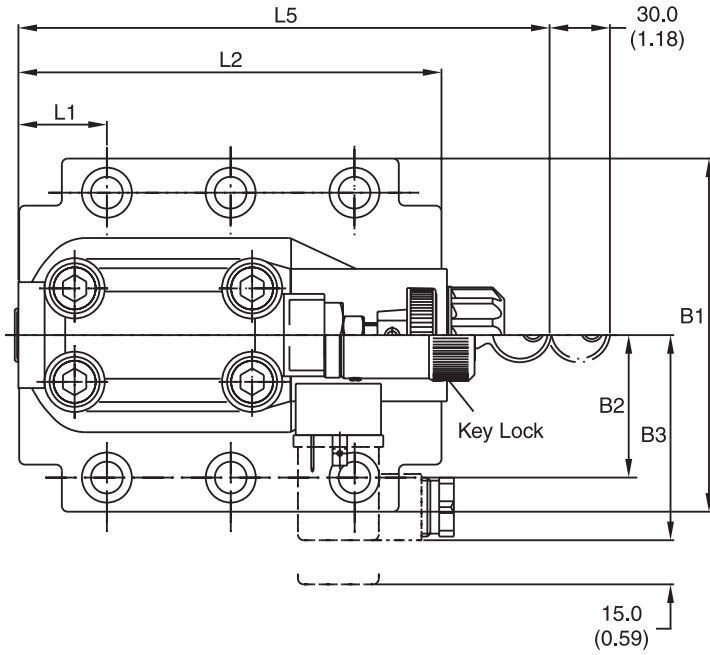
NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	6264-06-09-*-97	14.7 (0.58)	4.8 (0.19)	7.5 (0.30)	10.0 (0.39)	M12	20.0 (0.79)	13.5 (0.53)	20.0 (0.79)
25	6264-08-13-*-97	23.4 (0.92)	6.3 (0.25)	7.5 (0.30)	10.0 (0.39)	M16	27.0 (1.06)	17.5 (0.69)	25.0 (0.98)
32	6264-10-17-*-97	32.0 (1.26)	6.3 (0.25)	7.5 (0.30)	10.0 (0.39)	M18	28.0 (1.10)	20.0 (0.79)	30.0 (1.18)

NG	ISO-code	Bolt Kit			Seal Nitrile	Kit Fluorocarbon	Surface Finish
10	6264-06-09-*-97	BK494	4xM12 x 45-DIN 912 12.9	108 Nm (79.6 lb.-ft.) ±15%	S26-96396-0	S26-96396-5	
25	6264-08-13-*-97	BK366	4xM16 x 70-DIN 912 12.9	264 Nm (194.7 lb.-ft.) ±15%	S26-96589-0	S26-96589-5	
32	6264-10-17-*-97	BK507	4xM18 x 75-DIN 912 12.9	398 Nm (293.5 lb.-ft.) ±15%	S26-96392-0	S26-96392-5	

NG	ISO-code	Subplate	Size
10	6264-06-09-*-97	SPP3R6B910	P, T = 3/4" BSPP x = 1/4" BSPP
25	6264-08-13-*-97	SPP6R8B910	P, T = 1 1/4" BSPP x = 1/4" BSPP
32	6264-10-17-*-97	SPP10R12B910	P, T = 1 1/2" BSPP x, y = 1/4" BSPP



**D**



**Dimensions**



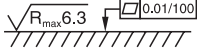
Inch equivalents for millimeter dimensions are shown in (\*\*)

NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	6264-06-07-*-97	42.9 (1.69)	35.8 (1.41)	21.5 (0.85)	– –	7.2 (0.28)	21.5 (0.85)	0.0 (0.00)	66.7 (2.63)	58.8 (2.31)	33.4 (1.31)	7.9 (0.31)	14.3 (0.56)	– –
25	6264-08-11-*-97	60.3 (2.37)	49.2 (1.94)	39.7 (1.56)	– –	11.1 (0.44)	20.6 (0.81)	0.0 (0.00)	79.4 (3.13)	73.0 (2.87)	39.7 (1.56)	6.4 (0.25)	15.9 (0.63)	– –
32	6264-10-15-*-97	84.2 (3.31)	67.5 (2.66)	59.5 (2.34)	42.1 (1.66)	16.7 (0.66)	24.6 (0.97)	0.0 (0.00)	96.8 (3.81)	92.8 (3.65)	48.4 (1.91)	3.8 (0.15)	21.4 (0.84)	– –

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	L1	L2	L3	L4	L5	L6	L7
10	6264-06-07-*-97	87.3 (3.44)	33.4 (1.31)	70.0 (2.76)	130.0 (5.12)	21.0 (0.83)	68.5 (2.70)	109.5 (4.31)	29.0 (1.14)	94.8 (3.73)	– –	143.0 (5.63)	181.0 (7.13)	165.6 (6.52)	144.8 (5.70)
25	6264-08-11-*-97	105.0 (4.13)	39.7 (1.59)	70.0 (2.76)	156.5 (6.16)	29.0 (1.14)	95.0 (3.74)	136.0 (5.35)	34.7 (1.37)	126.8 (4.99)	– –	143.0 (5.63)	181.0 (7.13)	165.6 (6.52)	144.8 (5.70)
32	6264-10-15-*-97	120.0 (4.72)	48.4 (1.91)	70.0 (2.76)	167.0 (6.57)	29.0 (1.14)	105.5 (4.15)	146.5 (5.77)	30.6 (1.20)	144.3 (5.68)	– –	143.0 (5.63)	181.0 (7.13)	165.6 (6.52)	144.8 (5.70)

NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	6264-06-07-*-97	15.0 (0.59)	7.0 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	16.0 (0.63)	10.8 (0.43)	17.0 (0.67)
25	6264-08-11-*-97	23.4 (0.92)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	18.0 (0.71)	10.8 (0.43)	17.0 (0.67)
32	6264-10-15-*-97	32.0 (1.26)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	20.0 (0.79)	10.8 (0.43)	17.0 (0.67)

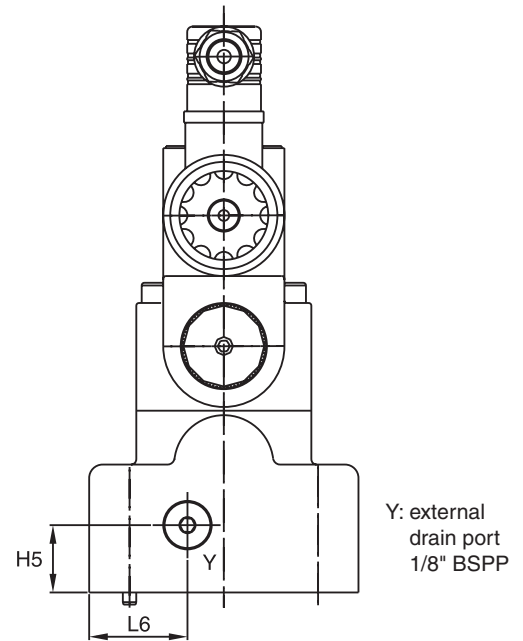
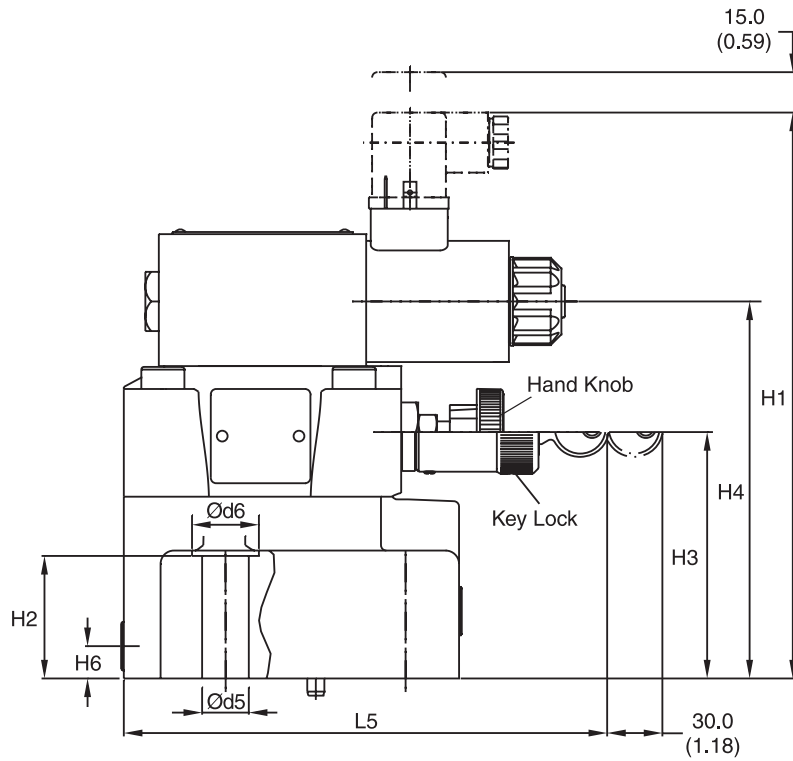
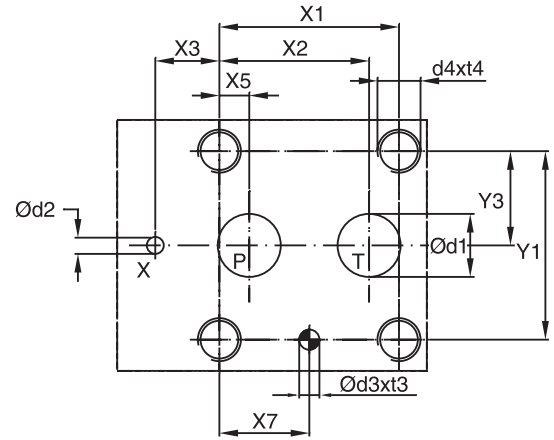
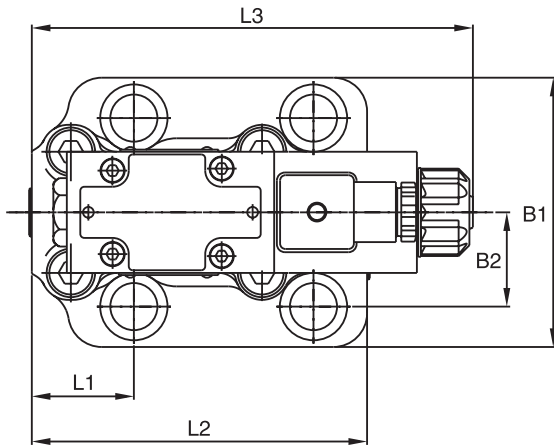
NG	ISO-code	Bolt Kit			Seal Kit		Surface Finish
					Nitrile	Fluorocarbon	
10	6264-06-07-*-97	BK505	4xM10 x 35-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58507-0	S26-58507-5	
25	6264-08-11-*-97	BK485	4xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58475-0	S26-58475-5	
32	6264-10-15-*-97	BK506	6xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58508-0	S26-58508-5	
VV01*					S56-40609-0	S56-40609-5	

\* Please combine seal kit of one size with seal kit of VV01 solenoid for complete seal kit.

NG	ISO-code	Subplate	Size
10	6264-06-07-*-97	SPP3M6B910	A, B = 3/4" BSPP x, y = 1/4" BSPP
25	6264-08-11-*-97	SPP6M8B910	A, B = 1" BSPP x, y = 1/4" BSPP
32	6264-10-15-*-97	SPP10M12B910	A, B = 1 1/2" BSPP x, y = 1/4" BSPP



**D**



Y: external  
drain port  
1/8" BSPP



Dimensions



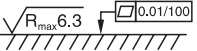
Inch equivalents for millimeter dimensions are shown in (\*\*)

NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	6264-06-09-*-97	53.8 (2.12)	47.5 (1.87)	0.0 (0.00)	-	22.1 (0.87)	-	22.1 (0.87)	53.8 (2.12)	-	26.9 (1.06)	-	-	-
25	6264-08-13-*-97	66.7 (2.63)	55.6 (2.19)	23.8 (0.91)	-	11.1 (0.44)	-	33.4 (1.31)	70.0 (2.76)	-	35.0 (1.38)	-	-	-
32	6264-10-17-*-97	88.9 (3.50)	76.2 (3.00)	31.8 (1.25)	-	12.7 (0.50)	-	44.5 (1.75)	82.6 (3.25)	-	41.3 (1.63)	-	-	-

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	80.0 (3.15)	26.9 (1.06)	206.0 (8.11)	27.0 (1.06)	88.0 (3.46)	136.5 (5.37)	25.0 (0.98)	12.0 (0.47)	52.5 (2.07)	118.5 (4.67)	163.8 (6.45)	-	180.0 (7.09)	36.5 (1.44)
25	6264-08-13-*-97	100.0 (3.94)	35.0 (1.38)	210.0 (8.27)	45.5 (1.79)	91.5 (3.60)	140.0 (5.51)	25.0 (0.98)	12.0 (0.47)	37.9 (1.49)	124.5 (4.90)	163.8 (6.45)	-	180.0 (7.09)	36.5 (1.44)
32	6264-10-17-*-97	120.0 (4.72)	41.3 (1.63)	215.5 (8.48)	52.0 (2.05)	97.0 (3.82)	145.5 (5.73)	25.0 (0.98)	12.0 (0.47)	45.0 (1.77)	153 (6.02)	163.8 (6.45)	-	180.0 (7.09)	36.5 (1.44)

NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	6264-06-09-*-97	14.7 (0.58)	4.8 (0.19)	7.5 (0.30)	10.0 (0.39)	M12	20.0 (0.79)	13.5 (0.53)	20.0 (0.79)
25	6264-08-13-*-97	23.4 (0.92)	6.3 (0.25)	7.5 (0.30)	10.0 (0.39)	M16	27.0 (1.06)	17.5 (0.69)	25.0 (0.98)
32	6264-10-17-*-97	32.0 (1.26)	6.3 (0.25)	7.5 (0.30)	10.0 (0.39)	M18	28.0 (1.10)	20.0 (0.79)	30.0 (1.18)

NG	ISO-code	Bolt Kit			Seal Nitrile	Kit Fluorocarbon	Surface Finish
10	6264-06-09-*-97	BK494	4xM12 x 45-DIN 912 12.9	108 Nm (79.6 lb.-ft.) ±15%	S26-96395-0	S26-96395-5	
25	6264-08-13-*-97	BK366	4xM16 x 70-DIN 912 12.9	264 Nm (194.7 lb.-ft.) ±15%	S26-96589-0	S26-96589-5	
32	6264-10-17-*-97	BK507	4xM18 x 75-DIN 912 12.9	398 Nm (293.5 lb.-ft.) ±15%	S26-96392-0	S26-96392-5	

NG	ISO-code	Subplate	Size
10	6264-06-09-*-97	SPP3R6B910	P, T = 3/4" BSPP x = 1/4" BSPP
25	6264-08-13-*-97	SPP6R8B910	P, T = 1 1/4" BSPP x = 1/4" BSPP
32	6264-10-17-*-97	SPP10R12B910	P, T = 1 1/2" BSPP x, y = 1/4" BSPP





**General Description**

Series R4V (TÜV) (DIN 24340 Form D) and R6V (TÜV) (DIN 24340 Form E) pilot operated pressure relief valves include a certification according to directive 97/23/EG for safety-related applications.

The valve is set and sealed by the German technical inspection association TÜV. The valve delivery includes the TÜV certificate of conformity.

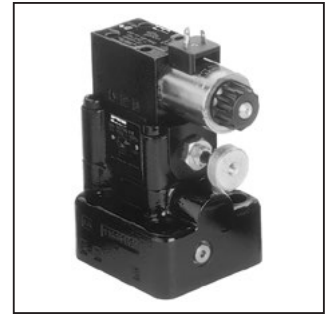
For Series R6V, a vent function with a solenoid operated directional valve is available for circulation at minimum pressure.

**Features**

- TÜV certificate
- Pilot operated with manual adjustment
- 2 interfaces:
  - Subplate, ISO 6264 (DIN 24340 Form D) with VV01 vent valve (R4V)
  - Subplate, ISO 6264 (DIN 24340 Form E) with CETOP 03 vent valve (R6V)
- Adjustment leaded (code W)
- Adjustment leaded to maximum pressure, lower pressure possible (code V)



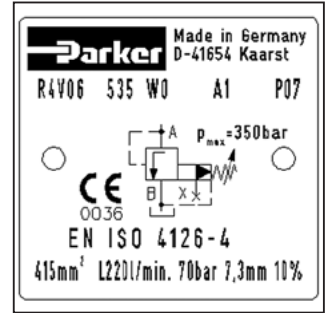
R6V06



R6V06 with Vent Valve

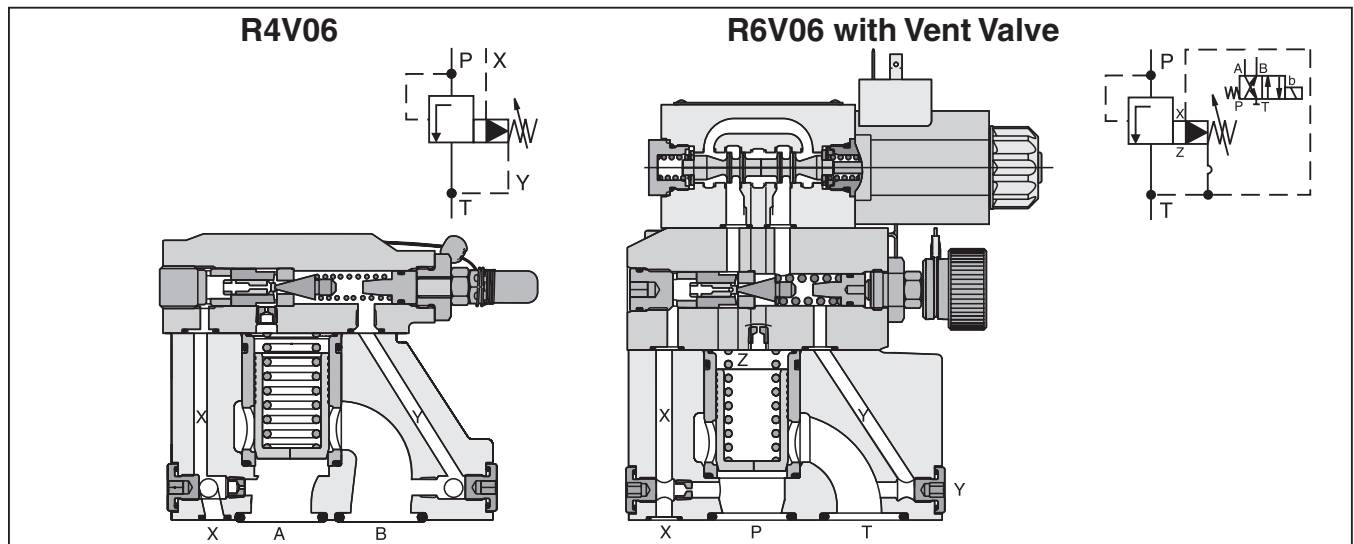


R4V06



**Name Plate Data R4V06**

415 mm <sup>2</sup> :	minimum opening width
L220 LPM:	maximum flow
70 Bar:	set pressure (compare p/Q curves)
7.3 mm:	cartridge stroke
10%:	permitted pressure increase of the flow range



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**R4V and R6V**

<b>R</b>		<b>V</b>		<b>5</b>		<b>5</b>		<b>0</b>			
Pressure Relief Valve	Interface	Relief Function	Size	Maximum Pressure 350 Bar (5075 PSI)	Body	Pressure Setting up to 350 Bar (5075 PSI) Maximum	Adjustment Led (TUV)	Pilot Oil Internal	Design Series	Seal	Pressure Range*

Code	Description
03*	NG10
06	NG25
10	NG32

\* Not for R6V.

Code	Description
A	R4V
B	R6V

Code	Description
1	Nitrile
5	Fluorocarbon

Code	Description
3	R4V
9	R6V

Code	Description
V	Hand Knob Led (lower pressure adjustment possible)
W	Acorn Nut Led

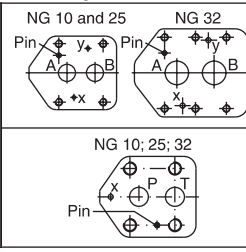
  

Code	Description
P10	100 Bar (1450 PSI)
P20	200 Bar (2900 PSI)
P30	300 Bar (4350 PSI)
P35	350 Bar (5075 PSI)

\* Further pressure ranges on request in 10 Bar (145 PSI) steps

Code	Description
4	Subplate Mounting ISO 6264
6	



**Weight:**

R4V03	2.7 kg (6.0 lbs.)
R4V06	4.5 kg (9.9 lbs.)
R4V10	6.0 kg (13.2 lbs.)
R6V06	5.8 kg (12.8 lbs.)
R6V10	7.8 kg (17.2 lbs.)

**R6V with Vent Valve**

<b>R</b>	<b>6</b>	<b>V</b>		<b>5</b>	<b>9</b>	<b>5</b>	<b>V</b>	<b>0</b>	<b>09</b>		<b>B</b>		
Pressure Relief Valve	Interface	Relief Function	Size	Maximum Pressure 350 Bar (5075 PSI)	Body Y Port = G 1/8"	Pressure Setting up to 350 Bar (5075 PSI) Maximum	Adjustment Led (TUV)	Pilot Oil Internal	Vent Valve Function	Solenoid Voltage	Design Series	Seal	Pressure Range*

Code	Description
06	NG25
10	NG32

Code	Description
V	Hand Knob Led (lower pressure adjustment possible)

Code	Description
09	Solenoid not activated, unpressured circulation

Code	Description
1	Nitrile
5	Fluorocarbon

Code	Description
G0R	12VDC
G0Q	24VDC

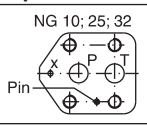
  

Code	Description
P10	100 Bar (1450 PSI)
P20	200 Bar (2900 PSI)
P30	300 Bar (4350 PSI)
P35	350 Bar (5075 PSI)

\* Further pressure ranges on request in 10 Bar (145 PSI) steps

Code	Description
6	Subplate Mounting ISO 6264



**Weight:**

R6V06	7.2 kg (15.9 lbs.)
R6V10	9.2 kg (20.3 lbs.)



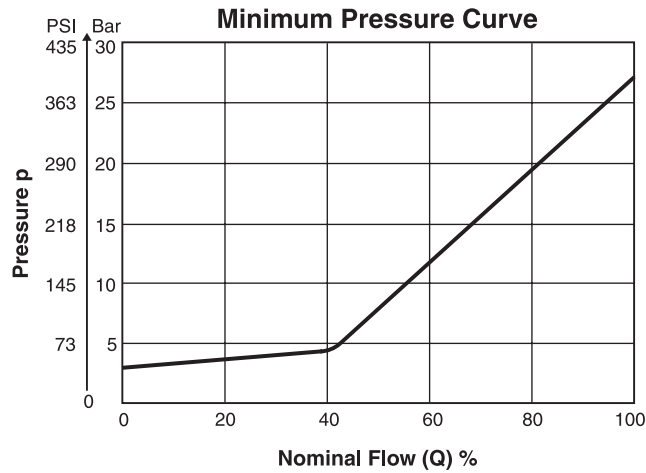
## R4V and R6V

General				
Size	NG10	NG25	NG32	
Interface	Subplate mounting acc. ISO 6264 (DIN 24340)			
Mounting Position	As desired, horizontal mounting preferred			
Ambient Temperature	-20°C to +80°C (-4°F to +176°F)			
MTTF <sub>D</sub> Value	75 years			
Hydraulic				
Operating Pressure	Ports P or A up to 350 Bar (5075 PSI), Port T or B 30 Bar (435 PSI)			
Pressure Range	100, 200, 300, 350 Bar (1450, 2900, 4350, 5075 PSI)			
Nominal Flow	Series R4V	110 LPM (29.1 GPM)	450 LPM (119.0 GPM)	500 LPM (132.3 GPM)
	Series R6V	250 LPM (66.1 GPM)	500 LPM (132.3 GPM)	500 LPM (132.3 GPM)
Fluid	Hydraulic oil according to DIN 51524 ... 51525			
Viscosity	Recommended Permitted	30 to 50 cSt / mm <sup>2</sup> /s (139 to 232 SSU) 20 to 380 cSt / mm <sup>2</sup> /s (93 to 1761 SSU)		
Fluid Temperature	-20°C to +70° (-4°F to +158°F)			
Filtration	ISO 4406 (1999), 18/16/13			

## R6V with Vent Function

General			
Size	NG10	NG25	NG32
Interface	Subplate mounting acc. ISO 6264 (DIN 24340)		
Mounting Position	As desired, horizontal mounting preferred		
Ambient Temperature	-20°C to +80°C (-4°F to +176°F)		
MTTF <sub>D</sub> Value	75 years		
Hydraulic			
Operating Pressure	Ports P or A up to 350 Bar (5075 PSI), Port T or B 30 Bar (435 PSI)		
Pressure Range	100, 200, 300, 350 Bar (1450, 2900, 4350, 5075 PSI)		
Nominal Flow	250 LPM (66.1 GPM)	500 LPM (132.3 GPM)	650 LPM (172.0 GPM)
Fluid	Hydraulic oil according to DIN 51524 ... 51525		
Viscosity	Recommended Permitted	30 to 50 cSt / mm <sup>2</sup> /s (139 to 232 SSU) 20 to 380 cSt / mm <sup>2</sup> /s (93 to 1761 SSU)	
Fluid Temperature	-20°C to +70° (-4°F to +158°F)		
Filtration	ISO 4406 (1999), 18/16/13 according to NAS 1638:7)		
Electrical (Solenoid)			
Duty Ratio	100% ED; CAUTION: Coil temperature up to 180°C (356°F)		
Solenoid Connector	Connector acc. to EN 175301-803		
Protection Class	IP65 in accordance with EN 60529 (plugged and mounted)		
	Code	G0R	G0Q
Supply Voltage		12V	24V
Supply Tolerance		+5...-10	+5...-10
Power Consumption	Hold	31W	31W
	In Rush	31W	31W
Switching Frequency	16,000 (DC), 7200 (AC) switchings/hour maximum		
Wiring Minimum	3 x 1.5 mm <sup>2</sup> Recommended		
Wiring Length Maximum	50 m (164 ft.) Recommended		

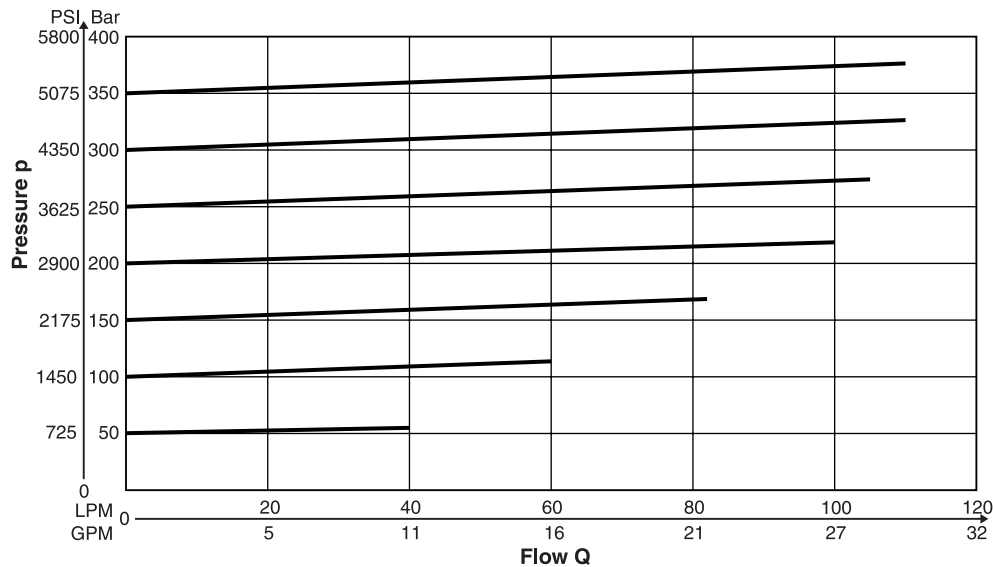
**Minimum Pressure Curve**  
**R4V and R6V**



**D**

The performance curves are measured with external drain.  
 For internal drain the tank pressure has to be added to curve.  
 All performance curves measured with HLP46 at 50°C (122°F).

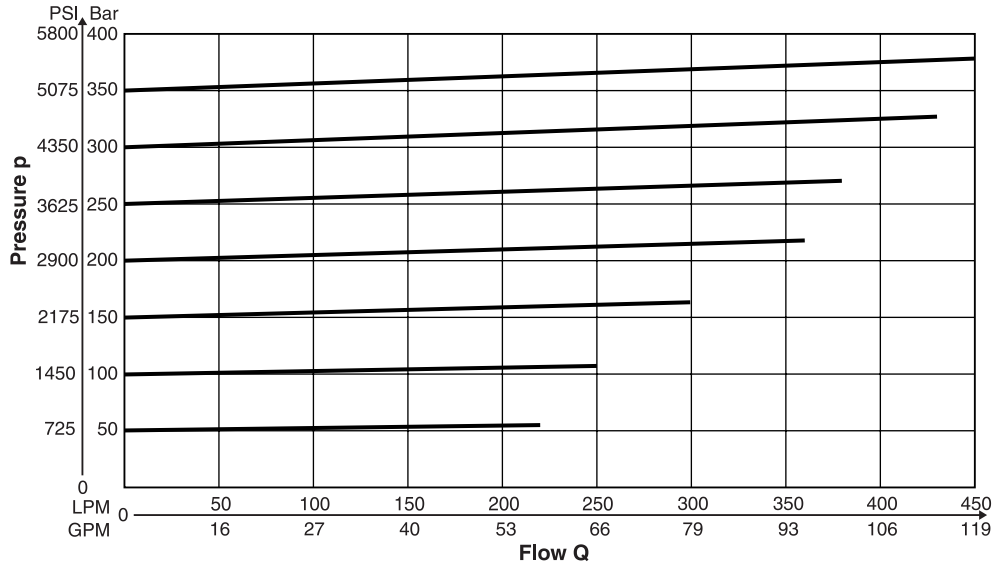
**p/Q Performance Curves – R4V03**



**R4V03**

Pressure Range	Q <sub>max</sub>	Minimum Opening Width	Cartridge Stroke	Permitted Pressure Increase
50 - 70 Bar (725 - 1015 PSI)	40 LPM (11 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%
80 - 120 Bar (1160 - 1740 PSI)	60 LPM (16 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%
130 - 170 Bar (1885 - 2465 PSI)	82 LPM (22 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%
180 - 200 Bar (2610 - 2900 PSI)	100 LPM (27 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%
210 - 250 Bar (3015 - 3625 PSI)	105 LPM (28 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%
260 - 300 Bar (3770 - 4350 PSI)	110 LPM (29 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%
310 - 350 Bar (4495 - 5075 PSI)	110 LPM (29 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%

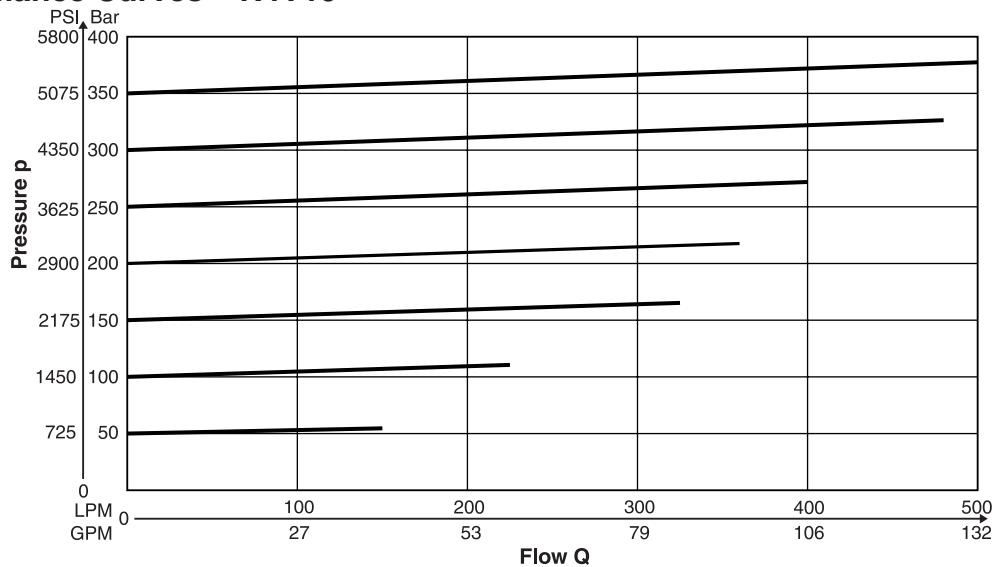
**p/Q Performance Curves – R4V06**



**R4V06**

Pressure Range	Q <sub>max</sub>	Minimum Opening Width	Cartridge Stroke	Permitted Pressure Increase
50 - 70 Bar (725 - 1015 PSI)	220 LPM (58 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%
80 - 120 Bar (1160 - 1740 PSI)	250 LPM (66 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%
130 - 170 Bar (1885 - 2465 PSI)	300 LPM (79 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%
180 - 200 Bar (2610 - 2900 PSI)	360 LPM (95 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%
210 - 250 Bar (3015 - 3625 PSI)	380 LPM (101 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%
260 - 300 Bar (3770 - 4350 PSI)	430 LPM (114 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%
310 - 350 Bar (4495 - 5075 PSI)	450 LPM (120 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%

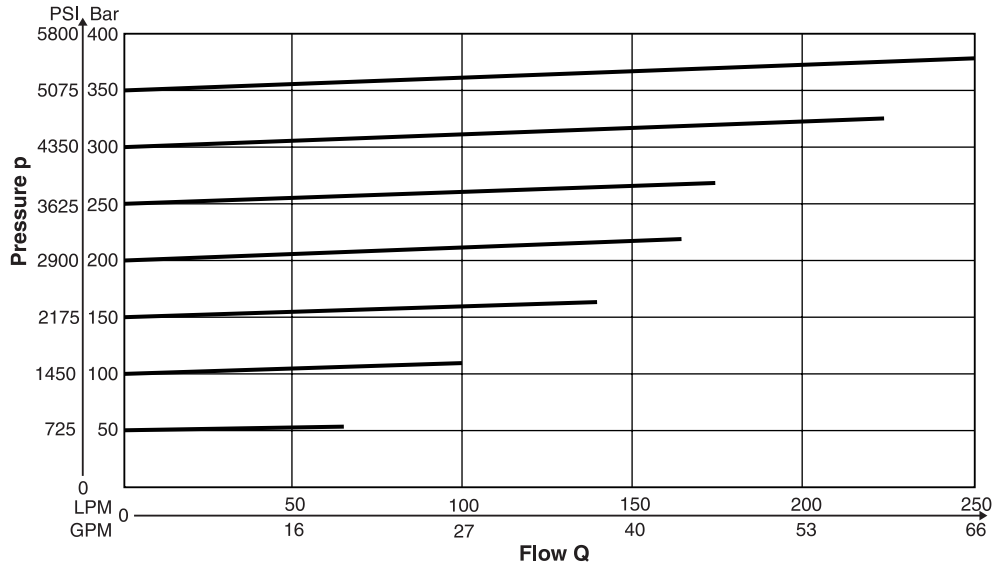
**p/Q Performance Curves – R4V10**



**R4V10**

Pressure Range	Q <sub>max</sub>	Minimum Opening Width	Cartridge Stroke	Permitted Pressure Increase
50 - 70 Bar (725 - 1015 PSI)	150 LPM (40 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%
80 - 120 Bar (1160 - 1740 PSI)	225 LPM (60 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%
130 - 170 Bar (1885 - 2465 PSI)	325 LPM (86 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%
180 - 200 Bar (2610 - 2900 PSI)	360 LPM (95 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%
210 - 250 Bar (3015 - 3625 PSI)	400 LPM (106 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%
260 - 300 Bar (3770 - 4350 PSI)	480 LPM (127 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%
310 - 350 Bar (4495 - 5075 PSI)	500 LPM (132 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%

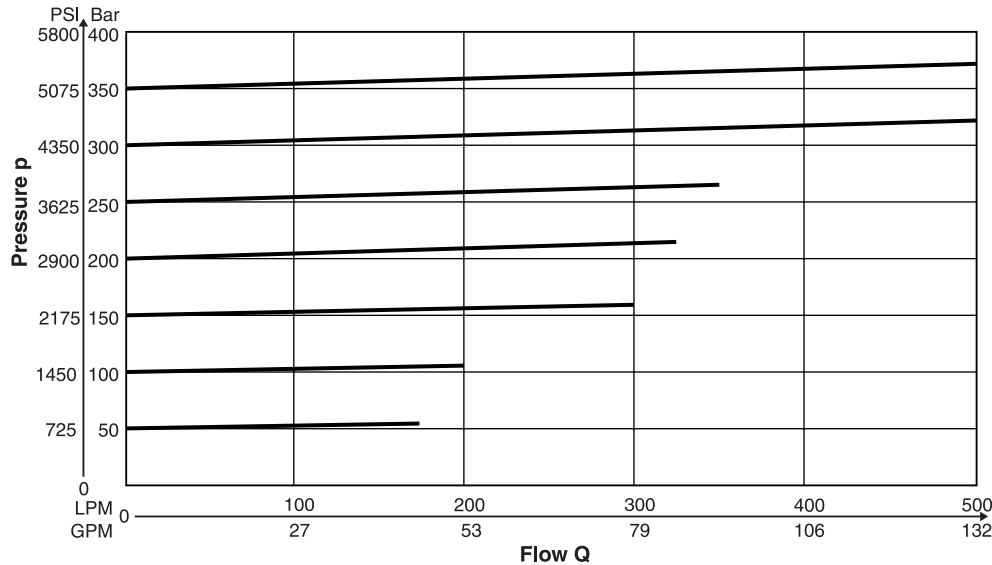
**p/Q Performance Curves – R6V03**



**R6V03**

Pressure Range	Q <sub>max</sub>	Minimum Opening Width	Cartridge Stroke	Permitted Pressure Increase
50 - 70 Bar (725 - 1015 PSI)	65 LPM (17 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%
80 - 120 Bar (1160 - 1740 PSI)	100 LPM (27 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%
130 - 170 Bar (1885 - 2465 PSI)	140 LPM (37 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%
180 - 200 Bar (2610 - 2900 PSI)	165 LPM (44 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%
210 - 250 Bar (3015 - 3625 PSI)	170 LPM (46 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%
260 - 300 Bar (3770 - 4350 PSI)	225 LPM (60 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%
310 - 350 Bar (4495 - 5075 PSI)	250 LPM (66 GPM)	154mm <sup>2</sup> (0.24 in. <sup>2</sup> )	4.4mm (0.17")	10%

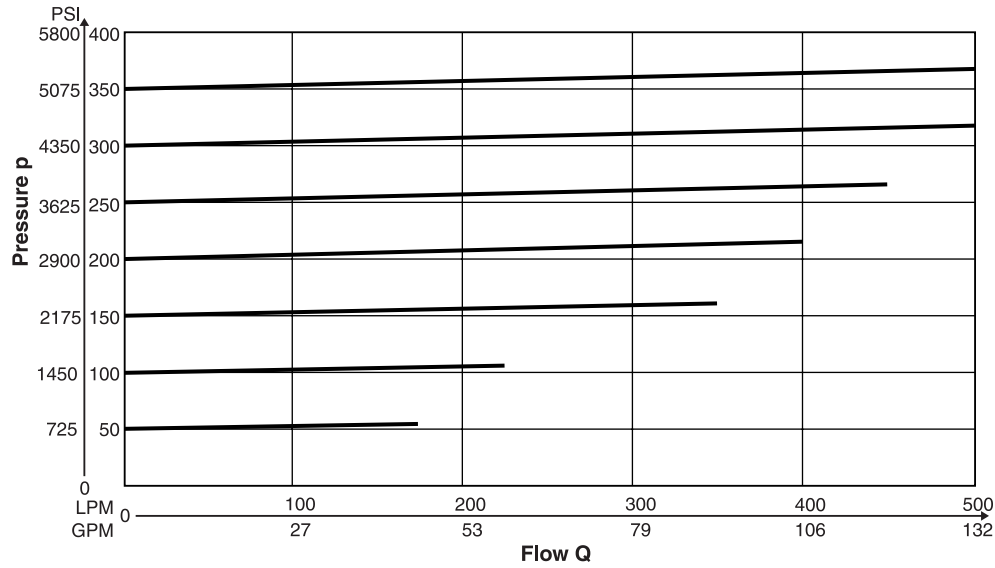
**p/Q Performance Curves – R6V06**



**R6V06**

Pressure Range	Q <sub>max</sub>	Minimum Opening Width	Cartridge Stroke	Permitted Pressure Increase
50 - 70 Bar (725 - 1015 PSI)	170 LPM (45 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%
80 - 120 Bar (1160 - 1740 PSI)	200 LPM (53 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%
130 - 170 Bar (1885 - 2465 PSI)	300 LPM (80 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%
180 - 200 Bar (2610 - 2900 PSI)	325 LPM (86 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%
210 - 250 Bar (3015 - 3625 PSI)	350 LPM (93 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%
260 - 300 Bar (3770 - 4350 PSI)	500 LPM (132 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%
310 - 350 Bar (4495 - 5075 PSI)	500 LPM (132 GPM)	415mm <sup>2</sup> (0.64 in. <sup>2</sup> )	7.3mm (0.29")	10%

**p/Q Performance Curves – R6V10**

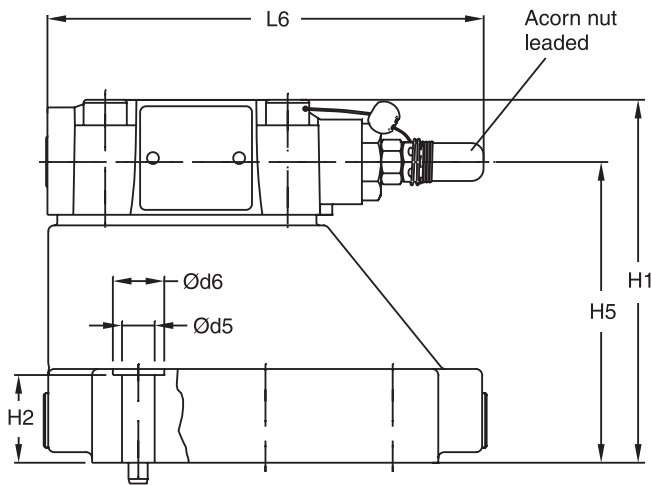
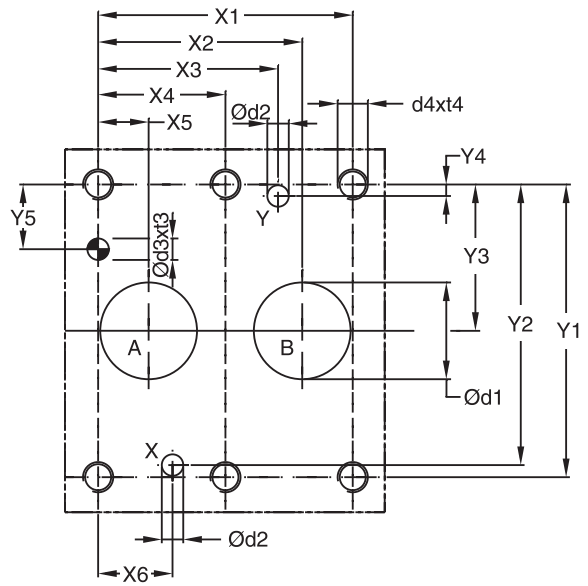
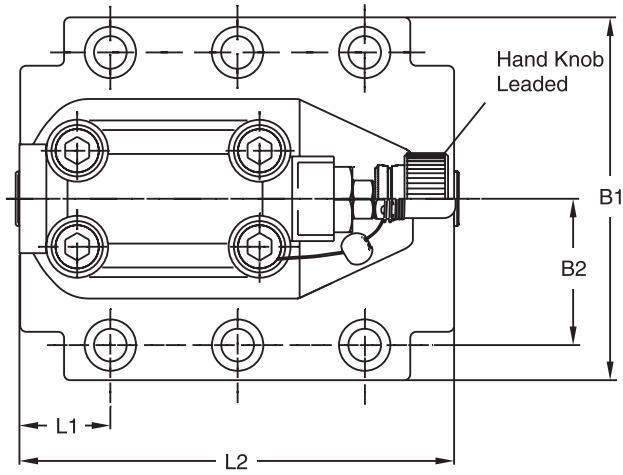


**R6V10**

Pressure Range	Q <sub>max</sub>	Minimum Opening Width	Cartridge Stroke	Permitted Pressure Increase
50 - 70 Bar (725 - 1015 PSI)	170 LPM (45 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%
80 - 120 Bar (1160 - 1740 PSI)	200 LPM (53 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%
130 - 170 Bar (1885 - 2465 PSI)	300 LPM (80 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%
180 - 200 Bar (2610 - 2900 PSI)	325 LPM (86 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%
210 - 250 Bar (3015 - 3625 PSI)	350 LPM (93 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%
260 - 300 Bar (3770 - 4350 PSI)	500 LPM (132 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%
310 - 350 Bar (4495 - 5075 PSI)	500 LPM (132 GPM)	607mm <sup>2</sup> (0.94 in. <sup>2</sup> )	7.3mm (0.29")	10%



**D**



**Dimensions**

**Pilot Operated Pressure Relief Valves  
Series R4V (TÜV)**

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



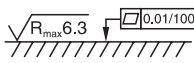
Size	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	6264-06-07-*-97	42.9 (1.69)	35.8 (1.41)	21.5 (0.85)	— —	7.2 (0.28)	21.5 (0.85)	0.0 (0.00)	66.7 (2.63)	58.8 (2.31)	33.4 (1.31)	7.9 (0.31)	14.3 (0.56)	— —
25	6264-08-11-*-97	60.3 (2.37)	49.2 (1.94)	39.7 (1.56)	— —	11.1 (0.44)	20.6 (0.81)	0.0 (0.00)	79.4 (3.13)	73.0 (2.87)	39.7 (1.56)	6.4 (0.25)	15.9 (0.63)	— —
32	6264-10-15-*-97	84.2 (3.31)	67.5 (2.66)	59.5 (2.34)	42.1 (1.66)	16.7 (0.66)	24.6 (0.97)	0.0 (0.00)	96.8 (3.81)	92.8 (3.65)	48.4 (1.91)	3.8 (0.15)	21.4 (0.84)	— —

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

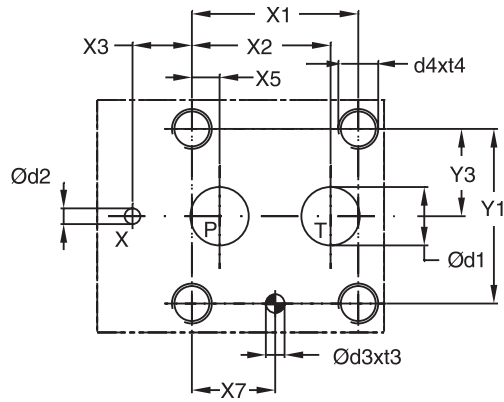
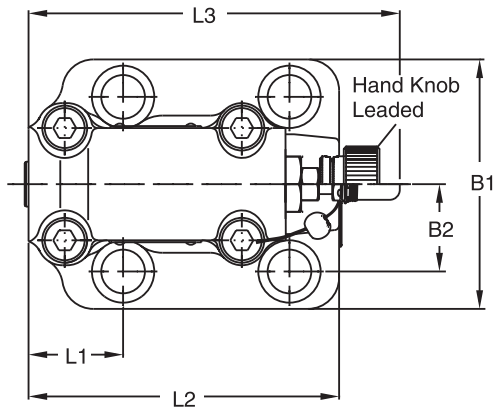
Size	ISO-code	B1	B2	H1	H2	H3	H4	H5	H6	L1	L2	L3	L6
10	6264-06-07-*-97	87.3 (3.44)	33.4 (1.31)	83.0 (3.27)	21.0 (0.83)	— —	— —	62.5 (2.46)	— —	29.0 (1.14)	94.8 (3.73)	— —	144.8 (5.76)
25	6264-08-11-*-97	105.0 (4.13)	39.7 (1.56)	109.5 (4.31)	29.0 (1.14)	— —	— —	89.0 (3.50)	— —	34.7 (1.37)	126.8 (4.99)	— —	144.8 (5.76)
32	6264-10-15-*-97	120.0 (4.72)	48.4 (1.91)	120.0 (4.72)	29.0 (1.14)	— —	— —	99.5 (3.92)	— —	30.6 (1.20)	144.3 (5.68)	— —	144.8 (5.76)

Size	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	6264-06-07-*-97	15.0 (0.59)	7.0 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	16.0 (0.63)	10.8 (0.43)	17.0 (0.67)
25	6264-08-11-*-97	23.4 (0.92)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	18.0 (0.71)	10.8 (0.43)	17.0 (0.67)
32	6264-10-15-*-97	32.0 (1.26)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	20.0 (0.79)	10.8 (0.43)	17.0 (0.67)

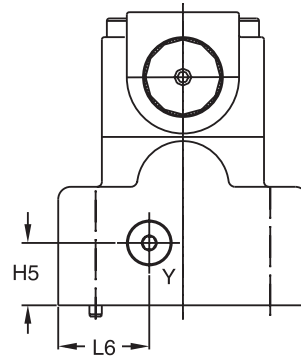
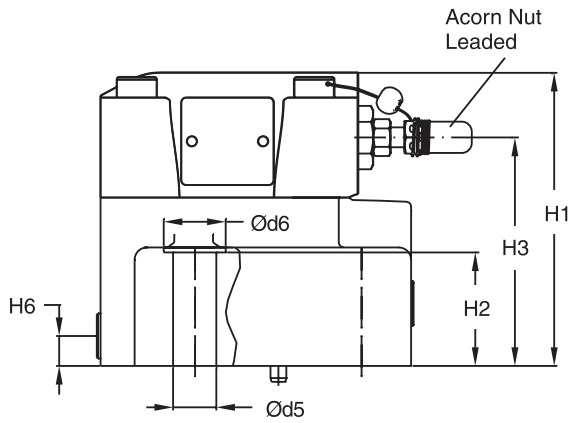
Size	ISO-code	Subplate	Size
10	6264-06-07-*-97	SPP3M6B910	A, B = 3/4" BSPP x,y = 1/4" BSPP
25	6264-08-11-*-97	SPP6M8B910	A, B = 1" BSPP x,y = 1/4" BSPP
32	6264-10-15-*-97	SPP10M12B910	A, B = 1 1/2" BSPP x,y = 1/4" BSPP

Size	ISO-code	Bolt Kit			Seal Kit		Surface Finish
					Nitrile	Fuorocarbon	
10	6264-06-07-*-97	BK505	4xM10 x 35-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58507-0	S26-58507-5	
25	6264-08-11-*-97	BK485	4xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58475-0	S26-58475-5	
32	6264-10-15-*-97	BK506	6xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58508-0	S26-58508-5	

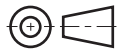




**D**



Y: external drain port G 1/8"





**Dimensions**

**Pilot Operated Pressure Relief Valves  
Series R6V (TÜV)**

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



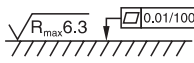
Size	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	6264-06-09-*97	53.8 (2.12)	47.5 (1.87)	0.0 (0.00)	– –	22.1 (0.87)	– –	22.1 (0.87)	53.8 (2.12)	– –	26.9 (1.06)	– –	– –	– –
25	6264-08-13-*97	66.7 (2.63)	55.6 (2.19)	23.8 (0.94)	– –	11.1 (0.44)	– –	33.4 (1.31)	70.0 (2.76)	– –	35.0 (1.38)	– –	– –	– –
32	6264-10-17-*97	88.9 (3.50)	76.2 (3.00)	31.8 (1.25)	– –	12.7 (0.50)	– –	44.5 (1.75)	82.6 (3.25)	– –	41.3 (1.63)	– –	– –	– –

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

Size	ISO-code	B1	B2	H1	H2	H3	H4	H5	H6	L1	L2	L3	L4	L6
10	6264-06-09-*97	80.0 (3.15)	26.9 (1.06)	114.0 (4.49)	27.0 (1.06)	88.0 (3.46)	– –	20.5 (0.81)	25.0 (0.98)	52.5 (2.07)	118.5 (4.67)	148.3 (5.84)	– –	29.5 (1.16)
25	6264-08-13-*97	100.0 (3.94)	35.0 (1.38)	117.5 (4.63)	45.5 (1.79)	91.5 (3.60)	– –	25.0 (0.98)	12.0 (0.47)	37.9 (1.49)	124.5 (4.90)	148.3 (5.84)	– –	36.5 (1.44)
32	6264-10-17-*97	120.0 (4.72)	41.3 (1.63)	123.0 (4.83)	52.0 (2.05)	97.0 (3.82)	– –	26.5 (1.04)	13.5 (0.53)	45.0 (1.77)	153.0 (6.02)	148.3 (5.84)	– –	46.5 (1.83)

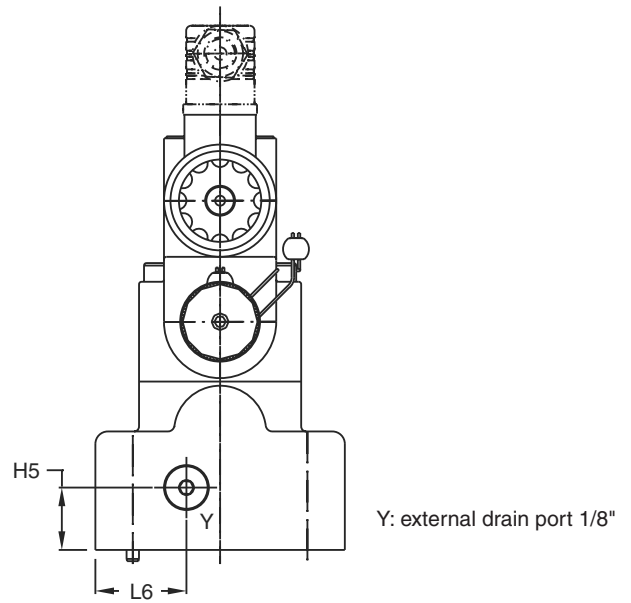
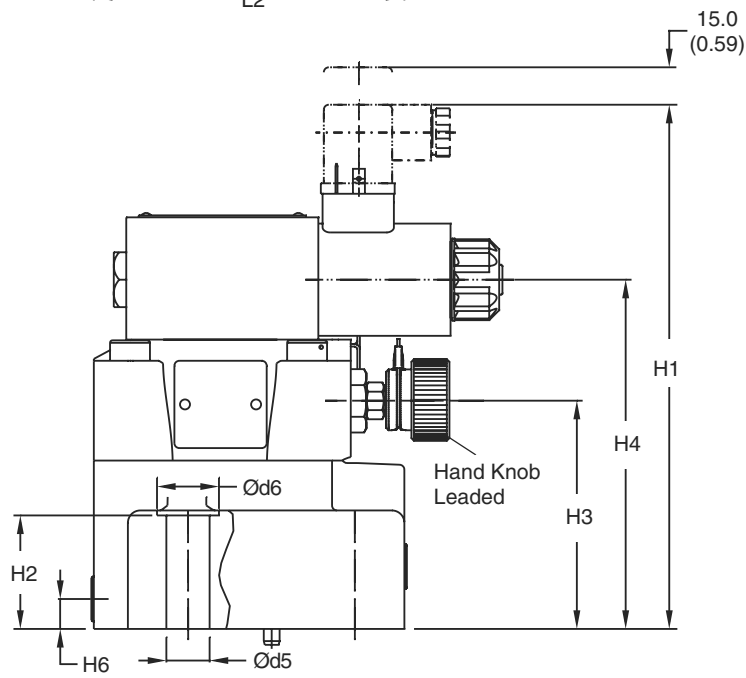
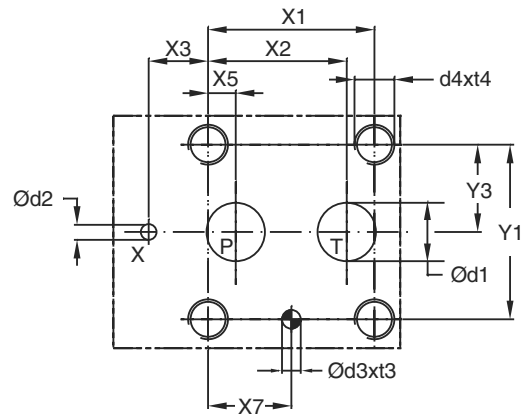
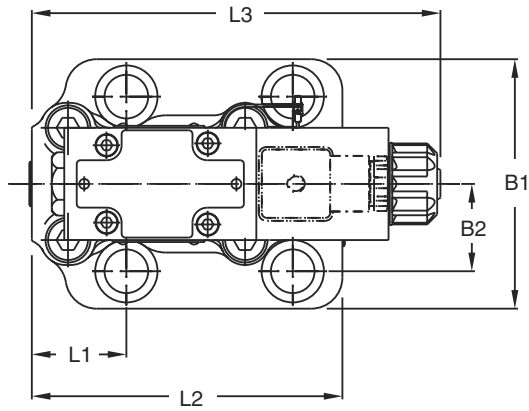
Size	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	6264-06-09-*97	14.7 (0.58)	4.8 (0.19)	7.5 (0.30)	10.0 (0.39)	M12	20.0 (0.79)	13.5 (0.53)	20.0 (0.79)
25	6264-08-13-*97	23.4 (0.92)	6.3 (0.25)	7.5 (0.30)	10.0 (0.39)	M16	27.0 (1.06)	17.5 (0.69)	25.0 (0.98)
32	6264-10-17-*97	32.0 (1.26)	6.3 (0.25)	7.5 (0.30)	10.0 (0.39)	M18	28.0 (1.10)	20.0 (0.79)	30.0 (1.18)

Size	ISO-code	Subplate	Size
10	6264-06-09-*97	SPP3R6B910	P, T = 3/4" BSPP x = 1/4" BSPP
25	6264-08-13-*97	SPP6R8B910	P, T = 1 1/4" BSPP x = 1/4" BSPP
32	6264-10-17-*97	SPP10R12B910	P, T = 1 1/2" BSPP x,y = 1/4" BSPP

Size	ISO-code	Bolt Kit			Seal Kit Nitrile Fluorocarbon	Surface Finish
10	6264-06-09-*97	BK494	4xM12 x 45-DIN 912 12.9	108 Nm (79.6 lb.-ft.) ±15%	S26-96396-0 S26-96396-5	
25	6264-08-13-*97	BK366	4xM16 x 70-DIN 912 12.9	264 Nm (194.7 lb.-ft.) ±15%	S26-96589-0 S26-96589-5	
32	6264-10-17-*97	BK507	4xM18 x 75-DIN 912 12.9	398 Nm (293.5 lb.-ft.) ±15%	S26-96392-0 S26-96392-5	



**D**



**Dimensions**

**Pilot Operated Pressure Relief Valves  
Series R6V (TÜV) with Vent Function**

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



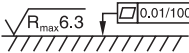
Size	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	6264-06-09-*-97	53.8 (2.12)	47.5 (1.87)	0.0 (0.00)	– –	22.1 (0.87)	– –	22.1 (0.87)	53.8 (2.12)	– –	26.9 (1.06)	– –	– –	– –
25	6264-08-13-*-97	66.7 (2.63)	55.6 (2.19)	23.8 (0.91)	– –	11.1 (0.44)	– –	33.4 (1.31)	70.0 (2.76)	– –	35.0 (1.38)	– –	– –	– –
32	6264-10-17-*-97	88.9 (3.50)	76.2 (3.00)	31.8 (1.25)	– –	12.7 (0.50)	– –	44.5 (1.75)	82.6 (3.25)	– –	41.3 (1.63)	– –	– –	– –

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

Size	ISO-code	B1	B2	H1	H2	H3	H4	H5	H6	L1	L2	L3	L4	L6
10	6264-06-09-*-97	80.0 (3.15)	26.9 (1.06)	206.0 (8.11)	27.0 (1.06)	88.0 (3.46)	136.5 (5.37)	25.0 (0.98)	12.0 (0.47)	52.5 (2.07)	118.5 (4.67)	163.8 (6.45)	– –	36.5 (1.44)
25	6264-08-13-*-97	100.0 (3.94)	35.0 (1.38)	210.0 (8.27)	45.5 (1.79)	91.5 (3.60)	140.0 (5.51)	25.0 (0.98)	12.0 (0.47)	37.9 (1.49)	124.5 (4.90)	163.8 (6.45)	– –	36.5 (1.44)
32	6264-10-17-*-97	120.0 (4.72)	41.3 (1.63)	215.5 (8.48)	52.0 (2.05)	97.0 (3.82)	145.5 (5.73)	25.0 (0.98)	12.0 (0.47)	45.0 (1.77)	153 (6.02)	163.8 (6.45)	– –	36.5 (1.44)

Size	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	6264-06-09-*-97	14.7 (0.58)	4.8 (0.19)	7.5 (0.30)	10.0 (0.39)	M12	20.0 (0.79)	13.5 (0.53)	20.0 (0.79)
25	6264-08-13-*-97	23.4 (0.92)	6.3 (0.25)	7.5 (0.30)	10.0 (0.39)	M16	27.0 (1.06)	17.5 (0.69)	25.0 (0.98)
32	6264-10-17-*-97	32.0 (1.26)	6.3 (0.25)	7.5 (0.30)	10.0 (0.39)	M18	28.0 (1.10)	20.0 (0.79)	30.0 (1.18)

Size	ISO-code	Subplate	Size
10	6264-06-09-*-97	SPP3R6B910	P, T = 3/4" BSPP x = 1/4" BSPP
25	6264-08-13-*-97	SPP6R8B910	P, T = 1 1/4" BSPP x = 1/4" BSPP
32	6264-10-17-*-97	SPP10R12B910	P, T = 1 1/2" BSPP x,y = 1/4" BSPP

Size	ISO-code	Bolt Kit			Seal Kit		Surface Finish
					Nitrile	Fluorocarbon	
10	6264-06-09-*-97	BK494	4xM12 x 45-DIN 912 12.9	108 Nm (79.6 lb.-ft.) ±15%	S26-96395-0	S26-96395-5	
25	6264-08-13-*-97	BK366	4xM16 x 70-DIN 912 12.9	264 Nm (194.7 lb.-ft.) ±15%	S26-96589-0	S26-96589-5	
32	6264-10-17-*-97	BK507	4xM18 x 75-DIN 912 12.9	398 Nm (293.5 lb.-ft.) ±15%	S26-96392-0	S26-96392-5	



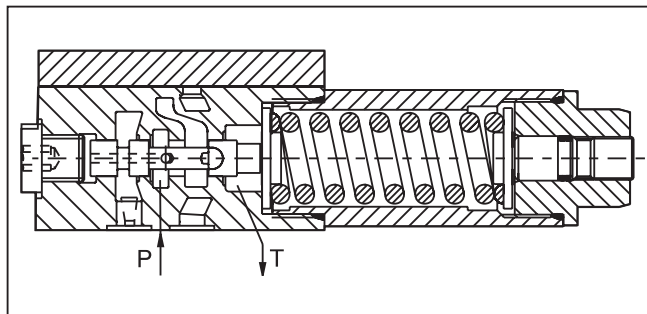
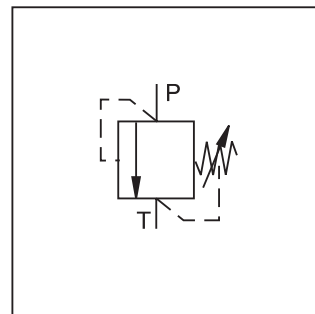
Technical Information

General Description

Series VS pressure relief valve is a direct operated spool valve for subplate mounting with internal drain to port T. The connection and function is according to ISO 6264.

Specifications

Size	NFPA D03 / NG6
Mounting Interface	ISO 6264
Mounting Position	Unrestricted
Ambient Temperature Range	-20°C to +70°C (-4°F to +158°F)
Working Pressure	Port P: 350 Bar (5075 PSI) Port T: depressurized
Pressure Range	25 Bar (363 PSI) 64 Bar (928 PSI) 160 Bar (2320 PSI) 210 Bar (3045 PSI) 350 Bar (5075 PSI)
Nominal Flow	25 LPM (6.6 GPM)
Pressure Fluid	Hydraulic oil as per DIN 51524 ... 525
Fluid Temperature Recommended Permitted	+30°C to +50°C (+86°F to +122°F) -20°C to +70°C (-4°F to +158°F)
Viscosity Recommended Permitted	30 to 50 cSt/mm <sup>2</sup> /s (139 to 232 SSU) 20 to 380 cSt / mm <sup>2</sup> /s (93 to 1761 SSU)
Filtration	ISO 4406 (1999), 18/16/13



Features

- Spool type valve
- Manifold mounting
- 5 pressure ranges
- 2 adjustment modes

Ordering Information

<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">VS</div> <p>Pressure Relief Valve</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Pressure Range</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">A</div> <p>Adjustment Screw with Hexagon Socket</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">06</div> <p>Size</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">V</div> <p>Seal Fluorocarbon</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Gage Port</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Lock</p>	<div style="border: 1px dashed black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Design Series NOTE: Not required when ordering.</p>																								
<table border="0"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>025</td><td>25 Bar (363 PSI)</td></tr> <tr><td>064</td><td>64 Bar (928 PSI)</td></tr> <tr><td>160</td><td>160 Bar (2320 PSI)</td></tr> <tr><td>210</td><td>210 Bar (3045 PSI)</td></tr> <tr><td>350</td><td>350 Bar (5075 PSI)</td></tr> </tbody> </table>	Code	Description	025	25 Bar (363 PSI)	064	64 Bar (928 PSI)	160	160 Bar (2320 PSI)	210	210 Bar (3045 PSI)	350	350 Bar (5075 PSI)	<table border="0"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>06</td><td>NFPA D03 / NG6</td></tr> </tbody> </table>	Code	Description	06	NFPA D03 / NG6	<table border="0"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>G</td><td>BSPP 1/4"</td></tr> <tr><td>M</td><td>M 12x1.5</td></tr> </tbody> </table>	Code	Description	G	BSPP 1/4"	M	M 12x1.5	<table border="0"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>Omit</td><td>Normal</td></tr> <tr><td>Z</td><td>Cylinder Lock</td></tr> </tbody> </table>	Code	Description	Omit	Normal	Z	Cylinder Lock
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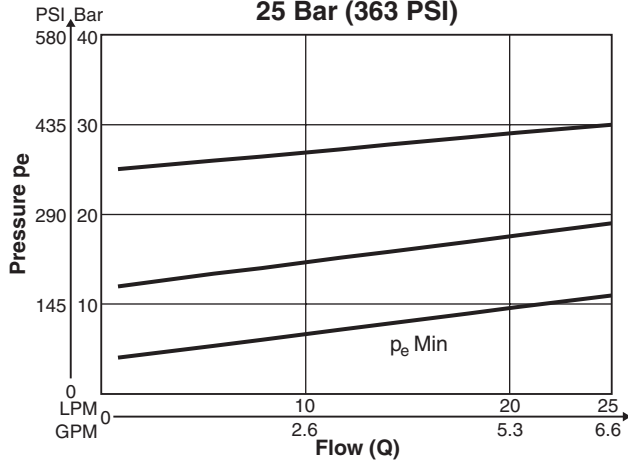
Weight: 1.3 kg (2.9 lbs.)

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

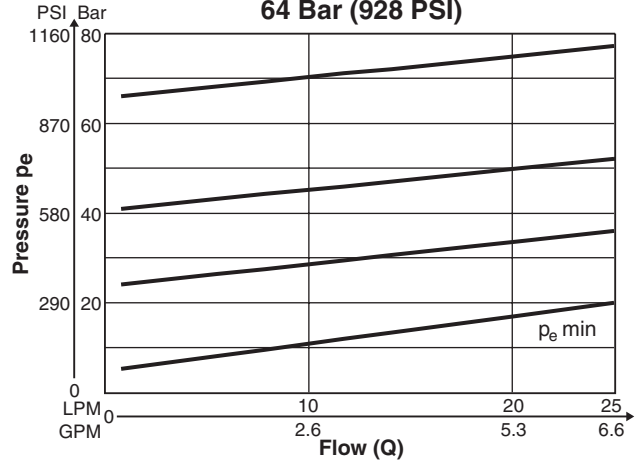


Performance Curves

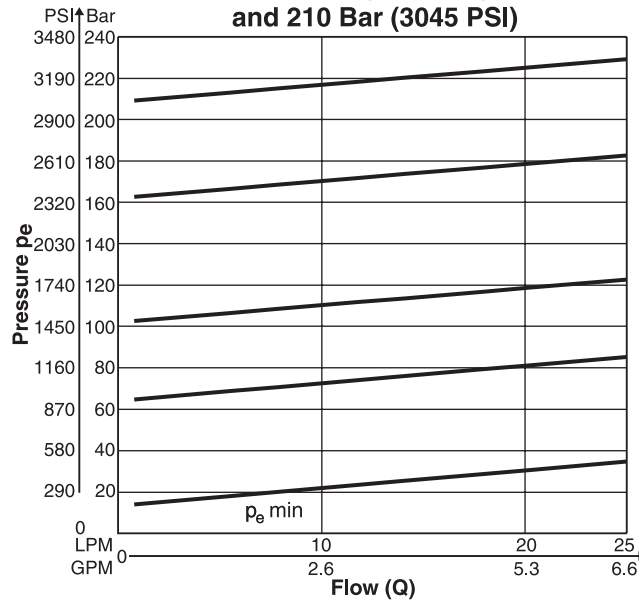
Maximum Setting Pressure  
25 Bar (363 PSI)



Maximum Setting Pressure  
64 Bar (928 PSI)



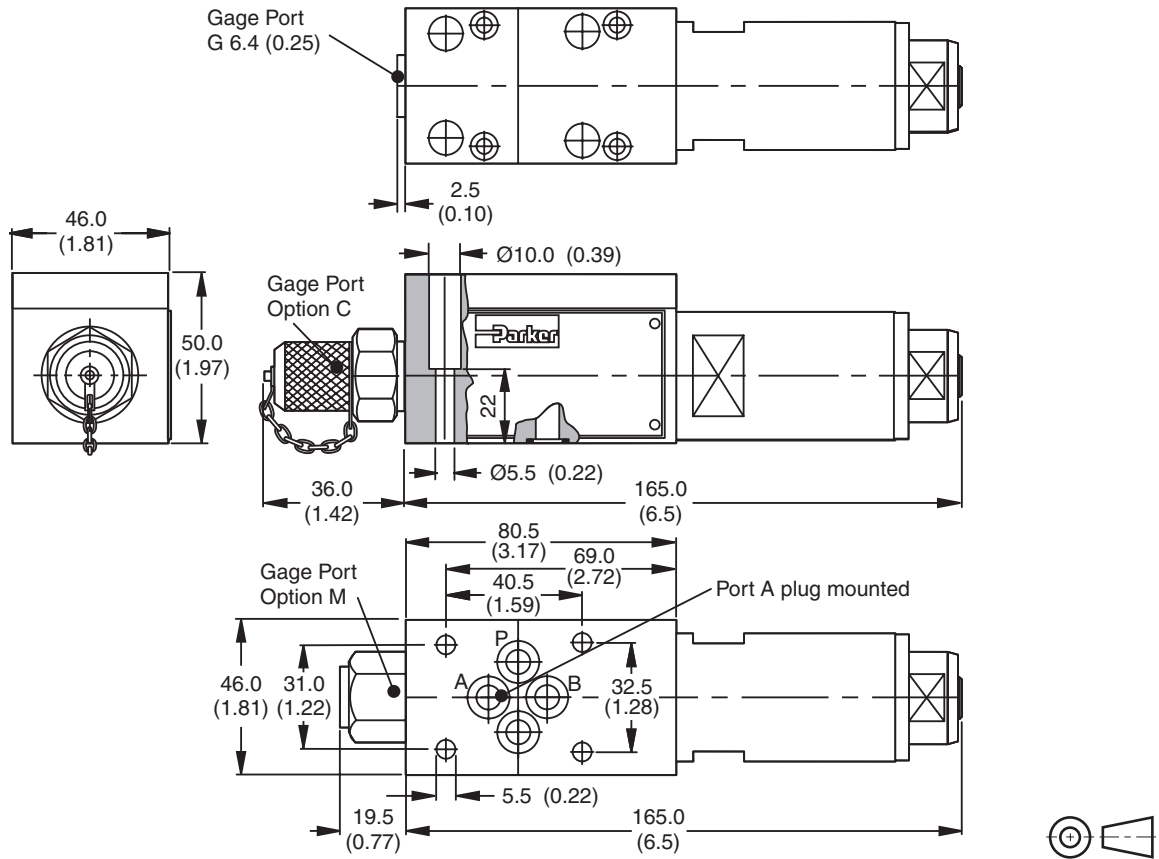
Maximum Setting Pressures  
160 Bar (2320 PSI)  
and 210 Bar (3045 PSI)



D

Dimensions

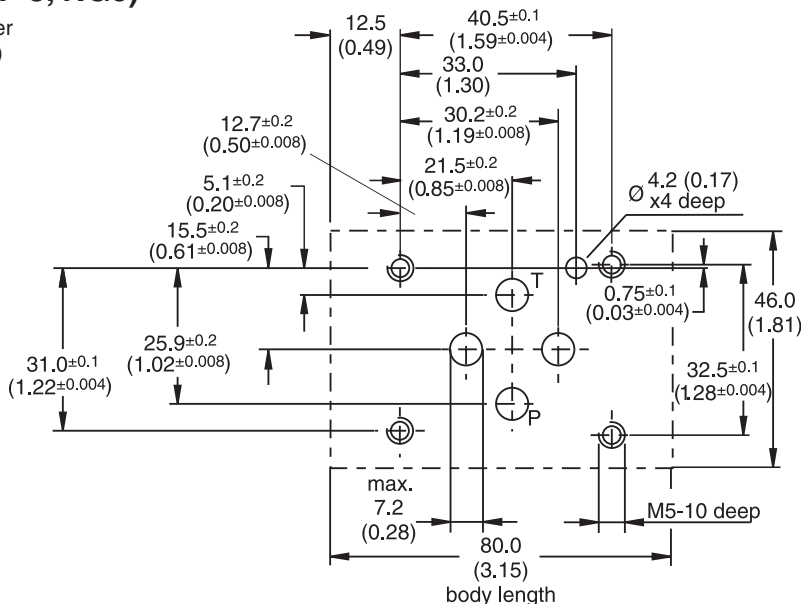
Inch equivalents for millimeter dimensions are shown in (\*\*)



Surface Finish	Bolt kit  DIN912 12.9		Seal  Kit Fluorocarbon
	M5x30-4pcs	8.1Nm (6.0 lb.-ft.)	SK-VB/VM/VS V

Mounting Pattern ISO 6264-03-04-\*-97  
(NFPA D03, CETOP 3, NG6)

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



**General Description**

Series R4U subplate mounted unloading valves are used to unload a circuit at low pressure. The mechanically adjustable pressure signal to unload the main stage has to be applied to port X. The pressure differential between opening and closing is nominal 15% or 28% of the setting pressure:

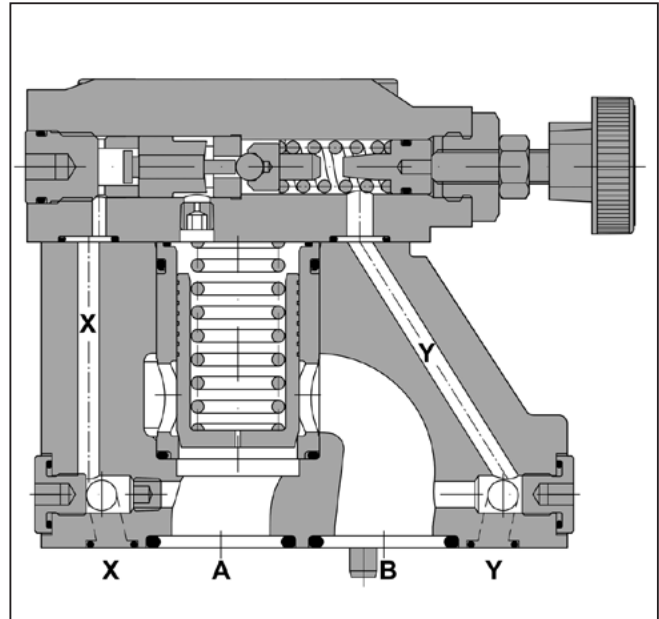
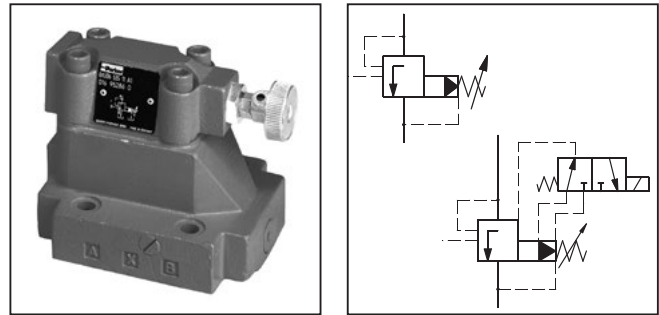
- 15% for pressure ranges 350 Bar (5075 PSI) and 28% for 105 Bar (1523 PSI) and 210 Bar (3045 PSI).

Typical applications are to unload the pumps in an accumulator circuit and to unload the low pressure stage of a double pump.

In addition, Series R4U with vent function is vented by electrical operation.

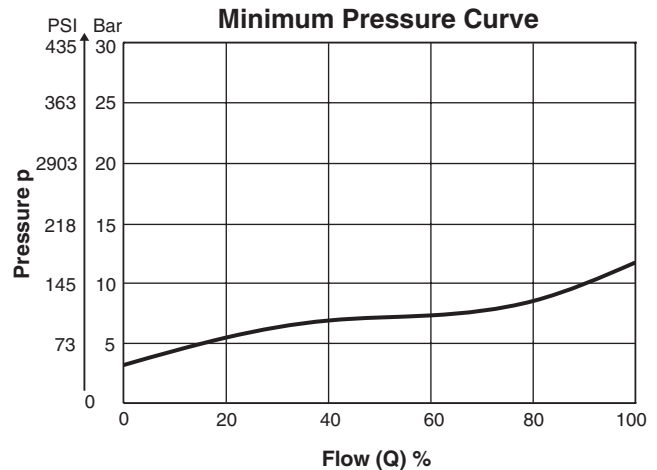
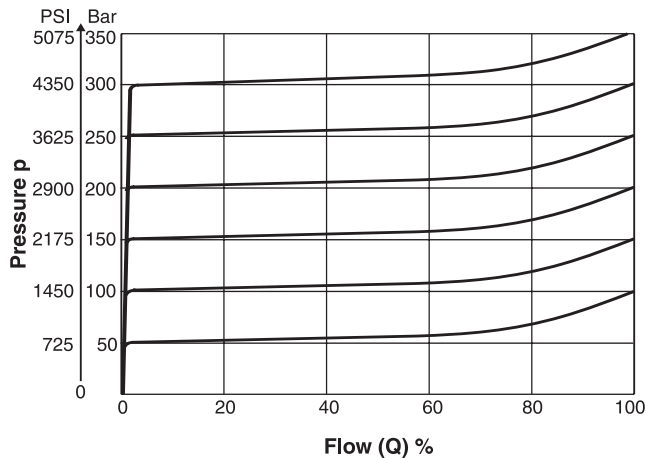
**Features**

- Pilot operated unloading valve
- 3 pressure ranges
- 2 switching types (series R4U with vent function)
- 3 adjustment modes:
  - Hand knob
  - Screw with locknut
  - Key lock



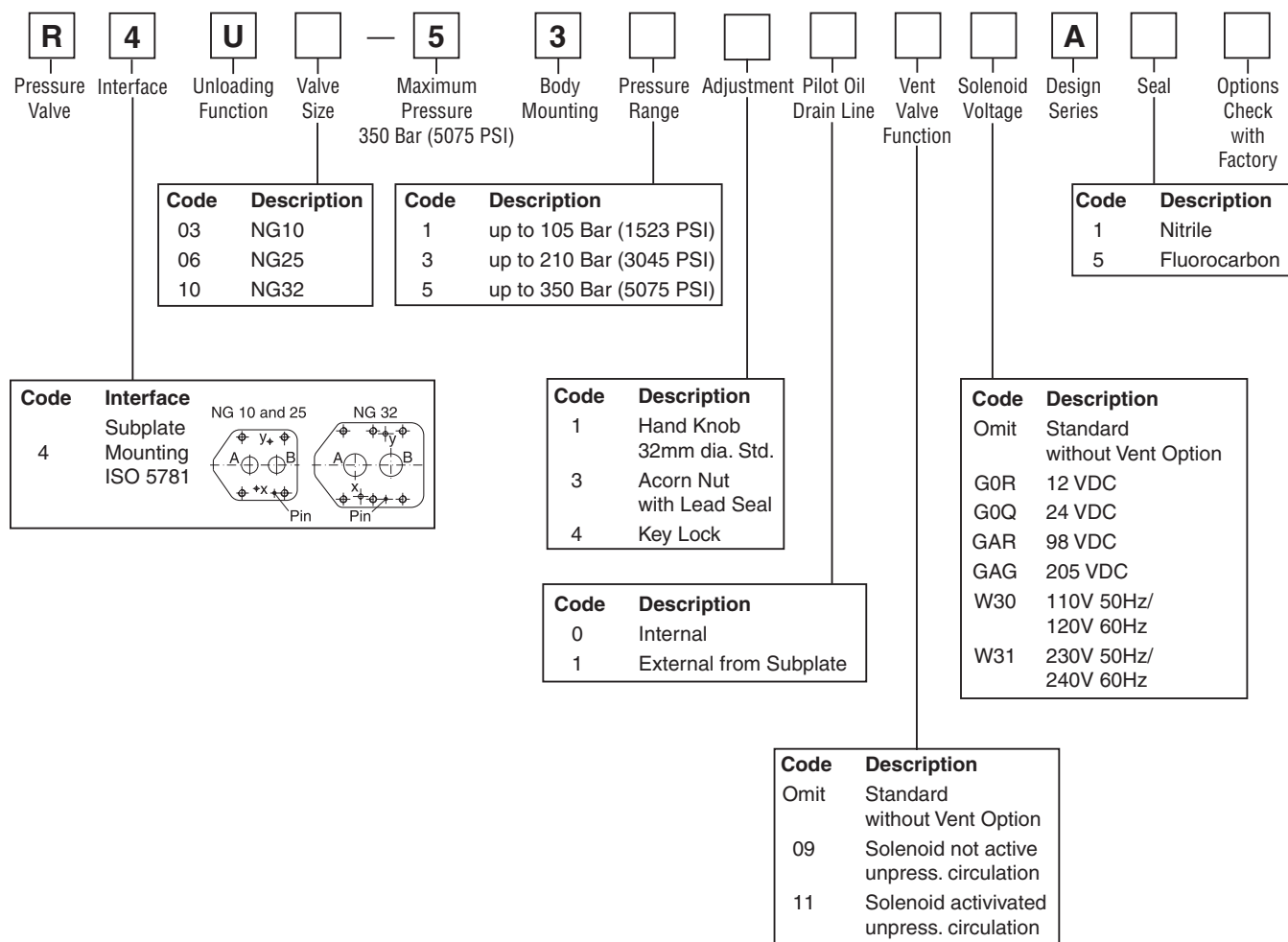
**D**

**Performance Curves**



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

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**D**

**Weight:**

- R4U03: 2.7 kg (6.0 lbs.)
- R4U06: 4.5 kg (9.9 lbs.)
- R4U10: 6.0 kg (13.2 lbs.)

**Weight: with Vent**

- R4U03: 4.4 kg (9.7 lbs.)
- R4U06: 6.2 kg (13.7 lbs.)
- R4U10: 7.7 kg (17.0 lbs.)

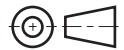
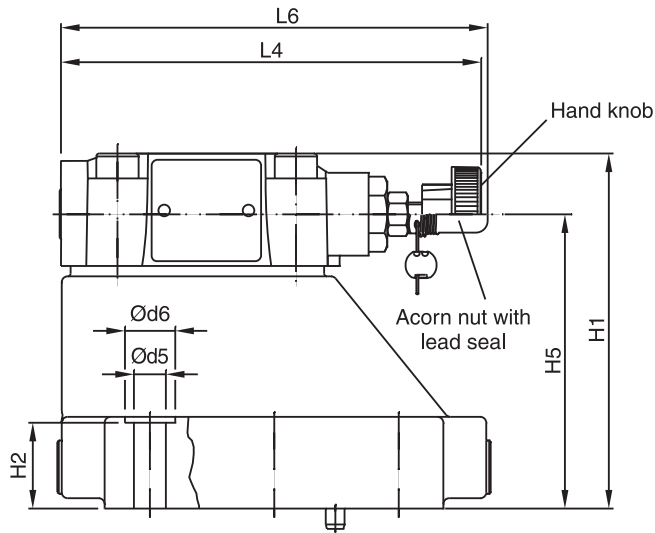
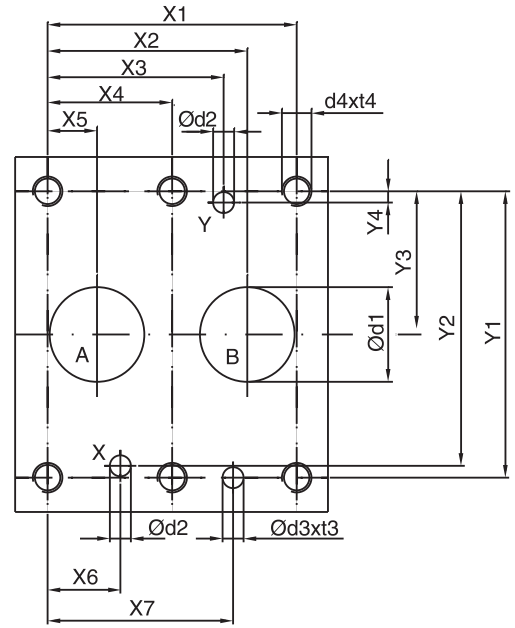
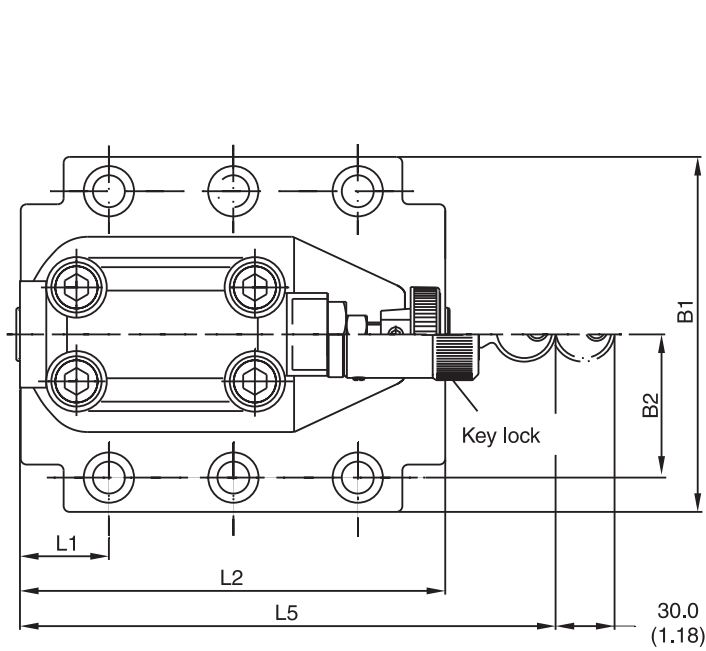


General		NG10	NG25	NG32
Size				
Interface	Subplate mounting acc. ISO 5781			
Mounting Position	As desired, horizontal mounting preferred			
Ambient Temperature	-20°C to +80°C (-4°F to +176°F)			
Hydraulic				
Operating Pressure	Ports A and X up to 350 Bar (5075 PSI), Ports B and Y depressurized			
Pressure Range	105, 210, 350 Bar (1523, 3045, 5075 PSI)			
Pressure Differential	15% for pressure range 350 Bar (2538 PSI) 28% for pressure ranges 105 Bar (1523 PSI) and 250 Bar (3625 PSI)			
Nominal Flow	150 LPM (39.7 GPM)	350 LPM (92.6 GPM)	650 LPM (172.0 GPM)	
Pressure Fluid	Hydraulic oil according to DIN 51524 ... 525			
Viscosity Recommended Maximum	30 to 50 cSt / mm <sup>2</sup> /s (139 to 232 SSU) 20 to 380 cSt / mm <sup>2</sup> /s (93 to 1761 SSU)			
Pressure Fluid Temperature Recommended Maximum	+30°C to +50°C (+86°F to +122°F) -20°C to +70°C (-4°F to +158°F)			
Filtration	ISO 4406 (1999), 18/16/13			

## With Vent Function

General		NG10	NG25	NG32			
Size							
Interface	Subplate mounting acc. ISO 5781						
Mounting Position	As desired, horizontal mounting preferred						
Ambient Temperature	-20°C to +80°C (-4°F to +176°F)						
Hydraulic							
Operating Pressure	Ports A and X up to 350 Bar (5075 PSI), Ports B and Y depressurized						
Pressure Range	105, 210, 350 Bar (1523, 3045, 5075 PSI)						
Pressure Differential	15% for pressure range 350 Bar (5075 PSI) 28% for pressure ranges 105 Bar (1523 PSI) and 250 Bar (3625 PSI)						
Nominal Flow	150 LPM (39.7 GPM)	350 LPM (92.6 GPM)	650 LPM (172.0 GPM)				
Pressure Fluid	Hydraulic oil according to DIN 51524 ... 525						
Viscosity Recommended Maximum	30 to 50 cSt / mm <sup>2</sup> /s (139 to 232 SSU) 20 to 380 cSt / mm <sup>2</sup> /s (93 to 1761 SSU)						
Pressure Fluid Temperature Recommended Maximum	+30°C to +50°C (+86°F to +122°F) -20°C to +70°C (-4°F to +158°F)						
Filtration	ISO 4406 (1999), 18/16/13						
Electrical (solenoid)							
Duty Cycle	100% ED CAUTION: Coil temperature up to 180°C (356°F) possible						
Max. Switching Frequency	16,000 (DC), 7200 (AC)						
Protection Class	IP65 in accordance with EN 60529 (plugged and mounted)						
	Code	G0R	G0Q	GAR	GAG	W30	W31
Supply Voltage		12V	24V	98V	205V	110 at 50Hz 120 at 60Hz	230 at 50Hz 240 at 60Hz
Supply Tolerance		+5...-10	+5...-10	+5...-10	+5...-10	+5...-10	+5...-10
Power Consumption	Hold	31W	31W	31W	31W	78W	78W
	In Rush	31W	31W	31W	31W	264W	264W
Solenoid Connection	Connector as per EN 175301-803						
Wiring Minimum	3 x 1.5 mm <sup>2</sup> recommended						
Wiring Length Maximum	50 m (164 ft.) recommended						

**D**





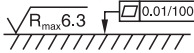
Inch equivalents for millimeter dimensions are shown in (\*\*)

NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	5781-06-07-0-00	42.9 (1.69)	35.8 (1.41)	21.5 (0.85)	—	7.2 (0.28)	21.5 (0.85)	31.8 (1.25)	66.7 (2.63)	58.8 (2.31)	33.4 (1.31)	7.9 (0.31)	—	—
25	5781-08-10-0-00	60.3 (2.37)	49.2 (1.94)	39.7 (1.56)	—	11.1 (0.44)	20.6 (0.81)	44.5 (1.75)	79.4 (3.13)	73.0 (2.87)	39.7 (1.56)	6.4 (0.25)	—	—
32	5781-10-13-0-00	84.2 (3.31)	67.5 (2.66)	59.5 (2.34)	42.1 (1.66)	16.7 (0.66)	24.6 (0.97)	62.7 (2.47)	96.8 (3.81)	92.8 (3.65)	48.4 (1.91)	3.8 (0.15)	—	—

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	5781-06-07-0-00	87.3 (3.44)	33.4 (1.31)	83.0 (3.27)	21.0 (0.83)	62.5 (2.46)	—	—	—	29.0 (1.14)	94.8 (3.73)	—	141.0 (5.55)	181.0 (7.13)	—
25	5781-08-10-0-00	105.0 (4.13)	39.7 (1.56)	109.5 (4.31)	29.0 (1.14)	89.0 (3.50)	—	—	—	34.7 (1.37)	126.8 (4.99)	—	141.0 (5.55)	181.0 (7.13)	—
32	5781-10-13-0-00	120.0 (4.72)	48.4 (1.91)	120.0 (4.72)	29.0 (1.14)	99.5 (3.92)	—	—	—	30.6 (1.20)	144.3 (5.68)	—	141.0 (5.55)	181.0 (7.13)	—

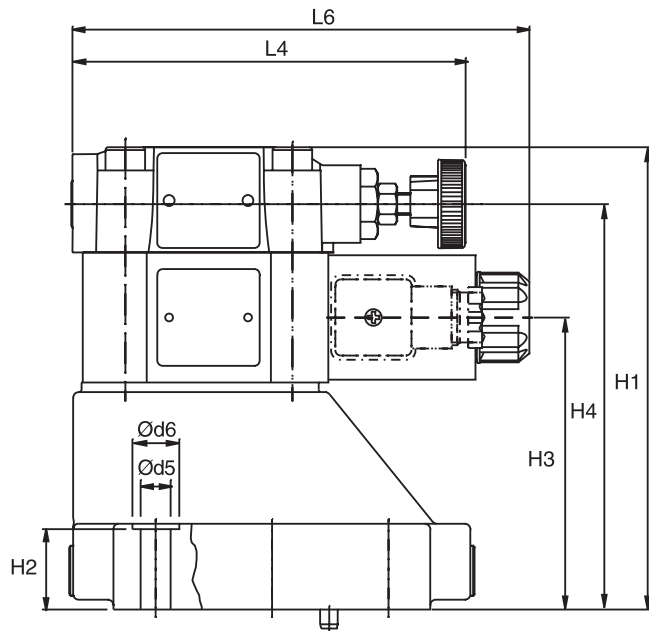
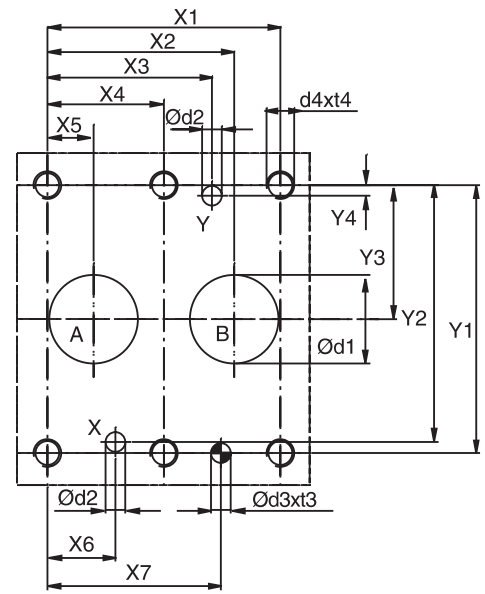
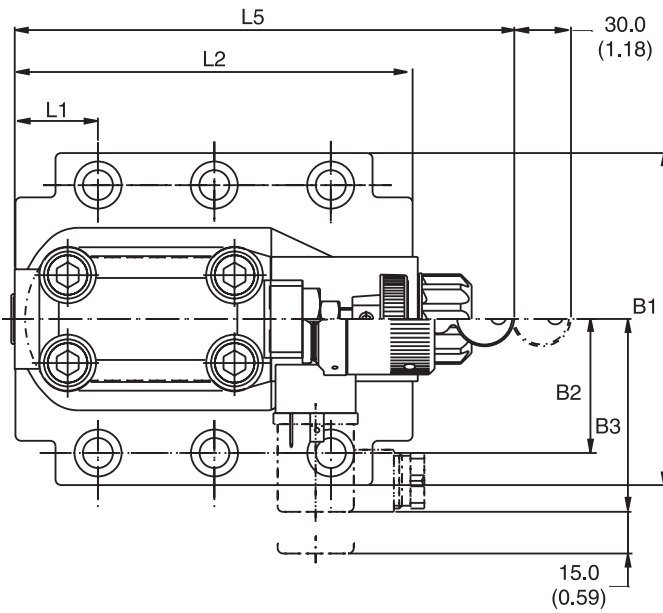
NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	5781-06-07-0-00	15.0 (0.59)	7.0 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	16.0 (0.63)	10.8 (0.43)	17.0 (0.67)
25	5781-08-10-0-00	23.4 (0.92)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	18.0 (0.71)	10.8 (0.43)	17.0 (0.67)
32	5781-10-13-0-00	32.0 (1.26)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	20.0 (0.79)	10.8 (0.43)	17.0 (0.67)

NG	ISO-code	Bolt Kit			Seal Kit		Surface Finish
					Nitrile	Fluorocarbon	
10	5781-06-07-0-00	BK505	4xM10 x 35-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58507-0	S26-58507-5	
25	5781-08-10-0-00	BK485	4xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58475-0	S26-58475-5	
32	5781-10-13-0-00	BK506	6xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58508-0	S26-58508-5	

NG	ISO-code	Subplate	Size
10	5781-06-07-0-00	SPP3M6B910	A, B = 3/4" BSPP x, y = 1/4" BSPP
25	5781-08-10-0-00	SPP6M8B910	A, B = 1" BSPP x, y = 1/4" BSPP
32	5781-10-13-0-00	SPP10M12B910	A, B = 1 1/2" BSPP x, y = 1/4" BSPP



**D**



**Dimensions**

**Pressure Unloading Valves  
Series R4U with Vent Function**

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




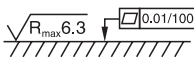
NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	5781-06-07-0-00	42.9 (1.69)	35.8 (1.41)	21.5 (0.85)	–	7.2 (0.28)	21.5 (0.85)	31.8 (1.25)	66.7 (2.63)	58.8 (2.31)	33.4 (1.31)	7.9 (0.31)	–	–
25	5781-08-10-0-00	60.3 (2.37)	49.2 (1.94)	39.7 (1.56)	–	11.1 (0.44)	20.6 (0.81)	44.5 (1.75)	79.4 (3.13)	73.0 (2.87)	39.7 (1.56)	6.4 (0.25)	–	–
32	5781-10-13-0-00	84.2 (3.31)	67.5 (2.66)	59.5 (2.34)	42.1 (1.66)	16.7 (0.66)	24.6 (0.97)	62.7 (2.47)	96.8 (3.81)	92.8 (3.65)	48.4 (1.91)	3.8 (0.15)	–	–

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	H5	H6	L1	L2	L3	L4	L5	L6
10	5781-06-07-0-00	87.3 (3.44)	33.4 (1.31)	70.0 (2.76)	130.0 (5.12)	21.0 (0.83)	68.5 (2.70)	109.5 (4.13)	–	–	29.0 (1.14)	94.8 (3.73)	–	141.0 (5.55)	181.0 (7.13)	165.6 (6.52)
25	5781-08-10-0-00	105.0 (4.13)	39.7 (1.56)	70.0 (2.76)	156.5 (6.16)	29.0 (1.14)	95.0 (3.74)	136.0 (5.35)	–	–	34.7 (1.37)	126.8 (4.99)	–	141.0 (5.55)	181.0 (7.13)	165.6 (6.52)
32	5781-10-13-0-00	120.0 (4.72)	48.4 (1.91)	70.0 (2.76)	167.0 (6.57)	29.0 (1.14)	105.5 (4.15)	146.5 (5.77)	–	–	30.6 (1.20)	144.3 (5.68)	–	141.0 (5.55)	181.0 (7.13)	165.6 (6.52)



NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	5781-06-07-0-00	15.0 (0.59)	7.0 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	16.0 (0.63)	10.8 (0.43)	17.0 (0.67)
25	5781-08-10-0-00	23.4 (0.92)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	18.0 (0.71)	10.8 (0.43)	17.0 (0.67)
32	5781-10-13-0-00	32.0 (1.26)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	20.0 (0.79)	10.8 (0.43)	17.0 (0.67)

NG	ISO-code	Bolt Kit			Seal  Kit		Surface Finish
					Nitrile	Fluorocarbon	
10	5781-06-07-0-00	BK505	4xM10 x 35-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58507-0*	S26-58507-5*	
25	5781-08-10-0-00	BK485	4xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58475-0*	S26-58475-5*	
32	5781-10-13-0-00	BK506	6xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58508-0*	S26-58508-5*	
VV01					S56-40609-0	S56-40609-5	

\*Please combine seal kit of one size with seal kit of VV01 DC / AC solenoid for complete seal kit.

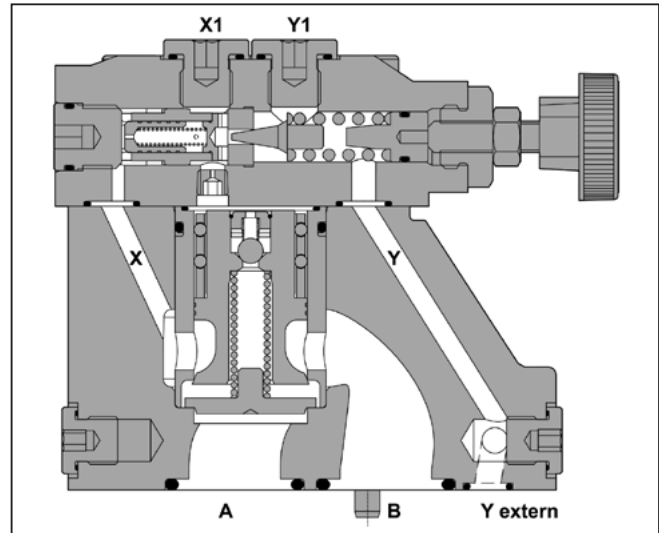
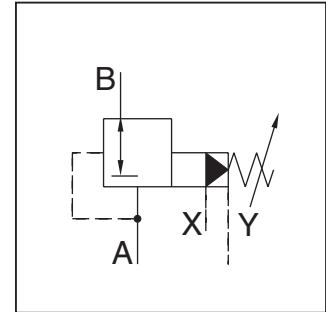
NG	ISO-code	Subplate	Size
10	5781-06-07-0-00	SPP3M6B910	A, B = 3/4" BSPP x, y = 1/4" BSPP
25	5781-08-10-0-00	SPP6M8B910	A, B = 1" BSPP x, y = 1/4" BSPP
32	5781-10-13-0-00	SPP10M12B910	A, B = 1 1/2" BSPP x, y = 1/4" BSPP

### General Description

Series R4R pressure reducing valves are used to control the pressure in the secondary part of the hydraulic system. Independent of the primary pressure the secondary pressure is reduced to the pressure setting. In order to avoid undesired motion the valves are normally closed.

### Specifications

<b>Size</b>	NG10, NG25, NG32
<b>Interface</b>	Subplate mounting acc. ISO 5781
<b>Mounting Pos.</b>	As desired, horizontal mounting preferred
<b>Ambient Temp.</b>	-20°C to +80°C (-4°F to +176°F)
<b>Max. Oper. Pressure</b>	Ports A, B and X: 350 Bar (5075 PSI), Port Y: depressurized
<b>Pressure Range</b>	up to 105, 210, 350 Bar (1523, 3045, 5075 PSI)
<b>Nominal Flow</b>	Size NG10: 150 LPM (39.7 GPM) Size NG25: 350 LPM (92.6 GPM) Size NG32: 500 LPM (132.3 GPM)
<b>Pressure Fluid</b>	Hydraulic oil according to DIN 51524... 51525
<b>Pressure Fluid Temperature</b>	Recommended: +30°C to +50°C (86°F to +122°F) Maximum: -20°C to +70°C (-4°F to +158°F)
<b>Viscosity</b>	Recommended: 30 to 50 cSt (mm <sup>2</sup> /s) Maximum: 20 to 380 cSt (mm <sup>2</sup> /s)
<b>Filtration</b>	ISO 4406 (1999), 18/16/13



### Features

- Subplate mounting acc. to ISO 5781
- Normally closed to avoid unintended motion
- 3 pressure ranges
- Three adjustment modes: Hand knob, acorn nut with lead seal, or key lock

### Ordering Information

<b>R</b>	<b>4</b>	<b>R</b>	—	<b>5</b>	□	□	□	<b>B</b>	□	□	
Pressure Reducing Valve	Interface	Reducing Function	Size	Maximum Pressure 350 Bar (5075 PSI)	Body Mounting	Pressure Range	Adjustment	Pilot Oil	Design Series	Seal	Options
											Check with Factory

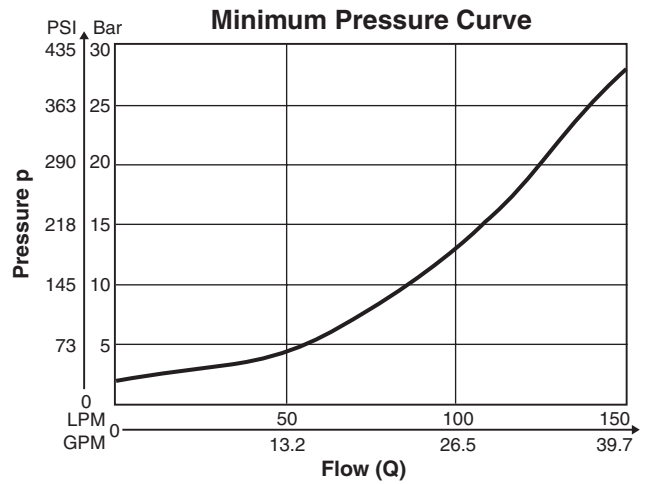
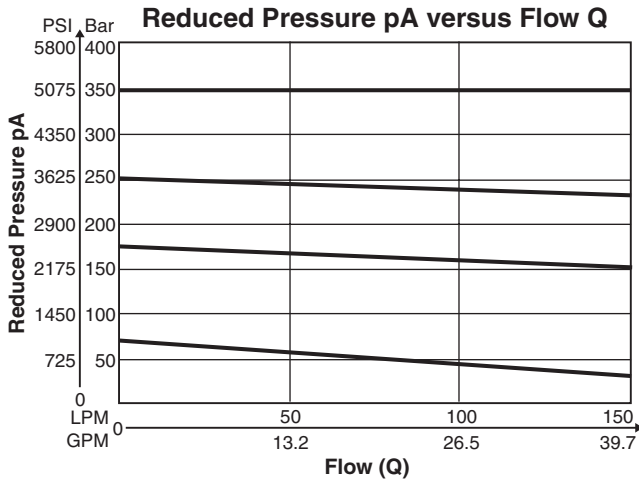
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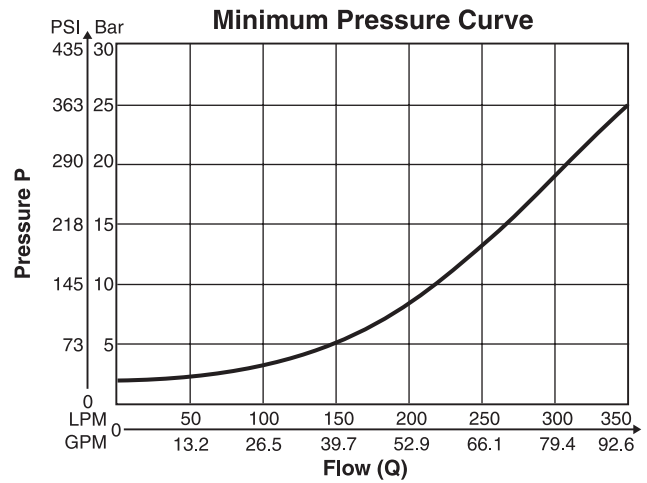
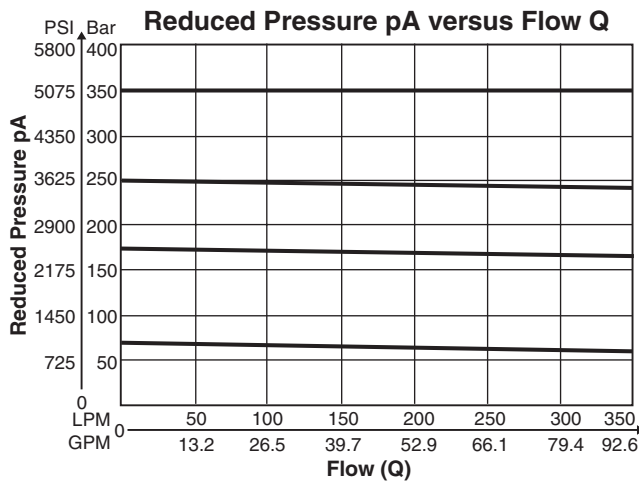
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**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

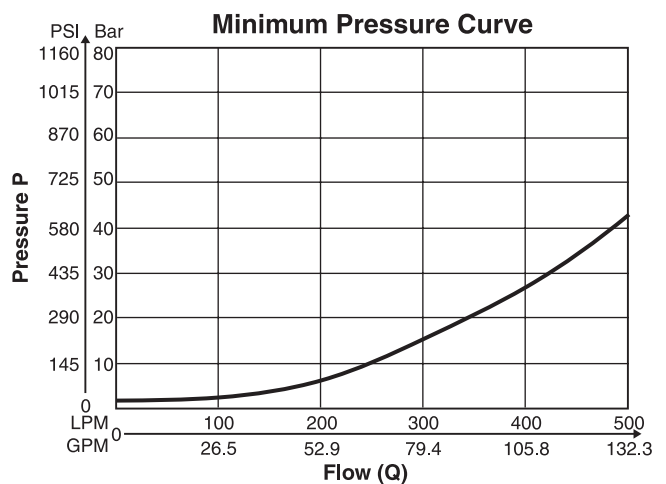
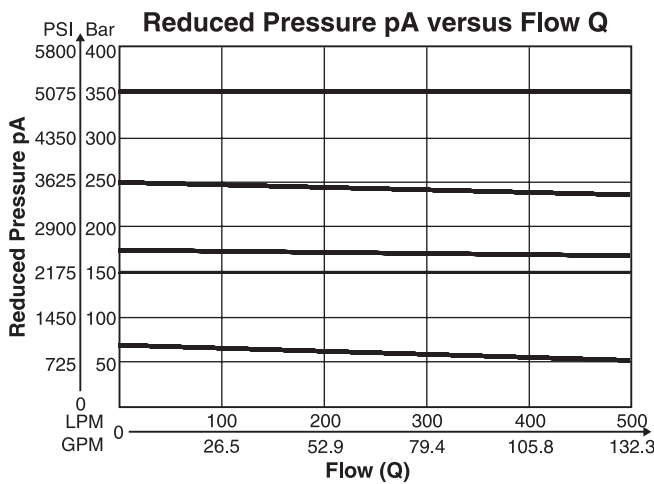
**R4R03** <sup>1)</sup>



**R4R06** <sup>1)</sup>



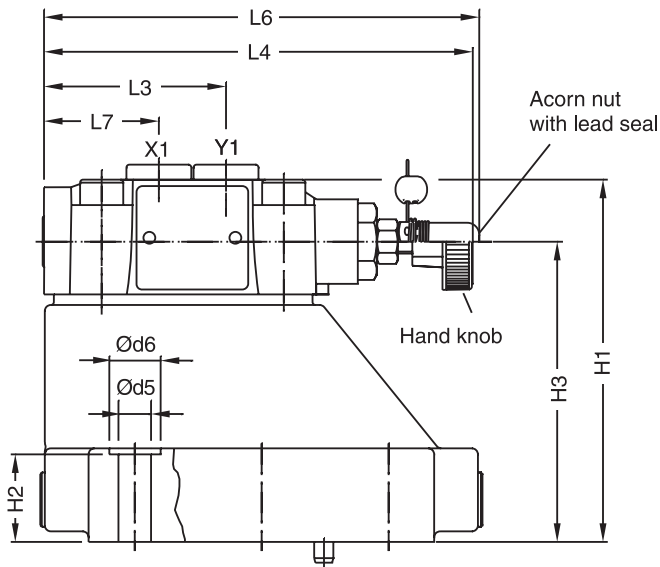
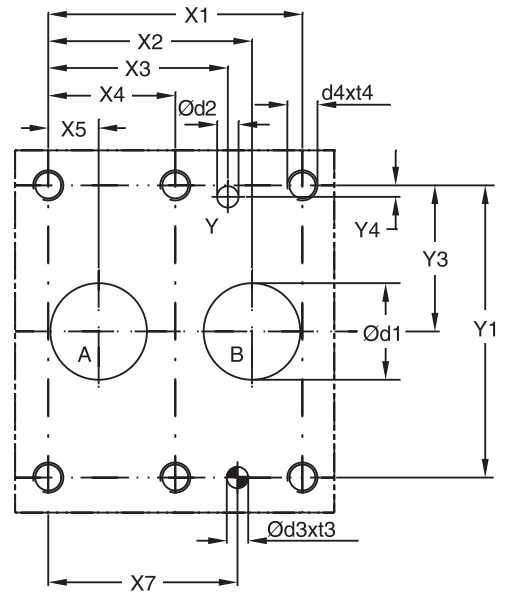
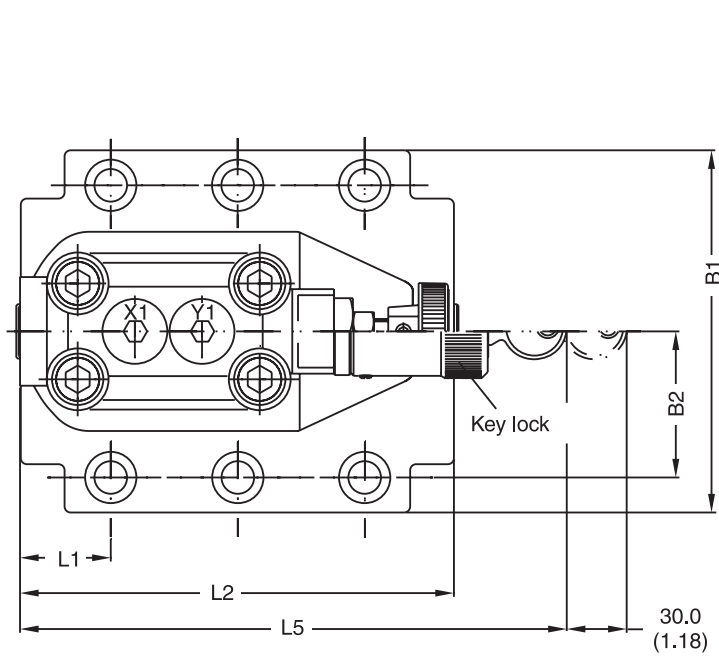
**R4R10** <sup>1)</sup>



<sup>1)</sup> Measured at 350 Bar (5075 PSI) primary pressure pB.



**D**





**Dimensions**

**Pressure Reducing Valves  
Series R4R**

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



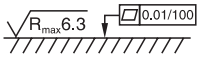
NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	5781-06-07-0-00	42.9 (1.69)	35.8 (1.41)	21.5 (0.85)	– –	7.2 (0.28)	– –	31.8 (1.25)	66.7 (2.63)	– –	33.4 (1.31)	7.9 (0.31)	– –	– –
25	5781-08-10-0-00	60.3 (2.37)	49.2 (1.94)	39.7 (1.56)	– –	11.1 (0.44)	– –	44.5 (1.75)	79.4 (3.13)	– –	39.7 (1.56)	6.4 (0.25)	– –	– –
32	5781-10-13-0-00	84.2 (3.31)	67.5 (2.66)	59.5 (2.34)	42.1 (1.66)	16.7 (0.66)	– –	62.7 (2.47)	96.8 (3.81)	– –	48.4 (1.92)	3.8 (0.15)	– –	– –

Tolerance for all dimensions ±0.2

NG	ISO-code	B1	B2	H1	H2	H3	H4	H5	H6	L1	L2	L3	L4	L5	L7
10	5781-06-07-0-00	87.3 (3.44)	33.4 (1.31)	83.0 (3.27)	21.0 (0.83)	62.5 (2.46)	– –	– –	– –	29.0 (1.14)	94.8 (3.73)	60.8 (2.39)	141.0 (5.55)	181.0 (7.13)	38.6 (1.52)
25	5781-08-10-0-00	105.0 (4.13)	39.7 (1.56)	109.5 (4.31)	29.0 (1.14)	89.0 (3.50)	– –	– –	– –	34.7 (1.37)	126.8 (4.99)	60.8 (2.39)	141.0 (5.55)	181.0 (7.13)	38.6 (1.52)
32	5781-10-13-0-00	120.0 (4.72)	48.4 (1.91)	120.0 (4.72)	29.0 (1.14)	99.5 (3.92)	– –	– –	– –	30.6 (1.20)	144.3 (5.68)	60.8 (2.39)	141.0 (5.55)	181.0 (7.13)	38.6 (1.52)

**D**

NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	5781-06-07-0-00	15.0 (0.59)	7.0 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	16.0 (0.63)	10.8 (0.43)	17.0 (0.67)
25	5781-08-10-0-00	23.4 (0.92)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	18.0 (0.71)	10.8 (0.43)	17.0 (0.67)
32	5781-10-13-0-00	32.0 (1.26)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	20.0 (0.79)	10.8 (0.43)	17.0 (0.67)

NG	ISO-code	Bolt Kit			Seal Nitrile	Kit Fluorocarbon	Surface Finish
10	5781-06-07-0-00	BK505	4xM10 x 35-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58507-0	S26-58507-5	
25	5781-08-10-0-00	BK485	4xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58475-0	S26-58475-5	
32	5781-10-13-0-00	BK506	6xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58508-0	S26-58508-5	

NG	ISO-code	Subplate	Size
10	5781-06-07-0-00	SPP3M6B910	A, B = 3/4" BSPP x, y = 1/4" BSPP
25	5781-08-10-0-00	SPP6M8B910	A, B = 1" BSPP x, y = 1/4" BSPP
32	5781-10-13-0-00	SPP10M12B910	A, B = 1 1/2" BSPP x, y = 1/4" BSPP

**General Description**

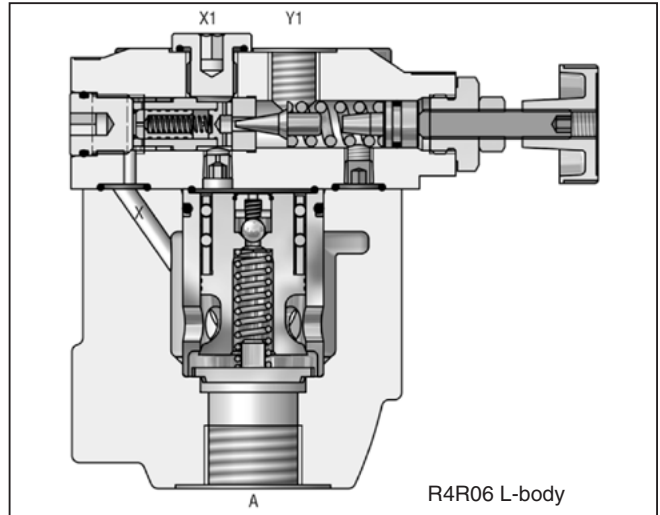
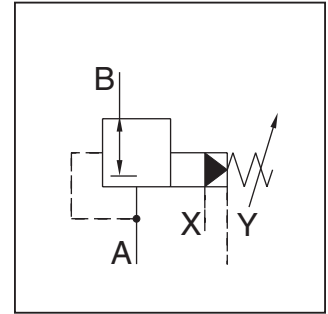
Series R4R pressure reducing valves are pilot operated and have a similar design to the subplate mounted R4R Series. For single functions (where no manifold blocks are used), the valves can be directly placed in the pipe-work. The valves are available with 2 ports (L-body) or with 3 ports (T-body).

**Features**

- Pilot operated with manual adjustment
- Normally closed to avoid unintended motion
- 2 interfaces:
  - L-body (R4R06-G3/4", R4R10-G1-1/4")
  - T-body (R4R03-G1/2", R4R06-G1")
- 3 pressure ranges
- Three adjustment modes:
  - Hand knob
  - Acorn nut with lead seal
  - Cylinder lock
- With optional vent function



R4R10 L-body



R4R06 L-body

**D**

**Ordering Information**

<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;">R4R</div> <p style="font-size: small;">Pressure Reducing Valve</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;"> </div> <p style="font-size: small;">Size</p>	<p style="font-size: x-large; margin: 0;">—</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;">5</div> <p style="font-size: small;">Max. Pressure 350 Bar (5075 PSI)</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;"> </div> <p style="font-size: small;">Body Mounting</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;"> </div> <p style="font-size: small;">Pressure Range</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;"> </div> <p style="font-size: small;">Adjustment</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;">2</div> <p style="font-size: small;">Drain Line ext. from Pilot Head (Y1)</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;"> </div> <p style="font-size: small;">Switching Type</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;"> </div> <p style="font-size: small;">Solenoid Voltage</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;">B</div> <p style="font-size: small;">Design Series</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;"> </div> <p style="font-size: small;">Seal</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;"> </div> <p style="font-size: small;">Options Check with Factory</p>																																																				
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**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**R4R**

General					
Design		T-body		L-body	
Size		03 (1/2")	06 (1")	06 (3/4")	10 (1-1/4")
Mounting		Threaded body			
Mounting Position		Unrestricted			
Ambient Temperature °C (°F)		-20 to +60 (-4 to +140)			
MTTF <sub>D</sub> Value years		75			
Weight kg (lbs)		3.2 (7.05)	3.3 (7.28)	5.6 (12.35)	6.6 (14.55)
Hydraulic					
Max. Oper. Pressure bar (PSI)		Ports A, B and X: 350 (5076); Port Y depressurized			
Pressure Stages bar (PSI)		105 (1523), 210 (3046), 350 (5076)			
Nominal Flow LPM (GPM)		60 (15.85)	200 (52.83)	200 (52.83)	450 (118.88)
Fluid		Hydraulic oil according to DIN 51524			
Fluid Temperature °C (°F)		-20...+70 (-4...+158) (NBR: -25...+70) (-13...+158)			
Viscosity Recommended Viscosity Maximum		30 to 80 cSt / mm <sup>2</sup> /s (139 to 371 SSU) 20 to 400 cSt / mm <sup>2</sup> /s (98 to 1853 SSU)			
Filtration LPM (GPM)		ISO 4406 (1999); 18/16/13			

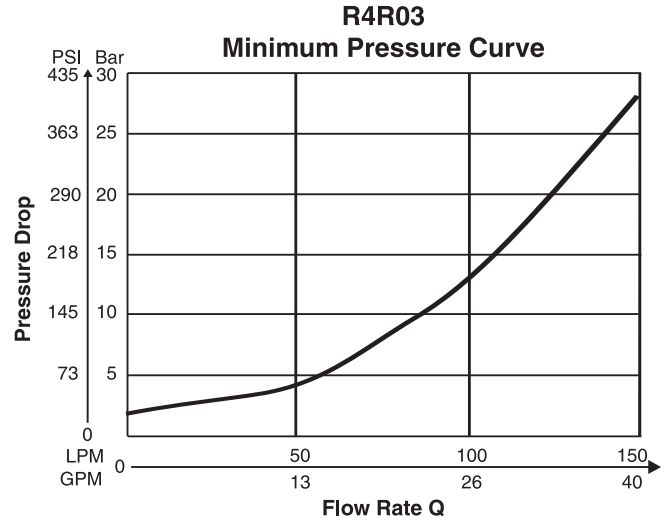
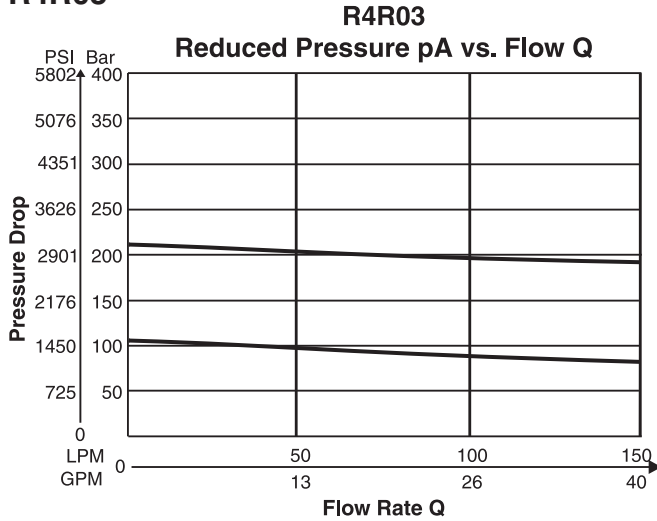


**R4R with Vent Function**

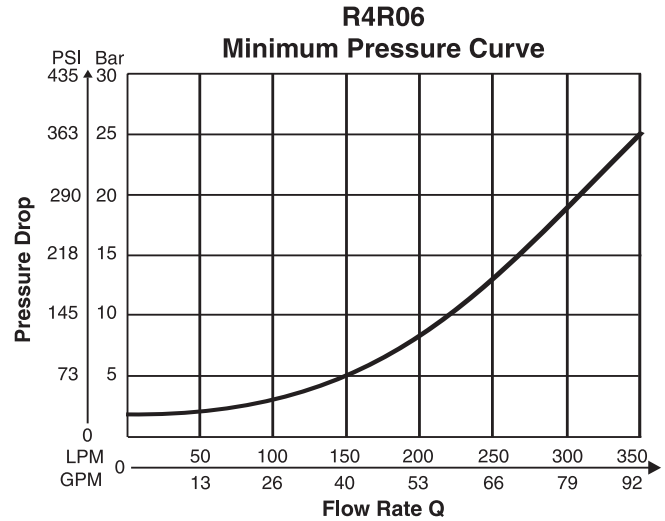
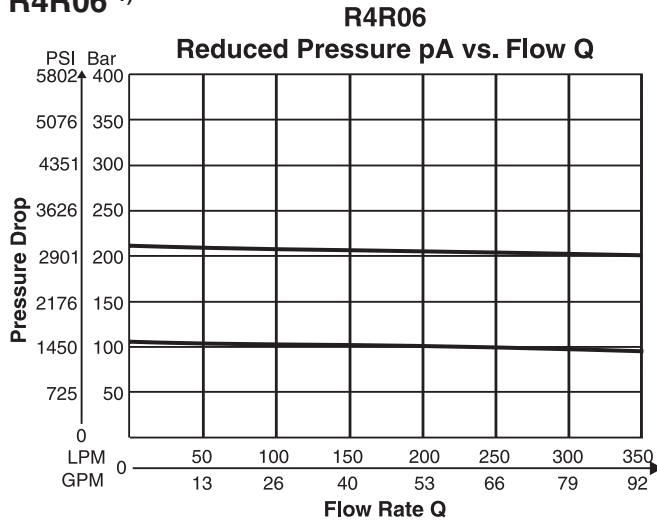
General							
Design		T-body			L-body		
Size		03 (1/2")	06 (3/4")	06 (1")	10 (1-1/4")		
Mounting		Threaded body					
Mounting Position		Unrestricted					
Ambient Temperature	°C (°F)	-20 to +60 (-4 to +140)					
MTTF <sub>D</sub> Value	years	75					
Weight	kg (lbs)	4.9 (10.80)	5.0 (11.02)	7.3 (16.09)	8.3 (18.30)		
Hydraulic							
Max. Oper. Pressure	bar (PSI)	Ports A, B and X: 350 (5076); Port Y depressurized					
Pressure Stages	bar (PSI)	105 (1523), 210 (3046), 350 (5076)					
Nominal Flow	LPM (GPM)	60 (15.85)	200 (52.83)	200 (52.83)	450 (118.88)		
Fluid		Hydraulic oil according to DIN 51524					
Fluid Temperature	°C (°F)	-20...+70 (-4...+158) (NBR: -25...+70) (-13...+158)					
Viscosity	Recommended	30 to 80 cSt / mm <sup>2</sup> /s (139 to 371 SSU)					
Viscosity	Maximum	20 to 400 cSt / mm <sup>2</sup> /s (98 to 1853 SSU)					
Filtration	LPM (GPM)	ISO 4406 (1999); 18/16/13					
Electrical (Solenoid)							
Duty Ratio		100% ED; CAUTION: coil temperature up to 150°C (302°F) possible					
Protection Class		IP65 in accordance with EN 60529 (with correctly mounted plug-in connector)					
Code		G0R	G0Q	GAR	GAG	W30	W31
Supply Voltage	V	12 V =	24 V =	90 V =	205 V =	110 at 50 Hz 120 at 60 Hz	230 at 50 Hz 240 at 60 Hz
Tolerance Supply Voltage	%	±10	±10	±10	±10	±5	±5
Current Consumption	Hold	2.72	1.29	0.33	0.13	0.6 / 0.55	0.3 / 0.27
	In Rush	2.72	1.29	0.33	0.13	2.5 / 2.4	1.25 / 1.2
Power Consumption	Hold	32.7	31	31.9	28.2	70 / 70 VA	70 / 70 VA
	In Rush	32.7	31	31.9	28.2	280 / 290 VA	280 / 290 VA
Solenoid Connection		Connector as per EN175301-803, solenoid identification as per ISO 9461					
Wiring Minimum		3 x 1.5 mm <sup>2</sup> recommended					
Wiring Length Maximum		50 m (164 ft.) recommended					

**D**

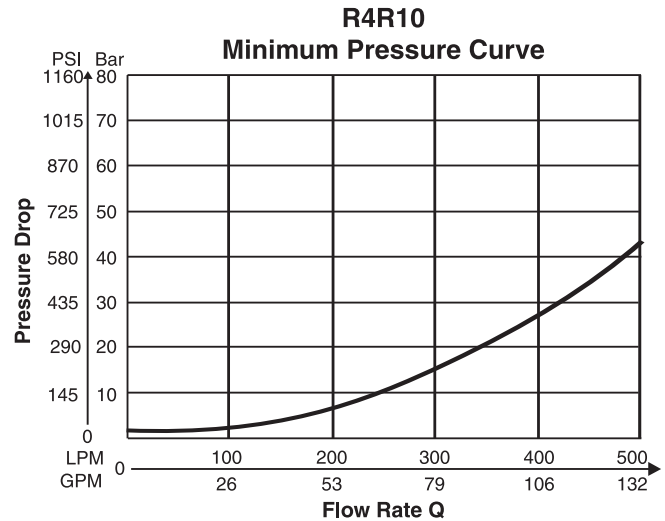
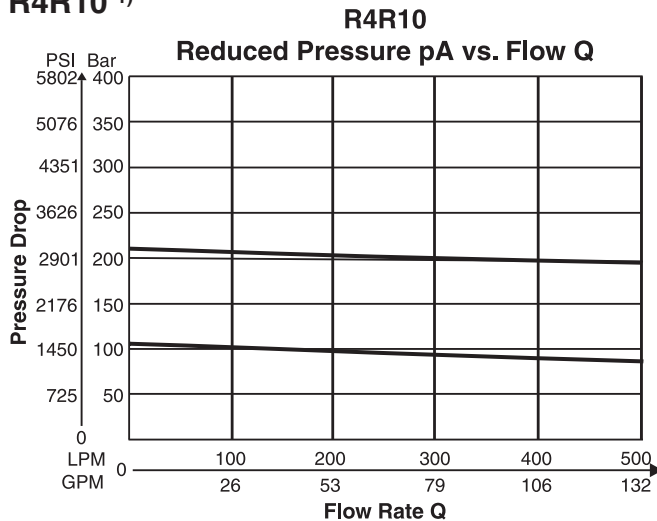
**R4R03** <sup>1)</sup>



**R4R06** <sup>1)</sup>



**R4R10** <sup>1)</sup>



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

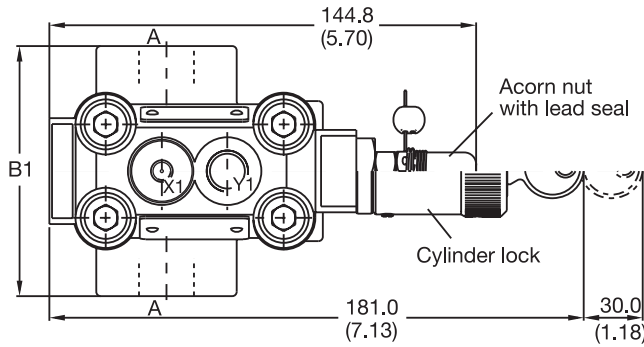
<sup>1)</sup> Measured at 350 Bar (5075 PSI) primary pressure pB.

**D**

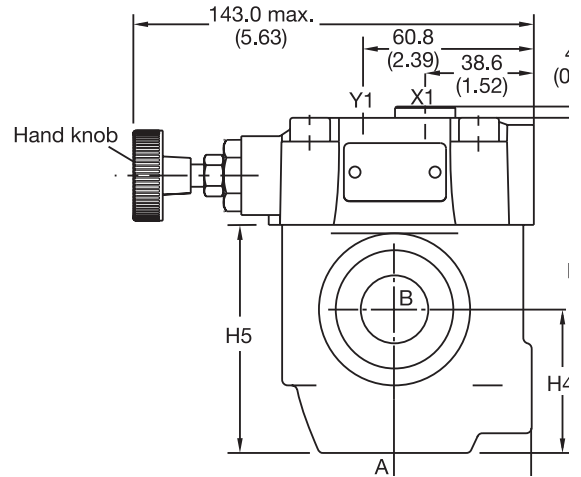
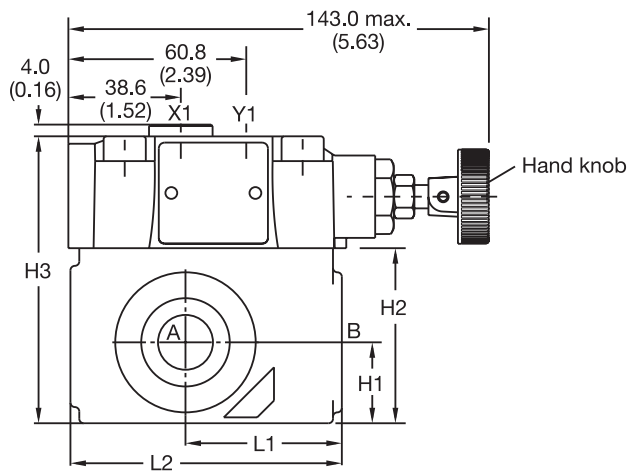
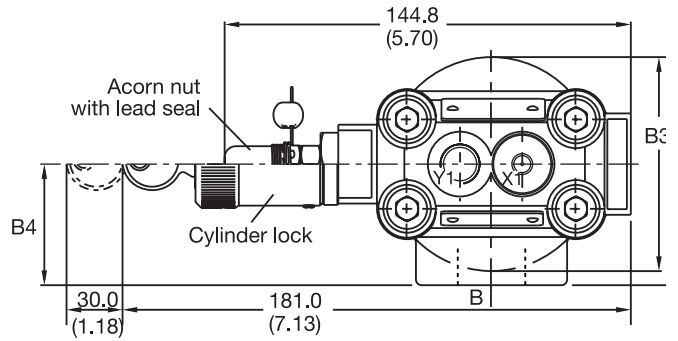
**R4R**

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

**T-body**



**L-body**



**Seal Kits**

NG	NBR	FPM
03	S26-58507-0	S26-58507-0
06	S26-58475-0	S26-58475-0
10	S26-58508-0	S26-58508-0

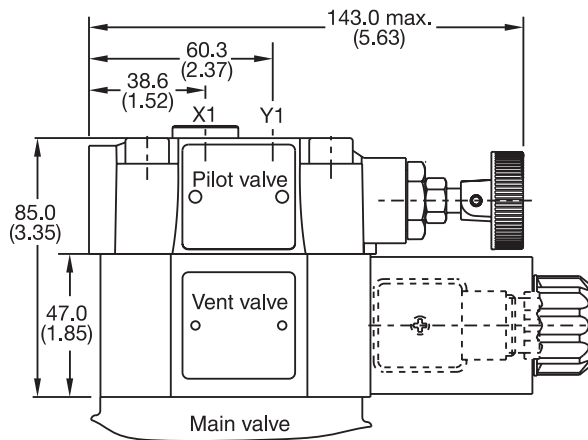
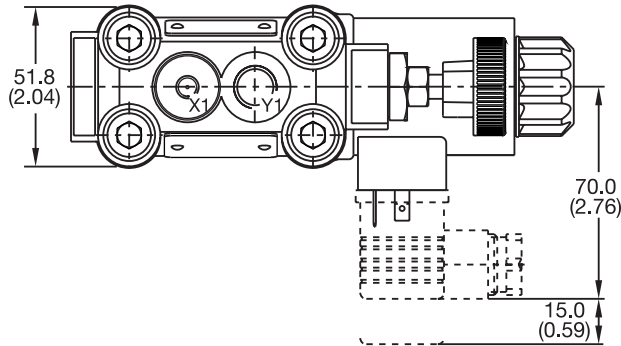


NG	Body	B1	B2	B3	B4	H1	H2	H3	H4	H5	H6	L1	L2	L3
03	T-body	85.0 (3.35)	—	—	—	27.5 (1.08)	59.5 (2.34)	97.5 (3.84)	—	—	—	53.0 (2.09)	92.0 (3.62)	—
06	T-body	136.0 (5.35)	—	—	—	38.0 (1.50)	93.0 (3.66)	131.0 (5.16)	—	—	—	66.5 (2.62)	117.5 (4.63)	—
06	L-body	—	81.0 (3.19)	76.0 (2.99)	43.0 (1.69)	—	—	—	51.0 (2.01)	81.0 (3.19)	119.0 (4.69)	—	—	49.0 (1.93)
10	L-body	—	120.7 (4.75)	85.8 (3.38)	77.8 (3.06)	—	—	—	50.8 (2.00)	96.0 (3.78)	134.0 (5.28)	—	—	49.8 (1.96)

Ports	Function	Port Size			
		R4V03 T-body	R4V06 L-body	R4V06 T-body	R410 L-body
B	Pressure (inlet)	G1/2"	G3/4"	G1"	G1-1/4"
A	Pressure (outlet)	G1/2"	G3/4"	G1"	G1-1/4"
X1	External remote control or vent connection	G1/4"	G1/4"	G1/4"	G1/4"
Y1	External Drain	G1/4"	G1/4"	G1/4"	G1/4"

**R4R with Vent Function**

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



Seal Kits	
NBR	FPM
<b>DC Solenoid</b>	
S56-40609-0	S56-40609-5
<b>AC Solenoid</b>	
S26-35237-0	S26-35237-5



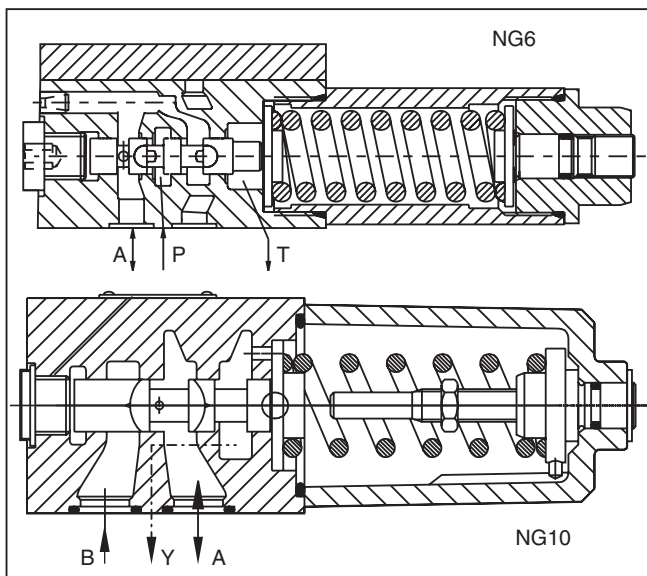
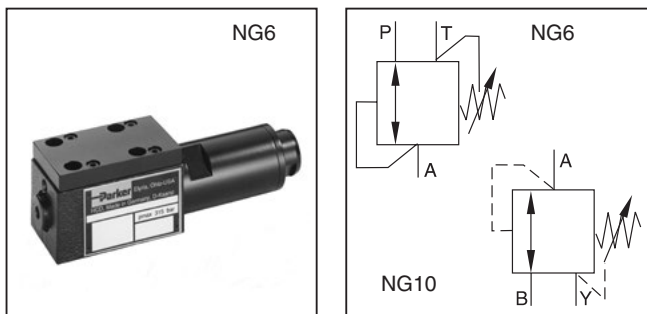
Code	External Drain
11	
09	

**D**

**General Description**

Series VM direct operated, pressure reducing valve with manual adjustment. Series VM is a direct-controlled, spring loaded 3-way pressure reducing valve, that is open in neutral position. The valve closes the connection from P to A (NG6) or B to A (NG10) when the pre-set pressure is exceeded.

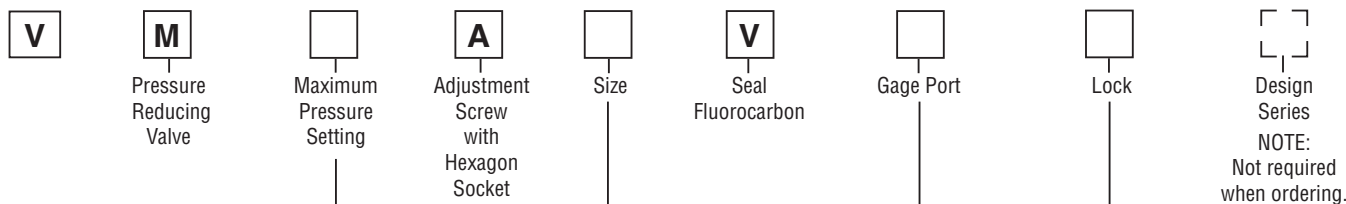
If the pressure increases due to an external influence in connection A, the spool moves and opens the connection from A to T (NG6) or A to Y (NG10) until the pre-set pressure is reached.



**D Features**

- Spool type valve
- Manifold mounting acc. to ISO 5871
- 5 pressure ranges at NG6
- 3 pressure ranges at NG10
- 2 adjustment modes

**Ordering Information**



Code	Description
025*	25 Bar (363 PSI)
064	64 Bar (928 PSI)
125**	125 Bar (1813 PSI)
160*	160 Bar (2320 PSI)
210	210 Bar (3045 PSI)
350*	350 Bar (5075 PSI)

\* NG6 only  
 \*\* NG10 only

Code	Description
06	NG6
10	NG10

Code	Description
G*	1/4" BSPP
M	M18x1.5** M12x1.5*

\* NG6 only  
 \*\* NG10 only

Code	Description
Omit	No Lock
Z	Cylinder Lock

**Weight:**  
 VM\*A06 1.3 kg (2.9 lbs.)  
 VM\*A10 3.7 kg (8.2 lbs.)

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

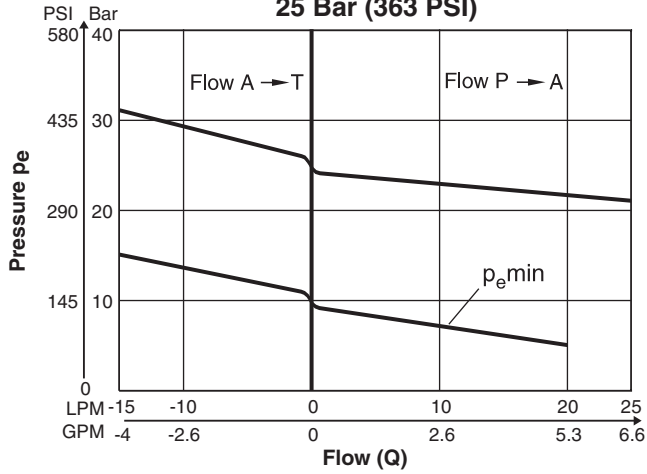


General		
Size	NG6	NG10
Interface	Subplate mounting acc. ISO 5781	
Mounting Position	Unrestricted	
Ambient Temperature	-20°C to +70° (-4°F to +158°F)	
Hydraulic		
Working Pressure	Ports P and A 350 Bar (5075 PSI) Port T depressurized	Ports A and B 210 Bar (3045 PSI) Port Y depressurized
Pressure Range	25, 64, 160, 210, 350 Bar (363, 928, 2320, 3045, 5075 PSI)	64, 125, 210 Bar (928, 1813, 3045 PSI)
Nominal Flow	25 LPM (6.6 GPM)	60 LPM (15.9 GPM)
Pressure Fluid	Hydraulic oil according to DIN 51524 ... 525	
Viscosity	Recommended 30 to 50 cSt / mm <sup>2</sup> /s (139 to 232 SSU) Maximum 20 to 380 cSt / mm <sup>2</sup> /s (93 to 1761 SSU)	
Pressure Fluid Temperature	Recommended +30°C to +50°C (+86°F to +122°F) Permitted -20°C to +70° (-4°F to +158°F)	
Filtration	ISO 4406 (1999), 18/16/13	

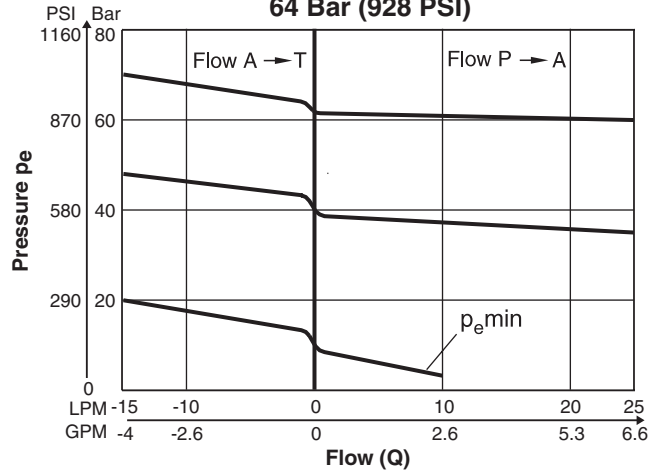
D

**VM\*06**

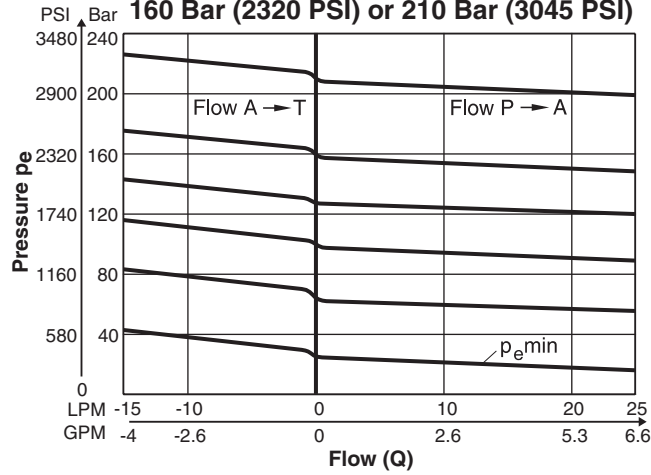
**Maximum Pressure Setting**  
**25 Bar (363 PSI)**



**Maximum Pressure Setting**  
**64 Bar (928 PSI)**

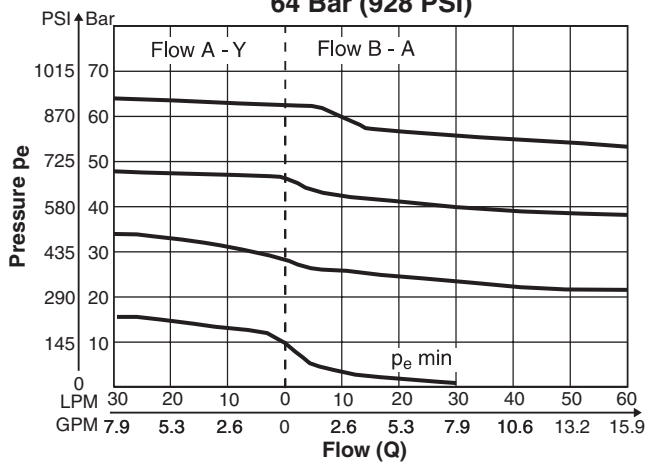


**Maximum Pressure Setting**  
**160 Bar (2320 PSI) or 210 Bar (3045 PSI)**

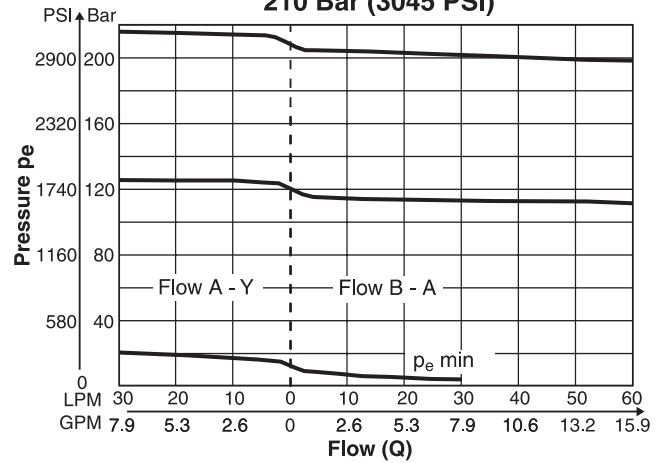


**VM\*10**

**Maximum Pressure Setting**  
**64 Bar (928 PSI)**

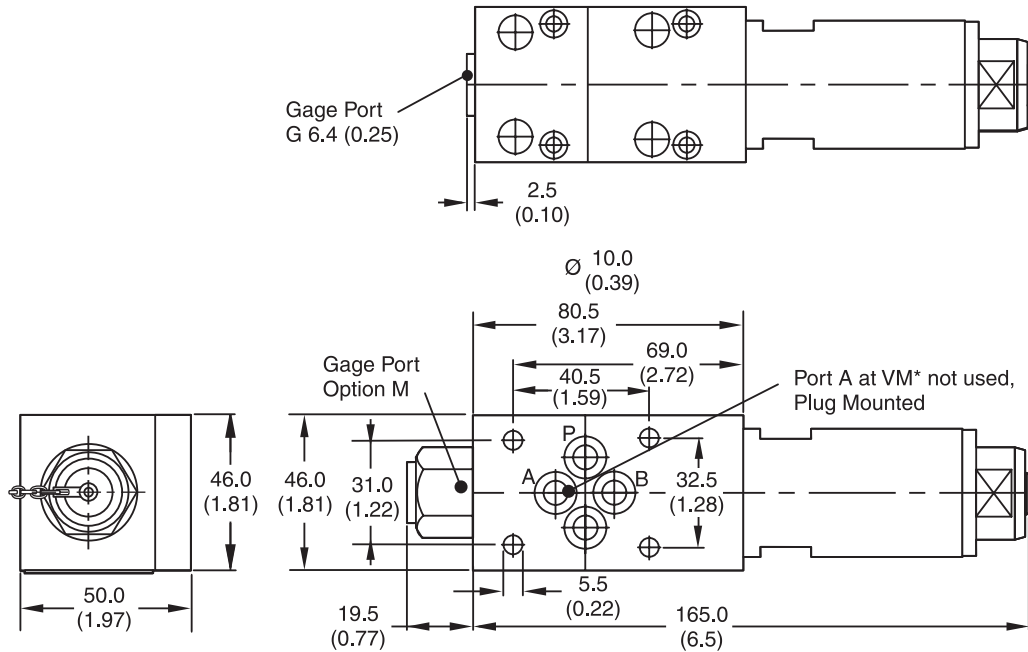





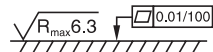
**Maximum Pressure Setting**  
**210 Bar (3045 PSI)**



**VM\*06**

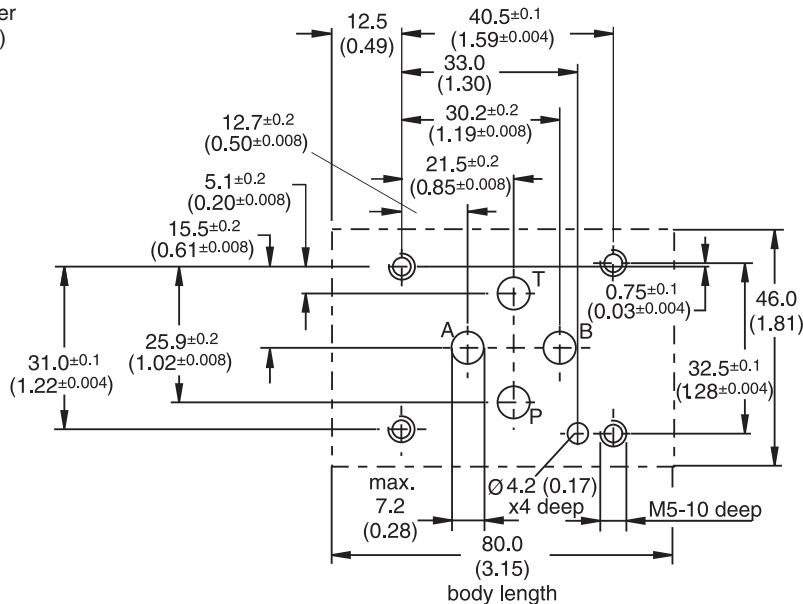
Inch equivalents for millimeter dimensions are shown in (\*\*)



<b>Surface Finish</b>	<b>Bolt Kit</b>  <b>DIN912 12.9</b>		<b>Seal Kit</b>  <b>Fluorocarbon</b>
	BK375 4x M5x30	8.1 Nm (6.0 lb.-ft.)	SK-VB/VM/VS-V

**Mounting Pattern ISO 5871-03-04-0-00 (NFPA D03, CETOP 3, NG6)**

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



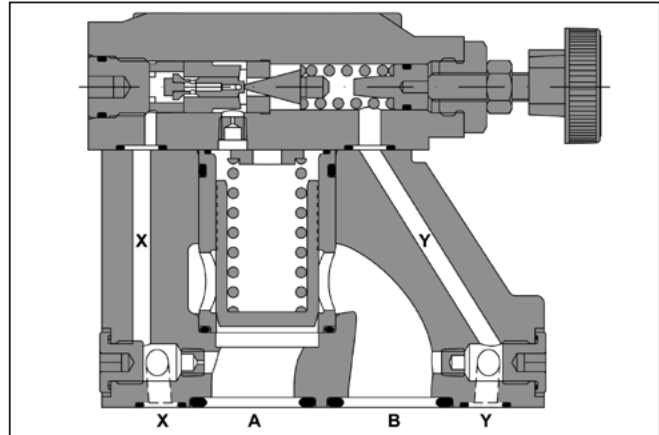
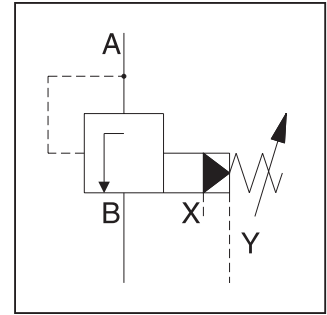


**General Description**

Series R4S pilot operated sequence valves enable a hydraulic system to operate in a pressure sequence. When the system pressure reaches the setting pressure the valve opens and permits flow to the secondary sub-system.

**Features**

- Pilot-operated sequence valve
- 3 pressure ranges
- 3 adjustment modes:
  - Hand knob
  - Acorn nut with lead seal
  - Key lock



**D**

**Ordering Information**

<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">R</div> Pressure Valve	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">4</div> Interface	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">S</div> Relief Function	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">5</div> Maximum Pressure 350 Bar (5075 PSI)	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">7</div> Body Mounting	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">1</div> External Drain from Subplate	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">A</div> Design Series	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">Seal</div>																														
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**Weight:**

R4S03:	2.7 kg	(6.0 lbs.)
R4S06:	4.5 kg	(9.0 lbs.)
R4S10:	6.0 kg	(13.2 lbs.)

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## Specifications

General			
Size	NG10	NG25	NG32
Interface	Subplate mounting acc. ISO 5781		
Mounting Position	As desired, horizontal mounting preferred		
Ambient Temperature	-20°C to +80°C (-4°F to +176°F)		
Hydraulic			
Operating Pressure	Ports A, B and X up to 350 Bar (5075 PSI), Port Y: depressurized		
Pressure Range	up to 105, 210, 350 Bar (1523, 3045, 5075 PSI)		
Nominal Flow	150 LPM (39.7 GPM)	350 LPM (92.6 GPM)	650 LPM (172.0 GPM)
Pressure Fluid	Hydraulic oil according to DIN 51524 ... 51525		
Viscosity	30 to 50 cSt / mm <sup>2</sup> /s (139 to 232 SSU) 20 to 380 cSt / mm <sup>2</sup> /s (93 to 1761 SSU)		
Pressure Fluid Temperature	+30°C to +50°C (+86°F to +122°F) -20°C to +70° (-4°F to +158°F)		
Filtration	ISO 4406 (1999), 18/16/13		

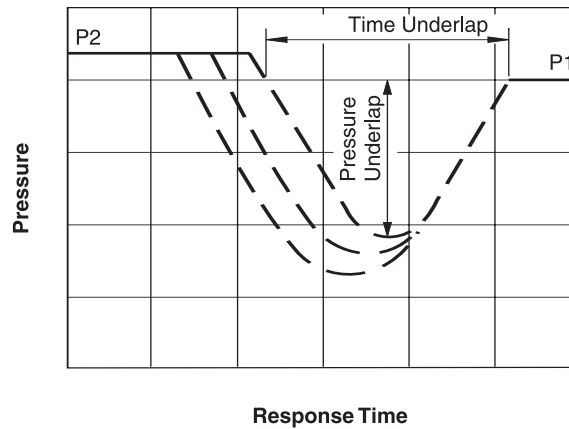
**D**

## Performance Curves

Typical pressure curves at closing point

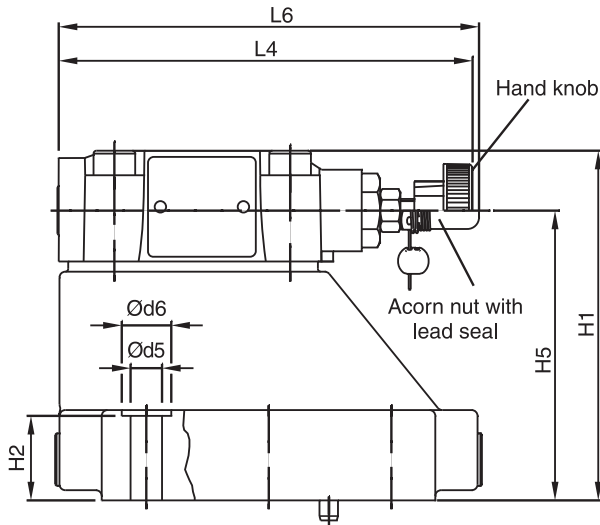
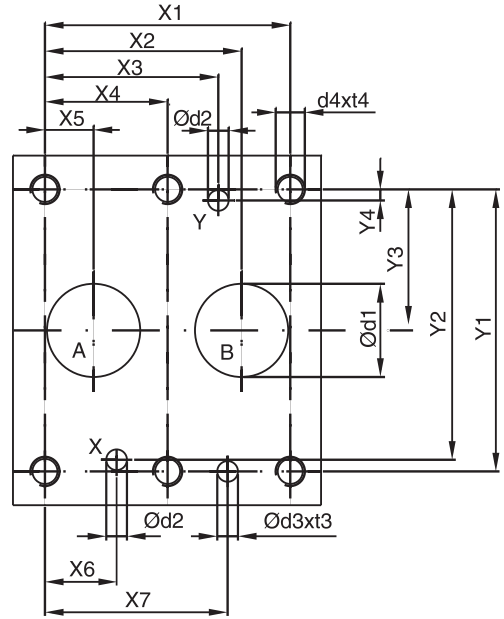
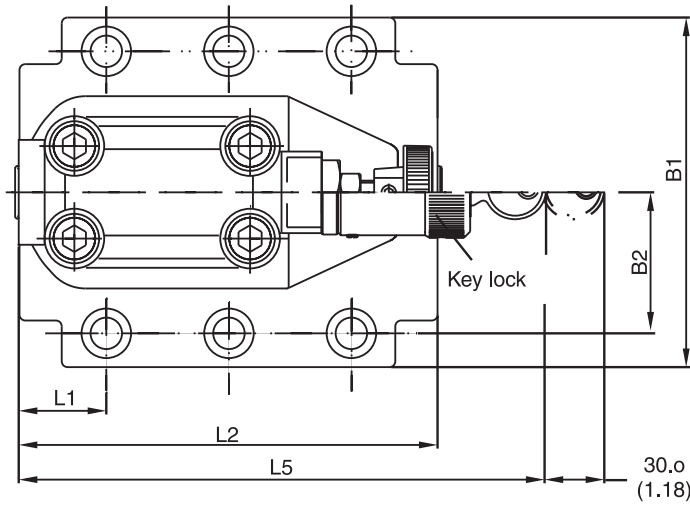
P1 = setting pressure

P2 = operating pressure



Note:

Time and pressure underlap depend on the characteristics of a specific system.



**D**



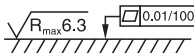
Inch equivalents for millimeter dimensions are shown in (\*\*)

NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	5781-06-07-0-00	42.9 (1.69)	35.8 (1.41)	21.5 (0.85)	–	7.2 (0.28)	21.5 (0.85)	31.8 (1.25)	66.7 (2.63)	58.8 (2.31)	33.4 (1.31)	7.9 (0.31)	–	–
25	5781-08-10-0-00	60.3 (2.37)	49.2 (1.94)	39.7 (1.56)	–	11.1 (0.44)	20.6 (0.81)	44.5 (1.75)	79.4 (3.13)	73.0 (2.87)	39.7 (1.56)	6.4 (0.25)	–	–
32	5781-10-13-0-00	84.2 (3.31)	67.5 (2.66)	59.5 (2.34)	42.1 (1.66)	16.7 (0.66)	24.6 (0.97)	62.7 (2.47)	96.8 (3.81)	92.8 (3.65)	48.4 (1.91)	3.8 (0.15)	–	–

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	5781-06-07-0-00	87.3 (3.44)	33.4 (1.31)	83.0 (3.27)	21.0 (0.83)	62.5 (2.46)	–	–	–	29.0 (1.14)	94.8 (3.73)	–	141.0 (5.55)	181.0 (7.13)	–
25	5781-08-10-0-00	105.0 (4.13)	39.7 (1.56)	109.5 (4.31)	29.0 (1.14)	89.0 (3.50)	–	–	–	34.7 (1.37)	126.8 (4.99)	–	141.0 (5.55)	181.0 (7.13)	–
32	5781-10-13-0-00	120.0 (4.72)	48.4 (1.91)	120.0 (4.72)	29.0 (1.14)	99.5 (3.92)	–	–	–	30.6 (1.20)	144.3 (5.68)	–	141.0 (5.55)	181.0 (7.13)	–

NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	5781-06-07-0-00	15.0 (0.59)	7.0 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	16.0 (0.63)	10.8 (0.43)	17.0 (0.67)
25	5781-08-10-0-00	23.4 (0.92)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	18.0 (0.71)	10.8 (0.43)	17.0 (0.67)
32	5781-10-13-0-00	32.0 (1.26)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	20.0 (0.79)	10.8 (0.43)	17.0 (0.67)

NG	ISO-code	Bolt Kit			Seal Nitrile	Kit Fluorocarbon	Surface Finish
10	5781-06-07-0-00	BK505	4xM10 x 35-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58507-0	S26-58507-5	
25	5781-08-10-0-00	BK485	4xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58475-0	S26-58475-5	
32	5781-10-13-0-00	BK506	6xM10 x 45-DIN 912 12.9	63 Nm (46.5 lb.-ft.) ±15%	S26-58508-0	S26-58508-5	

NG	ISO-code	Subplate	Size
10	5781-06-07-0-00	SPP3M6B910	A, B = 3/4" BSPP x, y = 1/4" BSPP
25	5781-08-10-0-00	SPP6M8B910	A, B = 1" BSPP x, y = 1/4" BSPP
32	5781-10-13-0-00	SPP10M12B910	A, B = 1 1/2" BSPP x, y = 1/4" BSPP

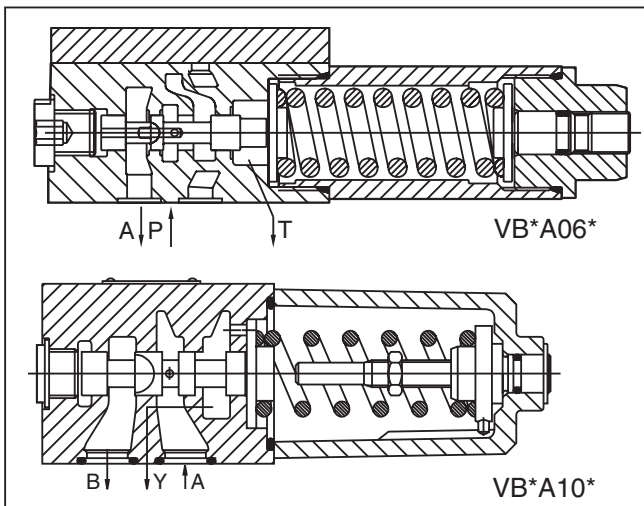
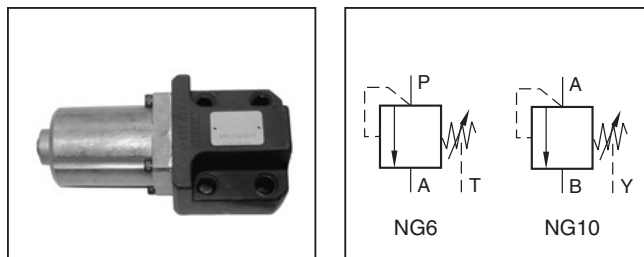


### General Description

Series VB are direct operated pressure relief valves with manual adjustment. Series VB valves can also be used as pressure sequence valves because of the high pressure capability in the outlet port and the external drain port.

### Specifications

<b>Size</b>	NG6, NG10
<b>Interface</b>	ISO 5791
<b>Mounting Pos.</b>	Unrestricted
<b>Ambient Temp.</b>	-20°C to +80°C (-4°F to +176°F)
<b>Max. Operating Pressure</b>	Size 6: Ports P and A 350 Bar (5075 PSI), Port T depressurized  Size 10: Ports A and B 315 Bar (4568 PSI), Port Y depressurized
<b>Pressure Range</b>	Size 6: 25, 64, 160, 210, 350 Bar (363, 928, 2320, 3045, 5075 PSI) Size 10: 64, 125, 210 Bar (928, 1813, 3045 PSI)
<b>Nominal Flow</b>	Size 6: 25 LPM (6.6 GPM) Size 10: 60 LPM (15.9 GPM)
<b>Pressure Fluid</b>	Hydraulic oil according to DIN 51524 ... 525
<b>Pressure Fluid Temperature</b>	Recommended: +30C to +50°C (+86°F to +122°F) Permitted: -20°C to +70°C (-4°F to +158°F)
<b>Viscosity</b>	Recommended: 30 to 50 cSt (mm <sup>2</sup> /s) Permitted: 20 to 380 cSt (mm <sup>2</sup> /s)
<b>Filtration</b>	ISO 4406 (1999), 18/16/13



### Features

- Spool valve
- Manifold mounting
- Five pressure ranges at NG6
- Three pressure ranges at NG10
- Two adjustment modes

### Ordering Information

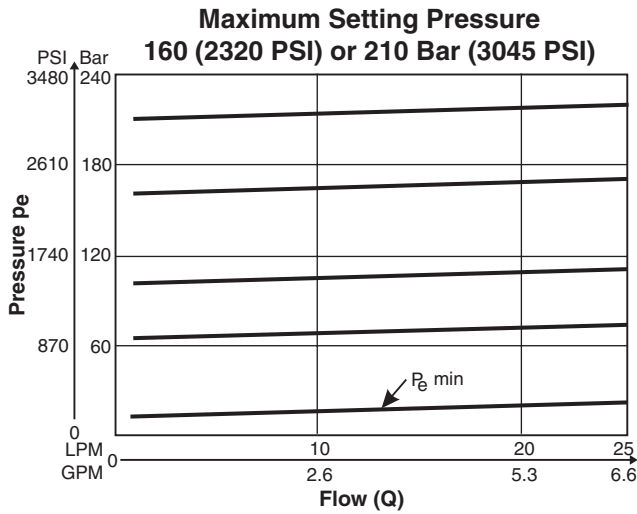
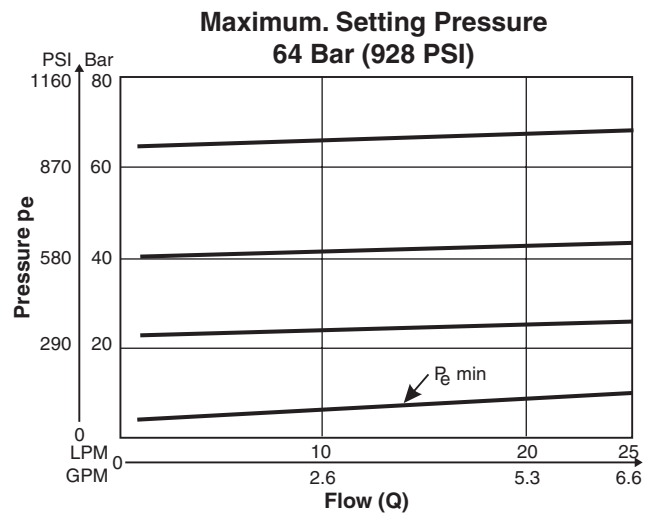
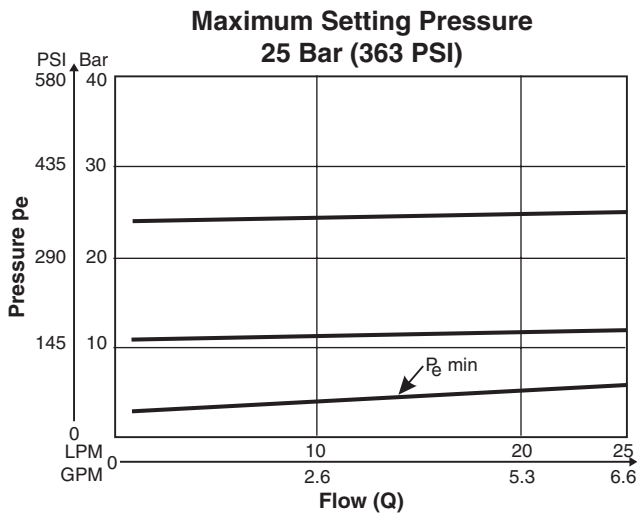
<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;">VB</div> <p>Sequence Valve</p>	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;"></div> <p>Maximum Pressure Setting</p>	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;">A</div> <p>Adjustment Screw with Hexagon Socket</p>	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;"></div> <p>Size</p>	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;">V</div> <p>Seal Fluorocarbon</p>	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;"></div> <p>Gauge Port</p>	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;"></div> <p>Lock</p>	<div style="border: 1px solid black; padding: 2px; width: 20px; margin: 0 auto;"></div> <p>Design Series</p>																																
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						<p><b>Weight:</b></p> <p>VB*A06      1.3 kg (2.9 lbs.)</p> <p>VB*A10      3.7 kg (8.2 lbs.)</p>																																	

\* only NG6.  
 \*\* only NG10.

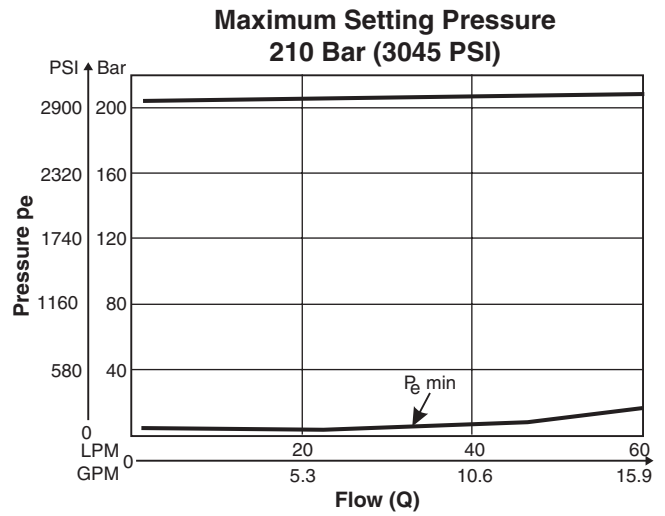
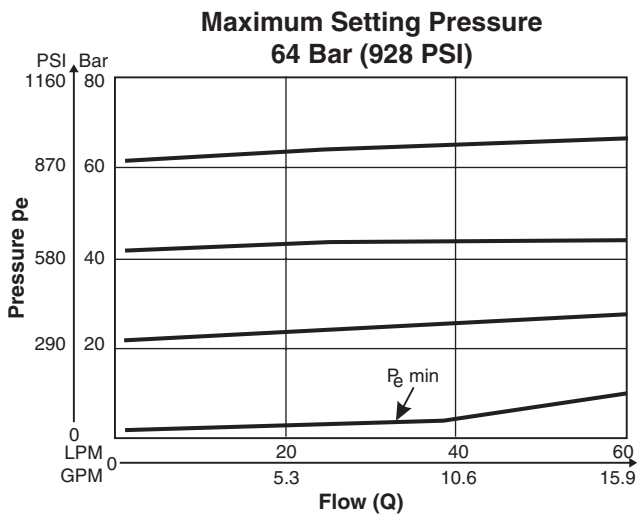
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**VB\*06**



**VB\*10**



**D**

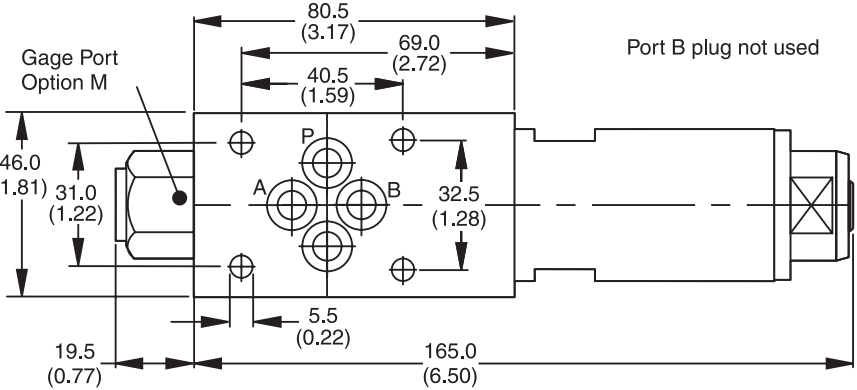
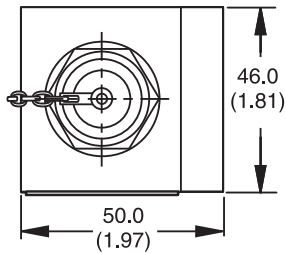
**VB\*06**

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



Gage Port  
G 6.4 (0.25)

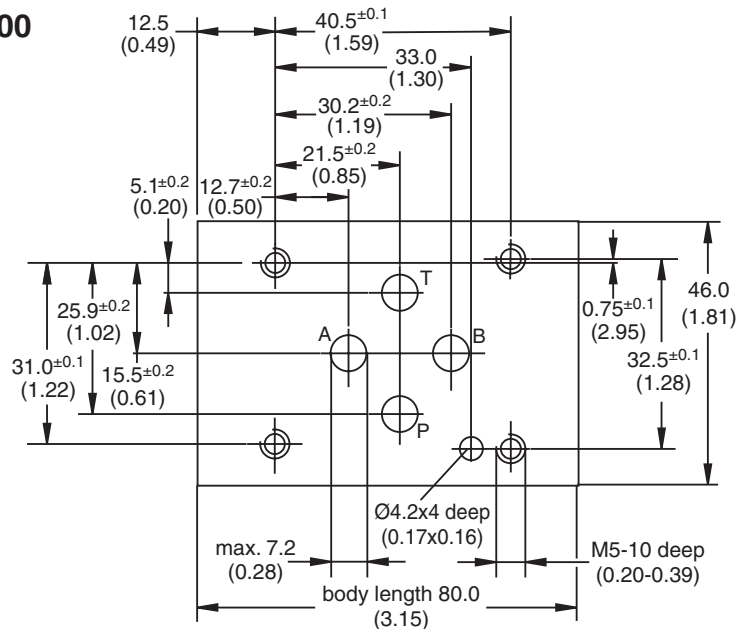
2.5  
(.10)



<b>Surface Finish</b>	$\sqrt{R_{max}6.3}$ $\square 0.01/100$
<b>Bolt Kit</b> DIN912 12.9	BK375 4x M5x30
	7.6 Nm (5.6 lb.-ft.) ±15%
<b>Seal Kit</b> Fluorocarbon	SK-VB/VM/V S V

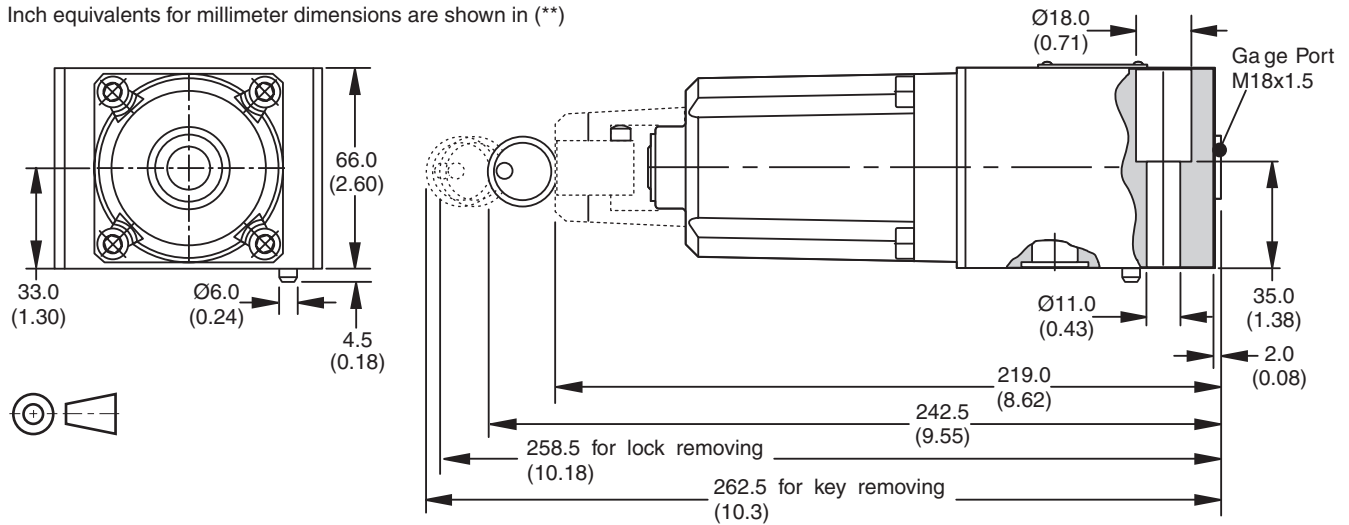
**Mounting Pattern ISO 5781-03-04-0-00  
(NFPA D03, CETOP 3, NG6)**

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



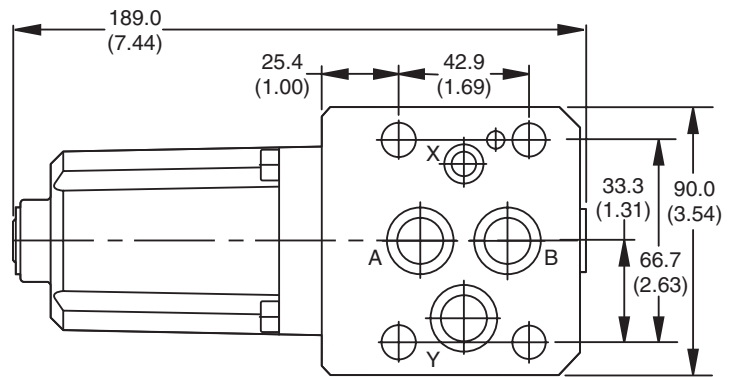
**VB\*10**

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



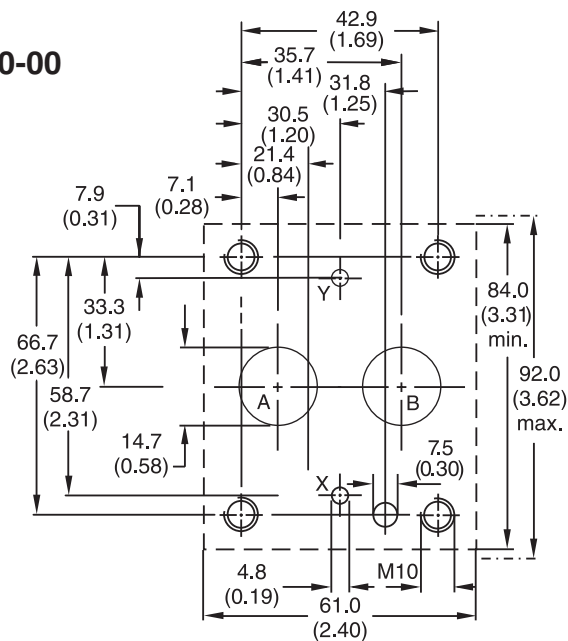
**D**

<b>Surface Finish</b>	$\sqrt{R_{max} 6.3}$ $\square 0.01/100$
<b>Bolt Kit</b> DIN912 12.9	BK389 4x M10x50
	65 Nm (48 lb.-ft.) ±15%
<b>Seal Kit</b> Fluorocarbon	SK-VB/VM-A10V
<b>Subplate</b>	<b>Size</b>
SPP3M6B910	A, B = 3/4" BSPP x, y = 1/4" BSPP



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

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



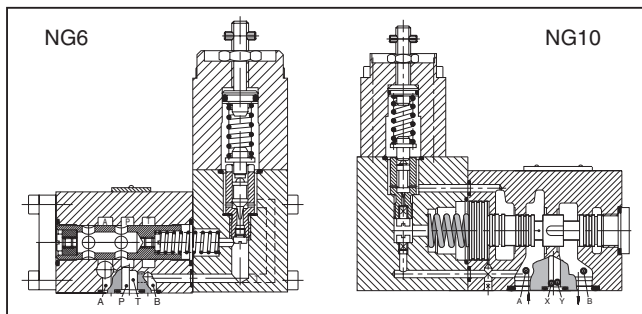
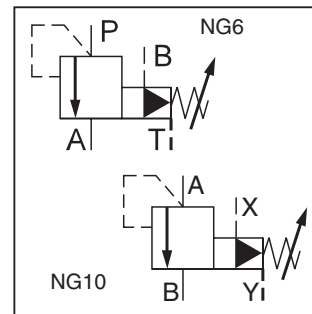
### General Description

Series VBY pilot operated sequence valves consist of a pilot with manual adjustment and a main part with spool execution. The valve has an external drain.

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

### Features

- Manifold mounting acc. to ISO 5781
- Type VBY with external drain
- Main stage spool type valve
- Pilot stage seated type valve
- 4 pressure ranges
- 2 adjustment modes
  - Screw with hexagon socket
  - DIN knob



### Specifications

Size	NG6	NG10
Mounting Pattern	ISO 5781	
Mounting Position	As desired	
Ambient Temperature	-20°C to +80°C (-4°F to +176°F)	
Operating Pressure, Ports External Drain Port Pressure	P, A, B up to 315 Bar (4568 PSI) T up to 100 Bar (1450 PSI)	A, B, X up to 315 Bar (4568 PSI) Y up to 100 Bar (1450 PSI)
Pressure Range	64, 160, 210, 315 Bar (928, 2320, 3045, 4568 PSI)	
Pressure Fluid Temperature	-20°C to +70°C (-4°F to +158°F)	
Viscosity Range Recommended Permitted	30 to 50 cSt / mm <sup>2</sup> /s (139 to 232 SSU) 20 to 380 cSt / mm <sup>2</sup> /s (93 to 1761 SSU)	
Filtration	ISO 4406 (1999), 18/16/13	
Pilot Oil Flow	approx. 500 cm <sup>3</sup> /min	approx. 1000 cm <sup>3</sup> /min

### Ordering Information

<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;">VBY</div> <p>Pressure Relief Valve</p>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> <p>Pressure Range</p>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> <p>Adjustment</p>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> <p>Size</p>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> <p>Seal</p>	<div style="border: 1px dashed black; width: 40px; height: 40px; margin: 0 auto;"></div> <p>Design Series</p> <p>NOTE: Not required when ordering.</p>																												
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**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

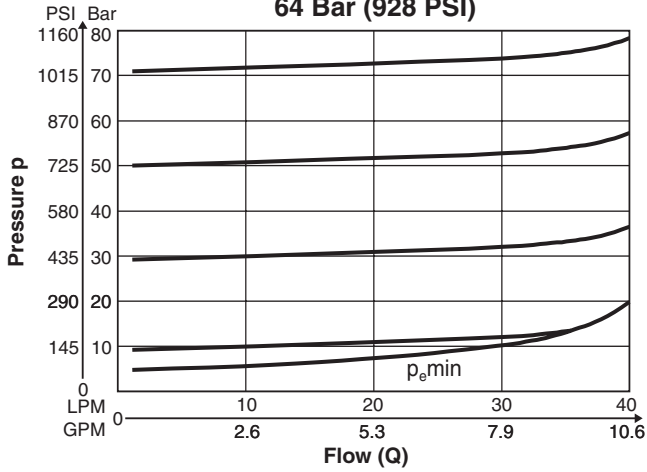


**VB Y\*06**

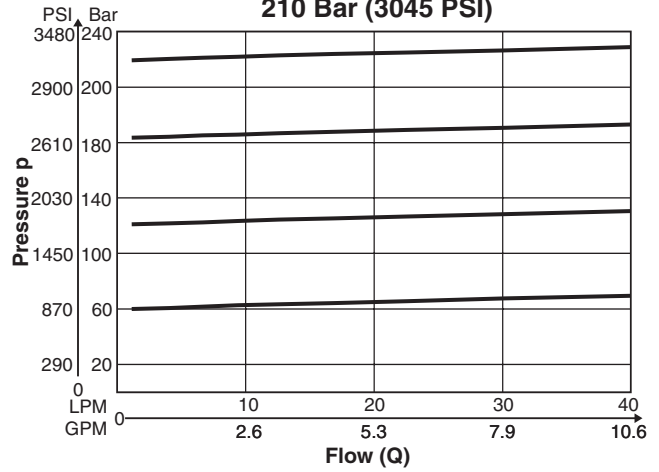
p/Q measured at t = 50°C (122°F) and  $\nu = 36\text{mm}^2/\text{s}$

**D**

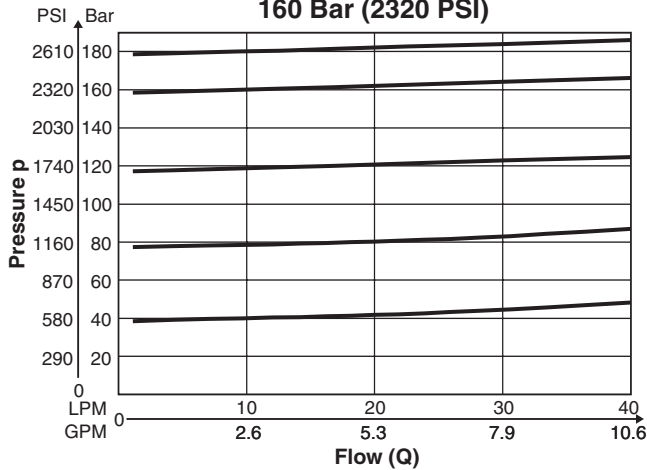
**Maximum Setting Range**  
**64 Bar (928 PSI)**



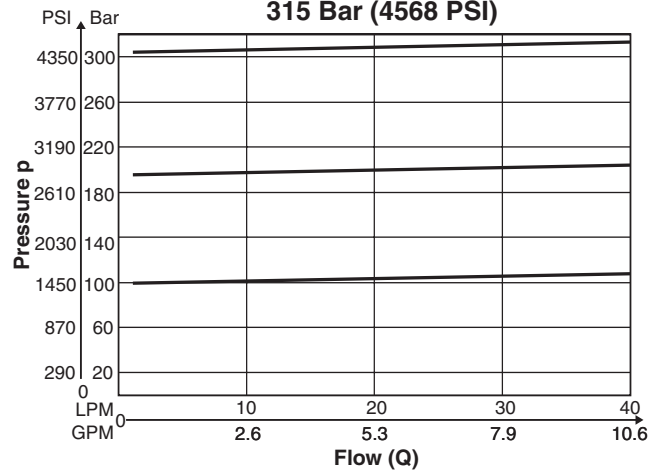
**Maximum Setting Range**  
**210 Bar (3045 PSI)**



**Maximum Setting Range**  
**160 Bar (2320 PSI)**

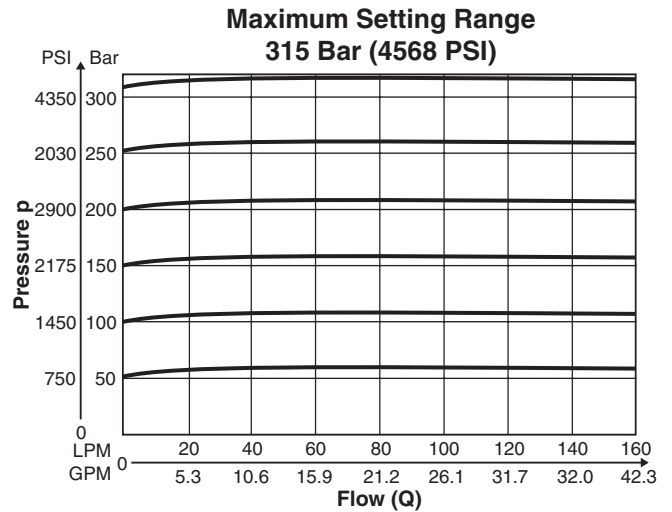
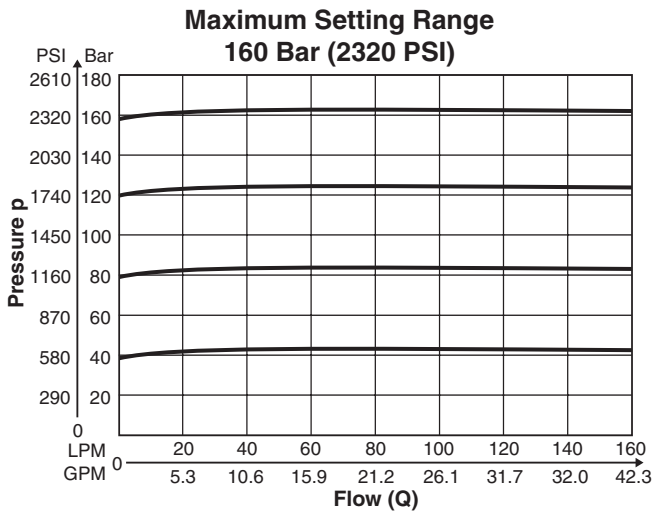
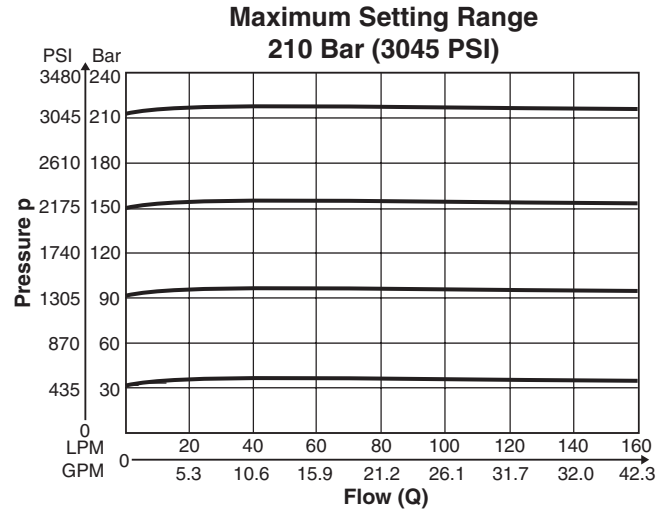
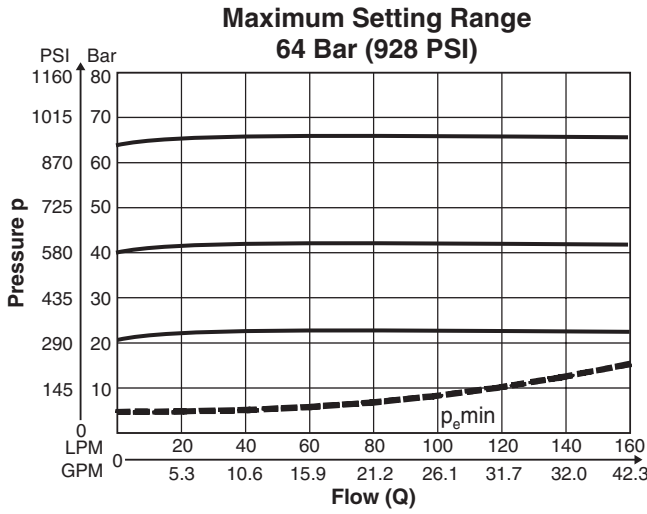


**Maximum Setting Range**  
**315 Bar (4568 PSI)**



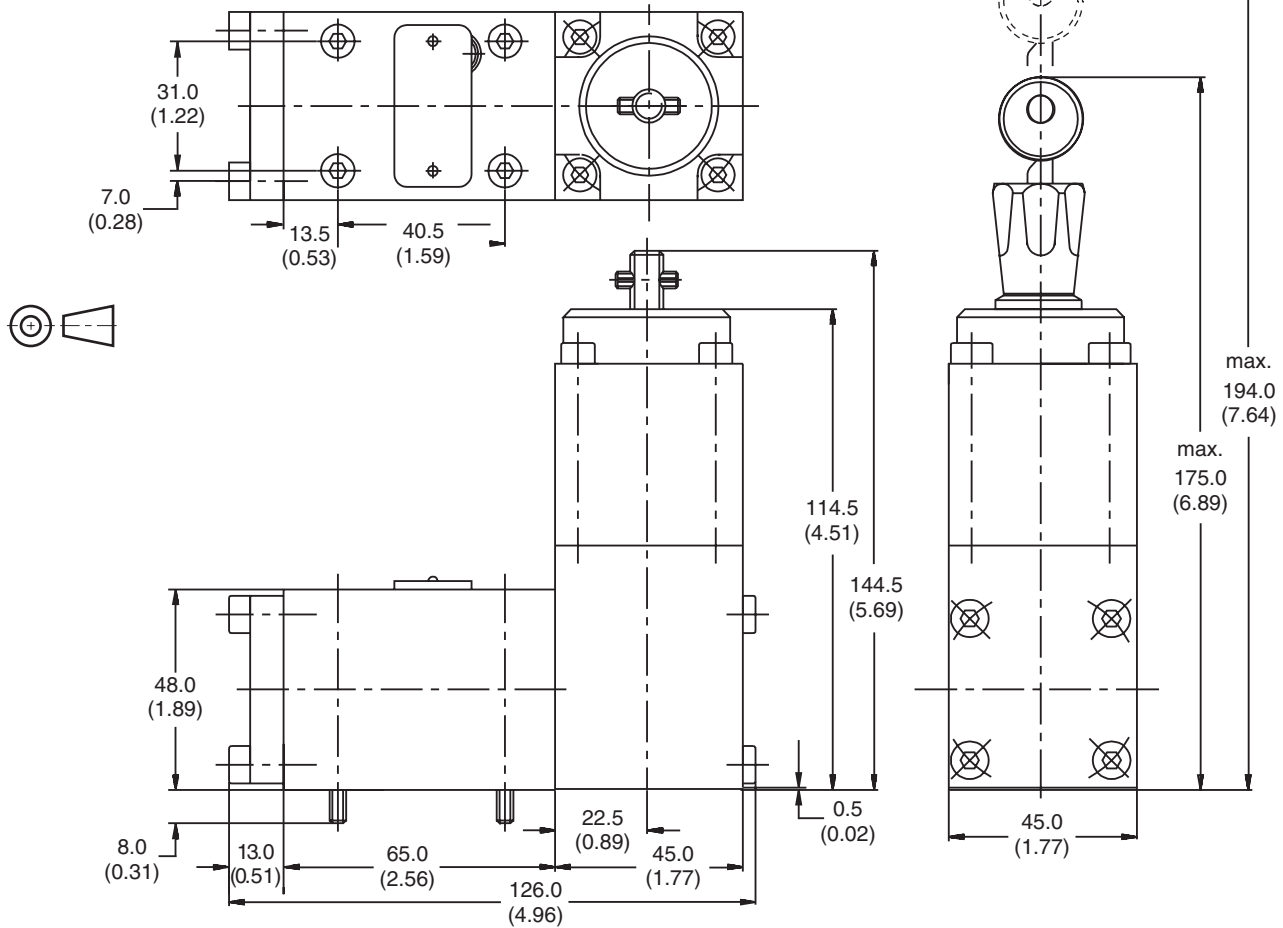
**VB Y\*10**




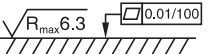
p/Q measured at t = 50°C (122°F) and v = 36mm<sup>2</sup>/s



**VBY\*06**

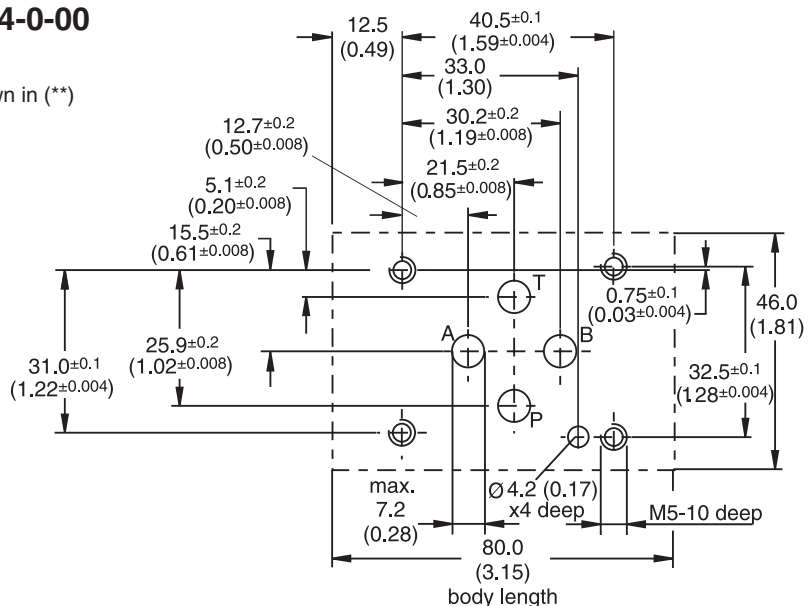
Inch equivalents for millimeter dimensions are shown in (\*\*)



<b>Surface Finish</b>	<b>Bolt Kit</b>  <b>DIN912 12.9</b>		<b>Seal Kit</b> 
	BK375 4x M5x30	7.5 Nm (5.5 lb.-ft.)	Nitrile: SK-VB/VM/VS Fluorocarbon: SK-VB/VM/VS V

**Mounting Pattern ISO 5781-03-04-0-00  
(NFPA D03, CETOP 3, NG6)**

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

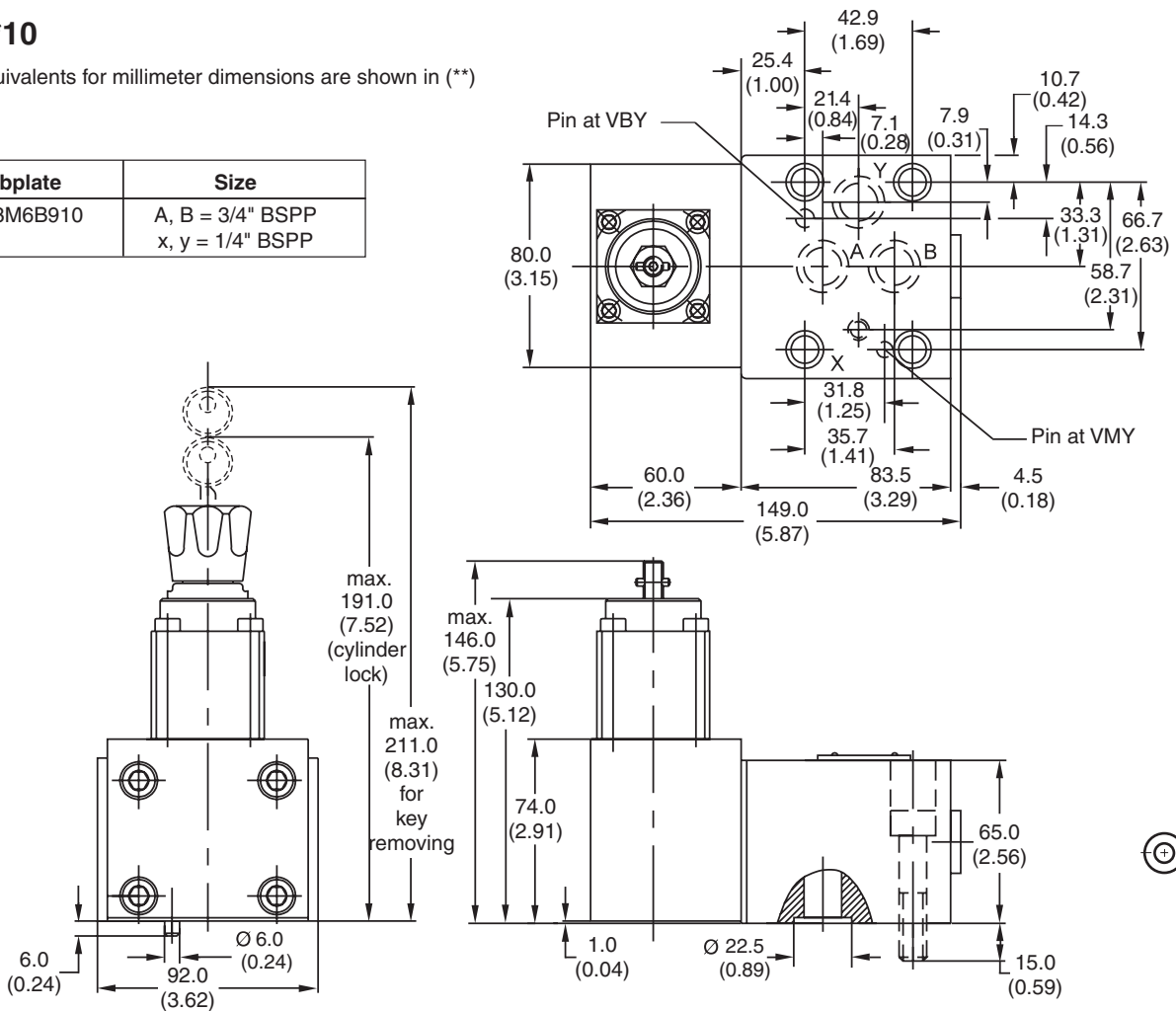





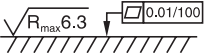


**VBY\*10**

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

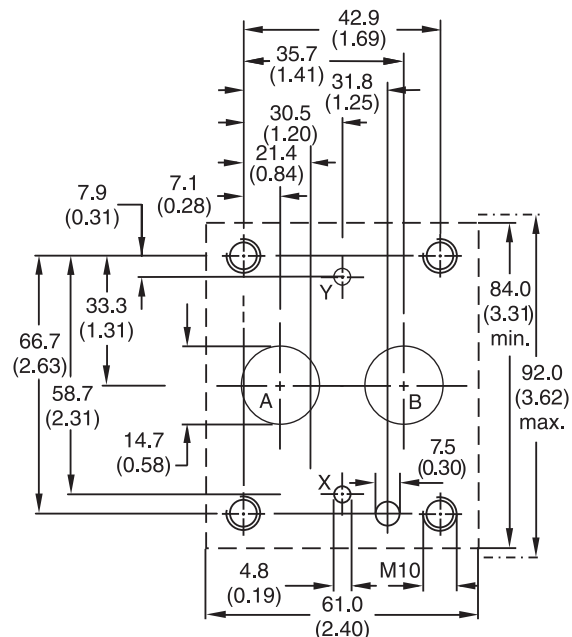
Subplate	Size
SPP3M6B910	A, B = 3/4" BSPP x, y = 1/4" BSPP



Surface Finish	Bolt Kit  DIN912 12.9		Seal  Kit
	BK389 4x M10x50	65 Nm (47.9 lb.-ft.)	Nitrile: SK-VB/VM-A10 Fluorocarbon: SK-VB/VM-A10V

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

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



**General Description**

Series R5V pilot operated pressure relief valves have a similar design to the subplate mounted R4V series. The SAE flanges allow to mount the valves directly on the outlet flanges of pumps or inlet flanges of actuators to achieve a very compact design.

Valves with SAE flanges can also be bolted together to combine functions without the need of a manifold block.

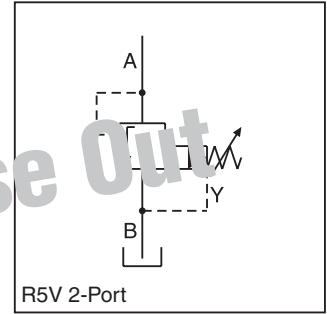
**Operation**

The system pressure in Port A is applied to the pilot valve and to the top surface of the main poppet via an orifice in X. The hydraulically balanced main poppet is held against the seat by the main spring. In this state there is no flow through the valve. The adjusted spring force acting on the pilot cone determines the relief pressure. If the pressure in Port A exceeds the set point, the pilot cone is lifted from its seat, releasing a small pilot flow to tank. The flow through the control orifice in X creates a pressure drop which limits the pressure at the top of the main poppet to the set point. The higher system pressure in Port A now lifts the main poppet off its seat and allows flow to Port B. In the resulting float position only enough flow is passed from Port A to Port B to maintain the inlet pressure in Port A at the set point. When the pressure in Port A falls below the set point, the hydraulic balance on the main poppet is restored. The main spring then forces the main poppet to close.

**D**



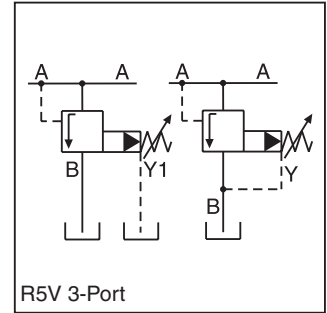
R5V 2-Port



R5V 2-Port



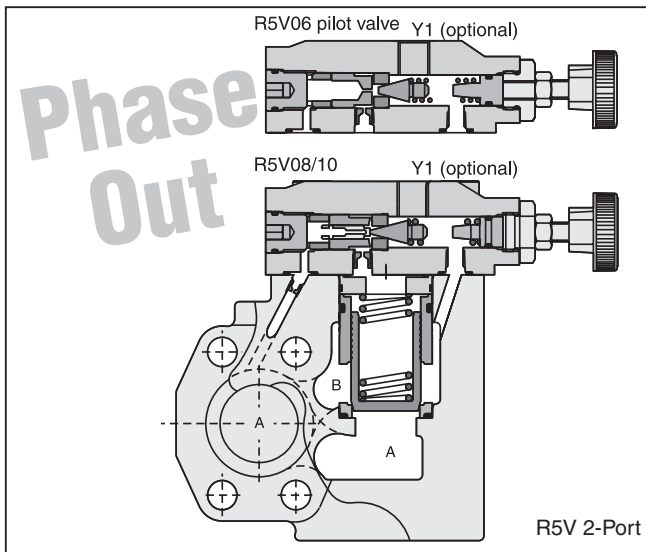
R5V 3-Port



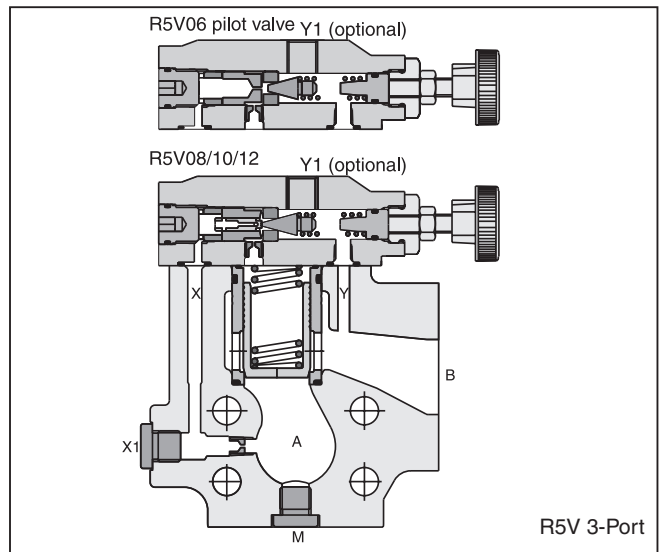
R5V 3-Port

**Features**

- Pilot operated with manual adjustment
- R5V with 2-port body: **PHASE OUT**
  - 3 sizes (SAE 3/4", 1", 1-1/4")
  - SAE 61 flange
- R5V with 3-port body:
  - 4 sizes (SAE 3/4", 1", 1-1/4", 1-1/2")
  - SAE 61 and SAE 62 flange
- 3 pressure stages
- 3 adjustment modes: Hand knob, acorn nut with lead seal, or key lock
- With optional vent function

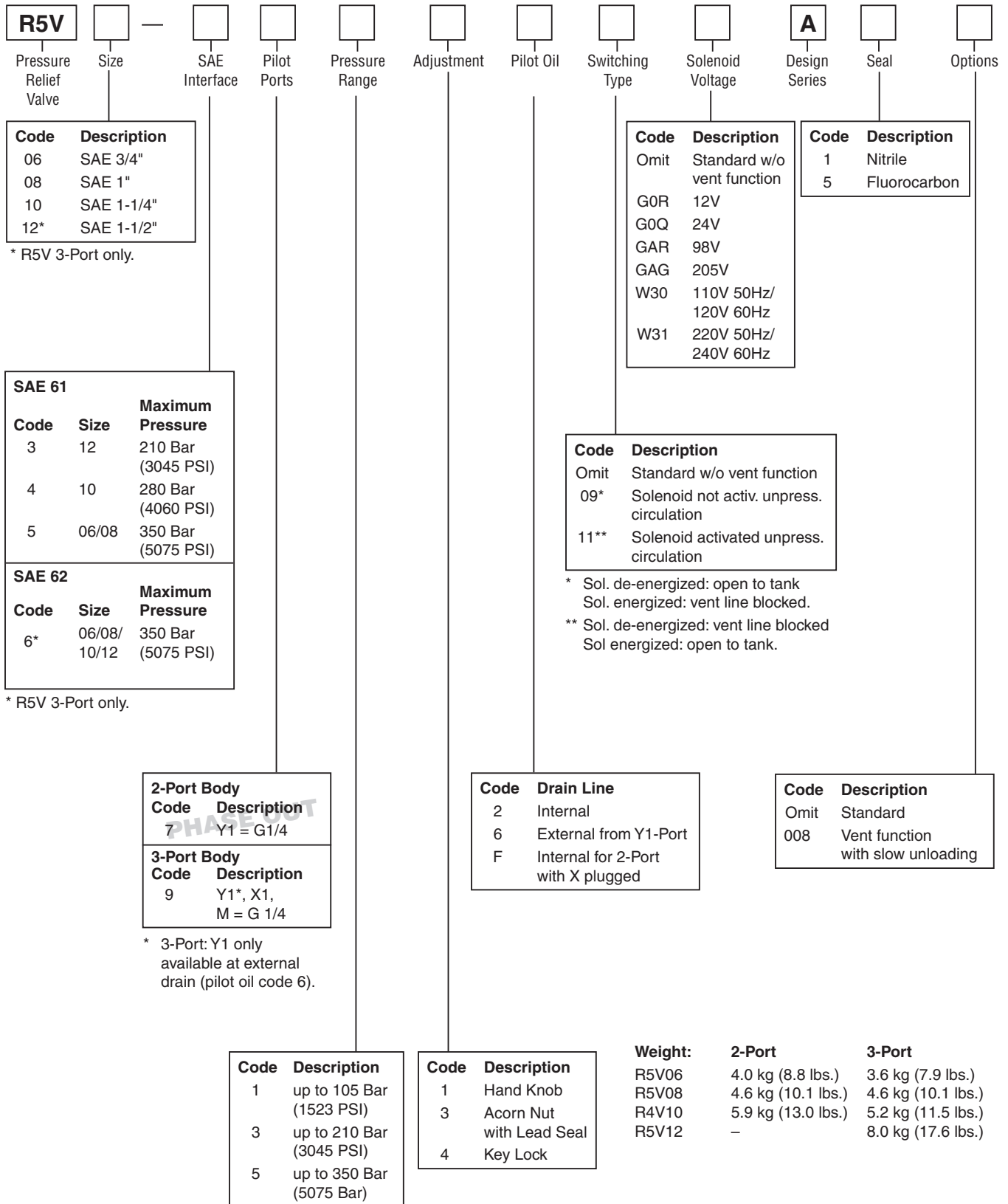


R5V 2-Port



R5V 3-Port

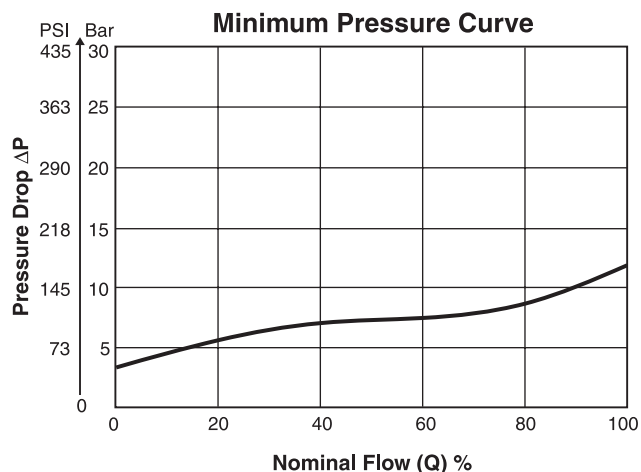
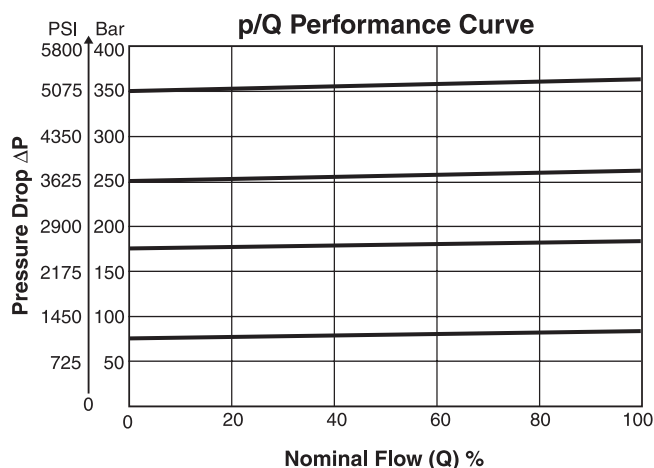
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



## Specifications

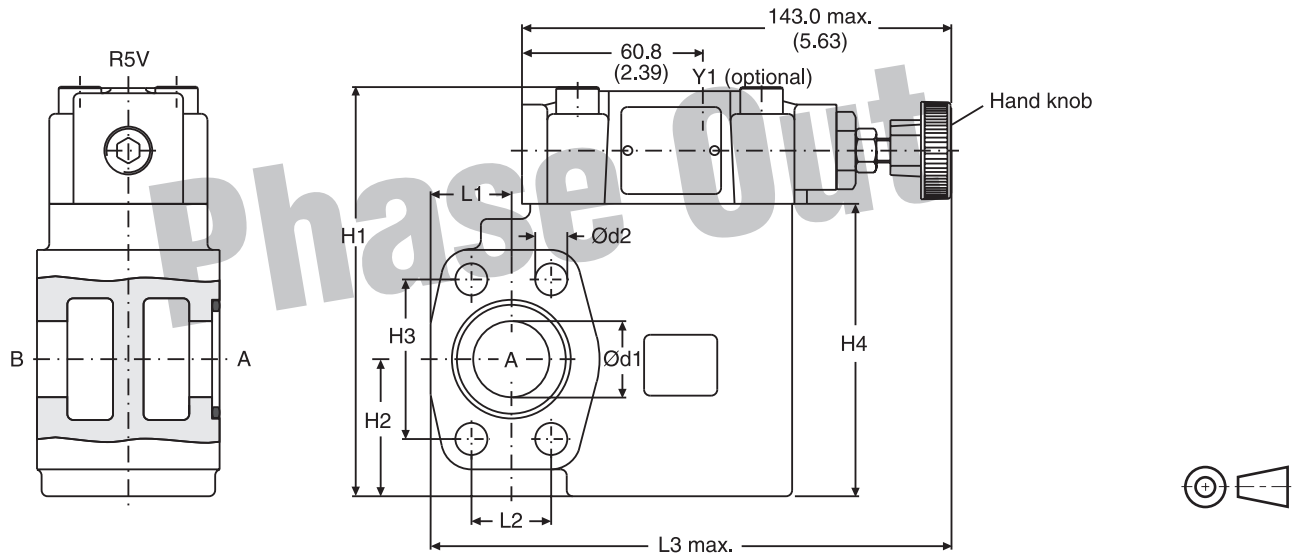
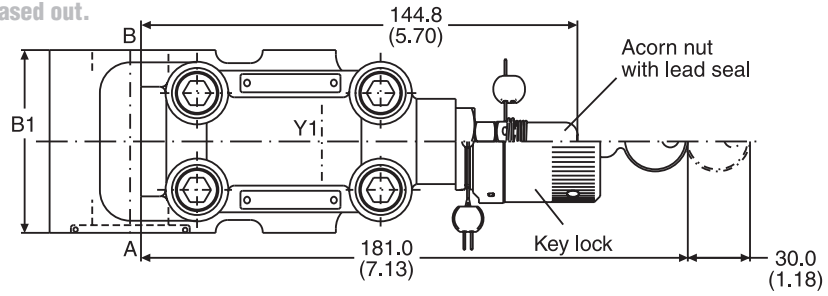
General							
<b>Size</b>		<b>06</b>	<b>08</b>	<b>10</b>	<b>12</b>		
<b>Mounting</b>	Flanged according to SAE 61 / SAE 62						
<b>Mounting Position</b>	Unrestricted						
<b>Ambient Temperature Range</b>	-20°C to +50°C (-4°F to +122°F)						
Hydraulic							
<b>Maximum Operating Pressure</b>	<b>SAE 61 Ports A, B</b>	350 Bar (5075 PSI)	350 Bar (5075 PSI)	280 Bar (4060 PSI)	210 Bar (3045 PSI)		
	<b>SAE 61 Port Y1</b>	30 Bar (435 PSI)	30 Bar (435 PSI)	30 Bar (435 PSI)	30 Bar (435 PSI)		
	<b>SAE 62 Ports A, B</b>	350 Bar (5075 PSI)	350 Bar (5075 PSI)	350 Bar (5075 PSI)	350 Bar (5075 PSI)		
	<b>SAE 62 Port Y1</b>	30 Bar (435 PSI)	30 Bar (435 PSI)	30 Bar (435 PSI)	30 Bar (435 PSI)		
<b>Pressure Ranges</b>	105 Bar (1523 PSI), 210 Bar (3045 PSI), 350 Bar (5075 PSI)						
<b>Nominal Flow</b>		90 LPM (23.8 GPM)	300 LPM (79.4 GPM)	600 LPM (158.7 GPM)	600 LPM (158.7 GPM)		
<b>Fluid</b>	Hydraulic oil as per DIN 51524 to 51525						
<b>Fluid Temperature</b>	-20°C to +80°C (-4°F to +176°F)						
<b>Viscosity</b>	<b>Permitted</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU)					
	<b>Recommended</b>	30 cSt / mm <sup>2</sup> /s (139 SSU)					
<b>Filtration</b>	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)						
Electrical (Solenoid)							
<b>Duty Ratio</b>	100%						
<b>Solenoid Connection</b>	Connector as per EN175301-803						
<b>Protection Class</b>	IP65 in accordance with EN60529 (plugged and mounted)						
	<b>Code</b>	<b>G0R</b>	<b>G0Q</b>	<b>GAR</b>	<b>GAG</b>	<b>W30</b>	<b>W31</b>
<b>Supply Voltage</b>		12V	24V	98V	205V	110V at 50Hz/ 120V at 60Hz	220V at 50Hz/ 240V at 60Hz
<b>Tolerance Supply Voltage</b>		+5 to -10	+5 to -10	+5 to -10	+5 to -10	±5	±5
<b>Power Consumption</b>	<b>Hold</b>	31W	31W	31W	31W	78W	78W
	<b>In Rush</b>	31W	31W	31W	31W	264W	264W
<b>Response Time</b>	Energized / De-energized AC 20/18ms, DC 46/27 ms						
<b>Maximum Switching Frequency</b>	AC up to 7200 switchings/hour; DC up to 16,000 switchings/hour						
<b>Coil Insulation Class</b>	H (180°C) (356°F)						

## Performance Curves



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

**2-Port** Note: 2-port bodies are being phased out.



Seal Kits		
Size	Nitrile	Fluorocarbon
06	S16-91850-0	S16-91850-5
08	S16-91851-0	S16-91851-5
10	S16-91852-0	S16-91852-5

**SAE 61**

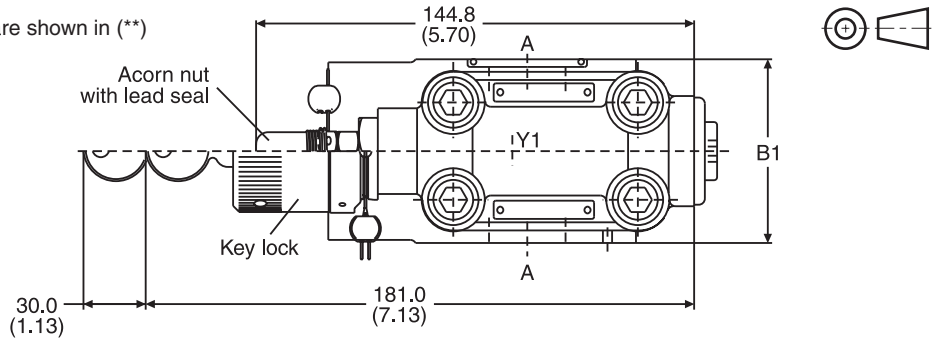
Size	B1	H1	H2	H3	H4	L1	L2	L3	d1	d2
06	60.0 (2.36)	131.6 (5.18)	37.0 (1.46)	47.6 (1.87)	90.0 (3.54)	24.6 (0.97)	22.2 (0.89)	152.0 (5.98)	19.0 (0.75)	10.5 (0.41)
08	60.0 (2.36)	137.6 (5.42)	45.0 (1.77)	52.4 (2.06)	96.0 (3.78)	26.5 (1.04)	26.2 (1.03)	171.0 (6.73)	25.0 (0.98)	10.5 (0.41)
10	75.0 (2.95)	150.6 (5.93)	48.0 (1.89)	58.7 (2.31)	109.0 (4.29)	34.0 (1.34)	30.2 (1.19)	179.0 (7.05)	32.0 (1.26)	12.5 (0.49)

Port	Function	Port Size		
		R5V06	R5V08	R5V10
A	Pressure	3/4" SAE 61	1" SAE 61	1-1/4" SAE 61
B	Tank	3/4" SAE 61	1" SAE 61	1-1/4" SAE 61
Y1	External Drain	SAE 4		

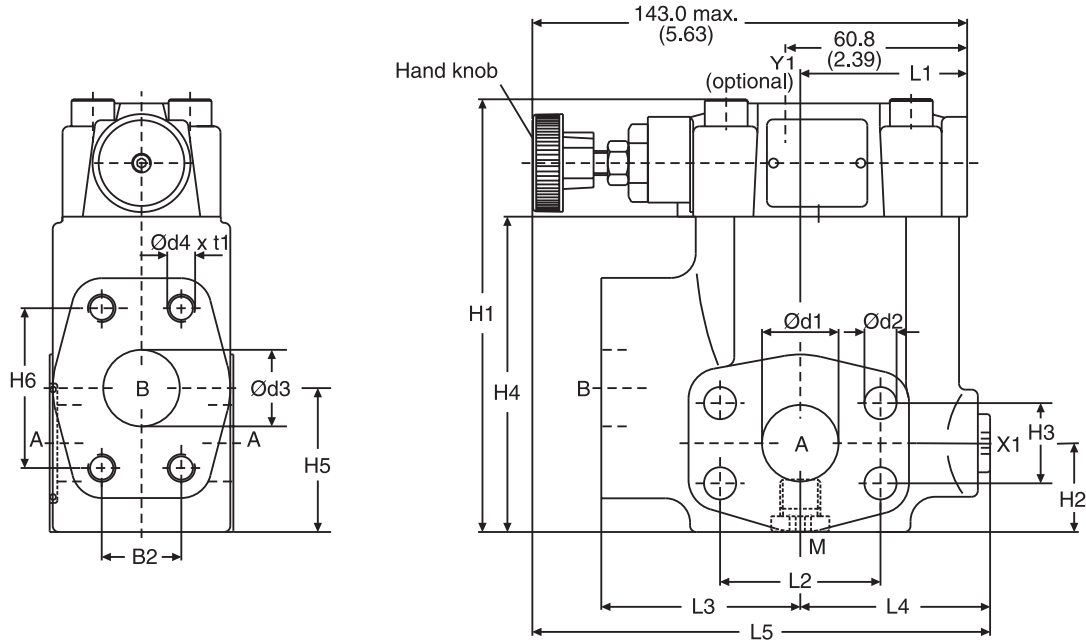
Inch equivalents for millimeter dimensions are shown in (\*\*)

**3-Port**

Seal Kits		
Size	Nitrile	Fluorocarbon
06	S16-91850-0	S16-91850-5
08	S16-91851-0	S16-91851-5
10	S16-91852-0	S16-91852-5
12	S26-27421-0	S26-27421-5



**D**



**SAE 61**

Size	B1	B2	H1	H2	H3	H4	H5	H6	L1	L2	L3	L4	L5	d1	d2	d3	t1
06	60.0 (2.36)	22.2 (0.87)	119.0 (4.69)	28.0 (1.10)	22.2 (0.87)	81.0 (3.19)	41.6 (1.64)	47.6 (1.87)	50.3 (1.98)	47.6 (1.87)	63.0 (2.48)	56.0 (2.20)	152.0 (5.98)	19.0 (0.75)	10.5 (0.41)	19.0 (0.75)	20.0 (0.79)
08	60.0 (2.36)	26.2 (1.03)	141.0 (5.55)	29.0 (1.14)	26.2 (1.03)	103.0 (4.06)	47.0 (1.85)	52.4 (2.06)	55.8 (2.20)	52.4 (2.06)	65.0 (2.56)	58.0 (2.28)	149.0 (5.87)	25.0 (0.98)	10.5 (0.41)	25.0 (0.98)	23.0 (0.91)
10	75.0 (2.95)	30.2 (1.19)	151.0 (5.94)	34.5 (1.36)	30.2 (1.19)	113.0 (4.45)	64.0 (2.52)	58.7 (2.31)	57.8 (2.28)	58.7 (2.31)	61.0 (2.40)	62.0 (2.44)	150.5 (5.93)	32.0 (1.26)	12.5 (0.49)	32.0 (1.26)	22.0 (0.87)
12	80.0 (3.15)	35.7 (1.41)	178.0 (7.01)	34.0 (1.34)	35.7 (1.41)	140.0 (5.51)	73.0 (2.87)	69.8 (2.75)	37.3 (1.47)	69.8 (2.75)	92.5 (3.64)	55.2 (2.17)	171.2 (6.74)	38.0 (1.50)	13.5 (0.53)	38.0 (1.50)	27.0 (1.06)

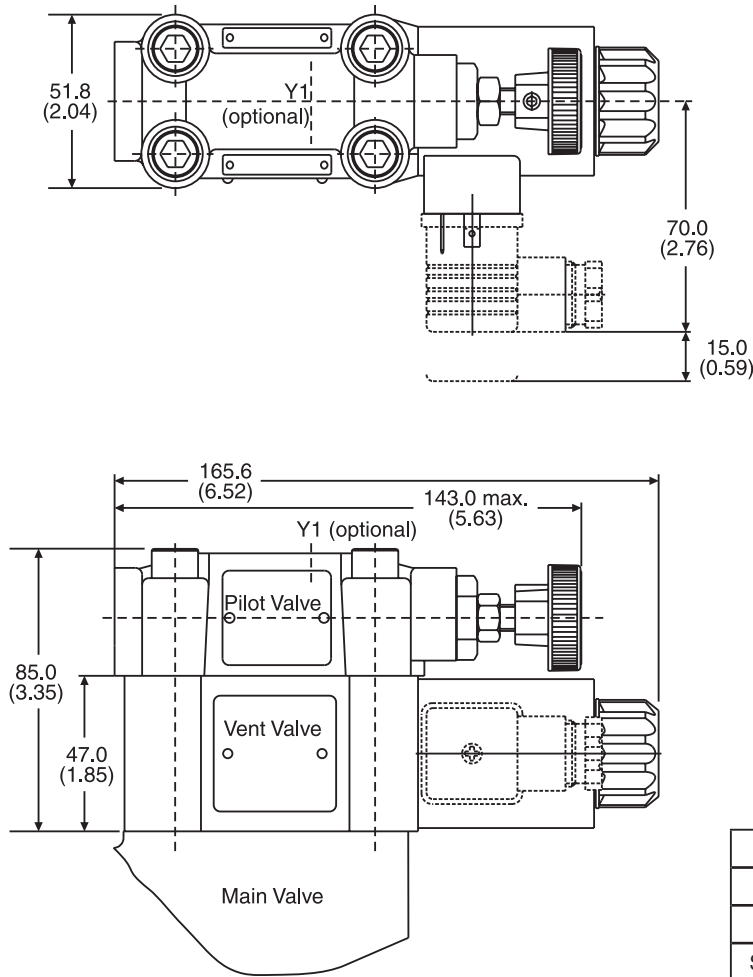
**SAE 62**

Size	B1	B2	H1	H2	H3	H4	H5	H6	L1	L2	L3	L4	L5	d1	d2	d3	t1
06	60.0 (2.36)	23.8 (0.94)	119.0 (4.69)	28.0 (1.10)	23.8 (0.94)	81.0 (3.19)	41.6 (1.64)	50.8 (2.00)	50.3 (1.98)	50.8 (2.00)	63.0 (2.48)	56.0 (2.20)	152.0 (5.98)	19.0 (0.75)	10.5 (0.41)	19.0 (0.75)	20.0 (0.79)
08	60.0 (2.36)	27.8 (1.09)	141.0 (5.55)	29.0 (1.14)	27.8 (1.09)	103.0 (4.06)	47.0 (1.85)	57.2 (2.25)	55.8 (2.20)	57.2 (2.25)	65.0 (2.56)	58.0 (2.28)	149.0 (5.87)	25.0 (0.98)	10.5 (0.41)	25.0 (0.98)	22.0 (0.87)
10	75.0 (2.95)	31.8 (1.25)	151.0 (5.94)	34.5 (1.36)	31.8 (1.25)	113.0 (4.45)	64.0 (2.52)	66.7 (2.63)	57.8 (2.28)	66.7 (2.63)	61.0 (2.40)	62.0 (2.44)	150.5 (5.93)	32.0 (1.26)	12.5 (0.49)	32.0 (1.26)	24.0 (0.94)
12	80.0 (3.15)	36.5 (1.44)	178.0 (7.01)	34.0 (1.34)	36.5 (1.44)	140.0 (5.51)	73.0 (2.87)	79.4 (3.13)	37.3 (1.47)	79.4 (3.13)	92.5 (3.64)	55.2 (2.17)	171.2 (6.74)	38.0 (1.50)	17.0 (0.67)	38.0 (1.50)	33.0 (1.30)

Port	Function	Port size			
		R5V06	R5V08	R5V10	R5V12
A (2)	Pressure	3/4" SAE 61/62	1" SAE 61/62	1-1/4" SAE 61/62	1-1/2" SAE 61/62
B	Tank	3/4" SAE 61/62	1" SAE 61/62	1-1/4" SAE 61/62	1-1/2" SAE 61/62
X1	External pilot port *	SAE 4			
Y1	External drain	SAE 4			
M	Pressure gauge	SAE 4			

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

**with Vent Function**



Vent Valve Seal Kits	
Nitrile	Fluorocarbon
<b>DC Solenoid</b>	
S26-58515-0	S26-58515-5
<b>AC Solenoid</b>	
S26-35237-0	S26-35237-5

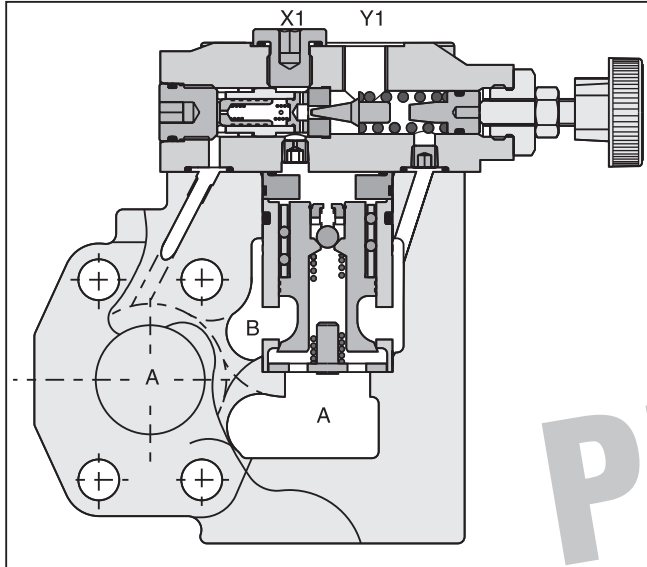
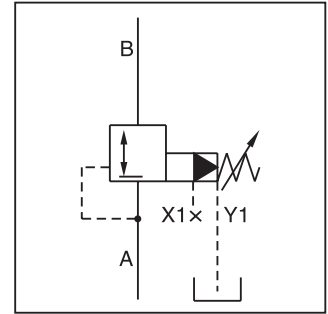
**Note: 2-port bodies are being phased out.**

Code	R5V 2-Port		R5V 3-Port	
	Internal Drain	External Drain	Internal Drain	External Drain
11				
09				

Phase Out

**General Description**

Series R5R pilot operated pressure reducing valves have a similar design as the subplate mounted R4R series. The SAE flanges allow to mount the valves directly on the inlet flanges of actuators to achieve a very compact design.



**Features**

- Pilot operated with manual adjustment
- Normally closed to avoid unintended motion
- 2-port body with SAE61 flange
- 3 sizes (SAE 3/4", 1", 1-1/4")
- 3 pressure stages
- 3 adjustment modes:
  - Hand knob
  - Acorn nut with lead seal
  - Key lock
- With optional vent function
- Flow direction B → A

**Ordering Information**

<b>R5R</b>	□	—	□	<b>2</b>	□	□	<b>6</b>	□	□	<b>A</b>	□	□
Pressure Reducing Valve	Size		SAE 61 Interface	2-Port Body X1, Y1 = SAE 4	Pressure Range	Adjustment	External Drain from Y1 Port	Switching Type	Solenoid Voltage	Design Series	Seal	Options Check with Factory

Code	Description
06	SAE 3/4"
08	SAE 1"
10	SAE 1-1/4"

Code	Size	Max. Pressure
4	10	280 Bar (4060 PSI)
5	06/08	350 Bar (5075 PSI)

Code	Description
1	Hand Knob
3	Acorn Nut with Lead Seal
4	Key Lock

Code	Description
Omit	Standard w/o vent function
G0R	12V
G0Q	24V
GAR	98V
GAG	205V
W30	110V 50Hz/ 120V 60Hz
W31	220V 50Hz/ 240V 60Hz

Code	Description
1	Nitrile
5	Fluorocarbon

Code	Description
Omit	Standard w/o vent function
09*	Solenoid not activ. unpress. circulation
11**	Solenoid activated unpress. circulation

Further options on request.

<b>Weight:</b>	
R5R06	4.0 kg (8.8 lbs.)
R5R08	4.6 kg (10.1 lbs.)
R5R10	5.9 kg (13.0 lbs.)

Code	Description
1	up to 105 Bar (1523 PSI)
3	up to 210 Bar (3045 PSI)
5	up to 350 Bar (5075 Bar)

\* Sol. de-energized: open to tank  
 Sol. energized: vent line blocked.

\*\* Sol. de-energized: vent line blocked  
 Sol energized: open to tank.

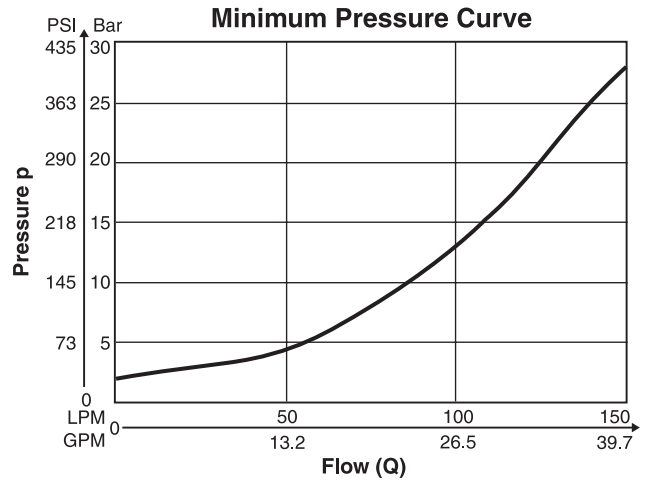
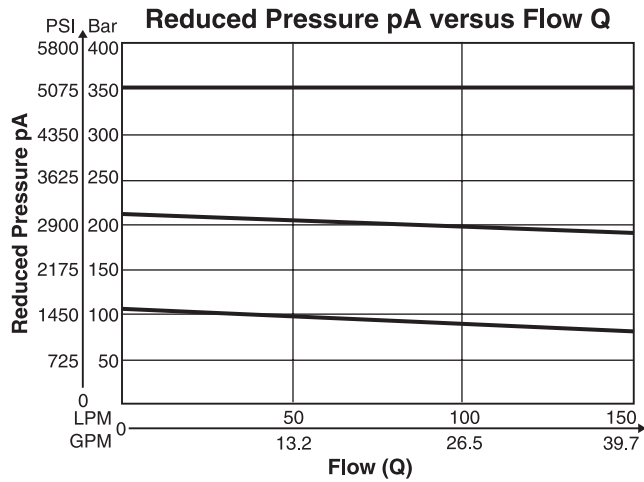
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



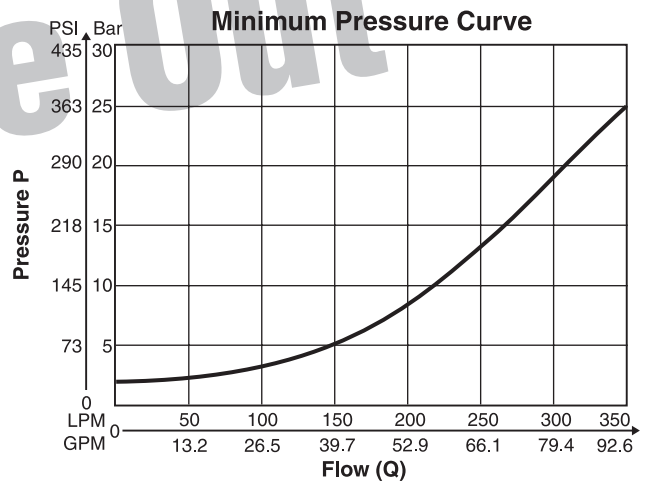
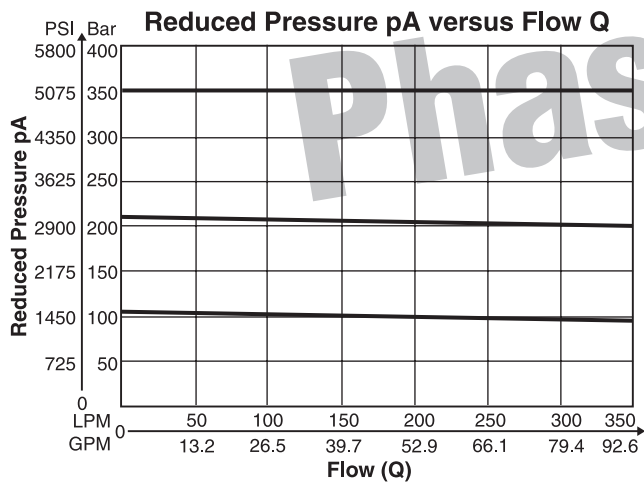
General						
Size	06		08		10	
Mounting	Flanged according to SAE 61					
Mounting Position	Unrestricted					
Ambient Temperature Range	-20°C to +50°C (-4°F to +122°F)					
Hydraulic						
Max. Operating Pressure	Ports A,B, X1	350 Bar (5075 PSI)		350 Bar (5075 PSI)		280 Bar (4060 PSI)
	Port Y1	30 Bar (435 PSI)		30 Bar (435 PSI)		30 Bar (435 PSI)
Pressure Ranges	105 Bar (1523 PSI), 210 Bar (3045 PSI), 350 Bar (5075 PSI)					
Nominal Flow	90 LPM (23.8 GPM)		300 LPM (79.4 GPM)		500 LPM (132.3 GPM)	
Fluid	Hydraulic oil as per DIN 51524 ... 51525					
Fluid Temperature	-20°C to +80°C (-4°F to +176°F)					
Viscosity Permitted Recommended	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU) 30 cSt / mm <sup>2</sup> /s (139 SSU)					
Filtration	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)					
Electrical (Solenoid)						
Duty Ratio	100%					
Solenoid Connection	Connector as per EN175301-803					
Protection Class	IP65 in accordance with EN60529 (plugged and mounted)					
Code	G0R	G0Q	GAR	GAG	W30	W31
Supply Voltage	12V	24V	98V	205V	110V at 50Hz 120V at 60Hz	2200V at 50Hz 240V at 60Hz
Tolerance Supply Voltage	+5 to -10	+5 to -10	+5 to -10	+5 to -10	±5	±5
Power Consumption	Hold	31W	31W	31W	31W	78W
	In Rush	31W	31W	31W	31W	264W
Response Time	Energized / De-energized AC 20/18ms, DC 46/27 ms					
Max. Switching Frequency	AC up to 7200, DC 70 to 16,000 switchings/hour					
Coil Insulation Class	H (180°C) (356°F)					

D

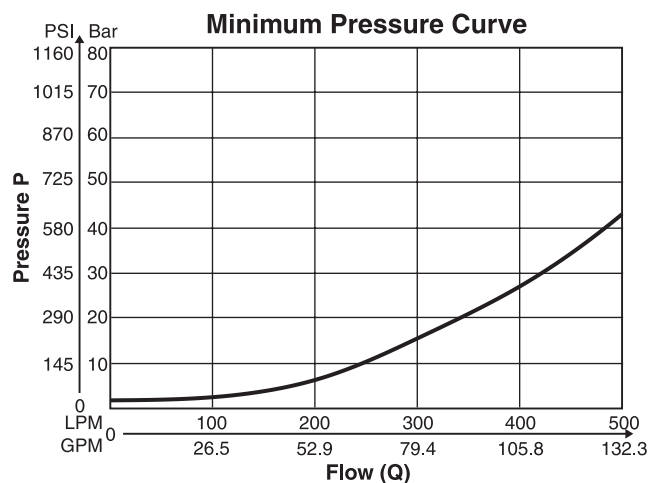
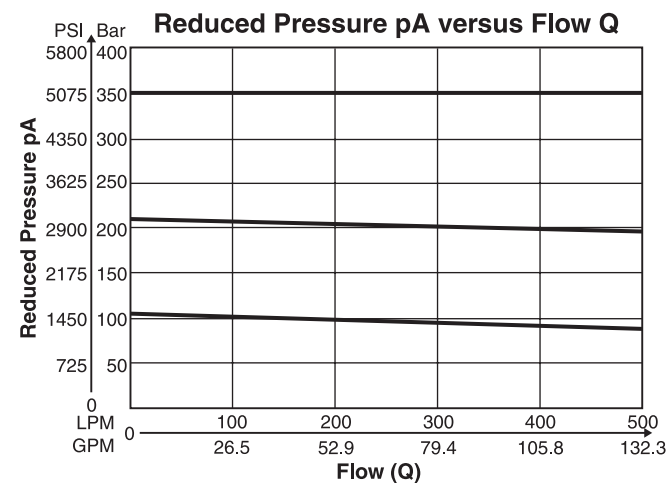
**R5R06\***



**R5R08\***



**R5R10\***

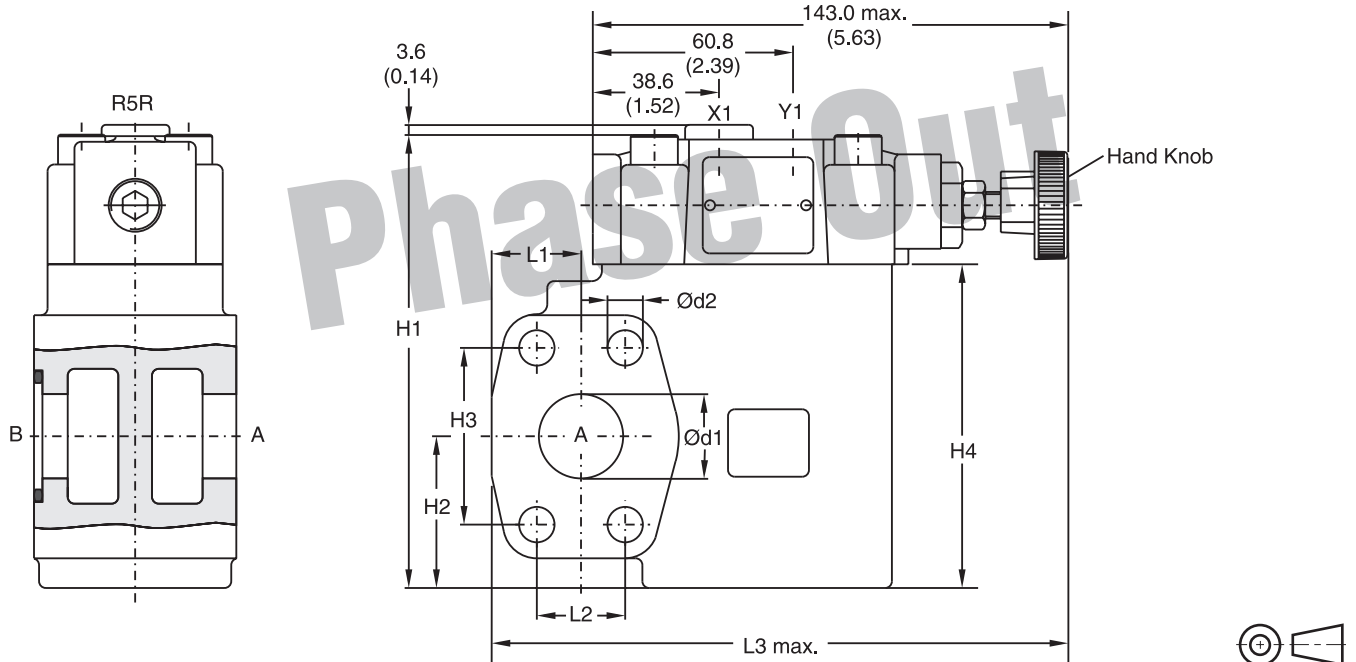
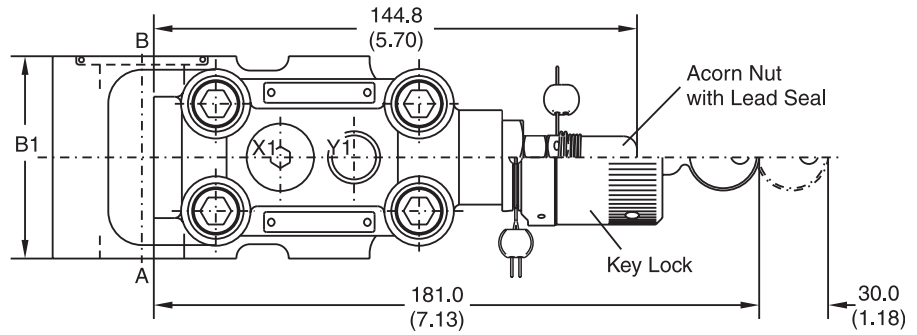


\*Measured at 350 Bar (5075 PSI) primary pressure pB.

**D**

Phase Out

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



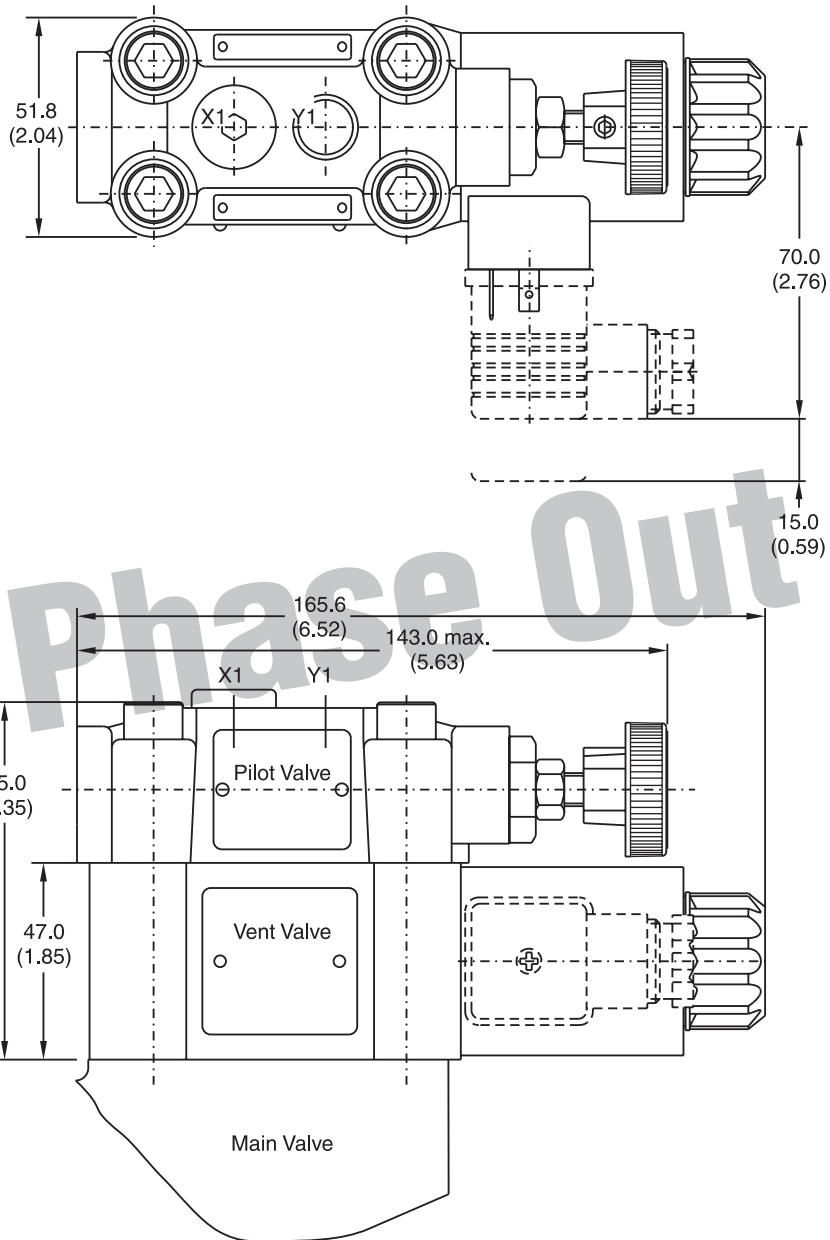
Seal Kits		
Size	Nitrile	Fluorocarbon
06	S16-91850-0	S16-91850-5
08	S16-91851-0	S16-91851-5
10	S16-91852-0	S16-91852-5

Size	B1	H1	H2	H3	H4	L1	L2	L3	d1	d2
06	60.0 (2.36)	131.6 (5.18)	37.0 (1.46)	47.6 (1.87)	90.0 (3.54)	24.6 (0.97)	22.2 (0.87)	152.0 (5.98)	19.0 (0.75)	10.5 (0.41)
08	60.0 (2.36)	137.6 (5.42)	45.0 (1.77)	52.4 (2.06)	96.0 (3.78)	26.5 (1.04)	26.2 (1.03)	171.0 (6.73)	25.0 (0.98)	10.5 (0.41)
10	75.0 (2.95)	150.6 (5.93)	48.0 (1.89)	58.7 (2.31)	109.0 (4.29)	34.0 (1.34)	30.2 (1.19)	179.0 (7.05)	32.0 (1.26)	12.5 (0.49)

Port	Function	Port Size		
		R5R06	R5R08	R5R10
B	Inlet Pressure	3/4" SAE 61	1" SAE 61	1-1/4" SAE 61
A	Reduced Outlet Pressure	3/4" SAE 61	1" SAE 61	1-1/4" SAE 61
Y1	External Drain	SAE 4		
X1	Pressure Gauge	SAE 4		

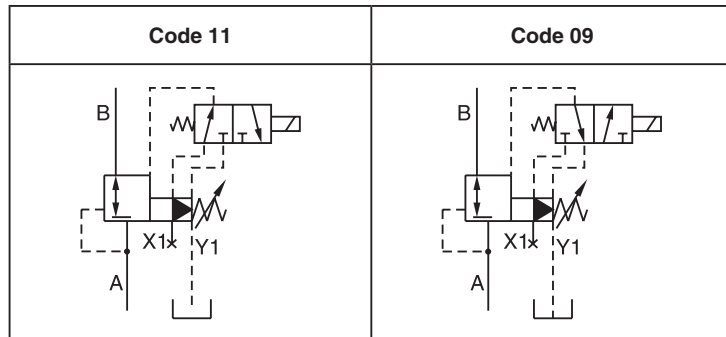
**Dimensions**

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



**D**

**External Drain**



Vent Valve Seal Kits	
Nitrile	Fluorocarbon
<b>DC Solenoid</b>	
S26-58515-0	S26-58515-5
<b>AC Solenoid</b>	
S26-35237-0	S26-35237-5

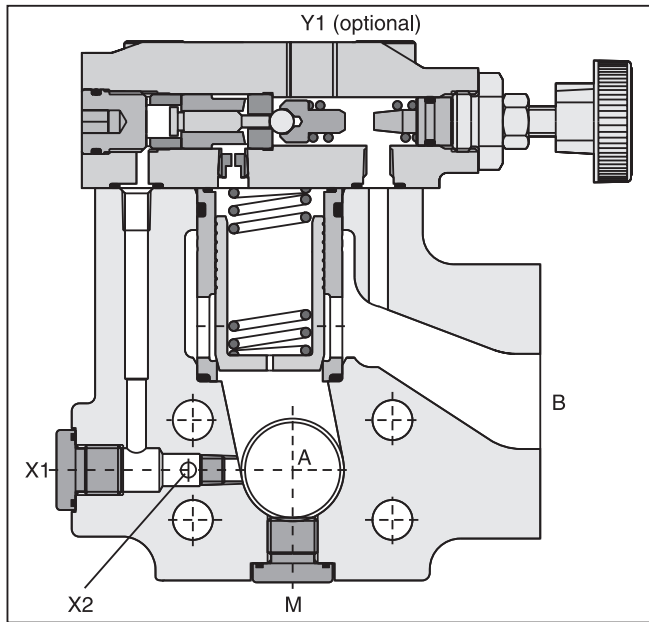
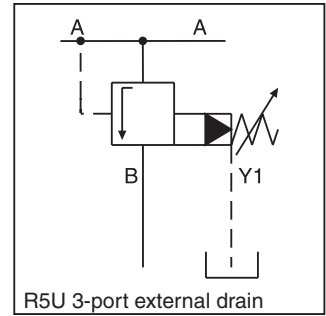
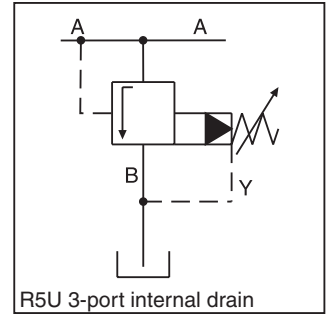
**General Description**

Series R5U pilot operated, pressure unloading valves have a similar design to the subplate mounted R4U series. The SAE flanges allow to mount the valve directly on the outlet flanges of pumps.

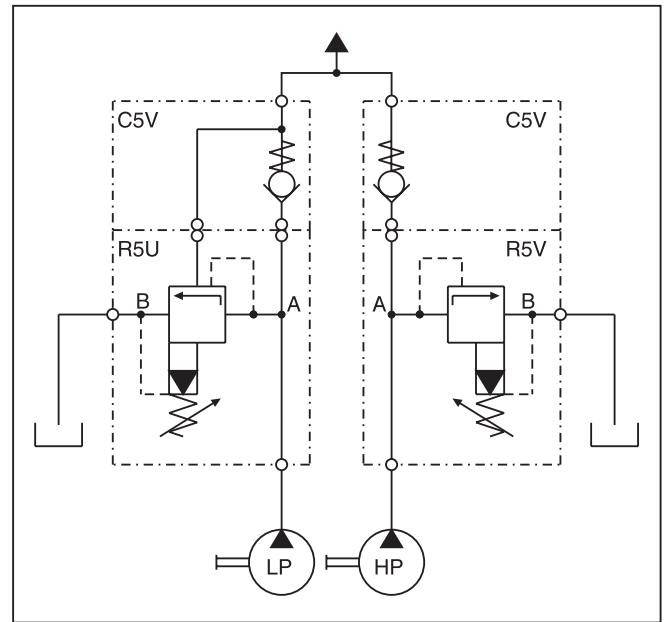
A typical application is the unloading of a pump in an accumulator circuit. The combination of an R5U, C5V and R5V on a double pump generates a high pressure / low pressure pump system without the need of a manifold block or piping between the valves.

**Features**

- Pilot operated unloading valve
- 3-port body with SAE 61 flange
- 4 sizes (SAE 3/4", 1", 1 1/4", 1 1/2")
- 3 pressure stages
- 3 adjustment modes:
  - Hand knob
  - Acorn nut with lead seal
  - Key lock
- With optional vent function

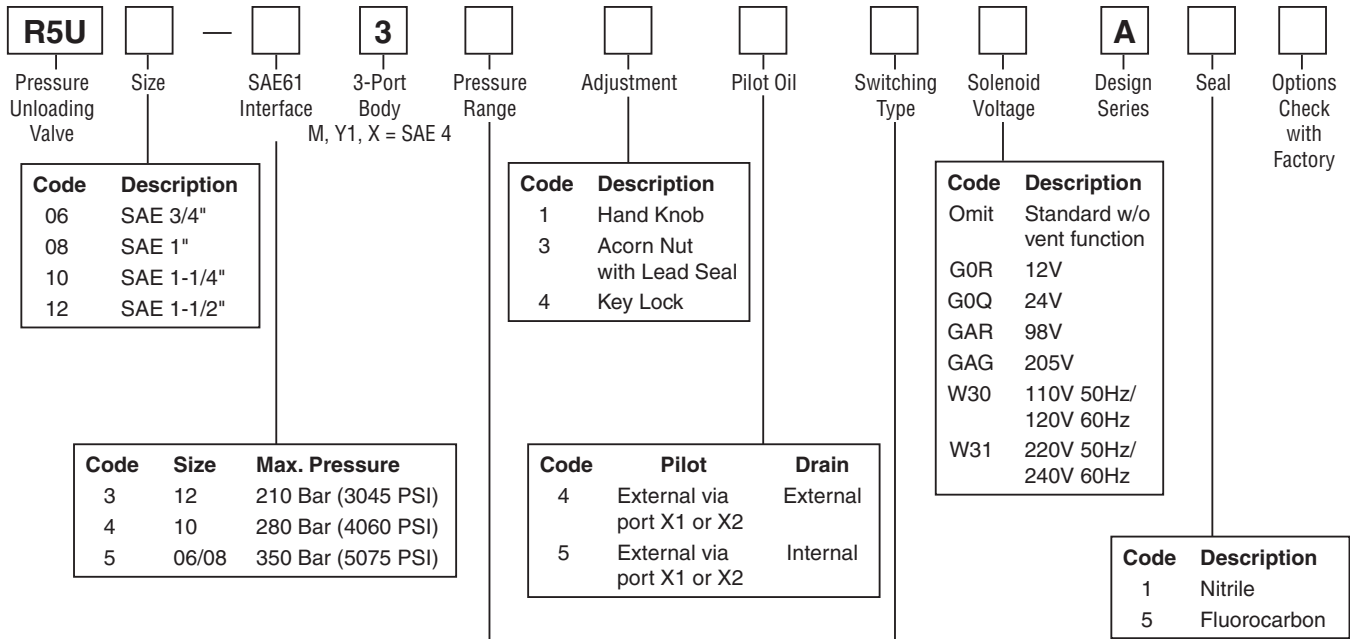


**High Pressure / Low Pressure System**



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Ordering Information**



**D**

**Weight:**

R5U06	3.6 kg (7.9 lbs.)
R5U08	4.6 kg (10.1 lbs.)
R5U10	5.2 kg (11.5 lbs.)
R5U12	8.0 kg (17.6 lbs.)

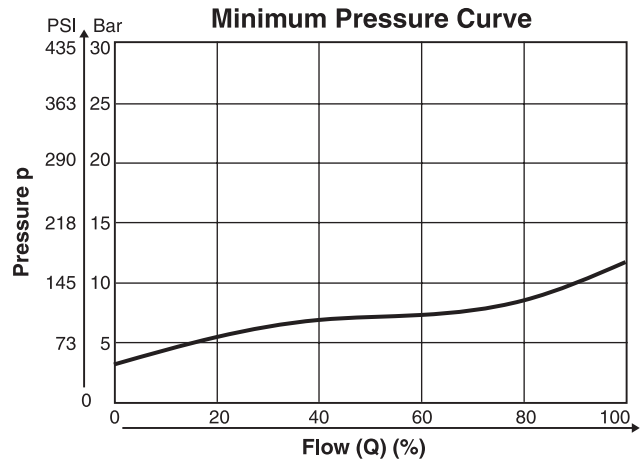
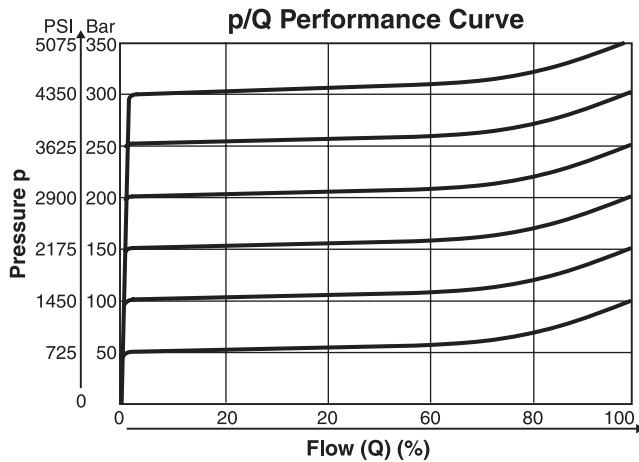
Code	Pressure Stage	Pressure Differential
1	up to 105 Bar (1523 PSI)	28%
3	up to 210 Bar (3045 PSI)	28%
5	up to 350 Bar (5075 Bar)	15%

Code	Description
Omit	Standard w/o vent function
09*	Solenoid not activ. unpress. circulation
11**	Solenoid activated unpress. circulation

\* Sol. de-energized: open to tank  
 Sol. energized: vent line blocked.  
 \*\* Sol. de-energized: vent line blocked  
 Sol energized: open to tank.

Further options on request.

**Performance Curves**



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

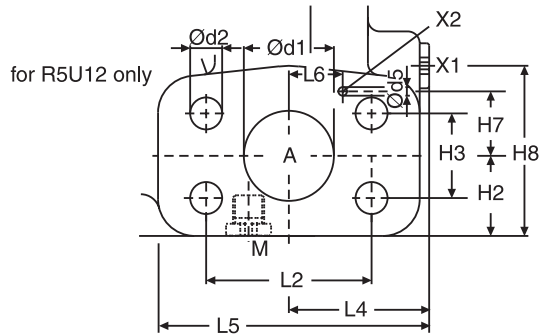
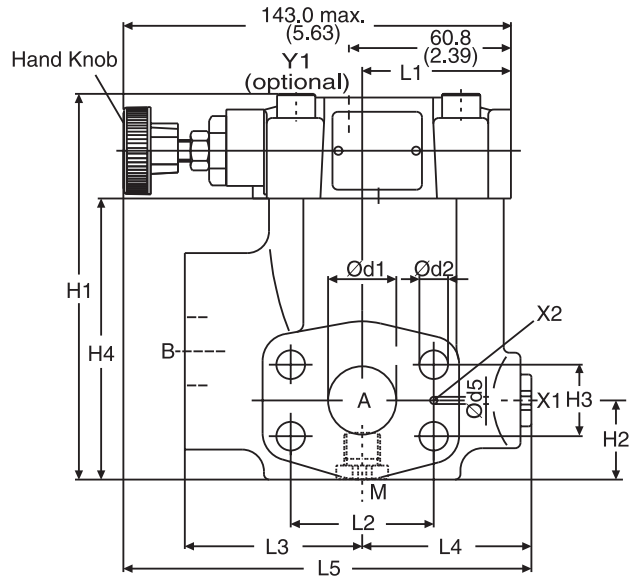
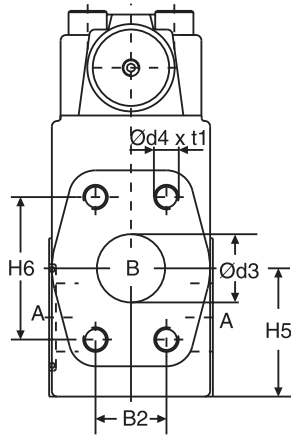
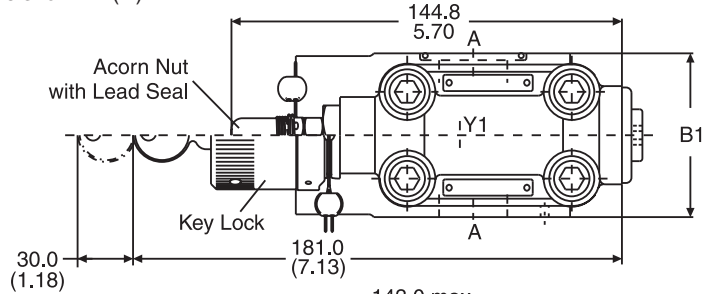
General						
<b>Size</b>		<b>06</b>	<b>08</b>	<b>10</b>	<b>12</b>	
<b>Mounting</b>	Flanged according to SAE 61					
<b>Mounting Position</b>	Unrestricted					
<b>Ambient Temperature</b>	-20°C to +50°C (-4°F to +122°F)					
Hydraulic						
<b>Maximum Operating Pressure</b>	<b>Ports A,B, X</b>	350 Bar (5075 PSI)	350 Bar (5075 PSI)	280 Bar (4060 PSI)	210 Bar (3045 PSI)	
	<b>Ports Y, Y1</b>	30 Bar (435 PSI)	30 Bar (435 PSI)	30 Bar (435 PSI)	30 Bar (435 PSI)	
<b>Pressure Ranges</b>	105 Bar (1523 PSI), 210 Bar (3045 PSI), 350 Bar (5075 PSI)					
<b>Nominal Flow</b>		90 LPM (23.8 GPM)	300 LPM (79.4 GPM)	600 LPM (158.7 GPM)	600 LPM (158.7 GPM)	
<b>Fluid</b>	Hydraulic oil as per DIN 51524 ... 51525					
<b>Fluid Temperature</b>	-20°C to +80°C (-4°F to +176°F)					
<b>Viscosity Permitted Recommended</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU) 30 cSt / mm <sup>2</sup> /s (139 SSU)					
<b>Filtration</b>	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)					
Electrical						
<b>Duty Ratio</b>	100%					
<b>Solenoid Connection</b>	Connector as per EN175301-803					
<b>Protection Class</b>	IP65 in accordance with EN60529 (plugged and mounted)					
<b>Code</b>		<b>G0R</b>	<b>G0Q</b>	<b>GAR</b>	<b>GAG</b>	<b>W30</b> <b>W31</b>
<b>Supply Voltage</b>		12V	24V	98V	205V	110V at 50Hz 120V at 60Hz    220V at 50Hz 240V at 60Hz
<b>Tolerance Supply Voltage</b>		+5 to -10	+5 to -10	+5 to -10	+5 to -10	±5    ±5
<b>Power Consumption</b>	<b>Hold</b>	31W	31W	31W	31W	78W    78W
<b>In Rush</b>		31W	31W	31W	31W	264W    264W
<b>Response Time</b>	Energized / De-energized AC 20/18ms, DC 46/27 ms					
<b>Maximum Switching Frequency</b>	AC up to 7200 switchings/hour DC up to 16,000 switchings/hour					
<b>Coil Insulation Class</b>	H (180°C) (356°F)					

D

**Dimensions**

**Unloading Valves  
Series R5U**

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



Seal Kits		
Size	Nitrile	Fluorocarbon
06	S16-91850-0	S16-91850-5
08	S16-91851-0	S16-91851-5
10	S16-91852-0	S16-91852-5
12	S26-27421-0	S26-27421-5

Size	B1	B2	H1	H2	H3	H4	H5	H6	L1	L2	L3	L4	L5	d1	d2	d3	d4	t1	d5	L6	H7	H8
06	60.0 (2.36)	22.2 (0.87)	119.0 (4.69)	28.0 (1.10)	22.2 (0.87)	81.0 (3.19)	41.6 (1.64)	47.6 (1.87)	50.0 (1.98)	47.6 (1.87)	63.0 (2.48)	56.0 (2.20)	152.0 (5.98)	19.0 (0.75)	10.5 (0.41)	19.0 (0.75)	3/8"-16 UNC	20.0 (0.79)	3.0 (0.12)	-	-	-
08	60.0 (2.36)	26.2 (1.03)	141.0 (5.55)	29.0 (1.14)	26.2 (1.03)	103.0 (4.06)	47.0 (1.85)	52.4 (2.06)	55.8 (2.20)	52.4 (2.06)	65.0 (2.56)	58.0 (2.28)	149.0 (5.87)	25.0 (0.98)	10.5 (0.41)	25.0 (0.98)	3/8"-16 UNC	23.0 (0.91)	3.0 (0.12)	-	-	-
10	75.0 (2.95)	30.2 (1.19)	151.0 (5.94)	34.5 (1.36)	30.2 (1.19)	113.0 (4.45)	64.0 (2.52)	58.7 (2.31)	57.8 (2.28)	58.7 (2.31)	61.0 (2.40)	62.0 (2.44)	150.5 (5.93)	32.0 (1.26)	12.5 (0.49)	32.0 (1.26)	7/16"-14 UNC	22.0 (0.87)	3.0 (0.12)	-	-	-
12	80.0 (3.15)	35.7 (1.41)	178.0 (7.01)	34.0 (1.34)	35.7 (1.41)	140.0 (5.51)	73.0 (2.87)	69.8 (2.75)	37.3 (1.47)	69.8 (2.75)	92.5 (3.64)	55.2 (2.17)	171.2 (6.74)	38.0 (1.50)	13.5 (0.53)	38.0 (1.50)	1/2"-13 UNC	27.0 (1.06)	3.0 (0.12)	22.4 (0.88)	27.2 (1.07)	73.0 (2.87)

Port	Function	Port Size			
		R5U06	R5U08	R5U10	R5U12
A (2)	Pressure	3/4" SAE 61	1" SAE 61	1-1/4" SAE 61	1-1/2" SAE 61
B	Tank	3/4" SAE 61	1" SAE 61	1-1/4" SAE 61	1-1/2" SAE 61
X1	External Pilot Port*	SAE 4			
Y1	External Drain	SAE 4			
M	Pressure Gauge	SAE 4			

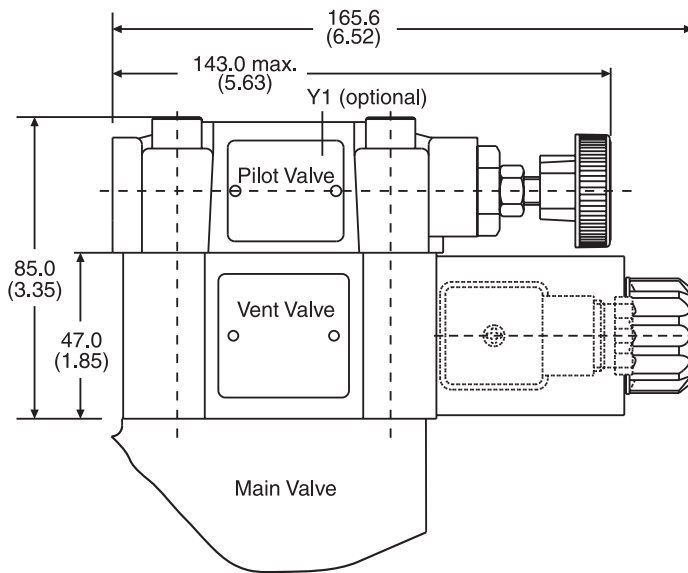
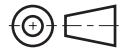
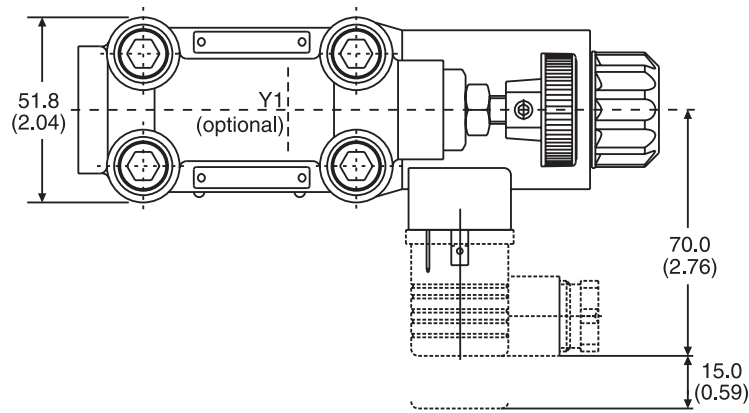
\* closed when supplied.



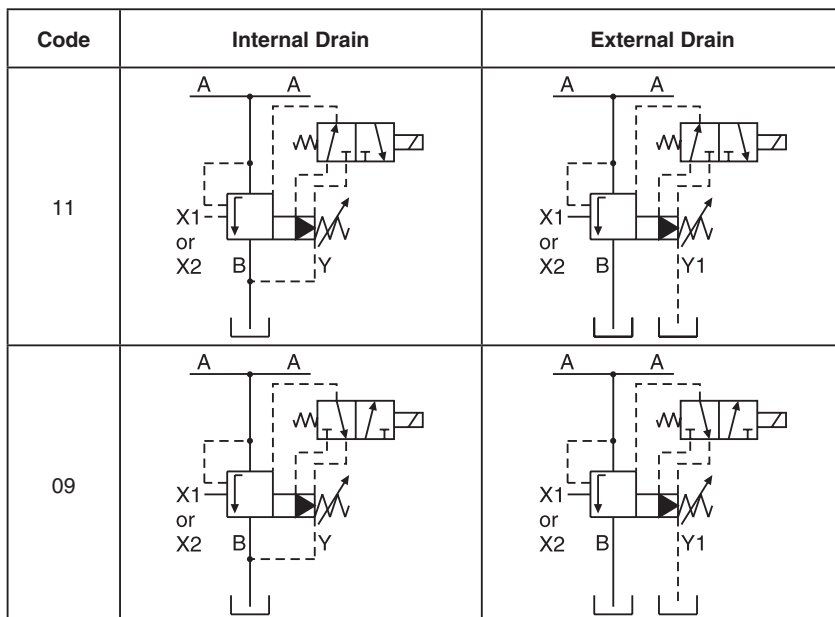


**Dimensions**

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



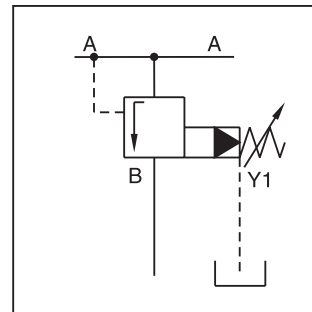
**D**



Vent Valve Seal Kits	
Nitrile	Fluorocarbon
<b>DC Solenoid</b>	
S26-58515-0	S26-58515-5
<b>AC Solenoid</b>	
S26-35237-0	S26-35237-5

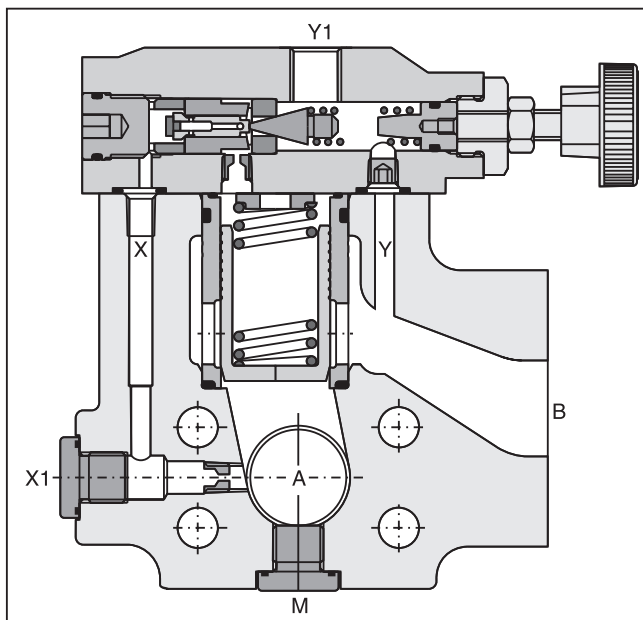
### General Description

Series R5S pilot operated sequence valves have a similar design to the subplate mounted R4S series. The SAE flanges allow to mount the valve directly on the inlet flanges of actuators or outlet flanges of pumps to achieve a very compact design.



### Features

- Pilot operated with manual adjustment
- 3-port body with SAE61 flange
- 3 sizes (SAE 3/4", 1", 1-1/4")
- 3 pressure stages:
- 2 adjustment modes:
  - Hand knob
  - Acorn nut with lead seal



### Ordering Information

<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;"><b>R5S</b></div> <p>Pressure Sequence Valve</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Size</p>	<p>—</p> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>SAE 61 Interface</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;"><b>3</b></div> <p>3-Port Body Y1, M = SAE 4</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; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Adjustment</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;"><b>6</b></div> <p>External Drain from Y1 Port</p>	<div style="border: 1px solid black; padding: 2px; width: 40px; margin: 0 auto;"><b>A</b></div> <p>Design Series</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Seal</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Options Check with Factory</p>																									
			<table border="0" style="width: 100%;"> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> <tr> <td>06</td> <td>SAE 3/4"</td> </tr> <tr> <td>08</td> <td>SAE 1"</td> </tr> <tr> <td>10</td> <td>SAE 1-1/4"</td> </tr> </table>	Code	Description	06	SAE 3/4"	08	SAE 1"	10	SAE 1-1/4"				<table border="0" style="width: 100%;"> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> <tr> <td>1</td> <td>up to 105 Bar (1523 PSI)</td> </tr> <tr> <td>3</td> <td>up to 210 Bar (3045 PSI)</td> </tr> <tr> <td>5</td> <td>up to 350 Bar (5075 Bar)</td> </tr> </table>	Code	Description	1	up to 105 Bar (1523 PSI)	3	up to 210 Bar (3045 PSI)	5	up to 350 Bar (5075 Bar)				<table border="0" style="width: 100%;"> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> <tr> <td>1</td> <td>Nitrile</td> </tr> <tr> <td>5</td> <td>Fluorocarbon</td> </tr> </table>	Code	Description	1	Nitrile	5	Fluorocarbon	
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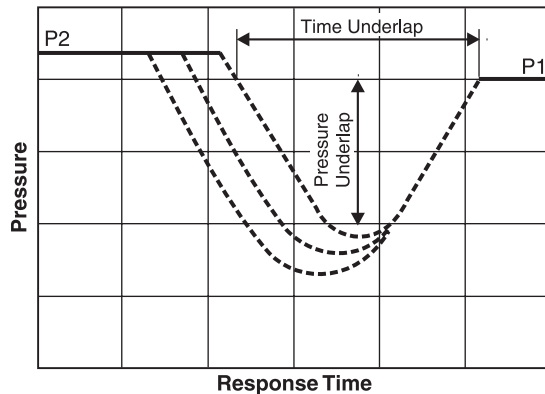
**Specifications**

General				
<b>Size</b>		<b>06</b>	<b>08</b>	<b>10</b>
<b>Mounting</b>	Flanged according to SAE 61			
<b>Mounting Position</b>	Unrestricted			
<b>Ambient Temperature Range</b>	-20°C to +50°C (-4°F to +122°F)			
Hydraulic				
<b>Max. Operating Pressure</b>	<b>Ports A,B</b>	350 Bar (5075 PSI)	350 Bar (5075 PSI)	280 Bar (4060 PSI)
	<b>Ports Y,Y1</b>	30 Bar (435 PSI)	30 Bar (435 PSI)	30 Bar (435 PSI)
<b>Pressure Ranges</b>	105 Bar (1523 PSI), 210 Bar (3045 PSI), 350 Bar (5075 PSI)			
<b>Nominal Flow</b>		90 LPM (23.3 GPM)	300 LPM (79.4 GPM)	600 LPM (158.7 GPM)
<b>Fluid</b>	Hydraulic oil as per DIN 51524 ... 51525			
<b>Fluid Temperature</b>	-20°C to 80°C (-4°F to 176°F)			
<b>Viscosity</b>	<b>Permitted</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU)		
	<b>Recommended</b>	30 cSt / mm <sup>2</sup> /s (139 SSU)		
<b>Filtration</b>	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			

**D**

**Performance Curve**

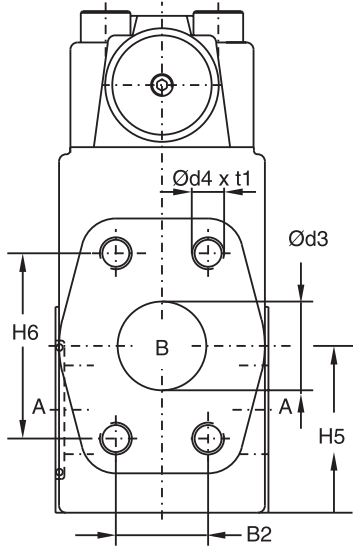
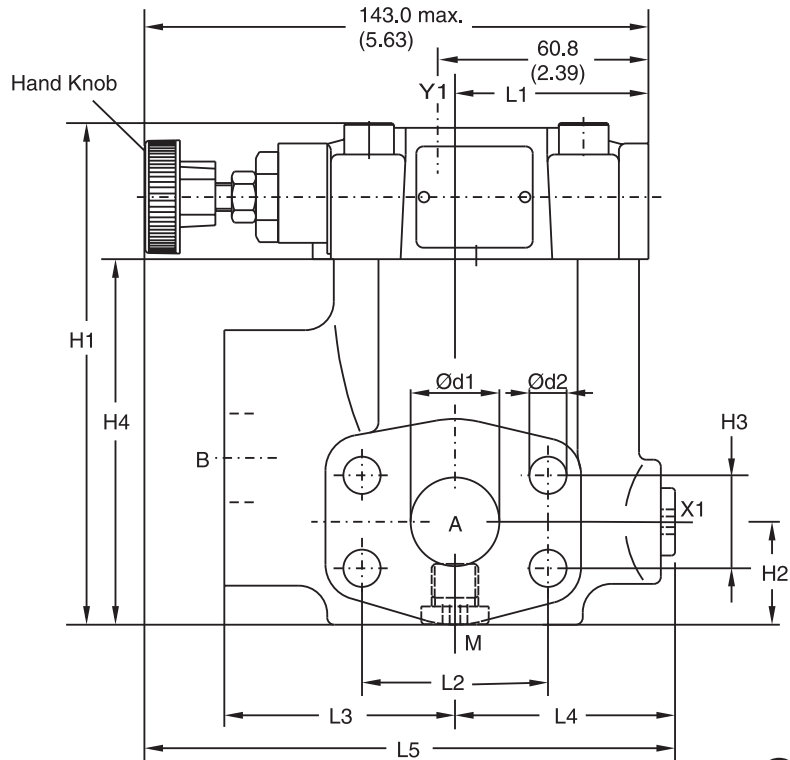
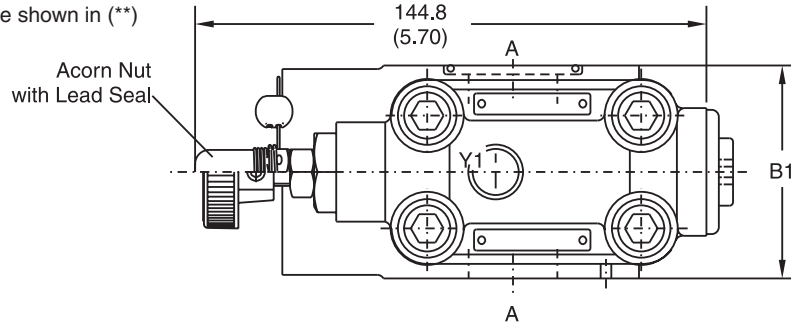
**Typical Pressure Characteristics at Closing Point**



P1 = Setting Pressure  
P2 = Operating Pressure

Time and pressure underlap depend on the characteristics of the specific system.

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



Seal Kits		
Size	Nitrile	Fluorocarbon
06	S16-91850-0	S16-91850-5
08	S16-91851-0	S16-91851-5
10	S16-91852-0	S16-91852-5

**SAE 61**

Size	B1	B2	H1	H2	H3	H4	H5	H6	L1	L2	L3	L4	L5	d1	d2	d3	d4 (option 152)	t1
06	60.0 (2.36)	22.2 (0.87)	119.0 (4.69)	28.0 (1.10)	22.2 (0.87)	81.0 (3.19)	41.6 (1.64)	47.6 (1.87)	50.3 (1.98)	47.6 (1.87)	63.0 (2.48)	56.0 (2.20)	152.0 (5.98)	19.0 (0.75)	10.5 (0.41)	19.0 (0.75)	3/8"-16 UNC (M10)	20.0 (0.79)
08	60.0 (2.36)	26.2 (1.03)	141.0 (5.55)	29.0 (1.14)	26.2 (1.03)	103.0 (4.06)	47.0 (1.85)	52.4 (2.06)	55.8 (2.20)	52.4 (2.06)	65.0 (2.56)	58.0 (2.28)	149.0 (5.87)	25.0 (0.93)	10.5 (0.41)	25.0 (0.98)	3/8"-16 UNC (M10)	23.0 (0.91)
10	75.0 (2.95)	30.2 (1.19)	151.0 (5.94)	34.5 (1.36)	30.2 (1.19)	113.0 (4.45)	64.0 (1.52)	58.7 (2.31)	57.8 (2.28)	58.7 (2.31)	61.0 (2.40)	62.0 (2.44)	150.5 (5.93)	32.0 (1.26)	12.5 (0.49)	32.0 (1.26)	7/16"-14 UNC (M12)	22.0 (0.87)

Port	Function	Port Size		
		R5S06	R5S08	R5S10
A (2)	Pressure	3/4" SAE 61	1" SAE 61	1-1/4" SAE 61
B	Secondary Port	3/4" SAE 61	1" SAE 61	1-1/4" SAE 61
X1	External Pilot Port*	SAE 4		
Y1	External Drain	SAE 4		
M	Pressure Gauge	SAE 4		

\* closed when supplied.

## General Description

Series R4V pilot operated, pressure relief valves for in-line mounting have a similar design to the subplate mounted R4V series. For single functions where no manifold blocks are used, the valves can be directly placed in the pipework.

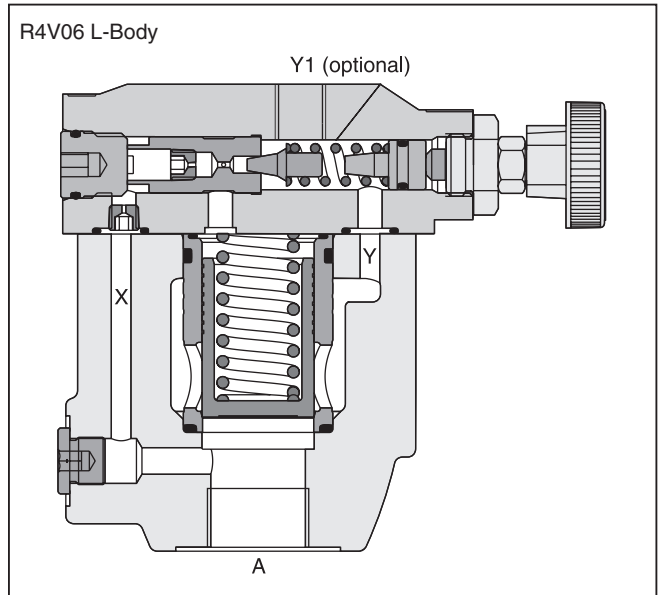
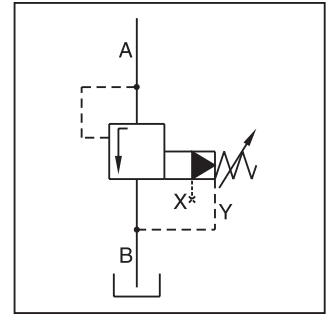
The R4V valves are available with 2 ports (L-body) for in-line relief function or with 3 ports (T-body) for relief functions in the bypass.

## Operation

The system pressure in Port A is applied to the pilot valve and to the top surface of the main poppet via an orifice in X. The hydraulically balanced main poppet is held against the seat by the main spring. In this state there is no flow through the valve. The adjusted spring force acting on the pilot cone determines the relief pressure. If the pressure in Port A exceeds the set point, the pilot cone is lifted from its seat, releasing a small pilot flow to tank. The flow through the control orifice in X creates a pressure drop which limits the pressure at the top of the main poppet to the set point. The higher system pressure in Port A now lifts the main poppet off its seat and allows flow to Port B. In the resulting float position only enough flow is passed from Port A to Port B to maintain the inlet pressure in Port A at the set point. When the pressure in Port A falls below the set point, the hydraulic balance on the main poppet is restored. The main spring then forces the main poppet to close.

## Features

- Pilot operated with manual adjustment
- 2 interfaces:
  - L-body (R4V06- SAE 12, R4V10- SAE 20)
  - T-body (R4V03- SAE 8, R4V06- SAE 16)
- 3 pressure stages
- 3 adjustment modes:
  - Hand knob
  - Acorn nut with lead seal
  - Key lock
- With optional vent function



**D**

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Ordering Information**

<b>R4V</b>	<input type="checkbox"/>	<b>5</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<b>A</b>	<input type="checkbox"/>	<input type="checkbox"/>
Pressure Relief Valve	Size	Max Pressure 350 Bar (5075 PSI)	Body	Pressure Range	Adjustment	Drain Line	Switching Type	Solenoid Voltage (Optional)	Design Series	Seal	Options Check with Factory	

Code	Description
03	NG10 (SAE 8)
06	NG25 (SAE 16 – T-Body) (SAE 12 – L-Body)
10	NG32 (SAE 20)

Code	Description
0	Internal
2	External from Pilot Head (Y1)

Code	Description
Omit	Standard w/o vent function
G0R	12V
G0Q	24V
GAR	98V
GAG	205V
W30	110V 50Hz/ 120V 60Hz
W31	220V 50Hz/ 240V 60Hz

Code	Description
1	Nitrile
5	Fluorocarbon

Code	Description
1	R4V03 T-Body NPT R4V06 T-Body NPT
4	R4V03 T-Body R4V06 T-Body
6	R4V03 T-Body BSP R4V06 T-Body BSP
A	R4V06 T-Body NPT R4V10 T-Body NPT
B	R4V06 L-Body R4V10 L-Body
D	R4V06 L-Body BSP R4V10 L-Body BSP

Code	Description
1	Hand Knob
3	Acorn Nut with Lead Seal
4	Key Lock

Code	Description
Omit	Standard w/o vent function
09*	Solenoid not activ. unpress. circulation
11**	Solenoid activated unpress. circulation

\* Sol. de-energized: open to tank  
Sol. energized: vent line blocked.

\*\* Sol. de-energized: vent line blocked  
Sol energized: open to tank.

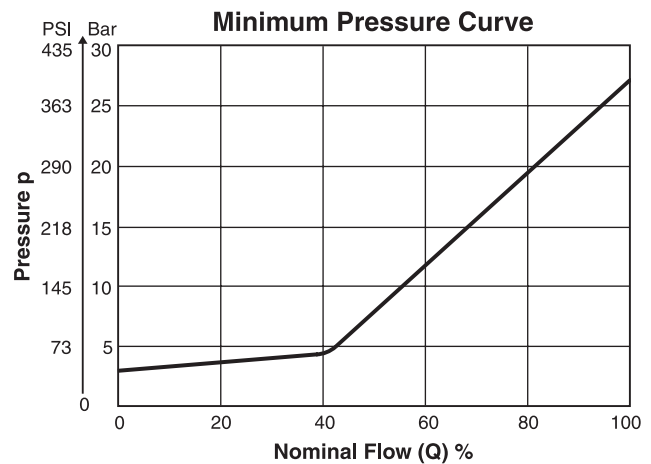
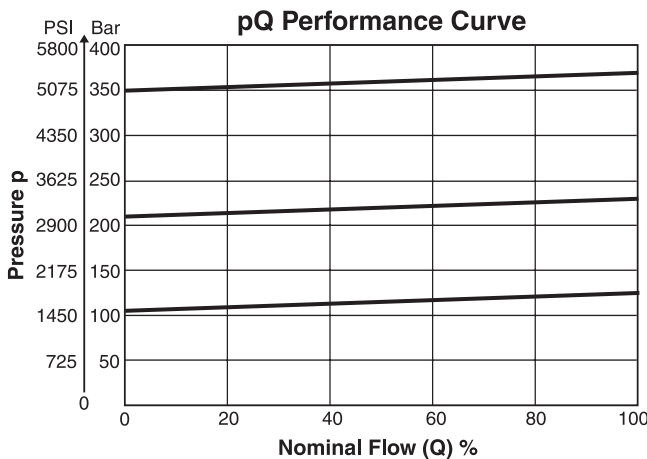
**Weight:**

R4V03	3.2 kg (7.1 lbs.)
R4V06*4	6.6 kg (14.6 lbs.)
R4V06*B	3.3 kg (8.2 lbs.)
R4V10	5.6 kg (12.3 lbs.)

Code	Description
1	up to 105 Bar (1523 PSI)
3	up to 210 Bar (3045 PSI)
5	up to 350 Bar (5075 Bar)

**Performance Curves\***



\* The performance curves are measured with external drain. For internal drain, the tank pressure has to be added to the curve.

## R4V

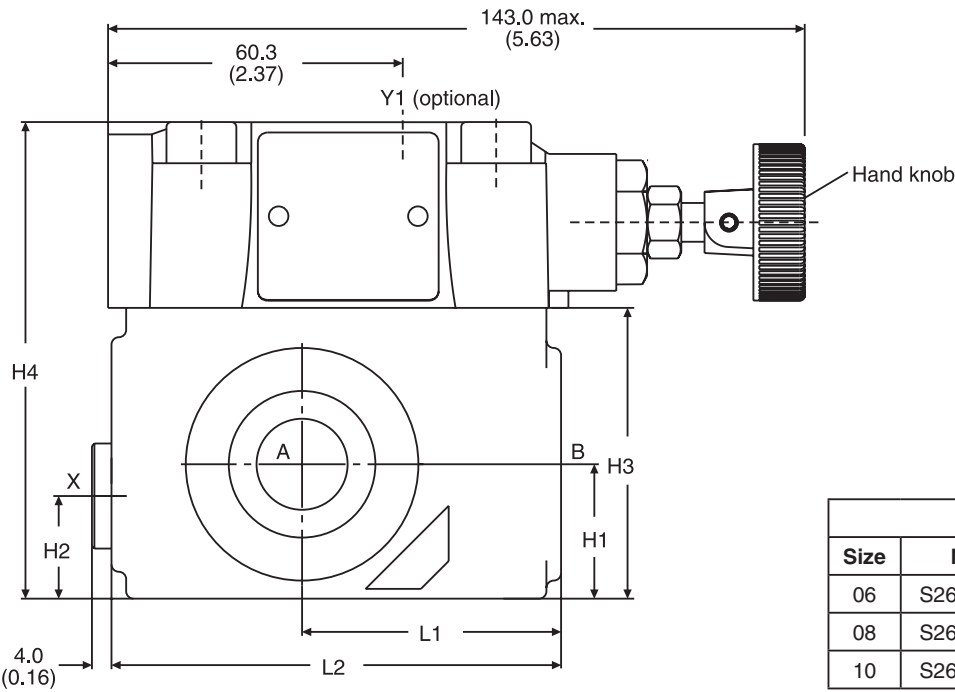
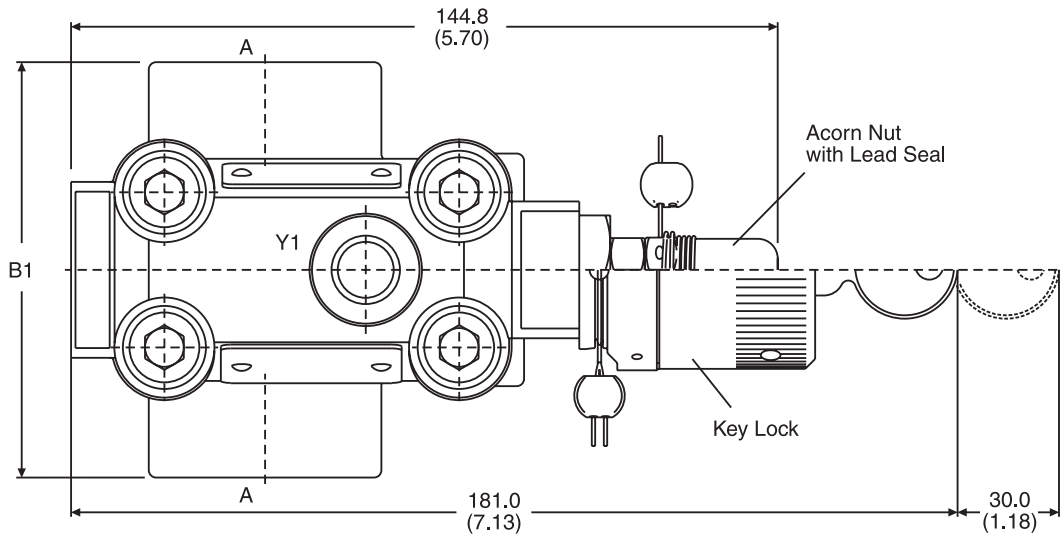
General				
Size	T-Body		L-Body	
	03 (SAE 8)	06 (SAE 16)	06 (SAE 12)	10 (SAE 20)
Mounting	Threaded Body			
Mounting Position	Unrestricted			
Ambient Temp. Range	-20°C to +50°C (-4°F to +122°F)			
Hydraulic				
Max. Operating Pressure	Ports A and X up to 350 Bar (5075 PSI); Ports B and Y 30 Bar (435 PSI)			
Pressure Ranges	105 Bar (1523 PSI), 210 Bar (3045 PSI), 350 Bar (5075 PSI)			
Nominal Flow	60 LPM (15.9 GPM)	200 LPM (52.9 GPM)	200 LPM (52.9 GPM)	450 LPM (119.0 GPM)
Fluid	Hydraulic oil as per DIN 51524 ... 51525			
Fluid Temperature	-20°C to +80°C (-4°F to +176°F)			
Viscosity	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU)			
Permitted Recommended	30 cSt / mm <sup>2</sup> /s (139 SSU)			
Filtration	ISO Class 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			

## R4V with Vent Function

General							
Size	T-Body			L-Body			
	03 (SAE 8)	06 (SAE 16)	06 (SAE 12)	10 (SAE 20)			
Mounting	Threaded Body						
Mounting Position	Unrestricted						
Ambient Temp. Range	-20°C to +50°C (-4°F to +122°F)						
Weight	3.2 kg (7.0 lbs)	6.6 kg (14.5 lbs)	3.3 kg (7.3 lbs)	5.6 kg (12.3 lbs)			
Electrical (Solenoid)							
Duty Ratio	100%						
Response Time	Energized / De-energized AC: 20/18ms, DC: 46/27 ms						
	Code	G0R	G0Q	GAR	GAG	W30	W31
Supply Voltage		12V	24V	98V	205V	110V at 50Hz 120V at 60Hz	220V at 50Hz 240V at 60Hz
Tolerance Supply Voltage		+5 to -10	+5 to -10	+5 to -10	+5 to -10	±5	±5
Power Consumption	Hold	31W	31W	31W	31W	78W	78W
	In Rush	31W	31W	31W	31W	264W	264W
Maximum Switching Frequency	AC up to 7,200 switchings per hour DC up to 16,000 switchings per hour						
Solenoid Connection	Connector as per EN175301-803						
Protection Class	IP65 in accordance with EN60529 (plugged and mounted)						
Coil Insulation Class	H (180°C) (356°F)						

**T-Body**

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



Seal Kits		
Size	Nitrile	Fluorocarbon
06	S26-58507-0	S26-58507-5
08	S26-58475-0	S26-58475-5
10	S26-58508-0	S26-58508-5

Size	Body	B1	B2	B3	B4	H1	H2	H3	H4	H5	H6	H7	H8	L1	L2	L3
03	T-body	85.0 (3.35)	-	-	-	27.5 (1.08)	21.0 (0.83)	59.5 (2.34)	97.5 (3.84)	-	-	-	-	53.0 (2.09)	92.0 (3.62)	-
06	T-body	136.0 (5.35)	-	-	-	38.0 (1.50)	28.0 (1.10)	93.0 (3.66)	131.0 (5.16)	-	-	-	-	66.5 (2.62)	117.5 (4.63)	-

Ports	Function	Port size	
		R4V03 T-body	R4V06 T-body
A	Pressure (inlet)	SAE 8	SAE 16
B	Tank (outlet)	SAE 8	SAE 16
X <sup>1)</sup>	Ext. Remote Control or Vent Connection	SAE 4	
Y1 <sup>2)</sup>	External Drain	SAE 4	

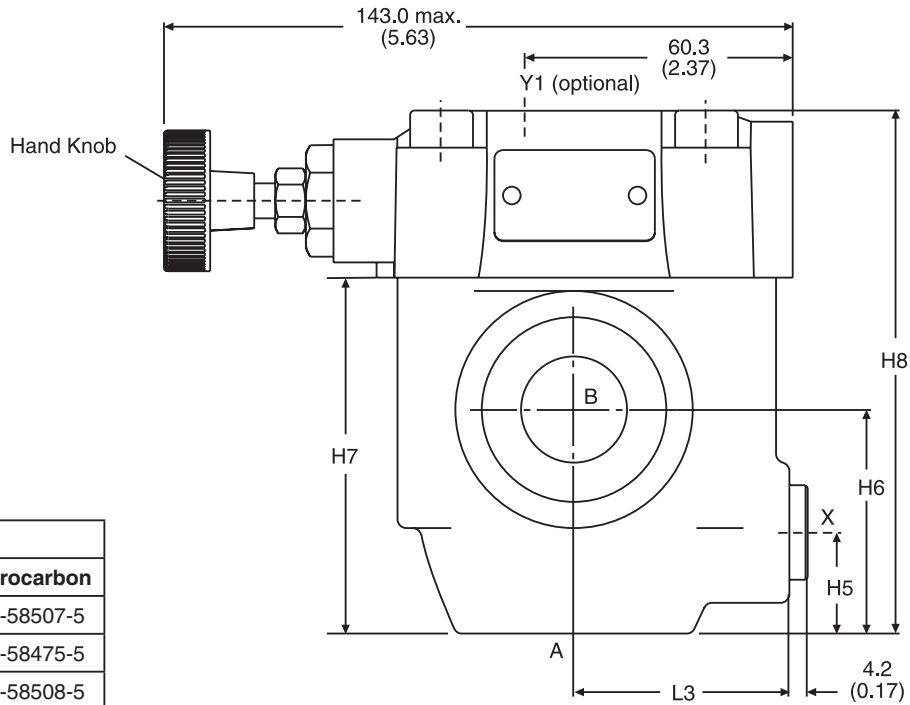
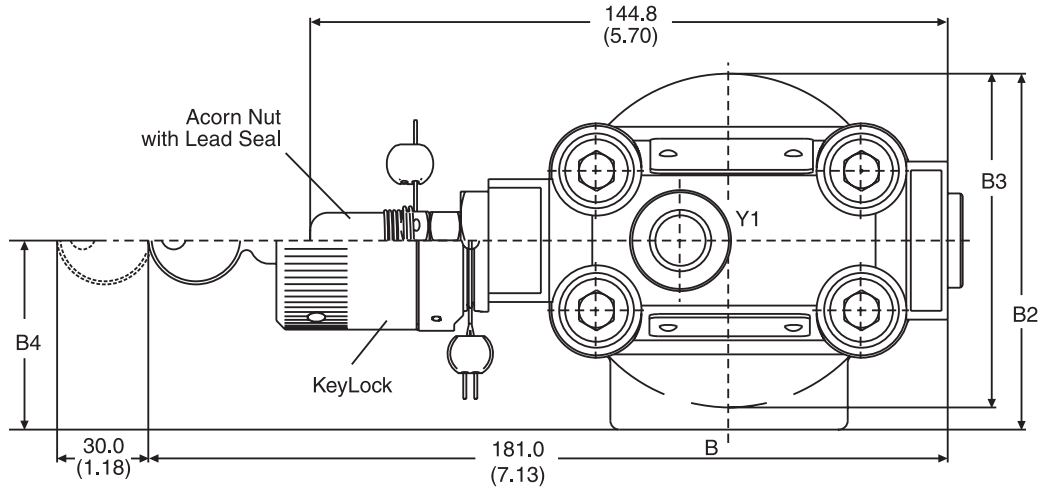
<sup>1)</sup> closed when supplied

<sup>2)</sup> port Y1 is only available at drain line (code 2) external from the pilot head



**L-Body**

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



Seal Kits		
Size	Nitrile	Fluorocarbon
06	S26-58507-0	S26-58507-5
08	S26-58475-0	S26-58475-5
10	S26-58508-0	S26-58508-5

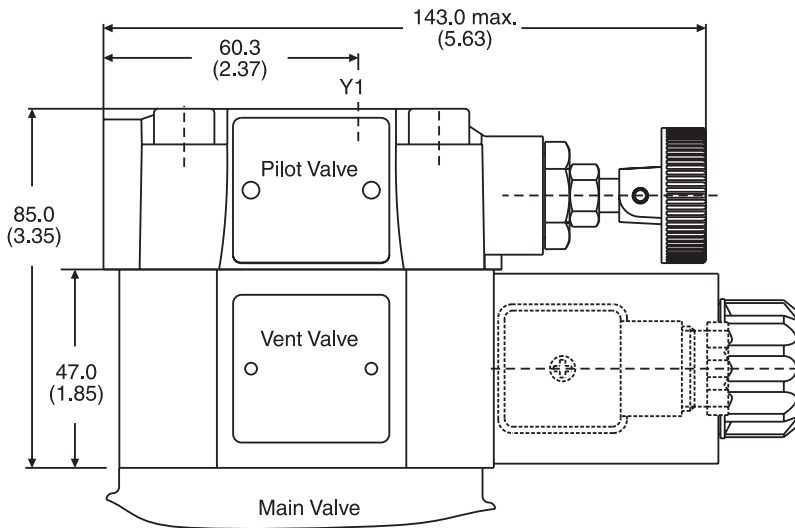
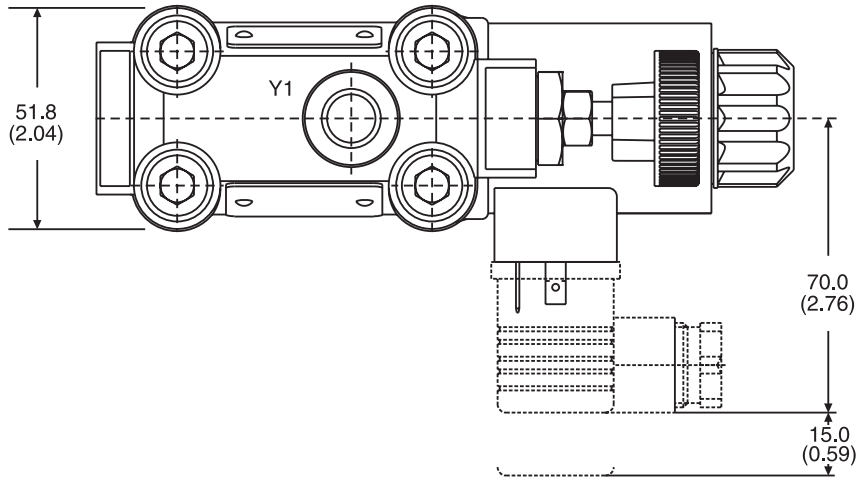
Size	Body	B1	B2	B3	B4	H1	H2	H3	H4	H5	H6	H7	H8	L1	L2	L3
06	L-body	-	81.0 (3.19)	76.0 (2.99)	43.0 (1.69)	-	-	-	-	23.0 (0.91)	51.0 (2.01)	81.0 (3.19)	119.0 (4.69)	-	-	49.0 (1.93)
10	L-body	-	120.7 (4.75)	85.8 (3.38)	77.8 (3.06)	-	-	-	-	31.8 (1.25)	50.8 (2.00)	96.0 (3.78)	134.0 (5.78)	-	-	49.8 (1.96)

Ports	Function	Port size	
		R4V06 L-body	R4V10 L-body
A	Pressure (inlet)	SAE 12	SAE 20
B	Tank (outlet)	SAE 12	SAE 20
X <sup>1)</sup>	Ext. Remote Control or Vent Connection	SAE 4	
Y1 <sup>2)</sup>	External Drain		

<sup>1)</sup> closed when supplied

<sup>2)</sup> port Y1 is only available at drain line (code 2) external from the pilot head

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



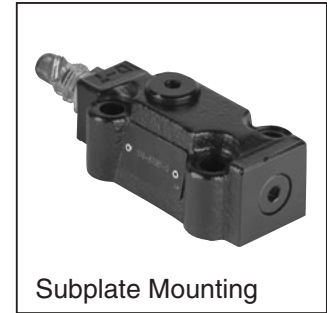
Vent Valve Seal Kits	
Nitrile	Fluorocarbon
<b>DC Solenoid</b>	
S26-58515-0	S26-58515-5
<b>AC Solenoid</b>	
S26-35237-0	S26-35237-5

Code	Internal Drain	External Drain
11		
09		

**General Description**

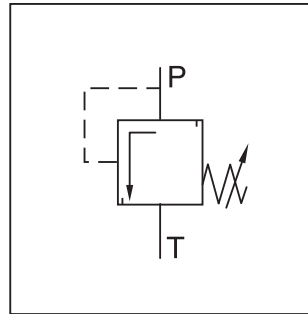
Series R1E02 direct operated, pressure relief valves are seated type valves typically used for remote pressure controls. In applications where the reliability and simplicity of a hydraulic remote control are preferred to an electrohydraulic system, Series R1E02 is an ideal solution.

Typically pilot operated pressure valves or compensators of variable pumps are controlled.



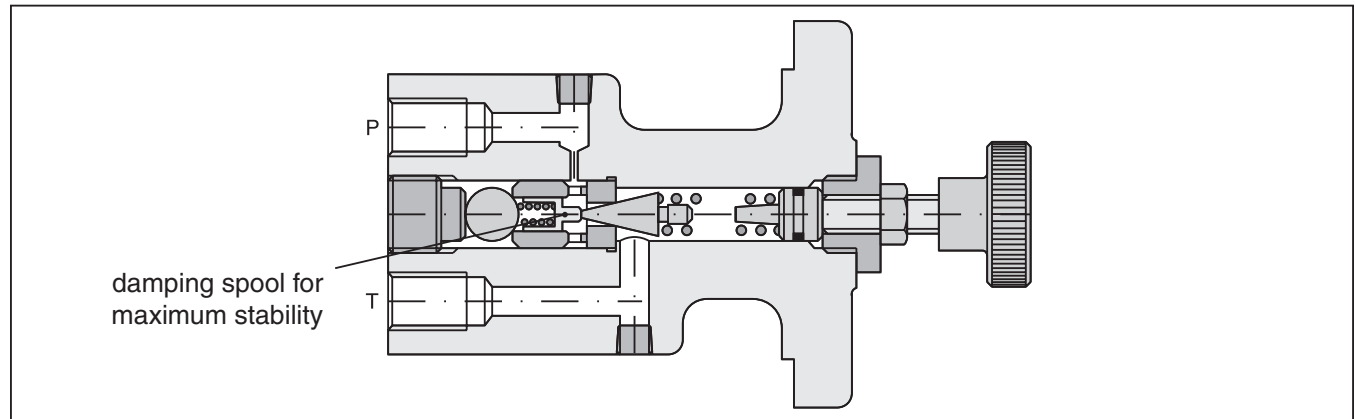
**Features**

- Seated type valve
- 2 body variants:
  - front panel mounting
  - subplate mounting
- 3 pressure ranges
- 3 adjustment modes:
  - hand knobs
  - acorn nut with lead seal
  - adjusting with lock

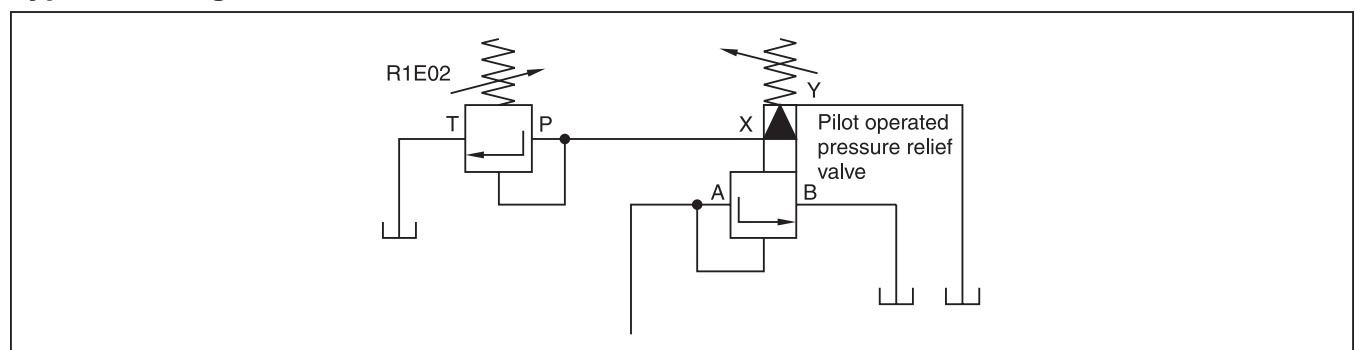


**D**

**Front Panel Mounting**

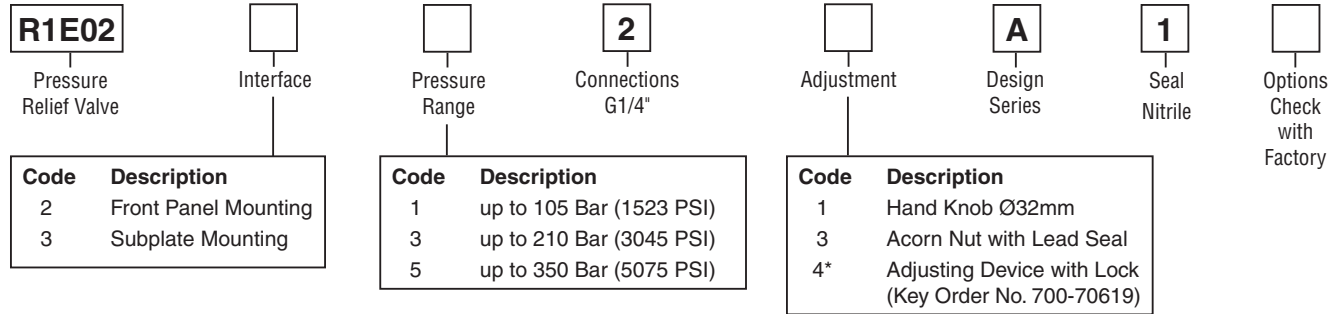


**Typical Configuration as Remote Pilot Valve**



**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Ordering Information**



**Weight:**

R1E022	2.1 kg (4.6 lbs.)
R1E023	1.0 kg (2.2 lbs.)

**Seal Kit:**

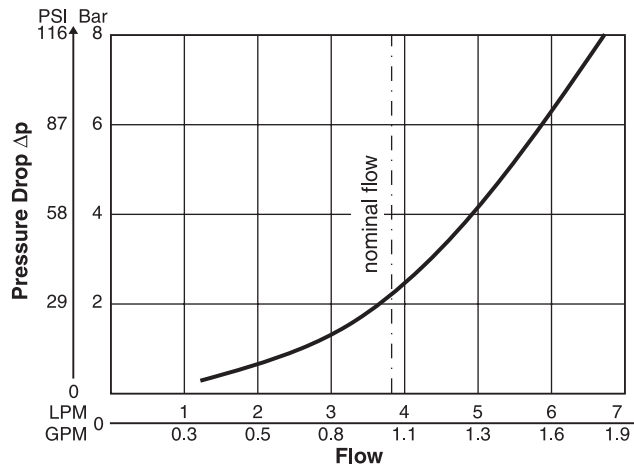
R1E022	S26-58466-0
R1E023	S16-91963-0

\* On bodies for subplate mounting use plate S16-64188.

**D Specifications**

General	
Size	1/4"
Interface	Front panel mounting, Subplate mounting
Mounting Position	Unrestricted
Ambient Temperature Range	-20°C to +70°C (-4°F to +158°F)
Hydraulic	
Maximum Operating Pressure	Port P 350 Bar (5075 PSI); Port T depressurized
Pressure Range	105 Bar (1523 PSI), 210 Bar (3045 PSI), 350 Bar (5075 PSI)
Fluid	Hydraulic oil as per DIN 51524 ... 51525
Fluid Temperature	-20°C to +70°C (-4°F to +158°F)
Nominal Flow	3.8 LPM (1.0 GPM)
Minimum Pressure Setting	7 Bar (102 PSI)
Viscosity	Permitted 10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU) Recommended 30 cSt / mm <sup>2</sup> /s (139 SSU)
Filtration	ISO Class 4406 (1999) 18/16/13

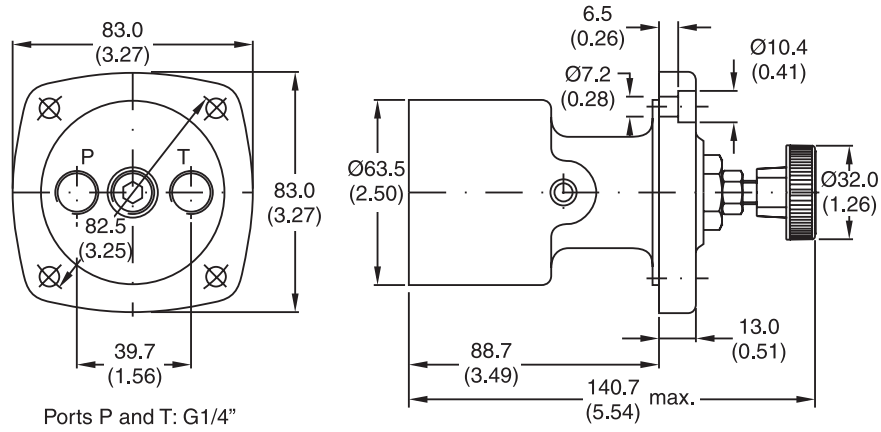
**Performance Curve**



Fluid viscosity 35 cSt at 50°C (122°F) ± 5°C (41°F)

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

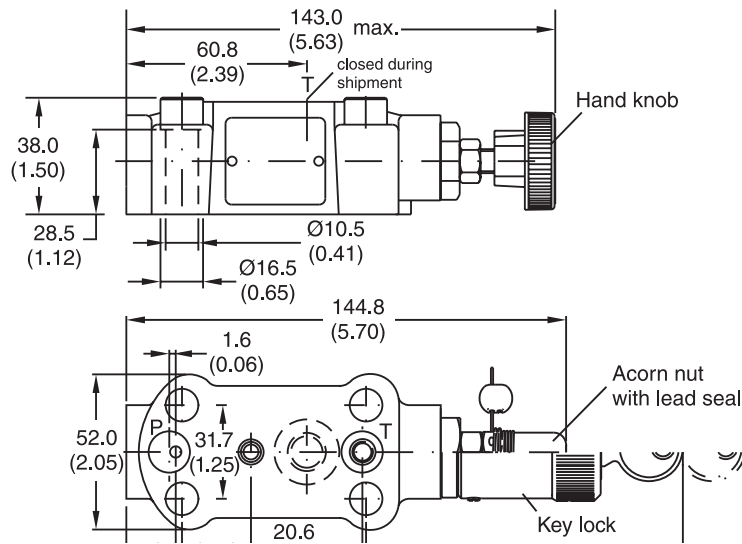
**Front Panel Mounting**



Ports P and T: G1/4"

Subplate	Size
518-00139-0	3/8" NPT

**Subplate Mounting**



## General Description

Pressure intensifiers are used wherever a particular section of a hydraulic system has to be pressurized to a substantially higher pressure than the available primary pressure (clamping functions). With an intensification ratio of 1 : 4 (1 : 2, 1 : 6) it enables a cost-effective system solution, especially in clamping applications, with primary pressures up to 125 bar (1813 PSI). A pilot operated check valve can be flanged underneath the pressure intensifier for quick filling and decompression of the high pressure section.

## Features

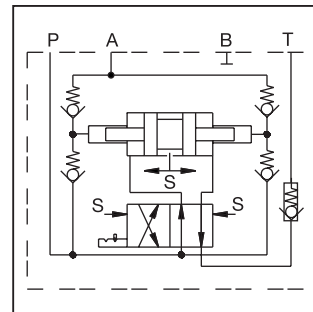
- Mounting pattern NG06, DIN 24 340 Design A, CETOP, ISO
- Check valve attachable to bottom flange
- High pressure up to 500 bar (7252 PSI)
- Volume flow formed with low pulsation
- Compact design

## Design

Main functional parts of the pressure intensifier: piston, rocker mechanism, slide valve with lock, four check valves which separate the high pressure section from the low pressure section, check valve in the tank port to partition of the tank section from the primary pressure.

## Function

After the high pressure section is filled with oil, (e.g., extension of a clamping cylinder), the pressure intensifier begins operation. The low pressure moves the intensifier piston because of the surface ratio and compresses the oil column in the high pressure section.



At the end of the intensifier's piston stroke, the rocker mechanism switches the directional slide valve to the crossed switching position and the intensifier piston pumps oil from the piston rod area into the high pressure section. The process repeats itself until the pressure ratio corresponding to the surface ratio has led to a balance of force on the intensifier piston.

The pressure intensifier switches itself off and immediately on again when the high pressure (e.g., due to external leakage) begins to drop. (Pay attention to the flow characteristic.) The switching speed of the slide valve is dependent on the operating speed of the intensifier piston.

## Note

- To avoid exceeding the admissible maximum pressure, a pressure relief or pressure control valve must be fitted on the primary side (pressure setting, max. 125 bar (1813 PSI) / 1 : 4, max. 250 bar (3626 PSI) / 1 : 2 or max. 83 bar (1204 PSI) / 1 : 6).
- There must be no pressure peak on the primary side when operating in the maximum pressure range.
- It is recommended to mount a 10µm filter on the primary side to ensure damage-free operation.

## Ordering Information

<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">SD</div> <p>Pressure Intensifier</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">500</div> <p>Working Pressure 500 bar (7252 PSI) (max. pressure)</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Intensification Ratio</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">06</div> <p>Nominal Size (pressure intensifier) Interface DIN 24 340 Design A, CETOP, ISO</p>	<div style="border: 1px solid black; padding: 2px; width: 30px; margin: 0 auto;">V</div> <p>Seals</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> <p>Design Series NOTE: Not required when ordering.</p>
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Code	Intensification Ratio
A	1 : 4
B	1 : 2
C	1 : 6

Code	Description
F	Fluorocarbon

## Specifications

General	
<b>Symbol</b>	DIN 24 300
<b>Design</b>	Piston and poppet valve in body
<b>Mounting Type</b>	NG06, DIN 24 340, Design A, CETOP, ISO
<b>Ports</b>	Subplate
<b>Mounting Position</b>	Unrestricted
<b>Ambient Temperature</b>	-20 to +60°C (-4 to +140°F)
<b>MTTF<sub>D</sub> Value</b>	150 years
<b>Weight</b>	3.0 kg (6.61 lbs)
Hydraulic	
<b>Max. Operating Pressure</b>	Port A 500 bar (7252 PSI) Port P, B, T 125 bar (1813 PSI) @ ratio 1:4, 250 bar (3626 PSI) @ ratio 1:2
<b>Fluid</b>	Hydraulic oil according to DIN 51524
<b>Fluid Temperature</b>	+10 to +70°C (+50 to +158°F)
<b>Viscosity</b>	Permitted 20 to 400 cSt / mm <sup>2</sup> /s (98 to 1853 SSU) Recommended 30 to 80 cSt / mm <sup>2</sup> /s (142 to 371 SSU)
<b>Filtration</b>	ISO 4406 (1999); 18/16/13
<b>Flow</b>	See performance curve
<b>Intensificatin Ratio</b>	$P_p : P_A = 1:4, 1:2, 1:6$
<b>Flow Volume</b>	$Q_p : Q_A = 4:1, 2:1, 6:1$
<b>Stroke Volume</b>	3 cm <sup>3</sup> (0.18 cu. in.) per double stroke
<b>Operating</b>	Hydraulic-mechanic automatic control




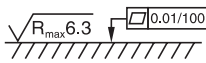
**D**

## Accessories

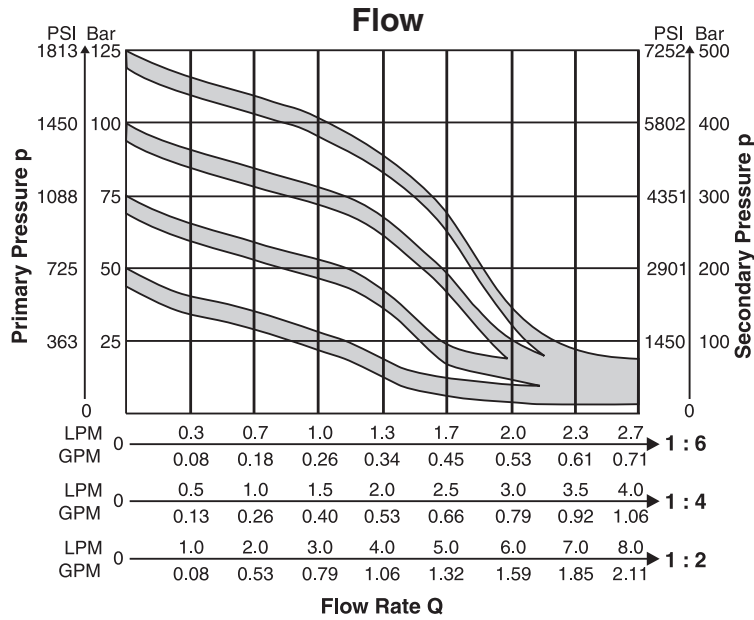
Type	Description	Number
SD 500*06V	Seals	—
	9.25 x 1.78	3
	10.82 x 1.78	1
	M5x75 ISO 4762-12.9	4

Seals are included in delivery.

Mounting screws are not included in delivery.

Surface Finish	 Kit		
	BK401	4 x M5x75 ISO 4762-12.9	9.0 Nm

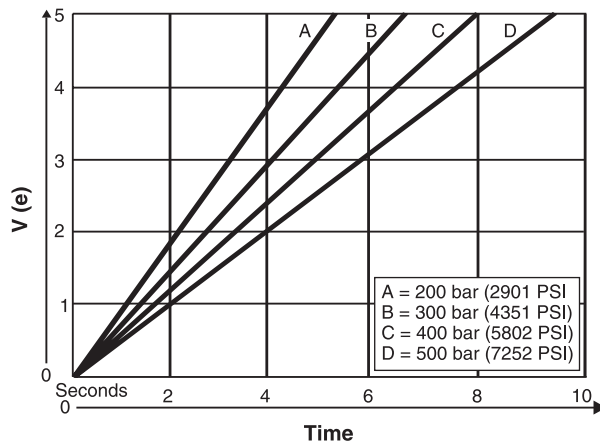
**Performance Curves**



**D**

### Compression

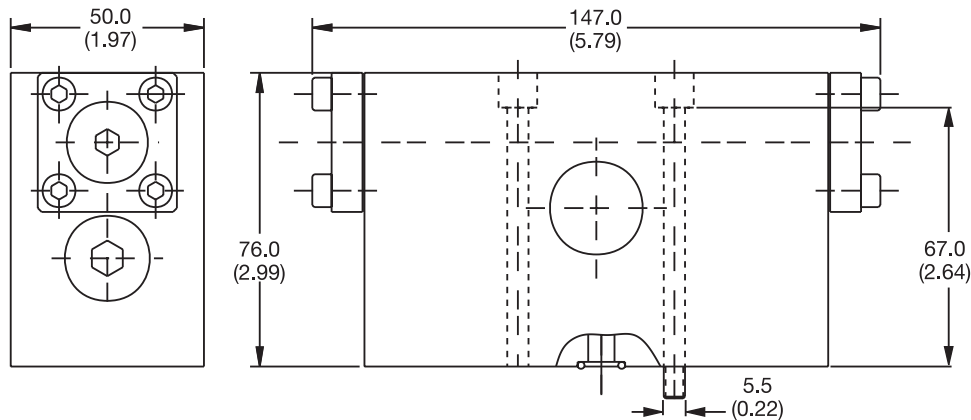
Approximate values of the compression time for compressing a filled volume to target pressure (1 : 4)



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

**Dimensions**

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





**Pilot Operated Check Valve Plates NG06 and NG10**

**Description**

Pilot operated check valve plates are flanged under the pressure intensifier for quick filling and decompression.

**Design**

The check valve plate is equipped with a hydraulic, pilot operated check valve.

Opening ratio: Main valve 2.5 : 1  
 Pilot ratio 10 : 1

**Specifications**

General	
<b>Design</b>	Spring loaded ball seat valve
<b>Mounting Type</b>	Flange
<b>Mounting Position</b>	Unrestricted
<b>Ambient Temp.</b>	-20 to +60°C (-4 to +140°F)
Hydraulic	
<b>Max. Operating Pressure</b>	Port A 500 bar (7252 PSI) Port P, B, T 125 bar (1813 PSI) @ ratio 1:4, 250 bar (3626 PSI) @ ratio 1:2
<b>Fluid</b>	Hydraulic oil according to DIN 51524
<b>Fluid Temperature</b>	+10 to +70°C (+50 to +158°F)
<b>Viscosity</b>	Permitted 20 to 400 cSt / mm <sup>2</sup> /s (98 to 1853 SSU) Recommended 30 to 80 cSt / mm <sup>2</sup> /s (142 to 371 SSU)
<b>Filtration</b>	ISO 4406 (1999); 18/16/13
<b>Flow</b>	See performance curve
<b>Pilot Ratio</b>	Main valve 2.5:1, pre-discharge 10:1
<b>Operating Pressure</b>	Approx. 0.5 bar (7 PSI)

**Accessories**

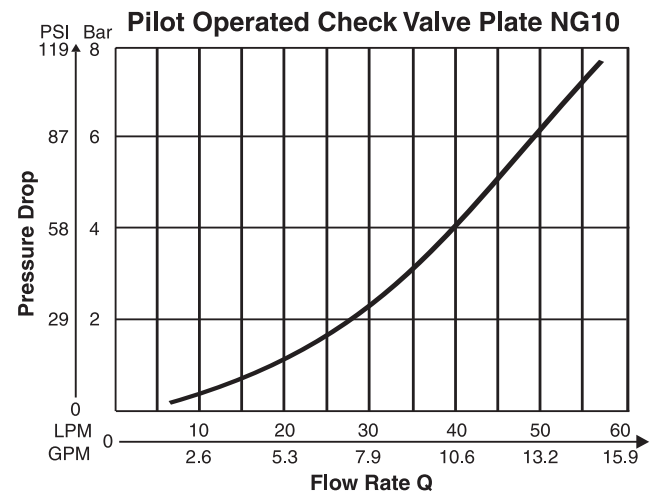
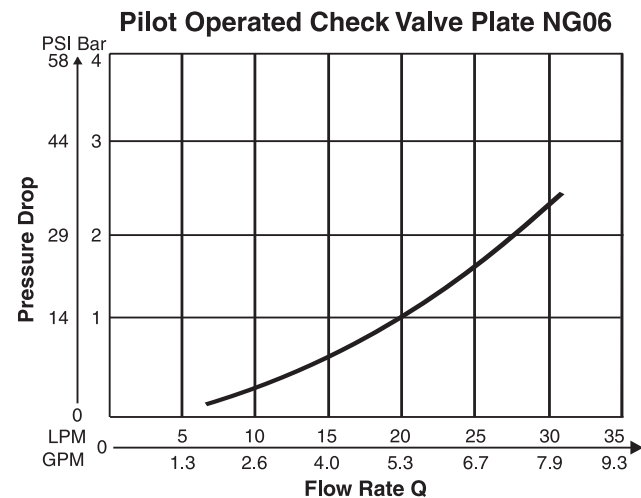
Type	Description	Qty
H06SDV	Seals	—
	9.25 x 1.78	4
	M5x115 ISO 4762-12.9	4
H10SDV	Seals	—
	12.24 x 1.78	4
	M5x75 ISO 4762-12.9	4
	M6x75 ISO 4762-12.9	4

Seals are included in delivery.  
 Mounting screws are not included in delivery.

**Weight**

NG06 1.3 kg (2.87 lbs.)  
 NG10 2.3 kg (5.07 lbs.)

**Performance Curves**



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



Ordering Information

NG06

**H06 SDV**

NG10

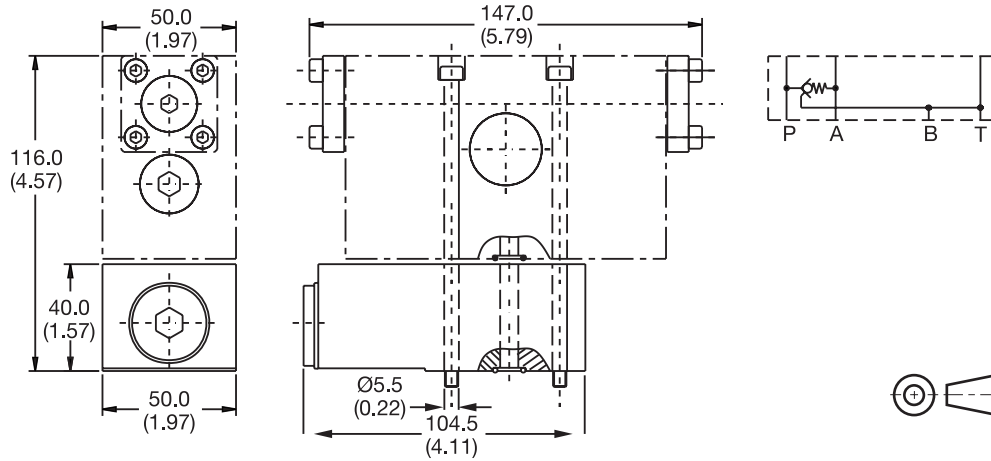
**H10 SDV**

**Bold = Short-term availability.**

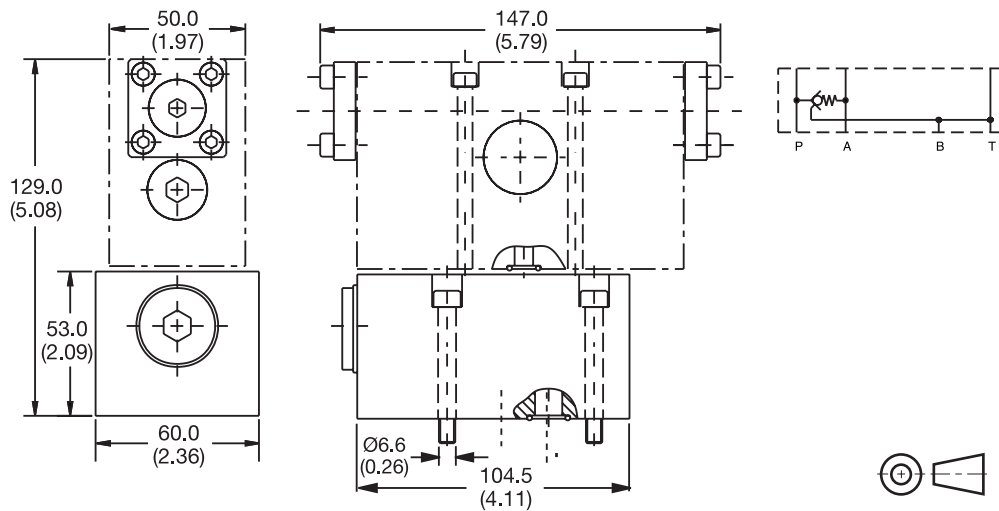
Dimensions






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

NG06



NG10



Size	Surface Finish	 Kit		
NG06	$\sqrt{R_{max}6.3}$ 	BK406	4 x M5x115 ISO 4762-12.9	9.0 Nm
NG10	$\sqrt{R_{max}6.3}$ 	BK490	4 x M5x75 4 x M6x50 ISO 4762-12.9	9.0 Nm 18.0 Nm

**Contents**

**Series 2F1C**

General Description..... 2-Way Flow Control Valves, Subplate Mounted ..... E2  
 Operation..... E2  
 Features ..... E2  
 Ordering Information ..... E2  
 Specifications ..... E3  
 Performance Curves..... E4 - E6  
 Dimensions..... E7

**Series C4V**

General Description..... Direct Operated Check Valves, Subplate Mounted ..... E8  
 Operation..... E8  
 Features ..... E8  
 Ordering Information ..... E8  
 Specifications ..... E9  
 Performance Curves..... E9  
 Dimensions..... E10

**Series C4V**

General Description ..... Pilot Operated Check Valves, Subplate Mounted ..... E11  
 Operation..... E11  
 Features ..... E11  
 Ordering Information ..... E11  
 Specifications ..... E12  
 Performance Curves..... E12  
 Dimensions..... E13

**Series C5V**

General Description..... Direct Operated Check Valves, SAE Flange ..... E14  
 Operation..... E14  
 Features ..... E14  
 Ordering Information ..... E14  
 Specifications ..... E15  
 Performance Curves..... E15  
 Dimensions..... E16

**Terms of Sale and Warranty Limitations** ..... E17

**Safety Guide**..... E19 - E22



**General Description**

Series 2F1C 2-way flow control valves provide pressure and viscosity compensated flow from port A to port B. The counter direction is blocked (standard) or can be open via an integral reverse flow check valve (optional).

**Operation**

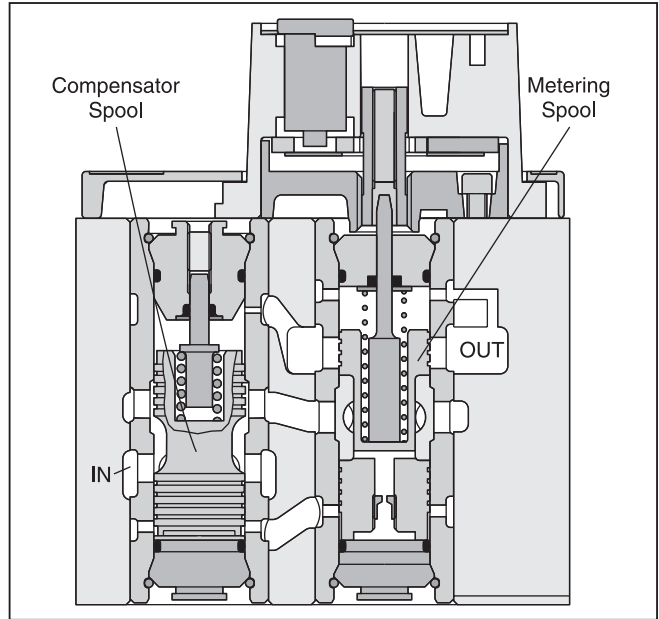
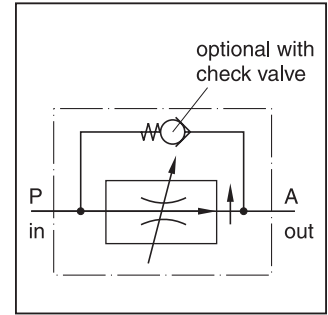
The compensator spool is located in front of the metering spool. The metering spool is closed in the neutral position to avoid undesired initial actuator motion. The oil flow to open the metering spool has to pass a needle valve (not shown in the sectional drawing). The needle valve can be adjusted from the front panel to set the response time of the 2F1C.

The metering spool is adjusted by the main control knob. The key lock has three positions:

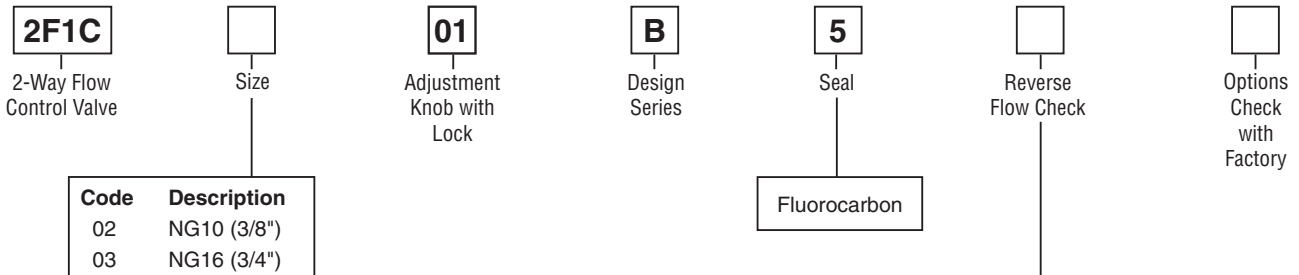
- Lock: Adjustment is locked
- Adjust: Full adjustment is permitted
- Trim: Fine adjustment of  $\pm 5\%$  is possible

**Features**

- 2 way flow control valve
- Subplate mounting according to ISO 6263
- Excellent fine adjustment
- Adjustable response time
- Closed in neutral position
- Optional reverse flow check valve
- 2 sizes: NG10 (3/8"), NG16 (3/4")



**Ordering Information**



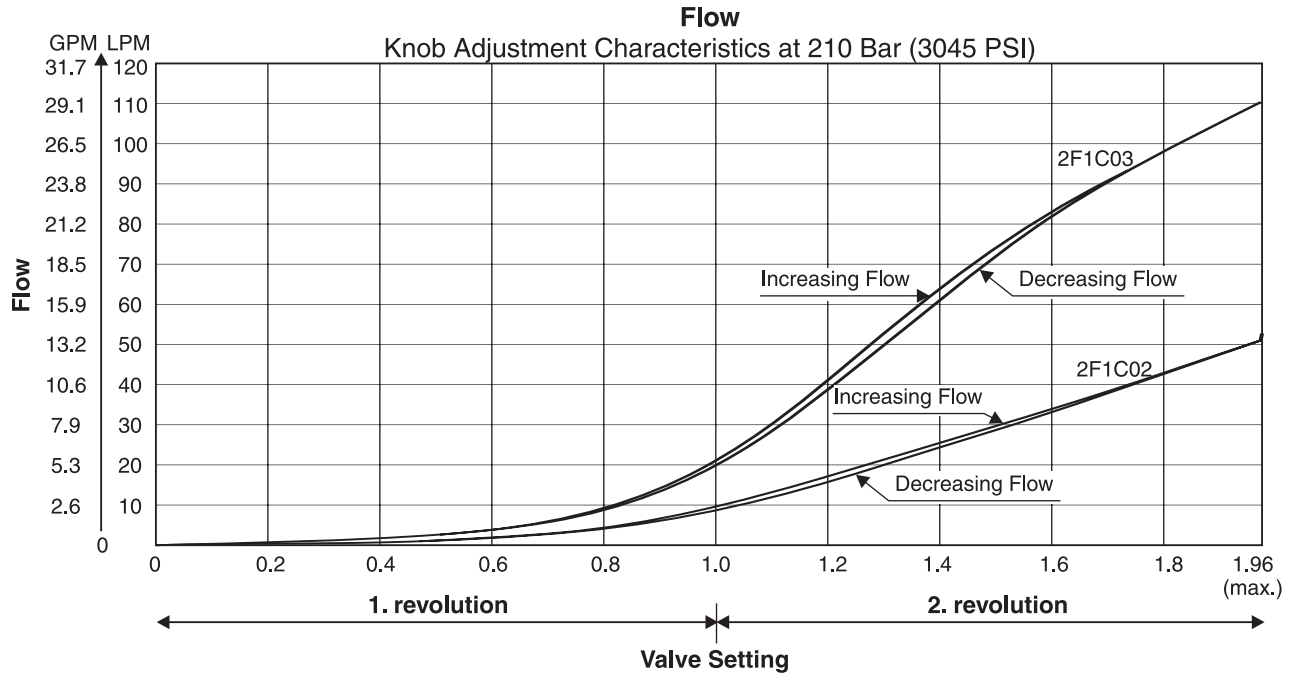
**Weight:**  
 2F1C02 6.0 kg (13.2 lbs.)  
 2F1C03 9.0 kg (19.8 lbs.)

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Specifications****Pressure Compensated Flow Control Valves  
Series 2F1C**

Size		NG10	NG16
Actuator		Manual flow rate adjustment	
Mounting Type		ISO 6263	
Mounting Position		Unrestricted	
Fluid Temperature		+70°C (+158°F) Maximum	
Ambient Temperature		-25°C to +50°C (-13°F to +122°F)	
Viscosity Range		2.8 to 400 cSt / mm <sup>2</sup> /s (13 to 1854 SSU)	
Filtration		ISO 4406 (1999); 18/16/13 (meet NAS 1638:7)	
Maximum Pressure Difference		See Diagram	
Maximum Operating Pressure	Port A	<b>2F1C02</b> 14 - 280 Bar (203 - 4060 PSI) 0 - 270 Bar (0 - 3915 PSI)	<b>2F1C03</b> 14 - 350 Bar (203 - 5075 PSI) 0 - 340 Bar (0 - 4930 PSI)
	Port B		
Flow Direction	A-B	Flow control function	
	B-A	Blocked or free flow through check valve	

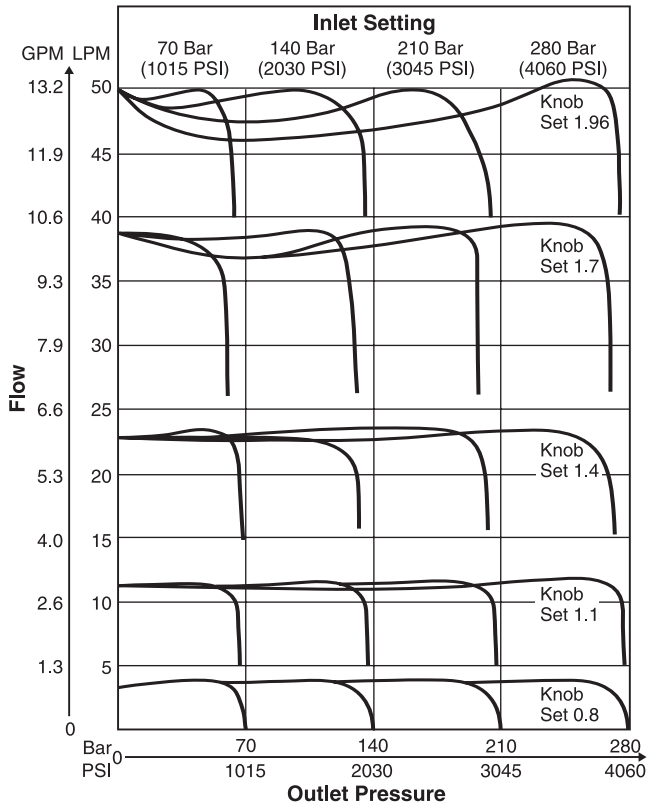
**E**



**2F1C02**

**Flow / Pressure Drop**

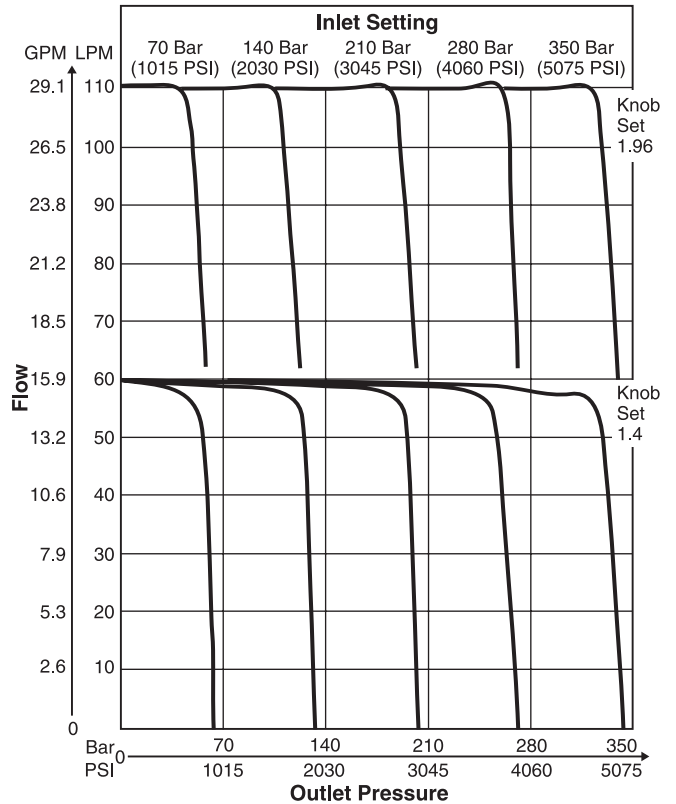
Constant Inlet Pressure – Variable Outlet Pressure



**2F1C03**

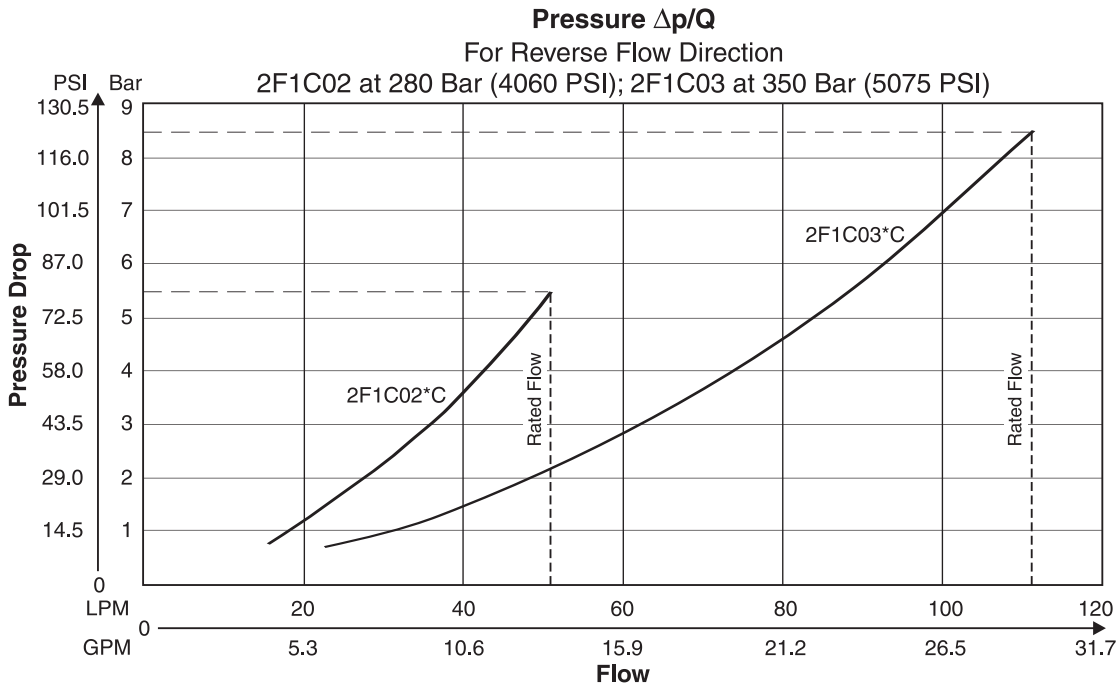
**Flow / Pressure Drop**

Constant Inlet Pressure – Variable Outlet Pressure



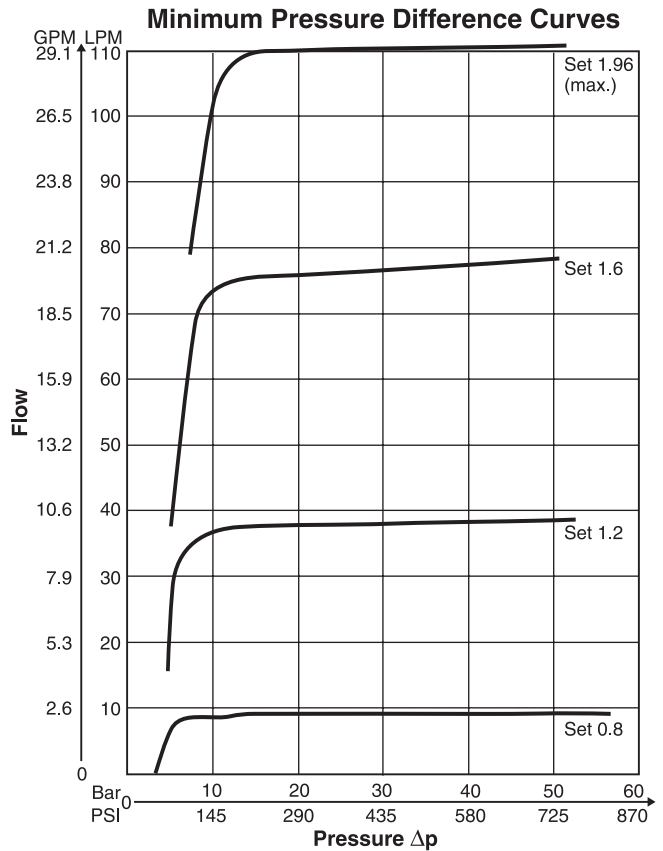
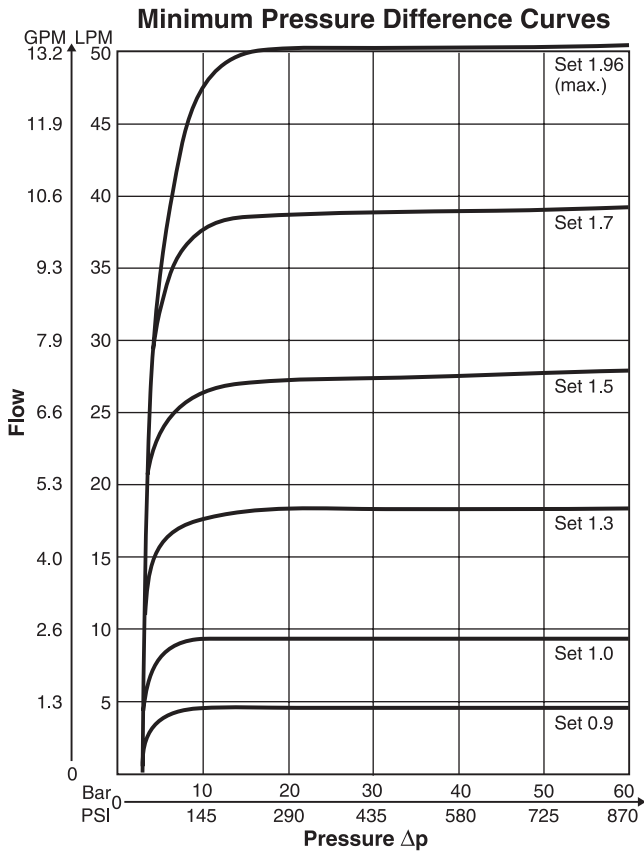
Fluid viscosity 40 cSt at 50°C (122°F)



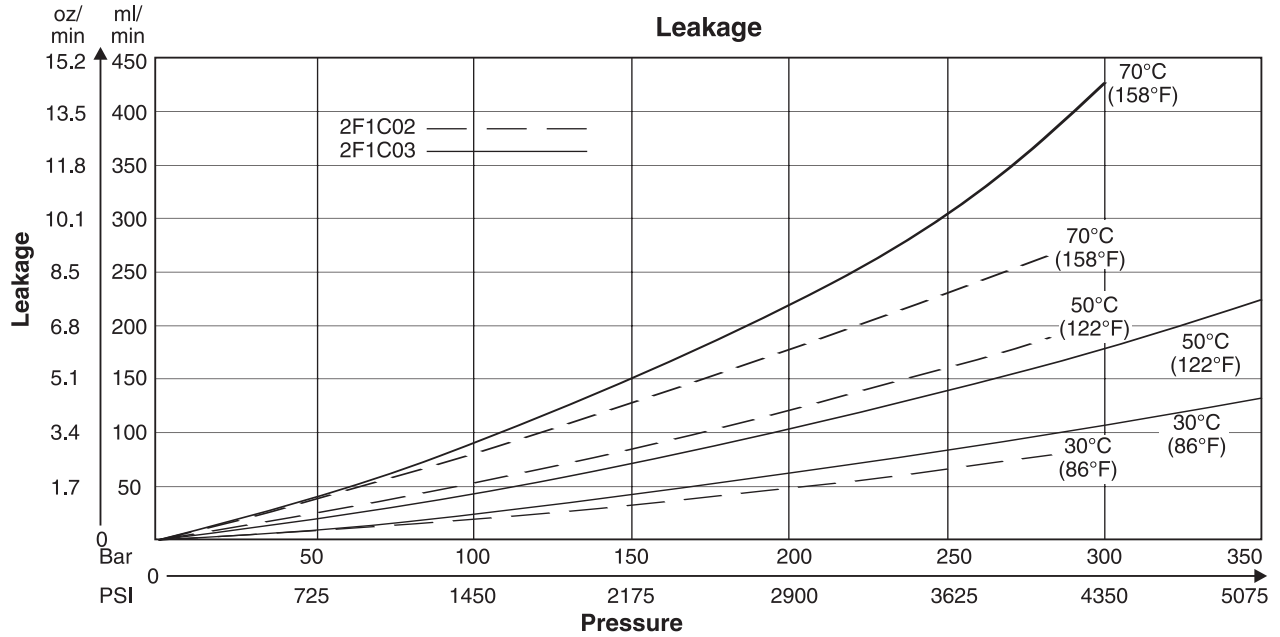


**2F1C02**

**2F1C03**



Fluid viscosity 40 cSt at 50°C (122°F)

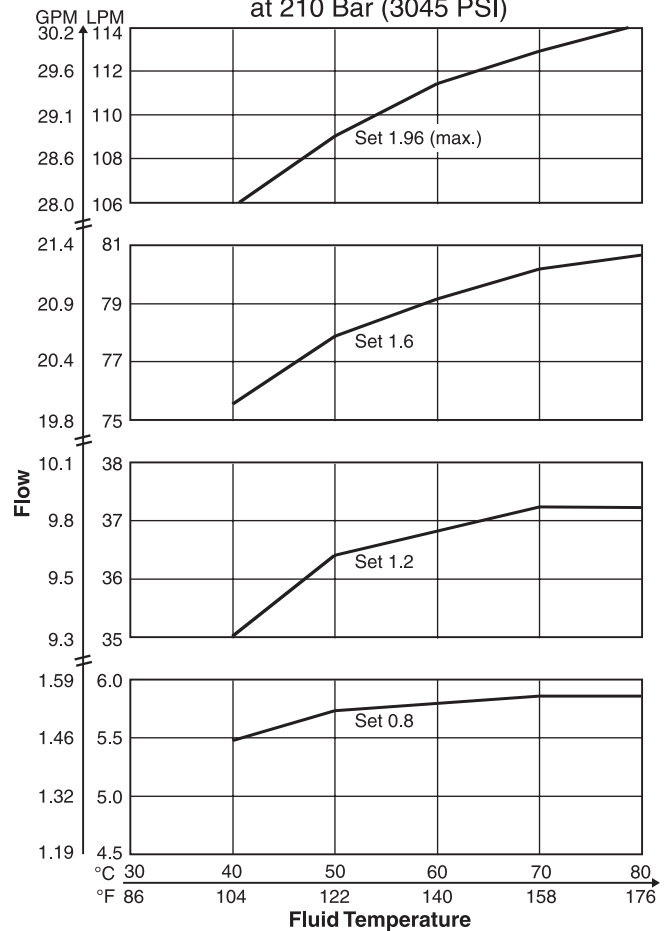
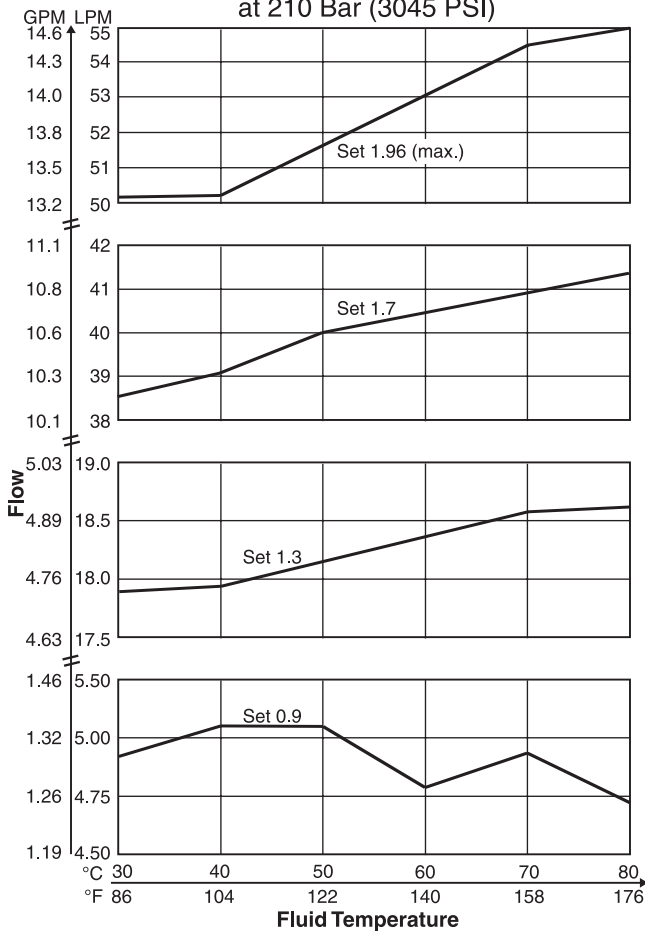


**2F1C02**

**2F1C03**

**Flow / Temperature Curves  
 at 210 Bar (3045 PSI)**

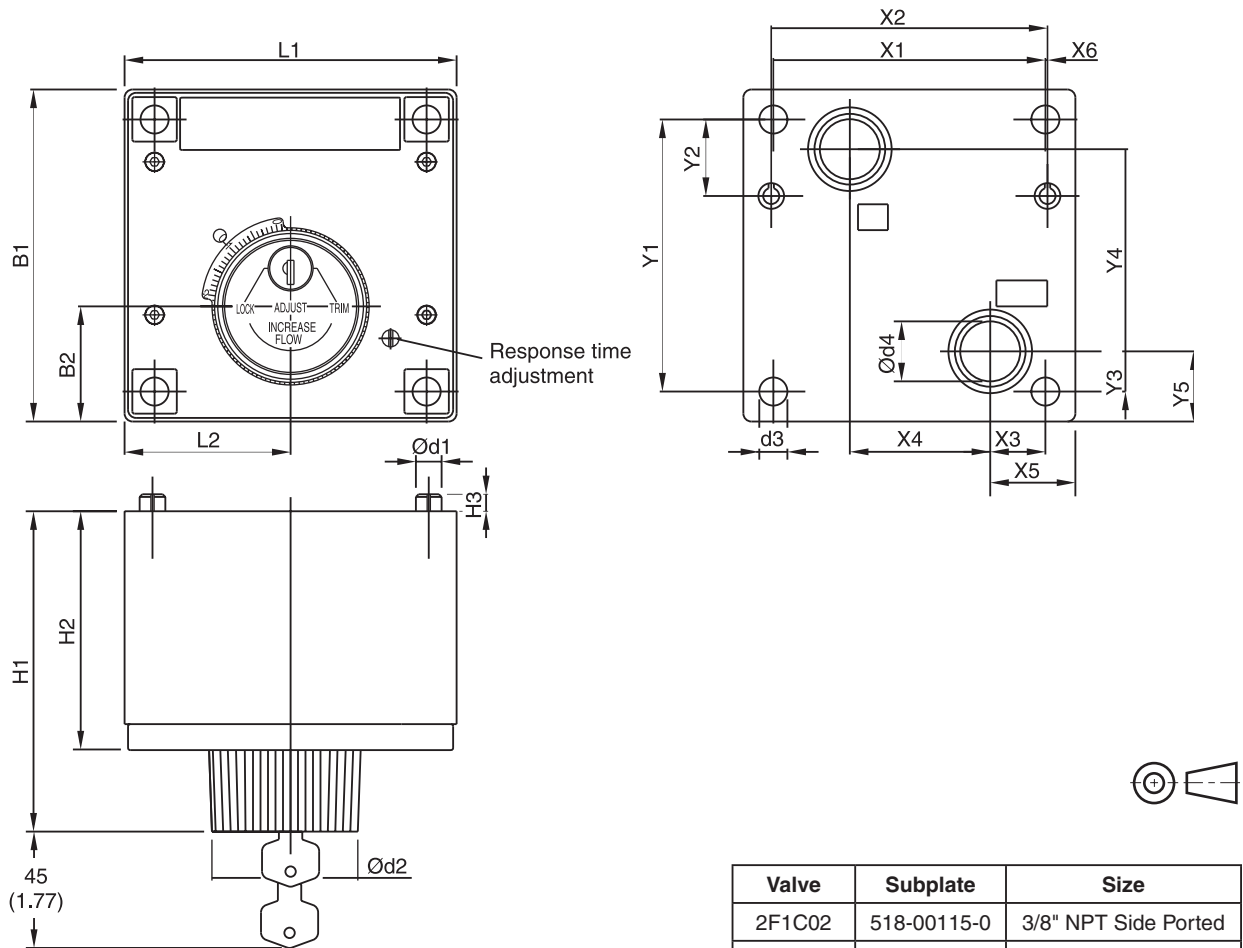
**Flow / Temperature Curves  
 at 210 Bar (3045 PSI)**



Fluid viscosity 40 cSt at 50°C (122°F)







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



Valve	Subplate	Size
2F1C02	518-00115-0	3/8" NPT Side Ported
2F1C03	518-00118-0	1/2" NPT Side Ported

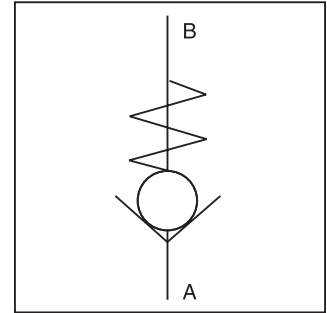
Size	ISO-code	x1	x2	x3	x4	x5	x6	y1	y2	y3	y4	y5
02	6263-AM-07-2-A	76.2 (3.00)	79.4 (3.13)	9.5 (0.37)	44.5 (1.75)	19.0 (0.75)	-	82.5 (3.25)	23.8 (0.94)	30.2 (1.19)	41.3 (1.63)	39.7 (1.56)
03	6263-AK-06-2-A	101.6 (4.00)	103.2 (4.06)	20.6 (0.81)	52.4 (2.06)	31.8 (1.25)	0.8 (0.03)	101.6 (4.00)	28.6 (1.13)	15.1 (0.59)	75.4 (2.97)	26.2 (1.03)

Size	ISO-code	B1	B2	H1	H2	H3	L1	L2	d1	d2	d3	d4
02	6263-AM-07-2-A	101.6 (4.00)	38.1 (1.50)	119.6 (4.71)	87.4 (3.44)	6.4 (0.25)	95.2 (3.75)	47.6 (1.87)	6.4 (0.25)	57.2 (2.25)	8.7 (0.34)	14.2 (0.56)
03	6263-AK-06-2-A	123.8 (4.87)	42.9 (1.69)	121.4 (4.78)	89.2 (3.51)	6.4 (0.25)	123.8 (4.87)	61.9 (2.44)	9.5 (0.37)	57.2 (2.25)	10.5 (0.41)	22.4 (0.88)

Size	ISO-Code	Bolt Kit  DIN912 12.9		Seal  Kit Fluorocarbon	Surface Finish 
02	6263-AM-07-2-A	BK-700-70842-8 4xM8x100	31.8 Nm (23.5 lb.-ft.) ±15%	S26-98617-5	$\sqrt{R_{max}6.3}$ $\square 0.01/100$
03	6263-AK-06-2-A	BK395 4xM10x100	63 Nm (46.5 lb.-ft.) ±15%		

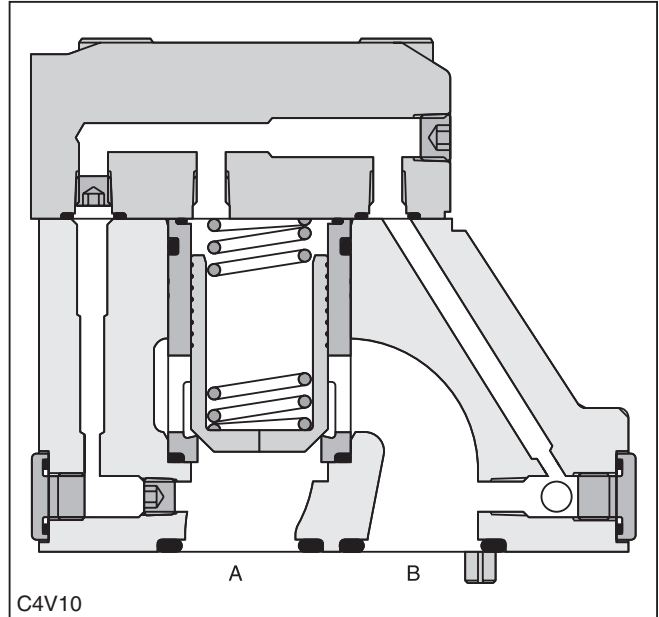
### General Description

Series C4V direct operated check valves allow free flow from A to B. The counter direction is blocked. Series C4V valves are equipped with a leak-free seat type cartridge.



### Operation

The pressure arising in port A lifts the poppet from the valve seat and releases the flow to B. In the counter direction, the spring and the pressure on top of the cartridge hold the poppet onto the seat and block the flow.



## E

### Features

- High flow, low pressure drop design
- Minimal internal leakage
- Six crack pressure options

### Ordering Information

**C4V**

Direct Operated  
Check Valve

□

Size

**5**

Maximum  
Pressure  
350 Bar  
(5075 PSI)

**3**

Subplate  
Mounting

**0**

Approximate  
Cracking  
Pressure

**B**

Design  
Series

□

Seal

□

Options  
Check  
with  
Factory

Code	Description
03	NG10
06	NG25
10	NG32

Code	Description
1	Nitrile
5	Fluorocarbon

#### Weight:

C4V03	2.8 kg (6.2 lbs)
C4V06	4.6 kg (10.1 lbs.)
C4V10	6.1 kg (13.5 lbs.)

Code	Description
<b>C4V03</b>	
1	2.8 Bar (40.6 PSI)
2	0.5 Bar (7.3 PSI)
3	0.3 Bar (4.4 PSI)
4	2.2 Bar (31.9 PSI)
5	—
6	1.2 Bar (17.4 PSI)
7	3.0 Bar (43.5 PSI)
<b>C4V06 / C4V10</b>	
1	3.5 Bar (50.8 PSI)
2	0.5 Bar (7.3 PSI)
3	0.3 Bar (4.4 PSI)
4	2.2 Bar (31.9 PSI)
5	9.0 Bar (130.5 PSI)
6	1.2 Bar (17.4 PSI)
7	—

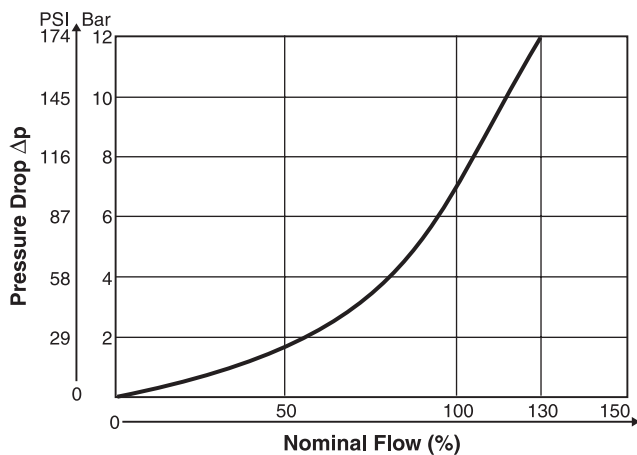
**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

### Specifications

General		NG10	NG25	NG32
<b>Size</b>				
<b>Subplate Mounting</b>		ISO 5781		
<b>Mounting Position</b>		Unrestricted		
<b>Ambient Temperature Range</b>		-20°C to +80°C (-4°F to +176°F)		
Hydraulic				
<b>Maximum Operating Pressure</b>		350 Bar (5075 PSI)		
<b>Pressure Range</b>		105 Bar (1523 PSI), 210 Bar (3045 PSI), 350 Bar (5075 PSI)		
<b>Nominal Flow</b>		150 LPM (39.7 GPM)	270 LPM (71.4 GPM)	450 LPM (119.0 GPM)
<b>Fluid</b>		Hydraulic oil to DIN 51524		
<b>Viscosity</b>	<b>Recommended Permitted</b>	30 to 50 cSt / mm <sup>2</sup> /s (139 to 232 SSU) 20 to 380 cSt / mm <sup>2</sup> /s (93 to 1761 SSU)		
<b>Fluid Temperature</b>	<b>Recommended Permitted</b>	+30°C to +50°C (86°F to +122°F) -20°C to +70°C (-4°F to +158°F)		
<b>Filtration</b>		ISO Class 4406 (1999) 18/16/13 (meet NAS 1638:7)		



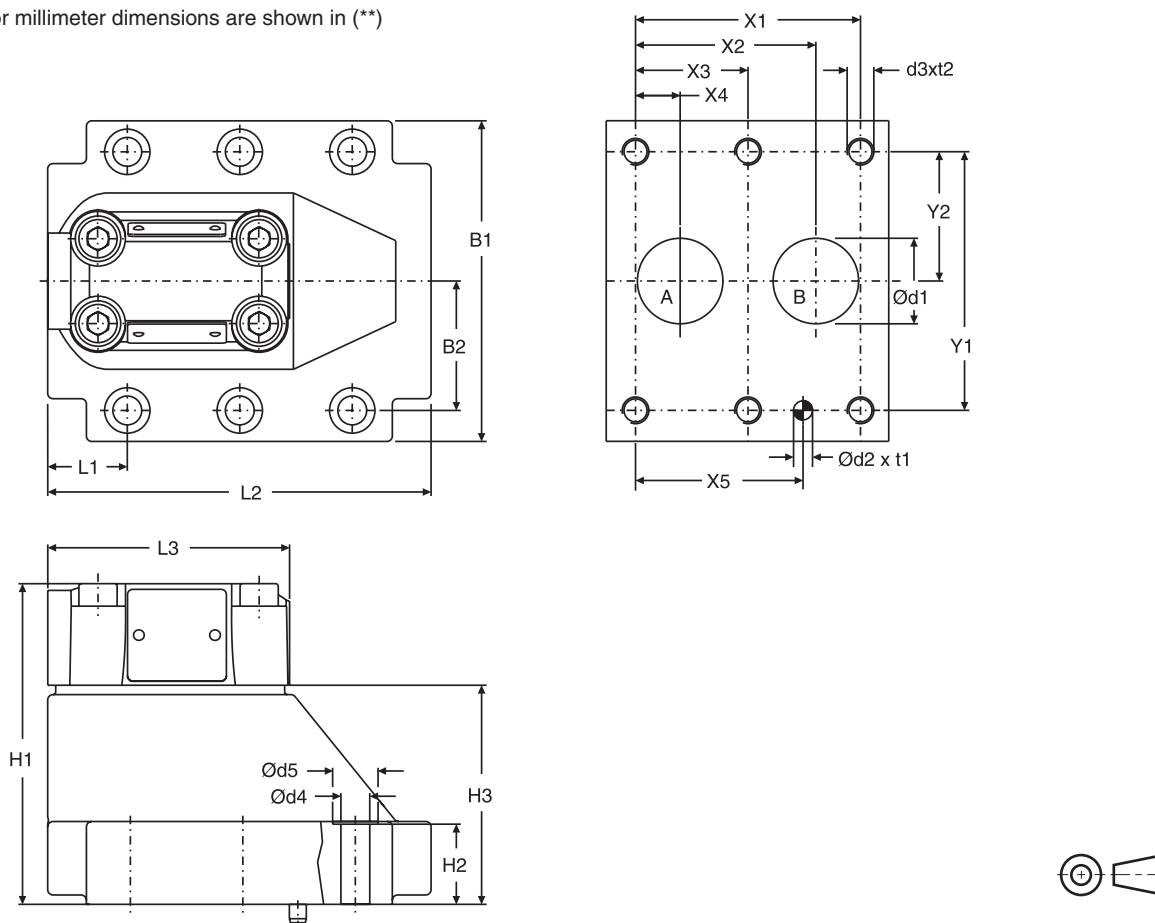
### Performance Curve



**Dimensions**

**Check Valves  
Series C4V (Direct Operated)**

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



**E**

NG	ISO-code	x1	x2	x3	x4	x5	y1	y2	B1	B2	H1	H2	H3	L1	L2
10	5781-06-07-0-00	42.9 (1.69)	35.8 (1.41)	-	7.2 (0.28)	31.8 (1.25)	66.7 (2.63)	33.4 (1.31)	87.3 (3.44)	33.4 (1.31)	83.0 (3.27)	21.0 (0.83)	45.0 (1.77)	29.0 (1.14)	94.8 (3.73)
25	5781-08-10-0-00	60.3 (2.37)	49.2 (1.94)	-	11.1 (0.44)	44.5 (1.75)	79.4 (3.13)	39.7 (1.56)	105.0 (4.13)	39.7 (1.56)	109.5 (4.31)	29.0 (1.14)	71.5 (2.81)	34.7 (1.37)	126.8 (4.99)
32	5781-10-13-0-00	84.2 (3.31)	67.5 (2.66)	42.1 (1.66)	16.7 (0.66)	62.7 (2.47)	96.8 (3.81)	48.4 (1.91)	120.0 (4.72)	48.4 (1.91)	120.0 (4.72)	29.0 (1.14)	82.0 (3.23)	30.6 (1.20)	144.3 (5.68)

Tolerance for all dimensions ±0.2 mm (0.01 inches)

NG	ISO-code	d1max	d2	t1	d3	t2	d4	d5
10	5781-06-07-0-00	15.0 (0.59)	7.1 (0.28)	8.0 (0.31)	M10	16.0 (0.63)	10.8 (0.43)	17.0 (0.67)
25	5781-08-10-0-00	23.4 (0.92)	7.1 (0.28)	8.0 (0.31)	M10	18.0 (0.71)	10.8 (0.43)	17.0 (0.67)
32	5781-10-13-0-00	32.0 (1.26)	7.1 (0.28)	8.0 (0.31)	M10	20.0 (0.79)	10.8 (0.43)	17.0 (0.67)

NG	ISO-code	Bolt Kit			Seal  Kit		Surface finish
					Nitrile	Fluorocarbon	
10	5781-06-07-0-00	BK505	4xM10 x 35 DIN 912 12.9	68 Nm (50.2 lb-ft) ±15%	S16-39362-0	S16-39362-5	
25	5781-08-10-0-00	BK485	4xM10 x 45 DIN 912 12.9	68 Nm (50.2 lb-ft) ±15%	S16-39364-0	S16-39364-5	
32	5781-10-13-0-00	BK506	6xM10 x 45 DIN 912 12.9	68 Nm (50.2 lb-ft) ±15%	S16-39366-0	S16-39366-5	

**General Description**

Series C4V hydraulically pilot operated check valves allow free flow from A to B. The counter-flow direction is blocked.

When pressure is applied to control port X, the ring chamber flow from B to A is released.

Up to four different pilot control ratios are available (see Ordering Information).

Check valves allow free flow from A to B. The counter direction is blocked. The C4V series are equipped with a leak-free seat type cartridge.

**Operation**

When no pressure is applied to the X-port, the flow from B to A is blocked, because the pressure in B is also in effect on top of the poppet.

Pressurizing the X port relieves the area on top of the poppet to the drain port and allows flow from B to A.

The seat design of the C4V valve series provides leak-free separation of port A and B in the closed position.

**Features**

- High flow, low pressure drop design
- Minimal internal leakage

**Ordering Information**

**C4V**

Pilot Operated Check Valve

Size

**5**

Maximum Pressure  
350 Bar  
(5075 PSI)

**9**

Y1 Port  
G1/4"

Opening Ratio

Approximate Cracking Pressure

**B**

Design Series

Seal

Options Check with Factory

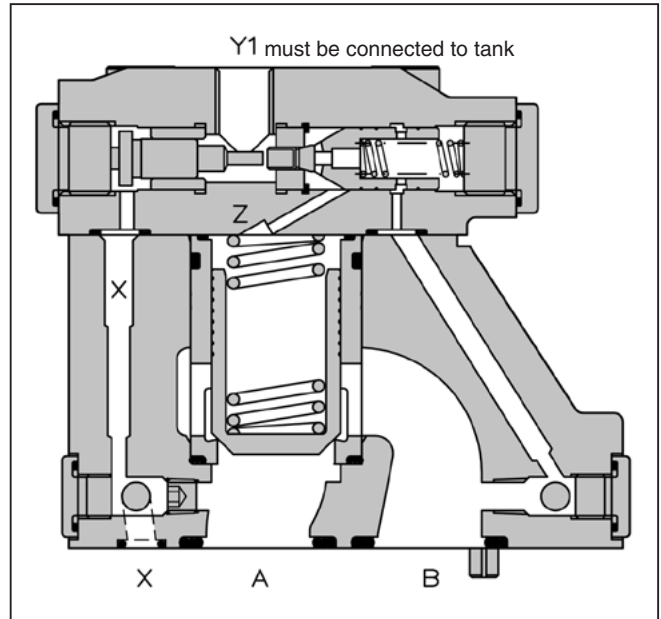
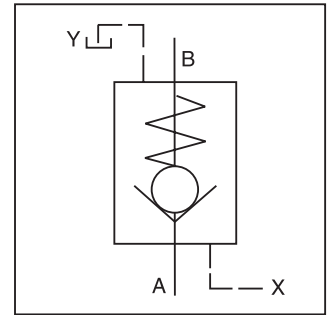
Code	Description
03	NG10
06	NG25
10	NG32

Code	Description
1	1:1
3	3:1
8	8:1
9	10:1

Code	Description
1	Nitrile
5	Fluorocarbon

**Weight:**

C4V03	2.8 kg (6.2 lbs)
C4V06	4.6 kg (10.1 lbs.)
C4V10	6.1 kg (13.5 lbs.)



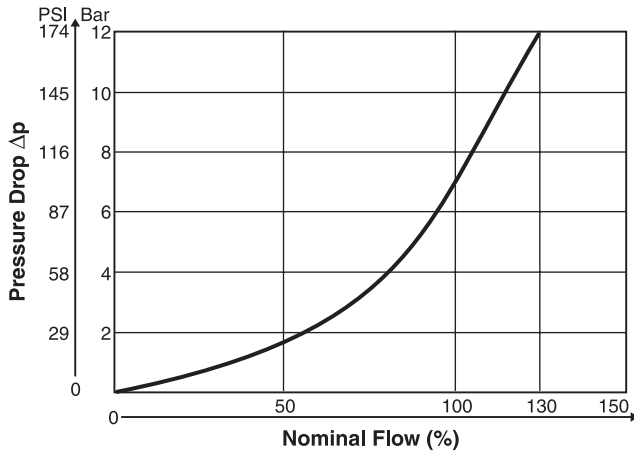
Code	Description	Flow A to B	Flow A to B
		<b>Flow A to B</b>	<b>Flow A to B</b>
		<b>C4V03</b>	<b>C4V06 / C4V10</b>
2	1.0 Bar (14.5 PSI)	1.0 Bar (14.5 PSI)	1.0 Bar (14.5 PSI)
4	4.0 Bar (58.0 PSI)	3.5 Bar (50.8 PSI)	3.5 Bar (50.8 PSI)
6	2.0 Bar (29.0 PSI)	2.2 Bar (31.9 PSI)	2.2 Bar (31.9 PSI)
		<b>Flow B to A</b>	<b>Flow B to A</b>
		<b>C4V03</b>	<b>C4V06 / C4V10</b>
2	1.5 Bar (21.8 PSI)	1.7 Bar (24.7 PSI)	1.7 Bar (24.7 PSI)
4	5.5 Bar (79.8 PSI)	6.0 Bar (87.0 PSI)	6.0 Bar (87.0 PSI)
6	3.0 Bar (43.5 PSI)	3.8 Bar (55.1 PSI)	3.8 Bar (55.1 PSI)

### Specifications

General				
Size	NG10		NG25	NG32
Subplate Mounting	ISO 5781			
Mounting Position	Unrestricted			
Ambient Temperature Range	-20°C to +80°C (-4°F to +176°F)			
Hydraulic				
Maximum Operating Pressure	350 Bar (5075 PSI)			
Nominal Flow	150 LPM (39.7 GPM)	270 LPM (71.4 GPM)	450 LPM (119.0 GPM)	
Fluid	Hydraulic oil to DIN 51524			
Viscosity	<b>Recommended Permitted</b>	30 to 50 cSt / mm <sup>2</sup> /s (139 to 232 SSU) 20 to 380 cSt / mm <sup>2</sup> /s (93 to 1761 SSU)		
Fluid Temperature	<b>Recommended Permitted</b>	+30°C to +50°C (86°F to +122°F) -20°C to +70°C (-4°F to +158°F)		
Filtration	ISO Class 4406 (1999) 18/16/13 (meet NAS 1638:7)			

**E**

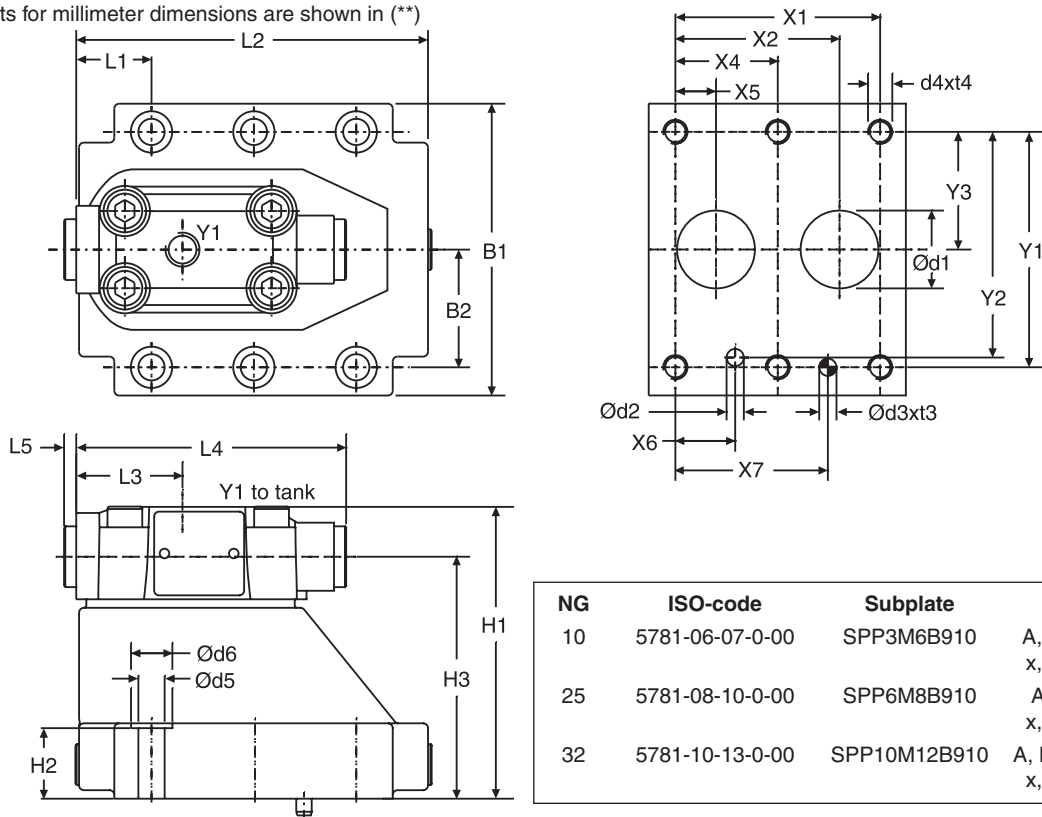
### Performance Curve



**Dimensions**

**Check Valves  
Series C4V (Pilot Operated)**

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



NG	ISO-code	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3	y4	y5	y6
10	5781-06-07-0-00	42.9 (1.69)	35.8 (1.41)	-	-	7.2 (0.28)	21.5 (0.85)	31.8 (1.25)	66.7 (2.63)	58.8 (2.31)	33.4 (1.31)	-	-	-
25	5781-08-10-0-00	60.3 (2.37)	49.2 (1.94)	-	-	11.1 (0.44)	20.6 (0.81)	44.5 (1.75)	79.4 (3.13)	73.0 (2.87)	39.7 (1.56)	-	-	-
32	5781-10-13-0-00	84.2 (3.31)	67.5 (2.66)	-	42.1 (1.66)	16.7 (0.66)	24.6 (0.97)	62.7 (2.47)	96.8 (3.81)	92.8 (3.65)	48.4 (1.91)	-	-	-

Tolerance for all dimensions ±0.2 mm (0.01 inches)

NG	ISO-code	B1	B2	H1	H2	H3	H4	H5	H6	L1	L2	L3	L4	L5	L6
10	5781-06-07-0-00	87.3 (3.44)	33.4 (1.31)	83.0 (3.27)	21.0 (0.83)	62.5 (2.46)	-	-	-	29.4 (1.16)	95.2 (3.75)	43.7 (1.72)	111.0 (4.37)	5.0 (0.20)	-
25	5781-08-10-0-00	105 (4.13)	39.7 (1.56)	109.5 (4.31)	29.0 (1.14)	89.0 (3.50)	-	-	-	35.1 (1.38)	127.2 (5.01)	43.7 (1.72)	111.0 (4.37)	5.0 (0.20)	-
32	5781-10-13-0-00	120 (4.72)	48.4 (1.91)	120.0 (4.72)	29.0 (1.14)	99.5 (3.92)	-	-	-	31.0 (1.22)	144.7 (5.70)	43.7 (1.72)	111.0 (4.37)	5.0 (0.20)	-

NG	ISO-code	d1max	d2max	d3	t3	d4	t4	d5	d6
10	5781-06-07-0-00	15.0 (0.59)	7.0 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	16.0 (0.63)	10.8 (0.43)	17.0 (0.67)
25	5781-08-10-0-00	23.4 (0.92)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	18.0 (0.71)	10.8 (0.43)	17.0 (0.67)
32	5781-10-13-0-00	32.0 (1.26)	7.1 (0.28)	7.1 (0.28)	8.0 (0.31)	M10	20.0 (0.79)	10.8 (0.43)	17.0 (0.67)

NG	ISO-code	Bolt Kit	Seal Kit	Seal Kit		Surface finish	
				Nitrile	Fluorocarbon		
10	5781-06-07-0-00	BK505	4xM10 x 35 DIN 912 12.9	68 Nm (50.2 lb-ft) ±15%	S16-39362-0	S16-39362-5	
25	5781-08-10-0-00	BK485	4xM10 x 45 DIN 912 12.9	68 Nm (50.2 lb-ft) ±15%	S16-39364-0	S16-39364-5	
32	5781-10-13-0-00	BK506	6xM10 x 45 DIN 912 12.9	68 Nm (50.2 lb-ft) ±15%	S16-39366-0	SS16-39366-5	



**General Description**

Series C5V direct operated check valves provide free flow in one direction and block the flow in the counter direction.

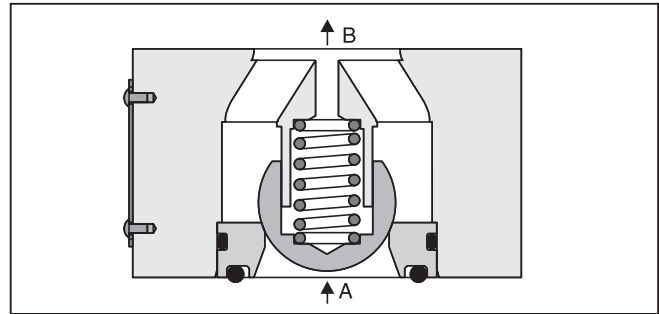
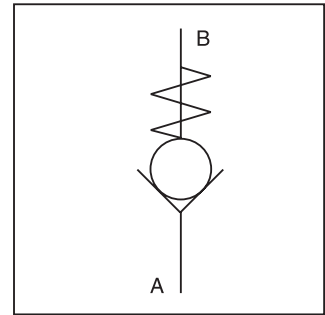
The SAE flanges allow to mount the C5V directly on the pressure port of pumps for protection against pressure shocks from the system.

**Operation**

The ball is held on its seat by a spring under zero pressure condition. When flow is increased to the cracking pressure, free flow is allowed from port A to port B. Blocked flow is created when operating pressure and spring on Port B exceed pressure on port A.

**Features**

- Direct operated check valve
- SAE 61 and SAE 62 flanges
- 4 sizes (SAE 3/4", 1", 1 1/4", 1 1/2")
- 3 springs
- 2 different seal configurations



**E**

**Ordering Information**

<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">C5V</div> <p>Direct Operated Check Valve</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Size</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Flange</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Body Sealing</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Cracking Pressure</p>	<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">B</div> <p>Design Series</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Seal</p>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <p>Options</p>																																	
<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> </thead> <tbody> <tr><td>06</td><td>SAE 3/4"</td></tr> <tr><td>08</td><td>SAE 1"</td></tr> <tr><td>10</td><td>SAE 1 1/4"</td></tr> <tr><td>12</td><td>SAE 1 1/2"</td></tr> </tbody> </table>	Code	Description	06	SAE 3/4"	08	SAE 1"	10	SAE 1 1/4"	12	SAE 1 1/2"	<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> </thead> <tbody> <tr><td>3</td><td>SAE 61</td></tr> <tr><td>6</td><td>SAE 62</td></tr> </tbody> </table>	Code	Description	3	SAE 61	6	SAE 62	<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> </thead> <tbody> <tr><td>0</td><td>0.5 Bar (7 PSI)</td></tr> <tr><td>1</td><td>1.0 Bar (15 PSI)</td></tr> <tr><td>2</td><td>2.0 Bar (29 PSI)</td></tr> </tbody> </table>	Code	Description	0	0.5 Bar (7 PSI)	1	1.0 Bar (15 PSI)	2	2.0 Bar (29 PSI)	<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> </thead> <tbody> <tr><td>1</td><td>Nitrile</td></tr> <tr><td>5</td><td>Fluorocarbon</td></tr> </tbody> </table>	Code	Description	1	Nitrile	5	Fluorocarbon	<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> </thead> <tbody> <tr><td>Omit</td><td>Standard</td></tr> <tr><td>019*</td><td>C5V10 for M14 Mounting Screws</td></tr> </tbody> </table> <p style="font-size: small; margin-top: 5px;">* For SAE 62 only.</p>	Code	Description	Omit	Standard	019*	C5V10 for M14 Mounting Screws
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Code	Description
1	Sealing for Port A
2*	Sealing for Ports A and X
3	Without Sealing

\* For combination with R5U Unloading Valve (SAE 61 only).

**Weight:**

C5V06	0.6 kg (1.3 lbs.)
C5V08	0.9 kg (2.0 lbs.)
C5V10	1.3 kg (2.9 lbs.)
C5V12	1.8 kg (4.0 lbs.)

**WARNING:** This product can expose you to chemicals including Lead, Nickel (Metallic), or 1,3-Butadiene which are known to the State of California to cause cancer, and Lead or 1,3-Butadiene which is known to the State of California to cause birth defects and other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



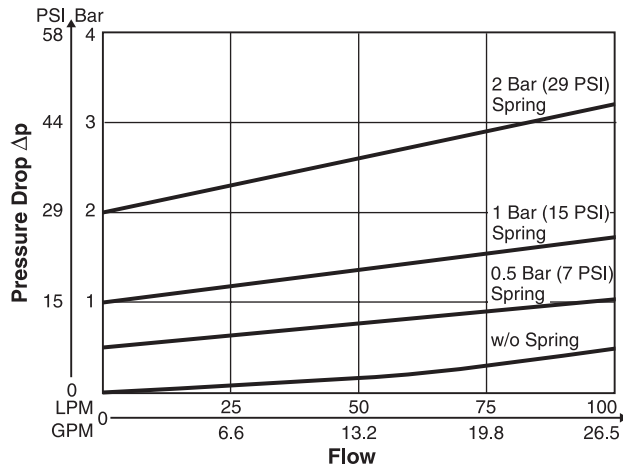
**Specifications**

General				
<b>Size</b>	<b>06 (3/4")</b>	<b>08 (1")</b>	<b>10 (1 1/4")</b>	<b>12 (1 1/2")</b>
<b>Mounting</b>	2-port in-line flange SAE 61 and SAE 62			
<b>Mounting Position</b>	Unrestricted			
<b>Ambient Temperature</b>	-20°C to +50°C (-4°F to +122°F)			
Hydraulic				
<b>Maximum Operating Pressure</b>				
<b>SAE 61</b>	350 Bar (5075 PSI)	350 Bar (5075 PSI)	280 Bar (4060 PSI)	210 Bar (3045 PSI)
<b>SAE 62</b>	420 Bar (6090 PSI)	420 Bar (6090 PSI)	420 Bar (6090 PSI)	420 Bar (6090 PSI)
<b>Nominal Flow</b>	100 LPM (26.5 GPM)	200 LPM (52.9 GPM)	400 LPM (105.8 GPM)	750 LPM (198.4 GPM)
<b>Fluid</b>	Hydraulic oil in accordance with DIN 51524...51525			
<b>Fluid Temperature</b>	-20°C to +80°C (-4°F to +176°F)			
<b>Viscosity Permitted</b>	10 to 650 cSt / mm <sup>2</sup> /s (46 to 3013 SSU)			
<b>Recommended</b>	30 cSt / mm <sup>2</sup> /s (139 SSU)			
<b>Filtration</b>	ISO 4406 (1999) 18/16/13 (acc. NAS 1638:7)			

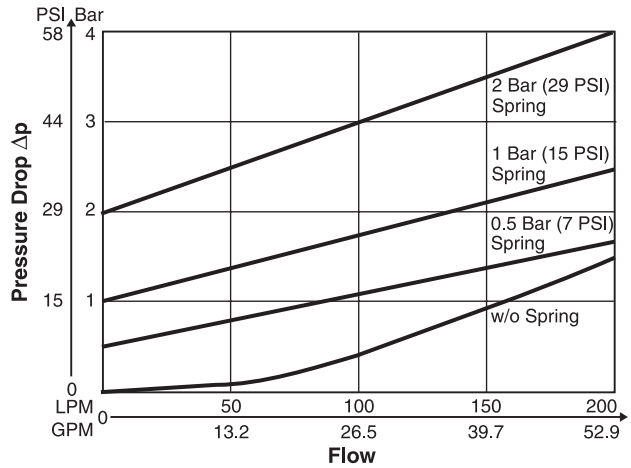
**E**

**Performance Curves**

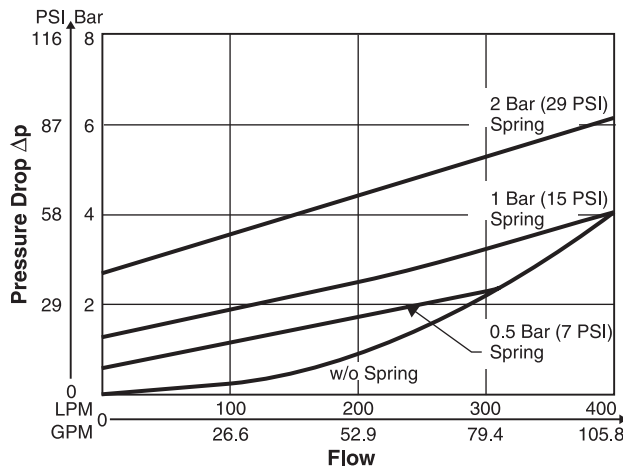
**C5V06**



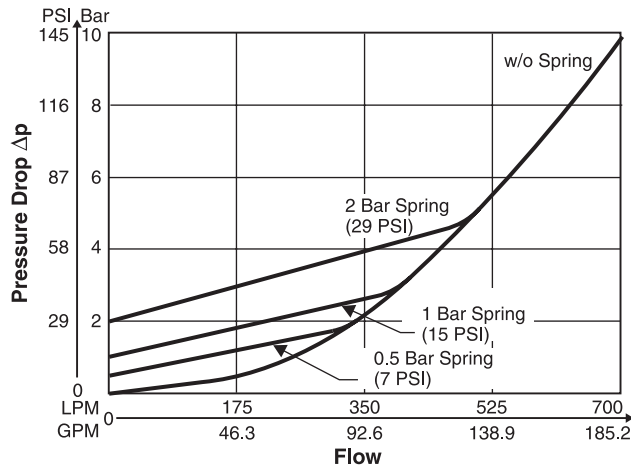
**C5V08**



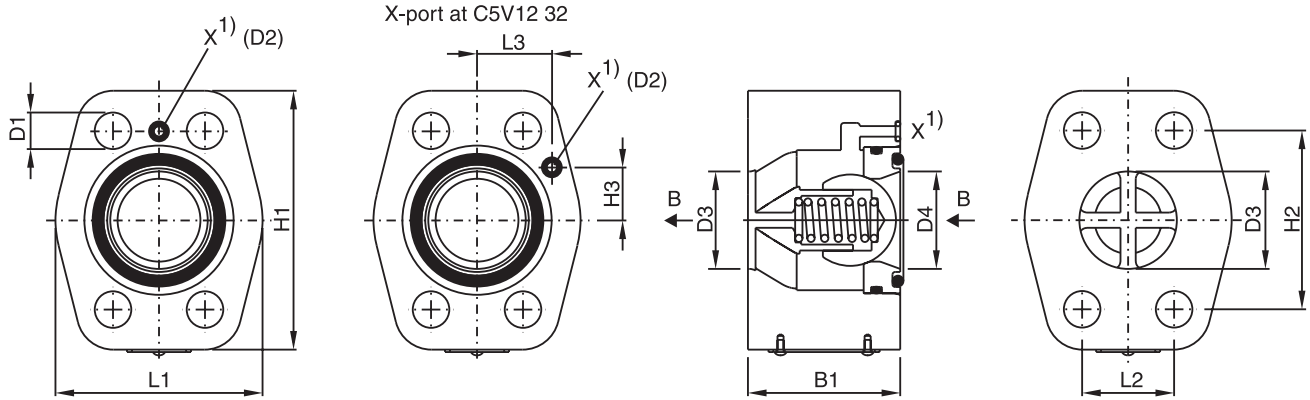
**C5V10**



**C5V12**



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



Position of O-ring seal according to ordering information

<sup>1)</sup> X1 port for C5V\*32\* (for use with Unloading Valve R5U)

**E**

Series	Nominal Size	L1	L2	L3	H1	H2	H3	B1	D1	D2	D3 + 0.8	D4	
C5V06	3/4"	SAE 61	48.0 (1.89)	22.2 (0.87)	27.2 (1.07)	64.0 (2.52)	47.6 (1.87)	22.4 (0.88)	45.0 (1.77)	10.5 (0.41)	Ø3.0 (0.12)	19.0 (0.75)	19.0 (0.75)
		SAE 62	48.0 (1.89)	23.8 (0.94)	27.2 (1.07)	64.0 (2.52)	50.8 (2.00)	22.4 (0.88)	45.0 (1.77)	10.5 (0.41)	-	19.0 (0.75)	19.0 (0.75)
C5V08	1"	SAE 61	60.0 (2.36)	26.2 (1.03)	27.2 (1.07)	74.0 (2.91)	52.4 (2.06)	22.4 (0.88)	45.0 (1.77)	10.5 (0.41)	Ø3.0 (0.12)	25.0 (0.98)	25.0 (0.98)
		SAE 62	60.0 (2.36)	27.8 (1.09)	27.2 (1.07)	74.0 (2.91)	57.2 (2.25)	22.4 (0.88)	45.0 (1.77)	12.5 (0.49)	-	25.0 (0.98)	25.0 (0.98)
C5V10	1 1/4"	SAE 61	68.0 (2.68)	30.2 (1.19)	27.2 (1.07)	85.0 (3.35)	58.7 (2.31)	22.4 (0.88)	50.0 (1.97)	12.5 (0.49)	Ø3.0 (0.12)	32.0 (1.26)	32.0 (1.26)
		SAE 62	68.0 (2.68)	31.8 (1.25)	27.2 (1.07)	85.0 (3.35)	66.7 (2.63)	22.4 (0.88)	50.0 (1.97)	13.5* (0.53)	-	32.0 (1.26)	32.0 (1.26)
C5V12	1 1/2"	SAE 61	80.0 (3.15)	35.7 (1.41)	27.2 (1.07)	104.0 (4.09)	69.8 (2.75)	22.4 (0.88)	50.0 (1.97)	13.5 (0.53)	Ø3.0 (0.12)	42.0 (1.65)	38.0 (1.50)
		SAE 62	80.0 (3.15)	36.5 (1.44)	27.2 (1.07)	104.0 (4.09)	79.4 (3.13)	22.4 (0.88)	50.0 (1.97)	17.0 (0.67)	-	42.0 (1.65)	38.0 (1.50)

\* D1 = 15 (0.59) at option code 019 for M14 mounting screws.

Seal Kits		
NG	Nitrile	Fluorocarbon
3	S26-75409-0	S26-75409-5
6	S26-75410-0	S26-75410-5
10	S26-75411-0	S26-75411-5
12	S26-75412-0	S26-75412-5

# Terms of Sale with Warranty Limitations

## PARKER-HANNIFIN CORPORATION — HYDRAULIC VALVE DIVISION OFFER OF SALE

**1. Definitions.** As used herein, the following terms have the meanings indicated.

- Buyer:** means any customer receiving a Quote for Products from Seller.  
**Goods:** means any tangible part, system or component to be supplied by the Seller.  
**Products:** means the Goods, Services and/or Software as described in a Quote provided by the Seller.  
**Quote:** means the offer or proposal made by Seller to Buyer for the supply of Products.  
**Seller:** means Parker-Hannifin Corporation, including all divisions and businesses thereof.  
**Services:** means any services to be supplied by the Seller.  
**Software:** means any software related to the Products, whether embedded or separately downloaded.  
**Terms:** means the terms and conditions of this Offer of Sale or any newer version of the same as published by Seller electronically at [www.parker.com/saleterms](http://www.parker.com/saleterms).

**2. Terms.** All sales of Products by Seller are contingent upon, and will be governed by, these Terms and, these Terms are incorporated into any Quote provided by Seller to any Buyer. Buyer's order for any Products whether communicated to Seller verbally, in writing, by electronic data interface or other electronic commerce, shall constitute acceptance of these Terms. Seller objects to any contrary or additional terms or conditions of Buyer. Reference in Seller's order acknowledgement to Buyer's purchase order or purchase order number shall in no way constitute an acceptance of any of Buyer's terms of purchase. No modification to these Terms will be binding on Seller unless agreed to in writing and signed by an authorized representative of Seller.

**3. Price; Payment.** The Products set forth in Seller's Quote are offered for sale at the prices indicated in Seller's Quote. Unless otherwise specifically stated in Seller's Quote, prices are valid for thirty (30) days and do not include any sales, use, or other taxes or duties. Seller reserves the right to modify prices at any time to adjust for any raw material price fluctuations. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). All sales are contingent upon credit approval and payment for all purchases is due thirty (30) days from the date of invoice (or such date as may be specified in the Quote). Unpaid invoices beyond the specified payment date incur interest at the rate of 1.5% per month or the maximum allowable rate under applicable law.

**4. Shipment; Delivery; Title and Risk of Loss.** All delivery dates are approximate. Seller is not responsible for damages resulting from any delay. Regardless of the manner of shipment, delivery occurs and title and risk of loss or damage pass to Buyer, upon placement of the Products with the shipment carrier at Seller's facility. Unless otherwise agreed, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferral of shipment at Buyers' request beyond the respective indicated shipping date will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.

**5. Warranty.** The warranty related to the Products is as follows: (i) Goods are warranted against defects in material or workmanship for a period of eighteen (18) months from the date of delivery; (ii) Services shall be performed in accordance with generally accepted practices and using the degree of care and skill that is ordinarily exercised and customary in the field to which the Services pertain and are warranted for a period of six (6) months from the completion of the Services by Seller; and (iii) Software is only warranted to perform in accordance with applicable specifications provided by Seller to Buyer for ninety (90) days from the date of delivery or, when downloaded by a Buyer or end-user, from the date of the initial download. All prices are based upon the exclusive limited warranty stated above, and upon the following disclaimer:

**DISCLAIMER OF WARRANTY: THIS WARRANTY IS THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. SELLER DOES NOT WARRANT THAT THE SOFTWARE IS ERROR-FREE OR FAULT-TOLERANT, OR THAT BUYER'S USE THEREOF WILL BE SECURE OR UNINTERRUPTED. BUYER AGREES AND ACKNOWLEDGES THAT UNLESS OTHERWISE AUTHORIZED IN WRITING BY SELLER THE SOFTWARE SHALL NOT BE USED IN CONNECTION WITH HAZARDOUS OR HIGH RISK ACTIVITIES OR ENVIRONMENTS. EXCEPT AS EXPRESSLY STATED HEREIN, ALL PRODUCTS ARE PROVIDED "AS IS".**

**6. Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon receipt. No claims for shortages will be allowed unless reported to the Seller within ten (10) days of delivery. Buyer shall notify Seller of any alleged breach of warranty within thirty (30) days after the date the non-conformance is or should have been discovered by Buyer. Any claim or action against Seller based upon breach of contract or any other theory, including tort, negligence, or otherwise must be commenced within twelve (12) months from the date of the alleged breach or other alleged event, without regard to the date of discovery.

**7. LIMITATION OF LIABILITY.** IN THE EVENT OF A BREACH OF WARRANTY, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE THE NON-CONFORMING PRODUCT, RE-PERFORM THE SERVICES, OR REFUND THE PURCHASE PRICE PAID WITHIN A REASONABLE PERIOD OF TIME. **IN NO EVENT IS SELLER LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, NON-COMPLETION OF SERVICES, USE, LOSS OF USE OF, OR INABILITY TO USE THE PRODUCTS OR ANY PART THEREOF, LOSS OF DATA, IDENTITY, PRIVACY, OR CONFIDENTIALITY, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, WHETHER BASED IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCTS.**

**8. Loss to Buyer's Property.** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which are or become Buyer's property, will be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer ordering the Products 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. Special Tooling.** Special Tooling includes but is not limited to tooling, jigs, fixtures and associated manufacturing equipment acquired or necessary to manufacture Products. A tooling charge may be imposed for any Special Tooling. 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 Special Tooling belonging to Seller that is utilized in the manufacture of the Products, even if such Special Tooling has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller has the right to alter, discard or otherwise dispose of any Special Tooling or other property in its sole discretion at any time.

**10. Security Interest.** To secure payment of all sums due, Seller retains a security interest in all Products delivered to Buyer and, Buyer's acceptance of these Terms is deemed to be a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

**11. User Responsibility.** The Buyer through its own analysis and testing, is solely responsible for making the final selection of the Products and assuring that all performance, endurance, maintenance, safety and warning requirements of the application of the Products are met. The Buyer must analyze all aspects of the application and follow applicable industry standards, specifications, and other technical information provided with the Product. If Seller provides Product options based upon data or specifications provided

by the Buyer, the Buyer is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products. In the event the Buyer is not the end-user, Buyer will ensure such end-user complies with this paragraph.

**12. Use of Products; Indemnity by Buyer.** Buyer shall comply with all instructions, guides and specifications provided by Seller with the Products. Unauthorized Uses. If Buyer uses or resells the Products for any uses prohibited in Seller's instructions, guides or specifications, or Buyer otherwise fails to comply with Seller's instructions, guides and specifications, Buyer acknowledges that any such use, resale, or non-compliance is at Buyer's sole risk. Buyer shall indemnify, defend, and hold Seller harmless from any losses, claims, liabilities, damages, lawsuits, judgments and costs (including attorney fees and defense costs), whether for personal injury, property damage, intellectual property infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, application, design, specification or other misuse of Products provided by Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, tooling, equipment, plans, drawings, designs or specifications or other information or things furnished by Buyer; (d) damage to the Products from an external cause, repair or attempted repair by anyone other than Seller, failure to follow instructions, guides and specifications provided by Seller, use with goods not provided by Seller, or opening, modifying, deconstructing or tampering with the Products for any reason; or (e) Buyer's failure to comply with these Terms. Seller shall not indemnify Buyer under any circumstance except as otherwise provided in these Terms.

**13. Cancellations and Changes.** Buyer may not cancel or modify any order for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller, at any time, may change Product features, specifications, designs and availability.

**14. Limitation on Assignment.** Buyer may not assign its rights or obligations without the prior written consent of Seller.

**15. Force Majeure.** Seller does not assume the risk and is not liable for delay or failure to perform any of Seller's obligations by reason of events or circumstances beyond its reasonable control ("Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

**16. Waiver and Severability.** Failure to enforce any provision of these Terms will not invalidate that provision; nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of these Terms by legislation or other rule of law shall not invalidate any other provision herein and, the remaining provisions will remain in full force and effect.

**17. Termination.** Seller may terminate any agreement governed by or arising from these Terms for any reason and at any time by giving Buyer thirty (30) days prior written notice. Seller may immediately terminate, in writing, if Buyer: (a) breaches any provision of these Terms (b) appoints a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or one if filed by a third party (d) makes an assignment for the benefit of creditors; or (e) dissolves its business or liquidates all or a majority of its assets.

**18. Ownership of Software.** Seller retains ownership of all Software supplied to Buyer hereunder. In no event shall Buyer obtain any greater right in and to the Software than a right in the nature of a license limited to the use thereof and subject to compliance with any other terms provided with the Software.

**19. Indemnity for Infringement of Intellectual Property Rights.** Seller is not liable for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights ("Intellectual Property Rights") except as provided in this Section. 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 a third party claim that one or more of the Products sold hereunder infringes the Intellectual Property Rights of a third party in the country of delivery of the Products by the Seller to the Buyer. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of any such claim, and Seller having sole control over the defense of the claim including all negotiations for settlement or compromise. If one or more Products sold hereunder is subject to such a claim, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Products, replace or modify the Products so as to render them non-infringing, or offer to accept return of the Products and refund the purchase price less a reasonable allowance for depreciation. Seller has no obligation or liability for any claim of infringement: (i) arising from information provided by Buyer; or (ii) directed to any Products provided hereunder for which the designs are specified in whole or part by Buyer; or (iii) resulting from the modification, combination or use in a system of any Products provided hereunder. The foregoing provisions of this Section constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for such claims of infringement of Intellectual Property Rights.

**20. Governing Law.** These Terms and the sale and delivery of all Products are deemed to have taken place in, and shall be governed and construed in accordance with, the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to the sale and delivery of the Products.

**21. Entire Agreement.** These Terms, along with the terms set forth in the main body of any Quote, forms the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. In the event of a conflict between any term set forth in the main body of a Quote and these Terms, the terms set forth in the main body of the Quote shall prevail. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter shall have no effect. These Terms may not be modified unless in writing and signed by an authorized representative of Seller.

**22. Compliance with Laws.** Buyer agrees to comply with all applicable laws, regulations, and industry and professional standards, including those of the United States of America, and the country or countries in which Buyer may operate, including without limitation the U.S. Foreign Corrupt Practices Act ("FCPA"), the U.S. Anti-Kickback Act ("Anti-Kickback Act"), U.S. and E.U. export control and sanctions laws ("Export Laws"), the U.S. Food Drug and Cosmetic Act ("FDCA"), and the rules and regulations promulgated by the U.S. Food and Drug Administration ("FDA"), each as currently amended. Buyer agrees to indemnify, defend, and hold harmless Seller from the consequences of any violation of such laws, regulations and standards by Buyer, its employees or agents. Buyer acknowledges that it is familiar with all applicable provisions of the FCPA, the Anti-Kickback Act, Export Laws, the FDCA and the FDA and certifies that Buyer will adhere to the requirements thereof and not take any action that would make Seller violate such requirements. Buyer represents and agrees that Buyer will not make any payment or give anything of value, directly or indirectly, to any governmental official, foreign political party or official thereof, candidate for foreign political office, or commercial entity or person, for any improper purpose, including the purpose of influencing such person to purchase Products or otherwise benefit the business of Seller. Buyer further represents and agrees that it will not receive, use, service, transfer or ship any Product from Seller in a manner or for a purpose that violates Export Laws or would cause Seller to be in violation of Export Laws.





# Parker Safety Guide for Selecting and Using Hose, Tubing, Fittings and Related Accessories

## Publication No. 4400-B.1

### Revised: October 2015, Rev A

**WARNING:** Failure or improper selection or improper use of hose, tubing, fittings, assemblies, valves, connectors, conductors or related accessories ("Products") can cause death, personal injury and property damage. Possible consequences of failure or improper selection or improper use of these Products include but are not limited to:

- Fittings thrown off at high speed.
- High velocity fluid discharge.
- Explosion or burning of the conveyed fluid.
- Electrocutation from high voltage electric powerlines.
- Contact with suddenly moving or falling objects that are controlled by the conveyed fluid.
- Injections by high-pressure fluid discharge.
- Dangerously whipping Hose.
- Tube or pipe burst.
- Weld joint fracture.
- Contact with conveyed fluids that may be hot, cold, toxic or otherwise injurious.
- Sparking or explosion caused by static electricity buildup or other sources of electricity.
- Sparking or explosion while spraying paint or flammable liquids.
- Injuries resulting from inhalation, ingestion or exposure to fluids.

Before selecting or using any of these Products, it is important that you read and follow the instructions below. No product from any division in Parker Fluid Connectors Group is approved for in-flight aerospace applications. For hoses and fittings used in in-flight aerospace applications, please contact Parker Aerospace Group.

## 1.0 GENERAL INSTRUCTIONS

1.1 Scope: This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) these Products. For convenience, all rubber and/or thermoplastic products commonly called "hose" or "tubing" are called "Hose" in this safety guide. Metallic tube or pipe are called "tube". All assemblies made with Hose are called "Hose Assemblies". All assemblies made with Tube are called "Tube Assemblies".

All products commonly called "fittings", "couplings" or "adapters" are called "Fittings". Valves are fluid system components that control the passage of fluid. Related accessories are ancillary devices that enhance or monitor performance including crimping, flaring, flanging, presetting, bending, cutting, deburring, swaging machines, sensors, tags, lockout handles, spring guards and associated tooling. This safety guide is a supplement to and is to be used with the specific Parker publications for the specific Hose, Fittings and Related Accessories that are being considered for use. Parker publications are available at [www.parker.com](http://www.parker.com). SAE J1273 ([www.sae.org](http://www.sae.org)) and ISO 17165-2 ([www.ansi.org](http://www.ansi.org)) also provide recommended practices for hydraulic Hose Assemblies, and should be followed.

1.2 Fail-Safe: Hose, Hose Assemblies, Tube, Tube Assemblies and Fittings can and do fail without warning for many reasons. Design all systems and equipment in a fail-safe mode, so that failure of the Hose, Hose Assembly, Tube, Tube Assembly or Fitting will not endanger persons or property.

1.3 Distribution: Provide a copy of this safety guide to each person responsible for selecting or using Hose, Tube and Fitting products. Do not select or use Parker Hose, Tube or Fittings without thoroughly reading and understanding this safety guide as well as the specific Parker publications for the Products.

1.4 User Responsibility: Due to the wide variety of operating conditions and applications for Hose, Tube and Fittings, Parker does not represent or warrant that any particular Hose, Tube or Fitting is suitable for any specific end use system. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The user, through its own analysis and testing, is solely responsible for:

- Making the final selection of the Products.
- Assuring that the user's requirements are met and that the application presents no health or safety hazards.
- Following the safety guide for Related Accessories and being trained to operate Related Accessories.
- Providing all appropriate health and safety warnings on the equipment on which the Products are used.
- Assuring compliance with all applicable government and industry standards.

1.5 Additional Questions: Call the appropriate Parker technical service department if you have any questions or require any additional information.

See the Parker publication for the Products being considered or used, or call 1-800-CPARKER, or go to [www.parker.com](http://www.parker.com), for telephone numbers of the appropriate technical service department.

## 2.0 HOSE, TUBE & FITTINGS SELECTION INSTRUCTIONS

2.1 Electrical Conductivity: Certain applications require that the Hose be nonconductive to prevent electrical current flow. Other applications require the Hose and the Fittings and the Hose/Fitting interface to be sufficiently conductive to drain off static electricity. Extreme care must be exercised when selecting Hose, Tube and Fittings for these or any other applications in which electrical conductivity or nonconductivity is a factor.

The electrical conductivity or nonconductivity of Hose, Tube and Fittings is dependent upon many factors and may be susceptible to change. These factors include but are not limited to the various materials used to make the Hose and the Fittings, Fitting finish (some Fitting finishes are electrically conductive while others are nonconductive), manufacturing methods (including moisture control), how the Fittings contact the Hose, age and amount of deterioration or damage or other changes, moisture content of the Hose at any particular time, and other factors.

The following are considerations for electrically nonconductive and conductive Hose. For other applications consult the individual catalog pages and the appropriate industry or regulatory standards for proper selection.

2.1.1 Electrically Nonconductive Hose: Certain applications require that the Hose be nonconductive to prevent electrical current flow or to maintain electrical isolation. For applications that require Hose to be electrically nonconductive, including but not limited to applications near high voltage electric lines, only special nonconductive Hose can be used. The manufacturer of the equipment in which the nonconductive Hose is to be used must be consulted to be certain that the Hose, Tube and Fittings that are selected are proper for the application. Do not use any Parker Hose or Fittings for any such application requiring nonconductive Hose, including but not limited to applications near high voltage electric lines or dense magnetic fields, unless (i) the application is expressly approved in the Parker technical publication for the product, (ii) the Hose is marked "nonconductive", and (iii) the manufacturer of the equipment on which the Hose is to be used specifically approves the particular Parker Hose, Tube and Fittings for such use.

2.1.2 Electrically Conductive Hose: Parker manufactures special Hose for certain applications that require electrically conductive Hose. Parker manufactures special Hose for conveying paint in airless paint spraying applications. This Hose is labeled "Electrically Conductive Airless Paint Spray Hose" on its layline and packaging. This Hose must be properly connected to the appropriate Parker Fittings and properly grounded in order to dissipate dangerous static charge buildup, which occurs in all airless paint spraying applications. Do not use any other Hose for airless paint spraying, even if electrically conductive. Use of any other Hose or failure to properly connect the Hose can cause a fire or an explosion resulting in death, personal injury, and property damage. All hoses that convey fuels must be grounded.

Parker manufactures a special Hose for certain compressed natural gas ("CNG") applications where static electricity buildup may occur. Parker CNG Hose assemblies comply with the requirements of ANSI/IAS NGV 4.2; CSA 12.52, "Hoses for Natural Gas Vehicles and Dispensing Systems"

([www.ansi.org](http://www.ansi.org)). This Hose is labeled "Electrically Conductive for CNG Use" on its layline and packaging. This Hose must be properly connected to the appropriate Parker Fittings and properly grounded in order to dissipate dangerous static charge buildup, which occurs in, for example, high velocity CNG dispensing or transfer. Do not use any other Hose for CNG applications where static charge buildup may occur, even if electrically conductive. Use of other Hoses in CNG applications or failure to properly connect or ground this Hose can cause a fire or an explosion resulting in death, personal injury, and property damage. Care must also be taken to protect against CNG permeation through the Hose wall. See section 2.6, Permeation, for more information. Parker CNG Hose is intended for dispenser and vehicle use within the specified temperature range. Parker CNG Hose should not be used in confined spaces or unventilated areas or areas exceeding the specified temperature range.



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Final assemblies must be tested for leaks. CNG Hose Assemblies should be tested on a monthly basis for conductivity per ANSI/IAS NGV 4.2; CSA 12.52.

Parker manufactures special Hose for aerospace in-flight applications. Aerospace in-flight applications employing Hose to transmit fuel, lubricating fluids and hydraulic fluids require a special Hose with a conductive inner tube. This Hose for in-flight applications is available only from Parker's Stratoflex Products Division. Do not use any other Parker Hose for in-flight applications, even if electrically conductive. Use of other Hoses for in-flight applications or failure to properly connect or ground this Hose can cause a fire or an explosion resulting in death, personal injury and property damage. These Hose assemblies for in-flight applications must meet all applicable aerospace industry, aircraft engine and aircraft requirements.

**2.2 Pressure:** Hose, Tube and Fitting selection must be made so that the published maximum working pressure of the Hose, Tube and Fittings are equal to or greater than the maximum system pressure. The maximum working pressure of a Hose, or Tube Assembly is the lower of the respective published maximum working pressures of the Hose, Tube and the Fittings used. Surge pressures or peak transient pressures in the system must be below the published maximum working pressure for the Hose, Tube and Fitting. Surge pressures and peak pressures can usually only be determined by sensitive electrical instrumentation that measures and indicates pressures at millisecond intervals. Mechanical pressure gauges indicate only average pressures and cannot be used to determine surge pressures or peak transient pressures. Published burst pressure ratings for Hose is for manufacturing test purposes only and is no indication that the Product can be used in applications at the burst pressure or otherwise above the published maximum recommended working pressure.

**2.3 Suction:** Hoses used for suction applications must be selected to insure that the Hose will withstand the vacuum and pressure of the system. Improperly selected Hose may collapse in suction application.

**2.4 Temperature:** Be certain that fluid and ambient temperatures, both steady and transient, do not exceed the limitations of the Hose, Tube, Fitting and Seals. Temperatures below and above the recommended limit can degrade Hose, Tube, Fittings and Seals to a point where a failure may occur and release fluid. Tube and Fittings performances are normally degraded at elevated temperature. Material compatibility can also change at temperatures outside of the rated range. Properly insulate and protect the Hose Assembly when routing near hot objects (e.g. manifolds). Do not use any Hose in any application where failure of the Hose could result in the conveyed fluids (or vapors or mist from the conveyed fluids) contacting any open flame, molten metal, or other potential fire ignition source that could cause burning or explosion of the conveyed fluids or vapors.

**2.5 Fluid Compatibility:** Hose, and Tube Assembly selection must assure compatibility of the Hose tube, cover, reinforcement, Tube, Plating and Seals with the fluid media used. See the fluid compatibility chart in the Parker publication for the product being considered or used. This information is offered only as a guide. Actual service life can only be determined by the end user by testing under all extreme conditions and other analysis.

Hose, and Tube that is chemically compatible with a particular fluid must be assembled using Fittings and adapters containing likewise compatible seals. Flange or flare processes can change Tube material properties that may not be compatible with certain requirements such as NACE

**2.6 Permeation:** Permeation (that is, seepage through the Hose or Seal) will occur from inside the Hose or Fitting to outside when Hose or Fitting is used with gases, liquid and gas fuels, and refrigerants (including but not limited to such materials as helium, diesel fuel, gasoline, natural gas, or LPG). This permeation may result in high concentrations of vapors which are potentially flammable, explosive, or toxic, and in loss of fluid. Dangerous explosions, fires, and other hazards can result when using the wrong Hose for such applications. The system designer must take into account the fact that this permeation will take place and must not use Hose or Fitting if this permeation could be hazardous. The system designer must take into account all legal, government, insurance, or any other special regulations which govern the use of fuels and refrigerants. Never use a Hose or Fitting even though the fluid compatibility is acceptable without considering the potential hazardous effects that can result from permeation through the Hose or Tube Assembly. Permeation of moisture from outside the Hose or Fitting to inside the

Hose or Fitting will also occur in Hose or Tube assemblies, regardless of internal pressure. If this moisture permeation would have detrimental effects (particularly, but not limited to refrigeration and air conditioning systems), incorporation of sufficient drying capacity in the system or other appropriate system safeguards should be selected and used. The sudden pressure release of highly pressurized gas could also result in Explosive Decompression failure of permeated Seals and Hoses.

**2.7 Size:** Transmission of power by means of pressurized fluid varies with pressure and rate of flow. The size of the components must be adequate to keep pressure losses to a minimum and avoid damage due to heat generation or excessive fluid velocity.

**2.8 Routing:** Attention must be given to optimum routing to minimize inherent problems (kinking or flow restriction due to Hose collapse, twisting of the Hose, proximity to hot objects or heat sources). For additional routing recommendations see SAE J1273 and ISO 17165-2. Hose Assemblies have a finite life and should be installed in a manner that allows for ease of inspection and future replacement. Hose because of its relative short life, should not be used in residential and commercial buildings inside of inaccessible walls or floors, unless specifically allowed in the product literature. Always review all product literature for proper installation and routing instructions.

**2.9 Environment:** Care must be taken to insure that the Hose, Tube and Fittings are either compatible with or protected from the environment (that is, surrounding conditions) to which they are exposed. Environmental conditions including but not limited to ultraviolet radiation, sunlight, heat, ozone, moisture, water, salt water, chemicals and air pollutants can cause degradation and premature failure.

**2.10 Mechanical Loads:** External forces can significantly reduce Hose, Tube and Fitting life or cause failure. Mechanical loads which must be considered include excessive flexing, twist, kinking, tensile or side loads, bend radius, and vibration. Use of swivel type Fittings or adapters may be required to insure no twist is put into the Hose. Use of proper Hose or Tube clamps may also be required to reduce external mechanical loads. Unusual applications may require special testing prior to Hose selection.

**2.11 Physical Damage:** Care must be taken to protect Hose from wear, snagging, kinking, bending smaller than minimum bend radius and cutting, any of which can cause premature Hose failure. Any Hose that has been kinked or bent to a radius smaller than the minimum bend radius, and any Hose that has been cut or is cracked or is otherwise damaged should be removed and discarded. Fittings with damages such as scratches on sealing surfaces and deformation should be replaced.

**2.12 Proper End Fitting:** See instructions 3.2 through 3.5. These recommendations may be substantiated by testing to industry standards such as SAE J517 for hydraulic applications, or MIL-A-5070, AS1339, or AS3517 for Hoses from Parker's Stratoflex Products Division for aerospace applications.

**2.13 Length:** When determining the proper Hose or Tube length of an assembly, be aware of Hose length change due to pressure, Tube length change due to thermal expansion or contraction, and Hose or Tube and machine tolerances and movement must be considered. When routing short hose assemblies, it is recommended that the minimum free hose length is always used. Consult the hose manufacturer for their minimum free hose length recommendations. Hose assemblies should be installed in such a way that any motion or flexing occurs within the same plane.

**2.14 Specifications and Standards:** When selecting Hose, Tube and Fittings, government, industry, and Parker specifications and recommendations must be reviewed and followed as applicable.

**2.15 Hose Cleanliness:** Hose and Tube components may vary in cleanliness levels. Care must be taken to insure that the Hose and Tube Assembly selected has an adequate level of cleanliness for the application.

**2.16 Fire Resistant Fluids:** Some fire resistant fluids that are to be conveyed by Hose or Tube require use of the same type of Hose or Tube as used with petroleum base fluids. Some such fluids require a special Hose, Tube, Fitting and Seal, while a few fluids will not work with any Hose at all. See instructions 2.5 and 1.5. The wrong Hose, Tube, Fitting or Seal may fail after a very short service. In addition, all liquids but pure water may burn fiercely under certain conditions, and even pure water leakage may be hazardous.

**2.17 Radiant Heat:** Hose and Seals can be heated to destruction without contact by such nearby items as hot manifolds or molten metal. The

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same heat source may then initiate a fire. This can occur despite the presence of cool air around the Hose or Seal. Performance of Tube and Fitting subjected to the heat could be degraded.

**2.18 Welding or Brazing:** When using a torch or arc welder in close proximity to hydraulic lines, the hydraulic lines should be removed or shielded with appropriate fire resistant materials. Flame or weld spatter could burn through the Hose or Seal and possibly ignite escaping fluid resulting in a catastrophic failure. Heating of plated parts, including Hose Fittings and adapters, above 450°F (232°C) such as during welding, brazing or soldering may emit deadly gases. Any elastomer seal on fittings shall be removed prior to welding or brazing, any metallic surfaces shall be protected after brazing or welding when necessary. Welding and brazing filler material shall be compatible with the Tube and Fitting that are joined.

**2.19 Atomic Radiation:** Atomic radiation affects all materials used in Hose and Tube assemblies. Since the long-term effects may be unknown, do not expose Hose or Tube assemblies to atomic radiation. Nuclear applications may require special Tube and Fittings.

**2.20 Aerospace Applications:** The only Hose, Tube and Fittings that may be used for in-flight aerospace applications are those available from Parker's Stratoflex Products Division. Do not use any other Hose or Fittings for in-flight applications. Do not use any Hose or Fittings from Parker's Stratoflex Products Division with any other Hose or Fittings, unless expressly approved in writing by the engineering manager or chief engineer of Stratoflex Products Division and verified by the user's own testing and inspection to aerospace industry standards.

**2.21 Unlocking Couplings:** Ball locking couplings or other Fittings with quick disconnect ability can unintentionally disconnect if they are dragged over obstructions, or if the sleeve or other disconnect member, is bumped or moved enough to cause disconnect. Threaded Fittings should be considered where there is a potential for accidental uncoupling.

### 3.0 HOSE AND FITTINGS ASSEMBLY AND INSTALLATION INSTRUCTIONS

**3.1 Component Inspection:** Prior to assembly, a careful examination of the Hose and Fittings must be performed. All components must be checked for correct style, size, catalog number, and length. The Hose must be examined for cleanliness, obstructions, blisters, cover looseness, kinks, cracks, cuts or any other visible defects. Inspect the Fitting and sealing surfaces for burrs, nicks, corrosion or other imperfections. Do NOT use any component that displays any signs of nonconformance.

**3.2 Hose and Fitting Assembly:** Do not assemble a Parker Fitting on a Parker Hose that is not specifically listed by Parker for that Fitting, unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division. Do not assemble a Parker Fitting on another manufacturer's Hose or a Parker Hose on another manufacturer's Fitting unless (i) the engineering manager or chief engineer of the appropriate Parker division approves the Assembly in writing or that combination is expressly approved in the appropriate Parker literature for the specific Parker product, and (ii) the user verifies the Assembly and the application through analysis and testing. For Parker Hose that does not specify a Parker Fitting, the user is solely responsible for the selection of the proper Fitting and Hose Assembly procedures. See instruction 1.4.

To prevent the possibility of problems such as leakage at the Fitting or system contamination, it is important to completely remove all debris from the cutting operation before installation of the Fittings. The Parker published instructions must be followed for assembling the Fittings on the Hose. These instructions are provided in the Parker Fitting catalog for the specific Parker Fitting being used, or by calling 1-800-CPARKER, or at [www.parker.com](http://www.parker.com).

**3.3 Related Accessories:** Do not crimp or swage any Parker Hose or Fitting with anything but the listed swage or crimp machine and dies in accordance with Parker published instructions. Do not crimp or swage another manufacturer's Fitting with a Parker crimp or swage die unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division.

**3.4 Parts:** Do not use any Parker Fitting part (including but not limited to socket, shell, nipple, or insert) except with the correct Parker mating parts, in accordance with Parker published instructions, unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division.

**3.5 Field Attachable/Permanent:** Do not reuse any field attachable Hose Fitting that has blown or pulled off a Hose. Do not reuse a Parker permanent Hose Fitting (crimped or swaged) or any part thereof. Complete Hose Assemblies may only be reused after proper inspection under section 4.0. Do not assemble Fittings to any previously used hydraulic Hose that was in service, for use in a fluid power application.

**3.6 Pre-Installation Inspection:** Prior to installation, a careful examination of the Hose Assembly must be performed. Inspect the Hose Assembly for any damage or defects. DO NOT use any Hose Assembly that displays any signs of nonconformance.

**3.7 Minimum Bend Radius:** Installation of a Hose at less than the minimum listed bend radius may significantly reduce the Hose life. Particular attention must be given to preclude sharp bending at the Hose to Fitting juncture. Any bending during installation at less than the minimum bend radius must be avoided. If any Hose is kinked during installation, the Hose must be discarded.

**3.8 Twist Angle and Orientation:** Hose Assembly installation must be such that relative motion of machine components does not produce twisting.

**3.9 Securement:** In many applications, it may be necessary to restrain, protect, or guide the Hose to protect it from damage by unnecessary flexing, pressure surges, and contact with other mechanical components. Care must be taken to insure such restraints do not introduce additional stress or wear points.

**3.10 Proper Connection of Ports:** Proper physical installation of the Hose Assembly requires a correctly installed port connection insuring that no twist or torque is transferred to the Hose when the Fittings are being tightened or otherwise during use.

**3.11 External Damage:** Proper installation is not complete without insuring that tensile loads, side loads, kinking, flattening, potential abrasion, thread damage or damage to sealing surfaces are corrected or eliminated. See instruction 2.10.

**3.12 System Checkout:** All air entrapment must be eliminated and the system pressurized to the maximum system pressure (at or below the Hose maximum working pressure) and checked for proper function and freedom from leaks. Personnel must stay out of potential hazardous areas while testing and using.

**3.13 Routing:** The Hose Assembly should be routed in such a manner so if a failure does occur, the escaping media will not cause personal injury or property damage. In addition, if fluid media comes in contact with hot surfaces, open flame or sparks, a fire or explosion may occur. See section 2.4.

**3.14 Ground Fault Equipment Protection Devices (GFEPDs):** WARNING! Fire and Shock Hazard. To minimize the danger of fire if the heating cable of a Multitube bundle is damaged or improperly installed, use a Ground Fault Equipment Protection Device. Electrical fault currents may be insufficient to trip a conventional circuit breaker.

For ground fault protection, the IEEE 515: ([www.ansi.org](http://www.ansi.org)) standard for heating cables recommends the use of GFEPDs with a nominal 30 milliampere trip level for "piping systems in classified areas, those areas requiring a high degree of maintenance, or which may be exposed to physical abuse or corrosive atmospheres".

### 4.0 TUBE AND FITTINGS ASSEMBLY AND INSTALLATION INSTRUCTIONS

**4.1 Component Inspection:** Prior to assembly, a careful examination of the Tube and Fittings must be performed. All components must be checked for correct style, size, material, seal, and length. Inspect the Fitting and sealing surfaces for burrs, nicks, corrosion, missing seal or other imperfections. Do NOT use any component that displays any signs of nonconformance.

**4.2 Tube and Fitting Assembly:** Do not assemble a Parker Fitting with a Tube that is not specifically listed by Parker for that Fitting, unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division. The Tube must meet the requirements specified to the Fitting. The Parker published instructions must be followed for assembling the Fittings to a Tube. These instructions are provided in the Parker Fitting catalog for the specific Parker Fitting being used, or by calling 1-800-CPARKER, or at [www.parker.com](http://www.parker.com).

**4.3 Related Accessories:** Do not preset or flange Parker Fitting components using another manufacturer's equipment or procedures unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division. Tube, Fitting component and tool

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ing must be checked for correct style, size and material. Operation and maintenance of Related Accessories must be in accordance with the operation manual for the designated Accessory.

4.4 **Securement:** In many applications, it may be necessary to restrain, protect, or guide the Tube to protect it from damage by unnecessary flexing, pressure surges, vibration, and contact with other mechanical components. Care must be taken to insure such restraints do not introduce additional stress or wear points.

4.5 **Proper Connection of Ports:** Proper physical installation of the Tube Assembly requires a correctly installed port connection insuring that no torque is transferred to the Tube when the Fittings are being tightened or otherwise during use.

4.6 **External Damage:** Proper installation is not complete without insuring that tensile loads, side loads, flattening, potential abrasion, thread damage or damage to sealing surfaces are corrected or eliminated. See instruction 2.10.

4.7 **System Checkout:** All air entrapment must be eliminated and the system pressurized to the maximum system pressure (at or below the Tube Assembly maximum working pressure) and checked for proper function and freedom from leaks. Personnel must stay out of potential hazardous areas while testing and using.

4.8 **Routing:** The Tube Assembly should be routed in such a manner so if a failure does occur, the escaping media will not cause personal injury or property damage. In addition, if fluid media comes in contact with hot surfaces, open flame or sparks, a fire or explosion may occur. See section 2.4.

### 5.0 HOSE AND FITTING MAINTENANCE AND REPLACEMENT INSTRUCTIONS

5.1 Even with proper selection and installation, Hose life may be significantly reduced without a continuing maintenance program. The severity of the application, risk potential from a possible Hose failure, and experience with any Hose failures in the application or in similar applications should determine the frequency of the inspection and the replacement for the Products so that Products are replaced before any failure occurs. Certain products require maintenance and inspection per industry requirements. Failure to adhere to these requirements may lead to premature failure. A maintenance program must be established and followed by the user and, at minimum, must include instructions 5.2 through 5.7

5.2 **Visual Inspection Hose/Fitting:** Any of the following conditions require immediate shut down and replacement of the Hose Assembly:

- Fitting slippage on Hose;
- Damaged, cracked, cut or abraded cover (any reinforcement exposed);
- Hard, stiff, heat cracked, or charred Hose;
- Cracked, damaged, or badly corroded Fittings;
- Leaks at Fitting or in Hose;
- Kinked, crushed, flattened or twisted Hose; and
- Blistered, soft, degraded, or loose cover.

5.3 **Visual Inspection All Other:** The following items must be tightened, repaired, corrected or replaced as required:

- Leaking port conditions;
- Excess dirt buildup;/
- Worn clamps, guards or shields; and
- System fluid level, fluid type, and any air entrapment.

5.4 **Functional Test:** Operate the system at maximum operating pressure and check for possible malfunctions and leaks. Personnel must avoid potential hazardous areas while testing and using the system. See section 2.2.

5.5 **Replacement Intervals:** Hose assemblies and elastomeric seals used on Hose Fittings and adapters will eventually age, harden, wear and deteriorate under thermal cycling and compression set. Hose Assemblies and elastomeric seals should be inspected and replaced at specific replacement intervals, based on previous service life, government or industry recommendations, or when failures could result in unacceptable downtime, damage, or injury risk. See section 1.2. Hose and Fittings may be subjected to internal mechanical and/or chemical wear from the conveying fluid and may fail without warning. The user must determine the product life under such circumstances by testing. Also see section 2.5.

5.6 **Hose Inspection and Failure:** Hydraulic power is accomplished by utilizing high pressure fluids to transfer energy and do work. Hoses, Fittings and Hose Assemblies all contribute to this by transmitting fluids at high pressures. Fluids under pressure can be dangerous and potentially lethal and, therefore, extreme caution must be exercised when working with fluids under pressure and handling the Hoses transporting the fluids. From time to time, Hose Assemblies will fail if they are not replaced at proper time intervals. Usually these failures are the result of some form of misapplication, abuse, wear or failure to perform proper maintenance. When Hoses fail, generally the high pressure fluids inside escape in a stream which may or may not be visible to the user. Under no circumstances should the user attempt to locate the leak by "feeling" with their hands or any other part of their body. High pressure fluids can and will penetrate the skin and cause severe tissue damage and possibly loss of limb. Even seemingly minor hydraulic fluid injection injuries must be treated immediately by a physician with knowledge of the tissue damaging properties of hydraulic fluid.

If a Hose failure occurs, immediately shut down the equipment and leave the area until pressure has been completely released from the Hose Assembly. Simply shutting down the hydraulic pump may or may not eliminate the pressure in the Hose Assembly. Many times check valves, etc., are employed in a system and can cause pressure to remain in a Hose Assembly even when pumps or equipment are not operating. Tiny holes in the Hose, commonly known as pinholes, can eject small, dangerously powerful but hard to see streams of hydraulic fluid. It may take several minutes or even hours for the pressure to be relieved so that the Hose Assembly may be examined safely.

Once the pressure has been reduced to zero, the Hose Assembly may be taken off the equipment and examined. It must always be replaced if a failure has occurred. Never attempt to patch or repair a Hose Assembly that has failed. Consult the nearest Parker distributor or the appropriate Parker division for Hose Assembly replacement information. . Never touch or examine a failed Hose Assembly unless it is obvious that the Hose no longer contains fluid under pressure. The high pressure fluid is extremely dangerous and can cause serious and potentially fatal injury.

5.7 **Elastomeric seals:** Elastomeric seals will eventually age, harden, wear and deteriorate under thermal cycling and compression set. Elastomeric seals should be inspected and replaced.

5.8 **Refrigerant gases:** Special care should be taken when working with refrigeration systems. Sudden escape of refrigerant gases can cause blindness if the escaping gases contact the eye and can cause freezing or other severe injuries if it contacts any other portion of the body.

5.9 **Compressed natural gas (CNG):** Parker CNG Hose Assemblies should be tested after installation and before use, and at least on a monthly basis per instructions provided on the Hose Assembly tag. The recommended procedure is to pressurize the Hose and check for leaks and to visually inspect the Hose for damage and to perform an electrical resistance test.

Caution: Matches, candles, open flame or other sources of ignition shall not be used for Hose inspection. Leak check solutions should be rinsed off after use.

### 6.0 HOSE STORAGE

6.1 **Age Control:** Hose and Hose Assemblies must be stored in a manner that facilitates age control and first-in and first-out usage based on manufacturing date of the Hose and Hose Assemblies. Unless otherwise specified by the manufacturer or defined by local laws and regulations:

6.1.1 The shelf life of rubber hose in bulk form or hose made from two or more materials is 28 quarters (7 years) from the date of manufacture, with an extension of 12 quarters (3 years), if stored in accordance with ISO 2230;

6.1.2 The shelf life of thermoplastic and polytetrafluoroethylene hose is considered to be unlimited;

6.1.3 Hose assemblies that pass visual inspection and proof test shall not be stored for longer than 2 years.

6.1.4 **Storage:** Stored Hose and Hose Assemblies must not be subjected to damage that could reduce their expected service life and must be placed in a cool, dark and dry area with the ends capped. Stored Hose and Hose Assemblies must not be exposed to temperature extremes, ozone, oils, corrosive liquids or fumes, solvents, high humidity, rodents, insects, ultraviolet light, electromagnetic fields or radioactive materials.











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