

Parker D31DW, D31VW Series Pilot Operated Directional Control Valve Service Manual

A





General Description

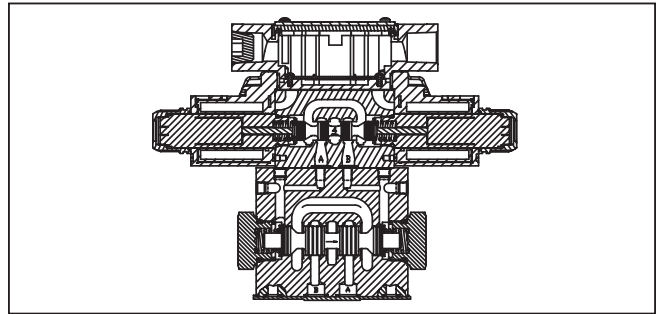
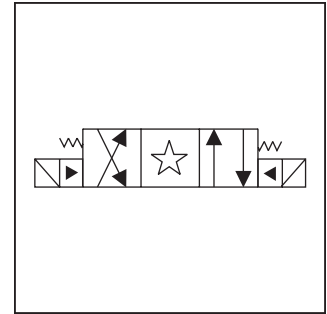
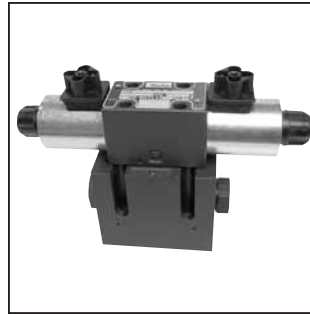
Series D31 directional control valves are 5-chamber, pilot operated, solenoid controlled valves. The valves are suitable for manifold or subplate mounting.

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

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



Response Time

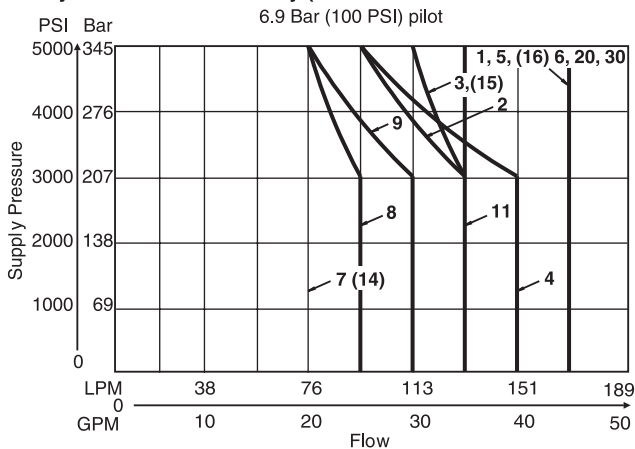
Response time (milliseconds)
at 345 Bar (5000 PSI) is 76 LPM (20 GPM)

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

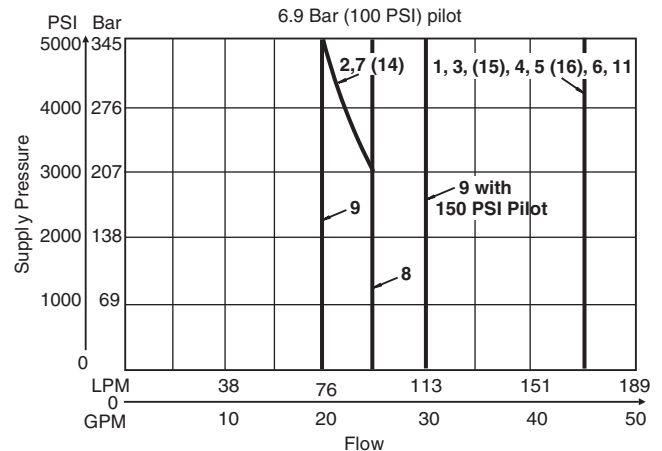
For Styles B, C, E, H and K

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



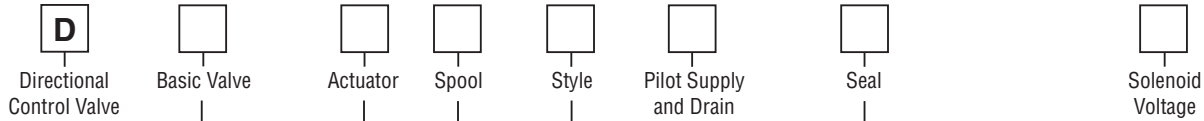
Note: Internal Drain
1, 4 spools – 113 LPM (30 GPM) max., 7 spool – per curve
All others – 95 LPM (25 GPM) max.

For Styles F and M – external drain only
(For internal drain see note below)



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

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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

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
A**	24/50 VAC
D	120 VDC
G	198 VDC
J	24 VDC
K	12 VDC
N***	220/50 VAC
P***	110/50 VAC
Q**	100/60 VAC
QD†	100 VAC/60 Hz 100 VAC/50 Hz
R	24/60 VAC
T	240/60 - 220/50 VAC
U	98 VDC
Y	120/60 - 110/50 VAC
Z	250 VDC

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, 007, 008, 009 or 014 spools.

** High watt only.
 *** Explosion proof only.
 † Available in DIN only.

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

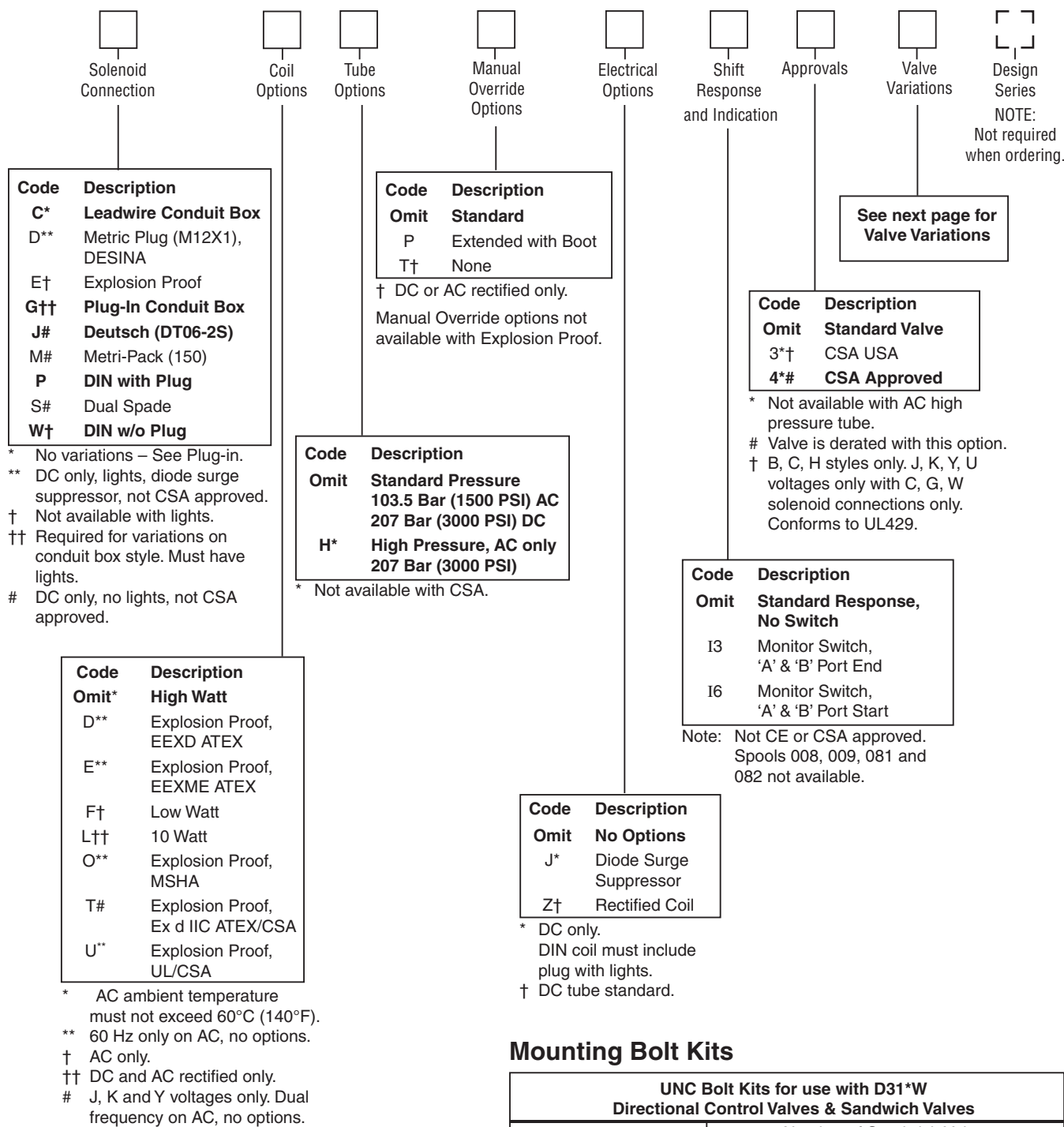
Code	Description	Symbol
B*	Single solenoid, 2 position, spring offset. P to A and B to T in offset position.	
C	Double solenoid, 3 position, spring centered.	
D*	Double solenoid, 2 position, detent.	
E	Single solenoid, 2 position, spring centered. P to B and A to T when energized.	
F†	Single solenoid,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

* 020 and 030 spools only.
 † High watt only.

* 008 & 020 spools have closed crossover.
 ** 009 & 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.



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" (50mm) thickness			
		0	1	2	3
D31*W	Standard:	BK98 1.62"	BK141 3.50"	BK142 5.50"	BK143 7.50"
	Metric:	BKM98 40mm	BKM141 90mm	BKM142 140mm	BKM143 190mm

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

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Code	Description
5*	Signal Lights – Standard
	Signal Lights – Hirsch. (DIN with Plug)
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
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	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.

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
005	3	3	1	1	-	-	-	5	-	-	-
006	3	3	1	1	-	5	7	6	5	-	-
007	4	2	1	1	4	-	-	-	3	-	2
009	3	3	1	1	7	-	-	-	-	-	-
010	3	2	-	-	-	-	-	-	-	-	-
011	3	2	1	1	-	-	-	-	-	8	8
014	2	4	1	1	4	-	-	4	-	2	-
015	3	2	4	1	-	-	-	-	-	-	4
016	5	2	1	1	-	-	-	-	5	-	-
020	5	4		2	2	-	-	-	-	-	-
030	4	3		1	1	-	-	-	-	-	-

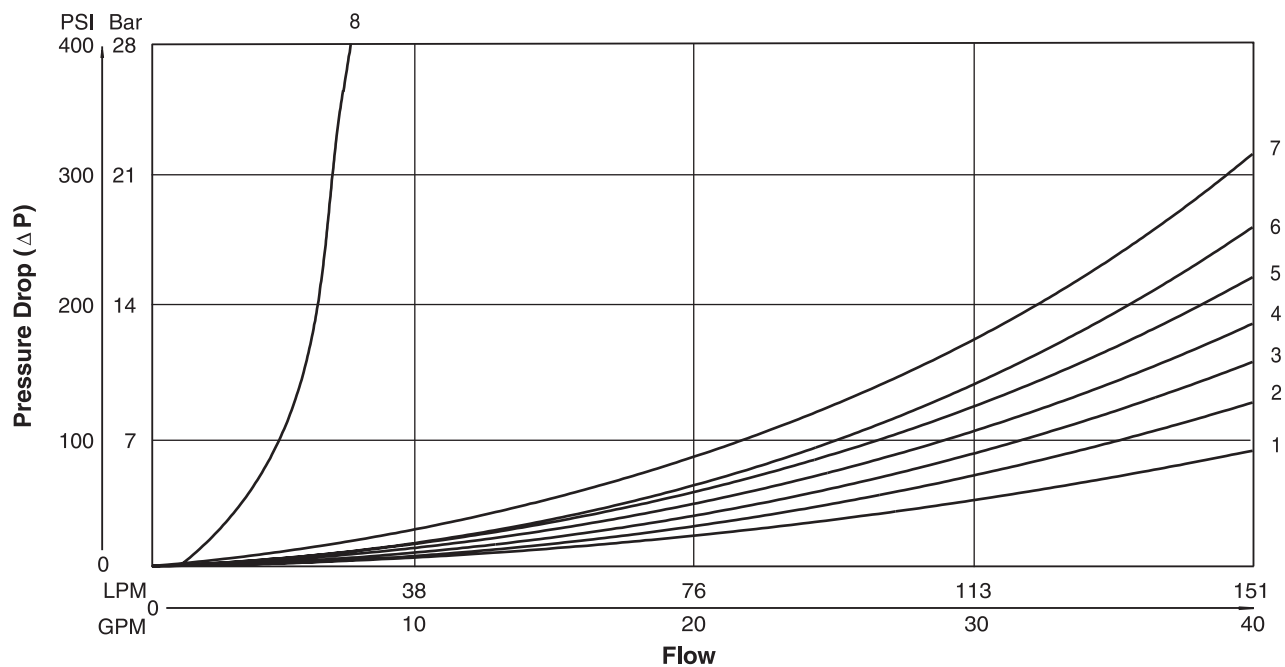


Viscosity Correction Factor

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

Curves were generated using 110 SSU hydraulic oil.
 For any other viscosity, pressure drop will change per chart.

Performance Curves





Solenoid Ratings

Insulation System	Class F
Allowable Deviation from rated voltage	-15% to +10% for DC and AC rectified coils -5% to +5% for AC Coils
Armature	Wet pin type
CSA File Number	LR60407
Environmental Capability	DC Solenoids meet NEMA 4 and IP67 when properly wired and installed. Contact HVD for AC coil applications.

Explosion Proof Solenoid Ratings*

U.L. & CSA (EU)	Class I, Div 1 & 2, Groups C & D Class II, Div 1 & 2, Groups E, F & G As defined by the N.E.C.
MSHA (EO)	Complies with 30CFR, Part 18
ATEX (ED)	Complies with ATEX requirements for: Exd, Group IIB; EN50014: 1999+ Amds. 1 & 2, EN50018: 2000
ATEX & CSA/US (ET)	Complies with ATEX EN60079-0, EN60079-1 Ex d IIC; CSA/US Ex d IIC, AEx d IIC for Class I, Zone 1, UL1203, UL1604, CSA E61241,1 Class II, Div 1

* Allowable Voltage Deviation ±10%.
 Note that Explosion Proof AC coils are single frequency only.

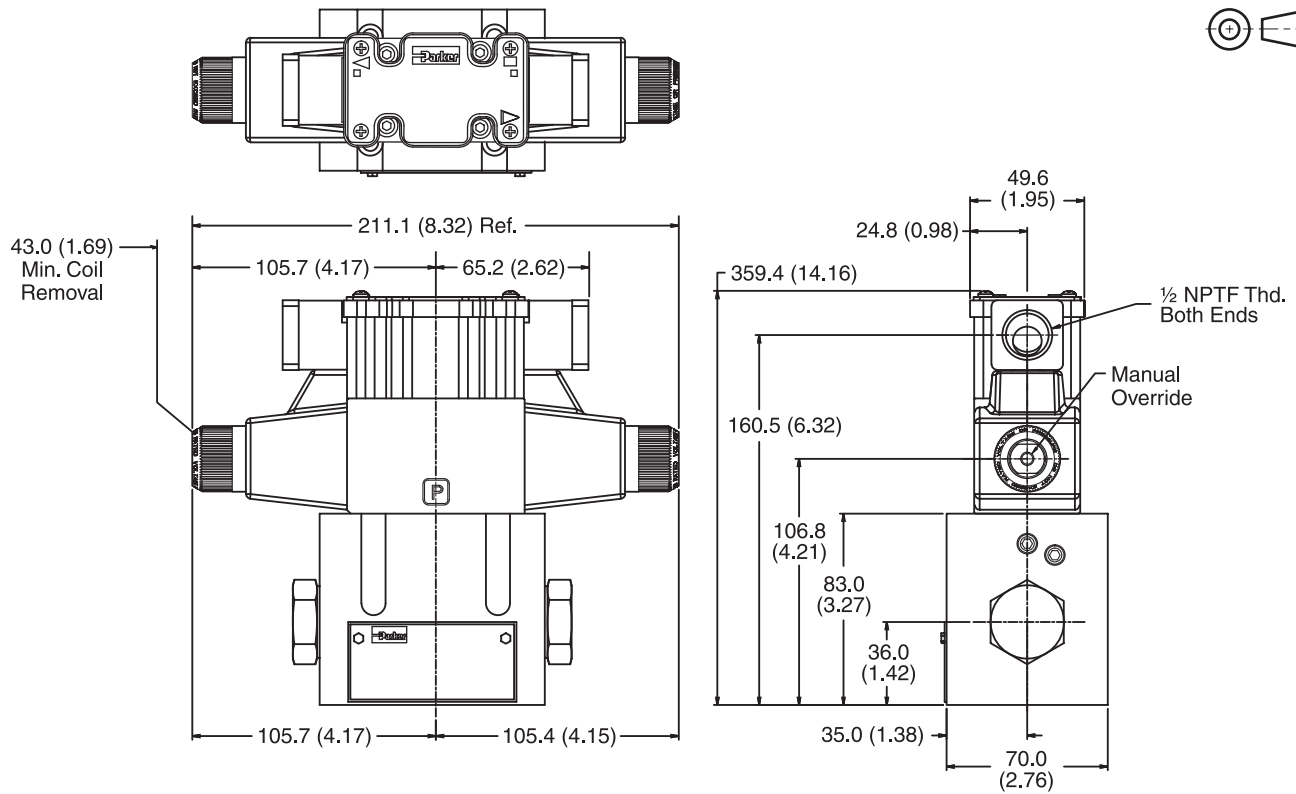
Code		Voltage	In Rush Amps Amperage	In Rush VA	Holding Amps @ 3MM	Watts	Resistance
Voltage Code	Power Code						
D	L	120 VDC	N/A	N/A	0.09 Amps	10 W	1584.00 ohms
D	Omit	120 VDC	N/A	N/A	0.26 Amps	30 W	528.00 ohms
G	Omit	198 VDC	N/A	N/A	0.15 Amps	30 W	1306.80 ohms
J	L	24 VDC	N/A	N/A	0.44 Amps	10 W	51.89 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
L	L	6 VDC	N/A	N/A	1.67 Amps	10 W	3.59 ohms
L	Omit	6 VDC	N/A	N/A	5.00 Amps	30 W	1.20 ohms
Q	Omit	100 VAC / 60 Hz	2.05 Amps	170 VA	0.77 Amps	30 W	19.24 ohms
QD	F	100 VAC / 60 Hz	1.35 Amps	135 VA	0.41 Amps	18 W	31.20 ohms
QD	F	100 VAC / 50 Hz	1.50 Amps	150 VA	0.57 Amps	24 W	31.20 ohms
R	F	24/60 VAC, Low Watt	6.67 Amps	160 VA	2.20 Amps	23 W	1.52 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	L	98 VDC	N/A	N/A	0.10 Amps	10 W	960.00 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
Z	L	250 VDC	N/A	N/A	0.04 Amps	10 W	6875.00 ohms
Z	Omit	250 VDC	N/A	N/A	0.13 Amps	30 W	1889.64 ohms
Explosion Proof Solenoids							
R		24/60 VAC	7.63 Amps	183 VA	2.85 Amps	27 W	1.99 ohms
T		240/60 VAC	0.76 Amps	183 VA	0.29 Amps	27 W	1.34 ohms
N		220/50 VAC	0.77 Amps	169 VA	0.31 Amps	27 W	1.38 ohms
Y		120/60 VAC	1.60 Amps	192 VA	0.58 Amps	27 W	33.50 ohms
P		110/50 VAC	1.47 Amps	162 VA	0.57 Amps	27 W	34.70 ohms
K		12 VDC	N/A	N/A	2.75 Amps	33 W	4.36 ohms
J		24 VDC	N/A	N/A	1.38 Amps	33 W	17.33 ohms
"ET" Explosion Proof Solenoids							
K		12 VDC	N/A	N/A	1.00 Amps	12 W	12.00 ohms
J		24 VDC	N/A	N/A	1.00 Amps	13 W	44.30 ohms
Y		120/60-50 VAC	N/A	N/A	0.16 Amps	17 W	667.00 ohms

D31.indd, dd

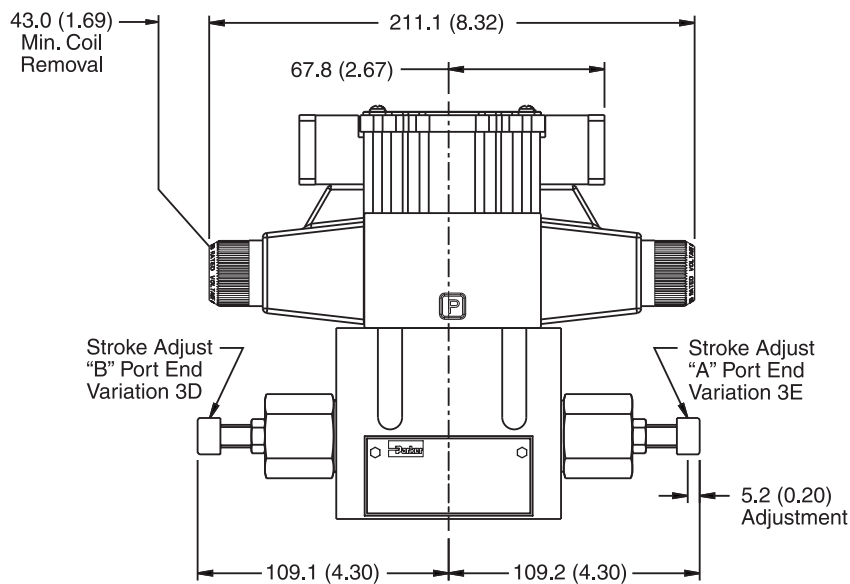


Inch equivalents for millimeter dimensions are shown in (**)

Conduit Box, Double AC Solenoid



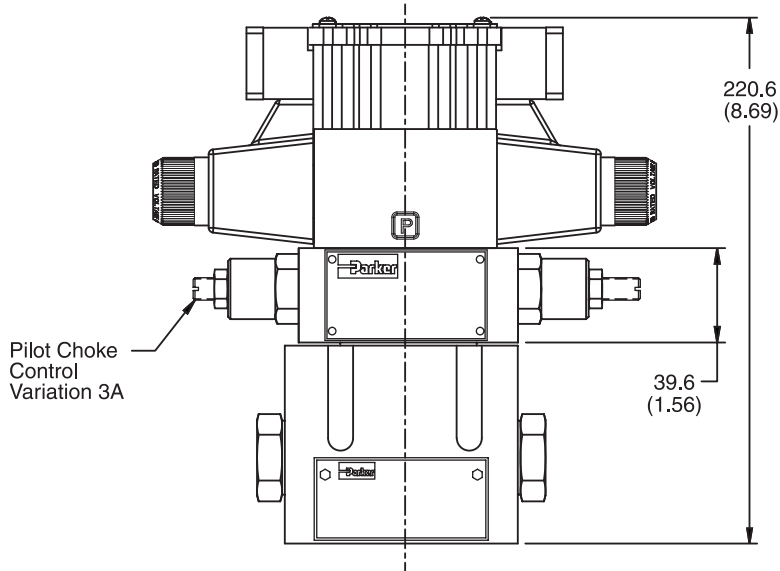
Conduit Box and Stroke Adjust, Double AC Solenoid



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

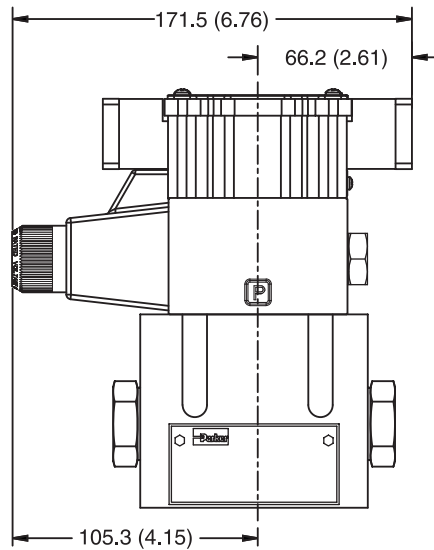
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Conduit Box and Pilot Choke Control, Double AC Solenoid



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

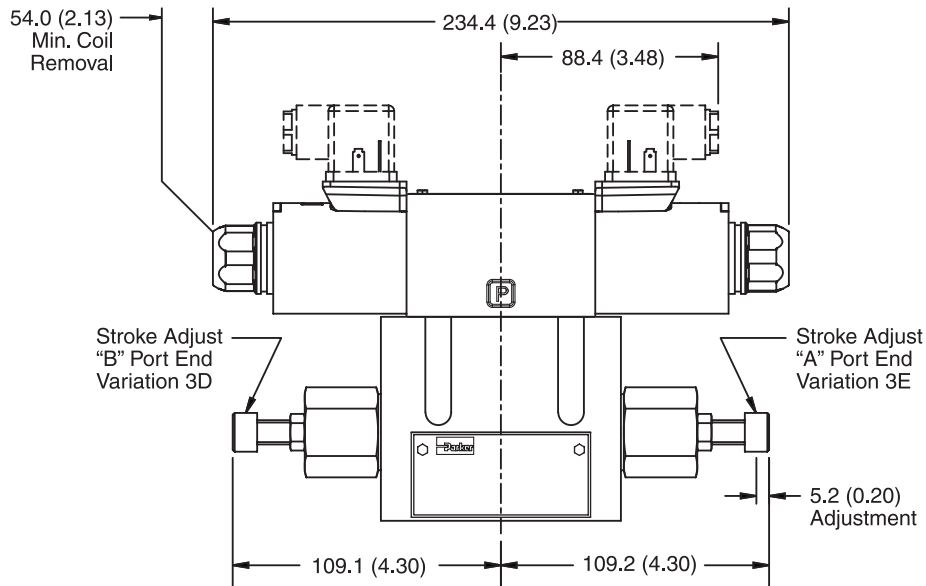
Conduit Box, Single AC Solenoid



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

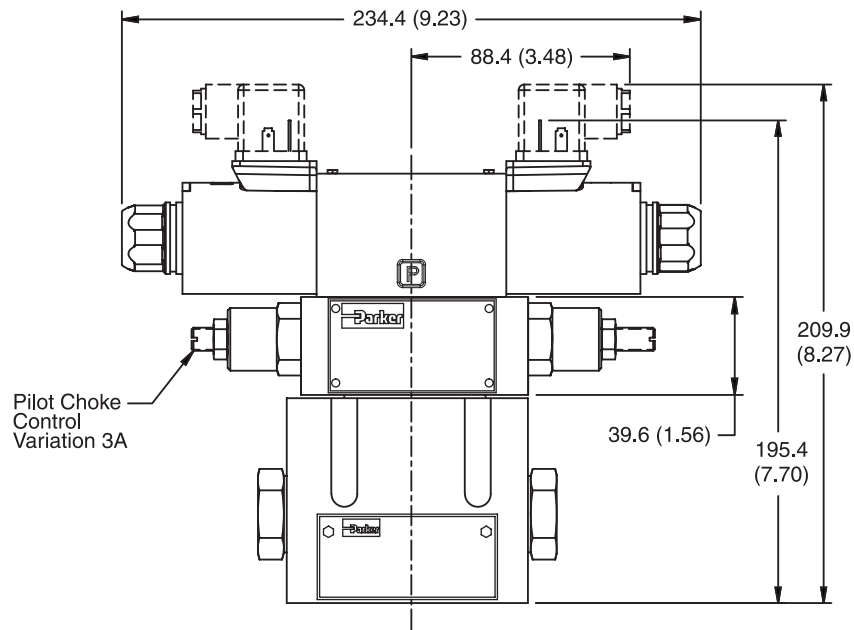
Inch equivalents for millimeter dimensions are shown in (**)

Hirschmann and Stroke Adjust, Double DC Solenoid



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

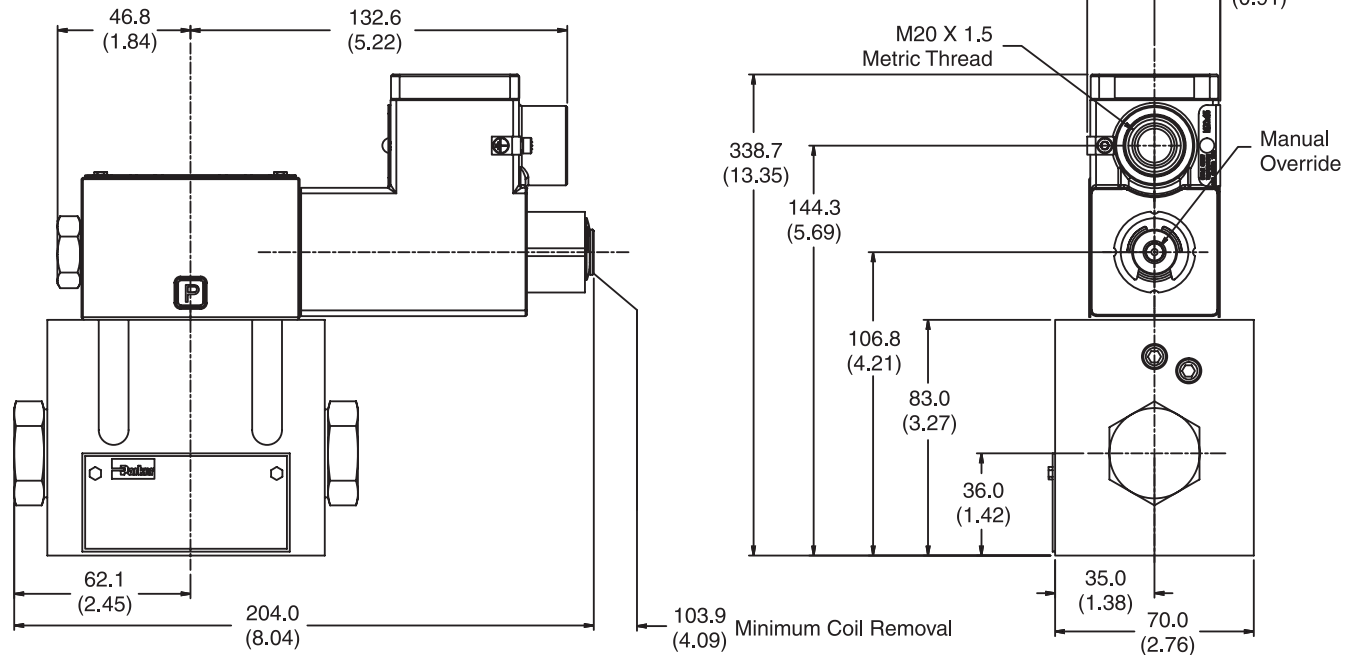
Hirschmann and Pilot Choke Control, Double DC Solenoid



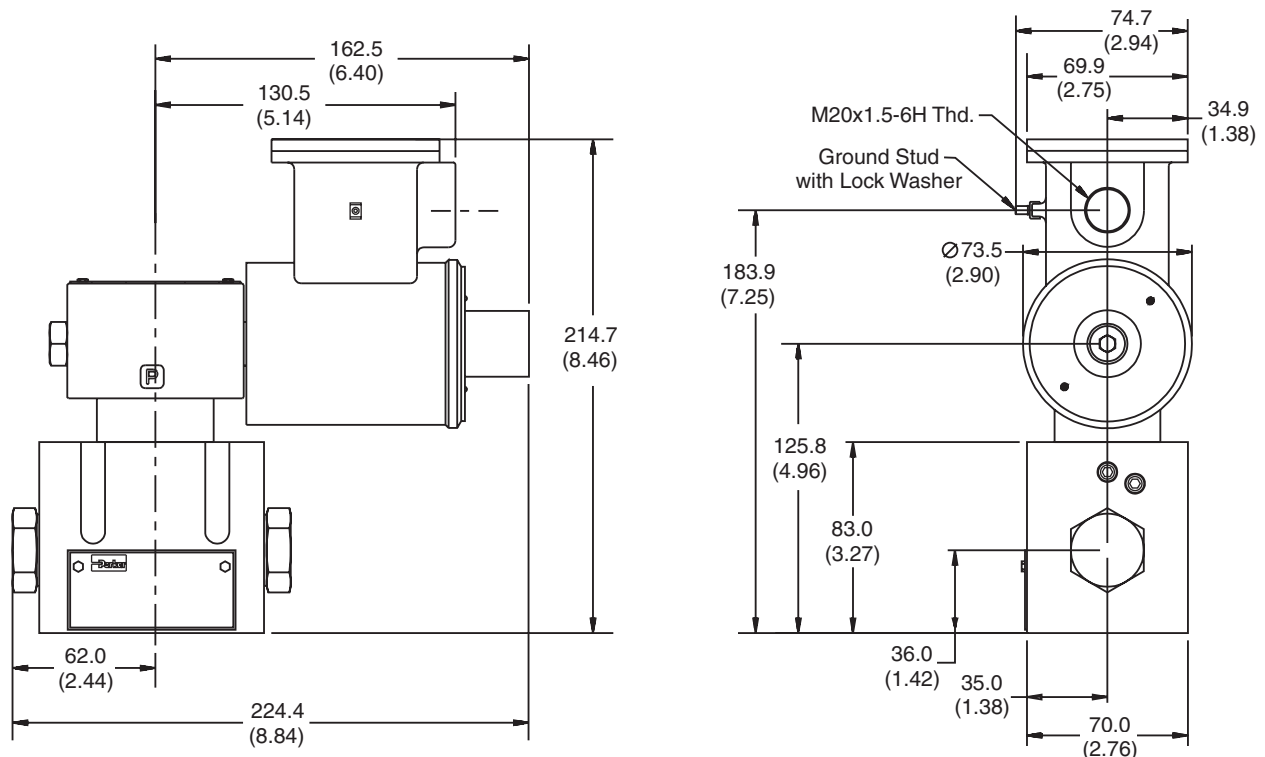
Note: 30.0mm (1.18") from bottom of bolt hole counterbore to bottom of valve.

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

Explosion Proof, EX d IIC ATEX/CSA Single Solenoid



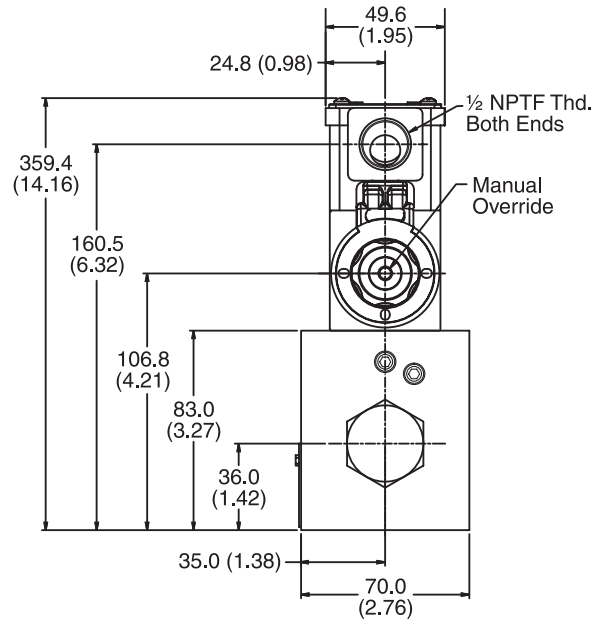
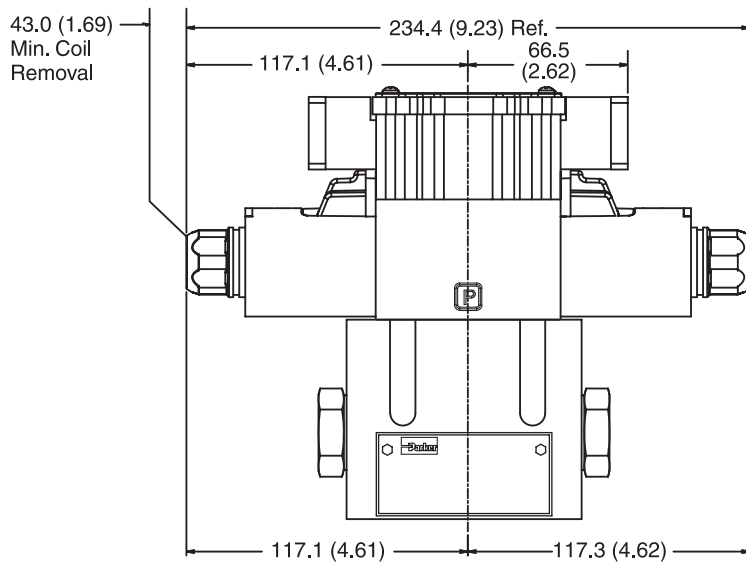
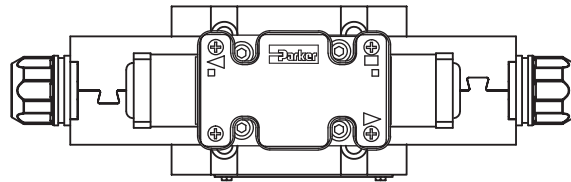
Explosion Proof, EEXD ATEX, Single Solenoid



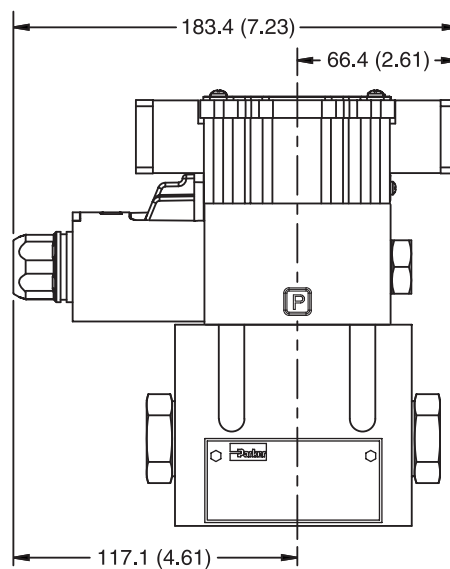
Inch equivalents for millimeter dimensions are shown in (**)

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Plug-in Conduit Box, Double DC Solenoid



Plug-in Conduit Box, Single DC Solenoid

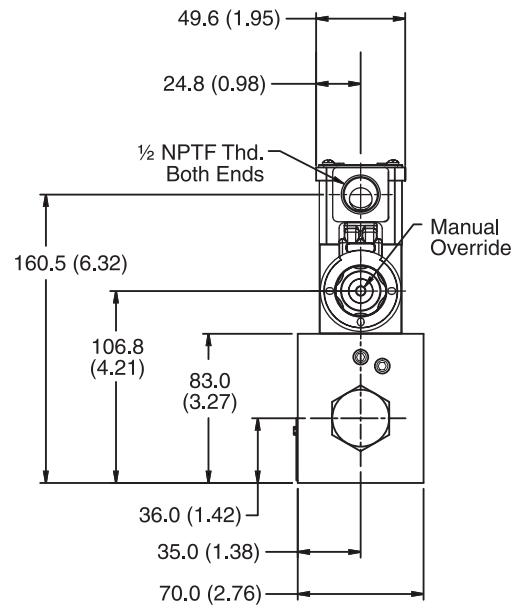
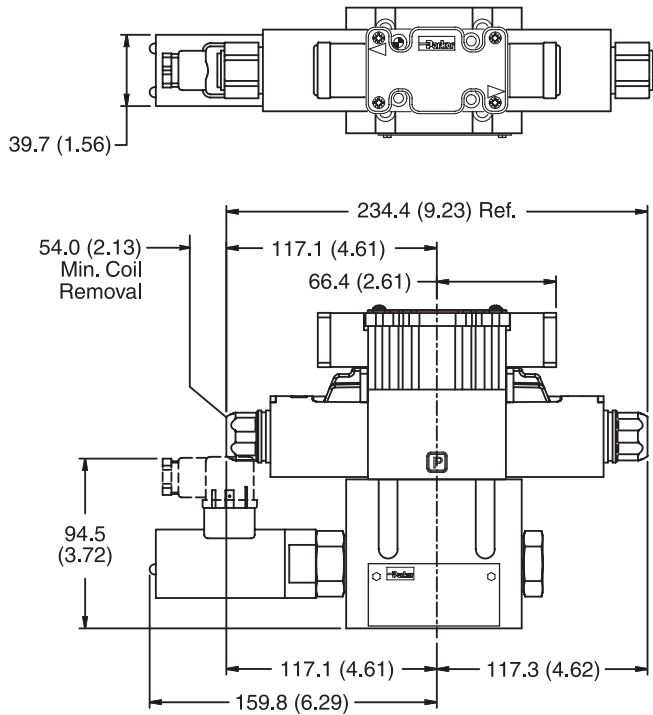


Inch equivalents for millimeter dimensions are shown in (**)

Plug-in Conduit Box, Double DC Solenoid with Variation I3 (Monitor Switch)



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.

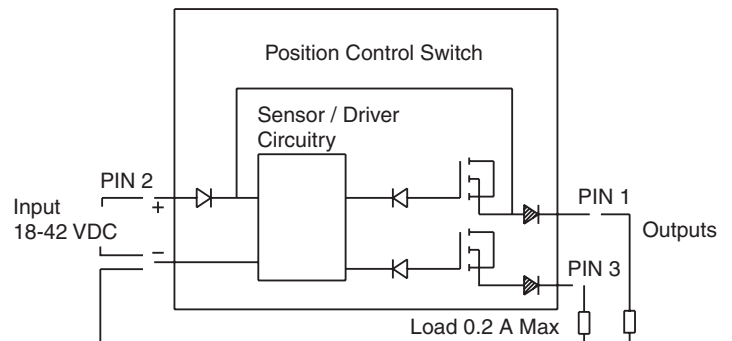


**Monitor Switch
(Variation I3 and I6)**

This feature provides for electrical confirmation of the spool shift. This can be used in safety circuits, to assure proper sequencing, etc.

Switch Data

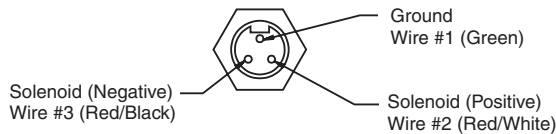
Pin 1 and Pin 3 have outputs equal to the input. When the monitor switch has the output to Pin 1, Pin 3 will have an output of zero, and vice-versa. When the valve is switched, Pin 1 and Pin 3 will switch outputs.





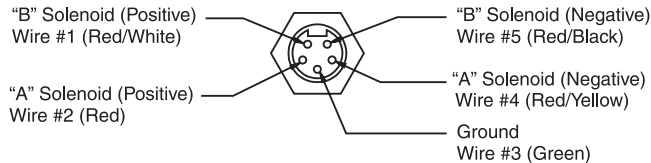
Manaplug (Options 6, 56, 1A & 1C)

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



3-Pin Manaplug (Mini) with Lights

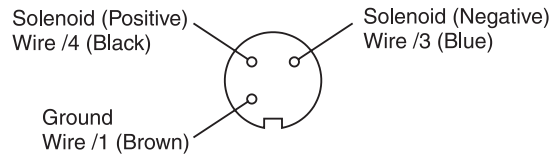
Single Solenoid Valves – Installed Opposite Side of Solenoid



5-Pin Manaplug (Mini) with Lights

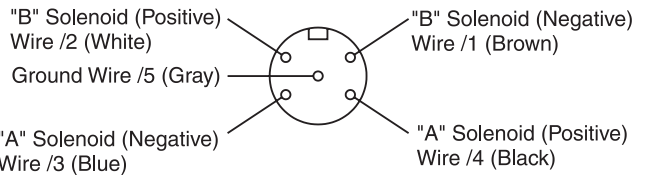
Single Solenoid Valves – Installed Opposite Side of Solenoid
 Double Solenoid Valves – Installed Over "A" Solenoid
 ("A" and "B" Solenoids Reversed for #8 and #9 Spools)

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

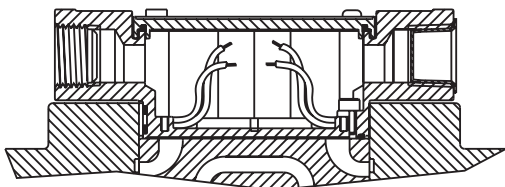
- EP336-30** 3 Pin Plug
- EP316-30** 5 Pin Plug (Double Solenoid)
- EP31A-30** 5 Pin Plug (Single Solenoid)

Manaplug – Electrical Micro Plug

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

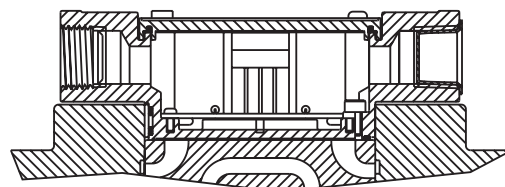
Conduit Box Option C

- No Wiring Options Available

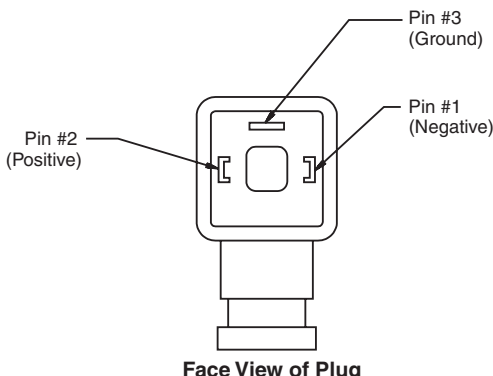


Signal Lights (Option 5) — Plug-in Only

- LED Interface
- Meets Nema 4/IP67



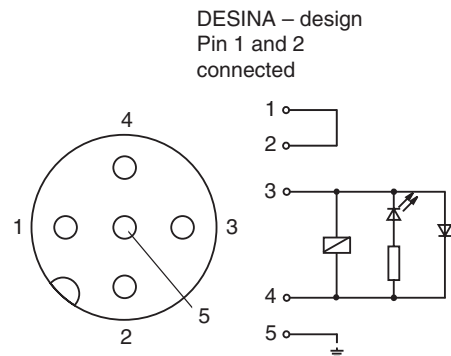
**Hirschmann Plug with Lights (Option P5)
 ISO 4400/DIN 43650 Form "A"**



Face View of Plug

**DESINA Connector (Option D)
 M12 pin assignment
 Standard**

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



Pins are as seen on valve (male pin connectors)