



**Application**

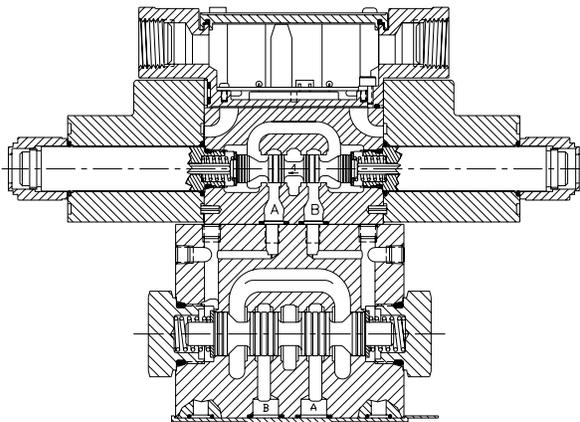
Parker D31 series hydraulic directional control valves are high performance, solenoid controlled, pilot operated, two-stage 4-way valves. They are available in 2 or 3 position styles and are manifold mounted. These valves conform to NFPA's D05H and can also be manufactured to a CETOP 5H configuration.

**Operation**

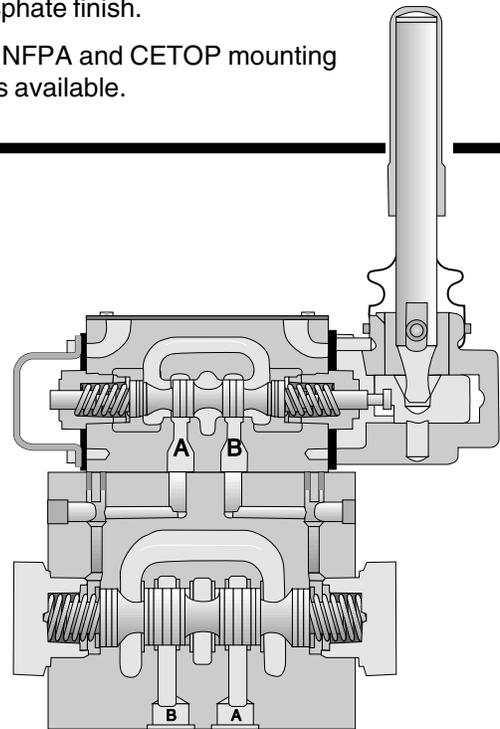
Parker's D31 series directional valves consist of a five chamber style main body, a case hardened sliding spool, and a pilot valve or pilot operators (hydraulic or pneumatic).

**Features**

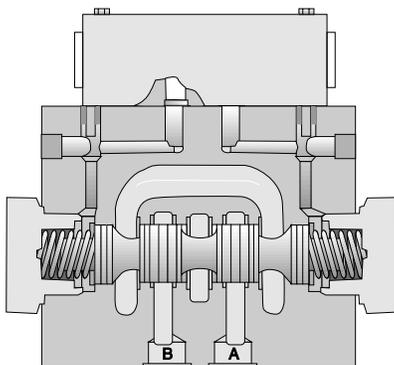
- Easy access mounting bolts.
- 345 Bar (5000 PSI) pressure rating.
- Flows to 175 L/M (45 GPM) depending on spool.
- Choice of four operator styles.
- Rugged four land spools.
- Low pressure drop.
- Phosphate finish.
- Both NFPA and CETOP mounting styles available.



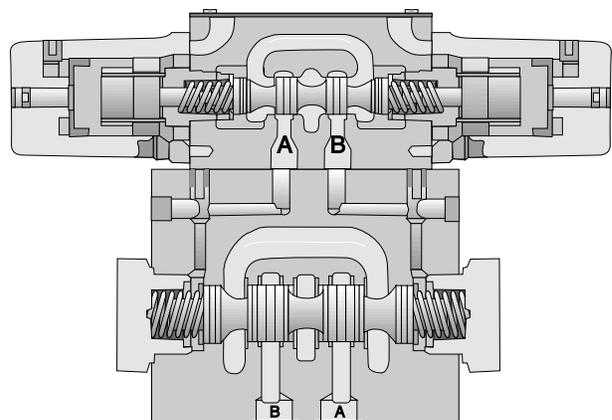
**D31\*W Solenoid Operated Conduit Box Style**



**D31\*L Lever Operated**



**D3\*P Oil Pilot Operated**



**D31\*A Air Pilot Operated**

## General Description

Parker's D31\*A is a five-chamber, air pilot operated, directional control valve. The valve is suitable for manifold or subplate mounting.

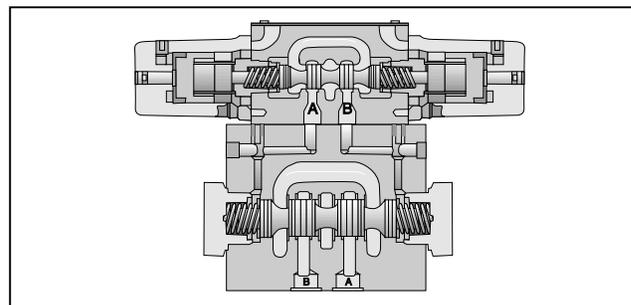
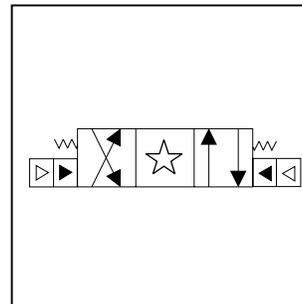
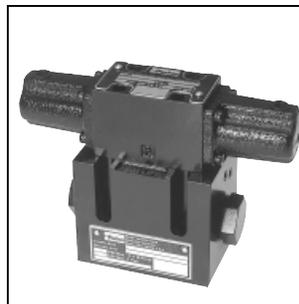
## Features

- **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.

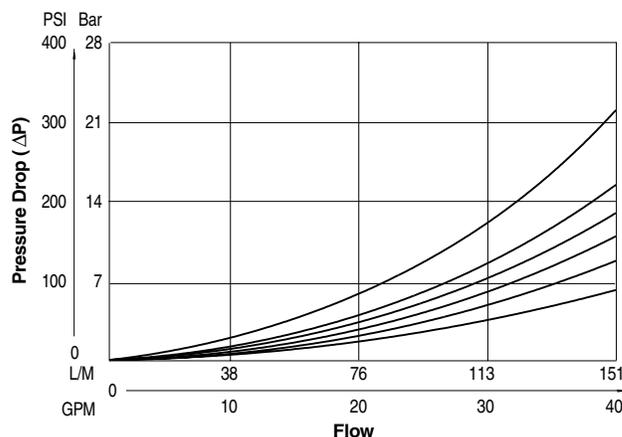
## Specifications

<b>Mounting Pattern</b>	NFPA D05H CETOP 5H
<b>Maximum Operating Pressure</b>	345 Bar (5000 PSI) "T" Port (tank): 207 Bar (3000 PSI) With External Drain Only
<b>Maximum Flow</b>	See Switching Limit Charts
<b>Pilot Pressure</b>	Oil Min: 6.9 Bar (100 PSI) Oil Max: 207 Bar (3000 PSI) Air Min: 3.4 Bar (50 PSI) Air Max: 10.2 Bar (150 PSI)
<b>Max. Drain Pressure</b>	34 Bar (500 PSI)
<b>Shift Volume</b>	For complete shift (from center to end) requires a volume of 1.7 cc (.1in. <sup>3</sup> )
<b>Response Time</b>	Varies with pilot line size and length, pilot pressure, pilot valve shift time & flow capacity (GPM)

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)
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	-	-	-	-	-	-	-



## 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 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 L/M (20 GPM) for a D31VA 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.

**Ordering Information**

<b>D</b>	□	<b>A</b>	□	□	□	□	□	□	□
Directional Control Valve	Basic Valve	Air Operated Pilot	Spool	Style	Pilot Supply and Drain	Seal Compound	Variations	Design Series	NOTE: Not required when ordering.

Code	Description
31D	NFPA D05HE, CETOP 5H (ISO)
31V	NFPA D05H

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 2, 7 & 9 spools.

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
Omit	Standard
7	Pilot choke - meter out
8	Stroke adj. 'A'
9	Stroke adj. 'B'
89	Stroke Adj. 'A' & 'B'
90	BSPM Threads

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

**Valve Weight:**  
 Double Operator  
 5.7 kg (12.7 lbs.)  
**Standard Bolt Kit:**  
 BK98

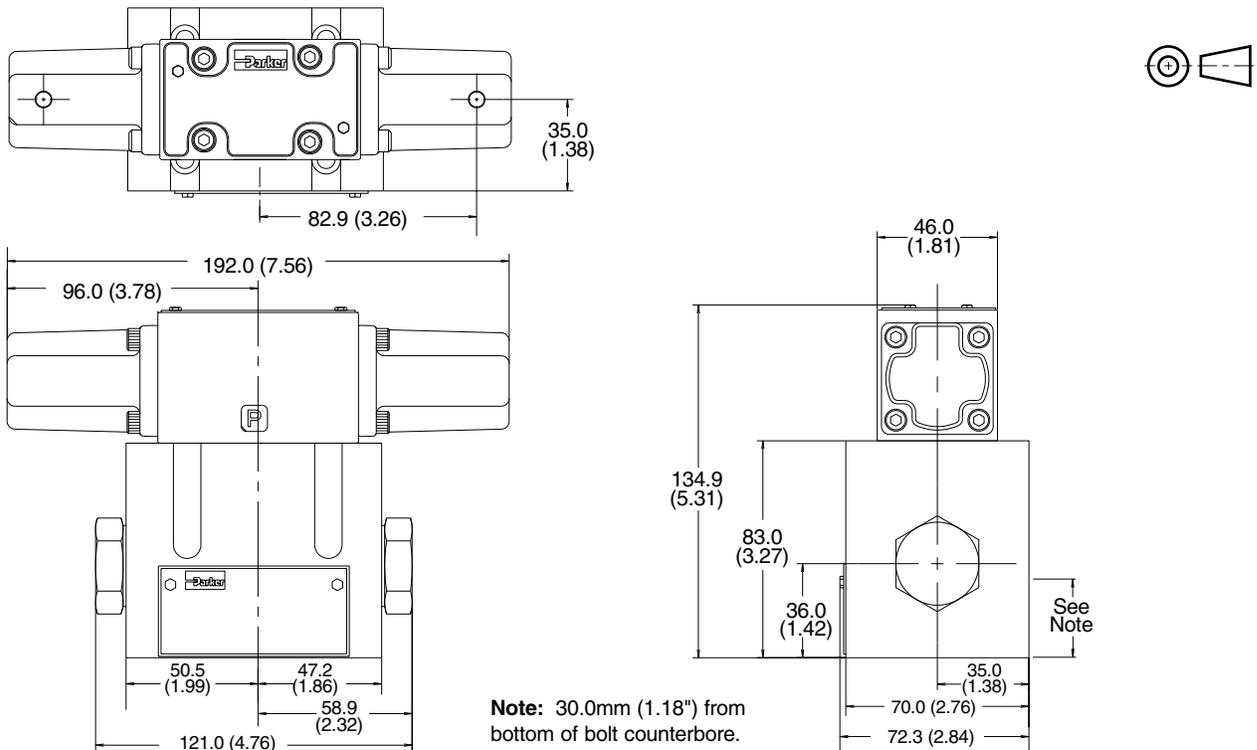
Code	Symbol
1	
2	
4	
9**	
20*	
30**	

\* 20 spool has closed crossover.  
 \*\* 9 and 30 spools have open crossover

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 when energized.	
H†	Sgl. operator, 2 position, spring offset. P to B and A to T in offset position.	
K	Sgl. operator, 2 position. Spring centered. A side. P to A and B to T when energized.	

† Only spools 20 and 30.  
 This condition varies with spool code.

**Dimensions – Air Operated** Inch equivalents for millimeter dimensions are shown in (\*\*)





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**

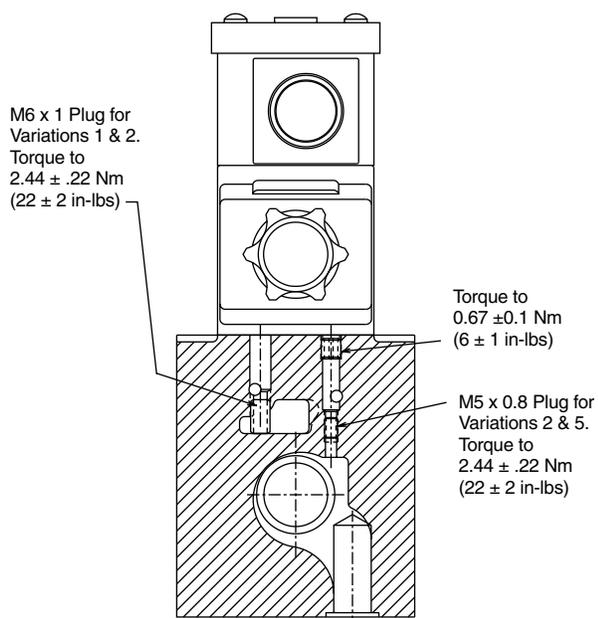
Premium quality hydraulic oil with a viscosity range between 150-250 SSU (32-54 cst.) At 100°F (38°C) is recommended. The absolute operating viscosity range is from 80-1000 SSU (16-220 cst.). Oil should have maximum anti-wear properties and rust and oxidation treatment.

**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:

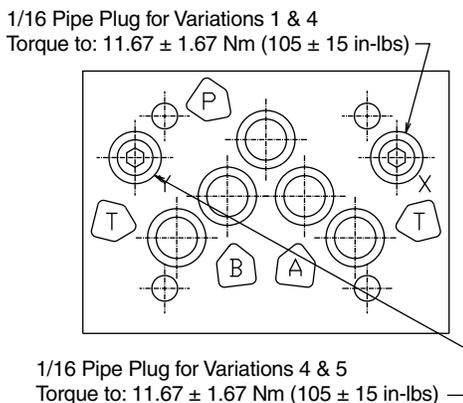
- Pressure above rating
- Fluid other than those specified
- Oil temperature above 160°F (71.1°C)
- Flow path other than normal.

**Mounting Patterns**

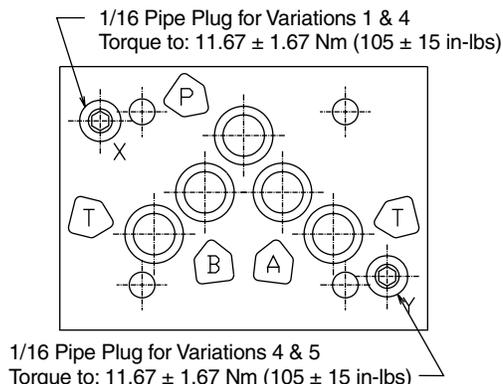
Series	NFPA	Size
D31V*, D3P	D05H	3/8"
D31D*, D3DP	D05HE	3/8"

**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).



**CETOP Pattern D31DW**



**NFPA 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 both AC and DC voltages. 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.

**Pilot/Drain Characteristics**

**Pilot Pressure:** 100 to 3000 PSI (6.9 to 207 Bar)

**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 1500 PSI (102 Bar), 3000 PSI (207 Bar) optional.

**External:** When using an external drain, an M6 x 1 x 10mm 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 1500 PSI (102 Bar), 3000 PSI (207 Bar) 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 1500 PSI (102 Bar), 3000 PSI (207 Bar) 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.

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**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: 100 to 3000 PSI (6.9 to 210 Bar)

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**



**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).

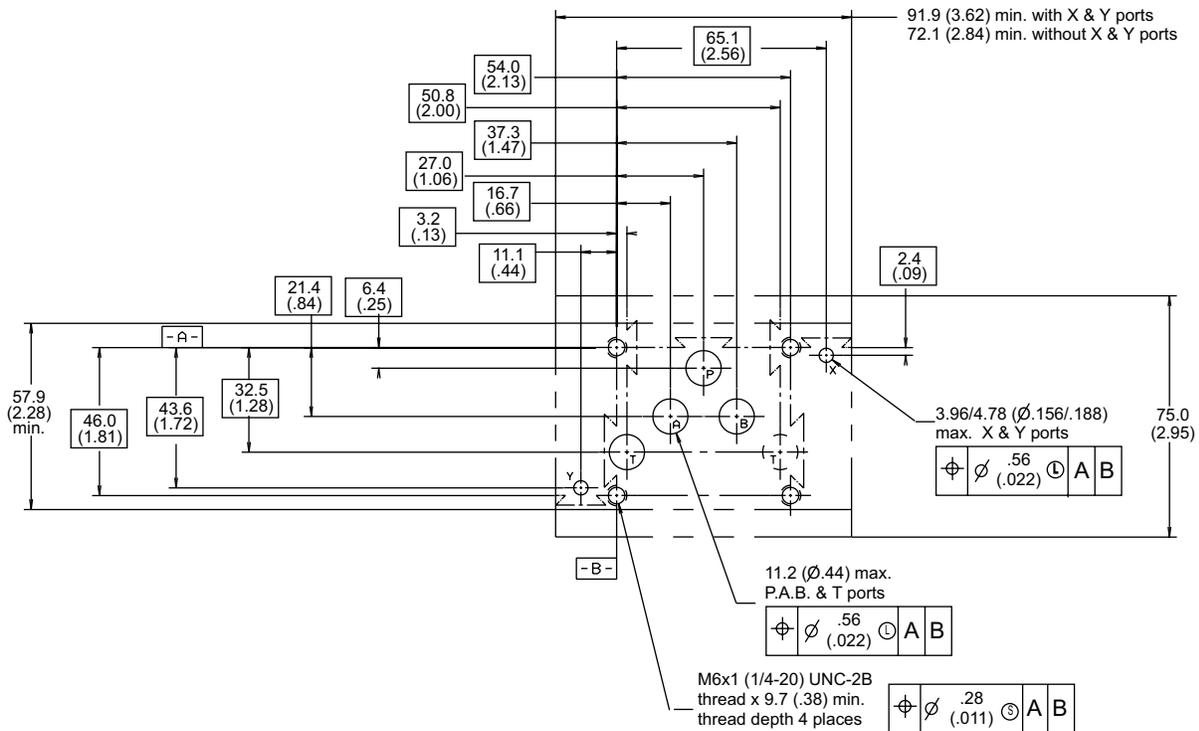
**For maximum valve reliability,  
 adhere to the following  
 installation information.**

**Mounting Position**

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

**Mounting Pattern**

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



**Series D31DW, D31DA, D31DL, D31DP**

**A**

**Subplate Mounting**  
**NFPA D05HE**

**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**

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

