

## HP03 Pattern Directional Control Valves

Also refer to "Directional Valve Features, Selection and Operating Recommendations" ([dynexdcvoperating.pdf](#))

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#### BROCHURE NOTES:

*Consult the Dynex sales department for a review of any application which requires operating above the rated flows or pressures, or higher than normal operating temperatures.*

*Specifications shown were in effect when published. Since errors or omissions are possible, contact your sales representative for the most current specifications before ordering. Dynex reserves the right to discontinue or change designs at any time without incurring any obligation.*



# HIGH PRESSURE HP03 PATTERN



## VALVE DESCRIPTION

HP03 valves operate at pressures to 10 000 psi (700 bar), double that of most other conventional subplate mounted valves.

These compact sliding-spool valves provide true four-way control in a simple compact package. A range of actuators, spools, internal operators and electrical options provides design flexibility.

For a description of spools, operators and application information, see [dynexdcvoperating.pdf](#).

## Mounting

Special HP03 pattern. Refer to page 5.

## Actuator Options

6100 Series: Manual Lever;  
6500 Series: Direct Solenoid;  
6800 Series: Hydraulic Piloted;  
6900 Series: Air Piloted.

## Rated Flow

5 U.S. gpm (19 L/min) nominal. Flows to 15 U.S. gpm (57 L/min) are possible with some models. See "Valve Flow Capacity".

## Rated Pressure

10 000 psi (700 bar).

## Tank Port Pressure (Maximum)

Manual Actuated Models:

3000 psi (210 bar).

Solenoid Actuated Models:

Standard,

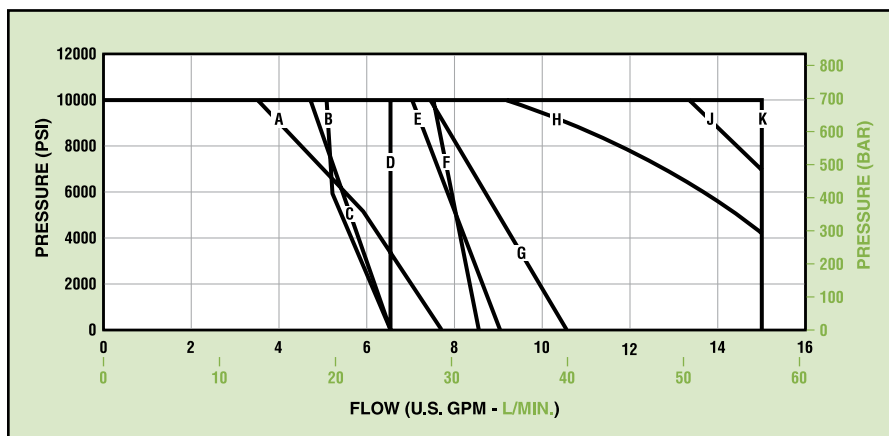
1500 psi (105 bar);

High Pressure Option ("HT"),  
AC models, 2300 psi (160 bar);  
DC models, 3000 psi (210 bar).

Hydraulic and Air Actuated Models:

1500 psi (105 bar).

## Flow Capacity – Solenoid Models



## Flow Curve Reference

Operator Code	Solenoid Type	Spool Type												
		0	20	1	21	3	4	011	2	2R	32	32R	36	03
1	All Types	–	J	–	K	–	–	–	–	–	–	–	–	–
2	All Types	–	J	–	K	–	–	–	–	–	–	–	–	–
3	All Types	B	–	K	–	–	–	–	–	–	–	–	–	–
4 and 5	AC	E	–	K	–	K	K	A	A	A	C	C	D	G
	DC and "EP"	K	–	K	–	K	K	A	A	A	K	K	K	K
6	All Types	K	–	K	–	K	K	F	F	F	K	K	K	H

## Response Time (Full Stroke)

Solenoid Energized:  
AC, 12 ms; DC, 20 ms.  
Spring Returned:  
AC, 15 ms; DC, 20 ms.

## Solenoid Options

Models are available with standard AC or DC solenoids. Optional Plug-In-Terminal Solenoids fit DIN Connector, Standard 43650 Form A ("Hirschmann" type).

## Electrical Connections

Standard Wiring Box with UL listed and CSA approved wire leads;

Optional Terminal Strip, Cable Grip or Pin Connector (N.F.P.A. standard T3.5-29-1980; A.N.S.I. standard B93.55M-1981).

## Explosion Proof Option ("EP")

Solenoids with special enclosures are approved by UL and CSA for use in hazardous locations. Available with AC or DC solenoids.

UL Classification:  
Class I, Group C, D;  
Class II, Group E, F, G.

## CSA/UL Recognized ("C" Option)

Solenoid coils are printed with the symbol:

 (CSA and UL Recognized)

This option is available with "115DF" standard AC solenoids only. For availability with other voltages, contact the Dynex sales department.

## VALVE FLOW CAPACITY

Flow capacity depends on valve actuator, internal operator and spool type.

## Solenoid Models

The flow capacity curves, above, show typical performance for each internal operator and spool type. The letters in the "Flow Curve Reference" table identify the appropriate curve.

# HIGH PRESSURE HP03 PATTERN

## Lever Actuated Models

Most manual models are rated for 15 U.S. gpm (57 L/min) maximum.

The exception is model 613011-D03 which is rated for 13 U.S. gpm (49 L/min) maximum. This model has a Code 3 internal operator (two position, detented operation) with Type 011 spool (tandem center).

## Pilot Operated Models

The nominal flow capacity for most pilot operated valves is 8 U.S. gpm (30 L/min). When using a Type 011 spool (tandem center, open crossover), the maximum flow is 6 U.S. gpm (23 L/min).

Maximum flow for pilot operated valves is dependent on pilot pressure. The table shows the minimum pressure required to shift the spool at 5 U.S. gpm (19 L/min).

Maximum Pilot Pressure:

Hydraulic, 3000 psi (210 bar);

Air, 200 psi (14 bar).

Required Volume (to shift spool full stroke):

Hydraulic, 0.014 in<sup>3</sup> (0,23 cm<sup>3</sup>);

Air, 0.220 in<sup>3</sup> (3,61 cm<sup>3</sup>).

## Lever Actuated Flow Limitations

Operator Code	Spool Type	Maximum Flow	
		U.S. gpm	L/min
1 and 2	0	7.0	26
	1	8.0 <sup>①</sup>	30 <sup>①</sup>
	03	7.0	26
3	1	8.0 <sup>①</sup>	30 <sup>①</sup>
	011	7.5	28
	2 or 2R	7.5	28
5	1	8.0 <sup>①</sup>	30 <sup>①</sup>
7	1	8.0 <sup>①</sup>	30 <sup>①</sup>

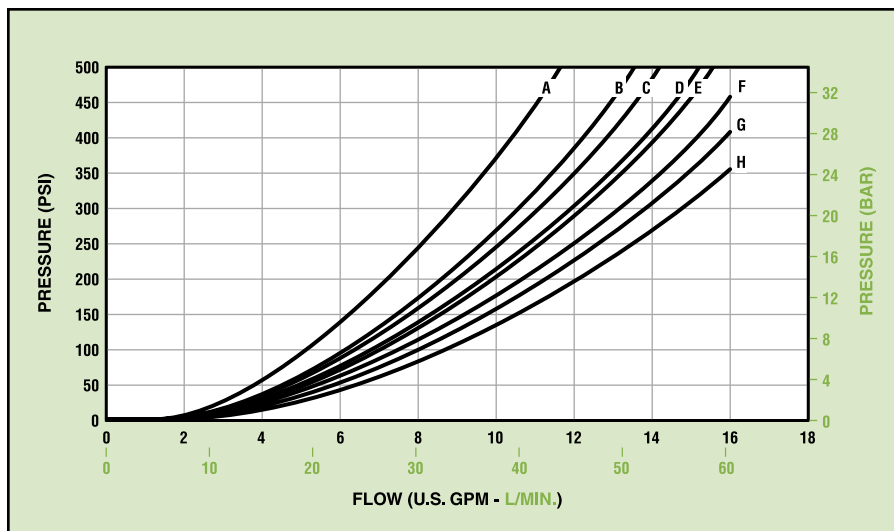
<sup>①</sup> 8 U.S. gpm (30 L/min) maximum at 10 000 psi (700 bar). Flow capacity increases at reduced pressure; i.e. 11 U.S. gpm (41 L/min) at 2000 psi (140 bar).

## Minimum Pilot Pressure

Series (Actuator Type)	Spool Type	Pilot Pressure at 5 U.S. gpm (19 L/min)	
		psi	bar
6800 Series (Hydraulic Piloted) <sup>①</sup>	0 or 20	215	14,8
	1 or 21	150	10,3
	3	145	10,0
	4	130	9,0
	011, 2 or 2R	190	13,1
	32 or 32R	150	10,3
	36	150	10,3
	03	130	9,0
6900 Series (Air Piloted)	0 or 20	25	1,7
	1 or 21	21	1,4
	3 or 4	25	1,7
	011	23	1,6
	2 or 2R	23	1,6
	32 or 32R	25	1,7
	36	25	1,7
	03	35	2,4

<sup>①</sup> The values listed are based on zero tank pressure. As back-pressure increases above zero, the minimum pilot pressure must be increased by the same amount.

## Pressure Drop (ΔP)



## VALVE EFFICIENCY

Pressure drop for all models, except manual lever actuated, are shown at right.

Flow may be limited for certain spools. See "Flow Capacity" curves on page 14.

## Determining Pressure Drop

The curves show typical resistance to flow for various spool types. The table identifies the proper pressure drop curve for each spool and flow path.

## An Example

In the table under spool Type 1, curve "D" is called out to determine the pressure drop for P→A. Looking at the curves, "D" indicates a drop of about 65 psi at 5 U.S. gpm (4,5 bar at 19 L/min).

To determine total "loop" drop, the individual pressure drops for P→A and B→T (or P→B and A→T) must be added.

## Flow Curve Reference

Flow Path	Spool Type												
	0	20	1	21	3	4	011	2	2R	32	32R	36	03
P→A	B	B	D	E	B	D	C	C	B	B	B	B	B
P→B	B	B	D	E	B	D	C	C	B	B	B	B	B
A→T	E	E	G	G	H	E	E	E	E	E	E	E	-
B→T	E	E	G	G	H	E	E	E	E	E	E	E	-
P→T	-	-	D	D	-	-	A	A	-	-	-	-	-

# HIGH PRESSURE HP03 PATTERN

## Manual Lever Models

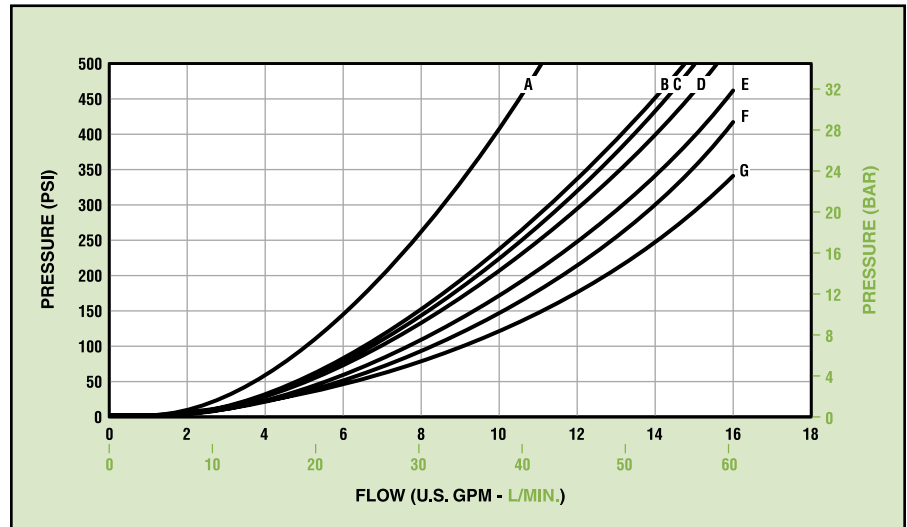
The curves show typical resistance to flow for various spool types. The table identifies the proper pressure drop curve for each spool and flow path.

### An Example

In the table under spool Type 1, curve "C" is called out to determine the pressure drop for P→A. Looking at the curves, "C" indicates a drop of about 60 psi at 5 U.S. gpm (4,1 bar at 19 L/min).

To determine total "loop" drop, the individual pressure drops for P→A and B→T (or P→B and A→T) must be added.

## Pressure Drop ( $\Delta P$ ) – Manual Lever Models



## Flow Curve Reference

Flow Path	Spool Type										
	0	1	3	4	011	2	2R	32	32R	36	03
P→A	B	C	B	C	B	B	B	B	B	B	B
P→A	B	C	B	C	B	B	B	B	B	B	B
P→A	F	G	G	F	D	D	D	F	F	F	–
P→A	E	G	G	F	D	D	D	F	F	F	–
P→T	–	B	–	–	A	A	A	–	–	–	–

# HIGH PRESSURE HP03 PATTERN

## INSTALLATION AND DIMENSIONS

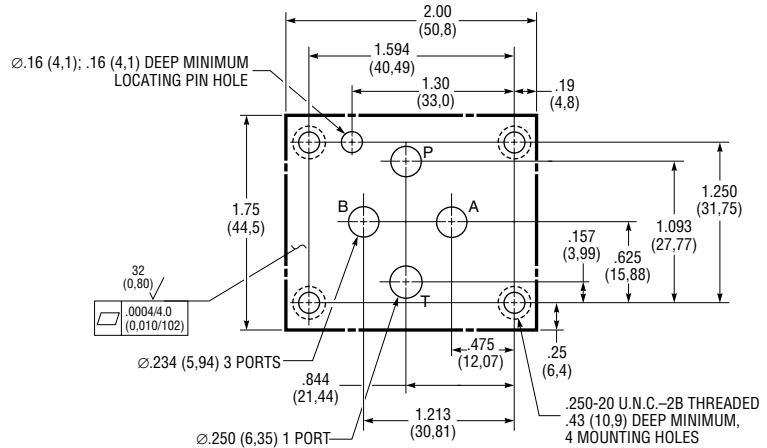
### Special Valve Mounting

Although similar to standard N.F.P.A. D03 (CETOP #3) valves in size, HP03 valves require a special high pressure mounting pattern. The mounting surface shows the minimum flush or raised surface required for the HP03 pattern.

Port o-rings are included with valves.

Mounting bolts must be ordered separately: .250-20 U.N.C. Threaded x 0.75 inch (19 mm), Grade 8 or better, four required. Recommended mounting torque is 12 lb·ft (16 N·m).

See "Subplate and Bolt Kits" on page 6.



Minimum Mounting Surface, Special HP03 Pattern

### Solenoid Model Dimensions

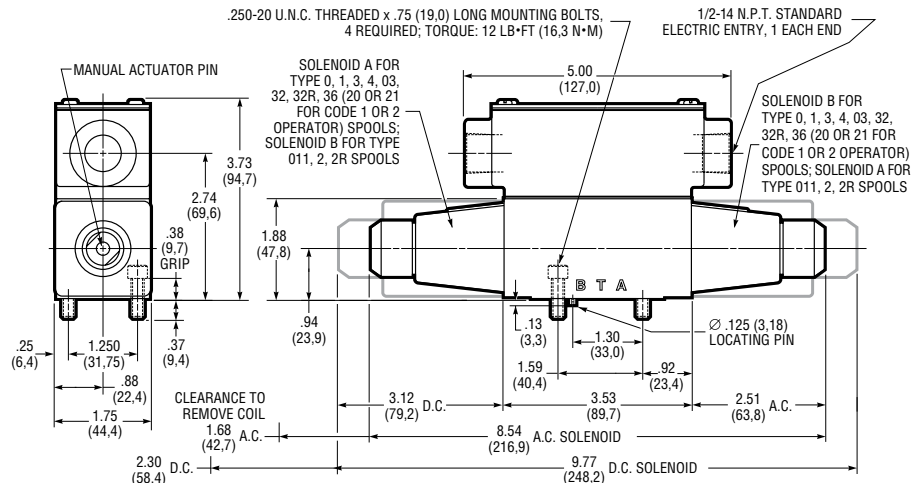
Dimensions are shown for both AC and DC solenoids. DC configuration is shown printed in gray.

The overall length of a single solenoid model (not shown) is 6.78 inches (172,2 mm) AC and 7.39 inches (187,7 mm) DC.

Weight (Mass):

Single Solenoid,  
AC, 3.4 lb (1,5 kg);  
DC, 3.9 lb (1,8 kg).

Double Solenoid,  
AC, 4.0 lb (1,8 kg);  
DC, 5.3 lb (2,4 kg).



6500 Series, Double Solenoid Models

### Explosion Proof Solenoids

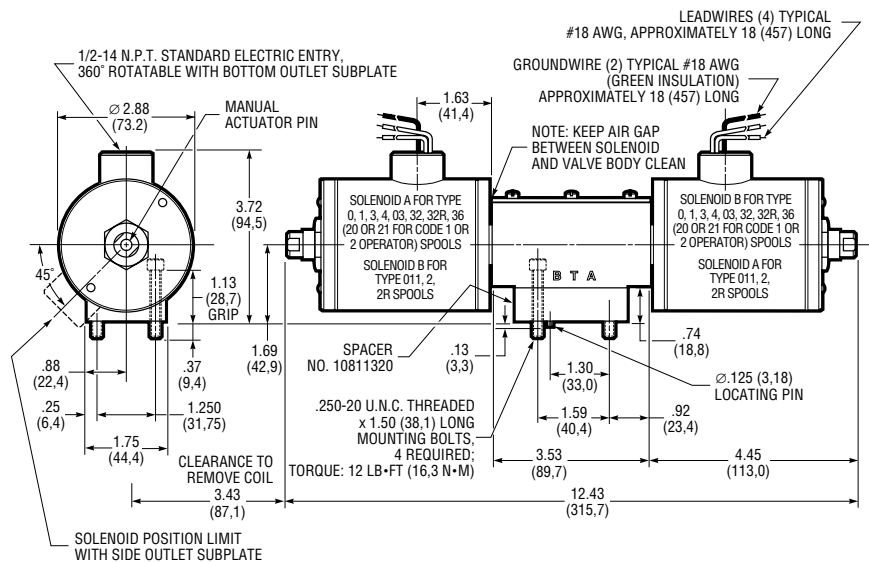
"EP" solenoids with special enclosures are approved by UL and CSA for use in hazardous locations.

Overall length of single solenoid models (not shown) is 8.23 inches (209,9 mm).

A kit with a spacer plate (part number KV00301066) is required when valves are mounted on manifolds, side outlet subplates or when used as a pilot valve.

Weight (Mass):

Single Solenoid, 8.3 lb (3,8 kg);  
Double Solenoid, 14.0 lb (6,4 kg).



6500 Series, Double "EP" Solenoid Models

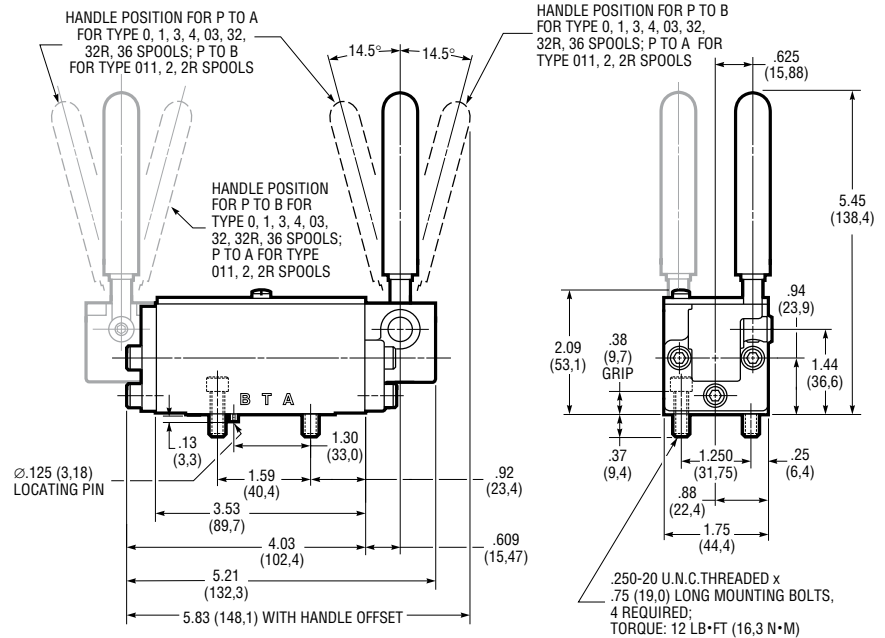
# HIGH PRESSURE HP03 PATTERN

## Manual Operated Models

Manual models are lever actuated, with handle positioned in a choice of four positions on either port "A" or port "B" end of valve. To specify position, refer to "Typical Model Code" on page 19.

Valves can be mounted without removing nameplate; openings in the nameplate provide access to mounting holes in valve body.

Weight (Mass):  
3.2 lb (1,5 kg).



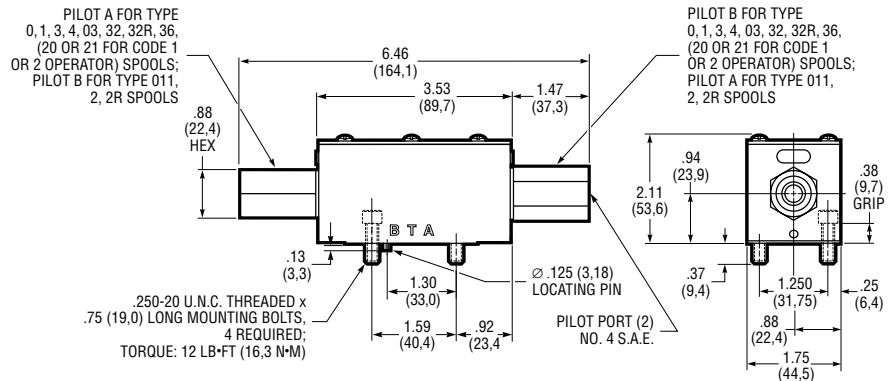
6100 Series, Manual Lever Operated Models

## Hydraulic Pilot Operated

Overall length of single actuator configuration (not shown) is 5.25 inches (133,4 mm).

Valves can be mounted without removing nameplate; openings in the nameplate provide access to mounting holes in valve body.

Weight (Mass):  
Single Actuator, 2.5 lb (1,1 kg);  
Double Actuator, 2.8 lb (1,3 kg).



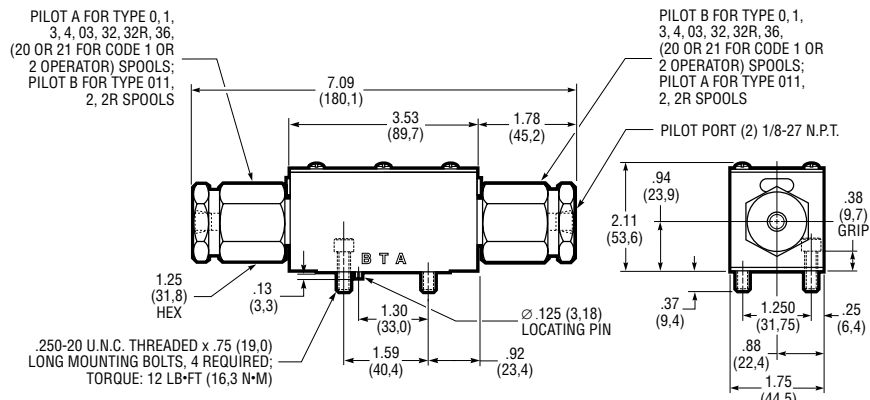
6800 Series, Double Hydraulic Piloted Models

## Air Piloted Models

Overall length of single actuator configuration (not shown) is 5.56 inches (141,2 mm).

Valves can be mounted without removing nameplate; openings in nameplate provide access to mounting holes in valve body.

Weight (Mass):  
Single Actuator, 2.3 lb (1,0 kg);  
Double Actuator, 2.5 lb (1,1 kg).



6900 Series, Double Air Piloted Models

## HP03 SUBPLATE AND BOLT KITS

Part Number	Description
<i>Subplates:</i>	
PSO29-HP03-SAE6	Side Ports, No. 6 S.A.E.
PSO29-HP03-BSP6	Side Ports, G 3/8 (B.S.P.)
PSO30-HP03-.56MP <sup>①</sup>	Side Ports, 9/16 Medium Pressure Coned and Threaded .8125-16 U.N. Threaded
<i>Mounting Bolts:</i>	
P11-BK	Four .250-20 U.N.C. Threaded x 0.75 inches (19,0 mm)

<sup>①</sup> Port uses Autoclave Medium Pressure, Butech M/P or equivalent fitting.

# HIGH PRESSURE HP03 PATTERN

## TYPICAL MODEL CODE

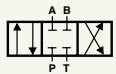
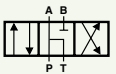
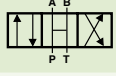
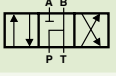

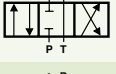

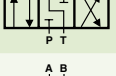
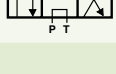
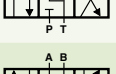
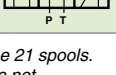
6 5 4 0 - HP03 - 115DF - R - T - \* - 2 0

Valve Type	
6	Subplate Mounted Directional Control

Actuator	
1	Manual Lever
5	Solenoid Operated
8	Hydraulic Piloted
9	Air Piloted

Internal Operator	
1	Two Position: Spring Offset (P→B), Actuator Offset (P→A) <sup>①</sup>
2	Two Position: Spring Offset (P→A), Actuator Offset (P→B) <sup>①</sup>
3	Two Position: Actuator Offset, Detented; <sup>②</sup> Three Position: Detented (Manual Lever Only)
4	Two Position: Spring Centered, Actuator Offset <sup>③④</sup>
5	Three Position: Spring Centered, Actuator Offset
6	Two Position: Spring Offset, Actuator Centered <sup>③⑤</sup>
7	Two Position: Detented (Manual Lever Only)

① Only available with Type 20 and 21 spools.  
 ② Only available with Type 0, 1 and 03 spools.  
 ③ Not available with Manual Lever valves.  
 ④ For most spools, normal flow is actuator offset P→A. For Spool Type 011 (tandem center) normal flow is actuator offset P→B.  
 ⑤ For most spools, normal flow is spring offset P→B. For Spool Type 011 (tandem center) normal flow is spring offset P→A.

Spools			
0,20 <sup>①</sup>		2 <sup>②</sup>	
1,21 <sup>①</sup>		2R <sup>②</sup>	
3 <sup>②</sup>		32 <sup>②</sup>	
4 <sup>②</sup>		32R <sup>②</sup>	
011 <sup>②③</sup>		36 <sup>②</sup>	
		03	

- ① Code 1 or 2 Operators only use Type 20 or Type 21 spools. These spools provide the same function, but are not interchangeable with Type 0 or Type 1 spools.  
 ② Not available with Type 3 Internal Operators (except Manual Lever models).  
 ③ Open Crossover.

Valve Size	
HP03	High Pressure Special Mounting Pattern

Reverse Flow Option	
R	Reverse Flow (Code 4 and Code 6 Internal Operators Only)

Design Number
2

Modification Number
0

Lever Position (Manual Models Only)	
A12	12 o'clock position, port "A" end
A3	3 o'clock position, port "A" end
A6	6 o'clock position, port "A" end
A9	9 o'clock position, port "A" end
B12	12 o'clock position, port "B" end
B3	3 o'clock position, port "B" end
B6	6 o'clock position, port "B" end
B9	9 o'clock position, port "B" end

Solenoid Options	
BH3A	3-pin Connector for single solenoid models on port "A" end <sup>①②③</sup>
BH3B	3-pin Connector for single solenoid models on port "B" end <sup>①②③</sup>
BH5A	5-pin Connector for single or double solenoid models on port "A" end <sup>①②③</sup>
BH5B	5-pin Connector for single or double solenoid models on port "B" end <sup>①②③</sup>
C	CSA and UL Recognized Coils (Etched with Symbol) <sup>④</sup>
CG	Cable Grip for .38 to .44 inch (9.5 to 11.1 mm) O.D. machine tool cable <sup>①②</sup>
HT	High Pressure Tank Port: 2300 psi (160 bar) maximum AC models; 3000 psi (210 bar) maximum DC models
M	Hand Actuated Manual Override <sup>①</sup>
SL	Solenoid Lights (available 115DF AC only) <sup>①②</sup>
T	Terminal Strip <sup>①②</sup>

① Option not available with "EP" solenoid models.  
 ② Option not available with "Plug-In Terminal" solenoid models.  
 ③ N.F.P.A. standard T3.539-1980; A.N.S.I. standard B93.55M-1981.  
 ④ Available with 115DF solenoids only.

Electrical Options			
Standard AC Solenoids (Dual Frequency):		Standard DC Solenoids:	
24DF	24V/60Hz, 24V/50Hz	12DC	12VDC
115DF	115V/60Hz, 110V/50Hz	24DC	24VDC
230DF	230V/60Hz, 220V/50Hz		
460DF	460V/60Hz, 440V/50Hz		
Plug-In Terminal AC Solenoids: <sup>①</sup>		Plug-In Terminal DC Solenoids: <sup>①</sup>	
115HA	115V/60Hz, 110V/50Hz	12HD	12VDC
230HA	230V/60Hz, 220V/50Hz	24HD	24VDC
Explosion-Proof AC Solenoids:		Explosion-Proof DC Solenoids:	
115EP	115V/60Hz	12EP	12VDC
110EP	110V/50Hz	24EP	24VDC
220EP	220V/50Hz		

① Fits DIN Connector Standard 43650 Form A ("Hirschmann" type).