

High Pressure, Subplate Mounted Directional Control Valves

MODEL HP03
5 gpm (19 L/min) nominal
10 000 psi (700 bar)

HP03 valves are rated for 5 gpm (19 L/min) nominal flow at pressures to 10 000 psi (700 bar). Flows to 15 gpm (57 L/min) are possible with some models (See "Typical Valve Performance", pages 3-4).

These high performance valves operate reliably at pressures double that of conventional subplate mounted valves.

The reliable sliding-spool valves provide true four-way control in a simple compact package.

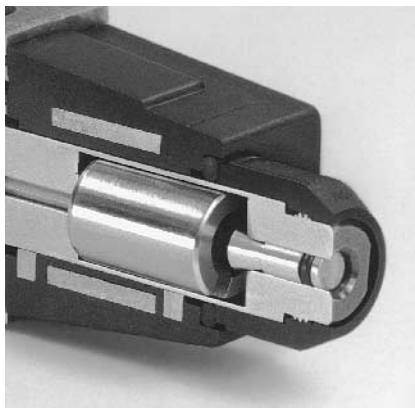
SMOOTH, PRECISE SHIFTING

Spool travel is exceptionally smooth because of a four-land spool design. Additional outboard lands provide greater support than two-land designs.

Balancing grooves provide precise centering, reducing silt buildup. Close tolerances assure accurate land sequencing and low leakage.

RELIABLE VALVE SEALING

Tapered o-ring counterbores reduce leakage, by assuring seal retention in rapid cycling operation. High-torque mounting prevents weepage.



Weather-Tight Solenoids



HP03 Valve With Optional Plug-In-Terminal Solenoids

SOLENOID ADVANTAGES

Solenoid models are quiet and weather-tight for extra-long life. Wet armature design eliminates dynamic seals and increases the available shifting forces. Static o-rings prevent external leakage.

MANUAL OVERRIDE

Solenoid override pins are made from corrosion-resistant brass for trouble-free operation. Convenient hand-actuated override, available as an option, provides solenoid override without the use of tools.

PLUG-IN TERMINAL SOLENOIDS

Optional solenoid plugs simplify electrical connections during installation and servicing. These integral three-terminal, bi-polar plugs fit DIN Connector Standard 43650 (Hirschmann GDM 209).



Hand-Actuated Override

LEVER-OPERATED MODELS

Lever operated valves offer superior handle position flexibility. Choose from eight different locations to put the handle where it is best for operator convenience.

Valve Specifications and Application Data

SPECIFICATIONS

Special Mounting

Although similar to standard NFPA D03 (CETOP 3) valves in size, HP03 valves require a special mounting pattern. Refer to page 5.

Rated Pressure

10 000 psi (700 bar)

Rated Flow

5 gpm (19 L/min) nominal; See "Typical Valve Performance", page 3.

Tank Port Pressure (Maximum)

Manual Operated Models:

3000 psi (210 bar);

Solenoid Actuated Models:

Standard,
1000 psi (70 bar) dynamic,
3000 psi (210 bar) static;
High Pressure Option (HPT),
3000 psi (210 bar) dynamic,
5000 psi (350 bar) static;

Hydraulic and air actuated models:

Standard, 1500 PSI (105 bar);

Response Time (Full Stroke)

Solenoid Energized:

A.C., 12 ms; D.C., 20 ms

Spring Returned:

A.C., 15 ms; D.C., 20 ms

Solenoids

Available with A.C. or D.C. solenoids. For electrical options refer to "Typical Model Code" on page 8. For complete installation details on these options, refer to *Bulletin VES*.

Electrical Connections

Standard Wiring Box with 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);
Optional Plug-In-Terminal Solenoids fit DIN Connector Standard 43650 (Hirschmann GDM 209)

Explosion Proof (EPW Option)

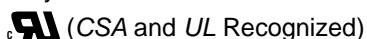
Solenoids with special enclosures are approved by *UL* and *CSA* for use in hazardous locations.

UL Classification:

Class I, Group C, D;
Class II, Group E, F, G

CSA and UL Recognized (C Option)

Solenoid coils are printed with the symbol:



Available with 115/DF coils only. For other voltages, contact the Dynex sales department.

ELECTRICAL DATA

Solenoid Code ^①	Input Voltage (Volts)	Frequency (Hz)	Inrush Current (Amps)	Holding Current (Amps)	Holding Power (Watts)	Coil Resistance (Ohms ± 10%)
115/DF (Dual Frequency)	110 A.C. 115 A.C.	50 60	1.65 1.55	.47 .40	20 20	40 44
230/DF (Dual Frequency)	220 A.C. 230 A.C.	50 60	.86 .80	.22 .18	20 20	150 150
460/DF (Dual Frequency)	440 A.C. 460 A.C.	50 60	.41 .40	.13 .10	23 21	600 600
12 VDC	12 D.C.	—	2.33	2.33	28	5.1
24 VDC	24 D.C.	—	1.17	1.17	28	20.6
115/60 EPW	115 A.C.	60	1.90	.50	23	33.5

^① Ordering Codes shown are for standard wire leads with wiring box. "Plug-In-Terminal" solenoids (Hirschmann GDM 209) are also available; see "Typical Model Code" on page 8.

MANUAL OPERATED MODELS

Lever operated models offer handle position flexibility with four positions on either port "A" end or port "B" end of valve.

In-the-field changes are easy, by removing the bracket assembly and rotating the handle to the desired position.

To specify position, see the installation drawing on page 7 and refer to "Typical Model Code" on page 8.



APPLICATION DATA

Flow Actuating Pattern

Operating actuator "A" opens flow path to port "A" (P→A). Operating actuator "B" opens flow path to port "B" (P→B). Models with Code 6 operators, which are actuator centered, are the exception.

Spring-centered or spring-offset models are spring positioned unless actuated continuously. Valves with detented operation can be actuated momentarily (minimum electrical signal duration, 50 ms) to shift and hold the spool in that position.

Mounting Position

Unrestricted for all models.

Standard Seals

All valves use fluorocarbon (*Viton*[®] or *Fluorel*[®]) o-rings, providing greater fluid compatibility and improved temperature range performance.

Fluid Recommendations

50 to 1500 SUS (7 to 323 cSt) viscosity; -20° to 200° F (-29° to 93° C) temperature range.

Filtration

Five micron or better is recommended for this high pressure valve.

Fine filtration is especially critical for sliding spool valves held in one position for long periods, subjected to high system pressures. Silting may cause spool sticking and improper shifting. To further prevent this occurrence, valves should be cycled periodically.

Differential Cylinder Circuits

High differential flows in cylinder circuits can cause any hydraulic valve to malfunction. Contact the Dynex sales department for a review of applications with differential flows (P→A versus B→T, or P→B versus A→T) above 6.6 gpm (25 L/min).

Pressure Surges

Consistent with standard practice, the system should be protected from pressure surges. With a common tank line serving multiple valves, shifting of any spool valve can be affected by surges of oil.

A separate line to tank, or to another low pressure line, is recommended. This is particularly critical with detented models.

Selecting Spools and Internal Operators

SPOOL SELECTION

The table at right shows the most common spools. Refer to "Typical Model Code" on page 8 for a complete listing of spool types.

Lever actuated models, with Code 1 or Code 2 internal operators, use *Type 0* or *Type 1* spools. All other models with Code 1 or Code 2 internal operators use *Type 20* or *Type 21* spools.

Type 0 and *Type 1* spools provide the same function, but are not interchangeable with *Type 20* or *Type 21* spools.

INTERNAL OPERATORS

The table shows available internal operators with flow symbols. Note the following exceptions:

Code 3 operators in models with lever actuators provide three position, detented operation.

With Code 4 and Code 6 operators, flow can be reversed with the "R" option. For example, with "R" in the model code, a Code 4 operator with a Type 0 spool will direct flow to port "B" (P→B) in the actuated position.

INTERNAL OPERATORS

Operator Code	Actuator, Operation	Spool Types	Operator Function		
			Non-Actuated	Actuated	Function Symbol
1	Single Actuator, Two Position	0, 20 1, 21	Offset P→B	P→A	
		03	Offset P→B	P→A	
2	Single Actuator, Two Position	0, 20 1, 21	Offset P→A	P→B	
		03	Offset P→A	P→B	
3	Double Actuator, Two Position	All Types	Detented in Actuated Positions	P→A or P→B	
4	Single Actuator, Two Position	0, 1, 3	Spring Centered	P→A	
		011	Spring Centered	P→B	
5	Double Actuator, Three Position	All Types	Spring Centered	P→A or P→B	
6	Single Actuator, Two Position	0, 1, 3	Spring Offset P→B	Centered	
		011	Spring Offset P→A	Centered	
7	Single Actuator, Two Position	0 or 1	Detented in Actuated Positions	P→A or P→B	

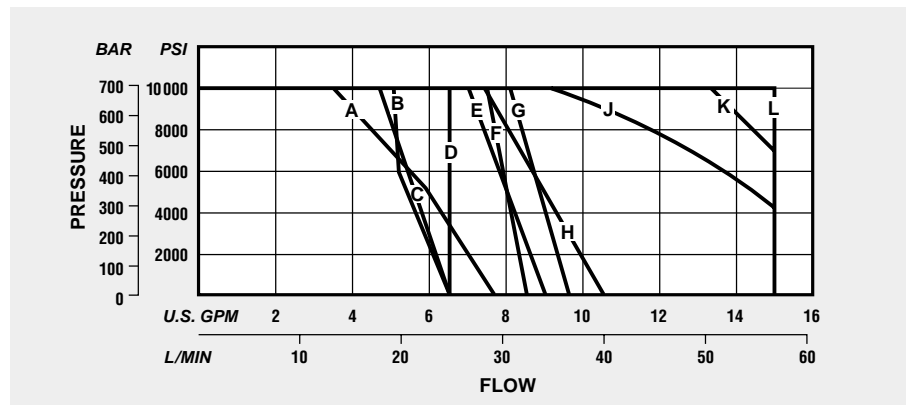
Typical Valve Performance

SOLENOID MODELS

The curves at right show typical flow capacity for each spool type. The letters in the "Flow Curve Reference" table identify the appropriate curve.

For example, in the table under spool Type 0, curve "L" is called out for models with Code 5 internal operators and D.C. solenoids. Looking at the curves, "L" indicates a maximum capacity of 15 gpm (57 L/min) at pressures to 10 000 psi (700 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	—	K	—	L	—	—	—	—	—	—	—	—	—
2	All Types	—	K	—	L	—	—	—	—	—	—	—	—	—
3	All Types	B	—	L	—	—	—	—	—	—	—	—	—	—
4	A.C.	E	—	L	—	L	L	G	A	A	C	C	D	H
	D.C. & EPW	L	—	L	—	L	L	G	G	G	L	L	L	L
5	A.C.	E	—	L	—	L	L	G	A	A	C	C	D	H
	D.C. & EPW	L	—	L	—	L	L	G	G	G	L	L	L	L
6	All Types	L	—	L	—	L	L	F	F	F	L	L	L	J

LEVER OPERATED MODELS

Most manual models are rated for 15 gpm (57 L/min) maximum. The exceptions are models with internal operators and spool types shown in the table below.

FLOW LIMITATIONS

Operator Code	Spool Type	Maximum Flow	
		gpm	L/min
1	0	7.0	26
	1	8.0 ^①	30 ^①
	03	7.0	26
2	0	7.0	26
	1	8.0 ^①	30 ^①
	03	7.0	26
3	1	8.0 ^①	30 ^①
	011	7.5	28
	2 or 2R	7.5	28
5	1	8.0 ^①	30 ^①
7	1	8.0 ^①	30 ^①

① 8 gpm (30 L/min) at 10 000 psi (700 bar). Flow capacity increases with reduced pressure; i.e., 11 gpm (41 L/min) at 2000 psi (140 bar).

Determining Valve Efficiency

PRESSURE DROP

The curves at right indicate pressure drop for all HP03 valves, except manual operated (see page 5 for those curves).

These curves show resistance to flow for specific flow paths and various spool types. The "Flow Curve Reference" table identifies the proper curve.

Maximum flow capacity depends on valve actuator, internal operator, spool type and other application factors. Refer to "Typical Valve Performance" on page 3.

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 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.

PILOT OPERATED MODELS

The maximum flow for pilot operated models is dependent on pilot pressure.

Generally, the maximum flow for most pilot operated valves is 8 gpm (30 L/min). When using a Type 011 spool (tandem center), the maximum flow rating is 6 gpm (23 L/min).

Minimum Pilot Pressure

The table at right shows the minimum pressure required to shift the spool at a nominal flow of 5 gpm (19 L/min). These values are based on zero tank pressure. For hydraulic piloted models, as back pressure increases above zero, the minimum pilot pressure must be increased equally.

Maximum Pilot Pressure

Hydraulic, 3000 psi (210 bar);
Air, 200 psi (14 bar)

Volume

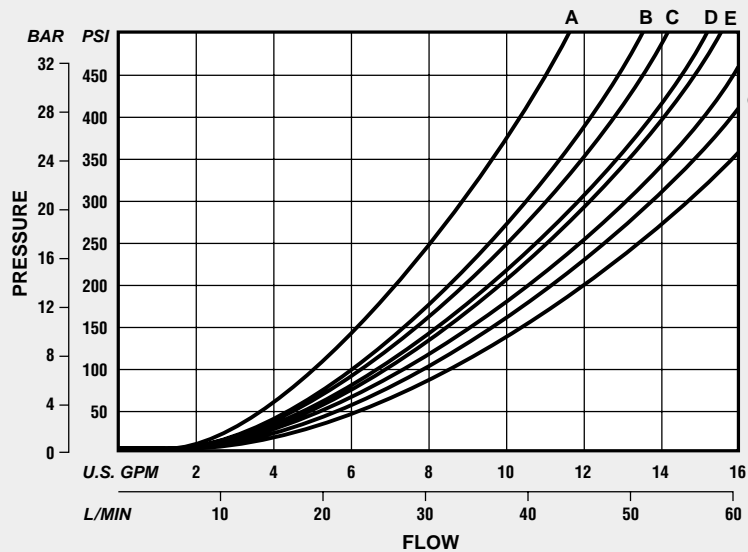
Maximum required to shift spool full stroke:

Hydraulic, 0.014 in³ (0,23 cm³);
Air, 0.220 in³ (3,61 cm³)

MINIMUM PILOT PRESSURE

Series	Spool Type	Pilot Pressure at 5 gpm (19 L/min)	
		psi	bar
6800 Series Hydraulic Piloted	0 or 20	215	14,8
	1 or 21	215	14,8
	3	215	14,8
	4	215	14,8
	011	360	24,8
	2 or 2R	360	24,8
	32 or 32R	260	17,9
	36	260	17,9
	03	215	14,8
	6900 Series Air Piloted	0 or 20	35
1 or 21		28	1,9
3		35	2,4
4		35	2,4
011		50	3,4
2 or 2R		50	3,4
32 or 32R		40	2,8
36		35	2,4
03		35	2,4

PRESSURE DROP (ΔP) — ALL MODELS EXCEPT LEVER ACTUATED



① These curves indicate efficiency for various spool types. For maximum flow capacity refer to curves on page 3.

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	C	B	B	B	B
P→B	B	B	D	E	B	D	C	C	C	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	A	—	—	—	—

LEVER ACTUATED MODELS

The curves at right indicate pressure drop for lever actuated HP03 valves.

These curves show resistance to flow for specific flow paths and various spool types. The "Flow Curve Reference" table identifies the proper curve.

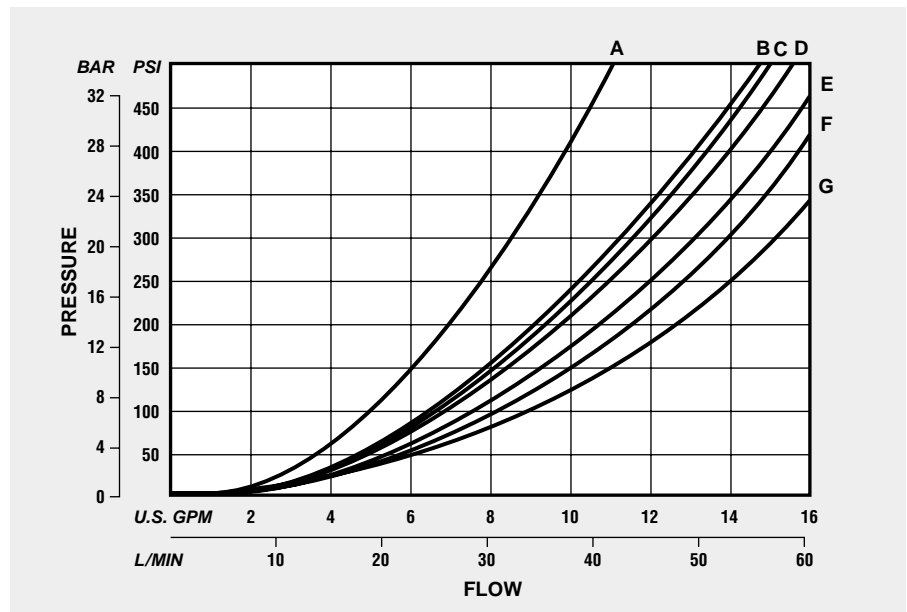
Maximum flow capacity depends on valve actuator, internal operator, spool type and other application factors. Refer to the "Flow Limitations" table on page 4.

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 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 (ΔP) — LEVER ACTUATED 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→B	B	C	B	C	B	B	B	B	B	B	B
A→T	F	G	G	F	D	D	D	F	F	F	—
B→T	F	G	G	F	D	D	D	F	F	F	—
P→T	—	B	—	—	A	A	A	—	—	—	—

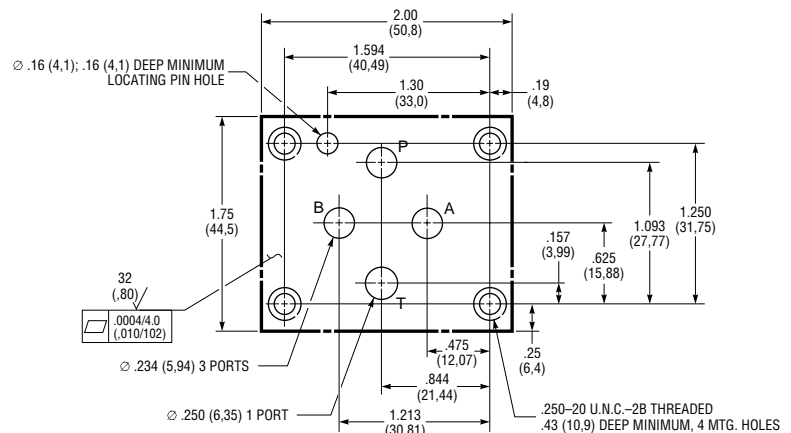
Installation and Dimensions

SPECIAL VALVE MOUNTING

The mounting surface drawing shows the minimum flush or raised surface required for this special pattern.

Mounting face must be flat within 0.0004 inch/4.0 inches (0,010 mm/102 mm) with a surface finish of 32 microinch (0,80 μm) AA.

Port o-rings are included with all valves. Mounting bolts must be ordered separately; .250-20 UNC Threaded x 0.75 inch (19 mm), Grade 8 or better; four required. Recommended mounting torque is 12 lb·ft (16 N·m) maximum.



Minimum Mounting Surface, Special HP03 Pattern

MANUAL OPERATED MODELS

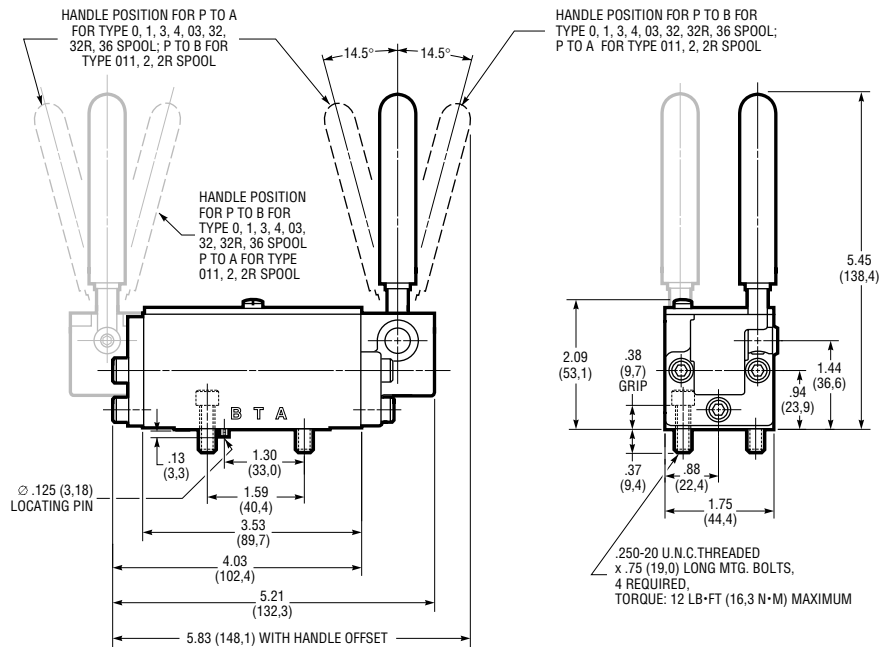
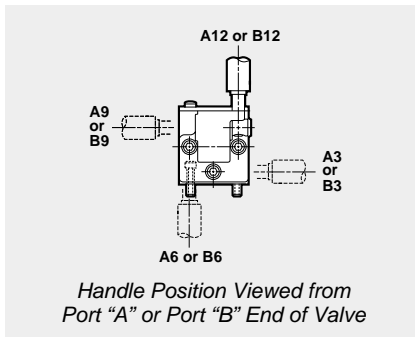
Manual models are lever actuated, with handle located in a choice of four positions on either port "A" or port "B" end of valve.

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

To specify handle position, see the drawing below and refer to "Typical Model Code" on page 8.

Weight (Mass)

3.2 lb (1,5 kg)



6100 Series, Manual Lever Operated Models

HYDRAULIC PILOTED MODELS

Single and double actuator models are available. Overall length of single actuator configuration (not shown) is 5.25 inches (133,4 mm).

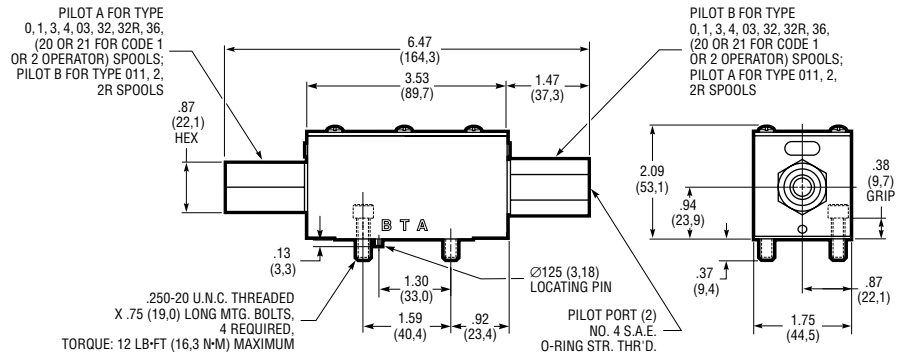
Valves can be mounted without removing nameplate. Openings in plate provide access to mounting holes in valve body.

Refer to page 4 for required shifting pressure and volume.

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

Single and double actuator models are available. Overall length of single actuator configuration (not shown) is 5.56 inches (141,2 mm).

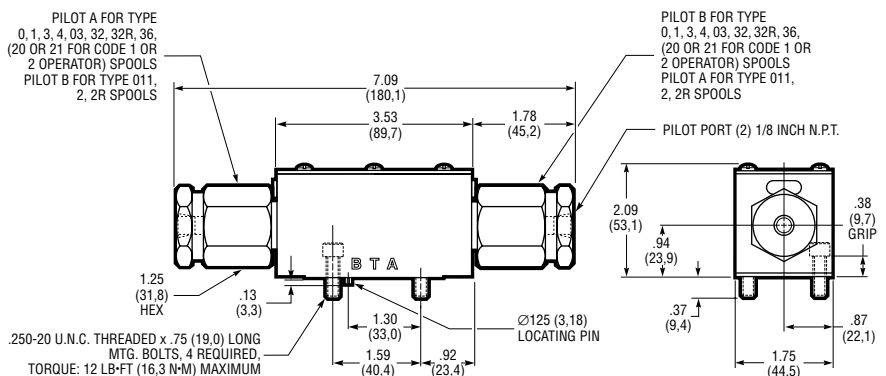
Valves can be mounted without removing nameplate. Openings in plate provide access to mounting holes in valve body.

Refer to page 4 for required shifting pressure and volume.

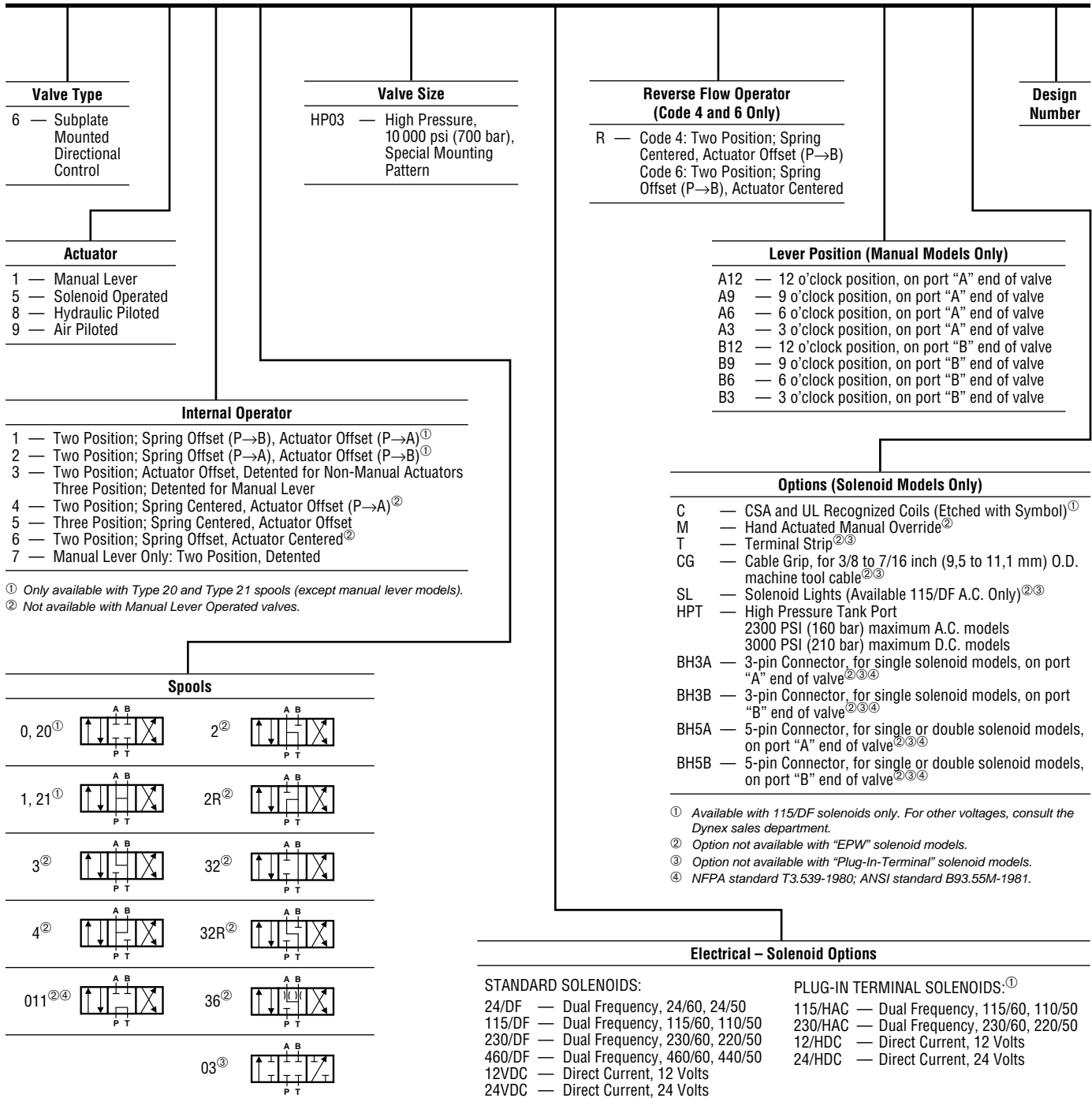
Weight (Mass)

Single Actuator: 2.3 lb (1,0 kg);

Double Actuator: 2.5 lb (1,1 kg)



6900 Series, Double Air Piloted Models



① Code 1 or Code 2 operators (non-lever actuated models) use Type 20 or Type 21 spools. These spools provide the same function, but are not interchangeable with Type 0 or 1 spools.
② Not available with Code 1, Code 2, or Code 3 Internal Operators (except manual lever models).
③ Not available with Code 1 or Code 2 Internal Operators (except manual lever models).
④ Open crossover.

① Fits DIN Connector Standard 43650 (Hirschmann GDM 209)

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