HP03 Pattern Directional Control Valves

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

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.
**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)**

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 Capacity Graph](image)

**Flow Curve Reference**

<table>
<thead>
<tr>
<th>Operator Code</th>
<th>Solenoid Type</th>
<th>Spool Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All Types J</td>
<td>K</td>
</tr>
<tr>
<td>2</td>
<td>All Types J</td>
<td>K</td>
</tr>
<tr>
<td>3</td>
<td>All Types B</td>
<td>K</td>
</tr>
<tr>
<td>4 and 5</td>
<td>AC E K K A</td>
<td>A C C D G</td>
</tr>
<tr>
<td></td>
<td>DC and “EP”</td>
<td>K K K K K</td>
</tr>
<tr>
<td>6</td>
<td>All Types K</td>
<td>K</td>
</tr>
</tbody>
</table>

**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.
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 in³ (0.23 cm³);
Air, 0.220 in³ (3.61 cm³).

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.

Minimum Pilot Pressure

Flow Curve Reference

<table>
<thead>
<tr>
<th>Flow Path</th>
<th>Spool Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>P→A</td>
<td>B B D E B D C C B B B B</td>
</tr>
<tr>
<td>P→B</td>
<td>B B D E B D C C B B B B</td>
</tr>
<tr>
<td>A→T</td>
<td>E E G G H E E E E E E E E E E E E E E</td>
</tr>
<tr>
<td>B→T</td>
<td>E E G G H E E E E E E E E E E E E E E</td>
</tr>
<tr>
<td>P→T</td>
<td>– – D D – – A A – – – – – –</td>
</tr>
</tbody>
</table>
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.

Flow Curve Reference

<table>
<thead>
<tr>
<th>Flow Path</th>
<th>Spool Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>P→A</td>
<td>B C B C B B B B B B B</td>
</tr>
<tr>
<td>P→A</td>
<td>B C B C B B B B B B B</td>
</tr>
<tr>
<td>P→A</td>
<td>F G G F D D D F F F --</td>
</tr>
<tr>
<td>P→A</td>
<td>E G G F D D D F F F --</td>
</tr>
<tr>
<td>P→T</td>
<td>-- B -- A A A -- -- -- --</td>
</tr>
</tbody>
</table>
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 drawing 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.

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).

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).
**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).

**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).

**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.)

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**HP03 SUBPLATE AND BOLT KITS**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS029-HP03-3AE6</td>
<td>Side Ports, No. 6 S.A.E.</td>
</tr>
<tr>
<td>PS029-HP03-BSP6</td>
<td>Side Ports, G 3/8 (B.S.P.)</td>
</tr>
<tr>
<td>PS030-HP03-56MP®</td>
<td>Side Ports, 9/16 Medium Pressure Coned and Threaded .8125-16 U.N. Threaded</td>
</tr>
</tbody>
</table>

**Mounting Bolts:**

Four .250-20 U.N.C. Threaded x 0.75 inches (19.0 mm)

Port uses Autoclave Medium Pressure, Butech M/P or equivalent fitting.

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**6100 Series, Manual Lever Operated Models**

**6800 Series, Double Hydraulic Piloted Models**

**6900 Series, Double Air Piloted Models**
### 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

#### Valve Size
- HP03: High Pressure Special Mounting Pattern

#### Design Number

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

### Internal Operator

| 1 | Two Position: Spring Offset (P→B), Actuator Offset (P→A) |
| 2 | Two Position: Spring Offset (P→A), Actuator Offset (P→B) |
| 3 | Two Position: Actuator Offset, Detented; Three Position: Detented (Manual Lever Only) |
| 4 | Two Position: Spring Centered, Actuator Offset |
| 5 | Three Position: Spring Centered, Actuator Offset |
| 6 | Two Position: Spring Offset, Actuator Centered |
| 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.
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 | 1 | A | B | 20 |
| 1,21 | 1 | A | B | 21 |
| 011 | 1 | A | B | 011 |
| 0 | 1 | A | B | 0 |
| 2 | 1 | A | B | 2 |
| 3 | 1 | A | B | 3 |
| 32 | 1 | A | B | 32 |
| 32R | 1 | A | B | 32R |
| 36 | 1 | A | B | 36 |
| 36 | 1 | A | B | 36 |

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.

### Solenoid Options

| BH3A | 3-pin Connector for single solenoid models on port ‘A’ end |
| BH3B | 3-pin Connector for single solenoid models on port ‘B’ end |
| BH5A | 5-pin Connector for single or double solenoid models on port ‘A’ end |
| BH5B | 5-pin Connector for single or double solenoid models on port ‘B’ end |
| CS | CSA and UL Recognized Coils (Etched with Symbol) |
| HT | High Pressure Tank Port: 2300 psi (160 bar) maximum AC models; 3000 psi (210 bar) maximum DC models |
| M | Hand Actuated Manual Override |
| SL | Solenoid Lights (available 115DF AC only) |
| T | Terminal Strip |

### 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 |

### Electrical Options

#### Standard AC Solenoids (Dual Frequency):
- 24DF: 24V/60Hz, 24V/50Hz
- 115DF: 115V/60Hz, 110V/50Hz
- 230DF: 230V/60Hz, 220V/50Hz
- 460DF: 460V/60Hz, 440V/50Hz

#### Plug-In Terminal AC Solenoids:
- 115HA: 115V/60Hz, 110V/50Hz
- 230HA: 230V/60Hz, 220V/50Hz

#### Explosion-Proof AC Solenoids:
- 115EP: 115V/60Hz
- 110EP: 110V/50Hz
- 220EP: 220V/50Hz

#### Standard DC Solenoids:
- 12DC: 12VDC
- 24DC: 24VDC

#### Plug-In Terminal DC Solenoids:
- 12HD: 12VDC
- 24HD: 24VDC

- Available with 115DF solenoids only.

### Open Crossover

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