Mechanical Actuators Directional Control Valves
Directional Control Valves

310 bar (4500 psi)
Flows to 114 l/min (30 USgpm)
NFPA D05, ISO-4401-05
DG1V4-01**-10 Knob Operated
DG17V4-01**-10 Lever Operated
General Description
The mechanical directional control valves described in this brochure are:
- Knob & Lever operated valves
  DG1/17V4-01**-10

Mechanical operation used by these valves is achieved by hand actuation. DG1 and DG17 are manual knob and lever operated valves used for applications requiring four-way directional operation. These valves are offered in spring offset, spring centered and no-spring detented versions.

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Typical Sectional View
Model Code
Two & Four-way Directional Valves

- Interface seals
  - Blank - Buna N (std.)
  - F3 - Viton (fire resistant seals)
  - F6 - Nitrile seals (water glycol)

- Directional control

- Mounting type
  - G - Manifold or subplate

- Control type
  - 17 - Manual lever operated
  - 1 - Knob operated

- Flow direction
  - V4 - Four-way, 310 bar (4500 psi)

- Valve size
  - 01 - ISO-4401-05, NFPA-D05 interface

- Spool type (crossover condition)
  - 0 - Open center
  - 1 - Open center, B blocked
  - 2 - Closed center
  - 3 - Closed center, P and B blocked
  - 6 - Closed center, P only
  - 7 - Closed center, T blocked
  - 8 - Open center, A and B blocked
  - 11 - Open center, A blocked
  - 22 - Closed center, 2-way
  - 31 - Closed center, A and P blocked
  - 33 - Closed center, bleed A & B

- Spool/Spring arrangement
  - A - Spring offset (handle out)
  - A2 - Spring offset (handle in)
  - C - Spring centered
  - N - No spring detented

- Left hand build
  - Omit for standard right hand assembly

- Handle
  - H - Booted handle for harsh environment
  - Omit if not required

- Flag symbol
  - M - Electrical features (applies only to switch models)
  - Omit if not required

- Spool indicator switch
  - S3 - Switch wired normally open
  - S4 - Switch wired normally closed
  - Omit if not required

- Switch connection
  - U - DIN 43650 connection for switch
  - U1 - DIN 43650 connector provided for switch
  - Omit if not required

- Design number
  - Subject to change. Installation dimensions remain as shown for design numbers 10 through 19.

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General Information

**Spool Variations**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>DG**V4-010*-10</td>
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<tr>
<td>DG**V4-011*-10</td>
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<tr>
<td>DG**V4-012*-10</td>
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<td>DG**V4-013*-10</td>
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<tr>
<td>DG**V4-016*-10</td>
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<tr>
<td>DG**V4-017*-10</td>
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</tbody>
</table>

**Build Variations**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Diagram</th>
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<tbody>
<tr>
<td>DG17V4-01*A-10</td>
<td></td>
<td></td>
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<tr>
<td>DG17V4-01*A2-10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DG17V4-01*AL-10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DG17V4-01*A2L-10</td>
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<tr>
<td>DG17V4-01*C-10</td>
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</tr>
<tr>
<td>DG17V4-01*CL-10</td>
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<tr>
<td>DG17V4-01*N-10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DG17V4-01*NL-10</td>
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</table>

**Operator Variations**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>DG17V4-01**-10</td>
<td>Lever operator</td>
<td></td>
</tr>
<tr>
<td>DG1V4-01**-10</td>
<td>Knob operator</td>
<td></td>
</tr>
</tbody>
</table>
**Performance Data**

Max. pressure P, A & B ports:
- For all spools except type “8” 315 bar (4500 psi)
- For type “8” spools only 175 bar (2500 psi)
Max. pressure T port: 70 bar (1000 psi)

Max. flow:
- All DG17V4 models except type “1” and “11” spools - 114 l/min (30 USgpm)
- All DG17V4 models with type “1” and “11” spools - 45 l/min (12 USgpm)
- All DG1V4-01* N models except type “1” and “11” spools - 76 l/min (20 USgpm)
- All DG1V4-01* N models with type “1” and “11” spools - 45 l/min (12 USgpm)
- All DG1V4-01* A/C models - 30 l/min (8 USgpm)

Handle shift force:
- DG17V4 “A” – 38 N. (8.5 lbs.)
- DG17V4 “C” – 36 N. (8.0 lbs.)
- DG17V4 “N” – 20 N. (4.5 lbs.)

Operating temperature:
- 20°C to 50°C (70°F to 120°F)

Weights (approx):
- DG1V4: 3.1 kg (6.9 lbs.)
- DG17V4: 3.4 kg (7.4 lbs.)

Bolt kits:
- (metric) - BK855993M
- (inch) - BDKG01-633

SAE grade 8 (metric grade 12,9) or better required

Max. bolt torque: 12.6 Nm (112 lb. in.)
Subplate: 2 kg (4.5 lbs.)

Fluid viscosity: 75-250 SUS (15-51 cSt)

**Fluids & Seals**

BUNA-N seals are standard and are compatible with water-in-oil emulsions, high water based fluids, and petroleum oil. “F3” (Viton) seals are compatible with phosphate esters, and “F6” seals are for water glycol. Maximum operating pressure for high water based fluids is 69 bar (1000 psi).

**Mounting Interface**

ISO 4401-05
CETOP 5
NFPA D05

**Shifting Action**

Spring offset valves are spring positioned unless lever is actuated.

Spring centered valves return the spool to center position when the lever or knob control is released.

No-spring detented valves will remain in the last position attained provided there is no severe shock, vibration or unusual pressure transients.

**Mounting Position**

No-spring detented valves must be installed with the longitudinal axis horizontal for good machine reliability. The mounting position of spring-offset, and spring centered models is unrestricted.

**Installation Data**

On two-way valves “T” is the drain connection and must be piped directly to tank through a surge-free line so there will be no back pressure at this port.

**NOTE**

Any sliding spool valve, if held for long periods of time, may stick and not spring return due to fluid residue formation and therefore, should be cycled periodically to prevent this from happening.

**CAUTION**

Surges of oil in a common tank line serving these and other valves can be of sufficient magnitude to cause inadvertent shifting of these valves. This is particularly critical in the no-spring detented type valves. Separate tank lines or a vented manifold with a continuous downward path to tank is necessary.
1. Figures in the pressure drop chart give approximate pressure drops ($\Delta P$) when passing 20.5 cSt (100 SUS) fluid having .865 specific gravity.

2. For any other flow rate ($Q_1$), the pressure drop ($\Delta P_1$) will be approximately:
$$\Delta P_1 = \Delta P \left(\frac{Q_1}{Q_2}\right)^2$$

3. For any other viscosity(s), the pressure drop ($\Delta P$) will change as follows:

<table>
<thead>
<tr>
<th>Flow l/min (USgpm)</th>
<th>Pressure Drop bar (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,5 (50)</td>
<td>7,0 (100)</td>
</tr>
<tr>
<td>7,0 (100)</td>
<td>10 (150)</td>
</tr>
<tr>
<td>10 (150)</td>
<td>14 (200)</td>
</tr>
<tr>
<td>14 (200)</td>
<td>17 (250)</td>
</tr>
<tr>
<td>17 (250)</td>
<td>21 (300)</td>
</tr>
<tr>
<td>21 (300)</td>
<td>24 (350)</td>
</tr>
</tbody>
</table>

4. For any other specific gravity ($G_1$)*, the pressure drop ($\Delta P_1$), will be approximately:
$$\Delta P_1 = \Delta P \left(\frac{G_1}{G}\right)$$

* Specific gravity of fluid may be obtained from its producer. The value is higher for fire-resistant fluids than for oil.

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### Pressure Drop Reference Curve

<table>
<thead>
<tr>
<th>Model Code</th>
<th>P - A</th>
<th>P - B</th>
<th>A - T</th>
<th>B - T</th>
<th>P - T</th>
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<tbody>
<tr>
<td>DG17V4-010*-10</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<td>DG17V4-011*-10</td>
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<tr>
<td>DG17V4-012*-10</td>
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<tr>
<td>DG17V4-013*-10</td>
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<td>DG17V4-016*-10</td>
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<td>DG17V4-017*-10</td>
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### Viscosity

<table>
<thead>
<tr>
<th>cSt (SUS)</th>
<th>14</th>
<th>20</th>
<th>43</th>
<th>54</th>
<th>65</th>
<th>76</th>
<th>85</th>
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</thead>
<tbody>
<tr>
<td>% of $\Delta P$ (Approx.)</td>
<td>81</td>
<td>88</td>
<td>104</td>
<td>111</td>
<td>116</td>
<td>120</td>
<td>124</td>
</tr>
</tbody>
</table>
Installation Dimensions

Manual Lever Operated Valves
Millimeters (inches)

DG17V4-01*A-10
DG17V4-01*A2-10

179,4 (7.06)
79,3 (3.13)
175,3 (6.90)

Position #3 (extreme in)
Neutral for DG17V4-01*A2-10 models

88,1 (3.47)

Position #1 (extreme out)
Neutral for DG17V4-01*A-10 models

3,6 (.14) stroke

Manual Knob Operated Valve

DG1V4-01**-10

47,3 (1.86)

3,6 (.14) stroke

“U” - DIN 43650 connector supplied for switch connection

“U1” - DIN 43650 for switch
Spring Centered & No-Spring Detented
Manual Lever Operated Valves

Millimeters (inches)

DG17V4-01-**-C-10
DG17V4-01-**-N-10

Position #3 - extreme in
Position #2 - intermediate
Position #1 - extreme out

NFPA D-01 (ISO 4401-05, CETOP 5)
interface, seals included

Mechanically Operated
for Harsh Environments

millimeters (inches) 39,2 (1.54)

DG17V4-01**-H-10
Valves, subplates and mounting bolts must be ordered separately.

Example:
One (1) DG17V4-012A-10 Valve
One (1) DGSM(E)-01-20-T8 Subplate
One (1) BKDG01-633 Bolt Kit

When subplate is not used, a machined pad must be provided for mounting. Pad must be flat within 0.0127 mm (.0005 inch) and smooth within 63 microinch. Mounting bolts, when provided by customer, should be SAE grade 7 or better.

Torque mounting bolts to:
13 Nm (115 lb. in.)

Mounting Subplate
DGSM-01-20-T8

Millimeters (inches)

-P- Pressure Conn.

10.3 (.41 D.) Thru 20.6 (.81 D.)
Spotface 4-holes for mounting

.438 Dia. System ports
4 holes

“B” Cyl. Conn.

“T” Tank Conn.

“A” Cyl. Conn.
¼” N.P.T.F. thd.

.250-20 UNC-2B Thd.
4-holes for mounting

.750-16 UNF-2B Thd. 4 holes
System connections. User to plug port “B” of subplate used with DG16 valve.
Mounting Subplate
DGSME-01-20-T8

Millimeters (inches)

10.3 (.41 D.) Thru 20.6 (.81 D.)
Spotface 4-holes for mounting

.438 Dia. System ports
4 holes

“P” Pressure Conn.
1/2” N.P.T.F. thd.

“B” Cyl. Conn.
1/2” N.P.T.F. thd.

“T” Tank Conn.
1/2” N.P.T.F. thd.

“A” Cyl. Conn.
1/2” N.P.T.F. thd.

.250-20 UNC-2B Thd.
4-holes for mounting
Application Data

**Fluid Cleanliness**
Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, and additives for protection against wear of components.


Recommendations on filtration and the selection of products to control fluid condition are included in 561.

Recommendation cleanliness levels, using petroleum oil under common conditions, are based on the highest fluid pressure levels in the system and are coded in the chart below. Fluids other than petroleum, severe service cycles, or temperature extremes are cause for adjustment of these cleanliness codes. See Vickers publication 561 for exact details.

Vickers products, as any components, will operate with apparent satisfaction in fluids with higher cleanliness codes than those described. Other manufacturers will often recommend levels above those specified. Experience has shown, however, that life of any hydraulic component is shortened in fluids with higher cleanliness codes than those listed below. These codes have been proven to provide a long, trouble-free service life for the products shown, regardless of the manufacturer.

<table>
<thead>
<tr>
<th>Product</th>
<th>System Pressure Level</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bar (psi)</td>
<td>&lt;70 (&lt;1000)</td>
<td>70-210 (1000-3000)</td>
</tr>
<tr>
<td>Vane Pumps – Fixed</td>
<td>20/18/15</td>
<td>19/17/14</td>
<td>18/16/13</td>
</tr>
<tr>
<td>Vane Pumps – Variable</td>
<td>18/16/14</td>
<td>17/15/13</td>
<td></td>
</tr>
<tr>
<td>Piston Pumps – Fixed</td>
<td>19/17/15</td>
<td>18/16/14</td>
<td>17/15/13</td>
</tr>
<tr>
<td>Piston Pumps – Variable</td>
<td>18/16/14</td>
<td>17/15/13</td>
<td>16/14/12</td>
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<tr>
<td>Directional Valves</td>
<td>20/18/15</td>
<td>20/18/15</td>
<td>19/17/14</td>
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<td>Pressure/Flow Control Valves</td>
<td>19/17/14</td>
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<td>CMX Valves</td>
<td>18/16/14</td>
<td>18/16/14</td>
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<tr>
<td>Proportional Valves</td>
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<td>19/17/14</td>
<td>18/16/13</td>
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<tr>
<td>Axial Piston Motors</td>
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<td>18/16/13</td>
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<tr>
<td>Radial Piston Motors</td>
<td>20/18/14</td>
<td>19/17/13</td>
<td>18/16/13</td>
</tr>
</tbody>
</table>

**Fluids and Seals**
Flourocarbon seals are standard and are suitable for use with phosphate ester type fluids or their blends, water glycol, water-in-oil emulsion fluids and petroleum oil. Refer to 694 for hydraulic fluid and temperature recommendations.