Proportional Directional Control Valves
Two-Stage Models Without Electrical Feedback

KBDG5V-5-1*
KBDG5V-7-1*
KBDG5V-8-1*
KBDG5V-10-1*
EATON Vickers Proportional Directional Control Valves

This product has been designed and tested to meet specific standards outlined in the European Electromagnetic Compatibility Directive (EMC) 89/336/EEC, amended by 91/286/EEC, 92/31/EEC and 93/68/EEC, article 5. For instructions on installation requirements to achieve effective protection levels, see this leaflet and the Installation Wiring Practices for Vickers™ Electronic Products leaflet 2468. Wiring practices relevant to this Directive are indicated by the Electromagnetic Compatibility (EMC) mark.
Vickers™ KBDG5V-5/7/8/10 are solenoid operated directional control, non-feedback type proportional valves. These are two-stage proportional directional control valves in which the main-stage spool is positioned according to the output from an integrally mounted proportional, solenoid-operated, pressure-reducing valve. Direction of main-spool travel depends upon which of the two solenoids of the pilot valve is energized and the amount of travel is dependent upon the current input to the solenoid.

At any intermediate position of the main spool, a force balance exists between the controlled, reduced pilot pressure acting on the spool end and the opposing centering spring, plus the action of flow forces. There is no electrical feedback of the main-stage spool position.

This range of valves offers effective and economic solutions for applications having repetitive load conditions throughout each operating cycle, e.g. mold closure /opening in plastics molding machinery.

**Standard Features and Benefits**

- These global products, manufactured to world-class quality standards, are sold and serviced throughout the world.

- These valves open up expanded application opportunities as a cost effective alternative to feedback-type proportional and servo valves.

- Auxiliary DIN-rail mounted function modules available.

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**Typical Section**

**KBDG5V-7 Without Integral Pilot Pressure Reducer**
### Model Codes

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>Model Series</td>
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<tr>
<td>2</td>
<td>Flow Rating</td>
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<td>Spool Type</td>
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<td>Electrical Connection</td>
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<td>12</td>
<td>Coil Identification</td>
</tr>
<tr>
<td>13</td>
<td>Design Number, 10 Series</td>
</tr>
</tbody>
</table>

**KB** – Proportional valve with integral amplifier, B series

**D** – Directional valve

**G** – Subplate mounted

**5** – Solenoid controlled/pilot operated

**V** – Pressure rating on P, A & B ports

Sizes 7, 8 and 10: 350 bar (5000 psi)

Size 5: 315 bar (4500 psi)

**Mounting Interface Size (ISO 4401)**

5 – NFPA D05, CETOP 5

7 – NFPA D07, CETOP 7

8 – NFPA D08, CETOP 8

10 – NFPA D10, CETOP 10

**Spool Type**

See “Spool Data”, page 5

2 – All ports blocked when spool centered

7 – Open P to A&B

12 – All ports blocked when spool centered, regenerative function when spool energized

33/133 – Bleed A and B to T when spool centered

**Flow Rating**

See “Spool Data”, page 5

Flow rating (L/min) for symmetric spools

“A” port flow rating (L/min) for asymmetric spools

**Spool Metering Type**

N – Meter-in and meter-out

**Flow Rating**

See “Spool Data”, page 5

“B” port flow rating (L/min) for asymmetric spools

**Pilot Supply**

Models without integral, fixed pilot pressure reducer module

E – External pilot supply

Blank – Internal pilot supply

Models with integral, fixed pilot pressure reducer module

X – Internal pilot supply

EX – External pilot supply

For system pressures less than 200 bar (2900 psi) the pilot pressure reducing module is optional.

For system pressures above 200 bar (2900 psi) the pilot pressure reducing module must be fitted.

**Pilot Drain**

T – Internal pilot drain

Blank – External pilot drain

**Manual Override**

Blank – Plain overrides

H – Water-resistant overrides

2 – No overrides

**Electrical Command Option**

1 – +/- 10V control signal

2 – 4-20 mA control signal

**Electrical Connection**

PC7 – 7 pin connector without plug supplied

PE7 – 7 pin connector with plug supplied

PH7 – As PE7 but with pin “C” used for enable signal

PR7 – As PC7 but with pin “C” used for enable signal

**Coil Identification**

H – 24V

**Design Number, 10 Series**

Subject to change. Installation dimensions unaltered for design numbers 10 to 19 respectively

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**Warning**

Valves with integral amplifiers are supplied with or without the metal 7-pin plug. The Vickers™ plug, part no. 934939, must be correctly fitted to ensure that the EMC rating and IP67 rating are achieved. The plug retaining nut must be tightened to 2-2.5 Nm (1.5-2.0 lbf ft) to effect a proper seal.
Spool Type 2C

\[ \text{Flow ratings for flow through P-A-B-T at } \Delta p = 5 \text{ bar (72 psi)} \]\n
Spool Type 7C

Spool Type 12C

Spool Type 33C

Spool Type 133C with typical regenerative circuit

Spool Symbols

Simplified symbols including transient flow conditions (dotted line).

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Spool Types and Flow Ratings

**Symmetric Spools**

Flow ratings for flow through P-A-B-T at \( \Delta p = 5 \text{ bar (72 psi)} \) per flow path, e.g., P-A, or B-T. For other pressure drop values see “Flow Gain” curves on pages 10 and 11.

### For KBDG5V-5 valves:

- **2C90N**: 2C 90 L/min (24 USgpm)
- **33C80**: 33C 80 L/min (21 USgpm)

### For KBDG5V-7 valves:

- **2C180N**: 2C 180 L/min (48 USgpm)
- **33C85N**: 33C 85 L/min (22.6 USgpm)
- **33C170N**: 33C 170 L/min (45 USgpm)

### For KBDG5V-8 valves:

- **2C330N**: 2C 330 L/min (88 USgpm)
- **33C85N**: 33C 85 L/min (22.6 USgpm)
- **33C170N**: 33C 170 L/min (45 USgpm)

### For KBDG5V-10 valves:

- **2C550N**: 2C 550 L/min (145 USgpm)
- **33C550N**: 33C 550 L/min (145 USgpm)
- **12C550N**: 12C 550 L/min (145 USgpm)
- **33C550N**: 33C 550 L/min (145 USgpm)

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**Asymmetric Spools**

Figure preceding metering type designator, “N” (e.g., 2C***N) is flow rating P-A, or A-T (“A” port flow); figure after “N” (N***) is flow rating P-B, or B-T (“B” port flow).

### For KBDG5V-5 valves:

- **2C70N**
  - 2C 70 L/min (18.6 USgpm), “A” port flow
  - 45 L/min (12.0 USgpm), “B” port flow
- **33C60N**
  - 33C 60 L/min (16.0 USgpm), “A” port flow
  - 40 L/min (10.6 USgpm), “B” port flow

### For KBDG5V-7 valves:

- **2C180N**
  - 2C 180 L/min (48.0 USgpm), “A” port flow
  - 100 L/min (26.6 USgpm), “B” port flow
- **33C130N**
  - 33C 130 L/min (34.6 USgpm), “A” port flow
  - 65 L/min (17.3 USgpm), “B” port flow

### For KBDG5V-8 valves:

- **2C330N**
  - 2C 330 L/min (88.0 USgpm), “A” port flow
  - 250 L/min (66.6 USgpm), “B” port flow
- **33C330N**
  - 33C 330 L/min (88.0 USgpm), “A” port flow
  - 250 L/min (66.6 USgpm), “B” port flow
- **133C330N**
  - 133C 330 L/min (88.0 USgpm), “A” port flow
  - 250 L/min (66.6 USgpm), “B” port flow
- **12C330N**
  - 12C 330 L/min (88.0 USgpm), “A” port flow
  - 250 L/min (66.6 USgpm), “B” port flow

### For KBDG5V-10 valves:

- **2C310N**
  - 2C 310 L/min (82.6 USgpm), “A” port flow
- **2C550N**
  - 310 L/min (82.6 USgpm), “B” port flow
- **33C310N**
  - 33C 310 L/min (82.6 USgpm), “A” port flow
- **33C550N**
  - 33C 550 L/min (145 USgpm), “A” port flow
  - 310 L/min (82.6 USgpm), “B” port flow

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Spool Symbols

Simplified symbols including transient flow conditions (dotted line).
Simplified symbol
KBDG5V models
(Spool type "2" shown)

Pilot stage with integral amplifier.

Pressure reducer module, see "Model Code".

Main-stage.
Spool type "2C" shown.

Typical schematic symbol

* Internal plug shown, for external pilot supply (via port X). For internal pilot supply (from port P) plug is not fitted. Port X should be blocked at mounting interface, or otherwise plugged at subplate or manifold block. See "Model Code".

▲ Internal plug shown, for external pilot drain (via port Y). For internal pilot drain (via port T) plug is not fitted. Port Y should be blocked at mounting interface, or otherwise plugged at subplate or manifold block. See "Model Code".
See also "Pilot Drain Application" notes.
## Operating Data

Data is typical with fluid at 36 cSt (168 SUS) and 50°C (122°F).

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply (24V)</td>
<td>24V DC (21V to 36V including 10% peak-to-peak ripple) maximum current - 1.2A</td>
</tr>
<tr>
<td>Command signal (Volts)</td>
<td>0 to +10V DC, or 0 to -10V DC, or -10V to +10V DC</td>
</tr>
<tr>
<td>Input impedance</td>
<td>47 kΩ</td>
</tr>
<tr>
<td>Common mode voltage to pin B</td>
<td>4V</td>
</tr>
<tr>
<td>Command signal (Current)</td>
<td>4 to 20 mA</td>
</tr>
<tr>
<td>Input impedance</td>
<td>100Ω</td>
</tr>
<tr>
<td>Valve enable signal:</td>
<td></td>
</tr>
<tr>
<td>Enable</td>
<td>&gt;9.0V (36V max)</td>
</tr>
<tr>
<td>Disable</td>
<td>&lt;2.0V</td>
</tr>
<tr>
<td>Input impedance</td>
<td>36 kΩ</td>
</tr>
</tbody>
</table>

### 7-pin plug connector

- **A** Power supply positive (+)
- **B** Power supply 0V and current command return
- **C** Valve enable (PH7 & PR7)
- **D** Command signal (+V or current in)
- **E** Command signal (-V or current GND)
- **F** Output monitor
- **G** Protective ground

### Electromagnetic compatibility (EMC):

- Emission (10 V/m): EN 50081-2
- Immunity (10 V/m): EN 50082-2
- Monitor signal (pin F): 0 to +5V (0.39 V/A)
- Output impedance: 10 kΩ

### Reproducibility, valve-to-valve (at factory settings):

- Flow at 100% command signal: ±5%

### Protection:

- Electrical: Reverse polarity protected
- Environmental: IEC 529, Class IP67

### Ambient air temperature range for full performance:

- 0°C to 70°C (32°F to 158°F)

### Oil temperature range for full performance:

- 0°C to 70°C (32°F to 158°F)

### Minimum temperature at which valves will work at reduced performance:

- -20°C (-4°F)

### Storage temperature range:

- -25°C to +85°C (-13°F to +185°F)

### Mass:

- **Valves with integral pressure reducing module**
  - KBDG5V-5: 9.8 kg (21.2 lb)
  - KBDG5V-7: 11.9 kg (25.8 lb)
  - KBDG5V-8: 20.6 kg (44.6 lb)
  - KBDG5V-10: 54.9 kg (118.9 lb)

- **For models without reducing module, deduct 1.2 kg (2.6 lb)**

### Supporting products:

- **Auxiliary electronic modules (DIN-rail mounting):**
  - EHA-CON-201-A-2 Signal converter: See catalog 2410A
  - EHD-DSG-201-A-1 Command signal generator: See catalog 2470
  - EHA-RMP-201-A-2 Ramp generator: See catalog 2410A
  - EHA-PID-201-A-2 PID controller: See catalog 2427
  - EHA-PSU-201-A-10 Power supply: See catalog 2410A

### Ramp time:

- 0-12 sec for full step input (0-100%)

### Relative duty factor:

- Continuous rating (ED = 100%)

### Hysteresis with flow through P-A-B-T:

- <8% of rated flow
Data is typical with fluid at 36 cSt (168 SUS) and 50°C (122°F).

Minimum Pressure
KBDG5V-5/7/8
For full flow performance, pilot pressure ≥45 bar (650 psi).
KBDG5V-10
For full flow performance, pilot pressure ≥28 bar (405 psi).
i.e.
Pressure at port P for internal pilot supply.
or
Pressure at port X for external pilot supply.

Pilot Drain Application Notes
External pilot drain is the recommended configuration.
Internal pilot drain is possible where a stable ‘T’ port pressure, not exceeding 8 bar (116 psi), can be guaranteed.

Any pressure surges at the ‘T’ port (drain) will cause the main spool to move and change the valve output. This possibility is eliminated by the use of an external drain.

Maximum Pressures, bar (psi)
For models without integral pilot pressure reducer

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PILOT PRESSURE SOURCE</th>
<th>MODEL CODE 7</th>
<th>PORTS P, A, B</th>
<th>T</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>KBDG5V-5</td>
<td>External E</td>
<td>315</td>
<td>210</td>
<td>200</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal Omit</td>
<td>(4500)</td>
<td>(3000)</td>
<td>(2900)</td>
<td>(116)</td>
<td></td>
</tr>
<tr>
<td>KBDG5V-7/8</td>
<td>External E</td>
<td>350</td>
<td>350</td>
<td>200</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal Omit</td>
<td>(5000)</td>
<td>(5000)</td>
<td>(2900)</td>
<td>(116)</td>
<td></td>
</tr>
<tr>
<td>KBDG5V-10</td>
<td>External E</td>
<td>350</td>
<td>350</td>
<td>40</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal Omit</td>
<td>(5000)</td>
<td>(5000)</td>
<td>(580)</td>
<td>(116)</td>
<td></td>
</tr>
</tbody>
</table>

For models with integral pilot pressure reducer

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PILOT PRESSURE SOURCE</th>
<th>MODEL CODE 7</th>
<th>PORTS P, A, B</th>
<th>T</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>KBDG5V-5</td>
<td>External EX</td>
<td>315</td>
<td>210</td>
<td>315</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal X</td>
<td>(4500)</td>
<td>(3000)</td>
<td>(4500)</td>
<td>(116)</td>
<td></td>
</tr>
<tr>
<td>KBDG5V-7/8</td>
<td>External EX</td>
<td>350</td>
<td>350</td>
<td>315</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal X</td>
<td>(5000)</td>
<td>(5000)</td>
<td>(4500)</td>
<td>(116)</td>
<td></td>
</tr>
<tr>
<td>KBDG5V-10</td>
<td>External EX</td>
<td>350</td>
<td>350</td>
<td>315</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal X</td>
<td>(5000)</td>
<td>(5000)</td>
<td>(4500)</td>
<td>(116)</td>
<td></td>
</tr>
</tbody>
</table>

When using internal pilot pressure, port X should be plugged at the subplate or manifold face (e.g. manifold not drilled for connection to port X).

§ The maximum pressure for ports A and B is: 310 bar (4500 psi) for size 5; 350 bar (5000 psi) for sizes 7 and 8.
† See "Pilot Drain Application" note.
◆ Pilot must be externally drained, otherwise ‘Y’ port pressure applies.
◆ Pilot must be externally drained, otherwise ‘T’ port pressure limited to 210 bar (3000 psi).
Power Capacity Envelopes

Flow through P-A-B-T or P-B-A-T

Power Capacity
Looped Flow

Pressure drop
psi
bar

Flow rate
0 50 100 150 200 250 300 350 400 450 500

USgpm
L/min

EATON Vickers Proportional Directional Control Valves  V-VLPO-MC001-E  January 2003
Flow Characteristics

Flow gain curves at stated values of total valve pressure drop, for flow P-A-B-T, or P-B-A-T.

KBDG5V-5-2C90N

KBDG5V-7-2C180N

KBDG5V-7-33C170N

KBDG5V-8-33C330N

KBDG5V-5-33C80N

KBDG5V-7-33C85N

KBDG5V-8-2C330N

KBDG5V-8-33C330N
Flow Characteristics (continued)

Flow gain curves at 10 bar (145) psi valve pressure drop, for flow P-A-B-T, or P-B-A-T.

**Asymmetric Spools**

At 5 bar (72 psi) valve pressure drop

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**KBDG5V-10-2C550N**

**KBDG5V-10-33C550N**

**KBDG5V-10-7C550N**

**KBDG5V-10-12C550N**

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**KBDG5V-10-33C550N310**
Step Response (Typical)

Test conditions:
No pressure reducer module
Flow P-A-B-T
Total valve $\Delta p = 10$ bar (145 psi)
External pilot pressure = 50 bar (725 psi)
“Response” = Time, from step response signal, until output reaches 90% of step change value

<table>
<thead>
<tr>
<th>INPUT SIGNAL STEP CHANGE</th>
<th>SPOOL RESPONSE TIMES (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KBDG5V-5</td>
</tr>
<tr>
<td>0 to 100%</td>
<td>42</td>
</tr>
<tr>
<td>100% to 0</td>
<td>33</td>
</tr>
<tr>
<td>10% to 90%</td>
<td>43</td>
</tr>
<tr>
<td>90% to 10%</td>
<td>40</td>
</tr>
<tr>
<td>25% to 75%</td>
<td>34</td>
</tr>
<tr>
<td>75% to 25%</td>
<td>30</td>
</tr>
<tr>
<td>90% to 90%</td>
<td>78</td>
</tr>
</tbody>
</table>

Pilot flow required to achieve above response times:

<table>
<thead>
<tr>
<th>KBDG5V-5</th>
<th>KBDG5V-7</th>
<th>KBDG5V-8</th>
<th>KBDG5V-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.8 L/min</td>
<td>6.2 L/min</td>
<td>6.2 L/min</td>
<td>23.0 L/min</td>
</tr>
<tr>
<td>(0.98 USgpm)</td>
<td>(1.6 USgpm)</td>
<td>(1.6 USgpm)</td>
<td>(5.96 USgpm)</td>
</tr>
</tbody>
</table>
Installation Dimensions

KBDG5V Models with “EX” or “X”
(With integral pilot pressure reducer)
The illustration is correct for KBDG5V-8 valves
Dimensions are shown in mm (inches)

KBDG5V Models with “E” or No Symbol
(Without integral pilot pressure reducer)

Add 11.0 (0.44) for manual override

Overall installed length of KBD valves is X1 with connector fitted, and X2 without.
Pilot Supply and Drain Plugs

KBDG5V-7 models only *
Remove this plug for access to pilot drain plug

M6 x 8 mm plug, part no. 471131:
- fitted for external pilot drain.
- Not fitted for internal pilot drain.

KBDG5V-8 models
Section through port P of main-stage

M5 plug,
part no. 471119.
Remove for internal pilot drain

1/16" NPT plug,
part no. 113000.
Remove for internal pilot supply

KBDG5V-5 models
Viewed from port B end of main-stage

M5 plug,
part no. 471119.
Remove for internal pilot supply

KBDG5V-7 models only *
M6 x 8 mm plug, part no. 471131:
- fitted for external pilot supply models; not fitted for internal pilot supply models. See “Model Code”.

KBDG5V-7 models only *
Size 7 only *
M5 internal thread for removal of closure plug

* Internal plug shown, for external pilot supply (via port X).
For internal pilot supply (from port P) plug is not fitted. Port X should be blocked at mounting interface, or otherwise plugged at subplate of manifold block. See “Model Code”.

KBDG5V-10 models
Plug,
part no. 7074.
Remove for internal pilot drain

Plug,
part no. 30560 for internal pilot drain, part no. 7074 for external pilot drain.
Views on Mounting Faces

All O-seals supplied

KBDG5V-5

4 holes for mounting bolts
Ø 7,02 (0.27 Ø) spotfaced to Ø 11,0 (0.43 Ø)

KBDG5V-7

6 holes for mounting bolts
4 x Ø 11,0 (0.43 Ø) c’bored
Ø 17,5 (0.68 Ø)
2 x Ø 6,4 (0.25 Ø) c’bored
Ø 11,0 (0.43 Ø)

KBDG5V-8

6 holes for mounting bolts
Ø 13,5 (0.53 Ø) spotfaced to Ø 20,0 (0.78 Ø)

KBDG5V-10

6 holes for mounting bolts
Electrical Information

Block Diagram
KBDG5V-*

COMMAND SIGNALS AND OUTPUTS

<table>
<thead>
<tr>
<th>7-pin plug</th>
<th>Flow direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24V</td>
<td>Power 0V</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Enable ▲</td>
<td>Non-inverting</td>
</tr>
<tr>
<td>C</td>
<td>E</td>
</tr>
<tr>
<td>Inverting</td>
<td>Current monitor</td>
</tr>
<tr>
<td>D</td>
<td>F</td>
</tr>
<tr>
<td>Protective ground G</td>
<td></td>
</tr>
</tbody>
</table>

Solenoid drive 2
Solenoid drive 1
PWM modulator

Wiring
Connections must be made via the 7-pin plug mounted on the amplifier. See this leaflet and Installation Wiring Practices for Vickers™ Electronic Products leaflet 2468. Recommended cable sizes are:

Power Cables
For 24V supply:
- 0,75 mm² (18 AWG) up to 20m (65 ft)
- 1,00 mm² (16 AWG) up to 40m (130 ft)

Signal Cables
- 0,50 mm² (20 AWG)
- A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen. Cable outside diameter 8,0-10,5 mm (0.31-0.41 inches). See connection diagrams on next page.

Command signal, see table

Command = Volts (+10V)
- Positive 0V P to A
- 0V Negative
- VD - VE = Positive
- Negative 0V P to B
- 0V Positive
- VD - VE = Negative

Command = Current (4-20 mA)
- More than 12 mA Current return P to A
- Less than 12 mA Current return P to B

Warning
All power must be switched off before connecting or disconnecting any plugs.

In valves with PH7 or PR7 type electrical connection.
Typical Connection Arrangements

Wiring Connections

![Wiring Diagram](image-url)

Pin C may be connected to ground or left unconnected.

Warning Electromagnetic Compatibility (EMC)

It is necessary to ensure that the valve is wired up as above. For effective protection the user electrical cabinet, the valve subplate or manifold and the cable screens should be connected to efficient ground points. The metal 7-pin connector part no. 934939 should be used for the integral amplifier.

In all cases both valve and cable should be kept as far away as possible from any sources of electromagnetic radiation such as cables carrying heavy current, relays and certain kinds of portable radio transmitters, etc. Difficult environments could mean that extra screening may be necessary to avoid the interference.

It is important to connect the 0V lines as shown above. The multi-core cable should have at least two screens to separate the demand signal and monitor output from the power lines.

The enable line to pin C should be outside the screen which contains the demand signal cables.

Note:

In applications where the valve must conform to European RFI/EMC regulations, the outer screen (shield) must be connected to the outer shell of the 7-pin connector, and the valve body must be fastened to the earth ground. Proper earth grounding practices must be observed in this case, as any differences in command source and valve ground potentials will result in a screen (shield) ground loop.
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, materials and additives for protection against wear of components, elevated viscosity and inclusion of air.

Recommendations on contamination control methods and the selection of products to control fluid condition are included in publication 9132 or 561, “Guide to Systemic Contamination Control”. The book also includes information on the concept of “ProActive Maintenance”. The following recommendations are based on ISO cleanliness levels at 2 µm, 5 µm and 15 µm.

For products in this catalog the recommended levels are:
- 0 to 70 bar (1000 psi)...18/16/13
- 70+ bar (1000+ psi)...17/15/12

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 above. These codes have been proven to provide a long trouble-free service life for the products shown, regardless of the manufacturer.

Hydraulic Fluids
Materials and seals used in these valves are compatible with antiwear hydraulic oils, and with non-alkyl-based phosphate esters.

The extreme operating viscosity range is 500 to 13 cSt (2270 to 70 SUS) but the recommended running range is 54 to 13 cSt (245 to 70 SUS).

Installation
The proportional valves in this catalog can be mounted in any attitude, but it may be necessary in certain demanding applications, to ensure that the solenoids are kept full of hydraulic fluid. Good installation practice dictates that the tank port and any drain port are piped so as to keep the valves full of fluid once the system start-up has been completed.

Mounting Bolt Kits
For KBDG5V-5
BKDG10636M (metric)
BKDG10636 (inch)

For KBDG5V-10
BKDG10636M (metric)
BKDG10636 (inch)

If not using recommended Vickers™ bolt kits, bolts used should be to ISO 898, 12.9 or better.

Mounting Bolt Torques
Recommended torques with threads lubricated
For KBDG5V-5
M6 or 1/4"-20 UNC bolts:
To 210 bar (3000 psi) 14 Nm (10.3 lbf ft)
To 310 bar (4500 psi) 20 Nm (14.75 lbf ft)

For KBDG5V-7
M10 or 3/8"-16 UNC bolts:
49 to 59 Nm (36 to 43 lbf ft)
plus
M6 or 1/4"-20 UNC bolts
9 to 14 Nm (6.6 to 10.3 lbf ft)

For KBDG5V-8
M12 or 1/2"-13 UNC bolts
103 to 127 Nm (76 to 93 lbf ft)

For KBDG5V-10
M20 or 3/4"-10 UNC-2B bolts
185-220 Nm (250-300 lbf ft)

Seal Kits (Mainstage Only)
KBDG5V-5......................565143
KBDG5V-7.....................02-351175
KBDG5V-8.....................02-352520
KBDG5V-10.................02-329888

Plugs
7-pin plug (metal) 934939
7-pin plug (plastic) 694534
(Metal plug must be used for full EMC protection)

Note: An alternative metal connector which gives EMC protection but not IP67 rating is available from ITT-Cannon, part number CA06-COM-E-14S-A7-P.