Proportional directional valves without feedback

KBD/TG4V-3, 1 Series
Pressures to 350 bar (5000 psi)
Contents

GENERAL DESCRIPTION 3
MODEL CODES 4
SPOOL DATA 5
FUNCTIONAL SYMBOLS 5
OPERATING DATA 6
POWER CAPACITY ENVELOPES 8
FLOW CHARACTERISTICS 11
FREQUENCY RESPONSE 14
INSTALLATION DIMENSIONS
  KBDG4V-3 .......................................................... 15
  KBTG4V-3 .......................................................... 15
  Parallel flow path module ....................................... 16
  Subplates and mounting surfaces .............................. 16
  Single station subplates ......................................... 17
  Port threads ...................................................... 17
  Mounting surface to ISO 4401 (Size 03) ...................... 17
ELECTRICAL INFORMATION
  Block diagram ................................................. 18
APPLICATION DATA 21

This product has been designed and tested to meet specific standards outlined in the European Electromagnetic Compatibility Directive (EMC) 2014/30/EU which repealed Directive 2004/108/EC. For Restriction of Hazardous Substances, complies to (RoHS) Directive 2011/65/EU. For instructions on installation requirements to achieve effective protection levels, see the Installation Wiring Practices for Eaton’s Electronic Products. Wiring practices relevant to this Directive are indicated by Electromagnetic Compatibility (EMC).
Vickers™ KB*G4V-3 proportional valves are designed to provide controlled oil flow in proportion to an electrical command signal. They are available in two versions. Firstly a double solenoid version that will provide reversible flow and return to an actuator. Secondly a single solenoid version that provides a single direction of flow.

The KB* valve incorporates an integral control amplifier. Factory set adjustments for gain, spool deadband compensation and dither ensure excellent reproducibility valve-to-valve.

Electrical connection is via a standard 7-pin plug and requires a power supply and command signal which can be either voltage or current (model code option).

In addition to improving machine performance and life, the KB* proportional valves substantially simplify system design by combining direction and flow capabilities in one single package that mounts onto a standard ISO 4401 interface.

### Standard features and benefits

- State of the art digital electronic technology
- Rugged and robust die-cast housing
- Optional voltage (+/-10 volt) or current (4-20 mA) demand input
- Adjustable ramp (0-12 sec)
- Wide range of supply voltage
- Optional external enable feature
- IP67 environmental protection
- Full CE electromagnetic capability to EN 50081-2 and EN 50082-2
- Vibration and shock tested
- Factory adjusted to ensure excellent valve-to-valve reproducibility
- Installation wiring reduced and simplified
- Wide range of spool and flow rate options
- Simple valve removal and replacement for service i.e. plug and play
- Standard 7-pin connector
- 350 bar (5000 psi) pressure rating
- Supported by auxiliary function electronic modules
## 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 with a torque of 2-2.5 Nm (1.5-2.0 lbf ft) to effect a proper seal.

---

### Model codes

<table>
<thead>
<tr>
<th>KB</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. **Valve type**
   - **KB**: Proportional valve with integral amplifier, B series

2. **Control type**
   - **D**: Directional valve
   - **T**: Throttle valve

3. **Mounting**
   - **G**: Subplate mounted

4. **Operation**
   - **4**: Solenoid operated

5. **Pressure rating**
   - **V**: 350 bar (5000 psi), ports P, A & B

6. **Interface**
   - **3**: ISO 4401, size 03-02-0-94, ANSI B93.7M-DO3

7. **Spool type**
   - **2**: Closed center
   - **33**: P port closed, A & B to tank

8. **Spool/spring arrangement**
   - **C**: Spring centered, dual solenoid
   - **B**: Spring centered, single solenoid (solenoid "B" version only, solenoid "A" for "V" version)

9. **Spool flow rating - at 5 bar (75 psi) per metering flow path**
   - **03**: 3 L/min (0.79 USgpm)
   - **07**: 7 L/min (1.85 USgpm)
   - **13**: 13 L/min (3.43 USgpm)
   - **20**: 20 L/min (5.28 USgpm)
   - **24**: 24 L/min (6.34 USgpm)
   - **25**: 25 L/min (6.6 USgpm)
   - **28**: 28 L/min (7.4 USgpm)

10. **Spool metering type**
    - **N**: Meter-in and meter-out

11. **Flow rating for asymmetric flow spools**
    - **10**: 10 L/min (2.64 USgpm) (20N10 only)
    - **Flow for symmetrical spools**

12. **Manual overrides**
    - **Blank**: Plain overrides
    - **H**: Water resistant overrides
    - **Z**: No overrides

13. **Solenoid energization identity**
    - **V**: Solenoid “A” is at “A” port end, solenoid “B” is at “B” port end, independent of spool type
    - **Blank**: US ANSI B93.9 standard (energize solenoid “A”, flow is P-A)

14. **Electrical command option**
    - **M1**: +/- 10V control signal
    - **M2**: 4-20 mA control signal

15. **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

16. **Coil rating**
    - **H**: 24V DC amplifier supply

17. **T port pressure**
    - **7**: 210 bar (3000 psi)

18. **Design number, 1* series**
    - **11**: Subject to change. Installation dimensions unaltered for design numbers 10 to 19 respectively
Spool data

Spool symbols

Functional symbols

Model type KBDG4V-3
Proportional directional valve (with integrated electronics)

<table>
<thead>
<tr>
<th>Spool symbols</th>
<th>Flow rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>2C03F</td>
<td>3 L/min (0.79 USgpm)</td>
</tr>
<tr>
<td>2C07N</td>
<td>7 L/min (1.85 USgpm)</td>
</tr>
<tr>
<td>2C13N</td>
<td>13 L/min (3.43 USgpm)</td>
</tr>
<tr>
<td>2C20N</td>
<td>20 L/min (5.28 USgpm)</td>
</tr>
<tr>
<td>2C24S</td>
<td>24 L/min (6.4 USgpm)</td>
</tr>
<tr>
<td>2C25N</td>
<td>25 L/min (6.6 USgpm)</td>
</tr>
<tr>
<td>2C28N</td>
<td>28 L/min (7.4 USgpm)</td>
</tr>
<tr>
<td>33C03F</td>
<td>3 L/min (0.79 USgpm)</td>
</tr>
<tr>
<td>33C07N</td>
<td>33 L/min (0.79 USgpm)</td>
</tr>
<tr>
<td>33C13N</td>
<td>33 L/min (0.79 USgpm)</td>
</tr>
<tr>
<td>33C20N</td>
<td>33 L/min (0.79 USgpm)</td>
</tr>
</tbody>
</table>

Model type KBTG4V-3
Proportional throttle valve (with integrated electronics)

<table>
<thead>
<tr>
<th>Spool symbols</th>
<th>Flow rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B03F</td>
<td>3 L/min (0.79 USgpm)</td>
</tr>
<tr>
<td>2B07N</td>
<td>7 L/min (1.85 USgpm)</td>
</tr>
<tr>
<td>2B13N</td>
<td>13 L/min (3.43 USgpm)</td>
</tr>
<tr>
<td>2B20N</td>
<td>20 L/min (5.28 USgpm)</td>
</tr>
</tbody>
</table>

Symmetric spools

Base line starting at $\Delta p = 5$ bar (75 psi) per metering flow path, e.g. B to T. For actual maximum flow refer to power capacity envelope curves.

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).

Available spools for KBDG4V-3

Spool Symbols

| Spool type 2C**N, meter-in/meter-out | Spool type 2C20N10, asymmetric flow | Spool type 2C24S, meter-out only | Spool type 3SC**N, meter-in/meter-out | Spool type 3SC20N10, asymmetric flow |

Available spools for KBTG4V-3

| Spool type 2B**N, meter-in/meter-out | Spool type 33B**N, meter-in/meter-out |
Operating data

KBD/TG4V-3 Valves with integral amplifier. Data is typical with fluid at 36 cSt (168 SUS) and 50°C (122°F).

<table>
<thead>
<tr>
<th>Power supply (24V)</th>
<th>(Model code [E]H)</th>
<th>24V DC (21V to 36V including 10% peak-to-peak ripple) max current - 1.2A</th>
</tr>
</thead>
</table>

**Command signal**

- Voltage mode: 0 to 10V DC, or 0 to –10V DC, or –10V to + 10V DC
- Input impedance:
  - M1: 47 kΩ
  - M2: 47 kΩ
- Common mode voltage to pin D: 18V (max)
- Max differential voltage to pin E to pin B: 4V

**Current mode**:

- 4-20 mA
- The content of raw input impedance: 100 ohms
- Command signal (Current): 4 to 20 mA
- Input impedance: (Model code [E]H) 100Ω

**Valve enable signal**

- Enable: >9.0V (36V max)
- Disable: <2.0V
- Input impedance: 36 kΩ

**7-pin plug connector**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Power supply positive (+)</td>
</tr>
<tr>
<td>B</td>
<td>Power supply 0V and current command return</td>
</tr>
<tr>
<td>C</td>
<td>Valve enable (PH7 &amp; PR7)</td>
</tr>
<tr>
<td>D</td>
<td>Command signal (+V or current in)</td>
</tr>
<tr>
<td>E</td>
<td>Command signal (-V or current GND)</td>
</tr>
<tr>
<td>F</td>
<td>Output monitor</td>
</tr>
<tr>
<td>G</td>
<td>Protective ground</td>
</tr>
</tbody>
</table>

**View of pins of fixed half**

**Electromagnetic compatibility (EMC)**

- IEC 61326-2-1 (Electrical equipment for measurement, control and laboratory use)
- Conducted Emissions CISPR11 -2015-06 Ed 6.0/EN55011 - Class A, 150kHz to 30MHz
- Radiated Emissions CISPR11 -2015-06 Ed 6.0 /EN55011 - Class A, 30MHz – 1GHz
- RF Continuous Conducted disturbances IEC 60000-4-6, 3Vrms Class A 150 kHz to 80 MHz
- RF Electromagnetic Field, 80MHz to 1GHz, 10V/m; 1.4GHz to 2.7GHz, 3V/m; Meets Criterion A
- Surge: IEC 61000-4-5
  - DC Power Port : ±1kV
  - Signal/Control Port : ±1kV
- Electrical Fast Transients IEC 61000-4-4, Class B
  - DC Power Port : ±1kV
  - Signal/Control Port : ±0.5kV
- Electrostatic discharges (ESD) IEC 61000-4-2, Class B
  - Air ±8kV
  - Contact ±4kV

**ROHS Compliance:**

Complies with: Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU

**Monitor signal (pin F) KBD valves**

- Output impedance: 10 kΩ
- Output impedance: 10 kΩ
- Step input response with flow through P-A-B-T
  - Δp=5 bar (75 psi) per metering path, e.g. P-A
  - Required flow step for 24V (H) version:
    - 0 - 100%: 26 ms
    - 100% - 0: 35 ms
    - +90% to -90%: 40 ms

**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]
### Operating data

**Supporting products:**

Auxiliary electronic modules (DIN-rail mounting):

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Catalog Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHA-CON-201-A2* Signal converter</td>
<td>See catalog 2410A</td>
<td></td>
</tr>
<tr>
<td>EHD-DSG-201-A-1* Command signal generator</td>
<td>See catalog 2470</td>
<td></td>
</tr>
<tr>
<td>EHA-RMP-201-A-2* Ramp generator</td>
<td>See catalog 2410A</td>
<td></td>
</tr>
<tr>
<td>EHA-PID-201-A-2* PID controller</td>
<td>See catalog 2427</td>
<td></td>
</tr>
<tr>
<td>EHA-PSU-201-A-10 Power supply</td>
<td>See catalog 2410A</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp time</td>
<td>0-12 sec for full step input (0-100%)</td>
</tr>
<tr>
<td>Relative duty factor</td>
<td>Continuous rating (ED = 100%)</td>
</tr>
<tr>
<td>Hysteresis with flow through P-A-B-T</td>
<td>&lt;8% of rated flow</td>
</tr>
<tr>
<td>Mass: KBDG4V-3</td>
<td>2.7 kg (5.9 lb) approx.</td>
</tr>
<tr>
<td>KBTG4V-3</td>
<td>1.9 kg (4.2 lb) approx.</td>
</tr>
</tbody>
</table>
Power capacity envelopes
Power capacity envelopes

Power Capacity P to S Flow

Pressure drop vs. Flow for different models:
- 33*20N
- 33*13N
- 33*07N
- 33*03N

Pressure drop vs. Flow for different models:
- 2*20N
- 2*13N
- 2*07N
- 2*03N

USgpm L/min

Bar psi

Power Capacity P to S Flow
Power capacity envelopes

Power capacity *C20N10 (for various area ratios)
Flow characteristics

KBD/TG4V-3
Spool types as noted
Looped flow at $\Delta p = 10$ bar (144 psi)

KB valves are preset at the factory to compensate for the effect of spool overlap.
Flow characteristics

KBD/TG4V-3
Spool types as noted
Looped flowpath at $\Delta p = 10$ bar (144 psi)

KB valves are preset at the factory to compensate for the effect of spool overlap.
Flow characteristics

KBD/TG4V-3

Spool types as noted

Looped flowpath at \( \Delta p = 10 \) bar (144 psi)

KB valves are preset at the factory to compensate for the effect of spool overlap.
Frequency response (typical)

For an amplitude of ±25% max. stroke about the 50% position, at Δp (P-B) = 5 bar (75 psi)
Installation dimensions in mm (inches)

### KBDG4V-3

**View with connector removed to show pin designations**

<table>
<thead>
<tr>
<th>Orientation</th>
<th>View with connector removed to show pin designations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (+24V)</td>
<td>B (Power OV)</td>
</tr>
<tr>
<td>C (Enable)</td>
<td>D (+VE)</td>
</tr>
<tr>
<td>E (-VE)</td>
<td>F (Monitor output)</td>
</tr>
<tr>
<td>G (Earth)</td>
<td></td>
</tr>
</tbody>
</table>

**View with connector removed to show pin designations**

<table>
<thead>
<tr>
<th>Orientation</th>
<th>View with connector removed to show pin designations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (+24V)</td>
<td>B (Power OV)</td>
</tr>
<tr>
<td>C (Enable)</td>
<td>D (+VE)</td>
</tr>
<tr>
<td>E (-VE)</td>
<td>F (Monitor output)</td>
</tr>
<tr>
<td>G (Earth)</td>
<td></td>
</tr>
</tbody>
</table>

**Mounting surface seals supplied**

† Note: Bleed screw locations. Air bleed: torque to 6.5-7.5 Nm (57-66 lbf ft).

**Note:** For optimum valve operation, bleed the air from the proportional solenoids at initial start-up. This may be done as follows:

- Remove the bleed screws until no bubbles appear and then reinstall bleed screws, or...
- Remove both bleed screws, and use a standard oil can nozzle to pump fluid in one side until it flows, free of air bubbles, out the other side. Reinstall screws.

If there is no inherent back pressure in the tank port of the circuit, do not allow the tank line to empty. This may be prevented by installing a check valve in the tank line. The cracking pressure of the check valve should be in the range of 1.5-3 bar (22-45 psi).

### KBTG4V-3

<table>
<thead>
<tr>
<th>Orientation</th>
<th>View with connector removed to show pin designations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (+24V)</td>
<td>B (Power OV)</td>
</tr>
<tr>
<td>C (Enable)</td>
<td>D (+VE)</td>
</tr>
<tr>
<td>E (-VE)</td>
<td>F (Monitor output)</td>
</tr>
<tr>
<td>G (Earth)</td>
<td></td>
</tr>
</tbody>
</table>

**Mounting surface seals supplied**

† Note: Bleed screw locations. Air bleed: torque to 6.5-7.5 Nm (57-66 lbf ft).

**Note:** For optimum valve operation, bleed the air from the proportional solenoids at initial start-up. This may be done as follows:

- Remove the bleed screws until no bubbles appear and then reinstall bleed screws, or...
- Remove both bleed screws, and use a standard oil can nozzle to pump fluid in one side until it flows, free of air bubbles, out the other side. Reinstall screws.

If there is no inherent back pressure in the tank port of the circuit, do not allow the tank line to empty. This may be prevented by installing a check valve in the tank line. The cracking pressure of the check valve should be in the range of 1.5-3 bar (22-45 psi).

**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 with a torque of 2-2,5 Nm (1.5-2.0 lbf ft) to effect a proper seal.
Installation dimensions in mm (inches)

Parallel flow path module
Size 03 Parallel-Flow-Path Module
KDGMA-3-616265-1*

Typically used for doubling effective flow capability of single solenoid proportional valves (throttle valves).

▲ A, T<sub>A</sub>, and T<sub>B</sub> ports at subplate face are blind holes fitted with O-seals.

Subplates and mounting surfaces

General description
If a subplate is not used a machined pad must be provided for valve mounting. Pad must be flat within 0.0127 mm (.0005 inch) and smooth within 1.6 μm (63 microinch). Mounting bolts, when provided by customer, should be ISO 898 class 12.9 or better.

Dimensional tolerances
Dimensional tolerance on interface drawings is ±0.2 mm (±0.008”) except where otherwise stated. ISO 4401 specifies inch conversion to ±0.01”.

Conversion from metric
ISO 4401 gives dimensions in mm. Inch conversions are accurate to 0.01” unless otherwise stated.

Mounting bolt tappings
ISO 4401 gives metric thread tappings. Alternate UNC tappings are recommendations that allow these plates and associated valves to be used up to their maximum pressures, when using recommended Vickers<sup>TM</sup> bolt kits, or bolts of an equivalent strength. It is recommended that customers’ own manifold blocks for UNC bolts should be tapped to the minimum depths given in the footnotes.

Subplates

<table>
<thead>
<tr>
<th>Description and mass kg (lb)</th>
<th>Functional symbol</th>
<th>Model code</th>
<th>Max. pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-station subplate;</td>
<td></td>
<td>KDGVM-3-1*-R</td>
<td>250 bar (3600 psi)</td>
</tr>
<tr>
<td>Rear ports P, T, A, B</td>
<td></td>
<td>KDGVM-3-676803-1*</td>
<td>(SAE/UNF ports)</td>
</tr>
<tr>
<td>Cast iron 1.3 (2.9)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Design number subject to change. No change of installation dimensions for design numbers 10 to 19 or 21 to 29 inclusive.

▲ “S” suffix = SAE/UNC ports and/or UNC fixing bolt tappings and/or orifice plugs as appropriate.

“R” suffix = BSPF and/or metric fixing bolt tappings and/or orifice plugs as appropriate.
Installation dimensions in mm (inches)

### Single-station subplates

4 holes tapped according to model type (see table):
- For models with BSPF ports, M5 x 12 (0.47) deep
- For models with SAE ports, #10-24 UNC-2B x 12.7 (0.5) deep

![Diagram of installation dimensions]

4 system connections for rear-entry models, see table.

### Port threads

<table>
<thead>
<tr>
<th>Model</th>
<th>Ports P, T, A, B</th>
<th>Port L</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSPF ports/M5</td>
<td>Rear</td>
<td>G3/8&quot; (3/8&quot; BSPF) x 12,0 (0.47) deep</td>
</tr>
<tr>
<td>KDGMV-3-1*-R</td>
<td></td>
<td>1/8&quot; BSPF) x 12,0 (0.47) deep</td>
</tr>
<tr>
<td>SAE ports/#10-24 UNC</td>
<td>Rear</td>
<td>3/4&quot;-16 UNF-2B x 14,3 (0.56) deep (SAE)</td>
</tr>
<tr>
<td>KDGMV-3-876903-1*</td>
<td></td>
<td>(SAE)</td>
</tr>
</tbody>
</table>

\[\text{\#10-24 UNC-2B optional.}\]

### Mounting surface to ISO 4401 (Size 03)

This interface conforms to:
- ISO 4401-03-02-0-94 plus location pin hole
- ANSI/B93.7M (and NFPA) size 03 CETOP R3SH4.2-4-03, plus location pin hole
- DIN 24340 Form A6 plus location pin hole

\[\text{#10-24 UNC-2B optional.}\]
Electrical information

Block diagram

**KBD/TG4V-3**

### Command Signals and Outputs

<table>
<thead>
<tr>
<th>7-pin plug</th>
<th>Pin D</th>
<th>Pin E</th>
<th>Flow direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command = Volts (+10V)</td>
<td>Positive</td>
<td>OV</td>
<td>P to A</td>
</tr>
<tr>
<td>Command = Volts (+10V)</td>
<td>Negative</td>
<td>OV</td>
<td></td>
</tr>
<tr>
<td>Command = Volts (+10V)</td>
<td>V_D - V_E = Positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Command = Volts (+10V)</td>
<td>Negative</td>
<td>OV</td>
<td>P to B</td>
</tr>
<tr>
<td>Command = Volts (+10V)</td>
<td>V_D - V_E = Negative</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7-pin plug</th>
<th>Pin D</th>
<th>Pin E</th>
<th>Pin B</th>
<th>Flow direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command = Current (4-20 mA)</td>
<td>more than 12 mA</td>
<td>Current GND</td>
<td>Current return</td>
<td>P to A</td>
</tr>
<tr>
<td>Command = Current (4-20 mA)</td>
<td>less than 12 mA</td>
<td>Current GND</td>
<td>Current return</td>
<td>P to B</td>
</tr>
</tbody>
</table>

### Wiring

Connections must be made via the 7-pin plug mounted on the amplifier. 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)

**Screen (Shield):**

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 diagram on next page.

### WARNING

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

Voltage input (M1)
- Spool position monitor voltage (pin F) will be referenced to the KB valve local ground.

Wiring connections for M1 valves with enable feature

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.
Electrical information

**Current input (M2)**

- Spool position monitor voltage (pin F) will be referenced to the KB valve local ground.

**Wiring connections for M2 valves with enable feature**

**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.

**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.

**Electrical Information Diagram**

![Diagram of electrical connections for M2 valves with enable feature]
Application data

Hydraulic Fluids and Fluid Cleanliness

Recommendations on contamination control methods and the selection of products to control fluid condition are included in Eaton Hydraulic Fluid Recommendation 03-401-2010 rev 1.

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

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

BK590716 (metric)
BK590716 (inch)

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

Seal kit

02-351111

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.

Service information

The products from this range are preset at the factory for optimum performance; disassembling critical items would destroy these settings. It is recommended that if any mechanical or electronic repair is necessary, valves should be returned to the nearest Eaton Hydraulics repair center. The products will be refurbished as necessary and retested to specification before return.

Field repair is restricted to the replacement of the seals.
This page is intentionally left blank