Vickers® Proportional Valves
Proportional Directional Valves with Feedback

KIBIFD/TG4V-3, 1*/2* Series
Pressures to 350 bar (5000 psi)

Eaton
Powering Business Worldwide
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Eaton’s Vickers® K(B)FD/TG4V proportional valves are designed to provide a controlled oil flow in direct proportion to a command signal. They are available in two types; a double solenoid version that will provide reversible flow to an actuator and a single solenoid throttle version that provides a single direction of flow. Hydrostats are available for load compensation and parallel flow path modules are available that will boost the flow capacity of single solenoid throttle versions to nearly twice that of the standard valve. Additionally, both of these valve types can be supplied with or without an integral amplifier built directly onto the valve.

**KFD/TG4V-3**

This version is supplied without the integral amplifier.

**Features and Benefits**

- Wide range of spool and flow rate options
- Electronic feedback LVDT ensures accurate spool position control
- Vibration and shock tested
- Supported by a broad range of amplifiers and auxiliary function modules
- Full CE electromagnetic compatibility

**KBFD/TG4V-3**

A range of proportional directional and throttle valves with integral control electronics. Factory-set adjustments of gain, spool deadband compensation and offset ensure consistent repeatability valve-to-valve. The only electrical inputs required are power supply (24V) and a voltage command signal of ± 10V or 4-20 mA. The amplifier is housed in a robust metal enclosure, sealed against ingress of water and other fluids. Electrical connections are via a standard 7-pin plug. A spool position monitor pin allows the function of the valve to be electrically monitored. Ramp functions, if required, can be generated externally.

**Features and Benefits**

- Factory-sealed adjustments ensure valve-to-valve reproducibility
- Installation wiring reduced and simplified
- Standard 7-pin connector
- Standard 24V DC supply with wide tolerance band
- Optional ± 10V DC or 4-20 mA command signals
- Valve with integrated amplifier selected, ordered, delivered and installed as one performance-tested package
- Spool position monitor pin to help with troubleshooting
- Simple valve removal and replacement for service (plug and play)
- Vibration and shock tested
- Auxiliary DIN rail mounted electronic function modules available
- Full CE electromagnetic compatibility
- IP65 and IP67 valve environmental protection rating
- Optional valve enable function

Typical Section View

![KBFD/TG4V-3-*PE7, 1* Design](image-url)
Model Codes

K (B) F * G 4 V - 3 - * * * * * * - Z - (V) - (M) -(U1) -(***) - H - * - *

1 Valve Type
K Proportional valve

2 Integral Amplifier
B Integral amplifier “B” series. Omit for models without integral amplifier

3 Feedback Arrangement
F Spool position

4 Control Type
D Directional valve
T Throttle valve

5 Mounting
G Subplate mounted

6 Operation
4 Solenoid operation

7 Pressure Rating
V 350 bar (5000 psi) on ports P, A & B

8 Interface
3 ISO 4401, size 03-02-0-94 ANSI/B93.7M-D03

9 Spool Type (center condition) (see spool data, page 5)
2 All ports closed
5 All ports closed (zero lap)
33 P port closed, bleed A & B to T

10 Spool/Spool Spring Arrangement
B Spring centered single solenoid valve (solenoid “B” only) Solenoid “A” for “V” version, Throttle valve
C Spring centered, dual solenoid, Direction valve

11 Spool Flow Rating
Δ p = 5 bar (75 psi) per metering flow path, e.g. B to T. (For actual maximum flow refer to power capacity envelope curves.

03 3 L/min (0.79 USgpm) Δ
07 7 L/min (1.85 USgpm) ▲
13 13 L/min (3.43 USgpm) ▲
20 20 L/min (5.28 USgpm) ▲
28 28 L/min (7.40 USgpm) △
30 30 L/min (7.92 USgpm) ■
▲ Meter-in/meter-out
△ Meter-out only; type 2 spool only
■ 5C Spool only

12 Spool Metering Type
N Meter-in and meter-out
F Fine meter-in and meter-out (only 03 spool)
S Meter-out only

13 Flow Rating (”B” port flow for asymmetric spools) K(B)FDG Valves only
10 10 L/min (2.64 USgpm)
20N10 only
Omit for symmetrical spools

14 Manual Overrides
Z No manual overrides

15 Solenoids Energization Identity
(B) (non-integral amplifier types KF only, omit for valves with integral amplifier)
V Solenoid “A” is at port “A” end and Solenoid “B” is at port “B” end independent of spool type
Blank US ANSI B93.9 standard (energize solenoid “A”, flow symbol is (P→A)

16 Command Input
M Electrical feature flag (KF only)
M1 ± 10VDC (KBF only)
M2 4-20 mA (KBF only)

17 Solenoid Connector
Omit for valves with integral amplifier KBF
U1 ISO 4400/DIN 43650, non-integral amplifier type KF only (mating plug supplied)

18 Electrical Connection (KBF valves only)
PC7 7-pin connector without plug
PE7 7-pin electrical plug with mating half
PH7 As PE7 but with pin “C” used for enable signal
PR7 As PC7 but with pin “C” used for enable signal

19 Coil Rating
H 24 VDC amplifier supply

20 Port T Pressure Limit Code
6 For 2C**S spools
7 For all other spools

21 Design Number
1* & 2* Series
Subject to change

WARNING
Valves with integral amplifier are supplied with or without the metal 7-pin plug. The Eaton 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 a proper seal)
**Spool Data**

**Spool Symbols**

Available Spools for K(B)FDG4V-3

- Spool type 2C**N, meter-in/meter-out
- Spool type 5C**N, meter-in/meter-out (zero lap)
- Spool type 2C20N10, asymmetric flow
- Spool type 2C28S, meter-out only
- Spool 33C**N, meter-in/meter-out
- Spool type 33C20N10, asymmetric flow

Available Spools for K(B)FTG4V-3

- Spool type 2B**N, meter-in/meter-out

**Spool Type and Flow Rating**

**Symmetric Spools**

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

For K(B)FDG4V-3 Valves

<table>
<thead>
<tr>
<th>Spool Code</th>
<th>Spool Symbol</th>
<th>Flow Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>2C03F</td>
<td>2C</td>
<td>3 L/min (0.79 USgpm)</td>
</tr>
<tr>
<td>2C07N</td>
<td>2C</td>
<td>7 L/min (1.85 USgpm)</td>
</tr>
<tr>
<td>2C13N</td>
<td>2C</td>
<td>13 L/min (3.43 USgpm)</td>
</tr>
<tr>
<td>2C20N</td>
<td>2C</td>
<td>20 L/min (5.28 USgpm)</td>
</tr>
<tr>
<td>2C30N</td>
<td>2C</td>
<td>30 L/min (7.92 USgpm)</td>
</tr>
<tr>
<td>2C28S</td>
<td>2C</td>
<td>28 L/min (7.40 USgpm)</td>
</tr>
<tr>
<td>33C03F</td>
<td>33C</td>
<td>3 L/min (0.79 USgpm)</td>
</tr>
<tr>
<td>33C07N</td>
<td>33C</td>
<td>7 L/min (1.85 USgpm)</td>
</tr>
<tr>
<td>33C13N</td>
<td>33C</td>
<td>13 L/min (3.43 USgpm)</td>
</tr>
<tr>
<td>33C20N</td>
<td>33C</td>
<td>20 L/min (5.28 USgpm)</td>
</tr>
<tr>
<td>5C30N</td>
<td>5C</td>
<td>30 L/min (7.92 USgpm)</td>
</tr>
</tbody>
</table>

For K(B)FTG4V-3 Valves

<table>
<thead>
<tr>
<th>Spool Code</th>
<th>Spool Symbol</th>
<th>Flow Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B03F</td>
<td>2B</td>
<td>03 L/min (0.79 USgpm)</td>
</tr>
<tr>
<td>2B07N</td>
<td>2B</td>
<td>07 L/min (1.85 USgpm)</td>
</tr>
<tr>
<td>2B13N</td>
<td>2B</td>
<td>13 L/min (3.43 USgpm)</td>
</tr>
<tr>
<td>2B20N</td>
<td>2B</td>
<td>20 L/min (5.28 USgpm)</td>
</tr>
</tbody>
</table>

**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 K(B)FDG4V-3 Valves

<table>
<thead>
<tr>
<th>Spool Code</th>
<th>Spool Symbol</th>
<th>Flow Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>2C20N10</td>
<td>2C</td>
<td>20 L/min (5.28 USgpm), “A” port flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 L/min (2.64 USgpm), “B” port flow</td>
</tr>
<tr>
<td>33C20N10</td>
<td>33C</td>
<td>20 L/min (5.28 USgpm), “A” port flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 L/min (2.64 USgpm), “B” port flow</td>
</tr>
</tbody>
</table>

**Functional Symbols**

Model Types K(B)FDG4V-3

- Proportional directional valve (with integrated electronics)

Model Types K(B)FTG4V-3

- Proportional throttle valve (with integrated electronics)
Operating Data
K(B)FD/TG4V-3
Valves with Amplifier

K(B)FD/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</th>
<th>24V DC (21 V to 36V including 10% peak-to-peak max. ripple) max current 3A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command signal</td>
<td></td>
</tr>
<tr>
<td>Voltage mode M1</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 Ω</td>
</tr>
<tr>
<td>Common mode voltage to pin B</td>
<td>18V (max)</td>
</tr>
<tr>
<td>Current mode M2</td>
<td>4-20 mA</td>
</tr>
<tr>
<td>Input impedance</td>
<td>100 Ω</td>
</tr>
<tr>
<td>Max differential voltage to pin E to pin D</td>
<td>100 mV</td>
</tr>
<tr>
<td>Valve enable signal for model codes PH7 &amp; PR7</td>
<td></td>
</tr>
<tr>
<td>Enable</td>
<td>&gt;8.5V (36V max)</td>
</tr>
<tr>
<td>Disable</td>
<td>&lt;6.5 V</td>
</tr>
<tr>
<td>Input impedance</td>
<td>10 Ω</td>
</tr>
<tr>
<td>7-pin plug connector</td>
<td>Pin Description</td>
</tr>
<tr>
<td>View of pins of fixed half</td>
<td>A  Power supply positive (+)</td>
</tr>
<tr>
<td>F</td>
<td>B  Power Supply 0V and current command return</td>
</tr>
<tr>
<td>G</td>
<td>C  Not connected (PE7 &amp; PC7)</td>
</tr>
<tr>
<td>E</td>
<td>D  Valve enable (PH7 &amp; PR7)</td>
</tr>
<tr>
<td>D</td>
<td>E  Command signal (+V or current IN)</td>
</tr>
<tr>
<td>C</td>
<td>F  Command signal (-V or current GND)</td>
</tr>
<tr>
<td>B</td>
<td>G  Mounting input</td>
</tr>
<tr>
<td>A</td>
<td>H  Protective ground</td>
</tr>
<tr>
<td>Electromagnetic compatibility (EMC)</td>
<td></td>
</tr>
<tr>
<td>Emission (10V/m)</td>
<td>EN 61326-2</td>
</tr>
<tr>
<td>Immunity (10V/m)</td>
<td>EN 61326-2</td>
</tr>
<tr>
<td>Threshold command voltage (minimum voltage for minimum flow)</td>
<td>0.25V</td>
</tr>
<tr>
<td>Monitor signal (pin F)</td>
<td>KBFD valves ± 10V DC for full spool stroke</td>
</tr>
<tr>
<td>KBFT valves 0 to -10 V DC for full spool stroke</td>
<td></td>
</tr>
<tr>
<td>Output impedance</td>
<td>10 Ω</td>
</tr>
<tr>
<td>Power stage PWM frequency</td>
<td>10 kHz nominal</td>
</tr>
<tr>
<td>Step input response with flow through P–A–B–T</td>
<td>Time to reach 90% of required step:</td>
</tr>
<tr>
<td>Δ p=5 bar (75 psi) per metering path, e.g. P–A</td>
<td>0 – 100%</td>
</tr>
<tr>
<td>Required flow step:</td>
<td>100% – 0</td>
</tr>
<tr>
<td>+90% – -90% (KBFDG4V-3 only)</td>
<td>25 ms</td>
</tr>
<tr>
<td>Reproducibility, valve-to-valve (at factory settings):</td>
<td>Flow at 100% command signal ≤ 5%</td>
</tr>
<tr>
<td>Protection</td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td>Reverse polarity protected</td>
</tr>
<tr>
<td>Environmental</td>
<td>IEC 60529, Class IP65 and IP67</td>
</tr>
<tr>
<td>Ambient air temperature range for full performance</td>
<td>0° C to 70° C (32° F to 158° F)</td>
</tr>
<tr>
<td>Oil temperature range for full performance</td>
<td>0° C to 70° C (32° F to 158° F)</td>
</tr>
<tr>
<td>Minimum temperature at which valves will work at reduced performance</td>
<td>-20° C (-4° F)</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>-25° C to +85° C (-13° F to +185° F)</td>
</tr>
<tr>
<td>Supporting products</td>
<td></td>
</tr>
<tr>
<td>Auxiliary electronic modules (DIN -rail mounting):</td>
<td></td>
</tr>
<tr>
<td>EHD-DSG-201-A-1* command signal generator</td>
<td>See catalog GB 2470</td>
</tr>
<tr>
<td>EHA-RMP-201-A-2* Ramp generator</td>
<td>See catalog GB 2410A</td>
</tr>
<tr>
<td>EHA-PID-201-A-2* PID controller</td>
<td>See catalog GB 2427</td>
</tr>
<tr>
<td>EHA-PSU-201-A-10 Power supply</td>
<td>See catalog GB 2410A</td>
</tr>
</tbody>
</table>
Operating Data

KFD/TG4V-3
Valves without Amplifier

KFD/TG4V-3 Valves without Integral Amplifier  (requires a Eurocard amplifier, refer to Supporting Products)

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

Max current, at 50° C (122° F)  2.7 A
Coil resistance, at 20° C (68° F)  1.87 Ω

Step response
Step size (% of max spool stroke)  Time to reach 90% of required step:
  0 – 100%  18 ms
  100% – 0  19 ms
  +90 – -90% (KBFDG4V3-3 only)  30 ms

Type of protection, with electrical plugs fitted correctly  IEC60529, Class IP65

Electromagnetic compatibility (EMC)
  Emission (10V/m)  EN 50081-2
  Immunity (10V/m)  EN 50082-2

Maximum allowalbe ambient air temperature  60° C (140° F)
Maximum allowalbe oil temperature  60° C (140° F)

Supporting products:
  Eurocard amplifiers
  EEA PAM 533 A/B/C/D/E/F  See catalog GB-2464

KFD/TG4V-3 and KBFD/4V-3 Valves (All Valves)

Relative duty factor  Continuous rating (ED = 100%)
Hysteresis with flow through P–A–B–T <1% of max stroke (center-to-offset)

Mass:
  KFDG4V3  2.7 kg (5.9 lb) approx.
  KBFDG4V3  3.1 kg (6.8 lb) approx.
  KFTG4V3  2.1 kg (4.6 lb) approx.
  KBFTG4V3  2.5 kg (5.5 lb) approx.

Portable test equipment
  EBA TEQ 460 A 10  See catalog V-ELAC-TM001-E

Pressure and Flow Rates

Maximum pressures, bar (psi)

<table>
<thead>
<tr>
<th>Model</th>
<th>Port L Condition</th>
<th>Ports P, A, B</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>All models for normal usage (L port not connected)</td>
<td>Normally blocked by mounting surface</td>
<td>315 (4500)</td>
<td>160 (2300)</td>
<td>160 (2300)</td>
</tr>
<tr>
<td>105 (1500)</td>
<td></td>
<td>350 (5000)</td>
<td></td>
<td>105 (1500)</td>
</tr>
<tr>
<td>For K(B)FDG4V3<strong>C</strong>N/F-Z models only a higher &quot;T&quot; port pressure is allowed if the &quot;L&quot; port is connected directly to tank.</td>
<td>Drained directly to tank</td>
<td>350 (5000)</td>
<td>210 (3000)</td>
<td>10 (150)</td>
</tr>
</tbody>
</table>
Performance
Curves
Power Capacity
Envelopes

**Single Solenoid Models:**
**K(B)FTG4V-3**
Spool types as noted

**Double Solenoid Models:**
**K(B)FDG4V-3**
Spool types as noted

*Performance Curves*

*Power Capacity Envelopes*

*Looped Flow Path*

*Parallel Flow Path*
Use parallel flow path module
KDGMA-3-616265-10 (see page 12)

*Max. system pressure = max. pressure for port T: 210 bar (3000 psi)*
Performance Curves

Flow Gain Curves

When using the single solenoid throttle valves version (K*FT) a parallel flowpath module (page 12) can be used to approximately double the flow rate.

KBF valves are preset at the factory to compensate for the effect of spool overlap. Curves shown include deadband compensation provided for the KF valve by Eaton's Vickers Eurocard Amplifier EEA-PAM-533-*-32 (user adjustable).

K(B)FD/TG4V-3

Spool types as noted

Single flowpath (e.g. P–A) pressure drop, \( \Delta p = 5 \text{ bar} \) (72 psi).

Frequency Response (Typical)

For an amplitude of \( \pm 25\% \), max. flow about the 50\% flow, at \( \Delta p \ (P–B) = 5 \text{ bar} \) (72 psi).
**NOTE:** For optimum valve operation, bleed the air from the proportional solenoids at initial start-up. This may be done as follows:

- The valve may be pressurized by removing the bleed screws until no bubbles appear and then reinstalling 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 22 - 45 psi (1.5 - 3 bar).

\[\begin{align*}
\text{KFDG4V-3} & \quad \text{mm (inch)} \\
\text{KFTG4V-3} & \quad \text{mm (inch)}
\end{align*}\]
**Warning**

Valves with integral amplifiers are supplied with or without the metal 7-pin plug. The Eaton 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 2.0-2.5 Nm (1.5-2.0 lbf ft) to effect a proper seal.

---

KBFDG4V-3

- **KBFDG4V-3**
- **KBFTG4V-3**
- **KBFDG4V-3**
- **KBFTG4V-3**

Amplifier and solenoid may be rotated 90° as shown by removing 4 screws shown X. Re-torque to 7-9 Nm (6-7 lbf ft)

* Bleed screw locations Air bleed, Socket Head Cap Screw. Torque to 2.5-3.0 Nm (2.0-2.5 lbf ft)
Parallel Path Flow Module

Size 03
Parallel-Flow-Path Module

**KDGA-3-616265-1***

Typically used for doubling effective flow capability of single solenoid proportional valves (throttle valves), as illustrated in "Typical Applications".

▲ A, TA and TB ports at subplate face are blind holes fitted with O-seals.

**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 for Metric**
ISO 4401 gives dimensions in mm. Inch conversions are accurate to 0.01” unless otherwise stated.

**Mounting Bolt Tapping**
ISO 4401 gives metric thread tappings. Alternate UNC tapping are Eaton’s recommendations that allow these plates and associated valves to be used up to their maximum pressures, when using Eaton recommended bolt kits, or bolts of an equivalent strength. It is recommended that customer’s own manifold blocks for UNC bolts should be tapped to the minimum depths given in the footnotes.

**Subplates and Mounting Surfaces**

**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; rear ports P, T, A, B; side port L</td>
<td>- -</td>
<td>KDGVM-3-1*-R</td>
<td>250 bar (3600 psi)</td>
</tr>
<tr>
<td>Cast iron 1.3 (2.9) P T B A</td>
<td>(SAE/UNF ports)</td>
<td>KDGVM-3-676803-1*</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 tapping and/or orifice plugs as appropriate.
Installation Dimensions

Single-Station Subplates
All dimensions in mm (inches)

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 mounting bolts: KDGVM-3-1*R</td>
<td>Rear</td>
<td>G 3/8” (3/8” BSPF) x 12,0 (0.47) deep</td>
</tr>
<tr>
<td>SAE ports/#10-24 UNC mounting bolts: KDGVM-3-676803-1*R</td>
<td>Rear</td>
<td>3/4”-16 UNF-2B x 14,3 (0.56) deep (SAE)</td>
</tr>
</tbody>
</table>

Mounting Surface to ISO 4401 (Size 03)
This interface conforms to:
ISO 4401-03-02-0-05

#10-24 UNC-2B optional

Interface with Additional Drain Port
ANSI/B93.7M (and NFPA) size 03 CETOP R35H4.2-4-03, plus location pin hole.
Typically used for proportional and other valves requiring an additional drain port.
**Block Diagram**

**Voltage Input (M1)**

KBFDG 4V-3

**KBFDG4V-3 Wiring**

Connections must be made via the 7-pin plug mounted on the amplifier. See page 15 of this leaflet and Eaton’s 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)

**Screen (shield):**

A suitable cable would have seven 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.

**KFDG4V-3 Wiring**

Wiring details for these valves are contained in the appropriate Eurocard literature and Eaton’s Installation Wiring Practices for Vickers® Electronic Products leaflet 2468.

---

**Electrical Information**

**Command Signals and Outputs, M1**

<table>
<thead>
<tr>
<th>7-pin Plug Flow direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin D</td>
</tr>
<tr>
<td>Positive</td>
</tr>
<tr>
<td>OV</td>
</tr>
<tr>
<td>$U_d - U_e = $ Positive</td>
</tr>
<tr>
<td>Negative</td>
</tr>
<tr>
<td>OV</td>
</tr>
<tr>
<td>$U_d - U_e = $ Negative</td>
</tr>
</tbody>
</table>

---

**WARNING**

All power must be switched off before connecting/disconnecting any plugs.
Electrical Information

Block Diagram
Current Input (M2)
KFSDG4V-3

KBSDG4V-3 Wiring
Connections must be made via the 7-pin plug mounted on the amplifier. See page 16 of this leaflet and Eaton’s 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)

**Screen (shield):**
A suitable cable would have seven 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.

KFDG4V-3 Wiring
Wiring details for these valves are contained in the appropriate Eurocard literature and Eaton’s Installation Wiring Practices for Vickers® Electronic Products leaflet 2468.

**Command Signals and Outputs, M2**

<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></td>
<td>More than 12 mA</td>
<td>Current</td>
<td>Power</td>
<td>P to A</td>
</tr>
<tr>
<td></td>
<td>Less than 12 mA</td>
<td>Current</td>
<td>Power</td>
<td>P to B</td>
</tr>
</tbody>
</table>

**WARNING**
All power must be switched off before connecting/disconnecting any plugs.
**Wiring Connections**

**Voltage Input (M1)**

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

**WARNING**

Do not ground pin C.

---

**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 earthing 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

Wiring Connections

Current Input (M2)

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

WARNING

Do not ground pin C.

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 earthing 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.
**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, 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 Eaton’s publication 9132 or 561, “Vickers Guide to Systemic Contamination Control”. The book also includes information on the Eaton’s 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

Eaton 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 components 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 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 K(B)FD/TG4V-3
- BK02-156493M (metric)
- BK590716 (inch)

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

**Seal Kits**
- KFD/TG4V-3 ......................... 565108
- KBFD/TG4V-3-1* ..................... 02-332693

**Plugs**
- KBFDG4V
  - 7-pin plug (metal) ............. 934939
  - 7-pin plug (plastic) ........... 694534

(metal plug must be used for full EMC protection)

**Extension Cable**
Extension Cable: Adapter for extending seven core cable when changing from KA to KB valve and existing wiring is not long enough. Consists of a 7-pin plug, a 7-pin socket and a length of cable, fully assembled for ease of use.

Field repair is restricted to the replacement of the seals.

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

NOTE: The feedback/solenoid assembly installed in this valve should not be disassembled.