Proportional Directional Valves with Feedback

K(B)FD/TG4V-5, 12 Series
Pressures to 315 bar (4500 psi)
# Table of contents

## INTRODUCTION
- Typical Section View ................................................................. 03
- Model Code ..................................................................................... 04
- Spool Data ....................................................................................... 05
- Functional Symbols ......................................................................... 05

## OPERATING DATA
- Valves with Amplifier, KBFD/TG4V-5 ................................................. 06
- Valves without Amplifier, KFD/TG4V-5 .............................................. 07
- KBFD/TG4V-5 & KFD/TG4V-5 ............................................................ 07
- Pressures and Flow Rates .................................................................. 07

## PERFORMANCE CURVES
- Power Capacity Envelopes, Single Solenoid Models ............................. 08
- Power Capacity Envelopes, Double Solenoid Models ........................... 08
- Flow Gain Curves ............................................................................ 09
- Frequency Response ......................................................................... 09

## INSTALLATION DIMENSIONS
- KFDG4V-5 ....................................................................................... 10
- KFTG4V-5 ....................................................................................... 10
- KBFDG4V-5 .................................................................................... 11
- KBFTG4V-5 .................................................................................... 11

## SUBPLATES AND MOUNTING SURFACES
- General Description ........................................................................ 12
- Mounting surfaces to ISO 4401 (Size 05) .......................................... 13

## ELECTRICAL INFORMATION
- Block Diagram Voltage Input (M1) KBFDG4V-5 ................................. 14
- Block Diagram Current Input (M2) KBFDG4V-5 ................................. 15
- Wiring Connections Voltage Input(M1) ............................................. 16
- Wiring Connections Current Input(M2) ............................................. 17

## APPLICATION DATA

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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 89/336/EEC, amended by Directives 91/263/EEC, 92/31/EEC, 93/68/EEC and 93/97/EEC. For instructions on installation requirements to achieve effective protection levels, see the leaflet and Installation Wiring Practices for Eaton’s Electronic Products leaflet 2468. Wiring practices relevant to this Directive are indicated by a Electromagnetic Compatibility (EMC).
Eaton 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-5**

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-5**

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 & play).
- Vibration and shock tested.
- Auxiliary DIN rail mounted electronic function modules available. Full CE electromagnetic compatibility.
- Full CE electromagnetic compatibility - 2014/30/EU
- IP65 & IP67 valve environmental protection rating.
- Optional valve enable function.
<table>
<thead>
<tr>
<th></th>
<th>Valve type</th>
<th>Integral amplifier</th>
<th>Feedback arrangement</th>
<th>Control type</th>
<th>Mounting</th>
<th>Operation</th>
<th>Pressure rating</th>
<th>Interface</th>
<th>Flow rating (“B” port flow for asymmetric spools) K(B)FDG valves only</th>
<th>Manual Overrides</th>
<th>Solenoids energization identity</th>
<th>Command input</th>
<th>Solenoid connector</th>
<th>Electrical connection (KBF valves only)</th>
<th>Coil rating</th>
<th>Port T pressure limit code</th>
<th>Design number 12 series</th>
<th>Design number 12 series</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Valve type</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25 L/min (6.6 USgpm) (50N25 only)</td>
<td>No manual overrides</td>
<td>(Non-integral amplifier types KF only, omit for valves with integral amplifier)</td>
<td></td>
<td></td>
<td>7-pin electrical plug with mating half</td>
<td>24 VDC amplifier supply</td>
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<tr>
<td>2</td>
<td>K</td>
<td>Proportional valve</td>
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<td></td>
<td></td>
<td>45 L/min (11.9 USgpm) (50N25 only)</td>
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<td>Solenoid “A” is at port “A” end and Solenoid “B” is at port “B” end independent of spool type</td>
<td>M1</td>
<td>ISO 4400/DIN 43650, non-integral amplifier type KF only (mating plug supplied)</td>
<td>PE7</td>
<td>4-20mA command and 4-20mA feedback</td>
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<td>B</td>
<td>Integral amplifier</td>
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<td></td>
<td></td>
<td>Omit for symmetrical spools</td>
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<td>M2</td>
<td>25 L/min /25 L/min, meter in/ meter out</td>
<td>PH7</td>
<td>+/-10V command and 4-20mA feedback</td>
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<td>F</td>
<td>Spool position</td>
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<td></td>
<td>Omit for models without integral amplifier</td>
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<td>V</td>
<td>M3</td>
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<td>V</td>
<td>M4</td>
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<td>Directional valve</td>
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<td>25 L/min /25 L/min, meter in/ meter out</td>
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<td>25 L/min /25 L/min, meter in/ meter out</td>
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<td>16</td>
<td>33C – P closed at center, A,B,T connected, KBD</td>
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<td>25 L/min /25 L/min, meter in/ meter out</td>
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<td>25 L/min /25 L/min, meter in/ meter out</td>
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<td>18</td>
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<td>19</td>
<td>33C70N</td>
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<td>25 L/min /25 L/min, meter in/ meter out</td>
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<td>50 L/min /25 L/min, meter in/ meter out</td>
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<td>25 L/min /25 L/min, meter in/ meter out</td>
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<tr>
<td>21</td>
<td>9C – zero lap</td>
<td>50 L/min symmetric, meter in/ meter out</td>
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<td>25 L/min /25 L/min, meter in/ meter out</td>
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<td>50 L/min symmetric, meter in/ meter out</td>
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<td>23</td>
<td>2B – single solenoid throttle valves, KBT</td>
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<td>25 L/min /25 L/min, meter in/ meter out</td>
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<td>24</td>
<td>2B30N</td>
<td>30 L/min symmetric, meter in/ meter out</td>
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<td>25 L/min /25 L/min, meter in/ meter out</td>
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<td>ISO 4400/DIN 43650, non-integral amplifier type KF only (mating plug supplied)</td>
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<td>25</td>
<td>2B50N</td>
<td>50 L/min symmetric, meter in/ meter out</td>
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<td>25 L/min /25 L/min, meter in/ meter out</td>
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<td>26</td>
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<td>65 L/min meter out only</td>
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<td>25 L/min /25 L/min, meter in/ meter out</td>
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<td>27</td>
<td>2B70N</td>
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<td>25 L/min /25 L/min, meter in/ meter out</td>
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**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 archived. The plug retaining nut must be tightened with a torque of 2-2.5 Nm (1.5-2.0 lb ft) to effect a proper a proper seal.
**Spool symbols**

**Available spools for K(B)FDG4V-3**

- Spool type 9C**N**, meter-in/meter-out
- Spool type 2C**N**, meter-in/meter-out (zero lap)
- Spool type 2C**S**, meter-out only
- Spool 33C**N**, meter-in/meter-out

**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 K(B)FTG4V-5**

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

**Functional symbols**

**Model types KBFDG4V-5**

Proportional directional valve (with intergated electronics)

**Model types KBFTG4V-5**

Proportional throttle valve (with intergated electronics)

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**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-5 valves**

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<thead>
<tr>
<th>Spool code</th>
<th>Spool symbol</th>
<th>Flow rating</th>
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<td>2C30N</td>
<td>2C</td>
<td>30 L/min (7.9 USgpm)</td>
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<tr>
<td>2C50N</td>
<td>2C</td>
<td>50 L/min (13.2 USgpm)</td>
</tr>
<tr>
<td>2C65S</td>
<td>2C</td>
<td>65 L/min (17.2 USgpm)</td>
</tr>
<tr>
<td>2C70N</td>
<td>2C</td>
<td>70 L/min (18.5 USgpm)</td>
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<tr>
<td>9C50N</td>
<td>9C</td>
<td>50 L/min (13.2 USgpm)</td>
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<td>33C</td>
<td>30 L/min (7.9 USgpm)</td>
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<tr>
<td>33C50N</td>
<td>33C</td>
<td>50 L/min (12.2 USgpm)</td>
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<tr>
<td>33C70N</td>
<td>33C</td>
<td>70 L/min (18.5 USgpm)</td>
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**For K(B)FTG4V-5 valves**

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<tr>
<td>2B30N</td>
<td>2B</td>
<td>30 L/min (7.9 USgpm)</td>
</tr>
<tr>
<td>2B50N</td>
<td>2B</td>
<td>50 L/min (13.2 USgpm)</td>
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<tr>
<td>2B65S</td>
<td>2B</td>
<td>65 L/min (17.2 USgpm)</td>
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<tr>
<td>2B70N</td>
<td>2B</td>
<td>70 L/min (18.5 USgpm)</td>
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**For K(B)FDG4V-5 valves**

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<th>Flow rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>2C50N25</td>
<td>2C</td>
<td>50 L/min (13.2 USgpm), &quot;A&quot; port flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 L/min (6.6 USgpm), &quot;B&quot; port flow</td>
</tr>
<tr>
<td>2C75N45</td>
<td>2C</td>
<td>75 L/min (19.8 USgpm), &quot;A&quot; port flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45 L/min (11.9 USgpm), &quot;B&quot; port flow</td>
</tr>
<tr>
<td>33C50N25</td>
<td>33C</td>
<td>50 L/min (13.2 USgpm), &quot;A&quot; port flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 L/min (6.6 USgpm), &quot;B&quot; port flow</td>
</tr>
</tbody>
</table>

---

**Model types KFDG4V-5**

Proportional directional valve (requires amplifier card)

**Model types KFTG4V-5**

Proportional throttle valve (requires amplifier card)
Operating data

K(B)FD/TG4V-5 valves with amplifier

K(B)FD/TG4V-5 valves with integral amplifier

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

| Power supply | 24V DC (18 V to 36V including 10% peak-to-peak max. ripple) max current 3A |

Command signal

- **Voltage mode M1**: 0 to +10V DC, or 0 to -10V DC, or -10V to +10V DC
- **Input impedance**: 47kohms
- **Common mode voltage to pin B**: 18V (max)
- **Current mode M2**: 4-20 mA
- **Input impedance**: 100 Ω
- **Max differential voltage to Pin E to Pin B**: 10V

<table>
<thead>
<tr>
<th>Valve enable signal for model codes PH7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enable</strong>: &gt;8.5V (36V max)</td>
</tr>
<tr>
<td><strong>Disable</strong>: &lt;6.5 V</td>
</tr>
<tr>
<td><strong>Input impedance</strong>: 10 k ohms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7-pin plug connector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong> Power supply positive (+)</td>
</tr>
<tr>
<td><strong>B</strong> Power supply 0V</td>
</tr>
<tr>
<td><strong>C</strong> Not connected (PE7)</td>
</tr>
<tr>
<td><strong>D</strong> Command signal (+V or current IN)</td>
</tr>
<tr>
<td><strong>E</strong> Command signal ⎪V or current (GND)</td>
</tr>
<tr>
<td><strong>F</strong> Output monitor</td>
</tr>
<tr>
<td><strong>G</strong> Protective ground</td>
</tr>
</tbody>
</table>

Electromagnetic compatibility (EMC)

- **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 61000-4-6, Class A 150 KHz to 80 MHz**
  - DC Power Port: ±1kV
  - Signal/Control Port: ±1kV
- **RF Electromagnetic field, 80 MHz to 2700 MHz, 10V/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: ±2kV
  - Signal/control port: ±1kV
- **Electrostatic discharges (ESD) IEC 61000-4-2, Class B**
  - Air ±8kV
  - Contact ±4kV

Threshold command voltage (minimum voltage for minimum flow) 0.25V

Monitor signal (pin F)

| K(B)FD valves | ± 10 V DC for full spool stroke |
| K(B)FT valves | 0 to –10 V DC for full spool stroke |

Voltage mode

- +/- 10V DC for full stroke

Output impedance

- 10KΩhm
- 4mA to 20mA

Current mode

- Upto 200 Ohm

Power stage PWM frequency

- 10 kHz nominal

Step input response with flow through P–A–B–T Δ p = 5 bar (75 psi) per metering path, e.g. P–A

<table>
<thead>
<tr>
<th>Required flow step:</th>
<th>Time to reach 90% of required step:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 100%</td>
<td>30 ms</td>
</tr>
<tr>
<td>100% – 0</td>
<td>40 ms</td>
</tr>
<tr>
<td>+90% – 90% (KBFDDAV4V3-3 only)</td>
<td>32 ms</td>
</tr>
</tbody>
</table>

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

| Flow at 100% command signal | ≤ 5% |

---

Electromagnetic compatibility (EMC)

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 61000-4-6, Class A 150 KHz to 80 MHz

- DC Power Port: ±1kV
- Signal/Control Port: ±1kV

RF Electromagnetic field, 80 MHz to 2700 MHz, 10V/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: ±2kV
- Signal/control port: ±1kV

Electrostatic discharges (ESD) IEC 61000-4-2, Class B

- Air ±8kV
- Contact ±4kV

Threshold command voltage (minimum voltage for minimum flow) 0.25V

Monitor signal (pin F)

| K(B)FD valves | ± 10 V DC for full spool stroke |
| K(B)FT valves | 0 to –10 V DC for full spool stroke |

Voltage mode

- +/- 10V DC for full stroke

Output impedance

- 10KΩhm
- 4mA to 20mA

Current mode

- Upto 200 Ohm

Power stage PWM frequency

- 10 kHz nominal

Step input response with flow through P–A–B–T Δ p = 5 bar (75 psi) per metering path, e.g. P–A

<table>
<thead>
<tr>
<th>Required flow step:</th>
<th>Time to reach 90% of required step:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 100%</td>
<td>30 ms</td>
</tr>
<tr>
<td>100% – 0</td>
<td>40 ms</td>
</tr>
<tr>
<td>+90% – 90% (KBFDDAV4V3-3 only)</td>
<td>32 ms</td>
</tr>
</tbody>
</table>

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

| Flow at 100% command signal | ≤ 5% |
### Operating data

**KFD/TG4V-5 valves without amplifier**

#### Protection
- **Electrical**
  - Reverse polarity protected
- **Environmental**
  - IEC 60529, Class IP65 & IP67

#### ROHS compliance
- Electronic amplifier is compliant to 2011/65/EU ROHS2

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient air temperature range for full performance</td>
<td>-40°C to +85°C (-40°F to 185°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>-40°C (-40°F)</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>-40°C to +85°C (-40°F to 185°F)</td>
</tr>
</tbody>
</table>

#### Supporting products
- **Auxiliary electronic modules (DIN-rail mounting):**
  - EHD-DSG-201-A-1* command signal generator
  - EHA-RMP-201-A-2* Ramp generator
  - EHA-PSU-201-A-10 Power supply
  - EHA-PID-201-A-20 PID controller

---

**KBFD/TG4V-5 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).*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max current, at 50°C (122°F)</td>
<td>2.7 A</td>
</tr>
<tr>
<td>Coil resistance, at 20°C (68°F)</td>
<td>1.87 Ω</td>
</tr>
<tr>
<td>Step response</td>
<td>Time to reach 90% of required step:</td>
</tr>
<tr>
<td>0 to 100%</td>
<td>31 ms</td>
</tr>
<tr>
<td>100% to 0</td>
<td>30 ms</td>
</tr>
<tr>
<td>+90 to -90% (KFDG4V-5 only)</td>
<td>45 ms</td>
</tr>
<tr>
<td>Type of protection, with electrical plugs fitted correctly</td>
<td>IEC 60529, Class IP65</td>
</tr>
<tr>
<td>Electromagnetic compatibility (EMC)</td>
<td></td>
</tr>
<tr>
<td>Emission (10V/m)</td>
<td>EN 50081-2</td>
</tr>
<tr>
<td>Immunity (10V/m)</td>
<td>EN 50082-2</td>
</tr>
<tr>
<td>Maximum allowable ambient air temperature</td>
<td>60°C (140°F)</td>
</tr>
<tr>
<td>Maximum allowable oil temperature</td>
<td>60°C (140°F)</td>
</tr>
</tbody>
</table>

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

---

**KFD/TG4V-5 and KBFD/TG4V-5 valves (all valves)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<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;1% of max stroke (center-to-offset)</td>
</tr>
<tr>
<td>Mass: KFDG4V-5</td>
<td>7.2 kg (15.86 lb) approx.</td>
</tr>
<tr>
<td>KBFDG4V-5</td>
<td>7.6 kg (16.76 lb) approx.</td>
</tr>
<tr>
<td>KFTG4V-5</td>
<td>5.5 kg (12.10 lb) approx.</td>
</tr>
<tr>
<td>KBFTG4V-5</td>
<td>5.9 kg (13.00 lb) approx.</td>
</tr>
</tbody>
</table>

#### 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>T</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>For KBFDG4V-5<strong>C</strong>N-Z models only a higher “T” port pressure is allowed if the “L” port is connected directly to tank</td>
<td>Drained directly to tank</td>
<td>315 (4500)</td>
<td>210 (3000)</td>
<td>210 (3000)</td>
</tr>
</tbody>
</table>
Performance curves
Power capacity envelopes

**Single solenoid models: K(B)FTG4V-5**
Spool types as noted

**Single flow path**

**Parallel flow path use parallel flow path module:**
KDAGMA-5-616877-10R or KDAGMA-5-02-139150-10S
(see page 16)

**Double solenoid models: K(B)FDG4V-5**
Spool types as noted

**Looped flow path**

Max. system pressure =
max. for port T: 210 bar (3000 psi)
Flow gain curves

When using the single solenoid throttle valve (K*FT), a dual flowpath module (page 16) can be used to approximately double the flow rate.

Curves shown include deadband compensation provided for the KF valve by the Eaton's Vickers Eurocard Amplifier EEA-PAM-535-*32 (user adjustable).

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

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

\[ Q_x = Q_d \]

At other \( \Delta p \) values and within the power capacity envelopes, flow rates approximate to:

\[ Q_x = Q_d \sqrt{\frac{\Delta p_x}{\Delta p_d}} \]

Frequency response (typical)

For an amplitude of \( \pm 25\% \) max. flow about the 50\% flow, at \( \Delta p \) (P–B) = 5 bar (72 psi)
Installation dimensions

KFDG4V-5

mm (inch)

Solenoid plug (ISO 4400/DIN 43650); gray, marked A, for V models, or black, marked B, for non-V models; see 15 in “Model Code”

LVDT plug, gray 8 (0.32) clearance for removal

KFTG4V-5

mm (inch)

Solenoid plug (ISO 4400/DIN 43650); gray, marked A, for V models, or black, marked B, for non-V models; see 15 in “Model Code”

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

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).
**KBFDG4V-5**

mm (inch)

![KBFDG4V-5 Diagram]

**KBFTG4V-5**

mm (inch)

![KBFTG4V-5 Diagram]

* Bleed screw locations air bleed, socket head cap screw.  
Torque to 2.5-3.0 Nm (2.0-2.5 lbf ft)

---

**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.
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 (0.0005 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**

<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><img src="image" alt="Symbol" /></td>
<td>KDGS-5-67805-20 (SAE/UNF ports)</td>
<td>210 bar (3000 psi)</td>
</tr>
<tr>
<td>Cast iron 1.3 (2.9)</td>
<td><img src="image" alt="Symbol" /></td>
<td>KDGS-5-615225-10 1/2” BSPF ports</td>
<td>315 bar (4500 psi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KDGS-5-615226-10 3/4” BSPF ports</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EKDS-01Y-10-R</td>
<td>280 bar (4000 psi)</td>
</tr>
</tbody>
</table>
Mounting surfaces to ISO 4401 (Size 05)

This interface conforms to:

ISO 4401-05-04-0-05

ANSI/B93.7M (and NFPA) size 05

Interface with additional drain port

The interface conforms to

ISO 4401-05-06-0-05

Typically used for proportional and other valves requiring an additional drain port, e.g.:

K(B)FDG4V-5
K(B)FTG4V-5
Electrical information

**Block diagram**

**Voltage input (M1) KBFDG4V-5**

**KBFDG4V-5 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.

**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 page 16.

---

**KFDG4V-5 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, M1**

<table>
<thead>
<tr>
<th>7-pin plug</th>
<th>Flow direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin D</td>
<td>Pin E</td>
</tr>
<tr>
<td>Positive</td>
<td>OV</td>
</tr>
<tr>
<td>0V</td>
<td>Negative</td>
</tr>
<tr>
<td>U_d - U_e</td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>P to A</td>
</tr>
<tr>
<td>Negative</td>
<td>0V</td>
</tr>
<tr>
<td>0V</td>
<td>Positive</td>
</tr>
<tr>
<td>U_d - U_e</td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>P to B</td>
</tr>
</tbody>
</table>

---

**WARNING**

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

Block diagram
Current input (M2) KBFDG4V-5

KBFDG4V-5 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 page 17.

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

KFDG4V-5 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

7-pin plug

<table>
<thead>
<tr>
<th>Pin D</th>
<th>Pin E</th>
<th>Pin B</th>
<th>Flow direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 12 mA</td>
<td>Current return</td>
<td>Power ground</td>
<td>P to A</td>
</tr>
<tr>
<td>Less than 12 mA</td>
<td>Current return</td>
<td>Power ground</td>
<td>P to B</td>
</tr>
</tbody>
</table>

![Diagram of KBFDG4V-5 wiring](image_url)

- Pin C is used for a valve enable signal with electrical connections PH7.
- R1 Shunt resistor 100R
- F1, F2 Resettable fuse
Electrical information

Wiring connections | 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

Wiring connections

Current input (M2)

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

**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 subplate 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.

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.
**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). For further technical information about fluids see “Technical Information” leaflet B-920 or I-286S.

**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.

**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.

Field repair is restricted to the replacement of the seals.

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