



*Powering Business Worldwide*

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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to meet specific standards outlined in the European Electromagnetic Compatibility Directive (EMC) 2014/30/EU which repealed Directive 89/336/EEC, amended by Directives 91/263/EEC, 92/31/EEC, 93/68/EEC and 93/97/EEC.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  $\Delta$  Electromagnetic Compatibility (EMC).

## General description

Eaton proportional valves shown in this catalog are suitable for working pressures up to 350 bar (5000 psi) and flow rates to 720 l/min (190 USgpm). They are designed to provide a controlled oil flow in proportion to a command signal, with spool position feedback to provide accurate control. Zero lapped spools are available for closed loop control applications and hydrostats are available for load compensation.

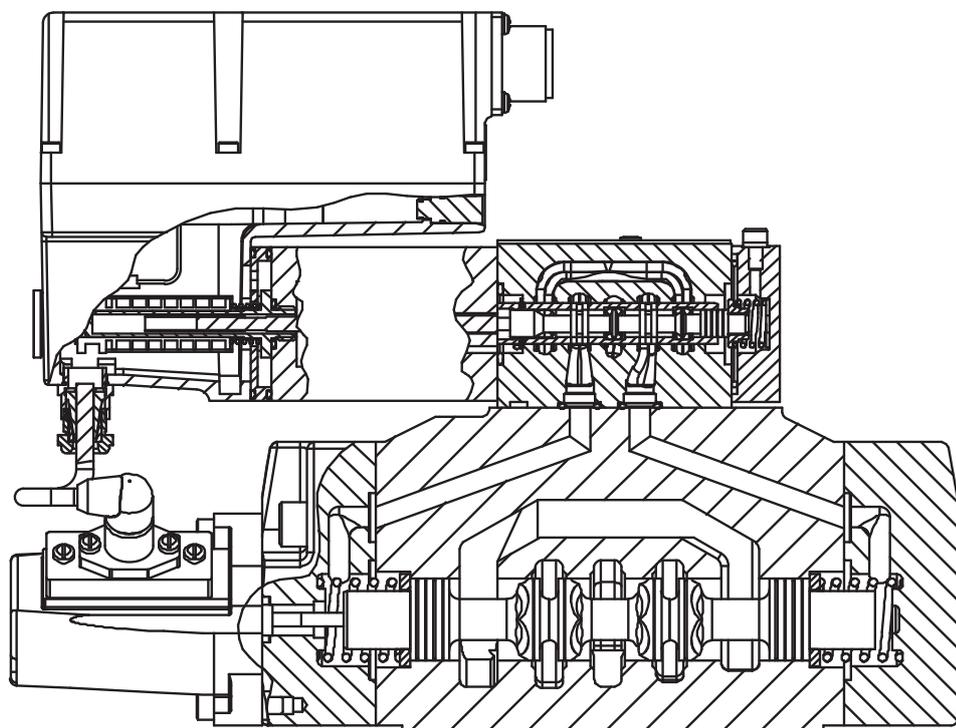
## KBHDG5V-5/7/8/10

A range of proportional directional valves with control amplifiers built directly on, and prewired to the valves. Factory-set adjustments of gain, spool deadband compensation, and offset ensure high valve-to-valve reproducibility. The only electrical inputs required are power supply (24V) and a voltage command signal of  $\pm 10V$ . 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 point allows the function of the valve to be electrically monitored. Ramp functions, if required, can be generated externally.

## Features and benefits

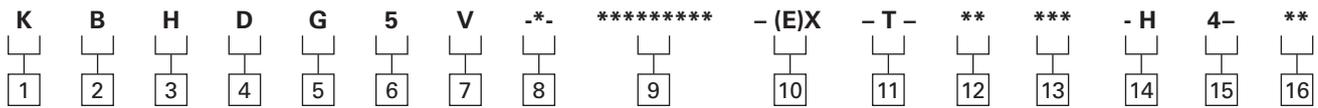
- Factory-sealed adjustments increase valve-to valve reproducibility.
- Valve with integrated amplifier selected, ordered, delivered and installed as one performance tested package.
- Electronic feedback LVDT ensures accurate spool position control.
- Vibration and shock tested.
- Standard 24V DC supply with wide tolerance band.
- Wide range of spool and flow rate options.
- Standard  $\pm 10V$  DC and 4-20mA command signals.
- Installation wiring reduced and simplified.
- Standard 7-pin connector.
- Simple valve removal and replacement for service.
- Supported by auxiliary function modules.
- Full CE electromagnetic compatibility. - 2014/30/EU
- IP65 and IP67 environmental protection rating.
- Optional valve enable function.
- Optional pilot pressure reducer.

## Typical section view



KBHDG5V-7, 12 design

## Model code



<b>1</b>	<b>Valve type</b>	<b>K</b> Proportional valve
<b>2</b>	<b>Integral amplifier</b>	<b>B</b> Integral amplifier "B" series
<b>3</b>	<b>Feedback arrangement</b>	<b>H</b> From pilot and main stages
<b>4</b>	<b>Control type</b>	<b>D</b> Directional valve
<b>5</b>	<b>Mounting</b>	<b>G</b> Subplate mounted
<b>6</b>	<b>Operation</b>	<b>4</b> Solenoid controlled, pilot operated
<b>7</b>	<b>Pressure rating</b>	<b>V</b> 310 bar (4500 psi) Size 05 350 bar (5000 psi) Size 07 350 bar (5000 psi) Size 08 350 bar (5000 psi) Size 10
<b>8</b>	<b>Interface</b>	ISO 4401 <b>5</b> Size 05 <b>7</b> Size 07 <b>8</b> Size 08 <b>10</b> Size 10

**9** **Spool type, flow rating and metering**

See "Functional Symbol" on page 7.  $\Delta p = 5$  bar (72 psi) per metering flow path, e.g. B to T.

**Symmetric spools for KBHDG5V-5 valves:**

<b>2C100N</b>	100 L/min (26 US gpm)
<b>33C80N</b>	80 L/min (21 US gpm)
<b>5C85N</b>	85 L/min (22 US gpm)

**For KBHDG5V-7 valves:**

<b>2C200N</b>	200 L/min (52 US gpm)
<b>33C160N</b>	160 L/min (42 US gpm)
<b>5C200N</b>	200 L/min (52 US gpm)

**For KBHDG5V-8 valves:**

<b>2C375N</b>	375 L/min (99 US gpm)
<b>33C375N</b>	375 L/min (99 US gpm)
<b>5C375N</b>	375 L/min (99 US gpm)

**For KBHDG5V-10 valves:**

<b>2C700N</b>	700 L/min (185 US gpm)
<b>33C700N</b>	700 L/min (185 US gpm)
<b>5C720N</b>	720 L/min (190 US gpm)

**Asymmetric spools**

First figure (\*\*N) is flow rating P-A, or A-T ("A" port flow); last figure (N\*\*) is flow rating P-B, or B-T ("B" port flow)

**For KBHDG5V-5 valves:**

<b>2C70N45</b>	70 L/min (18.5 US gpm), "A" port flow 45 L/min (11.9 US gpm), "B" port flow
<b>33C60N40</b>	60 L/min (17.2 US gpm), "A" port flow 40 L/min (10.6 US gpm), "B" port flow
<b>PQ87F</b>	See flow charts (p.11)

**For KBHDG5V-7 valves:**

<b>2C150N85</b>	150 L/min (40 US gpm), "A" port flow; +85 L/min (22.4 US gpm), "B" port flow
<b>33C130N65</b>	130 L/min (33.3 US gpm), "A" port flow; 65 L/min (17.2 US gpm), "B" port flow
<b>5C200N115</b>	200 L/min (52.8 US gpm), "A" port flow; 115 L/min (30.8 US gpm), "B" port flow
<b>PQ190F</b>	See flow charts (p.11)

**For KBHDG5V-8 valves:**

<b>2C375N250</b>	375 L/min (99 US gpm), "A" port flow; 250 L/min (66 US gpm), "B" port flow
<b>12C375N250</b>	375 L/min (99 US gpm), "A" port flow; 250 L/min (66 US gpm), "B" port flow
<b>33C375N250</b>	375 L/min (99 US gpm), "A" port flow; 250 L/min (66 US gpm), "B" port flow
<b>133C375N250</b>	375 L/min (99 US gpm), "A" port flow; 250 L/min (66 US gpm), "B" port flow
<b>733C375N250</b>	375 L/min (99 US gpm), "A" port flow; 250 L/min (66 US gpm), "B" port flow
<b>72C375N250</b>	375 L/min (99 US gpm), "A" port flow; 250 L/min (66 US gpm), "B" port flow
<b>PQ375F</b>	See flow charts (p.12)

**For KBHDG5V-10 valves:**

<b>2C700N420</b>	700 L/min (185 US gpm), "A" port flow; 420 L/min (110 US gpm), "B" port flow
<b>33C700N420</b>	700 L/min (185 US gpm), "A" port flow; 420 L/min (110 US gpm), "B" port flow
<b>12C700N420</b>	700 L/min (185 US gpm), "A" port flow; 420 L/min (110 US gpm), "B" port flow
<b>133C700N420</b>	700 L/min (185 US gpm), "A" port flow; 420 L/min (110 US gpm), "B" port flow
<b>72C700N420</b>	700 L/min (185 US gpm), "A" port flow; 420 L/min (110 US gpm), "B" port flow
<b>733C700N420</b>	700 L/min (185 US gpm), "A" port flow; 420 L/min (110 US gpm), "B" port flow
<b>PQ680 F</b>	See flow charts (p.13) For actual maximum flows refer to power capacity envelopes, page 10.

**10 Pilot supply**

<b>Blank</b>	Internal (without reducer)
<b>E</b>	External (without reducer)
<b>X</b>	Internal (with reducer)
<b>EX</b>	External (with reducer)
	See section on maximum pressures (page 9) for when pilot reducer must be used.

**11 Pilot drain**

<b>T</b>	Internal
	Omit for external drain

**12 Electrical control signal**

<b>M1</b>	+/-10V command and +/-10V feedback
<b>M2</b>	4-20mA command and +/-10V feedback
<b>M3</b>	+/-10V command and 4-20mA feedback
<b>M4</b>	4-20mA command and 4-20mA feedback

**13 Electrical connection**

<b>PE7</b>	7 pin connector with plug
<b>PH7</b>	As PE7 but with pin "C" used for enable signal

**14 Coil rating**

<b>H</b>	24 VDC amplifier supply
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**15 Port T pressure limit rating**

<b>4</b>	50 bar (700 psi) (for internal pilot drain option only, item 11 above)
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**16 Design number**

<b>12</b>	12 series
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**Note:** Additional configurations available upon request. Please contact your customer sales representative for details.

** 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 2-2.5 Nm (1.5-2.0 lbf ft) to effect a proper seal.

## Spool data

### Spool type and flow ratings

Valves with 5C spools are designed so that with the valve disabled the pressure in port B is at least twice that in port A (blocked ports).

### Application notes

#### Main-spool options

Spools shown are meter-in/meter-out types. Center-condition options are types 2, 33, 5, 12, 133, 72, 733 and PQ.

Internally Piloted Models Differ from detailed symbols above by omission of plug A and the blocking of port X by the mating surface.

#### Internally pilot drain models

Differ from detailed symbols above by omission of plug B and blocking of port Y by the mating surface.

#### Symmetric spools

Base line pressure drop  $\Delta p = 5$  bar (72 psi) per metering flow path, e.g. B to T. For actual maximum flow refer to power capacity envelope curves.

#### Asymmetric spools

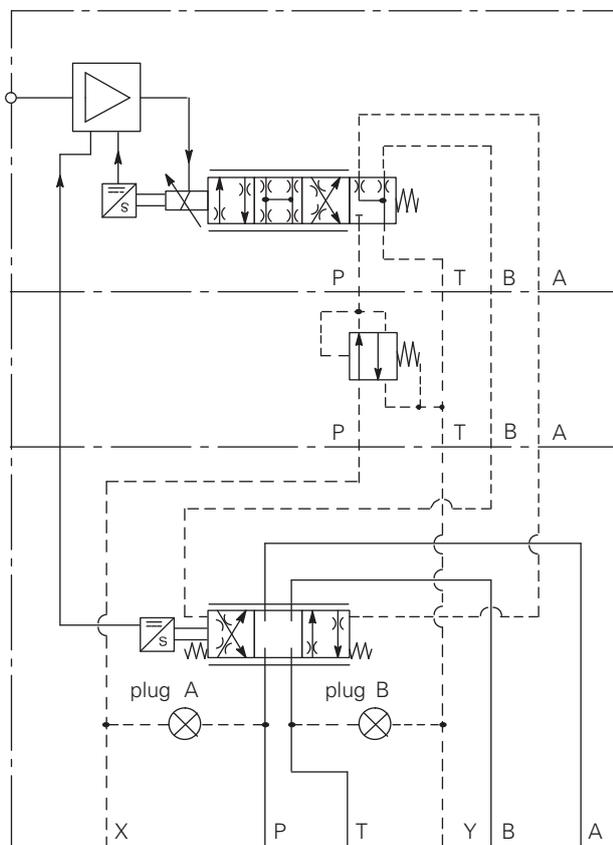
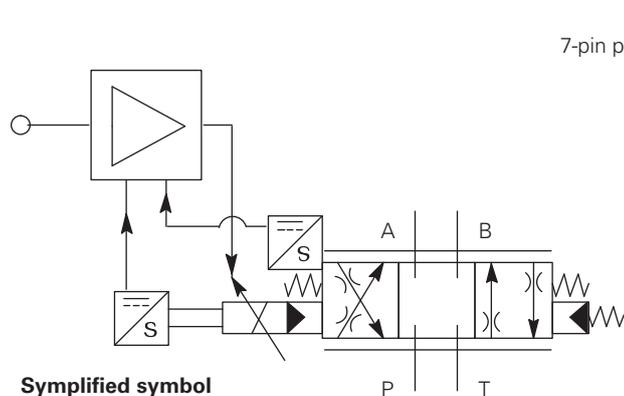
Figure preceding metering type designator, "N" e.g. 2C\*\*N) is flow rating P-A, or

A-T ("A" port flow): Figure after "N" (N\*\*) is flow rating P-B, or B-T ("B" port flow).

### Symmetric

Spool code	Spool symbol	Flow rating
For KBHDG5V-5 valves:		
2C100N	2C	100 L/min (26 USgpm)
33C80N	33C	80 L/min (21 USgpm)
5C85N	5C	85 L/min (22 USgpm)
For KBHDG5V-7 valves:		
2C200N	2C	200 L/min (52 USgpm)
33C160N	33C	160 L/min (42 USgpm)
5C200N	5C	200 L/min (52 USgpm)
For KBHDG5V-8 valves:		
2C375N	2C	375 L/min (99 USgpm)
33C375N	33C	375 L/min (99 USgpm)
5C375N	5C	375 L/min (99 USgpm)
For KBHDG5V-10 valves:		
2C700N	2C	700 L/min (185 USgpm)
33C700N	33C	700 L/min (185 USgpm)
5C720N	5C	720 L/min (190 USgpm)

### Functional symbol

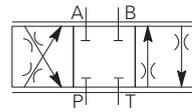


Detailed symbol

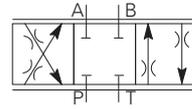
**Asymmetric**

Spool code	Spool symbol	Flow rating
For KBHDG5V-5 valves:		
2C70N45	2C	70 L/min (18.5 USgpm) "A" port flow 45 L/min (11.9 USgpm) "B" port flow
33C60N40	33C	60 L/min (17.2 USgpm) "A" port flow 40 L/min (10.6 USgpm) "B" port flow
PQ87F	PQ	See flow chart (p. 11)
For KBHDG5V-7 valves:		
2C150N85	2C	150 L/min (40 USgpm) "A" port flow 85 L/min (22.4 USgpm) "B" port flow
33C130N65	33C	130 L/min (33.3 USgpm) "A" port flow 65 L/min (17.2 USgpm) "B" port flow
5C200N115	5C	200 L/min (52.8 USgpm) "A" port flow, 115 L/min (30.8 USgpm) "B" port flow
PQ190F	PQ	See flow chart (p. 11)
For KBHDG5V-8 valves:		
2C375N250	2C	375 L/min (99 USgpm) "A" port flow 250 L/min (66 USgpm) "B" port flow
33C375N250	33C	375 L/min (99 USgpm) "A" port flow 250 L/min (66 USgpm) "B" port flow
12C375N250	12C	375 L/min (99 USgpm) "A" port flow 250 L/min (66 USgpm) "B" port flow
133C375N250	133C	375 L/min (99 USgpm) "A" port flow 250 L/min (66 USgpm) "B" port flow
72C375N250	72C	375 L/min (99 USgpm) "A" port flow 250 L/min (66 USgpm) "B" port flow
733C375N250	733C	375 L/min (99 USgpm) "A" port flow 250 L/min (66 USgpm) "B" port flow
PQ375F	PQ	See flow chart (p. 12)
For KBHDG5V-10 valves:		
2C700N420	2C	700 L/min (185 USgpm) "A" port flow 420 L/min (110 USgpm) "B" port flow
33C700N420	33C	700 L/min (185 USgpm) "A" port flow 420 L/min (110 USgpm) "B" port flow
12C700N420	12C	700 L/min (185 USgpm) "A" port flow 420 L/min (110 USgpm) "B" port flow
133C700N420	133C	700 L/min (185 USgpm) "A" port flow 420 L/min (110 USgpm) "B" port flow
72C700N420	72C	700 L/min (185 USgpm) "A" port flow 420 L/min (110 USgpm) "B" port flow
733C700N420	733C	700 L/min (185 USgpm) "A" port flow 420 L/min (110 USgpm) "B" port flow
PQ680F	PQ	See flow chart (p. 13)

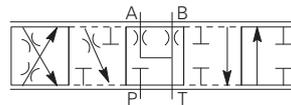
**Available spools for KBHDG5V**



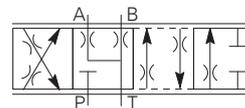
Spool type 2C



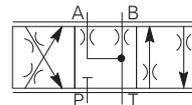
Spool type 5C (zero lapped)



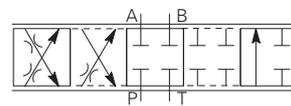
Spool type 133C



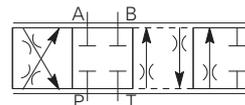
Spool type 733C



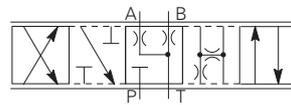
Spool type 33C



Spool type 12C



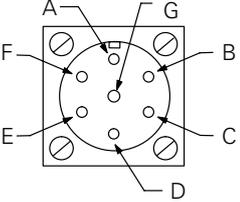
Spool type 72C



Spool type PQ

## Operating data

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

Power supply	24V DC (18V to 36V including 10% peak-to-peak max. ripple) max current 3A			
<b>Command signal</b>				
Voltage mode	0 to 10V DC, or 0 to -10V DC, or -10V to + 10V DC			
• Input impedance	M1: 47 kΩ - M2: 100R			
• Common mode voltage to pin D	18V (max)			
Current mode	4-20 mA			
• Max differential voltage to pin E to pin B	10V			
<b>Valve enable signal for model codes PH7</b>				
Enable	>8.5V (36V max)			
Disable	<6.5V			
Input impedance	10 kΩ			
7-pin plug connector	Pin Description			
 <p>View of pins of fixed half.</p>	A Power supply positive (+)			
	B Power supply 0V			
	C Not connected (PE7)			
	C Valve enable (PH7)			
	D Command signal (+V or current in)			
	E Command signal (-V or current command return)			
	F Output monitor			
G Protective ground				
<b>Electromagnetic compatibility (EMC)</b>				
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				
<ul style="list-style-type: none"> <li>• DC Power Port : 10Vrms</li> <li>• Signal/Control Port : 10Vrms</li> </ul>				
RF Electromagnetic Field, 80 MHz to 2700 MHz, 10V/m, Meets Criterion A				
Surge: IEC 61000-4-5				
<ul style="list-style-type: none"> <li>• DC Power Port : ±1kV</li> <li>• Signal/Control Port : ±1kV</li> </ul>				
Electrical Fast Transients IEC 61000-4-4, Class B				
<ul style="list-style-type: none"> <li>• DC Power Port : ±2kV</li> <li>• Signal/Control Port : ±1kV</li> </ul>				
Electrostatic discharges (ESD) IEC 61000-4-2, Class B				
<ul style="list-style-type: none"> <li>• Air ±8kV,</li> <li>• Contact ±4kV</li> </ul>				
Threshold command voltage (minimum voltage for minimum flow)	0V – 5C Spools 0.25V– 2C & 33C Spools			
<b>Monitor signal (pin F)</b>				
Voltage mode	+/- 10V DC for full stroke			
Output impedance	10KOhm			
Current mode	4mA to 20mA			
Output impedance	Upto 200 ohms			
Power stage PWM frequency	10 kHz nominal			
<b>Step input response, with flow through P-A-B-T, Δ p=5 bar (72 psi) per metering path, e.g. P-A, pilot pressure = 40 bar</b>				
Required flow step:	KBHDG5V-5	KBHDG5V-7	KBHDG5V-8	KBHDG5V-10
0 to 100%	24 ms	24 ms	33 ms	64 ms
100% to 0	23 ms	23 ms	33 ms	60 ms
+90 to -90%	35 ms	36 ms	49 ms	84 ms
Reproducibility, valve-to-valve (at factory settings): Flow at 100% command signal	≤5%			
Hysteresis with flow through P-A-B-T ∅p=5 bar (72 psi) per metering path (P-A or B-T)	<1%			
<b>Protection:</b>				
Electrical	Reverse polarity protected			
Environmental	IEC 60529, Class IP65 & IP67			
Ambient air temperature range for full performance	-40°C to +85°C (-40°F to 185°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	-40°C (-40° F)			
Storage temperature range	-40°C to +85°C (-40°F to 185°F)			
Relative duty factor	Continuous rating (ED = 100%)			
Mass: kg (lb) approx.	KBHDG5V-5	KBHDG5V-7	KBHDG5V-8	KBHDG5V-10
Valves with pressure reducer	10.15 (22.4)	11.4 (25.1)	17.05 (37.54)	44.3 (97.7)
Valves without pressure reducer	8.85 (19.5)	10.1 (22.2)	15.85 (34.84)	43.1 (95.1)

**Supporting products:**

Auxiliary electronic modules (DIN -rail mounting):

EHA-CON-201-A2* signal converter	See catalog GB 2410B
EHD-DSG-201-A-1* command signal generator	See catalog GB 2470
EHA-RMP-201-A-2* Ramp generator	See catalog GB 2410A
EHA-PSU-201-A-10 Power supply	See catalog GB 2410A
EHA-PID-201-A-20 PID controller	See catalog GB 2427

**Maximum pressures, bar (psi) valves with pressure reducer**

Model	Pilot pressure source †	Pilot drain connection	P Port	A&B Ports	T Port	X Port ◊	Y Port
KBHDG5V-5	External	External	315 (4500)	315 (4500)	210 (3000)	315 (4500)	50 (700)
		Internal*	315 (4500)	315 (4500)	50 (700)	315 (4500)	50 (700)
	Internal	External	315 (4500)	315 (4500)	210 (3000)	315 (4500)	50 (700)
		Internal*	315 (4500)	315 (4500)	50 (700)	315 (4500)	50 (700)
KBHDG5V-7/8/10	External	External	350 (5000)	350 (5000)	350 (5000)	350 (5000)	50 (700)
		Internal*	350 (5000)	350 (5000)	50 (700)	350 (5000)	50 (700)
	Internal	External	350 (5000)	350 (5000)	350 (5000)	350 (5000)	50 (700)
		Internal*	350 (5000)	350 (5000)	50 (700)	350 (5000)	50 (700)

† Minimum recommended pilot operating pressure = 50 bar (700 psi)

\* Internal drain is a non-preferred option

◊ For pilot pressures ≤ 210 bar (3000 psi) a pilot pressure reducer is optional

■ For pilot pressures > 210 bar (3000 psi) a pilot pressure reducer must be used

Unused pilot port: Maximum pressure as shown

**Maximum pressures, bar (psi) valves without pressure reducer**

	Pilot pressure source †	Pilot drain connection	P Port	A&B Ports	T Port	X Port ◊	Y Port
KBHDG5V-5	External	External	315 (4500)	315 (4500)	210 (3000)	210 (3000)	50 (700)
		Internal*	315 (4500)	315 (4500)	50 (700)	210 (3000)	50 (700)
	Internal	External	210 (3000)	315 (4500)	210 (3000)	210 (3000)	50 (700)
		Internal*	210 (3000)	315 (4500)	50 (700)	210 (3000)	50 (700)
KBHDG5V-7/8/10	External	External	350 (5000)	350 (5000)	350 (5000)	210 (3000)	50 (700)
		Internal*	350 (5000)	350 (5000)	50 (700)	210 (3000)	50 (700)
	Internal	External	210 (3000)	350 (5000)	350 (5000)	210 (3000)	50 (700)
		Internal*	210 (3000)	350 (5000)	50 (700)	210 (3000)	50 (700)

† Minimum recommended pilot operating pressure = 50 bar (700 psi)

\* Internal drain is a non-preferred option

◊ For pilot pressures ≤ 210 bar (3000 psi) a pilot pressure reducer is optional

■ For pilot pressures > 210 bar (3000 psi) a pilot pressure reducer must be used

Unused pilot port: Maximum pressure as shown

**Minimum recommended flow rates**

Valve size/spool code	Min. Flow rate L/min	In <sup>3</sup> /min
KBHDG5V-5	0.5	30
KBHDG5V-7	1.0	60
KBHDG5V-8	1.5	91
KBHDG5V-10	3.0	180

# Performance curves

KBHDG5V-5/7/8/10

## Flow gain

At  $\Delta p = 5 \text{ bar}$  (72 psi) per metering path (e.g. P-A), with flow through P-A-B-T or P-B-A-T. Percentage command signals applicable for positive and negative values of command signal.

At other  $\Delta p$  values, flow rates approximate to:

$$QX = QD \sqrt{\frac{\Delta pX}{\Delta pD}}$$

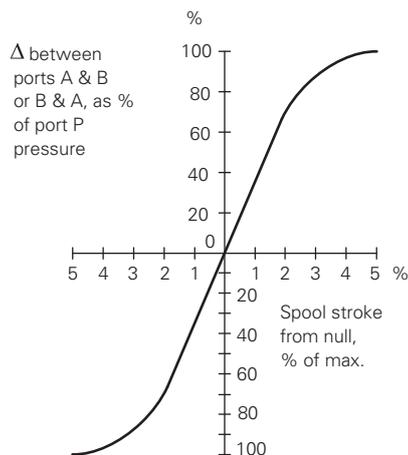
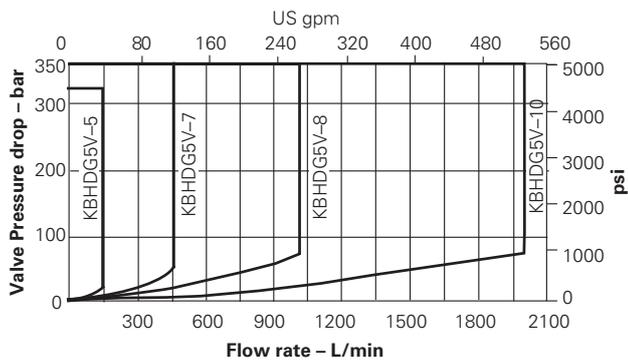
where QD= Datum flow rate

$\Delta pD$ = Pressure drop at datum flow rate

$\Delta pX$ = Required p

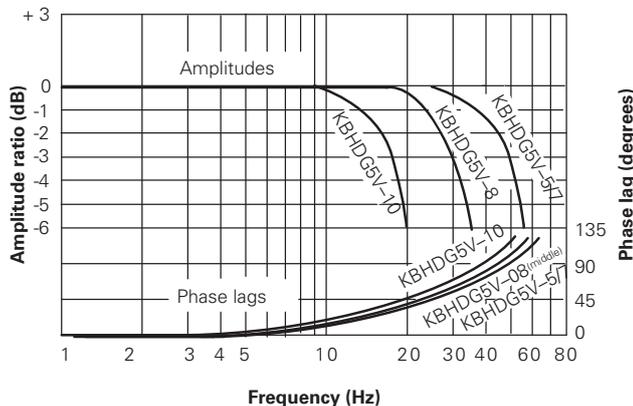
Limited by valve power capacity. Refer to curves on page 11.

**Power capacity envelope**  
Flow through P-A-B-T or P-B-A-T

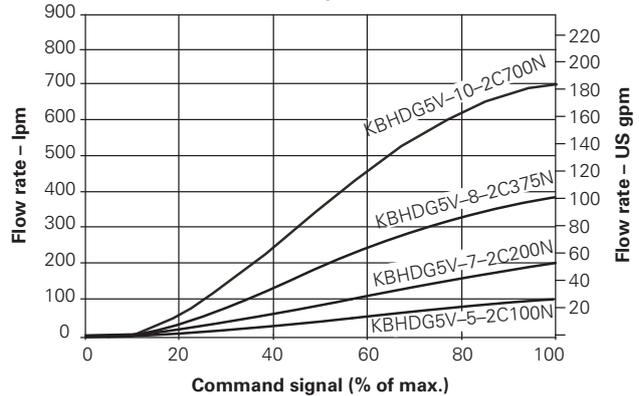


**Frequency response, Typical**

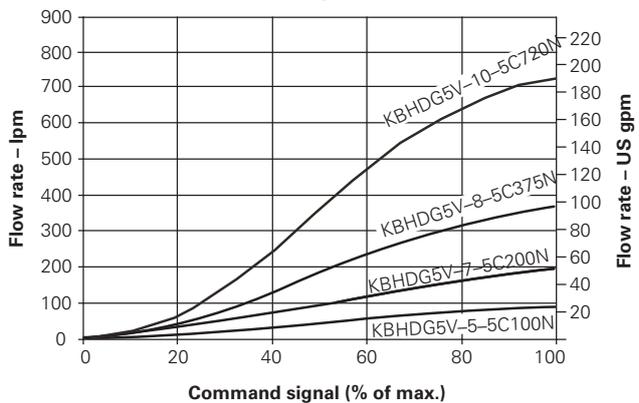
For an amplitude of  $50 \pm 25\%$  of rated flow (ISO 10770-1)  
2C spool measured at  $\nu = 36 \text{ cSt}$  (168 SUS),  
 $t = 50^\circ\text{C}$  (122°F) and pilot pressure = 40 bar (with-reducer model)



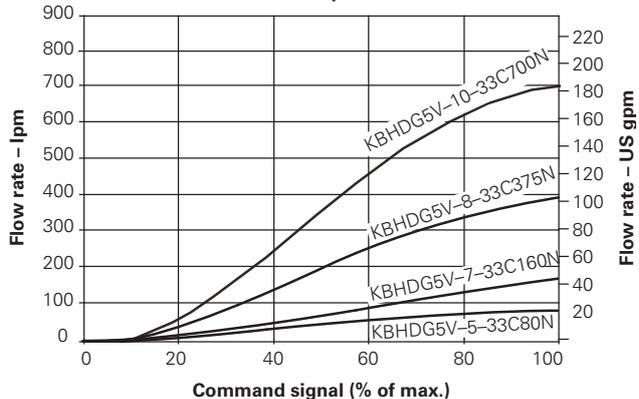
**"2C" Spools**



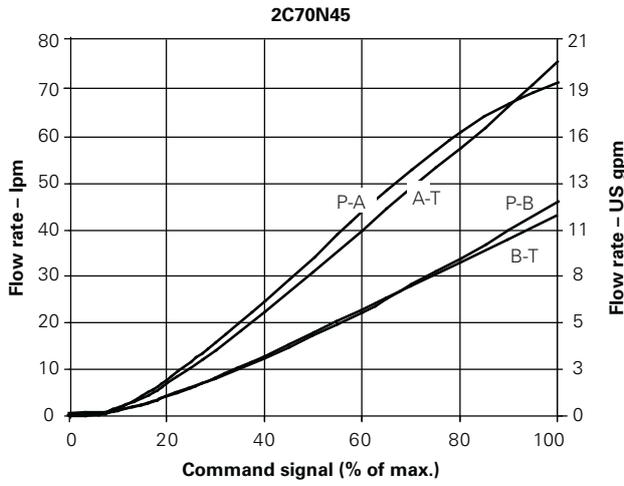
**"5C" Spools**



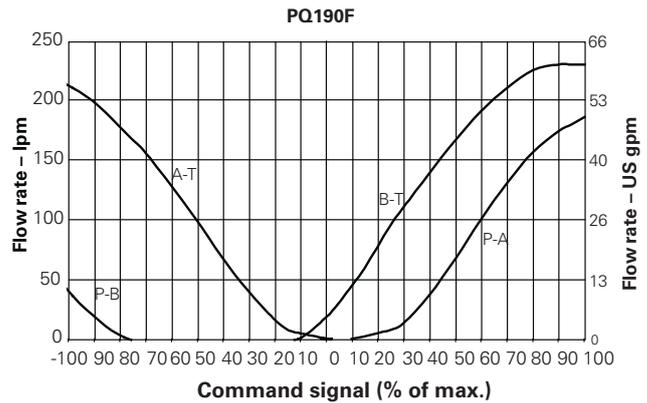
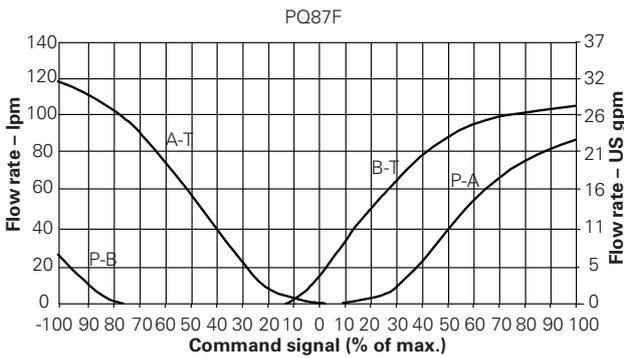
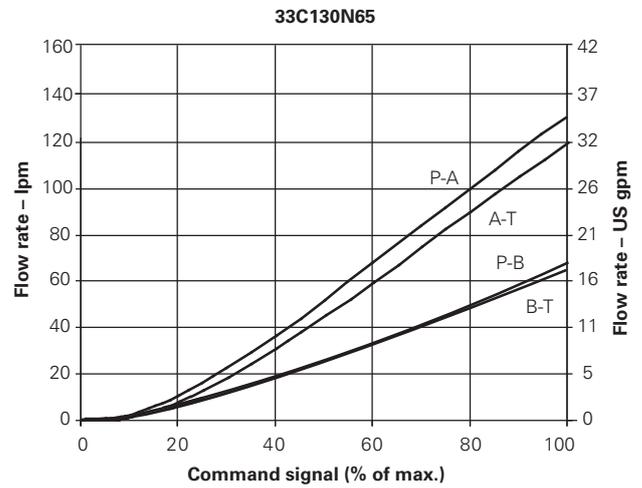
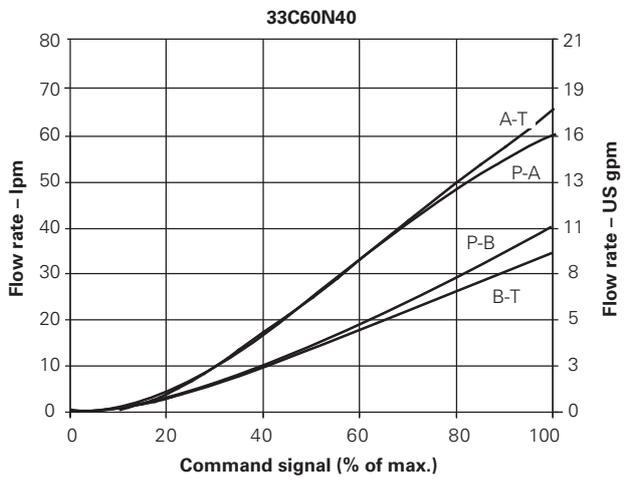
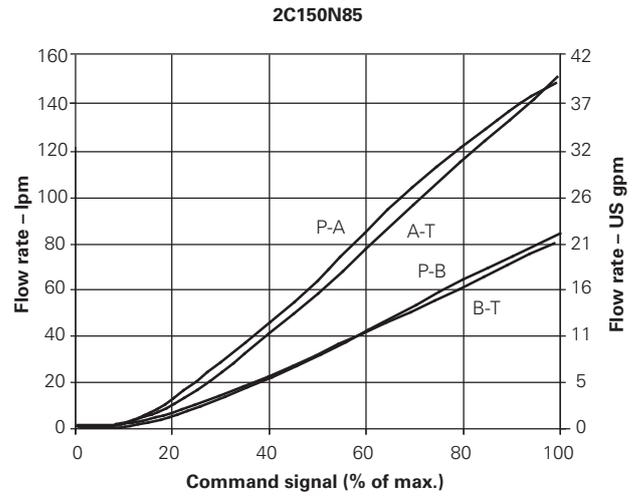
**"33C" Spools**



**KBHDG5V-5**



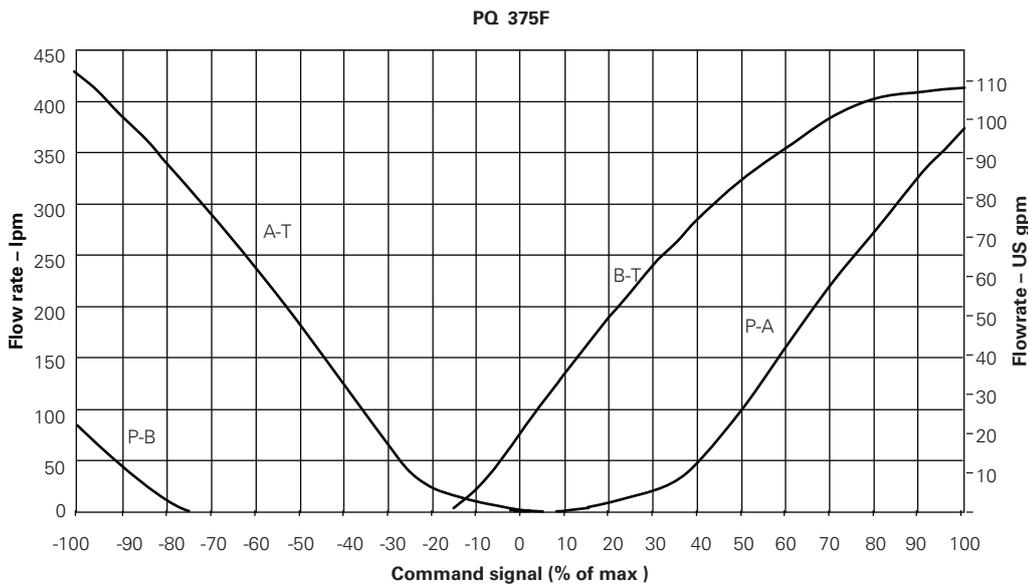
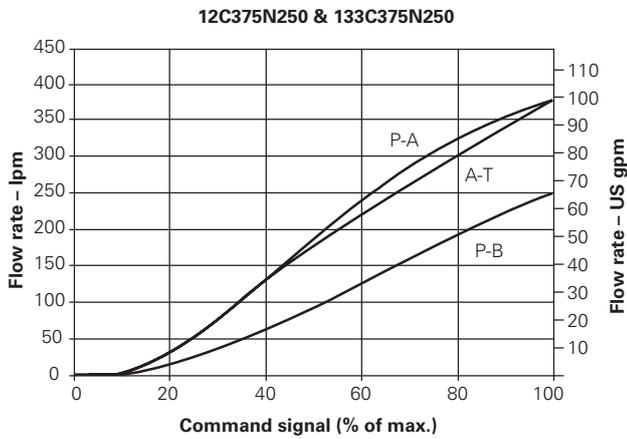
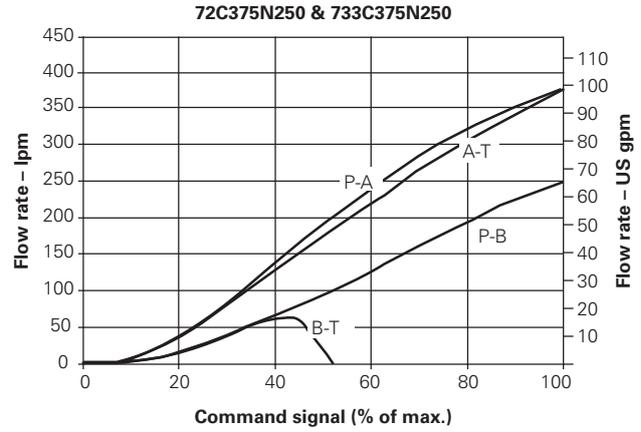
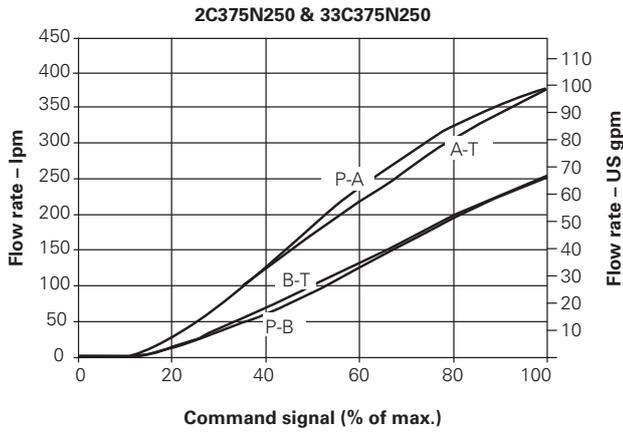
**KBHDG5V-7**



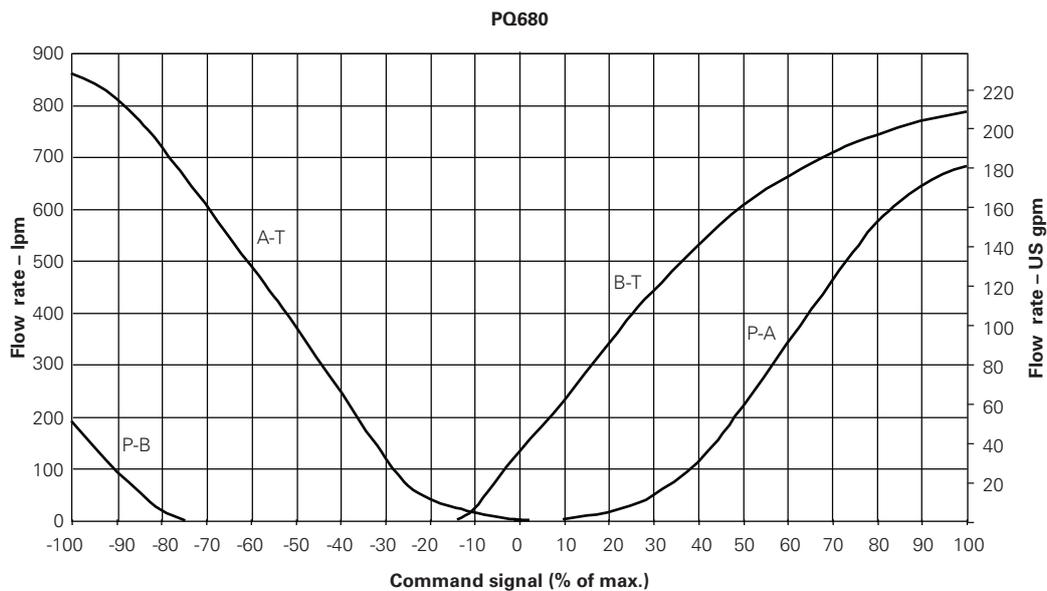
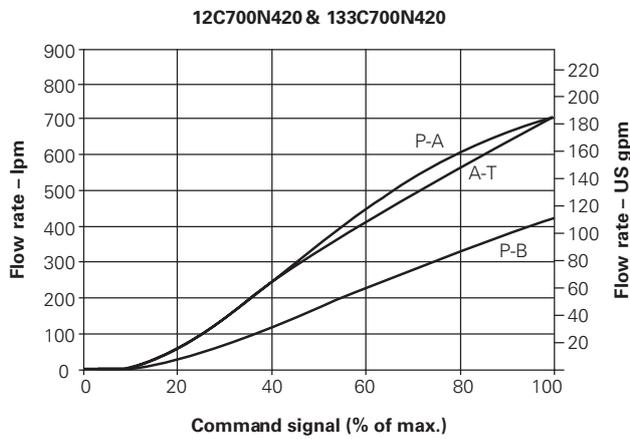
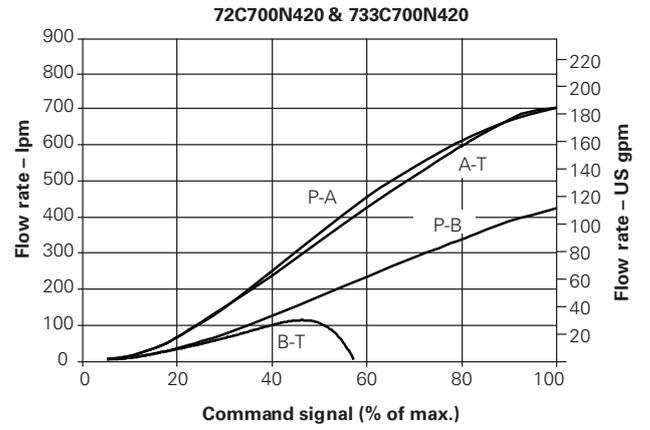
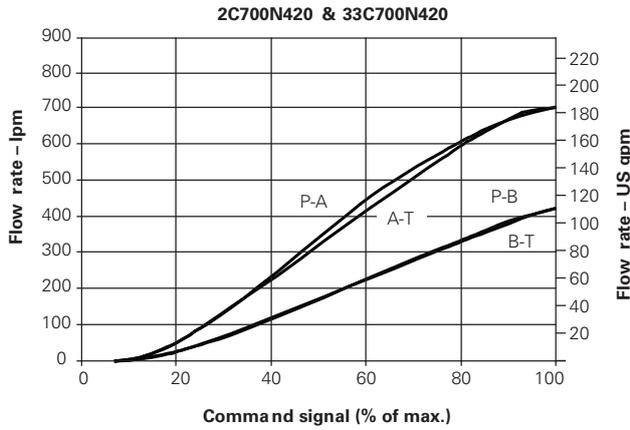
# Performance curves

## Flow gain

### KBHDG5V-8



**KBHDG5V-10**

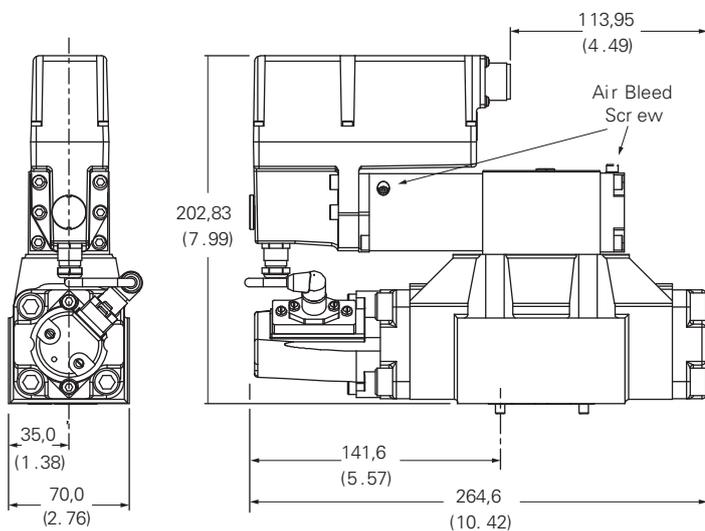


## Installation dimensions

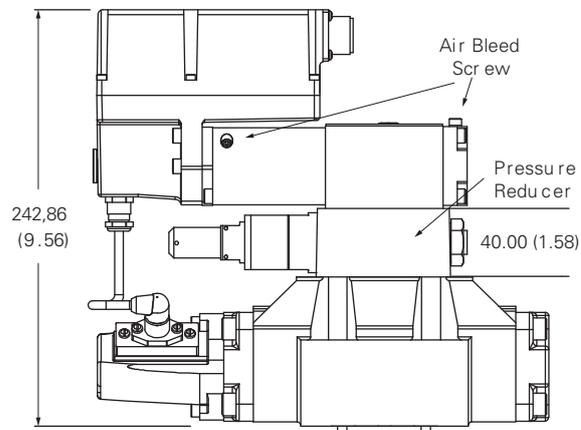
### KBHDG5V-5/7

Dimensions shown in mm (in).

#### KBHDG5V-5 Valve without pressure reducer



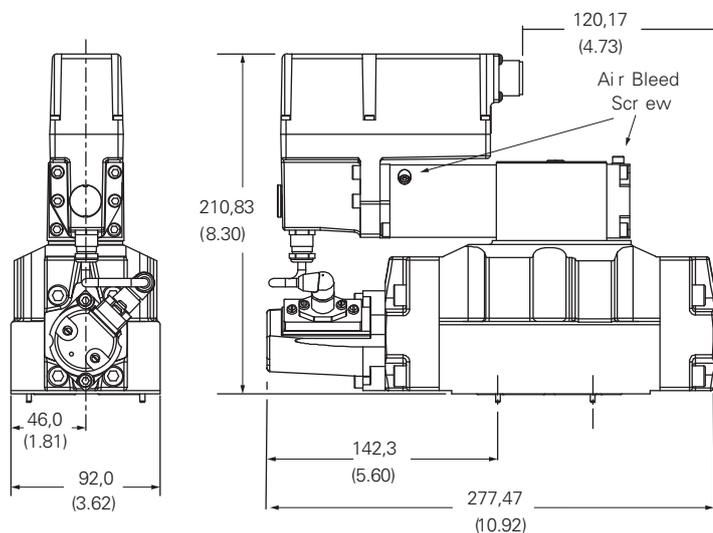
#### Valve with pressure reducer



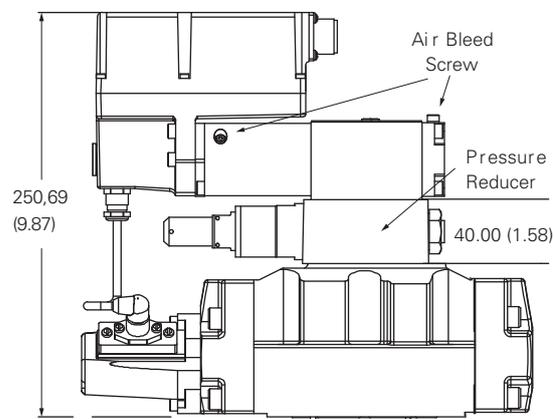
Mounting surface, seals supplied.  
For mating surface dimensions, see page 16.

For mounting subplate options and bolt options, see catalog GB-2425.

#### KBHDG5V-7 Valve without pressure reducer



#### Valve with pressure reducer



Mounting surface, seals supplied.  
For mating surface dimensions, see page 16.

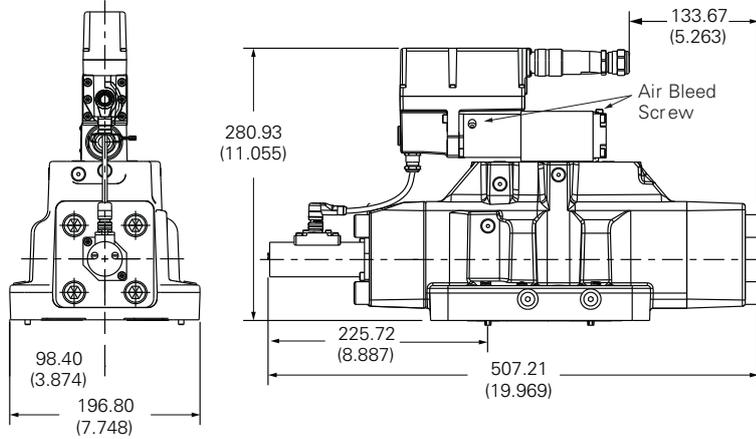
For mounting subplate options and bolt options, see catalog GB-2425.

**KBHDG5V-8/10**

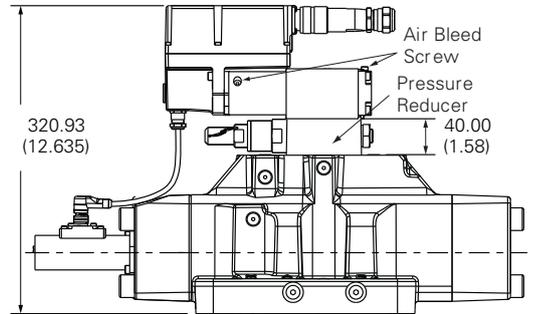
Dimensions shown in mm (in).

**KBHDG5V-8**

**Valve without pressure reducer**



**Valve with pressure reducer**

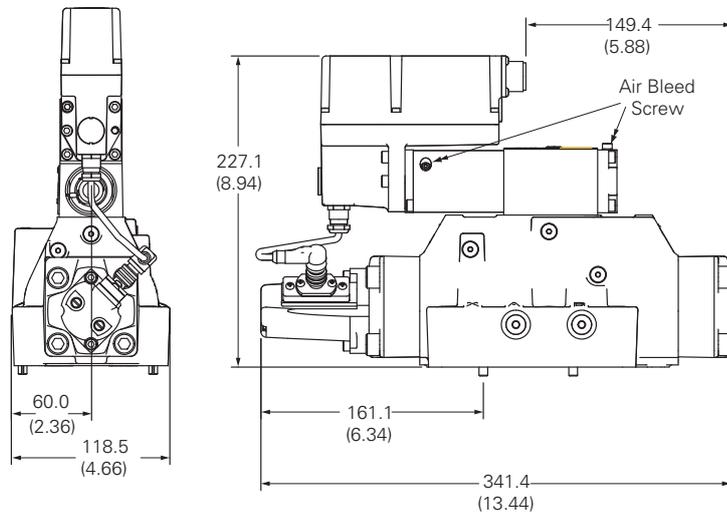


Mounting surface, seals supplied.  
For mating surface dimensions, see page 17.

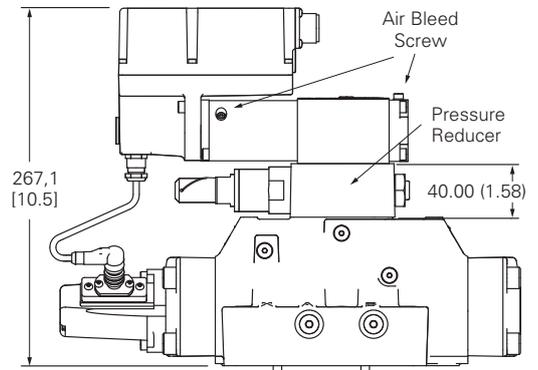
For mounting subplate options and bolt options,  
see catalog GB-2425.

**KBHDG5V-10**

**Valve without pressure reducer**



**Valve with pressure reducer**

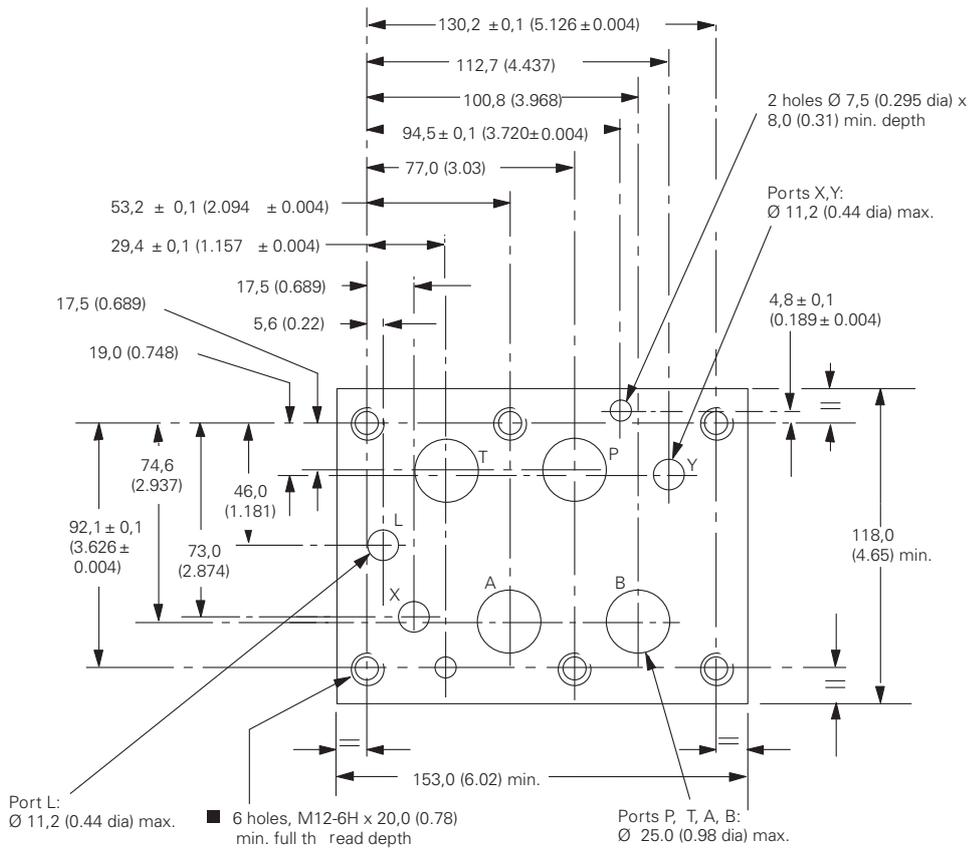


Mounting surface, seals supplied.  
For mating surface dimensions, see page 17.

For mounting subplate options and bolt options,  
see catalog GB-2425.



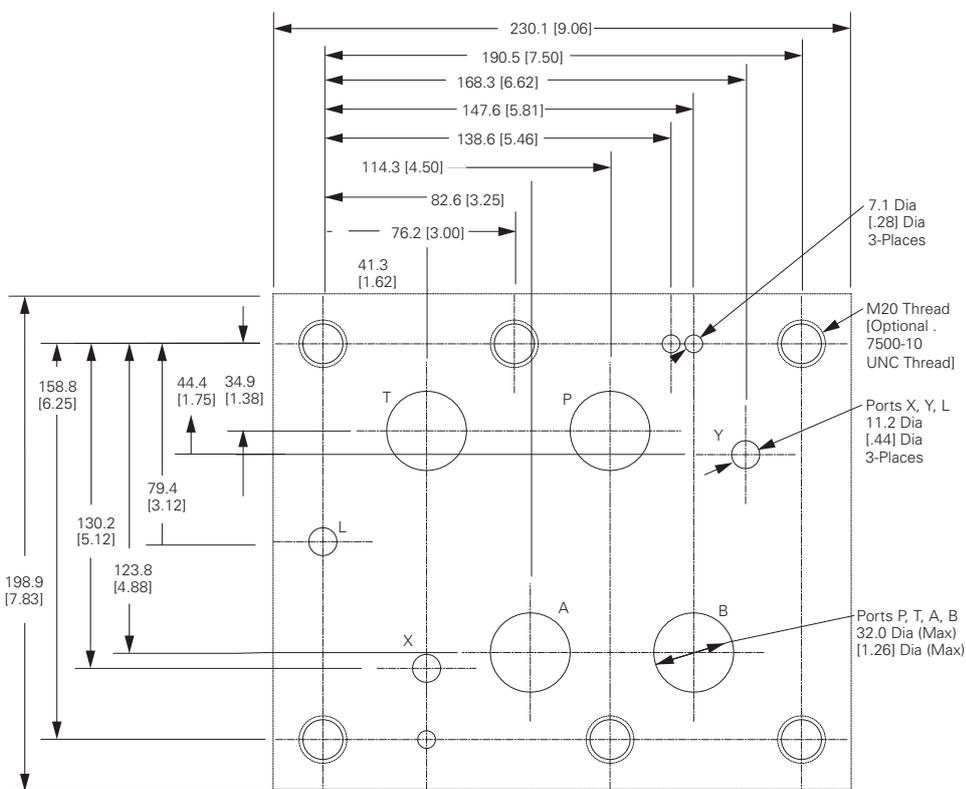
Dimensions shown in mm (in).



**ISO standard size 08 Interface**

This interface conforms to: ISO 4401-08-08-0-05 ANSI/ B93.7M (and NFPA) size 08 CETOP R35H4.3-08 DIN 24340 Form A25

■ 1/2 -13 UNC optional.



**ISO standard size 10 interface**

This interface conforms to: ISO 4401-10-09-0-05 ANSI/ B93.7M (and NFPA) size 10, CETOP 35H4.3-10, DIN 24340 Form A32

**Block diagram**

**Voltage input (M1)**

**KBHDG5V wiring**

Connections must be made via the 7-pin plug mounted on the amplifier. See page 18 of this leaflet and Eaton’s Installation Wiring Practices for Eaton™ Electronic Products, leaflet 2468. Recommended cable sizes are:

**Power cables:**

For 24V supply

0.75 mm<sup>2</sup> (18 AWG) up to 20m (65 ft)

1.00 mm<sup>2</sup> (16 AWG) up to 40m (130 ft)

**Signal cables:**

0.50 mm<sup>2</sup> (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)

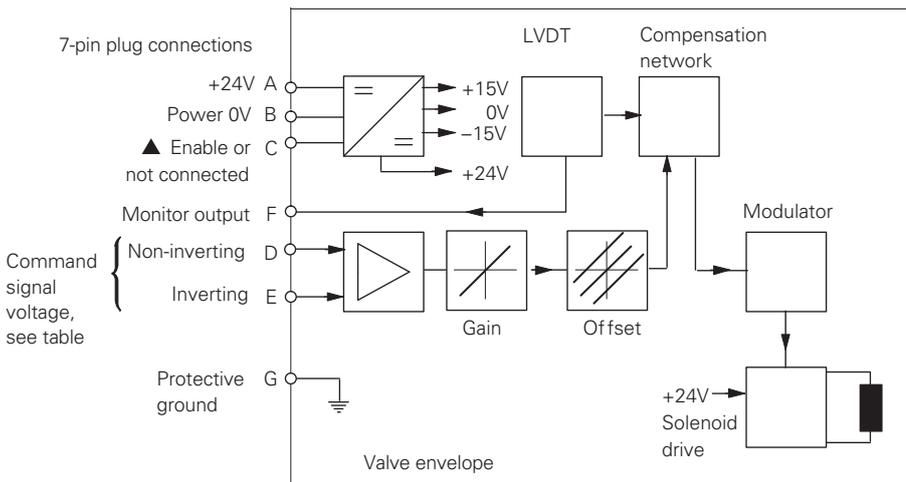
See connection diagram on page 20.

**KBHDG5V wiring**

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

**Command signals and outputs, M1**

7-pin plug		Flow direction
Pin D	Pin E	
Positive	0V	
0V	Negative	P to A
	$U_d - U_e = \text{Positive}$	
Negative	0V	
0V	Positive	P to B
	$U_d - U_e = \text{Negative}$	



▲ Pin C is used for a valve enable signal with electrical connections PH7

**WARNING**

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

**Block diagram**

**Current input (M2)  
KBHDG5V**

**KBHDG5V wiring**

Connections must be made via the 7-pin plug mounted on the amplifier. See page 19 of this leaflet and Eaton’s Installation Wiring Practices for Eaton™ Electronic Products, leaflet 2468. Recommended cable sizes are:

**Power cables:**

For 24V supply

0.75 mm<sup>2</sup> (18 AWG) up to 20m (65 ft)

1.00 mm<sup>2</sup> (16 AWG) up to 40m (130 ft)

**Signal cables:**

0.50 mm<sup>2</sup> (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 page 21.

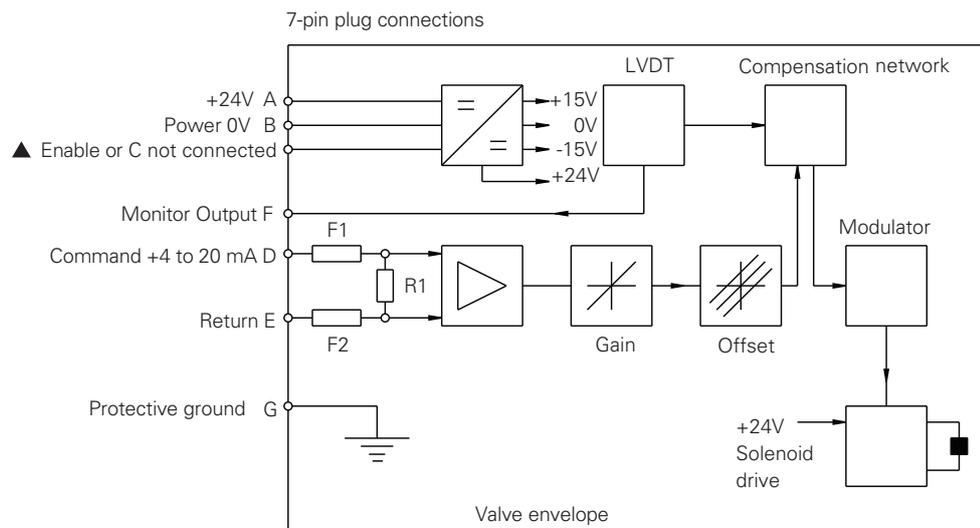
**KBHDG5V wiring**

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

**Command signals and outputs, M2**

**7-pin plug**

Pin D	Pin E	Pin B	Flow direction
More than 12 mA	Current return	Power ground	P to A
Less than 12 mA	Current return	Power ground	P to B



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

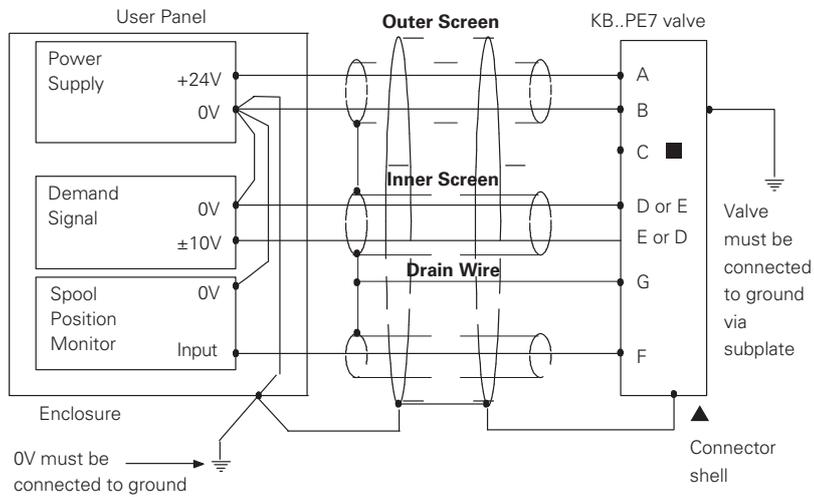
**WARNING**

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

## Electrical information

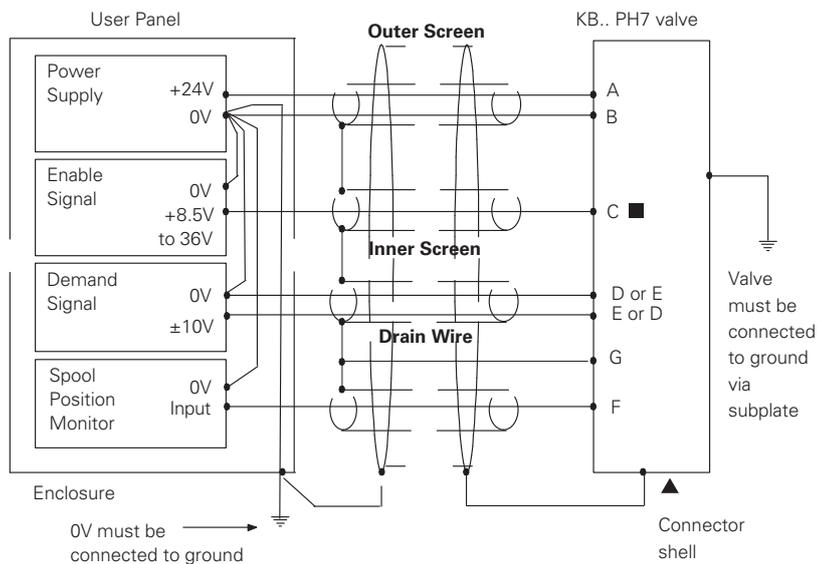
### Wiring connections voltage input (M1)

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



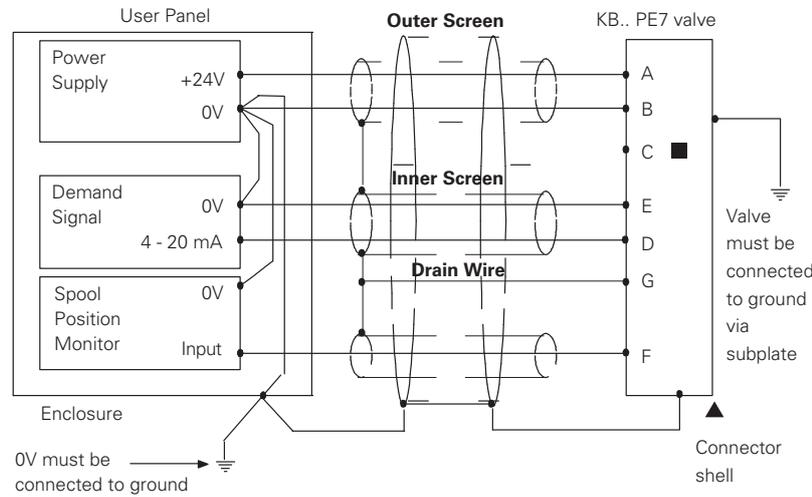
### Wiring connections for M1 valves with enable feature

**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.



### Wiring connections current input (M2)

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

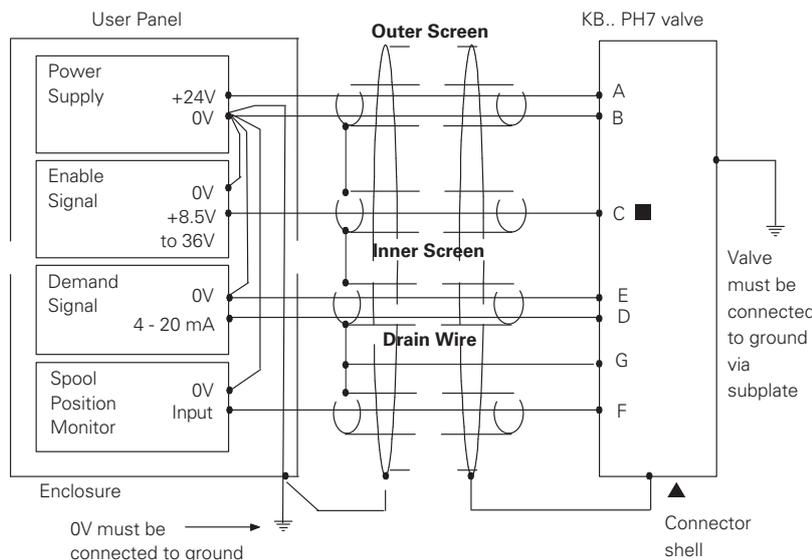


### ⚠ WARNING

**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 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.



## 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 publication 9132 or 561, "Eaton Guide to Systemic Contamination Control". The book also includes information on the Eaton 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.

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