ENGINEERING
TOMORROW

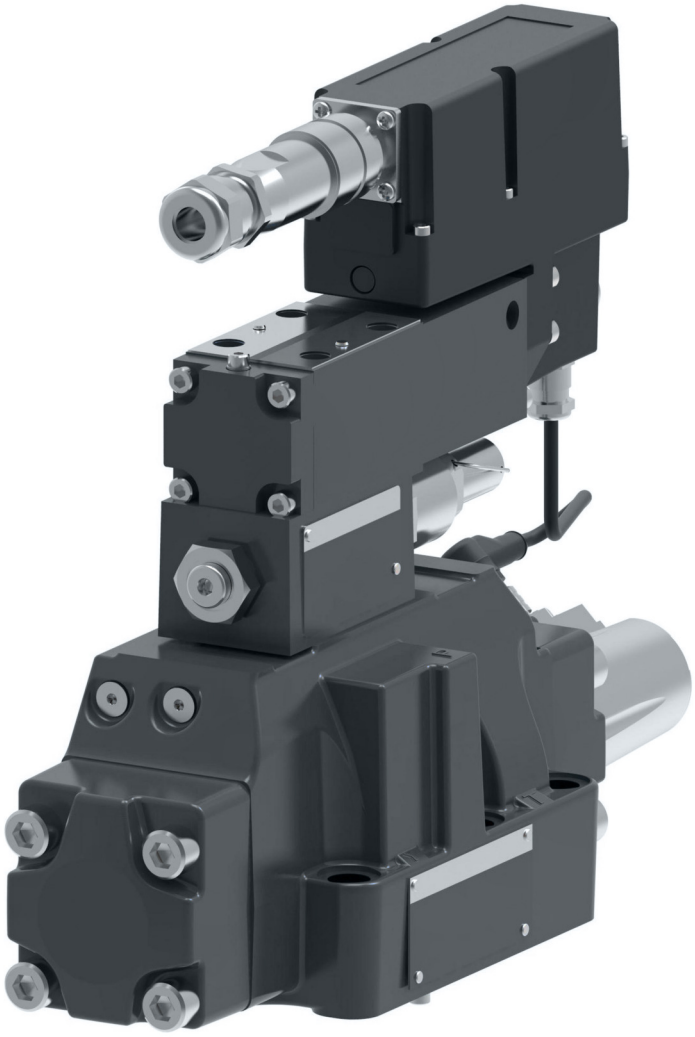
Technical Catalog

Vickers by Danfoss

Proportional Two-Stage Directional Valves

Servo Performance with Double Spool Feedback

KBHDG5V-5-12
KBHDG5V-7-20
KBHDG5V-8-12
KBHDG5V-10-12



VICKERS
by Danfoss

AF455369629154en-000101

Contents

CE

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to meet specific standards outlined in the European Electromagnetic Compatibility Directive (EMC) 2014/30/EU which repealed Directive 89/336/EEC, amended by Directives 91/263/EEC, 92/31/EEC, 93/68/EEC and 93/97/EEC.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 Danfoss Electronic Products leaflet 2468. Wiring practices relevant to this Directive are indicated by ⚠ Electromagnetic Compatibility (EMC).

General description

Vickers by Danfoss 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.

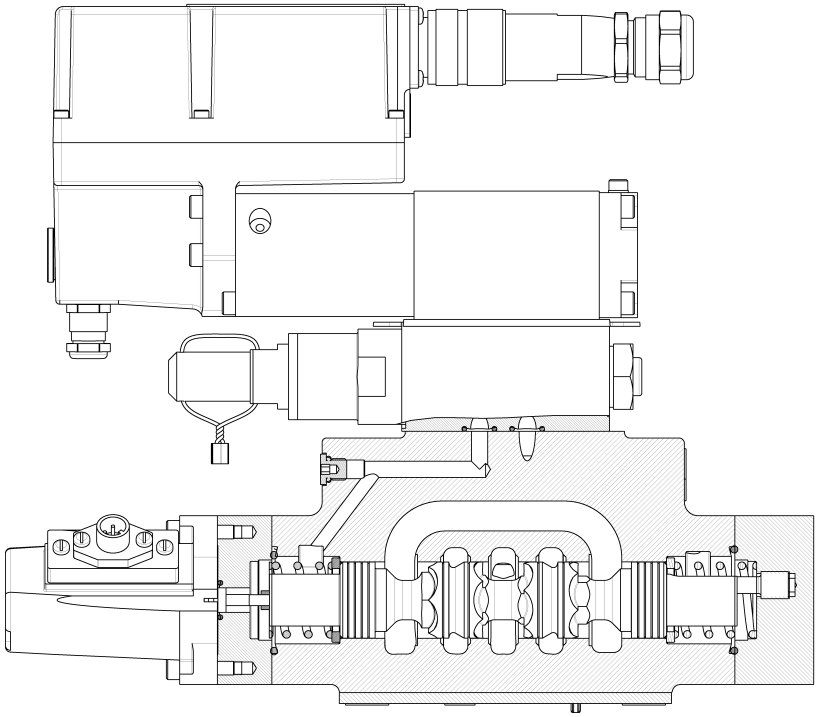
KBHDG5V-5/7/8/10

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 ±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 ± 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,-20 design

Model code

K	B	H	D	G	5	V	-*-	*********	– (E)X	– T –	**	***	- H	4–	**
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

1 **Valve type**

K	Proportional valve

2 **Integral amplifier**

B	Integral amplifier "B" series

3 **Feedback arrangement**

H	From pilot and main stages

4 **Control type**

D	Directional valve

5 **Mounting**

G	Subplate mounted

6 **Operation**

5	Solenoid controlled, pilot operated

7 **Pressure rating**

V	315 bar (4500 psi) Size 05 350 bar (5000 psi) Size 07 350 bar (5000 psi) Size 08 350 bar (5000 psi) Size 10

8 **Interface**

ISO 4401

5	Size 05
7	Size 07
8	Size 08
10	Size 10

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

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

Symmetric spools
for KBHDG5V-5 valves:

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

For KBHDG5V-7 valves:

2C200N	200 L/min (52 US gpm)
33C160N	160 L/min (42 US gpm)
2C230N	230 L/min (61 US gpm)
33C230N	230 L/min (61 US gpm)
5C230N	230 L/min (61 US gpm)
35C230N	230 L/min (61 US gpm)
35C200F	200 L/min (52 US gpm)
36C185N	185 L/min (49 US gpm)

For KBHDG5V-8 valves:

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

For KBHDG5V-10 valves:

2C700N	700 L/min (185 US gpm)
33C700N	700 L/min (185 US gpm)
5C720N	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:

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

For KBHDG5V-7 valves:

2C230N140	230 L/min (61 US gpm), "A" port flow 140 L/min (37 US gpm). "B" port flow
33C230N140	230 L/min (61 US gpm), "A" port flow 140 L/min (37 US gpm). "B" port flow
5C230N140	230 L/min (61 US gpm), "A" port flow 140 L/min (37 US gpm). "B" port flow
133C230N140	230 L/min (61 US gpm), "A" port flow 140 L/min (37 US gpm). "B" port flow
535C190N110	190 L/min (50 US gpm), "A" port flow 110 L/min (29 US gpm). "B" port flow
PQ230F50	See flow charts, page 12
PQ50F230	See flow charts, page 12
3PQ230F50	See flow charts, page 12

For KBHDG5V-8 valves:

2C375N250	375 L/min (99 US gpm), "A" port flow; 250 L/min (66 US gpm), "B" port flow
12C375N250	375 L/min (99 US gpm), "A" port flow; 250 L/min (66 US gpm), "B" port flow
33C375N250	375 L/min (99 US gpm), "A" port flow; 250 L/min (66 US gpm), "B" port flow
133C375N250	375 L/min (99 US gpm), "A" port flow; 250 L/min (66 US gpm), "B" port flow
733C375N250	375 L/min (99 US gpm), "A" port flow; 250 L/min (66 US gpm), "B" port flow
72C375N250	375 L/min (99 US gpm), "A" port flow; 250 L/min (66 US gpm), "B" port flow
PQ375F	See flow charts, page 13

For KBHDG5V-10 valves:

2C700N420	700 L/min (185 US gpm), "A" port flow; 420 L/min (110 US gpm), "B" port flow
33C700N420	700 L/min (185 US gpm), "A" port flow; 420 L/min (110 US gpm), "B" port flow
12C700N420	700 L/min (185 US gpm), "A" port flow; 420 L/min (110 US gpm), "B" port flow
133C700N420	700 L/min (185 US gpm), "A" port flow; 420 L/min (110 US gpm), "B" port flow
72C700N420	700 L/min (185 US gpm), "A" port flow; 420 L/min (110 US gpm), "B" port flow
733C700N420	700 L/min (185 US gpm), "A" port flow; 420 L/min (110 US gpm), "B" port flow
PQ680 F	See flow charts (p.14) For actual maximum flows refer to power capacity envelopes, page 10.

10 **Pilot supply**

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

11 **Pilot drain**

T	Internal

Omit for external drain

12 **Electrical control signal**

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

13 **Electrical connection**

PC7	7 pin connector without plug supplied
PE7	7 pin connector with plug supplied
PH7	As PE7 but with pin "C" used for enable signal
PR7	As PC7 but with pin "C" used for enable signal

14 **Coil rating**

H	24 VDC amplifier supply

15 **Port T pressure limit rating**

4	50 bar (700 psi) (for internal pilot drain option only, item 11 above)

16 **Design number**

12	12 series, only for KBHDG5V-5/8/10
20	20 design, only for KBHDG5V-7

Note: Additional configurations available upon request. Please contact you customer sales representative for details.

⚠ WARNING

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

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 below by omission of plug A and the blocking of port X by the mating surface.

Internally pilot drain models

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

Symmetric spools

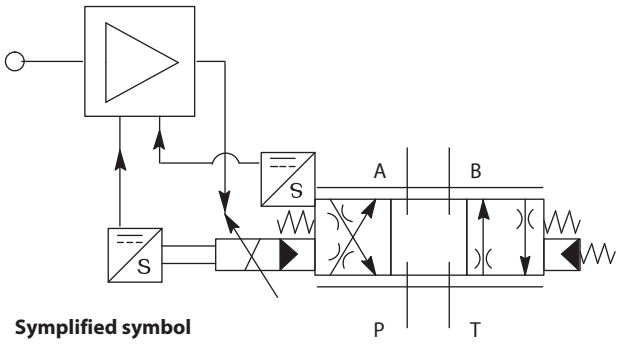
Base line pressure drop øp =5 bar (72 psi) per metering flow path, e.g. B to T. For actual maximum flow refer to power capacity envelope curves.

Asymmetric spools

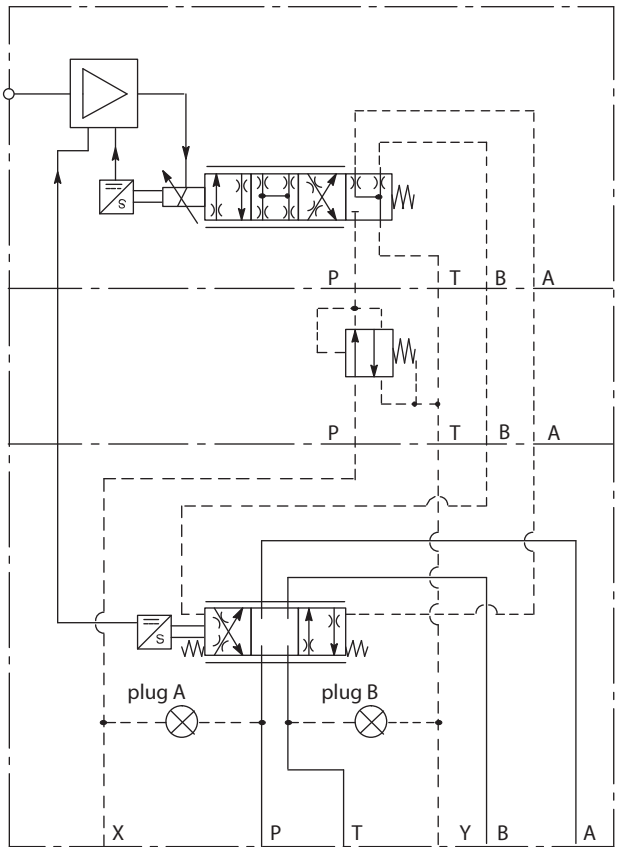
Figure preceding metering type designator, "N" e.g. 2C**N) is flow rating P–A, or

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

Functional symbol



Symplified symbol

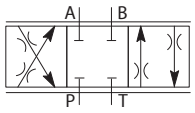


Detailed symbol

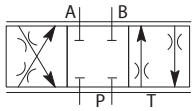
Asymmetric

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, page 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
2C230N140	2C	230 L/min (61 US gpm), "A" port flow
		140 L/min (37 US gpm). "B" port flow
33C230N140	33C	230 L/min (61 US gpm), "A" port flow
		140 L/min (37 US gpm). "B" port flow
5C230N140	5C	230 L/min (61 US gpm), "A" port flow
		140 L/min (37 US gpm). "B" port flow
133C230N140	133C	230 L/min (61 US gpm), "A" port flow
		140 L/min (37 US gpm). "B" port flow
535C190N110	535C	190 L/min (50 US gpm), "A" port flow
		110 L/min (29 US gpm). "B" port flow
PQ230F50	PQ	See flow charts, page 12
PQ50F230	PQ	See flow charts, page 12
3PQ230F50	3PQ	See flow charts, page 12
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, page 13
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, page 14

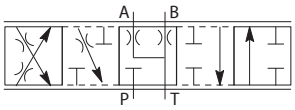
Available spools for KBHDG5V



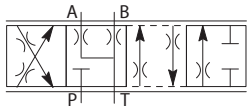
Spool type 2C



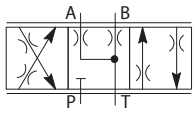
Spool type 5C (zero lapped)



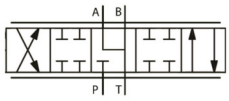
Spool type 133C



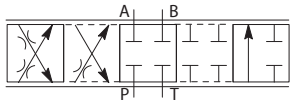
Spool type 733C



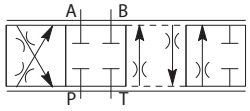
Spool type 33C



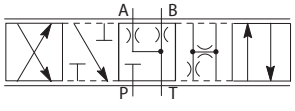
Spool type 35C and 36C



Spool type 12C



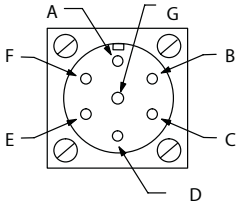
Spool type 72C



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
Command signal	
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 B	18V (max)
Current mode M2	4-20 mA
• Max differential voltage to pin B	100mV
Valve enable signal for model codes PH7	
Enable	>8.5V (36V max)
Disable	<6.5V
Input impedance	10 kΩ
7-pin plug connector  View of pins of fixed half.	Pin Description 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
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 : 10Vrms • Signal/Control Port : 10Vrms
	RF Electromagnetic Field, 80 MHz to 2700 MHz, 10V/m, Meets Criterion A
	Surge: IEC 61000-4-5, Class B
	• DC Power Port : ±0.5kV (L-L) • DC Power Port : ±1kV (L-Earth) • 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)	0V – 5C Spools 0.20V 2C & 33C Spools
Monitor signal (pin F)	
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

Step input response, with flow through P–A–B–T, Δp=5 bar (72 psi) per metering path, e.g. P–A, pilot pressure = 40 bar	**Time to reach 90% of required step:**			
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 Øp=5 bar (72 psi) per metering path (P–A or B–T)	<1%
Protection:	
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-PID-201-A-20 PID controller

See catalog GB 2427A

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 Pilot drain 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^3/min
KBHDG5V–5	0.5	30
KBHDG5V–7	1.0	60
KBHDG5V–8	1.5	91
KBHDG5V–10	3.0	180

Typical required pilot flow rates to achieve posted step responses

Valve size/spool code	Flow rate L/min
KBHDG5V–5	5 lpm
KBHDG5V–7	10 lpm
KBHDG5V–8	20 lpm
KBHDG5V–10	20 lpm

Flow gain

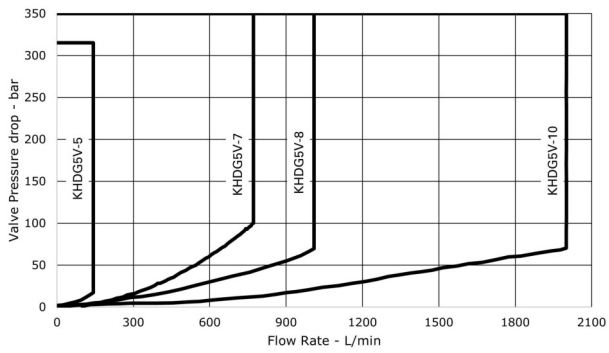
At Δp = 5 bar (72 psi) per metering path (e.g. P-A), with flow through P-A-B-T or P-B-A-T. Percentage command signals applicable for positive and negative values of command signal.

At other Δp values, flow rates approximate to:

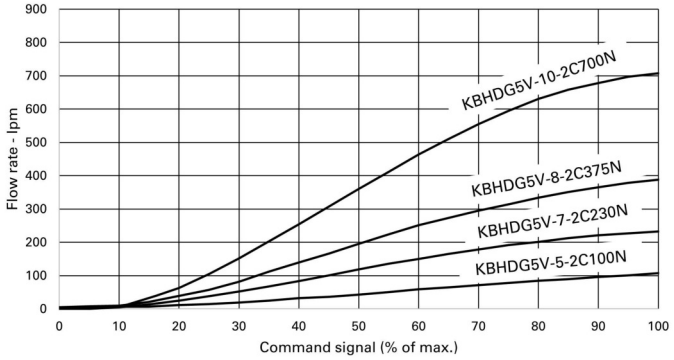
$$QX = QD \sqrt{\frac{\Delta pX}{\Delta pD}}$$

where QD= Datum flow rate
Δ pD= Pressure drop at datum flow rate
Δ pX= Required p
Limited by valve power capacity. Refer to curves on page 11.

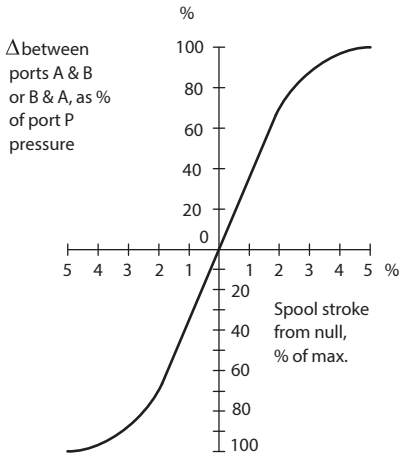
Power capacity envelope
Flow through P-A-B-T or P-B-A-T



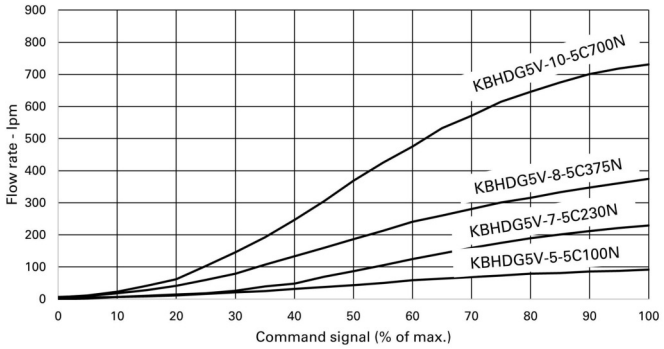
2C Spools



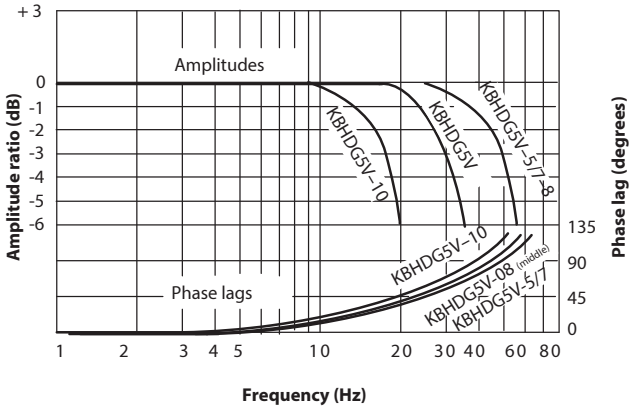
Pressure gain for 5C spools



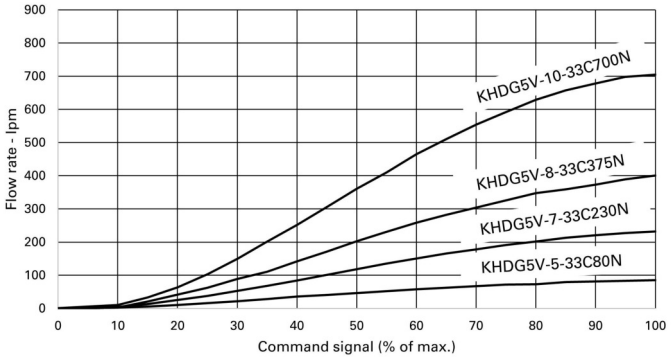
5C Spools



Frequency response, Typical
For an amplitude of 50 ± 25% of rated flow (ISO 10770-1)
2C spool measured at ν=36 cSt (168 SUS),
t = 50˚C (122˚F) and pilot pressure = 40 bar (with-reducer model)

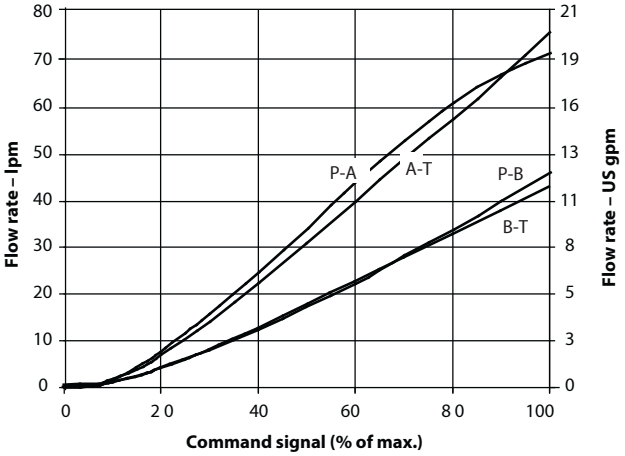


33C Spools

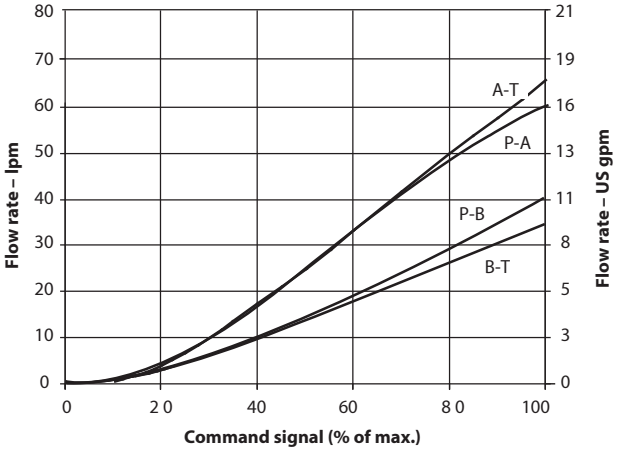


KBHDG5V-5

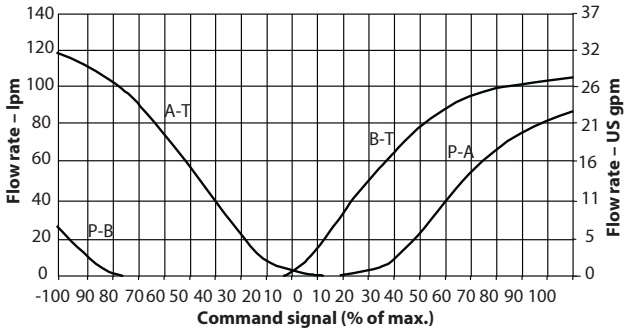
2C70N45



33C60N40

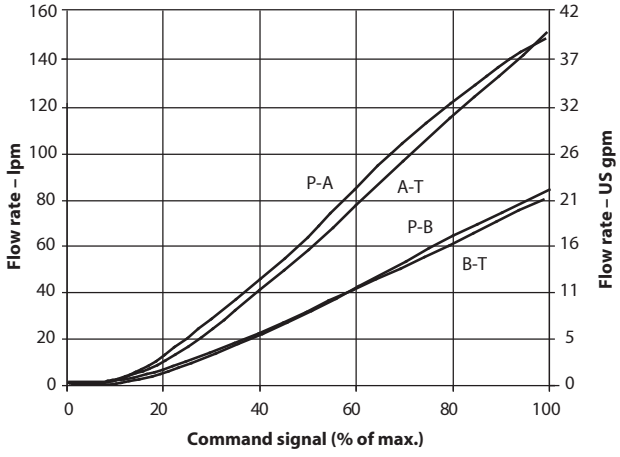


PQ87F

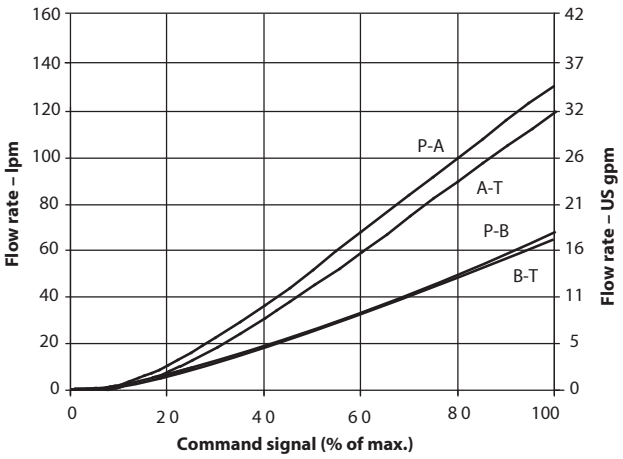


KBHDG5V-7

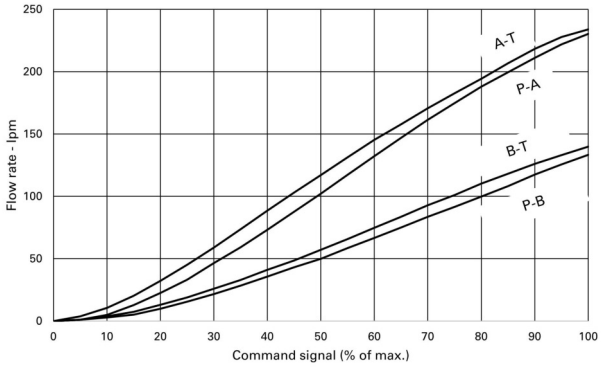
2C150N85



33C130N65

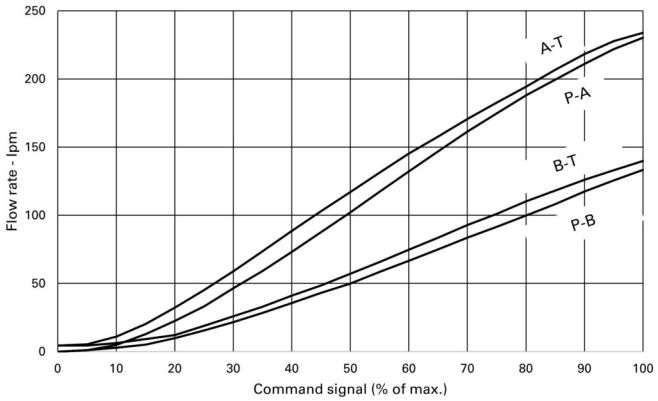


2C230N140

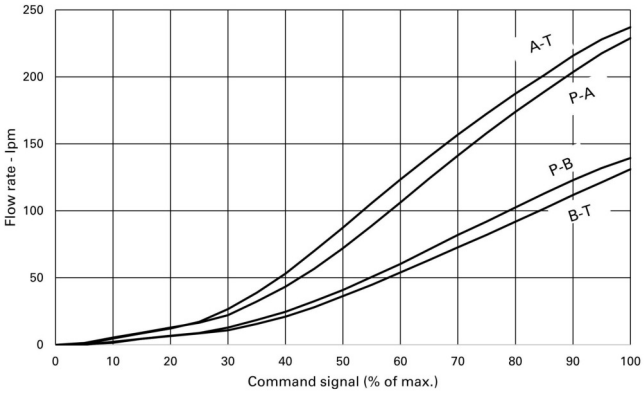


KBHDG5V-7 (Continued)

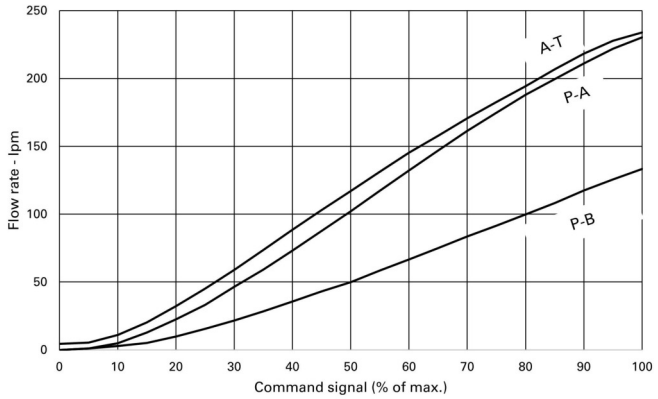
33C230N140



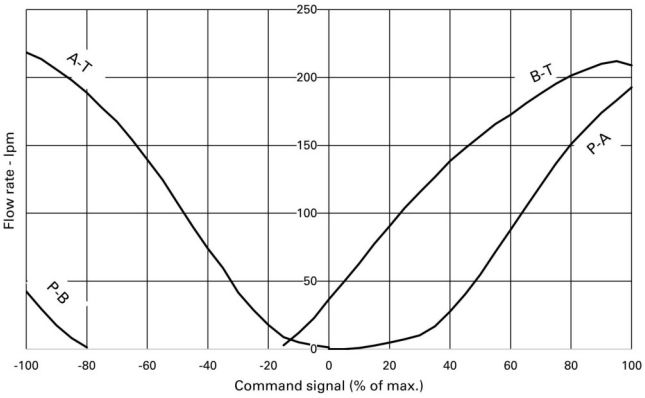
5C230N140



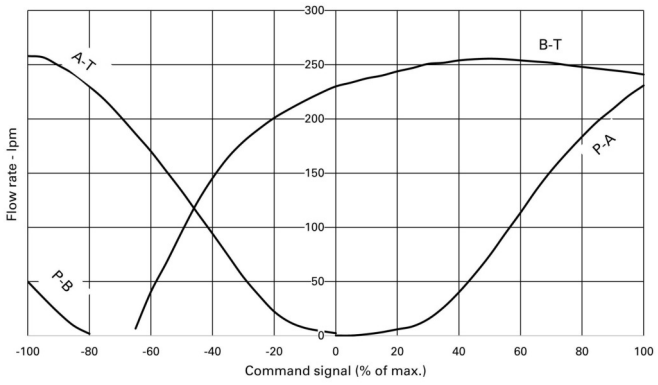
133C230N140



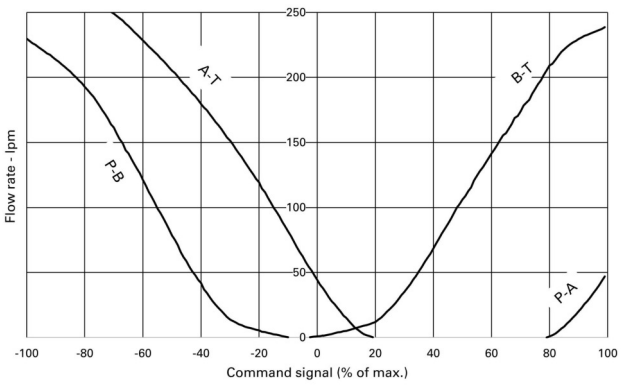
PQ230F50



3PQ230F50



PQ50F230

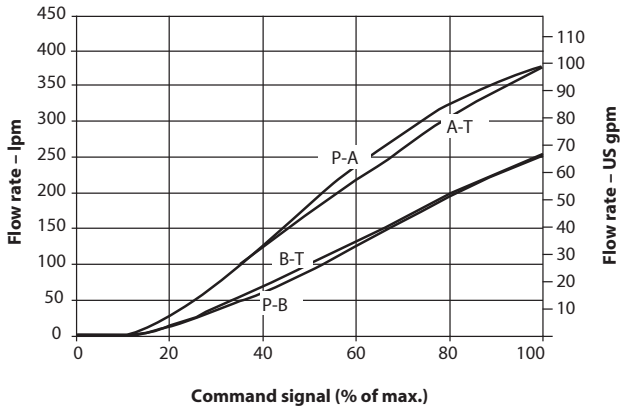


Performance curves

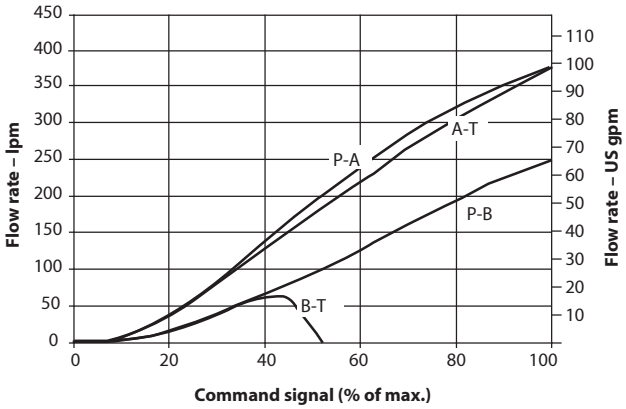
Flow gain

KBHDG5V-8

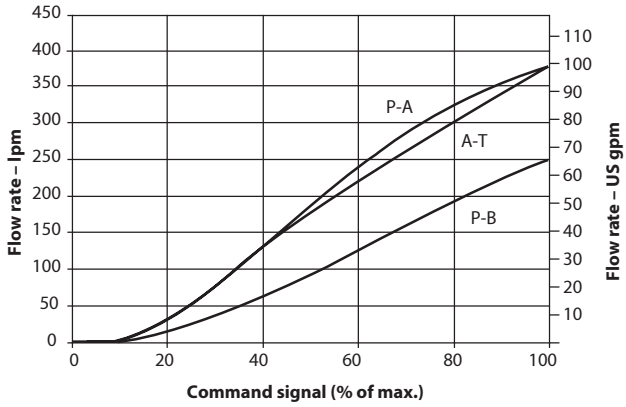
2C375N250 & 33C375N250



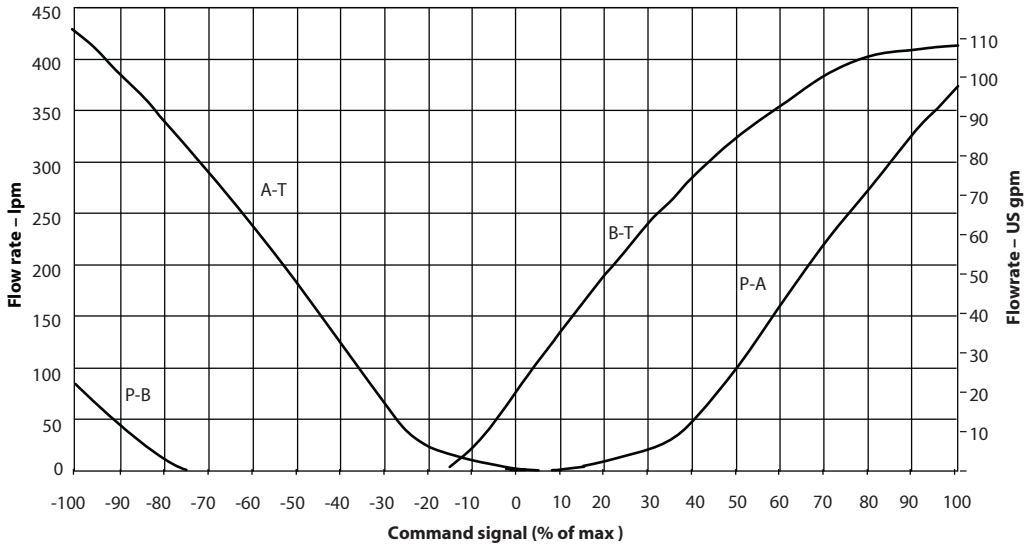
72C375N250 & 733C375N250



12C375N250 & 133C375N250

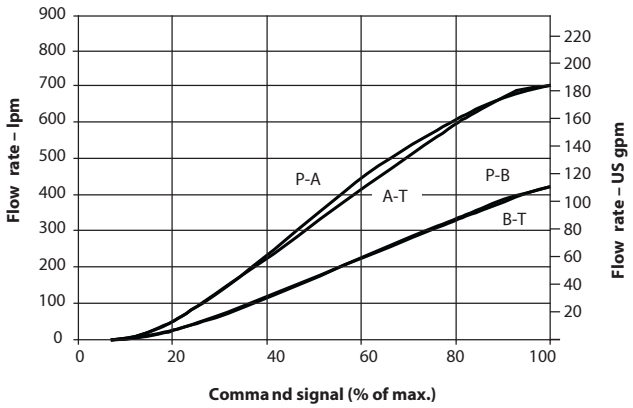


PQ375F

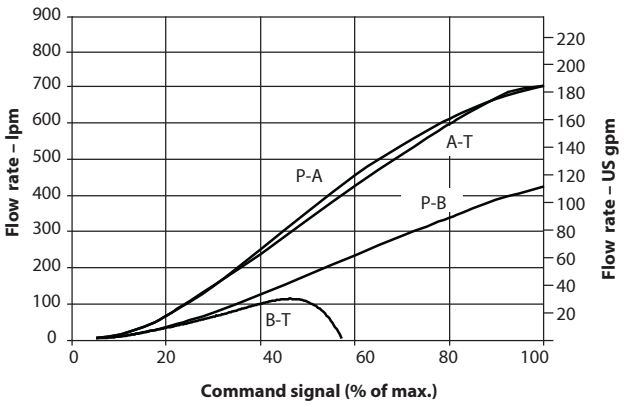


KBHDG5V-10

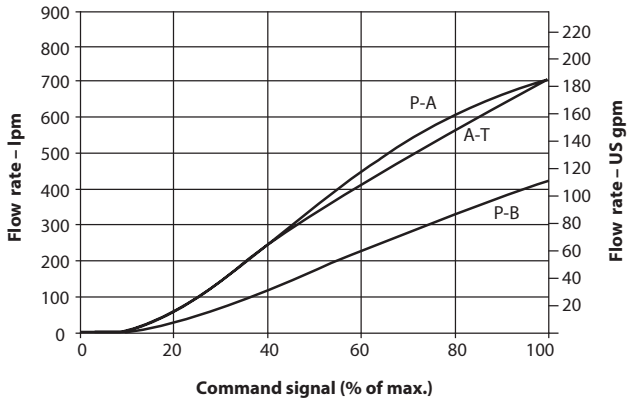
2C700N420 & 33C700N420



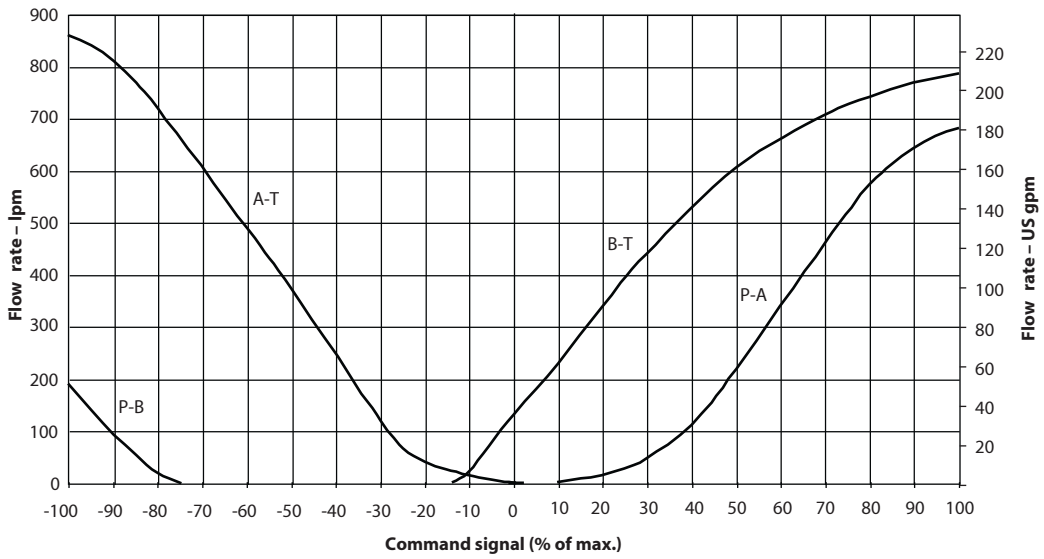
72C700N420 & 733C700N420



12C700N420 & 133C700N420



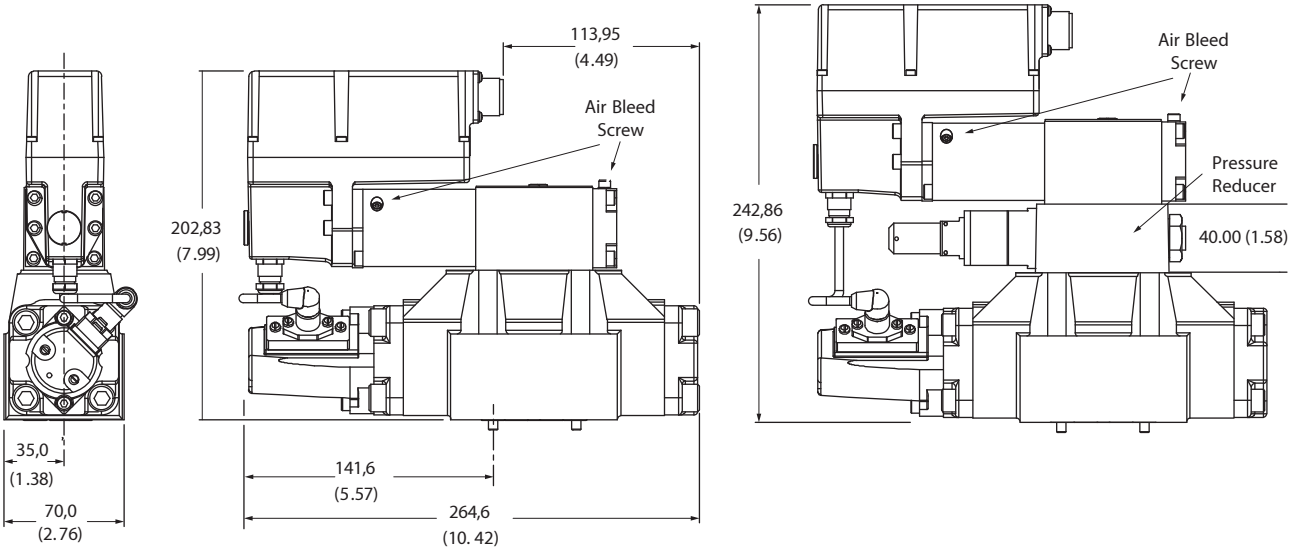
PQ680F



KBHDG5V-5/7

Dimensions shown in mm (in).

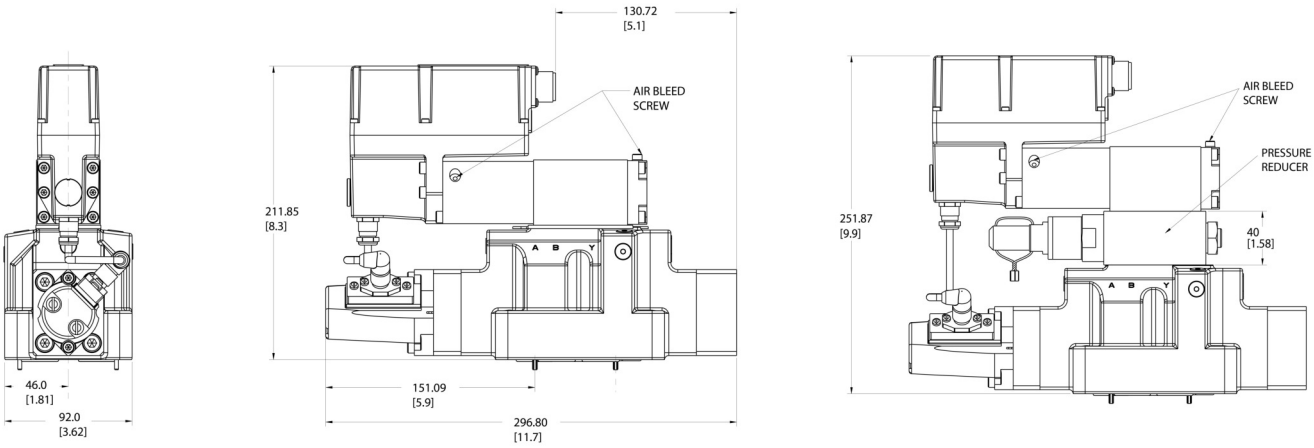
KBHDG5V-5 **Valve without pressure reducer** **Valve with pressure reducer**



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**



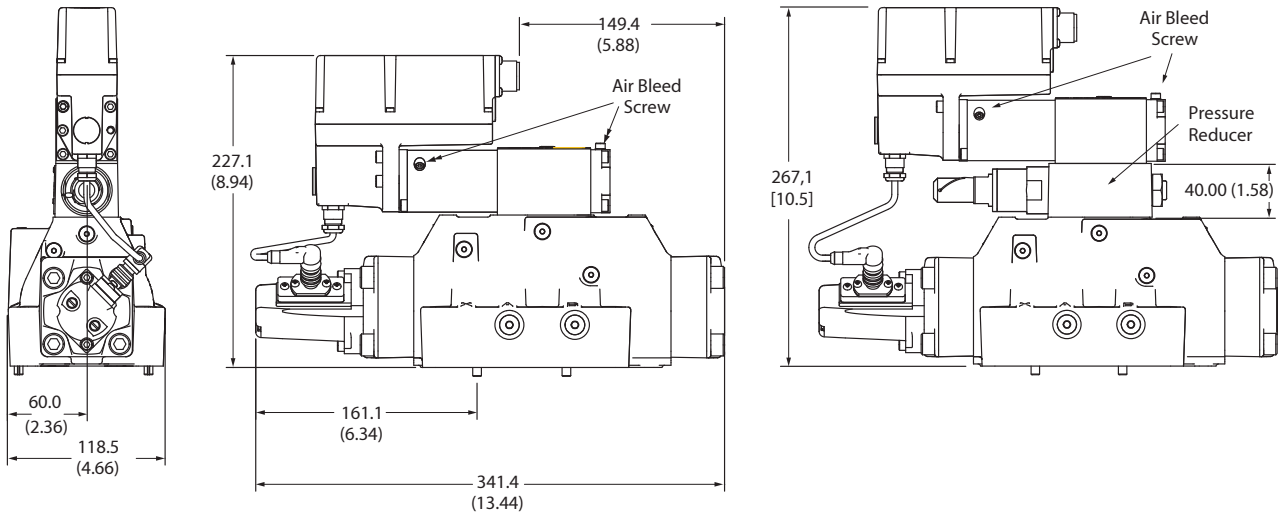
Mounting surface, seals supplied.
For mating surface dimensions, see page 16.

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

KBHDG5V-8/10

Dimensions shown in mm (in).

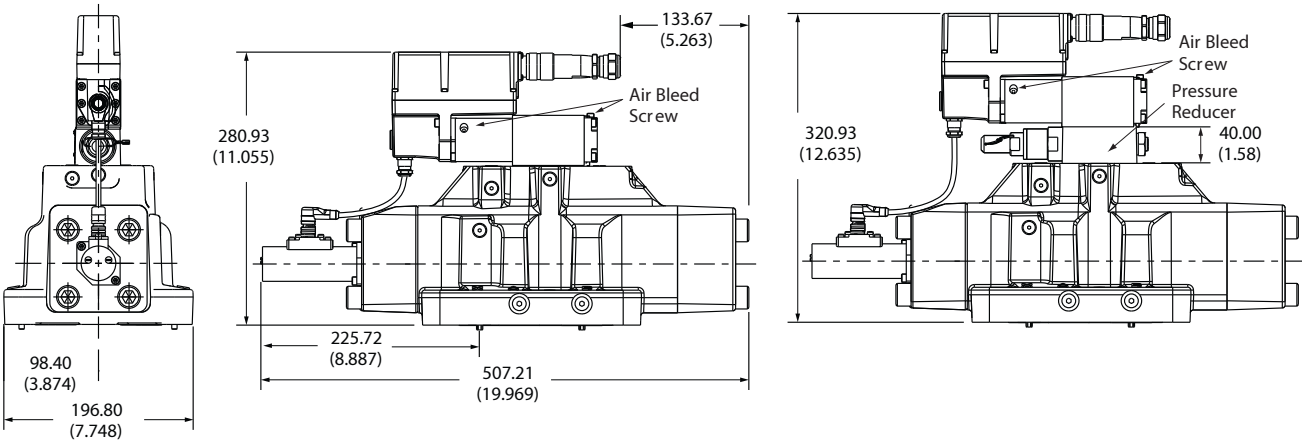
KBHDG5V-8 **Valve without pressure reducer** **Valve with pressure reducer**



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).

General description

When 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 mm (63 microinch). Mounting bolts, when provided by customer, should be ISO 898 class 12.9 or better. Bolt Kits See page 18.

Dimensional tolerances

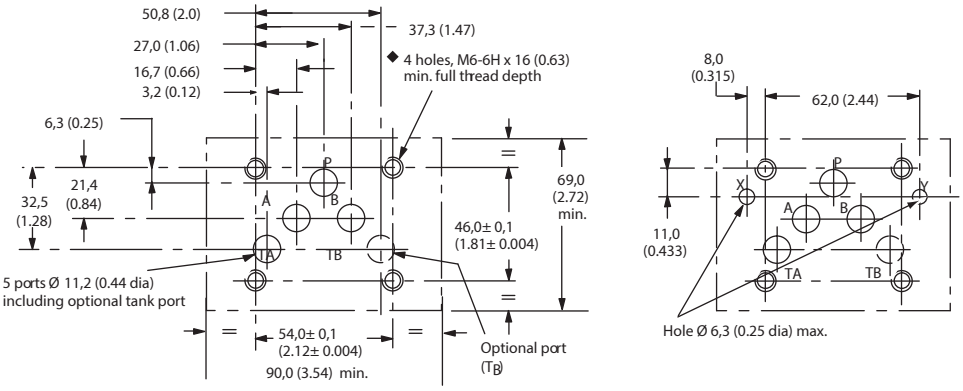
Dimensional tolerance on interface drawings is 0.2 mm (0.008") except where otherwise stated. ISO 4401 specifies inch conversion to 0.01"

Conversion from metric

ISO 4401 gives dimensions in mm. Inch conversions are accurate to 0.01" unless otherwise stated.

Mounting bolt tappings

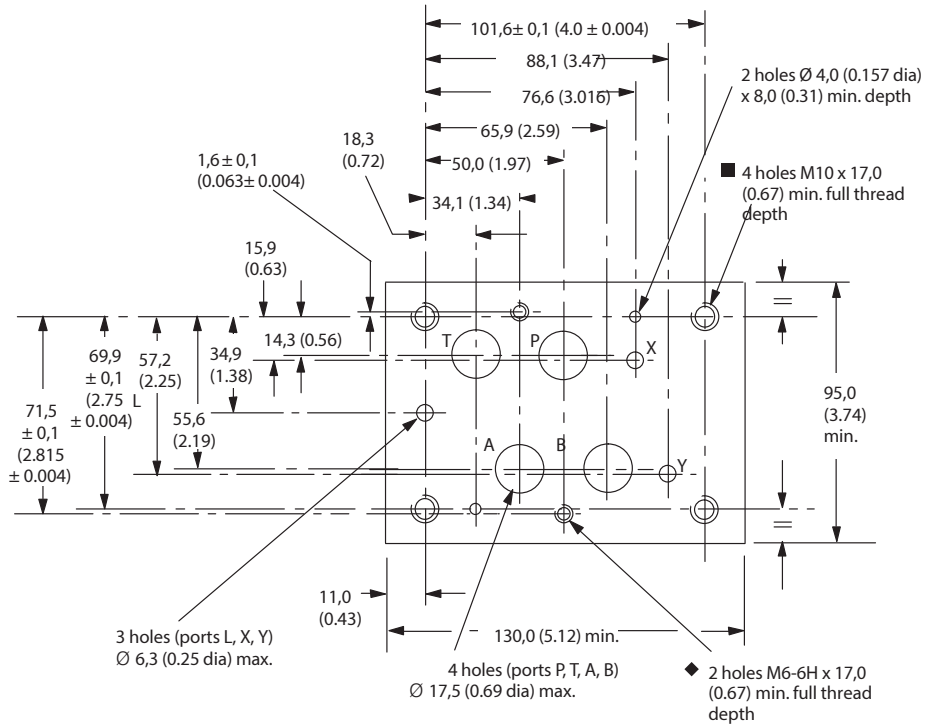
ISO 4401 gives metric thread tappings. Alternate UNC tappings are Eaton recommendations that allow these plates and associated valves to be used up to their maximum pressures, when using Eaton recommended bolt kits, or bolts of an equivalent strength. It is recommended that Customers own manifold blocks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



ISO standard size 05 with ports X and Y

This interface conforms to ISO 4401-05-04-0-05, NSI/ B93.7M (and NFPA) size 05, CETOP R35H4 2-05, DIN 24340 Form A10.

◆1/4" -20 UNC-2B optional.



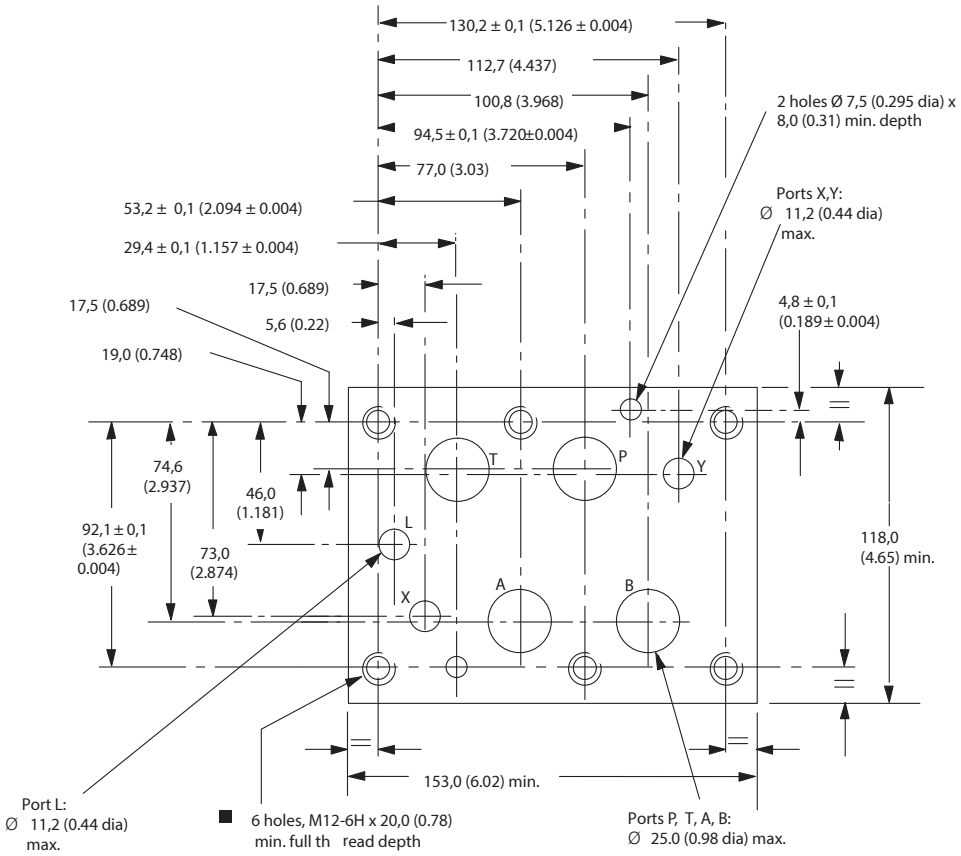
ISO standard size 07 interface

This interface conforms to: ISO 4401-07-07-0-05 ANSI/ B93.7M (and NFPA) size 07 CETOP R35H4.3-07 DIN 24340 Form A16

■ 3/8 -16 UNC optional.

◆ 1/4 -20 UNC optional.

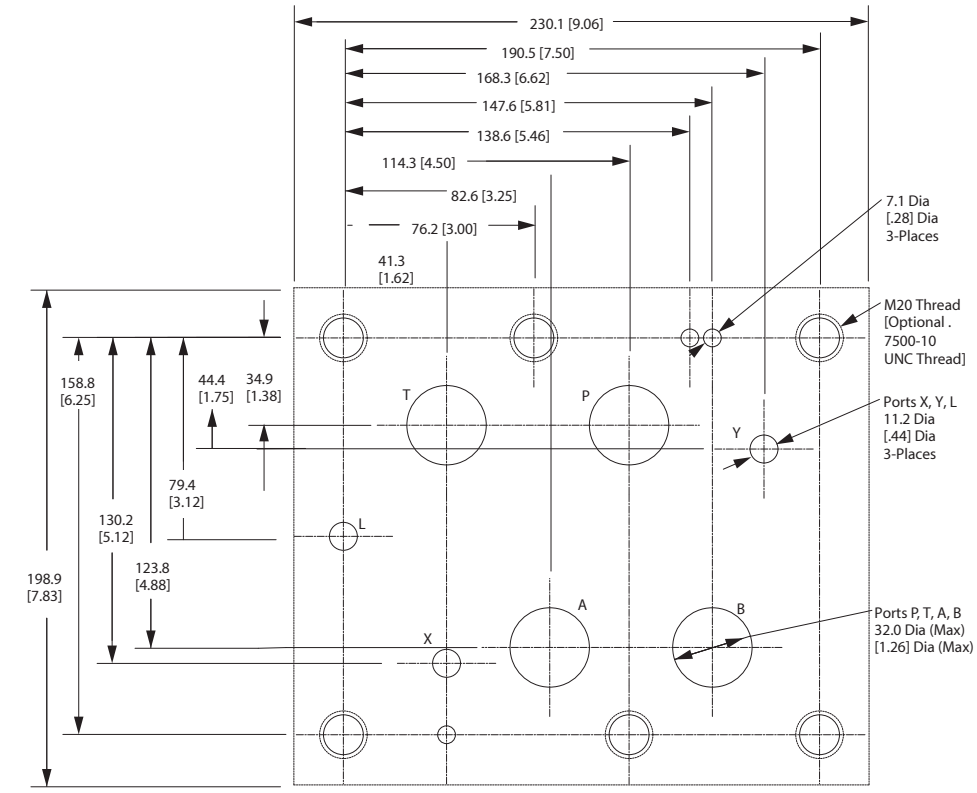
Dimensions shown in mm (in).



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 19 of this leaflet and Danfoss Installation Wiring Practices for Danfoss 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 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)

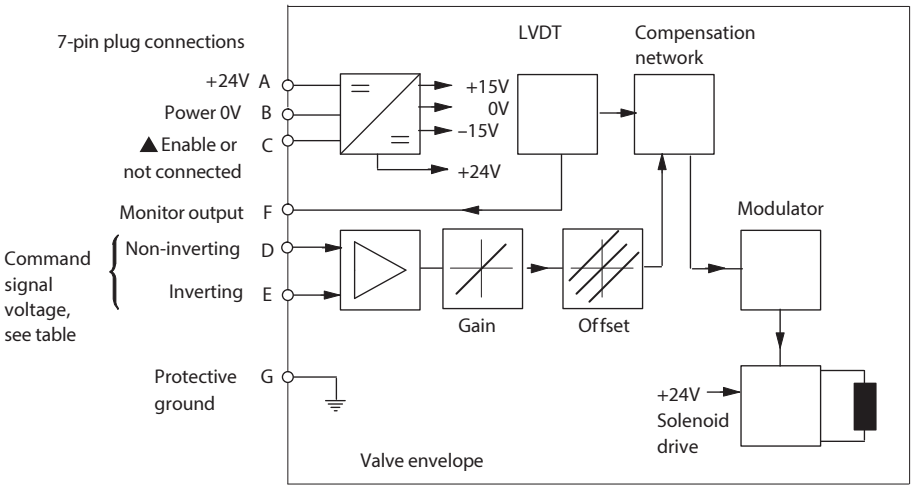
See connection diagram on page 20.

KBHDG5V wiring

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

Command signals and outputs, M1

7-pin plug		Flow direction
Pin D	**Pin E**	
Positive	OV	
OV	Negative	P to A
	U_d - U_e = Positive	
Negative	OV	
OV	Positive	P to B
	U_d - U_e = 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

Connections must be made via the 7-pin plug mounted on the amplifier. See page 20 of this leaflet and Danfoss Installation Wiring Practices for Danfoss 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 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.

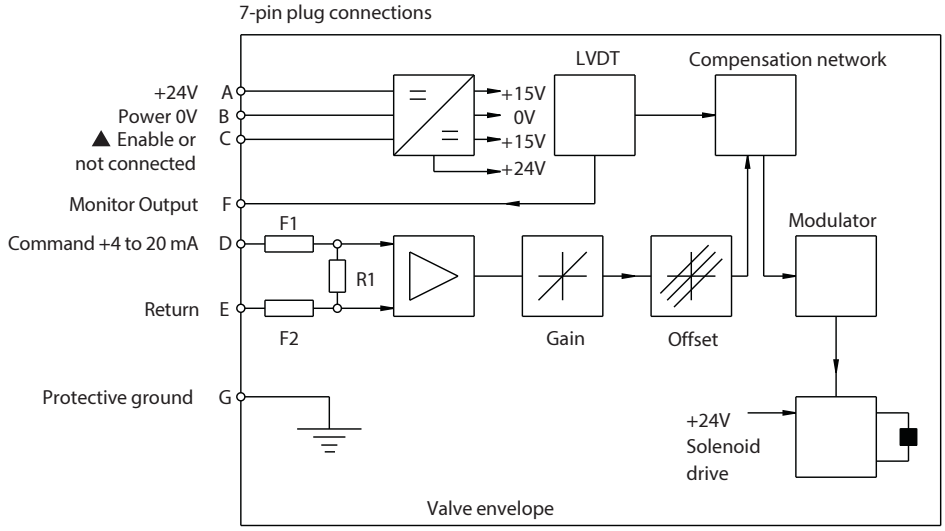
KBHDG5V wiring

Wiring details for these valves are contained in the appropriate Eurocard literature and Danfoss Installation Wiring Practices for Danfoss 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



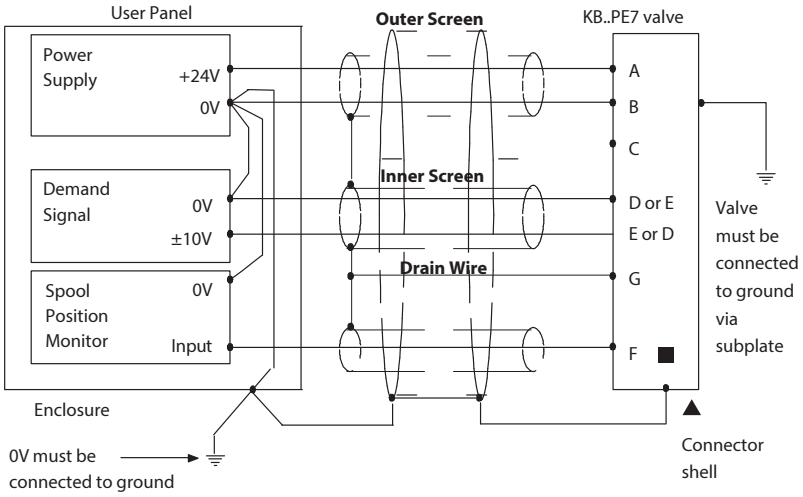
▲ Pin C is used for a valve enable signal with electrical connections PH7.
R1 Shunt resistor 100R
F1, F2 Resettable fuse

⚠WARNING

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

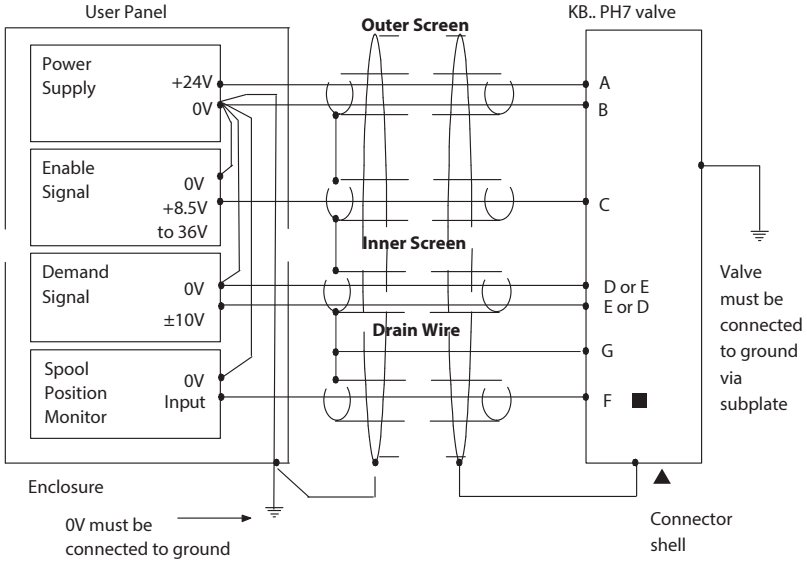
Wiring connections voltage input (M1)

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



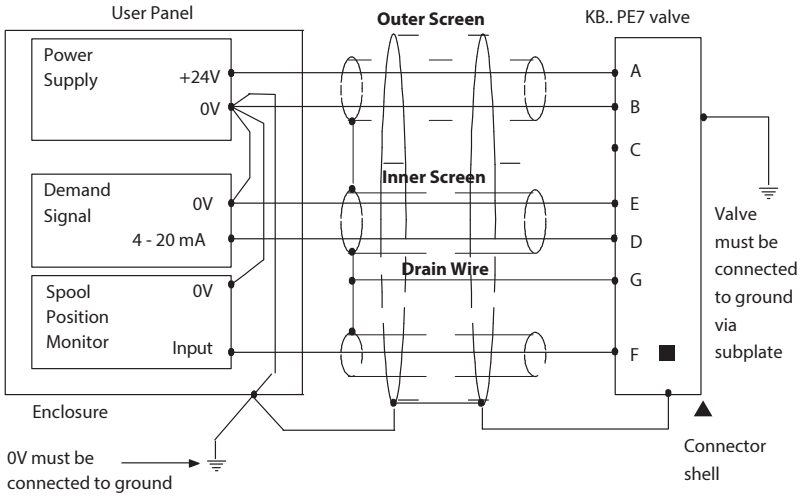
Wiring connections for M1 valves with enable feature

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.



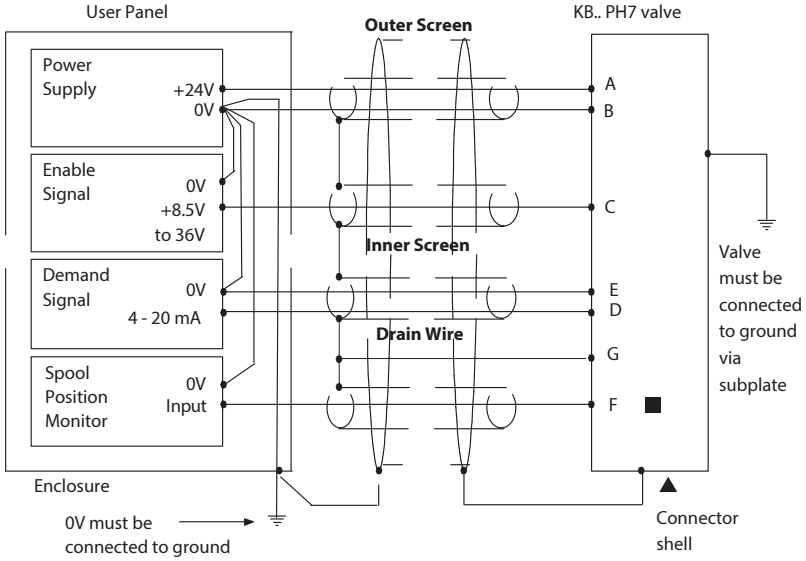
Wiring connections current input (M2)

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



Wiring connections for M2 valves with enable feature

Note: ▲ In applications where the valve must conform to European RFI/EMC regulations, the outer screen (shield) must be connected to the outer shell of the 7 pin connector, and the valve body must be fastened to the earth ground. Proper earth grounding practices must be observed in this case, as any differences in command source and valve ground potentials will result in a screen (shield) ground loop.



⚠ WARNING

Electromagnetic Compatibility (EMC) It is necessary to ensure that the valve is wired up as above. For effective protection the user electrical cabinet, the valve subplate or manifold and the cable screens should be connected to efficient ground points. The metal 7 pin connector part no. 934939 should be used for the integral amplifier. In all cases both valve and cable should be kept as far away as possible from any sources of electromagnetic radiation such as cables carrying heavy current, relays and certain kinds of portable radio transmitters, etc. Difficult environ-ments could mean that extra screening may be necessary to avoid the interfer-ence. 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.

Fluid cleanliness

Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials and additives for protection against wear of components, elevated viscosity and inclusion of air. Recommendations on contamination control methods and the selection of products to control fluid condition are included in publication 9132 or 561, "Guide to Systemic Contamination Control". The book also includes information on the concept of 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

Danfoss 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 Danfoss 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.

ENGINEERING
TOMORROW

Products we offer:

- Cartridge valves
- DCV directional control valves
- Electric converters
- Electric machines
- Electric motors
- Fluid Conveyance
- Gear motors
- Gear pumps
- Hydraulic integrated circuits (HICs)
- Hydrostatic motors
- Hydrostatic pumps
- Industrial hydraulics
- Orbital motors
- PLUS+1® controllers
- PLUS+1® displays
- PLUS+1® joysticks and pedals
- PLUS+1® operator interfaces
- PLUS+1® sensors
- PLUS+1® software
- PLUS+1® software services, support and training
- Position controls and sensors
- PVG proportional valves
- Steering components and systems
- Telematics

Danfoss Power Solutions is a global manufacturer and supplier of high-quality hydraulic and electric components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway and industrial markets as well as the marine sector. Building on our extensive applications expertise, we work closely with you to ensure exceptional performance for a broad range of applications. We help you and other customers around the world speed up system development, reduce costs and bring vehicles and vessels to market faster.

Danfoss Power Solutions – your strongest partner in hydraulics and mobile electrification.

Go to www.danfoss.com for further product information.

We offer you expert worldwide support for ensuring the best possible solutions for outstanding performance. And with an extensive network of Global Service Partners, we also provide you with comprehensive global service for all of our components.

Local address:

Hydro-Gear
www.hydro-gear.com

Daikin-Sauer-Danfoss
www.daikin-sauer-danfoss.com

Danfoss
Power Solutions (US) Company
2800 East 13th Street
Ames, IA 50010, USA
Phone: +1 515 239 6000

Danfoss
Power Solutions GmbH & Co. OHG
Krokamp 35
D-24539 Neumünster, Germany
Phone: +49 4321 871 0

Danfoss
Power Solutions ApS
Nordborgvej 81
DK-6430 Nordborg, Denmark
Phone: +45 7488 2222

Danfoss
Power Solutions Trading (Shanghai) Co., Ltd.
Building #22, No. 1000 Jin Hai Rd
Jin Qiao, Pudong New District
Shanghai, China 201206
Phone: +86 21 2080 6201

Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequent changes being necessary in specifications already agreed.
All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.