www: www.salushydraulics.pl
e-mail: pl@salushydraulics.pl
shop/sklep: www.sklep.salushydraulics.pl

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

4	Solenoid controlled, pilot operated

7 Pressure rating

V	310 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. Δ p = 5 bar (72 psi) per 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)
5C200N	200 L/min (52 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:

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

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 (p.12)

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.13) 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**

PE7	7 pin connector with plug
PH7	As PE7 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

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 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 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 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

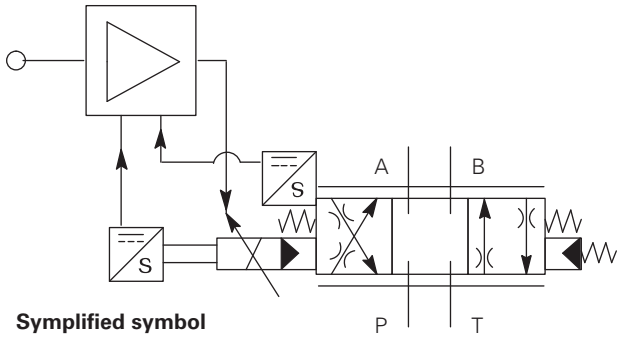
Figure preceding metering type designator, "N" e.g. 2C**N) is flow rating P–A, or

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

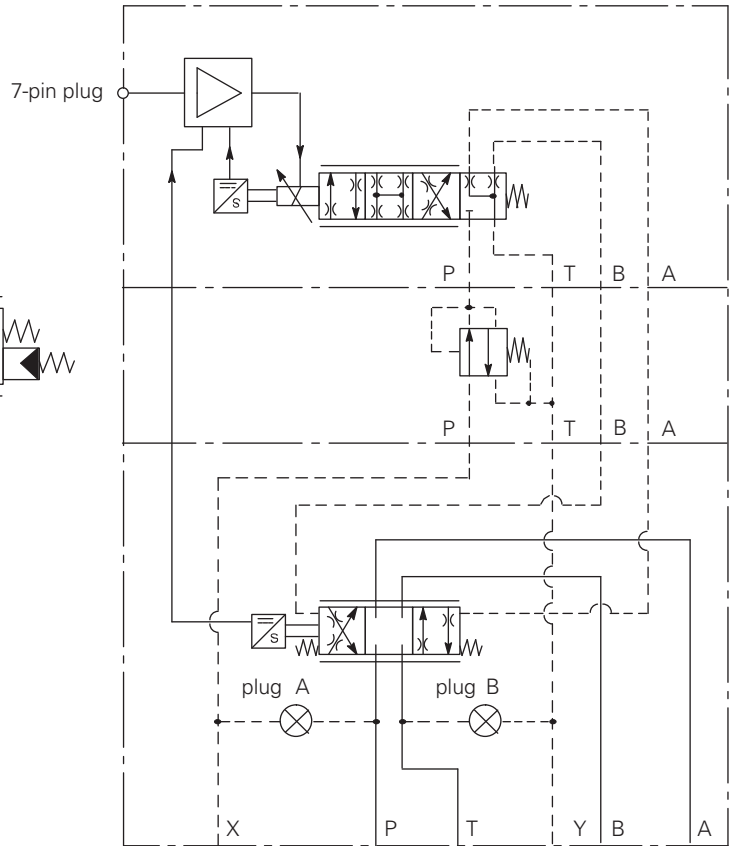
Symmetric

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



Symplified symbol

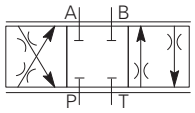


Detailed symbol

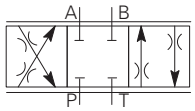
Asymmetric

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 (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)

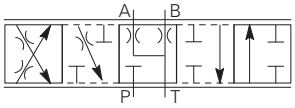
Available spools for KBHDG5V



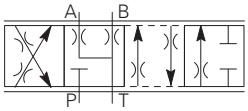
Spool type 2C



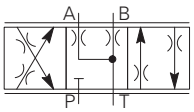
Spool type 5C (zero lapped)



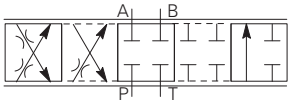
Spool type 133C



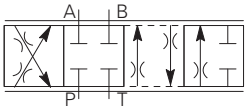
Spool type 733C



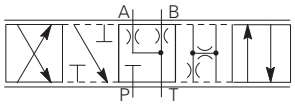
Spool type 33C



Spool type 12C

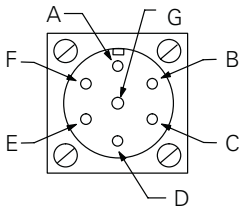


Spool type 72C



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			
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 D	18V (max)			
Current mode	4-20 mA			
• Max differential voltage to pin E to pin B	10V			
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			
	• 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)	0V – 5C Spools 0.25V– 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, Δ p=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-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 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

Flow gain

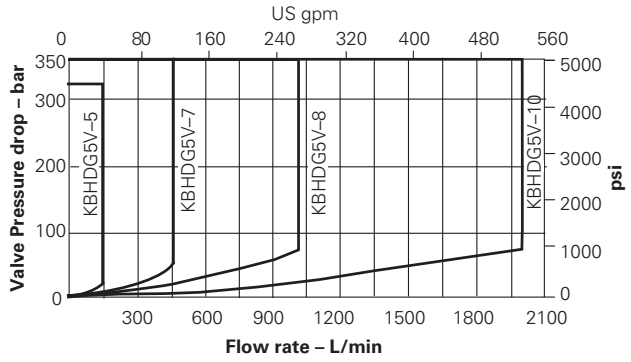
At Δ p = 5 bar (72 psi) per metering path (e.g. P-A), with flow through P-A-B-T or P-B-A-T. Percentage command signals applicable for positive and negative values of command signal.

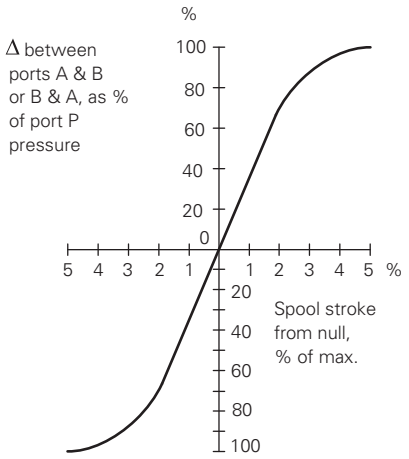
At other Δ p values, flow rates approximate to:

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

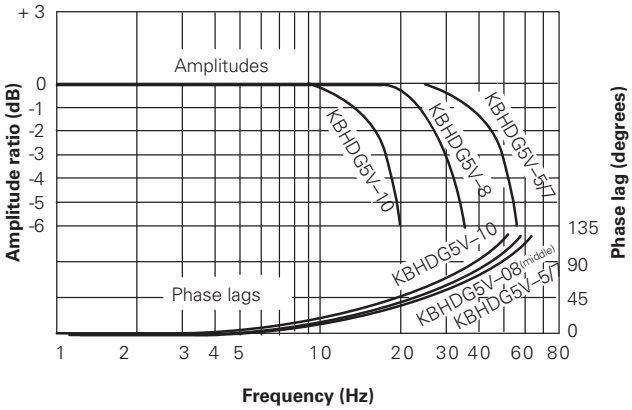
where QD= Datum flow rate
Δ pD= Pressure drop at datum flow rate
Δ pX= Required p
Limited by valve power capacity. Refer to curves on page 11.

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

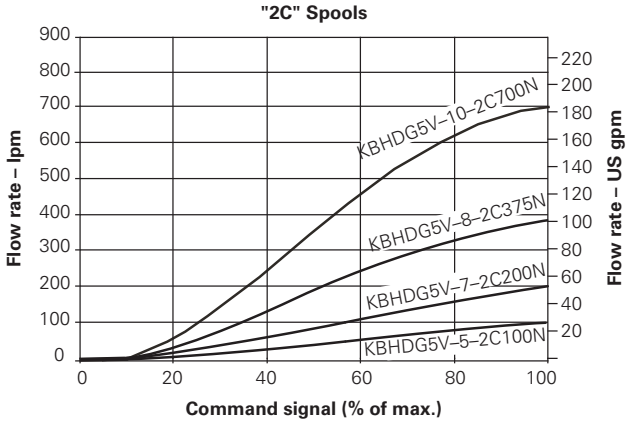




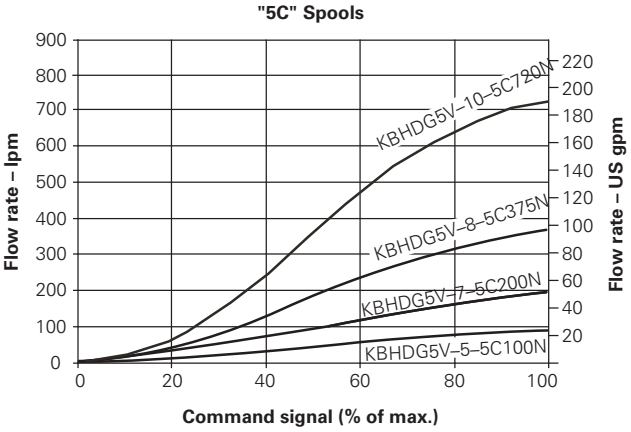
Frequency response, Typical
For an amplitude of 50 ± 25% of rated flow (ISO 10770-1)
2C spool measured at ν= 36 cSt (168 SUS),
t = 50°C (122°F) and pilot pressure = 40 bar (with-reducer model)



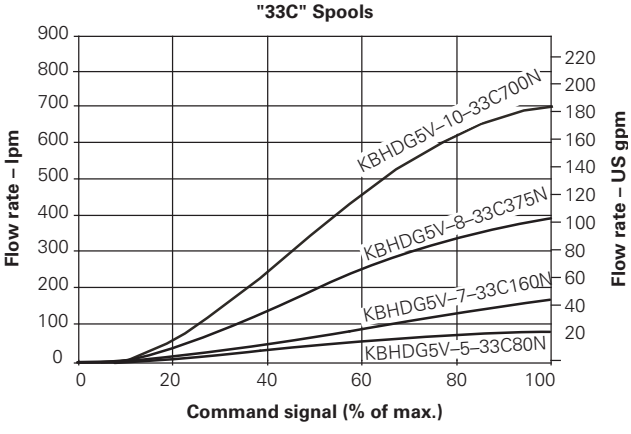
"2C" Spools



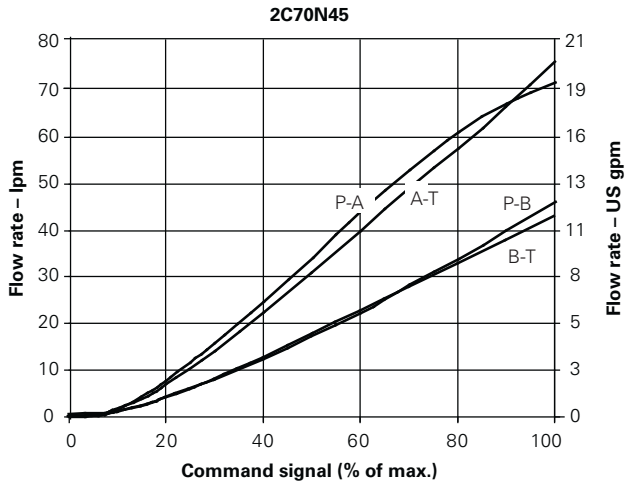
"5C" Spools

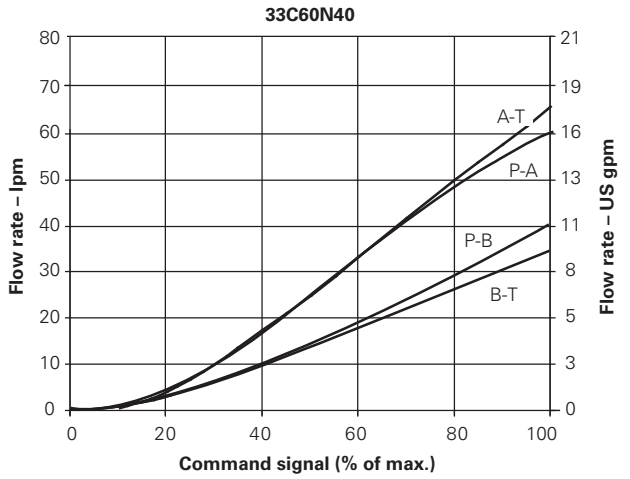


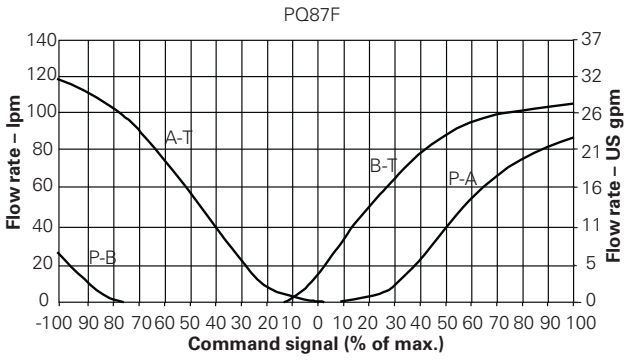
"33C" Spools



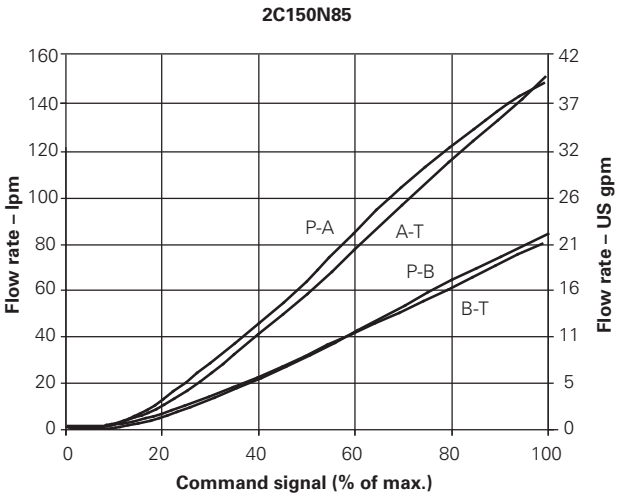
KBHDG5V-5

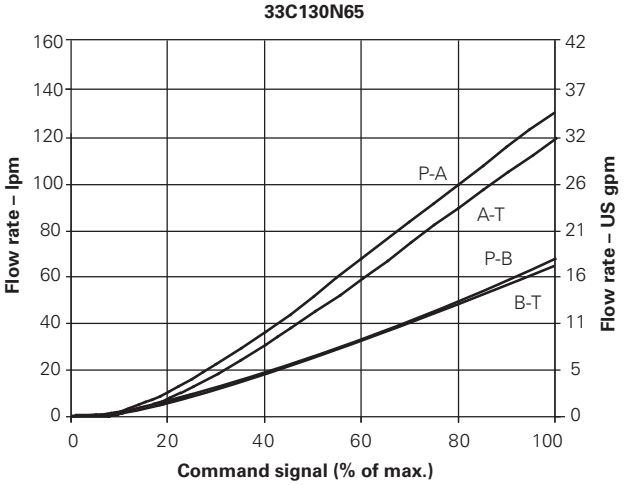


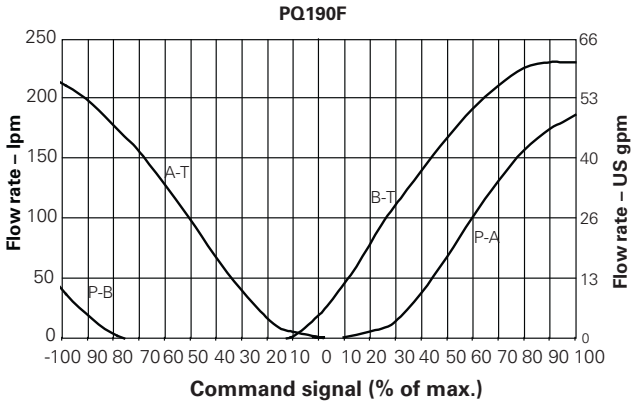




KBHDG5V-7





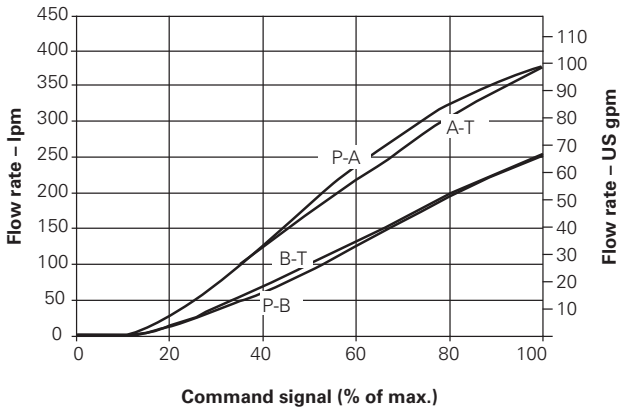


Performance curves

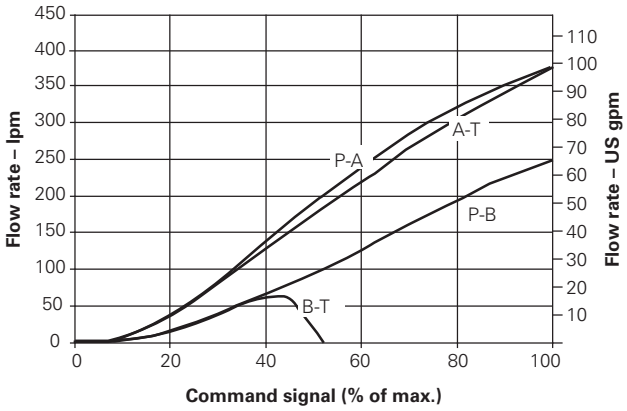
Flow gain

KBHDG5V-8

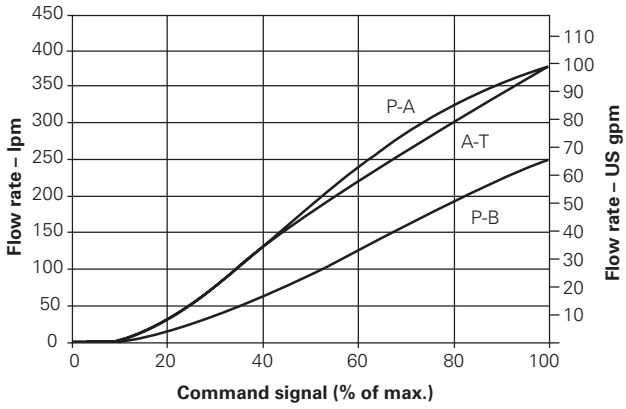
2C375N250 & 33C375N250



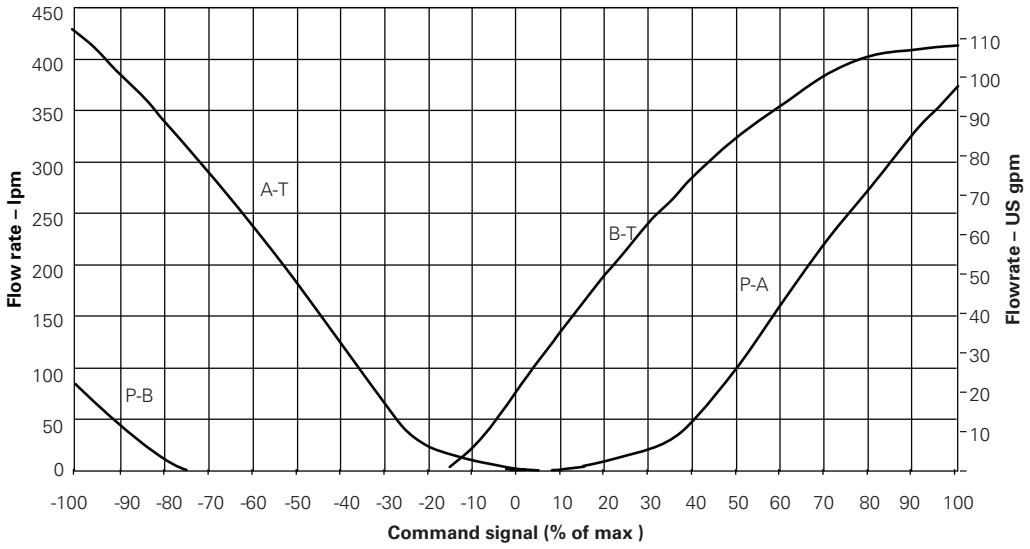
72C375N250 & 733C375N250



12C375N250 & 133C375N250

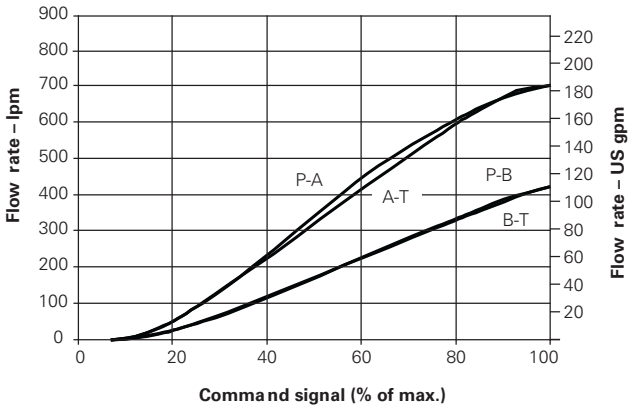


PQ 375F

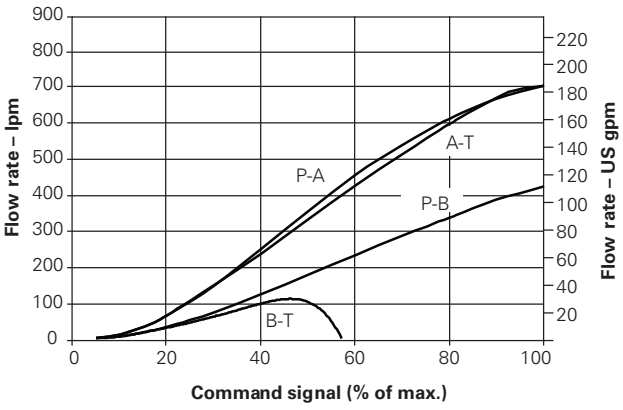


KBHDG5V-10

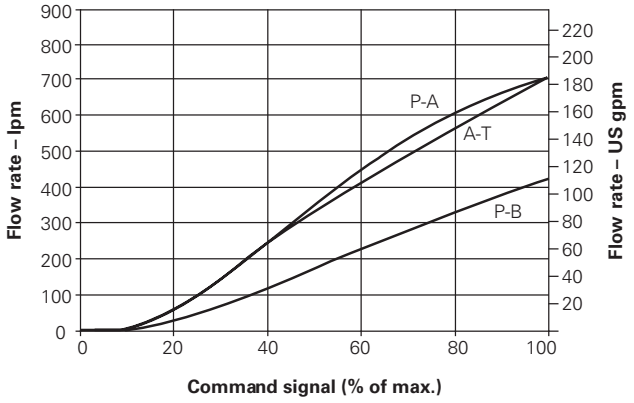
2C700N420 & 33C700N420



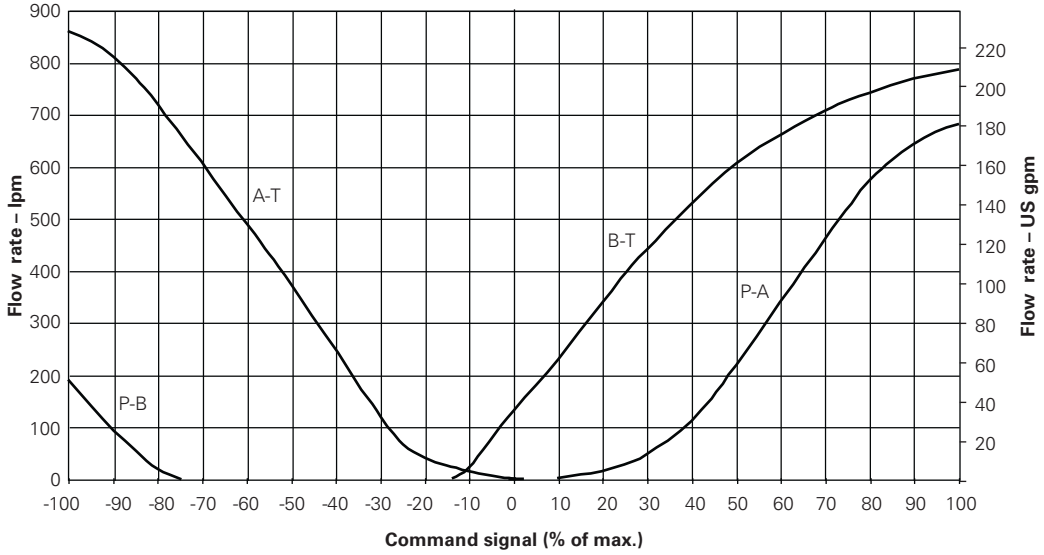
72C700N420 & 733C700N420



12C700N420 & 133C700N420



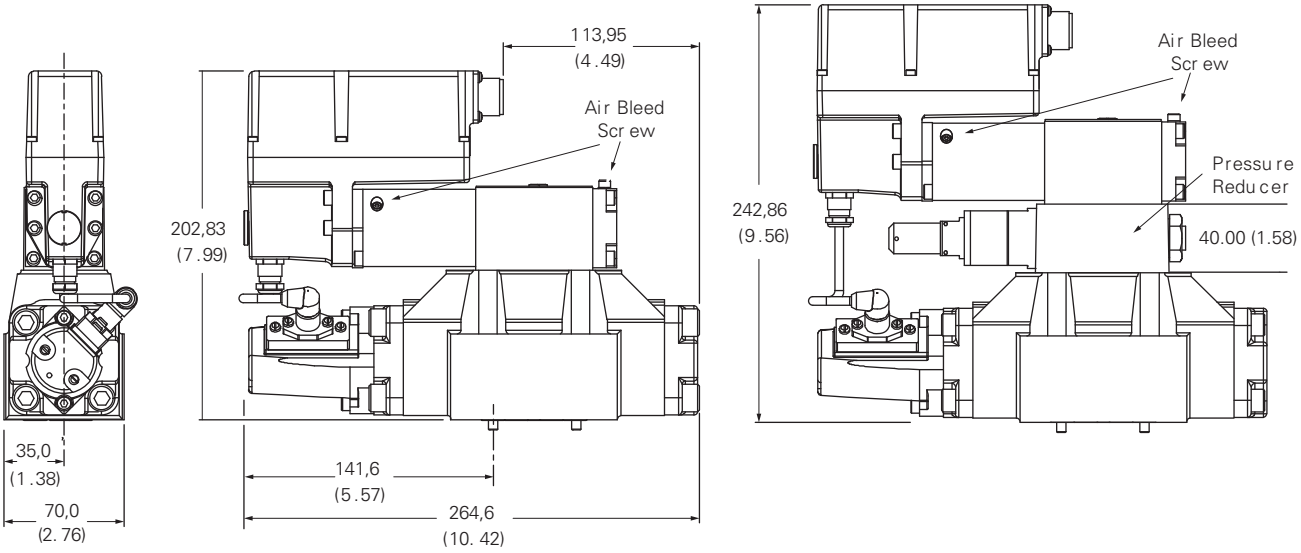
PQ680



KBHDG5V-5/7

Dimensions shown in mm (in).

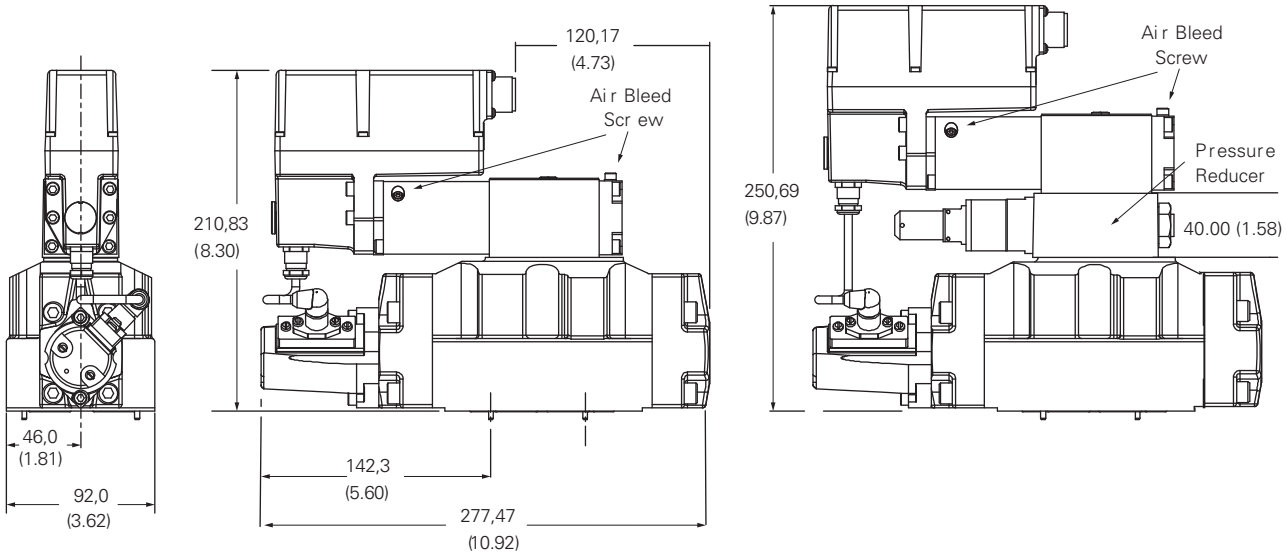
KBHDG5V-5 **Valve without pressure reducer** **Valve with pressure reducer**



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**



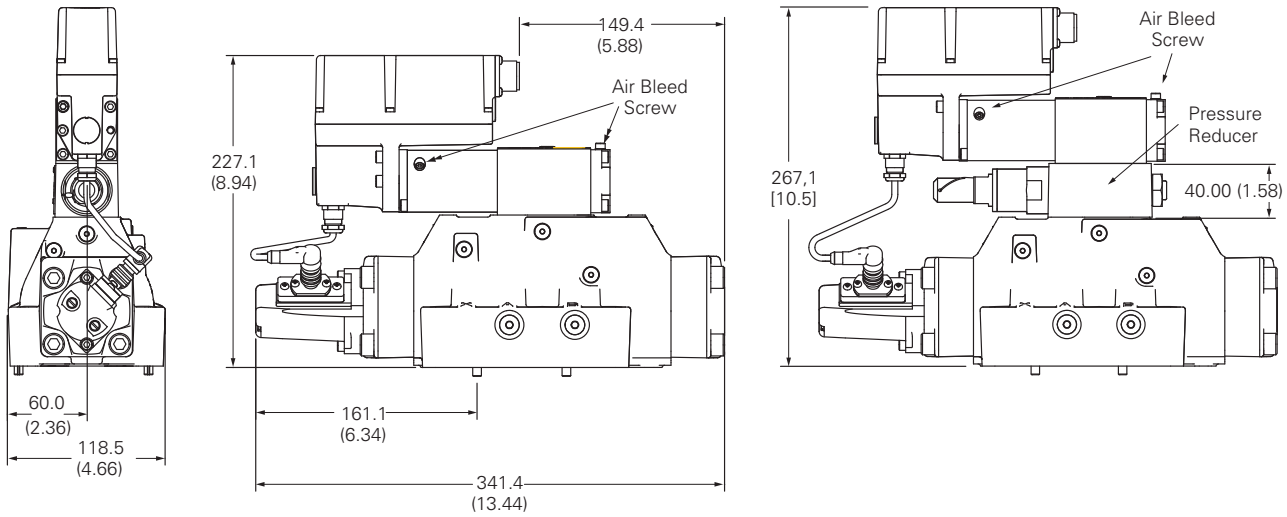
Mounting surface, seals supplied.
For mating surface dimensions, see page 16.

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

KBHDG5V-8/10

Dimensions shown in mm (in).

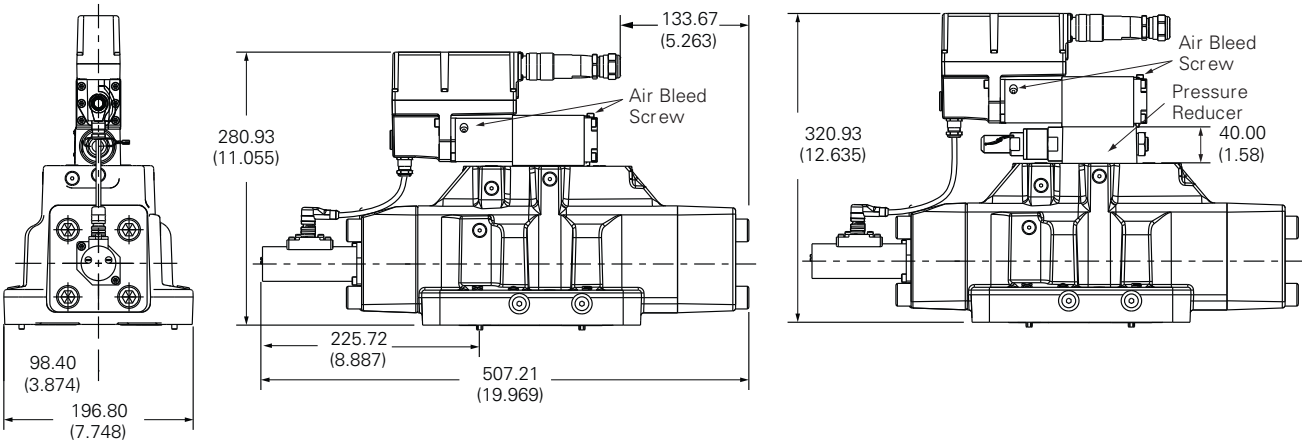
KBHDG5V-8 **Valve without pressure reducer** **Valve with pressure reducer**



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.