Model codes

K	(B)	F	*	G	4	V	-5-	**	*	**	*	**	-Z-	(V)	-(M)-	(U1)	(***)	-H-	*	12	EN***
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

1 Valve type

K Proportional valve

2 Integral amplifier

B Integral amplifier "B" series. Omit for models without integral amplifier

3 Feedback arrangement

F Spool position

4 Control type

D Directional valve
T Throttle valve

5 Mounting

G Subplate mounted

6 Operation

4 Solenoid operation

7 Pressure rating

V 315 bar (4500 psi) on ports P, A & B

8 Interface

5 ISO 4401, size 05-04-0-05 ANSI/ B93.7M-D05. ISO 4401, size 05-06-0-05 (with L ports)

9 10 2C - All ports closed at center, KBD

11 12

2C30N 30 L/min symmetric, meter in/ meter out
2C50N 50 L/min symmetric, meter in/ meter out
2C65S 65 L/min meter out only
2C70N 70 L/min symmetric, meter in/ meter out
2C50N25 50 L/min /25 L/min , meter in/ meter out
2C75N45 75 L/min /45 L/min , meter in/ meter out

33C – P closed at center, A,B,T connected, KBD

33C30N 30L/min symmetric, meter in/ meter out
33C50N 50 L/min symmetric, meter in/ meter out
33C70N 70 L/min symmetric, meter in/ meter out
33C50N25 50 L/min /25 L/min , meter in/ meter out

9C – zero lap

9C50N 50 L/min symmetric, meter in/ meter out

2B – single solenoid throttle valves, KBT

2B30N 30 L/min symmetric, meter in/ meter out
2B50N 50 L/min symmetric, meter in/ meter out
2B65S 65 L/min meter out only
2B70N 70 L/min symmetric, meter in/ meter out

13 Flow rating ("B" port flow for asymmetric spools) K(B)FDG valves only

25 25 L/min (6.6 USgpm) (50N25 only)
45 45 L/min (11.9 USgpm) (50N25 only)
Omit for symmetrical spools

14 Manual Overrides

Z No manual overrides

15 Solenoids energization identity

(Non-integral amplifier types KF only, omit for valves with integral amplifier)
V Solenoid "A" is at port "A" end and Solenoid "B" is at port "B" end independent of spool type
Blank US ANSI B93.9 standard (energize solenoid "A", flow symbol is (P➢A)

16 Command input

(omit for valves with integral amplifier)
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

17 Solenoid connector

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

18 Electrical connection (KBF valves only)

PE7 7-pin electrical plug with mating half
PH7 As PE7 but with pin "C" used for enable signal

19 Coil rating

H 24 VDC amplifier supply

20 Port T pressure limit code

6 For 2C**S spools
7 For all other spools

21 Design number 12 series

Subject to change

22

EN090 Resin filled,20G
EN119 Polyurethane interface seals

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

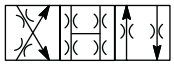
⚠ WARNING

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

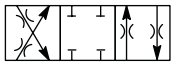
Spool symbols

Available spools for K(B)FDG4V-3

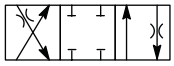
Spool type 9C**N, meter-in/meter-out



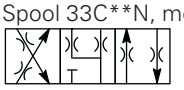
Spool type 2C**N, meter-in/meter-out (zero lap)



Spool type 2C**S, meter-out only



Spool 33C**N, meter-in/ meter-out

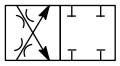


Asymmetric spools

Figure preceding metering type designator, "N" (e.g. 2C***N) is flow rating P–A, or A–T ("A" port flow); figure after "N" (N***) is flow rating P–B, or B–T ("B" port flow).

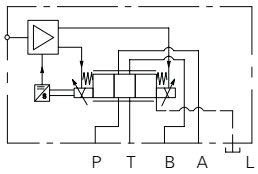
Available spools for K(B)FTG4V-5

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

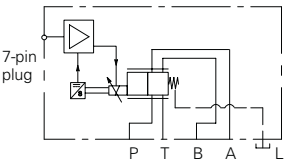


Functional symbols

Model types KBFDG4V-5
Proportional directional valve (with intergated electronics)



Model types KBFTG4V-5
Proportional throttle valve (with intergated electronics)



Spool type and flow rating

Symmetric spools

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

For K(B)FDG4V-5 valves

Spool code spool symbol flow rating

Spool code	Spool symbol	Flow rating
2C30N	2C	30 L/min (7.9 USgpm)
2C50N	2C	50 L/min (13.2 USgpm)
2C65S	2C	65 L/min (17.2 USgpm)
2C70N	2C	70 L/min (18.5 USgpm)
9C50N	9C	50 L/min (13.2 USgpm)
33C30N	33C	30 L/min (7.9 USgpm)
33C50N	33C	50 L/min (13.2 USgpm)
33C70N	33C	70 L/min (18.5 USgpm)

For K(B)FTG4V-5 valves

Spool code spool symbol flow rating

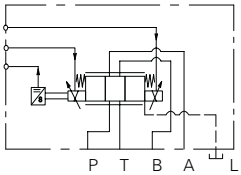
Spool code	Spool symbol	Flow rating
2B30N	2B	30 L/min (7.9 USgpm)
2B50N	2B	50 L/min (13.2 USgpm)
2B65S	2B	65 L/min (17.2 USgpm)
2B70N	2B	70 L/min (18.5 USgpm)

For K(B)FDG4V-5 valves

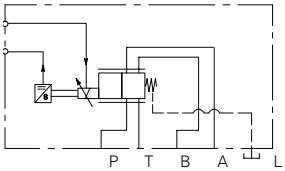
Spool code spool symbol flow rating

Spool code	Spool symbol	Flow rating
2C50N25	2C	50 L/min (13.2 USgpm), "A" port flow 25 L/min (6.6 USgpm), "B" port flow
2C75N45	2C	75 L/min (19.8 USgpm), "A" port flow 45 L/min (11.9 USgpm), "B" port flow
33C50N25	33C	50 L/min (13.2 USgpm), "A" port flow 25 L/min (6.6 USgpm), "B" port flow

Model types KFDG4V-5
Proportional directional valve (requires amplifier card)



Model types KFTG4V-5
Proportional throttle valve (requires amplifier card)

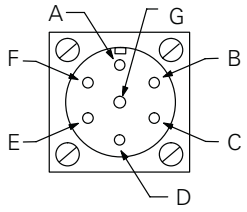


Operating data

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

KBFD/TG4V-5 valves with integral amplifier

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

Power supply	24V DC (18 V to 36V including 10% peak-to-peak max. ripple) max current 3A
Command signal	
Voltage mode M1	0 to +10V DC, or 0 to -10V DC, or -10V to +10V DC
• Input impedance	47kohms
• Common mode voltage to pin B	18V (max)
Current mode M2	4-20 mA
• Input impedance	100 Ω
• Max differential voltage to Pin E to Pin B 100mV	10V
Valve enable signal for model codes PH7	
Enable	>8.5V (36V max)
Disable	<6.5 V
Input impedance	10 k ohms
7-pin plug connector	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 GND)
	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)	0.25V
Monitor signal (pin F)	
KBFD valves	± 10V DC for full spool stroke
KBFT valves	0 to –10 V DC for full spool stroke
Voltage mode	+/- 10V DC for full stroke
Output impedance	10KOhm
Current mode	4mA to 20mA
Output impedance	Upto 200 Ohm
Power stage PWM frequency	10 kHz nominal
Step input response with flow through P–A–B–T Δ p = 5 bar (75 psi) per metering path, e.g. P–A	
Required flow step:	Time to reach 90% of required step:
0 – 100%	30 ms
100% – 0	40 ms
+90 – -90% (KBFDG4V3-3 only)	32 ms
Reproducibility, valve-to-valve (at factory settings): Flow at 100% command signal	≤ 5%

Protection	
Electrical	Reverse polarity protected
Environmental	IEC 60529, Class IP65 & IP67
ROHS compliance	Electronic amplifier is compliant to 2011/65/EU ROHS2
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)
Mimimum 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)
Supporting products Auxiliary electronic modules (DIN -rail mounting):	
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

KBFD/TG4V-5 Valves without Integral Amplifier – (requires a Eurocard Amplifier, refer to supporting products)

Data is typical with fluid at 36 cSt (168 SUS) and 50° C (122° F).	
Max current, at 50° C (122° F)	2.7 A
Coil reistance, at 20° C (68° F)	1.87 Ω
Step response	
Step size (% of max spool stroke)	Time to reach 90% of required step:
0 to 100%	31 ms
100% to 0	30 ms
+90 to -90% (KFDG4V-5 only)	45 ms
Type of protection, with electrical plugs fitted correctly	IEC 60529, Class IP65
Electromagnetic compatibility (EMC)	
Emmision (10V/m)	EN 50081-2
Immunity (10V/m)	EN 50082-2
Maximum allowable ambient air temperature	60° C (140° F)
Maximum allowable oil temperature	60° C (140° F)
Supporting products:	
Eurocard amplifiers	
EEA PAM 533 A/B/C/D/E/F	See catalog GB-2464

KFD/TG4V-5 and KBFD/TG4V-5 valves (all valves)	
Relative duty factor	Continuous rating (ED = 100%)
Hysteresis with flow through P–A–B–T	<1% of max stroke (center-to-offset)
Mass: KFDG4V-5	7.2 kg (15.86 lb) approx.
KBFDG4V-5	7.6 kg (16.76 lb) approx.
KFTG4V-5	5.5 kg (12.10 lb) approx.
KBFTG4V-5	5.9 kg (13.00 lb) approx.
Portable test equipment	
EBA TEQ 460 A 10	See catalog V-ELAC-TM001-E

Pressure and flow rates

Maximum pressures, bar (psi)

Model	Port L condition	Ports P, A, B	T	T
All models for normal usage (L port not connected)	Normally blocked by mounting surface	315 (4500)	160 (2300)	160 (2300)
For K(B)FDG4V-5**C**N-Z models only a higher "T" port pressure is allowed if the "L" port is connected directly to tank	Drained directly to tank	315 (4500)	210 (3000)	210 (3000)

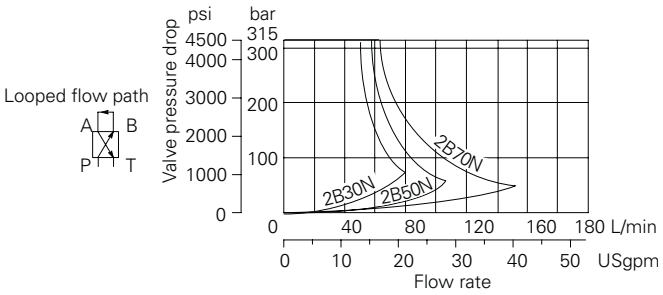
Performance curves

Power capacity envelopes

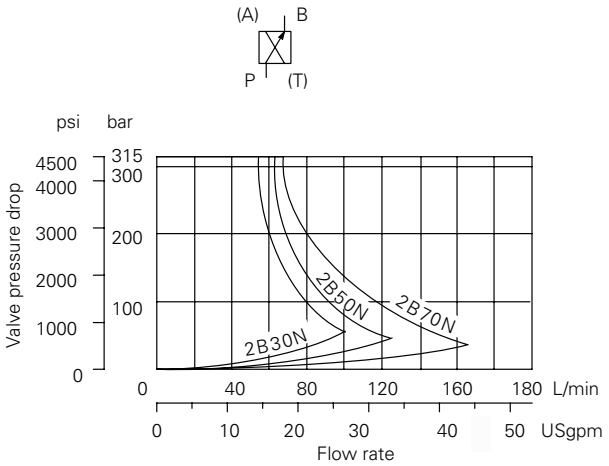
Single solenoid models: K(B)FTG4V-5

Spool types as noted

Looped flow path

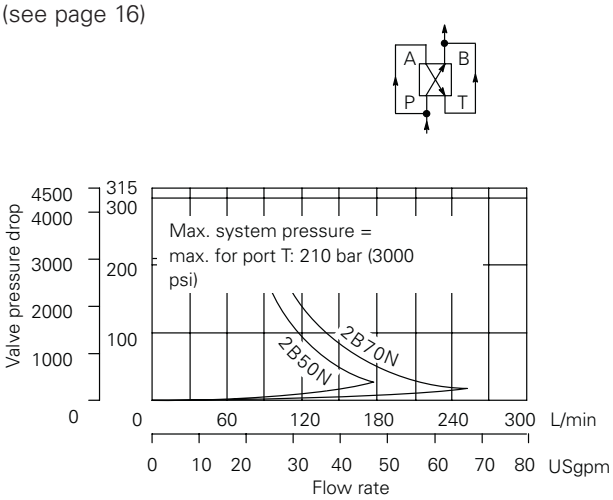


Single flow path



Parallel flow path use parallel flow path module:

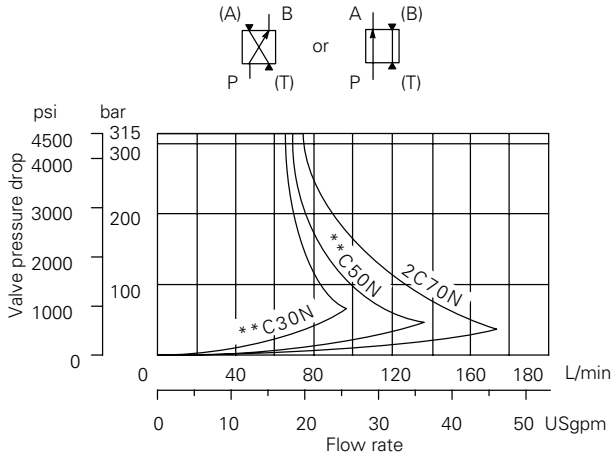
KDGMA-5-616877-10R or KDGMA-5-02-139150-10S (see page 16)

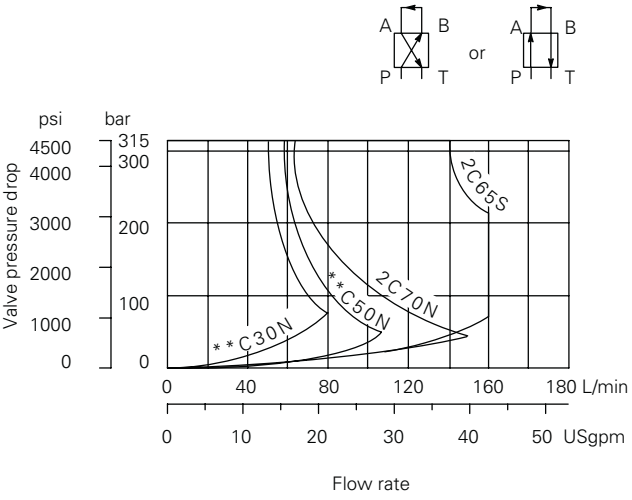


Double solenoid models: K(B)FDG4V-5

Spool types as noted

Looped flow path





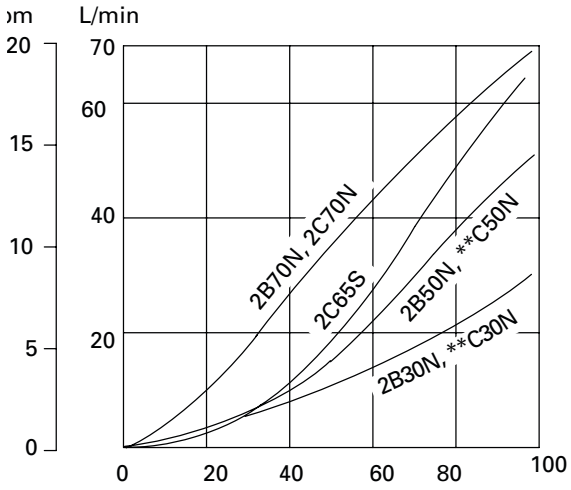
Flow gain curves

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

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

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

K(B)FD/TG4V-5
Spool types as noted



Single flowpath (e.g. P–A) pressure drop, Δ p = 5 bar (72 psi) ■.

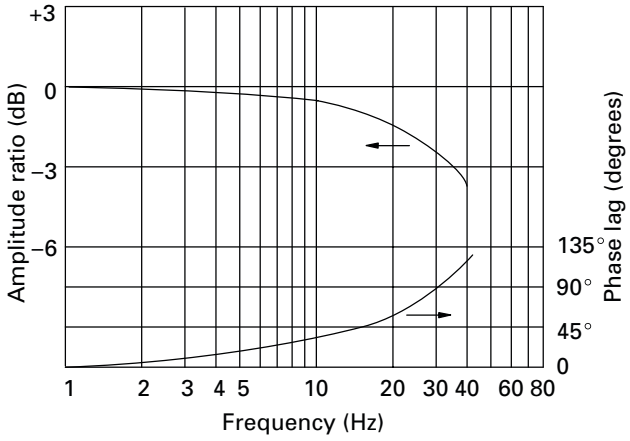
■ At other Δ p values and within the power capacity envelopes, flow rates approximate to:

$$Q_x = Q_d \sqrt{\frac{\Delta p_x}{\Delta p_d}}$$

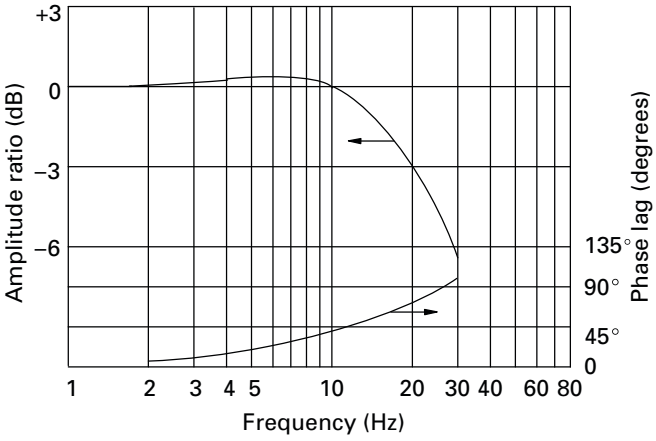
Frequency response (typical)

For an amplitude of ± 25% max. flow about the 50% flow, at Δ p (P–B) = 5 bar (72 psi)

KBFD/TG4V-5



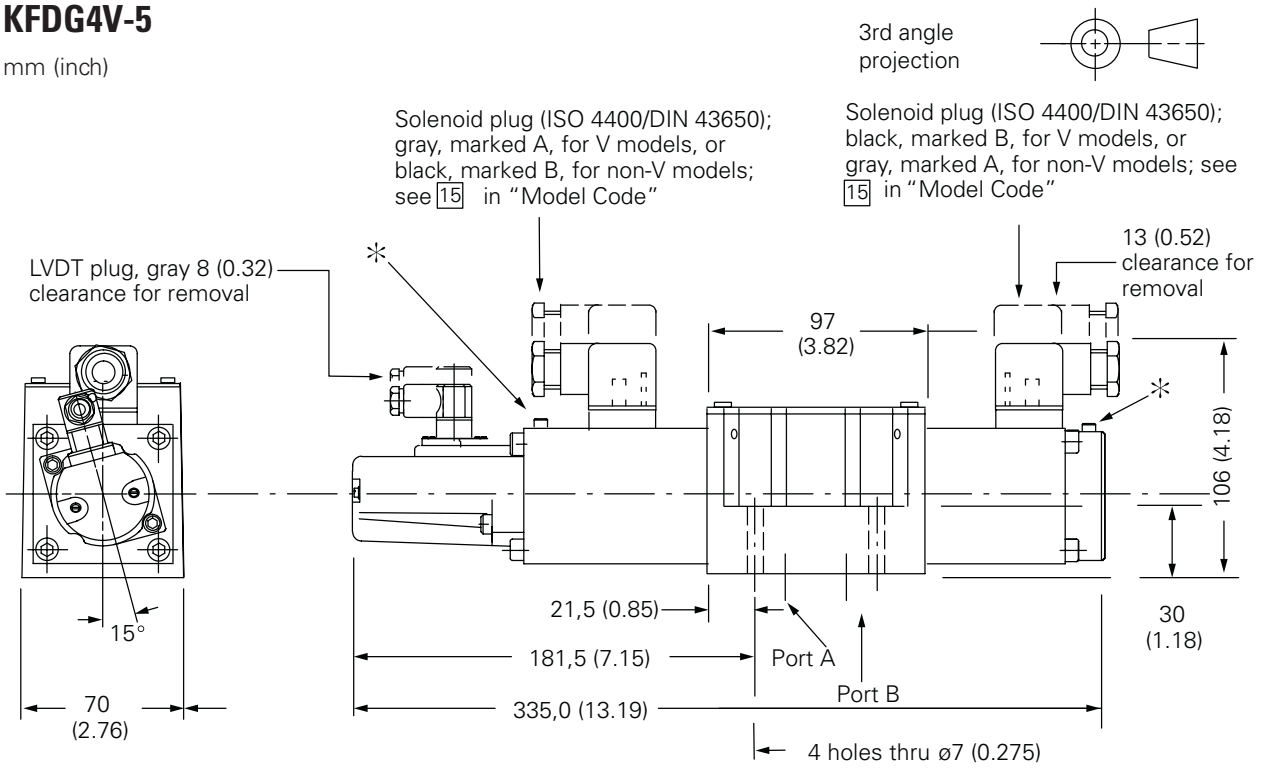
KFD/TG4V-5



Installation dimensions

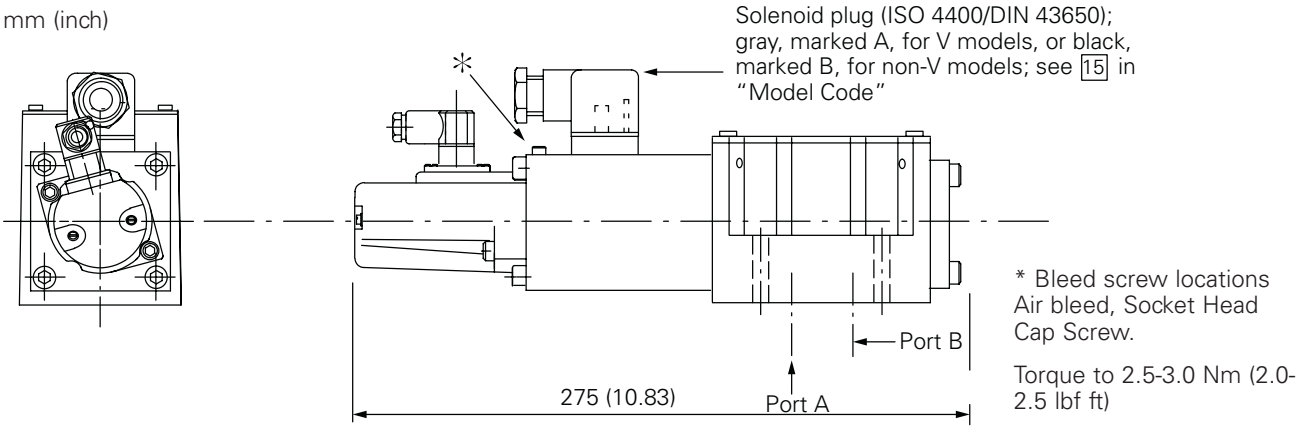
KFDG4V-5

mm (inch)



KFTG4V-5

mm (inch)



Note: For optimum valve operation, bleed the air from the proportional solenoids at initial start-up. This may be done as follows:

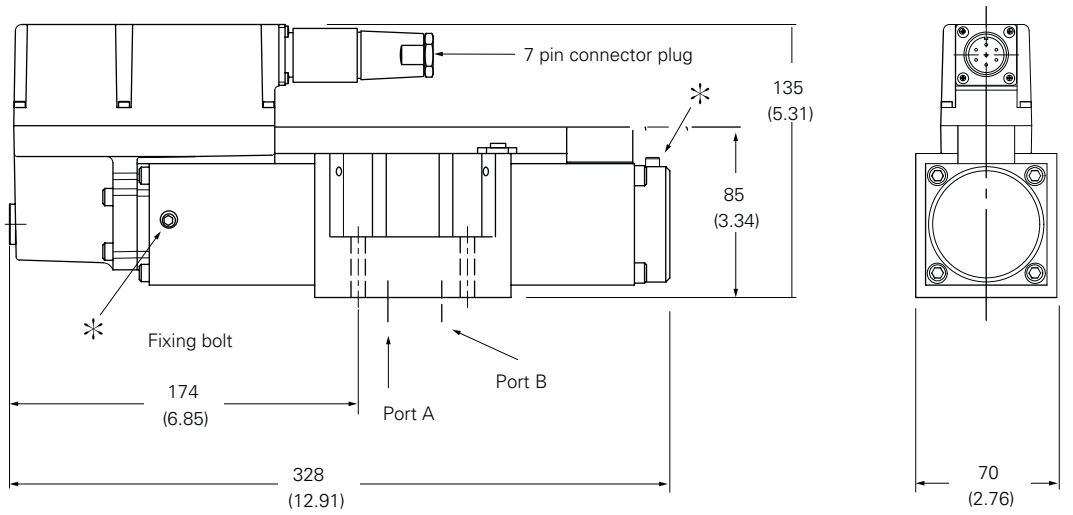
- The valve may be pressurized by removing the bleed screws until no bubbles appear and then reinstalling bleed screws, or...

- Remove both bleed screws, and use a standard oil can nozzle to pump fluid in one side until it flows, free of air bubbles, out the other side. Reinstall screws.
If there is no inherent back pressure in the tank port of the circuit do not allow the tank line to empty. This may be prevented by installing a check valve in the tank line.

The cracking pressure of the check valve should be in the range of 22 - 45 psi (1.5 - 3 bar).

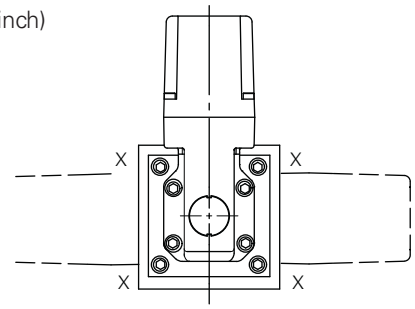
KBFDG4V-5

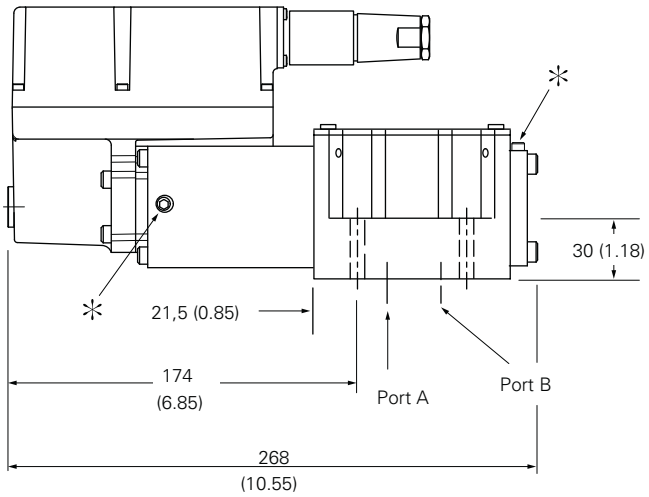
mm (inch)



KBFTG4V-5

mm (inch)





* Bleed screw locations air bleed, socket head cap screw.

Torque to 2.5-3.0 Nm (2.0-2.5 lbf ft)

⚠ WARNING

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