

## Installation and start-up guidelines for Eaton™ proportional pressure control valves

### Pressure relief valves

K(B)CG-3/6/8,11

### Pressure reducing valves

K(B)X(C)G-6/8,11



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to meet specific standards outlined in the European Electromagnetic Compatibility Directive (EMC) 2014/30/EU which repealed Directive 2004/108/EC. For Restriction of Hazardous Substances, complies to (RoHS) Directive 2011/65/EU. For instructions on installation requirements to achieve effective protection levels, see the Installation Wiring Practices for Eaton's Electronic Products. Wiring practices relevant to this Directive are indicated by  Electromagnetic Compatibility (EMC).

## 1. Introduction

1.1 These valves regulate hydraulic pressure in proportion to an electrical input signal. See appropriate catalog V-VLPO-MC002-E1, V-VLPO-MC003-E1 and V-VLPO-MC004-E1 for full technical and installation data: catalogs are listed under "6. Further information".

1.2 KCG-3, KCG-6/8, KX(C)G-6/8 in these models pressure is controlled by varying the power supplied to the proportional solenoid: up to 3.5A for the "G" model or up to 1.6A for the "H" model. Normally the variable power drive would be from a separate amplifier e.g. Eaton™ amplifier type EEA-PAM-513\*-33.

1.3 KBCG-3, KBCG-6/8, KBX(C)G,6/8 The integral drive amplifier of the KB - valves allows the pressure to be controlled from a low power command signal: either a voltage or current command. Power supply and the command signal are connected to the valve via a 7- pin plug. It is not necessary to make any adjustments to the valve/amplifier assembly prior to putting it into service either on a new installation or when replacing a valve on an existing installation

### 1.4 Warning

This valve was factory tested prior to dispatch for conformance to the cataloged specification and performance data but eaton hydraulics warranty may be nullified by such actions as:

- Dismantling or adjusting of any part of the assembly other than may be indicated in this leaflet.

- Incorrect installation.

- Application of the valve outside its cataloged performance limits.

- Incorrect electrical connections.

- Incorrect electrical control signals.

1.5 Before installing the valve, check that the model designation on the nameplate shows it to be the correct valve for the application

## 2. Valve for new application

### 2.1 Installation

2.1.1 These valves can be mounted in any attitude.

2.1.2 For correct pressure control characteristics the drain ports of these valves should be piped directly to the reservoir with minimum restriction, because back pressure at the drain port is additive to the controlled pressure. The drain port pressure should not exceed 2 bar (29 psi).

Drain port reference and location varies according to model type/code as follows:

KCG-3, KBCG-3:	Port T
KCG-6/8, KBCG-6/8:	Either port T or side port on pilot head if provided
KX(C)G-6/8, KBX(C)G-6/8:	Either port Y, or port Y1 (side port on pilot head) if provided

2.1.3 Do not remove the protection pad on the bottom face of the valve until immediately before installation. Take care not to lose the seals from the valve ports. Ensure that the surface on which the valve is to be mounted is clean and free from burrs and damage.

2.1.4 Size 3 valves have a locating pin between ports locations P & B in their bottom face. This ensures that the valve is correctly oriented on the mounting face, which should contain a mating hole.

**Note:** Interface ports A and B are not used in these 2- port valves and are blind counterbores with "O" seal recesses. seals are supplied for use only if the mating interface has port A and B drilled. these two seals should not be filled if ports A and B are not drilled in the mating interface.

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2.1.5 Install the valve on the mounting surface and secure it with bolts to class 12.9 (ISO 898) or better.

**Eaton™, Bolt Kits**

Valve Model	Metric bolt kit no.	Inch bolt Kit no.	Recommended bolt torque (Threads Lubricated)
KCG-3	M5	10-24	7 To 9 NM
KBCG-3	BKfIG3699M	BKDG369B	( 63.80 lbf in )
KCG-6	M12	1/2"-13UNC	103 - 127 NM
KBCG-6	BKOPNG25J05M	BKDPNG25704	(76-93 lbf.ft)
KCG-8	M16	5/8"-11 UNC	257 To 315-NM
KBCG-0	BKCG2V-8	BKDNG32713	(190-232 lbf ft)
KX(C)G-6/8	M10	3/8"-16UNC	59 - 73 NM
KBX(C)G-6/0	BKXG2V-6	BKXG2V-G-EN	(144-54 lbf ft)

2.1.6 Electrical Connections

KCG-3, KCG-6/8, KX(C)G-6/8

Before starting to connect cables ensure that all power is switched off.

The valve solenoid has terminal pins to suit a female receptacle conforming to DIN 43650 (not supplied with the valve). Suitable receptacles are available: Eaton™ part (order) number 710776 (gray plug).

**Recommended minimum wiring sizes are:**

for "G\*" model,  
 max. current 3.5A.....1.50mm<sup>2</sup>(0.0008in<sup>2</sup>)  
 max. length 20m (65 ft)

For "H\*" model,  
 max. current 1.6A.....0.75 mm<sup>2</sup> (0.0004 in<sup>2</sup>)  
 up to 20m (65ft)  
 1,00 mm<sup>2</sup> (0.0006 in<sup>2</sup>)  
 up to 40m (130 ft)

KBCG-3, KBCG-6/8, KBX(C)G-6/8 (Valves with integral amplifiers)

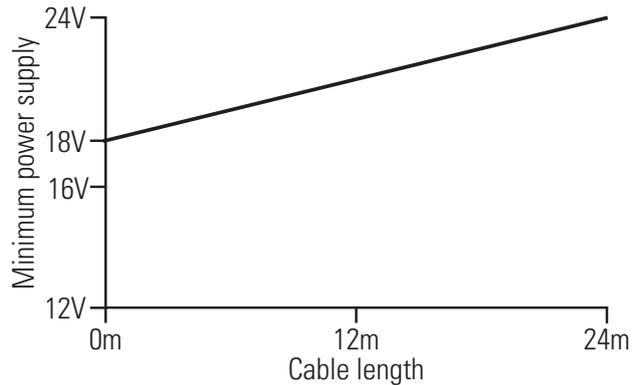
Before starting to connect cables ensure that all power is switched off.

Electrical connections must be made via the 7-pin plug mounted on the amplifier.

The recommended cable should have at least 6 cores with pairs of conductors individually screened and an overall braided screen.

A suitable cost effective cable is ALPHA type 1299/110C 10 conductor, 22 AWG foil shielded cable with drain wire. To achieve the recommended wire gages for the power supply and protective earth ground connections, pairs of wires are used.

The minimum power supply voltage under full load conditions should be as shown in the following graph.



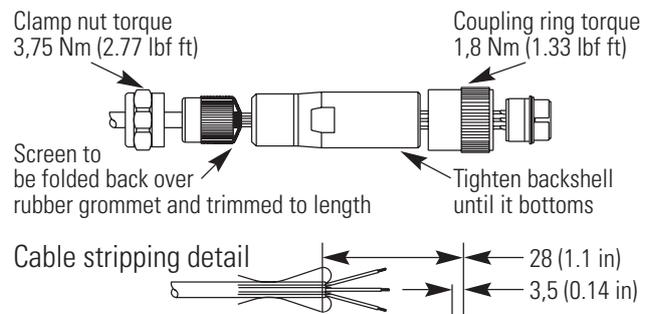
**WARNING**

To conform to the requirements of the European Community directive on Electromagnetic Compatibility (EMC) the valves with integral amplifiers must be filled with a metal plug. Suitable plugs are:

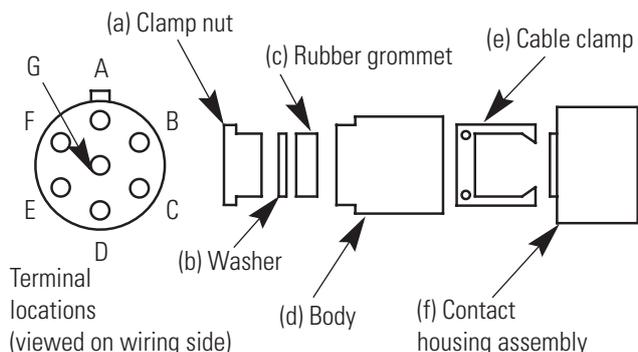
- 1) Eaton™ part no. 934939 which also gives environmental protection to IPB7 when tightened with a torque of 2-2,5 Nm (1.5-2.0 lbf.ft).
- 2) ITT-Cannon part no CA 06 COM-E 14S A7 P (Not available from eaton hydraulics). The plastic plug part no. 694534 is only suitable for use in a sealed electromagnetic environment or outside of the European Community.

**Plug assembly Instructions**

The metal 7-pin plug part no. 934939 must be used with this valve to achieve the full EMC specification. The assembly of the plug is as shown in the diagram.



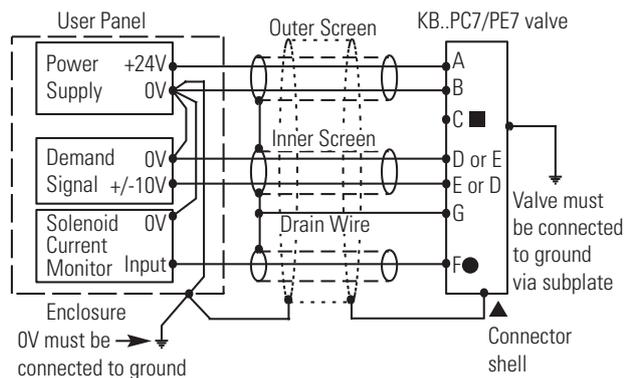
**Assembly instructions for plastic plug part number 694534**



Wiring assembly procedure:

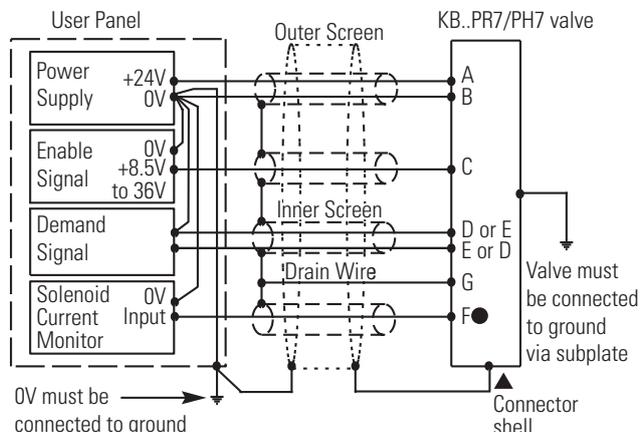
- Lead the cable through items a, b, c, d and e
- Make soldered connections to plug terminals:
  - Pin A Power supply
  - Pin B Power supply 0V and current command return
  - Pin C Enable input (PH7 & PR7 options)
  - Pin D Command signal (+V or current in)
  - Pin E Command signal (-V or current GND)
  - Pin F Output monitor
  - Pin G Protective ground
- Push cable clamp (e) into contact assembly housing (f) and tighten clamp screws.
- Screw body (d) into (f) and tighten.
- Push rubber grommet (e) and washer (b) into body (d)
- Thread clamp nut (a) into body and tighten to firmly clamp the cable.
- The plug assembly can now be connected to the amplifier.

**Figure 1. Wiring Connections for Valves With Integral Amplifier**



■ Pin C may be connected to ground or left unconnected.

**Figure 2. Wiring Connections For Valves With "Enable" Feature**



• Output monitor voltage (pin F) will be referenced to the power 0 volts (pin B).

**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 potential will result in a screen (shield) ground loop.

Wiring connections for valves without integral amplifier

Details of these are shown in the installation and start-up guidelines for the appropriate drivers. e.g.

Power plugs..... MI.-9168  
Eurocards .....GB-9160, GB-9151, GB-9156

### 2.1.7 Power and Signal Levels

Power supply:

KBCG-3(L) }  
KBCG-6/8 } 24V DC 122 to 36V including 10%  
KBX(C)G-6/8 } peak-to-peak ripple

Command signal ..... +/-10V or 4-20 mA  
Monitor signal ..... 1.7V per amp solenoid current

## 2.2 Start-up

### 2.2.1 KCG-3, KCG-6/8, KX(C)G-6/8

- Apply the correct power supply (see appropriate catalog V-VLPO-MC002-E1, V-VLPO-MC003-E1 and V-VLPO-MC004-E1 ) to the valve solenoid, and check the range of controlled pressure at port P.
- If incorrect controlled range:  
Check that valve model code is correct for the application.

Check power supply.

- The correct solenoid coil resistances at 20°C (68°F) are:
 

for 'G' models	1.65Ω
For 'GP' models	2.0Ω
For 'H' models	7.3Ω
For 'HA' models	22Ω
For 'HL' models	29Ω

### 2.2.2 KBCG-3, KBCG-6/8, KBX(C)G-6/8

- Switch power on.
- The valve response to a command signal can be monitored via the connection from plug pin F. If monitor signal does not follow command signal, check command signal connections to amplifier.

2.2.3 The pressure control ranges are according to the model type, see appropriate catalog for details.

## 3. Replacing an existing valve

### 3.1 Installation

- 3.1.1 The following are advisory and may not be applicable to specific systems or applications. The user may need to establish procedures to suit the application.

### WARNING- Before removing an existing valve:

- Turn off all electrical power.
- Relieve hydraulic pressure. Accumulators must either be isolated from the system by suitable valves or the hydraulic fluid discharged to the reservoir.
- Overhead or positive head reservoirs must be isolated from the system by suitable valves.
- Lower all vertical cylinders
- Block any cylinders whose movement could generate pressure.

3.1.2 Disconnect electrical plug from the valve.

3.1.3 Before removing valve make provision to prevent any hazard arising from fluid that will drain from exposed mounting surfaces.

3.1.4 Unscrew the valve mounting bolts, removing these and the valve. Keep the valve mounting surface clear of any contamination whilst draining all fluid from it. If returning the valve to eaton hydraulics for repair. Fit the protection plate from the new valve after ensuring that all fluid has been drained.

3.1.5 As 2.1.3.

3.1.6 If replacing a KACG valve with a KBCG valve, make sure wiring is according to figure 1. Power supply ground and command ground must be connected external from the valve, since pin C on the KBCG does not serve as command ground. Also make sure the positive and negative command pins are connected to command voltage or ground and are not left floating.

3.1.7 Install the new valve using the existing bolts and electrical plugs if in good condition. If not, refer to sections 2.1.5 and 2.1.6 respectively.

3.1.8 Check that any fluid lost during valve removal has not critically lowered the fluid level in the reservoir. This is important on small reservoir systems. Top up fluid as needed.

## 3.2 Re-start-up

3.2.1 Restore the application to its state immediately prior to section 3.1.1.

3.2.2 Proceed as for new valve (section 2.2).

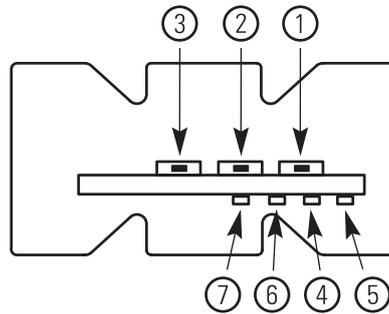
## 4. Ramp adjustment

### 4.1 The ramp adjustment feature is accessed by removing the amplifier lid.

**Note:** Before adjusting the ramp setting ensure that precautions are taken to prevent static discharge from harming the amplifier .

Ensure that the amplifier lid seal is not damaged or lost during adjustment.

### 4.2 In normal operation the amplifier status LED will flash, to activate the RAMP adjustment mode:



1. Select button
2. Ramp increase button
3. Ramp decrease button
4. Status LED - green
5. Store LED - red
6. Ramp increase /solenoid operation LED - green
7. Ramp decrease/solenoid operation LED- green

Adjustment	Notes
Press Select button (1)	The amplifier is now able to accept adjustments to the ramp rate. The Status LED will stop flashing during this adjustment mode.
Adjust the ramp rate by using either the Ramp Increase (2) or Ramp Decrease (3) buttons	The Ramp LEDs will illuminate as the Ramp Increase or Ramp Decrease buttons are activated
When the ramp adjustment is complete press the Select button (1) to store the ramp adjustment	This enters the adjusted Ramp Values into the amplifier memory. The Status LED will begin flashing to indicate that normal operating mode has been resumed.

**Note:** If you wish to exit the ramp adjustment mode without storing the ramp settings then switch off power to amplifier. The amplifier will return to previously stored settings.

### 4.3 When refitting the amplifier lid ensure that the seal is fitted correctly and is not damaged. The amplifier lid screws should be tightened to 0,7-0,9 Nm (6.20-7.97 lbf in).

## 5. Diagnostics

LED	Status
Green status LED (4) Flashes with 1 HZ	Supply voltage is within range
Green status LED (4) Flashes with 2 HZ	Supply voltage is out of range, <22V or >24V
Green status LED (7) on	drive stage for solenoid A active (connector side)
Green status LED (6) on	drive stage for solenoid B active (side opposite to connector)
Red store LED (5) on	Input current on 4 mA...20mA version is <2 mA or >22mA

## 6. Further information

Publication available on request.

### Valve technical catalogs

Model type	Catalog
KCG-3	2162
KBCG-3	V-VLPO-MC002-E
KCG-6/8	2324
KBCG-6/8	V-VLPO-MC003-E
KX(C)G-6/8	2322
KBX(C)G-6/8	V-VLPO-MC004-E

### Drive amplifiers for KCG-3, KCG-6/8, KX(C)G-6/8 valves

Amplifier type	Function	Catalog
EEA-PAM-513-A-33	Basic	2464
EEA-PAM-513-B-33	2 ramps, 4 command signals	2472
EEA-PAM-513-D-33	PID control	2474

### Rail-mounted, snap-on auxiliary electronic control modules, for use with KB-valves

Model type	Function	Catalog
EHD-DSG-201-A-10	Command signal generator	2470
EHD-PID-201-A-20	PID control	2427A

