

Installation and start-up guidelines for Eaton™ proportional valves with integral amplifiers

KBD/TG4V-3 and KBDG5V-*-11 Series



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to meet specific standards outlined in the European Electromagnetic Compatibility Directive (EMC) 2014/30/EU which repealed Directive 2004/108/EC.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 The Eaton™ “KB-D/T” range of proportional valves allow direction and rate of hydraulic fluid flow in a system to be controlled by a voltage command signal applied directly to the integral amplifier.

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.

1.2



WARNING: This valve with its integral electronic amplifier was factory tested prior to dispatch for conformance to the catalogued 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 catalogued performance limits.
- Incorrect electrical connections.
- Incorrect electrical control signals.

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

1.4 For further information

*Proportional Valves with Integral Amplifiers see catalogs V-VLPO-MC001-E1, V-VLDI-MC014-E1.

2. Valve for new application

2.1 Installation

- 2.1.1 The valve can be mounted in any attitude but the piping must be arranged to ensure that the valve is kept full of fluid at all times.
- 2.1.2 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. This applies also to any intermediate “stacking/sandwich” valves which may be used.
- 2.1.3 Size O3 valves have a locating pin between ports P & B in their bottom face. This ensures that the valve is correctly oriented on the mounting face, which should contain a mating hole.
- 2.1.4 Install the valve and any intermediate “stacking/sandwich” valves on the mounting surface and secure them with bolts with torque to class 12.9 (ISO 898) or better. Torque bolts according to the following recommendations. For details of available Eaton™ bolt kits see catalog 2314A “Fixing bolt kits”.

VALVE	Clamping height mm (in)	Bolts/studs for mounting surface	
		ISO 4401 (torque)	ANSI/B93.7M (torque)
KBD/T-3	21 (0.82)	4 x M5-6g (7-9 Nm)	4 x #10-24 UNC-31 (962-76 lbf in)
KBDG5V5	30(1.18)	4 x M6-6g	4 x 1/4" - 20 UNC-3A
KBDG5V7	33 (1.3)	4 x M10	4 x 3/8" - 16 UNC
KBDG5V8	42,5 (1.67)	6 x M12	6 x 1/2" - 13 UNC
KBDG5V10	35 (1.38)	6 x M20	6 x 3/4" - 10 UNC-28

- Minimum actual bolt lengths are the sum of relevant clamping heights plus the minimum engagement lengths in ferrous materials - see table below:

Metric		Inch	
Bolt size	Min. Engagement	Bolt size	Min. Engagement
M5	10 mm	#10-24	0.39"
M6	10 mm	1/4"	0.39"
M10	13 mm	3/8"	0.52"
M20	35 mm	3/4"	1.38"

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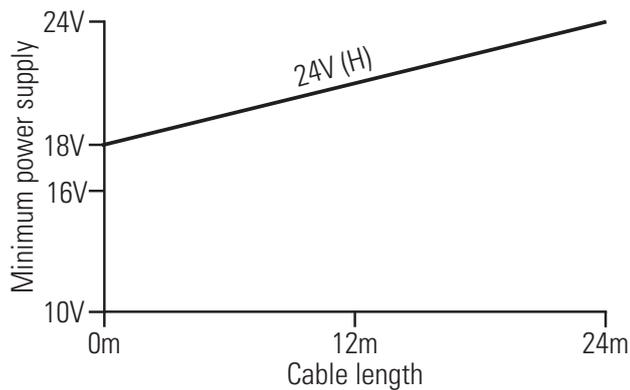
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2.1.5 Electrical Connections

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 product is offered by RS components (stock No 368-390) and consists of 3 pairs of 7/0.254 mm² (22 AWG) and one pair of 7/0.32 mm² (20 AWG) plain copper conductors with polyethylene insulation. Each pair is wrapped in an aluminized tape. The pairs are placed around a central drain wire with a tinned copper overall braid and gray PVC sheath (10 mm overall dia).



For additional wiring information, see installation & wiring guidelines GB-2468A.

Command signals and outputs

7-pin plug		Flow direction		
Command = Volts(±10V)	Pin D	Pin E		
	Positive	0V	P to A	
$V_D V_E = \text{Positive}$	0V	Negative		
	Negative	0V	P to B	
$V_D V_E = \text{Negative}$	0V	Positive		
	Pin D	Pin B	Pin E	Flow direction
Command = Current (4-20 mA)	More than 12 mA	Current GND	Current return	P to A
	Less than 12 mA	Current GND	Current return	P to B



WARNING

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

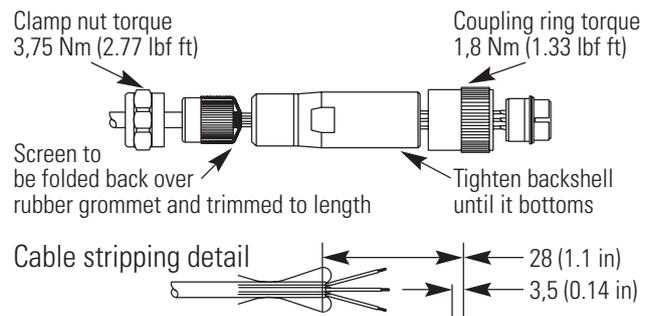
1) Eaton™ part no. 934939 which also gives environmental protection to IP67 when tightened with a torque of 2-2,5 Nm (1.5-2.0 lbf ft).

2) ITT -Cannon part no. CA 06 COM-E 14S A7 S (not available from Eaton hydraulics).

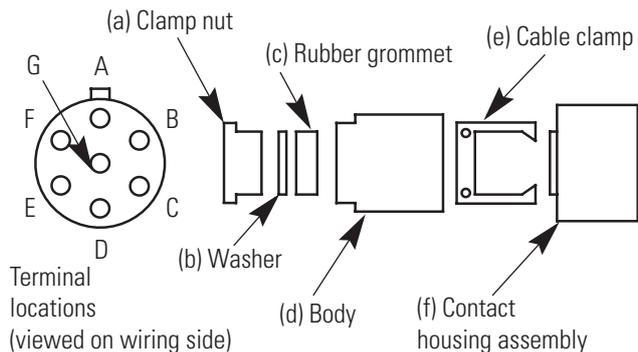
The plastic plug part no. 694534 is only suitable for use in a sealed electromagnetic environment or outside of the European Community.

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.



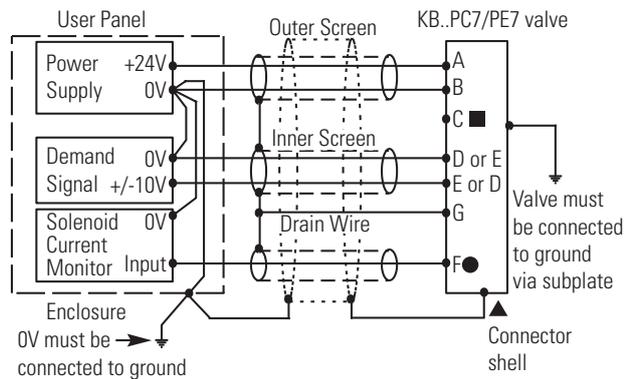
Assembly instructions for plastic plug part number 694534



Wiring assembly procedure

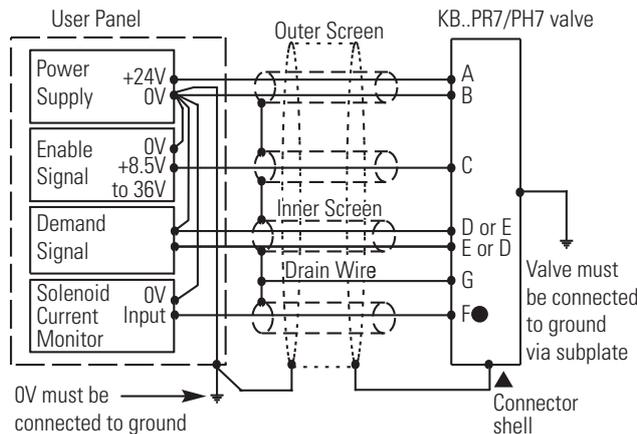
- Lead the cable through items a, b, c, d and e.
- Make soldered connections to plug terminals:
 - Pin A Power supply
 - Pin B Power supply 0V and current command return
 - Pin C Enable input (PH7 & PR7 options)
 - Pin D Command signal (+V or current in)
 - Pin E Command signal (-V or current GND)
 -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

2.1.6 Power and signal levels

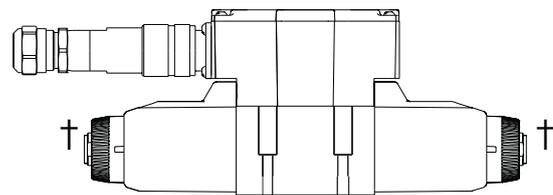
- Power supply24V DC (22 to 36V including 10% peak-to-peak ripple)
- Command signal+/-10V or 4-20 mA (model code option)
- Monitor signalH option coil = 1.7V per amp solenoid current output impedance 10 kΩ

2.2 Start-up

2.2.1 Single-stage valves

1. Switch power on.
2. The valve response to a command signal can be monitored via the connection from plug pin F (for pin F voltages, see 2.1.6). If monitor signal does not follow command signal, check command signal connections to amplifier.

2.2.2 It is advisable to bleed air from the solenoids of these valves. slacken bleed screws (counter-clockwise) until fluid starts to escape. Allow fluid to continue to escape until it is seen to be free of air bubbles. The higher the pressures at the tank port, the faster this process.



† Bleed screw locations. Re-tighten the screws to the following torque values: 6,5 - 7,5 Nm (57-66 lbf ft).

2.2.3 Two-stage valves

The procedure for bleeding the air for the single stage valves (section 2.2.2 above) can be applied to the two stage valves provided that the valve is supplied with hydraulic pilot pressure.

- EX models (external Pilot supply): pressure at X port = 50 bar (725 psi) minimum
- X models (internal pilot supply): pressure at P port = 50 bar (725 psi) minimum

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.
- Any 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 2.1.1.
- 3.1.6 As 2.1.2.
- 3.1.7 Install the new valve using the existing bolts and electrical plugs if in good condition. If not, refer to sections 2.1.4 and 2.1.5 respectively.

3.2 Re-start-up

- 3.2.1 Restore the application to its state immediately prior to section 3.1.1.
- 3.2.2 After initial start-up of the repaired system, bleed the new valve as in section 2.2.2.
- 3.2.3 Proceed as for new valve (sections 2.2.1).

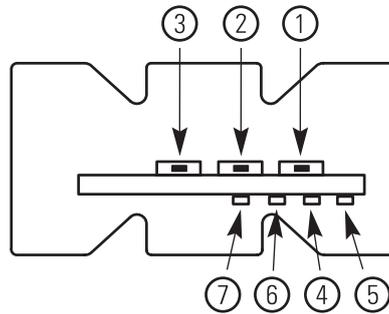
4. Ramp adjustment

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 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

