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**GB Installation and Start-up Guidelines for KBS/KBH AxisPro™**

**CE** This product has been designed and tested to comply with the provisions of European Directive 2014/30/EU and Harmonized Standards BS EN 61326-1:2006 Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements. For instructions on installation requirements to achieve effective protection levels, see this leaflet and the Installation Wiring Practices for Electronic Products, leaflet 2468. Wiring practices relevant to the Directive are indicated by ▲. Electromagnetic Compatibility (EMC). Eaton Hydraulics Operations Europe Route de la Longeraie 7 1110 Morges Switzerland Tel: +41 (0) 21 811 4600 Fax: +41 (0) 21 911 4601

**1. Introduction**

**1.1** When supplied with 24V DC power, the Eaton KBS/KBH series of proportional valves allows direction and rate of hydraulic fluid flow in a system to be controlled by a 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.

The KBS/KBH series of valves are available in a wide range of flow and performance capability.

**▲ 1.2 WARNING** This valve with its integral electronic amplifier 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.

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

In addition, be aware that after initial installation the valve has the capability to be reconfigured for various voltage and current command options or other model code options. If reconfigured, the model code may not match to the one originally supplied.

**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. This applies particularly to port T.

**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 3, 7, 8, and 10 valves have a locating pin(s) 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 on the mounting surface and secure them with bolts to class 12.9-ISO 898 (Alloy Steel, Rc 38-43, grade 8). The supplied shipping bolts meet this requirement. Torque bolts according to the following recommendations. Bolt thread tolerance class must match mating internal thread tolerance class (ex: use -g6 bolts with -H7 threads; use UNC-3A bolts with UNC-3B threads).

Valve	Minimum Bolt Length* mm (in)	Bolts/Studs for Mounting Surface: ISO 4401 (torque)**	ANSI/B93.7M (torque)**
KBS*-03	30 (1.25)	4x M5 (7-9 Nm)	4x #10-24 UNC (60-80 in-lbs)
KBS*-05	40 (1.625)	4x M6 (11-15 Nm)	4x ¼" -20 UNC (100-130 in-lbs)
KBH*-05	40 (1.625)	4x M6 (11-15 Nm)	4x ¼" -20 UNC (100-130 in-lbs)
KBH*-07	50 (2.0)	4x M10 (50-60 Nm) 2x M6 (11-15 Nm)	4x 3/8" -16 UNC (36-43 ft-lbs) 2x 1/4" -20 UNC (100-130 in-lbs)
KBH*-08	60 (2.25)	6x M12 (100-130 Nm)	6x 1/2" -13 UNC (70-90 ft-lbs)
KBH*-10	90 (3.5)	6x M20 (340-560 Nm)	6x 3/4" -10 UNC (250-300 ft-lbs)

\* Minimum bolt length is the sum of the valve body clamping height plus the minimum thread engagement in ferrous materials.

\*\* Reduce torque by 20% for lubricated threads.

**2.1.5 Fluid Cleanliness Point**

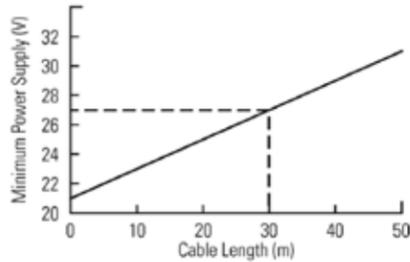
The following recommendations are based on ISO cleanliness levels at 2 µm, 5 µm and 15 µm. The recommended level is: 17/15/12

**2.1.6 Primary Connector**

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

The maximum recommended cable length is 30 metres. The minimum power supply voltage under full load conditions should be as shown in the following graph. This will ensure that the minimum valve voltage is maintained at all times.

Recommended cable: Alpha# 58643, 16AWG 3 Pairs, Alpha# 2243C 18AWG 3 Pairs, Alpha# 58633, 18AWG 3 Pairs.

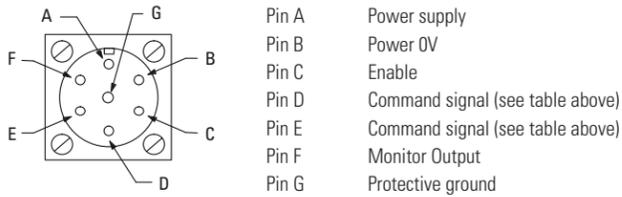


**Command Signals and Outputs, Voltage Command**

7-pin plug		Flow direction
Pin D	Pin E	
Positive 0V	0V	P to A
U <sub>0</sub> - U <sub>E</sub> = Positive	Negative	
Negative 0V	0V	P to B
U <sub>0</sub> - U <sub>E</sub> = Negative	Positive	

**Command Signals and Outputs, Current Command**

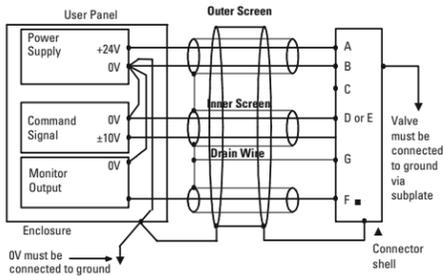
7-pin plug			
Pin D	Pin E	Pin B	Flow direction
More than 12 mA	Current return	Power ground	P to A
Less than 12 mA	Current return	Power ground	P to B



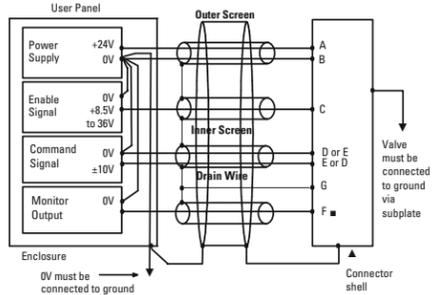
**Connections and Screening**

Connections and Screening must be used with specification

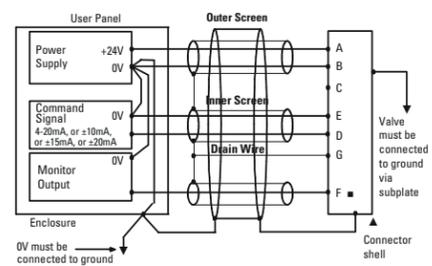
**Voltage Command/Feedback**



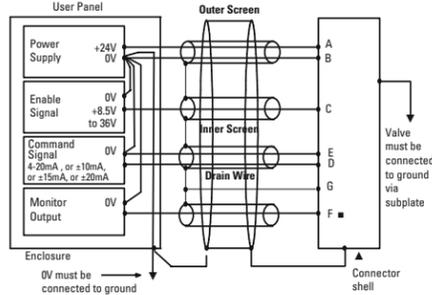
**Voltage Command/Feedback with Enable Wiring**



**Current Command/Feedback**



**Current Command/Feedback with Enable Wiring**



■ Monitor output [pin F] will be referenced to the KBS/KBH valve power 0V [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.

**Warning: Electromagnetic Compatibility (EMC)**

It is necessary to ensure that the unit is wired up as above. For effective protection of the user's 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 source of electromagnetic radiation such as cables carrying heavy current, relays and certain kinds of portable radio transmitters, etc. Difficult environments could mean that extra screening may be necessary to avoid the interference.

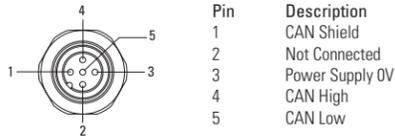
It is important to connect the 0V lines as shown above. The multi-core cable should have at least two screens to separate the command signal and monitor output from the power lines. The enable line to pin C should be outside the screen which contains the demand signal cables.

To avoid conducted EMI disturbance in other connected systems, ensure to use a dedicated power supply for the KB valves.

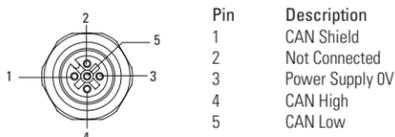
**2.1.7 CANbus Connector**

Wiring instructions and connector pinning for CANbus:

**M12 5-pin CAN Connector (Male)**



**M12 5-pin CAN Connector (Female)**

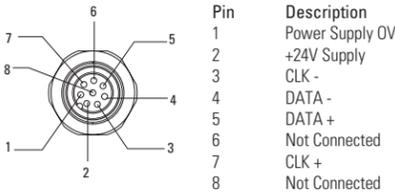


1. To ensure EMI protection use only metal shielded mating connectors.
2. Use only shielded twisted pair (STP) cables for mating connection.
3. The CANbus termination resistor is not installed in the valve. Use a 120 ohm termination resistor on both ends of the cable to realize a cable impedance of 60 ohms.

**2.1.8 External Sensor Connector (Digital)**

Wiring instructions and connector pinning for SSI connector:

**8-pin SSI Connector**



1. To ensure EMI protection use only metal shielded mating connectors.
2. 24V to Power supply 0V (pin 2, 1) is short circuit protected (max current 0.75A).
3. Use only shielded twisted pair (STP) cables for mating connection.

**2.1.9 External Sensor Connector (Analog)**

Wiring instructions and connector pinning for analog sensor connector:

8-pin External Sensor Signal Conditioner	Pin	Description
1	1	Speed Sensor Input1
2	2	Speed Sensor Input2
3	3	4-20 mA External Sensor Signal1
4	4	+15V Supply
5	5	4-20mA External Sensor Signal2
6	6	Power Supply 0V
7	7	4-20mA External Sensor Signal3
8	8	4-20mA External Sensor Signal4

1. To ensure EMI protection use only metal shielded mating connectors and shielded cables.
2. 15V to Power supply 0V (pin 4, 6) short circuit protected (max current 0.15A).

**2.1.10 Power and Signal Levels**

Power supply 24V DC (18V to 36V including 10% peak-to-peak max ripple) max current 3,7A  
Command signal options:

- 1 - +/- 10V voltage command signal
- 2 - 4-20mA current command signal
- 3 - +/- 10mA current command signal
- 4 - +/- 15mA current command signal
- 5 - +/- 20mA current command signal
- 9 - Command over Fieldbus

Monitor signal options:

- 1 - ±10V voltage feedback signal
- 2 - 4-20mA current feedback signal
- 9 - Feedback over Fieldbus

Voltage option require a minimum impedance of 10 Kohm

**Note:** Command/Feedback option 9 are not available with AxisPro™ KBS1 or KBH1 valve model.

**2.2 Start-up (Single Stage Valves)**

Valve models KBS/KBH can be checked for correct electrical functioning without any hydraulic supply:

**2.2.1** Switch power on and check that the voltage is within the above specification.

**2.2.2** The valve will respond to a command signal and can be monitored via the connection from the plug pin F.

**2.2.3** If monitor signal does not follow command signal, check command signal connections to amplifier.

**2.2.4** When the valve is working and is fitted correctly, the hydraulic power to the system can be turned on in accordance with the system designer's instructions.

**2.2.5** For optimum performance any air should be bled from the valve. If the valve has a pressure of 2 bar (30 psi) or greater in the "T" port, then bleeding can be achieved by slackening the bleed screw(s) and allowing fluid to escape until it is seen to be free of air bubbles. A higher pressure will make the bleeding process faster.

If the pressure in the "T" port is too low to bleed the valve, an alternative method can be used. Remove the bleed screw(s) completely and pump clean oil into the valve using a suitable force feed oil can until the valve is completely free of air. Replace the bleed screws and torque tighten to 2.5-3.0 Nm (2.0-2.5 lbf-ft).

**2.3 Start-up (2 Stage Valves)**

All the procedures for single-stage valves from 2.2 above can be applied to 2-stage valves provided that the valve is supplied with hydraulic pilot pressure (without pilot pressure, the valve main-stage spool will remain in its center position).

**2.3.1** Pilot pressure, at port X for "external pilot supply" ("EX" or "ES" in valve model code) or port P for "internal pilot supply" ("TS" or "TX" in valve model code); KBH models - 50 bar (725 psi) minimum.

**2.3.2** For optimum performance any air should be bled from the valve. If the valve has a pressure of 2 bar (30 psi) or greater in the "X" port, then bleeding can be achieved by slackening the bleed screw(s) and allowing fluid to escape until it is seen to be free of air bubbles. A higher pressure will make the bleeding process faster. If the pressure in the "X" port is too low to bleed the valve, an alternative method can be used. Remove the bleed screw(s) completely and pump clean oil into the valve using a suitable force feed oil can until the valve is completely free of air. Replace the bleed screws and torque tighten to 2,5-3,0 Nm (2,0-2,5 lbf ft).

**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** Install the new valve using the existing bolts and electrical plugs if in good condition. If not, replace parts appropriately.

**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)

**3.2.3** Configure level 2 and above valves to suit the application. Refer to the AxisPro™ user manual for detailed information.