



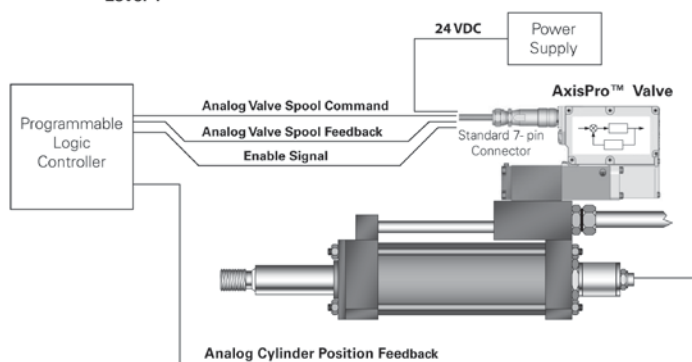
*Powering Business Worldwide*

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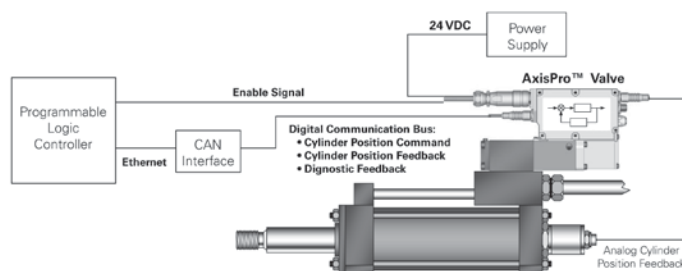
**AxisPro™ is a game changing machine control valve. Its embedded intelligence simplifies traditionally complex control practices. Plug and play design reduces machine build time, and its ability to predict potential maintenance issues increases machine reliability.**

**Example Use Case Level 1**



AxisPro level 1 KBH valves, can be used to control machine motions in open loop or closed loop control applications. The valve receives its analog command input on the 7-pin, main, connector from an external axis control device.

**Example Use Case Level 2 and 3**



AxisPro level 2 KBH valves, can be used to control machine motion in open or closed loop control applications. The valve can receive its analog command input on the 7-pin connector from an external axis control device or, with the available on-board motion control feature activated (via Eaton Pro-FX Configure), can close the external control loop around the actuator on the valve (taking feedback signal from cylinder or motor) – eliminating the separate motion controller. In this case the AxisPro valve receives a position, speed or force command and will create its own valve command needed to comply with the requested machine motion. In addition, digital communications over the CANopen bus is available for machine control or monitoring purposes.

# Introduction

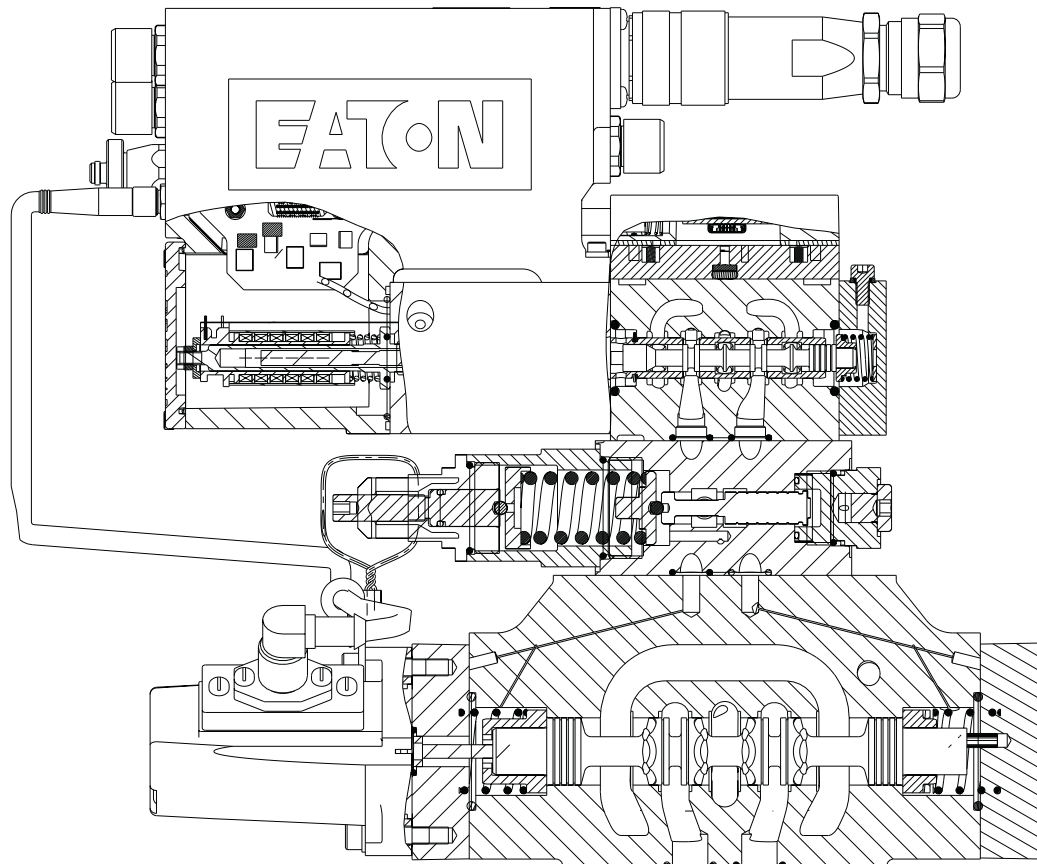
## General Description

Built on the proven KBH servo Proportional Valve technology, Eaton's new AxisPro™ Proportional Valve provides a range of controls capability in a modular design. These solenoid operated proportional valves offer high dynamic performance which enables them to be used in closed-loop control applications.

## Unique benefits from AxisPro

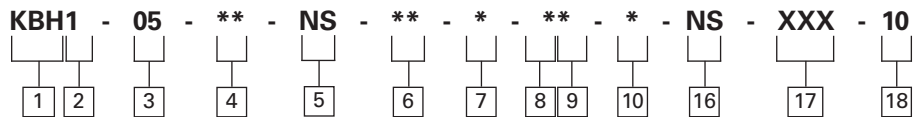
Reliable, extended uptime is enabled by valve and systems diagnostics capability. LED lens provides on-valve diagnostics information for level-1 valves. Access to systems and machine health data can be made available via CANopen networked valves and systems data collected from external sensors input to level-2 valves.

Leverage inventory of AxisPro valves by configuration through software. One valve SKU can serve multiple needs: Level-1 valves can be configured via Eaton's Pro-FX™ Configure software tool for optional command signal: Voltage or current, as well as activating the "enable"-pin. Level-2 valves can also have CAN bus activated and control modes selected and configured: VSC for valve-spool control, or for axis-control drive modes: DPC Cylinder position control, DSC Speed control, DFP Force/Pressure control, DPQ Pressure/Flow control. User applications can be developed in Eaton's Pro-FX Control software tool, which is based on the popular CODESYS development environment. This feature is available option on level-2 valves allowing the use of pre-developed motion control blocks from Eaton's Pro-FX Control library or custom developed solutions that can be loaded into a "white space" reserved in the on-board controller memory.



KBH\*-05

# Model Code



## 1 Valve Type

**KBH** – Two stage servo performance proportional valve with integral amplifier and electronic feedback

## 2 1 – Level 1

## 3 Interface

**05** – ISO 4401, Size 5

## 4 Spool/Sleeve

### Size 5

**01** – 2C95N - overlapped, P,A,B,T blocked

**02** – 5C97N - zero lapped;

**03** – 33C80N - P blocked, A & B to tank

**04** – 2C90N60 - overlapped, P,A,B,T blocked, asymmetric

**05** - 5C90N55 - zero lapped, asymmetric

**06** – 33C80N50 - P blocked, A & B to tank, asymmetric

**07** –PQ87F - Pressure flow control spoo

**08** –2C70N45 - overlapped, P,A,B,T blocked, asymmetric

## 5 Valve Special Feature

**NS** – Not Selected

## 6 Pilot Supply

**TS** – Internal supply without pressure reducer

**ES** – External supply without pressure reducer

**TX** – Internal supply with pressure reducer

**EX** – External supply with pressure reducer

## 7 Pilot Drain

**T** – Internal Drain

**D** – External Drain

## 8 Command Signal

**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 Monitor Output

**1** – ±10V voltage feedback signal

**2** – 4-20mA current feedback signal

## 10 Electrical Connection

**C** – 7 pin connector without plug

**E** – 7 pin connector with plug

**H** – As E but with pin “C” used for enable signal

**R** – As C but with pin “C” used for enable signal

## 16 Electronics Special Feature

**NS** – Not selected

## 17 Software Revision

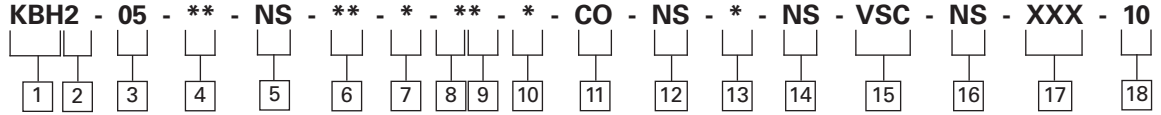
**XXX** – Software revision

## 18 Design Number

10 series.

To find available product configurations go to [www.eaton.com/AxisPro](http://www.eaton.com/AxisPro)

# Model Code



**2** – Level 1 plus Network enabled and DS408 control modes

## 8 Command Signal

**1** – +/- 10V voltage command signal

Note: Command signal is shipped with 1 configuration. You may configure to other command signal options using Pro-FX: Configure software.

**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

## 9 Monitor Output

**1** – ±10V voltage feedback signal

**Note:** Monitor Output is shipped with 1 setting. You

may configure to other monitor signal options using Pro-FX: Configure software.

**2** – 4-20mA current feedback signal

**9** – Feedback over Fieldbus

## 11 Digital Communication Interface

**CO** – CANOpen

## 12 Pilot Valve Sensors

**NS** – Not Selected

**PS** – Pilot Pressure and Temperature Sensors

## 13 External Sensor

**A** – 4 4-20mA external sensor analog inputs and 2 discrete inputs

**D** – 1 SSI external digital sensor input

## 14 Custom Application Programming Space

**NS** – Not Selected

**CW** – Codesys White Space

## 15 Control Mode

**VSC** - Valve spool position control

**Note:** Control Mode is shipped in valve spool closed loop position control (VSC) configuration. You may reconfigure to other command signal options using Pro-FX: Configure software.

**DPC** - DS408 Drive Position Control Mode Enabled

**DSC** - DS408 Drive Speed Control Mode Enabled

**DFF** - DS408 Drive Force/Pressure Control Mode Enabled

**DPQ** - Eaton Custom Drive Pressure / Flow Control Mode Enabled

Refer to previous model code on page 4 for descriptions of other model code options

To find available product configurations go to [www.eaton.com/AxisPro](http://www.eaton.com/AxisPro)

# Spool Sleeve Details

Main-stage spool	Hydraulic symbol	Description	Flow ℓ/min@ Δ10 bar	Symmetric	Asymmetric	Notes
<b>SIZE 5</b>						
1		Overlapped, all ports block	95	√	-	Legacy 2C95N
2		Critically lapped	97	√	-	Legacy 5C97N
3		Overlapped, A,B,T connected	80	√	-	Legacy 33C80N
4		Overlapped, all ports block	90/60	-	√	Legacy 2C90N60
5		Critically lapped	80/55	-	√	Legacy 5C90N55
6		Overlapped, A,B,T connected	80/50	-	√	Legacy 33C80N50
7		see flow curves	-	-	-	Legacy PQ87F
8		Overlapped, all ports block	70/45	-	√	Legacy 2C70N45

# Spool Data

## Spool Symbols

### Application Notes

#### 1. Main-Spool Options

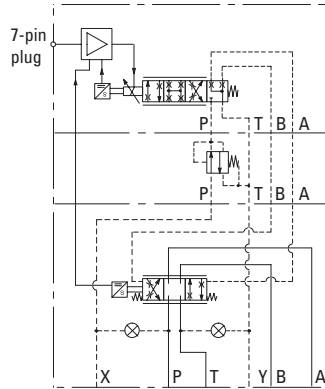
Spools shown are meter-in/meter-out types. Center-condition options are type 5C.

#### 2. Internally Piloted Models

Differ from detailed symbols above by omission of plug A and the blocking of port X by the mating surface.

#### 3. Internally Pilot Drain Models

Differ from detailed symbols above by omission of plug B and blocking of port Y by the mating surface.



### Spool Types and Flow Ratings

#### Symmetric Spools

Base line pressure drop  $\Delta p$  5 bar (72 psi) per metering flow path, e.g. B to T. For actual maximum flow refer to power capacity envelope curves.

**Note:** Valves with critically lapped spool are designed so that with the valve disabled the pressure in port B is at least twice that in port A (blocked ports).

## Pressure and Minimum Flow Rates

### 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
KBH*-05	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)

† Minimum recommended pilot operating pressure = 50 bar (700 psi)

\* Internal drain is a non-preferred option

♦ For pilot pressures  $\leq$  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

Model	Pilot pressure source †	Pilot drain connection	P Port	A&B Ports	T Port	X Port ♦	Y Port
KBH*-05	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)

† Minimum recommended pilot operating pressure = 50 bar (700 psi)

\* Internal drain is a non-preferred option

♦ For pilot pressures  $\leq$  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

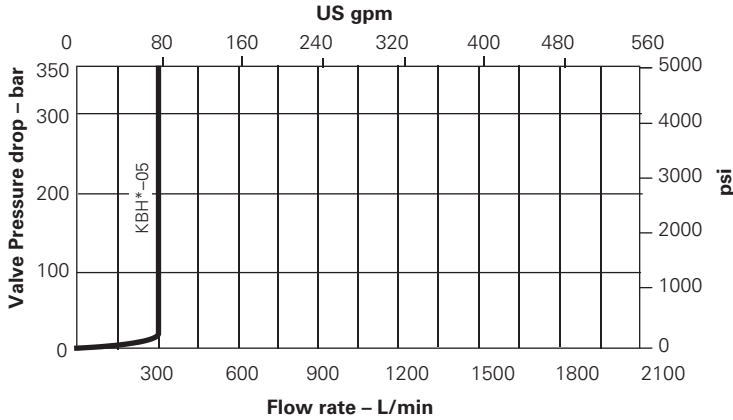
### Minimum Recommended Flow Rates

Valve Size/Spool Code	Min. Flow Rate L/min	in <sup>3</sup> /min
KBH*-05	0,5	30

# Performance Curves

## POWER CAPACITY ENVELOPE

Flow through P-A-B-T or P-B-A-T



## Flow again

At  $\Delta p = 5$  bar (72 psi) per metering (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  $\Delta p$  values, flow rates approximate to:  $Q_x = Q_D \sqrt{\frac{\Delta p_x}{\Delta p_D}}$

where Q = Datum flow rate

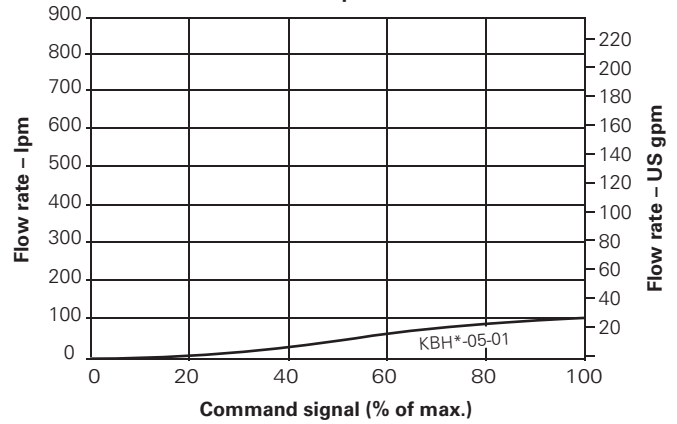
$\Delta p$  = Pressure drop at datum flow rate

$\Delta p$  = Required p

Limited by valve power capacity.

Refer to curves on page 9

## "08" Spool

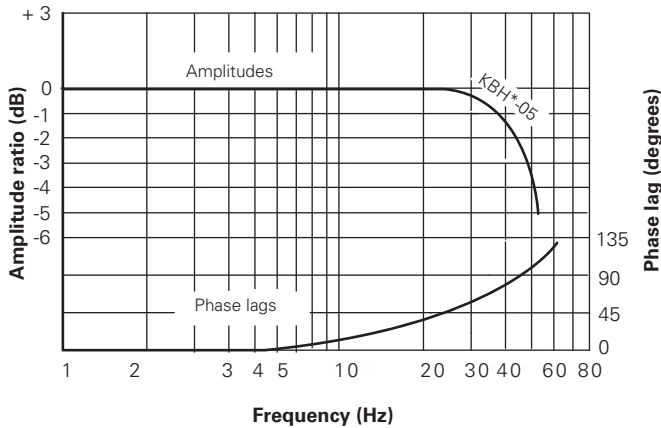


## FREQUENCY RESPONSE, TYPICAL

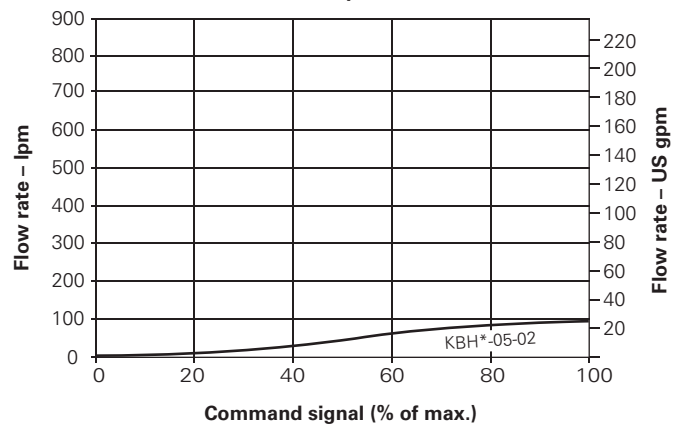
For an amplitude of  $50 \pm 25\%$  of rated flow (ISO 10770-1)

01 spool measured at  $\nu = 36$  cSt (168 SUS),

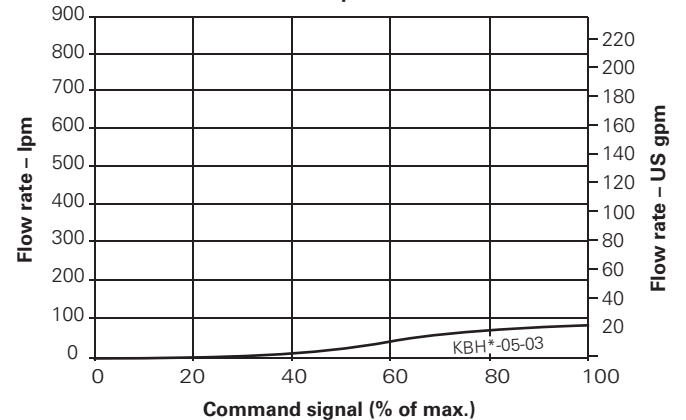
$t = 50^\circ\text{C}$  (122°F) and pilot pressure = 40 bar (with-reducer model)



## "02" Spool



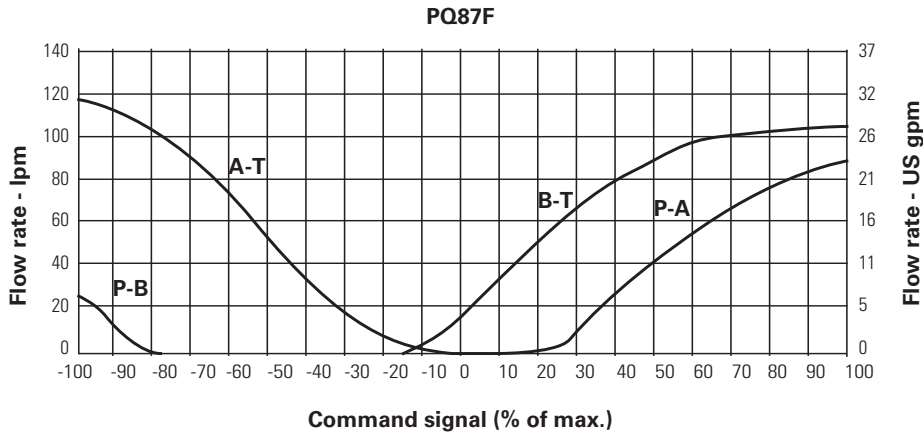
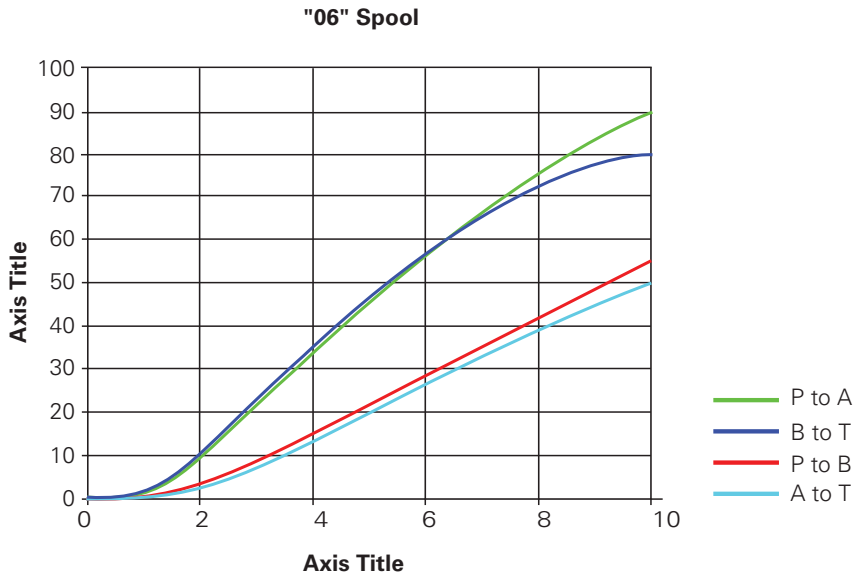
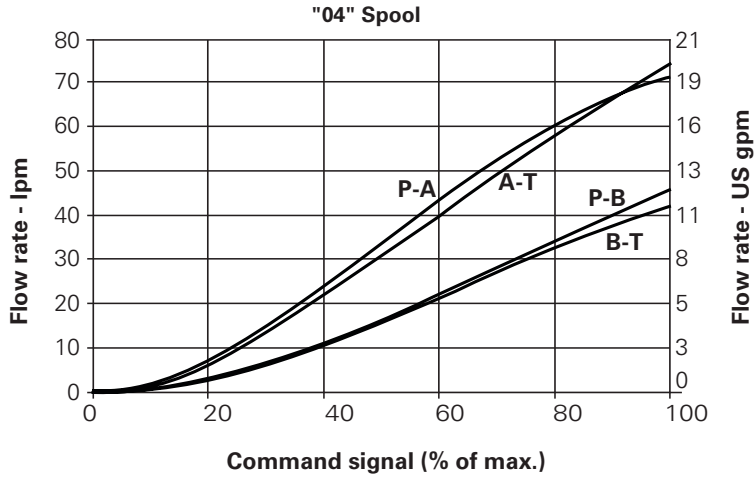
## "03" Spool





# Performance Curves

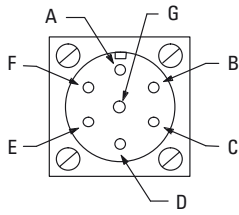
KBH\*-05



# Operating Data

## Connector Details

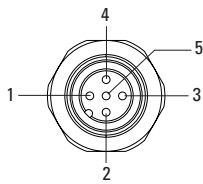
### 7-pin plug connector



Pin	Description
A	Power supply positive (+)
B	Power supply 0V and current command return
C	Not connected (Field 8 = C,E)
D	Valve enable (Field 8 = H,R)
E	Command signal (+V or current in)
F	Command signal (-V or current GND)
G	Output monitor
	Protective earth

Note:  
Present at location 1 of the electronics enclosure (see figure 1 below).  
To ensure EMI protection use only metal shielded mating connectors. Mating 7-pin (connector) is Eaton part number 934939

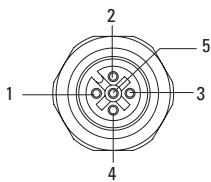
### M12 5-pin CAN Connector (Male)



Pin	Description
1	CAN shield
2	Not Connected
3	Power supply 0V
4	CAN High
5	CAN Low

Note:  
Present at location 2 and 4 of the electronics enclosure (see figure 1 below). Selection based on model code field number 9, present when CO option enabled.  
To ensure EMI protection use only metal shielded mating connectors  
Use only shielded twisted pair (STP) cables for mating connection.

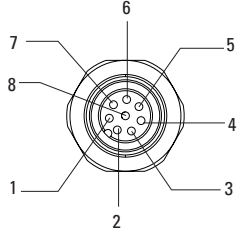
### M12 5-pin CAN Connector (Female)



Pin	Description
1	CAN shield
2	Not Connected
3	Power supply 0V
4	CAN High
5	CAN Low

Note:  
Present at location 5 of the electronics enclosure (see figure 1 below). Selection based on model code field number 9, present when CO option enabled.  
To ensure EMI protection use only metal shielded mating connectors  
Use only shielded twisted pair (STP) cables for mating connection.

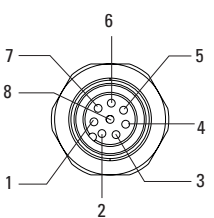
### M12 8-pin External Digital Sensor



Pin	Description
1	Power supply 0V
2	+24V Supply
3	CLK-
4	DATA-
5	DATA+
6	Not Connected
7	CLK+
8	Not Connected

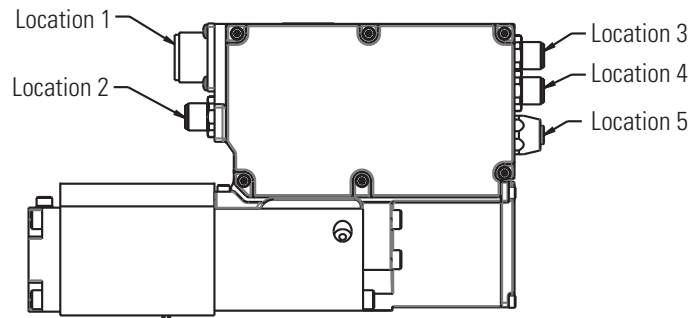
Note:  
Present at location 3 of the electronics enclosure (see figure 1 below). Selection based on model code field number 10, present when D option enabled.  
To ensure EMI protection use only metal shielded mating connectors  
24V to Power supply 0V (pin 2, 1) short circuit protected (max current 1.5 A).  
Use only shielded twisted pair (STP) cables for mating connection.

### M12 8-pin External Analog Sensor Port



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

Note:  
Present at location 3 of the electronics enclosure (see figure 1 below). Selection based on model code field number 10, present when A option enabled.  
To ensure EMI protection use only metal shielded mating connectors  
15V to Power supply 0V (pin 4, 6) short circuit protected (max current 500 mA).



**Figure 1**

Note: See above for connector plugs specifications.

# Operating Data

## Data is typical, with fluid at 32 cST (150 SUS) and 40°C (104°F)

Diagnostic	Color	Description
	A [Green]	Power
	B [Red]	CAN Error
	C [Green]	CAN Run
	D [Red]	Diagnostic
	E [Green]	Status
<p>Note:</p> <ol style="list-style-type: none"> <li>Figure to the left references the clear plastic window on the top of the valve.</li> <li>LED F (amber) will glow as a part of normal operation.</li> </ol>		
Electromagnetic compatibility (EMC):	IEC61326-2-1	
Monitor Points Signal:		
Voltage mode	±10V DC	
Current mode	4 to 20 mA	
Output impedance	10 kΩ	
Power stage PWM frequency	20 kHz nominal	
Reproducibility, valve-to-valve (at factory settings):		
Flow gain at 100% command signal	≤5%	
Protection:		
Electrical	Reverse polarity protected between pin A and B of the 7 pin plug connector	
Ambient air temperature range for full performance	-0°C to +70°C (+32°F to +158°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	-20°C (-4°F)	
Storage temperature range	-25°C to +85°C (-13°F to +185°F)	
Power supply	24V DC (18V to 36V including 10% peak-to-peak max ripple) max current 3,7A	
Command Signal:		
Voltage mode	-10V to +10V DC 13 bit resolution, ± 1%	
Input impedance	Field 8 = 1: 47kΩ, Field 6 = 2,3,4,5: 100Ω	
Voltage between Pin D and B	Field 8 = 1: 1.8v (max)	
Voltage between Pin E and B	Field 8 = 1: 1.8v (max)	
Current mode	Field 8 = 2,3,4,5: 13 bit resolution based on ±20mA , ± 1%	
Max differential voltage to pin E to pin B	Field 8 = 2,3,4,5: 100 mV	
Valve enable signal for model code H & R		
Enable Disable	Disable <6.5V; Enable Signal >8.5V (max 36V)	
Input impedance	10 kΩ	
Sensor Resolution:		
Ext. Sensor Port	4-20 mA: 0-20mA 12 bit resolution ± 1%, 3mA cable break detect, 22mA overcurrent detect. Speed, independent frequency mode: 10Hz to 100 kHz. Speed, incremental count and direction + frequency mode: signed 32bit count, 0 to 100 kHz. Speed, quadrature phase A&B + frequency mode: signed 32 bit count, 0 to 100 kHz. SSI: binary or gray code, 32bits max, adjustable resolution and zero offset.	
Integrated Pilot Pressure and Temperature Sensors	<p>Integrated PCB temperature sensor accuracy: ± 2°C For valves with "PS" Pressure Sensor option" Integrated pressure sensors on all ports Pressure sensor rated to 400bar Integrated pressure sensor accuracy: ± 0.5% of full scale Bandwidth: &gt;100 Hz Integrated temperature sensor on tank port Accuracy: ± 5°C Bandwidth: ~1 Hz</p>	
Amplifier Temperature Sensing	1°C (1.8°F) resolution, -25°C (-13°F) undertemp detect, 125°C (257°F) overtemp detect	
Power Supply Detect	18-36Vdc, 0.01 V resolution ± 1%, 19V under voltage detect, 36V overvoltage	

# Operating Data

## **KBS\*-05 Valves (all valves)**

Relative duty factor	Continuous rating (ED = 100%)
Hysteresis	<0.4%
Mass: kg (lb) approx.	
Valves with pressure reducer	10 kg (23 lb) approx
Valves without pressure reducer	9 kg (20 lb) approx
Environmental	IP65 and IP67 rated when using a similarly rated connector Location 2, 3, 4 and 5 connectors have IP65 and IP67 rated shipping covers

## **Step response:**

## **KBS\*-05**

Step, % Flow	ms
0% to 100%, 100% to 0%	24
10% to 90%, 90% to 10%	16
10% to -10%, -10% to 10%	14
25% to 75%, 75% to 25%	15

## **Parts Information:**

Interface Seal Kits	02-350686
Mating Electrical 7-pin Connector	934939

# Software Information

## KBH1

- Analog commanded spool control.
- Analog command source configuration options.
- Monitor output signal configuration options.
- Enable input signal enable/disable option.

## KBH2

- KBH1 capability.
- Sensor port configuration options. Configurable position, Speed, Pressure, Force and SSI Sensors.
- CANopen DS408 compliant control modes (device options vary per available hardware options).
  - valve spool position control (VPOC/VSC).
  - drive speed control (DSC).

- drive force/pressure control (DFPC/DFP).
- drive position control (DPC).
- drive pressure/flow control (Eaton DPQ).
- CANopen DSP306 compliant electronic data sheet (EDS).
- Diagnostic configuration options.
- Optional White Space
- Optional Pilot Pressure Sensors

All levels and models are compatible with the Eaton Pro-FX: For the latest revision, please visit [www.eaton.com/AxisPro](http://www.eaton.com/AxisPro)

## AxisPro test boxes



Part number: 107EC99004A

Hit the ground running.

Eaton offers test boxes that come with everything you need to communicate with your AxisPro valve right from your desk.

## Download Pro-Fx™, Technical Information and Support Materials from Eaton's Website:

<http://www.eaton.com/AxisPro>

Install the Eaton Pro-Fx™ Configure PC application tool. Installation is supported on a wide range of Windows based operating systems including Windows 7 32 bit and 64 bit.

The Pro-Fx™ configure installation provides several options for PC USB peripheral CANbus adapters supported by the software. During installation the user can choose to install drivers for an available CANbus adapter.

## Features:

- Power supply with wide range input (100V to 240V AC)
- Provision for +/-10V voltage command on the positive and negative valve command input
- Provision for +/-20mA current command
- Potentiometric knobs to set the command values
- Switch to drive the Enable signal
- Breakout bus bar to measure all voltages and currents on the 7 pin Amphenol connector

## Contents:

- Test box with command circuit, breakout terminals and switches
- Wide voltage power supply
- USB CANbus adapter for PC's, PCAN USB
- CAN bus cable M12-5pin to the Sub-D 9 (from the valve to the PC)
- Robust and watertight carrying case 27x24x17 (W x D x H)

The adapters supported by Pro-Fx™: Configure are:

- **PCAN-USB\*** PEAK-System Technik GmbH (<http://www.peak-system.com>)
- **ValueCAN** Intrepid Control Systems, Inc. (<http://www.intrepidcs.com>)
- **Leaf-Light** Kvaser AB (<http://www.kvaser.com>)

\* The PCAN-USB adapter is recommended for compatibility with Eaton Pro-Fx: Control development environment used with KBS4DGV-xxx and other Eaton Pro-Fx products.

# Electrical Information

## Block Diagram Voltage Input (Field 8 = 1)

Wiring connections must be made via the 7-pin plug mounted on the amplifier. See page 18 of this leaflet and Eaton's Installation Wiring Practices for Vickers™ Electronic Products, leaflet 2468. Recommended cable sizes are:

### Power cables:

For 24V supply  
 0.75 mm<sup>2</sup> (18 AWG) up to 20m (65 ft)  
 1.00 mm<sup>2</sup> (16 AWG) up to 40m (130 ft)

### Signal cables:

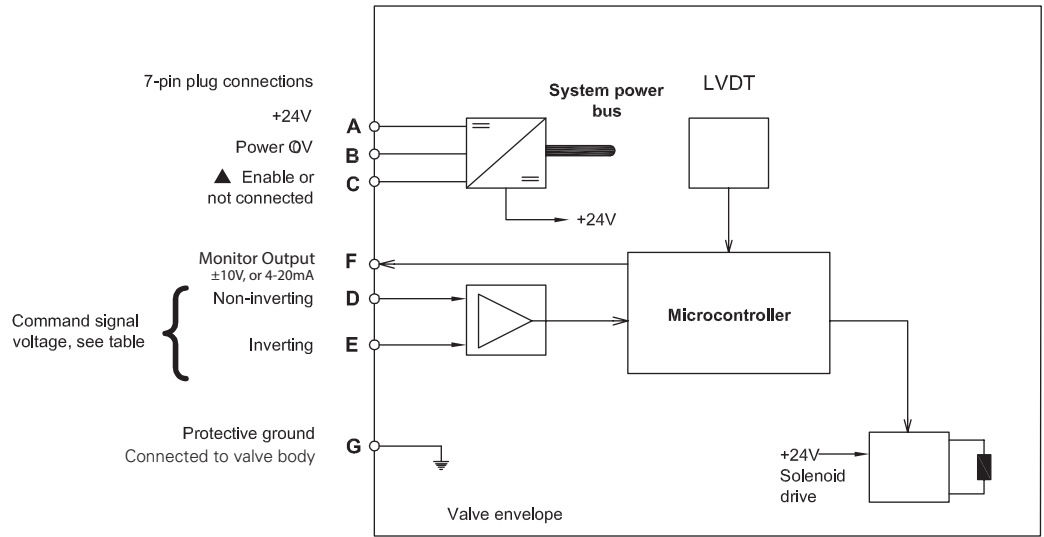
0.50 mm<sup>2</sup> (20 AWG)

### Screen (shield):

A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

Cable outside diameter 8.0 - 10.5 mm (0.31 - 0.41 inches)

See connection diagram on page 16.



▲ Pin C is used for a valve enable signal with electrical connections Field 8 = H or R.

## Command Signals and Outputs, Field 6 = 1

7-pin plug		Flow direction
Pin D	Pin E	
Positive	OV	P to A
OV	Negative	
$U_D - U_E = \text{Positive}$		
Negative	OV	P to B
OV	Positive	
$U_D - U_E = \text{Negative}$		

# Electrical Information

## Block Diagram Current Input (Field 8 = 2,3,4,5)

Wiring connections must be made via the 7-pin plug mounted on the amplifier. See page 19 of this leaflet and Eaton's Installation Wiring Practices for Vickers™ Electronic Products, leaflet 2468. Recommended cable sizes are:

### Power cables:

For 24V supply

0.75 mm<sup>2</sup> (18 AWG) up to 20m (65 ft)

1.00 mm<sup>2</sup> (16 AWG) up to 40m (130 ft)

### Signal cables:

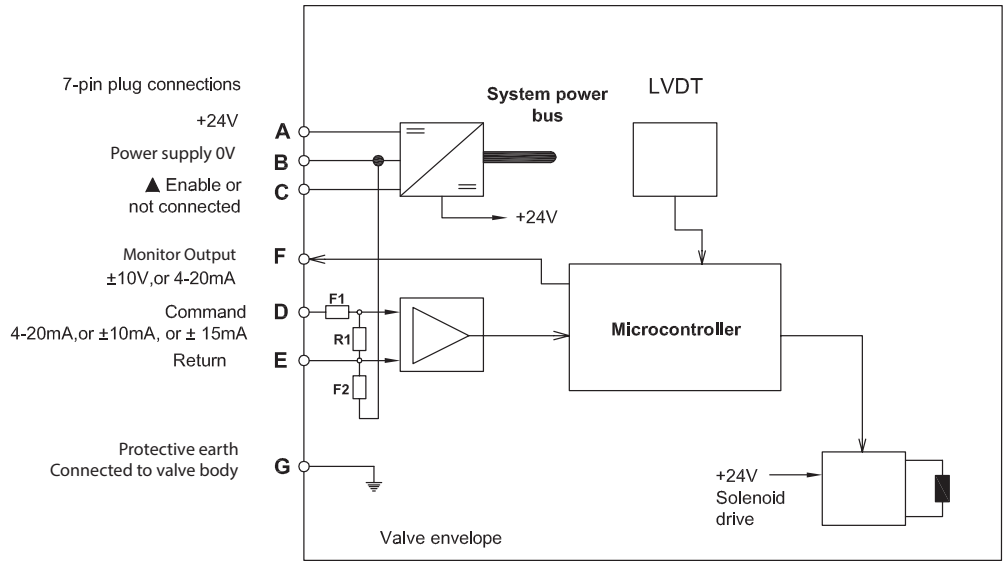
0.50 mm<sup>2</sup> (20 AWG)

### Screen (shield):

A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

Cable outside diameter 8.0 - 10.5 mm (0.31 - 0.41 inches)

See connection diagram on page 17.



▲ Pin C is used for a valve enable signal with electrical connections Field = H or R

R1 shunt resistor 100R

F1, F2 resettable fuse

### Command Signals and Outputs, Field 6 = 2

#### 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

### Command Signals and Outputs, Field 6 = 3,4,5

#### 7-pin plug

Pin D	Pin E	Pin B	Flow direction
More than 0 mA	Current return	Power ground	P to A
Less than 0 mA	Current return	Power ground	P to B



### Warning

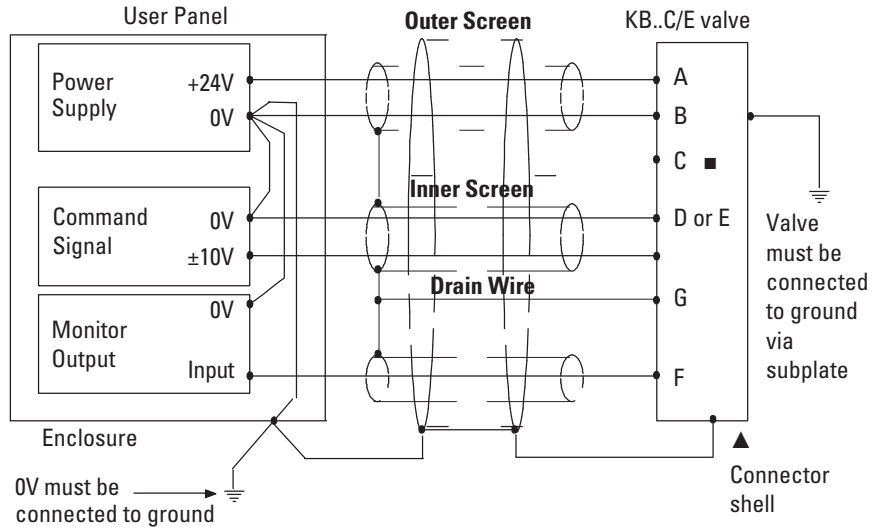
All power must be switched off before connecting/disconnecting any plugs.

# Electrical Information

## Wiring Connections

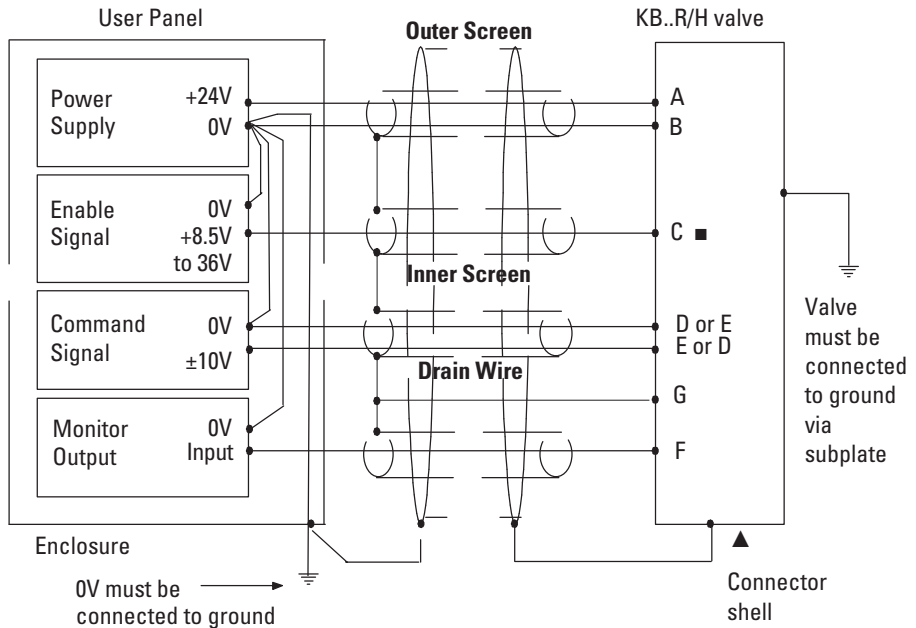
### Voltage Output (Field 9 = 1)

■ Spool position monitor voltage (pin F) will be referenced to the KB valve local ground (pin B).



### Wiring Connections for Voltage mode (Field 10 = R/H) Valves with Enable Feature

▲ 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 potentials will result in a screen (shield) ground loop.

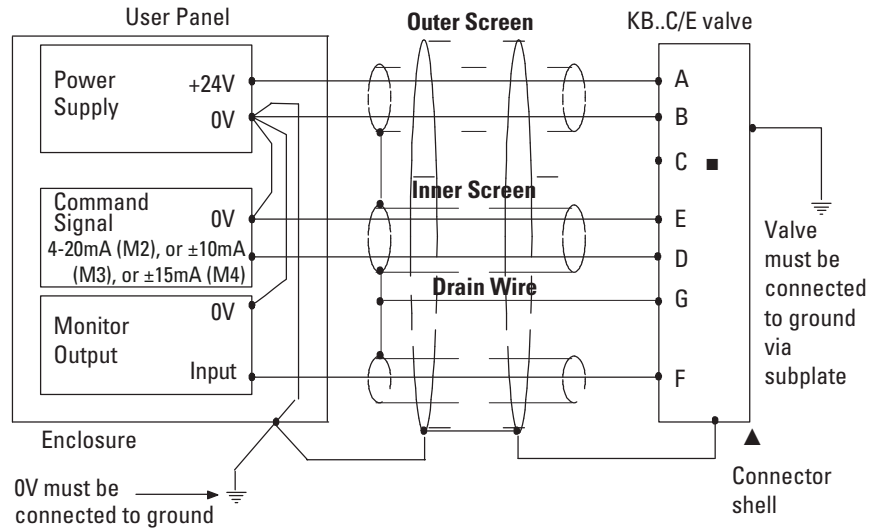




# Electrical Information

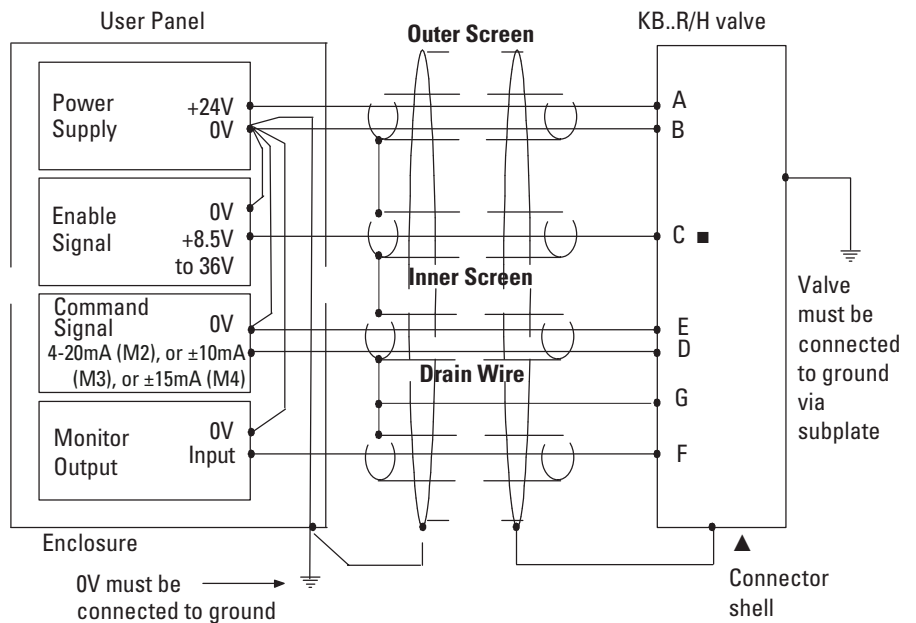
## Wiring Connections Current Output (Field 9 = 2)

■ Spool position monitor voltage (pin F) will be referenced to the KB valve local ground (pin B).



## Wiring Connections for Current mode (Field 10 = R/H) Valves with Enable Feature

▲ 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 potentials will result in a screen (shield) ground loop.



### Warning

Electromagnetic Compatibility (EMC) It is necessary to ensure that the valve is wired up as above. For effective protection of the user 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 sources 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 demand 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 ensure EMI protection use only metal shielded mating connectors.

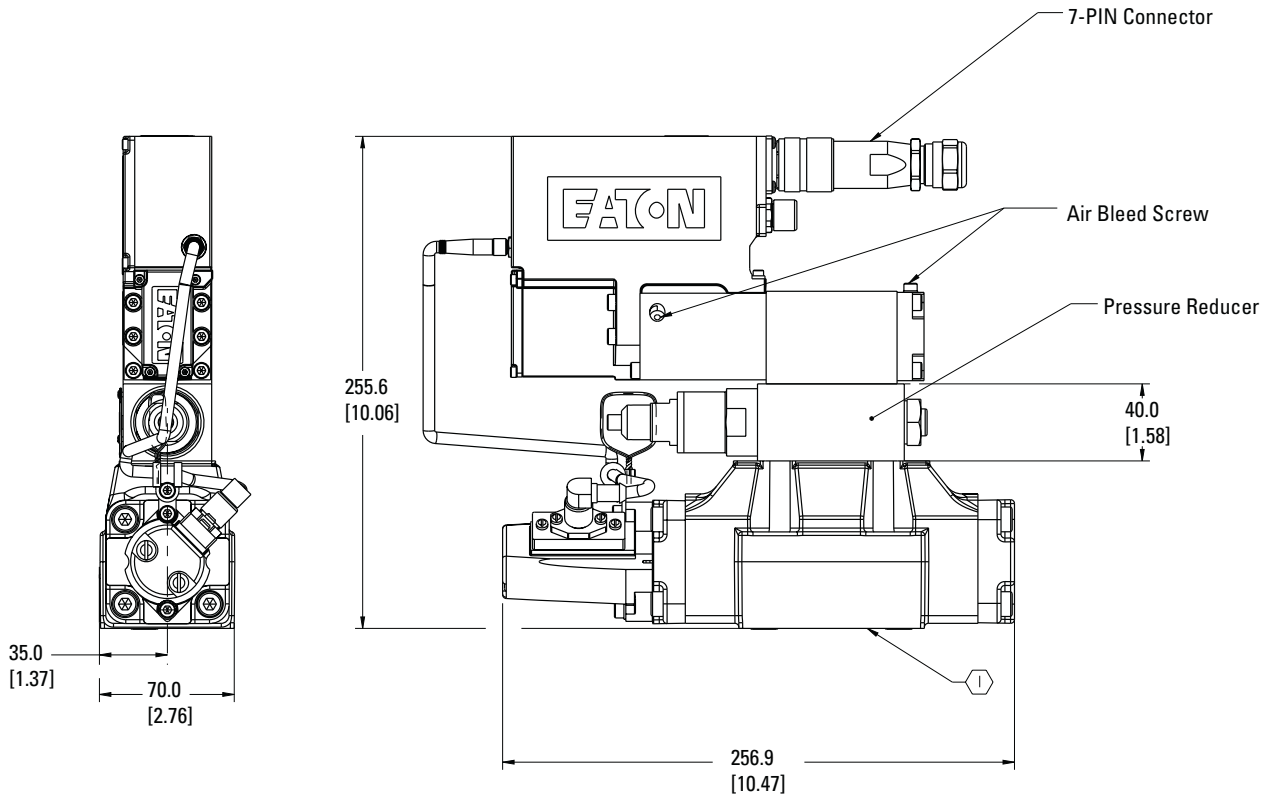
### Warning

All power must be switched off before connecting/disconnecting any plugs.

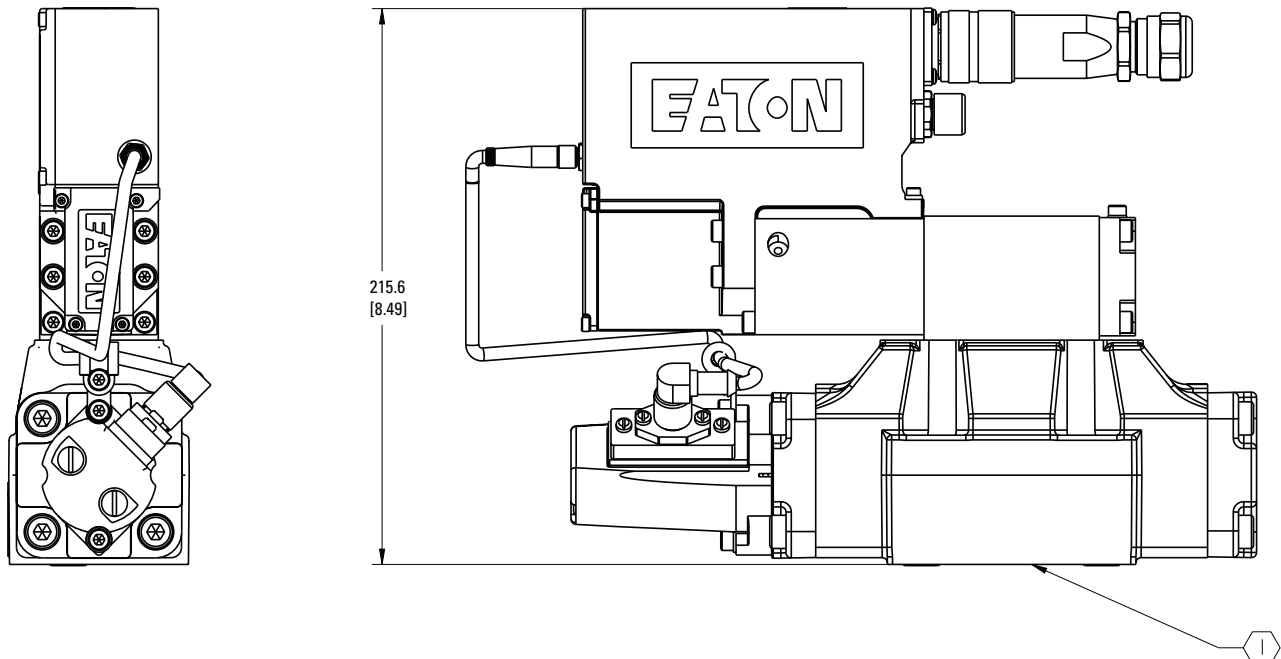
# Installation Dimensions

mm (inch)

## KBH1-05 with Pressure Reducer



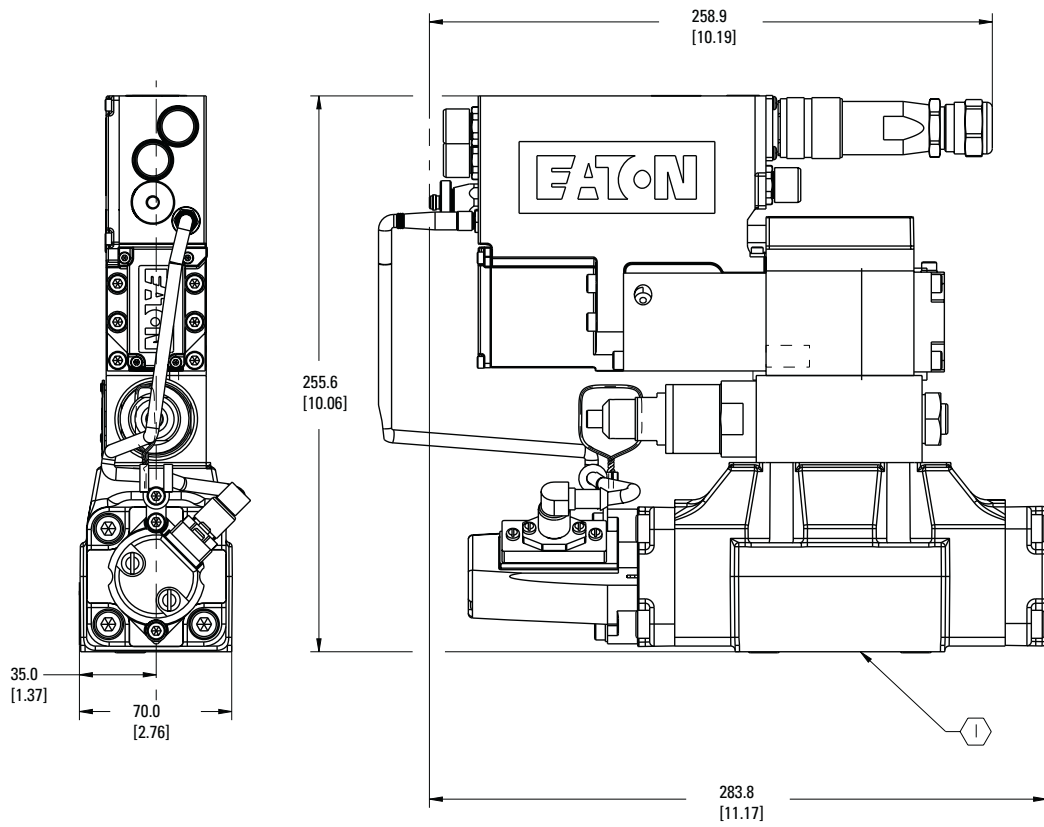
## KBH1-05 without Pressure Reducer



# Installation Dimensions

mm (inch)

## KBH2-05 with Reducer and Pilot Sensors



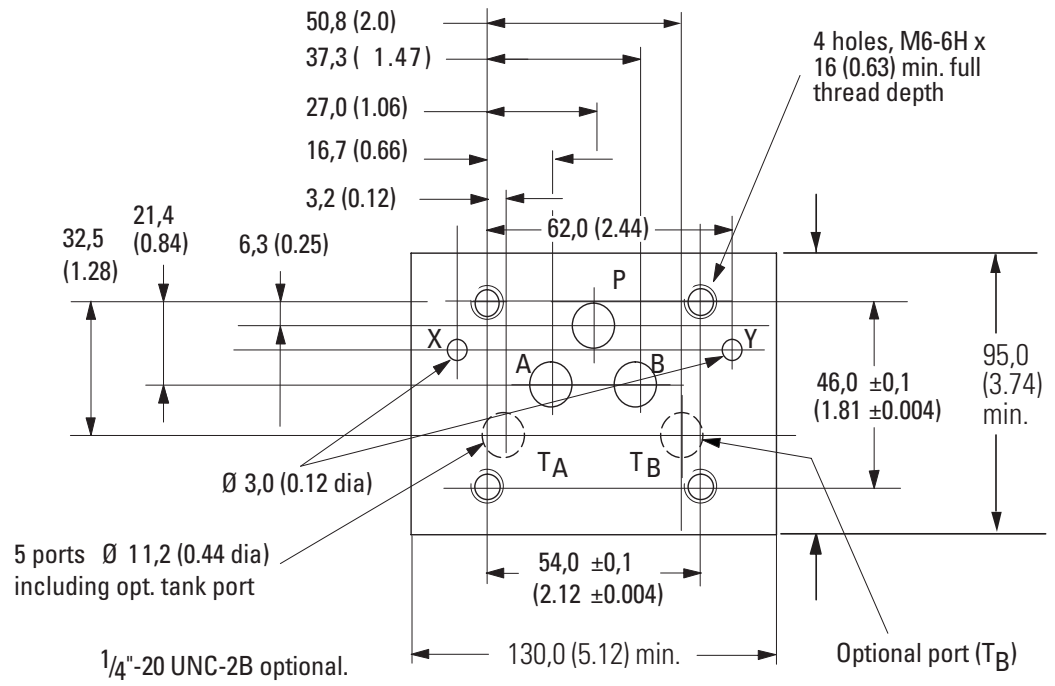
# Mounting Surfaces

## Mounting Surface Interface to ISO 4401 (Size 05)

This interface conforms to:  
ISO 4401-05-05-0-05

ANSI/B93.7M (and NFPA)  
size 05

CETOP R35H4.2-05  
DIN 24340 Form A10



# Application Data

## Fluid Cleanliness

Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials and additives for protection against wear of components, elevated viscosity and inclusion of air.

The following recommendations are based on ISO cleanliness levels at 2 µm, 5 µm and 15 µm. For products in this catalog the recommended levels are:

### 17/15/12

Eaton products, as any components, will operate with apparent satisfaction in fluids with higher cleanliness codes than those described. Other manufacturers will often recommend levels above those specified.

Experience has shown, however, that life of any hydraulic components is shortened in fluids with higher cleanliness codes than those listed above. These codes have been proven to provide a long trouble-free service life for the products shown, regardless of the manufacturer.

## Hydraulic Fluids

Materials and seals used in these valves are compatible with antiwear hydraulic oils, and aryl phosphate esters. The extreme operating viscosity range is 500 to 13 cSt (2270 to 70 SUS) but the recommended running range is 54 to 13 cSt (245 to 70 SUS).

## Installation

The proportional valves in this catalog can be mounted in any attitude, but it may be necessary in certain demanding applications, to ensure that the solenoids are kept full of hydraulic fluid. Good installation practice dictates that the tank port and any drain port are piped so as to keep the valves full of fluid once the system start-up has been completed.

## Service Information

The products from this range are preset at the factory for optimum performance; disassembling critical items would destroy these settings. It is therefore recommended that should any mechanical or electronic repair be necessary they should be returned to the nearest Eaton repair center.

The products will be refurbished as necessary and retested to specification before return. Field repair is restricted to the replacement of the seals.

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