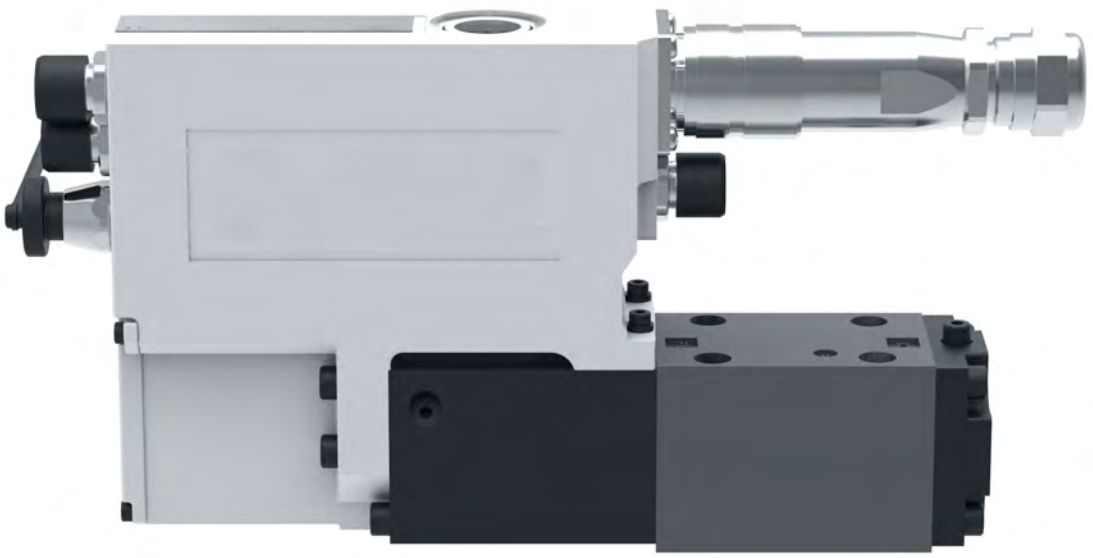
AxisPro®

# Servo-Performance Proportional Directional Valve

KBS*-03 11 Series



VICKERS by Danfoss

ENGINEERING TOMORROW

Danfoss

BC457503011221en-000103

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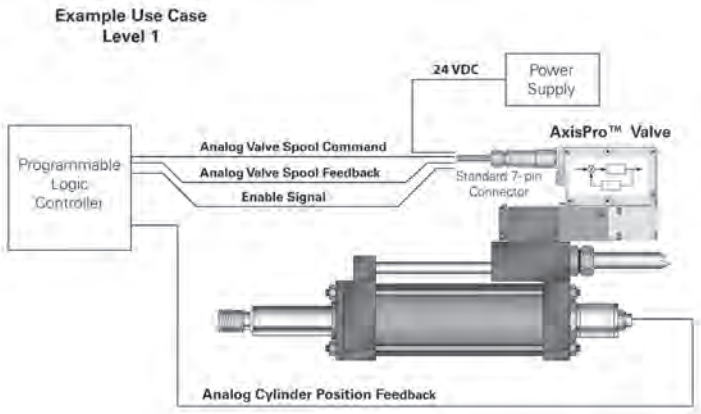
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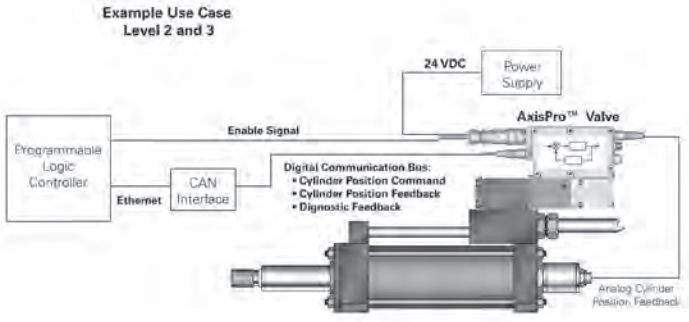
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**AxisPro is a game changing machine control valve. Its embedded intelligence simplifies traditionally complex control practices. Plug and play design reduces machine build time, and its ability to predict potential maintenance issues increases machine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




AxisPro level 1 valves, such as KBS1-03 (ISO size 3), 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.




AxisPro level 2 or level 3 valves, such as KBS2-03 (or KBS3-03 with sensors), 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 Danfoss's 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

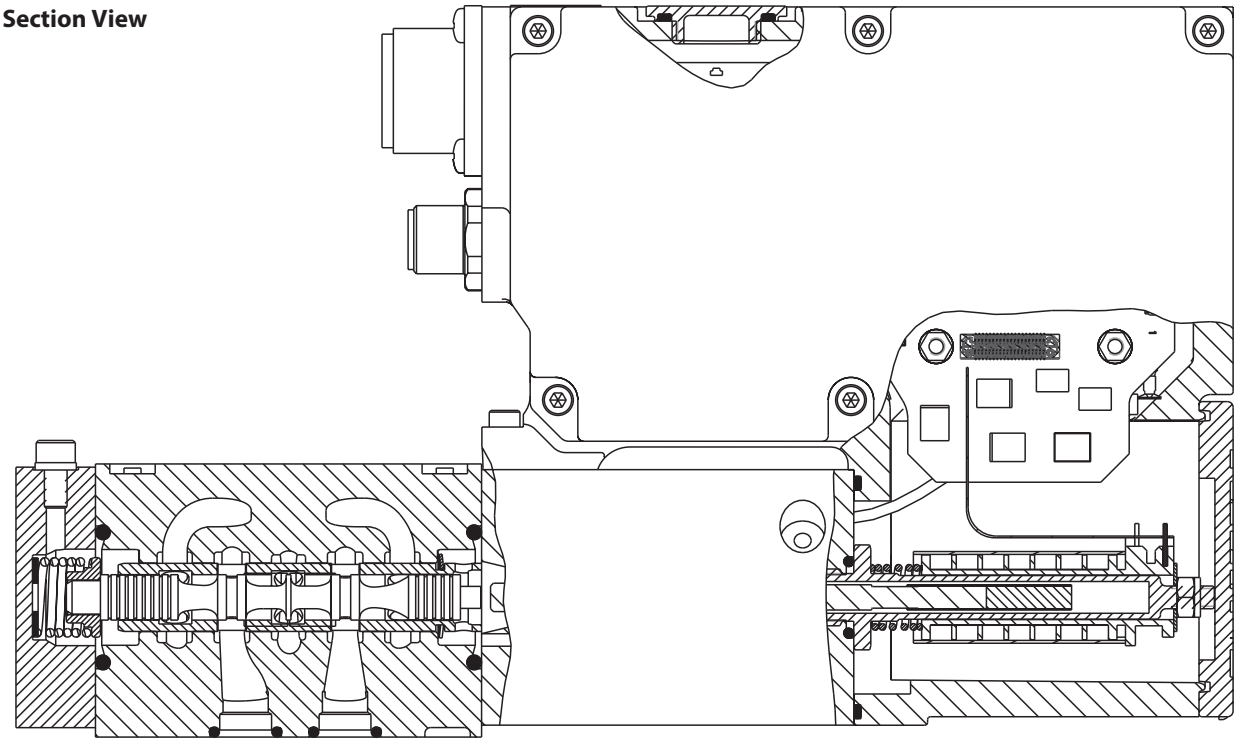
Built on the proven KBS servo Proportional Valve technology, the AxisPro™ Proportional Valve provides a range of control capabilities in a modular design. These four-way solenoid operated proportional valves offer high dynamic performance which enables them to be used in closed-loop control applications previously only possible using servo valves. Best-in-class ingression protection rated to IP65 and IP 67, combined with up to 85C (185F) ambient temperature allows operation in demanding environments.

### 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, 2 and 3 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, or from integrated sensors on level-3 valves featuring pressure sensors in A, B, P and T ports along with temperature data sensed from the T-port.

Leverage inventory of AxisPro valves by configuration through software. One valve SKU can serve multiple needs: Level-1 valves can be configured via Danfoss's Pro-FX™ Configure soft-ware tool for optional command signal: Voltage or current, as well as activating the "enable"-pin. Level-2 and 3 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 con-trol, DFP Force/Pressure control, DPQ Pressure/Flow control. User applications can be developed in Danfoss's Pro-FX Control software tool, which is based on the popular CODESYS development environment. This feature is available option on level-2 and 3 valves allowing the use of pre-developed motion control blocks from Danfoss's Pro-FX Control library or custom developed solutions that can be loaded into a "white space" reserved in the on-board controller memory.

**Typical Section View**



**KBS1-03**

# Model Code

**KBS1 - 03 - ** - NS - ** - * - NS - 004 - 11**

1 2 3 4 5 6 7 8 13 14 15

1 **Valve Type**

**KBS –** Servo performance proportional valve with integral amplifier and electronic feedback

2 **Control Level**

Level 1

3 **Interface**

**03 –** ISO 4401, size 03-02-0-94 ANSI/B93.7M-D03

4 **Spool/Sleeve**

**1 –** Symmetric -40ℓ/min - At Failsafe -all ports blocked (legacy 92L40)
**2 –** Symmetric -24ℓ/min - At Failsafe -all ports blocked (legacy 92L24)
**3 –** Symmetric -12ℓ/min - At Failsafe -all ports blocked (legacy 92L12)
**4 –** Symmetric -05ℓ/min - At Failsafe -all ports blocked (legacy 92L05)
**5 –** Symmetric -40ℓ/min - At Failsafe -P port blocked, A,B,T connected (legacy 96L40)
**6 –** Symmetric -24ℓ/min - At Failsafe -P port blocked, A,B,T connected (legacy 96L24)
**7 –** Symmetric -12ℓ/min - At Failsafe -P port blocked, A,B,T connected (legacy 96L12)
**8 –** Symmetric -05ℓ/min - At Failsafe -P port blocked, A,B,T connected (legacy 96L05)
**9 –** Symmetric -40ℓ/min - At Failsafe reduced flow A connected to T and B connected to P(legacy 94L40)
**13 –** Symmetric -40ℓ/min – reduced pressure at null - At Failsafe -P port blocked, A,B,T connected (legacy 86L40)
**17 –** Asymmetric -40ℓ/min A; 20ℓ/min B - At Failsafe -all ports blocked (legacy 92L40N20)
**18 –** Asymmetric -40ℓ/min A; 10ℓ/min B - At Failsafe -all ports blocked (legacy 92L40N10)
**19 –** Asymmetric -24ℓ/min A; 12ℓ/min B - At Failsafe -all ports blocked (legacy 92L24N12)
**20 –** Asymmetric -40ℓ/min A; 20ℓ/min B - At Failsafe -P port blocked, A,B,T connected (legacy 96L40N20)
**21 –** Asymmetric -40ℓ/min A; 10ℓ/min B - At Failsafe -P port blocked, A,B,T connected (legacy 96L40N10)
**22 –** Asymmetric -24ℓ/min A; 12ℓ/min B - At Failsafe -P port blocked, A,B,T connected (legacy 96L24N12)
**23 –** 2-gain Symmetric – 4ℓ/min @ 40% - 40ℓ/min @100% - At Failsafe -all ports blocked (legacy 92L04T40)
**24 –** 2-gain Symmetric – 2.4ℓ/min @ 60% -24ℓ/min @100% - At Failsafe -all ports blocked (legacy 92L02T24)
**25 –** 2-gain Symmetric – 1.5ℓ/min @ 60% -15ℓ/min @100% - At Failsafe -all ports blocked (legacy 92L01T15)
**26 –** 2-gain Symmetric – 4.0ℓ/min @ 40% -40ℓ/min @100% - @Failsafe -P port blocked, A,B,T connected (legacy 96L04T40)
**27 –** 2-gain Symmetric – 2.4ℓ/min @ 60% -24ℓ/min @100% - @Failsafe -P port blocked, A,B,T connected (legacy 96L02T24)
**28 –** 2-gain Symmetric – 1.5ℓ/min @ 60% -15ℓ/min @100% - @Failsafe -P port blocked, A,B,T connected (legacy 96L01T15)
**29 –** 2-gain Symmetric – 2.4ℓ/min @ 40% -24ℓ/min @100% - @Failsafe -P port blocked, A,B,T connected
**30 –** 2-gain Symmetric – 1.5ℓ/min @ 40% -15ℓ/min @100% - @Failsafe -P port blocked, A,B,T connected
**31-** symmetric 40 lpm 8% overlap failsafe P, A, B, blocked
**32-** symmetric 20 lpm 8% overlap failsafe P, A, B, blocked
**33 -** symmetric 10 lpm 8% overlap failsafe P, A, B, blocked
**34-** symmetric 05 lpm 8% overlap failsafe P, A, B, blocked
**35 -** symmetric 40 lpm 8% overlap failsafe P, blocked A, B, T connected
**36 -** symmetric 20 lpm 8% overlap failsafe P, blocked A, B, T connected
**37-** symmetric 10 lpm 8% overlap failsafe P, blocked A, B, T connected
**38-** symmetric 05 lpm 8% overlap failsafe P, blocked A, B, T connected
**39-** symmetric 14 lpm 8% overlap failsafe P, A, B, blocked
**40 -** symmetric 14 lpm 8% overlap failsafe P, P, blocked A, B, T connected

**To find available product configurations go to www.danfoss.com**

5 **Valve Special Feature**

**NS –** Not Selected

6 **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

7 **Monitor Output**

**1 –** ±10V voltage feedback signal
**2 –** 4-20mA current feedback signal

8 **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

13 **Electrical Special Feature**

**NS –** Not Selected

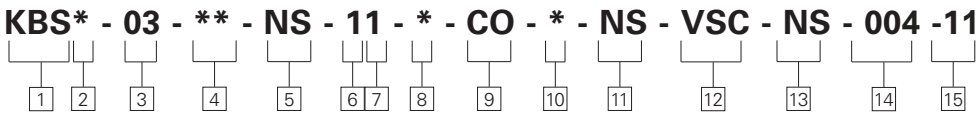
14 **Software Revision**

**XXX –** Software Revision

15 **Design Number**

11 series

# Model Code




2 **Control Level**

**2** – Level 1 plus Network enabled and Closed loop control modes

**3** – Level 2 plus Integrated pressure and temperature sensors

6 **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

9 – Command over Fieldbus

7 **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

8 **Electrical Connection**

**C** – 7 pin connector without plug

**E** – 7 pin connector with plug

**Note:** You may reconfigure pin "C" as the enable signal using Pro-FX configure software.

9 **Digital Communication Interface**

**CO** – CANOpen

**PN** - ProfiNet

**ET** - Ethernet/IP

**EC** - EtherCAT

10 **External Sensor**

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

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

11 **Customer Application Programming Space**

**NS –** Not Selected

**CW –** CODESYS White Space

12 **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 control mode options using Pro-FX: Configure software.

DPC - Drive Position Control Mode Enabled

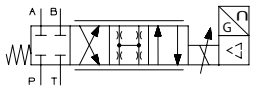
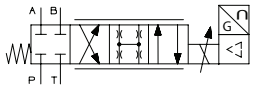
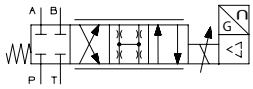
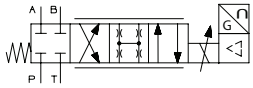
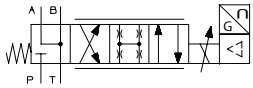
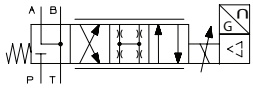
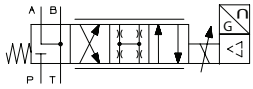
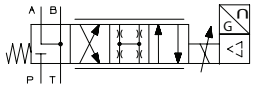
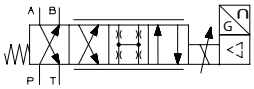
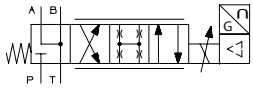
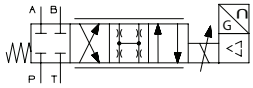
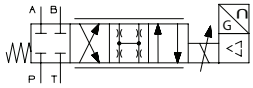
DSC – Drive Speed Control Mode Enabled

DFP – Drive Force/Pressure Control Mode Enabled

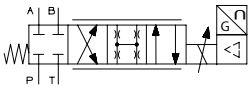
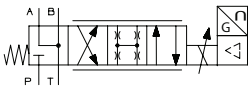
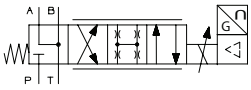
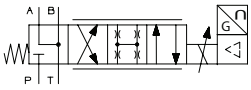
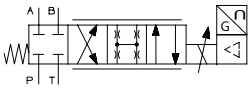
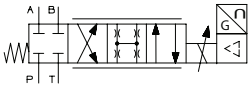
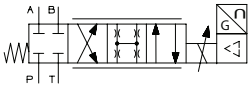
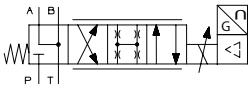
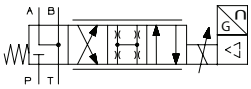
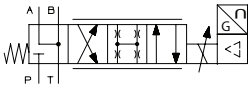
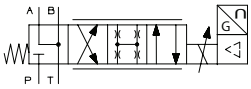
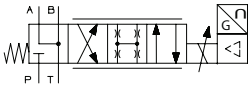
DPQ – Danfoss Drive Pressure / Flow Control Mode Enabled

**To find available product configurations go to www.danfoss.com**

# Spool Sleeve Details

| Spool/Sleeve # | Symbol | Failsafe behavior | Flow ℓ/min@ Δ70 bar | Symmetric | Asymmetric | Single gain | Dual gain | Notes |
|---|---|---|---|---|---|---|---|---|
| 1 |  | All Ports blocked | 40 | √ | | √ | | |
| 2 |  | All Ports blocked | 24 | √ | | √ | | |
| 3 |  | All Ports blocked | 12 | √ | | √ | | |
| 4 |  | All Ports blocked | 5 | √ | | √ | | |
| 5 |  | P - Blocked A,B,T connected | 40 | √ | | √ | | |
| 6 |  | P - Blocked A,B,T connected | 24 | √ | | √ | | |
| 7 |  | P - Blocked A,B,T connected | 12 | √ | | √ | | |
| 8 |  | P - Blocked A,B,T connected | 5 | √ | | √ | | |
| 9 |  | Reduced flow, A Conncted to T B connected to P | 40 | √ | | √ | | |
| 13 |  | P - Blocked A,B,T connected | 40 | √ | | √ | | Reduced pressure at null |
| 17 |  | All Ports blocked | 40/20 | | √ | √ | | |
| 18 |  | All Ports blocked | 40/10 | | √ | √ | | |

# Spool Sleeve Details

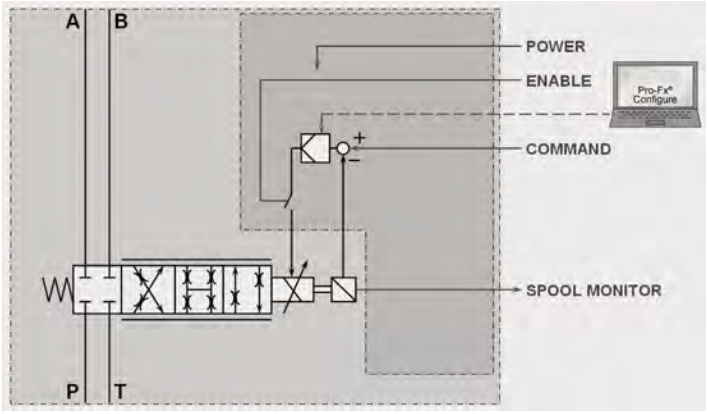
| Spool/Sleeve # | Symbol | Failsafe behavior | Flow ℓ/min@ Δ70 bar | Symmetric | Asymmetric | Single gain | Dual gain | Notes |
|---|---|---|---|---|---|---|---|---|
| 19 |  | All Ports blocked | 24/12 | | √ | √ | | |
| 20 |  | P - Blocked<br>A,B,T connected | 40/20 | | √ | √ | | |
| 21 |  | P - Blocked<br>A,B,T connected | 40/10 | | √ | √ | | |
| 22 |  | P - Blocked<br>A,B,T connected | 24/12 | | √ | √ | | |
| 23 |  | All Ports blocked<br>40 @ 100% | 4 @40% | √ | | | √ | |
| 24 |  | All Ports blocked<br>24 @ 100% | 2.4 @60% | √ | | | √ | |
| 25 |  | All Ports blocked<br>15 @ 100% | 1.5 @60% | √ | | | √ | |
| 26 |  | P - Blocked<br>A,B,T connected | 4 @ 40%<br>40@100% | √ | | | √ | |
| 27 |  | P - Blocked<br>A,B,T connected | 2.4 @ 60%<br>24@100% | √ | | | √ | |
| 28 |  | P - Blocked<br>A,B,T connected | 1.5 @ 60%<br>15@ 100% | √ | | | √ | |
| 29 |  | P - Blocked<br>A,B,T connected | 2.4 @ 40%<br>24@ 100% | √ | | | √ | |
| 30 |  | P - Blocked<br>A,B,T connected | 1.5 @ 40%<br>15@100% | √ | | | √ | |

# Spool Data

## Spool Symbols

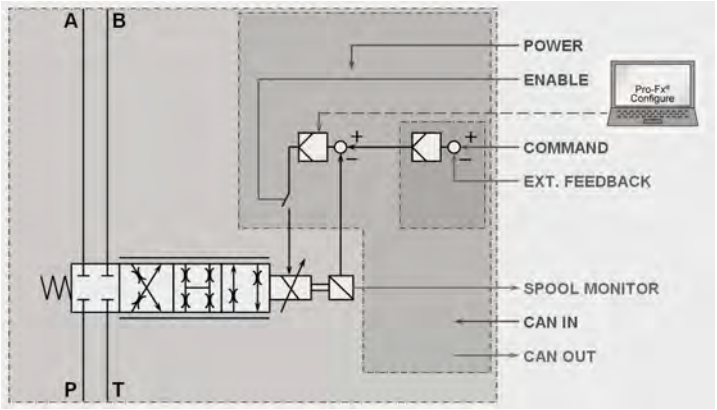
**Functional Symbol**

Model Type KBS1-03



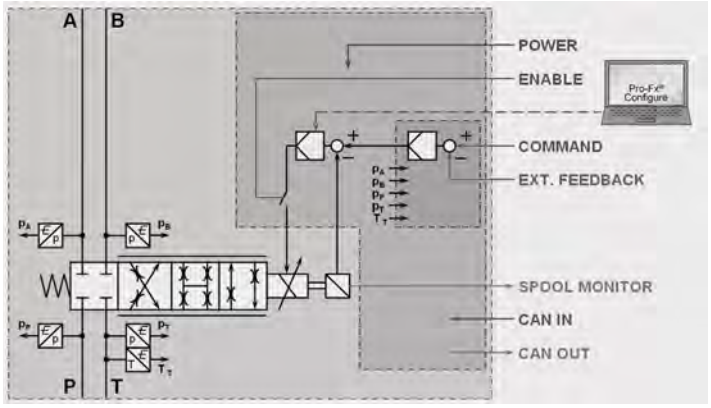

Centralized motion control, relying on external motion controller, not shown in the diagram

Model Type KBS2-03 w/Field 11 = NS



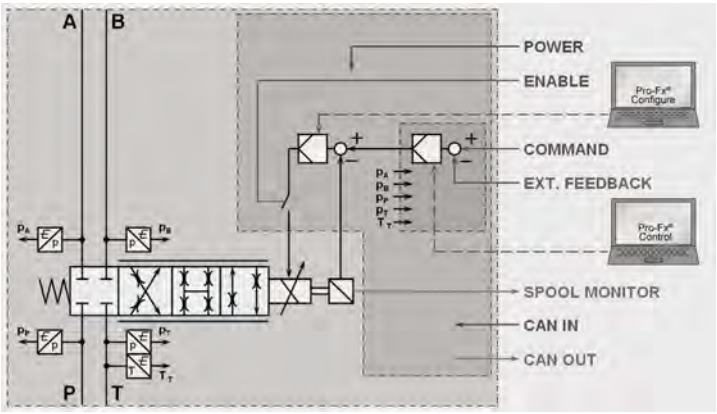

Distributed motion control, taking advantage of the available axis-control function embedded in the valve controller for AxisPro level 2 and 3.Command can be analog via the 7-pin connector or via CANopen using the M12 connections illustrated on page 12.

Model Type KBS3-03 w Field 11 = NS




Level 3 valve integrated pressure sensors can be used for machine health monitoring with data broadcast over the CANopen bus or employed for pressure control in addition to the external motion control illustrated for the level 2 valve.

Model Type KBS3-03 w/Field 11 = CW




Selecting the CW-option allows user specific applications to be developed in Danfoss's Pro-FX Control software tool, which is based on the popular CODESYS development environment.

**Spool Types and Flow Ratings**

**Symmetric Spools**

Base line pressure drop Δp = 35 bar (500 psi) per metering flow path, e.g. B to T. For actual maximum flow refer to power capacity envelope curves.

**Pressures and Flow Rates**

Operating Pressure: bar (psi)

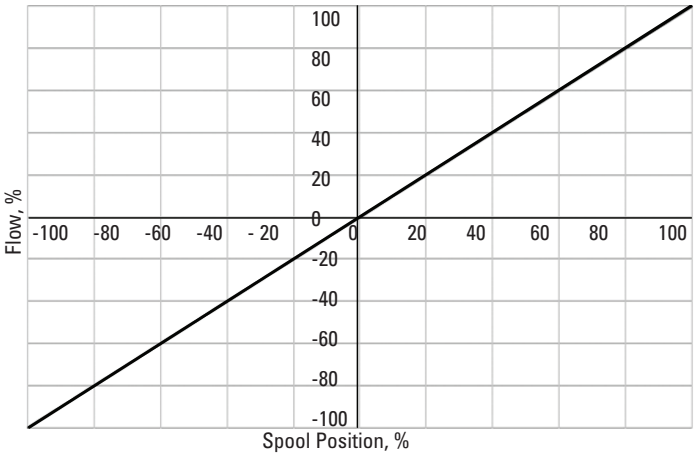
Ports

**P,A,B** : 350 (5075)
**T** : 250 (3625)

# Spool/Sleeve Combinations
# Functional Representation

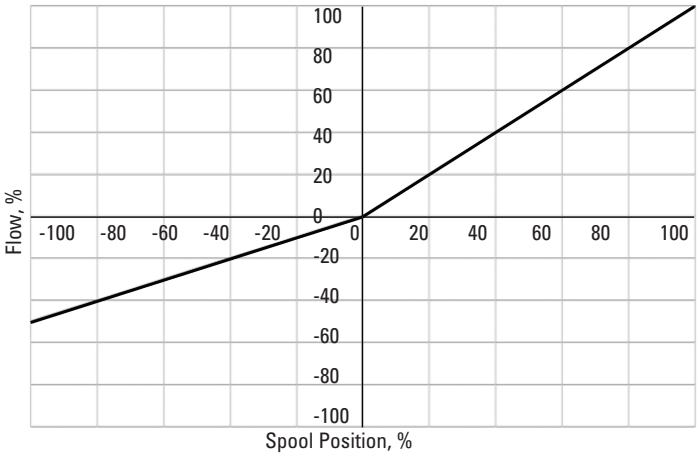
Spool/Sleeve#: 1, 2,3,4,5,6,7,8,9,13

Symmetric



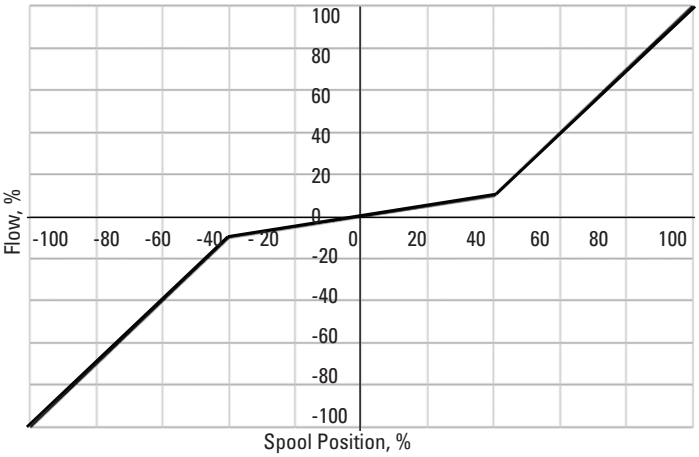

Spool/Sleeve#: 17,18,19,20,21,22

2:1 Asymmetric



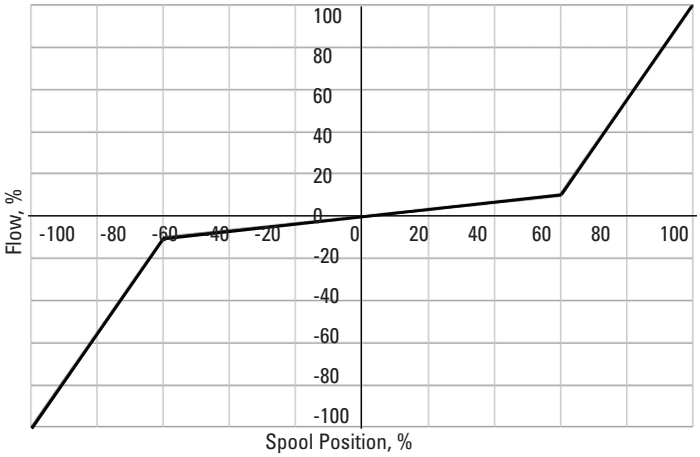

Spool/Sleeve#: 23,24, 26,29,30

Kink at 40%




Spool/Sleeve#: 25,27,28

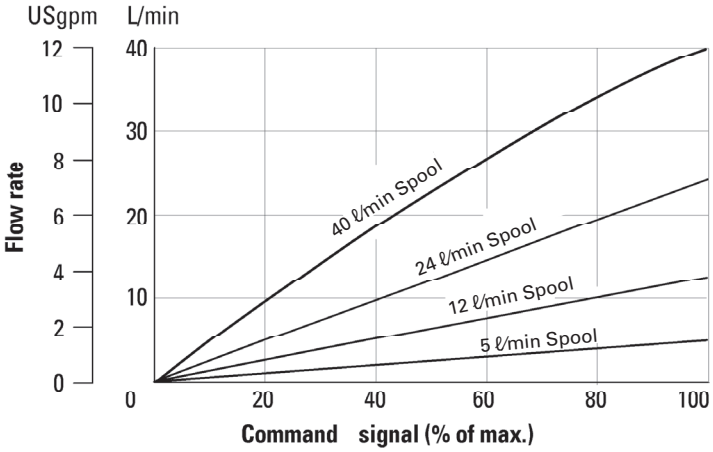
Kink at 60%



# Performance Curves

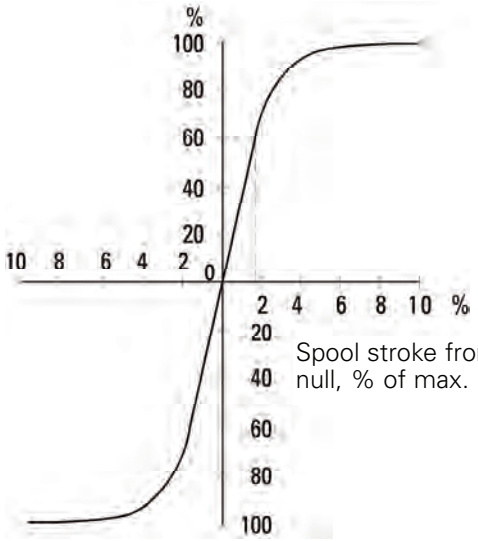
**Flow Gain**

Flow from port P-A-B-T or P-B-A-T at 70 bar (1000 psi) total valve Δp, 35 bar (500 psi) per metering edge



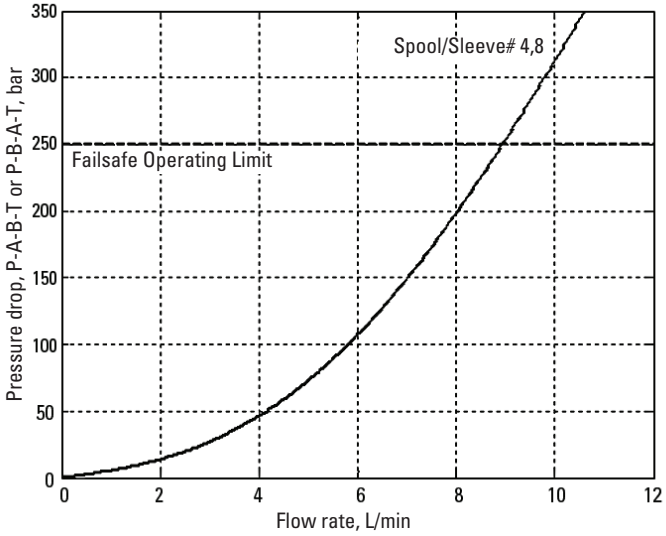

**Pressure Gain**

Δp between ports A and B or B and A, as % of port P pres-sure

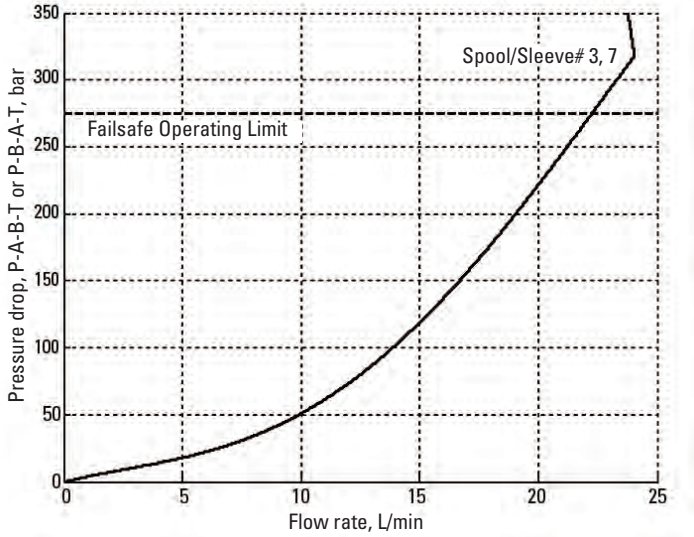



**Power Capacity Envelopes**

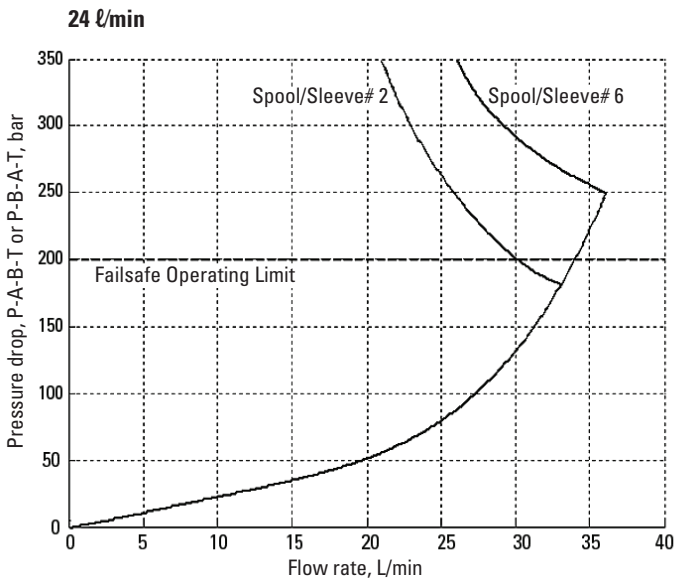
**5 ℓ/min**

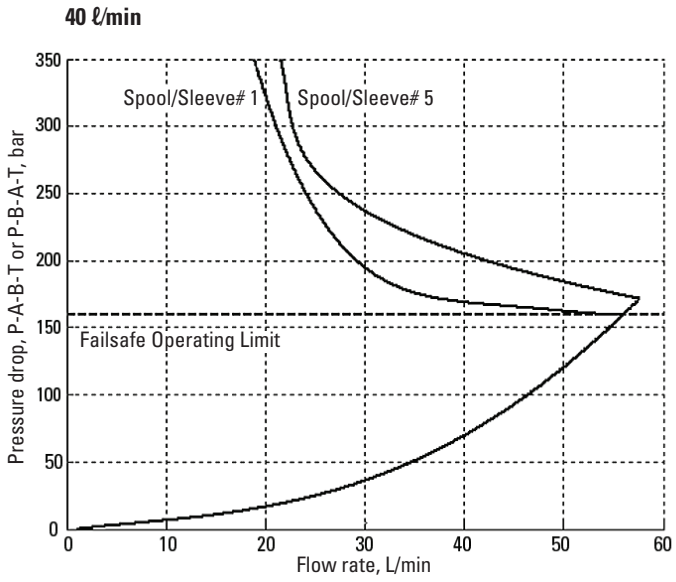



**12 ℓ/min**



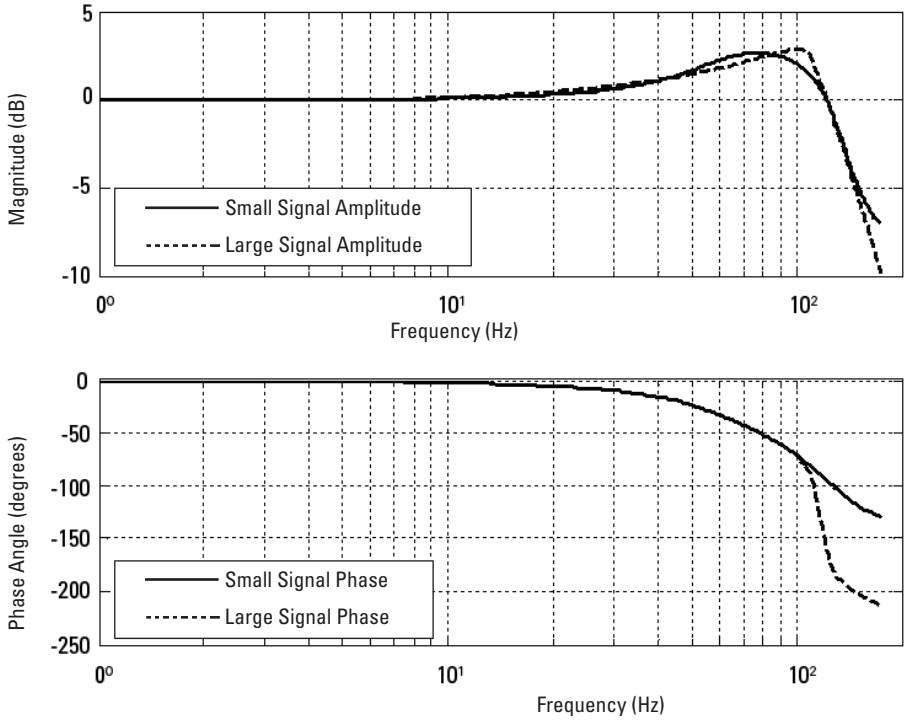
# Performance Curves




**Operating Limit:** When operating the valve beyond the operating pressure limit,spool may not return to failsafe when power is removed

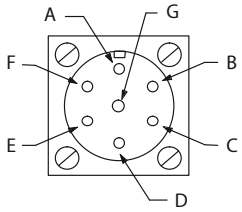
**Frequency Response, typical**
For amplitudes of +/- 5% with zero offset, +/- 25% with +/- 50% offsets. Δp (P to T) = 70 bar (1000 psi)



# Operating Data

**Connector Details**

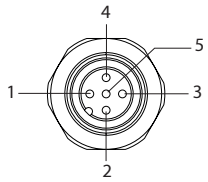
7-pin plug connector




| Pin | Description |
|---|---|
| A | Power supply positive (+) |
| B | Power supply 0V and current command return |
| C | Not connected (Field 8 = C,E) |
| C | Valve enable (Field 8 = H,R) |
| D | Command signal (+V or current in) |
| E | Command signal (-V or current GND) |
| F | Output monitor |
| G | 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 Danfoss part number 934939

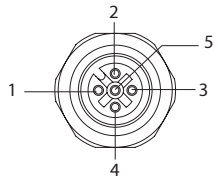
M12 5-pin CAN Connector (Male)




| 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.

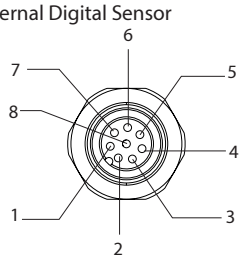
M12 5-pin CAN Connector (Female)




| 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.

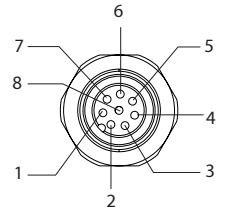
M12 8-pin External Digital Sensor




| 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.

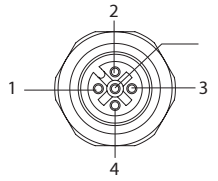
M12 8-pin External Analog Sensor Port




| 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).

M12 4-pin Ethernet Connector (Female)




| Pin | Description |
|---|---|
| 1 | TxD+ |
| 2 | RxD+ |
| 3 | TxD- |
| 4 | RxD- |

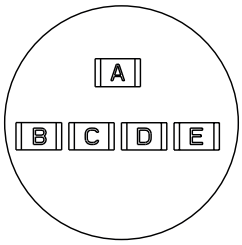
Note:
Present at location 4 and 5 of the electronics enclosure (see figure 1 below). Selection based on model code field number 9, present when PN,EC or E T option enabled.
Location 4 is Ethernet Channel 0 Location 5 is Ethernet Channel 1
M12 connector is D-Coded

To ensure EMI protection use only pre made CAT5 or CAT 6 cable

# Operating Data

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

Diagnostic




| Color | Description CO | PN | ET | EC |
|---|---|---|---|---|
| A [Green] | Power | Power | Power | Power |
| B [Red] | CAN Error | PN Diagnostic (SF) | ET Module Status | EC Error |
| C [Green] | CAN Run | Valve Diagnostic | Valve Diagnostic | EC Run |
| D [Red] | Diagnostic | PN Network Status (BF) | ET Network Status | Valve Diagnostic |
| E [Green] | Status | Valve Status | Valve Status | Valve Status |

Note:

1. Figure to the left references the clear plastic window on the top of the valve.

LED status depends on Network option choosen (CO/PN/ET/EC.

| | |
|---|---|
| Electromagnetic compatibility (EMC): | IEC61326-1 2021 |
| Monitor Points Signal:<br>Voltage mode Current<br>mode Output<br>impedance | <br>±10V DC<br>4 to 20 mA<br>10 kΩ |
| Power stage PWM frequency | 20 kHz nominal |
| Reproducibility, valve-to-valve (at factory settings):<br>Flow gain at 100% command signal | <br>≤5% |
| Protection:<br>Electrical | <br>Reverse polarity protected between pin A and B of the 7 pin plug connector |
| Ambient air temperature range for full performance<br>Oil temperature range for full performance | –25°C to +85°C (–13°F to +185°F) CN version -25°C to 70°C<br>PN version 0°C to +60°C (32°F to +140°F) |
| Minimum temperature at which valves<br>will work at reduced performance | <br>–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:<br>Voltage mode<br>Input impedance<br>Voltage between Pin D and B<br>Voltage between Pin E and B<br>Current mode<br>Max differential voltage to pin E to pin B | <br>–10V to +10V DC 13 bit resolution, ± 1%<br>Field 6 = 1: 47kΩ, Field 6 = 2,3,4,5: 100Ω<br>Field 6 = 1:18v (max)<br>Field 6 = 1:18v (max)<br>Field 6 = 2,3,4,5: 13 bit resolution based on ±20mA, ±1%Field<br>6 = 2,3,4,5: 100 mV |
| Valve enable signal for model code field 8 = H or R<br>Enable Disable<br>Input impedance | <br>Disable <6.5V Enable Signal >8.5V (max 36V) 10<br>kΩ |
| Sensor Resolution:<br>External Sensor Port | <br>4-20 mA: 0-20mA 12 bit resolution ± 1%, 3mA cable break detect, 22mA overcurrent detect.<br>Speed, independent frequency mode: 10Hz to 100 kHz.<br>Speed, incremental count and direction + frequency mode: signed 32bit count, 0 to 100 kHz.<br>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 Pressure and Temperature Sensors | Integrated PCB temperature sensor accuracy: ± 2°C<br><br>For Level 3 valves:<br>Integrated Pressure sensors on all ports<br>Pressure sensors rated to 400bar<br>Integrated Pressure sensors accuracy: ± 0.5% of full scale<br>Bandwidth: >100 Hz<br>Integrated temperature sensor on tank port Accuracy: ± 5°C<br>Bandwidth: ~1 Hz |
| Amplifier Temperature Sensing | 1°C (1.8°F) resolution, -25°C (-13°F) undertempdetect, 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*-03 Valves (all valves)** | |
|---|---|
| Relative duty factor | Continuous rating (ED = 100%) |
| Hysteresis | <0.1% |
| Mass | 2.49 kg (5.5 lb) approx. |
| Environmental | IP65 and IP67 rated when using a similarly rated connector<br>Location 2, 3, 4 and 5 connectors have IP65 and IP67 rated shipping covers |
| **Step response:** | |
| Step, % Flow | ms |
| 0% to 100%, 100% to 0% | 8.0 |
| 10% to 90%, 90% to 10% | 8.0 |
| -10% to 10%, 10% to -10% | 7.0 |
| 25% to 75%, 75% to 25% | 7.0 |
| **Parts Information:** | |
| Interface Seal Kits | 02-147573 |
| Mating Electrical 7-pin Connector | 934939 |

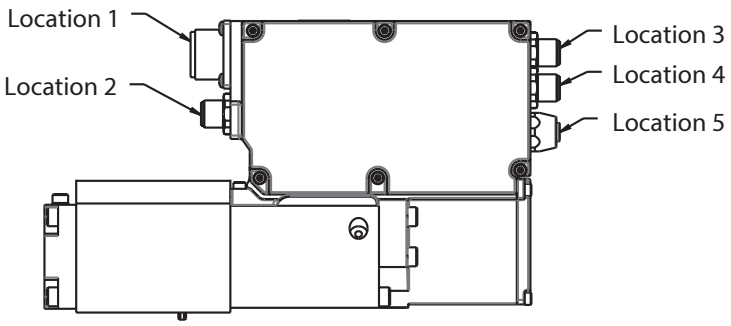



**Figure 1**

Note: See above for connector plugs specifications.

# Software Information

**KBS1**

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

**KBS2/KBS3**

- KBS1 capability.
- Sensor port configuration options. Configurable position, Speed, Pressure, Force and SSI Sensors.
- Closed loop 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 (Danfoss DPQ).
- CANopen DSP306 compliant electronic data sheet (EDS).
- Diagnostic configuration options.
- Ethernet Fieldbus option
- Profinet, Ethernet/IP, EtherCAT
- TCP/IP communication for Danfoss Profx 2.0 configuration tool -all closed loop control modes are available via industrial Ethernet

EtherCAT Version:
-EtherCAT Slave Device
-PDO communication 100us ring time 2ms refresh rate
-100/10Mbit data rate
-SDO communication (COE)
-PDO dynamic mapping support (8 parameters)
-ESI file available
-TCP port:80 webserver, 300 (Profx tool) planned via EOE
-Profx tool access via CANopen
-training material available for TwinCAT connectivity

Ethernet/IP Version:
-Ethernet/IP Adapter Device
-Assembly package for Process Data 2ms refresh rate
-100/10Mbit data rate
- two ports supported with daisy chaining, DLR support
- Class 3 explicit message support
-EDS file available
-TCP ports: 80 (webserver) 300 (Profx tool)
-Muticast support

Profinet Version:
-Protocol IO-Device
-Cyclic 5ms data exchange
-Conformance Class 2
-PROFINET IO specification: V 2.4
-100/10 Mbit RT compatible
-Acyclic data exchange via Read Write Data -Records
-Two ports both can be used as access, build in Switch
-GDML file for Level1 and Level2
-TCP ports: 80 (webserver) 300 (Profx tool)

All levels and models are compatible with the Danfoss Pro-FX: For the latest revision, please visit www.danfoss.com

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

http://www.danfoss.com

Install the Danfoss Pro-Fx™ Configure PC application tool. Installation is supported on a wide range of Windows based operating systems including Windows 10/11 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.

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 Danfoss ProFX: Control development environment used with KBS4DGV-xxx and other Danfoss Pro-FX products, it is also included in the TEQ-470-A-10 test box.

# Electrical Information

### Block Diagram Voltage Input (Field 6 = 1)

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

### Power cables:

For 24V supply
0.75 $mm_2$ (18 AWG) up to 20m (65 ft)
1.00 $mm_2$ (16 AWG) up to 40m (130 ft)

### Signal cables:

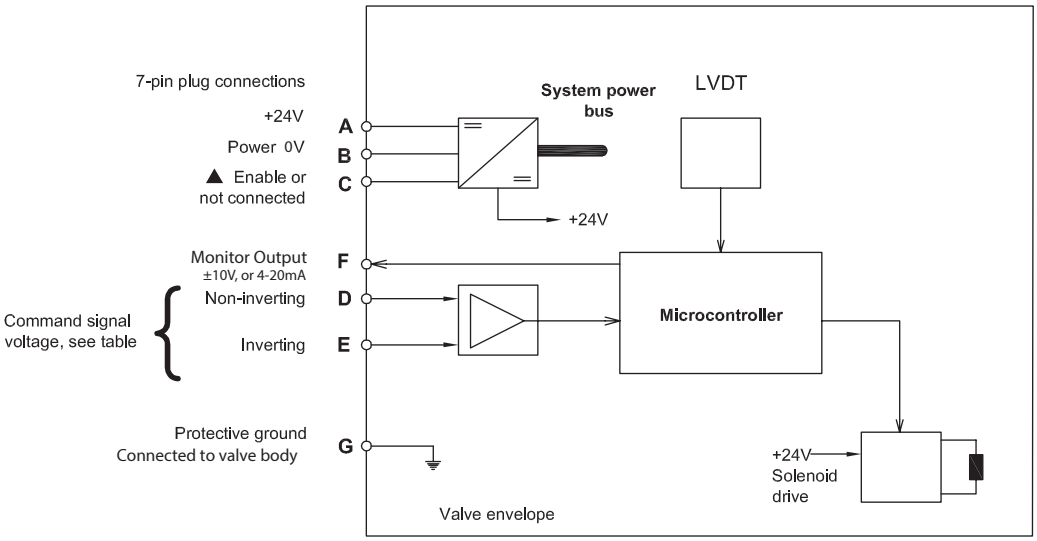
0.50 $mm_2$ (20 AWG)

### 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 - 0.41inches)

See connection diagram on page 18.




▲ 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<br>OV<br>$U_D$ - $U_E$ = Positive | OV<br>Negative | P to A |
| Negative<br>OV<br>$U_D$ - $U_E$ = Negative | OV<br>Positive | P to B |

# Electrical Information

**Block Diagram Current Input (Field 6 = 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 Danfoss's Installation Wiring Practices for Vickers Electronic Products, leaflet 2468. Recommended cable sizes are:

**Power cables:**

For 24V supply

0.75 $mm^2$ (18 AWG) up to 20m (65 ft)

1.00 $mm^2$ (16 AWG) up to 40m (130 ft)

**Signal cables:**

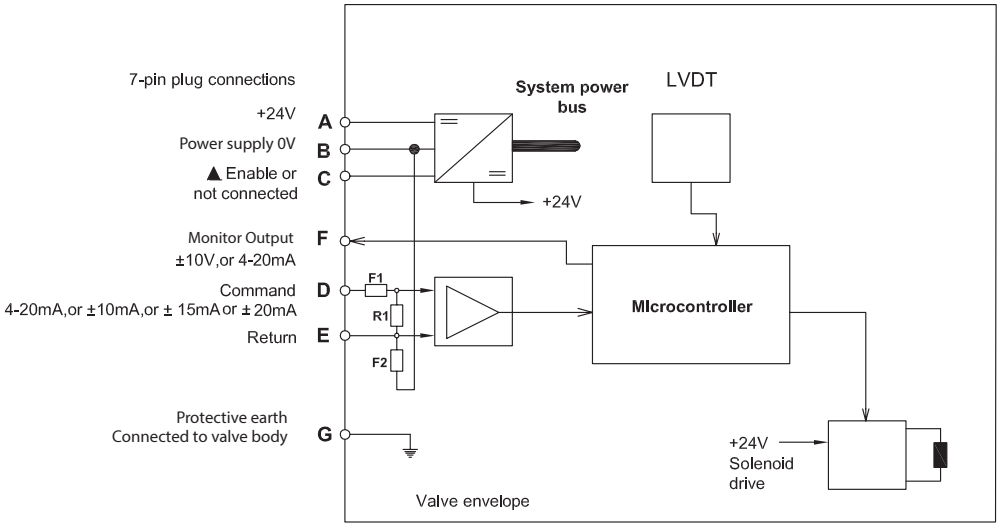
0.50 $mm^2$ (20 AWG)

**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 19.




▲ 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 |

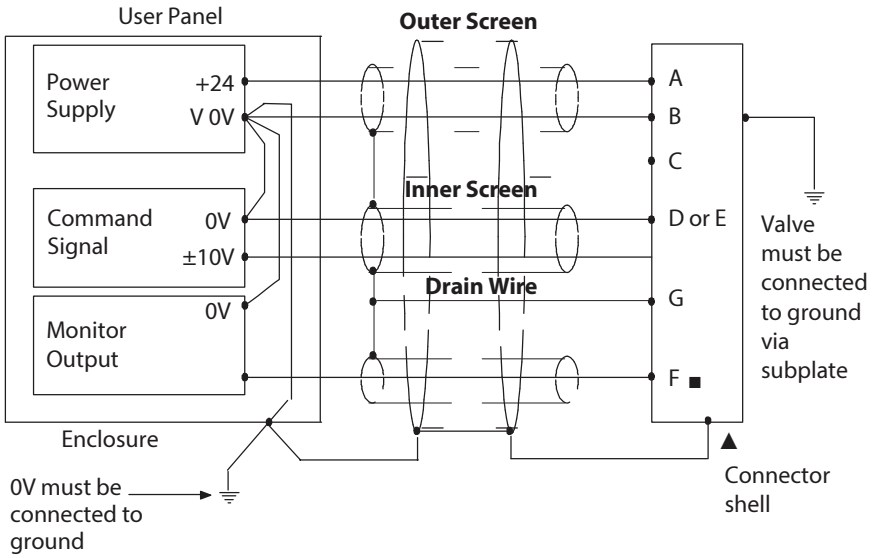
**Warning**

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

# Electrical Information

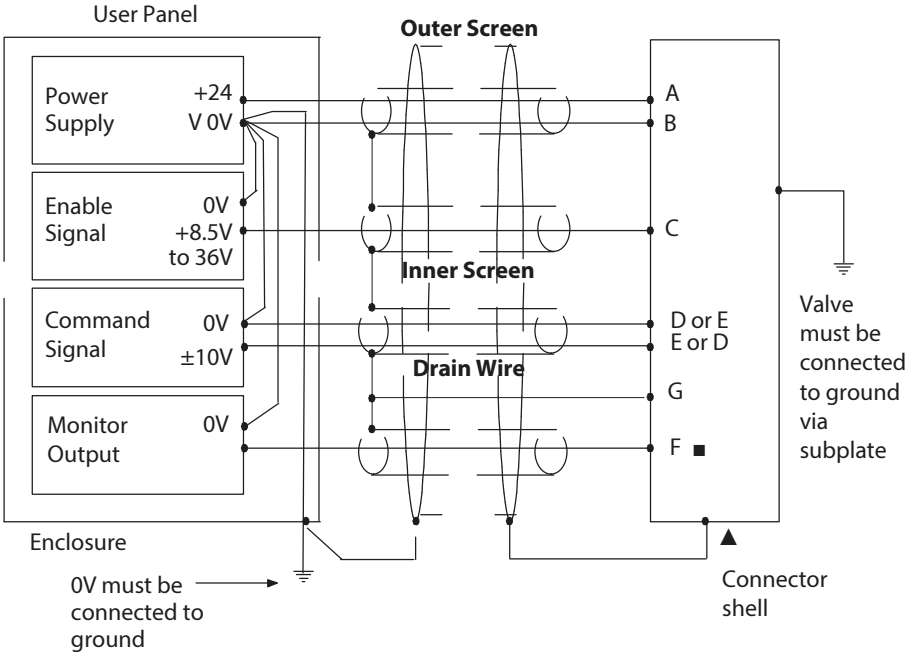
**Wiring Connections**
**Voltage Input (Field 6 = 1)**

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




**Wiring Connections for Voltage Mode (Field 6 = 1) Valves with Enable Feature**

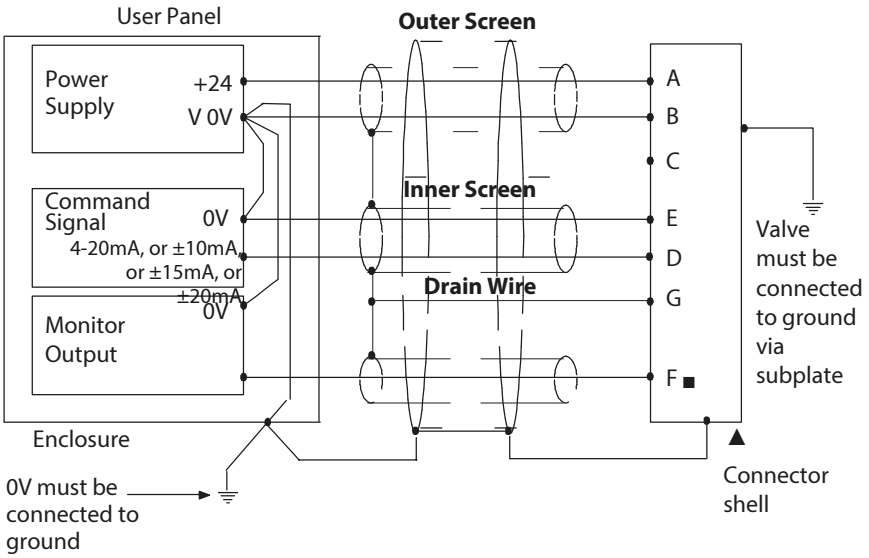
▲ Note: In applications where the valve must con-form to European RFI/EMC regulations, the outer screen (shield) must be connected to the outer shell of the 7 pin connector, and the valve body must be fastened to the earth ground. Proper earth grounding practices must be observed in this case, as any differences in command source and valve ground po-tentials will result in a screen (shield) ground loop.



# Electrical Information

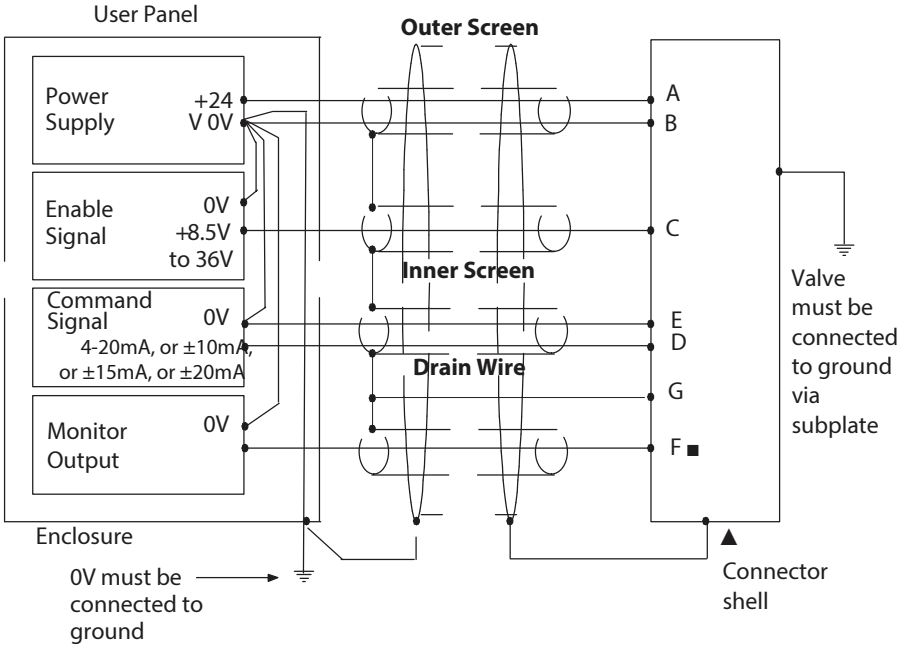
**Wiring Connections Current Input (Field 6 = 2, 3, 4, 5)**

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




**Wiring Connections for Current Input (Field 6 = 2, 3, 4, 5) 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.

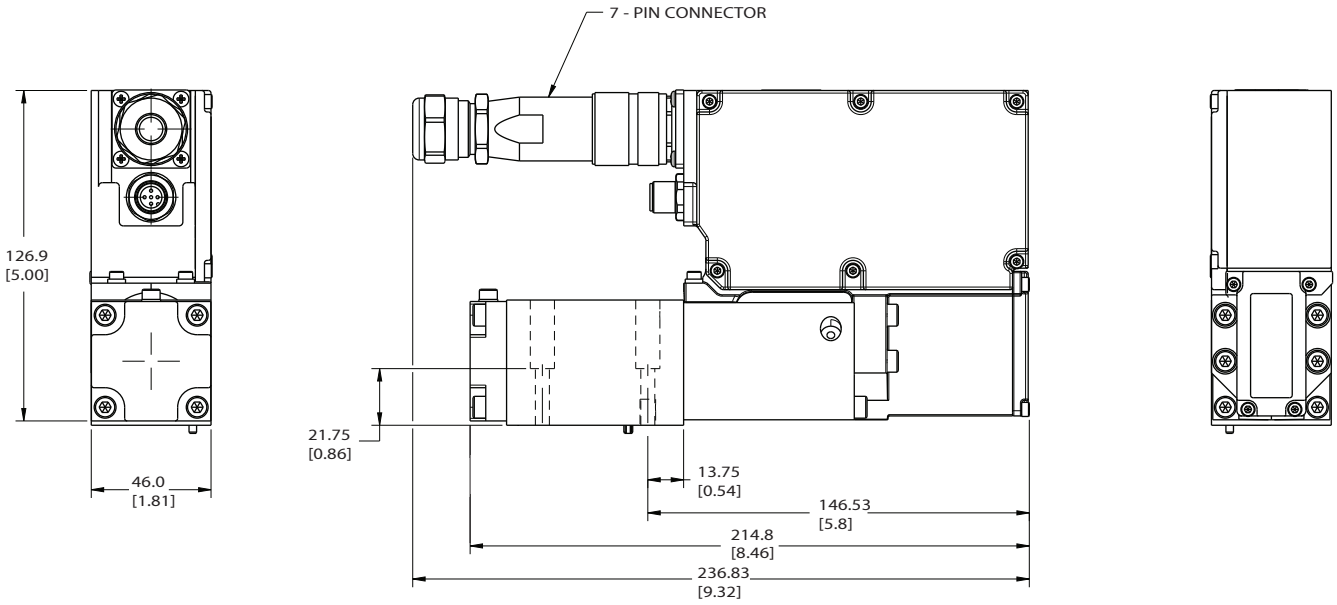
The enable line to pin C should be outside the screen which contains the demand signal cables.

To ensure EMI protection use only metal shielded mating connectors.

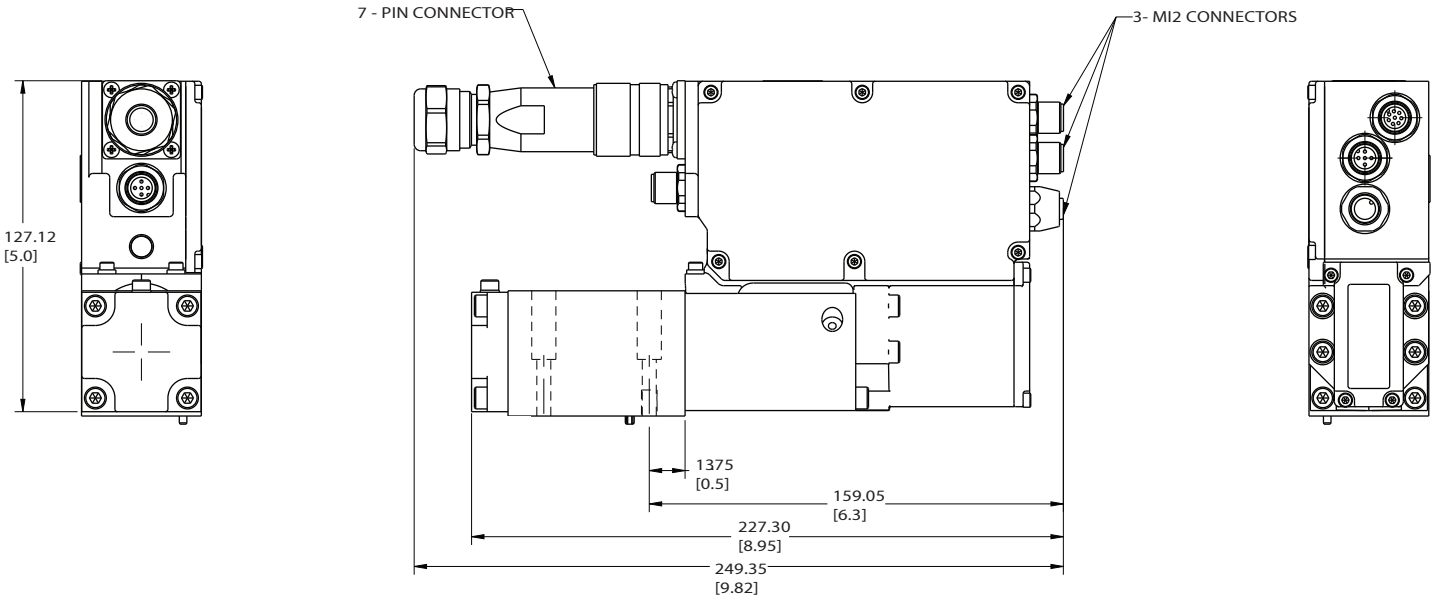
# Installation Dimensions

mm (inch)

**KBS1-03**



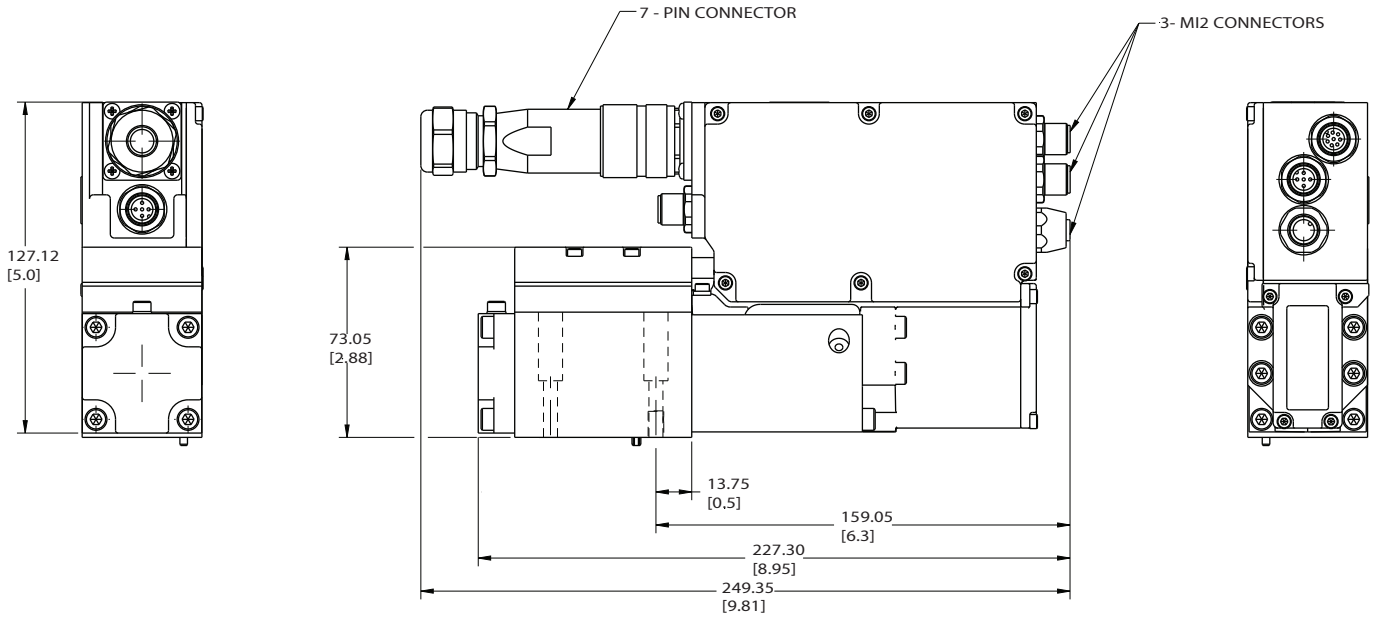

**KBS2-03**



# Installation Dimensions

mm (inch)

**KBS3-03**



# Mounting Surfaces

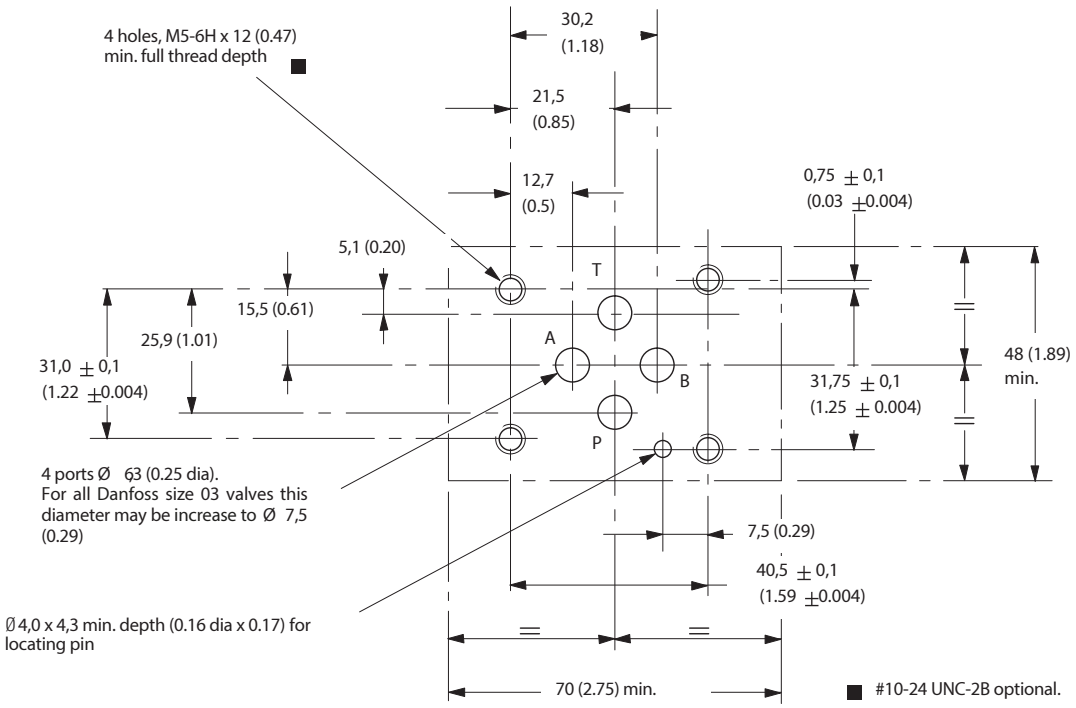
**Mounting Surfaces to ISO 4401 (Size 03)**

This interface conforms to: ISO 4401-03-02-0-94 plus location pin hole

ANSI/B93.7M (and NFPA) size 03

CETOP R35H4.2-4-03, plus location pin hole

DIN 24340 Form A6 plus location pin hole



# 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 addi-tives for protection against wear of components, elevated viscosity and inclusion of air.

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

**17/15/12**

Danfoss products, as any components, will operate with app ar-ent 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 prov-en 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 ester. The extrem e operating viscosity range is 500 to 13 cSt (2270 to 70 SUS) but the recommended running range is 54 to 13 cSt (245 to 7 0 SUS).

**Installation**

The proportional valves in this catalog can be mounted in any attitude, but it may be necessary in certain demanding appli-c ations, 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 de-stroy these settings. It is therefore recommended that should any mechanical or electronic repair be necessary they should be returned to the nearest Danfoss repair center.

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

ENGINEERING TOMORROW

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- PLUS+1® software
- PLUS+1® software services, support and training
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