

VSD03M and VSD05M

Direct Solenoid Operated Soft-Shift Directional Valve

VSD03M SUBPLATE MOUNTING ISO 4401-03

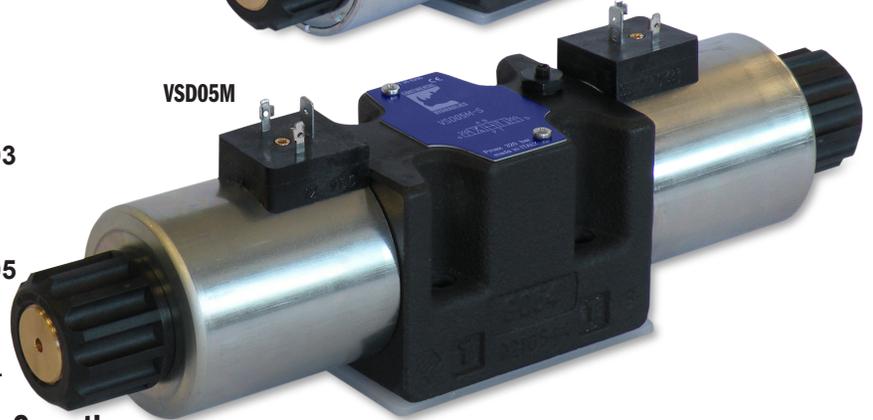
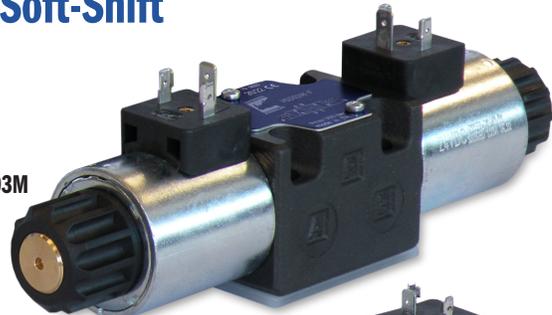
P max **5000 PSI 350 bar**
 Q max **21 GPM 80 l/min**

VSD05M SUBPLATE MOUNTING ISO 4401-05

P max **4600 PSI 320 bar**
 Q max **33 GPM 125 l/min**

VSD03M

VSD05M



► **DESCRIPTION: Shockless Hydraulic Operation**

As the valve spool shifts, the spool lands cross over the valve body ports. This can produce high instantaneous flow rates changes. The Soft-Shift valve provides a slow spool movement; slower than that of a standard directional valve. The Soft shift is achieved by either a dampening orifice in the solenoids core tube or via an adjustable-rate control in the valve body. Along with custom spool designs these valves results in reduction or elimination of hydraulic system shock produced by the spool movement and high flow rates.

Key Features:

- Smooth start and stop performance
- Reduce shocks in the system that cause leaks
- Longer component and system life
- Available in single or double solenoid configurations.
- DC solenoid prevents coil burnout during controlled rate of solenoid shift.
- Conventional alternating input current is converted to direct current through a rectifier in the DIN connector code VEA-6FR-A

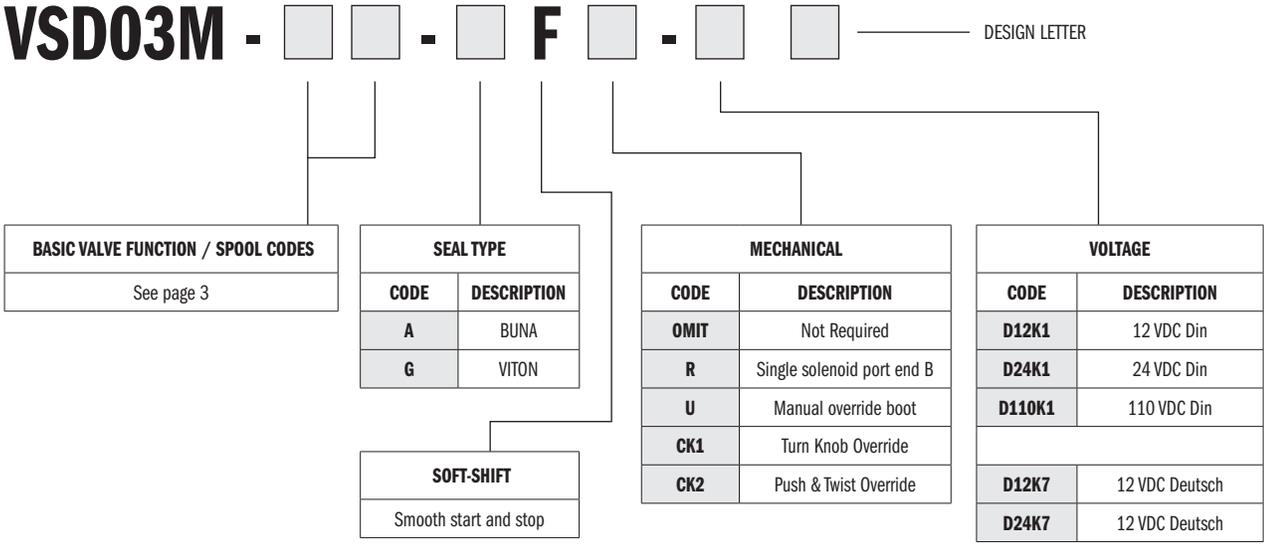
► **PERFORMANCE:** (Obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

| | | D03 | D05 |
|-------------------------------|-----------------|---|------------|
| Max operating pressure: | P - A - B ports | 5000 (350) | 4600 (320) |
| | T port | 3000 (210) | 3000 (210) |
| Maximum flow rate GPM (l/min) | | 21 (80) | 33 (125) |
| Pressure drops Δp-Q | | see page 4 | see page 6 |
| Operating limits | | see page 4 | see page 6 |
| Electronic features | | see page 8 | see page 8 |
| Electrical connections | | see page 9 | see page 9 |
| Ambient temperature range | °F (°C) | -4 / 140 (-20 / +50) | |
| Fluid temperature range | °F (°C) | -4 / 176 (-20 / +80) | |
| Fluid viscosity range | | cSt 10 - 400 | |
| Recommended viscosity | | cSt 25 | |
| Fluid contamination degree | | according to ISO 4406:1999 class 20/18/15 | |

DIRECTIONAL VALVES

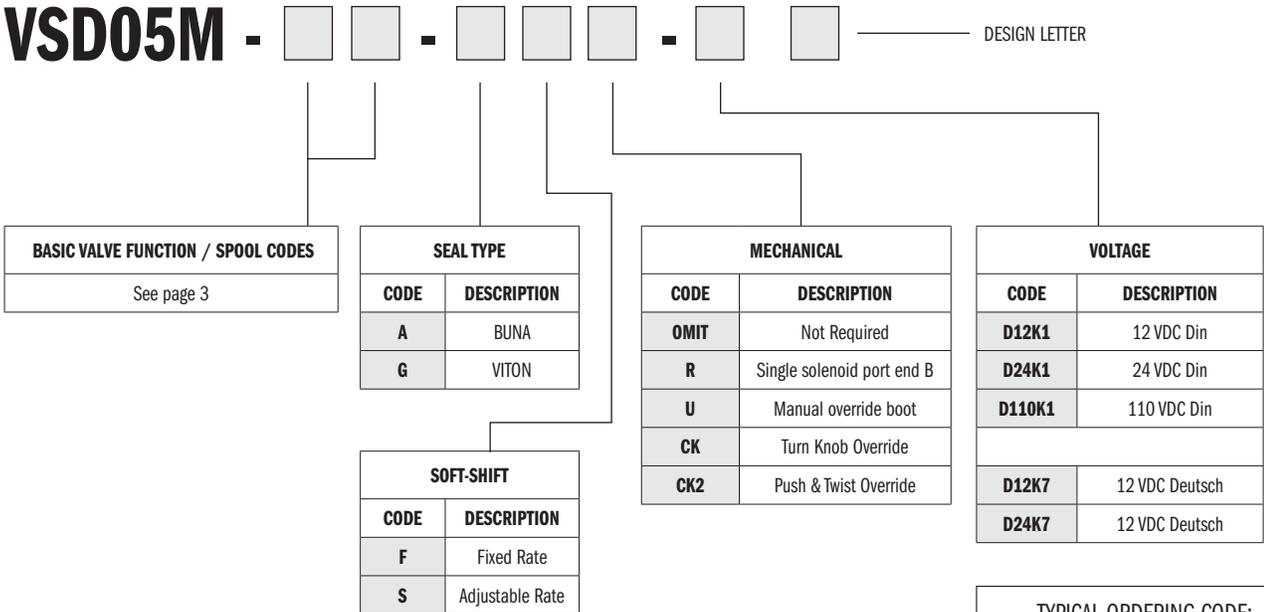
VSD03M and VSD05M Soft-Shift

► IDENTIFICATION CODE:



TYPICAL ORDERING CODE:
VSD03M-3AC-GF-D24K1

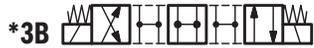
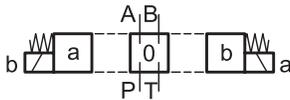
► IDENTIFICATION CODE:



TYPICAL ORDERING CODE:
VSD05M-1A-GS-D24K1

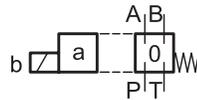
► **SPOOL TYPE:**

2 solenoids
3 positions with spring centering

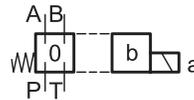


***D05 ONLY**

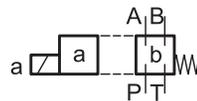
1 solenoid side A
2 positions (central + external)
with spring centering



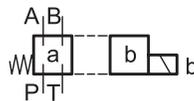
1 solenoid side B
2 positions (central + external)
with spring centering



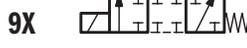
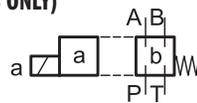
1 solenoid side A
2 external positions with
return spring



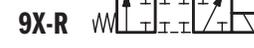
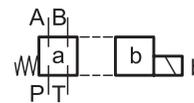
1 solenoid side B
2 external positions with
return spring



1 solenoid side A
2 positions with return spring
(D03 ONLY)



1 solenoid side B
2 positions with return spring



Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification, feasibility and operating limits.

VSD03M and VSD05M Soft-Shift

► VSD03M PERFORMANCE DATA:

(Obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

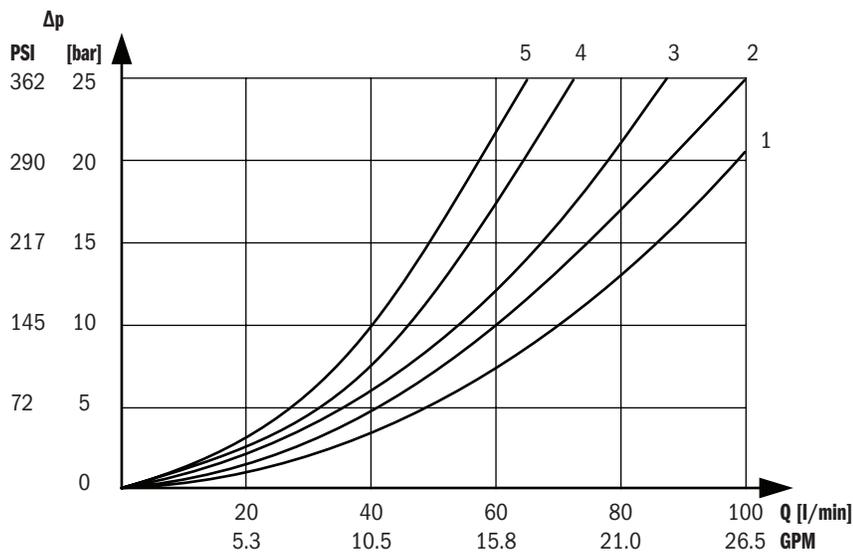
The diagram shows the operating limits of the spools available in the soft-shifting version, while the table shows the switching times. The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

The shifting time and characteristics curves are influenced by the viscosity (temperature) of the operating fluid. Shifting times can also vary according to the flow rate and operating pressure values of the valve. For correct operation of the soft-shifting ensure the solenoid tubes are always filled with fluid. For this it is recommend to install a back pressure valve set at 0.5 - 2 bar on T line, similar to the C03MSV-DT-7-AC valves.

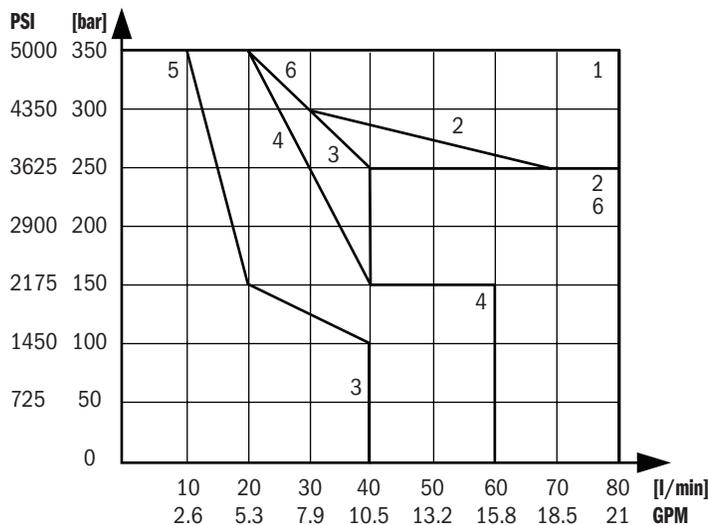
VSD03M

PRESSURE DROPS Δp -Q

(Obtained with viscosity 36 cSt at 50°C)



| Function / Spool Code | Flow Path Curve on Graph | | | | |
|-----------------------|--------------------------|-----|-----|-----|-----|
| | P-A | P-B | A-T | B-T | P-T |
| 1A1 | 3 | 3 | 3 | 3 | NA |
| 1B1 | 2 | 2 | 2 | 2 | NA |
| 3A, 5A | 1 | 2 | 3 | 3 | NA |
| 3A1 | 2 | 2 | 3 | 3 | NA |
| 3B1, 5B1 | 1 | 1 | 3 | 3 | 2 |
| 3F1 | 2 | 2 | 3 | 3 | NA |
| 3H, 3Q | 4 | 5 | 5 | 5 | 3 |
| 3L1, 5L1 | 5 | 5 | 5 | 5 | 3 |

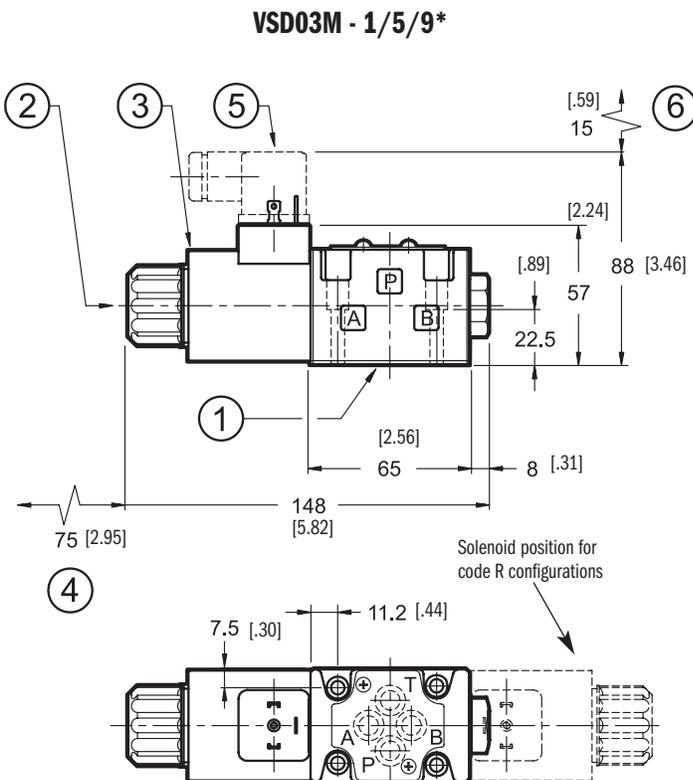
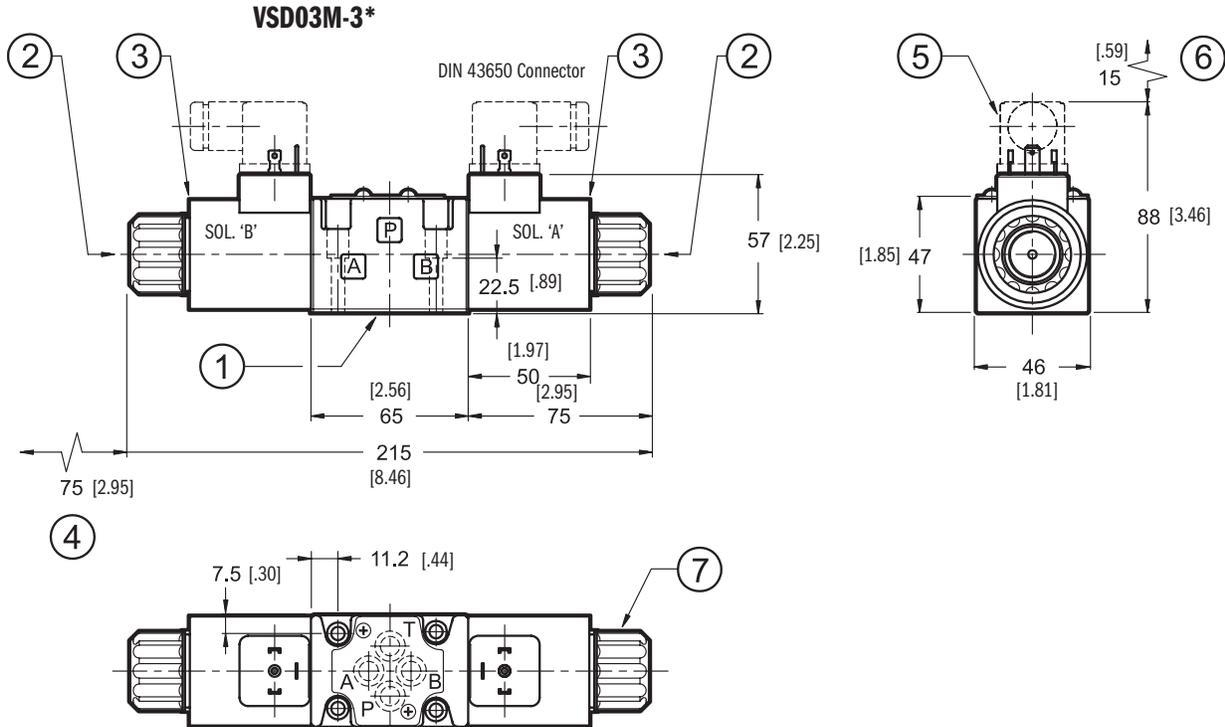


| Spool Code | Curve | Times [ms] | |
|------------|-------|------------|---------------|
| | | Energizing | De-Energizing |
| 3A, 3A1 | 1 | 350 | 200 ÷ 300 |
| 3B1 | 2 | 200 | 300 ÷ 400 |
| 3L1 | 3 | 350 | 150 ÷ 300 |
| 3F1 | 1 | 400 | 200 ÷ 300 |
| 1A1 | 4 | 180 | 200 ÷ 300 |
| 1B1 | 5 | 180 | 200 ÷ 300 |
| 9X | 6 | 300 | 200 ÷ 300 |

► **D03 INSTALLATION & DIMENSIONS DATA:**

Dimensions mm [in]

DC SOLENOID VALVES



| |
|---|
| Valve fastening: BD03-125 |
| Tightening torque: 4-6 lb-ft (5.4 - 8 Nm) |

| | |
|---|---|
| 1 | Mounting surface with sealing rings: 4pcs of AS568-012 90 Shore A |
| 2 | Standard manual override included in the solenoid tube |
| 3 | Coil (360° revolving) |
| 4 | Coil removal space |
| 5 | EN 175301-803 (ex DIN 43650) connector to be ordered separately. |
| 6 | Connector removal space |
| 7 | Locking ring: tightening torque 4 lb-ft (5 Nm) |

► VSD05M PERFORMANCE DATA:

(Obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

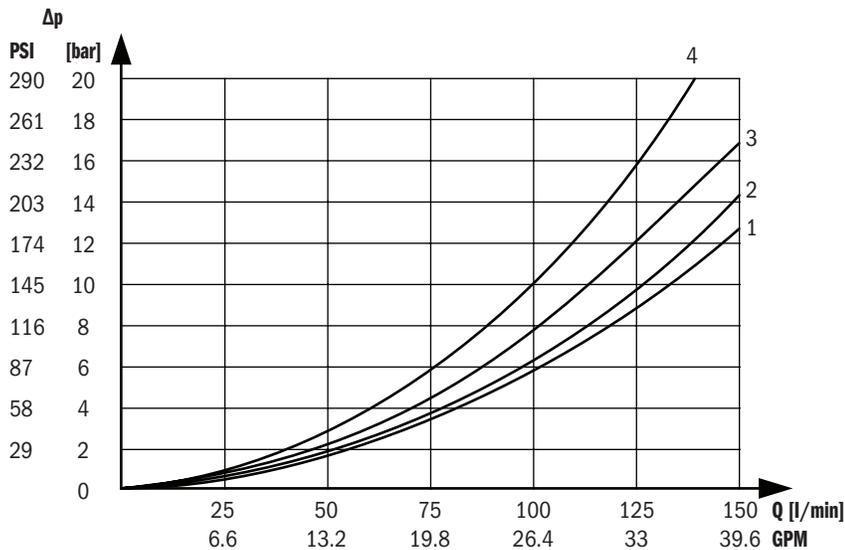
The diagram shows the operating limits of the spools available in the soft-shifting version, while the table shows the switching times. The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

The shifting time and characteristics curves are influenced by the viscosity (temperature) of the operating fluid. Shifting times can also vary according to the flow rate and operating pressure values of the valve. For correct operation of the soft-shifting ensure the solenoid tubes are always filled with fluid. For this it is recommend to install a back pressure valve set at 0.5 - 2 bar on T line, similar to the C05MSV-DT-7-AC valves.

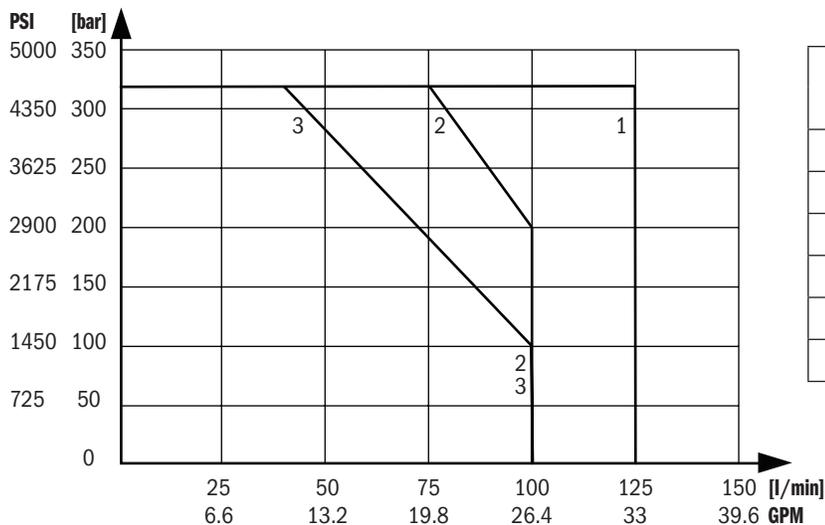
VSD05M

PRESSURE DROPS Δp -Q

(Obtained with viscosity 36 cSt at 50°C)



| Function / Spool Code | Flow Path Curve on Graph | | | | |
|-----------------------|--------------------------|-----|-----|-----|-----|
| | P-A | P-B | A-T | B-T | P-T |
| 1A | 3 | 3 | 2 | 2 | NA |
| 1B | 3 | 3 | 2 | 2 | NA |
| 3A, 5A | 2 | 2 | 1 | 1 | NA |
| 3AC | 2 | 2 | 1 | 1 | NA |
| 3B, 5B | 3 | 3 | 1 | 1 | 4 |
| 3F1 | 3 | 3 | 2 | 2 | NA |
| 3H, 3Q | 1 | 1 | 2 | 2 | NA |
| 3L, 5L | 1 | 1 | 2 | 2 | 4 |



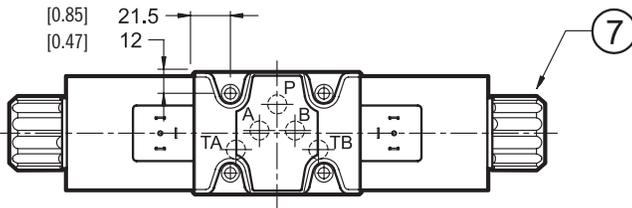
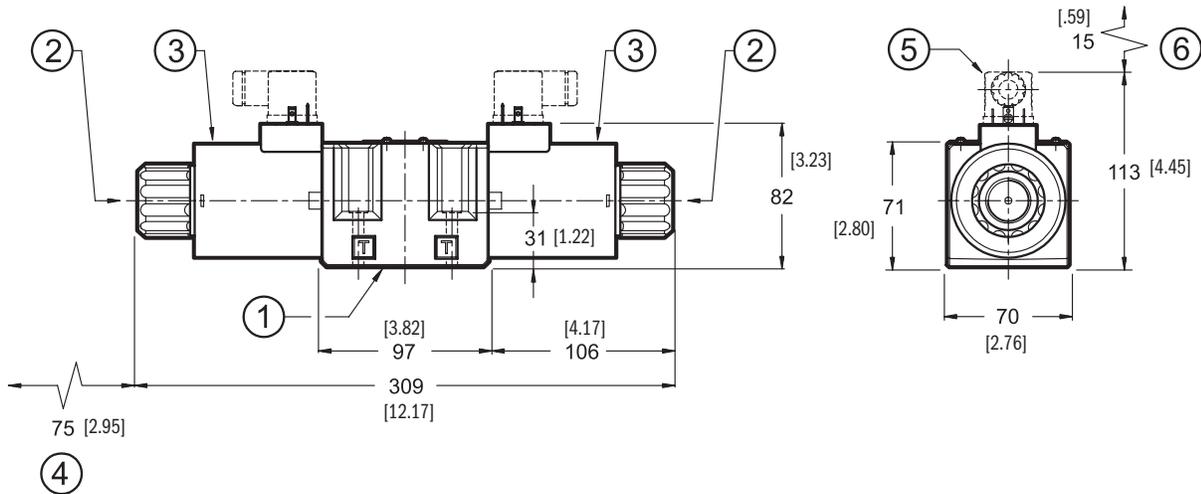
| Spool Code | Curves | | Times | |
|------------|--------|-----|------------|---------------|
| | P-A | P-B | Energizing | De-Energizing |
| 3A, 3AC | 1 | 1 | 300 ÷ 500 | 300 ÷ 500 |
| 3B | 2 | 2 | 450 | 200 ÷ 300 |
| 3L, 3H, 3Q | 3 | 3 | 400 | 400 ÷ 200 |
| 3F1 | 1 | 1 | 300 ÷ 500 | 300 ÷ 500 |
| 1A | 2 | 3 | 300 ÷ 400 | 300 ÷ 400 |
| 1B | 2 | 2 | 400 | 200 ÷ 300 |

► **D05 INSTALLATION & DIMENSIONS DATA:**

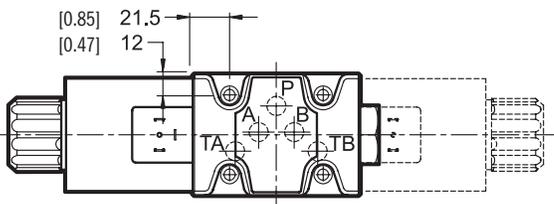
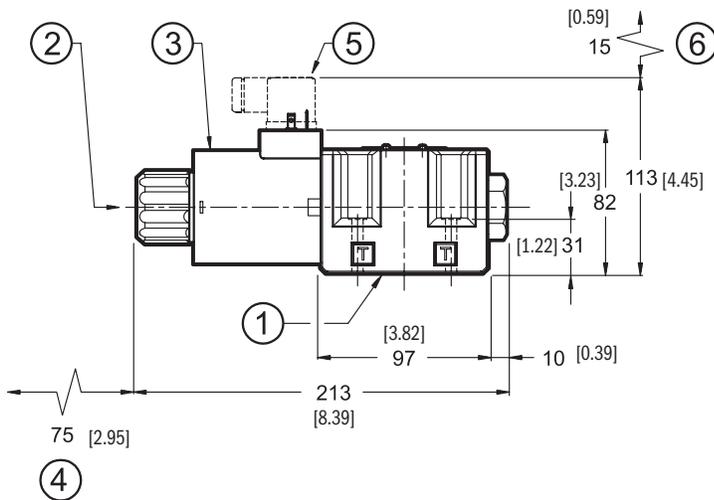
Dimensions mm [in]

DC SOLENOID VALVES

VSD05M-3*



VSD05M - 1/5*



Valve fastening: BD05-163-B
Tightening torque: 4-6 lb-ft (5.4 - 8 Nm)

| | |
|---|---|
| 1 | Mounting surface with sealing rings: 5pcs of AS568-014 90 Shore A |
| 2 | Standard manual override included in the solenoid tube |
| 3 | Coil (360° revolving) |
| 4 | Coil removal space |
| 5 | EN 175301-803 (ex DIN 43650) connector to be ordered separately. |
| 6 | Connector removal space |
| 7 | Locking ring: tightening torque 6-7 lb-ft (8 Nm) |

► ELECTRICAL FEATURES:

| | | |
|--|-------------------------------|------------------------------|
| VOLTAGE SUPPLY FLUCTUATION | ± 10% Vnom | |
| MAX SWITCH ON FREQUENCY | D03 18,000 ins/hr | D05 15,000 ins/hr |
| DUTY CYCLE | 100% | |
| ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE 1) | In compliance with 2014/30/EU | |
| LOW VOLTAGE | In compliance with 2014/35/EU | |
| CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation | Class H Class F | |

NOTE 1: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

| Connection Type | Electronic connection protection | Whole valve protection |
|-----------------------------|----------------------------------|------------------------|
| K1 EN 175301-803 | IP65 | IP65 |
| K7 DEUTSCH DT04 male | IP65/IP67/IP69 IP69K (*) | |

(*) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653

Current and absorbed power for DC solenoid valve

The table shows current and power consumption values relevant to the coil types for DC. Using connectors type "D" (VEA-6FR-A) with embedded bridge rectifier it is possible to feed DC coils (starting from 110V voltage) with alternating current (50 or 60 Hz). However, when supplying the valve with rectified current, it is necessary to consider a reduction of the operating limits by 15-20% approx.

VSD03M Coils for direct current (values ± 5%)

| Coil Code | Nominal Voltage (DC) | Resistance Ohms (Ω) | Current (Amps) | Power (Watts) | Solenoid Code |
|-----------|----------------------|---------------------|----------------|---------------|---------------|
| D12K1 | 12 | 4.4 | 2.72 | 33 | M1903080 |
| D24K1 | 24 | 18.6 | 1.29 | 31 | M1903081 |
| D110K1 | 110 | 423 | 0.26 | 28.2 | M1903464 |
| D12K7 | 12 | 4.4 | 2.72 | 33 | M1902940 |
| D24K7 | 24 | 18.6 | 1.29 | 31 | M1902941 |

VSD05M Coils for direct current (values ± 5%)

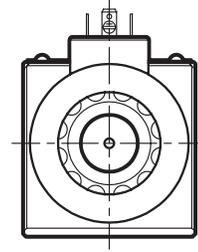
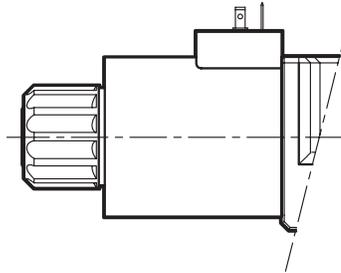
| Coil Code | Nominal Voltage (DC) | Resistance Ohms (Ω) | Current (Amps) | Power (Watts) | Solenoid Code |
|-----------|----------------------|---------------------|----------------|---------------|---------------|
| D12K1 | 12 | 3 | 4 | 48 | M1903550 |
| D24K1 | 24 | 12 | 2 | 48 | M1903551 |
| D110K1 | 110 | 250 | 0.44 | 48 | M1903554 |
| D12K7 | 12 | 3 | 4 | 48 | M1903620 |
| D24K7 | 24 | 12 | 2 | 48 | M1903221 |

Dimensions mm [in]

► **ELECTRICAL CONNECTIONS:**

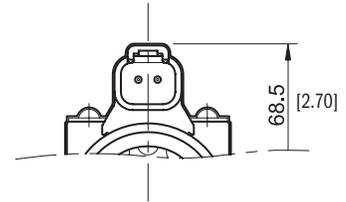
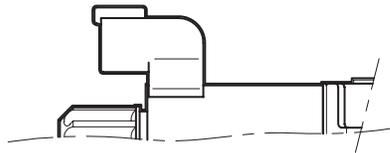
D03 and D05

Connection for EN 175301-803
(ex DIN 43650) connector form A
code K1 (standard)



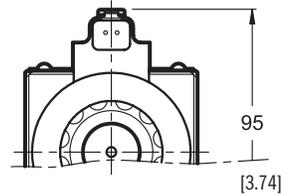
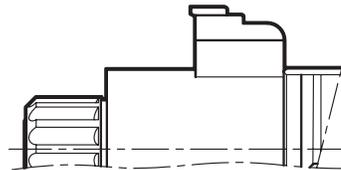
D03

Connection for VSD03M
DEUTSCH DT06-2S
male connector code K7



D05

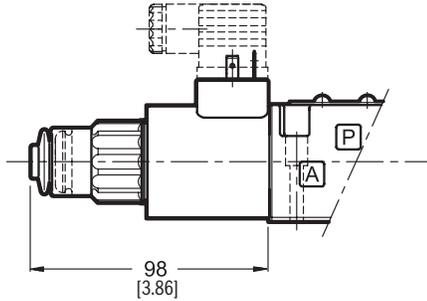
Connection for VSD03M
DEUTSCH DT06-2S
male connector code K7



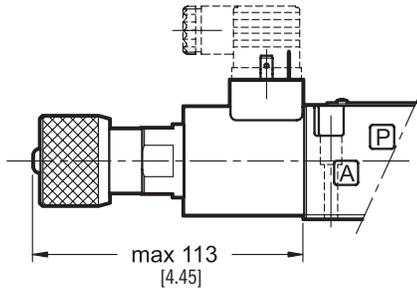
► **MANUAL OVERRIDE:**

VSD03M

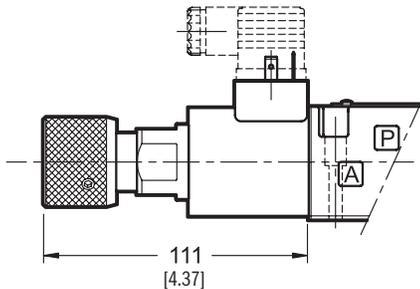
Manual override, boot protected
U - Version for DC solenoid valve
Code: M3401150006



Knob manual override, turning (only for DC solenoid valve)
Code: M3401150031

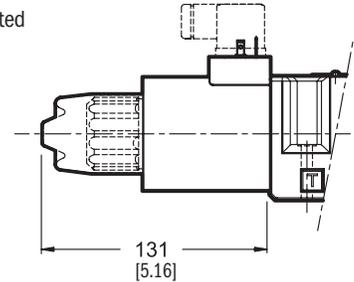


M - Push and twist manual override (only for DC solenoid valve)
Code: M3401150026



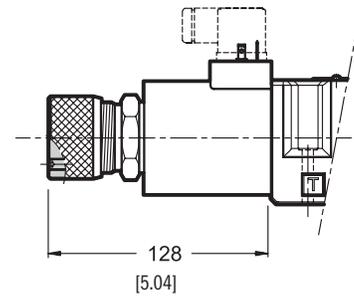
VSD05M

U - Manual override, boot protected
Code: M0239051

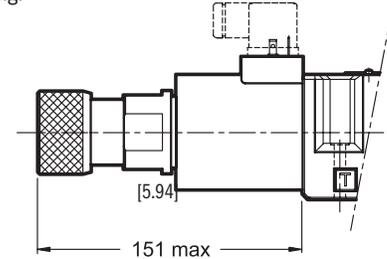


CK - Turning Knob
Spanner: 3mm
Code: M3803260003

When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosening.



CK2 - Push and twist
Code: M3401310001

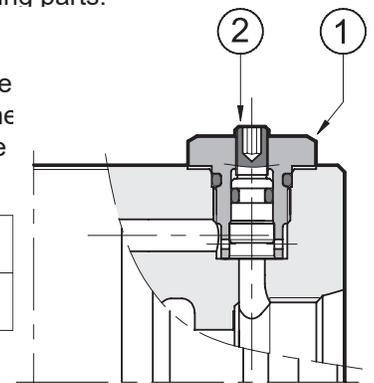


VSD05M

The VSD05M Directional solenoid valve is also available with an adjustable “soft-shifting” device (option S) This solenoid valve is supplied with a suitable device, adjustable by the user, which enables the control of the valve spool shifting time. In this way the hydraulic actuators can perform smooth movements, by controlling the valve switching time according to the machine cycle and the inertia of the moving parts.

NOTE:
During the first start-up the body must be filled with the operating fluid through the

| | |
|---|--|
| 1 | Spanner for plug: 17 mm [0.67] - tightening torque 20 Nm |
| 2 | Socket hex adjustment screw for shifting time: spanner 2.5 mm [0.10] |



► MOUNTING SURFACES:

All the mounting surfaces refer to NFPA T3.5.1 R2-2002 and ISO 4401:2005 Standards

The mounting surface standards recommends metric coarse threads. However, subplates are commercially available with UNC threads. Select a bolt size that matches the threads in the mounting surface.

Dimensional tolerance are ± 0.1 mm (0.004") for bolt and pin location; ± 0.2 mm (0.008") for the other quotes.

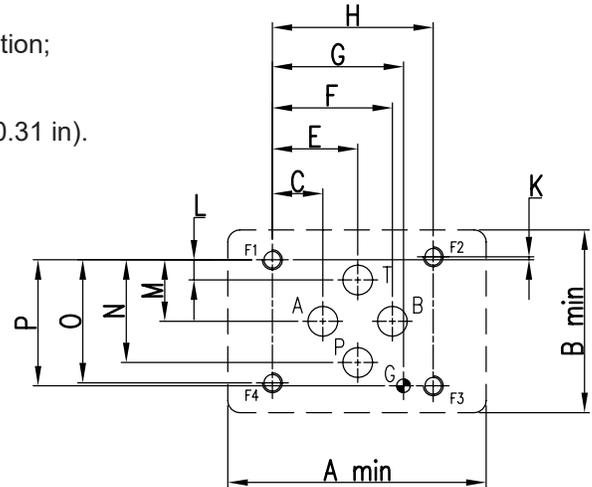
The minimum depth of the blind hole G where required is 8 mm (0.31 in).

D03

| | MM | INCH |
|------------------------------|-------------------|---------------------|
| P, A, B, T MAX | \varnothing 7.0 | \varnothing 0.276 |
| G MAX | \varnothing 7.0 | \varnothing 0.16 |
| MOUNTING BOLT THREAD SIZE | M5 | 10-24 UNC 2B |

| | MM | INCH |
|---|------|-------|
| A | 51.0 | 2.00 |
| B | 43.0 | 1.70 |
| C | 12.7 | 0.50 |
| E | 21.5 | 0.85 |
| F | 30.2 | 1.19 |
| G | 33.0 | 1.30 |
| H | 40.5 | 1.594 |

| | MM | INCH |
|---|------|------|
| K | 0.75 | 0.03 |
| L | 5.10 | 0.20 |
| M | 15.5 | 0.61 |
| N | 25.9 | 1.02 |
| O | 31.0 | 1.22 |
| P | 31.8 | 1.25 |

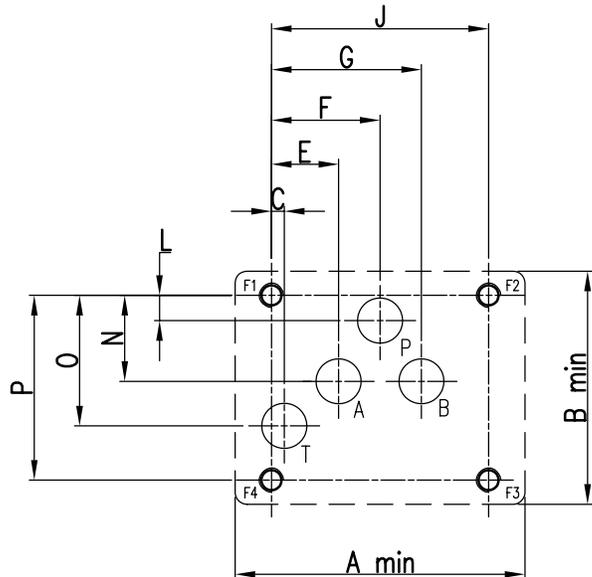


D05

| | MM | INCH |
|------------------------------|--------------------|--------------------|
| P, A, B, T MAX | \varnothing 11.2 | \varnothing 0.44 |
| MOUNTING BOLT THREAD SIZE | M6 | 1/4 - 20 UNC |

| | MM | INCH |
|---|------|-------|
| A | 72.0 | 2.84 |
| B | 58.0 | 2.28 |
| C | 3.20 | 0.126 |
| E | 16.7 | 0.66 |
| F | 27.0 | 1.06 |
| G | 37.3 | 1.47 |

| | MM | INCH |
|---|------|-------|
| J | 54.0 | 2.125 |
| L | 6.30 | 0.25 |
| N | 21.4 | 0.84 |
| O | 32.5 | 1.28 |
| P | 46.0 | 1.812 |





DIRECTIONAL VALVES

VSD03M and VSD05M Soft-Shift



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