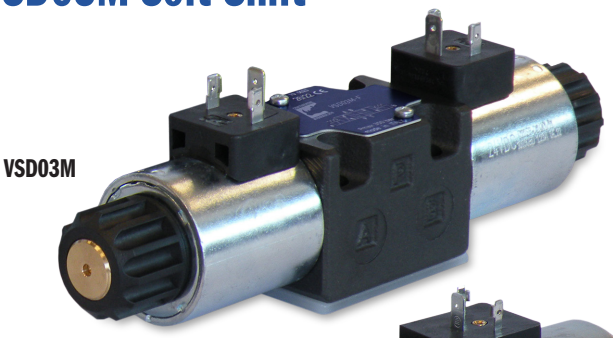
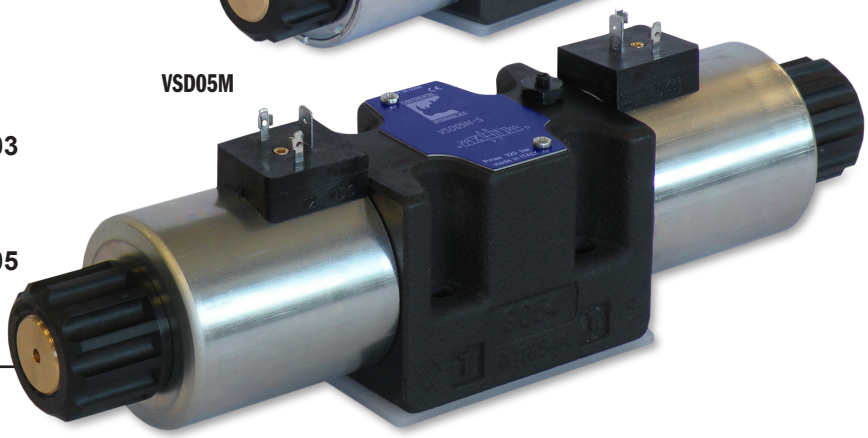




VSD03M and VSD05M

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**

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/mi)		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		

VSD03M and VSD05M Soft-Shift

IDENTIFICATION CODE:

VSD03M - □ □ - □ F □ - □ □ ← DESIGN LETTER

BASIC VALVE FUNCTION / SPOOL CODES
See page 3

SEAL TYPE	
CODE	DESCRIPTION
A	BUNA
G	VITON

SOFT-SHIFT
Smooth start and stop

MECHANICAL	
CODE	DESCRIPTION
OMIT	Not Required
R	Single solenoid port end B
U	Manual override boot
CK1	Turn Knob Override
CK2	Push & Twist Override

VOLTAGE	
CODE	DESCRIPTION
D12K1	12 VDC Din
D24K1	24 VDC Din
D110K1	110 VDC Din
D12K7	12 VDC Deutsch
D24K7	12 VDC Deutsch

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

IDENTIFICATION CODE:

VSD05M - □ □ - □ □ □ - □ □ ← DESIGN LETTER

BASIC VALVE FUNCTION / SPOOL CODES
See page 3

SEAL TYPE	
CODE	DESCRIPTION
A	BUNA
G	VITON

SOFT-SHIFT	
CODE	DESCRIPTION
F	Fixed Rate
S	Adjustable Rate

MECHANICAL	
CODE	DESCRIPTION
OMIT	Not Required
R	Single solenoid port end B
U	Manual override boot
CK	Turn Knob Override
CK2	Push & Twist Override

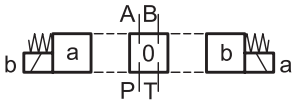
VOLTAGE	
CODE	DESCRIPTION
D12K1	12 VDC Din
D24K1	24 VDC Din
D110K1	110 VDC Din
D12K7	12 VDC Deutsch
D24K7	12 VDC Deutsch

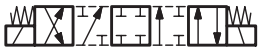
TYPICAL ORDERING CODE:
VSD05M-1A-GS-D24K1

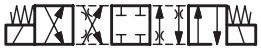
VSD03M and VSD05M Soft-Shift

SPOOL TYPE

2 solenoids
3 positions with spring centering



3A 

3A1 

3B1 

3F1 

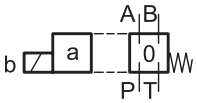
3L1 

***3H** 

***3Q** 

*D05 ONLY

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

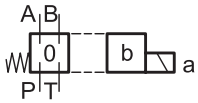


5A 

5B1 

5L1 

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

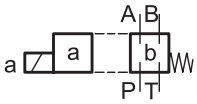


5A-R 

5B1-R 

5L1-R 

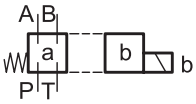
1 solenoid side A
2 external positions with
return spring



1A1 

1B1 

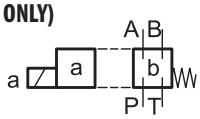
1 solenoid side B
2 external positions with
return spring



1A1-R 

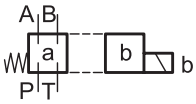
1B1-R 

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



9X 

1 solenoid side B
2 positions with return spring



9X-R 

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

CHARACTERISTIC CURVES

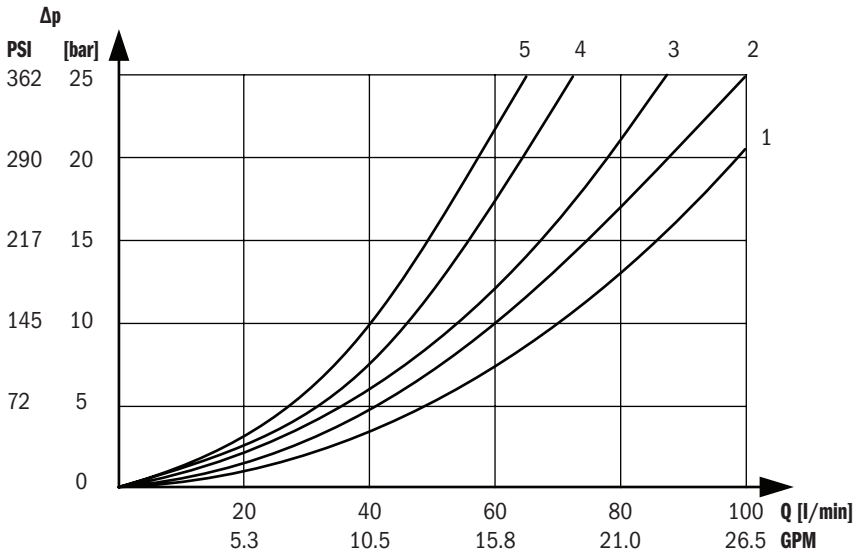
(Obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

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.

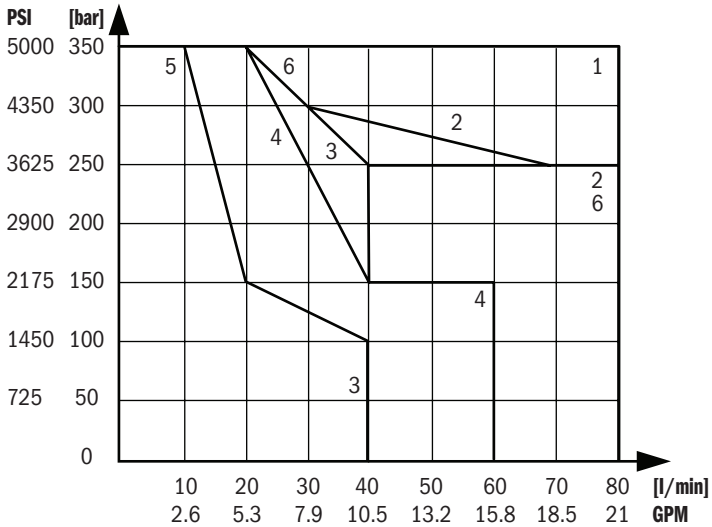
The shifting time and characteristics curves are influenced by the viscosity (temperature) of the operating fluid. Shifting times can also vary according to the flow rate and operating pressure values of the valve. For correct operation of the soft-shifting ensure the solenoid tubes are always filled with fluid. For this it is recommend to install a back pressure valve set at 1 - 2 bar on T line, similar to the C03MSV-DT-7-AC valves.

VSD03M Performance Data

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



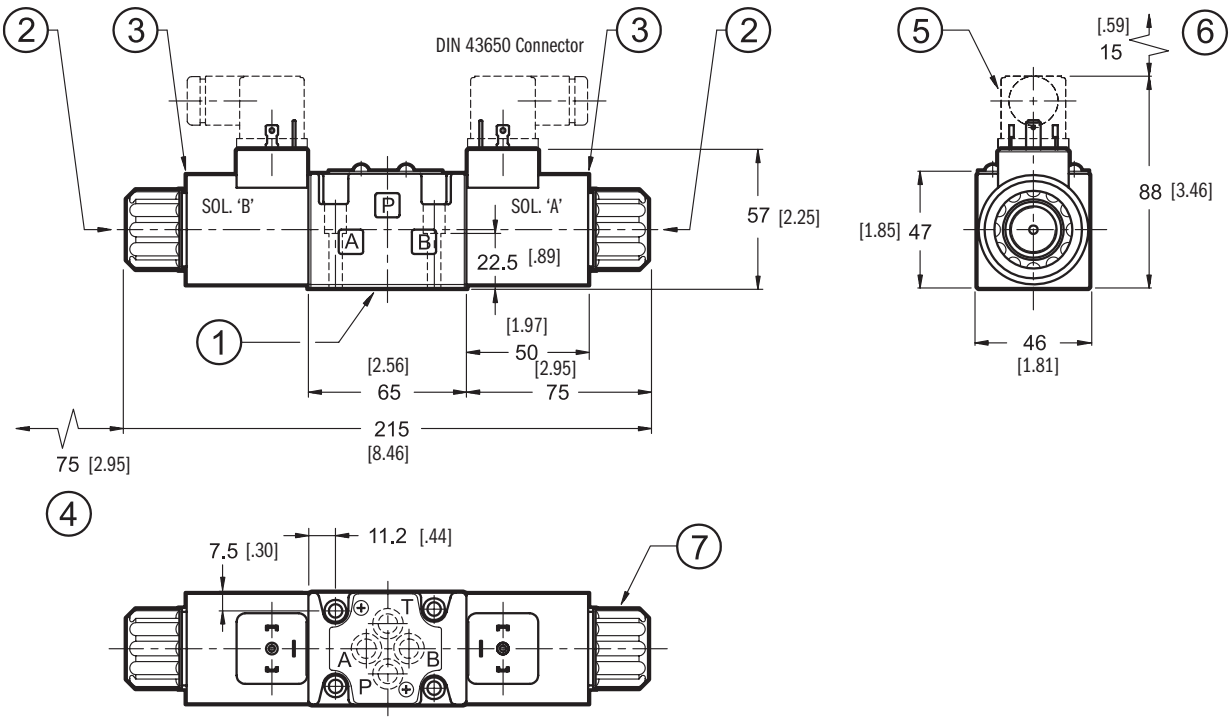
Spool Code	Curve	Times [ms]	
		Energizing	De-Energizing
3A, 3A1	1	350	200 ÷ 300
3B1	2	200	300 ÷ 400
3L1	3	350	150 ÷ 300
3F1	1	400	200 ÷ 300
1A1	4	180	200 ÷ 300
1B1	5	180	200 ÷ 300
9X	6	300	200 ÷ 300

VSD03M and VSD05M Soft-Shift

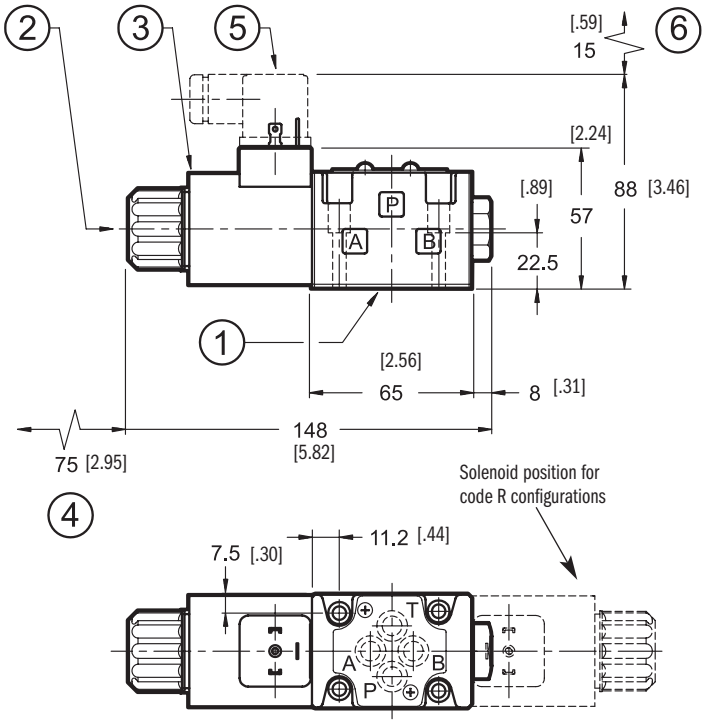
OVERALL AND MOUNTING DIMENSIONS FOR DC SOLENOID VALVES

Dimensions mm [in]

VSD03M-3*



VSD03M - 1/5/9*



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)

VSD03M and VSD05M Soft-Shift

CHARACTERISTIC CURVES

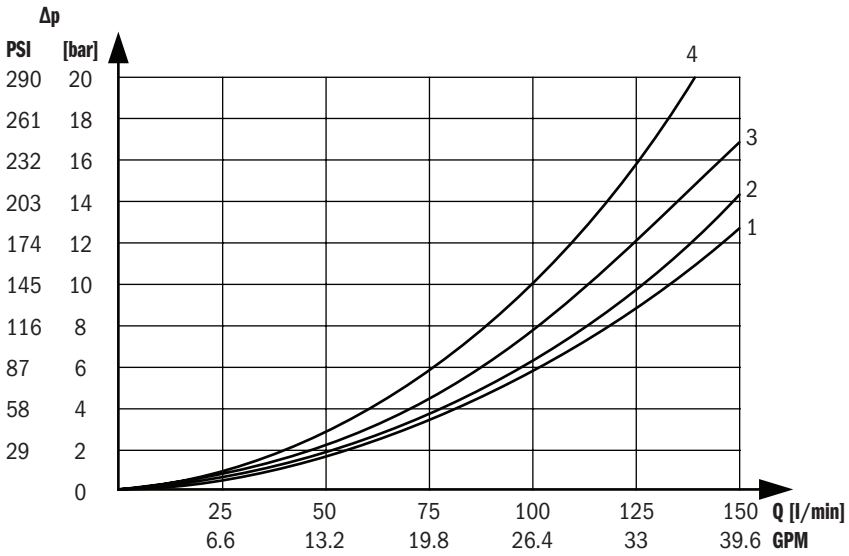
(Obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

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.

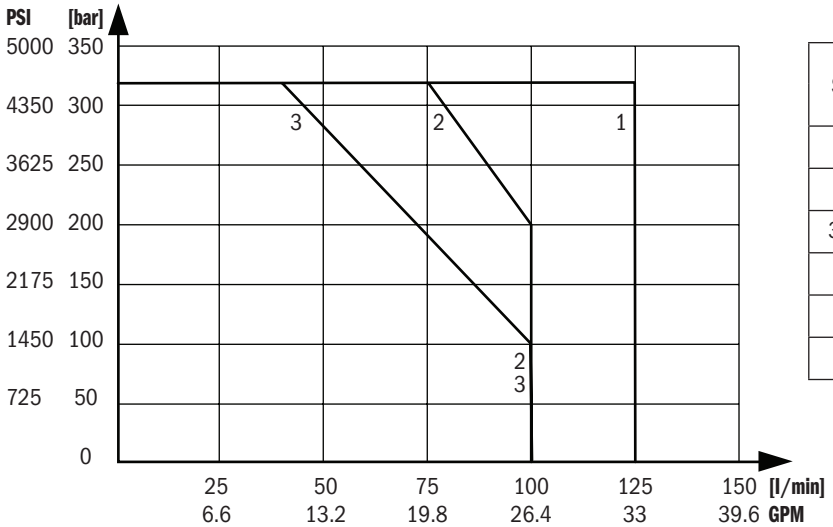
The shifting time and characteristics curves are influenced by the viscosity (temperature) of the operating fluid. Shifting times can also vary according to the flow rate and operating pressure values of the valve. For correct operation of the soft-shifting ensure the solenoid tubes are always filled with fluid. For this it is recommend to install a back pressure valve set at 1 - 2 bar on T line, similar to the C05MSV-DT-7-AC valves.

VSD05M Performace Data

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



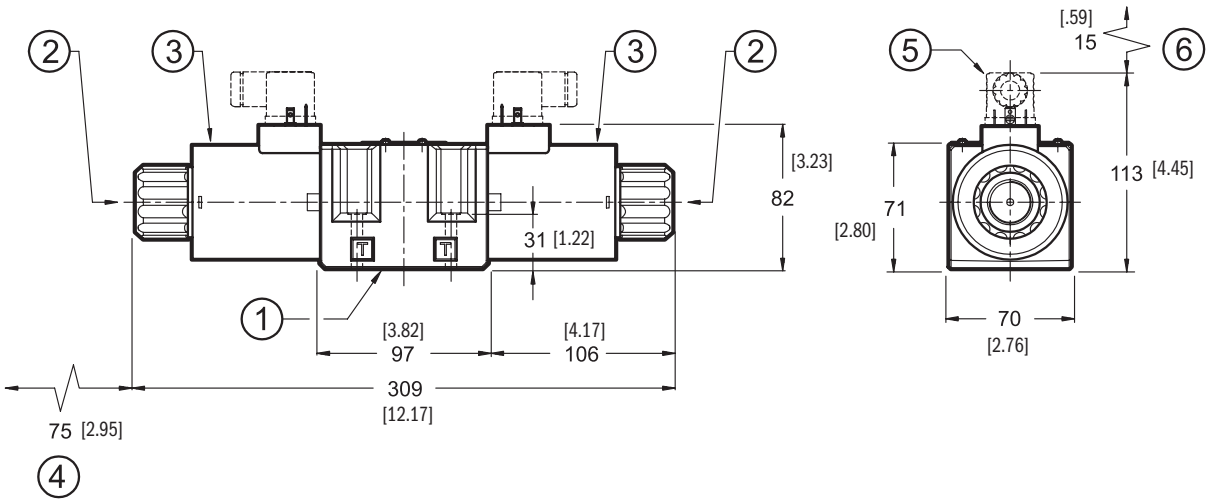
Spool Code	Curves		Times	
	P-A	P-B	Energizing	De-Energizing
3A, 3AC	1	1	300 ÷ 500	300 ÷ 500
3B	2	2	450	200 ÷ 300
3L, 3H, 3Q	3	3	400	400 ÷ 200
3F1	1	1	300 ÷ 500	300 ÷ 500
1A	2	3	300 ÷ 400	300 ÷ 400
1B	2	2	400	200 ÷ 300

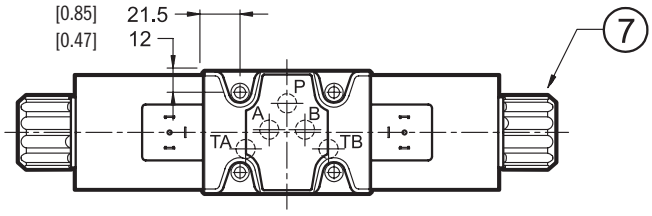
VSD03M and VSD05M Soft-Shift

OVERALL AND MOUNTING DIMENSIONS FOR DC SOLENOID VALVES

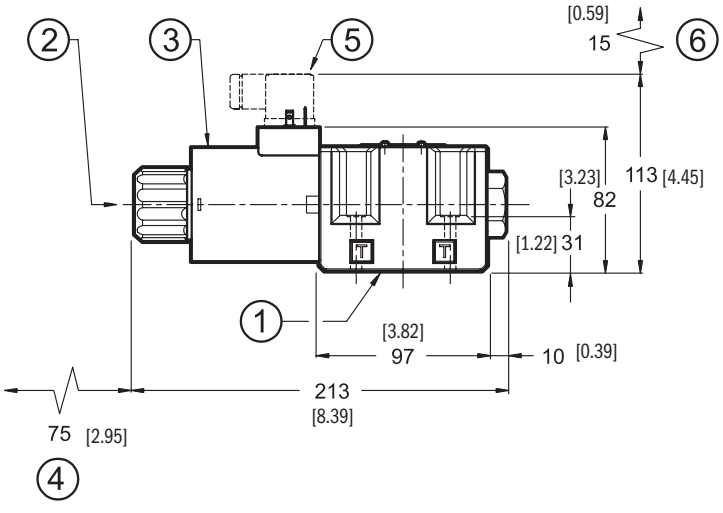
Dimensions mm [in]

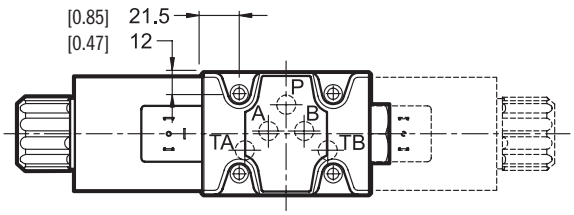
VSD05M-3*





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)

VSD03M and VSD05M Soft-Shift

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

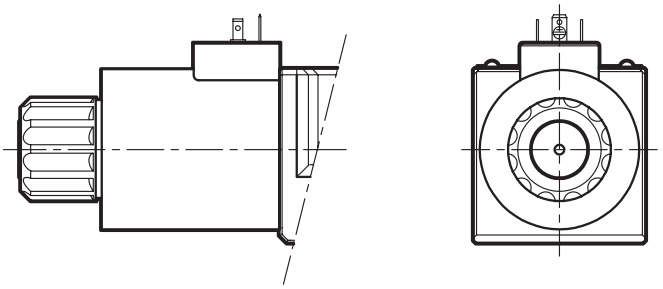
VSD05M Coils for direct current (values ± 5%)

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

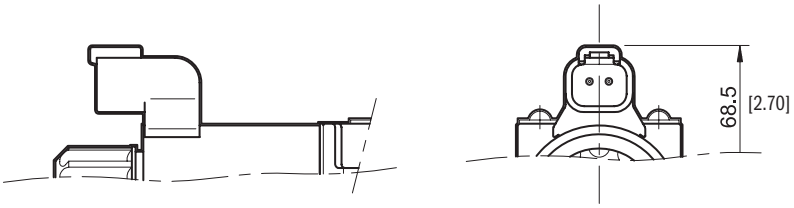
ELECTRICAL CONNECTIONS

Dimensions mm [in]

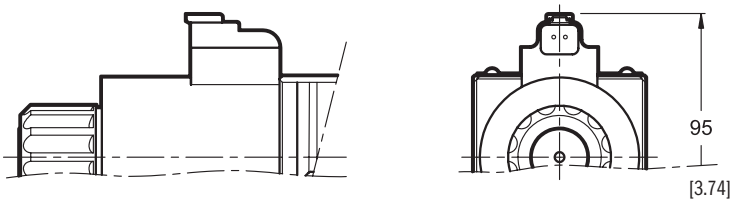
D03 and D05
Connection for EN 175301-803
(ex DIN 43650) connector form A
code K1 (standard)



D03
Connection for VSD03M
DEUTSCH DT06-2S
male connector code K7



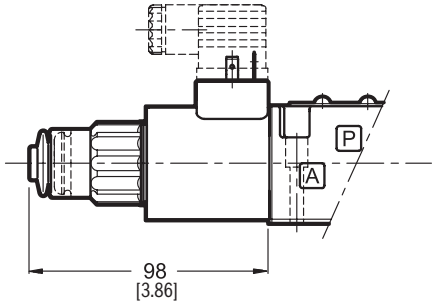
D05
Connection for VSD03M
DEUTSCH DT06-2S
male connector code K7



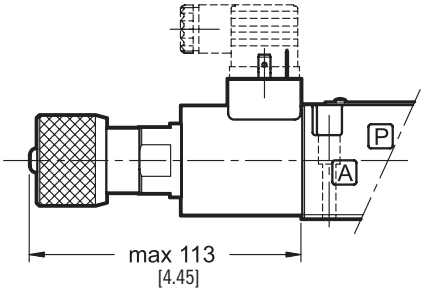
VSD03M and VSD05M Soft-Shift

MANUAL OVERRIDES VSD03M

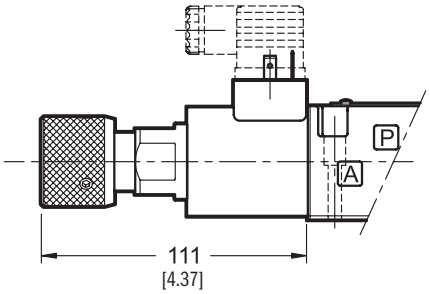
Manual override, boot protected
U - Version for DC solenoid valve
Code: M3401150006



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

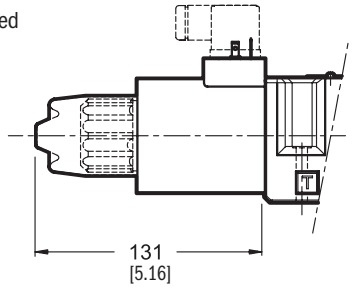


M - Push and twist manual override (only for DC solenoid valve)
Code: M3401150026



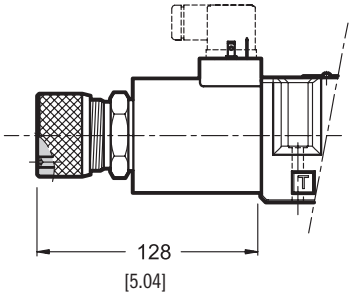
MANUAL OVERRIDES VSD05M

U - Manual override, boot protected
Code: M0239051

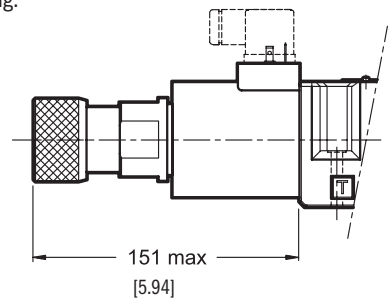


CK - Turning Knob
Spanner: 3mm
Code: M3803260003

When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spoul: 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 loosing.



CK2 - Push and twist
Code: M3401310001

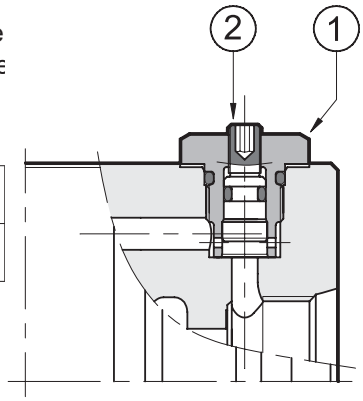


VSD05M

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]



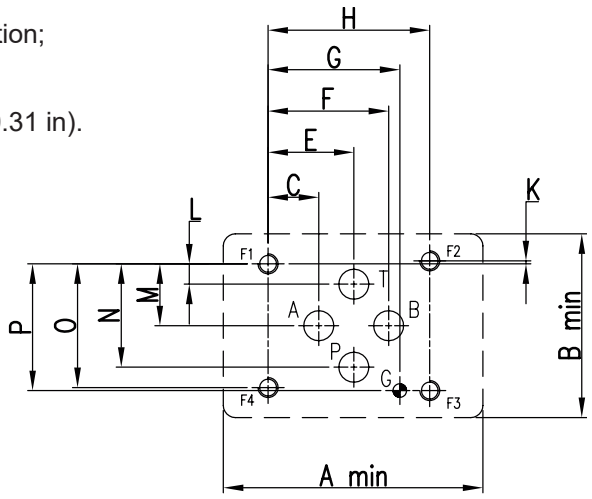
MOUNTING SURFACES

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).

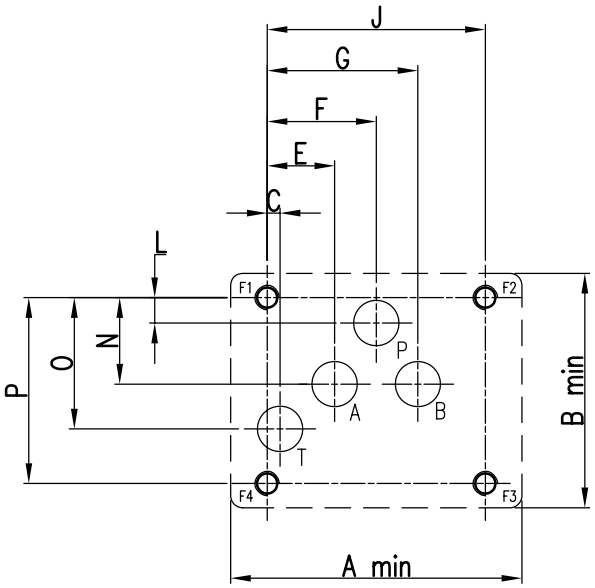


D03

	MM	INCH
P, A, B, T MAX	ø 7.0	ø 0.276
G MAX	ø 7.0	ø 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	ø 11.2	ø 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

VSD03M and VSD05M Soft-Shift

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