CONTINENTAL HYDRAULICS

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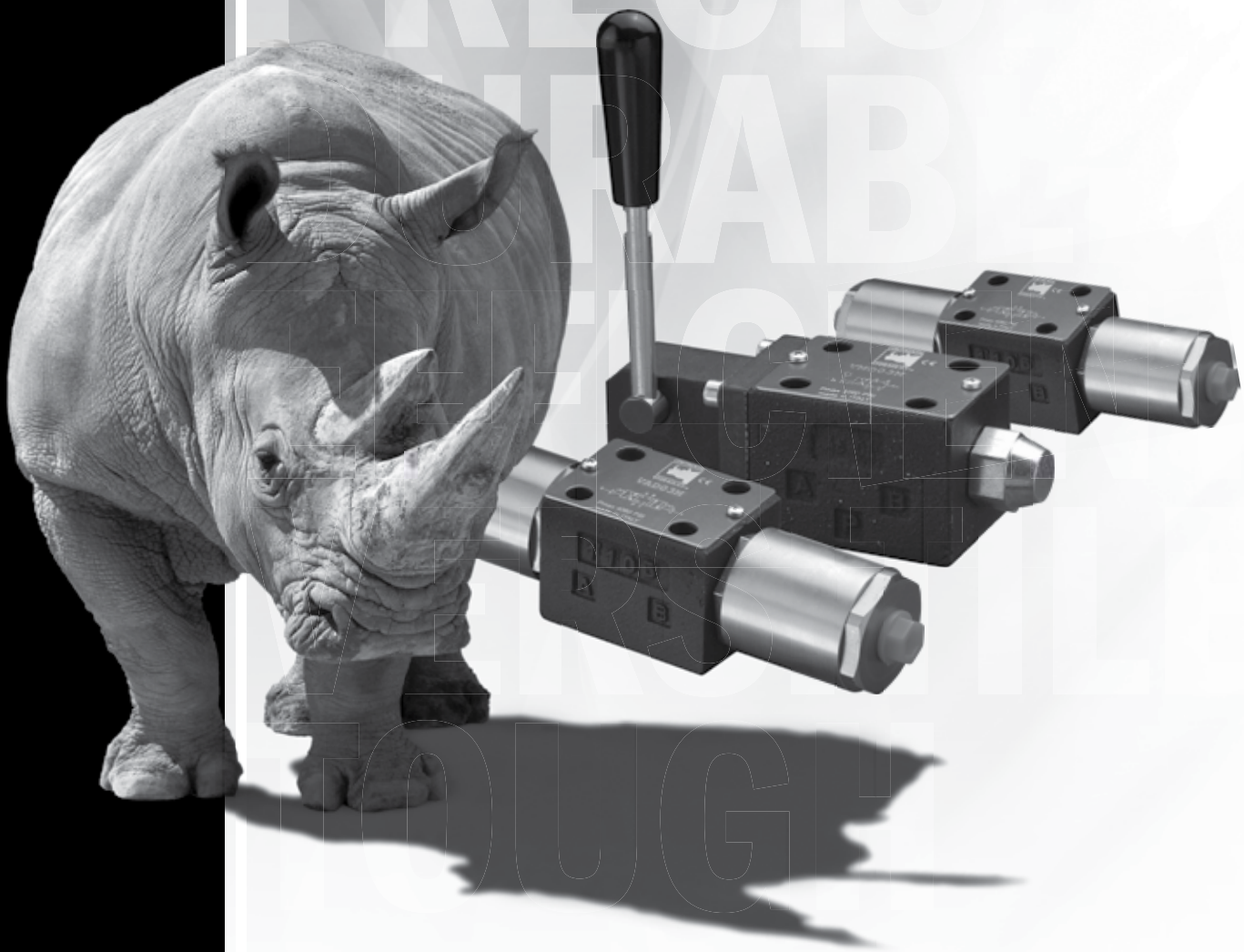
VAD03M-VPD03M-VMD03M

AIR, HYDRAULIC, LEVER OPERATED DIRECTIONAL VALVES



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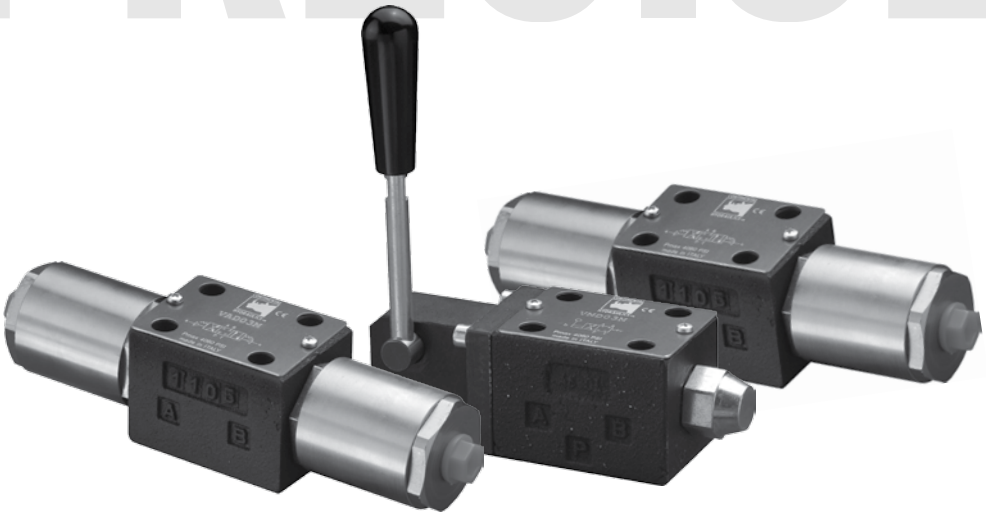
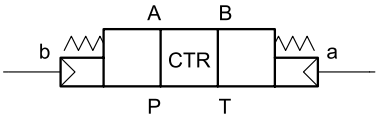


DESCRIPTION

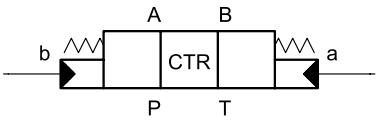
Continental Hydraulics offers directional control valves with air pilot actuation, hydraulic pilot actuation and lever actuation. These valves conform to NFPA D03 and ISO 4401 mounting standards. They are available in both 3 way and 4 way styles.

All versions are available in 2 position spring offset, 2 position detent, 2 position spring centered and 3 position spring centered versions. The lever valve also is available in a 3 position detent model.

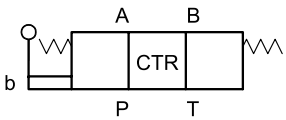
A wide range of spools is available.



VAD03M



VPD03M



VMD03M

TYPICAL PERFORMANCE SPECIFICATIONS

MAXIMUM OPERATING PRESSURE	P - A - B Ports	5000 psi	350 bar
	T Port VA, VP	360 psi	25 bar
	T Port VM	3000 psi	210 bar
MAXIMUM PILOT PRESSURE	VA	175 psi	12 bar
	VP	3000 psi	210 bar
MINIMUM PILOT PRESSURE	VA	60 psi	4 bar
	VP	215 psi*	15 bar*
FLOW RATE		20 gpm	76 l/min
MOUNTING SURFACE		NFPA D03 ISO 4401-03-02-0-03	
MAXIMUM WEIGHT	VA, VP Single Op.	2.9 lbs	1.3 kg
	VA, VP Dual Op.	3.7 lbs	1.7 kg
	VM - Lever	4.6 lbs	2.1 kg

***NOTE:**

The pilot pressure must be at least 215 psi (15 bar) above the T port pressure for the valve to shift properly. The pilot pressure circuit must be designed to allow the pilot pressure to drop rapidly to 0 psi to properly return the spool to its non-actuated position.

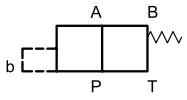
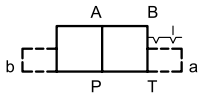
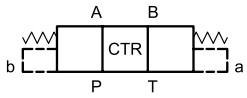
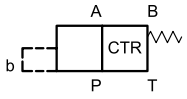
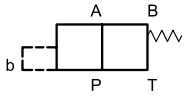
RANGE TEMPERATURES	Ambient	-4 to +130 °F	-20 to +54 °C
	Fluid	-4 to +180 °F	-20 to +82 °C
FLUID VISCOSITY	Range	60-1900 SUS	10-400 cSt
	Recommended	120 SUS	25 cSt
FLUID CONTAMINATION		ISO 4406:1999 Class 20/18/15	

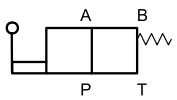
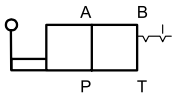
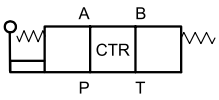
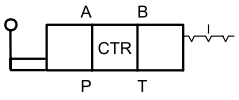
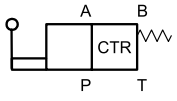
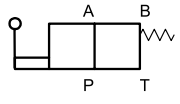
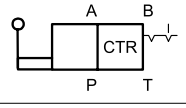
IDENTIFICATION CODE

V □ D03M - □ □ - □ □ - 10 - □ — DESIGN LETTER

Operator

OPERATOR	
A	Air
P	Oil
M	Lever

FUNCTION FOR AIR AND OIL OPERATOR	
1	
	Single Operator 2 Position Spring Offset
2	
	Dual Operator 2 Position Detented (No Spring)
3	
	Dual Operator 3 Position Spring Centered
5	
	Single Operator 2 Position Spring Centered
9	
	Single Operator 2 Position - 3 Way Spring Offset

FUNCTION FOR LEVER OPERATOR	
1	
	Lever Operator 2 Position Spring Offset
2	
	Lever Operator 2 Offset Position Detented (No Spring)
3	
	Lever Operator 3 Position Spring Centered
4	
	Lever Operator 3 Position Detented (No Spring)
5	
	Lever Operator 2 Position Spring Centered
9	
	Lever Operator 2 Position - 3 Way Spring Offset
25	
	Lever Operator 2 Position Detented (No Spring)

Spool Type
See Next Page

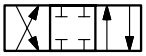
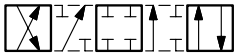
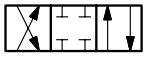
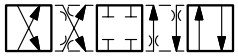
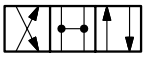
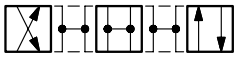
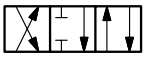
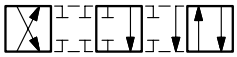
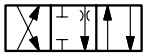
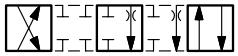
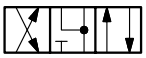
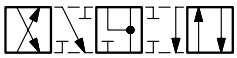
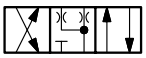
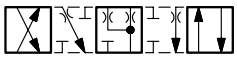
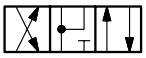
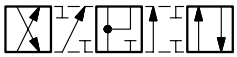
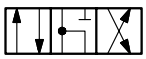
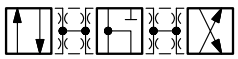
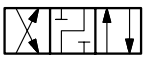
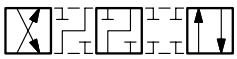
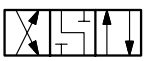
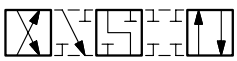
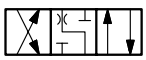
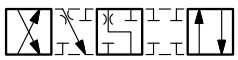
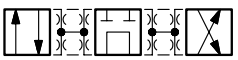
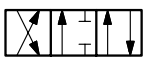
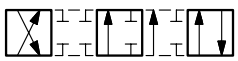
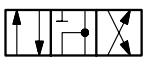
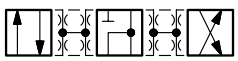
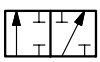
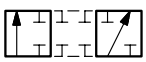
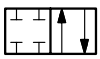
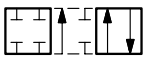
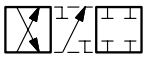
SEAL	
A	Buna (STD)
G	Viton

MECHANICAL OMIT IF NOT REQUIRED	
R	Operator at 'B' port end. Available only with function 1, 5 and 9. Also available on lever valve codes 3 and 4.
90	Lever operator rotated 90° toward tank port.

NOTE: Spool code 9X must have the T port connected to tank.

TYPICAL ORDERING CODE:

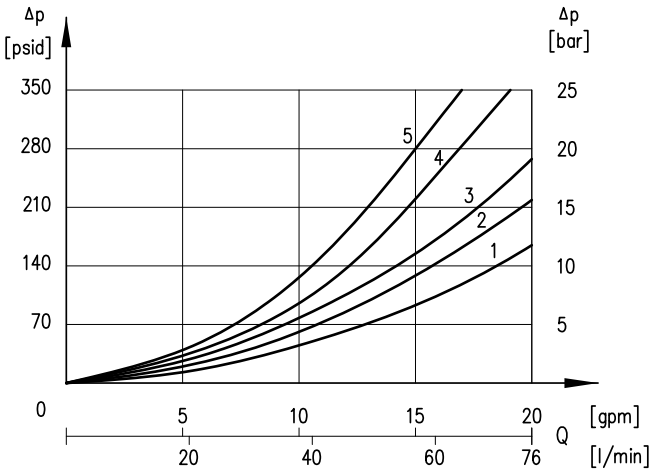
VAD03M-3A-A-10-B
VPD03M-3A-A-10-A
VMD03M-3A-A-10-B

SPOOLS					
NAME	**SYMBOL**	**FUNCTION**	**CENTER POSITION**	**CROSSOVER**	**FUNCTION MATCHING**
A			All ports blocked	P⟶B or P⟶A T blocked	1, 2, 3, 4*, 5, 25*
A1			All ports closed	P⟶B and A⟶T restricted or P⟶A and B⟶T restricted	3, 4*, 5, 25*
B			All ports open	All ports open	1, 2, 3, 4*, 5, 25*
E			P and A blocked, and B⟶T	All ports blocked or P and A blocked and B⟶T	3, 4*, 5, 25*
E1			P and A blocked, B restricted to T	All ports blocked or A blocked and B⟶T restricted	
F			P blocked, A⟶T and B⟶T	P blocked and A⟶T or B⟶T	
F1			P blocked, A and B restricted to T	P blocked, A or B restricted to T	
G			P to A and B T blocked	P⟶B or P⟶A T blocked	
H			P and A to T, B blocked	All ports open, restricted	
J			P⟶B A and T blocked	P⟶B and A blocked or all ports blocked	
K			P and B blocked, and A⟶T	P and B blocked and A⟶T or all ports blocked	
K1			P and B blocked, A restricted to T	P blocked and A⟶T restricted or all ports blocked	
L			P⟶T, A and B blocked	All ports open, restricted	
N			P⟶A B and T blocked	All ports blocked, or P⟶A B and T blocked	
Q			P and B to T, A blocked	All ports open, restricted	
X			-	All ports blocked	2*, 9
AN			-	All ports blocked	2 (only VA and VP)
AJ			-	All ports blocked	2 (only VA and VP)

NOTES:

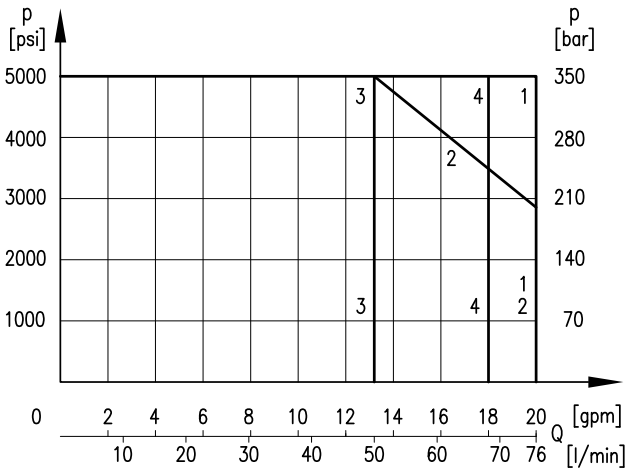
1. Functions marked with * are available with lever operator only.
2. AN and AJ spools are not available with lever operator.
3. These are the standard configurations. Contact Continental Hydraulics for special versions.

PRESSURE DROPS ΔP-Q (OBTAINED WITH VISCOSITY OF 36 CST AT 50 °C)



SPOOL	FLOW CURVE NUMBER				
	SHIFTED				CENTER
	P→A	P→B	A→T	B→T	P→T
A, A1, K1, F1, E1	2	2	3	3	
B	1	1	3	3	2
E	2	2	3	1	
F	3	3	1	1	
G	1	3	1	3	
H, Q	4	5	5	5	3
J	2	1	3	3	
K	2	2	1	3	
L	5	5	5	5	3
N	1	2	3	3	
1A, 2A, 2AN, 2AJ	3	3	3	3	
1A, 1B, 2A	2	2	2	2	
9X	3	3			

PERFORMANCE CURVE



VAD03M, VMD03M

CURVE	SPOOL
1	A, A1, AN, AJ, B, E1, F1, G, K1, J, N, X
2	F
3	E, K, H, L, Q
4	L (only for VMD03M)

VPD03M

CURVE	SPOOLS
2	A, F, 1B
3	B, L, X

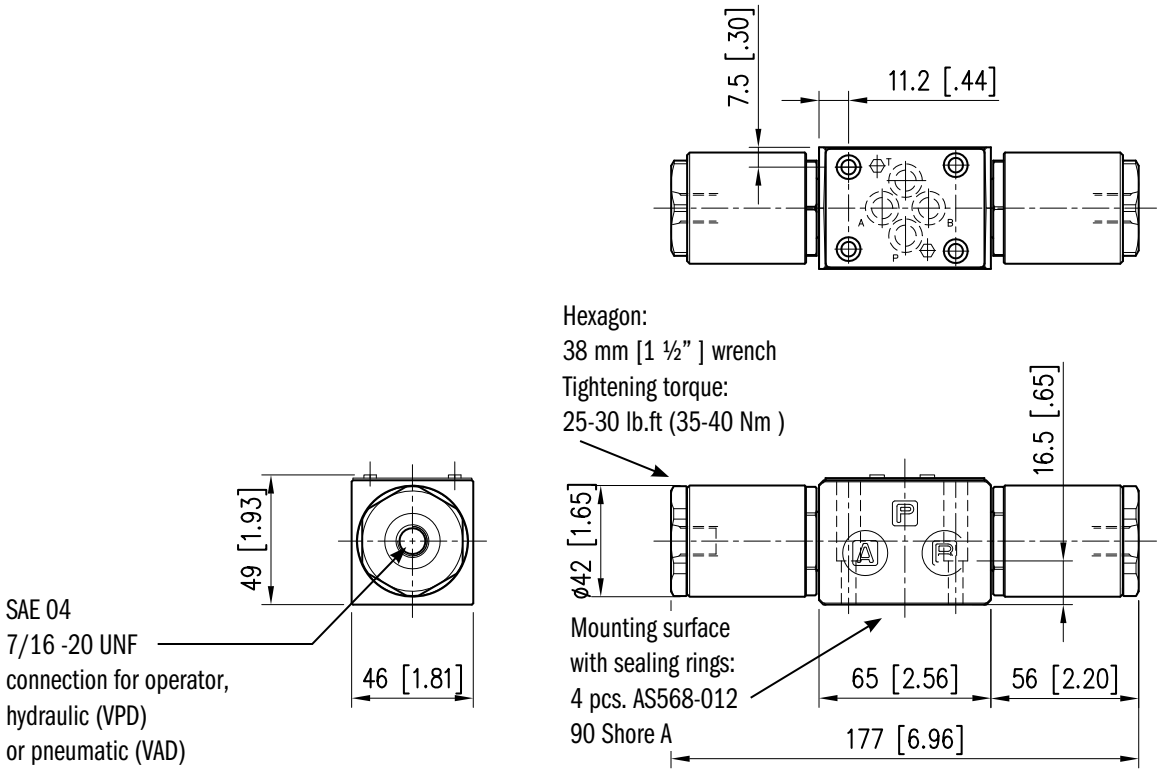
NOTES:

1. Valve performance was tested in a four way circuit (full loop). Performances may be reduced from that shown when used in a three-way circuit (half circuit), i.e. A or B port plugged.
2. The values have been obtained according to ISO 6403 norm with filtration according to ISO 4406:1999 class 18/16/13.

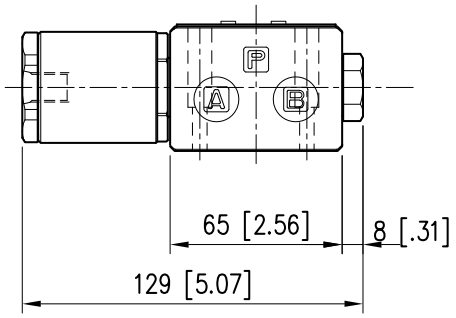
OVERALL AND MOUNTING DIMENSIONS FOR PNEUMATIC AND HYDRAULIC OPERATOR

VAD03M-2*, 3*
VPD03M-2*, 3*

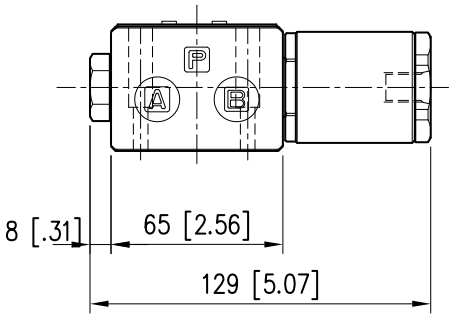
Dimensions in mm [IN]



VAD03M-1*, 5*, 9
VPD03M-1*, 5*, 9



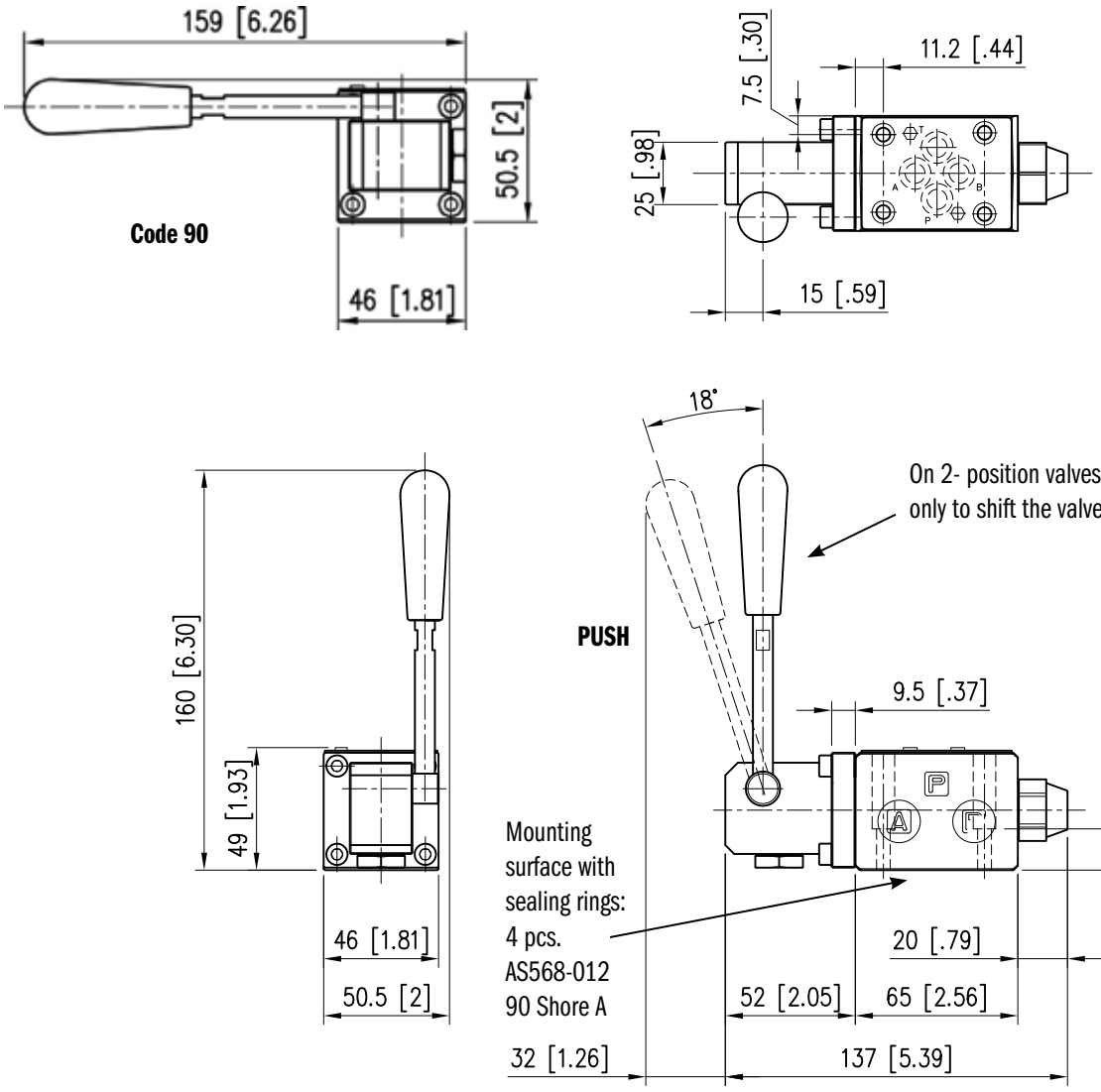
VAD03-1*-R, 5*-R, 9*-R
VPD03-1*-R, 5*-R, 9*-R



OVERALL AND MOUNTING DIMENSIONS FOR LEVER OPERATED VALVE

VMD03M

Dimensions in mm [IN]



NOTE:
the lever can be oriented by the user directly 180° turned to the standard position by uscrewing the lever and re-mounting it in the desired position.

APPLICATION DATA

FLUIDS

All pressure drops shown on these data pages are based on 170 SUS fluid viscosity and 0.87 specific gravity. For any other specific gravity (G1) the pressure drop (ΔP) will be approx. ΔP1 = ΔP (G1/G). See the chart for other viscosities.

FLUID VISCOSITIES	Cst	10	14.5	32	36	43	54	65	76	86	108	216	324	400
	SUS	60	75	150	170	200	250	300	350	400	500	1000	1500	1900
MULTIPIER		0.77	0.81	0.97	1.00	1.04	1.10	1.15	1.20	1.24	1.31	1.56	1.72	1.83

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code G). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 180 degrees F causes the accelerated degradation of seals as well as the degradation of the fluids physical and chemical properties.

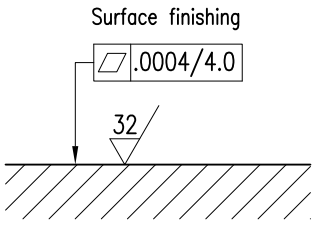
From a safety standpoint, temperatures above 130 degrees F are not recommended.

RANGE TEMPERATURES:	Ambient	- 4 to +130 °F	-20 to +54 °C
	Fluid	- 4 to +180 °F	-20 to +82 °C
FLUID VISCOSITY	Range	60 -1900 SUS	10 - 400 cSt
	Recommended	120 SUS	25 cSt
FLUID CONTAMINATION		ISO 4406:1999 Class 20/18/15	

INSTALLATION

The configurations with centering and return springs can be mounted in any position without impairing correct operation.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



SEAL KIT

Buna Seal Kit for VAD03M	1013311
Viton Seal Kit for VAD03M	1013312

Buna Seal Kit for VPD03M	1013313
Viton Seal Kit for VPD03M	1013314

Buna Seal Kit for VMD03M	1013315
Viton Seal Kit for VMD03M	1013316

BOLT KIT

BD03-100	Valve only	121472

SUBPLATES

REAR PORTED	**AD03SPB8S**	Aluminium	SAE-08	265801AU
	DD03SPB8S	Ductile	SAE-08	265801AH
SIDE PORTED	**AD03SPS8S**	Aluminium	SAE-08	265801AP
	DD03SPS8S	Ductile	SAE-08	265801AI

NOTES:
1. Max pressure for aluminum subplates: 3000 psi (210 bar)
2. Max pressure for ductile subplates: 5000 psi (350 bar)
3. Always verify subplate port size is proper for the application

ABOUT CONTINENTAL HYDRAULICS

Rugged, durable, high-performance, efficient—the reason Continental Hydraulics' products are used in some of the most challenging applications across the globe. With a commitment to quality customer support and innovative engineering, Continental's pumps, valves, power units, mobile and custom products deliver what the markets demand. Continental has been serving the food production, brick and block, wood products, automotive and machine tool industries since 1962. Learn how our products survive some of the most harsh environments.

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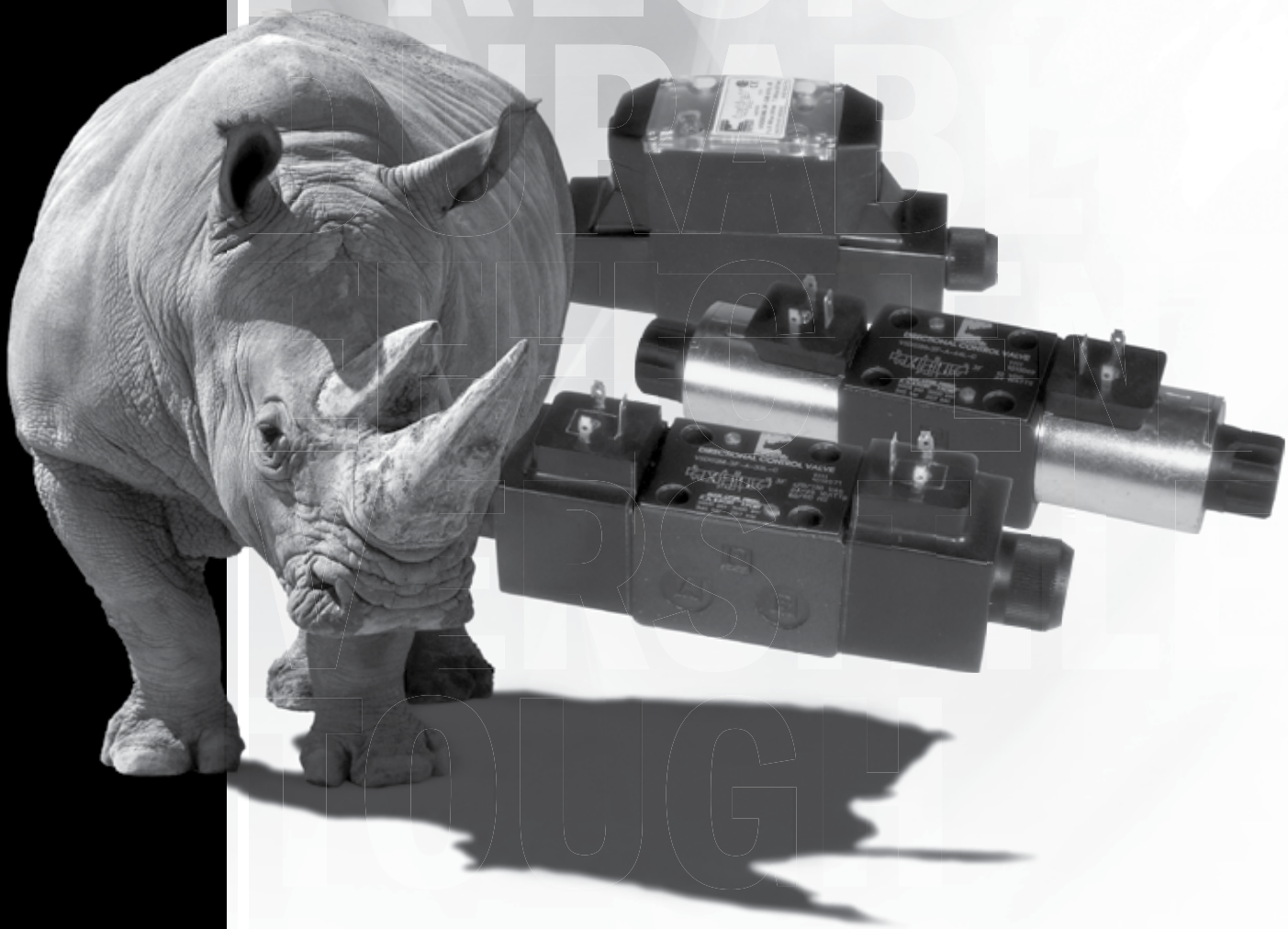
CONTINENTAL HYDRAULICS

CONTINENTAL HYDRAULICS

CONTINENTAL HYDRAULICS

VSD03M

SOLENOID OPERATED DIRECTIONAL VALVES



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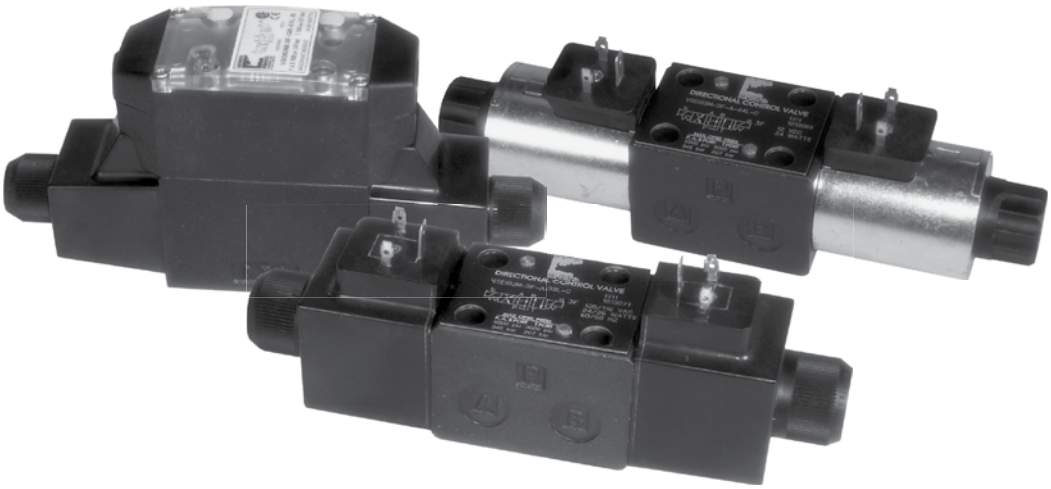
POWERFUL

VSD03M
SOLENOID OPERATED DIRECTIONAL VALVES



DESCRIPTION

These valves conform to NFPA D03 and ISO 4401 mounting standards. They are available in both 3 way and 4 way styles.

All versions are available in 2 position spring offset, 2 position detent, 2 position spring centered and 3 position spring centered versions.

A wide range of spools are available.

Standard and CSA approved versions are available.

TYPICAL PERFORMANCE SPECIFICATIONS

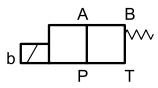
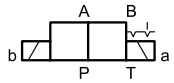
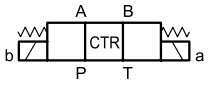
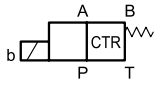
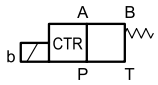
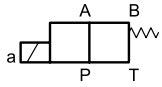
MAXIMUM OPERATING PRESSURE	P - A - B Ports	Standard	5000 psi	350 bar
		CSA	4000 psi	275 bar
	T Port	Standard	3000 psi	210 bar
		CSA	2500 psi	172 bar
FLOW RATE			20 gpm	76 l/min
MOUNTING SURFACE			NFPA D03 ISO 4401-03-02-0-03	
MAXIMUM WEIGHT		AC	4 lbs	1.8 kg
		DC	4.6 lbs	2.1 kg

RANGE TEMPERATURES		Ambient	-4 to +130°F	-20 to +54°C
	Fluid	Standard	-4 to +180°F	-20 to +82°C
		CSA	-4 to +150°F	-20 to +66°C
FLUID VISCOSITY		Range	60-1900 SUS	10-400 cSt
		Recommended	120 SUS	25 cSt
FLUID CONTAMINATION			ISO 4406:1999 Class 20/18/15	

IDENTIFICATION CODE

VSD03M - □ □ - □ □ □ □ - □ - □ L - □ — DESIGN LETTER

SOLENOIDS - See the codes on page 10

FUNCTION	
1	 Single Solenoid 2 Position Spring Offset
2	 Dual Solenoid 2 Position Detented (No Spring)
3	 Dual Solenoid 3 Position Spring Centered
5	 Single Solenoid 2 Position Spring Centered
6	 Single Solenoid 2 Position Energize To Center
9	 Single Operator 2 Position - 3 Way Spring Offset

SEAL	
A	Buna (STD)
G	Viton

Spool Type
See Next Page

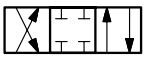
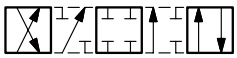
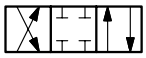
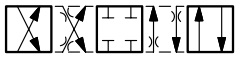
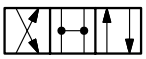
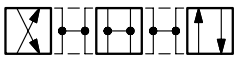
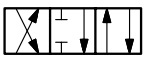
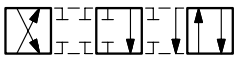
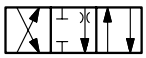
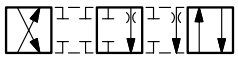
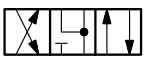
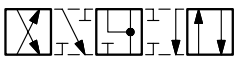
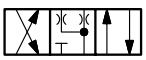
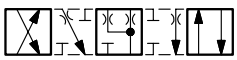
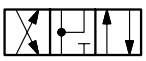
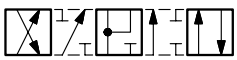
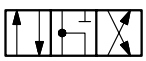
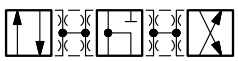
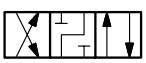
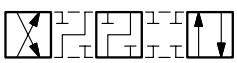
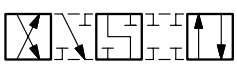
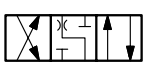
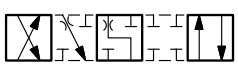
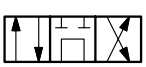
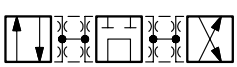
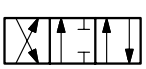
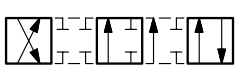
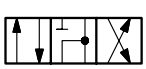
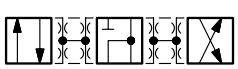
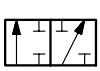
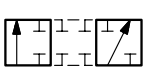
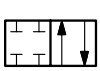
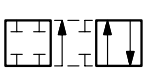
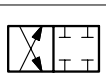
MECHANICAL OMIT IF NOT REQUIRED	
R	Single Solenoid Operator At 'B' Port End.
WD	Wash-Down

CONNECTION BOX OPTIONS OMIT IF NOT REQUIRED
See the codes on page 9

ELECTRICAL OPTION	
OMIT	Plug-in terminal solenoids or lead wires
B	Connection box with terminal posts and lights

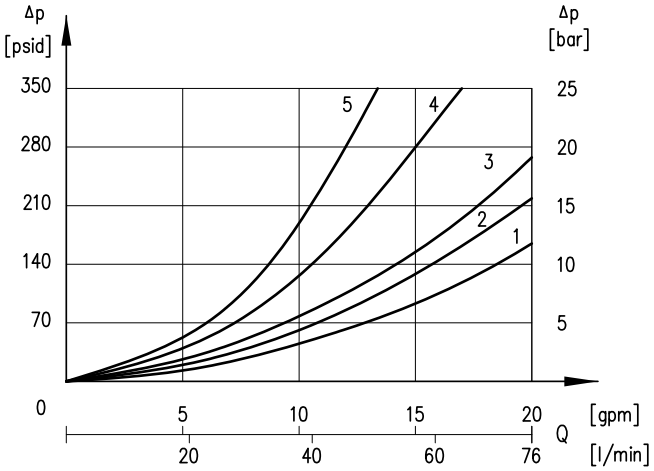
APPROVALS	
OMIT	STD VALVE
CSA	CSA US/CAN

TYPICAL ORDERING CODE:
VSD03M-3A-AB5A-60L-C
VSD03M-3A-A-33L-C

SPOOLS					
NAME	**SYMBOL**	**FUNCTION**	**CENTER POSITION**	**CROSSOVER**	**FUNCTION MATCHING**
A			All ports blocked	P⟶B or P⟶A T blocked	1, 2, 3, 5, 6
A1			All ports blocked	P⟶B and A⟶T restricted or P⟶A and B⟶T restricted	3, 5
B			All ports open	All ports open	1, 2, 3, 5, 6
E			P and A blocked, and B⟶T	All ports blocked or P and A blocked and B⟶T	3, 5
E1			P and A blocked, B restricted to T	All ports blocked or A blocked and B⟶T restricted	3, 5
F			P blocked, A⟶T and B⟶T	P blocked and A⟶T or B⟶T	3, 5, 6
F1			P blocked, A and B restricted to T	P blocked, A or B restricted to T	3, 5
G			P to A and B T blocked	P⟶B or P⟶A T blocked	
H			P and A to T, B blocked	All ports open, restricted	
J			P⟶B A and T blocked	P⟶B and A blocked or all ports blocked	
K			P and B blocked, and A⟶T	P and B blocked and A⟶T or all ports blocked	
K1			P and B blocked, A restricted to T	P blocked and A⟶T restricted or all ports blocked	
L			P⟶T, A and B blocked	All ports open, restricted	
N			P⟶A B and T blocked	All ports blocked, or P⟶A B and T blocked	3, 5, 6
Q			P and B to T, A blocked	All ports open, restricted	3, 5
X			-	All ports blocked	9
AN			-	All ports blocked	2
AJ			-	All ports blocked	2

These are the standard configurations. Contact Continental Hydraulics for special versions.

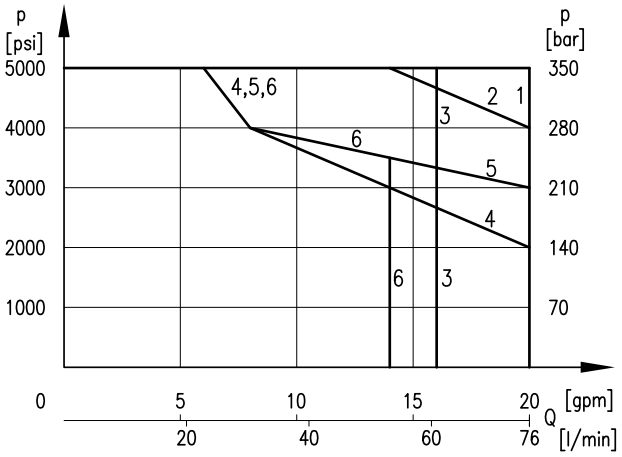
PRESSURE DROPS ΔP-Q
(OBTAINED WITH VISCOSITY OF 170 SUS - 36 CST AT 70°F - 50°C)



SPOOL	FLOW CURVE NUMBER				
	SHIFTED				CENTER
	P→A	P→B	A→T	B→T	P→T
A, A1, K1, F1, E1	2	2	3	3	
B	1	1	3	3	2
E	2	2	3	1	
F	3	3	1	1	
G	1	3	1	3	
H, Q	4	5	5	5	3
J	2	1	3	3	
K	2	2	1	3	
L	5	5	5	5	3
N	1	2	3	3	
1A, 2A, 2AN, 2AJ	3	3	3	3	
1A, 1B, 2A	2	2	2	2	
9X	3	3			

PERFORMANCE CURVE

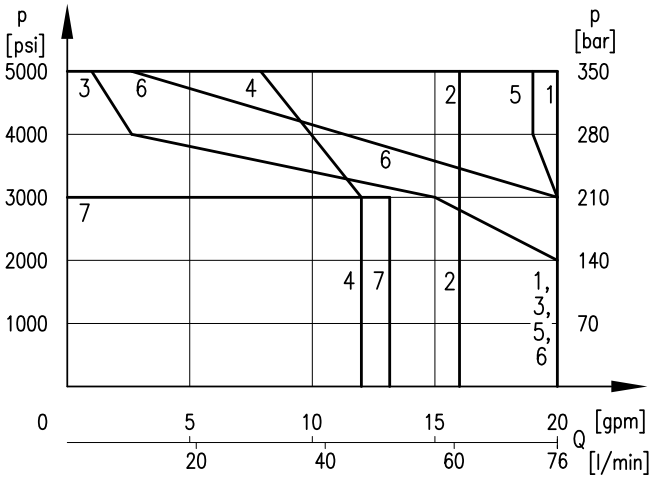
DC VOLTAGE



CURVE	SPOOL
1	A, 2A, A1, AN, AJ, E1, G, K1, J, N, X
2	F1
3	H, L, Q, B
4	F
5	1A
6	1B, E, K

PERFORMANCE CURVE

AC VOLTAGE

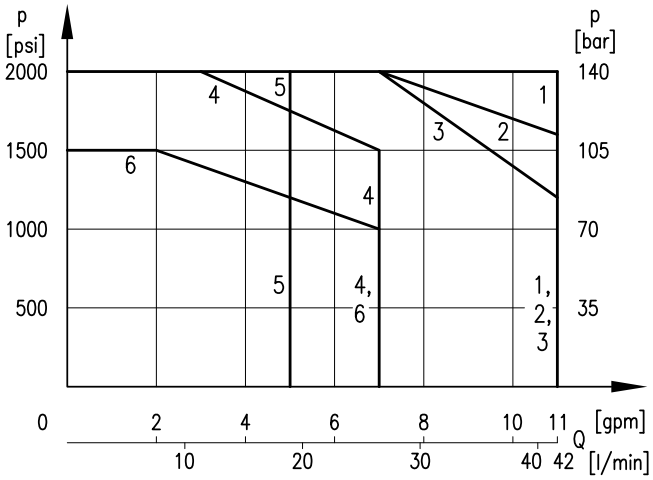


CURVE	SPOOL
1	A, A1, G, AN, AJ, X.
2	B
3	F
4	L, H, Q
5	J, N
6	F1, E1, K1
7	K, E

NOTES:

1. The values indicated in the graphs are relevant to the standard solenoid valve, with 42L coils.
2. Valve performance was tested in a four way circuit (full loop). Performances may be reduced from that shown when used in a three-way circuit (half circuit), i.e. A or B port plugged.
3. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with filtration according to ISO 4406:1999 class 18/16/13.

AC VOLTAGE - LOW FORCE

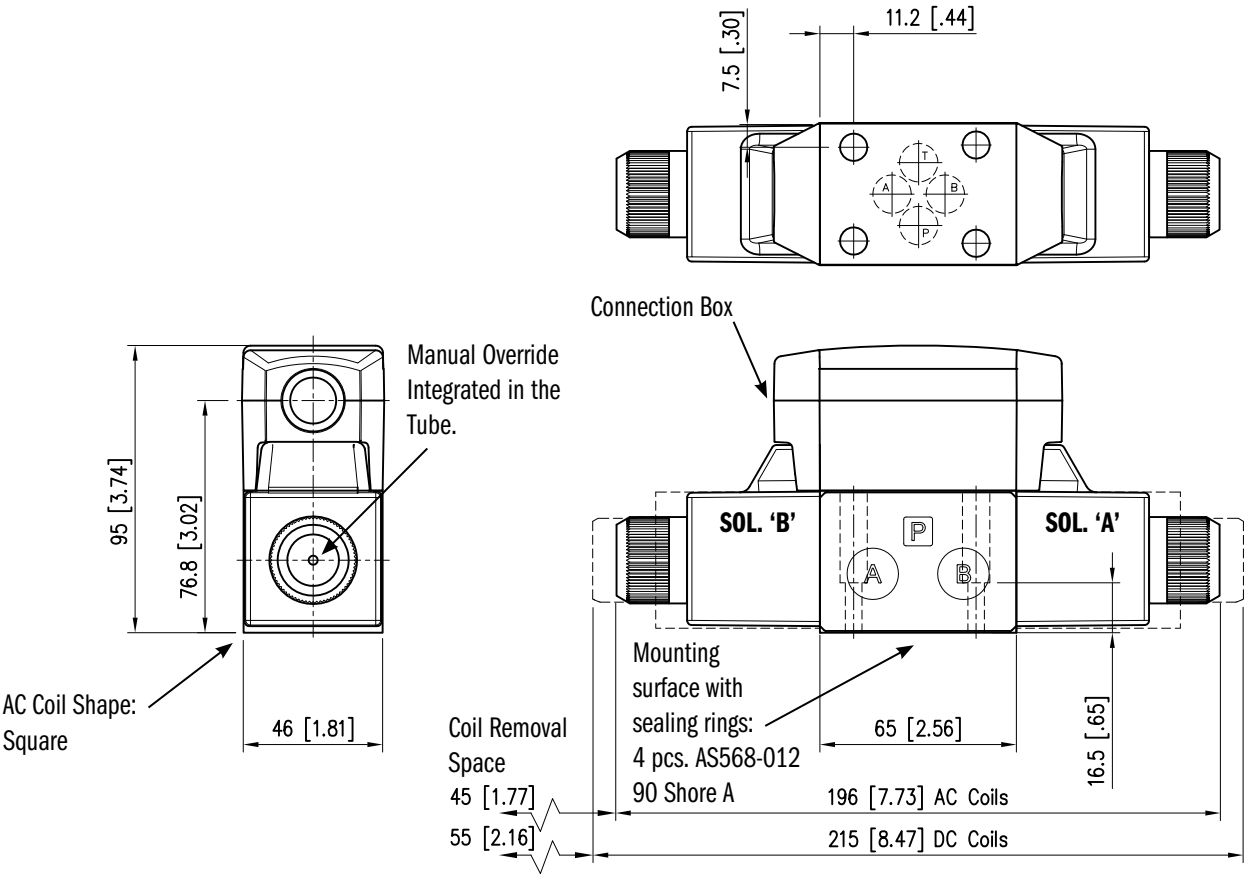


CURVE	SPOOL
1	2A, AN, B
2	1A, 1B, G
3	A
4	A1
5	L
6	F

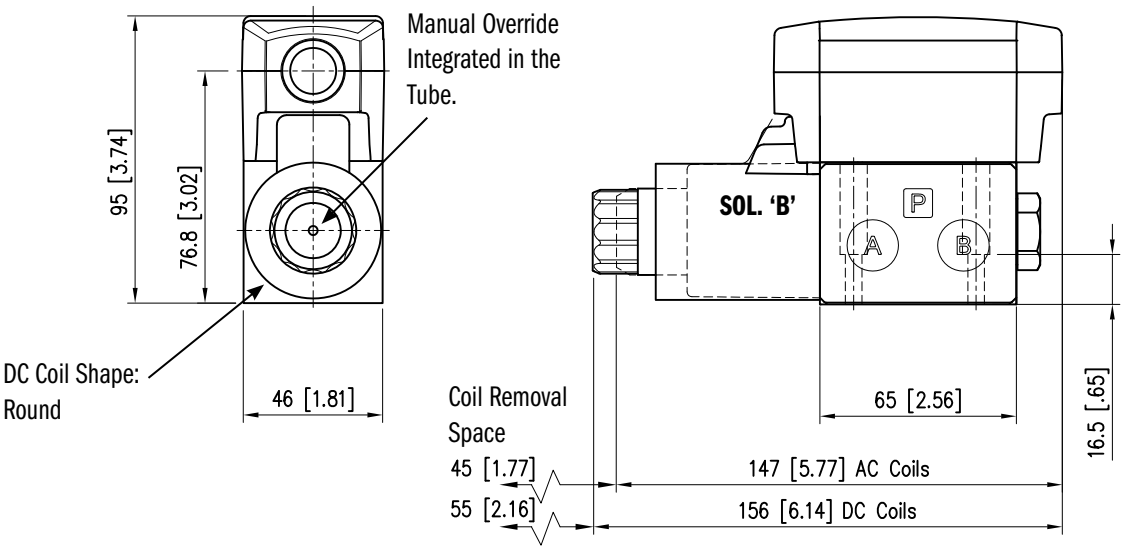
OVERALL AND MOUNTING DIMENSIONS - CONNECTION BOX VERSION

VSD03M-2*, 3*

Dimensions in mm [IN]



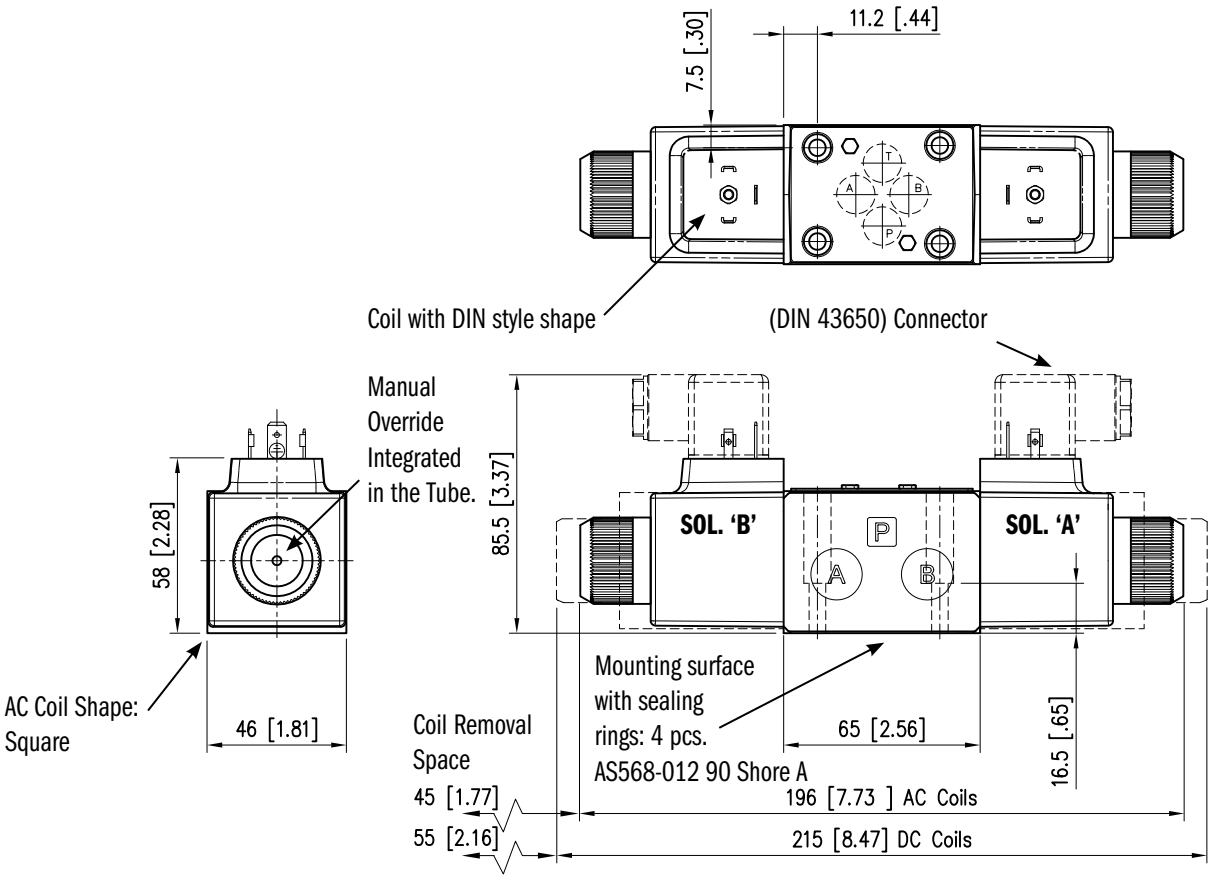
VSD03M-1*, 5*, 6*, 9*



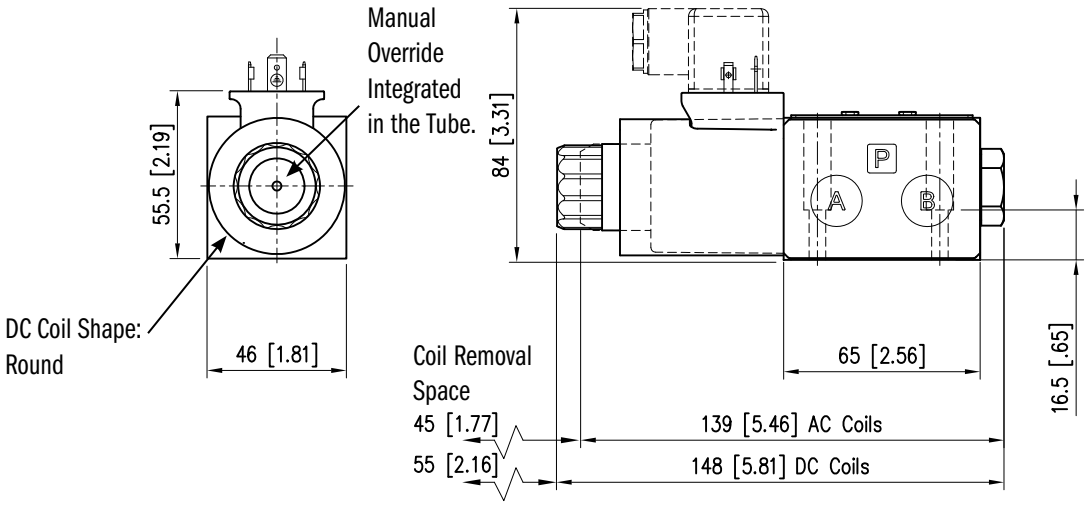
OVERALL AND MOUNTING DIMENSIONS - DIN STYLE VERSION

VSD03M-2*, 3*

Dimensions in mm [IN]



VSD03M-1*, 5*, 6*, 9*



ELECTRICAL CHARACTERISTICS

Valves are available with an electrical connection box or with DIN 43650 solenoids in both AC and DC voltages. Deutsch DT04 or lead wires are also available in DC voltages only.

CONNECTION BOX OPTIONS

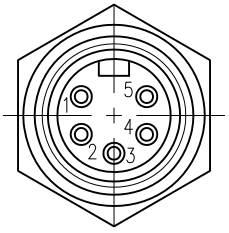
To simplify the connections and prevent wiring mistakes, we offer the option with connection boxes with quick connect pin receptacles, already wired.

Valves are available with receptacles on solenoid side 'A' or 'B' and several connector styles.

Below are the codes to be included in the box 'option' of the ordering code, depending on the version you choose.

Wiring diagrams at right show the standard connections for 3-pin, 4-pin and 5-pin connectors. The commercially available mating "female" connector are not included.

CODE	PIN	SHAPE	PORT END	NOTES
5A	5	Male Mini	A	Single and Dual Solenoid
5H	5		B	
3A	3	Male Mini	A	Single Solenoid Only
3H	3		B	
4A	4	Male Micro	A	For DC Current Only. Different Wiring. See Schematics.
D4A	4		A	
4	4		B	
D4	4		B	

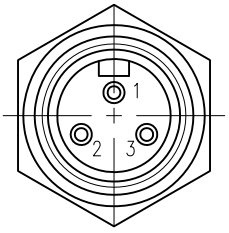


5 PIN RECEPTACLE

Male mini receptacles conform to NFPA/T3.5.29 R1 - 2007 used with single or double solenoid valve.

26 mm [1"] Wrench

1	Lead to Solenoid B
2	Lead to Solenoid A
3	Ground Lead (Green)
4	Lead to Solenoid A
5	Lead to Solenoid B

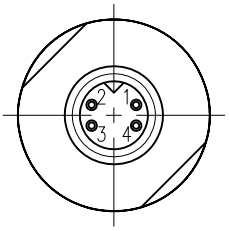


3 PIN RECEPTACLE

Male mini receptacles conform to NFPA/T3.5.29 R1 - 2007 used with single solenoid valve.

26 mm [1"] Wrench

1	Ground Lead (Green)
2	Lead to Solenoid
3	Lead to Solenoid



4 PIN RECEPTACLE

Male micro receptacles (M12x1 thread) used with DC valve only.

23 mm [7/8] Wrench

4A & 4		
1	Brown	Lead to Solenoid A
2	White	No Connection
3	Blue	Common Lead to Sol. A & B
4	Black	Lead to Solendoid B

D4A & D4		
1	Brown	No Connection
2	White	Lead to Solenoid A
3	Blue	Common Lead to Sol. A & B
4	Black	Lead to Solendoid B

SOLENOIDS

Listed below the types of solenoids available and the numbers to be added in the solenoid box on page 3.

PLUG-IN TERMINAL SOLENOID

DIN 43650

This solenoid has three terminal posts. Use bi-polar connectors that meet ISO 4400 / DIN 43650 (EN 175301-803). Protection against atmospheric agent: IP 65

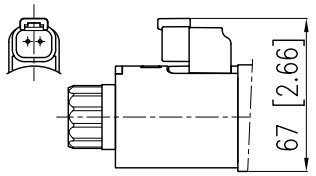
LEAD WIRES

6 inch length, protection against atmospheric agent: IP 67

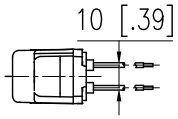
DEUTSCH DT04 MALE

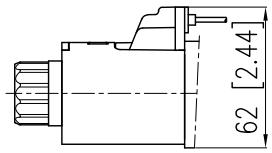
Protection against atmospheric agent: IP 69
Connectors must be ordered separately.

DEUTSCH DT04 MALE



LEAD WIRES





CONNECTION BOX SOLENOIDS

This is a two pin solenoid which connects to the circuit board. Wiring is done on the terminal strip inside the box.

DIN CONNECTION CODE	LEAD WIRE CONNECTION CODE	DEUTSCH DT04 CONNECTION CODE	BOX CONNECTION CODE	VOLTAGE & FREQ. [VOLT - HERTZ]	VOLTAGE LIMITS [MIN - MAX]	RESISTANCE ±10% [OHM]	INRUSH CURRENT [A]	HOLDING CURRENT [A]	HOLDING POWER [W]
33	Not Available	Not Available	60	120 - 60 110 - 50	108 - 126 99 - 116	35.7	1.35 1.41	0.46 0.53	26 29
34	Not Available	Not Available	61	240 - 60 220 - 50	216 - 252 198 - 231	146.4	0.61 0.71	0.23 0.26	26 29
Not Available	Not Available	Not Available	68	120 - 60 110 - 50	108 - 132 99 - 121	75.8	0.72 0.74	0.22 0.24	12 13
42	24K4	24K7	70	24 V DC	21 - 26	19.2	1.25	1.25	30
44	12K4	12K7	75	12 V DC	10 - 13	4.8	2.5	2.5	30

WASHDOWN OPTION (CODE WD)

The wash-down option with the electrical box is designed for an IP65 rating. This option uses a special cover without the mounting bolt access holes and uses silicone sealant to help seal between the coil and core tube.

The DIN, Deutsch and lead wire coils versions of the wash-down option uses silicone sealant to help seal between the coil and core tube.

APPLICATION DATA

FLUIDS

All pressure drops shown on these data pages are based on 170 SUS fluid viscosity and 0.87 specific gravity. For any other specific gravity (G1) the pressure drop (ΔP) will be approx. ΔP1 = ΔP (G1/G). See the chart for other viscosities.

FLUID VISCOSITIES	Cst	10	14.5	32	36	43	54	65	76	86	108	216	324	400
	SUS	60	75	150	170	200	250	300	350	400	500	1000	1500	1900
MULTIPIER		0.77	0.81	0.97	1.00	1.04	1.10	1.15	1.20	1.24	1.31	1.56	1.72	1.83

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code G). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 180 degrees F causes the accelerated degradation of seals as well as degradation of the fluids physical and chemical properties.

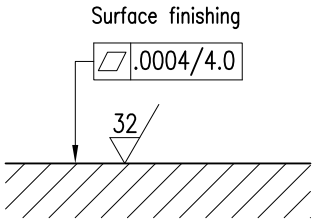
From a safety standpoint, temperatures above 130 degrees F are not recommended.

RANGE TEMPERATURES:	Ambient		- 4 to +130 °F	-20 to +54 °C
	Fluid	STD	- 4 to +180 °F	-20 to +82 °C
		CSA	- 4 to +150 °F	-20 to +66 °C
FLUID VISCOSITY	Range		60 - 1900 SUS	10 - 400 cSt
	Recommended		120 SUS	25 cSt
FLUID CONTAMINATION			ISO 4406:1999 Class 20/18/15	

INSTALLATION

Valves with centering and return springs can be mounted in any position without impairing correct operation. Valves with mechanical detent should have horizontal mounting.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



SEAL KIT

Buna Seal Kit	1013326
Viton Seal Sit	1013327

BOLT KIT

VSD03M	121472

ABOUT CONTINENTAL HYDRAULICS

Rugged, durable, high-performance, efficient—the reason Continental Hydraulics' products are used in some of the most challenging applications across the globe. With a commitment to quality customer support and innovative engineering, Continental's pumps, valves, power units, mobile and custom products deliver what the markets demand. Continental has been serving the food production, brick and block, wood products, automotive and machine tool industries since 1962. Learn how our products survive some of the most harsh environments.

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VSD03M*-S

SOLENOID OPERATED DIRECTIONAL ANTI-SHOCK VALVES

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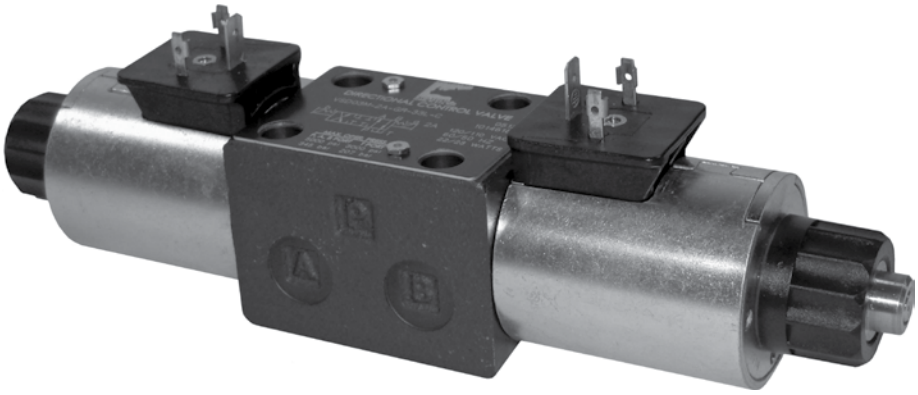
DURABLE

VSD03M*-S

SOLENOID OPERATED DIRECTIONAL ANTI-SHOCK VALVES



DESCRIPTION

These valves conform to NFPA D03 and ISO 4401 mounting standards. As the valve spool shifts, the spool lands cross-over the valve body ports. This can produce high instantaneous flow rates.

The anti-shock valve provides a slow spool movement; slower than that of a standard directional valve. This results in reduction or elimination of hydraulic system shock produced by the spool movement and high flow rates.

TYPICAL PERFORMANCE SPECIFICATIONS

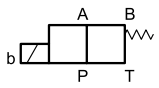
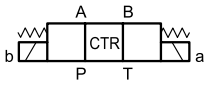
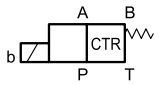
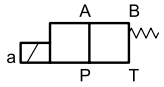
MAXIMUM OPERATING PRESSURE	P - A - B Ports	5000 psi	350 bar
	T Port	3000 psi	210 bar
FLOW RATE		20 gpm	76 l/min
MOUNTING SURFACE		NFPA D03 ISO 4401-03-02-0-03	
MAXIMUM WEIGHT	DC	4.6 lbs	2.1 kg

RANGE TEMPERATURES	Ambient	- 4 to +130 °F	-20 to +54 °C
	Fluid	- 4 to +180 °F	-20 to +82 °C
FLUID VISCOSITY	Range	60 - 1900 SUS	10 - 400 cSt
	Recommended	120 SUS	25 cSt
FLUID CONTAMINATION		ISO 4406:1999 Class 20/18/15	

IDENTIFICATION CODE

VSD03M - □ □ - □ S - □ □ □ - □ L - □ — DESIGN LETTER

SOLENOIDS - See the codes on page 9

FUNCTION	
1	 Single Solenoid 2 Position Spring Offset
3	 Dual Solenoid 3 Position Spring Centered
5	 Single Solenoid 2 Position Spring Centered
9	 Single Operator 2 Position - 3 Way Spring Offset

SEAL	
A	Buna (STD)
G	Viton

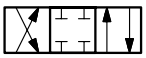
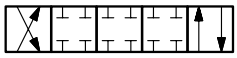
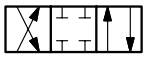
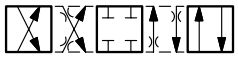
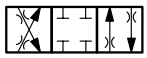
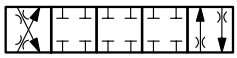
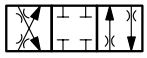
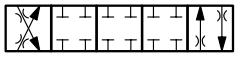
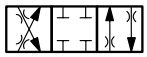
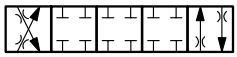
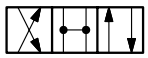
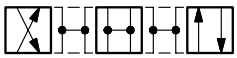
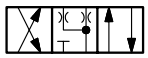
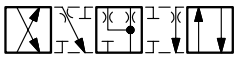
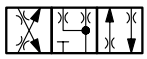
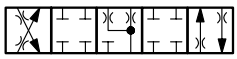
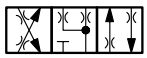
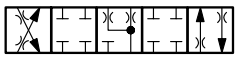
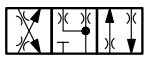
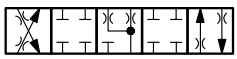
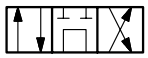
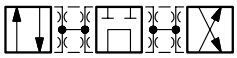
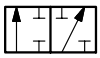
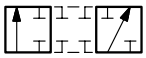
Spool Type
See Next Page

MECHANICAL OMIT IF NOT REQUIRED	
R	Single Solenoid Operator At 'B' Port End.
WD	Wash-Down

CONNECTION BOX OPTIONS OMIT IF NOT REQUIRED
See the codes on page 8

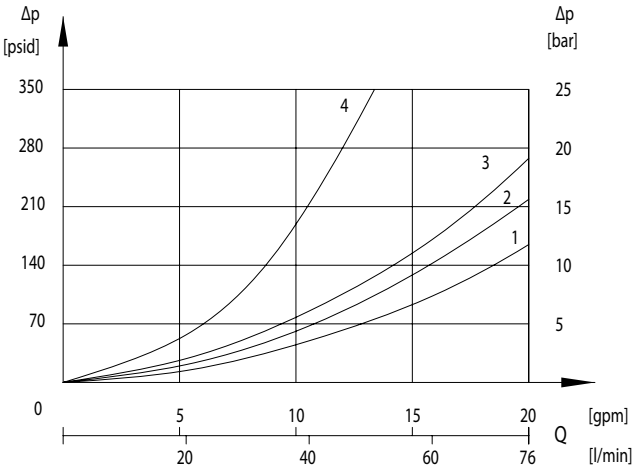
ELECTRICAL OPTION	
OMIT	Plug-in terminal solenoids or lead wires
B	Connection box with terminal posts and lights

TYPICAL ORDERING CODE:
VSD03M-3A-AS-B5A-70L-C
VSD03M-3AC-16-AS-44L-C

SPOOLS					
NAME	**SYMBOL**	**FUNCTION**	**CENTER POSITION**	**CROSSOVER**	**FUNCTION MATCHING**
A			All ports blocked	All ports blocked	1
A1			All ports blocked	P⟶B and A⟶T restricted or P⟶A and B⟶T restricted	3
AC-08			All ports blocked	All ports blocked	3
AC-16			All ports blocked	All ports blocked	3
AC-26			All ports blocked	All ports blocked	3
B1			All ports open	All ports open	1, 3
F1			P blocked, A and B restricted to T	P blocked, A or B restricted to T	3, 5
FC-08			P blocked, A and B restricted to T	All ports blocked	3
FC-16			P blocked, A and B restricted to T	All ports blocked	3
FC-26			P blocked, A and B restricted to T	All ports blocked	3
L1			P⟶T A and B blocked	All ports open, restricted	3, 5
X			-	All ports blocked	9

These are the standard configurations. Contact Continental Hydraulics for special versions.

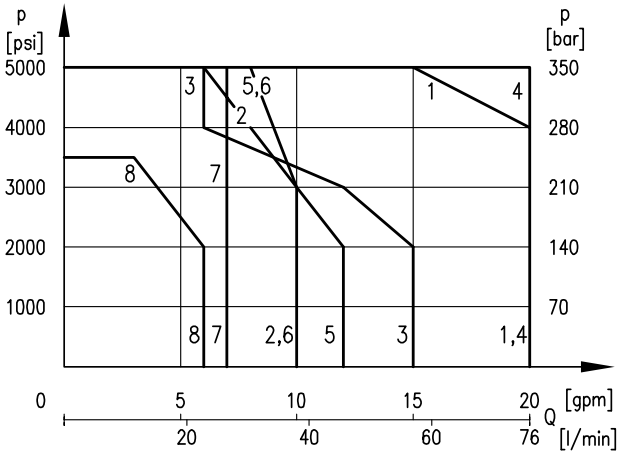
PRESSURE DROPS ΔP-Q
(OBTAINED WITH VISCOSITY OF 170 SUS - 36 CST AT 70°F - 50°C)



SPOOL	FLOW CURVE NUMBER				
	SHIFTED				CENTER
	P⟶A	P⟶B	A⟶T	B⟶T	P⟶T
A, A1	2	2	3	3	
B	1	1	3	3	2
L	4	4	4	4	3
9X	3	3			

PERFORMANCE CURVE

DC VOLTAGE

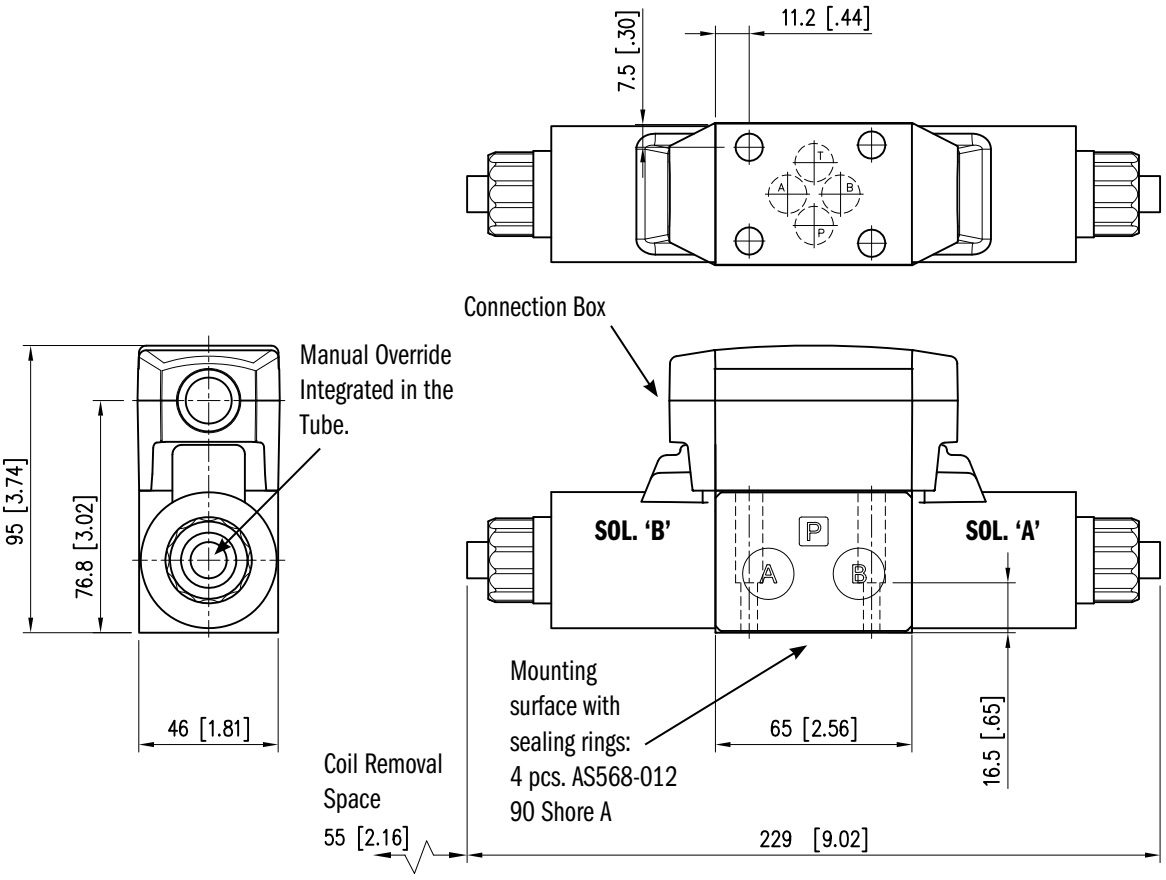


CURVE	SPOOL
1	A1
2	L1
3	B1, 9X
4	F1
5	3AC-26, 3FC-26
6	3AC-16, 3FC-16
7	3AC-08, 3FC-08
8	1A, 1B1

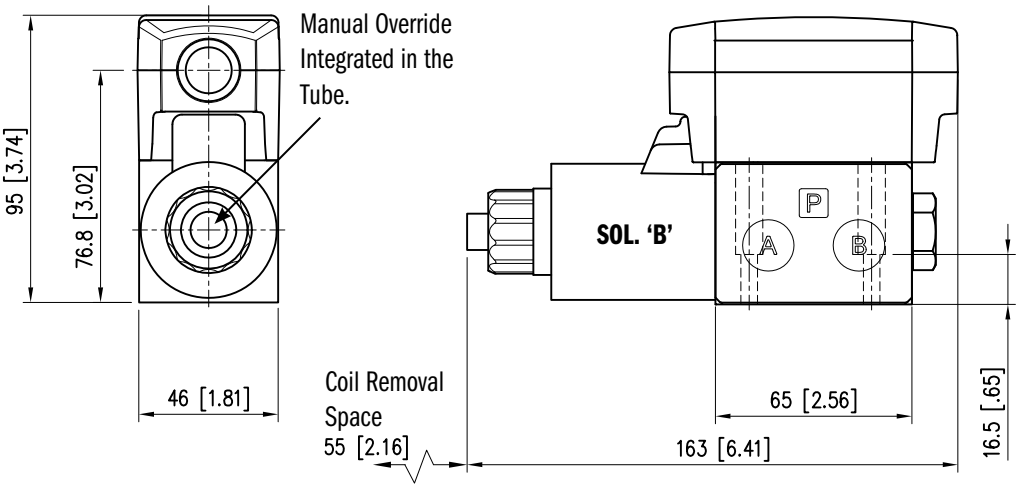
OVERALL AND MOUNTING DIMENSIONS - CONNECTION BOX VERSION

VSD03M, 3*

Dimensions in mm [IN]



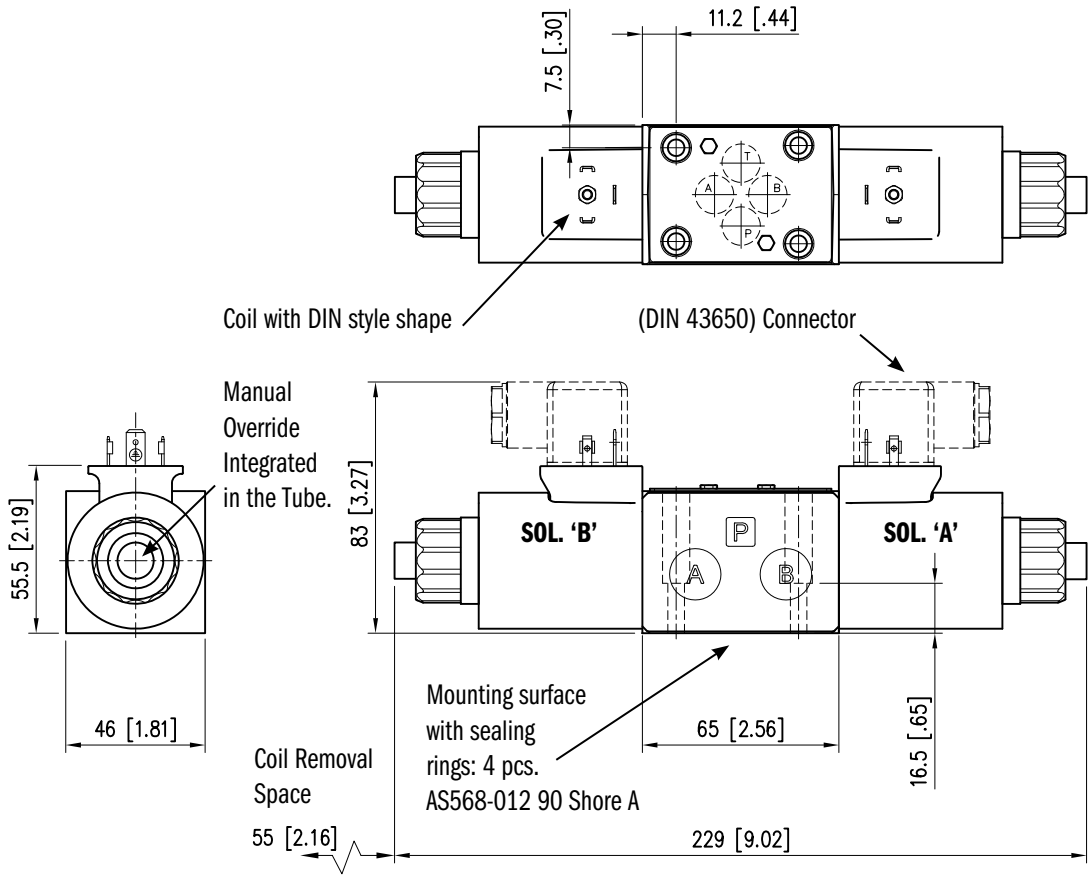
VSD03M-1*, 5*, 9*



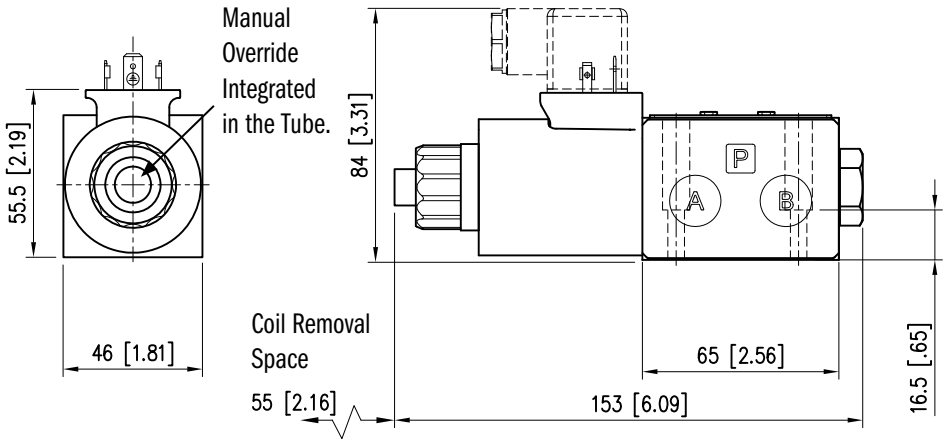
OVERALL AND MOUNTING DIMENSIONS - DIN STYLE VERSION

VSD03M, 3*

Dimensions in mm [IN]



VSD03M-1*, 5*, 9*



ELECTRICAL CHARACTERISTICS

Valves are available with an electrical connection box or with DIN 43650 solenoids, Deutsch DT04 or lead wires are also available.

CONNECTION BOX OPTIONS

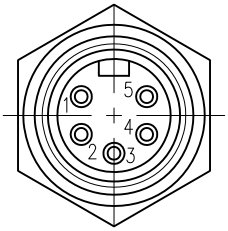
To simplify the connections and prevent wiring mistakes, we offer the option of connection boxes with quick connect pin receptacles, already wired.

Valves are available with receptacles on solenoid side 'A' or 'B' and several connector styles.

Below are the codes to be included in the box 'option' of the ordering code, depending on the version you choose.

Wiring diagrams below shows the standard connections for 3-pin, 4-pin and 5-pin connectors. The commercially available mating "female" connector are not included.

CODE	PIN	SHAPE	PORT END	NOTES
5A	5	Male Mini	A	Single and Dual Solenoid
5H	5		B	
3A	3	Male Mini	A	Single Solenoid Only
3H	3		B	
4A	4	Male Micro	A	Different Wiring. See Schematics.
D4A	4		A	
4	4		B	
D4	4		B	

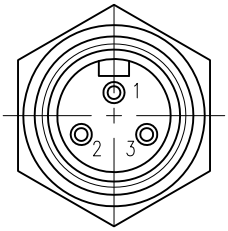


5 PIN RECEPTACLE

Male mini receptacles conform to NFPA/T3.5.29 R1 - 2007 used with single or double solenoid valve.

26 mm [1"] Wrench

1	Lead to Solenoid B
2	Lead to Solenoid A
3	Ground Lead (Green)
4	Lead to Solenoid A
5	Lead to Solenoid B

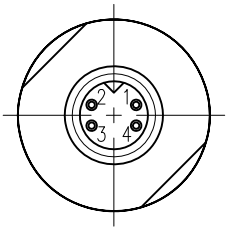


3 PIN RECEPTACLE

Male mini receptacles conform to NFPA/T3.5.29 R1 - 2007 used with single solenoid valve.

26 mm [1"] Wrench

1	Ground Lead (Green)
2	Lead to Solenoid
3	Lead to Solenoid



4 PIN RECEPTACLE

Male micro receptacles (M12x1 thread) used with DC valve only.

23 mm [7/8] Wrench

4A & 4		
1	Brown	Lead to Solenoid A
2	White	No Connection
3	Blue	Common Lead to Sol. A & B
4	Black	Lead to Solendoid B

D4A & D4		
1	Brown	No Connection
2	White	Lead to Solenoid A
3	Blue	Common Lead to Sol. A & B
4	Black	Lead to Solendoid B

SOLENOIDS

Listed below are the types of solenoids available and the numbers to be added in the solenoid box on page 3.

PLUG-IN TERMINAL SOLENOID

DIN 43650

This solenoid has three terminal posts. Use bi-polar connectors that meet ISO 4400 / DIN 43650 (EN 175301-803). Protection against atmospheric agent: IP 65

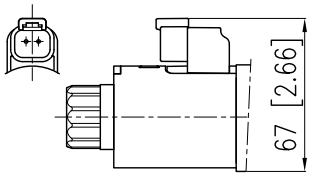
LEAD WIRES

6 inch length, protection against atmospheric agent: IP 67

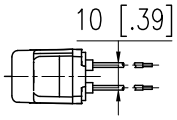
DEUTSCH DT04 MALE

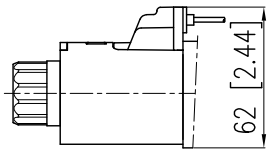
Protection against atmospheric agent: IP 69
Connectors must be ordered separately.

DEUTSCH DT04 MALE



LEAD WIRES





CONNECTION BOX SOLENOIDS

This is a two-pin solenoid which connects to the circuit board. Wiring is done on the terminal strip inside the box.

DIN CONNECTION CODE	LEAD WIRE CONNECTION CODE	DEUTSCH DT04 CONNECTION CODE	BOX CONNECTION CODE	VOLTAGE & FREQ. [VOLT - HERTZ]	VOLTAGE LIMITS [MIN - MAX]	RESISTANCE ±10% [OHM]	INRUSH CURRENT [A]	HOLDING CURRENT [A]	HOLDING POWER [W]
42	24K4	24K7	70	24 V DC	21 - 26	19.2	1.25	1.25	30
44	12K4	12K7	75	12 V DC	10 - 13	4.8	2.5	2.5	30

WASHDOWN OPTION (CODE WD)

The wash-down option with the electrical box is designed for an IP65 rating. This option uses a special cover without the mounting bolt access holes and uses silicone sealant to help seal between the coil and core tube.

The DIN, Deutsch and lead wire coils versions of the wash-down option uses silicone sealant to help seal between the coil and core tube.

APPLICATION DATA

FLUIDS

All pressure drops shown on these data pages are based on 170 SUS fluid viscosity and 0.87 specific gravity. For any other specific gravity (G1) the pressure drop (ΔP) will be approx. ΔP1 = ΔP (G1/G). See the chart for other viscosities.

FLUID VISCOSITIES	Cst	10	14.5	32	36	43	54	65	76	86	108	216	324	400
	SUS	60	75	150	170	200	250	300	350	400	500	1000	1500	1900
MULTIPIER		0.77	0.81	0.97	1.00	1.04	1.10	1.15	1.20	1.24	1.31	1.56	1.72	1.83

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code G). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 180 degrees F causes the accelerated degradation of seals as well as degradation of the fluids physical and chemical properties.

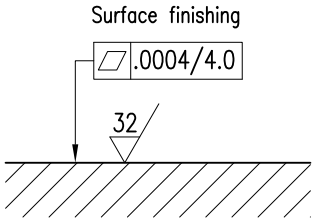
From a safety standpoint, temperatures above 130 degrees F are not recommended.

RANGE TEMPERATURES:	Ambient	- 4 to +130 °F	-20 to +54 °C
	Fluid	- 4 to +180 °F	-20 to +82 °C
FLUID VISCOSITY	Range	60 -1900 SUS	10 - 400 cSt
	Recommended	120 SUS	25 cSt
FLUID CONTAMINATION		ISO 4406:1999 Class 20/18/15	

INSTALLATION

Valves with centering and return springs can be mounted in any position without impairing correct operation. Valves with mechanical detent should have horizontal mounting.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



SEAL KIT

Buna Seal Kit	1013326
Viton Seal Sit	1013327

BOLT KIT

VSD03M	121472

VSD03M*-S - SOLENOID OPERATED DIRECTIONAL ANTI-SHOCK VALVES

ABOUT CONTINENTAL HYDRAULICS

Rugged, durable, high-performance, efficient—the reason Continental Hydraulics' products are used in some of the most challenging applications across the globe. With a commitment to quality customer support and innovative engineering, Continental's pumps, valves, power units, mobile and custom products deliver what the markets demand. Continental has been serving the food production, brick and block, wood products, automotive and machine tool industries since 1962. Learn how our products survive some of the most harsh environments.

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VSD05M

SOLENOID OPERATED DIRECTIONAL VALVES

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ACCURATE

VSD05M
SOLENOID OPERATED DIRECTIONAL VALVES

DESCRIPTION

These valves conform to NFPA D05 and ISO 4401 mounting standards. They are available in both 3 way and 4 way styles.

All versions are available in 2 position spring offset, 2 position detent, 2 position spring centered and 3 position spring centered versions.

A wide range of spools are available.

Standard and CSA approved versions are available.

TYPICAL PERFORMANCE SPECIFICATIONS

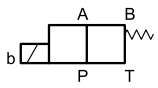
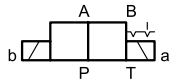
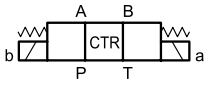
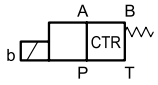
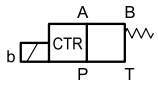
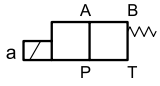
MAXIMUM OPERATING PRESSURE	P - A - B Ports	Standard		4600 psi	320 bar
		CSA		4000 psi	275 bar
	T Port	DC	STD	3000 psi	210 bar
			CSA	2500 psi	172 bar
		AC	ALL	2000 psi	140 bar
FLOW RATE		DC		38 gpm	145 lpm
		AC		32 gpm	120 lpm
MOUNTING SURFACE				NFPA D05, ISO 4401-05-04-0-05	
MAXIMUM WEIGHT		AC		8.0 lbs	3.6 kg
		DC		10.6 lbs	4.8 kg

RANGE TEMPERATURES	Ambient		-4 to +130°F	-20 to +54°C
	Fluid	Standard	-4 to +180°F	-20 to +82°C
		CSA	-4 to +150°F	-20 to +66°C
FLUID VISCOSITY	Range		60-1900 SUS	10-400 cSt
	Recommended		120 SUS	25 cSt
FLUID CONTAMINATION			ISO 4406:1999 Class 20/18/15	

IDENTIFICATION CODE

VSD05M - □ □ - □ □ □ □ - □ - □ L - □ — DESIGN LETTER

SOLENOIDS - See the codes on page 10

FUNCTION	
1	 Single Solenoid 2 Position Spring Offset
2	 Dual Solenoid 2 Position Detented (No Spring)
3	 Dual Solenoid 3 Position Spring Centered
5	 Single Solenoid 2 Position Spring Centered
6	 Single Solenoid 2 Position Energize To Center
9	 Single Operator 2 Position - 3 Way Spring Offset

SEAL	
A	Buna (STD)
G	Viton

Spool Type
See Next Page

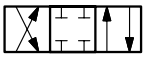
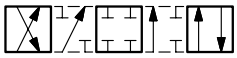
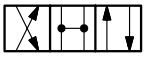
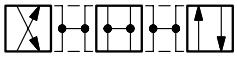
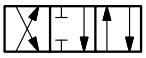
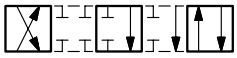
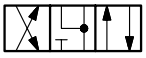
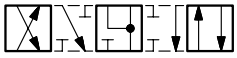
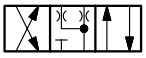
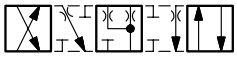
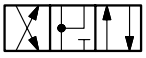
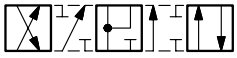
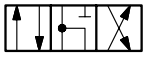
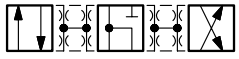
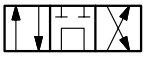
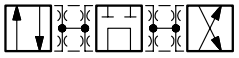
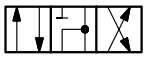
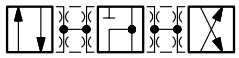
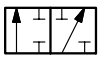
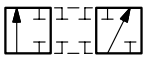
MECHANICAL OMIT IF NOT REQUIRED	
R	Single Solenoid Operator At 'B' Port End.
WD	Wash-Down

CONNECTION BOX OPTIONS OMIT IF NOT REQUIRED
See the codes on page 9

ELECTRICAL OPTION	
OMIT	Plug-in terminal solenoids or lead wires
B	Connection box with terminal posts and lights

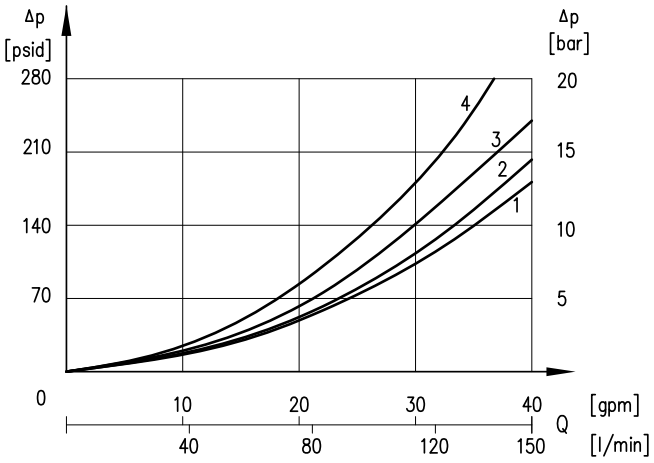
APPROVALS	
OMIT	STD VALVE
CSA	CSA US/CAN

TYPICAL ORDERING CODE:
VSD05M-3A-AB5A-60L-B
VSD05M-3A-A-33L-B

SPOOLS					
NAME	**SYMBOL**	**FUNCTION**	**CENTER POSITION**	**CROSSOVER**	**FUNCTION MATCHING**
A			All ports blocked	P⟶B or P⟶A T blocked	1, 2, 3, 5, 6
B			All ports open	All ports open	1, 2, 3, 5, 6
E			P and A blocked, and B⟶T	All ports blocked or P and A blocked and B⟶T	3, 5
F			P blocked, A⟶T and B⟶T	P blocked and A⟶T or B⟶T	3, 5, 6
F1			P blocked, A and B restricted to T	P blocked, A or B restricted to T	3, 5
G			P to A and B T blocked	P⟶B or P⟶A T blocked	
H			P and A to T, B blocked	All ports open, restricted	
K			P and B blocked, and A⟶T	P and B blocked and A⟶T or all ports blocked	
L			P⟶T, A and B blocked	All ports open, restricted	
Q			P and B to T, A blocked	All ports open, restricted	3, 5
X			-	All ports blocked	9

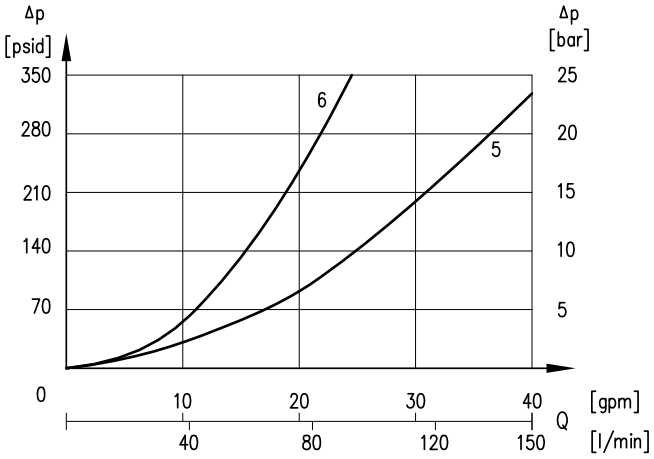
These are the standard configurations. Contact Continental Hydraulics for special versions.

PRESSURE DROPS ΔP-Q SHIFTED VALVE (OBTAINED WITH VISCOSITY OF 170 SUS - 36 CST AT 70°F - 21°C)



SPOOL	FLOW CURVE NUMBER			
	P→A	P→B	A→T	B→T
A	2	2	1	1
B	3	3	1	1
E, F, F1, K, 1A, 2A, 1B, 2B	3	3	2	2
H, L, Q	1	1	2	2
G	1	1	1	1

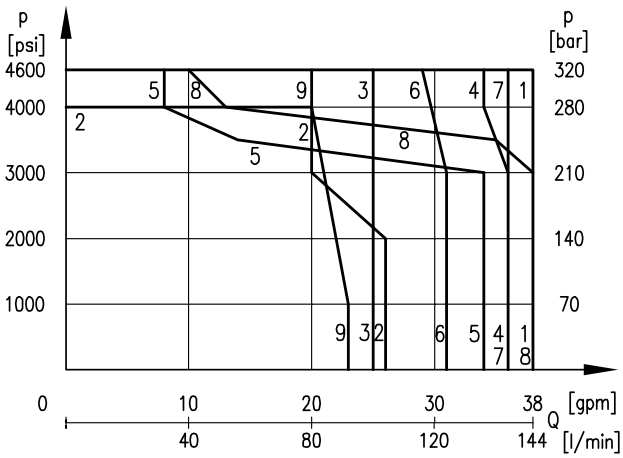
PRESSURE DROPS ΔP-Q CENTRAL POSITION



SPOOL	FLOW CURVE NUMBER				
	P→A	P→B	A→T	B→T	P→T
B, L, H, Q					5
E				6	
F			6	6	
G	3	3			
K			6		

PERFORMANCE CURVE

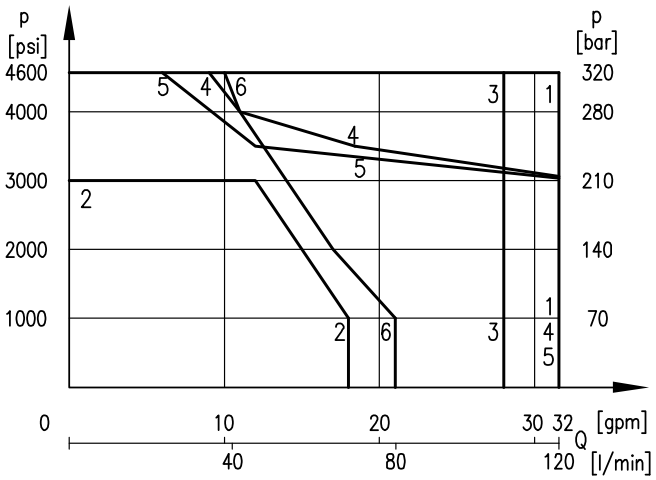
DC VOLTAGE



CURVE	SPOOL
1	A, B, G, 9X
2	L
3	1A
4	1A-R
5	F
6	1B
7	F1
8	E, K
9	H, Q

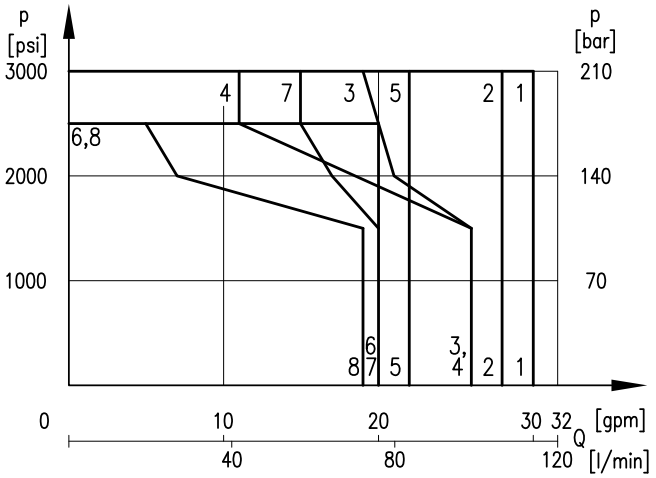
PERFORMANCE CURVE

AC VOLTAGE



CURVE	SPOOL
1	A, B, G, 9X
2	L
3	1A
4	F, F1
5	K, E
6	H, Q

AC VOLTAGE - LOW FORCE



CURVE	SPOOL
1	1B, 2B, G
2	1B-R
3	1A
4	1A-R
5	B
6	A
7	2A
8	F

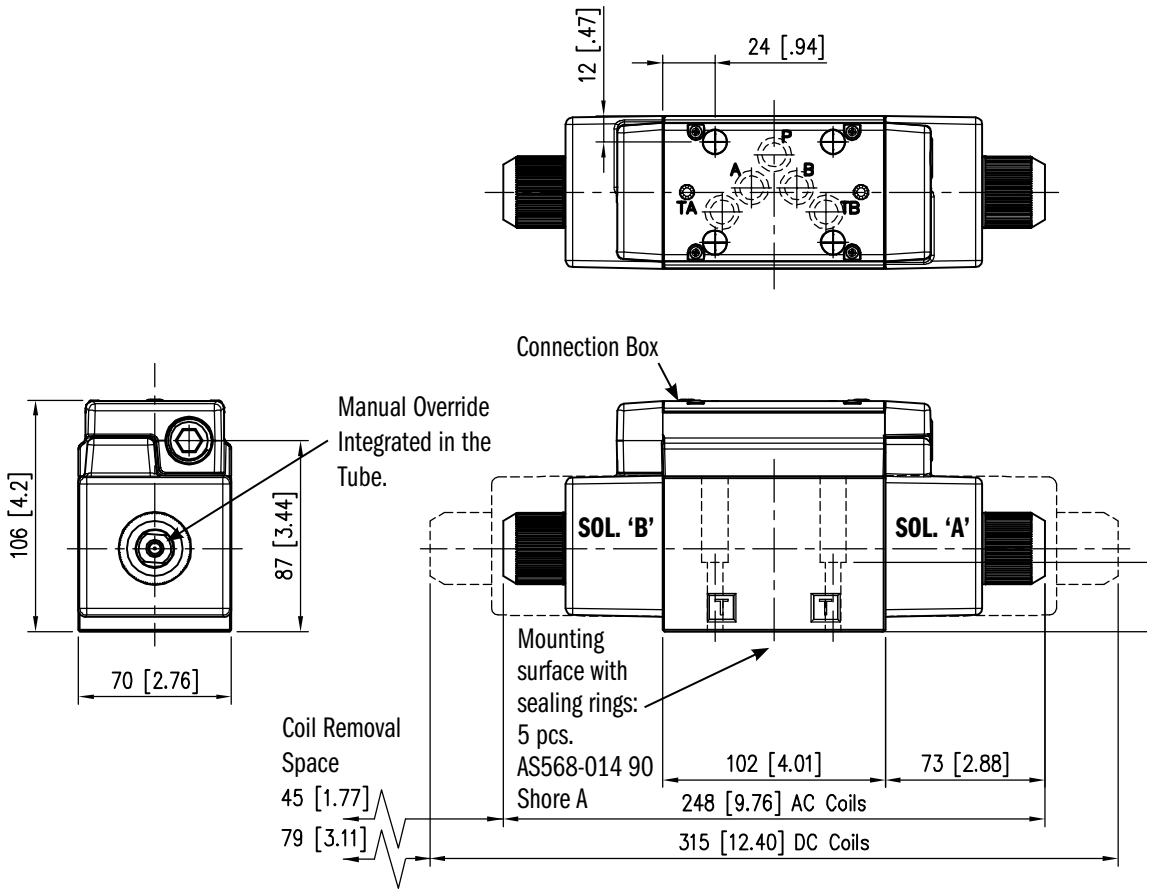
NOTES:

1. The values indicated in the graphs are relevant to the standard valve. The DC Performance Curve used a 42L coil, the AC Performance Curve used a 60L coil, and the AC Low Force Curve used a 68L coil.
2. Valve performance was tested in a four way circuit (full loop). Performances may be reduced from that shown when used in a three-way circuit (half circuit), i.e. A or B port plugged.
3. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with filtration according to ISO 4406:1999 class 18/16/13.

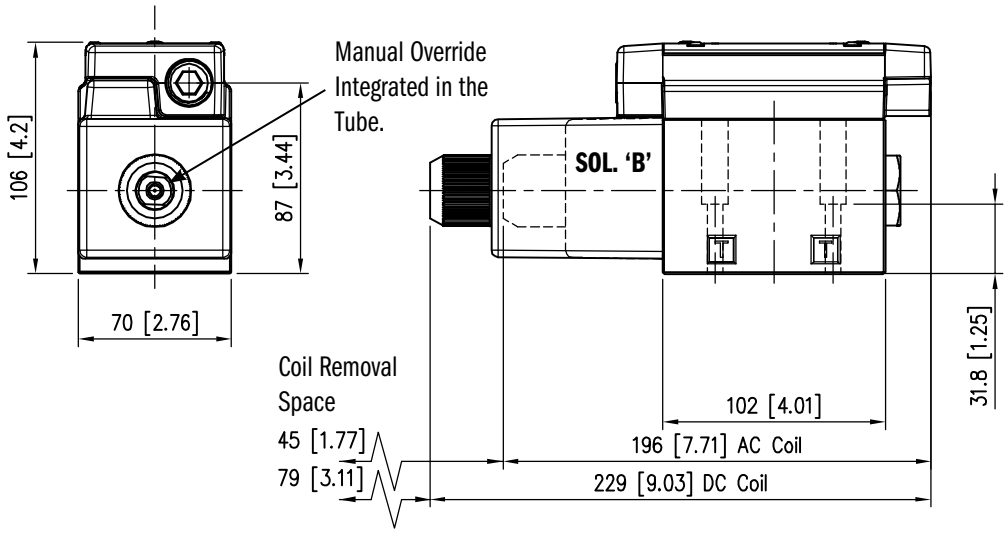
OVERALL AND MOUNTING DIMENSIONS - CONNECTION BOX VERSION

VSD05M-2*, 3*

Dimensions in mm [IN]



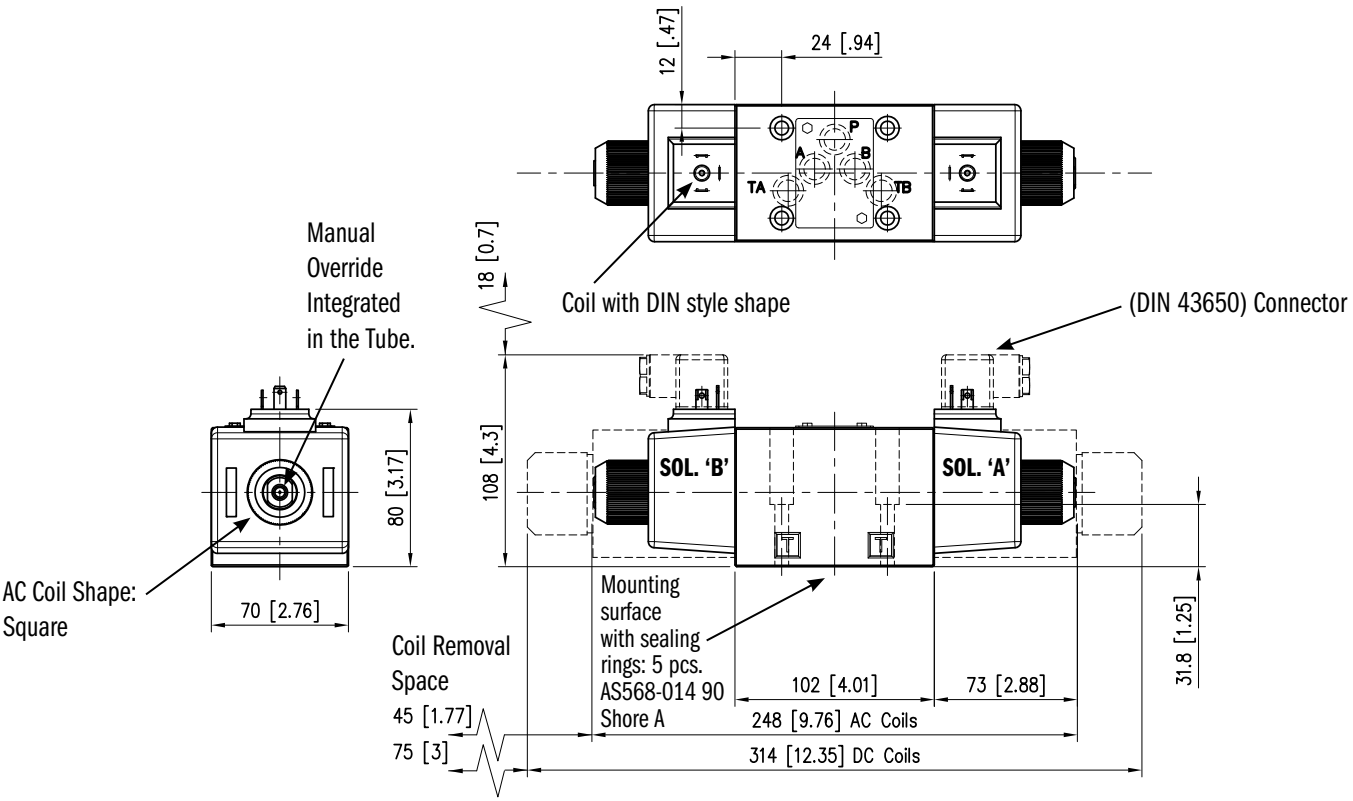
VSD05M-1*, 5*, 6*, 9*



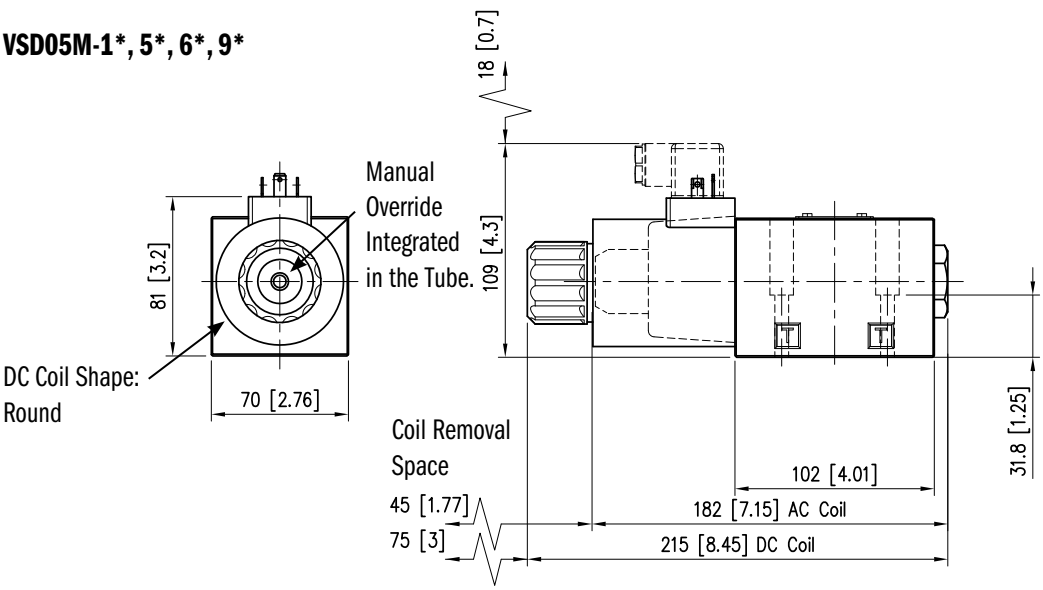
OVERALL AND MOUNTING DIMENSIONS - DIN STYLE VERSION

VSD05M-2*, 3*

Dimensions in mm [IN]



VSD05M-1*, 5*, 6*, 9*



ELECTRICAL CHARACTERISTICS

Valves are available with an electrical connection box or with DIN 43650 solenoids in both AC and DC voltages. Deutsch DT04 or lead wires are also available in DC voltages only.

CONNECTION BOX OPTIONS

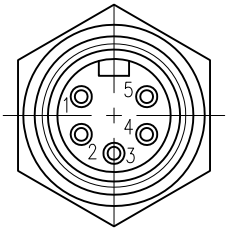
To simplify the connections and prevent wiring mistakes, we offer the option with connection boxes with quick connect pin receptacles, already wired.

Valves are available with receptacles on solenoid side 'A' or 'B' and several connector styles.

Below are the codes to be included in the box 'option' of the ordering code, depending on the version you choose.

Wiring diagrams below show the standard connections for 3-pin, 4-pin and 5-pin connectors. The commercially available mating "female" connector are not included.

CODE	PIN	SHAPE	PORT END	NOTES
5A	5	Male Mini	A	Single and Dual Solenoid
5H	5		B	
3A	3	Male Mini	A	Single Solenoid Only
3H	3		B	
4A	4	Male Micro	A	For DC Current Only. Different Wiring. See Schematics.
D4A	4		A	
4	4		B	
D4	4		B	

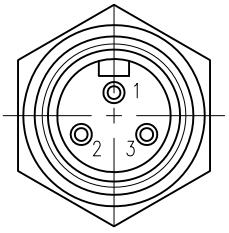


5 PIN RECEPTACLE

Male mini receptacles conform to NFPA/T3.5.29 R1 - 2007 used with single or double solenoid valve.

26 mm [1"] Wrench

1	Lead to Solenoid B
2	Lead to Solenoid A
3	Ground Lead (Green)
4	Lead to Solenoid A
5	Lead to Solenoid B

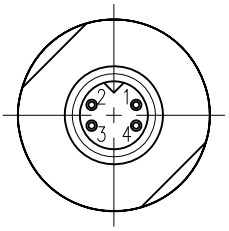


3 PIN RECEPTACLE

Male mini receptacles conform to NFPA/T3.5.29 R1 - 2007 used with single solenoid valve.

26 mm [1"] Wrench

1	Ground Lead (Green)
2	Lead to Solenoid
3	Lead to Solenoid



4 PIN RECEPTACLE

Male micro receptacles (M12x1 thread) used with DC valve only.

23 mm [7/8] Wrench

4A & 4		
1	Brown	Lead to Solenoid A
2	White	No Connection
3	Blue	Common Lead to Sol. A & B
4	Black	Lead to Solendoid B

D4A & D4		
1	Brown	No Connection
2	White	Lead to Solenoid A
3	Blue	Common Lead to Sol. A & B
4	Black	Lead to Solendoid B

SOLENOIDS

Listed below the types of solenoids available and the numbers to be added in the solenoid box on page 3.

PLUG-IN TERMINAL SOLENOID

DIN 43650

This solenoid has three terminal posts. Use bi-polar connectors that meet ISO 4400 / DIN 43650 (EN 175301-803). Protection against atmospheric agent: IP 65

CONNECTION BOX SOLENOIDS

This is a two pin solenoid which connects to the circuit board. Wiring is done on the terminal strip inside the box.

DIN CONNECTION CODE	BOX CONNECTION CODE	VOLTAGE & FREQ. [VOLT - HERTZ]	VOLTAGE LIMITS [MIN - MAX]	RESISTANCE ±10% [OHM]	INRUSH CURRENT [A]	HOLDING CURRENT [A]	HOLDING POWER [W]
33	60	120 - 60 110 - 50	108 - 126 99 - 116	9.2	5 6.2	0.91 1.1	45 43
34	61	240 - 60 220 - 50	216 - 252 198 - 231	38	2.9 3	0.48 0.53	45 43
NOT AVAILABLE	68	120 - 60 110 - 50	108 - 132 99 - 121	16.4	3.7 3.8	0.38 0.41	22 21
42	-	24 V DC	21 - 26	12	2	2	48
44	-	12 V DC	10 - 13	3.2	3.75	3.75	45
-	70	24 V DC	21 - 26	13.1	1.8	1.8	44
-	75	12 V DC	10 - 13	3.3	3.6	3.6	44

WASHDOWN OPTION (CODE WD)

The wash-down option with the electrical box is designed for an IP65 rating. This option uses a special cover without the mounting bolt access holes and uses silicone sealant to help seal between the coil and core tube.

The DIN, Deutsch and lead wire coils versions of the wash-down option uses silicone sealant to help seal between the coil and core tube.

APPLICATION DATA

FLUIDS

All pressure drops shown on these data pages are based on 170 SUS fluid viscosity and 0.87 specific gravity. For any other specific gravity (G1) the pressure drop (ΔP) will be approx. ΔP1 = ΔP (G1/G). See the chart for other viscosities.

FLUID VISCOSITIES	Cst	10	14.5	32	36	43	54	65	76	86	108	216	324	400
	SUS	60	75	150	170	200	250	300	350	400	500	1000	1500	1900
MULTIPIER		0.77	0.81	0.97	1.00	1.04	1.10	1.15	1.20	1.24	1.31	1.56	1.72	1.83

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code G). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 180 degrees F causes the accelerated degradation of seals as well as degradation of the fluids physical and chemical properties.

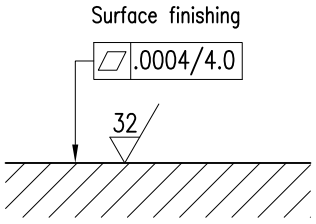
From a safety standpoint, temperatures above 130 degrees F are not recommended.

RANGE TEMPERATURES:	Ambient		- 4 to +130 °F	-20 to +54 °C
	Fluid	STD	- 4 to +180 °F	-20 to +82 °C
		CSA	- 4 to +150 °F	-20 to +66 °C
FLUID VISCOSITY	Range		60 - 1900 SUS	10 - 400 cSt
	Recommended		120 SUS	25 cSt
FLUID CONTAMINATION			ISO 4406:1999 Class 20/18/15	

INSTALLATION

Valves with centering and return springs can be mounted in any position without impairing correct operation. Valves with mechanical detent should have horizontal mounting.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



SEAL KIT

Buna Seal Kit	1015300
Viton Seal Sit	1015301

BOLT KIT

BD05-175	131110

VSD05M - SOLENOID OPERATED DIRECTIONAL VALVES

ABOUT CONTINENTAL HYDRAULICS

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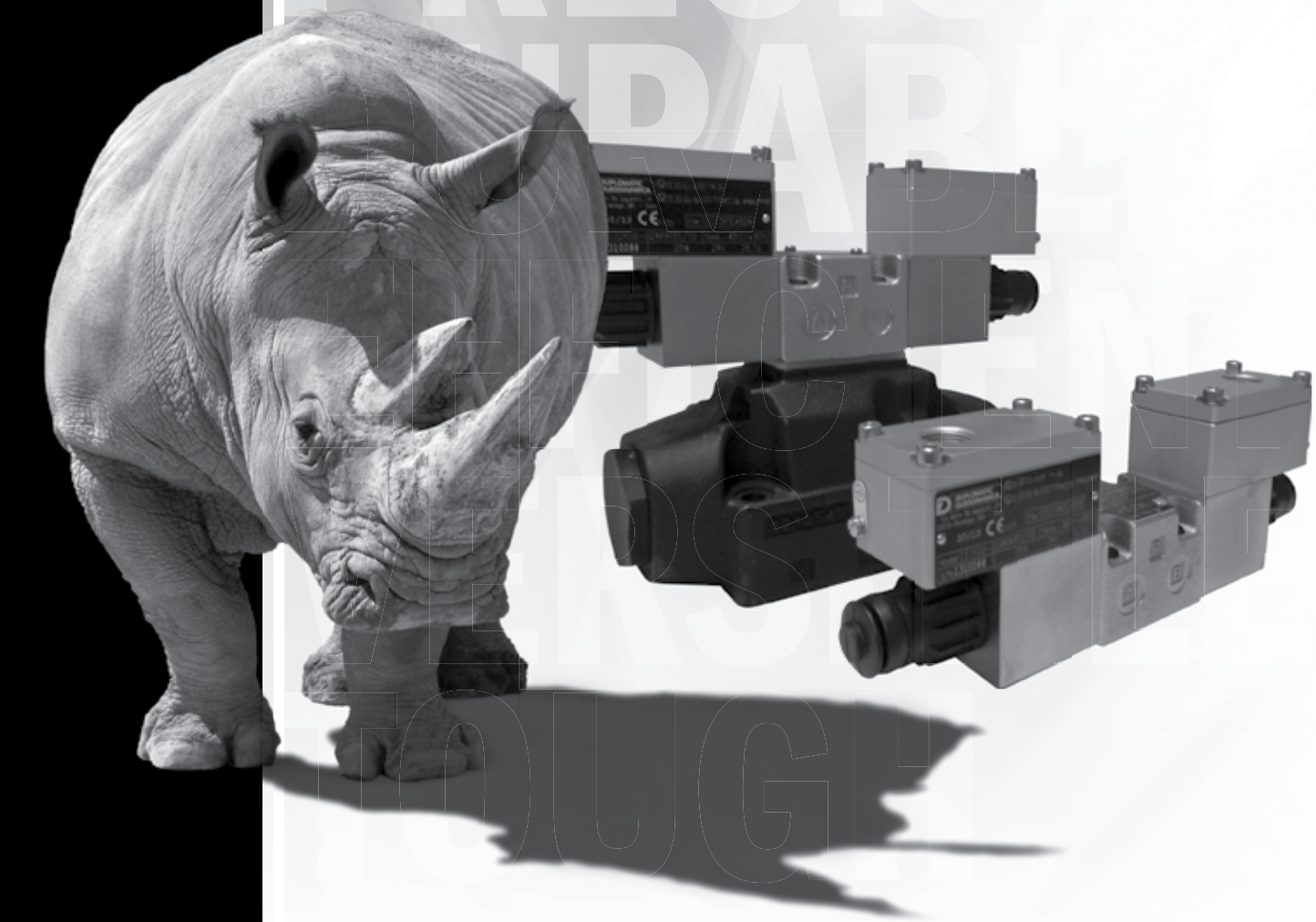
VSD*HL-*-KD2

HAZARDOUS LOCATION, SOLENOID, DIRECT & PILOT OPERATED VALVES

(IN COMPLIANCE WITH ATEX 94/9/EC)



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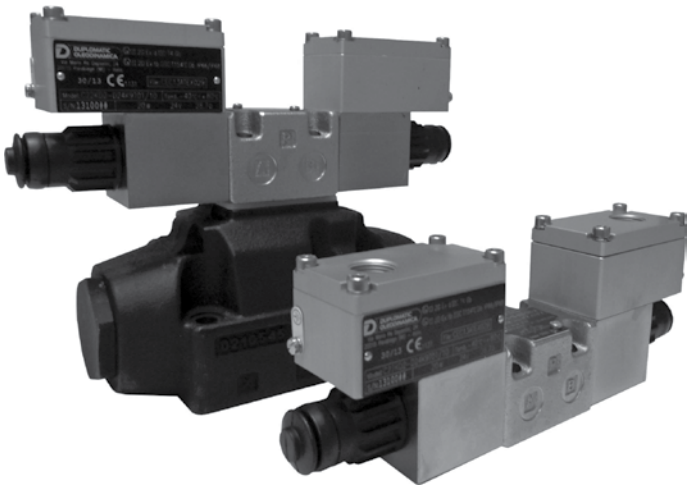
VSD*HL-*-KD2

HAZARDOUS LOCATION, SOLENOID, DIRECT & PILOT OPERATED VALVES



DESCRIPTION

The VSD**HL solenoid operated directional control valves are in compliance with ATEX 94/9/EC standards. They are suitable for use in potentially explosive atmospheres which fall within the ATEX II 2GD classification for gas and dust. See pages 18 and 19 for ATEX classification, operating temperatures and electrical characteristics.

These valves are available in both direct operated and pilot operated models in the following sizes:

DIRECT OPERATED: NFPA D03 (ISO 4401-03)
PILOT OPERATED: NFPA D05 alt. A/alt. B (ISO 4401-05-05-0-05), NFPA D07 (ISO 4401-07-07-0-05), NFPA D08 (ISO 4401-08-08-0-05), NFPA D10 (ISO 4401-10-09-0-05)

The VSD03HL valve is supplied with a Zinc-Nickel surface treatment to ensure a salt spray resistance of up to 370 h. (test conducted per UNI EN ISO 9227 and evaluated per UNI EN ISO 10289). The Zinc-Nickel surface treatment is available on the pilot operated valves upon request.

A statement of conformity to the applicable standards is supplied with each valve.

The label and electrical box on these valves have a concentration of magnesium lower than the critical value of 7.5% for the Hazardous Environments.

TYPICAL PERFORMANCE SPECIFICATIONS

		VSD03HL		VSD05*HL		VSD07HL		VSD08HL		VSD10HL	
MAXIMUM OPERATING PRESSURE	P - A - B Ports	5000 psi	350 bar	4600 psi	320 bar	5000 psi	350 bar	5000 psi	350 bar	5000 psi	350 bar
	T Port (Ext. Drain)	-	-	3000 psi	210 bar	3000 psi	210 bar	3000 psi	210 bar	3000 psi	210 bar
	T Port (Int. Drain)	3000 psi	210 bar	2000 psi	140 bar	2000 psi	140 bar	2000 psi	140 bar	2000 psi	140 bar
PILOT PRESSURE	Minimum	-	-	72-145 psi	5-10 bar	72-175 psi	5-12 bar	102-204 psi	7-14 bar	87-175 psi	6-12 bar
	Maximum	-	-	3000 psi	210 bar	3000 psi	210 bar	3000 psi	210 bar	3000 psi	210 bar
MAX FLOW RATE		20 gpm	76 l/min	40 gpm	150 l/min	80 gpm	300 l/min	160 gpm	600 l/min	290 gpm	1100 lpm
MOUNTING SURFACE		NFPA D03 ISO 4401-03-02-0-03		NFPA D05 alt. A/alt. B ISO 4401-05-05-0-05		NFPA D07 ISO 4401-07-07-0-05		NFPA D08 ISO 4401-08-08-0-05		NFPA D10 ISO 4401-10-09-0-05	
MAX WEIGHT		6.2 lbs	2.8 kg	17.2 lbs	7.8 kg	21.2 lbs	9.6 kg	36.4 lbs	16.5 kg	116.8 lbs	53 kg

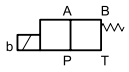
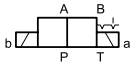
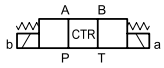
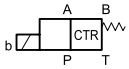
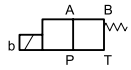
IDENTIFICATION CODE - HAZARDOUS LOCATION - DIRECT OPERATED

VSD03HL - □ □ - □ □ □ - KD2 - □ D - □ — DESIGN LETTER

- Solenoid Operated
- D03 Size
- Hazardous Location

SOLENOIDS
See the codes on page 19

VALVE ATEX APPROVAL
For gases, vapors, mists: EX II 2G IIC T4 Gb
For dust: EX II 2D IIIC T154°C Db
(Protection type of the coil "d")

FUNCTION	
1	
	Single Operator, 2 Position Spring Offset
2	
	Dual Operator, 2 Position Detent (No Spring)
3	
	Dual Operator, 3 Position Spring Centered
5	
	Single Operator, 2 Position Spring Centered
9	
	Single Operator, 2 Position Spring Centered

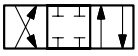
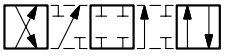
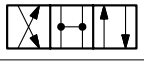
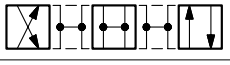
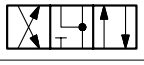
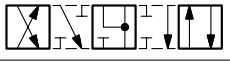
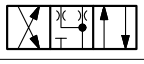
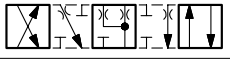
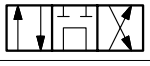
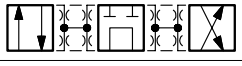
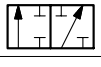
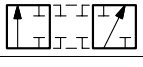
SEAL		TEMP RANGE
A	Buna (STD)	-20 to +80°C -4 to +176°F
G	Viton	
AL	Buna (Low Temp)	-40 to +80°C -40 to +176°F

MECHANICAL OPTIONS OMIT IF NOT REQUIRED	
R	Reverse Mode Sol. 'A' Supplied
F	Blind retainer (STD for AL Seal) See page 15

TERMINAL BLOCK CONNECT	
T01	TOP: M20 x 1.5 ISO 261
T02	TOP: Gk 1/2 UNI EN 10226-2
T03	TOP: 1/2" NPT ANSI B1.20.1 (ex ANSI B 2.1)
S01	SIDE: M20 x 1.5 ISO 261 (Available upon request only)
S04	SIDE: M16 x 1.5 ISO 261 (Only for 24 VDC)

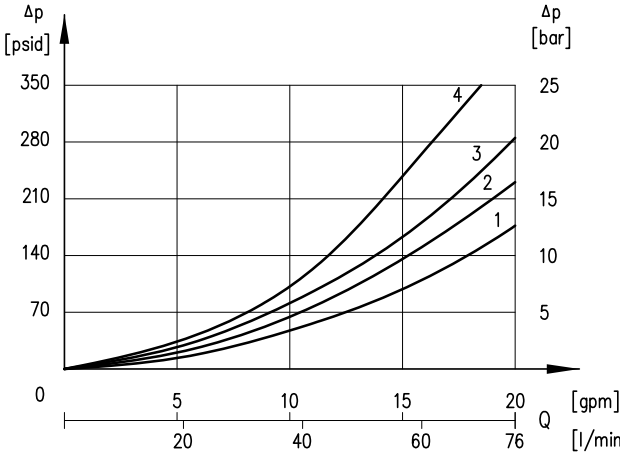
TYPICAL ORDERING CODE:
VSD03HL-3A-AT02-KD2-24D-A

NOTE:
The Zinc-Nickel body finishing surface treatment ensures a salt spray resistance up to 370 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 stds)

SPOOLS					
NAME	SYMBOL	FUNCTION	CENTER POSITION	CROSSOVER	FUNCTION MATCHING
A			All ports blocked	P⟶B or P⟶A T blocked	1,2,3,5
B			All ports open	All ports open	3, 5, 1 (only with DC coils)
F			P blocked and A⟶T or B⟶T	P blocked and A⟶T or B⟶T	3, 5
F1			P blocked, A and B restricted to T	P blocked, A or B restricted to T	3, 5
L			P⟶T A and B blocked	All ports open, restricted	3, 5
X			NA	All ports blocked	9

PRESSURE DROPS Δp-Q VSD03HL

(OBTAINED WITH VISCOSITY OF 170 SUS (36 cSt) AT 120°F (50°C)

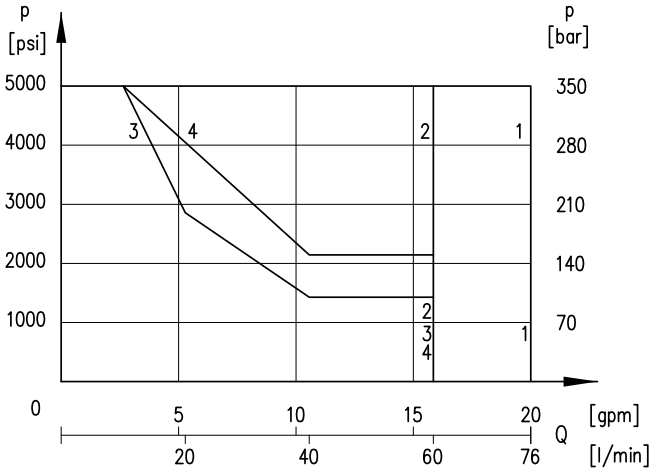


SPOOL	FLOW CURVE NUMBER				
	P→A	P→B	A→T	B→T	P→T
A, F1	2	2	3	3	-
B	1	1	3	3	2
F	3	3	1	1	-
L	4	4	4	4	3
1A	3	3	3	3	-
1B, 2A	2	2	2	2	-
X	3	3	-	-	-

NOTES:

1. The values indicated in the graphs are relevant to the standard solenoid valve, with 42L coils.
2. Valve performance was tested in a four way circuit (full loop). Performances may be reduced from that shown when used in a three-way circuit (half circuit), i.e. A or B port plugged.
3. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The values have been obtained with filtration according to ISO 4406:1999 class 18/16/13.

PERFORMANCE CURVE



SPOOL	CURVE NUMBER			
	DC		RAC COILS	
	P→A	P→B	P→A	P→B
A, F1	1	1	1	1
B	2	2	2	2
F	3	3	3	3
L	2	2	4	4
1B	4	4	-	-
X	4	4	4	4

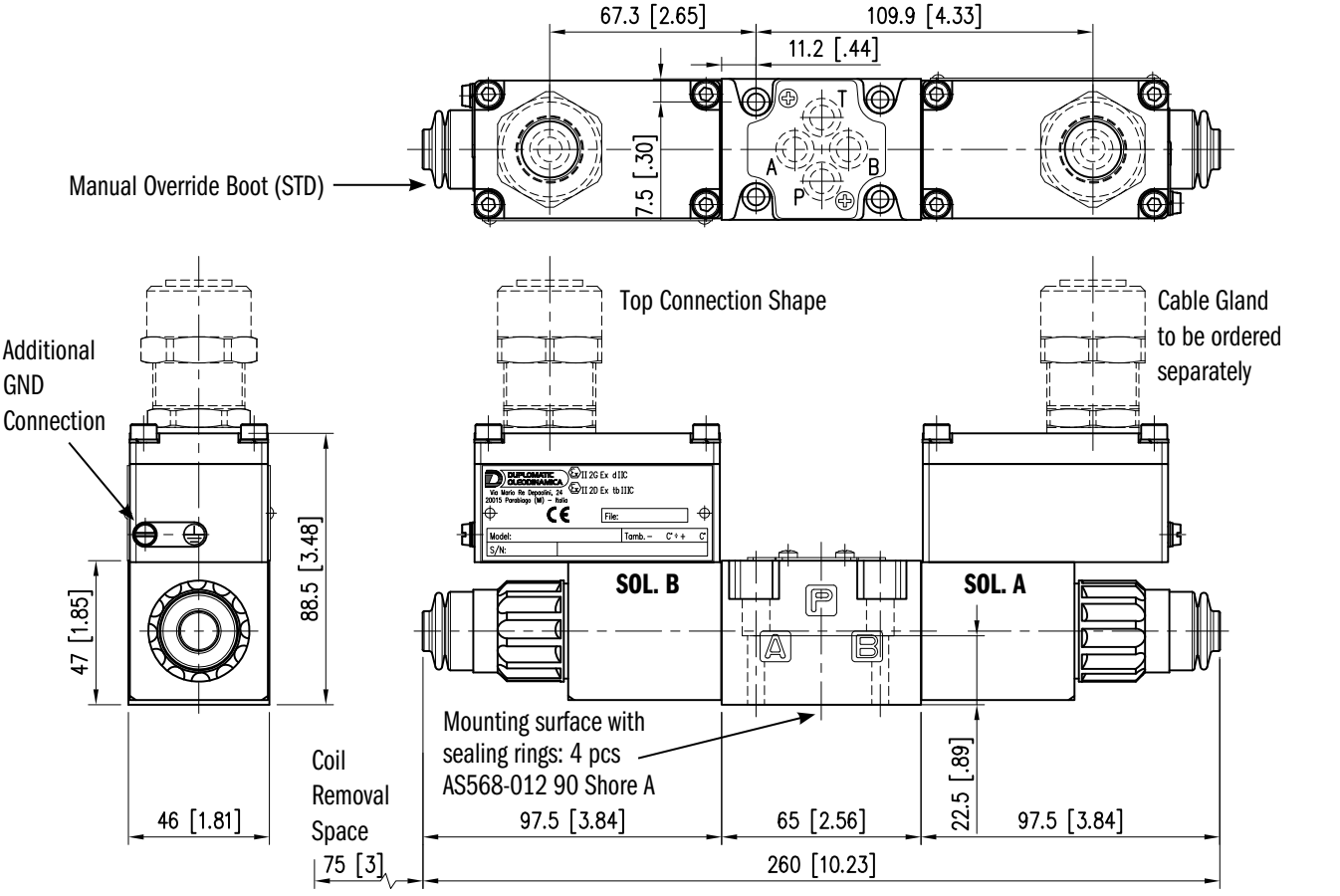
RESPONSE TIMES

SUPPLY	ENERGIZING [ms]	DE-ENERGIZING [ms]
VDC	60	40
RAC	60	140

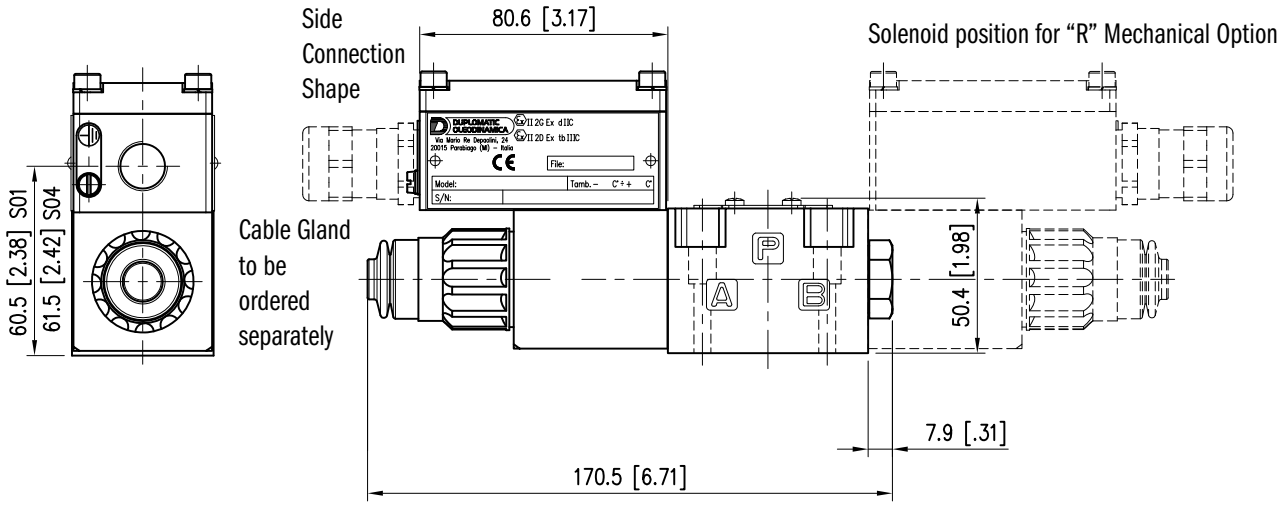
OVERALL AND MOUNTING DIMENSIONS

VSD03HL-2*, 3*-*T*

Dimensions in mm [IN]



VSD03HL-1*, 5*, 9*-*S*



IDENTIFICATION CODE - HAZARDOUS LOCATION - PILOT OPERATED

VSD ☐ HL - ☐ ☐ - ☐ ☐ ☐ ☐ ☐ - KD2 - ☐ D - ☐ — DESIGN LETTER

Solenoid Operated

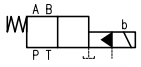
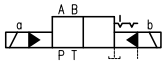
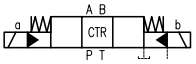
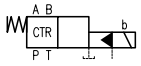
SOLENOIDS
See the codes on page 19

VALVE ATEX APPROVAL
For gases, vapours, mists: EX II 2G IIC T4 Gb
For dust: EX II 2D IIIC T154°C Db
(Protection type of the coil: "d")

SIZE	
05A	NFPA D05 alt. A (STD)
05B	NFPA D05 alt. B (STD)
07	NFPA D07
08	NFPA D08
10	NFPA D10

SEAL	
A	Buna (STD)
G	Viton
AL	Buna (Low Temp)

INTERNAL PILOT OPTIONS AVAILABLE ONLY WITH PILOT/DRAIN 1 AND 3 (OMIT IF NOT REQUIRED)	
Z	Pilot Pressure Reducer. Mandatory When Pressure Is Higher Than 3000 Psi (210 Bar).
C70	Check Valve On 'P' Port Cracking Pressure: 70 Psi (5 Bar). Available For D07 And D08 Sizes Only.

FUNCTION	
1	 Single Operator, 2 Position Spring Offset
2	 Dual Operator, 2 Position Detented (No Spring)
3	 Dual Operator, 3 Position Spring Centered
5	 Single Operator, 2 Position Spring Centered

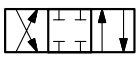
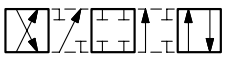
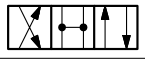
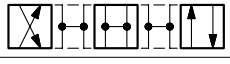
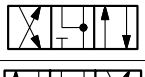
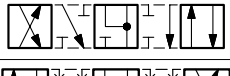
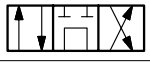
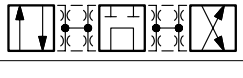
MECHANICAL OPTIONS OMIT IF NOT REQUIRED	
R	Reverse Mode Sol. 'A' Supplied
JJ	Stroke Adjustment On Main Stage
JA	Stroke Adjustment On A Port End
JB	Stroke Adjustment On B Port End
KK	Adjustable Pilot Chokes
P	Restrictor Suplate On P Port Between Main And Pilot Valve
F	Blind Retainer (STD for AL Seal) See page 15

PILOT / DRAIN	
1	Internal Pilot External Drain (Not available with B, L spools)
2	External Pilot External Drain
3	Internal Pilot Internal Drain (Not available with B, L spools)
4	External Pilot Internal Drain

TERMINAL BLOCK CONNECT	
T01	TOP: M20 x 1.5 ISO 261
T02	TOP: Gk 1/2 UNI EN 10226-2
T03	TOP: 1/2" NPT ANSI B1.20.1 (ex ANSI B 2.1)
S01	SIDE: M20 x 1.5 ISO 261 (Available upon request only)
S04	SIDE: M16 x 1.5 ISO 261 (Only for 24 VDC)

TYPICAL ORDERING CODE:
VSD07HL-3A-A2T01-KD2-24D-A

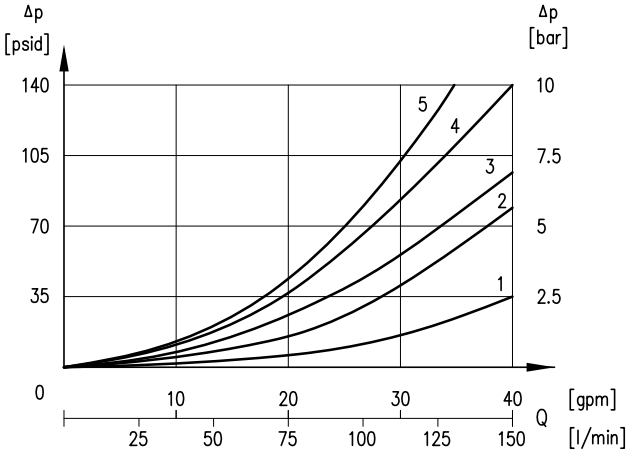
NOTE:
The valve is supplied with STD surface treatment of phospathing black for the main body and Zinc-Nickel for the D03 Pilot Valve.

SPOOLS					
NAME	SYMBOL	FUNCTION	CENTER POSITION	CROSSOVER	FUNCTION MATCHING
A			All ports blocked	P⟶B or P⟶A T blocked	1, 2, 3, 5
B			All ports open	All ports open	1, 3, 5
F			P blocked and A⟶T or B⟶T	P blocked and A⟶T or B⟶T	3, 5
L			P⟶T A and B blocked	All ports open, restricted	3, 5

PRESSURE DROPS Δp-Q - PILOT OPERATED VALVES

(OBTAINED WITH VISCOSITY OF 170 SUS (36 cSt) AT 120°F (50°C)

VSD05*HL

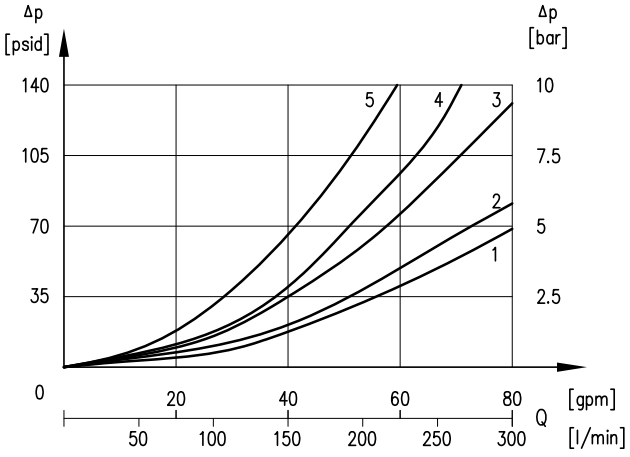


SPOOL	FLOW CURVE NUMBER					
					CTR	
	P→A	P→B	A→T	B→T	P→T	A→T B→T
A, 1A, 2A	4	4	1	1	-	-
B	3	3	1	2	5	-
F	4	4	1	1	-	4
L	5	5	2	3	5	-
1B	3	3	1	1	-	-

NOTES:

1. The values indicated in the graphs are relevant to the standard solenoid valve, with 42L coils.
2. Valve performance was tested in a four way circuit (full loop). Performances may be reduced from that shown when used in a three-way circuit (half circuit), i.e. A or B port plugged.
3. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with filtration according to ISO 4406:1999 class 18/16/13.

VSD07HL

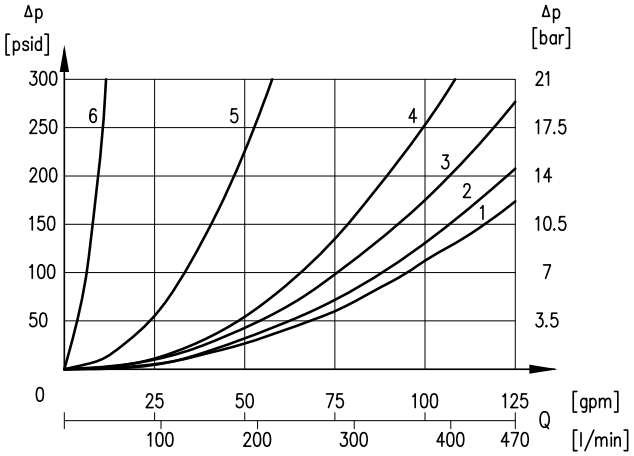


SPOOL	FLOW CURVE NUMBER					
					CTR	
	P→A	P→B	A→T	B→T	P→T	A→T B→T
A, 1A, 2A	1	1	3	4	-	-
B	1	1	4	4	2	-
F	1	1	4	4	-	4
L	2	2	4	5	4	-

PRESSURE DROPS Δp-Q - PILOT OPERATED VALVES

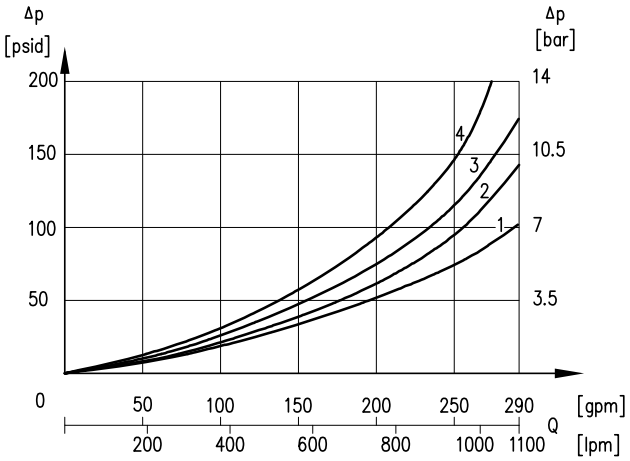
(OBTAINED WITH VISCOSITY OF 170 SUS (36 cSt) AT 120°F (50°C)

VSD08HL



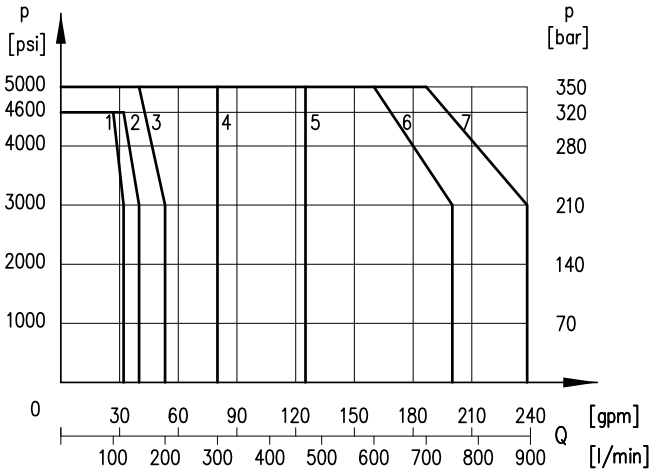
SPOOL	FLOW CURVE NUMBER					
					CTR	
	P→A	P→B	A→T	B→T	P→T	A→T B→T
A, 1A, 2A, 1B	2	2	3	3	-	-
B	1	1	2	1	4	-
F	2	2	2	1	-	4
L	4	4	3	5	6	-

VSD10HL



SPOOL	FLOW CURVE NUMBER					
					CTR	
	P→A	P→B	A→T	B→T	P→T	A→T B→T
A, 1B	1	1	1	1	-	-
B	2	2	2	2	3	-
F	1	1	4	4	-	4
L	2	2	2	2	4	-

PERFORMANCES



SPOOL	VSD05*HL	VSD07HL	VSD08HL	VSD10HL
A, F	2	4	5	7
B	2	4	5	6
L	1	3	5	6

RESPONSE TIMES

The values shown below refer to a solenoid valve working with piloting pressure of 1,450 PSI (100 bar), with mineral oil at a temperature of 122°F (50°C), at viscosity of 36 cSt and with PA and BT connections. The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

SIZE	ENERGIZING [ms]	DE-ENERGIZING [ms]	
	VDC / RAC	VDC	RAC
D05*	70	60	160
D07	80	70	170
D08	90	70	170
D10	120	90	190

OVERALL AND MOUNTING DIMENSIONS FOR VSD05*HL

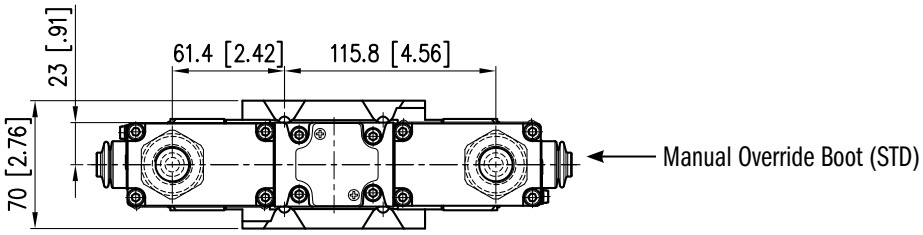
THREAD OF MOUNTING HOLE
1/4 - 20 UNC-2B x 0.60

FASTENING
4 bolts 1/4 - 20 UNC-2B x 1 1/2
Grade 8 or stronger

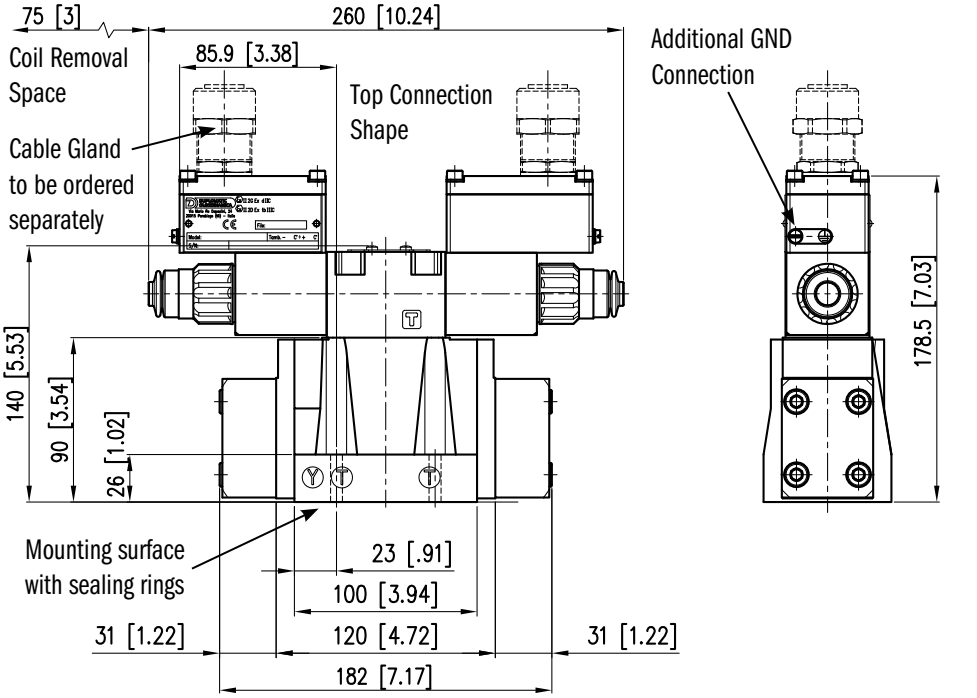
TIGHTENING TORQUE
6 lbf-ft (8 Nm)

SEALING RINGS
5 O-rings AS568-014 90 Shore A
2 O-rings AS568-012 90 Shore A

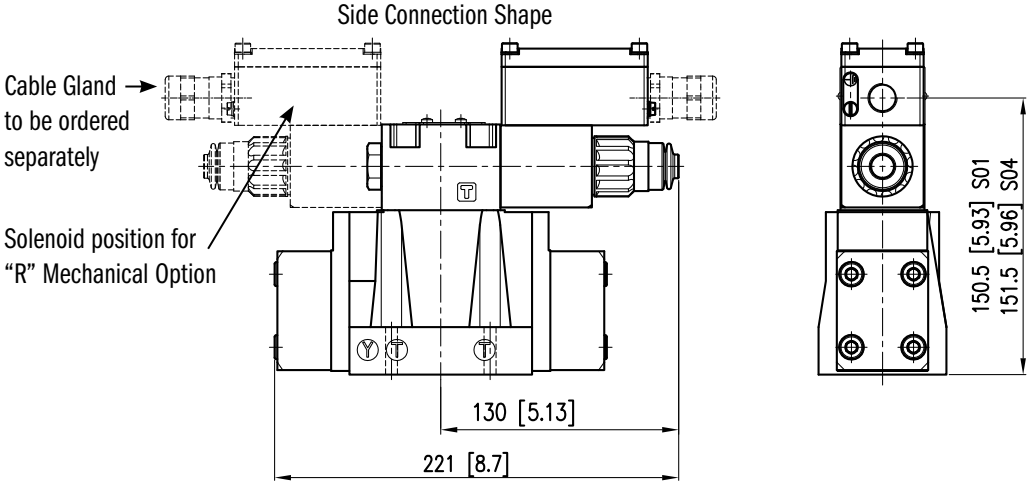
Dimensions in mm [IN]



VSD05*HL-2*, 3*-*T*



VSD05*HL-1*, 5*-*S*



OVERALL AND MOUNTING DIMENSIONS FOR VSD07HL

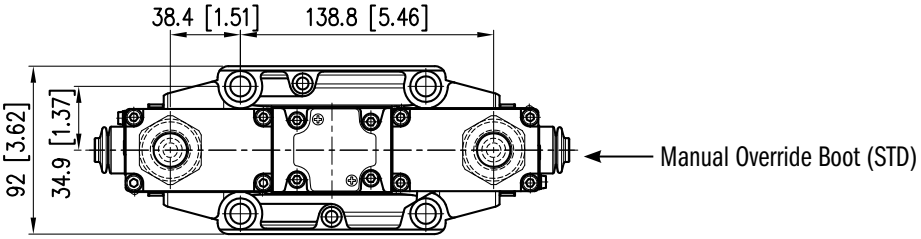
THREAD OF MOUNTING HOLE
1/4 - 20 UNC-2B x 0.50
3/8 - 16 UNC-2B x 0.90

FASTENING
2 bolts 1/4 - 20 UNC-2B x 2
Grade 8 or stronger
4 bolts 3/8 - 16 UNC-2B x 2 1/2
Grade 8 or stronger

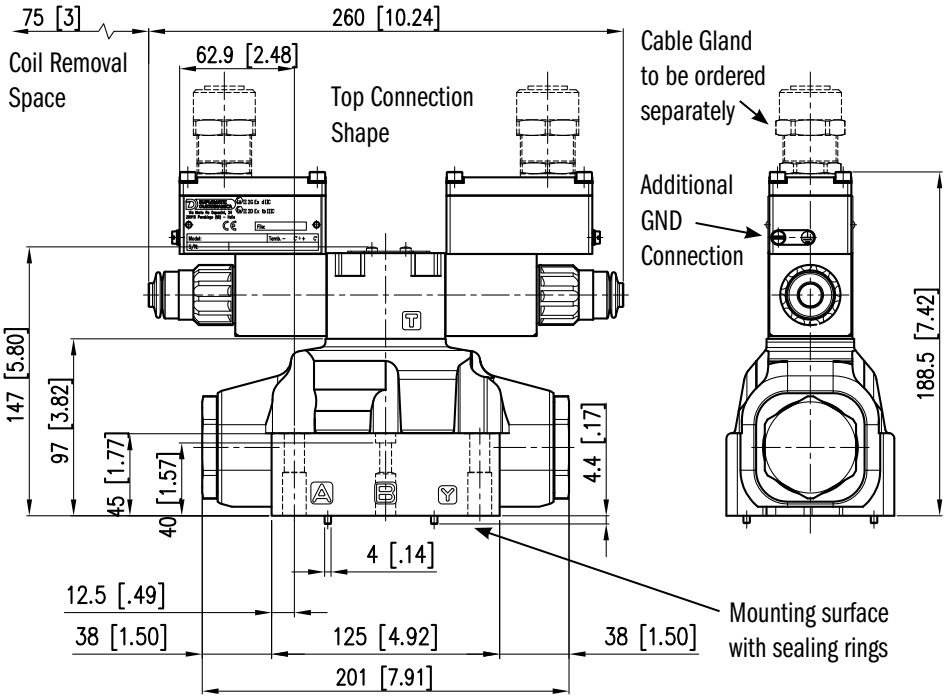
TIGHTENING TORQUE
1/4 - 20 UNC-2B: 6 lbf-ft (8 Nm)
3/8 - 16 UNC-2B: 30lbf-ft (40 Nm)

SEALING RINGS
4 O-rings 22.22 mm ID x 2.62 mm
CS90 Shore 90A
2 O-rings AS568-013 90 Shore A

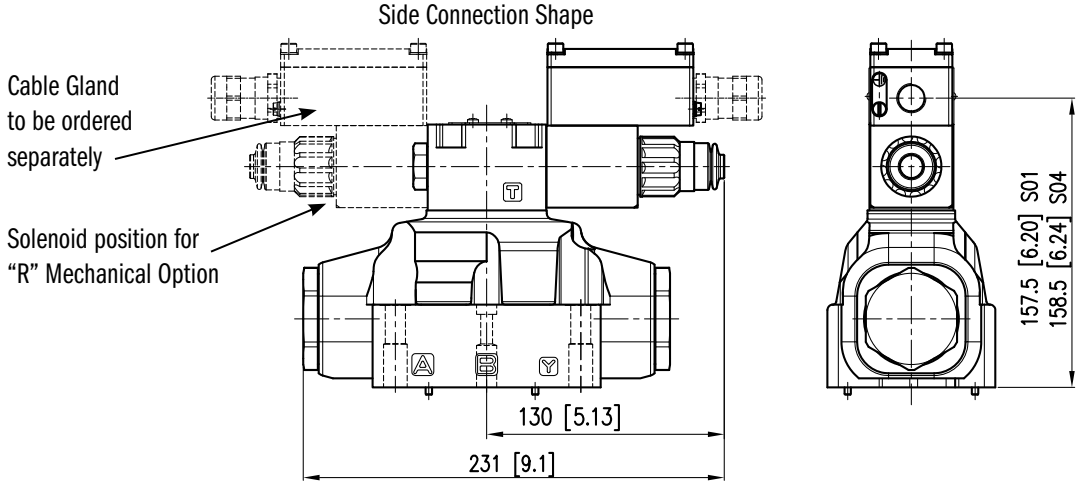
Dimensions in mm [IN]



VSD07HL-2*, 3*-*T*



VSD07HL-1*, 5*-*S*



OVERALL AND MOUNTING DIMENSIONS FOR VSD08HL

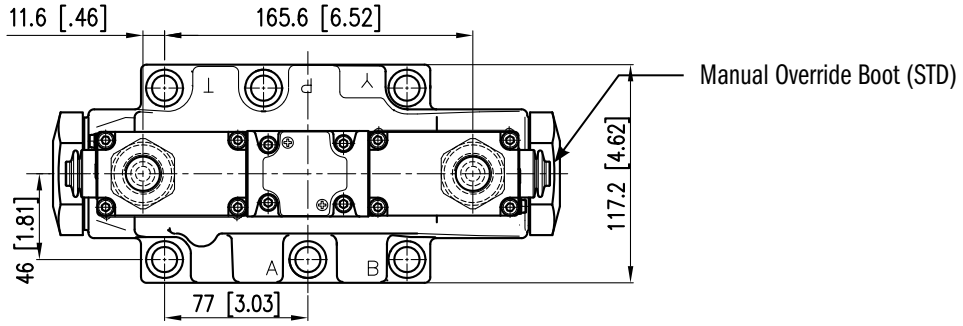
THREAD OF MOUNTING HOLE
1/2 - 13 UNC x 0.70

FASTENING
6 bolts 1/2 - 20 UNC x 2 1/2
Grade 8 or stronger

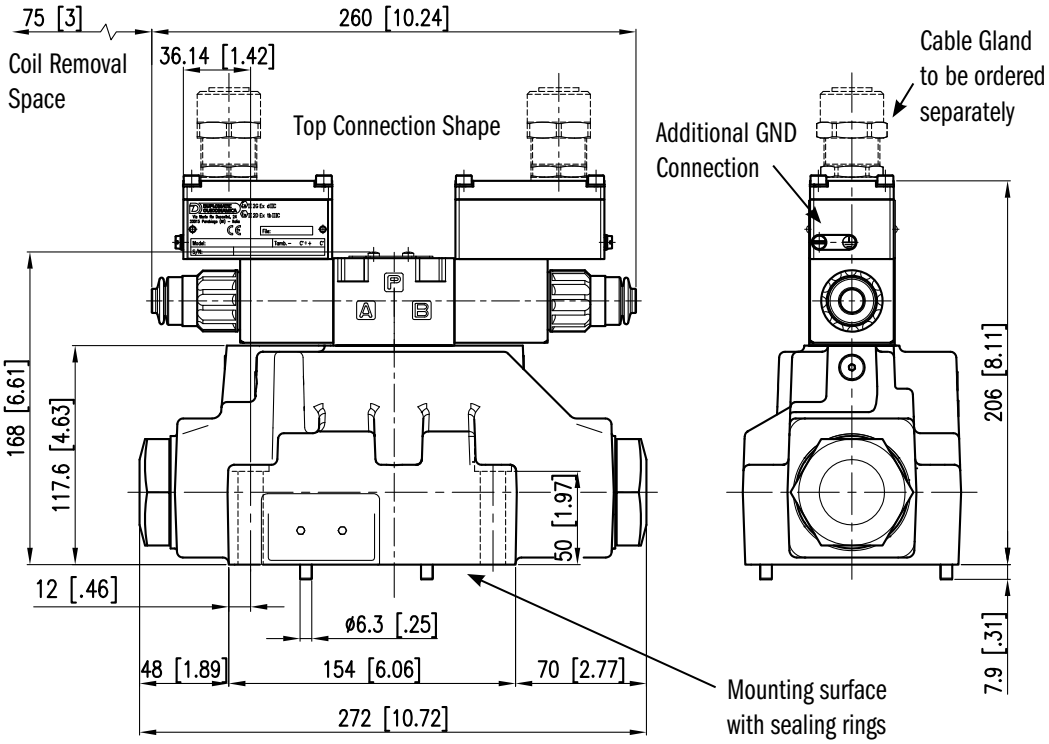
TIGHTENING TORQUE
90 to 100 lbf-ft (122 to 136 Nm)

SEALING RINGS
4 O-rings AS568-215 90 Shore A
2 O-rings AS568-210 90 Shore A

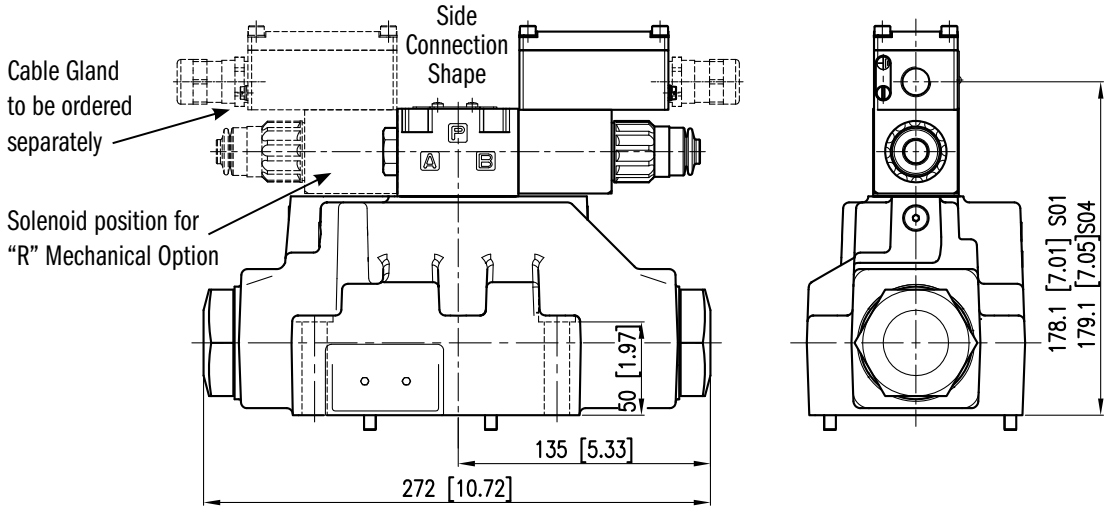
Dimensions in mm [IN]



VSD08HL-2*, 3*-*T*



VSD08HL-1*, 5*-*T*



OVERALL AND MOUNTING DIMENSIONS FOR VSD10HL

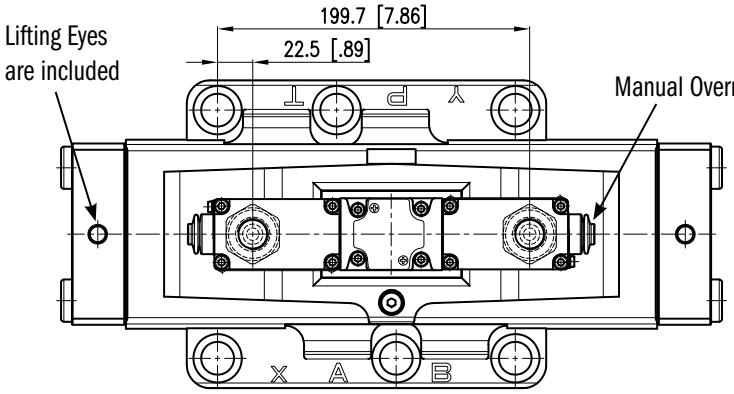
Dimensions in mm [IN]

THREAD OF MOUNTING HOLE
3/4 - 10 UNC-2B x 1.30

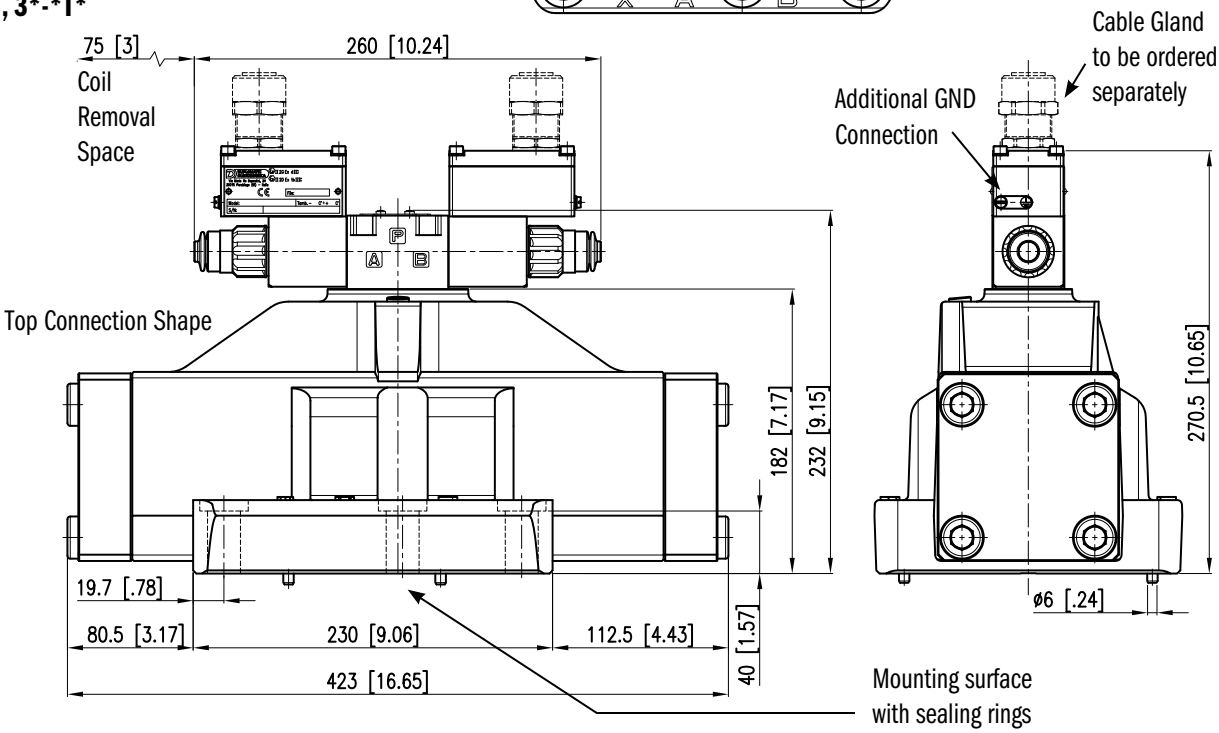
FASTENING
6 bolts 3/4 - 10 UNC-2B x 2 3/4
Grade 8 or stronger or higher strength

TIGHTENING TORQUE
240 lbf-ft (325 Nm)
415 lbf-ft (565 Nm) High Strength

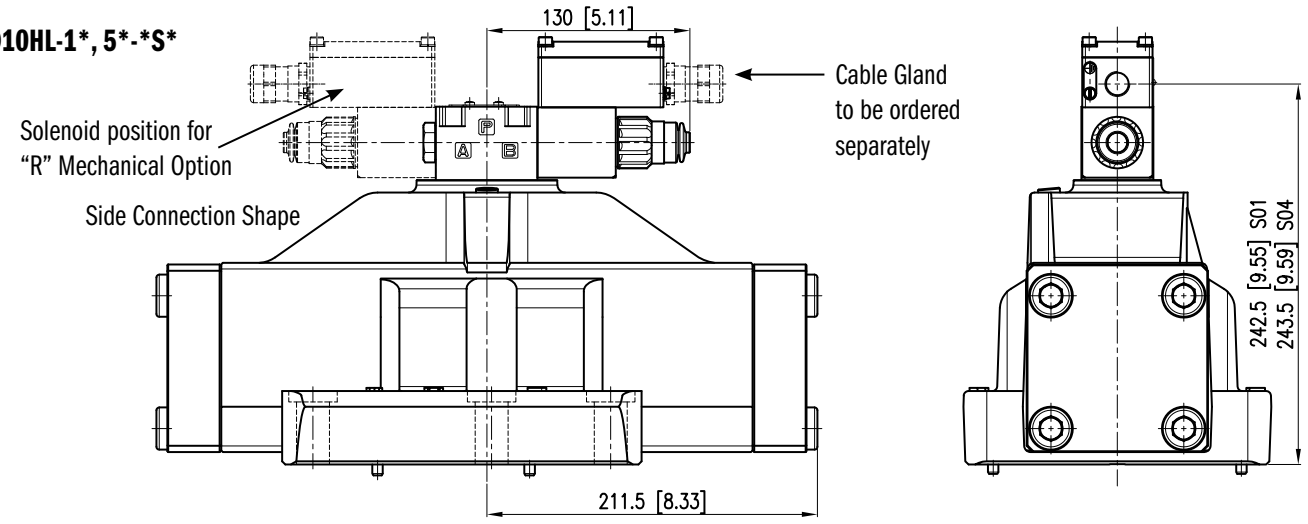
SEALING RINGS
4 O-rings AS568-222 90 Shore A
2 O-rings AS568-117 90 Shore A



VSD10HL-2*, 3*-*T*



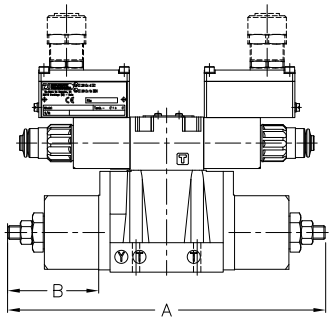
VSD10HL-1*, 5*-*S*



MECHANICAL OPTIONS

STROKE ADJUSTMENT (JJ)

This modification controls the flow of oil through the valve by limiting spool movement. It is used in hydraulic systems to govern the speed of system components.



This solution allows control of the flow rate from the pump to the actuator and from the actuator to the outlet, obtaining a double adjustment control on the actuator.

It is possible to order the valve with the stroke adjustment on the side only. To request these options add the letters “JA” or “JB” in the Mechanical Options Box in the indentification code.

The stroke adjustment kit is also available as an accessory. It includes 1 stroke assembly (one end only) and related seals. This kit is suitable even for the hydraulic operated version.

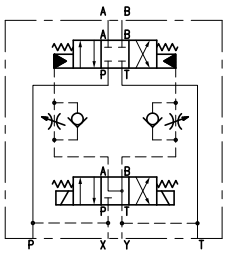
DIMENSION	VSD05*HL	VSD07HL	VSD08HL	VSD10HL
A	280 [11.00]	320 [12.60]	417 [16.40]	520 [20.50]
B	80 [3.15]	69 [2.72]	89 [3.50]	90 [3.54]

USE THE CODE BELOW TO ORDER STROKE ADJUSTMENT KIT

VALVE SERIES	SEAL MATERIAL	ORDERING NUMBER
VSD05*HL	Buna N	VMA-3A1
	Viton	VMA-3A2
VSD07HL	Buna N	VMA-4A1
	Viton	VMA-4A2
VSD08HL	Buna N	VMA-5A1
	Viton	VMA-5A2
VSD10HL	Buna N	VMA-7A1
	Viton	VMA-7A2

ADJUSTABLE PILOT CHOKES (KK)

Hydraulic shock may occur when stopping or reversing flow. This can be reduced and controlled by lowering the spool shift velocity. The chokes operate by metering out (returning) on all 2 position valves, and when going to center position on 3-position valves.

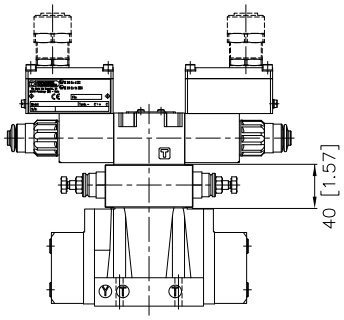


To request this option add the letters “KK” in the Mechanical Option Box in the identification code.

Consult with Continental Hydraulics for other metering configurations.

RESTRICTOR SUBPLATE (P)

It is possible to introduce a subplate with a restrictor of Ø 0.80 mm [0.03 in] for D05*, D07, D08 sizes and Ø 1.50 mm [0.06 in] for the D10 size on line P between the pilot solenoid valve and the main distributor with the purpose of increasing the switching time.



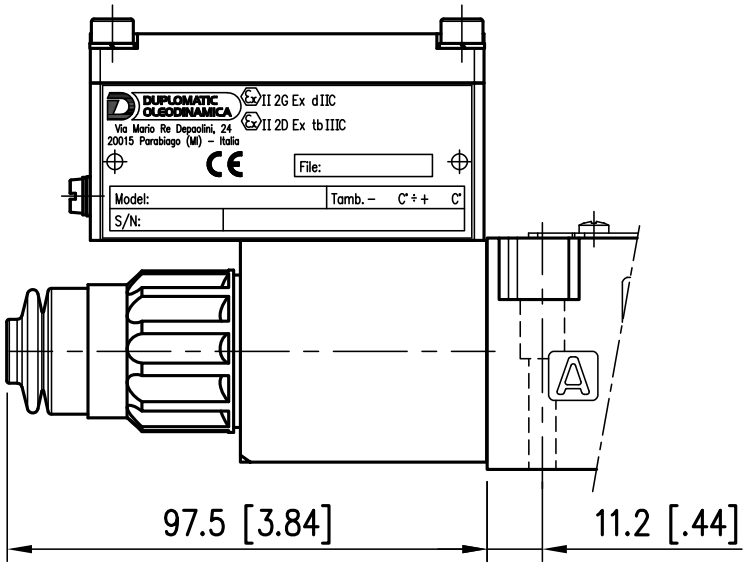
This part is 10 mm [0.39 in] tall.

To request this option add the letter “P” in the Mechanical Options Box in the indentification code.

MECHANICAL OPTIONS

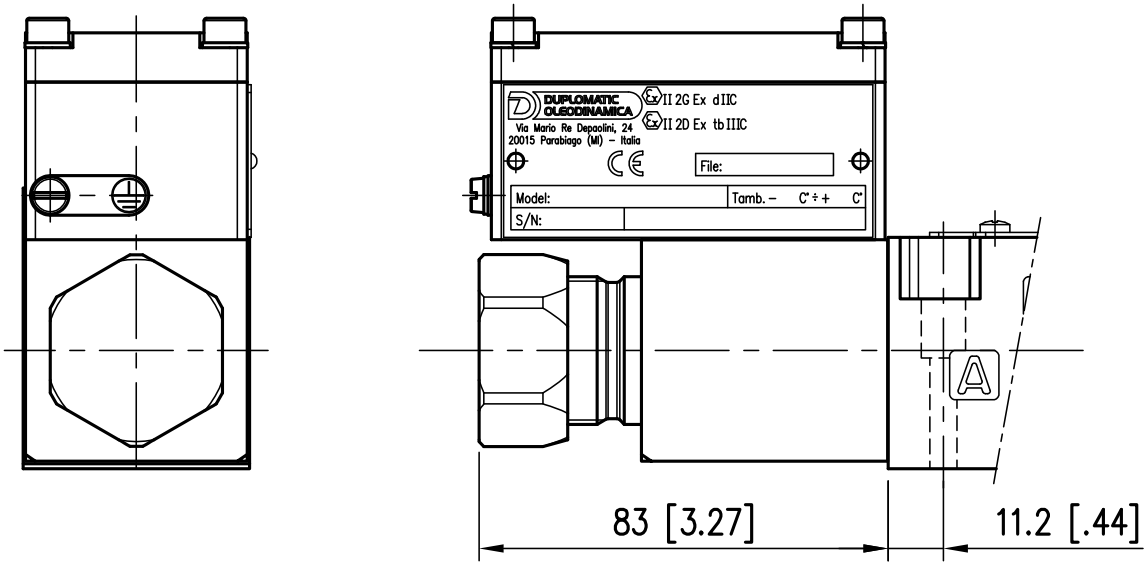
MANUAL OVERRIDE BOOT

The manual override boot is standard on valves with seal codes A and G. It is not available with seal code AL (low temp).



BLIND RETAINER (F)

The blind retainer is standard on valves with seal code AL. It is available as an option with seal code A and G.



PILOT AND DRAIN CONFIGURATION

The VSD*HL valves are available with four pilot/drain configurations: internal/internal, internal/external, external/internal and external/external.

When internal pilot and/or drain are used, the corresponding 'x' and 'y' ports in the manifold must be plugged. Pilot pressure must be at least 70 psi (5 bar) greater than the pressure in the 'T' line.

It may be desirable to use external pilot when system pressure is subject to wide flucuations. It is required to use external pilot or internal pilot with a pressure reducing valve when system pressure exceeds 3000 psi (210 bar) for the VSD05*HL, VSD07HL and VSD10HL.

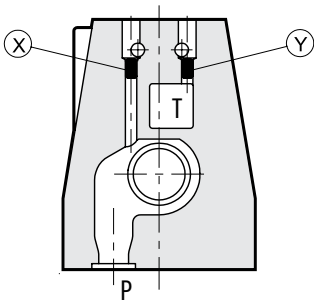
An external drain must be used when an open center (B) or a tandem center (L) spool is used, and is also recommended when using pilot checks. The version with external drain allows for higher tank line pressure in series circuits.

CODE	DESIGN	VSD05*M, VSD07M, VSD10M		VSD08M	
		Pilot (X)	Drain (Y)	Pilot (X) (W)	Drain (Y)
1	Internal Pilot / External Drain	□	■	◘ ■	■
2	External Pilot / External Drain	■	■	■ ◘	■
3	Internal Pilot / Internal Drain	□	□	◘ ■	□
4	External Pilot / Internal Drain	■	□	■ ◘	□

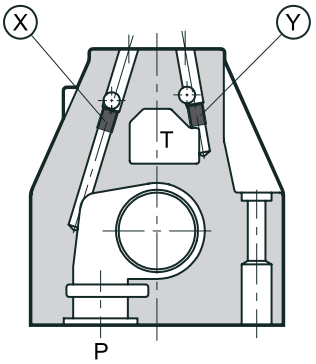
■ Plugged □ Unplugged ◘ Restricted

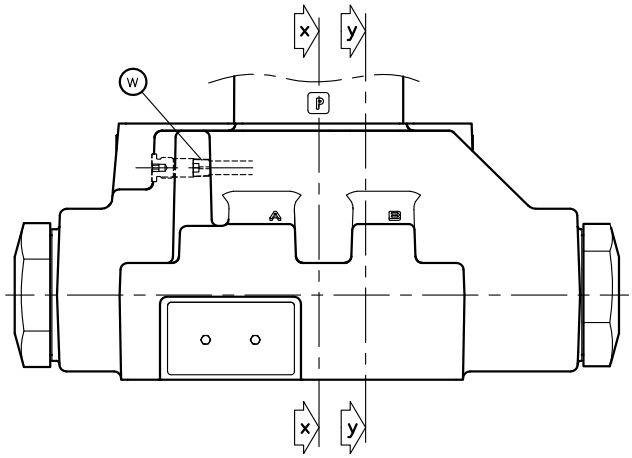
PLUG MOUNTING

VSD05*HL

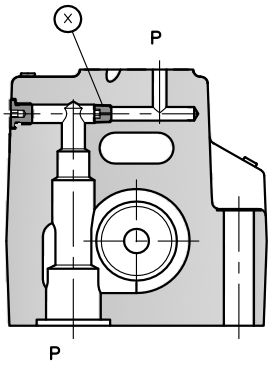


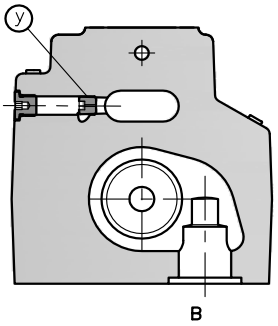
VSD07HL





VSD08HL

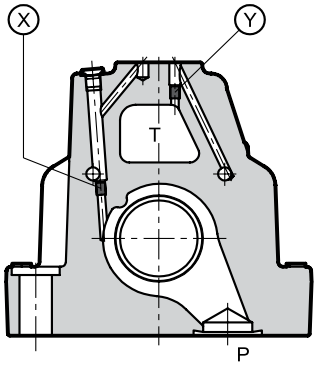




PLUG SIZE:

VSD05*HL	M5x6 mm
VSD07HL	M6x8 mm
VSD10HL	M6x8 mm
VSD08HL	1/16" NPT Pipe Plug 1/16" NPT Pipe Plug with Ø 0.070 (1.78MM) Orifice

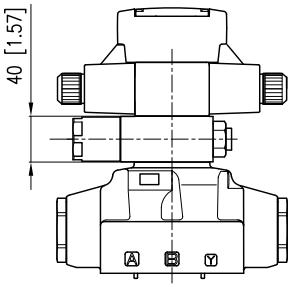
VSD10HL



INTERNAL PILOT OPTIONS

PRESSURE REDUCING (Z)

THE PRESSURE REDUCING MODULE IS TO PROTECT THE VALVE FROM PILOT PRESSURES EXCEEDING 3000 PSI (210 BAR).



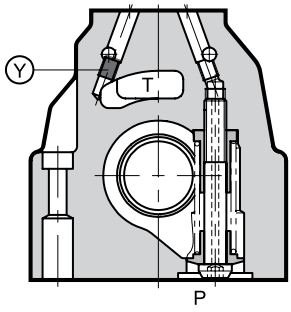
When the system pressure exceeds 3000 psi it is mandatory the use of an external pilot, or optional Z for internally piloted versions.

The pressure reducer is fixed at 430 psi (30 bar). This device is not available for the VSD05*HL.

To request this option add the letter 'Z' in the internal pilot options box, in the identification code.

BACK PRESSURE VALVE (C70)

The back pressure valve is for valves with internal pilot and B or L spool types where system pressure may drop below the 70 psi (5 bar) required for pilot operation.

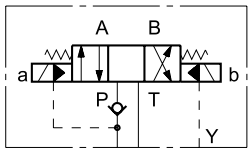


This device is available only for VSD07HL and VSD08HL.

NOTE: The back pressure valve can't be used as check because it doesn't assure the seal.

To request this option add the letters 'C70' in the internal pilot options box, in the identification code.

The backpressure valve is also available as a field conversion kit and can be easily mounted in the P port of the main control valve.



The kit includes 1 check assembly and related seals.

USE THE CODE BELOW TO ORDER THE KIT.

VALVE SERIES	SEAL MATERIAL	ORDERING NUMBER
VSD07HL	Buna N	VMA-4F1-A
	Viton	VMA-4F2-A
VSD08HL	Buna N	VMA-5F1-A
	Viton	VMA-5F2-A

HAZARDOUS LOCATION

Continental Hydraulics certified the valve/coil combination which are suitable for application and installation in potentially explosive atmospheres according to ATEX directives. **The product always includes the declaration of conformity to the directive and the operating and maintenance manual, which includes all the information needed to properly apply the valve in potentially explosive environments.** Coils assembled on these valves are separately certified according to ATEX directive and are suitable for use in potentially explosive atmospheres.

VALVE ATEX CLASSIFICATION

The valves can be used for applications and installations in potentially explosive atmospheres that fall within either the ATEX II 2G or the ATEX II 2D classification, with the following markings:

MARKING FOR GASES, VAPOURS & MISTS

II 2G IIC T4 Gb (-20°C Ta +80°C) for both A and G seals

II 2G IIC T4 Gb (-40°C Ta +80°C) for AL seals

EX: Specific marking of explosion protection as ATEX 94/9/EC directive and related technical specification requests.
II: Group II for surface plants
2: Category 2 high protection, eligible for zone 1 (therefore also eligible for category 3 zone 2)
G: Type of atmosphere with gases, vapours and mists
IIC: Gas group (therefore also eligible for group IIA and IIB)
T4: Temperature class (max surface temperature)
Gb: EPL protection level for electrical devices
-20°C Ta +80°C: Ambient temperature range for valves with both A and G seals.
-40°C Ta +80°C: Ambient temperature range for valves with AL seals.

MARKING FOR DUSTS

II 2D IIIC T154°C Db (-20°C Ta +80°C) for both A and G seals

II 2D IIIC T154°C Db (-40°C Ta +80°C) for AL seals

EX: Specific marking of explosion protection as ATEX 94/9/EC directive and related technical specification requests.
II: Group II for surface plants
2: Category 2 high protection, eligible for zone 21 (therefore also eligible for category 3 zone 22)
D: Type of atmosphere with dusts
IIIC: Gas group (therefore also eligible for group IIA and IIB)
T154°C: Temperature class (max surface temperature)
Db: EPL protection level for electrical devices
-20°C Ta +80°C: Ambient temperature range for valves with both A and G seals.
-40°C Ta +80°C: Ambient temperature range for valves with AL seals.

COIL ATEX CLASSIFICATION

MARKING FOR GASES, VAPOURS & MISTS

II 2G Ex d IIC T4 Gb (-40°C Ta +80°C)

EX: Specific marking of explosion protection as ATEX 94/9/EC directive and related technical specification requests.
II: Group II for surface plants
2: Category 2 high protection, eligible for zone 1 (therefore also eligible for category 3 zone 2)
G: Type of atmosphere with gases, vapours and mists
Ex d: “d” protection type, explosion-proof case
IIC: Gas Group (therefore also eligible for group IIA and IIB)
T4: Temperature class (max surface temperature)
Gb: EPL protection level for electrical devices
-40°C Ta +80°C: Ambient temperature range

MARKING FOR DUSTS

II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)

EX: Specific marking of explosion protection as ATEX 94/9/EC directive and related technical specification requests.
II: Group II for surface plants
2: Category 2 high protection, eligible for zone 21 (therefore also eligible for category 3 zone 22)
D: Type of atmosphere with dusts
Ex tb: “tb” protection type
IIIC: Dust groups (therefore also eligible for group IIA and IIB)
T154°C: Temperature class (max surface temperature)
Db: EPL protection level for electrical devices
IP66/IP68: Value IP degree
-40°C Ta +80°C: Ambient temperature range

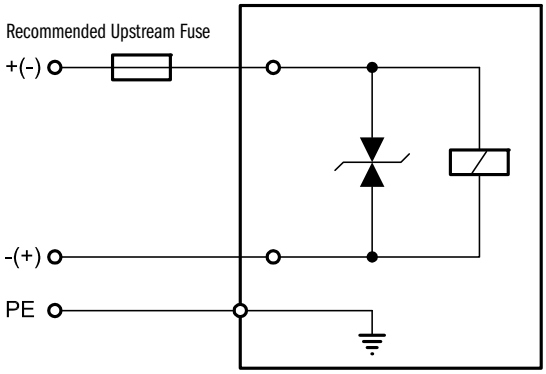
OPERATING TEMPERATURE

The operating ambient temperature must be between -20°C [-4°F]/+80°C [+176°F] for valves with both A and G seals and -40°C [-40°F]/+80°C [+176°F] for valves with AL seals. The fluid temperature must be between -20°C [-4°F]/+80°C [+176°F] for valves with both A and G seals and -40°C [-40°F]/+80°C [+176°F] for valves with AL seals. The valves are classified in T4 temperature class (T154°C = 309°F), therefore they are eligible for operation also at higher class temperatures (T3, T2, T1 for gas and T200°C = 392°F for dust).

SOLENOIDS

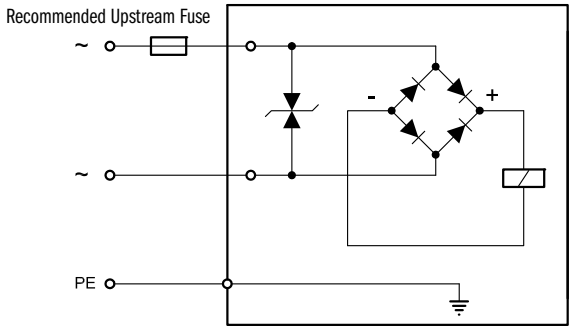
Listed below the types of solenoids available and the numbers to be added in the solenoid box on page 3 or 6.

VDC COILS



COIL CODE	VOLTAGE ±5% [VDC]	RESISTENCE ±5% [OHM]	HOLDING CURRENT [A]	POWER CONSUMPTION [VA]	PRE-FUSE [A]	MAX VOLTAGE UPON SWITCH OFF [V]
12	12	7.2	1.7	20	2.5	-49
24	24	28.7	0.83	20	1.25	-49
48	48	115	0.42	20	0.6	-81
110	110	549	0.2	22	0.3	-309

RECTIFIED COILS



COIL CODE	VOLTAGE [VAC]	FREQUENCY [Hz]	RESISTENCE ±5% [OHM]	HOLDING CURRENT [A]	POWER CONSUMPTION [VA]	PRE-FUSE [A]	MAX VOLTAGE UPON SWITCH OFF [V]
R120	120	60	489.6	0.21	25	0.30	-3
	110	50		0.19	21		
R240	240	60	2067.7	0.10	24	0.15	-3
	230	50		0.10	22.5		

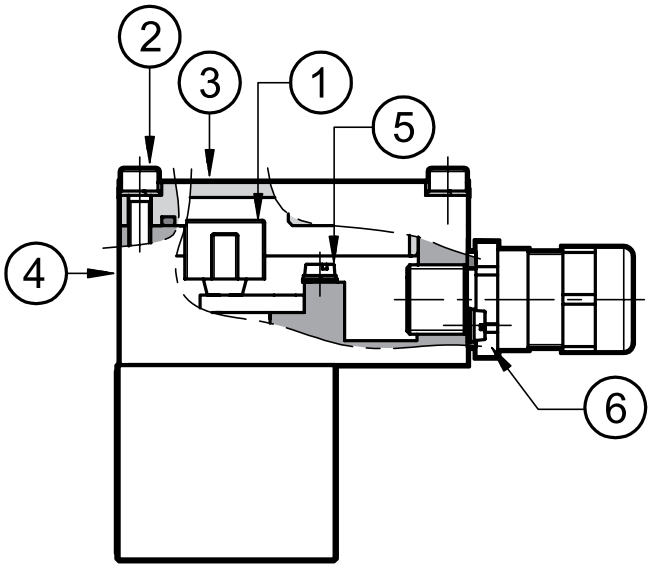
Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short-circuit current of the supply source. The fuse or protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

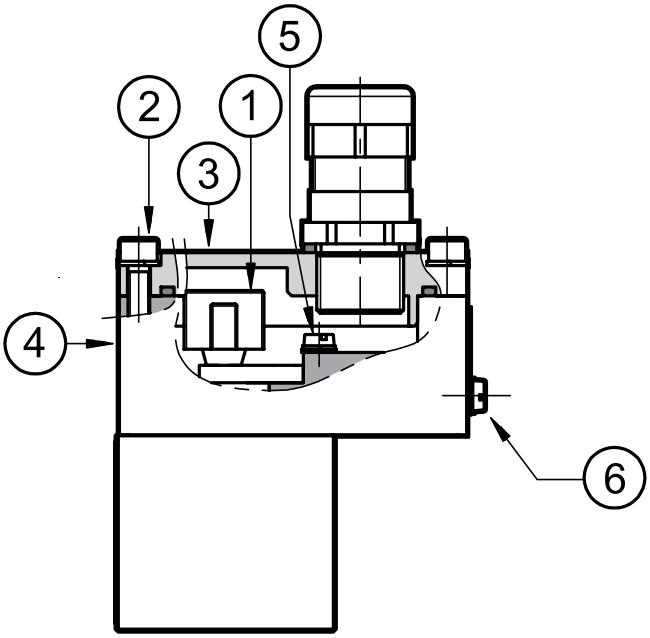
The charts above show the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

WIRING

SIDE CONNECTION



TOP CONNECTION



You must gain access to the terminal block (1) to wire the valve. Remove the 4 cover screws (2) that secure the cover (3) to the box (4). Remove the cover.

The electrical connection is polarity-independent.

It is important to connect the grouding points (5) in the terminal box (M4 screws), through suitable conductors, to the general grounding line of the system. There is a grounding point (6) (M4 screws) on the external body of the coil to ensure the valve and general grounding line are equal in potential. Connecting this point to the general grounding line verifies that, per standard EN13463-1, the equipotentiality of the elements included in a potentially explosive environment is guaranteed.

Maximum allowable resistance between elements is 100 Ω.

After the electrical wiring is complete, reassemble the cover (3) on to the box (4), checking to be sure the seal is correctly positioned in the cover seat. Fasten the 4 M5 screws with a torque of 4.9-6 Nm [3.6-4.4 lb/ft].

Characteristics of the cables connectable for wiring are indicated in the table below:

FUNCTION	CABLE SECTION
Operating voltage cables connection	Max 2.5 mm^2
Connection for internal grounding point	Max 2.5 mm^2
Connection for external equipotential grounding point	Max 6.0 mm^2

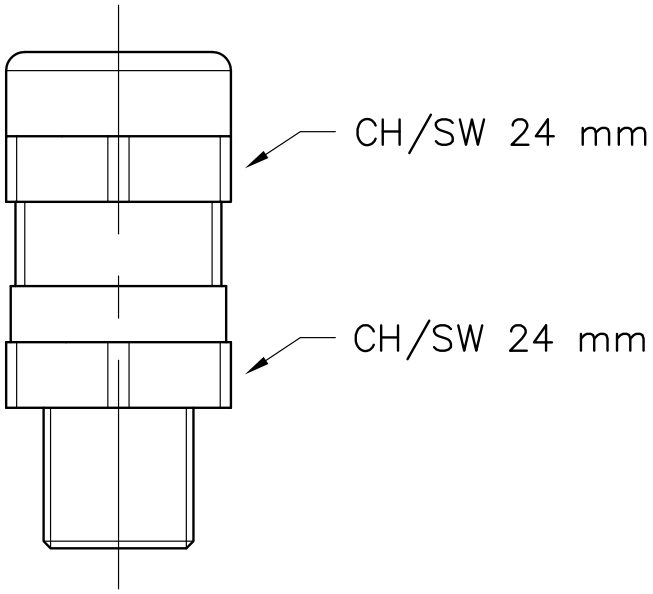
Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from -20°C [-4°F] to +110°C [+230°F] (for valves either with A or G seals) or from -40°C [-40°F] to +110°C [+230°F] (for valves with AL seals).

WIRING

CABLE GLANDS

Cable glands must be ordered seperately; Continental Hydraulics offers some types of cable glands with the following features:

- Version for non-armoured cable, external seal on the cable (suitable for diameter 8 to 10 mm cables)
- According to ATEX II 2GD directive certified
- Cable gland material: Nickel and Brass
- Rubber tip material: Silicone
- Ambient temperature range: -70°C [-94°F] to +220°C [+428°F]
- Protection degree: IP66/IP68



DESCRIPTION	NOTES	CONNECTION TYPE	ITEM
CGK2/NB-01/10	M20 x 1.5 - ISO 261 Male Tread	T01 - S01	M3908108001
CGK2/NB-02/10	Version with Gk 1/2 - UNI EN 10226-2 Male Tread	T02	M3908108002
CGK2/NB-03/10	Version with 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)	T03	M3908108003
CGK2/NB-04/10	Version with M16 x 1.5 - ISO 261 Male Thread	S03	M3908108004

NOTES:

CGK2/NB-01/10 & CGK2/NB-04/10

It is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil cover, so as to ensure IP66/IP68 protection degree.

CGK2/NB-02/10 & CGK2/NB-03/10

In order to ensure IP66/IP68 protection degree, the customer must apply LOCTITER 243™ Threadlocker or similar between the cable gland connection thread and the coil cover.

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 tolerances are ± 0.1 mm (0.004”) for bolt and pin location; ± 0.2 mm (0.008”) for the other quotes.

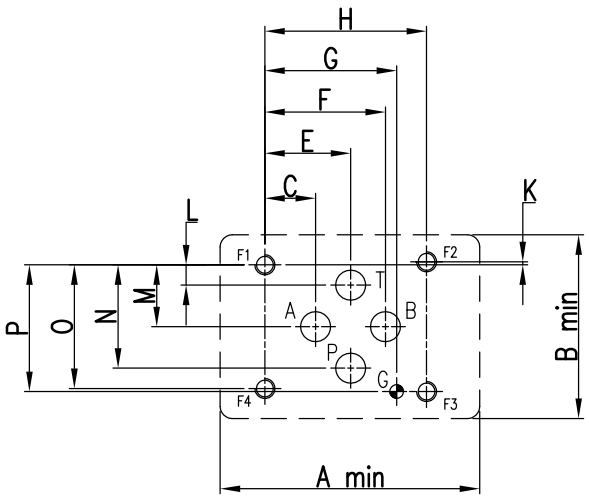
The minimum depth of the blind hole G where required is 8 mm (0.31 in).

D03

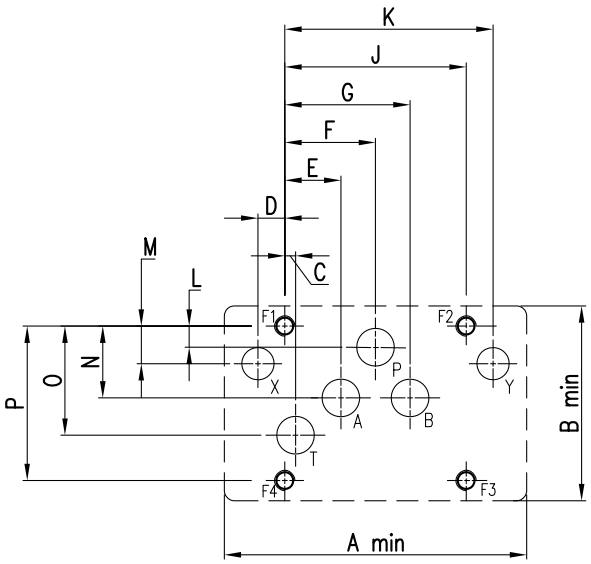
	MM	INCH
P, A, B, T MAX	Ø 7.0	Ø 0.276
G MAX	Ø 4.0	Ø 0.16
MOUNTING BOLT THREAD SIZE	M5	10-24 UNC 2B

	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

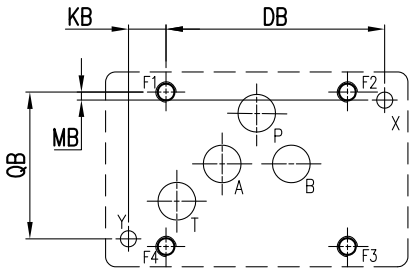
	MM	INCH
K	0.75	0.03
L	5.10	0.20
M	15.5	0.61
N	25.9	1.02
O	31.0	1.22
P	31.8	1.25



D05 - ALTERNATIVE A



D05 - ALTERNATIVE B



PORT FUNCTION:

P = PRESSURE PORT
T = TANK PORT

A = FIRST CYLINDER PORT
X = PILOT PORT

B = SECOND CYLINDER PORT
Y = DRAIN PORT

	MM	INCH
P,A,B,T MAX	Ø 11.2	Ø 0.44
X, Y ALT. A	Ø 6.30	Ø 0.25
X, Y ALT. B	Ø 4.80	Ø 0.19
MOUNTING BOLT THREAD SIZE	M6	1/4 - 20 UNC

	MM	INCH
A	90.0	3.54
B	58.0	2.28
C	3.20	0.126
D	8.00	0.31
E	16.7	0.66
F	27.0	1.06
G	37.3	1.47

	MM	INCH
J	54.0	2.125
K	62.0	2.44
L	6.30	0.25
M	11.2	0.44
N	21.4	0.84
O	32.5	1.28
P	46.0	1.82

	MM	INCH
DB	65.1	2.563
KB	11.2	0.44
MB	2.40	0.09
QB	43.7	1.72

NOTES:
NFPA D05 and ISO 4401-05 indicates different diameters for X and Y holes:
NFPA: Ø 9.6 max in D05 alt A
Ø 4.8 max in D05 alt B

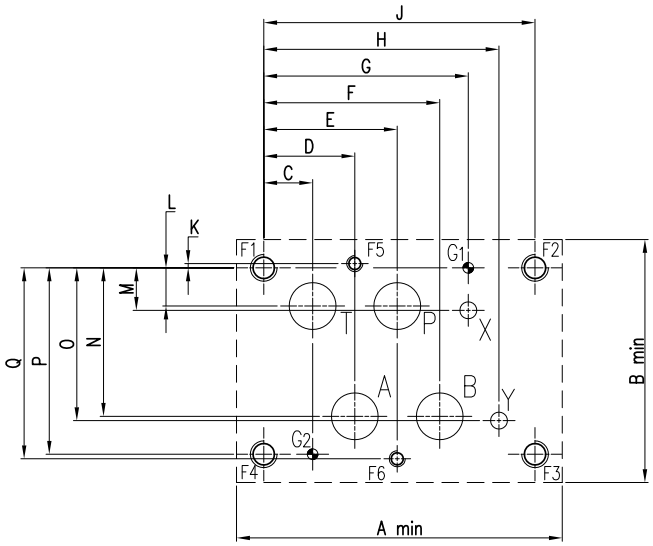
ISO: Ø 6.3 max both

D07

	MM	INCH
P,A,B,T MAX	Ø 17.5	Ø 0.69
X, Y MAX	Ø 6.30	Ø 0.25
G MAX	Ø 4.00	Ø 0.16
MOUNTING BOLT THREAD SIZE F1 - F4	M10	3/8 - 16 UNC
MOUNTING BOLT THREAD SIZE F5 - F6	M6	1/4 - 20 UNC

	MM	INCH
A	122.0	4.80
B	91.0	3.58
C	18.3	0.72
D	34.1	1.34
E	50.0	1.97
F	65.9	2.60
G	76.6	3.016
H	88.1	3.47

	MM	INCH
J	101.6	4.00
K	1.60	0.063
L	14.3	0.56
M	15.9	0.626
N	55.6	2.19
O	57.2	2.25
P	69.9	2.75
Q	71.5	2.815

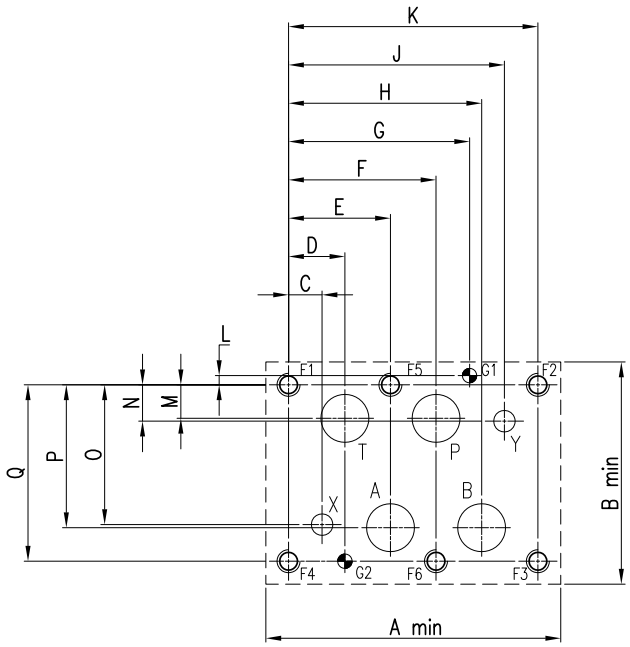


D08

	MM	INCH
P,A,B,T MAX	Ø 25.0	Ø 0.98
X, Y MAX	Ø 11.2	Ø 0.44
G MAX	Ø 7.50	Ø 0.30
MOUNTING BOLT THREAD SIZE	M12	1/2 - 13 UNC

	MM	INCH
A	154.0	6.00
B	116.0	4.57
C	17.5	0.69
D	29.4	1.157
E	53.2	2.09
F	77.0	3.03
G	94.5	3.719
H	100.8	3.97

	MM	INCH
J	112.7	4.44
K	130.2	5.125
L	4.80	0.187
M	17.5	0.69
N	19.0	0.75
O	73.0	2.874
P	74.6	2.93
Q	92.1	3.625

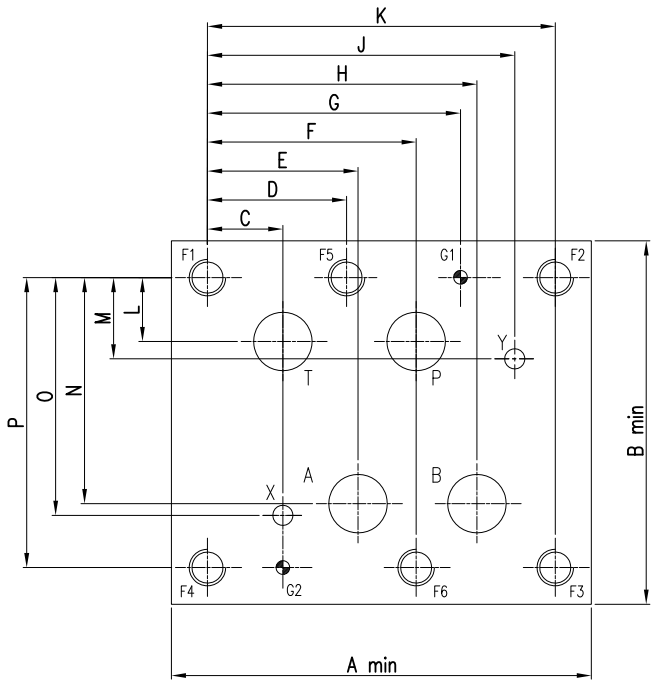


D10

	MM	INCH
P, A, B, T MAX	Ø 32	Ø 1.25
X, Y MAX	Ø 11.2	Ø .44
G MAX	Ø 7.5	Ø .30
MOUNTING BOLT THREAD SIZE	M20	3/4 - 10 UNC

	MM	INCH
A	230.0	9.06
B	199.0	7.83
C	41.3	1.63
D	76.2	3.00
E	82.5	3.25
F	114.3	4.50
G	138.6	5.457
H	147.6	5.81

	MM	INCH
J	168.3	6.63
K	190.5	7.50
L	35.0	1.38
M	44.5	1.75
N	123.8	4.87
O	130.2	5.13
P	158.8	6.25



APPLICATION DATA

FLUIDS

All pressure drops shown on these data pages are based on 170 SUS fluid viscosity and 0.87 specific gravity. For any other specific gravity (G1) the pressure drop (ΔP) will be approx. ΔP1 = ΔP (G1/G). See the chart for other viscosities.

FLUID VISCOSITIES	Cst	10	14.5	32	36	43	54	65	76	86	108	216	324	400
	SUS	60	75	150	170	200	250	300	350	400	500	1000	1500	1900
MULTIPIER		0.77	0.81	0.97	1.00	1.04	1.10	1.15	1.20	1.24	1.31	1.56	1.72	1.83

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code G). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 180 degrees F causes the accelerated degradation of seals as well as degradation of the fluids physical and chemical properties.

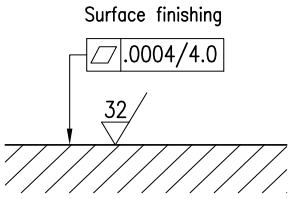
From a safety standpoint, temperatures above 130 degrees F are not recommended.

RANGE TEMPERATURES:	Ambient	- 4 to +176°F	-20 to +80°C
	Fluid	- 40 to +176°F	-40 to +80°C
FLUID VISCOSITY	Range	60 - 1900 SUS	10 - 400 cSt
	Recommended	120 SUS	25 cSt
FLUID CONTAMINATION		ISO 4406:1999 Class 20/18/15	

INSTALLATION

The configurations with centering and offset springs can be mounted in any position without impairing correct operation; instead, those without springs and with mechanical detent must be mounted with the longitudinal axis horizontal.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



BOLT KITS

D03 SIZE	**BD03-125**	Valve Only	1008406
D05* SIZE	**BD05H-150-B**	Valve Only	1009397
D07 SIZE	**BD07-250**	Valve Only	1009400
D08 SIZE	**BD08-275**	Valve Only	250141
D10 SIZE	**BD10-275**	Valve Only	1013038

SEAL KIT

D03 SIZE	**Buna Seal Kit**	1013326
	Buna Seal Kit	1013327
D05* SIZE	**Buna Seal Kit**	1013966
	Buna Seal Kit	1013967
D07 SIZE	**Buna Seal Kit**	1013968
	Viton Seal Kit	1013969
D08 SIZE	**Buna Seal Kit**	1013970
	Viton Seal Kit	1013971
D10 SIZE	**Buna Seal Kit**	1013972
	Viton Seal Kit	1013973

SUBPLATES

D05 alt. A SIZE	**AD05JESPS16S**	Aluminium	SAE-16	351716AJ
	DD05JESPS16S	Ductile	SAE-16	351716AK
D07 SIZE	**AD07SPS016S**	Aluminium	SAE-16	1013039AB
	DD07SPS016S	Ductile	SAE-16	1013039AC
D08 SIZE	**AD08SPS020S**	Aluminium	SAE-20	265803AP
	DD08SPS020S	Ductile	SAE-20	265803AL
D10 SIZE	**AD10SPS032S**	Aluminium	SAE-32	1013040AB
	DD10SPS032S	Ductile	SAE-32	1013040AC

NOTES:

1. Max pressure for aluminum subplates: 3000 psi (210 bar)
2. Max pressure for ductile subplates: 5000 psi (350 bar)
3. Always verify subplate port size is proper for the application

VSD*HL-*-KD2 - HAZARDOUS LOCATION, SOLENOID, DIRECT & PILOT OPERATED VALVES

ABOUT CONTINENTAL HYDRAULICS

Rugged, durable, high-performance, efficient—the reason Continental Hydraulics' products are used in some of the most challenging applications across the globe. With a commitment to quality customer support and innovative engineering, Continental's pumps, valves, power units, mobile and custom products deliver what the markets demand. Continental has been serving the food production, brick and block, wood products, automotive and machine tool industries since 1962. Learn how our products survive some of the most harsh environments.

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VSD*M-VPD*M

PILOT OPERATED DIRECTIONAL VALVES

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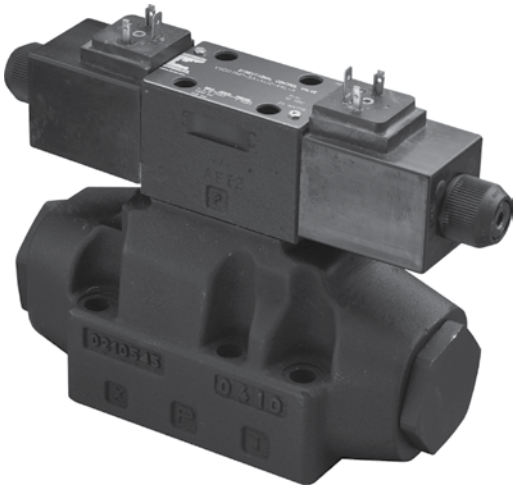
VSD*M-VPD*M
PILOT OPERATED DIRECTIONAL VALVES



DESCRIPTION
The VSD*M and VPD*M pilot operated directional control valves are available with either electric solenoid or hydraulic actuation of the main spool.

Available in 5 standard NFPA and ISO patterns, these pilot operated valves are used in applications requiring high flow rates.

OPERATION
The valves are available in both 2 or 3 position and various spool flow patterns.

On VSD*M valves, the configuration for internal or external pilot/drains can be easily changed in the field. Also available to improve consistent cycling of the valve are pilot pressure reducing, pilot chocks, and main stage stroke adjustments.

TYPICAL PERFORMANCE SPECIFICATIONS

		VSD05*M		VSD07M		VSD08M		VSD10M	
MAXIMUM OPERATING PRESSURE	P - A - B Ports	4600 psi	320 bar	5000	350 bar	5000 psi	350 bar	5000 psi	350 bar
	T Port (Ext. Drain)	3600 psi	250 bar	3600 psi	250 bar	3000 psi	210 bar	3000 psi	210 bar
	T Port (Int. Drain)	2000 psi	140 bar	2000 psi	140 bar	2000 psi	140 bar	2000 psi	140 bar
	X Port	3000 psi	210 bar	4000 psi	280 bar	5000 psi	350 bar	4000 psi	280 bar
MINIMUM PILOT PRESSURE		72 psi	5 bar	170 psi	12 bar	72 psi	5 bar	170 psi	12 bar
MAX FLOW RATE		40 gpm	150 l/min	80 gpm	300 l/min	125 gpm	473 l/min	290 gpm	1100 l/min
MOUNTING SURFACE		NFPA D05 alt. A /alt. B ISO 4401-05-05-0-05		NFPA D07 ISO 4401-07-07-0-05		NFPA D08 ISO 4401-08-08-0-05		NFPA D10 ISO 4401-10-09-0-05	
WEIGHT		19 lbs	8.6 kg	19.4 lbs	8.8 kg	34 lbs	15.4 kg	110 lbs	50 kg

IDENTIFICATION CODE - SOLENOID OPERATED

VSD □ M - □ □ - □ □ □ □ □ □ - □ L - □ — DESIGN LETTER

- Solenoid Operated
- Spool (See page 5)
- **SOLENOIDS** - See the codes on page 20)

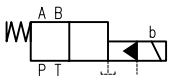
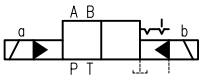
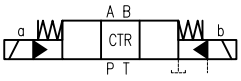
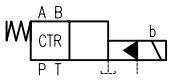
SIZE	
05A	NFPA D05 alt.A (STD)
05B	NFPA D05 alt.B (STD)
07	NFPA D07
08	NFPA D08
10	NFPA D10

SEAL	
A	Buna (STD)
G	Viton

PILOT / DRAIN	
1	Internal Pilot External Drain
2	External Pilot External Drain
3	Internal Pilot Internal Drain
4	External Pilot Internal Drain

CONNECTION BOX OPTIONS OMIT IF NOT REQUIRED
See the codes on page 19

ELECTRICAL OPTION	
OMIT	Plug-in terminal solenoids or lead wires
B	Connection box with terminal posts and lights

FUNCTION	
1	
	Single Operator 2 Position Spring Offset
2	
	Dual Operator 2 Position Detented (No Spring)
3	
	Dual Operator 3 Position Spring Centered
5	
	Single Operator 2 Position Spring Centered

MECHANICAL OPTIONS OMIT IF NOT REQUIRED	
R	Reverse Mode Sol. 'A' Supplied
JJ	Stroke Adjustment On Main Stage
JA	Stroke Adjustment On A Port End
JB	Stroke Adjustment On B Port End
KK	Adjustable Pilot Chokes
P	Restrictor Suplate On P Port Between Main And Pilot Valve
WD	Washdown

INTERNAL PILOT OPTIONS AVAILABLE ONLY WITH PILOT/DRAIN 1 AND 3 (OMIT IF NOT REQUIRED)	
Z	Pilot Pressure Reducer. Mandatory When Pressure Is Higher Than 3000 Psi (210 Bar). Not available for D05
C70	Check Valve On 'P' Port Cracking Pressure: 70 Psi (5 Bar). Available For D07 And D08 Sizes Only.

TYPICAL ORDERING CODE:
WITH CONNECTION BOX
VSD05AM-3A-A1B5A-60L-C
WITH PLUG-IN SOLENOID
VSD05AM-3A-A3-33L-C

The identification code for hydraulic operated valves is on page 4.

IDENTIFICATION CODE - HYDRAULIC OPERATED

VPD □ M - □ □ - □ □ 2 - □ — DESIGN LETTER

Hydraulic Operated

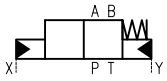
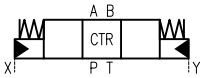
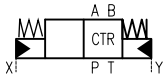
Spool (See page 5)

SIZE	
05A	NFPA D05 alt.A
05B	NFPA D05 alt.B
07	NFPA D07
08	NFPA D08
10	NFPA D10

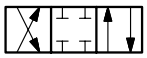
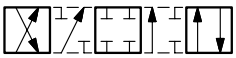
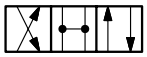
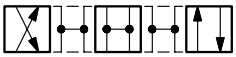
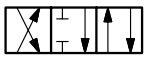
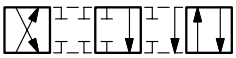
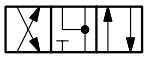
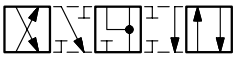
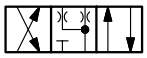
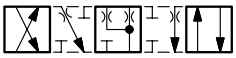
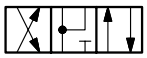
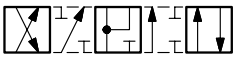
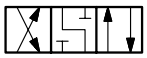
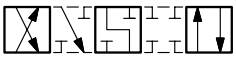
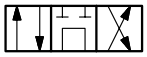
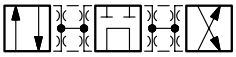
SEAL	
A	Buna (STD)
G	Viton

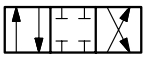
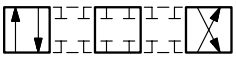
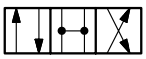
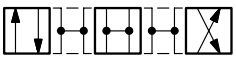
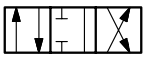
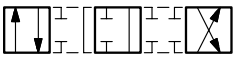
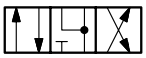
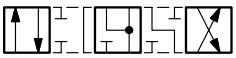
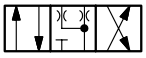
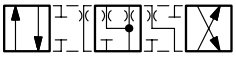
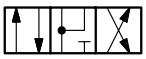
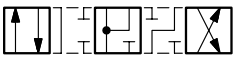
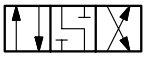
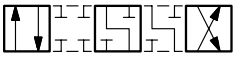
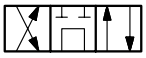
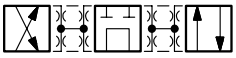
MECHANICAL OPTIONS OMIT IF NOT REQUIRED	
R	Reverse Mode
JJ	Stroke Adjustment On Main Stage
JA	Stroke Adjustment On A Port End
JB	Stroke Adjustment On B Port End
KK	Adjustable Pilot Chokes

HYDRAULIC ACTUATION	
2	X Port Is Actuator B Y Port Is Actuator A

FUNCTION	
1	
	Single Operator 2 Position Spring Offset
3	
	Dual Operator 3 Position Spring Centered
5	
	Single Operator 2 Position Spring Centered

TYPICAL ORDERING CODE:
VPD05AM-3A-A2-A

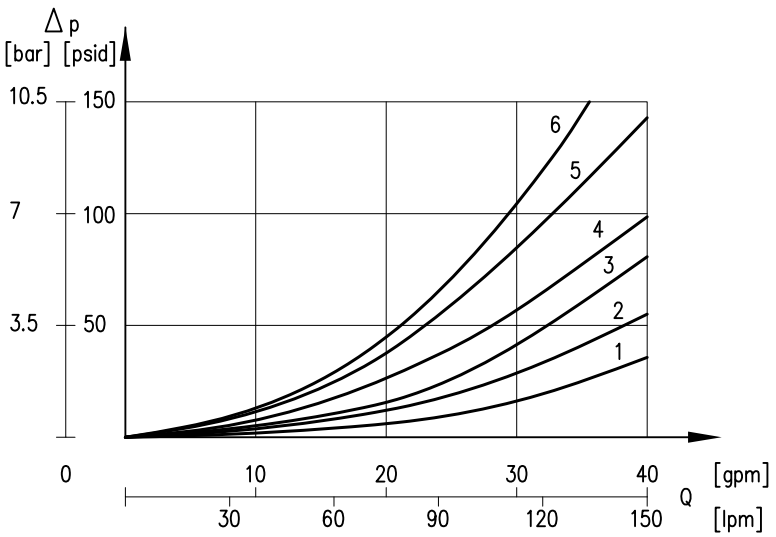
SPOOLS FOR D05, D07 AND D10					
NAME	**SYMBOL**	**FUNCTION**	**CENTER POSITION**	**CROSSOVER**	**FUNCTION MATCHING**
A			All ports blocked	All ports blocked	1, 2, 3, 5
B			All ports open	All ports open	1, 2, 3, 5.
E			P & A blocked, B →T	P & A blocked, B →T or all blocked	3
F			P blocked, A →T and B →T	P blocked, A →T or B →T	3, 5
F1			P blocked, A →T and B →T restricted	P blocked, A →T or B →T restricted	3
G			P → A & B T blocked	P → A or P → B T blocked	3
K			P & B blocked, A →T.	All blocked, or P & B blocked and A →T	3
L			P →T A & B blocked	All ports open, restricted	3, 5

SPOOLS FOR D08					
NAME	**SYMBOL**	**FUNCTION**	**CENTER POSITION**	**CROSSOVER**	**FUNCTION MATCHING**
A			All ports blocked	All ports blocked	1, 2, 3, 5
B			All ports open	All ports open	1, 2, 3, 5
E			P & A blocked, B →T	P & A blocked, B →T or all blocked	3
F			P blocked, A →T and B →T	P blocked, A →T or B →T	3, 5
F1			P blocked, A →T and B →T restricted	P blocked, A →T or B →T restricted	3
G			P → A & B T blocked	P → A or P → B T blocked	3
K			P & B blocked, A →T	All blocked, or P & B blocked and A →T	3
L			P →T A & B blocked	All ports open, restricted	3, 5

NOTE:
Here are shown only the most frequently used spools. Consult with Continental Hydraulics for special version availability.

PERFORMANCE CURVES FOR VSD05*M - VPD05*M

FLOW GAIN



SPOOL	FLOW CURVE NUMBER								
	SHIFTED				CENTER				
	P→A	P→B	A→T	B→T	P→A	P→B	A→T	B→T	P→T
1A	5	5	2	3	-	-	-	-	-
2A	5	5	2	3	-	-	-	-	-
3A, 5A	5	5	1	3	-	-	-	-	-
3B, 5B	4	4	1	2	-	-	-	-	6
3E, 5E	5	5	1	2	-	-	-	5	-
3F, 5F	5	5	1	2	-	-	5	5	-
3F1, 5F1	5	5	1	1	-	-	-	-	-
3G, 5G	4	4	3	3	5	5	-	-	-
3K, 5K	5	5	3	3	-	-	5	-	-
3L, 5L	6	6	1	1	-	-	-	-	6

NOTE:
Curves obtained with mineral oil with viscosity of 170 SUS (36 cSt) at 122°F (50°C).

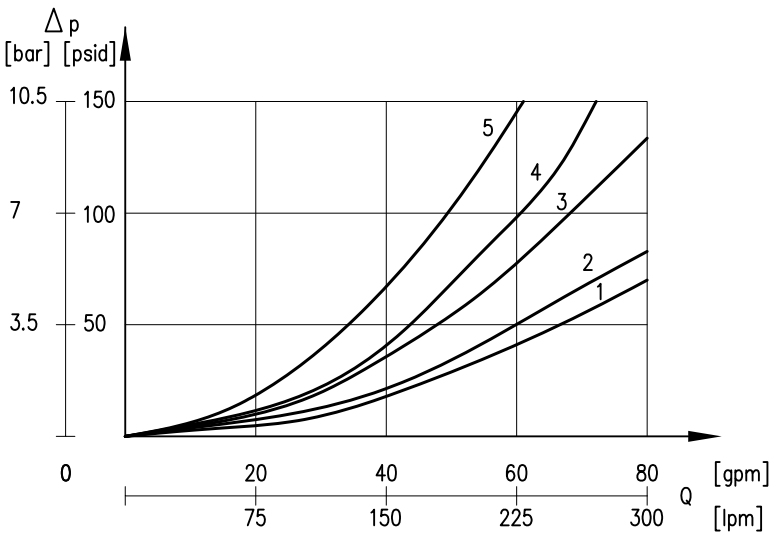
RESPONSE TIME

TIMES [ms]	ENERGIZING	DE-ENERGIZING
AC	25 MS	25 MS
DC	50 MS	50 MS

NOTE:
The values indicated refer to a solenoid valve working with 1450 psi (100 bar) pilot pressure, with mineral oil at 120°F (50°C) and viscosity of 165 SUS (36cSt). The energizing and de-energizing times are obtained at the point pressure changes in the work ports.

PERFORMANCE CURVES FOR VSD07M - VPD07M

FLOW GAIN



SPOOL	FLOW CURVE NUMBER								
	SHIFTED				CENTER				
	P⟶A	P⟶B	A⟶T	B⟶T	P⟶A	P⟶B	A⟶T	B⟶T	P⟶T
1A, 1B, 2A, 3A, 5A	1	1	3	4	-	-	-	-	-
3B, 5B	1	1	4	4	-	-	-	-	2
3E	1	1	3	4	-	-	-	4	-
3F, 5F	1	1	4	4	-	-	4	4	-
3F1, 5F1	1	1	3	4	-	-	-	-	-
3G, 5G	1	1	3	4	-	-	-	-	-
3K, 5K	1	1	3	4	-	-	4	-	-
3L, 5L	2	2	4	5	-	-	-	-	4

NOTE:
Curves obtained with mineral oil with viscosity of 170 SUS (36 cSt) at 122°F (50°C).

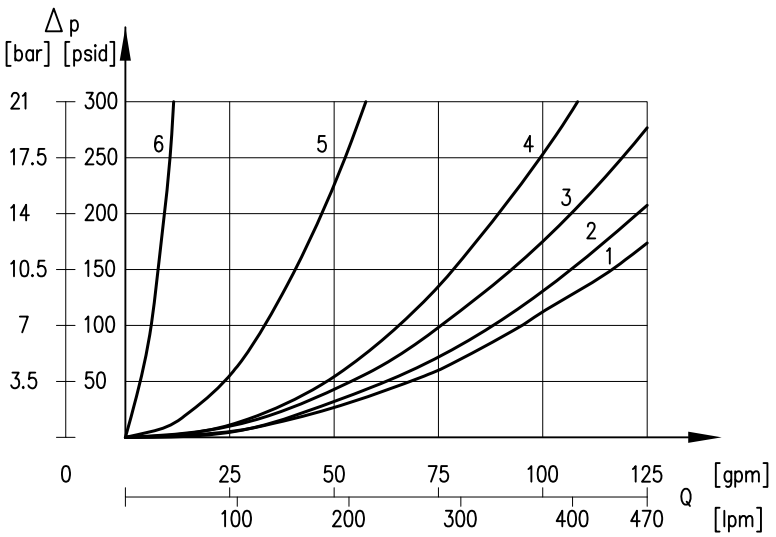
RESPONSE TIME

TIMES [ms]	ENERGIZING	DE-ENERGIZING
AC	30 MS	30 MS
DC	60 MS	45 MS

NOTE:
The values indicated refer to a solenoid valve working with 1450 psi (100 bar) pilot pressure, with mineral oil at 120°F (50°C) and viscosity of 165 SUS (36cSt). The energizing and de-energizing times are obtained at the point pressure changes in the work ports.

PERFORMANCE CURVES FOR VSD08M - VPD08M

FLOW GAIN



SPOOL	FLOW CURVE NUMBER								
	SHIFTED				CENTER				
	P⟶A	P⟶B	A⟶T	B⟶T	P⟶A	P⟶B	A⟶T	B⟶T	P⟶T
1A, 2A, 3A, 5A	1	1	2	2	-	-	-	-	-
1B, 3B, 5B	1	1	2	2	-	-	-	-	3
3F, 5F	1	1	2	2	-	-	3	3	-
3F1	1	1	2	2	-	-	6	6	-
3G	1	1	2	2	4	4	-	-	-
3K	1	1	2	2	-	-	5	-	-
3L, 5L	3	3	3	3	-	-	-	-	4

NOTE:
Curves obtained with mineral oil with viscosity of 170 SUS (36 cSt) at 122°F (50°C).

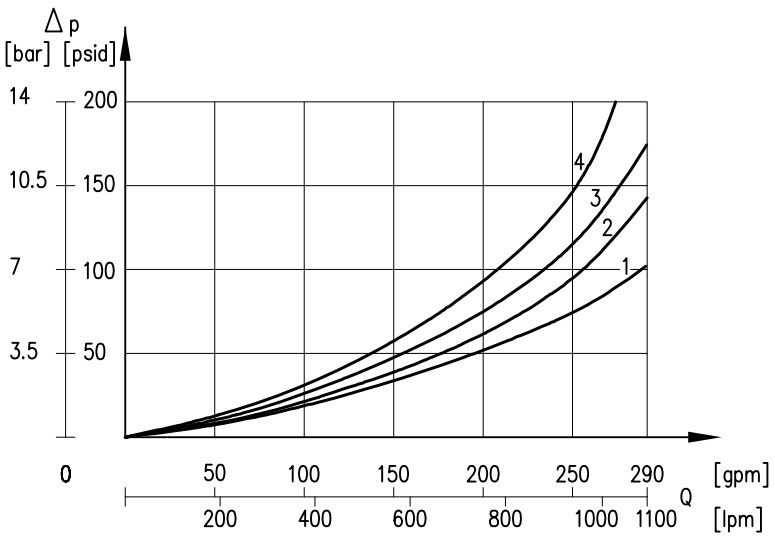
RESPONSE TIME

TIMES [ms]	ENERGIZING	DE-ENERGIZING
AC	30 MS	60 MS
DC	60 MS	80 MS

NOTE:
The values indicated refer to a solenoid valve working with 1450 psi (100 bar) pilot pressure, with mineral oil at 120°F (50°C) and viscosity of 165 SUS (36cSt). The energizing and de-energizing times are obtained at the point pressure changes in the work ports.

PERFORMANCE CURVES FOR VSD10M - VPD10M

FLOW GAIN



SPOOL	FLOW CURVE NUMBER								
	SHIFTED				CENTER				
	P→A	P→B	A→T	B→T	P→A	P→B	A→T	B→T	P→T
1A, 1B, 2A, 3A, 5A	1	1	1	1	-	-	-	-	-
3B, 5B	2	2	2	2	-	-	-	-	3
3F, 5F	1	1	4	4	-	-	4	4	-
3L, 5L	2	2	2	2	-	-	-	-	4

NOTE:
Curves obtained with mineral oil with viscosity of 170 SUS (36 cSt) at 122°F (50°C) and pilot valve at 24V AC.

RESPONSE TIME

TIMES [ms]	ENERGIZING	DE-ENERGIZING
AC	65 MS	65 MS
DC	100 MS	65 MS

NOTE:
The values indicated refer to a solenoid valve working with 1450 psi (100 bar) pilot pressure, with mineral oil at 120°F (50°C) and viscosity of 165 SUS (36cSt). The energizing and de-energizing times are obtained at the point pressure changes in the work ports.

MECHANICAL OPTIONS

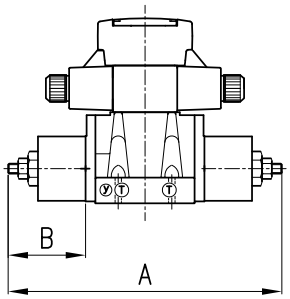
STROKE ADJUSTMENT (JJ)

This modification controls the flow of oil through the valve by limiting spool movement. It is used in hydraulic systems to govern the speed of system components.

This solution allows control of the flow rate from the pump to the actuator and from the actuator to the outlet, obtaining a double adjustable control on the actuator.

It is possible to order the valve with the stroke adj. on one side only. To request these options add the letters JA or JB in the Mechanical options box in the identification code.

The stroke adjustment kit is also available as an accessory. It includes 1 stroke assembly (one end only) and related seals. This kit is suitable even for the hydraulic operated version.



DIMENSION	VSD05*M	VSD07M	VSD08M	VSD10M
A	280 [11]	320 [12.6]	417 [16.40]	520 [20.5]
B	80 [3.15]	69 [2.72]	89 [3.50]	90 [3.54]

USE THE CODE BELOW TO ORDER STROKE ADJUSTMENT KIT.

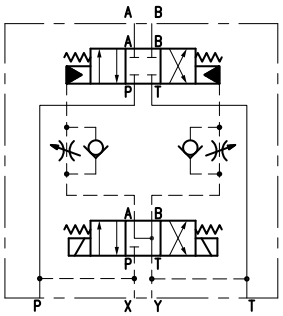
VALVE SERIES	SEAL MATERIAL	ORDERING NUMBER
VSD05*M	Buna N	VMA-3A1
	Viton	VMA-3A2
VSD07M	Buna N	VMA-4A1
	Viton	VMA-4A2
VSD08M	Buna N	VMA-5A1
	Viton	VMA-5A2
VSD10M	Buna N	VMA-7A1
	Viton	VMA-7A2

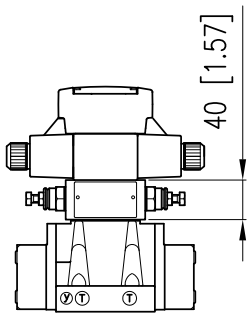
ADJUSTABLE PILOT CHOKES (KK)

Hydraulic shock may occur when stopping or reversing flow. This can be reduced and controlled by lowering the spool shift velocity. The chokes operate by metering out (returning) on all 2 position valves, and when going to center position on 3-position valves.

To request this option add the letters 'KK' in the mechanical options box, in the identification.

Consult with Continental Hydraulics for other metering configurations.





RESTRICTOR SUBPLATE (P)

It is possible to introduce a subplate with a restrictor of Ø 0.8 mm [0.03 in] on line P between the pilot solenoid valve and the main distributor with the purpose of increasing the switching time.

This part is 10 mm [0.39 in] tall.

To request this option add the letter 'P' in the mechanical options box, in the identification code.

PILOT AND DRAIN CONFIGURATION

The VPD*M valves are available with external pilot and drain only. The VSD*M valves are available with four pilot/drain configurations: internal/internal, internal/external, external/internal and external/external.

When internal pilot and/or drain are used, the corresponding 'x' and 'y' ports in the manifold must be plugged. Pilot pressure must be at least 70 psi (5 bar) greater than the pressure in the 'T' line.

It may be desirable to use external pilot when system pressure is subject to wide flucuations. It is required to use external pilot or internal pilot with a pressure reducing valve when system pressure exceeds 3000 psi (210 bar) for the VSD05*M, VSD07M and VSD10M.

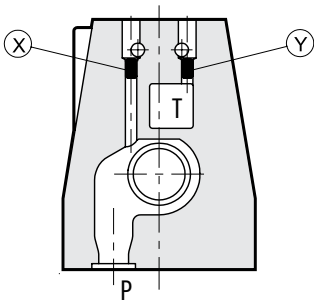
An external drain must be used when an open center (B) or a tandem center (L) spool is used, and is also recommended when using pilot checks. The version with external drain allows for higher tank line pressure in series circuits.

CODE	DESIGN	VSD05*M, VSD07M, VSD10M		VSD08M	
		Pilot (X)	Drain (Y)	Pilot (X) (W)	Drain (Y)
1	Internal Pilot / External Drain	□	■	◘ ■	■
2	External Pilot / External Drain	■	■	■ ◘	■
3	Internal Pilot / Internal Drain	□	□	◘ ■	□
4	External Pilot / Internal Drain	■	□	■ ◘	□

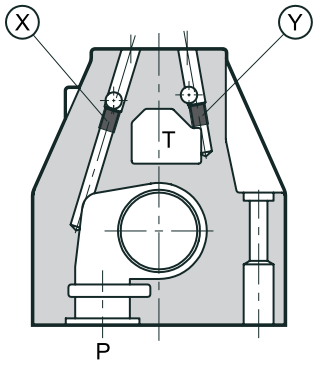
■ Plugged □ Unplugged ◘ Restricted

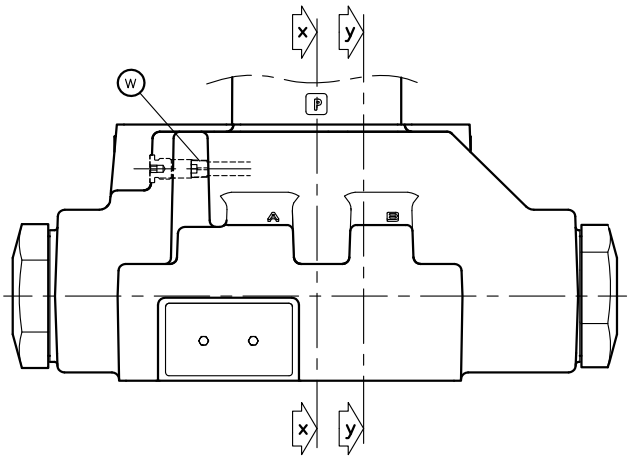
PLUG MOUNTING

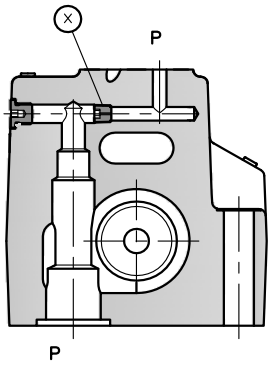
VSD05M



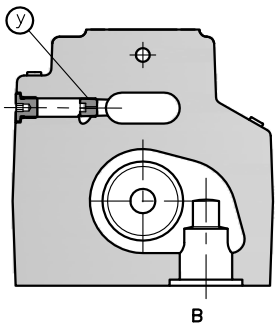
VSD07M







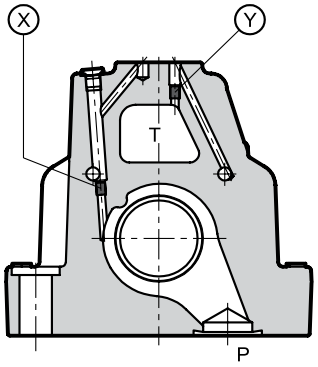
VSD08M



PLUG SIZE:

VSD05*M	M5x6 mm
VSD07M	M6x8 mm
VSD10M	M6x8 mm
VSD08M	1/16" NPT Pipe Plug 1/16" NPT Pipe Plug with Ø 0.070 (1.78MM) Orifice

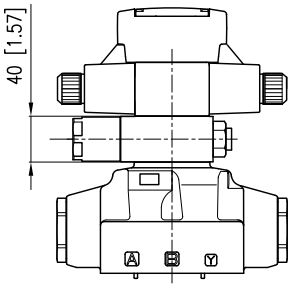
VSD10M



INTERNAL PILOT OPTIONS

PRESSURE REDUCING (Z)

THE PRESSURE REDUCING MODULE IS TO PROTECT THE VALVE FROM PILOT PRESSURES EXCEEDING 3000 PSI (210 BAR).



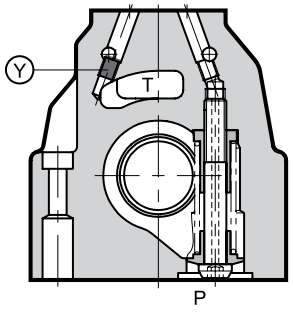
When the system pressure exceeds 3000 psi it is mandatory the use of an external pilot, or optional Z for internally piloted versions.

The pressure reducer is fixed at 430 psi (30 bar). This device is not available for the VSD05*M.

To request this option add the letter 'Z' in the internal pilot options box, in the identification code.

BACK PRESSURE VALVE (C70)

The back pressure valve is for valves with internal pilot and B or L spool types where system pressure may drop below the 70 psi (5 bar) required for pilot operation.

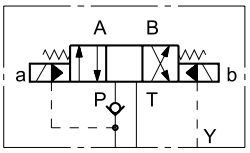


This device is available only for VSD07M and VSD08M.

NOTE: The back pressure valve can't be used as check because it doesn't assure the seal.

To request this option add the letters 'C70' in the internal pilot options box, in the identification code.

The backpressure valve is also available as a field conversion kit and can be easily mounted in the P port of the main control valve.



The kit includes 1 check assembly and related seals.

USE THE CODE BELOW TO ORDER THE KIT.

VALVE SERIES	SEAL MATERIAL	ORDERING NUMBER
VSD07M	Buna N	VMA-4F1-A
	Viton	VMA-4F2-A
VSD08M	Buna N	VMA-5F1-A
	Viton	VMA-5F2-A

OVERALL AND MOUNTING DIMENSIONS FOR VSD05*M

VSD05*M

Dimensions in mm [IN]

NOTES:

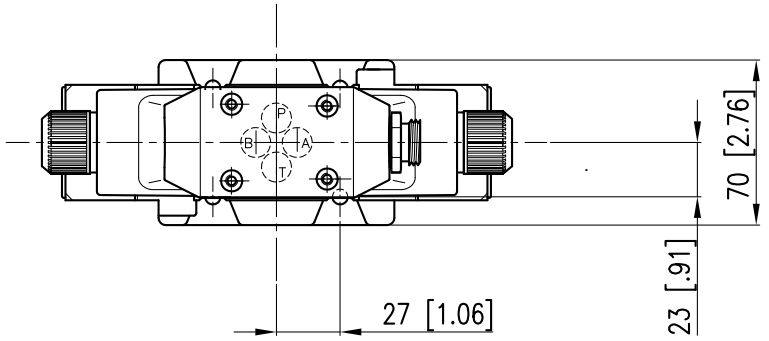
1. Drawings and dimensions refer to the AC version of pilot valve, with conduit box and 5A receptacle option on A port end.

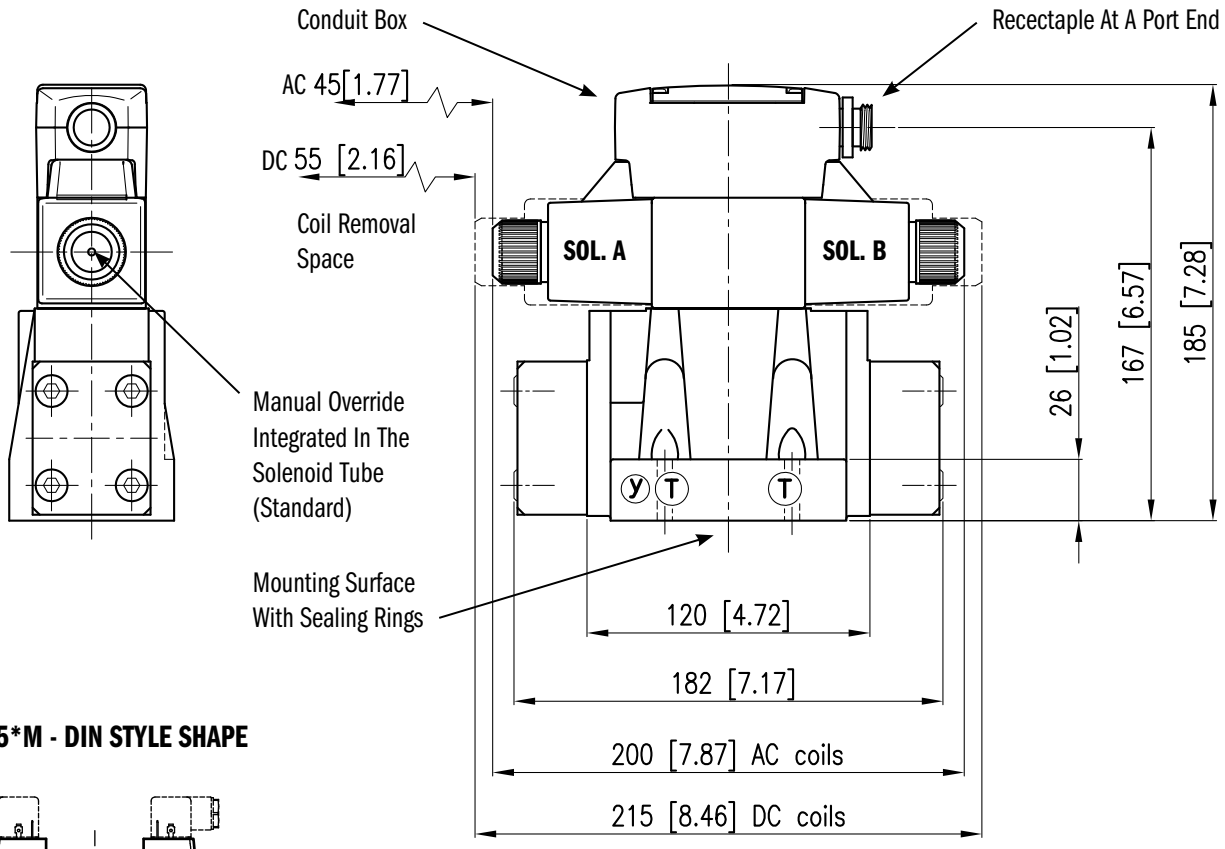
THREAD OF MOUNTING HOLES
1/4 - 20 UNC -2B x 0.60

FASTENING
4 bolts 1/4 - 20 UNC-2B x 1 1/2
Grade 8 or stronger

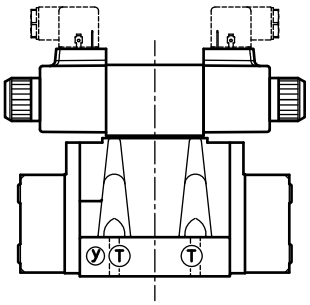
TIGHTENING TORQUE
6 lbf-ft (8 Nm)

SEALING RINGS
5 O-rings AS568-014 90 shore A
2 O-rings AS568-012 90 shore A





VSD05*M - DIN STYLE SHAPE



OVERALL AND MOUNTING DIMENSIONS FOR VSD07M

VSD07M

Dimensions in mm [IN]

NOTES:

1. Drawings and dimensions refer to the AC version of pilot valve, with conduit box and 5A receptacle option on A port end.

THREAD OF MOUNTING HOLE

1/4 - 20 UNC - 2B x 0.5
3/8 - 16 UNC - 2B x 0.9

FASTENING

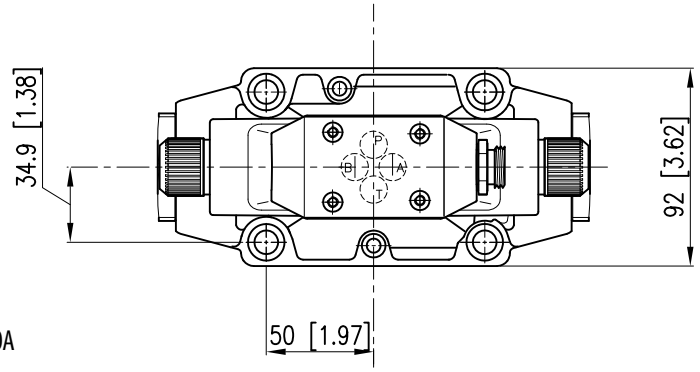
2 bolts 1/4-20 UNC-2B x 2
Grade 8 or stronger
4 bolts 3/8-16 UNC-2B x 2 1/2
Grade 8 or stronger

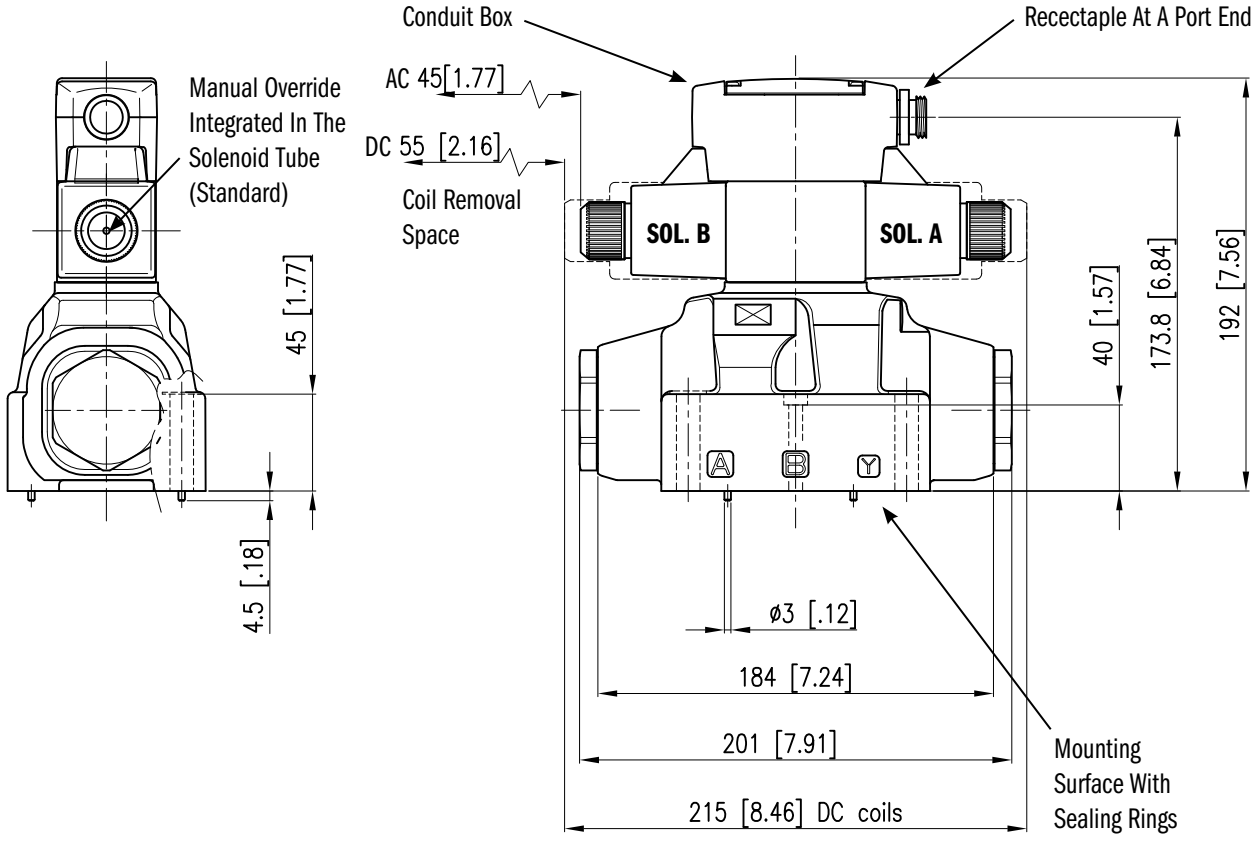
TIGHTENING TORQUE

1/4 - 20 UNC -2B: 6 lbf-ft (8 Nm)
3/8 - 16 UNC -2B: 30 lbf-ft (40 Nm)

SEALING RINGS

4 O-rings 22.22 mm ID x 2.62 mm CS90 shore 90A
2 O-rings AS568-013 90 shore A





OVERALL AND MOUNTING DIMENSIONS FOR VSD08M

VSD08M

Dimensions in mm [IN]

NOTES:

1. Drawings and dimensions refer to the AC version of pilot valve, with conduit box and 5A receptacle option on A port end.
2. On this size A and/or B operator reverse sides.

THREAD OF MOUNTING HOLES

1/2 - 13 UNC x 0.7

FASTENING

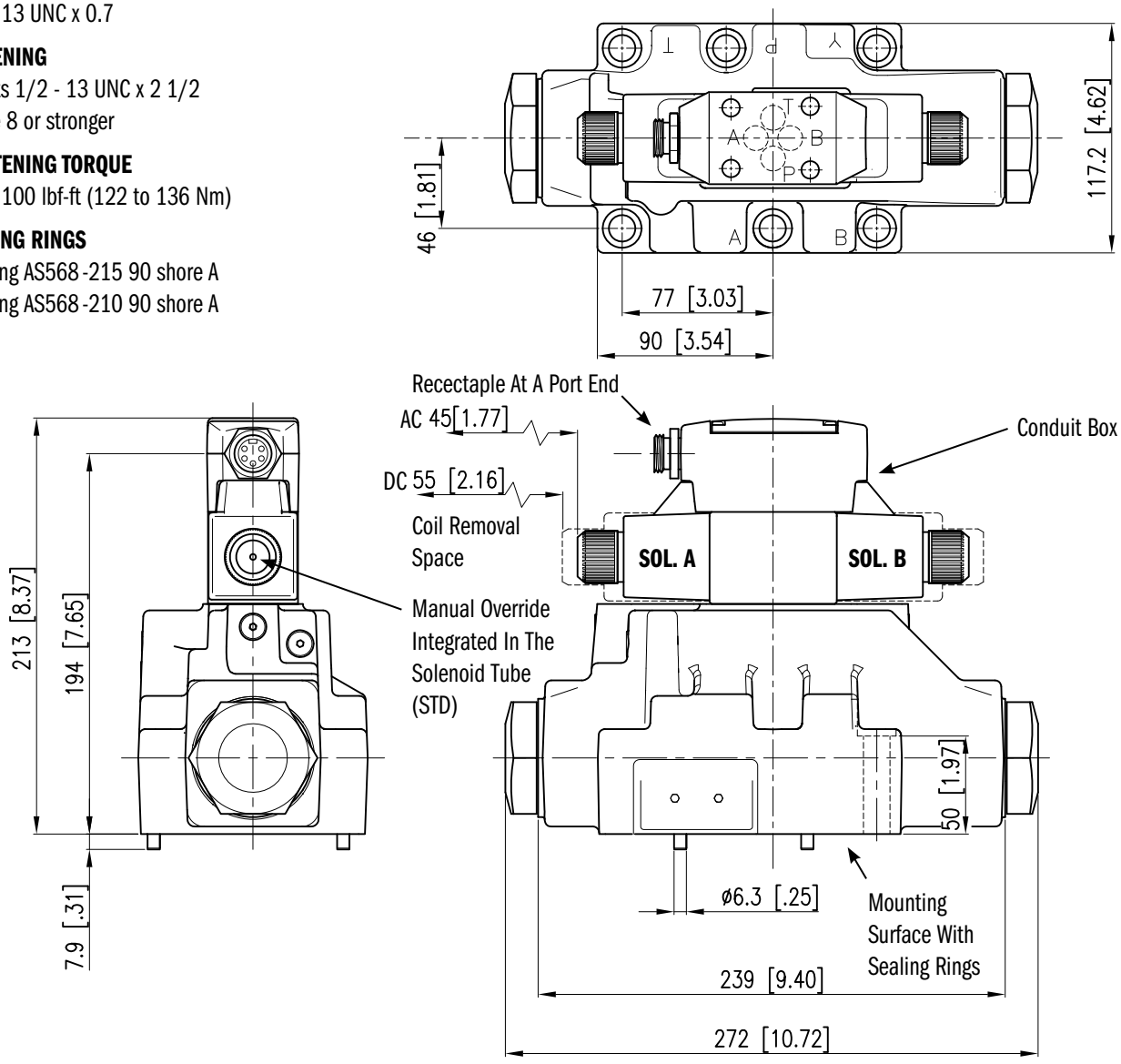
6 bolts 1/2 - 13 UNC x 2 1/2
Grade 8 or stronger

TIGHTENING TORQUE

90 to 100 lbf-ft (122 to 136 Nm)

SEALING RINGS

4 O-ring AS568 -215 90 shore A
2 O-ring AS568 -210 90 shore A



OVERALL AND MOUNTING DIMENSIONS FOR VSD10M

VSD10M

Dimensions in mm [IN]

NOTES:

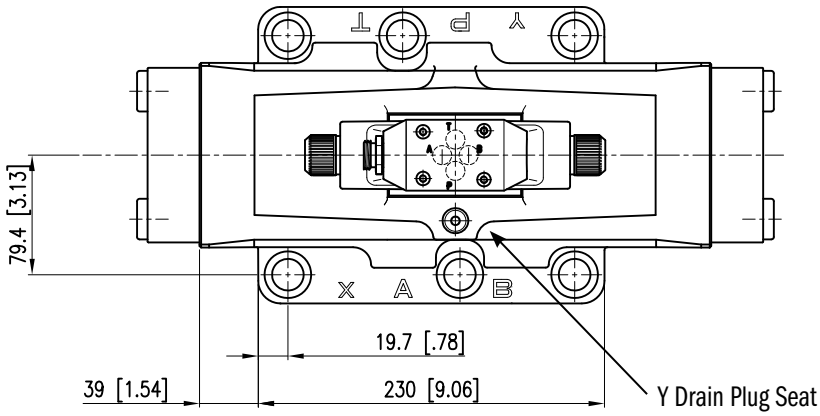
1. Drawings and dimensions refer to the AC version of pilot valve, with conduit box and 5A receptacle option on A port end.
2. On this size A and/or B operator reverse sides.

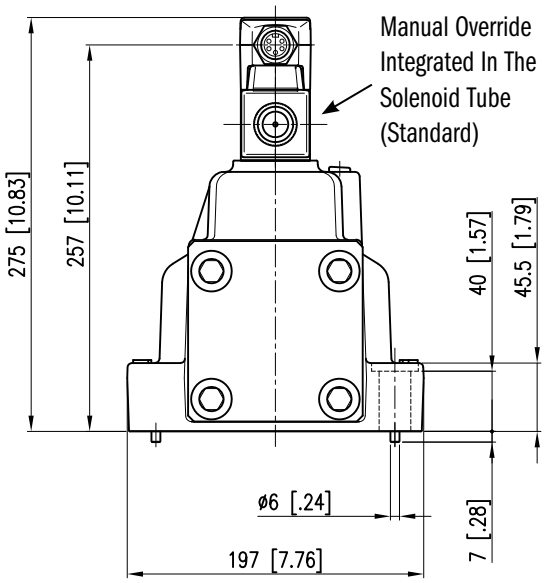
THREAD OF MOUNTING HOLES
3/4 - 10 UNC - 2B x 1.3

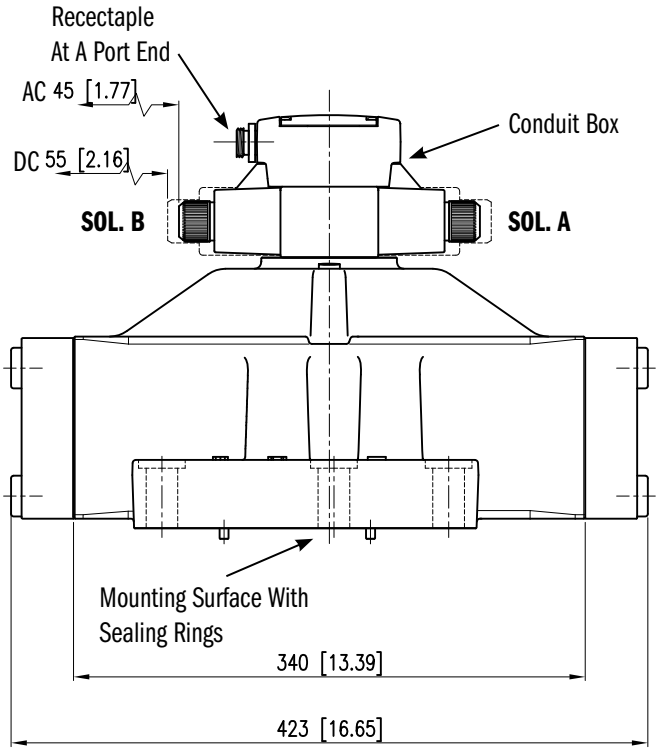
FASTENING
6 bolts 3/4 - 10 UNC - 2B x 2 3/4
Grade 8 or stronger or high strenghth

TIGHTENING TORQUE
240 lbf-ft (325 Nm)
415 lbf-ft (565 Nm) high strength

SEALING RINGS
4 O-Ring AS568-222 90 shore A
2 O-Ring AS568-117 90 shore A



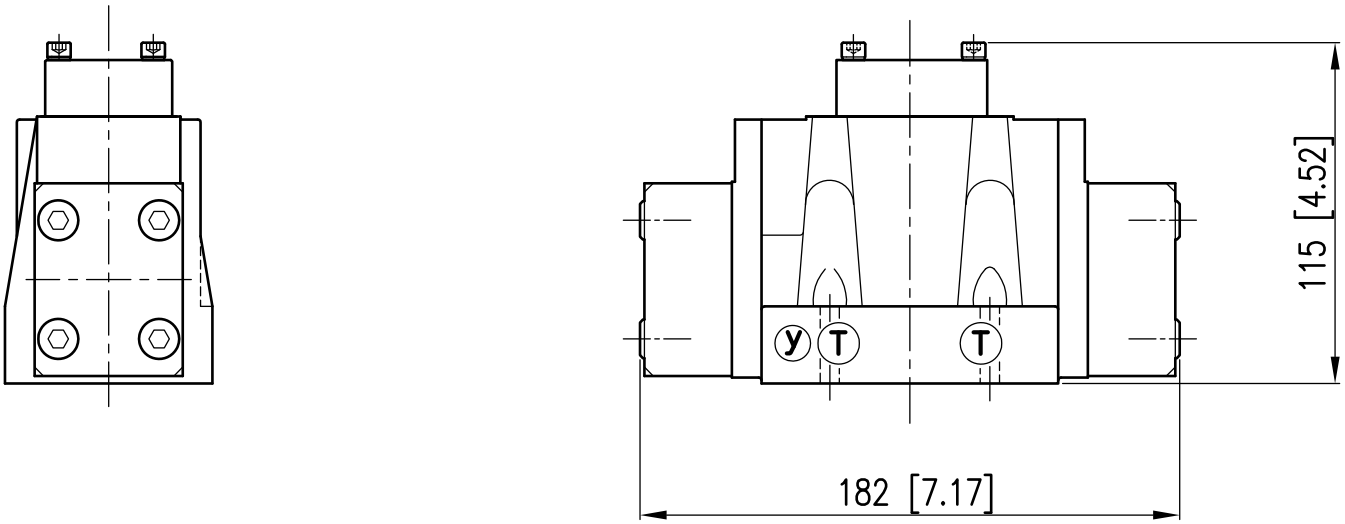




OVERALL AND MOUNTING DIMENSIONS VPD05*M

VPD05*M

Dimensions in mm [IN]

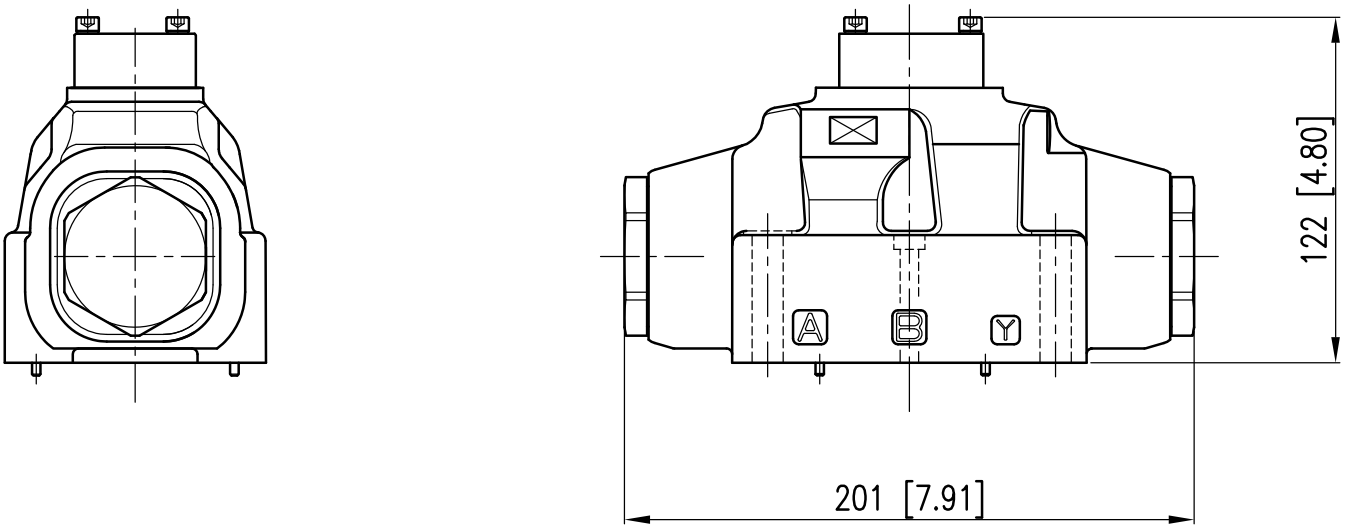


NOTE:
For missing dimensions, sealing rings and bolts information, please refer to the solenoid operated version drawings.

OVERALL AND MOUNTING DIMENSIONS VPD07M

VPD07M

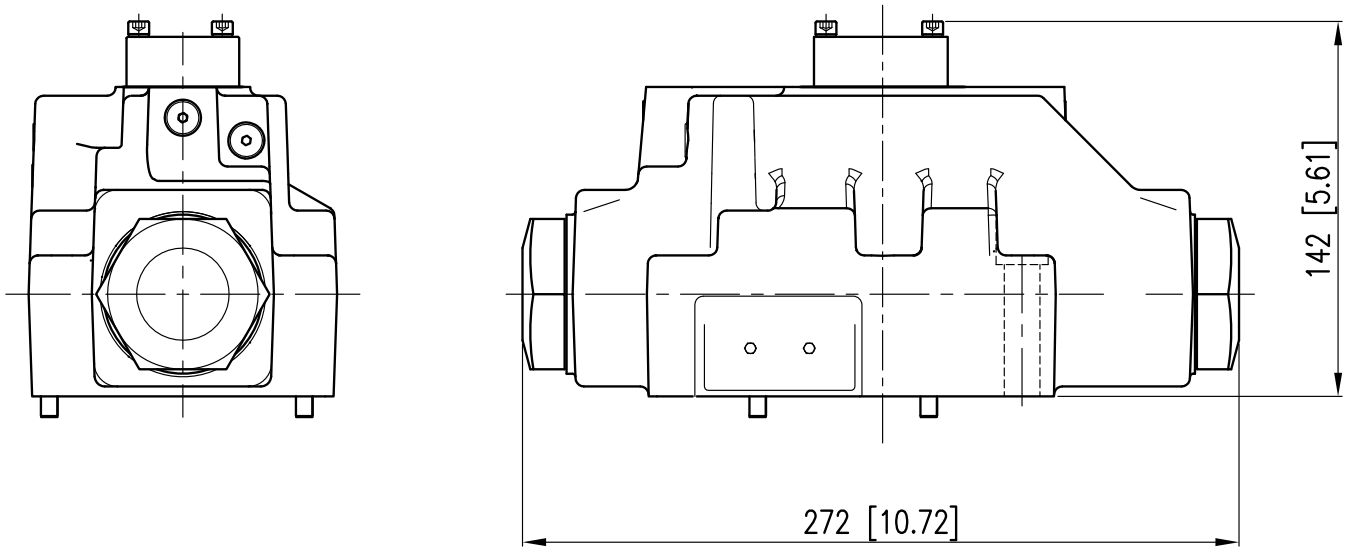
Dimensions in mm [IN]



OVERALL AND MOUNTING DIMENSIONS VPD08M

VPD08M

Dimensions in mm [IN]

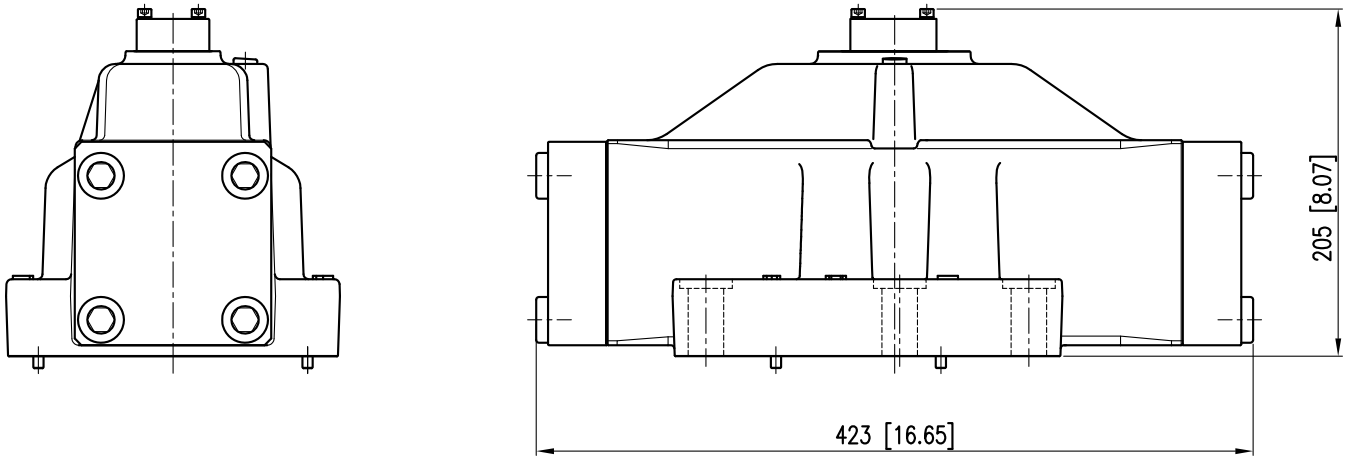


NOTE:
For missing dimensions, sealing rings and bolts information, please refer to the solenoid operated version drawings.

OVERALL AND MOUNTING DIMENSIONS VPD10M

VPD10M

Dimensions in mm [IN]



ELECTRICAL CHARACTERISTICS

Valves are available with an electrical connection box or with DIN 43650 solenoids in both AC and DC voltages. Deutsch DT04 or lead wires are also available in DC voltages only.

CONNECTION BOX OPTIONS

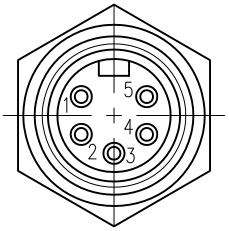
To simplify the connections and prevent wiring mistakes, we offer the option with connection boxes with quick connect pin receptacles, already wired.

Valves are available with receptacles on solenoid side 'A' or 'B' and several connector styles.

Below are the codes to be included in the box 'option' of the ordering code, depending on the version you choose.

Wiring diagrams at right show the standard connections for 3-pin, 4-pin and 5-pin connectors. The commercially available mating "female" connector are not included.

CODE	PIN	SHAPE	PORT END	NOTES
5A	5	Male Mini	A	Single and Dual Solenoid
5H	5		B	
3A	3	Male Mini	A	Single Solenoid Only
3H	3		B	
4A	4	Male Micro	A	For DC Current Only. Different Wiring. See Schematics.
D4A	4		A	
4	4		B	
D4	4		B	

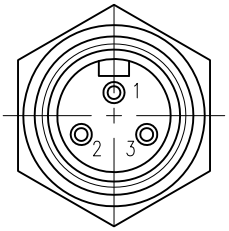


5 PIN RECEPTACLE

Male mini receptacles conform to NFPA/T3.5.29 R1 - 2007 used with single or double solenoid valve.

26 mm [1"] Wrench

1	Lead to Solenoid B
2	Lead to Solenoid A
3	Ground Lead (Green)
4	Lead to Solenoid A
5	Lead to Solenoid B

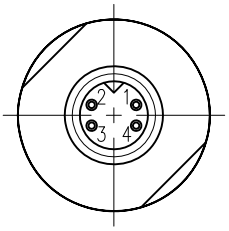


3 PIN RECEPTACLE

Male mini receptacles conform to NFPA/T3.5.29 R1 - 2007 used with single solenoid valve.

26 mm [1"] Wrench

1	Ground Lead (Green)
2	Lead to Solenoid
3	Lead to Solenoid



4 PIN RECEPTACLE

Male micro receptacles (M12x1 thread) used with DC valve only.

23 mm [7/8] Wrench

4A & 4		
1	Brown	Lead to Solenoid A
2	White	No Connection
3	Blue	Common Lead to Sol. A & B
4	Black	Lead to Solendoid B

D4A & D4		
1	Brown	No Connection
2	White	Lead to Solenoid A
3	Blue	Common Lead to Sol. A & B
4	Black	Lead to Solendoid B

SOLENOIDS

Listed below the types of solenoids available and the numbers to be added in the solenoid box on page 3.

PLUG-IN TERMINAL SOLENOID

DIN 43650

This solenoid has three terminal posts. Use bi-polar connectors that meet ISO 4400 / DIN 43650 (EN 175301-803). Protection against atmospheric agent: IP 65

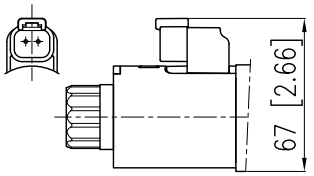
LEAD WIRES

6 inch length, protection against atmospheric agent: IP 67

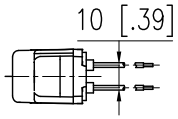
DEUTSCH DT04 MALE

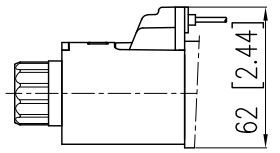
Protection against atmospheric agent: IP 69
Connectors must be ordered separately.

DEUTSCH DT04 MALE



LEAD WIRES





CONNECTION BOX SOLENOIDS

This is a two pin solenoid which connects to the circuit board. Wiring is done on the terminal strip inside the box.

DIN CONNECTION CODE	LEAD WIRE CONNECTION CODE	DEUTSCH DT04 CONNECTION CODE	BOX CONNECTION CODE	VOLTAGE & FREQ. [VOLT - HERTZ]	VOLTAGE LIMITS [MIN - MAX]	RESISTANCE ±10% [OHM]	INRUSH CURRENT [A]	HOLDING CURRENT [A]	HOLDING POWER [W]
33	Not Available	Not Available	60	120 - 60 110 - 50	108 - 126 99 - 116	35.7	1.35 1.41	0.46 0.53	22 23
34	Not Available	Not Available	61	240 - 60 220 - 50	216 - 252 198 - 231	146.4	0.61 0.71	0.23 0.26	22 23
Not Available	Not Available	Not Available	68	120 - 60 110 - 50	108 - 132 99 - 121	75.8	0.72 0.74	0.22 0.24	10 10
42	24K4	24K7	70	24 V DC	21 - 26	19.2	1.25	1.25	30
44	12K4	12K7	75	12 V DC	10 - 13	4.8	2.5	2.5	30

WASHDOWN OPTION (CODE WD)

The wash-down option with the electrical box is designed for an IP65 rating. This option uses a special cover without the mounting bolt access holes and uses silicone sealant to help seal between the coil and core tube.

The DIN, Deutsch and lead wire coils versions of the wash-down option uses silicone sealant to help seal between the coil and core tube.

MOUNTING SURFACES

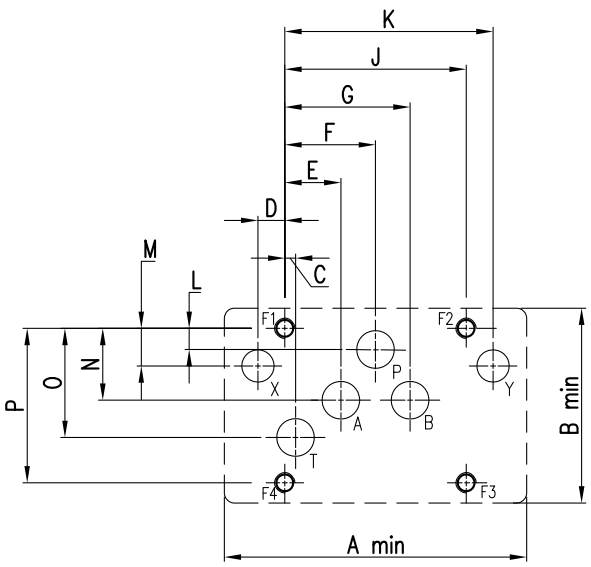
ALL THE MOUNTING SURFACES REFER TO NFPA T3.5.1 R2-2002 AND ISO 4401:2005 STANDARDS.

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.

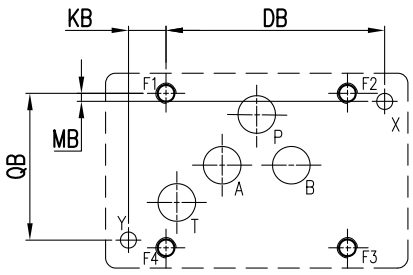
Dimensional tolerances are ± 0.1 mm (0.004") for bolt and pin location; ± 0.2 mm (0.008") for the other quotes.

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

D05 - ALTERNATIVE A



D05 - ALTERNATIVE B



PORT FUNCTION:

P = PRESSURE PORT
T = TANK PORT

A = FIRST CYLINDER PORT
X = PILOT PORT

B = SECOND CYLINDER PORT
Y = DRAIN PORT

	MM	INCH
P,A,B,T MAX	Ø 11.2	Ø 0.44
X, Y ALT. A	Ø 6.3	Ø 0.25
X, Y ALT. B	Ø 4.8	Ø 0.19
MOUNTING BOLT THREAD SIZE	M6	¼-20 UNC

	MM	INCH
A	90	3.54
B	58	2.28
C	3.2	0.126
D	8	0.31
E	16.7	0.66
F	27	1.06
G	37.3	1.47

	MM	INCH
J	54	2.125
K	62	2.44
L	6.3	0.25
M	11.2	0.44
N	21.4	0.84
O	32.5	1.28
P	46	1.82

	MM	INCH
DB	65.1	2.563
KB	11.2	0.44
MB	2.4	0.09
QB	43.7	1.72

NOTES:

NFPA D05 and ISO 4401-05 indicates different diameters for X and Y holes:

NFPA: Ø 9.6 max in D05 alt A
Ø 4.8 max in D05 alt B

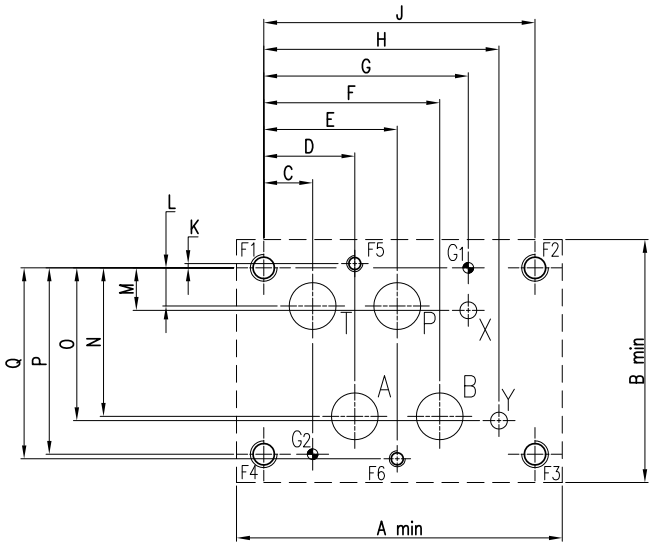
ISO: Ø 6.3 max both

D07

	MM	INCH
P,A, B,T MAX	Ø 17.5	Ø 0.69
X, Y MAX	Ø 6.3	Ø 0.25
G MAX	Ø 4	Ø 0.16
MOUNTING BOLT THREAD SIZE F1 - F4	M10	⅜ - 16 UNC
MOUNTING BOLT THREAD SIZE F5 - F6	M6	¼ - 20 UNC

	MM	INCH
A	122	4.8
B	91	3.58
C	18.3	0.72
D	34.1	1.34
E	50	1.97
F	65.9	2.60
G	76.6	3.016
H	88.1	3.47

	MM	INCH
J	101.6	4.0
K	1.6	0.063
L	14.3	0.56
M	15.9	0.626
N	55.6	2.19
O	57.2	2.25
P	69.9	2.75
Q	71.5	2.815

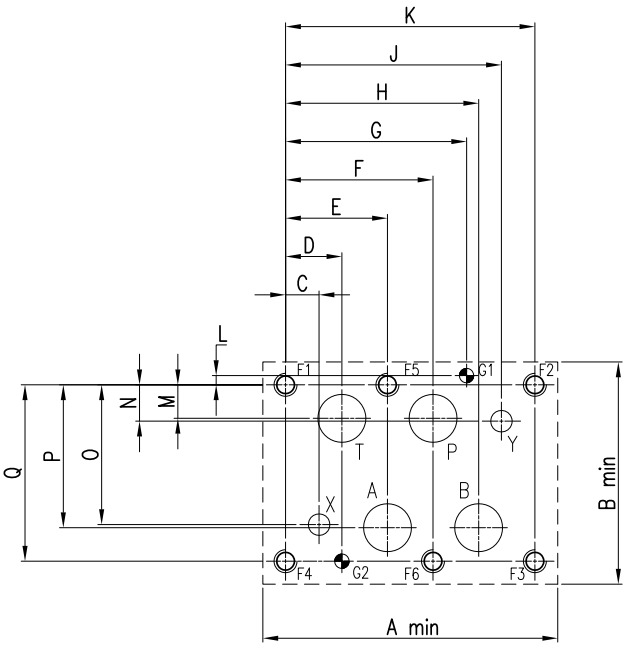


D08

	MM	INCH
P,A, B,T MAX	Ø 25	Ø 0.98
X, Y MAX	Ø 11.2	Ø 0.44
G MAX	Ø 7.5	Ø 0.30
MOUNTING BOLT THREAD SIZE	M12	½ - 13 UNC

	MM	INCH
A	154	6.0
B	116	4.57
C	17.5	0.69
D	29.4	1.157
E	53.2	2.09
F	77	3.03
G	94.5	3.719
H	100.8	3.97

	MM	INCH
J	112.7	4.44
K	130.2	5.125
L	4.80	0.187
M	17.5	0.69
N	19	0.75
O	73	2.874
P	74.6	2.93
Q	92.1	3.625

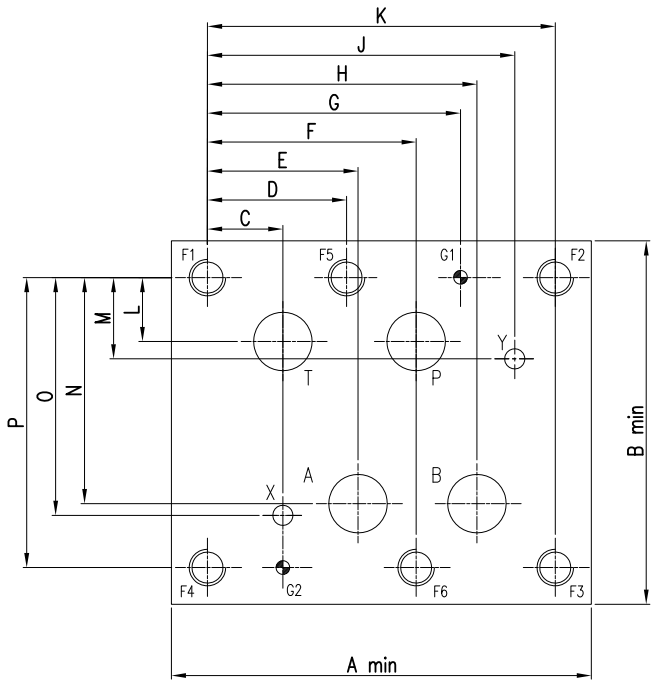


D10

	MM	INCH
P,A, B,T MAX	Ø 32	Ø 1.25
X, Y MAX	Ø 11.2	Ø .44
G MAX	Ø 7.5	Ø .30
MOUNTING BOLT THREAD SIZE	M20	¾ - 10 UNC

	MM	INCH
A	230	9.06
B	199	7.83
C	41.3	1.63
D	76.2	3.0
E	82.5	3.25
F	114.3	4.5
G	138.6	5.457
H	147.6	5.81

	MM	INCH
J	168.3	6.63
K	190.5	7.5
L	35	1.38
M	44.5	1.75
N	123.8	4.87
O	130.2	5.13
P	158.8	6.25



APPLICATION DATA

FLUIDS

All pressure drops shown on these data pages are based on 170 SUS fluid viscosity and 0.87 specific gravity. For any other specific gravity (G1) the pressure drop (ΔP) will be approx. ΔP1 = ΔP (G1/G). See the chart for other viscosities.

FLUID VISCOSITIES	Cst	10	14.5	32	36	43	54	65	76	86	108	216	324	400
	SUS	60	75	150	170	200	250	300	350	400	500	1000	1500	1900
MULTIPIER		0.77	0.81	0.97	1.00	1.04	1.10	1.15	1.20	1.24	1.31	1.56	1.72	1.83

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code G). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 180 degrees F causes the accelerated degradation of seals as well as degradation of the fluids physical and chemical properties.

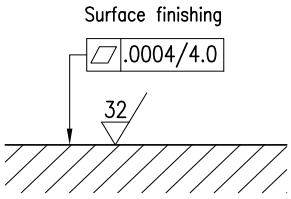
From a safety standpoint, temperatures above 130 degrees F are not recommended.

RANGE TEMPERATURES:	Ambient	- 4 to +130 °F	-20 to +54 °C
	Fluid	- 4 to +180 °F	-20 to +82 °C
FLUID VISCOSITY	Range	60 -1900 SUS	10 - 400 cSt
	Recommended	120 SUS	25 cSt
FLUID CONTAMINATION		ISO 4406:1999 Class 20/18/15	

INSTALLATION

The configurations with centering and offset springs can be mounted in any position without impairing correct operation; instead, those without springs and with mechanical detent must be mounted with the longitudinal axis horizontal.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



BOLT KITS

D05 SIZE	**BD05H-150-B**	Valve Only	1009397
D07 SIZE	**BD07-250**	Valve Only	1009400
D08 SIZE	**BD08-275**	Valve Only	250141
D10 SIZE	**BD10-275**	Valve Only	1013038

SEAL KIT

D05* SIZE	**Buna Seal Kit**	1013966
	Viton Seal Kit	1013967
D07 SIZE	**Buna Seal Kit**	1013968
	Viton Seal Kit	1013969
D08 SIZE	**Buna Seal Kit**	1013970
	Viton Seal Kit	1013971
D10 SIZE	**Buna Seal Kit**	1013972
	Viton Seal Kit	1013973

SUBPLATES

D05 alt. A SIZE	**AD05JESPS16S**	Aluminium	SAE-16	351716AJ
	DD05JESPS16S	Ductile	SAE-16	351716AK
D07 SIZE	**AD07SPS016S**	Aluminium	SAE-16	1013039AB
	DD07SPS016S	Ductile	SAE-16	1013039AC
D08 SIZE	**AD08SPS020S**	Aluminium	SAE-20	265803AP
	DD08SPS020S	Ductile	SAE-20	265803AL
D10 SIZE	**AD10SPS032S**	Aluminium	SAE-32	1013040AB
	DD10SPS032S	Ductile	SAE-32	1013040AC

NOTES:

1. Max pressure for aluminum subplates: 3000 psi (210 bar)
2. Max pressure for ductile subplates: 5000 psi (350 bar)
3. Always verify subplate port size is proper for the application

VSD*M-VPD*M - PILOT OPERATED DIRECTIONAL VALVES

ABOUT CONTINENTAL HYDRAULICS

Rugged, durable, high-performance, efficient—the reason Continental Hydraulics' products are used in some of the most challenging applications across the globe. With a commitment to quality customer support and innovative engineering, Continental's pumps, valves, power units, mobile and custom products deliver what the markets demand. Continental has been serving the food production, brick and block, wood products, automotive and machine tool industries since 1962. Learn how our products survive some of the most harsh environments.

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CONTINENTAL HYDRAULICS

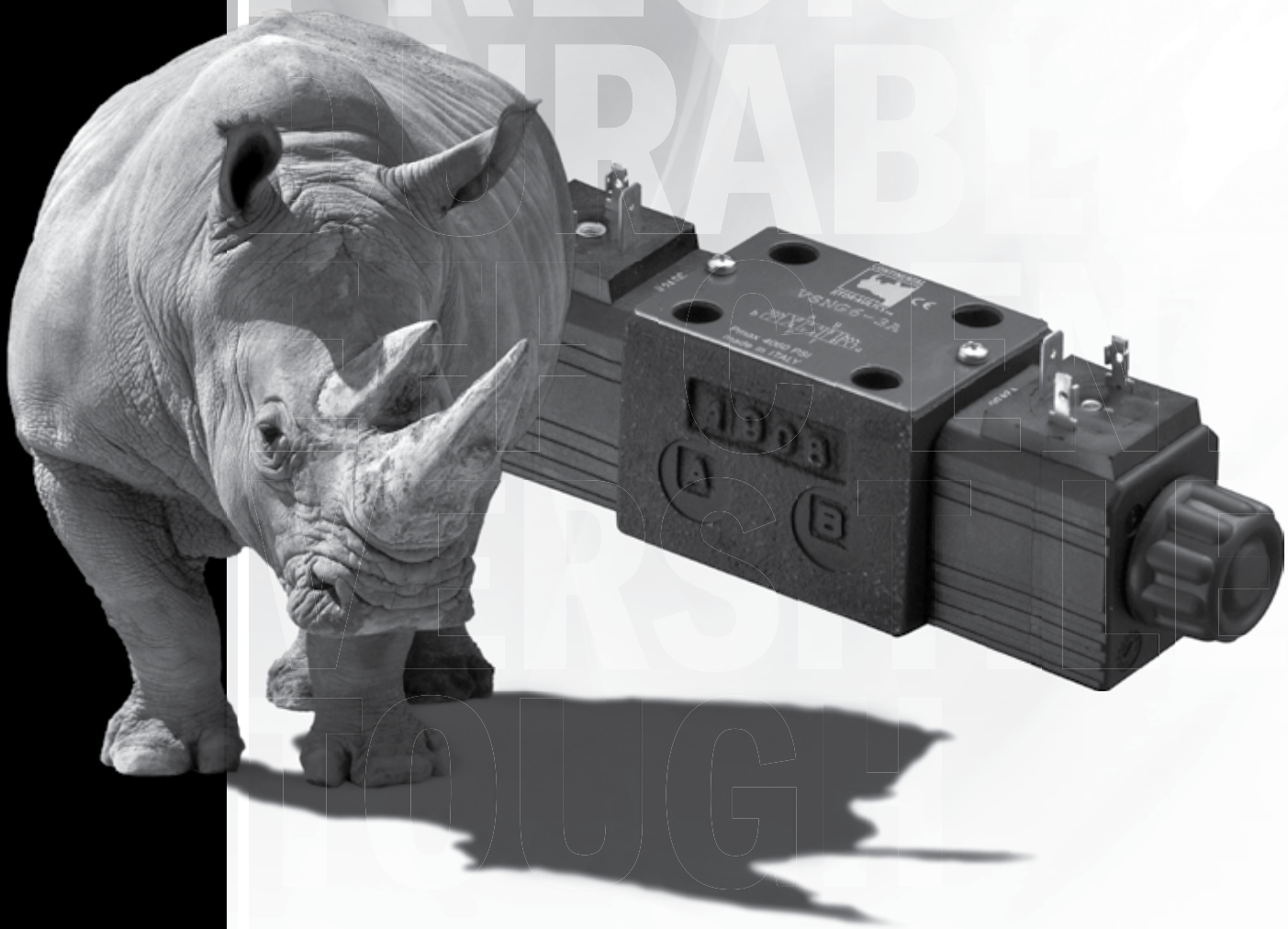
CONTINENTAL HYDRAULICS

VSNG6 - SOLENOID OPERATED DIRECTIONAL CONTROL VALVE COMPACT SIZE

CONTINENTAL HYDRAULICS

VSNG6

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE COMPACT SIZE



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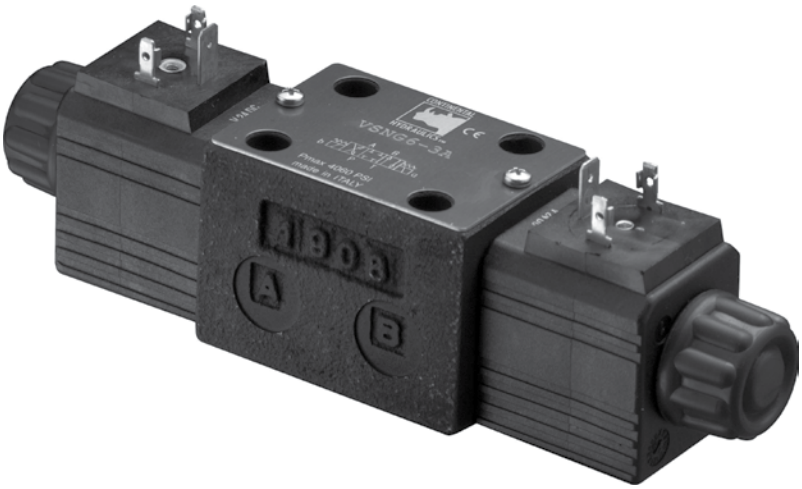
INNOVATIVE

VSNG6

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE COMPACT SIZE



DESCRIPTION

Direct acting, subplate mounted directional control valve, with mounting surface according to NFPA D03 ISO 4401-03 (CETOP RP 121H) standards suitable for mini-power packs and mobile and agricultural applications. The valve body is made with high strength iron castings with wide internal passages in order to minimize the flow pressure drop.

OPERATIONS

The valve can be supplied for valve functions requiring 2 positions or 3 positions, as well as 3 way or 4 way flow functions.

This valve is designed using DC voltage core tubes. The design makes this series of valves the perfect choice for flexibility and reduced inventory levels when various voltages or coil connections are required.

The DC core tubes will accept any one of the DIN 43650, AMP Junior, lead wire, DEUTSCH DT04-2P or AMP Super Seal coil connections. Various DC Voltage coils and AC Voltage coils (Rectification of the AC power is processed through the DIN Connector circuit).

The valve is supplied with a boot protected manual override which ensure IP65 protection or better dependent on the coil termination style selected.

A stroke limiter knob for the valve spool is available as accessory.

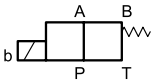
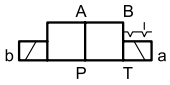
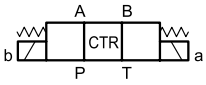
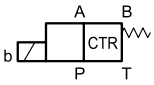
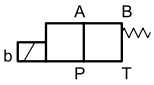
TYPICAL PERFORMANCE SPECIFICATIONS

MAXIMUM OPERATING PRESSURE:	P - A - B Ports	4000 psi	280 bar
	T Port	3600 psi	250 bar
MAXIMUM FLOW RATE		12 gpm	45 l/min
MOUNTING SURFACE		NFPA D03 ISO 4401-03-02-0-03	
CYCLE RATE	DC Solenoid	Up to 10000 Cycles/hr	
WEIGHT	DC Single Solenoid	2.54 lbs	1.1 Kg
	DC Dual Solenoid	3.13 lbs	1.4 Kg

RANGE TEMPERATURES:	Ambient	- 4 to +130° F	-20 to +54° C
	Fluid	- 4 to +180° F	-20 to +82° C
FLUID VISCOSITY	Range	60 -1900 SUS	10 - 400 cSt
	Recommended	120 SUS	25 cSt
FLUID CONTAMINATION		ISO 4406:1999 Class 20/18/15	

IDENTIFICATION CODE

VSNG6 - □ □ - □ □ - D00 - □ — DESIGN LETTER

FUNCTION	
1	 Single Operator 2 Position Spring Offset
2	 Dual Operator 2 Position Detented (No Spring)
3	 Dual Operator 3 Position Spring Centered
5	 Single Operator 2 Position Spring Centered
9	 Single Operator 2 Position 3 Way Spring Offset

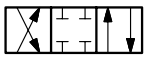
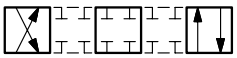
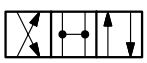
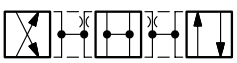
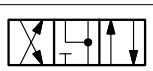
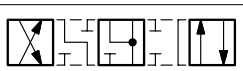
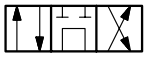
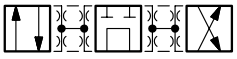
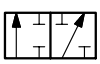
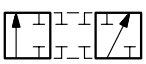
SEAL	
A	Buna (STD)
G	Viton

MECHANICAL OMIT IF NOT REQUIRED	
R	Single Solenoid 'B' Port End. Available Only with Function 1,5 and 9.

CORE TUBE	
D00	DC Tube Without Coils. See Note.

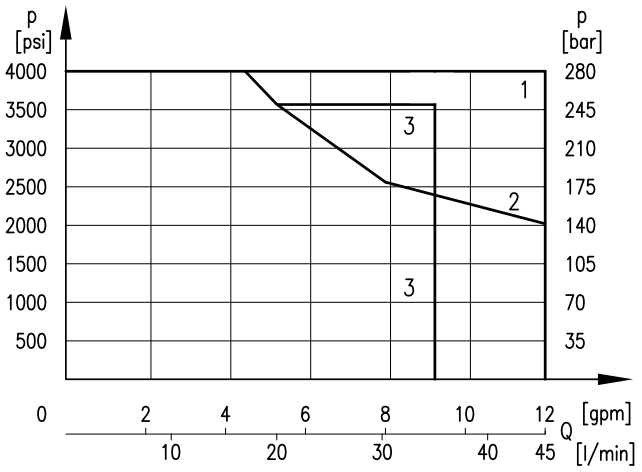
TYPICAL ORDERING CODE:
VSNG6-1A-AR-D00-A

NOTE:
Coil supplied separately.
See coils section on page 6.

SPOOLS					
NAME	SYMBOLS	FUNCTION	CENTER POSITION	CROSSOVER	FUNCTION MATCHING
A			All ports blocked	All ports blocked	1, 2, 3, 5
B			All ports open	All ports open	1, 3, 5
F			P blocked, A⟶T and B⟶T	P blocked, A⟶T and B⟶T	3, 5
L			P⟶T , A and B blocked	All ports open, restricted	3, 5
X			-	All port blocked	9

PERFORMANCE CURVE

DC SOLENOID VALVE

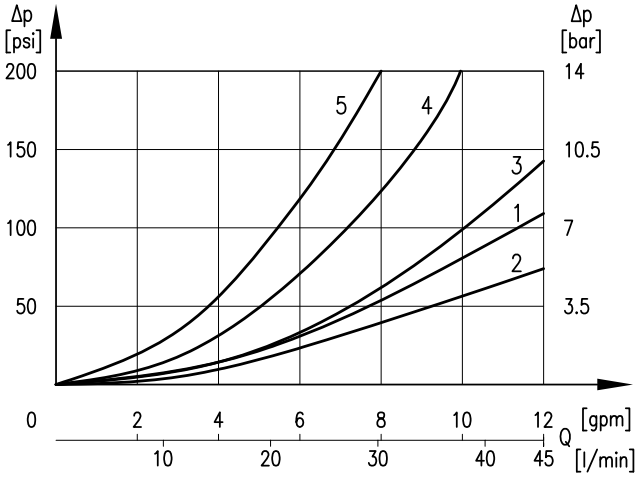


CURVE	SPOOLS
1	1A, 2A, 3A, 3B, 5A, 5B, 9X
2	3F, 5F
3	3L, 5L

NOTES:

1. The values indicated in the graphs are relevant to the standard solenoid valve, with D24K1 coils.
2. Valve performance was tested in a four way circuit (full loop). Performances may be reduced from that shown when used in a three-way circuit (half circuit), i.e. A or B port plugged.
3. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with filtration according to ISO 4406:1999 class 18/16/13.

PRESSURE DROPS Δp-Q (OBTAINED WITH VISCOSITY OF 36 cSt at 50°C)



SPOOL	FLOW CURVE NUMBER				
	SHIFTED				CENTERED
	P→A	P→B	A→T	B→T	P→T
3A, 5A	1	1	1	1	
3B, 5B	1	1	2	2	3
3F, 5F	3	3	2	2	
3L, 5L	5	5	5	5	5
2A	1	1	1	1	
1A	4	4	4	4	

SWITCHING TIMES

SUPPLY	TIMES (±10%) [ms]	
	ENERGIZING	DE-ENERGIZING
DC	25 - 75	15 - 25

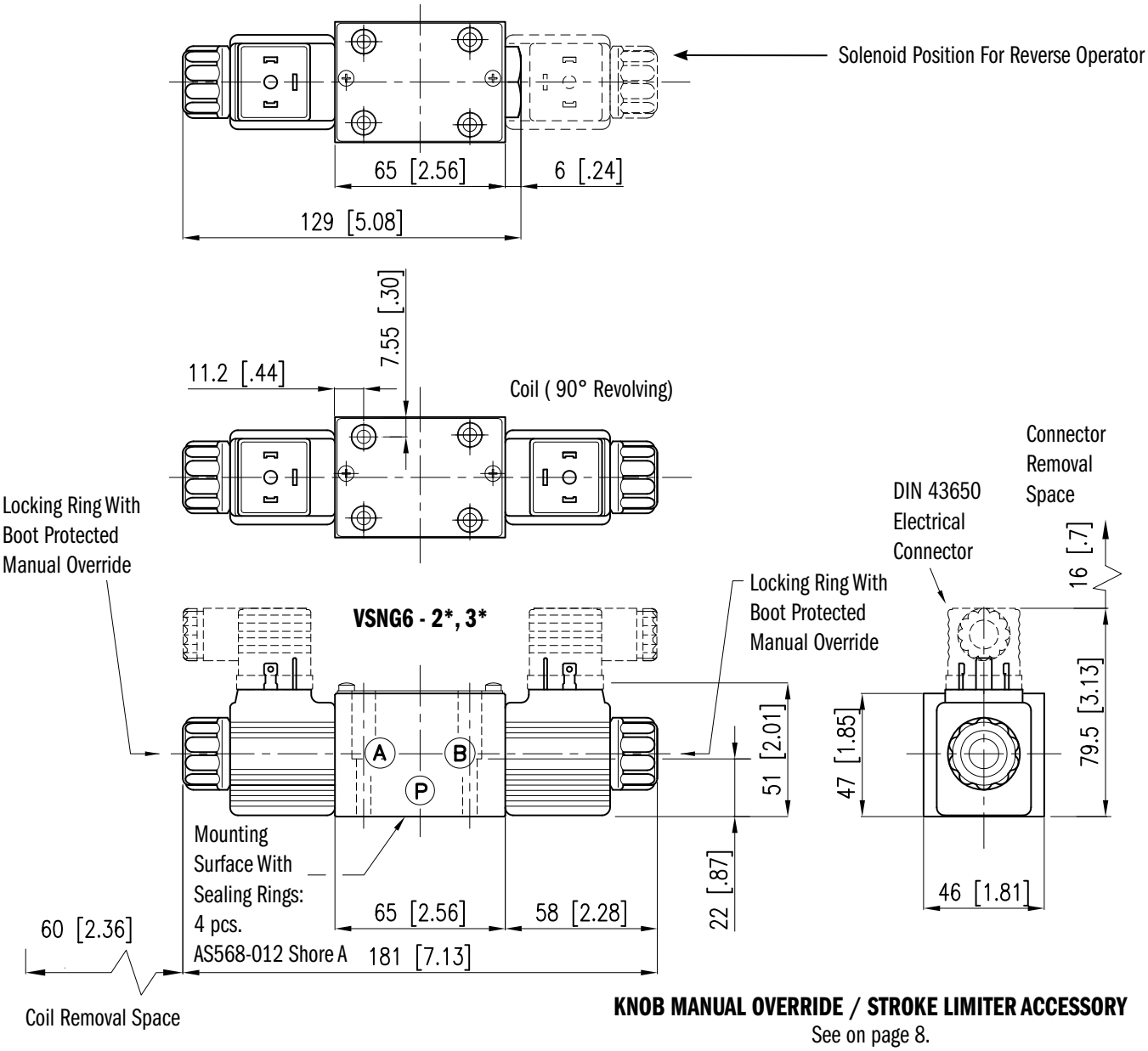
NOTE:

Switching times obtained with 3A solenoid valve. The energizing time is obtained at the time the spool switches over. The de-energized time are measured at the time pressure variation occurs on the line.

OVERALL AND MOUNTING DIMENSIONS

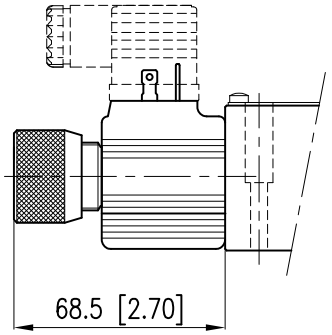
VSNG6 - 1*, 5*, 9

Dimensions in mm [IN]



KNOB MANUAL OVERRIDE / STROKE LIMITER ACCESSORY

See on page 8.



COILS

ORDERING CODE DC

D ☐ ☐

VOLTAGE	
12	12V DC
24	24V DC

CONNECTION	
K1	DIN 43650 - IP65
K2	AMP JUNIOR - IP67
K4	Lead Wires (1mt Length) - IP67
K7	DEUTSCH DT04 male - IP69K
K8	AMP SUPER SEAL IP69K

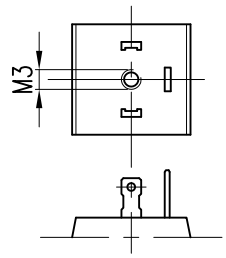
ORDERING CODE - RECTIFIED

R ☐ **K1**

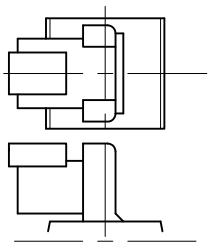
VOLTAGE	
120	120V DCR
230	230V DCR

CONNECTION	
K1	DIN 43650 - IP65

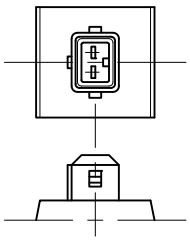
K1



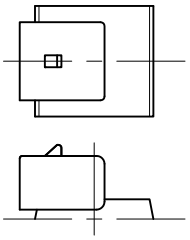
K7



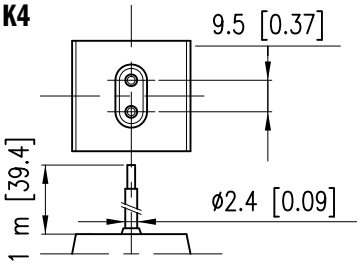
K2



K8



K4



SUPPLY VOLTAGE FLUCUATION		± 10% Vnom
MAXIMUM SWITCH ON FREQUENCY		10,000 cycles/hr
DUTY CYCLE		100%
ELECTROMAGNETIC COMPATIBILITY (EMC)		According to 2004/108/EC
LOW VOLTAGE		According to 2006/95 EC
CLASS OF PROTECTION	Coil Insulation	Class H
	Impregnation	Class H

CURRENT CONSUMPTION

	RESISTANCE AT 68°F [Ω] (±1%)	CURRENT CONSUMPTION [A] (±5%)	POWER CONSUMPTION (±5%) [W]	[VA]
D12	5.4	2.2	26.5	
D24	20.7	1.16	27.8	
R120	363	0.25		27.2
R230	1640	0.11		26.4

The coils are fastened to the tube by a threaded nut and can be rotated 360°.

'R' rectified coils must be used when the valve is fed with AC power supply subsequently rectified by means of rectifier bridge. Continental Hydraulics offers DIN43650 connectors with a built-in rectifier bridge. Refer to VEA-6FR on page 6. One is required per solenoid.

The interchangeability of coils of different voltages is allowed within the same type of supply current, alternating or direct.

The protection degree is IEC EN 60529 compliant. It's guaranteed only with the connector correctly connected and installed.
Coils are supplied without connectors.

APPLICATION DATA

FLUIDS

All pressure drops shown on these data pages are based on 170 SUS fluid viscosity and 0.87 specific gravity. For any other specific gravity (G1) the pressure drop (ΔP) will be approx. ΔP1 = ΔP (G1/G). See the chart for other viscosities.

FLUID VISCOSITIES	Cst	10	14.5	32	36	43	54	65	76	86	108	216	324	400
	SUS	60	75	150	170	200	250	300	350	400	500	1000	1500	1900
MULTIPIER		0.77	0.81	0.97	1.00	1.04	1.10	1.15	1.20	1.24	1.31	1.56	1.72	1.83

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 176 °F causes a faster degradation of the fluid and of the seals characteristics.

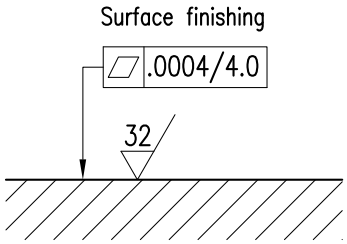
The fluid must be preserved in its physical and chemical characteristics.

RANGE TEMPERATURES:	Ambient	- 4 to +130 °F	-20 to +54 °C
	Fluid	- 4 to +180 °F	-20 to +82 °C
FLUID VISCOSITY	Range	60 - 1900 SUS	10 - 400 cSt
	Recommended	120 SUS	25 cSt
FLUID CONTAMINATION		ISO 4406:1999 Class 20/18/15	

INSTALLATION

The configurations with centering and return springs can be mounted in any position. Valve fitting takes place by means of bolts or stud kits, fixing the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



DIN 43650 CONNECTORS

ISO 4400 (Form A) 90°

VEA-3E	Gray 'A' Solenoid	165639
VEA-3F	Black 'B' Solenoid	165638
VEA-6FR	Black - With Built-in Graetz Bridge Rectifier Suitable for A and B Solenoids	1008400

KNOB MANUAL OVERRIDE / STROKE LIMITER

This dual-purpose device is an adjustable stop that may be utilized to position and hold the spool shifted. It may also be used to limit spool travel and regulate flow to the discharge port.

This device is ordered separately with the following code: **VMA-2A-A**

BOLT/STUD KITS

BD03-125	Valve only	1008406
BD03-317	Valve + (1) 40mm Stack	1008408
BD03-474	Valve + (2) 40mm Stack	1008409
BD03-631	Valve + (3) 40mm Stack	1008410

NOTE:

1. Bolt Kit Consists Of: 4 pcs. 10-24NC Fasteners
   4 pcs. #10 Lock Washer
2. Stud Kit Consists Of: 4 pcs. 10-24NC Studrods
   4 pcs. #10 Lock Studnuts
3. Tightening Torque: 5 - 7 Nm [4 - 5 lb.ft]

SEAL KIT

VSNG6 BUNA SEAL KIT	1008577
VSNG6 VITON SEAL KIT	1012888

VSNG6 - SOLENOID OPERATED DIRECTIONAL CONTROL VALVE COMPACT SIZE

ABOUT CONTINENTAL HYDRAULICS

Rugged, durable, high-performance, efficient—the reason Continental Hydraulics' products are used in some of the most challenging applications across the globe. With a commitment to quality customer support and innovative engineering, Continental's pumps, valves, power units, mobile and custom products deliver what the markets demand. Continental has been serving the food production, brick and block, wood products, automotive and machine tool industries since 1962. Learn how our products survive some of the most harsh environments.

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