CONTINENTAL HYDRAULICS™

PowerFlow™ D03 Directional Control Valves

DIRECTIONAL CONTROL VALVES

PRODUCT OVERVIEW

Features & Benefits

- High flow rates and low pressure drops reduce heat generation and increase efficiency
- Premium bore honing reduces crossport leakage
- Interchangeable spools for simplified field maintenance, and eliminate the need to change valve body when changing spools
- Below center-line mounting bolt position reduces body distortion that causes sticky spools
- Two-pin plug-in or DIN connection coils allow for quick replacement reducing down time
- All valves with optional electric box include indicator lights and electrical transorb surge suppression for coil protection and increased valve life
- Sealed wet armature solenoids provide maximum protection against moisture, corrosion and dirt.

Product Description

Continental Hydraulics PowrFlow™ Directional Control Valves offer some of the highest flow and pressure ratings in the industry today, making them the perfect choice whether you are designing a new system or just simply trying to get more out of your current system. Superior performance and durability makes these Directional Control Valves a great investment.

With 12 standard spools, numerous specialty spools and 7 functions, these directional control valves can be ordered to meet the specific needs of your applications.

Precise bore honing and spool grinding results in less cross-port leakage and less wasted energy. Spools also utilize U-groove machining making them more tolerant of contaminants than v-groove designs resulting in less spool hang-ups.

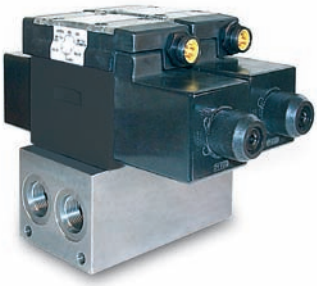
Controller options include solenoid, lever, air, soft shift and cam operators.

Specifications

- Mounting: Sub-plate or manifold mount in D03, D05, D08, and D10 configurations; conforming to NFPA and ANSI/ISO Standards
- Flow:
  D03 – Up to 20 GPM D05 – Up to 35 GPM
  D08 – Up to 150 GPM D10 – Up to 275 GPM
- Pressure: Up to 5,000 PSI
- Seals: Viton®
- Fluids: Petroleum-base, mostphosphate esters, water based fluids (not more than 40% water) and water glycol

Options & Accessories

- Solenoid, lever, air, soft shift and cam control operators
- Low watt power
- Wide variety of electrical connections
- Hazardous environment solenoids (dust and gas classifications)
- Wash down
- Anti-shock option
- Patented DeAccelatrol® motion control valve
- Wide variety of bolt and stud kits for mounting modular stack valves
- Spool indication switches
- Double redundant monitoring packages and lockout valves



In the event of a component or system failure, the double redundant valve option shuts down the system in a controlled manner to help avoid damage and injury.

Continental Hydraulics valves are designed to use interchangeable spools for simplified field maintenance.

TABLE OF CONTENTS

DIRECTIONAL CONTROL VALVE CATALOG

FEATURES

SOLENOID ACTUATED

- CSA certified (D03, D05, D08 sizes).
- CE approved (D03, D05, D0 8 and D10 sizes).
- Wet armature solenoids:
  - 2-pin plug-in coils or DIN (D03, D05, D08, D10 sizes).
  - Solenoid failures greatly reduced.
  - Standard and low amp coils available.
  - High temperature elements are isolated from direct human contact.
  - No oil leakage into electrical cavity.
  - Fast and easy solenoid replacement.
  - Continuous duty-rated coils.
- No dynamic seals eliminate external oil leakages.
- Electrical quick disconnects as factory installed or field installed options.
- 3-, 4- and 5-pin sealed connectors per ANSI recommended standard B93.55M-1981.
- Built-in lights, terminals and surge suppressor
- Access to mounting bolts without entering electrical box.
- Mounting bolt heads are below spool centerline to prevent body distortion and spool stick.

CAM ACTUATED

- Bronze bearing push-rod for increased life.
- Urethane wiper eliminates contamination from actuator.
- Internal actuator parts are electro-filmed to resist corrosion.

LEVER ACTUATED

- Lever boot keeps contaminants from linkage.
- Lever connects directly to spool for positive hold.
- Detent option for positive hold.
- Internal actuator parts are electro-filmed to resist corrosion.

AIR ACTUATED

- Wide operating range of air pilot pressure.
- Urethane sealing gland on air piston permits very low air flow rates.
- Excellent control of spool shift rate.
- Air operator internal parts are electro-filmed to resist corrosion.

GENERAL SPECIFICATIONS

RECOMMENDED FLUID

- Petroleum.
- Water-based fluids (not more than 40% water).
- Most phosphate esters.
- Other fluids are acceptable, but special O-rings may be required.
- Viton seals are standard.

FLUID TEMPERATURE RANGE

Fluid temperature up to 200° F. will not appreciably affect valve performance, however, from a safety standpoint, temperatures above 130° F. are not recommended.

RECOMMENDED OPERATING VISCOSITY

80 to 350 SUS.

FLUID OPERATING VISCOSITY

Acceptable start-up viscosity to 1500 SUS.

Minimum viscosity to 30 SUS.

FILTRATION

ISO 18/16/13.

MOUNTING POSITION

Optional; horizontal preferred.

NFPA FLOW PATH/ACTUATING PATTERN

SOLENOID, AIR AND OIL ACTUATED:

Actuating operator (a): connects flow to cylinder port A.

Actuating operator (b): connects flow to cylinder port B.

CAM ACTUATED:

Activated — connects flow to cylinder port B.
Released — connects flow to cylinder port A.

LEVER ACTUATED:

Push— connects flow to cylinder port A.
Pull — connects flow to cylinder port B.

NOTE:

The NFPA flow path/actuating pattern is reversed for Spool Code L.

GENERAL INFORMATION

VALVE OPERATION

Spring centered and spring offset valve types will be spring positioned unless actuated continuously. Detented, no spring valves may be actuated momentarily. When the operator is deactuated, the spool will remain shifted provided there is no severe shock, vibration, or pressure transients.

PRESSURE SURGES

Pressure surges in a common tank line serving these and other valves can be large enough to cause inadvertent shifting of these valves. This is particularly critical in no-spring detented type valves. Separate tank lines may be necessary. Maximum pressure rating on solenoid operated valve tank ports includes surges.

SILTING

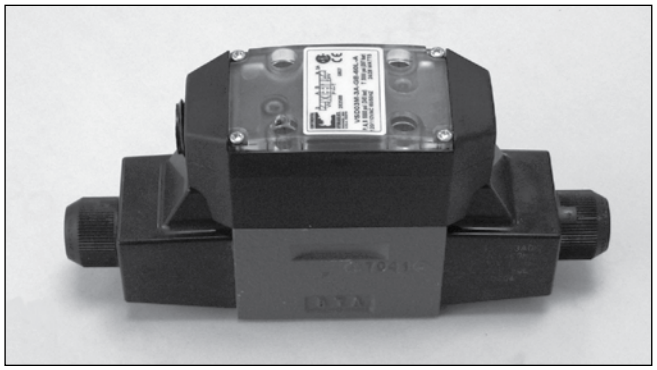
Any sliding spool valve, if held shifted under pressure for long periods of time, may stick and not spring return due to fluid residue formation. The valve should be cycled periodically to prevent this from happening.

RESPONSE TIME

Response times of air actuated valves are dependent on air flow rate and pressure supplied to the operator. Response times of hydraulic actuated valves will vary with pilot line diameter and length, pilot pressure, pilot control valve shift time, pilot oil flow rate, and fluid viscosity.

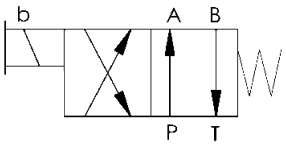
VSD03M

SOLENOID ACTUATED, DIRECT OPERATED

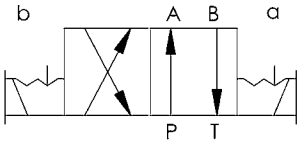


Basic Valve Operations

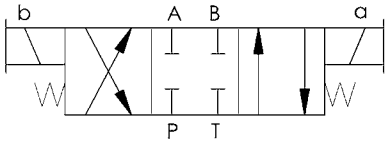
VSD03M-1 Single solenoid,
2 position, spring offset



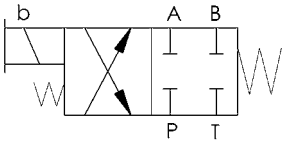
VSD03M-2 Double solenoid,
2 position, no spring, detented



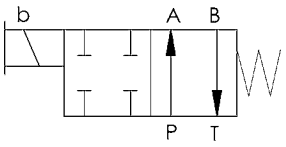
VSD03M-3 Double solenoid,
3 position, spring centered



VSD03M-5 Single solenoid, 2 position,
spring centered



VSD03M-6 Single solenoid, 2 position,
energize to center



Physical Specifications

Weight: (No modifications)
VSD03M - 1, 5 & 6 Single Operators:
3.2 lbs. (1.45 kg)
VSD03M - 2 & 3 Dual Operators:
3.9 lbs. (1.77 kg)

Size: Conforms to American National Standard, ANSI B93.7M, D03 Size Mounting Interface (ISO 4401 size 03 / CETOP 3 / NG 6)

Operating Specifications

Flow capacity:
Maximum flows up to 20 GPM (76 lpm)

Maximum operating pressure:
P, A and B ports - 5000 PSI (345 bar)

Maximum tank line back pressure:
- 3000 PSI (207 bar) including transient

Recommended fluid:
Any hydraulic fluid compatible with selected seal materials

Fluid temperature range:
Fluid temperatures up to 200˚F (93˚C) will not appreciably affect valve performance, however, from a safety standpoint, temperatures above 130˚F (54˚C) are not recommended.

Recommended fluid:
Operating viscosity ranges 80 to 350 SUS at operating temperature.

Filtration recommendations:
ISO CODE 18/16/13

Cycle rate:
A.C. solenoids -Up to 400 cycle/minute
D.C. solenoids -Up to 300 cycle/minute

Mounting – Unrestricted:
(Detented models; horizontal preferred)

Recommended mounting bolt torque:
4-5 lb.-ft. (.55 to .70 kg-m)

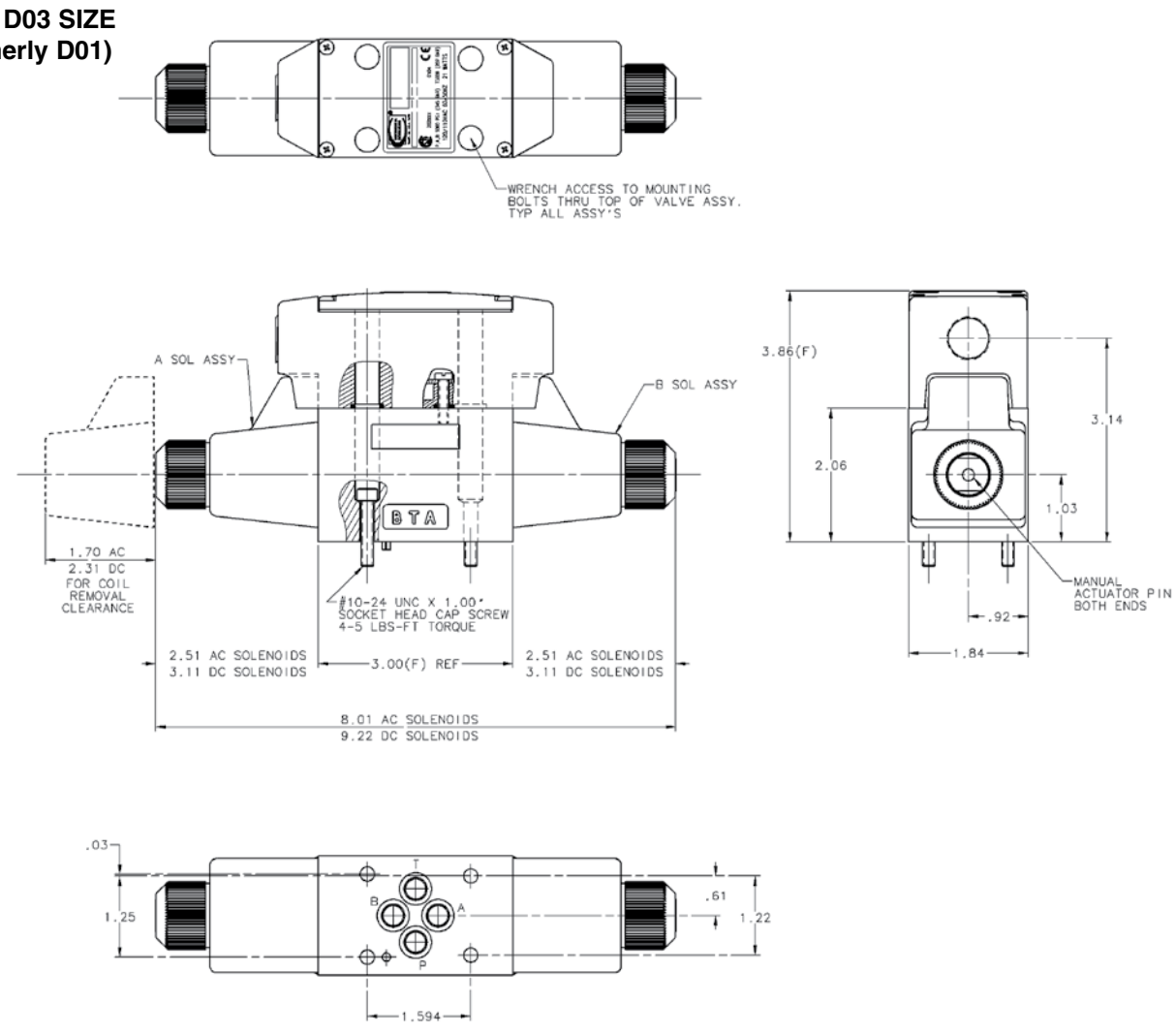
Duty cycle: Continuous

TYPICAL ELECTRICAL CHARACTERISTICS

	VOLTAGE & FREQUENCY	VOLTAGE LIMITS	INRUSH CURRENT (AMPS)	HOLDING CURRENT	HOLDING CURRENT MIN. VOLT.	HOLDING POWER
SOLENOID CODE	**VOLTS - Hz.**	**MIN. - MAX.**	**MAX.**	**(AMP)**	**(AMP)**	**(WATTS)**
33L, 60L	120 - 60	108 - 126	2.10	.49	.39	24
	110 - 50	99 - 116		.58	.45	26
34L, 61L	240 - 60	216 - 252	1.10	.24	.19	24
	220 - 50	198 - 231		.29	.22	26
39L, 68L	120 - 60	108 - 132	1.10	.19	.15	10
	110 - 50	99 - 121		.21	.17	10
42L, 70L	24 DC	21 - 26	1.00	1.00	.88	24
44L, 75L	12 DC	10 - 13	2.00	2.00	1.67	24

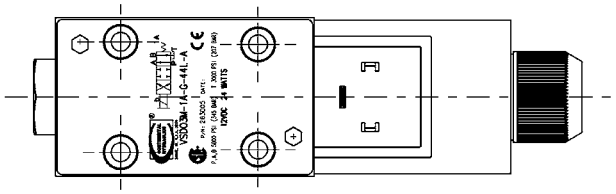
CONNECTION BOX DIMENSIONS

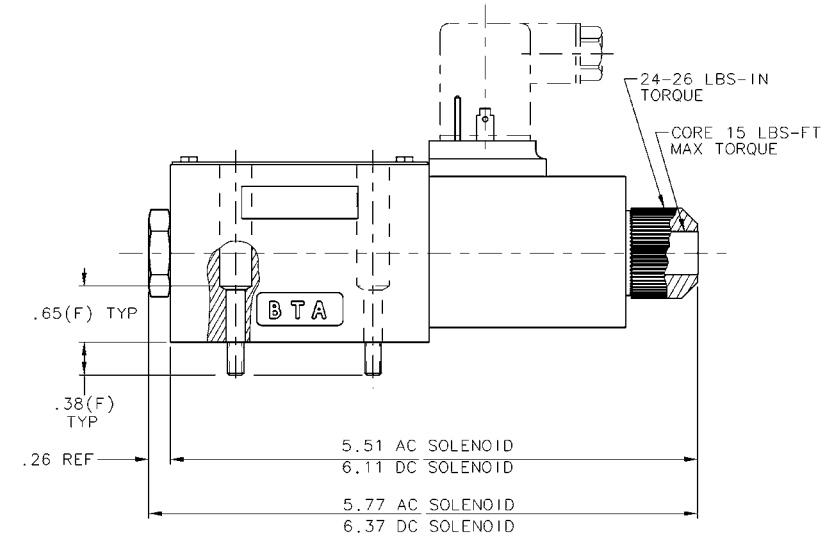
NFPA D03 SIZE (Formerly D01)

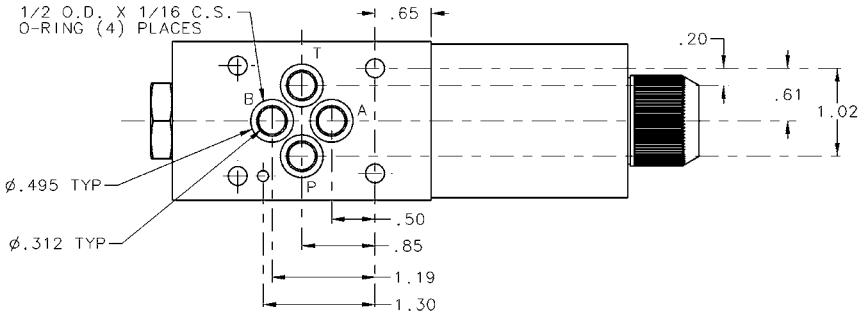


VSD03M DOUBLE SOLENOID

DIN CONNECTIONS



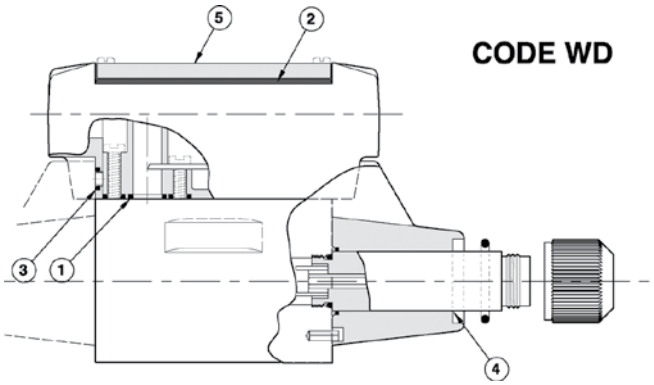




VSD03M SINGLE SOLENOID

VSD03M WASH DOWN OPTION

SOLENOID ACTUATED, DIRECT OPERATED



DESCRIPTION

Wash down option with electrical box, rated for IP65. Tested by CSA. The hose down test consisted spraying the valve and enclosure with 45 to 65 GPM of water from a 25mm nozzle for 5 minutes. The water stream was directed at the enclosure seams from a distance of 3 meters and moved along the joints or surface at a minimum rate of 6mm/s or 1.65in/s.

The main changes to the standard D03 valve include:

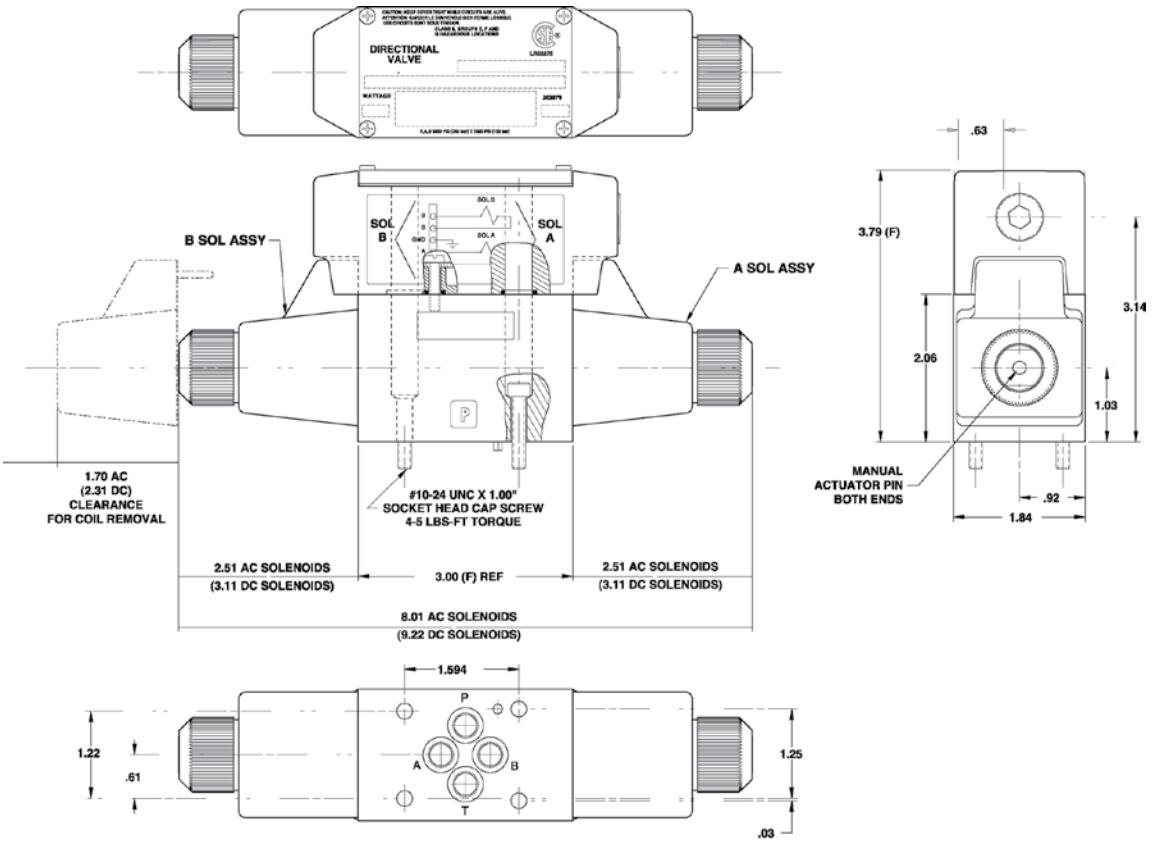
1. Addition of o-rings to seal the mounting bolt access holes between the electrical box and valve body.

2. Thicker cover gasket made of 40D nitrile to protect against direct spray. The softer material compresses more to provide a tighter seal.

3. .093" Thick gaskets made of 50D nitrile to seal the solenoid pins where they pass through the electrical box. Added compression provides better protection from direct spray. These replace the standard o-rings.

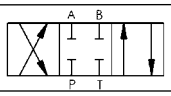
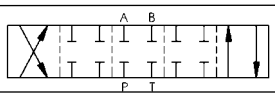
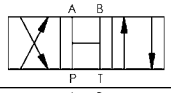
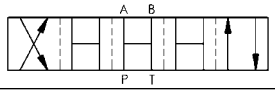
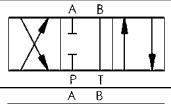
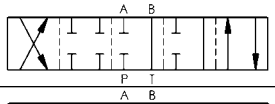
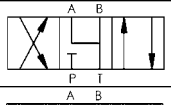
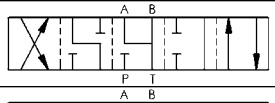
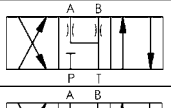
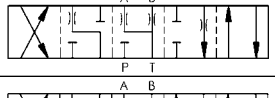
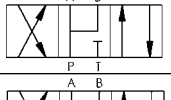
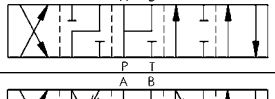
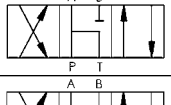
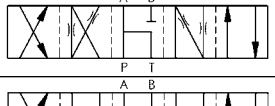
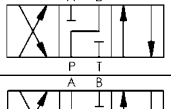
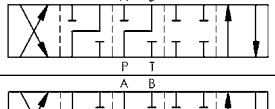
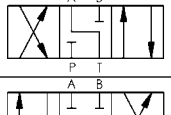
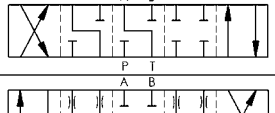
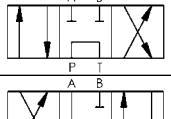
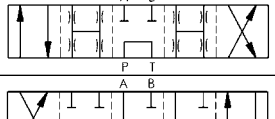
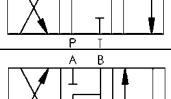
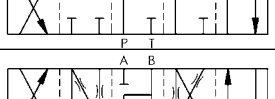
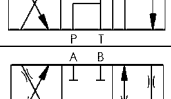
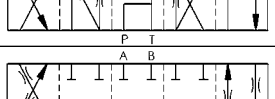
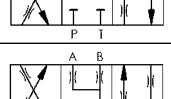
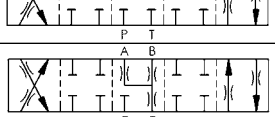
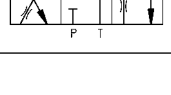
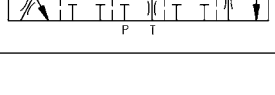
4. RTV sealant added around core tube area.

5. Solid Anodized Aluminum Cover (no bolt access holes) replaces the standard plastic cover for better sealing and chemical resistance.



VSD03M DOUBLE SOLENOID

SPOOL DESCRIPTION

CODE	SYMBOL	SPOOL FUNCTION	CENTER POSITION	CROSSOVER
A			All ports blocked	All ports blocked
B			All ports open	All ports open
E			P & A blocked B to T	All ports blocked, or P & A blocked B to T
F			P blocked A & B to T	P blocked A or B to T
F1			P blocked A & B restricted to T	P blocked A or B restricted to T
G			P to A & B T blocked	P to A or B T & A or B blocked
H			P to A & T B blocked	All ports open
J			P to B A & T blocked	All ports blocked, or P to B, A & T blocked
K			P & B blocked A to T	All ports blocked, or P & B blocked, A to T
L			P to T A & B blocked	All ports open, restricted
N			P to A B & T blocked	All ports blocked, or P to A, B & T blocked
Q			P to B & T A blocked	All ports open
AC-**			All ports blocked Tappered Spool	All ports blocked
FC-**			P blocked A & B to T Tapped Spool	All ports blocked

MAXIMUM RECOMMENDED FLOW RATINGS

MAXIMUM RECOMMENDED FLOW - **AC VOLTAGE**

Function / Spool	GPM (LPM)				
VSD03M-	1000 PSI	2000 PSI	3000 PSI	4000 PSI	5000 PSI
1A	14 (53)	14 (53)	14 (53)	14 (53)	14 (53)
1B	16 (60)	14 (53)	14 (53)	14 (53)	13 (49)
2A	16 (60)	16 (60)	16 (60)	16 (60)	16 (60)
2B	17 (64)	17 (64)	17 (64)	16 (60)	16 (60)
3A	20 (76)	20 (76)	20 (76)	20 (76)	20 (76)
3B	13 (49)	13 (49)	12 (45)	11 (42)	11 (42)
3F	13 (49)	13 (49)	11 (42) *	4 (15) **	N/A
3FS	13 (49)	13 (49)	11 (42) *	4 (15) **	N/A
3F1	13 (49)	13 (49)	11 (42) *	4 (15) **	N/A
3G	19 (72)	19 (72)	19 (72)	19 (72)	19 (72)
3L	10 (38)	10 (38)	10 (38)	5 (19)	4 (15)
3E/K	13 (49)	13 (49)	12 (45)	8 (30)	4 (15)
3H/Q	5 (19)	4 (15)	3 (11)	3 (11)	2 (7.6)
3J/N	15 (57)	15 (57)	14 (53)	14 (53)	14 (53)
5A	20 (76)	20 (76)	20 (76)	20 (76)	20 (76)
5B	13 (49)	13 (49)	12 (45)	11 (42)	11 (42)
5F	13 (49)	13 (49)	11 (42) *	4 (15) **	N/A
5FS	13 (49)	13 (49)	11 (42) *	4 (15) **	N/A
5F1	13 (49)	13 (49)	11 (42) *	4 (15) **	N/A
5G	19 (72)	19 (72)	19 (72)	19 (72)	19 (72)
5E/K	13 (49)	13 (49)	12 (45)	8 (30)	4 (15)
5H/Q	5 (19)	4 (15)	3 (11)	3 (11)	2 (7.6)
5J/N	15 (57)	15 (57)	14 (53)	14 (53)	14 (53)
5L	10 (38)	10 (38)	10 (38)	5 (19)	4 (15)
6A	17 (64)	17 (64)	17 (64)	17 (64)	17 (64)
6B	11 (42)	11 (42)	11 (42)	11 (42)	10 (38)
6F	14 (53)	12 (45)	10 (38)	3 (11)	N/A
6G	14 (53)	13 (49)	12 (45)	12 (45)	12 (45)
6L	8 (30)	8 (30)	8 (30)	5 (19)	3 (11)

MAXIMUM RECOMMENDED FLOW - **DC VOLTAGE**

Function / Spool	GPM (LPM)				
VSD03M-	1000 PSI	2000 PSI	3000 PSI	4000 PSI	5000 PSI
1A	12 (45)	11 (42)	10 (38)	10 (38)	10 (38)
1B	12 (45)	9 (34)	5 (19)	3 (11)	3 (11)
2A	13 (49)	12 (45)	12 (45)	11 (42)	10 (38)
2B	15 (57)	13 (49)	9 (34)	6 (23)	4 (15)
3A	18 (68)	18 (68)	17 (64)	17 (64)	15 (57)
3B	10 (38)	10 (38)	8 (30)	7 (26)	7 (26)
3F	15 (57)	15 (57)	12 (45)	N/A	N/A
3FS	15 (57)	15 (57)	10 (38)	N/A	N/A
3F1	15 (57)	15 (57)	10 (38)	N/A	N/A
3G	19 (72)	19 (72)	19 (72)	19 (72)	19 (72)
3L	12 (45)	12 (45)	12 (45)	10 (38)	5 (19)
3E/K	13 (49)	13 (49)	11 (42)	8 (30)	4 (15)
3H/Q	6 (23)	6 (23)	4 (15)	3 (11)	3 (11)
3J/N	14 (53)	12 (45)	12 (45)	12 (45)	12 (45)
3AC-09	5 (19)	5 (19)	5 (19)	5 (19)	5 (19)
3AC-16	8 (30)	8 (30)	8 (30)	8 (30)	6 (23)
3AC-26	10 (38)	10 (38)	10 (38)	6 (23)	6 (23)
3FC-09	5 (19)	5 (19)	5 (19)	5 (19)	5 (19)
3FC-16	8 (30)	8 (30)	8 (30)	8 (30)	6 (23)
3FC-26	10 (38)	10 (38)	10 (38)	6 (23)	6 (23)
5A	18 (68)	18 (68)	17 (64)	17 (64)	15 (57)
5B	10 (38)	10 (38)	8 (30)	7 (26)	7 (26)
5F	15 (57)	15 (57)	12 (45)	N/A	N/A
5FS	15 (57)	15 (57)	10 (38)	N/A	N/A
5F1	15 (57)	15 (57)	10 (38)	N/A	N/A
5G	19 (72)	19 (72)	19 (72)	19 (72)	19 (72)
5E/K	13 (49)	13 (49)	11 (42)	8 (30)	4 (15)
5H/Q	6 (23)	6 (23)	4 (15)	3 (11)	3 (11)
5J/N	14 (53)	12 (45)	12 (45)	12 (45)	12 (45)
5L	12 (45)	12 (45)	12 (45)	10 (38)	5 (19)
6A	17 (64)	17 (64)	15 (57)	15 (57)	15 (57)
6B	11 (42)	11 (42)	4 (15)	3 (11)	N/A
6F	17 (64)	17 (64)	17 (64)	3 (11)	N/A
6G	12 (45)	11 (42)	10 (38)	10 (38)	10 (38)
6L	7 (26)	7 (26)	7 (26)	4 (15)	3 (11)

MAXIMUM RECOMMENDED FLOW
SOLENOID CODES 39 AND 68 ONLY

Function / Spool	GPM (LPM)			
VSD03M-	500 PSI	1000 PSI	1500 PSI	2000 PSI
1A	8 (30)	7 (26)	7 (26)	7 (26)
1B	8 (30)	7 (26)	7 (26)	7 (26)
2A	10 (38)	10 (38)	10 (38)	10 (38)
2B	12 (45)	12 (45)	10 (38)	10 (38)
3A	10 (38)	10 (38)	10 (38)	4 (15)
3B	10 (38)	10 (38)	7 (26)	7 (26)
3F	10 (38)	10 (38)	10 (38)	4 (15)
3G	9 (34)	9 (34)	7 (26)	5 (19)
3L	5 (19)	5 (19)	5 (19)	5 (19)
5A	10 (38)	10 (38)	10 (38)	4 (15)
5B	10 (38)	10 (38)	7 (26)	7 (26)
5F	10 (38)	10 (38)	10 (38)	4 (15)
5G	9 (34)	9 (34)	7 (26)	5 (19)
5L	5 (19)	5 (19)	5 (19)	5 (19)

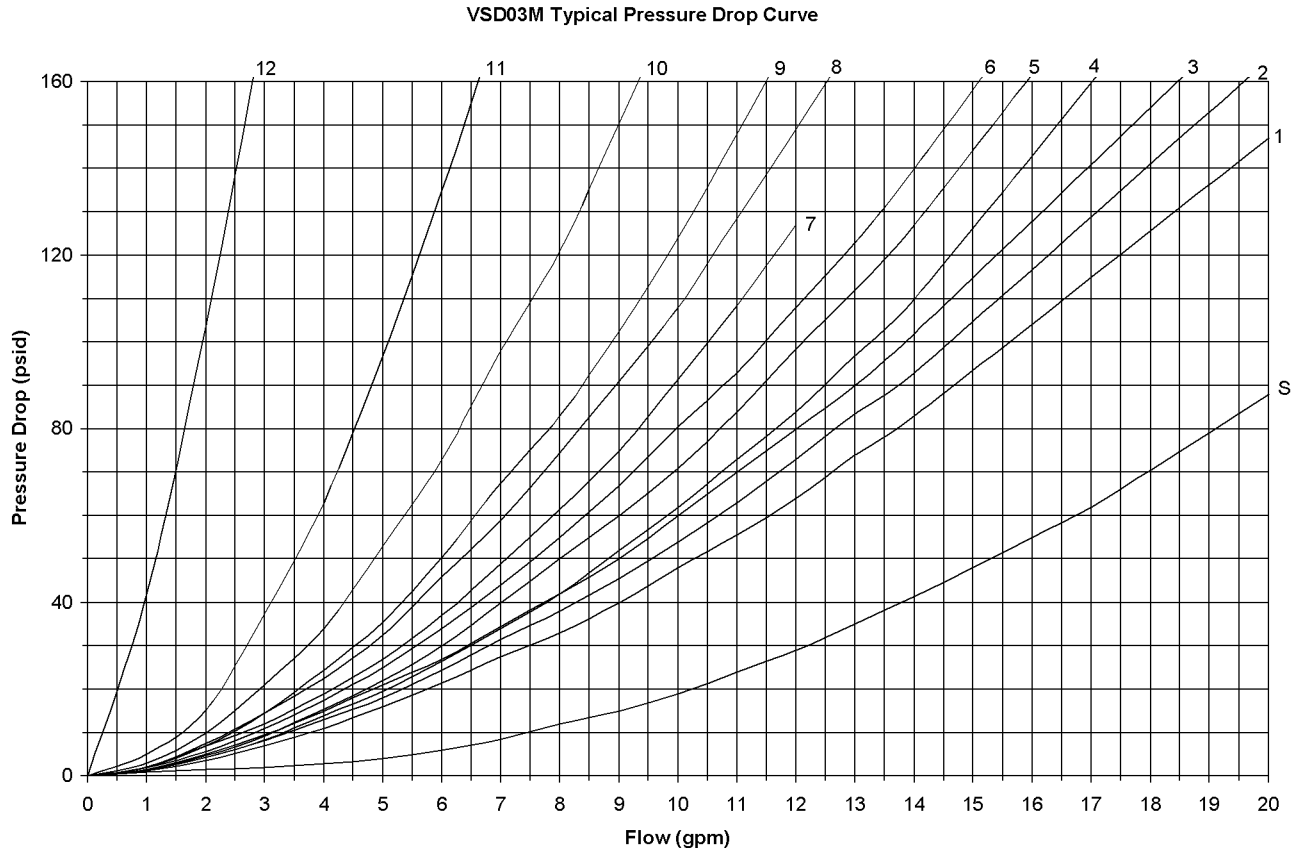
Notes

* 100% rated voltage applied

** 3500 PSI Maximum @ 100% voltage applied

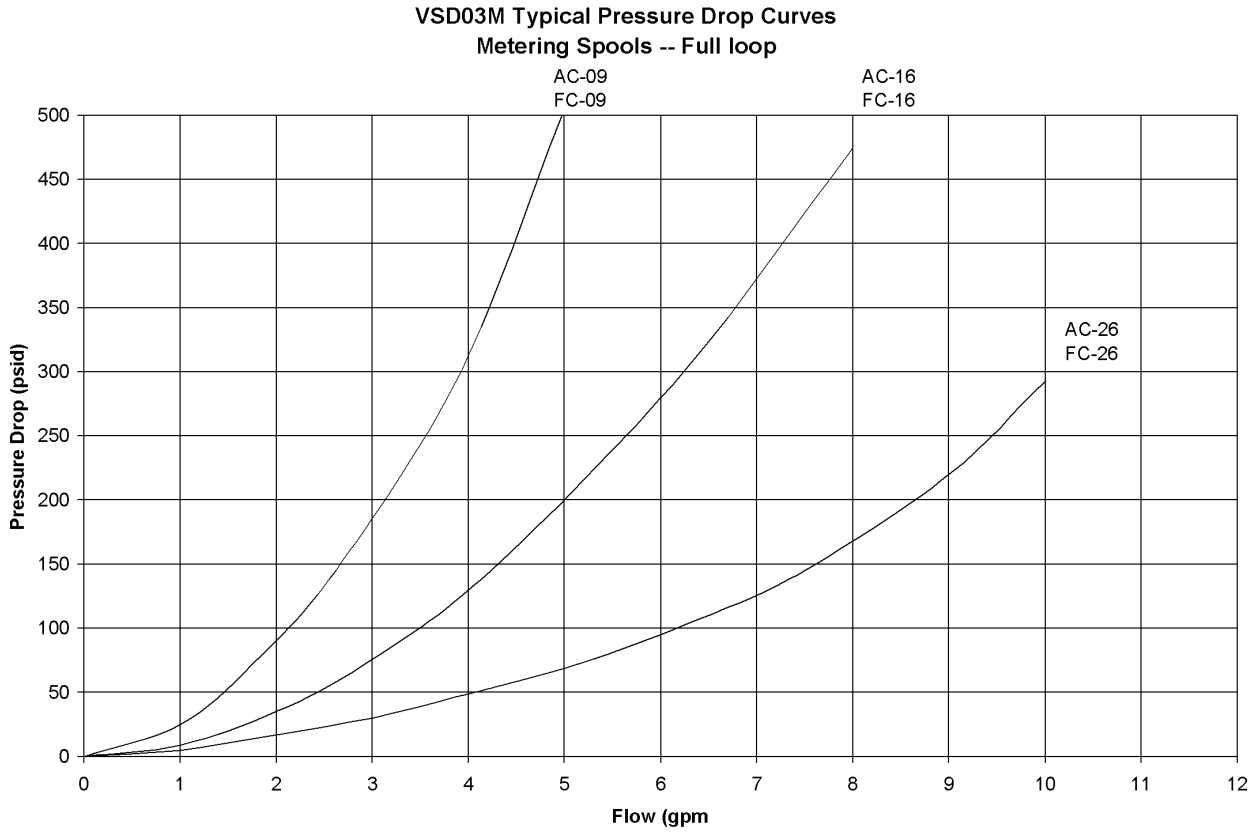
VSD03M

FLOW / PRESSURE DROP CURVES



	Spool Shifted				Spool Centered		
Spool Code	P to A	B to T	P to B	A to T	P to A or B	A or B to T	P to T
A	5	4	5	4	--	--	--
A Code 1&2	4	4	4	4	--	--	--
B	1	4	1	4	1	3	3
B code 1&2	3	1	3	1	3	3	4
E	5	2	5	4	--	9	--
F	5	1	5	1	--	8	--
F code 68	9	1	9	1	--	8	--
FS	5	2	5	2	--	11	--
F1	5	4	5	4	--	12	--
G	2	5	2	5	5	--	--
H	2	6	5	2	--	--	5
J	5	5	3	5	10	--	--
K	5	4	5	2	--	9	--
L	6	7	6	7	--	--	7
N	3	5	5	5	10	--	--
Q	5	2	2	6	--	--	5
Subplate	S (Full Circuit)						

Note: See Page 9 for maximum flow rates.



Spool selection notes

Spool shift characteristics are a common cause of shock in a hydraulic system. When a valve shifts, large decompression and pressure differential combine to create large surges of shock. This is usually in the form of mechanical vibration and excessive pressure spikes, causing premature failure of system components.
Most of the standard directional control valves designs use spools with sharp edges and as the spool is shifted the opening rate of the area for passage of oil is very fast. Conversely when the valve is shut off the flow path is at a sharp rate as well. This sudden change creates many of the pressure spikes we see in the system.

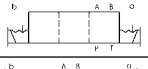
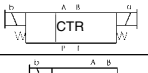
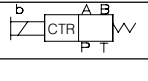
Valve spool type selection is critical, pay close attention to the cross-over or transition conditions when the valve is shifted form one condition to another. These transitional conditions play a large role in the level of the spike, as well as helping to control the decompression of stored energy.

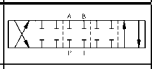
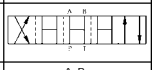
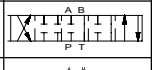
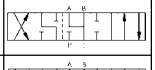
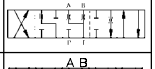
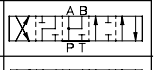
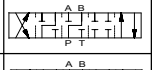
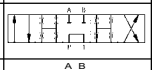
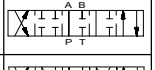
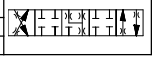
Continental Hydraulics offers the above metering spools for use in the standard solenoid valves. This allows for selecting a spool that better matches the flow requirements, metering characteristics and transition conditions. Metering spools in a standard solenoid valves, allow the upstream and downstream sides to have a more gradual rate of change. Matching of the spools to the system requirements encourage a softer shock to the system. By selecting this “metering” style of spool over the “sharp edge” style of spool, in most cases you may reduce some of the transitional shocks.

VSD03M

ORDERING CODE INFORMATION

VSD03M – [SELECT ONE] – [SELECT ONE] – [SELECT ON]

BASIC VALVE FUNCTION				
SEE NOTE	CODE	DESCRIPTION	SYMBOL	SPOOL AVLBL
	1	SINGLE OPERATOR 2 POSITION SPRING OFFSET		A,B
	2	DOUBLE OPERATOR 2 POSITION DETENT NO SPRING		A,B
4	3	DOUBLE OPERATOR 3 POSITION SPRING CENTER		ALL SPOOLS
4	5	SINGLE OPERATOR 2 POSITION SPRING CENTERED		ALL SPOOLS
	6	SINGLE OPERATOR 2 POSITION SPRING OFFSET ENERGIZE TO CENTER		A,B, F, G, L

SPOOL		
SEE NOTE	CODE	SYMBOL
	A	
	B	
7	E	
	F	
7	FS	
7	F1	
	G	
7	H	
7	J	
7	K	
4	L	
7	N	
7	Q	
5	AC-09 AC-16 AC-26	
5	FC-09 FC-16 FC-26	

SEAL		
SEE NOTE	CODE	DESCRIPTION
	G	VITON
10	A	BUNA
10, 11, 15	N	NEOPRENE

NOTES:

1 NOT AVAILABLE ON DOUBLE SOLENOID VALVES.
2 ELECTRICAL BOX OPTION REQUIRED ON 2 PIN SOLENOIDS.
3 BOX OPTION "HD" AVAILABLE ONLY ON CODE 50, 52 COILS.
4 OPERATOR IDENTIFICATIONREVERSED WITH "L" SPOOL:
5 AVAILABLE ON D.C. ONLY AT THIS TIME.
6 NOT AVAILABLE ON HD ELECTRICAL OPTION. (VITON SEALS ONLY)
7 SPOOL NOT AVAILABLE WITH LOW FORCE SOLENOIDS
8 CONNECTOR CONFORMS TO ANSI/B93.55M-1981
9 SEE WIRING DIAGRAM FOR PIN CALL OUTS
10 TANK PORT RATING 1500 PSI
11 AC SOLENOIDS ONLY.
12 AVAILABLE ON FUNCTION CODE 1 ONLY.
13 AVAILABLE ONLY WITH B5A / B5H BOX OPTIONS
14 AVAILABLE ONLY WITH TOP ELECTRIC CONNECTION BOX
15 NOT CSA APPROVED

ORDERING CODE INFORMATION

SELECT AS REQ'D

SELECT AS REQ'D

SELECT AS REQ'D

SELECT ONE

DESIGN LETTER

L

MECHANICAL OPTIONS		
SEE NOTE	CODE	DESCRIPTION
	OMIT	SINGLE SOL. "A" PORT END
1	R	SINGLE SOL. OPERATOR ON "B" PORT END
	M	RIVETT MTG. PATTERN
	U	MANUAL OVERRIDE BOOT
1	Z	MNL OVRD FOR SGL SOL VALVE NON SOL END
6	WD	WASH DOWN

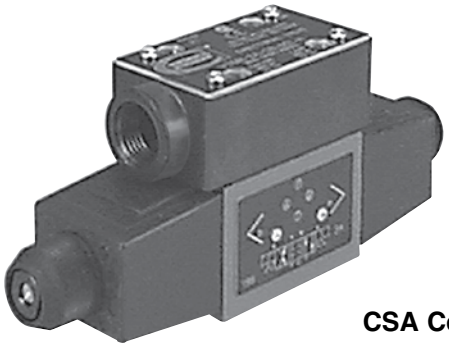
ELECTRICAL OPTIONS		
SEE NOTE	CODE	DESCRIPTION
	OMIT	DIN STYLE SOLENOIDS
2	B	TOP ELEC. CONN. BOX WITH TERMINAL POSTS, LIGHTS AND SURGE SUPPRESSOR
2	BE	TOP ELEC. CONN. BOX WITH TERMINAL POSTS

TERMINATION CONNECTORS FOR VALVES WITH B OR BE TOP ELEC. CONN. BOX		
8, 9, 14	5H	TOP ELEC. CONN. BOX W/5 PIN MALE MINI RECEPTACLE, CONNECTOR ON "B" PORT END
8, 9, 14	5A	TOP ELEC. CONN. BOX W/5 PIN MALE MINI RECEPTACLE, CONNECTOR ON "A" PORT END
5, 9, 14	4	TOP ELEC. CONN. BOX W/4 PIN MALE MICRO RECEPTACLE, CONNECTOR ON "B" PORT END
5, 9,14	4A	TOP ELEC. CONN. BOX W/4 PIN MALE MICRO RECEPTACLE, CONNECTOR ON "A" PORT END
5, 9, 14	D4	TOP ELEC. CONN. BOX W/4 PIN MALE MICRO RECEPTACLE, CONNECTOR ON "B" PORT END
5, 9, 14	D4A	TOP ELEC. CONN. BOX W/4 PIN MALE MICRO RECEPTACLE, CONNECTOR ON "A" PORT END
1, 8, 14	3H	TOP ELEC. CONN. BOX W/3 PIN MALE MINI RECEPTACLE, CONNECTOR ON "B" PORT END
1, 8, 14	3A	TOP ELEC. CONN. BOX W/3 PIN MALE MINI RECEPTACLE, CONNECTOR ON "A" PORT END
9, 14 15	T4	BOX w/ 4 PIN MALE DIN, CONNECTOR ON "B" PORT END
9, 15	T4A	BOX w/ 4 PIN MALE DIN, CONNECTOR ON "A" PORT END
3	HD	HAZARDOUS DUTY, TOP ELEC. CONN., BOX CLASS II, GROUPS E, F & G
9, 12, 13, 14	SW	N.O. SPOOL POSITION INDICATOR SWITCH

SOLENOID				
SEE NOTE	CODE	VOLT	FR	DESCRIPTION
	33	120/110	60/50	DIN. 43650 ELEC. CONN.
	34	240/220	60/50	DIN. 43650 ELEC. CONN.
	37	24/24	60/50	DIN. 43650 ELEC. CONN.
	39	120/110	60/50	DIN. 43650 ELEC. CONN. LOW FORCE
	42	24 VDC	N/A	DIN. 43650 ELEC. CONN.
	44	12 VDC	N/A	DIN. 43650 ELEC. CONN.
2, 3	50	120/110	60/50	HAZARDOUS LOCATION
2, 3	52	240/220	60/50	HAZARDOUS LOCATION
2	60	120/110	60/50	2 PIN
2	61	240/220	60/50	2 PIN
2	65	24/24	60/50	2 PIN
2	68	120/110	60/50	2 PIN LOW AMP, LOW FORCE
2	70	24 VDC	N/A	2 PIN
2	75	12 VDC	NA	2 PIN

VS5M ANTI-SHOCK VALVES

SOLENOID ACTUATED, DIRECT OPERATED

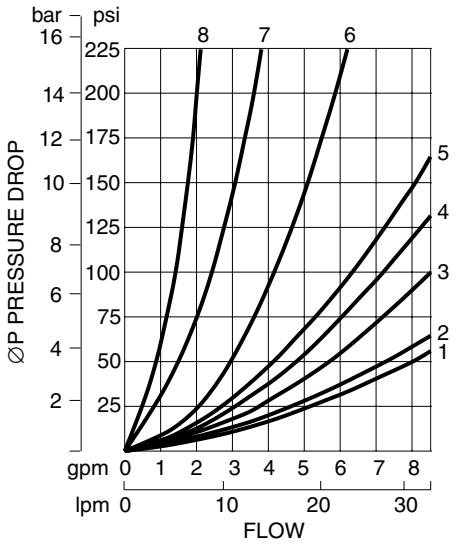


CSA Certified

DESCRIPTION

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 PRESSURE DROP CURVES



FLOW PATH ΔP CURVES

SPOOL TYPE	FLOW CURVE NUMBER			
	SPOOL SHIFTED		SPOOL CENTERED	
	P to A or B	A or B to T	A or B to T	P to T
A	2	1	N/A	N/A
A2C	6	6	N/A	N/A
B2	2	1	N/A	7
F1	2	1	8	N/A
L	5	4	N/A	3

TYPICAL PERFORMANCE SPECIFICATIONS

Performance is measured on a four-way circuit (full circuit). Performance may be reduced from that shown if a three-way circuit (half circuit) is used, i.e. A or B port plugged.

NOMINAL FLOW RATE @ 3500 PSI		5 gpm	19 lpm
MAXIMUM FLOW RATE		SEE CHART	
MAXIMUM OPERATING PRESSURE	P, A, B Ports	4600 psi	315 bar
	T Port (includes surges)	1500 psi	105 bar
INTERNAL LEAKAGE	(1-port) 3500 psi 100 SUS	9 cipm 23 cipm	148 mlpm 380 mlpm
MAXIMUM CYCLE RATE*	Option S1	60 cpm	
	Option S2	50 cpm	
TIMING SPOOL SHIFT*	Option S1	60 cpm	
	Option S2	50 cpm	
MOUNTING SURFACE		ANSI/B93.7-1986 - D08 ISO 4401 - SIZE 08	
WEIGHT	Single Actuator	31 LBS.	14 kg
	Double Actuator	32 lbs.	14.5 kg
SPOOL CODES AVAILABLE		A, A2C, B2,F1, L	

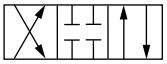
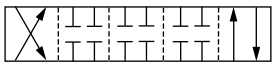
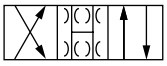
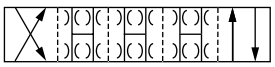
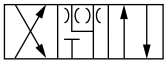
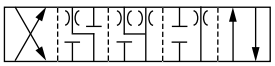
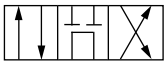
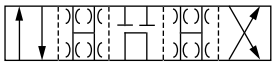
* Timingfor spool shift is dependent on fluid voscosity.

All pressure drops shown on this data page are based on 100 SUS fluid viscosity and 0.87 specific gravity. See the chart below for other viscosities.

Fluid	CS	14.5	20.5	32	43	54	65	76	86
Viscosities	SUS	75	100	150	200	250	300	350	400
Multiplier		0.93	1.00	1.11	1.19	1.26	1.32	1.37	1.41

For any other specific gravity (G1) the pressure drop (ΔP) will be approximaately ΔP1 = ΔP (G1/G).

SPOOL DESCRIPTION

CODE	SYMBOL	SPOOL FUNCTION	CENTER POSITION	CROSSOVER
A A1C A2C			All ports blocked	All ports blocked
B1 B2			All ports open, restricted	All ports open, restricted
F			P blocked A & B restricted to T	P blocked A or B restricted to T
L L3			P to T A & B blocked	All ports open, restricted

MAXIMUM FLOW

SPOOL AND TIMING

	FUNCTION CODE	S1										S2			
		A		A2C		B2		F1		L		A		L	
		AC	DC	AC	DC	AC	DC	AC	DC	AC	DC	AC	DC	AC	DC
(lpm) (70 bar) @ gpm 1000 psi	1	(23) 6	(23) 6	N/A	N/A	(19) 5	(23) 6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	3, 5	(27) 7	(27) 7	(15) 4	(23) 6	N/A	N/A	(23) 6	(30) 8	(23) 6	(23) 6	N/A	(23) 6	N/A	(19) 5
(lpm) (140 bar) @ gpm 2000 psi	1	(19) 5	(23) 6	N/A	N/A	(19) 5	(23) 6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	3, 5	(23) 6	(23) 6	(15) 4	(19) 5	N/A	N/A	(19) 5*	(30) 8	(19) 5	(15) 4	N/A	(23) 6	N/A	(15) 4
(lpm) 210 bar) @ gpm 3000 psi	1	(15) 4	(23) 6	N/A	N/A	(19) 5	(23) 6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	3, 5	(19) 5	(19) 5	(15) 4	(15) 4	N/A	N/A	(15) 4*	(30) 8	(15) 4	(12) 3	N/A	(19) 5	N/A	(12) 3

N/A Valve is not available in this configuration.

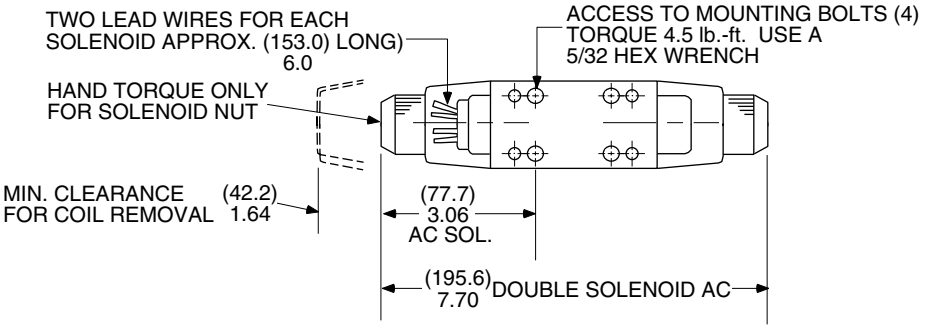
* 95% of rated voltage required at pressure above 2000 psi.

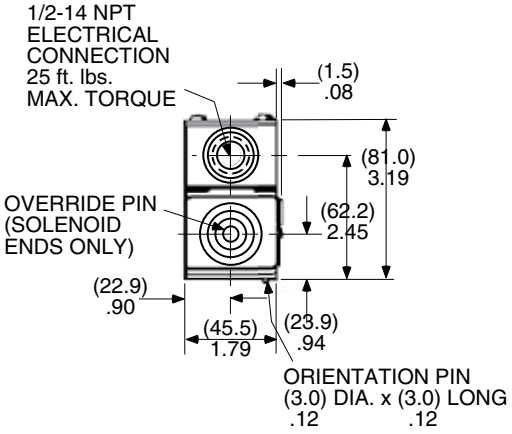
TYPICAL ELECTRICAL CHARACTERISTICS

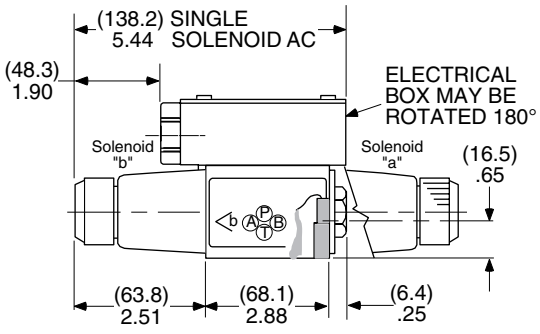
SOLENOID CODE		VOLTAGE & FREQUENCY	VOLTAGE LIMITS	RESISTANCE	INRUSH CURRENT (AMPS)	HOLDING CURRENT	HOLDING POWER
LEAD WIRE	DIN CONN.	VOLTS - Hz.	MIN. - MAX.	OHMS	MAX.	(AMP)	(WATTS)
60L	33L	120 - 60	108 - 126	36.5	2.10	.40	21
		110 - 50	99 - 116			.43	21
61L	34L	240 - 60	216 - 252	145.0	1.10	.21	22
		220 - 50	198 - 231			.25	22
70L	42L	24 DC	21 - 26	24.0	1.00	1.00	24
75L	44L	12 DC	10 - 13	6.3	2.00	2.00	24

NFPA D03 SIZE
(Formerly D01)
FOR INTERFACE PATTERN,
SEE MOUNTING SURFACE
SECTION

DIMENSIONS SHOWN IN: (MILLIMETERS)
INCHES



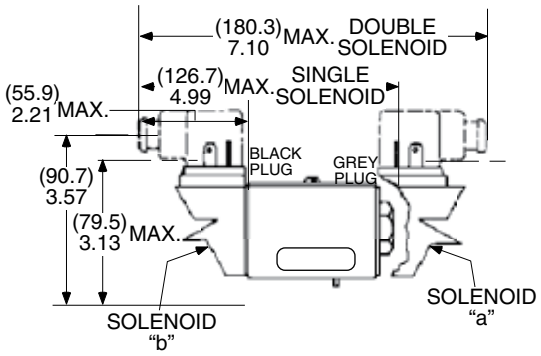




DIMENSIONS SHOWN IN: (MILLIMETERS)
INCHES

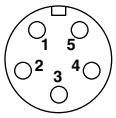
CODES 33L, 34L, 42L & 44L

Solenoid with DIN 43650/ISO 4400 (form A) connector(s).



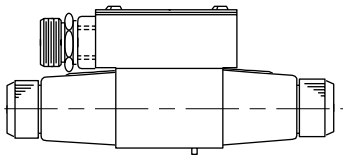
NOTES:
1. No electrical box required
2. Order connectors separately.

PIN NO.	WIRE NO.	GOES TO:
1	1	SOL. B
2	2	SOL. A
3	(GREEN)	GROUND
4	4	SOL.A
5	5	SOL. B



CODE B5H

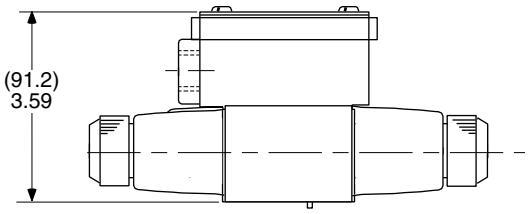
Quick disconnect for single or double solenoids.
Top electrical box with sealed 5-pin male receptacle.



NOTE:
Connector meets ANSI recommended standard B93.55M-1981.

CODES L1 & L2

Solenoid indicator lights.



NOTE:
Top electrical box is required.

VS5M ANTI-SHOCK VALVES

SOLENOID ACTUATED, DIRECT OPERATED

ORDERING INFORMATION

VS5M – [SELECT ONE] [SELECT ONE] **– G** [SELECT ONE] [SELECT ONE] [SELECT ONE] **–** [SELECT ONE]

BASIC VALVE

4-WAY DIRECTIONAL CONTROL VALVE

SOLENOID ACTIVATED

D03 SUBPLATE MOUNTING

4600 PSI MAXIMUM OPERATING PRESSURE

SPOOLS

CODE
REFER TO SPOOL DESCRIPTION CHART

SEALS

CODE
VITON SEALS STANDARD

ELECTRICAL OPTIONS

CODE	DESCRIPTION
	LEAD WIRE CONNECTIONS
B	TOP ELECTRICAL BOX WITHOUT TERMINAL POSTS
BT	TOP ELECTRICAL BOX WITH TERMINALS AND GROUND
B5H	TOP ELECTRICAL BOX WITH 5 PIN MALE RECEPTACLE FOR 1 OR 2 SOLENOIDS

SOLENOID*

CODE	VOLTAGE
	LEAD WIRE CONNECTIONS
60L	110/120 V 50/60 Hz
61L	220/240 V 50/60 Hz
70L	24 VDC
75L	12 VDC
	SOLENOID(S) WITH DIN 43650/ISO 4400 (FORM A) CONNECTIONS
33L	110/120 V 50/60 Hz
34L	220/240 V 50/60 Hz
42L	24 VDC
44L	12 VDC

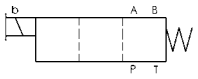
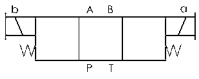
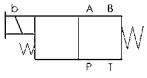
* Available on Codes 3 and 5 with DC solenoids only.

TIMING*

CODE	OPTION
S1	50 - 150 MS
S2**	100 - 300 MS (DC Only)

* Timing is dependent on fluid viscosity.
** Available on Codes 3 and 5 with DC solenoids only.

FUNCTION

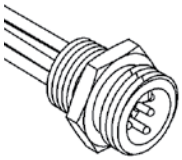
CODE	OPTION
1	 Single actuator • 2 position Spring offset
3	 Double actuator • 3 position Spring centered
5	 Single actuator • 2 position Spring centered

MECHANICAL OPTIONS

CODE	DESCRIPTION
OMIT	NONE
R	SINGLE SOLENOID REVERSE ASSEMBLY SOLENOID "A" SUPPLIED

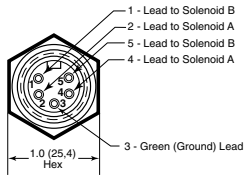
TYPICAL ORDERING CODE: **VS5M-1A-GS1B-60L**

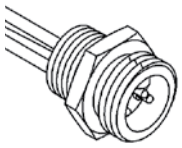
MALE RECEPTACLES



VEA-3C (5 PIN)

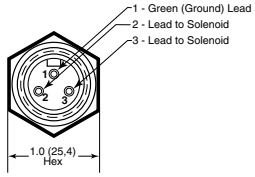
Five Pin Connector, Codes B5A, B5H
Use with single or double solenoid valve

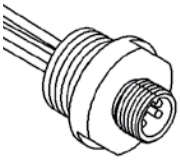




VEA-3MH (3 PIN)

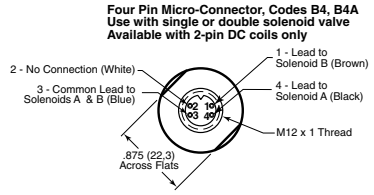
Three Pin Connector, Codes B3A, B3H
Use with single solenoid valve





VEA-3L4 (M12 4 PIN)

Four Pin Micro-Connector, Codes B4, B4A
Use with single or double solenoid valve
Available with 2-pin DC coils only

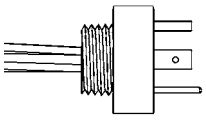


B4/B4A WIRING CHART

B4/B4A RECEPTACLE LEAD WIRE NO.		WIRING DATA TERMINAL DESIGNATION
PIN	COLOR	
1	BROWN	A
2	WHITE	NO CONNECTION
3	BLUE (COMMON)	A & B (USE JUMPER)
4	BLACK	B

BD4/BD4A WIRING CHART

BD4/BD4A RECEPTACLE LEAD WIRE NO.		WIRING DATA TERMINAL DESIGNATION
PIN	COLOR	
1	BROWN	NO CONNECTIONA
2	WHITE	A SOL
3	BLUE (COMMON)	A & B (USE JUMPER)
4	BLACK	B SOL

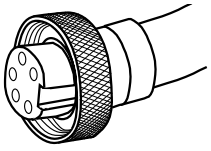


VEA-3T4 (DIN 3 + GND)

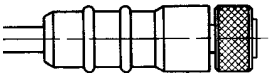
BT4/BT4A WIRING CHART

BT4/T4A RECEPTACLE LEAD WIRE NO.	WIRING DATA TERMINAL DESIGNATION
GREEN	GROUND
BLACK 1	SOLENOID B
WHITE 2	SOLENOID A
RED 3 (COMMON)	A & B (USE JUMPER)

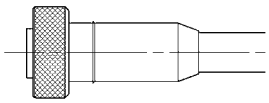
FEMALE RECEPTACLES



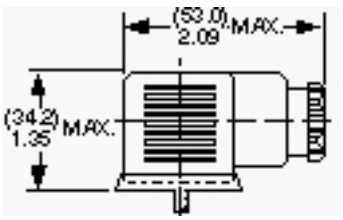
VEA-3D (5 PIN)
(9 ft. cord)



VEA-3L (M12 4 PIN)
(9 ft. cord)



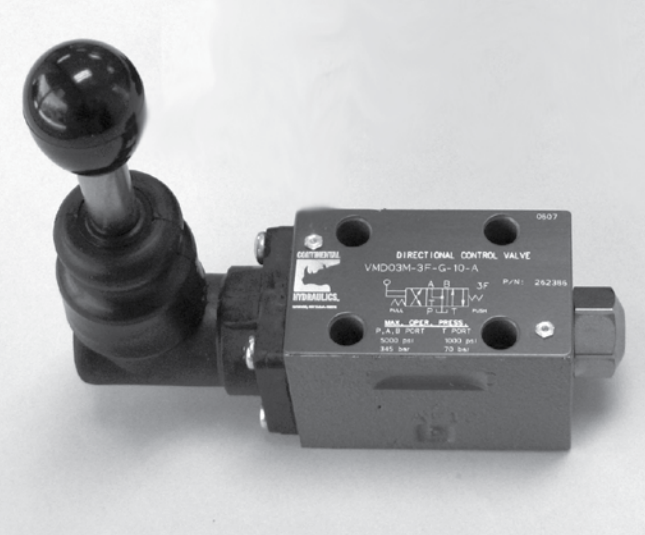
VEA-3M (3 PIN)
(9 ft. cord)



VEA-3E / VEA-3F
(gray) (black)

VMD03M

LEVER ACTUATED, MANUALLY OPERATED



TYPICAL PERFORMANCE SPECIFICATIONS

Performance is measured on a four-way circuit (full circuit. Performance may be reduced from that shown if a three-way circuit (half circuit) is used, i.e. A or B port plugged.

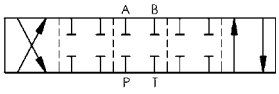
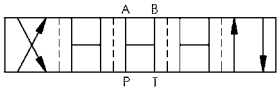
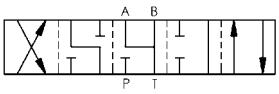
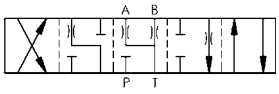
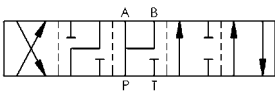
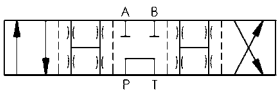
FLOW CAPACITY - (up to)		18 gpm	68 lpm
MAXIMUM OPERATING PRESSURE	P, A, B Ports	5000 psi	345 bar
	T Port	1000 psi	70 bar
LEVER FORCE AT MAXIMUM PRESSURE		10.0 lbs.	4.5 kg
MOUNTING SURFACE		ANSI/B93.7M - 1986 D03 ISO 4401 Size 03	
WEIGHT		3.4 lbs.	1.5 kg
SPOOL CODES AVAILABLE		SEE CHART	

MAXIMUM RECOMMENDED FLOW

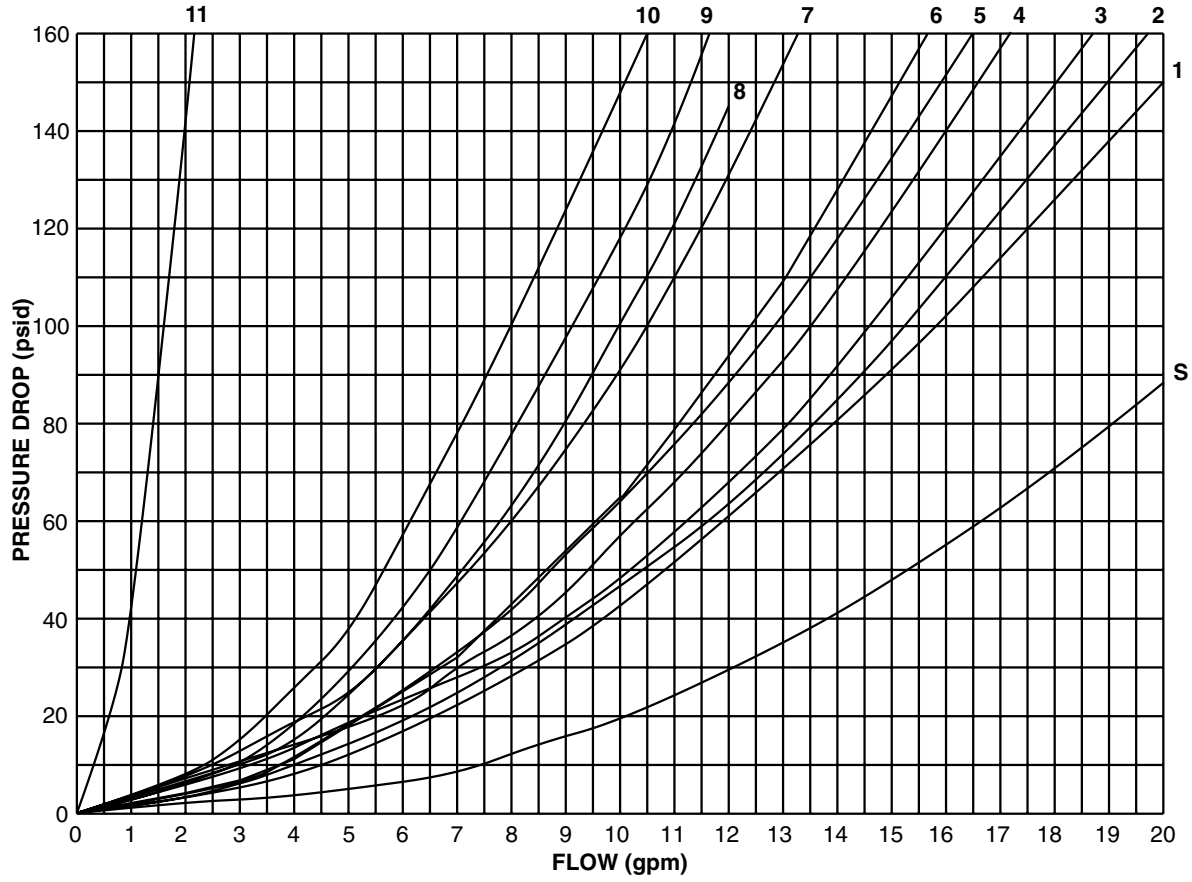
		SPOOL CODE				
	FUNCTION CODE	A	B	F	G*	L**
(lpm) (70 bar) @ gpm 1000 psi		(68) 18	(42) 11	N/A	N/A	N/A
	2	(68) 18	(61) 16	(61) 16	N/A	(38) 10
	3, 5	(68) 18	(61) 16	(61) 16	(68) 18	(38) 10
(lpm) (140 bar) @ gpm 2000 psi	1	(68) 18	(38) 10	N/A	N/A	N/A
	2	(68) 18	(61) 16	(61) 16	N/A	(38) 10
	3, 5	(68) 18	(61) 16†	(61) 16	(68) 18	(38) 10
(lpm) (210 bar) @ gpm 3000 psi	1	(68) 18	(34) 9	N/A	N/A	N/A
	2	(68) 18	(61) 16	(61) 16	N/A	(38) 10
	3, 5	(68) 18	(61) 16†	(53) 14†	(61) 16	(34) 9
(lpm) (276 bar) @ gpm 4000 psi	1	(68) 18	(26) 7	N/A	N/A	N/A
	2	(68) 18	(61) 16	(61) 16	N/A	(34) 9
	3, 5	(68) 18	(61) 16†	(45) 12†	(53) 14†	(26) 7
(lpm) (345 bar) @ gpm 5000 psi	1	(68) 18	(26) 7	N/A	N/A	N/A
	2	(68) 18	(61) 16	(61) 16	N/A	(15) 4
	3, 5	(68) 18	(53) 14†	(45) 12†	(45) 12†	(34) 9

N/A Not Available.
* "G" spool available on code 3 valves only.
** "L" spool available on codes 3 and 4 valves only.
† 11 gpm with 1000 psi tank pressure.

SPOOL DESCRIPTION

SPOOL TYPE	SPOOL SYMBOL
A	PULL  PUSH
B	PULL  PUSH
F	PULL  PUSH
F1	PULL  PUSH
G	PULL  PUSH
L	PULL  PUSH

TYPICAL PRESSURE DROP CURVES



PRESSURE DROP CURVE CHART

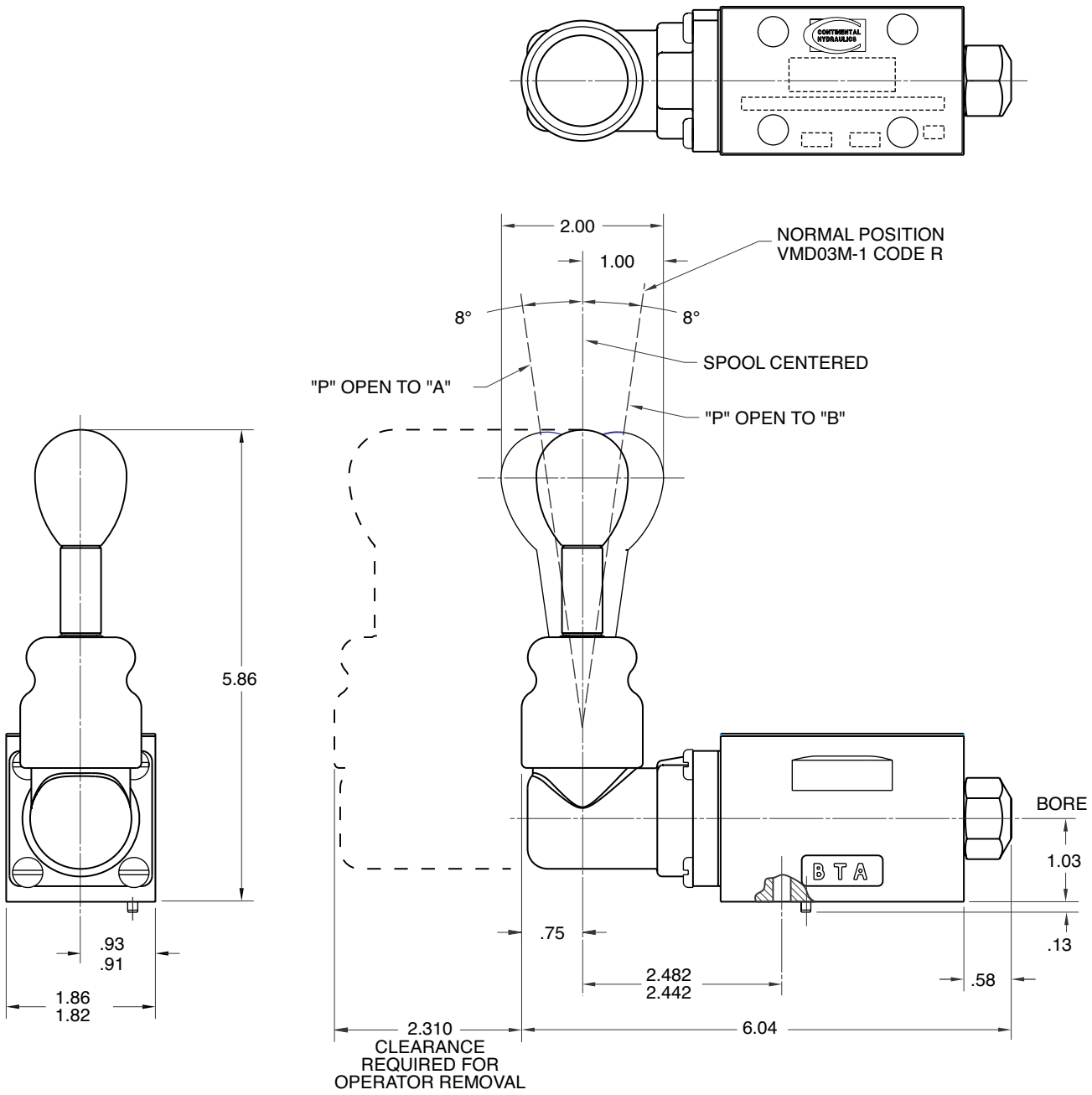
SPOOL TYPE	FLOW CURVE NUMBER						
	SPOOL SHIFTED				SPOOL CENTERED		
	P to A	B to T	P to B	A to T	P to A or B	A or B to T	P to T
A	4	4	4	4	N/A	N/A	N/A
B	2	4	2	4	5	6	5
F	5	1	5	1	N/A	10	N/A
F1	5	4	5	4	N/A	11	N/A
G	3	6	3	6	7	N/A	N/A
L	8	8	8	8	N/A	N/A	9
Subplate	S (Full Circuit)						

All pressure drops shown on this page are based on 100 SUS fluid viscosity, and 0.87 specific gravity. See the chart below for other viscosities.

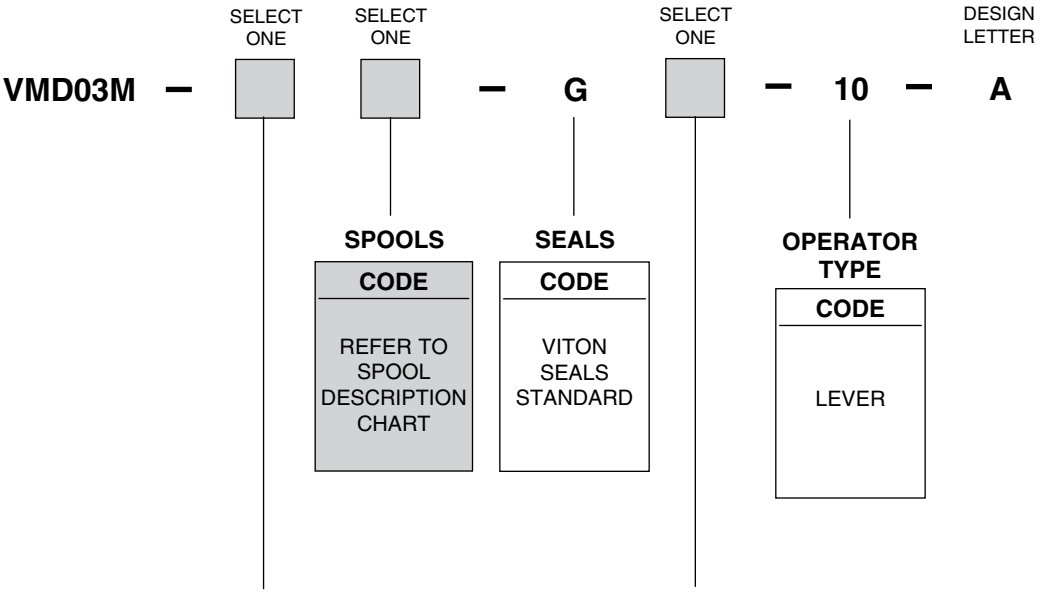
Fluid	CS	14.5	20.5	32	43	54	65	76	86
Viscosities	SUS	75	100	150	200	250	300	350	400
Multiplier		0.93	1.00	1.11	1.19	1.26	1.32	1.37	1.41

For any other specific gravity (G_1) the pressure drop (ΔP) will be approximately $\Delta P_1 = \Delta P\ (G_1/G)$.

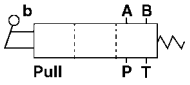
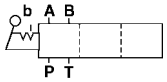
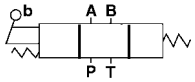
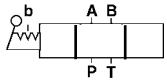
DIMENSIONS


2.00
1.00
NORMAL POSITION
VMD03M-1 CODE R
8°
8°
SPOOL CENTERED
"P" OPEN TO "A"
"P" OPEN TO "B"
5.86
BORE
1.03
.13
B T A
.75
.93
.91
1.86
1.82
2.482
2.442
.58
2.310
CLEARANCE
REQUIRED FOR
OPERATOR REMOVAL
6.04

ORDERING INFORMATION



FUNCTION

CODE	OPTION
1	 2 position spring offset
2	 2 position detented, no spring
3	 3 position spring centered
4	 3 position detented, spring centered

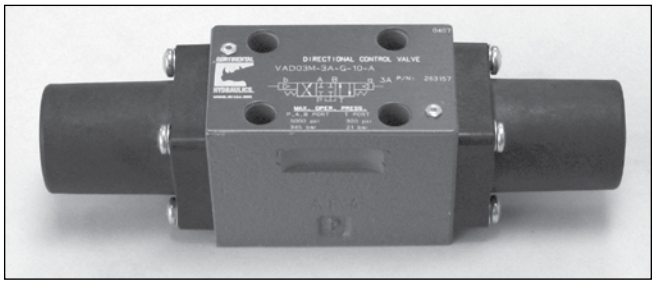
MECHANICAL OPTIONS

CODE	DESCRIPTION
OMIT	SINGLE SOLENOID "A" PORT END
R	SINGLE SOLENOID "B" PORT END
90	LEVER OPERATOR ROTATED 90 DEG. TOWARDS "T" PORT
90CW	LEVER OPERATOR ROTATED 90 DEG. TOWARDS "P" PORT

TYPICAL ORDERING CODE: **VMD03M-3A-G-10-A**

VAD03M

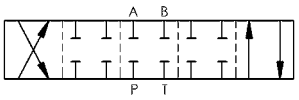
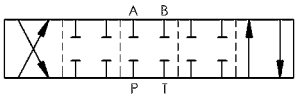
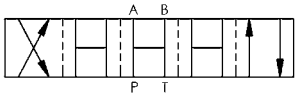
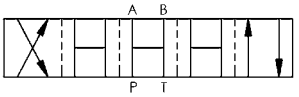
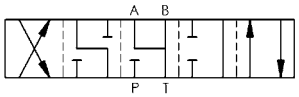
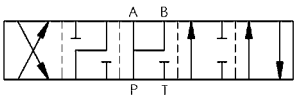
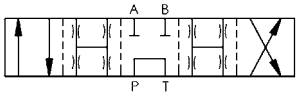
AIR ACTUATED, DIRECT OPERATED



TYPICAL PERFORMANCE SPECIFICATIONS

MAXIMUM FLOW RATE - (up to)		15 gpm	57 lpm
MAXIMUM OPERATING PRESSURE	P, A, B Ports	5000 psi	345 bar
	T Port	300 psi	21 bar
PILOT PRESSURE	Recommended Max.	150 psi	10.5 bar
	Minimum	50 psi	3.5 bar
ACTUATOR DISPLACEMENT	Offset to Offset	0.15 cu.in.	2.5 ml
	Center to Offset	0.08 cu. in.	1.25 ml
MAXIMUM CYCLE RATE		300 cpm	
MOUNTING SURFACE		ANSI/B93.7M - 1986 D03 IISO 4401 Size 03	
WEIGHT	Single Actuator	3.0 lbs.	1.35 kg
	Double Actuator	3.4 lbs.	1.56 kg
SPOOL CODES AVAILABLE		A, B F, G, L	

SPOOL DESCRIPTION

SPOOL TYPE	SPOOL SYMBOL		
A	b Port		a Port
A Code 1 and 2	b Port		a Port
B	b Port		a Port
B Code 1 and 2	b Port		a Port
F	b Port		a Port
G	b Port		a Port
L	a Port		b Port

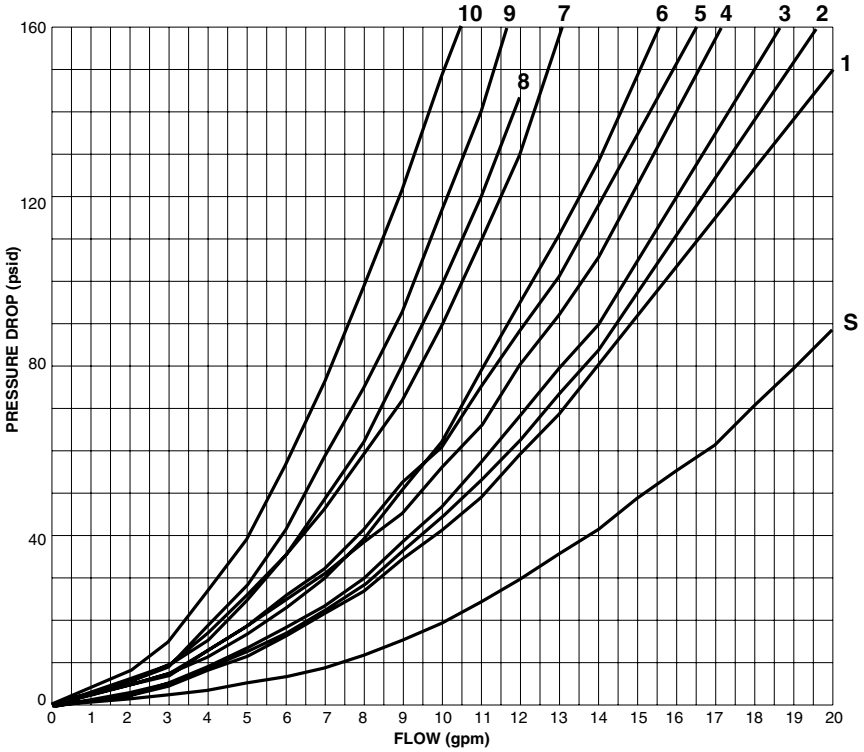
MAXIMUM FLOW*

	FUNCTION CODE	SPOOL CODE A	B	F	G	L
(lpm) (105 bar) @ gpm 1500 psi	1	(49) 13	(34) 9	N/A	N/A	N/A
	2	(57) 15	(57) 15	N/A	N/A	N/A
	3, 5	(57) 15	(57) 15	(57) 15	(49) 13	(34) 9
(lpm) (210 bar) @ gpm 3000 psi	1	(34) 13	(34) 9	N/A	N/A	N/A
	2	(57) 15	(57) 15	N/A	N/A	N/A
	3, 5	(57) 15	(57) 15	(38) 10	(49) 13	(34) 9
(lpm) (345 bar) @ gpm 5000 psi	1	(49) 13	(34) 9	N/A	N/A	N/A
	2	(57) 15	(57) 15	N/A	N/A	N/A
	3, 5	(45) 12	(45) 12	(19) 5	(49) 13	(38) 9

N/A Not Available.

* Performance measured on a four-way circuit with cylinder ports looped together with 50 psi pilot presure, measured @ 100 SUS oil viscosity.

TYPICAL PRESSURE DROP CURVES



FLOW PATH ΔP CURVES

SPOOL TYPE	FLOW CURVE NUMBER						
	SPOOL SHIFTED				SPOOL CENTERED		
	P to A	B to T	P to B	A to T	P to A or B	A or B to T	P to T
A	4	4	4	4	N/A	N/A	N/A
A Code 1 & 2	4	4	4	4	N/A	N/A	N/A
B	2	4	2	4	5	6	5
B Code 1 & 2	3	2	3	2	5	6	5
F	5	1	5	1	N/A	10	N/A
G	3	6	3	6	7	N/A	N/A
L	8	8	8	8	N/A	N/A	9
Subplate	S (Full Circuit)						

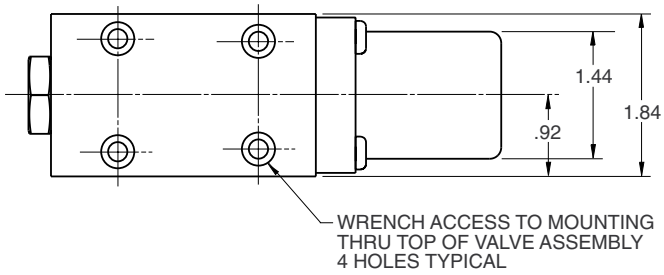
Performance is measured on a four-way circuit (full circuit). Performance may be reduced from that shown if a three-way circuit (half circuit) is used, i.e. A or B port plugged.

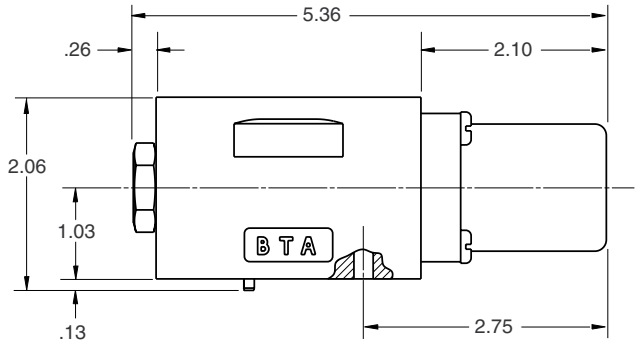
All pressure drops shown on this data page are based on 100 SUS fluid viscosity and 0.87 specific gravity. See the chart below for other viscosities.

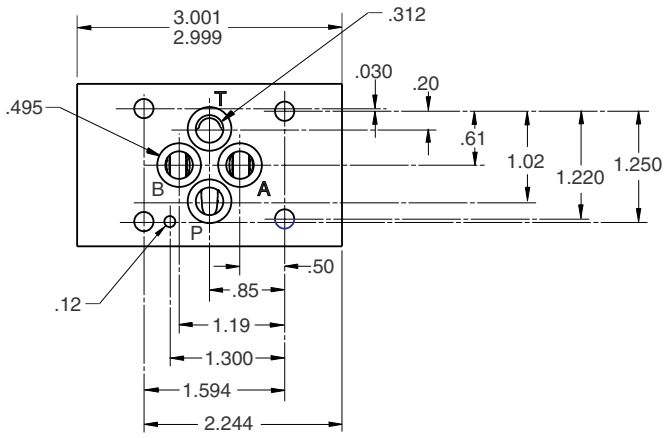
Fluid	CS	14.5	20.5	32	43	54	65	76	86
Viscosities	SUS	75	100	150	200	250	300	350	400
Multiplier		0.93	1.00	1.11	1.19	1.26	1.32	1.37	1.41

For any other specific gravity (G_1) the pressure drop (Δ P) will be approximately $\Delta P_1 = \Delta P\ (G_1/G)$.

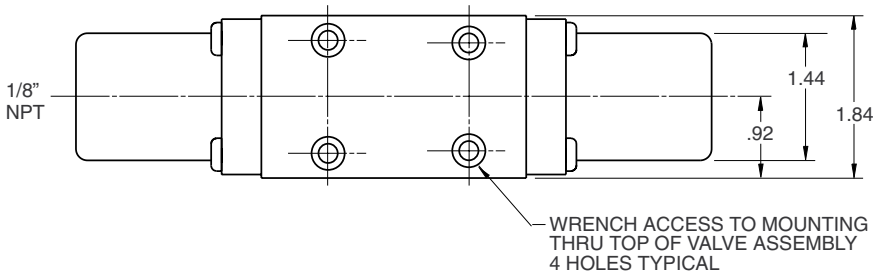
DIMENSIONS: MODELS VAD03M-1 & VADO3M-5

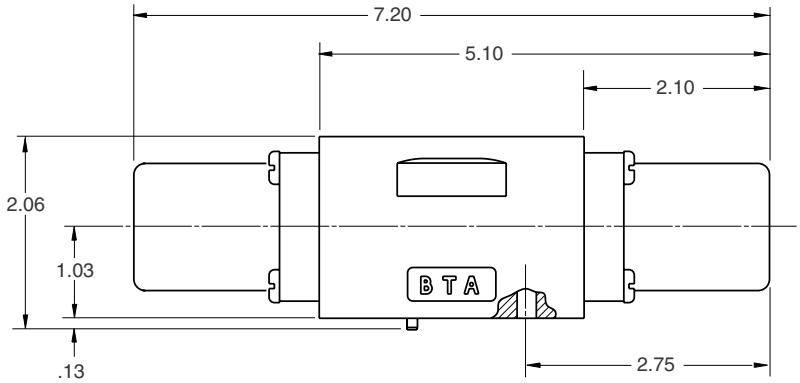




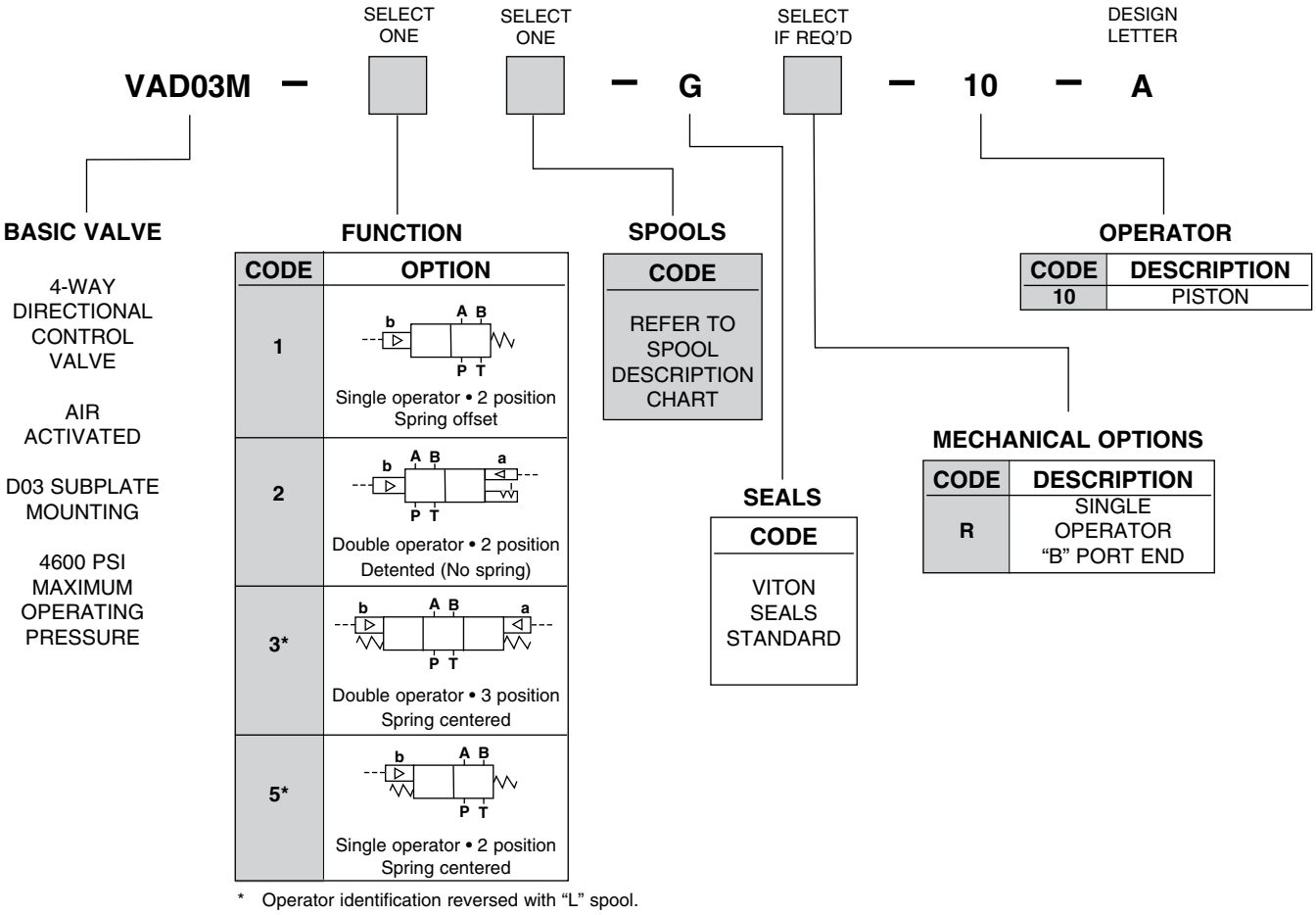


DIMENSIONS: MODELS VAD03M-2 & VAD03M-3





ORDERING INFORMATION



BASIC VALVE

4-WAY DIRECTIONAL CONTROL VALVE

AIR ACTIVATED

D03 SUBPLATE MOUNTING

4600 PSI MAXIMUM OPERATING PRESSURE

FUNCTION

CODE	OPTION
1	Single operator • 2 position Spring offset
2	Double operator • 2 position Detented (No spring)
3*	Double operator • 3 position Spring centered
5*	Single operator • 2 position Spring centered

* Operator identification reversed with "L" spool.

SPOOLS

CODE
REFER TO SPOOL DESCRIPTION CHART

SEALS

CODE
VITON SEALS STANDARD

MECHANICAL OPTIONS

CODE	DESCRIPTION
R	SINGLE OPERATOR "B" PORT END

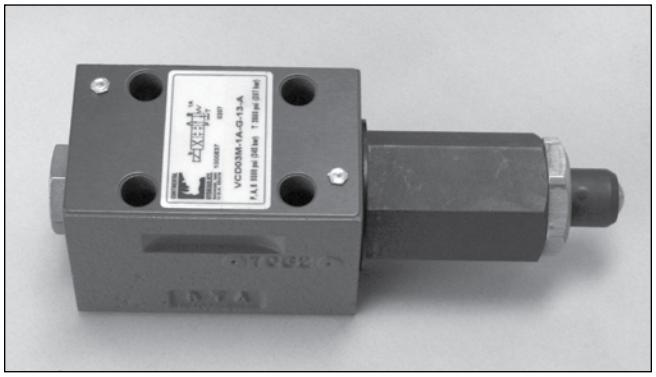
OPERATOR

CODE	DESCRIPTION
10	PISTON

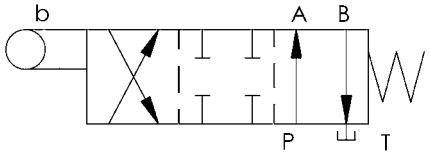
TYPICAL ORDERING CODE: **VAD03M-1A-G-10**

VCD03M

CAM ACTUATED, DIRECT OPERATED



VSD03M-1 Single Operator,
2 position, spring offset



Basic Valve Operation

This valve incorporates a cam operator on one end of the spool and an offset spring on the opposite end of the spool. With the spool in the normal position, the spring-loaded spool is held in position at the operator's side of the body by the offset spring providing a specific flow pattern. Actuating the push rod causes the spool to shift against the spring, to a position at the opposite side of the valve body providing a flow pattern opposite that obtained in the first (normal) position. The spool will remain in this position until the load is released from the push rod, allowing the spring to shift the spool back to its normal offset position. There is no center position dwell in this valve.

Physical Specifications

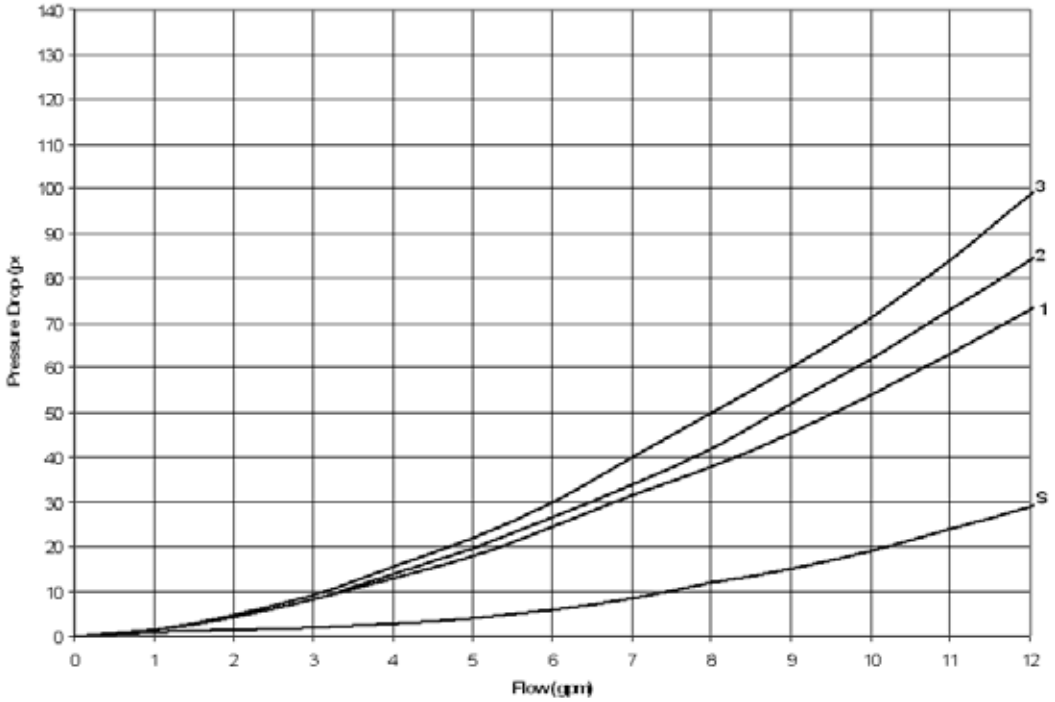
Weight (No modifications):
VCD03M-1 Single Operators
3.2 lbs. (1.45 kg)

Size: conforms to American National Standard, ANSI B93.7M, D03 Size Mounting Interface (ISO 4401 size 03 / CETOP 3 / NG 6)

Operating Specifications

Flow capacity: Maximum flows up to
12 GPM (46 lpm)
Maximum operating pressure:
P, A and B ports -5000 PSI
(345 bar)
Maximum tank line back pressure:
600 PSI (42 bar) including transient
Recommended fluid: Any hydraulic fluid
compatible with selected seal
materials
Fluid temperature range
Fluid temperatures up to 200°F
(93°C) will not appreciably affect
valve performance, however, from a
safety standpoint, temperatures
above 130°F. (54°C) are not
recommended.
Recommended fluid:
Operating viscosity ranges 80 to
350 SUS at operating temperature.
Filtration recommendations:
ISO CODE 18/16/13
Cycle rate:
Up to 1000 cycle/minute
Mounting: unrestricted
Recommended mounting bolt torque:
4-5 lbs.-ft.
.55 to .70 kg-m)
Duty cycle: Continuous

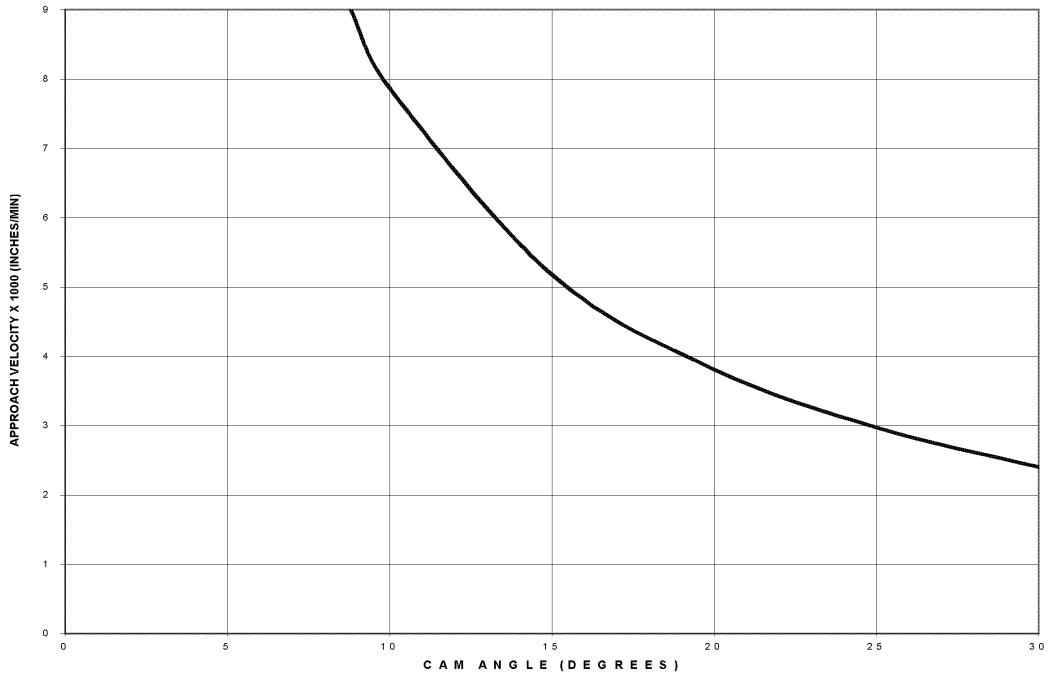
PRESSURE DROP CURVE CHARTS



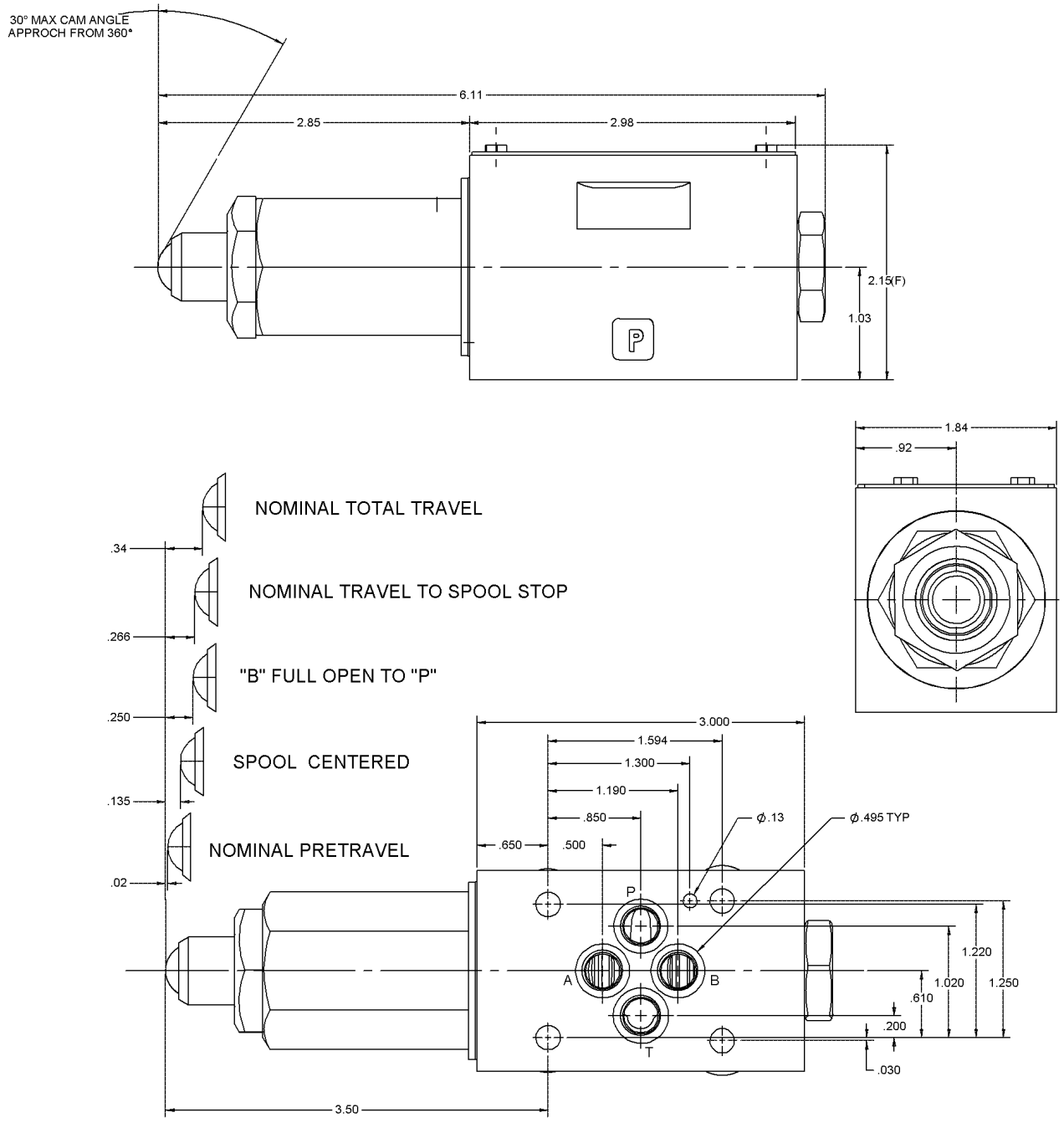
FLOW CURVE NUMBERS

Spool Code	Spool Shifted	
	P to A or B	A or B to T
A	3	2
G	1	3

MAXIMUM CAM VELOCITY APPROACH



DIMENSIONS:


30° MAX CAM ANGLE
APPROCH FROM 360°
6.11
2.85
2.98
2.15(F)
1.03
P
1.84
.92
NOMINAL TOTAL TRAVEL
.34
NOMINAL TRAVEL TO SPOOL STOP
.266
"B" FULL OPEN TO "P"
.250
SPOOL CENTERED
.135
NOMINAL PRETRAVEL
.02
3.000
1.594
1.300
1.190
.850
.650
.500
ϕ.13
ϕ.495 TYP
P
A
B
T
1.220
1.020
1.250
.610
.200
.030
3.50

ORDERING INFORMATION

SELECT ONE

DESIGN LETTER

VCD03M – 1 [ ] – G – 13 – A

BASIC VALVE

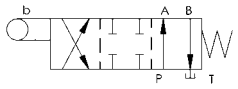
4-WAY DIRECTIONAL CONTROL VALVE

AIR ACTIVATED

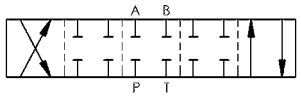
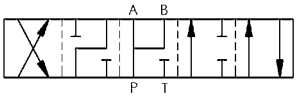
D03 SUBPLATE MOUNTING

4600 PSI MAXIMUM OPERATING PRESSURE

FUNCTION

CODE	OPTION
1	 CAM operated • 2 position Spring offset

SPOOL

CODE	SYMBOL
A	
G	

SEALS

CODE
VITON SEALS STANDARD

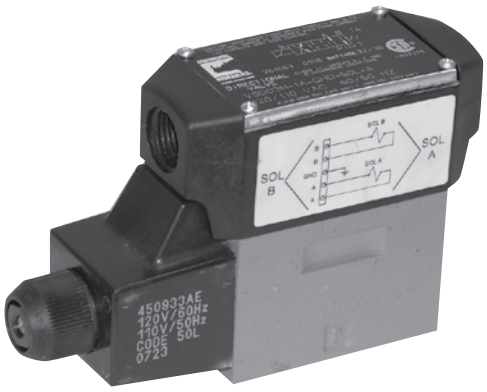
OPERATOR

CODE	DESCRIPTION
13	CAM TYPE

TYPICAL ORDERING CODE: **VCD03M-1A-G-13-A**

VSD03M SPECIAL APPLICATION PRODUCTS

HAZARDOUS DUTY, SOLENOID ACTUATED, DIRECT OR PILOT OPERATED



NFPA SIZE D03

VALVE FEATURES

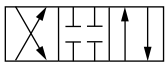
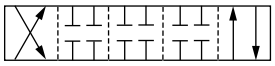
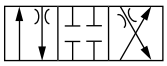
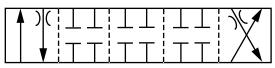
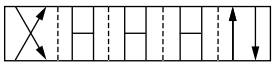
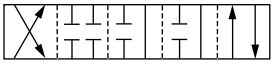
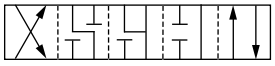
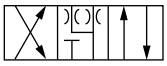
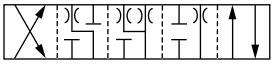
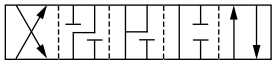
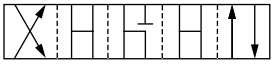
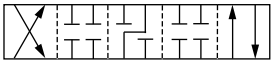
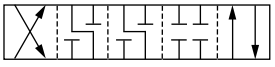
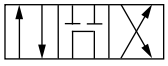
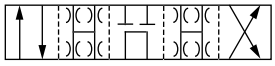
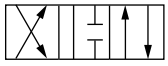
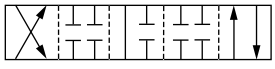
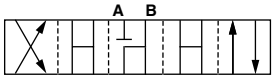
- Ground terminal located in wiring cavity.
- Electrical certification in accordance with **CSA STD. C22.2 No. 25-1966 for use in Class II; groups E, F, & G hazardous locations.**
- May be used in locations as defined in the National Electrical Code Class II; Div. 1 & 2; Groups E, F, & G. Designed in accordance with ANSI/NEMA ICS6110.26 Type 9 standards. (Combustible dust environments, i.e. metallic, coal, grain).
- CSA Certified (Canadian Std.Assn.).
- Same performance curves and specifications as standard valves unless noted below.

TYPICAL ELECTRICAL & RESPONSE TIME

SOLENOID CODE* 50L (110/120V 50/60 Hz)	VOLTAGE & FREQUENCY	VOLTAGE LIMITS	INRUSH CURRENT (AMPS)	HOLDING CURRENT	HOLDING POWER	RESPONSE TIME (MILLISECONDS)	
	VOLTS - Hz.	MIN. - MAX.	MAX.	(AMP)	(WATTS)	SOLENOID	SPRING
VSD03M	120 - 60	108 - 126	2.50	.56	28	12	15
	110 - 50	99 - 116		.69	31	14	15

* Consult factory on other voltages:

SPOOL DESCRIPTION

CODE	SYMBOL	SPOOL FUNCTION	CENTER POSITION	CROSSOVER
A			All ports blocked	All ports blocked
A2			All ports blocked	All ports blocked
B			All ports open	All ports open
E			P & A blocked B to T	All ports blocked
F			P blocked A & B to T	P blocked A or B to T
F1			P blocked A & B restricted to T	P blocked A or B restricted to T
G*			P to A or B T & A or B blocked	P to A or B T & A or B blocked
H			P to A & T B blocked	All ports open
J			P to B A & T blocked	All ports blocked
K			P to B blocked A to T	All ports blocked
L			P to T A & B blocked	All ports open, restricted
N			P to A B & T blocked	All ports blocked
Q			P to B & T A blocked	All ports open

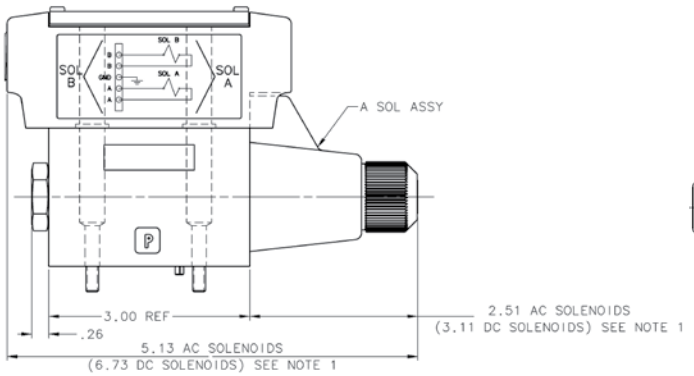
* VSD03M G spool available for quantity orders only. Consult factory for price and delivery.

NOTES: Code G or L available on Codes 3 and 5 valves only.
Code F1 available on Codes 1, 3 and 5 valves only.
Code B not available on Code 1 with D.C. solenoids.

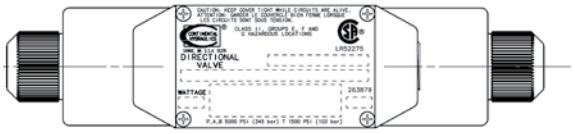
VSD03M VALVES
AC SOLENOIDS (SINGLE & DOUBLE)

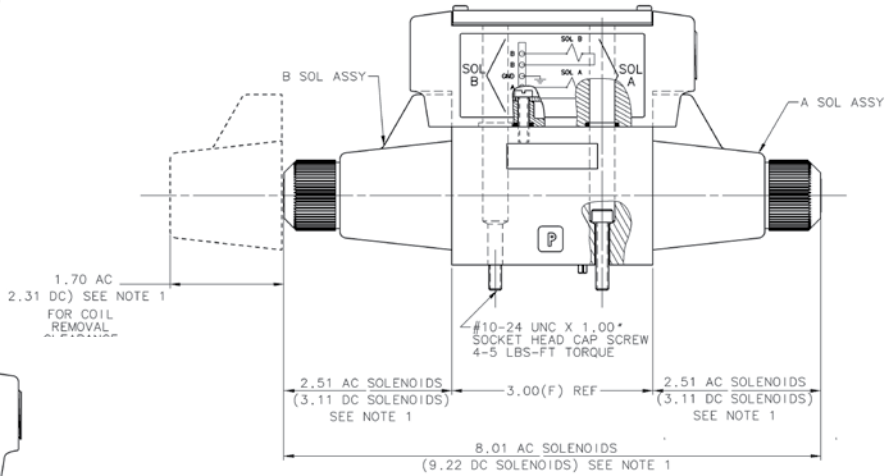
DIMENSIONS SHOWN IN: (MILLIMETERS)
INCHES

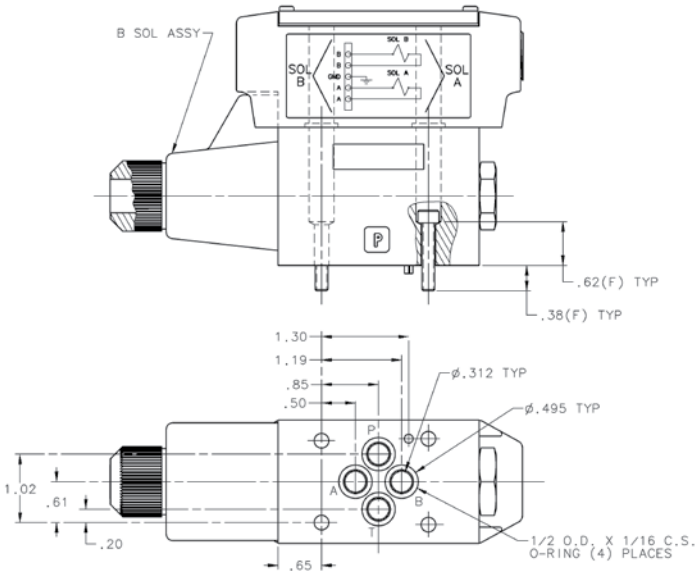
NFPA D03 SIZE
SEE MOUNTING
SURFACES SECTION FOR
INTERFACE PATTERN



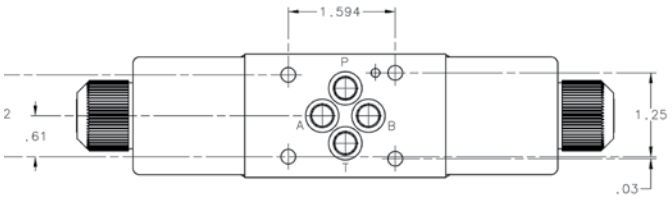
VSD03M CODE R SINGLE SOLENOID

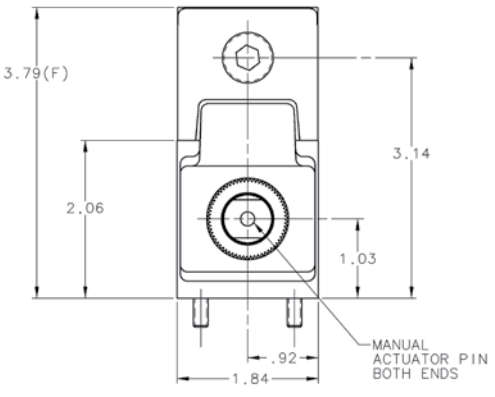






VSD03M SINGLE SOLENOID

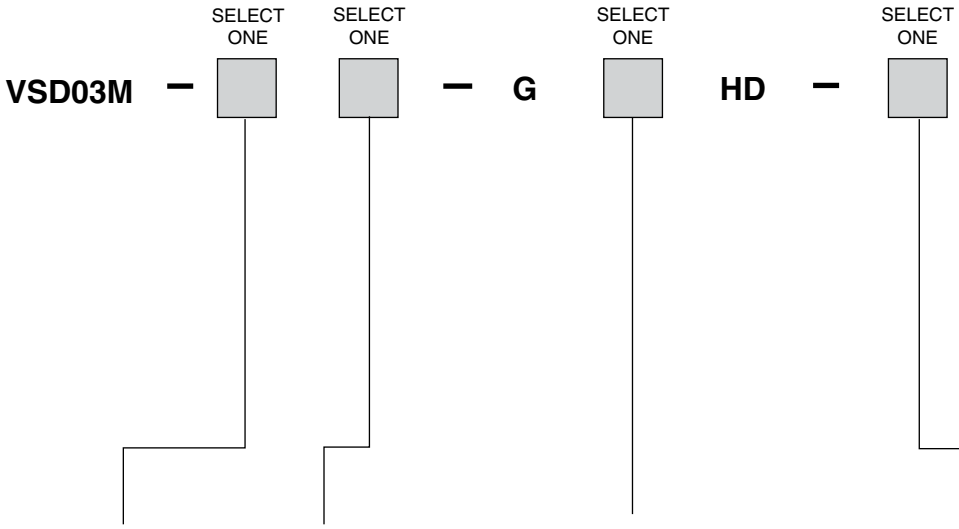




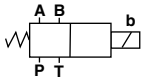
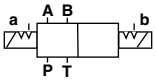
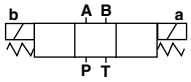
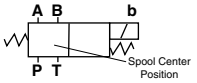
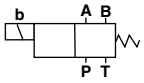
NOTE:

1. HAZARDOUS DUTY VALVES ARE NOT AVAILABLE WITH DC SOLENOIDS.

ORDERING INFORMATION



FUNCTION / SPOOLS

CODE	OPTION	AVAILABLE CODES
1	 Single actuator • 2 position Spring offset	A B F
2	 Double actuator • 3 position No spring, detented	A B F
3	 Double actuator • 3 position Spring centered	ALL SPOOLS
5	 Single actuator • 2 position Spring centered	ALL SPOOLS
6	 Single actuator • 2 position Spring offset, energize to center	A G B L F

MECHANICAL OPTIONS

CODE	OPTION
OMIT	NONE
R	SINGLE SOLENOID REVERSE ASS'Y. SOLENOID "A" SUPPLIED

SOLENOID

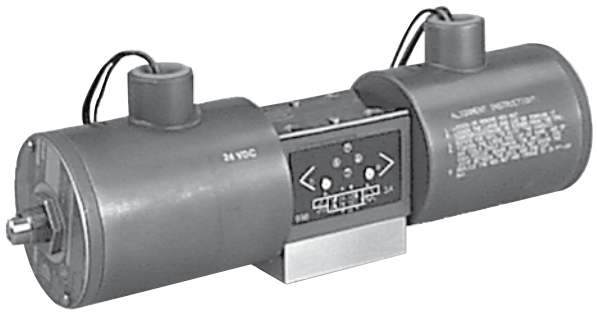
CODE	VOLTS
50L	120/110 VAC
52L	240/220 VAC

ORDERING INFORMATION: **VSD03M-2A-GHD-50L**

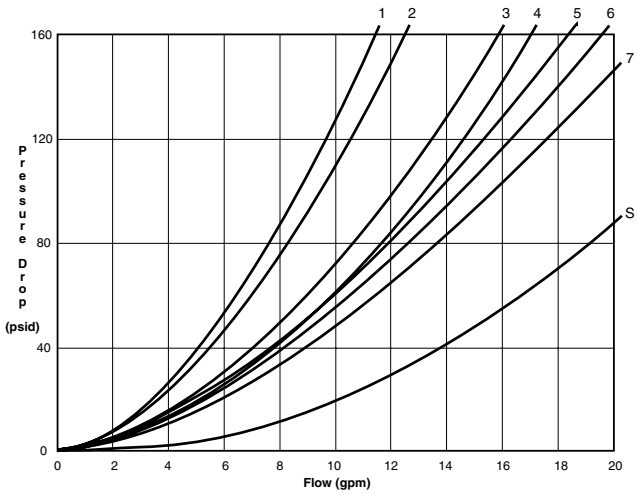
VSD03M SPECIAL APPLICATION PRODUCTS

HAZARDOUS DUTY, SOLENOID ACTUATED, DIRECT OR PILOT OPERATED

NFPA SIZE D03



TYPICAL PRESSURE DROP CURVES



TYPICAL PERFORMANCE SPECIFICATIONS

Performance is measured on a four-way circuit (full circuit). Performance may be reduced from that shown if a three-way circuit (half-circuit) is used, i.e. A or B port plugged.

FLOW RATE - (up to)		20 gpm	76 lpm
MAXIMUM OPERATING PRESSURE	P, A, B Ports	5000 psi	345 bar
	T Port (Includes surges)	1000 psi	69 bar
MAXIMUM CYCLE RATE	AC Solenoids	400 cpm	
	DC Solenoids	300 cpm	
MOUNTING SURFACE		NFPA/T3.5.1M R1-1984 (D03) (Formerly D01) ANSI/B93.7M - 1986 - D03 ISO 4401 - SIZE 05	
WEIGHT	Single Actuator	8.3 lbs.	3.76 kg
	Double Actuator	14.1 lbs.	6.40 kg
SPOOL CODES AVAILABLE		SEE CHART	

LISK SOLENOIDS ARE:
Class I Groups C & D
Class II Groups E,F & G
(Both Division I & 2)
Temperature Code No. T3C
- CSA Certified LR 49650-1
- UL Listed; File No. E71190 (N)
- Recognized by U.S. Coast Guard
- Registered by Lloyd"s Register of Shipping

All pressure drops shown on this data page are based on 100 SUS fluid viscosity and 0.87 specific gravity. See the chart below for other viscosities.

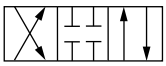
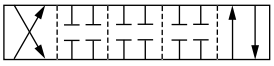
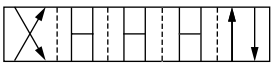
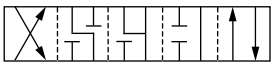
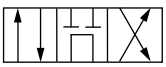
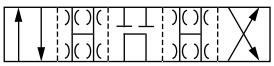
Fluid	CS	14.5	20.5	32	43	54	65	76	86
Viscosities	SUS	75	100	150	200	250	300	350	400
Multiplier		0.93	1.00	1.11	1.19	1.26	1.32	1.37	1.41

For any other specific gravity (G1) the pressure drop (ΔP) will be approximately $\Delta P1 = \Delta P\ (G1/G)$.

FLOW PATH ΔP CURVES

SPOOL TYPE	FLOW CURVE NUMBER				
	SPOOL SHIFTED		SPOOL CENTERED		
	P to A or B	A or B to T	P to A or B	A or B to T	P to T
A	5	4	N/A	N/A	N/A
A Code 1 & 2	2	2	N/A	N/A	N/A
B	1	4	1	3	3
B Code 1 & 2	2	1	3	3	4
F	5	1	N/A	6	N/A
L	3	5	N/A	N/A	7

SPOOL DESCRIPTION

CODE	SYMBOL	SPOOL FUNCTION	CENTER POSITION	CROSSOVER
A			All ports blocked	All ports blocked
B			All ports open	All ports open
F			P blocked A & B to T	P blocked A or B to T
L			P to T A & B blocked	All ports open, restricted

NOTE: Consult the factory for other spool configurations.

TYPICAL ELECTRICAL & RESPONSE TIME

SOLENOID CODE NO.	RATED VOLTAGE & FREQUENCY (VOLTS - Hz.)	ACCEPTABLE VOLTAGE (MIN. - MAX.)	MAXIMUM INRUSH CURRENT (AMP)	HOLDING CURRENT & RATED VOLTAGE (AMP)	HOLDING CURRENT & MINIMUM ACCEPTABLE VOLTAGE	HOLDING POWER & RATED VOLTAGE (WATTS)
80L	120 - 60	108 - 126	2.2	.58	.38	27
87L	24 DC	21 - 26	1.37	1.37	1.20	33
88L	12 DC	10 - 13	2.75	2.75	2.29	33

MAXIMUM FLOW**

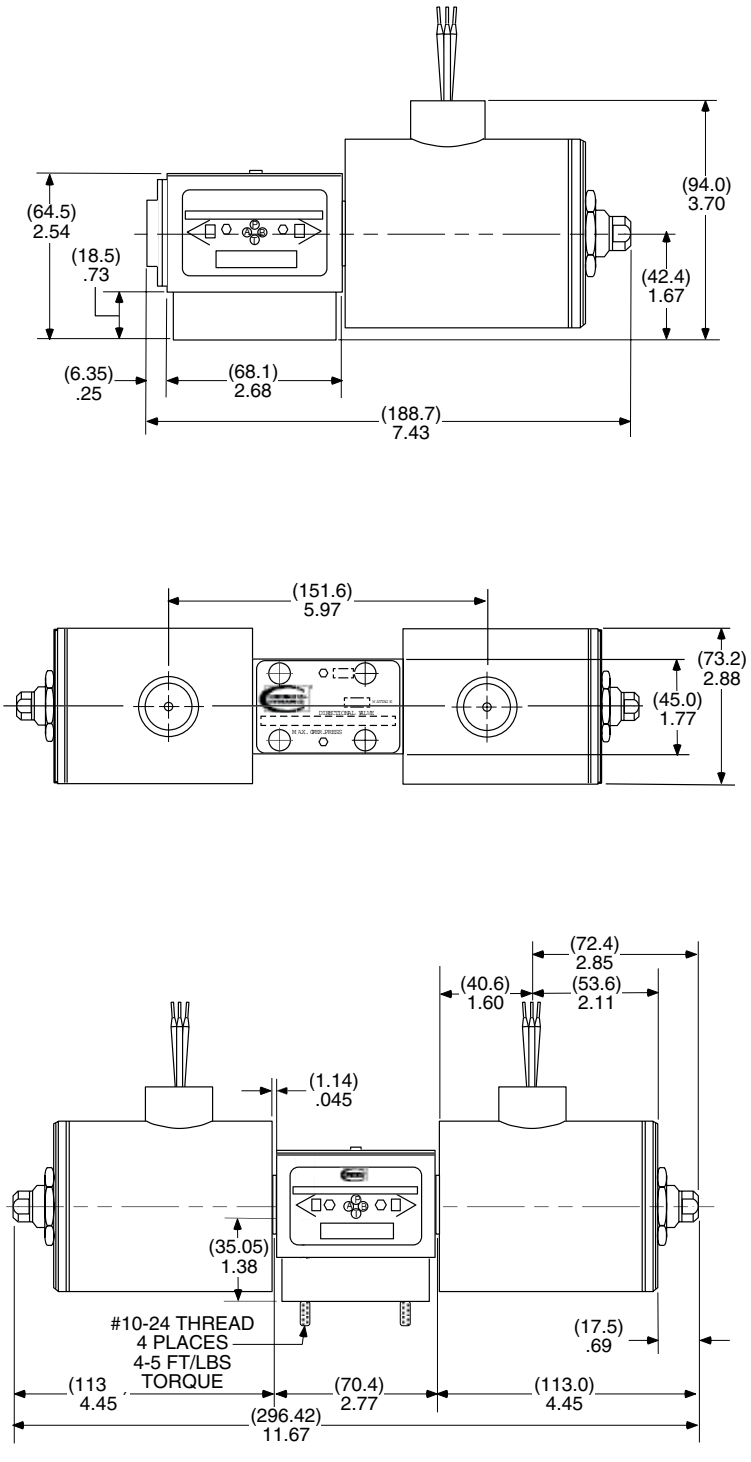
		SPOOL CODE							
	FUNCTION CODE	A		B		F*		L	
		AC	DC	AC	DC	AC	DC	AC	DC
(lpm) (70 bar) @ gpm 1000 psi	1	(49) 13	(49) 13	(60) 16	(45) 12	N/A	N/A	N/A	N/A
	2	(57) 15	(49) 13	(64) 17	(49) 13	N/A	N/A	N/A	N/A
	3, 5	(76) 20	(68) 18	(49) 13	(38) 10	(49) 13	(45) 12	N/A	N/A
(lpm) (140 bar) @ gpm 2000 psi	1	(42) 11	(42) 11	(53) 14	(34) 9	N/A	N/A	N/A	N/A
	2	(53) 14	(45) 12	(64) 17	(49) 13	N/A	N/A	N/A	N/A
	3, 5	(76) 20	(68) 18	(49) 13	(38) 10	(49) 13	(38) 10	N/A	N/A
(lpm) (210 bar) @ gpm 3000 psi	1	(42) 11	(42) 11	(49) 13	(19) 5	N/A	N/A	N/A	N/A
	2	(49) 13	(45) 12	(64) 17	(34) 9	N/A	N/A	N/A	N/A
	3, 5	(76) 20	(64) 17	(45) 12	(38) 10	(45) 12	(23) 6	N/A	N/A
(lpm) (276 bar) @ gpm 4000 psi	1	(42) 11	(42) 11	(49) 13	(11) 3	N/A	N/A	N/A	N/A
	2	(49) 13	(42) 11	(60) 16	(23) 6	N/A	N/A	N/A	N/A
	3, 5	(68) 18	(64) 17	(42) 11	(26) 7	(15) 4	N/A	N/A	N/A
(lpm) (345 bar) @ gpm 5000 psi	1	(42) 11	(42) 11	(45) 12	(11) 3	N/A	N/A	N/A	N/A
	2	(49) 13	(38) 10	(60) 16	(15) 4	N/A	N/A	N/A	N/A
	3, 5	(68) 18	(57) 15	(38) 10	(11) 3	N/A	N/A	N/A	N/A

N/A Not Available. * "F" spool pilot valve may be used up to 5000 psi.

** Performance measured on a four-way circuit (full circuit) with cylinder ports looped together @ 90% voltage for AC & DC solenoids measured @ 100 SUS oil viscosity & warm solenoids. Performance may be reduced from that shown with one flow direction as in the case when "A" or "B" port is plugged (half circuit).

DIMENSIONS

DIMENSIONS SHOWN IN: (MILLIMETERS)
INCHES



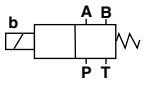
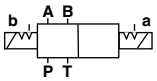
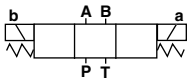
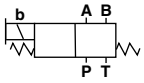
VSD03M SPECIAL APPLICATION PRODUCTS

WITH EXPLOSION-PROOF SOLENOIDS

ORDERING INFORMATION

	SELECT ONE	SELECT ONE		SELECT IF REQ'D		SELECT ONE	SELECT ONE		DESIGN LETTER
VSD03M*	–		–	**G**		**EX**	–	–	**A**

FUNCTION

CODE	OPTION
1	 Single operator • 2 position Spring offset
2	 Double operator • 2 position Detented (No spring)
3	 Double operator • 3 position Spring centered
5	 Single operator • 2 position Spring centered

SPOOLS

CODE
REFER TO SPOOL DESCRIPTION CHART

SEALS

CODE
VITON SEALS STANDARD

SOLENOID MFG.

CODE	DESCRIPTION
L	LISK

MECHANICAL OPTIONS

CODE	DESCRIPTION
R	SINGLE SOLENOID "B" PORT END

EXPLOSION-PROOF OPTIONS

CODE	DESCRIPTION
EX	EXPLOSION PROOF SOLENOIDS

SOLENOID

CODE	VOLTAGE
WITH 24" LEAD WIRES	
80	120VAC - 60 Hz
87	24 VDC
88	12 VDC

* **PLEASE NOTE:**
The complete VSD03M valve assembly is not CSA or UL certified. However, the Lisk solenoid valves are certified. Rise block included.

TYPICAL ORDERING CODE: **VSD03M-3A-GEX-80L-A**

Helping You Design Greater Safety Into Your Product

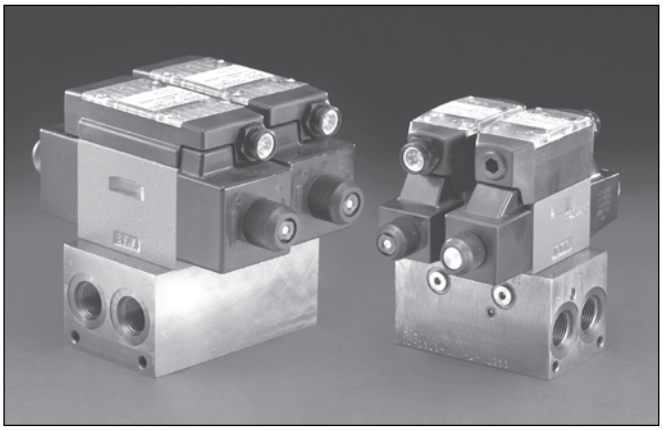
Many new regulations require double redundant monitoring in virtually all hydraulic systems. Only Continental Hydraulics offers an off-the-shelf double redundant directional control valve assembly that can help you meet the new regulations.

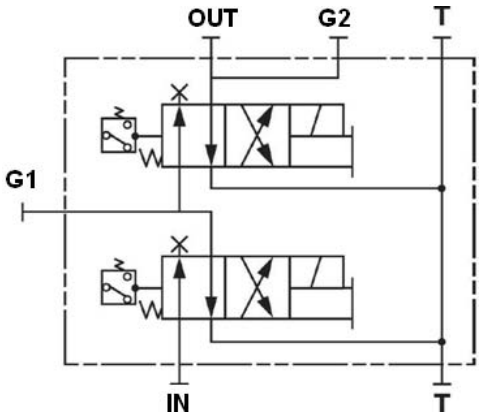
Double directional control valve redundancy means that if one critical valve fails, or your control circuit (i.e. light curtain) tells one of the valves to shut off, the machine or down-stream system will be disconnected from the pressure source. Any stored hydraulic pressure will routed back to the tank. Your system monitoring equipment will alert you to the failure, so the system can be shut down gracefully, avoiding damage and injury.

These double redundant monitoring valve assemblies are equipped with two main spool position monitoring switches, and two pressure tap ports. This allows your control circuit to monitor the spool position, and whether pressure is rising or falling. This information can be used by the controls to help meet some of the new regulations, and help you design a better machine.

Continental Hydraulics Double Redundant Valve Assemblies are ideal for applications such as:

- Brick and Block Manufacturing
- Automotive Assembly Lines
- Machining Centers
- Crushing Boxes
- Compacting Refuse
- Missile Test Stations
- Recharging Systems in Critical Petro-Chemical/Energy Producing Applications
- Pulp and Paper Product Production
- Manufacturing Automobiles
- Positioning Precision Machine Tools



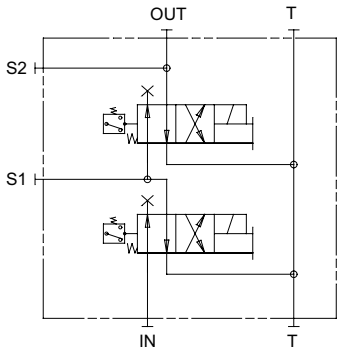


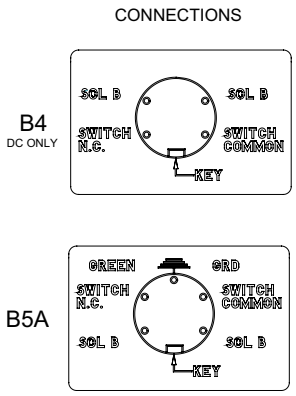
- Saw Mills
- Pouring Molten Steel
- Fish and Poultry Processing Plants
- Powering Dam Gates
- Motion Simulators
- Controlling Entertainment Rides

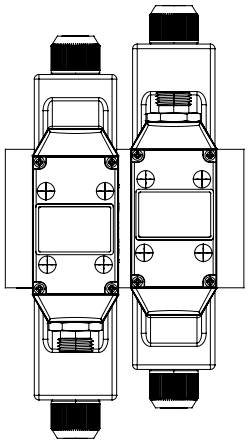
Continental Hydraulics Double Redundant Directional Control Valve Assemblies are available in D03 and D05 sizes, with flow rates from 1 to 20 GPM.

DOUBLE REDUNDANT

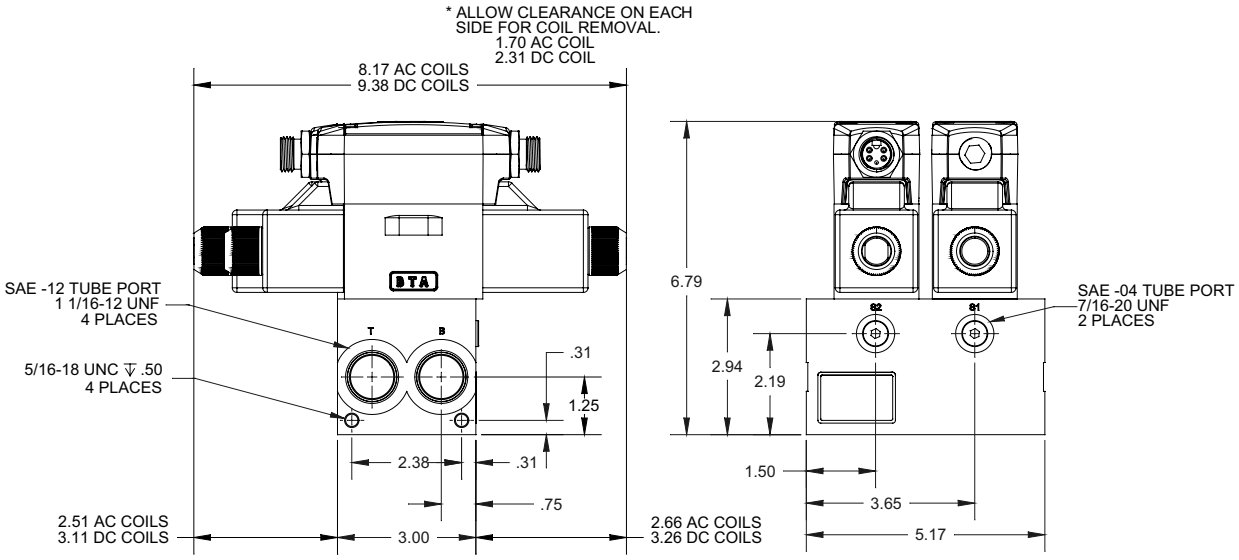
SOLENOID ACTUATED, DIRECT OPERATED







KIT DUAL MONITORING D03



ORDERING INFORMATION

SELECT ONE — SELECT ONE

Kit Dual Monitoring D03- [ ] - [ ] -M1233

Electrical Connection

Code	Description
Omit	5 pin Connector AC or DC Coils
B4	4 pin Connector DC Voltage Only

Solenoid

Code	Voltage	Description
60L	120/110AC	2 pin Coil
70L	24 VDC	2 pin Coil

DIMENSIONS: Mounting surfaces must be flat within 0.1 mm per 100 mm (.0004 in. per 4.0 in.) and N8 63AA finish.

NOTES: A = Cylinder Port B = Cylinder Port T = Tank Port
P = Pressure Port X = Pilot Port Y = Drain Port

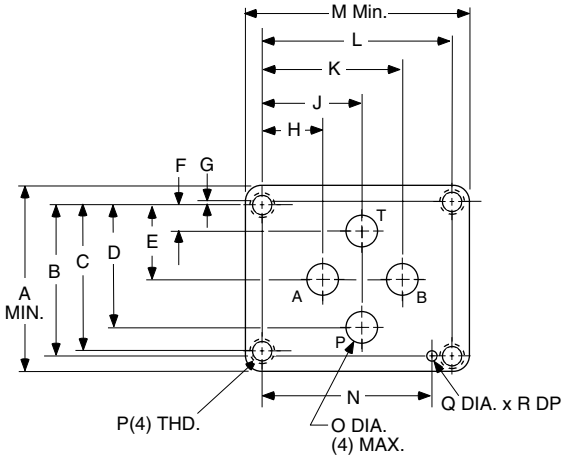
D03 MOUNTING SURFACE

Conforms to ANSI/B93.7-M-1986, ISO 4401 SIZE 03

DIMENSIONS SHOWN IN: (MILLIMETERS)
INCHES

DIMENSIONS

	mm	INCH		mm	INCH		mm	INCH
A	43.0	1.70	**G**	.075	0.03	**N**	33.0	1.30
B	31.8	1.2	**H**	12.7	0.50	**O**	6.3	0.25
C	31.0	1.22	**J**	21.5	0.85	**P**	10-24UNC-2B	
D	25.9	1.02	**K**	30.2	1.19	**Q**	4.0	.16
E	15.5	0.61	**L**	40.5	1.594	**R**	4.0	.16
F	5.1	0.20	**M**	51.0	2.00			

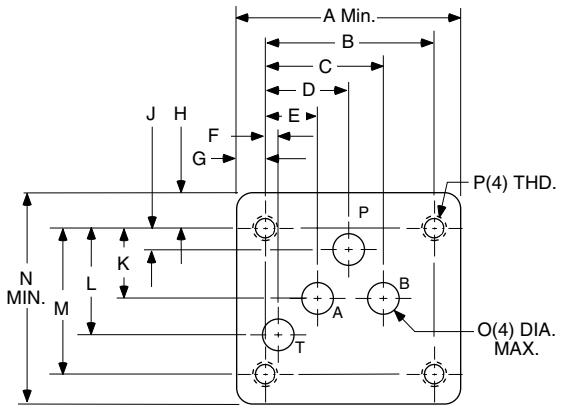


D05 MOUNTING SURFACE

Conforms to ANSI/B93.7-M-1986, ISO 4401 SIZE 05

DIMENSIONS

	mm	INCH		mm	INCH		mm	INCH
A	72.1	2.84	**F**	3.2	0.13	**L**	32.5	1.28
B	54.0	2.13	**G**	9.1	0.36	**M**	46.0	1.81
C	37.3	1.47	**H**	11.2	0.44	**N**	57.9	2.28
D	27.0	1.06	**J**	6.4	0.25	**O**	11.2	0.44
E	16.7	0.66	**K**	21.4	0.844	**P**	1/4-20 UNC	



NFPA MOUNTING SURFACES

DIMENSIONS: Mounting surfaces must be flat within 0.1 mm per 100 mm (.0004 in. per 4.0 in.) and N8 63AA finish.

NOTES: A = Cylinder Port B = Cylinder Port T = Tank Port
P = Pressure Port X = Pilot Port Y = Drain Port

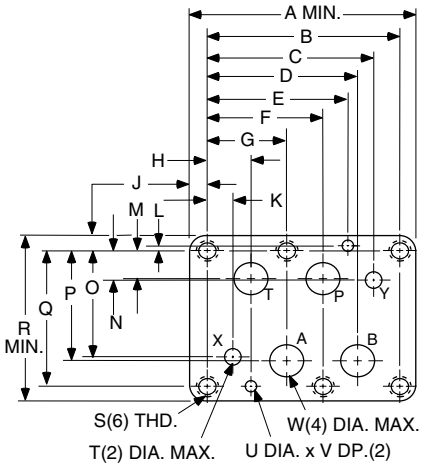
D08 MOUNTING SURFACE

Conforms to ANSI/B93.7-M-1986, ISO 4401 SIZE 08

DIMENSIONS SHOWN IN: (MILLIMETERS) INCHES

DIMENSIONS

	mm	INCH		mm	INCH		mm	INCH
A	154.0	6.00	**J**	11.1	0.44	**R**	116.0	4.57
B	130.2	5.13	**K**	17.5	0.69	**S**	1/2-13 UNC	
C	112.7	4.44	**L**	4.8	0.19	**T**	11.2	0.44
D	100.8	3.97	**M**	17.5	0.69	**U**	7.5	.28
E	94.5	3.719	**N**	19.0	0.75	**V**	9.7	0.38
F	77.0	3.03	**O**	73.0	2.8	**W**	23.4	0.92
G	53.2	2.09	**P**	74.6	2.93			
H	29.4	1.16	**Q**	92.1	3.63			

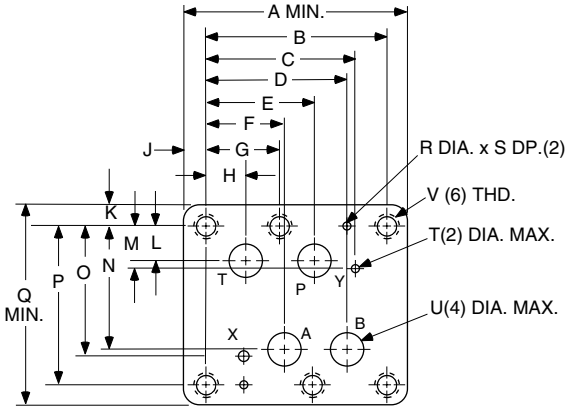


D10 MOUNTING SURFACE

Conforms to ANSI/B93.7-M-1986, ISO 4401 SIZE 10

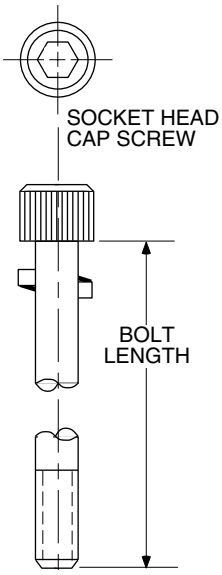
DIMENSIONS

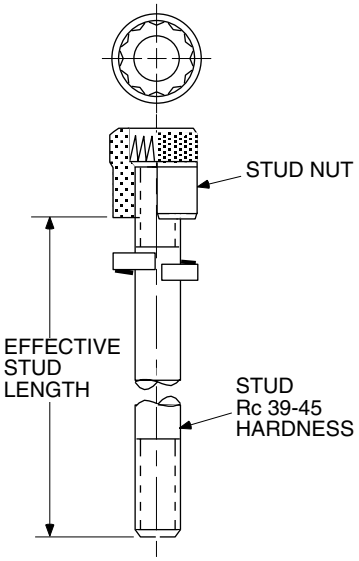
	mm	INCH		mm	INCH		mm	INCH
A	230.1	9.06	**H**	41.3	1.63	**P**	158.8	6.25
B	190.5	7.50	**J**	19.0	0.75	**Q**	198.9	7.83
C	168.4	6.63	**K**	19.0	0.75	**R**	7.1	0.28
D	147.6	5.81	**L**	35.1	1.38	**R**	9.7	.38
E	114.3	4.50	**M**	44.5	1.75	**T**	11.2	0.44
F	82.6	3.25	**N**	123.8	4.88	**U**	32.0	1.25
G	76.2	3.00	**O**	130.2	5.13	**V**	3/4-10 UNC	

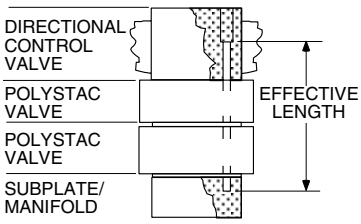


VALVE BOLT KITS

MODULAR STACK VALVE	VALVE STACK(MM) INCH	ORDER CODE	TYPE	WORKING LENGTH (MM) INCH	WEIGHT lbs. (kg)
V5M / VD03M NFPA D03 CETOP 3 NG6 **KIT: (4) 10-24NC FASTENERS (4) #10 LOCKWASHERS**	DIRECTIONAL VALVE ONLY	BD03-100	**BOLT**	(25.5) 1.00	(0.02) 0.05
	VALVE + (1) (40.0) 1.57 MODULAR STACK	BD03-250	**BOLT**	(63.8) 2.50	(0.04) 0.08
	VALVE + (1) (50.0) 1.96 MODULAR STACK	BD03-300	**BOLT**	(76.0) 3.00	(0.05) 0.13
	VALVE + (2) (40.0) 1.57 MODULAR STACK	BD03-4125	**BOLT**	(104.8) 4.125	(0.08) 0.18
	VALVE +(1) (40.0) MODULAR 1.57 +(1) (50.0) 1.96	BD08-450	**BOLT**	(114.0) 4.50	(0.09) 0.20
	VALVE + (3) (40.0) 1.57 MODULAR STACK	BD03-575	**BOLT**	(146.0) 5.75	(0.10) 0.23
	VALVE+ (2) (40.0) 1.57 MODULAR STACK	BD03-460	**STUD**	(104.8) 4.125	(0.08) 0.18
	VALVE + (3) (40.0) 1.57 MODULAR STACK	BD03-616	**STUD**	(146.0) 5.75	(0.10) 0.23
V12M / VD0-5M NFPA D05 CETOP 5 NG10 **KIT: (4) 1/4-20NC FASTENERS (4) 1/4" LOCKWASHERS**	DIRECTIONAL VALVE ONLY	BD05-175	**BOLT**	(44.6) 1.75	(0.05) 0.11
	VALVE + (1) (55.0) 2.17 MODULAR STACK	BD05-400	**BOLT**	(102.0) 4.00	(0.10) 0.24
	VALVE + (2) (55.0) 2.17 MODULAR STACK	BD05-6125	**BOLT**	(155.6) 6.125	(0.20) 0.44
	VALVE + (3) (55.0) 2.17 MODULAR STACK	BD05-825	**BOLT**	(209.6) 8.25	(0.25) 0.55
	VALVE + (2) (55.0) 2.17 MODULAR STACK	BD05-667	**STUD**	(155.6) 6.125	(0.20) 0.44
	VALVE + (3) (55.0) 2.17 MODULAR STACK	BD05-884	**STUD**	(209.6) 8.25	(0.25) 0.55
V50M / VD08M DVS50M NFPA D08 CETOP 8 NG25 **(6) 1/2-13NC FASTENERS (6) 1/2" LOCKWASHERS**	DIRECTIONAL VALVE ONLY	BD08-275	**BOLT**	(70.1) 2.75	(0.57) 1.25
	VALVE + (1) (88.9) 3.44 MODULAR STACK	BD08-625	**BOLT**	(159.4) 6.25	(1.02) 2.25
	VALVE + (1) (101.6) 4.00 MODULAR STACK	BD08-675	**BOLT**	(172.1) 6.75	(1.08) 2.40
	VALVE + (2) (88.9) 3.44 MODULAR STACK	BD08-9625	**BOLT**	(244.5) 9.625	(1.70) 3.75
	VALVE +(1) (88.9) MODULAR 3.44 +(1) (101.6) 4.00	BD08-1020	**BOLT**	(260.0) 10.25	(1.81) 4.00
	VALVE + (2) (101.6) 4.0 MODULAR STACK	BD08-1080	**BOLT**	(273.0) 10.75	(1.87) 4.13
	VALVE + (2) (88.9) 3.44 MODULAR STACK	BD08-1025	**STUD**	(244.5) 9.625	(1.70) 3.75
	VALVE +(1) (88.9) MODULAR 3.44 +(1) (101.6) 4.00	BD08-1075	**STUD**	(260.0) 10.25	(1.81) 4.00
	VALVE +(2) (101.6) 4.00 MODULAR STACK	BD08-1125	**STUD**	(273.0) 10.75	(1.87) 4.13
V100M / VD10M NFPA D10 CETOP 10 **KIT: (6) 3/4-10NC FASTENERS (6) 3/4" LOCKWASHERS**	DIRECTIONAL VALVE ONLY	BD10-250	**BOLT**	(63.8) 2.50	(1.19) 2.63







DIRECTIONAL CONTROL VALVES

ISO 9001:2000 CERTIFIED

When reliability and durability count....count on Continental Hydraulics!

Continental Hydraulics is a world leading hydraulic components manufacturer. Since 1955 we've been designing and manufacturing hydraulic equipment to withstand the most demanding applications. Continental Hydraulics is ISO 9001:2000 Certified.

Our Approach

Continental Hydraulics welcomes the opportunity to work with you to help design your hydraulic system from the ground up. Our Application specialists and our trained local support Distributors can advise you of the most efficient, cost-effective components available off the shelf, or work with you on custom designs to meet your needs.

Product Characteristics

Continental Hydraulic's products are designed to provide maximum overall value. Reliability, durability, and efficiency are designed in. Ease of maintenance, quiet operation and low operating costs are common design features.

Product Lineup

Pumps

- PVR Vane Pumps, rugged duty pumps for medium pressure applications
- PVX Vane Pumps, quiet pumps for higher pressure applications
- HPV Piston Pumps, efficient pumps for higher pressure applications

Valves

- D03/5/8/10 Directional Control Valves, for a variety of applications
- D03/5/8 Proportional Control Valves offer more control options, from programmable On-board amplifiers to panel and Euro card mounts.
- Modular Stack Valves for controlling flows and pressures in industrial and/or mobile applications
- Cartridge Valves for controlling flows and pressures in compact applications

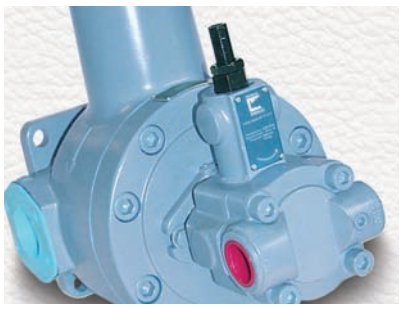
Power Units

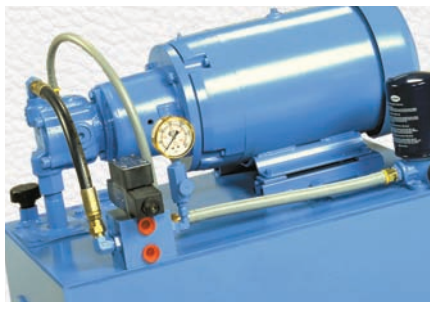
- Little Champ series for smaller and/or economical applications
- JIC and L-Shape series for larger industrial applications
- Available from fractional horse power and 3 gallon tank size, to 100 horse power, 330 gallon tank, straight out of the catalog.
- Custom Designed and larger units to match your application, exactly

Continental Hydraulics manufactured components are covered by a 3 year warranty!

How can we help you?

Contact your Continental Hydraulics representative for solutions to your toughest hydraulics problems. Whether it's reducing your operating expenses, or increasing your production capability, you can count on Continental Hydraulics!





CONTINENTAL HYDRAULICS™

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