

CONTINENTAL

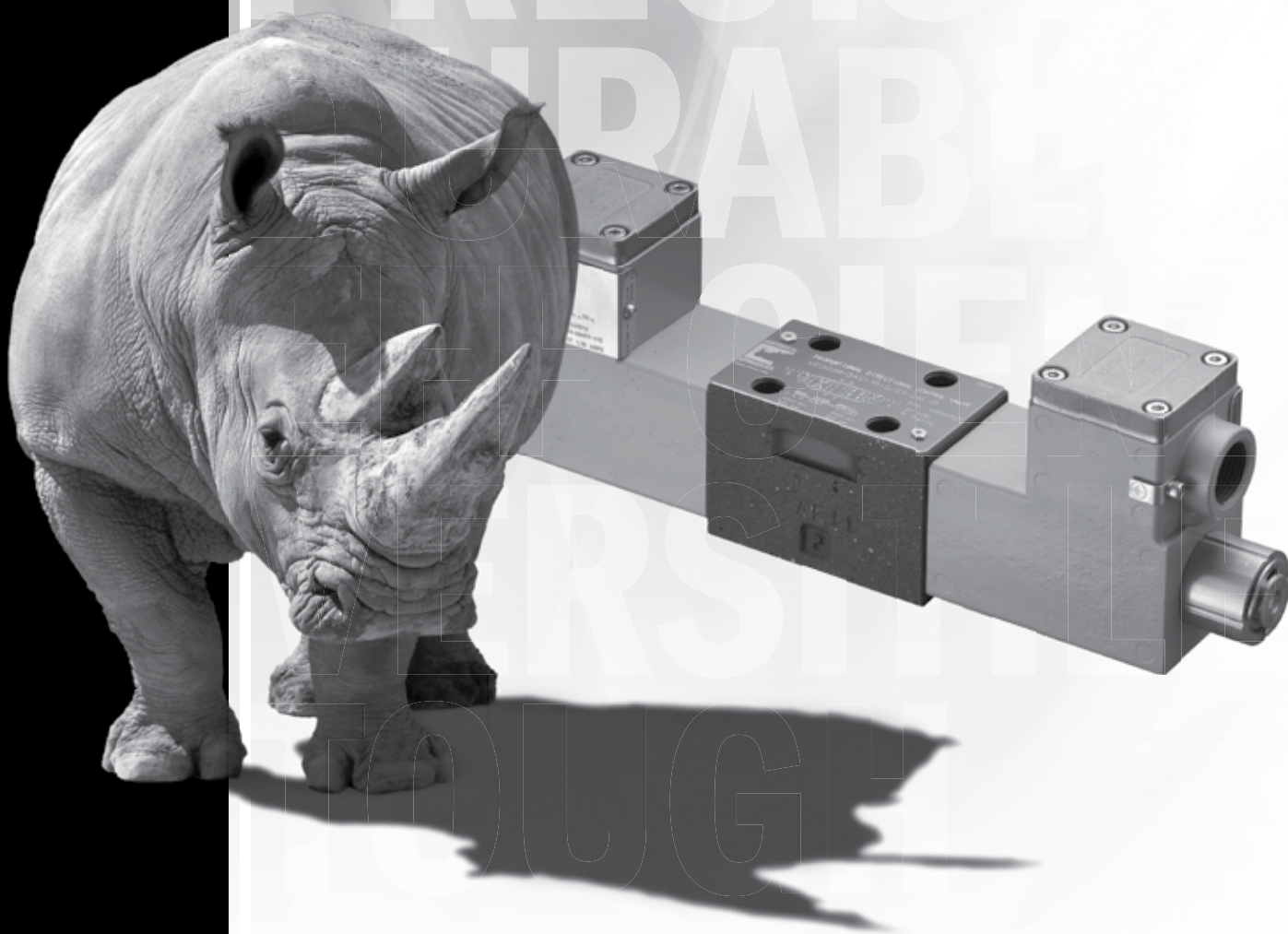


CONTINENTAL HYDRAULICS

# VSD03M-EXA

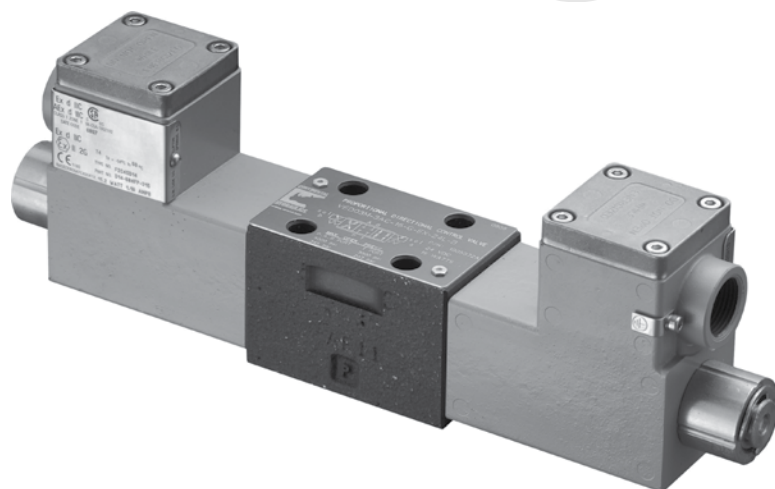
HAZARDOUS DUTY SOLENOID ACTUATED, DIRECT OPERATED

VSD03M-EXA - HAZARDOUS DUTY SOLENOID ACTUATED, DIRECT OPERATED



# VSD03M-EXA

## HAZARDOUS DUTY SOLENOID ACTUATED, DIRECT OPERATED



### DESCRIPTION

The solenoid operated directional control valves are in compliance with ATEX 94/9/CE standards and are suitable for the use in potentially explosive atmospheres, that fall within either the ATEX II 2GD for gas or for dust classification.

**CERTIFICATE NUMBER: CEC II ATEX 076**

### OPERATION

Continental's line of explosion proof, 4-way, directional control valves is available in 2 position spring offset, 2 position detent, 2 position spring centered and 3 position spring centered versions. Four spools are available: block center, open center, float center and tandem center.

The explosion proof solenoids are available in 12 VDC, 24VDC and 120VAC. The AC coil is equipped with a rectifier bridge. The DC coils have a built-in bi-directional diode for surge suppression.

### TYPICAL PERFORMANCE SPECIFICATIONS

|                                   |                    |                                 |          |
|-----------------------------------|--------------------|---------------------------------|----------|
| <b>MAXIMUM OPERATING PRESSURE</b> | P - A - B Ports    | 5000 psi                        | 350 bar  |
|                                   | T Port             | 3000 psi                        | 210 bar  |
| <b>MAXIMUM FLOW RATE</b>          |                    | 20 gpm                          | 76 l/min |
| <b>MOUNTING SURFACE</b>           |                    | NFPA D03<br>ISO 4401-03-02-0-03 |          |
| <b>CYCLE RATE</b>                 | DC Solenoid        | Up To 18,000 cycles/hr          |          |
| <b>WEIGHT</b>                     | DC Single Solenoid | 5.3 lbs                         | 2.4 kg   |
|                                   | DC Dual Solenoid   | 8.6 lbs                         | 3.9 kg   |

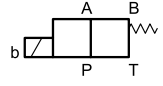
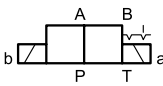
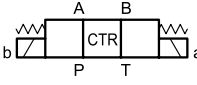
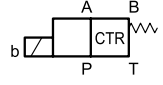
|                                      |             |                              |               |
|--------------------------------------|-------------|------------------------------|---------------|
| <b>RANGE TEMPERATURES (SEE NOTE)</b> | Ambient     | -4 to +140 °F                | -20 to +60 °C |
|                                      | Fluid       | -4 to 176 °F                 | -20 to +80 °C |
| <b>FLUID VISCOSITY</b>               | Range       | 60-1900 SUS                  | 10-400 cSt    |
|                                      | Recommended | 120 SUS                      | 25 cSt        |
| <b>FLUID CONTAMINATION</b>           |             | ISO 4406:1999 Class 20/18/15 |               |

#### NOTE:

A version resistant up to -40 °F (-40°C) is available upon request.

# IDENTIFICATION CODE

VSD03M -  -  - EXA -  L -  \_\_\_\_\_ DESIGN LETTER

| FUNCTION |                                                                                     |
|----------|-------------------------------------------------------------------------------------|
| 1        |    |
|          | Single Operator<br>2 Position<br>Spring Offset                                      |
| 2        |    |
|          | Dual Operator<br>2 Position<br>Detented (No Spring)                                 |
| 3        |  |
|          | Dual Operator<br>3 Position<br>Spring Centered                                      |
| 5        |  |
|          | Single Operator<br>2 Position<br>Spring Centered                                    |

| SEAL |            |
|------|------------|
| A    | Buna (STD) |
| G    | Viton      |

Spool Type  
See Next Page

| MECHANICAL<br>OMIT IF NOT REQUIRED |                                                                           |
|------------------------------------|---------------------------------------------------------------------------|
| R                                  | Single Solenoid 'B' Port End.<br>Available Only With Function<br>1 And 5. |

| SOLENOID |                                            |
|----------|--------------------------------------------|
| 130      | 120 V AC- 60 Hz<br>With Built-In Rectifier |
| 137      | 24 V DC                                    |
| 138      | 12 V DC                                    |

| CERTIFICATION |                             |
|---------------|-----------------------------|
| A             | 94/9/EC Directive<br>(ATEX) |

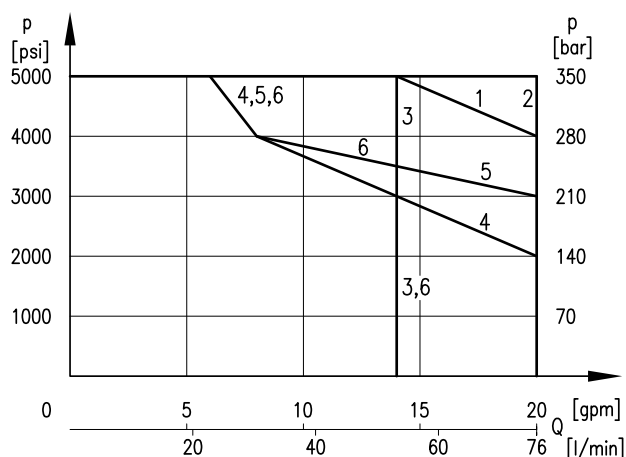
TYPICAL ORDERING CODE:  
**VSD03M-3A-A-EXA-137L-C**

VSD03M-EXA - HAZARDOUS DUTY SOLENOID ACTUATED, DIRECT OPERATED

| SPOOLS |        |          |                                       |                                                      |                   |
|--------|--------|----------|---------------------------------------|------------------------------------------------------|-------------------|
| NAME   | SYMBOL | FUNCTION | CENTER POSITION                       | CROSSOVER                                            | FUNCTION MATCHING |
| A      |        |          | All ports blocked                     | P→B or P→A<br>T blocked                              | 1, 2, 3, 5        |
| A1     |        |          | All ports closed                      | P→B and A→T restricted or<br>P→A and B→T restricted  | 3, 5              |
| B      |        |          | All ports open                        | All ports open                                       | 1, 2, 3, 5        |
| E      |        |          | P and A blocked,<br>and B→T           | All ports blocked or<br>P and A blocked and B→T      | 3, 5              |
| E1     |        |          | P and A blocked,<br>B restricted to T | All ports blocked or<br>A blocked and B→T restricted |                   |
| F      |        |          | P blocked,<br>A→T and B→T             | P blocked and<br>A→T or B→T                          |                   |
| F1     |        |          | P blocked,<br>A and B restricted to T | P blocked,<br>A or B restricted to T                 |                   |
| G      |        |          | P to A and B<br>T blocked             | P→B or P→A<br>T blocked                              |                   |
| H      |        |          | P and A to T,<br>B blocked            | All ports open, restricted                           |                   |
| J      |        |          | P→B<br>A and T blocked                | P→B and A blocked<br>or all port blocked             |                   |
| K      |        |          | P and B blocked,<br>and A→T           | P and B blocked and A→T<br>or all ports blocked      |                   |
| K1     |        |          | P and B blocked,<br>A restricted to T | P blocked and A→T<br>restricted or all ports blocked |                   |
| L      |        |          | P→T,<br>A and B blocked               | All ports open, restricted                           |                   |
| N      |        |          | P→A<br>B and T blocked                | All ports blocked, or P→A<br>B and T blocked         |                   |
| Q      |        |          | P and B to T,<br>A blocked            | All ports open, restricted                           |                   |
| X      |        |          | -                                     | All ports blocked                                    | 2                 |
| AN     |        |          | -                                     | All ports blocked                                    | 2                 |
| AJ     |        |          | -                                     | All ports blocked                                    | 2                 |

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

## PERFORMANCE CURVE

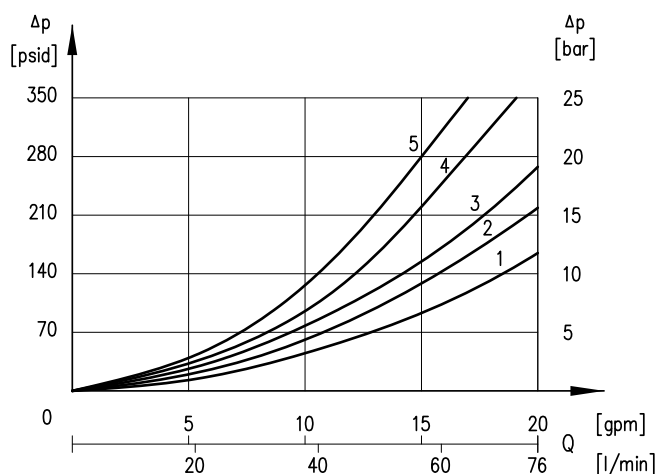


| CURVE | SPOOLS                                 |
|-------|----------------------------------------|
| 1     | A                                      |
| 2     | 2A, A1, AN, AJ, E1, F1, K1, G, J, N, X |
| 3     | B, E, K, H, L, Q                       |
| 4     | F                                  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

### NOTES:

1. The values indicated in the graphs are relevant to the standard solenoid valve, with 137L coils.
2. Valve performance was tested in a four way circuit (full loop). Performances may be reduced from that shown when used in a three-way circuit (half circuit), i.e. A or B port plugged.
3. The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage. The value have been obtained with filtration according to ISO 4406:1999 class 18/16/13.

### PRESSURE DROPS $\Delta p$ -Q (OBTAINED WITH VISCOSITY OF 170 SUS (36 cSt) AT 122°F (50°C))



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

## SWITCHING TIMES

| TIMES (±10%) [ms] |               |
|-------------------|---------------|
| ENERGIZING        | DE-ENERGIZING |
| 60                | 45            |

### NOTE:

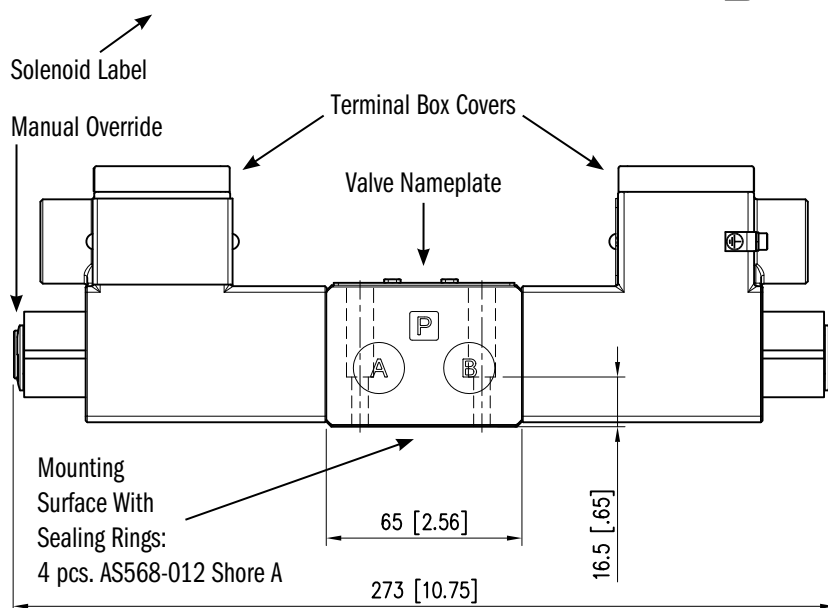
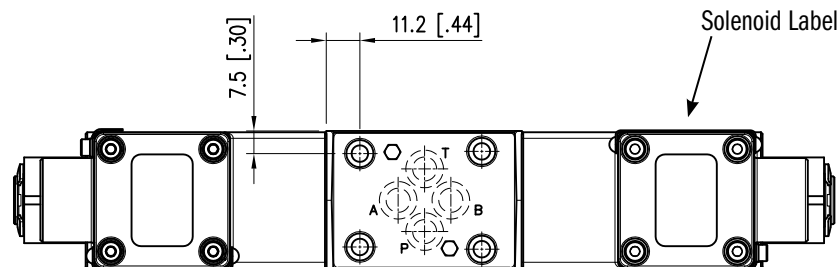
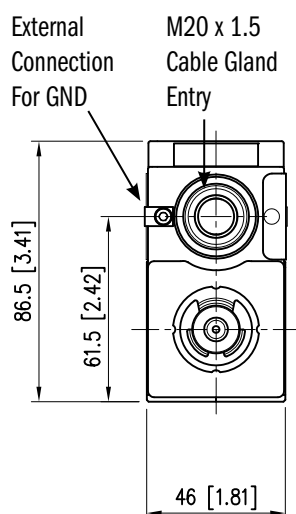
Switching times obtained with 1A solenoid valve with  $Q = 6.6$  gpm (25 l/min) and  $p = 2150$  psi (150 bar).

The energizing time is obtained at the time the spool switches over. The de-energized time are measured at the time pressure variation occurs on the line.

# OVERALL AND MOUNTING DIMENSIONS

VSD03M - 2\*, 3\*

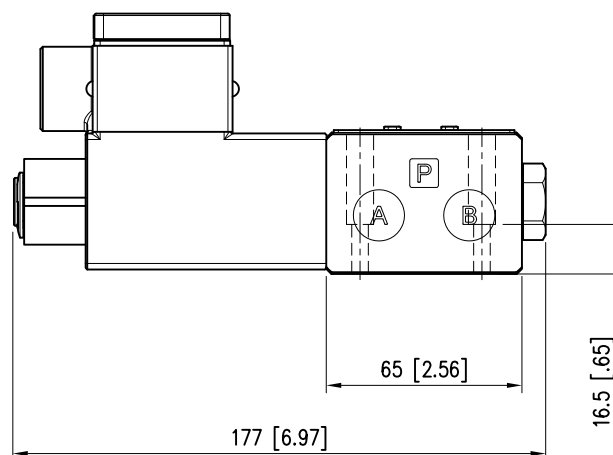
Dimensions in mm [IN]



VSD03M - 1\*, 5\*



Do not remove the cover from the coils while energized.



# HAZARDOUS DUTY

## CLASSIFICATION

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

- Group: II (Surface Plants)
- Category: 2 (High Protection For Areas 1 and 2)
- Type of Atmosphere:
  - G (Explosive Atmosphere With Gas Or Vapours)
  - D (Explosive Atmosphere With Dust)

## SOLENOIDS

These are essentially made up of two parts: tube and coil. The tube is threaded onto the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a retainer provided with anti-unlocking safety bowed retaining ring.

The 'D' type of mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment.

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

## VALVE - TYPE OF PROTECTION

|                                                |                                     |
|------------------------------------------------|-------------------------------------|
| RANGE OF APPLICATION AS PER DIRECTIVE 94//9/EC | II 2GD                              |
| TEMPERATURE CLASS                              | T4<br>(Surface Temperature ≤ 135°C) |

## SOLENOID - TYPE OF PROTECTION

|                                                                             |                                                                                                                                                                                             |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EN 60079-0:2006<br>EN 60079-1:2007                                          | Ex d IIC  IIB0  II 2G |
| EXAMINATION CERTIFICATE:                                                    | BASEEFA08ATEX004IX                                                                                                                                                                          |
| CSA 22.2<br>N° 60079-0. 07<br>N° 60079-1. 07<br>UL60079-0. 05 UL60079-1. 05 | <br>Ex d I I C, AEx d IIC<br>for class I zone I                                                          |
| EXAMINATION CERTIFICATE:                                                    | 08-CSA-1932102                                                                                                                                                                              |

|                                      |             |                 |
|--------------------------------------|-------------|-----------------|
| CLASS OF PROTECTION FOR INSULATION : | Copper Wire | Class H (356°F) |
|                                      | Coil        | Class H (356°F) |

## VALVE - ELECTRICAL DATA

|                                     |                          |       |
|-------------------------------------|--------------------------|-------|
| SUPPLY VOLTAGE FLUCTUATION          | ±10 % Vnom               |       |
| MAX SWITCH ON FREQUENCY             | 18,000 cycles/hr         |       |
| DUTY CYCLE                          | 100%                     |       |
| ELECTROMAGNETIC COMPATIBILITY (EMC) | According to 2004/108/EC |       |
| IP DEGREE                           | IEC EN 60529             | IP 65 |

## CURRENT AND POWER CONSUMPTION

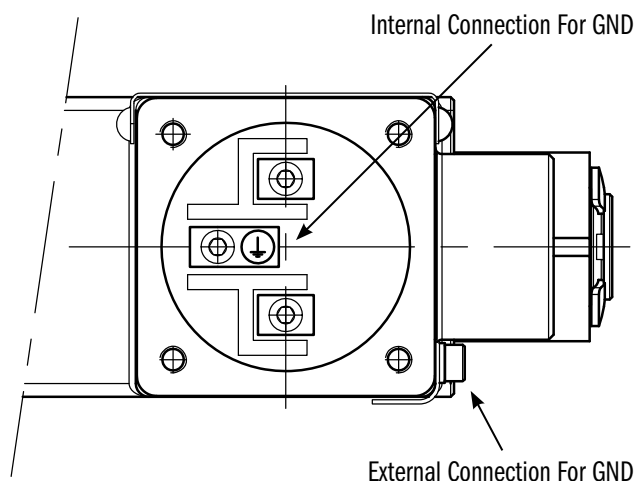
The table shows current and power consumption values relevant to the different coil types, for direct or alternating 50 or 60 Hz current supply. Code 130L coil must be used when the valve is fed with AC power supply and then rectified by means of the rectifier bridge incorporated into the coil.

| COIL TYPE | VOLTAGE         | ABSORBED CURRENT<br>A (± 5%) | POWER<br>W (± 10%) |
|-----------|-----------------|------------------------------|--------------------|
| 130L      | 120 V AC- 60 Hz | 0.188                        | 20                 |
| 137L      | 24 V DC         | 0.54                         | 13                 |
| 138L      | 12 V DC         | 1.02                         | 12.5               |



# WIRING PRACTICES

## TOP VIEW OF COIL FOR WIRING



A cable entry hole is provided to accommodate any suitable certified flameproof cable entry device. Cable entry temperature may exceed 158 °F (70 °C).

Connect external ground where required. (North American applications - external ground connections: Use where local codes or authorities permit or require external ground connections.)

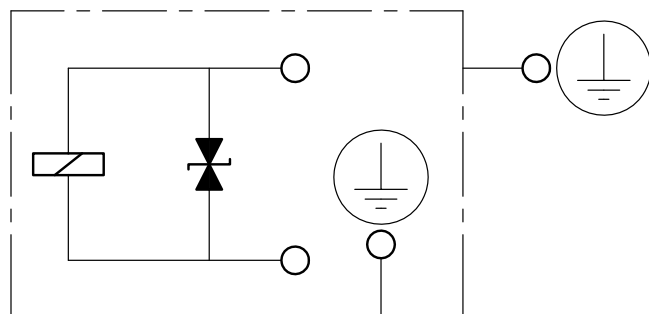
Remove the terminal box cover and connect electrical supply and ground to terminal block, torque to 0.23 - 0.90 Nm (2-8 lb.in).

AWG 16 for all internal connections.

**NOTE:** Coil is polarity insensitive.

Replace cover and secure with the 4 screws with lock washers, torque to 1.7 Nm (1.25 lb.ft).

## WIRING DIAGRAM FOR DC



### NOTE:

The circuit is provided with a surge suppressor: A component designed to dissipate the coil energy to protect circuit components.



# APPLICATION DATA

## FLUIDS

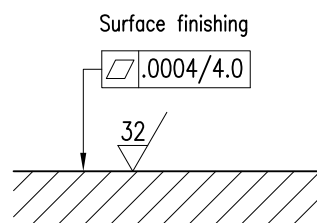
All pressure drops shown on these data pages are based on 170 SUS fluid viscosity and 0.87 specific gravity. For any other specific gravity (G1) the pressure drop ( $\Delta P$ ) will be approx.  $\Delta P1 = \Delta P (G1/G)$ . See the chart for other viscosities.

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

## INSTALLATION

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

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



## BOLT KIT

|          |            |        |
|----------|------------|--------|
| BD03-100 | Valve only | 121472 |
|----------|------------|--------|

## NOTES:

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

## SEAL KIT

|                           |         |
|---------------------------|---------|
| VSD03M-EXA Buna Seal Kit  | 1013275 |
| VSD03M-EXA Viton Seal Kit | 1013276 |

## ABOUT CONTINENTAL HYDRAULICS

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

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