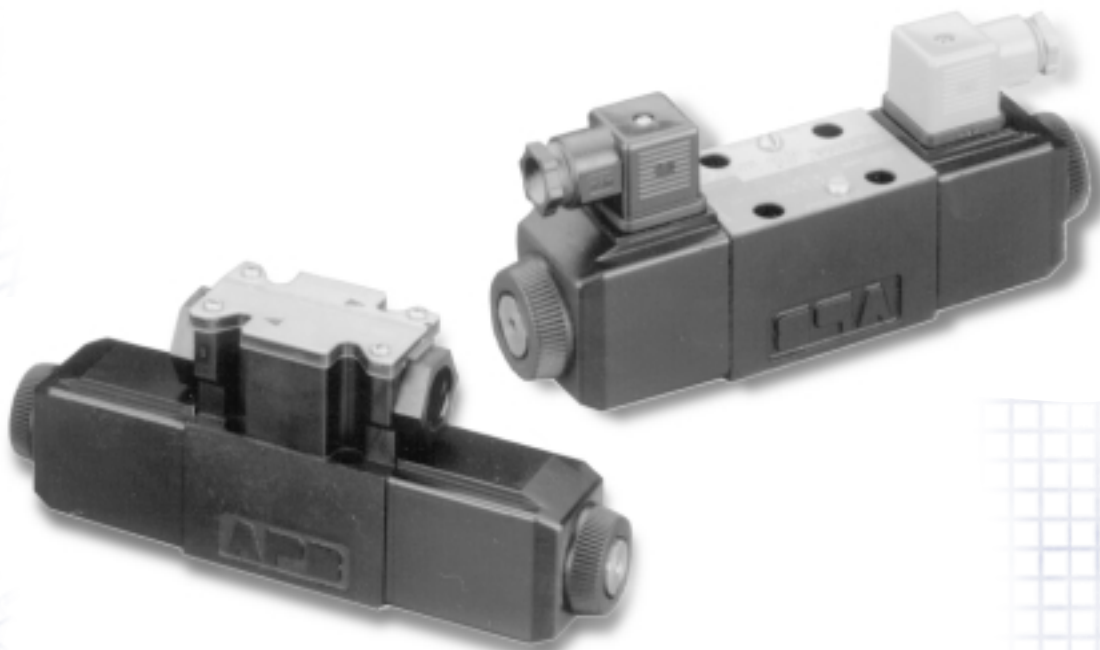


S

**Vickers™**

Solenoid Operated Directional Valves

No. 11-05-0001  
EN-0301



**VICKERS**

Optimized - Soft Shift Function

DG4V-3 -60 Design

ISO 4401; Size 03, ANSI/B93.7M-D03

We Manufacture

**Solutions**

Hydraulics

hydraulic solutions

Solutions

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## General Description

Basically, these solenoid operated directional control valves are for directing and stopping flow at any point in a hydraulic system. The soft shift feature is designed to provide smoother control of actuator acceleration and deceleration than is possible with conventional solenoid valves. The result is minimum hydraulic shock, more reliable systems with longer component life and less downtime.

This product line compliments the DG4V-3(S)\*\*2\*-60 Soft shift Valve by providing a lower price, higher performing unit. This valve uses an optimized damping orifice to achieve a guaranteed soft shift function. However, this fixed orifice is non-serviceable and can not be tuned. New solenoids allow the soft shift function to be offered with the higher flow and pressure ratings expected from our high performance DG4V3 valves.

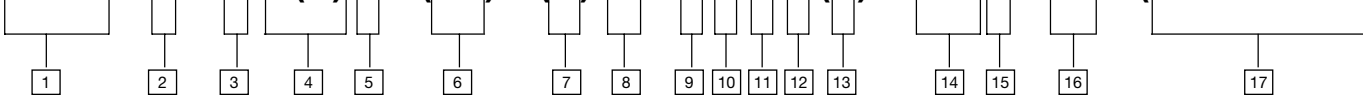
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## Features & Benefits

- Milled metering notches on the spool enable precise control of flow rate change as the spool is shifted.
- A “P12L” - model offers a junction box with rectifier, lights and plug-in coils for quick and easy solenoid changing without removing the valve from the machine.
- Installed cost and space savings from higher power/weight-and-size ratios.
- Reduced internal leakage reduces power losses, increases system efficiency: the result of improved manufacture of spool and bores.
- Installation flexibility resulting from a choice of numerous combinations of solenoid connectors and locations.
- Multi-fluid capability without need to change seals.
- Higher sustained machine productivity and higher uptime because of proven fatigue life and endurance, tested over 20 million cycles.
- Solenoid coils can be changed quickly and easily without leakage from hydraulic system.
- Compact, cost effective system design when used with Vickers SystemStak™ valves and multi-port subplates.
- The optimized damping orifice minimizes hydraulic shock and reduces installed cost.

## DG4V-3 Soft Shift Model Series

**DG4V - 3 - \* \* (L) 3 - (P2) - (V) M - \* \* \* \* (L) - \* \* \* 7 - 60 - (P\*-A\*-B\*-T)**



**1 Valve Type**

- D - Directional control valve
- G - Subplate mounted
- 4 - Solenoid operated
- V - Rated pressure (350 bar)

**2 Interface**

- 3 - ISO 4401-03, CETOP 3 (NFPA D03)  
(High performance only)

**3 Spool Types**

- 0 - Open center
- 2 - Closed center (all ports)
- 3 - P & B closed, A to T
- 6 - Closed center (P only)
- 8 - Tandem center (open crossover)
- 31 - P & A closed, B to T
- 33 - Closed center (bleed A & B)

**4 Spool/Spring Arrangement**

- A - Spring offset, single solenoid
- AL - Spring offset, single solenoid  
(left hand build)
- B - Spring centered, single solenoid
- BL - Spring centered, single solenoid  
(left hand build)
- C - Spring centered

**5 Soft Shift Valve - Optimized Fixed Orifice**

**6 Manual Override**

- Blank - Override in solenoid end only
- P2 - Manual override in end cap and solenoid, A & B models only.

**7 Solenoid Energization identity**

- Blank - ANSI B93 energize solenoid A to give flow P to A
- V - Solenoid identification determined by position of solenoid (i.e. solenoid A is at port A end of valve, solenoid B is at port B end of valve.)

**8 Flag Symbol**

(Introduces electrical features and options)

**9 Coil Types**

- F - Flying lead type coils
- U - DIN 43650 coils
- SP1 - Single 1/4" male spade
- SP2 - Dual 1/4" male spade
- P12L - Plug-in coils w/rectifier in junction box, lights included.
- KU - Top exit flying leads

**10 Coil Connectors**

- ("U" type coils only, omit if not required)
- 1 - Connector fitted
- 6 - Connector with light fitted
- 11 - Rectifier with lights fitted
- 12 - Rectifier fitted

**11 Electrical Connections**

- ("F" type coils only, omit if not required)
- PA - Insta-plug male recpt. only
- PA3 - 3-pin receptacle
- PA5 - 5-pin receptacle
- PB - Insta-plug male & female recpt.
- T - Terminal block

**12 Wiring Housing Thread**

- ("F" type coils only, omit if not required)
- W - 1/2" NPT
- J - M20 x 1.5 - 6H
- G - G1/2

**13 Solenoid Indicator Lights**

(Not available on PA, U, SP1, SP2. Omit if not required.)

**14 Coil Identification Letter**

- GH - 12V DC
- DTH - 18V DC
- HH - 24VDC
- DJH - 98V DC (req'd. for P12L models)
- PH - 110V DC
- SH - 220V DC

**15 Tank Pressure Rating**

- 7 - 210 bar (3045 psi)

**15 Design Number**

**17 Port Orifices**

- Blank - 00
- 03 - 0.3 mm dia.
- 06 - 0.6 mm dia.
- 08 - 0.8 mm dia.
- 10 - 1.0 mm dia.
- 13 - 1.3 mm dia
- 15 - 1.5 mm dia.
- 20 - 2.0 mm dia.
- 23 - 2.3 mm dia.  
(Example: "P03" = 0.3mm dia. orifice in P port of valve. Omit if not required.)

# DG4V-3 60 Operating Data

## Basic Characteristics

Max. pressure ports P, A & B:  
 ..... 350 bar (5075 psi)

Max. pressure port T:  
 ..... 210 bar (3045 psi)

Max. flow: ..... up to 83 l/min  
 (22 USgpm)

## Mounting Interface

ISO 4401-03  
 CETOP 3  
 NFPA D03

## Seals & Fluid Cleanliness

Fluorocarbon seals are standard and are suitable for use with phosphate ester type fluids or its blends, water glycol, water-in-oil emulsion fluids and petroleum oil.

Refer to data sheet I-286-S for hydraulic fluid and temperature recommendations.

Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials and additives for protection against wear of components, elevated viscosity and inclusion of air.

Essential information on the correct methods for treating hydraulic fluid is included in Vickers publication 561; "Vickers Guide to Systemic Contamination control," available from your local Vickers distributor or by contacting Eaton.

Recommendation of filtration and the selection of products to control fluid condition are included in 561.

Recommended cleanliness levels using petroleum oil under common conditions is based on the highest fluid pressure levels in the system.

Directional controls, regardless of manufacturer, will operate with fluids showing a higher cleanliness code. The operating life of the control, and other components in the system, will be less however. For maximum life and best system performance, cleanliness codes as defined below should be achieved.

Fluids other than petroleum, severe service cycles or temperature extremes are cause for adjustment of these cleanliness codes. See Vickers Publication 561 for exact details.

	System Pressure		
	1000 psi	2000 psi	3000+ psi
Valves	20/18/15	20/18/15	19/17/14

## Functional Symbols

Standard Spool Types	Graphic Symbol Center Condition	Spring Offset	Spring Centered
0			
3			
2			
6			
8			
31			
33			

## DG4V-3-60 Operating Data

### Solenoid Energizing

Spring centered and spring offset valves will be spring positioned unless the solenoid is energized continuously.

**NOTE**

Any sliding spool valve, if held shifted under pressure for long periods, may stick and not spring return, due to silting. Therefore, it is recommended that the valve be cycled periodically to prevent this from occurring.

Only DC coil voltages are available. For applications where the junction box is required, valves with F (flying lead) type coils must be driven by a DC electrical signal. The P12L models must be driven by a 110-120, 50-60 Hz AC signal.

For other applications, rectified DIN connectors ('11' or '12' in model code) can be used to convert AC input voltage to the DC voltage necessary to power the valve.

**NOTE**

The P12L designated coil is rectified.

**Drain**

The tank line must be plumbed above the level of the core tube (and valve body). This will insure that the tank port is always flooded with oil. By doing this, the core tube will remain flooded with oil and the soft shift will operate as designed.

### Specifications

Maximum flow ..... See curves  
 Maximum operating pressure ..... 350 bar (5075 psi)  
 Rated fatigue pressure ports ..... A, B and P 350 bar (5075 psi)  
 Maximum tank line pressure ..... 210 bar (3045 psi)  
 Mounting interface ..... ISO 4401-3, CETOP 3

**Weights**

Double solenoid models ..... 2.1 kg (4.6 lbs)  
 Single solenoid models ..... 1.7 kg (3.7 lbs)

### Solenoids

Solenoid Voltage DC	Solenoid ID	Amps	Watts	Ohms
12	GH	3.1	39	3.8
24	HH	1.5	36	15.9
98	DJH	.38	35	275
110	PH	.34	37	328
18	DTH	2.1	39	8.4
220	SH	.17	37	1280

### Valve Port Restrictor Plugs

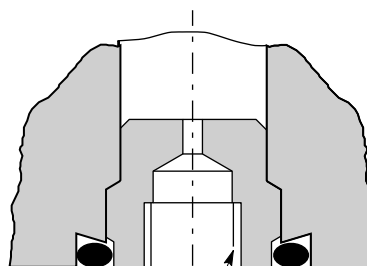
Restrictor plugs are available for use in ports P, T, A, or B. These can be used for restricting flow or for circuit dampening. Restrictor plugs are not recommended for use above 210 bar (3000 psi) system pressure.

694347	2,00 (0.080)	*20
694348	2,30 (0.090)	*23

† - Available in multiples of 25 per part number

\* - P,T, A, or B as required

Part Number †	Orifice Ø	Model Code
694353	Blank	*00
694341	0,30 (0.012)	*03
694342	0,60 (0.024)	*06
694343	0,80 (0.030)	*08
694344	1,00 (0.040)	*10
694345	1,30 (0.050)	*13
694346	1,50 (0.060)	*15



M5 x 0.8-6H thread for plug extraction

## DG4V-3-60 Operating Data

### Response Time

The soft shift feature of this valve gives smoother shifting and therefore longer response times than a standard solenoid. These times are influenced by flow, pressure, applied solenoid voltage, oil viscosity and ambient temperatures.

Response times shown are for a type "2C" spool at a system pressure of 210 bar (3045 psi), flow at 19L/m (5 USgpm), solenoid voltage at 100% of rating and 38° C (100° F) oil temperature. Times are determined from the instant of power on/off to the point of maximum cylinder velocity (shift) or the end of cylinder movement (spring return). All times are without arc suppression diodes. Spring return times can be expected to increase with diodes in place.

#### Response Times

Shift (ms)	Spring Return (ms)
400	175

Response times for spools other than the 2C spool are similar and are system dependent.

# Performance Data

## Pressure Drops

The pressure drop values shown are typical. Actual pressure drops will vary  $\pm 10\%$ .

The pressure drop curves give the approximate pressure drop ( $\Delta P$ ) when passing 21 cSt (100 SUS) fluid having .865 specific gravity through the indicated flow path.

For any other viscosity the pressure drop ( $\Delta P$ ) will change as follows:

Viscosity(s)	cSt	14	32	43	54	65	76	87
	(SUS)	(75)	(150)	(200)	(250)	(300)	(350)	(400)
% of $\Delta P$ (Approximate)		93	111	119	126	132	137	141

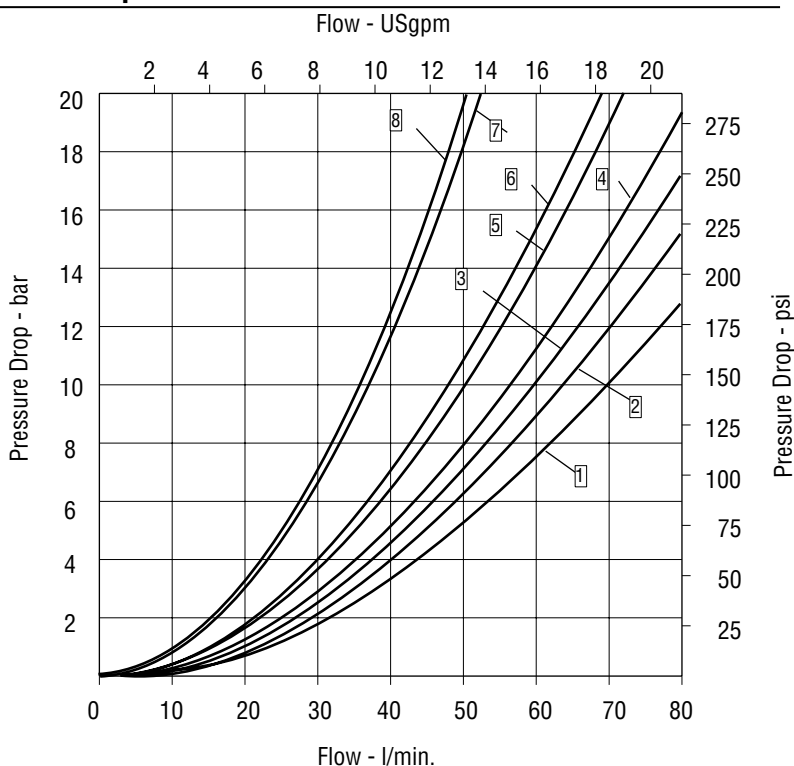
Spool Type	Pressure Drop Curve Reference Chart			
	P-A	B-T	P-B	A-T
Spring Centered				
"OC" +	5	1	5	1
"2C"	5	4	5	4
"6C"	6	1	6	1
"8C" +	5	3	5	3
"3C"	5	4	5	1
"31C" *	5	1	5	4
"33C" *	6	2	6	3

Spring Offset	P-A	B-T	P-B	A-T
"2A"	7	5	8	5

\* NOTE: Type "31C" & "33C" spools at center will pass 650 ml/min (40 in3/min) to 15L/min (4.0 USgpm) at 103 bar (1500 psi) tank pressure to both "A" and "B" ports.

+ type "OC" and "8C" centered pressure drop "P" to "T" represented by curve number "5". Cylinder ports blocked for type "OC".

## Pressure Drop Curves

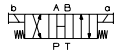
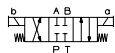

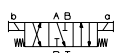

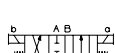




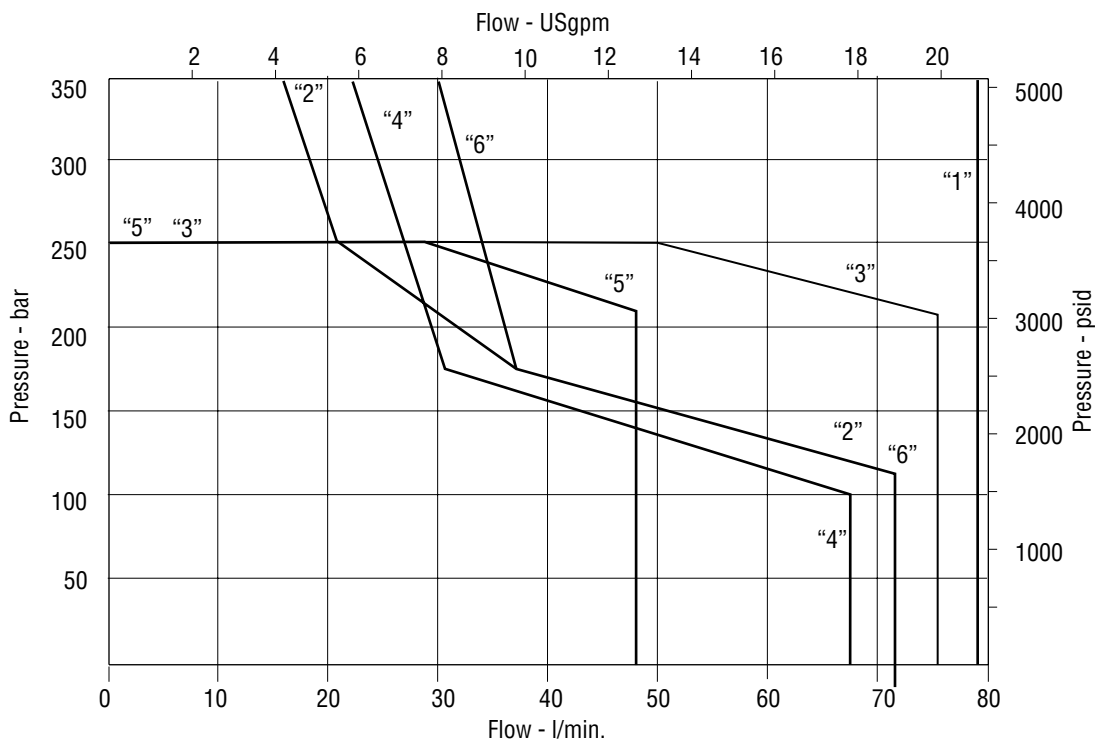


# Performance Data

## Maximum Flow Data

Maximum recommended flow data is for 90% nominal voltage in a 4-way circuit with cylinder ports either looped or blocked and containing 2,5 liters (.66 USgal) compressed volume. Reduced performance may result when certain spools are used in 3-way circuits. Flow rates are based on warm solenoids operating at minimum rated voltage (i.e. 90% of rating), and 38°C (100° F) oil temperature.

Spool Type	Curve Number
 "0C"	1
 "2C"	1
 "6C"	2
 "3C"	6
 "8C"	5
 "31C"	2
 "33C"	3
 "2A"	4

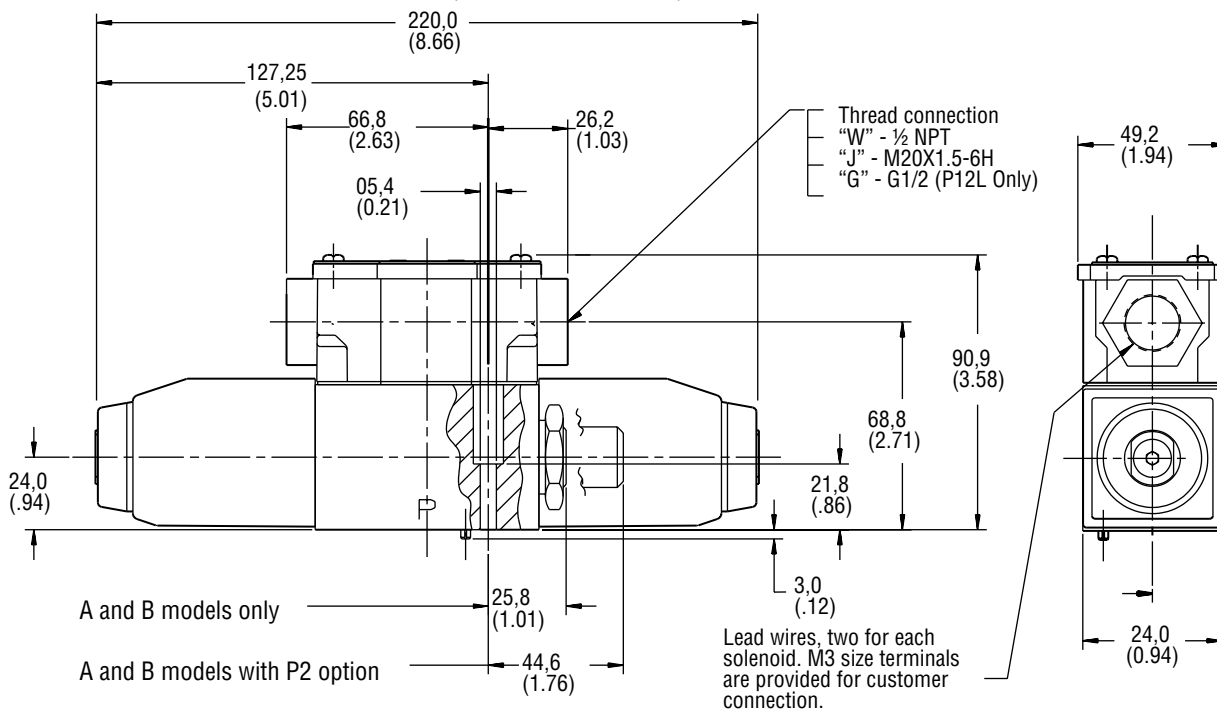


# Installation Dimensions

## DG4V-3-\*\*\*3-(V) M-F\*\*\*\* (L)-\*H5-60

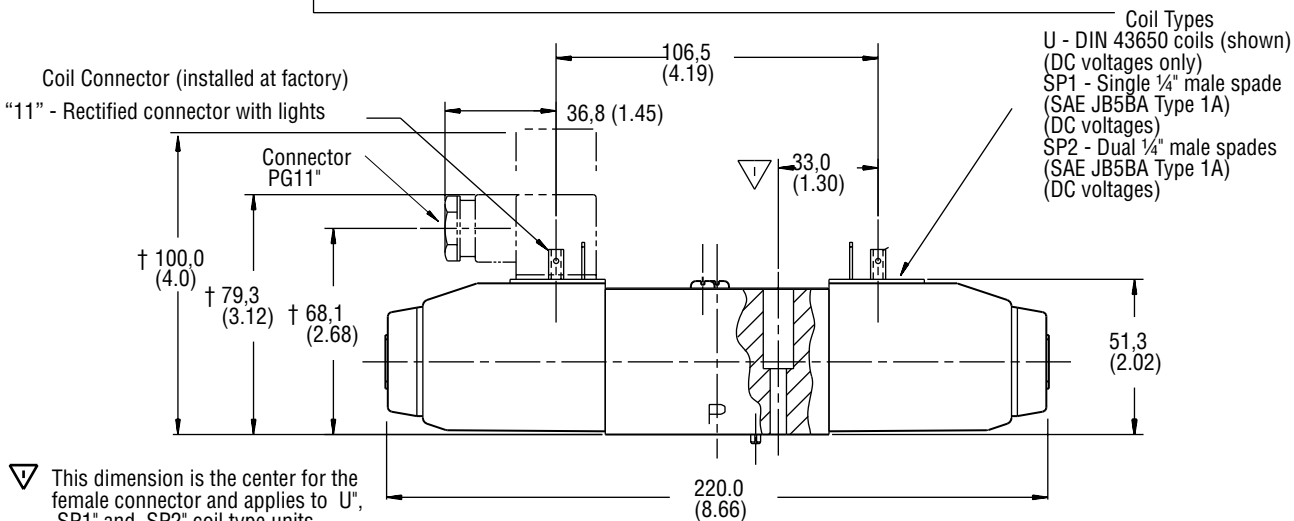
### Flying Lead Model

Flying lead models (All options except PB")



## DG4V-3-\*\*\*3-(V) M-U/SP1/SP2-\*H5-60

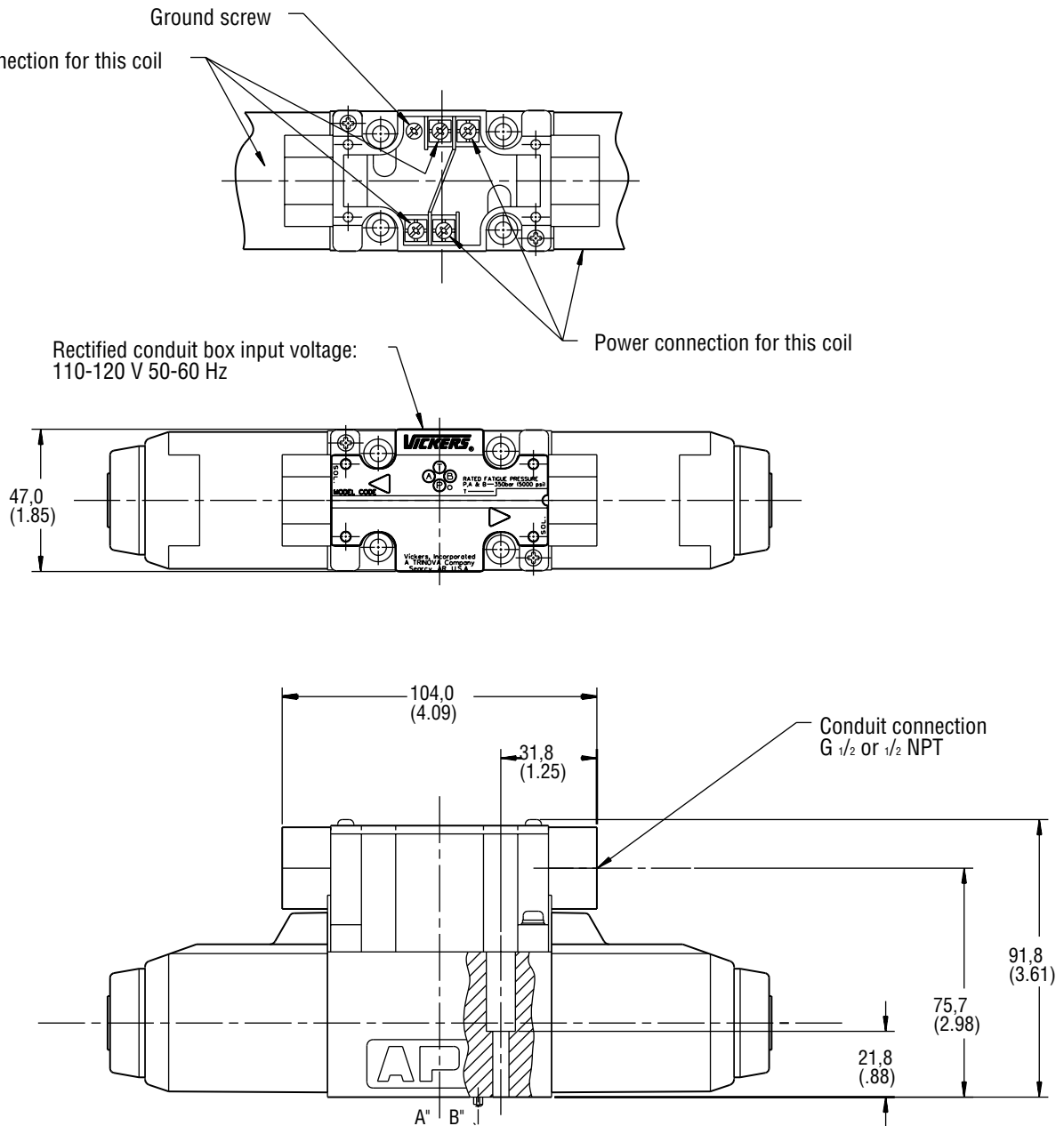
### DIN Connector



# Installation Dimensions

## DG4V-3 - \*\*3\*\*-M-P12L-DJH5-60 Plug-in Coil

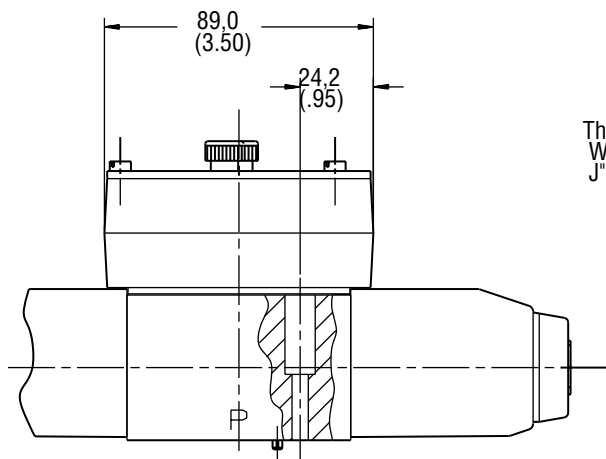
Millimeters (inches)



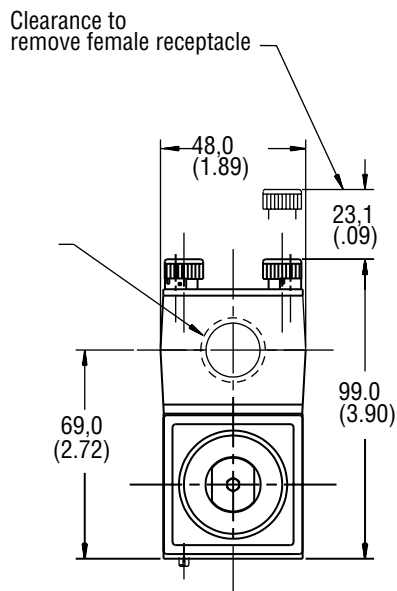
## Electrical Connectors

### DG4V-3-\*\*\*3\*\*-M-FPB Insta-plug Option

Millimeters (inches)

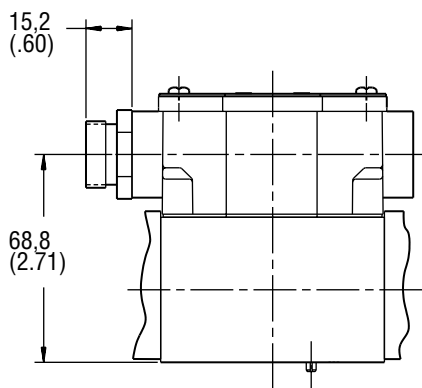


Threaded Connection  
W" - 1/2 NPT  
J" - M20X1.5-6H

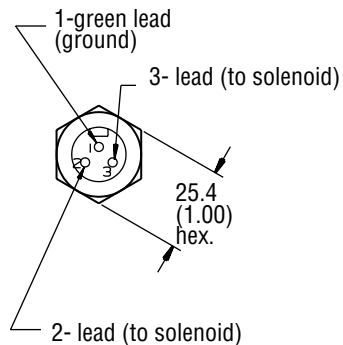


### NFPA Electrical Connector

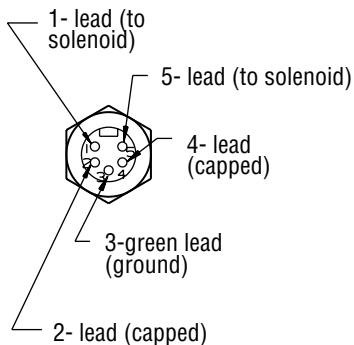
The receptacle is a standard three or five pole electrical connector with shortened leads and terminal added. The connector is assembled over the solenoid "B" on dual solenoid models and over the solenoid "A" for single solenoid models.



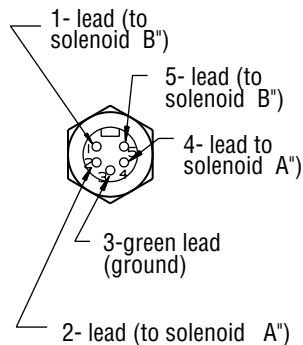
MODEL:  
DG4V-3-\*A/B3-M-FPA3



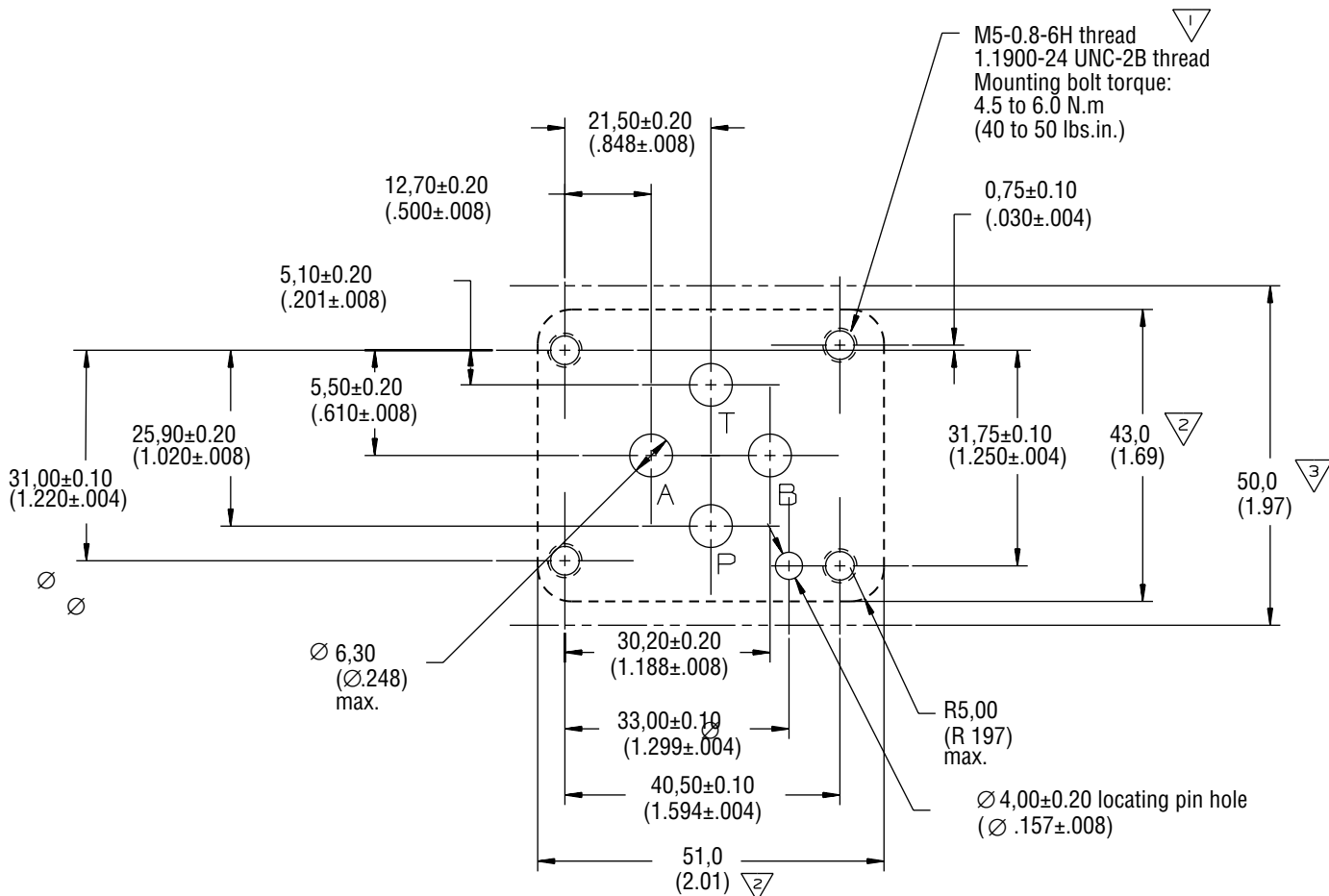
MODEL:  
DG4V-3-\*A/B3-M-FPA5



MODEL:  
DG4V-3-\*C3-M-FPA5



# Mounting Interface



1 The minimum thread depth is 1.5 of bolt diameter. The recommended full thread depth is 2xD+6mm to aid in the interchangeability of valves and to reduce the number of fixing bolt lengths. The recommended engagement of fixing bolt thread for ferrous mountings is 1.25 D.

2 The dimensions specifying the area within the dotted lines are the minimum dimensions for the mounting surface. The corners of the rectangle may be radiused as shown.

3 This dimension gives the minimum spacing distance between the valves and adjacent obstructions. For example, another valve or a wall. This dimension is therefore, the minimum distance from centerline to centerline of two similar mounting surfaces placed on a manifold block. The fixing holes are at equal distances to this dimension.  
 The mounting surface must be flat within 0.013 mm (.0005 inch) and smooth within 1.1 micrometer (0.045 microinch). Mounting bolts should be grade 12.9 (SAE grade 7) or better.

## Subplate & Bolt Kits

Valve subplates and mounting bolts must be ordered separately.  
 Example:

- (1) DG4V-3-2C3-M-FW-HH7-60 valve
- (1) DGVM-3-10-S subplate
- (1) BK590716 inch mounting bolt
- (1) BK616452M metric mounting bolt kit

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Information contained in this catalog is accurate as of the publication date and is subject to change without notice. Performance values are typical values. Customers are responsible for selecting products for their applications using normal engineering methods.

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