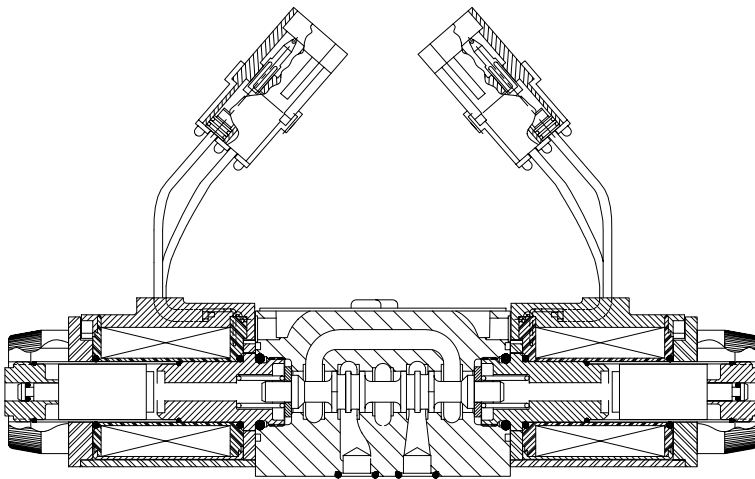


# Solenoid Operated Directional Valve

## DG4V-3S, EN 490 For Mobile Equipment

Flows to 40 l/min (10.5 USgpm), 6\* Design

P, A & B Pressures to 350 bar (5000 psi), T Pressures to 210 bar (3000 psi)



- Variety of manual override options are available: plain, water-resistant and latching.
- High performance features including minimal pressure drop, scratch-proof override seals, high reliability, multiple electrical connections and ease of servicing.

### Characteristics

#### Maximum Operating Pressure

“A”, “B” and “P” ports: 350 Bar  
(5000 psi)

#### Maximum Tank Line Pressure

210 bar (3000 psi)

#### Mounting Interface

ISO 4401-AB-03-4-A  
CETOP 3 or NFPA D03 (formerly D01)  
ANSI B93.7

### General Description

This solenoid operated directional control valve is for directing and stopping flow at any point in a hydraulic system. Its primary function is to determine the direction of fluid flow in a work cylinder or control the direction of rotation of a fluid motor.

Port connections are made by mounting the valve on a subplate or manifold. The valve has wet armature type solenoids. It is derived from the standard model series DG4V-3S-60.

It is distinguished as a special by the EN490 designation. Electrical connections to the valve are typically made directly to the solenoid by various plug-in devices. Solenoids are available in DC voltages only.

### Features and Benefits

- Special design for high tank line rating. Tank line can withstand pressures up to 210 bar (3000 psi). Ideal replacement for DG4V-3 for high tank line pressure applications.
- Meets key OEM specifications regarding temperature, vibration, heat rise/drop, impact test, water dunk (thermal shock and hermetic seal), salt spray and dielectric strength test.
- High thermal shock and impact resistance due to new coil design. Frame around coil ensures high strength and allows frame to expand/contract without added stress.
- Available with molded-in surge suppressor/diodes to protect PLCs or circuit boards from back electro-magnetic force (EMF).

### Weights (approximate)

Single solenoid models: 1,6 kg (3.5 lb)  
Double solenoid models: 2,2 kg (4.8 lb)

### Reference

GB-C-2015 Solenoid Operated Directional Valves

# Contents

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Model Code .....	3
Performance Data .....	4
Installation Dimensions .....	6
Electrical Plugs & Connectors .....	7
Mounting Bolts .....	10
Mounting Interface .....	11

# Model Code

**DG4V - 3S - \*\* - \*(L) - (\*\*) - (V)M - \*\*\* - \*\* - \*\* - \*7 - 60 - EN490 - (P\*\*-A\*\*-B\*\*-T\*\*)**

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

## 1 Directional Control Valve

**DG4V** - Subplate mounting; solenoid operated. Pressure rating 350 bar (5000 psi) for ports P, A & B.

## 2 Pilot Valve

**3S** - Standard performance; up to 40 l/min (10.5 USgpm) at 350 bar (5000 psi)

## 3 Spool Type

- 0 - Open center (all ports)
- 2 - Closed center (all ports)
- 6 - Closed center (P blocked) A & B to T
- 7 - Open center (P to A & B) T blocked
- 8 - Tandem center (P to T) open crossover
- 22 - Closed center (two way)
- 33 - Closed center, bleed A & B to T
- 34 - Closed center, bleed A & B to T
- 52 - Closed center (all ports) regen. towards workport A
- 56 - A&B to T, P blocked, regen. by solenoid A
- 66 - Closed center (P blocked) A & B to T
- 521 - Closed center (all ports) regen. towards workport B
- 561 - A&B to T, P blocked, regen. by solenoid B

## 4 Spool/Spring Arrangement

- A - Spring offset, end-to-end
- AL - Same as "A" but left hand build
- B - Spring offset, end to center
- BL - Same as "B" but left hand build
- C - Spring centered
- F - Spring offset, shift to center
- FL - Same as "F" but left hand build

## 5 Manual Override Options

**No symbol** - Plain override(s) in solenoid end(s) only▲

- H - Water-resistant override(s) on solenoid end(s)▲
  - H2 - Water resistant overrides on both ends
  - P2 - Standard overrides on both ends
  - Y - Latching manual override(s) on solenoid end(s) (includes "H" feature seal)▲
- ▲ *No override in non-solenoid end of single solenoid valves.*

## 6 Solenoid Energization Identity

- V - Solenoid "A" is at port "A" end/or solenoid "B" is at port "B" end, independent of spool type.
- Omit for U.S. ANSI B93.9 standard requiring solenoid "A" energization to connect P to A and/or solenoid "B" to connect P to B, independent of solenoid location.

## 7 Flag Symbol

- M - Electrical options and features

## 8 Coil Type

- U - ISO 4400 (DIN 43650) mounting◆
  - U1 - ISO 4400 (DIN 43650) mounting, with connector
  - U6 - ISO 4400 (DIN 43650) mounting, with connector and lights
  - KU - Top exit flying leads
  - SP1 - Single 6.3mm (0.25 in) spade connector to IEC 760 (NFPA, SAE J858a, Type 1A) (Internal ground)
  - SP2 - Dual 6.3mm (0.25 in) spade connector to IEC 760 (NFPA, SAE J858a, Type 1A)
- ◆ *Female connector to be supplied by customer.*

## 9 Top Exit Connectors (KU type only)

- Omit for no connector.
- P1 - Packard Weatherpak Connector (female)
- P6 - Deutsch Connector (male)
- P7 - Packard Weatherpak Pins (male)
- P12 - Packard Weatherpak Connector (male)

## 10 Surge Suppressor/Damper

- Omit for not fitted.
- D2 - Encapsulated diode -ve to right; +ve to left when facing retaining nut

## 11 Coil Rating

- G - 12 VDC
- H - 24 VDC

## 12 Port "T" Rating

- 7 - 210 bar (3000 psi)

## 13 Design Number

Subject to change, installation dimensions remain as shown for design numbers 60 through 69.

## 14 Special Version

Standard performance version with 210 bar (3000 psi) tank rating. Solenoid with external frame for improved thermal stability, improved hermetic seal.

## 15 Port Restrictor Plugs

Omit if no restrictor plugs are fitted. For details of plug orifice sizes and how to specify in model code, see page 8.

# Performance Data

Feature	
Pressure limits: P, A and B ports T port	350 bar (5000 psi) 210 bar (3000 psi)
Flow rating	See performance data
Relative duty factor	Continuous; ED = 100%
Type of protection: ISO 4400 coils with plug fitted correctly SP1 – Single spade 6,3 mm SP2 – Dual spade 6,3 mm Coil winding Lead wires (coils type KU) Coil encapsulation	IEC 144 class IP67 (depending on connector) IEC 760 IEC 760 Class H Class H Class F
Permissible voltage fluctuation: Maximum Minimum	Refer to temperature limits. 90% rated
Typical response times at 100% rated volts measured from application/removal of voltage to full spool displacement of "2C" spool at: Flow rate P-A, B-T Pressure DC (=) energizing DC (=) de-energizing	20 l/min (5.3 USgpm) 175 bar (2537 psi) 60 ms 40 ms

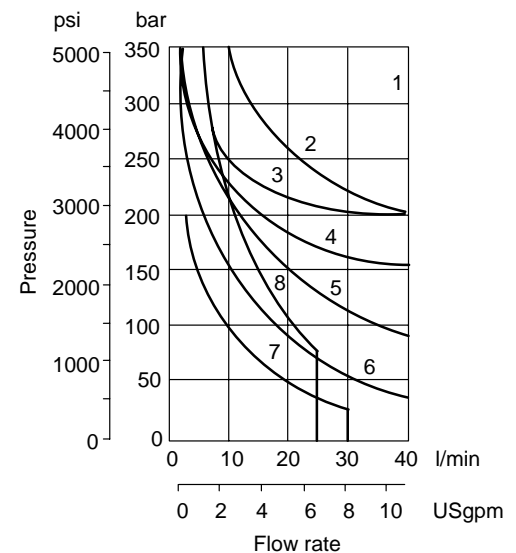
Power Consumption	
DC solenoids at rated voltage and 20°C (68°F).	
Full power coils: 12V, model type "G" 24V, model type "H"	30W 30W

## Maximum flow rates

Performance based on full power solenoid coils warm and operating at 90% rated voltage.

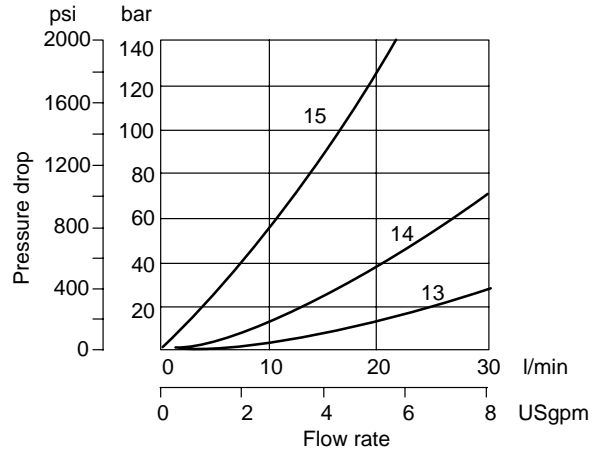
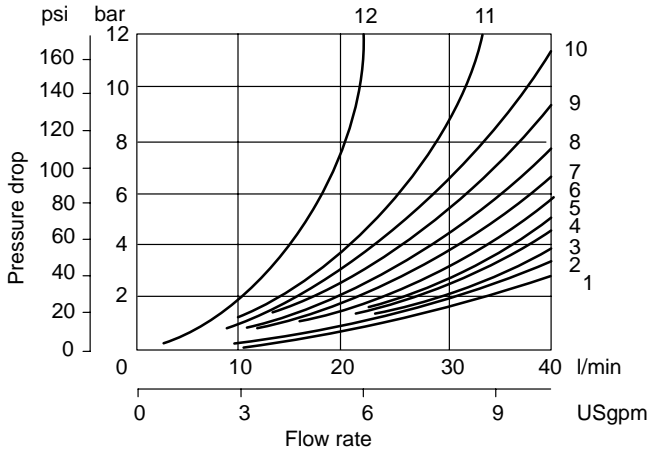
Typical with mineral oil at 36 cSt (168.6 SUS) and a specific gravity of 0.87.

Spool/Spring Code	Curve
0A(L)	3
0B(L) & 0C, 0F	1
2A(L)	3
2B(L) & 2C, 2F	3
6B(L) & 6C, 6F	5
7B(L) & 7C, 7F	2
8B(L) & 8C	8▲
22A(L)	7
22B(L) & 22C	6
33B(L) & 33C	4
34B(L) & 34C	5
52BL, 52C, 56BL & 56C	5
66B(L) & 66C	5
521B & 561B	5



▲ Consult Vickers regarding each application that will jointly have flow rates approaching this curve **and** a pressurized volume exceeding 2000 cm<sup>3</sup> (122 cu.in.).

## Pressure drops



### Pressure drops in offset positions except where otherwise indicated

Spool/spring code	Spool positions covered	P to A	P to B	A to T	B to T	P to T	B to A or A to B
0A(L)	Both	5	5	2	2	—	—
0B(L) & 0C, 0F	De-energized	—	—	—	—	4▲△	—
	Energized	4	4	2	2	—	—
2A(L)	Both	6	6	5	5	—	—
2B(L) & 2C, 2F	Energized	5	5	2	2	—	—
6B(L) & 6C, 6F	De-energized	—	—	3▲	3△	—	—
	Energized	6	6	1	1	—	—
7B(L) & 7C, 7F	De-energized	6▲	6△	—	—	—	7○
	Energized	4	4	3	3	—	—
8B(L) & 8C	All	9	9	5	5	3	—
22A(L), 22B(L) & 22C	All	6	6	—	—	—	—
33B(L) & 33C	De-energized	—	—	15▲	15△	—	—
	Energized	5	5	2	2	—	—
34B(L) & 34C	De-energized	—	—	14▲	14△	—	—
	Energized	5	5	2	2	—	—
52BL & 52C	Energized	6▲	6△	2	—	—	10○
56BL	Both	6▲	6△	11▲	10△	—	10○
56C	De-energized	—	—	11▲	10△	—	10○
	Energized	6▲	6△	2	—	—	10○
66B(L) & 66C	De-energized	—	—	12	12	—	13
	Energized	6	6	2	2	—	—
521B	All	6▲	6△	—	—	—	10○
561B	De-energized	—	—	10▲	11△	—	10○
	Energized	6	6△	—	—	—	10○

▲ "B" plugged    △ "A" plugged    ○ "P" plugged

For other viscosities, pressure drops approximate to:

Viscosity cSt (SUS)

14	20	43	54	65	76	85
(17.5)	(97.8)	(200)	(251)	(302)	(352)	(399)

% of Δp

81	88	104	111	116	120	124
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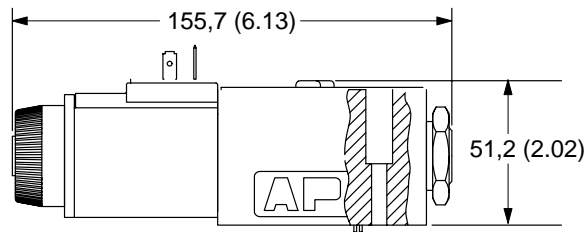
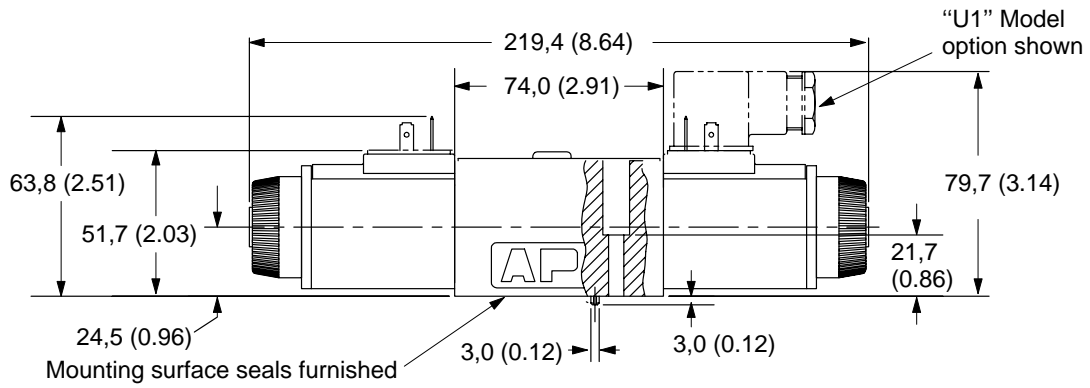
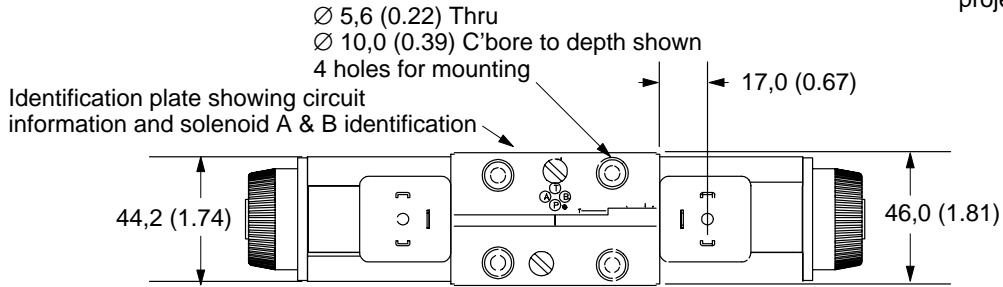
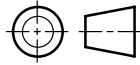
A change to another specific gravity will yield an approximately proportional change in pressure drop.

The specific gravity of a fluid may be obtained from its producer. Fire resistant fluids usually have higher specific gravities than oil.

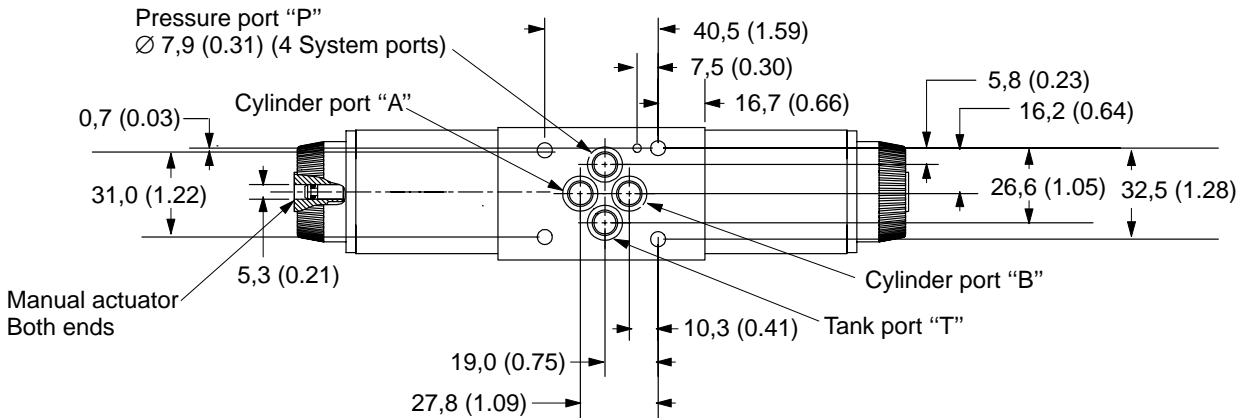
# Installation Dimensions

mm (inch)

3rd angle projection



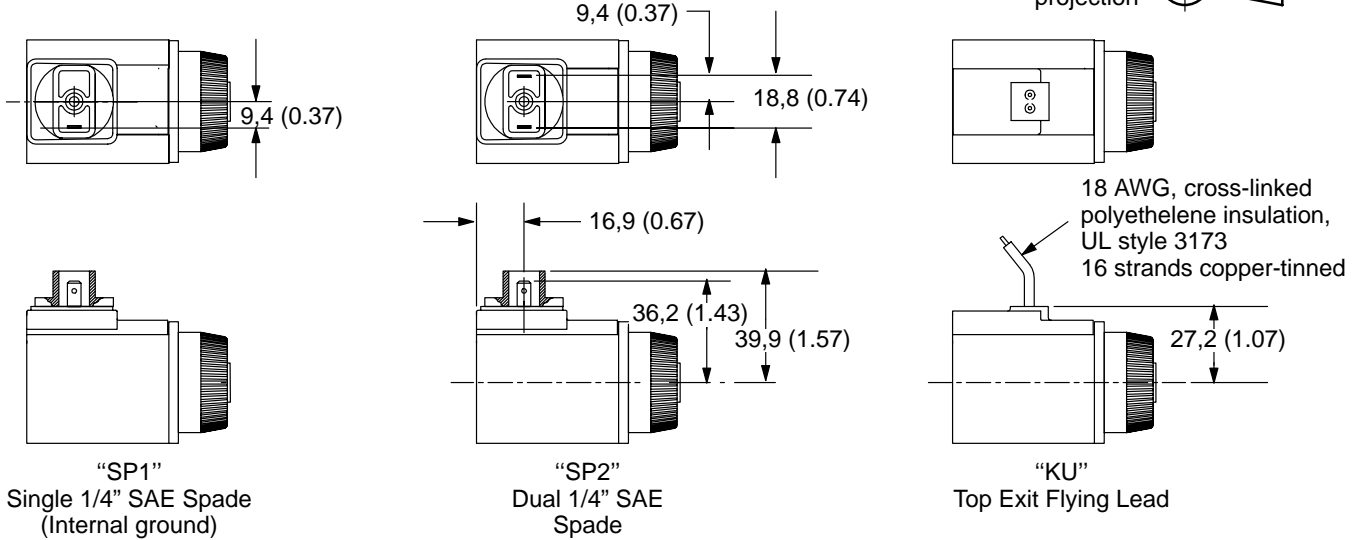
**"U" DIN 43650**



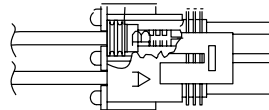
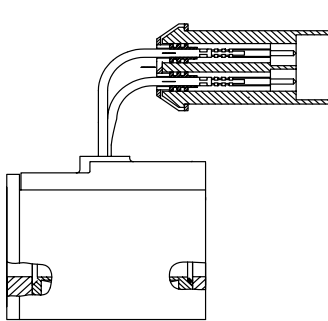
# Electrical Plugs & Connectors

Solenoid Connections  
mm (inch)

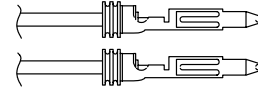
3rd angle projection 



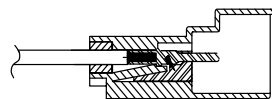
Typical Connector Assembly  
& Connectors



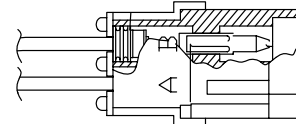
**P1 Packard Connector (Female)**



**P7 Packard Connector Pins (Male)**



**P6 Deutsch Connector (Male)**



**P12 Packard Connector (Male)**

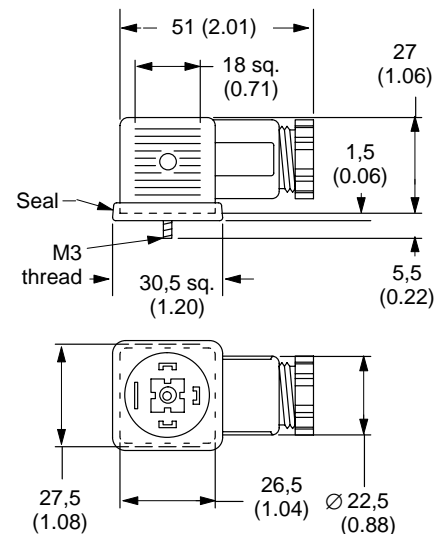
## DIN 43650 Connector

Cable diameter range . . . Ø6–10 mm (0.24–0.40)  
Wire section range . . . . . Ø,5–1,5 mm<sup>2</sup> (0.0008–0.0023 in<sup>2</sup>)  
Terminals . . . . . Screw type  
Type of protection . . . . . IEC144 class IP65, when plugs are fitted correctly to the valves with interface seals (supplied with plugs) in place.

Connector can be positioned at 90° intervals on valve by re-assembling contact holder into appropriate position inside connector housing.

Connectors with and without indicator lights are available (order separately):

Receptacle	Voltage	Part Numbers Gray – Black – “A” sol. “B” sol.
U1 Coils without lights	—	710776 710775
U6 Coils with lights	12-24	977467 977466



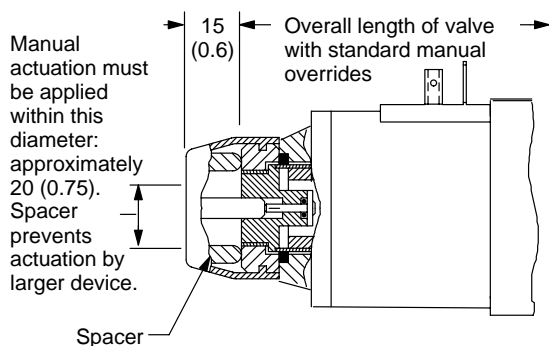
# Electrical Plugs & Connectors (continued)

## Manual Overrides

### Water-resistant manual override on solenoid DG4V-3S-\*\*\*\*(L)-H-(V)M-\*\*-\*\*-60-EN490

#### Application

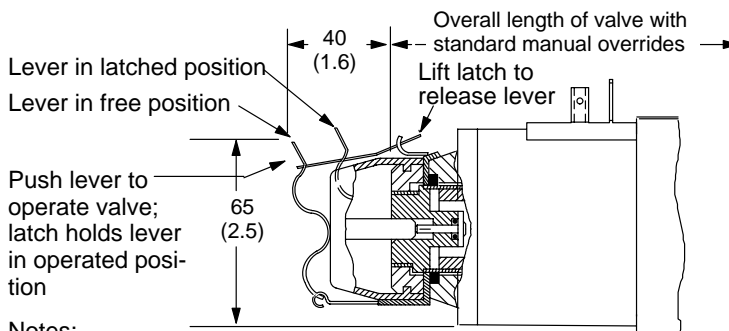
General use where finger operation is required (standard manual overrides cannot be operated without using small tool).



### Latching manual override on solenoid DG4V-3S-\*\*\*\*(L)-Y-(V)M-\*\*-\*\*-60-EN490

#### Application

Stainless steel lever/latch mechanism and water-resistant seal make this feature ideal for vehicle-mounted and exposed applications requiring emergency selection of valve for a period of time in the event of electrical failure.



#### Notes:

1. Opposite solenoid (on "C" and "N" double solenoid models) should not be energized while the valve is latched in selected position.
2. "Y" feature is field-convertible from "H" type manual override (omitting spacer), but is not field-convertible from other models.

## 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.

Typical model codes:  
DG4V-3S-\*\*-M-\*\*-\*\*-60-P08  
(0.8 mm dia orifice in port P)

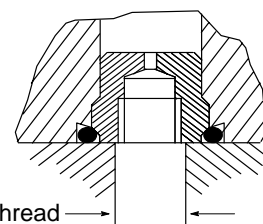
DG4V-3S-\*\*-M-\*\*-\*\*-60-P10-A10  
(1.0 mm dia orifice in ports P and A)

### Restrictor plug selection table

Code	Orifice diameter	Part number■
*00	Blank	694353
*03	0,30 (0.012)	694341
*06	0,60 (0.024)	694342
*08	0,80 (0.030)	694343
*10	1,00 (0.040)	694344
*13	1,30 (0.050)	694345
*15	1,50 (0.060)	694346
*20	2,00 (0.080)	694347
*23	2,30 (0.090)	694348

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

■ Available in multiples of 25 per part number



Maximum port dia in subplate/manifold block:  
For steel and SG (ductile) iron: 7,0 (0.3)  
For gray iron: 6,5 (0.25)

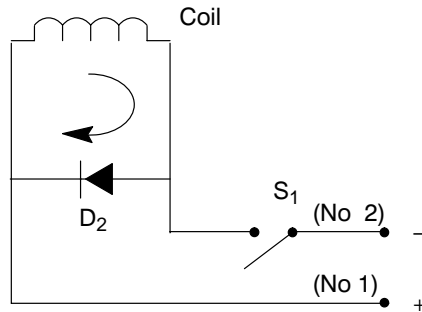


## Surge Suppression Devices (For DC Valves)

### Standard diode (D2)

Diode in parallel with coil. When switch (S<sub>1</sub>) is opened, the energy stored in the coil is trapped and dissipated by the diode (D<sub>2</sub>).

- Works only with DC voltage
- Polarity dependent
- Increases drop out time



*NOTE: These surge suppression devices are "Polarity Dependent." Proper biasing conditions must be met when installing/connecting a coil in a system.*

### Valve Shift and Dropout Times With and Without Surge Suppression

	Shift	Dropout
CETOP 3		
No Diode	23	60
Diode	23	141

Times represent cessation/application of voltage to coil versus velocity (start/stop) of a cylinder using a single solenoid, spring offset valve (time in milliseconds).

## Spare parts data

Refer to service drawing I-3886-S for spare parts and kit information.

### Seal kits

Kit No. 858995

*Note: Each seal kit covers a variety of models and may have redundant seals for a particular model.*

## Solenoid Coils

### DC Coils

Code	Voltage	"U" Type	"SP1" Type	"SP2" Type	"KU" Type
Full Power Coils:					
G	12V	02-309454	02-309460	02-309456	02-309452
H	24V	02-309455	02-309461	02-309457	02-309453
		"KUP1" Type	"KUP6" Type	"KUP7" Type	"KUP12" Type
Full Power Coils:					
G	12V	TBD	02-309468	02-316209	02-309466
H	24V	TBD	02-309469	TBD	02-309467

# Mounting Bolts

## Inch bolt kits, #10–24 UNC–2B

Size x length, in (mm)

#10-24 x 12,7 (0.50)	BK590715
#10-24 x 19,05 (0.75)	BK466847
#10-24 x 25,4 (1.00)	BK304
#10-24 x 31,8 (1.25)	BK590716
#10-24 x 38,1 (1.50)	BK306
#10-24 x 44,4 (1.75)	BK02-156494
#10-24 x 50,8 (2.00)	BKDG3698
#10-24 x 57,2 (2.25)	BK02-139165
#10-24 x 60,3 (2.38)	BK466849
#10-24 x 69,9 (2.75)	BK870017
#10-24 x 69,9 (2.75)	BKDGFN1694M
#10-24 x 76,2 (3.00)	BK02-156496
#10-24 x 79,4 (3.13)	BK466850
#10-24 x 88,9 (3.50)	BK466851
#10-24 x 95,3 (3.75)	BK869704
#10-24 x 100 (3.94)	BK466852
#10-24 x 101,6 (4.00)	BK02-156497
#10-24 x 109,5 (4.31)	BK466853
#10-24 x 120,7 (4.75)	BK466854
#10-24 x 127,0 (5.00)	BK02-156499
#10-24 x 130,2 (5.13)	BK466855
#10-24 x 133,4 (5.25)	BK02-156498
#10-24 x 139,7 (5.50)	BK466856
#10-24 x 150,9 (5.94)	BK466857
#10-24 x 160,3 (6.31)	BK466858
#10-24 x 170,0 (6.69)	BK466859
#10-24 x 177,8 (7.00)	BK890325

## Metric bolt kits, M5

Size x length, mm (in)

M5 x 20 (0.79)	BK466834M
M5 x 25 (0.98)	BK465723M
M5 x 30 (1.18)	BK616452M
M5 x 40 (1.57)	BK02–156493M
M5 x 50 (1.97)	BKDG3699M
M5 x 55 (2.17)	BK986135M
M5 x 60 (2.36)	BK466836M
M5 x 70 (2.76)	BK464125M
M5 x 75 (2.95)	BK869720M
M5 x 80 (3.15)	BK466837M
M5 x 90 (3.54)	BK466838M
M5 x 95 (3.74)	BK869721M
M5 x 100 (3.94)	BK466839M
M5 x 110 (4.33)	BK466840M
M5 x 120 (4.72)	BK466841M
M5 x 130 (5.12)	BK466842M
M5 x 140 (5.51)	BK466843M
M5 x 150 (5.91)	BK466844M
M5 x 160 (6.30)	BK466845M
M5 x 170 (6.69)	BK466846M
M5 x 200 (7.87)	BK464468M

## Metric bolt kits, M6

Size x length, mm (in)

M6 x 16 (0.63)	BK534564M
M6 x 20 (0.79)	BK534565M
M6 x 25 (0.98)	BK534566M
M6 x 30 (1.18)	BK534567M
M6 x 40 (1.57)	BKDG01633M
M6 x 45 (1.77)	BK534569M
M6 x 50 (1.97)	BK534570M
M6 x 55 (2.17)	BK534571M
M6 x 65 (2.56)	BK534572M
M6 x 70 (2.76)	BK534573M
M6 x 75 (2.95)	BK534574M
M6 x 80 (3.15)	BK638873M
M6 x 80 (3.15)	BKDGFN01637M
M6 x 85 (3.35)	BK978478M
M6 x 90 (3.54)	BK534576M
M6 x 100 (3.94)	BK978479M
M6 x 110 (4.33)	BK978480M
M6 x 115 (4.53)	BK534580M
M6 x 120 (4.72)	BK534581M
M6 x 140 (5.51)	BK638878M

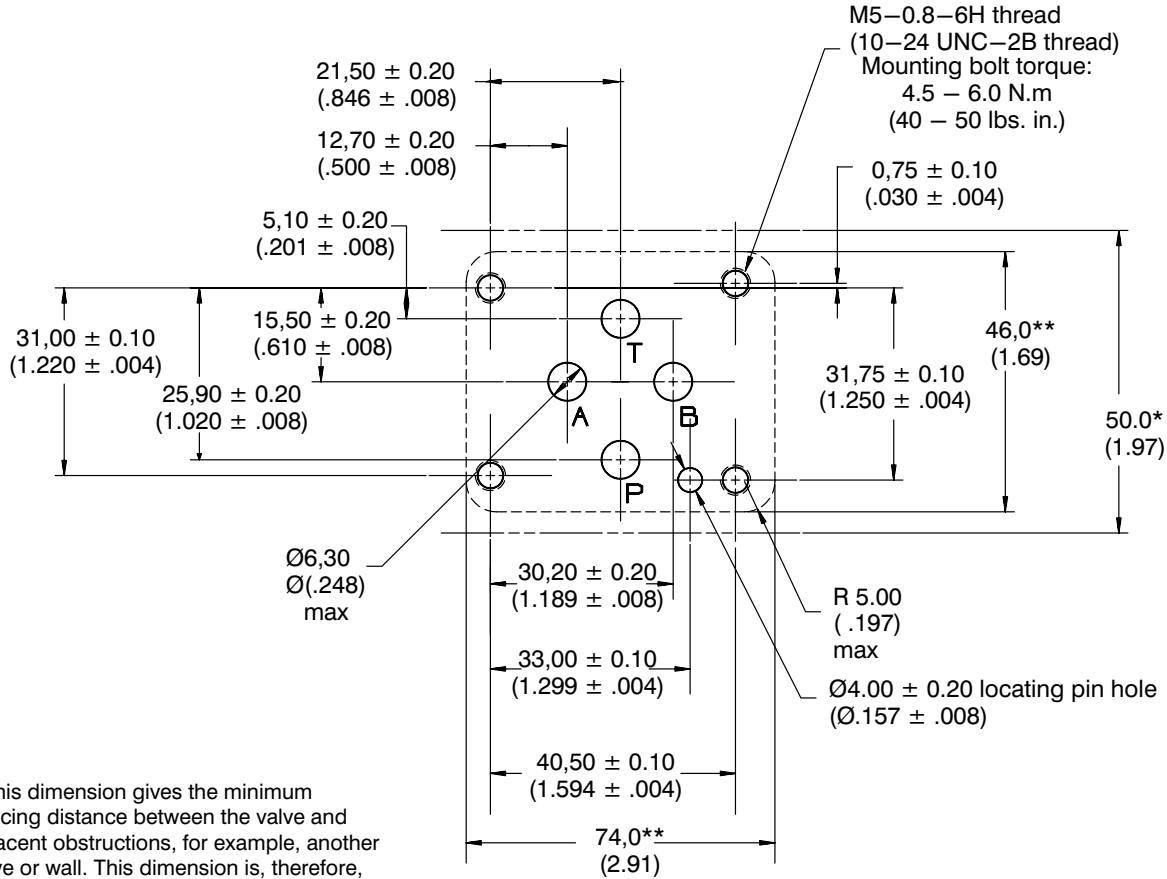
*Note: If not using Vickers bolt kits, bolts must be to Grade 12.9 (ISO 898) or better.*

The required bolt length should allow 0.40" (10 mm) thread engagement in the subplate/manifold block. Bolts should be torqued to 5–7 N.m (44–62 lbf. in.) with threads lubricated. Prior to installation of DG4V-3S valve, ensure that both the face of the valve and the face on which it is being mounted (i.e subplate, manifold, SystemStak valve or plate) is as clean as possible. Do not over tighten hold-down bolts beyond recommended values.

# Mounting Interface

The minimum thread depth is 1.5 times bolt diameter. The recommended full thread depth is  $2 \times D + 6\text{mm}$  to aid interchangeability of valves and to reduce the number of mounting bolt lengths. The recommended engagement of the mounting bolt thread for ferrous mounting is  $1.25 \times D$ .

Mounting surface must be flat within  $0.013\text{mm}$  (.0005) and smooth within 1.1 micrometer (45 microinch). Mounting bolts when provided by customer should be grade 12.9 (SAE grade 7) or better. Dimensions shown in millimeters (inches).



\* This dimension gives the minimum spacing distance between the valve and adjacent obstructions, for example, another valve or wall. This dimension is, therefore, the minimum distance from centerline to centerline of two similar mounting surfaces placed on a manifold block. The mounting holes are at equal distance to this dimension.

\*\*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.

## Fluid Cleanliness

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 Vickers, Incorporated. Recommendations on filtration and the selection of products to control fluid condition are included in 561.

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

## Filtration Requirements

19/17/14

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