

## Solenoid Operated, Two-Stage Directional Control Valve

**DG5S4-02**

**Flows to 115 l/min (30 USgpm)**

**Pressure to 210 bar (3000 psi)**



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# Introduction

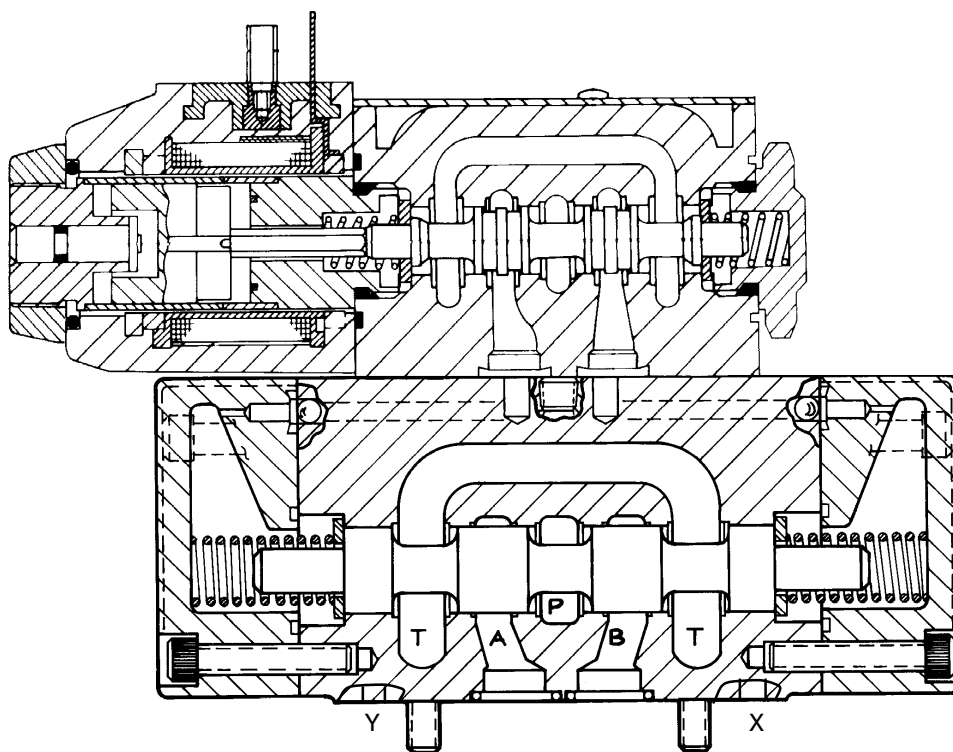
Series 02 two-stage directional valves are designed to meet the requirements of high performance, precision industrial hydraulic systems operating at pressures to 210 bar (3000 psi) and flows to 130 l/min (34 USgpm), depending on spool type (ref. maximum flow curves on page 4). Mounting surface is NFPA D05/ISO-05 with X-Y auxiliary ports.

Two-stage 02 valves (with additional pilot and drain ports) feature tapered main spool lands which permit faster operation with less hydraulic shock. Their close spool-to-bore tolerances also have minimum clearance for low internal leakage without the necessity of selective assembly.

Advanced design pilot valves provide reduced power consumption without any

sacrifice of valve performance. Quiet, long life solenoids can be replaced quickly without disturbing the hydraulic circuitry for easy maintenance. These pilot valves create a high margin of shift force that can overcome spool friction occasionally caused from dirt or other contaminants. The manual override is standard for quick start-ups.

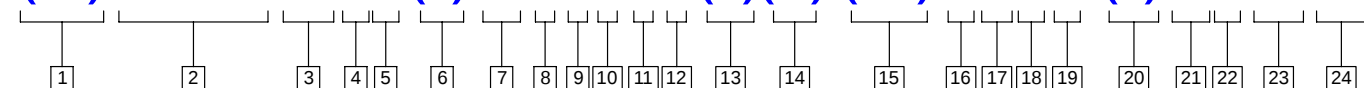
**Spring offset to "A" shown, reference model code for other spool/spring arrangements.**



# DG5S4-02 Model Series

## Model Code

**(F3)-DG5S4-02-\* \* (L)-\*\*-\*\*-\*\*-\*\*-\*(V)(M)-(SX)-\* \*\* \* \* -(L)-\*\*\*-\*\*\*-\*0**



### 1 Interface Seals

F3 – Special seals  
Blank – Standard seals

### 2 Valve Type

D – Directional control valve  
G – Manifold mounted  
5 – Solenoid controlled, pilot operated  
S – Sliding spool action  
4 – Four-way flow

### 3 Valve series

02 – CETOP 5 - 2 stage

### 4 Spool Type – see page 5

### 5 Spool/Spool Spring Arrangement

A – Spring offset to A  
B – Spring centered, shift to offset  
C – Spring centered  
F – Spring offset, shift to center  
N – No spring, detented

### 6 Left Hand Assembly

L – Single solenoid models only  
(omit for right hand assembly)

### 7 Manual Operator in Pilot Valve End Cap

H – Waterproof manual overrides on solenoid ends  
H2 – Waterproof overrides in both ends of single solenoid  
P2 – Overrides in both ends of single solenoid  
Y – Lockable manual overrides in solenoid ends only (DC only)  
Z – No overrides in either end  
Omit – Standard manual overrides on solenoid ends.

### 8 Response

X – Fast response  
(omit for standard models)

### 9 Spool Control Modifications (omit when not required)

1 – Stroke adjustment both ends  
(used with B,C and F spool/spring arrangements only)  
2 – Pilot choke adjustment, all models  
3 – Pilot choke and stroke adjustment, both ends (B, C and F models only)  
7 – Stroke adjustment cyl. A end only  
(not available on N and AL)  
8 – Stroke adjustment cyl. B end only  
(not available on N and A)  
2-7 – Pilot choke and stroke adjustment cyl. A end (not available on N and AL)  
2-8 – Pilot choke and stroke adjustment cyl. B end (not available on N and A models)

### 10 External Pilot Pressure

E – External pilot pressure  
(omit for internal pilot pressure models)

### 11 Pilot Drain

T – Internal pilot drain  
(omit for external pilot drain)

### 12 Mounting Screw Option

Blank – .2500-20 UNC-2A screws  
M – M6X1 - 6g screws

### 13 Solenoid Energization Identity

Blank – Standard arrangement for ANSI B93.9 (i.e. energize solenoid A to allow flow P to A)  
V – Solenoid identification determined by position of solenoid (i.e. solenoid A at port A end/solenoid B at port B end)  
NOTE: Type 4 & 8 spools are always V.

### 14 Flag Symbol Heading Electrical Features and Options

### 15 Spool Position Monitor Switch (A, B, and F models only)

S1\* – Proximity switch, normally open  
S2\* – Proximity switch, normally closed  
S3\*\* – Limit switch, normally open  
S4\*\* – Limit switch, normally closed  
S5\*\*\* – Limit switch, unwired  
\* Available on U models only  
\*\*Available on PA, PB, PA5 models only  
\*\*\*Available on FW & FJ models only

### 16 Coil Type

U – ISO 4400 (DIN 43650)  
P – Plug-in coil  
F – Flying lead  
SP1 – Single 6.3mm spade to IEC760  
SP2 – Dual 6.3mm spade to IEC760  
X1 – Flame proof solenoids to EEX-O-11B-T4  
X2 – Special protection solenoids to CSA/UL

### 17 Electrical Plug Features (F type coils only)

T – Wired terminal block  
PA – Insta-plug male connector only  
PB – Insta-plug male and female receptacles  
PA3 – NFPA 3-pin conduit connector  
PA5 – NFPA 5-pin conduit connector

### 18 Housing (F type coils only)

W – Wiring housing with 1/2" NPT thd. connectors  
J – 20mm thread

### 19 Electrical Options

1 – ISO 4400 with fitted plug  
(U type coils only)  
7 – Surge damper

## Model Code cont'd

### 20 Solenoid Indicator Lights

L – For models with flying lead ("F") and terminal block ("T") only  
(omit if not req'd.)

### 21 Coil Identification Letter

(Refer to GB-C-2015)

### Tank Pressure Rating

22 10 bar (145 psi) switch models  
(-30 design only)  
4 – 70 bar (1000 psi) hazardous models  
(-20 design only)  
5 – 100 bar (1450 psi) (-20 design only)  
6 – 160 bar (2285 psi) A.C. models  
(-30 design only)  
7 – 210 (3000 psi) D.C. models  
(-30 design only)

### 23 Pilot Valve Port Orifices

(omit if not required)

### 24 Design

20 – DG4V3S-60 standard pilot valve  
30 – DG4V3-60 high performance pilot valve

## Subplate Model Code

**DG V M \* - 5 \* SP PD 10 \***

1 2 3 4 5 6 7 8 9 10

### 1 Valve Type

DG – Directional control

### 5 Valve Size

5 – CETOP 5

### 9 Design Number

10 – Design

### 2 Pressure Rating

V – 345 bar (5000 psi)

### 6 Pipe Thread Size

Blank – 1/4 NPTF/BSP  
X – 3/8 NPTF/BSP  
Y – 1/2 NPTF/BSP  
Z – 3/4 NPTF/BSP

### 10 Connection/Mounting

Blank – NPTF thread connection  
T\*\* – SAE straight thread connection with .2500-20 UNC-2B inch thread mtg. 12-1.0626-12 UN 2-B conn.  
C\*\* – SAE straight thread connection with M6 x 1.8 metric thread 12-1.0625-12 UN 2-B connection

### Subplate

M – Subplate

### Ports

Blank – Back ports  
4 E – Side ports  
F – Side and bottom ports

### Subplate Options

7 Only way provided

### Modification

8 PD – Aux. pilot port and drain port

## Ordering procedure

Valves and subplates must be ordered separately.

Example:

(1) DG5S4-02-2C-M-W-G-10 valve

(1) DGVM-5Y-SP-PD-10 subplate

Subplate Bolt Kits:

BKDG01-633 (inch)

BK855993M (metric)

# Performance Data

## Recommended Maximum Flow According to Spool Type

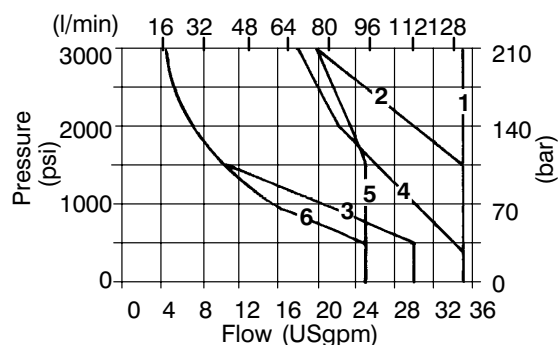
| Spool type | 3 position<br>Spring centered (C)** | Max. flow<br>curve* |
|------------|-------------------------------------|---------------------|
| 2          |                                     | 1                   |
| 0          |                                     | 2                   |
| 6          |                                     | 1                   |
| 3          |                                     | 1                   |
| 1          |                                     | 3                   |
| 7          |                                     | 1                   |
| 33         |                                     | 1                   |
| 4          |                                     | 4                   |
| 8          |                                     | 5                   |
| 9          |                                     | 6                   |

\*\* 2 position spring centered valves are also available. See model code for specifications and ordering information.

\* Maximum recommended flow data is for AC or DC solenoids at 90% nominal voltage in a 4-way circuit with cylinder ports looped together. Nominally reduced performance may result when certain spools are used in 3-way circuits.

| Spool type                               | 2 position<br>Detented (N) | Max. flow<br>curve* |
|------------------------------------------|----------------------------|---------------------|
| 2                                        |                            | 1                   |
| 0                                        |                            | 1                   |
| 6                                        |                            | 1                   |
| 9                                        |                            | 1                   |
| 2 position Spring offset to port A (A/L) |                            |                     |
| 2                                        |                            | 1                   |
| 0                                        |                            | 1                   |
| 6                                        |                            | 1                   |
| 9                                        |                            | 1                   |
| 2 position Spring offset to port B (A)   |                            |                     |
| 2                                        |                            | 1                   |
| 0                                        |                            | 1                   |
| 6                                        |                            | 1                   |
| 4                                        |                            | 1                   |

## Maximum Flow Curves



### NOTE

Surges of oil in a common tank line can be of sufficient magnitude to cause inadvertent shifting of these valves. This is particularly critical in the no-spring detented type valves. Separate tank lines or a vented manifold with a continuous downward path to tank is necessary.

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 and, therefore, should be cycled periodically to prevent this from happening.

# Operating Data

## Rated Fatigue Pressure

Ports P, A, B & T  
(external drain) 210 bar (3000 psi)  
Port T  
(internal drain) 100 bar (1500 psi)

## Solenoid Data

| Voltage          | Inrush<br>amps<br>(rms) | Holding<br>amps<br>(rms) | Holding<br>watts |
|------------------|-------------------------|--------------------------|------------------|
| 120/60           | 2.0                     | .59                      | 30               |
| 120/50<br>(dual) | 2.0                     | .65                      | 31               |
| 240/60           | 1.0                     | .28                      | 30               |
| 220/50<br>(dual) | 1.0                     | .30                      | 31               |
| 110/50           | 1.8                     | .58                      | 28               |
| 220/50           | .90                     | .28                      | 29               |
| 240/50           | .80                     | .26                      | 31               |
| 12 VDC           | --                      | 2.5                      | 30               |
| 24<br>VDC        | --                      | 1.5                      | 30               |

## Pressure Drop Curves

(Fluids @100 Ssu, 21 cSt)

| Typ. | P-A | B-T | P-B | A-T | P-T |
|------|-----|-----|-----|-----|-----|
| 2    | 1   | 2   | 1   | 2   |     |
| 0    | 1   | 2   | 1   | 2   | 1   |
| 6    | 1   | 2   | 1   | 2   |     |
| 3    | 1   | 2   | 1   | 2   |     |
| 1    | 1   | 2   | 1   | 2   | 2   |
| 7    | 1   | 2   | 1   | 2   |     |
| 33   | 1   | 2   | 1   | 2   |     |
| 4    | 4   | 5   | 4   | 5   | 3   |
| 8    | 4   | 5   | 4   | 4   | 3   |
| 9    | 1   | 2   | 1   | 2   |     |

Refer to flow curve table for  
corresponding pressure drop curves.

The method for verifying rated fatigue  
pressure conforms to NFPA  
recommended standard  
NFPS/T2.6.a – 1974 category 3/90.

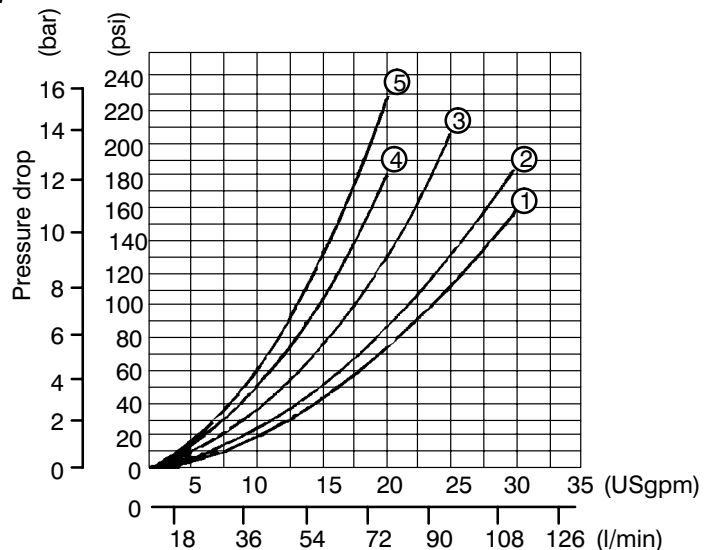
## Typical Response Time

| Pilot<br>Pressure<br>psi (bar) | Time (Seconds) |                  |
|--------------------------------|----------------|------------------|
|                                | Energize       | Spring<br>return |
| 100 (7)                        | .065           | .060             |
| 500 (35)                       | .040           | .060             |
| 1000 (70)                      | .035           | .060             |
| 2000<br>(140)                  | .030           | .060             |
| 3000<br>(210)                  | .025           | .065             |

## Fluid and Seals

Buna N seals are standard and are  
compatible with water glycol  
water-in-oil emulsions, high water base  
fluids, and petroleum oils. For  
phosphate ester, fire resistant fluids,  
viton seals (symbol "F3") must be used.  
Maximum operating pressure for  
high-water base fluids is 1000 psi.

## Flow



# Installation Data

## Pilot Pressure

Min. 5 bar (75 psi)  
Max. 210 bar (3000 psi)

The pilot pressure of internally drained valves must always exceed tank line pressure by a minimum of 5 bar (75 psi). Valves must be externally drained if there is a possibility of tank line pressure surges overcoming this differential.

## Mounting Position

There is no restriction on mounting position of spring centered or spring offset models. Detented models must be mounted with the spool bore horizontal to reduce the possibility of inadvertent spool shift, due to shock and/or vibration.

## Shifting Action

| Valve type               | Energized | De—energized      | Loss of pilot pressure |
|--------------------------|-----------|-------------------|------------------------|
| Spring center (C)        | Shift     | Return to center  | Return to center       |
| Spring offset (A/<br>AL) | Shift     | Return to offset  | Return to offset       |
| (B/BL)                   | Shift     | Return to center  | Return to center       |
| Detent (N)               | Shift **  | *Remain last pos. | *Remain last pos.      |

\* Provided no shock or vibration and mounting is horizontal.

\*\* A momentary signal of approximately .100 sec. is required.

## Filtration

For satisfactory service life of these components in industrial applications, use of full flow filtration to provide fluid which meets ISO cleanliness code 18/15 or cleaner, OFP, OFR and OFRS Vickers series filters are recommended.

## Viscosity Range

75 to 600 Ssu (15 to 128 cSt)

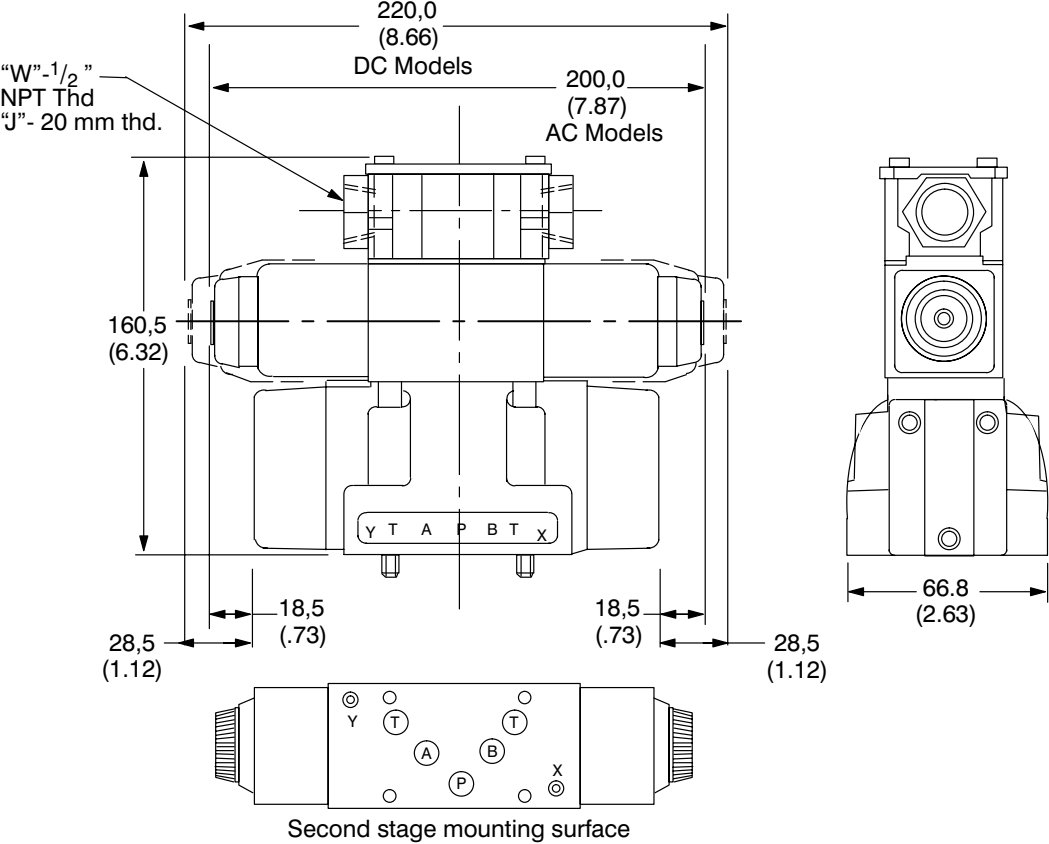
## Operating Temperature Range

–18° to 66°C (0° to 150°F)

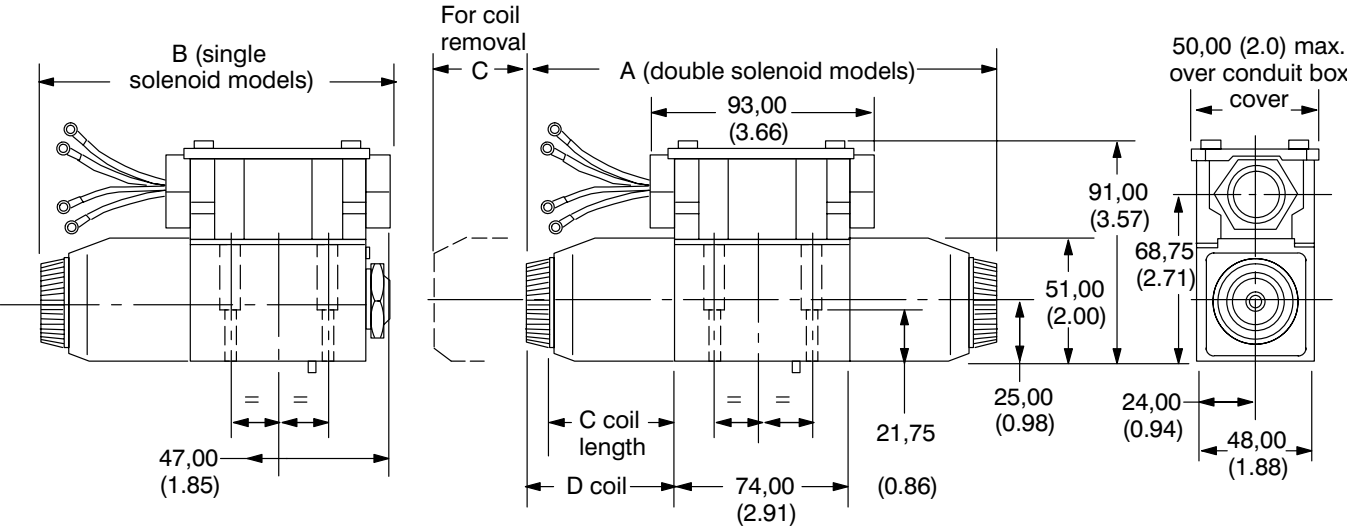
# Installation Dimensions

## With Terminal Box

mm (Inch)



| Model type | AC or DC | A          | B          | C        | D         |
|------------|----------|------------|------------|----------|-----------|
| All        | DC =     | 220 (8.66) | 156 (6.14) | 61 (2.5) | 73 (2.87) |
| DG4V3      | AC ~     | 200 (7.87) | 146 (5.75) | 51 (2.1) | 63 (2.48) |
| DG4V3S     | AC ~     | 200 (7.87) | 146 (5.75) | 45 (1.7) | 63 (2.48) |

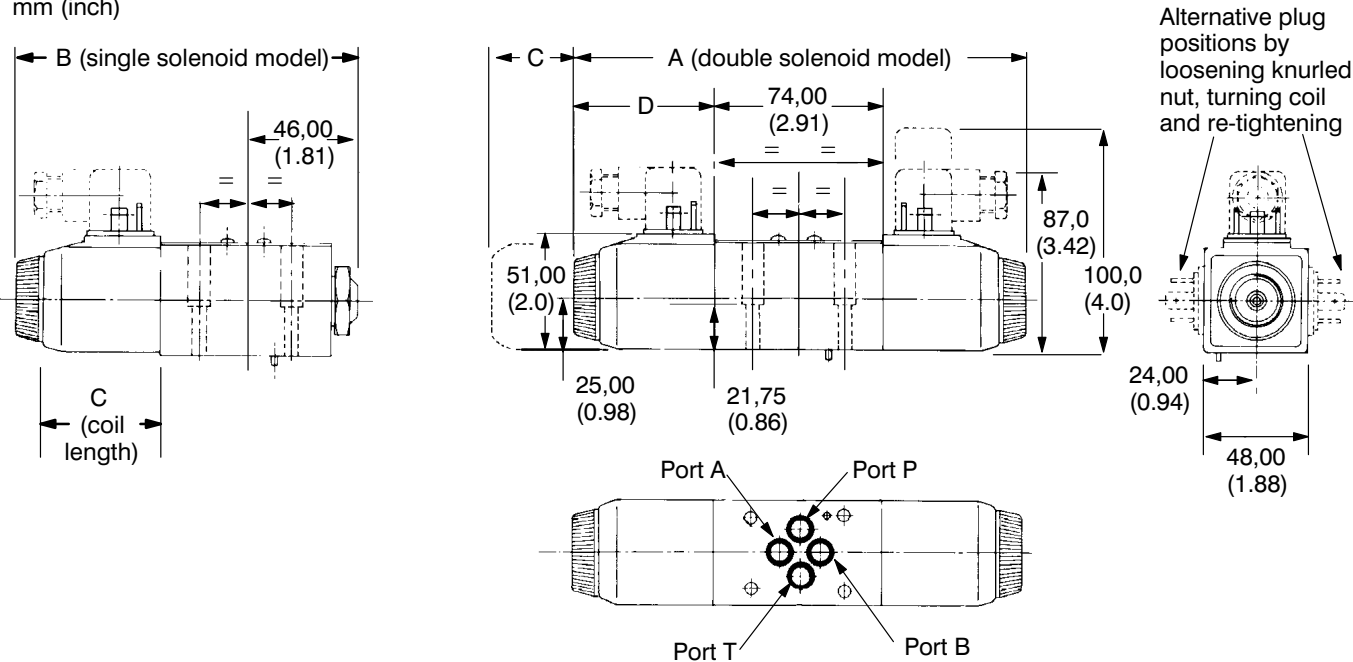


# Installation Dimensions

## With Plug-in Connectors

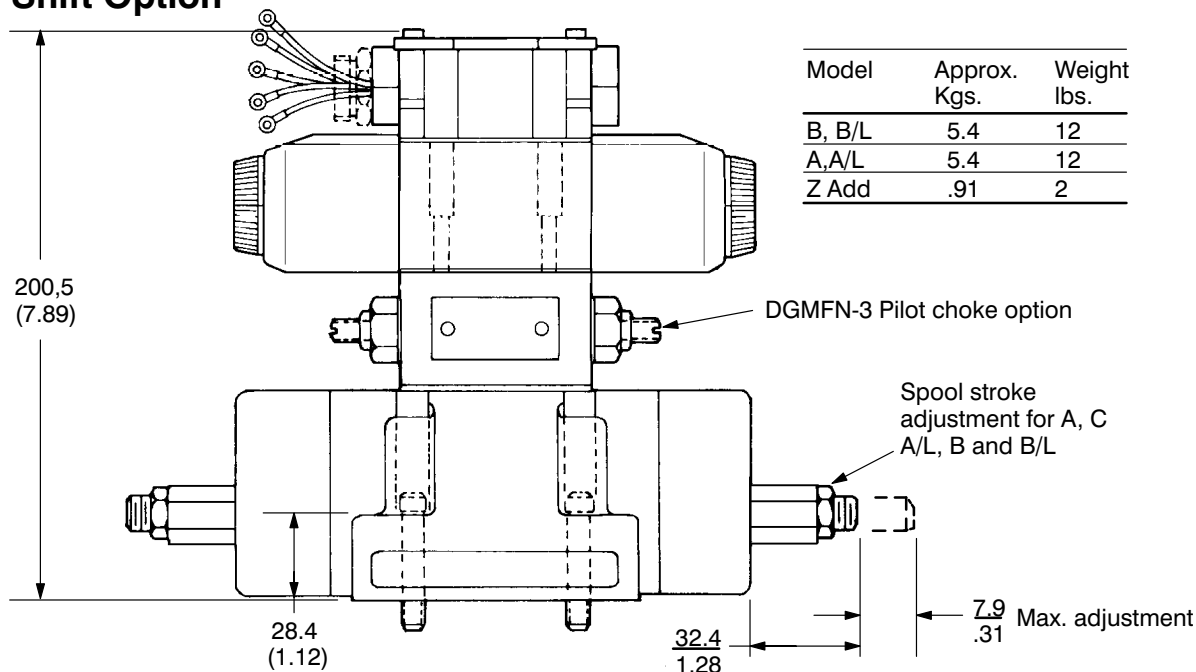
ISO 4401 (DIN 43650 Connectors)

mm (inch)



| Model  | AC or DC | A          | B          | C        | D         |
|--------|----------|------------|------------|----------|-----------|
| All    | DC =     | 220 (8.66) | 156 (6.14) | 61 (2.5) | 73 (2.87) |
| DG4V3  | AC ~     | 200 (7.87) | 146 (5.75) | 51 (2.1) | 63 (2.48) |
| DG4V3S | AC ~     | 200 (7.87) | 146 (5.75) | 45 (1.7) | 63 (2.48) |

## Spool Shift Option

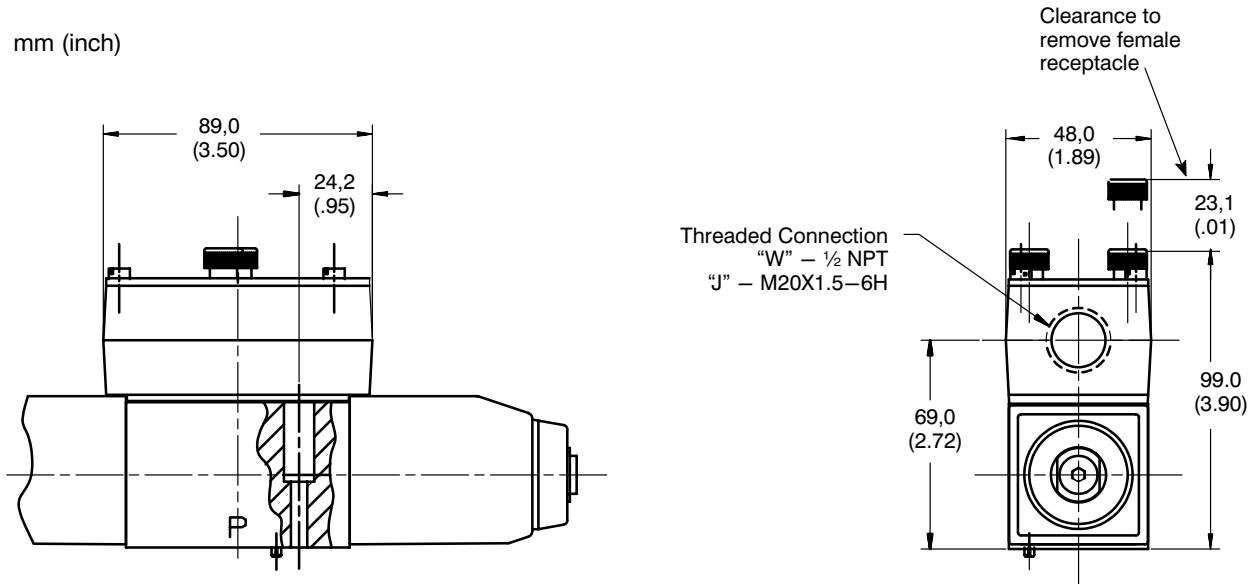


| Model  | Approx. Kgs. | Weight lbs. |
|--------|--------------|-------------|
| B, B/L | 5.4          | 12          |
| A, A/L | 5.4          | 12          |
| Z Add  | .91          | 2           |

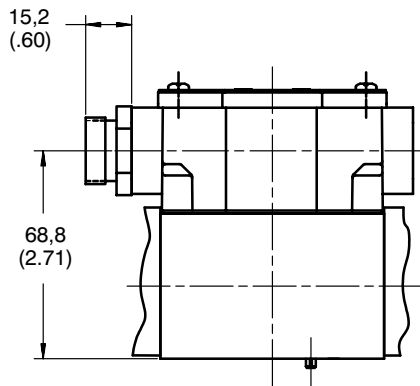
# Installation Dimensions

## With Insta-plug Option

mm (inch)



## With NFPA Connector



## Pilot Valve Port Orifices

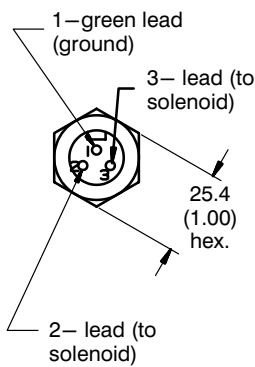
Restrictor plugs are available for use in A, B, P or T ports. They are used to restrict flow or circuit dampening. Available sizes are 0.3 mm to 2.3 mm (.020 inch to .098 inch).

- 03 – 0.30 dia.
- 06 – 0.60 dia.
- 08 – 0.80 dia.
- 10 – 1.0 dia.
- 13 – 1.3 dia.
- 15 – 1.5 dia.
- 20 – 2.0 dia.
- 23 – 2.3 dia.

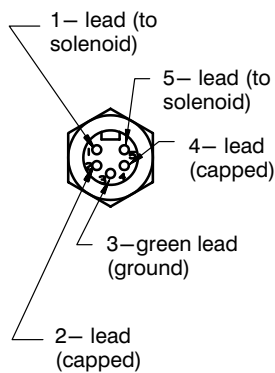
# Electrical Connections

## NFPA Electrical Connector

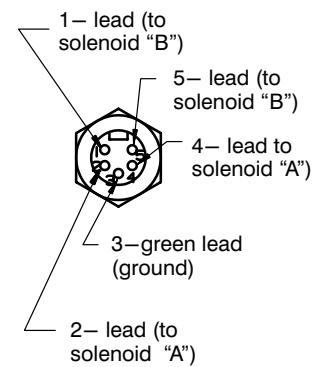
The receptacle is a standard three or five pole electrical connector with shortened leads and terminals added. The connector is assembled over the solenoid "B" on dual solenoid models and over the solenoid "A" for single solenoid models.



MODEL:  
DG5S4-02\*\*-MPA3-W  
├── "A" Models  
├── "B" Models  
└── "F" Models

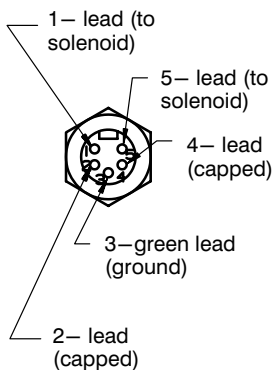


MODEL:  
DG5S4-02\*\*-MPA5-W  
├── "A" Models  
├── "B" Models  
└── "F" Models

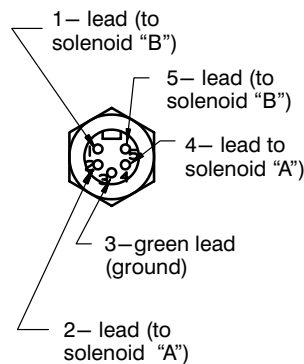


MODEL:  
DG5S4-02\*\*MPA5-W  
├── "C" Models  
└── "N" Models

## Insta-plug option



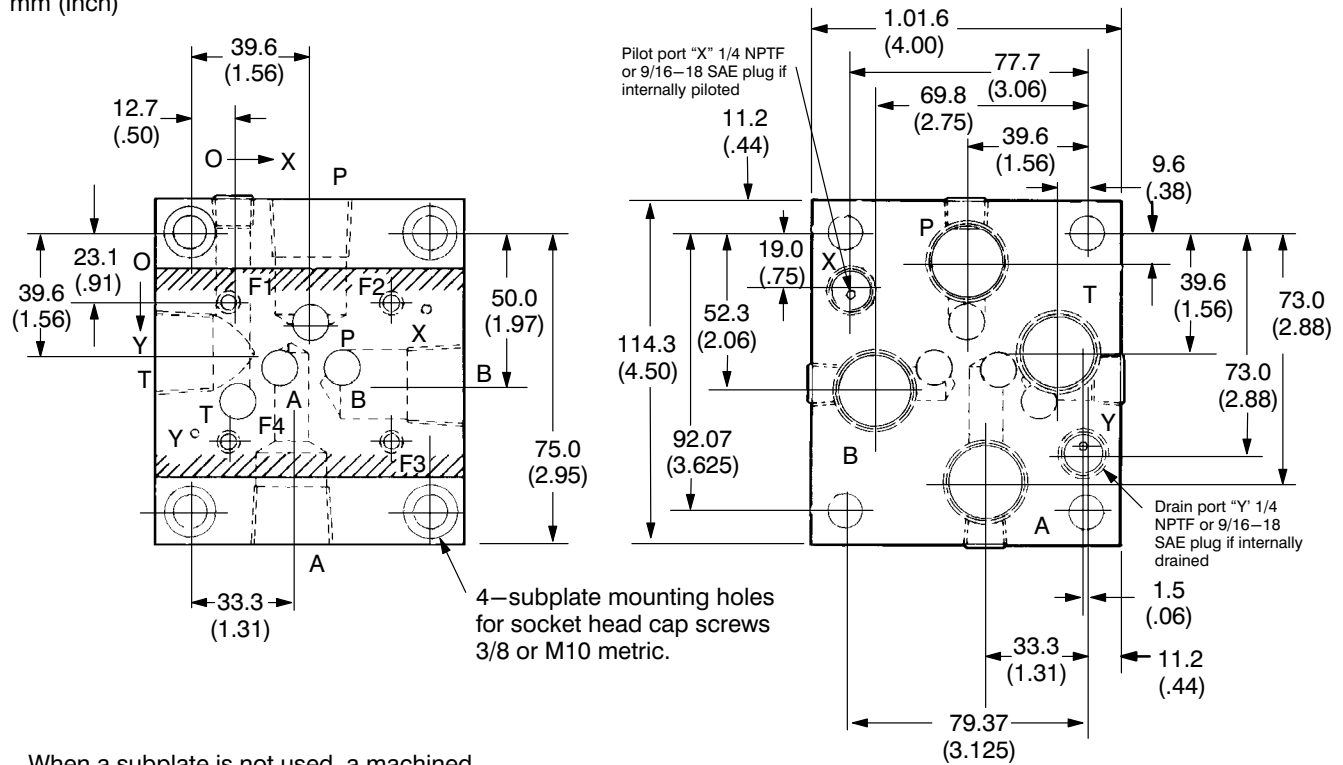
MODEL:  
DG5S4-02\*\*-MS1PA5-W  
├── "A" Models  
├── "B" Models  
└── "F" Models



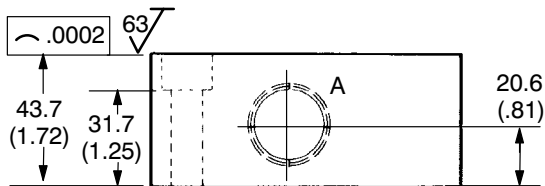
MODEL:  
DG5S4-02\*\*-MS2PA5-W  
├── "A" Models  
├── "B" Models  
└── "F" Models

# DGVM-5 Mounting Surface & Subplate

mm (Inch)



When a subplate is not used, a machined pad corresponding to the shaded area must be provided.



|   | P                 | A                 | T                 | B                 | F1         | F2            | F3            | F4            | X            | Y            |
|---|-------------------|-------------------|-------------------|-------------------|------------|---------------|---------------|---------------|--------------|--------------|
| X | 27.0<br>1.06      | 16.7<br>0.66      | 3.2<br>0.13       | 37.3<br>1.47      | 0<br>0     | 54.0<br>2.125 | 54.0<br>2.125 | 0<br>0        | 65.0<br>2.56 | 11.2<br>0.44 |
| Y | 6.3<br>0.25       | 21.4<br>0.84      | 32.5<br>1.28      | 21.4<br>0.84      | 0<br>0     | 0<br>0        | 46.0<br>1.812 | 46.0<br>1.812 | 2.3<br>0.09  | 43.7<br>1.72 |
| Q | 11.2 max.<br>0.44 | 11.2 max.<br>0.44 | 11.2 max.<br>0.44 | 11.2 max.<br>0.44 | M6<br>0.25 | M6<br>0.25    | M6<br>0.25    | M6<br>0.25    | 3.1<br>0.12  | 3.1<br>0.12  |

Approximate weight: Standard subplates 2.7 kgs. (6 lbs.)