

# VICKERS® by Danfoss

## Directional Controls User Guide

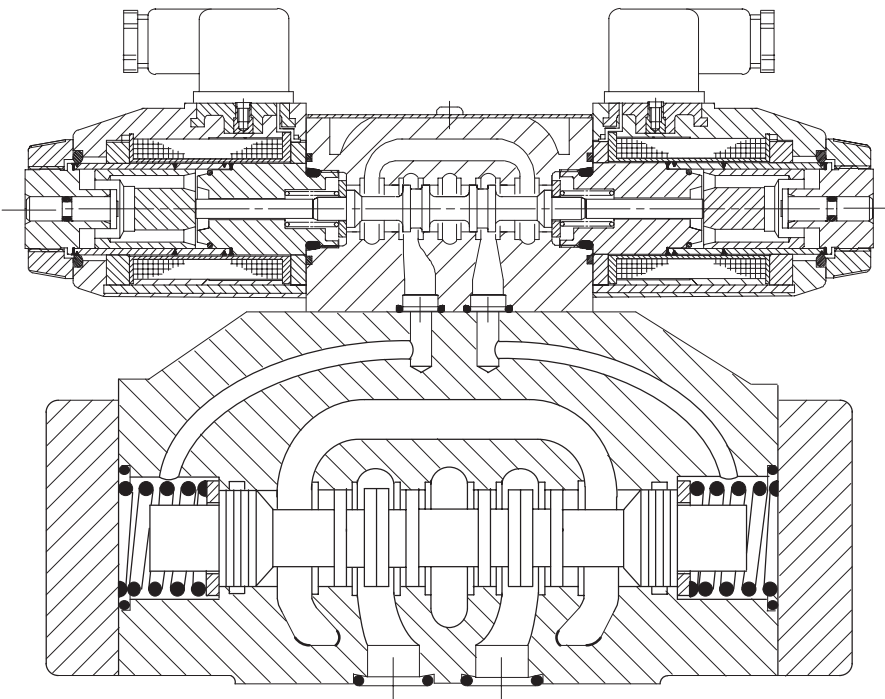
---

DG3V-5, 10 Series, Pilot Operated  
DG5V-5, 10/20 Series, Solenoid Controlled, Pilot Operated  
ISO 4401-05-05-0-94

---

### Typical Section

DG5V-5-2C



### Basic Characteristics

---

Max. operating pressure ..... 315 bar (4567 psi)  
Max. flow at max. pressure ..... 160 L/min (42 USgpm)

### General Description

These valves are used for controlling the starting, stopping and direction of fluid flow.

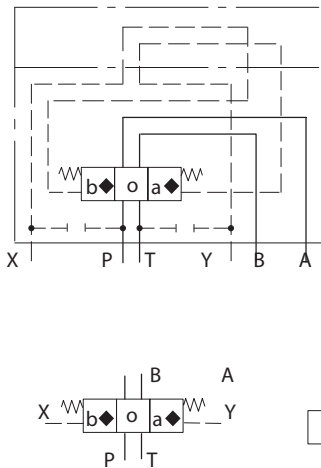
- Two types of control are available:
- Hydraulic pilot pressure (DG3V-5 models)
  - Integrally-mounted solenoid operated pilot valves (DG5V-5 models) comprising spring-offset, spring-centered and detented versions. Pilot pressure and drain can be independently configured for internal or external connection.

All spool types have been designed to provide good low-shock, fast-response characteristics which can be enhanced by an optional pilot choke module to control the speed of travel of the main spool.

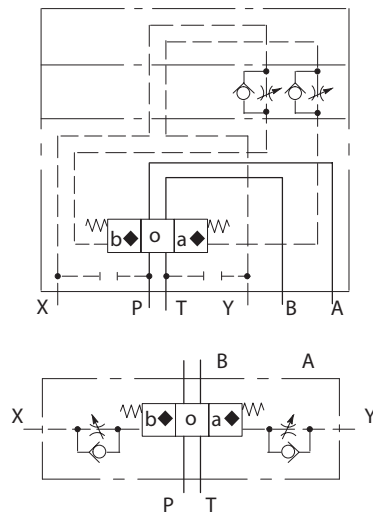
# Functional Symbols

DG3V-5, Pilot Operated Models  
Comprehensive and simplified symbols

Spring Centered,  
DG3V-5-\*\*C  
Spool types: All



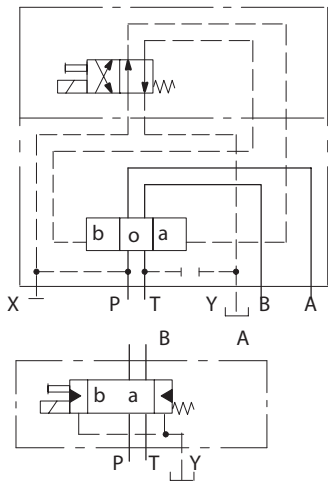
DG3V-5-\*\*C Models with Pilot Choke  
Module  
Obtained by specifying "2" at Model  
Code position 4



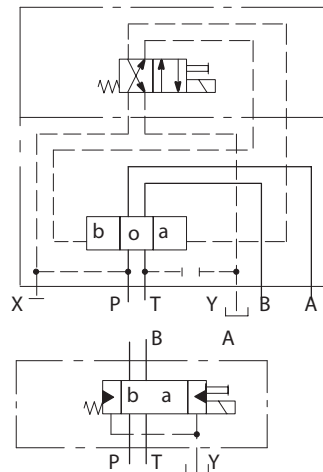
◆ "a" and "b" interchanged for spool type 8

DG5V-5, Solenoid Controlled, Pilot Operated Models  
Comprehensive and simplified symbols, shown configured for external pilot supply  
and internal drain

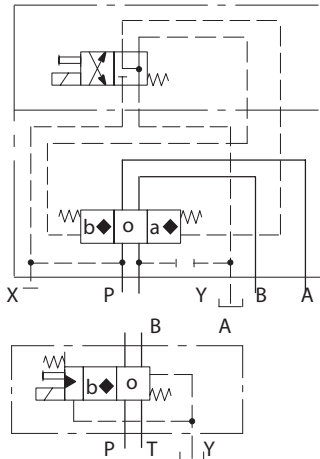
Spring Offset, End-to-End,  
DG5V-5-\*\*A  
Spool types: 0, 2, 6, 52



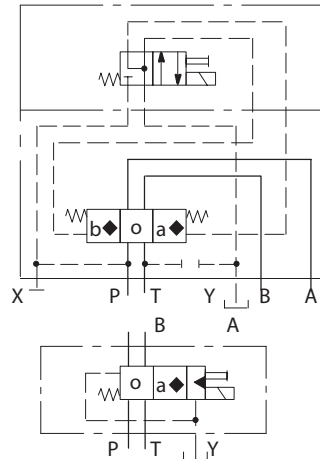
Spring Offset, End-to-End, Opposite  
Hand, DG5V-5-\*\*AL  
Spool types: 0, 2, 6, 52



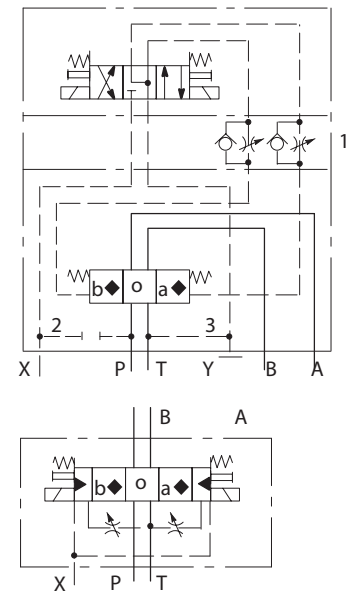
Spring Offset, End-to-Center  
 Models Spool types  
 DG5V-5-\*\* B 0, 2, 52  
 DG5V-5-\* BL 8



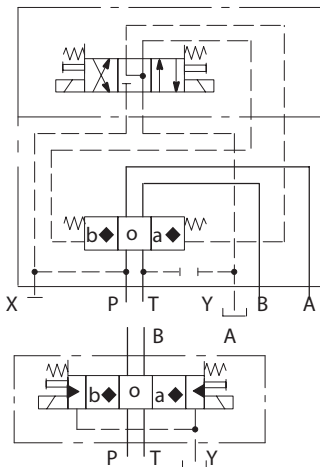
Spring Offset, End-to-Center,  
 Opposite Hand  
 Models Spool types  
 DG5V-5-\* B 8  
 DG5V-5-\*\* BL 0, 2, 52



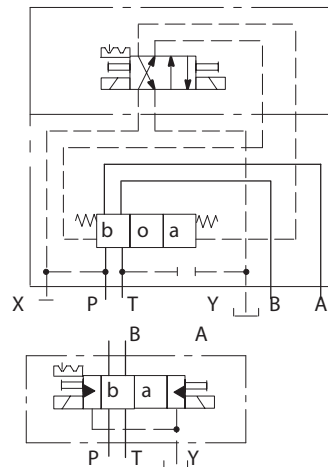
DG5V-5 Options  
 The following are shown in a  
 DG5V-5-\*\*C example:  
 1. Pilot choke module  
 2. External pilot connection  
 3. Internal drain



Spring Centered, DG5V-5-\*\*C  
 Spool types: All



Detented, DG5V-5-\*\*N  
 Spool types : 0, 2, 6, 52



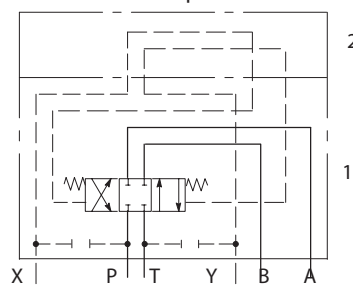
◆ "a" and "b" interchanged for spool type 8.

### Symbols on Nameplates

Control elements (i.e. solenoid pilot valve, choke module, cover plate) used with size 5 main stage valves are standard Vickers by Danfoss units complete with their individual nameplates including model code and symbols. The main stage carries the model code of the 2-stage valve and the functional symbol of the main stage spool. Referring to the examples, nameplates are located as follows:

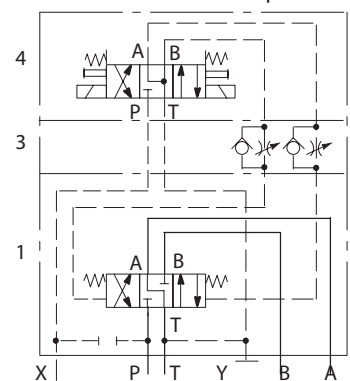
1. On main stage (DG3V-5/DG5V-5)
2. On cover plate (DG3V-5)
3. On pilot choke module (DG5V-5)
4. On pilot stage valve (DG5V-5)

### DG3V-5-2C example



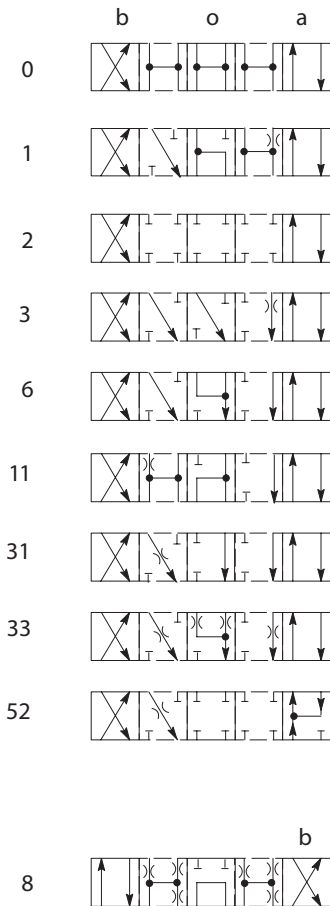
Note that for clarity pilot lines (dotted lines in illustrations) are omitted from the main-stage nameplate.

### DG5V-5-3C-2-E-T example



## Spool Types

Shown in 3-position form, plus 2 transients



### Notes:

1. In the detailed and simplified symbols on the previous pages, the transient positions are omitted for simplicity.
2. In certain 2-position valves, the "o" position becomes an additional transient, i.e. in DG5V-5-\*\*-A(L) and DG5V-5-\*\*-N valves.

## Model Codes

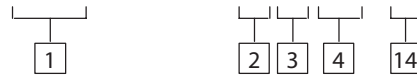
Features in brackets are optional; all other features must be specified when ordering.

For DG5V solenoid-controlled models, other features/options on the DG4V-3/3S 60-design pilot valve may be made available as applicable and subject to quantity required. See appropriate catalog for details:

- 2015 for AC voltages: DG4V-3 (high performance) models
- 2168 for DC voltages: DG4V-3S (standard performance) models

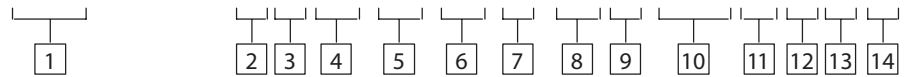
For Direct Pilot-Operated Models

(F3-) DG3V-5- \*\* C (-2)-1\*



For Solenoid-Controlled, Pilot-Operated Models

(F3-)DG5V-5- \*\* \*\* (-2) (-E) (-T) (\*) - (V) M -\*\*\*\*\* (L) -\* -\* -\*\*



1 Special seals for phosphate esters

Omit for standard seals (see "Hydraulic Fluids" section)

2 Spool type

See "Functional Symbols "

3 Spool spring arrangement

- o For DG3V-5
- C = Hydraulic pilot-operated, 3-position, spring-centered

For DG5V-5 ▲

- A = Single solenoid, spring-offset to position "a"; energize solenoid for position "b"
- AL = Single solenoid, spring-offset to position "b"; energize solenoid for position "a"
- B = Single solenoid, spring-offset to center position "o"; energize solenoid for position "b"
- BL = Single solenoid, spring-offset to center position "o"; energize solenoid for position "a"
- C = Double solenoid, spring-centered; energize solenoid for position "a" or "b"
- N = Double solenoid; energize solenoid for position "a" or "b"; detent-held in last selected position ■

- ▲ All main-stage assemblies are spring-centered. The conditions described depend on the availability of pilot pressure in excess of 4,5 bar (65 psi) to move the spool against these springs. This is particularly important when using external pilot pressure supply.
- Subject to availability of pilot pressure.

4 Spool shift control

- 2 = Pilot choke adjustment for both directions of spool travel
- Omit if not required

5 Pilot pressure supply

- E = Valve configured for external pilot supply to port "X"
- Omit for internal pilot supply (port "X" must be blanked off, e.g. at the valve mounting face, when using internal pilot supply)

6 Pilot drain arrangement ◆

- T = Valve configured for internal pilot valve drain (port "Y" must be blanked off, e.g. at the valve mounting face, when using internal drain)

Omit for external drain from port "Y"

- ◆ See 13 for pressure limits.

**7** Pilot valve manual override option

No symbol = Plain override(s) on solenoid end(s) only

H▼ = Water-resistant override(s) on solenoid end(s)

Z = No override at either end

▼ See catalog 2015 for details.

**8** Solenoid identity method

V = Solenoid "A" at port "A" end of pilot valve body and/or solenoid "B" at port "B" end of pilot valve body, independent of main-stage port locations and spool type.

Omit (except as noted below) for US ANSI B93.7 standard requiring solenoid "A" energization to connect main ports P and A and/or solenoid "B" energization to connect P and B, independent of solenoid location.

Note: The "V" code is always used for valves with type "8" spool as the solenoid identity is the same for both methods of identification.

**9** Start of electrical features

M = Start of electrical features codings

**10** Solenoid type/connection(s)

U = ISO 4400 (DIN 43650) mounting■

FJ = M20 thread conduit box

FTJ = M20 thread conduit box with terminal connector strip

FW = 1/2" NPT thread conduit box

FTW = 1/2" NPT thread conduit box with terminal connector strip

FPA3W = Junction box with 3-pin male connector▲ to NFPA T3.5.29-1980 for single-solenoid valves

FPA5W = Junction box with 5-pin male connector▲ to NFPA T3.5.29-1980 for single or double-solenoid valves

■ Some female plug connector options available separately from Vickers Systems (see "Plugs for ISO 4400" on page A.10).

▲ Female connector to be supplied by customer.

**11** Indicator lights

For FTJ, FTW, FPA3W and FPA5W type coils only

L = Lights fitted

No symbol = Lights not fitted

For U-type coils use separate plug with integral light; (see "Plugs for ISO 4400" on page A.10).

**12** Coil rating

A = 110V AC 50 Hz

B◇ = 110V AC 50 Hz/120V AC 60 Hz

C = 220V AC 50 Hz

D◇ = 220V AC 50 Hz/240V AC 60 Hz

G = 12V DC

H = 24V DC

◇ For 60 Hz or dual frequency.

**13** Port T or Y maximum pressure †

5 = 100 bar (1450 psi), for DC solenoids only

6 = 160 bar (2300 psi), for AC solenoids only

† This pressure rating (determined by the pilot valve drain port) is applicable to:

1. Port T when using internal drain ( "T" at position **6**)
2. Port Y when using external drain (no symbol at position **6**)

**14** Design number, 10 and 20 series

Subject to change. Installation dimensions unaltered for design numbers 10 to 19 and 20 to 29 inclusive.

10 = DG5V-5 with AC solenoids  
DG3V-5

20 = DG5V-5 with DC solenoids

## Operating Data

Based on petroleum oil at 36 cSt (168 SUS) and at 50 °C (122 °F).

Maximum pressures	
For DG3V-5:	
All ports	315 bar (4567 psi)
For DG5V-5 externally drained:	
Ports P, A, B, T, X	315 bar (4567 psi)
Port Y:	
With AC solenoids	160 bar (2300 psi)
With DC solenoids	210 bar (3045 psi)
For DG5V-5 internally drained:	
Ports P, A, B, X, Y	315 bar (4567 psi)
Port T:	
With AC solenoids	160 bar (2300 psi)
With DC solenoids	210 bar (3000 psi)
Maximum flow	160 L/min (42 USgpm)
Minimum pilot pressure	See "Control Data "

For all data related to the DG4V-3/3S 60-design pilot valve, refer to appropriate catalog:

2015 for AC voltages: DG4V-3 models

2168 for DC voltages: DG4V-3S models

## Control Data

### Pilot Pressures

Differential pressure, i.e. pilot pressure at port P (or port X) minus pilot drain pressure at port T (or port Y).

Maximum ..... 315 bar (4567 psi)

Minimum (for max. flow):

For spool types 0, 1,

8♦, 11 ..... 4,5 bar (65 psi)

For spool type 6 ..... 8 bar (116 psi)

For spool types 2, 3,

31, 33, 52 ..... 10 bar (145 psi)

All main stages are spring-centered.

Selection of spool offset positions "a" or "b" requires pilot pressure equal to or in excess of the above minimums to move the spool against the spring force. This is particularly important when using external pilot pressure supply.

♦ When using a type 8 spool with the valve configured for internal pilot supply, flow through the valve should be at least 80 L/min (21 USgpm) to generate 4,5 bar (65 psi) pressure drop when the spool is in the center position (flow P to T).

### DG5V-5-\*\*\*N

The spool of the pilot valve of this model is detent-held in its last selected position, and the spool will remain ▲ in this position after the solenoid has been de-energized.

The main stage is spring-centered and requires at least minimum pilot pressure to hold the spool in its offset ("detent-held") position. When pilot pressure falls below the recommended minimum, the main-stage spool will move to position "o" under the action of the centering springs. The system designer should ensure that under these conditions the flow condition at center position "o" is appropriate for the application.

▲ See comment in "Mounting Attitude".

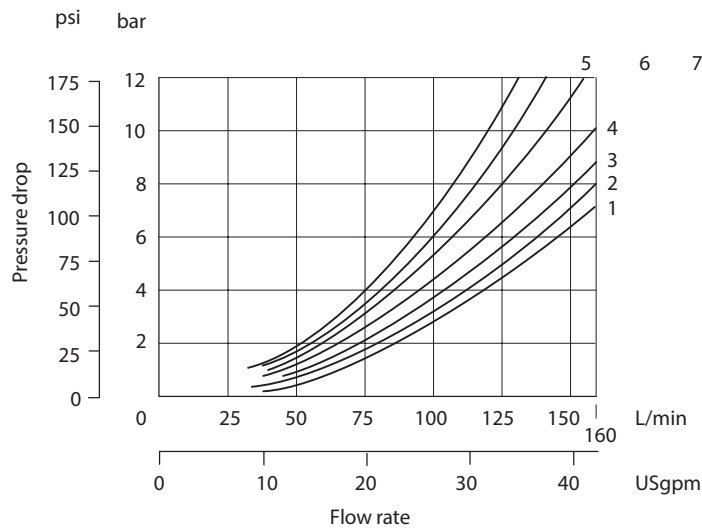
### Pilot Choke Module

This allows the velocity of the main-stage spool to be controlled, thereby reducing transient shock conditions. For best results a constant, low pilot pressure is recommended.

## Performance Data

### Pressure Drops

Based on petroleum oil at 36 cSt (168 SUS) and at 50 °C (122 °F).



Spool type	For positions "a" or "b":				For position "o":		
	P to A	B to T	P to B	A to T	A to T	B to T	P to T
0	4	4	1	4	1	3	5
1	1	4	1	4	3	–	6
2	1	2	1	5	–	–	–
3	2	3	1	4	5	–	–
6	1	2	1	3	–	–	–
8	4	2	2	6	–	–	7
11	4	1	3	4	–	7	5
31	3	3	3	4	–	4	–
33	2	2	3	4	–	–	–
52	2	3	3	5	–	–	–

### Hydraulic Fluids

These valves are suitable for use with hydraulic oils, water-in-oil emulsions and water glycols.

The extreme operating range is from 500 to 13 cSt (2270 to 70 SUS) but the recommended running range is 54 to 13 cSt (245 to 70 SUS).

### Contamination Control Requirements

Recommendations on contamination control methods and the selection of products to control fluid condition are included in Vickers by Danfoss publication 9132 or 561, "Vickers Guide to Systemic Contamination Control". The book also includes information on the Vickers by Danfoss concept of "ProActive Maintenance". The following recommendations are based on ISO cleanliness levels at 2 µm, 5 µm and 15 µm. For products in this catalog the recommended levels are:

Up to 210 bar (3000 psi) ..... 20/ 18/15  
Above 210 bar (3000 psi) .... 19/ 17/14

Temperature Limits

Minimum ambient ..... -20 °C (-4 °F)

Maximum ambient

Model	As for fluids
DG3V-5 models	As for fluids
DG5V-5 models	
With AC dual frequency coils:	
At 50 Hz and 107% voltage	40 °C (104 °F)
At 50 Hz and 110% voltage	30 °C (86 °F)
At 60 Hz and 107% voltage	50 °C (122 °F)
At 60 Hz and 110% voltage	40 °C (104 °F)
With AC single frequency (50 Hz) coils:	
At 50 Hz and 110% voltage	40 °C (104 °F)
With DC coils at 110% voltage	70 °C (158 °F)

Fluid temperature limits

	Petroleum oil	Water-containing
Min.	-20 °C (-4 °F)	+10 °C (+50 °F)
Max.*	+80 °C (+176 °F)	+54 °C (+130 °F)

\* To obtain optimum service life from both fluid and hydraulic system, 65 °C (150 °F) is the recommended maximum fluid temperature, except for water-containing fluids.

For synthetic fluids consult fluid manufacturer or Vickers by Danfoss where limits are outside those for petroleum oil.

Solenoid Identification (refers to installation drawing, next page)

For model code variants:

Position 3 spool spring arrangement

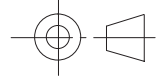
Position 8 solenoid identity method

Model	Spool types	Solenoid identity:	
		Main port A end	Main port B end
DG5V-5-*A/B(-2)(-E)(-T)(-**-M	All except "8"	-	B
DG5V-5-*A/B(-2)(-E)(-T)(-**-VM	All except "8" "8" only	- B	A -
DG5V-5-*AL/BL(-2)(-E)(-T)(-**-M	All except "8"	A	-
DG5V-5-*AL/BL(-2)(-E)(-T)(-**-VM	All except "8" "8" only	B -	- A
DG5V-5-*C/N(-2)(-E)(-T)(-**-M	All except "8"	A	B
DG5V-5-*C/N(-2)(-E)(-T)(-**-VM	All spools	B	A

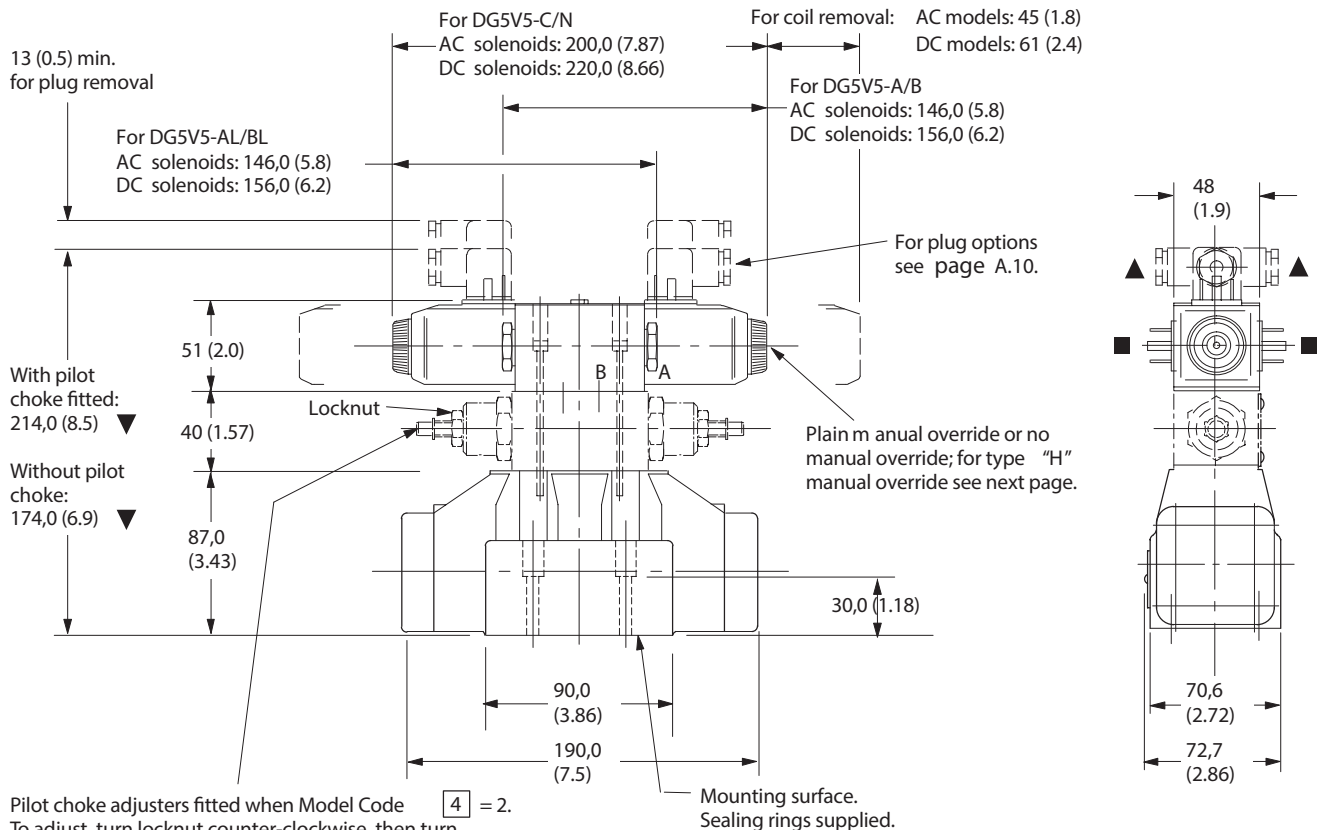
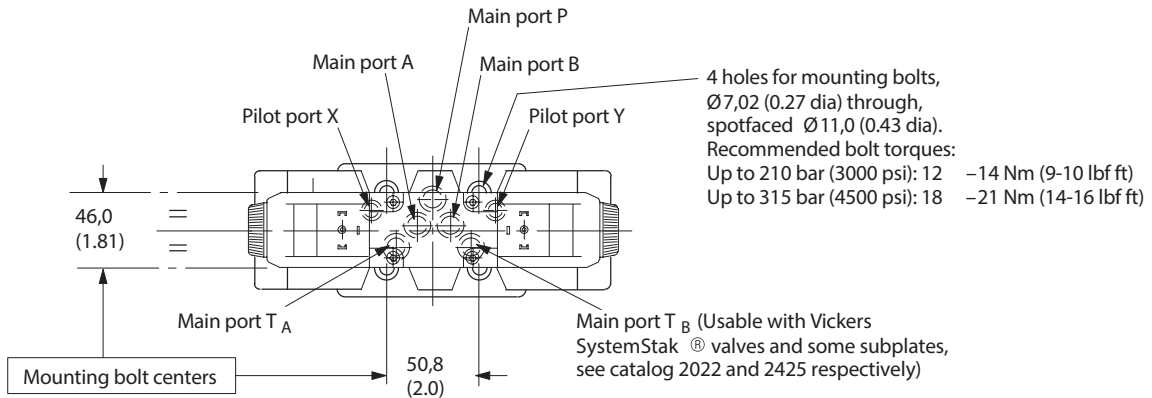
# Installation Dimensions in mm (inches)

Solenoid Controlled Models with ISO 4400 (DIN 43650) Electrical Connections and Optional Pilot Choke  
 DG5V-5-\*\*(L)(-2)(-E)(-T)(-\*)(-V)M-U example

3rd angle projection



For solenoid identification see previous page.



▼ May vary according to plug source.

■ Alternative plug positions by loosening knurled nut counter-clockwise, turning coil and re-tightening nut.

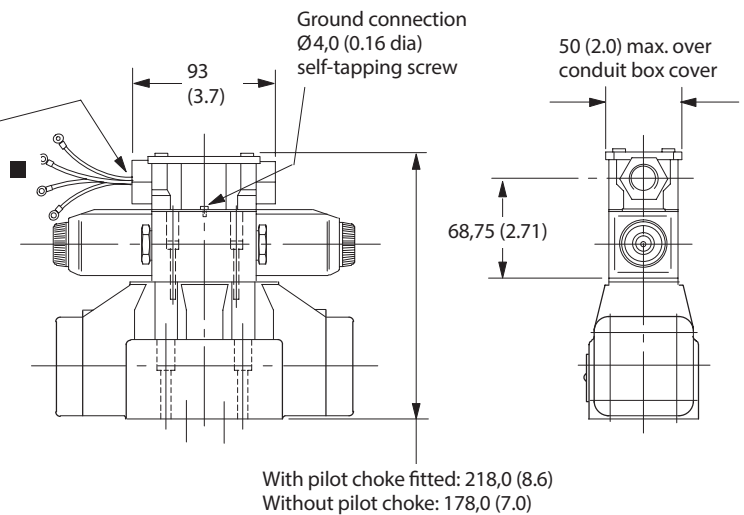
▲ Cable entry can be positioned at 90° either way from position shown, by re-assembling the contact holder into the appropriate position inside the plug connector housing.



Solenoid Controlled Models with Junction Box  
 having Optional Terminal Strip and Indicator Lights  
 DG5V-5-\*\*\*(L)(-2)(-E)(-T)(-\*)-(V)M-F\*\*\*\*(L) example

For solenoid identification see page A.7.  
 Available also with other options shown on  
 previous and following pages.

M20-6H x 1,5 thread for F(T)J options, or  
 1/2" NPT for F(T)W options, at both ends. Closure plug  
 fitted at one end.  
 For other options see **1Q** **ii1** "Model Code " on page  
 A.5 and under "NFPA Connector---" and "Terminal Strip  
 and Lights ", on pages A.10 and A.11.



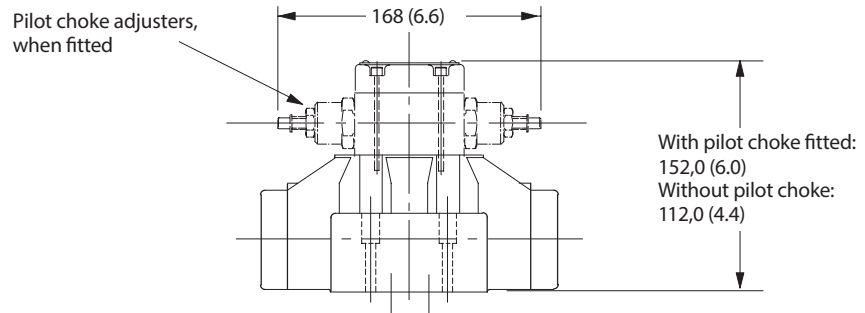
■ Ref. "Model Code " **1Q**  
 Codes "FJ " and "FW ":

2 lead wires for each solenoid, approx. 150 (6.0) long.  
 M3 (#6) terminals provided for customer connection.

Codes "FTJ " and "FTW ":

Valve supplied with lead wires connected into terminal strip  
 suitable for M3 (#6) terminals provided for customer connection.

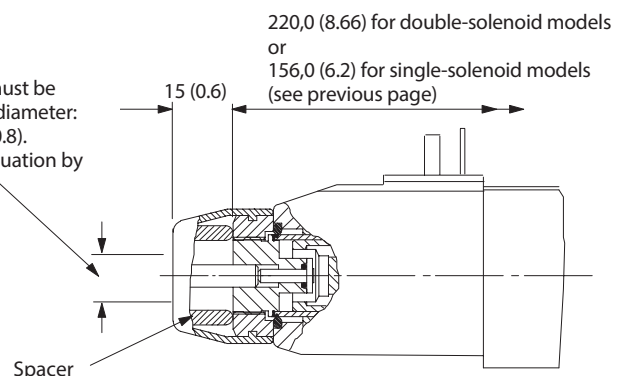
Pilot Operated Models with Optional Pilot Choke  
 DG3V-5-\*\* C(-2) example



Water-Resistant Manual Override  
 DG5V-5---M-\*\*\*\*\*(L)- H valves

Application:  
 General use where finger operation is required  
 (standard manual overrides can only be  
 operated by using a small tool).

Manual actuation must be  
 applied within this diameter:  
 approximately 20 (0.8).  
 Spacer prevents actuation by  
 larger device.



Note: "H" feature is not field convertible  
 from other models; specify with order.

# Electrical Plugs and Connectors for DG5 Valves

Plugs for ISO 4400 (DIN 43650) Type  
Coil Connection  
For valves with type "U" coils

The cable entry on these plugs can be repositioned at 90 ° intervals by reassembly of the contact holder relative to the plug housing.

The cable entry is Pg.11, for cable Ø 6-10 mm (0.24 to 0.39 " dia).

Order separately by part number.

## Plugs without indicator lights

Part no.	Color	Use on solenoid coil
710775	Black	Sol. B
710776	Gray	Sol. A

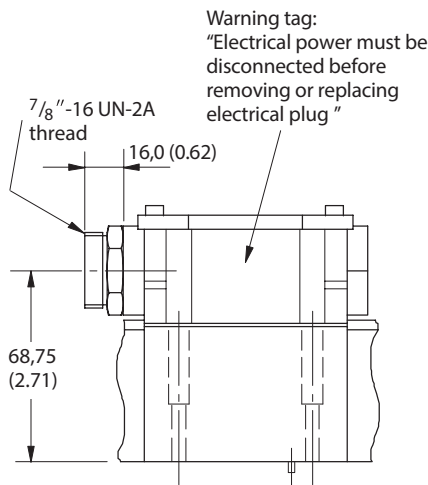
## Plugs with indicator lights

Voltage	Part no.	
	Gray (sol. A)	Black (sol. B)
12- 24V	977467	977466
100-125V	977469	977468
200-240V	977471	977470

NFPA Connector T3.5.29-1980  
DG5V-5-\*\*(\*\*)---FPA3W(L) and  
DG5V-5-\*\*(\*\*)---FPA5W(L) models

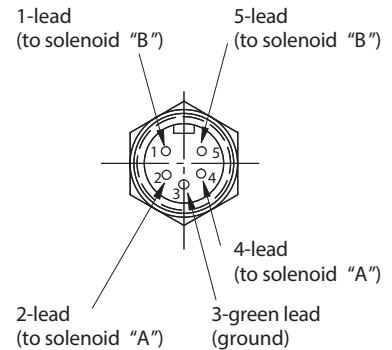
The receptacle is a standard three or five-pole connector with shortened leads and terminals added. The five-pole plug has four leads 101,6 mm (4.0 ") long and one of 177,8 mm (7.0 ") length. All wires have US Underwriters Laboratory-recognized non-solder insulated eyelet terminals. The green wire is used for the ground (earth) connection (No. 8-size screw furnished). Valves are supplied prewired.

## Connection details and model type/model code references



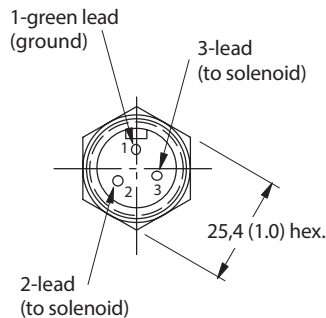
### 5-pin connector

When fitted in double-solenoid valves, e.g:  
DG5V-5-\*C\_(-\*\*)-(V)M-FPA5W\_(L)  
DG5V-5-\*N\_(-\*\*)-(V)M-FPA5W\_(L)



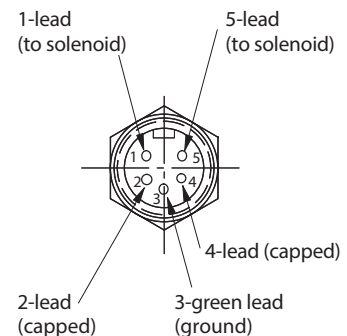
### 3-pin connector

When fitted in single-solenoid valves, e.g:  
DG5V-5-\*A\_(L)(-\*\*)-(V)M-FPA3W\_(L)  
DG5V-5-\*B\_(L)(-\*\*)-(V)M-FPA3W\_(L)



### 5-pin connector

When fitted in single-solenoid valves, e.g:  
DG5V-5-\*A\_(L)(-\*\*)-(V)M-FPA5W\_(L)  
DG5V-5-\*B\_(L)(-\*\*)-(V)M-FPA5W\_(L)

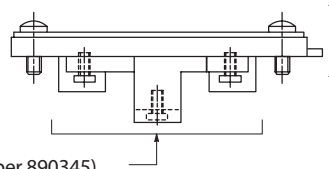


## Terminal Strip and Light Options

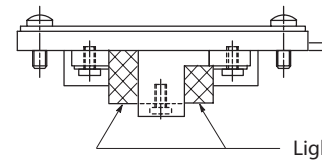
When fitted in solenoid controlled valves DG5V-5-\*\*(L)---F\*\*\*\*(L).

DG5V-5-\*\*(L)---F\*\*\*\*\_\*

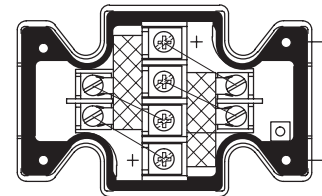
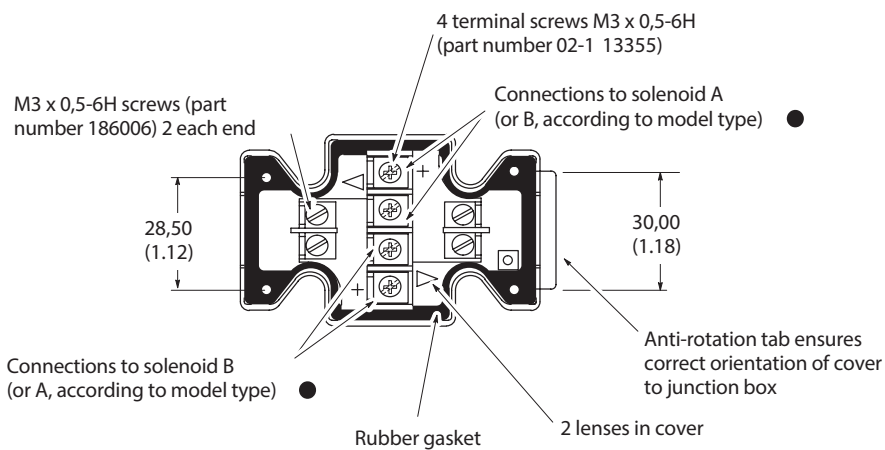
DG5V-5-\*\*(L)---F\*\*\*\*L\_\*



Conduit box cover and nameplate complete with sealing gasket and 4 screws



Lights



- 1. For DC coils the +ve lead(s) must be connected to the terminal(s) marked +. When using 3-wire incoming leads to double solenoid valves (i.e. common neutral) the inner pair of terminals must be linked.
2. For correct light indication of energized solenoid ensure that solenoid leads are correctly connected: light terminals are common with each outer pair of solenoid terminals according to the side with + mark.

## Mounting Attitude

Unrestricted except for no-spring detented model DG5V-5-\*\*N, which may be affected by severe vibration or shock, especially if a solenoid is not energized.

### Products we offer:

- Cartridge valves
- DCV directional control valves
- Electric converters
- Electric machines
- Electric motors
- Gear motors
- Gear pumps
- Hydraulic integrated circuits (HICs)
- Hydrostatic motors
- Hydrostatic pumps
- Orbital motors
- PLUS+1® controllers
- PLUS+1® displays
- PLUS+1® joysticks and pedals
- PLUS+1® operator interfaces
- PLUS+1® sensors
- PLUS+1® software
- PLUS+1® software services, support and training
- Position controls and sensors
- PVG proportional valves
- Steering components and systems
- Telematics

**Danfoss Power Solutions** is a global manufacturer and supplier of high-quality hydraulic and electric components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway market as well as the marine sector. Building on our extensive applications expertise, we work closely with you to ensure exceptional performance for a broad range of applications. We help you and other customers around the world speed up system development, reduce costs and bring vehicles and vessels to market faster.

Danfoss Power Solutions – your strongest partner in mobile hydraulics and mobile electrification.

### Go to [www.danfoss.com](http://www.danfoss.com) for further product information.

We offer you expert worldwide support for ensuring the best possible solutions for outstanding performance. And with an extensive network of Global Service Partners, we also provide you with comprehensive global service for all of our components.

Local address:

### Hydro-Gear

[www.hydro-gear.com](http://www.hydro-gear.com)

### Daikin-Sauer-Danfoss

[www.daikin-sauer-danfoss.com](http://www.daikin-sauer-danfoss.com)

**Danfoss Power Solutions (US) Company**  
2800 East 13th Street  
Ames, IA 50010, USA  
Phone: +1 515 239 6000

**Danfoss Power Solutions GmbH & Co. OHG**  
Krokamp 35  
D-24539 Neumünster, Germany  
Phone: +49 4321 871 0

**Danfoss Power Solutions ApS**  
Nordborgvej 81  
DK-6430 Nordborg, Denmark  
Phone: +45 7488 2222

**Danfoss Power Solutions Trading (Shanghai) Co., Ltd.**  
Building #22, No. 1000 Jin Hai Rd  
Jin Qiao, Pudong New District  
Shanghai, China 201206  
Phone: +86 21 2080 6201

Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequent changes being necessary in specifications already agreed. All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.