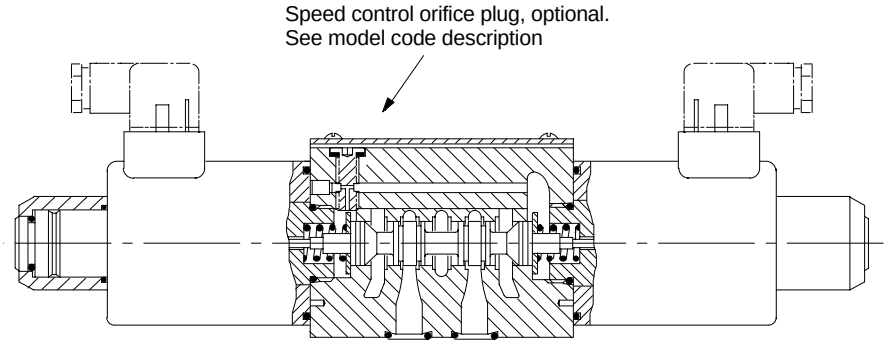
Wet Armature Solenoid Operated Directional Control Valves

Model DG4V-5, 20 Series

Typical Construction of a Spring-Centered DC Valve with Variable Speed Pilot Control passage



General Description

Max. pressure . . . . . 315 bar (4500 psi)
Max. flow rates . . . . . Up to 120 L/min (32 USgpm), dependent on spool
Mounting surface . . . . ISO 4401 size 05
NFPA D02
DIN 24340 (NG10)

A range of four-port solenoid operated directional control valves with four-land spool design to facilitate provision of smooth, variable valve response speeds.

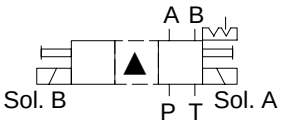
The range includes:

- AC and DC wet-armature solenoid options with ISO 4400 (DIN 43650) electrical connections and manual overrides.
- Variable speed changeover potential in all DC models; see “Response Times” section
- Many spool types; in spring-offset, spring-centered and detented arrangements.

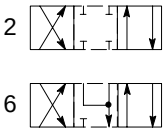
5069.00/EN/0497/A

Functional Symbols

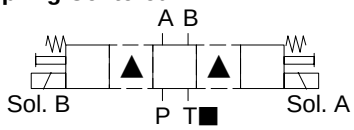
Double Solenoid Valves, Two-Position, Detented



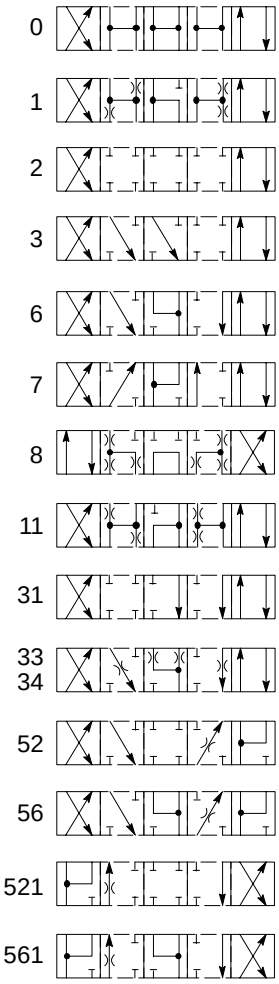
DG4V-5-***N** valves



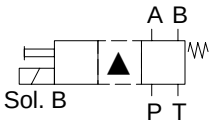
Double Solenoid Valves, Spring Centered



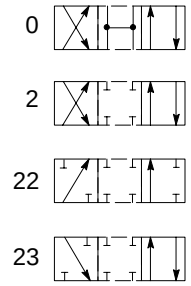
DG4V-5-***C** valves



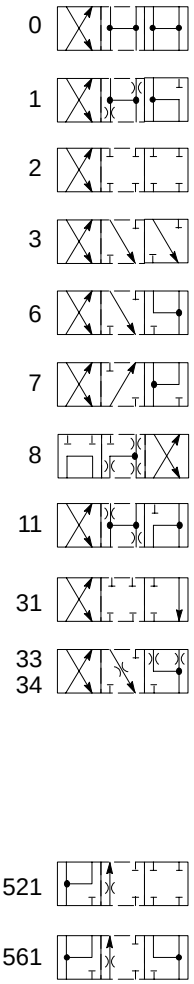
Single Solenoid Valves, Solenoid at Port A End



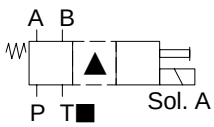
DG4V-5-***A** valves



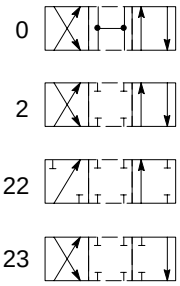
DG4V-5-***B** valves



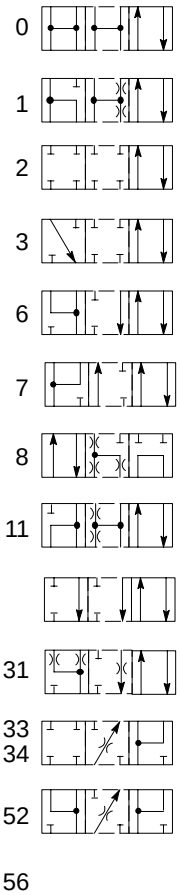
Single Solenoid Valves, Solenoid at Port B End



DG4V-5-***AL** valves



DG4V-5-***BL** valves



▲ *Transient condition only.*
■ *Both ports T_A and T_B are available.*

Model Code

(F13-) DG4V-5-*** *(L) (J) (-**)- (V) M- (S6)- U - ** 6- 20- J**

1 2 3 4 5 6 7 8 9 10 11

1 Prefix, fluid compatibility

Blank = AC or DC-voltage models for petroleum oils, water-in-oil (invert) emulsions or phosphate esters.
AC-voltage models for water glycols.
F13 = DC-voltage models for water glycols.

2 Spool type

See “Functional Symbols” section

3 Spool spring arrangement

A = Spring-offset, end-to-end
AL = As “A” but left-hand build
B = Spring offset, end-to-center
BL = As “B” but left-hand build
C = Spring centered
N = Two-position, detented
See also “Functional Symbols” section

4 Spool design

J = All DC valves except “0A” spool/spring arrangements.
AC valves with “8B(L)” and “8C” spool/spring arrangements.
Omit for “0A” DC-valves and all AC valves except “8B(L)” and “8C” spool/spring arrangements

5 Manual override option

P = Standard overrides in both ends of single-solenoid valves
H = Water-resistant override(s) in solenoid end(s)▼
H2 = Water-resistant overrides in both ends of single-solenoid valves
Z = No overrides at either end
Omit for standard plain override(s) in solenoid end(s) only▼

▼ *No override in non-solenoid end of single-solenoid valves.*

6 Solenoid energization identity

V = Solenoid “A” is at port A end and/or solenoid “B” is at port B end, independent of spool type
Omit for US ANSI B93.9 standard requiring solenoid “A” to connect P to A when energized and/or solenoid “B” to connect P to B

7 Spool position indicator switch

S6 - LVDT type DC switch with Pg7 connector plug

8 Electrical connection(s)

U = ISO 4400 (DIN 43650) mounting(s) without plug(s)

9 Coil rating

A = 110V AC 50
C = 220V AC 50
ED = 240V AC 50
EK = 115V AC 60
EH = 230V AC 60
G = 12V DC
H = 24V DC
HL = 24V DC (32W)
OJ = 48V DC
P = 110V DC

10 Design number, 20 series

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

11 Spool speed control

J06 = 0,6 mm orifice
J08 = 0,8 mm orifice
J10 = 1,0 mm orifice
J12 = 1,2 mm orifice
J99 = no orifice. Must be specified where future fitting of orifice is required, see page A.11, “Spool Speed Control Orifice”

For Mounting Subplates and Fixing Bolt Kits

See catalogs 2425 and 2314.

For Electrical Plug(s)

See end of “Installation Dimensions” section.

Operating Data

Max. Pressures

Ports P, A and B . . . . 315 bar (4500 psi)
Ports T_A and T_B . . . . 120 bar (1750 psi) for AC sol.
160 bar (2325 psi) for DC sol.

Control Data

For coil ratings see 8 in “Model Code” section.

Power Consumption

AC Solenoids

	AC 50 Hz	AC 60 Hz
Inrush, max. ▲VA	700	750
Steady-state ▼VA	375	440
Holding VA	105	130

All above values are RMS

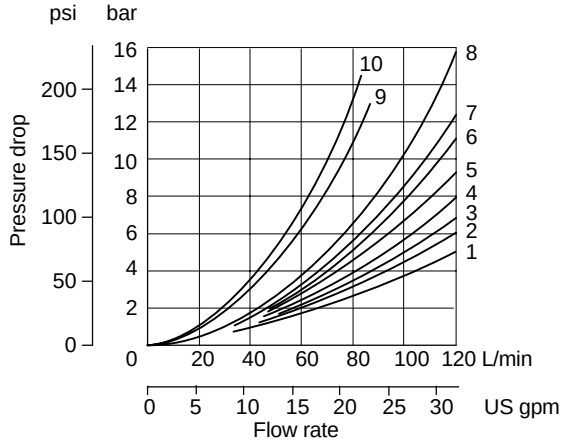
▲ *Armature fully retracted, 1st half-cycle.*
▼ *At start of normal working stroke of valve spool. Previously called “Inrush”.*

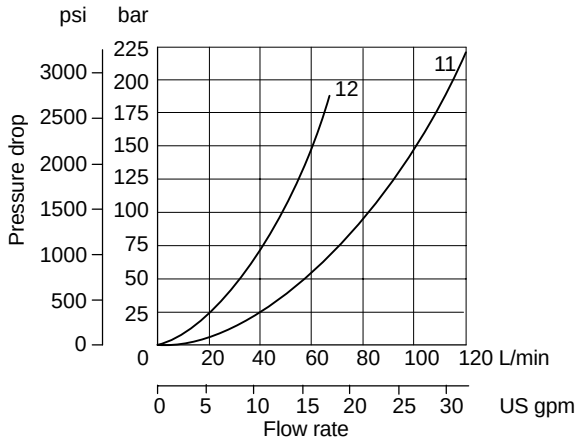
DC Solenoids

At rated voltage and wire temperature of 20°C (68°F):
Type HL 32W
Others 38-42W

Performance Data

Pressure Drops Typical with petroleum oil at 36 cSt (170 SUS) and a specific gravity of 0,87





Spool/spring code	Spool positions covered	P to A	P to B	A to T	B to T	P to T	A to B or B to A
0A(L)	Both	2	2	4	5	–	–
0B(L) & 0C	De-energized Energized	– 1	– 1	– 6	– 7	3▲ –	– –
1B(L) & 1C	De-energized Energized	– 1	– 2	– 6	– 4	6▼ –	– –
2A(L)	Both	3	3	5	6	–	–
2B(L) & 2C	All	2	2	4	5	–	–
2N	Both	3	3	5	6	–	–
3B(L) & 3C	De-energized Energized	– 2	– 3	5 6	– 5	– –	– –
6B(L) & 6C	De-energized Energized	– 3	– 3	5● 6	6▼ 7	– –	– –
6N	Both	4	4	4	5	–	–
7B(L) & 7C	De-energized Energized	3● 2	3▼ 2	– 5	– 6	– –	5■ –
8B(L) & 8C	All	2	2	7	8	8	–
11B(L) & 11C	De-energized Energized	– 2	– 1	– 4	– 7	6● –	– –
22A(L)	Both	3	3	–	–	–	–
23A(L)	Both	3	3	5	6	–	–
31B(L) & 31C	De-energized Energized	– 3	– 2	– 4	6 7	– –	– –
33B(L) & 33C	De-energized Energized	– 2	– 2	12● 5	12▼ 6	– –	– –
34B(L) & 34C	De-energized Energized	– 2	– 2	11● 5	11▼ 6	– –	– –
52BL & 52C	All	7●	8	4	–	–	9■
56BL & 56C	De-energized Energized	– 7●	– 8	8● 6	10▼ –	– –	– 9■
521B & 521C	All	8	7▼	–	5	–	9■
561B & 561C	De-energized Energized	– 8	– 7▼	10● –	8▼ 7	– –	– 9■

▲ *A and B blocked* ▼ *A blocked* ● *B blocked* ■ *P blocked*

Operating Data

Spool Position Indicator Models
Spool/spring arrangement types 0A (L), 2A(L), 22A(L)

DC model type "S6"

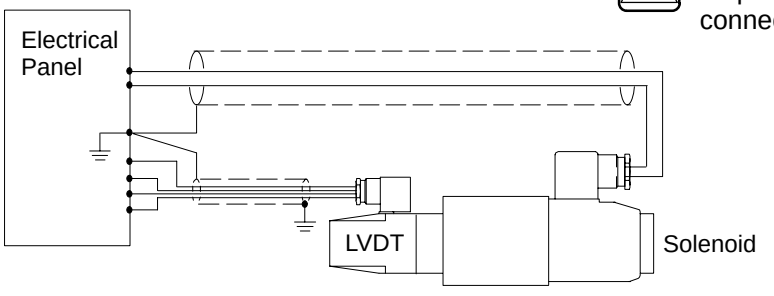
This product has been designed and tested to meet specific standards outlined in the European Electromagnetic Compatibility Directive (EMC) 89/336/EEC, amended by 91/263/EEC, 92/31/EEC and 93/68/EEC, article 5. For instructions on installation requirements to achieve effective protection levels see this leaflet and the Installation Wiring Practices for Vickers Electronic Products leaflet 2468. Wiring practices relevant to this Directive are indicated by ⚠ *Electromagnetic Compatibility (EMC) .*

Input:	
Supply voltage	10 to 35V DC inclusive of a maximum 4V pk-to-pk ripple
Current, switch open	5 mA
Current, switch closed	255 mA
Output:	
Voltage	1V below input at maximum load
Maximum continuous current	250 mA
Maximum load impedance	136Ω at maximum input volts
Maximum switching frequency	10 Hz
Plug connections:	
Pin 1 (output 1)	Normally open (ie. not connected to pin 3)
Pin 2	Supply +ve
Pin 3	0V
Pin 4 (output 2)	Normally closed (ie. connected to pin 3)
Switching point	Within the spool spring offset condition ●
Connector	Pg7 plug (supplied with valve)
Protection	Overload and short-circuit protected; self re-setting. IEC 144 class IP65 with connector correctly fitted.

● *Factory setting ensures this condition under all combinations of manufacturing tolerance and of temperature drift (see "Temperature Limits") .*

Wiring Connections

Warning
All power must be switched off before connecting or disconnecting any plugs.



WARNING: *Electromagnetic Compatibility (EMC)*

It is necessary to ensure that the unit is wired up in accordance with the connection arrangements shown above. For effective protection the user's electrical cabinet, the valve subplate or manifold and the cable screens should be connected to efficient ground points.
In all cases both valve and cable should be kept as far away as possible from any sources of electromagnetic radiation such as cables carrying heavy current, relays and certain kinds of portable radio transmitters, etc. Difficult environments could mean that extra screening may be necessary to avoid the interference.

Max. Flow Rates

Based on warm solenoid(s) operating at 10% below rated voltage.

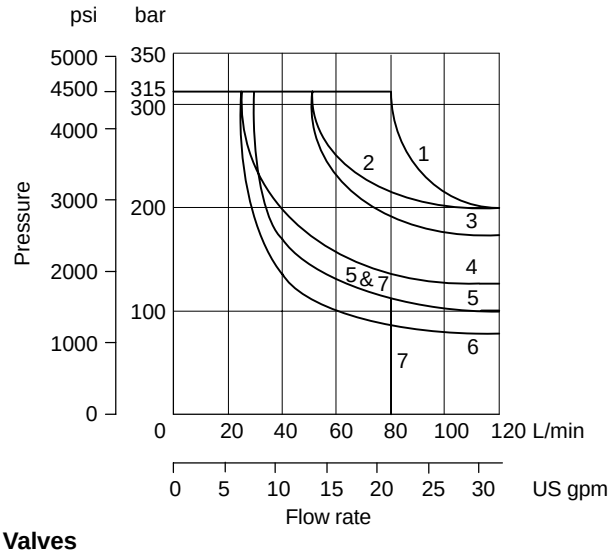
Flow limits applicable to following usages:

1. All valves except those with types 22, 52, 56, 521 and 561 spools having simultaneous equal flow rates from P to A or B and from B or A to T.
2. Valves with type 22 spools having flow from P to A or B, the other being blocked. T is drained at all times.
3. Valves with types 52, 56, 521 and 561 spools having one service port connected to the full bore end of a 2:1 area ratio double-acting cylinder and the other service port to the annulus end.
4. Valves with type 23 spools having single flow from A or B to T, P and the other service port being blocked.

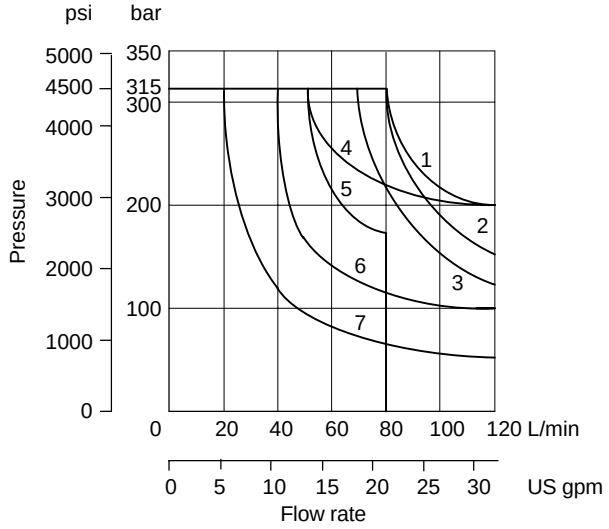
Consult Vickers with application details if any of the following are required:

a) Single flow path, i.e. P to A, P to B, A to T or B to T.
b) Substantially different simultaneous flow rates between P to A or B and B or A to T.
c) Spools as in 3 above are to be used with cylinder ratios greater than about 3:1 at low flow rates or 2:1 at high flow rates.

AC Solenoid Valves



DC Solenoid Valves



Spool/spring code	AC valve graph curve	DC valve graph curve
0A(L)	3	2
0B(L) & 0C	2	4
1B(L) & 1C	6	7
2A(L)	3	2
2B(L), 2C & 2N	1	1
3B(L), 3C, 6B(L) & 6C	4	6
6N	3	3
7B(L) & 7C	1	1
8B(L) & 8C	7	5
11B(L), 11C & 22A(L)	6	7
23A(L)	5	6
31B(L) & 31C	4	6
33B(L), 33C, 34B(L) & 34C	3	6
52B(L), 52C, 56BL, 56C, 521B, 521C, 561B & 561C	4	6

Response Times, Typical
Time taken from when signal is first applied at the solenoid until the spool completes its travel. Based on DG4V-5-2C at 60 L/min (16 USgpm) from P to A to B to T and at 160 bar (2320 psi) with petroleum oil at 36 cSt (168 SUS) and at 50°C (122°F):
AC energizing . . . . . 30 ms
AC de-energizing . . . . . 40 ms
DC energizing . . . . . 120 ms▲
DC de-energizing . . . . . 45 ms▲⁜

⁜ *In pure switched conditions, devoid of the efffects of any suppression diodes and full-wave rectifiers.*

▲ *DG4V-5-2CJ valves. Longer response times can be obtained by fitting an orifice plug in a special pilot port, standard in all bodies. An orifice kit 459065, containing a selection of plugs of differing orifice size, can be ordered separately. Ask your Vickers representative for details.*

Hydraulic Fluids
Water glycols can be used with F13-prefix DC-voltage models or with non-prefix AC-voltage models. Non-prefix DC-voltage models and all AC-voltage models can be used with anti-wear hydraulic oils, water-in-oil emulsions, phosphate esters (not alkyl based).

The extreme operating viscosity range is from 500 to 13 cSt (2300 to 70 SUS) but the recommended running range is 54 to 13 cSt (245 to 70 SUS).

For further information about fluids see catalog 920.

Temperature Limits
Minimum ambient . . . . . –20°C (–4°F)
Maximum ambient:
AC 50 Hz valves . . . . . 50°C (122°F)
AC 60 Hz valves . . . . . 40°C (104°F)
DC valves . . . . . 70°C (158°F)

Fluid temperatures

	Petroleum oil	**Water-containing**
Min.	–20°C (–4°F)	+10°C (+50°F)
Max.*	+70°C (+158°F)	+54°C (+130°F)

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

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

Whatever the actual temperature range, ensure that viscosities stay within the limits specified in the “Hydraulic Fluids” section.

Solenoid Surface Temperatures
Typical maximums at 20°C (68°F) ambient:
AC 50 Hz solenoids . . . . . 80°C (176°F)
AC 60 Hz solenoids . . . . . 92°C (197°F)
DC solenoids . . . . . 78°C (172°F)

Contamination Control Requirements
Recommendations on contamination control methods and the selection of products to control fluid condition are included in Vickers publication 9132 or 561, “Vickers Guide to Systemic Contamination Control”. The book also includes information on the Vickers 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:

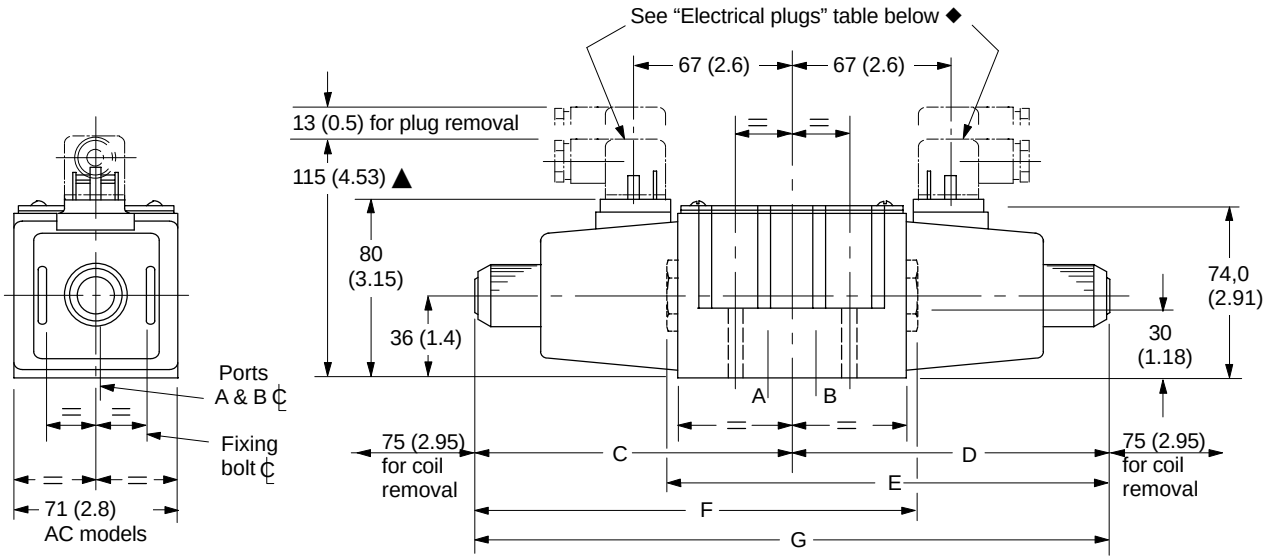
Up to 210 bar (3050 psi) 20/**18**/**15**
Above 210 bar (3050 psi) 19/**17**/**14**

Mass, Approx. kg (lb)
Single solenoid models,
AC coils 4,0 (8.8)
Single solenoid models,
DC coils 4,8 (10.6)
Double solenoid models,
AC coils 4,5 (9.9)
Double solenoid models,
DC coils 6,3 (13.9)

Installation Dimensions in mm (inches)

AC Solenoid Models

3rd angle projection

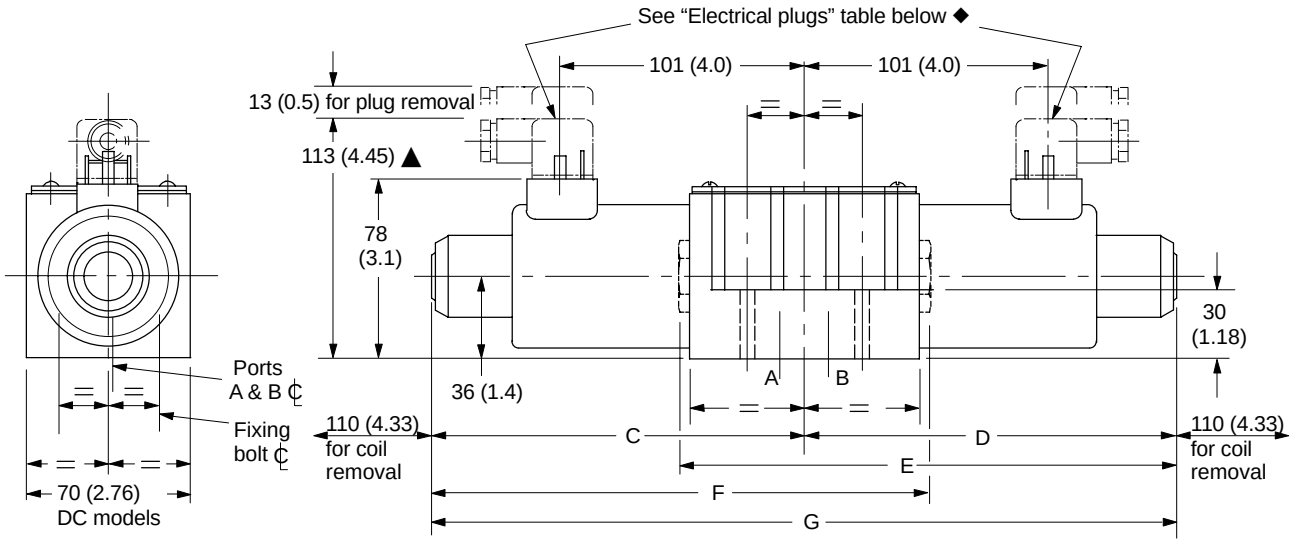


▲ *May vary according to plug source.*
◆ *The cable entry can be repositioned at 90° intervals from the position shown. This is done by reassembling the contact holder into the appropriate position inside the plug housing.*

Model	Solenoid at:	C	D	E	F	G
DG4V-5-*A(L)/B(L)(-Z)-(V)M	Port A end Port B end	123 (4.84) –	– 123 (4.84)	– 182 (7.17)	182 (7.17) –	– –
DG4V-5-*A(L)/B(L)-H2-(V)M	Port A end Port B end	138 (5.43) –	– 138 (5.43)	– 223 (8.78)	223 (8.78) –	– –
DG4V-5-*A(L)/B(L)-P-(V)M	Port A end Port B end	123 (4.84) –	– 123 (4.84)	– 195 (7.68)	195 (7.68) –	– –
DG4V-5-*C/N(-Z)-(V)M	Both ends	123 (4.84)	123 (4.84)	–	–	246 (9.68)
DG4V-5-*C/N-H-(V)M	Both ends	138 (5.43)	138 (5.43)	–	–	276 (10.87)

DC Solenoid Models

3rd angle projection



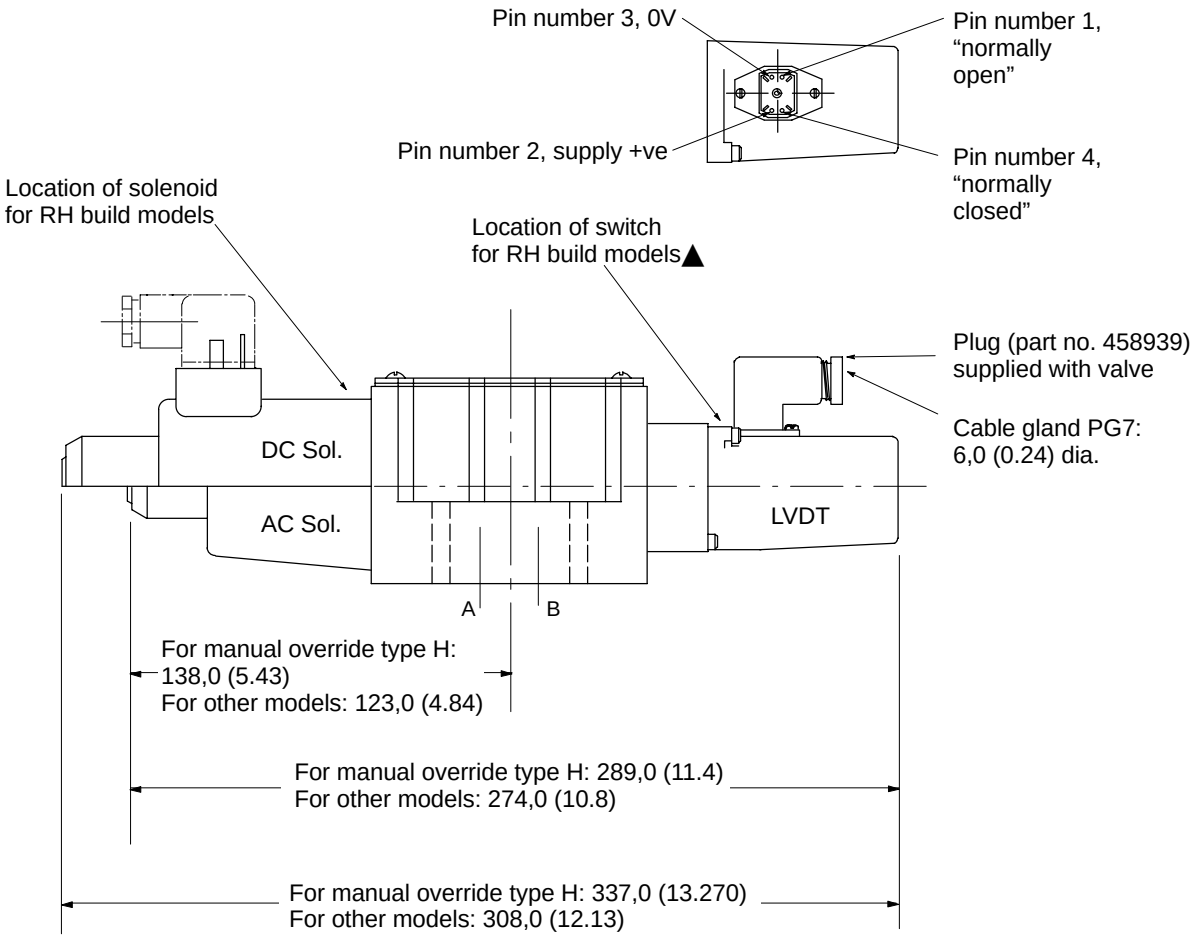
▲ *May vary according to plug source.*

◆ *The cable entry can be repositioned at 90° intervals from the position shown. This is done by reassembling the contact holder into the appropriate position inside the plug housing.*

Model	Solenoid at:	C	D	E	F	G
DG4V-5-*A(L)/B(L)-(-Z)-(V)M	Port A end Port B end	156 (6.14) –	– 156 (6.14)	– 215 (8.46)	215 (8.46) –	– –
DG4V-5-*A(L)/B(L)-H2-(V)M	Port A end Port B end	185 (7.28) –	– 185 (7.28)	– 270 (10.63)	270 (10.63) –	– –
DG4V-5-*A(L)/B(L)-P-(V)M	Port A end Port B end	156 (6.14) –	– 156 (6.14)	– 228 (8.98)	228 (8.98) –	– –
DG4V-5-*C/N(-Z)-(V)M	Both ends	156 (6.14)	156 (6.14)	–	–	312 (12.28)
DG4V-5-*C/N-H-(V)M	Both ends	185 (7.28)	185 (7.28)	–	–	370 (14.57)

Spool Position Indicator Switch Models

3rd angle projection



▲ *For LH models ("L" in model code location* 3 *) solenoid and switch locations are reversed*

⚠ Wiring: See warning note on page A.5

Model (see also 5 in "Model Codes")	Spool types	Solenoid identity Port A end	Port B end
DG4V-5-*A(J)/B(J)(-**)-M	All except 8	B	–
DG4V-5-*A(J)/B(J)(-**)-VM	All except 8	A	–
	8 only	–	B
DG4V-5-*AL(J)/BL(J)(-**)-M	All except 8	–	A
DG4V-5-*AL(J)/BL(J)(-**)-VM	All except 8	–	B
	8 only	A	–
DG4V-5-*C(J)/N(J)(-**)-M	All except 8	B	A
DG4V-5-*C(J)/N(J)(-**)-VM	All spools	A	B

Electrical plug(s) (without indicator light) to DIN 43650.

Must be ordered separately by part number(s).

Part No.	Color	Solenoid /LVDT identity	Cable gland
710775	Black	B	Pg11 Ø6-10 mm
710776	Gray	A	Pg11 Ø6-10 mm
458939	Gray	LVDT	Pg7 Ø3,5-6 mm

Spool Speed Control Orifice

For fine tuning of valve spool speed. Only applicable to valves already fitted with an orifice or blank plug, see model code, page A.3.

Warning - Changing procedure
Before breaking a circuit connection make certain that power is off and system pressure has been released. Lower all vertical cylinders, discharge accumulators and block any load whose movement could generate pressure. Plug all removed units and cap all lines to prevent entry of dirt into the system.

Orifice Kit

Orifice kits must be ordered separately, part number 02-350116.
Kit comprises 1 off each of the following:
0,6 mm dia
0,8 mm dia
1,0 mm dia
1,2 mm dia
Blank