ISO 4401 Size 07; ANSI/B93.7M-D07 Remote Pilot Operated Directional Valve DG3V-7, 30 Design Solenoid Controlled Pilot Operated Directional Valve DG5V-7, 50 Design





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DG5V-7 50 Design, Solenoid Controlled Pilot Operated Directional Valve DG3V-7 30 Design, Remote Pilot Operated Directional Valve



Introduction

General Description

DG*V-7 valves are used primarily for controlling the starting, stopping and direction of fluid flow.

Two series of valves, DG5V solenoid controlled, pilot operated and DG3V pilot operated models are available with a wide selection of spools. These include meter-in and meter-out spools and a regeneration type that can obviate extra valves essenti in traditional circuit arrangements.

All spools have been designed to provide low shock, fast response characteristics which can be enhanced by optional stroke and/or pilot choke adjustments.

Models include spring offset, spring centered and detented versions.

DG5V valves can be arranged for Internal or External pilot pressure and /or drain connections

Highlights/Benefits

- 50 design will only have high performance pilot valves.
- High pressure and flow capability for maximum cost-effectiveness.
- Performance upgrade for rated pressure of 350 bar & flow up to 300 lpm.
- Low pressure drop in P-A, P-B, B-T, A-T to minimize power wastage
- Low shock characteristics to maximize machine life.
- Facility to change solenoid coil without disturbing the hydraulics envelop.
- A lower pressure drop reduces the amount of energy required from
- the pump to meet the desired pressure and flows needed to move cylinders/ equipment. This in turn can save the customer money by reducing the amount of electricity drawn from their machine.
- Tank port pressure up to 250 bar.
- External / Internal, Pilot pressure & Drain Plug accessible from the top face & without removing the end cover
- The many optional features, particularly for DG5V valves, permit matching to virtually every application within the valve's power capacity.
- Optional mainstage spool position monitoring switch (CE marked) for Spool 35A-EN600

al

Functional Symbols

DG3V-7, Remote Pilot operated Models Comprehensive and simplified symbols.









Spring Offs et, E nd-to-En d,

Oppo si te Hand, DG3V -7-*AL



DG3V-7 Options

The following are shown in a DG3V-7-*C example:

1.1

- 1. Pilot choke module
- 2. Stroke adjusters at either or at both ends (shown at both ends in example)

One or more options can be built into any DG3V-7 series valve.



Spool types : All

- "a" and "b" interchanged for spool type 8.
- ▲ X' and Y' spools require a stroke adjuster at one or both ends, dependent on the application, to limit stroke towards posotions "a" and/or "b".

Functional Symbols

DG5V-7, Solenoid Controlled, Pilot Operated Models Comprehensive and simplified symbols shown configured for external pilot supply and internal drain

Spring Offs et, E nd-to-En d, DG5V -7-*A



Spring Offset, End-to-Cente r DG5V -7-*B



DG5V-7 Options

The following are shown in a DG5V -7-*C example:

- 1. Pilot choke module
- 2. Strok e adjusters, at either or at both ends (shown at both ends in example)
- 3. External pilot connection
- 4. Internal drain

One or more options can be built into any DG5 series valve.



Spring Off set, En d-to-End,



Spring Offset , End-to-Center , Opposite Hand DG5V -7-* BL





Spool types : All

- "a" and "b" interchanged for spool type 8.
- ▲ X' and Y' spools require a stroke adjuster at one or both ends, dependent on the application, to limit stroke towards posotions "a" and/or "b".

Spring Centered, DG5V -7-* C



Detented, DG5 V-7-*N



Functional Symbols

Spool Types DG3V-7 and DG5V-7 Shown in 3-position form, plus 2 transients.





Notes:

In certain 2-position valves, the "o" position becomes an additional transient, i.e. in DG5V-7-*A(L) and DG5V-7-*N valves.

Only 35A available

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Model Codes

Notapplicable toDG5¥7-*B(L)models.
Notapplicabletomodelshown in the

DG3V-7 30 Series, Remote Pilot Operated Directional Valve

DG5V-7 50 Design, Solenoid Controlled Pilot Operated Directional Valve

: (F3)-DG3V-7-***-(**) For Remote Pilot operated valves For solenoid controlled, pilot operated valves: (F3) - DG5V-7-* ** - (**) - (P**) - (E) - (T) - (*) - (V) M -***** (L) - *7 - 50 6 "Spring offset, end-to-center, 11 Indica tor Lights, Option for 9 Solenoid Ener gization 1 Fluid Compatibility opposite had" section on page 6 Codes FT W, in item 10 Blank = Standard BUNA-Nitrile Indentit y Not applicable for spool "8" models V = Solenoid "A" is at port A Seals L = Lights fitted F3 = Viton Seals end of pilot valve and/or Omit if lights not required 5 Main Stage Spool solenoid "B" at port B Note: For further information see end independent of ForU-code solenoid suse plugwith Monitoring Switch "Hydraulic Fluids" section on page 13. integralight. main-stage valve port Only with "35A" spool locations or spool type; (Omit if not required.) 2 Spool Type ¹² Coil Rating Germa n practice. See "Functional Symbols" sec-PPA - Offset sensing proximity Omit (except as noted below) See "Operating Data" on tion on pages 7 switc h "A" port end for US ANSI B93.9 standard page 11 for further whereby solenoid "A" is that information 3 Spool Spring Arrangement * The spool position monitoring switch which, when shown on this technical doument is CE A = Spring offset, end-to-end B = 110V AC 50 Hz/energized, connects P to A in marked and certified and complies to (P to B w hen operated) main-stage valve, and/or sole-120V AC 60 Hz European Standard EN 61000-4-42001 noid "B " c onnects P to B. AL = As "A" but left-hand build BL = 110V AC 50 Hz/ + (Emissions) for Class A and European Note: Energization identities on valves (P to A when operated) Standard EN 61000-6-22001 (Immunity) 120V AC 60 Hz with type 8 spools are identical under US B =S pring offset, end-to-- Low Power and German practices. In such cases the 6 Ex ternal Pilot Supply. center (P to B w hen "V" code is used. D = 220V AC 50 Hz/ • DG5V Valve Option operated) 240V AC 60 Hz 10 Solenoid Ty pe/Connection(s) Omit for internal pilot supply BL = As "B" but left-hand DS = 28V DC 30 Wattbuild (P to A when oper-U = ISO 4400 (DIN 43650) 7 Internal Pilot Drain, DG5V ated) ED = 250V AC 50 Hz mounting Valve Option C =Spring centere d U1 = ISO4400 fitted with G = 12V DCOmit for external drain, which PG11 plug N = Two-position detented GL = 1 2V DC 18 Watt is also mandatory for 1, 8 and U6=ISO4400 with fitted 9 spool-type valves DG5V option. Same function from H = 24V DCDIN plug with lights DG-7-*C valves by alternating plot sup-HL = 24V DC 18 Wattply to one port (X or Y) and permanantly 8 Manual Override Option KU =Top exit flying lead For60 Hzor dualfrequency draining the other (150mm) Blank = Plain override in sole noid end(s) only KUP4 = Junior timer (Amp)¹⁴ Design Number 4 Spool Cont rol H = W ater-resis tant manual connector 30 series for DG3V valves. 1 = Stroke adjustment at both KUP5 = Integral Deutsch override on solenoid end(s) 50 series for DG5V valves. ends 🔺 🗖 Connector Z = No override at either end Subjecttochange. 2 = Pilot choke adjustmen t FW = F lying lead with 1/2''A Nooverridein non-solenoiend of sin-For Mountin g S ubplat e and both ends NPT thread wiring gle-solenoidalves Fastener Kit Option s See 3 = "1" and "2" c ombined \blacktriangle housing "Supporting products" on 7 = Stroke adjustment, port A FTW = Flying lead with 1/2" page 11 end only 🔻 NPT thread junction 8 = Stroke adjustment, port B box and terminal strip end only 🔻 Some female plug connect options availale separately from Danfoss. Others 27 = 27 and 77 combined ∇ available from electrical stock lists. Female connector to be supplied by user. 28= "2" and "8 " c ombined Omit if not required

Application Notes DG5V-7 50 Design

Pilot Pressure

- Pilot pressure must always exceed tank line pressure by at least the requisite minimum pilot pressure. This also applies when combining open center spools (0, 1, 8, 9 and 11) with internal pilot pressure, but they should be used only with externally drained valves.
- Internally drained valves should be used only when surges in the tank line cannot possibly overcome the minimum pilot pressure differential referred to above.
 When the possibility of pressure surges in the tank line exist, externally drained valves are recommended.
- c. When DG5V-7-*N valves are de-energized the pilot and main spools remain in the last selected position, provided that pilot pressure is maintained. If pilot pressure fails, or falls below the minimum, the main spool will spring center.

Caution:Because of this in-built feature the flow conditions of the center position must be selected with care, for the effect on both the direction of flow and the pilot pressure

Stroke Adjustment Options

These control the maximum opening of the main spool/ body passages by adjusting the limits of spool stroke. By this means, the response time and the pressure drop across the valve for any particular flow rate can be controlled. Stroke adjusters can be fitted at either or both ends of the main-stage valve for adjusting the stroke in one or both directions. One use of stroke adjusters is for controlling the metering characteristics of "X*" or "Y*"- type spools. (See model code #4.)

Pilot Choke Adjustment Options

These provide a meter-out flow control system to the fluid in the pilot chambers of main-stage valves. It allows the velocity of the mainstage spool to be controlled, thereby reducing transient shock condition. For optimum results, a constant reduced pilot pressure is recommended.

Control Data, General

- Dependent on the application and the system filtration, any sliding spool valve, if held shifted under pressure for long periods of time, may stick and not move readily due to fluid residue formation. It may therefore need to be cycled periodically to prevent this from happening.
- Surges of fluid in a common drain line serving two or more valves can be of sufficient magnitude to cause inadvertent shifting of the spools. It is recommended that circuit protection be used, such as separate drain lines.
- c. Control by stroke adjusters, pilot chokes and minimum-pilotpressure generator options is described on this page.

Operating Data

Performance data typical under standard test conditions which use antiwear hydraulic oil (Class L-HM) at 21 cSt (102 SUS) and 50°C (122°F).

MAXIMUM PRESSURES:

DG3V-7 valves; ports:	
P, A, B	350 bar (5000 psi)
Т	300 bar (4351 psi)
X and Y	250 bar (2636 psi)
DG5V-7-**(L)(-*)(-E)(-*) valves, (externally drained); ports	
Р, А, В	350 bar (5000 psi)
Т	300 bar (4351 psi)
Y	210 bar (3045 psi) *
x	250 bar (3626 psi) **
DG5V-7-**(L)(-*)(-E)-T(-*) valves, (internally drained); port	IS:
P, A, B	350 bar (5000 psi)
T and Y	210 bar (3045 psi) *
X	250 bar (3626 psi) **

*Restricted by Pilot valve core tube rating

**A pressure reducer valve must be used for higher pressures.

MAXIMUM FLOW RATES, L/MIN (USGPM) AT THE MINIMUM PILOT PRESSURES, AND WITH SPOOL TYPE:

Operating Pressure in bar (psi)	50(725)	100(1450)	150(2175)	200(1900)	250(3625)	300(4351)	350(5076)	
0*,2,3,6,8*,9**,31,33,52,521,X2,X33,Y2,Y33,35A	300(80)	300(80)	300(80)	300(80)	300(80)	300(80)	300(80)	
1*,11*	300(80)	300(80)	300(80)	300(80)	175(47)	125(34)	70(20)	

** SUBJECT TO P-T PRESSURE SATURATION.

* Open centred spools

Pilot pressures	See "Pilot Pressures" on page 12	
Control (swept) volume(s), DG3V and main-	stage of DG5V valves:	
Center-to-end	4.9 cm ³ (0.29 in ³)	
End-to-end	9.8 cm ³ (0.60 in ³)	

ELECTRICAL INFORMATION:

Coil Voltage ratings, DG5V valves	See 12 in "Model Code" on page 8		
Coil Voltage limits, DG5V valves:			
Maximum voltage	See "Temperature limits", on pa	age 11	
Minimum voltage	90% of rated voltage		
Power consumption, DG5V valves with AC solenoids:	Initial VA rms	Holding VA rms	
Single-frequency coils, 50 Hz types "A" and "C"	225	39	
Dual-frequency coils at 50 Hz, types "B" and "D"	265	49	
Dual-frequency coils at 60 Hz, types "B" and "D"	260	48	
Power consumption, DG5V valves with DC solenoids	30W at rated voltage and 20 C (68 F)		
Relative duty factor, DG5V valves	Continuous; ED = 100%		
Type of protection, DG5V valves:			
ISO 4400 coils with plug fitted correctly	IEC 144 class IP65		
Junction box	IEC 144 class IP65 (NEMA 4)		
Coil winding	Class H		
Lead wires (coil types "F****")	Class H		
Coil encapsulation	Class F		

Operating Data

Pressure drop characteristics

See page 12, 13 Response times, DG5V valves:

Typical values for a DG5V-7-2C-E-50 based on a 100% rated voltage from energisation/de-energisation of the coil to full displacement of mainstage spool. At 150 lt/min. and 175 bar.

Coil rating:	Pilot pressure, bar (psi):	Energizing	Time, ms De-energizing
110V50Hz AC	15 (218)	60	40*
	100 (1450)	25	40*
	250 (3600)	15	40*
24V DC	15 (218)	95	60*
	100 (1450)	60	60*
	250 (3600)	50	60*

•From applying a signal at the solenoid until the main-stage spool completes its travel. *Based on pure switched circuit condition, devoid of effects of any suppression diodes.

TEMPERATURE LIMITS:	
Fluid temperature limits	-20°C (-4°F) to +70°C (158°F)
Ambient temperature limits:	-20°C (-4°F) to +70°C (158°F)
Maximum ambients, DG5V valves with coils listed in 12 in	"Model Code" two pages back, and under conditions stated below:
Dual-frequency coils:	
at 50 Hz and 107% of rated voltage	65°C (150°F)
at 50 Hz and 110% of rated voltage	65°C (150°F)
at 60 Hz and 107% of rated voltage	65°C (150°F)
at 60 Hz and 110% of rated voltage	65°C (150°F)
Single-frequency (50 Hz) coils at 50 Hz and 110% of rated voltage	65°C (150°F)
DC coils at 110% of rated voltage	70°C (158°F)

INSTALLATION DIMENSIONS:

Valves	See page 14
Mounting Surface	See page 14
Mass (weight), basic models:	kg (lb) approx.
DG3V-7	7,3 (16.1) 🔹
DG5V-7-*A/B (AC voltages)	8,4 (18.5) 🔶
DG5V-7-*A/B (DC voltages)	8,5 (18.7) 🔸
DG5V-7-*C/N (AC voltages)	8,7 (19.2) 🔹
DG5V-7-*C/N (DC voltages)	9,1 (20.0) 🔹
• Add 1,1 kg (2.4 lb) when pilot chock adjustment is fitted.	
Supporting products:	
Subplate	See catalog 2425
Fastener kits	See catalog 2314 for available metric bolt kit options, i.e. BKDG7-858918 and BKDG7-858919.
Installation and start-up (commissioning):	
Mounting attitudes, DG3V series	Optional for models shown.
Mounting attitudes, DG5V series	Optional for DG5V-7-*B(L)/C/D models, but horizontal mounting is recommended for DG5V-7-*A(L)/N models
After-sales service:	
Spare-parts data for DG3 valves and main stages of DG5 valves, and pilot choke modules	Consult your local Danfoss representative
Spare-parts data for DG4V-3S pilot stages of DG5 models	Ask for spares leaflet I-3886-S (minimal text, in English).

Performance Characteristics

Pilot Pressures

Maximum: 350 bar (5000 psi). Typical minimum differential pilot pressure characteristics, shown below, are based on looped flow through P to A to B to T under standard test conditions.

Spool Type	0	1	2	3	6	8	9	11	31	33	52	Χ*	Y*	35A
Minimum Differential Pilot Pressure (bar)	9	9	12	12	12	9	9	9	12	12	12	12	12	12

Pressure Drop Characteristics

The following typical pressure drops ($\triangle p$) at flow rates (Q) are based on standard test conditions, using oil of 0,865 specific gravity. Except where otherwise stated, for any other flow rate (Q) the pressure drop (\blacktriangle p1) will be approximately $\triangle p1 = \triangle p (Q1/Q)^2$.

SPOOL	SPOOL POSITION	P-A	B-T	P-B	A-T	P-T	
TYPE	COVERED						
0	All	1	5	1	4	5	
1	Energised	1	4	1	4		
	De-energised	7♦♦			4♦	8	
2	All	1	4	1	1		
3	Energised	1	4	1	4		
	De-energised				7		
6	Energised	1	5	1	4		
	De-energised		8		8		
8	All	3	3	3	7	9	
9	Energised	2	5	3	3		
	De-energised	-	-	-	-	** • ••	
11	Energised	1	5	1	1		
	De-energised		4♦	7♦♦		8.	
31	Energised	1	5	1	1		
	De-energised		8				
33	Energised	1	5	1	3		
	De-energised		-		-		
35A	Energised		8				
	De-energised	6					
52	Energised P-A	3.		6			
52	Energised P-B			3	2		
X2	All	*	5	*	2		
X33	Energised	*	5	*	2		
	De-energised		-		-		
Y2	All	3	11	3	8		
Y33	Energised	2	10	2	8		
	De-energised		-		-		

* 65 bar @300l/min.

** 70 bar @150l/min.

Port B blocked

•• Port A blocked

Port P blocked

Port T blocked

Performance Characteristics



Hydraulics Fluids Contamination Control Requirements

Recommendations on Hydraulic Fluids and contamination control methods and the selection of products to control fluid condition are included in Danfoss Hydraulics Fluid Recommendation 03-401-2010 rev 1

Fluid Temperatures

For petroleum oil:

Min......-20°C (-4°F) Max.*....+70°C (+158°F)

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

For other fluids where limits are outside those of petroleum oil, consult fluid manufacturer or Danfoss representative.

Whatever the actual temperature range, ensure that viscosities stay within those specified under "Hydraulic Fluids".

Installation Dimensions

Millimeters (inches)

Solenoid Controlled Models with ISO 4400 (DIN 43650) Electrical Connections and Pilot Choke

DG5V-7-**(L)(-2)(-E)(-T)(-*)-(V)M-U example For stroke adjusters see page 15



Optional Features



Electrical Information

DG5V-7-35A-PPA-(-E)(-T)-******-50 Valve with Spool Position Monitor



SPECIFICATIONS

Supply Voltage (Vs)	10 to 30 Vdc	
Supply Current (Is)	8 mA at 24 Vdc (plus load current)	
Supply Over-voltage Rating:	35 Vac continuous	
Supply Reverse Polarity Rating		
Short Circuit Tolerance:	Continuous short between any two pins	
High Potential Test, Pin to Case:	300 Vdc	
Electronmagnetic Compatibility:	ISO 7637 Parts O and I worst case and	
	Immunity to Radiated Electromagnetic	
	Fields, 10 KHZ to 1 GHZ per SAE J1113/25	
	Sep 95	
Pins to Case Resistance	50 Megonms	
Load Dump Tolerance:	80 Vac Peak, 400 ms Decay, with 1.5 Onm	
	source impedance	
Switching Frequency:	0 to 3K Hz	
Output:	Open collector PNP sourcing, normally open	
Sensing Distance (offset position):	1.27 ± 0.25 mm (.050" ± .010")	
Hysteresis:	0.25 mm (.010") Max.	
Rise/Fall Time:	6.5/1.5 microsec R1=820 Ohm,	
	C1=20 pF @ 8Vdc	
Output Leakage Current	IUµa Max.	
Output Voltage High:	+Vs – 2.2 Vdc minimum	
Output Load Current:	200 mA Max.	
Operating Pressure:	350 bar (5000 psi)	
Operating Temperature:	-40° to 110°C	
Humidity:	0 to 100%	

Electrical information shown in this window is for offset sensing, Proximity Switch "PPA" Model



0=voltage at pin 4 0.5V min. 1=voltage at pin 4 (Vs - 2.2V) min. Output Ci rcuit Wiring Instruct ions



Connec tor De tail





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