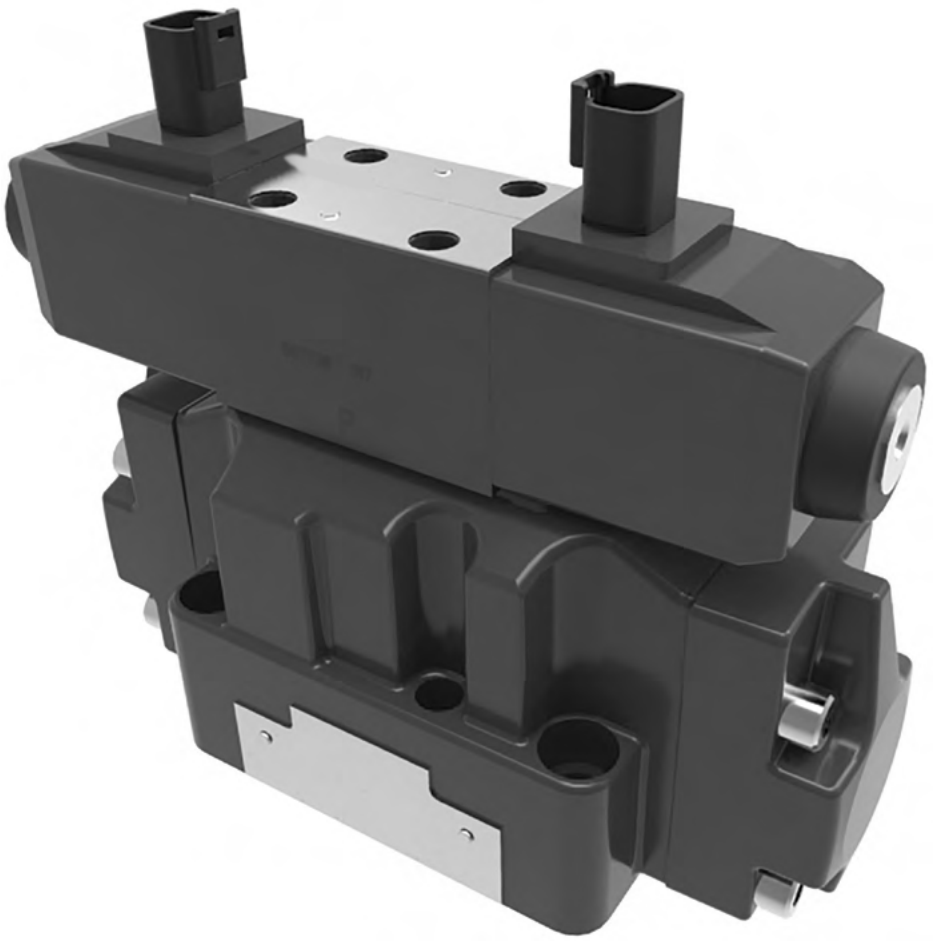
ISO4401 Size 07; ANSI/B93.7M-D07
DG5V-7 30 Design & DG3V-7 20



Pilot operated directional valve

DG3V-7-20 Design

Solenoid controlled pilot operated directional valve

DG5V-7-30 Design

IV-D

General description

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

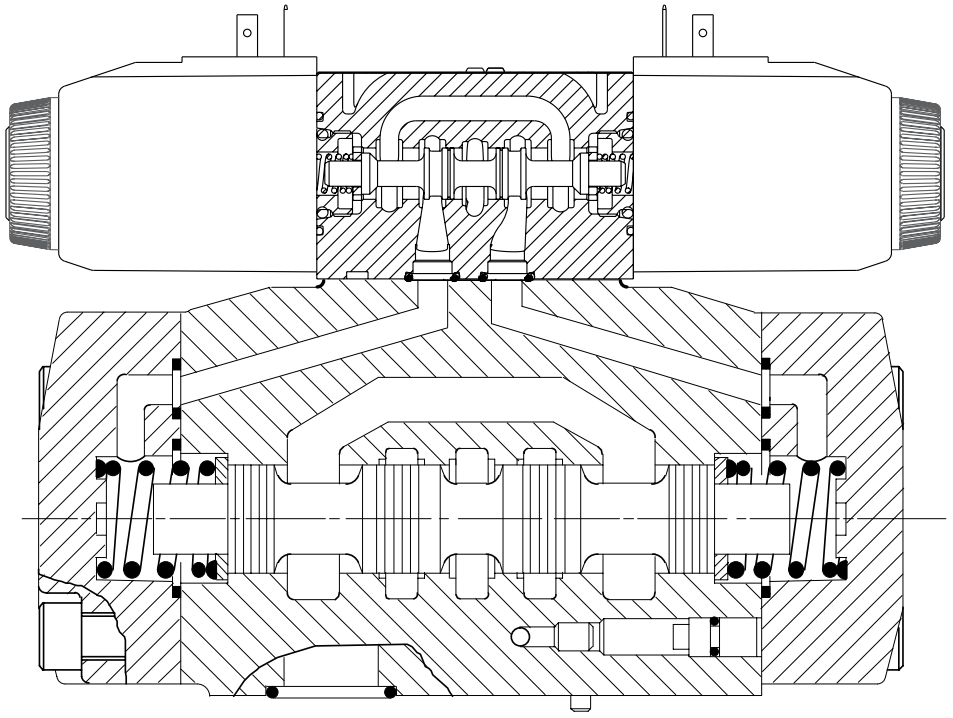
Two series of valves, DG5V solenoid controlled, pilot operated and DG3V pilot operated models are available with a wide selection of spools . These include meter-in and meter-out spools and a regeneration type that can obviate extra valves essential in traditional circuit arrangements .

All spools have been designed to provide good 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 .

Features and benefits

- High pressure and flow capability for maximum cost-effectiveness .
- Low headloss to minimize power wastage .
- Low shock characteristics to maximize machine life .
- Facility to change solenoid coils without disturbing the hydraulic envelope .
- 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 pilot operated valves:

*	DG3V-7	**	*	(-**)	20
1		2	3	4	15

For solenoid controlled, pilot operated valves:

* - DG5V-7-	**	**	(-**)	(-P**)	(-E)	(-T)	-	(-K)	-	(-*)	(V)M	-	*****	(L)	**	-	***	-*	-	30
1	2	3	4	5	6	7		8		9	10		11	12	13		14	15		16

1 Fluid compatibility

Blank	Standard BUNANitrile Seals
F3	Viton Seals
Note	For further information see “Hydraulic Fluids” section on page 13 .

2 Spool type

See “Functional Symbols” section on pages 5-6 .

3 Spool spring arrangement

A	Spring offset, end-to-end (P to B when operated)
AL	As “A” but left-hand build (P to A when operated)
B	Spring offset, endtocenter (P to B when operated) ■
BL	As “B” but left-hand build (P to A when operated) ■
C	Spring centered
N	Two-position detented
■	DG5V option . Same function from DG3V-7-*C valves by alternating pilot supply to one port (X or Y) and permanently draining the other .

4 Spool control

	Omit if not required
1	Stroke adjustment at both ends
2	Pilot choke adjustment both ends
3	“1” and “2” combined
7	Stroke adjustment, port A end only
8	Stroke adjustment, port B end only
27	“2” and “8” combined Omit if not required
28	“2” and “8” combined Omit if not required
▲	Not applicable to DG5V-7-*B(L) models .
▼	Not applicable to models shown in the “Spring offset, end-to-center, opposite hand” section on page 143
◆	Not applicable to models shown in the “Spring offset, end-to-center” section on page 143
■	Not applicable for spool “8” models

5 Main stage spool monitoring switch

Blank	None
PCA	Center sensing switch on “A” port end
PCB	Center sensing switch on “B” port end
PDA	Double offset sensing switch on “A” port end
PDB	Double offset sensing switch on “B” port end
*	The spool position monitoring switch shown on this technical document is CE marked and certified and complies to European Standard EN 61000-6-4: 2001 (Emissions) for Class A and European Standard EN 61000-6-2: 2001 (Immunity) .
■	Not applicable for spool “8” models

6 External pilot supply, DG5V valve option

Blank	for internal pilot supply
E	Valve configured for external pilot supply to port X

7 Internal pilot drain, DG5V valve option

Blank	Omit for external drain, which is also mandatory for 1, 8 and 9 spool-type valves
T	Valve configured for internal pilot valve drain .

8 Minimum pilot pressure generator (P port option)

Blank	None
K	0.35 bar cracking pressure

9 Manual override option

Blank	Plain override in solenoid end(s) only
H	Water-resistant manual override on solenoid
Z	No override at either end
	No override in non solenoid end of single solenoid valves . • DC only

10 Solenoid energization indentity

V	Solenoid “A” is at port A end of pilot valve and/ or solenoid “B” at port B end independent of mainstage valve port locations or spool type; German practice .
Omit	(Except as noted below) for US ANSI B93 .9 standard whereby solenoid “A” is that which, when energized, connects P to A in main-stage valve, and/or solenoid “B”connects P to B .
Note	Energization identities on valves with type 8 spools are identical under US and German practices . In such cases the “V” code is used .

Model code (Continued)

IV-D

For solenoid controlled, pilot operated valves:

* - DG5V-7-	**	**	(-**)	(-P**)	(-E)	(-T)	-	(-K)	-	(-*)	(V)M	-	*****	(L)	**	-	***	-*	-	30
	1	2	3	4	5	6	7	8		9	10		11	12	13		14	15		16

11 Solenoid type connection(s)

U	ISO4400, DIN43650 connector
U1	ISO4400 fitted with PG11 plug
KU	Top exit flying lead (150mm)
KUP4	Junior timer (Amp) connector
KUP5	Integral Deutsch connector
FW	Flying lead with 1/2" NPT thread wiring housing
FTW	Fly. lead wired terminal block & 1/2" NPT thread wiring housing

12 Indicator lights

Blank	None
L	Solenoid indicator lights•
	• Flying lead coil type only

13 Surge suppressor/ damper

D1	Diode positive bias
D2	Negative bias
D7	Transorb type

14 Coil rating

	See Page 7 for circuit details
B	110V AC 50Hz/120V AC 60 Hz
BL	110V 50 Hz/120V 60 Hz
D	220V AC 50 Hz/240V AC 60 Hz
DS	28V DC 30 watt
G	12V DC
GL	12V DC
H	24V DC
HL	24V DC
HM	24V DC 8 watt

15 Tank port rating

6	210 bar (3000 psi) for AC performance .
7	210 bar (3000 psi) for DC performance .

16 Design number

20	Series for DG3V valves .
30	Series for DG5V valves .
	Subject to change .

Pilot pressure

a. 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 .

b. Internally drained valves may 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

a. 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 .

b. 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 .

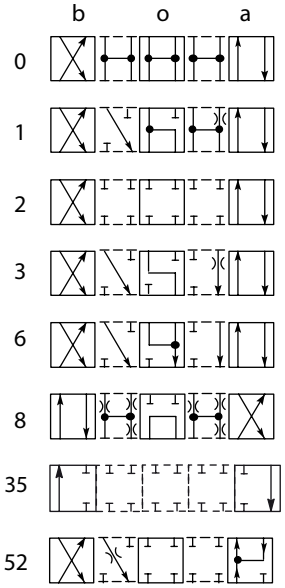
c. Control by stroke adjusters, pilot chokes and minimum-pilot-pressure generator options is described on this page .

Functional symbols

IV-D

Spool types

Shown in 3-position form, plus 2 transients .



Note:

1. In the detailed and simplified symbols on this and 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-7-*A(L) and DG5V-7-*N valves .

Your Danfoss representative can provide further details .

■ Only 35A available

DG3V-7 options

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

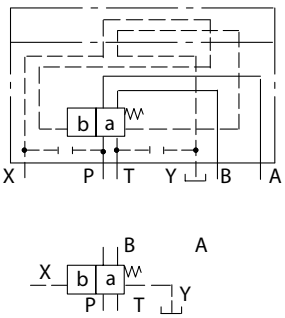
1. Pilot choke module
2. Stroke adjusters at either or at both ends (shown at both ends in example)

One or more options can be built into any DG3 series valve .

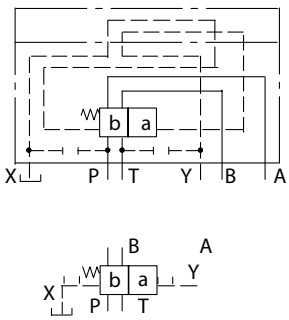
DG3V-7 pilot operated models

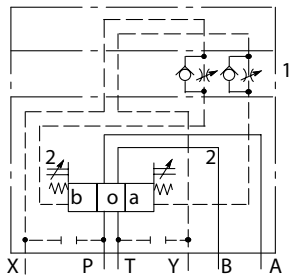
Comprehensive and simplified symbols.

Spring offset, end-to-end, DG3V-7-*A

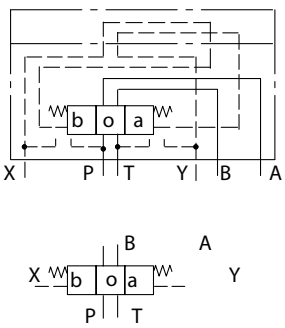


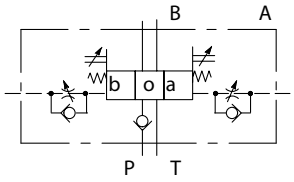
Spring offset, end-to-end, opposite hand, DG3V-7-*AL





Spring centered, DG3V-7-*C

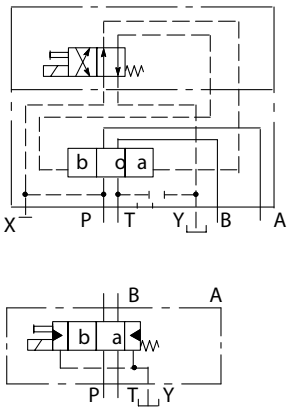




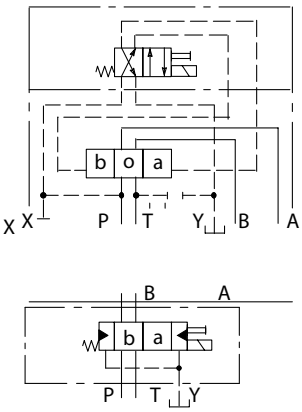
DG5V-7, Solenoid controlled, pilot operated models

Comprehensive and simplified symbols shown configured for external pilot supply and internal drain

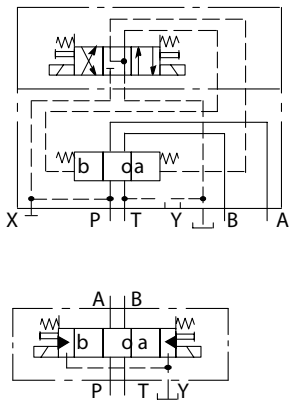
Spring offset, end-to-end, DG5V-7-*A



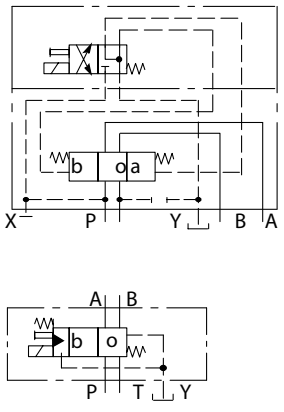
Spring offset, end-to-end, opposite hand, DG5V-7-*AL



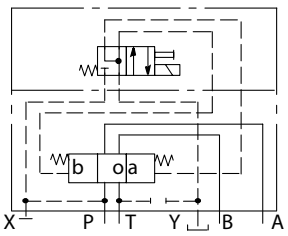
Spring centered, DG5V-7-*C



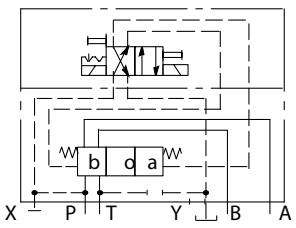
Spring offset, end-to-center DG5V-7-*B



Spring offset, end-to-center, opposite hand DG5V-7-*BL



Detented, DG5V-7-*N

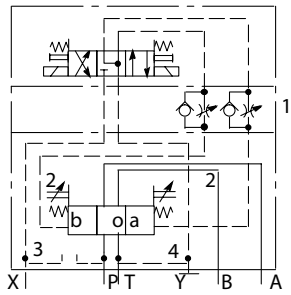


DG5V-7 Options

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

1. Pilot choke module
2. Stroke 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.



Solenoid identification

Model (see also in "Model Code" on page 8)	Spool types	Solenoid identity at: Main port "A" end	Solenoid identity at: Main port "B" end
DG5V-7-*A/B(-**)(-E)(-T)(-*)-M	All except "8"	–	B
DG5V-7-*A/B(-**)(-E)(-T)(-*)-VM	All except "8"	–	A
	"8" only	B	–
DG5V-7-*AL/BL(-**)(-E)(-T)(-*)-M	All except "8"	A	–
DG5V-7-*AL/BL(-**)(-E)(-T)(-*)-VM	All except "8"	B	–
	"8" only	–	A
DG5V-7-*C/N(-**)(-E)(-T)(-*)-M	All except "8"	A	B
DG5V-7-*C/N(-**)(-E)(-T)(-*)-VM	All spools	B	A

Operating data

IV-D

Maximum pressures:

DG3V-7 valves; ports:	
P, A, B, X and Y	350 bar (5000 psi)
T	250 bar (3626 psi)
DG5V-7-(L)(-*)(-E)(-*) valves, (externally drained); ports:**	
P, A, B, T and X	350 bar (5000 psi)
Y	210 bar (3045 psi)
DG5V-7-(L)(-*)(-E)-T(-*) valves, (internally drained)u; ports:**	
P, A, B and X	350 bar (5000 psi)
T	210 bar (3045 psi)
Pilot pressures	See “Pilot Pressures” on page 146

▲ The DG5V, 50 design two-stage valves have been designed to satisfy the needs of most applications .

Consult your Danfoss representative about an alternative model if:

a. Valves are required to remain pressurized for long periods without frequent switching, and /or

b. Back pressure on the drain port of externally drained models (or the tank port of internally drained models) is required to rise above 210 bar (3000 psi) .

Maximum flow rates, L/min (USGPM) at the minimum pilot pressures ■, and with spool type

See pilot pressures on page 147	70 (1000)	140(2000)	210 (3000)	280 (4060)	350 (5000)
0, 2, 3, 6, 31, 33, 35, 52 or 521◆	300 (80)	300 (80)	300 (80)	300 (80)	300 (80)
1, 9 or 11	260 (69)	220 (58)	120 (32)	100 (26)	90 (24)
8	300 (80)	300 (80)	250 (66)	165 (44)	140 (37)

■ Higher flow rates possible at higher pilot pressures; consult your local Danfoss sales engineer.

◆ Consult your local Danfoss sales engineer regarding flow limits relative to the regenerative position of type 52 and 521 spools .

Electrical information

Control (swept) volume(s), DG3V and main-stage of DG5V valves:	7.28 cm3 (0.44 in3)	
Center-to-end	14.56 cm3 (0.88 in3)	
End-to-end	See 14 in “Model Code” on page 140	
Voltage ratings, DG5V valves		
Voltage limits, DG5V valves:		
Maximum voltage	See “Temperature limits”, on page 145	
Minimum voltage	90% of rated voltage	
Power consumption, DG5V valves with AC solenoids:	**Initial VA rms**	**Holding VA rms**
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	

Pressure drop characteristics	See page 146, 147

Response times, DG5V valves:

Typical values for a DG5V-7-2C-E spring centered, externally piloted valve under standard test conditions and operating with 150 L/min (40 USgpm) at 350 bar (5000 psi).

Coil rating:	Pilot pressure, bar (psi):	Time, ms ■ Energizing	De-energizing
110V 50 Hz	15 (218)	75	40
	50 (730)	50	40
	150 (2180)	40	40
	210 (3000)	40	40
	250 (3600)	40	40
24V DC	15 (218)	90	45▲
	50 (730)	65	45▲
	150 (2180)	55	45▲
	210 (3000)	55	45▲
	250 (3600)	55	45▲

◆ From applying a signal at the solenoid until the main-stage spool completes its travel .

▲ In pure switched circuit conditions, devoid of the effects of any suppression diodes and full-wave rectifiers .

Temperature limits:	See page 146, 147
Fluid temperature limits	See appendix
Ambient temperature limits:	See appendix
Minimum ambient, all valves	-20°C (-4°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 148, 149, 150
Mass (weight), basic models:	kg (lb) approx.
DG3V-7-*A(L)	10,0 (22.0)◆
DG3V-7-*/*B(L)/*C	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)◆

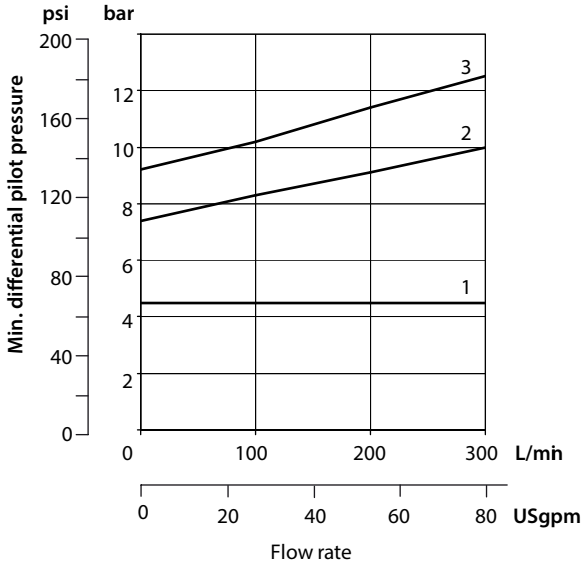
◆ Add 1,1 kg (2.4 lb) when pilot chock adjustment is fitted.

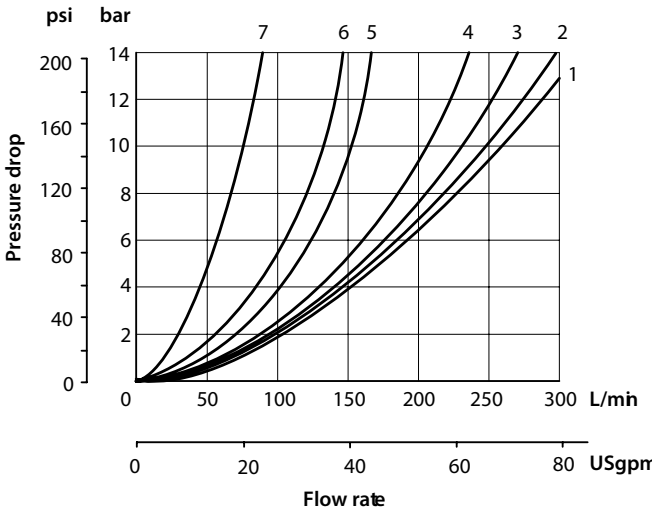
Notes: For information on pilot valves please refer segment B, C, D of the catalog .

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 types	0	1	2	3	4	6	8	9	11	31	33	52	X*	Y*
Curve ref.	1	1	3	3	1	2	1	1	1	3	3	3	3	3





Applicable to:

Model	Spool type	Curve correction
DG3V-7-*C	All	As drawn
DG5V-7-*A(L)	0, 2, 6, 9, 52, X2 & Y2	Subtract 3 bar (44 psi)
DG5V-7-*B(L)	0, 2, 6, 52▲, X2 & Y2	As drawn
DG5V-7-*C	All	As drawn
DG5V-7-*N	0, 2, 6, 9, 52, X2 & Y2	As drawn

▲ DG5V-7-52BL models only.

Pilot pressures

The following typical pressure drops (△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 (Q1) the pressure drop (△p1) will be approximately △p1 = △p (Q1/Q) ².

Flow-direction curve reference

Spool type	P - A	B - T	P - B	A - T	P - T
0	2	1	2	3	3■
1	1	2	2	3	4▼
2	1	2	1	2	-
3	1	2	1	3	-
4	2	2	2	1	6
6	1	1	1	3	-
8	2	2	2	1	5
9	1	2	1	3	7
11	2	3	1	2	4
31	1	3	1	2	-
33	1	2	1	2	-
52▲	2•	-	3▼	-	-
52◆	-	-	3	3	-

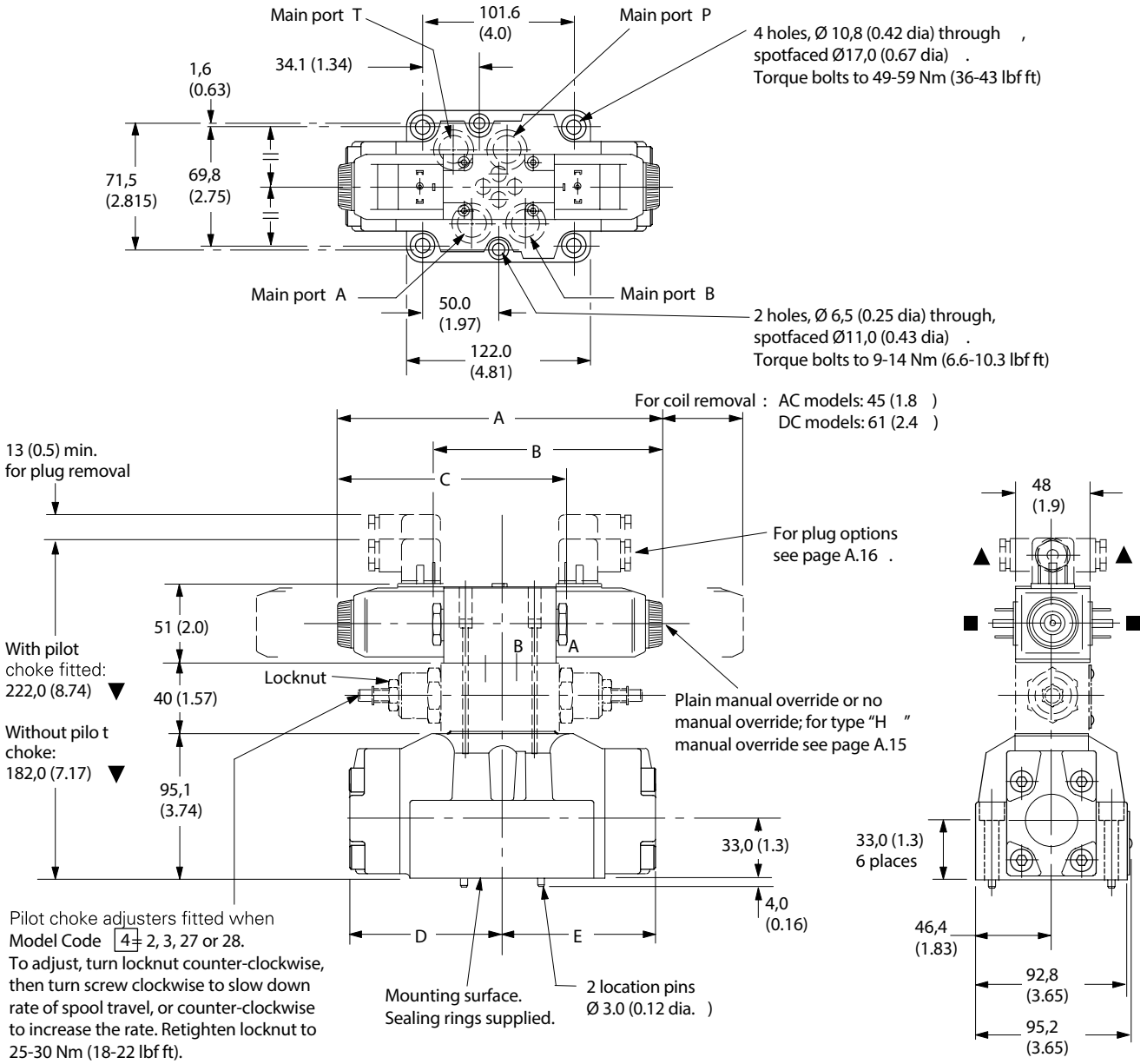
Solenoid Controlled Models with ISO 4400 (DIN 43650) Electrical Connections and Pilot Choke

DG5V-7–**(L)(-2)(-E)(-T)(-*)-(V)M–U example

For dimensions A, B, C, D and E see page 148

For solenoid identification see page 150

For stroke adjusters see page 151



▼ May vary according to plug source .

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

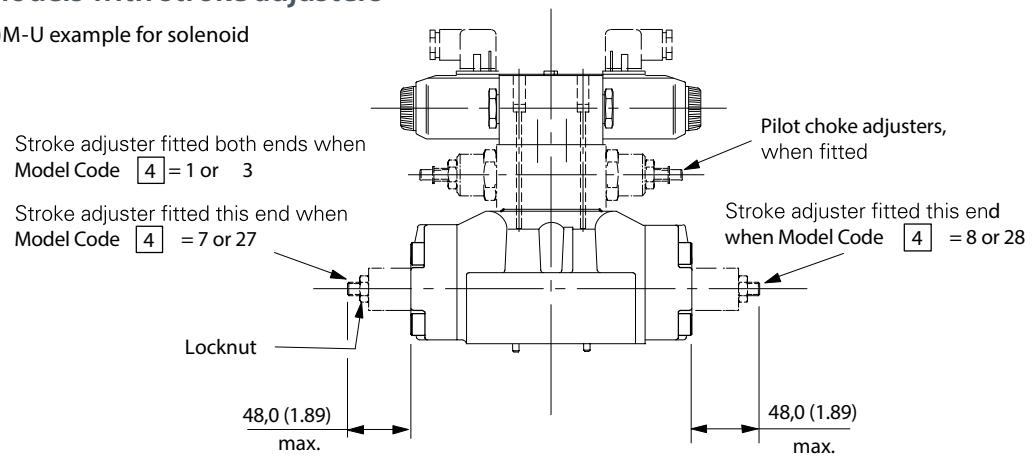
▲ Cable entry can be positioned at 90 either way from position shown, by re-assembling the contact holder into the appropriate position inside the plug connector housing .

Installation dimensions

IV-D

Solenoid controlled models with stroke adjusters

DG5V-7-***(L)(-2)(-E)(-T)(-*)-(V)M-U example for solenoid identification see page 16



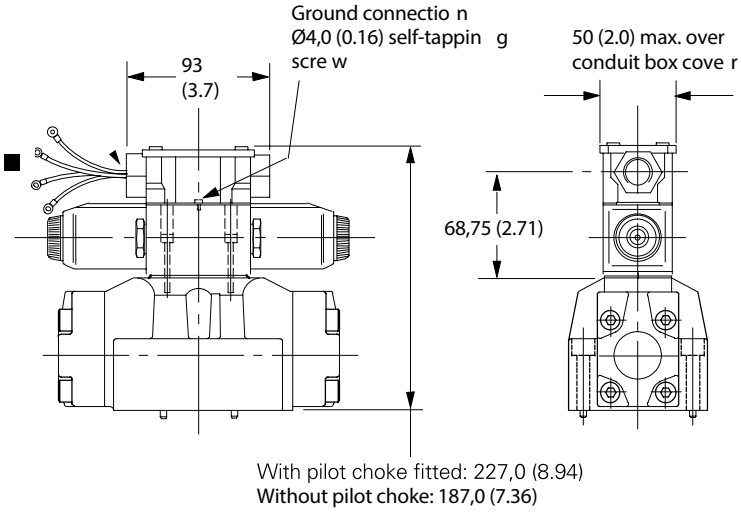
To adjust:

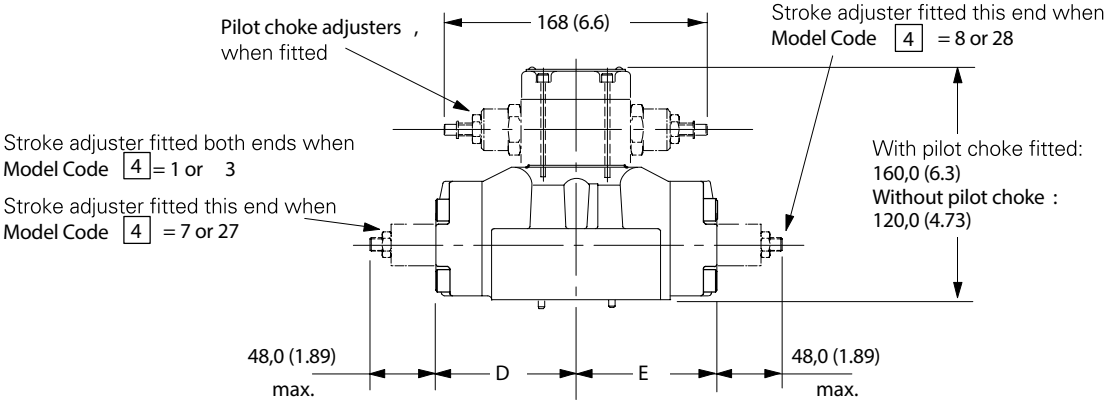
Turn locknut counter-clockwise, then turn screw clockwise to shorten stroke, or counter-clockwise to increase stroke . Re-tighten locknut .

Solenoid Controlled Models with Junction Box having Optional Terminal Strip and Indicator Lights

DG5V-7-***(L)(-**)(-E)(-T)(-*)-(V)MF**(L) example .

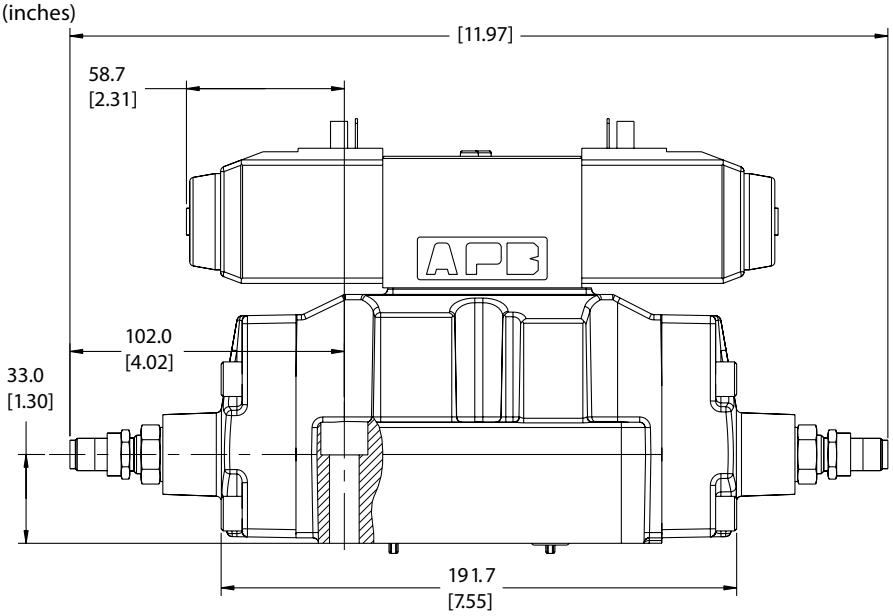
For solenoid identification see page 150
Available also with other options shown above and on previous page .





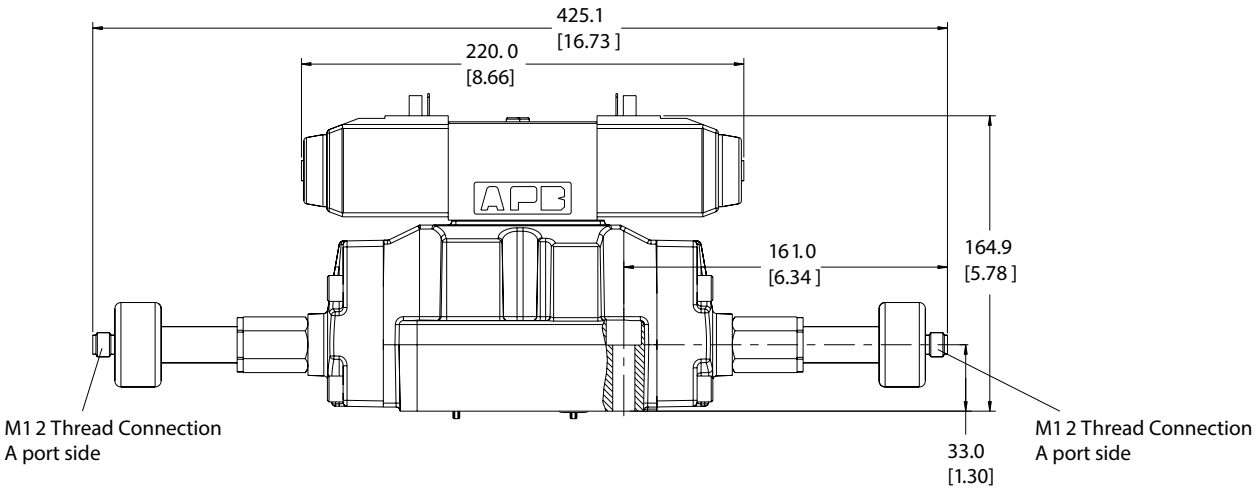
DG5V-7 with main stage spool monitoring switch "PPA", "PPB" or "PPD" models (proximity switch)

Millimeters (inches)



DG5V-7 with main stage spool monitoring switch "PPA", "PPB" or "PPD" models (LVDT style)

Millimeters (inches)



Installation dimensions

Solenoid identification

Model (see also in 10 "Model Code" on page 140)	Spool types	Solenoid identity at: main port "A" end	Solenoid identity at: main port "A" end
DG5V-7-*A/B(-**)(-E)(-T)(-K)(-*)-M	All except "4" & "8"	-	B
DG5V-7-*A/B(-**)(-E)(-T)(-K)(-*)-VM	All except "4" & "8" "4" & "8" only	-	A
		B	-
DG5V-7-*AL/BL(-**)(-E)(-T)(-K)(-*)-M	All except "4" & "8"	A	-
DG5V-7-*AL/BL(-**)(-E)(-T)(-K)(-*)-VM	All except "4" & "8" "4" & "8" only	B	-
		-	A
DG5V-7-*C/D/N(-**)(-E)(-T)(-K)(-*)-M	All except "4" & "8"	A	B
DG5V-7-*C/D/N(-**)(-E)(-T)(-K)(-*)-VM	All spools	B	A

Dimensions

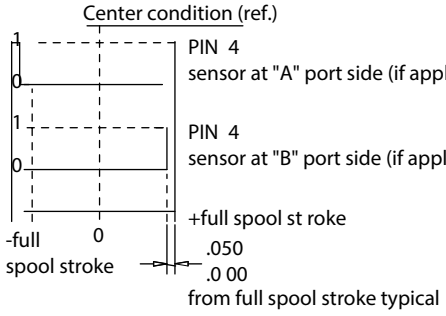
Basic model designation	AC models			DC models				
	A	B	C	A	B	C	D	E
DG3V-7-*C	–	–	–	–	–	–	97,0 (3.82)	97,0 (3.82)
DG3V-7-*A■	–	–	–	–	–	–	97,0 (3.82)	131,0 (5.16)
DG3V-7-*A(L■)								
DG3V-7-*D	–	–	–	–	–	–	131,0 (5.16)	97,0 (3.82)
DG5V-7-*A■	–	147 (5.8)	–	–	157 (6.2)		97,0 (3.82)	97,0 (3.82)
DG5V-7-*B■								
DG5V-7-4/8BL								
DG5V-7-*AL■	–	–	147 (5.8)	–	–	157 (6.2)	97,0 (3.82)	97,0 (3.82)
DG5V-7-*BL■								
DG5V-7-4/8B								
DG5V-7-*C	200 (7.8)	–	–	200 (7.8)	–	–	97,0 (3.82)	97,0 (3.82)
DG5V-7-*N								
DG5V-7-*D	200 (7.8)			200 (7.8)			131,0 (5.16)	97,0 (3.82)

■ Not types "8" or "8" spools .

Specifications	
Supply voltage (vs)	10 to 30 Vdc
Supply current (Is)	8 mA at 24 Vdc (plus load current)
Supply over-voltage rating:	35 Vdc continuous
Supply reverse polarity rating	-35 Vdc (with no shorts)
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 Megohms
Load dump tolerance:	80 Vdc Peak, 400 ms Decay, with 1.5 Ohm 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	10µa 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%

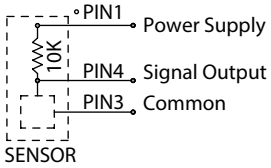
Electrical information shown in this window is for offset sensing, proximity switch "PPA" , "PPB" or "PPD" models

Functional diagram - spring offset

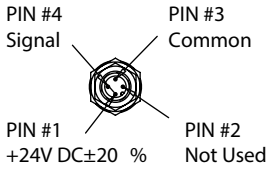


1= voltage at pin 4 (Vs – 2.2V) min.
0= voltage at pin 4 0.5V min.

Output circuit wiring instructions



Connector detail



Electrical information

Main stage spool monitoring switch (LVDT style)

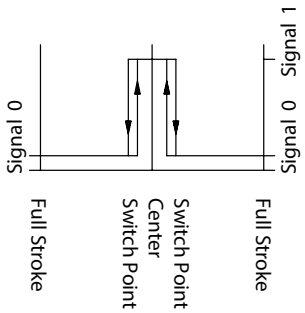
IV-D

Specifications	
Supply voltage (Vs)	24VDC +/-20%
(Full wave bridge with capacitor) reverse polarity protection	Max. 300 V Installed
Ripple voltage	10%
Current consumption	40 mA Approx.
Outputs	NC Contact Positive
Sensing distance (offset position)	5.85 to 6.15 mm
Sensing distance (from center position)	± 0.35 to 0.65 mm
Hysteresis	<0.06 mm
Output voltage	(No Short Circuit Protection)
Signal 1	Vs – 2.5 V
Signal 0	< 1.8 V
Output current	< 400 mA AT INPUT + 20%
Environmental protection	IP65 (With Mounted Plug)
Operating temp range	-20˚ C to +85˚ C
Operating pressure	315 bar (4500 psi)
CE Declaration of Conformity No.	00 02 002 9 93

Attention: EMC only ensured when using screened cables and screened plug casing!

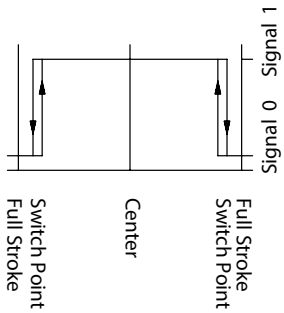
Electrical information shown in this window is for offset sensing, proximity switch "PPA" , "PPB" or "PPD" models

Typic AL "PC A/PCB" output (For sensing center position)



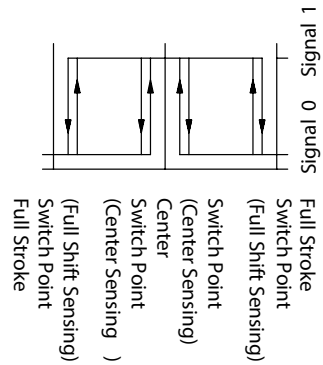
Signal 0 =V oltage at pin 2/4 < 1 .8 V
Signal 1 =V oltage at pin 2/4 > (Vs – 2.5V)

Typic AL "PD A/P DB" output (For full shift sensing)



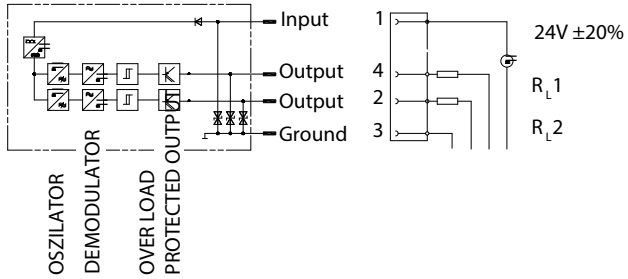
Signal 0 =V oltage at pin 2/4 < 1 .8V
Signal 1 =V oltage at pin 2/4 > (Vs – 2.5V)

Typical "PCD" output (For center se nsing 'a' port end, Full shift sensing 'b' port end)



Signal 0 =Voltage at pin 2/4 < 1 .8 V
Signal 1 =Voltage at pin 2/4 > (Vs – 2.5V)

Electrical schematic and mating connector detai l



Connector detail

