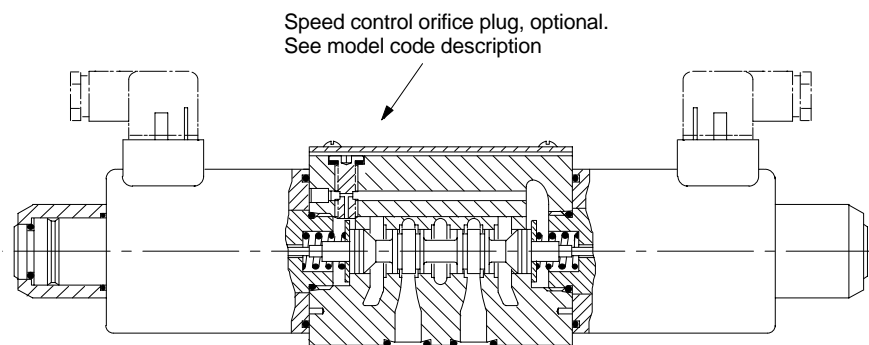


Wet Armature Solenoid Operated Directional Control Valves

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
NFFA 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.

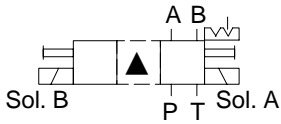
The range includes:

- 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

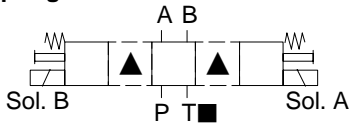
Double Solenoid Valves, Two-Position, Detented



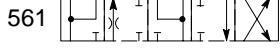
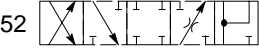
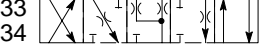
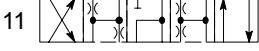
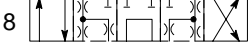
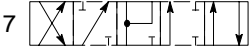
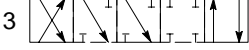
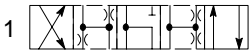
DG4V-5-*N valves



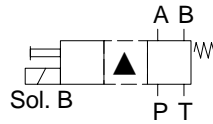
Double Solenoid Valves, Spring Centered



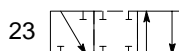
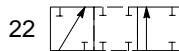
DG4V-5-*C valves



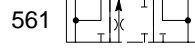
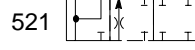
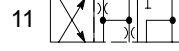
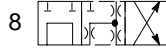
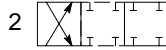
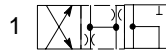
Single Solenoid Valves, Solenoid at Port A End



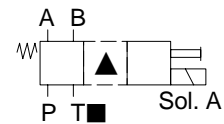
DG4V-5-*A valves



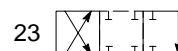
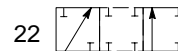
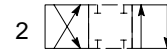
DG4V-5-*B valves



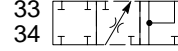
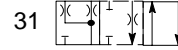
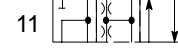
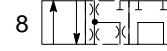
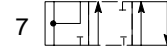
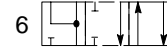
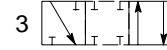
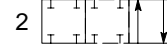
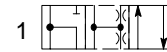
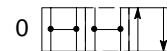
Single Solenoid Valves, Solenoid at Port B End



DG4V-5-*AL valves



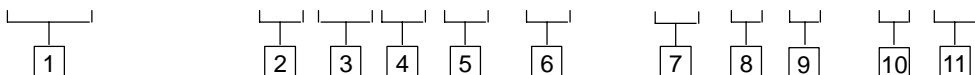
DG4V-5-*BL valves



▲ 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 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

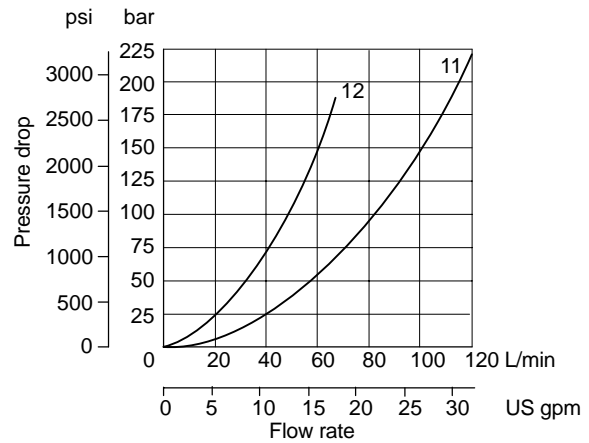
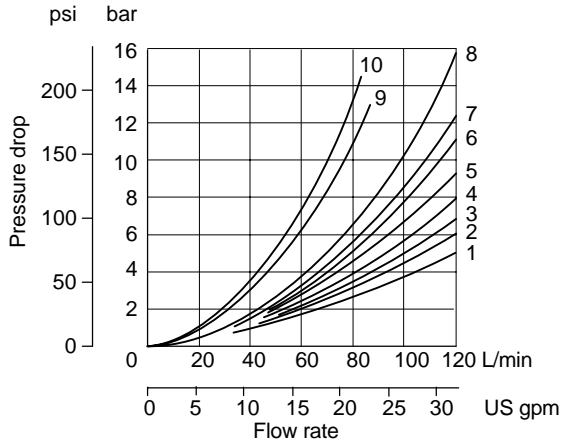
▲ Armature fully retracted, 1st half-cycle.
 ▼ At start of normal working stroke of valve spool. Previously called "Inrush".

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	–	–	–	–	3▲	–
	Energized	1	1	6	7	–	–
1B(L) & 1C	De-energized	–	–	–	–	6▼	–
	Energized	1	2	6	4	–	–
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	–	–	5	–	–	–
	Energized	2	3	6	5	–	–
6B(L) & 6C	De-energized	–	–	5●	6▼	–	–
	Energized	3	3	6	7	–	–
6N	Both	4	4	4	5	–	–
7B(L) & 7C	De-energized	3●	3▼	–	–	–	5■
	Energized	2	2	5	6	–	–
8B(L) & 8C	All	2	2	7	8	8	–
11B(L) & 11C	De-energized	–	–	–	–	6●	–
	Energized	2	1	4	7	–	–
22A(L)	Both	3	3	–	–	–	–
23A(L)	Both	3	3	5	6	–	–
31B(L) & 31C	De-energized	–	–	–	6	–	–
	Energized	3	2	4	7	–	–
33B(L) & 33C	De-energized	–	–	12●	12▼	–	–
	Energized	2	2	5	6	–	–
34B(L) & 34C	De-energized	–	–	11●	11▼	–	–
	Energized	2	2	5	6	–	–
52BL & 52C	All	7●	8	4	–	–	9■
56BL & 56C	De-energized	–	–	8●	10▼	–	–
	Energized	7●	8	6	–	–	9■
521B & 521C	All	8	7▼	–	5	–	9■
561B & 561C	De-energized	–	–	10●	8▼	–	–
	Energized	8	7▼	–	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:

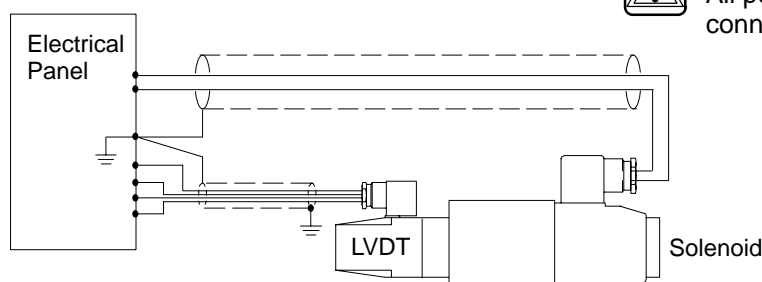
Pin 1 (output 1)	Normally open (ie. not connected to pin 3)
Pin 2	Supply +ve
Pin 3	0V
Pin 4 (output 2)	Normally closed (ie. connected to pin 3)
Switching point	Within the spool spring offset condition ●
Connector	Pg7 plug (supplied with valve)
Protection	Overload and short-circuit protected; self re-setting. 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.



Customer's protective ground connection



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.

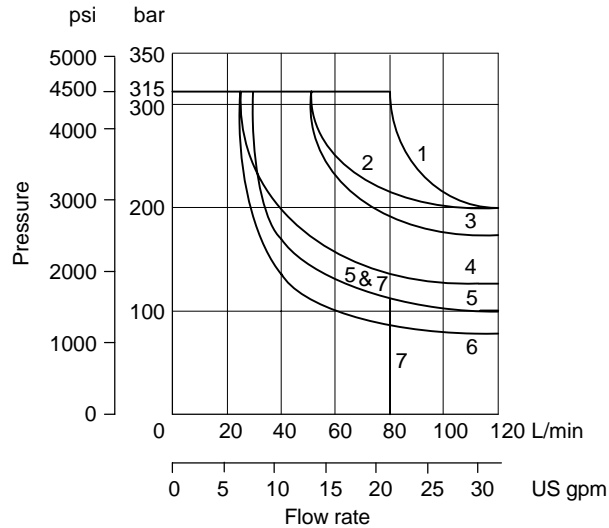
Flow limits applicable to following usages:

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.

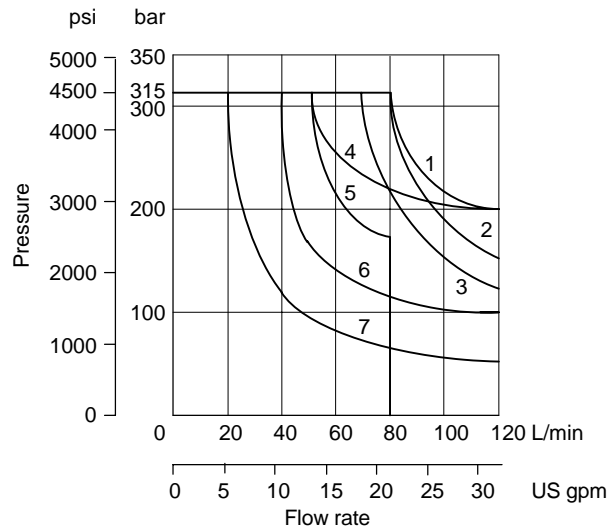
Consult Vickers with application details if any of the following are required:

- 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 effects 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

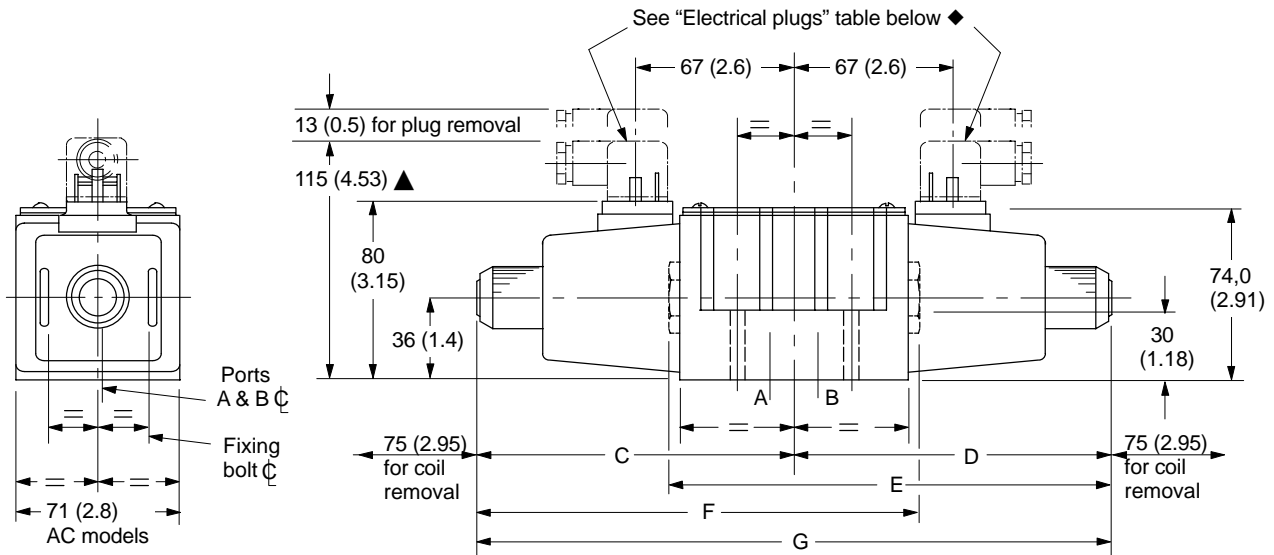
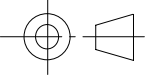
Mass, Approx. kg (lb)

- 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

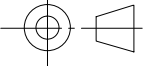
3rd angle projection

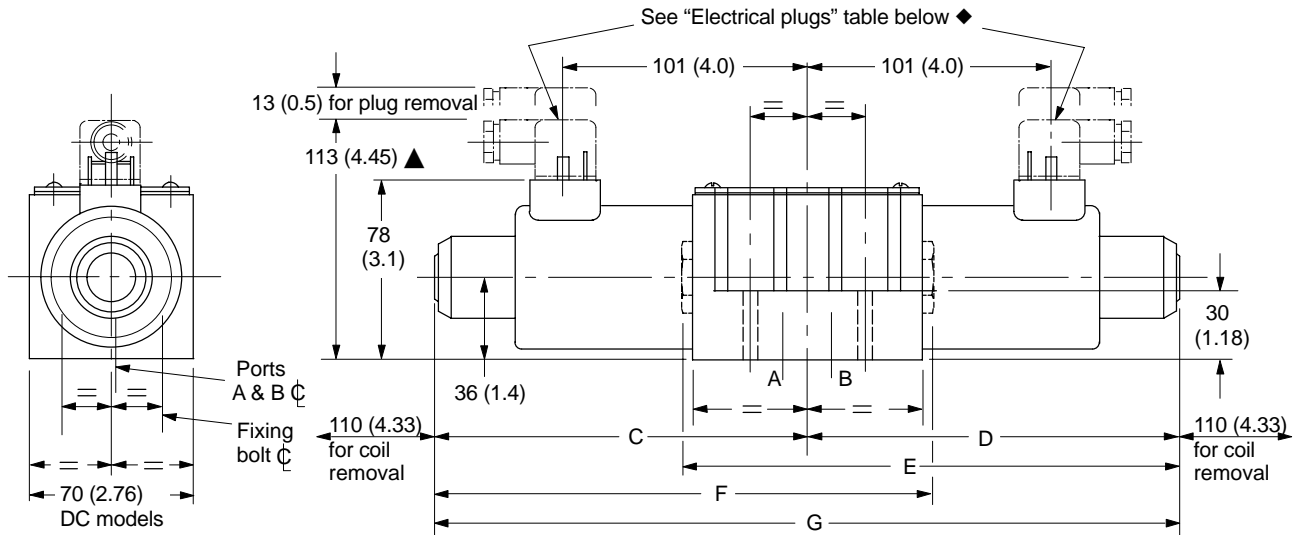


- ▲ May vary according to plug source.
- ◆ The cable entry can be repositioned at 90° intervals from the position shown. This is done by reassembling the contact holder into the appropriate position inside the plug housing.

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

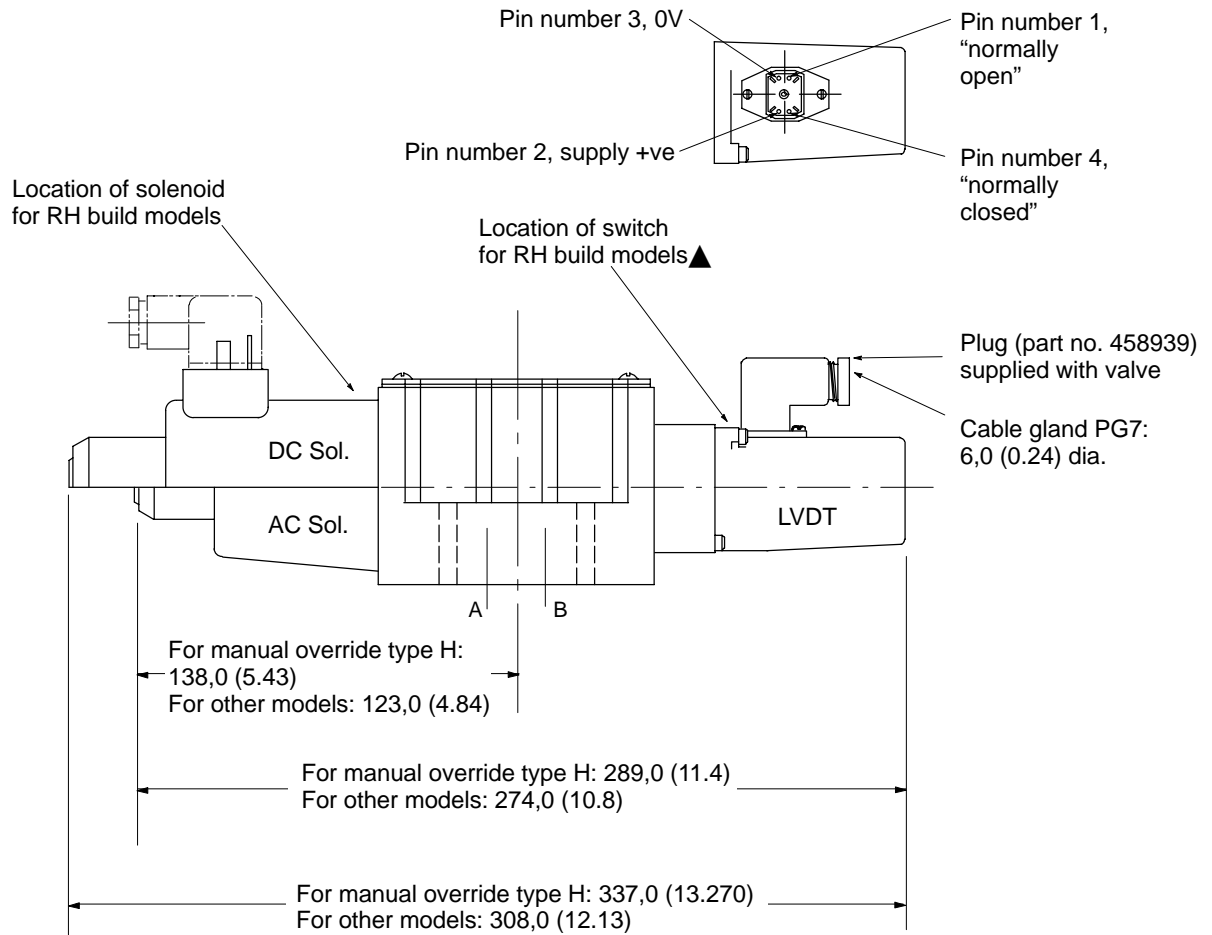
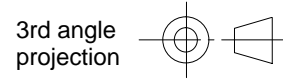
3rd angle projection 



- ▲ 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



▲ 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

VICKERS®

Directional Controls



Soft Shift Directional Control Valve

DG4S4-01-60-S*** Design

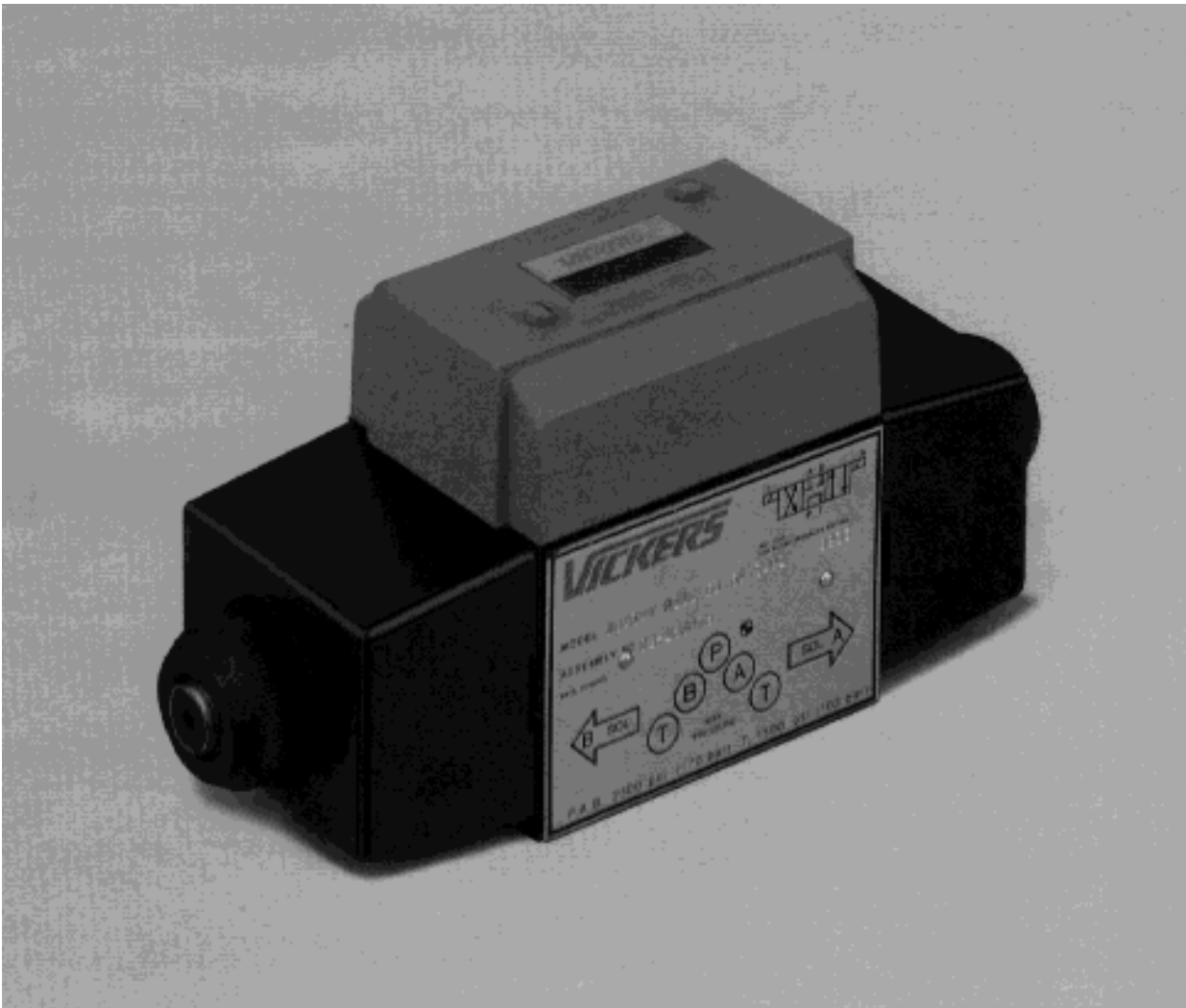


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Introduction

The DG4S4-01-60-S*** directional control is a solenoid operated, 4-way, soft-shift valve having a unique five-chamber design.

The spool end land configuration isolates the core tube volume from the valve's tank cavity. This volume is

displaced through an orifice in each solenoid armature to increase the shift and dropout periods.

System shock is greatly reduced by metering the flow across the special spool land as well as spool modulation produced by the armature orifice.

The valve terminal box contains a bridge rectifier, allowing alternating current to be applied directly to the valve.

Therefore, the solenoid winding senses only direct current, eliminating the "in-rush" characteristic of a standard AC solenoid.

Features & Benefits

- Low cost alternative to pilot-operated and proportional valves.
- Mounts interchangeable with any NFPA D05, CETOP 5, ISO 05 valve.
- Conventional direct-solenoid operated valve design with contoured spool and controlled solenoid shift speed.
- Available in single or double solenoid configurations.
- Wet armature solenoids for quieter operation and long life with no dynamic seals to leak.
- Rectifier is housed in the terminal junction box and is protected from moisture and dirt.
- Coil has plug-in construction and is held on by a nut enabling quick coil voltage interchange or service, without breaking into the hydraulic envelope.
- DC solenoid prevents coil burnout during controlled rate of solenoid shift. Conventional alternating input current is converted to direct current through a rectifier located in the terminal box. For example: 110-120 50/60V AC and 220-240 50/60V AC are converted to 105V DC and 214V DC, respectively.
- A larger diameter spool combined with five-chamber body core passages results in lower pressure drop.
- Milled metering notches on the spool enable precise control of flow rate change as the spool is shifted.
- Four-land spool permits manufacturing of a consistently rounder spool for better balance in the bore and lower spool wear and less leakage.
- Five-chamber body design isolates the tank passages from the core tube so that pressure spikes or surges are not transmitted to the solenoid core tube.
- NFPA fatigue pressure rated at 250 bar (3600 psi)
- Easily interchangeable orifice plugs allow for fine tuning of valve shift time to each application.
- Solenoid indicator lights are available.

General Information

Basic Characteristics

- Max. pressure ports P, A & B:
Up to 250 bar
(3600 psi) depending
on fluid
- Max. pressure port T:
70 bar (1000 psi)
- Max. flow rates . . . Up to 75 l/min
(20 USgpm)
depending on spool
- Operating temp. 20° to 82° C
(70° to 180° F)
- Fluid viscosity . . . 14-54 cSt
(75-250 SUS)

Mounting Interface

ISO 4401-05
CETOP 5
NFPA D05

Seals & Fluid Cleanliness

Fluorocarbon seals are standard and are suitable for use with phosphate ester type fluids or its blends, water glycol, water-in-oil emulsion fluids and petroleum oil. Refer to 694 for hydraulic fluid and temperature recommendations.

Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials and additives for protection against wear of components, elevated viscosity and inclusion of air.

Essential information on the correct methods for treating hydraulic fluid is included in Vickers publication 561; "Vickers Guide to Systemic Contamination Control," available from your local Vickers distributor or by contacting Vickers, Incorporated.

Recommended filtration and the selection of products to control fluid condition are included in 561.

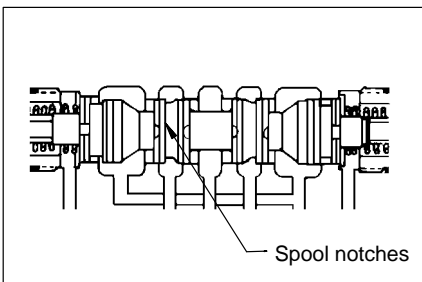
Recommended cleanliness levels using petroleum oil under common conditions is based on the highest fluid pressure levels in the system.

Directional controls, regardless of manufacturer, will operate with fluids showing a higher cleanliness code. The operating life of the control, and other components in the system, will be less however. For maximum life and best system performance, cleanliness codes as defined below should be achieved.

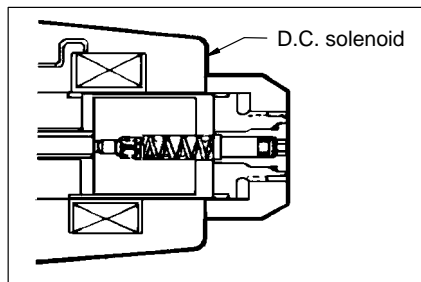
Fluids other than petroleum, severe service cycles or temperature extremes are cause for adjustment of these cleanliness codes. See Vickers Publication 561 for exact details.

System Pressure			
	1000 psi	2000 psi	3000+ psi
Valves	20/18/15	20/18/15	19/17/14

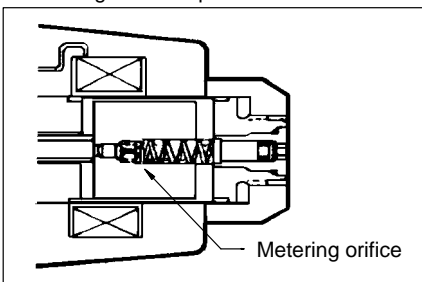
Operating Principles



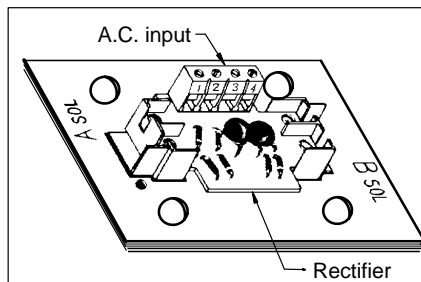
Spools with contoured or notched lands are used to provide maximum control of flow rate change as the spool is shifted.



D.C. solenoids prevent coil burnout during controlled rate of solenoid shift.



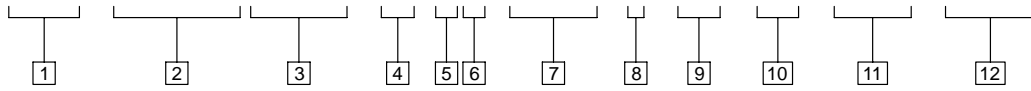
Spool shift speed is controlled by a metering orifice in the solenoid. Three orifice sizes are available to meet your application.



Conventional alternating current (120/60 or 110/50) input is converted to D.C. through a rectifier located in the terminal box.

Model Code

(F3) - DG4S4 (L) W - 01 ** - (U) - * - *** - 60 - (LH) - S *****



1 Seals

Blank – Standard seals
F3 – Special seals

2 Valve Type

D – Directional control valve
G – Manifold or subplate mounted
4 – Solenoid operated
S – Sliding spool
4 – 4-way flow direction

3 Electrical Accessories

Blank - For “U” type connectors
W – Terminal box
LW – Terminal box with lights

4 Interface

01 – ISO-4401-AC-05-4-A,
NFPA D05, CETOP 5

5 Spool Types

A models – 0, 2, 9
B models – 0, 2, 6, 8
C models – 0, 2, 6, 8

6 Spool/Spring Arrangement

A – Spring offset, P to A
B – Spring centered, solenoid “a” removed
C – Spring centered, three position

7 Wet Armature Solenoid(s) (non-serviceable core tubes)

Blank – Plug-in coils
U – DIN 43650 coil(s)* without electrical plug (non-rectified)
U1 – Connector fitted (DC only)
U6 – Connector fitted w/lights (DC only)
U11 – Connector fitted w/ rectifier & lights (AC only)
U12 – Connector fitted w/rectifier

8 Coil Identification Letter(s) (See “Solenoids” below)

9 Soft Shift Orifice

Blank – Standard (.047) **
.062 – .062 inch
.078 – .078 inch
(see response times, page 7)

10 Design Number

Subject to change.
Installation dimensions remain as shown for designs 60 through 69.

11 Left-hand Assembly

Omit for right-hand assembly with solenoid “a” removed.

12 Special Soft Shift Solenoids

S491 – Standard valve
S528 – Canadian Standards Assoc. CSA certification

Solenoids

Solenoid Identification Letter	Solenoid Voltage Rating	Holding Amps (rms)	Holding Watts
BB	120 VAC 60Hz Rectified	0.38	40
	110 VAC 50Hz 105 VDC	0.35	35
BD	240 VAC 60 Hz Rectified	0.19	40
	220 VAC 50 Hz 214 V DC	0.17	35
G	12V DC non-rectified	—	42
H	24 V DC non-rectified	—	42

* Note that the U type coils are non-rectified and require a connector with rectifier when using AC current.
A non-rectified connector must be used when supplying DC current.

** Not recommended for type 8 spool when operating at maximum flow and pressure.

Operating Data

Functional Symbols

Standard Spool Types	Graphic Symbol Center Condition	"A" Models ▲ Spring Offset	"B" Models ▲ Spring Centered	"C" Models Spring Centered
0				
2				
6				
8				
9				

▲ Standard (right hand) build shown. "A" solenoid omitted.

Note
When solenoid "a" is energized, flow is "P" to "A". When solenoid "b" is energized, flow is "P" to "B". This is in accordance with the ANSI-B93.9 standard.

Note
Solenoid designations "a" and "b" are identified on the diagram plate on the side of the valve.

Solenoid Energizing

Spring centered and spring offset valves will be spring positioned unless the solenoid is energized continuously.

NOTE

Any sliding spool valve, if held shifted under pressure for long periods, may stick and not spring return, due to silting. Therefore, it is recommended that the valve be cycled periodically to prevent this from occurring.

Bleeding Procedure

Apply a minimum of 3.4 bar (50 psi) tank pressure. Shift either solenoid "a" or "b". Loosen manual actuators in solenoid ends until air is evacuated. Tighten manual actuators. No further bleeding should be required.

To fully utilize the features of the soft shift solenoid, the core tubes must remain full of oil. The tank line must be plumbed so that the tank port is always flooded with oil. Addition of a back pressure check valve may be required to prevent bleed down.

Response Time

Response times are increased over that of a standard solenoid. These times are influenced by flow, pressure, applied solenoid voltage, oil and ambient temperatures. Response times can be fine tuned to the application by orifices that are changeable via the manual actuator in the solenoid end.

The DG4S4-01**-60-S*** valve comes with a .047 inch diameter orifice as standard. A .062 and a .078 inch orifices are also available.

Response times shown below were established with a system pressure of 250 bar (3600 psi), flow of 38 l/min (10 USgpm), solenoid voltage at 100% of rating and 38° C (110° F) oil temperature.

The given response times were measured from the point of energization/ de-energization to the point of first indication of inlet pressure change.

Response up to full system pressure is dependent on the system's compressed volume and can vary with each application.

Orifice & Tool Kit

For fine tuning shift performance, orifices must be ordered separately. The following kit comes with:

- Two (2) .047, .062 and .078 inch diameter orifices.
- One (1) Installation tool.
- One (1) $5/32$ " hex key.
- One (1) $3/32$ " hex key.

Order #02-119131

Response Time / Orifice Changing Procedure

Response Time

Model	Valve type	Spool type	Spool response (ms)					
			Shift			Return		
			Orifice dia. (in.)			Orifice dia. (in.)		
			.047	.062	.078	.047	.062	.078
A	Spring offset	0	140	100	80	260	230	200
		2	110	100	90	300	250	210
		9	150	100	90	250	210	190
C/B	Spring centered	0	150	100	80	280	240	200
		2	160	110	90	380	330	300
		6	190	120	100	190	160	150
		8	200	140	100	200	160	140

Orifice Changing Procedure

WARNING

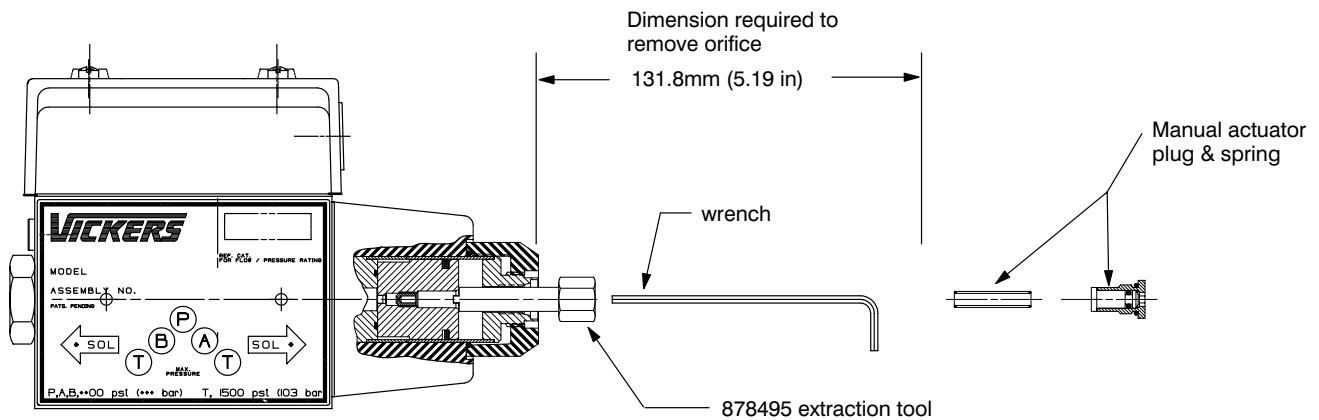
Before breaking a circuit connection make certain that power is OFF and system pressure has been released. Lower all vertical cylinders, discharge accumulators and block any load whose movement could generate pressure. Plug all removed units and cap all lines to prevent the entry of dirt into the system.

1. Using a $\frac{5}{32}$ " hex key, remove manual actuator plug and spring from the end of solenoid (Tightening torque 6.2-7.3 Nm 55-65 lbf. in.)

2. Insert extraction tool (878495) into solenoid via the manual actuator opening. Rotate tool until aligned and push into slot in armature.

3. Using $\frac{1}{2}$ " wrench and tool to prevent the armature from rotating, insert $\frac{3}{32}$ " hex key down the center of tool and remove orifice plug.

4. Replace by the same method, tightening orifice snug to ensure bottoming of threads. Smaller orifices increase response times. Larger orifices decrease response times. The .047 in. dia. orifice is standard in the valve.



Orifice & tool kit 02-119131

For fine tuning shift performance, orifices must be ordered separately. The kit includes (2) each of .047, .062, & .078 in. dia. orifices, (1) installation tool, (1) $\frac{5}{32}$ " hex key and (1) $\frac{3}{32}$ " hex key.

Performance Data

Pressure Drops

The pressure drop curves give approximate pressure drop (ΔP) when passing 21 cSt (100 SUS) fluid (having .865 specific gravity) through the indicated flow path.

For any other viscosity, the pressure drop (ΔP) will change as follows:

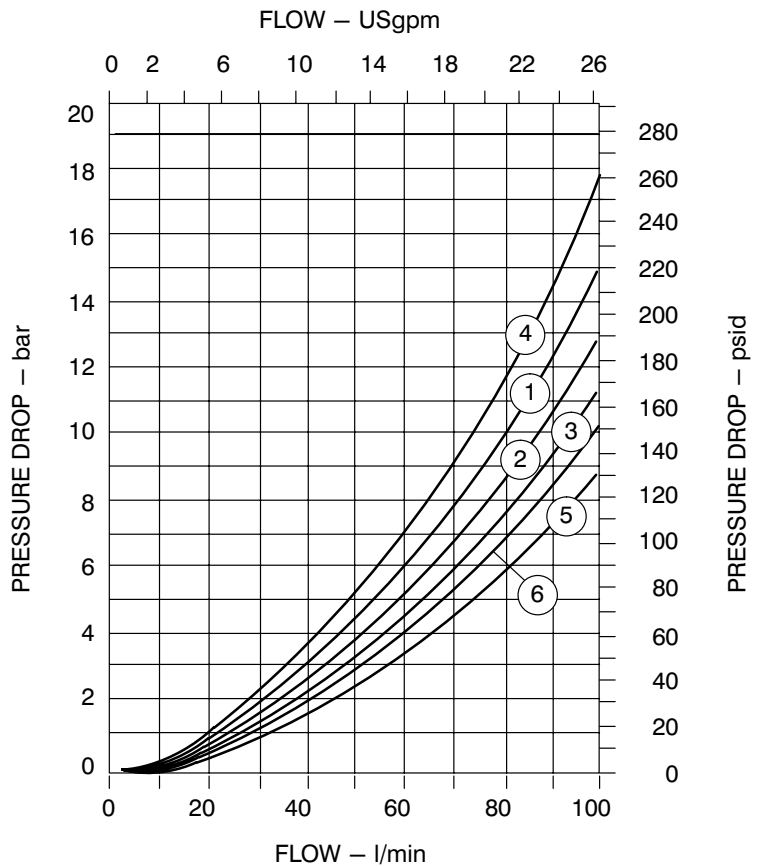
Viscosity cSt (SUS)	14 (75)	32 (150)	43 (200)	54 (250)	65 (300)	76 (350)	87 (400)
% of ΔP (Approx)	91	111	119	126	132	137	141

For any other specific gravity (G_1), the pressure drop (ΔP_1) will be approximately: $\Delta P_1 = \Delta P (G_1/G)$

Pressure Drop Curves

Pressure drop curve reference chart

Spool type	Curve numbers				
	P-A	B-T	P-B	A-T	P-T
0C/B	3	3	3	3	5
2C/B	1	1	1	2	—
6C/B	3	5	3	5	—
8C/B	4	1	4	2	6
0A	1	1	1	1	—
2A	1	1	1	1	—
9A	1	1	1	1	—



Performance Data

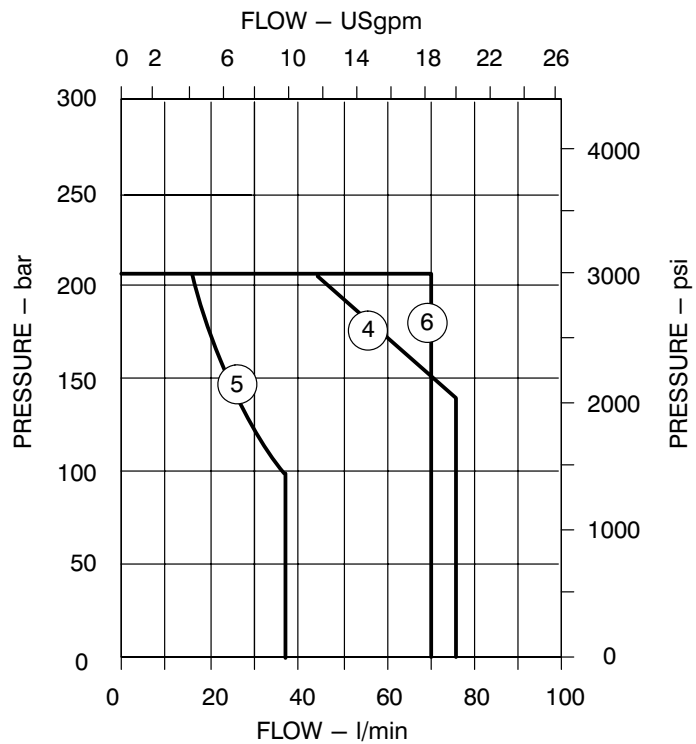
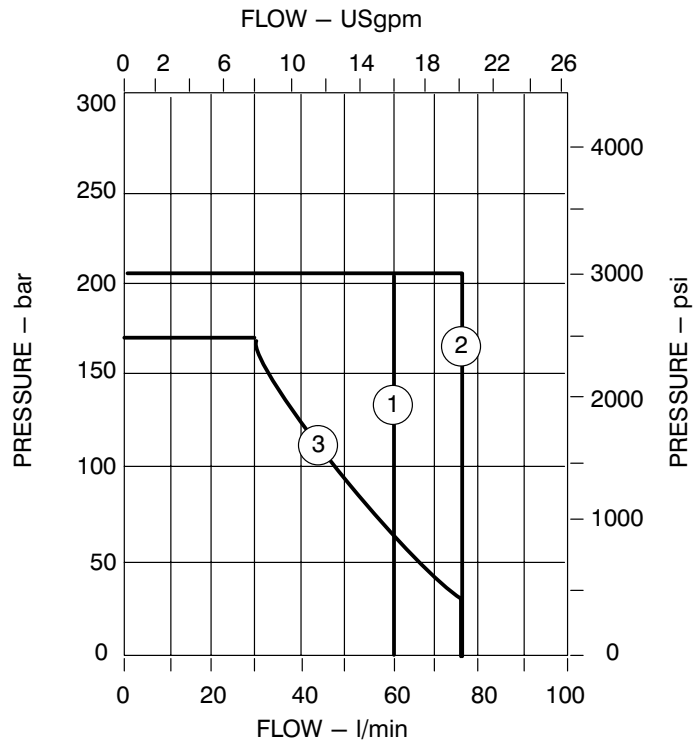
Maximum Flow Data

Maximum recommended flow data is for 90% nominal voltage in a 4-way circuit with cylinder ports either looped or blocked and containing 2,5 liter (.66 USgpm) compressed volume. Performance may vary when certain spools are used in 3-way circuits.

Maximum flow chart reference

Model	Spool type	Curve number
A	0	4
	2	5
	9	6
B/C	0	1
	2	2
	6	2
	8	3*

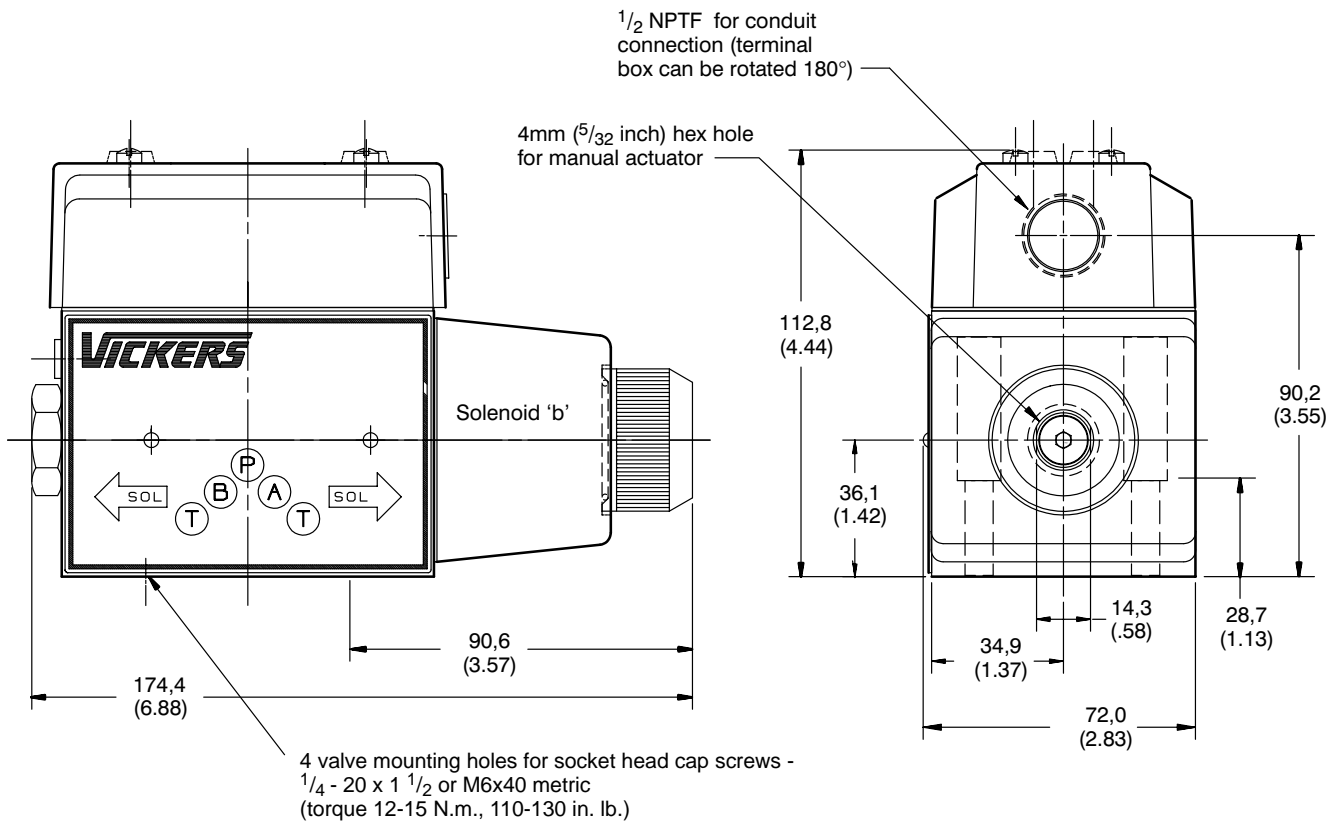
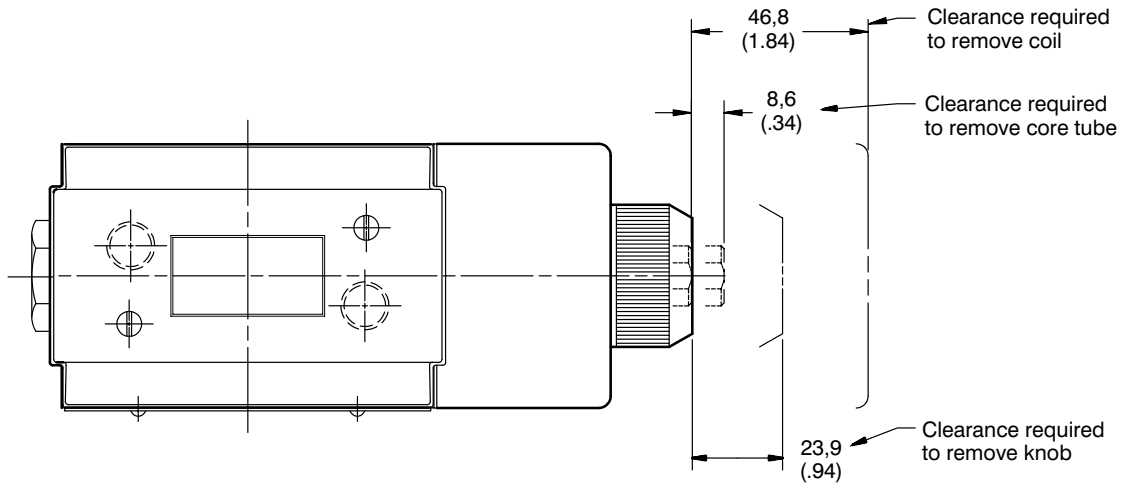
* .047 orifice not recommended at maximum flow curve.



Installation Dimensions

Spring offset Spring centered

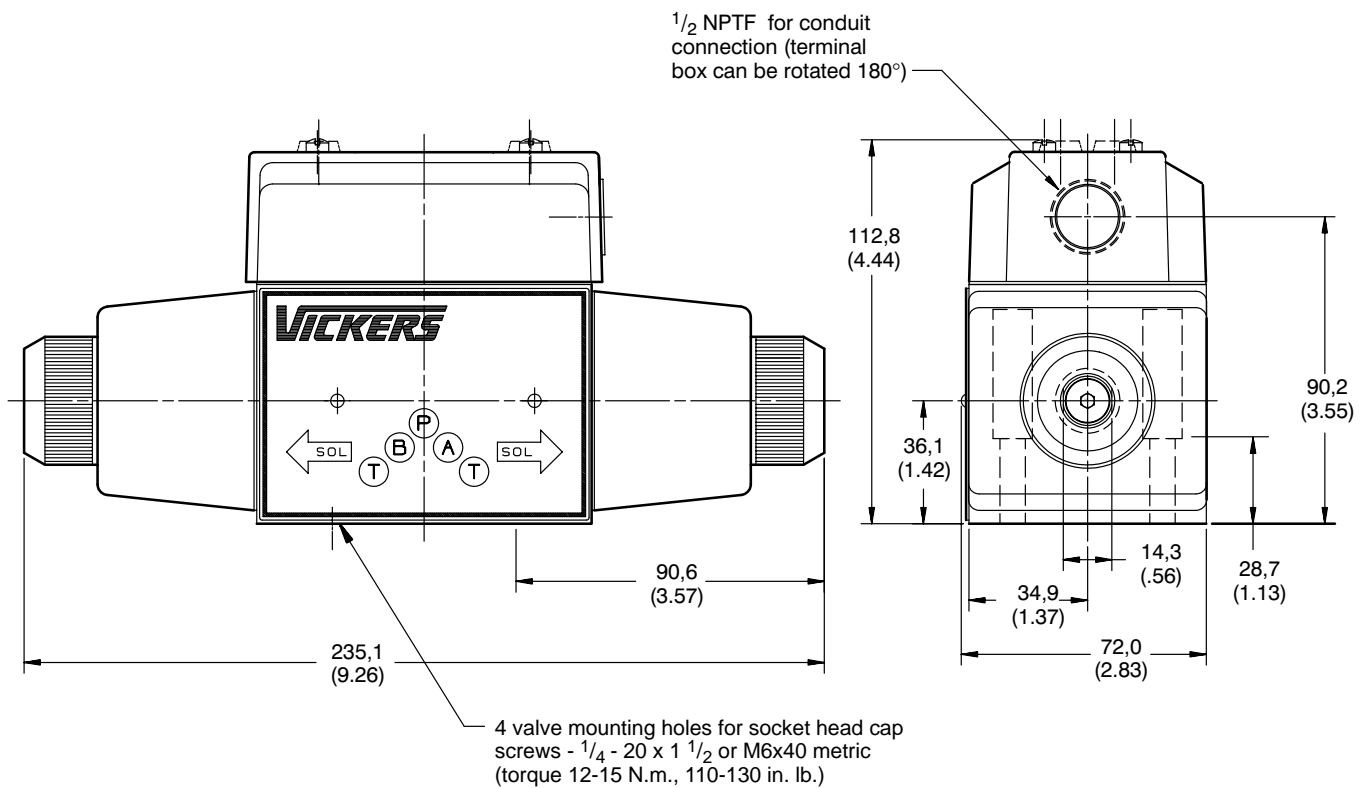
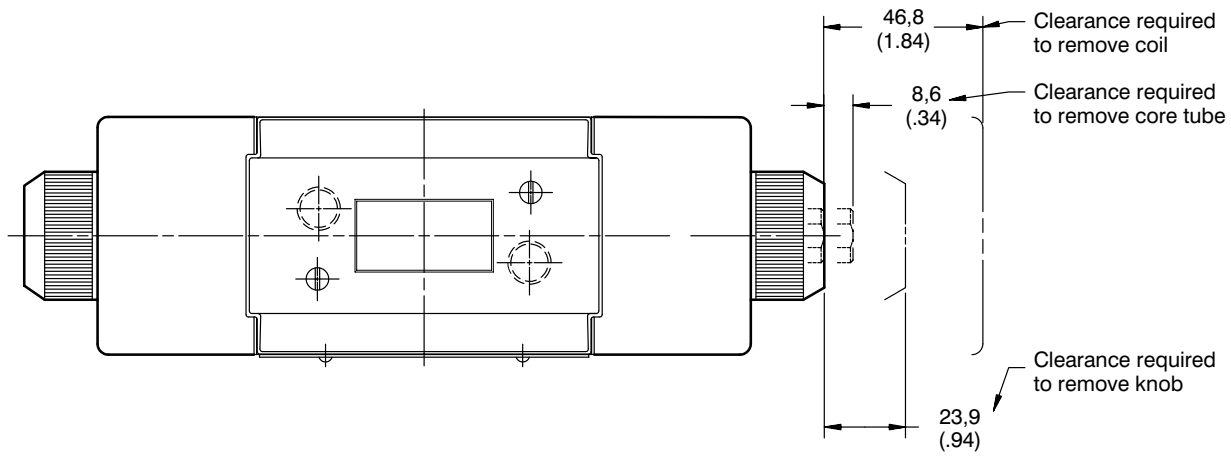
Millimeters (inches)



Installation Dimensions

Spring centered

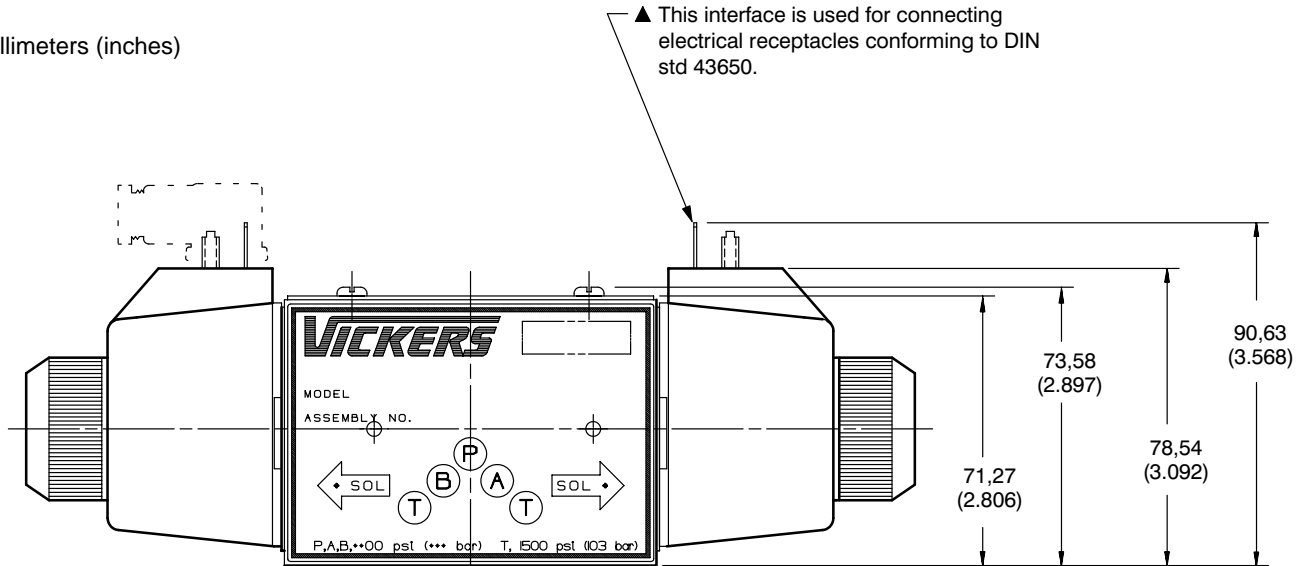
Millimeters (inches)



Installation Dimensions

DIN 43650 Connector

Millimeters (inches)



▲ **Plug connector**
(Order separately)
(ISO4400/DIN 43650)

**(Coils not rectified)
12 and 24V DC only**

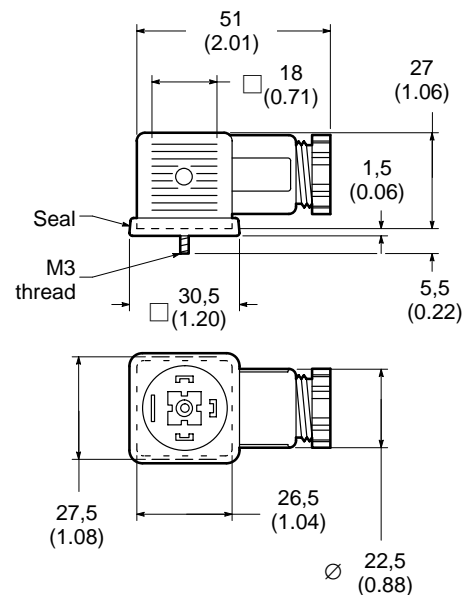
Cable diameter range ... Ø6–10 mm (0.24–0.40)
Wire section range Ø,5–1,5 mm² (0.0008–0.0023 in²)
Terminals Screw type
Type of protection IEC144 class IP65, when plugs are fitted correctly to the valves with the interface seals (supplied with plugs) in place.

Connector can be positioned at 90° intervals on valve by re-assembling contact holder into appropriate position inside connector housing.

Connectors with and without indicator lights are available (order separately):

Receptacle	Input Voltage (AC or DC)	Part Numbers	
		Gray – “A” sol.	Black – “B” sol.
U1 Coils without lights	All DC voltages	710776	710775
U6 Coils with lights	12-24	977467	977466
	100-125	977469	977468
	200-240	977471	977470
U11 Rectified coils with lights	12V AC	02-141358*	
	24V AC	02-141359*	
	110/120V AC	02-141360*	
	220/240V AC	02-141361*	
U12 Rectified coils without lights	All AC voltages	02-141357	02-141356

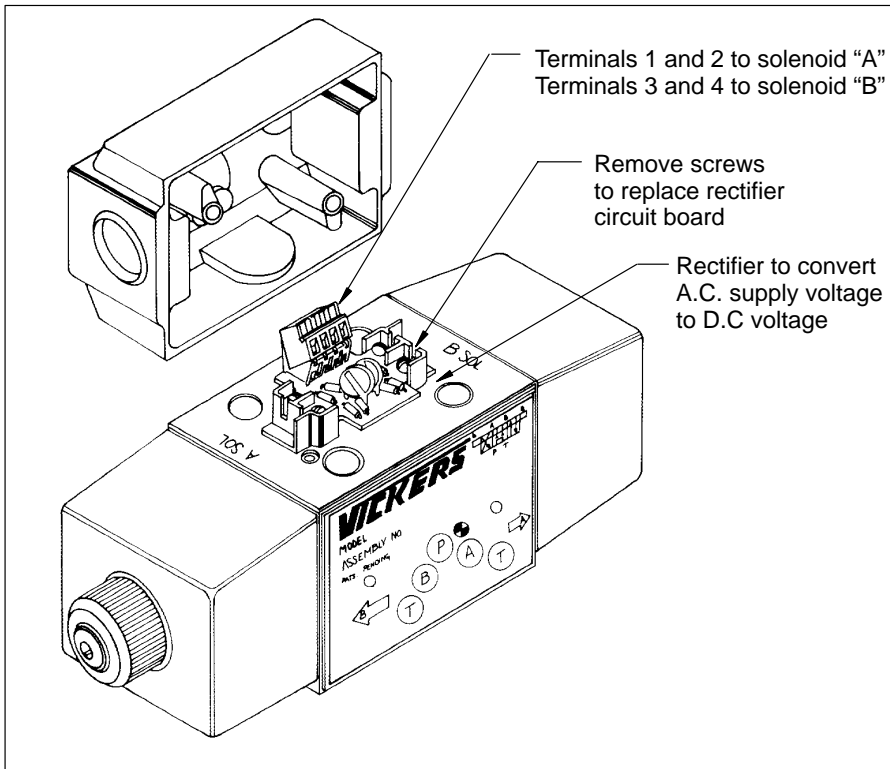
* Clear/translucent colored



Electrical Data

The DG4S4-01-60-S*** series valve is a solenoid operated directional control valve using special solenoids, a unique spool configuration and a rectifier package.

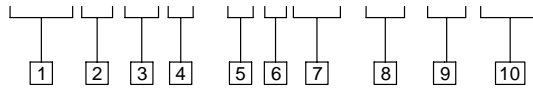
Rated supply voltage is 120V AC/60 Hz.
The rectifier package is enclosed within the terminal box and is protected against electrical surges with a M.O.V.



DGVM*-5 Subplate

Model Code

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



1 Valve Type DG - Directional control valve	5 Valve Size 5 - CETOP 5	9 Design Number 10 - Design
2 Pressure Rating V - 345 bar (5000 psi)	6 Pipe Thread Size Blank - 1/4 NPTF/BSP X - 3/8 NPTF/BSP Y - 1/2 NPTF/BSP Z - 3/4 NPTF/BSP	10 Connection/Mounting Blank - NPTF Thread connection T** - SAE straight thread connection with .250-20 UNC-2B inch thread mounting. T10 - .8750-14 UNF-2B conn. T12 - 1.0625-12 UN-2B conn. C** - SAE straight thread connection with M6 x 1.8 metric thread C10 - .8750-14 UNF-2B conn. C12 - 1.0625-12 UN-2B conn.
3 Subplate M - Subplate	7 Subplate Options None provided	
4 Ports Blank - Back ports E - Side ports	8 Modification	

Ordering Information

Valves, subplates, connectors, and bolt kits must be ordered as separate items.

Example:

One (1)
DG4S4-012C-BB-60-S491 valve

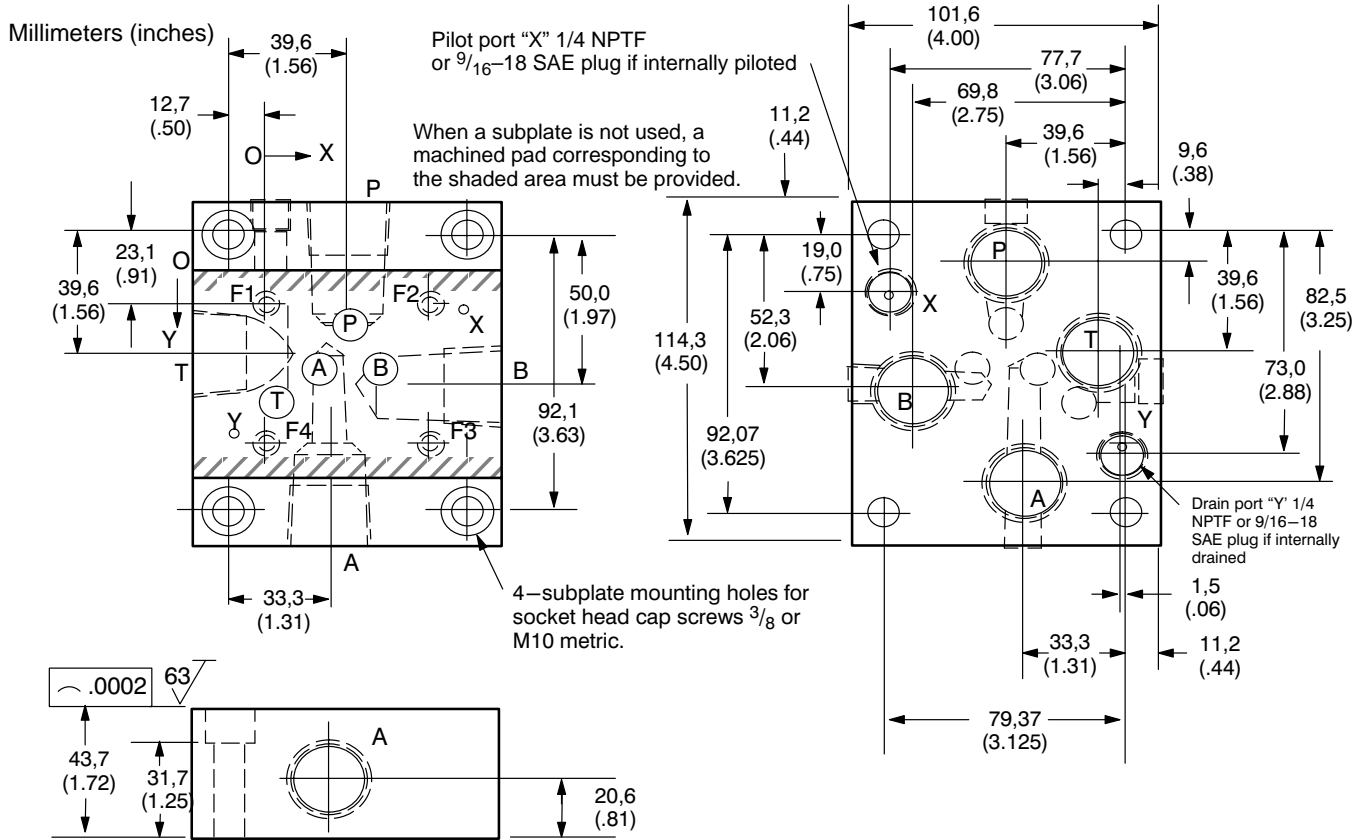
One (1)
DGVME-5-10-SP-T10 subplate

One (1)
BKDG01633 bolt kit

Torque Specifications

Maximum recommended mounting bolt torque is 13 N.m. (115 lb. in.).

Mounting Surface & Subplate Dimensions



	P	A	T	B	F1	F2	F3	F4	X	Y
X	27,0 1.06	16,7 0.66	3,2 0.13	37,3 1.47	0 0	54,0 2.125	54,0 2.125	0 0	65,0 2.56	11,2 0.44
Y	6,3 0.25	21,4 0.84	32,5 1.28	21,4 0.84	0 0	0 0	46,0 1.812	46,0 1.812	2,3 0.09	43,7 1.72
Q	11,2 max. 0.44	11,2 max. 0.44	11,2 max. 0.44	11,2 max. 0.44	M6 0.25	M6 0.25	M6 0.25	M6 0.25	3,1 0.12	3,1 0.12

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

Bolt kits*

Includes (4) directional valve mounting bolts.

Model codes	Sizes	Thread
BKDG01-633	1/4 x 20 x 1 1/2	Inch
BK855993M	M6 x 1.0P x 40	Metric

* Bolt kits are ordered separately.

NOTE: Metric grade 10.9 (SAE grade 8) mounting bolts required.

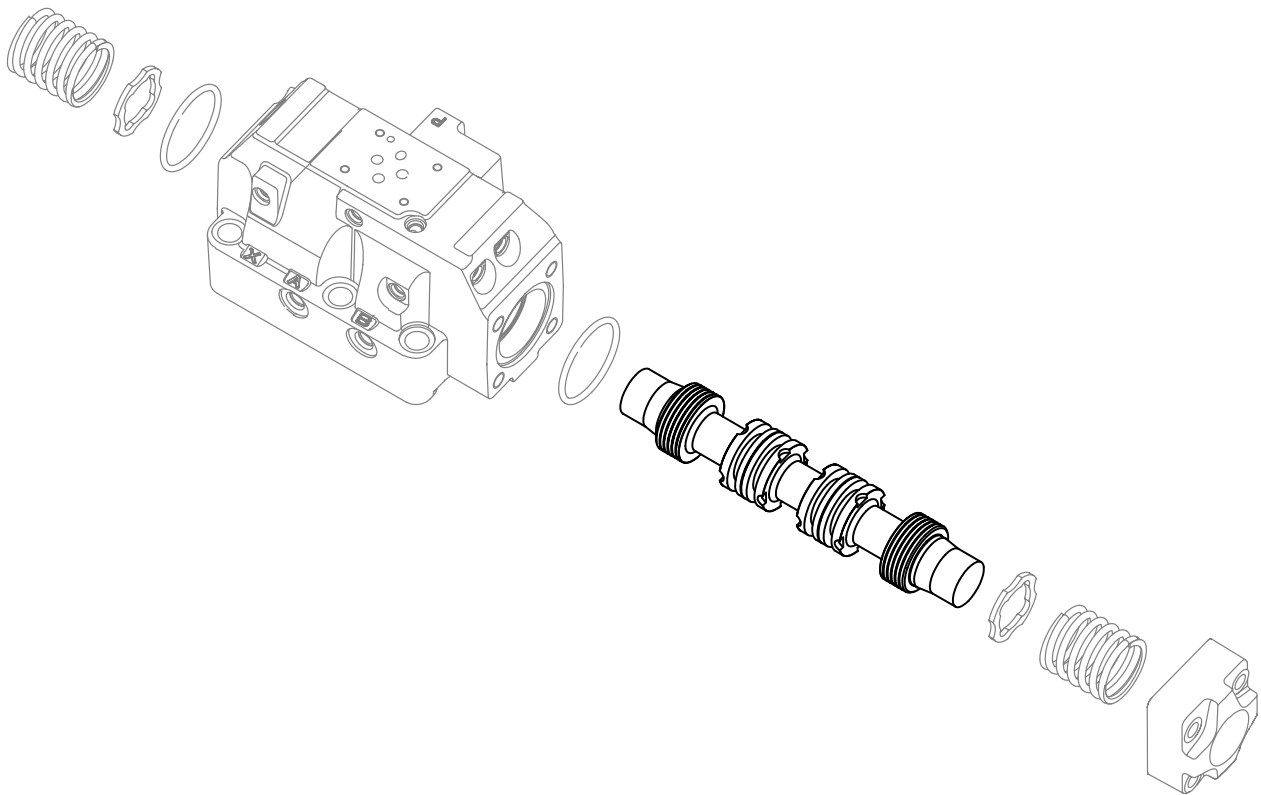
Vickers®

Directional Controls



Directional Valve Spools

Service Parts Information



Contents

D1L-21 Design and Mod-30/31 Designs

Type 0	327931	4
Type 2	327934	4
Type 2	324889	4
Type 6	327932	4

DG4S2/4-01*-50/51 Designs

Type 0	213230	4
Type 1	276278	5
Type 2	289186	5
	220344	5

DG4S2-01**W-50/51 Design

Type 0	463385	5
	587970	5
Type 0A	572287	5
Type 1	463386	6
Type 2	463387	6
	587971	6
Type 2A	463426	6
	573396	6
Type 2N	463393	6
Type 3	463388	7
Type 6	463389	7
Type 6A	572288	7
Type 7	463390	7
	587973	7
Type 8	463391	8
Type 33	463392	8
	587974	8

DG4S4-01*-50/51 Design

Type 2	213231	8
Type 3	239903	8
Type 6/68	213232	9
Type 7	236624	9
Type 8	235637	9
Type 33	236615	9

DG4V4-01-10

Type 0	691401	10
Type 1,11	691404	10
Type 2	691400	10
Type 3, 31	691403	10
Type 6	691402	11
Type 7	691405	11
Type 8	691412	11
Type 22	691411	11
Type 33	691407	11

DG4V3-40 / DG18V-40 Design

Type 0A	989594	12
Type 0N	989598	12
Type 1/11 B/C/F	683314	12
Type 2B/C/F	631611	12
Type 2N	635340	13
Type 3/31 B/C/F	989593	13
Type 6A	989595	13
Type 6/68 B/C/F	631603	13
Type 6/68N	989599	14
Type 7A	989596	14
Type 7/78 B/C/F	989592	14
Type 22A	989649	14
Type 33 B/C/F	635339	14

DG4V-3(S)-60 Design/Soft Shift

Type 0B/C	02-148720	15
Type 2A	892916	15
Type 2B/C	892913	15
Type 3/31/C	927027	15
Type 6B	892914	16
Type 8	02-303660	16
Type 8	893319	16
Type 33C	892915	16

DG4V3-60, DG18V-3-60

Type 0A	617498	16
Type 0B/C	617121	17
Type 1/11	458263	17
Type 2A	617120	17
Type 2B/C/F	617118	17
Type 2N	617126	17
Type 3,31 B/C/F	617124	18
Type 6A	890188	18
Type 6B/C/F	617119	18
Type 6N	617341	18
Type 7A	458151	18
Type 7B	617125	19
Type 8B/C	458950	19
Type 22A	617122	19
Type 33B/C	617123	19

DG3-20/31, MOD-30/31 Design, DG5S4-04-10 60/70 Design

Type 0	250333	20
	399891	20
Type 1/11	431972	20
Type 2	250334	20
	413482	20
	399892	20
Type 3	399893	20
Type 4	413481	21
Type 6	399894	21
Type 8	399896	21
Type 9	413483	21
Type 33	399897	21

DG3V3-40 Design

Type 2C	587127	22
Type 2N	681614	22
Type 6C	587130	22
Type 6N	681615	22

DG3V3-60 Design

Type 0	694435	22
Type 0A	694537	23
Type 2A	698839	23
Type 2N	698842	23
Type 6	694437	23

DG3S4, DG5S4-60/70 Design, DG19S4-50/-51 Design, DG5S8-10/30/40 Design

Type 0	363495	23
Type 1/11	276623	24
	276624	24
	431972	24
Type 2	363496	24
Type 3/31	276625	24
Type 4	276626	25
Type 6	363498	25
Type 8	363499	25
Type 9	363500	25
Type 33	363501	25

DG5S-H8 (High Flow) -20 Design 4-way Valve

Type 0	273677	26
Type 2	273676	26
Type 3	275803	26
Type 4	273720	26
Type 6	275804	27
Type 8	275805	27
Type 9	275806	27
Type 33	317777	27

DG3S4, DG5S & DG19S4-50/ -51/ -90/ - 100/ Design & DG5S8-10 Design 4-way Valves

Type 0	364037	28
Type 1	331404	28
Type 2	277478	28
	364038	28
Type 3	277479	28
Type 4	281193	29
Type 6	364039	29
Type 8	281194	29
Type 9	277563	29
Type 33	364042	29

DG5S4-10 60/70 Design

Type 0	399891	30
Type 1/11	431972	30
Type 2	399892	30
Type 4	413481	30
Type 6	399894	30
Type 8	399896	31
Type 9	413483	31
Type 33	399897	31

DG3S, DG5S-H8 (High Flow) 4-way Valve 20/60/70 Design

Type 0	786350	31
Type 1/11	786557	32
Type 2	786349	32
Type 3/31	786558	32
Type 4	628162	32
Type 6	786559	33
Type 8	627221	33
Type 9	786561	33
Type 33	786562	33

DG17/20V-3-40

Type 0C/N	683222	34
	683219	34
Type 2C/N	683223	34
	989729	34
Type 6C/N	683224	34
	989730	34
Type 7N	683220	34
Type 33C/N	683225	34
	683221	34

DG17V-3-60

Type 0	893025	35
Type 2C	893026	35
Type 6C	893027	35
Type 8	893029	35
Type 22A	893035	35
Type 33C	893030	36

DG20V-3-60

Type 2	916622	36
Type 6	916623	36

DG17S4-06-50 & DG17S-8--10 Design 4-way Valves**

Type 0	281922	36
Type 2	281924	37
Type 4	281926	37
Type 6	281927	37
Type 8	281929	37

DG17S4-53/ -100 Design 4-way Valves

Type 0	282281	37
Type 2	282287	38
Type 4	282286	38
Type 6	282283	38
Type 8	282339	38
Type 33	282285	38

DG3V8, DG5V8-10 Design, DG2S

Type 0	02-324575	39
Type 2	02-324577	39
Type 4	02-324579	39
Type 6	02-324580	39
Type 8	02-324582	39
Type 9	02-324583	40
Type 33	02-324584	40

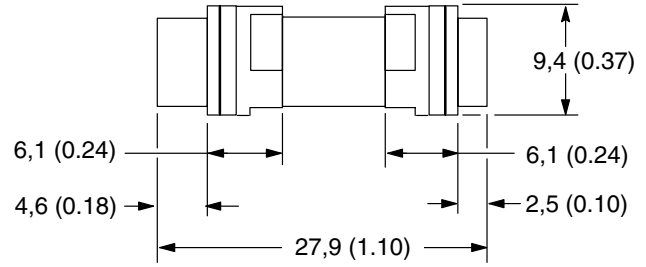
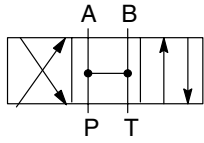
DG3V10, DG5V10-10 Design

Type 2	02-317237	40
Type 3/31	02-317227	40
Type 4	02-317231	41
Type 6	02-317238	41
Type 8	02-317233	41
Type 33	02-317234	41

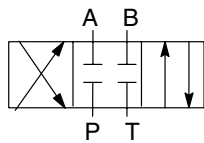
D1L-21 DESIGN and MOD-30/31 DESIGNS

mm (inch)

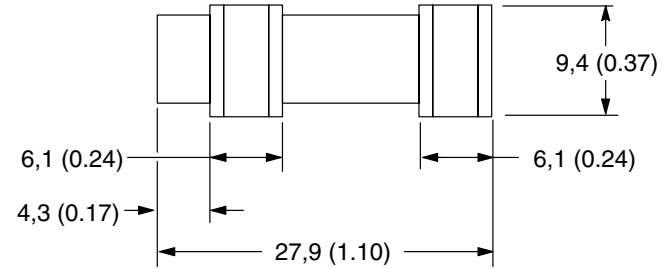
**Type 0 Spring Centered/Detent
Open Center
P/N 327931**



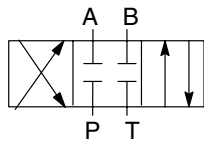
**Type 2 Spring Offset
Closed Center
P/N 327934**



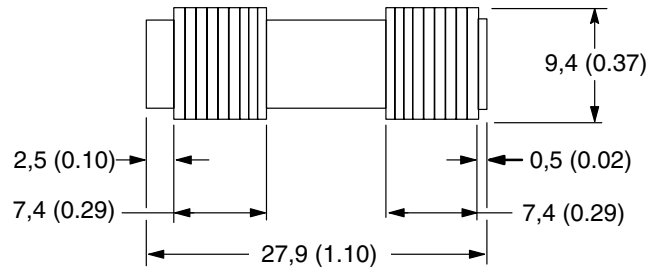
Note
This spool used in pilot stage of MOD-04*A and DG5S4-04*A



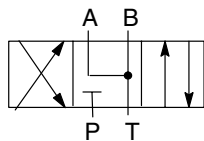
**Type 2 Spring Centered/Detent
Closed Center
P/N 324889**



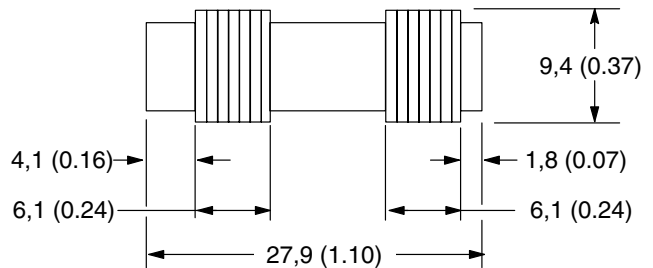
Note
This spool used in pilot stage of MOD-04* (No Spring) and MOD-04*N (Detent)



**Type 6 Spring Centered
A & B to Tank, P Closed
P/N 327932**

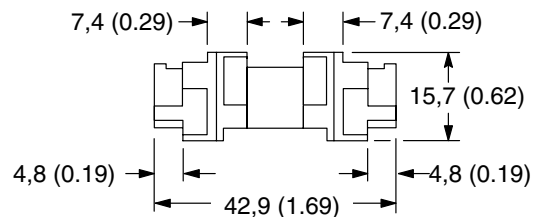
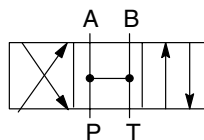


Note
This spool used in pilot stage of MOD-04*C and DG5S4-04*C



DG4S2/4-01*-50/51 DESIGNS

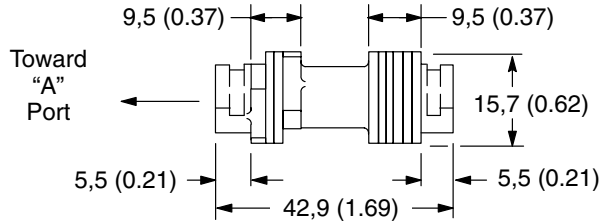
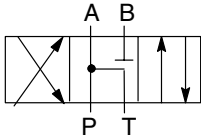
**Type 0 Spring Centered/Offset for 50 Design
Detented for 51 Design
Open Center
P/N 213230**



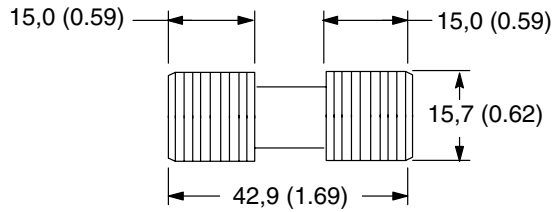
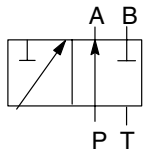
DG4S2/4-01*-50/51 DESIGN

mm (inch)

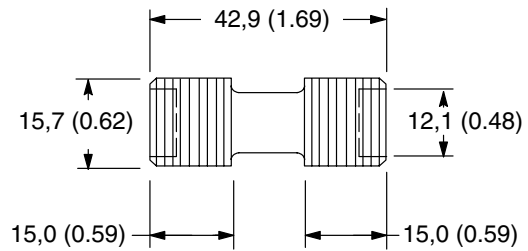
Type 1 Spring Centered for 50 Design
P&A to Tank, B Blocked
(Relieved Land Toward 'A' Port)
P/N 276278



Type 2 Spring Centered/Detent
51 Design
P/N 289186

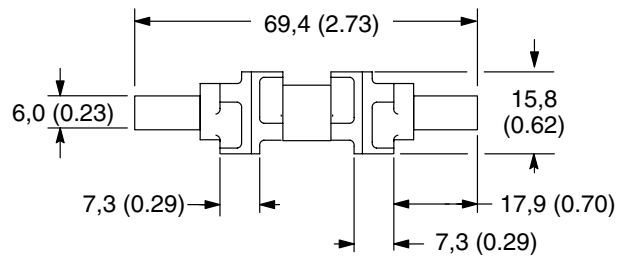
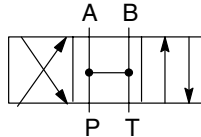


Spring Offset 50 Design
P/N 220344

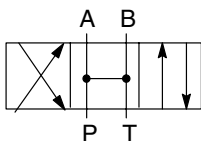


DG4S2-01W-50/51 DESIGNS**

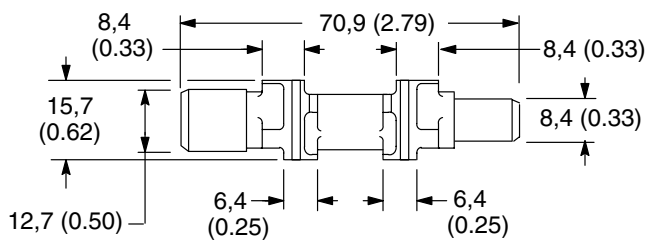
Type 0 Spring Centered for 50 Design
Detented for 51 Design
Open Center
P/N 463385 Spring Centered
P/N 587970 Detent (End Polished)



Type 0A Spring Offset 50 Design
Open Center
P/N 572287



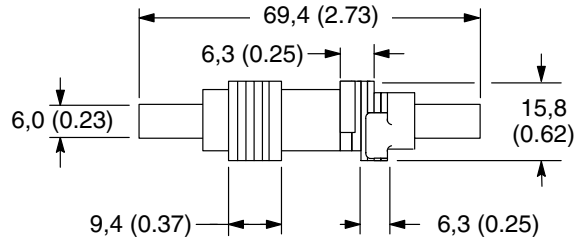
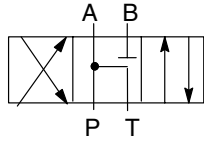
Toward
 "A"
 Port



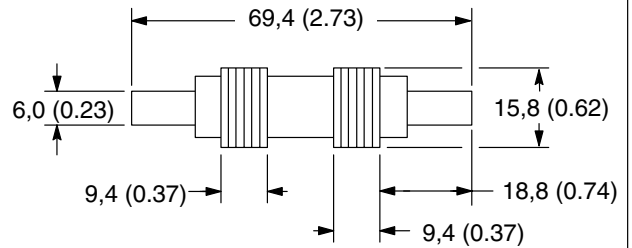
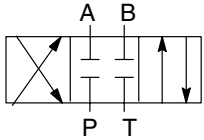
DG4S2-01**W-50/-51 DESIGN

mm (inch)

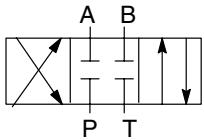
Type 1 Spring Centered 50 Design
Open Center, P Open to A & Tank, B Blocked
P/N 463386



Type 2 Spring Centered for 50 Design
Detented for 51 Design
Closed Center
P/N 463387 Spring Centered
P/N 587971 Detent (End Polished)

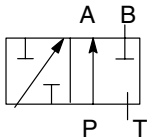
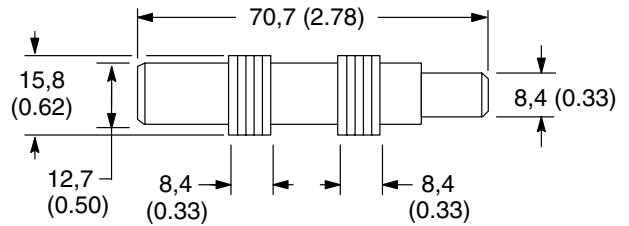


Type 2A Spring Offset 50 Design
Closed Center



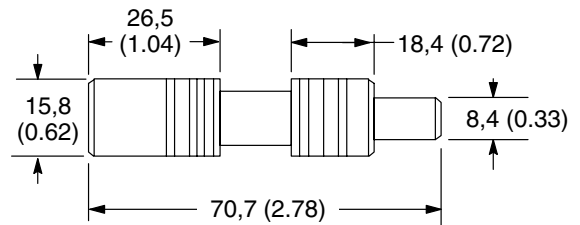
P/N 463426

Toward
 "A"
 Port ←

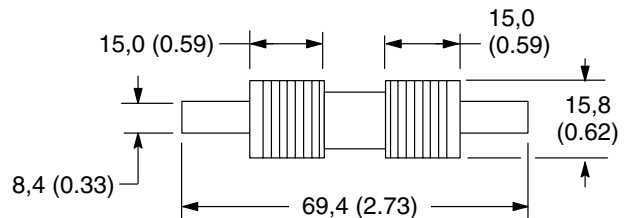
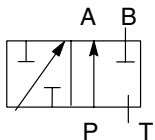


P/N 573396

Toward
 "A"
 Port ←



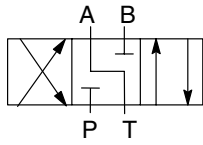
Type 2N Detent For 51 Design
P/N 463393



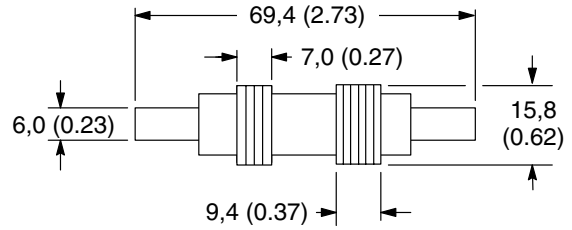
DG4S2-01**W-50/-51 DESIGNS

mm (inch)

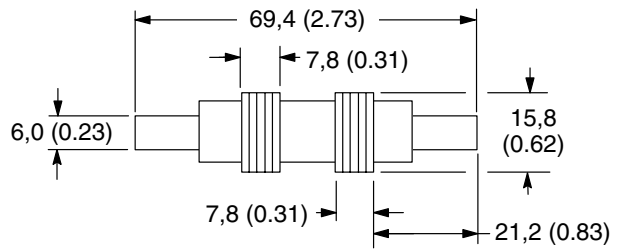
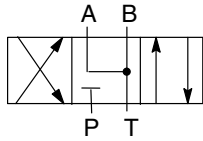
Type 3 Spring Centered 50 Design
A Open to Tank, P & B Blocked
P/N 463388



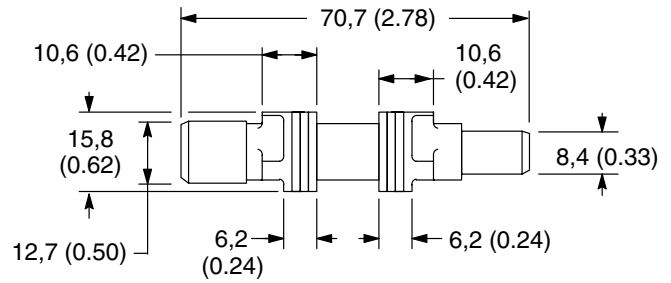
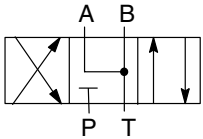
Toward
 "A"
 Port ←



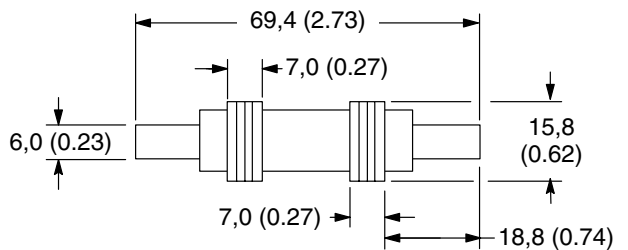
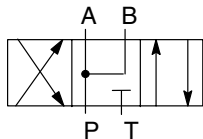
Type 6 Spring Centered for 50 Design
A & B Open to Tank, P Blocked
P/N 463389 Spring Centered



Type 6A Spring Offset 50 Design
A & B Open to Tank, P Blocked
P/N 572288



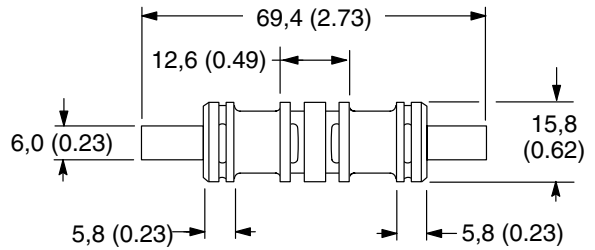
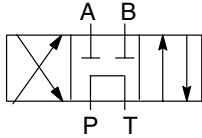
Type 7 Spring Centered for 50 Design
Detented for 51 Design
P Open to A & B, Tank Blocked
P/N 463390 Spring Centered
P/N 587973 Detent (End Polished)



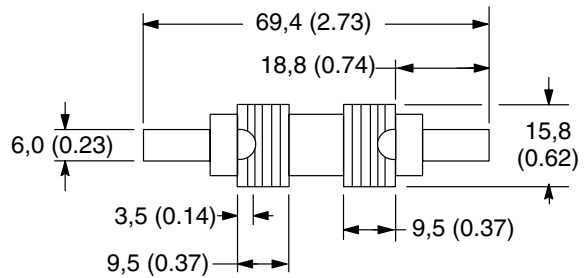
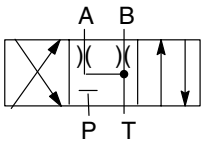
DG4S2-01**W-50/-51 DESIGNS

mm (inch)

Type 8 Spring Centered 50 Design
Tandem Open Center, Crossover P to Tank,
A & B Blocked
P/N 463391

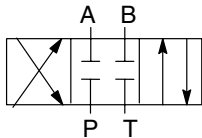


Type 33 Spring Centered for 50 Design
Detented for 51 Design
Controlled Leakage From A & B to Tank, P Blocked
P/N 463392 Spring Centered
P/N 587974 Detent (End Polished)

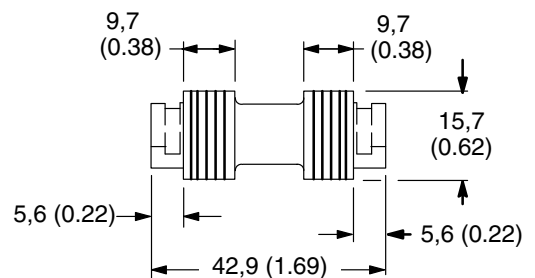


DG4S4-01*-50/-51 DESIGNS

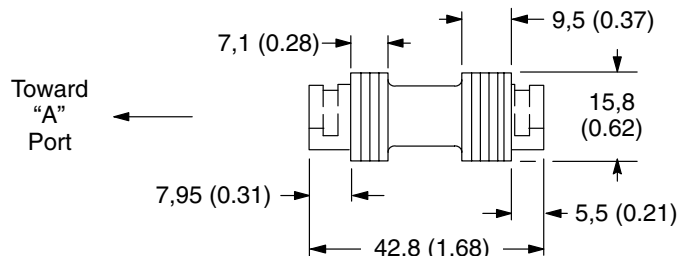
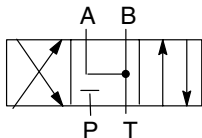
Type 2 Spring Centered/Offset for 50 Design
Detented for 51 Design
Closed Center
P/N 213231



Note
 This spool used in pilot stage of
 DG/DF5S4-**A*-50/-51 & DG/
 DF5S4-**N* & DG5S-8-*N*-10



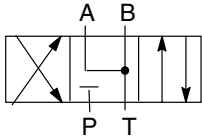
Type 3 Spring Centered For 50 Design
P & B Blocked, A to Tank
(Narrow Land Toward 'A' Port)
P/N 239903



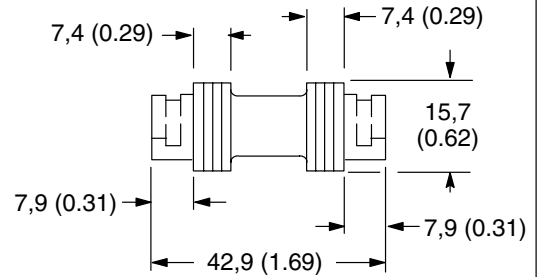
DG4S4-01*-50/-51 DESIGNS

mm (inch)

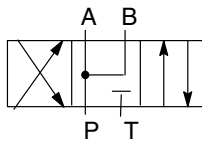
Type 6 Spring Centered/Offset for 50 Design
Detented for 51 Design
Type 68 Spring Centered with 4 or 8 Type Main Stage Spools
A & B to Tank, P Blocked
P/N 213232



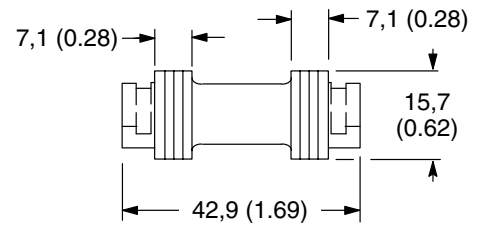
Note
 This spool used in pilot stage of
 DG/DF5S4-**C*-50/-51/-53 &
 DG5S-8-H8-10



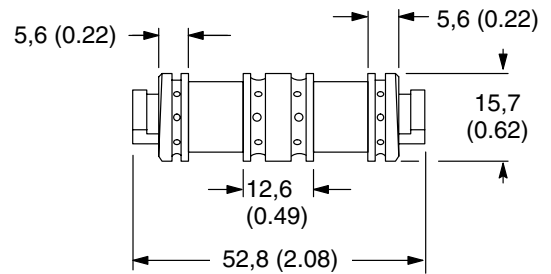
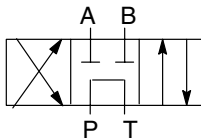
Type 7 Spring Centered for 50 Design
Detented for 51 Design
A & B to P, Tank Blocked
P/N 236624



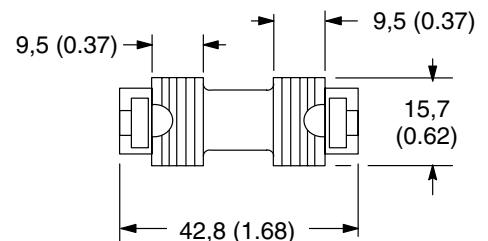
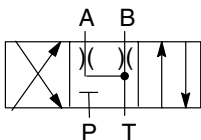
Note
 This spool used in pilot stage of
 DG5S4-**D*-50/-51



Type 8 Spring Centered for 50 Design
Tandem with Open Center Crossover
P/N 235637



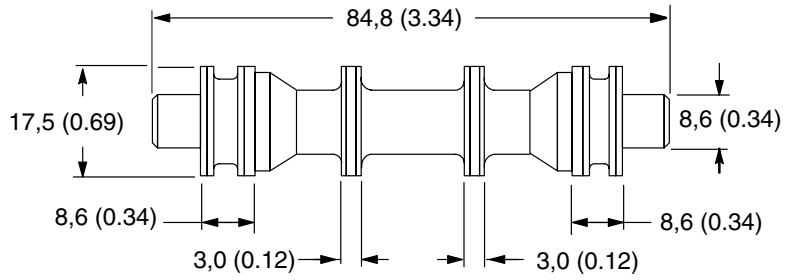
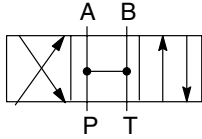
Type 33 Spring Centered for 50 Design
Detented for 51 Design
Controlled Leakage From A & B to Tank, P Blocked
P/N 236615



DG4V4-01 -10 DESIGN

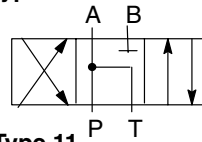
mm (inch)

Type 0A/B/C/N
Open Center
P/N 691401

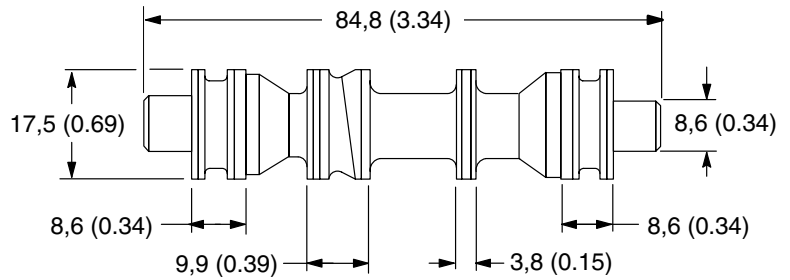


Type 1, 11
Open Center, P to A & Tank, B Blocked/
P to B & Tank, A Blocked
P/N 691404

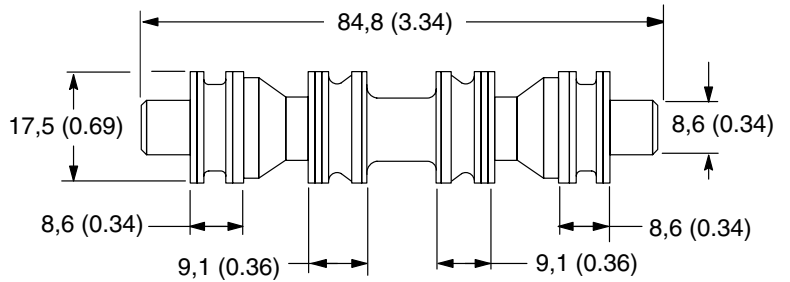
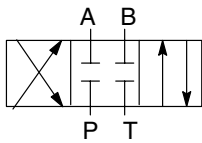
Type 1



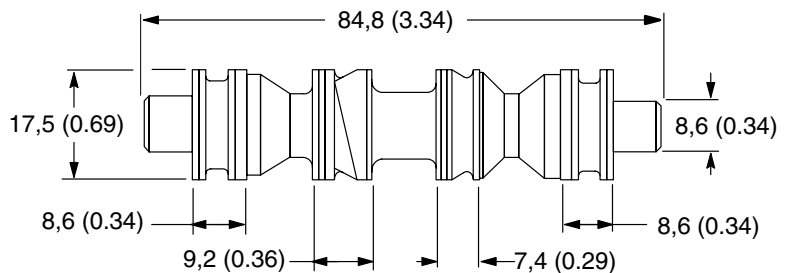
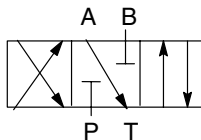
Type 11



Type 2A/B/C/N
Closed Center, All Ports
P/N 691400



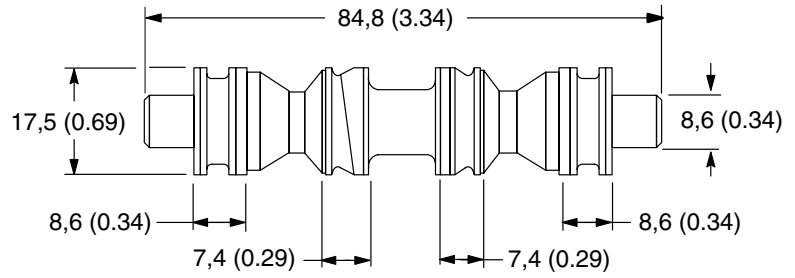
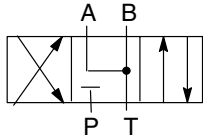
Type 3, 31
Open Center, P and B Blocked, A to Tank/
Closed Center, P & A Blocked, B to Tank
P/N 691403



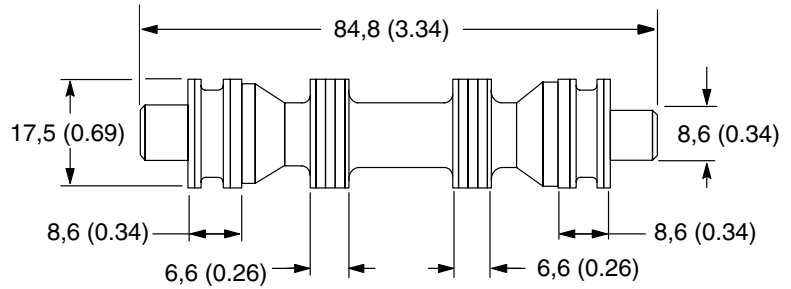
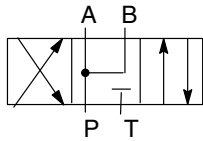
DG4V4-01 -10 DESIGN

mm (inch)

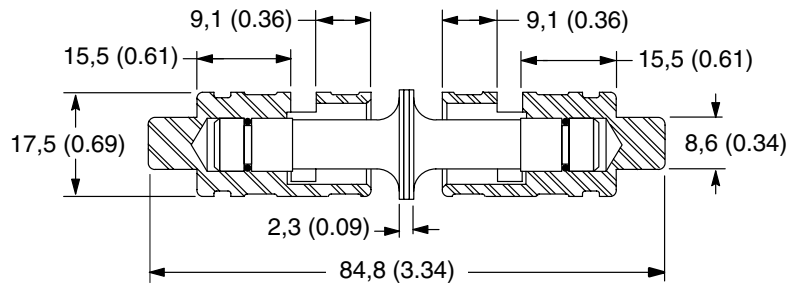
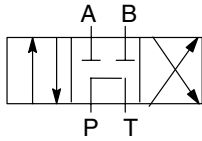
Type 6
Closed Center, A & B to Tank,
P Blocked
P/N 691402



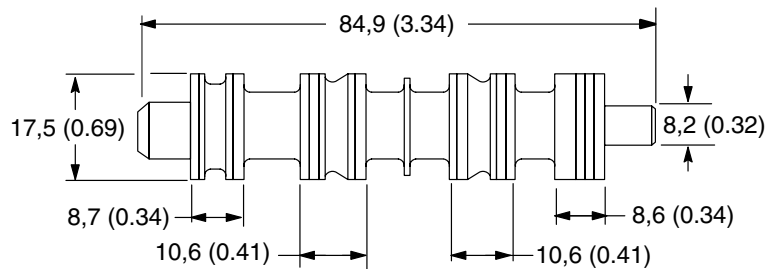
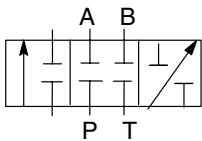
Type 7
Open Center, P to A & B, Tank Blocked
P/N 691405



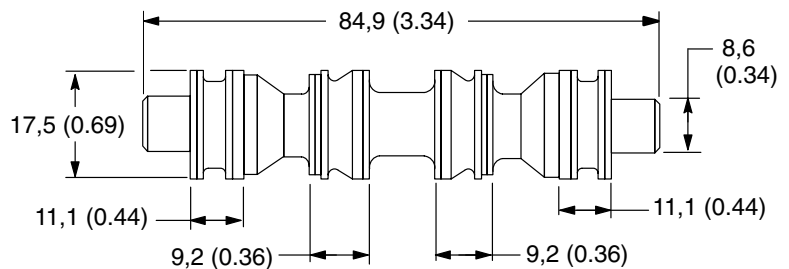
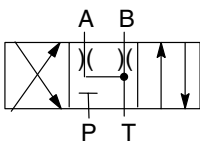
Type 8
Tandem Center, P to Tank, Open Crossover
P/N 691412



Type 22
Closed Center, Two-Way
P/N 691411



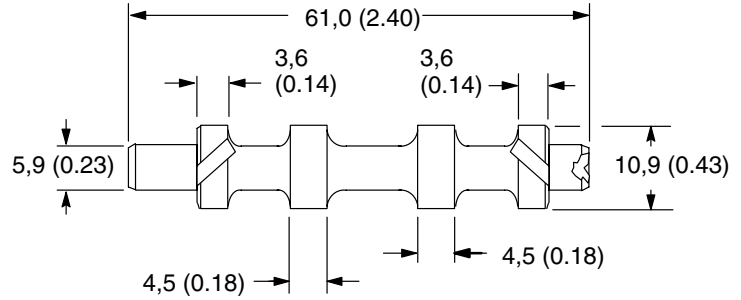
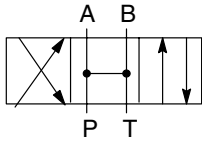
Type 33
Closed Center, Bleed A & B to Tank
P/N 691407



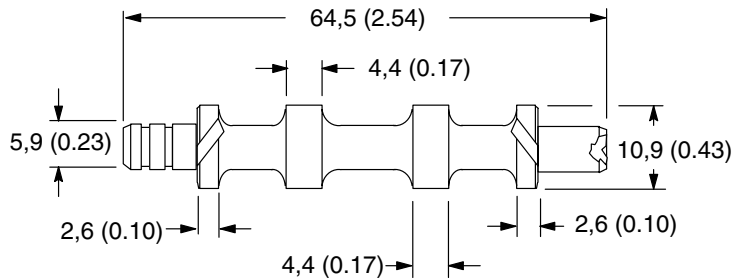
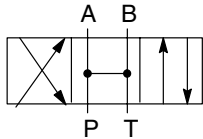
DG4V3-40/DG18V-40 DESIGN

mm (inch)

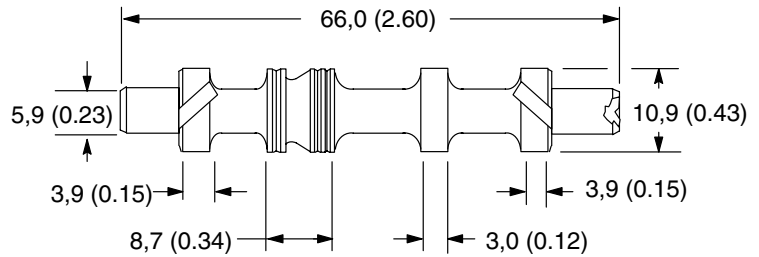
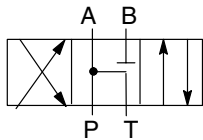
**Type 0A Spring Offset
Open Center
P/N 989594**



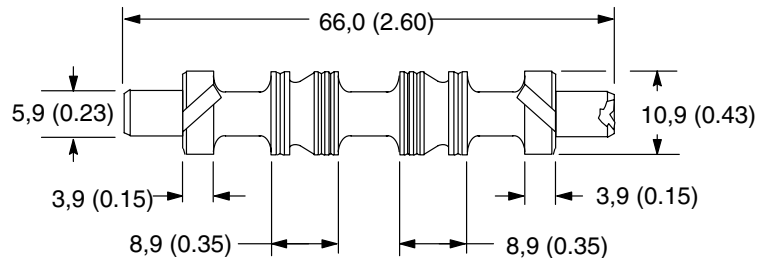
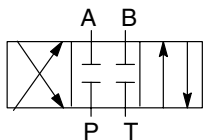
**Type 0N Detent
Open Center
P/N 989598**



**Type 1/11 B/C/F Spring Centered
P to A&Tank, B Blocked
P/N 683314**



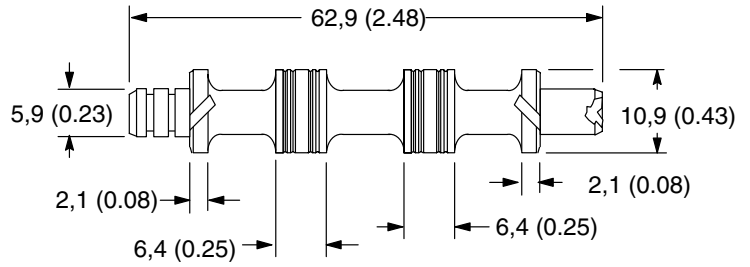
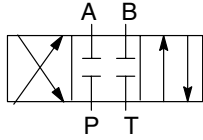
**Type 2B/C/F Spring Centered
Closed Center
631611**



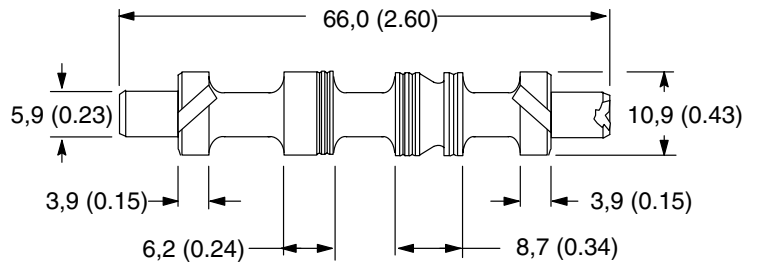
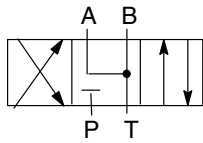
DG4V3-40/DG18V-40 DESIGN

mm (inch)

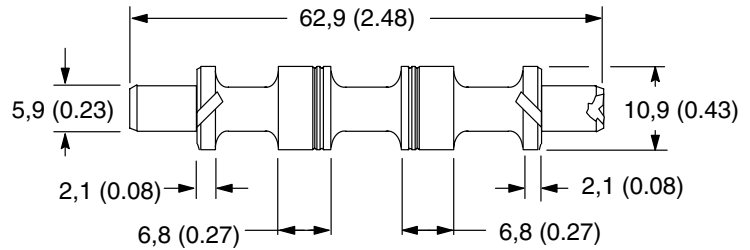
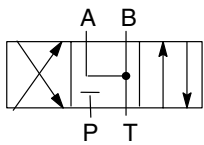
**Type 2N Detent
Closed Center
635340**



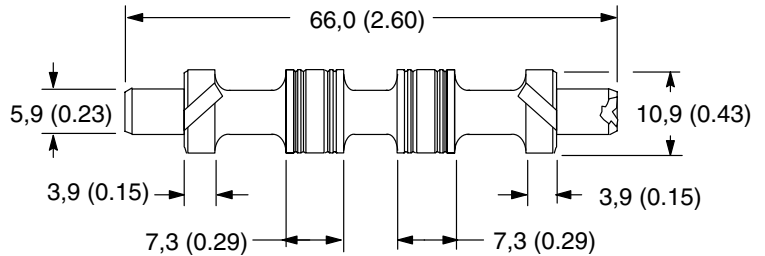
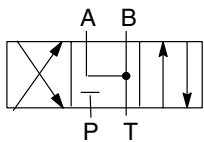
**Type 3/31 B/C/F Spring Centered
P&B Blocked, A to Tank
989593**



**Type 6A Spring Offset
A & B to Tank, P Blocked
P/N 989595**



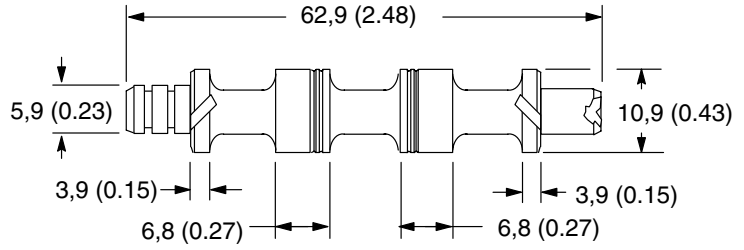
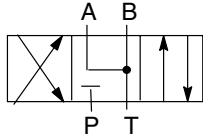
**Type 6/68 B/C/F Spring Centered
A & B to Tank, P Blocked
P/N 631603**



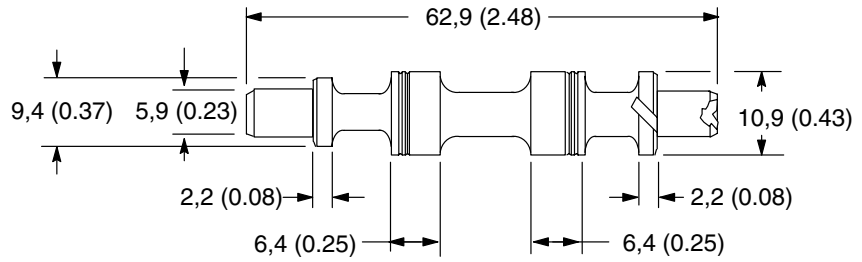
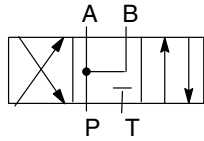
DG4V3-40/DG18V-40 DESIGN

mm (inch)

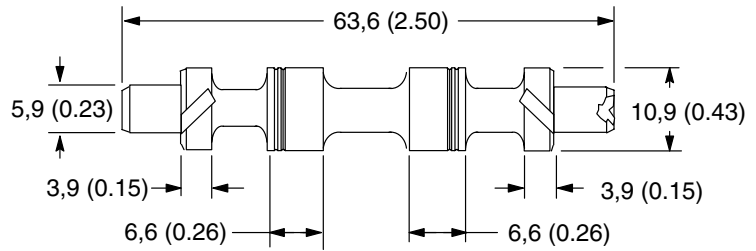
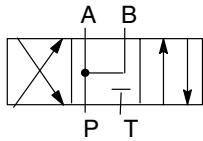
Type 6/68N Detent
A & B to Tank, P Blocked
P/N 989599



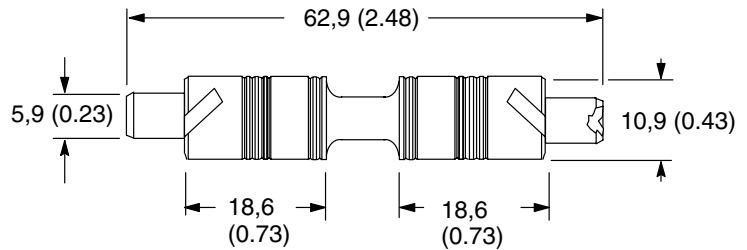
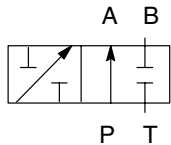
Type 7A Spring Offset
P to A & B, Tank Blocked
989596



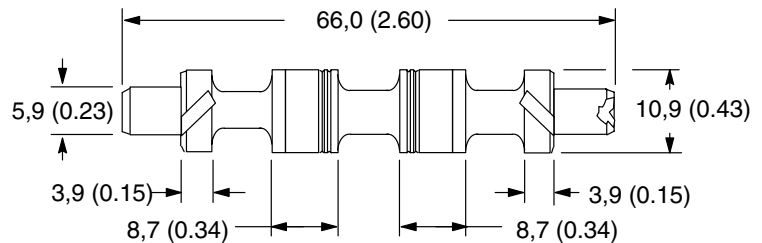
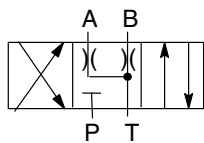
Type 7/78 B/C/F Spring Centered
P to A & B, Tank Blocked
P/N 989592



Type 22A Spring Offset
P Open to A, B & T Blocked
P/N 989649



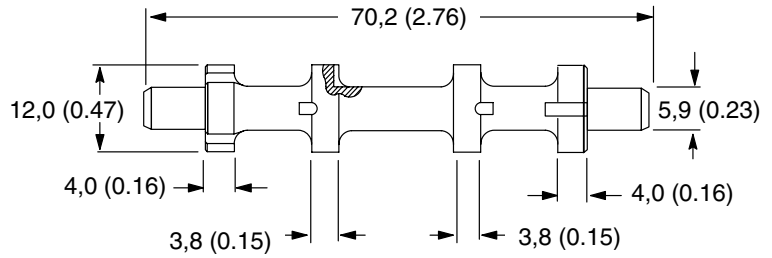
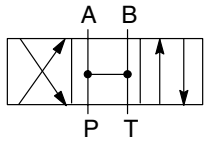
Type 33 B/C/F Spring Centered
Controlled Leakage from A & B to Tank,
P Blocked
P/N 635339



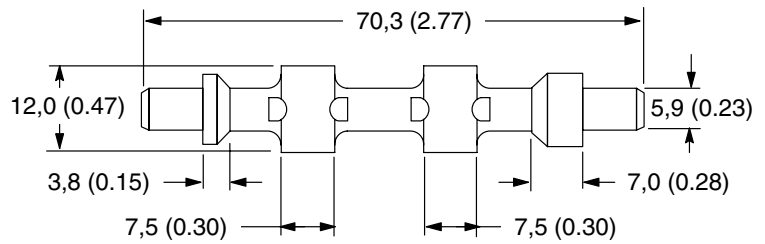
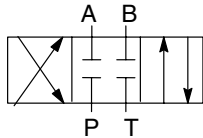
DG4V-3(S) -60 DESIGN

mm (inch)

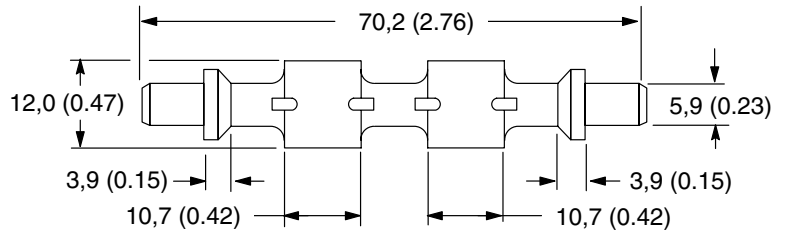
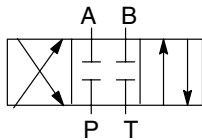
**Type 0B/C Spring Centered
Open Center
P/N 02-148720**



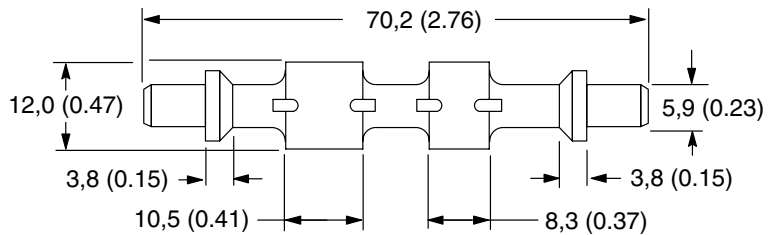
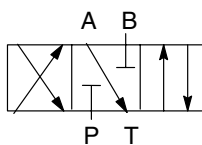
**Type 2A Spring Offset
Closed Center
P/N 892916**



**Type 2C
Closed Center
P/N 892913**



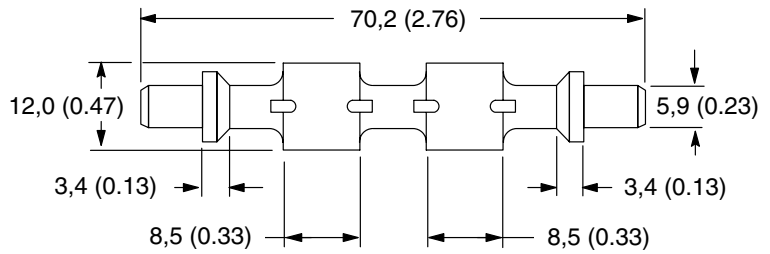
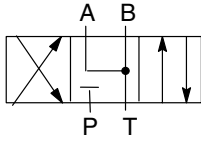
**Type 3/31C
Center Condition - Closed
P/N 927027**



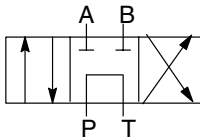
DG4V-3(S) -60/61 DESIGNS

mm (inch)

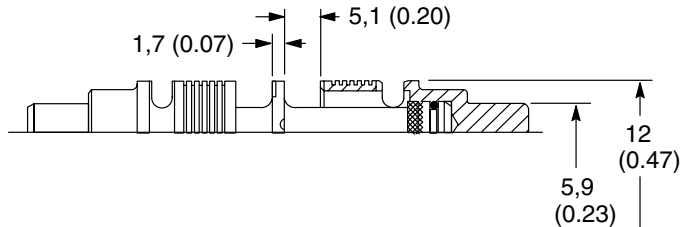
Type 6C Spring Centered
Closed Center, A & B to Tank,
P Closed
P/N 892914



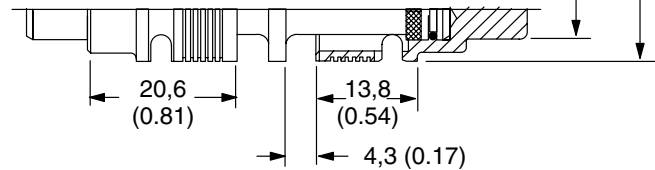
Type 8 Spring Centered for 61 Design
Tandem Open Center, Crossover P to Tank,
A & B Blocked



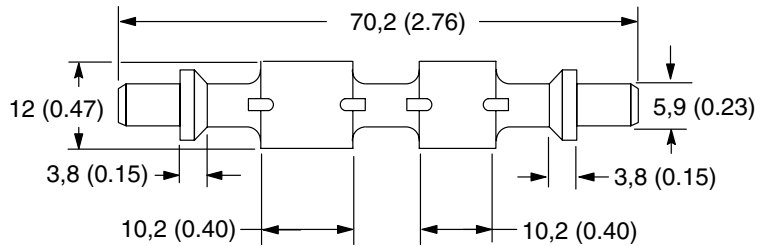
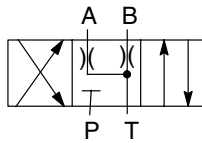
P/N 02-303660



P/N 893319

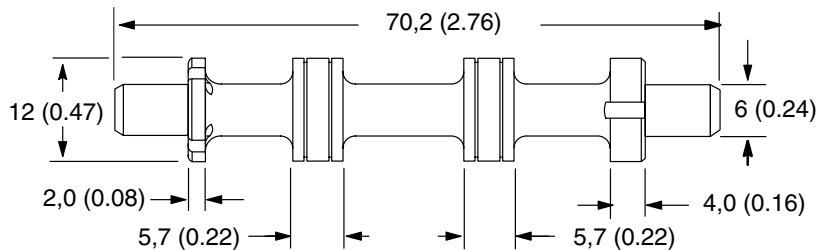
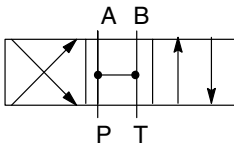


Type 33B/C Spring Centered
Bleed Center, A & B to Tank, P Closed
P/N 892915



DG4V3-60/DG18V3-60 DESIGN

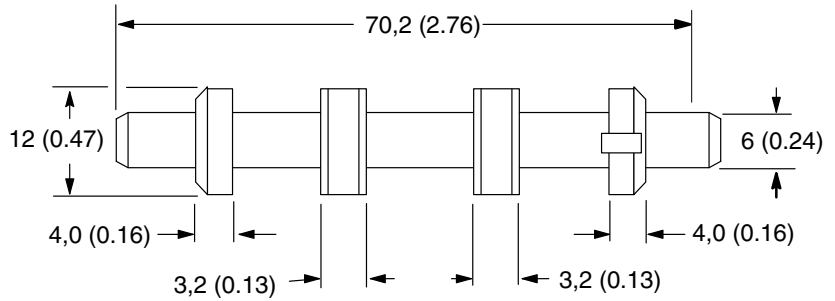
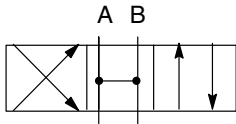
Type 0A
Open Center
P/N 617498



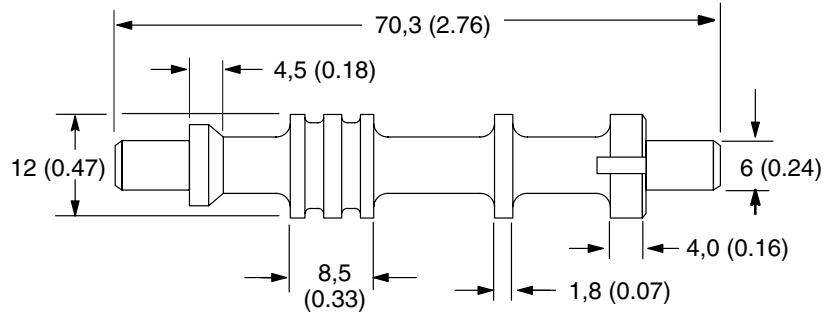
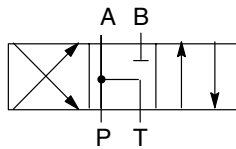
DG4V3-60/DG18V3-60 DESIGN

mm (inch)

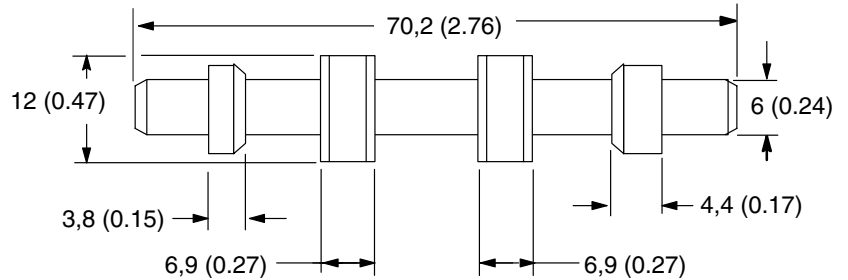
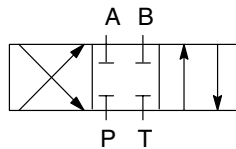
Type 0B/C
Open Center
P/N 617121



Type 1,11
Open Center, P&A to Tank, B Blocked
P/N 458263

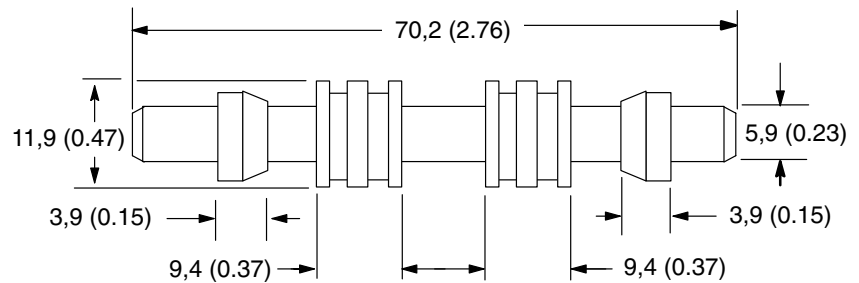
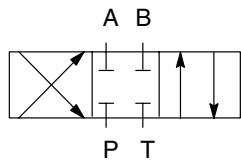


Type 2A
Closed Center
P/N 617120

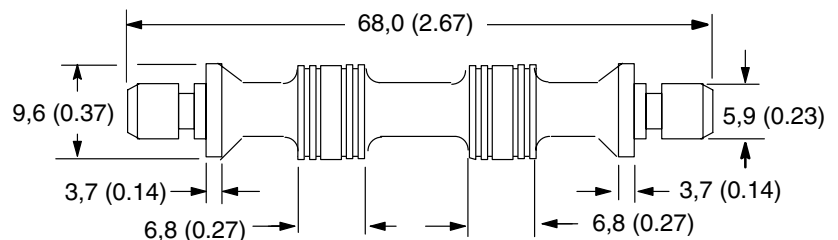
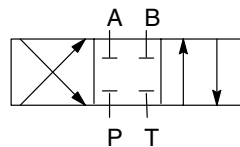


DG4V3-60/DG18V3-60 DESIGN

Type 2B/C/F
Closed Center
P/N 617118



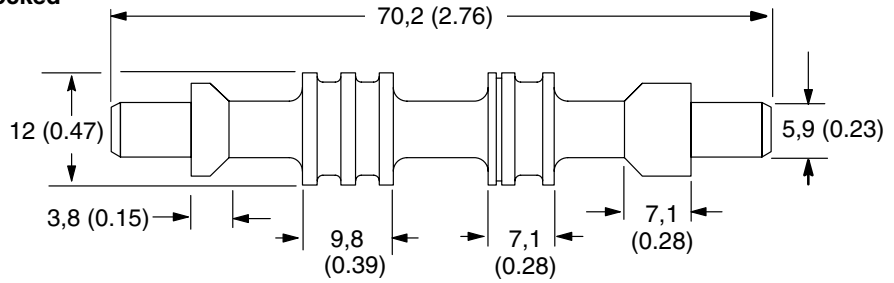
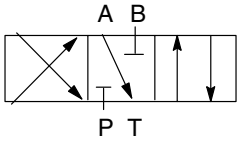
Type 2N
Open Center
P/N 617126



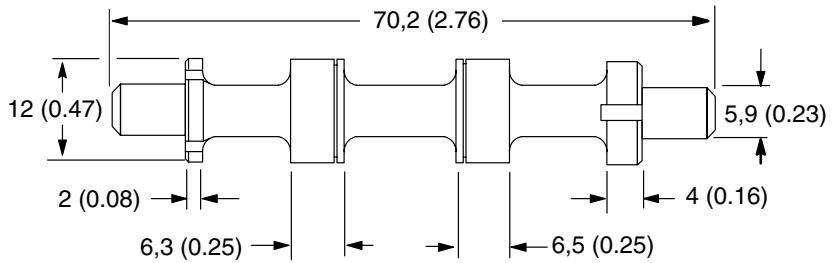
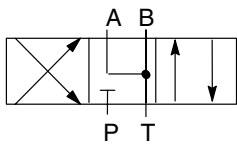
DG4V3-60/DG18V3-60 DESIGN

mm (inch)

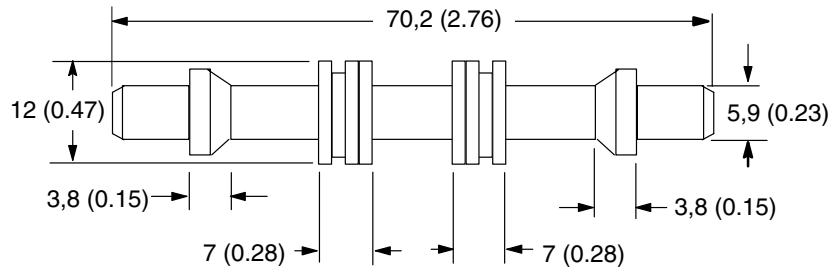
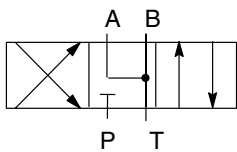
Type 3/31B/C/F
Closed Center, A to Tank, P & B Blocked
P/N 617124



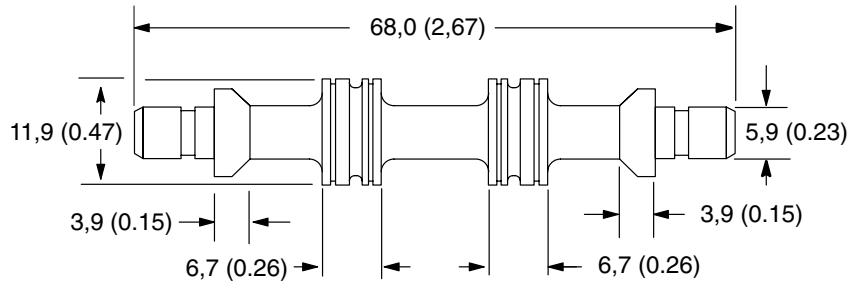
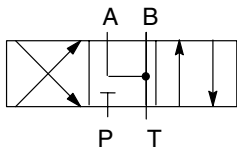
Type 6A
Closed Center with Crossover
P/N 890188



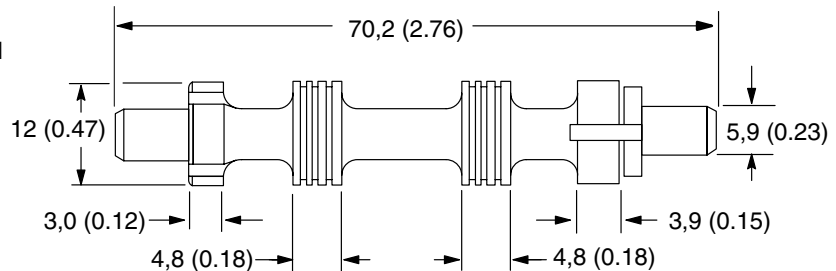
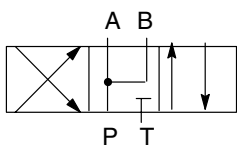
Type 6B/C/F
Closed Center, P Only
P/N 617119



Type 6N
Closed Center, P Only
P/N 617341



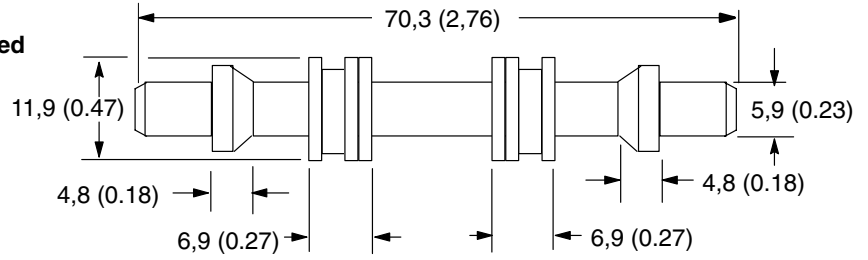
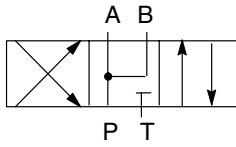
Type 7A
Open Center, P to A & B, Tank Blocked
P/N 458151



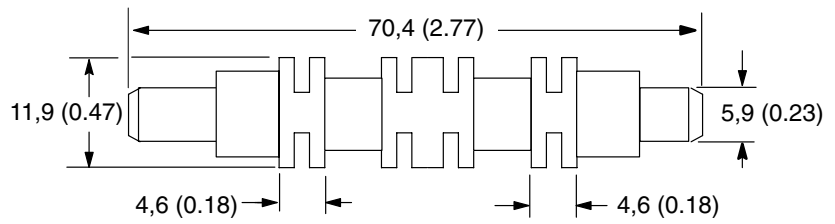
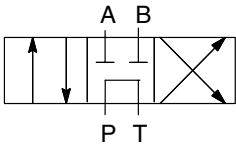
DG4V3-60/DG18V3-60 DESIGN

mm (inch)

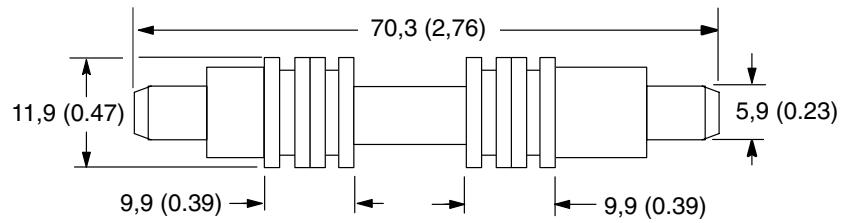
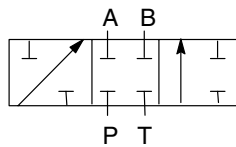
Type 7B
Open Center, P to A & B, Tank Blocked
P/N 617125



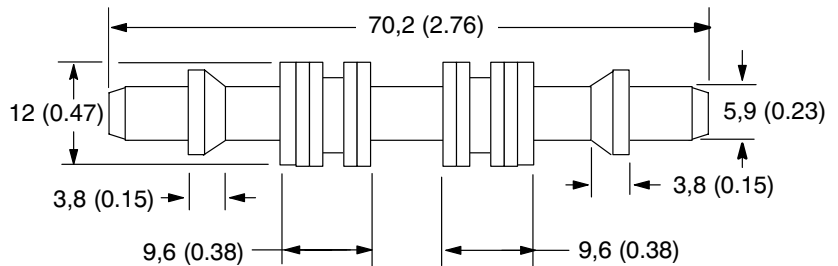
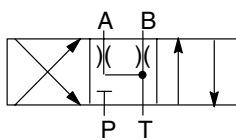
Type 8B/C
Tandem Center, P to Tank
P/N 458950



Type 22A
Closed Center, Two-Way
P/N 617122

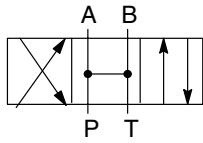


Type 33B/C
Closed Center, (Bleed A & B)
P/N 617123

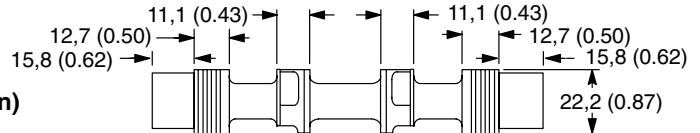


DG3 -20/-31, MOD -30/-31 DESIGNS

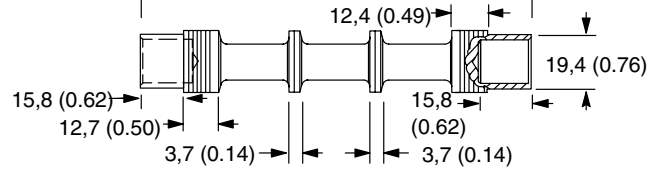
**Type 0
Open Center**



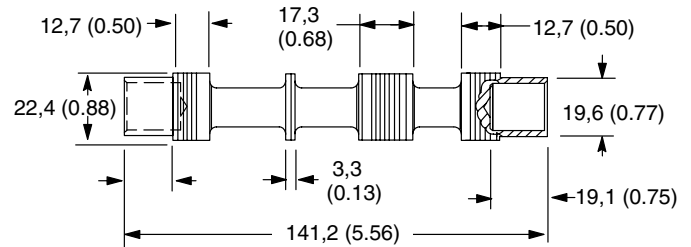
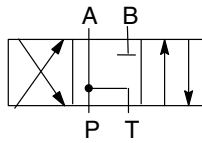
P/N 250333 (-20 & -30 Design)



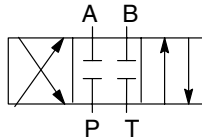
P/N 399891 (-31 Design)



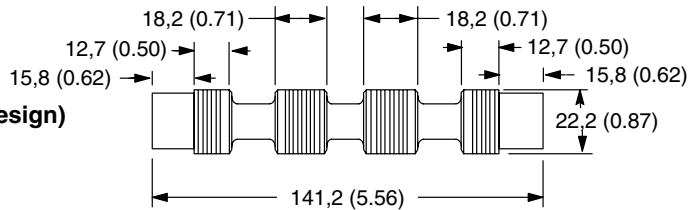
**Type 1/11
P&A to Tank, B Blocked
P/N 431972**



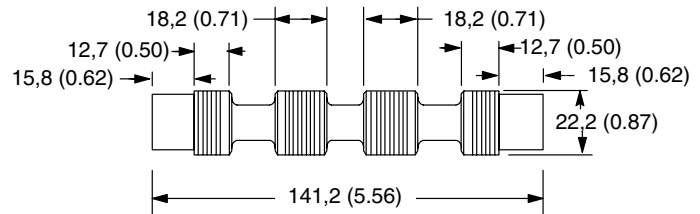
**Type 2
Closed Center**



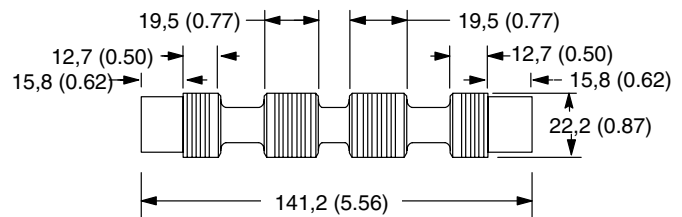
**P/N 250334 (-20 & -30 Design)
Spring Centered/Offset**



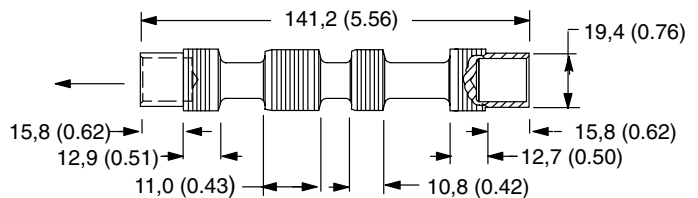
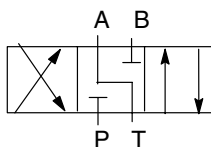
**P/N 413482(-31 Design)
Spring Offset**



**P/N 399892 (-31 Design)
Spring Centered**



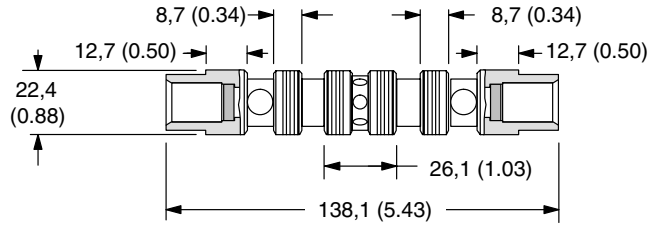
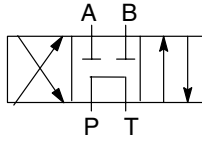
**Type 3
A Open to Tank, P&B Blocked
P/N 388893**



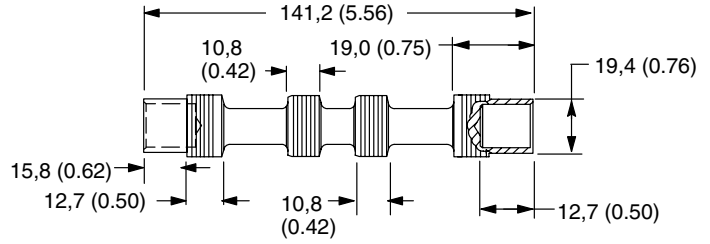
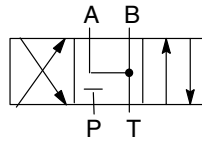
DG3-20/-31, MOD-30/-31 DESIGNS, DG5S4-04-10 60/70 DESIGNS

mm (inch)

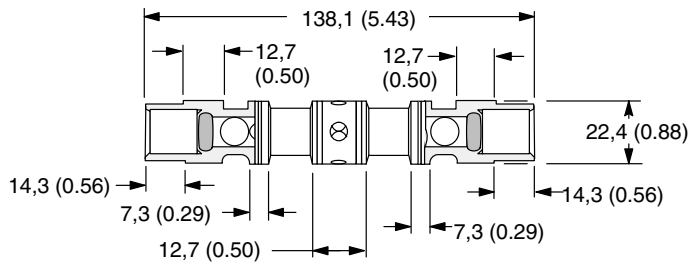
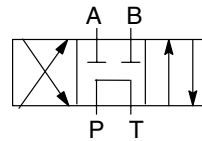
Type 4
Tandem with Closed Center Crossover
P/N 413481



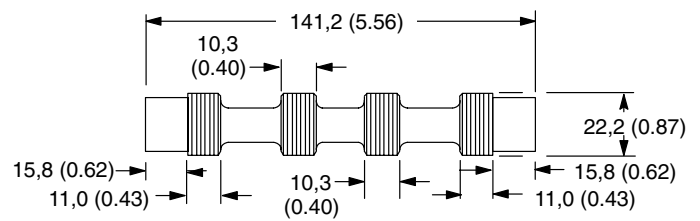
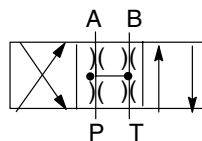
Type 6
A&B to Tank, P Blocked
P/N 399894



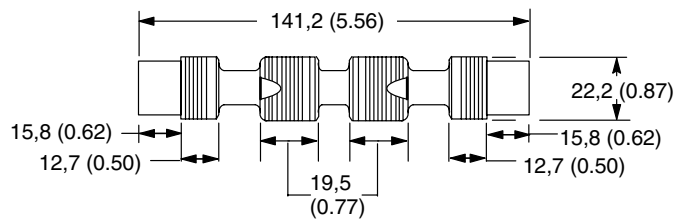
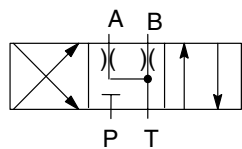
Type 8
Tandem with Open Center Crossover
P/N 399896



Type 9
Open over Tapers
P/N 413483



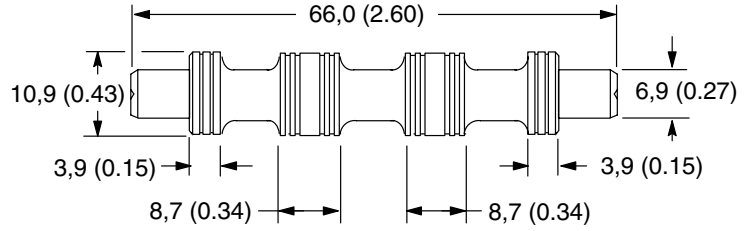
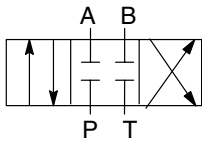
Type 33
Controlled Leakage from
A&B to Tank, P Blocked
P/N 399897



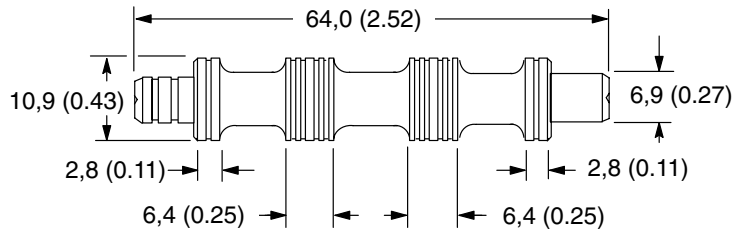
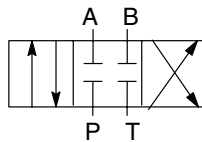
DG3V3 -40 DESIGN

mm (inch)

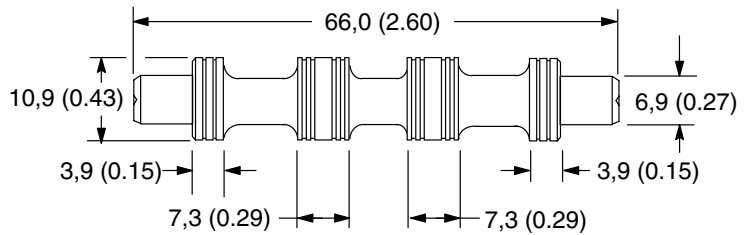
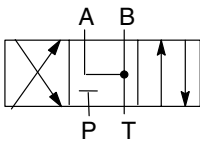
**Type 2C Spring Centered
Closed Center
P/N 587127**



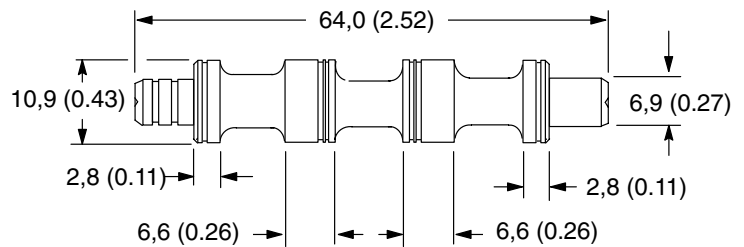
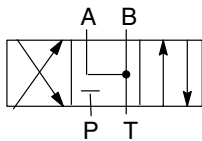
**Type 2N Detent
Closed Center
P/N 681614**



**Type 6C Spring Centered
A&B to Tank, P Blocked
P/N 587130**

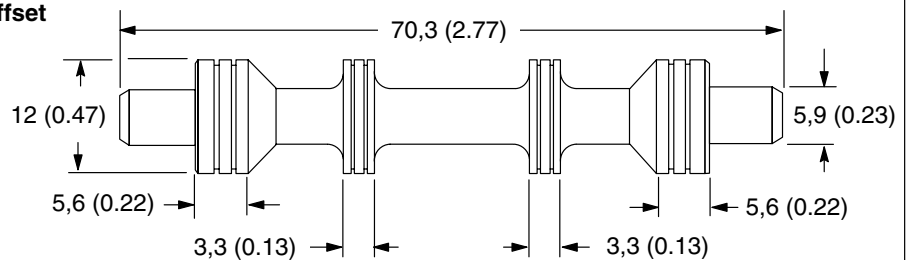
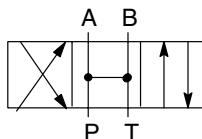


**Type 6N Detent
A&B to Tank, P Blocked
P/N 681615**



DG3V3 -60 DESIGN

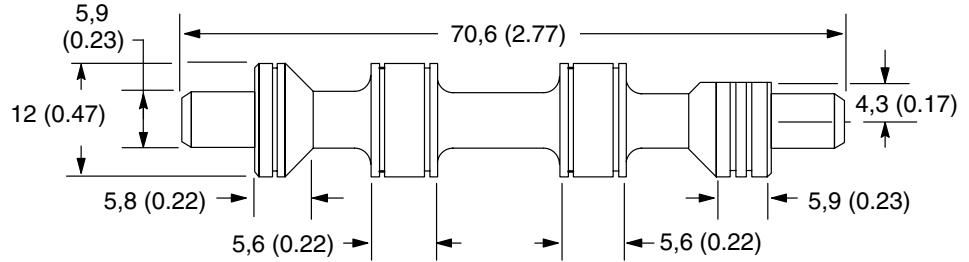
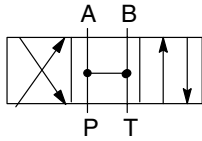
**Type 0 Spring Centered, Spring Offset
Open Center
P/N 694435**



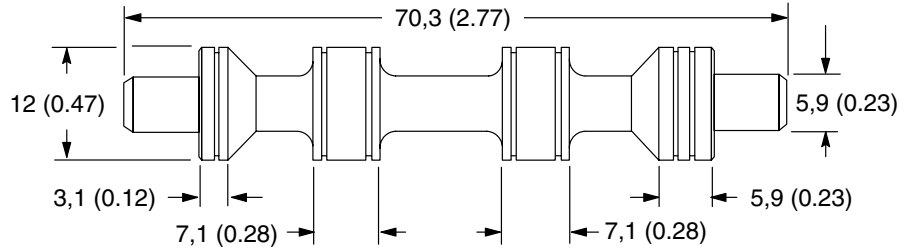
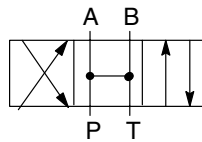
DG3V3 -60 DESIGN

mm (inch)

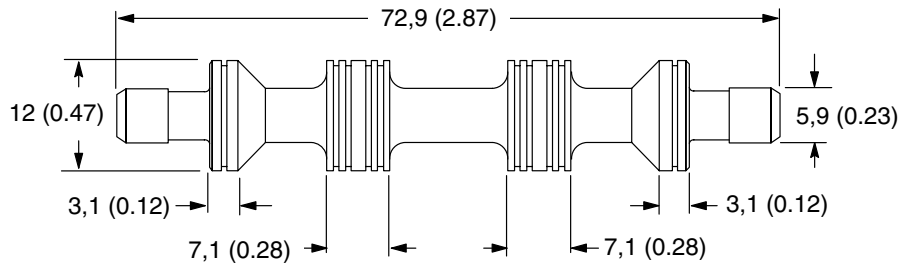
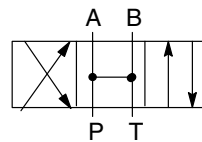
**Type 0A Spring Centered
Open Center
P/N 694537**



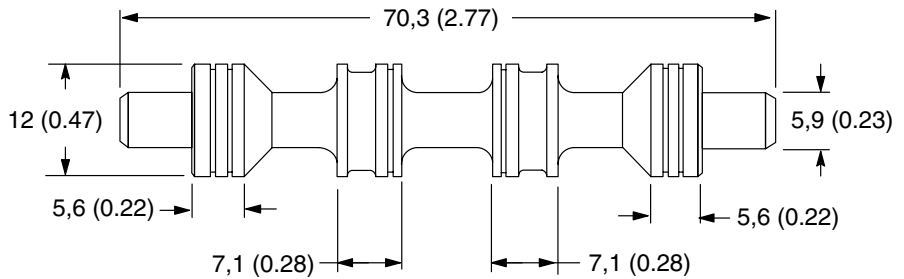
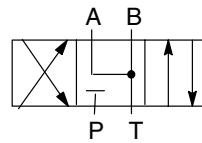
**Type 2A Spring Centered
Open Center
P/N 698839**



**Type 2N No-Spring Detented
Open Center
P/N 698842**

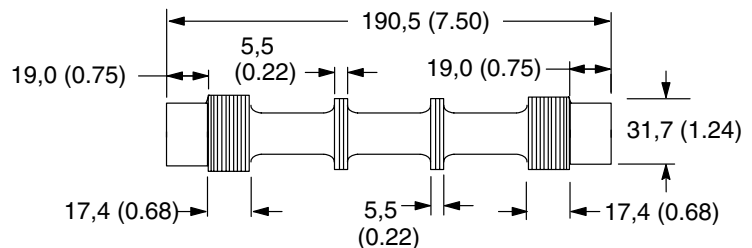
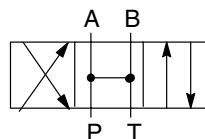


**Type 6 Spring Centered
A & B to Tank, P Blocked
P/N 694437**



DG3S4, DG5S4, DG19S4 -50/-51 DESIGNS & DG5S8 -10/30/40 DESIGNS

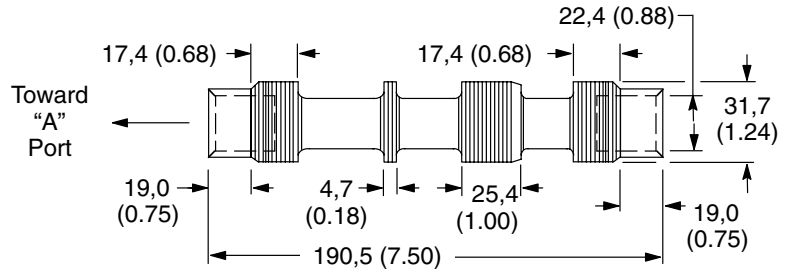
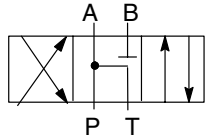
**Type 0
Fully Open
P/N 363495**



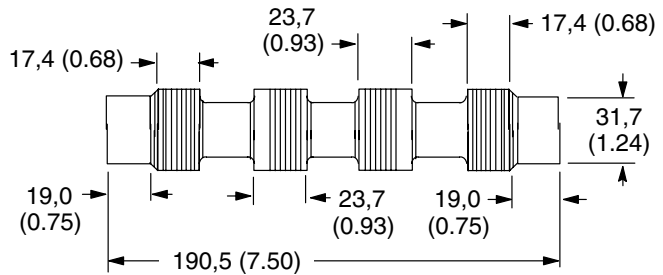
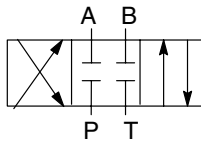
DG3S4, DG5S4, DG19S4 -50/-51 DESIGNS & DG5S8-10/30/40 DESIGNS

mm (inch)

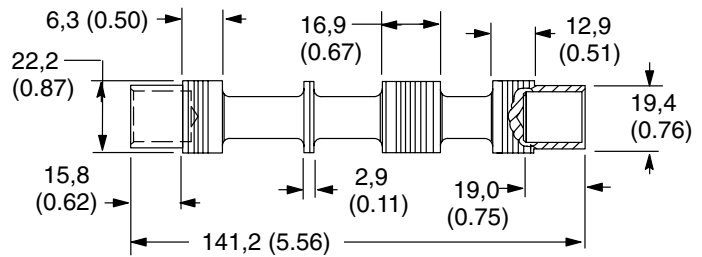
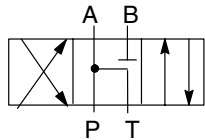
Type 1
P & A to Tank, B Blocked
P/N 276623



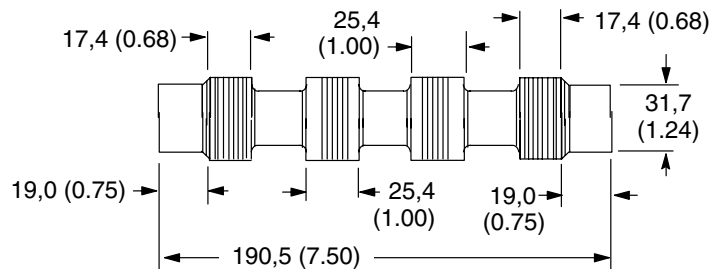
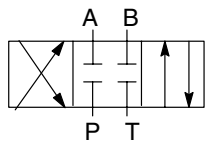
Type 1
Closed Center
P/N 276624



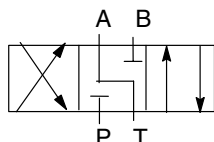
Type 1, 11
Open Center, P & A to Tank, B Blocked
P/N 431972



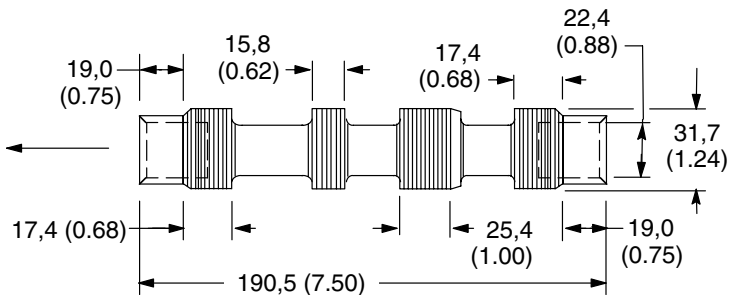
Type 2
Closed Center
P/N 363496



Type 3 & 31
A Open to Tank, P & B Blocked
P/N 276625



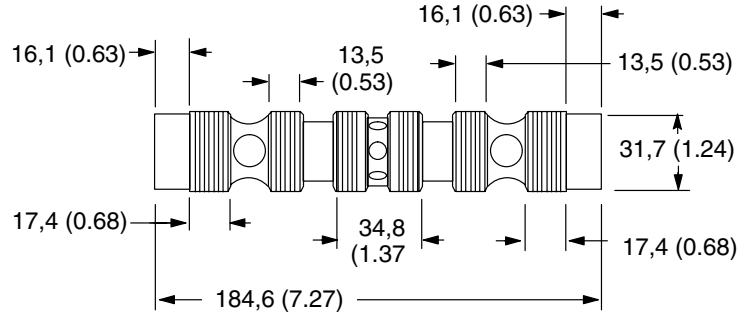
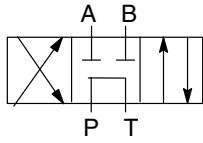
3 Toward "A" Port
 31 Toward "B" Port



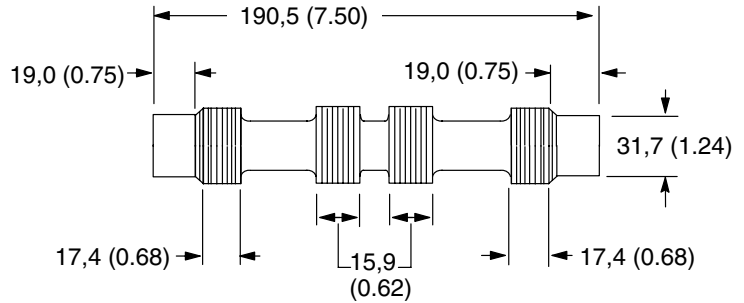
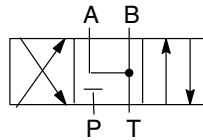
DG3S4, DG5S4, DG19S4 -50/-51 DESIGNS & DG5S8 -10/30/40 DESIGNS

mm (inch)

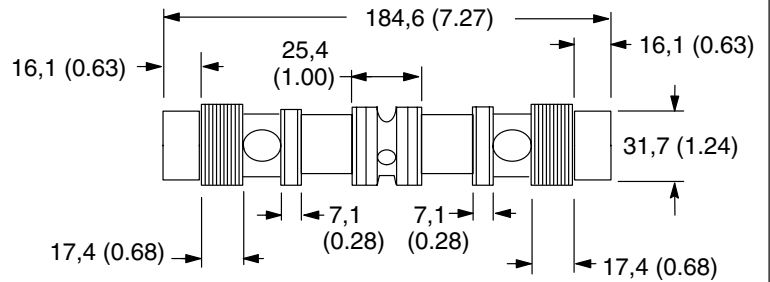
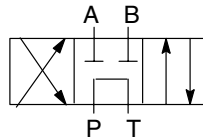
Type 4
Tandem with Closed Center Crossover
P/N 276626



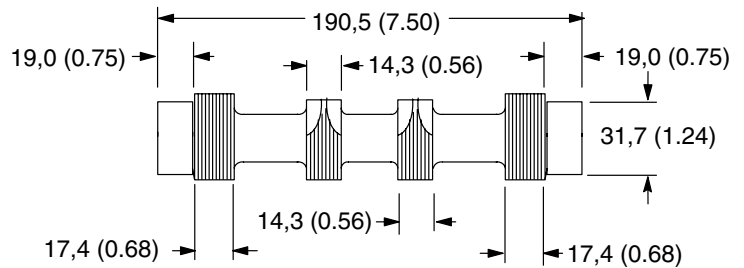
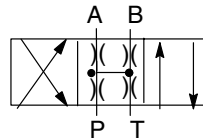
Type 6
A & B to Tank, P Blocked
P/N 363498



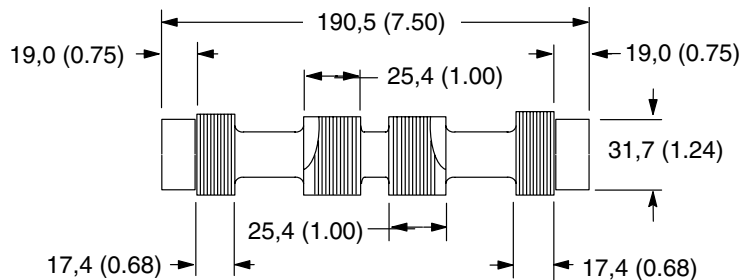
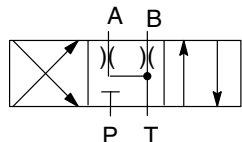
Type 8
Tandem with Open Center Crossover
P/N 363499



Type 9
Open Over Tapers
P/N 363500



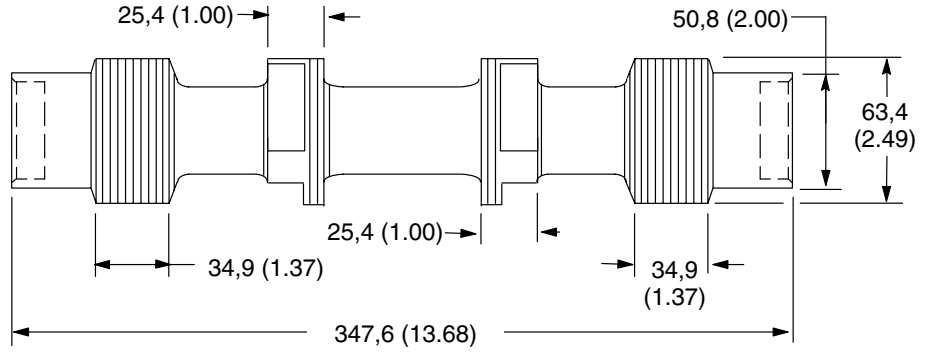
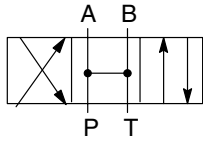
Type 33
Controlled Leakage from A & B to Tank,
P Blocked
P/N 363501



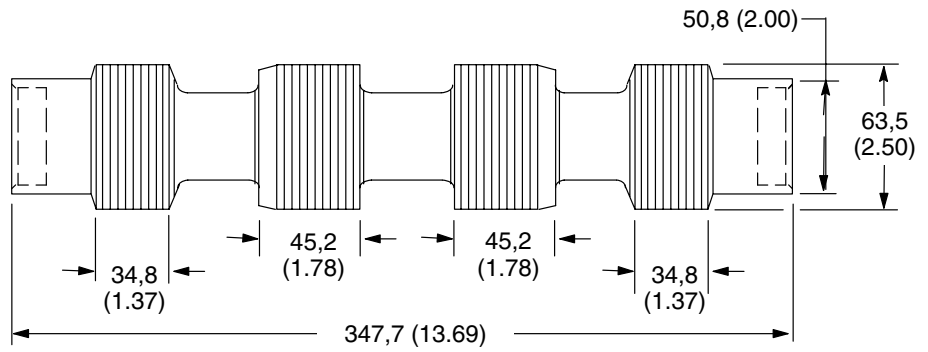
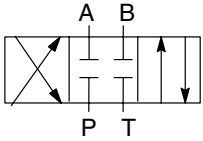
DG5S-H8 (HIGH FLOW) -20 DESIGN SERIES FOUR-WAY VALVE

mm (inch)

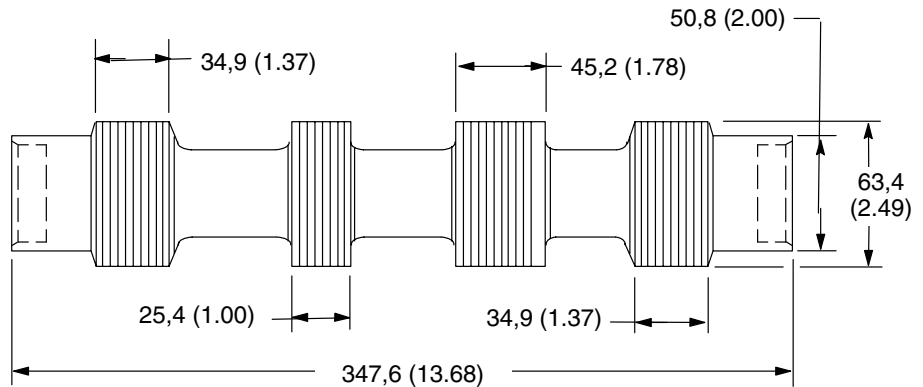
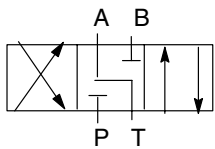
Type 0
Fully Open
P/N 273677



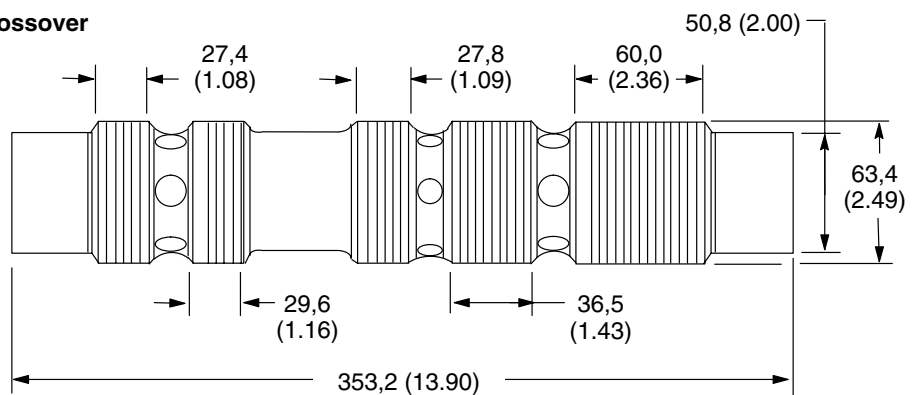
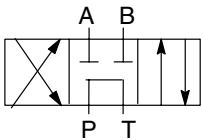
Type 2
Closed Center
P/N 273676



Type 3
A Open to Tank, P&B Blocked
P/N 275803



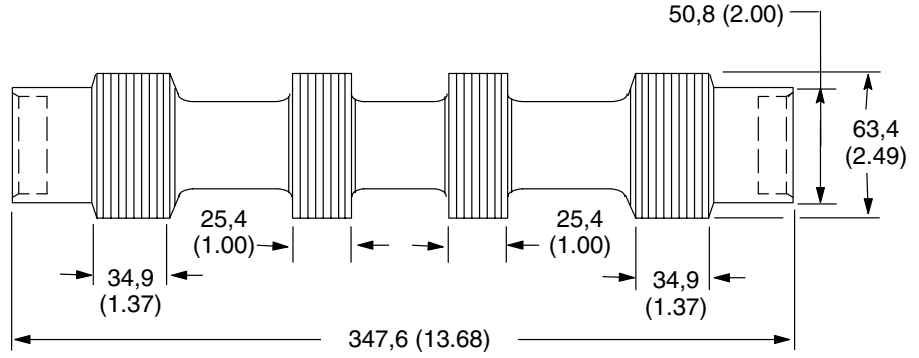
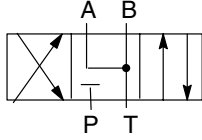
Type 4
Tandem with Closed Center Crossover
P/N 273720



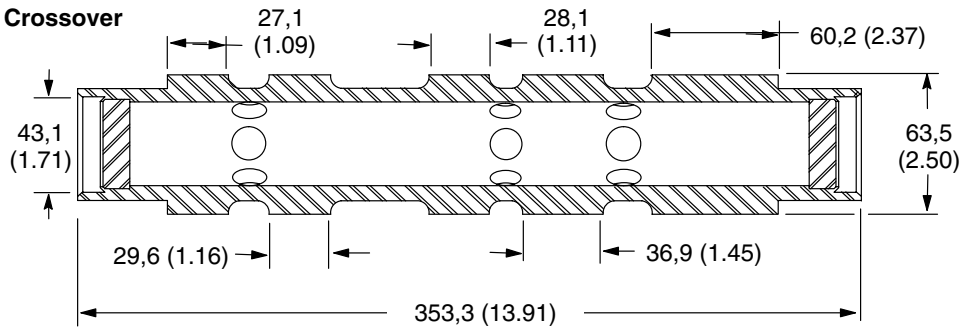
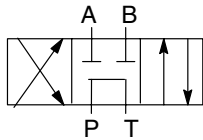
DG5S-H8 (HIGH FLOW) -20 DESIGN SERIES FOUR-WAY VALVE

mm (inch)

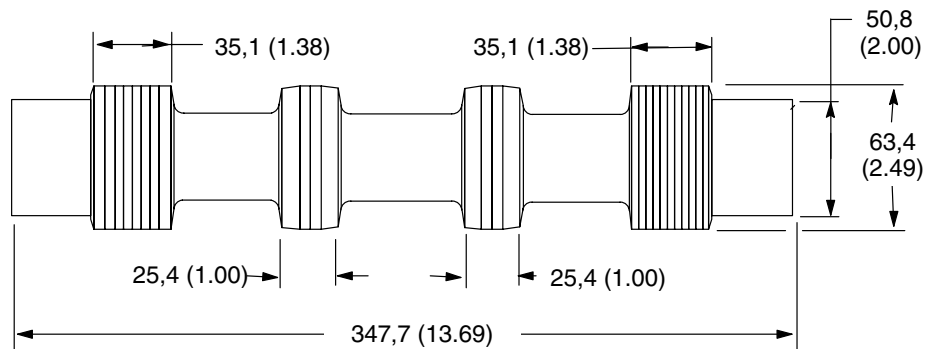
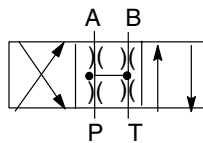
Type 6
A&B Open to Tank, P Blocked
P/N 275804



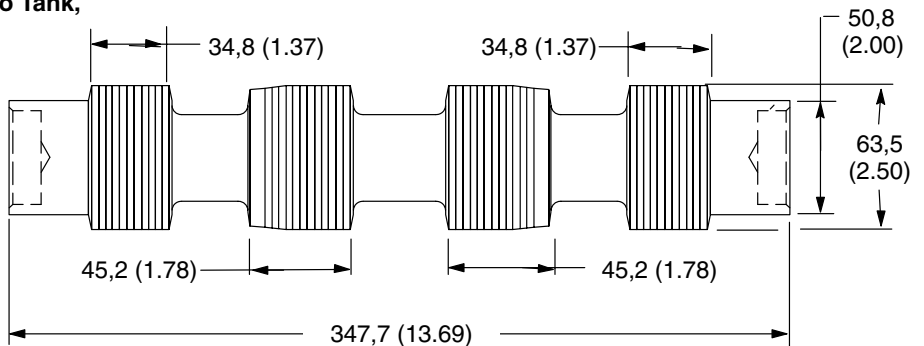
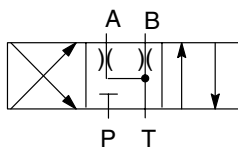
Type 8
Tandem with Open Center Crossover
P/N 275805



Type 9
Open over Tapers
P/N 275806



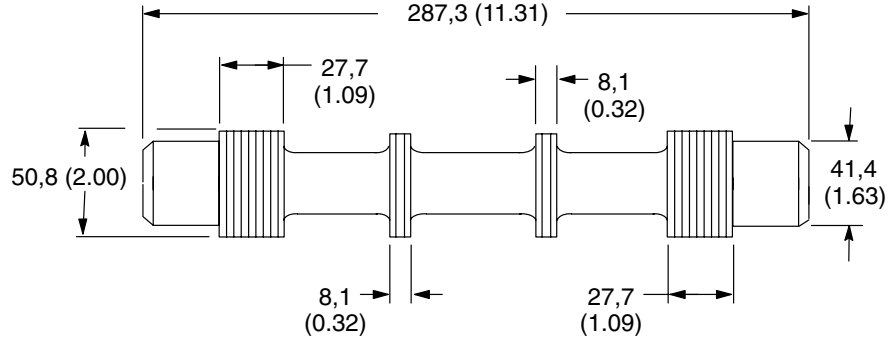
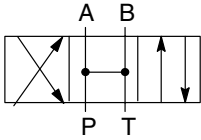
Type 33
Controlled Leakage from A & B to Tank,
P Blocked
P/N 317777



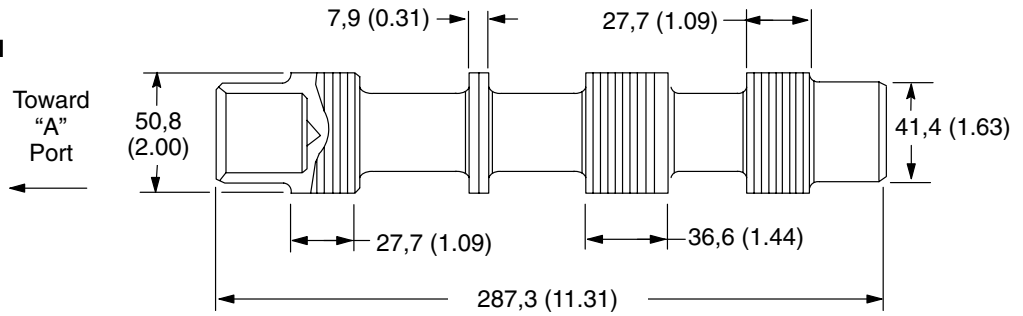
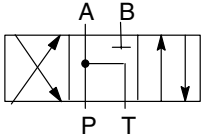
DG3S4, DG5S4, DG19S4 -50/-51/-90/-100 DESIGNS & DG5S8 -10 DESIGN

mm (inch)

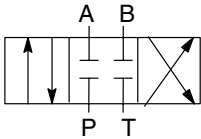
Type 0
Fully Open
P/N 364037



Type 1
P & A to Tank, B Blocked
P/N 331404

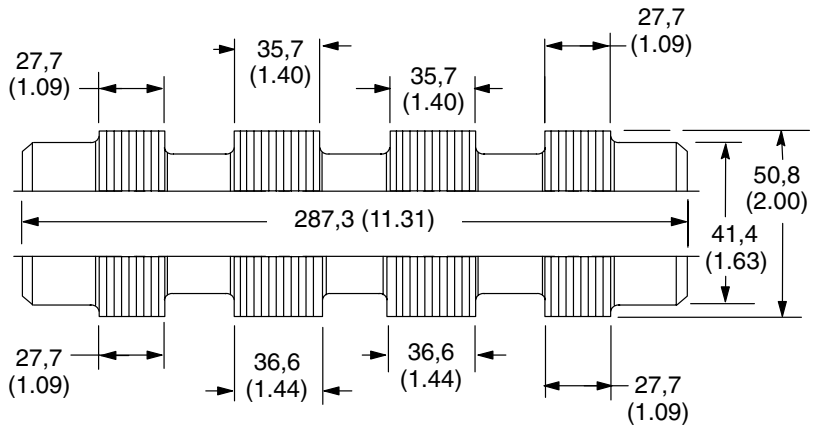


Type 2
Closed Center

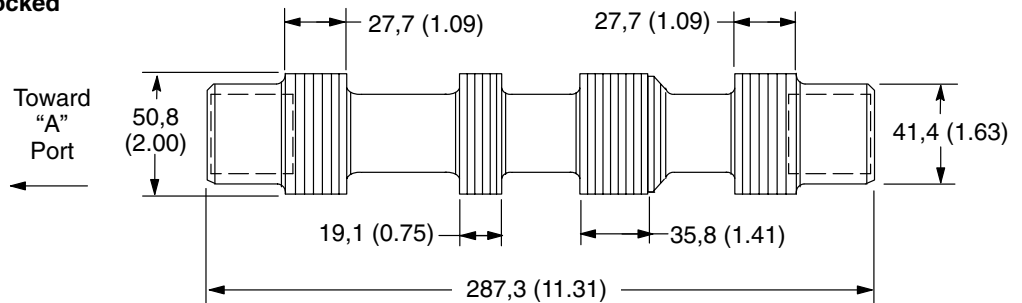
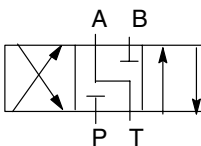


277478 -51 Design
DG3 Spring Offset
& -50 Design

364038 (-51,
-90/-100 Design)



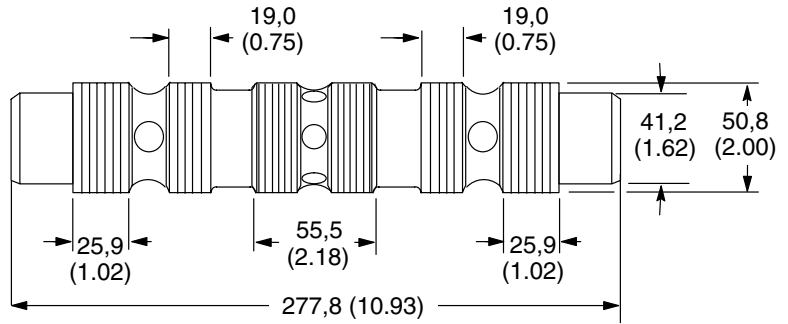
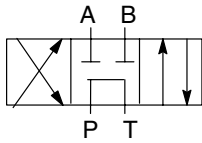
Type 3
A Open to Tank, P & B Blocked
P/N 277479



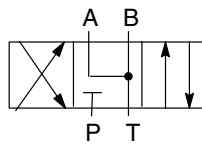
DG3S4, DG5S4, DG19S4 -50/-51/-90/-100 DESIGNS & DG5S8 -10 DESIGN

mm (inch)

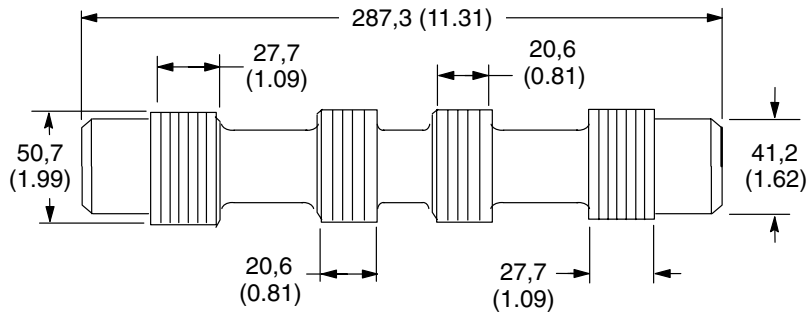
Type 4
Tandem with Closed Center Crossover
P/N 281193



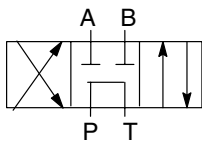
Type 6
A&B Open to Tank, P Blocked



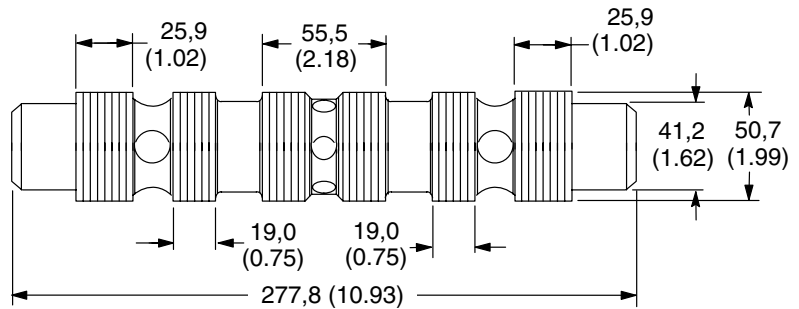
364039
(-51, -90/
-100 Design)



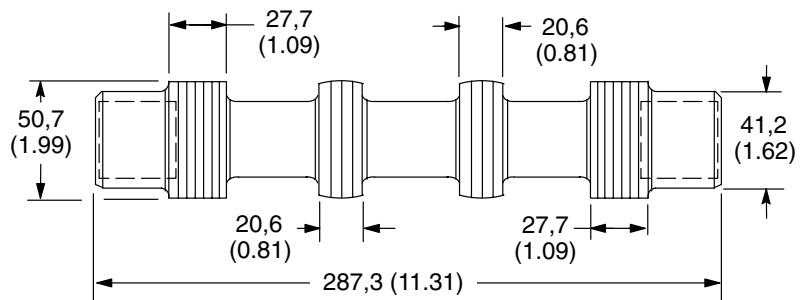
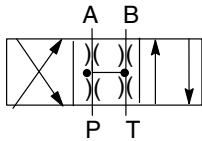
Type 8
Tandem with Open Center Crossover



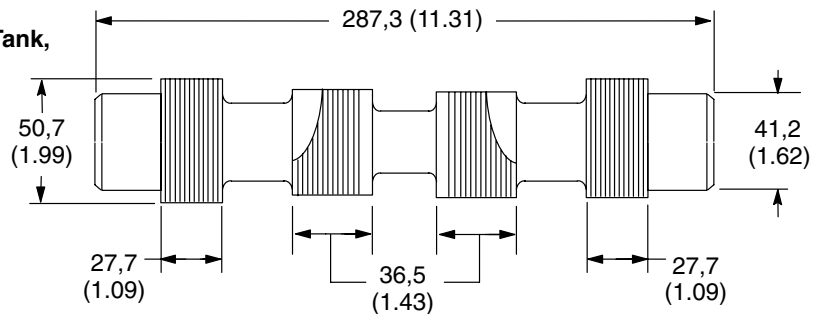
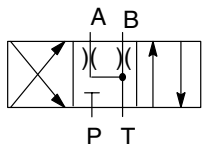
281194
(-50 Design)



Type 9
Open over Tapers
P/N 277563



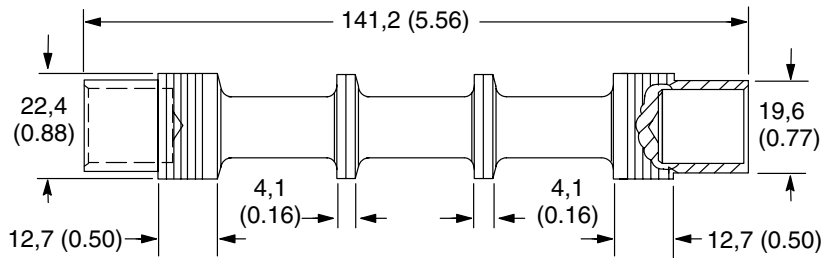
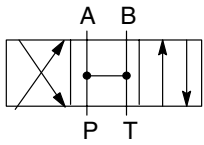
Type 33
Controlled Leakage from A & B to Tank,
P Blocked
P/N 364042



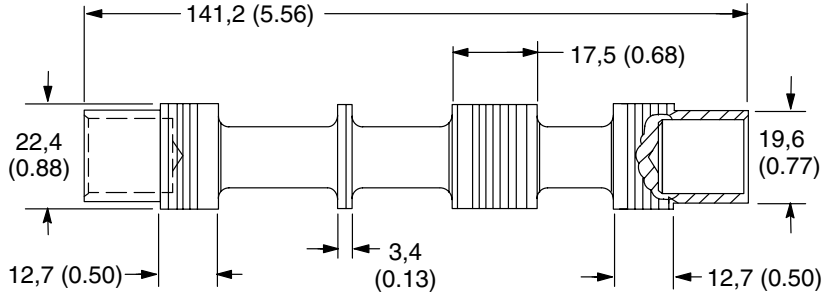
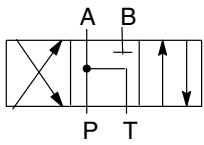
DG5S4-10 60/70 DESIGNS

mm (inch)

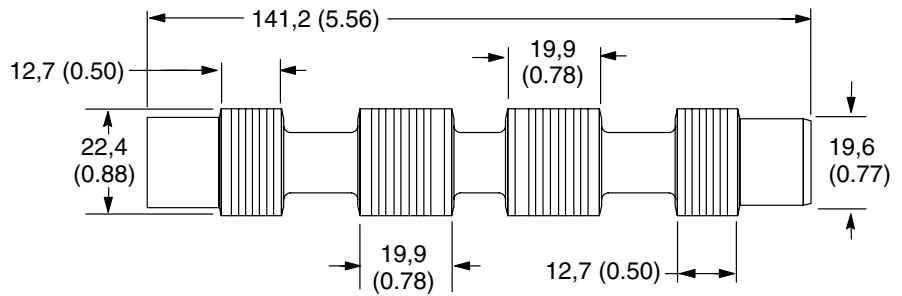
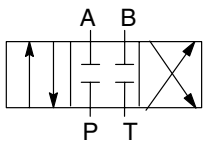
Type 0
Center Condition - Fully Open
P/N 399891



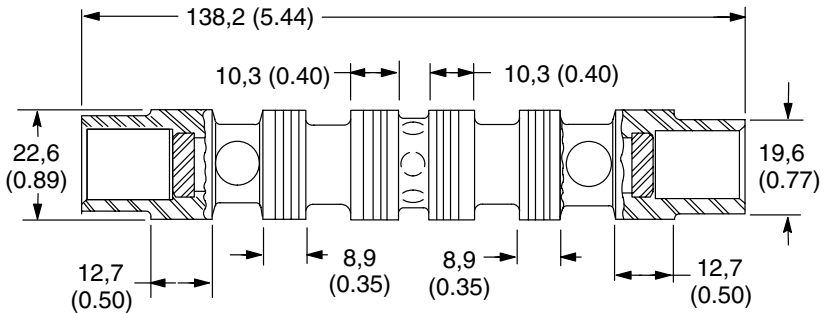
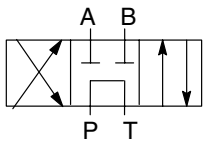
Type 1/11
Center Condition - P & A to Tank,
B Blocked
P/N 431972



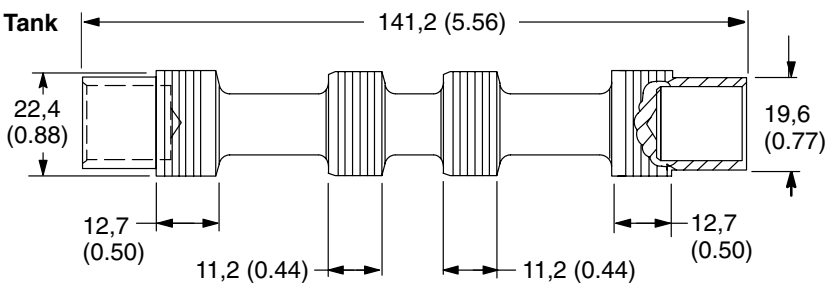
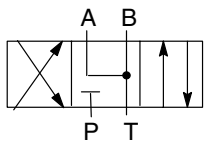
Type 2
Closed Center
P/N 399892



Type 4
Tandem with Closed Center Crossover
P/N 413481



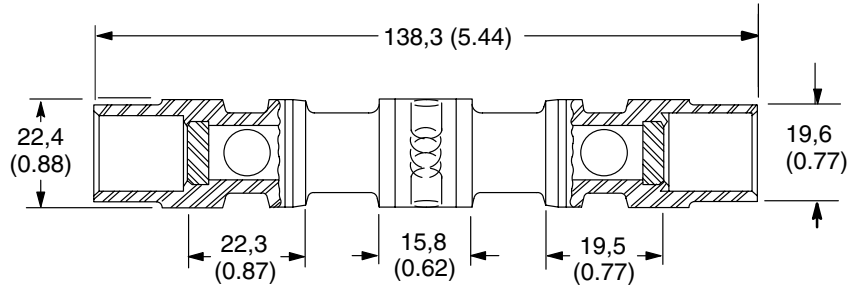
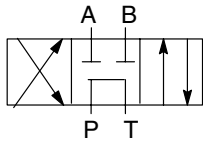
Type 6
Open Center, P Blocked, A & B Open to Tank
P/N 399894



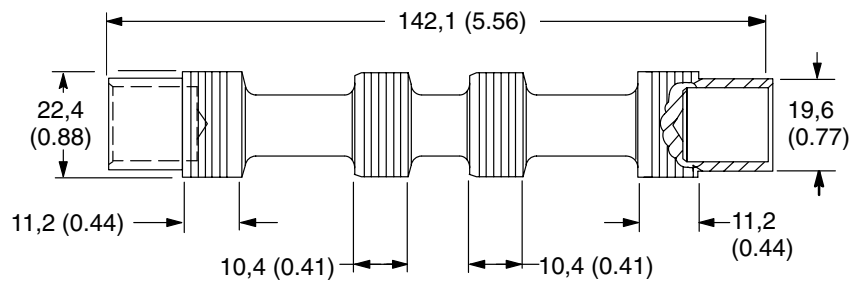
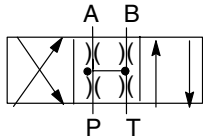
DG5S4-10 -60/70 DESIGN

mm (inch)

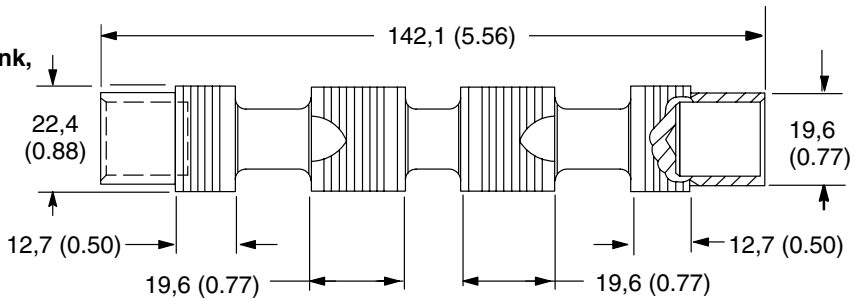
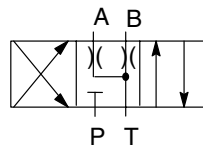
Type 8
Tandem with Open Center Crossover
P/N 399896



Type 9
Open Over Tapers
P/N 413483

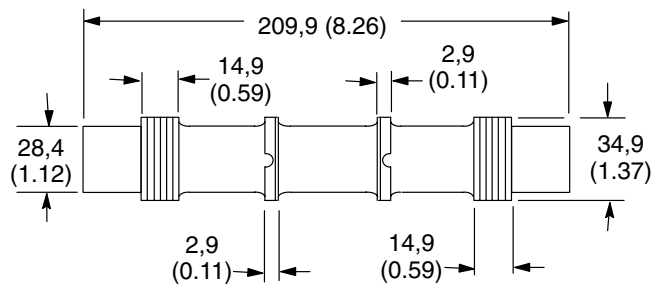
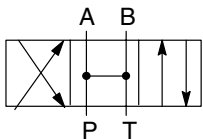


Type 33
Controlled Leakage from A & B to Tank,
P Blocked
P/N 399897



DG3S, DG5S-H8 (HIGH FLOW) FOUR WAY VALVE 20/60/70 DESIGN

Type 0
Open Center
P/N 786350

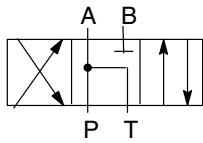


DG3S, DG5S-H8 (HIGH FLOW) FOUR WAY VALVE 20/60/70 DESIGNS

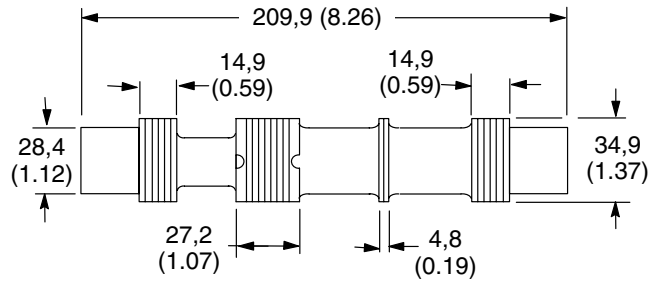
mm (inch)

Type 1
P & A to Tank, B Blocked

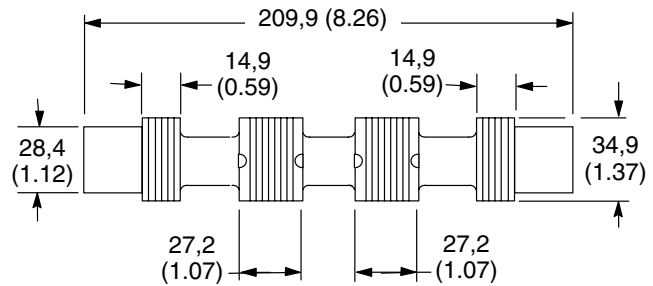
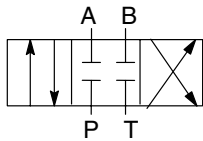
Type 11
P & B to Tank, A Blocked
P/N 786557



Toward
"B"
Port ←

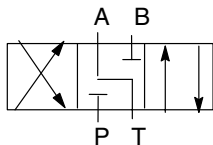


Type 2
Closed Center
P/N 786349

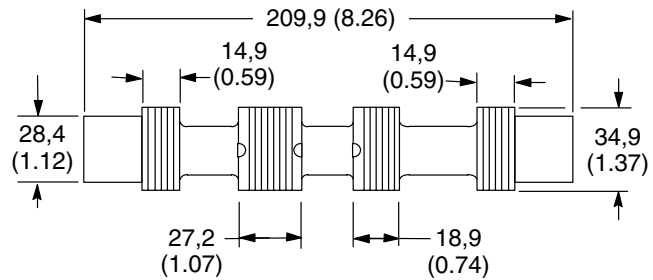


Type 3
A Open to Tank, P & B Blocked

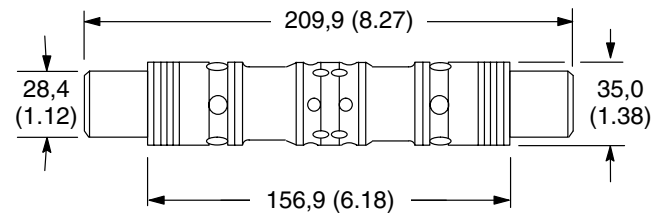
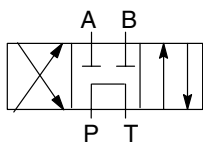
Type 31
P Open to B, A & Tank Blocked
P/N 786558



←
3 Toward "B" Port
31 Toward "A" Port



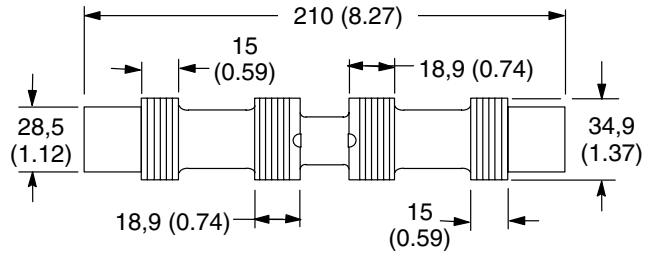
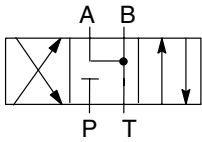
Type 4
Tandem with Closed Center Crossover
P/N 628162



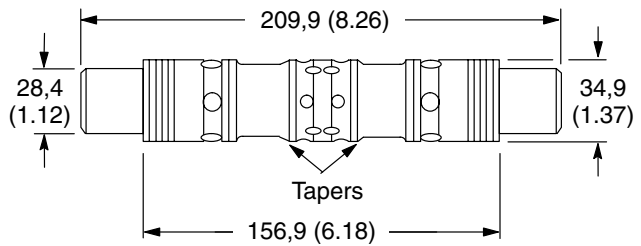
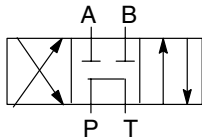
DG3S, DG5S-H8 (HIGH FLOW) FOUR WAY VALVE 20/60/70 DESIGNS

mm (inch)

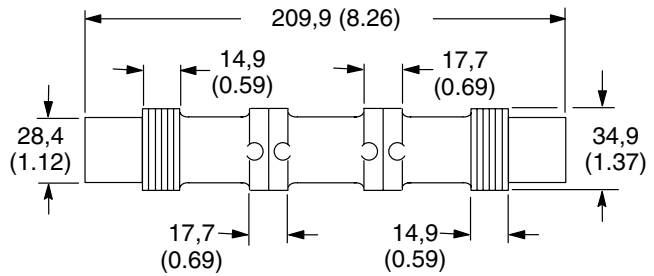
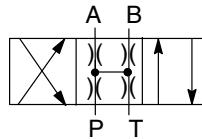
Type 6
A & B Open to Tank, P Blocked
P/N 786559



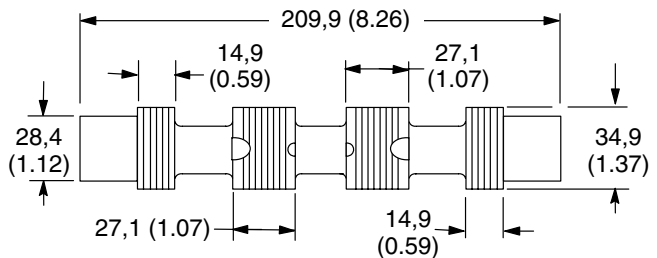
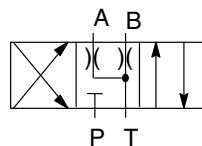
Type 8
Tandem with Open Center Crossover
P/N 627221



Type 9
Open Over Tapers
P/N 786561



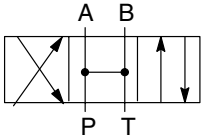
Type 33
Controlled Leakage from A & B to Tank,
P Blocked
P/N 786562



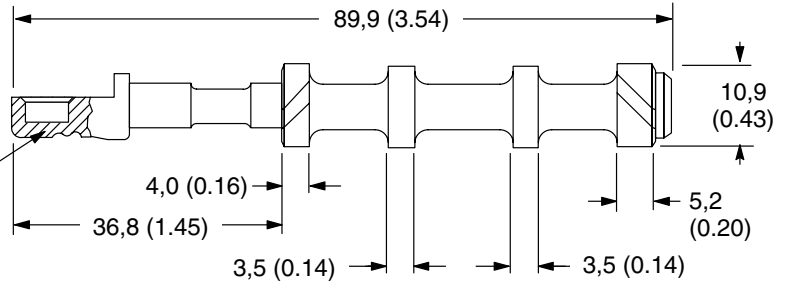
DG17/20V-3 -40 DESIGN

mm (inch)

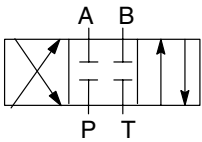
Type 0C/N Spring Centered/Detent Fully Open
P/N 683222 (0C Spring Centered)
P/N 683219 (0N Detent)



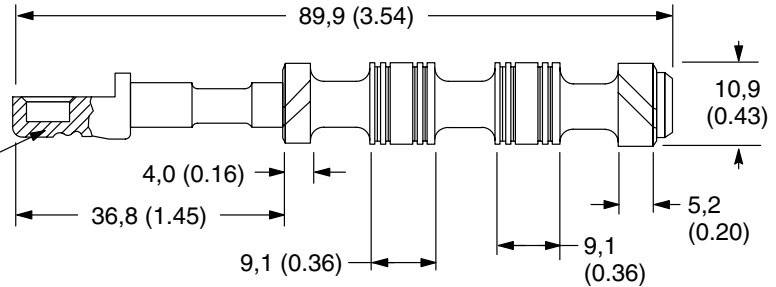
Detent Models Only



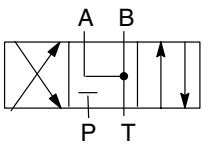
Type 2C/N Spring Centered/Detent Closed Center
P/N 683223 (2C Spring Centered)
P/N 989729 (2N Detent)



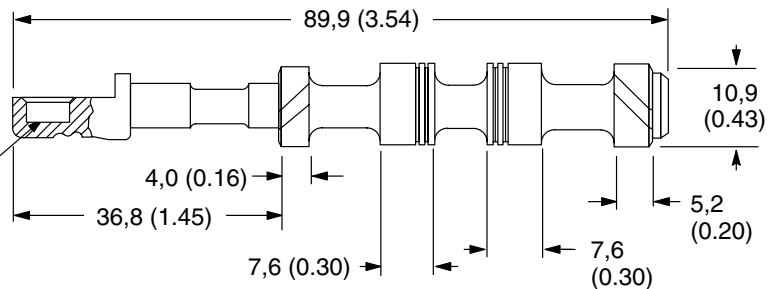
Detent Models Only



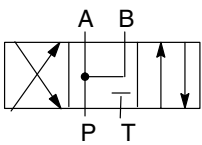
Type 6C/N Spring Centered/Detent A&B Open to Tank, P Blocked
P/N 683224 (6C Spring Centered)
P/N 989730 (6N Detent)



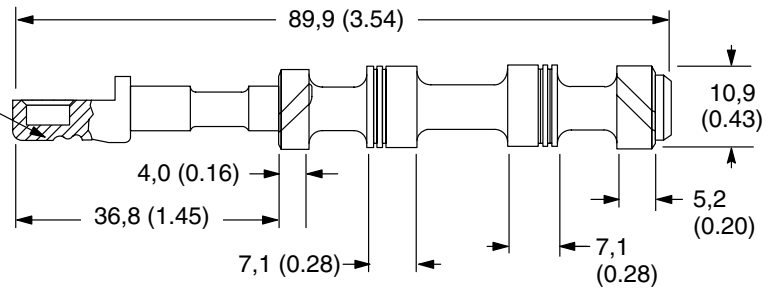
Detent Models Only



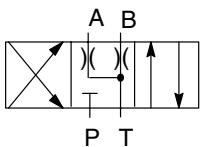
Type 7N Detent P to A & B, Tank Blocked
P/N 683220



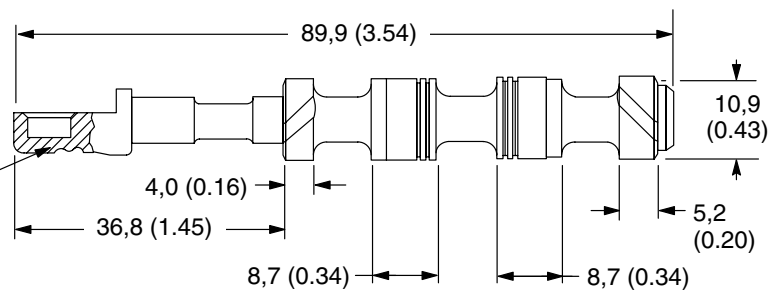
Detent Models Only



Type 33C/N Spring Centered/Detent Controlled Leakage from A & B to T, P Blocked
P/N 683225 (33C Spring Centered)
P/N 683221



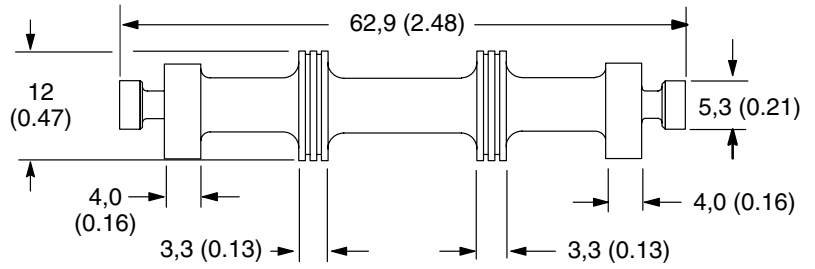
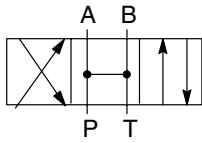
Detent Models Only



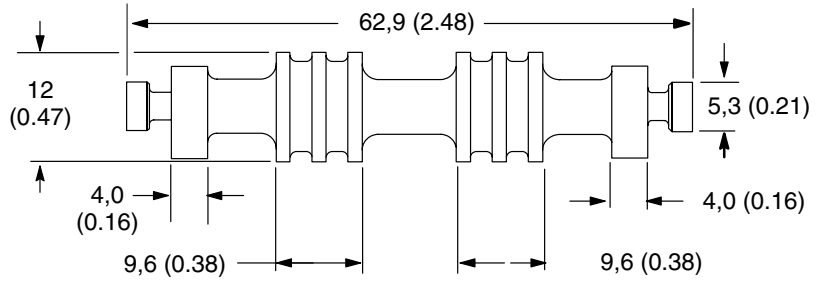
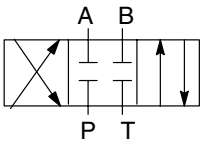
DG17V3 -60 DESIGN

mm (inch)

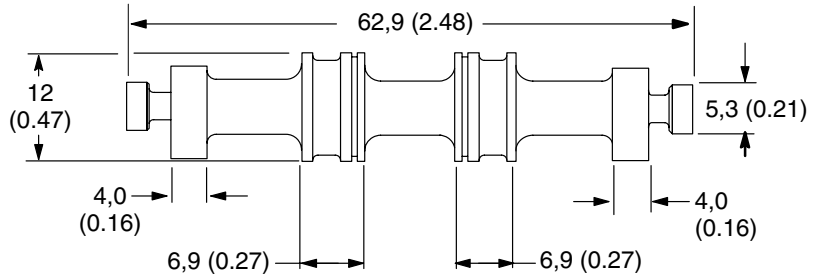
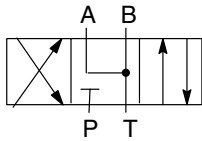
**Type 0C
Open Center
P/N 893025**



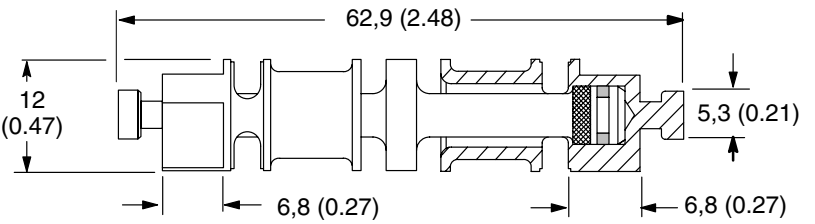
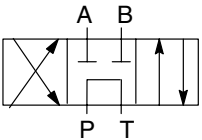
**Type 2C
Closed Center
P/N 893026**



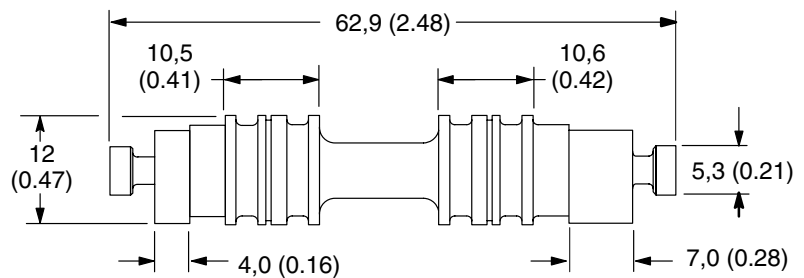
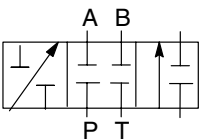
**Type 6C
Closed Center, A & B to Tank
P/N 893027**



**Type 8
Tandem Center, P to T
P/N 893029**



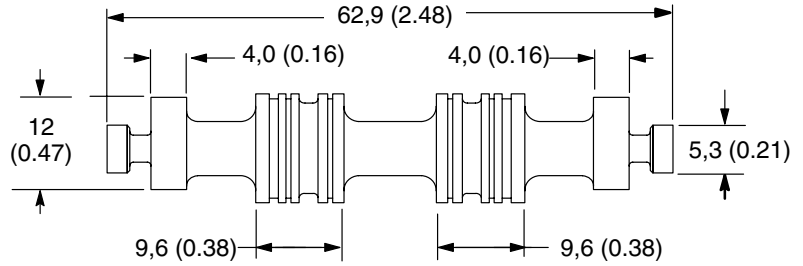
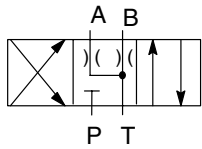
**Type 22A
Closed Center, 2-Way
P/N 893035**



DG17V3 -60 DESIGN

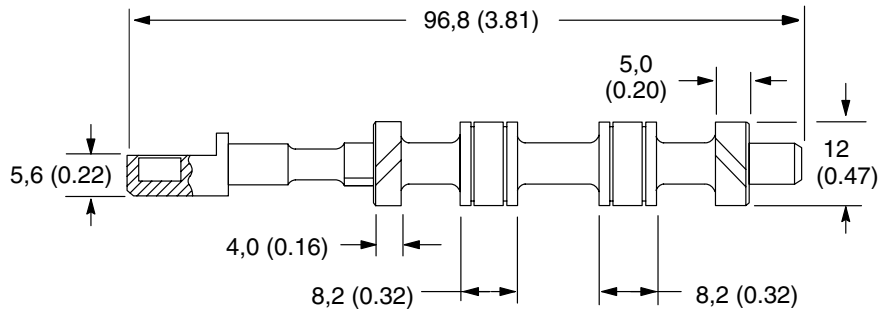
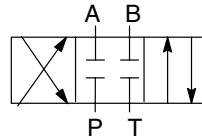
mm (inch)

Type 33C
Closed Center, Bleed to Tank
P/N 893030

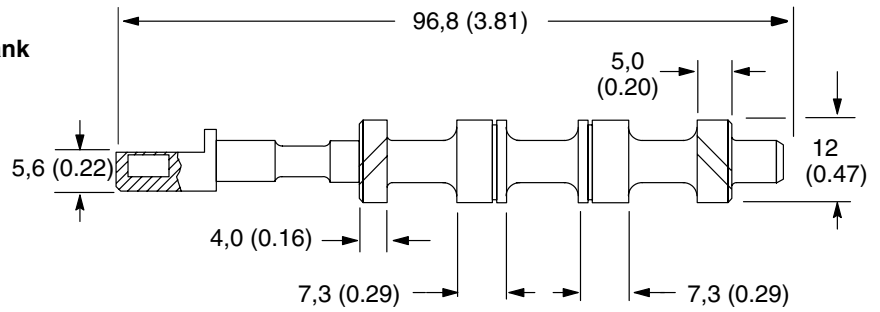
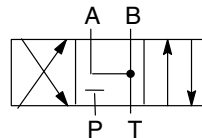


DG20V3 -60 DESIGN

Type 2
Closed Center, All Ports
P/N 916622

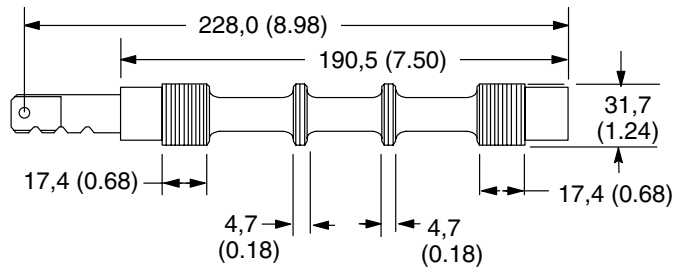
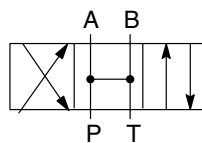


Type 6
Open Center, P Closed, A & B to Tank
P/N 916623



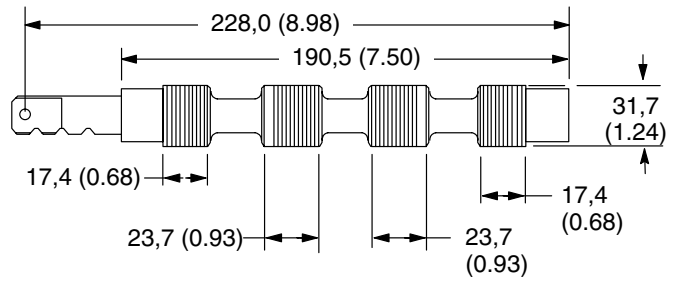
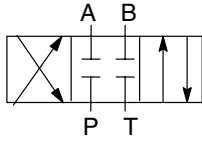
DG17S4-06-50 & DG17S-8--10**

Type 0
Open Center
P/N 281922

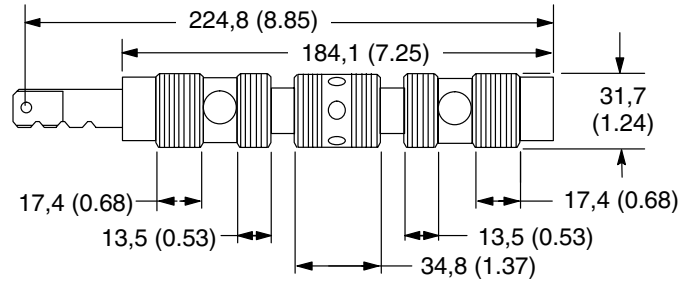
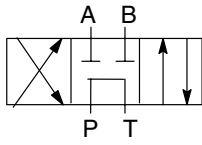


DG17S4-06-50 & DG17S-8-**-10

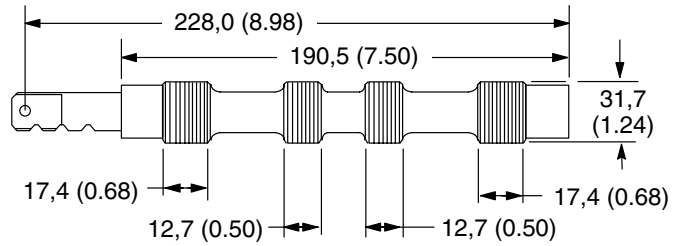
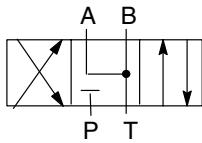
Type 2
Closed Center
281924



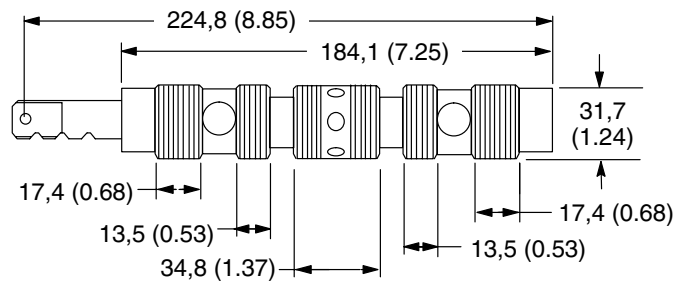
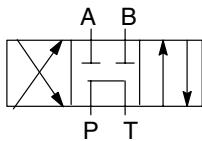
Type 4
Tandem with Closed Center Crossover
P/N 281926



Type 6
A & B Open to Tank, P Blocked
P/N 281927

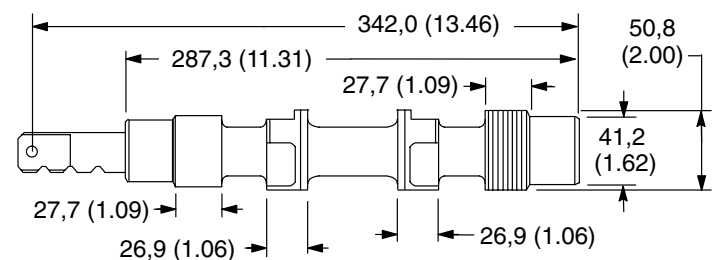
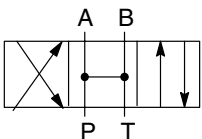


Type 8
Tandem with Open Center Crossover
P/N 281929



DG17S4 -53/-100 DESIGNS

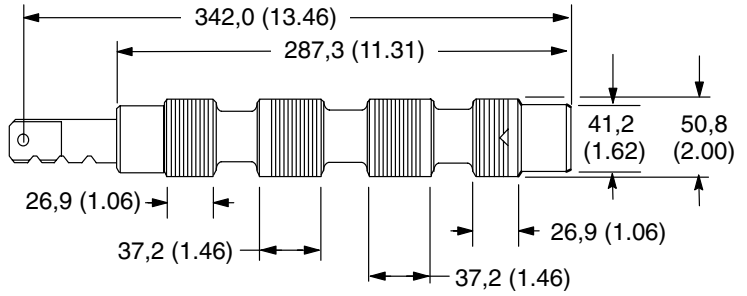
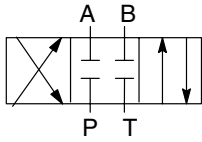
Type 0
Center Condition - Open
P/N 282281



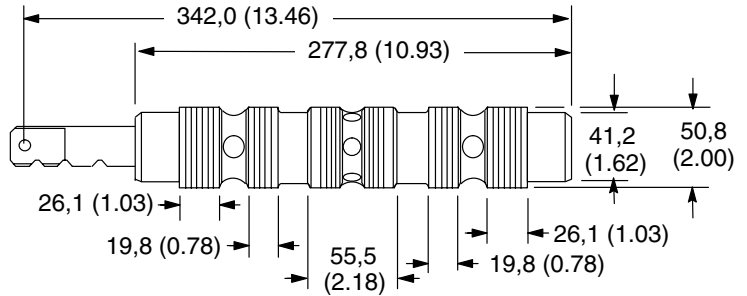
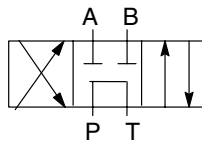
DG17S4 -53/- 100 DESIGNS

mm (inch)

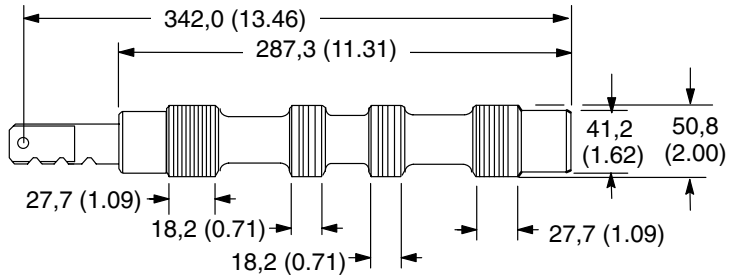
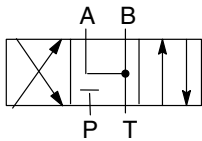
Type 2
Center Condition - Closed
P/N 282287



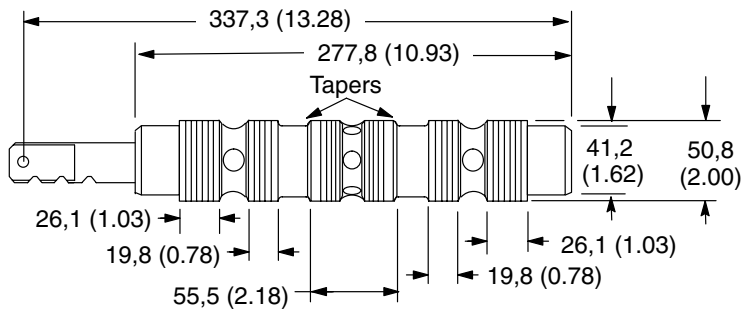
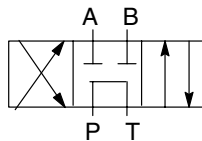
Type 4
Tandem with Closed Center Crossover
P/N 282286



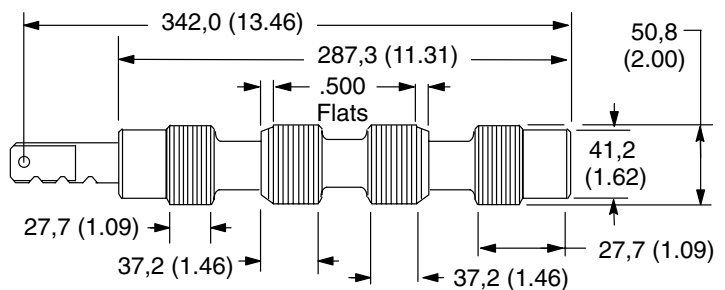
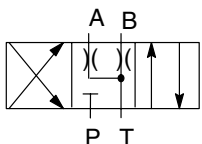
Type 6
A&B Open to T, P Blocked
P/N 282283



Type 8
Tandem with Open Center Crossover
P/N 282339



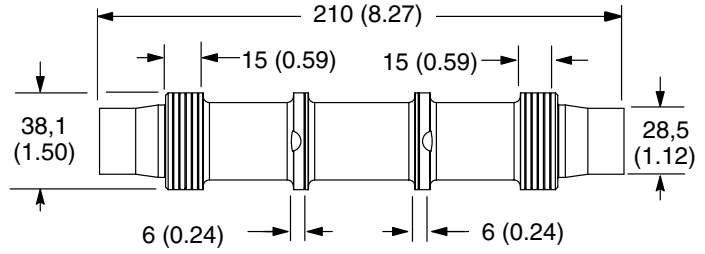
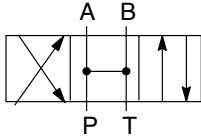
Type 33
Controlled Leakage from A&B to T,
P Blocked
P/N 282285



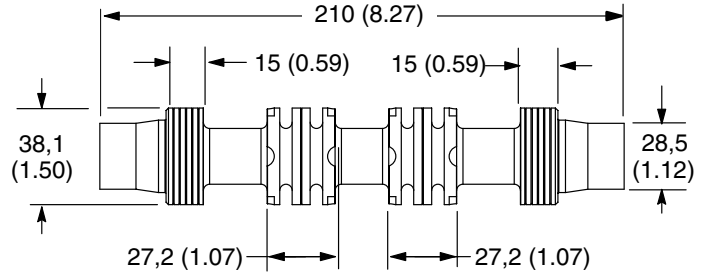
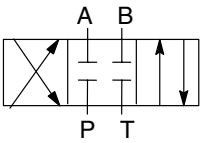
DG3V8/DG5V8 -10 DESIGN

mm (inch)

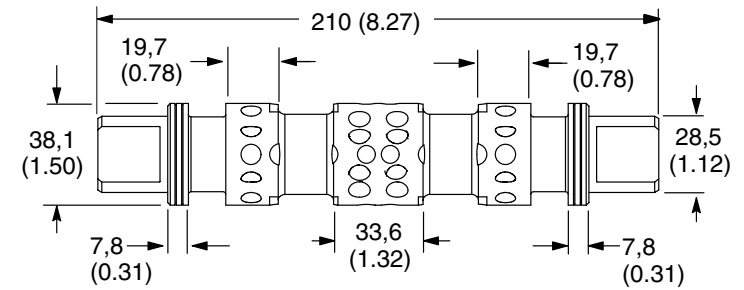
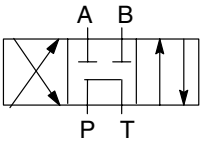
Type 0
Open Center
P/N 02-324575



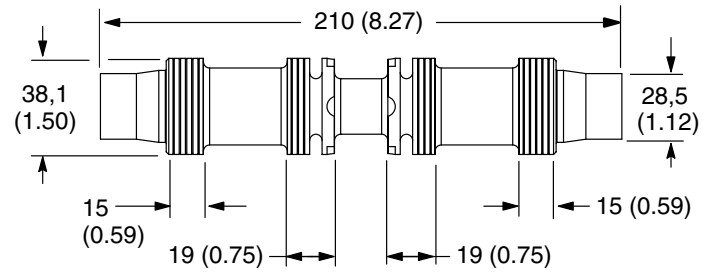
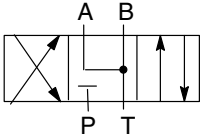
Type 2
Closed Center
P/N 02-324577



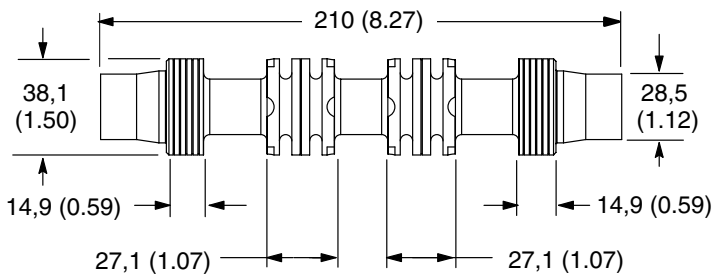
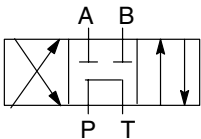
Type 4
Tandem Center, Closed Crossover
P/N 02-324579



Type 6
Closed Center, P Only
P/N 02-324580



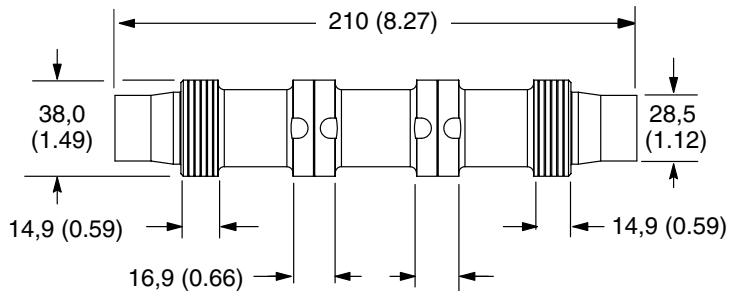
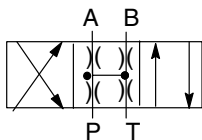
Type 8
Tandem Center, Open Crossover
P/N 02-324582



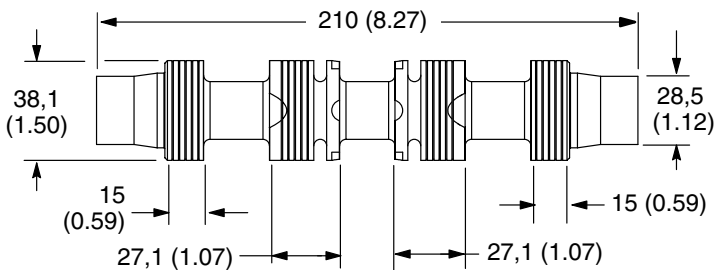
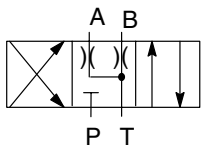
DG3V8/DG5V8 -10 DESIGN

mm (inch)

Type 9
Open Center (Partial All Ports)
P/N 02-324583

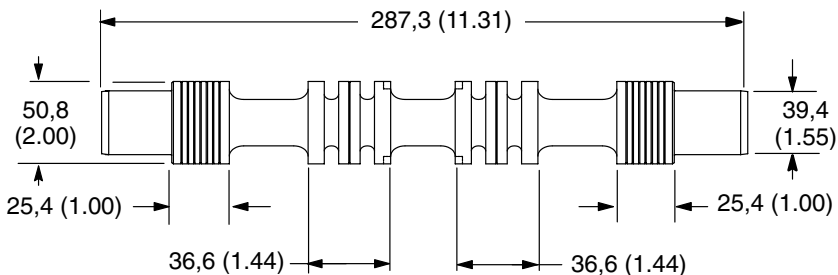
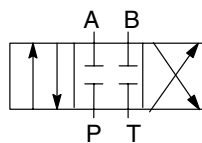


Type 33
A & B Open to Tank over Tapers,
P Blocked
P/N 02-324584

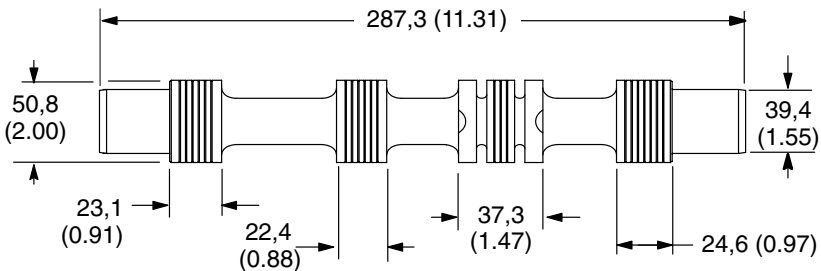
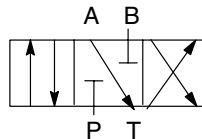


DG3V10/DG5V10 -10 DESIGN

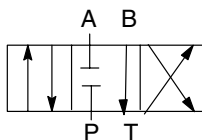
Type 2
Closed Center
P/N 02-317237



Type 3
A Open to Tank, P & B Blocked
P/N 02-317227



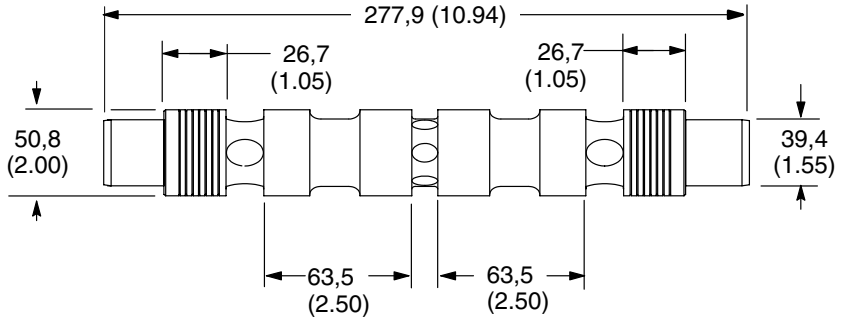
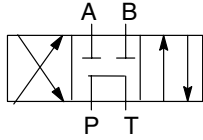
Type 31
B Open to Tank, P&A Blocked



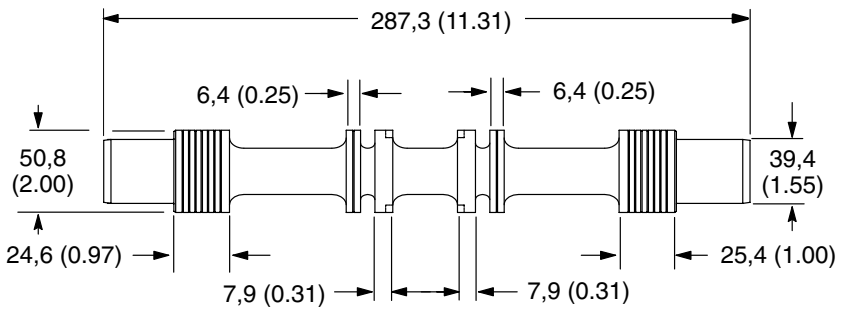
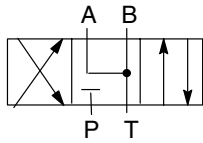
DG3V10/DG5V10 -10 DESIGN

mm (inch)

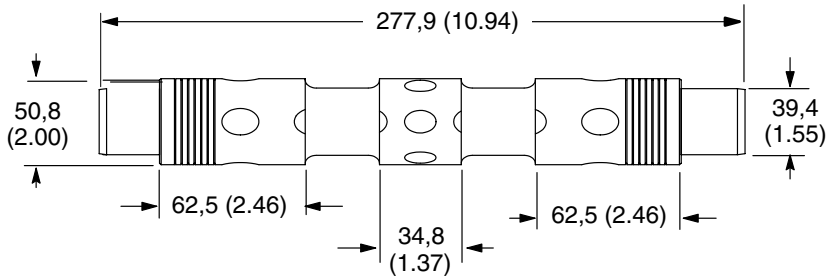
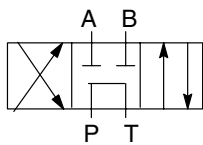
Type 4
P to Tank, A & B Blocked
Closed Crossover
P/N 02-317231



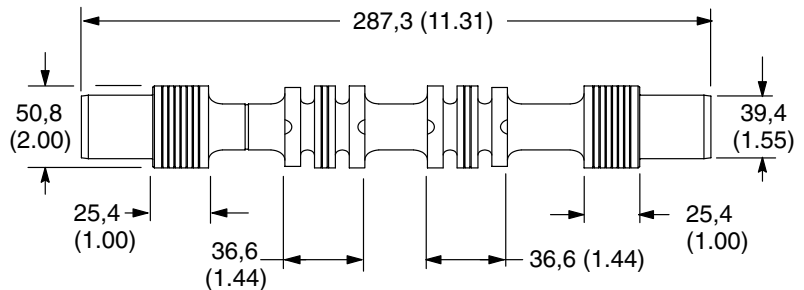
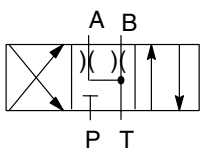
Type 6
Closed Center (P Only)
P/N 02-317238



Type 8
P Open to Tank, A & B Blocked
P/N 02-317233



Type 33
Closed Center, Bleed A & B
P/N 02-317234



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