

# E

## DIRECTIONAL CONTROLS

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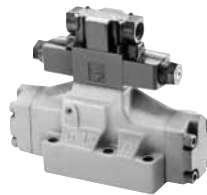
## Directional Valves

These valve are used for shifting oil flow direction of hydraulic circuit and for actuator starting/stopping as well as the operating direction shifting of actuator.

### ● Solenoid Operated Directional Valves



### ● Solenoid Controlled Pilot Operated Directional Valves



### ● "G" Series Shockless Type Directional Valves



### ● Pilot/Manually/Mechanically Operated Directional Valves



### ● Poppet Type Directional Valves



### ● Check/Pilot Controlled Check Valves



## Hydraulic Fluids

### 1. Type of Fluids

Any type of hydraulic fluid, listed in the table below can be used.

Type of Fluids	Remarks
Petroleum Base Oils	Use fluids equivalent to ISO VG32 or VG46.
Synthetic Fluids <sup>1)</sup>	Use phosphate ester or polyol ester type. When phosphate ester type fluid is to be used, prefix "F-" to the model number because a special seal (fluororubber) will be used.
Water Containing Fluids	Use water-glycol fluids or W/O emulsion type fluids.

- Notes
- 1: Not applicable with G-DSG and G-DSHG series valves.
  - 2: For two types of manually operated directional valves, DMT-<sup>06</sup>/<sub>06X</sub> and DMT-<sup>10</sup>/<sub>10X</sub>, only petroleum base oils and polyol ester type fluids are available.
  - 3: Water-glycol fluids cannot be used for two types of solenoid operated poppet type two-way valves; CDST-03\* and CDSG-03 types.
  - 4: For use with hydraulic fluids other than those listed above, please consult your Yuken representatives in advance.

### 2. Recommended Viscosity and Oil Temperatures

Use hydraulic fluids which satisfy the both recommended viscosity and oil temperatures given in the table below.

Name	Viscosity	Oil Temperature
DSG-005 series Solenoid Operated Directional Valves	20 – 200 mm <sup>2</sup> /s (100 – 900 SSU)	–15 – +60°C (5 – 140°F)
Solenoid Operated Directional Valves Solenoid Controlled Pilot Operated Directional Valves Poppet Type Solenoid Operated Directional Valves Multi Purpose Control Valves Solenoid Operated Poppet Type Two-Way Valves Pilot Controlled Directional Valves Manually Operated Directional Valves Mechanically Operated Directional Valves Check Valves Pilot Controlled Check Valves	15 – 400 mm <sup>2</sup> /s (80 – 1800 SSU)	–15 – +70°C (5 – 160°F)
G Series Shockless Type Solenoid Operated Directional Valves (Shifting Time Adjustable)	15 – 200 mm <sup>2</sup> /s (80 – 900 SSU)	–15 – +60°C (5 – 140°F)

### 3. Control of Contamination

Due caution must be paid to maintaining control over contamination of the hydraulic fluids which may otherwise lead to breakdowns and shorter the life of the valve. Please maintain the degree of contamination within NAS 1638-Grade 12. Use 25 μm or finer line filter (In case of DSG-005 series Solenoid Operated Directional Valves, NAS1638-Grade 11. Use 20 μm or finer line filter).



**Water-proof, dust-proof and vibration-resistance**

These properties are in compliance with the following standards.  
(The marking of ○ indicates compliance)

Item	Standard	Type	Description	Compliance							
				DSG-005	(S-/T-/L-)DSG-01 DSHG-01 DSHG-03 (S-)DSHG-04 (S-)DSHG-06 (S-)DSHG-10	(S-/E-/T-/L-)DSG-03	G-DSG-01 G-DSG-03 G-DSHG-04 G-DSHG-06	DSL DSLHG DSP*	CDS*		
★2 Water-proof	JIS F8001 Water-proof test for marine electric appliance	Class 1 water spray	Drip-proof construction	○	○	○	○	○	○		
		Class 2 water spray	Froth-roof construction	×	○	○	○	○	○		
	JIS D0203 Damp-proof and Water-proof test for automobile parts	Damp-proof test M1	Test to examine damp-resistance of parts	×	○	○	○	○	○		
		Damp-proof test M2	Test to examine functions of part under high temperature and high humidity	×	○	○	○	○	○		
		Splash-proof test R1	Test to examine functions of parts which are likely to be exposed to water splash.	○	○	○	○	○	○		
		Splash-proof test R2	Test to examine functions of parts which are indirectly exposed to stormy weather or water splash.	×	○	○	○	○	○		
	JIS C0920 Water-proof test for electro-mechanical parts and wiring materials	Drip-proof type	Not affected by water dropping at vertical angle of 15 degrees or less.	○	○	○	○	○	○		
		Rain-proof type	Not affected by rain fall at vertical angle of 60 degrees or less.	×	○	○	○	○	○		
		Froth-proof type	Not affected by water drip from any direction.	×	○	○	○	○	○		
		Jet-flow proof type	Not affected by jet flow from any direction.	×	○	×	×	×	×		
	(I.E.C) PUBL. 529	Protection Class 2: Drip-proof type (2)	Not affected by water drip falling at vertical angle of 15 degrees or less.	○	○	○	○	○	○		
		Protection Class 3: Rain-proof type	Not affected by rain falling at vertical angle of 60 degrees or less.	×	○	○	○	○	○		
		Protection Class 4: Froth-proof type	Not affected by water drip from any direction.	×	○	○	○	○	○		
		Protection Class 5: Jet-flow proof type	Not affected by jet flow from any direction.	×	○	×	×	×	×		
	Dust-proof	(I.E.C) PUBL. 529	Protection Class 6	Fully protected from entry of dust.	○	○	○	○	○	○	
	Vibration-resistance	JIS C0911 Vibration test for small electric appliances	Resonance test (IC)	Vibration range: 7-59.5 Hz Duplex amplitude: 0.1 mm	×	○	○	○	○	○	
Fixed frequency resistance test (IIC)				Frequency: 20 Hz	Grade 1: duplex amplitude-0.5 mm	×	○	○	○	○	○
				Grade 2: duplex amplitude-1.2 mm	×	○(2D*)★1	○(2D*)★1	○★1	○	○	
				Grade 3: duplex amplitude-1.8 mm	×	○(2D*)★1	○(2D*)★1	○★1	○	○	
Grade 4: duplex amplitude-2.4 mm			×	○(2D*)★1	○(2D*)★1	○★1	○	○			
Variable frequency resistance test (IIIC)			Frequency range: 7-59.5 Hz	Grade 1: duplex amplitude-0.3 mm	×	○(2D*)★1	○(2D*)★1	○★1	○	○	
			Grade 2: duplex amplitude-0.5 mm	×	○(2D*)★1	○(2D*)★1	○★1	○	×		
		Grade 3: duplex amplitude-0.75 mm	×	○(2D*)★1	○(2D*)★1	○★1	○	×			
JIS D1601 Vibration test for automobile parts		Class 1: mainly for parts of passenger car	Grade A: Parts mounted on spring of body or chassis having relatively low vibration.	×	○(2D*)★1	○(2D*)★1	○	○	×		
			Grade B: Parts mounted on spring of body or chassis having relatively low vibration.	×	○(2D*)★1	○(2D*)★1	○	○	×		
	Grade C: Parts mounted in engine having relatively low vibration		×	○(2D*)★1	○(2D*)★1	×	○	×			

★1 : No-spring detented type (2D\*) and No-spring type (2N\*) can be used when energised continuous for position holding.  
★2 : For outdoor use, protect equipment with a cover, etc., to prevent direct exposure to water.

# Solenoid Operated Directional Valves

## Solenoid Controlled Pilot Operated Directional Valves

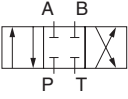
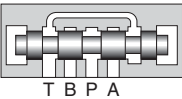
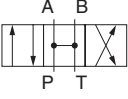
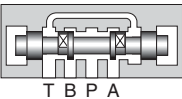
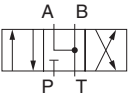
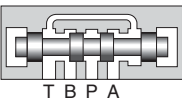
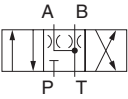
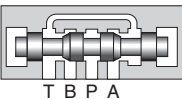
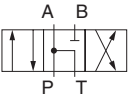
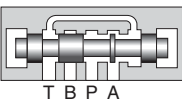
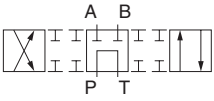
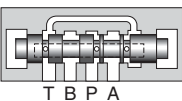
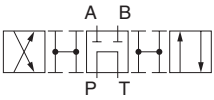
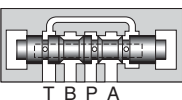
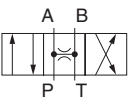
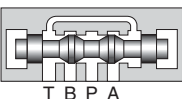
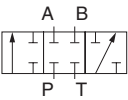
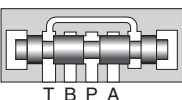
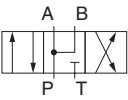
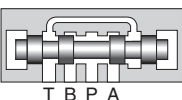
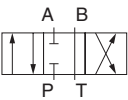
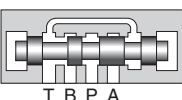
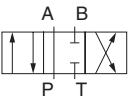
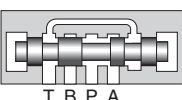
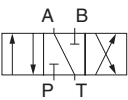
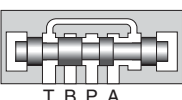
### “G” Series Shockless Type Directional Valves

### Pilot / Manually / Mechanically Operated Directional Valves

Valve Type	Graphic Symbols	Max. Operating Pressure MPa (PSI)	Maximum Flow		Page
			L/min	U.S.GPM	
Solenoid Operated Directional Valves		25 (3600)	DSG-005		336
		16 (2320)	L-DSG-01		344
		25 (3600)	S-DSG-01		
		35 (5080)	DSG-01		361
		16 (2320)	L-DSG-03		
		25 (3600)	S-DSG-03		
Low Wattage (5W) Type Solenoid Operated Directional Valves		16 (2320)	E-DSG-01		378
			E-DSG-03		
Electronic Relay Incorporated Solenoid Operated Directional Valves		25 (3600)	T-S-DSG-01		379
		35 (5080)	T-DSG-01		
		25 (3600)	T-S-DSG-03		379
		31.5 (4580)	T-DSG-03		
Solenoid Controlled Pilot Operated Directional Valve		21 (3050)	DSHG-01		381
		25 (3600)	DSHG-03		
			DSHG-04/S-DSHG-04		
		31.5 (4580)	DSHG-06/S-DSHG-06		
			DSHG-10/S-DSHG-10		
“G” Series Shockless Type Solenoid Operated Directional Valves		25 (3600)	G-DSG-01		412
			G-DSG-03		
“G” Series Shockless Type Solenoid Controlled Pilot Operated Directional Valves		25 (3600)	G-DSHG-04		418
			G-DSHG-06		
Pilot Operated Directional Valves		31.5 (4580)	DHG-04 06 10		423
Manually Operated Directional Valves		21 (3050)	Threaded Connection (DMT) 03 06 10		429
		31.5 (4580)	Sub-plate connection (DMG) 01 03 04 06 10		
Mechanically Operated Directional Valves		7 (1020)	Rotary (DR <sup>T</sup> <sub>G</sub> ) 02		441
		25 (3600)	Cam Operated (DC <sup>T</sup> <sub>G</sub> ) 01 03		

**Spool Types**

Spool types are classified to the condition of flow at the neutral position.

Spool Type	Graphic Symbols	Schematic Drawing (Centre Position)	Functions and Applications
<b>2</b> (Closed Centre All Ports)			Holds pump pressure and cylinder position at neutral. Care should be paid if used as a 2-position type because shock occurs when each port is blocked in transit.
<b>3</b> (Open Centre All Ports)			Pump can be unloaded and actuator is floating at neutral. If a 2-position type is used, shock is reduced as each ports is released to tank in transit.
<b>4</b> (Open Centre A, B&T)			Pump pressure is held and actuator is floated at neutral. 2-position type is used when system pressure is required to be held in transit. Shock during transit is less compared to spool type "2".
<b>40</b> (Open Centre A, B&T Restricted Flow)			In a variation of spool type "4", a restrictor is provided in A-T and B-T ports. Making it faster at stopping the actuator.
<b>5</b> (Open Centre P, A&T)			It can be used when a pump is unloading at neutral and actuator is halted at one way flow.
<b>6</b> (Open Centre P&T Closed Crossover)			Pump is unloading and actuator position held at neutral. Suitable for series operation.
<b>60</b> (Open Centre P&T Open Crossover)			It is a variation of spool type "6". Shock is reduced as each port is released to tank on transit.
<b>7</b> (Open Centre All Ports) Restricted Flow			Mainly used as a 2-position type. Shock is reduced on transit.
<b>8</b> (2-Way)			Pump pressure and cylinder position is held at neutral in the same way as spool type "2". It is used as 2 way type.
<b>9</b> (Open Centre P, A&B)			Regenerative circuit is provided at neutral.
<b>10</b> (Open Centre B&T)			Prevent actuator from one direction drift by leakage of P port at neutral.
<b>11</b> (Open Centre P&A)			Halt actuator movement positively at B, T ports blocked P, A ports connected at neutral.
<b>12</b> (Open Centre A&T)			Prevent actuator from one direction drift by leakage of P port at neutral.

## ■ Mounting Surface

Mounting surface dimensions conform to ISO 4401, Hydraulic fluid power-Four-Port directional control valves-Mounting surfaces.

Model Numbers	ISO Code of Mounting Surface
$\begin{pmatrix} S- \\ L- \\ E- \\ T- \\ G- \end{pmatrix}$ DSG-01 DSHG-01 DMG-01 DCG-01	ISO 4401-AB-03-4-A
$\begin{pmatrix} S- \\ L- \\ E- \\ T- \\ G- \end{pmatrix}$ DSG-03 DMG-03 DCG-03	ISO 4401-AC-05-4-A
DSHG-03	ISO 4401-AC-05-4-A*
$\begin{pmatrix} S- \\ G- \end{pmatrix}$ DSHG-04 DHG-04 DMG-04	ISO 4401-AD-07-4-A
$\begin{pmatrix} S- \\ G- \end{pmatrix}$ DSHG-06 DHG-06 DMG-06	ISO 4401-AE-08-4-A
(S-) DSHG-10 DHG-10 DMG-10	ISO 4401-AF-10-4-A

\* The main port conform to the ISO 4401-AC-05-4-A.  
 The pilot and drain ports is sccordance with the ISO original draft.

### Interchangeability in Installation between Current and New Design

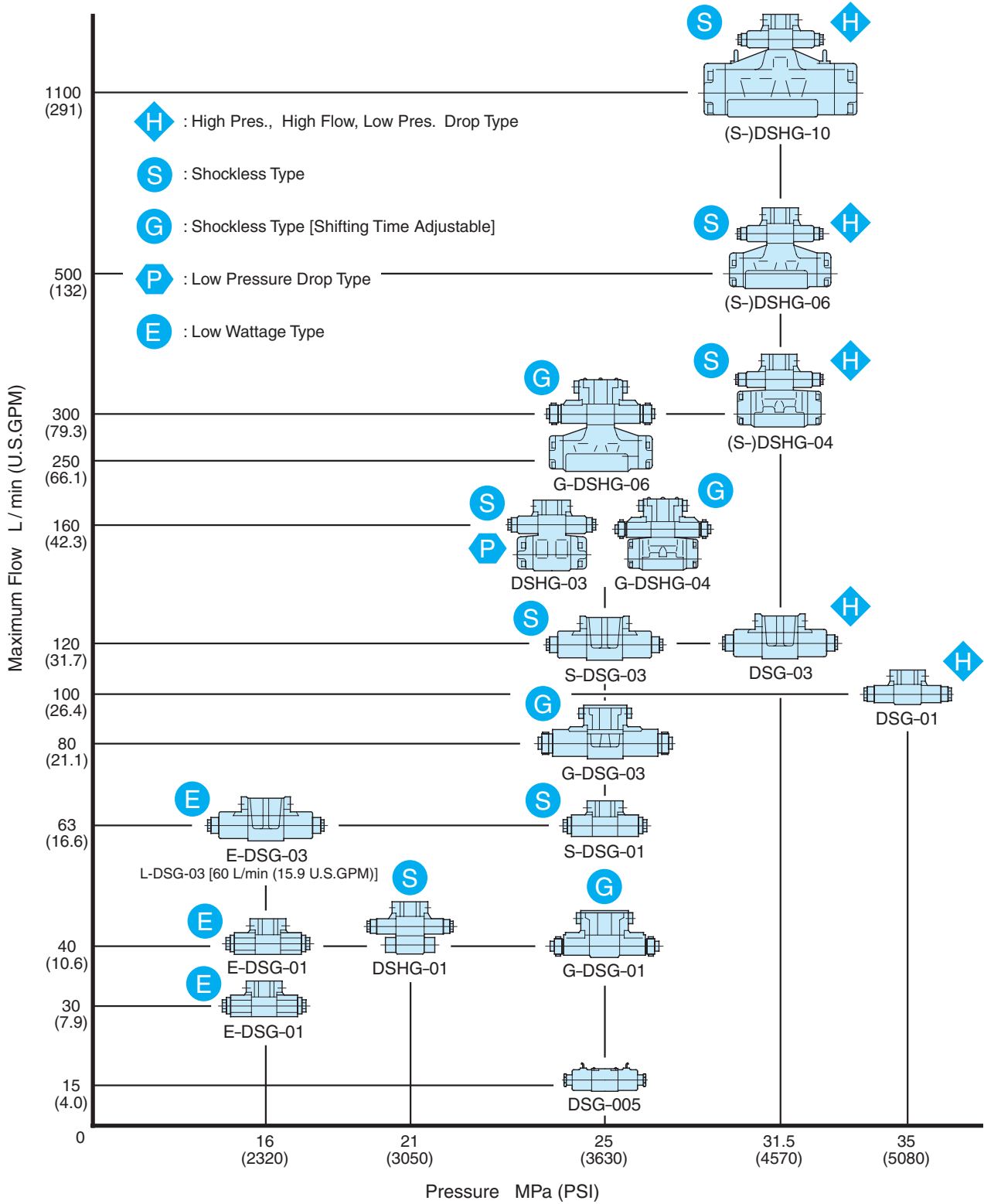
Model change has been made on the following product.

The difference between current and new design has been described on the paragraph of “Interchangeability in Installation between Current and New Design.” Refer to relevant pages on each series.

Name	Model Numbers		Interchangeability in Installation	Related Page	Major Changes
	Current	New			
DSG-005 Series Solenoid Operated Directional Valves	DSG-005-***-*-30/3090	DSG-005-***-*-40/4090 DSG-005-***-*- $\frac{N}{NI}$ -40/4090	Yes	—	<ul style="list-style-type: none"> <li>● High Flow</li> <li>● Low Pressure Drop</li> <li>● Din-connector type solenoid in addition</li> </ul>
DSG-01 Series Solenoid Operated Directional Valves	$\begin{pmatrix} S- \\ L- \\ T- \end{pmatrix}$ DSG-01-***-*-60/6090	$\begin{pmatrix} S- \\ L- \\ T- \end{pmatrix}$ DSG-01-***-*-70/7090	Yes	357	<ul style="list-style-type: none"> <li>● High Pressure and High Flow</li> <li>● Low Pressure Drop</li> </ul>
1/8,3/8 Solenoid Controlled Pilot Operated Directional Valves	DSHG-01-***-*-13/1390 DSHG-03-***-*-13/1390	DSHG-01-***-*-14/1490 DSHG-03-***-*-14/1490	Yes	—	<ul style="list-style-type: none"> <li>● Pilot valve has been changed from DSG-01, 60 design to 70 design.</li> </ul>
1/2 Solenoid Controlled Pilot Operated Directional Valves	(S-) DSHG-04-***-*-51/5190	(S-) DSHG-04-***-*-52/5290	Yes	—	<ul style="list-style-type: none"> <li>● Pilot valve has been changed from DSG-01, 60 design to 70 design.</li> </ul>
3/4,1-1/4 Solenoid Controlled Pilot Operated Directional Valves	(S-) DSHG-06-***-*-52/5290 (S-) DSHG-10-***-*-42/4290	(S-) DSHG-06-***-*-53/5390 (S-) DSHG-10-***-*-43/4390	Yes	—	<ul style="list-style-type: none"> <li>● Pilot valve has been changed from DSG-01, 60 design to 70 design.</li> </ul>

■ Solenoid Operated / Solenoid Controlled Operated Directional Valves

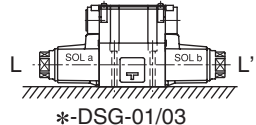
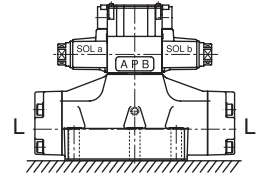
*WIDE RANGE OF MODELS – Choose the optimum valve to meet your needs from a largeselection available.*





## Instructions

### ● Mounting

DSG-005	No mounting restrictions for any model.	
* -DSG-01 * -DSG-03	No-spring detented models not energised continuously must be installed so that the spool axis L-L' is horizontal. Otherwise there is no mounting restrictions.	 <p style="text-align: center;">* -DSG-01/03</p>
DSHG-01 DSHG-03 (S-) DSHG-04 (S-) DSHG-06 (S-) DSHG-10	No-spring models not energised continuously must be installed so that the spool axis L-L' is horizontal. Otherwise there is no mounting restrictions.	 <p style="text-align: center;">* -DSHG</p>

### ● Energisation

#### 1. No-Spring Type

One of two solenoids should be energised continuously to avoid malfunction.

#### 2. On double solenoid valves do not energise both at the same time as it will result in coils burning out.

### ● Valve Tank Port

Avoid connecting the valve tank port to a line with possible surge pressure.

Piping end of tank line should be submerged in oil.

### ● Pilot Drain Port for Solenoid Controlled Pilot Operated Valve

Avoid connecting the valve pilot drain port to a line with possible surge pressure.

Piping end of drain should be submerged in oil.

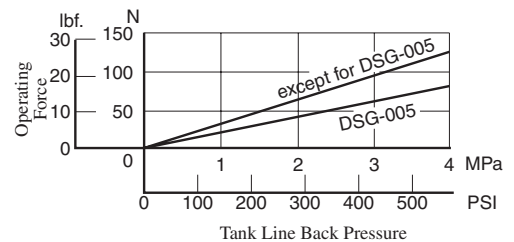
### ● Shockless Type

In order to benefit from a shockless operation, it is necessary to fill the tank line with operating oil.

Only after the tank line has been filled with operating oil should the valve be used on a regular basis.

### ● Operating Force by Manual Actuator

Take care as the operating force by the manual actuator increases in proportion to the tank line back pressure. (See the graph right.)



## Solenoid

#### ■ Solenoid connector (DIN connector)

The solenoid connector is in accordance with the international standard ISO 4400 (Fluid power systems and components-Three-pin electrical plug connectors-Characteristics and requirements).

#### ■ AC Solenoid

50-60 Hz common service solenoids do not require re-wiring when the applied frequency is changed.

#### ■ DC Solenoid (K-series Solenoid Operated Directional Valve)

These valves differ from conventional DC solenoid operated directional valves and have the following characteristics:

1. The spark between the relay contacts has been eliminated and therefore the valve can be operated by miniature relays.
2. The surge voltage is approximately 10 % of that normally experienced.
3. Time lag on de-energisation is reduced by approximately 50 %.

#### ■ R type Models with Current Rectifier and DC Solenoid

Specially designed DC solenoid and receptacle (or connector) containing AC-DC rectifier and transient peak suppressor are provided. Connection to be made to AC power source as with conventional AC solenoid. Remarkably high reliability and long life and other advantages including quiet valve operation. No overheating of coil due to the spool sticking and protection against transient voltage peaks are assured.

#### ■ RQ type Models with Current rectifier and Quick Return Solenoid

Valve characteristics are identical to R type except for the fast return time of the spool after deenergisation.

#### ■ Insulation Class of Solenoid

Model numbers	Insulation Class
DSG-005, DSG-01, S-DSG01 L-DSG-01, E-DSG-01, T-DSG-01 DSG-03, S-DSG-03, L-DSG-03 E-DSG-03, T-DSG-03 DSHG-01/03/04/06/10, S-DSHG-04/-06/10	Class H
G-DSG-01, G-DSG-03	Class F