E

DIRECTIONAL CONTROLS

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Directional Valves

These valves 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

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	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: Synthetic fluids not applicable with G-DSG and G-DSHG series valves.

2: For two types of manually operated directional valves, DMT-$\begin{matrix}06\\06*\end{matrix}$ and DMT-$\begin{matrix}10\\10*\end{matrix}$, 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.

4: For use with hydraulic fluids other than those listed above, please consult your Yuken representatives in advance.

Recommended Viscosity and Oil Temperature

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

Name	Viscosity	Oil Temperature	Contamination Degree
DSG-005 series Solenoid Operated Directional Valves DSG-007 series Solenoid Operated Directional Valves	20 - 200 mm²/s	−15 - +60°C	Within NAS Grade 11
Solenoid Operated Directional Valves (Except for DSG-005/007 Series) Solenoid Controlled Pilot Operated Directional Valves Manually Operated Directional Valves Mechanically Operated Directional Valves Poppet Type Solenoid Operated Directional Valves Shut-off Type Solenoid Operated Directional Valves Check Valves Pilot Controlled Check Valves In-Line Prefill Valves	15 - 400 mm²/s	−15 - +70°C	Within NAS Grade 12
G Series Shockless Type Solenoid Operated Directional Valves Shockless Type Solenoid Controlled Pilot Operated Directional Valves	15 - 200 mm²/s	−15 - +60°C	

Control of Contamination

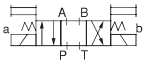
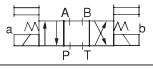
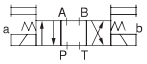
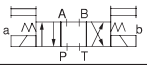
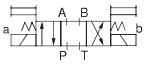
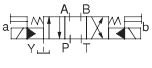
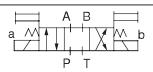
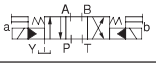
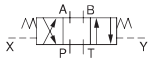
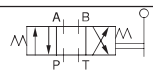
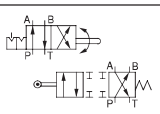
Due caution must be paid to maintaining control over contamination of the hydraulic fluids which may otherwise lead to breakdowns and shorter the life of the valve. Please maintain the degree of contamination above and use 25 μm or finer line filter (In case of DSG-005/007 series Solenoid Operated Directional Valves use 20 μm or finer line filter).

Water-Proof, Dust-Proof and Vibration-Resistance

Item	Standard	Type	Descriptions	Compliance					
				DSG-005 DSG-007	(L-/S-/T-)DSG-01 E-DSG-01 DSHG-01 DSHG-03 (S-)DSHG-04 (S-)DSHG-06 (S-)DSHG-10	(L-/S-/E-/T-)DSG-03	G-DSG-01 G-DSG-03 G-DSHG-04 G-DSHG-06	DSLG DSLHG DSP*	CDS*
Water-proof ★2	Current JIS F 8001 Water-proof test for marine electric appliance	Class 1 water spray	Drip-proof construction	○	○	○	○	○	○
		Class 2 water spray	Froth-proof construction	×	○	○	○	○	○
	JIS D 0203 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.	×	○	○	○	○	○
	International Electrotechnical Commission (I.E.C) Pub. 529 JIS C 0920 Water-proof test for electromechanical parts and protection level against the ingress of solid objects	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.	×	○	×	×	○ ★3	×
Dust-proof ★2	International Electrotechnical Commission (I.E.C) Pub. 529 JIS C 0920 Water-proof test for electromechanical parts and protection level against the ingress of solid objects	Protection Class 6	Fully protected from entry of dust.	○	○	○	○	○	○
Vibration-resistance	JIS C 0911 Vibration test for small electric appliances	Resonace test (IC)	Vibration range: 7-59.5 Hz Duplex amplitude: 0.1 m	×	○	○	○	○	○
		Fixed frequency resistance test (IIC)	Frequency: 20 Hz — Grade 1: duplex amplitude-0.5 mm	×	○	○	○	○	○
			Frequency: 20 Hz — Grade 2: duplex amplitude-1.2 mm	×	○ ★1	○ ★1	○ ★1	○	○
			Frequency: 20 Hz — Grade 3: duplex amplitude-1.8 mm	×	○ ★1	○ ★1	○ ★1	○	○
			Frequency: 20 Hz — Grade 4: duplex amplitude-2.4 mm	×	○ ★1	○ ★1	○ ★1	○	○
		Variable frequency resistance test (IIIC)	Frequency range: 7-59.5 Hz — Grade 1: duplex amplitude-0.3 mm	×	○ ★1	○ ★1	○ ★1	○	○
			Frequency range: 7-59.5 Hz — Grade 2: duplex amplitude-0.5 mm	×	○ ★1	○ ★1	○ ★1	○	×
			Frequency range: 7-59.5 Hz — Grade 3: duplex amplitude-0.75 mm	×	○ ★1	○ ★1	○ ★1	○	×
	JIS D 1601 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 high vibration.	×	○	○	○	○	×
			Grade B: Parts mounted on spring of body or chassis having relatively high vibration.	×	○	○	○	○	×
			Grade C: Parts mounted on spring of body or chassis having relatively low vibration.	×	○	○	×	○	×

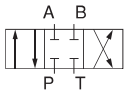
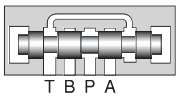
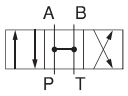
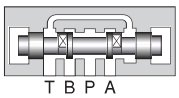
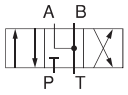
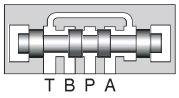
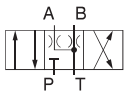
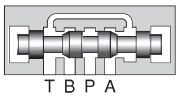
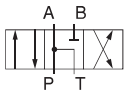
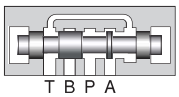
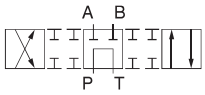
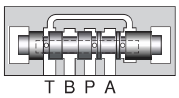
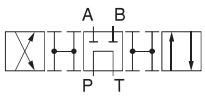
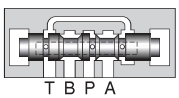
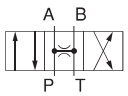
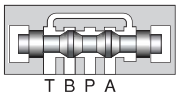
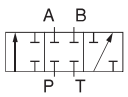
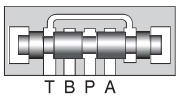
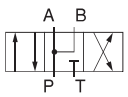
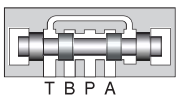
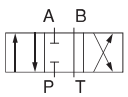
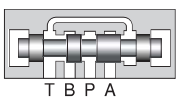
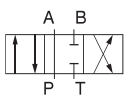
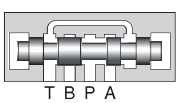
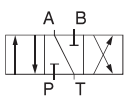
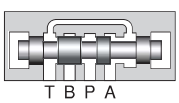
★1. No-spring detented type (2D*) and No-spring type (2N*) can be used when energised continous for position holding.
★2. For outdoor use, protect equipment with a cover, etc., to prevent direct exposure to water.
For the terminal-box type connecting port for electric wire tube, use each standard tube and make bushing construction.
★3. DSP*-01 can be used.

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	Max. Flow L/min (1 2 5 10 20 50 100 200 500 1000 2000 5000)	Page
Solenoid Operated Directional Valves		25	DSG-005	E-10
		25	DSG-007	E-16
		16	L-DSG-01	E-22
		25	S-DSG-01	
		35	DSG-01	
		16	L-DSG-03	E-37
		25	S-DSG-03	
		31.5	DSG-03	
Low Wattage (5W) Type Solenoid Operated Directional Valves		16	E-DSG-01 E-DSG-03	E-53
Electronic Relay Incorporated Solenoid Operated Directional Valves		25	T-S-DSG-01	E-62
		35	T-DSG-01	
		25	T-S-DSG-03	E-62
		31.5	T-DSG-03	
Explosion Proof (Flameproof) Type Solenoid Operated Directional Valves		31.5	DSG-01-***-**X* DSG-03-***-**X*	E-66
Explosion Proof (Increased Safety) Type Solenoid Operated Directional Valves		31.5	DSG-01-***-**Y* DSG-03-***-**Y*	E-68
Solenoid Controlled Pilot Operated Directional Valves		21	DSHG-01	E-69
		25	DSHG-03	
		31.5	DSHG-04/S-DSHG-04 DSHG-06/S-DSHG-06 DSHG-10/S-DSHG-10	
G Series Shockless Type Solenoid Operated Directional Valves		25	G-DSG-01 G-DSG-03	E-94
G Series Shockless Type Solenoid Controlled Pilot Operated Directional Valves		25	G-DSHG-04 G-DSHG-06	E-94
Pilot Operated Directional Valves		31.5	DHG-04 06 10	E-97
Manually Operated Directional Valves		21	Thread Connection (DMT) 03 06 10	E-98
		31.5	Sub-plate Connection (DMG) 01 03 04 06 10	
Mechanically Operated Directional Valves		7	Rotary (DR^{T}_{G}) 02	E-99
		25	Cam Operated (DC^{T}_{G}) 01 03	

Spool Types

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

Spool Types	Graphic Symbols	Schematic Drawing (Center Position)	Functions and Applications
"2" Closed Center 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.
"3" Open Center 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.
"4" Open Center A, B&T			Pump pressure is held and actuator is floating 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".
"40" Open Center 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.
"5" Open Center P, A&T			It can be used when a pump is unloading at neutral and actuator is halted at one way flow.
"6" Open Center P&T (Closed Crossover)			Pump is unloading and actuator position held at neutral. Suitable for series operation.
"60" Open Center P&T (Open Crossover)			It is a variation of spool type "6". Shock is reduced as each port is released to tank on transit.
"7" Open Center All Ports Restricted Flow			Mainly used as a 2-position type. Shock is reduced on transit.
"8" 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.
"9" Open Center P, A&B			Regenerative circuit is provided at neutral.
"10" Open Center B&T			Prevent actuator from one direction drift by leakage of P port at neutral.
"11" Open Center P&A			Halt actuator movement positively at B, T ports blocked P, A ports connected at neutral.
"12" Open Center 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
DSG–007	ISO 4401–02–01–0–05
(L–/S–/E–/HE–/T–/G–) DSG–01 DSHG–01 DMG–01 DCG–01	ISO 4401–03–02–0–05
(L–/S–/E–/T–/G–) DSG–03 DMG–03 DCG–03	ISO 4401–05–04–0–05
DSHG–03	ISO 4401–05–05–0–05
(S–/G–) DSHG–04 DHG–04 DMG–04	ISO 4401–07–07–0–05
(S–/G–) DSHG–06 DHG–06 DMG–06	ISO 4401–08–08–0–05
(S–) DSHG–10 DHG–10 DMG–10	ISO 4401–10–09–0–05

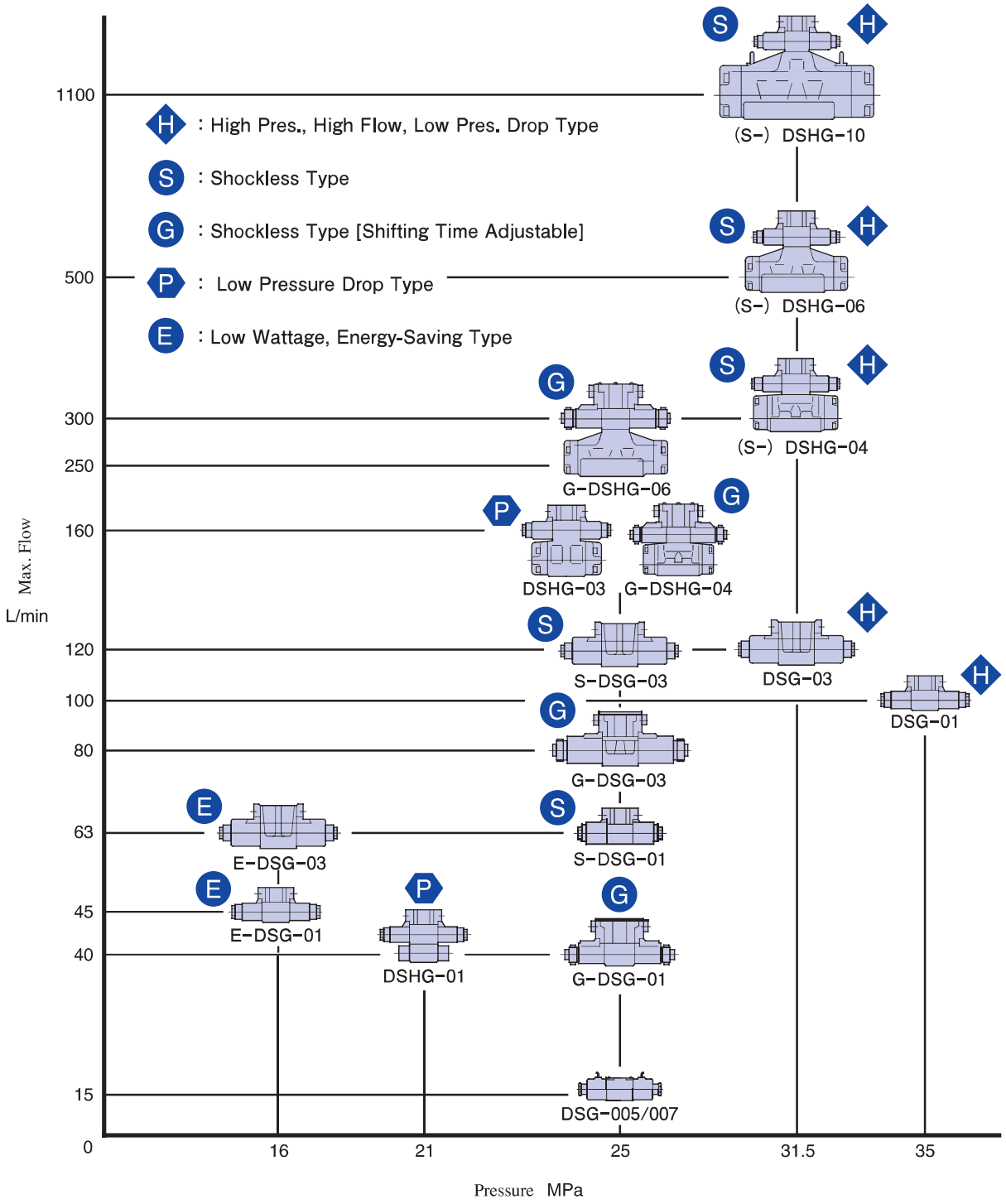
Note: Mounting surface of DSG-005 is YUKEN original standard.

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.

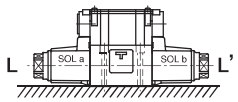
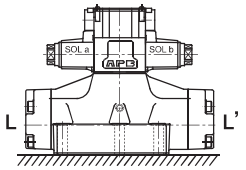
Name	Model Numbers		Interchangeability in Installation	Related Page	Major Changes
	Currrent	New			
DSG–005 Series Solenoid Operated Directional Valves	DSG-005-＊＊＊-＊-30	DSG–005–＊＊＊–＊–40 DSG–005–＊＊＊–＊–$^{N}_{N1}$–40	Yes	—	● High Flow ● Low Pressure Drop ● Din-connector type solenoid in addition
DSG–01 Series Solenoid Operated Directional Valves	$\binom{S-}{T-}$ DSG-01-＊＊＊-＊-60	$\binom{S-}{T-}$ DSG-01-＊＊＊-＊-70	Yes	E-32	● High Pressure ● High Flow ● High Max. T-Line Back Pressure ● Low Pressure Drop ● Small Mass
Low Wattage (5W) Type Solenoid Operated Directional Valves	E-DSG-01-＊＊＊-＊-60	E-DSG-01-＊＊＊-＊-70	Yes	E-61	● High Flow
Explosion Proof (Flameproof) Type Solenoid Operated Directional Valves	DSG-01-＊＊＊-＊X＊-50	DSG-01-＊＊＊-＊X＊-70	Yes	E-67	● Change Cable Lead-in Port ● High Pressure ● High Flow
Solenoid Controlled Pilot Operated Directional Valves	DSHG-01-＊＊＊-＊-13 DSHG-03-＊＊＊-＊-13 (S-) DSHG-04-＊＊＊-＊-51 (S-) DSHG-06-＊＊＊-＊-52 (S-) DSHG-10-＊＊＊-＊-42	DSHG-01-＊＊＊-＊-14 DSHG-03-＊＊＊-＊-14 (S-) DSHG-04-＊＊＊-＊-52 (S-) DSHG-06-＊＊＊-＊-53 (S-) DSHG-10-＊＊＊-＊-43	Yes	—	● Pilot valve has been changed from DSG-01, 60 design to 70 design.
G Series Shockless Type Solenoid Operated Directional Valves	G-DSG-01-＊-＊＊＊-＊-50 G-DSG-03-＊-＊＊＊-＊-50 G-DSHG-04-3C＊-＊-＊-＊-50 G-DSHG-06-3C＊-＊-＊-＊-50	G-DSG-01-＊-＊＊＊-＊-51 G-DSG-03-＊-＊＊＊-＊-51 G-DSHG-04-3C＊-＊-＊-＊-51 G-DSHG-06-3C＊-＊-＊-＊-51	Yes	E-96	● Use Digital Control Amplifier

Wide Range of Models – Choose the optimum valve to meet your needs from a large selection available.



Instructions

Mounting

DSG–005 DSG–007	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.	 ✻-DSG-01/03
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.	 ✻-DSHG

Energisation

1. On double solenoid valves do not energise both at the same time as it will result in coils burning out.
2. If use No-Spring Type, one of two solenoids should be energised continuously to avoid malfunction.

Valve Tank Port 《Solenoid Operated / Solenoid Controlled Pilot Operated Directional Valves (Internal Drain Type)》

Avoid connecting the valve tank port to a line with possible surge pressure.
Solenoid Operated Directional Valve is wet type, so piping have to constantly fill the tank line with operating oil.
Piping end of tank line should be submerged in oil.

Pilot Drain Port for Solenoid Controlled Pilot Operated Directional Valve

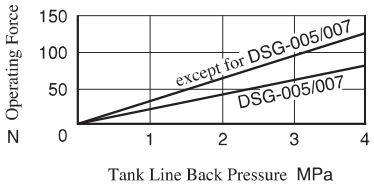
Avoid connecting the valve pilot drain port to a line with possible surge pressure.
Solenoid Controlled Pilot Operated Directional Valve is wet type, so piping have to constantly fill the Pilot Operated Directional valve with operating oil.

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 rewiring when the applied frequency is changed.

DC Solenoid

DC Solenoid is K-series with good reputation.

★Three Characteristics of K-series★

1. Avoid malfunction of computers.
   (The surge voltage is low, so these valves do not give bad influences like noise to electronic devices)
2. The relays last for long time.
   (The spark between the relay contacts has been eliminated and therefore drastically decrease damages of contacts)
3. Time lag on de-energisation is reduced.

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–007 (S–/E–/T–) DSG–01 DSG–03, S–DSG–03, E–DSG–03, T–DSG–03 DSHG–01/03/04/06/10 S–DSHG–04/06/10	Class H

DSG-005 Series Solenoid Operated Directional Valves

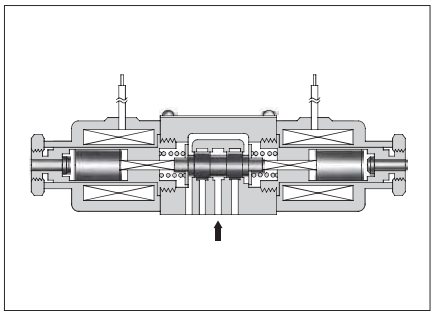
These DSG-005 series solenoid directional valves are the products newly developed as a “Mini-series”.
The valves are much more compactly manufactured but enjoy a maximum operating pressure of 25 MPa and a maximum flow rate of 15 L/min, while contributing further to a space saving requirement.
Moreover, using wet armature solenoids, the valves ensure the long life and low noise.



Flying Lead Wire Type



Plug-in Connector Type



Specifications

Model Numbers	Max. Flow★ L/min	Max. Operating Pressure MPa	Max. Tank-Line Back Pressure MPa	Max. Changeover Frequency min⁻¹	Approx. Mass kg
DSG–005–3C＊–＊–40	15	25	7	120	0.5
DSG–005–2B＊–＊–40					0.4

★ The maximum flow means the limited flow without inducing any abnormality to the operation (changeover) of the valve.
The maximum flow differs according to the type and operating conditions. For details, please refer to the “List of Standard Models and The Maximum Flow” on page E-12.

Solenoid Ratings

Electric Source	Coil Type	Frequency (Hz)	Voltage (V)		Current & Power at Rated Voltage		
			Source Rating	Serviceable Range	Inrush★1 (A)	Holding (A)	Power (W)
AC	A 100	50	100	80 – 110	0.36	0.16	–
		60		90 – 120	0.34	0.11	
	A 200	50	200	160 – 220	0.18	0.08	
		60		180 – 240	0.17	0.05	
DC★2	D12	–	12	10.8 – 13.2	–	1.2	15
	D24		24	21.6 – 26.4		0.6	

★1. Inrush current in the above table shows rms values at maximum stroke.
★2. The Plug-in Connector Type DC solenoid has a built-in surge absorber.
The Flying Lead Wire type has no surge absorber equipped. Install a surge absorber separately.

Model Number Designation

DSG	–005	–3	C	2	–D24	–N	–40
Series Number	Valve Size	Number of Valve Positions	Spool-Spring Arrangement	Spool Type	Coil Type	Electrical Conduit Connection	Design Number
DSG : Solenoid Operated Directional Valve (Sub-plate Mount Type)	005	3	C: Spring Centered	2, 3 40	AC A100 A200 DC D12 D24	None : Flying Lead Wire Type N : Plug-in Connector Type N1: Plug-in Connector with Indicator Light	40
		2	B: Spring Offset	2, 3			

Note: Models for phosphate ester fluid are available. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

Sub-plates

Sub-plate Model Numbers	Thread Size Rc	Approx. Mass kg
DSGM–005X–20	1/8	0.8
DSGM–005Y–20	1/4	

● Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. ($\frac{1.6}{\nabla}$)
And the port hole diameter should below 4.3 Dia..

Accessories

Mounting Bolts	Tightening Torque
Soc. Hd. Cap Screw : M4×35L…4Pcs.	2.5 - 3.5 Nm

Electrical Conduit Connection

The solenoid common use 50 & 60 Hz, so no need to change connection by difference of frequency.
The solenoid polarity is irrelevant with connection.

Typical Changeover Time (Example)

Changeover time varies according to oil viscosity, spool type and hydraulic circuit.

[Test Conditions]

Pressure : 16 MPa

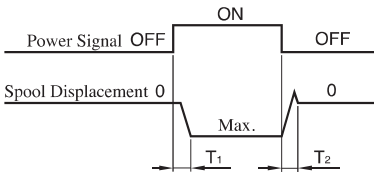
Flow Rate : 7.5 L/min

Viscosity : 30 mm²/s

Voltage : Rated Voltage (After coil temperature rise and saturated)

Direction of Flow : P ⇄ A → B ⇄ T, P ⇄ B → A ⇄ T

[Result of Measurement]



Model Numbers	Time ms	
	T1	T2
DSG–005–3C2–A＊	16	60
DSG–005–3C2–D＊	23	40
DSG–005–2B2–A＊	14	45
DSG–005–2B2–D＊	15	33

List of Standard Models

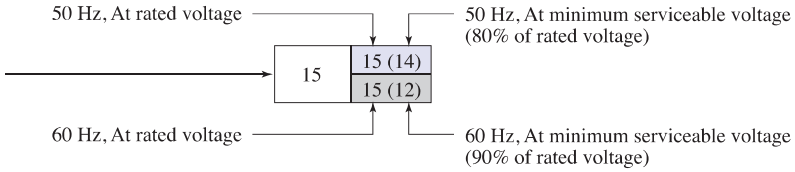
Models with AC Solenoids : DSG-005-＊＊＊-A＊

No. of Valve Positions	Spool-Spring Arrangement	Model Numbers	Graphic Symbols	Max. Flow L/min											
				P→A, B→A, B→T				P → A [Port "B" Blocked]				P → B [Port "A" Blocked]			
				Working Pressure MPa				Working Pressure MPa				Working Pressure MPa			
				5	10	16	25	5	10	16	25	5	10	16	25
Three Positions	Spring Centered	DSG-005-3C2		15	15	15	15	15 (14) 15 (12)	15 (7) 12 (3)	12 (3) 5 (1)	4 (0.5) 1 (0.5)	15 (14) 15 (12)	15 (7) 12 (3)	12 (3) 5 (1)	4 (0.5) 1 (0.5)
		DSG-005-3C3		12	12	12	12	15	15	15	15	15	15	15	15
		DSG-005-3C40		15	15	15	15	15 (14) 15 (10)	15 (6) 12 (5)	12 (2) 5 (2)	4 (0.5) 1 (0.5)	15 (14) 15 (10)	15 (6) 12 (5)	12 (2) 5 (2)	4 (0.5) 1 (0.5)
Two Positions	Spring Offset	DSG-005-2B2		14	14	14	14	2	1	1	1	15 (14) 15 (14)	15 (10) 14 (9)	13 (5) 8 (4)	6 (0.5) 4 (0.5)
		DSG-005-2B3		13.5	13.5	13.5	13.5	3	3	3	3	15	15 (14) 15 (14)	15 (11) 15 (11)	15 (9) 15 (9)

Notes: The relation between the maximum flow in the table above and the frequency/voltage (within the serviceable voltage) is as shown below.

(Example)

The maximum flow rate is constant regardless of 50 Hz or 60 Hz and of any voltage variants within the serviceable voltage



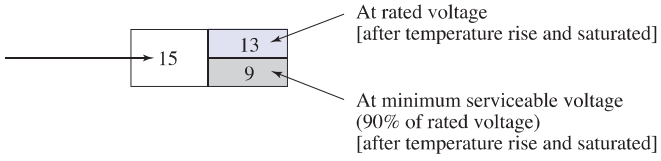
Models with DC Solenoids : DSG-005-＊＊＊-D＊

No. of Valve Positions	Spool-Spring Arrangement	Model Numbers	Graphic Symbols	Max. Flow L/min											
				P→A, B→A, B→T				P → A [Port "B" Blocked]				P → B [Port "A" Blocked]			
				Working Pressure MPa				Working Pressure MPa				Working Pressure MPa			
				5	10	16	25	5	10	16	25	5	10	16	25
Three Positions	Spring Centered	DSG-005-3C2		15	15	15	15	15 12	8 5	5 3	3 2	15 12	8 5	5 3	3 2
		DSG-005-3C3		15	15	15	15	15	15	15	15	15	15	15	15
		DSG-005-3C40		15	15	15	15	15	13 9	8 5.5	5 3.5	15	13 9	8 5.5	5 3.5
Two Positions	Spring Offset	DSG-005-2B2		14	14	14	14	8.5	4.5	6.5	6.5	15	15 11	11 7.5	9 5.5
		DSG-005-2B3		13.5	13.5	13.5	13.5	8	7	8	9	15	15	15	13.5 10.5

Notes: The relation between the maximum flow in the table above and the voltage (within the serviceable voltage) is as shown below.

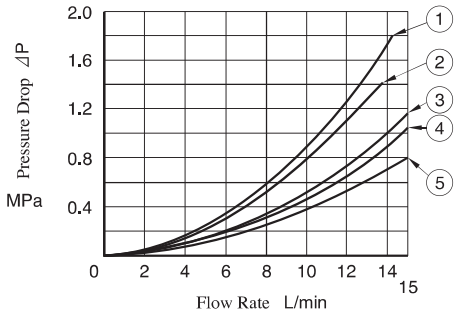
(Example)

The maximum flow rate is constant regardless of any voltage variants within the serviceable voltage



Pressure Drop

Pressure drop curves based on viscosity of 30 mm²/s and specific gravity of 0.850.



Model Numbers	Pressure Drop Curve Numbers				
	P→A	B→T	P→B	A→T	P→T
DSG-005-3C2	④	④	④	④	—
DSG-005-3C3	⑤	⑤	⑤	⑤	③
DSG-005-3C40	④	④	④	④	—
DSG-005-2B2	①	①	④	④	—
DSG-005-2B3	②	②	④	④	—

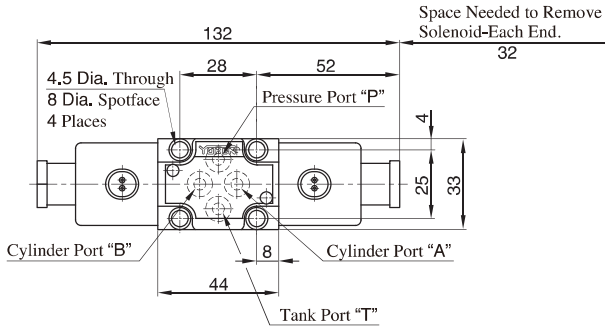
● For any other viscosity, multiply the factors in the table below.

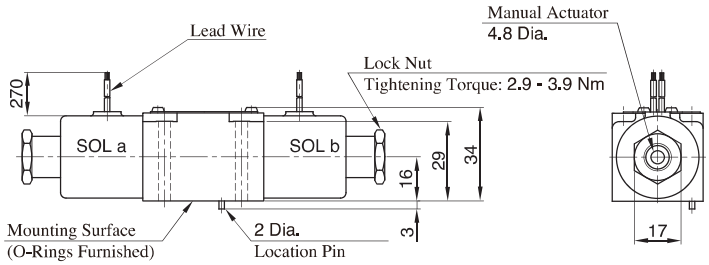
Viscosity mm²/s	15	20	30	40	50	60	70	80	90	100
Factor	0.84	0.91	1.00	1.07	1.14	1.19	1.24	1.28	1.32	1.35

● For any other specific gravity (G'), the pressure drop (ΔP) may be obtained from the formula below.
ΔP' = ΔP (G'/0.850)

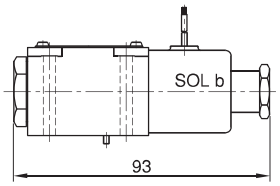
Flying Lead Wire Type

● Spring Centered : DSG-005-3C*-A*/D*





● Spring Offset : DSG-005-2B*-A*/D*

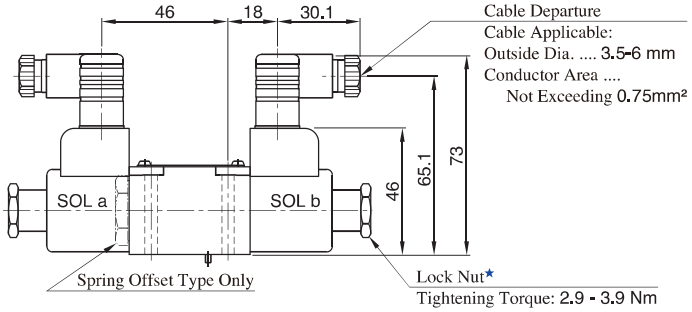


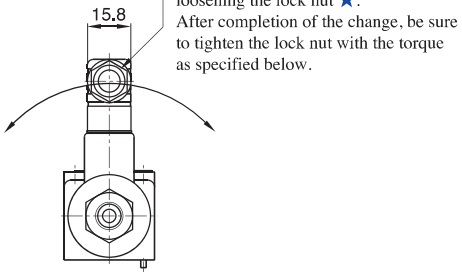
● For other dimensions, refer to "Spring Centered" type.

DIN Connector Type / DIN Connector with Indicator Light

● Spring Centered : DSG-005-3C*-A*/D*-N/N1

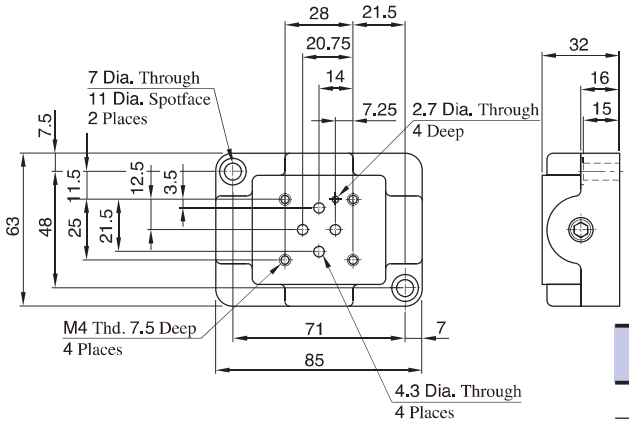
● Spring Offset : DSG-005-2B*-A*/D*-N/N1

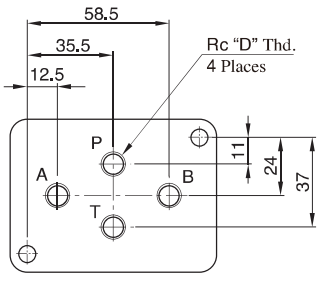




● For other dimensions, refer to "Flying Lead Wire Type".

Sub-plate : DSGM-005X, 005Y



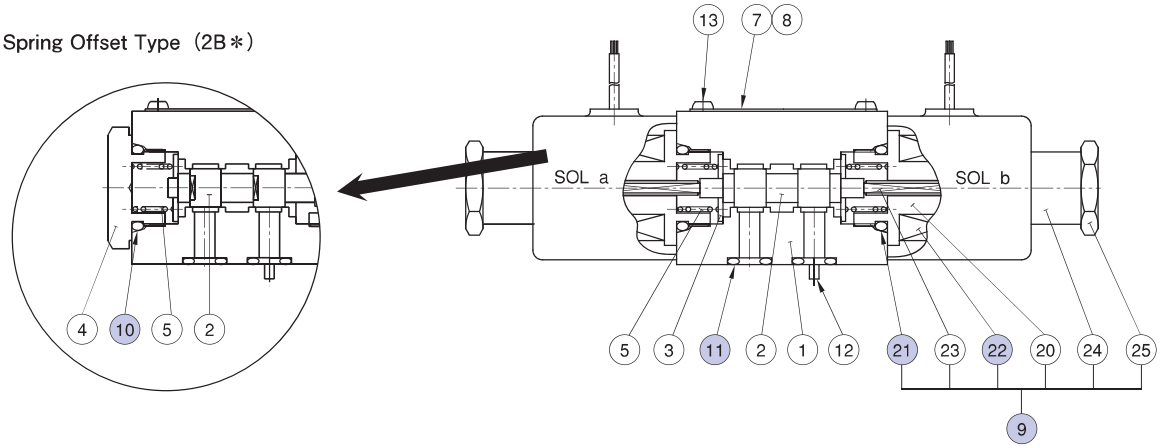


Sub-plate Model Numbers	D	Approx. Mass kg
DSGM-005X-20	1/8	0.8
DSGM-005Y-20	1/4	

List of Seals, Solenoid Ass'y

DSG-005

Spring Offset Type (2B*)



● List of Seals

Item	Name of Parts	Part Numbers	Qty.		Remarks
			3C*	2B*	
10	O-Ring	OR NBR-90 P14-N	—	1	
11	O-Ring	OR NBR-90 P6-N	4	4	
21	O-Ring	OR NBR-90 P14-N	2	1	Included in Solenoid Ass'y ⑨

■ Solenoid Ass'y, Coil Ass'y No.

Valve Model Numbers	⑨Solenoid Ass'y No.	㉒ Coil Ass' y No.	Remarks
DSG-005-* * *-A100	SA05-100-40	C-SA05-100-40	Flying Lead Wire Type
DSG-005-* * *-A200	SA05-200-40	C-SA05-200-40	
DSG-005-* * *-D12	SD05-12-40	C-SD05-12-40	
DSG-005-* * *-D24	SD05-24-40	C-SD05-24-40	
DSG-005-* * *-A100-N/N1	SA05-100-N-40	C-SA05-100-N-40	Plug-in Connector Type /Plug-in Connector with Indicator Light
DSG-005-* * *-A200-N/N1	SA05-200-N-40	C-SA05-200-N-40	
DSG-005-* * *-D 12-N/N1	SD05- 12-N-40	C-SD05- 12-N-40	
DSG-005-* * *-D 24-N/N1	SD05- 24-N-40	C-SD05- 24-N-40	

DSG-007 Series Solenoid Operated Directional Valves

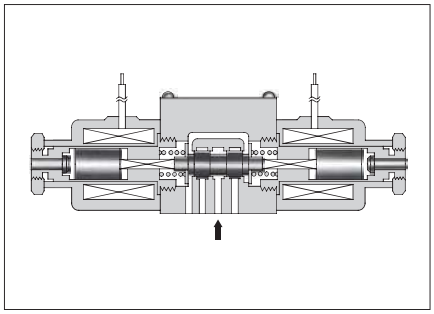
These DSG-007 series solenoid directional valves are the products based on the DSG-005 series and mounting surface dimensions are suit for ISO standard.
The valves are much more compactly manufactured but enjoy a maximum operating pressure of 25 MPa and a maximum flow rate of 15 L/min, while contributing further to a space saving requirement.
Moreover, using wet armature solenoids, the valves ensure the long life and low noise.



Flying Lead Wire Type



Plug-in Connector Type



Specifications

Model Numbers	Max. Flow★ L/min	Max. Operating Pressure MPa	Max. Tank-Line Back Pressure MPa	Max. Changeover Frequency min^{-1}	Approx. Mass kg
DSG–007–3C＊–＊–10	15	25	7	120	0.7
DSG–007–2B＊–＊–10					0.57

★ The maximum flow means the limited flow without inducing any abnormality to the operation (changeover) of the valve.
The maximum flow differs according to the type and operating conditions. For details, please refer to the “List of Standard Models and Maximum Flow” on pages E-18 to E-19.

Solenoid Ratings

Electric Source	Coil Type	Frequency (Hz)	Voltage (V)		Current & Power at Rated Voltage		
			Source Rating	Serviceable Range	Inrush★1 (A)	Holding (A)	Power (W)
AC	A 100	50	100	80 - 110	0.36	0.16	—
		60		90 - 120	0.34	0.11	
	A 200	50	200	160 - 220	0.18	0.08	
		60		180 - 240	0.17	0.05	
DC★2	D12	—	12	10.8 - 13.2	—	1.2	15
	D24		24	21.6 - 26.4		0.6	

★ 1. Inrush current in the above table shows rms values at maximum stroke.
★ 2. The Plug-in Connector Type DC solenoid has a built-in surge absorber.
The Flying Lead Wire type has no surge absorber equipped. Install a surge absorber separately.

Model Number Designation

DSG	–007	–3	C	2	–D24	–N	–10
Series Number	Valve Size	Number of Valve Positions	Spool-Spring Arrangement	Spool Type	Coil Type	Electrical Conduit Connection	Design Number
DSG : Solenoid Operated Directional Valve (Sub-plate Mount Type)	007	3	C : Spring Centered	2, 3 4, 40	AC A100 A200 DC D12 D24	None: Flying Lead Wire Type N: Plug-in Connector Type N1: Plug-in Connector with Indicator Light	10
		2	B : Spring Offset	2, 3, 8			

Note: Models for phosphate ester fluid are available. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

Sub-plates

Sub-plate Model Numbers	Thread Size Rc	Approx. Mass kg
DSGM–007X–10	1/8	0.8
DSGM–007Y–10	1/4	

● Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. (▽6)
And the port hole diameter should below 4.3 Dia..

Accessories

Mounting Bolts	Tightening Torque
Soc. Hd. Cap Screw : M5×40L···4Pcs.	5.0 - 7.0 Nm

Electrical Conduit Connection

The solenoid common use 50 & 60 Hz, so no need to change connection by difference of frequency.
The solenoid polarity is irrelevant with connection.

Typical Changeover Time (Example)

Changeover time varies according to oil viscosity, spool type and hydraulic circuit.

[Test Conditions]

Pressure : 16 MPa

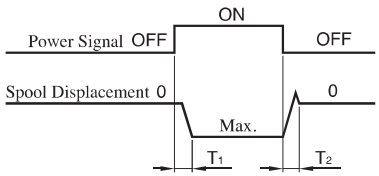
Flow Rate : 7.5 L/min

Viscosity : 30 mm²/s

Voltage : Rated Voltage (After coil temperature rise and saturated)

Direction of Flow : P → A → B → T, P → B → A → T

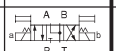
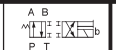
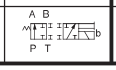
[Result of Measurement]



Model Numbers	Time ms	
	T1	T2
DSG–007–3C2–A✻	16	60
DSG–007–3C2–D✻	23	40
DSG–007–2B2–A✻	14	45
DSG–007–2B2–D✻	15	33

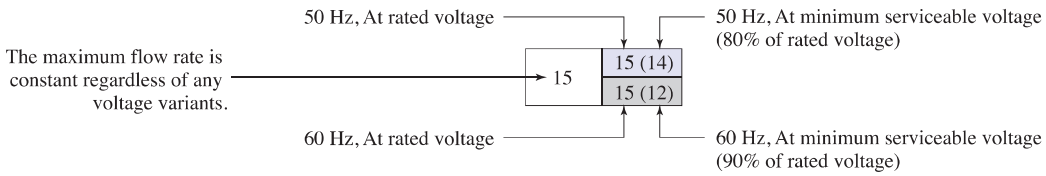
List of Standard Models

Models with AC Solenoids : DSG-007-＊＊＊-A＊

No. of Valve Positions	Spool-Spring Arrangement	Model Numbers	Graphic Symbols	Max. Flow L/min: P → A, B → T				P → A [Port "B" Blocked]				P → B [Port "A" Blocked]			
				Working Pressure MPa				Working Pressure MPa				Working Pressure MPa			
				5	10	16	25	5	10	16	25	5	10	16	25
Three Positions	Spring Centered	DSG–007–3C2		15	15	15	15	15(14)	15(7)	12(3)	4(0.5)	15(14)	15(7)	12(3)	4(0.5)
								15(12)	12(3)	5(1)	1(0.5)	15(12)	12(3)	5(1)	1(0.5)
		DSG–007–3C3		12	12	12	12	15	15	15	15	15	15	15	15
		DSG–007–3C4		13	13	13(6)	8(2)	15(14)	15(6)	12(2)	4(0.5)	15(14)	15(6)	12(2)	4(0.5)
						9(4)	4(1)	15(10)	12(5)	5(2)	1(0.5)	15(10)	12(5)	5(2)	1(0.5)
		DSG–007–3C40		15	15	15	15	15(14)	15(6)	12(2)	4(0.5)	15(14)	15(6)	12(2)	4(0.5)
								15(10)	12(5)	5(2)	1(0.5)	15(10)	12(5)	5(2)	1(0.5)
Two Positions	Spring Offset	DSG–007–2B2		14	14	14	14	2	1	1	1	15(14)	15(10)	13(5)	6(0.5)
												15(14)	14(9)	8(4)	4(0.5)
		DSG–007–2B3		13.5	13.5	13.5	13.5	3	3	3	3	15	15(14)	15(11)	15(9)
													15(14)	15(11)	15(9)
		DSG–007–2B8		—	—	—	—	3	1	1	0.5	15(5)	14(1)	6(0.5)	2(0.5)
												14(5)	3(1)	1(0.5)	1(0.5)

Notes: The table above based on viscosity of 30mm²/s.
The relation between the maximum flow and the voltage (within the serviceable voltage) is as shown below.

(Example)



● Models with DC Solenoids : DSG-007-＊＊＊-D＊

No. of Valve Positions	Spool-Spring Arrangement	Model Numbers	Graphic Symbols	Max. Flow L/min											
				P→A, B→T, P→B, B→A				P → A [Port "B" Blocked]				P → B [Port "A" Blocked]			
				Working Pressure MPa				Working Pressure MPa				Working Pressure MPa			
				5	10	16	25	5	10	16	25	5	10	16	25
Three Positions	Spring Centered	DSG-007-3C2		15	15	15	15	15	8	5	3	15	8	5	3
								12	5	3	2	12	5	3	2
		DSG-007-3C3		15	15	15	15	15	15	15	15	15	15	15	15
		DSG-007-3C4		15	15	8.5	4.5	15	9.5	5.5	3.5	15	9.5	5.5	3.5
					7.5	3.5	2	14.5	6	3.5	2	14.5	6	3.5	2
		DSG-007-3C40		15	15	15	15	15	13	8	5	15	13	8	5
									9	5.5	3.5		9	5.5	3.5
Two Positions	Spring Offset	DSG-007-2B2		14	14	14	14	8.5	4.5	6.5	6.5	15	15	11	9
													11	7.5	5.5
		DSG-007-2B3		13.5	13.5	13.5	13.5	8	7	8	9	15	15	15	13.5
															10.5
		DSG-007-2B8		—	—	—	—	15	3.5	2	1.5	15	4	2.5	2
												9	3	1.5	1.5

Notes: The table above based on viscosity of 30mm²/s.
The relation between the maximum flow and the voltage (within the serviceable voltage) is as shown below.

(Example)

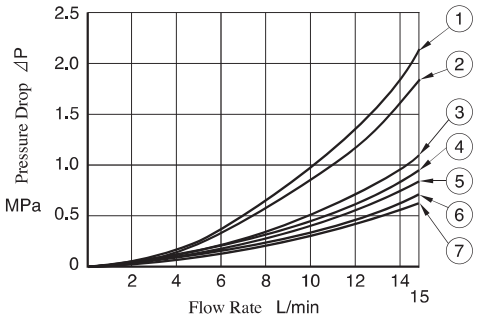
The maximum flow rate is constant regardless of any voltage variants → 15

15 — At rated voltage [after temperature rise and saturated]

12 — At minimum serviceable voltage (90% of rated voltage) [after temperature rise and saturated]

■ Pressure Drop

Pressure drop curves based on viscosity of 30 mm²/s and specific gravity of 0.850.



Model Numbers	Pressure Drop Curve Numbers				
	P→A	B→T	P→B	A→T	P→T
DSG-007-3C2	⑤	⑤	⑤	⑤	—
DSG-007-3C3	⑥	⑥	⑥	⑥	③
DSG-007-3C4	⑤	⑦	⑤	⑦	—
DSG-007-3C40	⑤	⑤	⑤	⑤	—
DSG-007-2B2	①	①	④	④	—
DSG-007-2B3	②	②	⑤	⑥	—
DSG-007-2B8	⑤	—	④	—	—

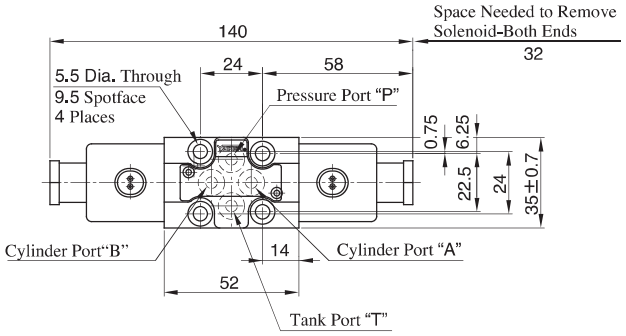
● For any other viscosity, multiply the factors in the table below.

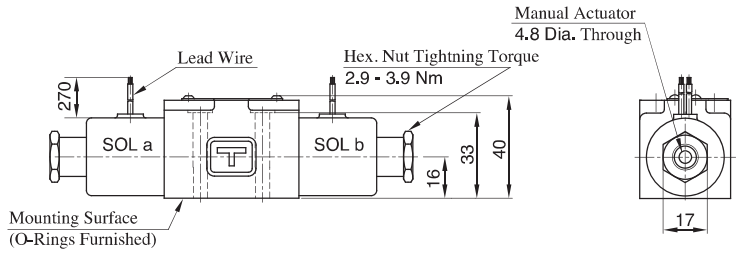
Viscosity mm²/s	15	20	30	40	50	60	70	80	90	100
Factor	0.84	0.91	1.00	1.07	1.14	1.19	1.24	1.28	1.32	1.35

● For any other specific gravity (G'), the pressure drop (ΔP) may be obtained from the formula below.
ΔP' = ΔP (G'/0.850)

Flying Lead Wire Type

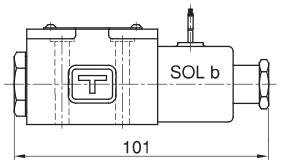
● Spring Centered : **DSG-007-3C＊-A＊/D＊**





Mounting Surface : ISO 4401-02-01-05

● Spring Offset : **DSG-007-2B＊-A＊/D＊**

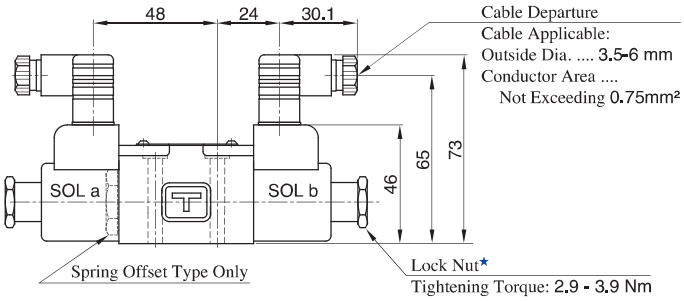


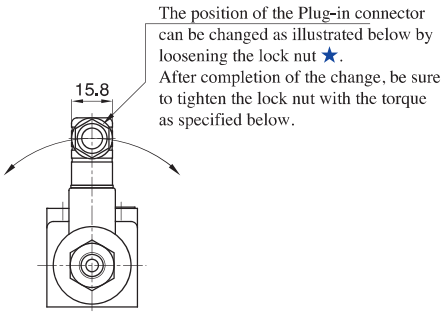
●For other dimensions, refer to "Spring Centered" type.

DIN Connector Type / DIN Connector with Indicator Light

● Spring Centered : **DSG-007-3C＊-A＊/D＊-N/N1**

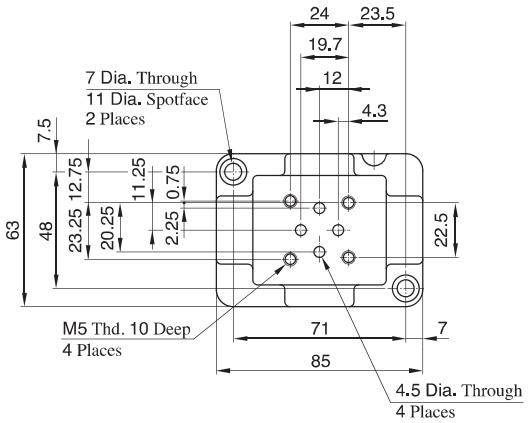
● Spring Offset : **DSG-007-2B＊-A＊/D＊-N/N1**

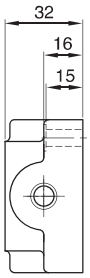


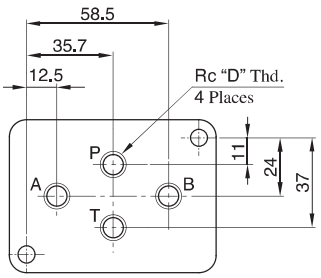


●For other dimensions, refer to "Flying Lead Wire Type".

Sub-plate : DSGM-007X, 007Y





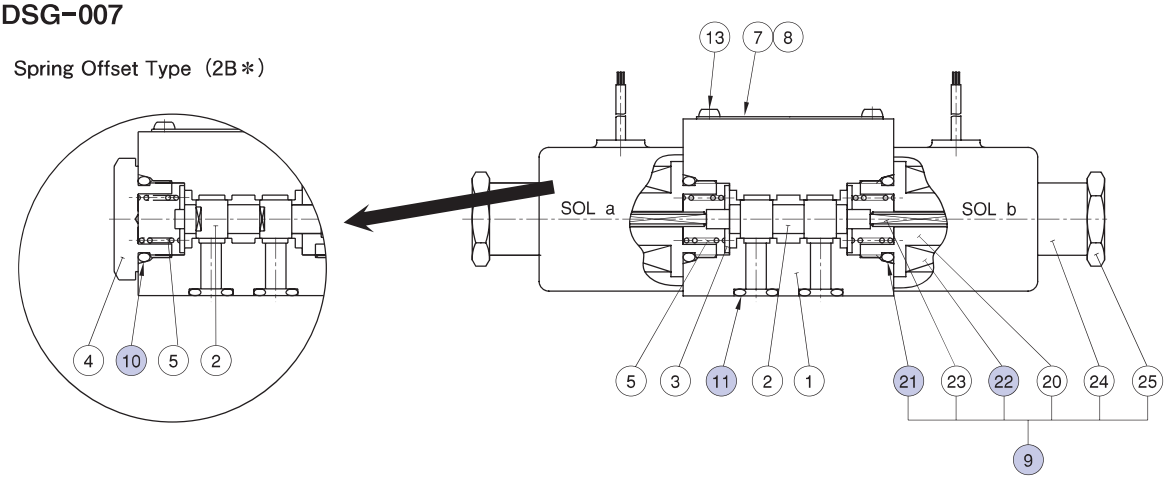


Sub-plate Model Numbers	D	Approx. Mass kg
DSGM-007X-10	1/8	0.8
DSGM-007Y-10	1/4	

List of Seals, Solenoid Ass'y

DSG-007

Spring Offset Type (2B*)



● List of Seals

Item	Name of Parts	Part Numbers	Qty.		Remarks
			3C*	2B*	
10	O-Ring	OR NBR-90 P14-N	—	1	
11	O-Ring	OR NBR-90 P7-N	4	4	
21	O-Ring	OR NBR-90 P14-N	2	1	Included in Solenoid Ass'y ⑨

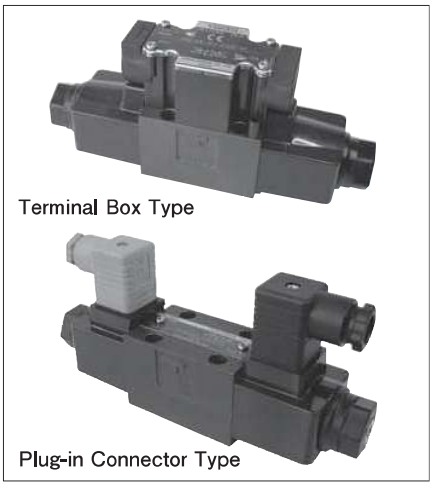
■ Solenoid Ass'y, Coil Ass'y No.

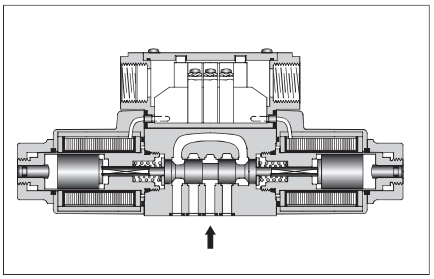
Valve Model Numbers	⑨Solenoid Ass'y No.	㉒Coil Ass'y No.	Remarks
DSG-007-* * *-A100	SA05-100-40	C-SA05-100-40	Flying Lead Wire Type
DSG-007-* * *-A200	SA05-200-40	C-SA05-200-40	
DSG-007-* * *-D12	SD05-12-40	C-SD05-12-40	
DSG-007-* * *-D24	SD05-24-40	C-SD05-24-40	
DSG-007-* * *-A100-N/N1	SA05-100-N-40	C-SA05-100-N-40	Plug-in Connector Type / Plug-in Connector with Indicator Light
DSG-007-* * *-A200-N/N1	SA05-200-N-40	C-SA05-200-N-40	
DSG-007-* * *-D 12-N/N1	SD05- 12-N-40	C-SD05- 12-N-40	
DSG-007-* * *-D 24-N/N1	SD05- 24-N-40	C-SD05- 24-N-40	

The World's Highest Level of High Pressure, High Flow and Low Pressure Drop

DSG-01 Series Solenoid Operated Directional Valves

These Solenoid Operated Directional Valves realized the world's highest level of high pressure, high flow and low pressure drop, the features of which can be materialized by employing a powerful wet type solenoid and the rational flow channel design including 5 chamber system.





● High Pressure & High Flow Rate

In comparison to our existing lines, both the pressure and flow of these valves are much increased.

- Max. Operating Pressure: approx. 10 % increased [31.5→35 MPa]
- Max. T-Line Back Pressure: approx. 30 % increased [16→21 MPa]
- Max. Flow : approx. 60 % increased [63→100 L/min]

● Low Pressure Drop

The pressure drop of these valves is reduced by 10 % from 1.0 to 0.9 MPa, in comparison to our existing lines*; the valves effectively reduce the energy consumption of the unit.

★At Flow Rate: 60 L/min, Spool Type: 3C2 (P→A)

● Compact & Small Mass

Despite of high pressure, high flow and low pressure drop, these valve bodies are compact and lightweight with DC double solenoids; the overall length and mass are reduced from 210 to 205 mm and from 2.2 to 1.85 kg, respectively.

● Shockless type available

In addition to the standard valves for high pressure and high flow, a shockless type capable of minimizing noise and vibration in piping during spool changeover is also available.

● Stable Operation

Due to the powerful magnetic and spring force of the solenoids, these valves exhibit a high tolerance to contaminants and especially stable operation.

● IP65-equivalent high dust- and water-proof

These valves demonstrate excellent dust- and water-proof characteristics, in compliance with I. E. C. Pub. 529. IP65 and JIS C 0920 IP65 (dust- and jet-proof type). The Deutsch Connector Type in compliance with IP67 is also available.

● CE marking compliance is possible

To accommodate equipment for the European market, our standard products are CE-compliant models.

● Various Type of Connection

In addition to the current Terminal Box Type and Plug-in Connector Type, according usage you can select M12-4 Pin Connector Type suitable for serial transfer, Center Plug-in Connector Type to contribute shortening the wiring man-hour, Deutsch Connector Type with good water-proof characteristics.

CE

Specifications

Valve Type	Model Numbers	Max. Flow★2 L/min	Max. Operating Pressure MPa	Max. T-Line Back Pressure MPa	Max. Changeover Frequency min⁻¹	Mass kg
Standard Type	DSG-01-3C✻-✻-70	100	35	21	300 (R Type Sol. Only) 120	1.85
	DSG-01-2D2-✻-70					
	DSG-01-2B✻-✻-70					1.4
Shockless Type	S-DSG-01-3C✻-✻-70	63	25	21	120	1.85
	S-DSG-01-2B2-✻-70					1.4
Low Wattage (14W) Type★1	L-DSG-01-3C✻-✻-70	40	16	16	300 (R Type Sol. Only) 120	1.85
	L-DSG-01-2D2-✻-70					
	L-DSG-01-2N✻-✻-70					
	L-DSG-01-2B✻-✻-70					1.4

★1. For details of Low Wattage (14W) Type, please contact us.

★2. The maximum flow means the limited flow without inducing any abnormality to the operation (changeover) of the valve. The maximum flow differs according to the spool type and operating conditions. For details, please refer to the "List of Standard Models" on pages E-25 to E-27.

Sub-plates

Sub-plate Model Numbers	Thread Size Rc	Approx. Mass kg
DSGM-01-31	1/8	0.8
DSGM-01X-31	1/4	
DSGM-01Y-31	3/8	

● Sub-plates are available. Specify the sub-plate model number from the table above.
When sub-plates are not used, the mounting surface should have a good machined finish. (▽1.6)

Solenoid Ratings

Valve Type	Electric Source	Coil Type★3	Frequency (Hz)	Voltage (V)		Current & Power at Rated Voltage		
				Source Rating	Serviceable Range	Inrush★2 (A)	Holding (A)	Power (W)
Standard Type / Shockless Type	AC★1	A 100	50	100	80 – 110	2.42	0.51	—
			60	100	90 – 120	2.14	0.37	
				110		2.35	0.44	
		A 120	50	120	96 – 132	2.02	0.42	
			60		108 – 144	1.78	0.31	
		A 200	50	200	160 – 220	1.21	0.25	
			60	200	180 – 240	1.07	0.19	
				220		1.18	0.22	
		A 240	50	240	192 – 264	1.01	0.21	
			60		216 – 288	0.89	0.15	
	DC (K Series)	D 12	—	12	10.8 – 13.2	—	2.45	29
		D 24		24	21.6 – 26.4		1.23	
		D 48		48	43.2 – 52.8		0.61	
	AC→ DC Rectified (R)	R 100	50/60	100	90 – 110	—	0.33	29
		R 200		200	180 – 220		0.16	

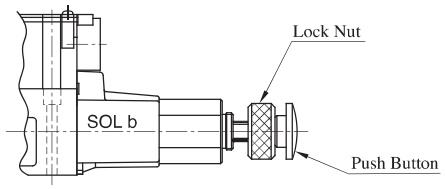
★1. AC solenoid is not available in shockless type.
R type models with built-in current rectifier is recommended for shockless operation with AC power.
★2. Inrush current in the above table show rms values at maximum stroke.
★3. There are more coil types other than the above. For details, please make inquiries.

The coil type numbers in the shaded column are handled as opotinal extras.
In case these coils are required to be chosen, please confirm the time of delivery with us before ordering.

Options

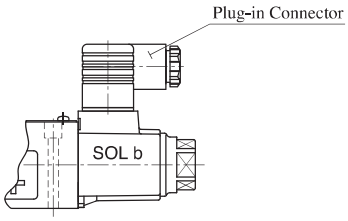
Push Button with Lock Nut

Can be used for manual changeover of spool. The push button can be locked in the pressed condition.



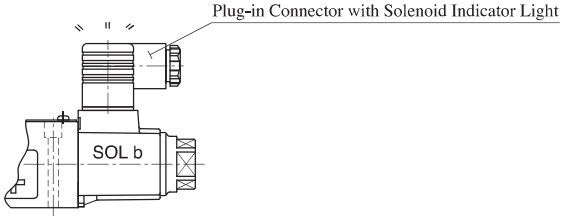
Plug-in Connector Type

Electrical conduit connecting part is plug-in type, so can mount/ dismount valves without disconnecting.



Plug-in Connector with Solenoid Indicator Light

These are the indicator light incorporated plug-in connector type solenoids. Energisation or de-energisation of the solenoid can be easily identified with the incorporated indicator light.



Special connector type (M12-4 Pin Connector Type, Center Plug-in Connector Type, Center Plug-in M12-4 Connector Type, Deutsch Connector Type), refer to pages E-35 & E-36.

Model Number Designation

S–	DSG	–01	–2	B	2	A	–D24	–C	–N★4	–70	–L
Shockless Type	Series Number	Valve Size	Number of Valve Positions	Spool Spring Arrangement	Spool Type	Input Only Valves Using Neutral Position & Side Position	Coil Type	Manual Override	Electrical Conduit Connection	Design Number	Models with Reverse Mtg. of Solenoid
None: Standard Type	DSG: Solenoid Operated Directional Valve (Sub-plate Mounting Type)	01	3	C : Spring Centered	2, 3, 4, 40, 60, 9, 10, 11, 12	——	AC : A100, A120, A200, A240 DC : D12, D24, D48 R : (AC→DC) R100, R200	None: Manual Override Pin C : Push Button and Lock Nut (Option)	None: Terminal Box Type N : Plug-in Connector Type (Option) ★2 N1 : Plug-in Connector Type with Indicator Light (Option)	70	——
			2	D : No-Spring Detented	2	——					
			2	B : Spring Offset	2, 3, 8	A : ★1 Using Neutral Position & SOL a Energised Position B : ★1 Using Neutral Position & SOL b Energised Position					L : Input only for reverse mtg. of solenoid.
S : Shockless Type			3	C : Spring Centered	2, 4	——	DC : D12, D24, D48 R : (AC→DC) R100, R200				——
			2	B : Spring Offset	2	——					L : Input only for reverse mtg. of solenoid.

★1. In case of Valves Using Neutral Position and Side Position, please refer to page E-28 for details.
★2. "N1: Plug-in Connector Type with Indicator Light" is not available for R type (AC→DC).
★3. Models for phosphate ester fluid are available. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.
★4. Special connector types, " M12-4 Pin Connector Type ", " Center Plug-in Connector Type ", " Center Plug-in M12-4 Connector Type ", " Deutsch Connector Type ", please refer to pages E-35 & E-36.

Attention

In the table above, the symbols or numbers highlighted with shade represent the optional extras. The valves with model number having such optional extras are handled as options, therefore, please confirm the time of delivery with us before ordering.

List of Standard Models

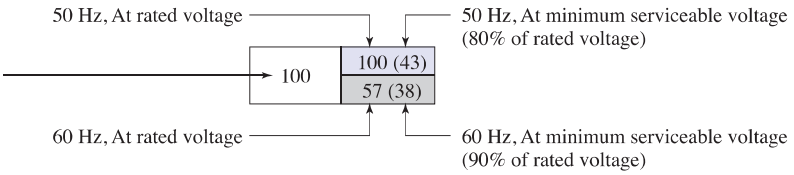
● Models with AC Solenoids : DSG-01-＊ ＊ ＊-A＊

No. of Valve Positions	Spool-Spring Arrangement	Model Numbers	Graphic Symbols	Max. Flow L/min: P → A, B → T (P → B, A → T)					Max. Flow L/min: P → A [Port "B" Blocked]					Max. Flow L/min: P → B [Port "A" Blocked]				
				Working Pressure MPa					Working Pressure MPa					Working Pressure MPa				
				10	16	25	31.5	35	10	16	25	31.5	35	10	16	25	31.5	35
Three Positions	Spring Centered	DSG-01-3C2		100	100	100	100	100	100 (43)	100 (41)	80 (21)	60 (17)	38 (15)	100 (43)	100 (41)	80 (21)	60 (17)	38 (15)
									57 (38)	53 (31)	29 (17)	19 (10)	13 (9)	57 (38)	53 (31)	29 (17)	19 (10)	13 (9)
		DSG-01-3C3		100 (80)	100 (80)	100 (80)	100 (77)	100 (77)	70 (46)	70 (46)	70 (46)	70 (46)	70 (46)	70 (46)	70 (46)	70 (46)	70 (46)	70 (46)
				90 (63)	90 (63)	90 (63)	90 (63)	90 (63)	45 (30)	45 (30)	45 (30)	45 (30)	45 (30)	45 (30)	45 (30)	45 (30)	45 (30)	45 (30)
		DSG-01-3C4		90	90	90	90 (22)	35 (18)	100 (38)	76 (28)	67 (15)	57 (10)	35 (7)	100 (38)	76 (28)	67 (15)	57 (10)	35 (7)
						90 (26)	43 (14)	30 (11)	50 (31)	38 (20)	20 (10)	16 (7)	12 (5)	50 (31)	38 (20)	20 (10)	16 (7)	12 (5)
		DSG-01-3C40		85	85	85	80 (40)	80 (22)	85 (40)	85 (35)	85 (24)	60 (16)	55 (12)	85 (40)	85 (35)	85 (24)	60 (16)	55 (12)
				80	80	80 (30)	63 (15)	25 (10)	70 (26)	50 (24)	32 (16)	22 (13)	18 (10)	70 (26)	50 (24)	32 (16)	22 (13)	18 (10)
		DSG-01-3C60 ★		43 (23)	43 (23)	42 (23)	42 (23)	42 (23)	54 (32)	54 (32)	52 (32)	52 (32)	52 (32)	54 (32)	54 (32)	52 (32)	52 (32)	52 (32)
				40 (23)	40 (23)	38 (23)	36 (23)	35 (23)	48 (30)	47 (30)	47 (30)	47 (30)	47 (30)	48 (30)	47 (30)	47 (30)	47 (30)	47 (30)
		DSG-01-3C9		100	100	100	100	100	20	15	10	10	8	20	15	10	10	8
		DSG-01-3C10 ◆		100	100	100 (63)	100 (33)	100 (27)	100 (50)	100 (37)	100 (20)	78 (16)	62 (13)	100 (50)	100 (37)	100 (20)	78 (16)	62 (13)
					100 (70)	80 (20)	70 (20)	40 (19)	100 (37)	55 (25)	29 (14)	20 (11)	15 (10)	100 (37)	55 (25)	29 (14)	20 (11)	15 (10)
		DSG-01-3C11 ◆		100	100	100	100	100	23	20	13	10	5	100 (65)	85 (52)	72 (45)	65 (34)	60 (27)
														70 (50)	57 (40)	50 (25)	43 (19)	35 (18)
		DSG-01-3C12 ◆		100	100	100 (63)	100 (33)	100 (27)	100 (50)	100 (37)	100 (20)	78 (16)	62 (13)	100 (50)	100 (37)	100 (20)	78 (16)	62 (13)
					100 (70)	80 (20)	70 (20)	40 (19)	100 (37)	55 (25)	29 (14)	20 (11)	15 (10)	100 (37)	55 (25)	29 (14)	20 (11)	15 (10)
Two Positions	No-Spring Detented	DSG-01-2D2		80	80	80	80	80	45	45	45 (21)	45 (16)	38 (13)	50	50 (45)	50 (42)	45 (40)	45 (40)
											36 (18)	28 (13)	22 (12)		50 (45)	50 (42)	45 (40)	45 (40)
	Spring Offset	DSG-01-2B2		85	85	85	85	85	20	16	16	15	13	85 (63)	80 (50)	63 (40)	44 (32)	44 (32)
														85 (30)	60 (33)	50 (28)	40 (28)	40 (28)
		DSG-01-2B3		70	70	70	70	70	50	50	50	50	50	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)
														70 (48)	70 (48)	70 (48)	70 (48)	70 (48)
		DSG-01-2B8		–	–	–	–	–	26	17	13	11	10	80 (50)	70 (40)	60 (20)	45 (10)	30 (10)
														35 (20)	23 (15)	15 (8)	10 (5)	7 (5)

Notes: 1. The relation between the maximum flow in the table above and the frequency/voltage (within the serviceable voltage) is as shown below.

(Example)

The maximum flow rate is constant regardless of 50 Hz or 60 Hz and of any voltage variants within the serviceable voltage



2. For the maximum flow rate in P → T of the valves with a ★ mark, please see page E-27.

The valve models with a ◆ mark are handled as options. If you choose such valves, check the time of delivery beforehand.

List of Standard Models

● Models with DC or R Type Solenoids : DSG-01-＊ ＊ ＊-D＊/R＊

No. of Valve Positions	Spool-Spring Arrangement	Model Numbers	Graphic Symbols	Max. Flow L/min															
				P → A, B → T (P → B, A → T)					P → A [Port "B" Blocked]					P → B [Port "A" Blocked]					
				Working Pressure MPa					Working Pressure MPa					Working Pressure MPa					
				10	16	25	31.5	35	10	16	25	31.5	35	10	16	25	31.5	35
Three Positions	Spring Centered	DSG-01-3C2		100	100	100	100	100	100	45	28	25	22	100	45	28	25	22
									55	35	23	19	17	55	35	23	19	17
		DSG-01-3C3		100	100	100	100	100	78	78	78	78	75	78	78	78	78	75
				80	80	80	80	80	70	70	70	70	70	70	70	70	70	70
		DSG-01-3C4		90	90	90	50	38	100	58	38	31	29	100	58	38	31	29
						42	26	20	62	48	30	25	23	62	48	30	25	23
		DSG-01-3C40		85	85	65	40	33	85	52	30	26	24	85	52	30	26	24
						45	30	26	65	36	25	21	19	65	36	25	21	19
		DSG-01-3C60★		50	50	50	50	50	66	66	66	66	66	66	66	66	66	66
				41	41	41	41	41	58	58	58	58	58	58	58	58	58	58
		DSG-01-3C9		100	100	100	100	100	20	15	10	10	8	20	15	10	10	8
		DSG-01-3C10◆		85	85	85	80	40	100	56	36	28	24	100	56	36	28	24
						35	23	20	74	43	28	20	19	74	43	28	20	19
		DSG-01-3C11◆		100	100	100	100	100	23	20	13	10	5	100	60	40	36	32
														85	46	32	28	24
		DSG-01-3C12◆		85	85	85	80	40	100	56	36	28	24	100	56	36	28	24
						35	23	20	74	43	28	20	19	74	43	28	20	19
Two Positions	No-Spring Detented	DSG-01-2D2		75	75	75	75	75	45	45	40	30	27	50	50	50	45	45
				70	70	70	70	70			30	25	22		45	42	40	40
	Spring Offset	DSG-01-2B2		80	80	80	80	80	20	16	16	15	13	46	31	24	22	22
														32	23	19	18	18
		DSG-01-2B3		70	70	70	70	70	50	50	50	50	50	75	75	75	75	75
														65	65	65	65	65
		DSG-01-2B8		—	—	—	—	—	26	17	13	11	10	53	35	23	19	17
														35	30	17	13	12

Notes: 1. The relation between the maximum flow in the table above and the voltage (within the serviceable voltage) is as shown below.

(Example)

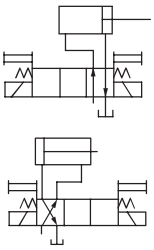
The maximum flow rate is constant regardless of any voltage variants within the serviceable voltage → 100 | 100 (At rated voltage [after temperature rise and saturated]) / 55 (At minimum serviceable voltage (90% of rated voltage) [after temperature rise and saturated])

2. For the maximum flow rate in P → T of the valves with a ★ mark, please see page E-27.

The valve models with a ◆ mark are handled as Options. If you choose such valves, check the time of delivery beforehand.

Maximum Flow Rate in P → T Flow

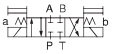
In valve type 3C60, in case where the actuator is put on in between the cylinder ports A and B as illustrated below and where the actuator moves and suspended at its stroke end and where the valve is then shifted to the neutral position in the suspended state of the actuator, the maximum flow rates available are those as shown as the table below regardless of any voltage in the range of serviceable voltage.



Model Numbers	Graphic Symbol	Max. Flow L/min				
		10 MPa	16 MPa	25 MPa	31.5 MPa	35 MPa
DSG–01–3C60–A＊/D＊/R＊		55	44	30	26	22

List of Standard Models (Shockless Type)

Models with DC or R Type Solenoids : S-DSG-01-＊ ＊ ＊-D＊/R＊

No. of Valve Positions	Spool-Spring Arrangement	Model Numbers	Graphic Symbols	Max. Flow L/min								
				P → A, B → A, B → T			P → A [Port "B" Blocked]			P → B [Port "A" Blocked]		
												
				Working Pressure MPa			Working Pressure MPa			Working Pressure MPa		
				10	16	25	10	16	25	10	16	25
Three Positions	Spring Centered	S-DSG-01-3C2		63	63	40	40	32	25	40	32	25
							32	20	16	32	20	16
		S-DSG-01-3C4		60	50	40	40	32	16	40	32	16
					40	20	32	16	12	32	16	12
Two Positions	Spring Offset	S-DSG-01-2B2		50	45	45	30	30	30	60	40	40
				45	40	40						

Notes: The relation between the maximum flow in the table above and the voltage (within the serviceable voltage) is as shown below.

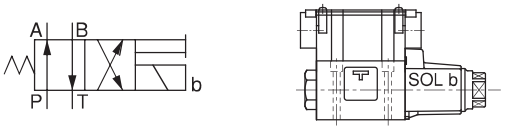
(Example)

The maximum flow rate is constant regardless of any voltage variants within the serviceable voltage → 60 (50 / 40)

- 50: At rated voltage [after temperature rise and saturated]
- 40: At minimum serviceable voltage (90% of rated voltage) [after temperature rise and saturated]

Reverse Mounting of Solenoid

In spring offset type, it is a standard configuration that the solenoid is mounted onto the valve in the SOL b position (side). However, in this particular spool-spring arrangement, the mounting of the solenoid onto the valve in the reverse position -SOL a side- is also available. The graphic symbol for this reverse mounting is as shown below.
As for the valve type 2B*A and 2B*B, please refer to the explanation under the heading of "Valves Using Neutral Position and Side Position" given below.



Standard Mtg. of Solenoid

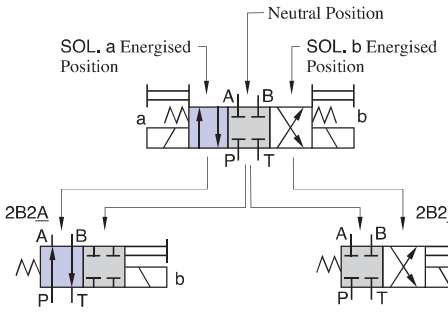


Reverse Mtg. of Solenoid

Valves Using Neutral Position and Side Position

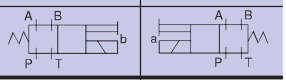
Besides the use of the standard 2-position valves aforementioned in the "List of Standard Models", the 3-position valves also can be used as the 2-position valves using the two of their three positions. In this case, there are two kinds of the valve available. One is the valve using the neutral position and SOL a position (2B*A) and another is the valve using the neutral position and SOL b position (2B*B).

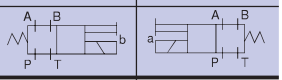
(Example) In case of Spool Type "2"



"A" Use of Neutral and SOL. a Energised Position

"B" Use of Neutral and SOL. b Energised Position

Model Numbers	Graphic Symbols	
	Standard Mtg. Type	Reverse Mtg. Type
DSG-01-2B*A		
DSG-01-2B2A		—

Model Numbers	Graphic Symbols	
	Standard Mtg. Type	Reverse Mtg. Type
DSG-01-2B*B		
DSG-01-2B2B		—
DSG-01-2B3B		—
DSG-01-2B4B		
DSG-01-2B60B		—
DSG-01-2B10B		—

In the above table, the graphic symbols in mounting type highlighted with shade are optional extra, therefore, please confirm the time of delivery with us before ordering.

Typical Changeover Time (Example)

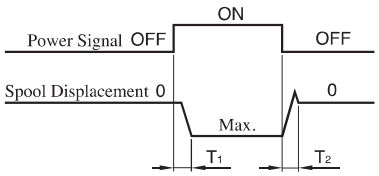
Changeover time varies according to oil viscosity, spool type and hydraulic circuit.

Standard Type (Without Shockless Function)

[Test Conditions]

Pressure：16 MPa
Flow Rate：31.5 L/min
Viscosity：35 mm²/s
Voltage：100 %V at rated voltage
(After coil temperature rise and saturated)

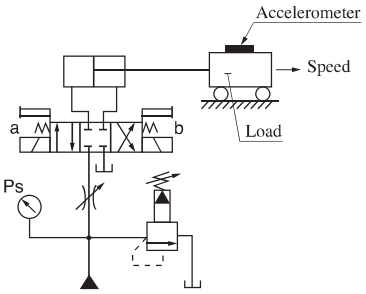
[Result of Measurement]



Type	Model Numbers	Time ms	
		T1	T2
Standard Type	DSG-01-3C2-A*	15	23
	DSG-01-3C2-D*	48	19
	DSG-01-3C2-R*	50	100

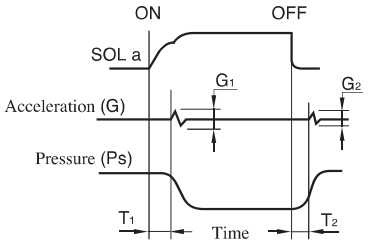
Shockless Type

[Test Circuit and Conditions]



Setting Pressure (Ps) : 7 MPa
Load (W) : 1000 kg
Cylinder Speed : 8 m/min
Viscosity : 35 mm²/s

[Result of Measurement]



Type	Model Nmbers	Time ms		Acceleration m/s²	
		T1	T2	G1	G2
Shockless Type	S-DSG-01-3C2-D*	70	30	12	7
Reference: Standard Type	DSG-01-3C2-D*	35	25	18	15

Mounting Bolts

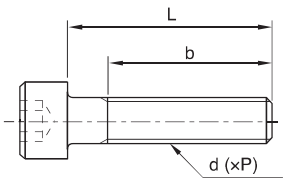
Mounting bolts are not available, please order separately.

Type/Dimension/Quantity

Item	Details
Type	Soc. Hd. Cap Screw (SCM)
Thread Size d	M5
Thread Pitch P mm	0.8
Bolt Length L mm	45
Thread Length (Reference) b mm	22
Quantity	4

Specifications/Machinery Characteristics

Item	Details
Material	Steel SCM
Screw Type	Meter Coarse Screw
Finishing	Black Oxide Film
Class of Strength	12.9
Standard	Based on JIS B 1176(2014)

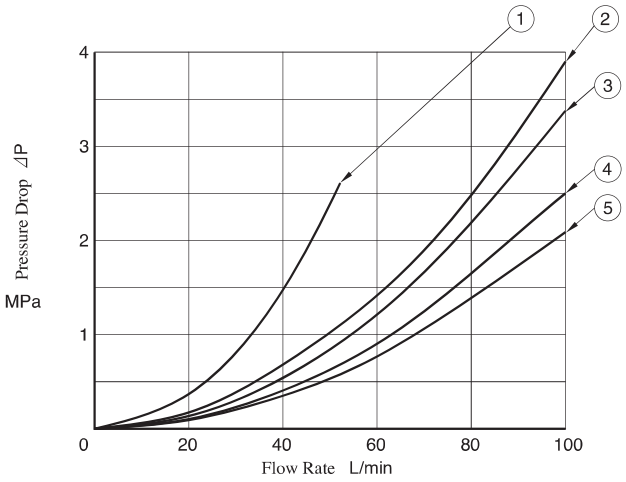


★If order to us, please use the model numbers below.
MBK-01-05-*
(*is the newest design number)

Pressure Drop

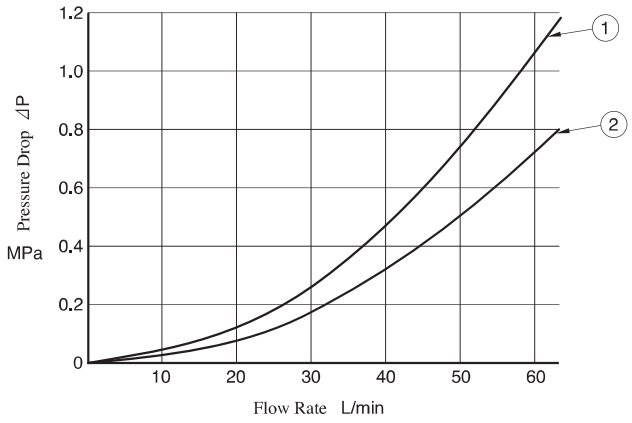
Pressure drop curves based on viscosity of 35 mm² /s and specific gravity of 0.850.

Standard Type



Model Numbers	Pressure Drop Curve Number				
	P→A	B→T	P→B	A→T	P→T
DSG-01-3C2	④	④	④	④	—
DSG-01-3C3	⑤	⑤	⑤	⑤	②
DSG-01-3C4	④	④	④	④	—
DSG-01-3C40	④	④	④	④	—
DSG-01-3C60	①	①	①	①	②
DSG-01-3C9	⑤	③	⑤	③	—
DSG-01-3C10	④	⑤	④	④	—
DSG-01-3C11	④	④	④	④	—
DSG-01-3C12	④	④	④	⑤	—
DSG-01-2D2	⑤	④	⑤	④	—
DSG-01-2B2	⑤	④	⑤	④	—
DSG-01-2B3	⑤	⑤	⑤	⑤	—
DSG-01-2B8	⑤	—	④	—	—

Shockless Type : S-DSG-01



Model Numbers	Pressure Drop Curve Number			
	P→A	B→T	P→B	A→T
S-DSG-01-3C2	①	①	①	①
S-DSG-01-3C4	①	②	①	②
S-DSG-01-2B2	①	①	①	①

● For any other viscosity, multiply the factors in the table below.

Viscosity mm²/s	15	20	30	40	50	60	70	80	90	100
Factor	0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

● For any other specific gravity (G'), the pressure drop (⊿P') may be obtained from the formula below.

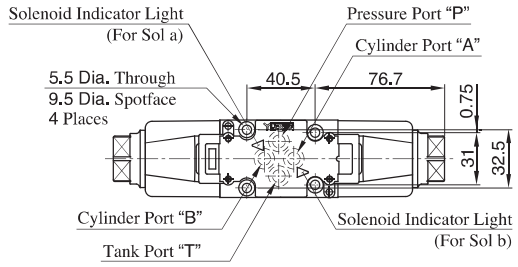
⊿P' = ⊿P (G'/0.850)

Mounting Surface: ISO 4401-03-02-0-05

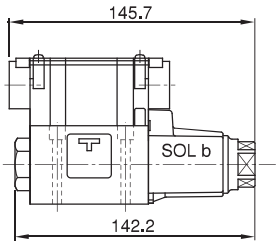
Terminal Box Type (Standard)

Models with AC Solenoids : DSG-01-＊＊＊-A＊

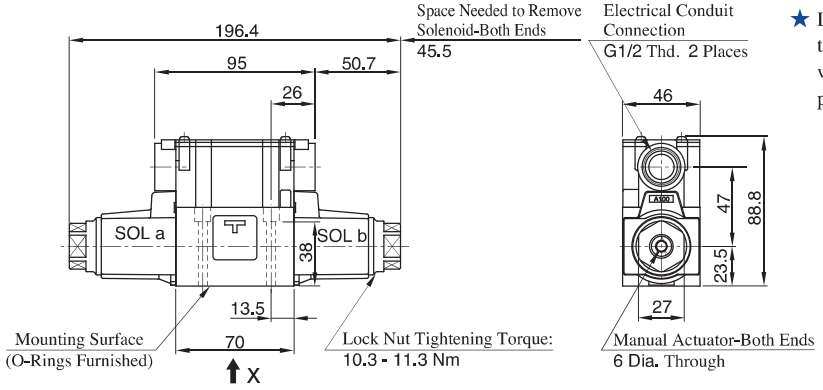
● Spring Centered & No-Spring Detented



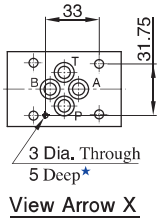
● Spring Offset



● For other dimensions, refer to the drawing left.
● Solenoid being mounted in the reverse position SOL a side is also available.



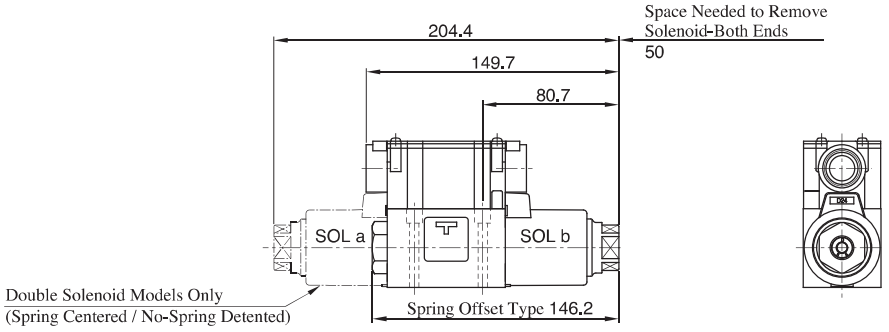
★ Locating pin can be fitted to this hole to conform with ISO standard. Valve with locating pin is also available, please consult Yuken for details.



Models with DC Solenoids : (S-) DSG-01-＊＊＊-D＊

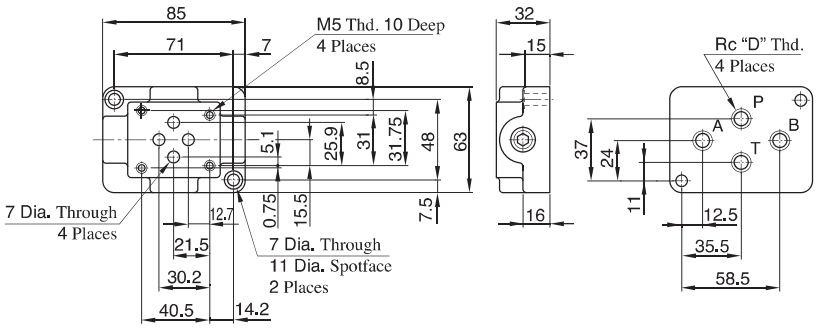
Models with R Type Solenoids : (S-) DSG-01-＊＊＊-R＊

● Spring Centered / No-Spring Detented / Spring Offset



● For other dimensions, refer to models with AC solenoids drawing above.

Sub-plates : DSGM−01, 01X, 01Y

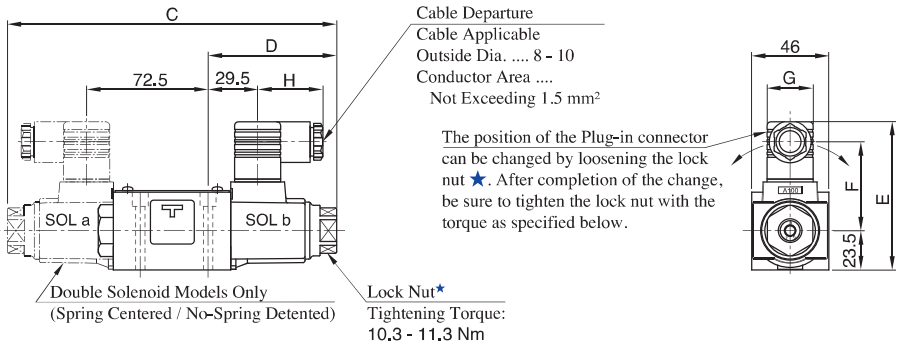


Sub-plate Model Numbers	D
DSGM–01–31	1/8
DSGM–01X–31	1/4
DSGM–01Y–31	3/8

Options

Plug-in Connector Type / Plug-in Connector with Indicator Light

- Models with AC Solenoids : **DSG-01-＊＊＊-A＊-N/N1**
- Models with DC Solenoids : **(S-) DSG-01-＊＊＊-D＊-N/N1**
- Models with R Solenoids : **(S-) DSG-01-＊＊＊-R＊-N**

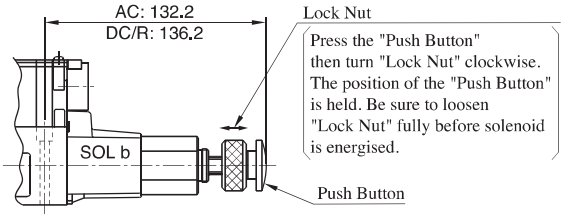


Model Numbers	C	D	E	F	G	H
DSG-01-＊＊＊-A＊-N＊	196.4	76.7	88.5	53	27.5	39
(S-) DSG-01-＊＊＊-D＊-N＊	204.4	80.7	99.5	64	27.5	39
(S-) DSG-01-＊＊＊-R＊-N	204.4	80.7	102.5	61.1	34	53

● For other dimensions, refer to "Terminal Box Type" (Page E-31).

Models with Push Button & Lock Nut

(S-) DSG-01-＊＊＊-＊-C



Interchangeability in Installation Current and New Design

In order to achieve higher pressure, higher flow, lower pressure drop and more compact, DSG-01 valves has been upgraded from the 60 design series to the 70 design series.

The figures in the table below are the comparison between current and new design valves.

Specifications

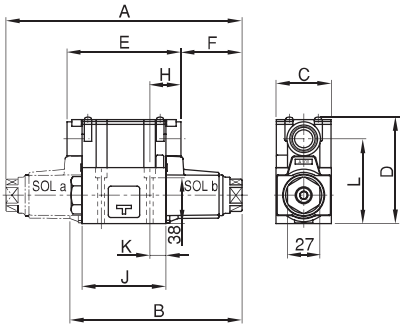
Design Number	Max. Flow L/min	Max. Operating Pressure MPa	Max. Tank-Line Back Pres. MPa	Max. Changeover Frequency min⁻¹	Pressure Drop★ MPa	Mass kg	
						3C＊/2D＊	2B＊
New Design : 70	100	35	21	300	0.9	1.85	1.4
Current Design : 60	63	31.5	16	(R Type sol. Only 120)	1.0	2.2	1.6

★Flow Rate: 60 L/min, Viscosity: 30 mm²/s, Spool type "2" (Closed center)

● The specifications of solenoid are not change between current and new designs.

Interchangeability in Installation

Interchangeability in installation is maintained though there are minor differences in demension as in the following table.



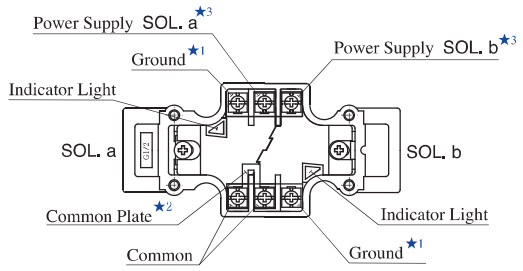
Solenoid Type	Design Number	A	B	C	D	E	F	H	J	K	L
AC	New Design : 70	196.4	142.2	46	88.8	95	50.7	26	70	13.5	70.5
	Current Design : 60	191.4	142.7	48	90.3	90	50.7	23.5	65	11	72
DC R	New Design : 70	204.4	146.2	46	88.8	95	54.7	26	70	13.5	70.5
	Current Design : 60	210	152	48	90.3	90	60	23.5	65	11	72

Electrical Conduit Connection

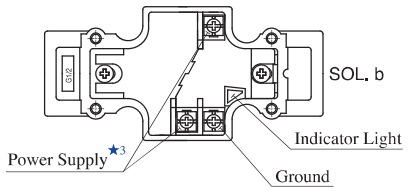
Details of Receptacle

Terminal Box Type

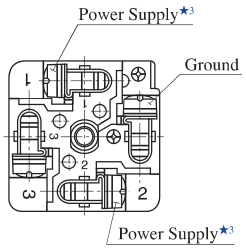
Double Solenoid Type



Single Solenoid Type (SOL b)



Plug-in Connector Type

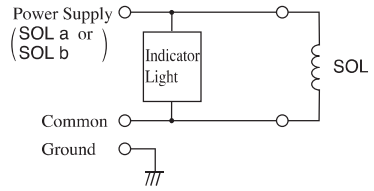


★1. There are two grounding terminals. You can use either one.
★2. If you do not need the common plate, remove it.
★3. With DC solenoids, polarity is no question.

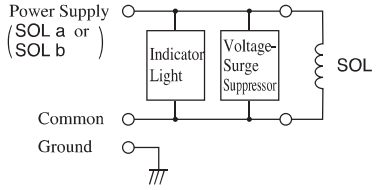
Electrical Circuit (Single Solenoid Type)

Terminal Box Type

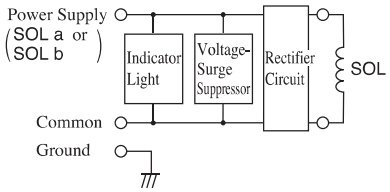
AC



DC

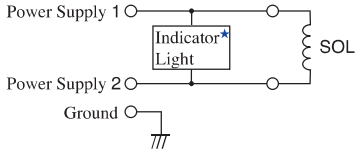


AC→DC Rectified



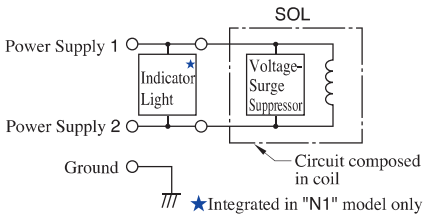
Plug-in Connector Type

AC



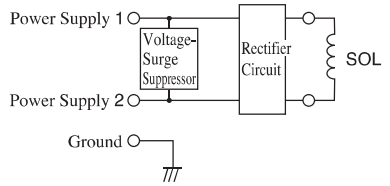
★Integrated in "N1" model only

DC



★Integrated in "N1" model only

AC→DC Rectified



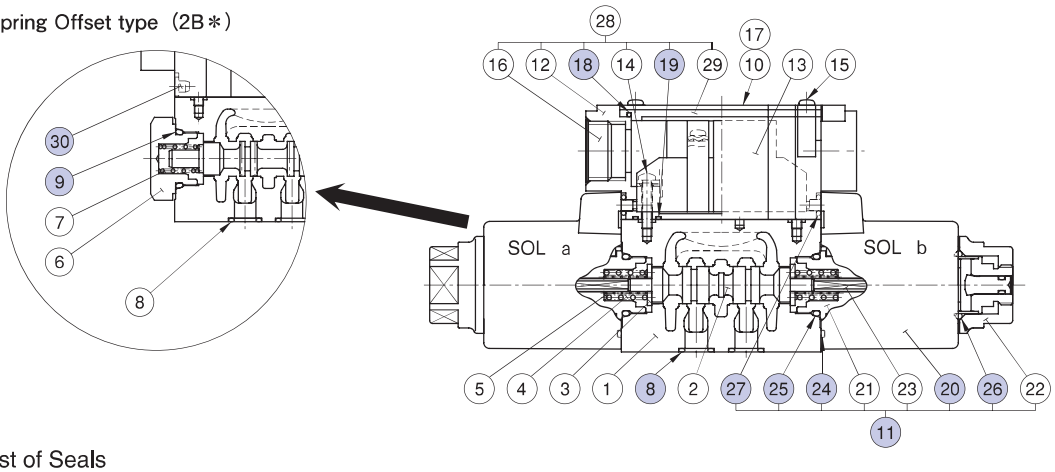
⚠ DANGER

- Do not perform wiring while the power is on.
  Doing so may result in electric shock, burns or death.
- Make the wiring properly. Improper wiring will cause an irregular movement of the machine, resulting in a grave accident.

List of Seals and Solenoid Ass'y

(S-) DSG-01-＊＊＊

Spring Offset type (2B＊)



List of Seals

Item	Name of Parts	Part Numbers	Qty.			Remarks
			3C＊	2D＊	2B＊	
8	O-Ring	AS 568-012 (NBR-90)	4	4	4	
9	O-Ring	OR NBR-90 P18-N	—	—	1	
18	Packing	1790S-VK421290-8	1	1	1	
19	O-Ring	S6	2	2	2	
24	O-Ring	AS 568-026 (NBR-70-1)	2	2	1	Included in Solenoid Ass'y (Item ⑪)
25	O-Ring	OR NBR-90 P18-N	2	2	1	
26	O-Ring	OR NBR-70-1 P20-N	2	2	1	
27	O-Ring	OR NBR-70-1 P4-N	4	4	2	
30	Plug	1790S-VK418329-9	—	—	2	

Solenoid Ass'y, Coil Ass'y No.

Model Numbers	⑪ Solenoid Ass'y No.	⑳ Coil Ass'y No.	Remarks
DSG-01-＊＊＊-A100	SA1-100-70	C-SA1-100-70	Terminal Box Type
DSG-01-＊＊＊-A120	SA1-120-70	C-SA1-120-70	
DSG-01-＊＊＊-A200	SA1-200-70	C-SA1-200-70	
DSG-01-＊＊＊-A240	SA1-240-70	C-SA1-240-70	
DSG-01-＊＊＊-D12	SD1-12-70	C-SD1-12-70	
DSG-01-＊＊＊-D24	SD1-24-70	C-SD1-24-70	
DSG-01-＊＊＊-D48	SD1-48-70	C-SD1-48-70	
DSG-01-＊＊＊-R100	SR1-100-70	C-SR1-100-70	
DSG-01-＊＊＊-R200	SR1-200-70	C-SR1-200-70	
DSG-01-＊＊＊-A100-N/N1	SA1-100-N-70	C-SA1-100-N-70	Plug-in Connector Type
DSG-01-＊＊＊-A120-N/N1	SA1-120-N-70	C-SA1-120-N-70	
DSG-01-＊＊＊-A200-N/N1	SA1-200-N-70	C-SA1-200-N-70	
DSG-01-＊＊＊-A240-N/N1	SA1-240-N-70	C-SA1-240-N-70	
DSG-01-＊＊＊-D12-N/N1	SD1-12-N-70	C-SD1-12-N-70	
DSG-01-＊＊＊-D24-N/N1	SD1-24-N-70	C-SD1-24-N-70	
DSG-01-＊＊＊-D48-N/N1	SD1-48-N-70	C-SD1-48-N-70	
DSG-01-＊＊＊-R100-N	SR1-100-N-70	C-SR1-100-N-70	
DSG-01-＊＊＊-R200-N	SR1-200-N-70	C-SR1-200-N-70	

● As of solenoid Ass'y of shockless type and models with push button & lock nut, please order as below.

(Example)SD1-12-S-C-N-70

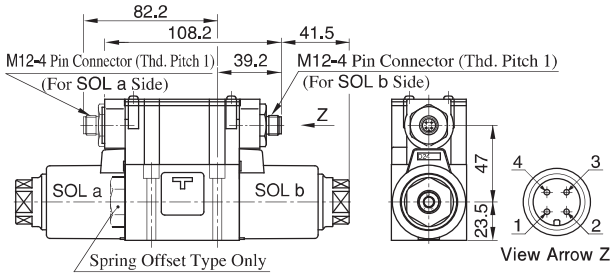
C : Only for the models with push button & lock nut (option).

S : Only for the models of shockless type.

Coil Ass'y numbers are same with those in above chart.

Special Electrical Conduit Connection

M12-4 Pin Connector Type



● For other dimensions, refer to page E-31 for Standard Terminal Box Type.

Model Numbers

DSG-01-2B2-D24-M1-70-L

M12-4 Pin Connector Electrical Conduit Connection
- M1 : Load Side Common Minus (PNP Type) Terminal Box SOL b Side Conduit Connection
- M2 : Load Side Common Minus (PNP Type) Terminal Box SOL a Side Conduit Connection
- M3 : Load Side Common Plus (NPN Type) Terminal Box SOL b Side Conduit Connection
- M4 : Load Side Common Plus Terminal Box SOL a Side Conduit Connection

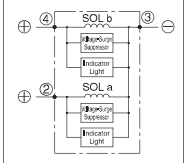
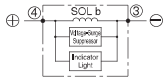
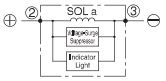
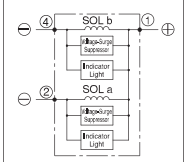
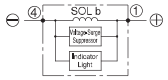
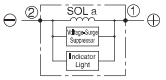
Coil numbers only for D12 and D24

● For other items, refer to page E-24 for Standard Model Number Designation.

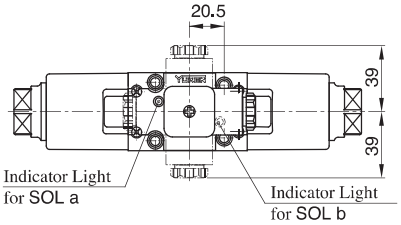
● Pin No.

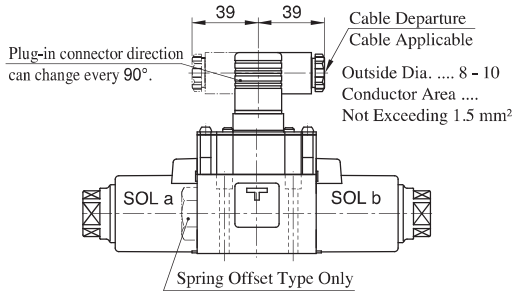
	Double Solenoid Type		Single Solenoid Type (Standard Mounting)		Single Solenoid Type (Reverse Mounting)	
Terminal	Common Minus PNP (Source)	Common Plus NPN (Sink)	Common Minus PNP (Source)	Common Plus NPN (Sink)	Common Minus PNP (Source)	Common Plus NPN (Sink)
①	Unused	Common(+)	Unused	Common(+)	Unused	Common(+)
②	SOL a	SOL a	Unused	Unused	SOL a	SOL a
③	Common(-)	Unused	Common(-)	Unused	Common(-)	Unused
④	SOL b	SOL b	SOL b	SOL b	Unused	Unused
Connector Departure Direction	M1: SOL b Side M2: SOL a Side	M3: SOL b Side M4: SOL a Side	M1: SOL b Side M2: Plug Side	M3: SOL b Side M4: Plug Side	M1: Plug Side M2: SOL a Side	M3: Plug Side M4: SOL a Side

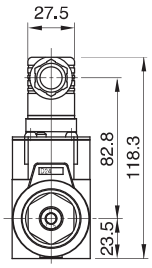
Connection Circuit

	Double Solenoid Type	Single Solenoid Type	
		Standard Mounting	Reverse Mounting
Load Side Common Minus			
Load Side Common Plus			

Center Plug-in Connector Type







Model Numbers

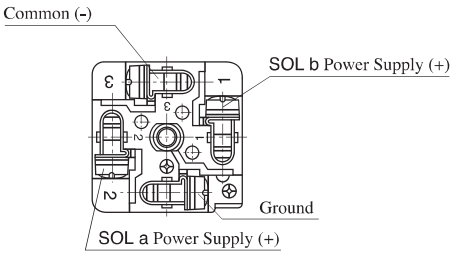
DSG-01-2B2-D24-S-70-L

Center Plug-in Connector Electrical Conduit Connection Type

Coil Numbers Only for D12, D24, A100, A120, A200 & A240

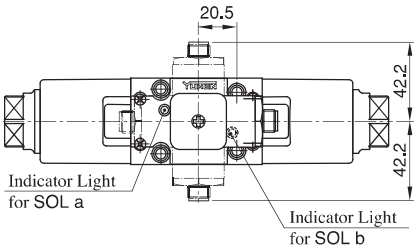
● For other items, refer to page E-24 for Standard Model Number Designation.

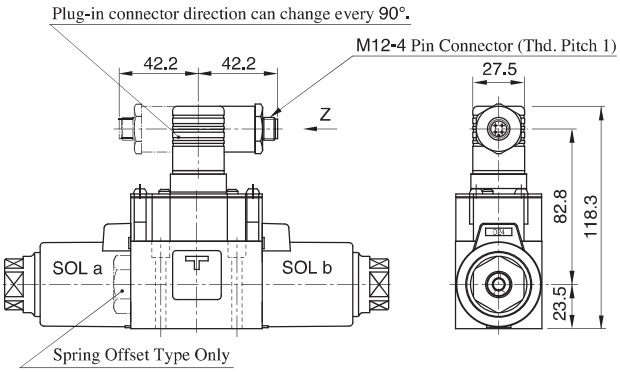
Details of Receptacle



● For other dimensions, refer to page E-31 for Standard Terminal Box Type.

Center Plug-in Connector M12-4 Pin Connector Type





● For other dimensions, refer to page E-31 for Standard Terminal Box Type.

Pin No.

Terminal	Double Solenoid Type		Single Solenoid Type (Standard Mounting)		Single Solenoid Type (Reverse Mounting)	
	Common Minus PNP (Source)	Common Plus NPN (Sink)	Common Minus PNP (Source)	Common Plus NPN (Sink)	Common Minus PNP (Source)	Common Plus NPN (Sink)
①	Unused	Common(+)	Unused	Common(+)	Unused	Common(+)
②	SOL a	SOL a	Unused	Unused	SOL a	SOL a
③	Common(-)	Unused	Common(-)	Unused	Common(-)	Unused
④	SOL b	SOL b	SOL b	SOL b	Unused	Unused

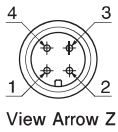
Model Numbers

DSG-01-2B2-D24-S1-70-L

- Center Plug-in M12 Connector 4 Pins Electrical Conduit Connection
  - S1 : Load Side Common Minus (PNP Type)
  - S2 : Load Side Common Plus (NPN Type)

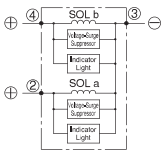
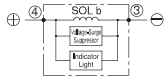
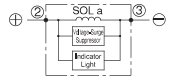
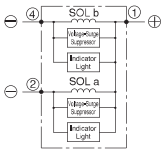
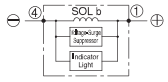
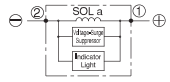
Coil numbers only for D12 and D24

● For other items, refer to page E-24 for Standard Model Number Designation.



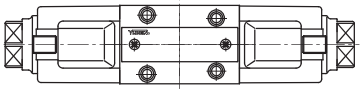
View Arrow Z

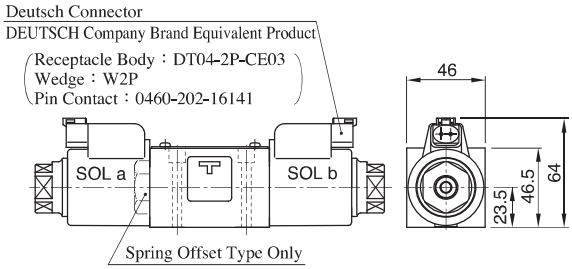
Connection Circuit

	Double Solenoid Type	Single Solenoid Type	
		Standard Mounting	Reverse Mounting
Load Side Common Minus			
Load Side Common Plus			

Deutsch Connector Type

Dust-proof / Water-proof property : IP67





● For other dimensions, refer to page E-31 for Standard Terminal Box Type.

Model Numbers

DSG-01-2B2-D24-D-70-L

- Deutsch Connector Electrical Conduit Connection
  - D : No Diode
  - D1 : Built-in Diode Type

Coil numbers only for D12 and D24

・For other items, refer to page E-24 for Standard Model Number Designation.

★ This valve needs another connector for electrical conduit connection.
The applicable connector as below.
Manufacturer : DEUTSCH Company
- ・Plug : DT06-2S-CE05
- ・Plug Wedge : W2S-P012
- ・Socket Contact : 0462-201-16141

DSG-03 Series Solenoid Operated Directional Valves

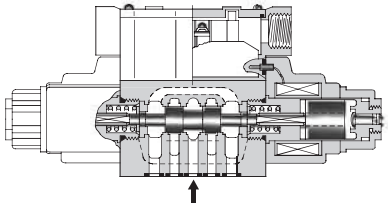
These are epoch-making solenoid operated valves of high pressure, high flow which have been developed incorporating a unique design concept into every part of the valve including the solenoid.
With wet type solenoids, these valves ensure the low noise and the long life, moreover, ensure no leakage of oil outside of the valves.



Terminal Box Type



Plug-in Connector Type



● Wide Range of Models

Choose the optimum valve to meet your need from a large selection available. The DSG-03 series solenoid operated directional valves are classified into the two basic models.

- Standard type …… Usable at high pressure: 31.5 MPa and high flow: 120 L/min.
- Shockless type …… A noise at spool changeover and a vibration in piping can be reduced to a minimum.

● Stable Operation

With a strong magnet and spring force, the valves are tough against contamination and thus ensure a stable operation.

● CE marking compliance is possible

To accommodate equipment for the European market, our standard products are CE-compliant models. (For details on CE marking, please contact us separately.)

● Various Type of Connection

In addition to the current Terminal Box Type and Plug-in Connector Type, according usage you can select M12-4 Pin Connector Type suitable for serial transfer, Center Plug-in Connector Type to contribute shortening the wiring man-hour.

CE

Specifications

Valve Type	Model Numbers	Max. Flow★2 L/min	Max. Operating Pressure MPa	Max. T-Line Back Pres. MPa	Max. Changeover Frequency min⁻¹	Approx. Mass kg	
						Type of Solenoid	
						AC	DC,R,RQ
Standard Type	DSG-03-3C✻-✻-50	120	31.5 (Spool Type 60 Only: 25)	16	240 (R Type Sol. Only: 120)	3.6	5
	DSG-03-2D2-✻-50						
	DSG-03-2B✻-✻-50					2.9	3.6
Shockless Type	S-DSG-03-3C✻-✻-50	120	25	16	120	—	5
	S-DSG-03-2B2-✻-50						3.6
Low Wattage (14W)★1	L-DSG-03-3C✻-✻-50	60	16	16	240 (R Type Sol. Only: 120)	3.6	4.8
	L-DSG-03-2D2-✻-50						
	L-DSG-03-2B✻-✻-50					2.9	3.5

★1. For details of L-DSG-03, please contact us.
★2. The maximum flow means the limited flow without inducing any abnormality to the operation (changeover) of the valve. The maximum flow differs according to the spool type and operating conditions. For details, please refer to the "List of Standard Models" on pages E-40 to E-42.

Sub-plates

Sub-plate Model Numbers	Thread Size Rc	Approx. Mass kg
DSGM-03-40	3/8	3
DSGM-03X-40	1/2	
DSGM-03Y-40	3/4	4.7

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. (▽6)

Solenoid Ratings

Valve Type	Electric Source	Coil Type	Frequency (Hz)	Voltage (V)		Current & Power at Rated Voltage		
				Source Rating	Serviceable Range	Inrush★2 (A)	Holding (A)	Power (W)
Standard Type	AC ★1	A 100	50	100	80 - 110	5.37	0.90	—
			60	100	90 - 120	4.57	0.63	
				110		5.03	0.77	
		A 120	50	120	96 - 132	4.48	0.75	
			60		108 - 144	3.81	0.52	
		A 200	50	200	160 - 220	2.69	0.45	
			60	200	180 - 240	2.29	0.31	
				220		2.52	0.38	
		A 240	50	240	192 - 264	2.24	0.37	
			60		216 - 288	1.91	0.26	
Shockless Type	DC (K Series)	D 12	—	12	10.8 - 13.2	—	3.16	38
		D 24		24	21.6 - 26.4		1.57	
		D 100		100	90 - 110		0.38	
	AC→DC Rectified	R 100	50/60	100	90 - 110	—	0.43	38
		R 200		200	180 - 220		0.21	
	AC→DC Rectified (Quick Return)	RQ100	50/60	100	90 - 110	—	0.43	38

★1. AC solenoid
AC solenoid (A＊) is not available in shockless type. AC→DC rectified type solenoid (R＊) or AC→DC rectified (quick return) type solenoid (RQ100) models are recommended for shockless operation with AC power.

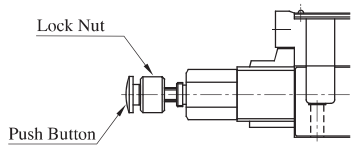
★2. Inrush Current
Inrush current in the above table show rms values at maximum stroke.

The coil type numbers in the shaded column are handled as optional extras. In case these coils are required to be chosen, please confirm the time of delivery with us before ordering.

Options

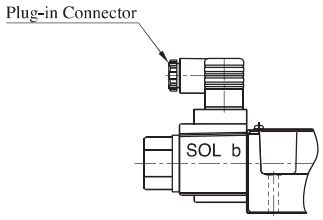
Push Button with Lock Nut

Can be used for manual changeover of spool. The push button can be locked in the pressed condition.



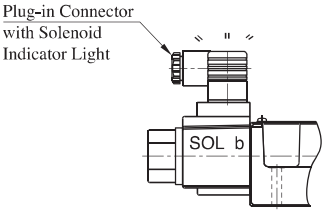
Plug-in Connector Type

Electrical conduit connecting part is plug-in type, so can mount/dismount valves without disconnecting.



Plug-in Connector with Solenoid Indicator Light

These are the indicator light incorporated plug-in connector type solenoids. Energisation or de-energisation of the solenoid can be easily identified with the incorporated indicator light.



M8 Mounting Bolts

As the mounting bolts, M6 socket head cap screws are used for the standard valves, however, M8 socket head cap screws are also available for supply as optional extras. In case the M8 screws are required, suffix "02" to the design number of both valve and sub-plate model number like below.

(Example) Valve：DSG-03-3C2-A100-5002
Sub-plate：DSGM-03-4002

The valve is supplied with 4 pcs. hexagon socket head cap screws M8 × 38 L.

Special connector type (M12-4 Pin Connector Type, Center Plug-in Connector Type, Center Plug-in M12-4 Connector Type), refer to pages E-51 & E-52.

Model Number Designation

S–	DSG	–03	–2	B	2	A	–D24	–C	–N★5	–50	–L
Shockless Type	Series Number	Valve Size	Number of Valve Positions	Spool Spring Arrangement	Spool Type	Input Only Valves Using Neutral Position & Side Position.	Coil Type	Manual Override	Electrical Conduit Connection	Design Number	Models with Reverse Mtg. of Solenoid
None: Standard Type	DSG: Solenoid Operated Directional Valve (Sub-plate Mounting Type)	03	3	C : Spring Centered	2 , 3 4 , 40 5, 60 9 , 10 11, 12	——	AC : A100 A120 A200 A240 DC : D12 D24 D100 R : (AC→DC) R100 R200 RQ : (AC→DC) RQ100	None: Manual Override Pin C : Push Button and Lock Nut (Option)	None: Terminal Box Type N : ★2 Plug-in Connector Type (Option) N1 : ★3 Plug-in Connector Type with Indicator Light (Option)	50	——
			2	D : No-Spring Detented	2	——					
				B : Spring Offset	2 3 8	A : ★1 Using Neutral Position & SOL a Energised Position B : ★1 Using Neutral Position & SOL b Energised Position					L : Input only for reverse mtg. of solenoid.
S : Shockless Type			3	C : Spring Centered	2 4	——	DC : D12 D24 D48 R : (AC→DC) R100 R200 RQ : (AC→DC) RQ100				——
			2	B : Spring Offset	2	A : ★1 Using Neutral Position & SOL a Energised Position B : ★1 Using Neutral Position & SOL b Energised Position					L : Input only for reverse mtg. of solenoid.

★1. In case of Valves Using Neutral Position and Side Position, please refer to page E-43 for details.
★2. "N: Plug-in Connector Type" is not available for RQ-type (AC→DC) solenoids (coil type: RQ100).
★3. "N1: Plug-in Connector Type with Indicator Light" is not available for R type (AC→DC) solenoids (coil type: R*) and RQ-type (AC→DC) solenoids (coil type: RQ100).
★4. Models for phosphate ester fluid are available. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.
★5. Special connector types, " M12-4 Pin Connector Type ", " Center Plug-in Connector Type ", " Center Plug-in M12-4 Connector Type ", please refer to pages E-51 & E-52.

Attention

In the table above, the symbols or numbers highlighted with shade represent the optional extras. The valves with model number having such optional extras are handled as options, therefore, please confirm the time of delivery with us before ordering.

List of Standard Models

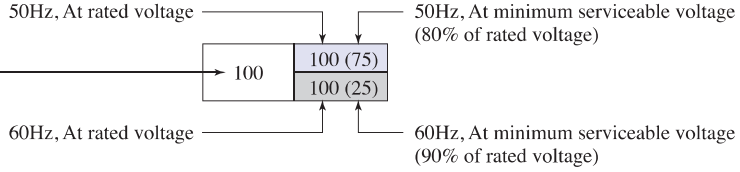
Models with AC Solenoids : DSG-03-＊＊＊-A＊

No. of Valve Positions	Spool-Spring Arrangement	Model Numbers	Graphic Symbols	Max. Flow L/min: P → A, B → T (P → A, B → T)				Max. Flow L/min: P → A [Port "B" Blocked]				Max. Flow L/min: P → B [Port "A" Blocked]			
				Working Pressure MPa				Working Pressure MPa				Working Pressure MPa			
				10	16	25	31.5	10	16	25	31.5	10	16	25	31.5
Three Positions	Spring Centered	DSG-03-3C2		100	100	100	100	100 (70)	100 (48)	96 (28)	65 (24)	100 (70)	100 (48)	96 (28)	65 (24)
								90 (49)	53 (30)	34 (19)	26 (15)	90 (49)	53 (30)	34 (19)	26 (15)
		◆★ DSG-03-3C3		90	90	90	90	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)
								100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)
		DSG-03-3C4		80	80	80 (65)	80 (25)	100 (58)	100 (33)	76 (22)	46 (19)	100 (58)	100 (33)	76 (22)	46 (19)
						75 (20)	30 (15)	90 (47)	50 (26)	28 (18)	22 (15)	90 (47)	50 (26)	28 (18)	22 (15)
		DSG-03-3C40		100	100	100	100 (75)	100 (62)	100 (39)	84 (21)	48 (18)	100 (62)	100 (39)	84 (21)	48 (18)
							100 (25)	62 (40)	47 (26)	27 (16)	20 (12)	62 (40)	47 (26)	27 (16)	20 (12)
		◆★ DSG-03-3C5		30	30	30	30	26	21	18	16	30	28	28	28
		★ DSG-03-3C60		70	70	70	—	100	100	100	—	100	100	100	—
		DSG-03-3C9		100	100	100	100	60	60	60	60	60	60	60	60
		◆ DSG-03-3C10		80	80	80 (30)	80 (20)	100 (55)	100 (36)	60 (21)	34 (16)	100 (55)	100 (36)	60 (21)	34 (16)
						30 (25)	20 (15)	60 (38)	47 (24)	23 (14)	17 (11)	60 (38)	47 (24)	23 (14)	17 (11)
		◆ DSG-03-3C11		100	100	100	100	100 (80)	100 (65)	85 (35)	62 (28)	100 (80)	100 (65)	85 (35)	62 (28)
								80 (60)	70 (46)	51 (32)	45 (25)	80 (60)	70 (46)	51 (32)	45 (25)
		◆ DSG-03-3C12		90	90	90 (30)	90 (20)	100 (55)	100 (36)	60 (21)	34 (16)	100 (55)	100 (36)	60 (21)	34 (16)
						40 (20)	20 (15)	60 (38)	47 (24)	23 (14)	17 (11)	60 (38)	47 (24)	23 (14)	17 (11)
Two Positions	No-Spring Detented	DSG-03-2D2		100	100	100	100	40	40	30	28	60	60	40	35
	Spring Offset	DSG-03-2B2		100	100	100	100	34	24	20	19	100 (62)	100 (62)	100 (44)	94 (37)
				100 (90)	100 (90)	100 (90)	100 (90)					80 (42)	73 (36)	63 (34)	51 (33)
		DSG-03-2B3		100	100	100	100	57	57	57	57	100 (79)	100 (72)	100 (64)	100 (59)
				100 (75)	100 (75)	100 (75)	100 (75)					92 (55)	89 (46)	78 (28)	70 (27)
		◆ DSG-03-2B8		—	—	—	—	26	19	18	16	100 (35)	87 (15)	61 (9)	49 (7)
												45 (21)	34 (12)	15 (9)	11 (6)

Notes) 1. The relation between the maximum flow in the table above and the frequency/voltage (within the serviceable voltage) is as shown below.

(Example)

The maximum flow rate is constant regardless of 50 Hz or 60 Hz and of any voltage variants within the serviceable voltage.



2. For the maximum flow rate in P → T of the valves with a mark ★, please see page E-42.

The valve models with a ◆ mark are handled as options. If you choose such valves, check the time of delivery beforehand.

List of Standard Models

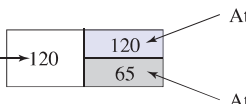
- Models with DC Solenoids : **DSG-03-＊＊＊-D＊**
- Models with R Type Solenoids : **DSG-03-＊＊＊-R＊**
- Models with RQ Type Solenoids : **DSG-03-＊＊＊-RQ100**

No. of Valve Positions	Spool-Spring Arrangement	Model Numbers	Graphic Symbols	Max. Flow L/min											
				P → A, B → A, P → B, A → T				P → A [Port "B" Blocked]				P → B [Port "A" Blocked]			
				Working Pressure MPa				Working Pressure MPa				Working Pressure MPa			
				10	16	25	31.5	10	16	25	31.5	10	16	25	31.5
Three Positions	Spring Centered	DSG-03-3C2		120	120	120	120	120	120 100	80 54	55 43	120	120 100	80 54	55 43
		DSG-03-3C3 ◆★		120	120	120	120	120	120	120	120	120	120	120	120
		DSG-03-3C4		120	120	120	120	120	120	84 65	64 53	120	120	84 65	64 53
		DSG-03-3C40		120	120	120	120	120	120 104	62 57	49 42	120	120 104	62 57	49 42
		DSG-03-3C5 ◆★		50	50	50	50	35	24	21	20	45	45	45	45
		DSG-03-3C60 ★		120	120	120	—	120	120	120	—	120	120	120	—
		DSG-03-3C9		120	120	120	120	100	100	100	100	100	100	100	100
		DSG-03-3C10 ◆		120	120	120 65	65 50	120	112 69	60 46	51 40	120	112 69	60 46	51 40
		DSG-03-3C11 ◆		120	120	120	120	100	100	80 62	65 52	100	100	80 62	65 52
		DSG-03-3C12 ◆		120	120	120 65	65 50	120	120 86	62 47	51 40	120	120 86	62 47	51 40
Two Positions	No-Spring Detented	DSG-03-2D2		120	120	120	120	45	37	30	28	60	60	40	35
	Spring Offset	DSG-03-2B2		110 100	110 100	110 100	110 100	68	47	38	38	120	114 83	75 58	63 48
		DSG-03-2B3		120	120	120	120	77	77	77	77	120	120	120	120 103
		DSG-03-2B8 ◆		—	—	—	—	53	33	24	23	120	120 62	62 40	47 37

Notes) 1. The relation between the maximum flow in the table above and the voltage (within the serviceable voltage) is as shown below.

(Example)

The maximum flow rate is constant regardless of any voltage variants within the serviceable voltage.



At rated voltage [after temperature rise and saturated]

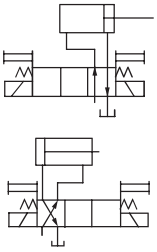
At minimum serviceable voltage (90% of rated voltage) [after temperature rise and saturated]

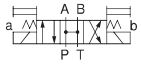
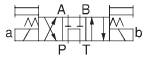
2. For the maximum flow rate in P → T of the valves with a ★ mark, please see page E-42.

The valve models with a ◆ mark are handled as options. If you choose such valves, check the time of delivery beforehand.

Maximum Flow Rate in P → T Flow

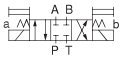
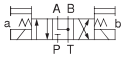
In valve type 3C3, 3C5, 3C60, in case where the actuator is put on between the cylinder ports A and B as illustrated below and where the actuator moves and suspended at its stroke end and where the valve is then shifted to the neutral position in the suspended state of the actuator, the maximum flow rates available are those as shown as the table below regardless of any voltage in the range of serviceable voltage.



Model Numbers	Graphic Symbols	Max. Flow L/min			
		10 MPa	16 MPa	25 MPa	31.5 MPa
DSG–03–3C3–A✻		100	100	100	100
DSG–03–3C3–D✻/R✻/RQ100		120	120	120	120
DSG–03–3C5–A✻		26	21	18	16
DSG–03–3C5–D✻/R✻/RQ100		35	24	21	20
DSG–03–3C60–A✻		84	52	52	—
DSG–03–3C60–D✻/R✻/RQ100		68	65	61	—

List of Standard Models (Shockless Type)

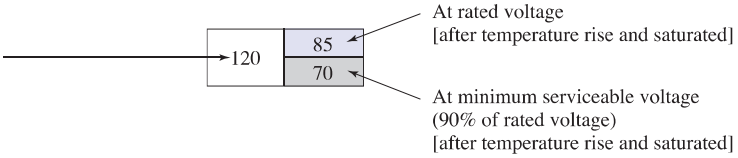
- Models with DC Solenoids : **S-DSG-03—✻✻✻-D✻**
- Models with R Type Solenoids : **S-DSG-03—✻✻✻-R✻**
- Models with RQ Type Solenoids : **S-DSG-03-✻✻✻-RQ100**

No. of Valve Positions	Spool-Spring Arrangement	Model Numbers	Graphic Symbols	Max. Flow L/min											
				P → A, B → T				P → A [Port "B" Blocked]				P → B [Port "A" Blocked]			
															
				Working Pressure MPa				Working Pressure MPa				Working Pressure MPa			
				5	10	16	25	5	10	16	25	5	10	16	25
Three Positions	Spring Centered	S-DSG-03-3C2		120	120	120	120	120	120	75	50	120	120	75	50
									105	65	40		105	65	40
		S-DSG-03-3C4		120	120	85	65	120	120	75	40	120	120	75	40
						70	45		100	65	35		100	65	35
Two Positions	Spring Offset	S-DSG-03-2B2		120	100	75	40	39	39	39	39	120	120	105	60
														85	50

Note) 1. The relation between the maximum flow in the table above and the voltage (within the serviceable voltage) is as shown below.

(Example)

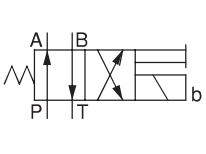
The maximum flow rate is constant regardless of any voltage variants within the serviceable voltage.

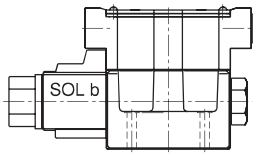


Reverse Mounting of Solenoid

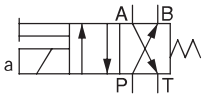
In spring offset type, it is a standard configuration that the solenoid is mounted onto the valve in the SOL b position (side). However, in this particular spool-spring arrangement, the mounting of the solenoid onto the valve in the reverse position -SOL a side- is also available. The graphic symbol for this reverse mounting is as shown below.

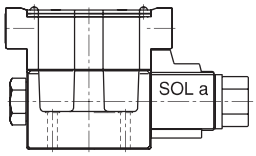
As for the valve type 2B*A and 2B*B, please refer to the explanation under the heading of "Valves Using Neutral Position and Side Position" given below.





Standard Mtg. of Solenoid



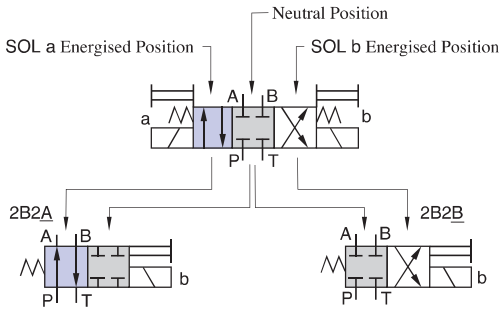


Reverse Mtg. of Solenoid

Valves Using Neutral Position and Side Position

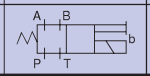
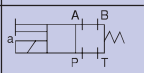
Besides the use of the standard 2-position valves aforementioned in the "List of Standard Models", the 3-position valves also can be used as the 2-position valves using the two of their three positions. In this case, there are two kinds of the valve available. One is the valve using the neutral position and SOL a position (2B*A) and another is the valve using the neutral position and SOL b position (2B*B).

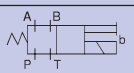
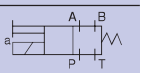
(Example) In case of Spool Type "2"



"A" Use of Neutral and SOL. a Energised Position

"B" Use of Neutral and SOL. b Energised Position

Model Numbers	Graphic Symbols	
	Standard Mtg. Type	Reverse Mtg. Type
(S-) DSG-03-2B *A		
(S-) DSG-03-2B2A		——

Model Numbers	Graphic Symbols	
	Standard Mtg. Type	Reverse Mtg. Type
*-DSG-03-2B *B		
(S-) DSG-03-2B2B		
DSG-03-2B3B		——
(S-) DSG-03-2B4B		——
DSG-03-2B60B		——
DSG-03-2B10B		——

In the above table, the graphic symbols in mounting type highlighted with shade are optional extra, therefore, please confirm the time of delivery with us before ordering.

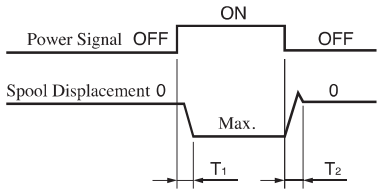
Typical Changeover Time (Example)

Standard Type (Without Shockless Function)

[Test Conditions]

Pressure : 16 MPa
Flow Rate : 70 L/min
Viscosity : 30 mm²/s
Voltage : 100 %V at rated voltage
(After temperature rise and saturated)

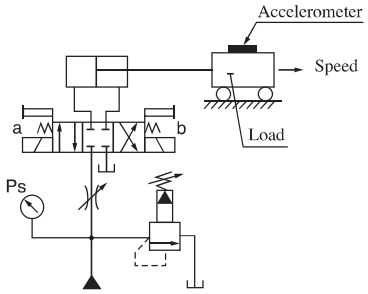
[Result of Measurement]



Type	Model Numbers	Time ms	
		T1	T2
Standard Type	DSG-03-3C2-A *	27	22
	DSG-03-3C2-D *	97	30
	DSG-03-3C2-R *	97	204
	DSG-03-3C2-RQ100	97	41

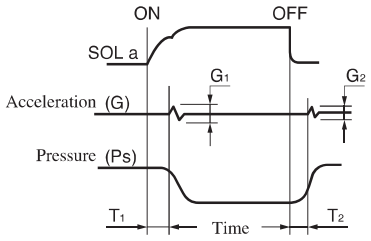
Shockless Type

[Test Circuit and Conditions]



Setting Pressure (Ps) : 7 MPa
Load (W) : 1000 kg
Cylinder Speed : 8.8 m/min
Viscosity : 30 mm²/s

[Result of Measurement]



Type	Model Numbers	Time ms		Acceleration m/s²	
		T1	T2	G1	G2
Shockless Type	S-DSG-03-3C2-D *	110	120	6.4	6.4
	S-DSG-03-3C2-R *	110	220		
	S-DSG-03-3C2-RQ100	110	120		

Mounting Bolts

Mounting bolts are not available, please order separately.

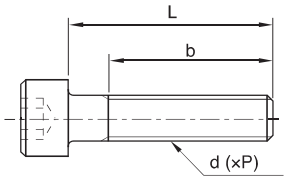
Type/Dimension/Quantity

Item		Details
Type		Soc. Hd. Cap Screw (SCM)
Thread Size d		M6
Thread Pitch P	mm	1
Bolt Length L	mm	35
Thread Length (Reference) b	mm	24
Quantity		4

★If order to us, please use the model numbers below.
MBK-03-05-*
(* is the newest design number)

Specifications/Machinery Characteristics

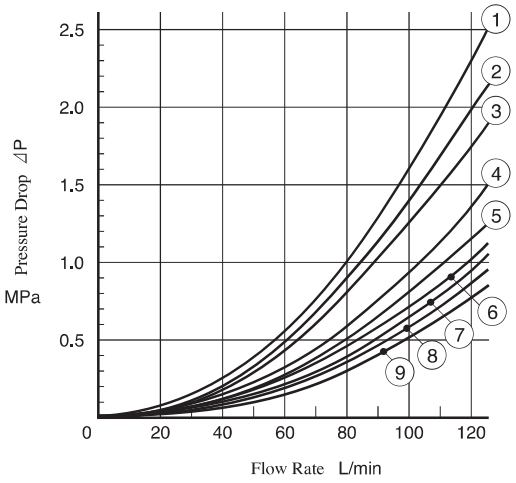
Item	Details
Material	Steel SCM
Screw Type	Meter Coarse Screw
Finishing	Black Oxide Film
Class of Strength	12.9
Standard	Based on JIS B 1176 (2014)



Pressure Drop

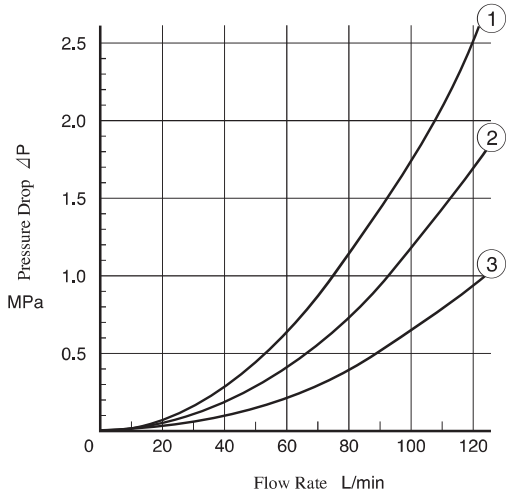
Pressure drop curves based on viscosity of 35 mm²/s and specific gravity of 0.850.

Standard Type : DSG-03



Model Numbers	Pressure Drop Curve Number				
	P→A	B→T	P→B	A→T	P→T
DSG-03-3C2	⑦	⑦	⑦	⑦	—
DSG-03-3C3	⑨	⑨	⑨	⑨	⑤
DSG-03-3C4	⑦	⑧	⑦	⑧	—
DSG-03-3C40	⑦	⑦	⑦	⑦	—
DSG-03-3C5	⑨	⑦	⑦	⑨	①
DSG-03-3C60	⑥	⑤	⑥	⑤	①
DSG-03-3C9	⑨	⑦	⑨	⑦	—
DSG-03-3C10	⑦	⑧	⑦	⑦	—
DSG-03-3C11	⑨	⑦	⑦	⑦	—
DSG-03-3C12	⑦	⑦	⑦	⑧	—
DSG-03-2D2	④	③	⑥	⑥	—
DSG-03-2B2	②	①	⑦	⑦	—
DSG-03-2B3	③	②	⑨	⑨	—
DSG-03-2B8	⑥	—	⑤	—	—

Shockless Type : S-DSG-03



Model Numbers	Pressure Drop Curve Number			
	P→A	B→T	P→B	A→T
S-DSG-03-3C2	②	②	②	②
S-DSG-03-3C4	②	②	③	③
S-DSG-03-2B2	①	②	②	②

● For any other viscosity, multiply the factors in the table below.

Viscosity mm²/s	15	20	30	40	50	60	70	80	90	100
Factor	0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

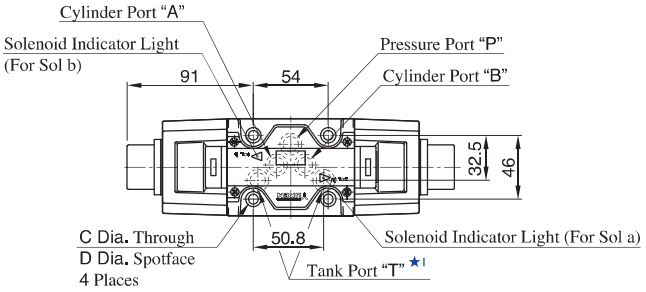
● For any other specific gravity (G'), the pressure drop (⊿ P') may be obtained from the formula below.
⊿ P' = ⊿ P (G'/0.850)

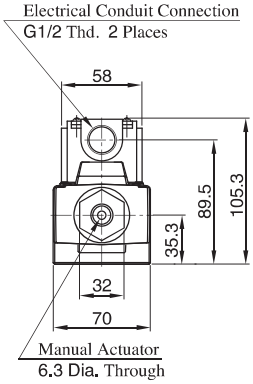
Mounting Surface: ISO 4401-05-04-0-05

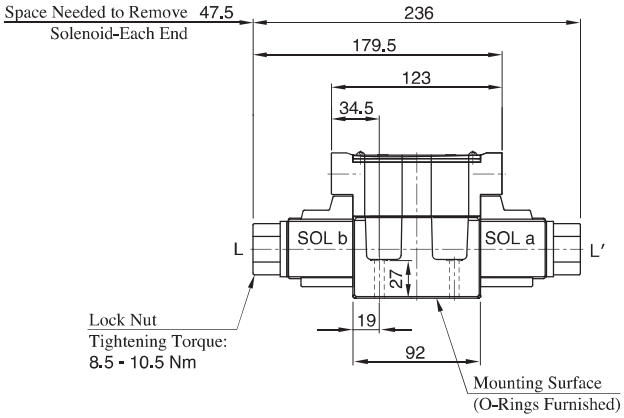
Terminal Box Type (Standard)

■ Models with AC Solenoids : DSG-03-＊＊＊-A＊

- Spring Centered
- No-Spring Detented



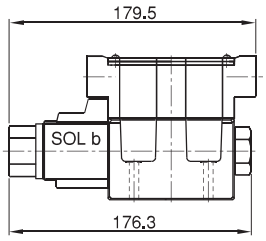




Model Numbers	C	D	Remarks
DSG-03-＊＊＊-A＊-50	7	11	Standard
DSG-03-＊＊＊-A＊-5002	8.8	14	Option

★1. Of the two of tank port "T", the tank port in the left side is normally used in our standard sub-plate, though, either side of the tank port "T" can be used without problem.

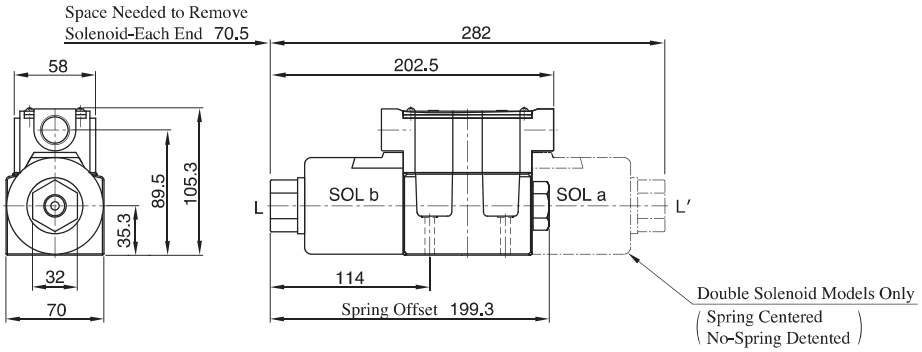
- Spring Offset



- For other dimensions, refer to the drawing above.
- Solenoid being mounted in the reverse position -SOL a side- is also available.

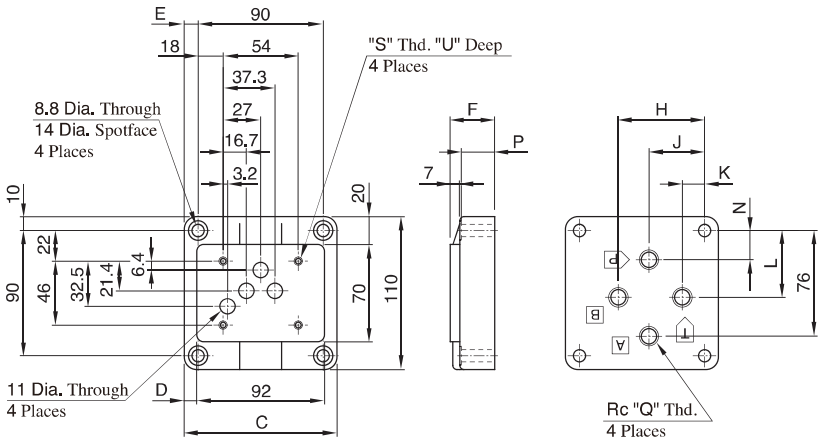
■ Models with DC Solenoids：(S-) DSG-03-＊＊＊-D＊
■ Models with R Type Solenoids：(S-) DSG-03-＊＊＊-R＊
■ Models with RQ Type Solenoids：(S-) DSG-03-＊＊＊-RQ100

- Spring Centered
- No-Spring Detented
- Spring Offset



● For other dimensions, refer to Models with AC solenoids (Page E-46).

■ Sub- plates：DSGM-03/03X/03Y



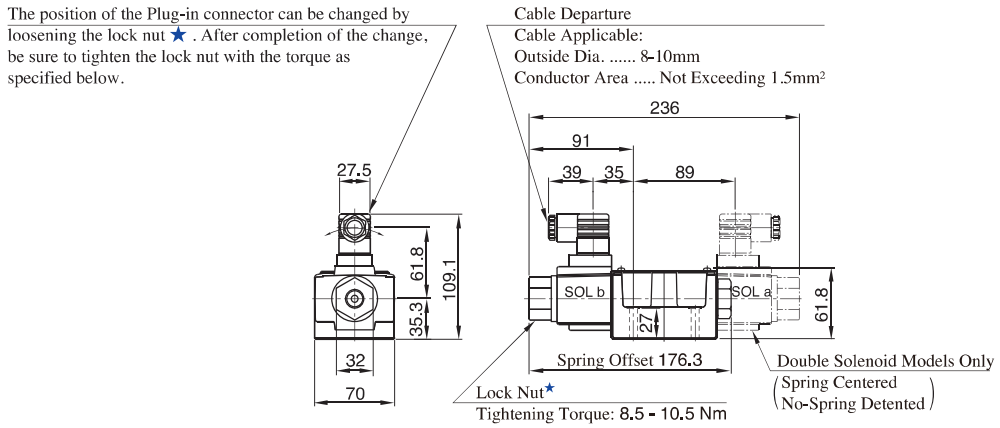
Sub-plate Model Numbers	C	D	E	F	H	J	K	L	N	P	Q
DSGM-03-40/4002	110	9	10	32	62	40	16	48	21	24	3/8
DSGM-03X-40/4002											1/2
DSGM-03Y-40/4002	120	14	15	50	80	45	10	47	16	42	3/4

Sub-plate Model Numbers	S	U	Remarks
DSGM-03＊-40	M6	13	Standard
DSGM-03＊-4002	M8	14	Option

Options

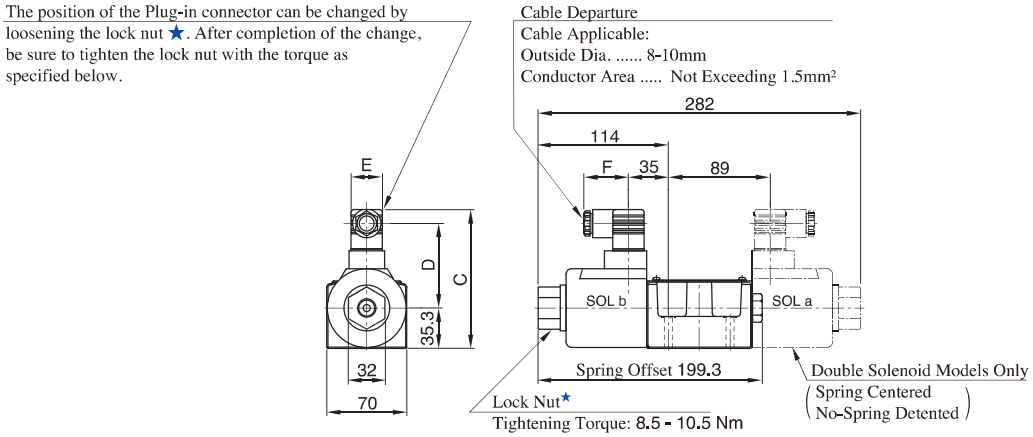
Plug-in Connector Type/Plug-in Connector with Indicator Light

● Models with AC Solenoids : **DSG-03-＊＊＊-A＊-N/N1**



● Models with DC Solenoids : **(S-) DSG-03-＊＊＊-D＊-N/N1**

● Models with R Type Solenoids : **(S-) DSG-03-＊＊＊-R＊-N**

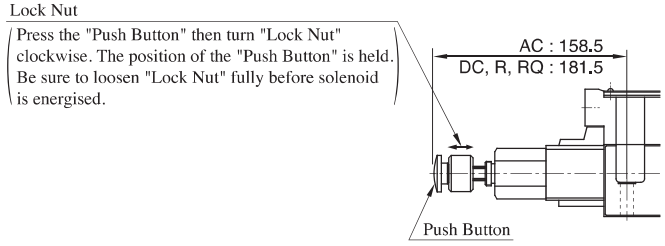


Model Numbers	C	D	E	F
DSG-03-＊＊＊-D＊-N/N1	121.1	73.8	27.5	39
DSG-03-＊＊＊-R＊-N	124.9	66.5	34	53

●For other dimensions, refer to "Terminal Box Type" (Page E-46 – E-47).

Models with Push Button & Lock Nut

(S-) DSG-03-＊＊＊-＊-C

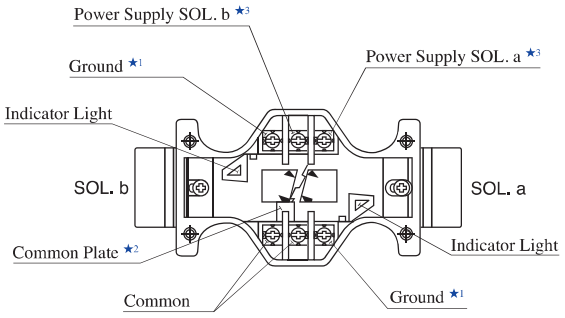


Electrical Conduit Connection

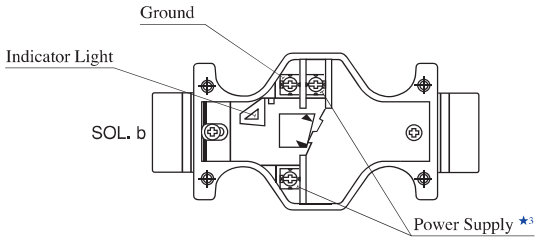
Details of Receptacle

Terminal Box Type

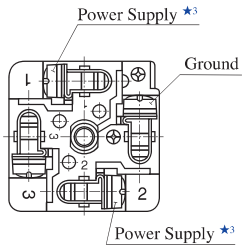
Double Solenoid Type



Single Solenoid Type (SOL b)



Plug-in Connector Type

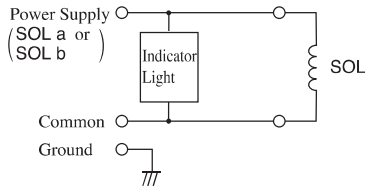


★1. There are two grounding terminals. You can use either one.
★2. If you do not need the common plate, remove it.
★3. With DC solenoids, polarity is no question.

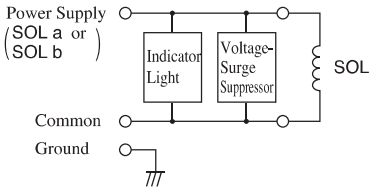
Electrical Circuit (Single Solenoid Type)

Terminal Box Type

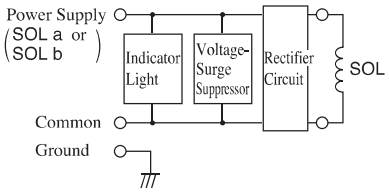
AC



DC

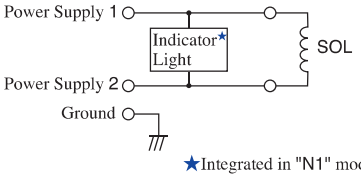


AC→DC Rectified



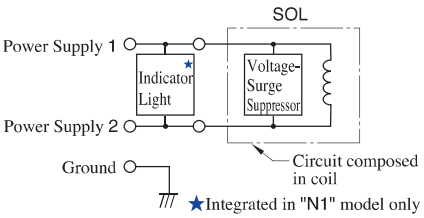
Plug-in Connector Type

AC



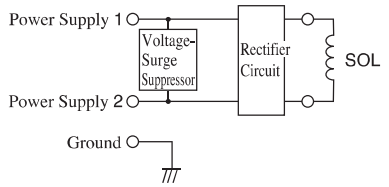
★Integrated in "N1" model only

DC



★Integrated in "N1" model only

AC→DC Rectified

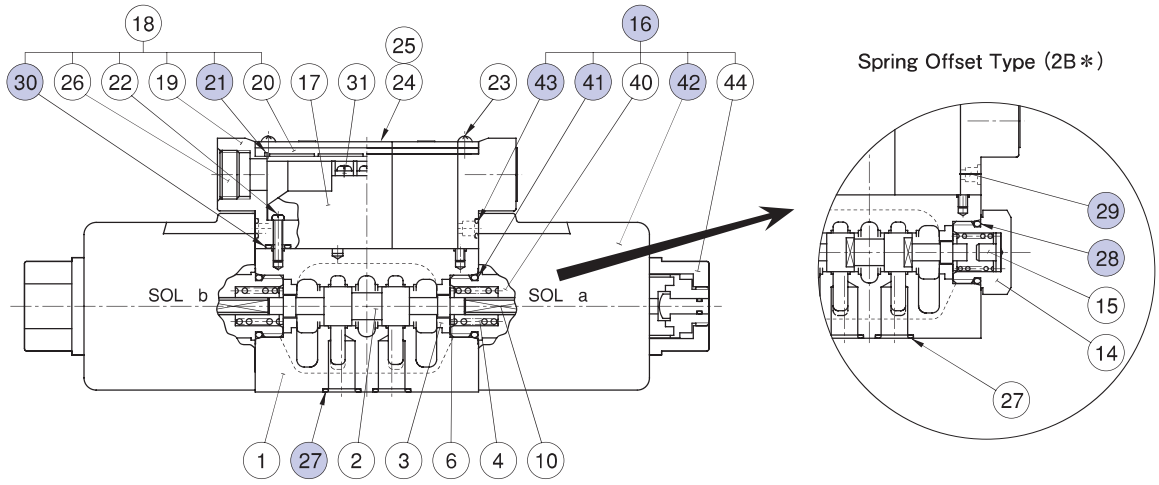


⚠ DANGER

- Do not perform wiring while the power is on.
  Doing so may result in electric shock, burns or death.
- Make the wiring properly. Improper wiring will cause an irregular movement of the machine, resulting in a grave accident.

List of Seals and Solenoid Ass'y

(S-) DSG-03-＊＊＊



List of Seals

Item	Name of Parts	Part Numbers	Qty.			Remarks
			3C＊	2D＊	2B＊	
21	Gasket	1751S-VK418689-6	1	1	1	
27	O-Ring	AS 568-014 (NBR-90)	5	5	5	
28	O-Ring	OR NBR-90 P21-N	—	—	1	
29	Plug	1790S-VK418329-9	—	—	2	
30	O-Ring	S 6	2	2	2	
41	O-Ring	OR NBR-90 P21-N	2	2	1	Included in Solenoid Ass'y ⑯
43	O-Ring	OR NBR-70-1 P4-N	4	4	2	

List of Solenoid Ass'y and Coil Ass'y

Model Numbers	⑯ Solenoid Ass'y No.	㊷ Coil No.	Remarks
DSG-03-＊＊＊-A100	SA3-100-51	C-SA3-100-51	
DSG-03-＊＊＊-A120	SA3-120-51	C-SA3-120-51	
DSG-03-＊＊＊-A200	SA3-200-51	C-SA3-200-51	
DSG-03-＊＊＊-A240	SA3-240-51	C-SA3-240-51	
DSG-03-＊＊＊-D12	SD3-12-51	C-SD3-12-51	Terminal Box Type
DSG-03-＊＊＊-D24	SD3-24-51	C-SD3-24-51	
DSG-03-＊＊＊-D48	SD3-48-51	C-SD3-48-51	
DSG-03-＊＊＊-R100/RQ100	SR3-100-51	C-SR3-100-51	
DSG-03-＊＊＊-R200	SR3-200-51	C-SR3-200-51	
DSG-03-＊＊＊-A100-N/N1	SA3-100-N-51	C-SA3-100-N-51	
DSG-03-＊＊＊-A120-N/N1	SA3-120-N-51	C-SA3-120-N-51	
DSG-03-＊＊＊-A200-N/N1	SA3-200-N-51	C-SA3-200-N-51	
DSG-03-＊＊＊-A240-N/N1	SA3-240-N-51	C-SA3-240-N-51	
DSG-03-＊＊＊-D12-N/N1	SD3-12-N-51	C-SD3-12-N-51	Plug-in Connector Type
DSG-03-＊＊＊-D24-N/N1	SD3-24-N-51	C-SD3-24-N-51	
DSG-03-＊＊＊-D48-N/N1	SD3-48-N-51	C-SD3-48-N-51	
DSG-03-＊＊＊-R100-N	SR3-100-N-51	C-SR3-100-N-51	
DSG-03-＊＊＊-R200-N	SR3-200-N-51	C-SR3-200-N-51	

● As of solenoid Ass'y of shockless type and models with push button & lock nut, please order as below.

(Example) SD3-12-S-C-N-51

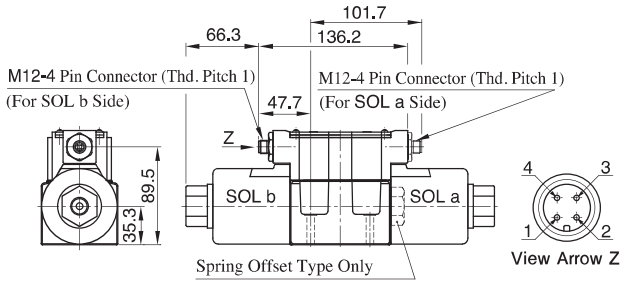
C : Only for the models with push button & lock nut (option)

S : Only for the models of shockless type

Coil Ass'y numbers are same with those in the above chart.

Special Electrical Conduit Connection

M12-4 Pin Connector Type



● For other dimensions, refer to page E-47 for Standard Terminal Box Type.

Model Numbers

DSG-03-2B2-D24-M1-50-L

M12-4 Pin Connector Electrical Conduit Connection
- M1 : Load Side Common Minus (PNP Type) Terminal Box SOL b Side Conduit Connection
- M2 : Load Side Common Minus (PNP Type) Terminal Box SOL a Side Conduit Connection
- M3 : Load Side Common Plus (NPN Type) Terminal Box SOL b Side Conduit Connection
- M4 : Load Side Common Plus Terminal Box SOL a Side Conduit Connection

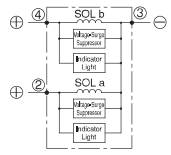
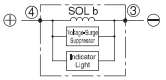
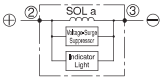
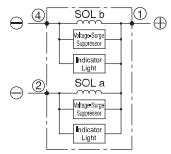
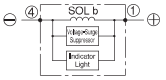
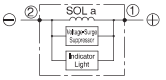
Coil numbers only for D12 and D24

● For other items, refer to page E-39 for Standard Model Number Designation.

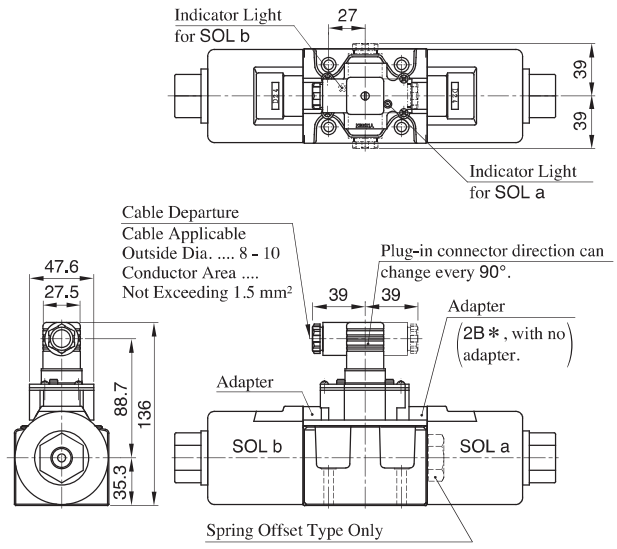
● Pin No.

	Double Solenoid Type		Single Solenoid Type (Standard Mounting)		Single Solenoid Type (Reverse Mounting)	
Terminal	Common Minus PNP (Source)	Common Plus NPN (Sink)	Common Minus PNP (Source)	Common Plus NPN (Sink)	Common Minus PNP (Source)	Common Plus NPN (Sink)
①	Unused	Common(+)	Unused	Common(+)	Unused	Common(+)
②	SOL a	SOL a	Unused	Unused	SOL a	SOL a
③	Common(-)	Unused	Common(-)	Unused	Common(-)	Unused
④	SOL b	SOL b	SOL b	SOL b	Unused	Unused
Connector Departure Direction	M1: SOL b Side M2: SOL a Side	M3: SOL b Side M4: SOL a Side	M1: SOL b Side M2: Plug Side	M3: SOL b Side M4: Plug Side	M1: Plug Side M2: SOL a Side	M3: Plug Side M4: SOL a Side

Connection Circuit

	Double Solenoid Type	Single Solenoid Type	
		Standard Mounting	Reverse Mounting
Load Side Common Minus			
Load Side Common Plus			

Center Plug-in Connector Type



● For other dimensions, refer to page E-47 for Standard Terminal Box Type.

Model Numbers

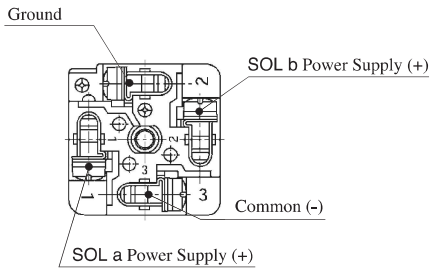
DSG-03-2B2-D24-S-50-L

Center Plug-in Connector
Electrical Conduit Connection Type

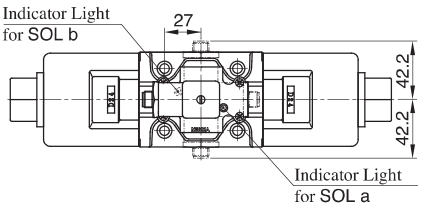
Coil Numbers Only for D12, D24, A100, A120, A200 & A240

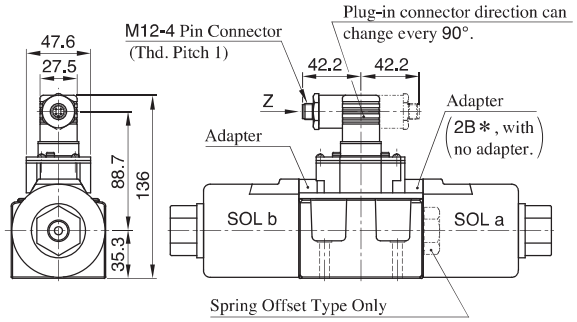
● For other items, refer to page E-39 for Standard Model Number Designation.

Details of Receptacle



Center Plug-in Connector M12-4 Pin Connector Type





● For other dimensions, refer to page E-47 for Standard Terminal Box Type.

Pin No.

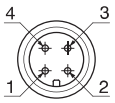
Terminal	Double Solenoid Type		Single Solenoid Type (Standard Mounting)		Single Solenoid Type (Reverse Mounting)	
	Common Minus PNP (Source)	Common Plus NPN (Sink)	Common Minus PNP (Source)	Common Plus NPN (Sink)	Common Minus PNP (Source)	Common Plus NPN (Sink)
①	Unused	Common(+)	Unused	Common(+)	Unused	Common(+)
②	SOL a	SOL a	Unused	Unused	SOL a	SOL a
③	Common(-)	Unused	Common(-)	Unused	Common(-)	Unused
④	SOL b	SOL b	SOL b	SOL b	Unused	Unused

Model Numbers

DSG-03-2B2-D24-S1-50-L

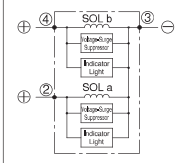
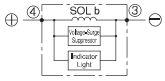
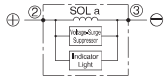
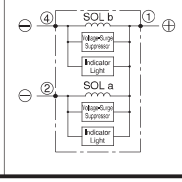
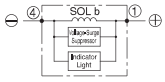
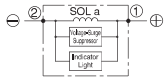
- Center Plug-in M12 Connector 4 Pins Electrical Conduit Connection
  - S1 : Load Side Common Minus (PNP Type)
  - S2 : Load Side Common Plus (NPN Type)
- Coil numbers only for D12 and D24

● For other items, refer to page E-39 for Standard Model Number Designation.



View Arrow Z

Connection Circuit

	Double Solenoid Type	Single Solenoid Type	
		Standard Mounting	Reverse Mounting
Load Side Common Minus			
Load Side Common Plus			

Low Wattage (5W) Type Solenoid Operated Directional Valves

Two types of Direct Acting Type Solenoid Operated Directional Valves, E-DSG-01/03, with suppressed consumption power 5W are launched in series.



E-DSG-01



E-DSG-03

● **Enable Savings In Operating Cost**

Because these valves only 5W of power which enables remarkable reduction of operating cost.

Standard DSG Series
DSG-01 : 29W
DSG-03 : 38W

→

Low Wattage Type E-DSG Series
E-DSG-01 : 5W
E-DSG-03 : 5W

● **Enable Savings In Initial Cost**

Since these valves operate on only 5W, they can be driven through the output circuit of a programmed or sequence controller. This feature simplifies the electric circuitry and enables savings in initial cost.

● **Low Coil Surface Temperature**

These low wattage valves minimize coil surface temperature.

● **CE Certified Products Available**

Because E-DSG-03 models are for the European equipment market, so CE certified products are also available.
(For more details, please contact us.)

Specifications

Model Numbers	Max. Flow★ L/min	Max. Operating Pressure MPa	Max. T-Line Back Pressure MPa	Max. Changeover Frequency min⁻¹	Mass kg
E-DSG-01-3C✻-D✻-70	45	16	16	240	2.0
E-DSG-01-2D2-D✻-70					2.0
E-DSG-01-2B✻-D✻-70					1.5
E-DSG-03-3C✻-D✻-50	63	16	16	240	5
E-DSG-03-2D2-D✻-50					5
E-DSG-03-2B2-D✻-50					3.6

★ The maximum flow means the limited flow without inducing any abnormality to the operation (changeover) of the valve.
The maximum flow differs according to the spool type and operating conditions. For details, please refer to the "List of Standard Models" on page E-55.

Solenoid Ratings

Model Numbers	Electric Source	Coil Type	Voltage (V)		Current & Power at Rated Voltage	
			Source Rating	Serviceable Range	Inrush (A)	Power (W)
E-DSG-01	DC (K Series)	D24	24	21.6 - 26.4	0.22	5
E-DSG-03		D12	12	10.8 - 13.2	0.44	5
		D24	24	21.6 - 26.4	0.22	

The coil type numbers in the shaded column are handled as optional extras. In case these coils are required to be chosen, please confirm the time of delivery with us before ordering.

Sub-plates

Valve Model Numbers	Sub-plate Model Numbers	Thread Size Rc	Mass kg
E-DSG-01	DSGM-01-31	1/8	0.8
	DSGM-01X-31	1/4	
	DSGM-01Y-31	3/8	
E-DSG-03	DSGM-03-40	3/8	3
	DSGM-03X-40	1/2	
	DSGM-03Y-40	3/4	4.7

● Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish.(6S)

● Sub-plates are same with those for DSG 01/03 series. For dimensions, refer to pages E-31 & E-47.

Mounting Bolts

Mounting bolts are not available, so please order separately. For details, please refer to pages E-29 & E-44.

Special Electrical Conduit Connection

"M12-4 Pin Connector Type", "Center Plug-in Connector Type" "Center Plug-in M12-4 Pin Connector Type" are available, please refer to page E-61 for details.

Model Number Designation

E–DSG	–01	–2	B	2	A	–D24	–N	–70	–L
Series Number	Valve Size	Number of Valve Positions	Spool Spring Arrangement	Spool Type	Input Only Valves Using ★1 Neutral Position & Side Position	Coil Type	Electrical Conduit Connection	Design Number	Models with Reverse Mtg. of Solenoid
E–DSG : Low Wattage (5W) Solenoid Operated Directional Valve (Sub-plate Mounting Type)	01	3	C : Spring Centered	2, 3, 4 11, 40	———	D24	None: Terminal Box Type (Standard) N : Plug-in Connector Type N1 : Plug-in Connector Type with Indicator Light	70	———
		2	D : No-Spring Detented	2	———				———
			B : Spring Offset	2, 3, 8	———				L : Input only for reverse mtg. of solenoid.
				2, 4 40	A : Using Neutral Position & SOL a Energised Position B : Using Neutral Position & SOL b Energised Position				
	03	3	C : Spring Centered	2, 4	———	D12 D24		50	———
		2	D : No-Spring Detented	2	———				———
			B : Spring Offset	2	B : Using Neutral Position & SOL b Energised Position				L : Input only for reverse mtg. of solenoid.

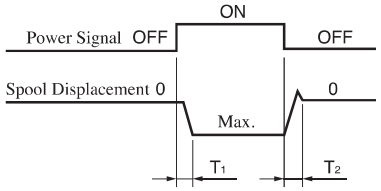
★1. In case of Valves Using Neutral Position and Side Position, please refer to page E-56 for details.
★2. Models for phosphate ester fluid are available. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

Attention

In the table above, the symbols or numbers highlighted with shade represent the optional extras. The valves with model number having such optional extras are handled as options, therefore, please confirm the time of delivery with us before ordering.

Typical Changeover Time (Example)

Changeover time varies according to oil viscosity, spool type and hydraulic circuit.



Valve Size	Model Numbers	Time ms		Test Conditions			
		T_1	T_2	Pressure MPa	Flow Rate L/min	Viscosity mm2/s	Voltage
01	E–DSG–01–3C2	125	37	16	30	30	100 %V at rated voltage (After temperature rise and saturated)
03	E–DSG–03–3C2	190	70	16	50	35	
	E–DSG–03–2B2	190	100		40		

LIst of Standard Models

Valve Size	No. of Valve Positions	Spool-Spring Arrangement	Model Numbers	Graphic Symbols	Max. Flow L/min: P → A, B → T			P → A [Port "B" Blocked]			P → B [Port "A" Blocked]		
					Working Pressure MPa			Working Pressure MPa			Working Pressure MPa		
					3.5	7	16	3.5	7	16	3.5	7	16
01	Three Positions	Spring Centered	E-DSG-01-3C2		45	45	45	45	45 30	20 15	45	45 30	20 15
			E-DSG-01-3C3		45	45	45	45	45	45	45	45	45
			E-DSG-01-3C4		45	45	45 35	45	45 30	20 15	45	45 30	20 15
			E-DSG-01-3C40		45	45	45 25	45	45 30	20 15	45	45 30	20 15
			E-DSG-01-3C11		45	45	45	16	8	3	45	25 14	9 6
	Two Positions	No-Spring Detented	E-DSG-01-2D2		40	40	40	40	30 23	20 12	40	30 23	20 12
		Spring Offset	E-DSG-01-2B2		45	45	45	30	10	9	45	20 13	12 6
			E-DSG-01-2B3		45	45 30	45 30	35	35 22	25 22	45 35	45 35	45 35
			E-DSG-01-2B8		—	—	—	16	5	2	40	25 14	9 6
03	Three Positions	Spring Centered	E-DSG-03-3C2		63	63	50	50	48 35	22 16	50	48 35	22 16
			E-DSG-03-3C4		63	63 50	30 18	50	45 32	32 22	50	45 32	32 22
	Two Positions	No-Spring Detented	E-DSG-03-2D2		63	63	50	34	34	25 20	34	34	25 20
		Spring Offset	E-DSG-03-2B2		50	50	40	16	12	10	50 35	32 18	16 10

Note) 1. The relation between the maximum flow in the table above and the voltage (within the serviceable voltage) is as shown below.

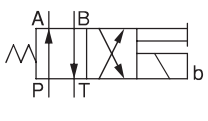
(Example)

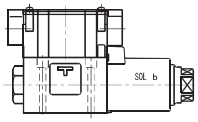
The maximum flow rate is constant regardless of any voltage variants within the serviceable voltage → 45 / 45 / 35

- 45 (upper): At rated voltage [after temperature rise and saturated]
- 35 (lower): At minimum serviceable voltage (90% of rated voltage) [after temperature rise and saturated]

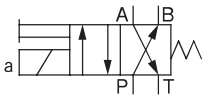
Reverse Mounting of Solenoid

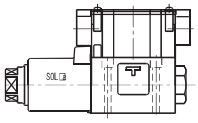
In spring offset type, it is a standard configuration that the solenoid is mounted onto the valve in the SOL b position (side). However, in this particular spool-spring arrangement, the mounting of the solenoid onto the valve in the reverse position -SOL a side- is also available. The graphic symbol for this reverse mounting is as shown below.
As for the valve type 2B*A and 2B*B, please refer to the explanation under the heading of "Valves Using Neutral Position and Side Position" given below.





Standard Mtg. of Solenoid



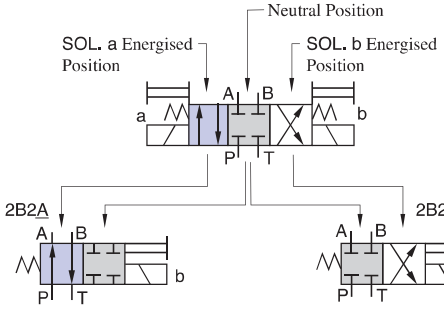


Reverse Mtg. of Solenoid

Valves Using Neutral Position and Side Position

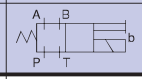
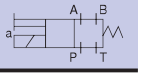
Besides the use of the standard 2-position valves aforementioned in the "List of Standard Models", the 3-position valves also can be used as the 2-position valves using the two of their three positions. In this case, there are two kinds of the valve available. One is the valve using the neutral position and SOL a position (2B*A) and another is the valve using the neutral position and SOL b position (2B*B).

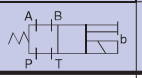
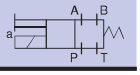
(Example) In case of Spool Type "2"



"A" : Use of Neutral and SOL. a Energised Position

"B" : Use of Neutral and SOL. b Energised Position

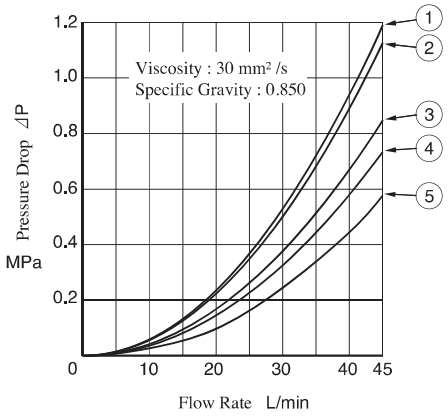
Model Numbers	Graphic Symbols	
	Standard Mtg. Type	Reverse Mtg. Type
E-DSG-01-2B*A		
E-DSG-01-2B2A		—

Model Numbers	Graphic Symbols	
	Standard Mtg. Type	Reverse Mtg. Type
E-DSG-$^{01}_{03}$-2B*B		
E-DSG-$^{01}_{03}$-2B2B		—
E-DSG-$^{01}_{03}$-2B4B		

In the above table, the graphic symbols in mounting type highlighted with shade are optional extra, therefore, please confirm the time of delivery with us before ordering.

Pressure Drop

E-DSG-01



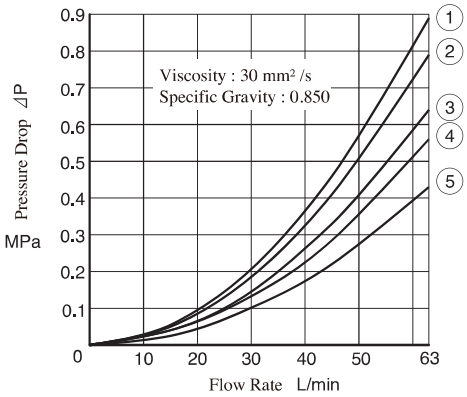
Model Numbers	Pressure Drop Curve Number			
	P→A	B→T	P→B	A→T
E–DSG–01–3C2	①	①	①	①
E–DSG–01–3C3	⑤	⑤	⑤	⑤
E–DSG–01–3C4	①	④	①	④
E–DSG–01–3C40	①	①	①	①
E–DSG–01–3C11	⑤	①	①	①
E–DSG–01–2D2	②	②	②	②
E–DSG–01–2B2	②	②	②	②
E–DSG–01–2B3	③	③	③	③
E–DSG–01–2B8	②	—	②	—

● For any other viscosity, multiply the factors in the table below.

Viscosity mm²/s	15	20	30	40	50	60	70	80	90	100
Factor	0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

● For any other specific gravity (G'), the pressure drop (⊿P') may be obtained from the formula below.
⊿P' = ⊿P (G'/0.850)

E–DSG–03



Model Numbers	Pressure Drop Curve Number			
	P→A	B→T	P→B	A→T
E-DSG-03-3C2	③	③	③	③
E-DSG-03-3C4	③	④	③	④
E-DSG-03-2D2	①	①	⑤	⑤
E-DSG-03-2B2	②	②	③	③

● For any other viscosity, multiply the factors in the table below.

Viscosity mm²/s	15	20	30	40	50	60	70	80	90	100
Factor	0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

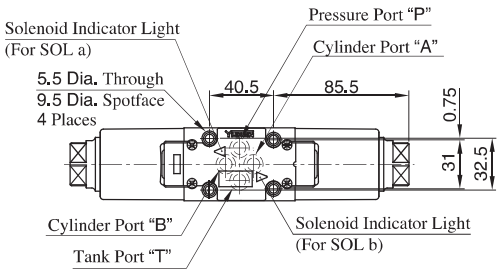
● For any other specific gravity (G'), the pressure drop (⊿P') may be obtained from the formula below.
⊿P' = ⊿P (G'/0.850)

Mounting Surface: ISO 4401-03-02-0-05

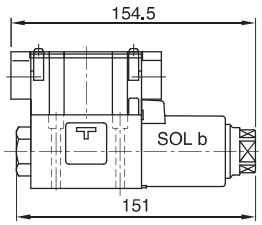
Terminal Box Type (Standard)

E-DSG-01-＊＊＊-D24

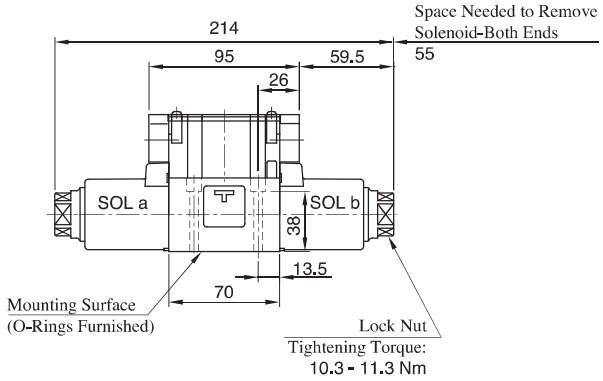
● Spring Centered & No-Spring Detented

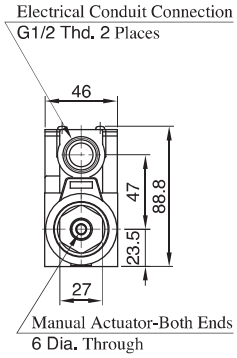


● Spring Offset



●For other dimensions, refer to the drawing left.
●Solenoid being mounted in the reverse position SOL a side is also available.

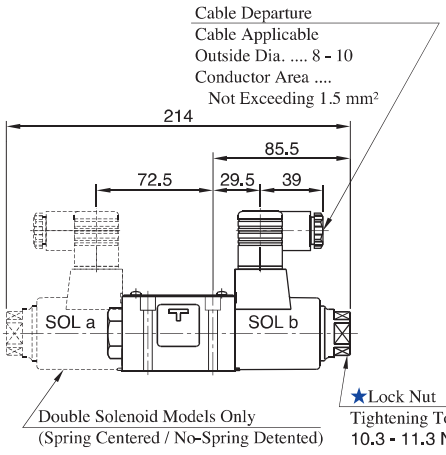




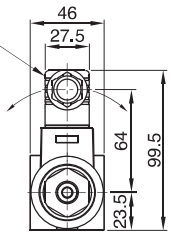
Note : Dimensions of valve mounting surface, refer to page E-31 for shared sub-plates dimensions.

Options

Plug-in Connector Type / Plug-in Connector with Indicator Light : E-DSG-01-＊＊＊-D24-N/N1



The position of the Plug-in connector can be changed by loosening the lock nut ★. After completion of the change, be sure to tighten the lock nut with the torque as specified below.



● For other dimensions, refer to "Terminal Box Type" drawing above.

E-DSG-03-＊＊＊-D＊

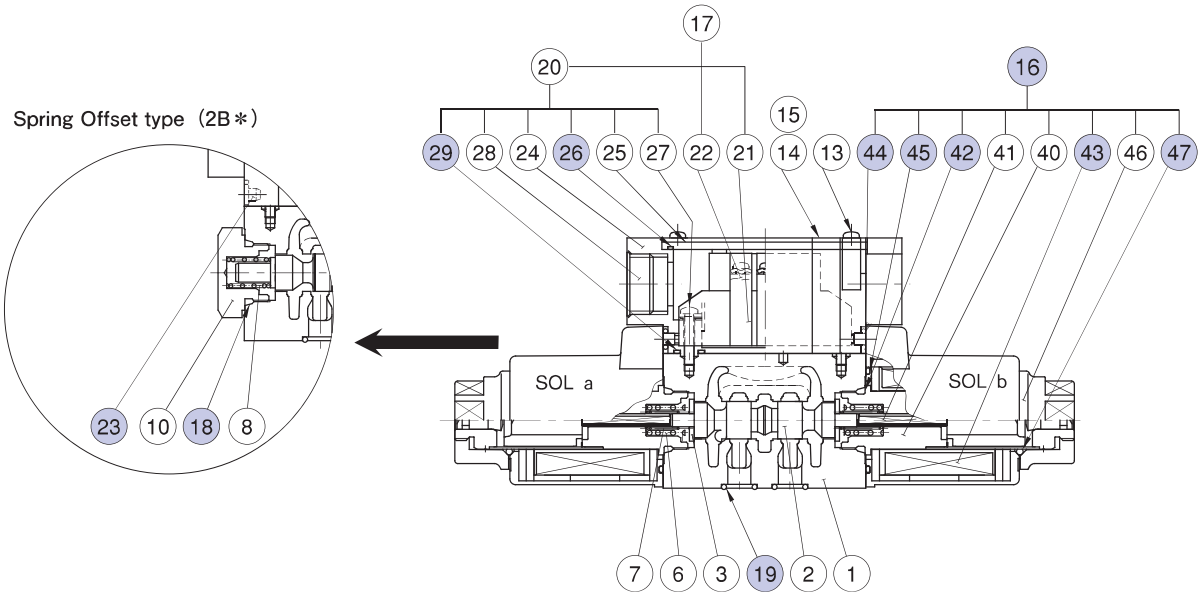
Outside dimensions are same with DSG-03 series solenoid operated directional valves, refer to pages E-47 & E-48.

Electrical Conduit Connection

As of details of receptacle and electrical circuit, please refer to page E-33 & E-49 for standard DSG-01 / DSG-03 series solenoid operated directional valves.

List of Seals and Solenoid Ass'y

E-DSG-01-＊＊＊-D24



● List of Seals

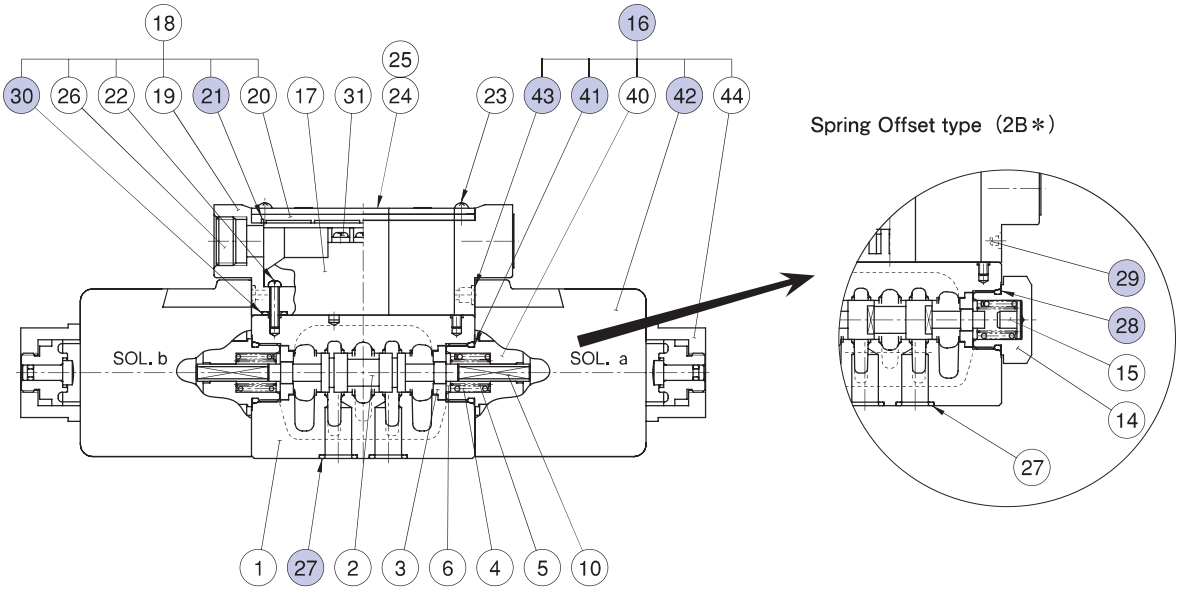
Item	Name of Parts	Part Numbers	Qty.			Remarks
			3C＊	2D＊	2B＊	
18	O-Ring	OR NBR-90 P18-N	—	—	1	
19	O-Ring	AS568-012 (NBR-90)	4	4	4	
23	Packing	1790S-VK418329-9	—	—	2	
26	Gasket	1790S-VK421290-8	1	1	1	
29	O-Ring	S 6	2	2	2	
42	O-Ring	OR NBR-90 P18-N	2	2	1	Included in Solenoid Ass'y (Item ⑯)
44	O-Ring	OR NBR-70-1 P4-N	4	4	2	
45	O-Ring	AS568-026 (NBR-70-1)	2	2	1	
47	O-Ring	OR NBR-70-1 P20-N	2	2	1	

Solenoid Ass'y, Coil Ass'y No.

Model Numbers	⑯ Solenoid Ass'y No.	㊸ Coil Ass'y No.	Remarks
E-DSG-01-＊＊＊-D24	E-SD1H-24-70	C-E-SD1H-24-70	Terminal Box Type
E-DSG-01-＊＊＊-D24-N/N1	E-SD1H-24-N-70	C-E-SD1H-24-N-70	Plug-in Connector Type / Plug-in Connector with Indicator Light

List of Seals and Solenoid Ass'y

E-DSG-03-＊＊＊-D＊



List of Seals

Item	Name of Parts	Part Numbers	Qty.			Remarks
			3C＊	2D＊	2B＊	
21	Gasket	1751S-VK418689-6	1	1	1	
27	O-Ring	AS 568-014 (NBR-90)	5	5	5	
28	O-Ring	OR NBR-90 P21-N	—	—	1	
29	Plug	1790S-VK418329-2	—	—	2	
30	O-Ring	S 6	2	2	2	
41	O-Ring	OR NBR-90 P21-N	2	2	1	Included in Solenoid Ass'y (Item ⑯)
43	O-Ring	OR NBR-70-1 P4-N	4	4	2	

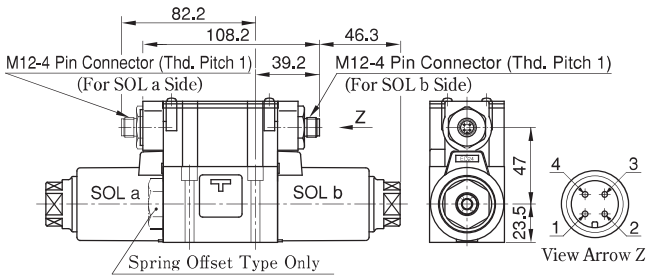
Solenoid Ass'y, Coil Ass'y No.

Model Numbers	⑯ Solenoid Ass'y No.	㊷ Coil Ass'y No.	Remarks
E-DSG-03-＊＊＊-D12	E-SD3-12-51	C-E-SD3-12-51	Terminal Box Type
E-DSG-03-＊＊＊-D24	E-SD3-24-51	C-E-SD3-24-51	
E-DSG-03-＊＊＊-D12-N/N1	E-SD3-12-N-51	C-E-SD3-12-N-51	Plug-in Connector Type / Plug-in Connector with Indicator Light
E-DSG-03-＊＊＊-D24-N/N1	E-SD3-24-N-51	C-E-SD3-24-N-51	

Special Electrical Conduit Connection

E-DSG-01-＊＊＊-D＊-M＊

● M12-4 Pin Connector Type



Model Numbers

E-DSG-01-2B2-D24-M1-70-L

M1-4 Pin Connector Electrical Conduit Connection

M1 : Load Side Common Minus (PNP Type) Terminal Box SOL b Side Conduit Connection

M2 : Load Side Common Minus (PNP Type) Terminal Box SOL a Side Conduit Connection

M3 : Load Side Common Plus (NPN Type) Terminal Box SOL b Side Conduit Connection

M4 : Load Side Common Plus Terminal Box SOL a Side Conduit Connection

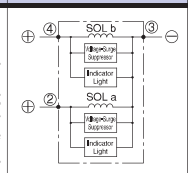
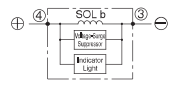
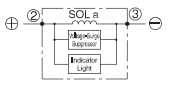
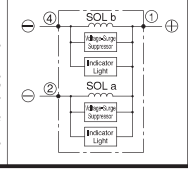
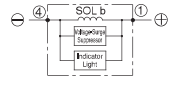
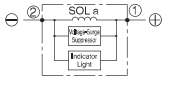
● For other dimensions, refer to page E-58 for Standard Terminal Box Type.

● For other items, refer to page E-54 for Standard Model Number Designation.

● Pin No.

	Double Solenoid Type		Single Solenoid Type (Standard Mounting)		Single Solenoid Type (Reverse Mounting)	
Terminal	Common Minus PNP (Source)	Common Plus NPN (Sink)	Common Minus PNP (Source)	Common Plus NPN (Sink)	Common Minus PNP (Source)	Common Plus NPN (Sink)
①	Unused	Common(+)	Unused	Common(+)	Unused	Common(+)
②	SOL a	SOL a	Unused	Unused	SOL a	SOL a
③	Common(-)	Unused	Common(-)	Unused	Common(-)	Unused
④	SOL b	SOL b	SOL b	SOL b	Unused	Unused
Connector Departure Direction	M1: SOL b Side M2: SOL a Side	M3: SOL b Side M4: SOL a Side	M1: SOL b Side M2: Plug Side	M3: SOL b Side M4: Plug Side	M1: Plug Side M2: SOL a Side	M3: Plug Side M4: SOL a Side

● Connection Circuit

	Double Solenoid Type	Single Solenoid Type	
		Standard Mounting	Reverse Mounting
Load Side Common Minus			
Load Side Common Plus			

E-DSG-03-＊＊＊-D＊-M＊/S/S＊

● M12-4 Pin Connector Type / Center Plug-in Connector Type / Center Plug-in M12-4 Pin Connector Type

Outside dimensions are same with DSG-03 series solenoid operated directional valves, refer to page E-47, E-51 & E-52.

Interchangeability in Installation between Current and New Design

E-DSG-01 model products made change from 60 design to 70 design, enables hige flow and compact.

● Specifications / Characteristics

①Max. Flow : 30 → 45 L/min

②Spool Type : Spool types are limited as below.

3C2, 3C3, 3C4, 3C40, 3C11, 2D2, 2B2, 2B3, 2B8

(If use neutral position and side position, please refer to page E-56.)

● Standard Solenoid Type

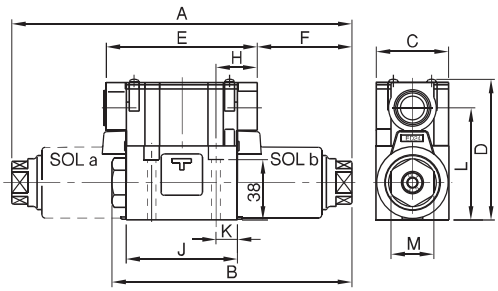
There are no changes in specifications, but coil type is limited only for D24.

● Special Electrical Conduit Connection

Electrical conduit connection is limited only for M12-4 pin connector type.

● Interchangeability in Mounting between Current and New Design

Position of electrical conduit connection port is changed a little, but has interchangeability in mounting.



Design Number	A	B	C	D	E	F	H	J	K	L	M
(New) 70 Design	214	151	46	88.8	95	59.5	26	70	13.5	70.5	27
(Current) 60 Design	216	155	48	90.3	90	63	23.5	65	11	72	22

Electronic Relay Incorporated Solenoid Operated Directional Valves

The valve is actuated by operating a built-in switch using a very small current signal (about 10 mA) when the solenoid is energised.



T-DSG-01



T-DSG-03

● A Direct drive by the programmable controller is now possible

As the valve can be actuated by a very small current signal (about 10 mA), a Direct Drive is possible on the output circuit of the programmable controller or sequence controller.

● Simple construction and stable operation

Since the valve is a direct type, the construction is quite simple. Also the solenoid is the well proven wet armature type, which can withstand contamination. Therefore a stable operation can be obtained.

Specifications and Characteristics of Standard Solenoid

Standard solenoid specifications and pressure drop are same with DSG-01/03 series, please refer to relevant pages.

Dimensions

Dimensions are same with DSG-01/03 series, please refer to relevant pages.

Sub-plates and Mounting Bolts

Sub-plates use same models with DSG-01/03 series. Mounting bolts are same with DSG-01/03 series, please refer to relevant pages.

Specifications

Valve Type	Model Numbers	Max. Flow★ L/min	Max. Operating Pressure MPa	Max. T-Line Back Pressure MPa	Max. Changeover Frequency min^{-1}	Mass kg
Standard Type	T-DSG-01-3C＊-D24＊-70	100	35	21	300	1.85
	T-DSG-01-2D2-D24＊-70					
	T-DSG-01-2B＊-D24＊-70					1.4
Shockless Type	T-S-DSG-01-3C＊-D24＊-70	63	25	21	120	1.85
	T-S-DSG-01-2B2-D24＊-70					1.4
Standard Type	T-DSG-03-3C＊-D24＊-50	120	31.5 (Spool Type 60 Only) / 25	16	240	5
	T-DSG-03-2D2-D24＊-50					
	T-DSG-03-2B＊-D24＊-50					3.6
Shockless Type	T-S-DSG-03-3C＊-D24＊-50	120	25	16	120	5
	T-S-DSG-03-2B2-D24＊-50					3.6

★ Maximum flow indicates a ceiling flow. As the ceiling flow depends on the type of spool and operating condition same as those for standard DSG-01/03, refer to the List of Standard Models for details.

● Pages for List of DSG-01/03 Standard Models

Valve Size	Type : Model Numbers	Pages for List of Standard Models
01	Standard Type : DSG–01–＊＊＊–D＊–70	E-26
	Shockless Type : S–DSG–01–＊＊＊–D＊–70	E-27
03	Standard Type : DSG–03–＊＊＊–D＊–50	E-41
	Shockless Type : S–DSG–03–＊＊＊–D＊–50	E-42

Signal Power Voltage (External Signal Power Type)

Valve Size	Signal Power Voltage	Current on Signal Cable
01	20 - 65 V DC★1	About 10 mA Constant★2
03		

★1. If use at the range of 5 - 20 V DC, please contact us.

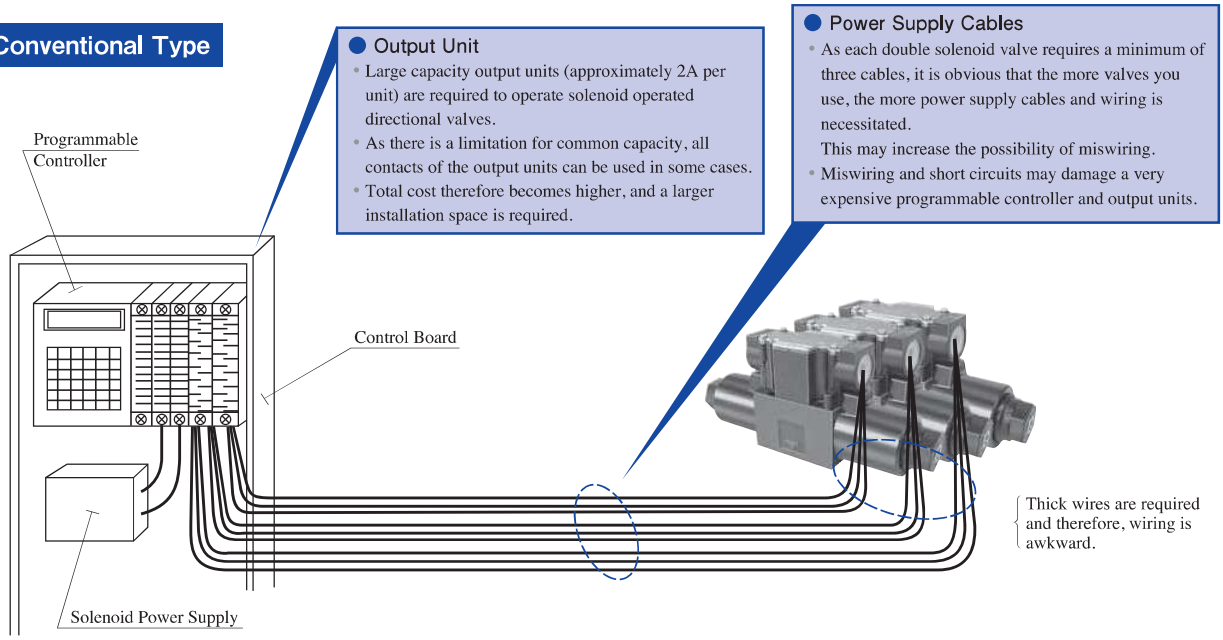
★2. Current does not increase with voltage increase, so no need to district current by resistor etc.

Characteristics and Effect

Characteristics	Merit	Effect (Example)
● Changeover signal current is very small as one hundredth of the conventional type. Changeover Signal Current : 10 mA Constant (Voltage 20 - 65V DC)	◆Enable to wiring by the cables thinner than conventional ones. ◆Can changeover directly from programmable controller ! ◆Programmable controller enable to be more compact and cut costs. ◆Enable to increase number of simultaneous changeover contacts. ◆Not influence on surge voltage in the sequence output unit.	■Cable occupied spaces reduce to one third. ■No need to relay for changeover. ■16 contacts output unit Conventional Type.....Max. 3 Contacts Electronic Relay Incorporated Type..... Max. 16 Contacts
● Protect of Output Circuit	◆Not influence on the output side even if over current by defective solenoid changeover for some reason.	■Only to replace solenoid operated valve in case of trouble.

Comparison of The Conventional Type and The Electronic Relay Incorporated Type

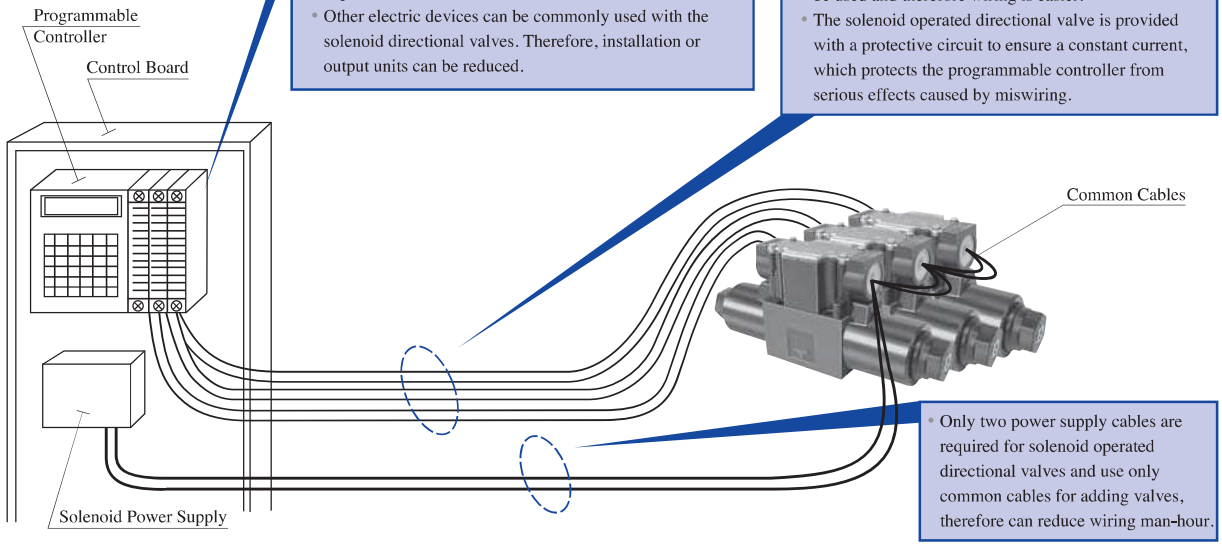
Conventional Type



● Output Unit
- Large capacity output units (approximately 2A per unit) are required to operate solenoid operated directional valves.
- As there is a limitation for common capacity, all contacts of the output units can be used in some cases.
- Total cost therefore becomes higher, and a larger installation space is required.

● Power Supply Cables
- As each double solenoid valve requires a minimum of three cables, it is obvious that the more valves you use, the more power supply cables and wiring is necessitated.
  This may increase the possibility of miswiring.
- Miswiring and short circuits may damage a very expensive programmable controller and output units.

Electronic Relay Incorporated Type



● Output Unit
- Standard small capacity output unit, which is usually less expensive can be used.
- Other electric devices can be commonly used with the solenoid directional valves. Therefore, installation or output units can be reduced.

● Signal Output Cables
- Thinner cable, compared with power supply cable, can be used and therefore wiring is easier.
- The solenoid operated directional valve is provided with a protective circuit to ensure a constant current, which protects the programmable controller from serious effects caused by miswiring.

- Only two power supply cables are required for solenoid operated directional valves and use only common cables for adding valves, therefore can reduce wiring man-hour.

Model Number Designation

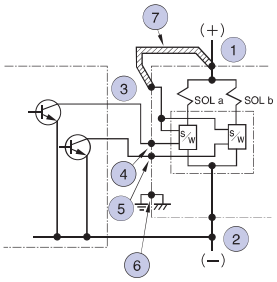
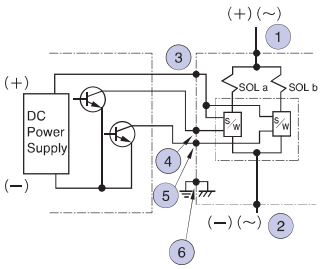
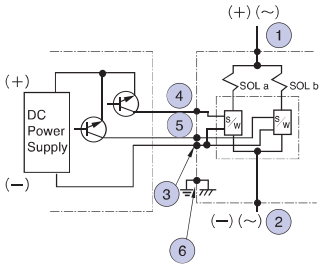
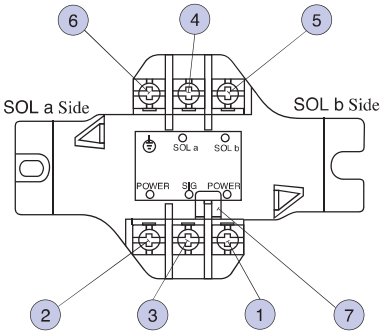
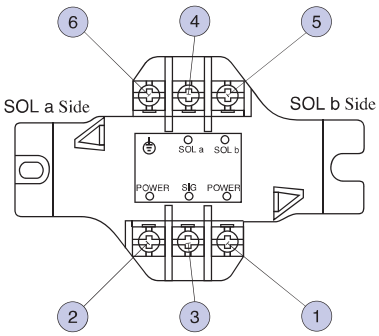
T–	S–	DSG	–01	–2	B	2	A	–D24	M	–70	–L
Control Type	Type	Series Number	Valve Size	Number of Valve Positions	Spool-Spring Arrangement	Spool Type	Input Only Valves Using Neutral Position & Side Position	Coil Type	Supply Type of Signal Power	Design Number	Models with Reverse Mtg. of Solenoid
T: Electronic Relay Incorporated Type	None: Standard Type	DSG: Solenoid Operated Directional Valve (Sub-plate Mounting Type)	01	3	C: Spring Centered	2, 3, 4, 40, 60, 9, 10, 11, 12	—	DC: D24	None: Internal Signal Power M: External Signal Power Sink Type MS: External Signal Power Source Type	70	— L: Input only for reverse mtg. of solenoid.
				2	D: No-Spring Detented	2	—				
					B: Spring Offset	2, 3, 8	A★1, B★1				
	S: Shockless Type			3	C: Spring Centered	2, 4	—	DC: D24	None: Internal Signal Power M: External Signal Power Sink Type MS: External Signal Power Source Type		— L: Input only for reverse mtg. of solenoid.
				2	B: Spring Offset	2	—				
	None: Standard Type		03	3	C: Spring Centered	2, 3, 4, 40, 5, 60, 9, 10, 11, 12	—	DC: D24	None: Internal Signal Power M: External Signal Power Sink Type MS: External Signal Power Source Type	50	— L: Input only for reverse mtg. of solenoid.
				2	D: No-Spring Detented	2	—				
					B: Spring Offset	2, 3, 8	A★1, B★1				
	S: Shockless Type			3	C: Spring Centered	2, 4	—	DC: D24	None: Internal Signal Power M: External Signal Power		— L: Input only for reverse mtg. of solenoid.
				2	B: Spring Offset	2	A★1, B★1				

★1. In case of Valves Using Neutral Position and Side Position, please refer to pages E-28 & E-43 for details.
★2. Models for phosphate ester fluid are available. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

Attention

In the table above, the symbols or numbers highlighted with shade represent the optional extras. The valves with model number having such optional extras are handled as options, therefore, please confirm the time of delivery with us before ordering.

Details of Receptacle

Item	Internal Signal Power	External Signal Power	
		Sink Type	Source Type
Electrical Circuit			
The numbers in circle on drawing right represent terminal numbers. Refer to the chart below for more details.	● The power of semiconductor switch operating signal is supplied from solenoid power source. ● When signal cable short circuit to the minus side of power source, approximate 10 mA current flow into signal cable. If solenoid power voltage increase, 10 mA current does not change.	● The power of semiconductor switch operating signal is supplied from the other power sources. ● Signal terminal and power terminal are insulated absolutely.	
Receptacle			

★ This drawing shows double solenoid type. Single solenoid type does not have terminal ④.

Terminal Number	Name of Terminals		
	Internal Signal Power	External Signal Power	
		Sink Type	Source Type
①	Power Terminal (24V DC ⊕ Terminal)	Power Terminal (24V DC ⊕ Terminal)	
②	Power Terminal (24V DC ⊖ Terminal)	Power Terminal (24V DC ⊖ Terminal)	
③	Short circuit to terminal ① by common plate. (Unused)	Signal Power Terminal (⊕ Terminal)	Signal Power Terminal (⊖ Terminal)
④	SOL a Signal Terminal (Single solenoid does not have this terminal.)		
⑤	SOL b Signal Terminal		
⑥	Ground Terminal (Connect to body of solenoid operated directional valve)		
⑦	Common Plates	———	

- Please wire correctly to the receptacle. Power terminals are fixed (+) and (-) sides. Please use smoothing power source for DC power supply.
- There is no time lag between signal output cables switch (ON/OFF) and solenoid switching (ON/OFF).
- Signal output cables do not need to use shield cables.
- This valves of external signal type, the signal terminal and power terminal are insulated. So that surge voltage which generated when solenoid off will not affect to control units connecting signal output cables. (Internal signal type generate surge voltage, so please install surge killer as required.)

Explosion Proof (Flameproof) Type Solenoid Operated Directional Valves

"Even if explosive gas invasion from outside into vessel cause internal ignition or explosion, substantially isolate ignition source in vessel by special elaborating to vessel structure for avoiding any bad influence externally." is the point of pressure & explosion proof construction.
On this point of view, YUKEN's Explosion Proof Type Solenoid Operated Directional Valves involve solenoid and receptacle in the vessel with all closed pressure proof structure.
If explosion of explosive gas happened in vessel, the vessel could stand the pressure and there is no danger to ignite external explosive gas.
Usable at the danger zone 1 & 2.



DSG-01



DSG-03

Type of Explosion Proof

d 2 G4

- G4 — Ignition Temperature……Apply for the ignition temperature range over 135 °C to under 200 °C
- 2 — Class of Explosion……Spatium having flame propagation at 25 mm depth, the minimum value over 0.4 mm to under 0.6 mm.
- d — Pressure & Explosion Proof Construction

Technology Institution of Industrial Safety Certificate Number

Model Numbers	Certificate Number	
	Threaded Conduit Connection	Pressure Proof Packing Type
DSG-01	T67046	T67037
DSG-03	T43853	—

Specifications

Model Numbers	Max. Flow★ L/min	Max. Operating Pressure MPa	Max. T-Line Back Pressure MPa	Max. Changeover Frequency min^{-1}	Mass kg
DSG-01-3C*-*X*-70	100	35	14	300 : With DC Solenoid 120 : With R Solenoid	7.75
DSG-01-2D2-*X*-70					7.75
DSG-01-2B*-*X*-70					4.35
DSG-03-3C*-*X*-50	120	31.5 [Spool Type 60 Only 25]	16	240 : With DC Solenoid 120 : With R Solenoid	18.2
DSG-03-2D2-*X*-50					18.2
DSG-03-2B*-*X*-50					10.2

★ The maximum flow means the limited flow without inducing any abnormality to the operation (changeover) of the valve.
The maximum flow differs according to the spool type and operating conditions. For details, please contact us.

Interchangeability in Installation between Current and New Design

For further improvement of reliability, Explosion Proof Type Solenoid Operated Directional Valves have been upgraded as below.
DSG-01 : 50 Design → 70 Design

Cable Departure

As of threaded conduit connection type, add sealing fitting on the cable departure. With this arrangement, the certificate number also changed.

Model Numbers	Certificate Number		
	(Current)	(New)	
		Threaded Conduit Connection Type	Pressure Proof Packing Type
DSG-01	T32873	T67046	T67037

Specifications / Characteristics

DSG-01 models improve high pressure and high flow.

Model Numbers	Max. Flow L/min	Max. Operating Pressure MPa	Max. T-Line Back Pressure MPa	Max. Changeover Frequency min^{-1}	Mass kg	
					3C*/2D*	2B*
(New) 70 Design	100	35	14	300 : With DC Solenoid 120 : With R Solenoid	7.75	4.35
(Current) 50 Design	35	31.5 (3C60 : 25)		120	7.3	4.1

Interchangeability in Installation between Current and New Design

There are some changes in dimensions concerned sealing fitting, but there is interchangeability in installation between current and new design.

Please contact us for details about Explosion Proof (Flameproof) Type Solenoid Operated Directional Valves.

Explosion Proof (Increased Safety) Type Solenoid Operated Directional Valves

"As of electrical machinery which has no spark parts or hot section being ignition source, especially increase safety and avoid trouble - Increased Safety of Electrical Machinery with No Spark" is the point of explosion proof (increased safety) construction.
On this point of view, YUKEN's Explosion Proof (Increased Safety) Type Solenoid Operated Directional Valves increased safety about high temperature, isolation and locking mechanism.
But explosion proof in case of internal trouble is not guaranteed, so please decide propriety of use considering about surround conditions and maintenance management.
Please use at the danger zone 2 in general, not recommend to use at zone 1.



DSG-01



DSG-03

Type of Explosion Proof

e G 3

- G 3 — Ignition Temperature……Apply for the ignition temperature range over 200 °C to under 300 °C
- e — Explosion Proof (Increased Safety) Construction

Technology Institution of Industrial Safety Certificate Number

- DSG-01 …… With DC Solenoid : T48037
  With AC Solenoid : T48038
  (Rectifier Incorporated Type)
- DSG-03 …… With DC Solenoid : T47687
  With AC Solenoid : T47688
  (Rectifier Incorporated Type)

Please contact us for details about Explosion Proof (Increased Safety) Type Solenoid Operated Directional Valves.

Specifications

Model Numbers	Max. Flow★ L/min	Max. Operating Pressure MPa	Max. T-Line Back Pressure MPa	Max. Changeover Frequency min^{-1}	Mass kg
DSG-01-3C*-*Y*-51	63	31.5 Spool Type 60 Only 25	16	240 : With DC Solenoid 120 : With R Solenoid	2.8
DSG-01-2D2-*Y*-51					2.8
DSG-01-2B*-*Y*-51					2.2
DSG-03-3C*-*Y*-50	120	31.5 Spool Type 5 & 60 Only 25	16	240 : With DC Solenoid 120 : With R Solenoid	5.8
DSG-03-2D2-*Y*-50					5.8
DSG-03-2B*-*Y*-50					4.4

★ Maximum flow indicates a ceiling flow to keep valve operation (changeover) normal.
It depends on the type of spool and operating condition, please contact us for details.

Solenoid Controlled Pilot Operated Directional Valves

High Pressure / High Flow

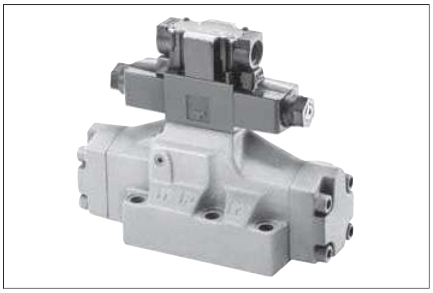
Size "04" valves can flow maximum 300 L/min, "06" valves can flow maximum 500 L/min and "10" valves can flow maximum 1100 L/min. High pressure along which high flow means compact system design.

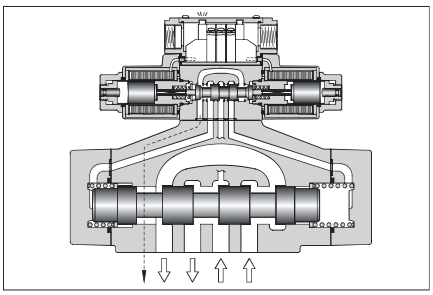
Lower Pressure Drop

System energy saving increased as pressure drop of each valve has been greatly reduced.

Easy Exchange Between Pilot and Drain Connection Type

It is easy to exchange between pilot and drain connection type (internal ⇔ external) by plug mounting on-off.





Specifications

Valve Type	Model Numbers	Max. Flow L/min	Max. Operating Pressure MPa	Max. Pilot Pressure MPa	Min.★2 Required Pilot Pres. MPa	Max. T-Line Back Pressure MPa		Max. Changeover Frequency min⁻¹			Mass kg
						Ext. Drain	Int. Drain	AC	DC	R	
Standard Type	DSHG-01-3C✻-✻-14	40	21	21	1.0	16	16	120	120	120	4.0 (3.2)★4
	DSHG-01-2B✻-✻-14										3.5 (2.7)★4
	DSHG-03-3C✻-✻-14	160	25	25	0.7	16	16	120	120	120	6.9
	DSHG-03-2N✻-✻-14										6.9
	DSHG-03-2B✻-✻-14										6.4
	(S-) DSHG-04-3C✻-✻-52	300	31.5	25	0.8	21	21	120	120	120	8.5
	(S-) DSHG-04-2N✻-✻-52										8.5
	(S-) DSHG-04-2B✻-✻-52										8.0
Shockless Type	(S-) DSHG-06-3C✻-✻-53	500	31.5	25	0.8★3	21	21	120	120	120	12.4
	(S-) DSHG-06-2N✻-✻-53										12.4
	(S-) DSHG-06-2B✻-✻-53										11.9
	(S-) DSHG-06-3H✻-✻-53			21	1.0			110	110	110	13.2
	(S-) DSHG-10-3C✻-✻-43	1100	31.5	25	1.0★3	21	21	120	120	100	45.0
	(S-) DSHG-10-2N✻-✻-43							100	100	100	45.0
	(S-) DSHG-10-2B✻-✻-43			21				60	60	50	44.5
	(S-) DSHG-10-3H✻-✻-43										52.9

★1. Maximum flow indicates a ceiling flow, refer to the List of Standard Models on pages E-74 - E-78 for details.
★2. Pilot pressure of internal pilot drain models must always exceed tank line back pressure by a minimum required pilot pressure.
★3. Min. pilot pressure of with pilot piston is 1.8 MPa.
★4. Only the mass of internal pilot and internal drain type valve is the value in parentheses.
● Please contact us about High Flow Valves (Flange Connecting Type).

Solenoid Ratings

Refer to relevant solenoid ratings described on the page below.

Model Numbers	Pilot Valve Model Numbers	Solenoid Ratings described on the page below
DSHG-01	DSG-01-✻ ✻ ✻-✻-70	E-23
DSHG-03		
(S-) DSHG-04		
(S-) DSHG-06		
(S-) DSHG-10		

Model Number Designation

S–	DSHG	–06	–2	B	2	A	–C2	–E	T	
Type	Series Number	Valve Size	No. of Valve Positions	Spool-Spring Arrangement	Spool Type	Input Only Valves Using Neutral Position & Side Position	Models with Pilot Choke Valve	Pilot Connection	Drain Connection	
None: Standard Type	DSHG : Solenoid Controlled Pilot Operated Directional Valve, Sub-plate Mounting	01	3	C : Spring Centered	2 , 3 , 4 40 , 5 , 60 7 , 9 , 10 11 , 12	—	—	None: Internal Pilot E : External Pilot	None: External Drain T : Internal Drain	
			2	B : Spring Offset	2 , 3 , 4 40 , 7					
		03	3	C : Spring Centered	2 , 3 , 4 40 , 5 , 60 7 , 9 , 10 11 , 12	—	C1 : With C1 Choke C2 : With C2 Choke C1C2 : With C1 & C2 Choke			
			2	N : No-Spring	2 3 4 40 7					
				B : Spring Offset						
None: Standard Type S: Shockless Type		04	3	C : Spring Centered	2 , 4 , 40 60 , 10 , 12 (3 , 5 , 6 7 , 9 , 11) ★1	—				
			2	N : No-Spring	2 , 4 , 40 (3 , 7) ★1	A ★2				
				B : Spring Offset	2 , 4 , 40 (3 , 7) ★1	A ★2 B ★2				
		06	3	C : Spring Centered	2 , 4 , 40 60 , 10 , 12 (3 , 5 , 6 7 , 9 , 11) ★1	—				
				H : Pressure Centered ★3						
		10	2	N : No-Spring	2 , 4 , 40 (3 , 7) ★1	A ★2				
				B : Spring Offset	2 , 4 , 40 (3 , 7) ★1	A ★2 B ★2				

Note: In spool type “3”, “5”, “6”, “60”, and “7”, the combination applicable between pilot system and drain system is as described in the table below.

Pilot Connection	Drain Connection	Care in Application
Internal Pilot	External Drain	Hold back pressure in the tank line so that the difference between pilot pressure and drain pressure is always more than minimum required pilot pressure.
	Internal Drain (T)	Combination is not applicable.
External Pilot (E)	External Drain	No restrictions in the combination on us
	Internal Drain (T)	

Attention

In the table above, the symbols and numbers highlighted with shade represent the optional extras. The valves with model number having such optional extras are handled as options, therefore please confirm the time of delivery with us before ordering.

<table>
<tr><th></th><th>–R2</th><th>–A100</th><th>–C</th><th>–H</th><th>–N</th><th>–53</th><th>–L</th></tr>
<tr><td></td><td>Spool Control Modification (Omit if not required)</td><td>Coil Type</td><td>Manual Override of Pilot Valve</td><td>Built-in Orifice for Pilot Line</td><td>Type of Electrical Conduit Connection</td><td>Design Number</td><td>Models with Reverse Mtg. of Solenoid</td></tr>
<tr><td rowspan="4"></td><td rowspan="2">——</td><td rowspan="2">AC:
A100 , A200
A120 , A240
DC:
D12 , D24
D48
AC → DC :
R100 , R200</td><td rowspan="4">None : Manual Override Pin

C : Push Button & Lock Nut</td><td rowspan="2">——</td><td rowspan="4">None: Terminal Box Type

N : Plug-in Connector Type

N1 : Plug-in★4 Connector with Indicator Light</td><td>14</td><td>——
L : Input only for reverse mtg. of solenoid.</td></tr>
<tr><td>14</td><td>——
L : Input only for reverse mtg. of solenoid.</td></tr>
<tr><td rowspan="2">R2 : With Stroke Adjustment, Both Ends
RA : With Stroke Adjustment, Port "A" End
RB : With Stroke Adjustment, Port "B" End</td><td rowspan="2">——</td><td>52</td><td>——
L : Input only for reverse mtg. of solenoid.</td></tr>
<tr><td rowspan="2">AC:
A100 , A200
A120 , A240
DC:
D12 , D24
D48
AC → DC :
R100 , R200</td><td rowspan="2">H : ★5
Input only for spool-spring arrangement “H” and with built-in orifice.</td><td>53</td><td rowspan="2">——
L : Input only for reverse mtg. of solenoid.</td></tr>
<tr><td>R2 : With Stroke Adjustment, Both Ends
RA : With Stroke Adjustment, Port "A" End
RB : With Stroke Adjustment, Port "B" End
P2 : With Pilot Piston, Both Ends
PA : With Pilot Piston, Port "A" End
PB : With Pilot Piston, Port "B" End</td><td>43</td></tr>
</table>

★1. Shockless type (S-DSHG) are not available for spool type marked ( ).
★2. As for the details of the valve using the neutral position and the side position, please refer to page E-79. Furthermore, the spool types other than “2”, “4”, “40” (3, 7) are also available.
★3. In spool-spring arrangement “H” (Pressure centered models), the valves with stroke adjustment (R*) and pilot-piston (P*) are not available.
★4. N1 stands for Plug-in connector with solenoid indicator light. N1 is not available for R-type solenoids.
★5. In spool-spring arrangement “H” (pressure centered models), in case the pilot pressure is more than 10 MPa, please specify that the valve should have the built-in orifice to the pilot line.
★6. Models for phosphate ester fluid are available. When phosphate ester fluid is used, prefix “F-” to the model number because the special seals (fluororubber) are required to be used.

CSA Approved Solenoid Valve

Available to supply DSHG-06 series valve approved by the CSA (Canadian Standards Association). Consult us for details.

Sub-plates

Valve Model Numbers	Sub-plate Model Numbers	Thread Size Rc	Approx. Mass kg	Figure for the dimensions described on the page below	Remarks
DSHG-01	DSGM-01-31	1/8	0.8	E-31	Common to those for DSG-01 Solenoid Operated Directional Valves
	DSGM-01X-31	1/4			
	DSGM-01Y-31	3/8			
DSHG-03	DSGM-03-40	3/8	3	E-47	As for Internal Pilot - Internal Drain Type, common to those for DSG-03 Solenoid Operated Directional Valves
	DSGM-03X-40	1/2			
	DSGM-03Y-40	3/4	4.7		
	DHGM-03Y-10	3/4	4.7	E-84	For External Pilot Type or External Drain Type
(S-) DSHG-04	DHGM-04-20	1/2	4.4	E-85	———
	DHGM-04X-20	3/4	4.1		
(S-) DSHG-06	DHGM-06-50	3/4	7.4	E-87	———
	DHGM-06X-50	1			
(S-) DSHG-10	DHGM-10-40	1 1/4	21.5	E-87	———
	DHGM-10X-40	1 1/2			

● Sub-plates are available. Specify the sub-plate model number from the table above.
When sub-plates are not used, the mounting surface should have a good machined finish. (1.6▽)

Accessories

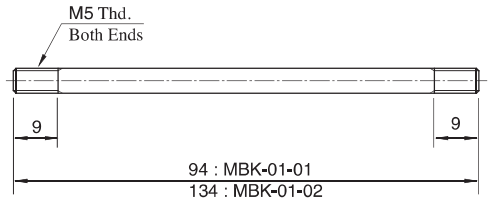
Mounting Bolt

Model Numbers	Mounting Bolt	Qty.	Tightening Torque Nm
DSHG-01	Bolt Kits : MBK-01-01-30★1 / MBK-01-02-30★2	1set	5 - 6
DSHG-03	Socket Head Cap Bolt : M6×35L	4	12 - 15
(S-) DSHG-04	Socket Head Cap Bolt : M6×45L	2	12 - 15
	Socket Head Cap Bolt : M10×50L	4	58 - 72
(S-) DSHG-06	Socket Head Cap Bolt : M12×60L	6	100 - 123
(S-) DSHG-10	Socket Head Cap Bolt : M20×75L	6	473 - 585

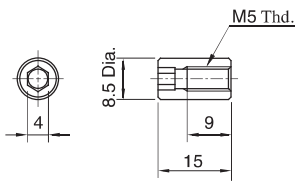
★1. For Internal Pilot-Internal Drain.
★2. For External Pilot-External Drain, External Pilot-Internal Drain and Internal Pilot-External Drain.

Bolt Kits Details

● Stud Bolt .....4 Pcs.



● Nut .....4 Pcs.



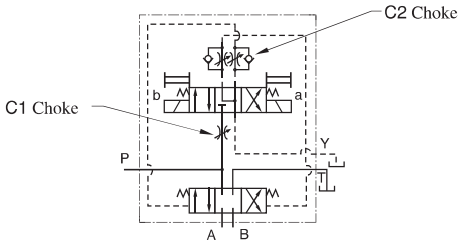
Options

Models with Pilot Choke Adjustment (C1, C2, C1C2)

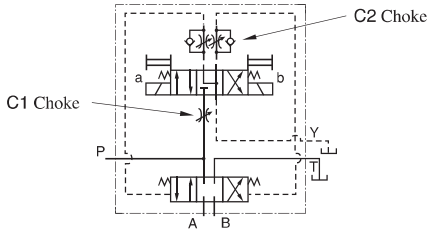
When the adjustment screw is turned clockwise, changeover speed of the main spool becomes slow. In case of the spring centered valves in particular, making slow of the returning speed of the main spool to the neutral position is possible with a C2 choke valve. These choke valves can be used in combination with the valves of spring centered, no-spring, offset, pressure centered and the valves with stroke adjustment.

Graphic Symbols (Ex.: Spring Centered)

DSHG-01, 06, 10



DSHG-03, 04

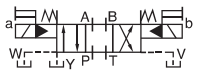


Models with Pilot Piston (P2, PA, PB)

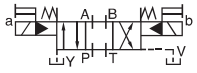
The valves with a pilot piston can be used when the high speed changeover of the main spool is required. However, in case of spring centered valves, there is no change in the returning speed of the main spool to the neutral position even with the pilot piston.

Graphic Symbols (Ex.: Spring Centered)

"P2" Models



"PA" Models



"PB" Models

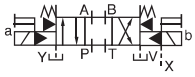


Pressure Centered Models (3H*)

The pressure centered type can be used when the returning of the main spool to the neutral position is required to be firmly.

Graphic Symbols (Ex.: External Pilot-External Drain)

(Only for 3H6, 3H60)



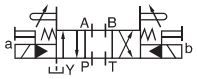


Models with Stroke Adjustment (R2, RA, RB)

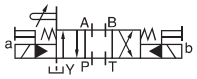
When the adjustment screw is screwed in , the main spool stroke becomes short and flow rate reduces.

Graphic Symbols (Ex.: Spring Centered)

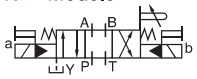
"R2" Models



"RA" Models



"RB" Models



Additional Mass of Options

Add the mass described below to the mass of standard models on page E-69, if options are required.

(kg)

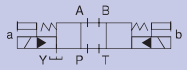
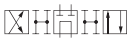
Model Numbers	Models with Pilot Choke Adj.		Models with Pilot Piston		Models with Stroke Adj.	
	C1, C2	C1C2	P2	PA PB	R2	RA RB
DSHG-03	0.65	1.3	—	—	0.6	0.3
(S-) DSHG-04	0.65	1.3	—	—	1.0	0.5
(S-) DSHG-06	0.65	1.3	1.0	0.5	1.2	0.6
(S-) DSHG-10	0.65	1.3	3.6	1.8	3.7	1.85

Options on Pilot Valve

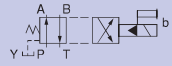
The same options to DSG-01 series valves are available.
Please refer to page E-23 for the details.

List of Standard Models (DSHG-01)

Three Positions

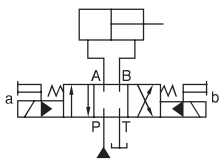
Spool Type	Spring Centered			
	Graphic Symbol 	Maximum Flow L/min		
	Model Numbers	7 MPa	14 MPa	21 MPa
"2" 	DSHG-01-3C2	40	40	40
"3" 	DSHG-01-3C3	40	40	40
"4" 	DSHG-01-3C4	40	40	40
"40" 	DSHG-01-3C40	40	40	40
"5" 	DSHG-01-3C5	40	40	40
"60" 	DSHG-01-3C60	40	40	40
"7" 	DSHG-01-3C7	40	40	40
"9" 	DSHG-01-3C9	40	40	40
"10" 	DSHG-01-3C10	40	40	40
"11" 	DSHG-01-3C11	40	40	40
"12" 	DSHG-01-3C12	40	40	40

Two Positions

Spool Type	Spring Offset			
	Graphic Symbol 	Maximum Flow L/min		
	Model Numbers	7 MPa	14 MPa	21 MPa
"2" 	DSHG-01-2B2	40	40	40
"3" 	DSHG-01-2B3	40	40	40
"4" 	DSHG-01-2B4	40	40	40
"40" 	DSHG-01-2B40	40	40	40
"7" 	DSHG-01-2B7	40	40	40

Notes) 1. Max. flow shows value at pilot pressure more than 1 MPa.

2. Max. flow in the table above represents the value in the flow condition of P → A → B → T (or P → B → A → T) as shown in the circuit diagram below. In case the valve is used in the condition that either A or B port is blocked, the maximum flow differs according to a hydraulic circuit, therefore, please consult us for details.



List of Standard Models (DSHG-03)

Three Positions

Spool Type	Spring Centered			
	Graphic Symbol	Maximum Flow L/min		
	Model Numbers	7 MPa	14 MPa	25 MPa
"2"	DSHG-03-3C2	160	85	60
			160	95
"3"	DSHG-03-3C3	160	160	160
"4"	DSHG-03-3C4	160	85	60
			160	95
"40"	DSHG-03-3C40	160	85	60
			160	95
"5"	DSHG-03-3C5	160	85	60
			160	95
"60"	DSHG-03-3C60	160	160	125
				160
"7"	DSHG-03-3C7	160	85	60
			160	95
"9"	DSHG-03-3C9	160	85	60
			160	95
"10"	DSHG-03-3C10	160	85	60
			160	95
"11"	DSHG-03-3C11	160	85	60
			160	95
"12"	DSHG-03-3C12	160	85	60
			160	95

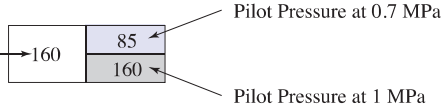
Two Positions

Spool Type	No-Spring				Spring Offset			
	Graphic Symbol	Maximum Flow L/min			Graphic Symbol	Maximum Flow L/min		
	Model Numbers	7 MPa	14 MPa	25 MPa	Model Numbers	7 MPa	14 MPa	25 MPa
"2"	DSHG-03-2N2	160	160	85	DSHG-03-2B2	160	160	85
				160				160
"3"	DSHG-03-2N3	160	160	85	DSHG-03-2B3	160	160	85
				160				160
"4"	DSHG-03-2N4	160	160	85	DSHG-03-2B4	160	160	85
				160				160
"40"	DSHG-03-2N40	160	160	85	DSHG-03-2B40	160	160	85
				160				160
"7"	DSHG-03-2N7	160	160	85	DSHG-03-2B7	160	160	85
				160				160

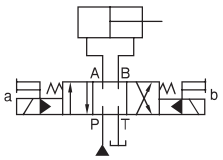
Notes: 1. The relation between max. flow and pilot pressure in the table above is as shown below.

(Example)

Maximum flow rate is constant regardless of pilot pressure.
Pilot Pressure more than 0.7 MPa.

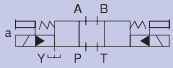


2. Max. flow in the table above represents the value in the flow condition of P → A → B → T (or P → B → A → T) as shown in the circuit diagram right.
In case the valve is used in the condition that either A or B port is blocked, the maximum flow differs according to a hydraulic circuit, therefore, please consult us for details.

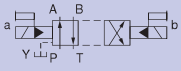
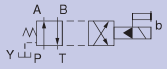


List of Standard Models (DSHG-04/S-DSHG-04)

Three Positions

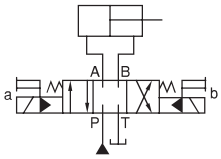
Spool Type	Spring Centered				
	Graphic Symbol 	Maximum Flow L/min			
	Model Numbers	10 MPa	16 MPa	25 MPa	31.5 MPa
"2" 	DSHG-04-3C2	300	300	200	145
	S-DSHG-04-3C2	300	250	120	110
"3" 	DSHG-04-3C3	300	300	300	300
"4" 	DSHG-04-3C4	300	300	250	165
	S-DSHG-04-3C4	300	300	140	110
"40" 	DSHG-04-3C40	300	300	200	145
	S-DSHG-04-3C40	300	250	120	110
"5" 	DSHG-04-3C5	255	250	245	235
"6" 	DSHG-04-3C6	300	260	245	235
"60" 	DSHG-04-3C60 S-DSHG-04-3C60	300	300	300	300
"7" 	DSHG-04-3C7	300	300	200	145
"9" 	DSHG-04-3C9	300	300	280	250
"10" 	DSHG-04-3C10	300	300	200	150
	S-DSHG-04-3C10	300	250	120	110
"11" 	DSHG-04-3C11	300	260	160	140
"12" 	DSHG-04-3C12	300	280	170	135
	S-DSHG-04-3C12	300	250	120	110

Two Positions

Spool Type	No-Spring					Spring Offset				
	Graphic Symbol 	Maximum Flow L/min				Graphic Symbol 	Maximum Flow L/min			
	Model Numbers	10 MPa	16 MPa	25 MPa	31.5 MPa	Model Numbers	10 MPa	16 MPa	25 MPa	31.5 MPa
"2" 	(S-) DSHG-04-2N2	300	300	300	300	(S-) DSHG-04-2B2	300	300	300	300
"3" 	DSHG-04-2N3	300	300	300	300	DSHG-04-2B3	300	300	300	300
"4" 	(S-) DSHG-04-2N4	300	300	300	300	(S-) DSHG-04-2B4	300	300	300	300
"40" 	(S-) DSHG-04-2N40	300	300	300	300	(S-) DSHG-04-2B40	300	300	300	300
"7" 	DSHG-04-2N7	300	300	300	300	DSHG-04-2B7	300	300	300	300

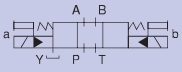
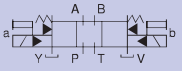
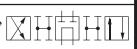
Notes: 1. Max. flow described above shows value at pilot pressure more than 0.8 MPa.

2. Max. flow in the table above represents the value in the flow condition of P → A → B → T (or P → B → A → T) as shown in the circuit diagram below.
In case the valve is used in the condition that either A or B port is blocked, the maximum flow differs according to a hydraulic circuit, therefore, please consult us for details.

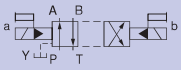
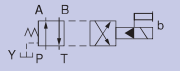


List of Standard Models (DSHG-06/S-DSHG-06)

Three Positions

Spool Type	Spring Centered					Pressure Centered				
	Graphic Symbol 	Maximum Flow L/min				Graphic Symbol 	Maximum Flow L/min			
	Model Numbers	10 MPa	16 MPa	25 MPa	31.5 MPa	Model Numbers	10 MPa	16 MPa	25 MPa	31.5 MPa
"2" 	(S-) DSHG-06-3C2	500	500	410 500	310 410	(S-) DSHG-06-3H2	500	500	500	420 500
"3" 	DSHG-06-3C3	500	500	460	370	DSHG-06-3H3	500	500	500	500
"4" 	(S-) DSHG-06-3C4	500	500	410 500	310 500	(S-) DSHG-06-3H4	500	500	500	420 500
"40" 	(S-) DSHG-06-3C40	500	500	410 500	310 500	(S-) DSHG-06-3H40	500	500	500	420 500
"5" 	DSHG-06-3C5	500	500	425	350	DSHG-06-3H5	500	500	500	470 500
"6" 	DSHG-06-3C6	475	390	300	230	DSHG-06-3H6	500	500	500	420 500
"60" 	(S-) DSHG-06-3C60	475	420	340	280	(S-) DSHG-06-3H60	500	500	500	420 500
"7" 	DSHG-06-3C7	500	500	450	360	DSHG-06-3H7	500	500	500	500
"9" 	DSHG-06-3C9	500	500	450 500	360 500	DSHG-06-3H9	500	500	500	500
"10" 	(S-) DSHG-06-3C10	500	500	410 500	310 500	(S-) DSHG-06-3H10	500	500	500	460 500
"11" 	DSHG-06-3C11	500	500	410 500	310 500	DSHG-06-3H11	500	500	500	460 500
"12" 	(S-) DSHG-06-3C12	500	500	410 500	310 500	(S-) DSHG-06-3H12	500	500	500	460 500

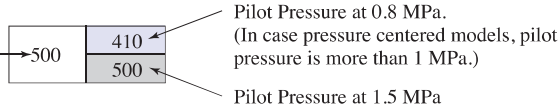
Two Positions

Spool Type	No-Spring					Spring Offset				
	Graphic Symbol 	Maximum Flow L/min				Graphic Symbol 	Maximum Flow L/min			
	Model Numbers	10 MPa	16 MPa	25 MPa	31.5 MPa	Model Numbers	10 MPa	16 MPa	25 MPa	31.5 MPa
"2" 	(S-) DSHG-06-2N2	500	500	500	500	(S-) DSHG-06-2B2	500	500	500	500
"3" 	DSHG-06-2N3	500	500	500	500	DSHG-06-2B3	500	500	500	500
"4" 	(S-) DSHG-06-2N4	500	500	500	500	(S-) DSHG-06-2B4	500	500	500	500
"40" 	(S-) DSHG-06-2N40	500	500	500	500	(S-) DSHG-06-2B40	500	500	500	500
"7" 	DSHG-06-2N7	500	500	500	500	DSHG-06-2B7	500	500	500	500

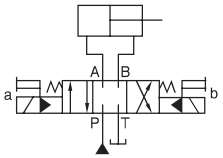
Notes: 1. The relation between max. flow and pilot pressure in the table above is as shown below.

(Example)

Maximum flow rate is constant regardless of pilot pressure.
(Pilot Pressure more than 0.8 MPa. In case pressure centered models, pilot pressure is more than 1 MPa.)



2. Max. flow in the table above represents the value in the flow condition of P → A → B → T (or P → B → A → T) as shown in the circuit diagram right.
In case the valve is used in the condition that either A or B port is blocked, the maximum flow differs according to a hydraulic circuit, therefore, please consult us for details.



List of Standard Models (DSHG-10/S-DSHG-10)

Three Positions

Spool Type	Spring Centered					Pressure Centered				
	Graphic Symbol	Maximum Flow L/min				Graphic Symbol	Maximum Flow L/min			
	Model Numbers	10 MPa	16 MPa	25 MPa	31.5 MPa	Model Numbers	10 MPa	16 MPa	25 MPa	31.5 MPa
"2"	(S-) DSHG-10-3C2	1100	1100	950 1100	750 1100	(S-) DSHG-10-3H2	1100	1100	1100	970 1100
"3"	DSHG-10-3C3	1100	1100	1060	895	DSHG-10-3H3	1100	1100	1100	1050 1100
"4"	(S-) DSHG-10-3C4	1100	1100	950 1100	750 1100	(S-) DSHG-10-3H4	1100	1100	1100	970 1100
"40"	(S-) DSHG-10-3C40	1100	1100	950 1100	750 1100	(S-) DSHG-10-3H40	1100	1100	1100	970 1100
"5"	DSHG-10-3C5	1100	1100	980	850	DSHG-10-3H5	1100	1100	1100	1000 1100
"6"	DSHG-10-3C6	1050	880	700	570	DSHG-10-3H6	1100	1100	1100	970 1100
"60"	(S-) DSHG-10-3C60	1050	940	785	680	(S-) DSHG-10-3H60	1100	1100	1100	970 1100
"7"	DSHG-10-3C7	1100	1100	1040 1100	870 1100	DSHG-10-3H7	1100	1100	1100	1100
"9"	DSHG-10-3C9	1100	1100	1040	870	DSHG-10-3H9	1100	1100	1100	1100
"10"	(S-) DSHG-10-3C10	1100	1100	950 1100	750 1100	(S-) DSHG-10-3H10	1100	1100	1100	1060 1100
"11"	DSHG-10-3C11	1100	1100	950 1100	750 1100	DSHG-10-3H11	1100	1100	1100	1060 1100
"12"	(S-) DSHG-10-3C12	1100	1100	950 1100	750 1100	(S-) DSHG-10-3H12	1100	1100	1100	1060 1100

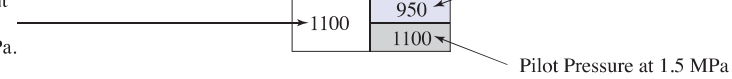
Two Positions

Spool Type	No-Spring					Spring Offset				
	Graphic Symbol	Maximum Flow L/min				Graphic Symbol	Maximum Flow L/min			
	Model Numbers	10 MPa	16 MPa	25 MPa	31.5 MPa	Model Numbers	10 MPa	16 MPa	25 MPa	31.5 MPa
"2"	(S-) DSHG-10-2N2	1100	1100	1100	1100	(S-) DSHG-10-2B2	1100	1100	1100	1100
"3"	DSHG-10-2N3	1100	1100	1100	1100	DSHG-10-2B3	1100	1100	1100	1100
"4"	(S-) DSHG-10-2N4	1100	1100	1100	1100	(S-) DSHG-10-2B4	1100	1100	1100	1100
"40"	(S-) DSHG-10-2N40	1100	1100	1100	1100	(S-) DSHG-10-2B40	1100	1100	1100	1100
"7"	DSHG-10-2N7	1100	1100	1100	1100	DSHG-10-2B7	1100	1100	1100	1100

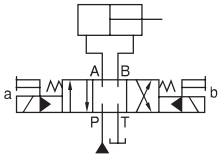
Notes) 1. The relation between max. flow and pilot pressure in the table above is as shown below.

(Example)

Maximum flow rate is constant regardless of pilot pressure.
Pilot Pressure more than 1 MPa.

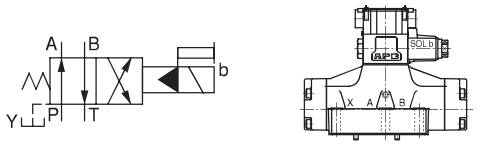


2. Max. flow in the table above represents the value in the flow condition of P → A → B → T (or P → B → A → T) as shown in the circuit diagram right.
In case the valve is used in the condition that either A or B port is blocked, the maximum flow differs according to a hydraulic circuit, therefore, please consult us for details.

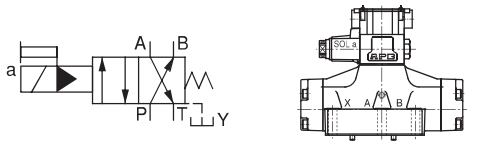


Reverse Mounting of Solenoid

In spring offset type, it is a standard configuration that the solenoid is mounted onto the valve in the SOL b position (side). However, in this particular spool-spring arrangement, the mounting of the solenoid onto the valve in the reverse position - SOL a side - is also available. The graphic symbol for this reverse mounting is as shown below.
As for the valve type 2B＊A and 2B＊B, please refer to the explanation under the heading of "Valves Using Neutral Position and Side Position" given below.



Standard Mtg. of Solenoid

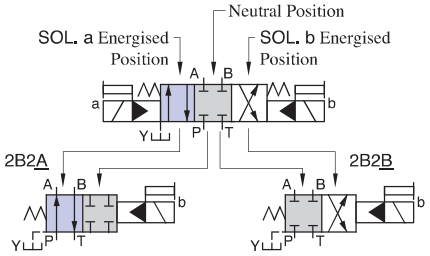


Reverse Mtg. of Solenoid

Valves Using Neutral Position and Side Position

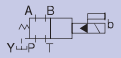
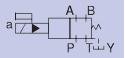
Besides the use of the standard 2-position valves aforementioned in the "List of Standard Models", the 3-position valves also can be used as the 2-position valves using the two of their three positions. In this case, there are two kinds of the valve available. One is the valve using the neutral position and SOL a position (2B＊A) and another is the valve using the neutral position and SOL b position (2B＊B).

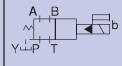
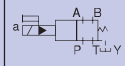
(Example) In case of Spool Type "2"



"A"：Use of Neutral and SOL. a Energised Position

"B"：Use of Neutral and SOL. b Energised Position

Model Numbers	Graphic Symbols	
	Standard Mtg. Type	Reverse Mtg. Type
04 DSHG-06-2B＊A 10		
(S-) DSHG-＊-2B2A		
DSHG-＊-2B3A		
(S-) DSHG-＊-2B4A		
(S-) DSHG-＊-2B40A		
DSHG-＊-2B5A		
DSHG-＊-2B6A		
(S-) DSHG-＊-2B60A		
DSHG-＊-2B7A		
DSHG-＊-2B9A		
(S-) DSHG-＊-2B10A		
DSHG-＊-2B11A		
(S-) DSHG-＊-2B12A		

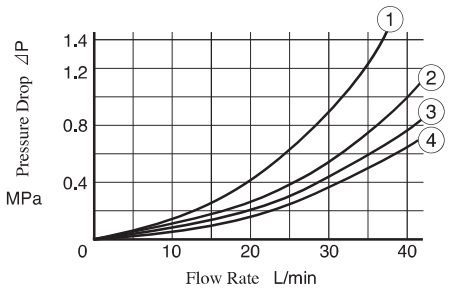
Model Numbers	Graphic Symbols	
	Standard Mtg. Type	Reverse Mtg. Type
04 DSHG-06-2B＊B 10		
(S-) DSHG-＊-2B2B		
DSHG-＊-2B3B		
(S-) DSHG-＊-2B4B		
(S-) DSHG-＊-2B40B		
DSHG-＊-2B5B		
DSHG-＊-2B6B		
(S-) DSHG-＊-2B60B		
DSHG-＊-2B7B		
DSHG-＊-2B9B		
(S-) DSHG-＊-2B10B		
DSHG-＊-2B11B		
(S-) DSHG-＊-2B12B		

Model Numbers	Graphic Symbols
	Standard Mtg. Type
04 DSHG-06-2N＊A 10	
(S-) DSHG-＊-2N2A	
DSHG-＊-2N3A	
(S-) DSHG-＊-2N4A	
(S-) DSHG-＊-2N40A	
DSHG-＊-2N5A	
DSHG-＊-2N6A	
(S-) DSHG-＊-2N60A	
DSHG-＊-2N7A	
DSHG-＊-2N9A	
(S-) DSHG-＊-2N10A	
DSHG-＊-2N11A	
(S-) DSHG-＊-2N12A	

Pressure Drop

Pressure drop curves based on viscosity of 35 mm²/s and specific gravity of 0.850.

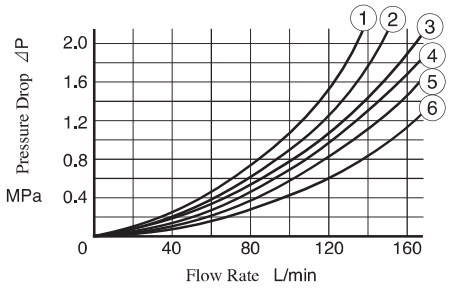
DSHG–01



DSHG–01

Spool Type	Pressure Drop Curve Number					Spool Type	Pressure Drop Curve Number				
	P→A	B→T	P→B	A→T	P→T		P→A	B→T	P→B	A→T	P→T
2	③	②	③	②	—	7	③	②	③	②	—
3	④	②	④	②	②	9	④	②	④	②	—
4	③	②	③	②	—	10	③	②	③	②	—
40	③	②	③	②	—	11	③	②	③	②	—
5	③	②	③	②	①	12	③	②	③	②	—
60	③	②	③	②	①						

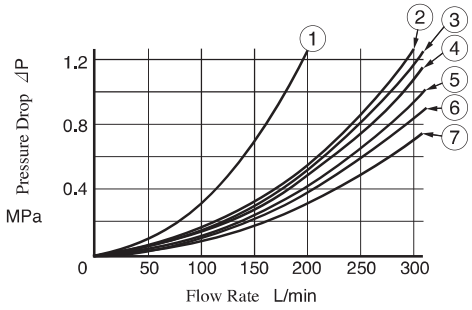
DSHG–03



DSHG–03

Spool Type	Pressure Drop Curve Number					Spool Type	Pressure Drop Curve Number				
	P→A	B→T	P→B	A→T	P→T		P→A	B→T	P→B	A→T	P→T
2	③	③	④	④	—	7	③	③	④	④	—
3	⑤	⑤	⑤	⑥	④	9	⑥	③	⑥	④	—
4	③	⑤	④	⑥	—	10	③	⑤	④	④	—
40	③	③	④	④	—	11	⑥	③	④	④	—
5	⑥	③	④	⑥	②	12	③	③	④	⑥	—
60	④	③	④	④	①						

DSHG–04、S–DSHG–04



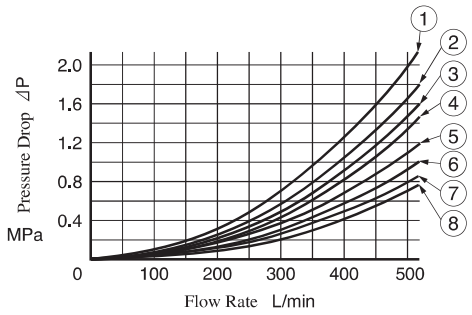
DSHG–04

Spool Type	Pressure Drop Curve Number					Spool Type	Pressure Drop Curve Number				
	P→A	B→T	P→B	A→T	P→T		P→A	B→T	P→B	A→T	P→T
2	⑤	④	⑤	⑥	—	60	⑦	⑤	⑦	⑦	②
3	⑤	③	⑤	⑤	⑦	7	⑤	④	⑤	⑥	—
4	⑤	③	⑤	⑤	—	9	⑤	④	⑤	⑥	—
40	⑤	④	⑤	⑥	—	10	⑤	②	⑤	⑥	—
5	⑦	④	⑤	⑤	⑤	11	⑥	④	⑤	⑥	—
6	⑤	③	⑤	⑥	①	12	⑤	④	⑤	⑤	—

S–DSHG–04

Spool Type	Pressure Drop Curve Number					Spool Type	Pressure Drop Curve Number				
	P→A	B→T	P→B	A→T	P→T		P→A	B→T	P→B	A→T	P→T
2	②	②	②	④	—	60	⑥	④	⑥	⑦	②
4	②	③	②	⑤	—	10	②	②	②	④	—
40	②	④	②	⑥	—	12	②	②	②	⑤	—

● DSHG–06、S–DSHG–06



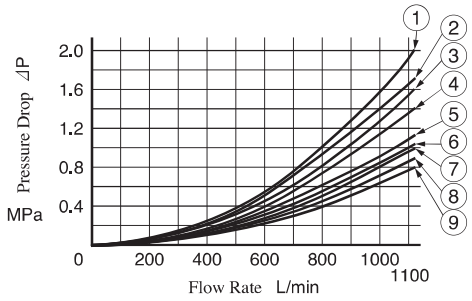
● DSHG–06

Spool Type	Pressure Drop Curve Number					Spool Type	Pressure Drop Curve Number				
	P→A	B→T	P→B	A→T	P→T		P→A	B→T	P→B	A→T	P→T
2	⑧	⑤	⑧	⑦	—	60	⑥	⑤	⑥	⑦	①
3	⑥	④	⑥	⑦	④	7	⑥	④	⑥	⑦	—
4	⑧	⑤	⑧	⑦	—	9	⑥	⑤	⑥	⑦	—
40	⑧	⑤	⑧	⑦	—	10	⑧	⑤	⑧	⑦	—
5	⑧	④	⑤	⑦	①	11	⑧	④	⑤	⑦	—
6	⑤	③	⑤	④	①	12	⑧	⑤	⑧	⑦	—

● S–DSHG–06

Spool Type	Pressure Drop Curve Number					Spool Type	Pressure Drop Curve Number				
	P→A	B→T	P→B	A→T	P→T		P→A	B→T	P→B	A→T	P→T
2	⑥	①	⑥	②	—	60	⑥	②	⑥	③	①
4	⑥	②	⑥	②	—	10	⑧	⑤	⑧	⑦	—
40	⑧	⑤	⑧	⑦	—	12	⑧	⑤	⑧	⑦	—

● DSHG–10、S–DSHG–10



● DSHG–10

Spool Type	Pressure Drop Curve Number					Spool Type	Pressure Drop Curve Number				
	P→A	B→T	P→B	A→T	P→T		P→A	B→T	P→B	A→T	P→T
2	⑨	⑥	⑨	⑧	—	60	⑧	⑤	⑧	⑤	③
3	⑦	⑥	⑦	⑦	⑤	7	⑦	⑥	⑦	⑦	—
4	⑨	⑥	⑨	⑥	—	9	⑦	⑥	⑦	⑧	—
40	⑨	⑥	⑨	⑧	—	10	⑨	⑤	⑨	⑧	—
5	⑨	⑥	⑧	⑥	①	11	⑨	⑥	⑧	⑦	—
6	⑤	③	⑤	④	②	12	⑨	⑦	⑨	⑥	—

● S–DSHG–10

Spool Type	Pressure Drop Curve Number					Spool Type	Pressure Drop Curve Number				
	P→A	B→T	P→B	A→T	P→T		P→A	B→T	P→B	A→T	P→T
2	⑧	③	⑧	④	—	60	⑧	④	⑧	④	②
4	⑧	⑤	⑧	⑥	—	10	⑨	⑤	⑨	⑧	—
40	⑨	⑥	⑨	⑧	—	12	⑨	⑦	⑨	⑥	—

● For any other viscosity, multiply the factors in the table below.

Viscosity mm²/s	15	20	30	40	50	60	70	80	90	100
Factor	0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

● For any other specific gravity (G'), the pressure drop (⊿P') may be obtained from the formula below.
⊿P' = ⊿P(G'/0.850)

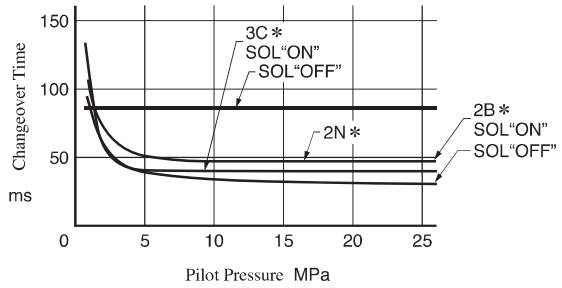
Typical Changeover Time

Changeover time varies according to oil viscosity, spool type and hydraulic circuit.

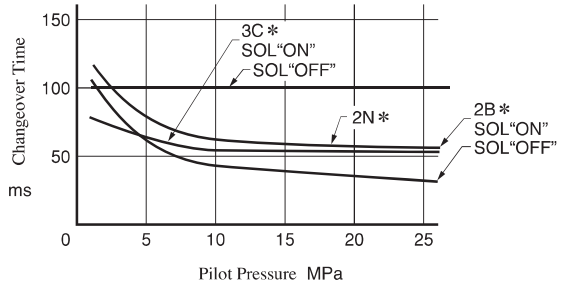
Test Conditions

Coil Type : D✻ (Models with DC solenoids)
Voltage : Rated Voltage
Oil Viscosity : 35 mm²/s

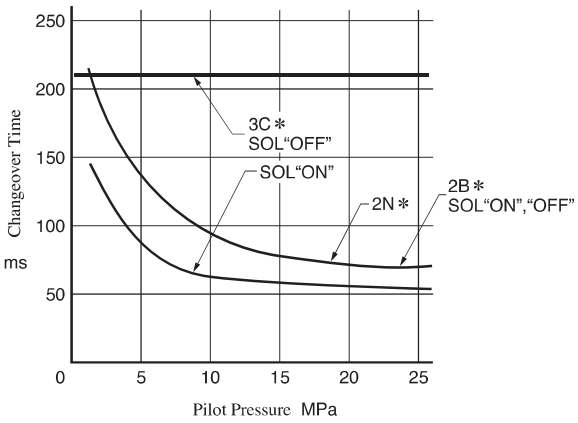
● DSHG-04



● DSHG-06



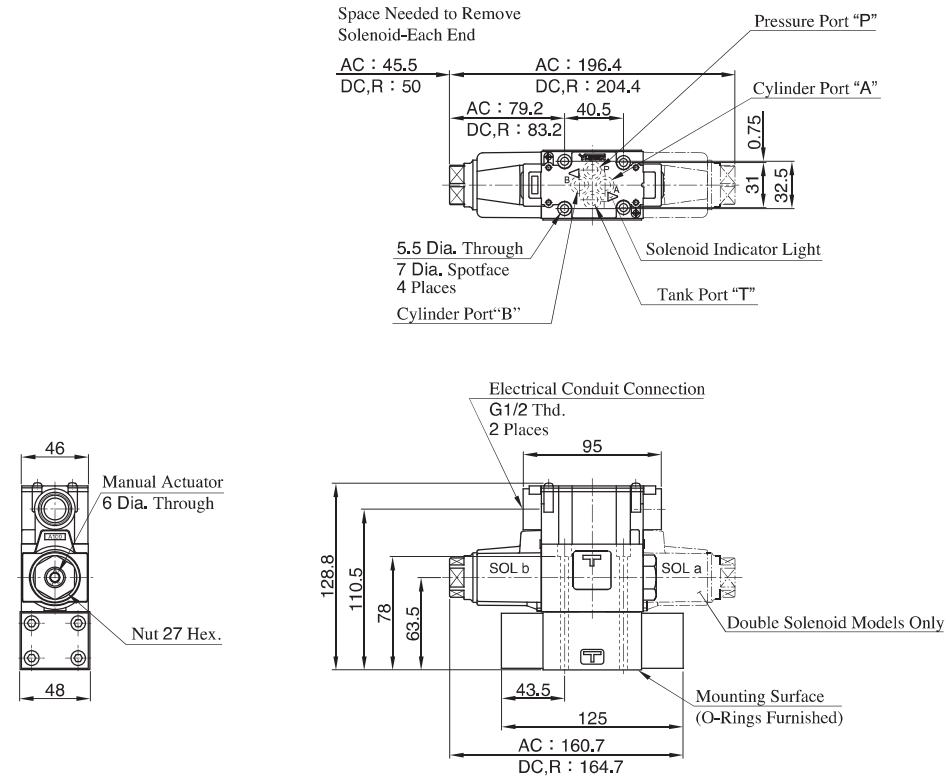
● DSHG-10



Mounting Surface: ISO 4401-03-02-0-05

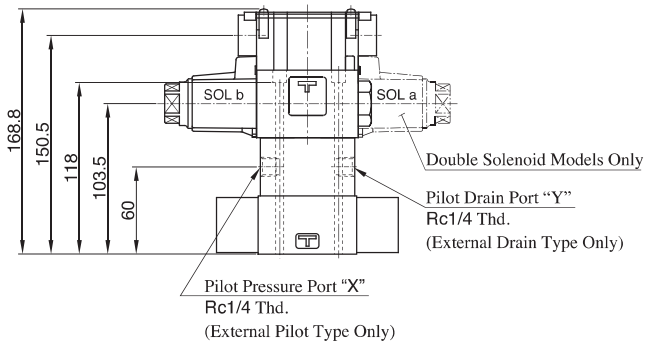
DSHG-01

● Internal Pilot - Internal Drain



Note) Valves that position of cable departure can change plug-in connector type are also available.
For details, refer to DSG-01 valve on page E-32.

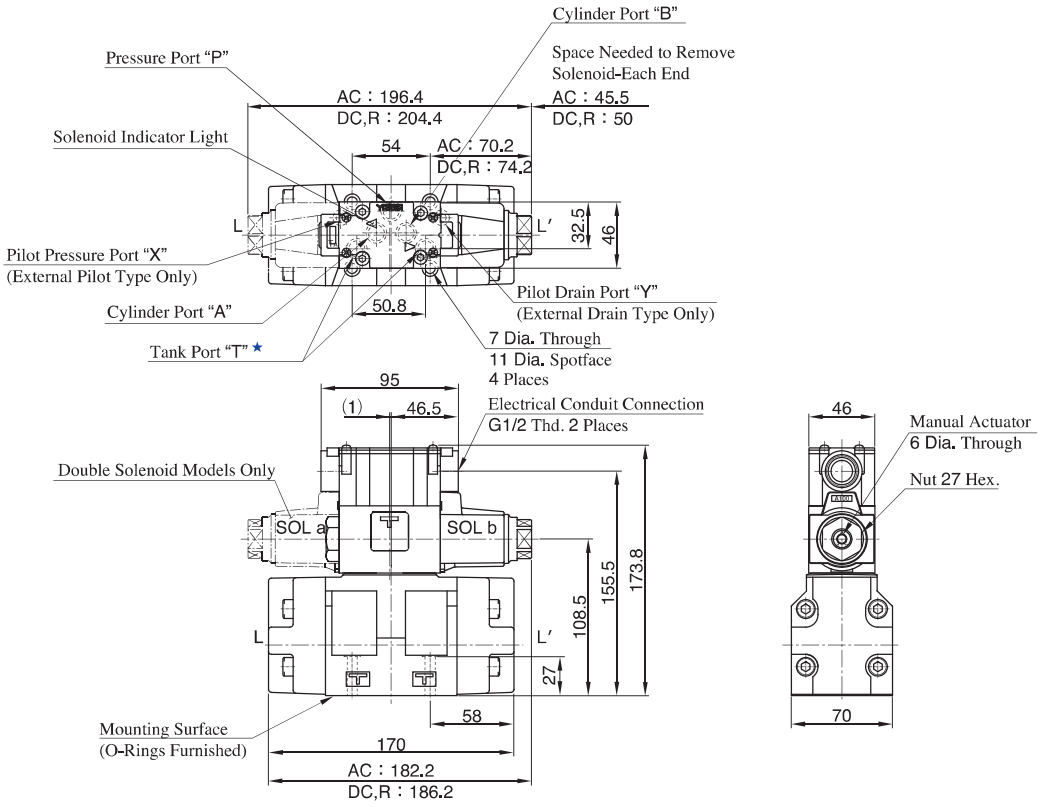
● External Pilot - External Drain
● External Pilot - Internal Drain
● Internal Pilot - External Drain



● For other dimensions, refer to "Internal Pilot / Internal Drain Type".

Mounting Surface: ISO 4401-05-05-0-05

DSHG-03

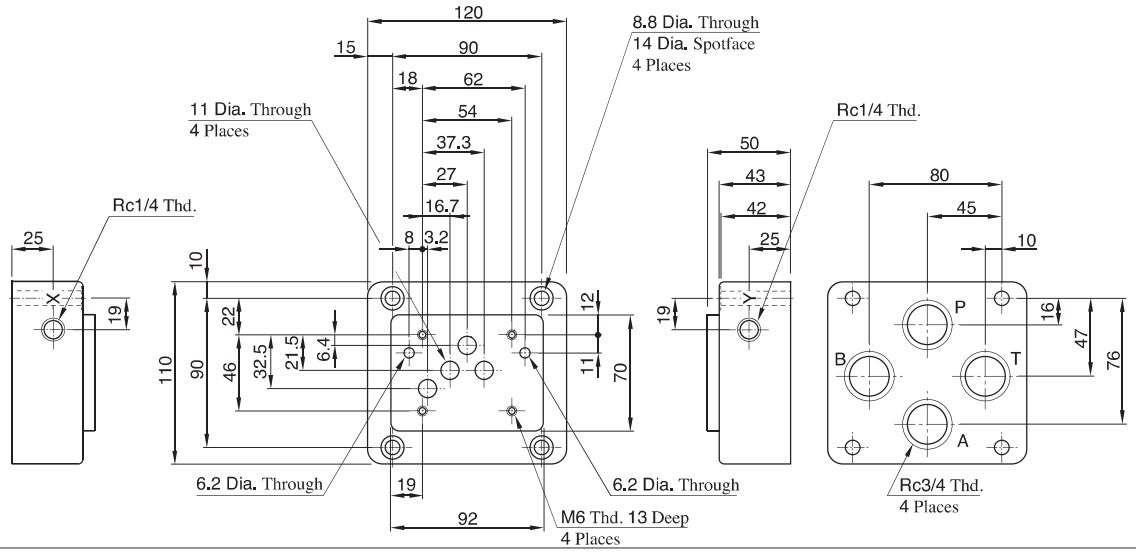


★Of the two of tank port "T", the tank port in the left side is normally used in our standard sub-plate, though, either side of the tank port "T" can be used without problem.

Note) Valves that position of cable departure can change plug-in connector type are also available.
For details, refer to DSG-01 valve on page E-32.

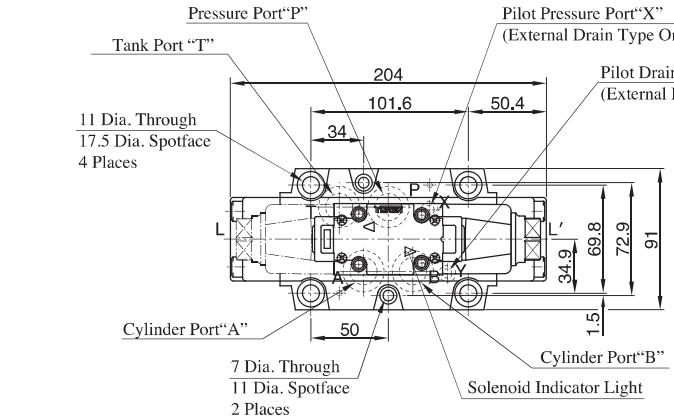
Sub-plate

DHGM-03Y

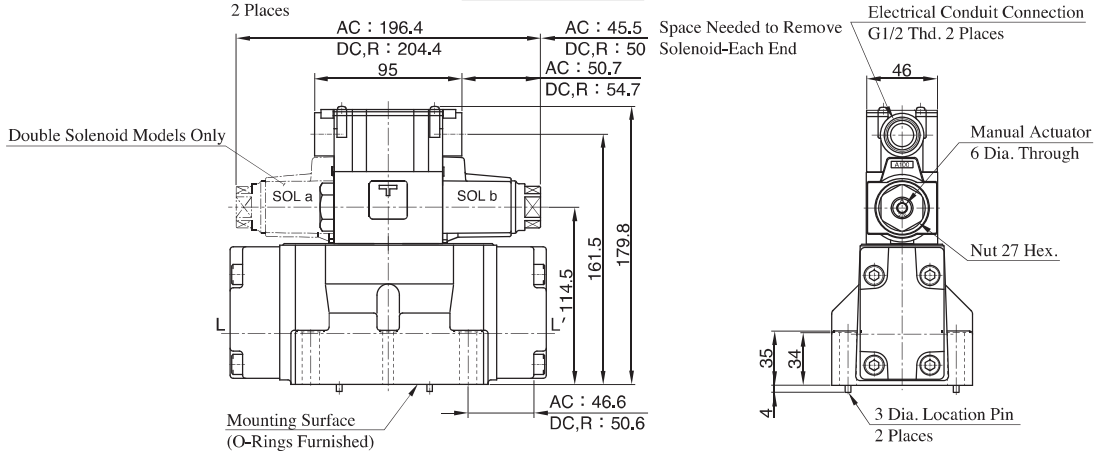


(S-) DSHG-04

Mounting Surface: ISO 4401-07-07-0-05



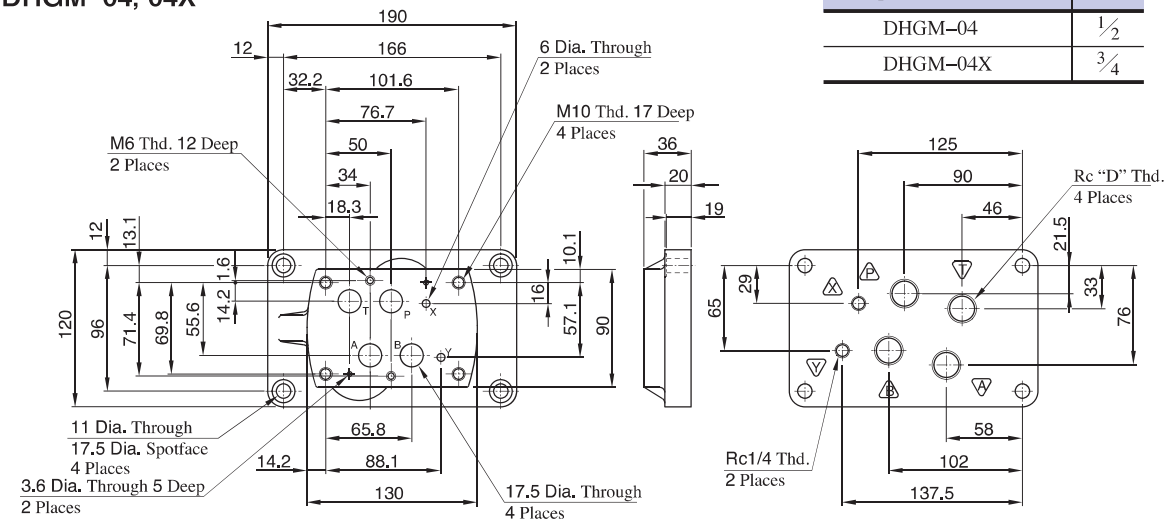
Note) Valves that position of cable departure can change plug-in connector type are also available.
For details, refer to DSG-01 valve on page E-32.



Sub-plate

DHGM-04, 04X

Sub-plate Model Numbers	D
DHGM-04	1/2
DHGM-04X	3/4

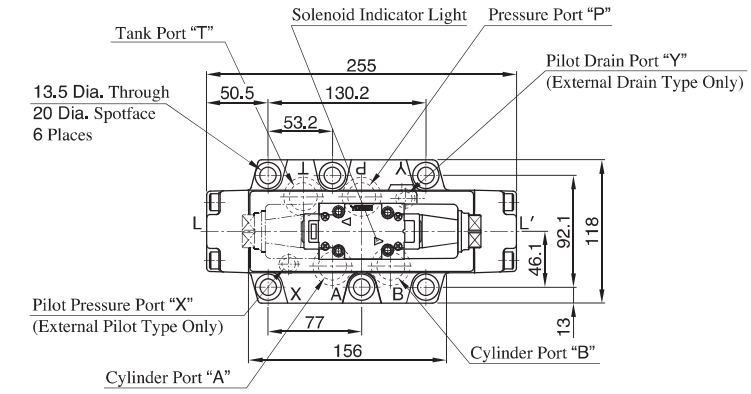


Note) Use Type of Port"X"and "Y"

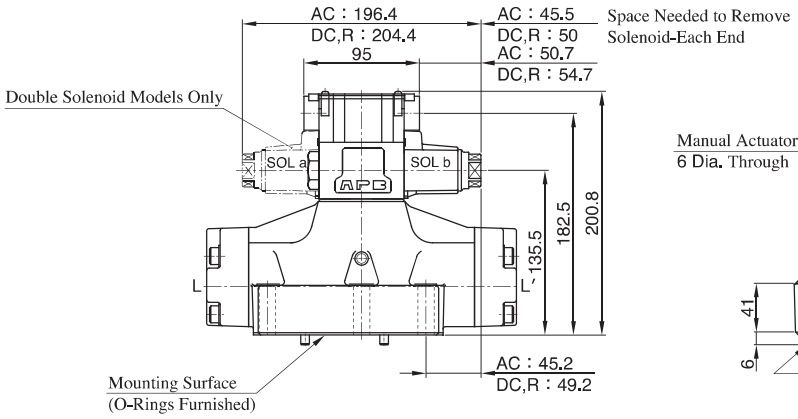
Pilot Pressure Port "X"	Drain Port "Y"
Used only on external pilot type valves. To be plugged on internal pilot type valves.	Used as drain port only on external drain type valves. To be plugged on internal drain type valves.

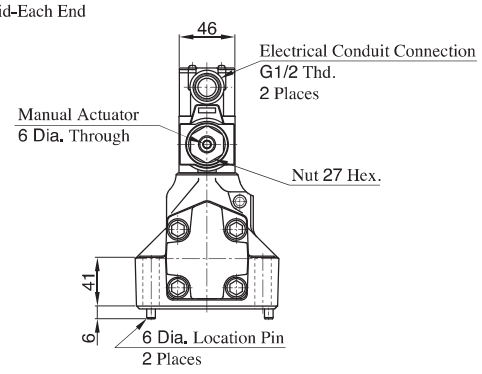
(S-) DSHG-06

Mounting Surface: ISO 4401-08-08-0-05



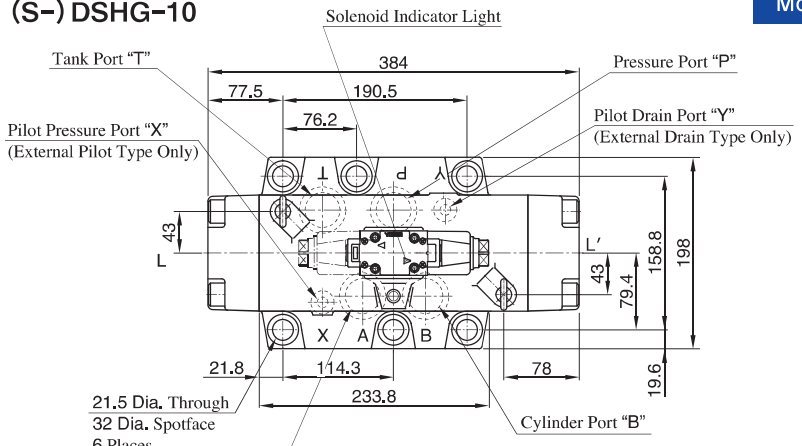
Note) Valves that position of cable departure can change plug-in connector type are also available.
For details, refer to DSG-01 valve on page E-32.



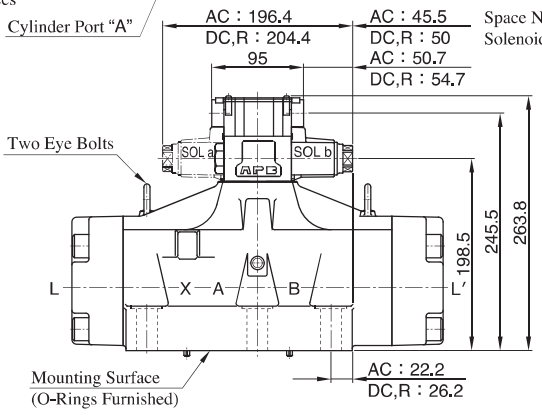


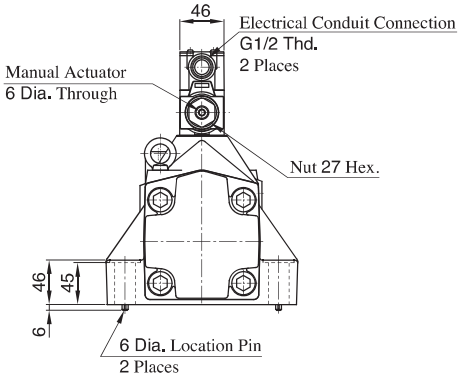
(S-) DSHG-10

Mounting Surface: ISO 4401-10-09-0-05



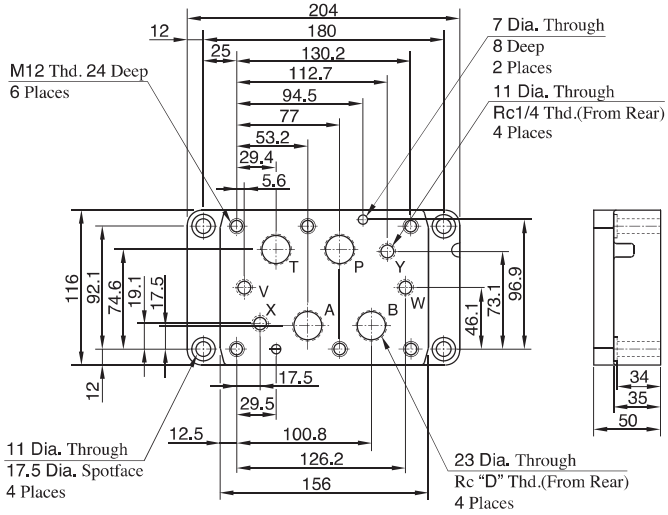
Note) Valves that position of cable departure can change plug-in connector type are also available.
For details, refer to DSG-01 valve on page E-32.





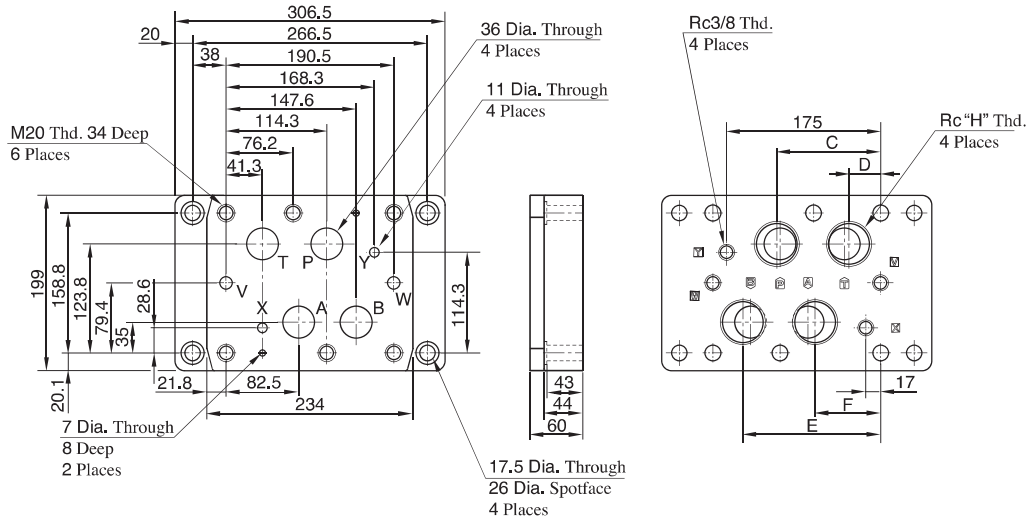
Sub-plate

DHGM-06, 06X



Sub-plate Model Numbers	"D"
DHGM-06	3/4
DHGM-06X	1

DHGM-10, 10X



Sub-plate Model Numbers	C	D	E	F	H
DHGM-10	114	41	147.5	82.5	1 1/4
DHGM-10X	118	36	156.5	74.5	1 1/2

Note) Use Type of Port "X", "Y", "V" and "W"

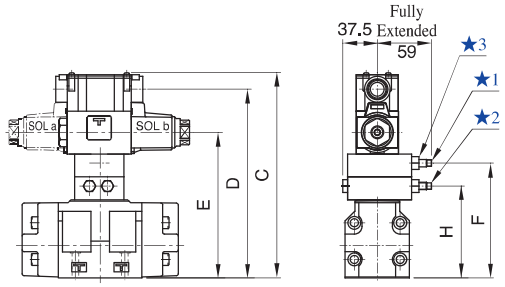
Valve Types	Pilot Pres. Port"X"	Pilot Drain Port"Y"	Drain Port"V"	Drain Port"W"
Spring Centered, No-Spring, Spring Offset	Used only on external pilot type valves. To be plugged on internal pilot type valves.	Used as drain port only on external drain type valves. To be plugged on★ internal drain type valves.	Not used (plug is not required)	
Pressure Centered			Used	Not used (plug is not required)
With Pilot Piston, Both Ends			Used	Used
With Pilot Piston, Port "A" End			Used	Not used (plug is required)
With Pilot Piston, Port "B" End			Not used (plug is required)	Used

★ As the thread is provided on the body, plug either port on the sub-plate or port on the body.

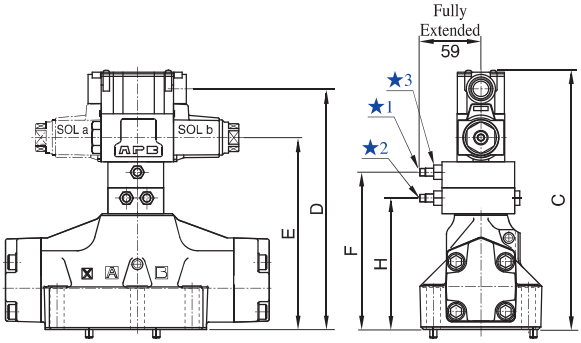
Options

Models with Pilot Choke Valve

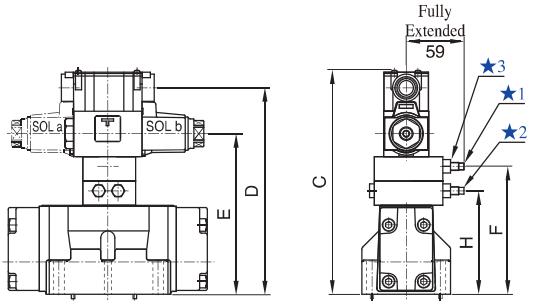
● DSHG-03-＊＊＊-C1, C2, C1C2



● (S-) DSHG-$\frac{06}{10}$-＊＊＊-C1, C2, C1C2



● (S-) DSHG-04-＊＊＊-C1, C2, C1C2



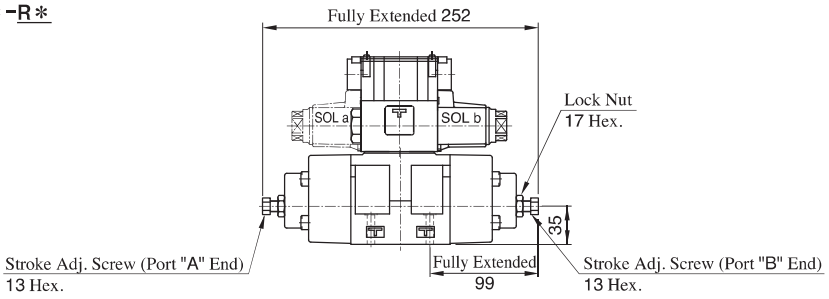
★ 1. "C1" Choke (Meter-in) Adj. Screw 6 Hex.
★ 2. "C2" Choke (Meter-out) Adj. Screw 6 Hex.
★ 3. Lock Nut 12 Hex.

Model Numbers	C	D	E	F	H
DSHG-03-＊＊＊-C1	198.8	180.5	133.5	100	—
DSHG-03-＊＊＊-C2				—	100
DSHG-03-＊＊＊-C1C2	223.8	205.5	158.5	125	100
(S-) DSHG-04-＊＊＊-C1	204.8	186.5	139.5	106	—
(S-) DSHG-04-＊＊＊-C2				—	106
(S-) DSHG-04-＊＊＊-C1C2	229.8	211.5	164.5	131	106
(S-) DSHG-06-＊＊＊-C1	225.8	207.5	160.5	127	—
(S-) DSHG-06-＊＊＊-C2				—	127
(S-) DSHG-06-＊＊＊-C1C2	250.8	232.5	185.5	152	127
(S-) DSHG-10-＊＊＊-C1	288.8	270.5	223.5	190	—
(S-) DSHG-10-＊＊＊-C2				—	190
(S-) DSHG-10-＊＊＊-C1C2	313.8	295.5	248.5	215	190

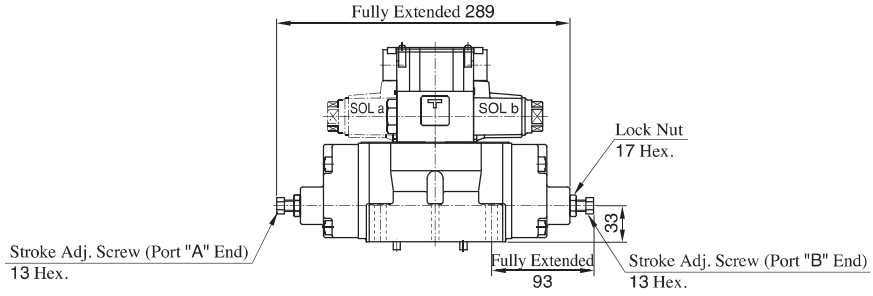
Options

Models with Stroke Adjustment

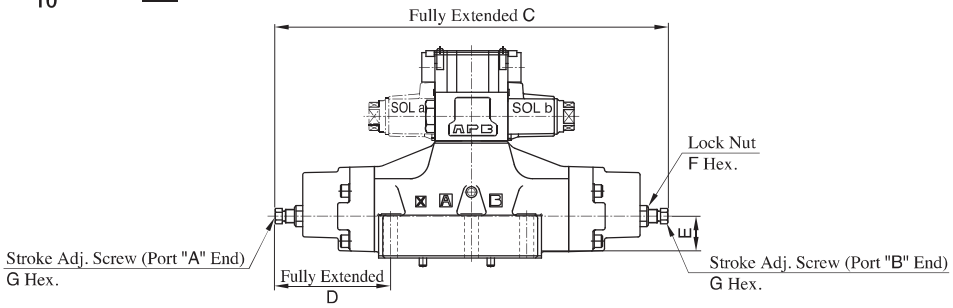
● DSHG-03-＊＊＊-R＊



● (S-) DSHG-04-＊＊＊-R＊



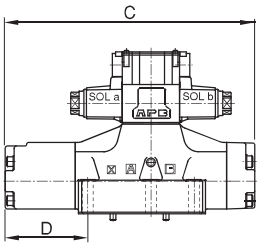
● (S-) DSHG-$\frac{06}{10}$-＊＊＊-R＊



Model Numbers	C	D	E	F	G
(S-) DSHG-06-＊＊＊-R2	376	111	40	19	13
(S-) DSHG-10-＊＊＊-R2	558	164.5	65	24	17

Pressure Centered Models

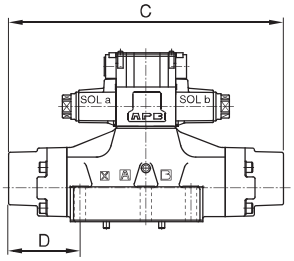
● (S-) DSHG-$\frac{06}{10}$-3H＊



Model Numbers	C	D
(S-) DSHG-06-3H＊	306.5	102
(S-) DSHG-10-3H＊	456	149.5

Models with Pilot Piston

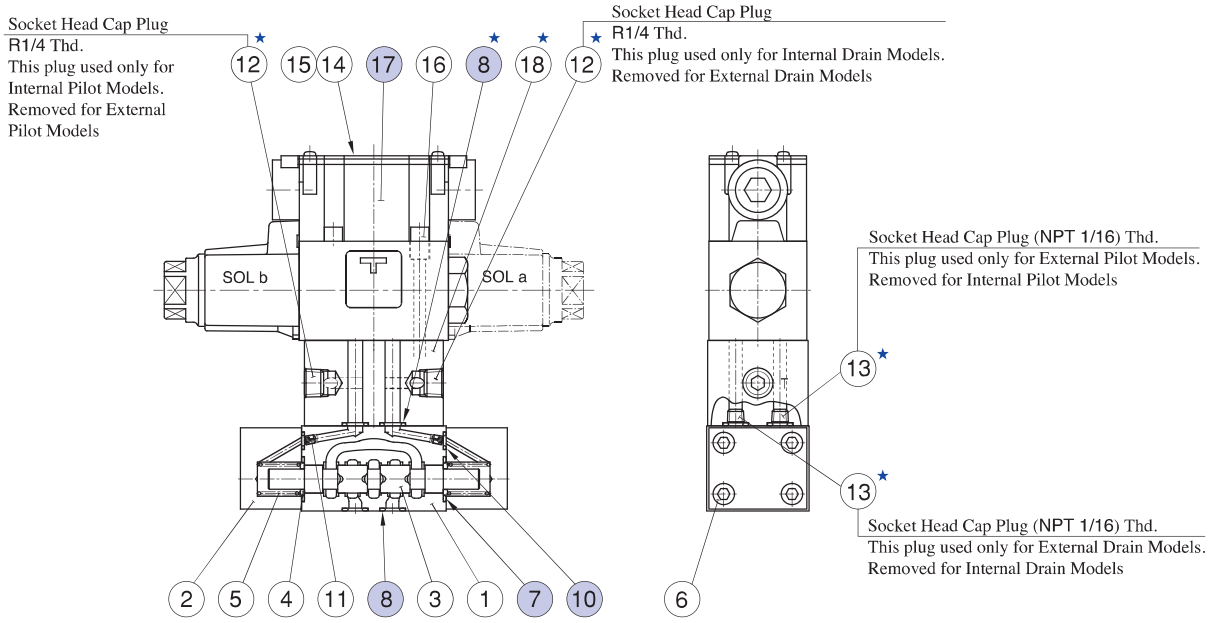
● (S-) DSHG-$\frac{06}{10}$-＊＊＊-P＊



Model Numbers	C	D
(S-) DSHG-06-＊＊＊-P2	323	84
(S-) DSHG-10-＊＊＊-P2	479	125

List of Seals and Pilot Valves

DSHG-01



Note: Piece parts marked ★ are not available for internal pilot-internal drain type.

List of Seals

Item	Name	Part Numbers	Qty.
7	O-Ring	JASO 1018 1A	2
8		OR NBR-90 P9-N	8 (4) ★1
10		OR NBR-90 P5-N	2

★1. Quantities in the ( ) are applicable to internal pilot-internal drain.

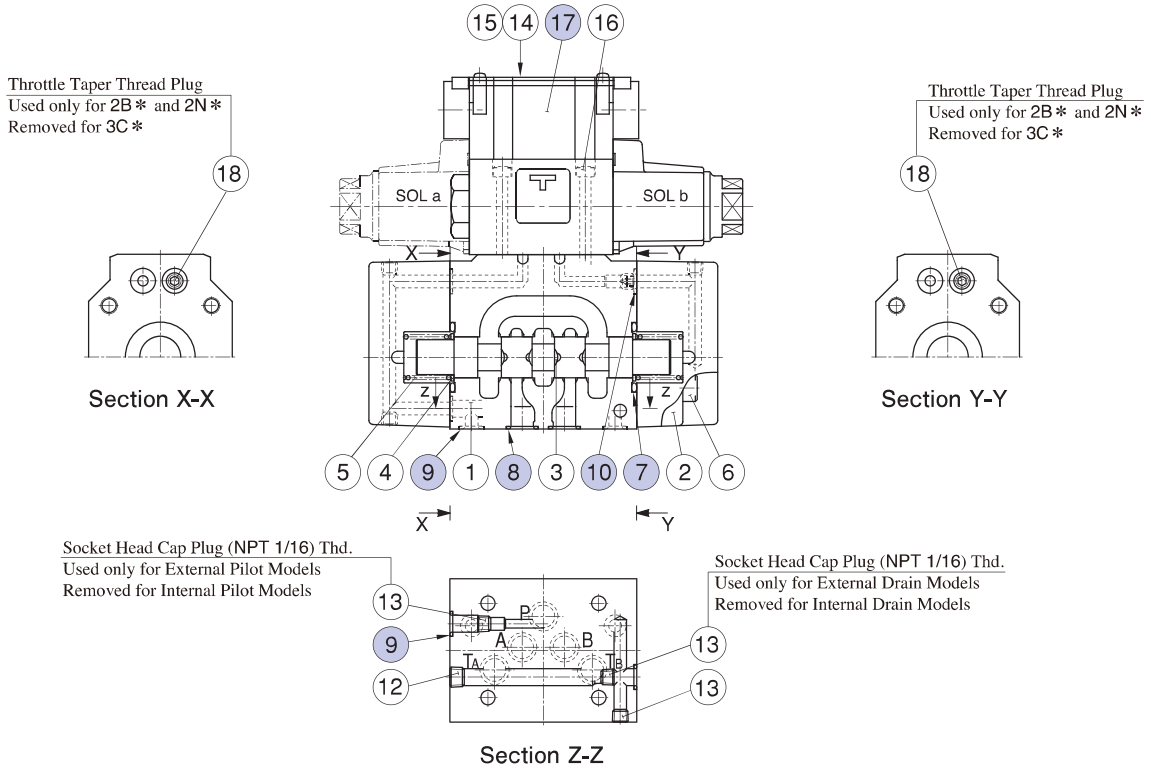
List of Item ⑰ Pilot Valves

Solenoid Controlled Pilot Operated Directional Valve Model Numbers	⑰ Pilot Valve Model Numbers
DSHG-01-3C ✻-★-14	DSG-01-3C4-★-70
DSHG-01-2B ✻-★-14	DSG-01-2B2-★-70-L

Note) Fill coil type (a symbol representing current/voltage) in section marked ★.
For the details of the pilot valves, refer to page E-34 for DSG-01 series.

List of Seals and Pilot Valves

DSHG-03



List of Seals

Item	Name	Part Numbers	Qty.
7	O-Ring	OR NBR-90 P28-N	2
8		AS568-014 (NBR-90)	5
9		OR NBR-90 P9-N	2
10		OR NBR-90 P9-N	6

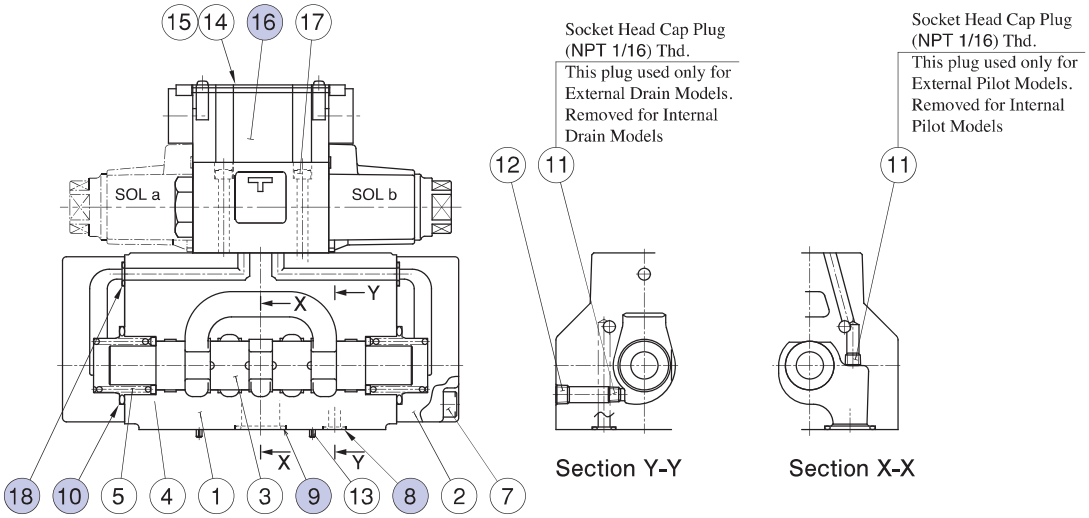
List of Item ⑰ Pilot Valves

Solenoid Controlled Pilot Operated Directional Valve Model Numbers	⑰ Pilot Valve Model Numbers
DSHG-03-3C＊-★-14	DSG-01-3C4-★-70
DSHG-03-2B＊-★-14	DSG-01-2B2-★-70
DSHG-03-2N＊-★-14	DSG-01-2D2-★-70

Note) Fill coil type (a symbol representing current/voltage) in section marked ★.
For the details of the pilot valves, refer to page E-34 for DSG-01 series.

List of Seals and Pilot Valves

(S-) DSHG-04



List of Seals

Item	Name	Part Numbers	Qty.
8	O-Ring	OR NBR-90 P9-N	2
9		OR NBR-90 P22-N	4
10		OR NBR-90 P34-N	2
18		OR NBR-90 P9-N	2

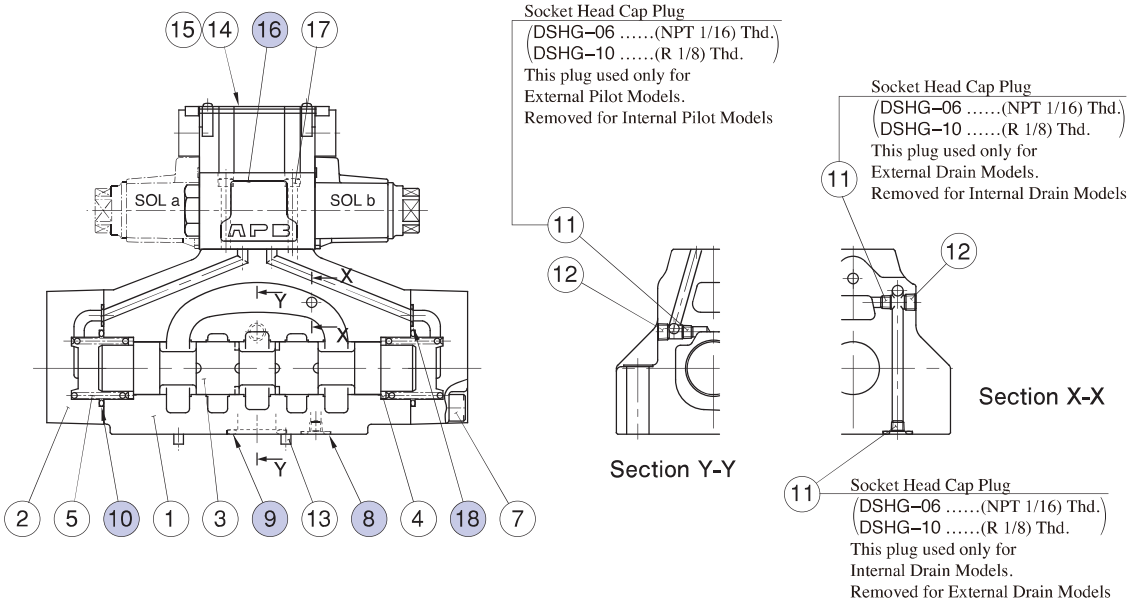
List of Item ⑯ Pilot Valves

Solenoid Controlled Pilot Operated Directional Valve Model Numbers	⑯ Pilot Valve Model Numbers
(S-) DSHG-04-3C＊-★-52	DSG-01-3C4-★-70
(S-) DSHG-04-2N＊-★-52	DSG-01-2D2-★-70
(S-) DSHG-04-2B＊-★-52	DSG-01-2B2-★-70

Note) Fill coil type (a symbol representing current/voltage) in section marked ★.
For the details of the pilot valves, refer to page E-34 for DSG-01 series.

List of Seals and Pilot Valves

(S-) DSHG-06, 10



List of Seals

Item	Name	Part Numbers		Qty.
		(S-) DSHG-06	(S-) DSHG-10	
8	O-Ring	OR NBR-90 P14-N	OR NBR-90 P20-N	2
9		OR NBR-90 P30-N	OR NBR-90 P42-N	4
10		OR NBR-90 P40-N	OR NBR-90 G65-N	2
18		OR NBR-90 P10-N	OR NBR-90 P14-N	2

List of Item ⑯ Pilot Valves

Solenoid Controlled Pilot Operated Directional Valve Model Numbers	⑯ Pilot Valve Model Numbers
(S-) DSHG-06-3C*-★-53	DSG-01-3C4-★-70
(S-) DSHG-10-3C*-★-43	
(S-) DSHG-06-2N*-★-53	DSG-01-2D2-★-70
(S-) DSHG-10-2N*-★-43	
(S-) DSHG-06-2B*-★-53	DSG-01-2B2-★-70-L
(S-) DSHG-10-2B*-★-43	
(S-) DSHG-06-3H*-★-53	DSG-01-3C9-★-70
(S-) DSHG-10-3H*-★-43	

Note) Fill coil type (a symbol representing current/voltage) in section marked ★.
For the details of the pilot valves, refer to page E-34 for DSG-01 series.

"G" Series Shockless Type Solenoid Operated / Solenoid Controlled Pilot Operated Directional Valves

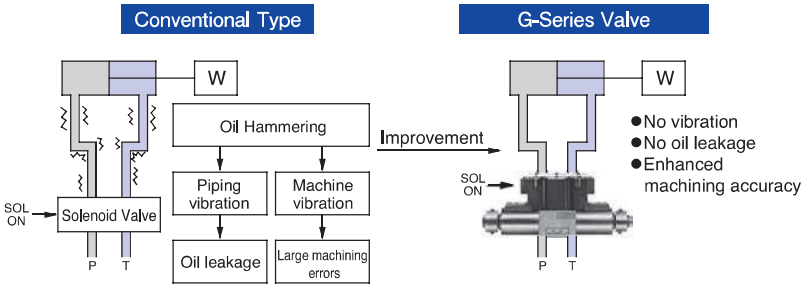
Patent Number 1775681

The shifting time of conventional Solenoid Operated, Shockless, and Directional Valves is constant and cannot be adjusted.
The G-Series Solenoid Operated Directional Valves incorporate electronic circuits enable adjustment of the spool shifting time, it can be set at an optimal level to minimise shocks to the machine.

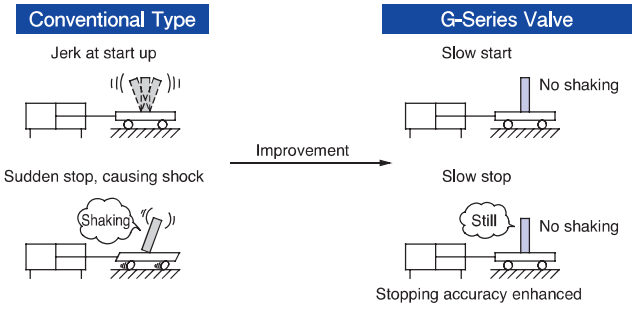

G-DSG-01


G-DSHG-04

1 Reduces oil hammering during spool changeover.

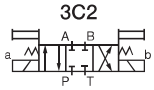


2 Reduces shock caused by acceleration and deceleration

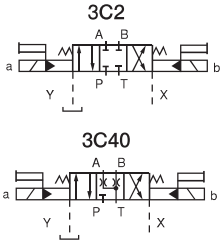


Graphic Symbols

● G-DSG-01/03



● G-DSHG-04/06



Specifications

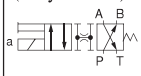
Model Numbers	Max. Flow L/min	Max. Operating Pressure MPa	Max. T-Line Back Pressure MPa	Pilot Pressure MPa		Pilot Flow L/min		Shifting Time Range s		Mass kg	
				Max.	Min.	at Normal	at Transition	for ON	for OFF	3C＊	2B7
G-DSG-01-＊-＊＊＊-＊-51	10 20 30 40	25	16	—	—	—	—	0.1 - 1		3	2.1
G-DSG-03-＊-＊＊＊-＊-51	40 60 80	25	16	—	—	—	—	0.3 - 1		7.5	5.3
G-DSHG-04-3C＊-＊-＊-＊-51	160	25	16	16	1.5	1	4	0.06 - 1.5	0.1 - 2	12	—
G-DSHG-06-3C＊-＊-＊-＊-51	250					1	6	0.1 - 1	0.2 - 2	15	—

● Electrical Specifications

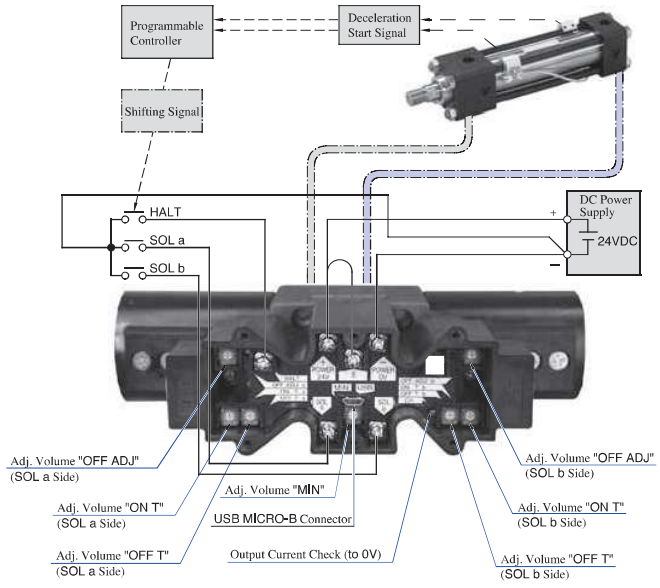
Model Numbers	Electric Power Supply		Shifting Signal, low speed operation halt signal (HALT)		
	Voltage	Input Power	Voltage	Current	Input Interface
G-DSG-01-＊-＊＊＊-＊-51 G-DSG-03-＊-＊＊＊-＊-51 G-DSHG-04-3C＊-＊-＊-＊-51 G-DSHG-06-3C＊-＊-＊-＊-51	24 V DC (21 - 28 V DC Included Ripple) Use a stable power supply	36 W	5 - 48 V DC (Can be used in common with electric power supply) Use a stable power supply	Constant at 10 mA (A constant current circuit is used)	Sink Type, Source Type

For details of "G " Series Shockless Type Solenoid Operated / Solenoid Controlled Pilot Operated Directional Valves, please contact us.

Model Number Designation

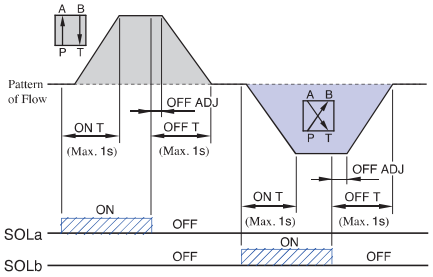
G–DSG	–01	–10	–2B7	—	—	–S	–51	–L
G–DSHG	–04	—	–3C2	–E	–R2	–S	–51	—
Series Number	Valve Size	Metered Flow Capacity	Spool Type (Refer to Graphic symbols)	Pilot Connection	Input only for options below	Input Interface	Design Number	Models with reverse mtg. of solenoid
G-DSG : "G " Series Shockless Type Solenoid Operated Directional Valves (Sub-plate Mounting Type)	01	None : 40L/min 10 : 10L/min 20 : 20L/min	3C2 3C40	—	—	None : Sink Type (Standard) S : Source Type	51	L : Input only for reverse mtg. of solenoid. (Only for 2B7) 
		None : 30L/min 10 : 10L/min 20 : 20L/min	2B7					
	03	None : 80L/min 40 : 40L/min 60 : 60L/min	3C2 3C40				51	
		None : 60L/min 40 : 40L/min	2B7					
G-DSHG : "G " Series Shockless Type Solenoid Controlled Pilot Operated Directional Valves (Sub-plate Mounting Type)	04	—	3C2 3C40	None : Internal Pilot E : External Pilot	R2 : With Stroke Adjustment, Both Ends RA : With Stroke Adjustment, Port "A" End RB : With Stroke Adjustment, Port "B" End		51	—
	06						51	

System Diagram (Example of sink type wiring)

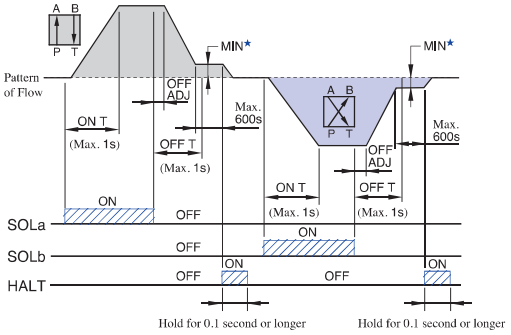


Relationships between SOL signals and flow patterns

Without HALT functions



With HALT functions



★ The minimum adjustment volume is common for SOL a and b, and it is not possible to set a different volume for each SOL a and b individually.
If the HALT functions are not used, set the minimum adjustment volume to zero.

Interchangeability between Current and New Product

"G " Series Shockless Type Solenoid Operated Directional Valves and Solenoid Controlled Pilot Operated Directional Valves have changed models from 50 design to 51 design by installation of new amplifier.

Name	Current Model Numbers	New Model Numbers
"G " Series Shockless Type Solenoid Operated Directional Valves	G-DSG-01-*-*****-*-50 G-DSG-03-*-*****-*-50	G-DSG-01-*-*****-*-51 G-DSG-03-*-*****-*-51
"G " Series Shockless Type Solenoid Controlled Pilot Operated Directional Valves	G-DSHG-04-*-*****-*-50 G-DSHG-04-*-*****-*-50	G-DSHG-04-*-*****-*-51 G-DSHG-04-*-*****-*-51

Major Changes

Use newly developed Digital Control Amplifier.

Interchangeability

Adjusting trimmer is inherited from the current model. Same as on the current model, trimmer adjustment allows to modify the time of spool switching in accordance with the machine.

New Functions

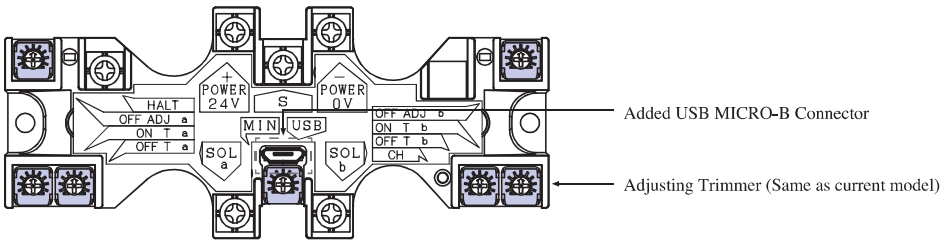
USB MICRO-B connector has been added and adjustment on PC using specialized software made available.
Making minute adjustments and readjusting has become easier compared to current model. Copying of set adjustment value made available. There is a maintenance function that allows to check working conditions of the valve such as solenoid current value and operating time on PC.

Interchangeability in Installation

Yes

Comparison between Current and New

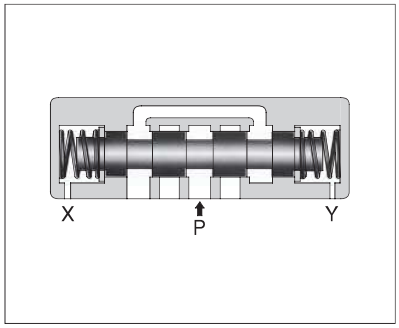
No changes in specifications, characteristics, dimensions, installations, connecting terminal and trimmer arrangement.
USB MICRO-B connector has been added to the on-board amplifier.



Pilot Operated Directional Valves

These valves perform a change over of spool by hydraulic pilot and shift the direction of oil flow.





Specifications

Model Numbers		Max. Flow★ L/min	Max. Operating Pressure MPa	Max. Pilot Pressure MPa	Min. Required Pilot Pressure MPa
Spring Centered	DHG-04-3C✻-50	300	31.5	25	0.8
No-Spring	DHG-04-2N✻-50	300			
Spring Offset	DHG-04-2B✻-50	130			
Spring Centered	DHG-06-3C✻-50	500	31.5	25	0.8
No-Spring	DHG-06-2N✻-50	500			
Spring Offset	DHG-06-2B✻-50	140			
Pressure Centered	DHG-06-3H✻-50	500		21	1.0
Spring Centered	DHG-10-3C✻-40	1100	31.5	25	1.0
No-Spring	DHG-10-2N✻-40	1100			
Spring Offset	DHG-10-2B✻-40	460			
Pressure Centered	DHG-10-3H✻-40	1100		21	

★ Maximum flow indicates a ceiling flow to keep valve operation (changeover) normal.
It depends on the type of valve and circuit, please contact us for details.

Note) Models for phosphate ester fluid are available. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

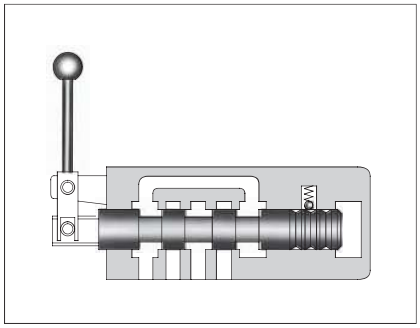
● About high flow valves (Flange Connection Type), please contact us for details.

For details of Pilot Operated Directional Valves, please contact us.

Manually Operated Directional Valves

These valves may be used to manually shift the spool position and change the direction of oil flow.





Specifications

	Model Numbers	Maximum Flow Note)1 L/min				Max. Operating Pressure MPa	Max. T-Line Back Pressure MPa	Approx. Mass kg
		7 MPa	14 MPa	21 MPa	31.5 MPa			
Threaded Connections	DMT-03-3C＊-50	100★1	100★1	100★1	—	25	16	5.0
	DMT-03-3D＊-50	100	100	100	—			
	DMT-03-2D＊-50	100	100	100	—			
	DMT-03-2B＊-50	100★1	100★1	100★1	—			
	DMT-06＊-3C＊-30	300 (200)★2	300 (120)★2	300 (100)★2	—	21	At time spool shift is required: 7 At time spool shift is not required: 21	12.9
	DMT-06＊-3D＊-30	300	300	300	—			
	DMT-06＊-2D＊-30	300	300	300	—			
	DMT-06＊-2B＊-30	200	120	100	—			
	DMT-10＊-3C＊-30	500 (315)★2	500 (315)★2	500 (315)★2	—	21	At time spool shift is required: 7 At time spool shift is not required: 21	22
	DMT-10＊-3D＊-30	500	500	500	—			
	DMT-10＊-2D＊-30	500	500	500	—			
	DMT-10＊-2B＊-30	315	315	315	—			
Sub-plate Mounting	DMG-01-3C＊-10	35	35	35	—	25	14★6	1.8
	DMG-01-3D＊-10							
	DMG-01-2D＊-10							
	DMG-01-2B＊-10							
	DMG-03-3C＊-50	100★1	100★1	100★1	—	25	16	4.0
	DMG-03-3D＊-50	100	100	100	—			
	DMG-03-2D＊-50	100	100	100	—			
	DMG-03-2B＊-50	100★1	100★1	100★1	—			
	DMG-04-3C＊-21	200★3	200★3	105★3	—	21	21★7	7.4
	DMG-04-3D＊-21	200	200	200	—			
	DMG-04-2D＊-21	200	200	200	—			
	DMG-04-2B＊-21	90	60	50	—			7.9
	DMG-06-3C＊-50	500★4	500★4	500★4	500★4	31.5	21★7	11.5
	DMG-06-3D＊-50	500	500	500	500			
	DMG-06-2D＊-50	500	500	500	500			
	DMG-06-2B＊-50	420	300	250	200			12
	DMG-10-3C＊-40	1100★5	1100★5	1100★5	1100★5	31.5	21★7	48.2
	DMG-10-3D＊-40	1100	1100	1100	1100			
	DMG-10-2D＊-40	1100	1100	1100	1100			
	DMG-10-2B＊-40	670	350	260	200			50

Note) 1. The maximum flow means the limited flow of the valve. In case of pressure or flow condition, the lever operating torque of over DMG-04 size models is possible over 40 Nm.

★1. Varies depending on the spool type. For details, see the "List of Standard Models" for DSG-03 Series Solenoid Operated Directional Valves (page E-40 at 50 Hz rated voltage).

★2. The figures in parentheses indicate max. flow for 3C3,3C5, 3C6 and 3C60.

★3. Varies depending on the spool type. Please contact us for details.

★4. Varies depending on the spool type. Same as DSHG-06 (at pilot pressure of 0.8 MPa), see page E-77.

★5. Varies depending on the spool type. Same as DSHG-10 (at pilot pressure of 1.0 MPa), see page E-78.

★6. Lever operating torque varies depending on the T-line back pressure.

★7. If the T-Line back pressure exceeds 7 MPa, directly connect the drain port to the reservoir.

● About high flow valves (Flange Connection Type), please contact us for details.

For details of Manually Operated Directional Valves, please contact us.

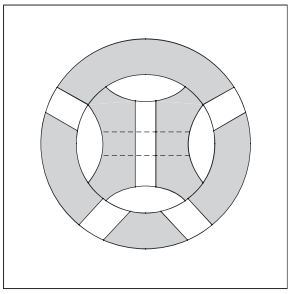
Mechanically Operated Directional Valves

These valves are chiefly used to shift the pilot circuit. Rotary Type Directional Valves and Cam Operated Type Directional Valves are available.

Rotary Type Directional Valves

These valves are used to rotate the spool either manually or by way of cam and shift the direction of oil flow.
The detented mechanism incorporated in these valves prevents the valve from being changed over by itself due to vibrations or any other shocks.





Specifications

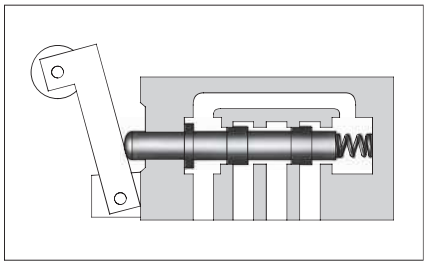
Model Numbers		Rated Flow L/min	Max. Operating Pressure MPa	Max. T-Line Pressure MPa	Approx. Mass kg	
Threaded Connection	Sub-plate Mounting				DRT Type	DRG Type
DRT–02–＊D＊–＊＊–20	DRG–02–＊D＊–＊＊–20	16	7	7★	4.7	3.4

★ When a back pressure of more than 3 MPa is generated in the tank port, be sure to use External Drain Type.

Cam Operated Directional Valves

These valves may be used to shift the direction of oil flow by depressing the spool by way of cam.





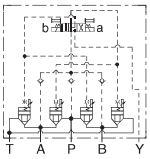
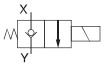
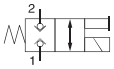
Specifications

Model Numbers		Max. Flow★ L/min	Max. Operating Pressure MPa	Max. T-Line Pressure MPa	Approx. Mass kg	
Threaded Connection	Sub-plate Mounting				DCT Type	DCG Type
DCT–01–2B＊–＊–40	DCG–01–2B＊–＊–40	30	21	7	1.1	1.1
DCT–03–2B＊–＊–50	DCG–03–2B＊–＊–50	100	25	10	4.5	2.9

★ Max. flow indicates the ceiling flow which does not affect the normal function (changeover) of valves.

For details of Mechanically Operated Directional Valves, please contact us.

Poppet Type Directional Valves

Valve Type	Graphic Symbols	Max. Operating Pressure MPa	Maximum Flow L/min (1 2 5 10 20 50 100 200 500 1000)	Page
Multi Purpose Control Valves		25	DSLHG-04 DSLHG-06 DSLHG-10	E-102
Solenoid Operated Poppet Type Two-Way Valves		21	CDSC-01	E-122
		14	CDSC-03 CDST-03* CDSG-03	
Shut-off Type Solenoid Operated Directional Valves		25	DSPC-01 DSPG-01 DSPC-03 DSPG-03	E-128

Mounting Surface

Mounting surface dimensions conform to ISO standard described in the below table.

Name	Model Numbers	ISO Code of Mounting Surface
Shut-off Type Solenoid Operated Directional Valves	DSPG-01	ISO 4401-03-02-0-05
	DSPG-03	ISO 4401-05-04-0-05
	DSPC-01	ISO 7789 20-01-0-07
	DSPC-03	ISO 7789 27-01-0-07
Multi Purpose Control Valves	DSLHG-04	ISO 4401-07-07-0-05
	DSLHG-06	ISO 4401-08-08-0-05
	DSLHG-10	ISO 4401-10-09-0-05

Interchangeability in Installation between Current and New Design

Model change has been made on the following products.
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		Mtg. Interchangeability	Page	Major Changes
	Current	New			
1/2, 3/4, 1 1/4 Multi Purpose Control Valves	DSLHG-04-＊-＊-12 DSLHG-06-＊-＊-12 DSLHG-10-＊-＊-12	DSLHG-04-＊-＊-13 DSLHG-06-＊-＊-13 DSLHG-10-＊-＊-13	Yes	—	• Pilot valve (DSG-01) changed 60→70 design.
Solenoid Operated Poppet Type Two-Way Valves	CDS＊-03＊-C-＊-20	CDS＊-03＊-C-＊-21	Yes	E-127	• The change of solenoid ratings.
Shut-off Type Solenoid Operated Directional Valves	DSP＊-01-C-＊-20	DSP＊-01-C-＊-30	Yes	E-135	• High pressure and the change of solenoid ratings.

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 rewiring when the applied frequency is changed.

DC Solenoid

K-series DC Solenoid which has a reputation for excellent DC control is employed.

★Three Characteristics of K-series★

1. Avoid malfunction of computers.
   (The surge voltage is low, so these valves do not give bad influences like noise to electronic devices)

2. The relays last for long time.
   (The spark between the relay contacts has been eliminated and therefore drastically decrease damages of contacts)

3. Time lag on de-energisation is reduced.

R Type Models with Current Rectifier and DC Solenoid

Specially designed DC solenoids 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.

Insulation Class of Solenoid

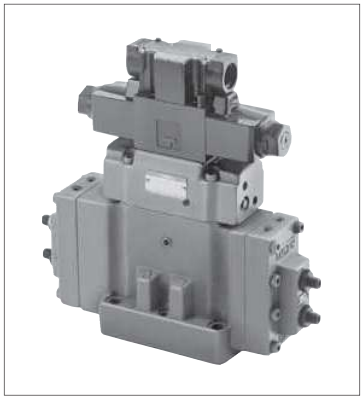
Model Numbers	Insulation Class
DSLHG-04/06/10	Class H
CDSC-01 CDS＊-03＊ DSP＊-01/03	

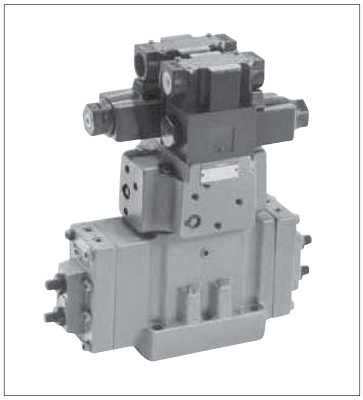
Multi Purpose Control Valves

The Yuken Multi-Purpose Control Valves Comply with The Needs of Reducing Cost and Size of Your Machine

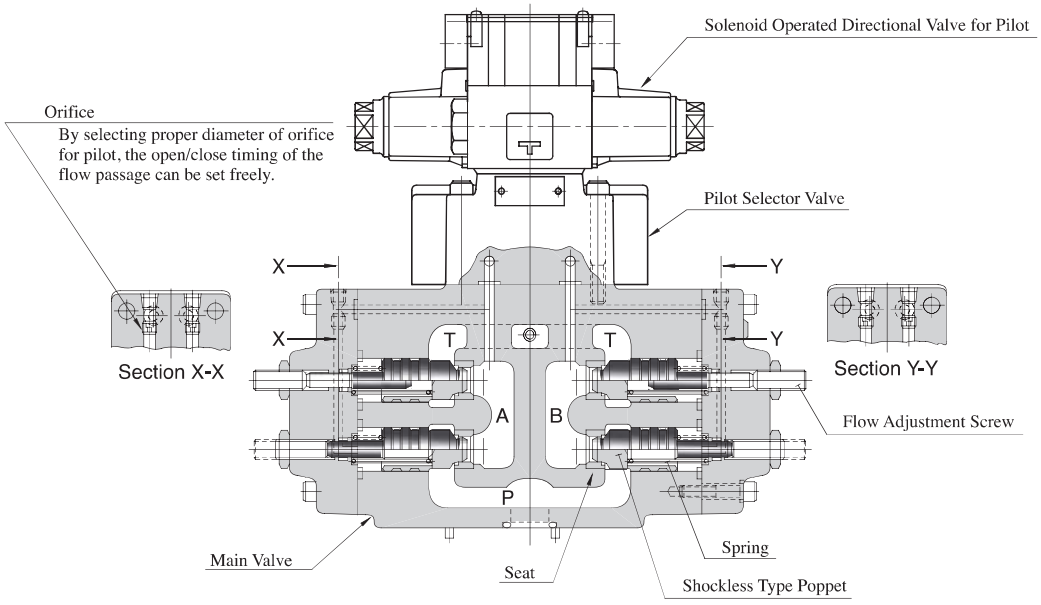
YUKEN's Multi Purpose Control Valves are compound valves composed of the main valve having four poppets, 1/8 Solenoid Operated Directional Valves for pilot and Pilot Selector Valves. This valve is multifunctionalized by having individual poppet had functions such as directional control, flow control or pressure control according to the combination of the main valve and pilot selector valve.

Features





- **Multi-purpose control valves**
  The valves combine three functions of directional control, flow control and of pilot operated check valve (or counterbalance valve). The valves contribute for reducing a number of valves in applications and space for installation and then eventually leads to reduction in size and cost of your machines.
- **Quick response, High reliability**
  Changeover response time is very quick as the valves are poppet type, there is no over-lap.
  No hydraulic lock occurs as there is no leakage of pressurised oil from the seat parts.
- **Easy to reduce shock in your hydraulic system**
  By selecting proper diameter of orifice for pilot, the open/close timing of the flow passage can be set freely. Therefore, smooth starting and stopping of actuator can be done combined with using shockless type poppet. Noise of ON/OFF and vibration of piping in hydraulic system can be also reduced.
- **For regenerative circuit**
  4 position-4 way type, which is to compose regenerative circuit, is available. By adopting regenerative circuit, gaining fast feed speed by using smaller volume pump is possible. Therefore saving electric power of system is possible.
- **The mounting dimensions are conformed with ISO standard**
  The valves are interchangeable with our conventional valves in mounting.



Specifications

Model Numbers	Max. Flow L/min	Max. Operating Pressure MPa	Max. Pilot Pressure MPa	Max. T-Line Back Pres. MPa	Pressure Adj. Range of Counterbalance MPa	Ratio of Poppet Area (Seat Area: Annular Area)		Approx. Mass kg
						Direction & Flow Control	Pressure Control	
DSLHG-04-1-∗-13∗	150 (39.6)	25	25	16	—	1:1	—	15
DSLHG-04-2-∗-13∗								15
DSLHG-04-3-∗-13∗								19
DSLHG-04-4∗-∗-∗-13∗	150 {100}★				Refer to Model No. Designation	1:1	24:1	20
DSLHG-04-5∗-∗-∗-13∗								22.5
DSLHG-06-1-∗-13∗	300 (79.3)	25	25	16	—	1:1	—	26.5
DSLHG-06-2-∗-13∗								26.5
DSLHG-06-3-∗-13∗								28
DSLHG-06-4∗-∗-13∗	300 {200}★				Refer to Model No. Designation	1:1	24:1	31
DSLHG-06-5∗-∗-13∗								34.5
DSLHG-10-1-∗-13∗	500 (132)	25	25	16	—	1:1	—	59
DSLHG-10-2-∗-13∗								59
DSLHG-10-3-∗-13∗								62
DSLHG-10-4∗-∗-13∗	500 {300}★				Refer to Model No. Designation	1:1	24:1	63.5
DSLHG-10-5∗-∗-13∗								67

★In case of counterbalance function line, maximum flow is limited to the values in brackets.

Solenoid Ratings

Refer to Pilot Valve (DSG-01 Series Solenoid Operated Directional Valve) Solenoid Ratings on page E-23.

Sub-plate

Valve Model Numbers	Japanese Standard "JIS"		
	Sub-plate Model Numbers	Thread Size	Approx. Mass kg
DSLHG-04	DHGM-04-20	Rc 1/2	4.4
	DHGM-04X-20	Rc 3/4	4.1
DSLHG-06	DHGM-06-50	Rc 3/4	7.4
	DHGM-06X-50	Rc 1	7.4
DSLHG-10	DHGM-10-40	Rc 1-1/4	21.5
	DHGM-10X-40	Rc 1-1/2	21.5

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. ($\frac{1.6}{\nabla}$)
- These sub-plates are sharable with those for DSHG Series Solenoid Controlled Pilot Operated Directional Valve. For dimensions, see pages E-85 and E-87.

Mounting Bolts

Socket head cap screws in the table below are included.

Model Numbers	Socket Head Cap Screw
DSLHG-04	M6 × 40 M10 × 45
DSLHG-06	M12 × 60
DSLHG-10	M20 × 75

Model Number Designation

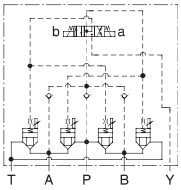
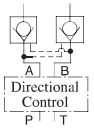
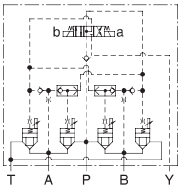
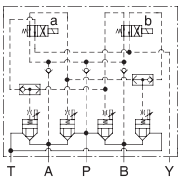
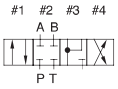
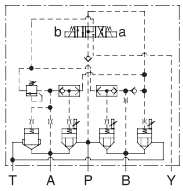
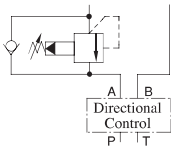
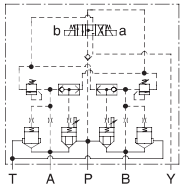
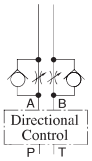
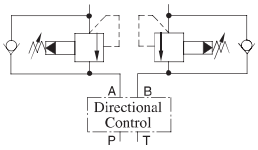
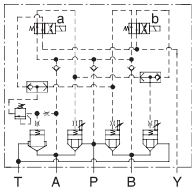
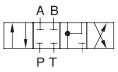
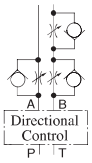
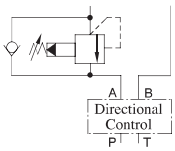
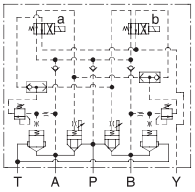
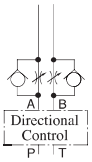
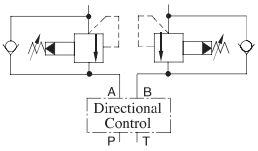
DSLH	G	-04	-4	A	-B	-E	T	-A100	-C	-N	-13
Series Number	Type of Mounting	Valve Size	Type of Pilot Control	Counterbalance Function	Pressure Adj. Range of Counterbalance MPa	Pilot Connection	Drain★2 Connection	Coil Type	Manual Override	Electrical Conduit Connection	Design Number
DSLH: Multi-Purpose Control Vave	**G**: Sub-plate Mounting	**04**	**1** **2** **3**	—	—	**None**: Internal Pilot **E**: External Pilot	**None**: External Drain **T**: Internal Drain	AC: **A100** **A120** **A200** **A240** DC: **D12** **D24** **D48** R: (AC→DC) **R100** **R200**	**None**: Manual Override Pin **C**: Push Button & Lock Nut (Options)	**None**: Terminal Box Type **N**: Plug-in Connector Type	**13**
			4 **5**	**A** : AT Line **W**: AT & BT Lines	**B** : ∗★1 - 7 **H** : 6 - 25						
		06	**1** **2** **3**	—	—						**13**
			4 **5**	**A** : AT Line **W**: AT & BT Lines	**None**: ∗★1 - 25						
		10	**1** **2** **3**	—	—						**13**
			4 **5**	**A** : AT Line **W**: AT & BT Lines See page E-105 for functions and purpose of use.	**None**: ∗★1 - 25						

★1. See "Min. Adjustment Pressure", page E-107, for information on minimum adjustment pressure.

★2. In case of lines with counterbalance function (-4$^{A}_{W}$, -5$^{A}_{W}$), External Drain must be selected for Drain Connection.

The coil type numbers in the shaded column are handled as optional extras. In case these coils are required to be chosen, please confirm the time of delivery with us before ordering.

Function and Purpose of Use

Type of Pilot Control	Model No.	Graphic Symbols	Function: Directional Control	Function: Flow Control	Function: Pilot Operated Check Valve / Pressure Control	Purpose of Use
Type "1"	DSLHG-∗-1					● Functions as Three Position Four-Way Valve (Spring Centered Model).
Type "2"	DSLHG-∗-2			Both Meter-in and Meter-out are possible	To get a function of pilot operated check valve, the following conditions should be fulfilled. ● Internal pilot type ("P" port pressure) ≧ ("A""B" ports pressure) ● External pilot type (Pilot pressure) ≧ ("A""B" ports pressure)	● Functions as Three Position Four-Way Valve (Spring Centered Model) as well as Two Position Valve which uses positions #1 and #3. ● Effective especially when the actuator has inertia force.
Type "3"	DSLHG-∗-3					● Functions as Four Position Four-Way Valve. ● Regenerative circuit can be constructed at the Position #3.
Type "4"	DSLHG-∗-4A					● Pressure control function (counterbalance valve) has been added to Type "2" to make this type.
	DSLHG-∗-4W					● Used to control the back pressure of the actuator.
Type "5"	DSLHG-∗-5A					● Pressure control function (counterbalance valve) has been added to Type "3" to make this type.
	DSLHG-∗-5W					● Used to control the back pressure of the actuator.

Position	#1	#2	#3
SOL a	ON	OFF	OFF
SOL b	OFF	OFF	ON

Position	#1	#2	#3	#4
SOL a	ON	OFF	ON	OFF
SOL b	OFF	OFF	ON	ON

Instructions

- **Pilot Pressure**
  Pilot pressure of external pilot drain models must always exceed the pressure of the main pressure port "P".

- **Pilot Drain Port**
  Avoid connecting the pilot drain port to a line with possible surge pressure.

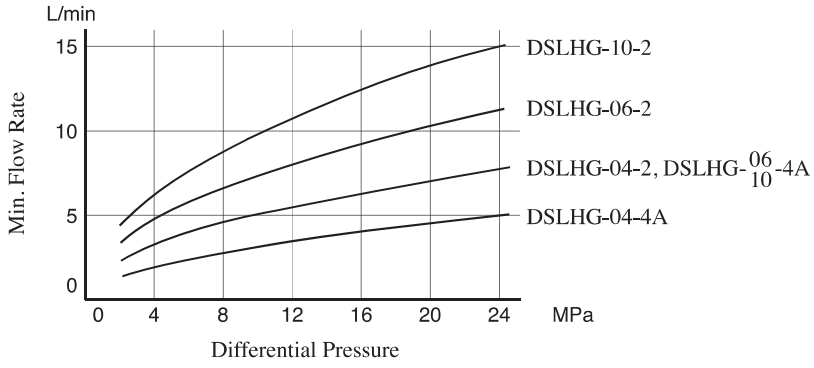
- **Drain Connection when with Counterbalance Function**
  When a valve having counterbalance function is used with internal drain type, the counterbalance pilot valve is subjected to pressure fluctuation and the pressure setting becomes unstable. For this reason, be sure to use external drain type valve.

- **Flow Adjustment**
  To perform the flow adjustment, loosen the lock nut, then turn the flow adjustment screw clockwise to decrease the flow. Be sure to re-tighten the lock nut after the adjustment.

- **Pressure Adjustment**
  To perform the pressure adjustment, loosen the lock nut, then turn the pressure adjustment screw clockwise to increase the pressure. Be sure to re-tighten the lock nut after the adjustment.

- **Min. Controlled Flow for Types "2" and "4A" at The Time of Meter-out Control**
  Minimum controlled flow at the time of meter-out control is limited (this does not happen during meter-in control) as shown in the figure below only in the case of pilot control types "2" (DSLHG-∗-2) and "4A" (DSLHG-∗-4A).

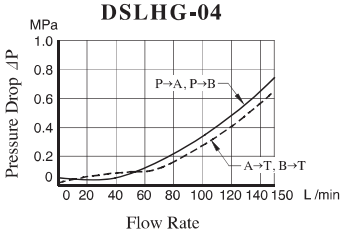
Min. Controlled Flow for Types "2" and "4A" at The Time of Meter-out Control



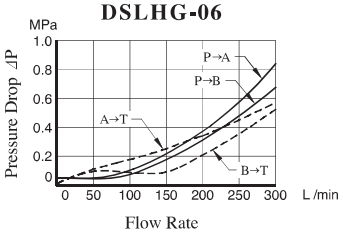
Hydraulic Fluid: Viscosity 35 mm²/s, Specific Gravity 0.850

Pressure Drop

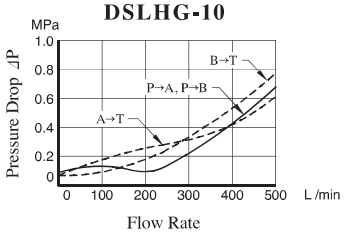
DSLHG-04



DSLHG-06



DSLHG-10



- For any other viscosity, multiply the factors in the table below.

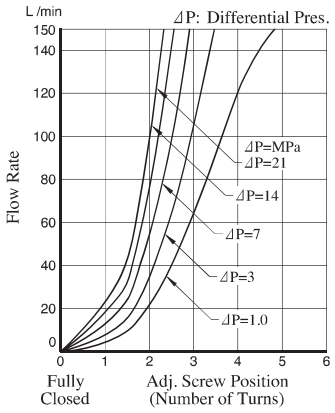
Viscosity	mm²/s	15	20	30	40	50	60	70	80	90	100
Factor		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

- For any other specific gravity (G'), the pressure drop (⊿P') may be obtained from the formula below.

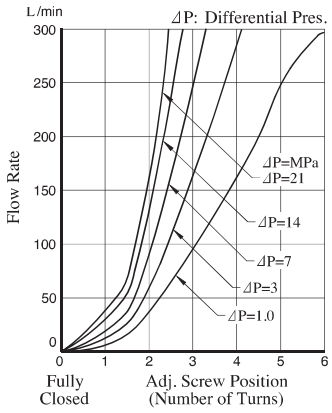
$$\Delta P' = \Delta P \, (G'/0.850)$$

Flow vs. Adjustment Revolutions

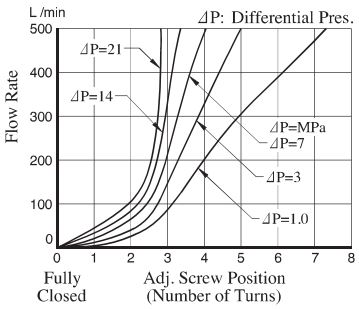
DSLHG-04



DSLHG-06



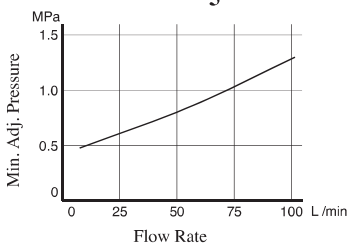
DSLHG-10



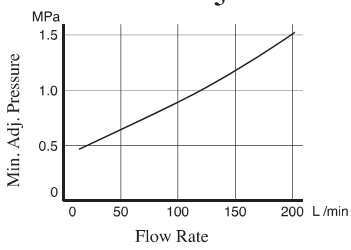
Minimum Adjustment Pressure

Because the minimum adjustment pressure varies with the tank line back pressure, add the tank line back pressure to the value on the following lines.

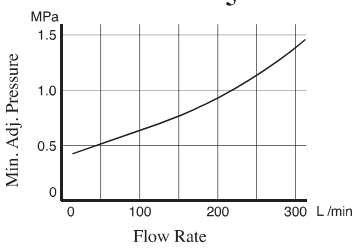
DSLHG-04-$\frac{4}{5}$*



DSLHG-06-$\frac{4}{5}$*



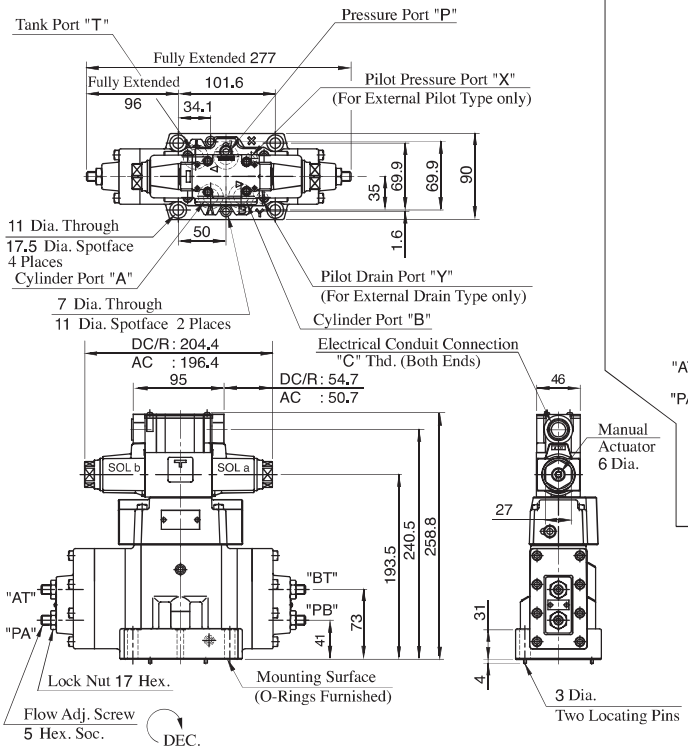
DSLHG-10-$\frac{4}{5}$*



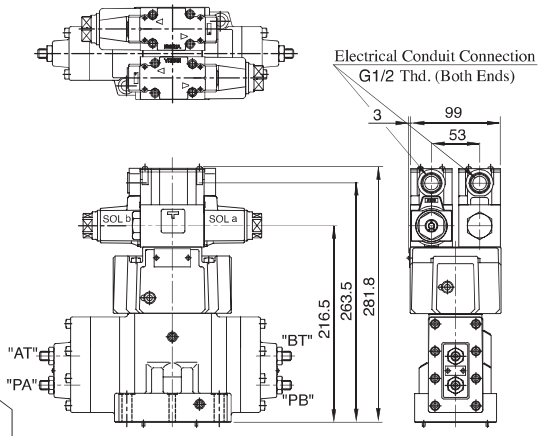
Terminal Box Type

Mounting Surface:
ISO 4401-07-07-0-05

DSLHG-04-$\frac{1}{2}$-∗-13

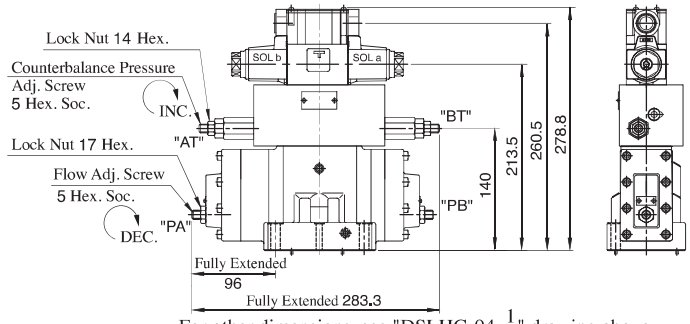


DSLHG-04-3-∗-13



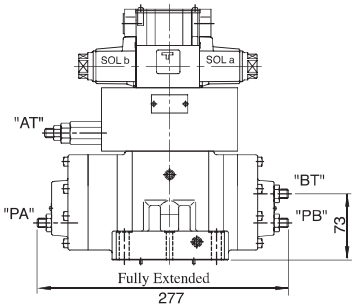
For other dimensions, see "DSLHG-04-$\frac{1}{2}$" drawing left.

DSLHG-04-4W-∗-∗-13



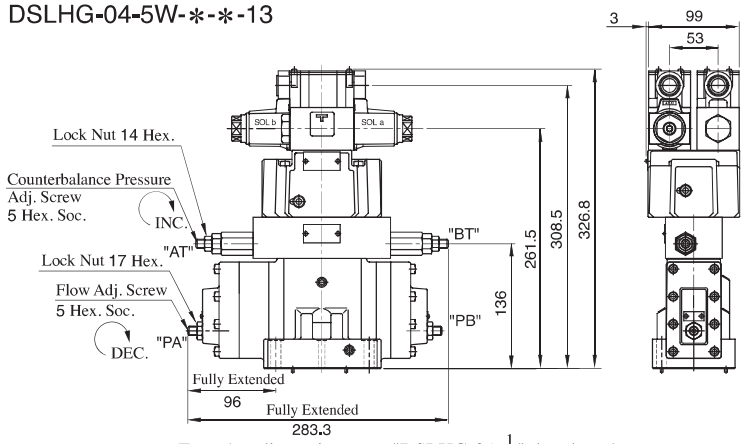
For other dimensions, see "DSLHG-04-$\frac{1}{2}$" drawing above.

DSLHG-04-4A-∗-∗-13



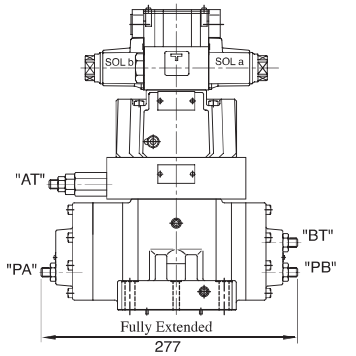
For other dimensions, see "DSLHG-04-4W" drawing left.

DSLHG-04-5W-∗-∗-13



For other dimensions, see "DSLHG-04-$\frac{1}{2}$" drawing above.

DSLHG-04-5A-∗-∗-13

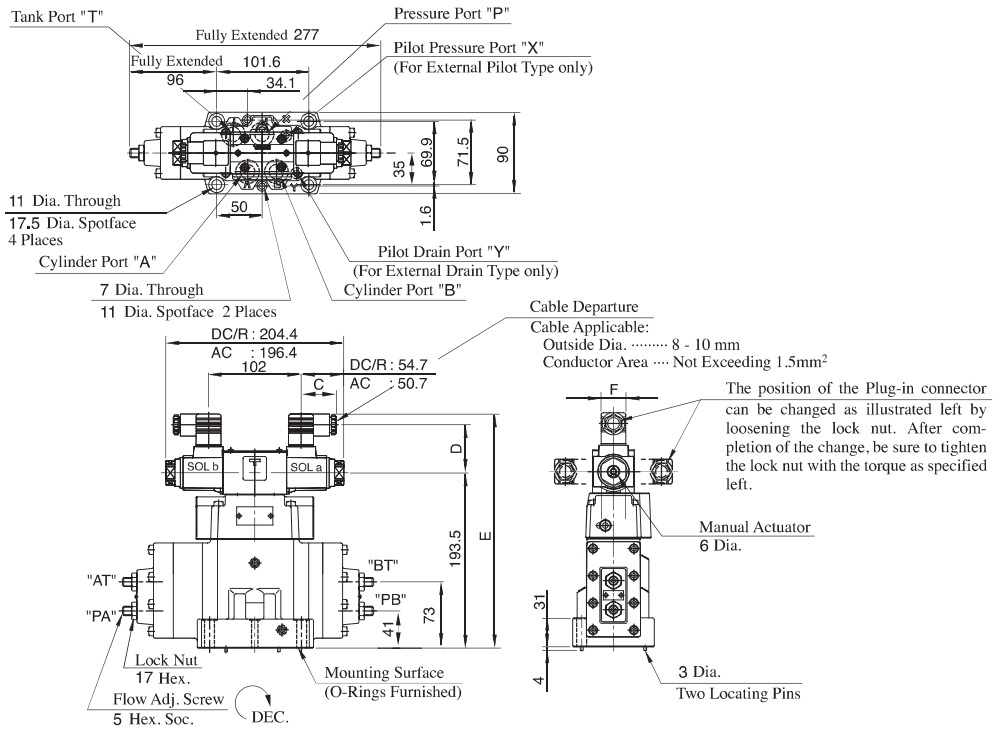


For other dimensions, see "DSLHG-04-5W" drawing left.

DSLHG-04-$\frac{1}{2}$-∗-N-13

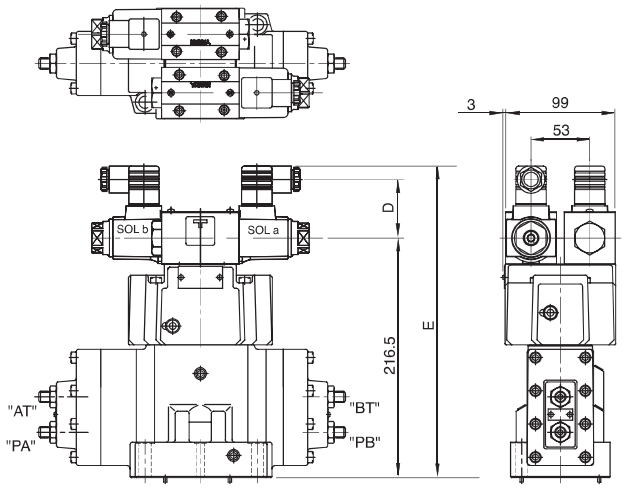
Plug-in Connector Type

Mounting Surface:
ISO 4401-07-07-0-05



Model Numbers	C	D	E	F
DSLHG-04-∗-A∗-N	39	53	258.5	27.5
DSLHG-04-∗-D∗-N	39	64	269.5	27.5
DSLHG-04-∗-R∗-N	53	57.2	272.5	34

DSLHG-04-3-∗-N-13



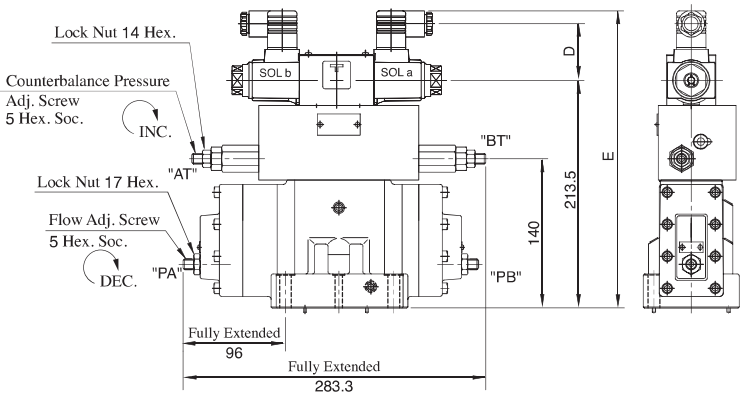
Model Numbers	D	E
DSLHG-04-3-A∗-N	53	281.5
DSLHG-04-3-D∗-N	64	292.5
DSLHG-04-3-R∗-N	57.2	299.5

For other dimensions, see "DSLHG-04-$\frac{1}{2}$-∗-N" drawing above.

Plug-in Connector Type

Mounting Surface:
ISO 4401-07-07-0-05

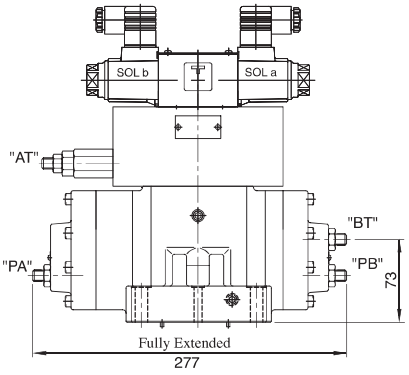
DSLHG-04-4W-∗-∗-N-13



Model Numbers	D	E
DSLHG-04-4W-∗-A∗-N	53	278.5
DSLHG-04-4W-∗-D∗-N	64	289.5
DSLHG-04-4W-∗-R∗-N	57.2	292.5

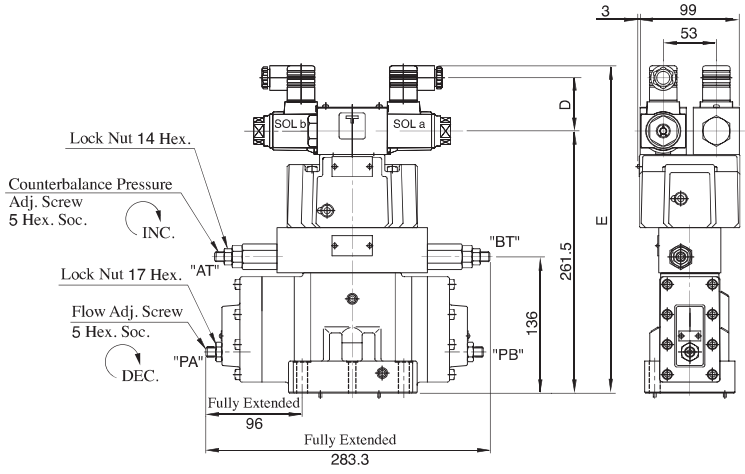
For other dimensions, see DSLHG-04-$\frac{1}{2}$-∗-N on the previous page.

DSLHG-04-4A-∗-∗-N-13



For other dimensions, see "DSLHG-04-4W-∗-∗-N" drawing left.

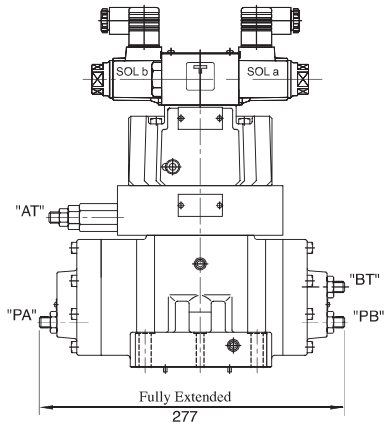
DSLHG-04-5W-∗-∗-N-13



Model Numbers	D	E
DSLHG-04-5W-∗-A∗-N	53	326.5
DSLHG-04-5W-∗-D∗-N	64	337.5
DSLHG-04-5W-∗-R∗-N	57.2	340.5

For other dimensions, see DSLHG-04-$\frac{1}{2}$-∗-N on the previous page.

DSLHG-04-5A-∗-∗-N-13

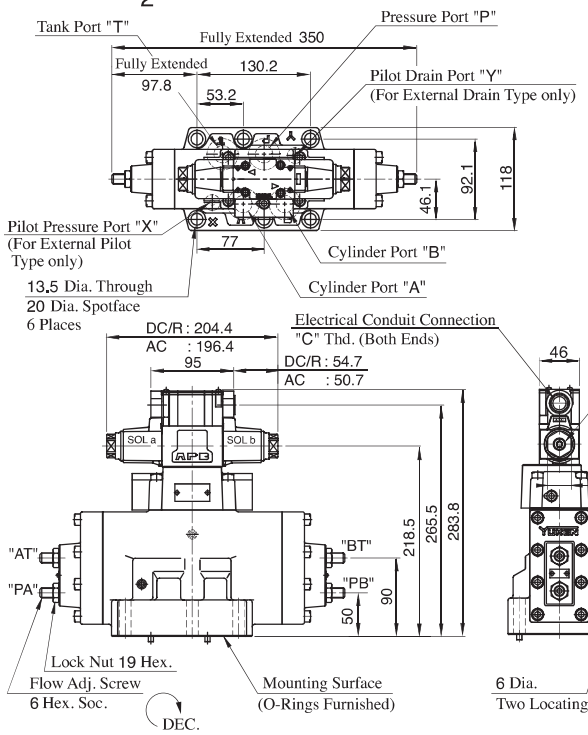


For other dimensions, see "DSLHG-04-5W-∗-∗-N" drawing left.

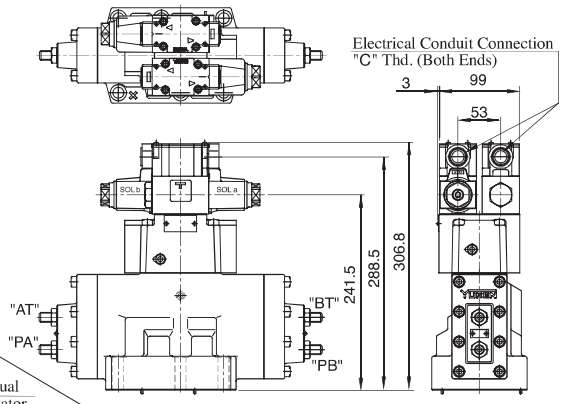
Terminal Box Type

Mounting Surface:
ISO 4401-08-08-0-05

DSLHG-06-$\frac{1}{2}$-∗-13

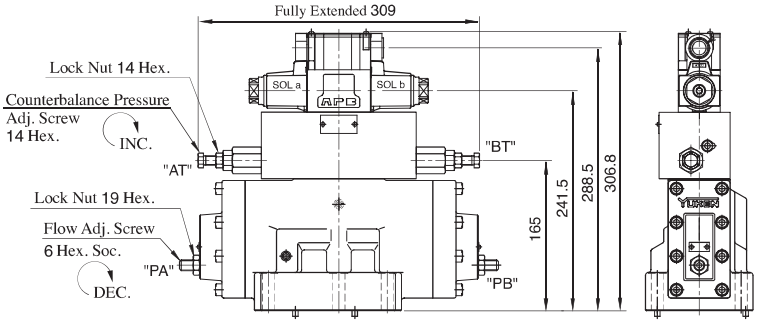


DSLHG-06-3-∗-13



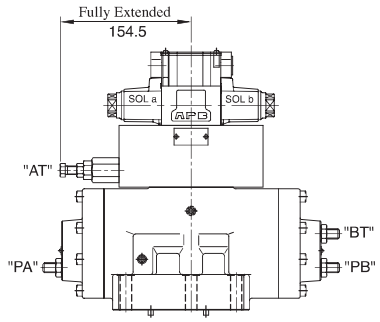
For other dimensions, see "DSLHG-06-$\frac{1}{2}$" drawing left.

DSLHG-06-4W-∗-13



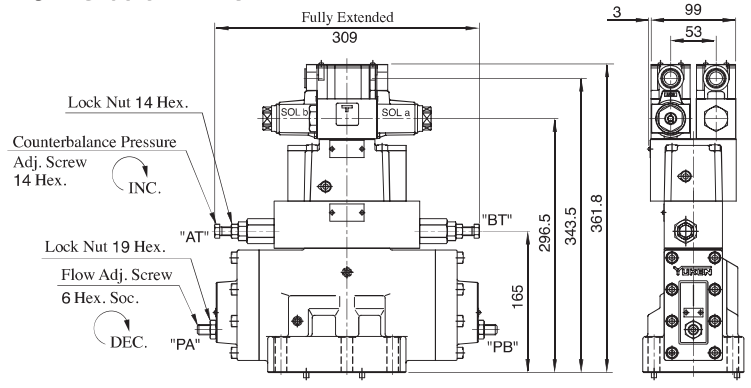
For other dimensions, see "DSLHG-06-$\frac{1}{2}$" drawing above.

DSLHG-06-4A-∗-13



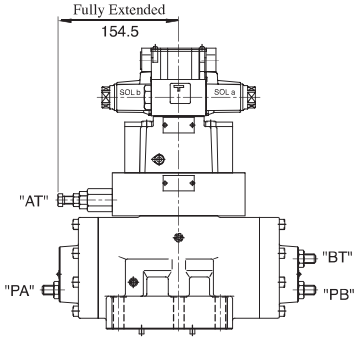
For other dimensions, see "DSLHG-06-4W" drawing left.

DSLHG-06-5W-∗-13



For other dimensions, see "DSLHG-06-$\frac{1}{2}$" drawing above.

DSLHG-06-5A-∗-13

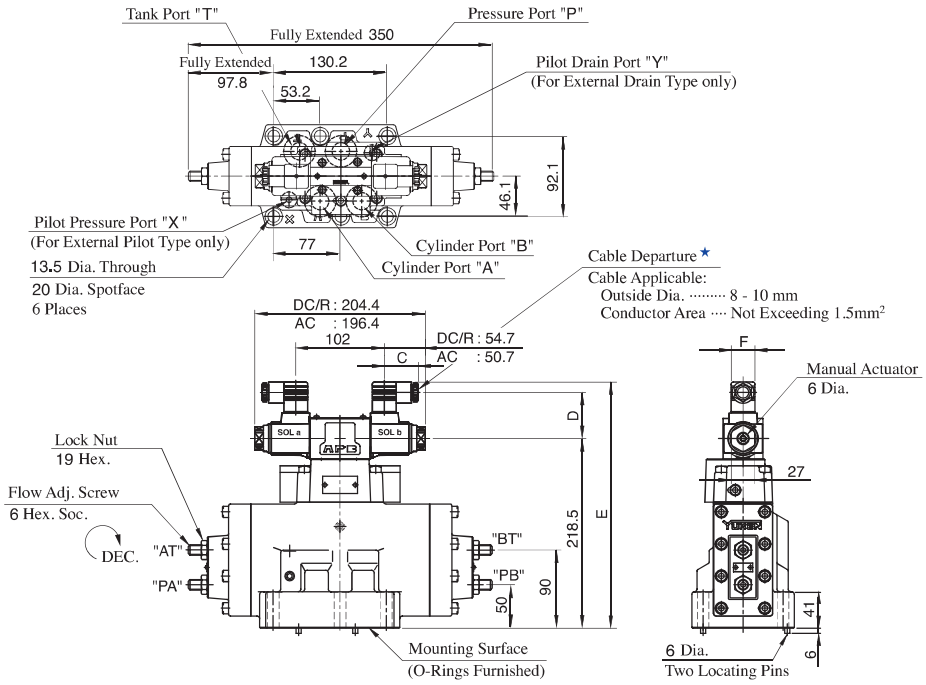


For other dimensions, see "DSLHG-06-5W" drawing left.

DSLHG-06-$\frac{1}{2}$-∗-N-13

Plug-in Connector Type

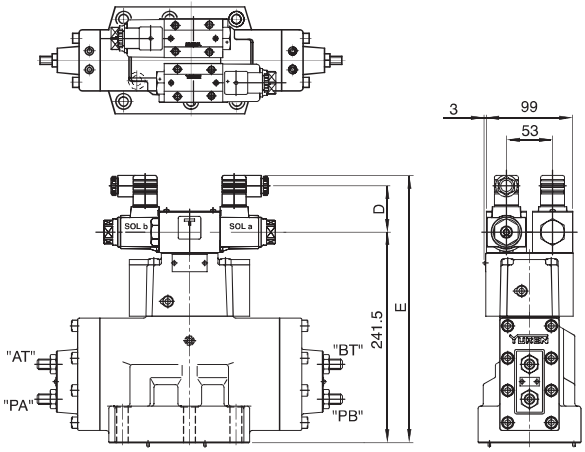
Mounting Surface:
ISO 4401-08-08-0-05



Model Numbers	C	D	E	F
DSLHG-06-∗-A∗-N	39	53	283.5	27.5
DSLHG-06-∗-D∗-N	39	64	294.5	27.5
DSLHG-06-∗-R∗-N	53	57.2	297.5	34

★ Position of cable departure can be changed. For the details, refer to DSLHG-04 valve on page E-109.

DSLHG-06-3-∗-N-13



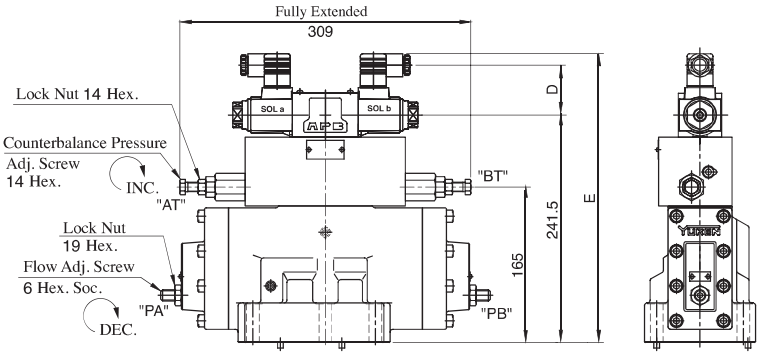
Model Numbers	D	E
DSLHG-06-3-A∗-N	53	306.5
DSLHG-06-3-D∗-N	64	317.5
DSLHG-06-3-R∗-N	57.2	320.5

For other dimensions, see "DSLHG-06-$\frac{1}{2}$-∗-N" drawing above.

Plug-in Connector Type

Mounting Surface:
ISO 4401-08-08-0-05

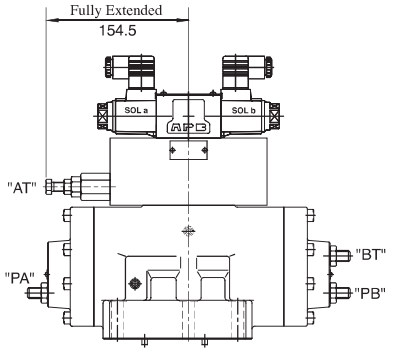
DSLHG-06-4W-∗-N-13



Model Numbers	D	E
DSLHG-06-4W-A∗-N	53	306.5
DSLHG-06-4W-D∗-N	64	317.5
DSLHG-06-4W-R∗-N	57.2	320.5

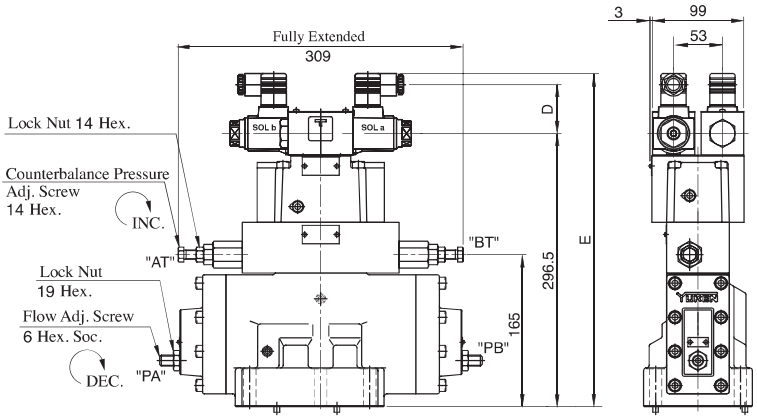
For other dimensions, see DSLHG-06-$\frac{1}{2}$-∗-N on the previous page.

DSLHG-06-4A-∗-N-13



For other dimensions, see "DSLHG-06-4W-∗-N" drawing left.

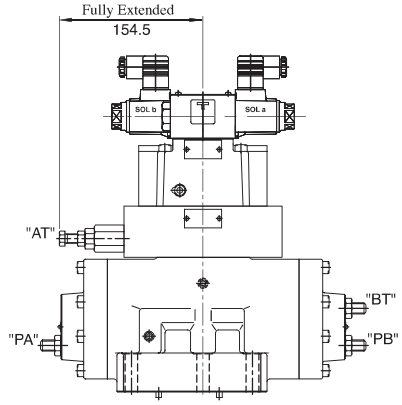
DSLHG-06-5W-∗-N-13



Model Numbers	D	E
DSLHG-06-5W-A∗-N	53	361.5
DSLHG-06-5W-D∗-N	64	372.5
DSLHG-06-5W-R∗-N	57.2	375.5

For other dimensions, see DSLHG-06-$\frac{1}{2}$-∗-N on the previous page.

DSLHG-06-5A-∗-N-13

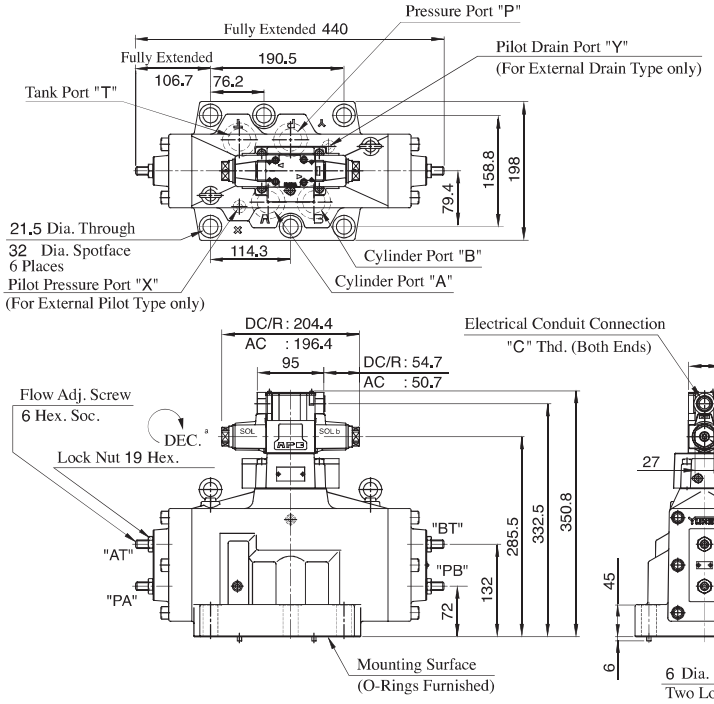


For other dimensions, see "DSLHG-06-5W-∗-N" drawing left.

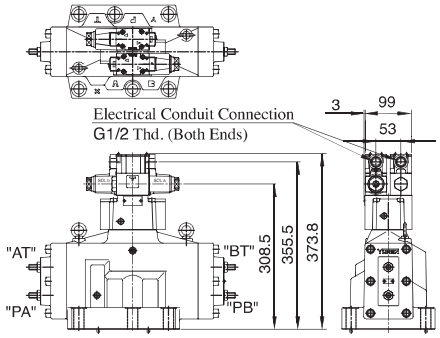
Terminal Box Type

Mounting Surface:
ISO 4401-10-09-0-05

DSLHG-10-$\frac{1}{2}$-∗-13

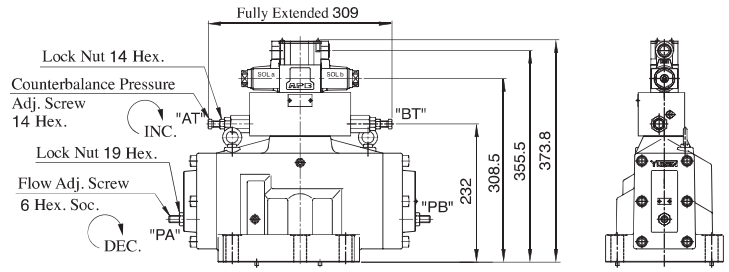


DSLHG-10-3-∗-13



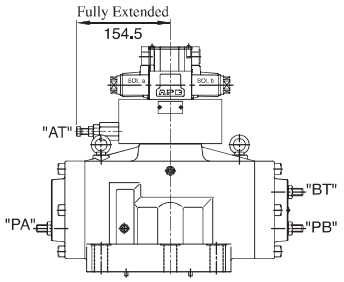
For other dimensions, see "DSLHG-10-$\frac{1}{2}$" drawing left.

DSLHG-10-4W-∗-13



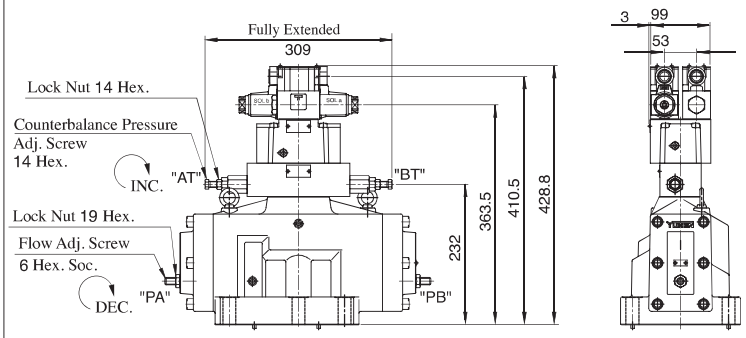
For other dimensions, see "DSLHG-10-$\frac{1}{2}$" drawing above.

DSLHG-10-4A-∗-13



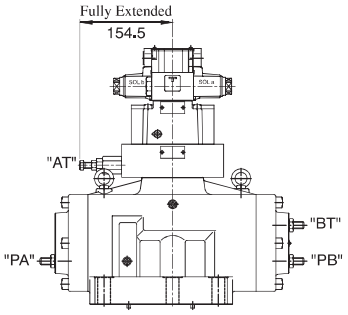
For other dimensions, see "DSLHG-10-4W" drawing left.

DSLHG-10-5W-∗-13



For other dimensions, see "DSLHG-10-$\frac{1}{2}$" drawing above.

DSLHG-10-5A-∗-13

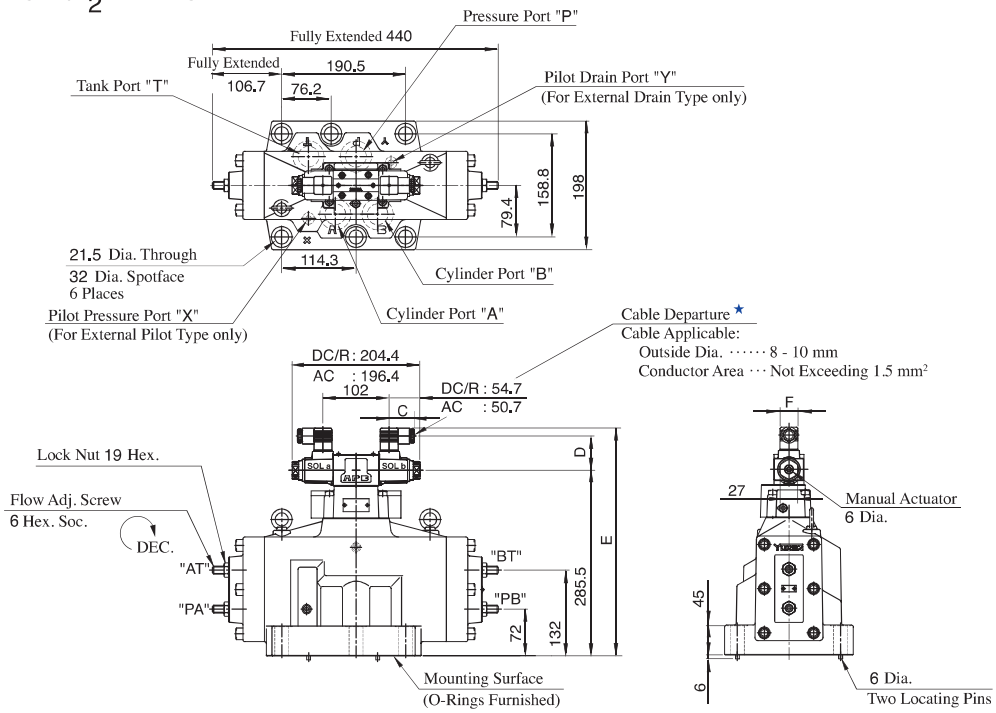


For other dimensions, see "DSLHG-10-5W" drawing left.

Plug-in Connector Type

Mounting Surface:
ISO 4401-10-09-0-05

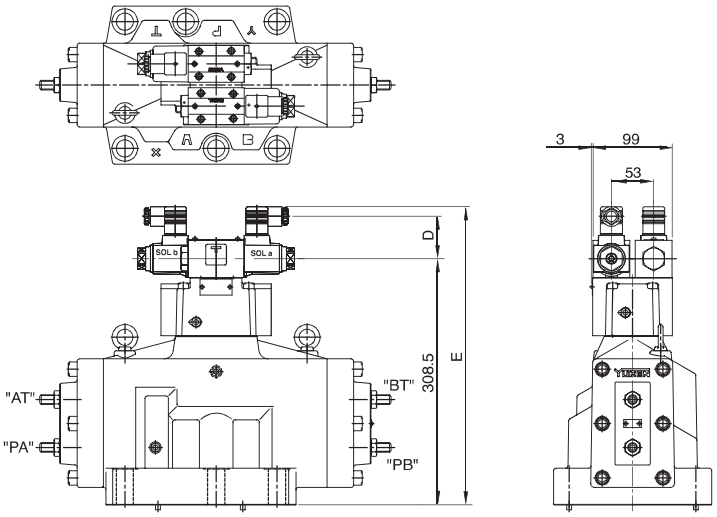
DSLHG-10-$\frac{1}{2}$-∗-N-13



Model Numbers	C	D	E	F
DSLHG-10-∗-A∗-N	39	53	350.5	27.5
DSLHG-10-∗-D∗-N	39	64	361.5	27.5
DSLHG-10-∗-R∗-N	53	57.2	364.5	34

★ Position of cable departure can be changed. For the details, refer to DSLHG-04 valve on page E-109.

DSLHG-10-3∗ -N-13



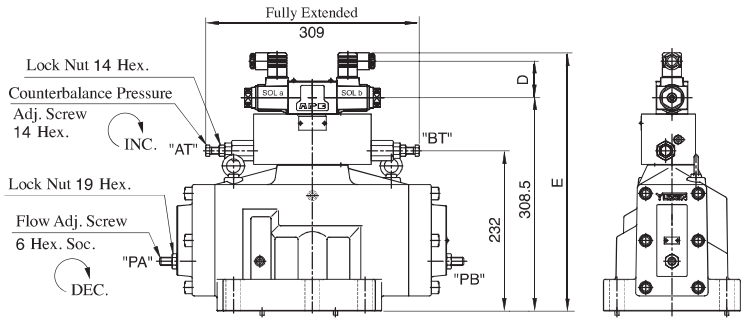
Model Numbers	D	E
DSLHG-10-3-A∗-N	53	373.5
DSLHG-10-3-D∗-N	64	384.5
DSLHG-10-3-R∗-N	57.2	387.5

For other dimensions, see "DSLHG-10-$\frac{1}{2}$-∗-N" drawing above.

Plug-in Connector Type

Mounting Surface:
ISO 4401-10-09-0-05

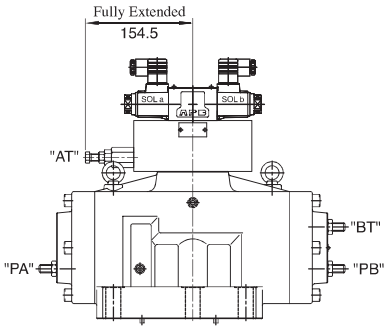
DSLHG-10-4W-∗-N-13



Model Numbers	D	E
DSLHG-10-4W-A∗-N	53	373.5
DSLHG-10-4W-D∗-N	64	384.5
DSLHG-10-4W-R∗-N	57.2	387.5

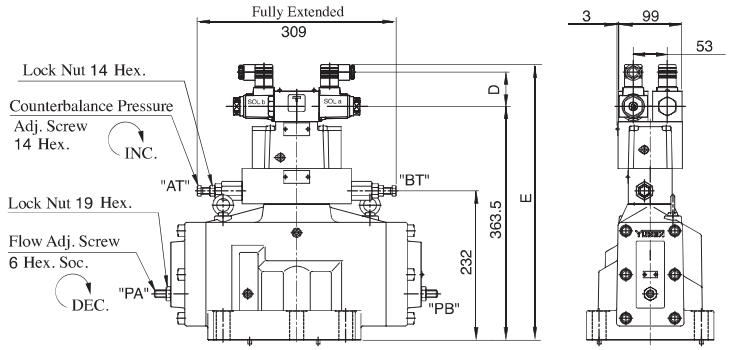
For other dimensions, see DSLHG-10-$\frac{1}{2}$-∗-N on the previous page.

DSLHG-10-4A-∗-N-13



For other dimensions, see
"DSLHG-10-4W-∗-N" drawing left.

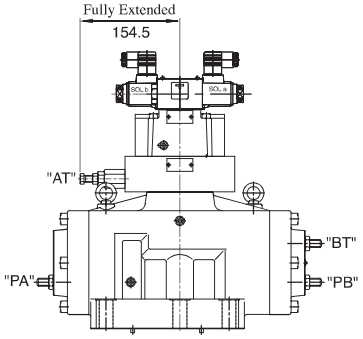
DSLHG-10-5W-∗-N-13



Model Numbers	D	E
DSLHG-10-5W-A∗-N	53	428.5
DSLHG-10-5W-D∗-N	64	439.5
DSLHG-10-5W-R∗-N	57.2	442.5

For other dimensions, see DSLHG-10-$\frac{1}{2}$-∗-N on the previous page.

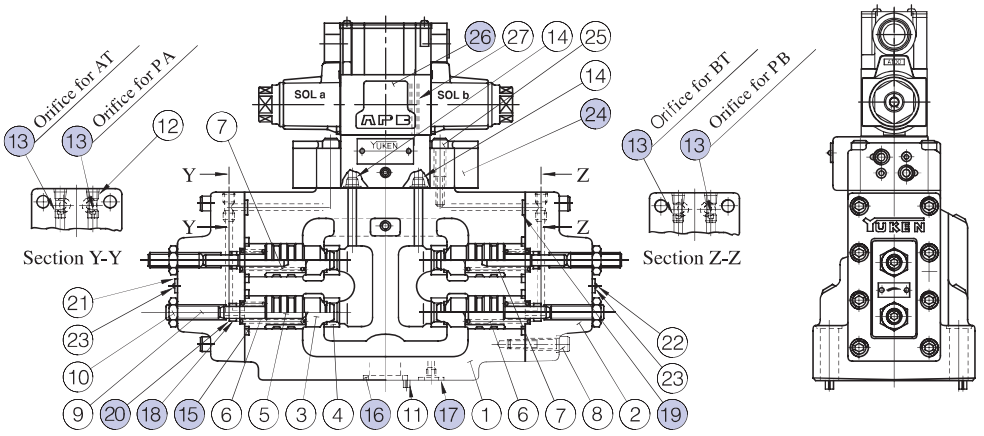
DSLHG-10-5A-∗-N-13



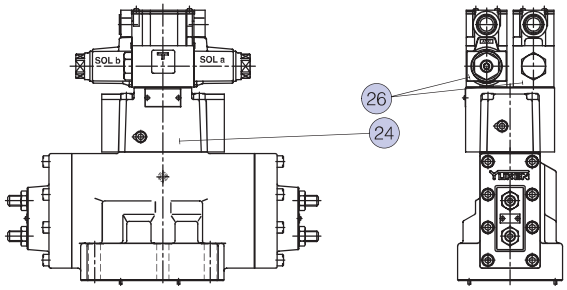
For other dimensions, see
"DSLHG-10-5W-∗-N" drawing left.

List of Seals for Main Valve, Pilot Selector Valve and Orifice

DSLHG-04/06/10-$\frac{1}{2}$-∗-13



DSLHG-04/06/10-3-∗-13



Note) Main valve is same as above drawings.

List of Seals for Main Valves

Item	Name of Parts	Part Numbers			Qty.
		DSLHG-04	DSLHG-06	DSLHG-10	
15	O-Ring	OR NBR-90 P22-N	OR NBR-90 G30-N	OR NBR-90 G40-N	4
16	O-Ring	OR NBR-90 P22-N	OR NBR-90 P30-N	OR NBR-90 P42-N	4
17	O-Ring	OR NBR-90 P9-N	OR NBR-90 P14-N	OR NBR-90 P14-N	2
18	O-Ring	OR NBR-70 P8-N	OR NBR-70 P10-N	OR NBR-70 P16-N	4
19	O-Ring	OR NBR-90 P8-N	OR NBR-90 P9-N	OR NBR-90 P11-N	4
20	Back Up Ring	BR JIS B 2401-4-T2-P8	BR JIS B 2401-4-T2-P10	BR JIS B 2401-4-T2-P16	4

Item (13) Orifice

The timing of flow path opening/closing can be adjusted as required by selecting the appropriate pilot orifice diameter. When the diameter of the orifice is to be changed, another orifice should be ordered. Standard built-in orifice diameters and selectable orifice diameters are listed in the table below.

Orifice Type	TP-OPT-1/16 x d		
Model Numbers	Orifice Diameter "d" mm		
	Standard Built-in	Selectable	Max. Dia. at Pressure over 20 MPa
DSLHG-04	1.0	0.5, 0.6, 0.8, 1.0 1.2, 1.4, 1.6, 1.8 2.0, 2.5	1.2
DSLHG-06	1.2		
DSLHG-10	1.4		1.4

Item (24) Pilot Selector Valve List

Multi-Purpose Control Valve Model Numbers	(24) Pilot Selector Valve Model Numbers
DSLHG-04-1	CG-04-1-10
DSLHG-04-2	CG-04-2-10
DSLHG-04-3	CG-04-3-10
DSLHG-06-1	CG-06-1-10
DSLHG-06-2	CG-06-2-10
DSLHG-06-3	CG-06-3-10
DSLHG-10-1	CG-06-1-10
DSLHG-10-2	CG-06-2-10
DSLHG-10-3	CG-06-3-10

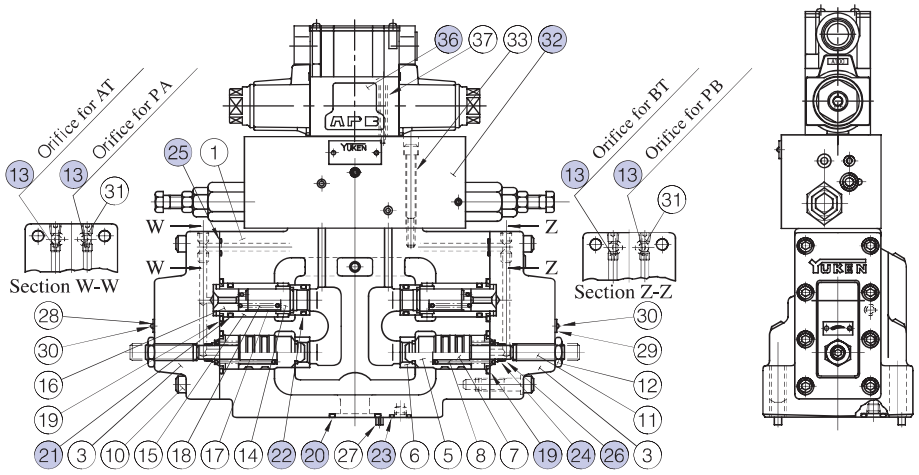
Note For details of Pilot Selector Valve, see page E-119.

Pilot Valve

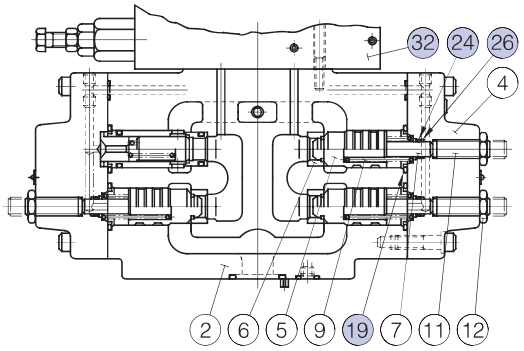
Refer to page E-121 for Pilot Valve Model Numbers.

List of Seals for Main Valves and Pilot Selector Valve

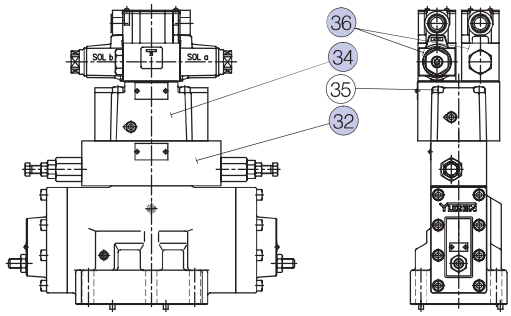
DSLHG-04/06/10-4W-∗-12



DSLHG-04/06/10-$^{4A}_{5A}$-∗-12



DSLHG-04/06/10-5W-∗-12



Note) Main valve is the same as above drawings.

List of Seals for Main Valves

Item	Name of Parts	Part Numbers			Qty.
		DSLHG-04	DSLHG-06	DSLHG-10	
19	O-Ring	OR NBR-90 P22-N	OR NBR-90 G30-N	OR NBR-90 G40-N	4
20	O-Ring	OR NBR-90 P22-N	OR NBR-90 P30-N	OR NBR-90 P42-N	4
21	O-Ring	OR NBR-90 P16-N	OR NBR-90 P22-N	OR NBR-90 P30-N	2(1)
22	O-Ring	OR NBR-90 P14-N	OR NBR-90 P20-N	AS568-A122(NBR-90)	2(1)
23	O-Ring	OR NBR-90 P9-N	OR NBR-90 P14-N	OR NBR-90 P14-N	2
24	O-Ring	OR NBR-70 P8-N	OR NBR-70 P10-N	OR NBR-70 P16-N	2(3)
25	O-Ring	OR NBR-90 P8-N	OR NBR-90 P9-N	OR NBR-90 P11-N	4
26	Back Up Ring	BR JIS B 2401-4-T2-P8	BR JIS B 2401-4-T2-P10	BR JIS B 2401-4-T2-P16	2(3)

Note 1: The figures in ( ) indicate the quantity of seals used for 4A and 5A.

Pilot Valve

Refer to page E-121 for Pilot Valve Model Numbers.

Pilot Selector Valve List

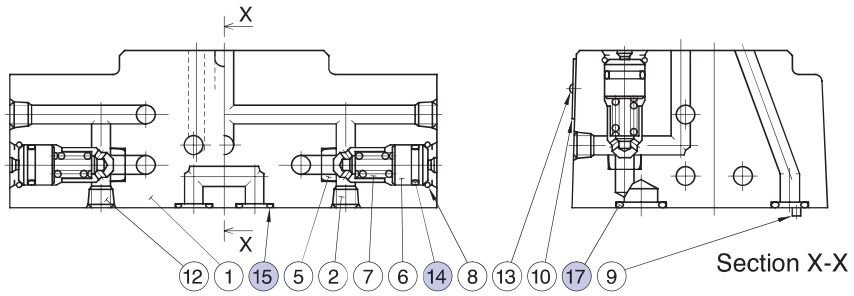
Multi-Purpose Control Valve Model Numbers	Pilot Selector Valve Model Numbers	
	Item (32)	Item (34)
DSLHG-04-4A-■	CG-04-4A-■-10	—
DSLHG-04-4W-■	CG-04-4W-■-10	—
DSLHG-04-5A-■	CG-04-5A-■-10	CG-04-3-10
DSLHG-04-5W-■	CG-04-5W-■-10	
DSLHG-06-4A	CG-06-4A-10	—
DSLHG-06-4W	CG-06-4W-10	—
DSLHG-06-5A	CG-06-5A-10	CG-06-3-10
DSLHG-06-5W	CG-06-5W-10	
DSLHG-10-4A	CG-06-4A-10	—
DSLHG-10-4W	CG-06-4W-10	—
DSLHG-10-5A	CG-06-5A-10	CG-06-3-10
DSLHG-10-5W	CG-06-5W-10	

Note: Fill "B" or "H" representing the pressure adjustment range in section marked with ■.
See page E-120 for the details of the pilot selector valves.

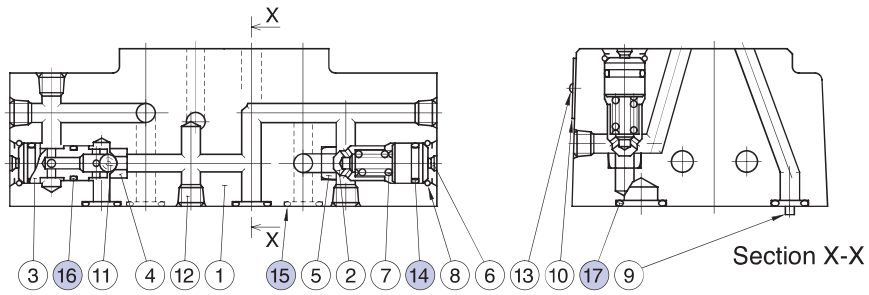
See the previous page for Item (13) Orifice.

List of Seals (Pilot Selector Valves)

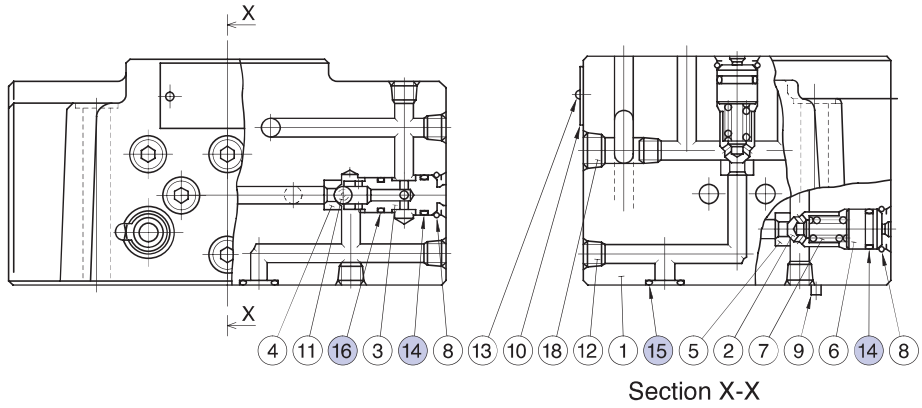
CG-04/06-1-10



CG-04/06-2-10



CG-04/06-3-10

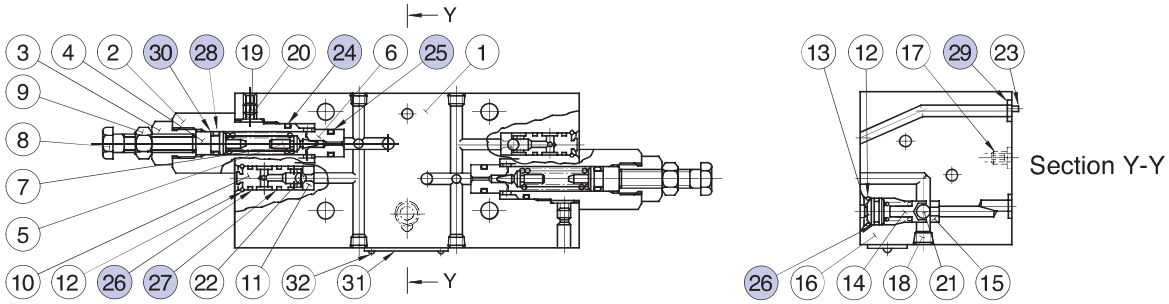


List of Seals

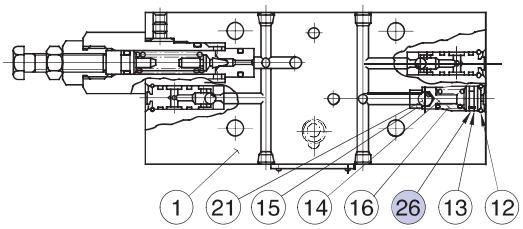
Item	Name of Parts	CG-04				CG-06			
		Part Numbers	Quantity			Part Nmbers	Quantity		
			CG-04-1	CG-04-2	CG-04-3		CG-06-1	CG-06-2	CG-06-3
14	O-Ring	OR NBR-90 P10-N	3	5	5	OR NBR-90 P10-N	3	5	5
15	O-Ring	OR NBR-90 P8-N	7	7	8	OR NBR-90 P9-N	7	7	8
16	O-Ring	OR NBR-90 P8-N	—	2	2	OR NBR-90 P8-N	—	2	2
17	O-Ring	OR NBR-90 P8-N	1	1	—	AS568-A014(NBR-90)	1	1	—

List of Seals (Pilot Selector Valves)

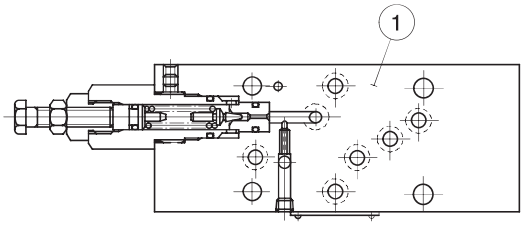
CG-04/06-4W-10



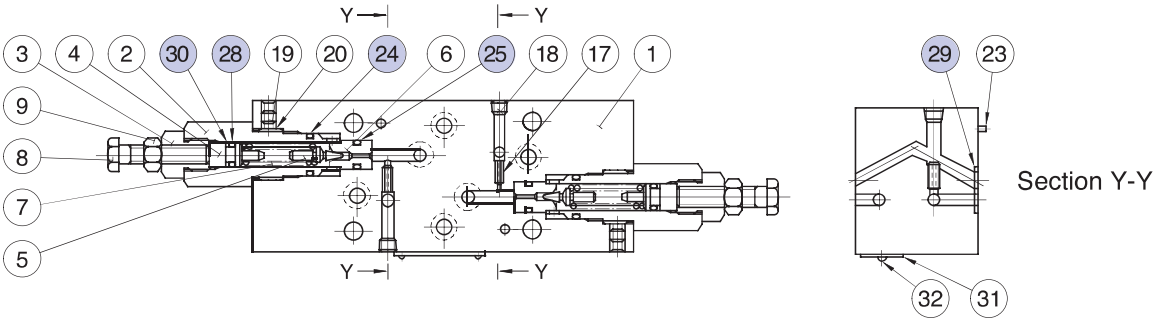
CG-04/06-4A-10



CG-04/06-5A-10



CG-04/06-5W-10



List of Seals

Item	Name of Parts	CG-04					CG-06				
		Part Numbers	Quantity				Part Nmbers	Quantity			
			-4W-	-4A-	-5W-	-5A-		-4W-	-4A-	-5W-	-5A-
24	O-Ring	OR NBR-90 P12-N	2	1	2	1	OR NBR-90 P16-N	2	1	2	1
25	O-Ring	OR NBR-90 P9-N	2	1	2	1	OR NBR-90 P11-N	2	1	2	1
26	O-Ring	OR NBR-90 P10-N	3	4	—	—	OR NBR-90 P10-N	3	4	—	—
27	O-Ring	OR NBR-90 P8-N	2	2	—	—	OR NBR-90 P8-N	2	2	—	—
28	O-Ring	OR NBR-70 P6-N	2	1	2	1	OR NBR-70 P9-N	2	1	2	1
29	O-Ring	OR NBR-90 P8-N	8	8	8	8	OR NBR-90 P9-N	8	8	8	8
30	Back Up Ring	BR JIS B 2401-4-T2-P6	2	1	2	1	BR JIS B 2401-4-T2-P9	2	1	2	1

List of Pilot Valves

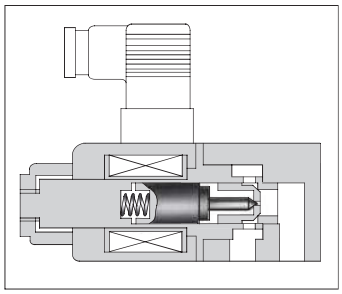
Model Numbers	Pilot Valve Model Numbers
DSLHG-04-1-★-▲-13	DSG-01-3C9-★-▲-70
DSLHG-04-2-★-▲-13	DSG-01-3C9-★-▲-70
DSLHG-04-3-★-▲-13	DSG-01-2B2-★-▲-70
DSLHG-04-4A-✻-★-▲-13	DSG-01-3C9-★-▲-70
DSLHG-04-4W-✻-★-▲-13	DSG-01-3C9-★-▲-70
DSLHG-04-5A-✻-★-▲-13	DSG-01-2B2-★-▲-70
DSLHG-04-5W-✻-★-▲-13	DSG-01-2B2-★-▲-70
DSLHG-06-1-★-▲-13	DSG-01-3C9-★-▲-70
DSLHG-06-2-★-▲-13	DSG-01-3C9-★-▲-70
DSLHG-06-3-★-▲-13	DSG-01-2B2-★-▲-70
DSLHG-06-4A-★-▲-13	DSG-01-3C9-★-▲-70
DSLHG-06-4W-★-▲-13	DSG-01-3C9-★-▲-70
DSLHG-06-5A-★-▲-13	DSG-01-2B2-★-▲-70
DSLHG-06-5W-★-▲-13	DSG-01-2B2-★-▲-70
DSLHG-10-1-★-▲-13	DSG-01-3C9-★-▲-70
DSLHG-10-2-★-▲-13	DSG-01-3C9-★-▲-70
DSLHG-10-3-★-▲-13	DSG-01-2B2-★-▲-70
DSLHG-10-4A-★-▲-13	DSG-01-3C9-★-▲-70
DSLHG-10-4W-★-▲-13	DSG-01-3C9-★-▲-70
DSLHG-10-5A-★-▲-13	DSG-01-2B2-★-▲-70
DSLHG-10-5W-★-▲-13	DSG-01-2B2-★-▲-70

Note 1: Fill coil type (a symbol representing current/voltage) in section marked★. Likewise, in section marked▲, fill a symbol representing the type of electrical conduit connection (None: Terminal Box Type, N: Plug-in Connector Type).
2: See page E-22 for the detailed information on the pilot valves.

Solenoid Operated Poppet Type Two-Way Valves

These valves are used for opening/closing the oil path by having the poppet valve operated with an electric signal via solenoid. Because these are poppet type valves, the internal leakage is quite small and there is no worry about hydraulic lock.





Specifications

Model Numbers	Max. Flow★1 L/min	Max. Operating Pressure MPa	Internal leakage cm^3/min	Max. Changeover Frequency min^{-1}	Approx. Mass kg
CDSC-01-C-D24-10	15	21★2	0.25 or less	240	0.35
CDSC-03-C-*-21	50	14	0.25 or less	AC : 300 DC : 240 R : 120	0.5
CDST-$^{03W}_{03}$-C-*-21					0.85
CDSG-03-C-*-21					0.85

★1. The maximum flow means the limited flow without inducing any abnormality to the operation (changeover) of the valve.

★2. When the valve is operated at 18.5 MPa or higher pressure, continuous energies time is restricted with max. 30 min., and also the energies ratio less than 90 %.

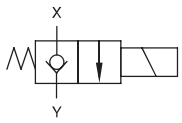
Solenoid Ratings

Electric Source	Coil Type	Frequency (Hz)	Voltage (V)		Current & Power at Rated Voltage		
			Source Rating	Serviceable Range	Inrush (A)	Holding (A)	Power (W)
AC	A 100	50	100	80 – 100	1.12	0.55	—
		60	100	90 – 120	0.95	0.40	
			110		0.86	0.36	
	A 120	50	120	96 – 132	0.93	0.46	
		60		108 – 144	0.79	0.33	
	A 200	50	200	160 – 220	0.56	0.28	
		60	200	180 – 240	0.48	0.20	
			220		0.43	0.18	
	A 240	50	240	192 – 264	0.47	0.23	
		60		216 – 288	0.40	0.17	
DC (K Series)	D 12	—	12	10.8 – 13.2	—	2.20	26
	D 24★		24	21.6 – 26.4		1.10	
	D 100		100	90 – 110		0.27	
AC → DC Rectified	R 100	50/60	100	90 – 110	—	0.30	26
	R 200		200	180 – 220		0.15	

★CDSC-01 is available with coil type "D24" only.

- Because both AC and DC solenoids employ the plug-in type electrical wiring, the valve can be removed without removing the wiring. (Coil type of CDSC-01 is flying lead wire only.)
- Being 50-60 Hz common service AC solenoids, do not require rewiring when the applied frequency is changed.
- K-Series DC Solenoid which has a reputation for excellent DC control is employed. (Coil type of CDSC-01 is with Surge Suppressor.)

Graphic Symbol



Instructions

Direction of flow when the solenoid is energised

These valves do not allow flow from Y to X when the solenoid is energised.

Mounting

There are no mounting restrictions for any models.

At the time of test run

At the time of test run, there is a possibility that the oil may not flow even after the solenoid is energised because of the residual air in the valve, so please release the air by few times solenoid energising at on-load condition.

Accessories

Mounting bolt below is attached only for Gasket mounting type valve (CDSG-03).

Socket Head Cap Screws :
M6×60L ...2pcs.

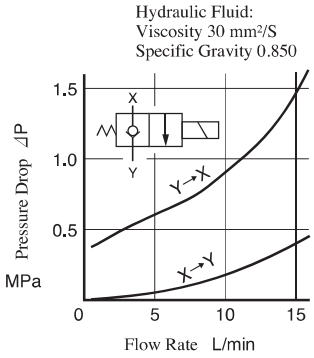
Model Number Designation

CDS	T	–03	–C	–D12	–21
Series Number	Type of Connection	Valve Size	Valve Type	Coil Type	Design Number
CDS : Solenoid Operated Poppet Type Two-Way Valves	C : Cartridge Type	01	C : Normally Closed	DC D24	10
		03		AC A100 A120 A200 A240	21
	T : Threaded Connection	03W (Rc 1/4)		DC D12 D24 D100	21
		03 (Rc 3/8)			
	G : Gasket Mounting	03		AC DC Rectified R100 R200	21

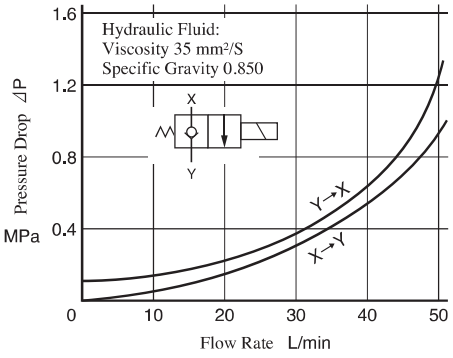
★ Models for phosphate ester fluid are available. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

Pressure Drop

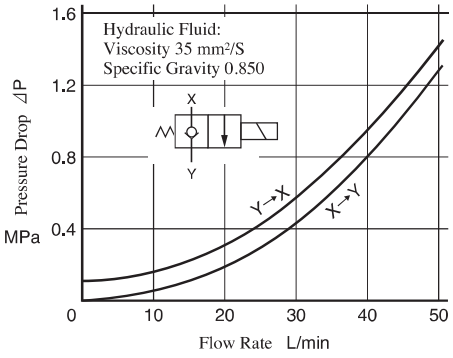
CDSC–01



CDSC–03
CDST–03
CDSG–03



CDST–03W



Note: Measuring has been made for the CDSC-03 (Cartridge type) when it is equipped with the same body as the threaded connections and the gasket mounting type.

● For any other viscosity, multiply the factors in the table below.

Viscosity mm²/s	15	20	30	40	50	60	70	80	90	100
Factor	0.84	0.91	1.00	1.07	1.14	1.19	1.24	1.28	1.32	1.35

● For any other specific gravity (G'), the pressure drop (⊿P') may be obtained from the formula below.

⊿P' = ⊿P(G'/0.850)

● For any other viscosity, multiply the factors in the table below.

Viscosity mm²/s	15	20	30	40	50	60	70	80	90	100
Factor	0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

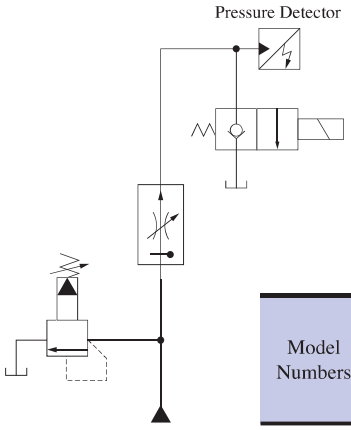
● For any other specific gravity (G'), the pressure drop (⊿P') may be obtained from the formula below.

⊿P' = ⊿P(G'/0.850)

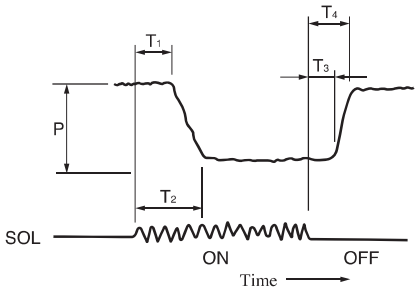
Changeover Time

Changeover time, T_2 and T_4, in particular, varies according to the hydraulic circuit and operating conditions. As an example, the following figures show how the measurement is made.

Test Circuit



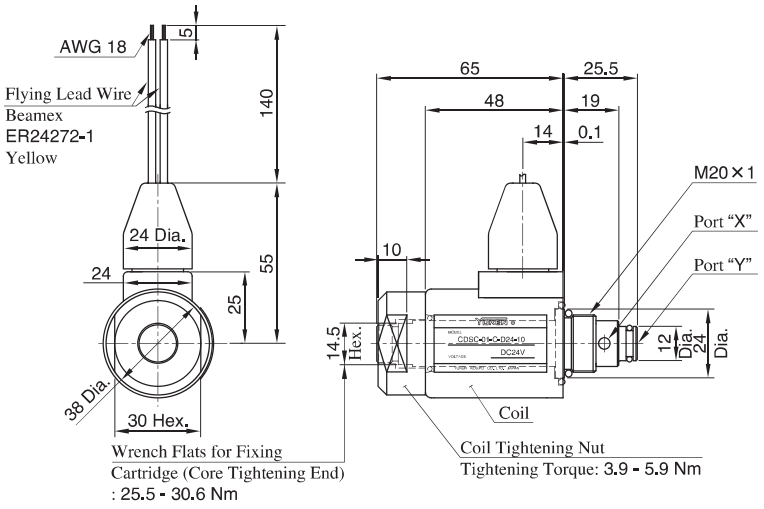
Result of measurement



Model Numbers	Solenoid Types	Condition		Time ms			
		Pressure "P" MPa	Flow Rate L/min	SOL"ON"(Open→Close)		SOL"OFF"(Open→Close)	
				T_1	T_2 (ex.)	T_3	T_4 (ex.)
CDSC-01	DC	10	15	21.4	44.0	29.0	38.4
		21	15	30.6	47.0	27.0	44.0
CDS＊-03	AC	7	50	10.0	86.0	20.0	44.0
		14	50	11.0	43.0	12.0	54.0
	DC	7	50	22.0	104.0	44.0	66.0
		14	50	24.0	60.0	41.0	73.0
	AC→DC Rectified	7	50	27.0	100.0	114.0	146.0
		14	50	32.0	66.0	108.0	142.0

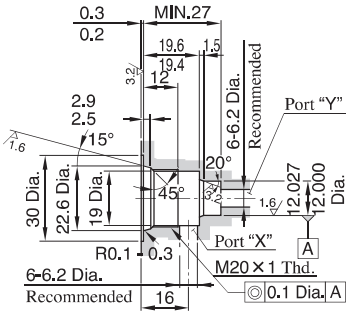
Note: Shifting time above is the value at rated voltage.

CDSC-01



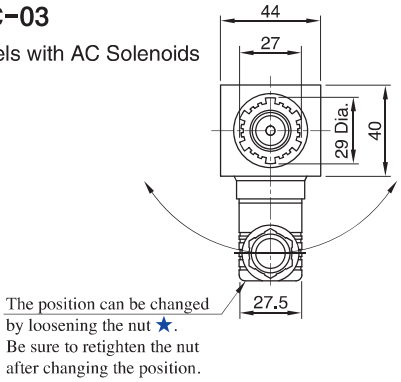
Details of Mounting Holes

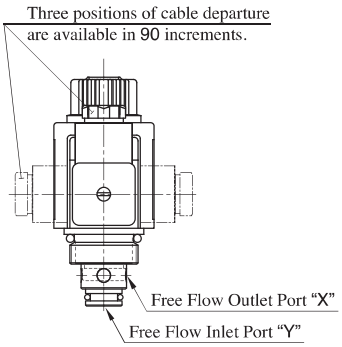
How to mount, see CDSC-03 below.

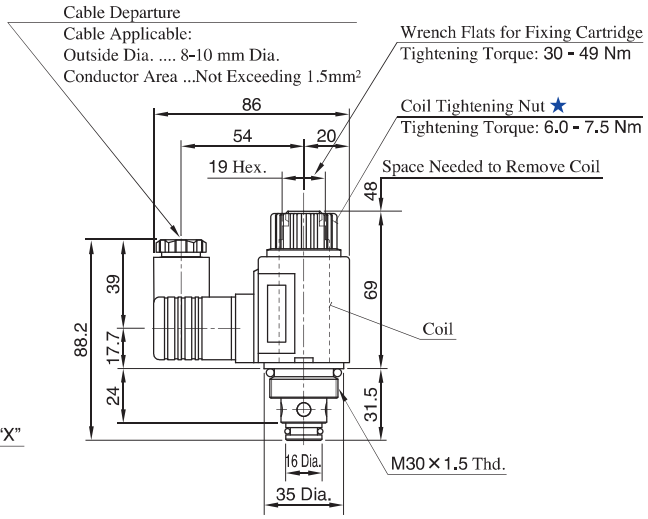


CDSC-03

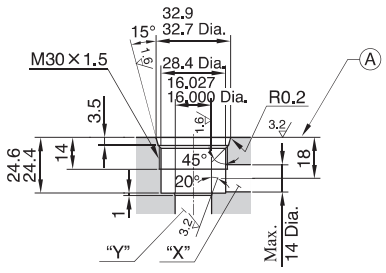
Models with AC Solenoids







Details of Mounting Holes



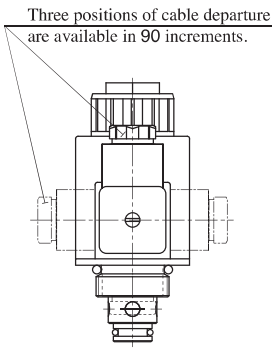
How to Mount

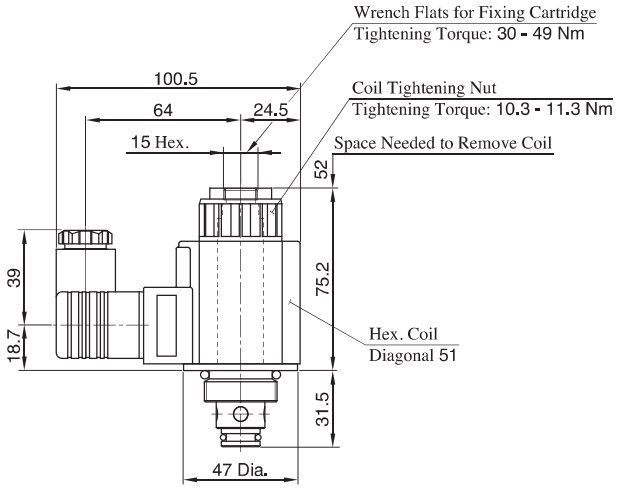
When mounting, the following steps must be followed:

1. Loosen the nut★, then remove the coil.
2. Thread the cartridge, making sure that the collar (AC:35 Dia.,DC/R:47 Dia.) of the cartridge is well fitted to the component surface (Ⓐ surface in the left drawing).
3. Attach the coil and secure it with a nut.

CDSC-03

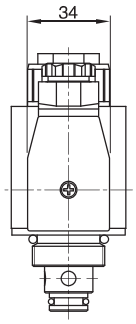
● Models with DC Solenoids

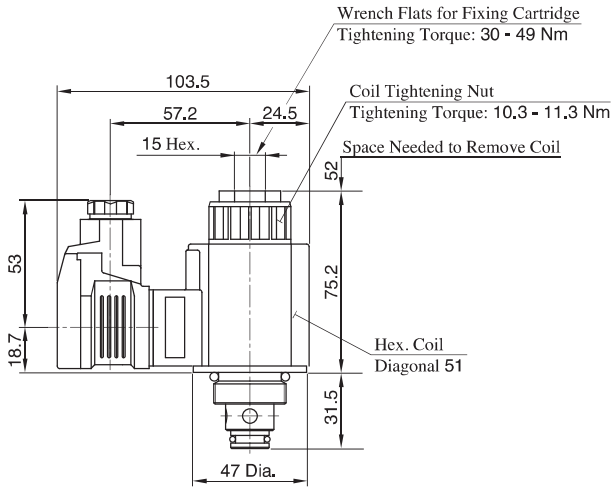




● For other dimensions, refer to the "Models with AC Solenoids".
● How to mount, refer to the previous page.

● Models with R Type Solenoids

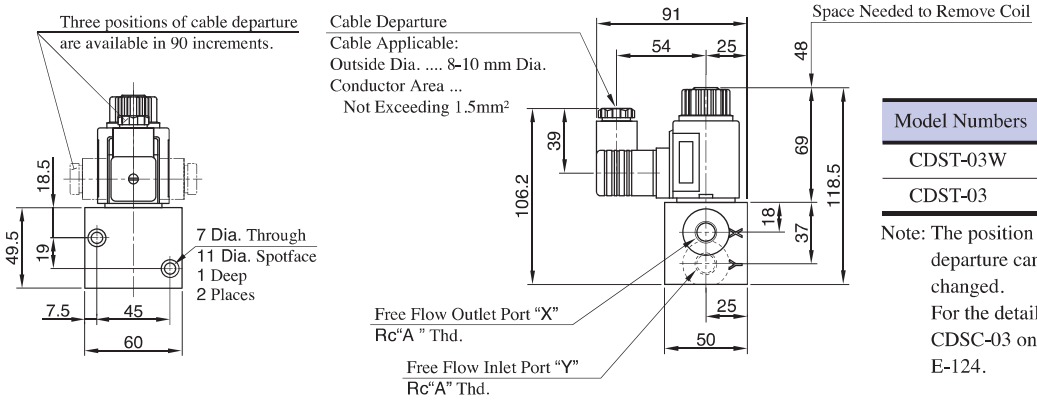




● For other dimensions, refer to the "Models with AC Solenoids".
● How to mount, refer to the previous page.

CDST-03, 03W

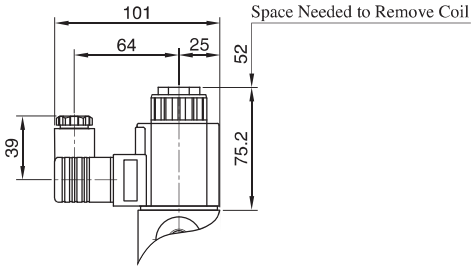
Models with AC Solenoids



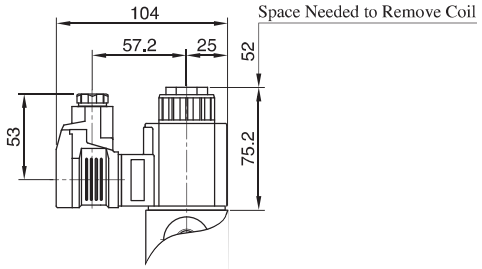
Model Numbers	A
CDST-03W	1/4
CDST-03	3/8

Note: The position of cable departure can be changed.
For the detail, refer to CDSC-03 on page E-124.

Models with DC Solenoids



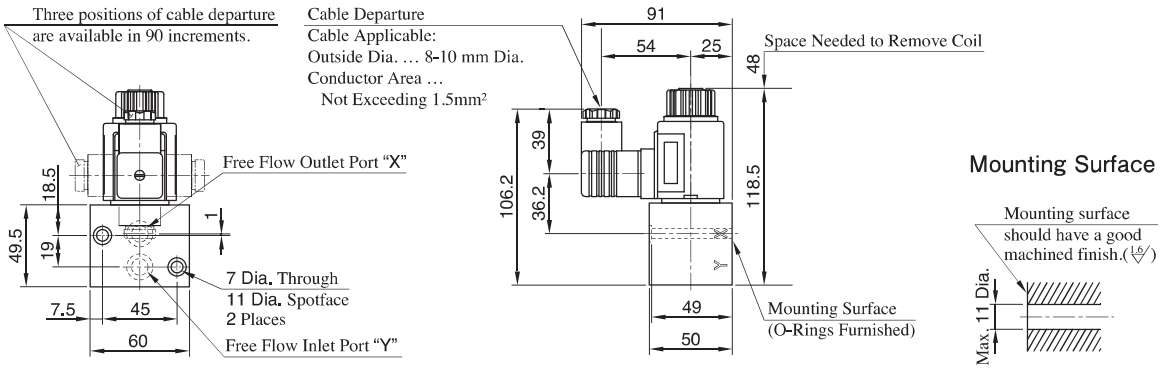
Models with R Type Solenoids



For other dimensions, refer to the "Models with AC Solenoids".

CDSG-03

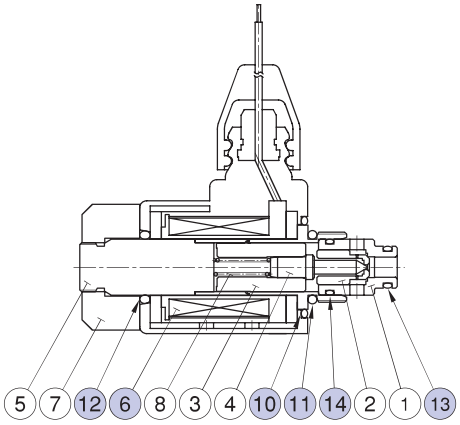
Models with AC Solenoids



Note) 1. For models with DC solenoids and models with R type solenoids, refer to CDST-03, 03W.
2. The position of cable departure can be changed. For the detail, refer to CDSC-03 on page E-124.

List of Seals, Solenoid Ass'y, Coil Ass'y

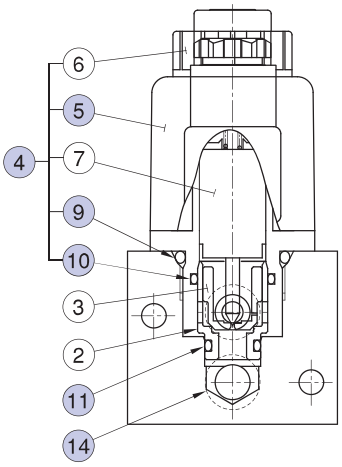
CDSC-01



List of Seals and Coil Ass'y

Item	Name of Parts	Part Numbers	Qty.
6	Coil Ass'y	2697-VK317470-3	1
10	O-Ring	JASO 2025 4 D	1
11	O-Ring	OR NBR-90 P18-N	1
12	O-Ring	OR NBR-90 P16-N	1
13	O-Ring	OR NBR-90 P9-N	1
14	O-Ring	AS 568-014 (NBR-90)	1

CDSC/CDST/CDSG-03∗



List of Seals

Item	Name of Parts	Part Numbers	Qty.	Remarks
9	O-Ring	OR NBR-90 P26-N	1	Included in Solenoid Ass'y
10	O-Ring	OR NBR-90 P20-N	1	
11	O-Ring	OR NBR-90 P12-N	1	
14	O-Ring	AS 568-014 (NBR-90)	2	only for CDSG

Solenoid Ass'y, Coil Ass'y

Valve Model No.	④ Solenoid Ass'y No.	⑤ Coil Ass'y No.
CDS∗-03∗-C-A100	CSA1-100-20	C-CSA1-100-20
CDS∗-03∗-C-A120	CSA1-120-20	C-CSA1-120-20
CDS∗-03∗-C-A200	CSA1-200-20	C-CSA1-200-20
CDS∗-03∗-C-A240	CSA1-240-20	C-CSA1-240-20
CDS∗-03∗-C-D 12	CSD1-12-20	C-SD1-12-N-50
CDS∗-03∗-C-D 24	CSD1-24-20	C-SD1-24-N-50
CDS∗-03∗-C-D100	CSD1-100-20	C-SD1-100-N-50
CDS∗-03∗-C-R100	CSR1-100-20	C-SR1-100-N-50
CDS∗-03∗-C-R200	CSR1-200-20	C-SR1-200-N-50

Interchangeability between Current and New Design

Because of solenoid assembly improvements, CDS -03 has been model-changed (design 20 to design 21).

Specifications and Characteristics

There are no changes in the specifications and characteristics of the valves themselves.

Solenoid Ratings

There are changes in the inrush current, holding current and power, but there are no technical problem.

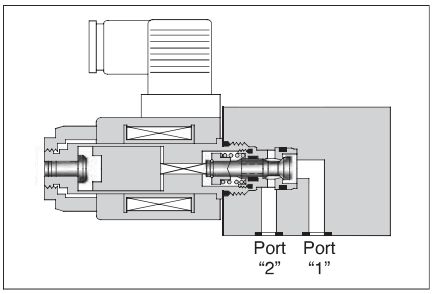
Interchangeability in Installation

There are some changes in dimensions about solenoids, but interchangeability in installation is no problem.

Shut-off Type Solenoid Operated Directional Valves

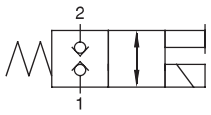
The shut-off type solenoid operated directional valves are poppet type solenoid operated two-way directional valves developed to meet the needs of this age such as energy and resources saving.





- **High-response**
  High response is provided by the poppet design.
- **Smallest internal leakage**
  Internal leakage are very small, less than 5 drips per min., which is achieved by the poppet design.
- **Two mounting types: cartridge and sub-plate**
  Mounting dimensions for both types conform to ISO standard.

Graphic Symbol



Specifications

Model Numbers	Max. Flow★1 L/min	Max. Operating Pressure MPa			Max. Changeover Frequency min⁻¹	Internal leakage cm³/min	Approx. Mass kg
		Port"1"		Port "2"			
		"1"→"2"Flow	"2"→"1"Flow				
DSPC-01-C-D24-30★2	40	10	21	25	300	0.25 or Less	0.6
DSPG-01-C-D24-30★2							1.6
DSPC-03-C-D24-10★2	80		16		240	0.25 or Less	1.0
DSPG-03-C-D24-10★2							3.9

★1. Maximum flow rates depend on operating conditions. For details, see page E-130.
★2. Protections against dust and water conform to the international electric standard below.
DSPC-01, DSPG-01 : (I.E.C) PUBL.529 IP65
DSPC-03, DSPG-03 : (I.E.C) PUBL.529 IP64

Instructions

- Do not connect port "1" to a line subjected to surge pressures. In addition, if you use port "1" for tank line, be sure to keep the end of the line in the oil.
- In the case of "DSPC", use iron material for installation body.

Model Number Designation

DSP	G	–01	–C	–D24	–30
Series Number	Type of Connection	Valve Size	Valve Type	Coil Type	Design Number
DSP : Shut-off Type Solenoid Operated Directional Valves	C : Cartridge Type G : Sub-plate Mounting	01	C : Normally Closed	DC D24	30
		03		DC D12 D24	10

★ Models for phosphate ester fluid are available. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

Solenoid Ratings

Electric Source	Coil Type	Frequency (Hz)	Voltage (V)		Current & Power at Rated Voltage					
			Source Rating	Serviceable Range	Inrush★1 (A)		Holding (A)		Power (W)	
					01	03	01	03	01	03
DC★2	D12	—	12	10.8 - 13.2	—	—	—	3.16	—	38
	D24		24	21.6 - 26.4			1.22	1.57	29	

★ 1. Inrush current in the above table shows rms values at maximum stroke.
★ 2. K-Series DC Solenoid which has a reputation for excellent DC control is employed.

Sub-plates

Valve Model Numbers	Sub-plate Model Numbers	Thread Size Rc	Approx. Mass kg
DSPG-01	DSGM-01-31	1/8	0.8
	DSGM-01X-31	1/4	
	DSGM-01Y-31	3/8	
DSPG-03	DSGM-03-40	3/8	3
	DSGM-03X-40	1/2	
	DSGM-03Y-40	3/4	4.7

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. (▽6)
- These sub-plates are sharable with those for DSG-01/03 Series Solenoid Operated Directional Valve. For dimensions, see pages E-31 and E-47.

Accessories

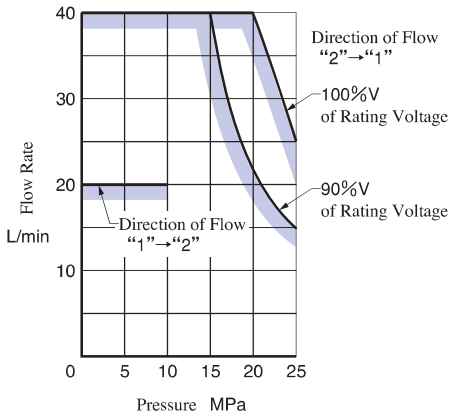
Valve Model Numbers	Mounting Bolts (Soc. Hd. Cap Screw)	
	Size	Tightening Torque
DSPG-01	M5×50L .....4 pcs.	5 - 7 Nm
DSPG-03	M6×80L .....4 pcs.	12 - 15 Nm

Characteristics Typical Performance Characteristics at Viscosity 30 mm²/s (ISO VG 46 oils, 50°C)

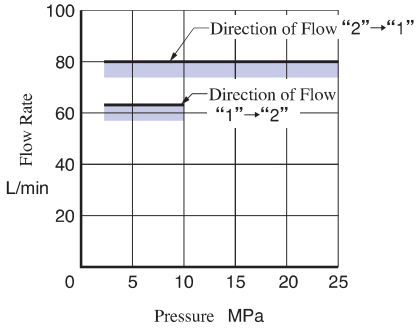
Maximum Flow Rate

The zone under each shaded line denotes the flow rate ranges being free of trouble in changeover.

DSPC/DSPG-01



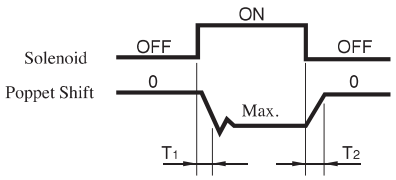
DSPC/DSPG-03



Typical Changeover Time

[Test Conditions]

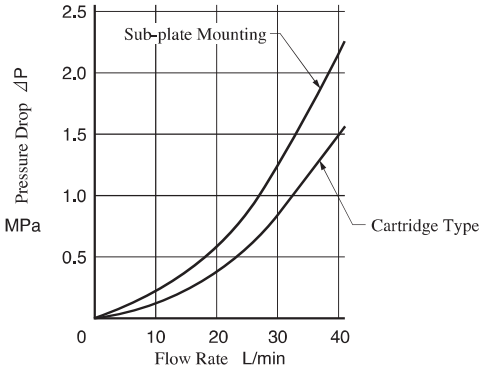
- Pressure : 15 MPa
- Flow Rate : (01) 30 L/min
  (03) 63 L/min
- Voltage : 100%Vof Rating Voltage
- Direction of Flow : "2"→"1"



Model Numbers	Time ms	
	T_1	T_2
DSP✻-01-C-D✻	69	14
DSP✻-03-C-D✻	60	80

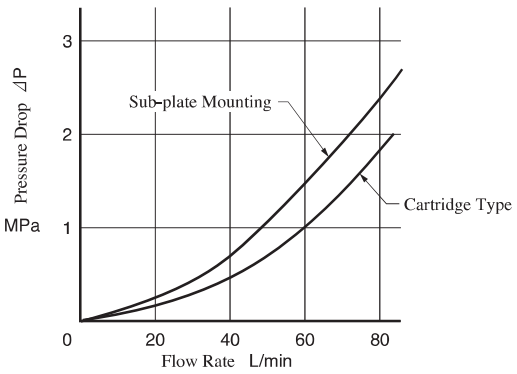
Pressure Drop

DSPC/DSPG-01



- For any other viscosity, multiply the factors in the table right.
- For any other specific gravity (G'), the pressure drop (⊿P') may be obtained from the formula below.
  ⊿P' = ⊿P(G'/0.850)

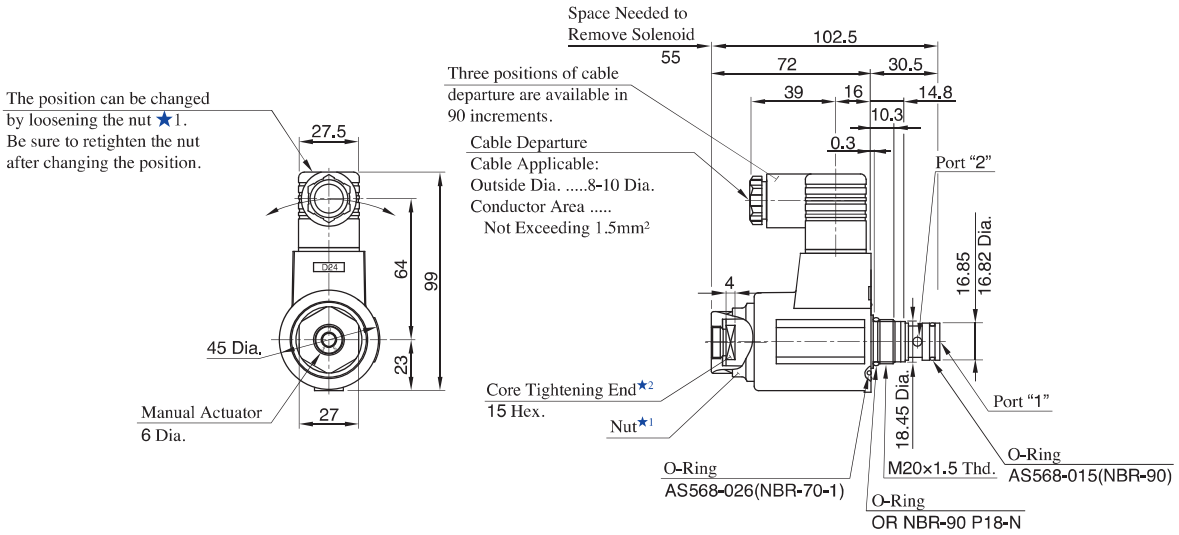
DSPC/DSPG-03



Viscosity mm²/s	15	20	30	40	50	60	70	80	90	100
Factor	0.84	0.91	1.00	1.07	1.14	1.19	1.24	1.28	1.32	1.35

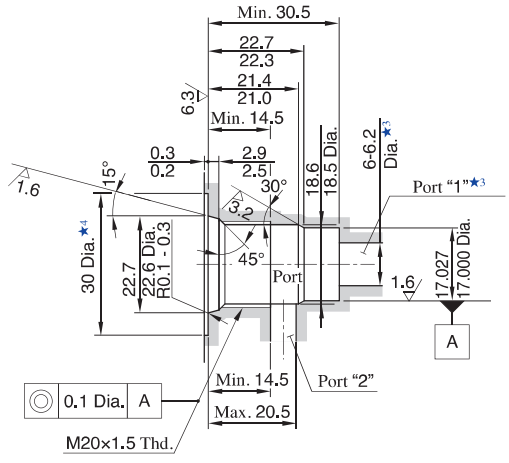
DSPC-01

Mounting Surface: ISO 7789 20-01-0-07



★1. Tightening Torque for Nuts : 10.3 - 11.3 Nm
★2. Tightening Torque for Iron Core Assembly : 20.5 - 25.5 Nm

Details of Mounting Holes



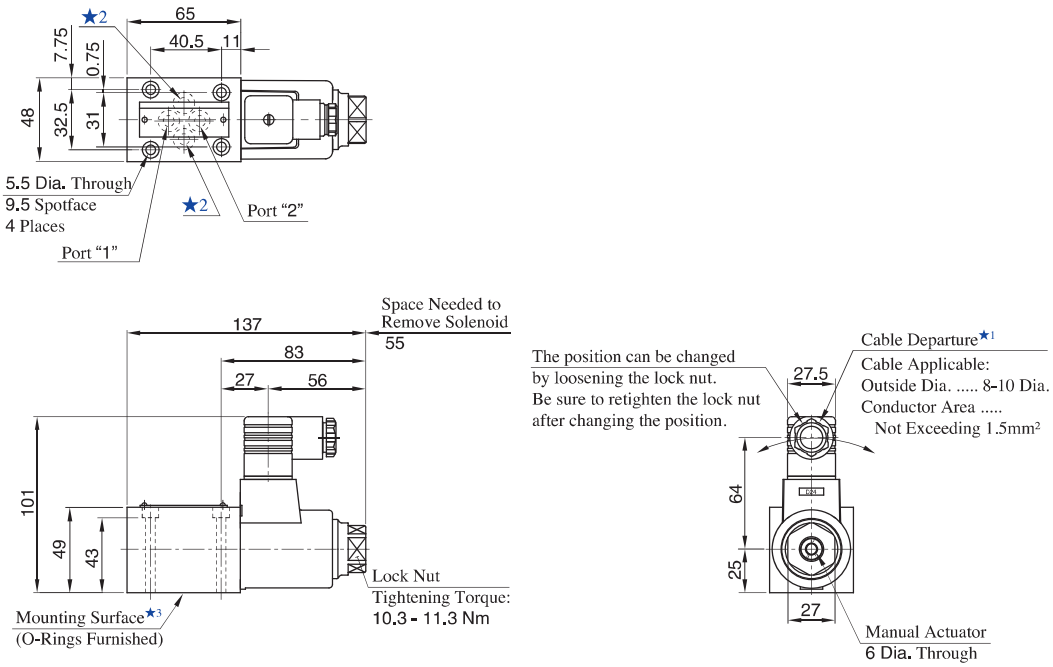
How to Mount

When mounting, the following steps must be followed.
1. Loosen the coil fastening the nut ★2 and remove the coil.
2. Making use of the core tightening end ★1, screw the cartridge in.
3. Attach the coil and fix it with the nut.

Note 1) ★3 Port diameter of 6.2 Dia. recommended.
Note 2) Mounting hole dimensions conform to ISO 7789 20-01-0-07, only ★4 dimension is different.
So in case that 30 design products mount on 33 Dia. hole of current design (10,20 design), those of water-proof function decrease to about IP 64 level.
Note 3) Use iron materials for the mounting section.

DSPG-01

Mounting Surface: ISO 4401-03-02-0-05

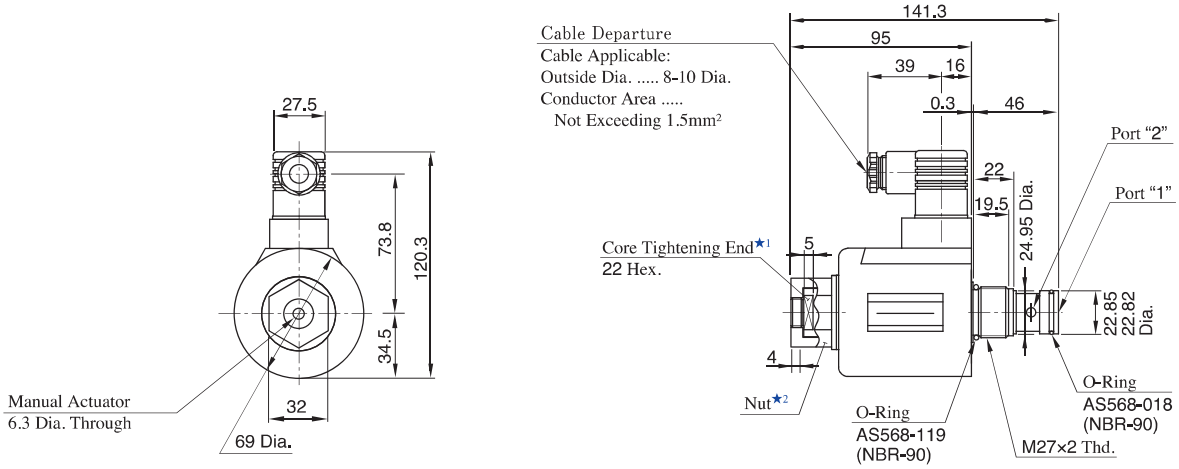


★1. The location and the position of the cable departure can be changed. For details, see the cartridge type.
★2. These ports (2 places) are not used. In addition, the body has the O-ring grooves and O-rings are included in the body.
★3. Ports A and B are used as ports "2" and "1" respectively.
★4. O-rings for Ports: OR NBR-90 P9-N

Note) Dimensions of valve mounting surface are shared with those of sub-plates, refer to page E-31.

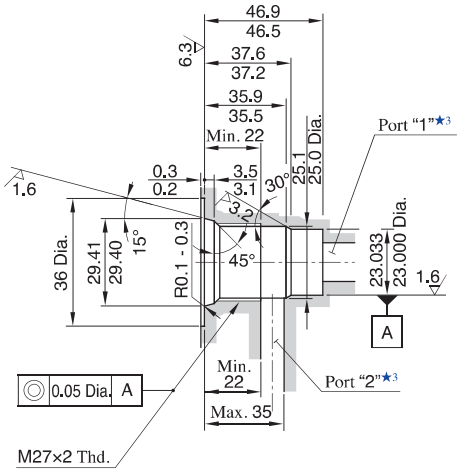
DSPC-03

Mounting Surface: ISO 7789 27-01-0-07



★1. Tightening Torque for Iron Core Assembly : 110 - 140 Nm
★2. Tightening Torque for Nuts : 8.5 - 10.5 Nm

Details of Mounting Holes



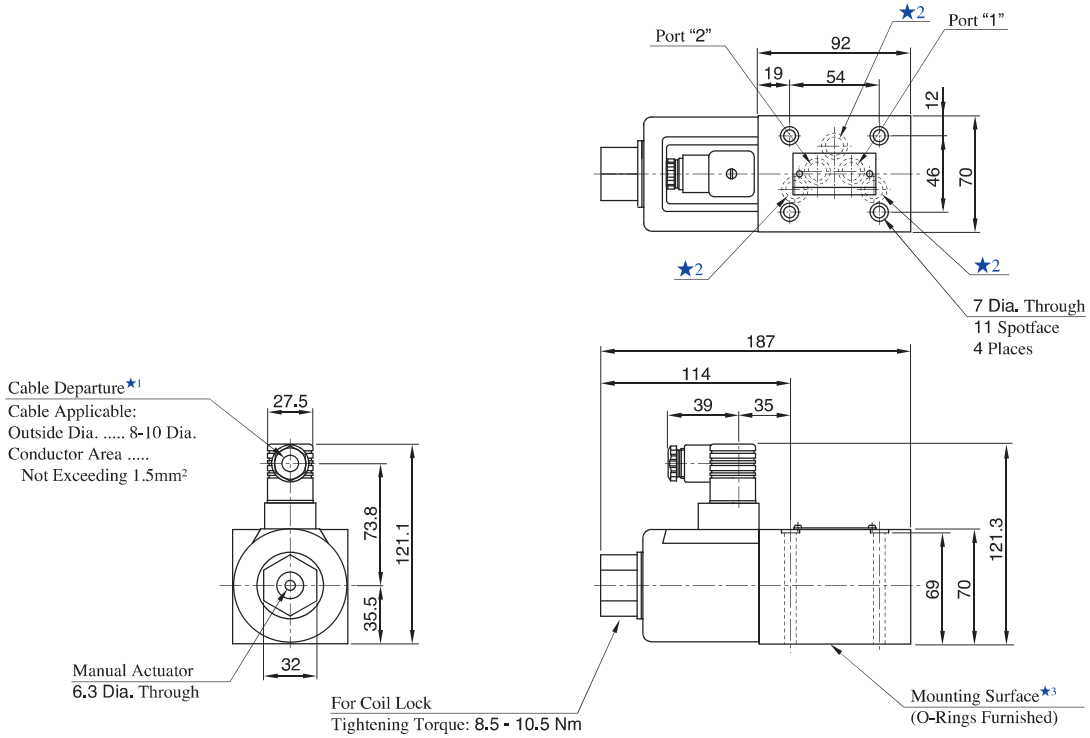
How to Mount

When mounting, the following steps must be followed.
1. Loosen the coil fastening the nut ★2 and remove the coil.
2. Making use of the core tightening end ★1, screw the cartridge in.
3. Attach the coil and fix it with the nut.

Note 1) ★3 Port diameter of 11 Dia. recommended.
Note 2) Use iron materials for the mounting section.

DSPG-03

Mounting Surface: ISO 4401-05-04-0-05

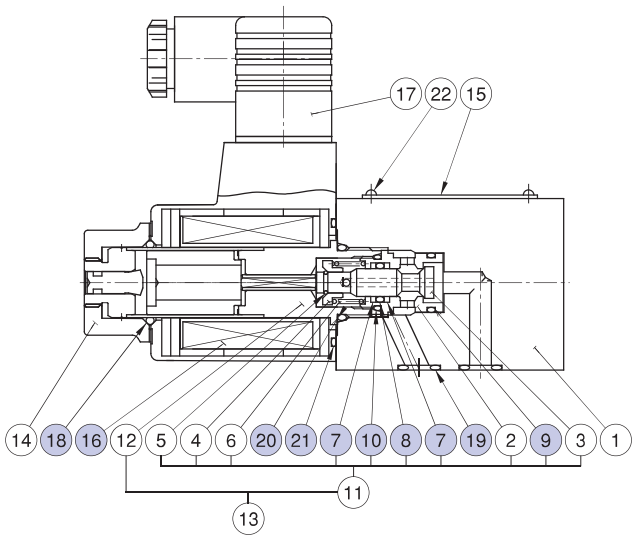


★1. The location and the position of the cable departure can be changed. For details, see the DSG-03 Series Solenoid Operated Valves on page E-48.
★2. These ports (3 places) are not used. In addition, the body has the O-ring grooves and O-rings are included in the body.
★3. Ports A and B are used as ports "2" and "1" respectively.
★4. O-rings for ports: AS 568-014 (NBR-90)

Note) Dimensions of valve mounting surface are shared with those of sub-plates, refer to page E-47.

List of Seals, Solenoid Ass'y, Coil Ass'y

DSPC/DSPG-01
DSPC/DSPG-03



List of Seals

Item	Name of Parts	DSP＊–01		DSP＊–03	
		Part Numbers	Qty.	Part Numbers	Qty.
7	Back Up Ring	SD 1286-VK420107-5	2	2691-VK418550-0	2
8	O-Ring	OR NBR-70-1 P8-N	1	OR NBR-70-1 P12-N	1
9	O-Ring	AS 568-015 (NBR-90)	1	AS 568-018 (NBR-90)	1
10	O-Ring	AS 568-014 (NBR-90)	1	AS 568-017 (NBR-90)	1
18	O-Ring	OR NBR-70-1 P20-N	1	—	—
19★	O-Ring	OR NBR-90 P9-N	4	AS 568-014 (NBR-90)	5
20	O-Ring	OR NBR-90 P18-N	1	AS 568-119 (NBR-90)	1
21	O-Ring	AS 568-026 (NBR-70-1)	1	—	—

★ O-ring item ⑲, use only for sub-plates mounting type (DSPG-01/03).

List of Solenoid Ass'y, Coil Ass'y

Valve Model No.	Solenoid Ass'y No.	⑯Coil Ass'y No.
DSPC/DSPG-01-C-D24	—★	C-SD1H-24-N-70
DSPC/DSPG-03-C-D12	SD3-12-N-5130	C-SD3-12-N-51
DSPC/DSPG-03-C-D24	SD3-24-N-5130	C-SD3-24-N-51

★About replacement of DSPC/DSPG-01 solenoid ass'y, please contact us.

Interchangeability between Current and New Design

Because of solenoid assembly improvements, DSP*-03 has been model-changed (design 20 to design 30).

Specifications and Characteristics

Max. operating pressure at port "1" flow "2"→"1", pressure changed 16MPa → 21 MPa.

Solenoid Ratings

There are changes in the holding current, but there are no technical problem.

But the coil type is limited only for D24, about replacement of solenoid ass'y, please contact us.

Dust and Water Proof Specifications

Water-proof protection level is upgraded. (IEC) PUBL.529 IP64 → (IEC) PUBL.529 IP65

In case that DSPC-01 mount on 33 Dia. hole of current design, those of water-proof function decrease to IP 64 level.

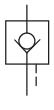
Interchangeability in Installation

There are some changes in dimensions about solenoids, but interchangeability in installation is no problem.

Models with AC Solenoids

Because of the component parts stock shortage, stop selling.

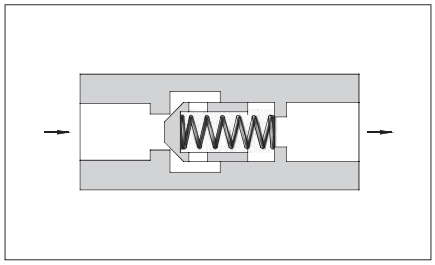
Check/Pilot Controlled Check Valves

Valve Type	Graphic Symbols	Max. Operating Pressure MPa	Maximum Flow L/min (1 2 5 10 20 50 100 200 500 1000 2000 5000)	Page
Check Valves		25	In-Line (CIT) 02 03 06 10 Right Angle (CRT/CRG) 03 06 10 Right Angle, Flanged Connection (CRF) 10 16 24	E-137
Pilot Operated Check Valves		25	Threaded Connection (CP＊T) Sub-plate Mounting (CP＊G) 03 06 10 Flanged Connection (CP＊F) 10 16	E-143
In-Line Prefill Valves		25	PI＊F-40 50 63 80 100	E-148

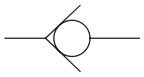
In-Line Check Valves

These valves allow free flow in one direction and prevent flow in the reverse direction. Cracking pressure specified is the pressure required to open the valve and allow free flow.





Graphic Symbol



Specifications

Model Numbers	Rated Flow★ L/min	Max. Operating Pres. MPa	Cracking Pres. MPa	Approx. Mass kg
CIT-02-*-50	16	25	0.04 0.35 0.5	0.1
CIT-03-*-50	30			0.3
CIT-06-*-50	85			0.8
CIT-10-*-50	230			2.3

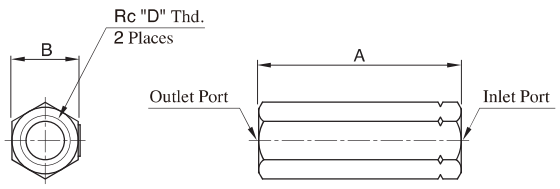
★Rated flow is the approximate flow rate, when there is a free flow pressure drop of maximum 0.3 MPa, the fluid has a specific gravity of 0.85 and a kinematic viscosity of 20 mm²/s, and the cracking pressure is 0.04 MPa.

Model Number Designation

CI	T	–03	–04	–50
Series Number	Type of Connection	Valve Size	Cracking Pressure MPa	Design Number
CI : In-Line Check Valve	T : Threaded Connection	02	04 : 0.04 35 : 0.35 50 : 0.5	50
		03		50
		06		50
		10		50

● For In-Line Check Valves, standard type (for petroleum base oils) can be used phosphate ester type fluid.

CIT-02, 03, 06, 10

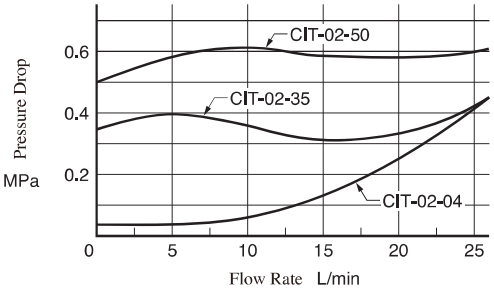


Model Numbers	A	B	D
CIT-02-*-50	58	19	1/4
CIT-03-*-50	76	27	3/8
CIT-06-*-50	95	41	3/4
CIT-10-*-50	133	60	1 1/4

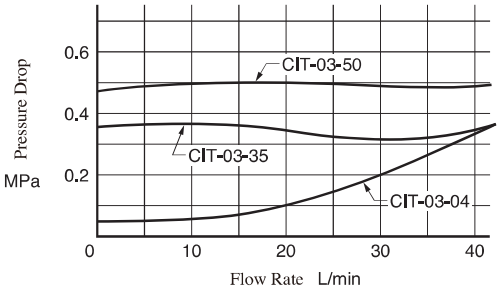
Pressure Drop

Hydraulic Fluid: Viscosity 30 mm²/s

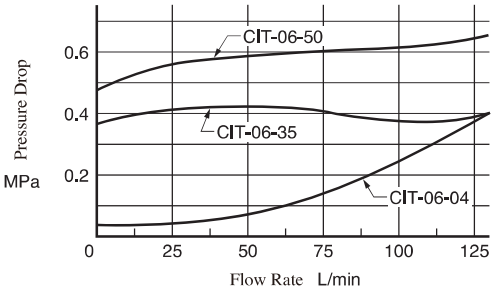
CIT-02



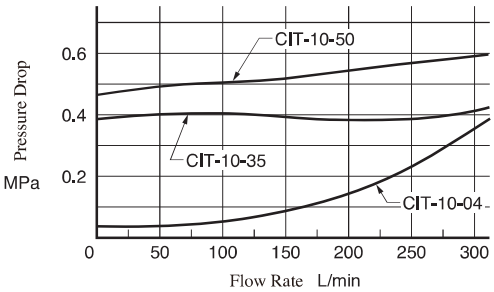
CIT-03



CIT-06



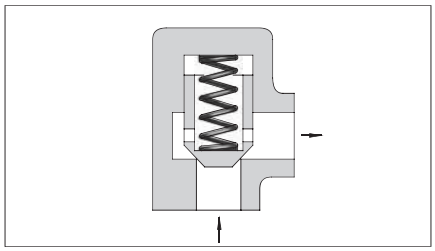
CIT-10



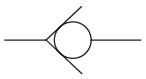
Right Angle Check Valves

These valves allow free flow in one direction and prevent flow in the reverse direction. Cracking pressure specified is the pressure required to open the valve and allow free flow.





Graphic Symbol



Specifications

Model Numbers		Rated Flow★ L/min	Max. Operating Pres. MPa	Cracking Pres. MPa	Approx. Mass kg
Threaded Connection	CRT-03-＊-50	40	25	0.04	0.9
	CRT-06-＊-50	125		0.35	1.7
	CRT-10-＊-50	250		0.5	5.6
Sub-plate Mounting	CRG-03-＊-50	40	25	0.04	1.7
	CRG-06-＊-50	125		0.35	2.9
	CRG-10-＊-50	250		0.5	5.5

★ Rated flow is the approximate flow rate, when there is a free flow pressure drop of maximum 0.3 MPa, the fluid has a specific gravity of 0.85 and a kinematic viscosity of 20 mm²/s, and the cracking pressure is 0.04 MPa.

Model Number Designation

CR	T	–03	–04	–50
Series Number	Type of Connection	Valve Size	Cracking Pressure MPa	Design Number
CR : Right Angle Check Valve	T : Threaded Connection	03	04 : 0.04 35 : 0.35 50 : 0.5	50
		06		50
		10		50
	G : Sub-plate Mounting	03		50
		06		50
		10		50

Note) Models for phosphate ester fluid are available. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

Yuken can offer flanged connection valves described below.
For details, contact us.

Model No.	Rated Flow L/min	Max. Operating Pres. MPa
CRF-10-＊-50	300	25
CRF-16-＊-50	600	
CRF-24-＊-50	1300	

Sub-plates

Valve Model Numbers	Sub-plate Model Numbers	Thread Size Rc	Approx. Mass kg
CRG-03	CRGM-03-50	3/8	1.6
	CRGM-03X-50	1/2	1.6
CRG-06	CRGM-06-50	3/4	2.4
	CRGM-06X-50	1	3.0
CRG-10	CRGM-10-50	1 1/4	4.8
	CRGM-10X-50	1 1/2	5.7

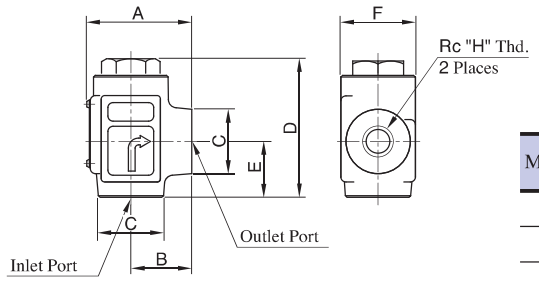
● Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. (1.6▽)

Accessories

Mounting Bolts

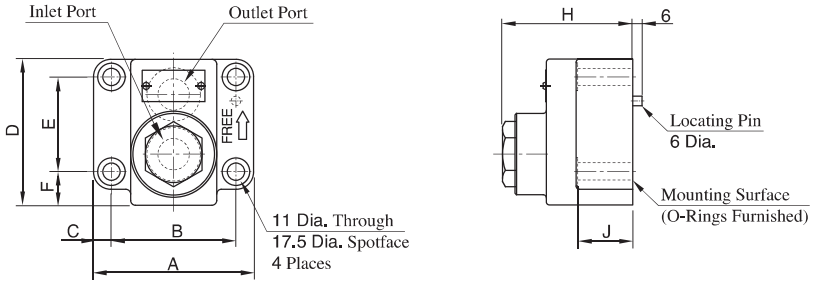
Valve Model Numbers	Socket Head Cap Screw	Qty.
CRG-03	M10 × 45L	4
CRG-06	M10 × 50L	4
CRG-10	M10 × 55L	6

CRT-03, 06, 10



Model Numbers	A	B	C	D	E	F	H
CRT-03	62	36	38 Dia.	80.5	33	44	3/8
CRT-06	74	45	54 Dia.	104.5	49	54	3/4
CRT-10	107	65	80 SQ.	130	65	80	1 1/4

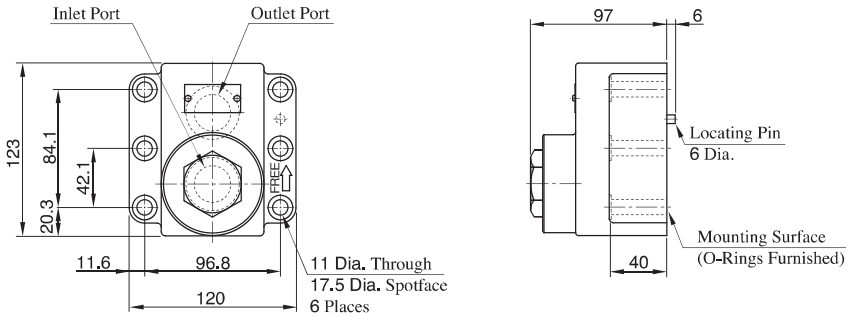
CRG-03, 06



Model Numbers	A	B	C	D	E	F	H	J	Mounting surface conform to ISO standard below
CRG-03	90	66.7	11.7	72	42.9	17.5	72.5	30	ISO 5781-06-07-0-00
CRG-06	102	79.4	11.3	93	60.3	21.4	84.5	35	ISO 5781-08-10-0-00

CRG-10

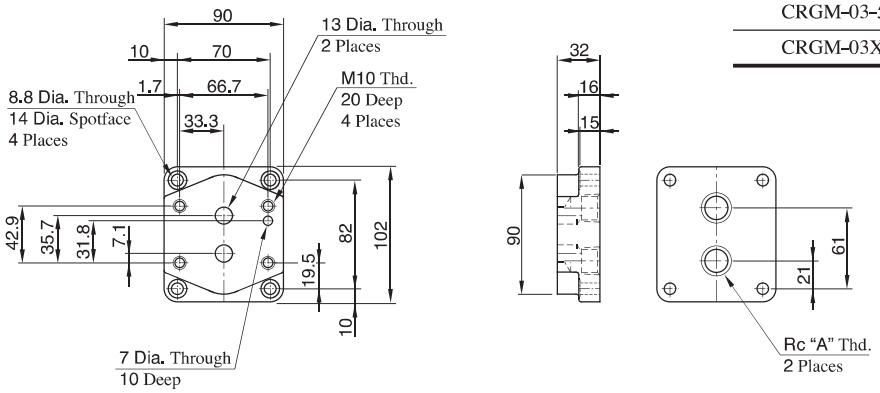
Mounting Surface: ISO 5781-10-13-0-00



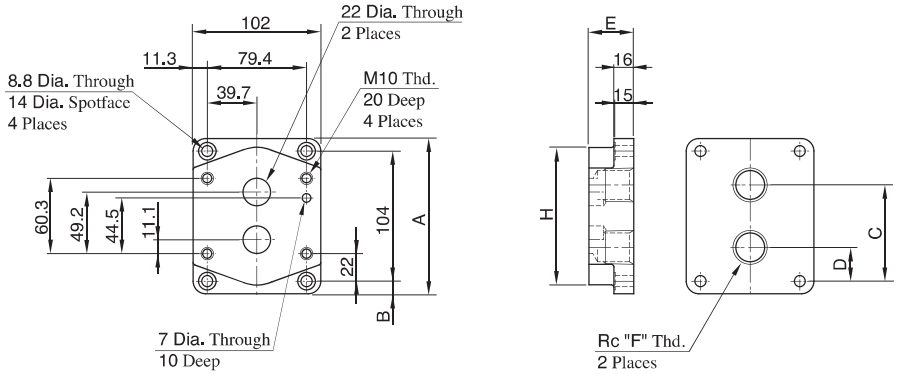
Sub-plate

CRGM–03, 03X

Sub-plate Model Numbers	A
CRGM–03–50	3/8
CRGM–03X–50	1/2

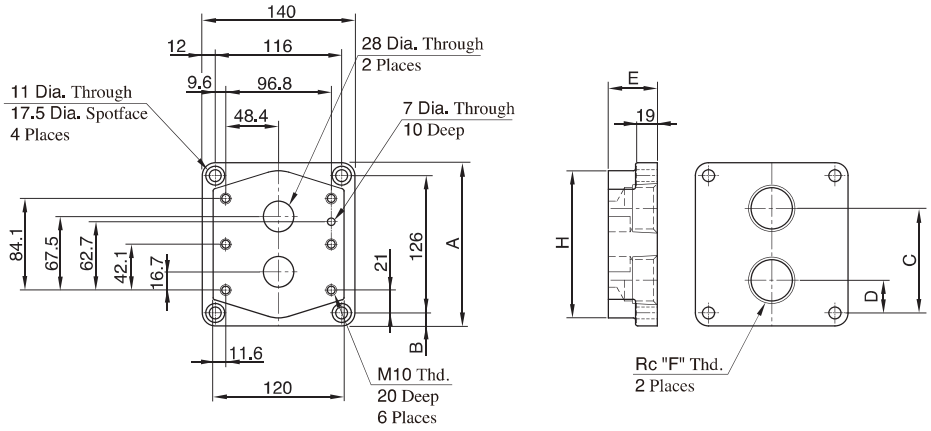


CRGM–06, 06X



Sub-plate Model Numbers	A	B	C	D	E	F	H
CRGM–06–50	124	10	77	27	36	3/4	110
CRGM–06X–50	136	16	82.3	22	45	1	130

CRGM–10, 10X

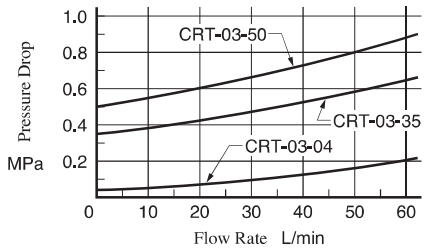


Sub-plate Model Numbers	A	B	C	D	E	F	H
CRGM–10–50	150	12	96	30	45	1 1/4	135
CRGM–10X–50	177	25.5	104	22	50	1 1/2	167

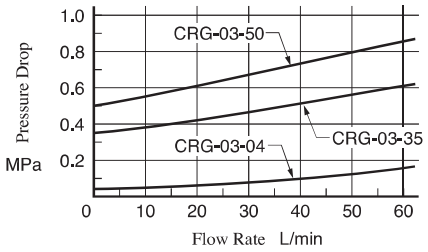
Pressure Drop

Hydraulic Fluid: Viscosity 30mm²/s

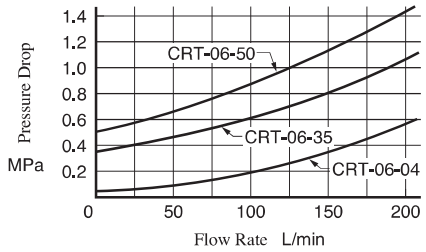
CRT-03



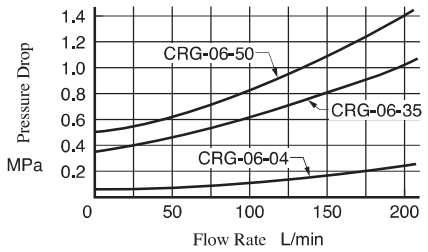
CRG-03



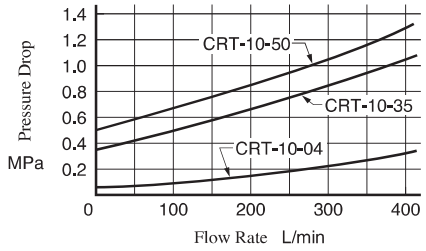
CRT-06



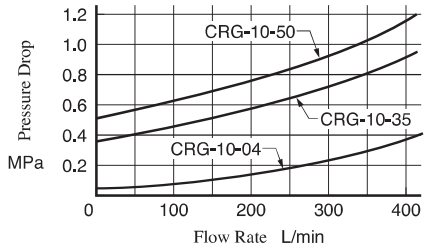
CRG-06



CRT-10

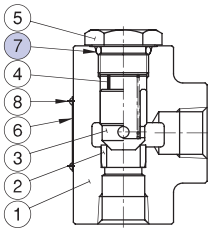


CRG-10



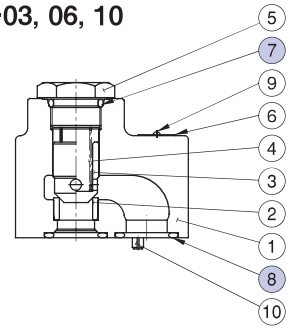
List of Seals

CRT-03, 06, 10



Item	Name of Parts	Part Numbers			Qty.
		CRT-03	CRT-06	CRT-10	
7	O-Ring	OR NBR-90 P21-N	OR NBR-90 P24-N	OR NBR-90 P32-N	1

CRG-03, 06, 10

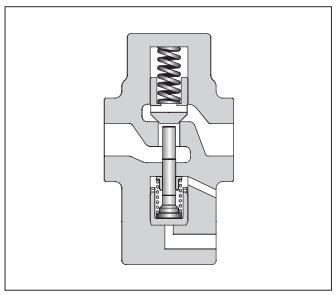


Item	Name of Parts	Part Numbers			Qty.
		CRG-03	CRG-06	CRG-10	
7	O-Ring	OR NBR-90 P21-N	OR NBR-90 P24-N	OR NBR-90 P32-N	1
8	O-Ring	OR NBR-90 P18-N	OR NBR-90 P28-N	OR NBR-90 P32-N	2

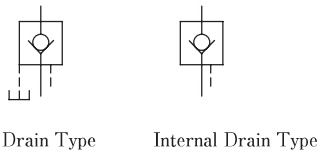
Pilot Controlled Check Valves

These check valves allow flow in one direction and prevent flow in the reverse direction, until operated by pilot pressure to allow free reverse flow.





Graphic Symbols



External Drain Type　　Internal Drain Type

Specifications

Model Numbers		Rated Flow★ L/min	Max. Operating Pres. MPa	Cracking Pres. MPa	Approx. Mass kg
Threaded Connection	CP＊T-03-＊-＊-50	40	25	0.04 0.2 0.35 0.5	3.0
	CP＊T-06-＊-＊-50	125			5.5
	CP＊T-10-＊-＊-50	250			9.6
Sub-plate Mounting	CP＊G-03-＊-＊-50	40	25	0.04 0.2 0.35 0.5	3.3
	CP＊G-06-＊-＊-50	125			5.4
	CP＊G-10-＊-＊-50	250			8.5

★ Rated flow is the approximate flow rate, when there is a free flow pressure drop of maximum 0.3 MPa, the fluid has a specific gravity of 0.85 and a kinematic viscosity of 20 mm²/s, and the cracking pressure is 0.04 MPa.

Model Number Designatioin

CP	T	–03	–E	–04	–50
Series Number	Type of Connection	Valve Size	Drain Connection	Cracking Pres. MPa	Design Number
CP：Pilot Operated Check Valve CPD：Decompression Type Pilot Operated Check Valve	T：Threaded Connection	03	None：Internal Drain	04：0.04 20：0.2 35：0.35 50：0.5	50
		06			50
		10			50
	G：Sub-plate Mounting	03	E：External Drain		50
		06			50
		10			50

Note) Models for phosphate ester fluid are available. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.

Accessories

Mounting Bolts

Valve Model Numbers	Socket Head Cap Screw	Qty.
CP＊G-03	M10 × 45L	4
CP＊G-06	M10 × 50L	4
CP＊G-10	M10 × 55L	6

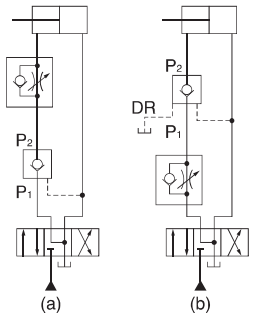
Yuken can offer flanged connection valves described below.
For details, contact us

Model Numbers	Rated Flow L/min	Max. Operating Pres. MPa
CP＊F-10-＊-＊-50	250	25
CP＊F-16-＊-＊-50	600	25

Instructions

Operation of internal and external drain types

When the outlet side P_1 is directly connected to the tank in reversed free flow (Fig. a), the internal drain type is normally used. When the back pressure is applied to the outlet side P_1 (Fig. b), be sure to use the external drain type.



Minimum pilot pressure characteristics

That depends on the pressure of the inlet side P_2 in the reversed free flow.

This value can be determined from the characteristics chart on page E-146.

Sub-plates

Valve Model Numbers	Sub-plate Model Numbers	Thread Size Rc	Approx. Mass kg
CP*G-03	HGM-03-20	3/8	1.6
	HGM-03X-20	1/2	
CP*G-06	HGM-06-20	3/4	2.4
	HGM-06X-20	1	3.0
CP*G-10	HGM-10-20	1 1/4	4.8
	HGM-10X-20	1 1/2	5.7

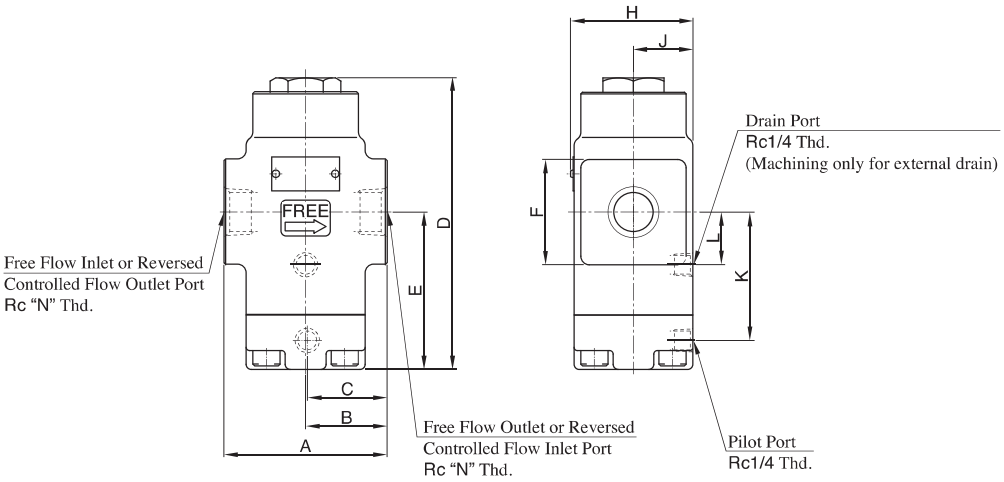
- Sub-plates are available, specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish. ($\frac{1.6}{\nabla}$)
- Sub-plates are shared with those for H Type Pressure Control Valves. Refer to pages E-149 for dimensions.

Cautions on replacement of 20 design low cracking pressure type valves with 50 design valves.

In 20 design valve with cracking pressure of 0.035 MPa (Code "5"), for closing the valve completely and certainly, it was necessary to introduce the pressurized oil into the drain port to push down the piston compulsory.

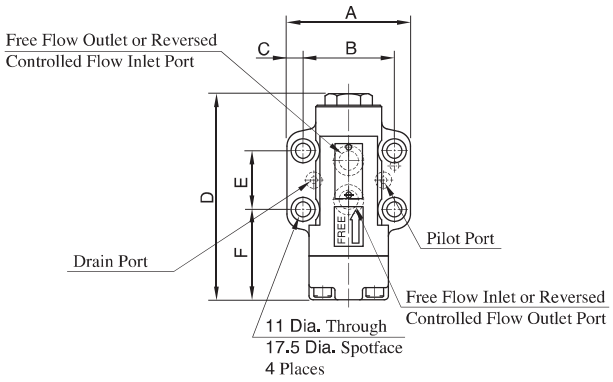
While in 50 design valve with cracking pressure of 0.04 MPa (Code "6"), it has such structure that the valve can be closed completely and certainly without introducing the pressurized oil into the drain port. On the contrary , what is worse is that if the pressurized oil is introduced into the drain port, the oil acts towards the direction of opening the valve, which is very dangerous and has to be absolutely avoided. Therefore, please do not supply any pressurized oil into the drain port in case of using 50 design valve.

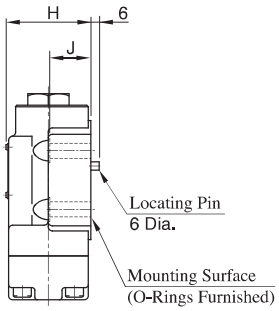
CPT CPDT -03, 06, 10



Model Numbers	A	B	C	D	E	F	H	J	K	L	N
CP*T-03	80	40	39	150.5	84.5	38 Dia.	60	29	67.5	26.5	3/8
CP*T-06	96	48	47	171.5	92.5	62 SQ.	72	35	75.5	31	3/4
CP*T-10	140	70	64	203.5	113	80 SQ.	82	40	96	43	1 1/4

CPG CPDG -03, 06

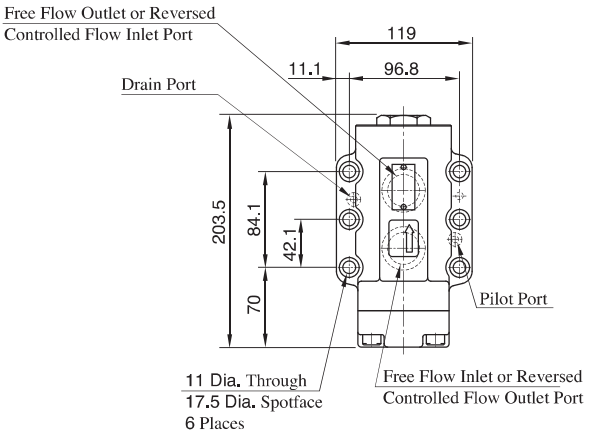


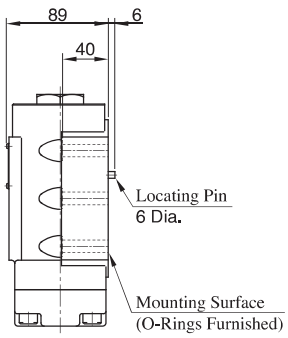


Model Numbers	A	B	C	D	E	F	H	J	Mounting Surface
CP*G-03	90	66.7	11.7	150.5	42.9	66	62	30	ISO 5781-06-07-0-00
CP*G-06	102	79.4	11.3	171.5	60.3	67.5	74	35	ISO 5781-08-10-0-00

CPG CPDG -10

Mounting Surface: ISO 5781-10-13-0-00

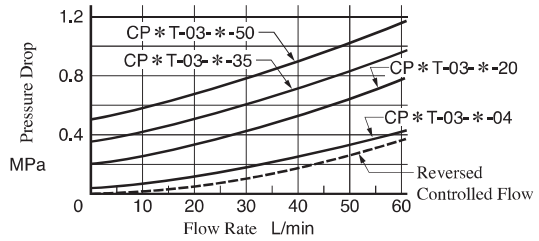




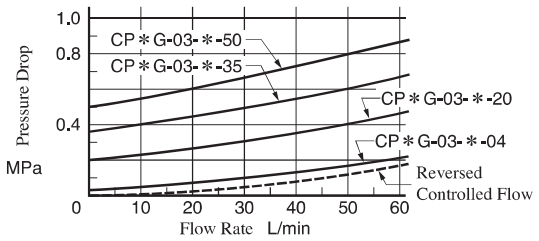
Pressure Drop

Hydraulic Fluid: Viscosity 30 mm²/s

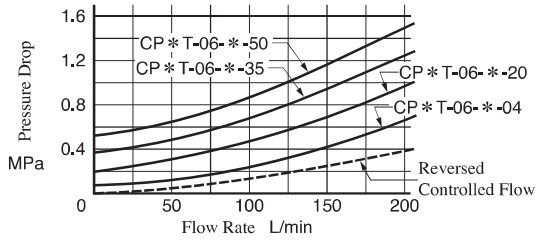
CPT-03, CPDT-03



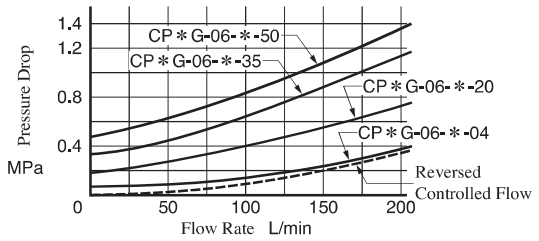
CPG-03, CPDG-03



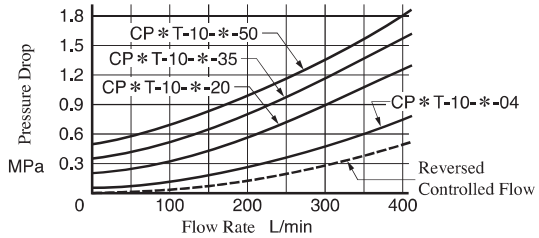
CPT-06, CPDT-06



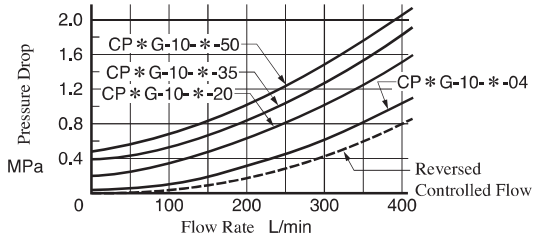
CPG-06, CPDG-06



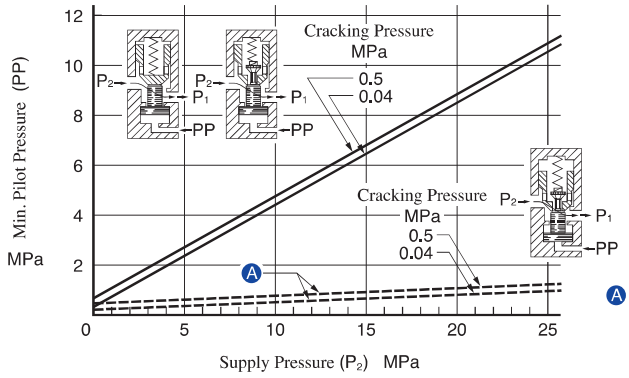
CPT-10, CPDT-10



CPG-10, CPDG-10



Min. Pilot Pressure Chart

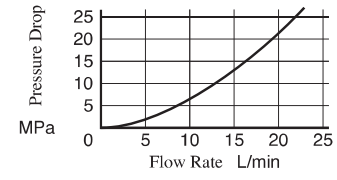


A : Min. Pilot Pressure to open the Decompression Valve (CPD : Decompression Type)

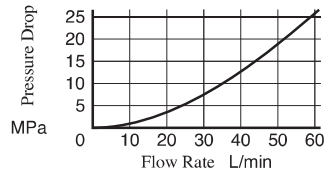
Pressure Drop for Reversed Controlled Flow Only when Decompression Valve is Opened

Hydraulic Fluid: Viscosity 30 mm²/s

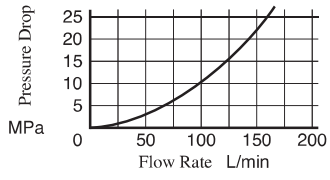
CPDT-03, CPDG-03



CPDT-06, CPDG-06

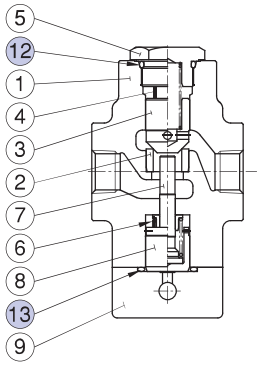


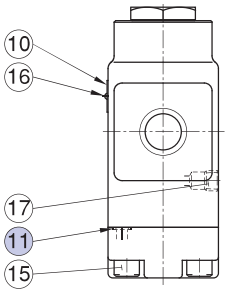
CPDT-10, CPDG-10



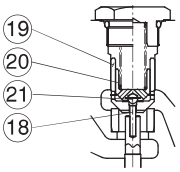
List of Seals

CPT-03, 06, 10



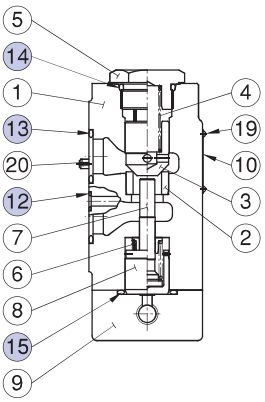


CPDT-03, 06, 10

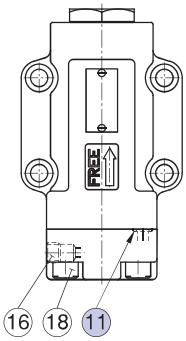


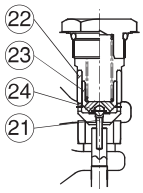
Item	Name of Parts	Part Numbers			Qty.
		CP*T-03	CP*T-06	CP*T-10	
11	O-Ring	OR NBR-90 P7-N	OR NBR-90 P9-N	OR NBR-90 P9-N	1
12	O-Ring	OR NBR-90 P21-N	OR NBR-90 P29-N	OR NBR-90 P36-N	1
13	O-Ring	OR NBR-90 G25-N	OR NBR-90 P32-N	OR NBR-90 P42-N	1

CPG-03, 06, 10



CPDG-03, 06, 10





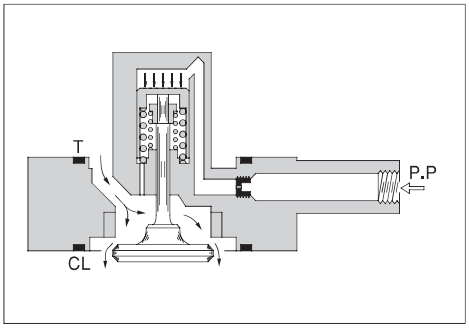
Item	Name of Parts	Part Numbers			Qty.
		CP*G-03	CP*G-06	CP*G-10	
11	O-Ring	OR NBR-90 P7-N	OR NBR-90 P9-N	OR NBR-90 P9-N	1
12	O-Ring	OR NBR-90 P9-N	OR NBR-90 P9-N	OR NBR-90 P9-N	2
13	O-Ring	OR NBR-90 P18-N	OR NBR-90 P28-N	OR NBR-90 P32-N	2
14	O-Ring	OR NBR-90 P21-N	OR NBR-90 P29-N	OR NBR-90 P36-N	1
15	O-Ring	OR NBR-90 G25-N	OR NBR-90 P32-N	OR NBR-90 P42-N	1

In-Line Prefill Valves

Prefill valves can be used by putting them between cylinder and reservoir in such a hydraulic system for large presses and injection molding machines where a high-speed operation is required with a small capacity pump.
In a high-speed forward stroke of the cylinder, the prefill valve sucks large amount of oil from the reservoir and feeds it into the cylinder.
In pressurizing process, the valves prevent a reserve flow from the reservoir to the cylinder, and in return stroke of the cylinder, the valve has a function of discharging the oil into the reservoir by opening the valve with a pilot pressure.

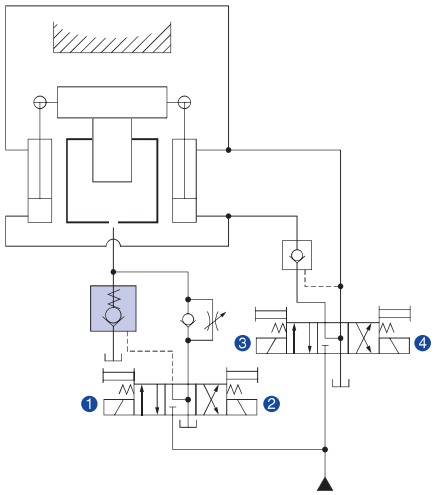


- Simple structure and high durability
- Low pressure drop and large flow
- Direct and decompression types are available for all sizes.
- Slow return valves are optionally available for pilot ports.



(Example Diagram)

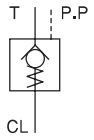
● Ram Cylinder System (with auxiliary cylinder)



〔Solenoid Shifting and Operation〕

Solenoid	Rapid Increase	Pressure	Rapid Decrease
❶	ON	OFF	ON
❷	OFF	ON	OFF
❸	ON	ON	OFF
❹	OFF	OFF	ON

Graphic Symbol



Specifications

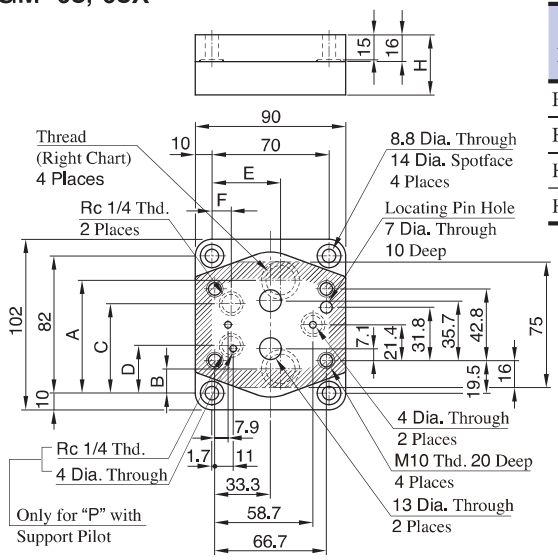
Model Numbers	Piping Size	Max. Flow★1 L/min	Max. Operating Pressure MPa	Cracking Pressure MPa	Min. Pilot Pressure Ratio★2 (Direct Type)		Pilot Volume cm^3
					P-Line Pressure	C-Line Pressure	
PI＊F- 40-10	65A	200	25	0.011	3.4 : 1		2.5
PI＊F- 50-10	80A	400		0.012	4.0 : 1		4.9
PI＊F- 63-10	90A	630			4.0 : 1		8.5
PI＊F- 80-10	100A	1000			4.3 : 1		16.3
PI＊F-100-10	125A	1600			4.3 : 1		31.8

★1. Each maximum flow rate is an approximate value when the pressure drop at free flow is ⊿P≒0.03 MPa.
★2. The minimum pilot pressure ratio is determined by the area ratio between the seat and pressured part of the pilot. The decompression type is also available.

For details about In-Line Prefill Valves, refer to the model catalogues.

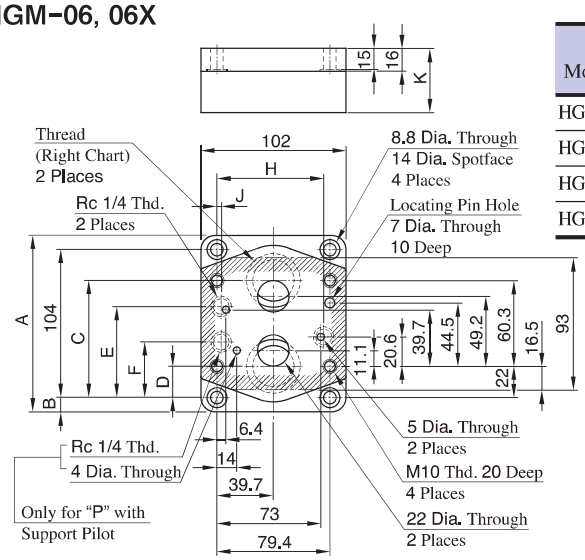
HGM-03, 03X

Sub-plate



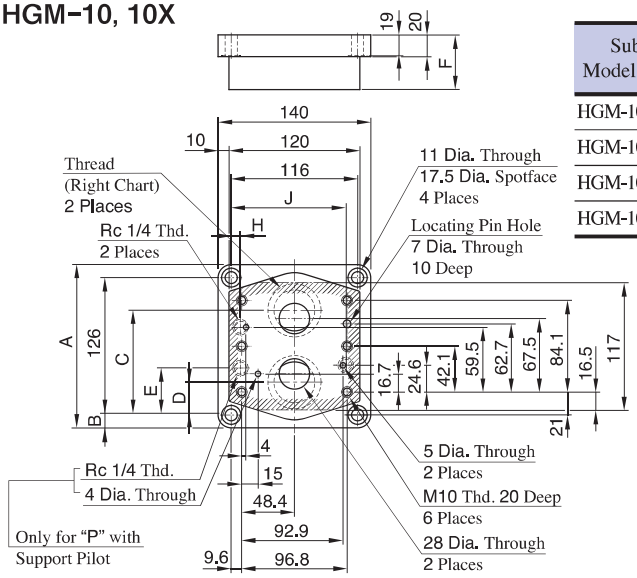
Sub-plate Model Numbers	Thread Size Rc	A	B	C	D	E	F	H
HGM-03-20	3/8	61	21	40.9	—	35	9.6	32
HGM-03X-20	1/2							
HGM-03-P-20	3/8	69.5	12.5	53.5	28.5	35	11.5	36
HGM-03X-P-20	1/2	67.5	14.5			41		

HGM-06, 06X



Sub-plate Model Numbers	Thread Size Rc	A	B	C	D	E	F	H	J	K
HGM-06-20	3/4	124	10	77	27	61.7	—	73	6.4	36
HGM-06X-20	1	136	16	82.3	22	61.7	—	75	6.4	45
HGM-06-P-20	3/4	124	10	77	27	64	39	73	3	36
HGM-06X-P-20	1	136	16	82.3	22	64	39	75	3	45

HGM-10, 10X



Sub-plate Model Numbers	Thread Size Rc	A	B	C	D	E	F	H	J
HGM-10-20	1 1/4	150	12	96	30	—	45	13.6	102.5
HGM-10X-20	1 1/2	177	25.5	104	22	—	50	13.6	102.5
HGM-10-P-20	1 1/4	150	12	96	30	43	45	9.6	102.5
HGM-10X-P-20	1 1/2	177	25.5	104	22	43	50	9.6	106