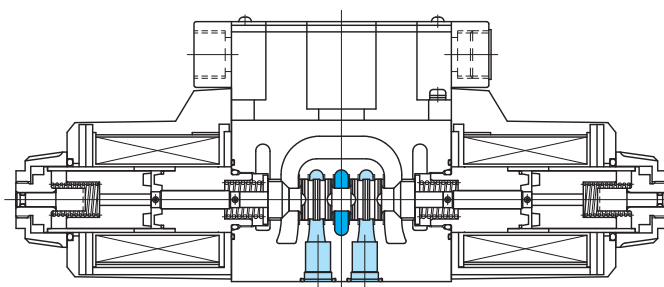
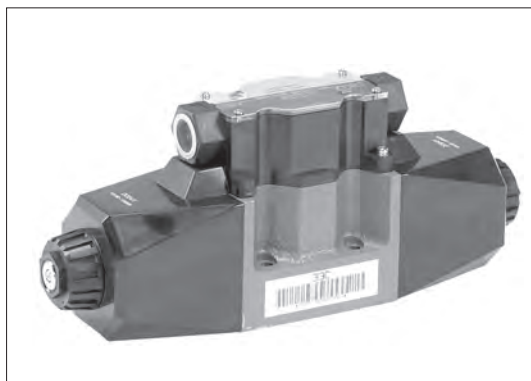


Shockless solenoid operated directional control valves DG4VS-5



- This solenoid directional valves provides reduced shock during switching (compared to standard DG4V-5).

Model Code

(F3)-DG4VS-5-2A(L)-M-P7L-H-7-40-(P10)

1 2 3 4 5 6 7 8 9 10 11 12

- 1 Hydraulic fluid
Omit: mineral oil based fluid, water-glycol based fluid
F3: Phosphate ester
- 2 Shockless solenoid operated directional control valve (gasket mounting)
Wet armature type
- 3 Mounting dimensions
5: ISO 4401-AC-05-4-A
- 4 Spool type
See page E11-2 and E11-3
- 5 Spool/spring arrangement
A: Spring offset, A type (2 position, single solenoid)
B: Spring offset, B type (2 position, single solenoid)
C: Spring centered type (3 position, double solenoid)
N: No spring detented type (2 position, double solenoid)
- 6 Solenoid assembly configuration (for spring sets, type A and B)
Omit: standard (energized: P to B, A to T)
L: Left hand build (energized: P to A, B to T)
- 7 Electrical wiring system
P: Plug-in solenoids, conduit box, G 1/2
U: DIN43650 connectors, Pg. 11
KU: Flying leads (standard lead wire length 350 mm, DC 12 V, 24 V only)
- 8 Electrical accessories
Omit: no accessories (electrical wiring KU) and for no connectors (electrical wiring U)
1: Connectors without accessories (electrical wiring U)
4: With surge suppressor (electrical wiring KU, slow solenoid deenergize)
7L: With indicator lamp and surge suppressor
9L: ADC solenoid rectifier (fast solenoid deenergization), indicator lamp and surge suppressor (electrical wiring P)
12L: ADC solenoid rectifier (slow solenoid deenergization), indicator lamp and surge suppressor (electrical wiring U)

Table of electrical accessories which can be selected

Electrical Wiring System	Solenoid Power Supply	Electrical Accessories					
		Omitted	1	2	7L	9L	12L
P	DC	×	×	×	○	×	×
	AC/DC conversion	×	×	×	×	○	×
U	DC	○	○	×	○	×	×
	AC/DC conversion	×	×	×	×	×	○
KU	DC	○	×	○	×	×	×

- : Electrical accessory which can be selected
×: Electrical accessory which cannot be selected

- 9 Solenoid voltage
See page E11-3
- 10 Allowable T port back pressure
7: 20.6 MPa
- 11 Design no.
- 12 Port orifice (option)
Omit: no port orifices (standard)
Port orifices
<Example 1> P10 (1.0 mm orifice in P port)
| Orifice Diameter
Port (A, B, P and T)
<Example 2> B12 (1.2 mm orifice in B port)
<Example 3> 2 port combinations
Combination sequence, PTAB
P10T12, P10B10

- Note:
- T port orifice is used in T port on A port side.
 - When using T port orifice, make sure that surge pressures do not exceed allowed back pressure.
 - When using port orifices, keep circuit pressure below 21 MPa.
 - When using in stacked module assemblies, consult Tokyo Keiki regarding use of port orifices.

Specifications

Model Code	Max. Working Pressure MPa	Max. Flow L/min	Allowable Tank Port Back Pressure MPa	Max. Switching Frequency (cycles/min)		Weight kg	
				DC	AC/DC Conversion	Single Solenoids	Double Solenoids
DG4VS-5	31.5	See "Pressure-Flow Characteristics"	20.6	140	100	4.4	6.1

Spool Types and Pressure-Flow Characteristics

DC, AC-DC Rectifier Solenoid (applied voltage 90% of rated)

Spool Center Position	Model Code, Functional Symbol			Max. Flow L/min															
	3 Position	2 Position		P → A (B port block)					P → B (A port block)										
		Spring Offset, B Type		P → A (B port block)					P → B (A port block)										
	Spring Centered	Spring Offset, B Type		P → A (B port block)					P → B (A port block)										
	- C -	- B -	- BL -	7 MPa	14 MPa	21 MPa	28 MPa	31.5 MPa	7 MPa	14 MPa	21 MPa	28 MPa	31.5 MPa	7 MPa	14 MPa	21 MPa	28 MPa	31.5 MPa	
0		DG4VS-5-0C 	DG4VS-5-0B 	DG4VS-5-0BL 	*	*	*	*	*	120	120	120	120	120	120	120	120	120	120
1		DG4VS-5-1C 	DG4VS-5-1B 	DG4VS-5-1BL 	*60	*50	*40	*40	*40	60	50	40	40	40	60	50	40	40	40
2		DG4VS-5-2C 	DG4VS-5-2B 	DG4VS-5-2BL 	120	120	120	120	120	120	120	110	100	95	120	120	110	100	95
3		DG4VS-5-3C 	DG4VS-5-3B 	DG4VS-5-3BL 	120	120	110	100	100	120	120	110	100	95	120	120	110	100	95
6		DG4VS-5-6C 	DG4VS-5-6B 	DG4VS-5-6BL 	120	120	110	100	100	120	120	110	100	95	120	120	110	100	95
7		DG4VS-5-7C 	DG4VS-5-7B 	DG4VS-5-7BL 	120	120	120	120	120	50	35	30	22	20	50	35	30	22	20
8		DG4VS-5-8C 	DG4VS-5-8B 	DG4VS-5-8BL 	*110	*70	*55	*50	*40	110	70	55	50	40	110	70	55	50	40
11		DG4VS-5-11C 	DG4VS-5-11B 	DG4VS-5-11BL 	*60	*50	*40	*40	*40	60	50	40	40	40	60	50	40	40	40
22		DG4VS-5-22C 	DG4VS-5-22B 	DG4VS-5-22BL 	—	—	—	—	—	120	120	110	100	95	120	120	110	100	95
31		DG4VS-5-31C 	DG4VS-5-31B 	DG4VS-5-31BL 	120	120	110	100	100	120	120	110	100	95	120	120	110	100	95
33 34		DG4VS-5-33/34C 	DG4VS-5-33/34B 	DG4VS-5-33/34BL 	120	120	120	120	120	120	120	110	100	95	120	120	110	100	95

- Note:
- Max. flow refers to limit flow without valve malfunction for valve switching.
 - Max. flow values with marked * indicate that with A port and B port are blocked.
 - For KU4 coil, it may differ from this table.

Spool Types and Pressure-Flow Characteristics

DC, AC-DC Rectifier Solenoid (applied voltage 90% of rated)

Spool Transient Condition	Model Code, Functional Symbol			Max. Flow L/min																
	2 Position			N, A, AL					N, A			AL			N, A			AL		
	No Spring Detented	Spring Offset, A Type																		
	- N -	- A -	- AL -																	
				7 MPa	14 MPa	21 MPa	28 MPa	31.5 MPa	7 MPa	14 MPa	21 MPa	28 MPa	31.5 MPa	7 MPa	14 MPa	21 MPa	28 MPa	31.5 MPa		
2		DG4VS-5-2A	DG4VS-5-2AL			50	38	30	22	20	48	32	24	21	20	48	32	24	21	20
		DG4VS-5-22A	DG4VS-5-22AL			—	—	—	—	—	48	32	24	20	20	48	32	24	21	20
		DG4VS-5-2N									120	120	90	80	80	120	120	90	80	80
		DG4VS-5-22N									120	120	90	80	80	120	120	90	80	80

Note: • Max. flow refers to limit flow without valve malfunction for valve switching.
• For KU4 coil, it may differ from this table.

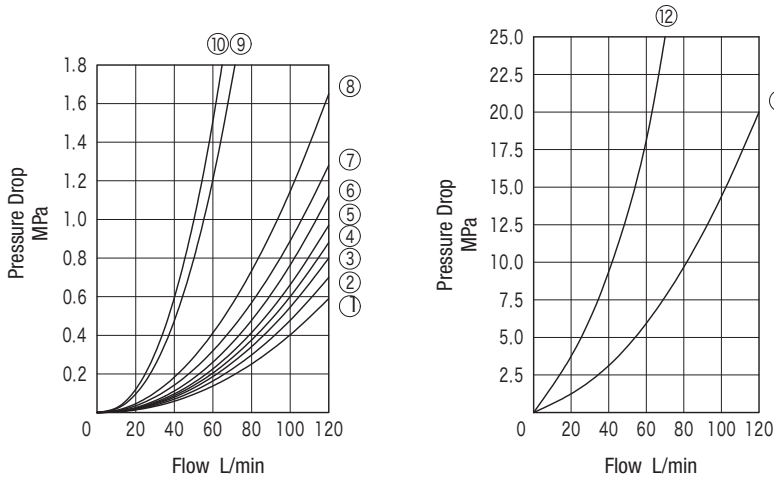
Solenoid Specifications

Power Supply	Voltage Code	Voltage V	Frequency Hz	Initial Current A	Holding Current A	Power Consumption W	Allowable Voltage Fluctuation %	Insulation Class (Allowable Temperature)
DC	G	12	—	—	3.17	38	±10	H (180°C)
	H	24			1.58			
	R	100			0.38			
AC ↓ DC (AC/DC conversion) (ADC)	TR	AC100 V 50/60 Hz ↓ DC90 V (coil)	—	—	0.42	38	±10	H (180°C)
	BR	AC110 V 50/60 Hz ↓ DC100 V (coil)			0.38			
	VR	AC200 V 50/60 Hz ↓ DC180 V (coil)			0.21			

Note: • Current values and power consumption varies with temperature conditions. Values shown in table are based on 20°C.
• In the AC/DC conversion type, AC power is used to activate the DC solenoid by the built-in rectifier, and it comes with the characteristics featured by DC solenoids. This means that the items given for the DC solenoids apply for the maximum flow.
• Consult Tokyo Keiki for details on solenoids for the supply voltages which are not listed above.

Characteristics Curve (viscosity 36 mm²/s, specific gravity 0.87) (typical examples)

Pressure Drop Characteristics



1. For pressure drops (ΔP_1) of viscosities other than 36 mm²/s, calculate using multiplier coefficients shown in below table.
2. The formula to calculate pressure drops (ΔP_1) for specific gravities other than 0.87 is as follows.

$$\Delta P_1 = \Delta P \times G_1 / G$$

$$\Delta P \dots \dots \text{Values according to characteristics curve}$$

$$G \dots \dots 0.87$$

$$G_1 \dots \dots \text{Desired specific gravity value}$$

Viscosity mm ² /s	10	20	30	36	40	50	60	70	80	90	100	110	120	130	140	150
Coefficient	0.73	0.86	0.96	1.00	1.03	1.09	1.14	1.18	1.22	1.26	1.29	1.32	1.35	1.38	1.40	1.43

Pressure Drop Curve Number

Spool Type	C, B, BL								A Note:				N						
	Switched Condition				Neutral Condition				Spool Type	Switched Condition				Spool Type	Switched Condition				
	P	B	P	A	P	A	B	P		P	P	B	P		A	P	B	P	A
	↓	↓	↓	↓	↓	↓	↓	↓		↓	↓	↓	↓		↓	↓	↓	↓	↓
A	T	B	T	T	T	T	A	B	A	T	B	T	A	T	B	T			
0	②	⑤	②	⑤	③	—	—	—	—	2	⑥	⑦	⑥	⑦	2	⑤	⑥	⑤	⑥
1	①	⑤	④	⑤	⑥	—	—	—	—	22	⑥	—	⑥	—	22	⑤	—	⑤	—
2	⑤	⑥	⑤	⑥	—	—	—	—	—										
3	⑤	⑥	⑤	④	—	⑩	—	—	—										
6	⑤	④	⑤	④	—	⑩	⑨	—	—										
7	③	⑥	③	⑥	—	—	—	⑥	⑥										
8	②	⑦	②	⑦	⑧	—	—	—	—										
11	④	⑤	①	⑤	⑥	—	—	—	—										
22	⑤	—	⑤	—	—	—	—	—	—										
31	⑤	④	⑤	④	—	—	⑨	—	—										
33	⑤	⑥	⑤	⑥	—	⑫	⑫	—	—										
34	⑤	⑥	⑤	⑥	—	⑪	⑪	—	—										

Note: Column A applicable in case of AL, with B transposed for A and A transposed for B for P to A and P to B.

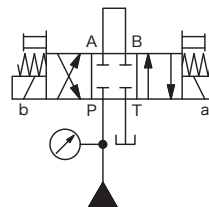
Switching Times

Power Supply	Operation	Spring Centered	Spring Offset	No Spring Detented
DC	Energize	120		120
	Spring Return	50 * (175)		
AC/DC conversion (with Rectifier)	Energize	120		120
	Spring Return	F	75	
		S	175	

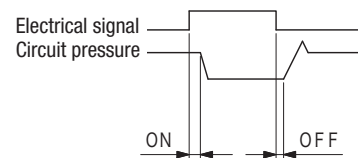
Note: • Values shown may vary according to spool type and circuit conditions.
• * Indicates KU4 coil.

Conditions: No. 2 spool, open loop circuit, flow 60 L/min, supply pressure 17.5 MPa, fluid viscosity 36 mm²/s

[Circuit Example]



[Switching Time Definition]



Notes on Operation

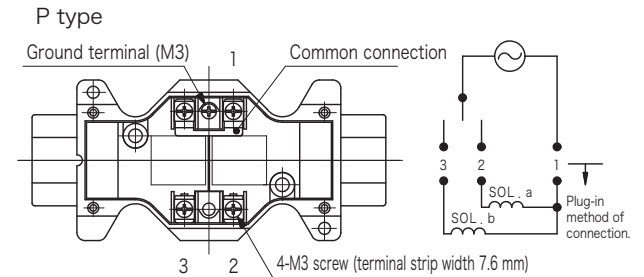
- **Mounting orientation**
To ensure sure switching of no spring detented type valves, mount valves so spool axis is horizontal. There are no mounting attitude restrictions for other spool/spring arrangements.
- **Solenoid energization**
Always ensure that one side of solenoid is deenergized before energizing the opposite side. For spring centered and spring offset valves, solenoid should be continuously energized during circuit switching. Deenergization of solenoid will cause spool to return to prescribed position by spring force. For no spring detented type valves, spool will be maintained in switched position by the detent but to ensure sure circuit switching, solenoid should be energized for more than 0.1 second.
- **T (tank) port piping**
Prevent abnormal pressure surges above the allowable back pressure rating from being generated in T port. Valve is wet armature type so ensure that valve is always filled with oil.
- **Using valves as two-way and three-way**
Valve is designed as four-way and max. flow is limited when using as two or three-way valves. Consult Tokyo Keiki for details.
- **Long periods of solenoid energization**
Care should be paid as long periods of solenoid energization at high pressure may cause spool sticking and switching malfunction.
- **Malfunctions due to surge pressure**
Avoid combining flows of tank lines prone to surge pressures. Surge pressures in T port may lead to spool malfunctions. No spring detented type valves are susceptible to such malfunctions during deenergization.
- **Manual operation**
For manual switching, push the manual override pin. Be aware that actuation force increases with higher back pressure. (See graph)

Mounting Bolts (JIS B 1176, Strength Class 12.9)

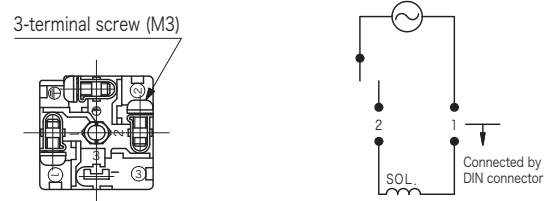
Hex Socket Bolts	Qty
M6 × 40	4

- Mounting bolts must be ordered separately.
- Tightening torque of mounting bolts: 12 to 15 N•m

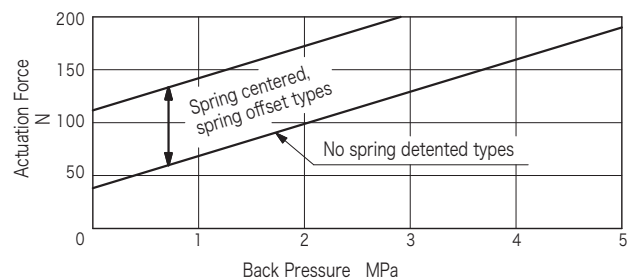
- **Solenoid indicator lamp**
For valves with indicator lamps, the lamps will light when current flows to the solenoid.
- **Electrical wiring**
Solenoid and conduit box are pre-wired. Refer to below diagrams for wiring from power source to conduit box and DIN connectors.



U type (DIN connector) The electrical wiring has no polarities.



Terminals 1 and 2 have no polarities.



Subplate

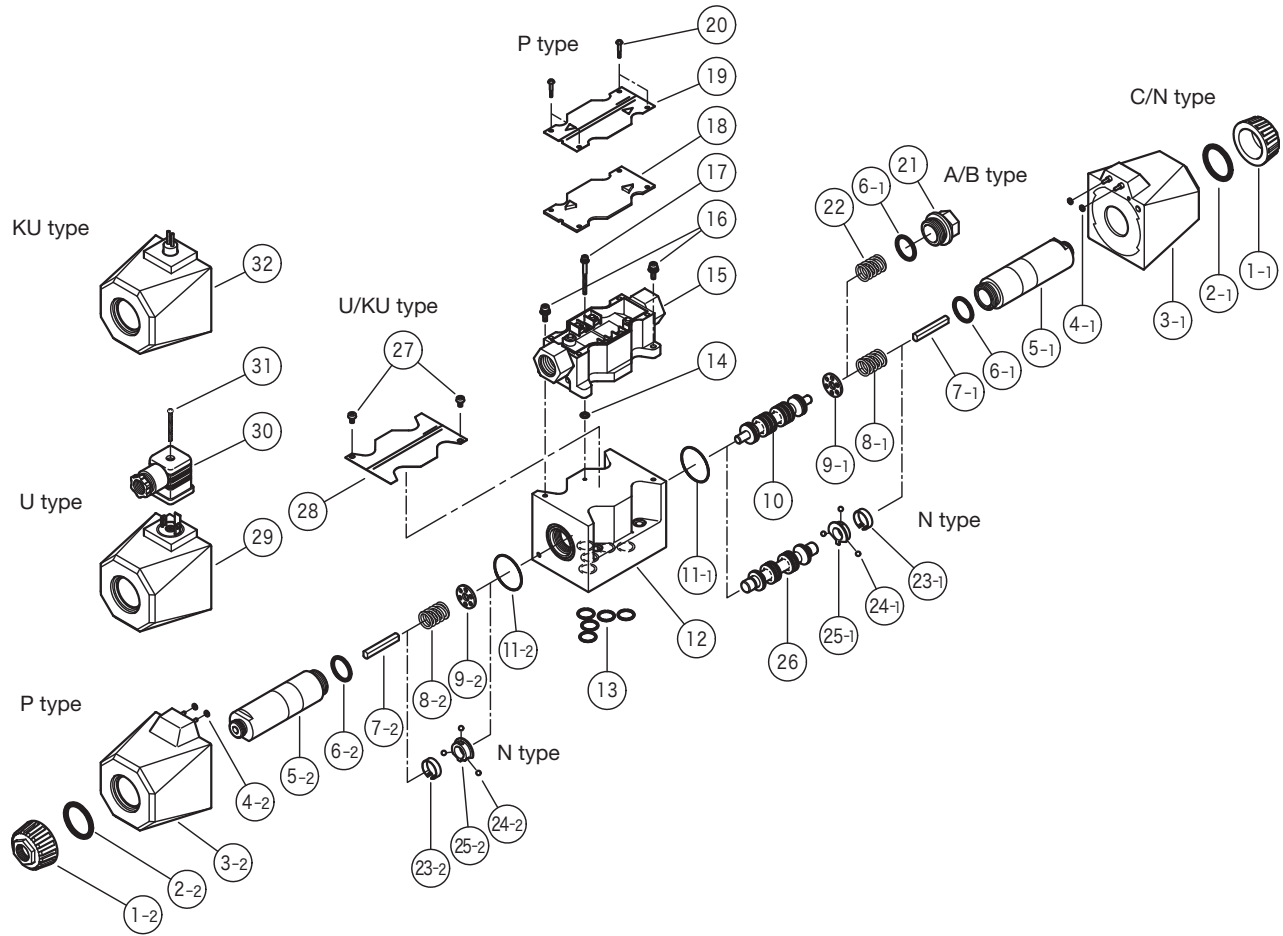
Subplate	Connection Port Dia. Rc
DGSM-01X-10-JA-M	3/8
DGSM-01Y-10-JA-M	1/2

- Subplate and bolts must be ordered separately.
- See page R6-7 for dimensions.
- See page R6-7 for plural mount subplates.
- Max. working pressure is 21 MPa. For higher pressures, valve should be mounted on manifold block.

Dimensions

Dimensions and mounting are same as DG4V-5. See page E3-6 (Mounting) and E3-7 to E3-9 (Dimensions).

Construction



O-ring

No.	Part No.	Standard	Qty	
			A/B	C/N
2	007921617	AS568-216 (NBR, Hs70)	1	2
4	008000217	JIS B 2401 1A-P4	2	4
6	007911729	AS568-117 (FKM, Hs90)	2	2
11	007902617	AS568-026 (NBR, Hs70)	1	2
13	007901419	AS568-014 (NBR, Hs90)	5	5
14	007900817	AS568-008 (NBR, Hs70)	1	1

Note: <4> and <14> only used for P type.

Solenoid coil (P type)

No.	Voltage Code	Part No.
3	G	40018937
	H	40018938
	R	40018939
	TR	40018940
	BR	40028832
	VR	40018941

Solenoid coil (U type)

No.	Voltage Code	Part No.
29	G	40018969
	H	40018970
	R	40018971
	TR	40028810
	BR	40018971
	VR	40028811

Solenoid coil (KU type)

No.	Electrical Accessories, Voltage Code	Part No.
32	KU-G	40028127
	KU-H	40028128
	KU4-G	40028311
	KU4-H	40028312