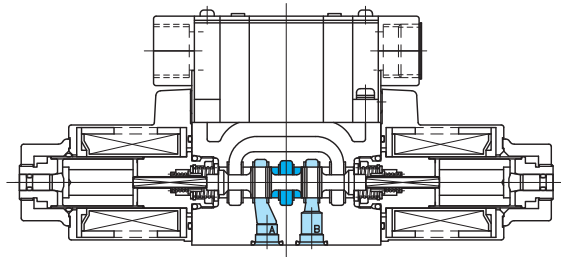


Mini-watt solenoid operated directional control valves DG4SM-3



● This mini-watt valve uses 5W power consumption solenoids.

Model Code

(F3)-DG4SM-3-2A(L)-P7-H-(P08)-54

1 2 3 4 5 6 7 8 9 10 11

- | | |
|---|--|
| <p>1 Hydraulic fluid
Omit: mineral oil based fluid, water-glycol based fluid
F3: Phosphate ester</p> <p>2 Mini-watt solenoid operated directional control valve (gasket mounting)
Wet armature type</p> <p>3 Mounting dimensions
3: ISO 4401-03</p> <p>4 Spool type
See page E12-2</p> <p>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)</p> <p>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)</p> <p>7 Electrical wiring (configuration, wiring connection port side)
P: Plug-in solenoids, conduit box, G 1/2
KU: Lead wire system (standard lead wire length: 350 mm)</p> | <p>8 Electrical accessories
Omit: no accessories (electrical wiring KU)
7: With indicator lamp and surge suppressor (electrical wiring P)</p> <p>9 Solenoid voltage
G: DC12 V
H: DC24 V</p> <p>10 Port orifice (option)
Omit: no port orifices (standard)
Port orifices
<Example 1> P08 (0.8 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, P08B10</p> <p>11 Design no.</p> |
|---|--|

Specifications

Model Code	Max. Working Pressure MPa	Max. Flow L/min	Allowable Tank Port Back Pressure MPa	Max. Switching Frequency (cycles/min)	Weight kg	
					Single Solenoids	Double Solenoids
DG4SM-3	16	See "Pressure-Flow Characteristics"	15.7	180	1.6	2.0

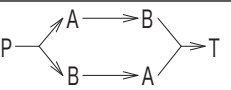
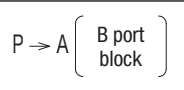
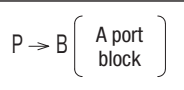
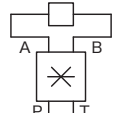
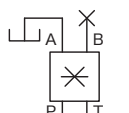
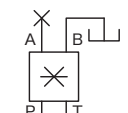

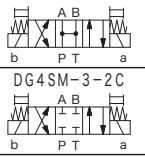
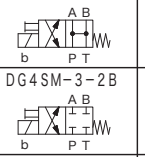
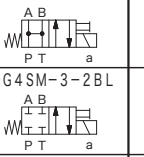

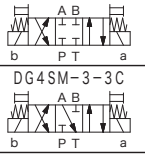
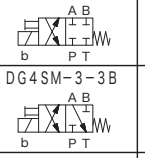
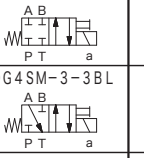

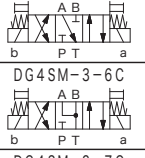
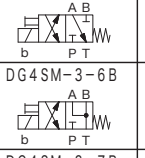
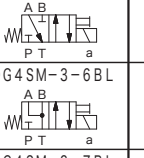

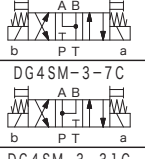
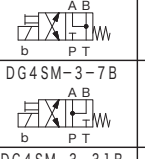
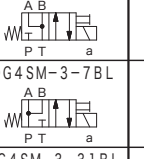

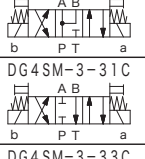
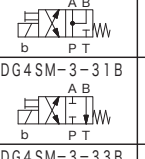
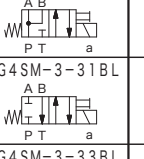

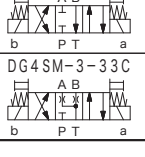
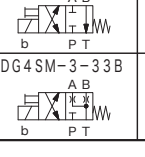
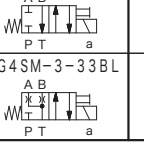

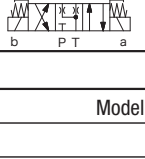
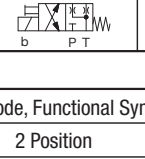
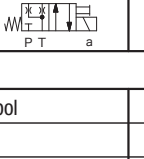
Solenoid Specifications

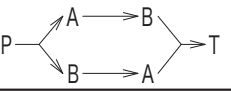
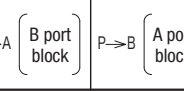
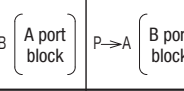
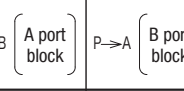
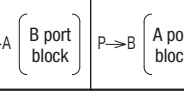
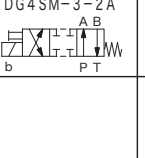
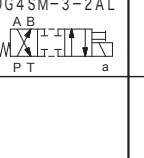
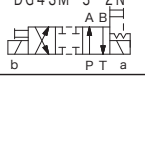
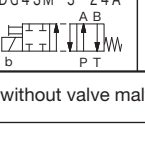
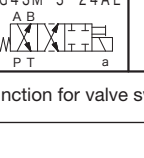
Power Supply	Voltage Code	Voltage V	Holding Current A	Power Consumption W	Allowable Voltage Fluctuation %	Insulation Class (Allowable Temperature)
DC	G	12	0.50	6.0	± 10	B (130°C)
	H	24	0.23	5.5		

Note: ● Current values and power consumption varies with temperature conditions. Values shown in table are based on 20°C.

Spool Types and Pressure-Flow Characteristics

DC Solenoids (applied voltage 90% of rated)

Spool Center Position	Model Code, Functional Symbol			Max. Flow L/min								
	3 Position	2 Position										
	Spring Centered	Spring Offset, B Type										
- C -	- B -	- BL -	7MPa	10, 5MPa	16MPa	7MPa	10, 5MPa	16MPa	7MPa	10, 5MPa	16MPa	
0	 DG4SM-3-0C 	DG4SM-3-0B 	DG4SM-3-0BL 	30	30	30	30	30	30	30	30	
2	 DG4SM-3-2C 	DG4SM-3-2B 	DG4SM-3-2BL 	30	30	30	30	30	10	30	10	
3	 DG4SM-3-3C 	DG4SM-3-3B 	DG4SM-3-3BL 	30	30	5	30	30	10	30	30	
6	 DG4SM-3-6C 	DG4SM-3-6B 	DG4SM-3-6BL 	30	30	20	30	30	—	30	30	
7	 DG4SM-3-7C 	DG4SM-3-7B 	DG4SM-3-7BL 	30	30	30	—	—	—	—	—	
31	 DG4SM-3-31C 	DG4SM-3-31B 	DG4SM-3-31BL 	30	30	5	30	30	—	30	10	
33	 DG4SM-3-33C 	DG4SM-3-33B 	DG4SM-3-33BL 	30	30	20	30	30	10	30	10	

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 -	7MPa	10, 5MPa	16MPa	7MPa	10, 5MPa	16MPa	7MPa	10, 5MPa	16MPa	
2	DG4SM-3-2A 	DG4SM-3-2AL 		30	30	30	10	—	—	30	—	—
	DG4SM-3-2N 			30	30	30	30	20	10	30	20	10
24	DG4SM-3-24A 	DG4SM-3-24AL 		20	20	20	10	—	—	—	—	—

Note: Max. flow refers to limit flow without valve malfunction for valve switching.

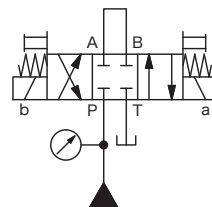
Switching Times

Power Supply	Operation	Unit: ms		
		Spring Offset Spring Centered C, B, BL	Spring Offset A, AL	No Spring Detented N
DC	Energize	75		75
	Spring Return	35		

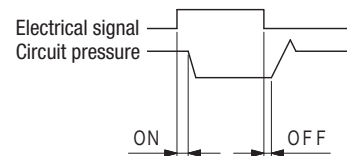
Note: Values shown may vary according to spool type and circuit conditions.

Conditions: No. 2 spool, open loop circuit, flow 20 L/min, supply pressure 16 MPa, fluid viscosity 20 mm²/s

[Circuit Example]

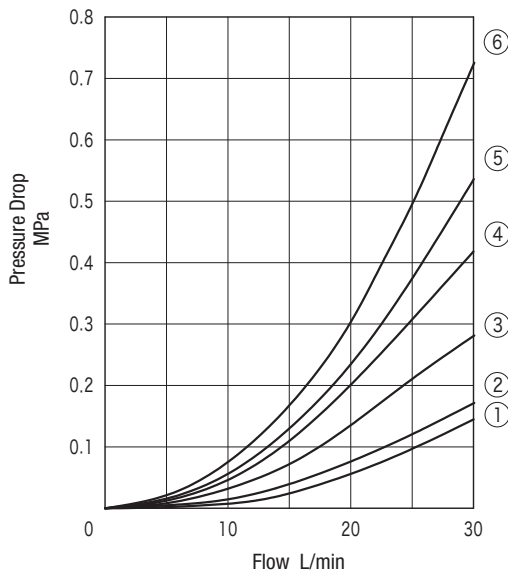


[Switching Time Definition]



Characteristics Curve (viscosity 20 mm²/s, specific gravity 0.87) (typical examples)

Pressure Drop Characteristics



Pressure Drop Curve Number

C, B, BL									
Spool Type	Switched Condition				Neutral Condition				
	P ↓ A	B ↓ T	P ↓ B	A ↓ T	P ↓ T	A ↓ T	B ↓ T	P ↓ A	P ↓ B
0	②	①	②	①	②	③	③	②	②
2	⑥	④	⑥	④	—	—	—	—	—
3	⑥	④	⑥	②	—	④	—	—	—
6	⑥	②	⑥	②	—	④	④	—	—
7	②	⑤	②	⑤	—	—	—	⑤	⑤
31	⑥	②	⑥	④	—	—	④	—	—
33	⑥	④	⑥	④	—	—	—	—	—

A, AL					N				
Spool Type	Switched Condition				Spool Type	Switched Condition			
	P ↓ A	B ↓ T	P ↓ B	A ↓ T		P ↓ A	B ↓ T	P ↓ B	A ↓ T
2	④	④	⑥	⑥	2	⑥	⑥	⑥	⑥
24	⑥	④	⑥	④					

1. For pressure drops (ΔP_1) of viscosities other than 20 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.

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

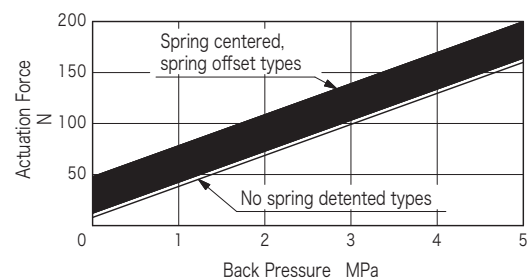
ΔP Values according to characteristics curve
 G 0.87
 G_1 Desired specific gravity value

Viscosity mm ² /s	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Coefficient	0.85	1.00	1.09	1.17	1.24	1.29	1.34	1.38	1.42	1.46	1.49	1.52	1.56	1.59	1.62

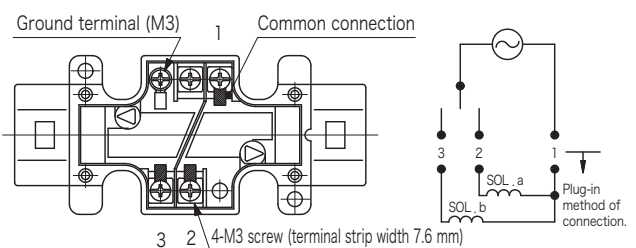
Notes on Operation

- **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 0.2 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)



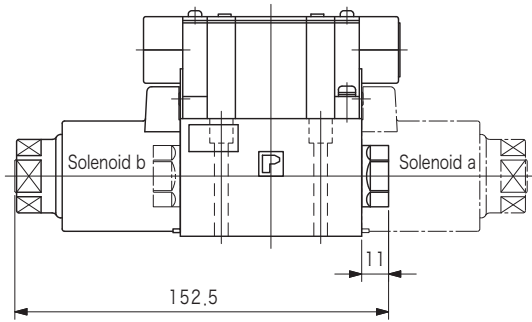
- **Solenoid indicator lamp**
For valves with indicator lamps, the lamps will light when current flows to the solenoid.
- **Conduit box wiring**
Solenoid and conduit box are pre-wired. Refer to below diagrams for wiring from power source to conduit box.



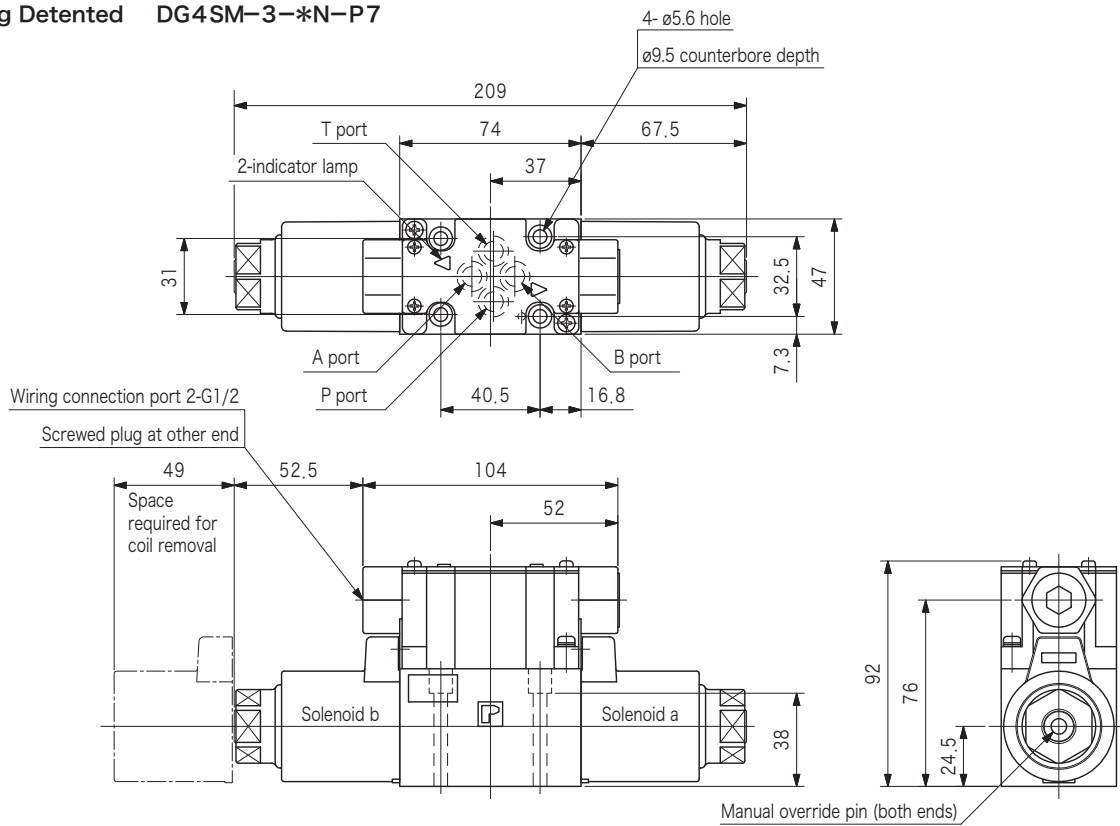
The electrical wiring has no polarities.

Dimensions

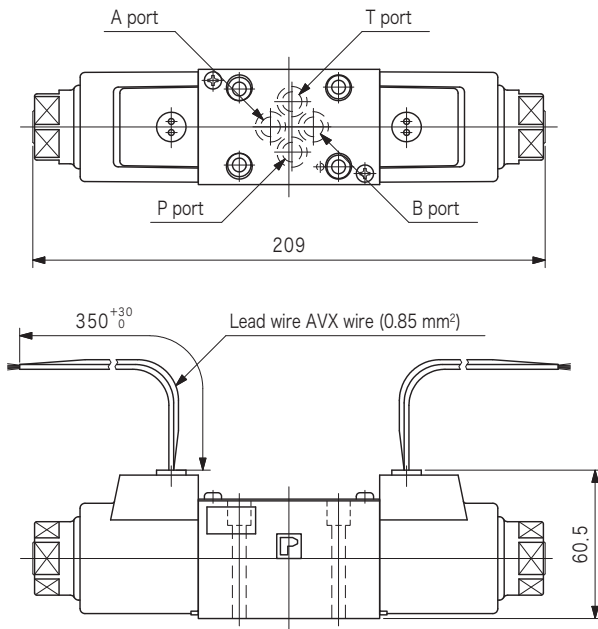
Spring Offset DG4SM-3-*A/B-P7 (solid line)
 Spring Offset DG4SM-3-*AL/BL-P7 (dashed line)



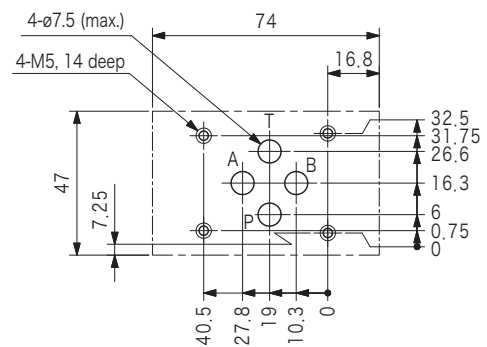
Spring Centered DG4SM-3-*C-P7
 No Spring Detented DG4SM-3-*N-P7



DG4SM-3-*C/N-KU



●Mounting dimensions



●Mounting surface machining accuracy

Surface Roughness	1.6 μm Ra	
Flatness	Less than 0.01 (□ per 100 mm)	0.01 / 100
Permissible Tolerance	Mounting bolt hole: ±0.1 Ports: ±0.2	

Mounting Bolts (JIS B 1176, Strength Class 12.9)

Hex Socket Bolts	Qty
M5 × 50	4

- Mounting bolts must be ordered separately.
- Tightening torque of mounting bolts: 7 to 8 N•m

Subplate

Subplate		Connection Port Dia. Rc
Side Piping	DGMS-3-1E-10-T-JA-J	3/8
Bottom Piping	DGVM-3-10-T-JA-J	

- Subplate and bolts must be ordered separately.
- See page R6-6 for dimensions.
- See page R6-6 for plural mount subplates.

Construction

O-ring

No.	Part No.	Standard	Qty	
			A/B	C/N
2	008001817	JIS B 2401 1A-P20	1	2
4	008000217	JIS B 2401 1A-P4	2	4
5	007902617	AS568-026 (NBR, Hs70)	1	2
7	007911429	AS568-114 (FKM, Hs90)	1	2
16	007901219	AS568-012 (NBR, Hs90)	4	4
23	007911419	AS568-114 (NBR, Hs90)	1	—
32	007900817	AS568-008 (NBR, Hs70)	1	1

Solenoid coil

No.	Voltage Code	Part No.
3	G	40078358
	H	40078359

