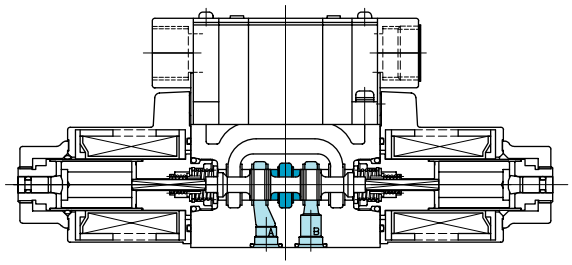
Mini-watt solenoid operated directional control valves DG4SM-3



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

Model Code

(F3) - DG4SM - 3 -2 A(L) -P 7- H- (P08) - 54

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

1 Fluid
Omitted for mineral oil, water glycol
F3: phosphate ester

2 Mini-watt CETOP 3 solenoid directional valve
Wet armature type (gasket mounting)

3 Mounting
3: ISO 4401-03

4 Spool
See page E21

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 (3 position, double solenoid)
N: No spring detented (2 position, double solenoid)

6 Solenoid assembly orientation (for spool/spring arrangement A, B)
Omitted for standard (energized P to B, A to T)
L: Left hand build
(energized: P to A, B to T)

7 Electrical wiring (configuration, port thread size)
P: Plug-in type conduit box, G 1/2
KU: Flying lead type (standard lead wire length, 350mm)

8 Electrical accessories
Omitted for no accessories (for KU type electical wiring)
7: WIth indicator lamp and surge suppressor
(for P type conduit box wiring)

9 Solenoid coil voltage
G:DC12V
H:DC24V

10 Port orifice (option)
Omitted for no port orifice (standard)
Port orifices
<Example> P08 (0.8mm in P port)
Orifice diameter
Port (A, B, P, T)
<Example2> B12 (1.2mm orifice in B port)
<Example 3> 2 port orifice combinations
Combination sequence, PTAB
P10T12, P08B10

11 Design no.

Specifications

Model Code	Maximum Operating Press. MPa	Max. Flow L/min	Allowable Tank Port Back Pressure MPa	Max. Switching Freq. (cycles/min.)	Weight kg	
					Single Solenoid	Double Solenoid
DG4SM-3	16		15. 7	180	1. 6	2. 0

Solenoid Specifications

Power Supply	Volt. Code	Voltage V	Holding Current A	Power Consump. W	Allow. Tank Port Back Pressure %	Insul. Class (Allow. Temp.)
DC	G	12	0. 45	5. 4	±10	B (130 °C)
	H	24	0. 23	5. 5		

Note: • Current values and power consumption varies according to temperature conditions. Table at left is based on values at 20°C.

Spool Types and Pressure-Flow Characteristics

DC Solenoid (applied voltage 90% of rated)

Spool Neutral Position	Valve Function Schematics			Max. Flow L/min								
	3 Position	2 Position		P→A, B→T			P→A (B Port blocked)			P→B (A Port blocked)		
	Spring Centered	Spring Offset, Type B										
	– C –	– B –	– BL –	7 MPa	10.5MPa	16MPa	7 MPa	10.5MPa	16MPa	7 MPa	10.5MPa	16MPa
0	DG4SM-3-0C	DG4SM-3-0B	DG4SM-3-0BL	30	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	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	30	10
33	DG4SM-3-33C	DG4SM-3-33B	DG4SM-3-33BL	30	30	30	30	30	10	30	30	10

Spool Transient Condition	Valve Function Schematics			Max. Flow L/min								
	2 Position			N, A, AL			N, A		AL	N, A		AL
	No Spring Detented	Spring Offset, Type A		P→A, B→T			P→A (B Port blocked)		P→B (A Port blocked)	P→B (A Port blocked)		P→A (B Port blocked)
	– N –	– A –	– AL –	7 MPa	10.5MPa	16MPa	7 MPa	10.5MPa	16MPa	7 MPa	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 without valve malfunction.

Switching Times

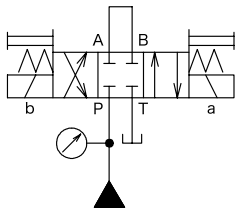
Unit : ms

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

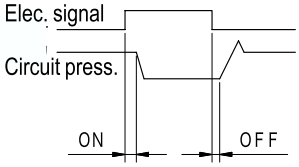
Note: • Values may differ according to spool type, circuit condition.

Conditions: Spool type 2, open loop circuit, flow 20 L/min, supply pressure 16 MPa, fluid viscosity 20 mm²/s

[Circuit Example]

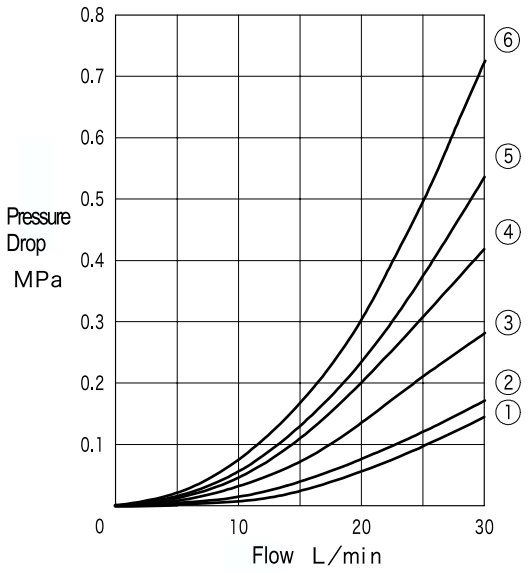


[Switching Time Definition]



Performance Curve (viscosity 20 mm²/s , specific gravity 0.87)

Pressure Drop Characteristics



Pressure Drop Curve No.

Spool	C, B, BL Switched Condition P↓A	B↓T	P↓B	A↓T	Neutral Condition 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	—	—	—	—	—

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

Spool	N Switched Condition P↓A	B↓T	P↓B	A↓T
2	⑥	⑥	⑥	⑥

1. For pressure drops ($\triangle P_1$) of viscosities other than 20mm²/s, calculate using multiplier coefficients shown in below table.

2. The formula to calculate pressure drops ($\triangle P_1$) for specific gravities other than 0.87 is as follows:

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

$\triangle P$ ····· Value from press. drop curve
G ····· 0.87
G_1 ····· Selected specific gravity

Viscosity mm²/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

Operating Considerations

• 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 insure that one side solenoid is deenergized before energizing the opposite side solenoid. 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.

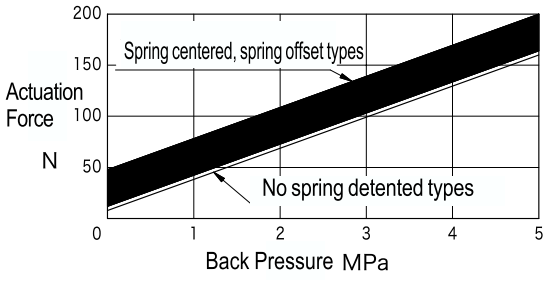
• T (tank) port piping
Prevent abnormal pressure surges above the allowable back pressure rating from being generated in T port. Valve is wet armature type so insure that valve is always filled with oil.

• Using valves as two-way and three-way
Valve is designed as four-way and as such max. flow is limited when using as two or three-way valves. Consult TOKIMEC for details.

• Long periods of solenoid eanergization
Care should be paid as long periods of solenoid energization at high pressure may cause spool "sticking" and switching malfunction.

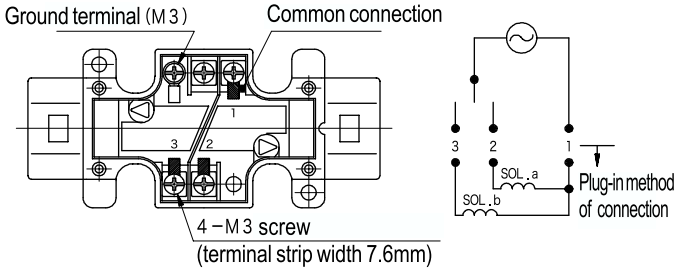
• Malfunctions due to surge pressure
Avoid combining flows of tank lines prone to surge pressures. Surge pressures in valve T port may lead to spool malfunctions. No spring detented type valves are susceptible to such malfunctions during deenergization.

• Manual operation
For manual switching, push the manual override pin. Be aware that actuation force increases with higher back pressure. (See graph)



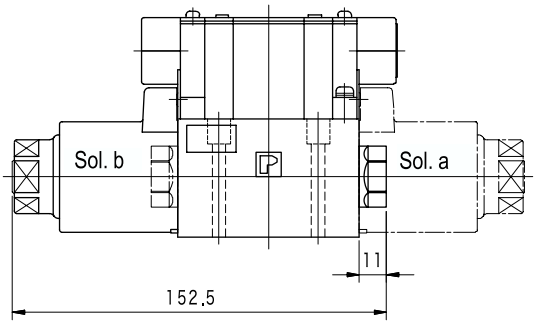
• Solenoid indicator lamp
For valves with indicator lamps, the lamps will light when current flows to the solenoid.

• Conduit box wiring
Solenoid and conduit box are pre-wired. Refer to below diagrams for wiring from power source to conduit box or DIN connectors.

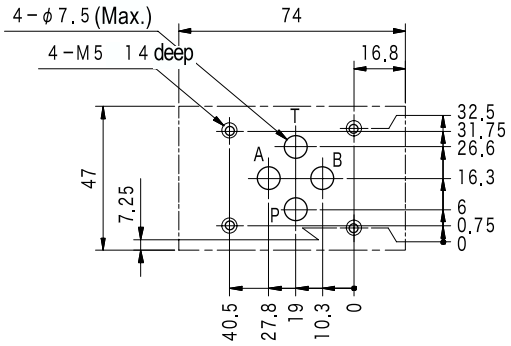


Dimensions

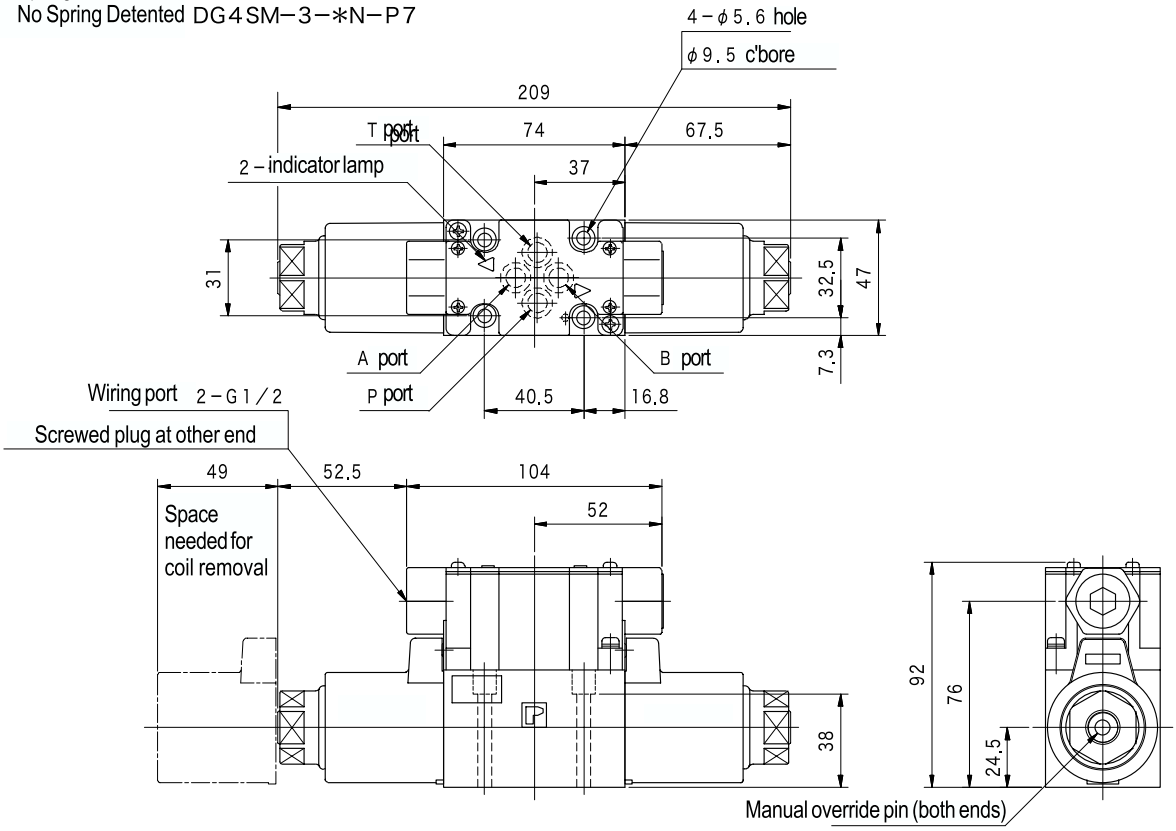
Spring Offset DG4SM−3−∗A/B−P7
Spring Offset DG4SM−3−∗AL/BL−P7



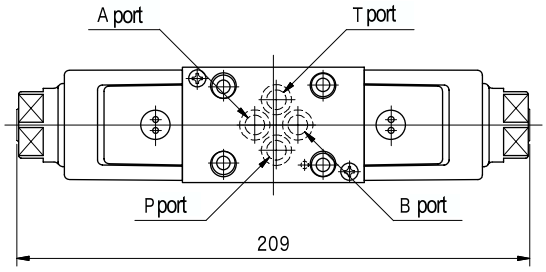
Mounting Dimensions (ISO 4401−03)

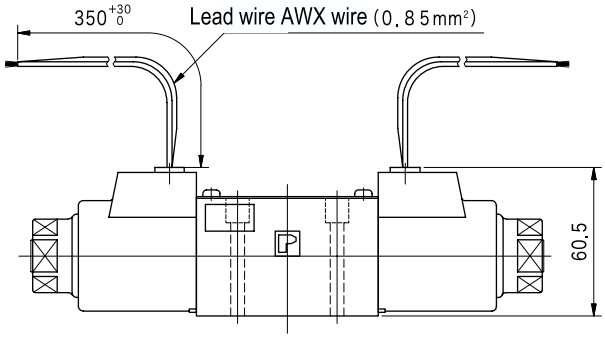


Spring Centered DG4SM−3−∗C−P7
No Spring Detented DG4SM−3−∗N−P7



DG4SM−3−∗C/N−KU





Mounting Bolts (JIS B1176,Strength Class 12.9)

Hex Socket Bolts	Qty
M5 × 50	4

- Order mounting bolts separately.
- Mounting bolt tightening torque: 7 ~ 8Nm

Subplate

Subplate Model		Port Dia. Rc
Side Ported	DGMS-3-1E-10-T-JA-J	3/8
Rear Ported	DGVM-3-10-T-JA-J	

- Subplate and bolts must be ordered separately.
- See page Q8 for dimensions.
- See page Q8 for multiple valve mount subplates.

Construction

O-Rings

No.	Part No.	Standard	Qty A/B	Qty 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