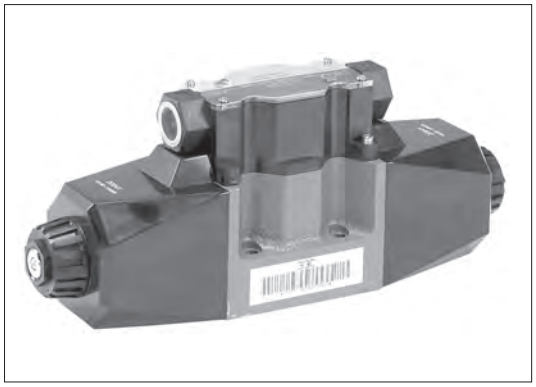
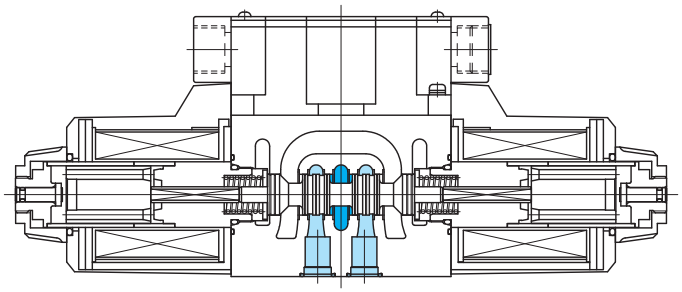
Solenoid operated directional control valves DG4V-5, 40





●Wet type solenoid valve boasts superior valve life with low switching noise. No seals on sliding surfaces eliminates leakage worries.
●Many valve options including 3 types of wiring connections, indicator lamp, surge suppressor, and AC/DC rectifier.

Model Code

(F3)-DG4V-5-2A(L)-M-P7L-T-6-40-(P08)

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 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 E3-2 to E3-3
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 (configuration, wiring connection port side)
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)

Electrical Wiring System	Solenoid Power Supply	Electrical Accessories					
		Omitted	1	4	7L	9L	12L
P	AC	×	×	×	○	×	×
	DC	×	×	×	○	×	×
	AC/DC conversion	×	×	×	×	○	×
U	AC	○	○	×	○	×	×
	DC	○	○	×	○	×	×
	AC/DC conversion	×	×	×	×	×	○
KU	DC	○	×	○	×	×	×

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

9 Solenoid supply voltage (See page E3-4)
10 Allowable T port back pressure
6: 15.7 MPa (for AC solenoids)
7: 20.6 MPa (for DC, AC-DC rectifier solenoids)
11 Design no.
12 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, etc.

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			
				AC	DC	AC/DC Conversion	Single Solenoids		Double Solenoids	
							AC	DC	AC	DC
DG4V–5	31. 5	See “Pressure-Flow Characteristics”	15. 7 (AC solenoid) 20. 6 (DC solenoid)	240	180	120	3. 6	4. 4	4. 6	6. 1

Spool Types and Pressure-Flow Characteristics

Spool Center Position	Model Code, Functional Symbol			Max. Flow L/min															
	3 Position	2 Position		P → A, B → T					P → A (B port block)					P → B (A port block)					
	Spring Centered	Spring Offset, B Type																	
	– 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	DG4V-5-0C	DG4V-5-0B	DG4V-5-0BL	*160	*160	*160	*160	*160	160	160	160	160	160	160	160	160	160	160
1	DG4V-5-1C	DG4V-5-1B	DG4V-5-1BL	*60 *50	*50 *40	*40 *35	*40 *30	*40 *30	60 50	50 40	40 35	40 30	40 30	60 50	50 40	40 35	40 30	40 30
2	DG4V-5-2C	DG4V-5-2B	DG4V-5-2BL	160	160	160	160	160	160	160 100	110 160 15	100 160 10	95 160 10	160	160 100	110 160 15	100 160 10	95 160 10
3	DG4V-5-3C	DG4V-5-3B	DG4V-5-3BL	160	160	160	120 160	110 80	160	160 100	110 160 15	100 160 10	95 160 10	160	160 100	110 160 15	100 160 10	95 160 10
6	DG4V-5-6C	DG4V-5-6B	DG4V-5-6BL	160	160	160	120 160	110 80	160	160 100	110 160 15	100 160 10	95 160 10	160	160 100	110 160 15	100 160 10	95 160 10
7	DG4V-5-7C	DG4V-5-7B	DG4V-5-7BL	160	160	160	160	160	120 100	35 40	30 30	25 30	20 30	120 100	35 40	30 30	25 30	20 30
8	DG4V-5-8C	DG4V-5-8B	DG4V-5-8BL	*160	*70 *55	*55 *45	*50 *40	*50 *40	160	70 55	55 45	50 40	50 40	160	70 55	55 45	50 40	50 40
11	DG4V-5-11C	DG4V-5-11B	DG4V-5-11BL	*60 *50	*50 *40	*40 *35	*40 *30	*40 *30	60 50	50 40	40 35	40 30	40 30	60 50	50 40	40 35	40 30	40 30
22	DG4V-5-22C	DG4V-5-22B	DG4V-5-22BL	—	—	—	—	—	160 160 160	160 160 100	110 160 15	100 160 10	95 160 10	160 160 160	160 160 100	110 160 15	100 160 10	95 160 10
31	DG4V-5-31C	DG4V-5-31B	DG4V-5-31BL	160	160	160	120 160	110 80	160	160 100	110 160 15	100 160 10	95 160 10	160	160 100	110 160 15	100 160 10	95 160 10
33 34	DG4V-5-33/34C	DG4V-5-33/34B	DG4V-5-33/34BL	160	160	160	160	160	160	160 100	110 160 15	100 160 10	95 160 10	160	160 100	110 160 15	100 160 10	95 160 10

Spool Types and Pressure-Flow Characteristics

Spool Transient Condition	Model Code, Functional Symbol			Max. Flow L/min															
	2 Position			N, A, AL					N, A					AL					
	No Spring Detented	Spring Offset, A Type		P→A, B→T					P→A B port block					P→B A port block					
	– 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	
0		DG4V-5-0A	DG4V-5-0AL	*120	*120	*120	*120	*120	80	80	80	80	80	160	160	160	150	140	
				* 160	* 160	* 160	* 160	* 160	100	100	100	100	100		85	80	80	80	
															45	40	40	40	
2		DG4V-5-2A	DG4V-5-2AL	160	160	90	60	50	120	40	30	30	20	160	140	100	75	70	
						160	90	90	160	40	30	30	30		30	20	20	20	
					100	40	20	20							30	20	20	20	
		DG4V-5-22A	DG4V-5-22AL	—	—	—	—	—	120	40	30	20	20	160	140	100	75	70	
									160	40	30	30	30		30	20	20	20	
															30	20	20	20	
		DG4V-5-23A	DG4V-5-23AL	160	160	160	160	160	120	40	30	20	20	—	—	—	—	—	—
					100	75	35	30	100	35	25	20	20						
		DG4V-5-24A	DG4V-5-24AL	160	60	45	35	30	120	40	30	20	20	160	160	160	160	160	160
					40	30	30	30	160	40	30	30	30						
		DG4V-5-28A	DG4V-5-28AL	160	160	160	160	160	120	40	30	20	20	160	140	100	75	70	
									160	40	30	30	30		30	20	20	20	
															30	20	20	20	
	DG4V-5-2N			—	—	—	—	—	140	140	140	120	110	140	140	140	120	110	
											15	10	10			15	10	10	
											15	10	10			15	10	10	
	DG4V-5-22N			—	—	—	—	—	140	140	140	120	110	140	140	140	120	110	
											15	10	10			15	10	10	
											15	10	10			15	10	10	
6	DG4V-5-6N			—	—	—	—	—	140	140	140	120	110	140	140	140	120	110	
											15	10	10			15	10	10	
											15	10	10			15	10	10	

Note: • Max. flow refers to limit flow without valve malfunction for valve switching.
• Max. flow - 2nd and 3rd level values: upper level DC90%V, middle level AC50Hz85%V, lower level AC60 Hz90%V.

→ DC90%V
→ AC50Hz85%V
→ AC60Hz90%V

• Max flow value for * is with A port and B port blocked.
• For KU4 coil, it may differ from this table.

Specifications

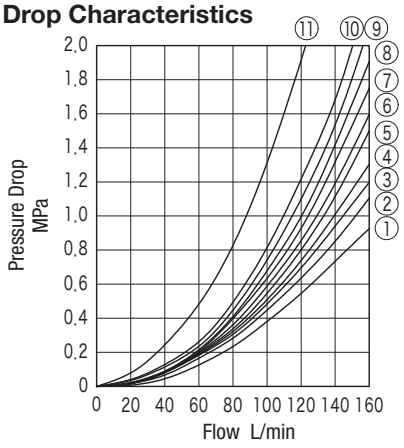
Solenoid Specifications

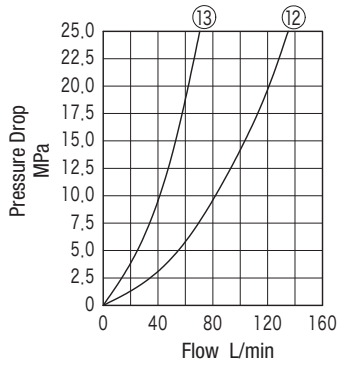
Power Supply	Voltage Code	Voltage V	Frequency Hz	Initial Current A	Holding Current A	Power Consumption W	Allowable Voltage Fluctuation	Insulation Class (Allowable Temperature)
AC	T	100	50	7. 7	0. 78	36	+10, −15	H (180°C)
			60	7. 4	0. 62	32	+20, −10	
		110	60	7. 9	0. 72	40	+10, −15	
	B	110	50	7. 0	0. 71	36	+10, −15	
		115	60	6. 9	0. 63	36	+15, −10	
		120	60	7. 3	0. 66	40	+10, −15	
	OV	200	50	3. 8	0. 39	36	+10, −15	
			60	3. 7	0. 31	32	+20, −10	
		220	60	4. 0	0. 36	40	+10, −15	
	D	220	50	3. 5	0. 36	36	+10, −15	
		230	60	3. 5	0. 32	36	+15, −10	
		240	60	3. 6	0. 33	40	+10, −15	
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.
- AC initial current and holding current are effective.

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

Pressure Drop Characteristics





1. For pressure drops ($\triangle P_1$) of viscosities other than 20 mm²/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.

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

$\triangle P$ ..... Values according to characteristics curve

G 0.87

G_1 ..... Desired specific gravity value

Viscosity mm²/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

C, B, BL										A Note:					N				
Spool Type	Switched Condition				Neutral Condition					Spool Type	Switched Condition				Spool Type	Switched Condition			
	P ↓ A	B ↓ T	P ↓ B	A ↓ T	P ↓ T	A ↓ T	B ↓ T	P ↓ A	P ↓ B		P ↓ A	B ↓ T	P ↓ B	A ↓ T		P ↓ A	B ↓ T	P ↓ B	A ↓ T
0	⑦	⑩	⑦	⑩	⑧	⑧	⑧	⑥	⑥	0	⑥	⑨	⑥	⑥	2	⑦	③	⑦	③
1	⑥	③	⑨	⑪	⑩	②	—	⑥	—	2	⑥	③	⑥	③	6	⑦	⑤	⑦	⑤
2	⑤	③	⑤	③	—	—	—	—	—	22	⑦	—	⑦	—	22	⑦	—	⑦	—
3	⑤	③	⑤	⑨	—	④	—	—	—	23	⑥	③	—	③					
6	⑤	⑨	⑤	⑨	—	④	④	—	—	24	⑥	③	—	—					
7	⑥	③	⑥	③	—	—	—	⑦	⑦	28	⑥	—	⑥	③					
8	①	⑩	①	⑩	⑪	—	—	—	—										
11	⑨	⑪	⑥	③	⑩	—	②	—	⑥										
22	⑤	—	⑤	—	—	—	—	—	—										
31	⑤	⑨	⑤	③	—	—	④	—	—										
33	⑤	③	⑤	③	—	⑬	⑬	—	—										
34	⑤	③	⑤	③	—	⑫	⑫	—	—										

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

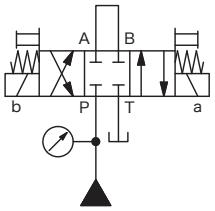
Unit: ms

Power Supply	Operation		Spring Centered	Spring Offset	No Spring
AC	Energize		10～15		10～15
	Spring Return		25		———
DC	Energize		60		60
	Spring Return		25 * (150)		———
AC/DC conversion with Rectifier	Energize		60		60
	Spring Return	F	50		———
		S	100		

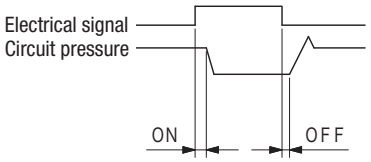
Note: Values shown may vary according to spool type and circuit conditions.
* Indicates KU4 coil.

Conditions: No. 2 spool, open loop circuit, flow 80 L/min, supply pressure 17.5 MPa, fluid viscosity 36 mm²/s

[Circuit Example]



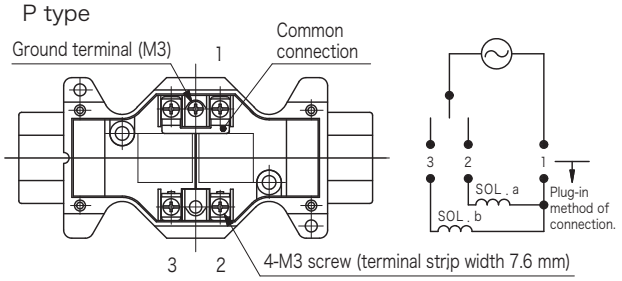
[Switching Time Definition]



Notes on Operation

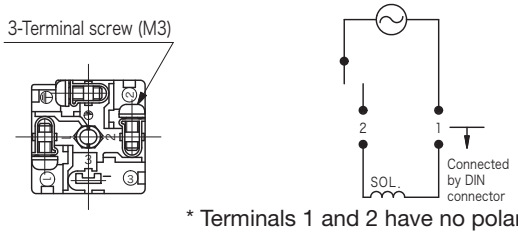
- Mounting orientation
  To ensure sure switching of no spring detented type valves, mount valves so spool axis is horizontal. There are no mounting attitude restrictions for other spool/spring arrangements.
- Solenoid energization
  Always ensure that one side of solenoid is deenergized before energizing 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)
- 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.

P type

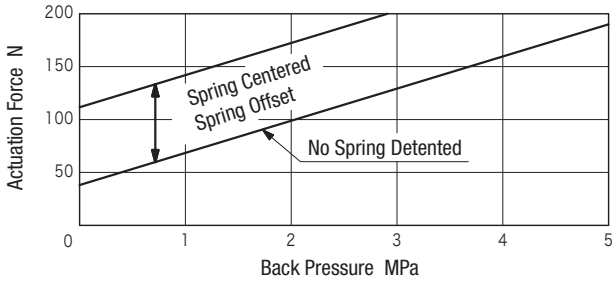


* The electrical wiring has no polarities.

U type (DIN connector)



* Terminals 1 and 2 have no polarities.



Mounting Bolts (JIS B 1176, Strength Class 12.9)

Hex Socket Bolts	Qty
M6×40	4

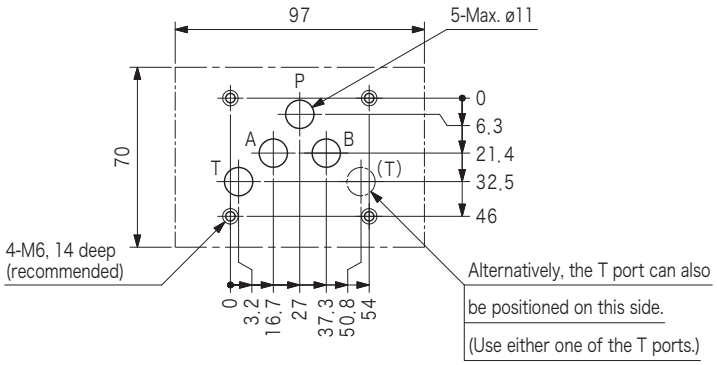
- Mounting bolts must be ordered separately.
- Tightening torque of mounting bolts: 12 to 15 N•m

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.

●Mounting dimensions



● Mounting surface machining accuracy

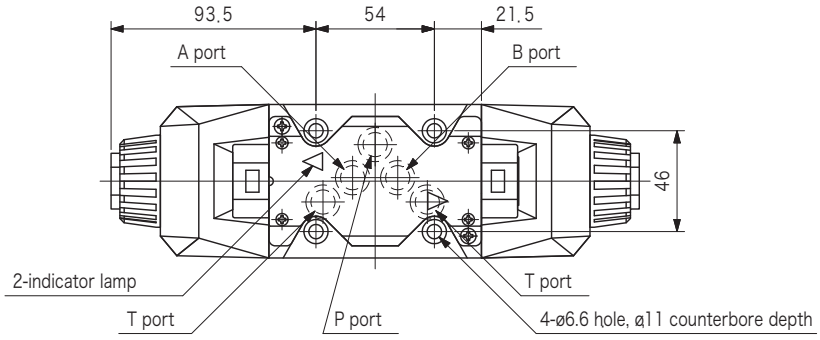
Surface Roughness	1.6μm Ra	
Flatness	Less than 0.01 (□ per 100 mm)	0.01/□100
Permissible Tolerance	Mounting bolt hole: ±0.1 Ports: ±0.2	

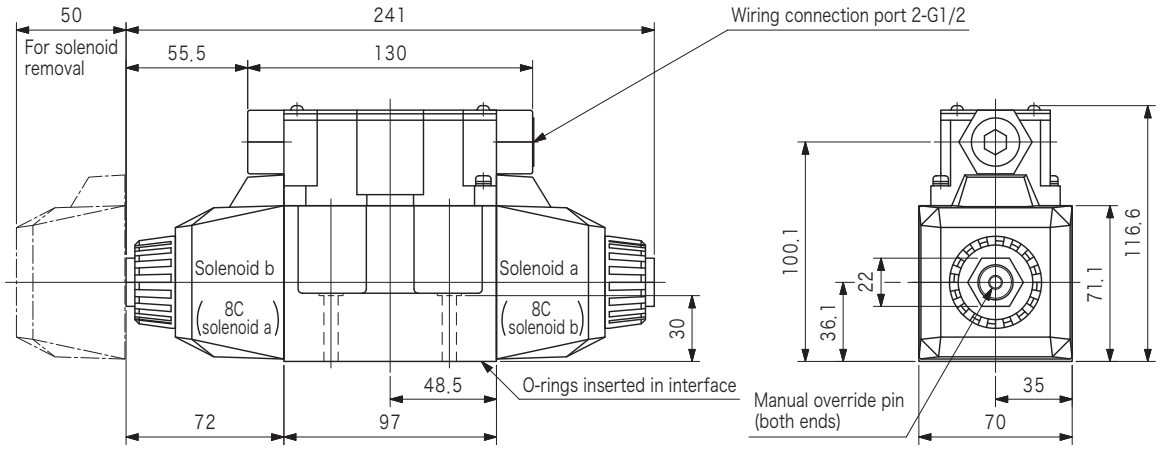
Dimensions

■ P Type Electrical Wiring

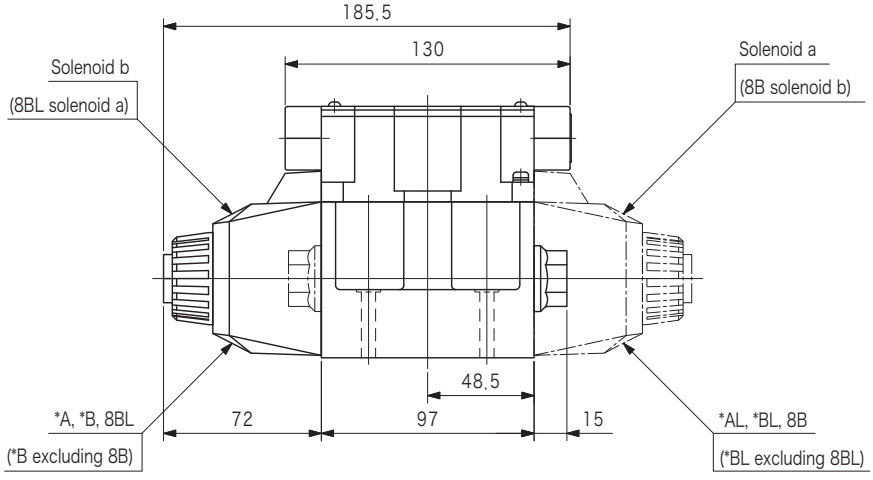
● AC Solenoids

Spring Centered DG4V-5-*C-M-P*-*-6-40
No Spring Detented DG4V-5-*N-M-P*-*-6-40





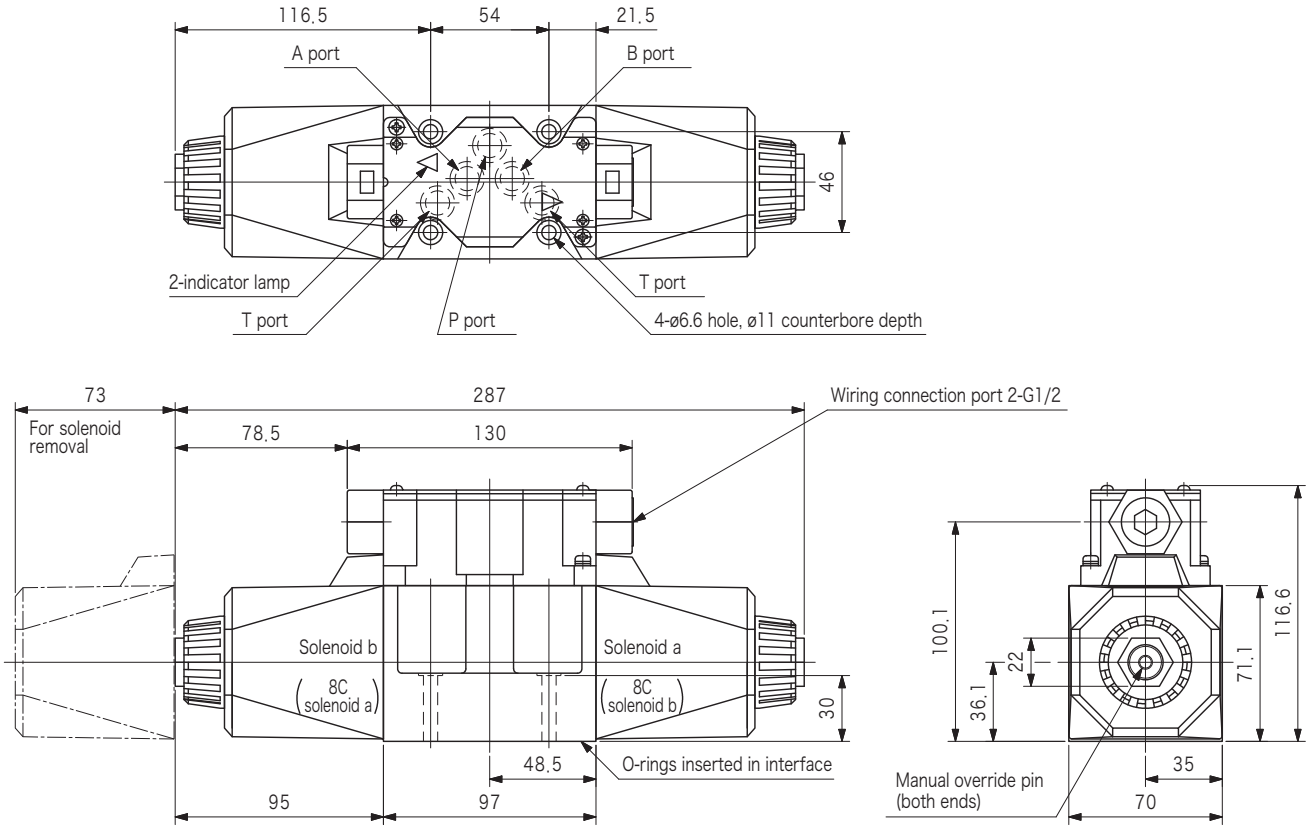
Spring Offset DG4V-5-*A/B-M-P*-*-6-40 (solid line)
Spring Offset DG4V-5-*AL/BL-M-P*-*-6-40 (dotted line)



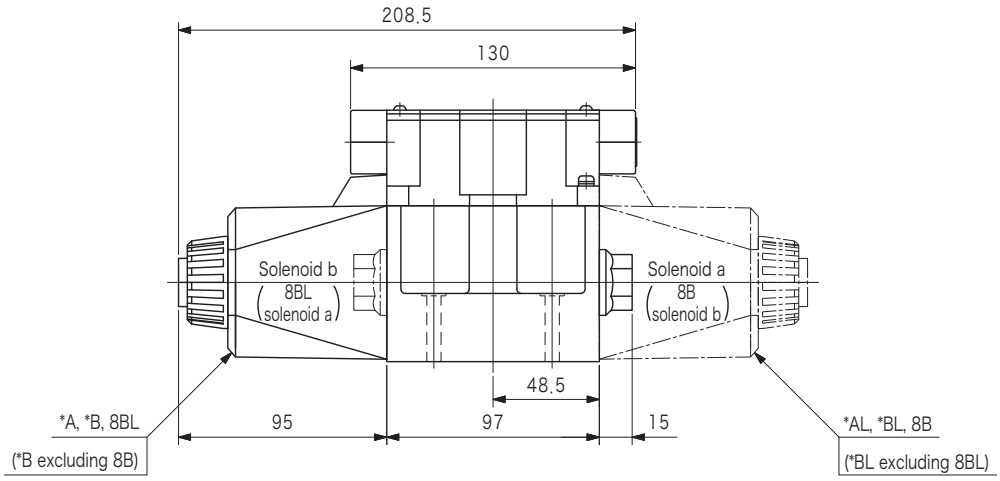
Dimensions

● AC Solenoids

Spring Centered	DG4V-5-*C-M-P*-*-7-40
No Spring Detented	DG4V-5-*N-M-P*-*-7-40



Spring Offset	DG4V-5-*A/B-M-P*-*-7-40 (solid line)
Spring Offset	DG4V-5-*AL/BL-M-P*-*-7-40 (dotted line)

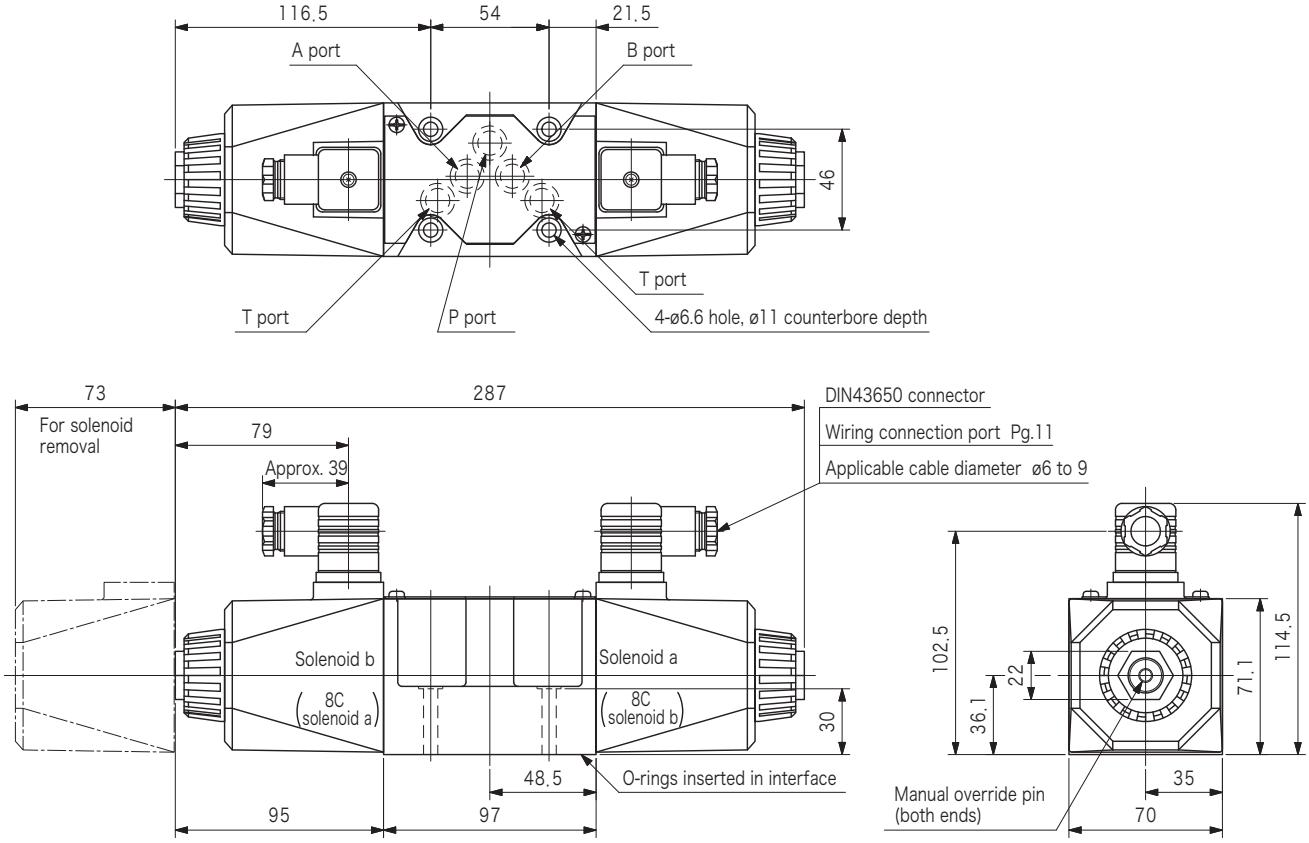


Dimensions

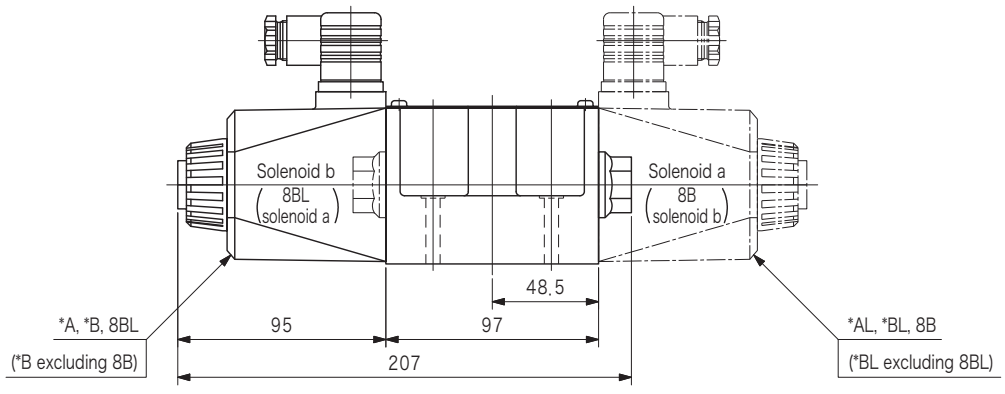
■ U Type Electrical Wiring

● DC Solenoids

Spring Centered DG4V-5-*C-M-U*-*-7-40
No Spring Detented DG4V-5-*N-M-U*-*-7-40



Spring Offset DG4V-5-*A/B-M-U*-*-7-40 (solid line)
Spring Offset DG4V-5-*AL/BL-M-U*-*-7-40 (dotted line)

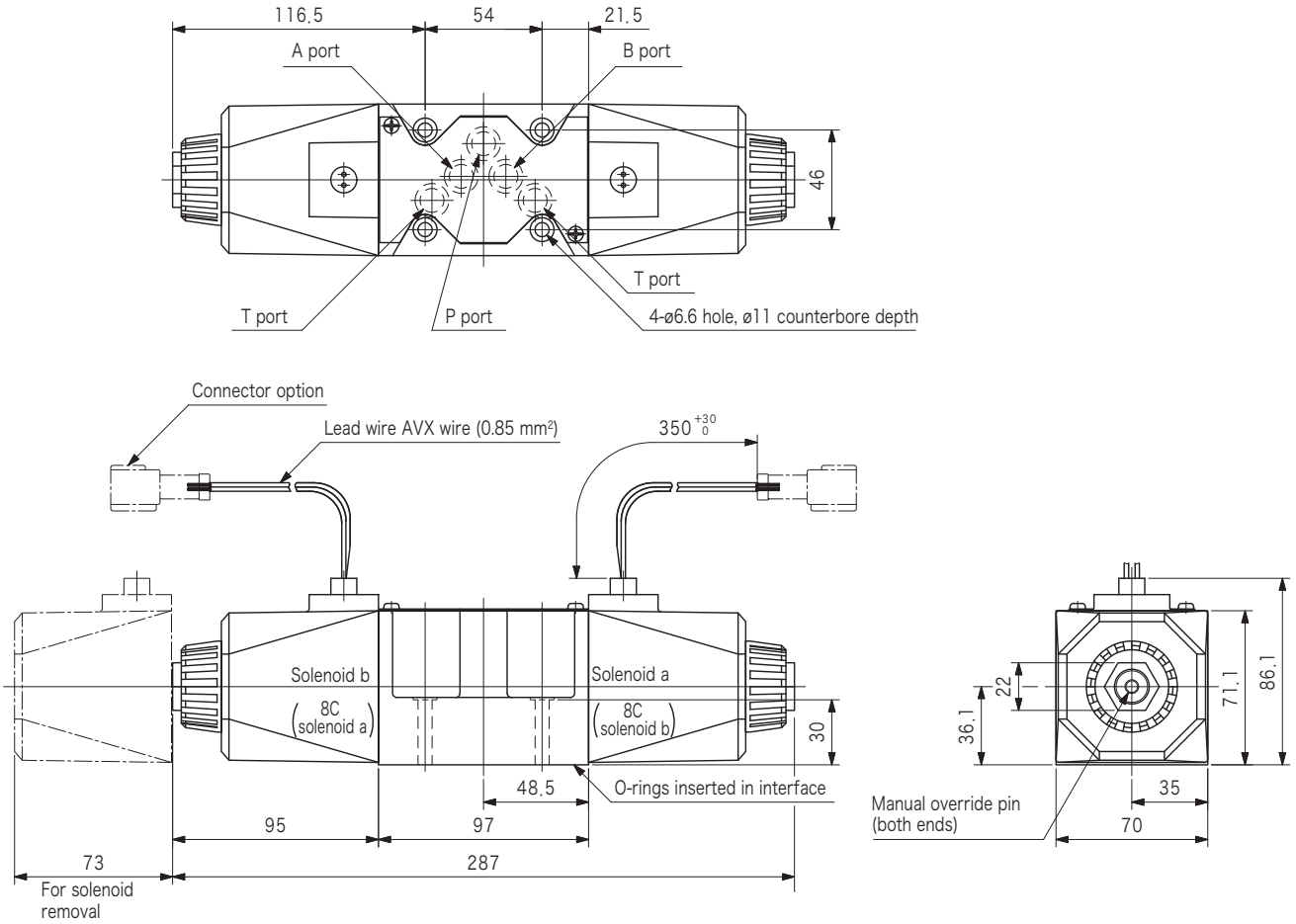


Dimensions

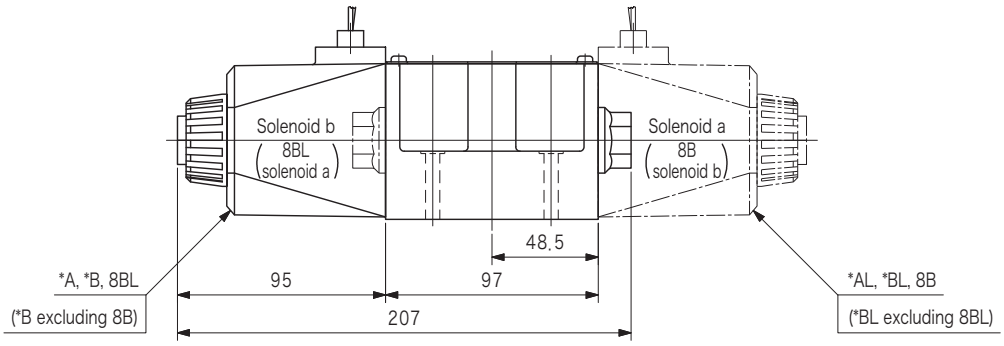
■ KU Type Electrical Wiring

● DC Solenoids

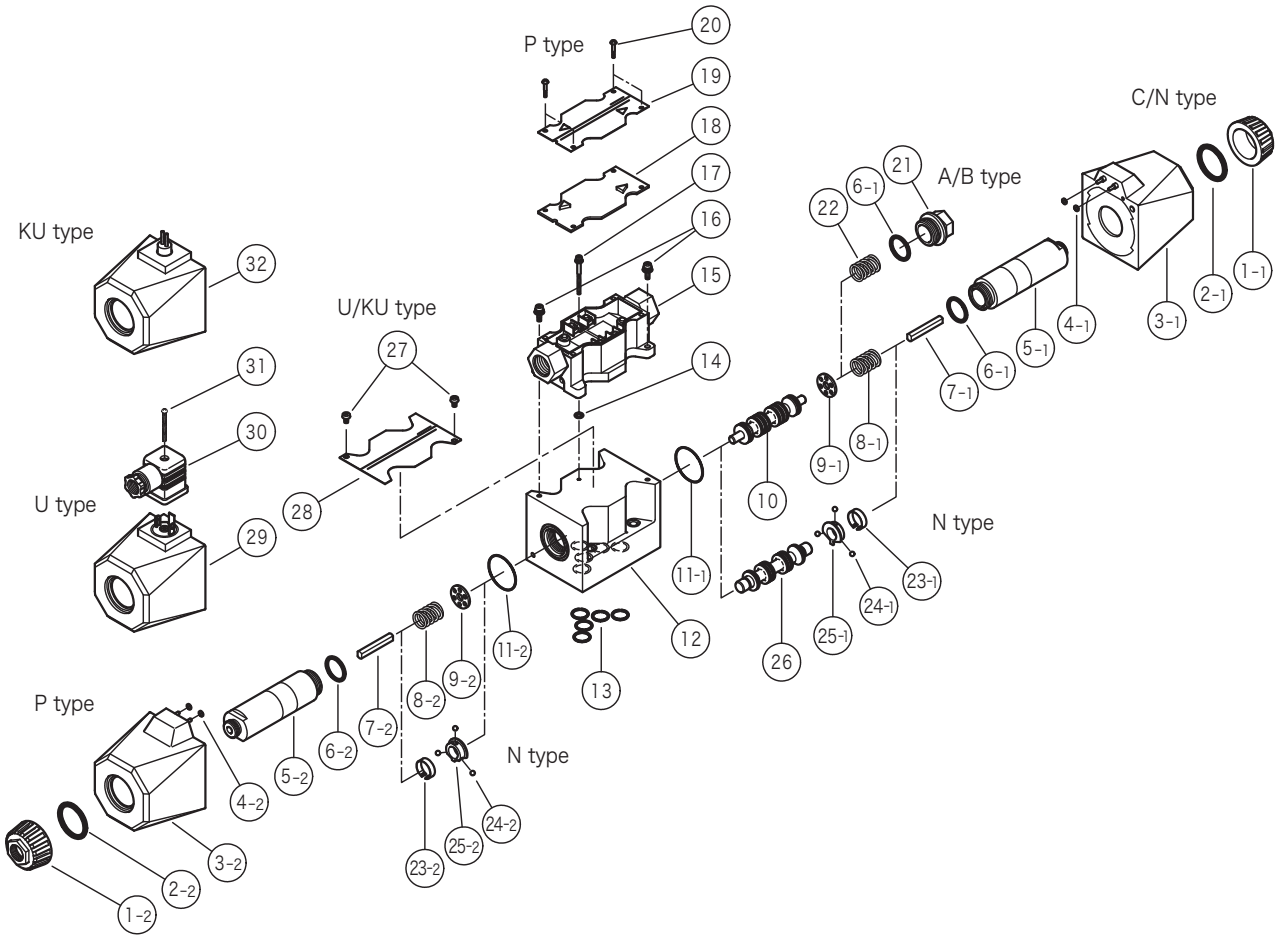
Spring Centered	DG4V-5-*C-M-KU*-*-7-40
No Spring Detented	DG4V-5-*N-M-KU*-*-7-40



Spring Offset	DG4V-5-*A/B-M-KU*-*-7-40 (solid line)
Spring Offset	DG4V-5-*AL/BL-M-KU*-*-7-40 (dotted line)



Construction



O-ring

No.	Part No.	Standard	Qty A/B	Qty 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	T	40018923
	B	40018925
	OV	40018924
	D	40018926
	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