

DG4V-3 SERIES

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

INSTRUCTION MANUAL

Please read this manual carefully to insure proper handling of product.
Maintain manual in location readily accessible for reference.



TOKIMEC INC.
CONTROL SYSTEMS DIVISION

CAUTION FOR SAFETY

Hydraulic equipment will perform as intended if used properly. However as hydraulic components involve pressurized vessels, incorrect use may cause bursting or other hazardous situations which may lead to accidental injuries or death. Carefully read this section "CAUTION FOR SAFETY", please observe the following points in order to avoid accidents.

The meaning of indicators for safety used in this manual is as follows.



Indicates an imminently hazardous situation which, if not avoided, may be LIFE-threatening.



Indicates a potentially hazardous situation which, if not avoided, may result in death or serious injury and property damage.



Indicates a potentially hazardous situation which, if not avoided, may result in personal injury and property damage.

1. Handling of products

CAUTION

- ① To prevent injury when handling products, protective gear should be worn depending on the situation.
- ② Care should be paid on how the work is carried out in order to prevent injuries, such as to hands and back, attributable to component weight and working posture.
- ③ Do not step on, hit, drop or apply excessive external force to the component as it may affect function or cause damage, oil leakage, and other problems.
- ④ Oil on the product or floor should be wiped clean to prevent dropping or slipping.

2. Mounting and Removal of product

DANGER

- ① There is much similarity in appearance of hydraulic components. Confirm correct product model code when making product replacements.

WARNING

- ① Confirm that power to equipment is OFF and that electric motor or engine has stopped movement prior to activities such as component installation, removal, and piping. Also confirm that pressure does not remain in the hydraulic system.
- ② Pumps, motors and other rotating shafts or components should be covered to protect against enmeshing hands or clothing.
- ③ Tasks should be performed by technician competent in hydraulic systems.
- ④ Insure that power is disconnected before performing any electrical wiring work to prevent shock and injury.

CAUTION

- ① Clean mounting holes and mounting interfaces. Improper tightening of bolts or damage to seals may result in product damage or oil leakage.
- ② Use specified bolts for mounting and tighten to specified torques as improper mounting may cause operational failures, product damage, or fire by oil leakage.

3. During operation

DANGER

- ① In explosive or flammable environments, insure that product which is used is suitable for such ambient conditions in order to prevent serious injury or death.

WARNING

- ① Pumps, motors and other rotating shafts or components should be covered to protect against enmeshing hands or clothing. Also, never operate with a cover removed.
- ② Before system is started up for the first time, check to insure correctness of the hydraulic circuit and electrical wiring and that joints are not loose.
- ③ Immediately halt operation when an abnormal condition is detected (abnormal noise, oil leakage, smoke, etc.) and take appropriate action, as such condition may lead to equipment damage, fire, or injury.

CAUTION

- ① Products should be used in conformance with the specifications outlined in the product catalog, drawings, or specification sheets.
- ② Proper fluid should be used and recommended cleanliness(contamination) levels should be maintained in order to prevent operational failures or component damage.
- ③ Components may become hot during operation due to increased oil temperatures and solenoid energization and cause injury if touched.

4. Maintenance and storage

DANGER

- ① As many fluids are flammable, never operate hydraulic equipment or machines near a fire source or welding work.

WARNING

- ① User's SHOULD NEVER attempt to modify components. Do not disassemble or reassemble components, unless as directed by the manufacturer, as this may affect product function or lead to failures or accidents.

CAUTION

- ① When transporting or storing product, care must be paid to ambient conditions such as temperature and humidity to prevent dust accumulation and corrosion.
- ② After long periods of storage, component seals should be replaced before operating product.

PREFACE

This manual provides information on safety, specifications, storage · mounting · removal · piping · wiring, start · operation and adjustment, maintenance and checking etc..

Familiarize yourself with the contents for correct usage of products.

Observance items for manuals



WARNING

Regarding this operation manual pay attention to the following.

(1) Carefully read this manual.

Manual should be thoroughly read and understood.

(2) Maintain manual with care.

Keep manual closely for ready reference when handling the product. Determine storage location and person in charge of this manual.

(3) This manual should be provided to the person actually handling the product.

Intermediaries such as sales agents should provide this manual to the actual person handling this product.

(4) If the manual is lost, replace immediately.

If you have lost this manual, contact the office shown on the last page to order a replacement.

Precautions to protect the product

This manual outlines important points regarding the handling of the product.

CAUTIONS in HANDLING

Indicates contents to which particular attention must be paid.

CONTENTS

CAUTION FOR SAFETY	(1)
PREFACE	(4)
CONTENTS	(5)
Chapter 1 Introduction	1
Chapter 2 Specifications	1
2.1 Model code	2
2.2 Specifications	4
2.2.1 Property	4
2.2.2 Switching time	4
2.2.3 Pressure drop characteristics	5
2.3 Solenoid specifications	7
2.4 Fluid	8
2.4.1 Applicable fluid	8
2.4.2 Viscosity and temperature of fluid	8
2.4.3 Recommended cleanliness level of fluid	9
Chapter 3 Storage, Mounting and Wiring	10
3.1 Storage	10
3.2 Mounting, Removal	10
3.3 Wiring	12
Chapter 4 Operation, Adjustment	13
Chapter 5 Troubleshooting	14
Chapter 6 Structure and Operation	15
6.1 Spring center type	15
6.2 Spring offset type	16
6.3 No spring detent type	18
TOKIMEC INC. OFFICE TO CONTACT	19

Chapter 1 Introduction

The solenoid operated directional control valve (DG4V-3 series) is a directional control valve which incorporates a solenoid to shift a spool.

The valve offers excellent durability with quiet switching because of its wet construction where the iron core (armature) moves within a fluid-filled core tube for a lubricating and dampening effect.

Chapter 2 Specifications



CAUTION


Using the product under conditions beyond the specifications may cause injury due to failure.

This chapter describes each solenoid operated directional control valve model code, performance and specifications.

2.1 Model code

(F3) - DG4V - 3 - 2 A (L) - M - P 2 - T - 7 - (P08) - 52 - (JA16)

1 2 3 4 5 6 7 8 9 10 11 12 13

- 1** Fluid
Omit for mineral oil, water glycol
F3 : Phosphate ester
- 2** Directional control valve
- 3** Mounting size
3 : ISO 4401-AB-03-4-A
- 4** Spool type (Refer to Catalog)
- 5** Spring set
A: spring offset A type (2 position, single sol.)
B: spring offset B type (2 position, single sol.)
C: spring centered (3 position, double sol.)
N: no spring detent (2 position, double sol.)
- 6** Solenoid assembly direction
Omit for st'd (energized P to B, A to T)
L: left hand assembly (energized P to A, B to T)
- 7** Electrical wiring connection
P : Plug-in conduit box G1/2(PF1/2)
U : DIN 43650 connector Pg11
Application cable diameter $\phi 8 \sim \phi 10$
K U : Lead wire (350mm, DC only)
- 8** Electrical accessories
Omit for no accessories (P, KU)
1 : with DIN connector and no accessories (U)
2 : with indicator lamp (AC st'd)
4 : with surge absorber (KU, slow de-energized)
7 : with indicator lamp and surge absorber (DC st'd)
9 : with ADC rectifier (fast de-energized) and indicator lamp
12 : with ADC rectifier (slow de-energized) and indicator lamp
- Note) Electrical accessories for "9" "12"
 - Applicable to only ADC solenoid
 - Applicable to only electrical wiring type P
 - with surge absorber
 Electrical accessories "2" "7" are not applicable for electrical wiring type KU.
- 9** Solenoid voltage
T: 100V 50/60Hz, 110V 60Hz
V: 200V 50/60Hz, 220V 60Hz
G: DC12V
H: DC24V
TR: 100V 50/60Hz (ADC rectifier)
VR: 200V 50/60Hz (ADC rectifier)
- 10** Maximum tank line pressure
7: 20.6MPa
- 11** Port orifice
Omit for no port orifice (st'd)
With the orifice indicator ex.
Ex.1) P 08 (It has the orifice with 0.8mm diameter at the P port.)


Ex.2) B12 (It has the orifice with 1.2mm diameter at the B port.)
Ex.3) 2 port combinations
Indicator of the combination by the order of P, T, A, B
P10T12, P08B10
For the details of the port orifice, refer to the next page.
- 12** Design No.
- 13** Special feature
JA16: with manual operated knob

11 Port orifice (option)

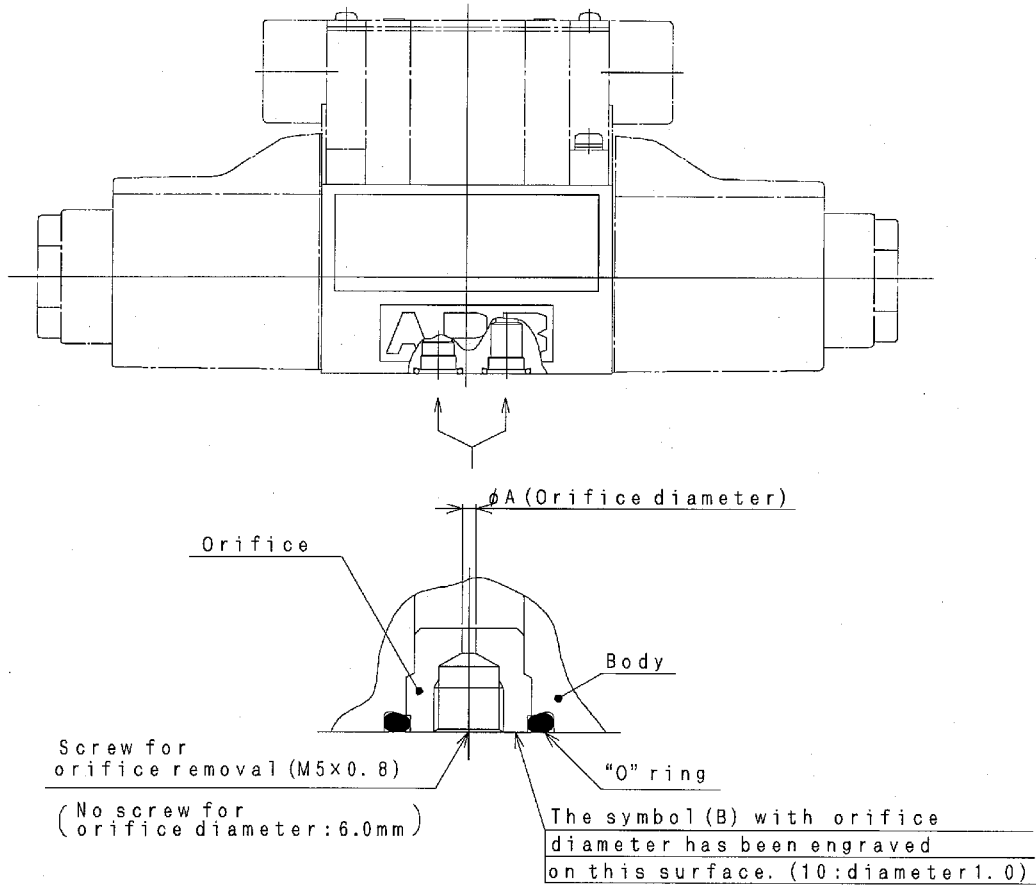


FIGURE ORIFICE

Orifice diameter "A" mm	Seal No. "B"	Orifice diameter "A" mm	Seal No. "B"	Orifice diameter "A" mm	Seal No. "B"
0.5	05	1.6	16	2.7	27
0.6	06	1.7	17	2.8	28
0.7	07	1.8	18	2.9	29
0.8	08	1.9	19	3.0	30
0.9	09	2.0	20	3.2	32
1.0	10	2.1	21	3.3	33
1.1	11	2.2	22	3.6	36
1.2	12	2.3	23	4.0	40
1.3	13	2.4	24	4.1	41
1.4	14	2.5	25	4.3	43
1.5	15	2.6	26	6.0	—

2.2 Specifications

2.2.1 Property

Model code	Max. operating pressure MPa	Max. flow L/min	Tank Port pressure MPa	Max. response Freq. (times/min.)			Mass (kg)			
				AC	DC	ADC	Single sol.		Double sol.	
DG4V-3 Series	35	Refer to * mark below	20.6	300	300	120	AC	DC	AC	DC
							1.6	1.7	2.0	2.1

* CAUTIONS in HANDLING

The max. flow is the flow limit at which the valve will shift.

Because max. flow depends on the spool type, the usage condition and so on, refer to the catalog.

Also, as the valve is designed as a 4 way valve, max. flow is limited when using as the 2 way or the 3 way. For details contact us.

2.2.2 Switching time

Unit : ms

Power supply	Operating	De-energize time	Spring center type Spring offset type C, B, BL	Spring offset type A, AL	No spring detent type N
AC	Energizing	/	10~15		10~15
	Spring return		20		—
DC	Energizing		30		30
	Spring return		15 *(90)		—
ADC	Energizing		20		30
	Spring return		fast	20	
slow		90		—	

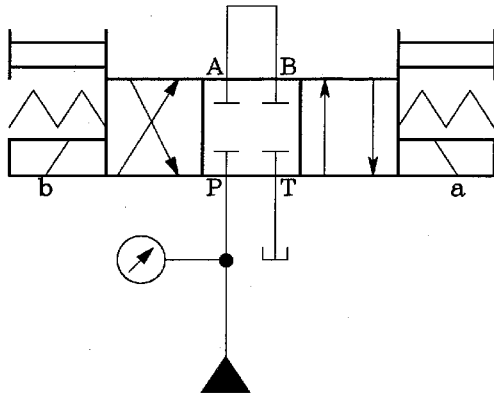
* mark shows KU4 coil.

Measurement condition : Spool type 2, Open loop circuit, flow 40L/min

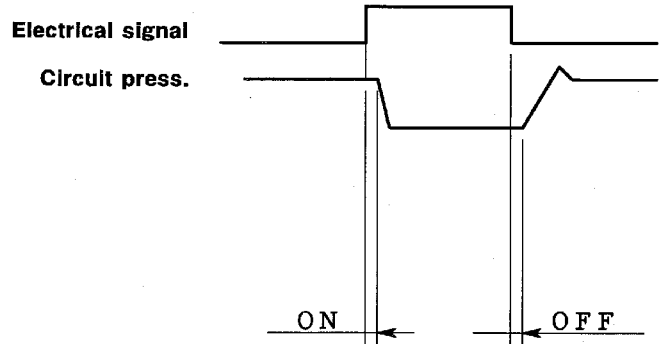
Supply pressure 17.5MPa

Fluid viscosity 20mm²/s

< Circuit ex. >



< Switching time definition >

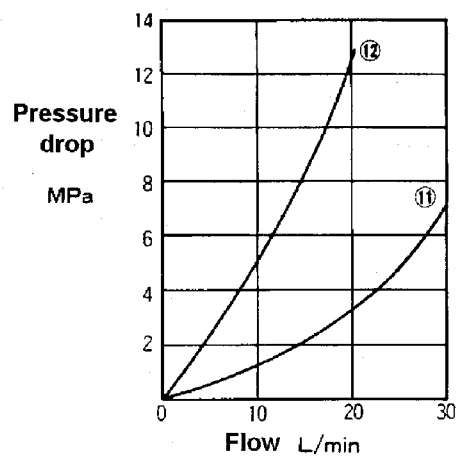
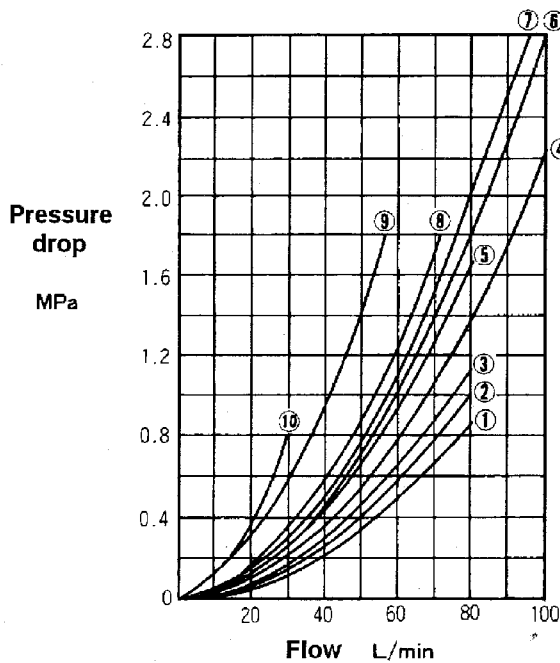


CAUTIONS in HANDLING

The switching time sometimes depends on the spool type and the use condition.

2. 2. 3 Pressure drop characteristics

Measurement condition -- Viscosity 20mm²/s, specific gravity 0.87



Pressure drop line curve number

C, B, BL										A				AL																																	
Spool type	energized				de-energized					Spool type	energized				Spool type	energized																															
	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																														
0	④	③	④	③	④	①	①	④	④	0	⑤	④	⑤	④	0	⑤	④	⑤	④																												
1	④	③	④	③	⑧	②	-	④	-	2	⑦	⑥	⑦	⑧	2	⑦	⑥	⑦	⑧																												
2	⑥	④	⑥	④	-	-	-	-	-	6	⑦	④	⑧	④	6	⑦	④	⑧	④																												
3	⑥	④	⑧	②	-	④	-	-	-	7	⑤	⑧	⑤	⑨	7	⑤	⑧	⑤	⑨																												
6	⑧	②	⑧	②	-	④	④	-	-	22	⑥	-	⑦	-	22	⑥	-	⑦	-																												
7	④	⑥	④	⑥	-	-	-	⑦	⑦	23	⑦	⑤	-	⑦	23	⑦	⑤	-	⑦																												
8	⑦	⑤	⑦	⑤	⑧	-	-	-	-	24	⑦	④	⑦	④	24	⑦	④	⑦	④																												
22	⑦	-	⑦	-	-	-	-	-	-	26	-	④	-	⑥	26	-	④	-	⑥																												
31	⑧	②	⑥	④	-	-	④	-	-	27	⑤	-	⑤	-	27	⑤	-	⑤	-																												
33	⑥	④	⑥	④	-	⑫	⑫	-	-	28	⑦	-	⑧	⑦	28	⑦	-	⑧	⑦																												
34	⑥	④	⑥	④	-	⑪	⑪	-	-	32	⑦	⑤	⑧	-	32	⑦	⑤	⑧	-																												
52	⑦	-	⑦	③	-	-	-	-	-	35	⑦	④	-	-	35	⑦	④	-	-																												
56	⑥	-	②	③	-	⑩	⑧	-	-	<table border="1"> <thead> <tr><th colspan="5">N</th></tr> <tr><th rowspan="2">Spool type</th><th colspan="4">energized</th></tr> <tr><th>P ↓ A</th><th>B ↓ T</th><th>P ↓ B</th><th>A ↓ T</th></tr> </thead> <tbody> <tr><td>0</td><td>④</td><td>③</td><td>④</td><td>③</td></tr> <tr><td>2</td><td>⑦</td><td>④</td><td>⑦</td><td>④</td></tr> <tr><td>6</td><td>⑧</td><td>②</td><td>⑧</td><td>②</td></tr> </tbody> </table>									N					Spool type	energized				P ↓ A	B ↓ T	P ↓ B	A ↓ T	0	④	③	④	③	2	⑦	④	⑦	④	6	⑧	②	⑧	②
N																																															
Spool type	energized																																														
	P ↓ A	B ↓ T	P ↓ B	A ↓ T																																											
0	④	③	④	③																																											
2	⑦	④	⑦	④																																											
6	⑧	②	⑧	②																																											
62	⑧	-	⑧	②	-	④	⑥	-	-																																						
63	⑧	-	⑧	-	-	⑥	⑥	-	-																																						
521	⑦	③	⑦	-	-	-	-	-	-																																						
561	⑦	③	⑦	-	-	⑧	⑩	-	-																																						
621	⑧	②	⑧	-	-	⑥	④	-	-																																						

- Determine pressure drop (ΔP1) for specific viscosities except usage condition 20mm²/s by utilizing the coefficients in the table below.
- Calculation formula of pressure drop (ΔP1) except usage condition with specific gravity of 0.87

$$\Delta P_1 = \Delta P \frac{G_1}{G}$$

ΔP...Value of the above characteristic figure
 G ... 0.87
 G1 ...Optional 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

2.3 Solenoid specifications

Power	Coil code	Coil rating /Frequency (V)/(Hz)	Inrush amps (A)	Holding amps (A)	Holding watts (W)	Allowable voltage tolerance (%)	Insulation class
AC	T	100 / 50	1.8	0.52	23	+10, -15	H class (180°C)
		100 / 60	1.4	0.40	20	+20, -10	
		110 / 60	1.6	0.46	24	+10, -15	
	B	110 / 50	1.6	0.47	23	+10, -15	
		115 / 60	1.3	0.36	22	+15, -10	
		120 / 60	1.5	0.42	24	+10, -15	
	V	200 / 50	0.9	0.26	23	+10, -15	
		200 / 60	0.7	0.20	20	+20, -10	
		220 / 60	0.8	0.23	24	+10, -15	
	D	220 / 50	0.8	0.24	23	+10, -15	
		230 / 60	0.65	0.18	22	+15, -10	
		240 / 60	0.75	0.21	24	+10, -15	
DC	G	12	X	2.40	29	±10	F class (155°C)
	H	24		1.16	28		
	J	48		0.6	29		
	R	100		0.34	34		
AC ↓ DC	TR	AC100V 50/60Hz ↓ DC90V(coil)	X	0.37	34	±10	F class (155°C)
(ADC)	VR	AC200V 50/60Hz ↓ DC180V(coil)		0.20	36		

- Note) ① Holding amps and holding watts depend on temperature conditions. Above values are based on 30°C.
- ② ADC operates a direct current solenoid using an alternating current power supply with a rectifier, and the characteristic are the same with direct current solenoids.

2.4 Fluid

2.4.1 Applicable fluid

① Mineral oil

Use anti-wear type hydraulic oil corresponding to JIS K 2213-2 type (subjunction) ISO VG 32 ~68(old turbine #90~#180) or crankcase oil of class SC, SD, SE or SF in SAE usage. Do not use diesel engine oil.

② Incombustible fluid

Specify "F3-" in valve model code for phosphate, for "fluorine rubber" for the seals. The standard product can be used, as is, for both water-glycol and mineral oil.

2.4.2 Viscosity and temperature of fluid

- Use fluid in range of viscosity, $13\sim 54\text{mm}^2/\text{s}$.
- Use Mineral oil and phosphate ester in range of temperature, $-20\sim +70^\circ\text{C}$, water glycol fluid, $+10\sim 54^\circ\text{C}$.

2.4.3 Recommended cleanliness level of fluid

The cleanliness management of fluid is critical for long performance of the hydraulic equipment. Please maintain recommended cleanliness level according to the ISO code mentioned below.

Recommended cleanliness code by the ISO code	Kind of hydraulic system	Recommended filtration rating of the filter (Absolute filtration rating) μm
21/17	Low-pressure systems of below 5MPa	40
19/15	General industrial systems which are used at the pressure of 5~15MPa	25
18/14	General machinery and mobile systems which are used at the pressure of 15~25MPa	10~25
16/13	High-pressure systems which are used at the pressure above 25MPa	5~10
15/11	High pressure or High reliability systems which contain servo valves such as aircraft, machine tools, etc.	below 5

The cleanliness code by the ISO code is determined by the number of particles which is larger than 5 μm and 15 μm .

The designation of the cleanliness code comprises only two numbers. The first number of the code shown in the table above indicates the range number for particle size larger than 5 μm and the second number indicates the range number for particle size larger than 15 μm .

The range number for particle size is determined by the below table.

Range number	Max. number of particles per 1mL
21	20,000
19	5,000
18	2,500
17	1,300
16	640
15	320
14	160
13	80
11	20

Chapter 3 Storage, Mounting, Wiring

This chapter described precautions regarding storage, mounting, and wiring of the solenoid operated directional control valve (DG4V-3 series).

3.1 Storage

When valve is stored for long periods, apply anti-corrosive oil on the gasket surface.

3.2 Mounting and Removal



DANGER

- There is much similarity in appearance of hydraulic components. Confirm correct product model code when making product replacements.



WARNING

- ① Confirm that power to equipment is OFF and that electric motor or engine has stopped movement prior to activities such as component installation, removal, and piping. Also confirm that pressure does not remain in the hydraulic system.
- ② Pumps, motors and other rotating shafts or components should be covered to protect against enmeshing hands or clothing.
- ③ Tasks should be performed by technician competent in hydraulic systems.
- ④ Insure that power is disconnected before performing any electrical wiring work to prevent shock.



CAUTION

- ① Clean mounting holes and mounting interfaces. Improper tightening of bolts or damage to seals may result in product damage or oil leakage.
- ② Use specified bolts for mounting and tighten to specified torques as improper mounting may cause operational failures, product damage, or oil leakage.

Mounting bolt (ISO 4762 Strength grade: 12.9)

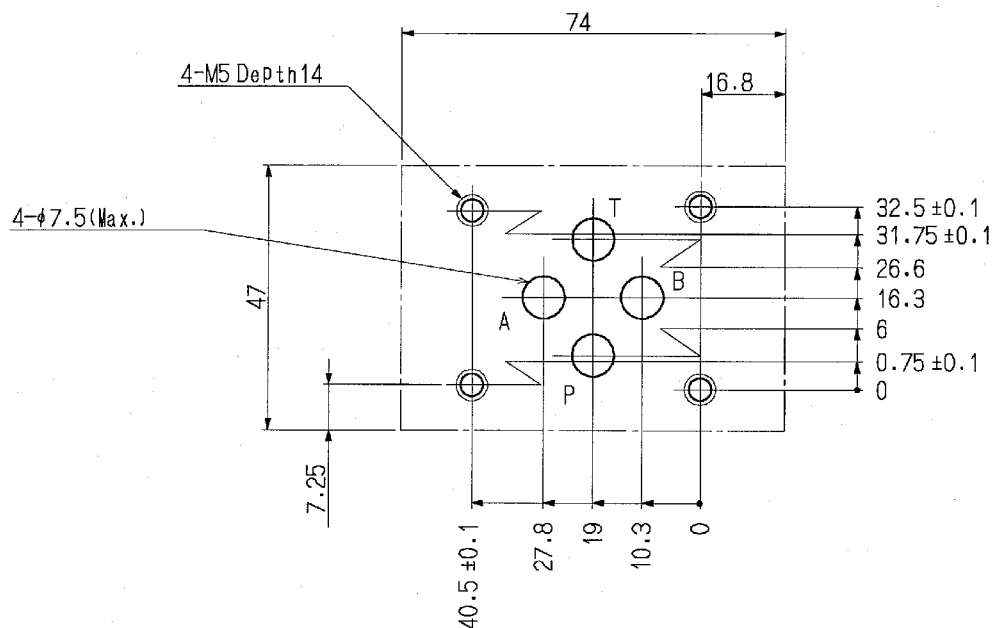
Hexagon socket head cap screw	Quantity
M5 × 50	4

- Mounting bolt torque : 7~8 N · m

CAUTIONS in HANDLING

- ① Installation direction
Mount no spring detent type with spool axis level to insure proper switching. There is no limitation for the other spring set method types.
- ② Piping at the T (the tank) port
Extraordinary surge pressure should not exceed allowable back pressure at the T port. Also, this wet type valve must always be filled with fluid.
- ③ Malfunction caused by surge pressure
Avoid piping to the tank line which may cause surge pressures. When surge pressure occurs in the T port of the valve, malfunction of the spool sometimes occurs. No spring detent type valves are prone to this problem at de-energization, so particular caution should be exercised.
- ④ Installation surface of the valve should be smooth (equal to or less than $6.3 \mu\text{m}$ of rough R_{max} , equal to or less than 0.012 plane degrees). Refer to the below figure for the installation dimensions of the valve. Dimensional tolerance = ± 0.2 except where otherwise stated.

Installation surface dimensions (ISO 4401-AB-03-4-A)

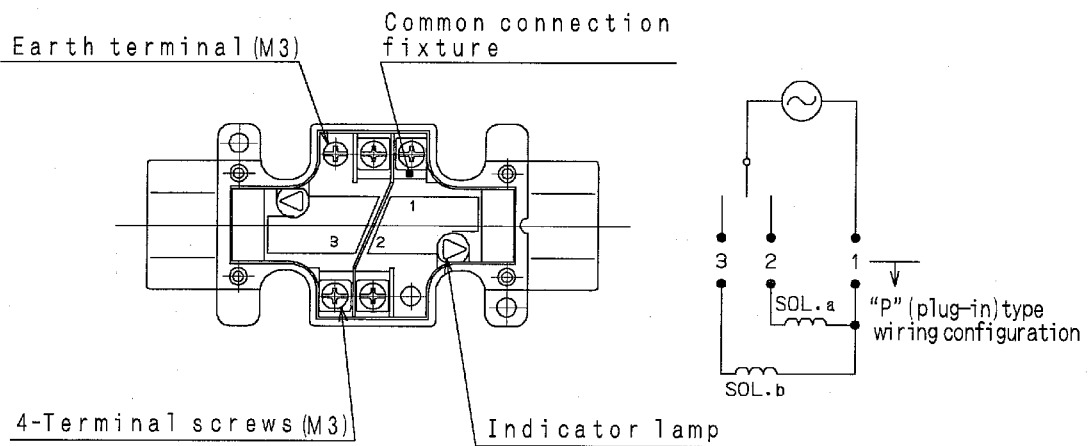


3.3 Wiring

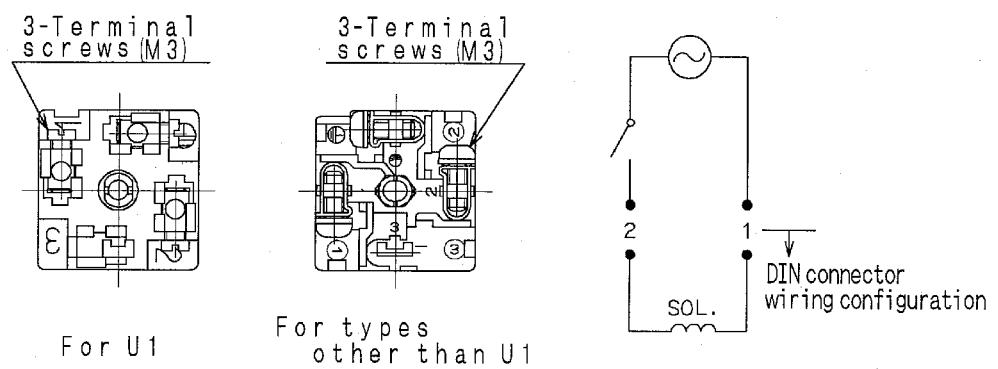
• Conduit box wiring

Solenoid(s) are pre-wired to the conduit box at the factory. Refer to the schematic below for wiring of the valve conduit box or DIN connector(s) to the power source.

P type



U type (Interior of DIN connector)



Chapter 4 Operation, Adjustment

This chapter describes precautions regarding operation and adjustment of the solenoid operated directional control valve (DG4V-3 series).



DANGER

- ① In explosive or flammable environments, insure that product which is used is suitable for such ambient conditions in order to prevent serious injury or death.
- ② As many fluids are flammable, never operate hydraulic equipment or machine near a fire source or welding work.

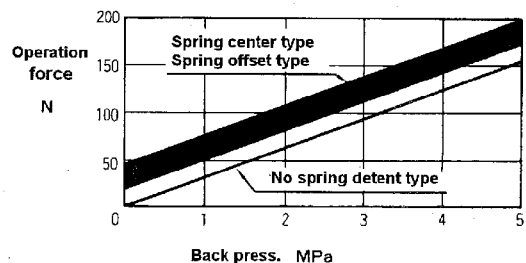


WARNING

- ① Before system is started up for the first time, check to insure correctness of the hydraulic circuit and electrical wiring and that joints are not loose.
- ② Immediately halt operation when an abnormal condition is detected (abnormal noise, oil leakage, smoke, etc.) and take appropriate action, as such condition may lead to equipment damage, fire, or injury.
- ③ If the valve is switched in the wrong direction, the actuator will operate in the opposite direction and may cause accident or injury.
- ④ User's **SHOULD NEVER** attempt to modify components. Do not disassemble or reassemble components, unless as directed by the manufacturer, as this may affect product function or lead to failures or accidents.

CAUTIONS in HANDLING

- ① Solenoid energization
Always energize a solenoid after the other solenoid is deenergized. During circuit switching, energize continuously for the spring center type and the spring offset type. When deenergized, the spool is returned to the fixed position by spring force. The no spring detent type maintains the switched position of the spool by the detent mechanism but energization time equal to or more than 0.1 seconds will be required for sure circuit switching.
- ② Solenoid energized for long periods
Energizing for long periods at high pressure, may cause sticking of the spool which sometimes leads to switching failures.
- ③ Manual operation
It is possible to operate valve manually by pushing the manual override pin, but the force needed increases when the back pressure of the tank line is high.
Reference right figure.
Manual operation is usually employed to confirm the direction of the hydraulic pressure to the cylinder or motor and system operation during startup or after equipment replacement.



Chapter 5 Troubleshooting



WARNING

- User's SHOULD NEVER attempt to modify components. Do not disassemble or reassemble components, unless as directed by the manufacturer, as this may affect product function or lead to failures or accidents.

Table 1 Malfunction Causes and Countermeasures

Malfunction	Possible Cause	Remedy
Switching malfunction or failure to switch	Coil burnout	Replace coil
	Spool "stick" ----- Unusual spool wear	Investigate cleanliness of fluid (it may be necessary to flush system)
	Using valve at pressures, flows exceeding specifications	Change to higher capacity solenoid directional valve or adjust usage conditions so they fall within valve specifications.
Coil burnout	Insufficient coil insulation	Replace coils.
	Excessive voltage	Maintain prescribed voltage. (see Section 2.3, solenoid specifications.)
	Fluid temperature or ambient temperature exceed prescribed values.	Measure fluid and/or ambient temperature. Install cooler if prescribed values are exceeded.
	Using valve at pressures, flows exceeding specifications.	Change to higher capacity solenoid directional valve or adjust usage conditions so they fall within valve specifications.
If the above proposed solutions do not solve the malfunction, or in case of doubt or problems not listed in the table, contact TOKIMEC sales office or service center.		

Chapter 6 Structure and Operation

6.1 Spring center type

Figure 1 shows the structure of the spring center type (DG4V-3-*C) solenoid operated directional control valve.

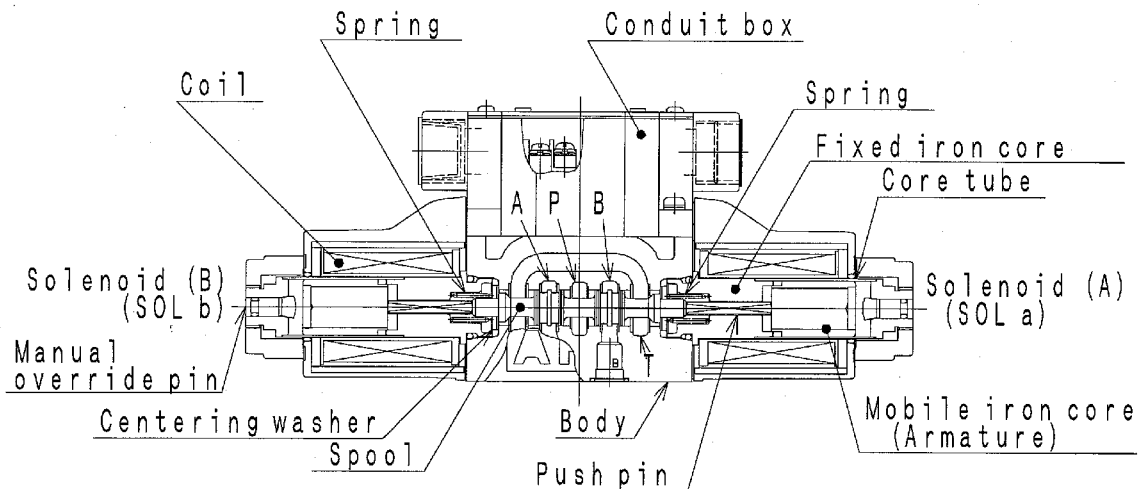


FIGURE 1 Structure of DG4V-3-*C (except for 8C)

- (1) This directional valve model has 3 switching positions - solenoid de-energized, solenoid (A) energized, and solenoid (B) energized. (This type is referred to as a 3-position directional valve.)
- (2) When both solenoids are de-energized, the spool is maintained in the neutral position by the force of the springs at both ends of the spool. (Fig. 1 shows the spool in the neutral position.) There are various spool types available which can be selected according to the desired circuit configuration.
- (3) When solenoid (A) is energized, the right armature is attracted to the fixed iron core. This movement is conveyed to the spool via the push pin and moves the spool to the left while compressing the left side spring. This action creates circuit, $P \rightarrow A$, $B \rightarrow T$ (in the case of a "2C" spool).
- (4) When solenoid (A) is de-energized, force of the left side spring compressed by the spool, will act to return the spool to the neutral position.
- (5) When solenoid (B) is energized, the spool will move in the direction opposite (ie. right direction) to that in (3) above to form circuit configuration, $P \rightarrow B$, $A \rightarrow T$ (in the case of a "2C" spool).
- (6) When solenoid (B) is de-energized, the spool will return to the neutral position, similar to (4) above.

6.2 Spring offset type

Figure 2 shows the structure of the spring offset A type (DG4V-3-*A) solenoid operated directional control valve.

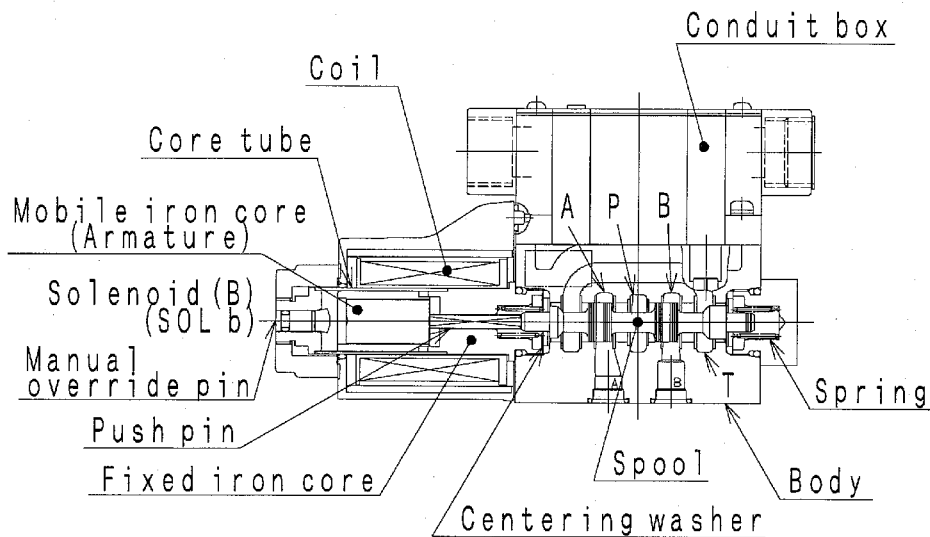


FIGURE 2 Structure of DG4V-3-*A

- (1) When the solenoid of this directional control valve type is deenergized, the spool is offset in the fixed position by spring force. In the condition of FIGURE 2, it is $P \rightarrow A$, $B \rightarrow T$ (in case of the 2A spool).
- (2) When solenoid (B) is energized, the armature is drawn to the fixed iron core. The movement pushes the spool while compressing a spring through the push pin switching the circuit. The circuit condition when switched becomes $P \rightarrow B$, $A \rightarrow T$. (In case of the 2A spool)
- (3) When solenoid (B) is deenergized, the spool returns to the condition of the offset (FIGURE 2).

Figure 3 shows the structure of the spring offset B type (DG4V-3-*B) solenoid operated directional control valve.

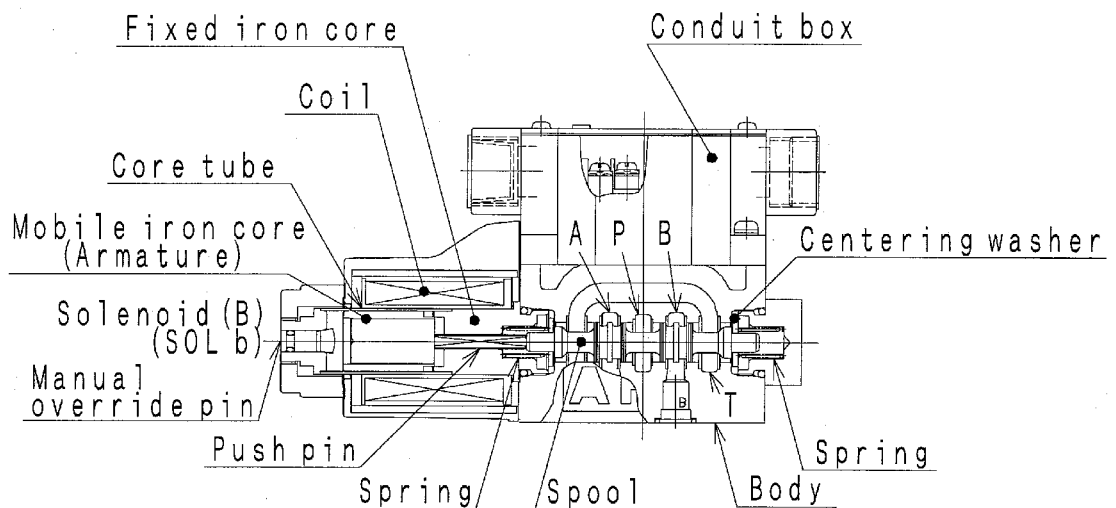


FIGURE 3 Structure of DG4V-3-*B (except for 8B)

- (1) With directional control valves of this type, there is only one solenoid (SOLb) and when the solenoid is deenergized, the spool is maintained by neutralizing by the spring on both sides.
- (2) At the time of solenoid (B) ON, the circuit becomes $P \rightarrow B$, $A \rightarrow T$ (in case of the 2B spool).

6.3 No spring detent type

Figure 4 shows the structure of the no spring detent type (DG4V-3-*N) solenoid operated directional control valve.

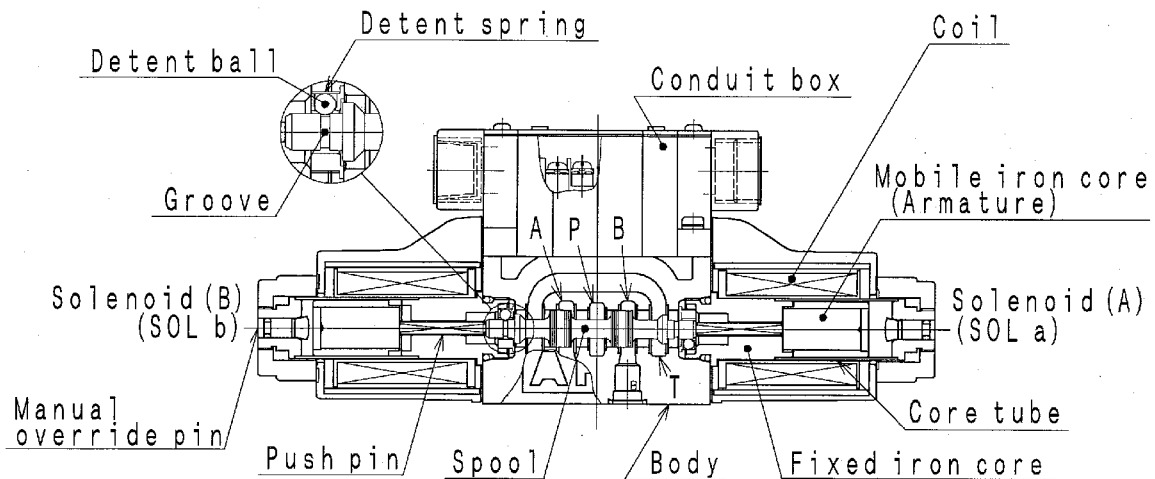


FIGURE 4 Structure of DG4V-3-*N

- (1) This directional control valve type has no spring at both ends of the spool and incorporates a mechanical detent (clasp) mechanism to maintain the switched position. When the solenoid is deenergized, the spool is prevented from moving in the axial direction by the detent mechanism.
- (2) The hydraulic circuit in switched position (i.e. when solenoid is energized) is the same as the case of the spring center type directional control valve (DG4V-3-*C).

TOKIMEC INC. OFFICE TO CONTACT

- The office to contact for repair is as follows.

Name	TEL	FAX	Location
TOKIMEC INC. Head office	81(3)3737-8631	81(3)3737-8666	2-16-46. MINAMI-KAMATA, OTA-KU, TOKYO, 144-8551, JAPAN

- Contents of this manual are subject to change without notice.
- Contact us if you require clarification on any contents of this manual.

Solenoid operated directional control valve
DG4V-3 Series
Instruction Manual [Document No.TS98-017B]

September 4th , 1998	First Edition
February 23th , 1999	Revision A
October 6th , 1999	Revision B

Publication **TOKIMEC INC.**
CONTROL SYSTEMS DIVISION
2-16-46, MINAMI-KAMATA, OTA-KU, TOKYO
144-8551 JAPAN
TEL 81(3)3737-8616 FAX 81(3)3737-8663
