

# J

## PROPORTIONAL VALVES SERVO VALVES

Model [Model No.]	Maximum operating pressure MPa {kg/cm <sup>2</sup> }	Maximum/rated flow rate L/min								Page	
		1	5	10	50	100	500	1000			
Solenoid pilot operated proportional relief valve [JRP]	25 {250}	02									J-5
Solenoid operated proportional relief valve [JRPL]	21 {210}	02									J-8
Type C2 solenoid operated proportional relief valve [C2RP]	25 {250}	03									J-11
		06									
Type C2 solenoid operated proportional low-pressure relief valve [C2RLP]	21 {210}	03									J-15
Type C2 solenoid operated proportional low-pressure reducing valve [C2GLP]	25 {250}	03									J-18
Direct operated type solenoid operated proportional throttle valve [LEM*]	21 {210}	02									J-21
	16 {160}	03									
		04									
Stack type; pressure reduction type pressure compensation valve (for LEMS) [MGS]	21 {210}	02									J-29
	16 {160}	03									

## Contact Details

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Model [Model No.]	Maximum operating pressure MPa {kgf/cm <sup>2</sup> }	Maximum/rated flow rate L/min										Page	
		1	5	10	50	100	500	1000					
Direct operated type solenoid operated proportional directional control valve [KSP]	35 {350}	02											J-32
		03											
Stack type; bypass type pressure compensation valve (for KSP) [MRS]	35 {350}	02											J-45
Stack type; pressure reduction type pressure compensation valve (for KSP) [MGS]	35 {350}	02											J-45
		03											
Solenoid pilot operated proportional directional control valve [SEM]	21 {210}	03											J-49
		04											
		06											
Direct operated servo valve [KSPS]	35 {350}	02											J-56
Solenoid pilot operated servo valve [JSES]	21 {210}	03											J-57
		04											
Manual proportional control valve [MHV]	21 {210}	12											J-58
		16											
		20											
		25											
		32											
Solenoid operated proportional control valve [MEV]	21 {210}	12											J-64
		16											
		20											
		25											
		32											
Bypass type pressure compensation valve [MUV]	21 {210}	12											J-58
		16											
		20											J-64
		25											
		32											
Pressure reduction type pressure compensation valve [MDM]	21 {210}	12											J-64
		16											
		20											
		25											
		32											

**Driver/controller selection table**

Control method	Classification	Valve model code	Applicable driver model code		Page	Controller model code	Page	Command input device model code	Page			
			Supply power									
			AC 100/200/220 V	DC 24 V								
Open loop	Pressure control valves	JRP-G02	KC-6-10	ZH-6-10	J-72	-	-	KMT-6-10	J-90			
		JRPL-G02										
		C2RP-G**										
		C2RLP-G03										
		C2GLP-G03										
	MEV**	-	ZDN-2-10 (Supplied with the valve)	J-78	PSL-02-10	J-88	-	-				
	KSP-G02											
	KSP-G02-N		EPD-02-10 EPK-02-10	J-80								
KSP-G03	EPD-03-10 EPK-03-10											
Open loop with minor feedback	Flow control valves	KSP-G02-M	KF-5-10	-	J-83	-	-	KMT-6-10	J-90			
		LEM-G**										
		LEMT-G03										
		LEMS-**										
		LEMT-G04								KFH-5-10	-	
		SEM-G**								KSV-2-10	-	J-86
		SEM-G**-A								-	PSV-2-10 (Supplied with the valve)	-
KSPS-G02	EPKS-02-10 (Supplied with the valve)	-	For pressure control SEC-P	-	KMT-6-10	J-90						
Closed loop	Servo valves	JSES-G**	-		-	-	-	-	-	-		
				PSV-2-10 (Supplied with the valve)							-	For pressure/ speed control SEC-PV

J  
PROPORTIONAL VALVES SERVO VALVES

## Handling

### ● Hydraulic oil

- Use a petroleum-based hydraulic fluid equivalent to ISO VG32 to 68.
- Use the proportional pressure control valves in an environment where both the following conditions are satisfied: viscosity range from 15 to 400 mm<sup>2</sup>/s {cSt} and oil temperature from -15 to 70°C.

Use the proportional flow control valves and servo valves in an environment where both the following conditions are satisfied: viscosity range from 16 to 200 mm<sup>2</sup>/s {cSt} and oil temperature from -5 to 70°C.

- Contamination of the hydraulic fluid causes valve trouble and reduces the service life, so pay due attention to controlling contamination and ensure that it goes no higher than NAS contamination class 12 for the proportional pressure control valves and NAS contamination class 9 for the proportional flow control valves and servo valves.

### ● Ambient temperature, relative humidity

- Use the product under the following conditions. Ambient temperature: -5 to 50°C, Relative humidity: 0 to 90%

### ● Filters

- Use a line filter with a filtration accuracy of 25 μm or better for the proportional pressure control valve and 10 μm or better for the proportional flow control valves.

### ● Installation and maintenance

- Install the proportional pressure control valves such that the iron core of the proportional solenoid is leveled. Install the proportional flow control valves such that the spool shaft is leveled.
- Finish the face on which the valve is mounted to a surface roughness of 1.6a or better and a flatness tolerance within 0.01 mm.
- Use an O-ring with a hardness of Hs90 for the valve's gasket.
- Dip the end of the pipe connected to the proportional valves into oil in the tank.

### ● Tank/drain port piping

- Connect piping to the tank and drain ports such that the ports are always filled with the fluid.
- Ensure that no surge pressures beyond the permissible back pressure are applied to the tank and drain port.

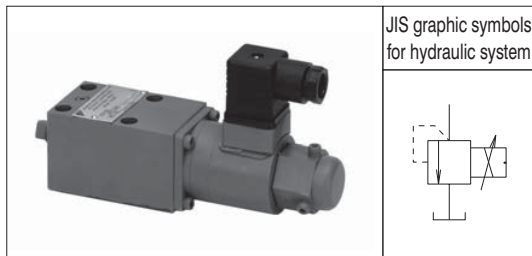
### ● Bleeding air from the solenoid

- To enable secure proportional control over the entire control range, fill the iron core of the proportional solenoid with fluid by loosening the air bleeding screw and bleeding air adequately, until fluid containing air no longer oozes out from the top.

### ● Applicable driver

- Use the dedicated driver cited for each model.

# Solenoid Pilot Operated Proportional Relief Valve



## Features

- These valves are used for remotely controlling relief valves and reducing valves as the pilot operated pressure control valve or for variable displacement piston pumps as the pilot valve.

## Nomenclature

※ - JRP - G 02 - ※ ※ - ※ - 30 - ※ ※ ※  
 1      2      3   4      5      6      7      8   9   10

### 1 Applicable fluid code

No designation: Petroleum-based hydraulic fluid,  
 water-glycol hydraulic fluid  
 F: Phosphate ester hydraulic fluid

### 2 Model No.

JRP: J series solenoid pilot operated proportional relief valve

### 3 Connections

G: Gasket mount type

### 4 Nominal diameter

02: ¼

### 5 Pressure adjustment range

03: Up to 3.5 MPa {Up to 35 kgf/cm<sup>2</sup>}  
 1: Up to 7 MPa {Up to 70 kgf/cm<sup>2</sup>}  
 2: Up to 16 MPa {Up to 160 kgf/cm<sup>2</sup>}  
 3: Up to 25 MPa {Up to 250 kgf/cm<sup>2</sup>}

### 6 Structure code

N: Direct operated type  
 S: Spring balance type

### 7 Design No. (The design No. is subject to change)

### 8 Drainage code

No designation: Internal drain type  
 E: External drain type

### 9 Option code

No designation: DIN connector mounting position: Top  
 L: DIN connector mounting position, left side  
 R: DIN connector mounting position, right side

### 10 Solenoid codes

No designation: DC 24 V solenoid  
 N: DC 12 V solenoid

## 10: Solenoid code and applicable driver model code

Solenoid codes	Solenoid	Rated current (20°C) mA	Coil resistance (20°C) Ω	Applicable driver	
				Model code	Power supply voltage
No designation	DC 24 V solenoid	850	26	KC-6-10	AC 100, 200, 220 V (Common for 50 and 60 Hz)
N	DC 12 V solenoid	1700	6.5	ZH-6-10	DC 24 V

## Specifications

Model code	Nominal diameter	Pressure adjustment range *1 MPa {kgf/cm <sup>2</sup> }	Maximum flow rate L/min	Hysteresis	Repeatability	Mass kg
JRP-G02-03-※-30	¼	Up to 3.5 {Up to 35}	1	No greater than 3% of the maximum adjusting pressure	No greater than 1% of the maximum adjusting pressure	1.8
JRP-G02-1 -※-30		Up to 7 {Up to 70}				
JRP-G02-2 -※-30		Up to 16 {Up to 160}				
JRP-G02-3 -※-30		Up to 25 {Up to 250}				

Note: \*1 The minimum adjustment pressure varies depending on the flow rate. See the minimum adjustment pressure characteristics for details.

○ When used as the pilot valve for a main valve, the minimum adjusting pressure varies depending on the main valve.

### Sub-plate model code

- The sub-plate is not provided with the valve. Order it separately as required by specifying the model code given in the table below.

Model code	Nominal diameter	Connection port diameter	Mass kg
JS-01M02	1/4	Rc1/4	0.64

Refer to Page S-8 for the dimensions of the sub-plate.

### Accessories

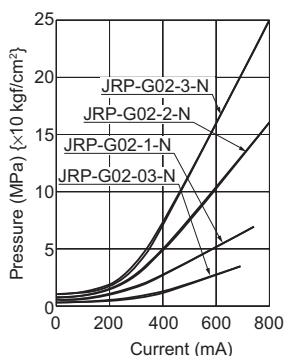
Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
M5 × 45	4	6 to 8 {60 to 80}

### Handling

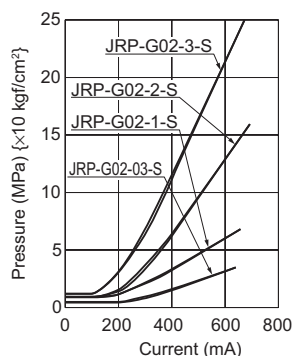
- Directly connect the tank piping of the valve to the tank without merging it with other tank piping.
- Since excessive internal volume of the pilot piping may lead to vibration, use steel pipes with an inner diameter of 4 mm maximum and with thick walls for this piping.
- To achieve stable pressure control, completely remove air by loosening the air bleeding screw and fill the inside of the valve with fluid.
- The minimum pressure adjusting screw (manual adjusting screw) is factory adjusted before shipment but it can be used to adjust the pressure when electric current cannot be applied to the solenoid during initial adjustment or due to electrical failure. Before adjusting the pressure with the pressure adjusting screw, check and note the initial position of the screw. The pressure is increased by turning the screw clockwise. After recovering the normal operation status, return the screw to the initial position and tighten the lock nut.
- N type (direct operated type) models have a structure where the poppet is directly operated with the proportional solenoid and this enables reduction of surge pressure in pressure control with the pressure compensator, especially when installed in a variable displacement piston pump.  
S type (spring balance type) models have a structure where the poppet is operated by the proportional solenoid via a spring and this makes it possible to prevent resonance with the pulsation of the pump, resulting in improved linearity.
- Do not excite the valve continuously for 30 minutes or longer at a constant current.

### Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})

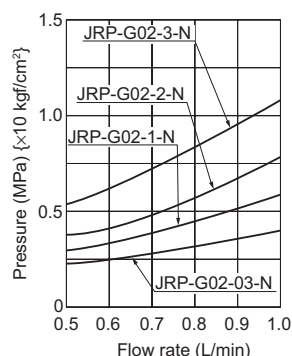
Input current - Pressure characteristics  
JRP-G02-※-N



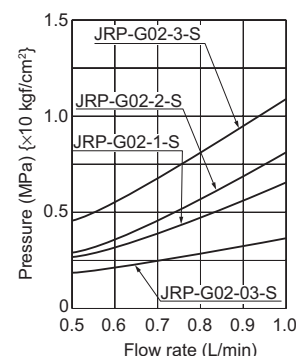
JRP-G02-※-S



Minimum adjustment pressure characteristics  
JRP-G02-※-N



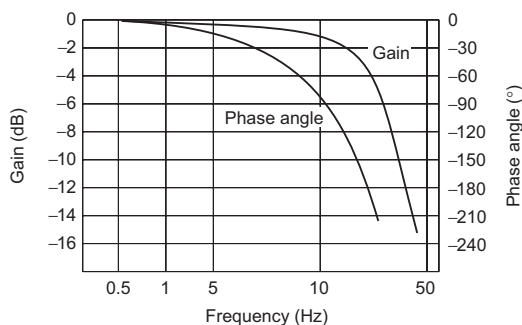
JRP-G02-※-S



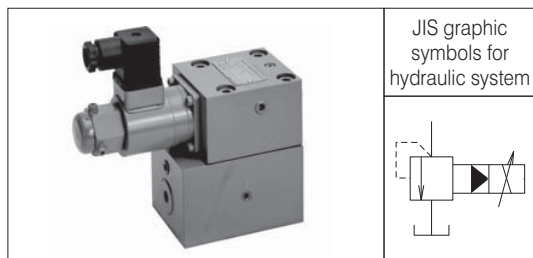
Frequency response characteristics

JRP-G02-2-※-30

Driver: KC-6-10 Pressure fluctuation: 10 ± 2 MPa



## Solenoid Operated Proportional Relief Valve



### Features

- Enables proportional pressure control of the hydraulic circuit in reference to the input current.

### Nomenclature

※ - **JRPL** - **G 02** - ※ - **20** - ※ ※

**1 Applicable fluid code**

No designation: Petroleum-based hydraulic fluid,  
water-glycol hydraulic fluid  
F: Phosphate ester hydraulic fluid

**2 Model No.**

JRPL: J series solenoid operated proportional relief valve

**3 Connections**

G: Gasket mount type

**4 Nominal diameter**

02: ¼

**5 Pressure adjustment range**

- 1: Up to 7 MPa {Up to 70 kgf/cm<sup>2</sup>}
- 2: Up to 14 MPa {Up to 140 kgf/cm<sup>2</sup>}
- 3: Up to 21 MPa {Up to 210 kgf/cm<sup>2</sup>}

**6 Design No.**

**(The design No. is subject to change)**

**7 Option code**

No designation: DIN connector mounting position: Top  
L: DIN connector mounting position, left side  
R: DIN connector mounting position, right side

**8 Solenoid codes**

No designation: DC 24 V solenoid  
N: DC 12 V solenoid

### 8: Solenoid code and applicable driver model code

Solenoid codes	Solenoid	Rated current (20°C) mA	Coil resistance (20°C) Ω	Applicable driver	
				Model code	Power supply voltage
No designation	DC 24 V solenoid	850	26	KC-6-10	AC 100, 200, 220 V (Common for 50 and 60 Hz)
N	DC 12 V solenoid	1700	6.5	ZH-6-10	DC 24 V

### Specifications

Model code	Nominal diameter	Pressure adjustment range *1 MPa {kgf/cm <sup>2</sup> }	Maximum flow rate L/min	Hysteresis	Repeatability	Mass kg
JRPL-G02-1-20	¼	Up to 7 {Up to 70}	30	No greater than 5% of the maximum adjusting pressure	No greater than 1% of the maximum adjusting pressure	5
JRPL-G02-2-20		Up to 14 {Up to 140}				
JRPL-G02-3-20		Up to 21 {Up to 210}				

Note: \*1 The minimum adjustment pressure varies depending on the flow rate. See the minimum adjustment pressure characteristics for details.

### Accessories

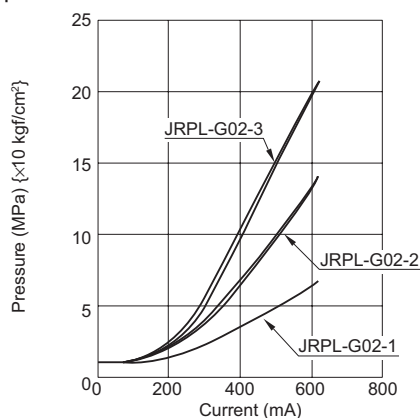
Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
M8 × 115	4	25 to 30 {250 to 300}

## Handling

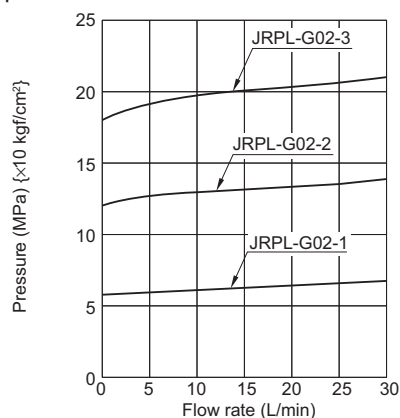
- Directly connect the tank piping of the valve to the tank without merging it with other tank piping.
- To achieve stable pressure control, completely remove air by loosening the air bleeding screw and fill the inside of the valve with fluid.
- The minimum pressure adjusting screw (manual adjusting screw) is factory adjusted before shipment but it can be used to adjust the pressure when electric current cannot be applied to the solenoid during initial adjustment or due to electrical failure. Before adjusting the pressure with the pressure adjusting screw, check and note the initial position of the screw. The pressure is increased by turning the screw clockwise. After recovering the normal operation status, return the screw to the initial position and tighten the lock nut.
- No sub-plate is provided for JRPL-G02.

## Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})

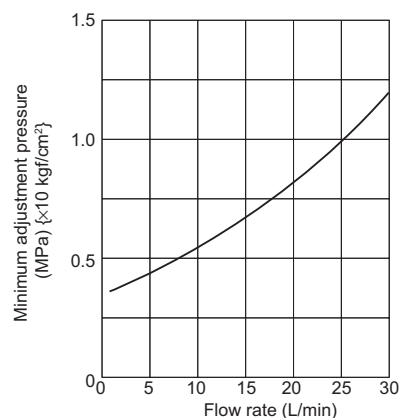
Input current - pressure characteristics



Flow rate - pressure characteristics

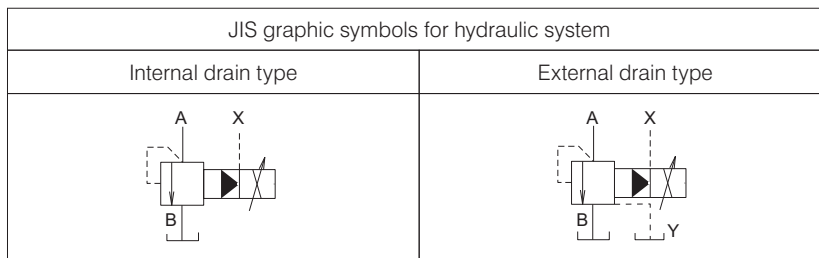


Minimum adjustment pressure characteristics





## Type C2 Solenoid Operated Proportional Relief Valve



### Features

- Enables proportional pressure control of the hydraulic circuit in reference to the input current.

### Nomenclature

※ - **C2RP** - **G** ※※ - ※ - **10** - ※ ※ ※  
1    2    3 4    5    6    7 8 9

#### 1 Applicable fluid code

No designation: Petroleum-based hydraulic fluid,  
water-glycol hydraulic fluid  
F: Phosphate ester hydraulic fluid

#### 2 Model No.

C2RP: Type C2 solenoid operated proportional relief valve

#### 3 Connections

G: Gasket mount type

#### 4 Nominal diameter

03:  $\frac{3}{8}$   
06:  $\frac{3}{4}$

#### 5 Pressure adjustment range

1: Up to 7 MPa {Up to 70 kgf/cm<sup>2</sup>}  
2: Up to 16 MPa {Up to 160 kgf/cm<sup>2</sup>}  
3: Up to 25 MPa {Up to 250 kgf/cm<sup>2</sup>}

#### 6 Design No.

(The design No. is subject to change)

#### 7 Drainage code

No designation: Internal drain type  
E: External drain type

#### 8 Option code

No designation: DIN connector mounting position: Top  
L: DIN connector mounting position, left side  
R: DIN connector mounting position, right side

#### 9 Solenoid codes

No designation: DC 24 V solenoid  
N: DC 12 V solenoid

### 9: Solenoid code and applicable driver model code

Solenoid codes	Solenoid	Rated current (20°C) mA	Coil resistance (20°C) Ω	Applicable driver	
				Model code	Power supply voltage
No designation	DC 24 V solenoid	850	26	KC-6-10	AC 100, 200, 220 V (Common for 50 and 60 Hz)
N	DC 12 V solenoid	1700	6.5	ZH-6-10	DC 24 V

### Specifications

Model code	Nominal diameter	Pressure adjustment range *1 MPa {kgf/cm <sup>2</sup> }	Maximum flow rate L/min	Hysteresis	Repeatability	Mass kg
C2RP-G03-1-10	$\frac{3}{8}$	Up to 7 {Up to 70}	160	No greater than 3% of the maximum adjusting pressure	No greater than 1% of the maximum adjusting pressure	6.3
C2RP-G03-2-10		Up to 16 {Up to 160}				
C2RP-G03-3-10		Up to 25 {Up to 250}				
C2RP-G06-1-10	$\frac{3}{4}$	Up to 7 {Up to 70}	400			
C2RP-G06-2-10		Up to 16 {Up to 160}				
C2RP-G06-3-10		Up to 25 {Up to 250}				

Note: \*1 The minimum adjustment pressure varies depending on the flow rate. See the minimum adjustment pressure characteristics for details.

### Sub-plate model code

- The sub-plate is not provided with the valve. Order it separately as required by specifying the model code given in the table below.

Model code	Nominal diameter	Connection port diameter	Mass kg
JGB-03M	3/8	Rc3/8	1.6
JGB-03M04		Rc1/2	
JGB-06M	3/4	Rc3/4	3.9
JGB-06M08		Rc1	

Refer to Page S-6 for the dimensions of the sub-plate.

### Accessories

Model No.	Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
C2RP-G03	M10 × 60	4	51 to 68 {510 to 680}
C2RP-G06	M10 × 75	4	51 to 68 {510 to 680}

### Handling

- Directly connect the tank piping of the valve to the tank without merging it with other tank piping.
- To achieve stable pressure control, completely remove air by loosening the air bleeding screw and fill the inside of the valve with fluid.
- The minimum pressure adjusting screw (manual adjusting screw) is factory adjusted before shipment but it can be used to adjust the pressure when electric current cannot be applied to the solenoid during initial adjustment or due to electrical failure. Before adjusting the pressure with the pressure adjusting screw, check and note the initial position of the screw. The pressure is increased by turning the screw clockwise. After recovering the normal operation status, return the screw to the initial position and tighten the lock nut.
- The safety valve is set to the value shown in the table below (at the maximum flow rate).

Model code	Safety valve pressure setting MPa {kgf/cm <sup>2</sup> }	Pressure change MPa {kgf/cm <sup>2</sup> } per screw revolution
C2RP-G***-1	10{100}	2.5 {25}/revolution
C2RP-G***-2	19{190}	4.6 {46}/revolution
C2RP-G***-3	28{280}	7.9 {79}/revolution

- Use the valve with a flow rate of 12 L/min minimum since the pressure setting may be unstable if the flow rate is too low.

### Drain type setting guide

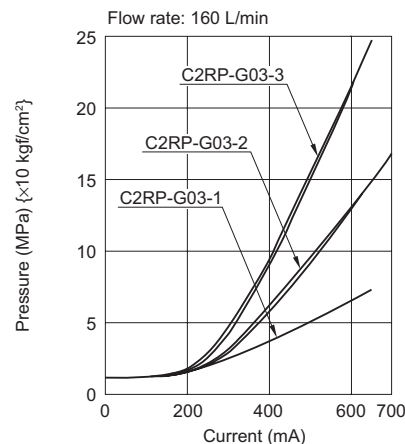
- Either the internal or external drain type can be set by fitting/removing plugs. When the valve is set as the external drain type, connect the piping directly from the external drain port (port Y) to the tank.

	Internal drain type	External drain type	Hexagon socket taper thread plug	Tightening torque N·m {kgf·cm}
Plug A	Plugged	Not plugged	NPTF <sup>1</sup> / <sub>16</sub>	6 to 7.5 {60 to 75}
Plug B	Not plugged	Plugged		

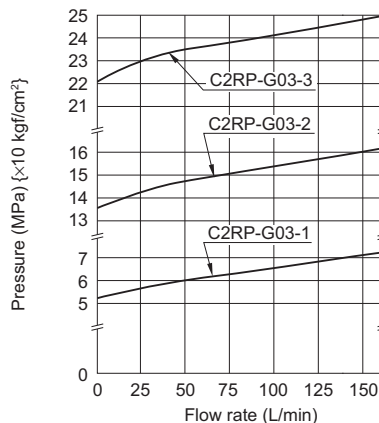
### Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})

#### ● C2RP-G03

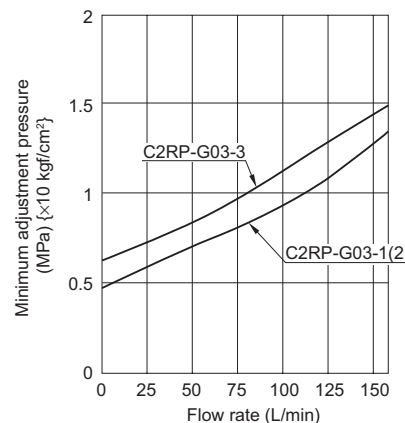
Input current - Pressure characteristics



Flow rate - Pressure characteristics

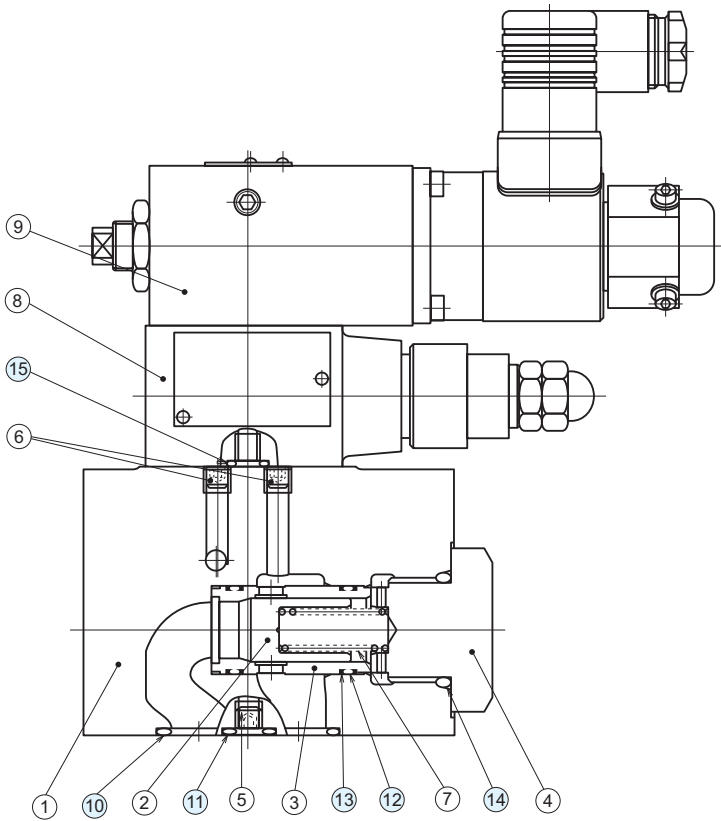


Minimum adjustment pressure characteristics



## Sectional structural diagram

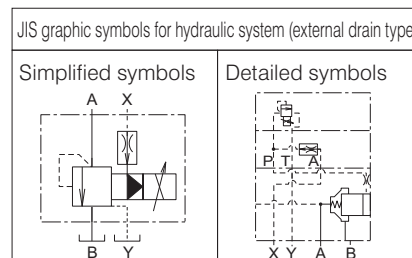
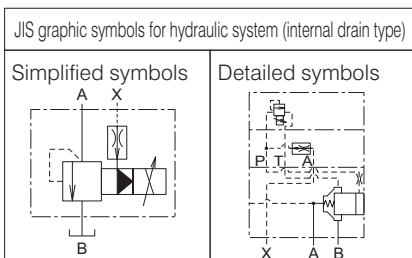
C2RP-G03 (G06)



Sealing part table

Part No.	Name	Quantity	Part specifications	
			C2RP-G03	C2RP-G06
10	O-ring	2	JIS B 2401 1B P20	JIS B 2401 1B P28
11	O-ring	2	JIS B 2401 1B P12	JIS B 2401 1B P12
12	O-ring	2	AS568-020 (NBR, Hs90)	AS568-122 (NBR, Hs90)
13	Backup ring	4	Spiral for AS568-020	Spiral for AS568-122
14	O-ring	1	AS568-215 (NBR, Hs90)	AS568-222 (NBR, Hs90)
15	O-ring	2	JIS B 2401 1B P9	JIS B 2401 1B P9

## Type C2 Solenoid Operated Proportional Low-Pressure Relief Valve



### Features

- These normally open type valves are capable of pressure control from the low pressure range because of a structure that supplies the external pilot flow rate to the built-in flow rate adjusting valve.

### Nomenclature

※ - C2RLP - G 03 - ※※ - 10 - ※ ※ ※

1                      2                      3    4                      5                      6                      7    8    9

#### 1 Applicable fluid code

No designation: Petroleum-based hydraulic fluid,  
water-glycol hydraulic fluid  
F: Phosphate ester hydraulic fluid

#### 2 Model No.

C2RLP: Type C2 solenoid operated proportional low-pressure relief valve

#### 3 Connections

G: Gasket mount type

#### 4 Nominal diameter

03: 3/8

#### 5 Pressure adjustment range

03: Up to 3.5 MPa {Up to 35 kgf/cm<sup>2</sup>}  
1: Up to 7 MPa {Up to 70 kgf/cm<sup>2</sup>}  
2: Up to 16 MPa {Up to 160 kgf/cm<sup>2</sup>}

#### 6 Design No.

(The design No. is subject to change)

#### 7 Drainage code

No designation: Internal drain type  
E: External drain type

#### 8 Option code

No designation: DIN connector mounting position: Top  
L: DIN connector mounting position, left side  
R: DIN connector mounting position, right side

#### 9 Solenoid codes

No designation: DC 24 V solenoid  
N: DC 12 V solenoid

### 9: Solenoid code and applicable driver model code

Solenoid codes	Solenoid	Rated current (20°C) mA	Coil resistance (20°C) Ω	Applicable driver	
				Model code	Power supply voltage
No designation	DC 24 V solenoid	850	26	KC-6-10	AC 100, 200, 220 V (Common for 50 and 60 Hz)
N	DC 12 V solenoid	1700	6.5	ZH-6-10	DC 24 V

### Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm <sup>2</sup> }	Pressure adjustment range *1 MPa {kgf/cm <sup>2</sup> }	Maximum flow rate L/min	External pilot flow rate L/min	Hysteresis	Repeatability	Mass kg
C2RLP-G03-03-10	3/8	21 {210} (External pilot pressure)	Up to 3.5 {Up to 35}	80	0.5 to 0.6	No greater than 3% of the maximum adjusting pressure	No greater than 1% of the maximum adjusting pressure	6.4
C2RLP-G03- 1-10			Up to 7 {Up to 70}					
C2RLP-G03- 2-10			Up to 16 {Up to 160}					

Note: \*1 The minimum adjustment pressure varies depending on the flow rate. See the minimum adjustment pressure characteristics for details.

### Sub-plate model code

- The sub-plate is not provided with the valve. Order it separately as required by specifying the model code given in the table below.

Model code	Nominal diameter	Connection port diameter	Mass kg
JGB-03M	3/8	Rc3/8	1.6
JGB-03M04		Rc1/2	

Refer to Page S-6 for the dimensions of the sub-plate.

### Accessories

Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
M10 × 60	4	51 to 68 {510 to 680}

### Handling

- Directly connect the tank piping of the valve to the tank without merging it with other tank piping.
- To achieve stable pressure control, completely remove air by loosening the air bleeding screw and fill the inside of the valve with fluid.
- External pilot pressure is required to operate the valve. Set the external pilot pressure 1 MPa {10 kgf/cm<sup>2</sup>} higher than the maximum adjustment pressure.
- The minimum pressure adjusting screw (manual adjusting screw) is factory adjusted before shipment but it can be used to adjust the pressure when electric current cannot be applied to the solenoid during initial adjustment or due to electrical failure. Before adjusting the pressure with the pressure adjusting screw, check and note the initial position of the screw. The pressure is increased by turning the screw clockwise. After recovering the normal operation status, return the screw to the initial position and tighten the lock nut.
- Use the valve with a flow rate of 12 L/min minimum since the pressure setting may be unstable if the flow rate is too low.

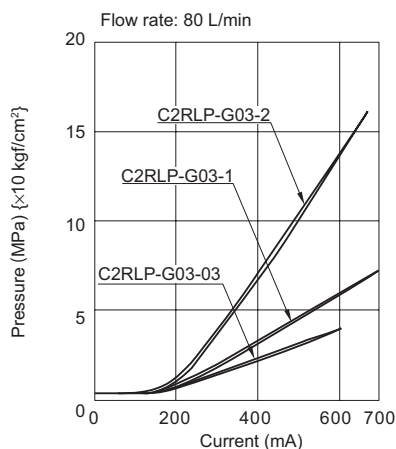
### Drain type setting guide

- Either the internal or external drain type can be set by fitting/removing plugs. When the valve is set as the external drain type, connect the piping directly from the external drain port (port Y) to the tank.

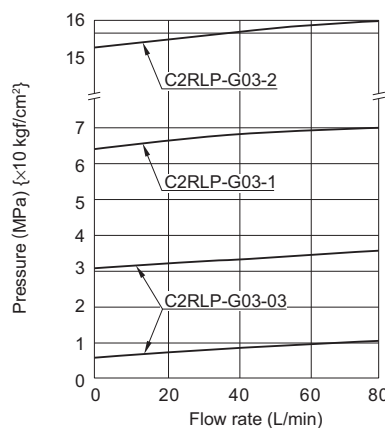
	Internal drain type	External drain type	Hexagon socket taper thread plug	Tightening torque N·m {kgf·cm}
Plug A	Plugged	Not plugged	NPTF <sup>1</sup> / <sub>16</sub>	6 to 7.5 {60 to 75}
Plug B	Not plugged	Plugged		

### Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})

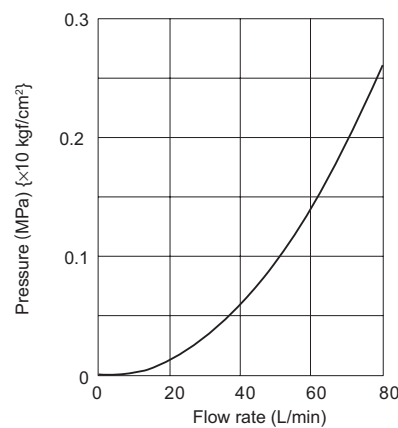
Input current - Pressure characteristics



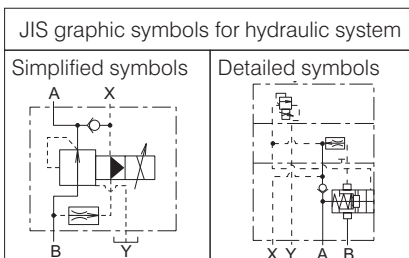
Flow rate - Pressure characteristics



Minimum adjustment pressure characteristics



## Type C2 Solenoid Operated Proportional Low-pressure Reducing Valve



### Features

- These normally closed type valves are capable of pressure control from the low pressure range because of a structure that supplies the pilot flow rate from the primary side of the valve to the built-in flow rate adjusting valve.

### Nomenclature

※ - C2GLP - G 03 - ※※ - 10 - ※ ※

1                      2                      3    4                      5                      6                      7    8

#### 1 Applicable fluid code

No designation: Petroleum-based hydraulic fluid,  
water-glycol hydraulic fluid  
F: Phosphate ester hydraulic fluid

#### 2 Model No.

C2GLP: Type C2 solenoid operated proportional low-pressure reducing valve

#### 3 Connections

G: Gasket mount type

#### 4 Nominal diameter

03:  $\frac{3}{8}$

#### 5 Pressure adjustment range

03: Up to 3.5 MPa {Up to 35 kgf/cm<sup>2</sup>}  
1: Up to 7 MPa {Up to 70 kgf/cm<sup>2</sup>}  
2: UP to 16 MPa {UP to 160 kgf/cm<sup>2</sup>}

#### 6 Design No.

(The design No. is subject to change)

#### 7 Option code

No designation: DIN connector mounting position: Top  
L: DIN connector mounting position, left side  
R: DIN connector mounting position, right side

#### 8 Solenoid codes

No designation: DC 24 V solenoid  
N: DC 12 V solenoid

### 8: Solenoid code and applicable driver model code

Solenoid codes	Solenoid	Rated current (20°C) mA	Coil resistance (20°C) Ω	Applicable driver	
				Model code	Power supply voltage
No designation	DC 24 V solenoid	850	26	KC-6-10	AC 100, 200, 220 V (Common for 50 and 60 Hz)
N	DC 12 V solenoid	1700	6.5	ZH-6-10	DC 24 V

### Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm <sup>2</sup> }	Pressure adjustment range *1 MPa {kgf/cm <sup>2</sup> }	Maximum flow rate L/min	Drainage rate L/min	Hysteresis	Repeatability	Mass kg
C2GLP-G03-03-10	$\frac{3}{8}$	25 {250}	Up to 3.5 {Up to 35}	80	0.5 to 0.6	No greater than 3% of the maximum adjusting pressure	No greater than 1% of the maximum adjusting pressure	6.4
C2GLP-G03- 1-10			Up to 7 {Up to 70}					
C2GLP-G03- 2-10			Up to 16 {Up to 160}					

Note: \*1 The minimum adjustment pressure varies depending on the flow rate. See the flow rate - pressure characteristics.

### Sub-plate model code

- The sub-plate is not provided with the valve. Order it separately as required by specifying the model code given in the table below.

Model code	Nominal diameter	Connection port diameter	Mass kg
JGB-03M	3/8	Rc3/8	1.6
JGB-03M04		Rc1/2	

Refer to Page S-6 for the dimensions of the sub-plate.

### Accessories

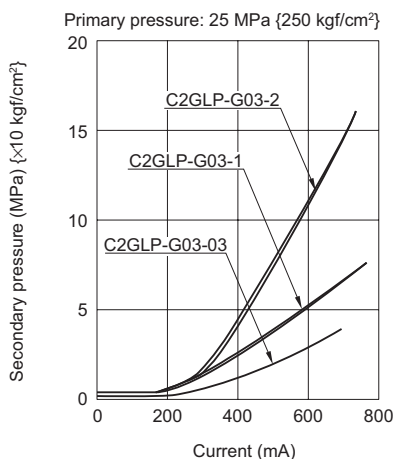
Hexagon socket head cap bolt	Number	Tightening torque N·m {kgf·cm}
M10 × 60	4	51 to 68 {510 to 680}

### Handling

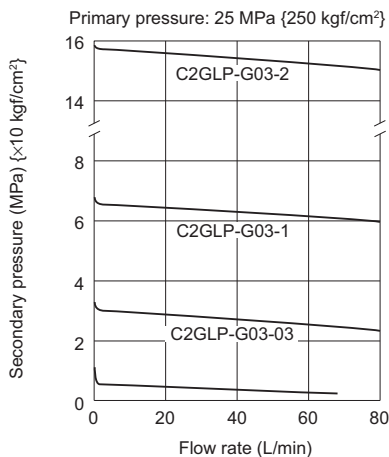
- Directly connect the drain piping to the tank without merging it with other tank piping.
- To achieve stable pressure control, completely remove air by loosening the air bleeding screw and fill the inside of the valve with fluid.
- To ensure good pressure reducing performance, set the primary side main circuit pressure and the secondary pressure reducing circuit pressure such that there is a minimum difference of 1 MPa {10 kgf/cm<sup>2</sup>}.
- The minimum pressure adjusting screw (manual adjusting screw) is factory adjusted before shipment but it can be used to adjust the pressure when electric current cannot be applied to the solenoid during initial adjustment or due to electrical failure. Before adjusting the pressure with the pressure adjusting screw, check and note the initial position of the screw. The pressure is increased by turning the screw clockwise. After recovering the normal operation status, return the screw to the initial position and tighten the lock nut.

### Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})

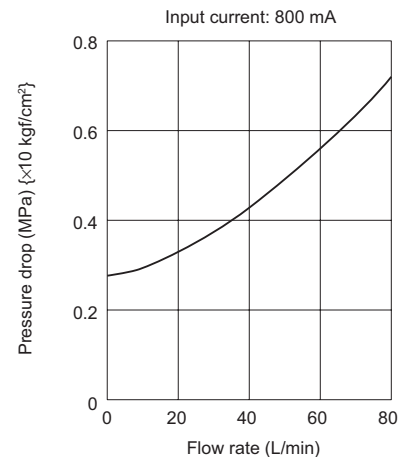
Input current - pressure characteristics



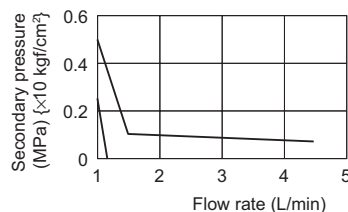
Flow rate - pressure characteristics



Pressure drop characteristics

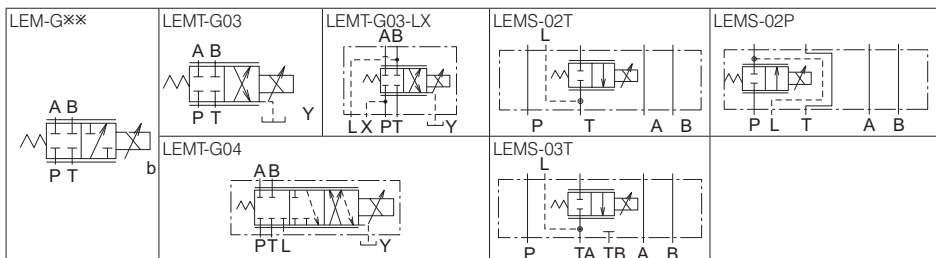
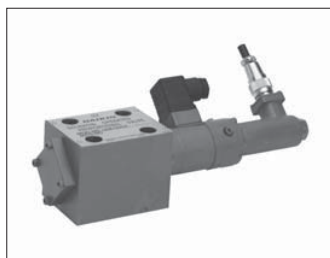


Flow rate - pressure characteristics



Note: The minimum adjustment pressure at 0 L/min is 0.28 MPa {2.8 kgf/cm<sup>2</sup>}.

## Direct Operated Type Solenoid Operated Proportional Throttle Valve

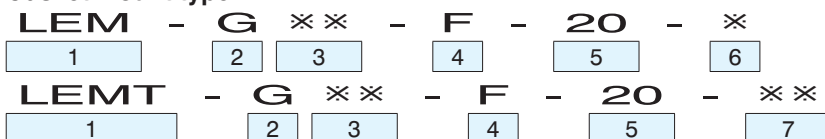


### Features

- These proportional throttle directional control valves perform spool position feedback control by directly driving the spool with the proportional solenoid and detecting the displacement with the differential transformer.
- Combining the valve with a pressure compensation valve and the dedicated driver achieves highly accurate proportional flow rate control.
- Highly accurate proportional flow rate control with meter-in control at port P or meter-out control at port T can be realized by stacking the LEMS valves in combination with the dedicated reduction type pressure compensation valve (MGS) under the solenoid valve.

### Nomenclature

#### ● Gasket mount type



#### 1 Model No.

LEM: Solenoid operated proportional throttle valve  
 LEMT: Back pressure type solenoid operated proportional throttle valve

#### 2 Connections

G: Gasket mount type

#### 3 Nominal diameter

02: 1/4 <Applicable only to the model designation LEM>  
 03: 3/8  
 04: 1/2 <Applicable only to the model designation LEMT>

Note: \*1 Specifications with SOL.a apply only to nominal diameter 02 (1/4).

\*2 DIN connector mounting at the left side applies only to nominal diameter 03 (3/8).

\*3 The option code II applies only to LEMT-G03.

#### 4 Spool type

F: Spring offset type  
 All ports blocked when neutral

#### 5 Design No. (The design No. is subject to change)

#### 6 Option code I

No designation: With SOL.b (flow P → B)  
 G: With SOL.a (flow P → A) \*1  
 L: DIN connector mounting position, left side \*2

#### 7 Option code II \*3

No designation: Without ports L and X  
 LX: With ports L and X

#### ● Stacking type



#### 1 Model No.

LEMS: Stacking type solenoid operated proportional throttle valve

#### 2 Nominal diameter

02: 1/4  
 03: 3/8

#### 3 Control port

P: Port P \*4  
 T: Port T

Note: \*4 Applicable only to nominal diameter 02 (1/4)

#### 4 Design No. (The design No. is subject to change)

20: Nominal diameter 03 (3/8)  
 30: Nominal diameter 02 (1/4)

#### 5 DIN connector mounting position \*4

No designation: Bottom  
 A: Right  
 B: Top  
 C: Left

#### 6 Differential transformer connector mounting position \*4

No designation: Bottom  
 Q: Right  
 R: Top  
 S: Left



## Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm <sup>2</sup> }	Rated flow rate *5 L/min	Port permissible back pressure MPa {kgf/cm <sup>2</sup> }	Hysteresis, resolution, repeatability	Coil resistance (20°C) Ω	Current at start of flow (Nominal) mA	Current at rated flow (Nominal) mA
LEM -G02-F-20	¼	21 {210}	25	2.5 { 25}	No greater than 1% of rated input voltage	26	300	700
LEM -G03-F-20	⅜		50					
LEMT-G03-F-20	⅜		130	21 {210}				
LEMT-G04-F-20	½							
LEMS-02* -30	¼	25	2.5 { 25}	26		300	700	
LEMS-03T -20	⅜	50						

Note: \*5 The rated flow rate indicates the values when the valve is used in combination with a pressure compensation valve (differential pressure: 0.6 MPa {6 kgf/cm<sup>2</sup>})

## Applicable driver model code

Valve model code	Applicable driver	
	Model code	Power supply voltage
LEM-G**, LEMT-G03, LEMS-**	KF-5-10	AC 100, 200, 220 V (Common for 50 and 60 Hz)
LEMT-G04	KFH-5-10	

## Sub-plate model code

- The sub-plate is not provided with the valve. Order it separately as required by specifying the model code given in the table below.

Model code	Nominal diameter	Connection port diameter	Mass kg
JS-01M02	¼	Rc¼	0.64
JS-02M03		Rc⅜	2.3
JS-03M	⅜	Rc⅝	2.5
JS-03M04		Rc½	2.2

Refer to Page S-8 for the dimensions of the sub-plate.

## Accessories

Model No.	Hexagon socket head cap bolt	Number	Tightening torque N·m {kgf·cm}
LEM-G02	M5 × 45	4	5 to 8 { 50 to 80}
LEM(T)-G03	M6 × 35	4	10 to 13 {100 to 130}
LEMT-G04	M6 × 50	2	10 to 13 {100 to 130}
	M10 × 55	4	59 to 62 {590 to 620}

## Handling

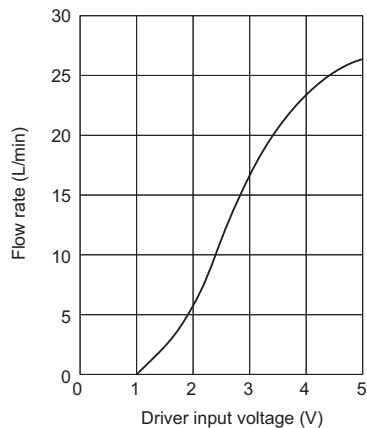
- Directly connect the tank and drain piping to the tank without merging it with other tank piping.
- Do not touch the zero adjusting screw of the differential transformer since it is factory adjusted.
- Use this valve in combination with a pressure compensation valve. Order a pressure compensation valve separately by referring to the table below as necessary.

Model No.	Bypass type pressure compensation valve	Reduction type pressure compensation valve
LEM-G**	MUV12AL6S	MDM12AL6N
LEMT-G03	MUL12AL6N-358	
LEMT-G04	MUV16AL6S MUL16AL6N-347 MUL12AL*N-561	MDM16AL6N
LEMS-02P	-	MGS-02P-20-** (Stacking type)
LEMS-02T	-	MGS-02T-20-** (Stacking type)
LEMS-03T	-	MGS-03T-10-* (Stacking type)

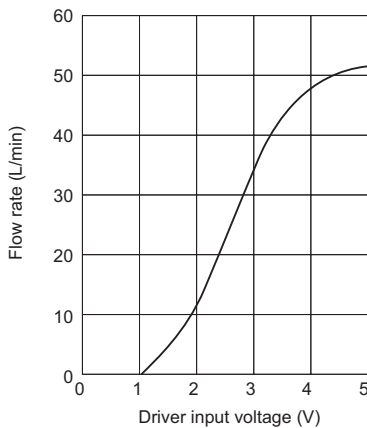
**Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})**

Input voltage - Flow rate characteristics

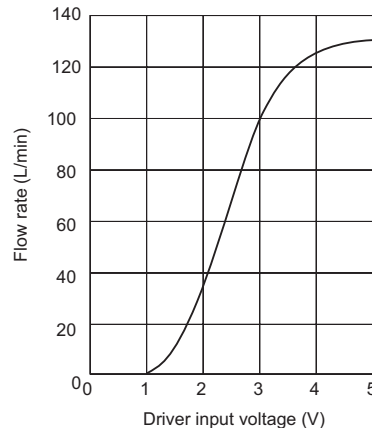
LEM-G02



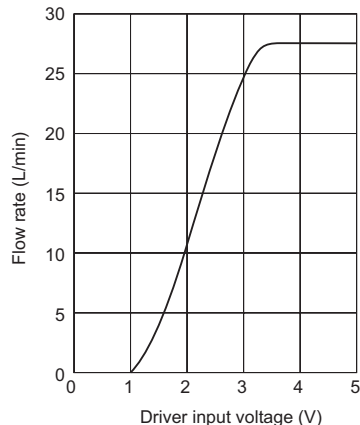
LEM(T)-G03



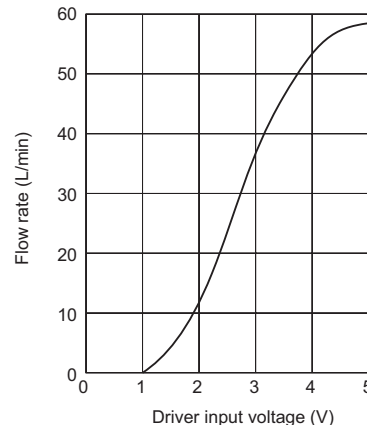
LEMT-G04



LEMS-02P(T)



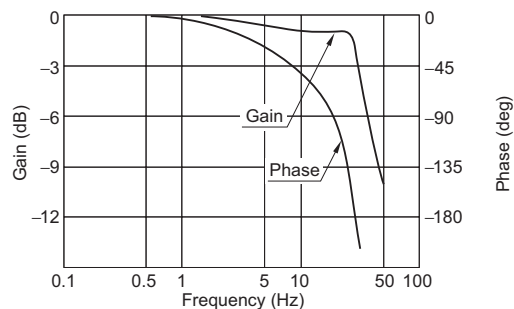
LEMS-03T



Frequency response characteristics

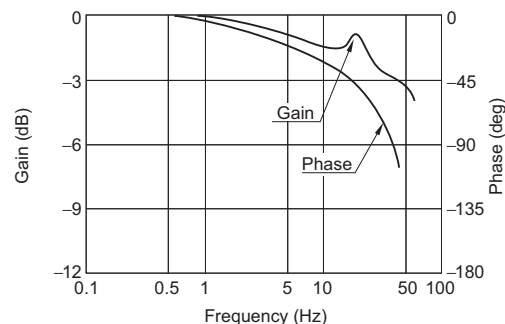
LEM\*(G)02

Flow rate fluctuation: 12 ± 1.25 L/min



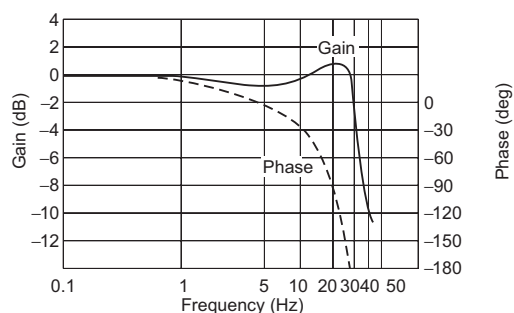
LEM\*(G)03

Flow rate fluctuation: 25 ± 2.5 L/min



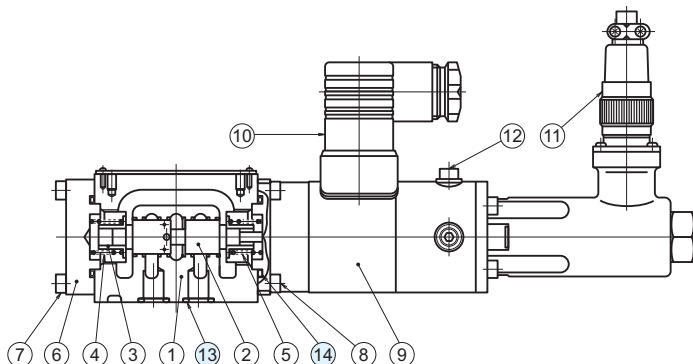
LEMT-G04

Flow rate fluctuation: 65 ± 5 L/min



## Sectional structural diagram

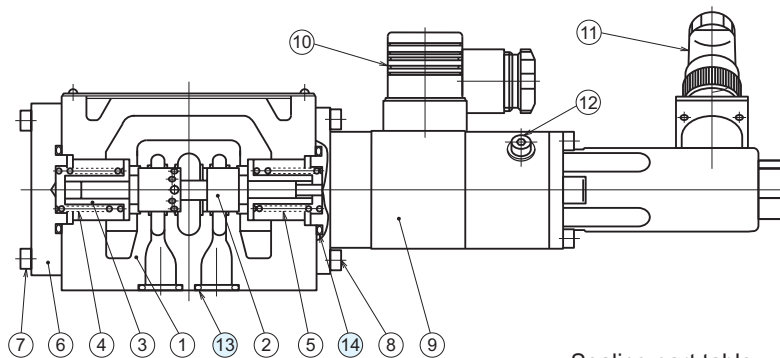
LEM-G02



Sealing part table

Part No.	Name	Quantity	Part specifications
13	O-ring	4	JIS B 2401 1B P9
14	O-ring	2	AS568-121 (NBR, Hs90)

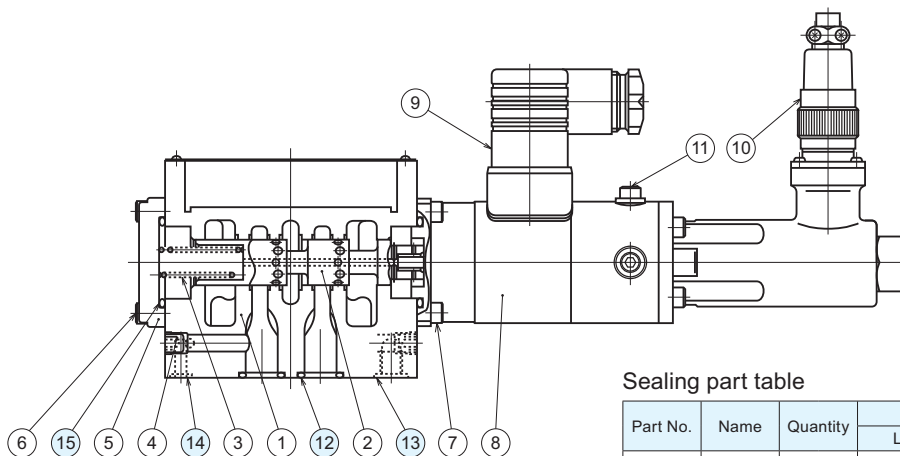
LEM-G03



Sealing part table

Part No.	Name	Quantity	Part specifications
13	O-ring	5	JIS B 2401 1B P12
14	O-ring	2	AS568-121 (NBR, Hs90)

LEMT-G03

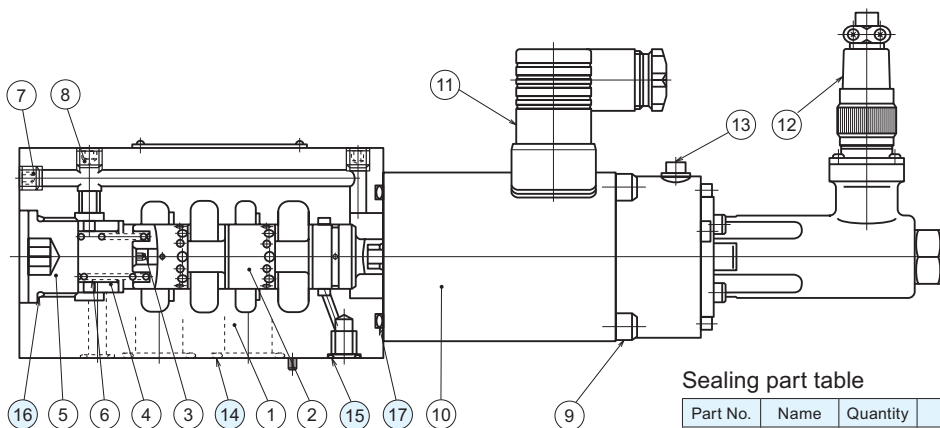


Sealing part table

Part No.	Name	Quantity	Part specifications	
			LEMT-G03-F-20	LEMT-G03-F-20-LX
12	O-ring	5	AS568-014 (NBR, Hs90)	AS568-014 (NBR, Hs90)
13	O-ring	1   2	JIS B 2401 1B P9	JIS B 2401 1B P9
14	O-ring	1	-	AS568-008 (NBR, Hs90)
15	O-ring	2	AS568-121 (NBR, Hs90)	AS568-121 (NBR, Hs90)

## Sectional structural diagram

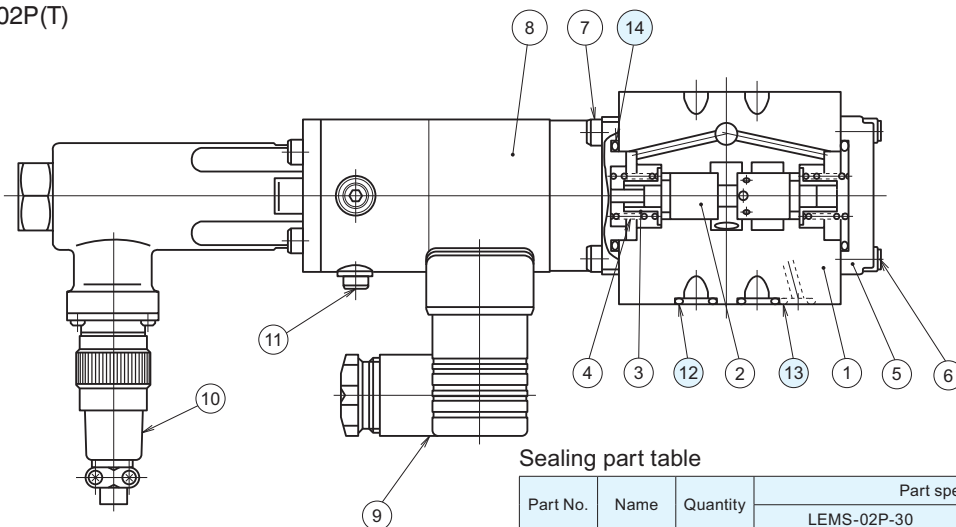
LEMT-G04



Sealing part table

Part No.	Name	Quantity	Part specifications
14	O-ring	4	JIS B 2401 1B P22
15	O-ring	2	JIS B 2401 1B P9
16	O-ring	1	AS568-021 (NBR, Hs90)
17	O-ring	1	JIS B 2401 1B P44

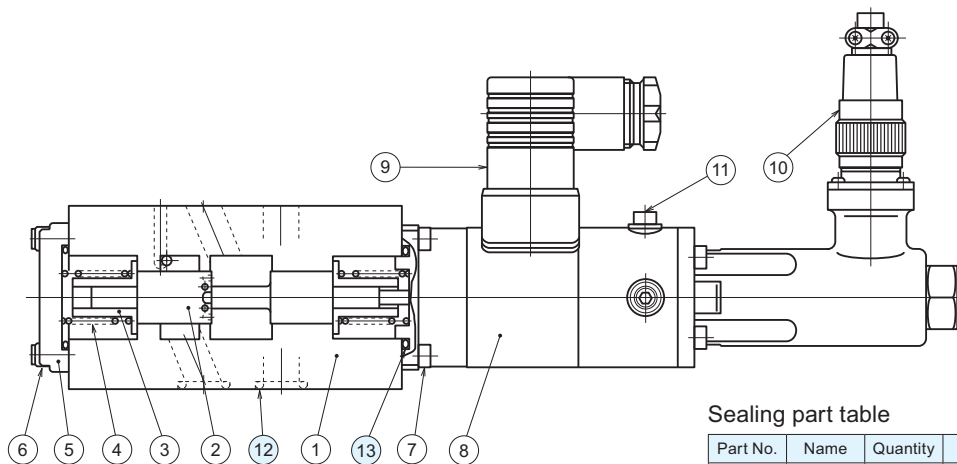
LEMS-02P(T)



Sealing part table

Part No.	Name	Quantity	Part specifications	
			LEMS-02P-30	LEMS-02T-30
12	O-ring	4	JIS B 2401 1B P9	JIS B 2401 1B P9
13	O-ring	1	JIS B 2401 1B P7	-
14	O-ring	2	AS568-121 (NBR, Hs90)	AS568-121 (NBR, Hs90)

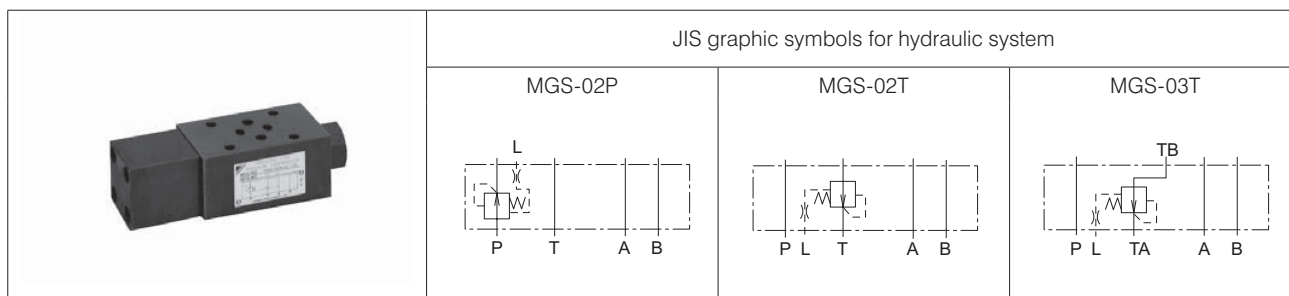
LEMS-03T



Sealing part table

Part No.	Name	Quantity	Part specifications
12	O-ring	5	AS568-014 (NBR, Hs90)
13	O-ring	2	AS568-121 (NBR, Hs90)

## Stacking Reduction Type Pressure Compensation Valve (for LEMS)



### Features

- Combining the valve with a LEMS valve enables proportional flow rate control with reduction type pressure compensation.

### Nomenclature

- Nominal diameter 02

MGS - 02 ※ - 20 - ※ ※  
 1 2 3 4 5 6

- Nominal diameter 03

MGS - 03 T - 10 - ※  
 1 2 3 4 6

**1 Model No.**

MGS: Modular stacking reduction type pressure compensation valve

**2 Nominal diameter**

02: 1/4  
 03: 3/8

**3 Control port**

P: Port P \*1  
 T: Port T

**4 Design No.**

**(The design No. is subject to change)**

10: Nominal diameter 03 (3/8)  
 20: Nominal diameter 02 (1/4)

**5 Differential pressure control port \*2**

No designation: P-L differential pressure control  
 A: P-A differential pressure control (without port L)

**6 Differential pressure code**

No designation: Differential pressure of 0.6 MPa {6 kgf/cm<sup>2</sup>}  
 3: Differential pressure of 0.3 MPa {3 kgf/cm<sup>2</sup>}  
 8: Differential pressure of 0.8 MPa {8 kgf/cm<sup>2</sup>} \*3

Note: \*1 Port P control applies only to nominal diameter 02 (1/4).

\*2 The differential pressure control port code applies only to port P control.

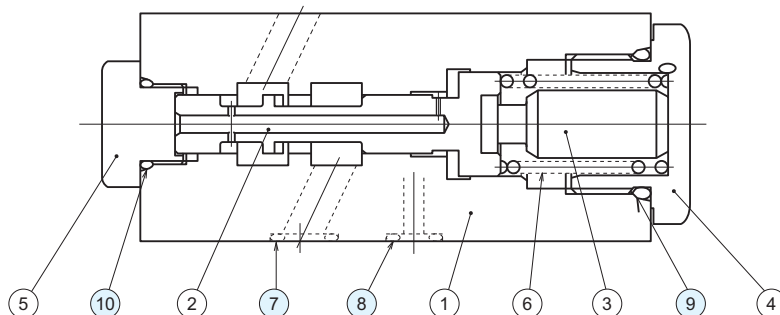
\*3 Differential pressure code "8" applies only to nominal diameter 02 (1/4).

### Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm <sup>2</sup> }	Maximum flow rate L/min	Mass kg
MGS-02P-20	1/4	21 {210}	25	1.2
MGS-02T-20				
MGS-03T-10	3/8	16 {160}	50	3.4

## Sectional structural diagram

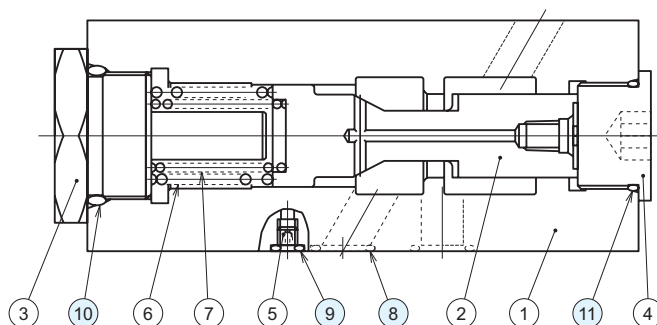
MGS-02\*



Sealing part table

Part No.	Name	Quantity	Part specifications	
			MGS-02P-20	MGS-02T-20
7	O-ring	4	JIS B 2401 1B P9	JIS B 2401 1B P9
8	O-ring	1	-	JIS B 2401 1B P7
9	O-ring	1	JIS B 2401 1B P22	JIS B 2401 1B P22
10	O-ring	1	AS568-014 (NBR, Hs90)	AS568-014 (NBR, Hs90)

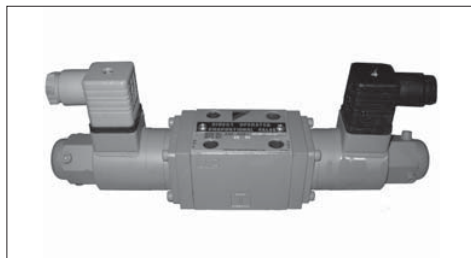
MGS-03T



Sealing part table

Part No.	Name	Quantity	Part specifications
8	O-ring	4	AS568-014 (NBR, Hs90)
9	O-ring	1	JIS B 2401 1B P5
10	O-ring	1	JIS B 2401 1B P28
11	O-ring	1	AS568-021 (NBR, Hs90)

## Direct Operated Type Solenoid Operated Proportional Directional Control Valve



### Features

- These four-way proportional directional control valves enable control of the forward and reverse motion of an actuator.
- The valve can be used alone as a shockless directional control valve.

- With differential transformer
  - These proportional directional control valves perform spool position feedback control by directly driving the spool with the proportional solenoid and detecting the displacement with the differential transformer.
  - Combining the valve with a pressure compensation valve and the dedicated driver achieves highly accurate proportional flow rate control.
- Without differential transformer
  - Installed with the dedicated driver (ZDN-2-10).
  - The valve can be used as a simple flow control valve by combining it with a pressure compensation valve.

### Nomenclature

#### ● Nominal diameter 02

**KSP - G 02 -** \* \* \* \* \* - **10** - \* - \* \* \*

1      2   3      4   5   6      7      8      9

#### ● Nominal diameter 03

**KSP - G 03 -** \* \* \* \* \* - **10** - \* \* \*

1      2   3      4   5      7      9

#### 1 Model No.

KSP: Solenoid operated proportional directional control valve

#### 2 Connections

G: Gasket mount type

#### 3 Nominal diameter

02: ¼  
03: ⅜

#### 4 Spool type and spool operating method (See the spool type table)

#### 5 Rated flow rate (the values at 1 land differential pressure: ΔP = 1 MPa {10 kgf/cm<sup>2</sup>})

1: 10 L/min  
2: 18 L/min  
3: 30 L/min  
4: 40 L/min  
5: 50 L/min

#### 6 Solenoid code \*<sup>1</sup>

P: DC 24 V solenoid  
N: DC 12 V solenoid

#### 7 Design No.

(The design No. is subject to change)

#### 8 Option code \*<sup>2</sup>

No designation: Without differential transformer, with driver ZDN-2-10

N: Without differential transformer, without driver ZDN-2-10

M: With differential transformer

Note: Models with a differential transformer or with a driver are not available with nominal diameter 03 (3/8).

#### 9 Auxiliary spool type (See the spool type table)

Note: \*<sup>1</sup> The solenoid code applies only to option code N.

\*<sup>2</sup> The option code applies only to nominal diameter 02 (1/4)

### Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm <sup>2</sup> }	Rated flow rate * <sup>3</sup> L/min	Permissible back pressure MPa {kgf/cm <sup>2</sup> }	Hysteresis, resolution, repeatability	Mass kg	
						Double solenoid	Single solenoid
KSP-G02-***1*-10	¼	35 {350}	10	2.5 { 25}	5% maximum	2.7	2.1
KSP-G02-***2*-10			18				
KSP-G02-***1*-10-M			10		1% maximum	3.1	2.5
KSP-G02-***2*-10-M			18				
KSP-G02-***3*-10-M			30				
KSP-G03-***4*-10	⅜		40	16 {160}	8% maximum	6.5	4.8
KSP-G03-***5*-10			50				

Note: \*<sup>3</sup> The rated flow rate indicates the value at 1 land differential pressure: ΔP = 1 MPa {10 kgf/cm<sup>2</sup>}.

## Applicable driver model code

Valve model code	Solenoid Code	Solenoid	Maximum current (20°C) mA	Coil resistance (20°C) Ω	Applicable driver			
					Model code	Power supply voltage		
KSP-G02-***-10	–	DC 12 V	1400	6.5	ZDN-2-10	DC 24 V		
KSP-G02-**C*N-10-N	N							
KSP-G02-**A(B)*N-10-N								
KSP-G02-**C*P-10-N	P	DC 24 V	700	26	KC-6-10	AC 100, 200, 220 V (Common for 50 and 60 Hz)		
KSP-G02-**A(B)*P-10-N								
KSP-G02-**C*-10-M	–	DC 12 V	1600	6.5	EPKD-02-10	DC 24 V		
KSP-G02-**A(B)*-10-M								
KSP-G03-**C*-10								
KSP-G03-**A(B)*-10					1800		4.2	EPD-03-10
								EPK-03-10

## 4 9: Spool type table

Spool type and spool operating method	JIS graphic symbols for hydraulic system	Spool type and spool operating method	JIS graphic symbols for hydraulic system	Spool type and spool operating method	JIS graphic symbols for hydraulic system
2C		2A...H2		81A...H44	
44C		2B...2T		8B...44T	

Note: The model code after ... indicates the model of the auxiliary spool.

## Sub-plate model code

- The sub-plate is not provided with the valve. Order it separately as required by specifying the model code given in the table below.

Model code	Nominal diameter	Connection port diameter	Mass kg
JS-01M02	¼	Rc¼	0.64
JS-02M03		Rc¾	2.3
JS-03M	¾	Rc¾	2.5
JS-03M04		Rc½	2.2

Refer to Page S-8 for the dimensions of the sub-plate.

## Handling

- Directly connect the tank piping of the valve to the tank without merging it with other tank piping.
- The input voltage - flow rate characteristics of these valves vary from valve to valve. Even when using valves of the same model, the flow rates of individual valves have to be finely adjusted. The degree of variation can be corrected by adjusting the maximum and minimum values with the dedicated driver's MAX/MIN trimmer.
- Do not touch the zero adjusting screw of the differential transformer since it is factory adjusted.
- Use this valve in combination with a pressure compensation valve. Order a pressure compensation valve separately by referring to the table below as necessary.

Model No.	Bypass type pressure compensation valve	Reduction type pressure compensation valve
KSP-G02-**C	MRS-02W-**-70	MGS-02W-**-70
KSP-G02-**A	MRS-02A-**-70	MGS-02A-**-70
KSP-G02-**B	MRS-02B-**-70	MGS-02B-**-70
KSP-G03-**C	–	MGS-03W-**-70
KSP-G03-**A	–	MGS-03A-**-70
KSP-G03-**B	–	MGS-03B-**-70

- When using the valve in combination with a pressure compensation valve, maintain a pressure difference between port P and the load port within the control range shown in the minimum operating pressure characteristics curve to ensure good pressure compensation performance.
- When using the valve in combination with a bypass type pressure compensation valve, maintain a bypass flow rate of 10 L/min minimum.
- When using the valve in combination with a pressure compensation valve, meter-in control is applied to all flow rate controls.
- When a differential circuit is constructed using this valve, combined use with a pressure compensation valve is not possible.

Refer to Pages J-45 to 48 for the specifications and external dimensions of pressure compensation valves.

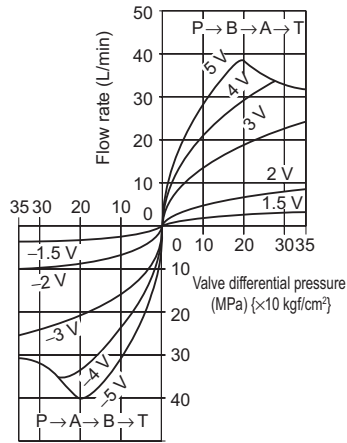
Refer to Pages J-78 to 79 for the specifications and external dimensions of the driver (ZDN-2-10).



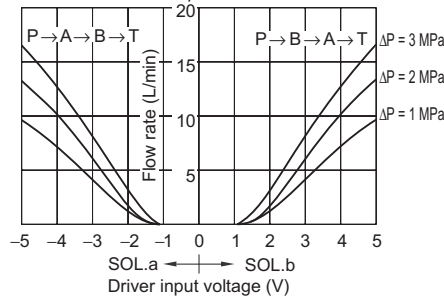
## Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})

### ● KSP-G02-2C1\*-10-M

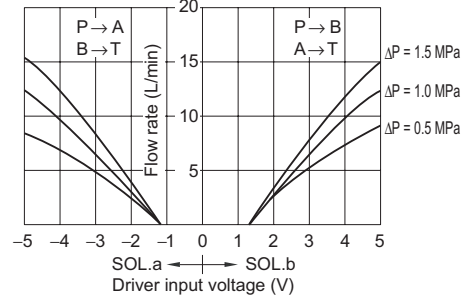
Differential pressure - Flow rate characteristics



Input voltage - Flow rate characteristics (4-way flow)  
ΔP: Valve differential pressure

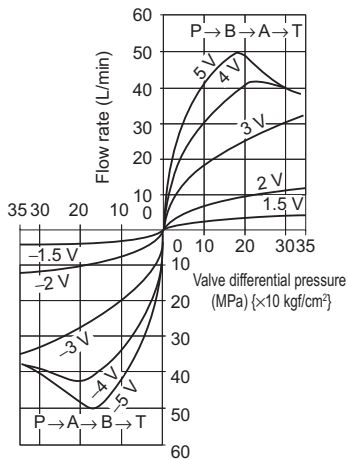


Input voltage - Flow rate characteristics (single side flow)  
ΔP: 1 land differential pressure

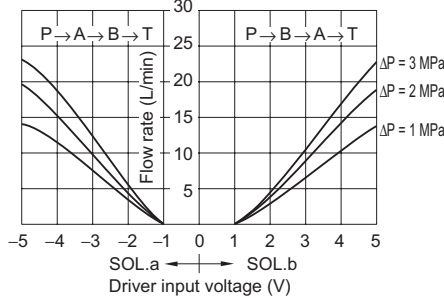


### ● KSP-G02-2C2\*-10-M

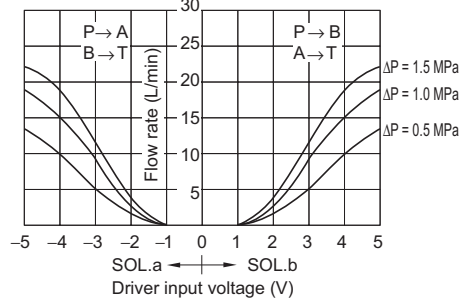
Differential pressure - Flow rate characteristics



Input voltage - Flow rate characteristics (4-way flow)  
ΔP: Valve differential pressure

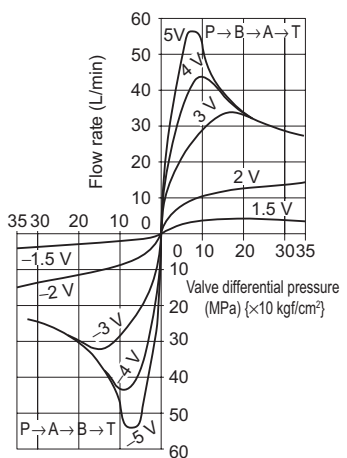


Input voltage - Flow rate characteristics (single side flow)  
ΔP: 1 land differential pressure

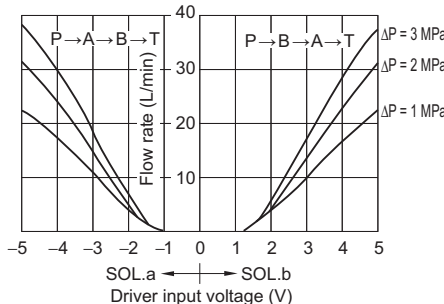


### ● KSP-G02-2C3\*-10-M

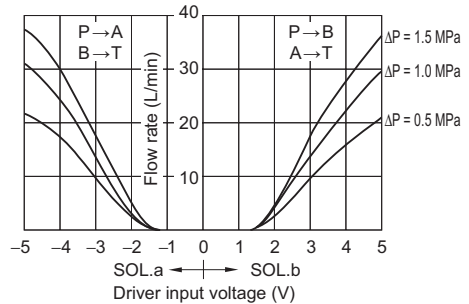
Differential pressure - Flow rate characteristics



Input voltage - Flow rate characteristics (4-way flow)  
ΔP: Valve differential pressure



Input voltage - Flow rate characteristics (single side flow)  
ΔP: 1 land differential pressure



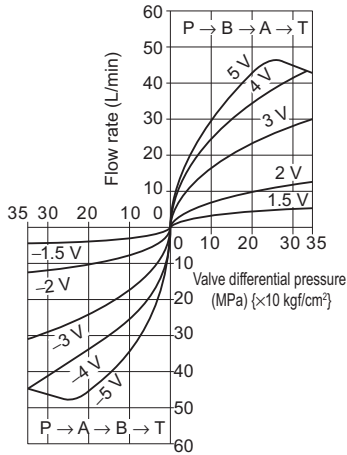
Note: ○ The input voltage - flow rate characteristics are the characteristics when the valve is used in combination with a pressure compensation valve (MRS-02, MGS-02).  
○ For the characteristic curves of single solenoid models, see the characteristic curves indicated in the table below.

Spool type and spool operating method	Performance curve for reference	
	Spool type and spool operating method	Flow direction
2A-H2	2C	P → A → B → T
2B-2T	2C	P → B → A → T

## Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})

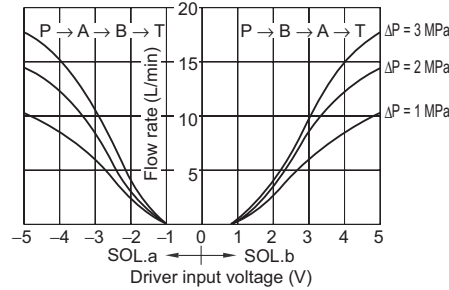
### ● KSP-G02-44C1※-10-M

Differential pressure - Flow rate characteristics



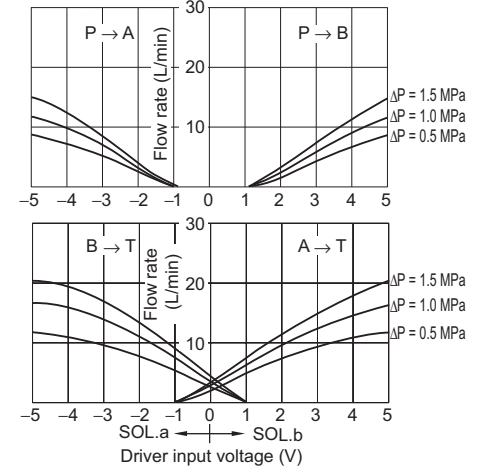
Input voltage - Flow rate characteristics (4-way flow)

ΔP: Valve differential pressure



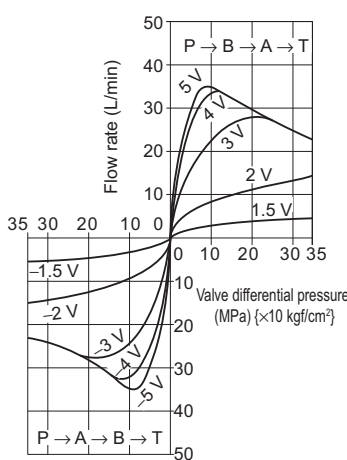
Input voltage - Flow rate characteristics (single side flow)

ΔP: 1 land differential pressure



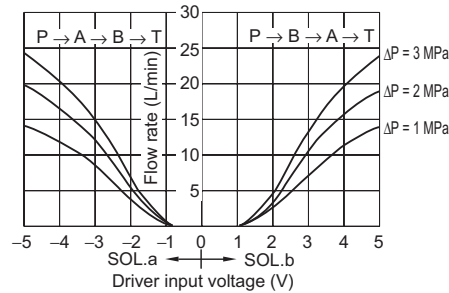
### ● KSP-G02-44C2※-10-M

Differential pressure - Flow rate characteristics



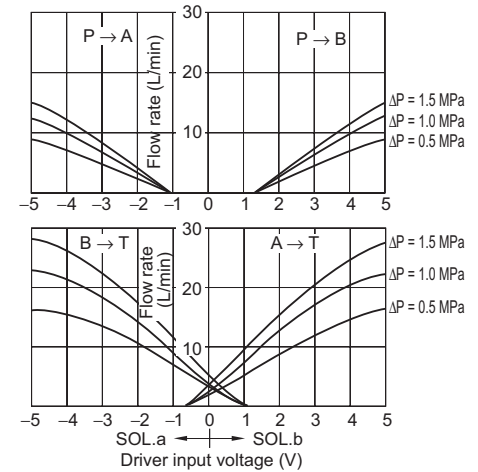
Input voltage - Flow rate characteristics (4-way flow)

ΔP: Valve differential pressure



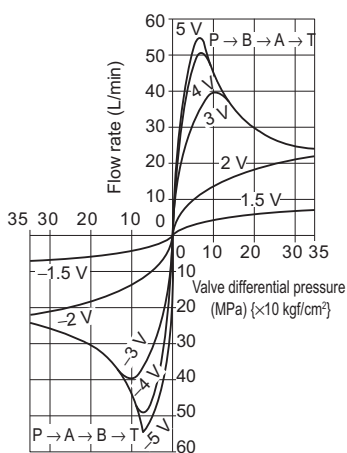
Input voltage - Flow rate characteristics (single side flow)

ΔP: 1 land differential pressure



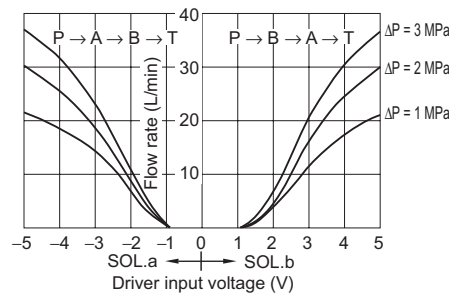
### ● KSP-G02-44C3※-10-M

Differential pressure - Flow rate characteristics



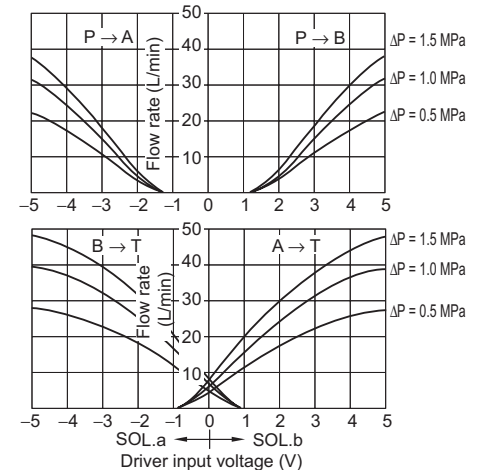
Input voltage - Flow rate characteristics (4-way flow)

ΔP: Valve differential pressure



Input voltage - Flow rate characteristics (single side flow)

ΔP: 1 land differential pressure



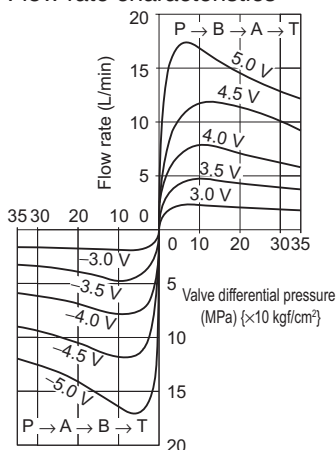
Note: ○ The input voltage - flow rate characteristics are the characteristics when the valve is used in combination with a pressure compensation valve (MRS-02, MGS-02).  
○ For the characteristic curves of single solenoid models, see the characteristic curves indicated in the table below.

Spool type and spool operating method	Performance curve for reference	
	Spool type and spool operating method	Flow direction
81A-H44	44C	P → A → B → T
8B-44T	44C	P → B → A → T

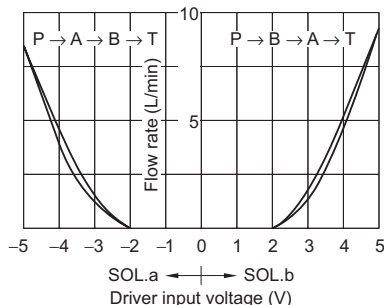
## Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})

### ● KSP-G02-2C1\*-10

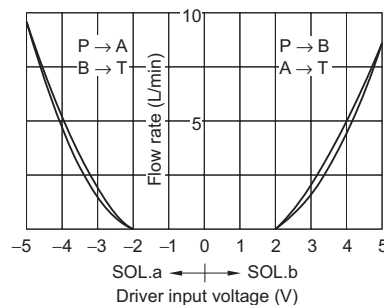
Differential pressure -  
Flow rate characteristics



Input voltage -  
Flow rate characteristics (4-way flow)  
Valve differential pressure ΔP = 1 MPa {10 kgf/cm<sup>2</sup>}

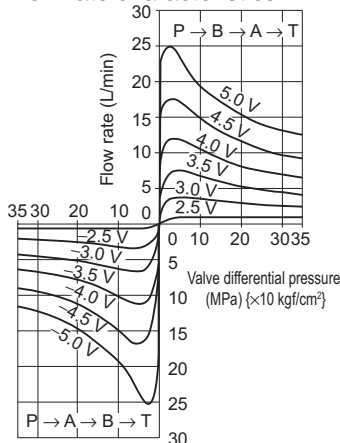


Input voltage -  
Flow rate characteristics (single side flow)  
1 land differential pressure ΔP = 0.5 MPa {5 kgf/cm<sup>2</sup>}

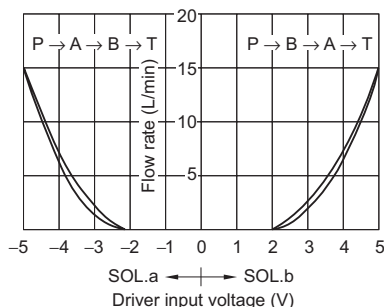


### ● KSP-G02-2C2\*-10

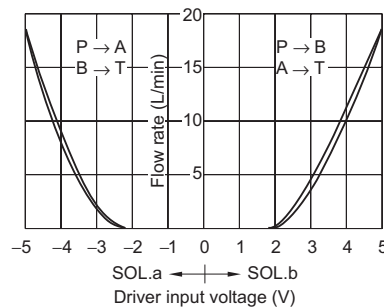
Differential pressure -  
Flow rate characteristics



Input voltage -  
Flow rate characteristics (4-way flow)  
Valve differential pressure ΔP = 1 MPa {10 kgf/cm<sup>2</sup>}



Input voltage -  
Flow rate characteristics (single side flow)  
1 land differential pressure ΔP = 0.5 MPa {5 kgf/cm<sup>2</sup>}

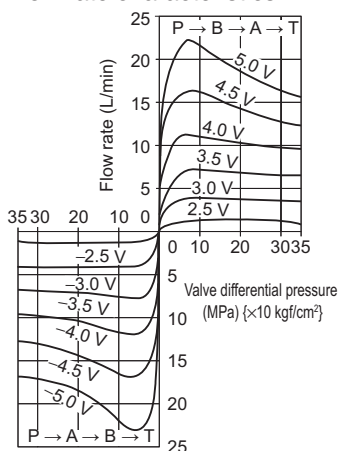


Note: ○ The input voltage - flow rate characteristics are the characteristics when the valve is used in combination with a pressure compensation valve (MRS-02, MGS-02).  
○ For the characteristic curves of single solenoid models, see the characteristic curves indicated in the table below.

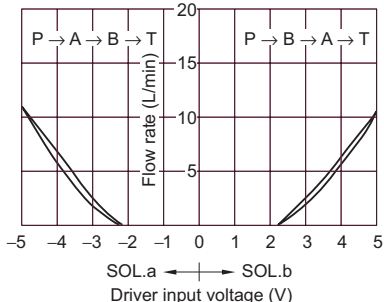
Spool type and spool operating method	Performance curve for reference	
	Spool type and spool operating method	Flow direction
2A-H2	2C	P → A → B → T
2B-2T	2C	P → B → A → T

### ● KSP-G02-44C1\*-10

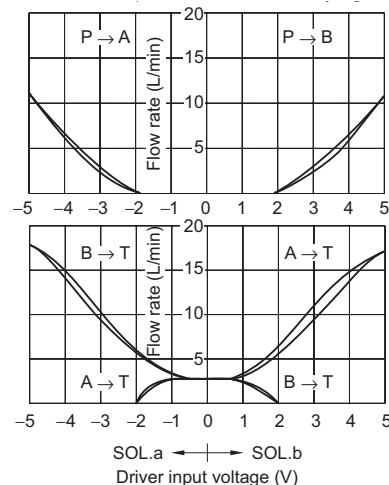
Differential pressure -  
Flow rate characteristics



Input voltage -  
Flow rate characteristics (4-way flow)  
Valve differential pressure ΔP = 1 MPa {10 kgf/cm<sup>2</sup>}



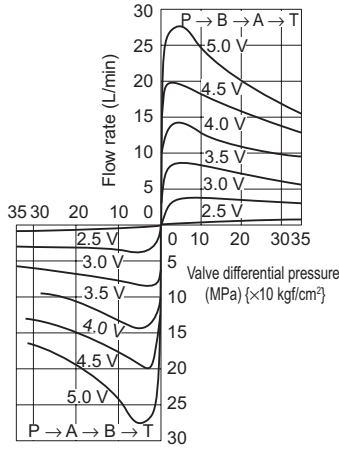
Input voltage -  
Flow rate characteristics (single side flow)  
1 land differential pressure ΔP = 0.5 MPa {5 kgf/cm<sup>2</sup>}



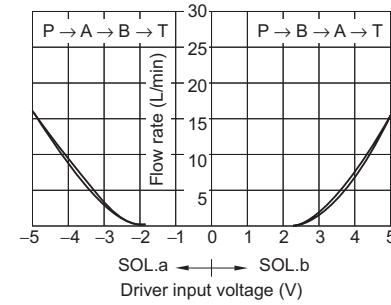
## Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})

### ● KSP-G02-44C2\*-10

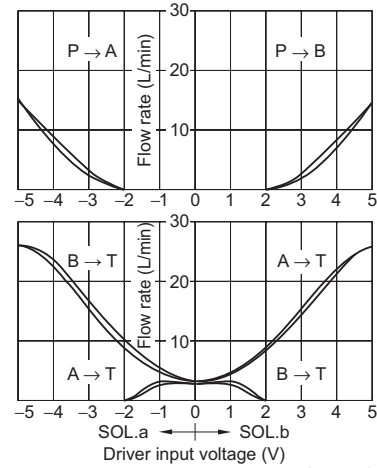
Differential pressure - Flow rate characteristics



Input voltage - Flow rate characteristics (4-way flow)  
Valve differential pressure  $\Delta P = 1 \text{ MPa} \{10 \text{ kgf/cm}^2\}$



Input voltage - Flow rate characteristics (single side flow)  
1 land differential pressure  $\Delta P = 0.5 \text{ MPa} \{5 \text{ kgf/cm}^2\}$



Note: ○ The input voltage - flow rate characteristics are the characteristics when the valve is used in combination with a pressure compensation valve (MRS-02, MGS-02).  
○ For the characteristic curves of single solenoid models, see the characteristic curves indicated in the table below.

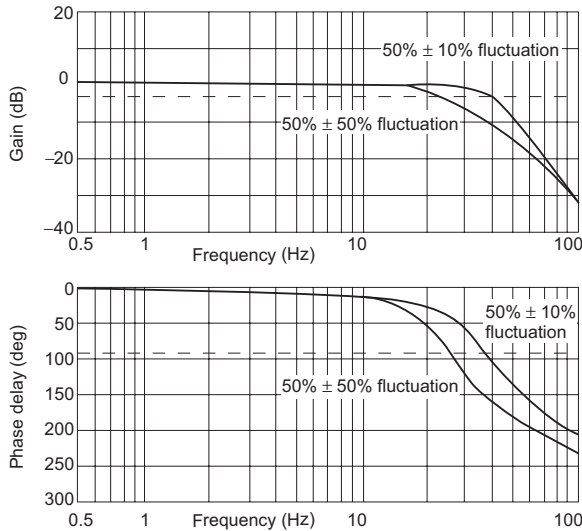
Spool type and spool operating method	Performance curve for reference	
	Spool type and spool operating method	Flow direction
81A-H44	44C	P → A → B → T
8B-44T	44C	P → B → A → T

### ● KSP-G02-M

Frequency response characteristics

Pressure at port P: 2 MPa {20 kgf/cm<sup>2</sup>}

Note: Frequency characteristics of the spool displacement voltage in reference to input voltage

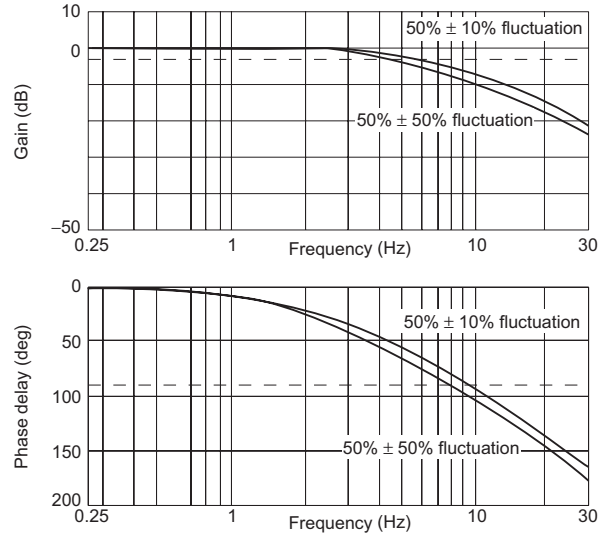


### ● KSP-G02

Frequency response characteristics

Pressure at port P: 2 MPa {20 kgf/cm<sup>2</sup>}

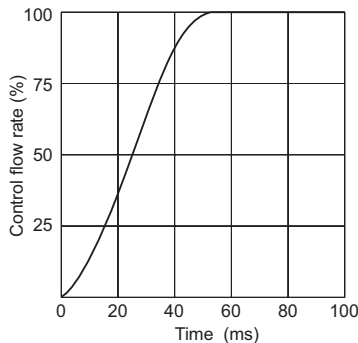
Note: Frequency characteristics of the spool displacement voltage in reference to input voltage



### ● KSP-G02-M

Step response characteristics

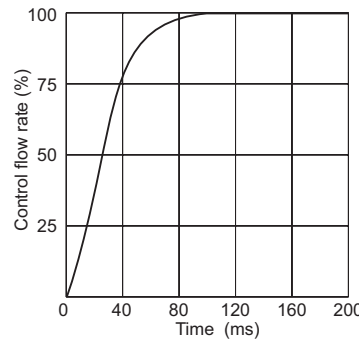
Pressure at port P: 7 MPa {70 kgf/cm<sup>2</sup>}



### ● KSP-G02

Step response characteristics

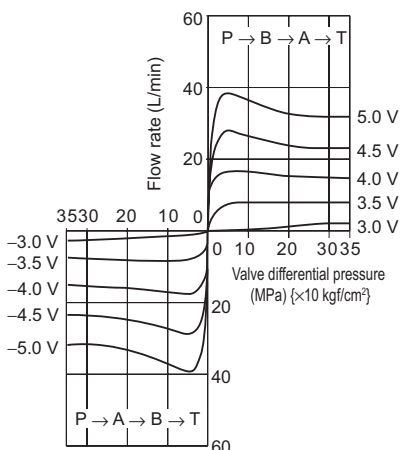
Pressure at port P: 7 MPa {70 kgf/cm<sup>2</sup>}



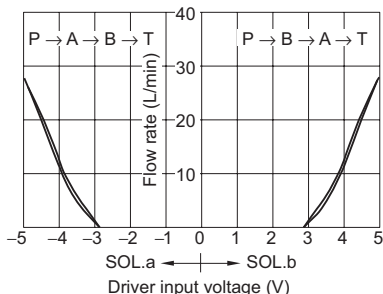
## Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})

### ● KSP-G03-2C4\*-10

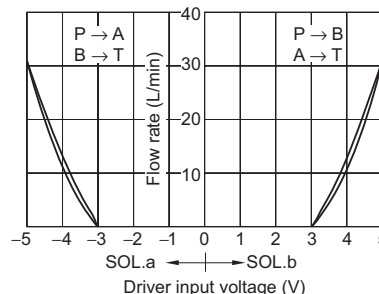
Differential pressure -  
Flow rate characteristics



Input voltage -  
Flow rate characteristics (4-way flow)  
Valve differential pressure  $\Delta P = 1 \text{ MPa} \{10 \text{ kgf/cm}^2\}$

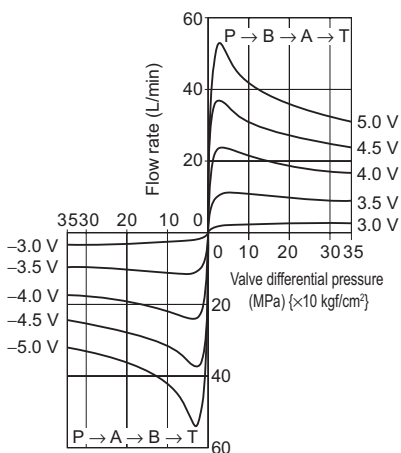


Input voltage -  
Flow rate characteristics (single side flow)  
1 land differential pressure  $\Delta P = 0.5 \text{ MPa} \{5 \text{ kgf/cm}^2\}$

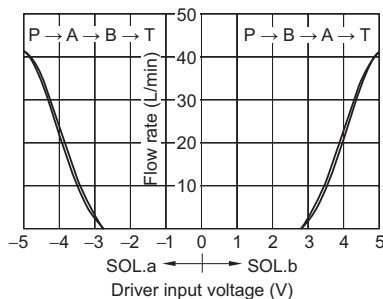


### ● KSP-G03-2C5\*-10

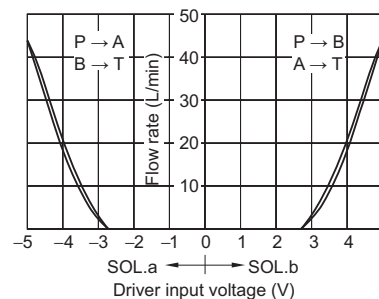
Differential pressure -  
Flow rate characteristics



Input voltage -  
Flow rate characteristics (4-way flow)  
Valve differential pressure  $\Delta P = 1 \text{ MPa} \{10 \text{ kgf/cm}^2\}$

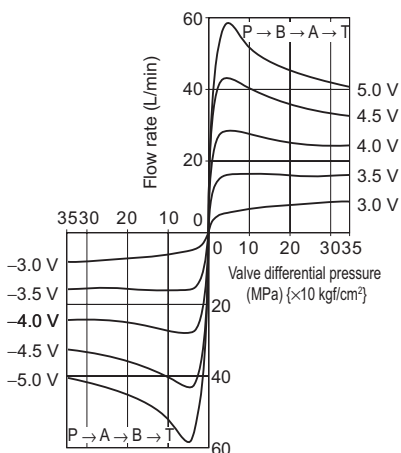


Input voltage -  
Flow rate characteristics (single side flow)  
1 land differential pressure  $\Delta P = 0.5 \text{ MPa} \{5 \text{ kgf/cm}^2\}$

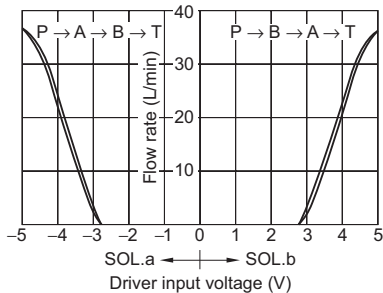


### ● KSP-G03-44C4\*-10

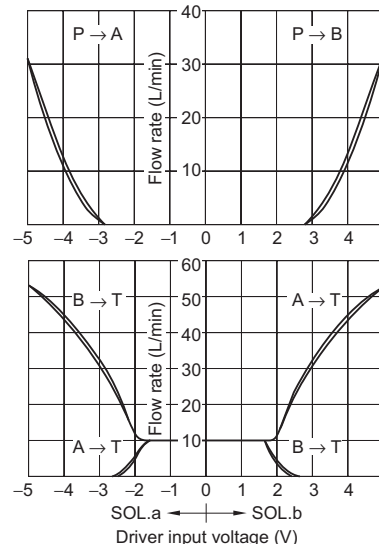
Differential pressure -  
Flow rate characteristics



Input voltage -  
Flow rate characteristics (4-way flow)  
Valve differential pressure  $\Delta P = 1 \text{ MPa} \{10 \text{ kgf/cm}^2\}$



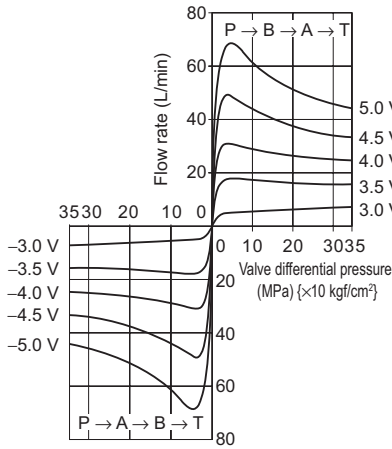
Input voltage -  
Flow rate characteristics (single side flow)  
1 land differential pressure  $\Delta P = 0.5 \text{ MPa} \{5 \text{ kgf/cm}^2\}$



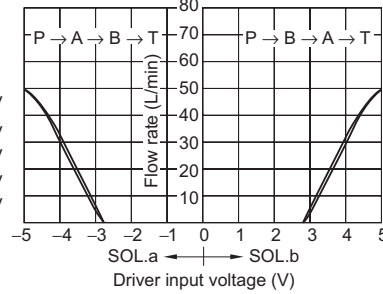
## Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})

● KSP-G03-44C5\*-10

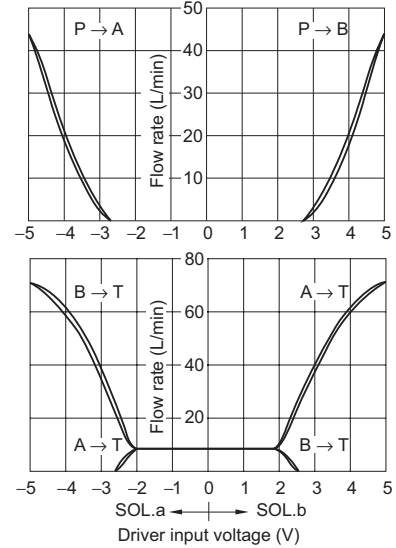
Differential pressure  
- Flow rate characteristics



Input voltage  
- Flow rate characteristics (4-way flow)  
Valve differential pressure  $\Delta P = 1 \text{ MPa} \{10 \text{ kgf/cm}^2\}$



Input voltage -  
Flow rate characteristics (single side flow)  
1 land differential pressure  $\Delta P = 0.5 \text{ MPa} \{5 \text{ kgf/cm}^2\}$



Note: ○ The input voltage - flow rate characteristics are the characteristics when the valve is used in combination with a pressure compensation valve (MGS-03).  
○ For the characteristic curves of single solenoid models, see the characteristic curves indicated in the table below.

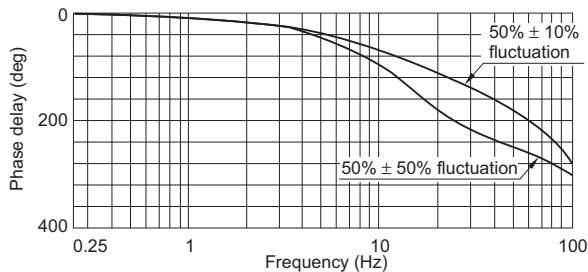
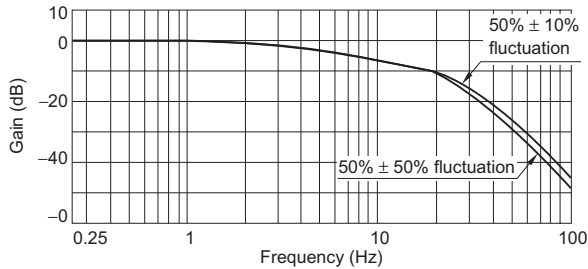
Spool type and spool operating method	Performance curve for reference		Spool type and spool operating method	Performance curve for reference	
	Spool type and spool operating method	Flow direction		Spool type and spool operating method	Flow direction
2A-H2	2C	P → A → B → T	81A-H44	44C	P → A → B → T
2B-2T	2C	P → B → A → T	8B-44T	44C	P → B → A → T

● KSP-G03

Frequency response characteristics

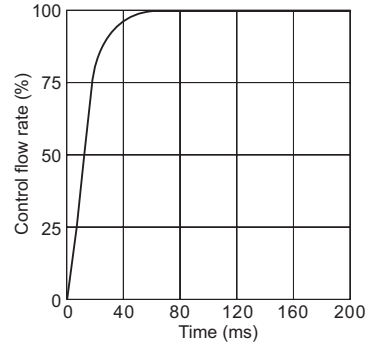
Pressure at port P: 7 MPa {70 kgf/cm<sup>2</sup>}

Note: Frequency characteristics of the spool displacement voltage in reference to input voltage



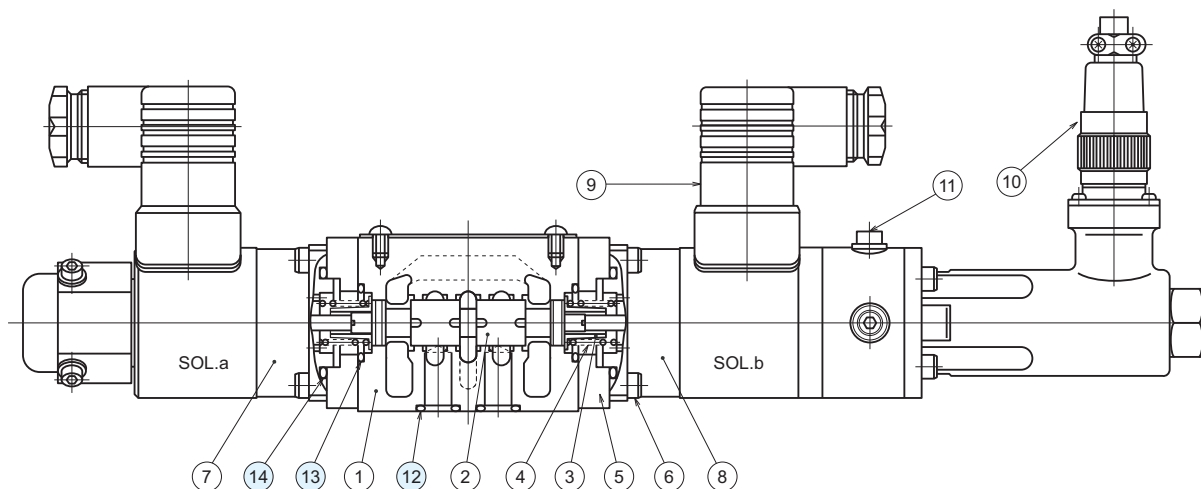
Step response characteristics

Pressure at port P: 7 MPa {70 kgf/cm<sup>2</sup>}



## Sectional structural diagram

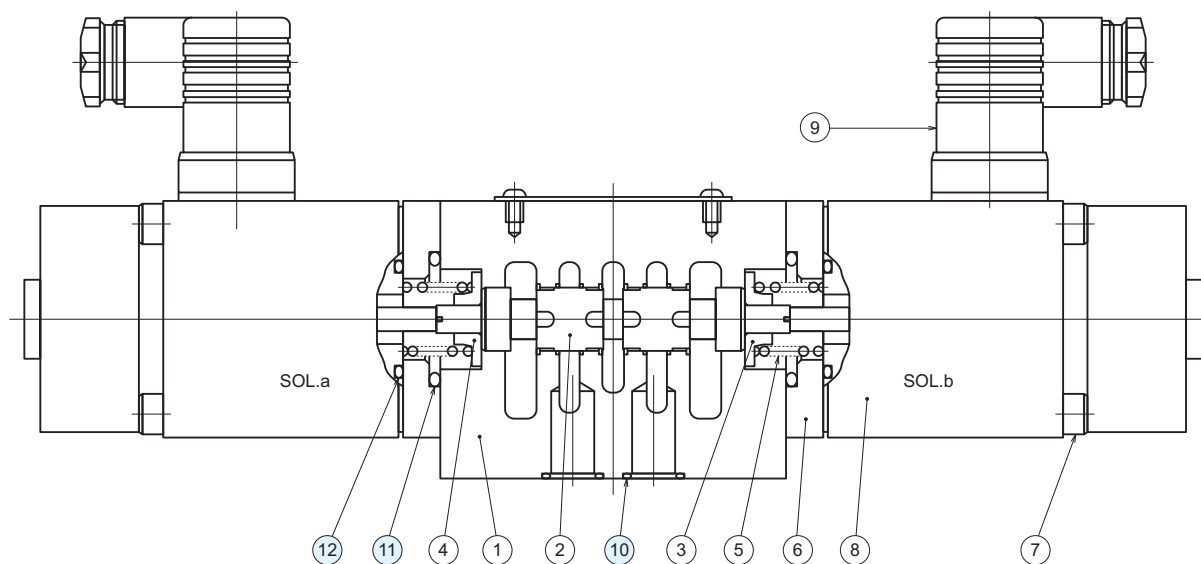
KSP-G02-\*\*\*C\*\*-10-M



Sealing part table

Part No.	Name	Quantity		Part specifications
		Type C	Type A/B	
12	O-ring	4	4	AS568-012 (NBR, Hs90)
13	O-ring	2	2	JIS B 2401 1B P18
14	O-ring	2	1	AS568-121 (NBR, Hs90)

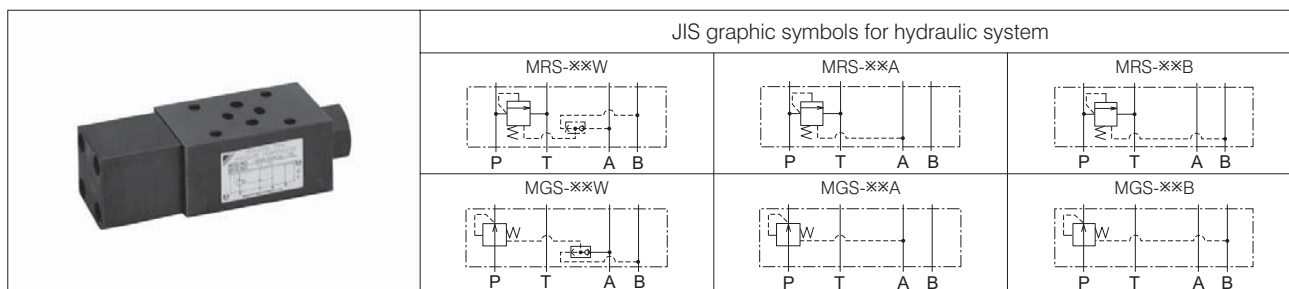
KSP-G03-\*\*\*C\*\*-10



Sealing part table

Part No.	Name	Quantity		Part specifications
		Type C	Type A/B	
10	O-ring	5	5	AS568-014 (NBR, Hs90)
11	O-ring	2	2	JIS B 2401 1B P28
12	O-ring	2	1	AS568-120 (NBR, Hs90)

## Stacking Type Pressure Compensation Valve (for KSP Valves)



### Features

- Enables proportional flow rate control with pressure compensation by combination with a KSP valve.

### Nomenclature

- Bypass type pressure compensation valve

**MRS** - **02** **×** - **×** **×** - **70**

1                      2    3                      4                      5

- Reduction type pressure compensation valve

**MGS** - **×** **×** **×** - **×** **×** - **70**

1                      2    3                      4                      5

**1 Model No.**

MRS: Modular stacking bypass type pressure compensation valve  
 MGS: Modular stacking reduction type pressure compensation valve

**2 Nominal diameter**

02: ¼  
 03: ⅜ <Applicable to the model designation MGS>

**3 Control port**

W: Port A/B  
 A: Port A  
 B: Port B

**4 Differential pressure code**

05: Differential pressure P = 0.5 MPa { 5 kgf/cm<sup>2</sup> }  
 10: Differential pressure P = 1 MPa { 10 kgf/cm<sup>2</sup> }  
 15: Differential pressure P = 1.5 MPa { 15 kgf/cm<sup>2</sup> } \*<sup>1</sup>

**5 Design No.**

**(The design No. is subject to change)**

Note: \*<sup>1</sup> Differential pressure code "15" applies only to nominal diameter 02 (¼).

### Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm <sup>2</sup> }	Maximum flow rate L/min	Mass kg	
				(1)	(2)
MRS-02W -xx-70	¼	35 {350}	35	1.8	2
MRS-02A (B) -xx-70				1.6	1.8
MGS-02W -xx-70				1.8	2
MGS-02A (B) -xx-70				1.6	1.8
MGS-03W -xx-70	⅜		68	4	4.4
MGS-03A (B) -xx-70				3.9	4.3

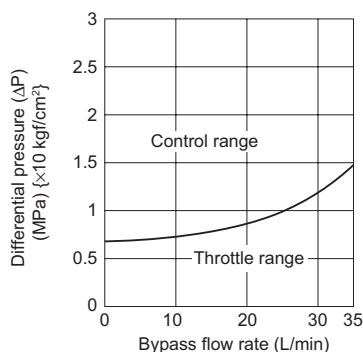
Note: Mass (1) Differential pressure code 05  
 (2) Differential pressure code 10, 15



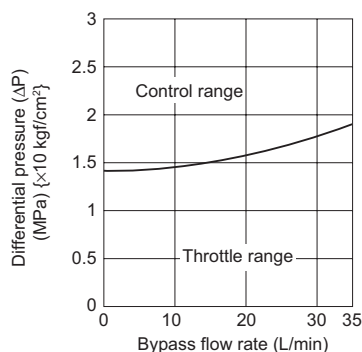
## Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})

Minimum operating pressure characteristics ( $\Delta P$  = Pressure at port P – Load pressure)

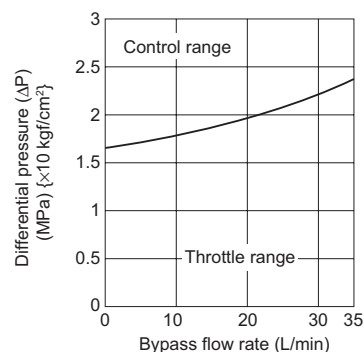
MRS-02\*-05



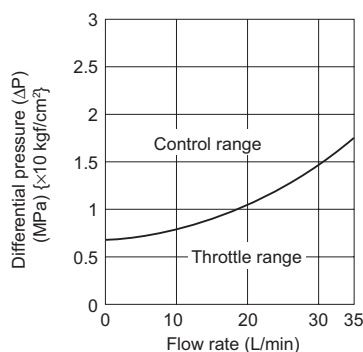
MRS-02\*-10



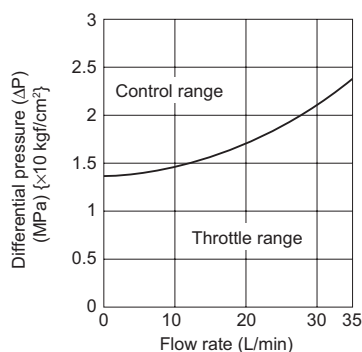
MRS-02\*-15



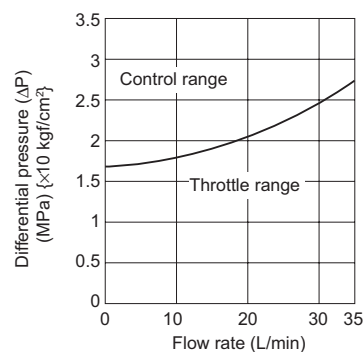
MGS-02\*-05



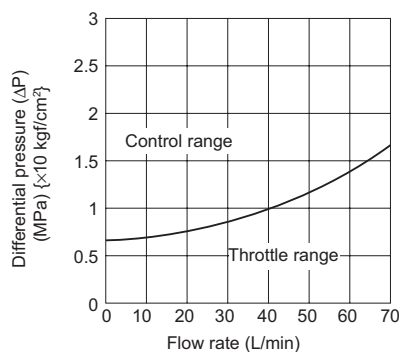
MGS-02\*-10



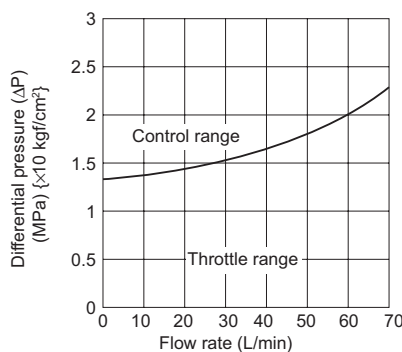
MGS-02\*-15



MGS-03W-05

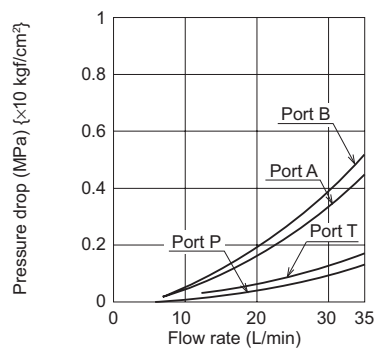


MGS-03W-10

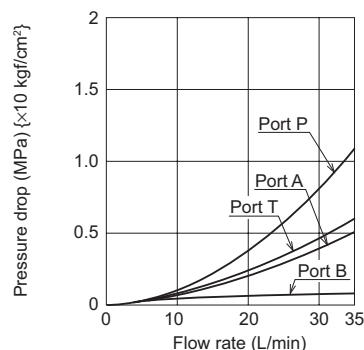


### Pressure drop characteristics

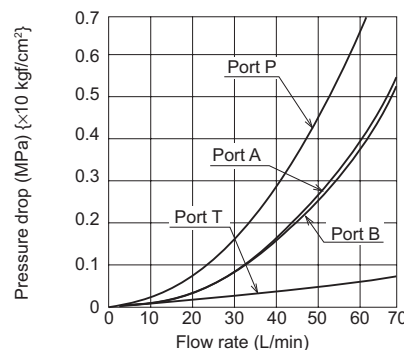
MRS-02\*-\*\*



MGS-02\*-\*\*

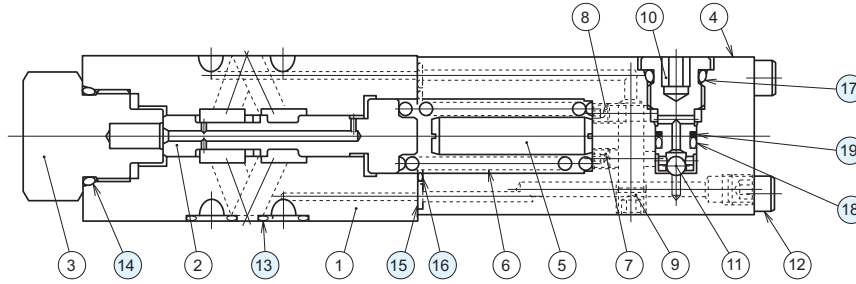


MGS-03W-\*\*



## Sectional structural diagram

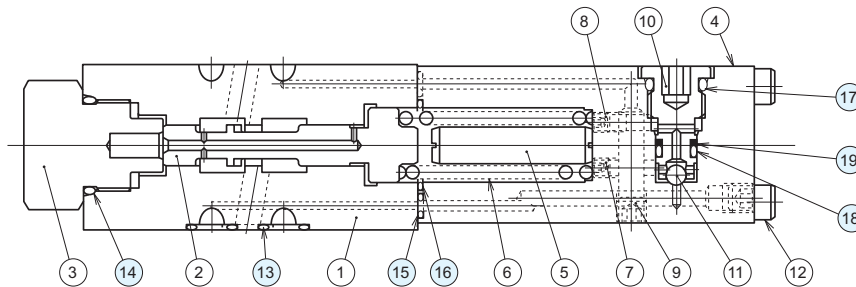
MRS-02W



Sealing part table

Part No.	Name	Quantity	Part specifications
13	O-ring	4	AS568-012 (NBR, Hs90)
14	O-ring	1	JIS B 2401 1B P20
15	O-ring	2	AS568-006 (NBR, Hs90)
16	O-ring	1	AS568-018 (NBR, Hs90)
17	O-ring	1	JIS B 2401 1B P11
18	O-ring	1	JIS B 2401 1B P7
19	Backup ring	1	JIS B 2407 Bias cut P7

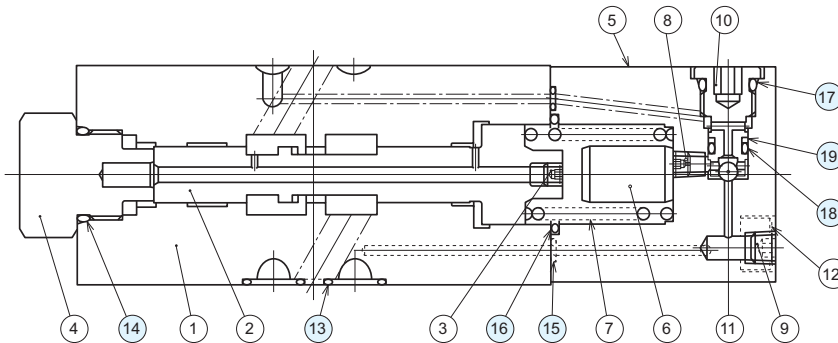
MGS-02W



Sealing part table

Part No.	Name	Quantity	Part specifications
13	O-ring	4	AS568-012 (NBR, Hs90)
14	O-ring	1	JIS B 2401 1B P20
15	O-ring	2	AS568-006 (NBR, Hs90)
16	O-ring	1	AS568-018 (NBR, Hs90)
17	O-ring	1	JIS B 2401 1B P11
18	O-ring	1	JIS B 2401 1B P7
19	Backup ring	1	JIS B 2407 Bias cut P7

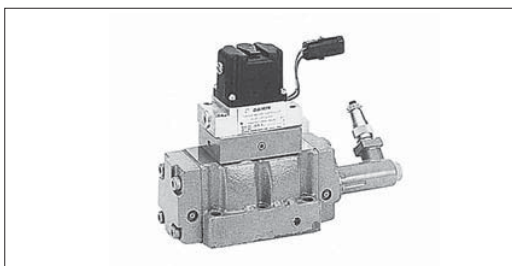
MGS-03W



Sealing part table

Part No.	Name	Quantity	Part specifications
13	O-ring	5	AS568-014 (NBR, Hs90)
14	O-ring	1	JIS B 2401 1B P20
15	O-ring	2	AS568-006 (NBR, Hs90)
16	O-ring	1	AS568-120 (NBR, Hs90)
17	O-ring	1	JIS B 2401 1B P11
18	O-ring	1	JIS B 2401 1B P7
19	Backup ring	1	JIS B 2407 Bias cut P7

# Solenoid Pilot Operated Proportional Directional Control Valve



## Features

- These solenoid pilot operated proportional directional control valves use a nozzle flapper valve as pilot valve and perform spool position feedback control by detecting the displacement of the main valve with the differential transformer.

## Nomenclature

**SEM** - **G** ※※ - ※ - **20** - ※ ※

1            2    3            4            5            6    7

### 1 Model No.

SEM: Solenoid pilot operated proportional directional control valve

### 2 Connections

G: Gasket mount type

### 3 Nominal diameter

03: 3/8  
04: 1/2  
06: 3/4

### 4 Spool type and spool operating method (See the spool type table)

### 5 Design No.

(The design No. is subject to change)

### 6 Option code I

No designation: Without driver  
A: Driver installation type \*1

### 7 Option code II

No designation: With filter block  
P: Filter block, with reducing valve (MG-02P-1-55)

Note: \*1 The driver installation type applies only to nominal diameters 03 (3/8) and 04 (1/2).

## Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm <sup>2</sup> }	Rated flow rate *2 L/min	Permissible back pressure at drainage line MPa {kgf/cm <sup>2</sup> }	Hysteresis, resolution, repeatability	Pilot valves		
						Supplied pressure MPa {kgf/cm <sup>2</sup> }	Required flow rate L/min	Saturated current mA
SEM-G03-※-20	3/8	21 {210}	100	1.4 {14}	0.5 % maximum	3 to 5 {30 to 50}	2.7 to 3.5	250
SEM-G04-※-20	1/2		170			3 to 7 {30 to 70}	4 to 7	
SEM-G06-※-20	3/4		300					

Note: \*2 The rated flow rate indicates the value at 1 land differential pressure: ΔP= 1 MPa {10 kgf/cm<sup>2</sup>}.

○ Filtration accuracy of filter block: 75 μm

## 4: Spool type table

Spool type and spool operating method	A	B	C	D
JIS graphic symbols for hydraulic system				

## 6: Specifications of installation type driver

Power supply voltage	DC ±15 V 1% (ripples included)
Command input	DC 0 to ±10 V
Output current	500 mA or more
Power consumption	Approx. 6 W
Input impedance	17 ±4 kΩ

## 6: Model code of separate installation type driver

Valve model code	Applicable driver	
	Model code	Power supply voltage
SEM-G※※-※-20	KSV-2-10	AC 100, 200, 220 V (Common for 50/60 Hz)

**Mass (kg)**

Model No.	(1)	(2)	(3)	(4)
SEM-G03	9.2	9.9	10.4	11.1
SEM-G04	11.7	13.2	12.9	14.4
SEM-G06	16.9	-	18.1	-

Note: Mass (1) Without driver, with filter block  
 (2) Driver installation type, with filter block  
 (3) Without driver, with filter block, with reducing valve  
 (4) Driver installation type, with filter block, with reducing valve

**Sub-plate model code**

The sub-plate is not provided with the valve. Order it separately as required by specifying the model code given in the table below.

Model No.	Model code	Nominal diameter	Connection port diameter	Mass kg
SEM-G06	JS-06M	3/4	Rc3/4	5.2
	JS-06M08		Rc1	

Refer to Page S-9 for the dimensions of the sub-plate.

Note: No sub-plate is provided for JSP-G03, 04.

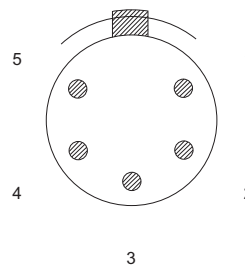
**Accessories**

Model No.	Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
SEM-G03	M6 × 35	4	11 to 14 {110 to 140}
SEM-G04	M6 × 40	2	11 to 14 {110 to 140}
	M10 × 45	4	53 to 68 {530 to 680}
SEM-G06	M12 × 60	6	94 to 118 {940 to 1180}

**Wiring guide (driver installation type)**

Pin No.	Signal name
1	Input voltage: 0 to ±10 V
2	Spool displacement check
3	DC +15 V ±1% (ripples included), 0.5 A minimum [Supplied power]
4	0 V [Supplied power]
5	DC -15 V ±1% (ripples included), 0.5 A minimum [Supplied power]

**Pin arrangement (driver installation type)**



**Handling**

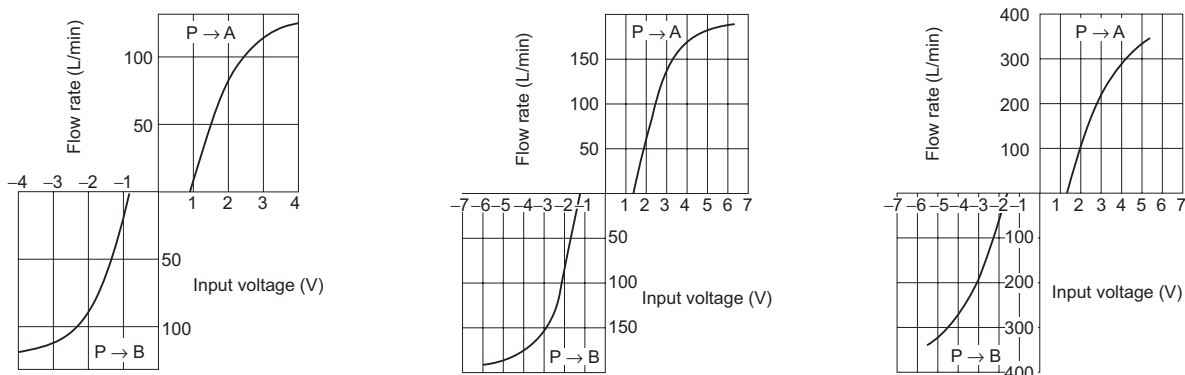
- Directly connect the drain piping to the tank without merging it with other tank piping.
- This valve uses an external pilot and adopts the external drain type.
- This valve is equipped with a filter block (model: MFB-02-75-10) as standard to protect the pilot valve.
- Contamination of the hydraulic fluid causes valve trouble and reduces the service life, so pay due attention to controlling contamination and ensure that it goes no higher than NAS contamination class 9.
- The input voltage - flow rate characteristics vary from valve to valve.  
 Even when using valves of the same model, the flow rates of individual valves have to be finely adjusted.
- Do not touch the zero adjusting screw of the differential transformer since it is factory adjusted.
- Use shielded cables for connecting the differential transformer. (Applicable cable diameter: φ7)
- For specifications with a reducing valve (option code II: P), the pressure setting at shipment is as shown in the table below.

Model No.	Set pressure MPa {kgf/cm <sup>2</sup> }
SEM-G03	5 {50}
SEM-G04	7 {70}
SEM-G06	

**Performance curves (viscosity: 32 mm<sup>2</sup>/s {cSt})**

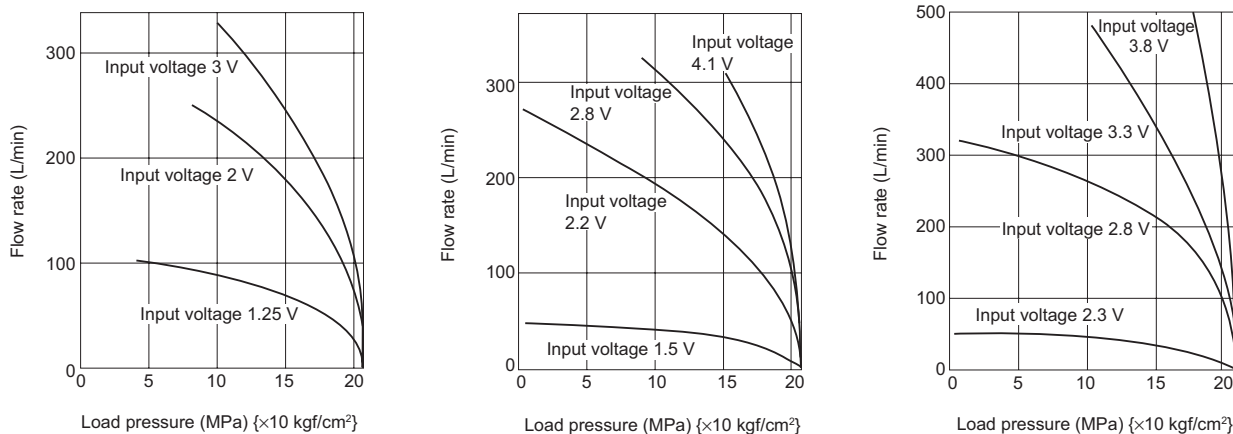
Input voltage - Flow rate characteristics (1 land differential pressure:  $\Delta P = 1 \text{ MPa}$  {10 kgf/cm<sup>2</sup>})

SEM-G03-A (driver installation type) SEM-G04-A (driver installation type) SEM-G06 (without driver)



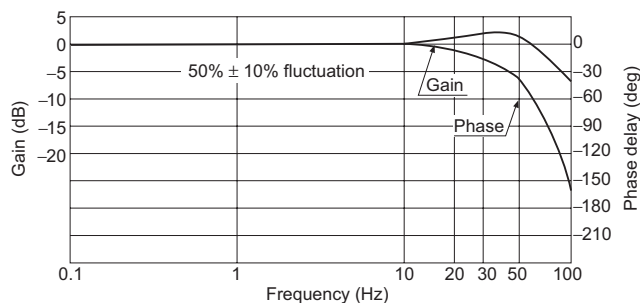
Load pressure - Flow rate characteristics

SEM-G03-A (driver installation type) SEM-G04-A (driver installation type) SEM-G06 (without driver)

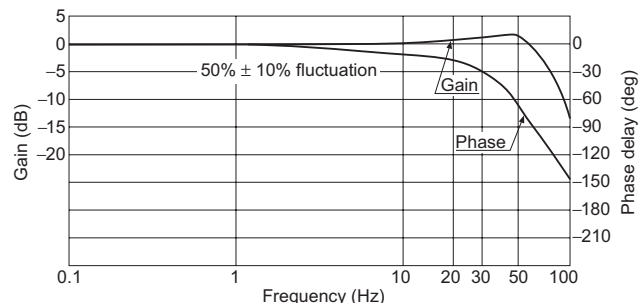


Frequency response characteristics

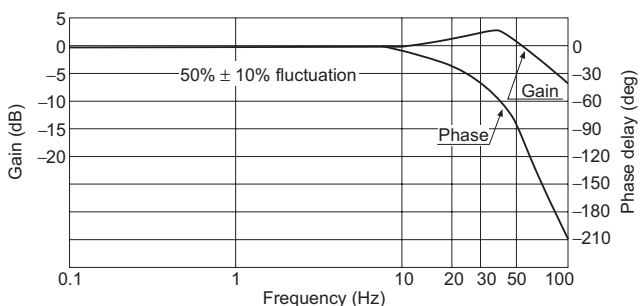
SEM-G03



SEM-G04



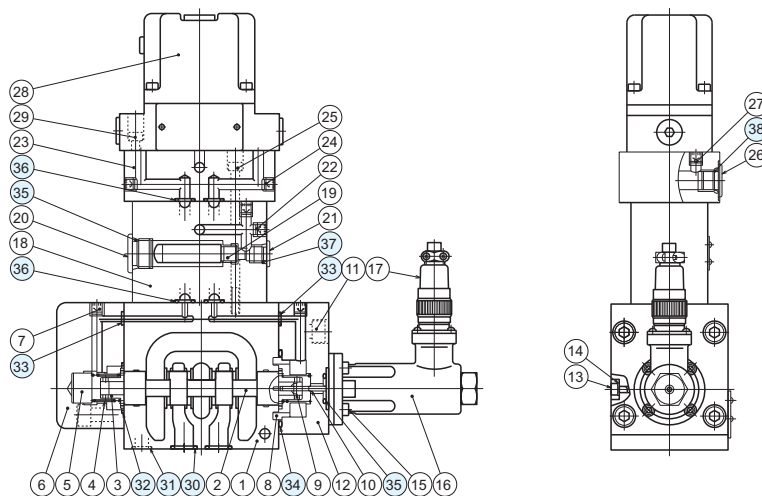
SEM-G06



Pilot pressure: 7 MPa {70 kgf/cm<sup>2</sup>}, 5 MPa {50 kgf/cm<sup>2</sup>} for G03  
Note: Frequency characteristics of the spool displacement voltage in reference to input voltage

## Sectional structural diagram

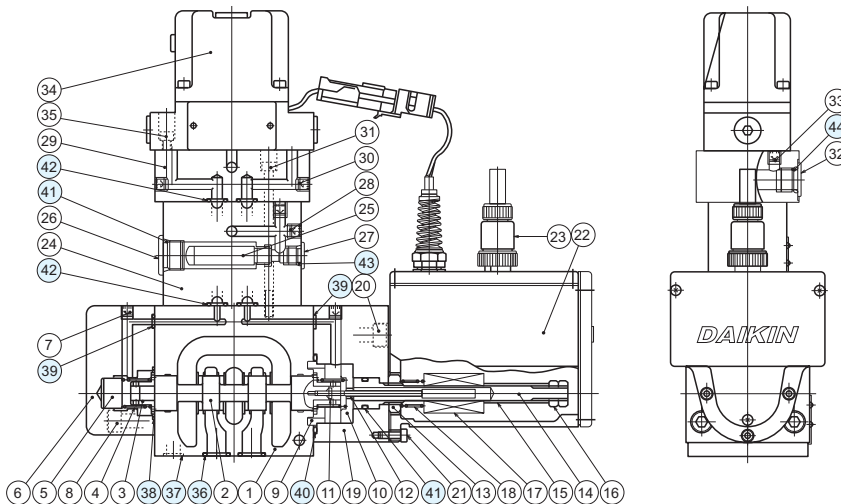
SEM-G\*\*-\*-20



Sealing part table

Part No.	Name	SEM-G03		SEM-G04		SEM-G06	
		Quantity	Part specifications	Quantity	Part specifications	Quantity	Part specifications
30	O-ring	5	JIS B 2401 1B P12	4	JIS B 2401 1B P22A	4	JIS B 2401 1B P28
31	O-ring	2	JIS B 2401 1B P9	1	JIS B 2401 1B P9	2	JIS B 2401 1B P20
				1	JIS B 2401 1B P12		
32	O-ring	1	AS568-023 (NBR, Hs90)	1	JIS B 2401 1B P34	1	JIS B 2401 1B P40
33	O-ring	5	JIS B 2401 1B P5	2	JIS B 2401 1B P7		
34	O-ring	1	AS568-130 (NBR, Hs90)	1	JIS B 2401 1B P34	1	JIS B 2401 1B P40
35	O-ring	2	JIS B 2401 1B P14	2	JIS B 2401 1B P14	2	JIS B 2401 1B P14
36	O-ring	8	JIS B 2401 1B P9	8	JIS B 2401 1B P9	8	JIS B 2401 1B P9
37	O-ring	1	JIS B 2401 1B P8	1	JIS B 2401 1B P8	1	JIS B 2401 1B P8
38	O-ring	1	JIS B 2401 1B P11	1	JIS B 2401 1B P11	1	JIS B 2401 1B P11

SEM-G\*\*-\*-20-A



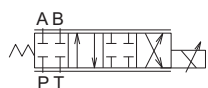
Sealing part table

Part No.	Name	SEM-G03		SEM-G04	
		Quantity	Part specifications	Quantity	Part specifications
36	O-ring	5	JIS B 2401 1B P12	4	JIS B 2401 1B P22A
				1	JIS B 2401 1B P9
37	O-ring	2	JIS B 2401 1B P9	1	JIS B 2401 1B P12
				1	JIS B 2401 1B P12
38	O-ring	1	AS568-023 (NBR, Hs90)	1	JIS B 2401 1B P34
39	O-ring	5	JIS B 2401 1B P5	2	JIS B 2401 1B P7
40	O-ring	1	AS568-130 (NBR, Hs90)	1	JIS B 2401 1B P34
41	O-ring	2	JIS B 2401 1B P14	2	JIS B 2401 1B P14
42	O-ring	8	JIS B 2401 1B P9	8	JIS B 2401 1B P9
43	O-ring	1	JIS B 2401 1B P8	1	JIS B 2401 1B P8
44	O-ring	1	JIS B 2401 1B P11	1	JIS B 2401 1B P11

## Direct Operated Servo Valve



JIS graphic symbols for hydraulic system



### Features

- Ideal for closed loop control of the position, speed, and pressure of main machine's actuators because of the high responsiveness achieved by combining the valve with the dedicated driver. (Frequency response: 130 Hz/-3 dB ±10% fluctuation)
- Driving the spool directly with a proportional solenoid reduces the amount of leakage compared to nozzle flapper type servo valves.
- When the dedicated driver is used, all ports will be blocked at power off to provide a fail safe function.

### Nomenclature

**KSPS** - **G** **02** - **※** **※** - **10** - **※** **※** **※**

1                      2    3                      4    5                      6                      7    8    9

- |  |  |
|--|--|
| <p><b>1 Model No.</b><br/>KSPS: Direct operated servo valve</p> <p><b>2 Connections</b><br/>G: Gasket mount type</p> <p><b>3 Nominal diameter</b><br/>02: ¼</p> <p><b>4 Rated flow rate</b><br/>(1 land differential pressure:<br/>ΔP = 3.5 MPa {35 kgf/cm<sup>2</sup>})<br/>1: 10 L/min<br/>2: 20 L/min<br/>4: 40 L/min</p> | <p><b>5 Pressure gain</b><br/>1: 2% maximum<br/>2: 4% maximum</p> <p><b>6 Design No.</b><br/><b>(The design No. is subject to change)</b></p> <p><b>7 Drainage code</b><br/>No designation: Internal drain type<br/>E: External drain type</p> <p><b>8 Solenoid installation orientation</b><br/>No designation: Upward (standard)<br/>R: Rightward (option)<br/>L: Leftward (option)</p> <p><b>9 Dedicated driver Front panel EPKS-02-10</b><br/>No designation: With front panel (standard)<br/>N: With front panel (option)</p> |
|--|--|

### Specifications

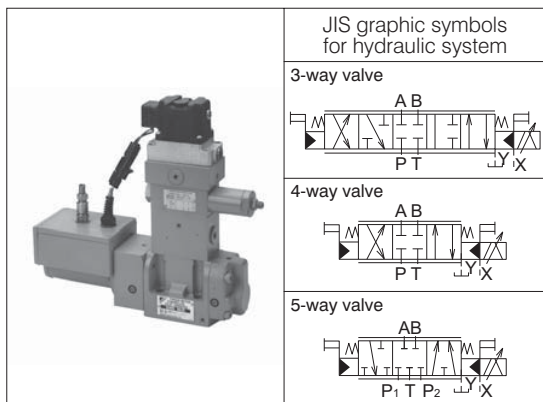
Model code	Maximum operating pressure MPa {kgf/cm <sup>2</sup> }	Rated flow rate *1 L/min	T port permissible back pressure MPa {kgf/cm <sup>2</sup> }	Pressure gain	Hysteresis, resolution, repeatability	Rated voltage of solenoid V	Maximum current mA	Mass kg
KSPS-G02-1※-10	35 {350}	10	2.5 { 25}	1st pattern: 2% maximum 2nd pattern: 4% maximum	1% or less	DC 12	1700	2.5
KSPS-G02-2※-10		20						
KSPS-G02-4※-10		40						
KSPS-G02-1※-10-E		10	16 {160}					
KSPS-G02-2※-10-E		20						
KSPS-G02-4※-10-E		40						

Note: \*1 The rated flow rate indicates the values at 1 land differential pressure: ΔP = 3.5 MPa {35 kgf/cm<sup>2</sup>}.

### Applicable driver model code

EPKS-02-10 (Supplied with the valve)  
※ Driver (EPKS-02-10) is not available by itself.

# Solenoid Pilot Operated Servo Valve



## Features

- Ideal for closed loop control of the position, speed, and pressure of main machine's actuators.
- The orifice nozzle adopted as the pilot valve has a large diameter for a nozzle flapper type valve and achieves greater resistance to contamination.
- The drive is installed on the valve.
- Specifications with a pressure sensor are available as an option to enable closed loop control of the pressure.

## Nomenclature

**JSES** - **G** \* \* - \* \* - **30** - \* \* \*

1                      2    3                      4    5                      6                      7    8

**1 Model No.**

JSES: Solenoid pilot operated servo valve

**2 Connections**

G: Gasket mount type

**3 Nominal diameter**

03: 3/8  
04: 1/2

**4 Servo type**

3: 3-way valve  
4: 4-way valve  
5: 5-way valve \*<sup>1</sup>

**5 Flow rate rank**

(Valve differential pressure: at  $\Delta P = 7 \text{ MPa } \{70 \text{ kgf/cm}^2\}$ )\*<sup>2</sup>  
1: 45 L/min  
2: 95 L/min  
3: 190 L/min

**6 Design No.**

(The design No. is subject to change)

**7 Option code I**

No designation: With filter block  
P: Filter block, with reducing valve (MG-02P-1-55)

**8 Option code II \*<sup>3</sup>**

No designation: Without pressure sensor  
T: With pressure sensor  
TL: With pressure sensor (installed at the left side viewed from the driver side)  
TR: With pressure sensor (installed at the right side viewed from the driver side)

Note: \*<sup>1</sup> 5-way valves apply only to nominal diameter 03 (3/8).

\*<sup>2</sup> The flow rate rank applies only to the combination of nominal diameter 03 (3/8) and servo type 4.

\*<sup>3</sup> The option code II applies only to servo types 3 and 5.

## Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm <sup>2</sup> }	Rated flow rate* <sup>4</sup> L/min	Permissible back pressure at drainage line MPa {kgf/cm <sup>2</sup> }	Hysteresis, resolution, repeatability	Pilot valves			Mass kg
						Supplied pressure MPa {kgf/cm <sup>2</sup> }	Required flow rate L/min	Saturated current mA	
JSES-G03- 3-30	3/8	21 {210}	190	1.4 {14}	0.5 % maximum	3 to 5 {30 to 50}	2.7 to 3.5	250	9.9
JSES-G03-41-30			45						
JSES-G03-42-30			95						
JSES-G03-43-30			190						
JSES-G03- 5-30			360						
JSES-G04- 3-30	1/2		540			3 to 7 {30 to 70}	4.2 to 6.5		11.5
JSES-G04- 4-30			500						

Note: \*<sup>4</sup> The rated flow rate indicates the values under the conditions below.

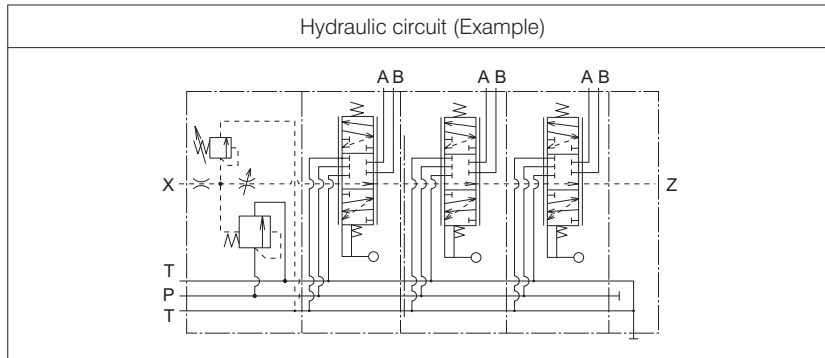
○ Servo type 3, 5: 1 land differential pressure  $\Delta P = 3.5 \text{ MPa } \{35 \text{ kgf/cm}^2\}$

(For servo type 5, when P1 → A and P2 → B are merged.)

○ Servo type 4: Valve differential pressure  $\Delta P = 7 \text{ MPa } \{70 \text{ kgf/cm}^2\}$



# Manual Proportional Directional Control Valve (with Pressure Compensation, Multiple Valve Series)



## Features

- These stacking type multiple control valves are equipped with the bypass type pressure compensation function and have proportional flow rate characteristics.
- The pump pressure can be changed according to variation of the load pressure that causes the excess flow to go to the tank.
- Enables individual flow rate control at ports A and B.
- Up to 8 valves can be connected in a series and there are 11 directional control valve symbols.
- These valves have the directional control valve neutral unload function and a built-in relief valve.

## Nomenclature

These are stacking type manual multi-control valves. The valves can be delivered set up to meet customer requirements. When placing an order, specify the model codes in the order that the valves are to be combined.

- Inlet valve block (MUV) or connection plate (AN)
- First directional control valve block
- Second directional control valve block
- . . . . .
- End plate (AP)

When two or more valves with the same model code are included, state the model codes of the individual valves as shown above.

### • Inlet valve block



**1 Model No.**  
MUV: Bypass type pressure compensation valve

**2 Port size (nominal diameter)**  
12: 1/2  
16: 3/4  
20: 1  
25: 1 1/4  
32: 1 1/2

**3 Mount type**  
K: Stacking type

**4 Maximum operating pressure**  
L: 21 MPa {210 kgf/cm<sup>2</sup>}

**5 Unloading pressure (Pressure compensation structure differential pressure)**  
3: 0.3 MPa {3 kgf/cm<sup>2</sup>}

6: 0.6 MPa {6 kgf/cm<sup>2</sup>} \*1

**6 Option code I**  
S: Pressure adjusting screw type (standard)  
H: Pressure adjusting handle type

**7 Option code II**  
No designation: Standard  
R: For variable displacement pump control

Note: \*1 Used when a large flow passes through the directional control valve or when many series of valves are used. See the spring selection table for details.

## Nomenclature

### ● Directional control valve block

MHV ※ ※ K L ※ ※ ※ ※ ※ ※ ※ - ※ ※ ※

1 2 3 4 5 6 7 8 9 10

#### 1 Model No.

MHV: Manual proportional directional control valve

#### 2 Port size (nominal diameter)

12: ½  
16: ¾  
20: 1  
25: 1¼  
32: 1½

#### 3 Mount type

K: Stacking type

#### 4 Maximum operating pressure

L: 21 MPa {210 kgf/cm<sup>2</sup>}

#### 5 Return spring function

F: Spring center type, spring offset type,  
R: No-spring type (with detent)  
O: No-spring type (without detent)  
S: No-spring type (with braking structure)

#### 6 Lever installation position

W: Opposite side to valve mounting face (See the diagram at the bottom of Page J-62.)  
S: Horizontal position  
H: Valve mounting face side  
U: Without lever

#### 7 Spool differential pressure code \*2

3: Differential pressure of 0.3 MPa {3 kgf/cm<sup>2</sup>}

6: Differential pressure of 0.6 MPa {6 kgf/cm<sup>2</sup>}

#### 8 Spool type (See the spool type table)

#### 9 Rated flow rate (See the specification table) \*3

#### 10 Option code

No designation: Standard  
H: With maximum flow rate adjusting screw \*4  
Y: With auxiliary pressure control port  
KS: With micro switch (1 pc.)  
SR2: With micro switches (2 pcs.)

Note: \*2 Designate this code only when connecting to a connection plate (model code: AN※※K). When no code is designated, the differential pressure at the inlet valve block applies.

\*3 When different rated flow rates are required for ports A and B, designate the code for port A first, then the code for port B. Example: 50-100 (option)

\*4 The specifications with the maximum flow rate adjusting screw cannot be selected for the no-spring type (with braking structure).

For the delivery terms for spool type other than A and C and port sizes 25 and 32, consult Daikin separately.

### ● End plate

AP ※ ※ K - ※

1 2 3 4

#### 1 Model No.

AP: End plate

#### 2 Port size (nominal diameter)

12: ½  
16: ¾  
20: 1  
25: 1¼  
32: 1½

#### 3 Mount type

K: Stacking type

#### 4 Option code

No designation: Standard  
T: With isolated tank port T1  
Z: With external drainage port Z for unloading

### ● Connection plate

AN ※ ※ K

1 2 3

#### 1 Model No.

AN: Connection plate

#### 2 Port size (nominal diameter)

12: ½  
16: ¾  
20: 1  
25: 1¼  
32: 1½

#### 3 Mount type

K: Stacking type

## Specifications

Port size	Nominal diameter	Maximum operating pressure MPa {kgf/cm <sup>2</sup> }	Rated flow rate L/min			Port T Permissible back pressure MPa {kgf/cm <sup>2</sup> }	Relief valve/unload valve	
			Q1	Q2	QMAX		Pressure adjustment range MPa {kgf/cm <sup>2</sup> }	Unloading pressure MPa {kgf/cm <sup>2</sup> }
12	½	21 {210}	25	50	75	2 {20}	3rd pattern: 0.3 to 21 {3 to 210} 6th pattern: 0.6 to 21 {6 to 210}	3rd pattern: 0.3 {3} 6th pattern: 0.6 {6}
16	¾		50	100	130			
20	1		80	160	200			
25	1¼		125	250	300			
32	1½		200	400	500			

Note: See the spring selection table for the relationships among the rated flow rate, number of directional control valve series, and inlet valve block spring.

### Spring selection table/unloading (differential pressure)

Number of directional control valve series		1		2		3		4		5		6		7		8	
Rated flow rate	Q1	3	6	3	6	3	6	3	6	3	6	6	6	6	6	6	6
	Q2	3	6	3	6	6	6	6	6	6	6	-	-	-	-	-	-
	QMAX	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: 3: Spring for differential pressure of 0.3 MPa {3 kgf/cm<sup>2</sup>}  
 6: Spring for differential pressure of 0.6 MPa {6 kgf/cm<sup>2</sup>}

### 8: Spool type table

Spool type	JIS graphic symbols for hydraulic system	Spool type	JIS graphic symbols for hydraulic system	Spool type	JIS graphic symbols for hydraulic system
A		E		M	
B		F		N	
C		K		O	
D		L			

Note: ○ With spool types B, C and D, the passage area from port A/B to port T becomes 20% of the standard rated area at the neutral position, and the flow rate to port T is reduced accordingly. 100% of the rated area is secured at the switching position.

○ With spool types E, M and N, the passage area becomes 70% of the standard rated area and the flow rate is reduced accordingly. The pump does not unload at any operation position of the valve.

### Mass (kg)

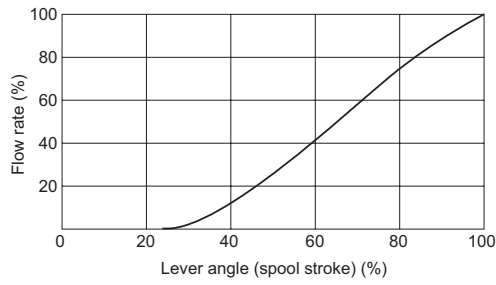
Model No.	Port size				
	12	16	20	25	32
MUV	2.4	4.3	8	12.5	21
MHV	2.8	3.9	7	13	16.5
AP	1	1.7	3	5.4	7
AN	0.9	1.6	3	5.3	7

### Handling

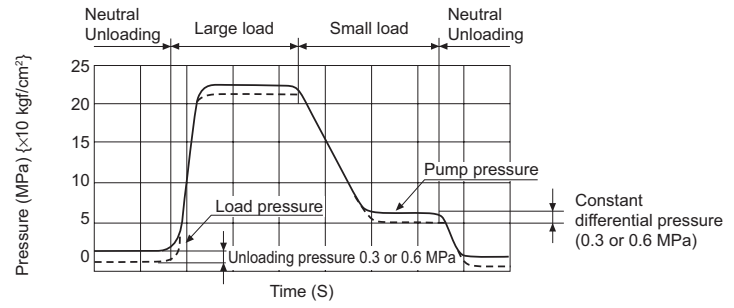
- Use parallel thread joints since the use of taper thread joints may distort the valve and cause malfunctions.
- When setting the maximum pressure at the start of operation, fully open the relief valve's adjusting screw. Adjust the pressure only while the actuator is stopped at the stroke end or the load is the maximum. Clockwise rotation of the pressure adjusting screw increases the pressure. The pressure changes by 10 MPa {100 kgf/cm<sup>2</sup>} per revolution of the adjusting screw.  
 Since the pump is unloaded when the directional control valve is at the neutral position, it is not necessary to fully open the relief valve when starting the pump once the relief valve has been set.
- When connecting ports A and B to a cylinder, connect the head side of the cylinder to port B since the pressure drop is smaller in the B → T flow.  
 When the flow rate exceeds rated flow rate Q2 or when many series of valves are used, use an end plate with isolated tank port T1 (model code: AP\*\*K-T).
- Directly connect the piping to the tank without merging it with other piping. If it is merged with other piping, use larger pipes.
- Since this valve incorporates a pressure compensation valve with meter-in control, a back pressure valve such as a counter balance valve needs to be inserted between the outlet port of the actuator and this valve if a negative load will be applied.
- This valve can incorporate only one pressure compensation valve. Therefore, when two directional control valves are used, the pressure compensation function operates only for the directional control valve closer to the inlet valve.

## Performance curves

Lever angle - Flow rate characteristics

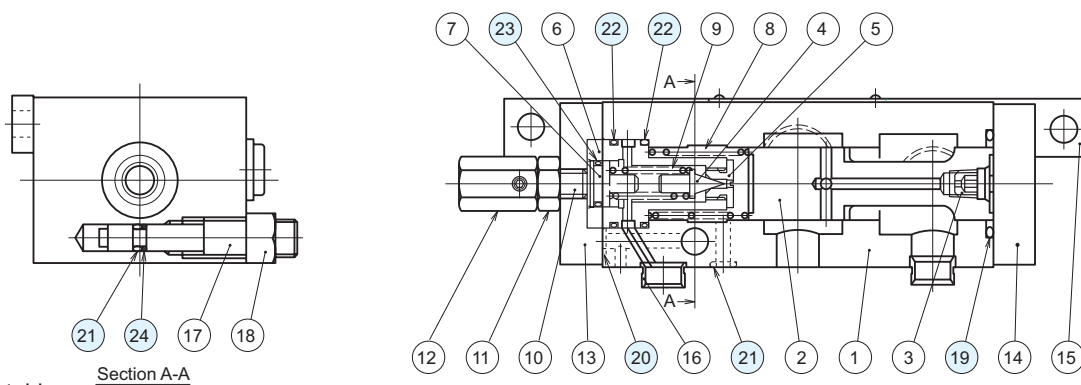


Pressure characteristics



### Sectional structural diagram

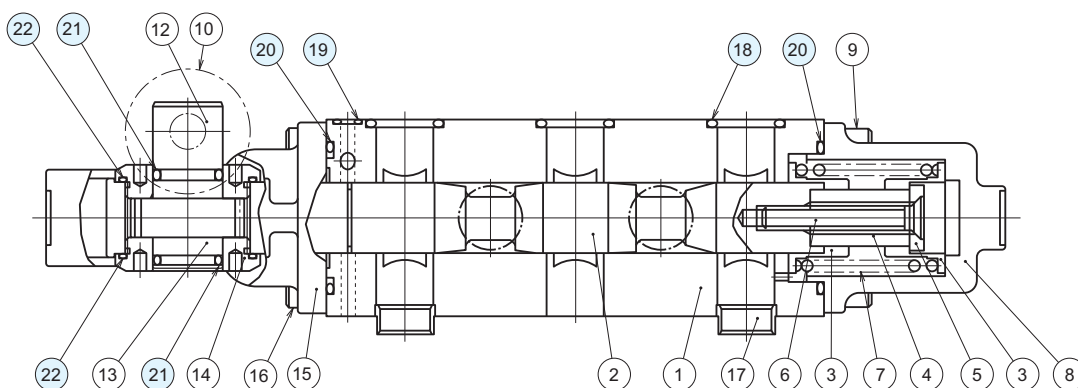
MUV\*\*KL



Sealing part table

Part No.	Name	Quantity	Part model					Part specifications
			MUV12	MUV16	MUV20	MUV25	MUV32	
19	O-ring	1	AS568-120	AS568-120	AS568-122	AS568-128	AS568-130	NBR, Hs90
20	O-ring	1	AS568-008	AS568-008	AS568-008	AS568-008	AS568-010	NBR, Hs90
21	O-ring	2	AS568-008	AS568-008	AS568-008	AS568-008	AS568-008	NBR, Hs90
22	O-ring	2	AS568-019	AS568-019	AS568-023	AS568-122	AS568-126	NBR, Hs90
23	O-ring	1	AS568-012	AS568-012	AS568-012	AS568-012	AS568-012	NBR, Hs70
24	Backup ring	1	For AS568-008	For AS568-008	For AS568-008	For AS568-008	For AS568-008	Bias cut

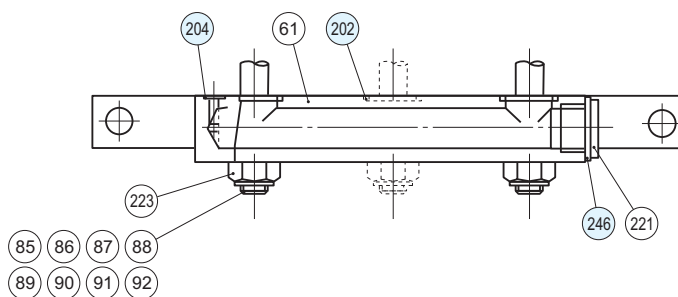
MHV\*\*KL



Sealing part table

Part No.	Name	Quantity	Part model					Part specifications
			MHV12	MHV16	MHV20	MHV25	MHV32	
18	O-ring	3	AS568-112	AS568-115	AS568-118	AS568-121	AS568-125	NBR, Hs90
19	O-ring	1	AS568-008	AS568-008	AS568-008	AS568-008	AS568-008	NBR, Hs90
20	O-ring	2	AS568-025	AS568-128	AS568-136	AS568-228	AS568-231	NBR, Hs90
21	O-ring	2	AS568-114	AS568-114	AS568-114	AS568-213	AS568-213	NBR, Hs70
22	O-ring	2	AS568-028	AS568-028	AS568-028	AS568-034	AS568-034	NBR, Hs90

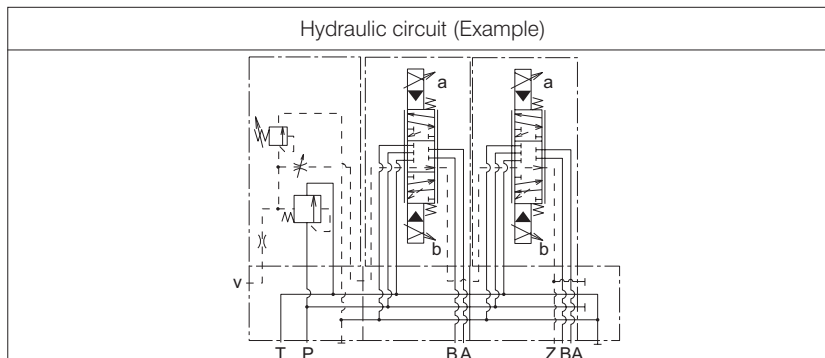
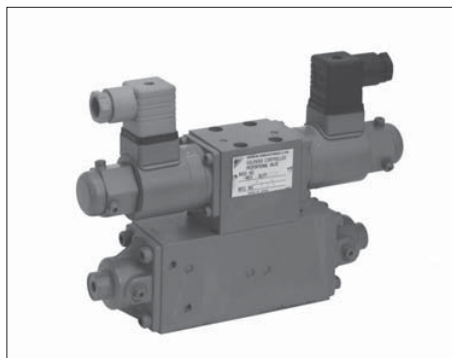
AP-\*\*K-\*



Sealing part table

Part No.	Name	Quantity	Part model					Part specifications
			AP12	AP16	AP20	AP25	AP32	
202	O-ring	3	AS568-112	AS568-115	AS568-118	AS568-121	AS568-125	NBR, Hs90
204	O-ring	1	AS568-008	AS568-008	AS568-008	AS568-008	AS568-008	NBR, Hs90
246	Sealing washer	1	SWP-1/4	SWP-3/8	SWP-1/2	SWP-3/4	SWP-1	

# Solenoid Operated Proportional Directional Control Valve (with Pressure Compensation, Multiple Valve Series)



## Features

- These stacking type control valves show pressure compensated type proportional flow rate characteristics and control the flow rate in proportion to electrical current regardless of the load volume.
- Combining the valve with a variable displacement pump enables construction of a power match circuit that outputs the required pressure/flow rate.
- Enables individual flow rate control at ports A and B.
- This product combines an inlet valve block and solenoid operated proportional directional control valves, in that order, by mounting each valve block on a manifold block. There are separate manifold blocks and sub-blocks for each valve block, and up to 8 valve blocks can be connected according to requirements and clamped together with an end block using through bolts. (Block-build system)

## Nomenclature

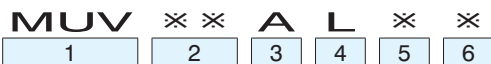
This valve is a stacking type valve adopting the block-build system. The valves can be delivered set up to meet customer requirements.

When placing an order, split the product into valve blocks as follows and specify the model code of each valve block.

- Inlet valve block (MUV, MDM) or connection plate (AN)
- Sub-block for inlet valve block (A\*\*UV, A\*\*DM)
- First directional control valve (MEV)
- Sub-block for first directional control valve (A\*\*EV)
- Second directional control valve (MEV)
- Sub-block for second directional control valve (A\*\*EV)
- ... ..
- End plate (AP)

When two or more valves with the same model code are included, state the model codes of the individual valves as shown above.

### • Inlet valve block



#### 1 Model No.

MUV: Bypass type pressure compensation valve  
MDM: Reduction type pressure compensation valve

#### 2 Port size (nominal diameter)

- 12: ½
- 16: ¾
- 20: 1
- 25: 1¼
- 32: 1½

#### 3 Mount type

A: Sub-block type



#### 4 Maximum operating pressure

L: 21 MPa {210 kgf/cm<sup>2</sup>}

#### 5 Unloading pressure

(Pressure compensation structure differential pressure)

- 3: Differential pressure of 0.3 MPa {3 kgf/cm<sup>2</sup>}
- 6: Differential pressure of 0.6 MPa {6 kgf/cm<sup>2</sup>}

#### 6 Option code

S: Pressure adjusting screw type  
H: Pressure adjusting handle type

#### 7 Option code

N: Without pilot relief valve

## Nomenclature

### ● Directional control valve block

MEV ※ ※ B L F F ※ ※ ※ ※ ※ - ※ ※ ※ ※ ※ ※

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

**1 Model No.**

MEV: Solenoid operated proportional directional control valve

**2 Port size (nominal diameter)**

12: ½  
16: ¾  
20: 1  
25: 1¼  
32: 1½

**3 Mount type**

B: Gasket mount type

**4 Maximum operating pressure**

L: 21 MPa {210 kgf/cm<sup>2</sup>}

**5 Return spring function**

F: Spring center type, spring offset type

**6 Flow rate adjustment structure**

F: For proportional control

**7 Spool differential pressure code**

3: Differential pressure of 0.3 MPa {3 kgf/cm<sup>2</sup>}  
6: Differential pressure of 0.6 MPa {6 kgf/cm<sup>2</sup>}

**8 Spool type (See the spool type table)**

**9 Rated flow rate (See the specification table)**

**10 Pilot code**

No designation: Internal pilot type  
X2: With external pilot port X2 \*1

**11 Drainage code**

No designation: Internal drain type  
T3: With external drainage port T3

**12 Solenoid code**

No designation: DC 24 V solenoid  
N: DC 12 V solenoid

**13 Option code**

No designation: Without maximum flow rate adjusting screw  
H: With maximum flow rate adjusting screw

Note: \*1 When using the valve in combination with a reduction type pressure compensation valve (MDM), select a model with an external pilot port.

### ● Sub-block

A ※ ※ ※ ※ - ※ ※

1 2 3 4

**1 Model No.**

A: Sub-block

**2 Port size (nominal diameter)**

12: ½  
16: ¾  
20: 1  
25: 1¼  
32: 1½

**3 Mounting valve block**

EV: For MEV  
UV: For MUV  
DM: For MDM

**4 Special type**

No designation: Standard  
Y1: With external auxiliary pressure control port Y1  
<Applicable to mounting valve block code EV>  
Z: With external drainage port for external unloading  
<Applicable to mounting valve block code EV>  
R: For variable displacement pump control  
<Applicable to mounting valve block code UV>

### ● End plate

AP ※ ※

1 2

**1 Model No.**

AP: End plate

**2 Port size (nominal diameter)**

12: ½  
16: ¾  
20: 1  
25: 1¼  
32: 1½

### ● Connection plate

AN ※ ※

1 2

**1 Model No.**

AN: Connection plate

**2 Port size (nominal diameter)**

12: ½  
16: ¾  
20: 1  
25: 1¼  
32: 1½

## Specifications

Port size	Nominal diameter	Maximum operating pressure MPa {kgf/cm <sup>2</sup> }	Rated flow rate L/min			T port permissible back pressure MPa {kgf/cm <sup>2</sup> }	Relief valve/unload valve	
			Q1	Q2	QMAX		Pressure adjustment range MPa {kgf/cm <sup>2</sup> }	Unloading pressure MPa {kgf/cm <sup>2</sup> }
12	1/2	21 {210}	25	50	75	2.5 {25} (With internal drain) 7.0 {70} (With external drain type)	3rd pattern: 0.3 to 21 {3 to 210} 6th pattern: 0.6 to 21 {6 to 210}	3rd pattern: 0.3 {3} 6th pattern: 0.6 {6}
16	3/4		50	100	130			
20	1		80	160	200			
25	1 1/4		125	250	300			
32	1 1/2		200	400	500			

Port size	Pilot pressure MPa {kgf/cm <sup>2</sup> }	Pilot drainage volume cm <sup>3</sup>	Current at start of flow (nominal) mA		Current at maximum flow (nominal) mA		Coil resistance (20°C) Ω
			DC 24 V solenoid	DC 12 V solenoid	DC 24 V solenoid	DC 12 V solenoid	
12	1.2 to 21 {12 to 210} (Difference from drain back pressure)	1.4	300	600	700	1400	DC 24 V solenoid 26 DC 12 V solenoid 6.5
16		3.1					
20		5.9					
25		9.9					
32		15.4					

Note: ○ See the spring selection table for the relationships among the rated flow rate, number of directional control valve series, and inlet valve block spring.

## Spring selection table/unloading (differential pressure)

Number of directional control valve series		1		2		3		4		5		6		7		8	
Rated flow rate	Q1	3	6	3	6	3	6	3	6	3	6	3	6	3	6	3	6
	Q2	3	6	3	6	3	6	6	6	-	-	-	-	-	-	-	-
	QMAX	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: 3: Spring for differential pressure of 0.3 MPa {3 kgf/cm<sup>2</sup>}  
6: Spring for differential pressure of 0.6 MPa {6 kgf/cm<sup>2</sup>}

## 8: Spool type table

Spool type	JIS graphic symbols for hydraulic system	Spool type	JIS graphic symbols for hydraulic system	Spool type	JIS graphic symbols for hydraulic system
Meter-in control		Meter-in control		Meter-out control	
A		F		P	
B		K		Q	
C		L		R	
D		O		S	

Note: With spool types B, C and D, the passage area from port A/B to port T becomes 20% of the standard rated area at the neutral position, and the flow rate to port T is reduced accordingly. 100% of the rated area is secured at the switching position.  
For spool K, port A is blocked with a sub-block, and for spools L and O, port B is blocked with a sub-block.

## 12: Solenoid code and applicable driver model code

Solenoid code	Solenoid	Coil resistance (20°C) Ω	Applicable driver	
			Model code	Power supply voltage
No designation	DC 24 V solenoid	26	KC-6-10	AC 100, 200, 220 V (Common for 50 and 60 Hz)
N	DC 12 V solenoid	6.5	ZH-6-10	DC 24 V



## Mass (kg)

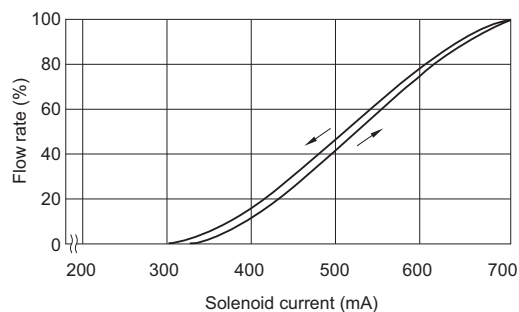
Model No.	Port size					Model No.	Port size				
	12	16	20	25	32		12	16	20	25	32
MUV	2.7	4.2	8	12.8	21	A-UV/DM	1.8	2.4	3.5	8	9.5
MDM	2.7	4.2	8.5	14	21.6	A-EV	1.3	2.4	4.5	6.0	9.0
MEV	4.9	6.6	10.5	17	22	AP	1.4	1.7	3	6	9.5
						AN	1	1.3	2.2	3.9	5.3

## Handling

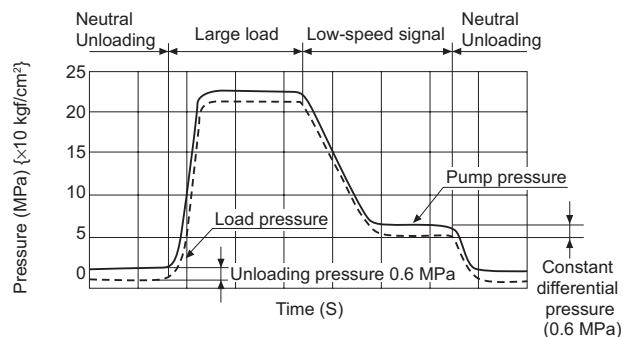
- Use parallel thread joints since the use of taper thread joints may distort the valve and cause malfunctions.
- When setting the maximum pressure at the start of operation, fully open the relief valve's adjusting screw. Adjust the pressure only while the actuator is stopped at the stroke end or the load is the maximum. Clockwise rotation of the pressure adjusting screw increases the pressure. The pressure changes by 10 MPa {100 kgf/cm<sup>2</sup>} per revolution of the adjusting screw. Since the pump is unloaded when the directional control valve is at the neutral position, it is not necessary to fully open the relief valve when starting the pump once the relief valve has been set.
- Directly connect the piping to the tank without merging it with other piping. If it is merged with other piping, use larger pipes.
- A pilot pressure of 1.2 MPa {12 kgf/cm<sup>2</sup>} is required to achieve a full stroke of the valve. In an application where the load is small and the pump pressure does not rise up to 1.2 MPa {12 kgf/cm<sup>2</sup>}, select an external pilot model and provide the required pilot pressure.
- Since this valve incorporates a pressure compensation valve with meter-in control, a back pressure valve such as a counter balance valve needs to be inserted between the outlet port of the actuator and this valve if a negative load will be applied.
- This valve can incorporate only one pressure compensation valve. Therefore, when two directional control valves are used, the pressure compensation function operates only for the directional control valve closer to the inlet valve.

## Performance curves

Input current - Flow rate characteristics



Pressure characteristics



## Model code for auxiliary products

KLP - ☒ ☒ ☒ ☒ - ☒  
 1      2   3   4   5      6

**1 Model No.**

KLP: Pilot valve (solenoid operated proportional valve)

**2 Solenoid code**

S: Single solenoid

W: Double solenoid

**3 Pilot code**

No designation: Internal pilot type

X: External pilot

**4 Drainage code**

No designation: Internal drain type

T: External drain type

**5 Solenoid code**

No designation: DC 24 V solenoid

N: DC 12 V solenoid

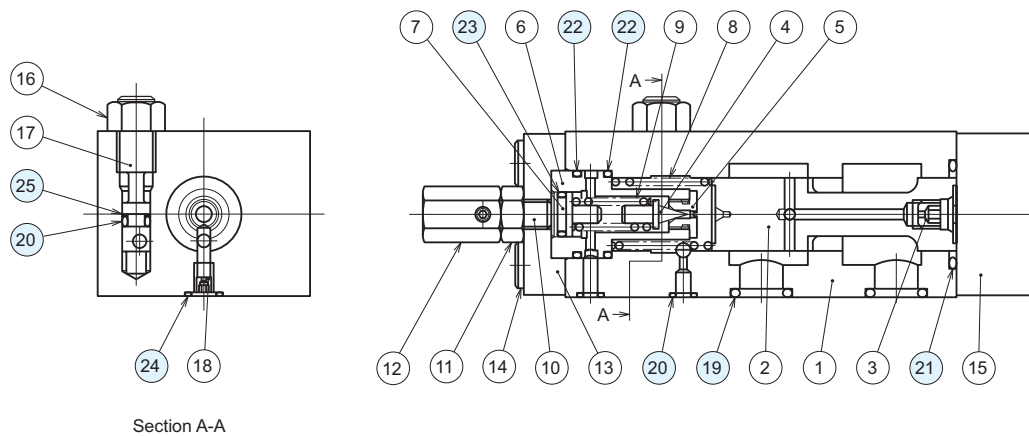
**6 Option code**

No designation: Standard

S: With throttle screw

## Sectional structural diagram

### MUV\*\*AL

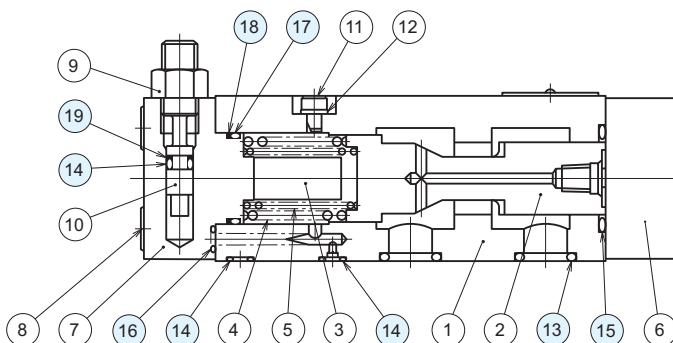


Section A-A

### Sealing part table

Part No.	Name	Quantity	Part model					Part specifications
			MUV12	MUV16	MUV20	MUV25	MUV32	
19	O-ring	2	AS568-112	AS568-115	AS568-118	AS568-121	AS568-125	NBR, Hs90
20	O-ring	3	AS568-008	AS568-008	AS568-008	AS568-008	AS568-008	NBR, Hs90
21	O-ring	1	AS568-120	AS568-120	AS568-122	AS568-128	AS568-130	NBR, Hs90
22	O-ring	2	AS568-019	AS568-019	AS568-023	AS568-122	AS568-126	NBR, Hs90
23	O-ring	1	AS568-012	AS568-012	AS568-012	AS568-012	AS568-012	NBR, Hs70
24	O-ring	1	AS568-011	AS568-011	AS568-011	AS568-011	AS568-011	NBR, Hs90
25	Backup ring	1	For AS568-008	For AS568-008	For AS568-008	For AS568-008	For AS568-008	Bias cut

### MDM\*\*AL

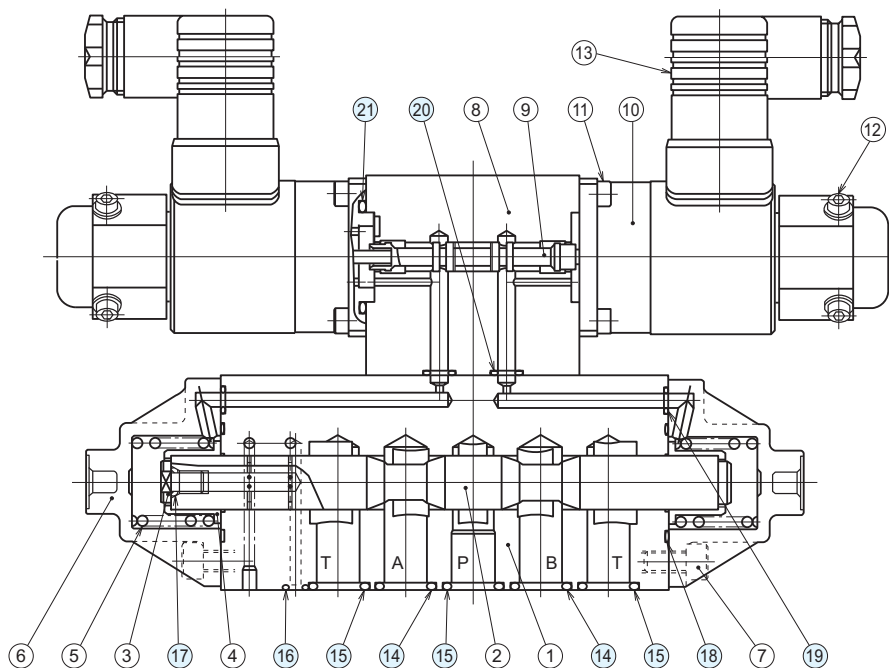


### Sealing part table

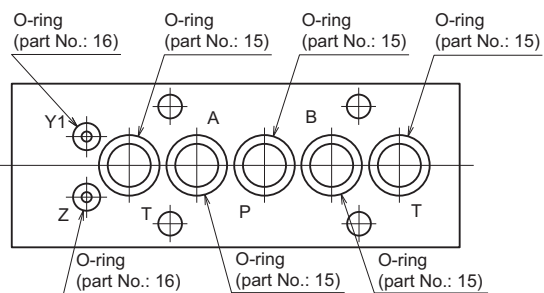
Part No.	Name	Quantity	Part model					Part specifications
			MDM12	MDM16	MDM20	MDM25	MDM32	
13	O-ring	2	AS568-112	AS568-115	AS568-118	AS568-121	AS568-125	NBR, Hs90
14	O-ring	5 (MDM12) 4 (MDM16 to 32)	AS568-008	AS568-008	AS568-008	AS568-008	AS568-008	NBR, Hs90
15	O-ring	1	AS568-120	AS568-120	AS568-122	AS568-128	AS568-130	NBR, Hs90
16	O-ring	1 (MDM12) 2 (MDM16 to 32)	AS568-010	AS568-010	AS568-010	AS568-011	AS568-011	NBR, Hs90
17	O-ring	1	AS568-020	AS568-026	AS568-129	AS568-134	AS568-227	NBR, Hs90
18	Backup ring	1	For AS568-020	For AS568-026	For AS568-129	For AS568-134	For AS568-227	Bias cut
19	Backup ring	1	For AS568-008	For AS568-008	For AS568-008	For AS568-008	For AS568-008	Bias cut

## Sectional structural diagram

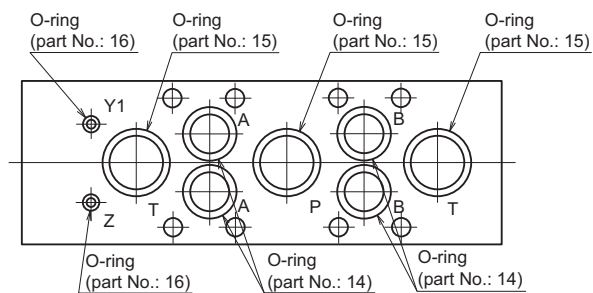
MEV12, 16 and 20



● With MEV12, 16 and 20



● MEV25 and 32



Sealing part table

Part No.	Name	Quantity	Part model					Part specifications
			MEV12	MEV16	MEV20	MEV25	MEV32	
14	O-ring	4	—	—	—	AS568-117	AS568-120	NBR, Hs90
15	O-ring	5 (MEV12 to 20) 3 (MEV25, 32)	AS568-112	AS568-115	AS568-118	AS568-121	AS568-125	NBR, Hs90
16	O-ring	2	AS568-008	AS568-008	AS568-008	AS568-008	AS568-008	NBR, Hs90
17	O-ring	1	1B P5	1B P7	1B P10A	1B P10A	1B P12	JIS B 2401
18	O-ring	2	AS568-025	AS568-128	AS568-136	AS568-228	AS568-231	NBR, Hs90
19	O-ring	2	AS568-008	AS568-008	AS568-008	AS568-009	AS568-009	NBR, Hs90
20	O-ring	4	AS568-010	AS568-010	AS568-010	AS568-010	AS568-010	NBR, Hs90
21	O-ring	2	AS568-121	AS568-121	AS568-121	AS568-121	AS568-121	NBR, Hs90

## Open Loop Control Driver (for AC Power Supply)



### Features

- Achieves optimum control of open loop control type solenoid operated proportional control valves.
- The constant current characteristics suppress the power supply voltage fluctuation, and the output current fluctuation due to temperature rise of the solenoid, to almost zero.
- The output current waveforms (dither frequency, amplitude) are set to optimize the hysteresis and resolution of solenoid operated proportional control valves.
- The PWM (pulse width modulation) control of electrical current minimizes heat generation from the driver.
- The response time adjustment function that smoothly changes output current in response to stepped changes in command inputs enables shockless change of hydraulic output. The response time can be adjusted independently for the rising and falling edges.

### Nomenclature

**KC-6 - 10**

1

2

**1 Model No.**

KC-6: Open loop control driver (for DC power supply)

**2 Design No. (The design No. is subject to change)**

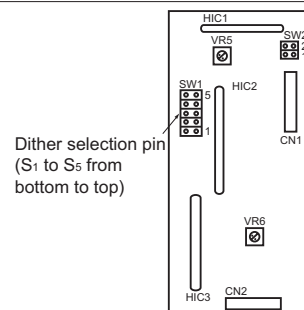
### Specifications

Power supply voltage	AC 100, 200, 220 V (Common for 50 and 60 Hz)	
Permissible voltage fluctuation	-10 to +10%	
Applied load	Proportional solenoid (DC 24 V)	
Command input	DC 0 to 5 V or 1 kΩ potentiometer	
Output current	0 to 850 mA (mean value indication)	
Power consumption	32 VA maximum	
Input impedance	50 ±5 kΩ	
Trimmer adjustment	MIN	0 to 400 mA minimum (at 0 V input)
	MAX	850 to 300 mA minimum (at 5 V input)
Dither selection	Five kinds (by replacing internal socket pins)	
Response time adjustment range	TMU	0.05 to 3.0 seconds (at maximum output)
	TMD	0.05 to 3.0 seconds (at maximum output)
Operating ambient temperature	0 to 55°C	
Operating ambient humidity	25 to 90%RH	
Mass	1.8 kg	

### Dither selection guide

Valve model code	Pin code	Valve model code	Pin code
JRP-G02	S5	MEV12	S4
JRPL-G02		MEV16	
C2RP-G**		MEV20	S3
C2RLP-G03		MEV25	S2
C2GLP-G03		MEV32	S1

Note: Set to S4 at shipment



Part layout diagram for KC-6-10, viewing the panel from the rear.

## Open Loop Control Driver (for DC Power Supply)



### Features

- Optimize the control of solenoid operated proportional control valves with an open loop control type.
- The constant current characteristics suppress the power supply voltage fluctuation, and the output current fluctuation due to temperature rise of the solenoid, to almost zero.
- The output current waveforms (dither frequency, amplitude) are set to optimize the hysteresis and resolution of solenoid operated proportional control valves.
- The PWM (pulse width modulation) control of electrical current minimizes heat generation from the driver.
- The response time adjustment function that smoothly changes output current in response to stepped changes in command inputs enables shockless change of hydraulic output. The response time can be adjusted independently for the rising and falling edges.

### Nomenclature

ZH-6 - 10 - ※

1

2

3

**1 Model No.**

ZH-6: Open loop control driver (for DC power supply)

**2 Design No. (The design No. is subject to change)**

**3 Option code**

No designation: Standard

N: Without case

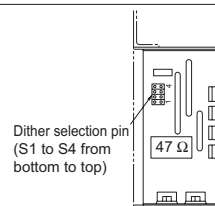
### Specifications

Power supply voltage	DC 24 V	
Permissible voltage fluctuation	-20 to +30% (ripples included)	
Applied load	Proportional solenoid (DC 12 V)	
Command input	DC 0 to 5 V or 1 kΩ potentiometer	
Output current	0 to 1700 mA (mean value indication)	
Power consumption	52 VA maximum	
Input impedance	72 ±5 kΩ	
Trimmer adjustment	MIN	0 to 600 mA minimum (at 0 V input)
	MAX	1700 to 600 mA maximum (at 5 V input)
Dither selection	Four kinds (by replacing internal socket pins)	
Response time adjustment range	TMU	0.05 to 3.0 seconds (at maximum output)
	TMD	0.05 to 3.0 seconds (at maximum output)
Operating ambient temperature	-20 to 55°C	
Operating ambient humidity	25 to 95%RH	
Vibration resistance	6.8 G (66.6 m/s <sup>2</sup> ) Total amplitude: 3 mm Frequency: 33.3 Hz Vertical direction: 4h Front and rear, left and right :2h	
Mass	0.4 kg	

### Dither selection guide

Valve model code	Pin code	Valve model code	Pin code
JRP-G02	S4	MEV12	S3
JRPL-G02		MEV16	S3
C2RP-G※※		MEV20	S2
C2RLP-G03		MEV25	S1
C2GLP-G03		MEV32	S1

Note: Set to S3 at shipment



Dither selection pin (S1 to S4 from bottom to top)

Part layout schematic for ZH-6-10, viewing the left side with the side cover removed

## Minor Loop Control Driver (for AC Power Supply)



### Features

- Optimize the control of minor feedback control type LEM※ valves by detecting the spool position with a differential transformer.
- The constant current characteristics suppress the power supply voltage fluctuation, and the output current fluctuation due to temperature rise of the solenoid, to almost zero.
- The output current waveforms (dither frequency, amplitude) are set to optimize the hysteresis and resolution of solenoid operated proportional control valves.
- The PWM (pulse width modulation) control of electrical current minimizes heat generation by the driver.

### Nomenclature

**KF** ※ - **5** - **10**  
1 2 1 3

**1 Model No.**

KF-5: Minor feedback control driver (for AC power supply)

**2 Applicable control valve**

No designation: LEM-G※※, LEMT-G03, LEMS-※※  
 H: LEMT-G04

**3 Design No. (The design No. is subject to change.)**

### Specifications

Model code		KF-5-10	KFH-5-10
Power supply voltage		AC 100, 200, 220 V (Common for 50 and 60 Hz)	
Permissible voltage fluctuation		-10 to +10%	
Applied load		Proportional solenoid (DC 24 V)	
Command input		DC 0 to 5 V or 1 kΩ potentiometer	
Output current		0 to 850 mA	0 to 1700 mA
Power consumption		62 VA	100 VA
Input impedance		70 ±5 kΩ	
Trimmer adjustment	MIN	0 to 2 V or more: Variable	
	MAX	5 to 1.9 V or less: Variable	
Dither selection		Selected among three kinds: high, medium and low, by changing the terminal connection	
Operating ambient temperature		0 to 55°C	
Operating ambient humidity		25 to 90%RH	
Mass		3.3 kg	

### Handling

- Terminals 5 and 6 are for connecting an ammeter. Short the terminals when not connecting an ammeter.
- Dither selection terminals 9 and 11 are shorted at shipment (medium setting). Shorting 9 and 10 results in greater dither effect (low setting) and shorting 9 and 12 results in less dither effect (high setting).
- Terminals 16 and 17 are shorted at shipment. Do not remove the pin for short.
- Terminal 23 is for checking the minor feedback voltage to detect the spool position.

## DIN Terminal Type Driver for KSP-G02



### Features

- Optimize the control of direct type solenoid operated proportional directional control valve KSP-G02.
- The constant current characteristics suppress the power supply voltage fluctuation, and the output current fluctuation due to temperature rise of the solenoid, to almost zero.
- The output current waveforms (dither frequency, amplitude) are set to optimize the hysteresis and resolution of solenoid operated proportional control valves.
- The PWM (pulse width modulation) control of electrical current minimizes heat generation by the driver.
- The response time adjustment function that smoothly changes output current in response to stepped changes in command inputs enables shockless change of hydraulic output.

### Nomenclature

**ZDN - 2 - 10 - ※**

1                      2                      3

**1 Model No.**

ZDN-2: DIN terminal type driver for KSP-G02

**3 Casing color**

A: Gray  
B: Black

**2 Design No. (The design No. is subject to change)**

### Specifications

Power supply voltage	DC 24 V (Capacity of 1.2 A minimum)
Permissible voltage fluctuation	-20 to +20%
Applied load	Proportional solenoid (DC 12 V)
Command input	DC 0 to 5 V
Output current	0 to 1400 mA
Power consumption	22 VA maximum
Dither	Factory adjusted
Response time adjustment range	0.1 to 1.5 seconds (at maximum output)
Operating ambient temperature	-10 to 50°C
Operating ambient humidity	10 to 90%RH
Vibration resistance	6.8 G (66.6 m/sec <sup>2</sup> ), Frequency: 11.7 to 200 Hz 1 cycle: 15 minutes, 3 directions: 2h each
Mass	0.3 kg

### Handling

- Do not change the DITF trimmer setting because it is factory adjusted.
- When mounting this driver on a KSP valve, tighten the mounting screws (M3 × 40) at a tightening torque of 0.5 to 0.6 N·m {5 to 6 kgf·cm}.
- The TIME trimmer to adjust the response time during transient time applies to both the rising and falling edges. (Individual settings are not possible.)



## Open Loop Control Euro Card Type Driver



### Features

- Optimize the control of open loop control type KSP valves.
- The constant current characteristics suppress the power supply voltage fluctuation, and the output current fluctuation due to temperature rise of the solenoid, to almost zero.
- The output current waveforms (dither frequency, amplitude) are set to optimize the hysteresis and resolution of solenoid operated proportional control valves.
- The PWM (pulse width modulation) control of electrical current minimizes heat generation by the driver.
- The response time adjustment function that smoothly changes output current in response to stepped changes in command inputs enables shockless change of hydraulic output. The response time can be adjusted independently for the rising and falling edges.

### Nomenclature

EP ※ - ※※ - 10 - ※

1 2 3 4 5

**1 Model No.**

EP: Open loop control Euro card type driver

**2 Solenoid code**

D: For double solenoid  
K: For single solenoid

**3 Applicable control valve size**

02: ¼  
03: ⅜

**4 Design No. (The design No. is subject to change)**

**5 Option code**

No designation: With panel  
N: Without panel

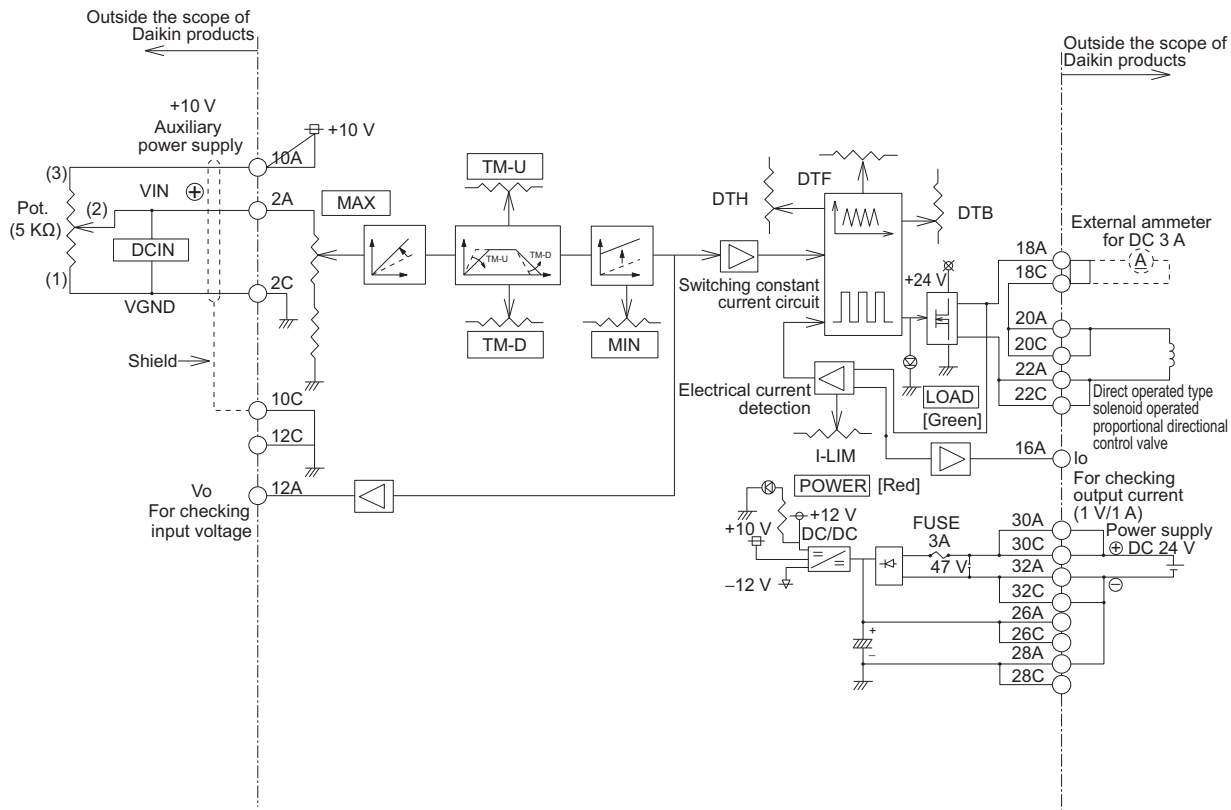
### Specifications

Model code	EPD-02-10	EPK-02-10	EPD-03-10	EPK-03-10
Power supply voltage	DC 24 V (Capacity of 2 A minimum)			
Permissible voltage fluctuation	-10 to +10%			
Applied load	Proportional solenoid (DC 12 V)			
Command input	DC 0 to ± 5 V or DC 0 to ±10 V	DC 0 to 5 V or DC 0 to 10 V	DC 0 to ± 5 V or DC 0 to ±10 V	DC 0 to 5 V or DC 0 to 10 V
Output current	0 to 1600 mA		0 to 1800 mA	
Power consumption	50 VA maximum			
Input impedance	Approx. 30 kΩ	Approx. 15 kΩ	Approx. 30 kΩ	Approx. 15 kΩ
Dither	Factory adjusted			
Response time adjustment range	0.1 to 2 seconds (at maximum output)			
Operating ambient temperature	0 to 50°C			
Operating ambient humidity	20 to 90%RH			
Vibration resistance	(1 G (9.8 m/sec <sup>2</sup> ), Frequency: 11.7 to 100 Hz, 1 cycle: 15 minutes, 3 directions: 2h each)			
Mass	Approx. 0.5 kg			

EPD-02-10 has been integrated into EPD-03-10 as of October 2011 and discontinued.

# Circuit configuration diagram

EPK-※※-10



## Minor Loop Control Euro Card Type Driver



### Features

- Optimize the control of minor feedback control type KSP valves by detecting the spool position with a differential transformer.
- The constant current characteristics suppress the power supply voltage fluctuation, and the output current fluctuation due to temperature rise of the solenoid, to almost zero.
- The output current waveforms (dither frequency, amplitude) are set to optimize the hysteresis and resolution of solenoid operated proportional control valves.
- The PWM (pulse width modulation) control of electrical current minimizes heat generation by the driver.
- The response time adjustment function that smoothly changes output current in response to stepped changes in command inputs enables shockless change of hydraulic output. The response time can be adjusted independently for the rising and falling edges.

### Nomenclature

EPK ※ - 02 - 10 - ※

1 2 3 4 5

**1 Model No.**

EPK: Minor loop control Euro card type driver

**2 Solenoid code**

D: For double solenoid  
F: For single solenoid

**3 Applicable control valve size**

02: ¼

**4 Design No. (The design No. is subject to change)**

**5 Option code**

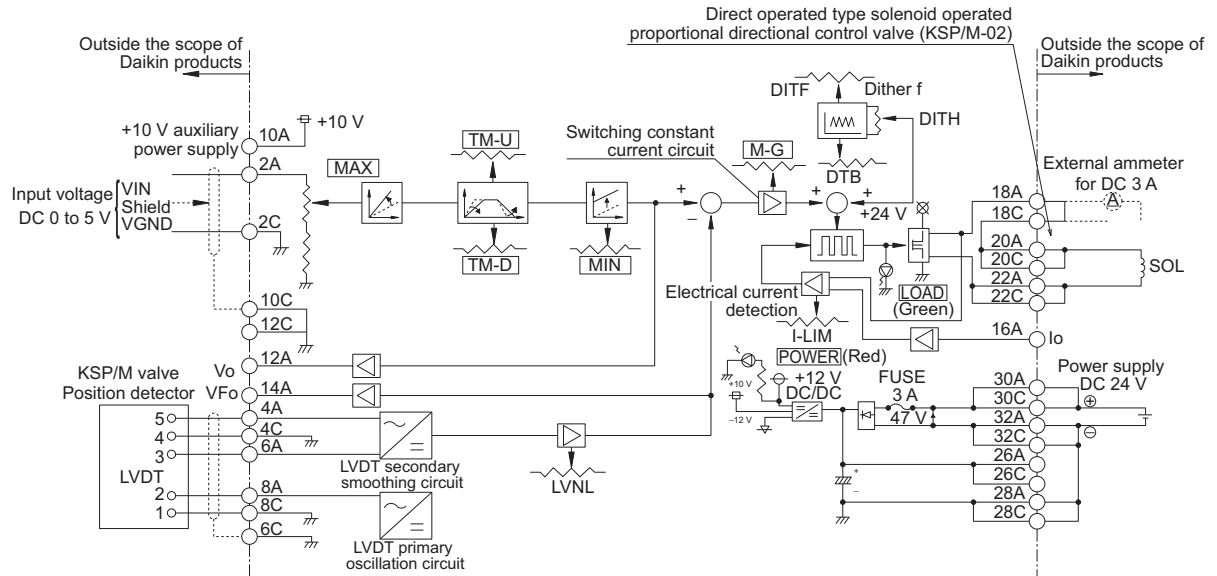
No designation: With panel  
N: Without panel

### Specifications

Model code	EPKD-02-10	EPKF-02-10
Power supply voltage	DC 24 V (Capacity of 2 A minimum)	
Permissible voltage fluctuation	-10 to +10%	
Applied load	Proportional solenoid (DC 12 V)	
Command input	DC 0 to ± 5 V or DC 0 to ±10 V	DC 0 to 5 V or DC 0 to 10 V
Output current	0 to 1600 mA	
Power consumption	50 VA maximum	45 VA maximum
Input impedance	Approx. 30 kΩ	
Dither	Factory adjusted	
Response time adjustment range	0.1 to 1.5 seconds (at maximum output)	
Operating ambient temperature	0 to 50°C	
Operating ambient humidity	20 to 90%RH	
Vibration resistance	1 G (9.8 m/sec <sup>2</sup> ), Frequency: 11.7 to 100 Hz 1 cycle: 15 minutes, 3 directions: 2h each	
Mass	0.5 kg	0.3 kg

# Circuit configuration diagram

EPKF-02-10



J  
PROPORTIONAL VALVES SERVO VALVES

## Minor Loop Control Driver (for SEM)



### Features

- Optimize the control of minor feedback control type SEM valves by detecting the spool position with a differential transformer.
- The constant current characteristics suppress the power supply voltage fluctuation, and the output current fluctuation due to temperature rise of the solenoid, to almost zero.

### Nomenclature

**KSV-2 - 10**

1

2

**1 Model No.**

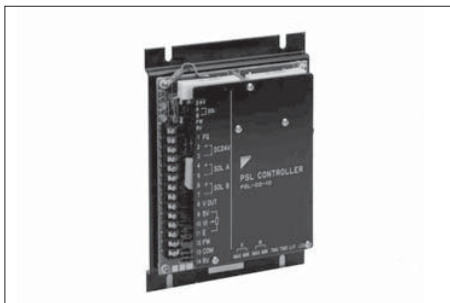
KSV-2: Minor loop control driver

**2 Design No. (The design No. is subject to change)**

### Specifications

Power supply voltage	AC 100, 200, 220 V (Common for 50 and 60 Hz)
Permissible voltage fluctuation	-10 to +10%
Applied load	Torque motor coil for SEM-G※※
Command input	DC 0 to ±10 V or 5 to 10 kΩ potentiometer
Output current	0 to ±280 mA
Power consumption	20 W maximum
Input impedance	16 kΩ
Dither	Factory adjusted
Operating ambient temperature	0 to 55°C
Operating ambient humidity	25 to 90%RH
Mass	2 kg

# Shockless Reversal Controller



## Features

- Enables shockless reversal with heavy loads.
- The constant current characteristics suppress the power supply voltage fluctuation, and the output current fluctuation due to temperature rise of the solenoid, to almost zero.
- The output current waveforms (dither frequency, amplitude) are set to optimize the hysteresis and resolution of solenoid operated proportional control valves.

## Nomenclature

**PSL - 02 - 20**

1

2

3

**1 Model No.**  
PSL: Shockless reversal controller

**2 Applicable control valve size**  
02: ¼

**3 Design No. (The design No. is subject to change)**

## Specifications

Power supply voltage	DC 24 V (Capacity of 2 A minimum)	
Permissible voltage fluctuation	-10 to +10% (ripples included)	
Applied load	Proportional solenoid (DC 12 V)	
Command input	DC 0 to 5 V or 1 to 5 kΩ potentiometer	
Output current	0 to 1600 mA	
Power consumption	45 VA maximum	
Input impedance	55 ±5 kΩ	
Dither	Factory adjusted	
Response time adjustment range	TMU	Approx. 0.1 to 1.1 seconds (at maximum output)
	TMD	Approx. 0.1 to 1.1 seconds (at maximum output)
Operating ambient temperature	0 to 50°C	
Operating ambient humidity	20 to 90%RH	
Vibration resistance	2.2 G (21.6 m/sec <sup>2</sup> ), 3 directions: 2h each	

## Multi-step Signal Controller



### Features

- Combining this controller with a driver for solenoid operated proportional valves enables setting of multi-step command input voltages.
- 6-step output voltage levels and the response time to reach these voltage levels can be set.
- Switching among the steps can be easily achieved with an external relay contact circuit or a PLC.
- Voltage input is also possible.

### Nomenclature

**KMT-6** - **10**

1                      2

**1 Model No.**

KMT-6: 6-channel multi-step signal controller (for AC power supply)

**2 Design No. (The design No. is subject to change)**

### Specifications

Power supply voltage	AC 100, 200 V (Common for 50 and 60 Hz)
Permissible voltage fluctuation	-10 to +10%
Signal for switching steps	Shorting the common (DC 24 V) of the switching signal and the switching terminal of each step with a relay contact or open collector output
Input current for switching steps	10 mA
External input voltage *1	DC 0 to 5 V (10 V also possible by removing jumper wire (JP6) inside the controller)
Output	DC 0 to 5 V
Power consumption	3 W maximum
Response time adjustment range	0.1 to 3.5 seconds (time to reach 95% of the set voltage)
Operating ambient temperature	0 to 55°C
Operating ambient humidity	25 to 90%RH

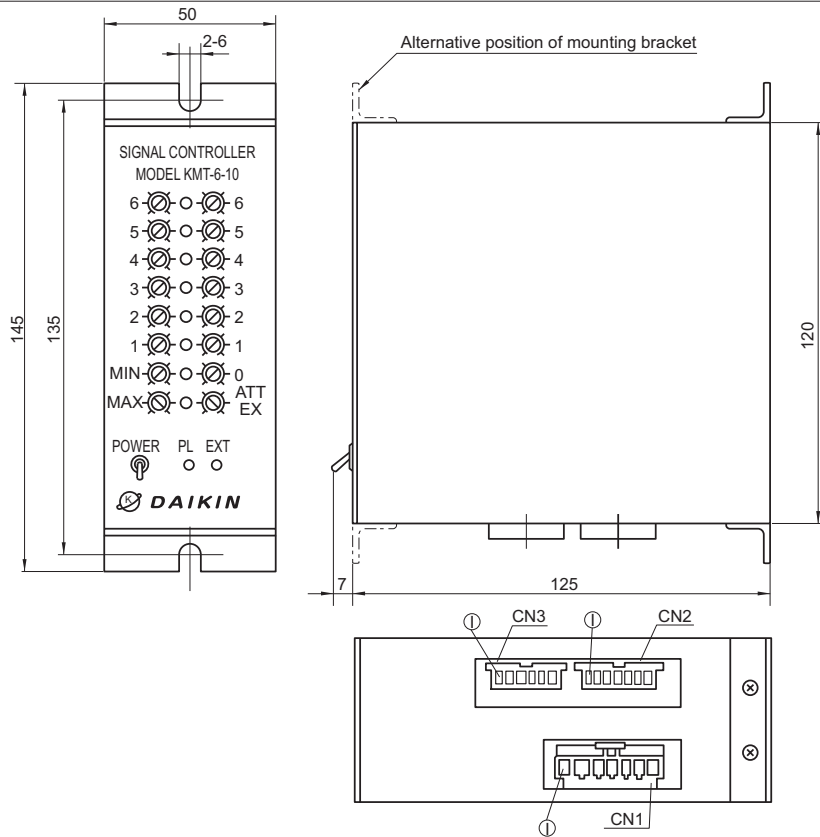
Note: \*1 When operating this controller with external input voltages, switch the connection at JP1 to the EXT position on the connector or that at JP2 to the EXT position on the connector in the controller.

JP1: To be selected when operating only STEP1 with external input voltages

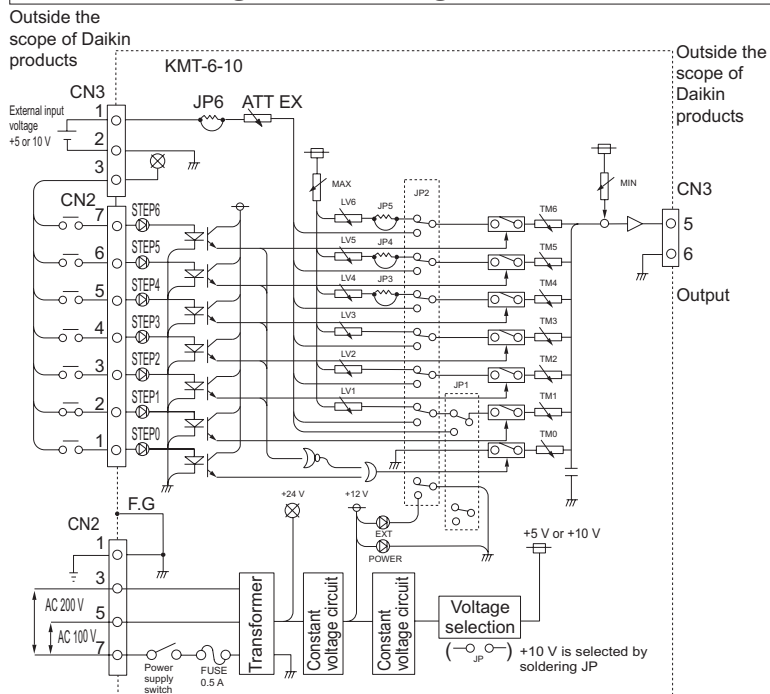
JP2: To be selected when operating STEP1 to STEP6 with external input voltages

For details, see the circuit configuration diagram on Page J-91.

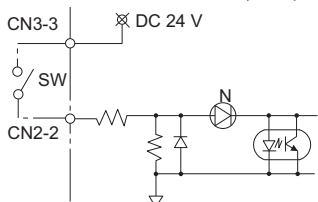
### External dimension diagram



### Circuit configuration diagram

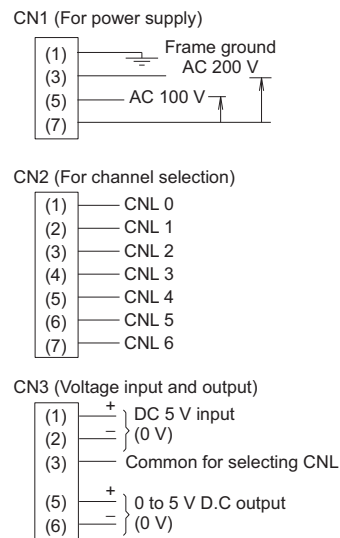


Internal channel selection circuit (example of CNL1)



Note: The DC 24V common power supply for channel selection is not applicable to any other purpose.

### Wiring diagram



Note: To select a channel, connect the channel common and the CNL terminal of the relevant channel.

(Example: When channel 1 selected)





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