G

DIRECTIONAL CONTROL VALVES I

Model [Model No.]	Maximum Operating pressure MPa {kgf/cm²}	Maximum flow rate L/min (1 – 10 – 100 – 1000)	Page
Low-watt type solenoid valve [LS]	7 {70} 16 {160}	02 02	G-4
Solenoid valve [KSO]	35 {350}	02 03	G-12
Minute signal current type solenoid valve [KSOB]	35 {350}	02 03	G-28
Solenoid pilot operated directional control valve [JSP]	21 {210}	02 03	G-30
Solenoid pilot operated directional control valve [KSH]	35 {350} 31.5 {315} 31.5 {315}	04 06 10	G-37 G-44 G-49

Model [Model No.]	Maximum Operating pressure MPa {kgf/cm²}	Maximum flow rate L/min (1 – 10 – 100 – 1000)	Page
Solenoid pilot operated directional control valve [JS]	21 {210} 25 {250}	06 10	G-54
Solenoid pilot operated directional control valve [MEP]	21 {210}	12 16 20 25 32	G-61
Pilot operated directional control valve [JP]	21 {210}	03 06 10	G-67
Type C2 solenoid pilot operated directional control valve [C2SW]	25 {250}	03 06	G-70
Type C4 solenoid pilot operated directional control valve [C4S]	25 {250}	06	G-74
Seat type solenoid valve [JSC]	25 {250}	01	G-78
Type C2 Seat type solenoid pilot operated directional control valve [C2SL]	25 {250}	03 06	G-81
Manually operated valve [DMO]	14 {140}	03 06	G-86
Manually operated valve [JM]	21 {210}	02	G-89
Rotary directional control valve [DRO]	7 {70}	02	G-91
Deceleration valve [DDC]	14 {140}	03 06	G-93
Cam operated pilot operated valve [DD]	14 {140}	02	G-95

Handling

- **Hydraulic oil**
  - ○ Use a petroleum-based hydraulic fluid equivalent to ISO VG32 to 68.
  - ○ Operate the unit in an environment where both the following conditions are satisfied: viscosity range from 15 to 400 mm^2/s {cSt} and oil temperature from –15 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.

- **Ambient temperature, relative humidity**
  - ○ Use the product under the following conditions.Ambient temperature: –15 to 50°C, Relative humidity: 0 to 95%

- **Fluid temperature and ambient temperature**
  - ○ When there is a large difference between the fluid and ambient temperature, take care about thermal shocks while using the products. The recommended ambient temperatures for solenoid valves are the guide for the temperature limits of electrical parts and thermal shocks are not taken into consideration.

- **Filters**
  - ○ Use a line filter with a filtration accuracy of 25 µm or better.

- **Installation and maintenance**
  - ○ No restriction applies to the installation direction. However, install the solenoid valves and solenoid pilot operated directional control valves of the no-spring type 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 unless otherwise specified.
  - ○ Dip the end of the pipe connected to the valves into oil in the tank.

- **Tank port piping**
  - ○ Connect piping to the tank port such that the tank port is always filled with the fluid.
  - ○ Ensure that no surge pressures beyond the permissible back pressure are applied to the tank port.

- **Continuous pressurization**
  - ○ Avoid holding the solenoid valves and solenoid pilot operated directional control valves at the switching position over a prolonged period under high pressure. Otherwise, hydraulic locking may occur, causing operation failure.

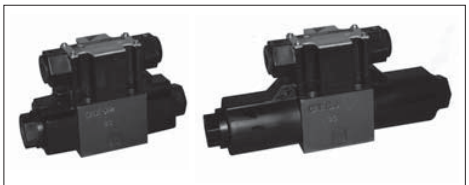
- **Maximum flow rate**
  - ○ The maximum flow rate refers to the largest possible flow rate at each pressure at which the valve can function properly, or the largest flow rate possible with the pressure drop ignored.

- **Energize the solenoids**
  - ○ With solenoid valves or solenoid pilot operated directional control valves, be sure to energize each solenoid after demagnetizing the other. Never energize both solenoids at the same time.

- **No-spring type (without detent)**
  - ○ Energize the solenoid continuously to prevent reverse rotation of the spool.

- **No-spring type (with detent)**
  - ○ Momentary energizing (0.1 seconds minimum) is sufficient. However, continuous energizing will be necessary if reverse rotation of the spool is required without fail.
  - ○ When continuous energizing is off, the tank line piping connected to the valve should be isolated.
    If the tank line is connected to a common line instead of having an isolated line, the spool may switch unexpectedly due to surge pressures generated by switching of other directional control valves. This phenomenon is likely to occur especially when using the valve in a non-energized state.

Low-watt Type Solenoid Valve



For AC power supply For DC power supply

Features

- These solenoid valves use low-wattage type coils (DC: 5 W, AC: 12 W).
- This valve can be driven directly from a programmable sequence controller since it has a low current requirement.

Nomenclature

※	–	LS	–	G	02	–	※※	※	※	–	30	–	※※※
1		2		3	4		5	6	7		8		9

M12-4-pin connector specifications

LS	–	G	02	–	※※	※	P	–	30	–	D	3B
2		3	4		5	6	7		8		10	11

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
F: Phosphate ester hydraulic fluid

2 Model No.
LS: Low-wattage type solenoid valve

3 Connections
G: Gasket mount type

4 Nominal diameter
02: ¼

5 Spool type (See the model table)

6 Spool operating method (See the model table)
C: Spring center type
A: Spring offset type (with A solenoid)
B: Spring offset type (with B solenoid)
N: No-spring type (without detent)
D: No-spring type (with detent)

7 Voltage code (See the solenoid specification table)

8 Design No. (The design No. is subject to change)

9 Option code (See the option code table)

10 Connector code
D: M12-4-pin connector specifications

11 Connector connecting method
3B: Load side: Negative common
Wiring port: Outlet at port B side

Note: With M12-4-pin connector specifications, only 2C, 4C, 2B and 2D can be designated for 5 Spool type and 6 Spool operating method.

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate *1 L/min	Permissible back pressure MPa {kgf/cm²}	Maximum switching frequency Times per minute
LS-G02-※※※※-30	1/4	7 { 70}	30	7 {70}	240
LS-G02-※※※※-30-※W		16 {160}		12 (AC) {120}	
				14 (DC) {140}	
LS-G02-※※※※-30-D3B		7 { 70}		7 {70}	120

Note: *1 The maximum flow rate is 15 L/min when 66C is designated for the spool type and spool operating method.

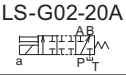
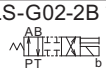
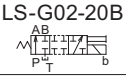
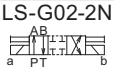
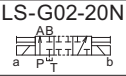
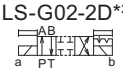
7 : Solenoid specification table

Voltage code	Power supply voltage	Starting current A	Holding current A	Holding power W	Permissible voltage fluctuation (%)
A	AC 100 V (50 Hz)	1.13	0.32	12.0	80 to 110
	AC 100 V (60 Hz)	1.02	0.22	8.5	90 to 121
	AC 110 V (60 Hz)	1.13	0.26	11.2	82 to 110
B	AC 200 V (50 Hz)	0.57	0.16	12.0	80 to 110
	AC 200 V (60 Hz)	0.51	0.11	8.5	90 to 121
	AC 220 V (60 Hz)	0.57	0.13	11.2	82 to 110
P	DC 24 V	–	0.216	5.2	90 to 110

Time rating	Insulation resistance	Withstand voltage	Insulation type
Continuous	50 MΩ	AC 1500 V, 1 minute	Type B (Coils: AC: H class, DC: F class)

Note: ○ The electric current and power indicated are the values at 20°C.
○ The starting current is the value required to operate the solenoid with the movable core at the furthest position from the stationary core.

5 6 : Model table

Model code JIS graphic symbols for hydraulic system Spool type and spool operating method Type C, N, D	Type A	Type B	Power supply	Pressure - Flow rate characteristics (See the graphs) A B / P T	 A B / P T	 A B / P T	Pressure drop characteristics (See the graphs) P → A P → B	 A → T B → T	 P → T
LS-G02-2C *2 	–	–	AC	A	a	a	(3)	(5)	–
			DC	D F	b c	b c			
LS-G02-3C 	–	–	AC	A	A	A	(4)	(3)	(3)
			DC	A	A	A			
LS-G02-4C*2 	–	–	AC	B	a	a	(3)	(6)	–
			DC	E G	b c	b c			
LS-G02-44C 	–	–	AC	B	a	a	(2)	(5)	–
			DC	E G	b c	b c			
LS-G02-66C 	–	–	AC	C	e	e	(1)	(1)	(3)
			DC	C	e	e			
LS-G02-7C 	–	–	AC	A	g	g	(6)	(5)	–
			DC	A	g	g			
LS-G02-8C 	–	–	AC	B	a	a	(3)	(5) (3)	–
			DC	G	c	c			
LS-G02-9C 	–	–	AC	A	g	a	(5) (3)	(3)	–
			DC	G	g	c			
–	LS-G02-2A 	–	AC	A	A	f	(5)	(5)	–
			DC	A	h	f			
–	LS-G02-20A 	–	AC	–	A	f	(4)	–	–
			DC	–	h	f			
–	–	LS-G02-2B *2 	AC	A	f	A	(5)	(5)	–
			DC	A	f	h			
–	–	LS-G02-20B 	AC	–	f	A	(4)	–	–
			DC	–	f	h			
LS-G02-2N 	–	–	AC	A	d	d	(3)	(5)	–
			DC	A	d	d			
LS-G02-20N 	–	–	AC	–	d	d	(5)	–	–
			DC	–	d	d			
LS-G02-2D*2 	–	–	AC	A	d	d	(5)	(3)	–
			DC	A	d	d			
LS-G02-20D 	–	–	AC	–	d	d	(5)	–	–
			DC	–	d	d			

Note: *2 With M12-4-pin connector specifications, only 2C, 4C, 2B and 2D can be designated.

9 : Option code table

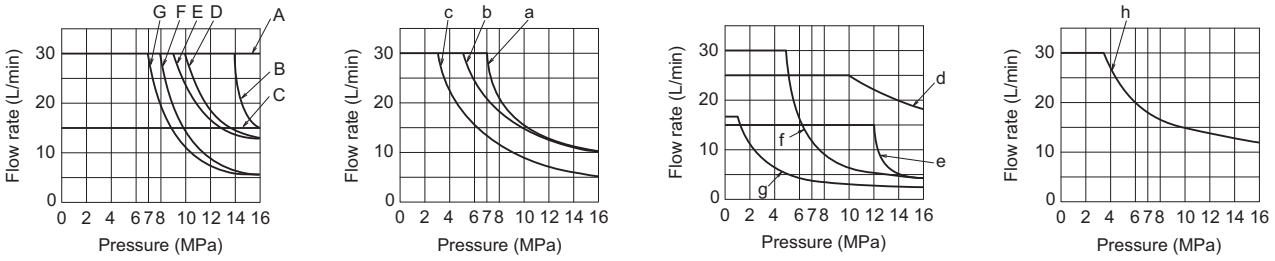
Option code	Option details					Notes
No designation	Terminal box type	With lamp	Without earth terminal		Without surge killer	
N					With surge killer	
NR					With surge killer (with resistance)	*3
E			With earth terminal	CE standard compliant	Without surge killer	*4
C	DIN connector type	Without lamp	With earth terminal		Without surge killer	*5
CL		With lamp				*5
CLE				CE standard compliant		*4, 5
C1	Without DIN connector socket					*5
W	High-pressure model (maximum operating pressure: 16 MPa)					

○ If two or more options are selected, sort the option codes in alphanumeric order.

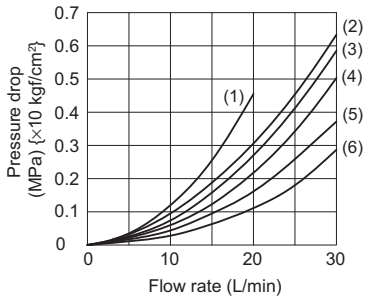
Note: *3 The specifications with surge killer (with resistance) are only applicable to voltage code P.
*4 Only voltage codes A and P can be designated for CE compliant products (option code: E, EN, ENR).
Only voltage code A can be designated for CE compliant products (option code: CE, CLE) (Voltage codes other than A and P are not compliant with the CE standards.)
*5 The DIN connector type is only applicable to voltage codes A and B.

Performance curves (viscosity: 32 mm²/s {cSt})

Pressure - Flow rate characteristics



Pressure drop characteristics



Note: ○ The flow rates shown in the graphs are the maximum flow rates under which operation (switching) of the valve is possible under the following conditions.

AC	After rising to the saturation temperature, 90% of rated voltage applied (60 Hz)
DC	After rising to the saturation temperature, 90% of rated voltage applied

○ In the 5 model table, the conditions for each of the values given in the two rows for DC power supply are as follows.
Top row: After rising to the saturation temperature, 100% of rated voltage applied
Bottom row: After rising to the saturation temperature, 90% of rated voltage applied

Operation time (Sec.)

Power supply	Applicable wiring method	Operating direction	Operation time
AC	Terminal box type DIN connector type	Energize	0.01 to 0.03
		Spring return	0.01 to 0.05
DC	Terminal box type	Energize	0.01 to 0.08
		Spring return	0.02 to 0.04
	M12-4-pin connector type	Energize	0.01 to 0.08
		Spring return	0.05 to 0.12

Mass (kg)

Double solenoid		Single solenoid	
AC	DC	AC	DC
1.5	2.2	1.3	1.6

Note: ○ The operation time may change slightly depending on the spool code, conditions of use (pressure, flow rate, hydraulic fluid viscosity, etc.).
○ Solenoid valves with M12-4-pin connector specifications incorporate a diode to absorb surge current. Therefore there will be a slight delay in the operation time at spring return when compared to terminal box type/DIN connector type solenoid valves.

Sub-plate model code

● The sub-plate is not provided with the valve. Order it separately if 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}

Solenoid model codes

Power supply	Applicable wiring method	Model code of solenoid set	Model code of solenoid coil
AC	Terminal box type	LA-2※-30	C-LA-2※-30
	DIN connector type	LA-2※-C1-30	C-LA-2※-C1-30
DC	Terminal box type	LD-2P-30 or LD-2P-W-30 *7	C-LD-2P-30
	M12-4-pin connector type	LD-2P-30	C-LD-2P-30

Note: *6 ※: Voltage code (See [7]: Solenoid specification table.)
*7 The solenoid model code for DC type with high-pressure specifications (option code "W") is LD-2P-W-30.
○ The solenoid set comprises a solenoid coil, a solenoid cartridge, a plastic nut, and a push pin.
○ DIN connector type solenoid sets and solenoid coils are not provided with a DIN connector socket.
○ When a DIN connector socket is required, order it from your nearest distributor, specifying the model code given in the table below.
Manufacturer: Hirschmann

Model code	Power supply voltage	Details	
GDM2011		Without lamp	Without surge killer
GDML2011-LG110-H0	AC 100 V, AC 110 V	With lamp	
GDML2011-LG240-H0	AC 200 V, AC 220 V		
GDML2011-LG110/Z-H0	AC 100 V, AC 110 V		With surge killer
GDML2011-LG220/Z-H0	AC 200 V, AC 220 V		

Terminal box model code

Terminal box type

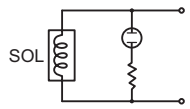
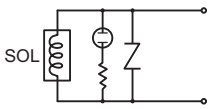
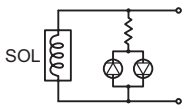
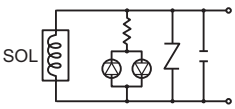
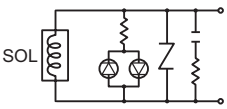
Voltage code	Spool operating method: Type C, N or D				Spool operating method: Type A				Spool operating method: Type B			
	Without surge killer		With surge killer		Without surge killer		With surge killer		Without surge killer		With surge killer	
A	TLW2-AB	(1)	TLW2-A-N	(2)	TLSA2-AB	(1)	TLSA2-A-N	(2)	TLSB2-AB	(1)	TLSB2-A-N	(2)
B			TLW2-B-N				TLSA2-B-N				TLSB2-B-N	
P	TLW2-NP	(3)	TLW2-NP-N	(4)	TLSA2-NP	(3)	TLSA2-NP-N	(4)	TLSB2-NP	(3)	TLSB2-NP-N	(4)
			TLW2-NP-NR	(5)			TLSA2-NP-NR	(5)			TLSB2-NP-NR	(5)

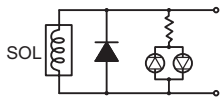
M12-4-pin connector type

Voltage code	Spool operating method: Type C, N or D		Spool operating method: Type A		Spool operating method: Type B	
P	TLW2-NP-D3BPG-M12	(6)	TLSA2-NP-D3BPG-M12	(6)	TLSB2-NP-D3BPG-M12	(6)

Note: ○ The number next to each model code indicates the type of the electrical circuit. (See the electrical circuits section for details.)

Electrical circuits (terminal box type: (1), (4), (5), DIN connector type: (1), (3), M12-4-pin connector type: (6))

AC 100 V minimum DC 100 V minimum	AC 100 V minimum With surge killer	DC 24 V	DC 24 V With surge killer	DC 24 V With surge killer (with resistance)
(1)	(2)	(3)	(4)	(5)
				

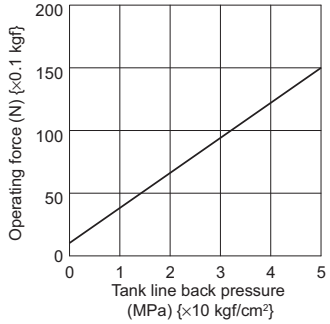
DC 24 V With diode
(6)


Note: ○ When switching a DC solenoid valve with a surge killer through an electromagnetic relay, the reverse surge voltage is suppressed by the varistor and sparks between relay contacts are suppressed by the capacitor at demagnetization of the solenoid.
Standard solenoid valves with a surge killer (option code "N") are very effective to eliminate sparks. However, adequate consideration should be given to the service life of the relay to avoid contact welding due to inrush current at solenoid excitation.
In applications where contact welding due to inrush current is expected, solenoid valves with a surge killer (with resistance) (option code "NR") are effective. Note, however, they are not as effective as standard solenoid valves with a surge killer (option code "N") in terms of elimination of sparks.
○ When using solenoid valves without a surge killer, adequate consideration should be given to protection against the reverse surge voltage generated at demagnetization of the solenoid. (It is advisable to incorporate a surge absorbing element such as a varistor in the circuit.)
○ Be careful about the polarity (+/–) when wiring the terminal box (6) for the M12-4-pin connector type. Carrying current with miswiring will cause short-circuit current to flow into the built-in diode and damage the diode and drive circuit.

Handling

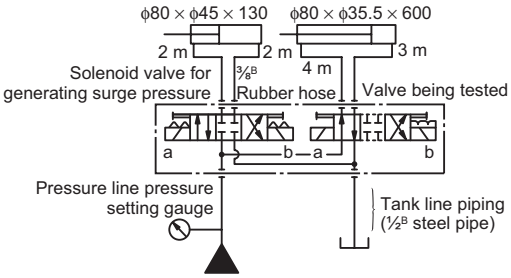
- **Wiring guide for solenoid (AC solenoid valve)**
  Solenoids can be used with both 50 and 60 Hz.
- **No-spring type (with detent)**
  When continuous energizing is not applied with a no-spring type (with detent) solenoid valve, isolate the valve's tank line piping.
  If the tank line piping is connected to a common line rather than an isolated line being provided, the spool may rotate in the reverse direction unexpectedly due to surge pressures generated by switching of other directional control valves. When connecting the tank line to a common line, incorporate a check valve in the tank line or carefully consider the piping length of the tank line by using the example test given below as a guide.
- **Operating force for manual operation pin**
  The force required to operate the manual operation pin varies depending on the back pressure in the tank line.

Operating force for manual operation pin

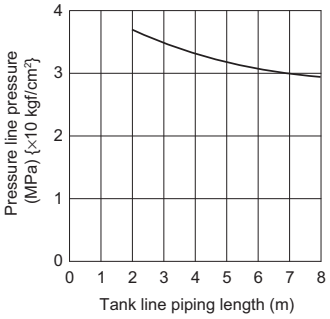


- **Testing withstanding surge pressure of no-spring type (with detent) solenoid valve (example)**
  <Method> Measuring the limit pressure in the pressure line where the spool of the valve being tested does not rotate in the reverse direction in the non-energized state when the solenoid valve for generating surge pressure is switched
  <Conditions> Pressure line pressure: 3.5 MPa {35 kgf/cm^2}
  Flow rate: 26 L/min

<Circuit>

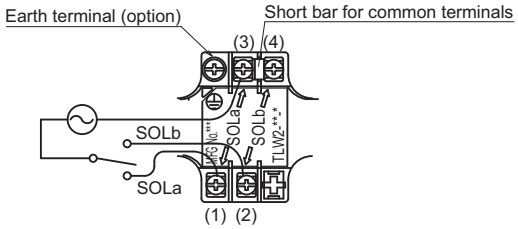


<Result>

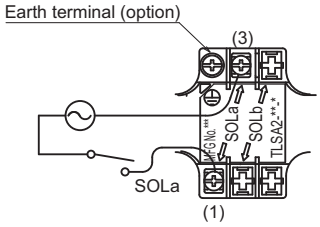


Wiring guide

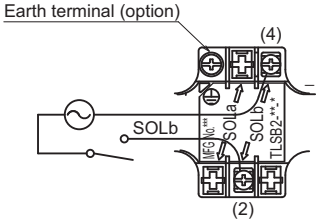
Spool operating method: Type C, N or D
[Terminal box type]



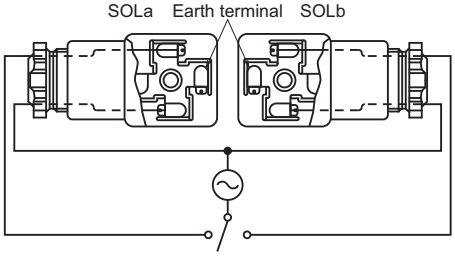
Spool operating method: Type A
[Terminal box type]



Spool operating method: Type B
[Terminal box type]

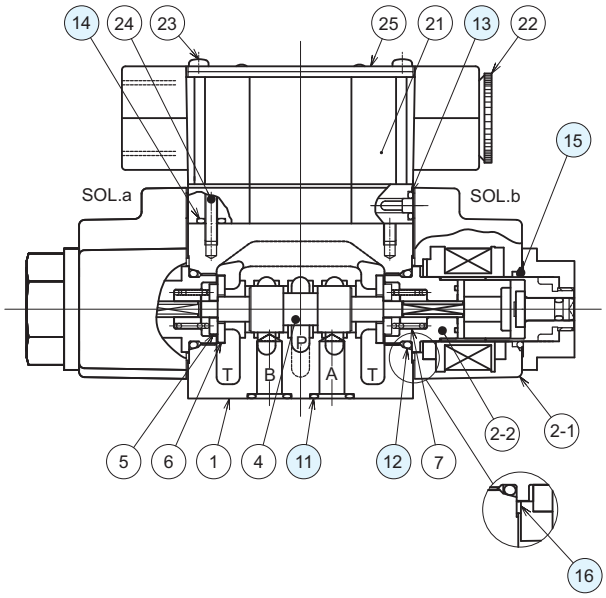


Spool operating method: Type C, N, D, A, B
[DIN connector type]



Sectional structural diagram

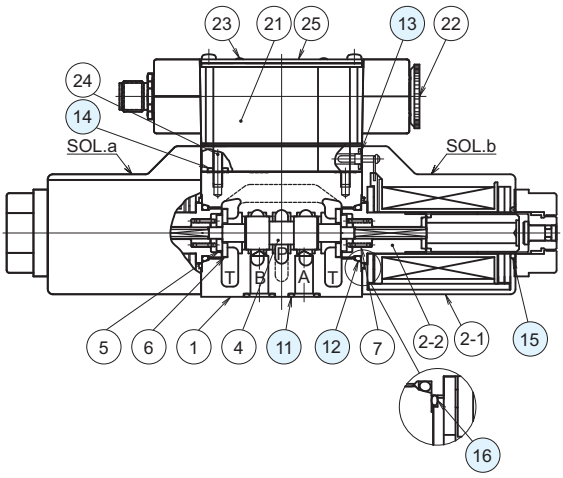
LS-G02
(Terminal box type)



Sealing part table

Part No.	Name	Quantity		Part specifications
		AC	DC	
11	O-ring	4	4	AS568-012 (NBR, Hs90)
12	O-ring	2	2	JIS B 2401 1B P18
13	O-ring	4	4	JIS B 2401 1A P4
14	O-ring	3	3	JIS B 2401 1A P5
15	O-ring	2	–	JIS B 2401 1A P18
		–	2	JIS B 2401 1A P16
16	Sheet packing	2	–	NBR, Hs65
	O-ring	–	2	AS568-021 (NBR, Hs70)

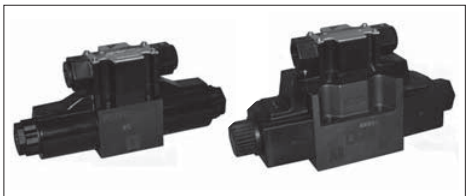
LS-G02
(M12-4-pin connector specifications)



Sealing part table

Part No.	Name	Quantity	Part specifications
11	O-ring	4	AS568-012 (NBR, Hs90)
12	O-ring	2	JIB B 2401 1B P18
13	O-ring	4	JIB B 2401 1A P4
14	O-ring	3	JIB B 2401 1A P5
15	O-ring	2	JIB B 2401 1A P16
16	Sheet packing	2	AS568-021 (NBR, Hs70)

Solenoid Valve



G02 For DC power supply G03 For AC power supply

Features

- These models realize high-pressure large-flow-rate control at 35 MPa {350 kgf/cm^2} and 100 L/min (G02) or 160 L/min (G03).
- They are best suited to integration into European Safety Standard (CE) compliant equipment since they have dust-/water-proof properties that satisfy the IEC Pub529 IP65 ingress protection grade.

Nomenclature

※	–	KSO	–	G	※※	–	※※	※	※	–	※※	–	※※※	–	※※※
1		2		3	4		5	6	7		8		9		10

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
H: Water-glycol hydraulic fluid (G02 accepts water-glycol hydraulic fluid with no designation.)
F: Phosphate ester hydraulic fluid

2 Model No.
KSO: K series solenoid valve

3 Connections
G: Gasket mount type

4 Nominal diameter
02: ¼ 03: ⅜

5 Spool type (See the model table)

6 Spool operating method (See the model table)
C: Spring center type
A: Spring offset type (with A solenoid)
B: Spring offset type (with B solenoid)
N: No-spring type (without detent, applicable only to KSO-G02)
D: No-spring type (with detent)

7 Voltage code (See the solenoid specification table)

8 Design No. (The design No. is subject to change)
20: Nominal diameter 03 (⅜)
30: Nominal diameter 02 (¼)

9 Option code (See the option code table)

10 Auxiliary spool type (See the model table)

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm^2}	Maximum flow rate L/min	Permissible back pressure MPa {kgf/cm^2}	Maximum switching frequency times/minute			External coating protection
					AC, DC	With rectifier	With built-in surge killer DIN connector type with lamp	
KSO-G02	¼	35 {350} (25 {250}) *1	100	17.5 {175}	240	120	100	IEC Pub529 IP65
KSO-G03	⅜		160 (DC), 130 (AC)	16 {160}			60	

Note: *1 The maximum operating pressure is 25 MPa {250 kgf/cm^2} when 5C, 66C or 51C is designated for the spool type and spool operating method.

7 : Solenoid specification table

● KSO-G02

Voltage code	Power supply voltage	Starting current A	Holding current A	Holding power W	Permissible voltage fluctuation %	Voltage code	Power supply voltage	Starting current A	Holding current A	Holding power W	Permissible voltage fluctuation %
A	AC 100 V (50 Hz)	2.42	0.51	21.5	80 to 110	M	AC 230 V (50 Hz)	1.05	0.22	21.5	80 to 110
	AC 100 V (60 Hz)	2.14	0.37	18	90 to 121		AC 230 V (60 Hz)	0.93	0.16	18	90 to 120
	AC 110 V (60 Hz)	2.35	0.44	22.5	82 to 110						
B	AC 200 V (50 Hz)	1.21	0.26	21.5	80 to 110	N	DC 12 V *2	–	2.35	28.2	90 to 110
	AC 200 V (60 Hz)	1.07	0.19	18	90 to 121	P	DC 24 V *2	–	1.22	29.2	90 to 110
	AC 220 V (60 Hz)	1.18	0.22	22.5	82 to 110	Q	DC 48 V *2	–	0.61	29.3	90 to 110
C	AC 110 V (50 Hz)	2.2	0.46	21.5	80 to 110	R	DC 100 V *2	–	0.35	34.8	90 to 110
D	AC 220 V (50 Hz)	1.1	0.23	21.5	80 to 110	S	DC 110 V *2	–	0.32	35	90 to 110
J	AC 240 V (50 Hz)	1.01	0.21	21.5	80 to 110	T	DC 200 V *2	–	0.18	35.4	90 to 110
	AC 240 V (60 Hz)	0.89	0.15	18	90 to 120	U	DC 220 V *2	–	0.15	33.6	90 to 110
K	AC 120 V (50 Hz)	2.02	0.43	21.5	80 to 110	E	AC 100 V with rectifier	–	0.38	33.5	90 to 110
	AC 120 V (60 Hz)	1.78	0.31	18	90 to 120	F	AC 110 V with rectifier	–	0.34	32.8	90 to 110
L	AC 115 V (50 Hz)	2.1	0.44	21.5	80 to 110	G	AC 200 V with rectifier	–	0.2	36.8	90 to 110
	AC 115 V (60 Hz)	1.86	0.32	18	90 to 120	H	AC 220 V with rectifier	–	0.17	34	90 to 110

Note: *2 With DC power supply voltage, solenoid valves with a surge killer (option code: N, EN) are recommended to prevent reverse surge voltage that may occur at demagnetization of the solenoid.

7 : Solenoid specification table

● KSO-G03

Voltage code	Power supply voltage	Starting current A	Holding current A	Holding power W	Permissible voltage fluctuation %	Voltage code	Power supply voltage	Starting current A	Holding current A	Holding power W	Permissible voltage fluctuation %
A	AC 100 V (50 Hz)	5.7	0.88	37	80 to 110	M	AC 230 V (50 Hz)	2.5	0.35	37	80 to 110
	AC 100 V (60 Hz)	4.9	0.64	33	90 to 121		AC 230 V (60 Hz)	2.1	0.26	33	90 to 120
	AC 110 V (60 Hz)	5.4	0.77	41	82 to 110						
B	AC 200 V (50 Hz)	2.9	0.44	37	80 to 110	N	DC 12 V *2	–	3.08	37	90 to 110
	AC 200 V (60 Hz)	2.4	0.32	33	90 to 121	P	DC 24 V *2	–	1.6	38	90 to 110
	AC 220 V (60 Hz)	2.7	0.39	41	82 to 110	Q	DC 48 V *2	–	0.77	37	90 to 110
C	AC 110 V (50 Hz)	5.2	0.74	37	80 to 110	R	DC 100 V *2	–	0.37	37	90 to 110
D	AC 220 V (50 Hz)	2.6	0.37	37	80 to 110	S	DC 110 V *2	–	0.34	37	90 to 110
J	AC 240 V (50 Hz)	2.4	0.34	37	80 to 110	T	DC 200 V *2	–	0.19	38	90 to 110
	AC 240 V (60 Hz)	2	0.25	33	90 to 120	U	DC 220 V *2	–	0.17	38	90 to 110
K	AC 120 V (50 Hz)	4.8	0.68	37	80 to 110	E	AC 100 V with rectifier	–	0.42	37	90 to 110
	AC 120 V (60 Hz)	4.1	0.5	33	90 to 120	F	AC 110 V with rectifier	–	0.39	38	90 to 110
L	AC 115 V (50 Hz)	5	0.7	37	80 to 110	G	AC 200 V with rectifier	–	0.2	36	90 to 110
	AC 115 V (60 Hz)	4.3	0.52	33	90 to 120	H	AC 220 V with rectifier	–	0.19	37	90 to 110

Note: ○ The electric current and power indicated are the values at 20°C.
○ The starting current is the value required to operate the solenoid with the movable core at the furthest position from the stationary core.

Time rating	Insulation resistance	Withstand voltage	Insulation type
			KSO-G02/KSO-G03
Continuous	50 MΩ	AC 1500 V, 1 minute	B class (Coils: AC: H class, DC: F class)

9 Option code table

Option code	Option details					KSO-G02	KSO-G03	Notes
No code	Terminal box type	With lamp	Without earth terminal		Without surge killer	✓	✓	
N					With surge killer	✓	✓	*3
NR					With surge killer (with resistance)	✓	✓	*4
E			With earth terminal	CE standard compliant	Without surge killer	✓	✓	*5
EN					With surge killer	✓	✓	*3, 5
ENR					With surge killer (with resistance)	✓	✓	*4, 5
QR			With rectifier with built-in quick return circuit			–	✓	*6
C	DIN connector type *7	Without lamp	With earth terminal		Without surge killer	–	✓	
CE				CE standard compliant		✓	✓	*5
CL		With lamp				–	✓	
CLE				CE standard compliant		✓	✓	*5
N-CL					With surge killer	–	–	
N-CLE				CE standard compliant		✓	–	*3, 5
C1		Without DIN connector socket				✓	✓	
L	Lead wire type	Without lamp	Without earth terminal		Without surge killer	✓	✓	*8
8	Mounting bolt: M8					–	✓	
P	With spool locking device					✓	✓	*9

○ If two or more options are selected, sort the option codes in alphanumeric order.

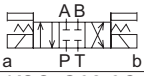
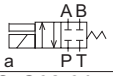
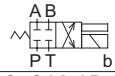
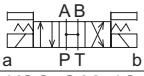
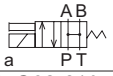
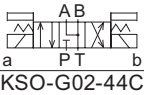
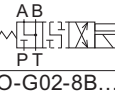
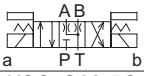
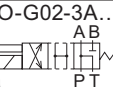
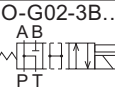
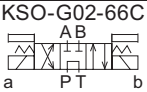
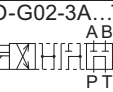
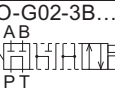
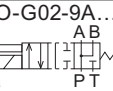
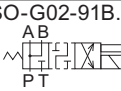
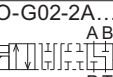
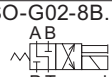
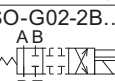
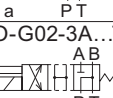
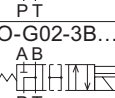
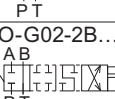
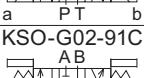
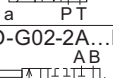
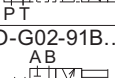
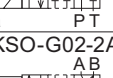
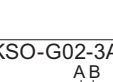
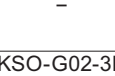
Note: *3 The specifications with surge killer are only applicable to voltage codes A to D, J to M, and N to U.
*4 The specifications with surge killer (with resistance) are only applicable to voltage code P.
*5 The applicable voltage codes for CE compliant products (option code: E, EN, ENR, CE, CLE, N-CLE) are as follows.
With KSO-G02, CE compliant specifications are available for all voltage codes.
With KSO-G03, CE compliant specifications are available only for voltage codes A and P.
*6 The specifications with rectifier with built-in quick return circuit are applicable to voltage codes E and G. This option comes with a dedicated driver. (One dedicated driver is provided for each solenoid.)
Driver model: SSQ-101 (for voltage code E)
Driver model: SSQ-201 (for voltage code G)
*7 The DIN connector type is only applicable to voltage codes A to D, J to M, and N to U. The specifications with surge killer are only applicable to voltage codes A to D, N, P, and R to U.
*8 With KSO-G02, the lead wire type is only applicable to voltage codes A to D, J to M, and N to U.
With KSO-G03, it is only applicable to voltage codes N to U.
*9 The spool locking device is suited to applications where the solenoid valve is switched manually because it enables the spool to be locked in the switched status. Note that the product with this option is not compliant with the CE standards.

Mass (kg)

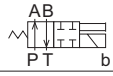
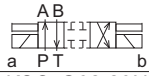
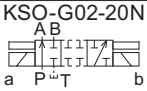
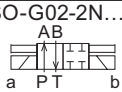
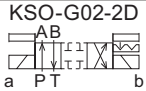
Details		KSO-G02		KSO-G03	
		AC	DC, with rectifier	AC	DC, with rectifier
Terminal box type	Double solenoid	1.8	2.2	4.4	5.8
	Single solenoid	1.5	1.7	3.7	4.4
DIN connector type	Double solenoid	1.8	2.1	4.3	5.7
	Single solenoid	1.4	1.6	3.6	4.3
Lead wire type	Double solenoid	1.7	2	–	5.7
	Single solenoid	1.4	1.5	–	4.3

5 6 10 : Model table

● KSO-G02

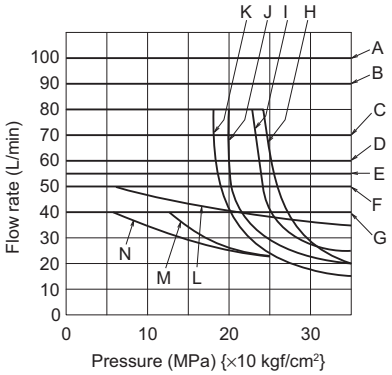
Model code JIS graphic symbols for hydraulic system Spool type, spool operating method ... Subordinary spool type			Power supply	Pressure - Flow rate characteristics (See performance curves)			Pressure drop characteristics (See performance curves)		
				A B P T	A B P T	A B P T	P → A P → B	A → T B → T	P → T
Type C	Type A	Type B							
KSO-G02-2C 	KSO-G02-2A…H2 	KSO-G02-2B…2T 	AC	A	f	f	(5)	(7)	–
			DC	A	a	a			
KSO-G02-3C 	KSO-G02-3A…H3 	KSO-G02-3B…3T 	AC	F	F	F	(5)	(8)	(4)
			DC	F	F	F			
KSO-G02-4C 	KSO-G02-81A…H4 	KSO-G02-8B…4T 	AC	K	j	j	(4)	(7)	–
			DC	J	h	h			
KSO-G02-44C 	KSO-G02-81A…H44 	KSO-G02-8B…44T 	AC	H	j	j	(4)	(7)	–
			DC	I	h	h			
KSO-G02-5C 	KSO-G02-3A…T5 	KSO-G02-3B…5H 	AC	N	b	b	(3)	(1)	(2)
			DC	M	b	b			
KSO-G02-66C 	KSO-G02-3A…T66 	KSO-G02-3B…66H 	AC	N	b	b	(3)	(1)	(2)
			DC	M	b	b			
KSO-G02-7C 	KSO-G02-9A…H7 	KSO-G02-91B…7T 	AC	A	m	m	(5)	(6)	–
			DC	A	m	m			
KSO-G02-8C 	KSO-G02-2A…H8 	KSO-G02-8B…8T 	AC	K	j	j	(4)	(7)	–
			DC	J	h	h			
KSO-G02-9C 	KSO-G02-9A…H9 	KSO-G02-2B…9T 	AC	D	m	f	(5)	(7) (6)	–
			DC	D	m	a			
KSO-G02-51C 	KSO-G02-3A…T51 	KSO-G02-3B…51H 	AC	N	b	b	(3)	(1)	(2)
			DC	M	b	b			
KSO-G02-81C 	KSO-G02-81A…H81 	KSO-G02-2B…81T 	AC	K	j	j	(4)	(7)	–
			DC	J	h	h			
KSO-G02-91C 	KSO-G02-2A…H91 	KSO-G02-91B…91T 	AC	D	f	m	(5)	(6) (7)	–
			DC	D	a	m			
–	KSO-G02-2A 	–	AC	C	L	m	(5)	(3)	–
			DC	D	k	m			
–	–	KSO-G02-2B 	AC	C	m	L	(5)	(3)	–
			DC	D	m	k			
–	KSO-G02-3A 	–	AC	L	c	C	(5)	(7)	–
			DC	F	C	C			
–	–	KSO-G02-3B 	AC	L	C	c	(5)	(7)	–
			DC	F	C	C			
–	KSO-G02-20A	–	AC	–	L	m	(5)	–	–
			DC		k	m			
–	–	KSO-G02-20B	AC	–	m	L	(5)	–	–
			DC		m	k			

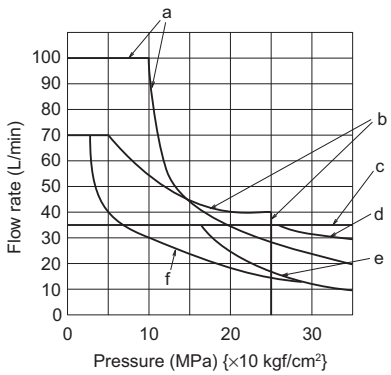
5 6 10 : Model table

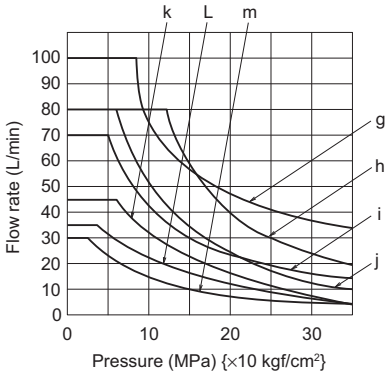
Model code JIS graphic symbols for hydraulic system			Power supply	Pressure - Flow rate characteristics (See performance curves)			Pressure drop characteristics (See performance curves)		
Spool type, spool operating method ... Subordinary spool type				A B P T	A B P T	A B P T	P → A P → B	A → T B → T	P → T
Type N, D	Type A	Type B							
–	KSO-G02-2A…2T 	–	AC	C	–	m	– (5)	(7) –	–
			DC	D		m			
–	–	KSO-G02-2B…H2 	AC	C	m	–	(5) –	– (7)	–
			DC	D	m				
KSO-G02-2N 	–	–	AC	A	i	i	(6)	(5)	–
			DC	E	g	g			
KSO-G02-20N 	–	–	AC	–	i	i	(6)	–	–
			DC		g	g			
KSO-G02-2N…2T 	–	–	AC	A	–	f	– (5)	(7) –	–
			DC	E		a			
KSO-G02-2N…H2 	–	–	AC	A	f	–	(5) –	– (7)	–
			DC	E	a				
KSO-G02-2D 	–	–	AC	B	d	d	(6)	(5)	–
			DC	G	e	e			
KSO-G02-20D 	–	–	AC	–	d	d	(6)	–	–
			DC		e	e			

Performance curves (viscosity: 32 mm²/s {cSt})

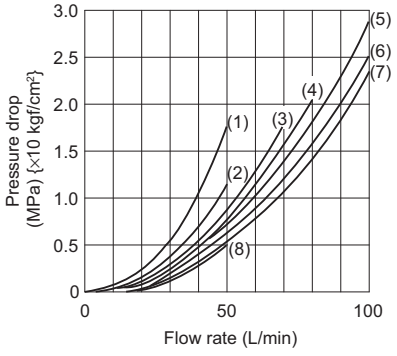
Pressure - Flow rate characteristics







Pressure drop characteristics



Note: ○ The flow rates shown in the graphs are the maximum flow rates under which operation (switching) of the valve is possible under the following conditions.

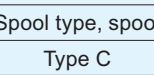
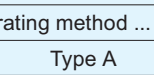
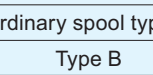
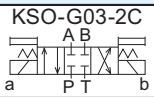
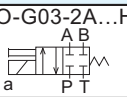
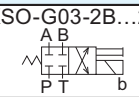
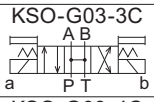
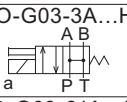
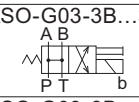
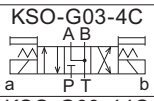
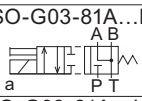
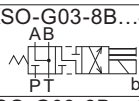
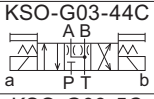
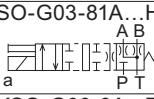
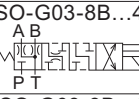
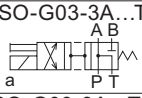
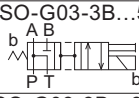
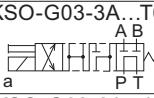
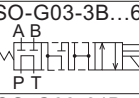
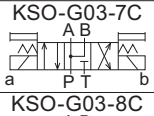
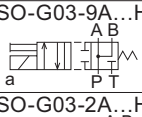
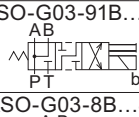
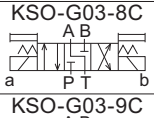
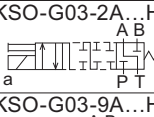
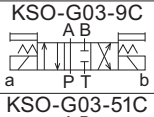
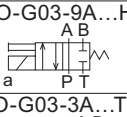
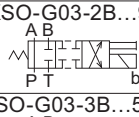
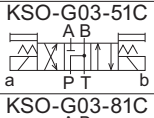
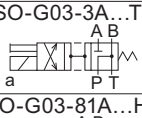
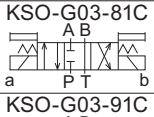
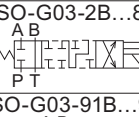
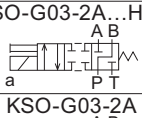
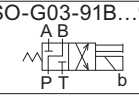
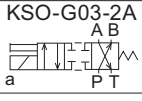
AC	After rising to the saturation temperature, 90% of rated voltage applied (60 Hz)
DC	After rising to the saturation temperature, 90% of rated voltage applied

○ For the flow rate with a rectifier, see the section covering products for DC power supplies.

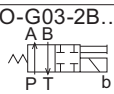
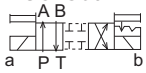
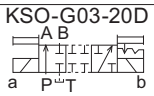
○ The maximum operating pressure is 25 MPa {250 kgf/cm²} when 5C, 66C, 51C, 3A-T5, 3B-5H, 3A-T66, 3B-66H, 3A-T51 or 3B-51H is designated for the spool type and spool operating method.

5 6 10 : Model table

● KSO-G03

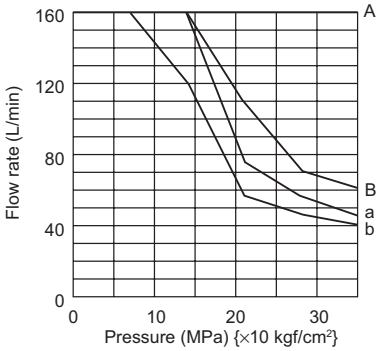
Model code JIS graphic symbols for hydraulic system Spool type, spool operating method ... Subordinary spool type			Power supply	Pressure - Flow rate characteristics (See performance curves)			Pressure drop characteristics (See performance curves)		
							P → A P → B	A → T B → T	P → T
Type C	Type A	Type B							
KSO-G03-2C 	KSO-G03-2A…H2 	KSO-G03-2B…2T 	AC	E	i	i	(4)	(4)	–
			DC	A	b	b			
KSO-G03-3C 	KSO-G03-3A…H3 	KSO-G03-3B…3T 	AC	E	E	E	(5)	(3)	(3)
			DC	A	A	A			
KSO-G03-4C 	KSO-G03-81A…H4 	KSO-G03-8B…4T 	AC	F	n	n	(4)	(4)	–
			DC	B	a	a			
KSO-G03-44C 	KSO-G03-81A…H44 	KSO-G03-8B…44T 	AC	F	n	n	(4)	(4)	–
			DC	B	a	a			
KSO-G03-5C 	KSO-G03-3A…T5 	KSO-G03-3B…5H 	AC	M	g	g	(2)	(1)	(1)
			DC	L	o	o			
KSO-G03-66C 	KSO-G03-3A…T66 	KSO-G03-3B…66H 	AC	G	g	g	(2)	(1)	(1)
			DC	L	o	o			
KSO-G03-7C 	KSO-G03-9A…H7 	KSO-G03-91B…7T 	AC	E	v	v	(5)	(4)	–
			DC	A	p	p			
KSO-G03-8C 	KSO-G03-2A…H8 	KSO-G03-8B…8T 	AC	F	n	i	(4)	(4)	–
			DC	B	a	b			
KSO-G03-9C 	KSO-G03-9A…H9 	KSO-G03-2B…9T 	AC	E	v	i	(5) (4)	(4)	–
			DC	A	q	b			
KSO-G03-51C 	KSO-G03-3A…T51 	KSO-G03-3B…51H 	AC	M	g	g	(2)	(1)	(1)
			DC	L	o	o			
KSO-G03-81C 	KSO-G03-81A…H81 	KSO-G03-2B…81T 	AC	F	i	n	(4)	(4)	–
			DC	B	b	a			
KSO-G03-91C 	KSO-G03-2A…H91 	KSO-G03-91B…91T 	AC	E	i	v	(4) (5)	(4)	–
			DC	A	b	q			
–	KSO-G03-2A 	–	AC	N	j	m	(4)	(4)	–
			DC	N	c	e			
–	–	KSO-G03-2B	AC	J	m	j	(4)	(4)	–
			DC	J	e	c			
–	KSO-G03-3A	–	AC	I	E	f	(3)	(4)	–
			DC	H	E	k			
–	–	KSO-G03-3B	AC	I	f	E	(3)	(4)	–
			DC	H	k	E			
–	KSO-G03-20A	–	AC	–	j	m	(4)	–	–
			DC		c	e			
–	–	KSO-G03-20B	AC	–	m	j	(4)	–	–
			DC		e	c			

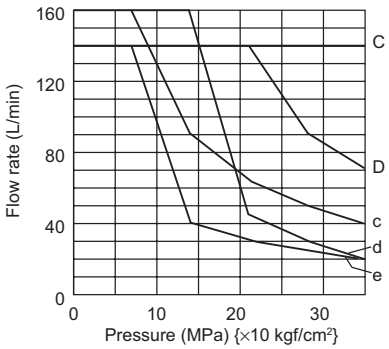
5 6 10 : Model table

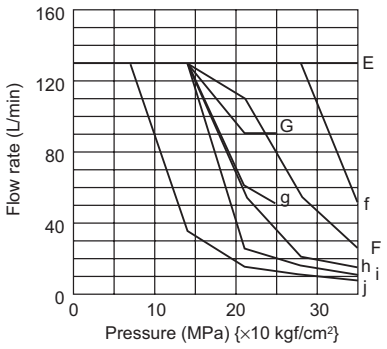
Model code JIS graphic symbols for hydraulic system			Power supply	Pressure - Flow rate characteristics (See performance curves)			Pressure drop characteristics (See performance curves)		
Spool type, spool operating method ... Subordinary spool type				A B P T	A B P T	A B P T	P → A P → B	A → T B → T	P → T
Type D	Type A	Type B							
–	KSO-G03-2A…2T 	–	AC	K	–	h	– (4)	(4) –	–
			DC	D		d			
–	–	KSO-G03-2B…H2 	AC	J	h	–	(4) –	– (4)	–
			DC	C	d				
KSO-G03-2D 	–	–	AC	O	u	u	(4)	(4)	–
			DC	O	s	s			
KSO-G03-20D 	–	–	AC	–	u	u	(4)	–	–
			DC		s	s			

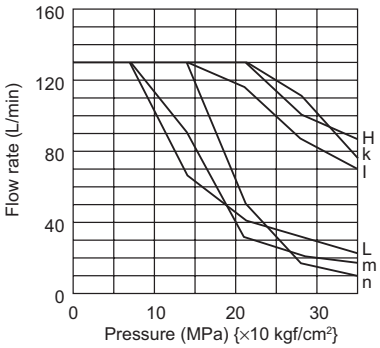
Performance curves (viscosity: 32 mm²/s {cSt})

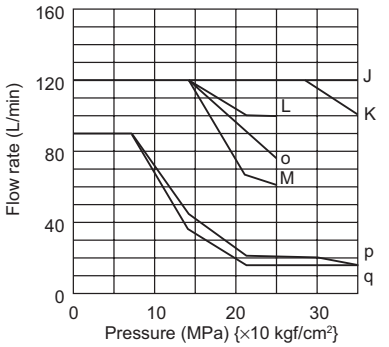
● Pressure - Flow rate characteristics

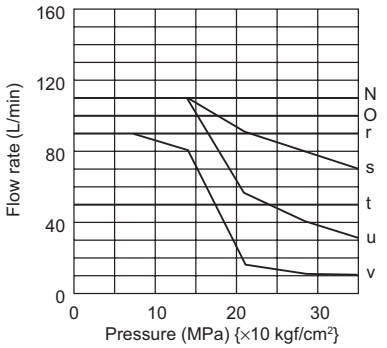




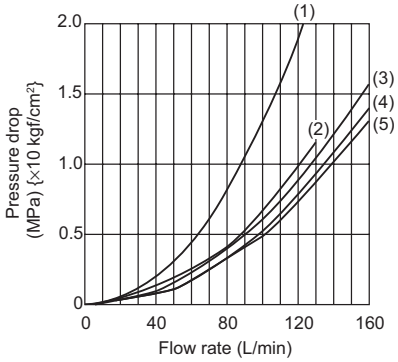








● Pressure drop characteristics



Note: The flow rates shown in the graphs are the maximum flow rates under which operation (switching) of the valve is possible under the following conditions.

AC	After rising to the saturation temperature, 90% of rated voltage applied (60 Hz)
DC	After rising to the saturation temperature, 90% of rated voltage applied

○ For the flow rate with a rectifier, see the section covering products for DC power supplies.

○ The maximum operating pressure is 25 MPa {250 kgf/cm²} when 5C, 66C, 51C, 3A-T5, 3B-5H, 3A-T66, 3B-66H, 3A-T51 or 3B-51H is designated for the spool type and spool operating method.

Operation time (Sec.)

Power supply	Operating direction	KSO-G02	KSO-G03
AC	Energize	0.01 to 0.025	0.005 to 0.025
	Spring return	0.01 to 0.045	0.005 to 0.03
DC	Energize	0.025 to 0.045	0.03 to 0.09
	Spring return	0.01 to 0.035	0.02 to 0.05
With rectifier	Energize	0.025 to 0.045	0.03 to 0.09
	Spring return	0.07 to 0.12	0.15 to 0.25

Note: The operation time may change slightly depending on the conditions of use (pressure, flow rate, hydraulic fluid viscosity, etc.).

Sub-plate model code

● The sub-plate is not provided with the valve. Order it separately if 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
JS-02M03		Rc3/8	2.3
JS-03M	3/8	Rc3/8	2.5
JS-03M04		Rc1/2	2.2

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

Accessories

Model No.	Hexagon socket head cap bolt	Quantity	Tightening torque (N·m {kgf·cm})
KSO-G02	M5 × 45 *10	–	6.5 to 8.5 { 65 to 85}
KSO-G03	M6 × 35	4	12 to 15 {120 to 150}
	M8 × 60 *11	4	25 to 30 {250 to 300}

Note: *10 KSO-G02 is not provided with mounting bolts.
*11 M8 bolts for KSO-G03 are optional (option code: 8).

Solenoid model codes

Power supply	Details	KSO-G02 *12		KSO-G03 *12	
		Model code of solenoid set	Model code of solenoid coil	Model code of solenoid set	Model code of solenoid coil
AC	Terminal box type	KA-2※-30	C-KA-2※-30	KA-3※-20-L	C-KA-3※-20-L
	DIN connector type	KA-2※-C1-30	C-KA-2※-C1-30	KA-3※-C1-20-L	C-KA-3※-C1-20-L
	Lead wire type	KA-2※-30	C-KA-2※-30		
DC	Terminal box type	KD-2※-30	C-KD-2※-30	KD-3※-20-L	C-KD-3※-20-L
	DIN connector type	KD-2※-C1-30	C-KD-2※-C1-30	KD-3※-C1-20-L	C-KD-3※-C1-20-L
	Lead wire type	KD-2※-30	C-KD-2※-30	(1) KD-3※-LW-20-L (2) KD-3※-LB-20-L	(1) C-KD-3※-LW-20-L (2) C-KD-3※-LB-20-L
With rectifier	Terminal box type	KR-2※-30	C-KR-2※-30	KR-3※-20-L	C-KR-3※-20-L

Note: ※: Voltage code (7: See the solenoid specification table)
*12 (1) Lead wire color: white (2) Lead wire color: black
○ The solenoid set comprises a solenoid coil, a solenoid cartridge, a plastic nut, and a push pin.
○ With KSO-G02, lead wire type solenoid sets and solenoid coils are not provided with a lead wire connector.
○ DIN connector type solenoid sets and solenoid coils are not provided with a DIN connector socket.
○ When a DIN connector socket is required, order it from your nearest distributor, specifying the model code given in the table below.
Manufacturer: Hirschmann

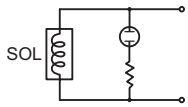
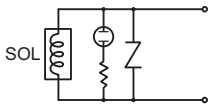
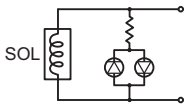
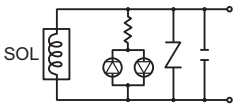
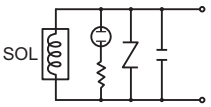
Model code	Power supply voltage	Details	
GDM2011		Without lamp	Without surge killer
GDML2011-LG110-H0	AC 100 V, AC 110 V, DC 100 V, DC 110 V	With lamp	
GDML2011-LG240-H0	AC 200 V, AC 220 V, AC 240 V, DC 200 V, DC 220 V		
GDML2011-2LED12-H0	DC 12 V		
GDML2011-2LED24-H0	DC 24 V		
GDML2011-2LED48-H0	DC 48 V		
GDML2011-LG110/Z-H0	AC 100 V, AC 110 V, DC 100 V, DC 110 V		With surge killer
GDML2011-LG220/Z-H0	AC 200 V, AC 220 V, DC 200 V, DC 220 V		
GDML2011-2LED24/Z-H0	DC 24 V		

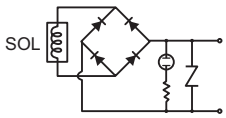
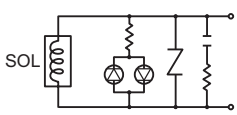
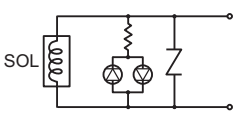
Terminal box model code

Voltage code	Spool operating method: Type C, N or D				Spool operating method: Type A				Spool operating method: Type B			
	Without surge killer		With surge killer		Without surge killer		With surge killer		Without surge killer		With surge killer	
A	TNW2 (3) -AB	(1)	TNW2 (3) -A-N	(2)	TNSA2 (3) -AB	(1)	TNSA2 (3) -A-N	(2)	TNSB2 (3) -AB	(1)	TNSB2 (3) -A-N	(2)
B			TNW2 (3) -B-N	(2)			TNSA2 (3) -B-N	(2)			TNSB2 (3) -B-N	(2)
C			TNW2 (3) -A-N	(2)			TNSA2 (3) -A-N	(2)			TNSB2 (3) -A-N	(2)
D			TNW2 (3) -B-N	(2)			TNSA2 (3) -B-N	(2)			TNSB2 (3) -B-N	(2)
J												
K			TNW2 (3) -A-N	(2)			TNSA2 (3) -A-N	(2)			TNSB2 (3) -A-N	(2)
L												
M			TNW2 (3) -B-N	(2)			TNSA2 (3) -B-N	(2)			TNSB2 (3) -B-N	(2)
N	TNW2 (3) -NP	(3)	TNW2 (3) -NP-N	(4)	TNSA2 (3) -NP	(3)	TNSA2 (3) -NP-N	(4)	TNSB2 (3) -NP	(3)	TNSB2 (3) -NP-N	(4)
P												
Q	TNW2 (3) -Q	(3)	TNW2 (3) -Q-N	(4)	TNSA2 (3) -Q	(3)	TNSA2 (3) -Q-N	(4)	TNSB2 (3) -Q	(3)	TNSB2 (3) -Q-N	(4)
R	TNW2 (3) -AB	(1)	TNW2 (3) -R-N	(5)	TNSA2 (3) -AB	(1)	TNSA2 (3) -R-N	(5)	TNSB2 (3) -AB	(1)	TNSB2 (3) -R-N	(5)
S												
T			TNW2 (3) -T-N	(5)			TNSA2 (3) -T-N	(5)			TNSB2 (3) -T-N	(5)
U												
E	TNW2 (3) -EG	(6)	–		TNSA2 (3) -EG	(6)	–		TNSB2 (3) -EG	(6)	–	
F												
G												
H												
P-NR	–		TNW2 (3) -P-NP	(7)	–		TNSA2 (3) -P-NR	(7)	–		TNSB2 (3) -P-NR	(7)

Note: ○ The numbers in parentheses indicate the model code of the terminal box for KSO-G03.
○ The number next to each model code indicates the type of the electrical circuit. (See the electrical circuits section for details.)

Electrical circuits (terminal box type: (1) to (7), DIN connector type: (1), (2), (3), (8))

AC 100 V minimum DC 100 V minimum	AC 100 V minimum With surge killer	DC 48 V maximum	DC 48 maximum With surge killer	DC 100 V minimum With surge killer
(1) 	(2) 	(3) 	(4) 	(5) 

With rectifier	DC 24 V Surge killer with resistance	DC 24 V maximum With surge killer
(6) 	(7) 	(8) 

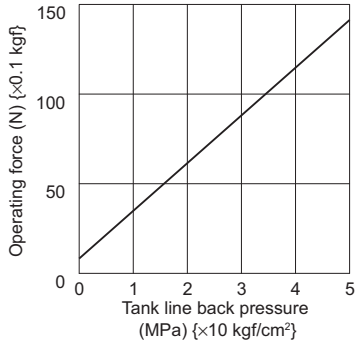
Note: ○ When switching a DC solenoid valve with a surge killer through an electromagnetic relay, the reverse surge voltage is suppressed by the varistor and sparks between relay contacts are suppressed by the capacitor at demagnetization of the solenoid.
Standard solenoid valves with a surge killer (option code "N") are very effective to eliminate sparks. However, adequate consideration should be given to the service life of the relay to avoid contact welding due to inrush current at solenoid excitation.
In applications where contact welding due to inrush current is expected, solenoid valves with a surge killer (with resistance) (option code "NR") are effective. Note, however, they are not as effective as standard solenoid valves with a surge killer (option code "N") in terms of elimination of sparks.

○ When using solenoid valves without a surge killer, adequate consideration should be given to protection against the reverse surge voltage generated at demagnetization of the solenoid. (It is advisable to incorporate a surge absorbing element such as a varistor in the circuit.)

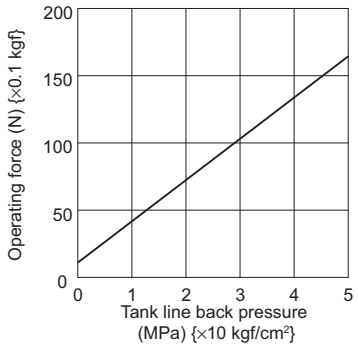
Handling

- **Wiring guide for solenoid (AC solenoid valve)**
  Solenoids can be used with both 50 and 60 Hz.
- **Drainage**
  When adopting a spool type/operating method (20A, 20B, 20N or 20D) that does not incorporate flow at the tank port, connect drain piping from the tank port.
- **Fixed throttle valve**
  ○ It is possible to insert a fixed throttle at port P, A, B, or T. However, when fitting a throttle, be careful to maintain the pressure difference before and after the throttle at no greater than 21 MPa {210 kgf/cm^2}.
  ○ When inserting a fixed throttle at the tank port, maintain the back pressure at the tank port within the permissible back pressure.
- **Operating force for manual operation pin**
  The force required to operate the manual operation pin varies depending on the back pressure in the tank line.

KSO-G02

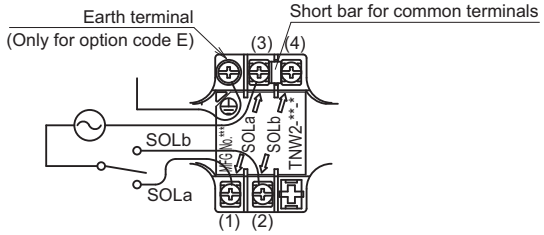


KSO-G03

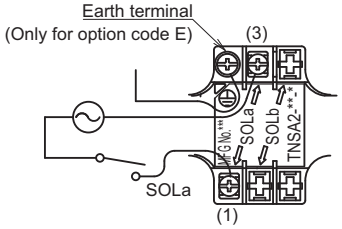


Wiring guide

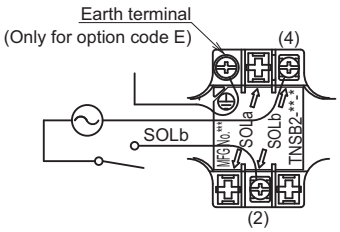
Spool operating method: Type C, N or D
[Terminal box type]



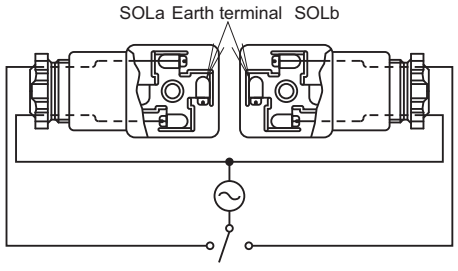
Spool operating method: Type A
[Terminal box type]



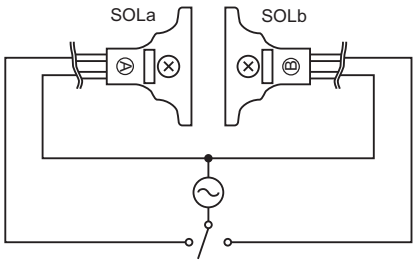
Spool operating method: Type B
[Terminal box type]



[DIN connector type]



[Lead wire type (G02)]

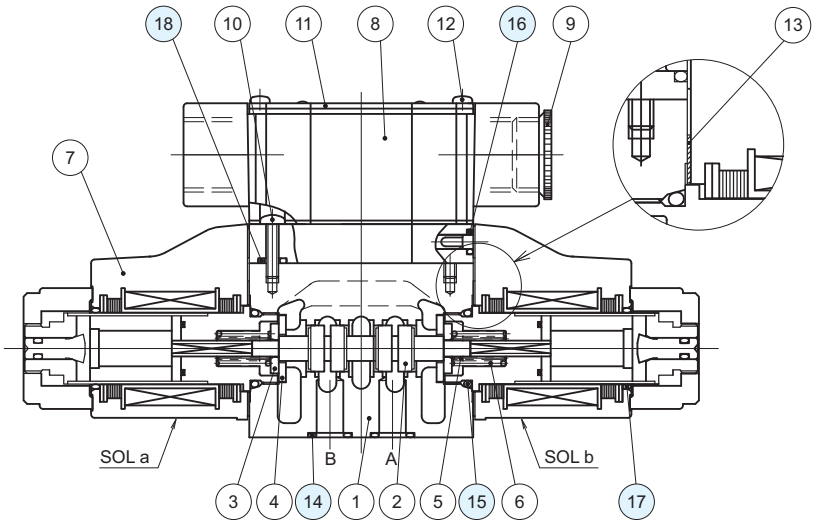


- The figure shows the status with the terminal box nameplate removed.
- The earth terminal is optional (option code: E).
- Always turn off the power supply before starting wiring work.
- Use crimp-style terminals for M3.
- For double solenoid type valves, a short bar for common terminals is fitted to facilitate wiring. Connection to either terminal (3) or (4) is sufficient.
- Tighten the terminal screws (M3) at a tightening torque of 0.34 to 0.51 N·m {3.4 to 5.1 kgf·cm}
- There is no polarity even with DC solenoid valves.

Sectional structural diagram

● KSO-G02

● KSO-G02-※※C※-30

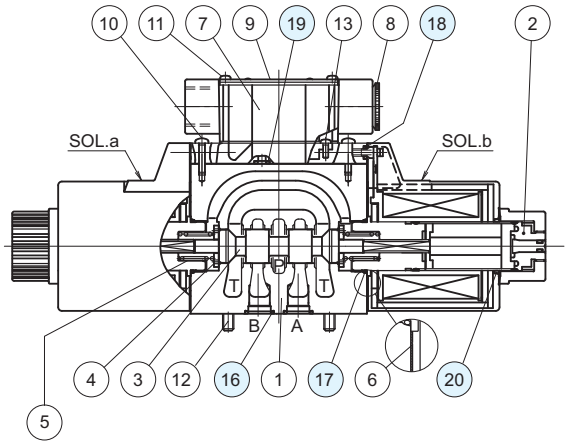


Sealing part table

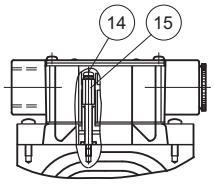
Part No.	Name	Quantity	Part specifications
14	O-ring	4	AS568-012 (NBR, Hs90)
15	O-ring	2	JIS B 2401 1B P18
16	O-ring	4	JIS B 2401 1A P4
17	O-ring	2	JIS B 2401 1A P20
18	O-ring	3	JIS B 2401 1A P5

● KSO-G03

● KSO-G03-※※C※-20



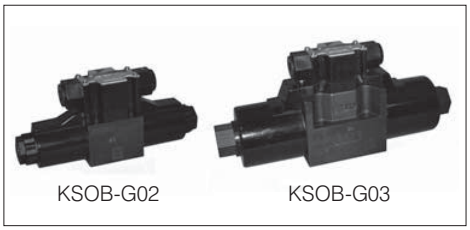
● KSO-G03-※※C※-20-E



Sealing part table

Part No.	Name	Quantity	Part specifications
16	O-ring	5	AS568-014 (NBR, Hs90)
17	O-ring	2	AS568-022 (NBR, Hs90)
18	O-ring	4	JIS B 2401 1A P4
19	O-ring	1	JIS B 2401 1A P5
20	O-ring	2	S 26 (NBR, Hs70) Manufacturer: NOK

Minute Signal Current Type Solenoid Valve


KSOB-G02 KSOB-G03

Features

- The capability to switch the valve with a minute signal current (approximately 10 mA) enables direct drive from a programmable sequence controller.

Nomenclature

※	–	KSOB	–	G	※※	–	※※	※	P	–	※※	–	※	N	–	※※※
1		2		3	4		5	6	7		8		9	10		11

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
H: Water-glycol hydraulic fluid (G02 accepts water-glycol hydraulic fluid with no designation.)
F: Phosphate ester hydraulic fluid

2 Model No.
KSOB: K series minute signal current type solenoid valve

3 Connections
G: Gasket mount type

4 Nominal diameter
02: ¼
03: ⅜

5 Spool type (See the model table)

6 Spool operating method (See the model table)
C: Spring center type
A: Spring offset type (with SOL. a)
B: Spring offset type (with SOL. b)
N: No-spring type (without detent)
D: No-spring type (with detent)

7 Voltage code
P: DC 24 V

8 Design No.
(The design No. is subject to change)
40: Nominal diameter 03 (⅜)
50: Nominal diameter 02 (¼)

9 Option code I
8: Mounting bolt M8 *1

10 Option code II
N: With surge killer

11 Auxiliary spool type (See the model table)

Note: *1 Mounting bolts M8 are only applicable to nominal diameter 03 (⅜).

- Refer to KSO-G※※ on Page G-12 for the model table, performance curves and details on handling.
- The external dimensions and sectional structure are the same as those of the terminal box type of KSO-G※※.

Specifications

Model No.	Nominal diameter	Maximum operating pressure *2 MPa {kgf/cm²}	Maximum flow rate L/min	Permissible back pressure MPa {kgf/cm²}	Maximum switching frequency Times per minute	External coating protection	Signal current (At DC 24 V)
KSOB-G02	¼	35 {350} (25 {250})	100	17.5 {175}	240	IEC Pub529 IP65	10 mA ±10%
KSOB-G03	⅜		160	16 {160}			

Note: *2 The maximum operating pressure is 25 MPa {250 kgf/cm²} when 5C, 66C or 51C is designated for the spool type and spool operating method.

Solenoid specifications

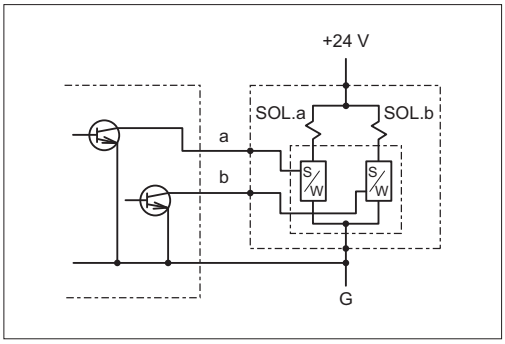
Model No.	Power supply voltage	Holding current A	Holding power W	Permissible voltage fluctuation %
KSOB-G02	DC 24 V	1.22	29.2	90 to 110 Ripples included
KSOB-G03		1.6	38	

Note: The electric current and power indicated are the values at 20°C.

Time rating	Insulation resistance	Withstand voltage	Insulation class	
			KSOB-G02	KSOB-G03
Continuous	50 MΩ	AC 1500 V, 1 minute	Class B (Coils: Class F)	

Electrical circuit diagram

- Signaling method: Internal signal



Mass (kg)

Details		KSOB-G02	KSOB-G03
Terminal box type	Double solenoid	2.2	5.8
	Single solenoid	1.7	4.4

Operation time (Sec.)

Operating direction	KSOB-G02	KSOB-G03
Energize	0.025 to 0.045	0.03 to 0.09
Spring return	0.01 to 0.035	0.02 to 0.05

Note: The operation time may change slightly depending on the conditions of use (pressure, flow rate, hydraulic fluid viscosity, etc.).

Sub-plate model code

- The sub-plate is not provided with the valve. Order it separately if 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
JS-02M03		Rc3/8	2.3
JS-03M	3/8	Rc3/8	2.5
JS-03M04		Rc1/2	2.2

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

Accessories

Model No.	Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
KSOB-G02	M5 × 45 *3	–	6.5 to 8.5 { 65 to 85}
KSOB-G03	M6 × 35	4	12 to 15 {120 to 150}
	M8 × 60 *4	4	25 to 30 {250 to 300}

Note: *3 KSOB-G02 is not provided with mounting bolts.
*4 M8 bolts for KSOB-G03 are optional (option code: 8).

Solenoid model codes

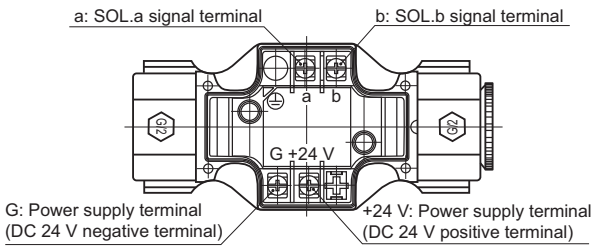
Details	KSOB-G02		KSOB-G03	
	Model code of solenoid set	Model code of solenoid coil	Model code of solenoid set	Model code of solenoid coil
Terminal box type	KD-2P-30	C-KD-2P-30	KD-3P-20-L	C-KD-3P-20-L

○ The solenoid set comprises a solenoid coil, a solenoid cartridge, a plastic nut, and a push pin.

Terminal box model code

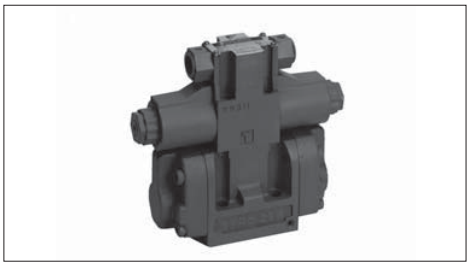
Model No.	Spool operating method C, N, D type	Spool operating method A type	Spool operating method B type
KSOB-G02	TNW2-BP-N	TNSA2-BP-N	TNSB2-BP-N
KSOB-G03	TNW3-BP-N	TNSA3-BP-N	TNSB3-BP-N

Wiring guide



- The diagram shows the double solenoid type.
- The figure shows the status with the terminal box nameplate removed.
- The single solenoid type has three terminals.
- Always turn off the power supply before starting wiring work.
- Use crimp-style terminals for M3.
- Tighten the terminal screws (M3) at a tightening torque of 0.34 to 0.51 N·m {3.4 to 5.1 kgf·cm}

Solenoid Pilot Operated Directional Control Valve



Features

- Adoption of the shockless spool enables smooth reversal and stopping of the load.
- This model is best suited to integration into European Safety Standard (CE) compliant equipment since it has dust-/water-proof properties that satisfy the IEC Pub529 IP65 ingress protection grade.

Nomenclature

※	–	JSP	–	G	※※	–	※※	※	※	–	40	–	※
1		2		3	4		5	6	7		8		9

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
H: Water-glycol hydraulic fluid
F: Phosphate ester hydraulic fluid

2 Model No.
JSP: J series solenoid pilot operated directional control valve

3 Connections
G: Gasket mount type

4 Nominal diameter
02: ¼
03: ⅜

5 Spool type (See the model table)

6 Spool operating method (See the model table)
C: Spring center type
B: Spring offset type (with B solenoid)
N: No-spring type (without detent)

7 Voltage code (See the voltage code table)

8 Design No.
(The design No. is subject to change)

9 Option code (See the option code table)

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Pilot pressure MPa {kgf/cm²}	Permissible back pressure MPa {kgf/cm²}		Fluid drainage volume at spool switching cm³	
					External drain type	Internal drain type	Type C	Type B, N
JSP-G02	¼	21 {210}	30	0.45 to 21 {4.5 to 210}	21 {210}	10 {100}	0.66	1.32
JSP-G03	⅜		120				2.2	4.4

Refer to KSO-G02 on Page G-12 for the solenoid specifications.

7: Voltage code table

Voltage code	Power supply voltage	Voltage code	Power supply voltage
A	AC 100 V (50/60 Hz), AC 110 V (60 Hz)	N	DC 12 V
B	AC 200 V (50/60 Hz), AC 220 V (60 Hz)	P	DC 24 V
C	AC 110 V (50 Hz)	Q	DC 48 V
D	AC 220 V (50 Hz)	R	DC 100 V
J	AC 240 V (50/60 Hz)	S	DC 110 V
K	AC 120 V (50/60 Hz)	T	DC 200 V
L	AC 115 V (50/60 Hz)	U	DC 220 V
M	AC 230 V (50/60 Hz)	E	AC 100 V (50/60 Hz) with rectifier
		F	AC 110 V (50/60 Hz) with rectifier
		G	AC 200 V (50/60 Hz) with rectifier
		H	AC 220 V (50/60 Hz) with rectifier

See the solenoid specification table for KSO-G02 on Page G-12 for solenoid specifications.

9: Option code table

● JSP-G02

Code	Option details
No designation*1	Internal pilot, internal drain type
X *2	Internal pilot, internal drain type
Y	External pilot, external drain type
Z	External pilot, internal drain type
E *1	Internal pilot, external drain type
D	No-spring type (with detent)
S	With stroke adjusting structure

● JSP-G03

Code	Option details
No code	Internal pilot, external drain type
X	Internal pilot, internal drain type
Y	External pilot, external drain type
Z	External pilot, internal drain type
D	No-spring type (with detent)
S	With stroke adjusting structure
P	With spool lock structure (solenoid valve)

See the option code table of KSO-G02 on Page G-12 for the options for solenoid pilot valves.

Note: ○ If two or more options are selected, sort the option codes in alphabetical order.
*1 When 3C or 66C is designated for the spool code and spool operating method, code E is not required because the internal pilot and external drain type model is standard.
*2 When the solenoid pilot option with grounding terminal (code E, EN, ENR, etc.) is selected for an internal pilot and internal drain type model, the option code is "X".

Mass (kg)

Details		JSP-G02 *3		JSP-G03	
		AC	DC, with rectifier	AC	DC, with rectifier
Terminal box type	Double solenoid	3.5	3.9	6.9	7.3
	Single solenoid	3.2	3.4	6.6	6.8
DIN connector type	Double solenoid	3.5	3.7	6.9	7.2
	Single solenoid	3.1	3.3	6.5	6.7
Lead wire type	Double solenoid	3.4	3.8	6.8	7.1
	Single solenoid	3.1	3.3	6.5	6.6

Note: *3 The mass is 1 kg larger than the values indicated above when 3C or 66C is designated for the spool type and spool operating method and the option code is Y, Z or E.

Solenoid pilot valve model code

Model code	Applicable solenoid valve model code (※: Voltage code)
JSP-G※※-※※C※-40	KSO-G02-4C※-30
JSP-G※※-※※B※-40	KSO-G02-2B※-30
JSP-G※※-※※N※-40	KSO-G02-2N※-30
JSP-G※※-※※N※-40-D	KSO-G02-2D※-30

Sub-plate model code

● The sub-plate is not provided with the valve. Order it separately if 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
JS-02M03		Rc3/8	2.3

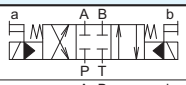
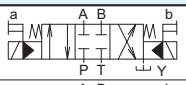
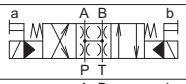
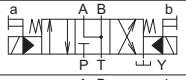
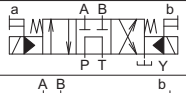
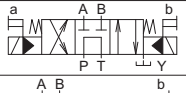
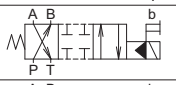
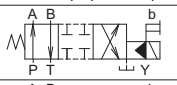
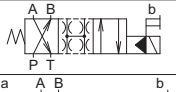
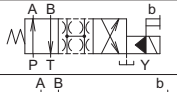
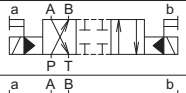
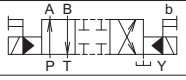
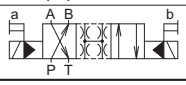
Refer to Page S-8 for the dimensions of the sub-plate for G02.
Note: No sub-plate is provided for JSP-G03.

Accessories

Model No.		Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
JSP-G02	(1)	M5 × 85	4	4 to 5 { 40 to 50}
	(2)	M5 × 125	4	
JSP-G03		M6 × 35	4	10 to 13 {100 to 130}

Note: Basic model (1) Models other than the ones below
(2) Spool type/operating method 3C or 66C and option code Y, Z or E

5 6 : Model table

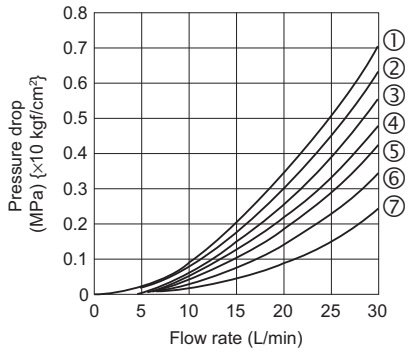
Model code	JIS graphic symbols for hydraulic system		Maximum flow rate L/min		Pressure drop characteristics (See performance curves)					
					JSP-G02			JSP-G03		
	JSP-G02	JSP-G03	JSP-G02	JSP-G03	P → A P → B	A → T B → T	P → T	P → A P → B	A → T B → T	P → T
JSP-G※※-2C			30	120	⑤	②	–	❹	❺ ❸	–
JSP-G※※-3C			30	90	⑦	④	⑥	❺	❻ ❺	❹
JSP-G02-33C		–	30	–	⑤	②	–	–	–	–
JSP-G※※-4C			30	120	⑤	④	–	❹	❹ ❺	–
JSP-G※※-44C			30	120	⑤	②	–	❹	❻ ❺	–
JSP-G※※-66C			30 (12)*4	100	⑥	③	①	❸ ❶	❸ ❷	❶
JSP-G※※-2B			30	120	⑤	②	–	❹	❺ ❸	–
JSP-G※※-33B			30	120	⑤	②	–	❺	❻ ❺	–
JSP-G※※-2N			30	120	⑤	②	–	❹	❺ ❸	–
JSP-G02-33N		–	30	–	⑤	②	–	–	–	–

Note: *4 The flow rate at 12 MPa {120 kgf/cm²} or higher is 12 L/min.

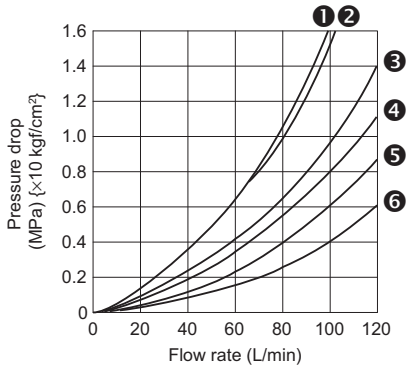
Performance curves (viscosity: 32 mm²/s {cSt})

● Pressure drop characteristics

JSP-G02



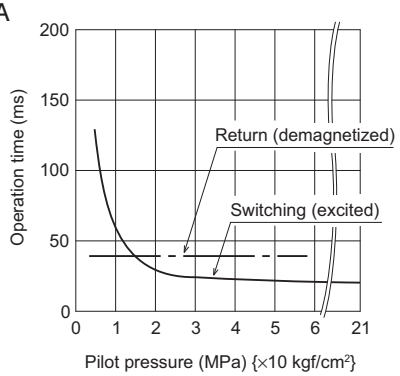
JSP-G03



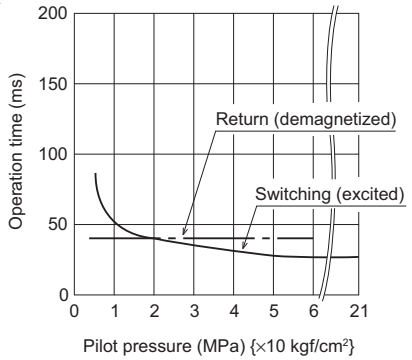
● Operation time characteristics

Note: The operation time may change slightly depending on the conditions of use (pressure, flow rate, hydraulic fluid viscosity, etc.).

JSP-G02-2CA



JSP-G03-2CA



Handling

- **Pilot**
  - ○ With the internal drain type, maintain the pressure difference between the pilot pressure and the back pressure of the tank line no lower than the minimum pilot pressure of 0.45 MPa {4.5 kgf/cm^2}.
  - ○ When using the product with spool type 3 or 66 as the internal pilot type, insert a resistance valve with a cracking pressure of 0.45 MPa {4.5 kgf/cm^2} minimum in the tank line and set it as the external drain type.
- **Drainage**
  - ○ Directly connect the drain piping to the tank without merging it with other tank piping.
  - ○ External pilot type products can be used as internal drain type regardless of the model.
  - ○ Internal pilot type products can be used as internal drain type when the spool type is 2, 33, 4, or 44.
- **Pilot throttle valve**

  To suppress shocks at switching by adjusting the switching speed of the spool, stack one of the 02 size stack valves (MT-02W) below the solenoid pilot valve.

  When using stack valves, order mounting bolts separately by referring to the table below since the required mounting bolts vary depending on the stacking height.

Number of stacked valves	JSP-G02			JSP-G03	
	Mounting bolt model code		Hexagon socket head cap bolt	Mounting bolt model code	Hexagon socket head cap bolt
1	(1)	HB102	M5 × 125, 4 pcs.	HB101	M5 × 85, 4 pcs.
	(2)	HB103	M5 × 165, 4 pcs.		

Note: JSP-G02 (1) Models other than the ones below
(2) Spool type/operating method 3C or 66C and option code Y, Z or E
○ Tightening torque of hexagon socket head cap bolts: 6 to 8 N·m {60 to 80 kgf·cm}

Pilot/drain type setting guide (JSP-G03)

- With JSP-G03, either the internal or external pilot and drain types can be set by fitting/removing plugs.
  With JSP-G02, the setting cannot be changed.

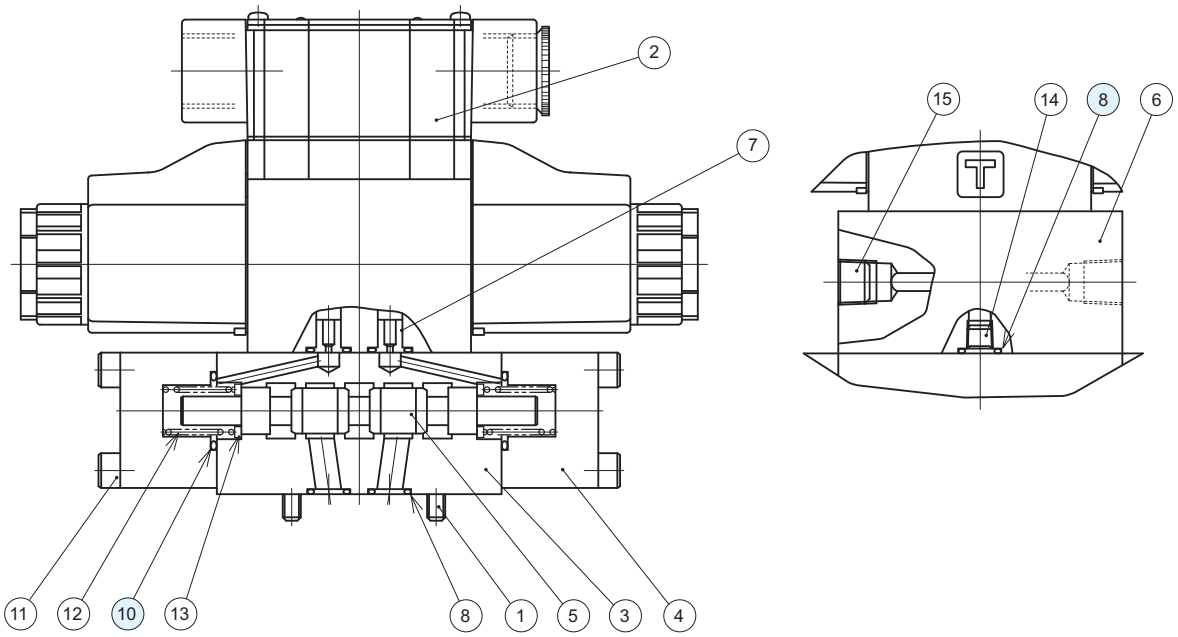
	Pilot type	Plug B	Drain type	Plug A
No designation	Internal	Without plug	External	With plug
X	Internal	Without plug	Internal	Without plug
Y	External	With plug	External	With plug
Z	External	With plug	Internal	Without plug
Guide	The pilot type can be set by changing plug B.		The drain type can be set by changing plugs A.	

Hexagon socket taper thread plug	Tightening torque N·m {kgf·cm}
NPTF1/32	0.9 to 1.2 {9 to 12}

- See the sectional structural diagram on Page G-36 for the positions of plugs A and B.
  Do not wrap the plugs with sealing tape.

Sectional structural diagram

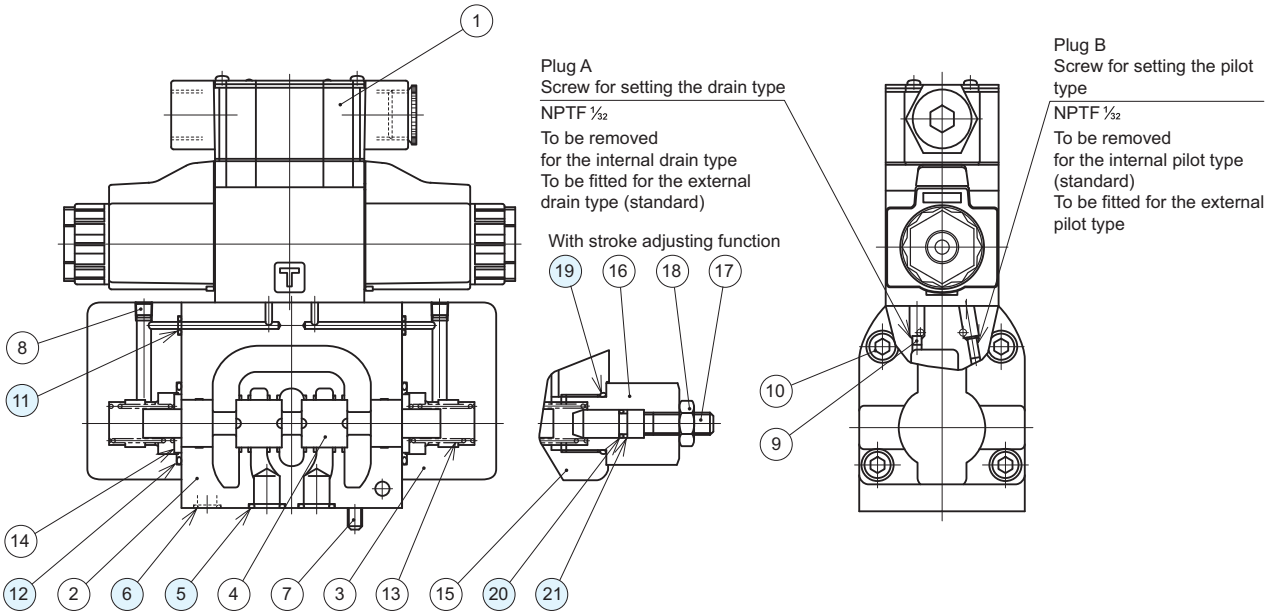
JSP-G02



Sealing part table

Part No.	Name	Quantity	Part specifications
8	O-ring	8	JIS B 2401 1B P9
10	O-ring	2	JIS B 2401 1B P18

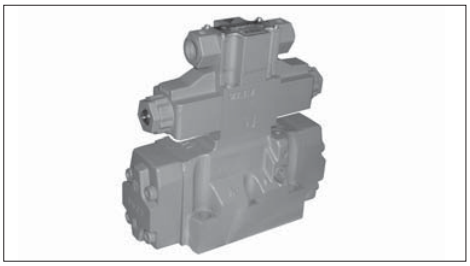
JSP-G03



Sealing part table

Part No.	Name	Quantity	Part specifications
5	O-ring	5	JIS B 2401 1 P12
6	O-ring	2	JIS B 2401 1B P9
11	O-ring	4	JIS B 2401 1B P5
12	O-ring	2	AS568-123 (NBR, Hs90)
19	O-ring	2	JIS B 2401 1B P22
20	O-ring	2	JIS B 2401 1B P9
21	Backup ring	2	JIS B 2407 for P9 (bias cut)

Solenoid Pilot Operated Directional Control Valve



Features

- These models realize high-pressure large-flow-rate control at 35 MPa {350 kgf/cm²} and 300 L/min.
- They are best suited to integration into European Safety Standard (CE) compliant equipment since they have dust-/water-proof properties that satisfy the IEC Pub529 IP65 ingress protection grade.
- Models equipped with a built-in check valve for pilot pressure are also available, eliminating the need to incorporate a resistance valve to generate pilot pressure in the circuit.
- The hydro-center type that can be used in applications where secure return of the main spool to neutral is required in a high-pressure large-flow-rate circuit is also available.

Nomenclature

※	-	KSH	-	G	04	-	※※	※	※	-	20	-	※	※	-	※
1		2		3	4		5	6	7		8		9	10		11

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
H: Water-glycol hydraulic fluid
F: Phosphate ester hydraulic fluid

2 Model No.
KSH: K series solenoid pilot operated directional control valve

3 Connections
G: Gasket mount type

4 Nominal diameter
04: ½

5 Spool type (See the model table)

Note: The maximum number of digit in the model code is limited to 23. Combining the codes for the specifications above may exceed the limit of 23 digits. In such cases, select the codes to be designated according to the functional importance of each specification and restrict the model code to 23 digits with the non-standard number appended. For the model codes in such cases, contact Daikin in each instance.

6 Spool operating method (See the model table.)
C: Spring center type
B: Spring offset type (with SOL.b)
D: No-spring type (with detent)
H: Hydro-center type

7 Voltage code (See the voltage code table)

8 Design No. (The design No. is subject to change)

9 Main valve option code (See the option code table)

10 Solenoid pilot valve option code
Refer to the option code table for KSO-G02 on Page G-12.

11 Pilot stack valve code (See the option code table)

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Pilot pressure MPa {kgf/cm²} *1		Permissible back pressure MPa {kgf/cm²}		Maximum switching frequency times/minute
						External drain type	Internal drain type	
KSH-G04	½	35 {350}	300	(1)	0.8 to 25 { 8 to 250}	21 {210}	16 {160}	120 *2
				(2)	1.2 to 25 {12 to 250}			
				(3)	0.44 to 25 { 4.4 to 250}			

Spool operating method	Fluid drainage volume at spool switching cm³
Type C	4
Type B, D	8
Type H	6

Note: *1 The pilot pressure varies depending on the following structure.

(1)	Spool operating method: Type C, B or D
(2)	Spool operating method: Type H
(3)	With check valve for pilot pressure (spool type: 3, 5, 6, 66)

Note: *2 The maximum switching frequency of the DIN connector type with built-in surge killer (option code: N-CL(E)) is 100 times/min.

Refer to KSO-G02 on Page G-12 for the solenoid specifications.

7: Voltage code table

Voltage code	Power supply voltage	Voltage code	Power supply voltage
A	AC 100 V (50/60 Hz), AC 110 V (60 Hz)	N	DC 12 V
B	AC 200 V (50/60 Hz), AC 220 V (60 Hz)	P	DC 24 V
C	AC 110 V (50 Hz)	Q	DC 48 V
D	AC 220 V (50 Hz)	R	DC 100 V
J	AC 240 V (50/60 Hz)	S	DC 110 V
K	AC 120 V (50/60 Hz)	T	DC 200 V
L	AC 115 V (50/60 Hz)	U	DC 220 V
M	AC 230 V (50/60 Hz)	E	AC 100 V (50/60 Hz) with rectifier
		F	AC 110 V (50/60 Hz) with rectifier
		G	AC 200 V (50/60 Hz) with rectifier
		H	AC 220 V (50/60 Hz) with rectifier

See the solenoid specification table for KSO-G02 on Page G-12 for solenoid specifications.

9 11: Option code table

9 Code	Option details
No designation	Internal pilot, external drain type
X	Internal pilot, internal drain type
Y	External pilot, external drain type
Z	External pilot, internal drain type
S	With stroke adjusting structure *3
T	With check valve for pilot pressure

11 Code	Option details *4
No designation	Without stack valve
W	With MT-02W-60
R	With MG-02P-1-60-S02
RR	With MG-02P-1-60-R02
G	With MT-02W-60, MG-02P-1-60-S02
GR	With MT-02W-60, MG-02P-1-60-R02

Note: ○ If two or more options are selected, sort the option codes, separately for option types 9 and 10, in alphabetical order.
○ Option codes TY and TZ are mutually exclusive.
*3 The hydro-center type cannot be selected for models with the stroke adjusting structure.
*4 With MT-02W-60: To be selected for applications where shocks at switching need to be suppressed
With MG-02P-1-60-※02: To be selected for applications where an operating pressure beyond 25 MPa {250 kgf/cm²} is required

Mass (kg)

Details		AC	DC, with rectifier
Terminal box type	Double solenoid	9	9.4
	Single solenoid	8.7	8.9
DIN connector type	Double solenoid	9	9.3
	Single solenoid	8.6	8.8
Lead wire type	Double solenoid	8.9	9.2
	Single solenoid	8.6	8.7

Note: With the following options, the mass will be increased by the mass given for each option.

Details	Code	Mass kg
Hydro-center type	H	1.3
With stroke adjusting structure	S	2.2
With MT-02W-60	W	1.4
With MG-02P-1-60-※02	R, RR	1.3
With MT-02W-60, MG-02P-1-60-※02	G, GR	2.7

Solenoid pilot valve model code

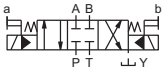
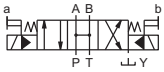
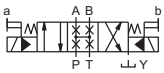
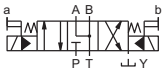
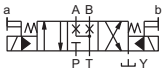
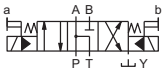
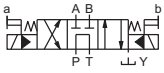
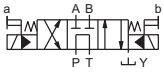
Model code	Applicable solenoid valve model code (※: Voltage code)
KSH-G04-※※C※-20	KSO-G02-4C※-30
KSH-G04-※※B※-20	KSO-G02-2B※-30
KSH-G04-※※D※-20	KSO-G02-2D※-30
KSH-G04-※※H※-20	KSO-G02-7C※-30

Accessories

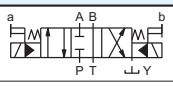
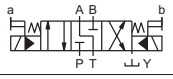
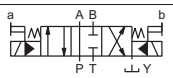
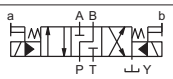
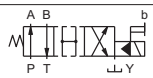
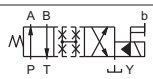
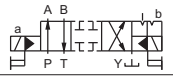
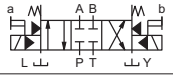
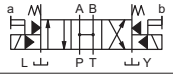
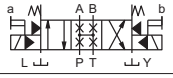
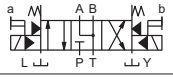
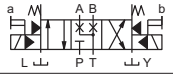
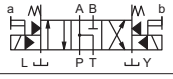
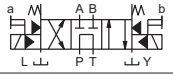
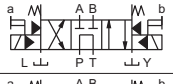
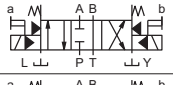
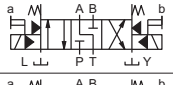
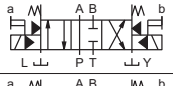
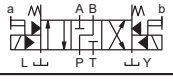
Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
M 6 × 45	2	13 to 15 {130 to 150}
M10 × 50	4	50 to 55 {500 to 550}

Note: No sub-plate is provided for KSH-G04.

5 6: Model table

Model code	JIS graphic symbols for hydraulic system	Pressure - Flow rate characteristics (See the performance curves)	Maximum flow rate L/min Pressure MPa {kgf/cm²}				Pressure drop characteristics (See the performance curves)		
			14 {140}	21 {210}	28 {280}	35 {350}	P → A P → B	A → T B → T	P → T
KSH-G04-2C		C	300	250	225	210	(4)	(5) (3)	–
KSH-G04-3C		A	300	300	300	300	(5)	(5) (3)	(4)
KSH-G04-33C		A	300	300	300	300	(4)	(5) (3)	–
KSH-G04-4C		B	300	270	160	140	(4)	(5) (4)	–
KSH-G04-44C		D	300	300	300	220	(4)	(5) (3)	–
KSH-G04-5C		E	300	270	230	210	(5) (4)	(5) (3)	(2)
KSH-G04-6C		A	300	300	300	300	(3)	(4) (2)	(1)
KSH-G04-66C		A	300	300	300	300	(3)	(4) (2)	(1)

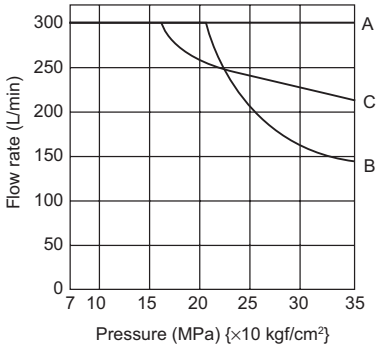
5 6: Model table

Model code	JIS graphic symbols for hydraulic system	Pressure - Flow rate characteristics (See the performance curves)	Maximum flow rate L/min Pressure MPa {kgf/cm²}				Pressure drop characteristics (See the performance curves)		
			14 {140}	21 {210}	28 {280}	35 {350}	P → A P → B	A → T B → T	P → T
KSH-G04-8C		A	300	300	300	300	(4)	(3) (6)	–
KSH-G04-81C		A	300	300	300	300	(4)	(6) (3)	–
KSH-G04-9C		A	300	300	300	300	(5) (4)	(5) (3)	–
KSH-G04-91C		A	300	300	300	300	(4) (5)	(3) (5)	–
KSH-G04-2B		A	300	300	300	300	(4)	(5) (3)	–
KSH-G04-3B		A	300	300	300	300	(5)	(5) (3)	–
KSH-G04-33B		A	300	300	300	300	(4)	(5) (3)	–
KSH-G04-2D		A	300	300	300	300	(4)	(5) (3)	–
KSH-G04-3D		A	300	300	300	300	(5)	(5) (3)	–
KSH-G04-33D		A	300	300	300	300	(4)	(5) (3)	–
KSH-G04-2H		A	300	300	300	300	(4)	(5) (3)	–
KSH-G04-3H		A	300	300	300	300	(5)	(5) (3)	(4)
KSH-G04-33H		A	300	300	300	300	(4)	(5) (3)	–
KSH-G04-4H		A	300	300	300	300	(4)	(5) (4)	–
KSH-G04-44H		A	300	300	300	300	(4)	(5) (3)	–
KSH-G04-5H		A	300	300	300	300	(5) (4)	(5) (3)	(2)
KSH-G04-6H		A	300	300	300	300	(3)	(4) (2)	(1)
KSH-G04-66H		A	300	300	300	300	(3)	(4) (2)	(1)
KSH-G04-8H		A	300	300	300	300	(4)	(3) (6)	–
KSH-G04-81H		A	300	300	300	300	(4)	(6) (3)	–
KSH-G04-9H		A	300	300	300	300	(5) (4)	(5) (3)	–
KSH-G04-91H		A	300	300	300	300	(4) (5)	(3) (5)	–

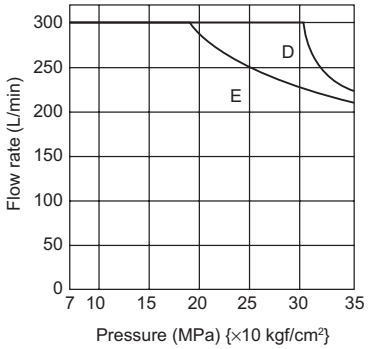
Note: ○ In the transient period of switching, all ports are blocked with spool type/operating method 6C and 6H, and all ports are open with spool type/operating method 66C and 66H.

Performance curves (viscosity: 32 mm²/s {cSt})

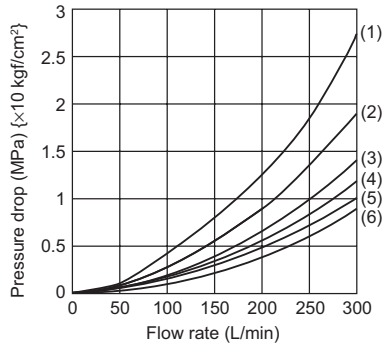
Pressure - Flow rate characteristics



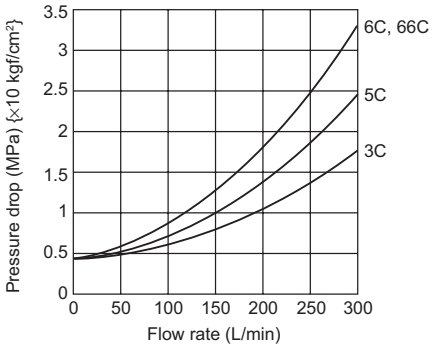
Pressure - Flow rate characteristics



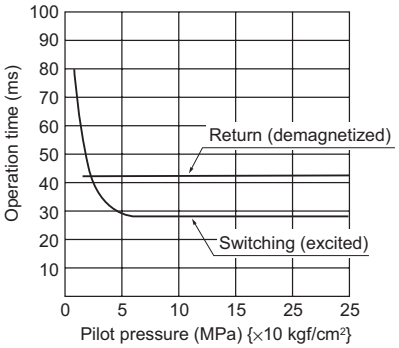
Pressure drop characteristics



With check valve for pilot pressure
P-T pressure drop characteristics



Operation time characteristics
KSH-G04-2CA



Note: The operation time may change slightly depending on the conditions of use (pressure, flow rate, hydraulic fluid viscosity, etc.).

Handling

- **Pilot**
  - ○ With the internal drain type, maintain the pressure difference between the pilot pressure and the back pressure of the tank line no lower than the minimum pilot pressure.
  - ○ When using spool type 3, 5, 6, or 66 as the internal pilot type, select the main valve option specifications with a check valve for pilot pressure (option code: T).
- **Drainage**
  - ○ Directly connect the drain piping to the tank without merging it with other tank piping.
  - ○ External pilot type products can be used as internal drain type regardless of the model.
  - ○ Internal pilot type products can be used as internal drain type when the spool type is 2, 33, 4, 44, 8, 81, 9 or 91.
  - ○ Directly connect the drain piping from port L to the tank without merging it with other tank piping. Note that the drain setting of port L cannot be changed.
- **Tightening torque of pilot valve mounting bolts (M5):** 6.5 to 8.5 N·m {65 to 85 kgf·cm}

Pilot/drain type setting guide

- Either the internal or external pilot and drain types can be set by fitting/removing plugs.

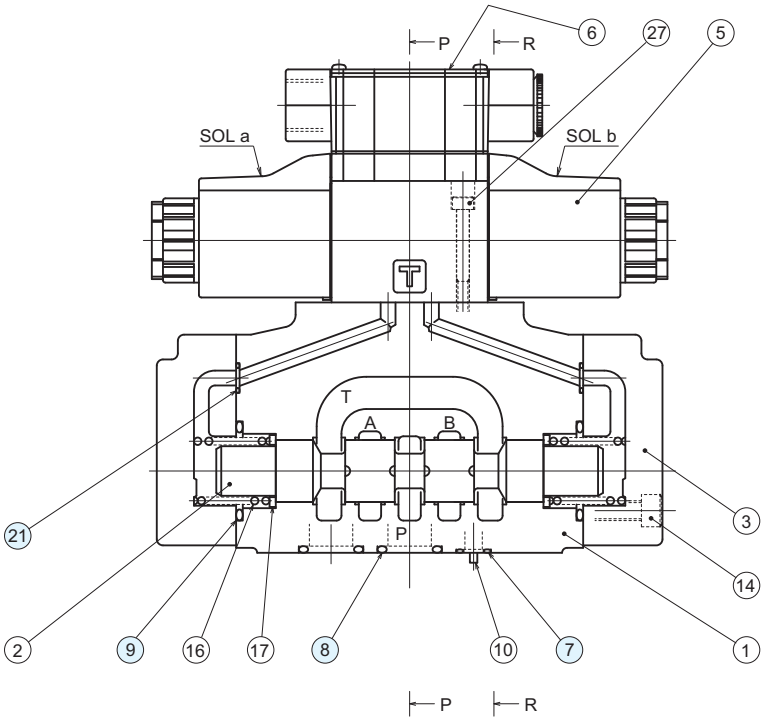
	Pilot method	Plug A	Plug D	Drain method	Plug B	Plug C
No designation	Internal	Without plug	With plug	External	With plug	Without plug
X	Internal	Without plug	With plug	Internal	Without plug	With plug
Y	External	With plug	Without plug	External	With plug	Without plug
Z	External	With plug	Without plug	Internal	Without plug	With plug
Guide	The pilot type can be set by changing plugs A and D.			The drain type can be set by changing plugs B and C.		

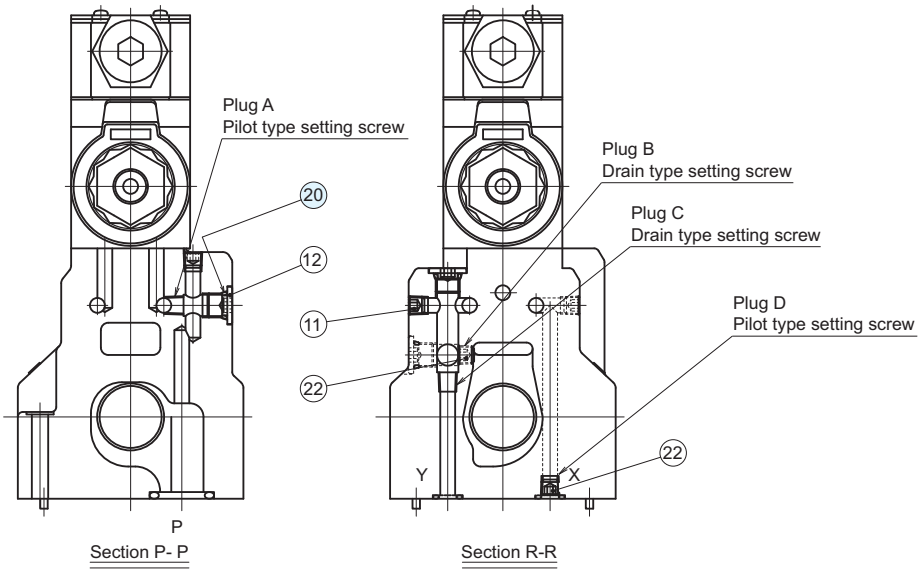
Hexagon socket taper thread plug	Tightening torque N·m {kgf·cm}
NPTF1/16	6 to 7.5 {60 to 75}

○ Tightening torque of hexagon socket thread plug with flange: 13 to 15 N·m {130 to 150 kgf·cm}
○ See the sectional structural diagram on Page G-43 for the positions of plugs A, B, C and D. Do not wrap the plugs with sealing tape.

Sectional structural diagram

KSH-G04-2C

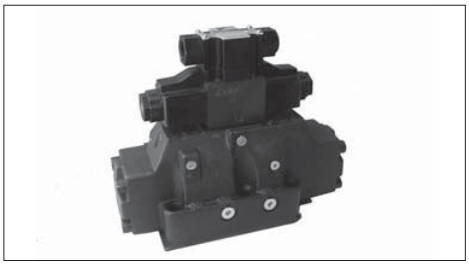




Sealing part table

Part No.	Part name	Quantity		Part specifications
		Type C, B, D	Type H	
7	O-ring	2	3	JIS B 2401 1B P10A
8	O-ring	4	4	JIS B 2401 1B P22
9	O-ring	2	2	JIS B 2401 1B P34
20	O-ring	3	3	JIS B 2401 1B P8
21	O-ring	2	2	JIS B 2401 1B P9

Solenoid Pilot Operated Directional Control Valve



Features

- These models realize high-pressure large-flow-rate control at 35 MPa {350 kgf/cm²} and 700 L/min.

Nomenclature

※	–	KSH	–	G	06	–	※※	※	※	–	20	–	※	※	–	※
1		2		3	4		5	6	7		8		9	10		11

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
Water-glycol hydraulic fluid
F: Phosphate ester hydraulic fluid

2 Model No.
KSH: K series solenoid pilot operated directional control valve

3 Connections
G: Gasket mount type

4 Nominal diameter
06: ¾

5 Spool type (See the model table)

6 Spool operating method (See the model table)
C: Spring center type
B: Spring offset type (with SOL.b)

7 Voltage code (See the voltage code table)

8 Design No. (The design No. is subject to change)

9 Main valve option code (See the option code table)

10 Solenoid pilot valve option code
Refer to the option code table for KSO-G02 on Page G-12.

11 Pilot stack valve code (See the option code table)

Note: The maximum number of digit in the model code is limited to 23. Combining the codes for the specifications above may exceed the limit of 23 digits. In such cases, select the codes to be designated according to the functional importance of each specification and restrict the model code to 23 digits with the non-standard number appended. For the model codes in such cases, contact Daikin in each instance.

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Pilot pressure MPa {kgf/cm²} *1		Permissible back pressure MPa {kgf/cm²}		Maximum switching frequency times/minute
						External drain type	Internal drain type	
KSH-G06	¾	35 {350}	700	(1)	1.0 to 35 {10 to 350}	35 {350}	16 {160}	120 *2
				(2)	0.5 to 35 { 5 to 350}			

Note: *1 The pilot pressure varies depending on the following structure.

(1)	For spool types other than 3 and 66
(2)	For spool types 3 and 66

Spool operating method	Fluid drainage volume at spool switching cm³
Type C	13.7
Type B	27.4

Note: *2 The maximum switching frequency of the DIN connector type with built-in surge killer (option code: N-CL(E)) is 100 times/min.

Refer to KSO-G02 on Page G-12 for the solenoid specifications.

7: Voltage code table

Voltage code	Power supply voltage	Voltage code	Power supply voltage
A	AC 100 V (50/60 Hz), AC 110 V (60 Hz)	N	DC 12 V
B	AC 200 V (50/60 Hz), AC 220 V (60 Hz)	P	DC 24 V
C	AC 110 V (50 Hz)	Q	DC 48 V
D	AC 220 V (50 Hz)	R	DC 100 V
J	AC 240 V (50/60 Hz)	S	DC 110 V
K	AC 120 V (50/60 Hz)	T	DC 200 V
L	AC 115 V (50/60 Hz)	U	DC 220 V
M	AC 230 V (50/60 Hz)	E	AC 100 V (50/60 Hz) with rectifier
		F	AC 110 V (50/60 Hz) with rectifier
		G	AC 200 V (50/60 Hz) with rectifier
		H	AC 220 V (50/60 Hz) with rectifier

See the solenoid specification table for KSO-G02 on Page G-12 for solenoid specifications.

9 10 11: Option code table

9 Code	Option details
No designation	Internal pilot, external drain type
X	Internal pilot, internal drain type
Y	External pilot, external drain type
Z	External pilot, internal drain type
T	With check valve for pilot pressure

11 Code	Option details *2
No designation	Without stack valve
W	With MT-02W-60
R	With MG-02P-1-60-S02
RR	With MG-02P-1-60-R02
G	With MT-02W-60, MG-02P-1-60-S02
GR	With MT-02W-60, MG-02P-1-60-R02

Note: ○ If two or more options are selected, sort the option codes, separately for option types 9 and 10, in alphabetical order.
○ When using spool type 3 or 66 as the internal pilot type, select the main valve option specifications with a check valve for pilot pressure (option code: T).
*3 With MT-02W-60: To be selected for applications where shocks at switching need to be suppressed
With MG-02P-1-60-※02: To be selected to restrict the pilot pressure to 7 MPa {70 kgf/cm²} maximum

Mass (kg)

Details		AC	DC, with rectifier
Terminal box type	Double solenoid	14.8	15.2
	Single solenoid	14.5	14.7
DIN connector type	Double solenoid	14.8	15.1
	Single solenoid	14.4	14.6
Lead wire type	Double solenoid	14.7	15.0
	Single solenoid	14.4	14.5

Note: With the following options, the mass will be increased by the mass given for each option.

Details	Code	Mass kg
With MT-02W-60	W	1.4
With MG-02P-1-60-※02	R, RR	1.3
With MT-02W-60, MG-02P-1-60-※02	G, GR	2.7

Solenoid pilot valve model code

Model code	Applicable solenoid model code (※: Voltage code)
KSH-G06-※※C※-20	KSO-G02-4C※-30
KSH-G06-※※B※-20	KSO-G02-2B※-30

Accessories

Hexagon socket head cap bolt	Quautity	Tightening torque N·m {kgf·cm}
M12 × 60	6	90 to 100 {900 to 1000}

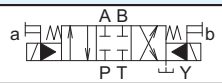
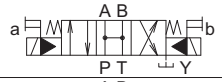
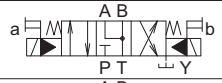
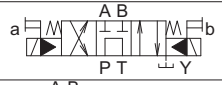
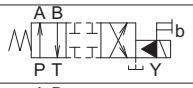
Sub-plate model code

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

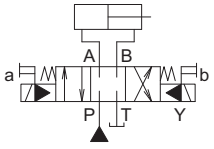
Model code	Nominal diameter	Connection port diameter	Mass kg
JS-06M	¾	Rc¾	5.2
JS-06M08		Rc1	

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

5 6: Model table

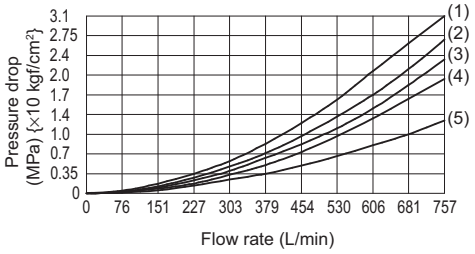
Model code	JIS graphic symbols for hydraulic system	Maximum flow rate: See the Pressure - Flow rate characteristics	Pressure drop characteristics (See the performance curves): P → A, P → B	A → T, B → T	P → T
KSH-G06-2C		B	(5)	(5) (4)	–
KSH-G06-3C		A	(4)	(4)	(3)
KSH-G06-4C		A	(5)	(2) (3)	–
KSH-G06-66C		A	(2)	(4) (3)	(1)
KSH-G06-2B		B	(5)	(5) (4)	–
KSH-G06-3B		A	(4)	(4)	(3)

Note: 1. In the transient period of switching, all ports are blocked with spool type 66C.
2. The maximum flow rates given in the table above are the values with the flow P → A → B → T (or P → B → A → T) as shown in the diagram to the right.

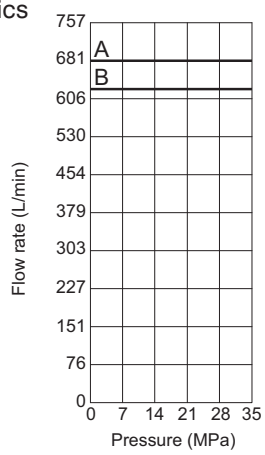


Performance curves (Viscosity: 35 mm²/s {cSt})

Pressure drop characteristics



Pressure - Flow rate characteristics



Note: The operation time may change slightly depending on the conditions of use (pressure, flow rate, hydraulic fluid viscosity, etc.).

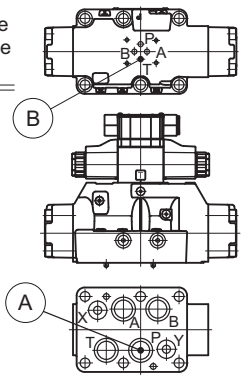
Handling

- **Pilot/drain types**
  The internal pilot and external drain type is standard. Set the pilot pressure such that the differential pressure between the pilot pressure and the back pressure of the drain line is no lower than the minimum pilot pressure.
  Either the internal or external pilot and drain types can be set by fitting/removing plugs. (See the section below for details.)
- **Pilot**
  - ○ When using the product with spool type 3 or 66 as the internal pilot type, insert a resistance valve with a cracking pressure of 0.5 MPa minimum in the tank line and set it as the external drain type. Or, select the main valve option specifications with check valve for pilot pressure (option code: T).
  - ○ With the internal pilot type products, block the X port on the mounting face.
- **Drainage**
  - ○ Directly connect the drain piping to the tank without merging it with other tank piping.
  - ○ External pilot type products can be used as internal drain type regardless of the model.
  - ○ Internal pilot type products can be used as internal drain type when the spool type is 2, or 4.
  - ○ With internal drain type products, block the Y port on the mounting face.
- **Tightening torque of pilot valve mounting bolts (M5):** 6.5 to 8.5 N·m {65 to 85 kgf·cm}

Pilot/drain type setting guide

- Either the internal or external pilot and drain types can be set by fitting/removing plugs.
  When changing the pilot setting from internal pilot type to external pilot type, one additional hexagon socket plug (M5 × 0.8) will be necessary. Order one separately.
  When changing the drain setting from internal drain type to external drain type, one additional hexagon socket plug (NPTF1/16) will be necessary. Order one separately.

View of the main valve from above without the solenoid pilot valve



[Pilot/drain type setting guide]

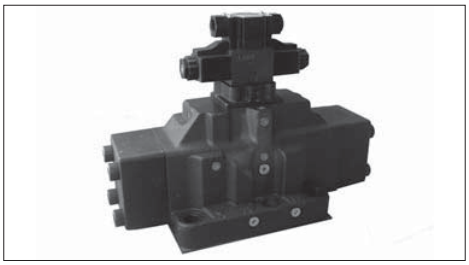
Code	Pilot/drain type	Position A	Position B
No designation	Internal pilot, external drain	Without plug	With plug
X	Internal pilot, internal drain	Without plug	Without plug
Y	External pilot, external drain	With plug	With plug
Z	External pilot, internal drain	With plug	Without plug

[Tightening torque at each section]

Product name	Tightening torque N·m {kgf·cm}
Hexagon socket head cap bolt (M5)	6.5 to 8.5 {65 to 85}
Hexagon socket plug (NPTF1/16): Position A	5.1 to 5.9 {51 to 59}
Hexagon socket plug (M5 × 0.8): Position B	1.7 to 2.1 {17 to 21}

Note: Do not wrap the plugs with sealing tape.
Note: When fitting a hexagon socket plug (M5 × 0.8) at position B, apply Loctite #222 or an equivalent thread locking agent to the thread and tighten the plug at the torque given in the table.
Note: When removing the hexagon socket plug (M5 × 0.8), remove the Loctite competely.

Solenoid Pilot Operated Directional Control Valve



Features

- These models realize high-pressure large-flow-rate control at 35 MPa {350 kgf/cm^2} and 1100 L/min.

Nomenclature

※	–	KSH	–	G	10	–	※※	※	※	–	20	–	※	※	–	※
1		2		3	4		5	6	7		8		9	10		11

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
Water-glycol hydraulic fluid
F: Phosphate ester hydraulic fluid

2 Model No.
KSH: K series solenoid pilot operated directional control valve

3 Connections
G: Gasket mount type

4 Nominal diameter
10: 1¼

5 Spool type (See the model table)

6 Spool operating method (See the model table)
C: Spring center type
B: Spring offset type (with SOL.b)

7 Voltage code (See the voltage code table)

8 Design No.
(The design No. is subject to change)

9 Main valve option code
(See the option code table)

10 Solenoid pilot valve option code
Refer to the option code table for KSO-G02 on Page G-12

11 Pilot stack valve code (See the option code table)

Note: The maximum number of digits in the model code is limited to 23. Combining the codes for the specifications above may exceed the limit of 23 digits. In such cases, select the codes to be designated according to the functional importance of each specification and restrict the model code to 23 digits with the non-standard number appended. Contact Daikin about individual cases.

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm^2}	Maximum flow rate L/min	Pilot pressure MPa {kgf/cm^2} *1		Permissible back pressure MPa {kgf/cm^2}		Maximum switching frequency times/min
						External drain type	Internal drain type	
KSH-G10	1¼	35 {350}	1100	(1)	1.0 to 35 {10 to 350}	21 {210}	16 {160}	120 *2
				(2)	0.5 to 35 { 5 to 350}			

Note: *1 The pilot pressure varies depending on the following structure.

(1)	For spool types other than 3 and 66
(2)	For spool types 3 and 66

Spool operating method	Fluid drainage volume at spool switching cm^3
Type C	32.4
Type B	64.8

Note: *2 The maximum switching frequency of the DIN connector type with built-in surge killer (option code: N-CL(E)) is 100 times/min.

Refer to KSO-G02 on Page G-12 for the solenoid specifications.

7: Voltage code table

Voltage code	Power supply voltage	Voltage code	Power supply voltage
A	AC 100 V (50/60 Hz), AC 110 V (60 Hz)	N	DC 12 V
B	AC 200 V (50/60 Hz), AC 220 V (60 Hz)	P	DC 24 V
C	AC 110 V (50 Hz)	Q	DC 48 V
D	AC 220 V (50 Hz)	R	DC 100 V
J	AC 240 V (50/60 Hz)	S	DC 110 V
K	AC 120 V (50/60 Hz)	T	DC 200 V
L	AC 115 V (50/60 Hz)	U	DC 220 V
M	AC 230 V (50/60 Hz)	E	AC 100 V (50/60 Hz) with rectifier
		F	AC 110 V (50/60 Hz) with rectifier
		G	AC 200 V (50/60 Hz) with rectifier
		H	AC 220 V (50/60 Hz) with rectifier

See the solenoid specification table for KSO-G02 on Page G-12 for solenoid specifications.

9 10 11: Option code table

9 Code	Option details
No designation	Internal pilot, external drain type
X	Internal pilot, internal drain type
Y	External pilot, external drain type
Z	External pilot, internal drain type
T	With check valve for pilot pressure

11 Code	Option details *3
No designation	Without stack valve
W	With MT-02W-60
R	With MG-02P-1-60-S02
RR	With MG-02P-1-60-R02
G	With MT-02W-60, MG-02P-1-60-S02
GR	With MT-02W-60, MG-02P-1-60-R02

Note: ○ If two or more options are selected, sort the option codes, separately for option types 9 and 10, in alphabetical order.
○ When using spool type 3 or 66 as the internal pilot type, select the main valve option specifications with a check valve for pilot pressure (option code: T).
*3 With MT-02W-60: To be selected for applications where shocks at switching need to be suppressed
With MG-02P-1-60-※02: To be selected for applications where an operating pressure beyond 25 MPa {250 kgf/cm^2} is required

Mass (kg)

Details		AC	DC, with rectifier
Terminal box type	Double solenoid	45.5	45.9
	Single solenoid	45.2	45.4
DIN connector type	Double solenoid	45.5	45.8
	Single solenoid	45.1	45.3
Lead wire type	Double solenoid	45.4	45.7
	Single solenoid	45.1	45.2

Note: With the following options, the mass will be increased by the mass given for each option.

Details	Code	Mass kg
With MT-02W-60	W	1.4
With MG-02P-1-60-※02	R, RR	1.3
With MT-02W-60, MG-02P-1-60-※02	G, GR	2.7

Solenoid pilot valve model code

Model code	Applicable solenoid valve model code (※: Voltage code)
KSH-G10-※※C※-20	KSO-G02-4C※-30
KSH-G10-※※B※-20	KSO-G02-2B※-30

Accessories

Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
M20 × 75	6	473 to 585 {4730 to 5850}

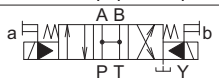
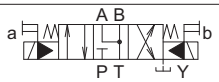
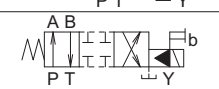
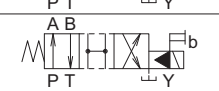
Sub-plate model code

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

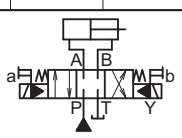
Model code	Nominal diameter	Connection port diameter	Mass kg
JS-10M	1¼	Rc1¼	17
JS-10M12		Rc1½	

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

5 6: Model table

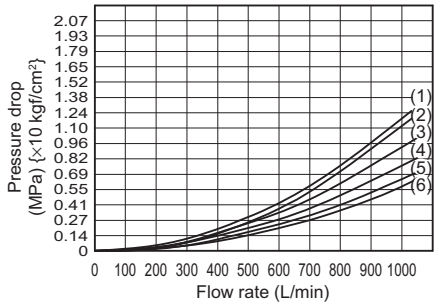
Model code	JIS graphic symbols for hydraulic system	Maximum flow rate L/min, Pressure MPa {kgf/cm^2} 7 {70}	14 {140}	21 {210}	28 {280}	35 {350}	Pressure drop characteristics (See the performance curves) P → A, P → B	A → T, B → T	P → T
KSH-G10-2C		1100	1078	1022	832	757	(6)	(6) (5)	–
KSH-G10-3C		946	889	851	757	662	(2)	(1) (2)	(3)
KSH-G10-4C		1100	1078	1022	832	757	(6)	(2)	–
KSH-G10-66C		946	889	851	757	662	(4)	(4)	(1)
KSH-G10-2B		1100	1078	1022	832	757	(6)	(6) (5)	–
KSH-G10-3B		1100	1078	1022	832	757	(2)	(1) (2)	(3)

Note 1: In the transient period of switching, all ports are blocked with spool type 66C.
2: The maximum flow rates given in the table above are the values with the flow P → A → B → T (or P → B → A → T) as shown in the diagram to the right.



Performance curves (Viscosity: 35 mm²/s {cSt})

Pressure drop characteristics



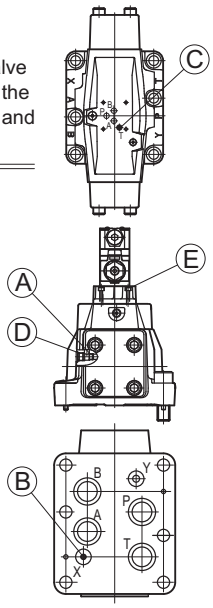
Handling

- **Pilot**
  - ○ With the internal drain type, maintain the pressure difference between the pilot pressure and the back pressure of the tank line no lower than the minimum pilot pressure.
  - ○ When using the product with spool type 3 or 66 as the internal pilot type, insert a resistance valve with a cracking pressure of 0.5 MPa minimum in the tank line and set it as the external drain type. Or, select the main valve option specifications with check valve for pilot pressure (option code: T).
  - ○ With the internal pilot type products, block the X port on the mounting face.
- **Drainage**
  - ○ Directly connect the drain piping to the tank without merging it with other tank piping.
  - ○ External pilot type products can be used as internal drain type regardless of the model.
  - ○ Internal pilot type products can be used as internal drain type when the spool type is 2, or 4.
  - ○ With internal drain type products, block the Y port on the mounting face.
- **Tightening torque of pilot valve mounting bolts (M5):** 6.5 to 8.5 N·m {65 to 85 kgf·cm}

Pilot/drain type setting guide

- Either the internal or external pilot and drain types can be set by fitting/removing plugs.
  When changing the pilot setting from internal pilot type to external pilot type, one additional hexagon socket plug (NPTF⅛) will be necessary. Order one separately.
  When changing the drain setting from internal drain type to external drain type, one additional hexagon socket plug (NPTF⅛) will be necessary. Order one separately.

View of the main valve from above without the solenoid pilot valve and adapter plate



[Pilot/drain type setting guide]

Code	Pilot/drain type	Position A	Position B (Port X)	Position C
No designation	Internal pilot, external drain	ϕ3.2 With fixed throttle	Without plug	With plug
X	Internal pilot, internal drain	ϕ3.2 With fixed throttle	Without plug	Without plug
Y	External pilot, external drain	With plug	ϕ3.2 With fixed throttle	With plug
Z	External pilot, internal drain	With plug	ϕ3.2 With fixed throttle	Without plug

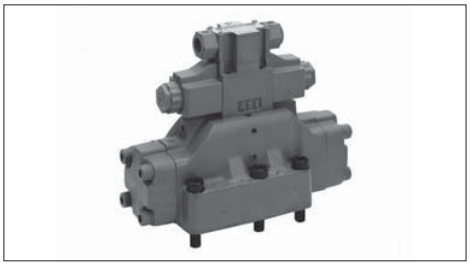
Note: When fitting a plug at position A, remove the plug with flange at position D and tighten the plug at the torque given below.

[Tightening torque at each section]

Product name	Tightening torque N·m {kgf·cm}
Hexagon socket head cap bolt (M5)	6.5 to 8.5 { 65 to 85}
Hexagon socket plug (NPTF⅛): Position A, B, C	11.1 to 12.8 {111 to 128}
Hexagon socket plug (½-20UNF): Position D	20.5 to 22.5 {205 to 225}
Hexagon socket plug (¼-20UNRC-3A): Position E	14.0 to 15.4 {140 to 154}

Note: Do not wrap the plugs with sealing tape.

Solenoid Pilot Operated Directional Control Valve



Features

- The highly reliable KSO-G02 adopted as the pilot valve ensures long service life and stable operation.
- This model is best suited to integration into European Safety Standard (CE) compliant equipment since it has dust-/water-proof properties that satisfy the IEC Pub529 IP65 ingress protection grade.

Nomenclature

※	–	JS	–	G	※※	–	※※	※	※	–	※※	–	※
1		2		3	4		5	6	7		8		9

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
H: Water-glycol hydraulic fluid
F: Phosphate ester hydraulic fluid

2 Model No.
JS: J series solenoid pilot operated directional control valve

3 Connections
G: Gasket mount type

4 Nominal diameter
06: ¾
10: 1¼

5 Spool type (See the model table)

6 Spool operating method (See the model table)
C: Spring center type
B: Spring offset type (with SOL.b)
N: No-spring type (without detent)

7 Voltage code (See the voltage code table)

8 Design No.
(The design No. is subject to change)
30: Nominal diameter 10 (1¼)
75: Nominal diameter 06 (¾)
<21 MPa {210 kgf/cm^2 specifications}>
85: Nominal diameter 06 (¾)
<25 MPa {250 kgf/cm^2 specifications}>

9 Option code (See the option code table)

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm^2}	Maximum flow rate L/min	Pilot pressure MPa {kgf/cm^2}	Permissible back pressure MPa {kgf/cm^2}		Fluid drainage volume at spool switching cm^3		
					External drain type	Internal drain type	(1)	(2)	(3)
JS-G06 Design No. 75	¾	21 {210}	300	0.45 to 21 {4.5 to 210}	21 {210}	10 {100}	8.8	10.7	17.6
JS-G06 Design No. 85		25 {250}		0.45 to 25 {4.5 to 250}	25 {250}	16 {160}			
JS-G10	1¼	21 {210}	800	0.45 to 21 {4.5 to 210}	21 {210}	7 { 70}	34.7	42.1	69.4

Note: Pilot fluid drainage volume (1) Spool operating method: type C (when the spool type/operating method is other than 6C)
(2) Spool operating method: type C (when the spool type/operating method is 6C)
(3) Spool operating method: type B, N

Refer to KSO-G02 on Page G-12 for the solenoid specifications.

7: Voltage code table

Voltage code	Power supply voltage	Voltage code	Power supply voltage
A	AC 100 V (50/60 Hz), AC 110 V (60 Hz)	N	DC 12 V
B	AC 200 V (50/60 Hz), AC 220 V (60 Hz)	P	DC 24 V
C	AC 110 V (50 Hz)	Q	DC 48 V
D	AC 220 V (50 Hz)	R	DC 100 V
J	AC 240 V (50/60 Hz)	S	DC 110 V
K	AC 120 V (50/60 Hz)	T	DC 200 V
L	AC 115 V (50/60 Hz)	U	DC 220 V
M	AC 230 V (50/60 Hz)	E	AC 100 V (50/60 Hz) with rectifier
		F	AC 110 V (50/60 Hz) with rectifier
		G	AC 200 V (50/60 Hz) with rectifier
		H	AC 220 V (50/60 Hz) with rectifier

See the solenoid specification table for KSO-G02 on Page G-12 for solenoid specifications.

9: Option code table

Code	Option details
No designation	Internal pilot, external drain type
X	Internal pilot, internal drain type
Y	External pilot, external drain type
Z	External pilot, internal drain type
D	No-spring type (with detent)
P	With spool lock structure (solenoid valve)

See the option code table of KSO-G02 on Page G-12 for the options for solenoid pilot valves.

Note: ○ If two or more options are selected, sort the option codes in alphabetical order.

Solenoid pilot valve model code

Model code	Applicable solenoid valve model code (※: Voltage code)
JS-G※※-※※C※-※※	KSO-G02-4C※-30
JS-G※※-※※B※-※※	KSO-G02-2A※-30
JS-G※※-※※N※-※※	KSO-G02-2N※-30
JS-G※※-※※N※-※※-D	KSO-G02-2D※-30

Note: Select KSO-G02-※※※-30-BGM for JS-G06.

Mass (kg)

Details		JS-G06		JS-G10	
		AC	DC, with rectifier	AC	DC, with rectifier
Terminal box type	Double solenoid	13.3	13.7	45.8	46.2
	Single solenoid	13	13.2	45.5	45.7
DIN connector type	Double solenoid	13.3	13.6	45.8	46.1
	Single solenoid	12.9	13.1	45.4	45.6
Lead wire type	Double solenoid	13.2	13.5	45.7	46
	Single solenoid	12.9	13.1	45.4	45.5

Sub-plate model code

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

Model code	Nominal diameter	Connection port diameter	Mass kg
JS-06M	¾	Rc¾	5.2
JS-06M08		Rc1	
JS-10M	1¼	Rc1¼	17
JS-10M12		Rc1½	

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

Accessories

Model No.	Hexagon socket head cap bolt	Quautity	Tightening torque N·m {kgf·cm}
JS-G06	M12 × 60	6	85 to 110 { 850 to 1100}
JS-G10	M20 × 70	6	200 to 220 {2000 to 2200}

Handling

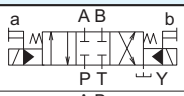
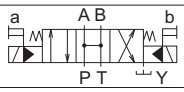
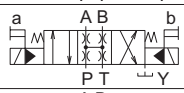
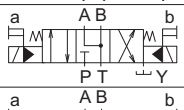
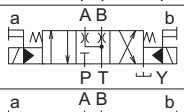
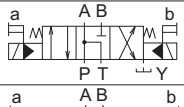
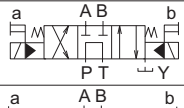
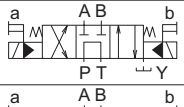
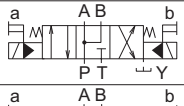
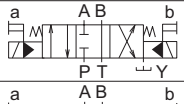
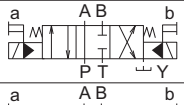
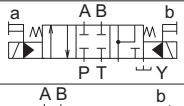
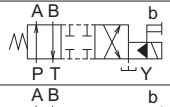
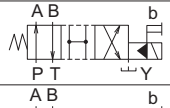
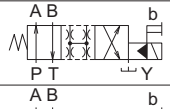
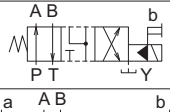
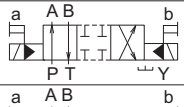
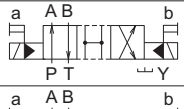
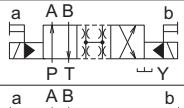
- **Pilot**
  - ○ With the internal drain type, maintain the pressure difference between the pilot pressure and the back pressure of the tank line no lower than the minimum pilot pressure of 0.45 MPa {4.5 kgf/cm^2}.
  - ○ When using the product with spool type 3, 33, 5, 6 or 66 as the internal pilot type, insert a resistance valve with a cracking pressure of 0.45 MPa {4.5 kgf/cm^2} minimum in the tank line and set it as the external drain type.
- **Drainage**
  - ○ Directly connect the drain piping to the tank without merging it with other tank piping.
  - ○ External pilot type products can be used as internal drain type regardless of the model.
  - ○ Internal pilot type products can be used as internal drain type when the spool type is 2, 4, 44, 7, 8, 9 or 27.

Pilot throttle valve

To suppress shocks at switching by adjusting the switching speed of the spool, stack one of the following 02 size stack valves below the solenoid pilot valve. When using stack valves, order mounting bolts separately by referring to the table below since the required mounting bolts vary depending on the stacking height.

Stack valve model code	Mounting bolt model code	Hexagon socket head cap bolt	Tightening torque N·m {kgf·cm}
MT-02W-55	HB101	M5 × 85, 4 pcs.	6 to 8 {60 to 80}
MT-02P-65			
MT-02W-55, MT-02P-65	HB102	M5 × 125, 4pcs.	

5 6: Model table

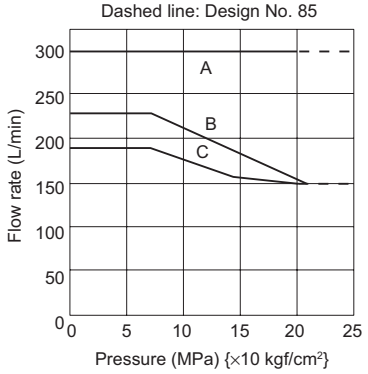
Model code	JIS graphic symbols for hydraulic system	Maximum flow rate L/min		Pressure – Flow rate characteristics (See the performance curves)		Pressure drop characteristics (See performance curves)					
						JS-G06			JS-G10		
		JS-G06	JS-G10	JS-G06	JS-G10	P → A P → B	A → T B → T	P → T	P → A P → B	A → T B → T	P → T
JS-G××-2C		300	800	A	F	⑥	⑤	-	❼	❻	-
JS-G××-3C		150	400	B	G	⑦	⑥	⑥	❼	❻	❼
JS-G××-33C		150	400	B	G	⑥	⑤	-	❼	❼	-
JS-G××-4C		300	800	A	F	⑤	⑥	-	❻	❼	-
JS-G××-44C		300	800	A	F	⑥	⑥	-	❼	❼	-
JS-G××-5C		150	340	C	H	⑦ ⑤	⑥ ⑤	⑥	❼ ❻	❼	❺
JS-G××-6C		100 (85)	340	E	H	②	① ②	②	❷	❶ ❸	❷
JS-G××66C		150	340	C	H	② ⑥	③ ⑥	②	❸ ❻	❹ ❻	❸
JS-G××-7C		300	800	A	F	⑦	⑦ ⑥	-	❼	❼	-
JS-G××-8C		300	800	A	F	⑥	⑤ ⑥	-	❼	❼	-
JS-G××-9C		300	800	A	F	⑥	⑤	-	❼	❼	-
JS-G××-27C		150 (130)	400	D	G	③	④	-	❺	❻	-
JS-G××-2B		300	800	A	F	⑥	⑤	-	❼	❻	-
JS-G××-3B		300	800	A	F	⑦	⑥	-	❼	❻	-
JS-G××-33B		300	800	A	F	⑥	⑤	-	❼	❼	-
JS-G××-4B		300	800	A	F	⑤	⑥	-	❻	❼	-
JS-G××-2N		300	800	A	F	⑥	⑤	-	❼	❻	-
JS-G××-3N		300	800	A	F	⑦	⑥	-	❼	❻	-
JS-G××-33N		300	800	A	F	⑥	⑤	-	❼	❼	-
JS-G××-4N		300	800	A	F	⑤	⑥	-	❻	❼	-

Note: ○ In the transient period of switching, all ports are blocked with spool type/operating method 6C, and all ports are open with spool type/operating method 66C.
○ The values in parentheses indicate the maximum flow rate with design No. 85 products.

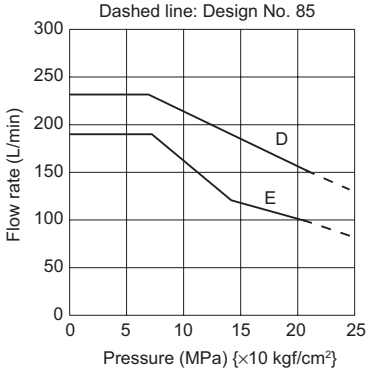
Performance curves (viscosity: 32 mm²/s {cSt})

● JS-G06

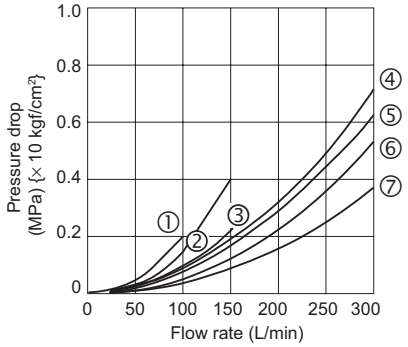
Pressure – Flow rate characteristics



Pressure – Flow rate characteristics

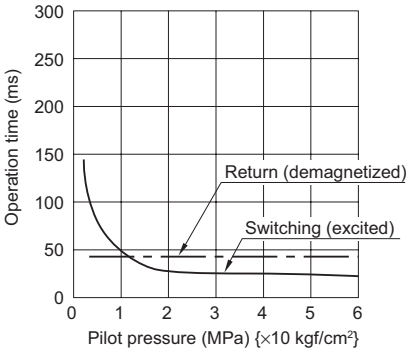


Pressure drop characteristics



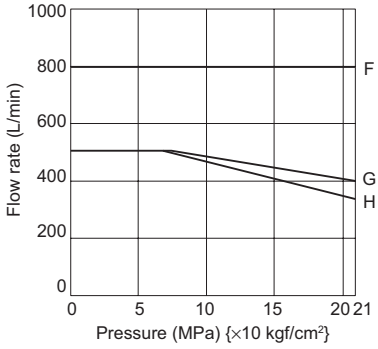
Operation time characteristics

JS-G06-2C (AC)

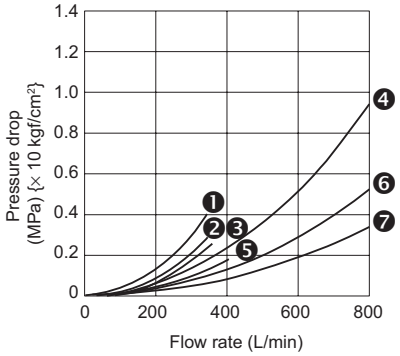


● JS-G10

Pressure – Flow rate characteristics

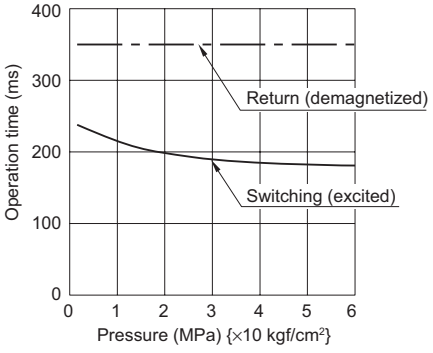


Pressure drop characteristics



Operation time characteristics

JS–G10–2C (AC)



Note: The operation time may change slightly depending on the conditions of use (pressure, flow rate, hydraulic fluid viscosity, etc.).

Pilot/drain type setting guide

● Either the internal or external pilot and drain types can be set by fitting/removing plugs.

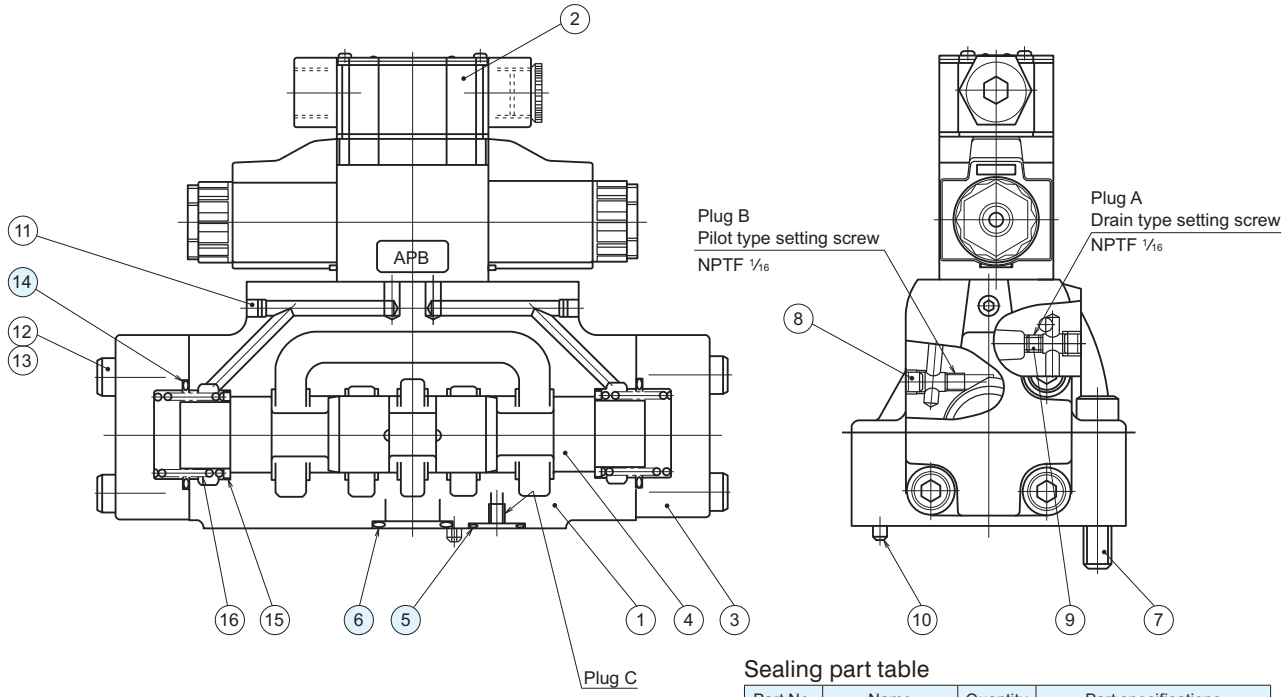
	Pilot type	Port X	Plug B	Drain type	Plug A	Plug C (Port Y)
No designation	Internal	With plug	Without plug	External	With plug	Without plug
X	Internal	With plug	Without plug	Internal	Without plug	With plug
Y	External	Without plug	With plug	External	With plug	Without plug
Z	External	Without plug	With plug	Internal	Without plug	With plug
Guide	The pilot type can be set by changing port X and plug B.			The drain type can be set by changing plugs A and C.		

Hexagon socket taper thread plug	Tightening torque N·m {kgf·cm}
NPTF1/16 (G06)	6 to 7.5 {60 to 75} (G06)
R⅛ (G10)	13 to 14.5 {130 to 145} (G10)

○ See the sectional structural diagram on page G-60 for the positions of plugs A, B and C.
Do not wrap the plugs with sealing tape.

Sectional structural diagram

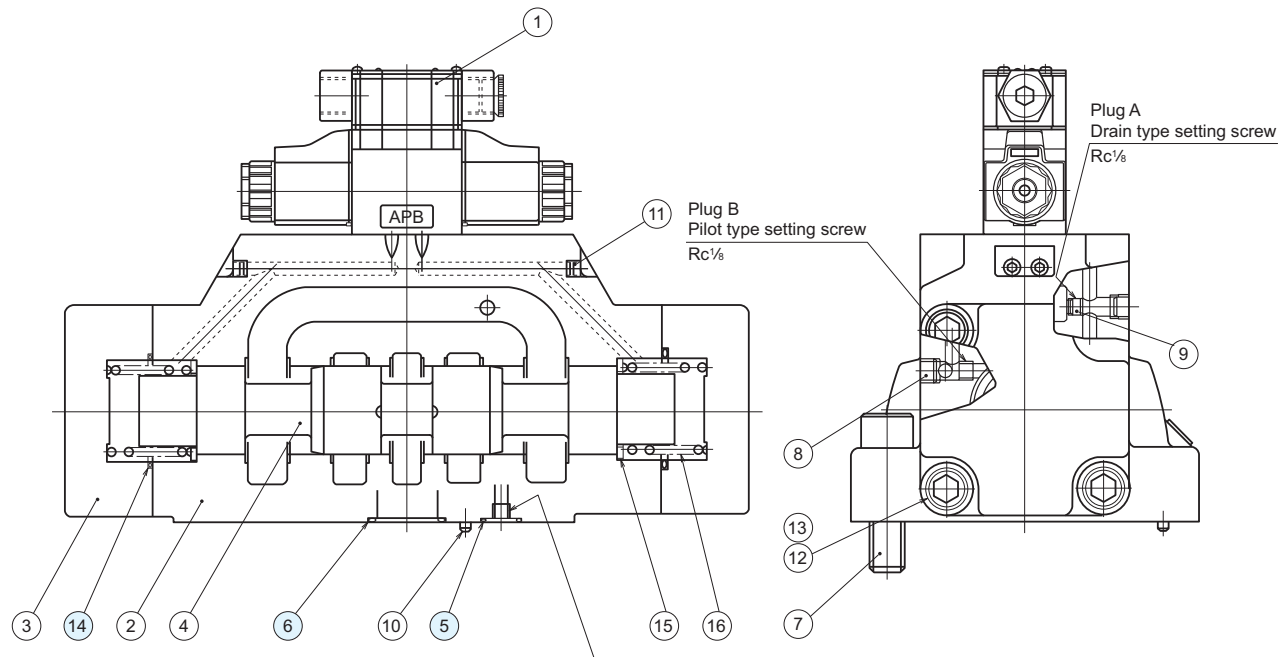
● JS-G06



Sealing part table

Part No.	Name	Quantity	Part specifications
5	O-ring	2	JIS B 2401 1B P20
6	O-ring	4	JIS B 2401 1B P28
14	O-ring	2	JIS B 2401 1B P40

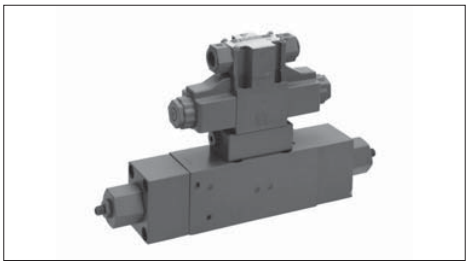
● JS-G10



Sealing part table

Part No.	Name	Quantity	Part specifications
5	O-ring	2	JIS B 2401 1B P20
6	O-ring	4	JIS B 2401 1B G40
14	O-ring	2	JIS B 2401 1B G60

Solenoid Pilot Operated Directional Control Valve



Features

- Using these valves in combination with a pressure compensation valve (MUV, MDM) achieves flow rate characteristics with pressure compensation according to the adjustment made with the flow rate adjusting screw.
- This model provide the shock reduction function of a solenoid pilot operated directional control valves by themselves.
  Even greater shock reduction performance can be realized by inserting a 02 size stack valve (throttle valve or reduction valve) in the pilot line.
- It is possible to configure a multi-purpose valve block by stacking with solenoid operated proportional directional control valves (MEV).

Nomenclature

※	—	MEP	※※	※	※	※	※	※	※	—	60	—	※	※
1		2	3	4	5	6	7	8	9		10		11	12

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
H: Water-glycol hydraulic fluid
F: Phosphate ester hydraulic fluid

2 Model No.
MEP: Solenoid pilot operated directional control valve

3 Nominal diameter
12: ½
16: ¾
20: 1
25: 1¼
32: 1½

4 Spool type (See the spool type table)

5 Flow type (See the specifications)
1: Q1 flow
2: Q2 flow
3: QMAX flow

6 Spool operating method
C: Spring center type
B: Spring offset type (with SOL.b)
N: No-spring type (without detent)

7 Voltage code (See the voltage code table)

8 Pilot/drain type code
X: Internal pilot, internal drain type
Y: External pilot, external drain type
Z: External pilot, internal drain type
N: Internal pilot, external drain type

※ The pilot and drain type setting cannot be changed.

9 Pilot stack valve code
O: Without stack valve
W: With MT-02W-55
P: With MG-02P-1-55
G: With MT-02W-55, MG-02P-1-55

10 Design No.
(The design No. is subject to change)

11 Spool differential pressure code
No designation: Differential pressure of 0.6 MPa {6 kgf/cm^2}
3: Differential pressure of 0.3 MPa {3 kgf/cm^2}

12 Solenoid pilot valve option code
No designation: Terminal box type
D: No-spring type (with detent)

For options other than the ones given above, see the option code table for KSO-G02 on Page G-12

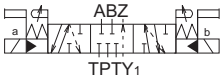
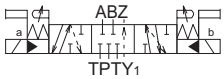
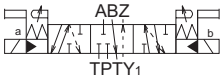
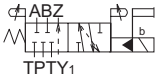
Specifications

Model No.	Nominal diameter	Port diameter	Maximum operating pressure MPa {kgf/cm^2} *1	Maximum flow rate *2 L/min			Pilot pressure MPa {kgf/cm^2} *1	Permissible back pressure MPa {kgf/cm^2}	Fluid drainage volume at spool switching cm^3
				Q1	Q2	QMAX			
MEP12	12	½	21 {210}	25	50	75	0.8 to 14 {8 to 140}	10 {100}	1.4
MEP16	16	¾		50	100	130			3.1
MEP20	20	1		80	160	200			5.9
MEP25	25	1¼		125	250	300			9.9
MEP32	32	1½		200	400	500			15.4

Note: *1 When the maximum operating pressure exceeds 14 MPa {140 kgf/cm^2}, select the external pilot type with a pilot pressure of 14 MPa {140 kgf/cm^2} maximum. When a pilot pressure beyond 14 MPa {140 kgf/cm^2} is required with the internal pilot type, select the specifications with MG-02P-1-55 (option code: P).
*2 The maximum flow rates Q1 and Q2 show the values when equipped with an inlet valve block with a spring for a differential pressure of 0.6 MPa {6 kgf/cm^2} or 0.3 MPa {3 kgf/cm^2}, and QMAX shows the values when equipped with an inlet valve block with a spring for a differential pressure of 0.6 MPa {6 kgf/cm^2}. When multiple series of valves with a pressure compensation valve are configured, the maximum flow rate may not be reached at the second or later series of valves. Take 80% of the maximum flow rate as the guide at the third series.

Refer to KSO-G02 on Page G-12 for the solenoid specifications.

4 Spool type table

Spool type Meter-in spool *3	JIS graphic symbols for hydraulic system	Spool type Meter-out spool *4	JIS graphic symbols for hydraulic system
A		P	
B		Q	
C		R	
D		S	
F			

Note: *3 Although the maximum opening levels from P to A and from P to B vary depending on Q1, Q2 and QMAX, the opening levels from A to T and from B to T are always equivalent to QMAX.
*4 Although the maximum opening levels from A to T and from B to T vary depending on Q1, Q2 and QMAX, the opening levels from P to A and from P to B are always equivalent to three times QMAX.
○ The spool is the same as that of solenoid operated proportional directional control valves (MEV).

7 Voltage code table

Voltage code	Power supply voltage	Voltage code	Power supply voltage
A	AC 100 V (50/60 Hz), AC 110 V (60 Hz)	N	DC 12 V
B	AC 200 V (50/60 Hz), AC 220 V (60 Hz)	P	DC 24 V
C	AC 110 V (50 Hz)	Q	DC 48 V
D	AC 220 V (50 Hz)	R	DC 100 V
J	AC 240 V (50/60 Hz)	S	DC 110 V
K	AC 120 V (50/60 Hz)	T	DC 200 V
L	AC 115 V (50/60 Hz)	U	DC 220 V
M	AC 230 V (50/60 Hz)	E	AC 100 V (50/60 Hz) with rectifier
		F	AC 110 V (50/60 Hz) with rectifier
		G	AC 200 V (50/60 Hz) with rectifier
		H	AC 220 V (50/60 Hz) with rectifier

See the solenoid specification table for KSO-G02 on Page G-12 for solenoid specifications.

Mass (kg)

Model No.	(1)	(2)	(3)	(4)
MEP12	6.5	7.9	7.8	9.2
MEP16	9	10.4	10.3	11.7
MEP20	14.4	15.8	15.7	17.1
MEP25	19.1	20.5	20.4	21.8
MEP32	27.9	29.3	29.2	30.6

Note: Mass (1) Pilot stack valve code: O (without stack valve)
(2) Pilot stack valve code: W (with MT-02W -55)
(3) Pilot stack valve code: P (with MG-02P-1-55)
(4) Pilot stack valve code: G (with MT-02W-55, MG-02P-1-55)

Solenoid pilot valve model code

Model code	Applicable solenoid valve model code (※: Voltage code)
MEP※※※※C※※※-60-※※	KSO-G02-4C※-30
MEP※※※※B※※※-60-※※	KSO-G02-8B※-30-4T
MEP※※※※N※※※-60-※※	KSO-G02-2N※-30
MEP※※※※N※※※-60-※D	KSO-G02-2D※-30

Accessories

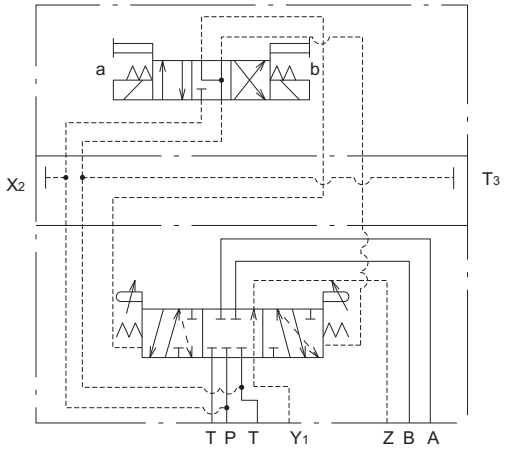
Model No.	Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
MEP12	M6 × 25	4	12 to 15 {120 to 150}
MEP16	M8 × 35	4	25 to 30 {250 to 300}
MEP20	M10 × 50	4	48 to 63 {480 to 630}
MEP25	M8 × 50	8	25 to 30 {250 to 300}
MEP32	M10 × 45	8	48 to 63 {480 to 630}

Handling

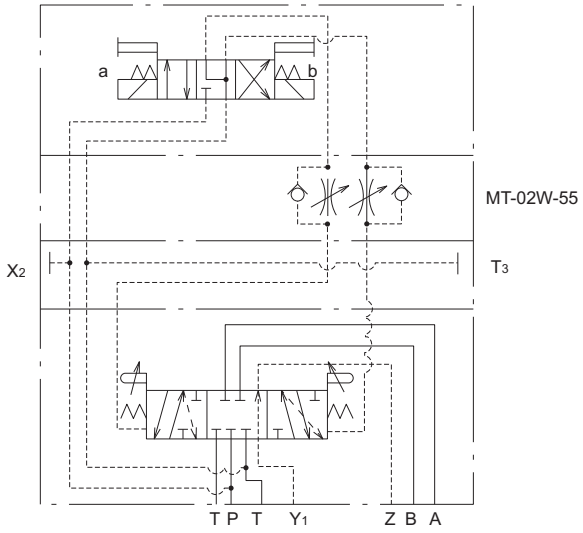
- Maintain the pressure difference between the pilot pressure and drain pressure no lower than 0.8 MPa {8 kgf/cm^2}. The spool starts moving at a differential pressure of 0.6 MPa {6 kgf/cm^2}.

JIS graphic symbols for hydraulic system (detail)

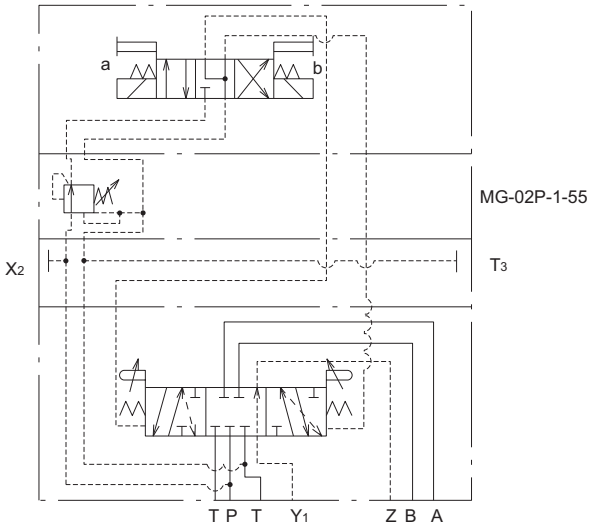
- MEP※※※※※※※O
  (Symbol for pilot stack valve: O)



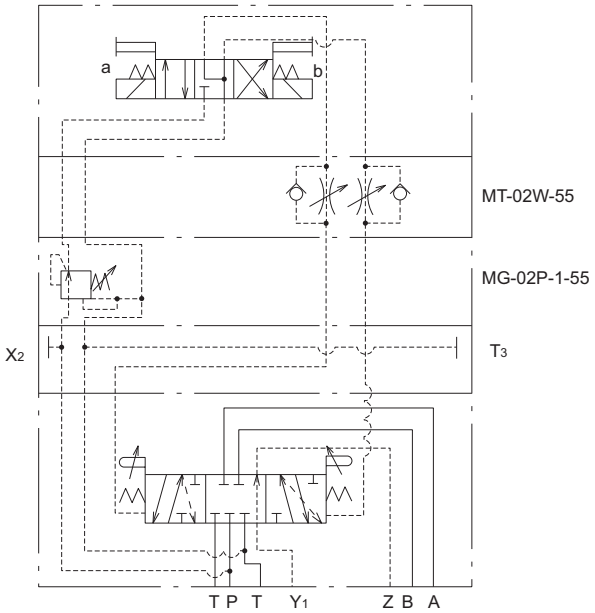
- MEP※※※※※※※W
  (Pilot stack valve code: W)



- MEP※※※※※※※P
  (Pilot stack valve code: P)

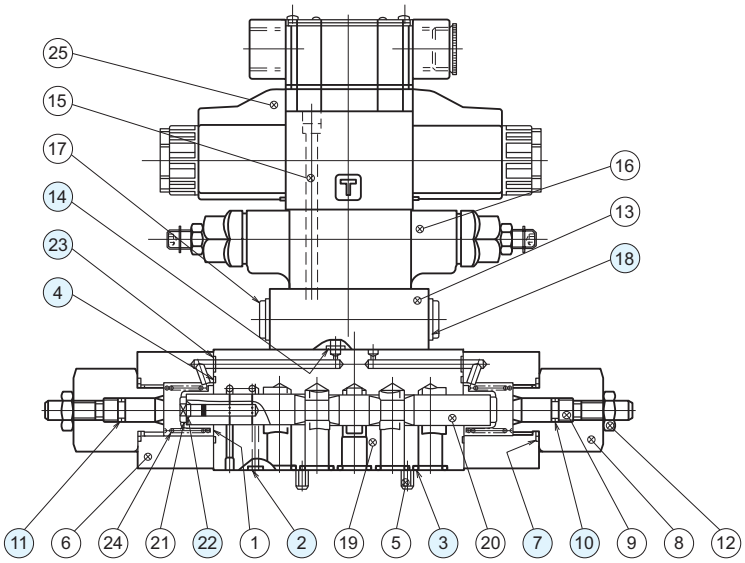


- MEP※※※※※※※G
  (Pilot stack valve code: G)



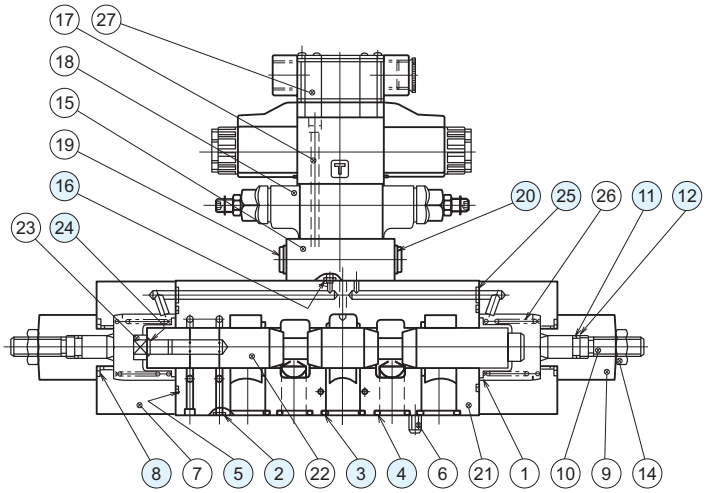
Sectional structural diagram

● MEP12, 16, 20



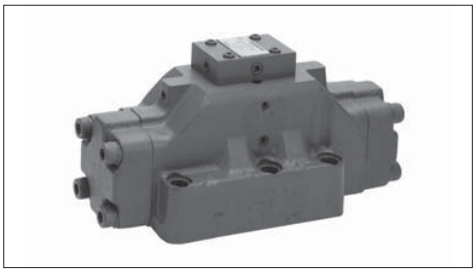
Part No.	Name	Quantity	Part specifications			Part specifications
			MEP-12	MEP-16	MEP-20	
2	O-ring	2	AS568-008	AS568-008	AS568-008	NBR, Hs90
3	O-ring	5	AS568-112	AS568-115	AS568-118	NBR, Hs90
4	O-ring	2	AS568-025	AS568-128	AS568-136	NBR, Hs90
7	O-ring	2	AS568-024	AS568-024	AS568-026	NBR, Hs90
10	O-ring	2	1B P9	1B P9	1B P12	JIS B 2401
11	Backup ring	2	P9	P9	P12	JIS B 2407 bias cut
14	O-ring	4	AS568-010	AS568-010	AS568-010	NBR, Hs90
18	Sealing washer	2	KP-C-02	KP-C-02	KP-C-02	
22	O-ring	1	1B P5	1B P5	1B P10A	JIS B 2401
23	O-ring	2	AS568-008	AS568-008	AS568-009	NBR, Hs90

● MEP25, 32



Part No.	Name	Quantity	Part specifications		Part specifications
			MEP-25	MEP-32	
2	O-ring	2	AS568-008	AS568-008	NBR, Hs90
3	O-ring	3	AS568-121	AS568-125	NBR, Hs90
4	O-ring	2	AS568-117	AS568-120	NBR, Hs90
5	O-ring	2	AS568-228	AS568-231	NBR, Hs90
8	O-ring	2	AS568-026	AS568-026	NBR, Hs90
11	O-ring	2	1B P12	1B P12	JIS B 2401
12	Backup ring	2	P12	P12	JIS B 2407 bias cut
16	O-ring	4	AS568-010	AS568-010	NBR, Hs90
20	Sealing washer	2	KP-C-02	KP-C-02	
24	O-ring	1	1B P10A	1B P12	JIS B 2401
25	O-ring	2	AS568-009	AS568-009	NBR, Hs90

Pilot Operated Directional Control Valve



Features

- These directional control valves enable switching of the direction of flow of the fluid by operating the spool with the hydraulic pilot valve.

Nomenclature

※	–	JP	–	G	※※	–	※※	※	–	※
1		2		3	4		5	6		7

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

2 Model No.
JP: J series pilot operated directional control valve

3 Connections
G: Gasket mount type

4 Nominal diameter
03: ⅜ 06: ¾ 10: 1¼

5 Spool type (See the model table)

6 Spool operating method (See the model table)
C: Spring center type
B: Spring offset type
N: No-spring type

7 Design No.
(The design No. is subject to change)
10: Nominal diameter 03 (⅜)
12: Nominal diameter 10 (1¼)
13: Nominal diameter 06 (¾)

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Pilot pressure MPa {kgf/cm²}	Permissible back pressure MPa {kgf/cm²}	Mass kg
JP-G03	⅜	21 {210}	*1	0.45 to 21 {4.5 to 210}	21 {210}	5.5
JP-G06	¾					12.5
JP-G10	1¼					45

Note: *1 Refer to JSP–G03 on Page G-30 and JS–G※※ on Page G-54 for the maximum flow rate for type C and type N spool operating methods. See the table below for the maximum flow rate for the type B spool operating method.

Model code	Maximum flow rate (type B) L/min		
	Pressure MPa {kgf/cm²}		
	7 {70}	14 {140}	21 {210}
JP-G03-※※B	120	120	120
JP-G06-※※B	230	190	150
JP-G10-※※B	500	450	400

Sub-plate model code

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

Model No.	Nominal diameter	Connection port diameter	Mass kg
JS-06M	¾	Rc¾	5.2
JS-06M08		Rc1	
JS-10M	1¼	Rc1¼	17
JS-10M12		Rc1½	

Note: Refer to Page S-9 for the dimensions of the sub-plate for G06 and G10. No sub-plate is provided for JP-G03.

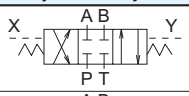
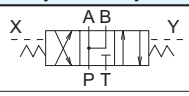
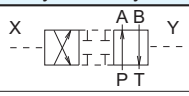
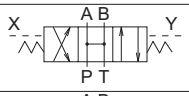
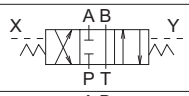
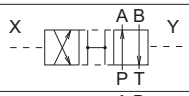
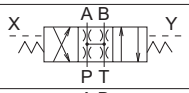
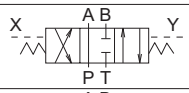
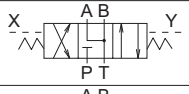
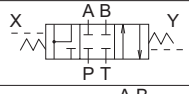
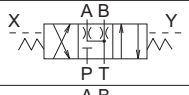
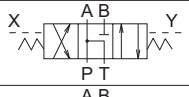
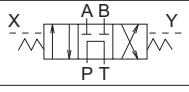
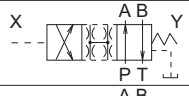
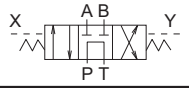
Accessories

Model No.	Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
JP-G03	M6 × 35	4	11 to 14 {110 to 140}
JP-G06	M12 × 60	6	85 to 110 {850 to 1100}
JP-G10	M20 × 70	6	200 to 220 {2000 to 2200}

Handling

- For the type B spool operating method, use port Y as the drain port and directly connect the drain piping to the tank without merging it with other tank piping.

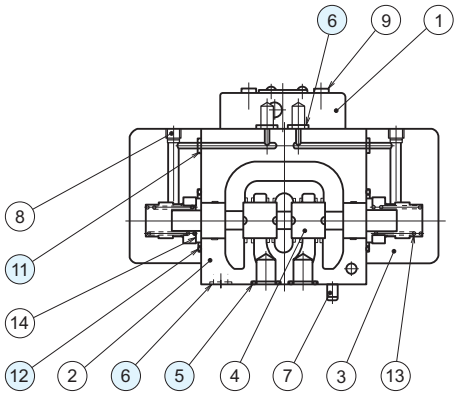
5 6: Model table

Model code	JIS graphic symbols for hydraulic system	Model code	JIS graphic symbols for hydraulic system	Model code	JIS graphic symbols for hydraulic system
JP-G※※-2C		JP-G※※-7C		JP-G※※-2N	
JP-G※※-3C		JP-G※※-8C		JP-G※※-3N	
JP-G※※-33C		JP-G※※-9C		JP-G※※-33N	
JP-G※※-4C		JP-G※※-27C		JP-G※※-4N	
JP-G※※-44C		JP-G※※-2B			
JP-G※※-5C		JP-G※※-3B			
JP-G※※-6C		JP-G※※-33B			
JP-G※※-66C		JP-G※※-4B			

Note: In the transient period of switching, all ports are blocked with spool type 6C, and all ports are open with spool type 66C.

Sectional structural diagram

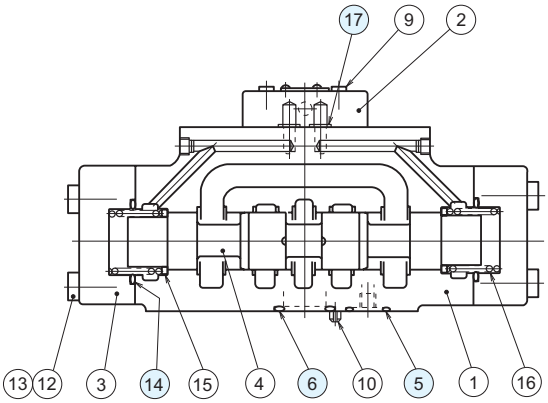
JP-G03



Sealing part table

Part No.	Name	Quantity	Part specifications
5	O-ring	5	JIS B 2401 1B P12
6	O-ring	6	JIS B 2401 1B P9
11	O-ring	4	JIS B 2401 1B P5
12	O-ring	2	AS568-123 (NBR, Hs90)

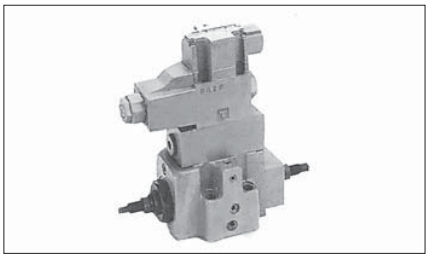
JP-G06, G10

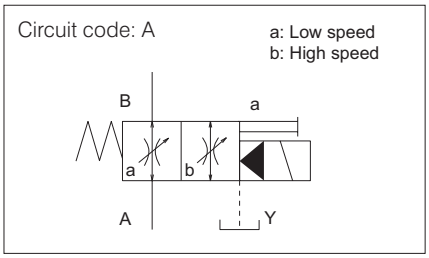


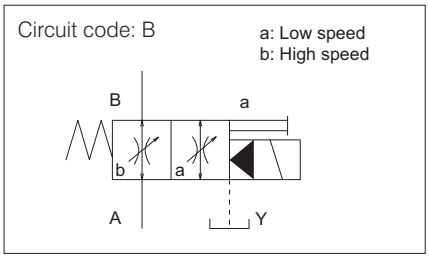
Sealing part table

Part No.	Name	Quantity	Part specifications	
			JP-G06	JP-G10
5	O-ring	2	JIS B 2401 1B P20	JIS B 2401 1B P20
6	O-ring	4	JIS B 2401 1B P28	JIS B 2401 1B G40
14	O-ring	2	JIS B 2401 1B P40	JIS B 2401 1B G60
17	O-ring	4	JIS B 2401 1B P9	JIS B 2401 1B P9

Type C2 Solenoid Pilot Operated Directional Control Valve (with 2-speed Throttle Function)







Features

- Enables 2-speed control (acceleration/deceleration control) of an actuator by switching the solenoid pilot valve.

Nomenclature

※	-	C2S	W	-	G	※※	-	※	※※	※	-	30	-	※	※
1		2	3		4	5		6	7	8		9		10	11

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
H: Water-glycol hydraulic fluid
F: Phosphate ester hydraulic fluid

2 Model No.
C2S: Type C2 solenoid pilot valve

3 Compound function
W: With 2-speed throttle function

4 Connections
G: Gasket mount type

5 Nominal diameter
03: ⅜ 06: ¾

6 Circuit code
A: Low speed when not energized, B: High speed when not energized

7 Cracking pressure code
10: 0.1 MPa {1 kgf/cm^2} at flow A → B
0.17 MPa {1.7 kgf/cm^2} at flow B → A
40: 0.4 MPa {4 kgf/cm^2} at flow A → B
0.67 MPa {6.7 kgf/cm^2} at flow B → A

8 Voltage code for the solenoid valve
A: AC 100 V (50/60 Hz), AC 110 V (60 Hz)
B: AC 200 V (50/60 Hz), AC 220 V (60 Hz)
P: DC 24 V

9 Design No.
(The design No. is subject to change)

10 Option code
No designation: Flow rate adjusting screw type
D: Digital handle type

11 Solenoid pilot valve option code
See the option code table of KSO-G02 on Page G-12 for the options for solenoid pilot valves.

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm^2}	Maximum flow rate L/min	Permissible back pressure MPa {kgf/cm^2}	Cartridge area ratio *1	Cartridge drainage volume cm^3	Mass kg
C2SW-G03	⅜	25 {250}	200	16 {160}	AA:AF = 1:1.6	2 maximum	6.7
C2SW-G06	¾		500			5 maximum	9.8

Note: *1 Area at port A (AA) : Area at port F (AF)

Refer to KSO-G02 on Page G-12 for the solenoid specifications.

Model code	Applicable solenoid valve model code (※: Voltage code)
C2SW-G※※-A※※※	KSO-G02-2A※-30
C2SW-G※※-B※※※	KSO-G02-2A※-30-M

Accessories

Model No.	Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
C2SW-G03	M10 × 60	4	51 to 68 {510 to 680}
C2SW-G06	M10 × 75	4	51 to 68 {510 to 680}

Sub-plate model code

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

Model code	Nominal diameter	Connection port diameter	Mass kg
JGB-03M	⅜	Rc⅜	1.6
JGB-03M04		Rc½	
JGB-06M	¾	Rc¾	3.9
JGB-06M08		Rc1	

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

Handling

● **External drain pressure and switching conditions**

○ When the solenoid with circuit code A is energized and the solenoid with circuit code B is not energized, the valve cannot be switched at an external drain pressure (at port Y) of $^{1}/_{1.6}$ × {Pressure at port A + 0.6 × Pressure at port B - (Spring force with flow A → B)} or greater. Therefore, directly connect the drain piping to the tank without merging it with other tank piping.

● **Flow rate adjusting method**

○ With the high-speed flow rate adjusting screw, counterclockwise turning increases the flow rate. With the low-speed flow rate adjusting screw, clockwise turning increases the flow rate.

○ Since a large force will be required to operate the flow rate adjusting screw when the pressures at ports A and B increase, adjust the flow rate at 10 MPa {100 kgf/cm^2} maximum.

● **Adjusting responsiveness at switching**

○ Adjustment using the fixed throttles

The responsiveness can be adjusted by changing the responsiveness adjusting fixed throttles (NPTF $^{1}/_{16}$).
At shipment, the product is equipped with C2SW-G03 (ϕ1.0) and C2SW-G06 (ϕ1.2).
If you require fixed throttles other than these, order them separately by referring to the model codes below.

Model code: T1-16-※※ (※※: Throttle diameter code) Tightening torque: 6 to 7.5 N·m {60 to 75 kgf·cm}

Throttle diameter code	06	07	08	09	10	12	14	16	18	20	25
Fixed throttle diameter	ϕ0.6	ϕ0.7	ϕ0.8	ϕ0.9	ϕ1	ϕ1.2	ϕ1.4	ϕ1.6	ϕ1.8	ϕ2	ϕ2.5

○ Adjustment using the pilot throttle valve

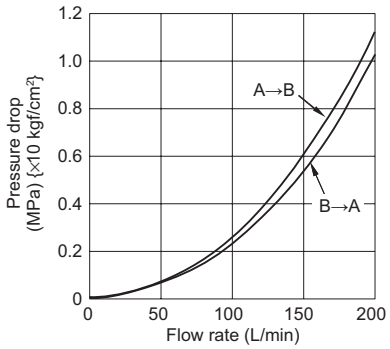
To control the opening speed and closing speed of the valve separately, stack size 02 stack valves below the solenoid pilot valve. When using stack valves, order mounting bolts separately by referring to the table below since the mounting bolts required differ depending on the stacking height.

	Opening speed adjustment	Closing speed adjustment	Opening/closing speed adjustment
Stack valve model code	MT-02B-55	MT-02Bi-55	MT-02B-55, MT-02Bi-55
Mounting bolt model code	HB102		HB103
Hexagon socket head cap bolt	M5 × 125		M5 × 165
Tightening torque N·m {kgf·cm}	6 to 8 {60 to 80}		

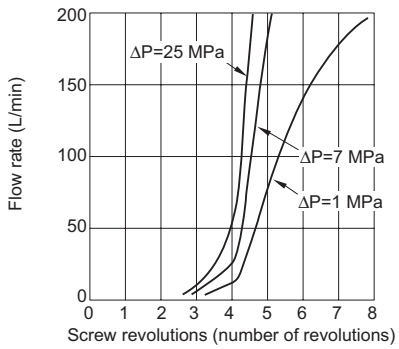
Performance curves (viscosity: 32 mm^2/s {cSt})

● C2SW-G03

Pressure drop characteristics

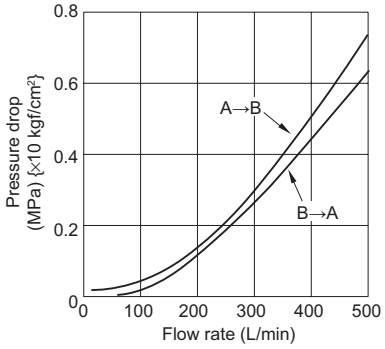


Adjusting screw revolution - Flow rate characteristics

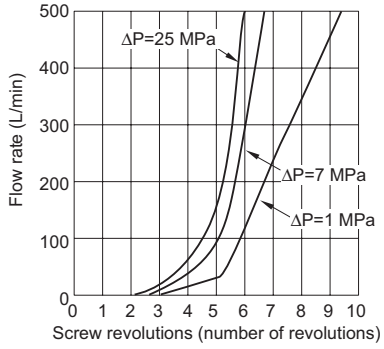


● C2SW-G06

Pressure drop characteristics

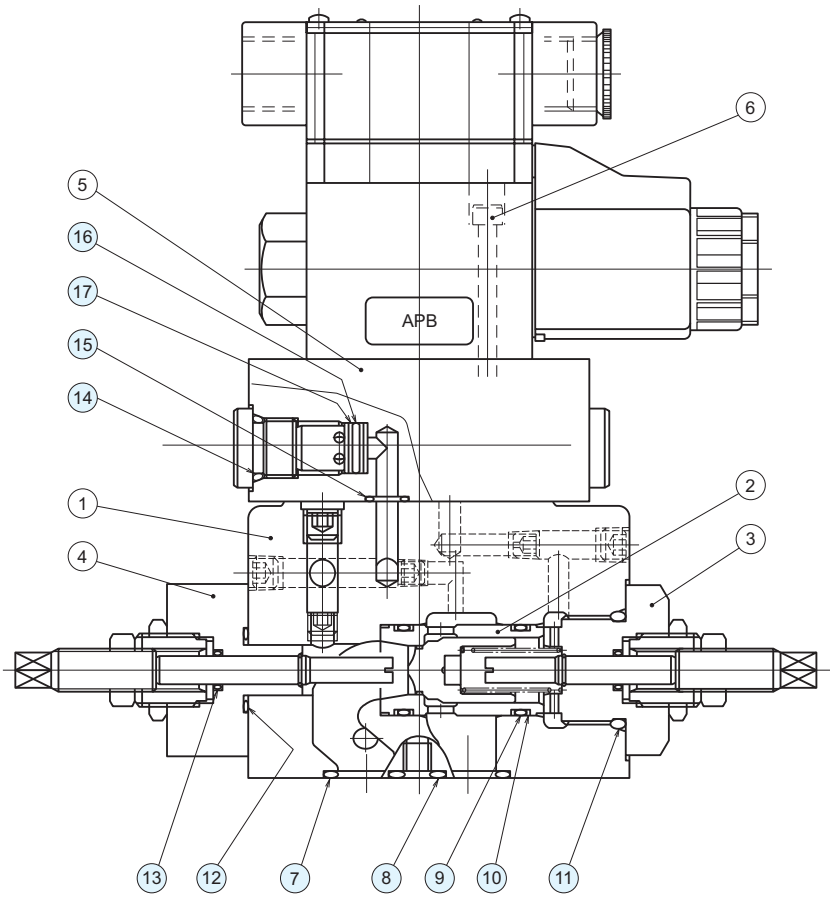


Adjusting screw revolution - Flow rate characteristics



Sectional structural diagram

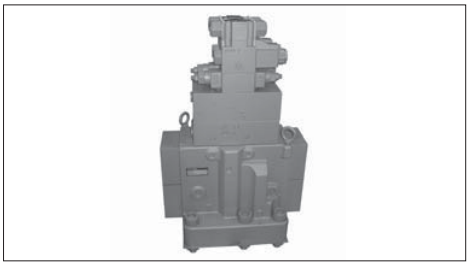
● C2SW-G03, 06



Sealing part table

Part No.	Name	Quantity	Part specifications	
			C2SW−G03	C2SW−G06
7	O-ring	2	JIS B 2401 1B P20	JIS B 2401 1B P28
8	O-ring	2	JIS B 2401 1B P12	JIS B 2401 1B P12
9	O-ring	2	AS568-020 (NBR, Hs90)	AS568-122 (NBR, Hs90)
10	Backup ring	4	Bias cut for AS568-020	Bias cut for AS568-122
11	O-ring	1	AS568-215 (NBR, Hs90)	AS568-222 (NBR, Hs90)
12	O-ring	1	AS568-019 (NBR, Hs90)	AS568-026 (NBR, Hs90)
13	O-ring	2	AS568-011 (NBR, Hs90)	AS568-011 (NBR, Hs90)
14	O-ring	2	JIS B 2401 1B P14	JIS B 2401 1B P14
15	O-ring	4	JIS B 2401 1B P9	JIS B 2401 1B P9
16	O-ring	2	AS568-013 (NBR, Hs90)	AS568-013 (NBR, Hs90)
17	Backup ring	2	Bias cut for AS568-013	Bias cut for AS568-013

Type C4 Solenoid Pilot Operated Directional Control Valve



Features

- These compound valves incorporating the functions of a differential circuit, counterbalance valve and a throttle valve, along with a decompression function, make it easy to construct a hydraulic press circuit.

Nomenclature

※	—	C4S	※	—	G	06	—	7	QD	※	※	—	30	—	※	※	※
1		2	3		4	5		6	7	8	9		10		11	12	13

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
H: Water-glycol hydraulic fluid
F: Phosphate ester hydraulic fluid

2 Model No.
C4S: Type C4 solenoid pilot valve

3 Compound function
No designation: Without throttle function
T: With meter-in throttle function at ports A and B

4 Connections
G: Gasket mount type

5 Nominal diameter
06: ¾

6 Switch code
7: Equivalent to 7C

7 Circuit code
QD: With counterbalance valve function at port A
With decompression function at port B

8 Pressure adjustment range of counterbalance valve at port A
1: Up to 7 MPa {Up to 70 kgf/cm^2}
2: Up to 16 MPa {Up to 160 kgf/cm^2}
3: Up to 25 MPa {Up to 250 kgf/cm^2}

9 Voltage code for the solenoid valve
A: AC 100 V (50/60 Hz), AC 110 V (60 Hz)
B: AC 200 V (50/60 Hz), AC 220 V (60 Hz)
P: DC 24 V

10 Design No.
(The design No. is subject to change)

11 Cartridge valve option code *1
No designation: Standard cartridge valve type
K: Shockless cartridge valve type

12 Option code
No designation: Flow rate adjusting screw type
D: Digital handle type

13 Solenoid pilot valve option code
See the option code table of KSO-G02 on Page G-12 for the options for solenoid pilot valves.

Note: *1 Applicable only to C4S (without throttle function)

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm^2}	Maximum flow rate L/min	Permissible back pressure MPa {kgf/cm^2}	Mass kg
C4S※-G06	¾	25 {250}	400	7 {70} *2	50

Note: *2 Keep the back pressure of the tank line as small as possible since it is added to the minimum adjustment pressure of the counterbalance valve function.

Refer to KSO-G02 on Page G-12 for the solenoid specifications.

Sub-plate model code

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

Model code	Nominal diameter	Connection port diameter	Mass kg
JS-06M	¾	Rc¾	5.2
JS-06M08		Rc1	

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

Accessories

Model No.	Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
C4S※-G06	M12 × 90	6	80 to 100 {800 to 1000}

Handling

- **Adjusting switching response**
  - ○ The response can be adjusted by changing the adjusting fixed throttles (NPTF1/16).
  - ○ The opening/closing speeds from port P to port A, from port P to port B, and from port B to port T can be adjusted using the fixed throttle for each cartridge element at PA, PB, and BT.
  - ○ At shipment, the product is equipped with fixed throttles of ϕ1.4 at PA and PB and of ϕ1 at BT. If you require fixed throttles other than these, order them separately by referring to the model codes below.

Model code: T1-16-※※ (※※: Throttle diameter code) Tightening torque: 6 to 7.5 N·m {60 to 75 kgf·cm}

Throttle diameter code	06	07	08	09	10	12	14	16	18	20	25
Fixed throttle diameter	ϕ0.6	ϕ0.7	ϕ0.8	ϕ0.9	ϕ1	ϕ1.2	ϕ1.4	ϕ1.6	ϕ1.8	ϕ2	ϕ2.5

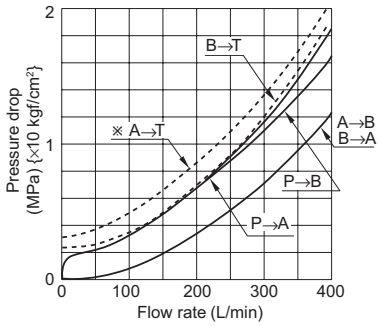
- **Flow rate adjustment method (only with C4ST)**
  - ○ Turning the flow rate adjusting screw counterclockwise increases the flow rate.
  - ○ Since a large force will be required to operate the flow rate adjusting screw when the pressures at ports P, A, B and T increase, adjust the flow rate at 10 MPa {100 kgf/cm²} maximum or with the solenoid valve turned off.a
- **Pressure responsiveness adjusting method (counterbalance valve function)**
  Turning the pressure adjusting screw clockwise increases the pressure.

Model code	Pressure change (MPa) {kgf/cm²} per screw revolution
C4S※-G06-7QD1※-30	2.5 {25}/revolution
C4S※-G06-7QD2※-30	4.6 {46}/revolution
C4S※-G06-7QD3※-30	7.9 {79}/revolution

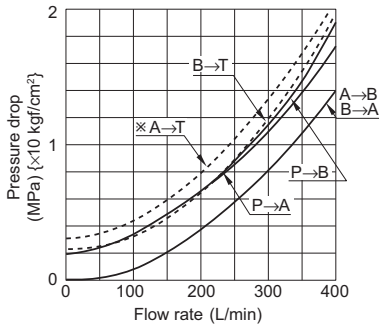
- **Decompression (depressurizing) response adjusting method**
  Turning the adjusting screw clockwise increases the response speed.
- **Differential circuit**
  A differential circuit can be constructed based on energizing of SOL. a, b, c.
  With the meter-in throttle function of C4ST, flows A → B and B → A are controlled with two meter-in throttles.
  The meter-out throttle function does not control flows A → B and B → A. It differs from the JIS graphic symbols for hydraulic system at this point.
- **Shocks at switching can be suppressed by using the shockless cartridge valve type (option code: K).**

Performance curves (viscosity: 32 mm²/s {cSt})

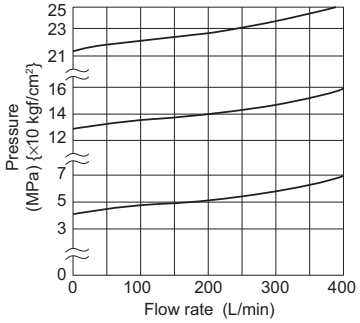
Pressure drop characteristics
C4S



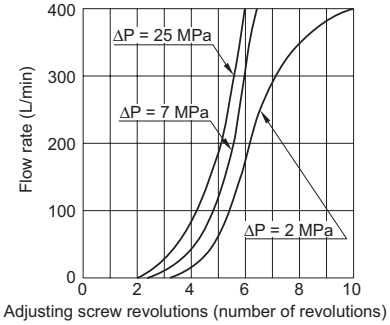
Pressure drop characteristics
C4S-K, C4ST



Pressure - Flow rate characteristics
Counterbalance valve function at port A



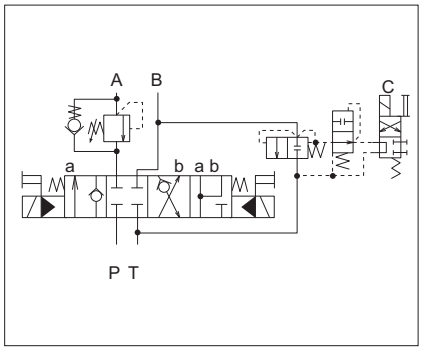
Adjusting screw revolution - Flow rate characteristics (C4ST)
Meter-in throttle (P → A, P → B)



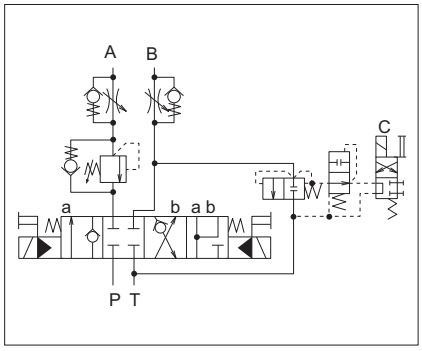
Note: The line marked with (※) indicates the minimum adjustment pressure of the counterbalance valve function.

JIS graphic symbols for hydraulic system

C4S

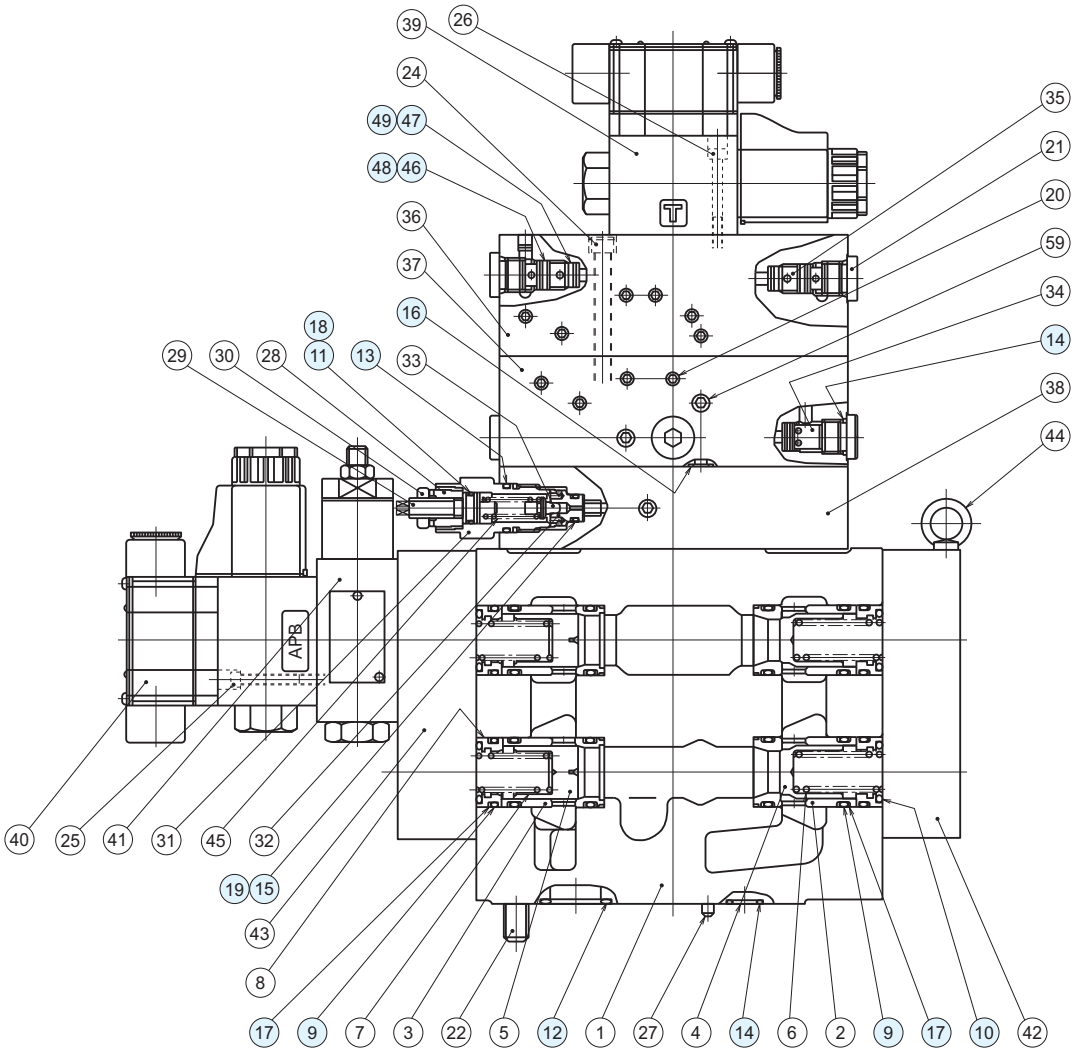


C4ST



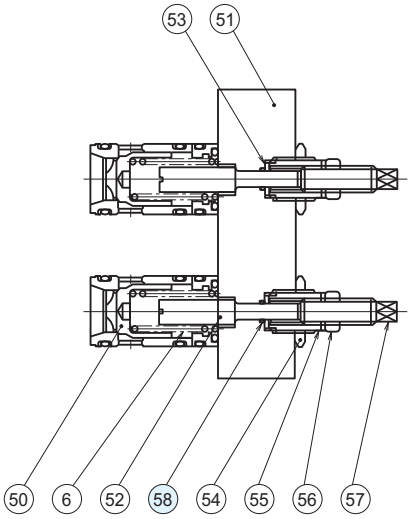
Sectional structural diagram

● C4S-G06-7QD



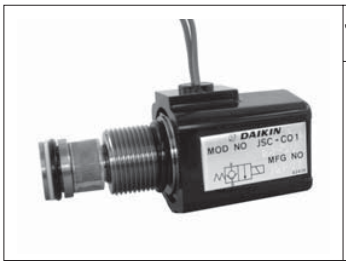
Sealing part table

Part No.	Name	Quantity	Part specifications
9	O-ring	12	AS568-122（NBR, Hs90）
10	O-ring	4	JIS B 2401 1B P24
11	O-ring	1	AS568-014（NBR, Hs90）
12	O-ring	4	JIS B 2401 1B G30
13	O-ring	1	JIS B 2401 1B P20
14	O-ring	9	JIS B 2401 1B P14
15	O-ring	1	JIS B 2401 1B P10
16	O-ring	32	JIS B 2401 1B P9
17	Backup ring	20	Bias cut for AS568-122
18	Backup ring	1	Bias cut for AS568-014
19	Backup ring	1	JIS B 2407 bias cut P10
46	O-ring	2	AS568-012（NBR, Hs90）
47	O-ring	2	AS568-013（NBR, Hs90）
48	Backup ring	2	Bias cut for AS568-012
49	Backup ring	2	Bias cut for AS568-013
58	O-ring	2	AS568-011（NBR, Hs90）

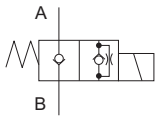


With C4ST-G06-7QD

Seat Type Solenoid Valve



JIS graphic symbols for hydraulic system



Features

- No hydraulic locking occurs even during long periods of pressurized operation

Nomenclature

※ - JSC - ※ 01 - 2 ※ - 10 - ※

1 2 3 4 5 6 7 8

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
F: Phosphate ester hydraulic fluid

2 Model No.
JSC: J series seat type solenoid valve

3 Connections
G: Gasket mount type
C: Cartridge mount type

4 Nominal diameter
01: ⅛

5 Maximum operating pressure
2: 25 MPa {250 kgf/cm^2}

6 Voltage code
(See the solenoid specification table)

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

8 Option code
No designation: Lead wire type
C: DIN connector type (without lamp)
CL: DIN connector type (with lamp)

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm^2}	Maximum flow rate L/min	Maximum switching frequency Times per minute	Leak amount cm^3/min	Mass kg	
						Gasket mount type (G)	Cartridge mount type (C)
JSC-※01	⅛	25 {250}	15	240	0.25 maximum	0.97	0.27

6: Solenoid specification table

Voltage code	Power supply voltage	Starting current A	Holding current A	Holding power W	Permissible voltage fluctuation %
A	AC 100 V (50 Hz)	0.362	0.258	17	80 to 110
	AC 100 V (60 Hz)	0.318	0.208	14	90 to 121
	AC 110 V (60 Hz)	0.356	0.244	18	82 to 110
B	AC 200 V (50 Hz)	0.183	0.13	17	80 to 110
	AC 200 V (60 Hz)	0.158	0.104	14	90 to 121
	AC 220 V (60 Hz)	0.178	0.121	18	82 to 110
N	DC 12 V	–	1.48	17.8	90 to 110
P	DC 24 V	–	0.74	17.8	90 to 110

Note: The current and power indicated are the values at 20°C.

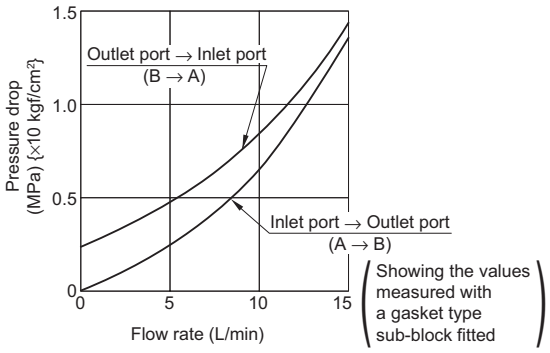
Time rating	Insulation resistance	Withstand voltage	Insulation type
Continuous	50 MΩ	AC 1500 V, 1 minute	Class B (Class H for coils)

Accessories (gasket mount type)

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

Performance curves (viscosity: 32 mm²/s {cSt})

Pressure drop characteristics



Operation time (Sec.)

Power supply	Operating direction	Operation time Sec.
AC	Excited	0.02 to 0.03
	Demagnetized	0.02
DC	Excited	0.03
	Demagnetized	0.03 to 0.04

Note: The operation time may change slightly depending on the conditions of use (pressure, flow rate, hydraulic fluid viscosity, etc.).

Handling

- **Wiring guide for solenoid (AC solenoid valve)**
  Solenoids can be used with both 50 and 60 Hz.
- **Flow direction**
  ○ Flow A → B is blocked with the solenoid at the normal position (non-energized state), and flow B → A becomes a free flow at the cracking pressure of approximately 0.2 MPa {2 kgf/cm²}.
  ○ Flow B → A cannot be utilized with the solenoid excited.
- **Tightening torque**

	Tightening torque N·m {kgf·cm}
Cartridge	66 to 70 {660 to 700}
Button bolt	3 to 4 {30 to 40}

Solenoid model codes

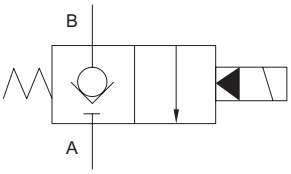
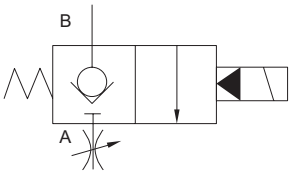
Details	Model code of solenoid coil
Lead wire type	C-PS-※
DIN connector type	C-PS-※-C1

Note: ※: Voltage code
○ DIN connector type solenoid coils are not provided with a DIN connector socket.
○When a DIN connector socket is required, order it from your nearest distributor, specifying the model code given in the table below.
Manufacturer: Hirschmann

Model code	Power supply voltage	Details
GDM2011		Without lamp
GDML2011-LG110-H0	AC 100 V, AC 110 V	With lamp
GDML2011-LG240-H0	AC 200 V, AC 220 V	
GDML2011-2LED12-H0	DC 12 V	
GDML2011-2LED24-H0	DC 24 V	

Type C2 Seat Type Solenoid Pilot Valve

JIS graphic symbols for hydraulic system

C2SL	C2SLT
	

Features

● No hydraulic locking occurs even during long periods of pressurized operation

Nomenclature

※	–	C2SL	※	–	G	※※	–	※※	※	–	10	–	※	※	※
1		2	3		4	5		6	7		8		9	10	11

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid
F: Phosphate ester hydraulic fluid

2 Model No.
C2SL: Type C2 seat type solenoid pilot valve

3 Compound function
No designation: Without throttle function
T: With throttle function

4 Connections
G: Gasket mount type

5 Nominal diameter
03: ⅜
06: ¾

6 Cracking pressure code
03: 0.05 MPa {0.5 kgf/cm^2} at flow B → A
10: 0.17 MPa {1.7 kgf/cm^2} at flow B → A

7 Voltage code for the solenoid valve
A: AC 100 V (50/60 Hz), AC 110 V (60 Hz)
B: AC 200 V (50/60 Hz), AC 100 V (60 Hz)
P: DC 24 V

8 Design No.
(The design No. is subject to change)

9 Cartridge valve option code *1
No designation: Standard cartridge valve type
K: Shockless cartridge valve type

10 Option code *2
No designation: Standard adjusting screw type
D: Digital handle type

11 Solenoid pilot valve option code
No designation: Lead wire type
C: DIN connector type (without lamp)
CL: DIN connector type (with lamp)

Note: *1 Applicable only to C2SL (without throttle function)
*2 Applicable only to C2SLT (with throttle function)

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm^2}	Maximum flow rate L/min	Maximum switching frequency Times per minute	Leak amount cm^3/min	Cartridge area ratio *3	Cartridge drainage volume cm^3 *4		Mass kg
							(1)	(2)	
C2SL※-G03	⅜	25 {250}	200	240	0.25 maximum	AA:AF = 1:1.6	1.5	2	5.2
C2LS※-G06	¾		500				3.5	5	8

Note: *3 Area at port A (AA) : Area at port F (AF)
*4 Cartridge drainage volume (1) Model code: C2SL
(2) Model code: C2SLT, C2SL-K

Refer to JSC-※01 on Page G-78 for the solenoid specifications.

Accessories

Model No.	Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
C2SL※-G03	M10 × 60	4	51 to 68 {510 to 680}
C2SL※-G06	M10 × 75	4	51 to 68 {510 to 680}

Sub-plate model code

- The sub-plate is not provided with the valve. Order it separately if 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.

Handling

- **Flow A → B cannot be utilized with the solenoid either energized or demagnetized.**
- **Flow rate adjusting method (with C2SLT energized)**
  - ○ Turning the flow rate adjusting screw counterclockwise increases the flow rate.
  - ○ Since a large force will be required to operate the flow rate adjusting screw when the pressures at ports A and B increase, adjust the flow rate at 10 MPa {100 kgf/cm^2} maximum.
  - ○ The flow rate will not be zero even when the flow rate adjusting screw is fully tightened. See the minimum control flow rate characteristics.
- **Adjusting response at switching**
  - ○ Adjustment using the fixed throttles
    The response can be adjusted by changing the responsive adjusting fixed throttles (NPTF1/16).
    At shipment, the product is not equipped with fixed throttles.
    If you require fixed throttles, order them separately by referring to the model codes below.
    Model code: T1-16-※※ (※※: Throttle diameter code) Tightening torque: 6 to 7.5 N·m {60 to 75 kgf·cm}

Throttle diameter code	06	07	08	09	10	12	14	16	18	20	25
Fixed throttle diameter	ϕ0.6	ϕ0.7	ϕ0.8	ϕ0.9	ϕ1	ϕ1.2	ϕ1.4	ϕ1.6	ϕ1.8	ϕ2	ϕ2.5

  - ○ Adjustment using the pilot throttle valve
    To control the opening speed and closing speed of the valve separately, stack size 02 stack valves below the solenoid pilot valve. When using stack valves, order mounting bolts separately by referring to the table below since the mounting bolts required differ depending on the stacking height.

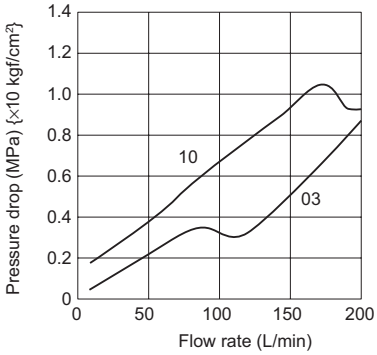
	Opening speed adjustment	Closing speed adjustment	Opening/closing speed adjustment
Stack valve model code	MT-02B-55	MT-02Bi-55	MT-02B-55, MT-02Bi-55
Hexagon socket head cap bolt	M5 × 90		M5 × 130
Quantity	4		4
Tightening torque N·m {kgf·cm}	6 to 8 {60 to 80}		

- **Shocks at switching can be suppressed by using the shockless cartridge valve type (option code: K).**

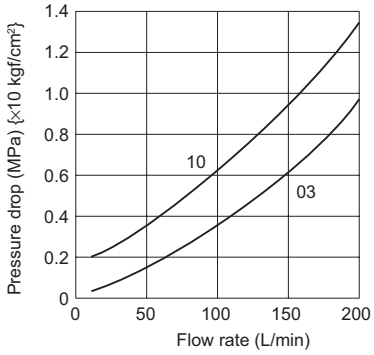
Performance curves (viscosity: 32 mm²/s {cSt})

● C2SL※-G03

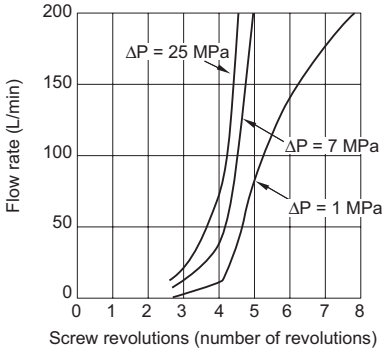
Pressure drop characteristics
C2SL



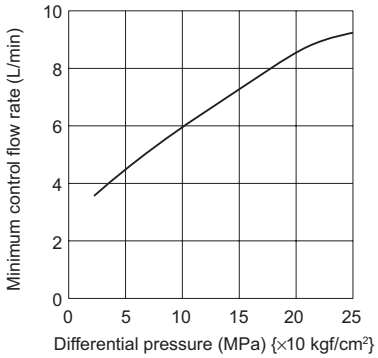
Pressure drop characteristics
C2SL-K, C2SLT



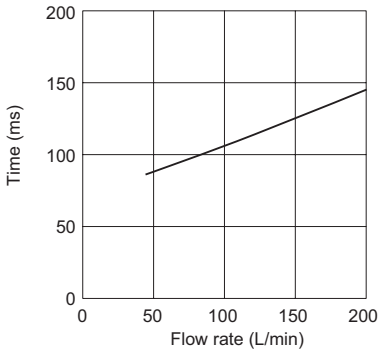
Adjusting screw revolution - Flow rate characteristics
With C2SLT energized



Minimum control flow rate characteristics
With C2SLT energized



Response (closing time) *5



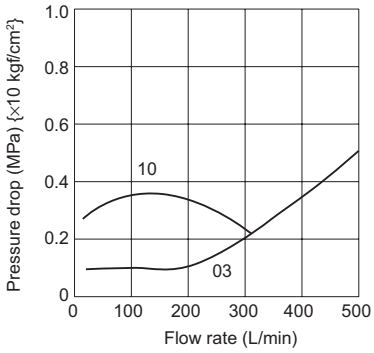
Response (opening time)

Power supply	Opening time (sec)
AC	0.025 to 0.035
DC	0.035

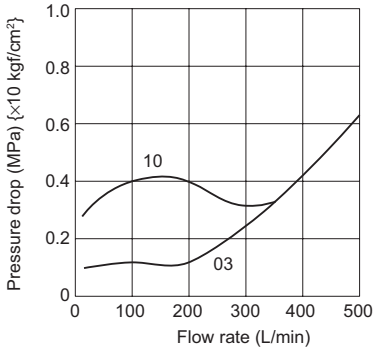
Note:
*5 With the pressure at port B set at 25 MPa {250 kgf/cm²} when demagnetized and the port A vent to the tank for C2SL-G03-10P-10
*5 The closing time may change slightly depending on the differential pressure.

● C2SL※-G06

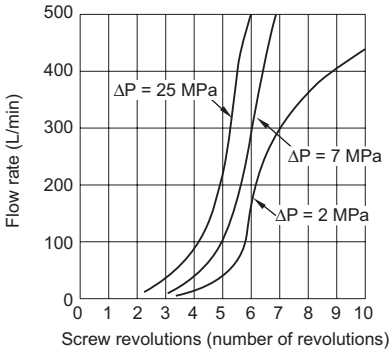
Pressure drop characteristics
C2SL



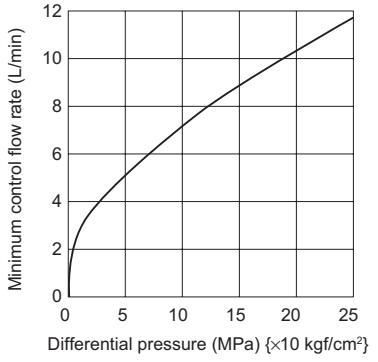
Pressure - Flow rate characteristics
C2SL-K, C2SLT



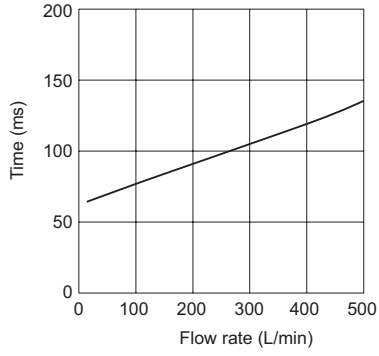
Adjusting screw revolution - Flow rate characteristics
With C2SLT energized



Minimum control flow rate characteristics
With C2SLT energized



Response (closing time) *6



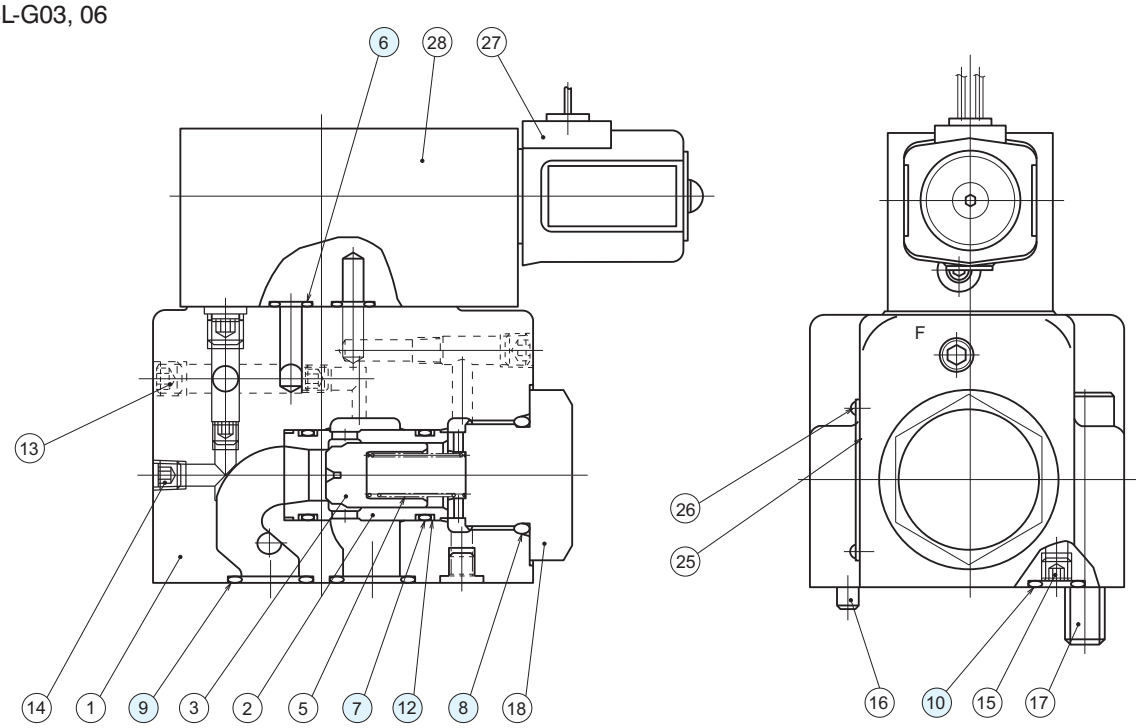
Response (opening time)

Power supply	Opening time (Sec.)
AC	0.025 to 0.035
DC	0.035

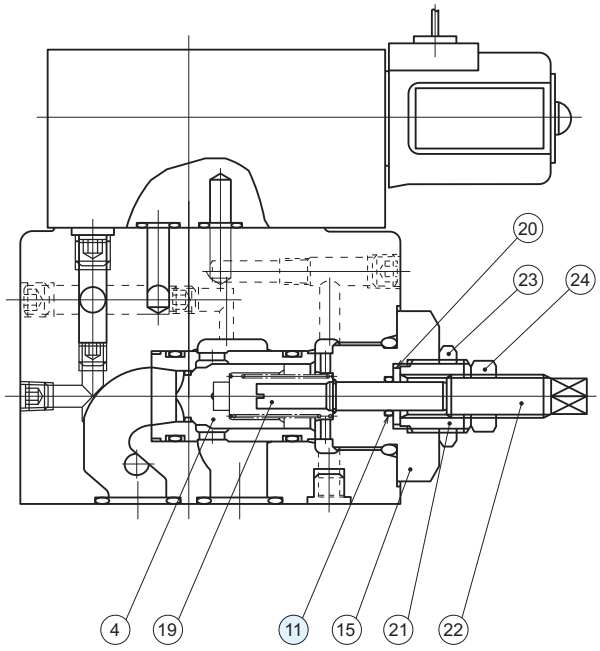
Note:
*6 With the pressure at port B set at 25 MPa {250 kgf/cm²} when demagnetized and the port A vent to the tank for C2SL-G06-10P-10
*6 The closing time may change slightly depending on the differential pressure.

Sectional structural diagram

● C2SL-G03, 06



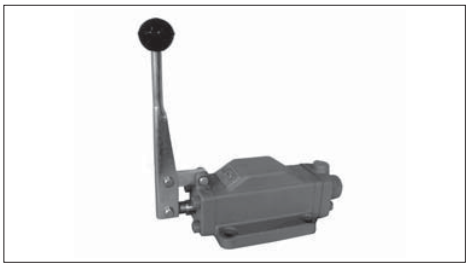
● C2SLT-G03, 06



Sealing part table

Part No.	Name	C2SL (T) -G03		C2SL (T) -G06	
		Quantity	Part specifications	Quantity	Part specifications
6	O-ring	4	JIS B 2401 1B P9	4	JIS B 2401 1B P9
7	O-ring	2	AS568-020 (NBR, Hs90)	2	AS568-122 (NBR, Hs90)
8	O-ring	1	AS568-215 (NBR, Hs90)	1	AS568-222 (NBR, Hs90)
9	O-ring	2	JIS B 2401 1B P20	2	JIS B 2401 1B P28
10	O-ring	2	JIS B 2401 1B P12	2	JIS B 2401 1B P12
11	O-ring	1	AS568-011 (NBR, Hs90)	5	AS568-011 (NBR, Hs90)
12	Backup ring	4	Bias cut for AS568-020	4	Bias cut for AS568-122

Manually Operated Valve



Features

- These directional control valves enable switching of the direction of fluid flow by operating the spool with the manual operation lever.
- The handle can be operated easily even at a high pressure.

Nomenclature

※	-	DMO	4	-	※	※	※※	-	※	※
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.
DMO: D series manually operated valve

3 Number of directions
4: 4-way valve

4 Number of positions
2: 2-position valve
3: 3-position valve

5 Connections
G: Gasket mount type
T: Screw connection type

6 Nominal diameter
03: ⅜ 06: ¾

7 Spool type (See the model table)

8 Spool operating method (See the model table)
C: Spring center type
B: Spring offset type
N: No-spring type (with detent)

Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Permissible back pressure MPa {kgf/cm²}	Mass kg	
					Gasket mount type (G)	Screw connection type (T)
DMO4-※※03	⅜	14 {140}	25	7 {70}	7	4.2
DMO4-※※06	¾		75		11	6.5

Sub-plate model code

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

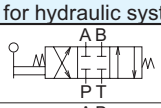
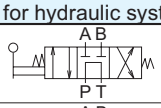
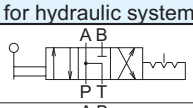
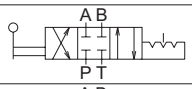
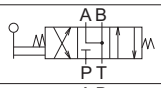
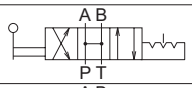
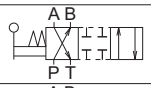
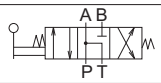
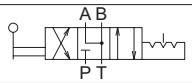
Model code	Nominal diameter	Connection port diameter	Mass kg
DMO-03M	⅜	Rc⅜	2.2
DMO-06M	¾	Rc¾	3.1

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

Accessories (gasket mount type)

Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
M10 × 30	4	48 to 63 {480 to 630}
M12 × 35	4	85 to 110 {850 to 1100}

7 8: Model table

Model code	JIS graphic symbols for hydraulic system	Model code	JIS graphic symbols for hydraulic system	Model code	JIS graphic symbols for hydraulic system
DMO4-3※※※-2C		DMO4-3※※※-66C		DMO4-3※※※-5N	
DMO4-3※※※-3C		DMO4-3※※※-2N		DMO4-3※※※-66N	
DMO4-3※※※-4C		DMO4-3※※※-3N		DMO4-2※※※-2B	
DMO4-3※※※-5C		DMO4-3※※※-4N		DMO4-2※※※-3B	

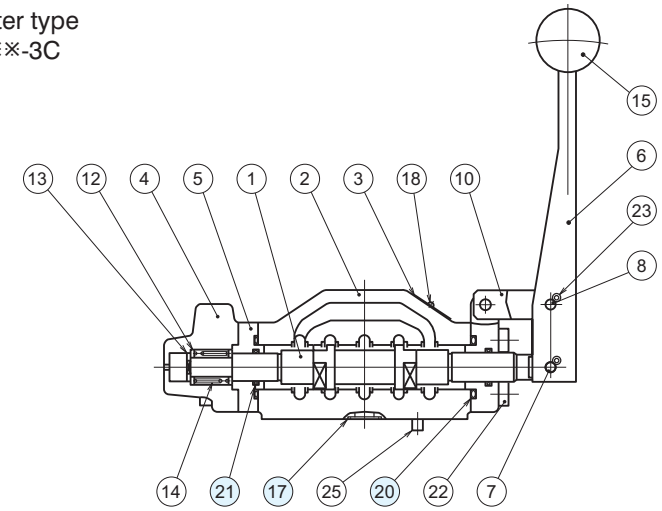
Handling

- Tighten the piping for the screw connection type with the tightening torque given in the table to the right.

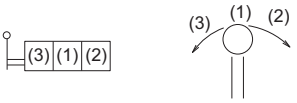
Model code	Tightening torque N·m {kgf·cm}
DMO4-※T03	70 to 80 {700 to 800}
DMO4-※T06	90 to 110 {900 to 1100}

Sectional structural diagram

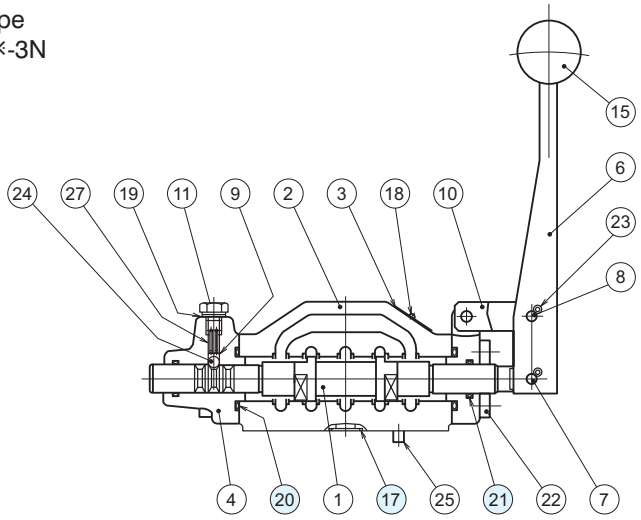
- Spring center type
  DMO4-3G※※-3C



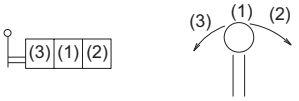
The relationship between the lever position and JIS codes is as follows.



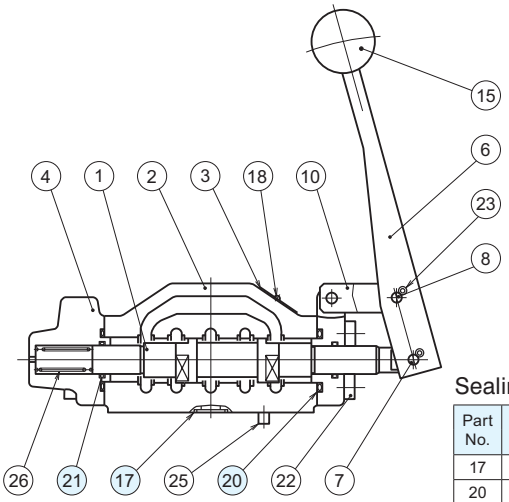
- No-spring type
  DMO4-3G※※-3N



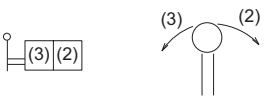
The relationship between the lever position and JIS codes is as follows.



- Spring offset type
  DMO4-2G※※-3B



The relationship between the lever position and JIS codes is as follows.



Sealing part table

Part No.	Name	Quantity	Part specifications	
			DMO4-※ G03	DMO4-※ G06
17	O-ring	4	JIS B2401 1A P15	JIS B2401 1A 22A
20	O-ring	2	JIS B2401 1A G30	JIS B2401 1A G35
21	O-ring	2	AS568-114 (NBR, Hs70)	AS568-116 (NBR, Hs70)

Manually Operated Valve

Features

- These directional control valves enable switching of the direction of fluid flow by operating the spool with the manual operation lever.
- Enables construction of a wide variety of circuits in combination with 02 size stack valves.

Nomenclature

※	–	JM	–	G	02	–	※	※	–	20	–	※
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.
JM: J series manually operated valve

3 Connections
G: Gasket mount type

4 Nominal diameter
02: ¼

5 Spool type (See the model table)

6 Spool operating method (See the model table)
C: Spring center type
B: Spring offset type
N: No-spring type (with detent) 3-position valve
E: No-spring type (with detent) 2-position valve

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

8 Option code
No designation: Lever at port A side
G: Lever at port B side

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Permissible back pressure MPa {kgf/cm²}	Mass kg
JM-G02	¼	21 {210}	30	7 {70}	1.4

Sub-plate model code

- The sub-plate is not provided with the valve. Order it separately if 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

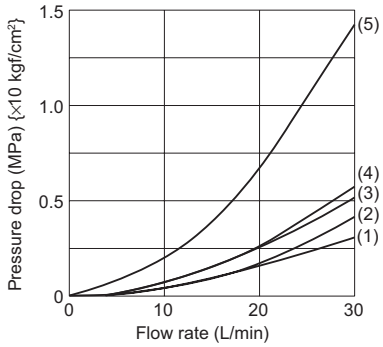
Refer to Page S-8 for the dimensions of the sub-plate.

Accessories

Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
M5 × 45	4	5 to 8 {50 to 80}

Performance curves (viscosity: 32 mm²/s {cSt})

Pressure drop characteristics

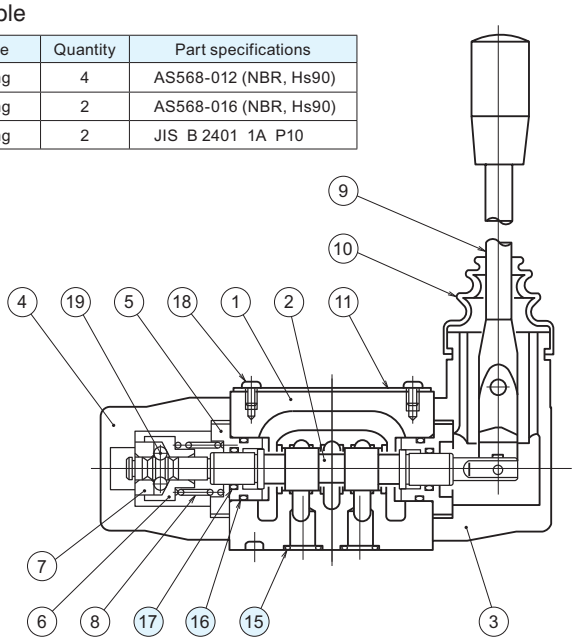


Sectional structural diagram

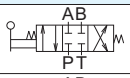
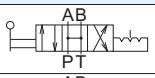
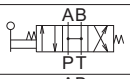
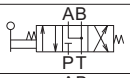
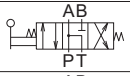
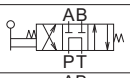
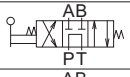
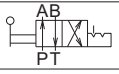
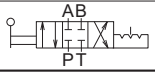
Sealing part table

Part No.	Name	Quantity	Part specifications
15	O-ring	4	AS568-012 (NBR, Hs90)
16	O-ring	2	AS568-016 (NBR, Hs90)
17	O-ring	2	JIS B 2401 1A P10

- JM-G02



5 6: Model table

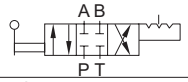
Model code	JIS graphic symbols for hydraulic system	Pressure drop characteristics (See the performance curves)			Model code	JIS graphic symbols for hydraulic system	Pressure drop characteristics (See the performance curves)		
		P → A P → B	B → T A → T	P → T			P → A P → B	B → T A → T	P → T
JM-G02-2C		(1)	(1)	–	JM-G02-3N		(2)	(2)	(2)
JM-G02-3C		(2)	(2)	(2)	JM-G02-4N		(1)	(2)	–
JM-G02-4C		(1)	(2)	–	JM-G02-5N		(1)	(1)	(4)
JM-G02-5C		(1)	(1)	(4)	JM-G02-6N		(3)	(3)	(5)
JM-G02-6C		(3)	(3)	(5)	JM-G02-66N		(3)	(3)	(5)
JM-G02-66C		(3)	(3)	(5)	JM-G02-2E		(2)	(2)	–
JM-G02-2N		(1)	(1)	–	JM-G02-2B		(2)	(2)	–

Note: In the transient period of switching, all ports are blocked with spool types/operating methods 6C and 6N, and all ports are open with spool types/operating methods 66C and 66N.

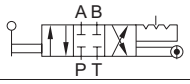
Rotary Directional Control Valve

JIS graphic symbols for hydraulic system

Manually operated type



Cam operated type



Features

- These are compact directional control valves using a rotary spool available in two models, one dedicated to manual operation and the other with a dog for cam operation (manual operation also possible).
- The structure has a high level of pressure balance, which suppresses the variation in the force required to operate the handle according to the pressure change.

Nomenclature

※	-	DRO	※	4	-	3	T	02	-	2	N
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 Basic method
DRO: D series rotary directional control valve

3 Connection method
B: With dog for cam operation
H: Manually operated type (without dog)

4 Number of directions
4: 4-way valve

5 Number of positions
3: 3-position valve

6 Connections
T: Screw connection type

7 Nominal diameter
02: ¼

8 Spool type
2: All ports blocked

9 Spool operating method
N: No-spring type (with detent)

Specifications

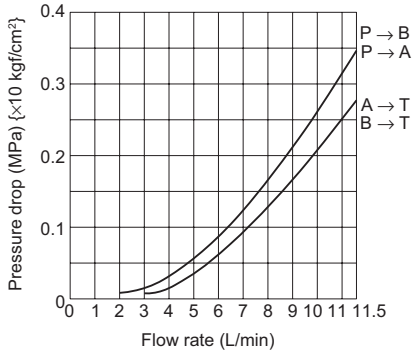
Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Permissible back pressure MPa {kgf/cm²}	Mass kg
DRO※4	¼	7 {70}	11.5	0.5 {5}	1.2

Handling

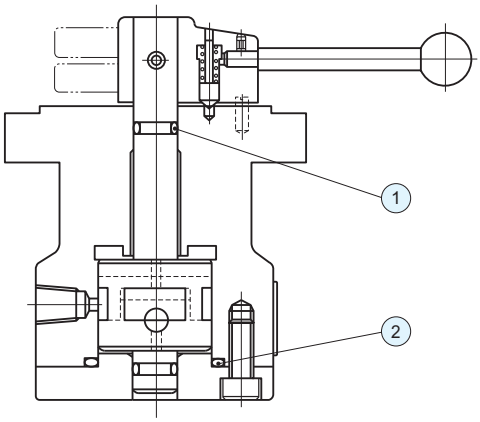
- **Dead angle**
  - ○ From the neutral position to start of flow: 7°20'
  - ○ From the start of flow to the stroke end: 22°30' – 7°20' = 15°10'

Performance curves (viscosity: 32 mm²/s {cSt})

Pressure drop characteristics



Sectional structural diagram



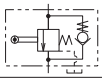
Sealing part table

Part No.	Name	Part specifications	Quantity
1	O-ring	JIS B 2401 1A P11	2
2	O-ring	JIS B 2401 1A P40	1

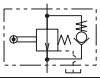
Deceleration Valve

JIS graphic symbols for hydraulic system

Normally closed type



Normally open type



Features

- Enables acceleration/deceleration of a cylinder by adjusting the plunger stroke with a cam mechanism

Nomenclature

※	–	DDC	–	G	※※	–	※
1		2		3	4		5

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

2 Model No.
DDC: D series deceleration valve

3 Connections
G: Gasket mount type

4 Nominal diameter
03: ⅜
06: ¾

5 Spool operating method
2: Normally closed type
3: Normally open type

Specifications

Model No.	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Cracking pressure MPa {kgf/cm²}	Operating force N {kgf}	Stroke mm	Mass kg
DDC-G03	⅜	14 {140}	25	0.05 {0.5}	Approx. 150 {15}	10	4
DDC-G06	¾		75		Approx. 300 {30}	12	7

Sub-plate model code

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

Model code	Nominal diameter	Connection port diameter	Mass kg
DDC-03M	⅜	Rc⅜	1.5
DDC-06M	¾	Rc¾	2

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

Accessories

Model No.	Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
DDC-G03	M8 × 80	4	25 to 30 {250 to 300}
DDC-G06	M12 × 90	4	85 to 110 {850 to 1100}

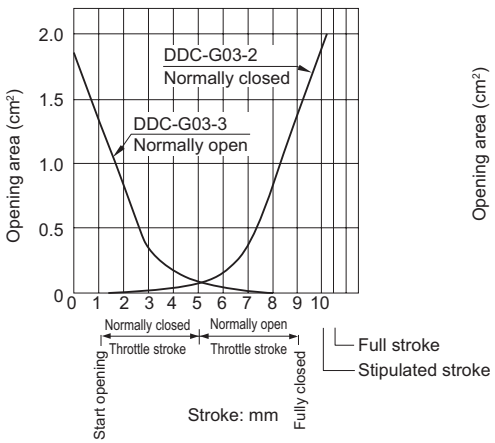
Handling

- Directly connect the drain piping to the tank without merging it with other tank piping.
- Use a cam with an inclination angle of no greater than 30°.

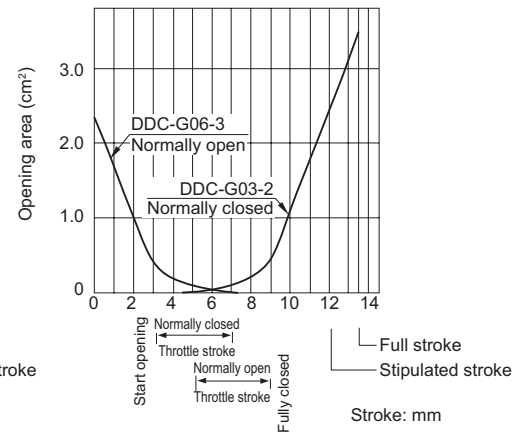
Performance curves

Stroke - opening area characteristics

DDC-G03



DDC-G06



Cam Operated Pilot Operated Valve

JIS graphic symbols for hydraulic system

Features

- These 2-position 2-way valves enable switching of the fluid passage in a hydraulic pilot circuit or interlocking circuit using cam operation.
- Their compact and lightweight designs are ideal for automatic operation.

Nomenclature

※	-	DD	2	-	2	※	02
1		2	3		4	5	6

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

2 Model No.
DD: Cam operated pilot valve

3 Number of directions
2: 2-way type

4 Number of positions
2: 2-position valve

5 Connections
G: Gasket mount type
T: Screw connection type

6 Nominal diameter
02: ¼

Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Operating force N {kgf}	Stroke mm	Mass kg
DD2-2※02	¼	14 {140}	11.4	127 {12.7}	Maximum 12.5	2.3

Accessories (gasket mount type)

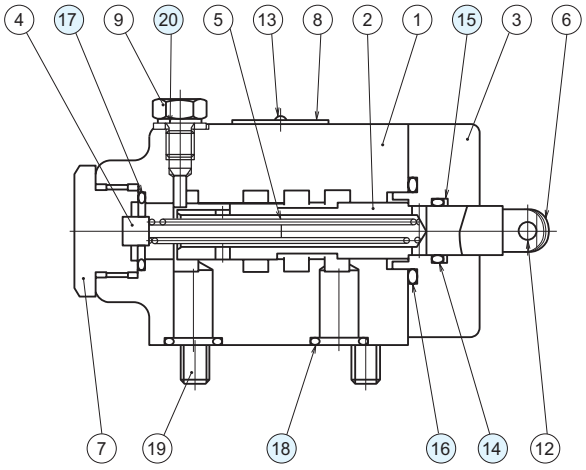
Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
M8 × 70	4	20 to 25 {200 to 250}

Handling

- Directly connect the tank piping to the tank without merging it with other tank piping.
- Operate the valve with a cam. Use a cam with an inclination angle of no greater than 35°.
- Switch operation requires a minimum stroke of 8 mm.

Sectional structural diagram

- DD2-2G02



Sealing part table

Part No.	Name	Quantity	Part specifications
14	O-ring	1	JIS B 2401 1A P14
15	Backup ring	1	JIS B 2407 Spiral P14
16	O-ring	1	JIS B 2401 1B G25
17	O-ring	1	JIS B 2401 1A P18
18	O-ring	4	JIS B 2401 1B P12
20	Sealing washer	1	OKY-S-1712 SWM-8

Forward/backward compatibility of products subject to model changes

● Size 02 solenoid valve (terminal box type)

Model code	Voltage	Installation compatibility with KSO-G02 (design No. 30)	General outside dimensions				Notes
			Total length (double solenoid)	Total length (single solenoid)	Total width	Total height	
KSO-G02-※※※※-30	AC	–	190	145	48	96	*1
	DC		208	154			
KSO-G02-※※※※-20	AC	Compatible	207	148.5	48	95.6	Designate option code "E" when the specifications with earth terminal are required.
	DC		227	158.5			
KSO-G02-※※※※-10	AC	Compatible	207	148.5	48	95.6	Designate option code "E" when the specifications with earth terminal are required.
	DC		227	158.5			
JSO-G02-※※※-30	AC	Compatible	213	158.5	46	93.5	Designate option code "E" when the specifications with earth terminal are required.
	DC		234	169			
JSO-G02-※※※-20	AC	Compatible	213	158.5	46	93.5	Designate option code "E" when the specifications with earth terminal are required.
	DC		234	169			
JSO-G02-※※※-10	AC	Compatible	213	158.5	46	91.6	Designate option code "E" when the specifications with earth terminal are required.
	DC		234	169			
JSW-G02-※※※-11	AC	Compatible	213	158.5	46	82.5	
	DC		234	169			
JSW-G02-※※※-10	AC	Compatible	213	158.5	46	82.5	
	DC		234	169			
JS-G02-※※※-10	AC	Compatible	202	196.2	46	82.5	
	DC						
S-G02-※※※-10	AC	Compatible	212	156.5	48	92.6	
	DC						
DSO-G02-※※※	AC	See notes.	250	255	74	72.4	There is installation compatibility with KSO-G03-※※※※-20-8.

The compatibility is indicated in the table as follows:
Compatible: Installation compatibility provided (The outside dimensions differ.)
Note: *1 The products with 36 or higher as the first two digits of the manufacturing No. accept both petroleum-based hydraulic fluids and water-glycol hydraulic fluids.

● Size 02 low-watt solenoid valve (terminal box type)

Model code	Voltage	Installation compatibility with LS-G02 (design No. 30)	General outside dimensions				Notes
			Total length (double solenoid)	Total length (single solenoid)	Total width	Total height	
LS-G02-※※※※-30	AC	–	153	126.5	48	95	
	DC		214	157			
LS-G02-※※※※-20	AC	Compatible	158	129	48	95	Designate option code "E" when the specifications with earth terminal are required.
	DC		214	157			
LS-G02-※※※※-10	AC	Compatible	158	129.5	48	95.6	Designate option code "E" when the specifications with earth terminal are required.
	DC		213	157			

The compatibility is indicated in the table as follows:
Compatible: Installation compatibility provided (The outside dimensions differ.)

Forward/backward compatibility of products subject to model changes

● Size 03 solenoid valve

Model code	Voltage	Installation compatibility with KSO-G03 (design No. 20)	General outside dimensions				Notes
			Total length (double solenoid)	Total length (single solenoid)	Total width	Total height	
KSO-G03-※※※※-20	AC	–	239	178.5	70	127	
	DC		284	201			
KSO-G03-※※※※-10	AC	Compatible	225	171.5	70	127	Designate option code "E" when the specifications with earth terminal are required.
	DC		274	196			
JSO-G03-※※※-10	AC	Compatible	214	158	70	98	Designate option code "E" when the specifications with earth terminal are required.
	DC		264	183			
JSW-G03-※※※-20	AC	Compatible	238.6	182.2	70	98	
	DC		286.6	206.2			
JSW-G03-※※※-10	AC	Compatible	238.6	182.2	70	90.9	
	DC		286.6	206.2			
JS-G03-※※※-11	AC	Compatible	266.6	196.2	70	90.9	The terminal layout of the terminal box is different.
	DC		286.6	206.2			
JS-G03-※※※-10	AC	Compatible	266.6	196.2	70	90.9	The terminal layout of the terminal box is different.
	DC		286.6	206.2			
HDSO-G03-※※※-10	AC	See notes.	279.2	210.5	70	84.6	Since M8 mounting bolts are used, select KSO-G03-※※※※-20-8. The terminal layout of the terminal box is different.
	DC		312.6	227.2			
S-G03-※※※-20	AC	Compatible	256.6	191.2	70	98	
	DC						
S-G03-※※※-10	AC	Compatible	256.6	191.2	70	90.9	
	DC						
SO※-G03-※※※	AC	See notes.	279.2	210.5	70	84.6	Since M8 mounting bolts are used, select KSO-G03-※※※※-20-8. The terminal layout of the terminal box is different.
	DC		301.6	221.7			
DSO-G03-※※※	AC	See notes.	345	255	95	102	The conversion plate (model code: HDSO-03A03D) is required. Since M8 mounting bolts are used, select KSO-G03-※※※※-20-8. The terminal layout of the terminal box is different.
DSOM※-※G03-※※※	AC	See notes.	247	178	60	76	The conversion plate (model code: JS-03A 03M) is required. The terminal layout of the terminal box is different.
	DC		327	218			
DSOM※-※G04-※※※	AC	See notes.	282	197	70	86	The conversion plate (model code: JS-03A 04M) is required. The terminal layout of the terminal box is different.
	DC		341	226.5			

The compatibility is indicated in the table as follows:
Compatible: Installation compatibility provided (The outside dimensions differ.)

Handling

● Hydraulic oil

○ Use a petroleum-based hydraulic fluid equivalent to ISO VG32 to 68.

○ Operate the unit in an environment where both the following conditions are satisfied: viscosity range from 15 to 400 mm^2/s {cSt} and oil temperature from −15 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.

● Installation and maintenance

○ No restriction applies to the installation direction.

○ 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 valves into oil in the tank.

● Filters

○ Use a line filter with a filtration accuracy of 25 μm or better.

● Maximum flow rate

○ The maximum flow rate refers to the largest possible flow rate at each pressure at which the valve can function properly, or the largest flow rate possible with the pressure drop ignored.

Inline Check Valve

JIS graphic symbols for hydraulic system

Features

- Installed in a hydraulic line parallel to the line, the check valve opens when the pressure reaches the cracking pressure, allowing fluid to flow only in one direction and blocking the flow in the reverse direction.

Nomenclature

※ – HDIN – ※ ※※ – ※※

1 2 3 4 5

1 Applicable fluid code
No designation: Petroleum-based hydraulic fluid, water-glycol hydraulic fluid
F: Phosphate ester hydraulic fluid *1

2 Model No.
HDIN: H series inline check valve

3 Connections
T: Screw connection type
F: Flange connection type

4 Nominal diameter
03: ⅜
06: ¾
10: 1¼
12: 1½
16: 2
24: 3

5 Cracking pressure code
See the cracking pressure table below.

Note: *1 "F" is not necessary even for phosphate ester hydraulic fluids in the case of the screw connection type (T).

5 : Cracking pressure table

Cracking pressure code	0	01	015	02	05	10	12	15	20	25	30	35	45	56	60	90
Model No.	Cracking pressure MPa {kgf/cm²}															
	0 {0}	0.01 {0.1}	0.015 {0.15}	0.02 {0.2}	0.05 {0.5}	0.1 {1}	0.12 {1.2}	0.15 {1.5}	0.2 {2}	0.25 {2.5}	0.3 {3}	0.35 {3.5}	0.45 {4.5}	0.56 {5.6}	0.6 {6}	0.9 {9}
HDIN-T03	✓	–	–	✓	✓	✓	–	✓	✓	–	–	✓	✓	✓	✓	✓
HDIN-T06	✓	–	✓	✓	✓	✓	–	✓	✓	–	–	✓	✓	✓	✓	✓
HDIN-F06	✓	–	✓	✓	✓	✓	–	✓	✓	–	–	✓	✓	✓	✓	✓
HDIN-T10	✓	–	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	–
HDIN-F10	✓	–	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	–
HDIN-F12	✓	–	–	–	✓	✓	–	✓	✓	–	–	✓	✓	–	–	–
HDIN-F16	✓	–	–	✓	✓	✓	–	✓	✓	✓	–	✓	✓	–	✓	–
HDIN-F24	✓	✓	–	–	✓	✓	–	–	✓	–	–	✓	✓	–	–	–

Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Mass kg
HDIN-T03-※※	⅜	21 {210}	30	0.3
HDIN-T06-※※	¾		75	0.7
HDIN-F06-※※				3.2
HDIN-T10-※※	1¼		190	2.7
HDIN-F10-※※				6.9
HDIN-F12-※※	1½		240	13
HDIN-F16-※※	2		370	16
HDIN-F24-※※	3		1060	43

Note: The mass of the flange mount type valve (F) includes the mass of the flange and bolts.

Accessories (Flange mount type)

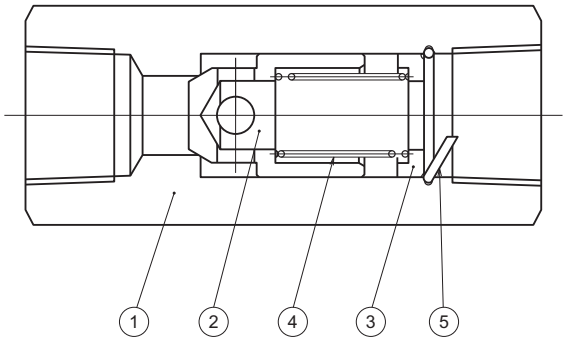
Flange (JIS B 2291 SSA), O-ring, mounting bolts

Handling

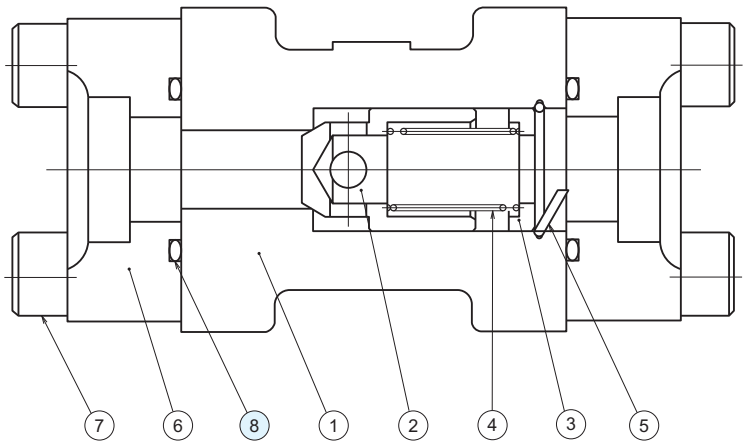
- Valves of cracking pressure type "0" (cracking pressure of 0 MPa {0 kgf/cm²}) need to be installed with the inlet port facing downward.

Sectional structural diagram

HDIN-T※※



HDIN-F※※



Sealing part table

Model No.	Part No.	Name	Quantity	Part specifications
HDIN-F06	8	O-ring	2	JIS B2401 1B G30
HDIN-F10		O-ring	2	JIS B2401 1B G40
HDIN-F12		O-ring	2	JIS B2401 1B G50
HDIN-F16		O-ring	2	JIS B2401 1B G60
HDIN-F24		O-ring	2	JIS B2401 1B G85

Right-angle Check Valve

JIS graphic symbols for hydraulic system

Features

- Installed in a hydraulic line perpendicular to the line, the check valve opens when the pressure reaches the cracking pressure, allowing fluid to flow only in one direction and blocking the flow in the reverse direction.

Nomenclature

※ – JCA – ※ ※※ – ※※ – 20

1 2 3 4 5 6

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

2 Model No.
JCA: J series right-angle check valve

3 Connections
G: Gasket mount type
T: Screw connection type
F: Flange connection type

4 Nominal diameter
03: ⅜
06: ¾
10: 1¼
16: 2
24: 3

5 Cracking pressure code *1
04: 0.04 MPa {0.4 kgf/cm²}
50: 0.5 MPa {5 kgf/cm²}

6 Design No. (The design No. is subject to change)

Note: *1 See the cracking pressure table for cracking pressures other than those above.

Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Mass kg
JCA-G03-※※-20	⅜	25 {250}	60	1.7
JCA-T03-※※-20				0.9
JCA-G06-※※-20	¾		200	2.9
JCA-T06-※※-20				1.7
JCA-F06-※※-20				3.7
JCA-G10-※※-20	1¼		400	5.5
JCA-T10-※※-20				5.6
JCA-F10-※※-20			500	7.6
JCA-F16-※※-20	2		800	20
JCA-F24-※※-20	3		1600	62.5

Note: The mass of the flange mount type valve (F) includes the mass of the flange and bolts.

Handling

- Valves of cracking pressure type "0" (cracking pressure of 0 MPa {0 kgf/cm²}) need to be installed with the inlet port facing downward.
  The gasket mount type valves need to be installed with the gasket mating face facing downward (horizontal orientation).

5: Cracking pressure table

Code	0	01	02	20	35
Model No.	Cracking pressure MPa {kgf/cm²}				
	0 {0}	0.01 {0.1}	0.02 {0.2}	0.2 {2}	0.35 {3.5}
JCA-※03	✓	✓	✓	✓	✓
JCA-※06	✓	✓	–	✓	✓
JCA-※10	✓	–	–	✓	✓
JCA-F 16	✓	–	–	✓	✓
JCA-F 24	✓	–	–	✓	✓

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
JCP-03M	⅜	Rc⅜	1.6
JCP-03M04		Rc½	
JCP-06M	¾	Rc¾	2.4
JCP-06M08		Rc1	3
JCP-10M	1¼	Rc1¼	4.8
JCP-10M12		Rc1½	5.7

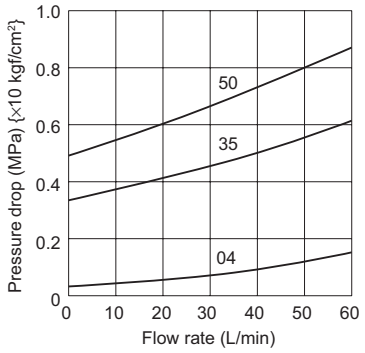
Refer to Page S-10 for the dimensions of the sub-plate.

Accessories

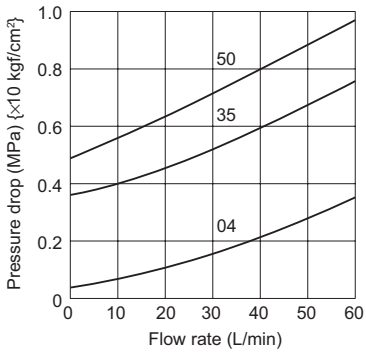
Connections	Model No.	Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
Gasket mount type	JCA-G03	M10 × 45	4	48 to 63 {480 to 630}
	JCA-G06	M10 × 50	4	48 to 63 {480 to 630}
	JCA-G10	M10 × 55	6	48 to 63 {480 to 630}
Flange connection type	Flange (JIS B 2291 SSA), O-ring, mounting bolts			

Performance curves: Pressure drop characteristics (viscosity: 32 mm^2/s {cSt})

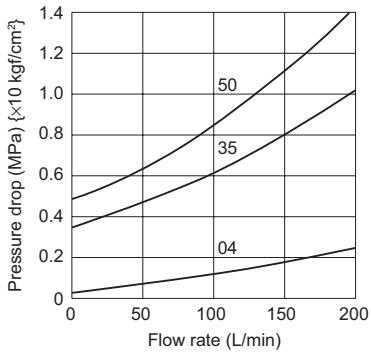
JCA-G03



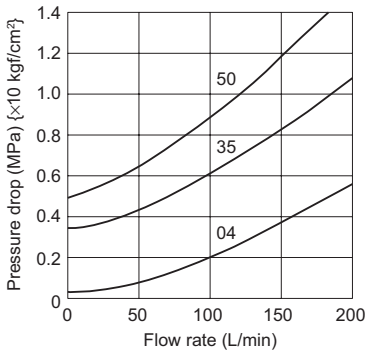
JCA-T03



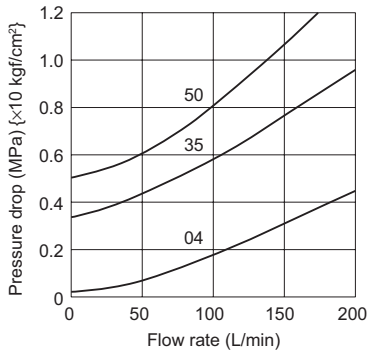
JCA-G06



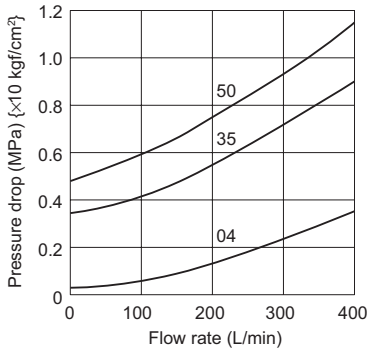
JCA-T06



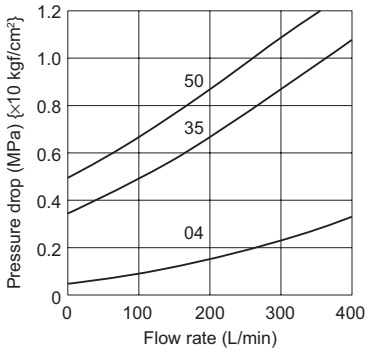
JCA-F06



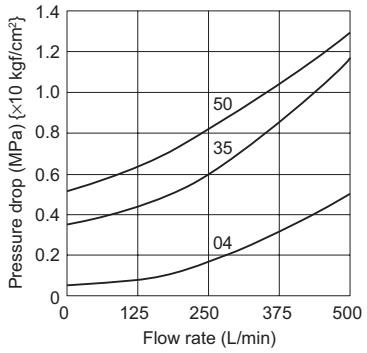
JCA-G10



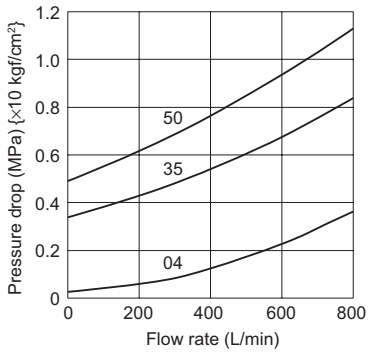
JCA-T10



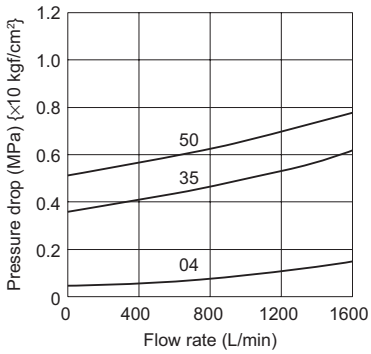
JCA-F10



JCA-F16

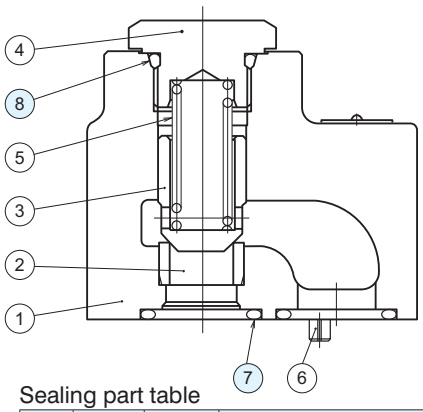


JCA-F24



Sectional structural diagram

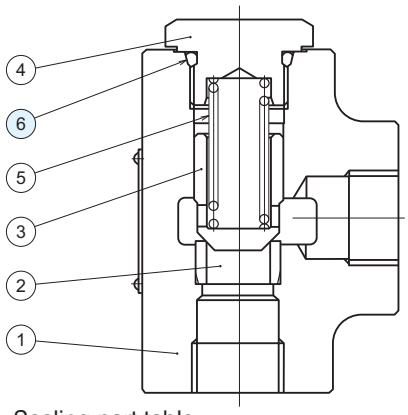
JCA-G※※



Sealing part table

Part No.	Name	Quantity	Part specifications		
			JCA-G03	JCA-G06	JCA-G10
7	O-ring	2	JIS B 2401 1B P18	JIS B 2401 1B P28	JIS B 2401 1B P32
8	O-ring	1	JIS B 2401 1B P21	JIS B 2401 1B P24	JIS B 2401 1B P32

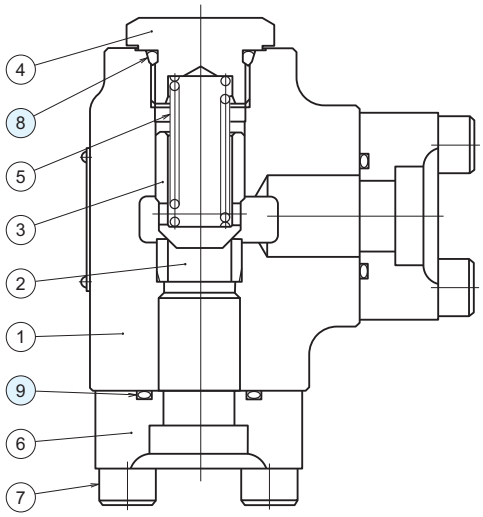
JCA-T※※



Sealing part table

Part No.	Name	Quantity	Part specifications		
			JCA-T03	JCA-T06	JCA-T10
6	O-ring	1	JIS B 2401 1B P21	JIS B 2401 1B P24	JIS B 2401 1B P32

JCA-F06, F10

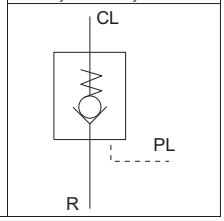


Sealing part table

Part No.	Name	Quantity	Part specifications			
			JCA-F06	JCA-F10	JCA-F16	JCA-F24
8	O-ring	1	JIS B 2401 1B P24	JIS B 2401 1B P32	JIS B 2401 1B G60	JIS B 2401 1B G90
9	O-ring	2	JIS B 2401 1B G30	JIS B 2401 1B G40	JIS B 2401 1B G60	JIS B 2401 1B G85

Pilot Operated Check Valves

JIS graphic symbols for hydraulic system



Features

- The check valve opens when the pressure reaches the cracking pressure, allowing fluid to flow only in one direction. The fluid can also be allowed to flow in the reverse direction by applying external pilot pressure to push up the check valve.
- A decompression type incorporating a small check valve that opens before the main valve is opened is also available.

Nomenclature

※	–	JCP	※	–	※	※※	–	※※	–	20	–	※
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.
JCP: J series pilot operated check valve

3 Decompression code
No designation: Direct operated type
D: Decompression type

4 Connections
G: Gasket mount type
T: Screw connection type
F: Flange connection type

5 Nominal diameter
03: ⅜
06: ¾
10: 1¼
16: 2

6 Cracking pressure code
04: 0.04 MPa {0.4 kgf/cm^2}
20: 0.2 MPa {2 kgf/cm^2}
35: 0.35 MPa {3.5 kgf/cm^2}
50: 0.5 MPa {5 kgf/cm^2}

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

8 Drainage code
No designation: External drain type
Z: Internal drain type

※ The external/internal drain type setting cannot be changed.

Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm^2}	Maximum flow rate L/min	Area ratio*1	Mass kg
JCP(D)-G03-※※-20	⅜	25 {250}	60	(1) 2.47:1 (2) 30.25:1	3.3
JCP(D)-T03-※※-20					3
JCP(D)-G06-※※-20	¾		200	(1) 2.46:1 (2) 31.36:1	5.4
JCP(D)-T06-※※-20					5.5
JCP(D)-F06-※※-20					6.6
JCP(D)-G10-※※-20	1¼		400	(1) 2.50:1 (2) 29.47:1	8.5
JCP(D)-T10-※※-20		21 {210}			9.6
JCP(D)-F10-※※-20		25 {250}			11.6
JCP(D)-F16-※※-20	2		800	(1) 2.48:1 (2) 27.56:1	31.9

Note: *1 Area ratio (1) Pilot piston: Large check valve
(2) Pilot piston: Small check valve (Decompression type)

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
JCP-03M	⅜	Rc⅜	1.6
JCP-03M04		Rc½	
JCP-06M	¾	Rc¾	2.4
JCP-06M08		Rc1	3
JCP-10M	1¼	Rc1¼	4.8
JCP-10M12		Rc1½	5.7

Refer to Page S-10 for the dimensions of the sub-plate.

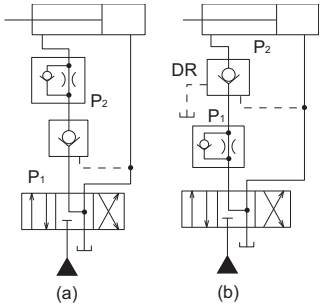
Accessories

Connections	Model No.	Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
Gasket mount type	JCP(D)-G03	M10 × 45	4	48 to 63 {480 to 630}
	JCP(D)-G06	M10 × 50	4	48 to 63 {480 to 630}
	JCP(D)-G10	M10 × 55	6	48 to 63 {480 to 630}
Flange connection type	Flange (JIS B 2291 SSA), O-ring, mounting bolts			

Handling

● Application of internal and external drain types

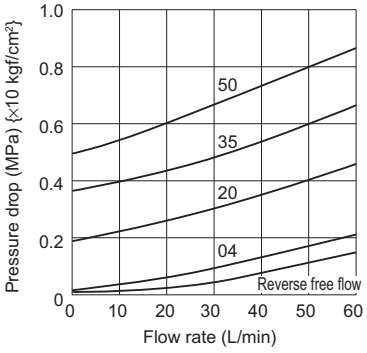
○ When port P1 at the outlet side is directly connected to the tank with reverse free flow as shown in figure (a), use the internal drain type. When back pressure is applied to port P1 at the outlet side as shown in figure (b), use the external drain type.



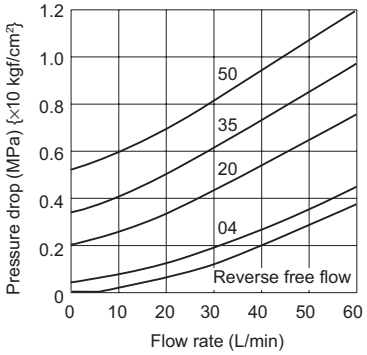
Performance curves (viscosity: 32 mm²/s {cSt})

● Free flow pressure drop characteristics/reverse free flow pressure drop characteristics

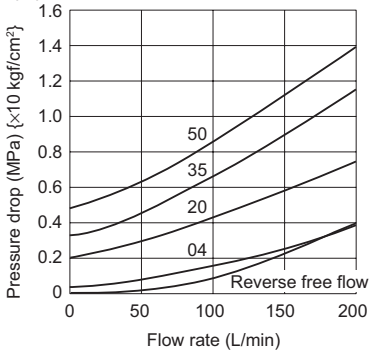
JCP(D)-G03



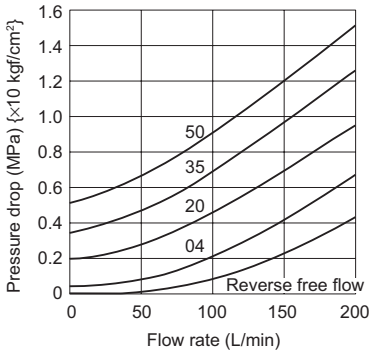
JCP(D)-T03



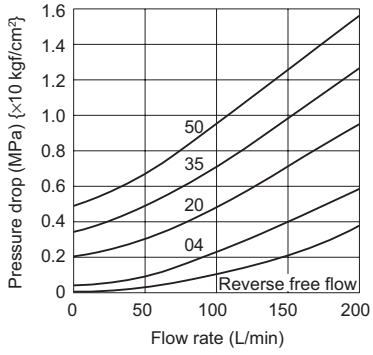
JCP(D)-G06



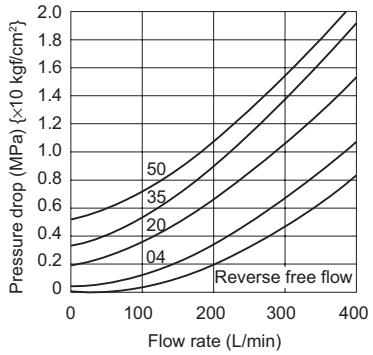
JCP(D)-T06



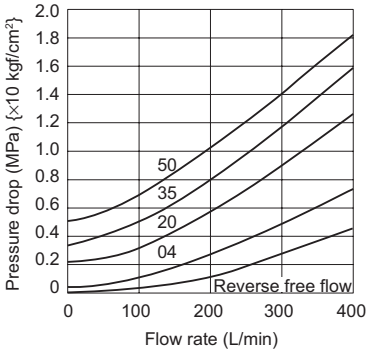
JCP(D)-F06



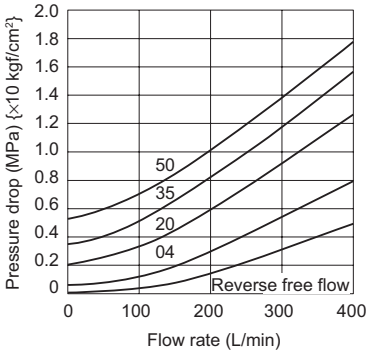
JCP(D)-G10



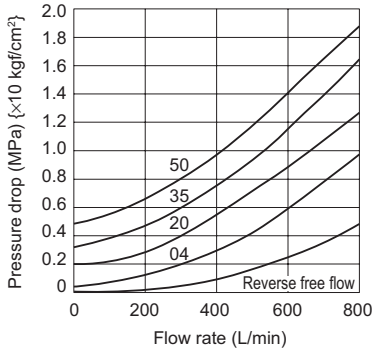
JCP(D)-T10



JCP(D)-F10

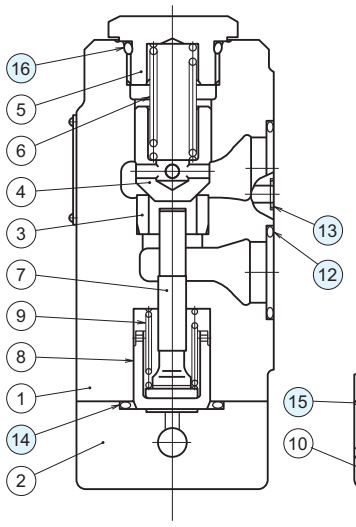


JCP(D)-F16

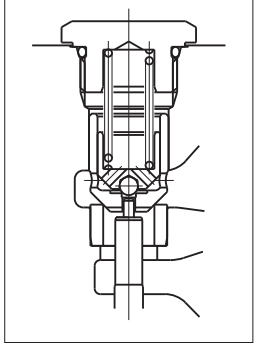


Sectional structural diagram

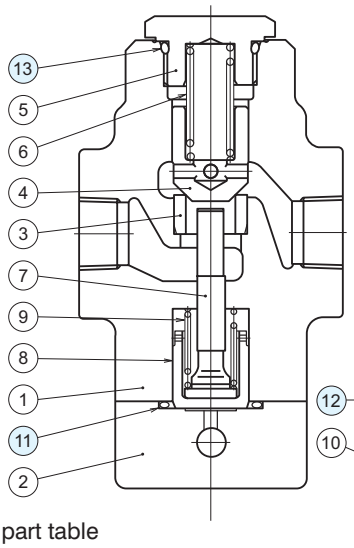
JCP-G※※



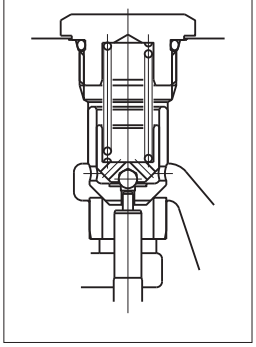
JCPD-G※※



JCP-T※※



JCPD-T※※



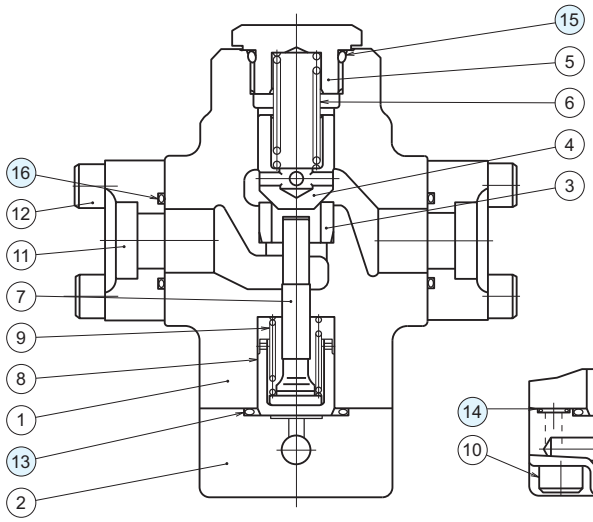
Sealing part table

Part No.	Name	Quantity	Part specifications		
			JCP(D)-G03	JCP(D)-G06	JCP(D)-G10
12	O-ring	2	JIS B 2401 1B P18	JIS B 2401 1B P28	JIS B 2401 1B P32
13	O-ring	2	JIS B 2401 1B P9	JIS B 2401 1B P9	JIS B 2401 1B P9
14	O-ring	1	JIS B 2401 1B G25	JIS B 2401 1B P32	JIS B 2401 1B P42
15	O-ring	1	JIS B 2401 1B P7	JIS B 2401 1B P9	JIS B 2401 1B P9
16	O-ring	1	JIS B 2401 1B P21	JIS B 2401 1B P29	JIS B 2401 1B P36

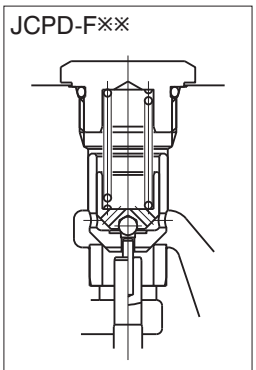
Sealing part table

Part No.	Name	Quantity	Part specifications		
			JCP(D)-T03	JCP(D)-T06	JCP(D)-T10
11	O-ring	1	JIS B 2401 1B G25	JIS B 2401 1B P32	JIS B 2401 1B P42
12	O-ring	1	JIS B 2401 1B P7	JIS B 2401 1B P9	JIS B 2401 1B P9
13	O-ring	1	JIS B 2401 1B P21	JIS B 2401 1B P29	JIS B 2401 1B P36

JCP-F※※



JCPD-F※※

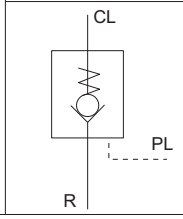


Sealing part table

Part No.	Name	Quantity	Part specifications		
			JCP(D)-F06	JCP(D)-F10	JCP(D)-F16
13	O-ring	1	JIS B 2401 1B P32	JIS B 2401 1B P42	JIS B 2401 1B G70
14	O-ring	1	JIS B 2401 1B P9	JIS B 2401 1B P9	JIS B 2401 1B G25
15	O-ring	1	JIS B 2401 1B P29	JIS B 2401 1B P36	JIS B 2401 1B G70
16	O-ring	2	JIS B 2401 1B G30	JIS B 2401 1B G40	JIS B 2401 1B G60

Pre-fill Valve

JIS graphic symbols for hydraulic system



Features

- These valves are used to suction/discharge fluid between a hydraulic cylinder and a tank. In applications to large hydraulic press structures, the valve sucks hydraulic fluid from the tank to the hydraulic cylinder in the fast forward process, blocks reverse flow from the hydraulic cylinder to the tank in the pressurizing process, and discharges hydraulic fluid from the hydraulic cylinder to the tank in the return process.

Nomenclature

※ - HPF - F ※※ - ※ - ※※ - ※

1 2 3 4 5 6 7

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

2 Model No.
HPF: H series pre-fill valve

3 Connections
F : Flange connection type

4 Nominal diameter
16: 2 20: 2½ 24: 3 32: 4

5 Cracking pressure code
1: 0.005 MPa {0.05 kgf/cm^2}
2: 0.015 MPa {0.15 kgf/cm^2}

6 Design No. (The design No. is subject to change)
10: Nominal diameter 16 (2), 24 (3), 32 (4)
20: Nominal diameter 20 (2½)

7 Option code
No designation: With flange *1
N: Without flange

Note: *1 For specifications with flange, the valves with the nominal diameters of 16, 20 and 24 are provided with the flanges for the CL side and R side, and the valves with the nominal diameter 32 are provided with the flange for the R side.

Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm^2}			Maximum flow rate L/min		Area ratio Seat: Pilot piston	Mass *2 kg
		CL side	R side	Pilot pressure	R → CL	CL → R		
HPF-F16-※-10	2	25 {250}	2 {20}	25 {250}	160	320	1.66:1	6.1
HPF-F20-※-20	2½				320	640	2.37:1	12
HPF-F24-※-10	3				500	1000	2.93:1	15.5
HPF-F32-※-10	4				900	1800	3.05:1	18.9

Note: *2 The masses of the flange and bolts are not included.

Handling

● Installation and maintenance

○ When installing the valve below the fluid level in the open tank, keep the height difference within 1 m for cracking pressure type 1 and within 2.5 m for cracking pressure type 2. When installing it above the fluid level, adequate consideration should be given to the capacity to suck hydraulic fluid from the tank to the cylinder.

● Pilot operation

○ The minimum pilot pressure required to open the valve is approximately equivalent to the cylinder side (CL side) pressure multiplied by the area ratio given above.

○ When discharging hydraulic fluid from the cylinder, depressurize the cylinder side and then apply pressure at the pilot port (PL port).

● Back pressure in the pilot line

○ When opening the pilot line to the tank, make the pipe resistance as low as possible and connect the piping to the tank without merging to other lines. High back pressure and pipe resistant prolongs the valve's reseat time and the valve will not close if the back pressure is 0.2 MPa {2 kgf/cm^2} or higher.

● The cracking pressure cannot be changed by setting at the product.

Handling (HPF-F32)

● The special flange for the tank side (R side) is provided with its mounting bolts.

When not using the special flange for the tank side (R side), follow the dimensions of the special flange for the installation dimensions and use a tank port (port R) with an inner diameter of ϕ130 and a minimum depth of 120. Use 125A (5B) pipes with a schedule No. of 40 for piping to the special flange.

Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·m}
M22 × 150	8	620 to 780 {62 to 78}

Handling (HPF-F32)

- At the cylinder side (CL side), follow the dimensions of the sub-plate for the installation dimensions and use a cylinder port (port CL) with an inner diameter of ϕ130 and a minimum depth of 50.
- The sub-plate for the cylinder side (CL side) is not provided with the valve. Order it separately if required by specifying the model code given in the table below.

Model code	Nominal pipe diameter	Mass kg
HPF-32M	100A (4B)	33.4

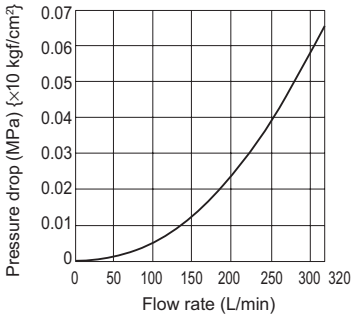
Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·m}
M30 × 105	4	1560 to 1960 {156 to 196}

Note: The sub-plate is provided with four M30 × 105 hexagon socket head cap bolts.
Refer to Page S-10 for the dimensions of the sub-plate.

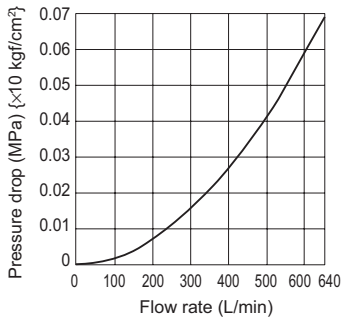
Performance curves (viscosity: 32 mm²/s {cSt})

Pressure drop characteristics (discharge) CL → R

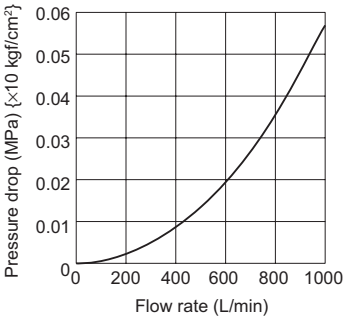
● HPF-F16



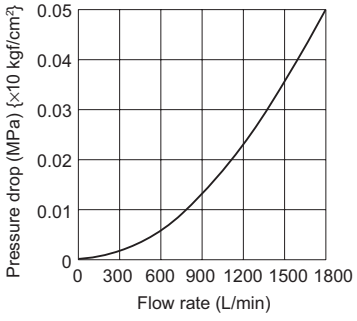
● HPF-F20



● HPF-F24

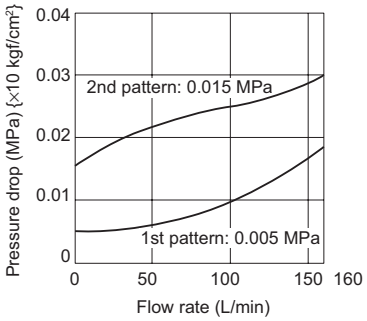


● HPF-F32

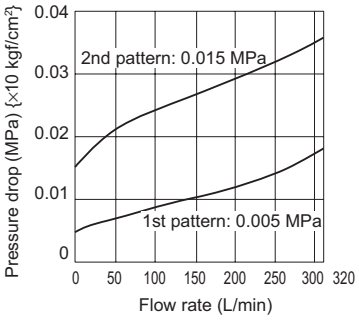


Pressure drop characteristics (suction) R → CL

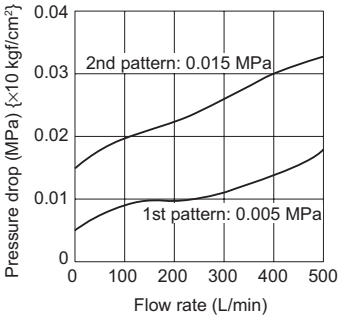
● HPF-F16



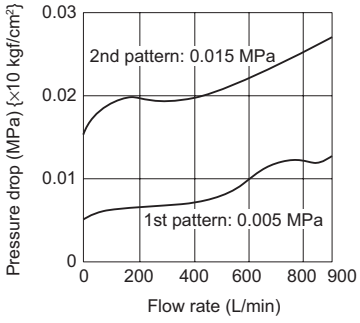
● HPF-F20



● HPF-F24

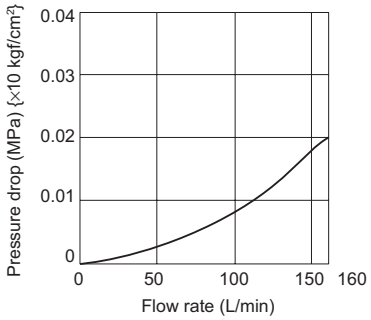


● HPF-F32

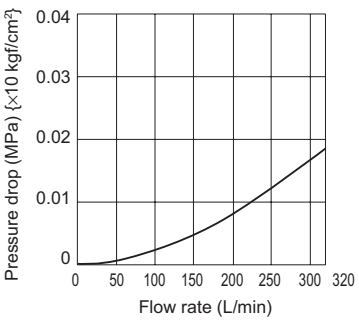


Pressure drop characteristics (suction, pilot operation) R → CL

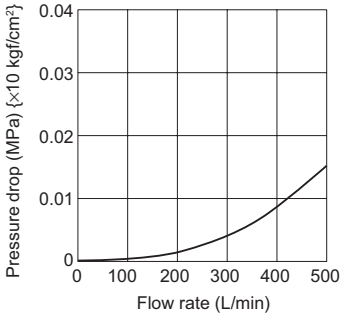
● HPF-F16



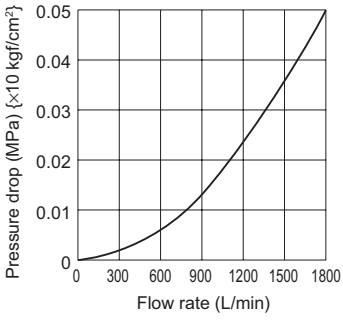
● HPF-F20



● HPF-F24

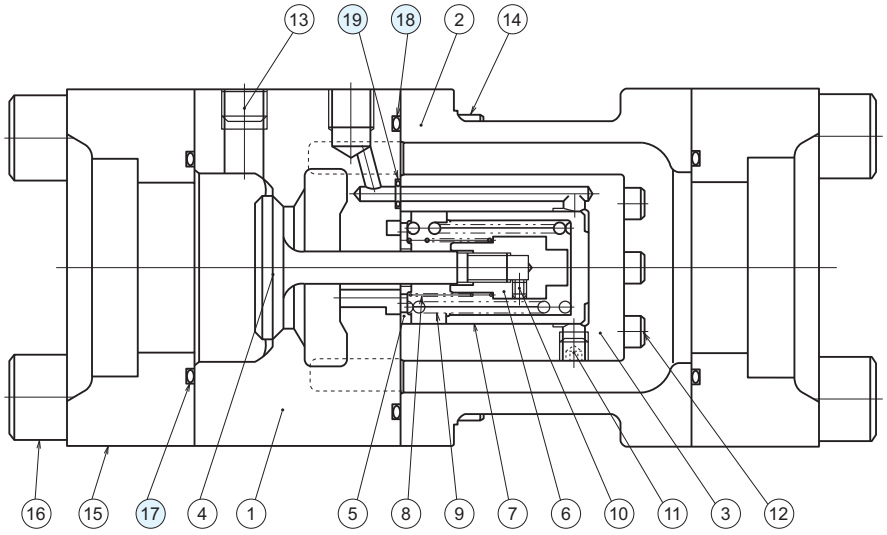


● HPF-F32



Sectional structural diagram

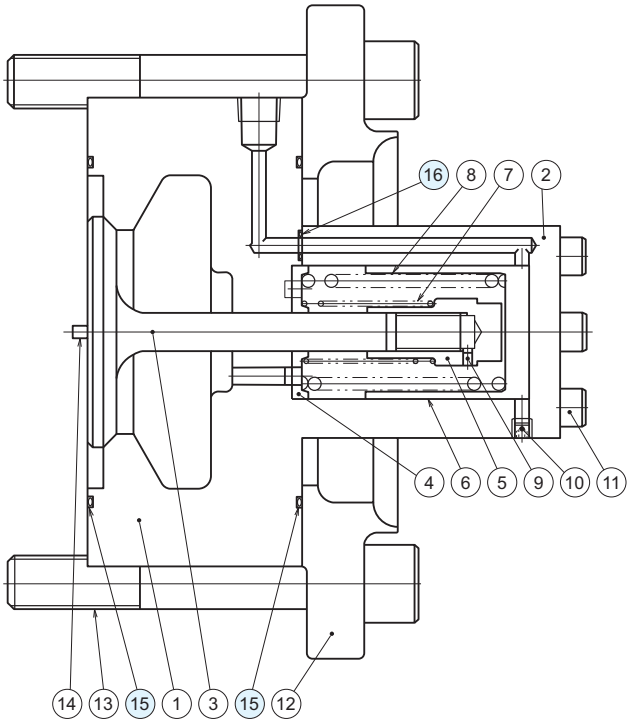
HPF-F16, 20, 24



Sealing part table

Part No.	Name	Quantity	Part specifications		
			HPF-F16	HPF-F20	HPF-F24
17	O-ring	2	JIS B 2401 1B G60	JIS B 2401 1B G75	JIS B 2401 1B G85
18	O-ring	1	JIS B 2401 1B G80	JIS B 2401 1B G100	JIS B 2401 1B G110
19	O-ring	1	JIS B 2401 1B P5	JIS B 2401 1B P7	JIS B 2401 1B P7

HPF-F32

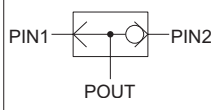


Sealing part table

Part No.	Name	Quantity	Part specifications
15	O-ring	2	JIS B 2401 1B G140
16	O-ring	1	JIS B 2401 1B P9

Shuttle Valve (Screw Connection Type)

JIS graphic symbols for hydraulic system



Features

- These valves are used to open a line from the inlet port with the higher pressure of the two ports to the outlet port.

Nomenclature

※ - ST - 02 F
1 2 3 4

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

2 Model No.
ST: Type ST shuttle valve

3 Nominal diameter
02: ¼

4 Connections
F: G¼ port, O-ring boss connection type

Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Pressure drop *1 MPa {kgf/cm²}	Mass kg
ST-02F	¼	21 {210}	20	0.5 {5}	0.5

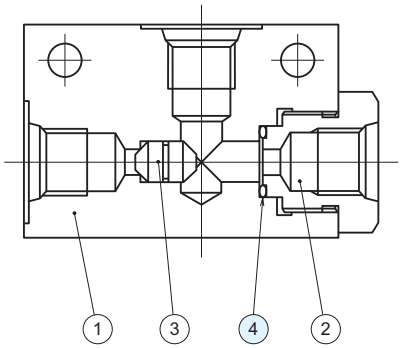
Note: *1 The pressure drop indicated is the value at a flow rate of 20 L/min.

Handling

- Connect the two selective lines to the inlet ports P_{IN1} and P_{IN2}.
- Use a G¼ O-ring boss joint for piping.
  Do not use taper thread joints because they may distort the valve body and cause malfunctions.

Sectional structural diagram

ST-02F

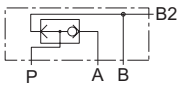


Sealing part table

Part No.	Name	Quantity	Part specifications
4	O-ring	1	AS568-013 (NBR, Hs90)

Shuttle Valve (Gasket Mount Type)

JIS graphic symbols for hydraulic system



Features

- These valves are used to open a line from the inlet port with the higher pressure of the two ports to the outlet port.

Nomenclature

※ - WS - 02 - 10 - ※※

1 2 3 4 5

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

2 Model No.
WS: Type WS shuttle valve

3 Nominal diameter
02: ¼

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

5 Control No.
60: Port B2 (auxiliary connection port), Rc¼
83: Port B2 (auxiliary connection port), G¼ O-ring boss

Specifications

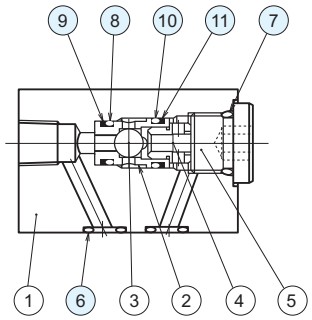
Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm²}	Maximum flow rate L/min	Mass kg	Installation dimensions
WS-02-10-60	¼	25 {250}	30	0.9	ISO 4401-AB-03-4-A
WS-02-10-83					

Handling

- Connect the two selective lines to the inlet ports A and B.
- Plug port B2 if it is not used.

Sectional structural diagram

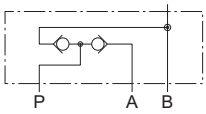
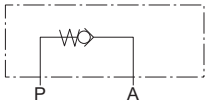
WS-02-10-60



Sealing part table

Part No.	Name	Quantity	Part specifications
6	O-ring	3	JIS B 2401 1B P9
7	O-ring	1	JIS B 2401 1B P14
8	O-ring	1	AS568-012 (NBR, Hs90)
9	Backup ring	1	Bias cut for AS568-012
10	O-ring	1	AS568-013 (NBR, Hs90)
11	Backup ring	1	Bias cut for AS568-013

Check Valve Block

JIS graphic symbols for hydraulic system	
KS-02-10-50	KS-02-10-59
	

Nomenclature

※ - KS - 02 - 10 - ※※

1 2 3 4 5

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

2 Model No.
KS: Type KS check valve

3 Nominal diameter
02: ¼

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

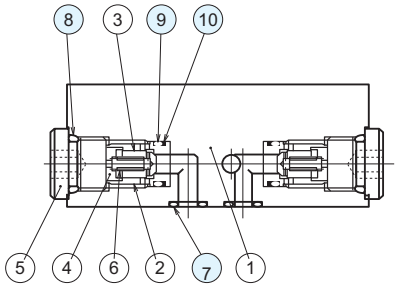
5 Control No.
50: } See the JIS graphic symbols for hydraulic system
59: } for details.

Specifications

Model code	Nominal diameter	Maximum operating pressure MPa {kgf/cm^2}	Maximum flow rate L/min	Cracking pressure MPa {kgf/cm^2}	Mass kg	Installation dimensions
KS-02-10-50	¼	25 {250}	30	0.05 {0.5}	1.3	ISO 4401-AB-03-4-A
KS-02-10-59						

Sectional structural diagram

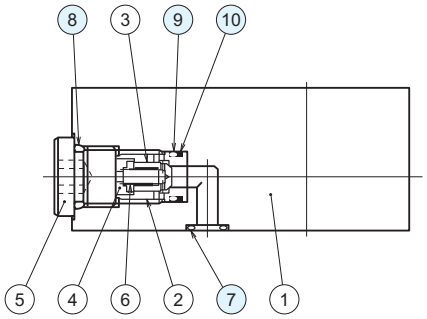
KS-02-10-50



Sealing part table

Part No.	Name	Quantity	Part specifications
7	O-ring	3	JIS B 2401 1B P9
8	O-ring	2	JIS B 2401 1B P14
9	O-ring	2	AS568-013 (NBR, Hs90)
10	Backup ring	2	Bias cut for AS568-013

Sectional structural diagram



Part No.	Name	Quantity	Part specifications
7	O-ring	2	JIS B 2401 1B P9
8	O-ring	1	JIS B 2401 1B P14
9	O-ring	1	AS568-013 (NBR, Hs90)
10	Backup ring	1	Bias cut for AS568-013

DAIKIN INDUSTRIES, LTD.

Oil Hydraulic Equipment

Osaka Office
YODOGAWA PLANT
1-1, Nishi-Hitotsuya, Settsu, Osaka 566-8585, Japan

Indian Representative
Technocrats Alliance Engineering Pvt. Ltd.
Works/Correspondence Office : 11/23, TIL Compound, Site-IV,
Sahibabad Industrial. Area, Ghaziabad - 201010 (UP) INDIA

Registered Office : C - 12 / 333, Yamuna Vihar, Delhi - 110053 INDIA
Tel: +91-11- 42448311, 22448312 Fax: +91-11-4248312
E-mail : **info@tca.co.in** website : **www.tca.co.in**