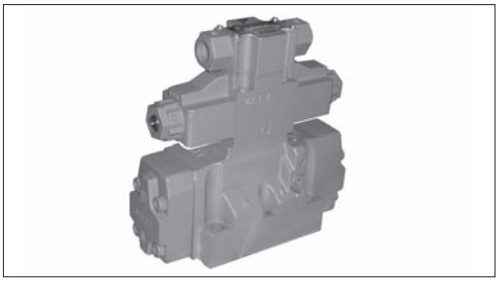
Solenoid Pilot Operated Directional Control Valve



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

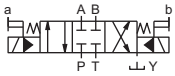
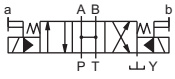
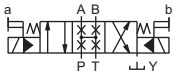
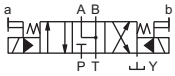
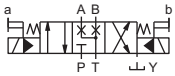
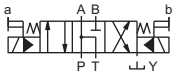
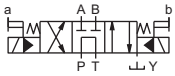
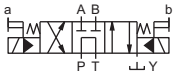
Model code	Applicable solenoid valve model code (※: Voltage code)
KSH-G04-※※C※-20	KSO-G02-4C※-30
KSH-G04-※※B※-20	KSO-G02-2B※-30
KSH-G04-※※D※-20	KSO-G02-2D※-30
KSH-G04-※※H※-20	KSO-G02-7C※-30

Accessories

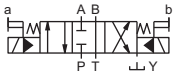
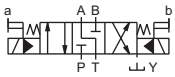
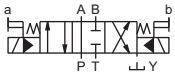
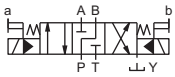
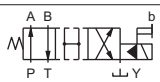
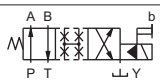
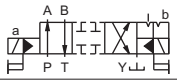
Hexagon socket head cap bolt	Quantity	Tightening torque N·m {kgf·cm}
M 6 × 45	2	13 to 15 {130 to 150}
M10 × 50	4	50 to 55 {500 to 550}

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)	–
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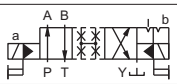
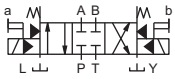
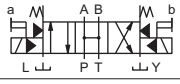
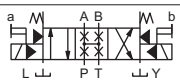
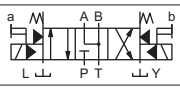
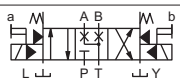
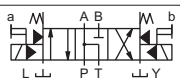
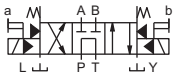
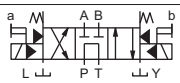
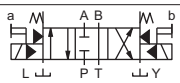
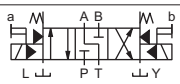
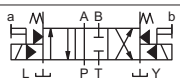
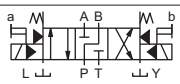
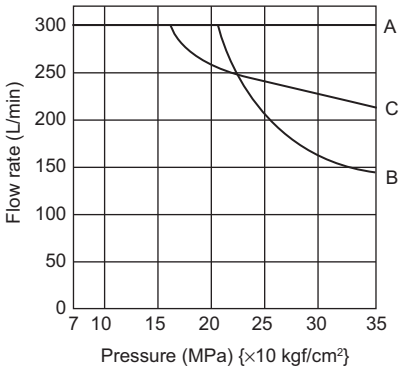
KSH-G04-33D		A	300	300	300	300	(4)	(5) (3)	–
KSH-G04-2H		A	300	300	300	300	(4)	(5) (3)	–
KSH-G04-3H		A	300	300	300	300	(5)	(5) (3)	(4)
KSH-G04-33H		A	300	300	300	300	(4)	(5) (3)	–
KSH-G04-4H		A	300	300	300	300	(4)	(5) (4)	–
KSH-G04-44H		A	300	300	300	300	(4)	(5) (3)	–
KSH-G04-5H		A	300	300	300	300	(5) (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)	–

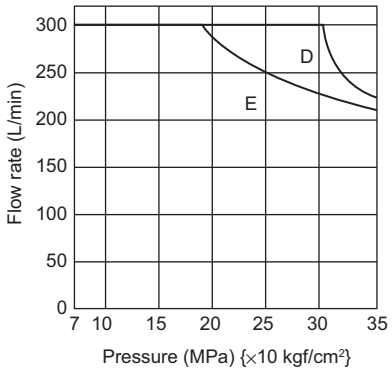
Note: ○ In the transient period of switching, all ports are blocked with spool type/operating method 6C and 6H, and all ports are open with spool type/operating method 66C and 66H.

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

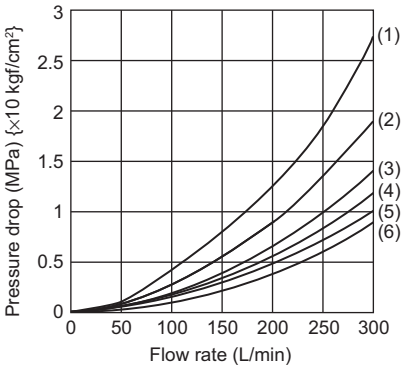
Pressure - Flow rate characteristics



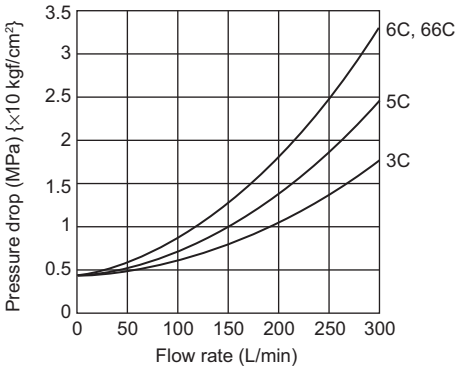
Pressure - Flow rate characteristics



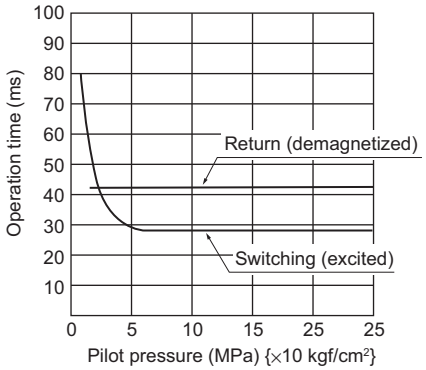
Pressure drop characteristics



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.

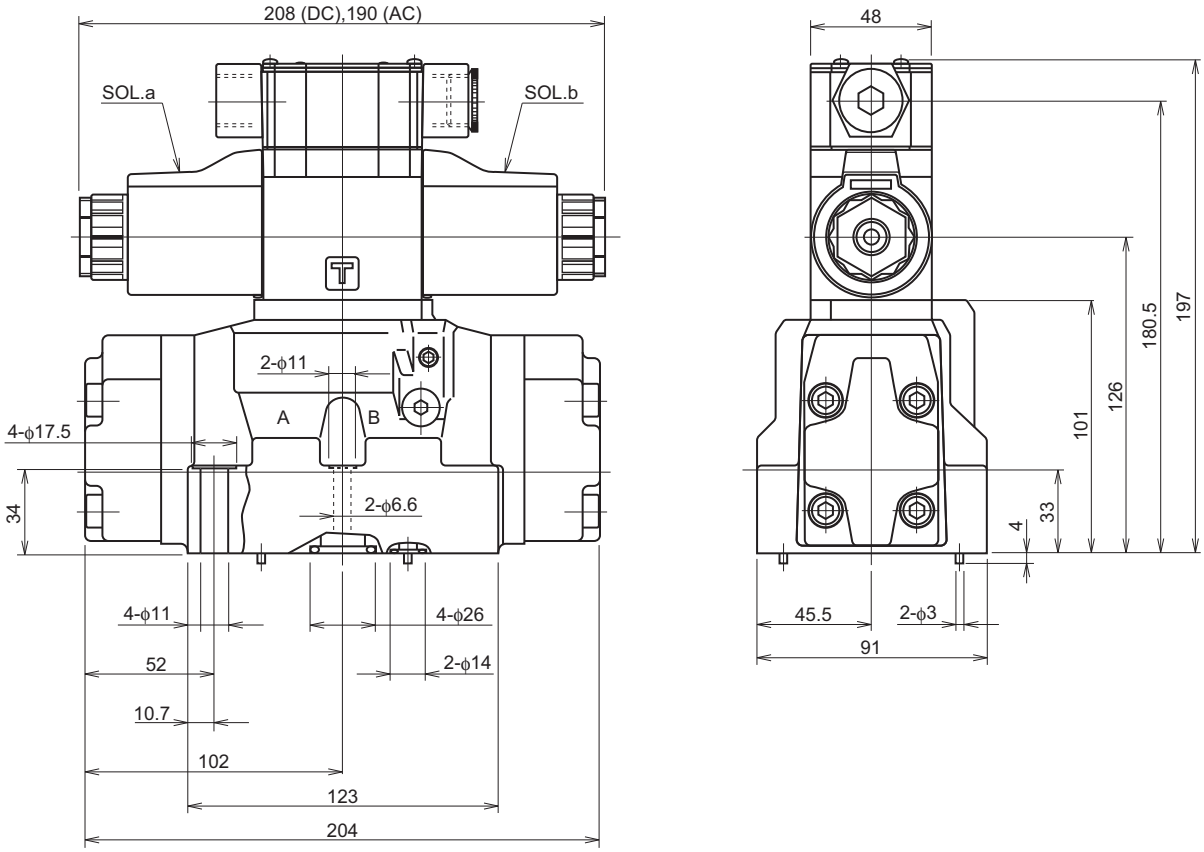
	Pilot method	Plug A	Plug D	Drain method	Plug B	Plug C
No designation	Internal	Without plug	With plug	External	With plug	Without plug
X	Internal	Without plug	With plug	Internal	Without plug	With plug
Y	External	With plug	Without plug	External	With plug	Without plug
Z	External	With plug	Without plug	Internal	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.

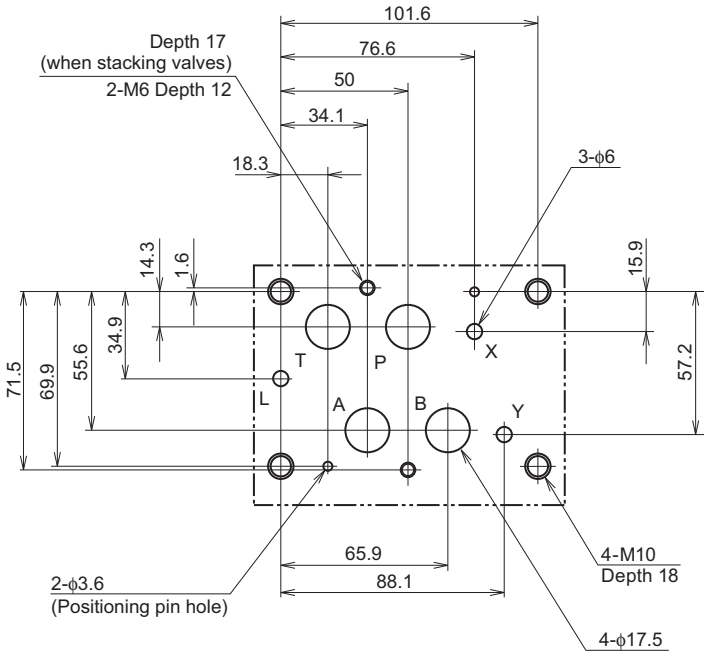
External dimension diagram

- Spring center type (type C) (terminal box type)
- No-spring type (with detent) (type D) (terminal box type)



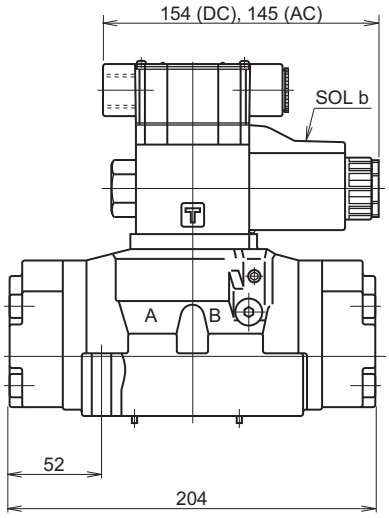
Mounting face (conforming standard)
ISO 4401-07-07-0-05

※ Port L is only applicable to the hydro-center type.



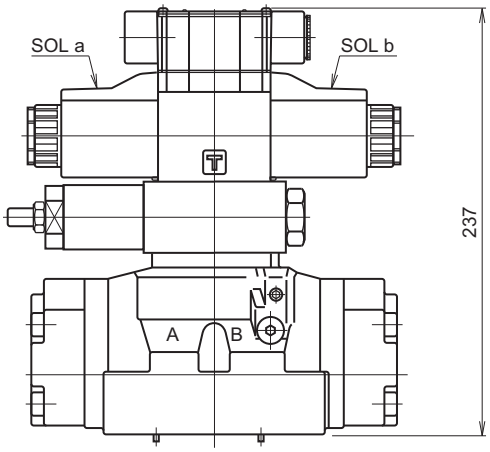
External dimension diagram

● Spring offset type (type B)

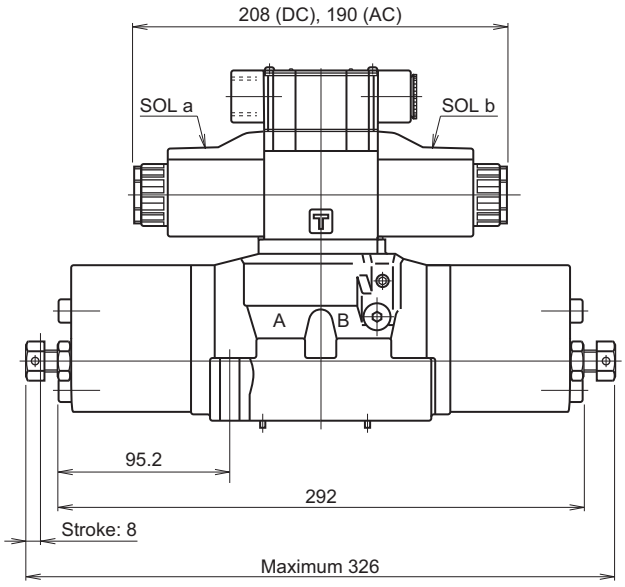


※ 02 series stack valve added in the pilot line

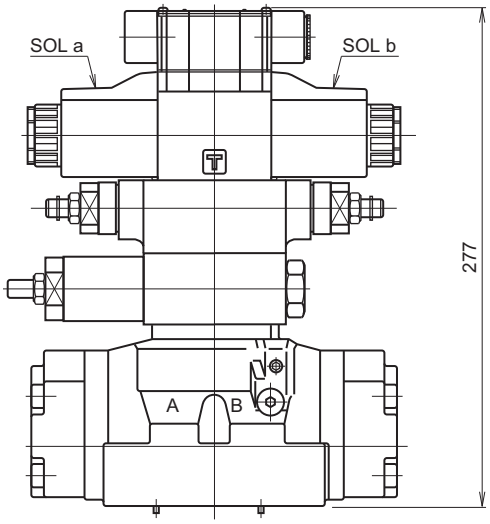
● MG-02P-1-60-S02 (type R)
(Hexagon socket head cap bolts used: M5 × 85, 4 pcs.)



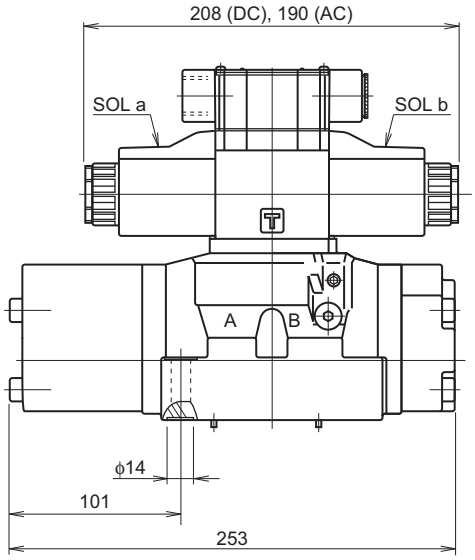
● Stroke adjustable type (main valve option: S)



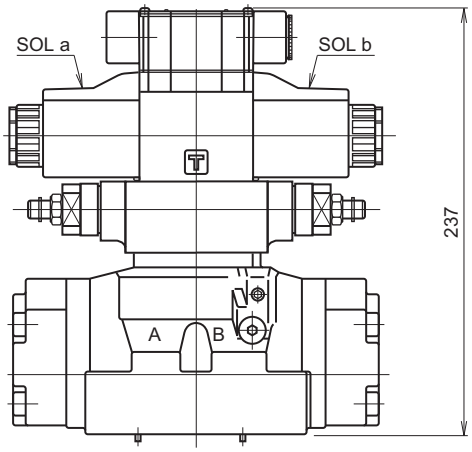
● With MT-02W-60, MG-02P-1-60-S02 (Type G)
(Hexagon socket head cap bolts used: M5 × 125, 4 pcs.)



● Hydro-center type (type H)

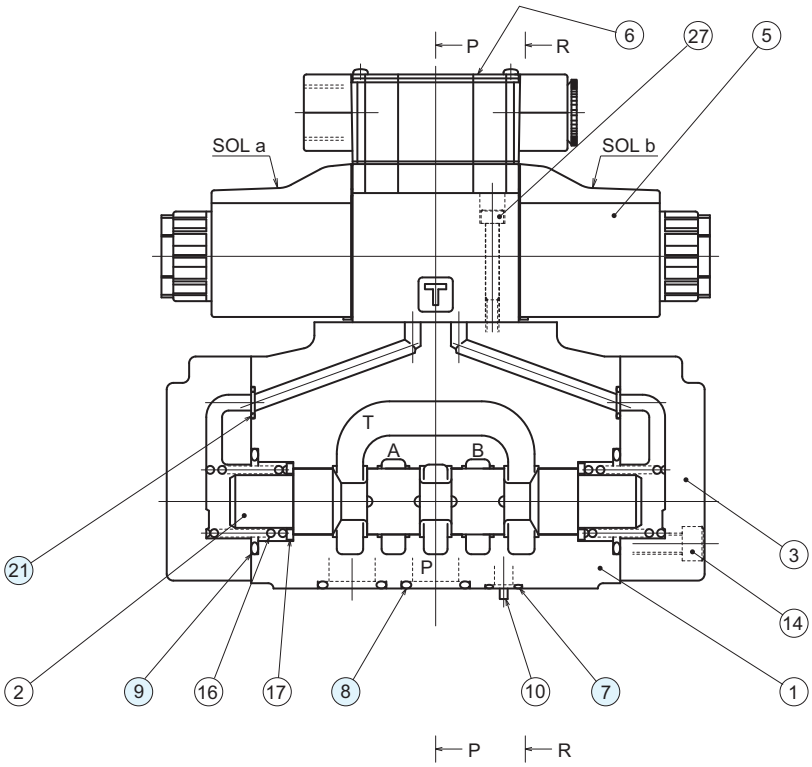


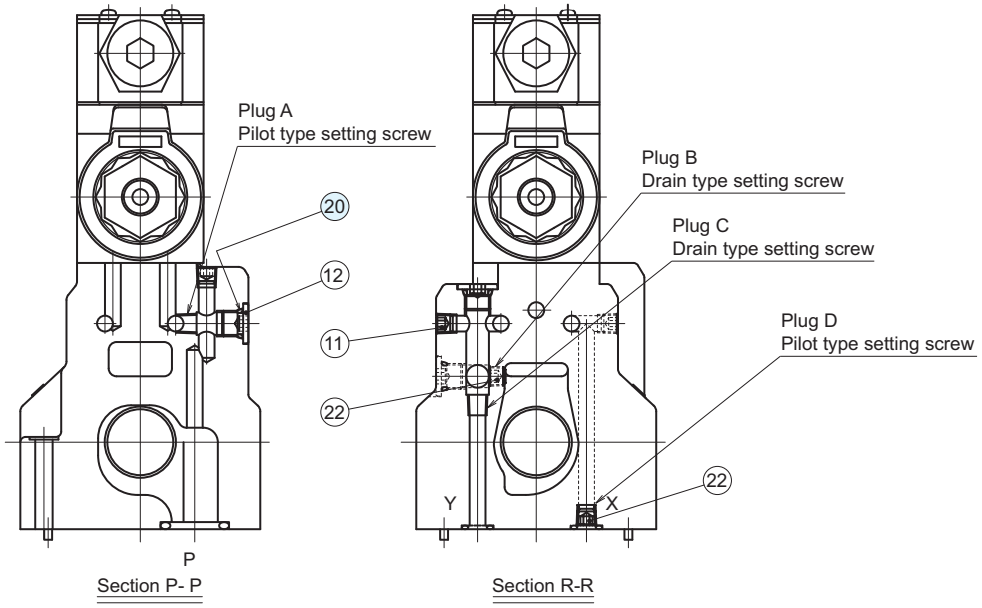
● MT-02W-60 (type W)
(Hexagon socket head cap bolts used: M5 × 85, 4 pcs.)



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