

Solenoid Valve

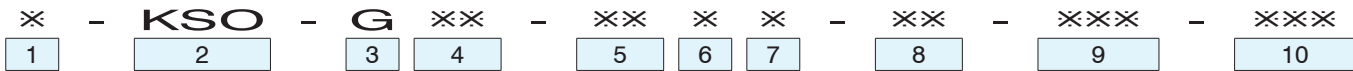


G02 For DC power supply G03 For AC power supply

Features

- These models realize high-pressure large-flow-rate control at 35 MPa {350 kgf/cm²} 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



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} | 100 | 17.5 {175} | 240 | 120 | 100 | IEC Pub529 IP65 |
| KSO-G03 | ⅜ | (25 {250}) *1 | 160 (DC), 130 (AC) | 16 {160} | | | 60 | |

Note: *1 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.

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.

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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 | CE standard compliant | Without surge killer | ✓ | ✓ | |
| N | | | | | With surge killer | ✓ | ✓ | *3 |
| NR | | | | | With surge killer (with resistance) | ✓ | ✓ | *4 |
| E | | | With earth terminal | | 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 | CE standard compliant | Without surge killer | – | ✓ | |
| CE | | | | | | ✓ | ✓ | *5 |
| CL | | | | | | – | ✓ | |
| CLE | | With lamp | | | Without surge killer | ✓ | ✓ | *5 |
| N-CL | | | | | With surge killer | – | – | |
| N-CLE | | | | | With surge killer | ✓ | – | *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 |

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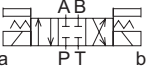
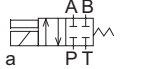
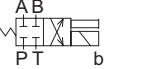
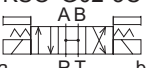
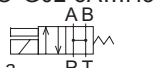
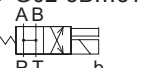
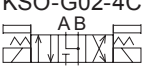
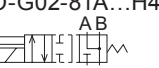
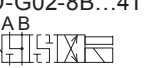



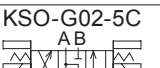
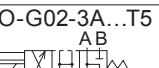
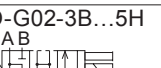
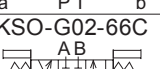
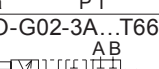
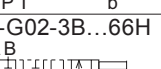
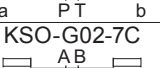
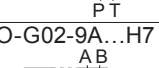
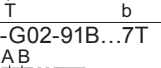
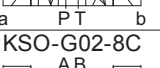
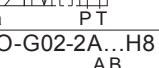
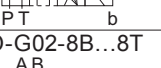
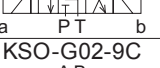
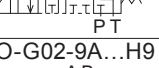
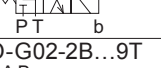
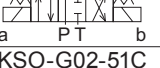




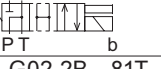

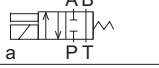

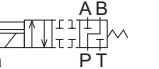
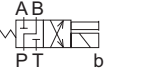




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5 6 10 : Model table

● KSO-G02

| 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 ... Subordinate spool type | | | | A | A [*] B | A [*] B [*] | 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 | | | |

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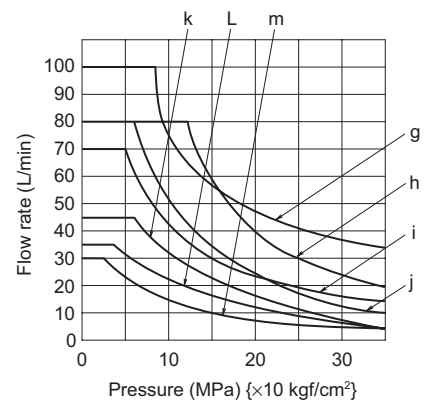
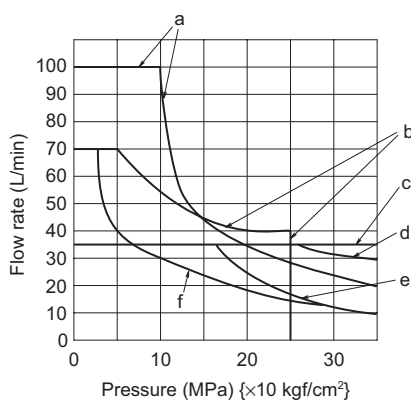
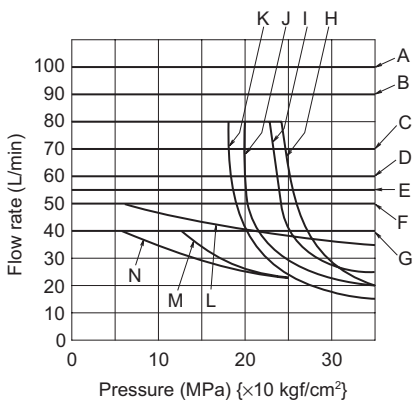
5 6 10 : Model table

| 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 ... Subordinate spool type | | | | A | B | A | P → A | A → T | P → T |
| Type N, D | Type A | Type B | P | T | P | T | P → B | B → T | P → T |
| - | KSO-G02-2A...2T | - | AC | C | - | m | - | (7) | - |
| - | - | - | DC | D | - | m | (5) | - | - |
| - | - | KSO-G02-2B...H2 | AC | C | m | - | (5) | - | - |
| - | - | - | DC | D | m | - | - | (7) | - |
| 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 | - | (7) | - |
| - | - | - | DC | E | - | a | (5) | - | - |
| KSO-G02-2N...H2 | - | - | AC | A | f | - | (5) | - | - |
| - | - | - | DC | E | a | - | - | (7) | - |
| KSO-G02-2D | - | - | AC | B | d | d | (6) | (5) | - |
| - | - | - | DC | G | e | e | - | - | - |
| KSO-G02-20D | - | - | AC | - | d | d | (6) | - | - |
| - | - | - | DC | - | e | e | - | - | - |

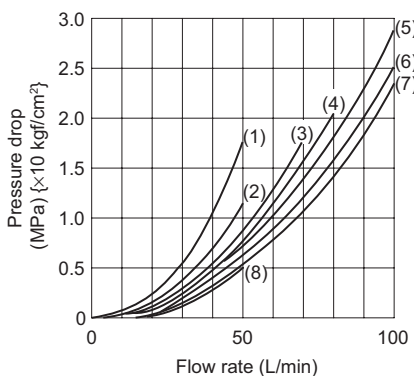
DIRECTIONAL CONTROL VALVES G

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.

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5 6 10 : Model table

● KSO-G03

| 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 ... Subordinate spool type | | | | A | B | A | P → A | A → T | P → T |
| Type C | Type A | Type B | P | T | P | T | P → B | B → T | P → T |
| 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) | - |
| | | | DC | A | q | b | (4) | | |
| 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) | (4) | - |
| | | | DC | A | b | q | (5) | | |
| - | 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 | | | |

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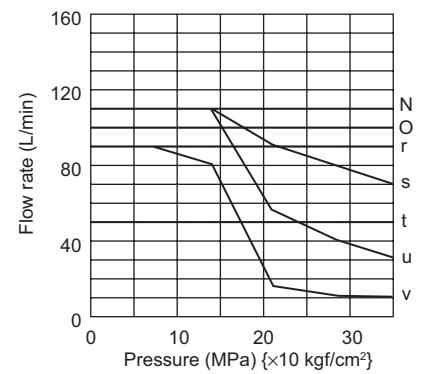
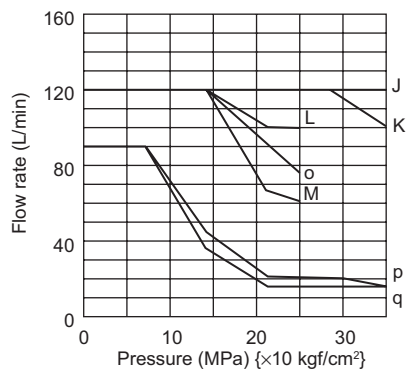
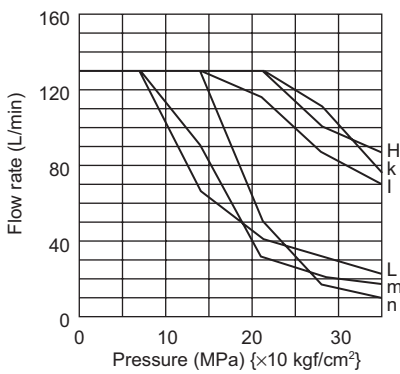
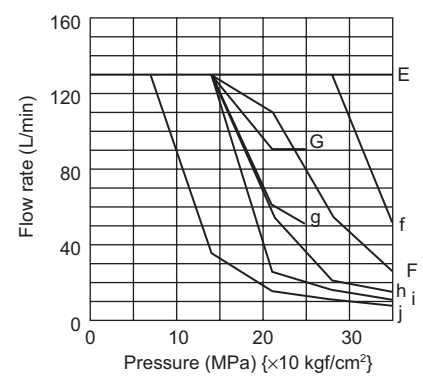
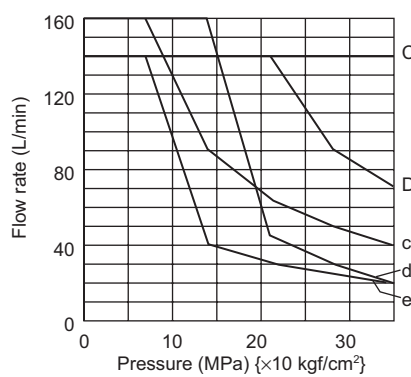
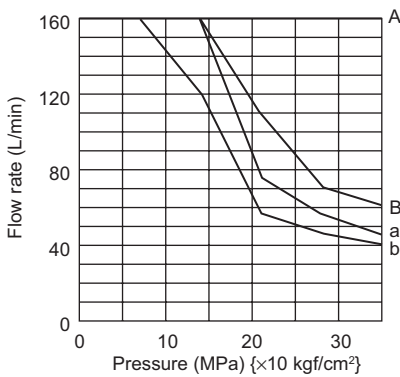
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5 6 10 : Model table

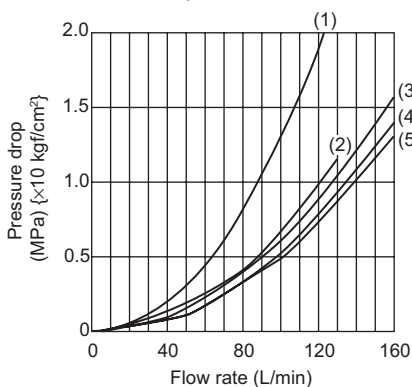
| Model code JIS graphic symbols for hydraulic system | | | Power supply | Pressure - Flow rate characteristics (See performance curves) | | | Pressure drop characteristics (See performance curves) | | |
|---|---------------------|---------------------|--------------|---|---|-------|--|-------|-------|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

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.

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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 | | |

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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 | | TNW2 (3) -A-N (2) | | TNSA2 (3) -A-N (2) | | TNSB2 (3) -A-N (2) |
| K | | TNW2 (3) -B-N (2) | | TNSA2 (3) -B-N (2) | | TNSB2 (3) -B-N (2) |
| L | | TNW2 (3) -A-N (2) | | TNSA2 (3) -A-N (2) | | TNSB2 (3) -A-N (2) |
| 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 | 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 | | TNW2 (3) -T-N (5) | | TNSA2 (3) -T-N (5) | | TNSB2 (3) -T-N (5) |
| T | | | | | | |
| U | | | | | | |
| E | TNW2 (3) -EG (6) | - | TNSA2 (3) -EG (6) | - | TNSB2 (3) -EG (6) | - |
| F | | | | | | |
| G | | | | | | |
| H | | | | | | |
| P-NR | - | TNW2 (3) -P-NR (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.)

DIRECTIONAL CONTROL VALVES G

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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.

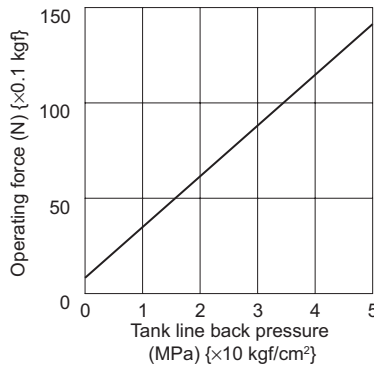
● Fixed throttle valve

- 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/cm²}.
- When inserting a fixed throttle at the tank port, maintain the back pressure at the tank port within the permissible back pressure.

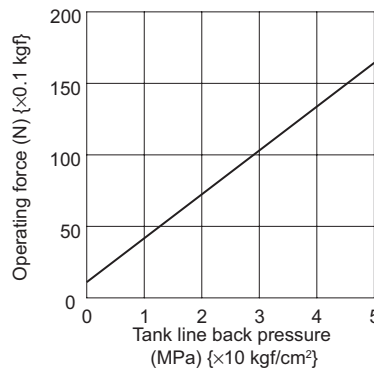
● Operating force for manual operation pin

The force required to operate the manual operation pin varies depending on the back pressure in the tank line.

KSO-G02

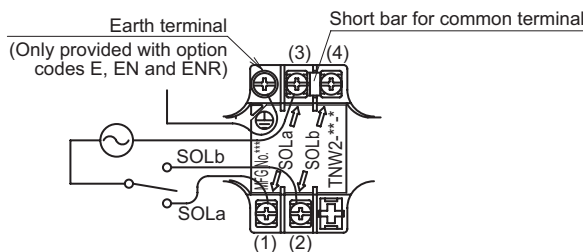


KSO-G03

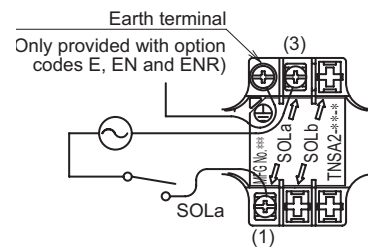


Wiring guide

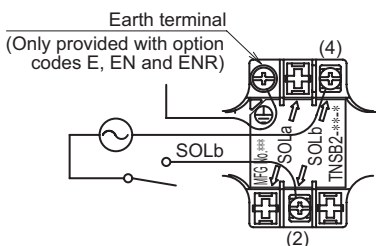
Spool operating method: Type C, N or D [Terminal box type]



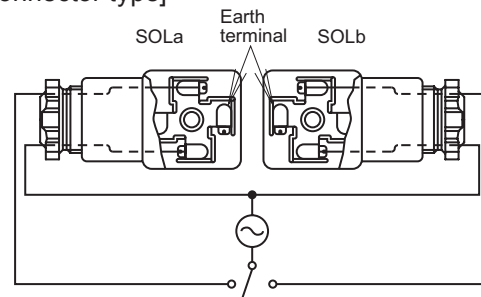
Spool operating method: Type A [Terminal box type]



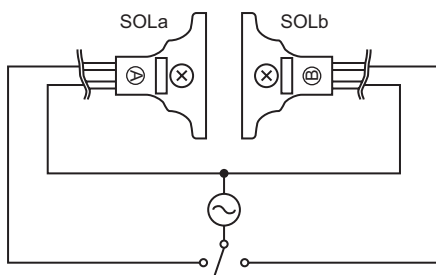
Spool operating method: Type B [Terminal box type]



[DIN connector type]



[Lead wire type (G02)]



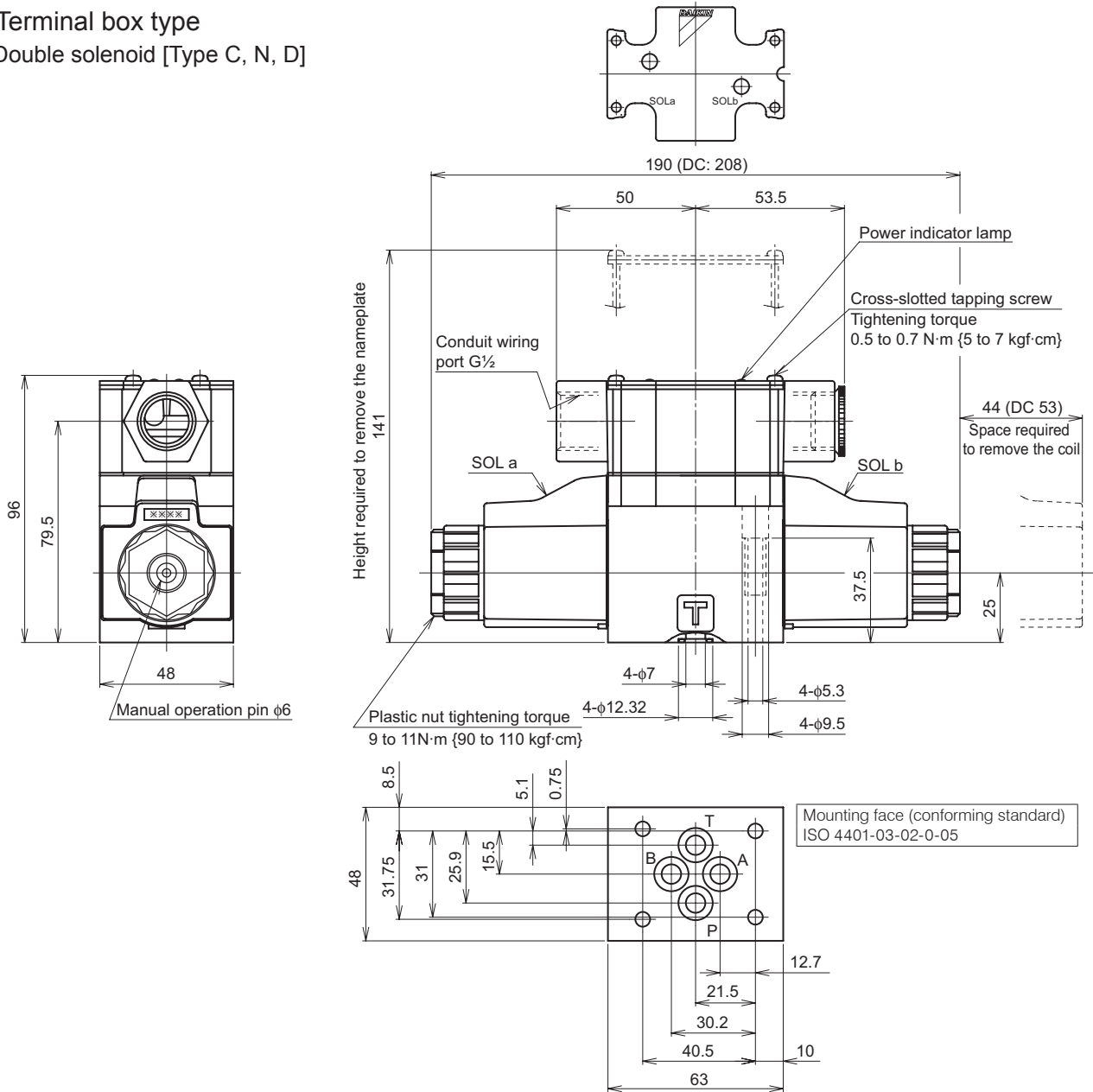
- The figure shows the status with the terminal box nameplate removed.
- The earth terminal is optional (option code: E, EN, ENR).
- Always turn off the power supply before starting wiring work.
- Use crimp-style terminals for M3.
- For double solenoid type valves, a short bar for common terminals is 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.

External dimension diagram

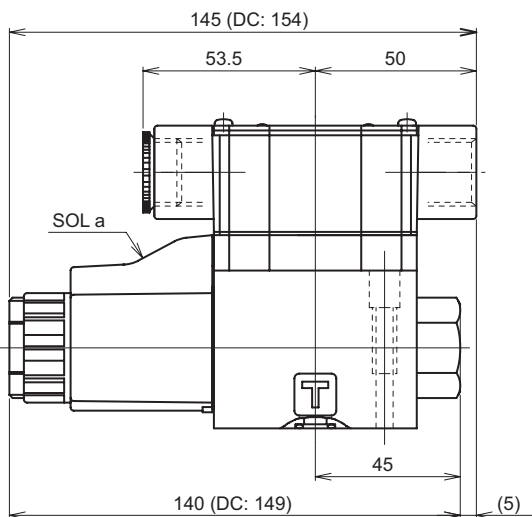
● KSO-G02

■ Terminal box type

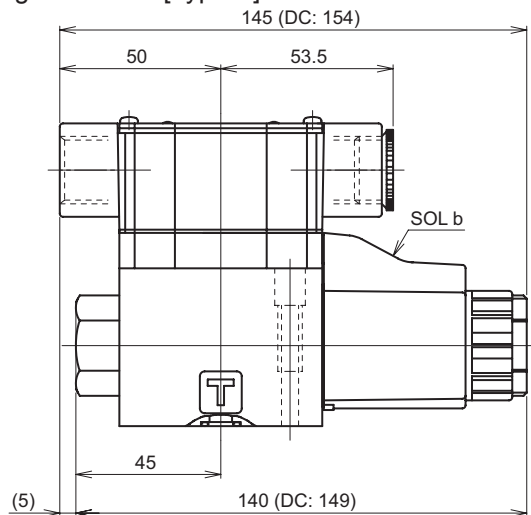
● Double solenoid [Type C, N, D]



● Single solenoid [Type A]



● Single solenoid [Type B]



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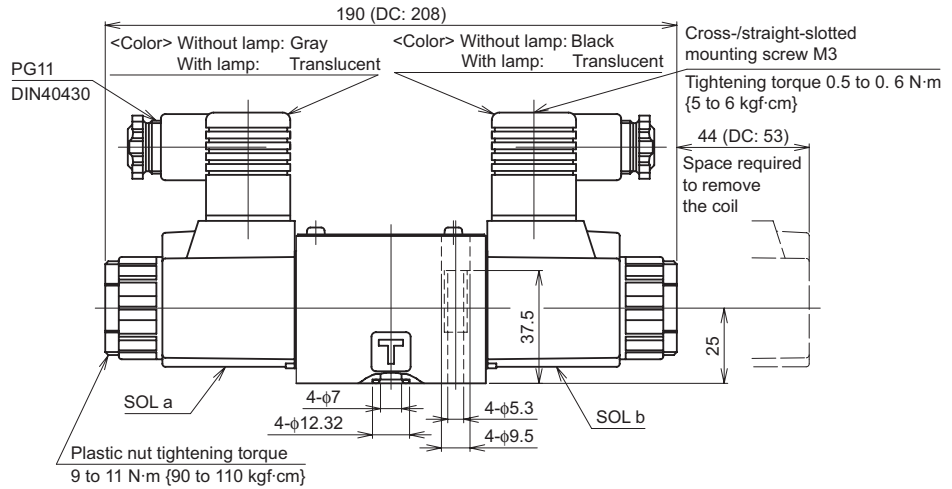
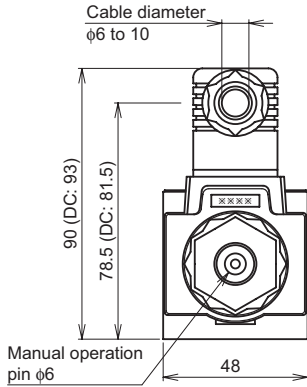
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External dimension diagram

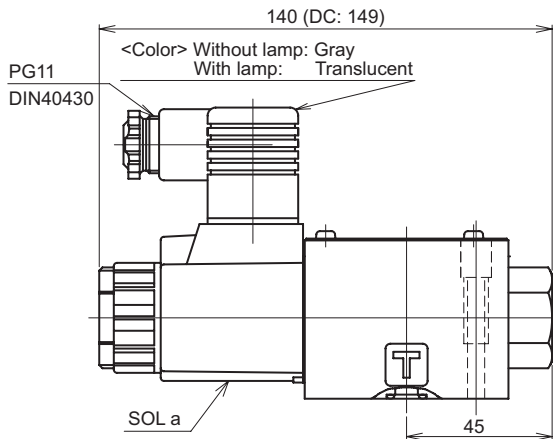
● KSO-G02

■ DIN connector type

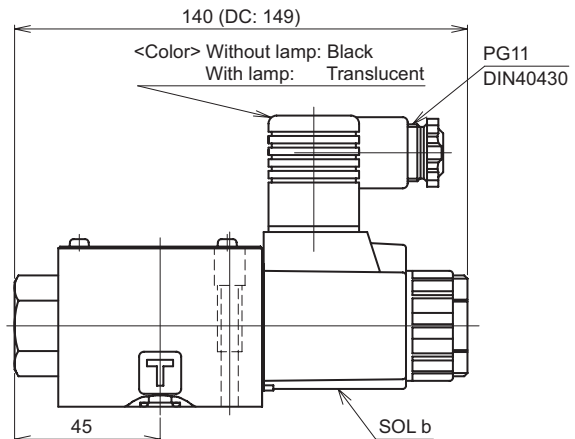
● Double solenoid [Type C, N, D]



● Single solenoid [Type A]

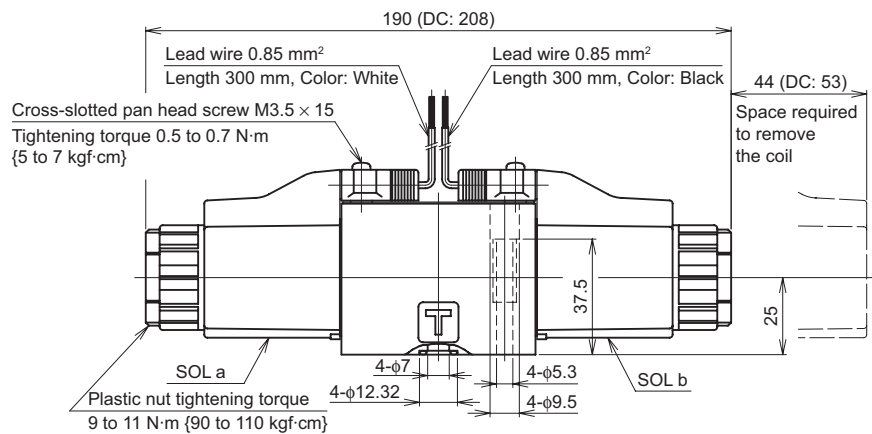
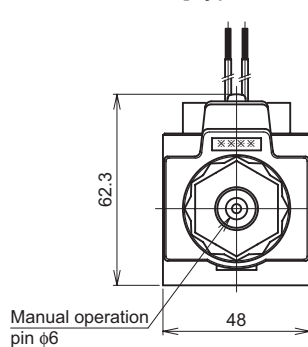


● Single solenoid [Type B]

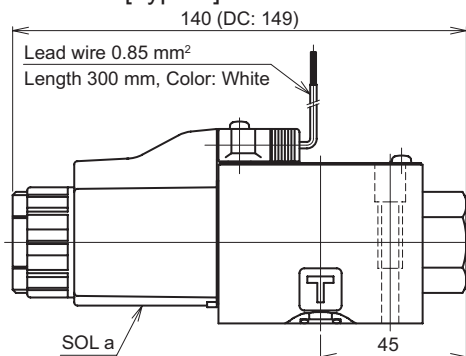


■ Lead wire type

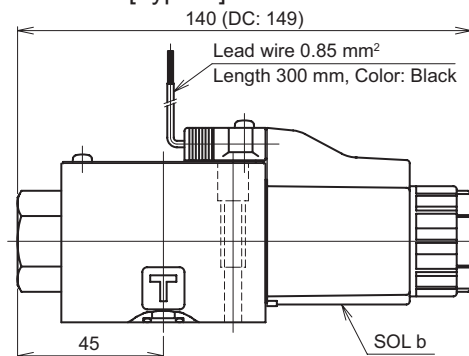
● Double solenoid [Type C, N, D]



● Single solenoid [Type A]



● Single solenoid [Type B]



Contact Details

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Internet

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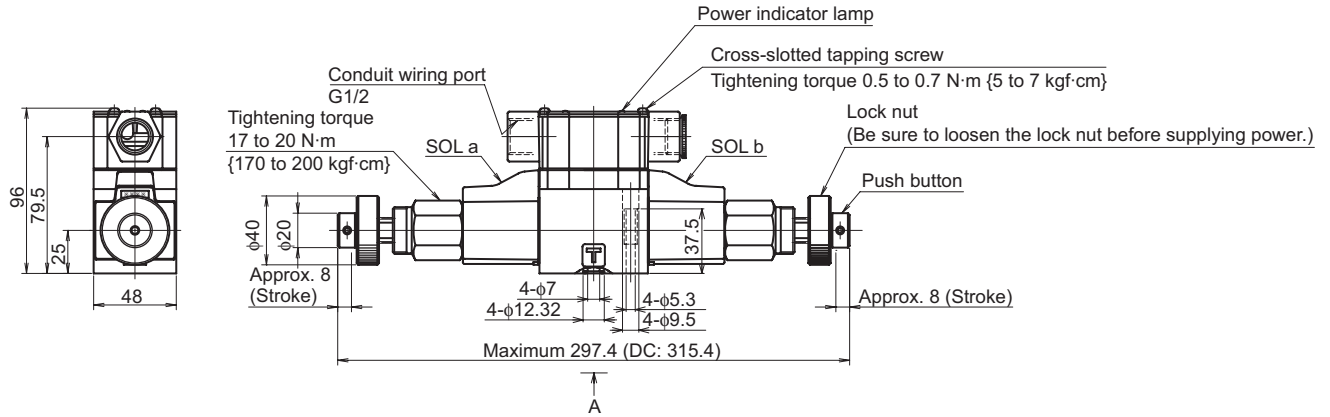
For latest information, PDF catalogs and operation manuals

External dimension diagram

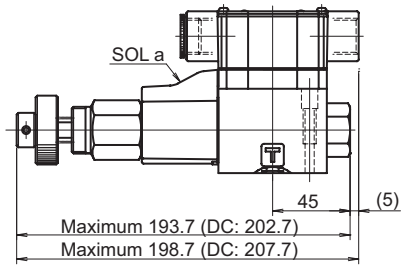
● With spool locking device

■ KSO-G02-※※C※-30-※P [With AC solenoid]

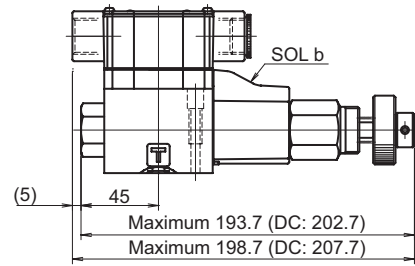
● Double solenoid [Type C, D, N]



● Single solenoid [Type A]



● Single solenoid [Type B]



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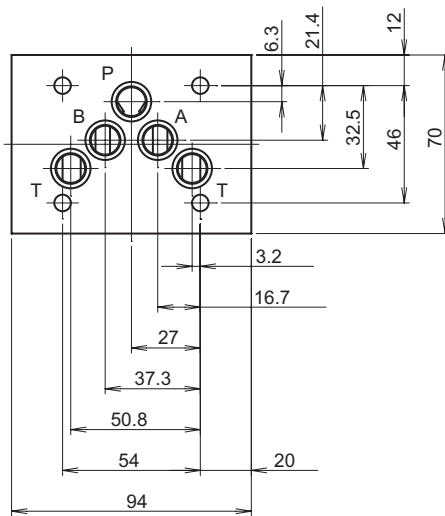
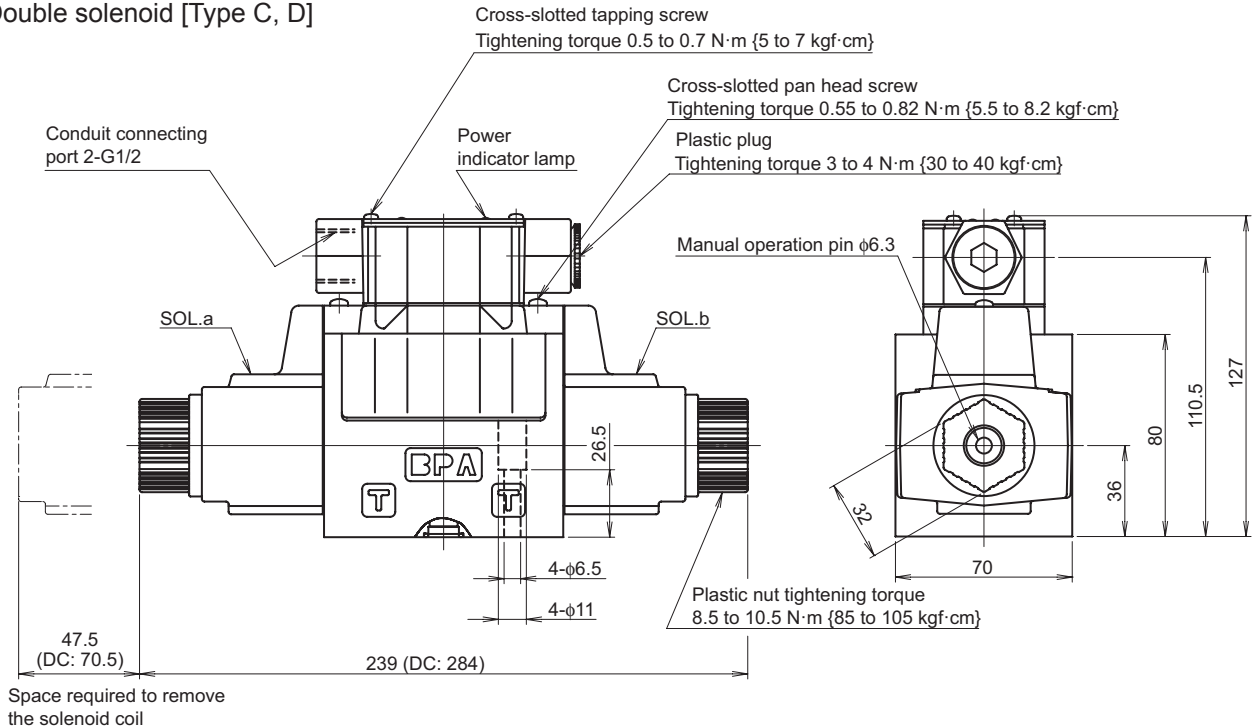
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External dimension diagram

● KSO-G03

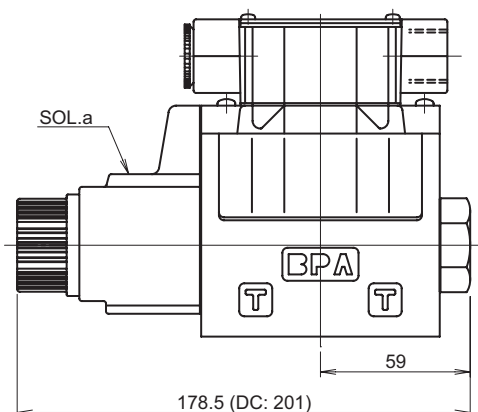
■ Terminal box type

● Double solenoid [Type C, D]

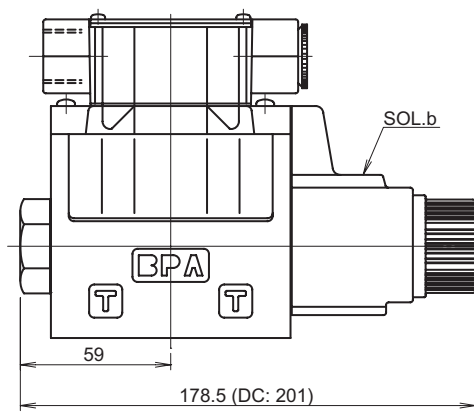


Mounting face (conforming standard)
ISO 4401-05-04-0-05

● Single solenoid [Type A]



● Single solenoid [Type B]



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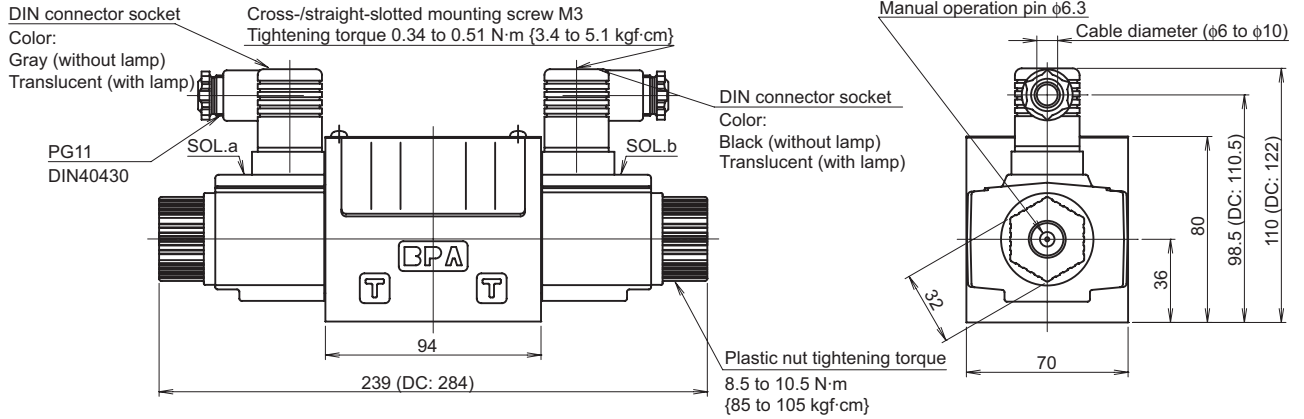
For latest information, PDF catalogs and operation manuals

External dimension diagram

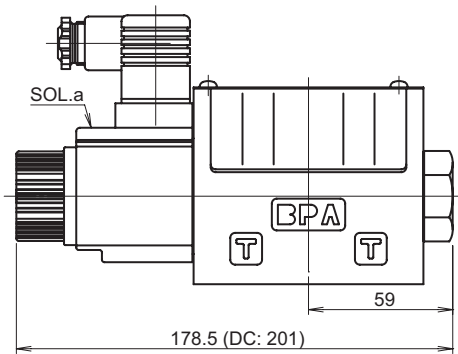
● KSO-G03

■ DIN connector type

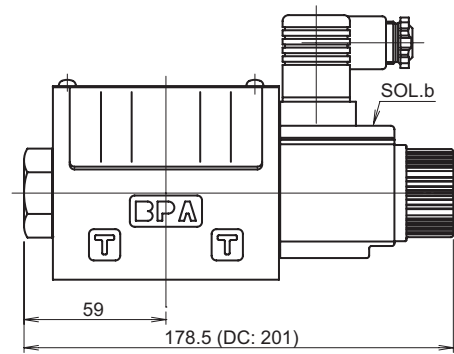
● Double solenoid [Type C, D]



● Single solenoid [Type A]

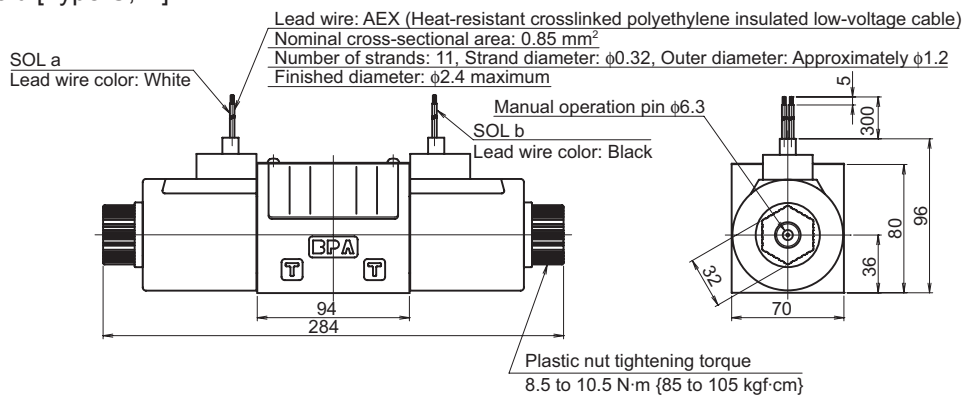


● Single solenoid [Type B]

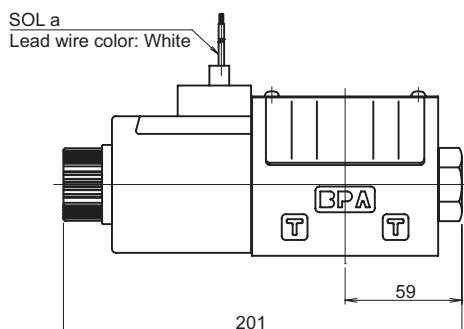


■ Lead wire type

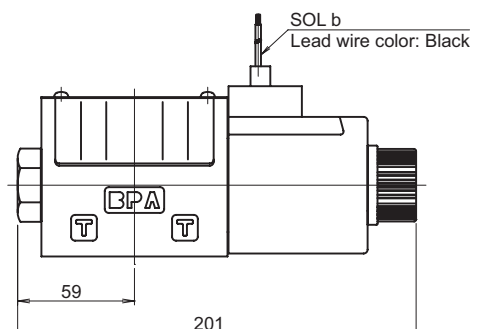
● Double solenoid [Type C, D]



● Single solenoid [Type A]



● Single solenoid [Type B]



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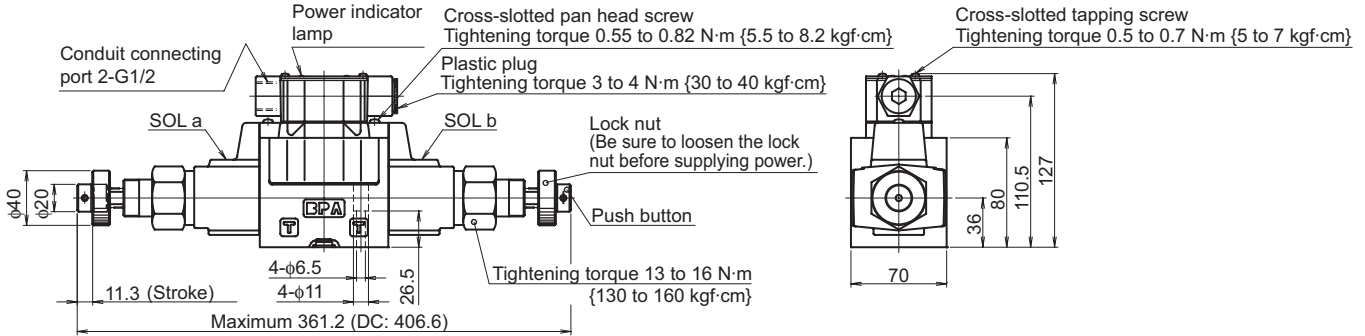
For latest information, PDF catalogs and operation manuals

External dimension diagram

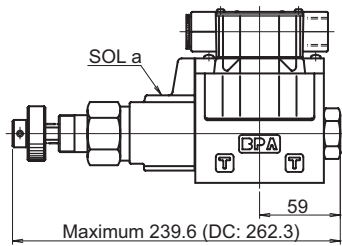
● With spool locking device

■ KSO-G03-※※C※-20-※P [With AC solenoid]

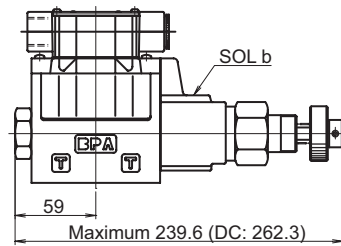
● Double solenoid [Type C, D]



● Single solenoid [Type A]



● Single solenoid [Type B]



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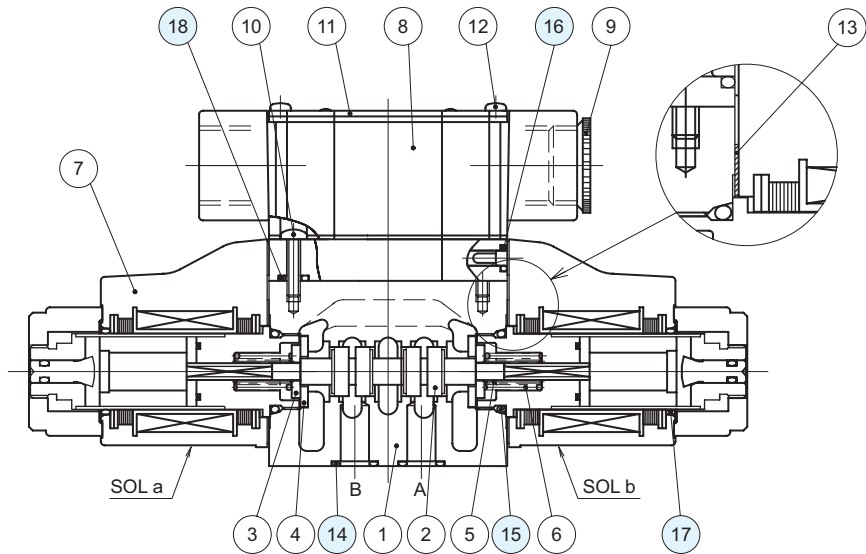
Internet

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For latest information, PDF catalogs and operation manuals

Sectional structural diagram

- KSO-G02
- KSO-G02-※C※-30

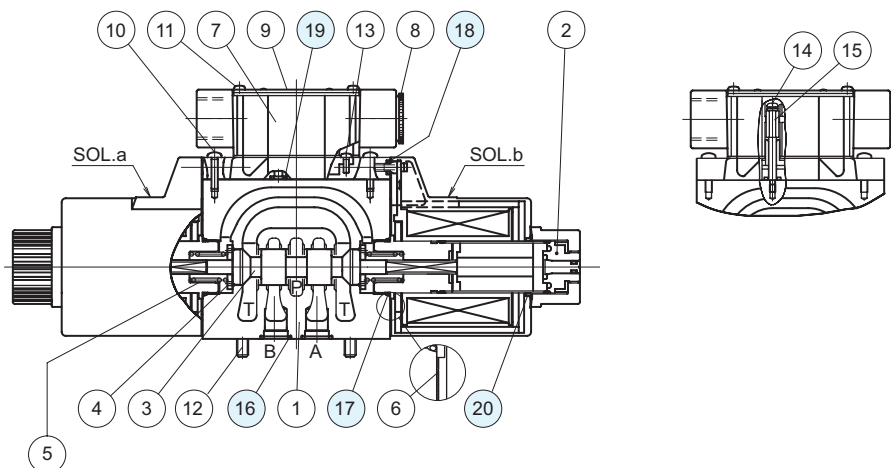


Sealing part table

| 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 |