Solenoid operated directional valve — DE10

DE10

■Overview

This solenoid operated directional valve is used for controlling start and stop, and movement direction of the hydraulic system with electrical signals.

■Features

1. This valve is resistant to contamination and provides stable operation.
2. A wide variety of options are available.
3. Explosion proof solenoids are also available.

■Type indication

DE 10 P - 20 - 2 04 - W D 24 AL - P08 - ☐

Solenoid operated directional valve

Nominal dimension
10

Connection method
P = Gasket connection type

Series number: 20

Position holding method
1 = 2 position, no spring type (with detent)
2 = 2 position, spring offset type
or
3 position, spring center type

Spool type
* Refer to "Spool type symbols".

Solenoid type
W = Wet type (with standard emergency manual operation)
* (For the explosion proof type, please contact us.)

Input power supply
A = Alternating current
D = Direct current
R = AC/DC conversion

Type of hydraulic oil
No symbol = Mineral based hydraulic oil
Fatty ester based hydraulic oil
Water-glycol based hydraulic oil
V = Phosphate ester based hydraulic oil

Presence/absence of P port restriction
No symbol = No restriction
P08 = Restriction contraction diameter ϕ 0.8 mm
P10 = Restriction contraction diameter ϕ 1.0 mm
P12 = Restriction contraction diameter ϕ 1.2 mm
P15 = Restriction contraction diameter ϕ 1.5 mm
P20 = Restriction contraction diameter ϕ 2.0 mm
P25 = Restriction contraction diameter ϕ 2.5 mm
P30 = Restriction contraction diameter ϕ 3.0 mm
P40 = Restriction contraction diameter ϕ 4.0 mm

Electric connection symbol

Symbol	Explanation	Input power supply		
		A	D	R
AL	Integrated terminal box with lamp	○	○	○
B	With DIN connector	○	○	—
C	With DIN large connector	○	○	○
CL	DIN large connector with lamp	○	○	—

Input voltage

Alternating current A		Direct current D		AC/DC conversion R	
100	100V-50/60Hz	12	12V	100	100V-50/60Hz
	110V-60Hz	24	24V	120	120V-50/60Hz
120	110V-50Hz	48	48V	200	200V-50/60Hz
	120V-50/60Hz	100	100V	220	220V-50/60Hz
200	200V-50/60Hz	110	110V		
	220V-60Hz	200	200V		
240	220V-50Hz	220	220V		
	240V-50/60Hz				

■Spool type symbol

●2 position valve

Number of positions	Position holding method	Spool type symbol	Hydraulic symbols	Transient state
2 positions	2 (Spring offset type)		Sol. a — B A / T P	Sol. a — B A / T P
		01		
		03		
		04		
			B A / a b — Sol. b	B A / a b — Sol. b
		02		
		25		
	1 (No spring type with detent)		Sol. a — B A — Sol. b	Sol. a — B A — Sol. b
		01		
		03		
		04		

●3 position valve

Number of positions	Position holding method	Spool type symbol	Hydraulic symbols	Transient state
3 positions	2 (Spring center type)		Sol. a — B A — Sol. b / T P	B A / T P
		05		
		06		
		07		
		08		
		09		
		10		
		12		
		13		
		16		
		17		
		21		
		22		

● When neutral position and one side position of the 3 position valve are used together

With reference to the 3 position valve, two types of the 2 position valve are available: the valve that uses the neutral position and sol.a excitation position of the 3 position valve (2**A) and the one that uses the neutral position and sol.b excitation position (2**B).

Number of positions	Position holding method	Spool type symbol	Hydraulic symbols	
2 positions	2 (Spring offset type)		Sol. a — B A / T P	o b — Sol. b
		05A		
		05B		
		06A		
		06B		
		07A		
		07B		
		08A		
		08B		
		10A		
		10B		

■Specifications

Nominal dimension			10
Maximum working pressure MPa (kgf/cm²)	Port A, B, P	(Note 1)	31.5 (321)
	Port T		16 (163)
Maximum switching frequency Number of times/min	AC, DC		240
	AC/DC conversion		120
Switching time ms (Note 2)	Solenoid excitation	AC	15 to 25
		DC	70 to 110
		AC/DC conversion	70 to 110
	Solenoid demagnetization	AC	8 to 25
		DC	40 to 50
		AC/DC conversion	(Note 3) 170 to 200
Highest operating temperature ˚C			50
Waterproof			IP64
Mass kg	Single solenoid type	AC	2.9
		AC/DC conversion	3.6
	Double solenoid type	AC	3.6
		AC/DC conversion	5

(Note 1) The maximum working pressure is 25 MPa (255 kgf/cm²) only for spool type "07".
(Note 2) Switching time varies slightly depending on use conditions.
(Note 3) A quick return type, in which switching time at the time of deenergization of the solenoid is equivalent to that of DC solenoid, is also available.

■Sub-plate

Valve type	Sub-plate type	Connection diameter	Mass
DE10P	P-DE10R38-0	Rc $\frac{3}{8}$	2.1 kg
	P-DE10G38-0	G $\frac{3}{8}$	
	P-DE10R12-0	Rc $\frac{1}{2}$	
	P-DE10G12-0	G $\frac{1}{2}$	

When you use a sub-plate, please place an order for the above sub-plate type.
For the dimension drawing, refer to page 9 of the appendix.

■Accessories
●Mounting bolt

Type	Hexagon socket head cap thread	Quantity	Tightening torque N·m (kgf·cm)
DE10P	M6×35L	4 pcs.	13 ± 1 (133 ± 10)

■Solenoid specifications

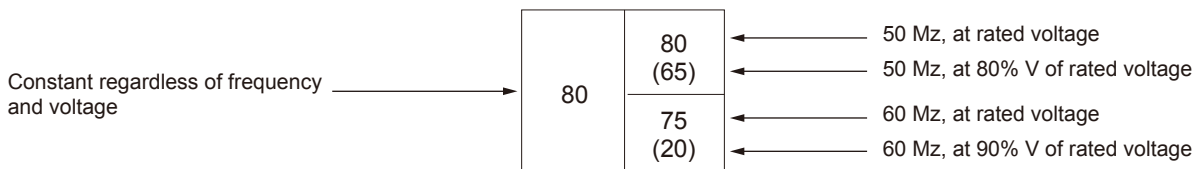| Solenoid type	Power supply	Symbol	Rated voltage V	Frequency Hz	Working voltage range V	Current value at rated voltage			Energized time	Type of coil insulation
						Holding current A	Starting current A	Electric power W		
Oil immersion type	Alternating current A	A100	100	50	80 to 110	0.90	5.37	—	Continuous rating	H type
				60	90 to 120	0.63	4.57			
			110			0.77	5.03			
		A120	120	50	96 to 132	0.75	4.48			
				60	108 to 144	0.52	3.81			
		A200	200	50	160 to 220	0.45	2.69			
				60	180 to 240	0.31	2.29			
			220			0.38	2.52			
		A240	240	50	192 to 264	0.37	2.24			
				60	216 to 288	0.26	1.91			
	Direct current D	D12	12	—	10.8 to 13.2	3.16	—	38	—	
		D24	24		21.6 to 26.4	1.57				
		D48	48		43.2 to 52.8	0.79				
		D100	100		90 to 110	0.38				
		D110	110		99 to 121	0.34				
		D200	200		180 to 220	0.19				
		D220	220		198 to 242	0.17				
	AC/DC conversion R	R100	100	50/60	90 to 110	0.43	—	38	—	
		R110	110		99 to 121	0.39				
		R200	200		180 to 220	0.21				
		R220	220		198 to 242	0.19				

■Connection method
●Similar to that of solenoid operated directional valve (DE6)
Refer to the section of the type number index "DE6".

Solenoid operated directional valve

Maximum flow rate

● With AC solenoid DE10P-20***-WA*

Maximum flow rate L/min — Working pressure MPa (kgf/cm²)

Number of positions	Position holding method	Spool type symbol	Hydraulic symbols	Flow direction P→A(B)→B(A)→T 10(102)	16(163)	25(255)	31.5(321)	Flow direction P→A 10(102)	16(163)	25(255)	31.5(321)	Flow direction P→B 10(102)	16(163)	25(255)	31.5(321)
3 positions	2 (Spring center type)	05	(hydraulic symbol)	100	100	100	100	100(70) / 90(49)	100(48) / 53(30)	96(28) / 34(19)	65(24) / 26(15)	100(70) / 90(49)	100(48) / 53(30)	96(28) / 34(19)	65(24) / 26(15)
		06	(hydraulic symbol)	30	30	30	30	26	21	18	16	30	28	28	28
		07	(hydraulic symbol)	70	70	70	—	100	100	100	—	100	100	100	—
		08	(hydraulic symbol)	90	90	90	90	100(81) / 100(81)	100(81) / 100(81)	100(81) / 100(81)	100(81) / 100(81)	100(81) / 100(81)	100(81) / 100(81)	100(81) / 100(81)	100(81) / 100(81)
		09	(hydraulic symbol)	100	100	100	100	100(80) / 80(60)	100(65) / 70(46)	85(35) / 51(32)	62(28) / 45(25)	100(80) / 80(60)	100(65) / 70(46)	85(35) / 51(32)	62(28) / 45(25)
		10	(hydraulic symbol)	80	80	80(65) / 75(20)	80(25) / 30(15)	100(58) / 90(47)	100(33) / 50(26)	76(22) / 28(18)	46(19) / 22(15)	100(58) / 90(47)	100(33) / 50(26)	76(22) / 28(18)	46(19) / 22(15)
		12	(hydraulic symbol)	90	90	90(30) / 40(20)	90(20) / 20(15)	100(55) / 60(38)	100(36) / 47(24)	60(21) / 23(14)	34(16) / 17(11)	100(55) / 60(38)	100(36) / 47(24)	60(21) / 23(14)	34(16) / 17(11)
		13	(hydraulic symbol)	100	100	100	100	60	60	60	60	60	60	60	60
		17	(hydraulic symbol)	100	100	100	100(75) / 100(25)	100(62) / 62(40)	100(39) / 47(26)	84(21) / 27(16)	48(18) / 20(12)	100(62) / 62(40)	100(39) / 47(26)	84(21) / 27(16)	48(18) / 20(12)
		21	(hydraulic symbol)	80	80	80(30) / 30(25)	80(20) / 20(15)	100(55) / 60(38)	100(36) / 47(24)	60(21) / 23(14)	34(16) / 17(11)	100(55) / 60(38)	100(36) / 47(24)	60(21) / 23(14)	34(16) / 17(11)
		22	(hydraulic symbol)	100 / 100(50)	100(50) / 60(30)	100(30) / 30(25)	100(30) / 30(25)	100(22) / 22(19)	100(22) / 22(19)	40(22) / 22(19)	40(22) / 22(19)	100(22) / 22(19)	100(36) / 22(19)	40(22) / 22(19)	40(22) / 22(19)
2 positions	2 (Spring offset type)	01	(hydraulic symbol)	—	—	—	—	26	19	18	16	100(35) / 45(21)	87(15) / 34(12)	61(9) / 15(9)	49(7) / 11(6)
		02	(hydraulic symbol)	—	—	—	—	100(35) / 45(21)	87(15) / 34(12)	61(9) / 15(9)	49(7) / 11(6)	26	19	18	16
		03	(hydraulic symbol)	100 / 100(75)	100 / 100(75)	100 / 100(75)	100 / 100(75)	57	57	57	57	100(79) / 92(55)	100(72) / 89(46)	100(64) / 78(28)	100(59) / 70(27)
		04	(hydraulic symbol)	100 / 100(90)	100 / 100(90)	100 / 100(90)	100 / 100(90)	34	24	20	19	100(62) / 80(42)	100(62) / 73(36)	100(44) / 60(34)	94(37) / 51(33)
		25	(hydraulic symbol)	100 / 100(90)	100 / 100(90)	100 / 100(90)	100 / 100(90)	100(62) / 80(42)	100(62) / 73(36)	100(44) / 60(34)	94(37) / 51(33)	34	24	20	19
	1 (No spring type with detent)	01	(hydraulic symbol)	—	—	—	—	50	50	50(35) / 50(30)	40(23) / 35(20)	50	50	50(35) / 50(30)	40(23) / 35(20)
		03	(hydraulic symbol)	100	100	100	100	40	40	30	28	60	60	40	35
		04	(hydraulic symbol)	100	100	100	100	40	40	30	28	60	60	40	35

(Note) The relationship between the maximum flow rate and the frequency and voltage in the above table is as shown below.

Constant regardless of frequency and voltage ────→ 80

80	80 (65)
	75 (20)

- 80 ← 50 Hz, at rated voltage
- (65) ← 50 Hz, at 80% V of rated voltage
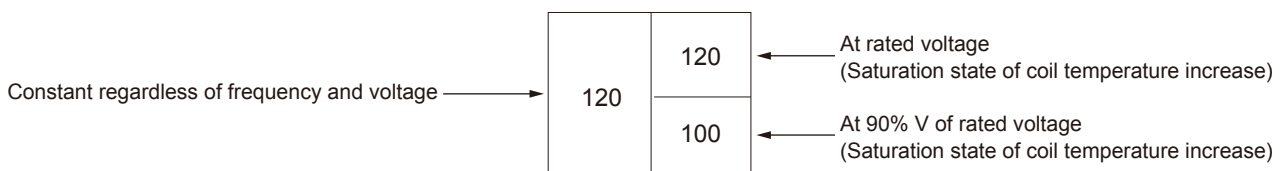- 75 ← 60 Hz, at rated voltage
- (20) ← 60 Hz, at 90% V of rated voltage

Maximum flow rate

● With DC solenoid DE10P-20-***-WD*
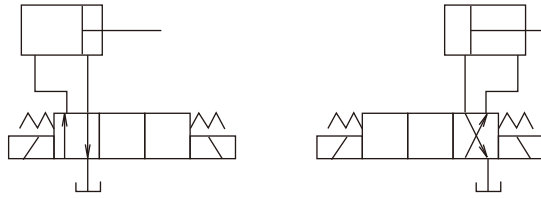 With AC/DC conversion type solenoid DE10P-20-***-WR*

Number of positions	Position holding method	Spool type symbol	Hydraulic symbols	Maximum flow rate L/min — Flow direction of oil P→A(B)→B(A)→T				Flow direction of oil P→A				Flow direction of oil P→B			
				Working pressure MPa (kgf/cm²)				Working pressure MPa (kgf/cm²)				Working pressure MPa (kgf/cm²)			
				10 (102)	16 (163)	25 (255)	31.5 (321)	10 (102)	16 (163)	25 (255)	31.5 (321)	10 (102)	16 (163)	25 (255)	31.5 (321)
3 positions	2 (Spring center type)	05		120	120	120	120	120	120/100	80/54	55/43	120	120/100	80/54	/43
		06		50	50	50	50	35	24	21	20	45	45	45	45
		07		120	120	120	—	120	120	120	—	120	120	120	—
		08		120	120	120	120	120	120	120	120	120	120	120	120
		09		120	120	120	120	100	100	80/62	65/52	100	100	80/62	65/52
		10		120	120	120	120	120	120	84/65	64/53	120	120	84/65	64/53
		12		120	120	120/65	65/50	120	120/86	62/47	51/40	120	120/86	62/47	51/40
		13		120	120	120	120	100	100	100	100	100	100	100	100
		17		120	120	120	120	120	120/104	62/57	49/42	120	120/104	62/57	49/42
		21		120	120	120/65	65/50	120	112/69	60/46	51/40	120	112/69	60/46	51/40
		22		120	120	120/65	45/40	120	67/45	35/31	35/31	120	67/45	35/31	35/31
2 positions	2 (Spring offset type)	01		—	—	—	—	53	33	24	23	120	120/62	62/40	47/37
		02		—	—	—	—	120	120/62	62/40	47/37	53	33	24	23
		03		120	120	120	120	77	77	77	77	120	120	120	120/103
		04		110/100	110/100	110/100	110/100	68	47	38	38	120	114/83	75/58	63/48
		25		110/100	110/100	110/100	110/100	120	114/83	75/58	63/48	68	47	38	38
	1 (No spring type with detent)	01		—	—	—	—	60	60	40	35	60	60	40	35
		03		120	120	120	120	45	37	30	28	60	60	40	35
		04		120	120	120	120	45	37	30	28	60	60	40	35

(Note) The relationship between the maximum flow rate and the frequency and voltage in the above table is as shown below.

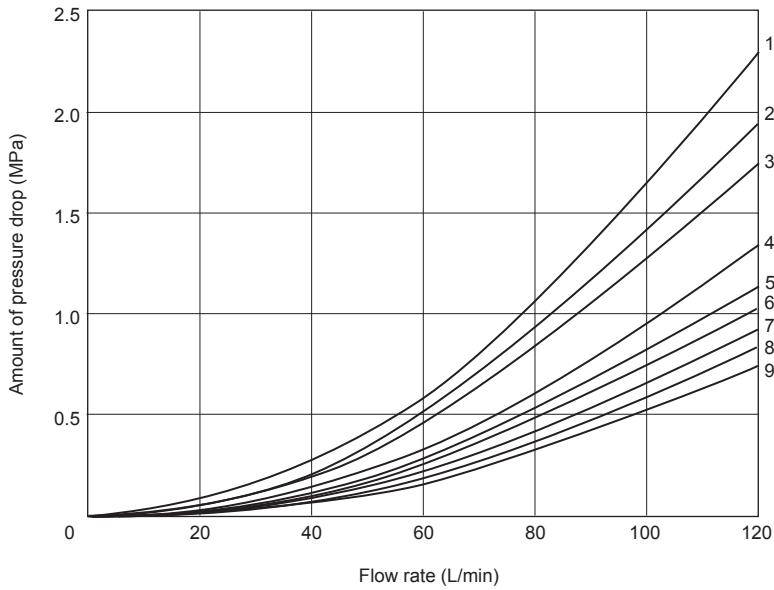|		
Constant regardless of frequency and voltage →	120	120 → At rated voltage (Saturation state of coil temperature increase)
		100 → At 90% V of rated voltage (Saturation state of coil temperature increase)

■Maximum flow rate

●When switching the valve to neutral state with spool type 06, 07 and 08 reaching the stroke end

Number of positions	Position holding method	Spool type symbol	Hydraulic symbols	Solenoid	Maximum flow rate L/min			
					Working pressure MPa (kgf/cm²)			
					10 (102)	16 (163)	25 (255)	31.5 (321)
3 positions	2 (Spring center type)	06		AC	26	21	18	16
				DC, AC/DC conversion	35	24	21	20
		07		AC	84	52	52	—
				DC, AC/DC conversion	68	65	61	—
		08		AC	100	100	100	100
				DC, AC/DC conversion	120	120	120	120

■ Pressure drop characteristics (viscosity 36 mm²/s (cSt))

● DE10

Amount of pressure drop (MPa) vs Flow rate (L/min)

Spool holding method	Flow direction				
	P→A	B→T	P→B	A→T	P→T
205	7	7	7	7	–
206	9	7	7	9	1
207	6	5	6	5	1
208	9	9	9	9	5
209	9	7	7	7	–
210	7	8	7	8	–
212	7	7	7	8	–
213	9	7	9	7	–
217	7	7	7	7	–
221	7	8	7	7	–
222	7	7	7	7	–
201	6	–	5	–	–
202	5	–	6	–	–
203	3	2	9	9	–
204	2	1	7	7	–
225	7	7	2	1	–
101	6	–	6	–	–
103	6	4	7	7	–
104	4	3	6	6	–

■ Option

The following options are available in addition to the standard items.

SOL. b

<With push button lock>

At the time of adjustment, the valve can be held at the switched position even if the solenoid in an emergency is not energized.
When placing an order, add a special type, -07, at the end of the type.
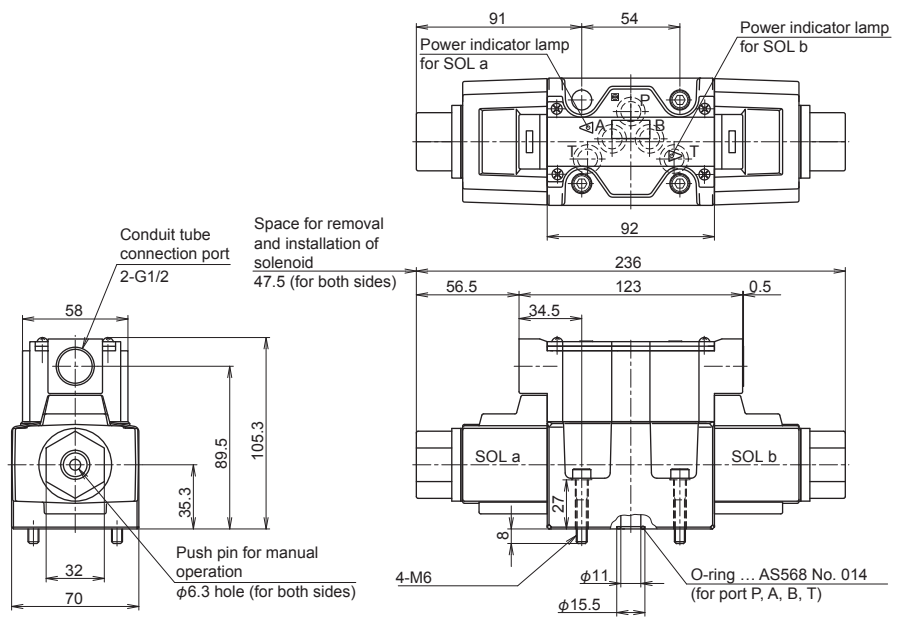
■ Precautions in use

● Mounting posture
When using the valve of the no spring detent type without excitation, mount the solenoid horizontally so that the detent effect is securely obtained. For the valve of other type, there is no limitation of mounting posture.
● Switching of solenoid
Be sure to deenergize one solenoid before energizing the other solenoid.
● Tank port
Do not connect the tank port to a conduit where surge pressure is generated.
Be sure to immerse the end of the tank line piping into oil.
● Manual pin operating force
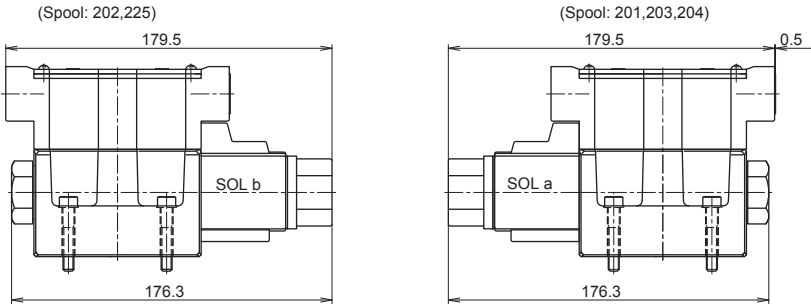Be careful that the operation of the manual pin is difficult if the back pressure of the tank line becomes high.

Operating force N / Operating force kgf vs Back pressure MPa (kgf/cm²)

■Dimension drawing

●DE10P (Integrated terminal box type)

● With AC solenoid
  Spring center type
  No spring detent type

91 54

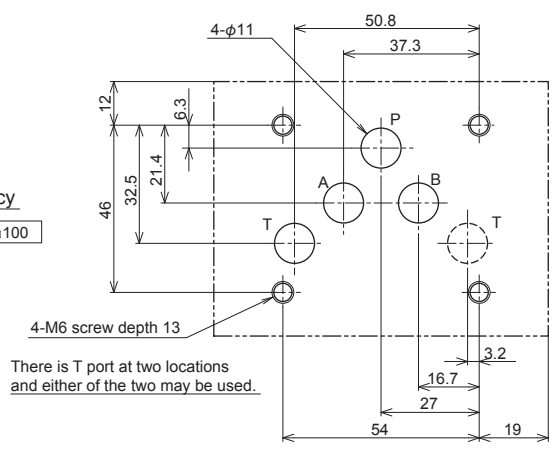Power indicator lamp for SOL a

Power indicator lamp for SOL b

92

Conduit tube connection port
2-G1/2

Space for removal and installation of solenoid
47.5 (for both sides)

236

56.5 123 0.5

34.5

58

105.3

89.5

35.3

SOL a SOL b

27

8

32

70

4-M6

φ11

φ15.5

O-ring … AS568 No. 014
(for port P, A, B, T)

Push pin for manual operation
φ6.3 hole (for both sides)

Spring offset type

(Spool: 202,225)

179.5

SOL b

176.3

(Spool: 201,203,204)

179.5 0.5

SOL a

176.3

● With DC solenoid
● With AC/DC conversion type solenoid
  (Note) For other dimensions, refer to "with AC solenoid".

Space for removal and installation of solenoid
70.5 (for both sides)

282

202.5

114

SOL a SOL b

199.3 in the case of spring offset type

4-φ11

50.8

37.3

12

6.3

P

21.4

32.5

A B

46

T T

4-M6 screw depth 13

There is T port at two locations and either of the two may be used.

3.2

16.7

27

54 19

Mounting surface accuracy

Flatness : ▱ 0.01／□100

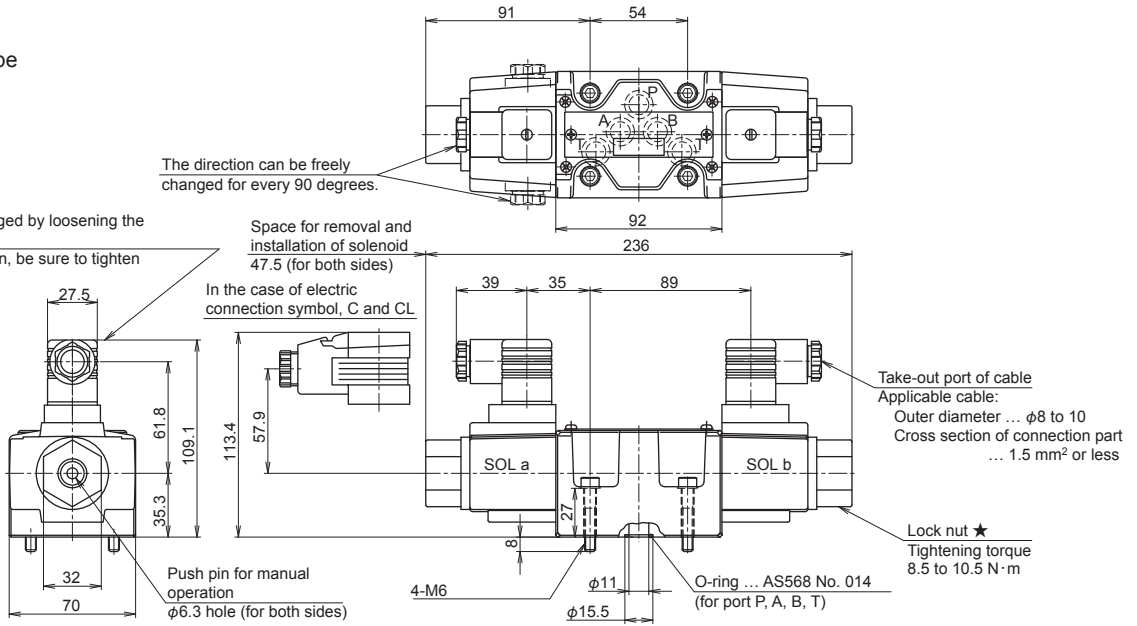Surface roughness : 1.6 ▽

Machining dimension of manifold

● **DE10P** (DIN connector type, DIN large connector type, DIN large connector type with power indicator lamp)

● With AC solenoid
Spring center type
No spring detent type

The position can be changed by loosening the lock nut ★.
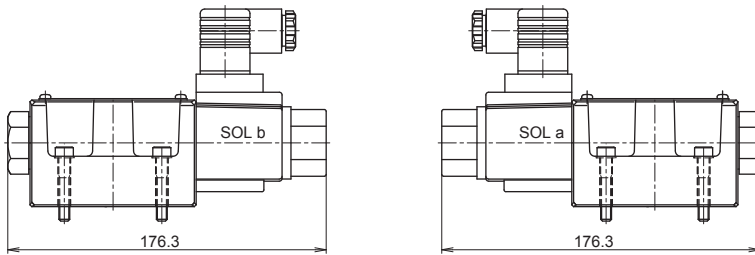After changing the position, be sure to tighten the lock nut.

27.5

61.8
109.1
35.3

32
70

Push pin for manual operation
φ6.3 hole (for both sides)

Space for removal and installation of solenoid
47.5 (for both sides)

In the case of electric connection symbol, C and CL

113.4
57.9

91 · 54
92
236

39 · 35 · 89

SOL a · SOL b

27
8

4-M6
φ11
φ15.5

Take-out port of cable
Applicable cable:
Outer diameter … φ8 to 10
Cross section of connection part … 1.5 mm^2 or less

Lock nut ★
Tightening torque 8.5 to 10.5 N·m

O-ring … AS568 No. 014
(for port P, A, B, T)

The direction can be freely changed for every 90 degrees.
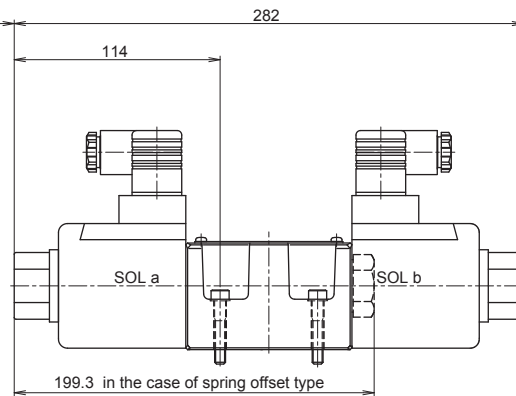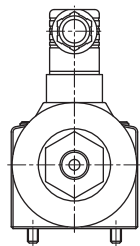
Spring offset type

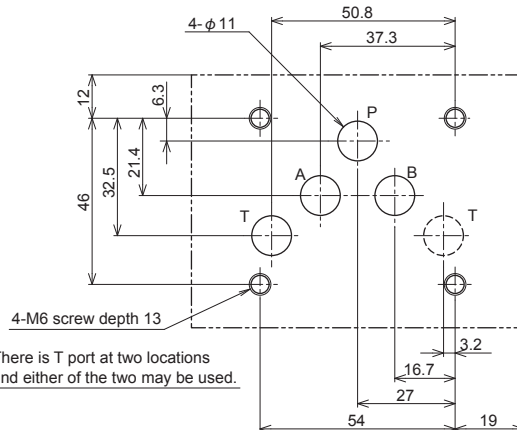(Spool: 202,225)
SOL b
176.3

(Spool: 201,203,204)
SOL a
176.3

● With DC solenoid
● With AC/DC conversion type solenoid
(Note) For other dimensions, refer to "with AC solenoid".

Space for removal and installation of solenoid
70.5 (for both sides)

282
114
SOL a · SOL b
199.3 in the case of spring offset type

Machining dimension of manifold

4-φ11
50.8
37.3
12
6.3
46
32.5
21.4
P
A · B
T · T
4-M6 screw depth 13
3.2
16.7
27
54 · 19

Mounting surface accuracy
Flatness : 0.01/100
Surface roughness : 1.6

There is T port at two locations and either of the two may be used.

1-19