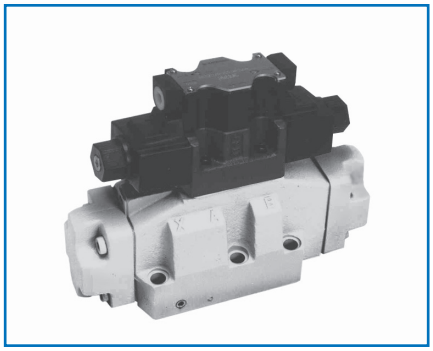
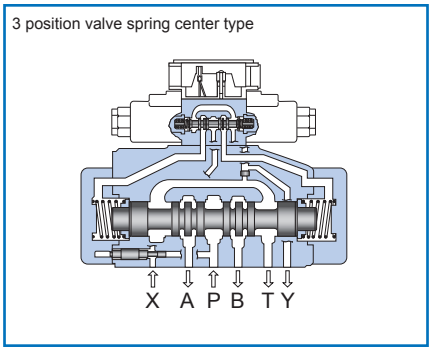
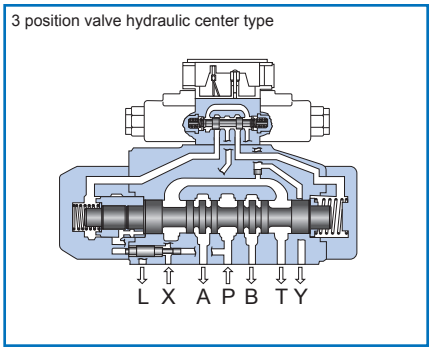
Solenoid controlled pilot operated directional valve (1) DEH16 to 32







Overview

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

Features

1. The improvement of internal coring shape and spool shape of the casing has substantially reduced the flow resistance.
2. For return to neutral of the main valve, the spring center type and pressure-centred type are prepared as standard items.
3. A stroke limiter for adjusting spool stroke of the main valve can be installed.
4. The selection between the internal pilot and external pilot can be made only by changing the assembly direction of the plug for selection.
5. The maximum working pressure is 34.3 MPa (350 kgf/cm^2).

Type indication

●DEH16

DEH 16 P - 31 - 2 05 - 2 W A 100 AL P08 - ET S2 10 -

Solenoid controlled pilot operated directional valve

Nominal dimension
16

Connection method
P = Gasket connection type

Series number
Without choke valve = 30
With choke valve = 31

Position holding method (main valve)
2 = 2 position, spring offset type
3 position, spring center type
3 = 2 position, hydraulic offset type
3 position, hydraulic center type

Spool type
* Refer to “Spool type symbols”.

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

Solenoid type
W = Wet type (with standard emergency manual operation)

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

Input voltage

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

* For other power supply voltage, please contact us.

Electric connection symbol
* For details, refer to the section of “Solenoid operated directional valve”.

Symbol	Pilot valve type
	DE6
AL	Integrated terminal box with lamp
B	With DIN connector
C	With DIN large connector
CL	With DIN large connector with lamp

P port restriction of solenoid valve
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

Pilot and drain type
No symbol = external pilot, external drain
E = internal pilot, external drain
ET = internal pilot, internal drain
T = external pilot, internal drain

Choke valve provided or not
No symbol = without choke valve
S1 = with meter-in choke valve
S2 = with meter-out choke valve

Pilot pressure reducing valve provided or not
No symbol = without pressure reducing valve
R = with pressure reducing valve

Accessory parts of cover part provided or not
No symbol = No accessory parts
10 = with stroke limiter
11 = with stroke limiter on port A side
12 = with stroke limiter on port B side

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

Type indication

●DEH22,32

DEH 22 P - 21 - 3 05 - 2 W D 24 AL P08 - S2 R -

Solenoid controlled pilot operated directional valve

Nominal dimension
22, 32

Connection method
P = Gasket connection type

Series number
Without choke valve = 20
With choke valve = 21

Position holding method (main valve)
2 = 2 position, spring offset type
3 position, spring center type
3 = 2 position, hydraulic offset type
3 position, hydraulic center type

Spool type
* Refer to “Spool type symbols”.

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

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

Input voltage

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

* For other power supply voltage, please contact us.

Electric connection symbol
* For details, refer to the section of “Solenoid operated directional valve”.

Symbol	Pilot valve type
	DE10
AL	Integrated terminal box with lamp
B	With DIN connector
C	With DIN large connector
CL	With DIN large connector with lamp

P port restriction of solenoid valve
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

Pilot and drain type
No symbol = external pilot, external drain
E = internal pilot, external drain
ET = internal pilot, internal drain
T = external pilot, internal drain

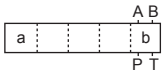
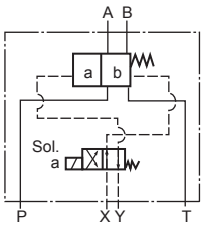
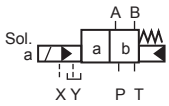
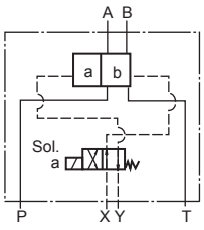
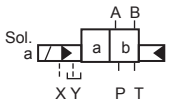
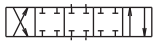
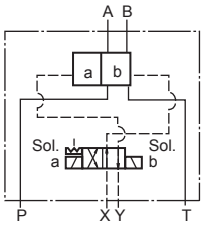
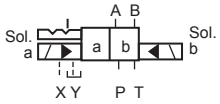
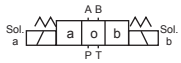
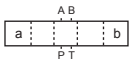
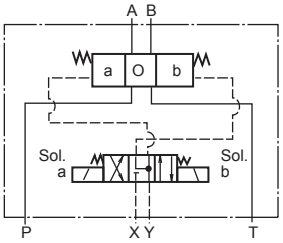
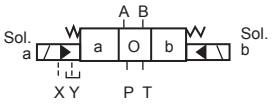
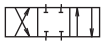
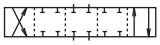
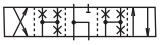
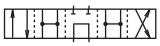
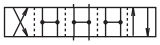
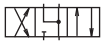
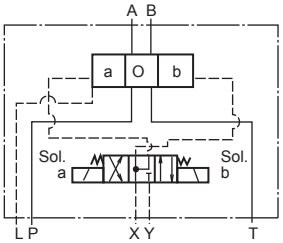
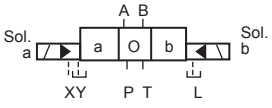
Choke valve provided or not
No symbol = without choke valve
S1 = with meter-in choke valve
S2 = with meter-out choke valve

Pilot pressure reducing valve provided or not
No symbol = without pressure reducing valve
R = with pressure reducing valve

Accessory parts of cover part provided or not
No symbol = No accessory parts
10 = with stroke limiter
11 = with stroke limiter on port A side
12 = with stroke limiter on port B side

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

Spool type symbol

Valve type	Spool type	Hydraulic symbols	Transient state	Spool holding method		Detailed hydraulic symbols (Example: External pilot and external drain type)	Simplified hydraulic symbols (Example: External pilot and external drain type)
2 position valve				Spring offset type			
	03			Hydraulic offset type	—		
	04						
	11						
	26				No spring type with detent		
3 position valve				Spring center type			
	05						
	06						
	07						
	08						
	10						
	12						
	13			Hydraulic center type			
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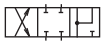
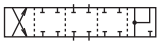
	18						
	19						
	20						
	21						
	22						
	23						

Specifications

Nominal dimension						16			22			32		
Maximum working pressure MPa (kgf/cm²)	(Note 1) Port P, A, B					34.3 (350)								
	Port T	External drain				24.5 (250)								
		Internal drain	2 position valve, 3 position valve spring (Note 2) 3 position valve hydraulic center type		Oil immersion type solenoid	15.7 (160)								
Highest pilot pressure MPa (kgf/cm²) (Note 3)						24.5 (250)								
Lowest pilot pressure MPa (kgf/cm³) (Note 5)	3 position valve					0.78 (8.0)								
	2 position valve spring offset type					0.98 (10.0)								
	2 position valve hydraulic offset type					0.49 (5.0)								
Stroke volume of pilot part cm³	2 position valve					8.9			19.3			70.7		
	3 position valve spring center type					4.45			9.65			35.5		
	3 position valve pressure center type	Neutral → Position "a" (Solenoid "a" energized)				2.30			5.0			17.25		
		Neutral → Position "b" (Solenoid "b" energized)				4.45			9.65			35.35		
		Position "a" → Neutral				2.15			4.65			18.1		
		Position "b" → Neutral				2.30			4.65			17.25		
Opening area at spool neutral position (with spool 10 as 100%)		Spool 17, 22				16%								
		Spool 23				3%								
Switching time ms (AC solenoid) (Note 4)	Pilot pressure MPa (kgf/cm²)					5(50)	15(150)	25(250)	5(50)	15(150)	25(250)	5(50)	15(150)	25(250)
	Neutral → Switching position	2 position valve				35	30	25	80	60	45	105	85	75
		3 position valve spring center type				30	25	20	40	30	25	60	45	35
		3 position valve pressure center type	Solenoid "a" → energized			20	20	<20	35	30	<25	55	40	35
			Solenoid "b"→ energized			30	25	20	40	35	25	65	50	45
	Switching position → Neutral	2 position valve				35	30	25	80	60	45	105	85	75
		3 position valve spring center type				40			60			95		
		3 position valve pressure center type	Solenoid "a" → deenergized			30	25	20	35	30	25	65	60	60
			Solenoid "b" → deenergized			40	35	25	30	30	25	70	60	60
Pilot flow rate L/min						27			46			70		
Mass kg		Single solenoid type				8.3			16.0			48.5		
		Double solenoid type				8.6			17.4			49.9		

(Note 1) If the valve is used with the internal pilot, the maximum working pressure of port P is 24.5 MPa (250 kgf/cm²).
(Note 2) If you wish to use the 3 position valve hydraulic center type with the internal drain, please contact us.
(Note 3) In the case of 3 position valve hydraulic center type with meter-out choke valve, the highest pilot pressure is 12.3 MPa (125 kgf/cm²).
(Note 4) Switching time of DC solenoid is obtained by adding the following numerical values to the numerical values in the above table, respectively.
● Nominal dimension 16: 20 ms ● Nominal dimension 22 and 32 : 60 ms
(Note 5) If you wish to use the P-T connection spool type with the internal pilot when neutral, please contact us.

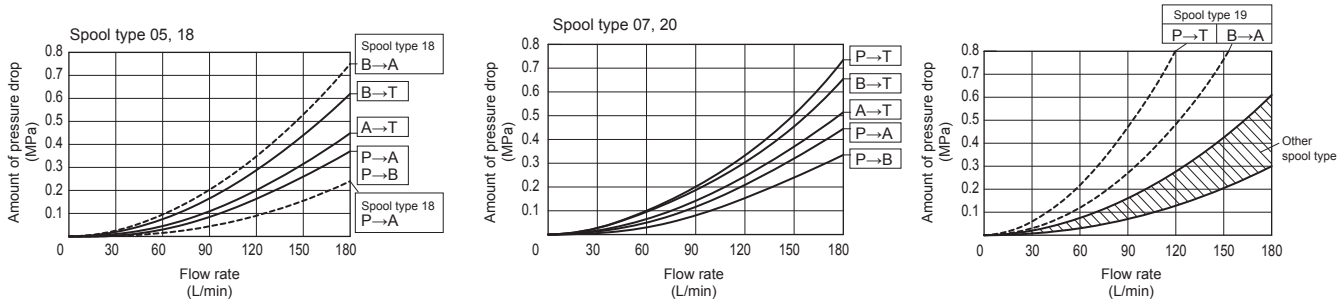
Maximum flow rate

Maximum flow rate L/min		2 position valve spring offset type 3 position valve spring center type				
Nominal dimension	Spool type	Working pressure MPa (kgf/cm²)				
		7 (70)	14 (140)	20.6 (210)	27.4 (280)	34.3 (350)
16 (A)	05, 10, 12, 13, 17, 18, 21 22, 23, 03, 04, 11, 26	* 240	240	205	180	170
	06	200	145	115	100	90
	07, 08, 19, 20	220	160	130	110	100
22 (A)	05, 10, 12, 13, 17, 18, 21 22, 23, 03, 04, 11, 26	* 450	450	370	320	300
	06, 07, 08, 19, 20	360	250	210	180	160
32 (A)	05, 10, 12, 13, 17, 18, 21 22, 23, 03, 04, 11, 26	* 1100	1050	860	750	680
	06, 07, 08, 19, 20	820	630	510	450	400

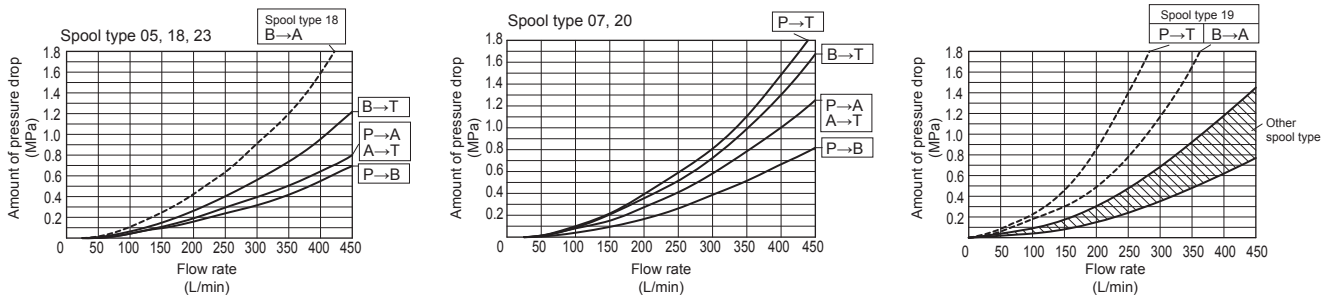
(Note) ·The above table shows numerical values in the case of the lowest pilot pressure.
·The maximum flow rate in the case of the 2 position valve hydraulic offset type and 3 position valve hydraulic center type is the flow rate of stage (A) regardless of the spool type, and is the flow rate marked with * regardless of the spool type and pressure if the pilot pressure is 1.5 MPa (15 kgf/cm²) or higher.

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

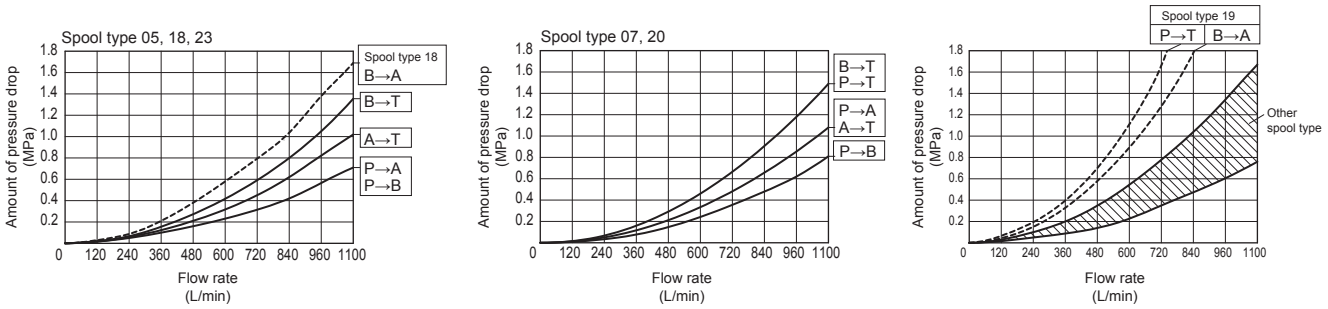
DEH16



DEH22



DEH32



Pilot valve

Pilot valve type

The pilot valve uses the following solenoid operated directional valve.

Main valve		Pilot valve		
Nominal dimension	Type	Type	Spool type	Hydraulic symbols
16	2 position valve spring offset type 2 position valve hydraulic offset type	DE 6	04	Spool type04
	3 position valve spring center type		10	Spool type10
	3 position valve hydraulic center type		13	Spool type13
22 32	2 position valve spring offset type 2 position valve hydraulic offset type	DE10	04	
	3 position valve spring center type		10	
	3 position valve hydraulic center type		13	

* For the pilot valve specifications, refer to the section of the type number index “DE6” and “DE10”.

Sub-plate

Valve type	Sub-plate type	Connection diameter	Mass
DEH16	P-DEH16R34-0	Rc 3/4	7.0kg
	P-DEH16G34-0	G 3/4	
	P-DEH16R1-0	Rc 1	14.5kg
	P-DEH16G1-0	G 1	
DEH22	P-DEH22R1-0	Rc 1	11kg
	P-DEH22G1-0	G 1	
	P-DEH22R54-0	Rc 1 1/4	24kg
	P-DEH22G54-0	G 1 1/4	
	P-DEH22R32-0	Rc 1 1/2	
	P-DEH22G32-0	G 1 1/2	
DEH32	P-DEH32R32-0	Rc 1 1/2	19kg
	P-DEH32G32-0	G 1 1/2	

When you use a sub-plate, please place an order for the above sub-plate type.
For the dimension drawing, refer to pages 9,10 and 11 of the appendix.

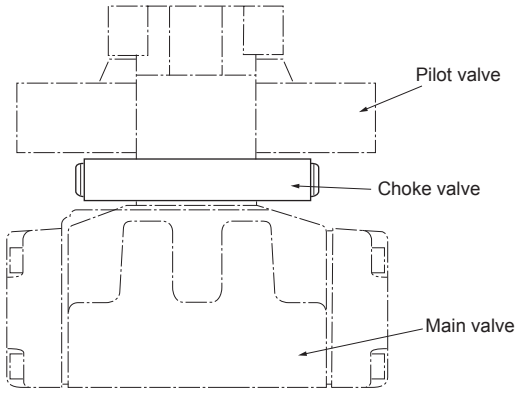
Accessories

Mounting bolt

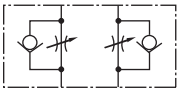
Type	Hexagon socket head cap thread	Quantity	Tightening torque N·m(kgf·cm)
DEH16	M6×55L	2 pcs.	11.8± 1.7 (120± 18)
	M10×60L	4 pcs.	56.8± 8.5 (580± 87)
DEH22	M12×60L	6 pcs.	98.0±14.7 (1000±150)
DEH32	M20×80L	6 pcs.	431.2±64.6 (4400±660)

Choke valve for adjusting stroke speed

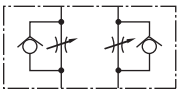
●Handling method When the adjust thread is turned clockwise, switching time of the spool becomes slow and when it is turned counterclockwise, switching time becomes fast.
When meter-in is changed to meter-out, the choke valve needs to be replaced.



In the case of meter-in (choke valve: S-2TC*-20-E1)



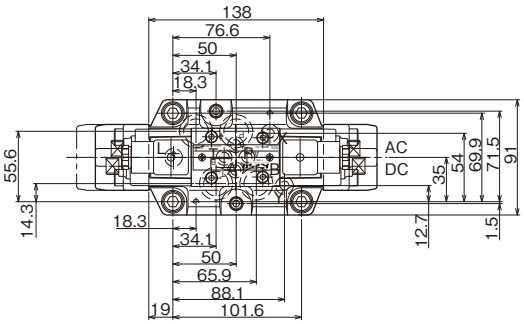
In the case of meter-out (choke valve: S-2TC*-20-F1)



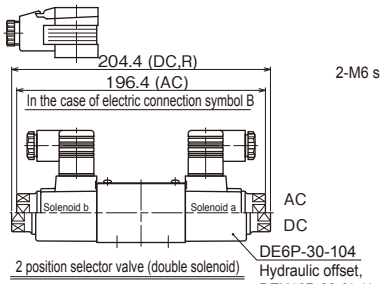
Nominal dimension	Choke valve type
16	S-2TC 6-20-E/F 1
22, 32	S-2TC10-20E/F 1

Dimension drawing

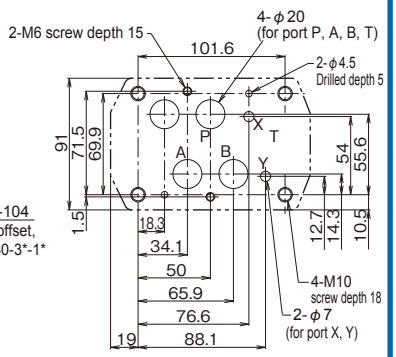
●DEH16

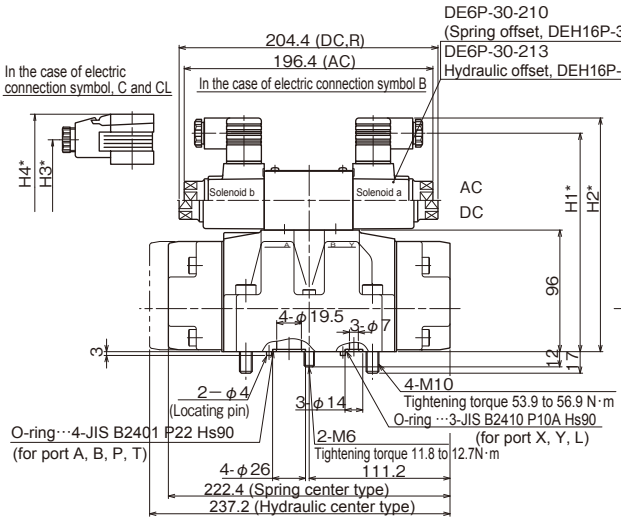


In the case of electric connection symbol, C and CL

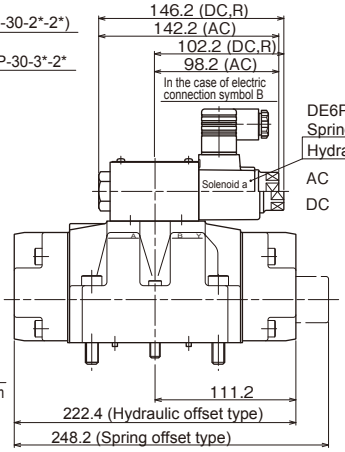


Machining dimension of manifold (2 position valve)





3 position selector valve



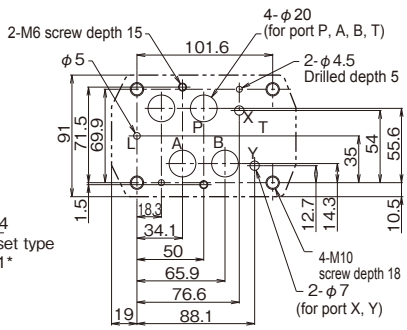
2 position selector valve (single solenoid)

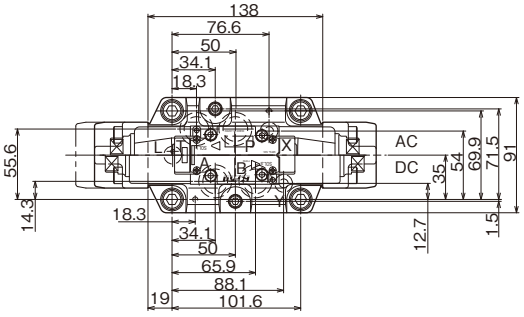
(Note. Port L is not used.)

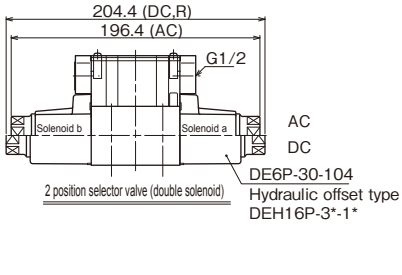
Input power supply symbol	H1*	H2*	H3*	H4*
A = Alternating current	172.5	184.5	165.6	187.5
D = Direct current	183.5	195.5	176.7	198.5
R = AC/DC conversion	—	—	176.7	198.5

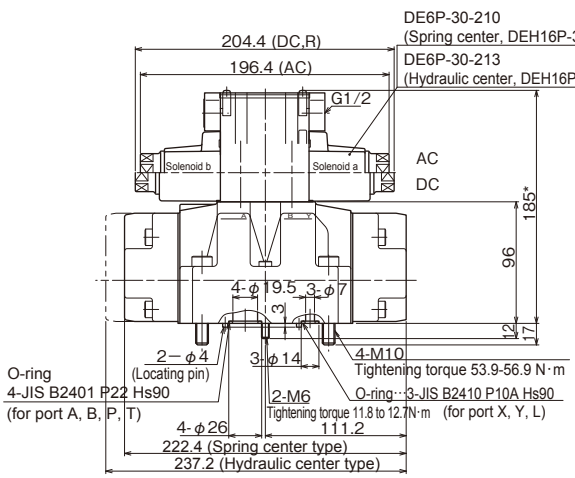
Note. Port L is not used in the case of the spring center type.
Use port L with tank pressure in the case of the hydraulic center type.

Machining dimension of manifold (3 position valve)

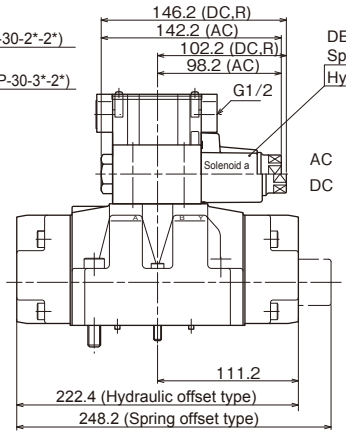








3 position selector valve



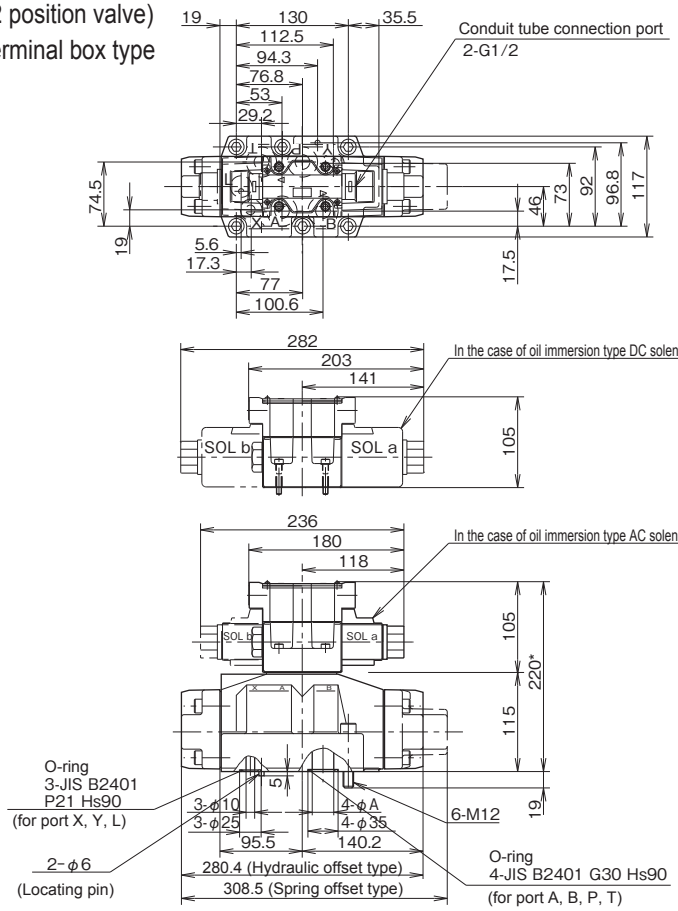
2 position selector valve (single solenoid)

(Note. Port L is not used.)

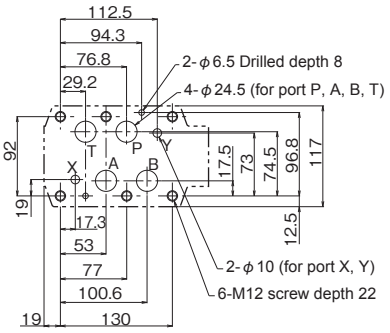
Note. Port L is not used in the case of the spring center type.
Use port L with tank pressure in the case of the hydraulic center type.

The dimension marked with * differs depending on the type.
With choke valve (S1, S2): +40 mm
With pressure reducing valve (R): +40 mm

●DEH22 (2 position valve)
Integrated terminal box type



Machining dimension of manifold

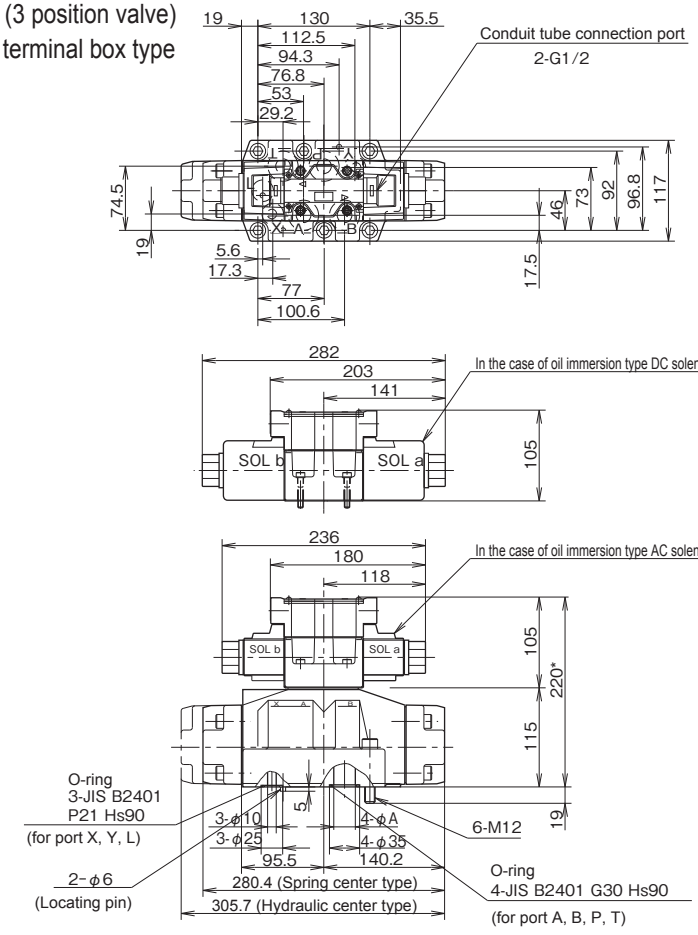


(Note) Port L is not used.

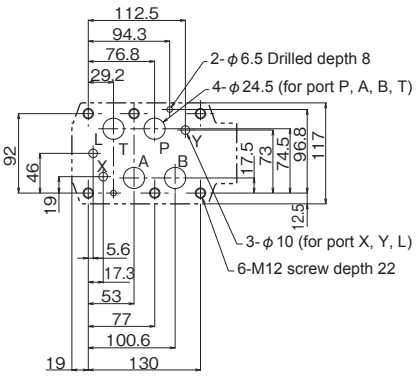
The dimension marked with * differs depending on the type.
With choke valve (S1, S2): +55 mm
With pressure reducing valve (R): +50 mm

Dimension	φA
Port P	24
Port A, B	24.5
Port T	25

●DEH22 (3 position valve)
Integrated terminal box type



Machining dimension of manifold

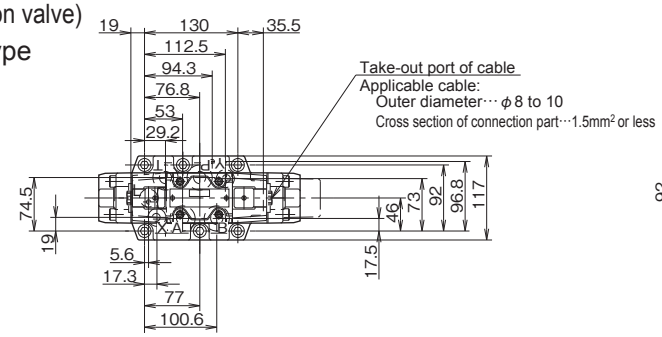


(Note) Port L is not used in the case of the spring center type.
Use port L with tank pressure in the case of the hydraulic center type.

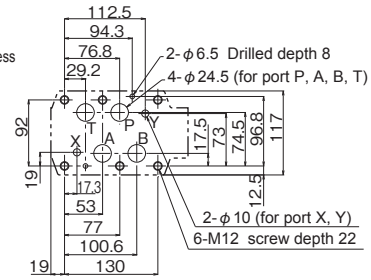
The dimension marked with * differs depending on the type.
With choke valve (S1, S2): +55 mm
With pressure reducing valve (R): +50 mm

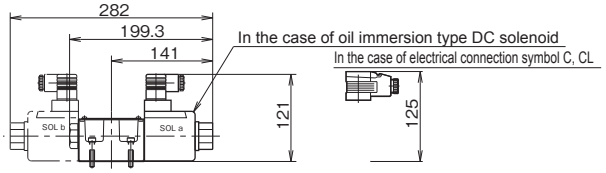
Dimension	φA
Port P	24
Port A, B	24.5
Port T	25

●DEH22 (2 position valve)
DIN connector type

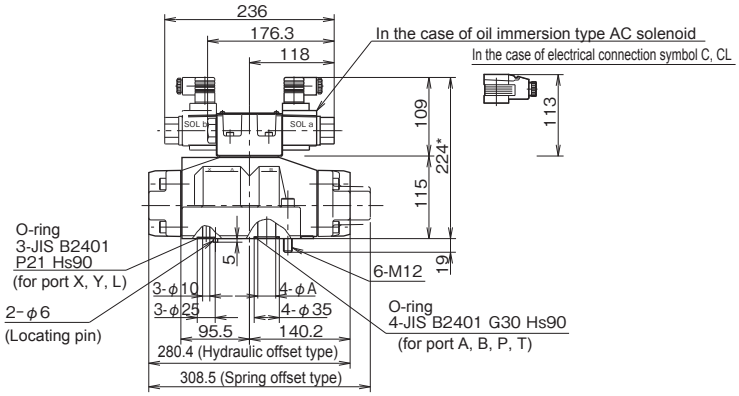


Machining dimension of manifold





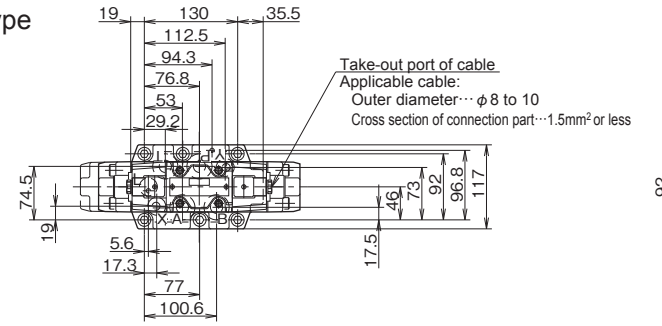
(Note) Port L is not used.



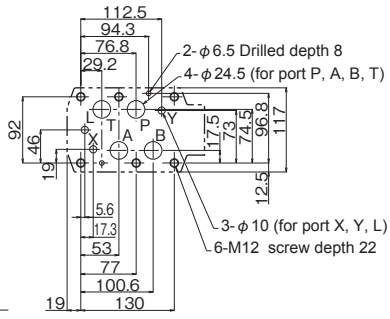
The dimension marked with * differs depending on the type.
With choke valve (S1, S2): +55 mm
With pressure reducing valve (R): +50 mm

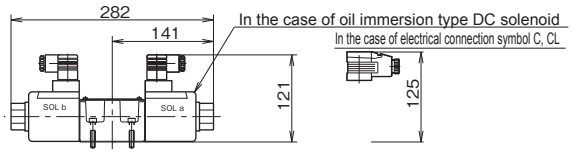
Dimension	φA
Port P	24
Port A, B	24.5
Port T	25

●DEH22 (3 position valve)
DIN connector type

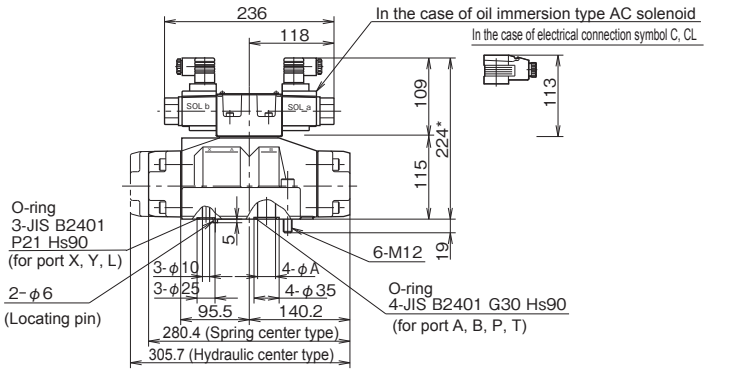


Machining dimension of manifold





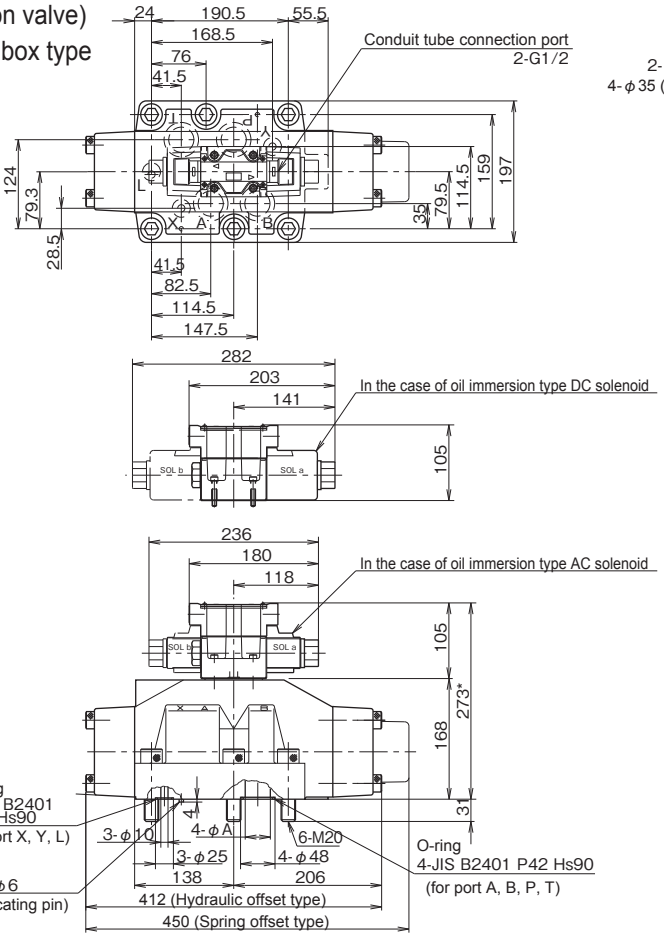
(Note) Port L is not used in the case of the spring center type.
Use port L with tank pressure in the case of the hydraulic center type.



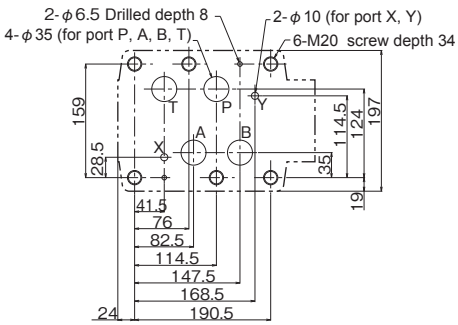
The dimension marked with * differs depending on the type.
With choke valve (S1, S2): +55 mm
With pressure reducing valve (R): +50 mm

Dimension	φA
Port P	24
Port A, B	24.5
Port T	25

●DEH32 (2 position valve)
Integrated terminal box type



Machining dimension of manifold

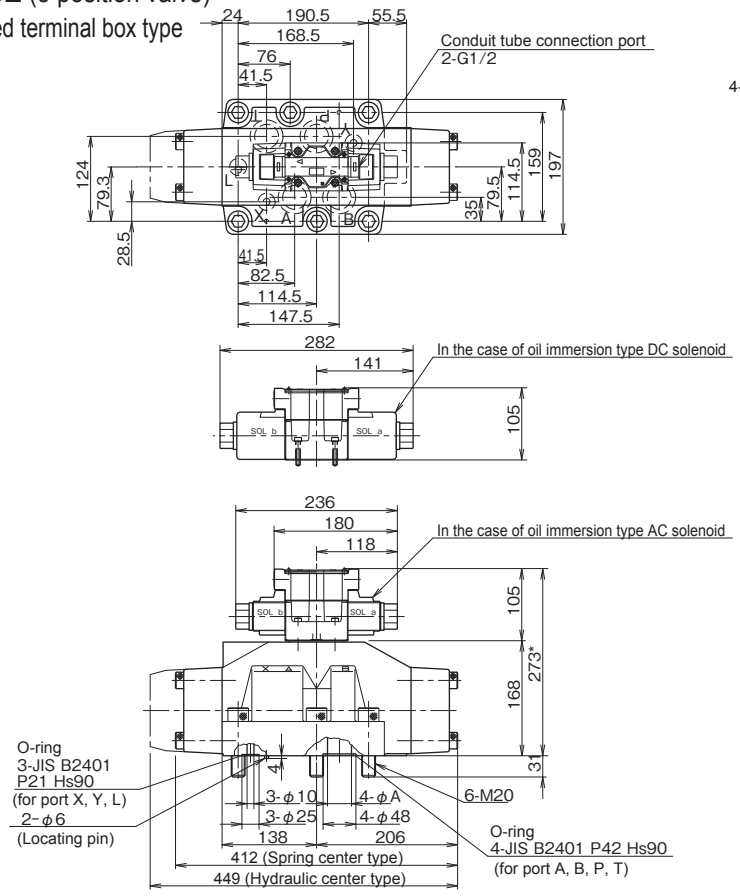


(Note) Port L is not used.

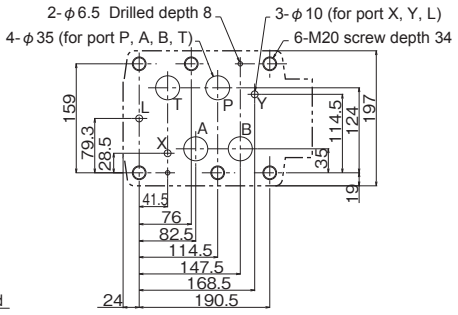
The dimension marked with * differs depending on the type.
With choke valve (S1, S2): +55 mm
With pressure reducing valve (R): +50 mm

Dimension	φA
Port P	38
Port A, B, T	35

●DEH32 (3 position valve)
Integrated terminal box type



Machining dimension of manifold

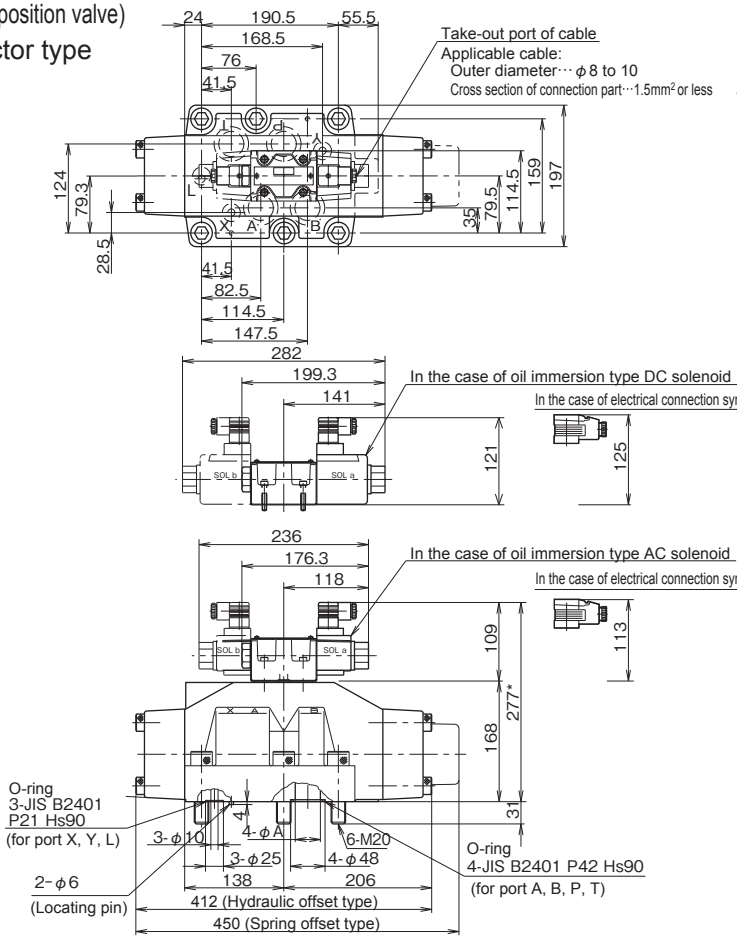


(Note) Port L is not used in the case of the spring center type.
Use port L with tank pressure in the case of the hydraulic center type.

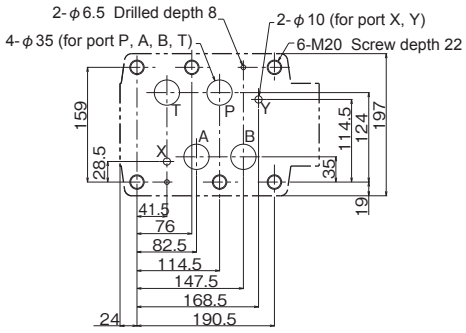
The dimension marked with * differs depending on the type.
With choke valve (S1, S2): +55 mm
With pressure reducing valve (R): +50 mm

Dimension	φA
Port P	38
Port A, B, T	35

●DEH32 (2 position valve)
DIN connector type



Machining dimension of manifold

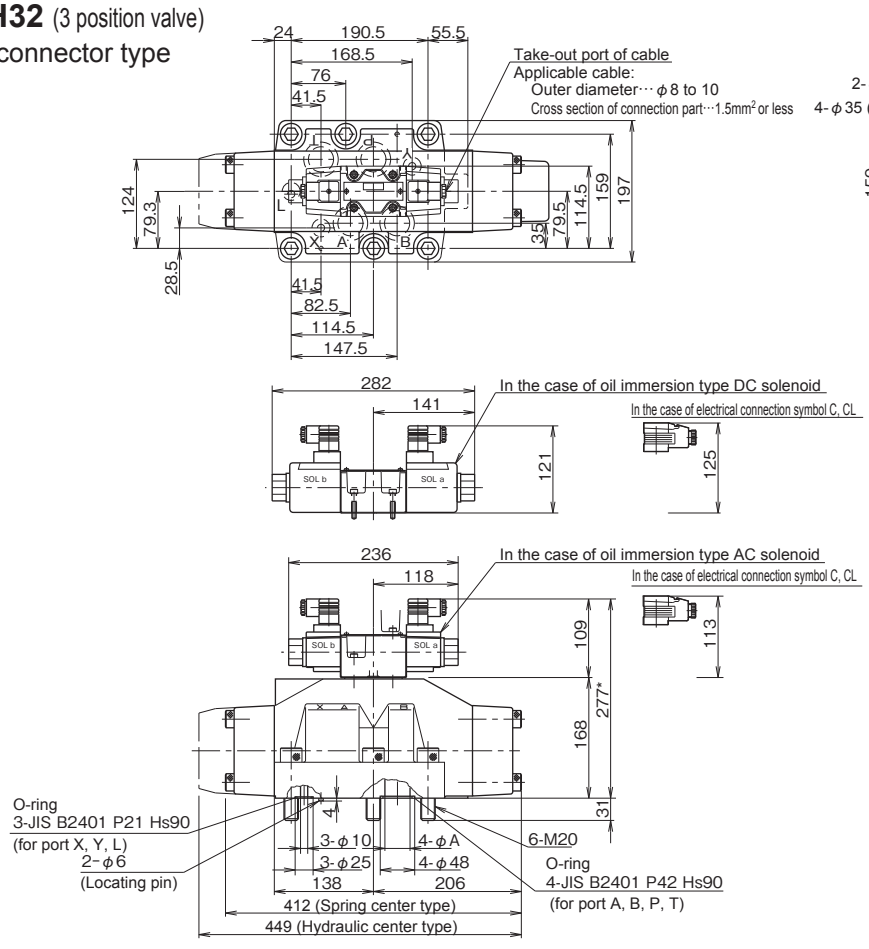


(Note) Port L is not used.

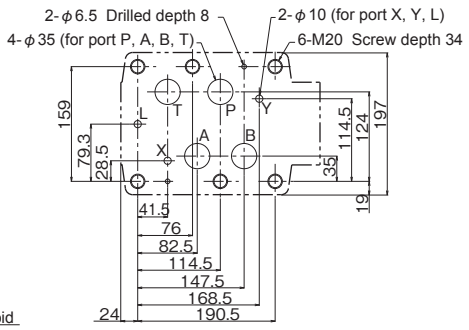
The dimension marked with * differs depending on the type.
With choke valve (S1, S2): +55mm
With pressure reducing valve (R): +50mm

Dimension	φA
Port P	38
Port A, B, T	35

●DEH32 (3 position valve)
DIN connector type



Machining dimension of manifold



(Note) Port L is not used in the case of the spring center type.
Use port L with tank pressure in the case of the hydraulic center type.

The dimension marked with * differs depending on the type.
With choke valve (S1, S2): +55 mm
With pressure reducing valve (R): +50 mm

Dimension	φA
Port P	38
Port A, B, T	35