

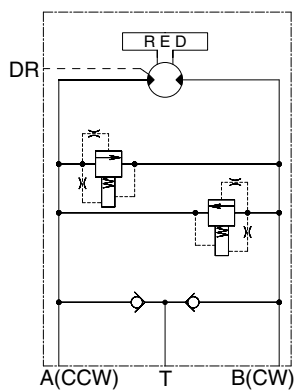
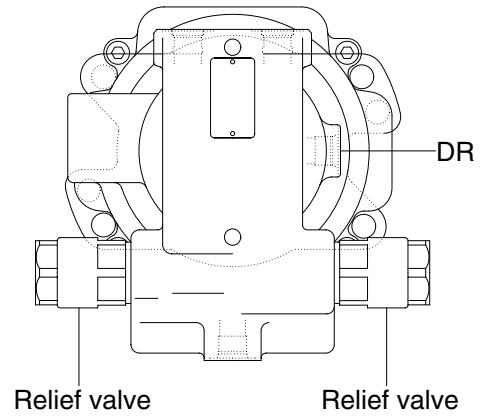
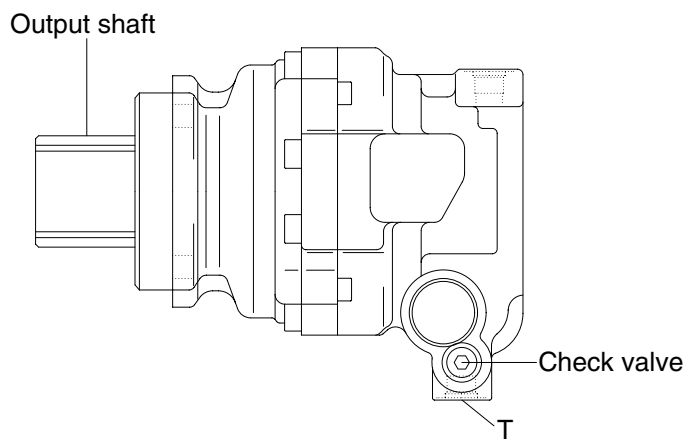
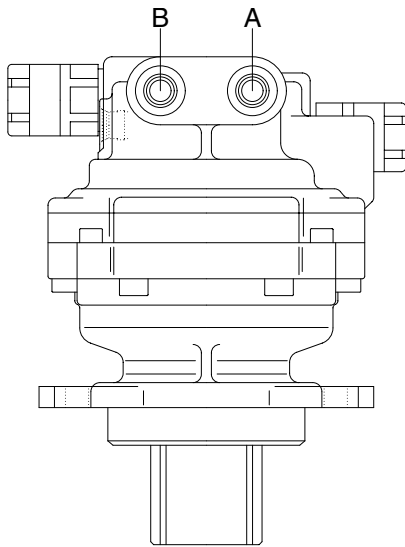
## GROUP 3 SWING DEVICE

### 1. STRUCTURE

Swing device consists swing motor and swing reduction gear.

#### 1) SWING MOTOR

Swing motor include mechanical relief valve, make up valve and check valve.

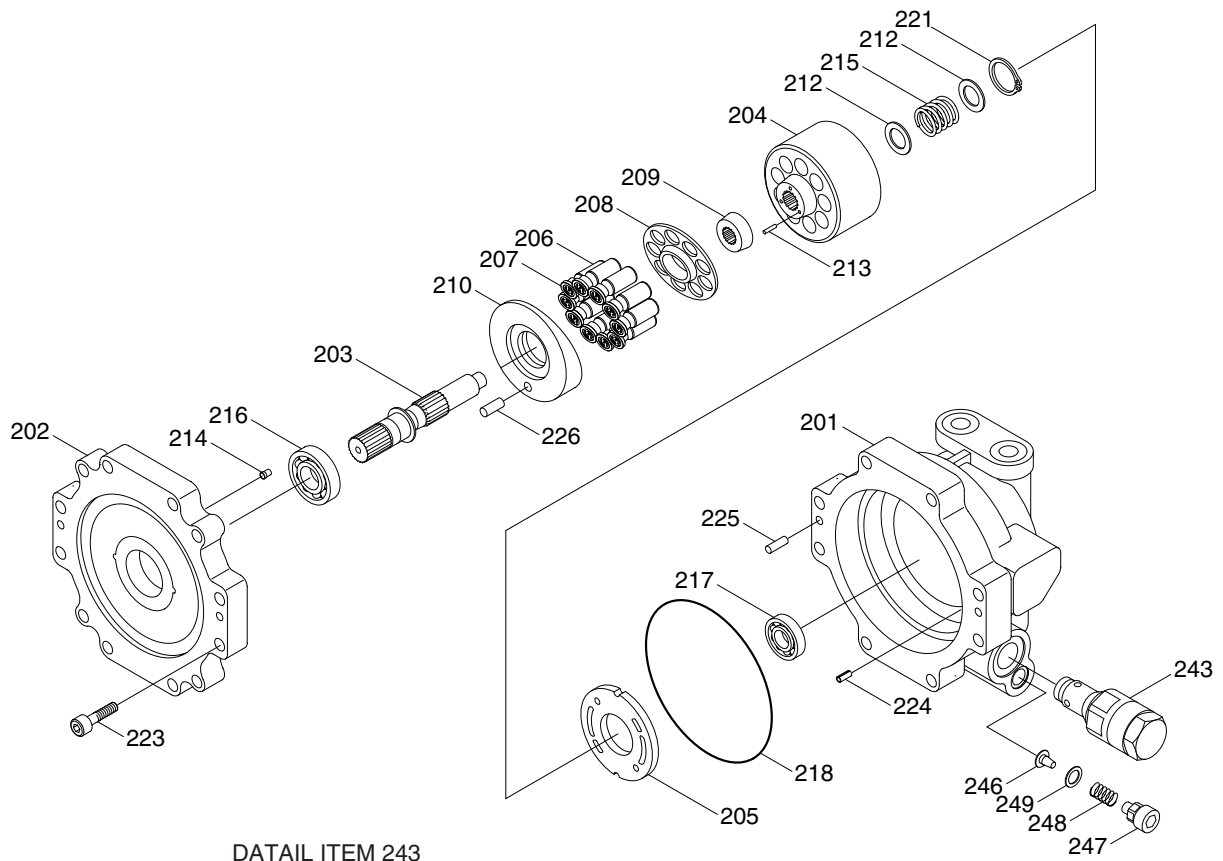


HYDRAULIC CIRCUIT

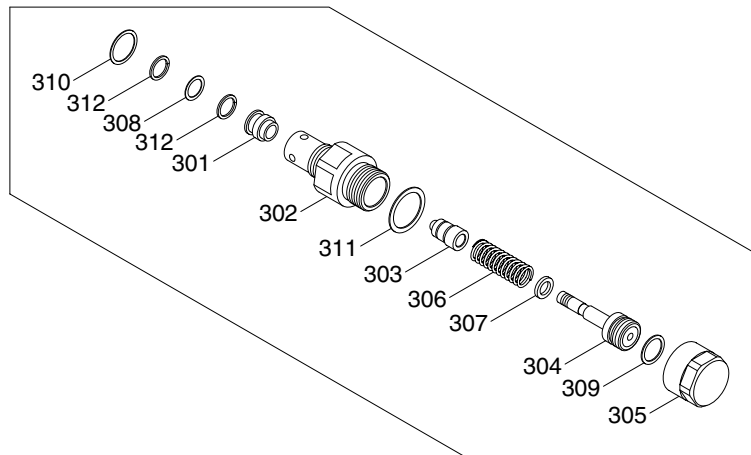
1692SM01

Port	Port name	Port size
A	Main port	PF 3/8
B	Main port	PF 3/8
DR	Drain port	PF 3/8
T	Make up port	PF 3/8

## 2) COMPONENTS (1/2)



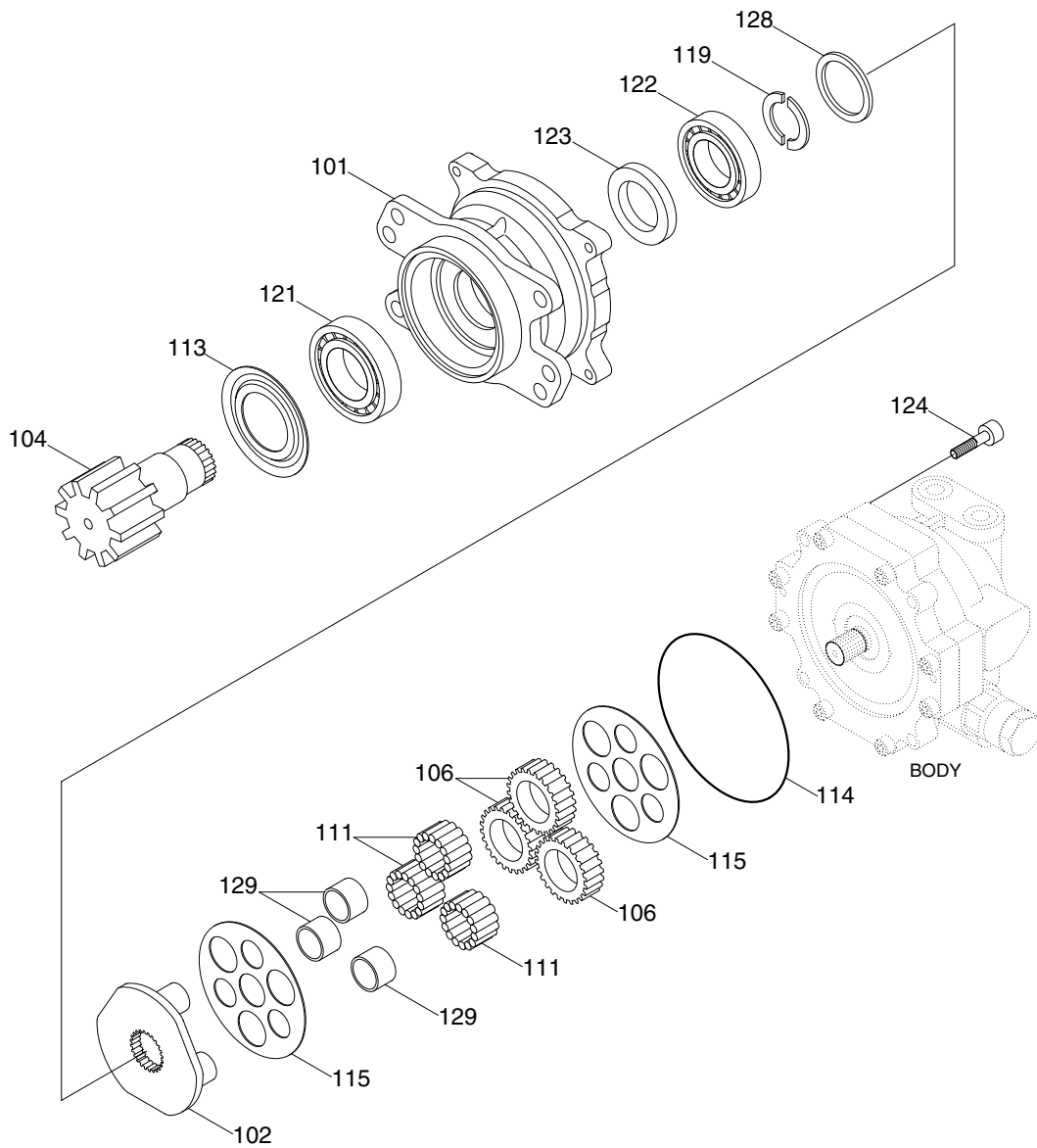
DETAIL ITEM 243



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201	Body	212	Retainer	225	Pin	304	Piston
202	Plate	213	Pin	226	Pin	305	Cap
203	Shaft	214	Filter	243	Relief valve	306	Spring
204	Cylinder barrel	215	Spring C	246	Check valve	307	Spacer
205	Valve plate	216	Bearing	247	Plug	308	O-ring
206	Piston	217	Bearing	248	Spring	309	O-ring
207	Shoe	218	O-ring	249	O-ring	310	O-ring
208	Shoe holder	221	Snap ring	301	Seat	311	O-ring
209	Barrel holder	223	Screw	302	Retainer	312	Back up-ring
210	Swash plate	224	Spring pin	303	Poppet		

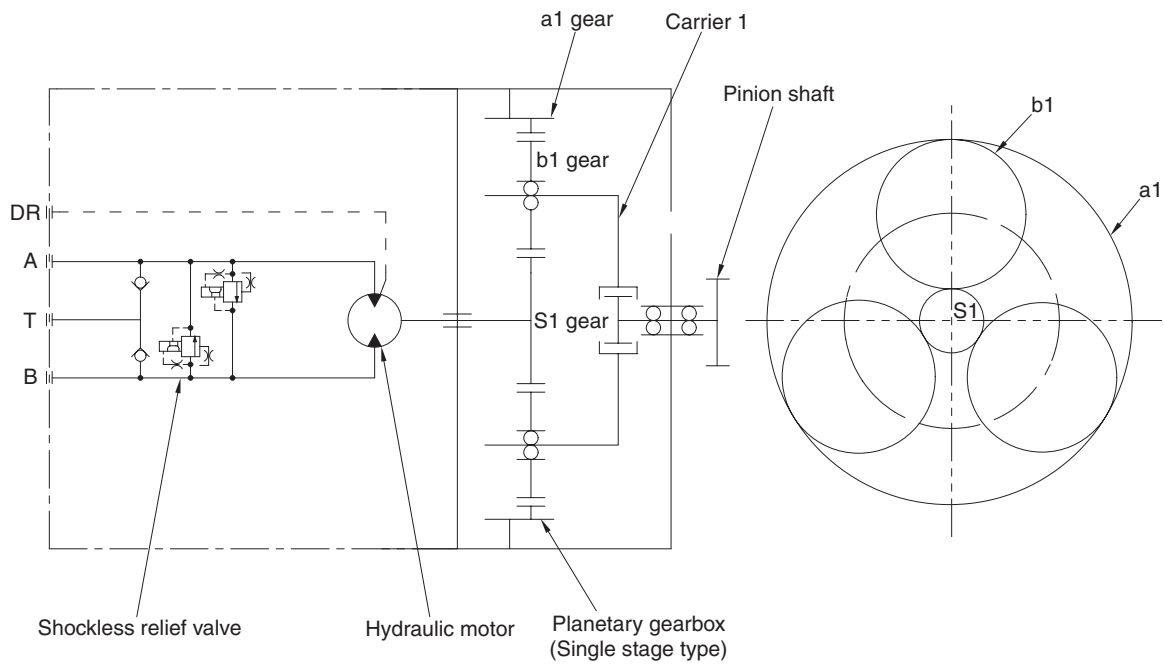
## COMPONENTS (2/2)



1692SM07

101	Body	114	O-ring	123	Oil seal
102	Carrier 1	115	Thrust plate 1	124	Screw
104	Pinion shaft	119	Preload collar	128	Ring
111	Needle	121	Bearing	129	Ring 1
113	Seal ring	122	Bearing		

## 2. OPERATION PRINCIPLE



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### 3. OPERATION

The swing motor consists of a planetary gear speed reducer, a hydraulic motor and the hydraulic valves.

#### 1) REDUCTION GEAR SECTION

##### (1) Function

The speed reducer of swing motor is a simple planetary gear type with single stage. The high output speed of the hydraulic motor is reduced to low speed with high torque and obtaining the pinion shaft rotation.

##### (2) Operation

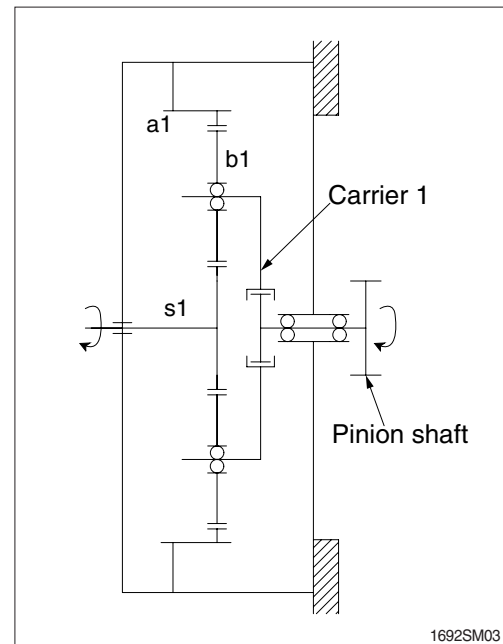
The s1 gear is attached to the hydraulic motor shaft, and the s1 output speed is reduced between the gears (s1, b1, a1).

This reduced output speed is transmitted to the pinion shaft, and drives the machine.

The gear ratio of single stages simple planetary speed reducer is calculated using the following formula.

$$R = \frac{Z_{s1}}{Z_{s1} + Z_{a1}}$$

※ Z \*\* : Number of gear teeth.



## 2) HYDRAULIC MOTOR SECTION

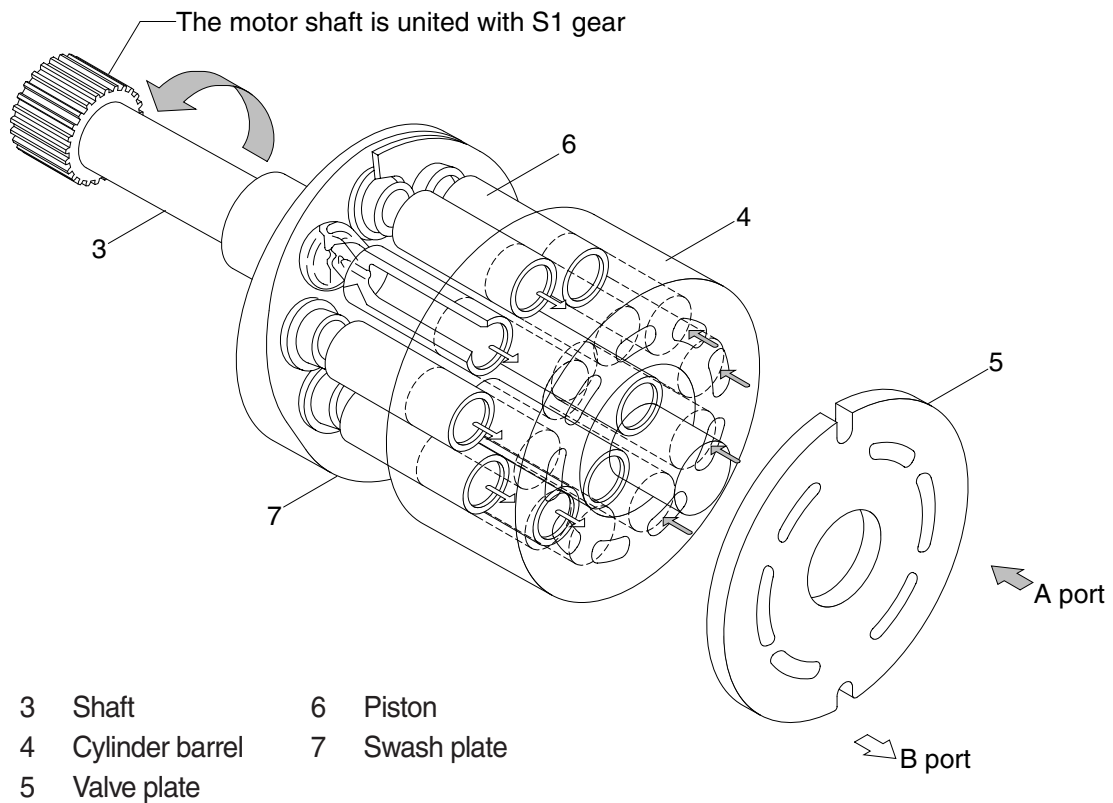
### (1) Function

This hydraulic motor is an axial piston type, and changes the hydraulic energy supplied from the pump to the rotary motion.

### (2) Structure

Through a hydraulic valve, the pressurized oil is supplied to the valve plate (5). When the pressurized oil is supplied to the A port, this pressurized oil pushes the piston (6) in the cylinder barrel (4). This pushing force is changed to the rotational power by the swash plate (7) and transmitted to the shaft (3) which is connected to the cylinder barrel (4) with the spline. The return flow from the cylinder port is going out through the B port of the valve plate (5).

To reverse rotation, pressurized oil is supplied to the B port and returning oil exits through the A port.



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### 3) HYDRAULIC VALVE SECTION

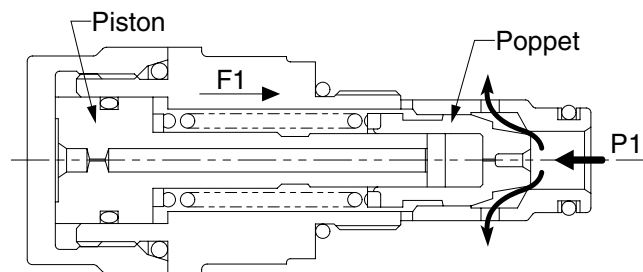
#### (1) Shockless relief valve

The shockless relief valve consists of the direct relief valve (poppet) and the piston for changing the spring force with two stages.

When the hydraulic motor is stopped, even after closing IN and OUT port of the hydraulic motor, the motor tries to run with inertia. Motor works as like a pump, and the pressure (brake pressure) is made on the OUT port side. The shockless relief valve releases this brake pressure with two stages of operation. This makes the shock smooth, and prevents the motor being damaged. It also makes the start of the motor smooth.

##### ① First stage

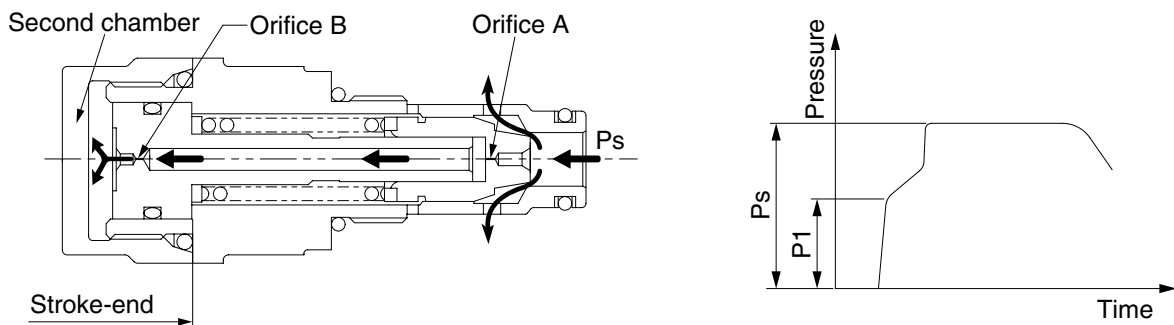
When the P1 pressure is going up, the poppet opens due to the pressure of the spring force F1.



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##### ② Second stage

When P1 pressure enters the second chamber through the orifice A and B, the piston moves to its stroke-end. With this action, the spring is compressed, the spring force becomes stronger, and the P1 pressure is increased to the setting pressure Ps.



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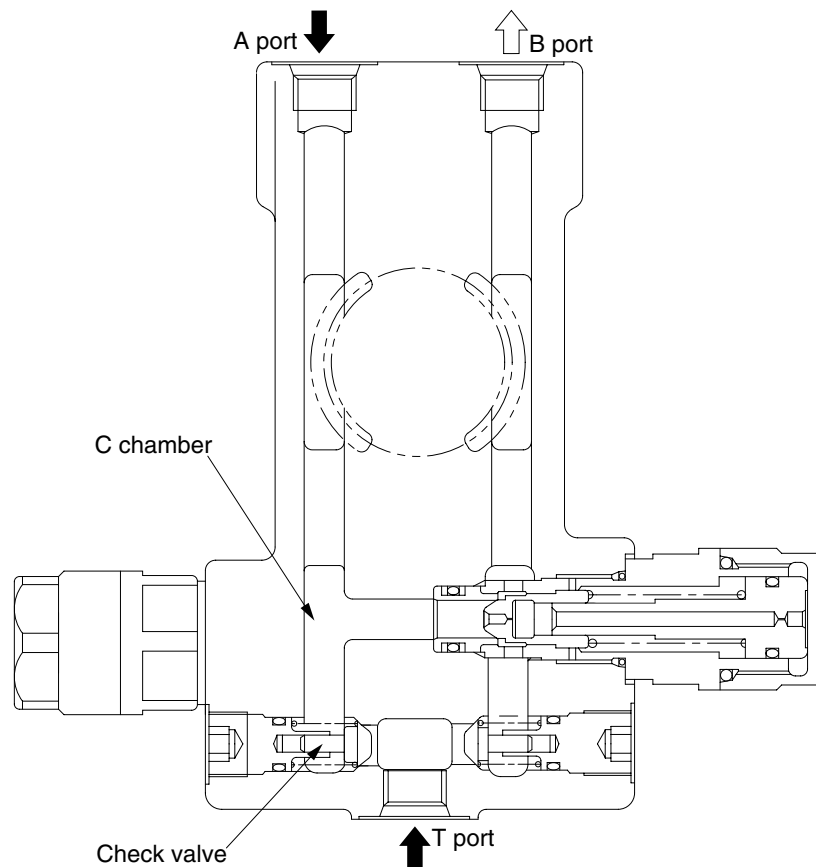
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With the above two stages of operation, the motor starts and stops smoothly.

## (2) Check valve

When the swing motor is decelerated by operating the control valve, it continues to be moved by the inertia of the machine. Then, it works as pump, and the pressure of C chamber tends to become negative. However, when B port pressure is below cracking pressure of the relief valve, all flow in A port goes out from B port through the motor.

Therefore, if C chamber can get flow only from the control valve, the flow will not be enough to prevent the negative pressure; as a result, cavitation could occur. The check valve works to supply the flow from T port to C chamber; and prevents cavitation.



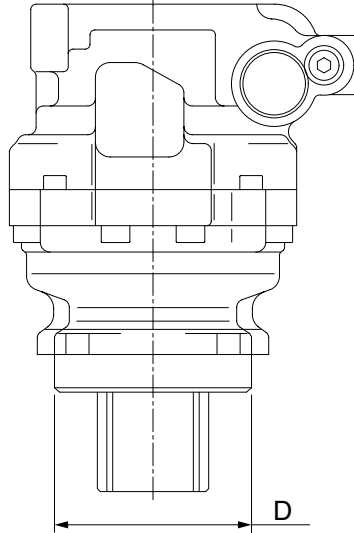
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## 4. HANDLING

### 1) MOUNTING

#### (1) Pilot dimension D

$$D = \varnothing 110h8 \begin{matrix} 0 \\ -0.054 \end{matrix}$$



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- (2) When installing the motor to the machine, do not force the sections and/or strike them with a heavy object as damage may result. The best method is to use the mounting bolts as a guide and slowly slide it into place.
- (3) Use the specified bolts (equivalent grade 10.9 or higher) for mounting the motor, and tighten using the following torque.

Bolt size	Torque
M12	$10 \pm 1 \text{ kgf} \cdot \text{m}$ $(72.3 \pm 7.2 \text{ lbf} \cdot \text{ft})$

### 2) PIPING

- (1) Pay attention to the rotation direction and piping.

Rotation direction (from view of output shaft)

Direction	IN Port	OUT port
Clockwise	B port	A port
Counter clockwise	A port	B port

- (2) When assembling the motor to the machine, fill hydraulic oil into the motor body through the drain port for lubrication before connecting the drain port.
- (3) The permissible drain pressure is limited by the oil seal. Pay attention to the drain piping so that the drain pressure does not exceed the limit. The permissible drain pressure is  $2.0 \text{ kgf/cm}^2$  (28.4 psi).
- (4) Fine filtration prolongs the hydraulic system life and ensures high reliability. Install a  $10 \mu\text{m}$  filter, or better in the circuit.

### **3) GEAR LUBRICATION OIL**

The gearbox is lubricated with drain oil from the hydraulic motor. When shipped, the gearbox is empty. Fill hydraulic oil through the drain port before use.

Replacement of the hydraulic oil in the gearbox is not required.

### **4) GENERAL PRECAUTION**

- (1) Always pay attention to oil leaks and loose bolts, detect and correct these problems as soon as possible to prevent damage to the motor or machine. Making a check sheet is recommended.
- (2) Pay attention to the temperature of the reduction gear body. The permissible maximum temperature is 100°C.