

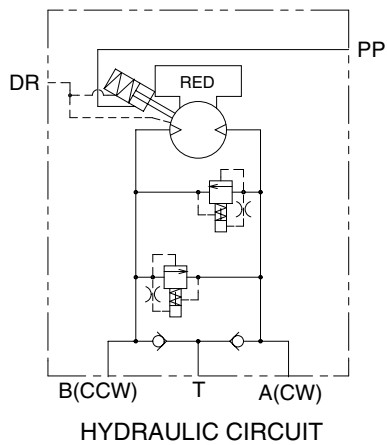
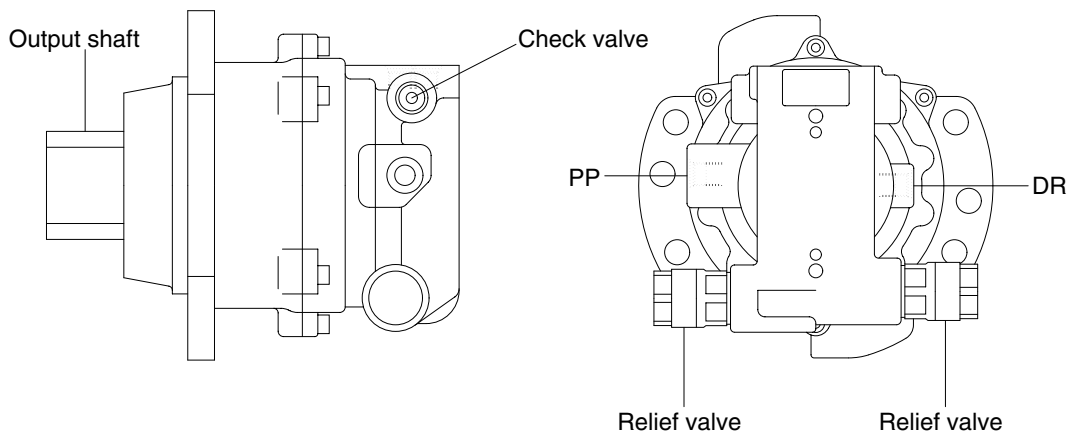
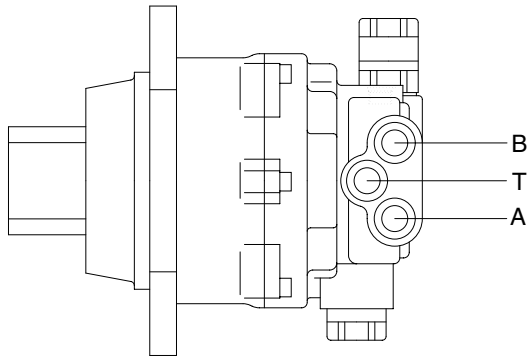
## GROUP 3 SWING DEVICE

### 1. STRUCTURE

Swing device consists swing motor and swing reduction gear.

#### 1) SWING MOTOR

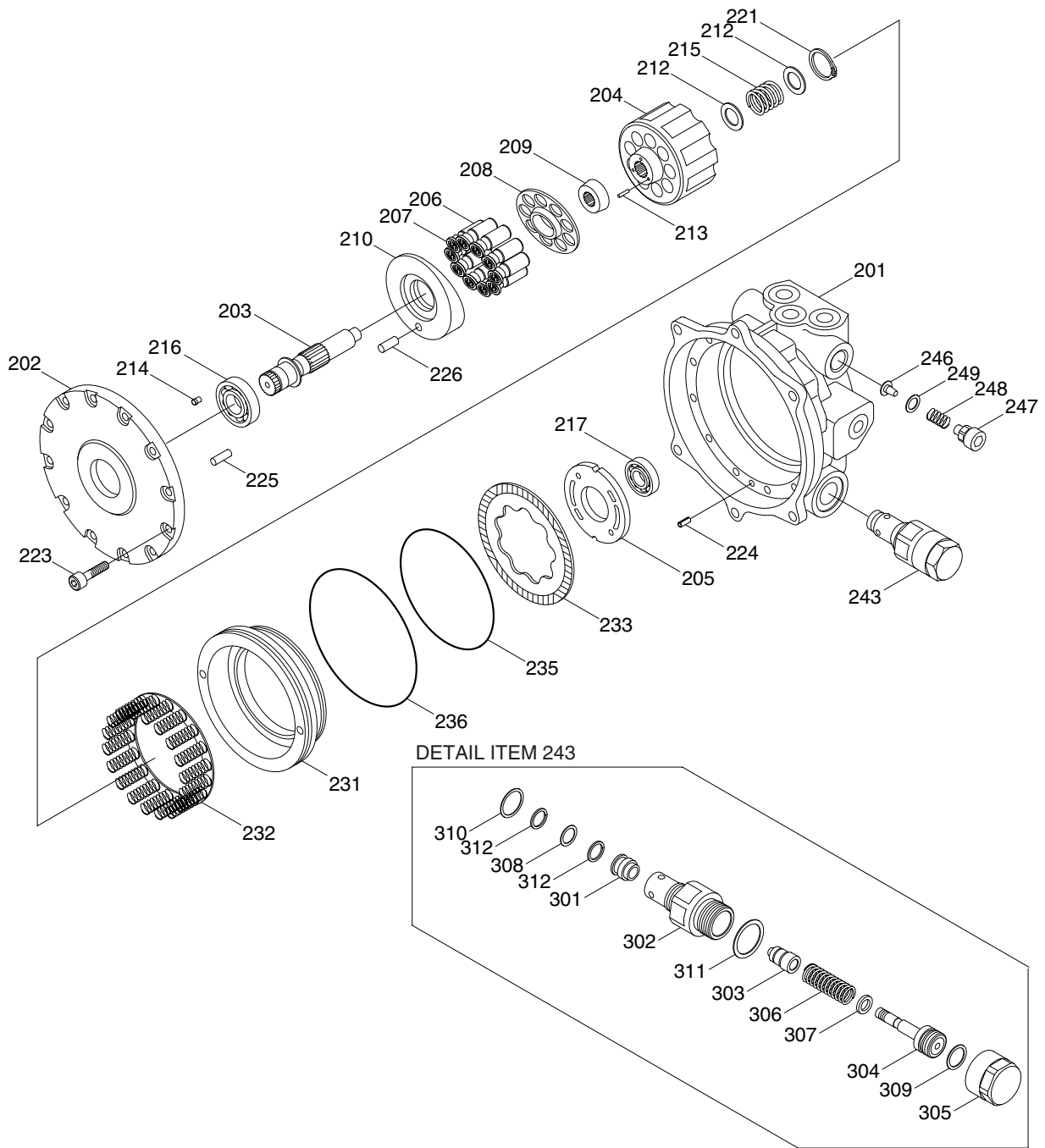
Swing motor include mechanical parking valve, relief valve, make up valve and time delay valve.



R27Z92SM01

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
PP	Brake release port	PF 1/4

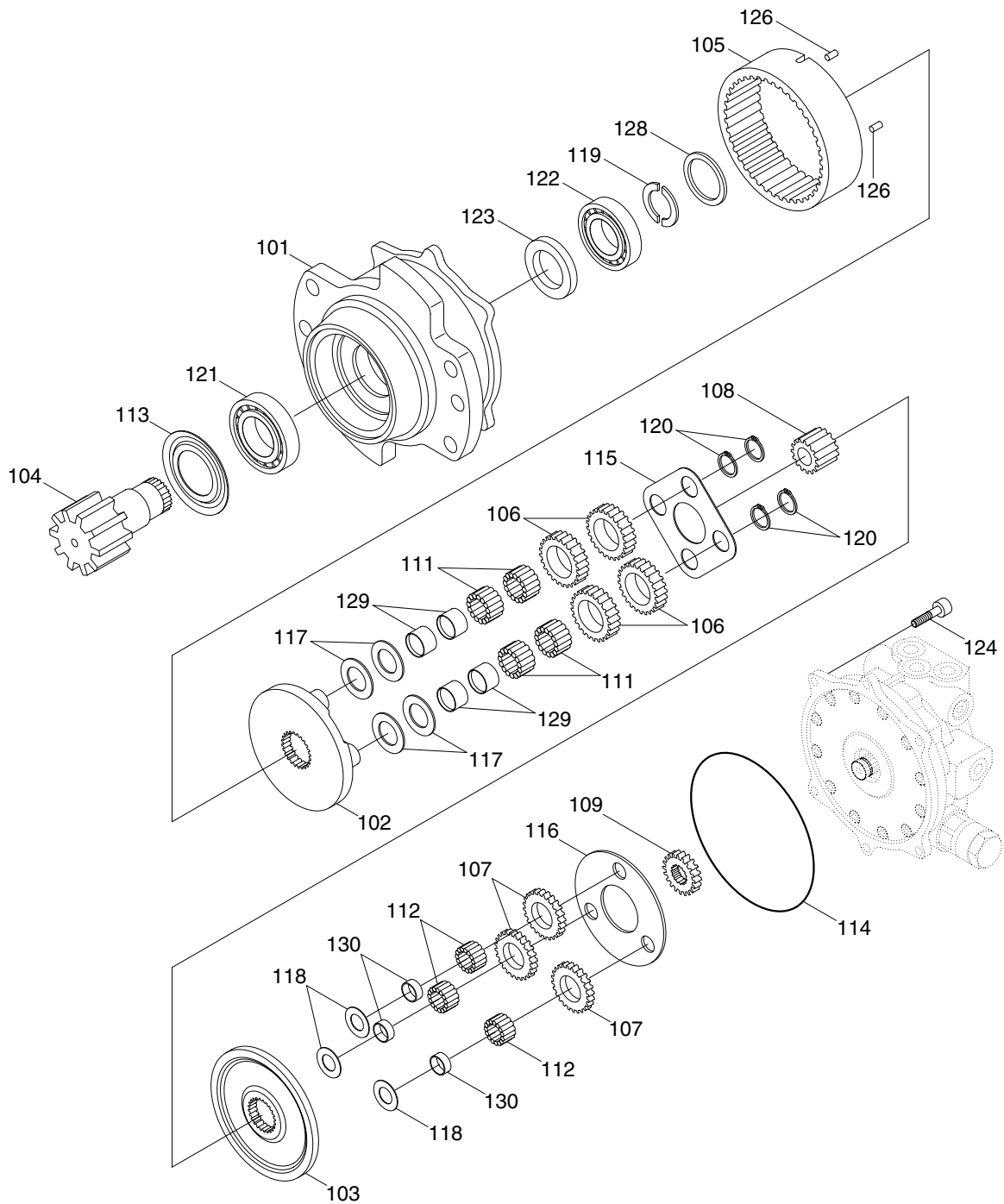
## 2) COMPONENTS (1/2)



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201	Body	213	Pin	232	Spring assy	303	Poppet
202	Plate	214	Filter	233	Disk plate	304	Piston
203	Shaft	215	Spring C	235	O-ring	305	Cap
204	Cylinder barrel	216	Bearing	236	O-ring	306	Spring
205	Valve plate	217	Bearing	243	Relief valve	307	Spacer
206	Piston	221	Snap ring	246	Check valve	308	O-ring
207	Shoe	223	Screw	247	Plug	309	O-ring
208	Shoe holder	224	Spring pin	248	Spring	310	O-ring
209	Barrel holder	225	Pin	249	O-ring	311	O-ring
210	Swash plate	226	Pin	301	Seat	312	Back up-ring
212	Retainer	231	Brake piston	302	Retainer		

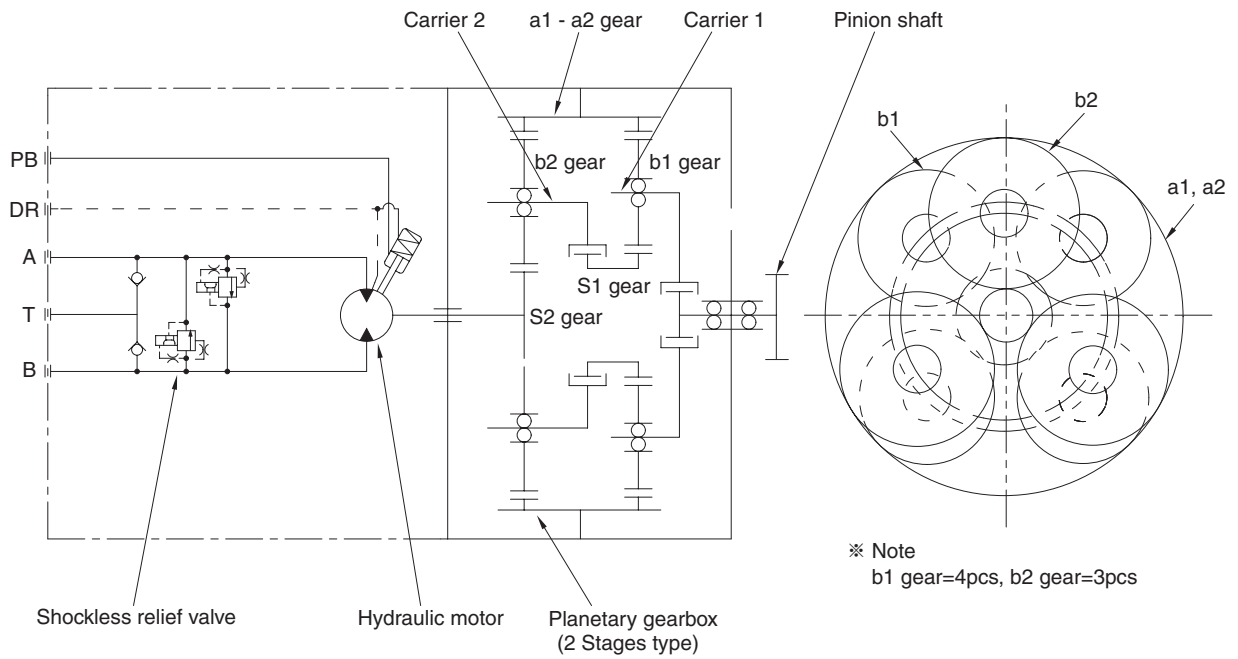
## COMPONENTS (2/2)



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101	Body	111	Needle	120	Snap ring
102	Carrier 1	112	Needle	121	Bearing
103	Carrier 2	113	Seal ring	122	Bearing
104	Pinion shaft	114	O-ring	123	Oil seal
105	Internal gear	115	Thrust plate 1	124	Screw
106	Gear B1	116	Thrust plate 2	126	Pin
107	Gear B2	117	Thrust washer 1	128	Ring
108	Gear S1	118	Thrust washer 2	129	Ring 1
109	Gear S2	119	Preload collar	130	Ring 2

## 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 two stages. The high output speed of the hydraulic motor is reduced to low speed with high torque and obtaining the pinion shaft rotation.

##### (2) Operation

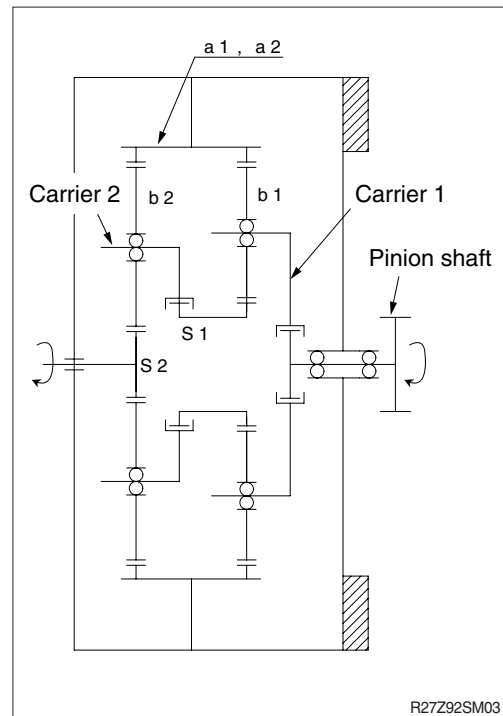
The s2 gear is attached to the hydraulic motor shaft, and the s2 output speed is reduced between the gears (s2, b2, a2).

This reduced output speed is transmitted to the s1 gear and the speed is reduced again between the gears (s1, b1, a1), and it is transmitted to the pinion shaft, and drives the machine.

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

$$R = \frac{Z_{s1}}{Z_{s1} + Z_{a1}} \times \frac{Z_{s2}}{Z_{s2} + Z_{a2}}$$

※ Z \*\* : Number of gear teeth.



## 2) HYDRAULIC MOTOR SECTION

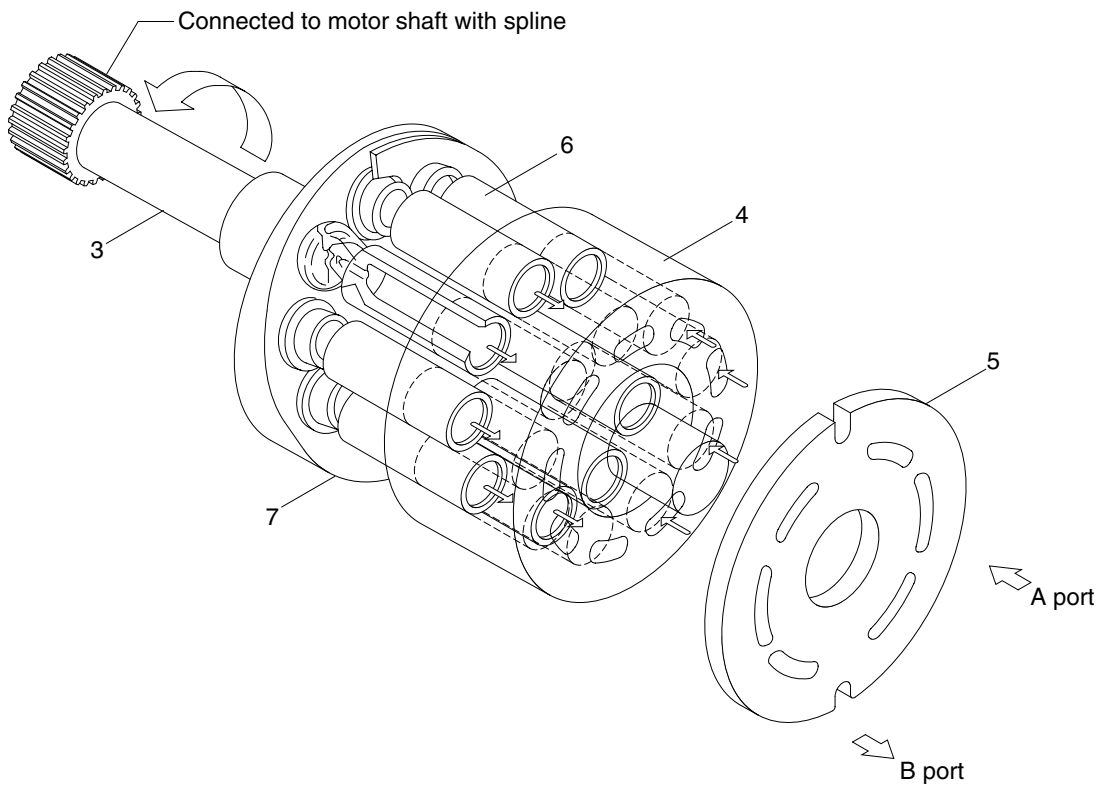
### (1) Function

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.



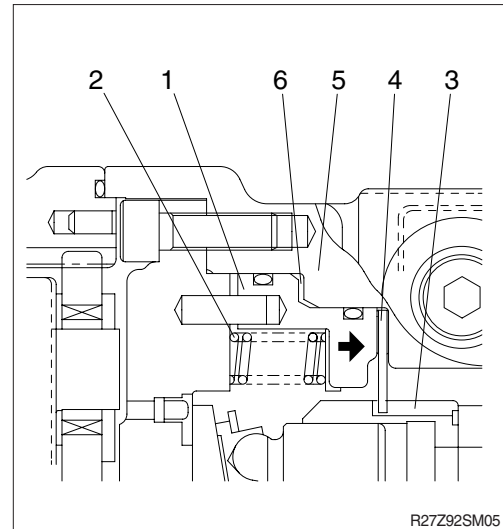
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### (3) Parking brake

The parking brake fixes the output shaft of hydraulic motor mechanically while the wheel motor is stopped.

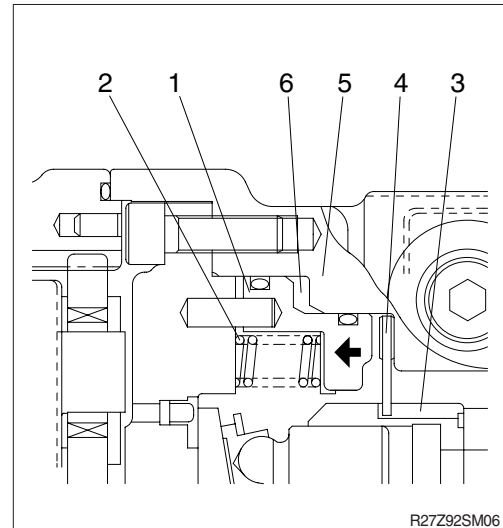
#### ① At the brake releasing pressure OFF

When brake releasing pressure is not supplied, the brake piston (1) is pressed in the direction (shown as arrow) by the spring (2). Then the disk plate (4) which is fixed to the cylinder barrel (3) is held between the body H (5) and the brake piston (1). As a result, with the friction of these parts, the cylinder barrel (3) and the hydraulic motor are unable to rotate.



#### ② At the brake releasing pressure ON

When brake releasing pressure is supplied, the oil is lead to chamber (6). Then the brake piston (1) is moved to the direction (shown as arrow in) against the force of spring (2). As a result, the disk plate (4) is released from the friction, and the cylinder barrel (3) can be rotated.



### 3) HYDRAULIC VALVE SECTION

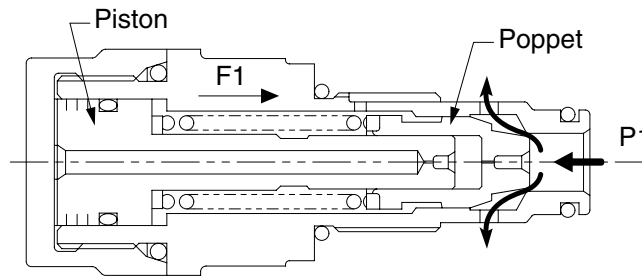
#### (1) Shockless relief valve

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

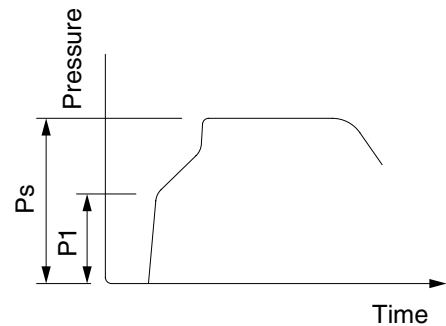
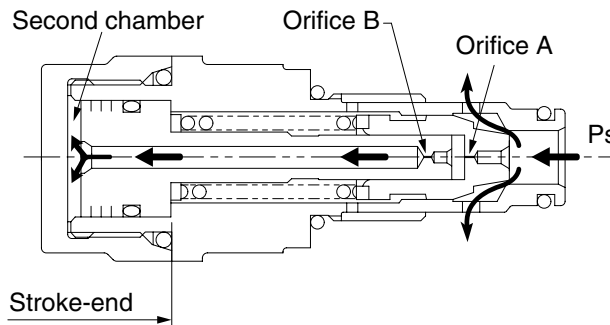
When the P1 pressure is going up, the poppet opens due to the pressure of the spring force F1.



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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  $P_s$ .



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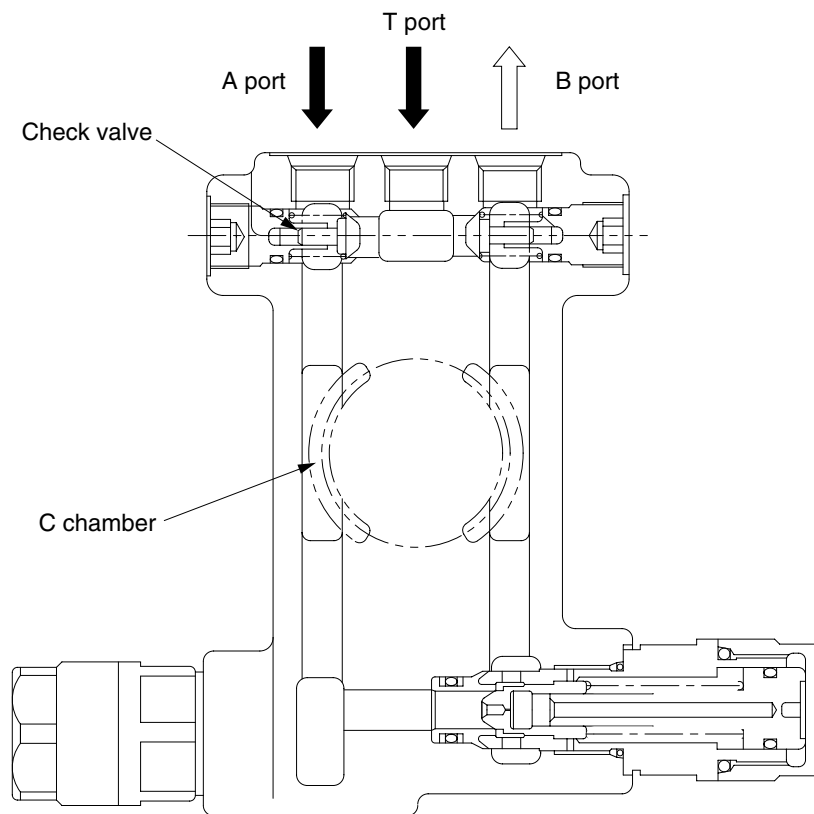
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With the above two stages of operation, the motor starts and stops smoothly.

## (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.



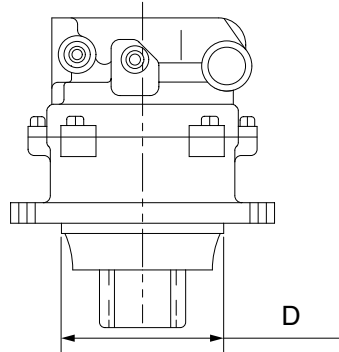
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## 4. HANDLING

### 1) MOUNTING

#### (1) Pilot dimension D

$$D = \varnothing 150h8 \begin{matrix} 0 \\ -0.063 \end{matrix}$$



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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
M16	25 ± 3 kgf · m (181 ± 21.7 lbf · 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 kgf/cm<sup>2</sup> (28.4 psi).
- (4) Fine filtration prolongs the hydraulic system life and ensures high reliability. Install a 10 μm 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.