

SECTION 2 STRUCTURE AND FUNCTION

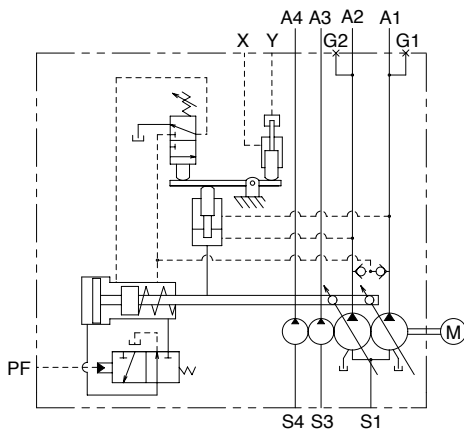
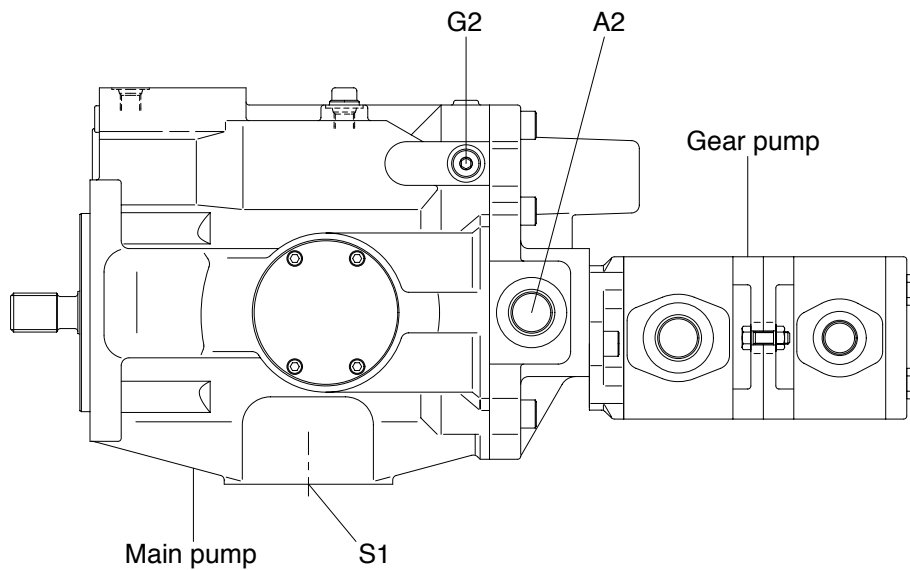
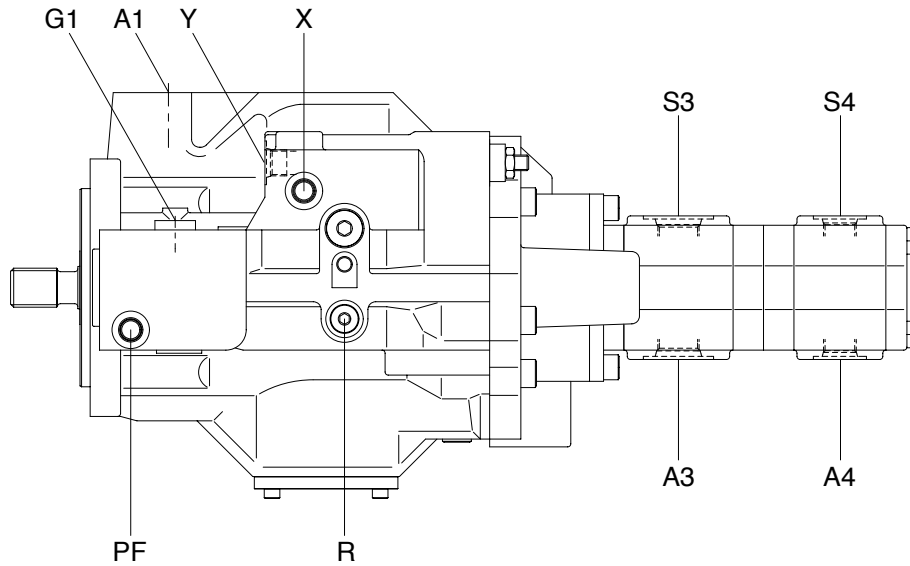
Group 1 Pump Device	2-1
Group 2 Main Control Valve	2-10
Group 3 Swing Device	2-29
Group 4 Travel Device	2-36
Group 5 RCV Lever	2-42
Group 6 Accelerator Pedal	2-51
Group 7 Brake Pedal(Valve)	2-53
Group 8 Transmission	2-56
Group 9 Power Control Valve	2-63
Group 10 Steering Valve	2-65
Group 11 Axle	2-67
Group 12 Brake Supply Valve	2-73

SECTION 2 STRUCTURE AND FUNCTION

GROUP 1 PUMP DEVICE

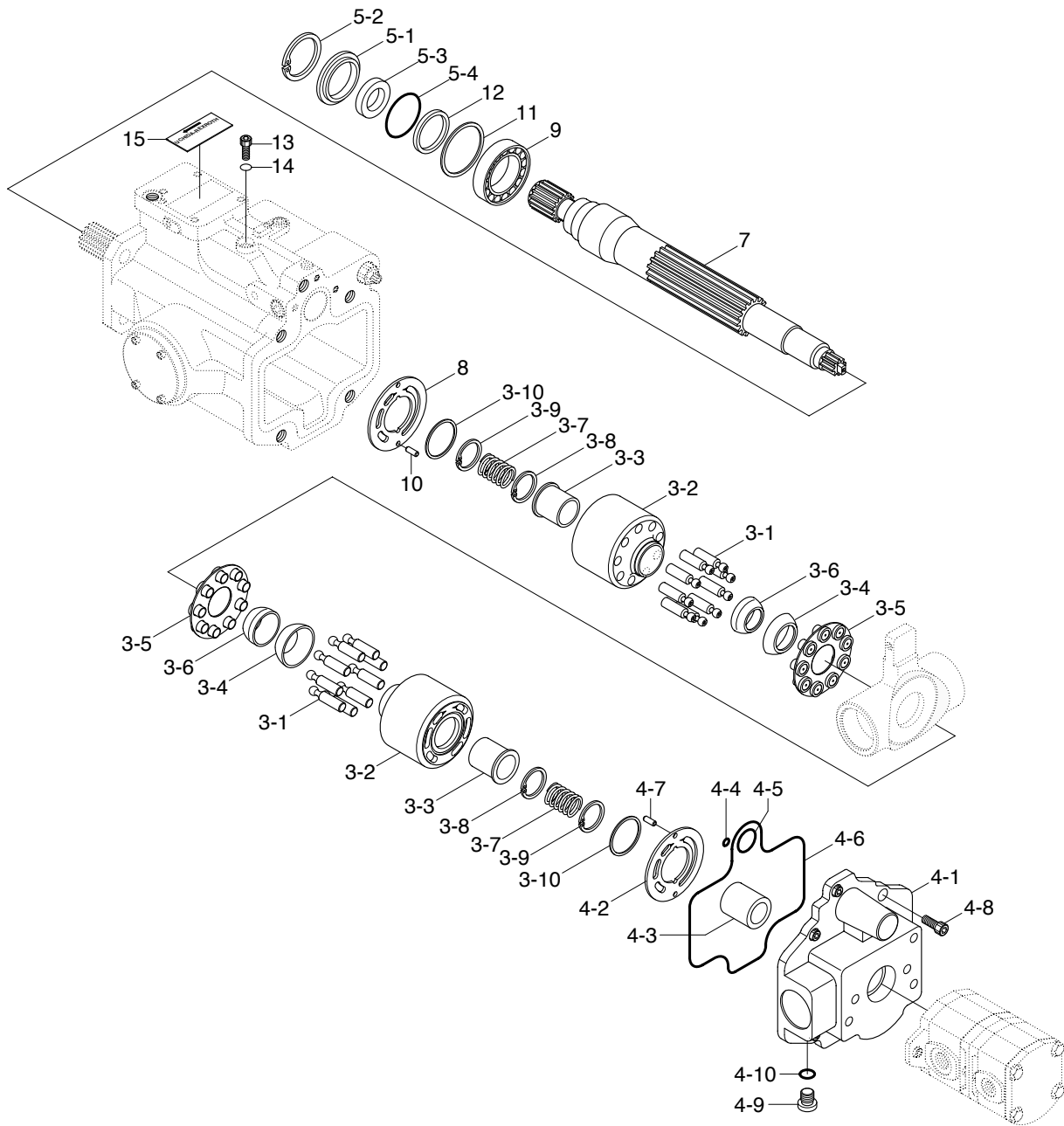
1. STRUCTURE

The pump device consists of main pump and gear pump.



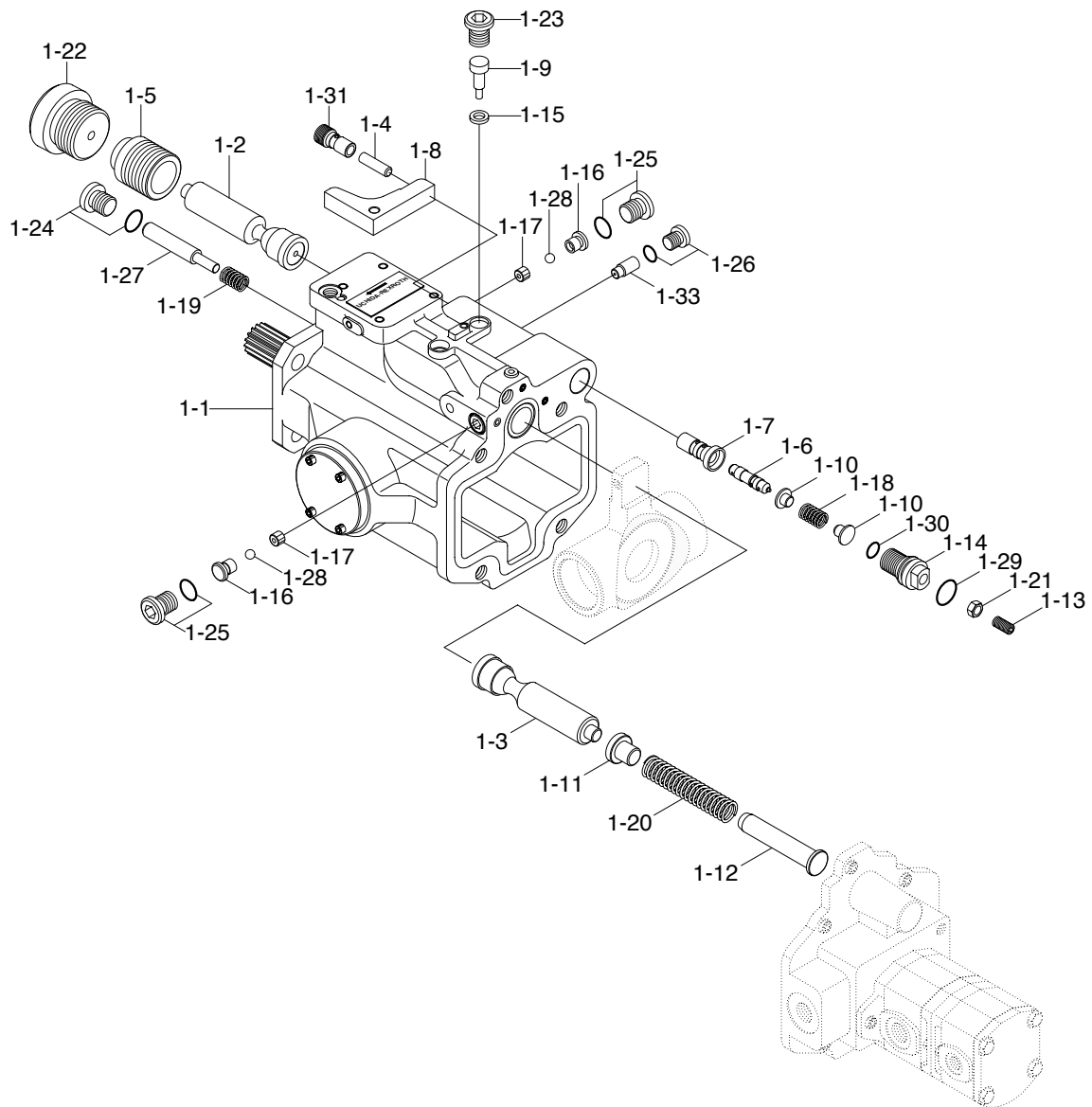
Port	Port name	Port size
A1, 2	Delivery port	PF 3/4
A3	Gear pump delivery port	PF 3/4
A4	Gear pump delivery port	PF 1/2
S1	Suction port	SAE 2
S3	Gear pump suction port	PF 3/4
S4	Gear pump suction port	PF 1/2
X	Pilot port	PF 1/4
Y	Port port	PF 3/8
PF	Pilot port	PF 1/4
G1, 2	Gauge port	PF 1/4
R	Air breather port	PF 1/4

1) MAIN PUMP(1/3)



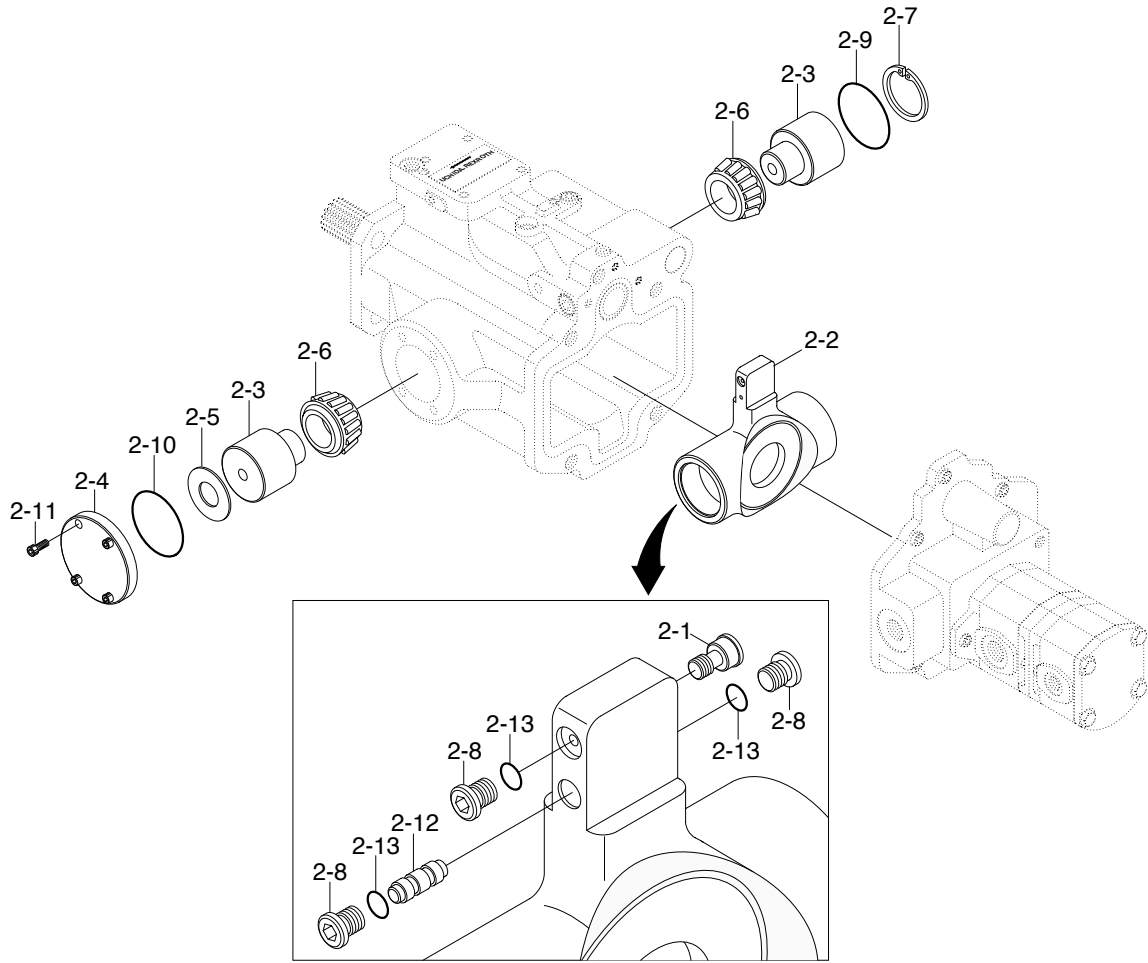
3	Rotary group	4-1	Cover	5-2	Retaining
3-1	Piston	4-2	Control plate	5-3	Oil seal
3-2	Cylinder block	4-3	Bearing	5-4	O-ring
3-3	Pin	4-4	O-ring	7	Shaft
3-4	Retainer	4-5	O-ring	8	Control plate
3-5	Plate	4-6	O-ring	9	Bearing
3-6	Guide	4-7	Pin	10	Pin
3-7	Spring	4-8	Bolt	11	Shim
3-8	Spring seat	4-9	Plug	12	C type retaining ring
3-9	Spring seat	4-10	O-ring	13	Plug
3-10	C type retaining ring	5	Case	14	O-ring
4	Cover	5-1	Case	15	Name plate

MAIN PUMP(2/3)



1	Control part	1-11	Spring seat B	1-22	Plug
1-1	Housing	1-12	Spring seat C	1-23	Plug
1-2	Control piston A	1-13	Adjust screw	1-24	Plug
1-3	Control piston B	1-14	Guide	1-25	Plug
1-4	Piston	1-15	Shim	1-26	Plug
1-5	Piston	1-16	Valve seat	1-27	Spool
1-6	Spool	1-17	Guide	1-28	Steel ball
1-7	Barrel	1-18	Spring	1-29	O-ring
1-8	Arm	1-19	Spring	1-30	O-ring
1-9	Shaft	1-20	Spring	1-31	Bushing
1-10	Spring seat A	1-21	Bolt	1-32	Orifice

MAIN PUMP(3/3)

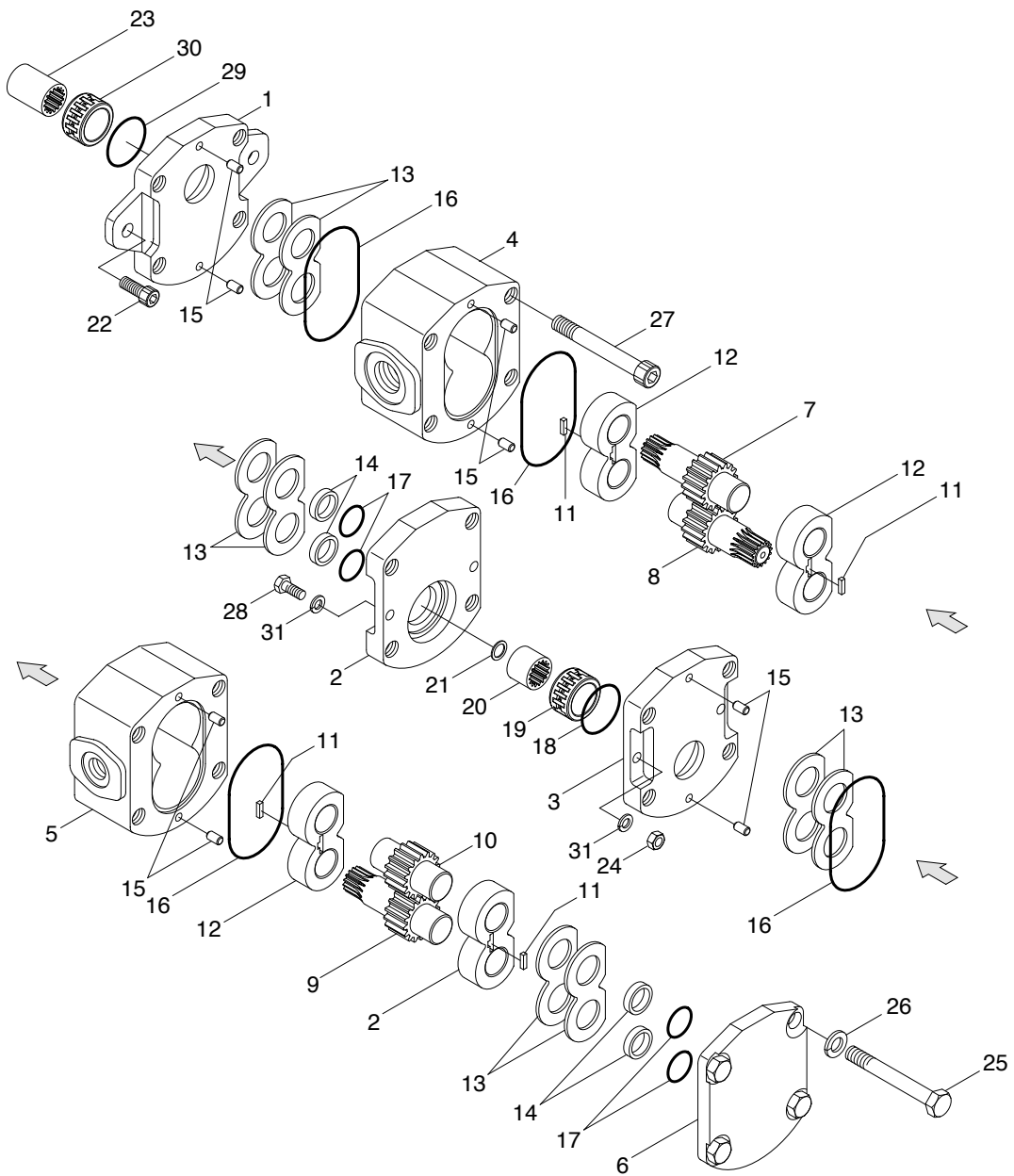


- 2 Hanger
- 2-1 Pilot piston
- 2-2 Hanger
- 2-3 Shaft
- 2-4 Plate

- 2-5 Shim
- 2-6 Bearing
- 2-7 Retaining
- 2-8 Plug
- 2-9 O-ring

- 2-10 O-ring
- 2-11 Bolt
- 2-12 Spool
- 2-13 O-ring

2) GEAR PUMP



1	Frame	12	Side plate	22	Socket bolt
2	Frame	13	Plate	23	Coupling
3	Frame	14	Guide	24	Nut
4	Case	15	Parallel pin	25	Bolt
5	Case	16	Ring	26	Spring washer
6	Cover	17	O-ring	27	Bolt
7	Gear	18	O-ring	28	Bolt
8	Gear	19	Bushing	29	O-ring
9	Gear	20	Coupling	30	Bushing
10	Gear	21	Retaining	31	Plain washer
11	Ring				

2. OUTLINE

The piston pump unit is a double pump unit consisting of two variable displacement pumps of same capacity mounted against a swash plate in a single housing.

The two rotary groups(Front and rear) are connected by a shaft. By driving the input shaft, both front and rear pumps can be run simultaneously.

This pump unit can have a gear pump connected via a coupling.

The control method used: Summation horse power constant control.

3. MAJOR COMPOSITION AND FUNCTIONS

1) PUMP FUNCTION

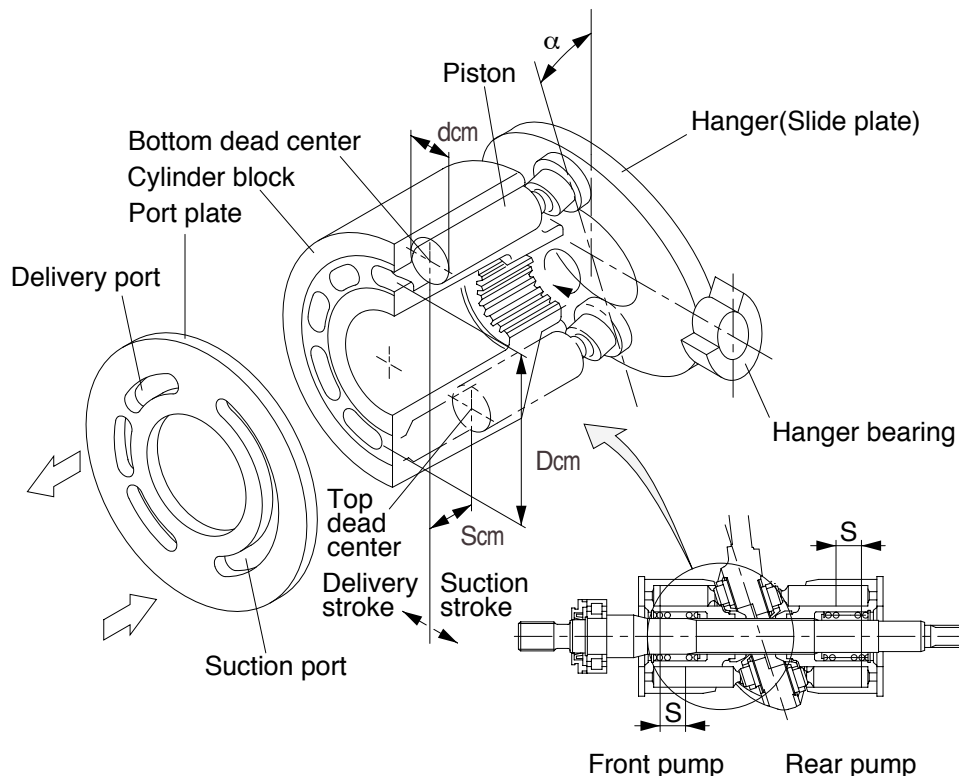
The cylinder block is splined so that it rotates with the drive shaft.

The pistons built in the cylinder block make reciprocating motion following the slide plate on the hanger.

When the pistons move from the bottom dead center to top dead center, the cylinder volume increases so that oil flows into the cylinder block from the suction port through the port plate(Suction stroke).

When the pistons move from the top dead center to bottom dead center, the cylinder volume decreases so that oil is discharged to the delivery port(Delivery stroke).

By changing the inclination of hanger(Slide plate), the volume change(Displacement volume) can be changed.



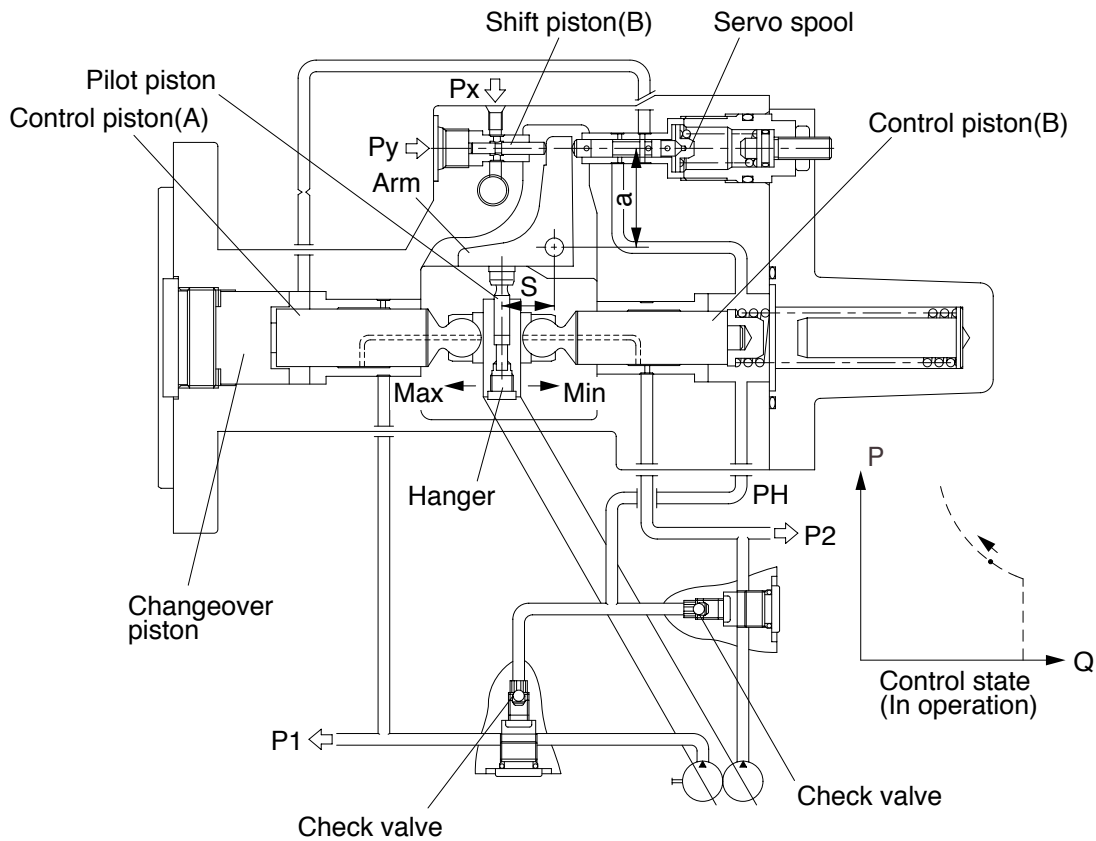
2) CONTROL FUNCTIONS

Full power control SR(With a mode changeover function)

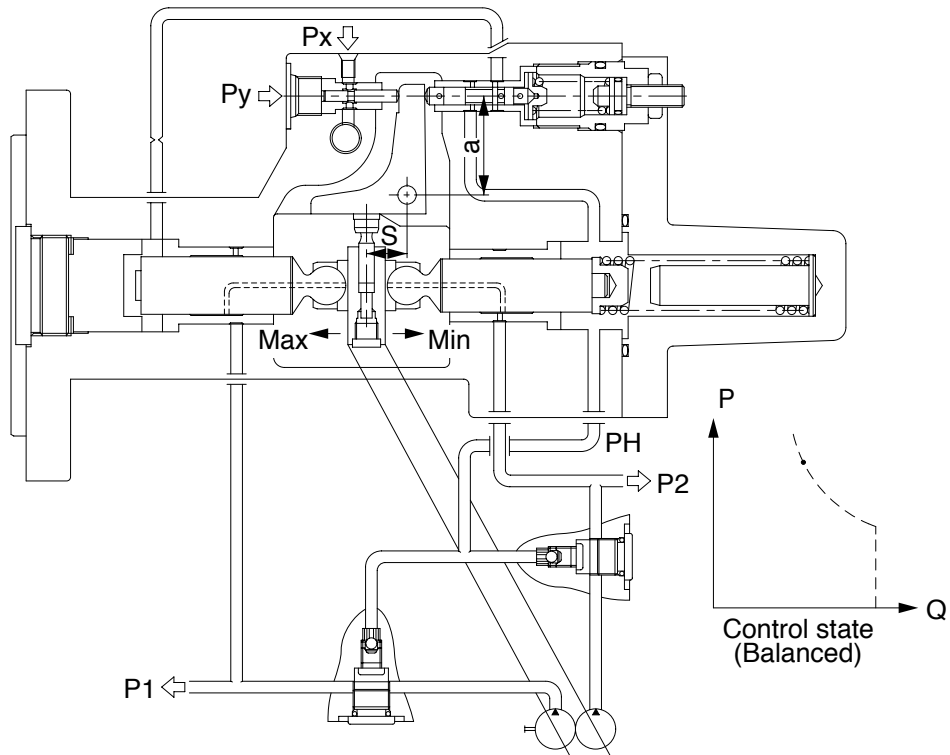
The front pump pressure P_1 and rear pump pressure P_2 passes through the inside of the control piston to be directed respectively to the stepped portion and end portion of the pilot piston in the hanger. The pressure P_H , that is P_1 or P_2 whichever is higher, acts on the end of the control piston(B), pressing the hanger to the maximum tilting side.

When the moment around the arm fulcrum caused by the oil pressure acting on the pilot piston is smaller than the moment caused by the spring force, the end of the control piston(A) connects to the tank, putting the hanger into the maximum tilting state.

When the discharge pressure rises and the moment caused by the oil pressure exceeds the moment by the spring force, the servo spool moves to direct P_H to the end of the control piston(A).



The hanger is tilted due to difference in the diameter of control piston (A) and (B). Tilting of the hanger causes naturally travel of the built in pilot piston, resulting in decrease in the distance between the work point and fulcrum and reduction in the moment caused by oil pressure. The servo spool is moved back, and tilting is held at a point where the moment caused by the oil pressure and that caused by the spring force are balanced.



The shift piston is arranged in a manner opposing to the spring and exposed to the moment caused by the pilot pressure in addition to that caused by the discharge pressure. Accordingly, the set torque decreases along with rise of the pilot pressure.

Principle of full power control

From the balance of the moment around the arm fulcrum;

$$(P1 \cdot A + P2 \cdot A) \cdot S + (Px \cdot Bx + Py \cdot By) \cdot a = Fsp \cdot a$$

From relationship between the swept volume q and stroke S;

$$S = C \cdot q$$

From and ;

$$(P1 + P2) \cdot q = \{Fsp - (Px \cdot Bx + Py \cdot By) \cdot a\} / (C \cdot A)$$

Since this is a single swash plate pump

$$q = q1 = q2$$

Accordingly, may be rewritten as follows:

$$P1 \cdot q1 + P2 \cdot q2 = C$$

Legend

P	Discharge pressure
A	Pilot piston end portion and annular pressure receiving area
Px, Py	External pilot pressure
B	Shift piston pressure receiving area
a	Distance between the fulcrum and spring force work point
Fsp	Spring force
S	Distance between the fulcrum and oil pressure work point(Tilting stroke)
q	Swept volume
C	Constant
Attached letter 1	Front pump
2	Rear pump

In this way, control with the constant torque is achieved.

This set torque value is freely adjustable by changing the spring force Fsp.

The torque also changes in reverse proportion to the external pilot pressure Px, Py the mode can be changed over by applying the pilot pressure appropriate to the required torque setting.

4. ADJUSTMENT

This pump has been set and inspected according to the input power and control as set forth in the required specification. Readjustment of all adjusting parts may cause each control to fail in execution of the required function. Besides, the performance of the pump proper cannot be guaranteed. Never attempt operation of the adjusting screw, etc.