

HYDRAULIC SYSTEM

GENERAL

Kamewa standard hydraulic system for merchant application consists of a hydraulic power pack, e.g. all pumps, filters, valves etc. mounted on the tank. See the drawing “*hydraulic power pack*”.

The tank has to be located as near the oil distribution box as possible, looking to the view of space available and within reach for service.

The purpose of the power pack tank is:

- A To distribute pressure oil to the oil distribution box, for further transport through the twin tube in the shafting to the servo actuator, and of course, take care of the return oil coming from the hub servo motor. Connection **R** on the hydraulic power pack.
- B The pitch manoeuvring valve(s) on the tank receive their signals from the electronic remote control

The hydraulic power pack has two electrically driven pumps **P1** and **P2**, which may be either single or double pumps depending of the propeller size. One of the pump is usually running and the other remains in stand-by, nevertheless, as it will be explained later, in certain conditions the two pumps may be running at the same time.

In some cases one of the pumps is driven by a Power Take Off from the gear box and it exist only one electric pump which works in stand-by

HYDRAULIC SYSTEM WITH TWO DOUBLE PUMPS

General description

The flow of the servo-pump **S** is about 1/3 of the total flow and the flow of the booster pump **B** has the remaining 2/3 of the total flow. Pump units **P1** and **P2** are of the same type and size. Normally, the pumps are gear pumps or vane pumps.

Main oil flow from pumps goes via the control valve **V3** and booster valve **V2**, via the OD-box directly to the main cylinder. Small and slow manoeuvres are carried out with the control valve.

For big and fast manoeuvres, also the booster valve will open up. In this moment, both pumps will be connected to the main cylinder. The booster valve will be activated when the control error exceeds about 5%. (Adjustable at sea trials).

Both pumps work unloaded when no manoeuvre are carried out. This means low heat generation and low power consumption. It also makes it possible to operate without cooler in almost all cases. Booster pump will be unloaded to almost zero pressure and servopump will operate with about 15 bar. During manoeuvres, pressure will rise to about 15 bar higher than required by the propeller. This depends on the actual pitch position, see enclosed diagram and it is shown on the pressure gauge **G4**

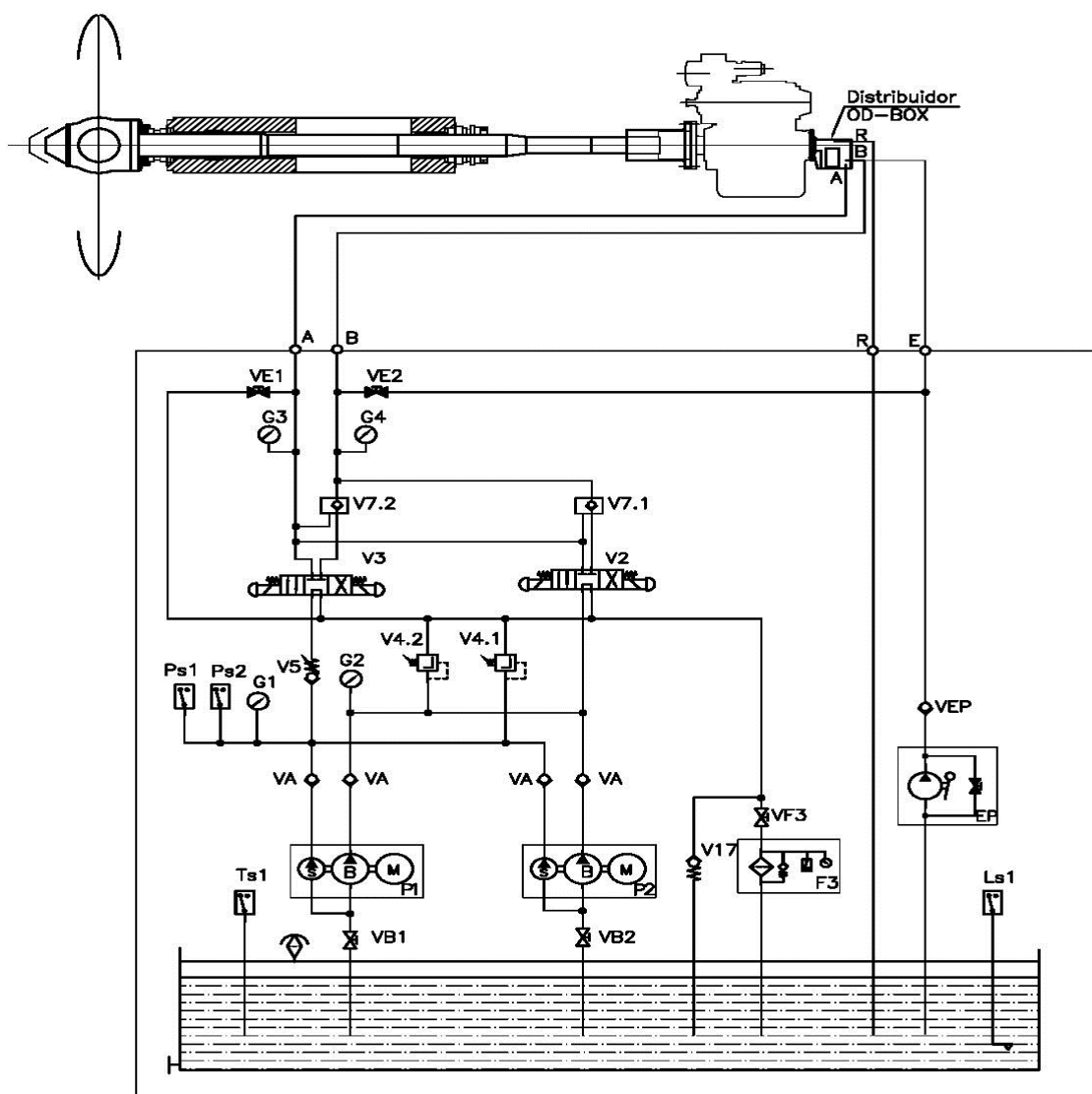
The pressure gauge **G2** show the pressure in the pump B (if exist)

The pressure gauge **G3** show the pressure in the line A, astern side of the piston.

The pressure gauge **G4** show the pressure in the line B, ahead side of the piston.

The pilot-check valves **V7.1** and **V7.2** help to keep the pitch in position avoiding that, due to oil leakages in the hydraulic power pack the pitch goes by itself toward astern which is its normal tendency.

Each electro-valve circuit has his own safety valve **V4.1** and **V4.2** independent.



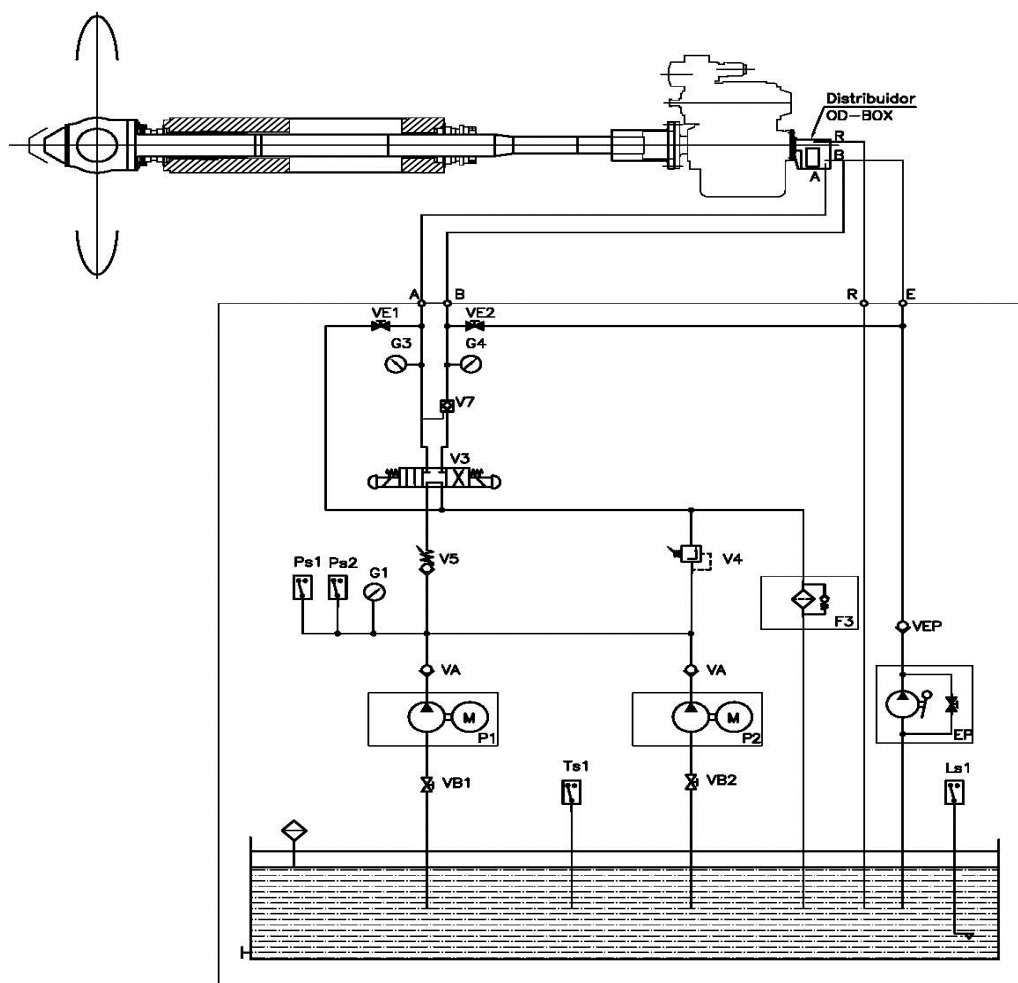
Back up manoeuvres

In case of control system failure, the back up manoeuvres will be carried out with push buttons on the bridge. The booster valve will be activated.

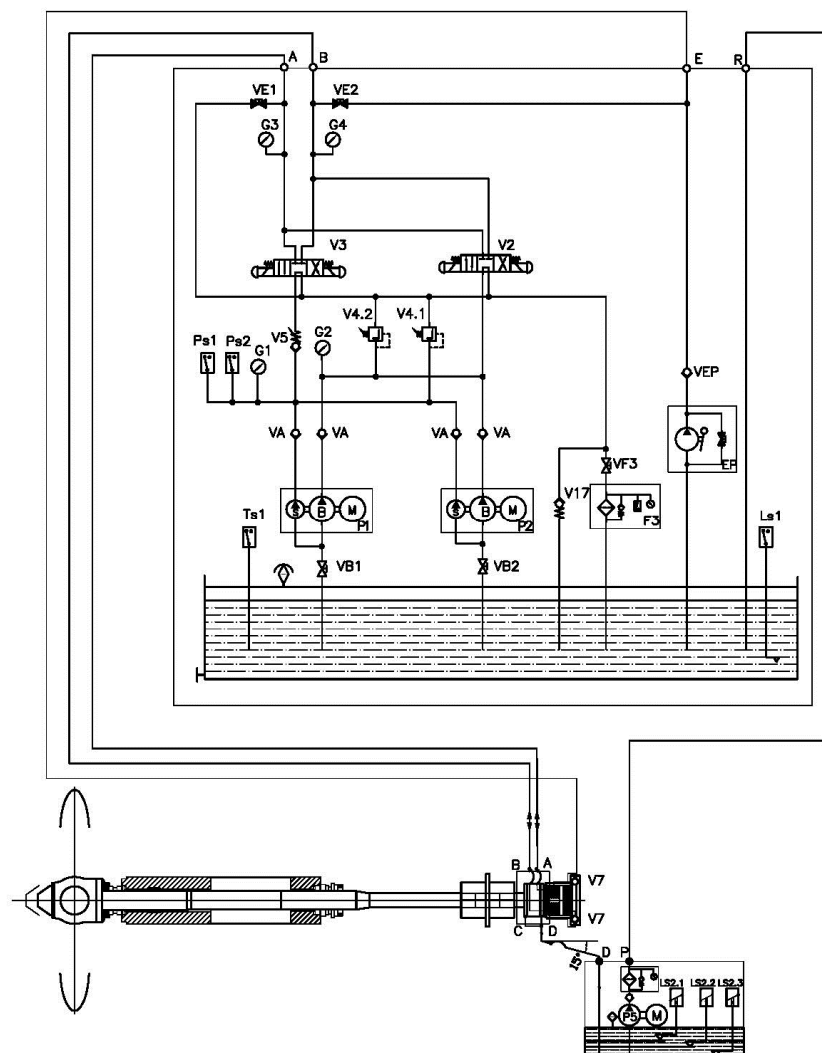
The functioning of the manual pump **EP** and the valves **VE1** y **VE2** (which must be normally closed) are explained in the chapter “**EMERGENCY ADJUSTING OF THE PROPELLER PITCH**”

HYDRAULIC SYSTEM WITH TWO SINGLE PUMPS

For small propellers that require less flow, the pumps **P1** and **P2** are single, this means only one pump **S** and one control valve **V3**. Its functioning is similar to what it has been explained previously for **S** and **V3**. They have no booster valve **B** and consequently only one safety valve **V4** and pilot check valve **V7**.



CONSIDERATIONS WHEN THE PITCH SETTING MECHANISM IS TYPE “A”



When the pitch setting mechanism is of type “A”, this means with the OD Box placed on the intermediate shaft, at the aft side of the gear box, the pilot-check valve **V7** are mounted on the intermediate shaft flange, the valves are of cartridge type of the brand SUN. Except this, the power packs described previously are exactly the same.

Moreover it can be distinguished two types of OD Boxes:

- 1- With seals type lip (this solution is only applied to the smaller pitch setting mechanism). In this case the drain oil flows back to the hydraulic power pack by itself when the pipes are full of oil, this requires that the tank is never higher than 2 m. above the shafting line.
- 2- With covers type labyrinth. In this case the drain oil goes by gravity down to a drain group placed under the shafting line the nearer possible to the OD Box. That drain power pack has an electric driven pump P5 which starts and stops controlled by level switches

RECOMMENDATION FOR USE OF ONE OR TWO PUMPS

1. Normally one pump unit shall be running.
2. If quick pitch setting is required in harbours and channels, both pump units shall be running.

Note: Normally the diesel engine will be overloaded if pitch setting is too rapid and load control system (if installed) will limit the speed. This means that manoeuvres will not be quicker with two pumps running and in such a case one pump is sufficient.

Adjustment of valves and maximum pressures

Adjustment of pressure levels on pumps and valves are normally made at KaMeWa before delivery. Usually no adjustments are required but it must be checked at start-up.

Adjustment of safety valve

1. Set the switch Remote / Local in position Local Control
2. Start one pump unit (Stopped propeller shaft)
3. Set the valves **V4.1** and **V4.2** to low pressure.
4. Go to mechanical end position by push buttons on the valve **V2**.
5. Adjust safety valve **V4.1** to about 65 bar by reading the pressure gauge **G4** (see the correct pressure in the hydraulic diagram), during adjustment, the valve must be activated continuously.
6. Then move the pitch to the mechanical end astern and check that the pressure is the same by reading the pressure gauge **G3**
7. In the same way move the pitch to the mechanical ends with the valve **V3** and adjust the valve **V4.2**.

Switches:

- Pressure switch **PS1** give alarm for low servo pressure at 12 bar
- Pressure switch **PS2** for Auto-start stand-by pump at 10 bar
- Temperature switch **Ts1** for alarm high oil temperature above 65°C.
- Level switch **Ls1** for low oil level indication

Pressure gauges showing:

- G1 Servo-pump pressure
- G2 Booster-pump pressure
- G3 Pressure port A on main piston (astern)
- G4 Pressure port B on main piston (ahead)

The diagram on next page shows the pressure needed to keep the pitch in position that can be seen in the pressure gauge **G4**, and the servo-pump pressure required which is seen in the pressure gauge **G1**. During the pitch manoeuvres, this pressure increases about 15-30 bar, depending on the shaft speed.

