

# Hydraulic System

**FLOW:** *determines the speed of the work equipment.*

Speed of work equipment is determined by the amount of pump flow.

Greater the pump flow the greater the speed.

Lesser pump flow creates slower speeds.

Pump flow rate is determined by the pump swash plate angle and rpm.

**PRESSURE:** *determines the amount of force the work equipment can exert.*

Pressure is determined by resistance up until maximum relief pressure is reached.

Resistance can come in two forms:

Flow rate and size of port the oil must pass through.

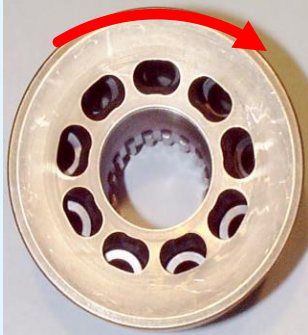
Amount of resistance from the work equipment.

When maximum relief pressure is reached the machine cannot exert any more force and the work equipment stops.

### Pump RPM

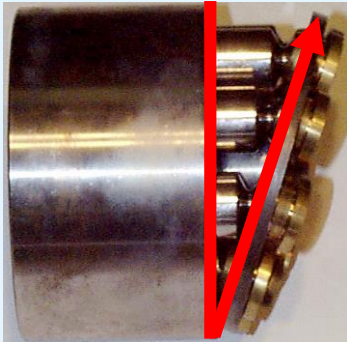


When the pump **rotation speed increases**, the pump flow increases. This is directly effected by engine rpm.

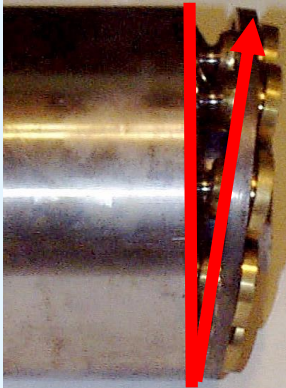


When the pump **rotation speed decreases**, the pump flow decreases. This is directly effected by engine rpm.

### Pump Swash Plate Angle



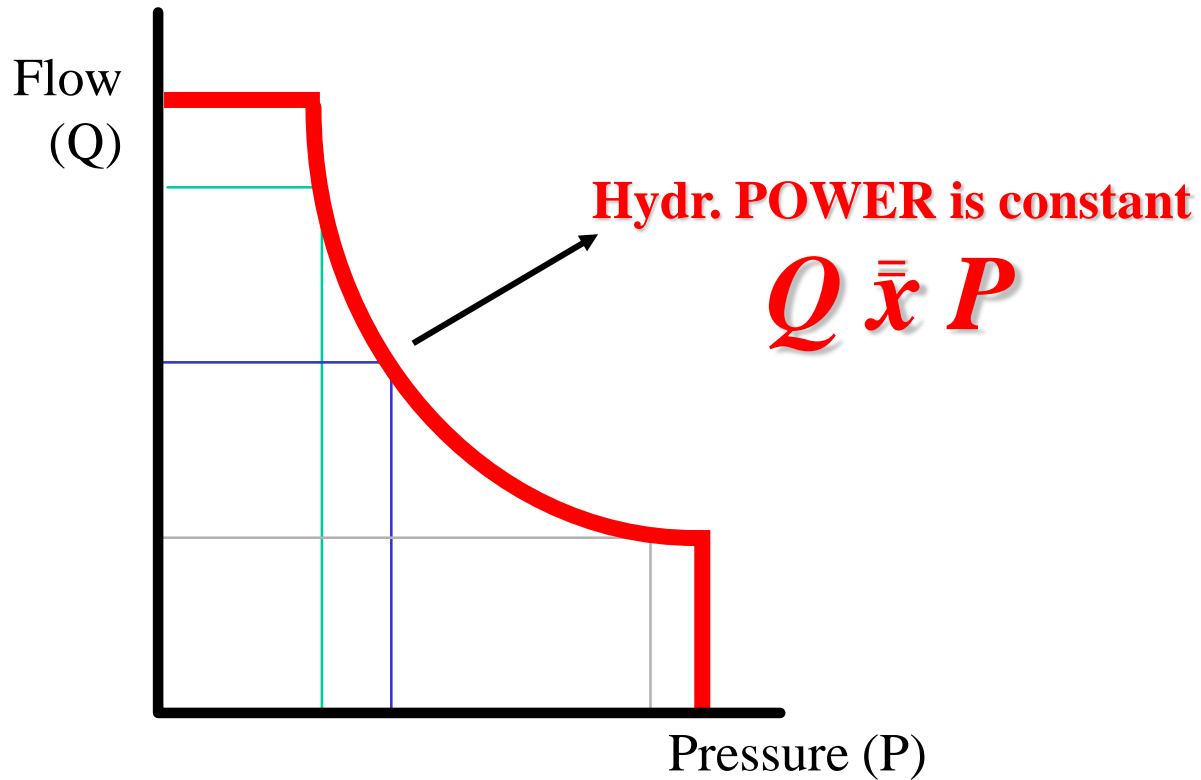
As the pump **swash plate angle increases** more fluid can fill each chamber increasing the flow.



As the pump **swash plate angle decreases** less fluid can fill each chamber decreasing flow.

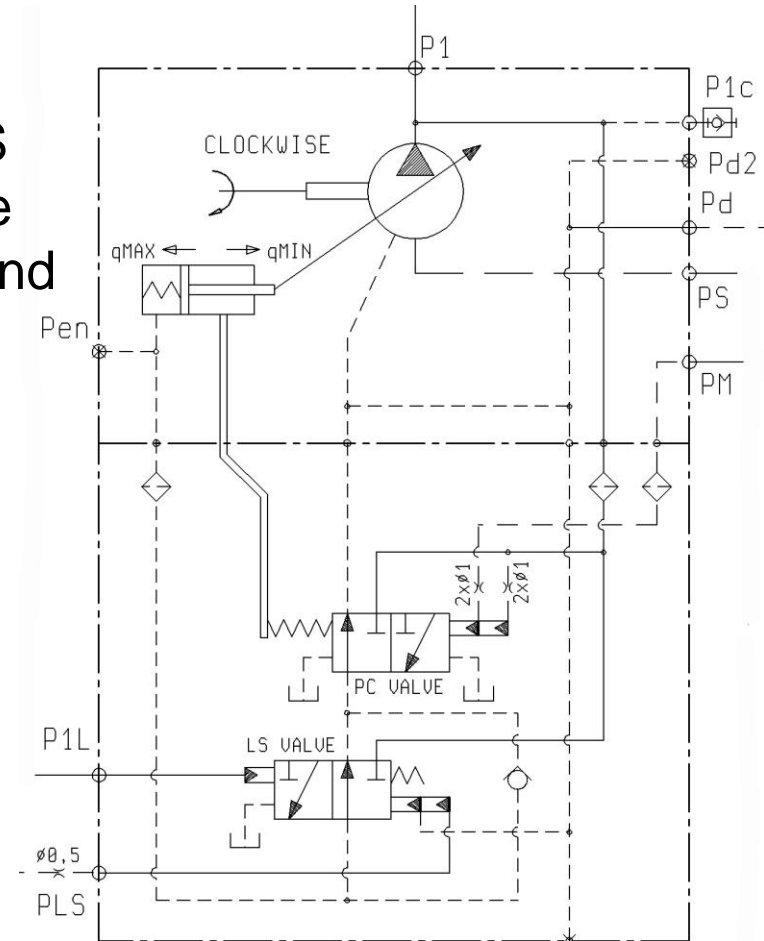
This is valid also for the gear pump not represented here

The relationship between flow and pressure is shown in the Hydraulic Output Curve. With all hydraulic equipment the relationship between flow and pressure is inversely proportional: as pressure increases flow decreases and as pressure decreases flow increases.

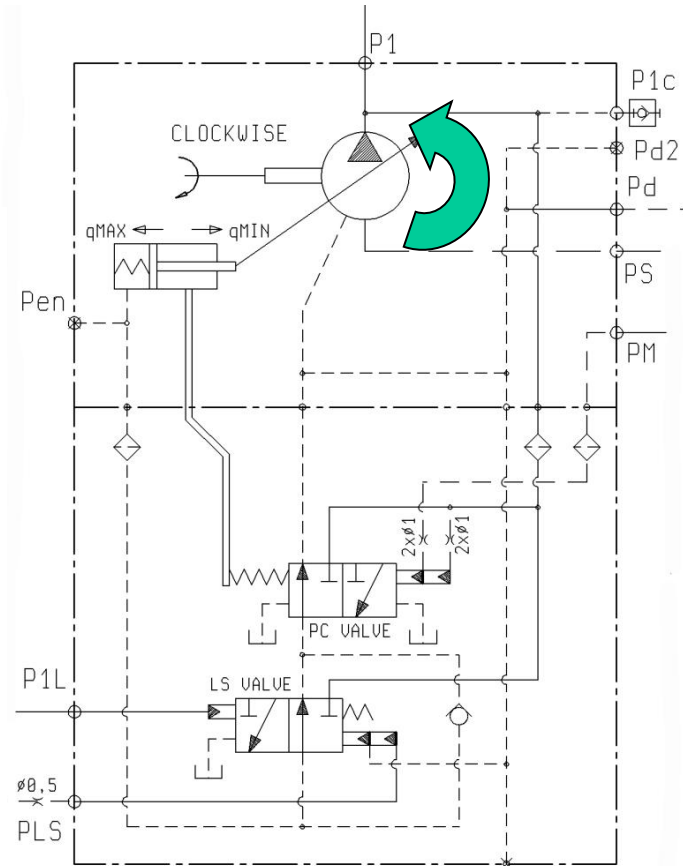
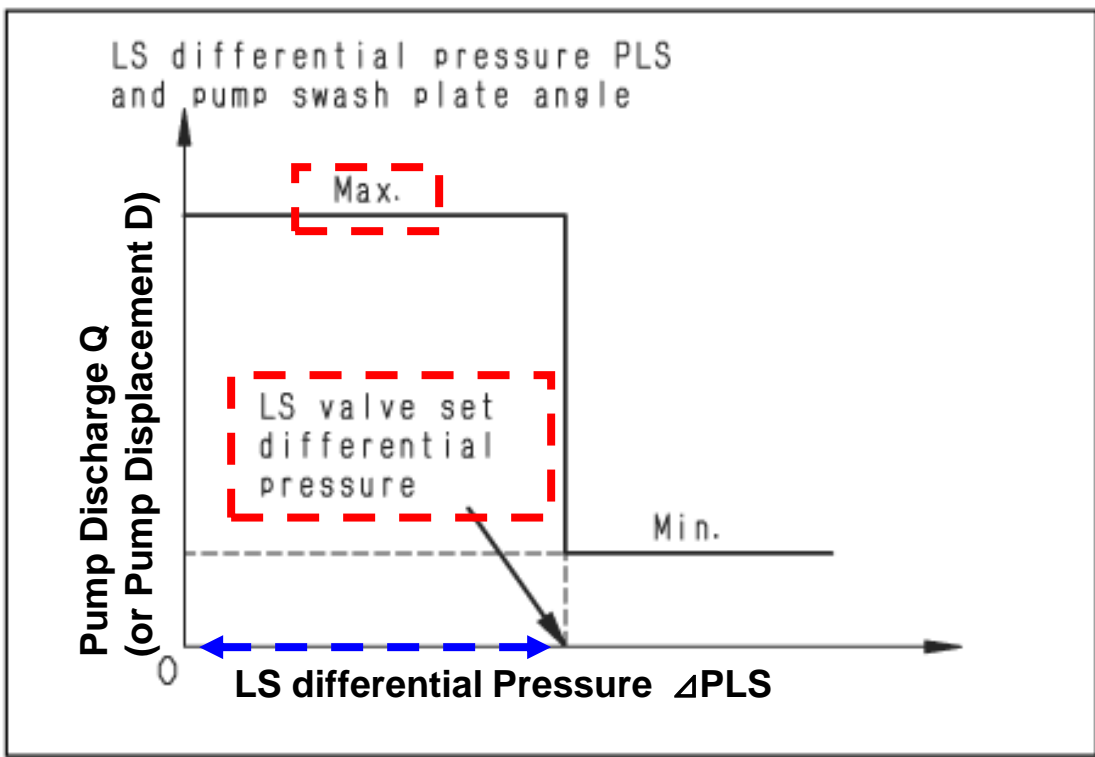


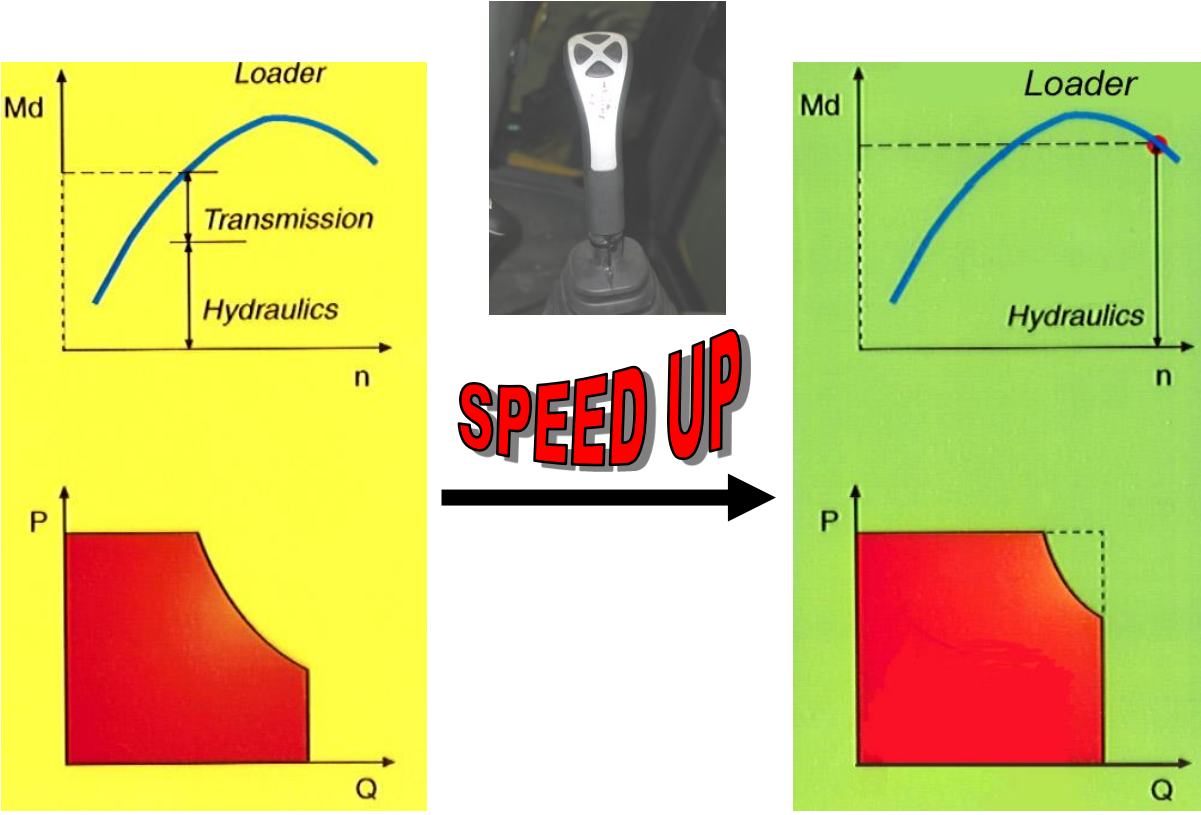
## BASIC PRINCIPLE

1. Control of pump swash plate angle
  - The pump swash plate angle (pump discharge amount) is controlled so that LS differential pressure  $\Delta PLS$  (the difference between pump (discharge) pressure **PP** and control valve outlet port LS pressure **PLS**) load pressure of actuator) is constant. (LS pressure  $\Delta PLS = \text{Pump discharge pressure } PP - \text{LS pressure } PLS$ )

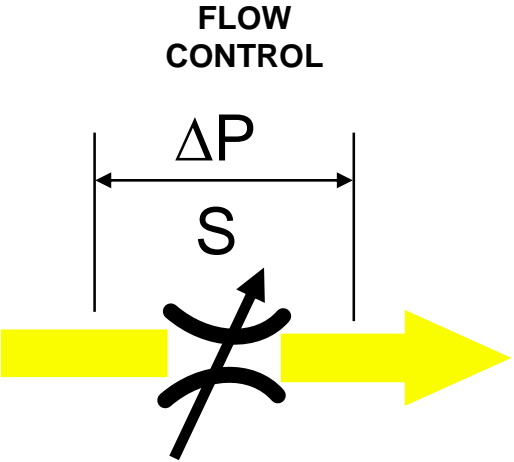


<If the  $\Delta PLS$  is lower than the  $\Delta PLS$  set pressure>

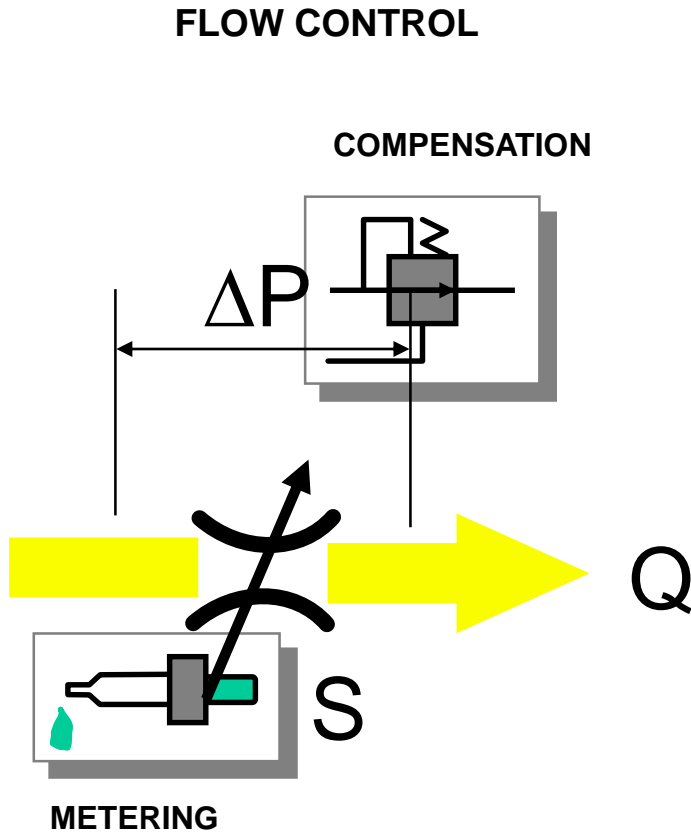




- **POWER MODE & SPEED UP ADVANTAGES:**
  - PERFECT CONTROL OF THE AVAILABLE POWER
  - NO ENERGY LOSS AND COSTS SAVING
  - SELF-ADJUSTMENT SYSTEM ACCORDING TO THE APPLICATION
  - OVERDIMENSIONED COMPONENTS TO GUARANTEE RELIABILITY AND DURABILITY
  - WORKING MODE SELECTION LIKE IN KOMATSU EXCAVATORS
  - TWO FRONT LOADER SPEEDS LIKE IN KOMATSU WHEEL LOADERS



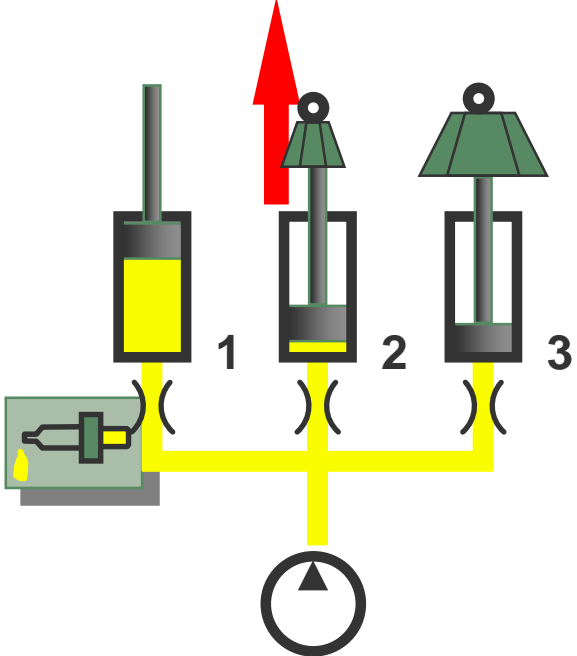
$$Q = k S \sqrt{\Delta P}$$



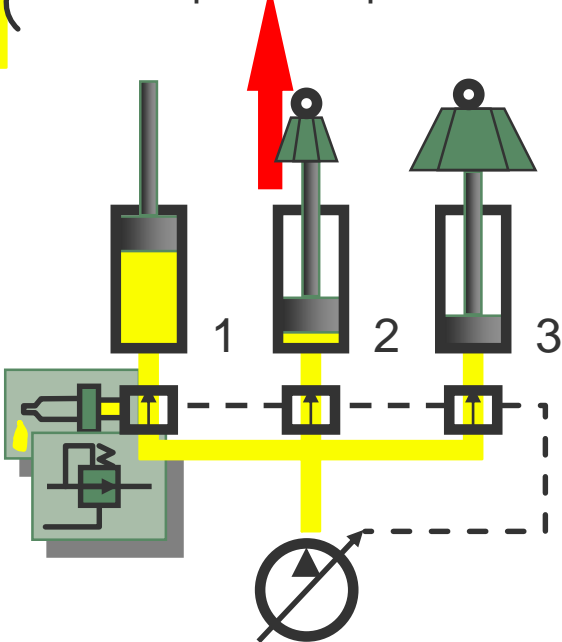


## CONVENTIONAL SYSTEM

Flow division without pressure compensator

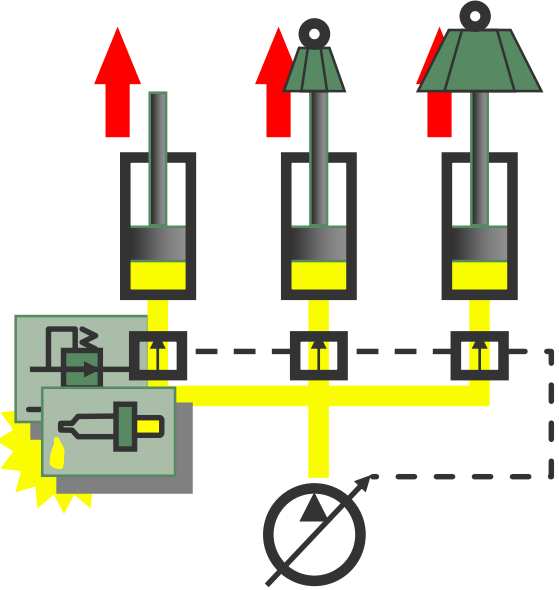


Flow division with pressure compensator



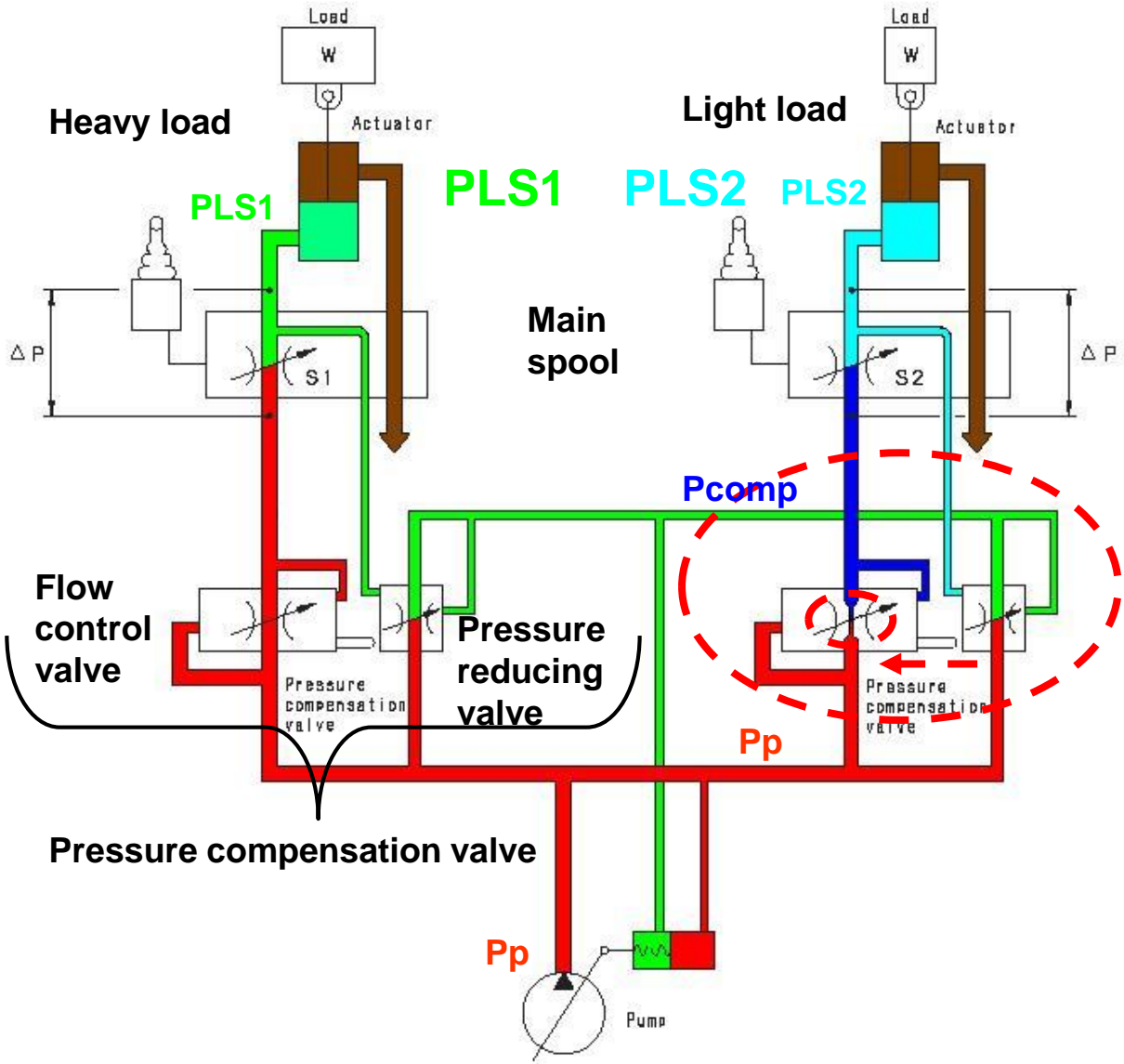
**THE INNOVATIVE SYSTEM  
INSTALLED  
ON THE  
NEW  
KOMATSU  
BACKHOE  
LOADERS**

Flow division with



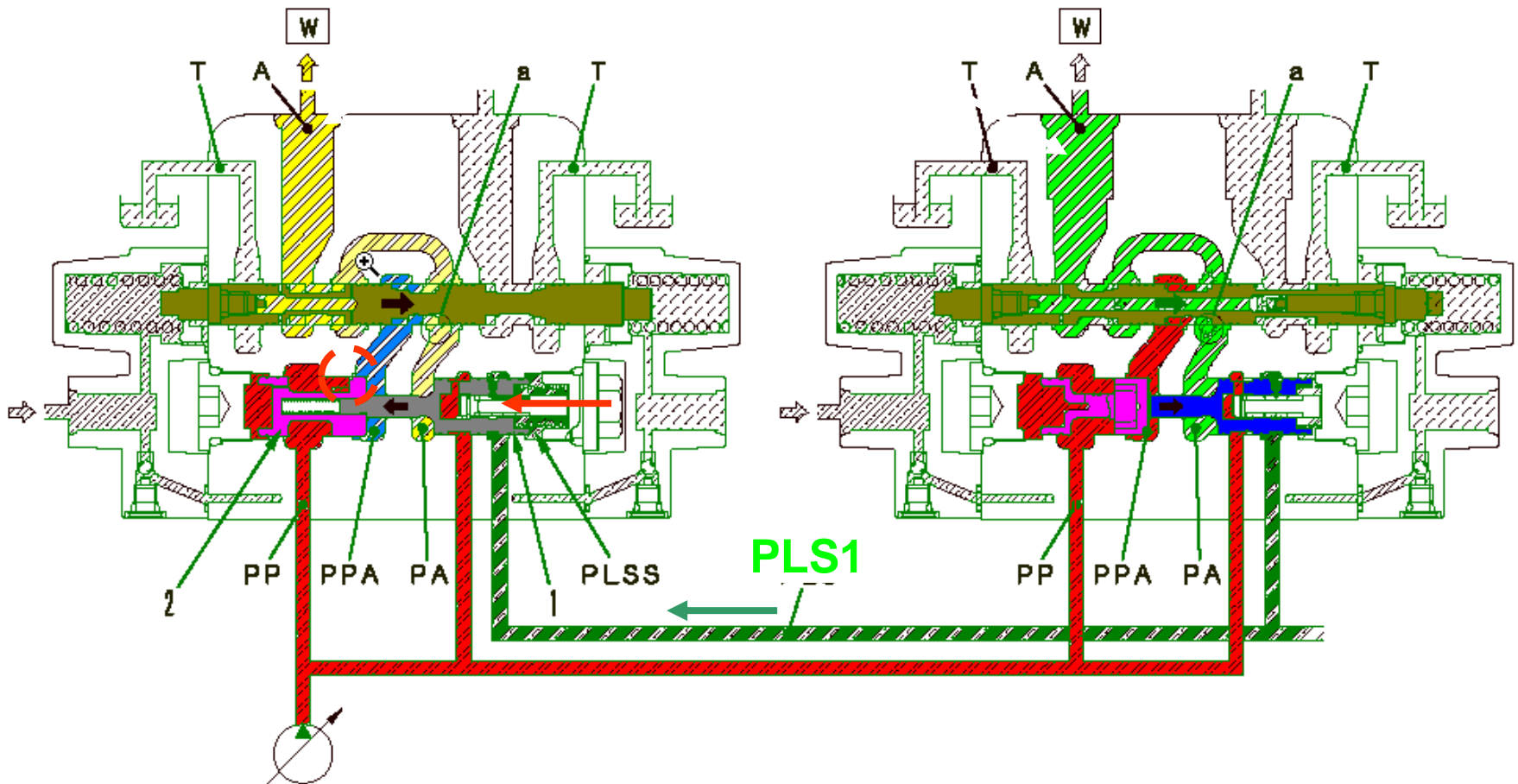
Customer Service Department

# Hydraulic System : Compensators

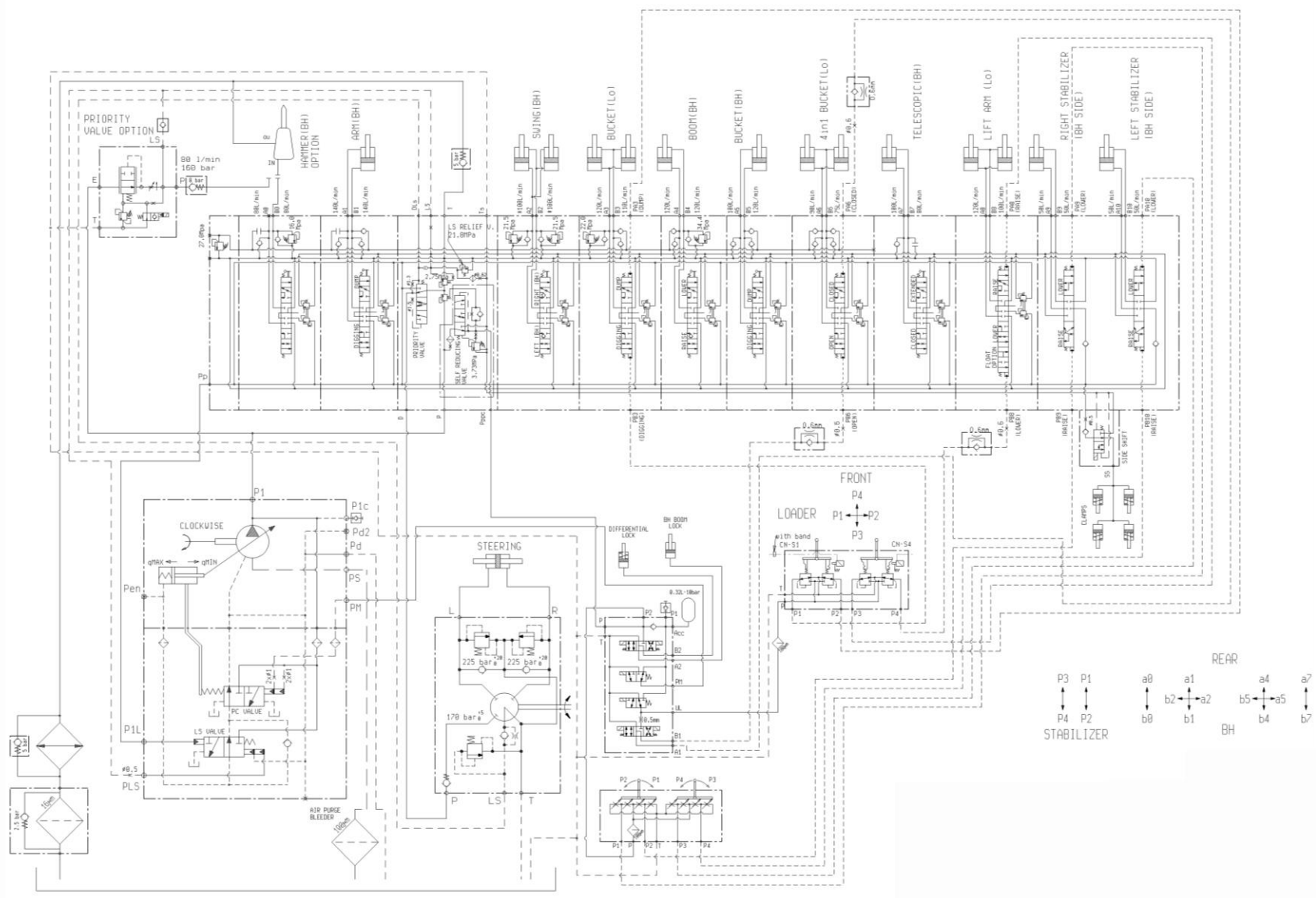


2. Light load  
(Compensated side)  $PLS2 < PLS1$

1. Heavy load  
(Compensating side)



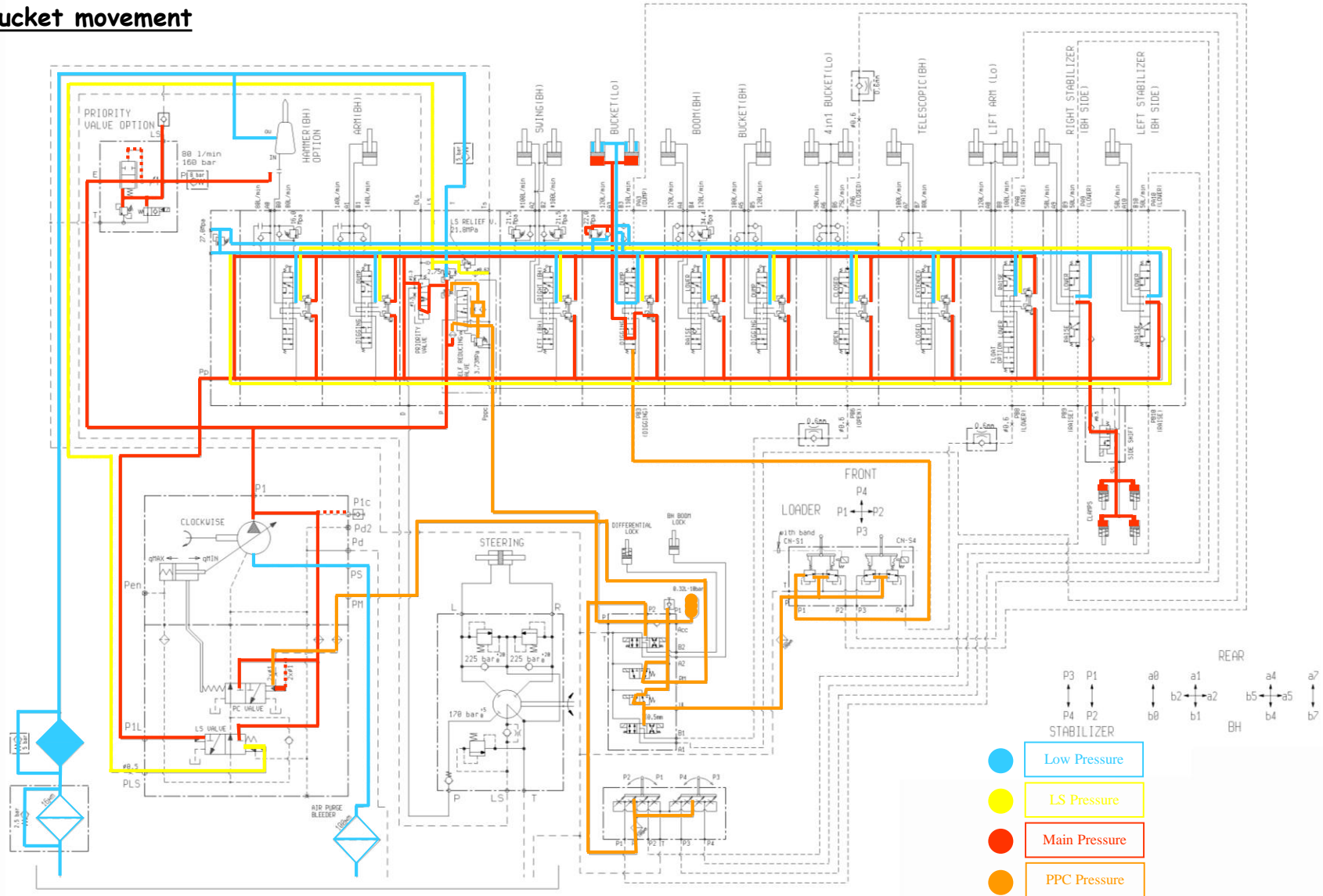
# Hydraulic System : Lay Out



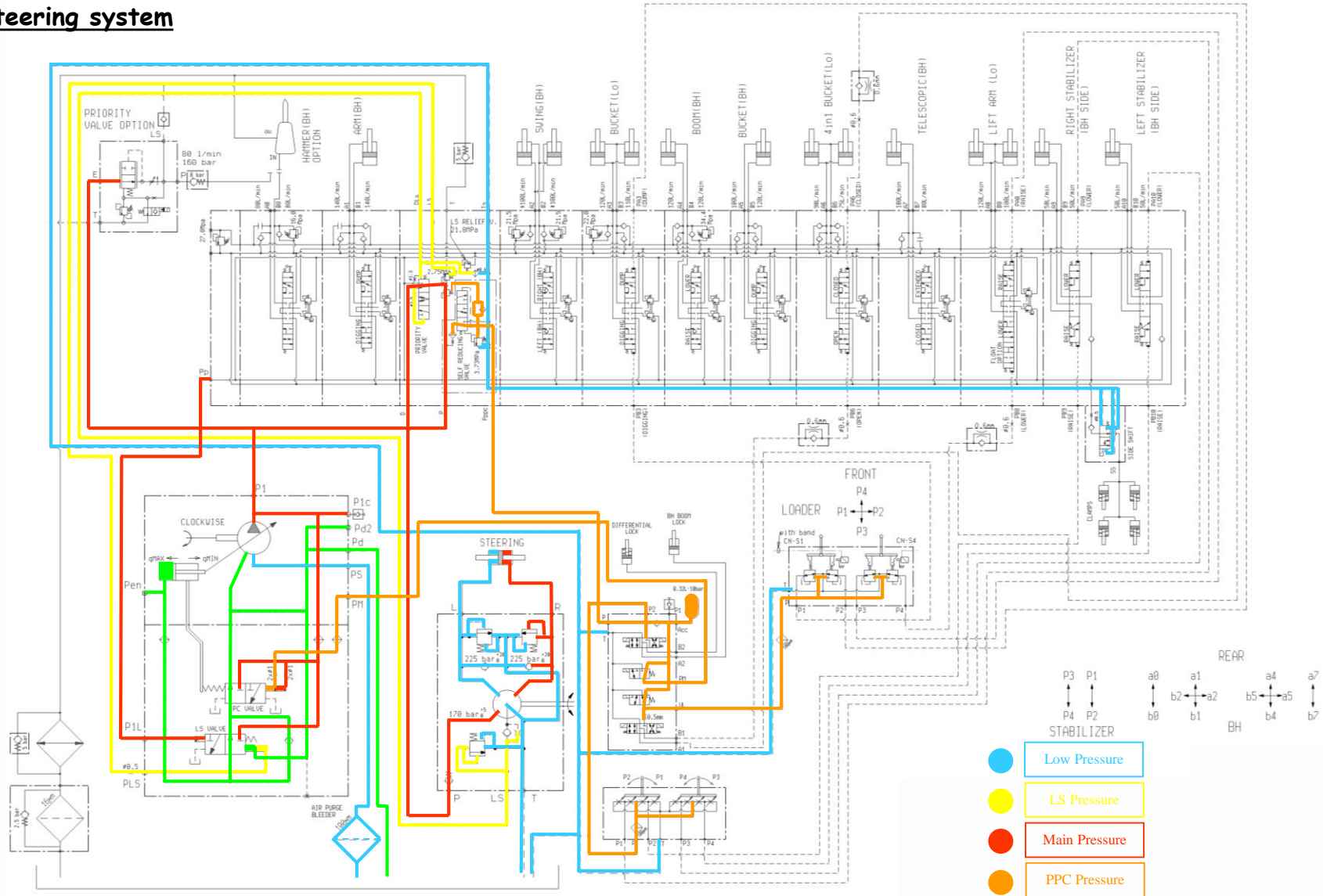
Customer Service Department



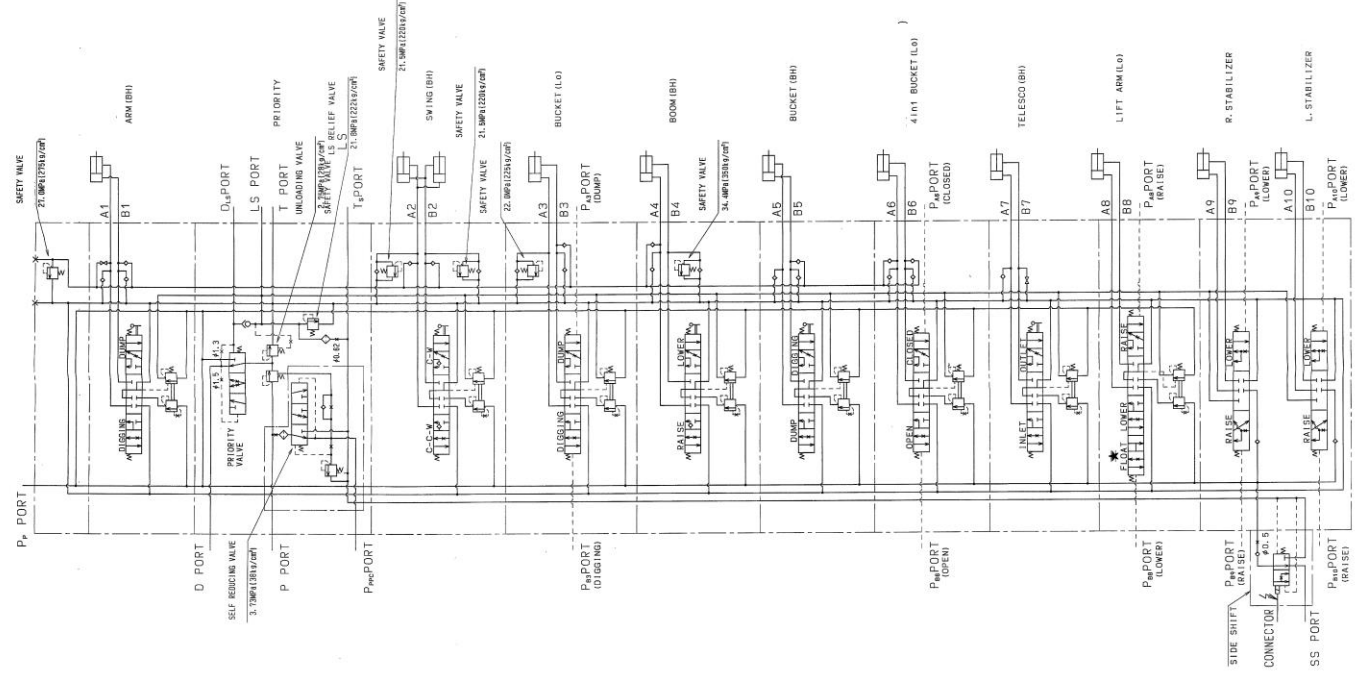
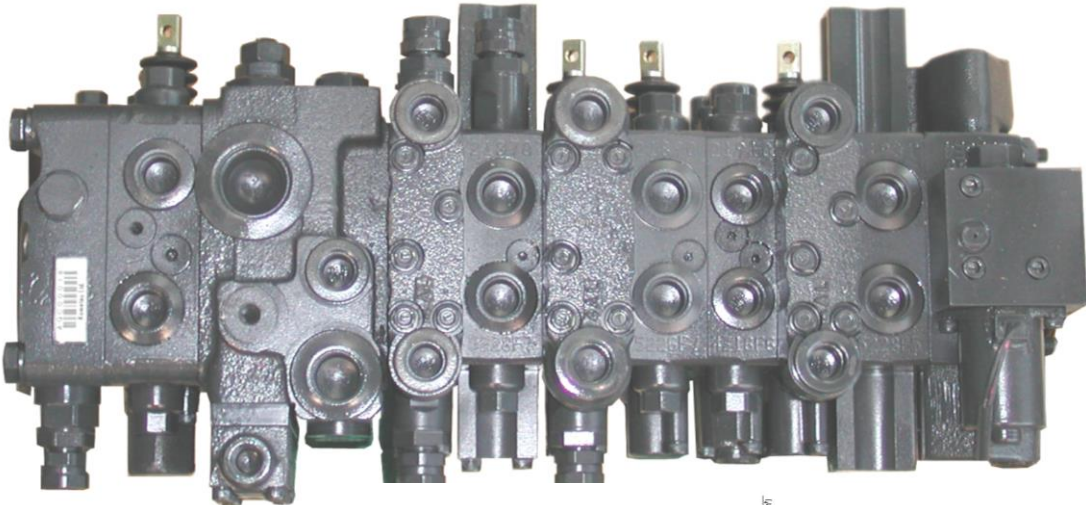
## Bucket movement



## Steering system



# Hydraulic System : Control Valve

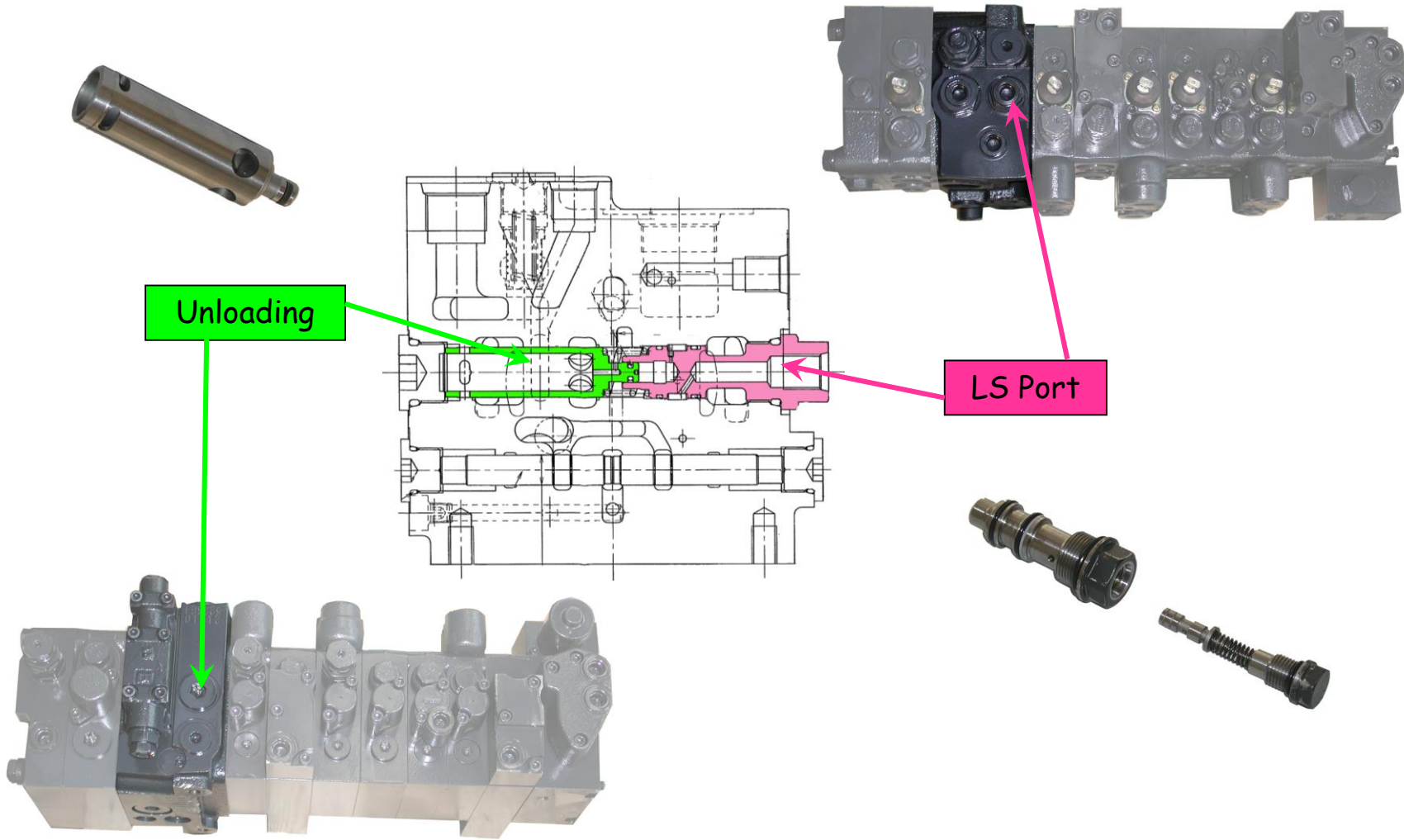


Customer Service Department

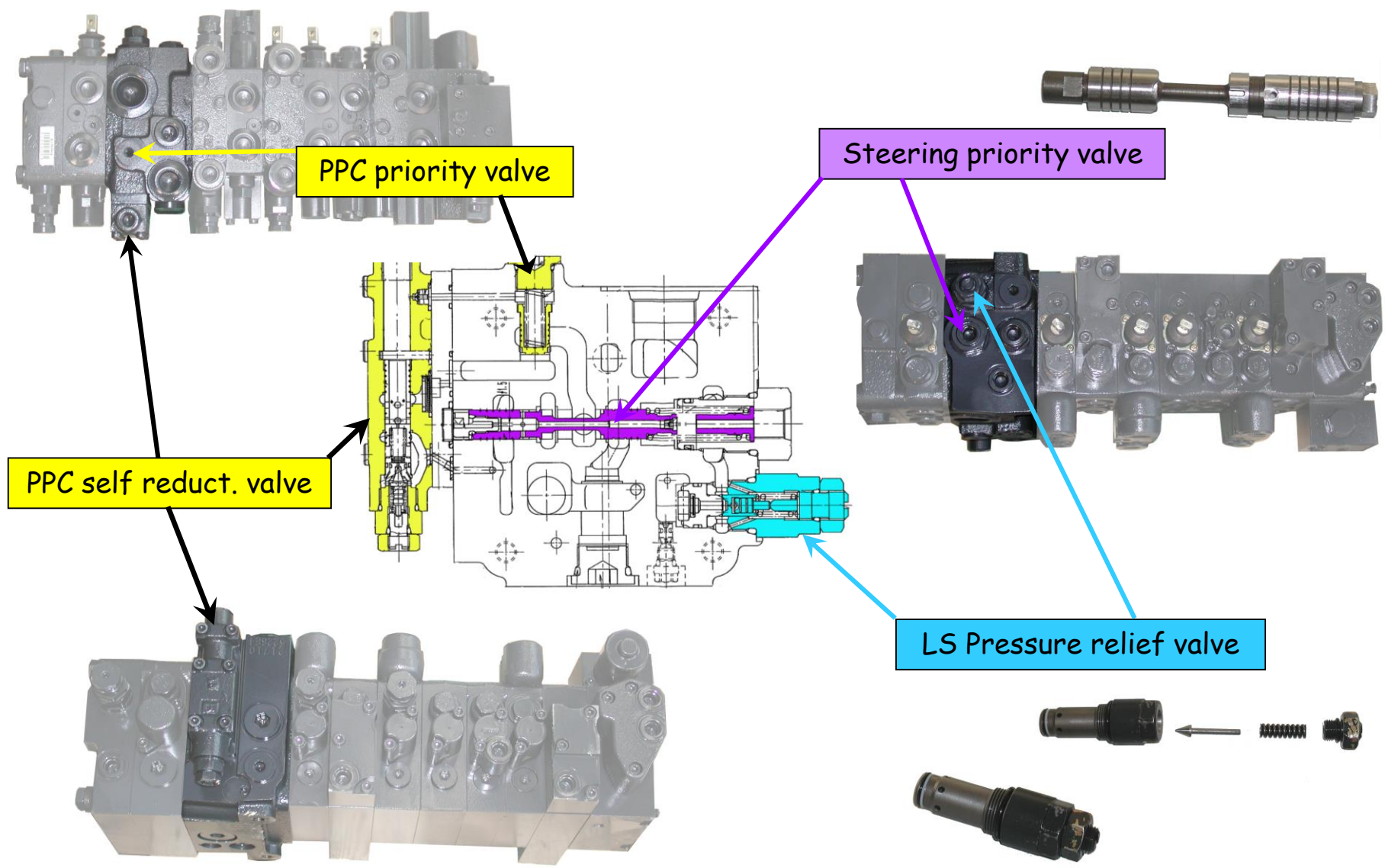




# Hydraulic System : Control Valve



# Hydraulic System : Control Valve



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