SINJIN PRECISION CO., LTD.

Power Steering System

What is a power steering unit?

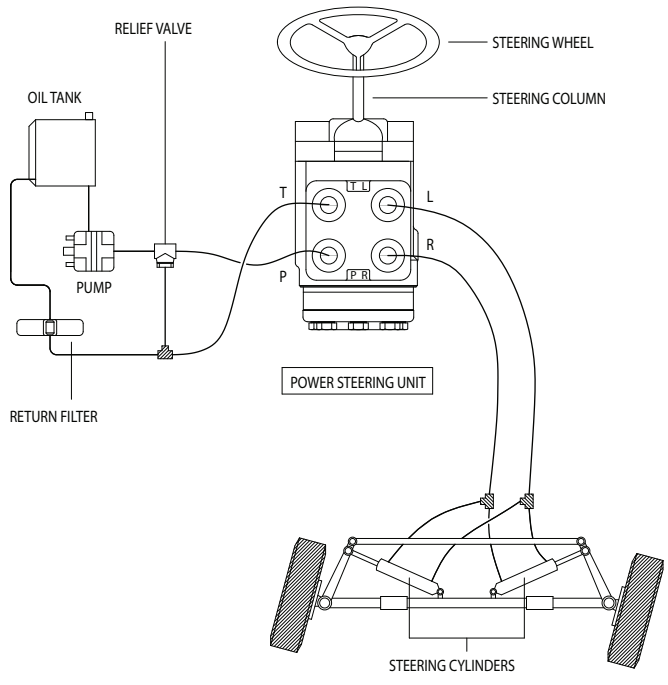
The power steering unit is an essential component for steering of the heavy duty vehicles, which provide higher steering power, reliability, comfort and safety.
The power steering unit is classified as "a hydrostatic steering system". This is not a mechanical connection between a steering column and steered wheels but the connection between a power steering unit and steering cylinders by use of hydraulic hoses and pipes.
By the power steering unit the driver's steering operation controls the directions and pressure of the oil from the pump.
The oil flows into the steering cylinders(left or right) and the same volume goes back to tank. The steering wheel controls the direction and wheels are turned proportionally as steering wheel turns.

The power steering unit is used normally for industrial vehicles, constructional equipments, marine ships, and servo-type systems that are needed to control directions and positions.

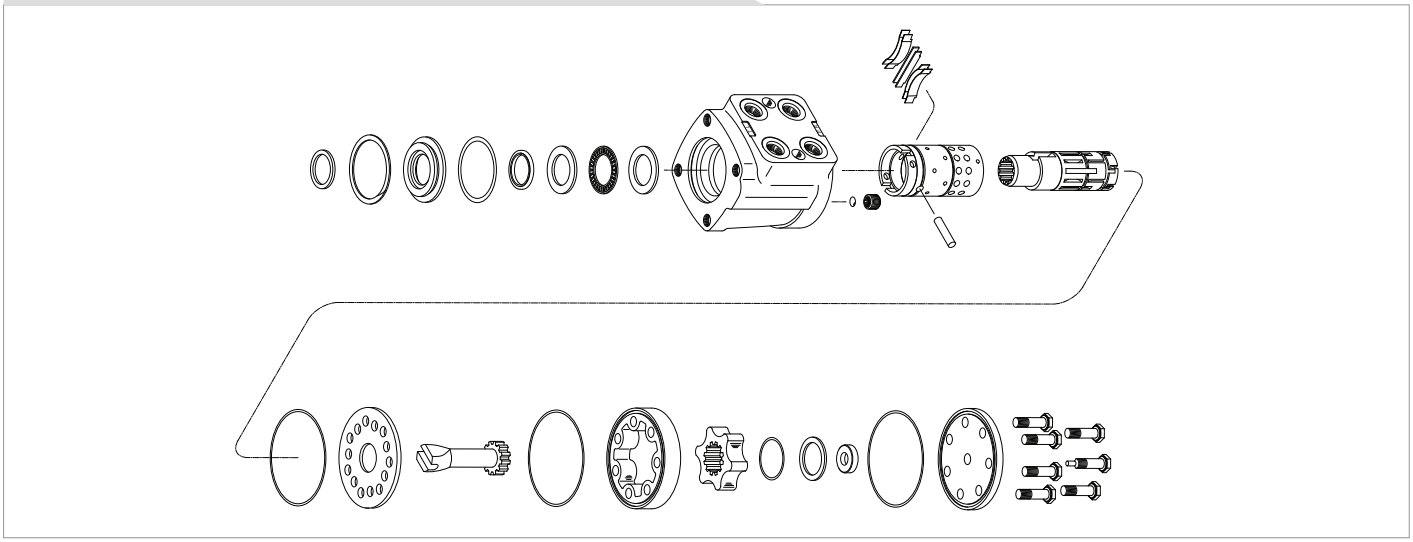
The advantages of the power steering unit

* Minimization of the steering linkage(by replacing the mechanical link with flexible hose)
  - Design flexibility and cost-down
* Preventing the wheels from transferring the load to the steering column
  - Reducing the driver's fatigue
* Low input torque and continuous steering function
  - Oil output directly proportional to the steering speed
* Wide range of choices of gerotor displacement
* Various hydraulic systems available to fit the optimum system design

Typical steering system



Power Steering Unit (Exploded View)



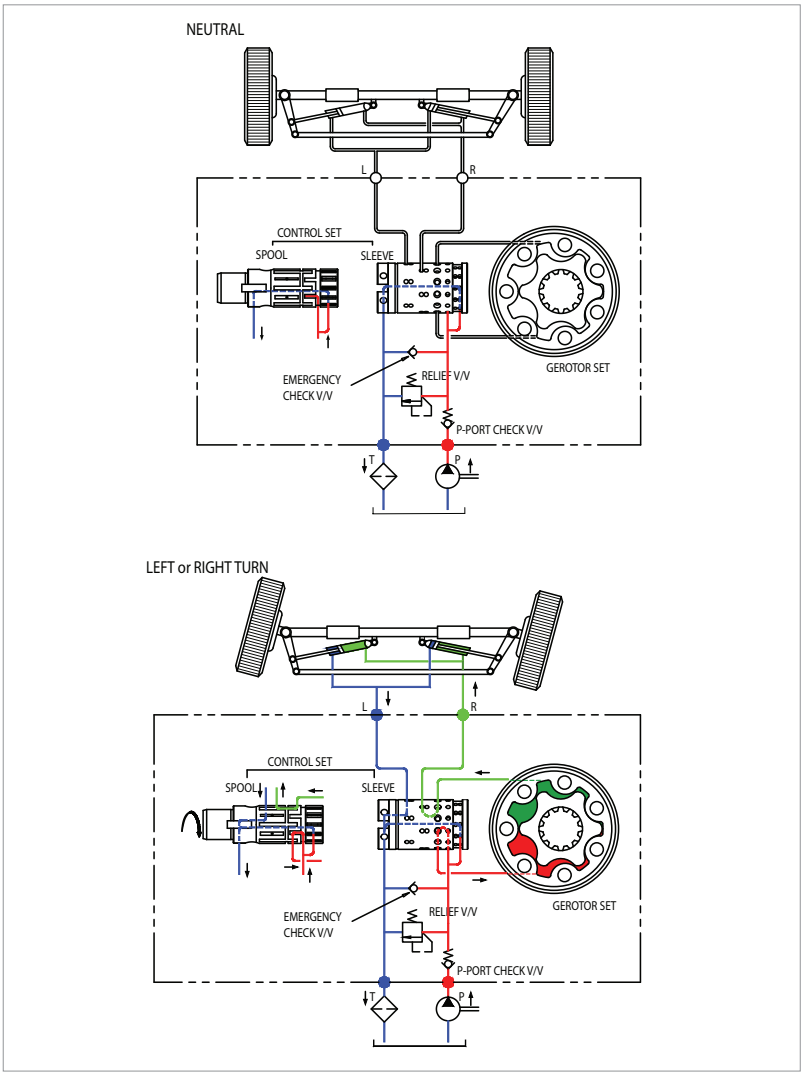
System operational principle (Open Center)

In neutral position of the steering wheel, the oil from the pump passes through the housing, control set, and tank and it does not go into any chamber of the gerotor set, which stays in fixed position.

When the steering wheel is turned, the control set makes flow paths open between the spool and sleeve. This path, consequently, blocks the oil path to tank and opens the path to the chambers of the gerotor set. The pressurized chambers make the inner rotor turn. When the inner rotor turns inside the outer rotor, there are increase and decrease of volume in each chamber. The oil coming from the decreasing chamber controls the angle of the wheel by moving cylinder rod after passing through the control set and housing.

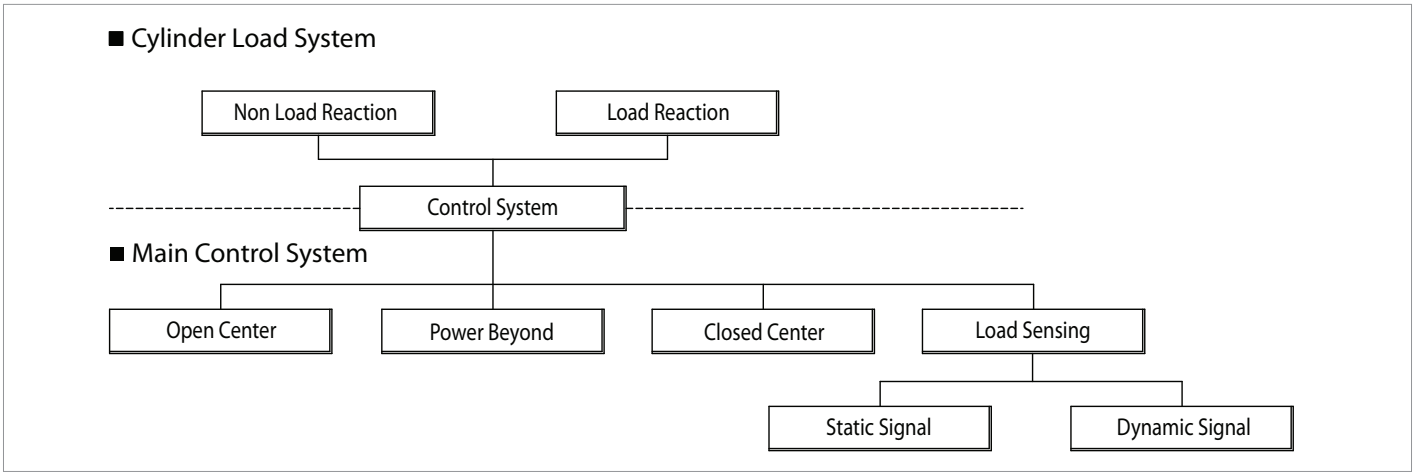
Meanwhile, the oil on the opposite side of the steering cylinder comes out from cylinder and goes to tank through the control set and the return port of the housing.

When the steering wheel stops, the oil supply to gerotor is stopped and the oil from the pump returns to tank as a result of control set's returning to neutral position by means of center spring.



Classification of hydrostatic steering system

Power steering units can be classified according to the transferability of the load from the wheels and the characteristics of the oil path in neutral position as shown below.

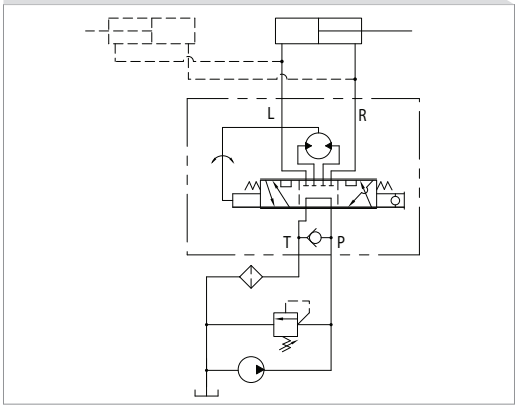


Open center steering system

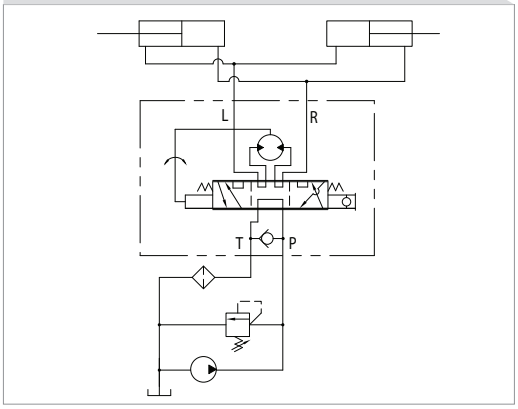
In the open center steering system, the oil from the pump returns to tank in neutral position.

- Quick response to the turning of the steering wheel
- Stable steering even under abrupt change of the steering load and pump oil flow.

Non Load Reaction

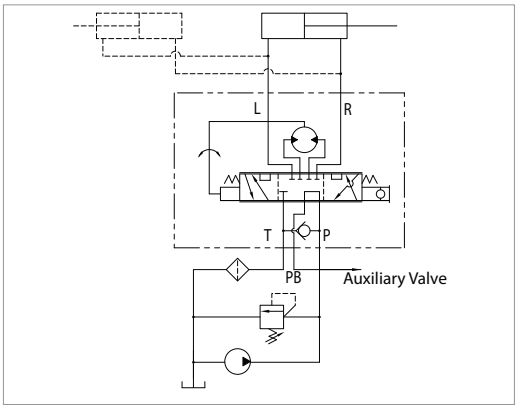


Load Reaction



Power Beyond System

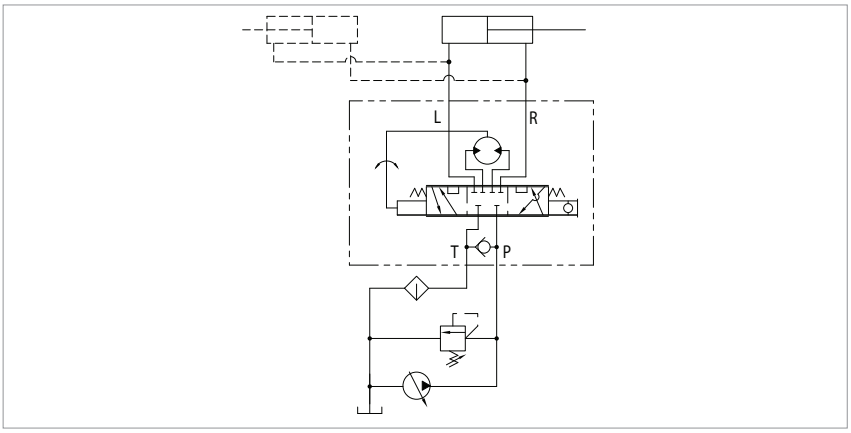
With three ports, it provides additional hydraulic component down stream sufficient flow when the prioritized steering function is not used. The additional device is connected to the exiting EF(Excess Flow) port. Flow used for steering cannot be used for auxiliary function of the additional component.



Closed center steering system

Due to the high pressure resulted from the blocking of the path between P and T in neutral position, a pressure compensation pump is incorporated.

• Quick response to the steering due to high pressure in system



Load sensing steering system

The oil from the pump passes the steering system through the priority valve.

• Additional auxiliary devices as well as the steering unit are usable with one pump.

• When the steering system operated, oil flows primarily to the power steering unit.

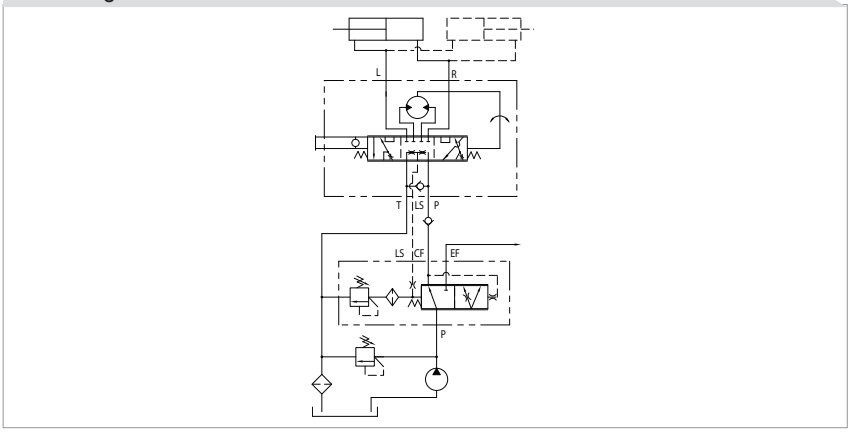
(1) Static system

In neutral position, there is no oil supply to the power steering unit: To minimize energy loss.

• Quick response to the steering through dynamic flow: Lower the temperature difference by oil flow within the system.

• Prevent the control set from sticking to the housing at the initial state.

Static Signal



(2) Dynamic system

Dynamic flow in LS line into the power steering unit at neutral position: 0.6~0.9 l/min

• Prevent the kick back phenomena at the steering end.

Dynamic Signal

