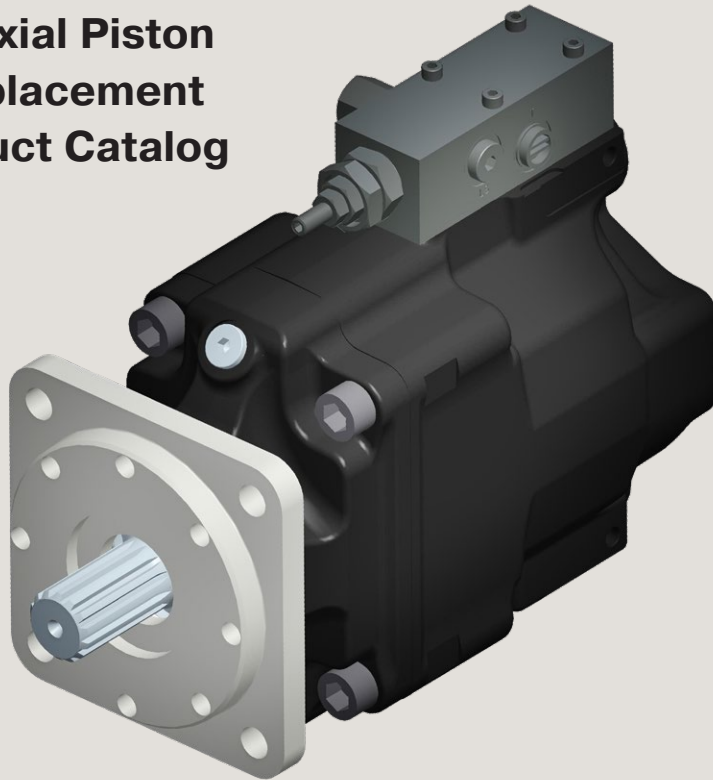


**Vp1 Series Axial Piston  
 Variable Displacement  
 Pumps Product Catalog**



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## VP1 Pump SAE

The VP1 is a variable displacement pump for truck applications. It can be close-coupled to a gearbox PTO (power take-off) or to a coupling independent PTO (e.g. an engine PTO).

An application that makes full use of all the features of the VP1 is truck cranes with a load sensing system. The complex systems of refuse collection vehicles and sewage trucks as well as various combinations of tippers, cranes, snow ploughs, and salt/sand spreaders can also be greatly simplified and optimised with the VP1 pump.

The VP1 provides the hydraulic system with the correct amount of fluid at precisely the right moment, effectively reducing energy consumption and heat generation. This means a smoother and quieter hydraulic system with much reduced impact on the environment.

The VP1 is highly efficient and extremely light. It is reliable, economical and easy to install.

The 3 sizes, VP1-095, -110 and -130 have small installation dimensions.

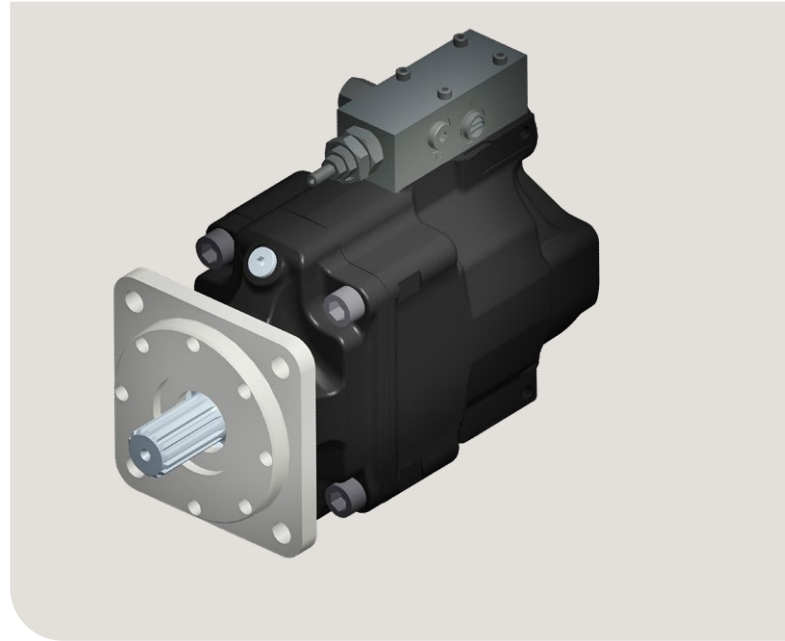
## Design

### Large angle – compact design

The pump design permits a large angle, 20°, between piston and slipper shoe/swashplate, providing compactness and small outer dimensions.

### Long life

The VP1 is designed for trucks with hydraulic load sensing systems. It is sturdy, yet simple, with few moving parts. The result is a reliable pump with long service life.



*The VP1 is suitable for all load sensing systems, regardless of make.*

## Features

- Variable displacement
- Low noise level
- High power-to-weight ratio
- Compact and light
- Highly efficient
- Sturdy design
- Withstands low temperatures

## Retainer plate

The retainer plate (refer to the cut-away illustration in next page) is of a heavy duty design which makes the pump withstand high shaft speeds and fast speed changes. (e.g. engine PTO).

## Specifications

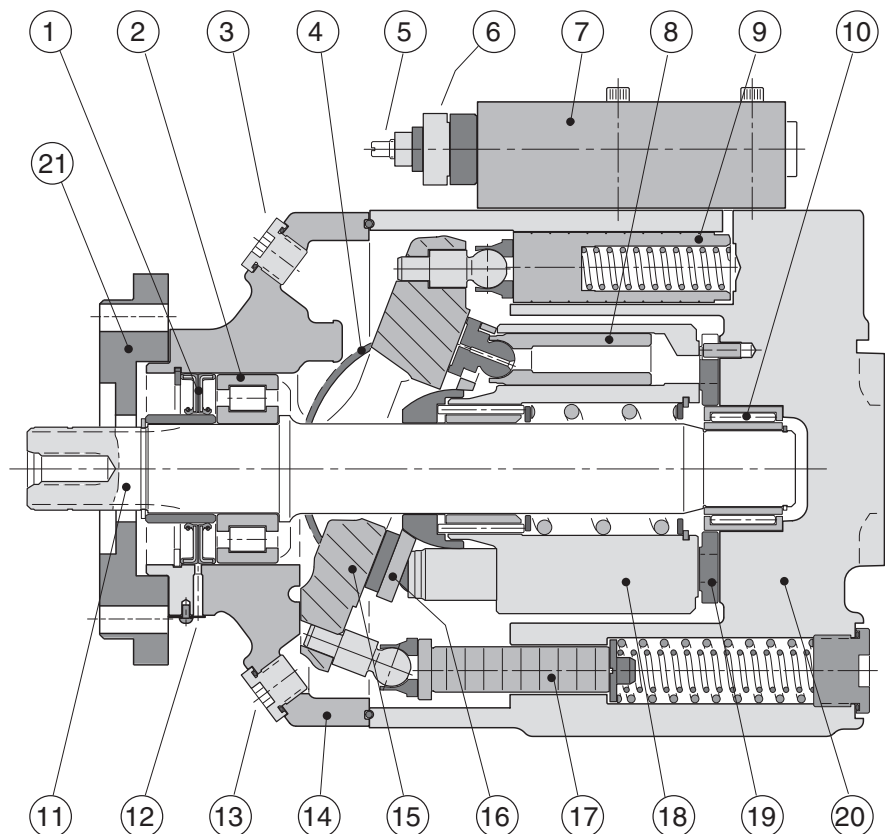
Size VP1 -	095	110	130
<b>Displacement</b> [cm <sup>3</sup> /rev]	95	110	128
[cu in/rev]	5.80	6.71	7.81
<b>Max operating pressure</b>			
continuous [bar]/[psi]	400 / 5800	400 / 5800	350 / 5075
intermittent <sup>1)</sup> [bar]/[psi]	420 / 6090	420 / 6090	370 / 5365
<b>Mass moment of inertia J</b> [kgm <sup>2</sup> ]	0.00681	0.00690	0.00690
<b>Selfpriming speed</b> <sup>2)</sup> [rpm]			
2" suction line, max	1250	1100	900
2 <sup>1</sup> / <sub>2</sub> " suction line, max	1750	1500	1300
3" suction line, max	2200	2100	1900
<b>Min Speed</b> [rpm]	500	500	500
<b>Max Speed unloaded</b> [rpm]			
(in bypass mode, no flow)	3000	3000	3000
<b>Control type</b>	LS		
<b>Shaft end spline</b>	Spline SAE C 14T 12/24 DP		
<b>Mounting flange</b>	SAE C 4 bolt flange		
<b>Weight (with control)</b> [kg]	27		
[lbs]	59.5		

<sup>1)</sup> Max 6 seconds in any one minute.

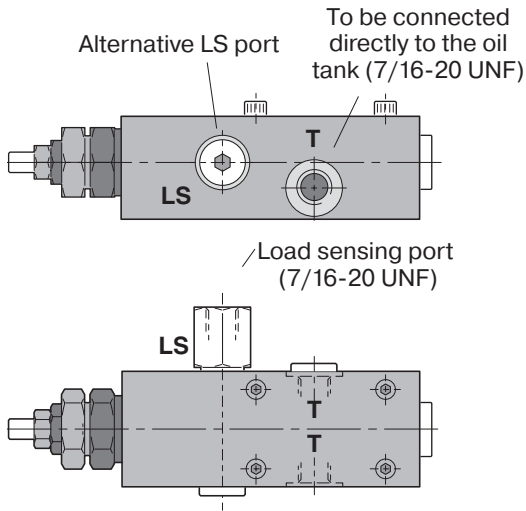
<sup>2)</sup> At an inlet pressure of 1.0 bar (abs.) with mineral oil at a viscosity of 30 mm<sup>2</sup>/s (cSt).

## VP1-095/-110/-130 cross section

1. Shaft seal
2. Roller bearing
3. 'Upper' purge plug
4. Bearing shell
5. Setting screw (pressure relief valve)
6. Setting bushing (standby pressure)
7. Control
8. Piston with piston shoe
9. 'Upper' setting piston (control pressure)
10. Needle bearing
11. Shaft
12. Drain hole, shaft seals
13. 'Lower' purge plug
14. Bearing housing
15. Swash plate
16. Retainer plate
17. 'Lower' setting piston (pump pressure)
18. Cylinder barrel
19. Valve plate
20. Barrel housing
21. SAE C 4 bolt flange

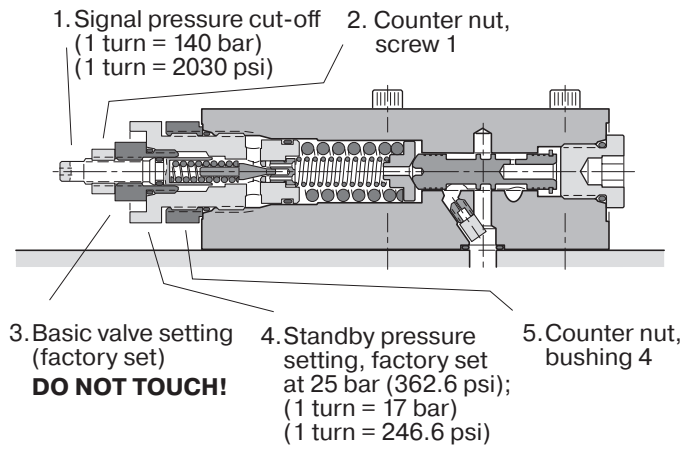


● **LS control** (for VP1-095/- 110/- 130)



LS control ports.

**NOTE:** Always run a function, after adjusting the standby pressure or the max pressure setting, before you read the value.

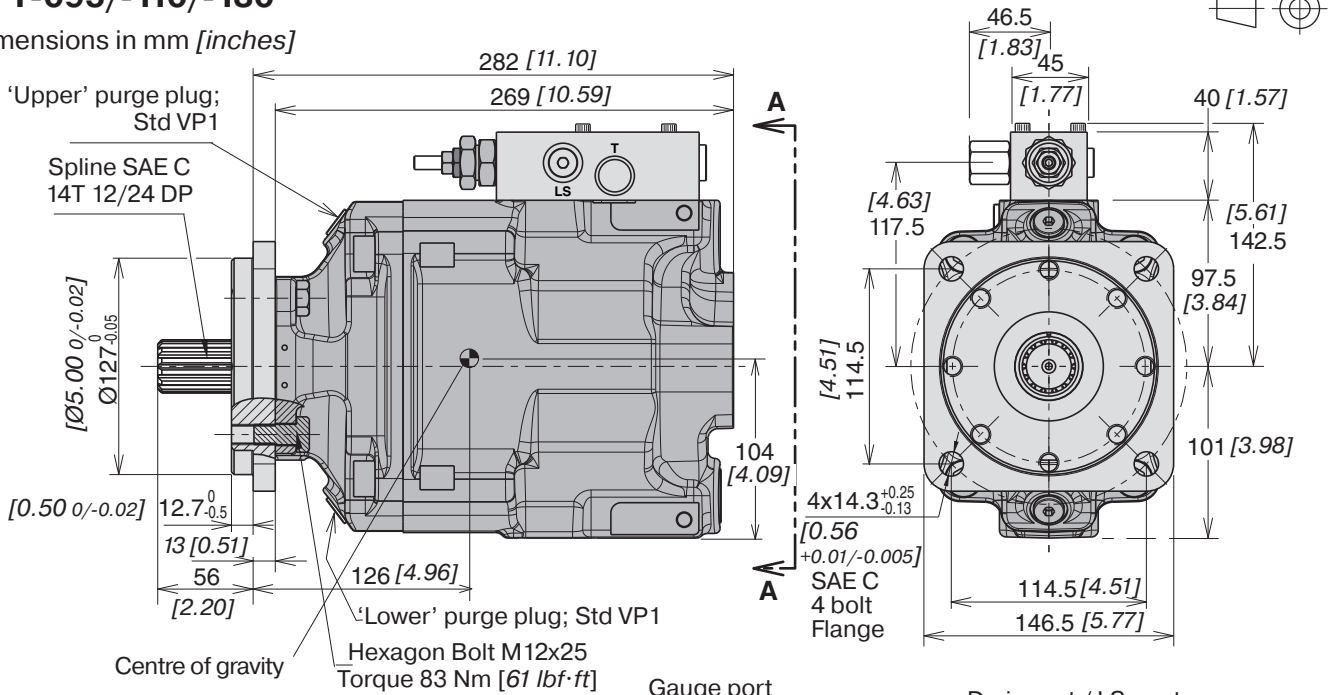


LS control cross section.

Item	Wrench / dimension
1	Hex Head Wrench / 4 mm
2	Wrench / 13 mm
3	<b>DO NOT TOUCH</b>
4	Wrench / 27 mm
5	Wrench / 27 mm

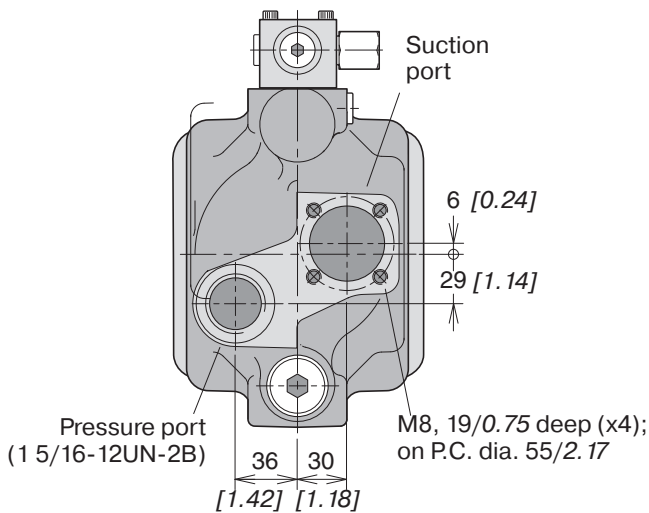
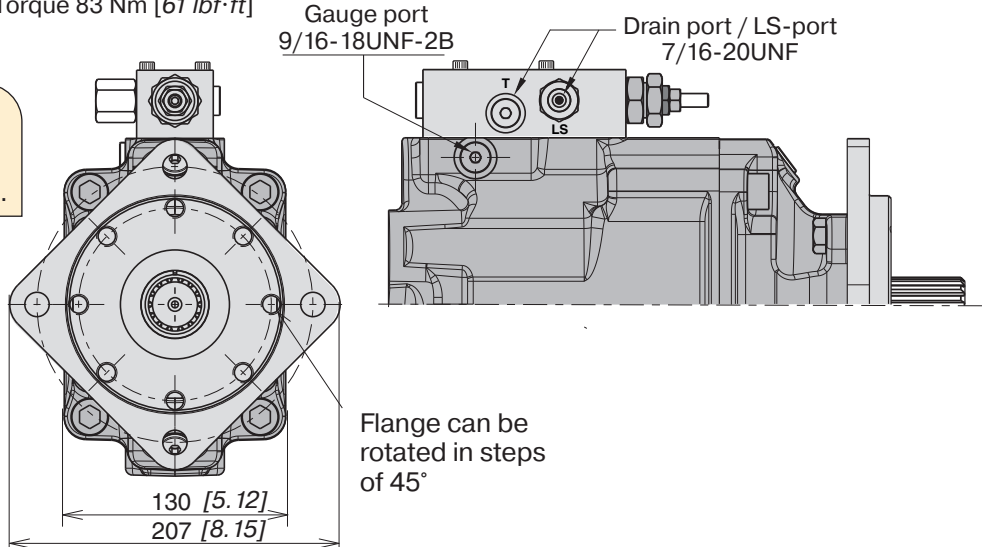
**VP1-095/-110/-130**

Dimensions in mm [inches]

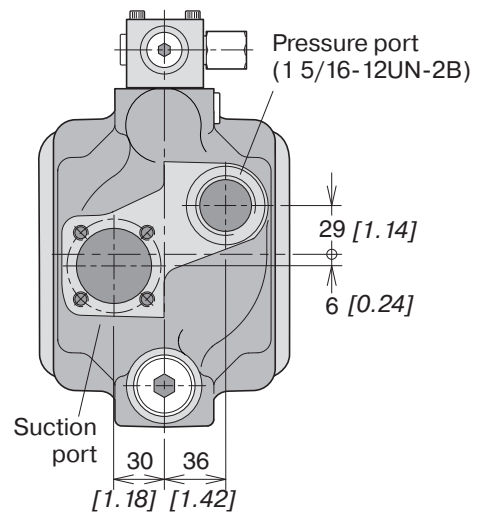


**NOTE:**  
 The pump **does not** include a suction fitting; it must be ordered separately. See page 18.

**IMPORTANT!**  
 The control is **not** drained through the pump case; an external drain line must be installed from control port T and, directly, to the oil tank.



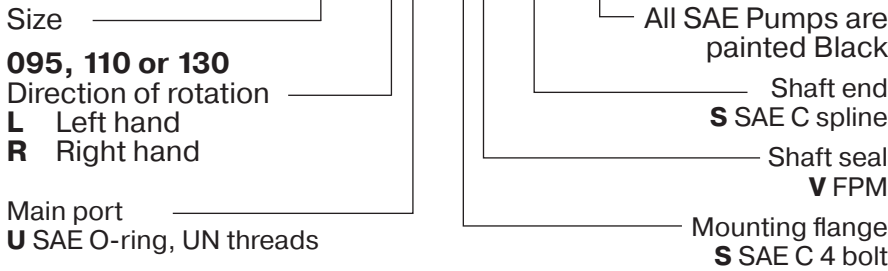
**View A-A**  
**Left hand rotating pump**



**View A-A**  
**Right hand rotating pump**

### Ordering information

Example: **VP1 - 095 - RU - SV - S - 102**



### Standard model numbers

Designation	Ordering no.
VP1-095-RU	378 4095
VP1-095-LU	378 4096
VP1-110-RU	378 4093
VP1-110-LU	378 4094
VP1-130-RU	378 4091
VP1-130-LU	378 4092

**NOTE:** The VP1 is uni-directional. Consequently, the desired direction of rotation must be stated *when ordering*.

### VP1 in load sensing systems

When installed in a load sensing system, the VP1 supplies the correct amount of flow required by the various work functions currently engaged.

This means that energy consumption and heat generation are minimised and much reduced in comparison with a fixed displacement pump used in the same system.

Diagram 1 shows the required power (flow times pressure) in a constant flow system with a fixed displacement pump.

Diagram 2 shows the sharply reduced power requirement in a load sensing system with a variable displacement pump such as the VP1.

In both cases the pump pressure is slightly higher than what is required by the heaviest load ('Load 2') but the VP1, because of the much smaller flow being delivered, needs only the power indicated by the shaded area 'Load power'.

In a constant flow system, on the other hand, excess fluid is shunted to tank and the corresponding power, 'Wasted power' (shown in diagram 1), is a heat loss.

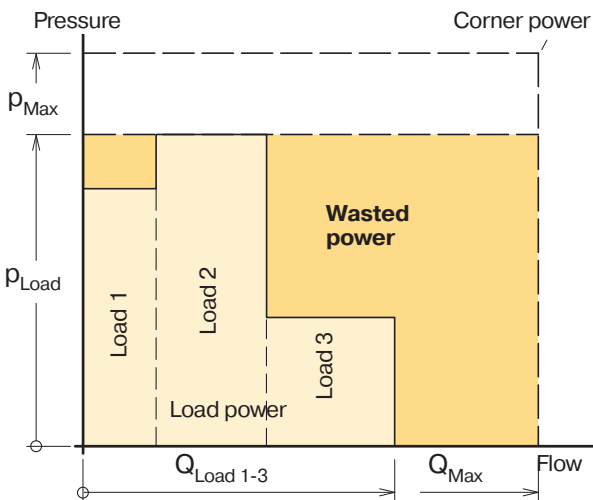


Diagram 1. Constant flow system with a fixed displacement pump.

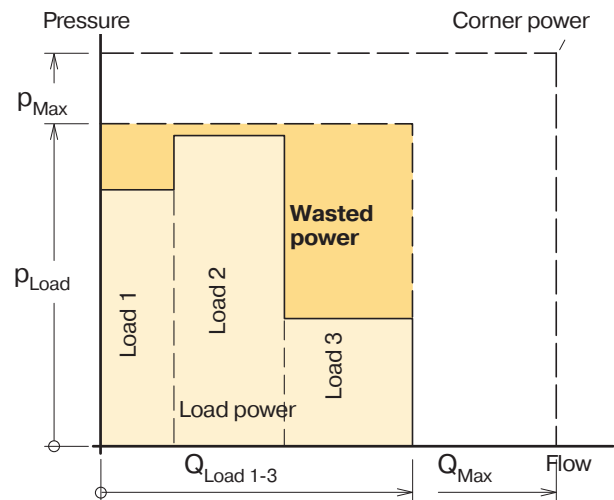


Diagram 2. Constant flow system with a variable displacement pump (e.g. VP1).

### Systems comparison

System	Constant flow	Load-sensing
Pump	Fixed displ.	VP1 variable displ.
Pump adjustments	Pressure only	Pressure and flow
Load *	Some influence	Some influence
Energy consumption	High	Low
Heat generation	High	Low

\* Simultaneous operation of loads with non-equal flows and pressures; refer to the above diagrams.

### LS load sensing control function

Refer to corresponding hydraulic schematic below.  
 A selected 'opening' of the directional control valve spool corresponds to a certain flow to the work function. This flow, in turn, creates a pressure differential over the spool and, consequently, also a  $\Delta p$  between the pump outlet and the LS port.

When the differential pressure decreases (e.g. the directional valve is 'opened' further) the  $\Delta p$  also decreases and the LS valve spool moves to the left. The pressure to the setting pistons then decreases and the pump displacement increases.

The increase in pump displacement stops when the  $\Delta p$  finally reaches the setting (e.g. 25 bar) and the forces acting on the valve spool are equal.

If there is no LS signal pressure (e.g. when the directional valve is in the neutral, no-flow position) the pump only delivers sufficient flow to maintain the standby pressure as determined by the  $\Delta p$  setting.

### LS control adjustments Pressure limiter

Pump size	Factory setting [bar/psi]	Max pressure intermittent [bar/psi]
VP1- 095/110/130	350 / 5075	420 / 6090*

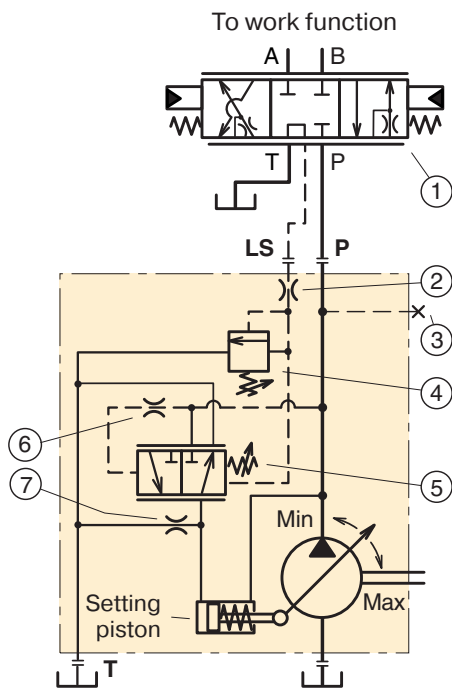
\* **Note:** Max allowed pressure for size VP1-130 is 370 bar

Pump size	Factory setting [bar/psi]	Min pressure [bar/psi]	Max pressure [bar/psi]
VP1- 095/110/130	25 / 363	15 / 218	40 / 580

### LS load sensing valve

The factory setting, and the standard orifice sizes shown in the corresponding schematic below, will usually provide an acceptable directional valve characteristic as well as system stability.

For additional information, contact Parker Hannifin.



1. Directional, load sensing control valve
2. Load signal orifice (1.0 mm)
3. Gauge port
4. Signal pressure limiter adjustment
5. Standby ( $\Delta p$ ) pressure adjustment
6. System pressure dampening orifice (fixed)
7. Bleed-off nozzle (1.2 mm)

Hydraulic schematic for VP1-095/-110/-130