



Truck Hydraulics

Series GPA, GP1, F1, T1, F2, F3, VP1,
Fixed and Variable Displacement Pumps,
Motors and Accessories



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Change History for edition 01.2017

Pages 9, 42-46: New F3 pump incorporated.
Page 52: Ordering no. for Black Painted VP1 pumps
Pages 59-64: BPV for F1, T1 and for F2 changed. New design of Manual override.
Pages 49 and 52: Centre of gravity changed, VP1.
Pages 17, 19-21: New GP1-pump. Page 76: New pump pictures for GPA and GP1
Pages 51, 52 and 67: LS-control with alternative drain port T.
Pages 23 and 40: Mass moment of inertia
Pages 59 and 61: BPV-F1 and BPV-F2

On our website, www.parker.com/pmde,
you can find:
2D & 3D drawings,
Installation Manuals,
Service Manuals,
Spare Parts Lists

Conversion factors

1 kg.....	2.20 lb
1 N.....	0.225 lbf
1 Nm.....	0.738 lbf ft
1 bar	14.5 psi
1 l.....	0.264 US gallon
1 cm ³	0.061 cu in
1 mm.....	0.039 in
$\frac{9}{5} \text{ }^{\circ}\text{C} + 32$	1°F
1 kW	1.34 hp



WARNING – USER RESPONSIBILITY

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VP1 Pump

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) which meets ISO standard 7653-1985.

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 five frame sizes, VP1-045, -075, -095, -110 and -130 have small installation dimensions.



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

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.

Tandem coupling

The through-shaft on VP1-45/-75 permits tandem coupling of an additional pump, such as a series F1 fixed displacement pump.

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.

Features

- Variable displacement
- Low noise level
- High power-to-weight ratio
- Compact and light
- Highly efficient
- Sturdy design
- Withstands low temperatures
- Can be close coupled and tandem mounted.
(tandem coupling only for VP1-45/-75)

Retainer plate

The retainer plate (refer to the cut-away illustration in chapter 9) is of a heavy duty design which makes the pump withstand high shaft speeds and fast speed changes.(e. g. engine PTO).

See page 47

VP1 Pump



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Specifications

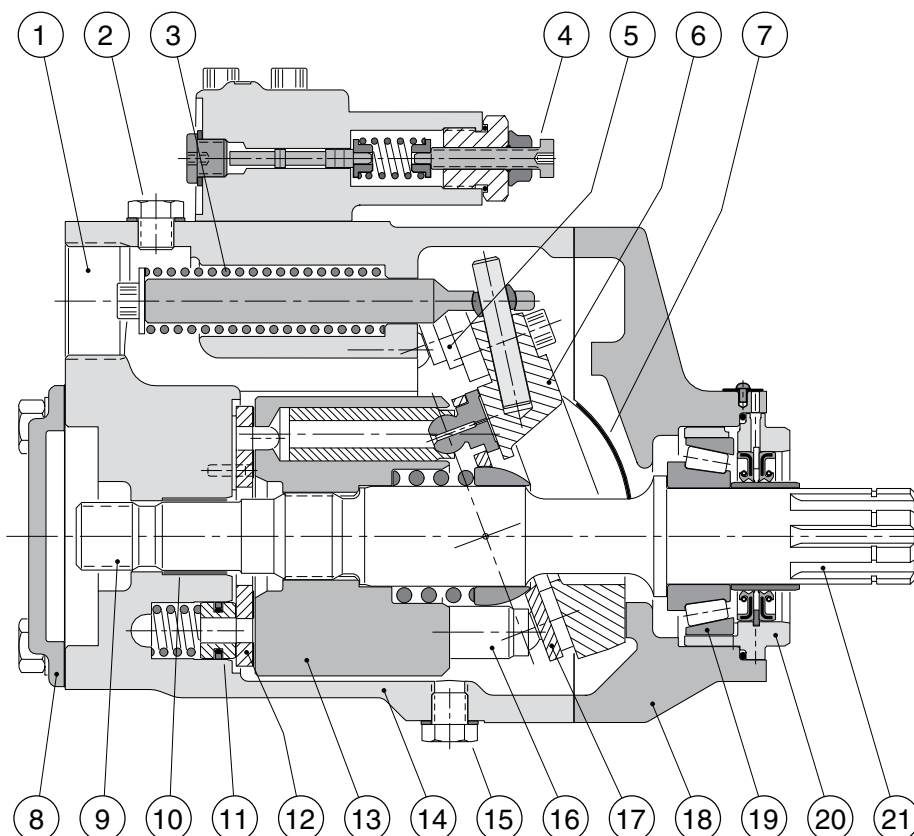
Frame size VP1--	045	075	095	110	130
Displacement [cm ³ /rev]	45	75	95	110	128
Max operating pressure [bar]					
continuous	350	350	400	400	400
intermittent ¹⁾	400	400	420	420	420
Mass moment of inertia J [kgm ²]	0.00606	0.00606	0.00681	0.00690	0.00690
Selfpriming speed ²⁾ [rpm]					
2" suction line, max	2200	1700	1250	1100	900
2 1/2" suction line, max	2400	2100	1750	1500	1300
3" suction line, max	-	-	2200	2100	1900
Max Speed unloaded [rpm]					
(in bypass mode, no flow)	3000	3000	3000	3000	3000
Control type	LS				
Shaft end spline	DIN 5462				
Mounting flange	ISO 7653-1985				
Weight (with control) [kg]	27				

1) Max 6 seconds in any one minute.

2) At an inlet pressure of 1.0 bar (abs.) with mineral oil at a viscosity of 30 mm²/s (cSt).

VP1-045/-075 cross section

1. Inlet port
2. 'Top' purge plug
3. Return spring
4. Control
5. Setting piston (one of two)
6. Swash plate
7. Bearing shell
8. End cover
9. Spline (for mounting an auxiliary pump)
10. Plain bearing
11. Hold-down plunger
12. Valve plate
13. Cylinder barrel
14. Barrel housing
15. 'Bottom' purge plug
16. Piston with piston shoe
17. Retainer plate
18. Bearing housing
19. Roller bearing
20. Shaft seals with carrier
21. Input shaft



LS valve block VP1-045/075

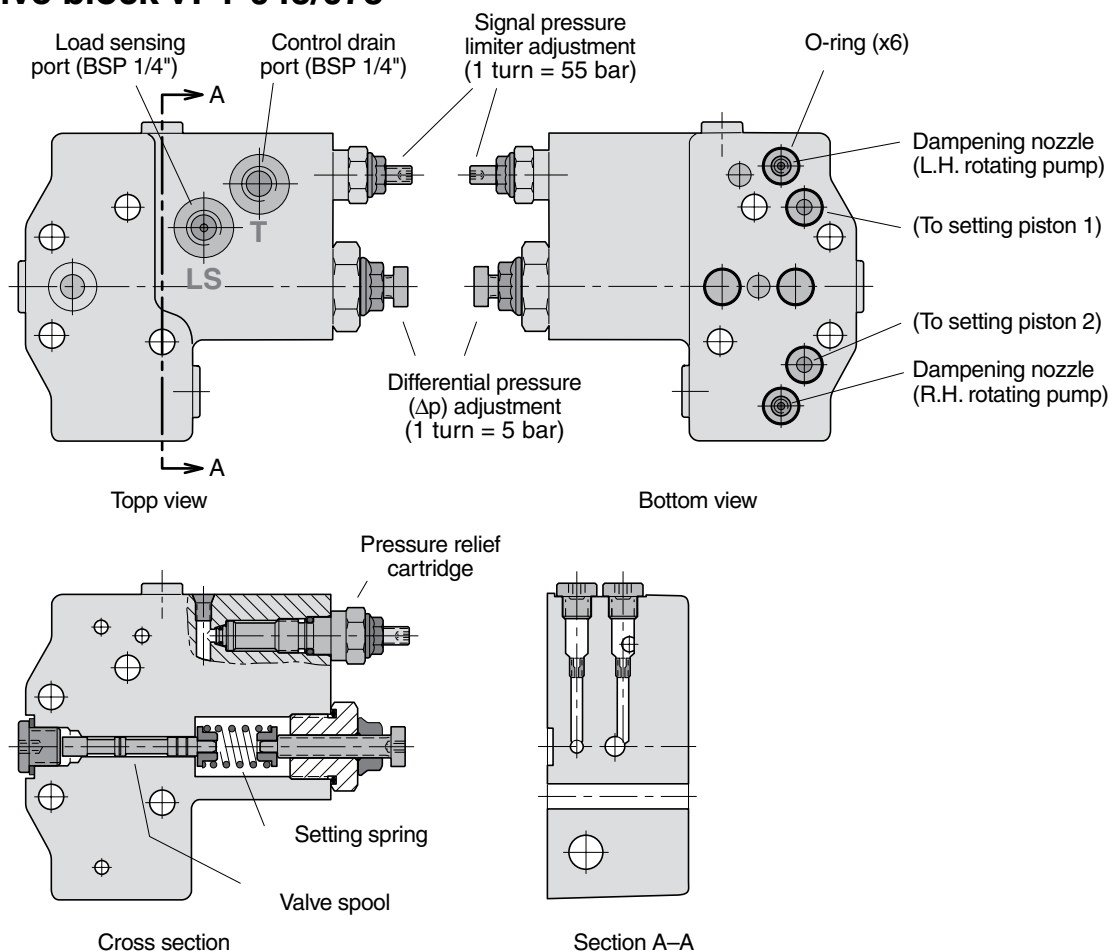


Fig. 2. LS valve block.

Through-shaft coupling VP1-045/075

The VP1 pump has a through-shaft which means that an additional pump, such as a fixed displacement F1, can be installed in tandem with the VP1 by means of an adaptor kit (fig. 3).

NOTE: The bending moment caused by the weight of a tandem assembly normally exceeds that allowed by the PTO.

To prevent damage, the auxiliary pump should be supported by a bracket attached to the gearbox; it *must not* be fastened to the truck chassis.

Likewise, when the tandem assembly is installed on a separate bracket and driven by a cardan shaft, the auxiliary pump should have a support attached to the pump bracket.

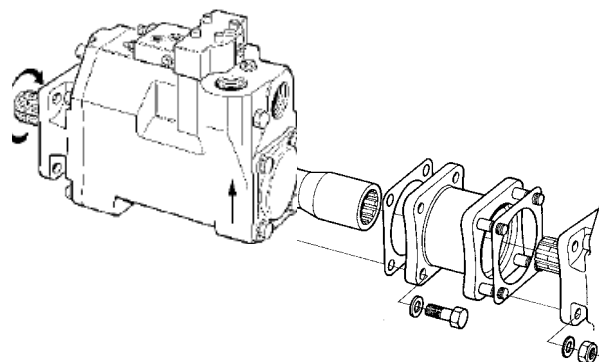


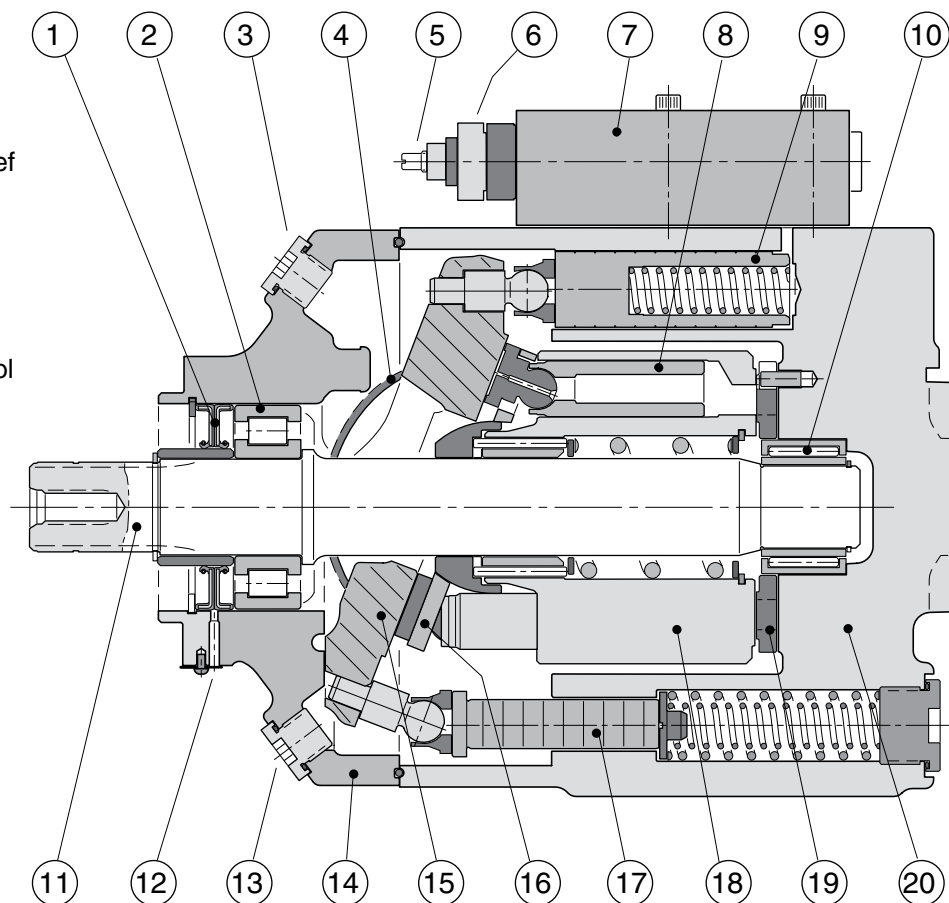
Fig. 3. Adaptor kit (P/N 379 7795) for tandem coupling.

IMPORTANT

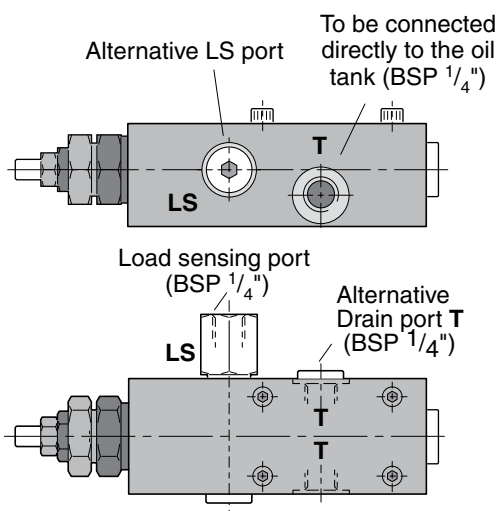
Contact Parker Hannifin for additional information when considering tandem mounting a second VP1 pump.
 The maximum torque that can be transmitted through the first pump VP1-045/75 in tandem is 420 Nm.

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

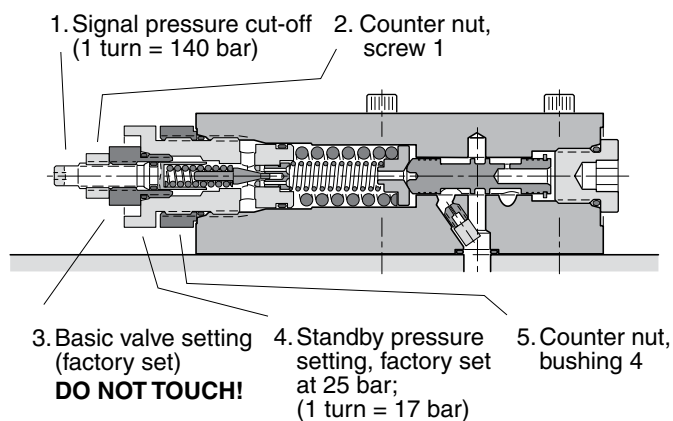


LS control (for VP1-095/-110/-130)



LS control ports.

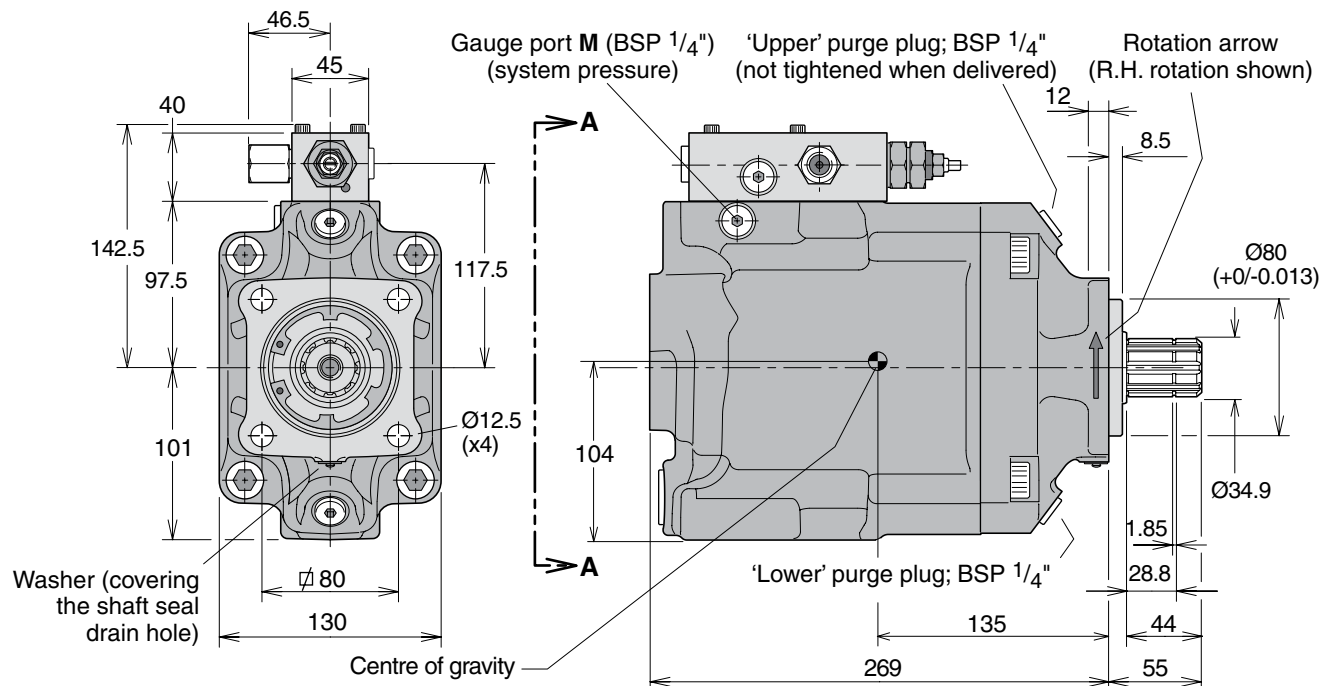
NOTE: Always run a function, after adjusting the standby pressure or the max pressure setting, before you read the value.



LS control cross section.

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

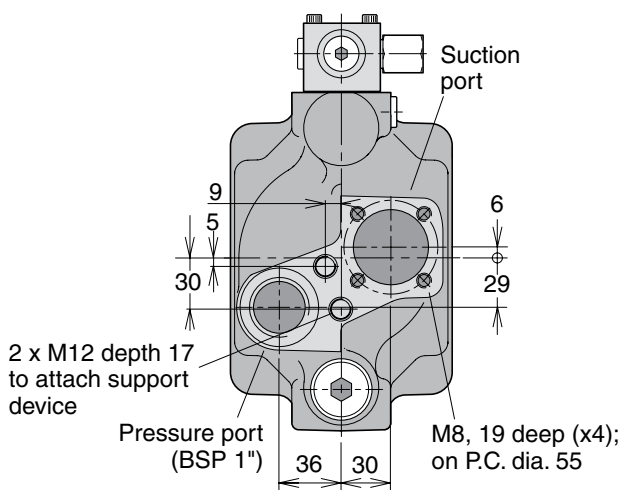
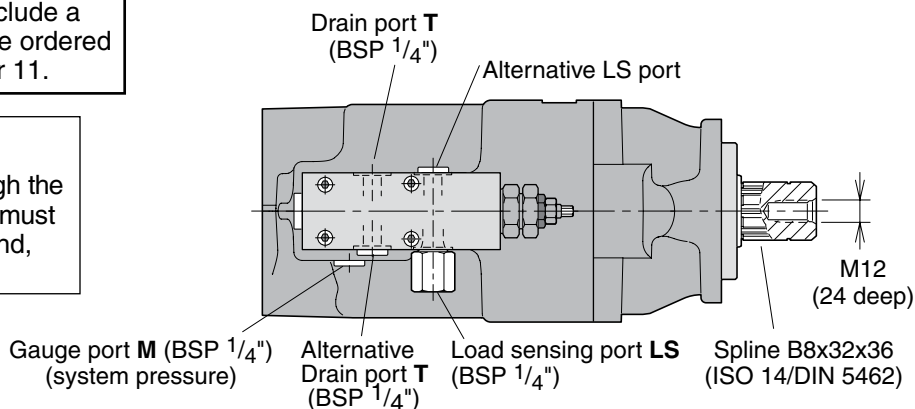
VP1-095/-110/-130



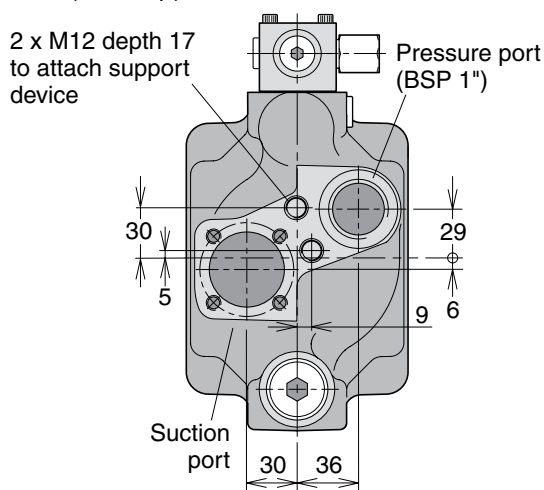
NOTE: The pump **does not** include a suction fitting; it must be ordered separately. See chapter 11.

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 - 045 - L**

Frame size 045, 075, 095, 110 or 130

045, 075, 095, 110 or 130

Direction of rotation L Left hand
R Right hand

L Left hand
R Right hand

NOTE:

The VP1 is uni-directional.

Consequently, the desired direction of rotation must be stated *when ordering*.

Standard model numbers

Designation	Ordering no. No Paint	Ordering no. Black Paint
VP1-045-R	378 0334	378 6169
VP1-045-L	378 0335	378 6170
VP1-075-R	378 0336	378 6171
VP1-075-L	378 0337	378 6172
VP1-095-R	378 6000	378 6003
VP1-095-L	378 6001	378 6002
VP1-110-R	378 4110	378 3814
VP1-110-L	378 4111	378 3815
VP1-130-R	378 4500	378 4507
VP1-130-L	378 4501	378 4508

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.

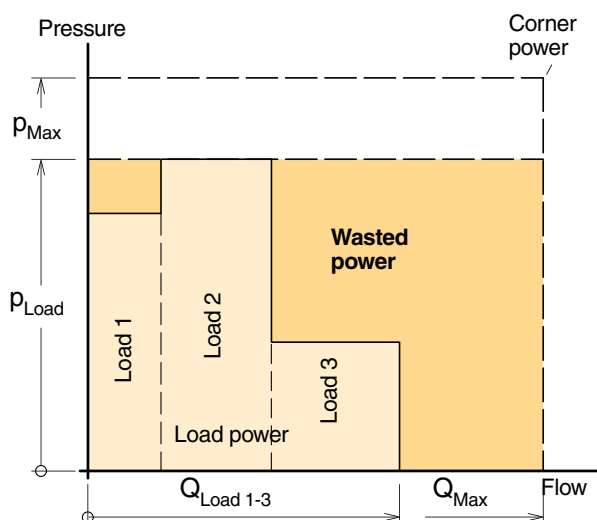


Diagram 1. Constant flow system with a fixed displacement pump.

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.

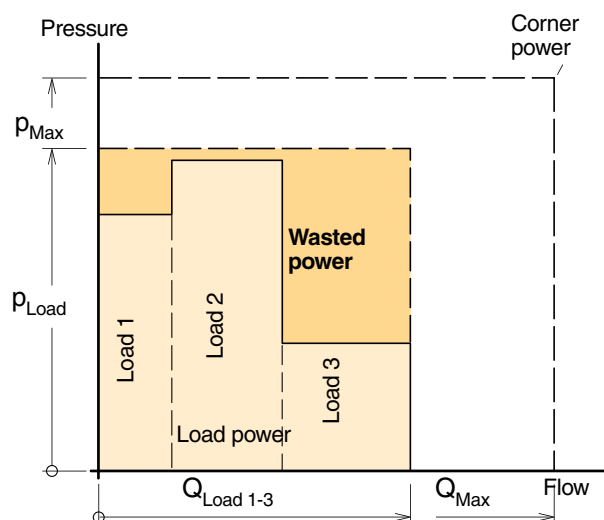


Diagram 2. Constant flow system with a variable displacement pump (e.g. VP1).

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 Δp between the pump outlet and the LS port.

When the differential pressure decreases (e.g. the directional valve is 'opened' further) the Δp 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 Δp 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 Δp setting.

LS control adjustments

Pressure limiter

Pump size	Factory setting [bar]	Max pressure intermittent [bar]
VP1-045/075	350	400
VP1- 095/110/130	350	420

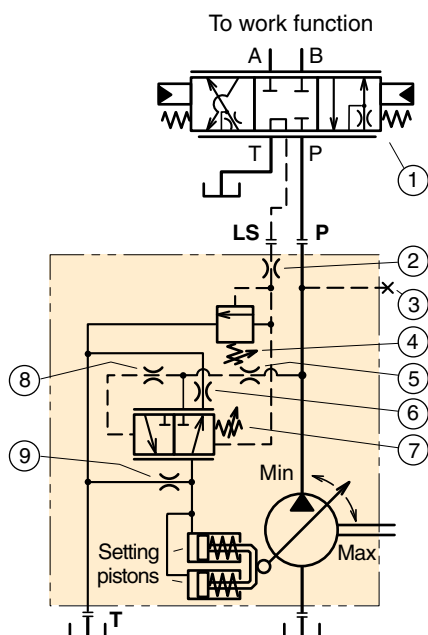
LS load sensing valve

Pump size	Factory setting [bar]	Min pressure [bar]	Max pressure [bar]
VP1-045/075	25	20	35
VP1- 095/110/130	25	15	40

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.

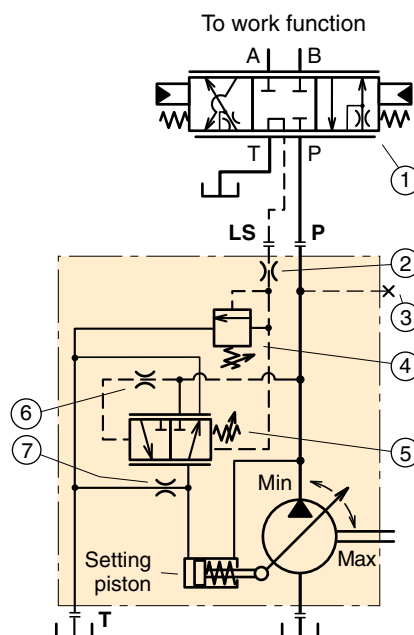
For additional information, contact Parker Hannifin.

Hydraulic schematic for VP1-45/75



1. Directional, load sensing control valve
2. Load signal orifice (1.0 mm; fixed)
3. Gauge port
4. Signal pressure limiter adjustment
5. System pressure dampening nozzle (2.0 mm)
6. Return line nozzle (0.6 mm)
7. Standby (Δp) pressure adjustment
8. System pressure dampening orifice (fixed)
9. Bleed-off nozzle (0.6 mm).

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



1. Directional, load sensing control valve
2. Load signal orifice (0.8 mm)
3. Gauge port
4. Signal pressure limiter adjustment
5. Standby (Δp) pressure adjustment
6. System pressure dampening orifice (fixed)
7. Bleed-off nozzle (1.2 mm)