

## F1 Pump ISO

Series F1 is a further development of our well known 'truck pump', the F1. The F1 offers many additional values for operators of cargo cranes, hook loaders, skip loaders, forest cranes, concrete mixers and similar truck applications.

Series F1 is a very efficient and straight forward pump design with unsurpassed reliability.

Its small envelope size gives a simple and inexpensive installation.

### Features of the F1 are:

- High selfpriming speeds
- Operating pressures up to 400 bar
- High overall efficiency
- Low noise level
- Small installation dimensions
- Low weight

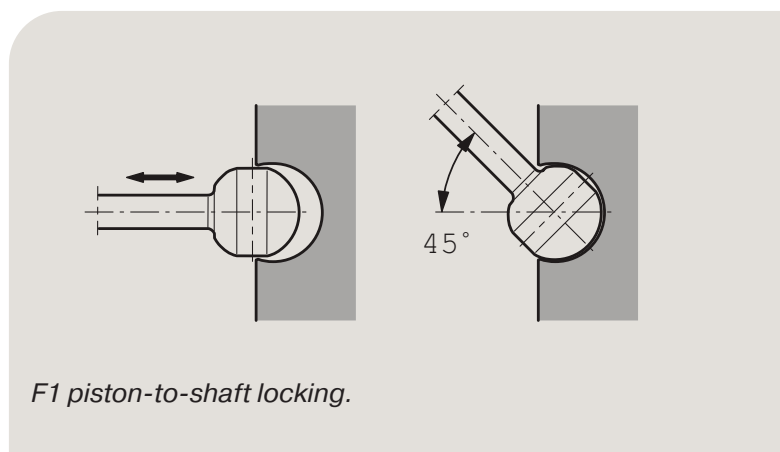
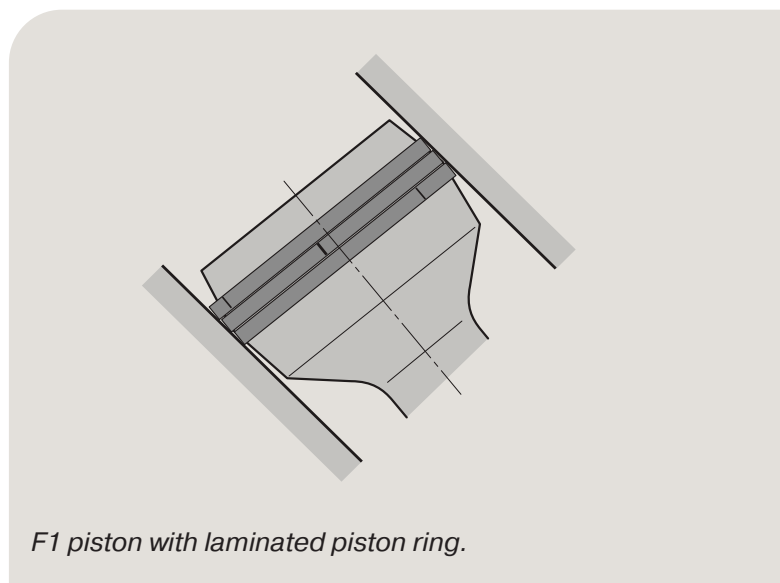
### ... thanks to:

- 45° bent-axis angle
- Optimal inlet port geometry in the end cap
- Single housing design
- Spherical pistons – high speeds
- Laminated piston rings – low leakage
- Positive synchronisation with timing gear
- Installation above the reservoir level possible
- Tolerates low temperatures and high temperature shocks
- Shaft end and mounting flange meet the ISO standard for all sizes

See page 23



Find more information on the F1 product page.



## F1 Pump SAE

### Features:

- Laminated piston rings – low leakage
- Positive synchronisation with timing gear
- Operating pressure up to 350 bar
- Installation above the reservoir level possible
- Tolerates low temperatures and high temperature shocks
- Shaft end and mounting flange meet the standard SAE-B
- 4 sizes -25 / -41 / -51 / -61 cm<sup>3</sup>/rev

See page 31



Find more information on the F1 pump product page.



## F1 Motor ISO

### Features:

- Laminated piston rings – low leakage
- Positive synchronisation with timing gear
- Operating pressure up to 250 bar
- Tolerates low temperatures and high temperature shocks
- Shaft end and mounting flange meet the ISO standard for all sizes
- Tolerates high acceleration

See page 38



Find more information on the F1 motor product page.



## F2 Twin-flow Pump

Series F2 is a further development of the twin-flow version of series F1, the very first bent-axis truck pump on the market to feature two entirely independent flows.

With a suitable build-up of the hydraulic system, the main advantage with a twin-flow pump is that three different flows can be provided at the same engine speed.

The twin-flow pump makes it possible to further optimise the hydraulic system and offers:

- Less energy consumption
- Reduced risk of system overheating
- Lower weight
- Easier installation
- Standardised system solutions

The twin-flow pump makes it possible to operate two work functions that are independent of each other which leads to higher speed and an increased operating precision.

Another requirement can be a large and a small flow, or two equal flows. All of these alternatives are possible with the twin-flow pump.

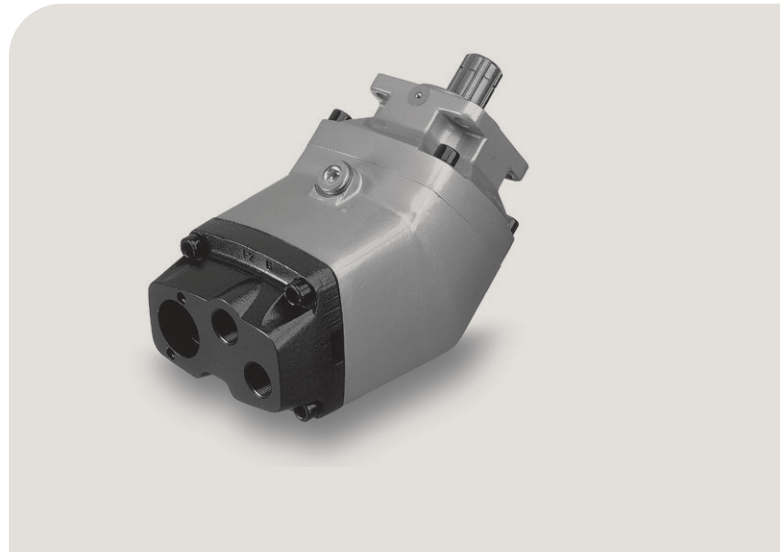
The pump can be utilised to provide one flow at high system pressure, and, as soon as the pressure has decreased sufficiently, add the flow from the other circuit.

This eliminates the risk of exceeding the PTO power rating and, at the same time, provide an optimal driving function.

See page 40



Find more information on the F2 product page.



### Typical twin-flow applications

- Large truck loaders
- Forestry cranes
- Hook loaders/lift dumpers
- Tipper/crane combinations
- Refuse collecting vehicles

The pump shaft end/mounting flange meets the ISO standard and suits PTO direct mounting.

## 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 6 frame sizes, VP1-045, -060 -075, -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.

### Tandem coupling

The through-shaft on VP1-045/-060/-075 permits tandem coupling of an additional pump, such as a series F1 fixed displacement pump.

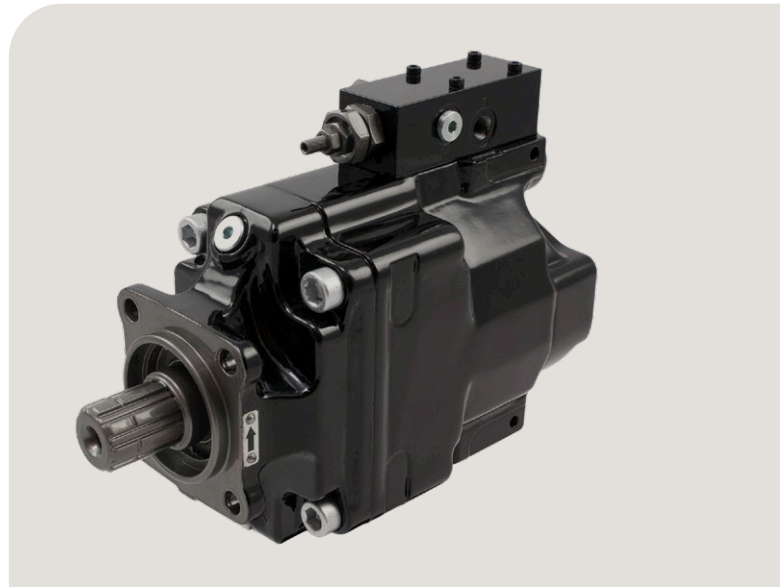
### Long life

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.

See page 54



Find more information on the VP1 product page.



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
- Can be close coupled and tandem mounted.  
(tandem coupling only for VP1-045/-060/-075)

## Retainer plate

The retainer plate (refer to the cut-away illustration pages 47 ff.) is of a heavy duty design which makes the pump withstand high shaft speeds and fast speed changes. (e.g. engine PTO).

**F1 Pump**  
**F1-ISO**



<b>Contents.....</b>	<b>Page</b>
Pump and Line selection.....	13
F1-25 to -101, ISO.....	24
Specifications and pump cross section .....	24
Installation Dimensions, F1-25, to -61 .....	25
Ordering code and standard versions .....	25
Installation Dimensions F1-81 and -101 .....	26
Port size and standard versions .....	26
F1-12 ISO with BSP port treads .....	27
Specifications and pump cross section .....	27
Installation Dimensions, F1-12 with BSP port treads.....	28
Ordering code and standard versions .....	28
Installation Dimensions, F1-25 to -101 with BSP port treads.....	29
Ordering code, port size and standard versions.....	29
Suction fittings.....	63
Installation and start up.....	80

**F1-25 to -101, ISO**

**Specifications**

Frame size F1-	25	41	51	61	81	101
<b>Displacement</b> [cm <sup>3</sup> /rev]	25.6	40.9	51.1	59.5	81.6	102.9
<b>Max flow</b> <sup>1)</sup> [l/min]	78	104	125	143	180	216
<b>Max operating pressure</b> [bar]	400	400	400	400	400	400
<b>Mass moment of inertia J</b> [kgm <sup>2</sup> ]	0.00274	0.00266	0.00261	0.00257	0.00532	0.00524
<b>Shaft speed</b> [rpm]						
- short circuited pump (low press.)	3100	2700	2700	2700	2300	2300
- max selfpriming speed <sup>2)</sup>	3050	2550	2450	2400	2200	2100
<b>Torque</b> <sup>1)</sup> [Nm]	163	260	324	378	518	653
<b>Max Input power</b> <sup>3)</sup> [kW]	45	61	73	83	105	126
<b>Weight</b> [kg]	8.5	8.5	8.5	8.5	12.3	12.1

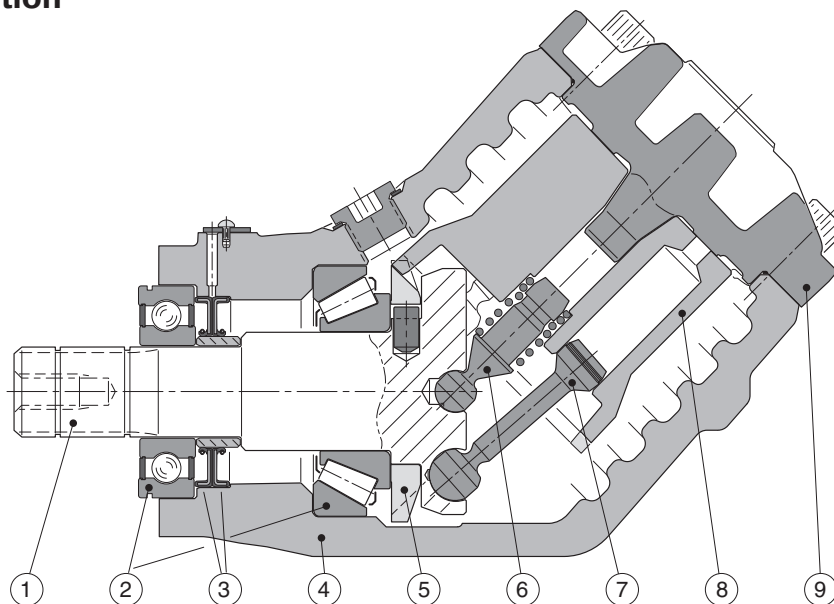
1) Theoretical values

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

3) Max 6 seconds in any one minute.

**NOTE:** For noise level information, contact Parker Hannifin

**Pump cross section**

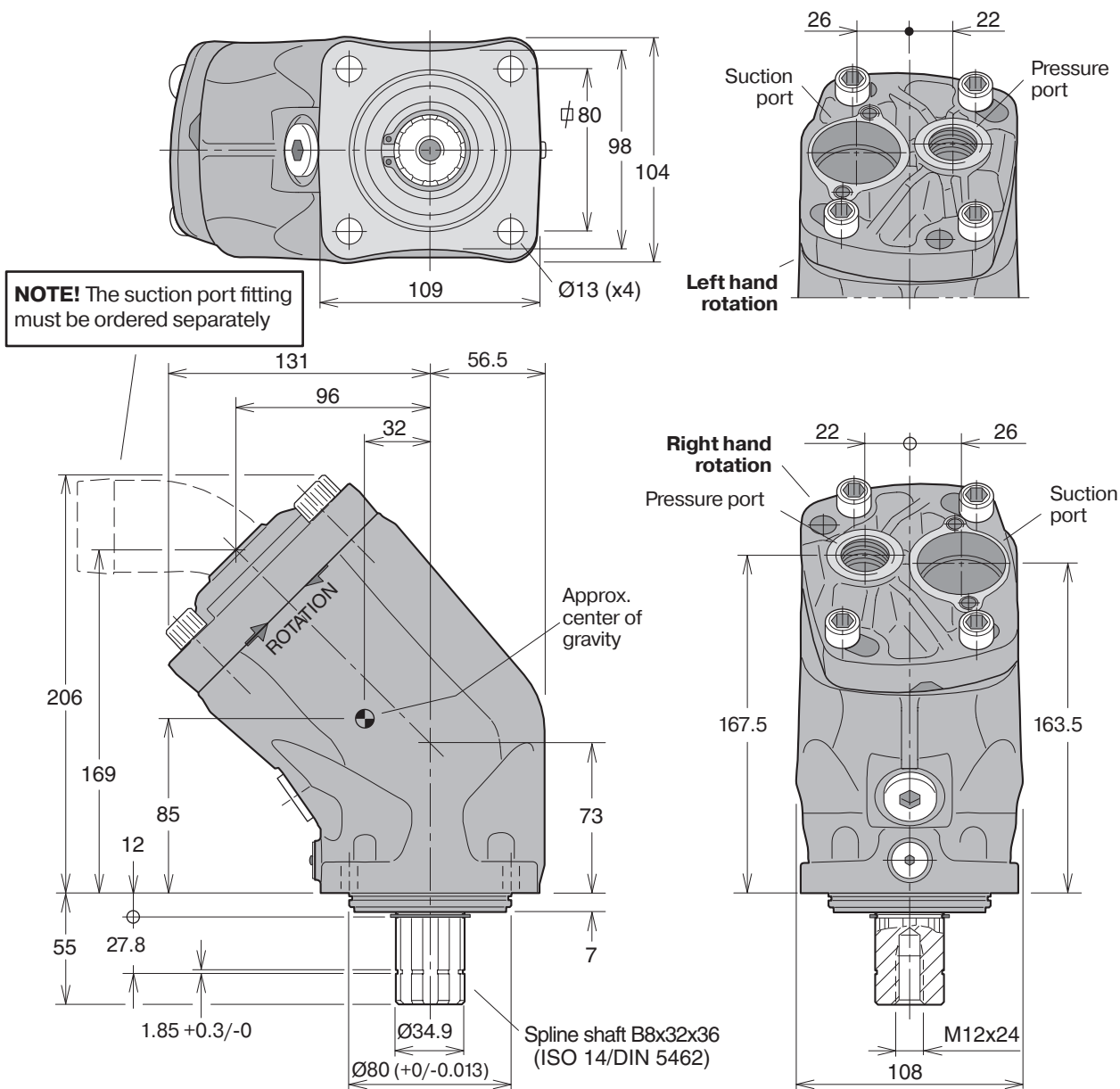


- 1. Input shaft
- 2. Bearings
- 3. Shaft seals

- 4. Housing
- 5. Timing gear
- 6. Barrel support

- 7. Piston with piston ring
- 8. Cylinder barrel
- 9. End cap

F1-25, -41, -51 and -61



Ordering code

Example: **F1-81-R**

F1 frame size  
**25, 41, 51, 61, 81 or 101**

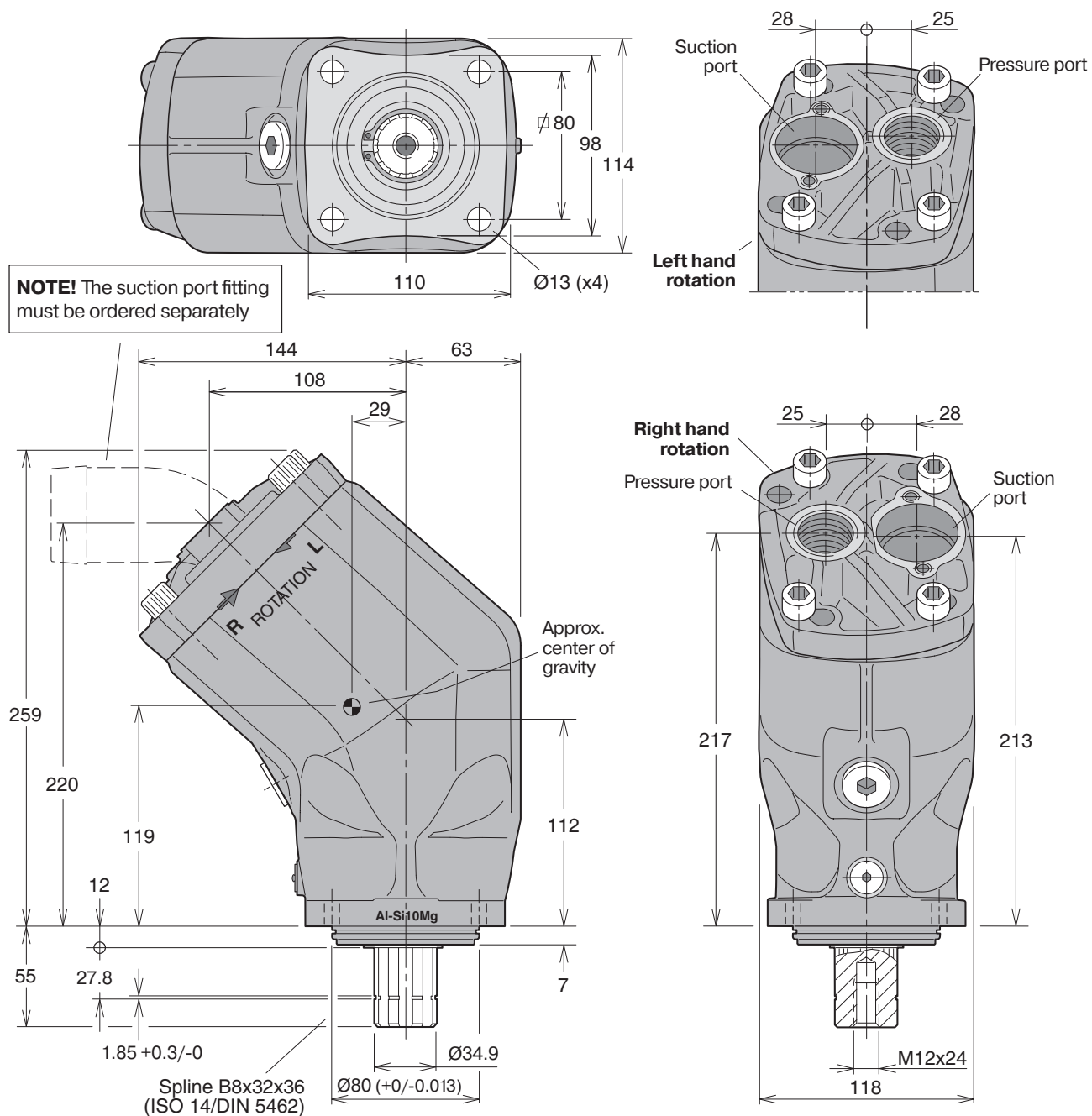
Shaft rotation  
**R** Right hand  
**L** Left hand

**NOTE:** The pump **does not** include a suction fitting; it must be ordered separately. See page 63ff..

Standard versions

Designation	Ordering no.
F1-25-R	378 1024
F1-25-L	378 1025
F1-41-R	378 1040
F1-41-L	378 1041
F1-51-R	378 1050
F1-51-L	378 1051
F1-61-R	378 1060
F1-61-L	378 1061

F1-81 and -101



Port size

F1 frame size	Pressure port <sup>1)</sup>
-25	3/4"
-41	3/4"
-51	3/4"
-61	3/4"
-81	1"
-101	1"

<sup>1)</sup> BSP thread (fitting not included)

Standard versions

Designation	Ordering no.
F1-81-R	378 1080
F1-81-L	378 1081
F1-101-R	378 1100
F1-101-L	378 1101

**NOTE:** The pump **does not** include a suction fitting; it must be ordered separately. See page 63ff.



**F1-12 ISO with BSP port treads**

**Specifications**

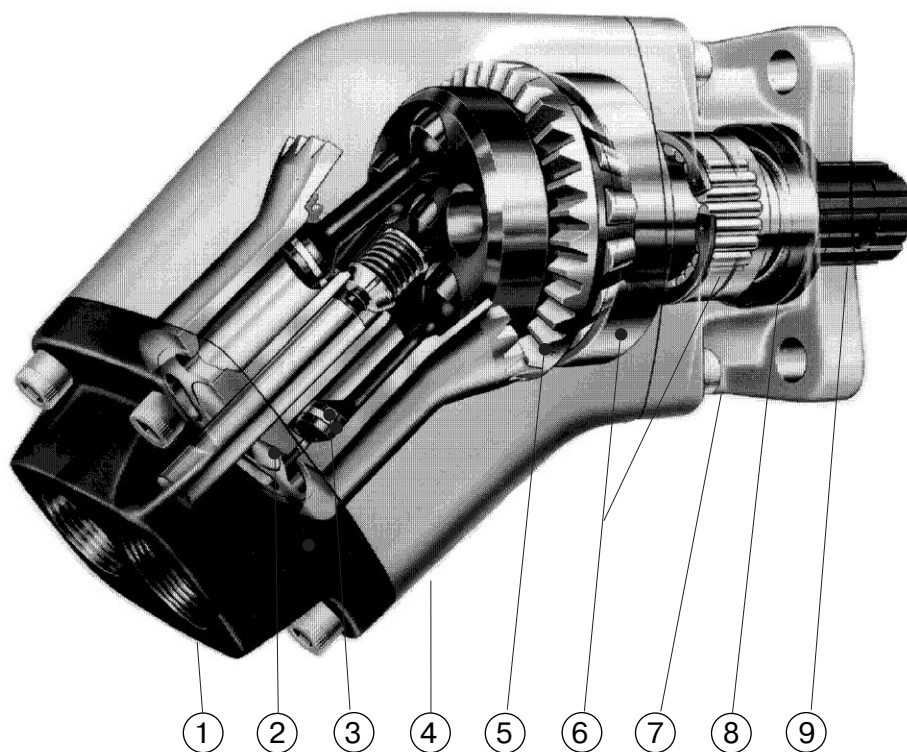
Frame size F1-	12
<b>Displacement</b> [cm <sup>3</sup> /rev]	12
<b>Max flow</b> <sup>1)</sup> [l/min]	28
<b>Max operating pressure</b> [bar]	350
<b>Shaft speed</b> [rpm]	
- short circuited pump (low press.)	3100
- max selfpriming speed	2300
<b>Torque</b> <sup>1)</sup> [Nm]	67
<b>Max input power</b> [kW]	16
<b>Weight</b> [kg]	6.7

<sup>1)</sup> Theoretical values

**NOTE:**

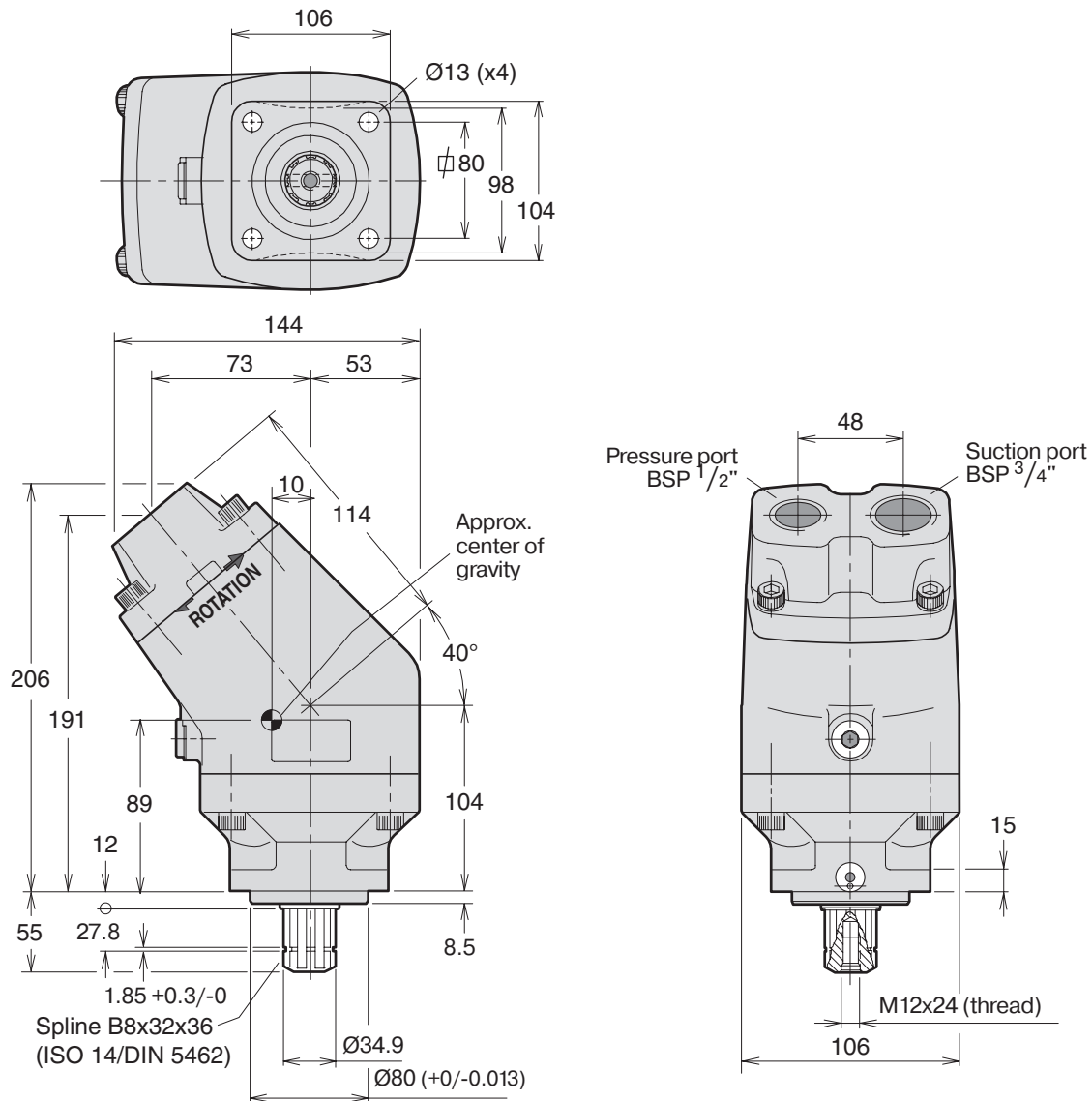
For noise level information, contact Parker Hannifin

**Pump cross section**



- |                           |                   |                               |
|---------------------------|-------------------|-------------------------------|
| 1 End cap                 | 4 Barrel housing  | 7 Bearing housing with flange |
| 2 Cylinder barrel         | 5 Timing gear     | 8 Shaft seals                 |
| 3 Piston with piston ring | 6 Roller bearings | 9 Input shaft                 |

● **F1-12 with BSP port treads**



● **Ordering code**

Example: **F1-12-R**

F1 frame size **12**

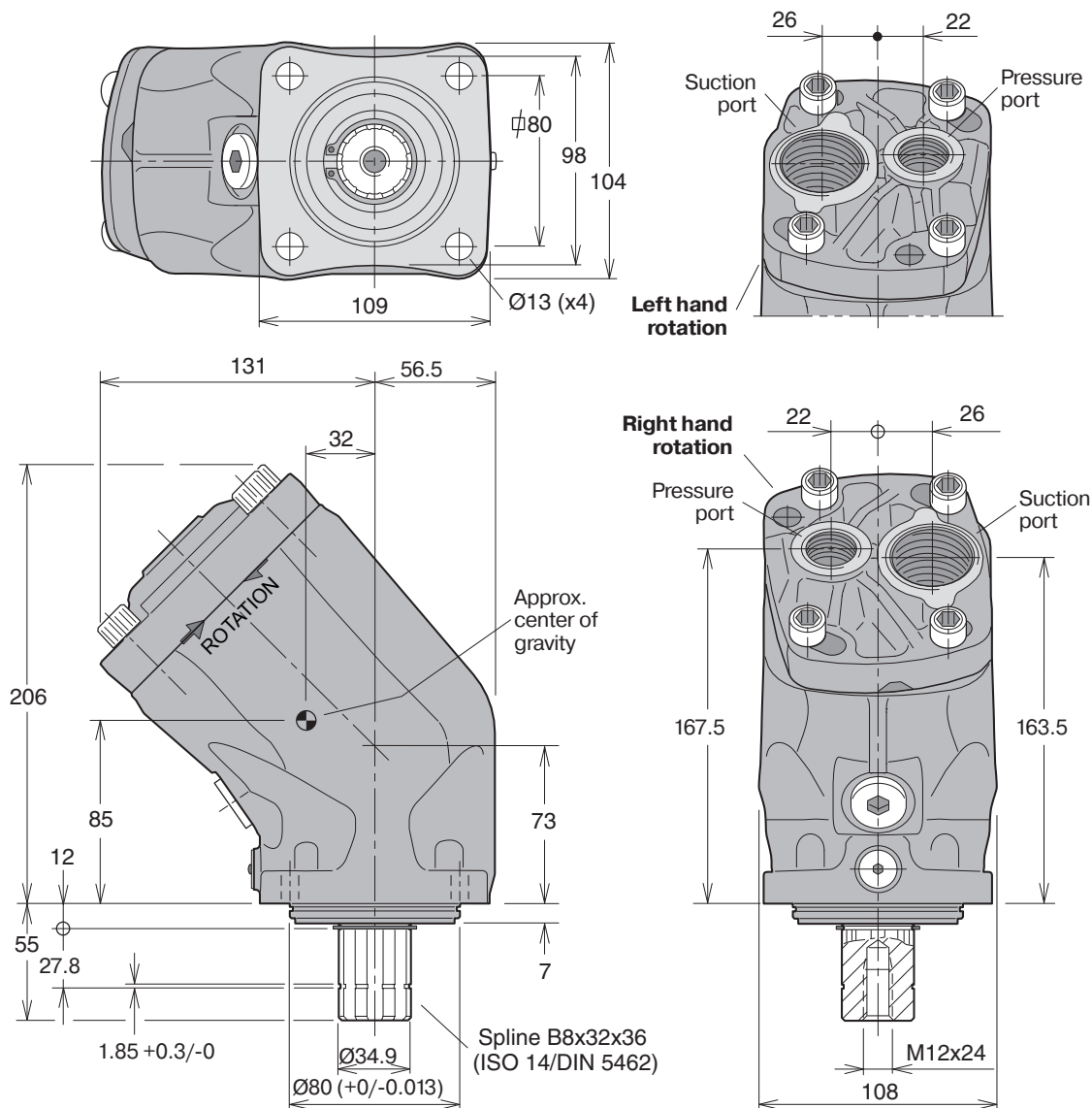
Shaft rotation  
**R** Right hand  
**L** Left hand

**Standard versions**

Designation	Ordering no.
F1-12-R	378 2212
F1-12-L	378 2211

**NOTE:** The pump **does not** include a suction fitting; it must be ordered separately. See page 63ff.

F1-25, -41, -51 and -61 with BSP port treads



Port size (all ports are BSP)

F1 frame size	Pressure port <sup>1)</sup>	Suction port
-25	3/4"	1"
-41	3/4"	1"
-51	3/4"	1"
-61	3/4"	1"

Ordering code

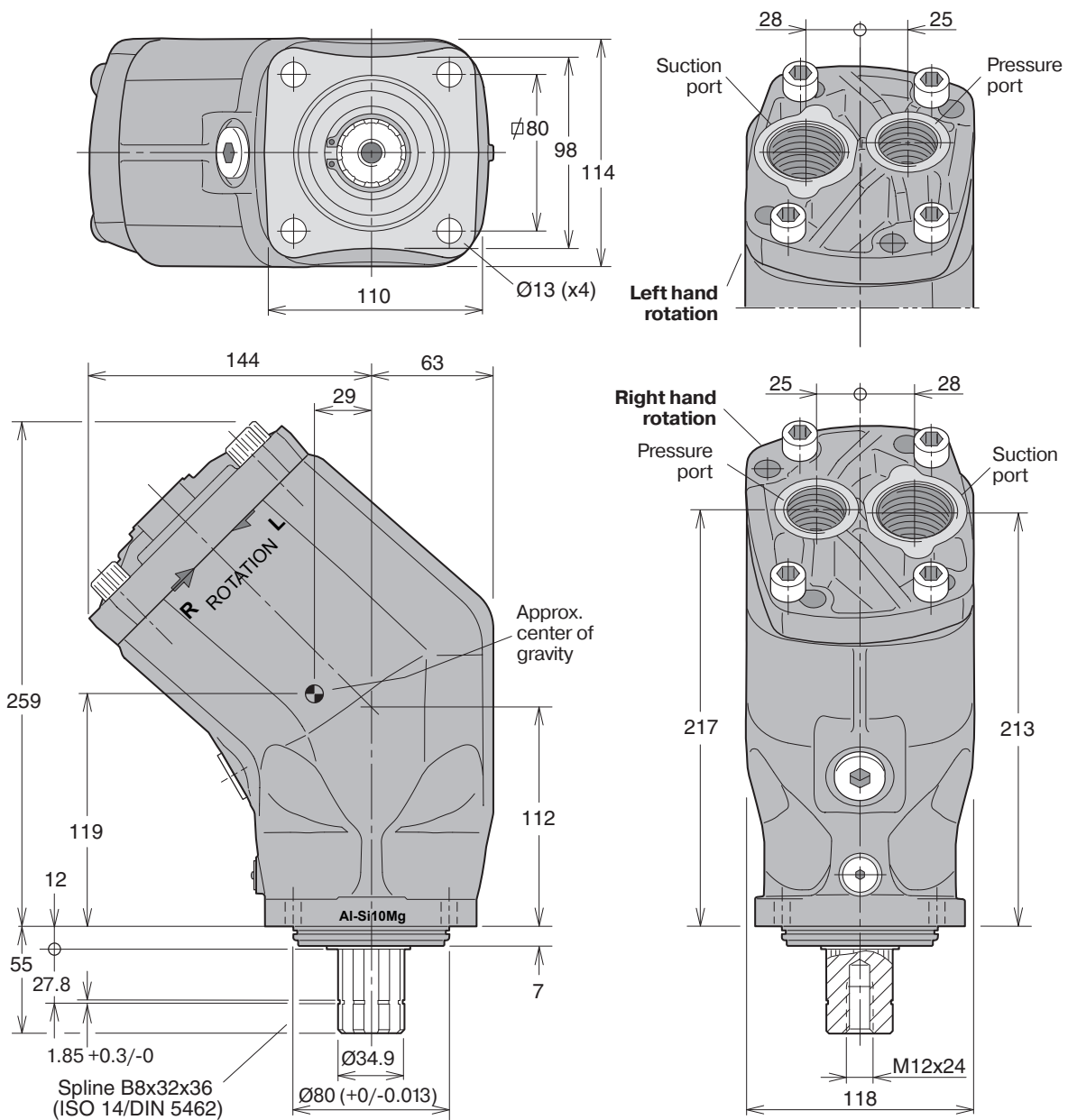
Example: **F1 - 61 - RB**  
 F1 frame size ————— 25, 41, 51, 61, 81 or 101  
 Shaft rotation/port threads —————  
**RB** Right hand/BSP  
**LB** Left hand/BSP

Standard versions

Designation	Ordering no.
F1-25-RB	378 4024
F1-25-LB	378 4025
F1-41-RB	378 4040
F1-41-LB	378 4041
F1-51-RB	378 4050
F1-51-LB	378 4051
F1-61-RB	378 4060
F1-61-LB	378 4061

**NOTE:** The pump **does not** include a suction fitting; it must be ordered separately. See page 63ff.

● **F1-81 and -101 with BSP port treads**



● **Port size** (all ports are BSP)

F1 frame size	Pressure port <sup>1)</sup>	Suction port
-81	1"	1 1/4"
-101	1"	1 1/4"

● **Ordering code**

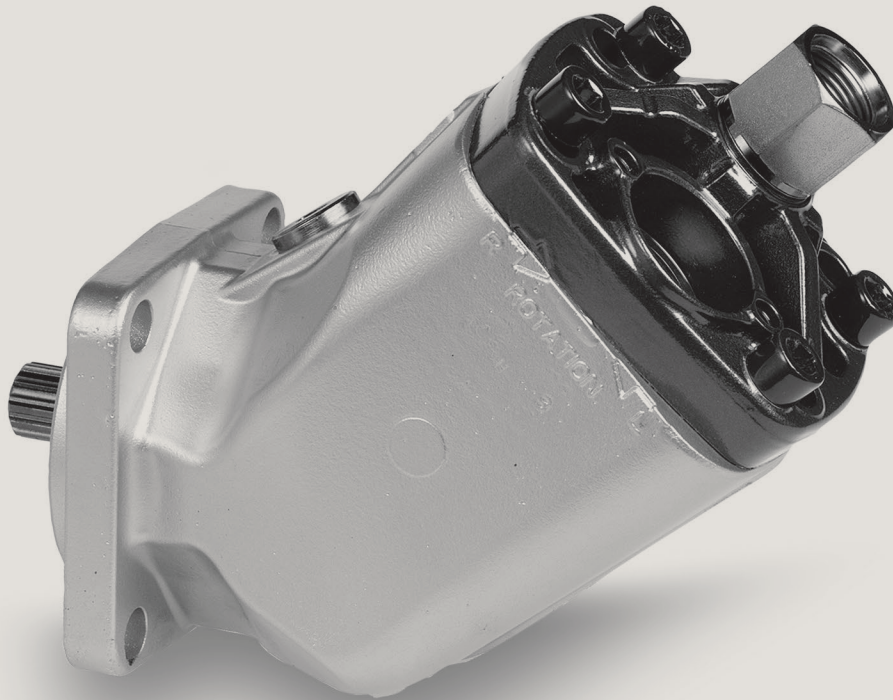
Example: **F1-81-RB**  
 F1 frame size ————  
**25, 41, 51, 61, 81 or 101**  
 Shaft rotation/port threads ————  
**RB** Right hand/BSP  
**LB** Left hand/BSP

**Standard versions**

Designation	Ordering no.
F1-81-RB	378 4080
F1-81-LB	378 4081
F1-101-RB	378 4100
F1-101-LB	378 4101

**NOTE:** The pump **does not** include a suction fitting; it must be ordered separately. See page 63ff.

**F1 Pump**  
**F1-SAE**



<b>Contents.....</b>	<b>Page</b>
Pump and Line selection.....	13
Specifications.....	32
Pump cross section.....	32
Installation Dimensions, F1-25, -41, -51 and -61 (SAE) .....	33
Ordering code (SAE).....	33
Port size and standard versions.....	33
Suction fittings.....	63
Installation and start up.....	80

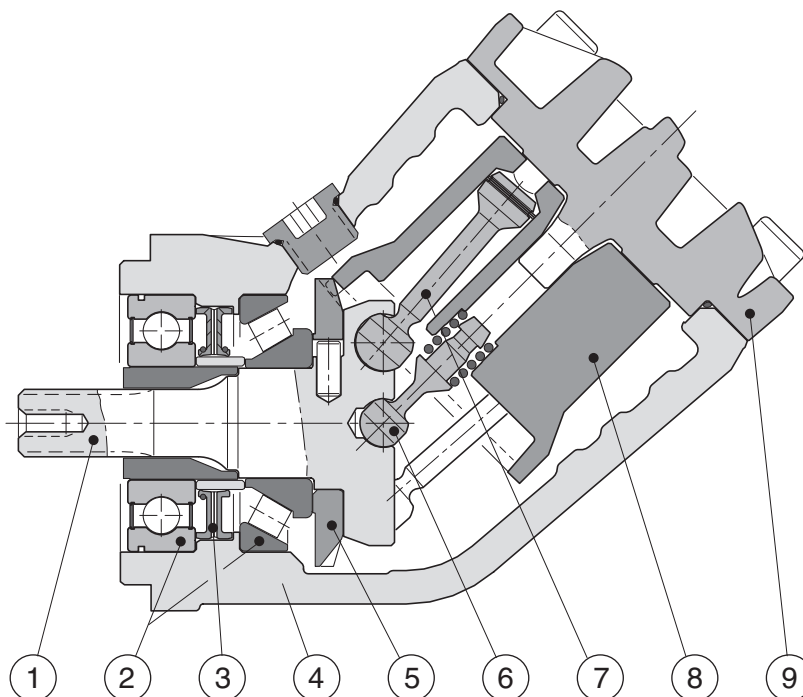
## Specifications

Frame size F1-	25	41	51	61
<b>Displacement</b> [cm <sup>3</sup> /rev]	25.6	40.9	51.1	59.5
	[cu in/rev]	1.56	2.50	3.12
<b>Max flow</b> <sup>1)</sup> [l/min]	78	104	125	143
	[gpm]	20.6	27.5	33.0
<b>Max operating pressure</b> [bar]	350	350	350	350
	[psi]	5000	5000	5000
<b>Shaft speed</b> [rpm]				
- short circuited pump (low press.)	3100	2700	2700	2700
- max selfpriming speed <sup>2)</sup>	3050	2550	2450	2400
<b>Torque</b> <sup>1)</sup>				
at 350 bar [Nm]	142	227	284	331
at 5000 psi [lbf ft]	105	168	210	244
<b>Input power</b>				
[kW]	45	61	73	83
[hp]	60	82	98	111
<b>Weight</b> [kg]	8.5	8.5	8.5	8.5
	[lbs]	18.7	18.7	18.7

1) Theoretical values

2) Valid at an inlet pressure of 1.0 bar/15 psi (abs.) when operating on mineral oil at a viscosity of 30 mm<sup>2</sup>/s (cSt)/150 SUS.

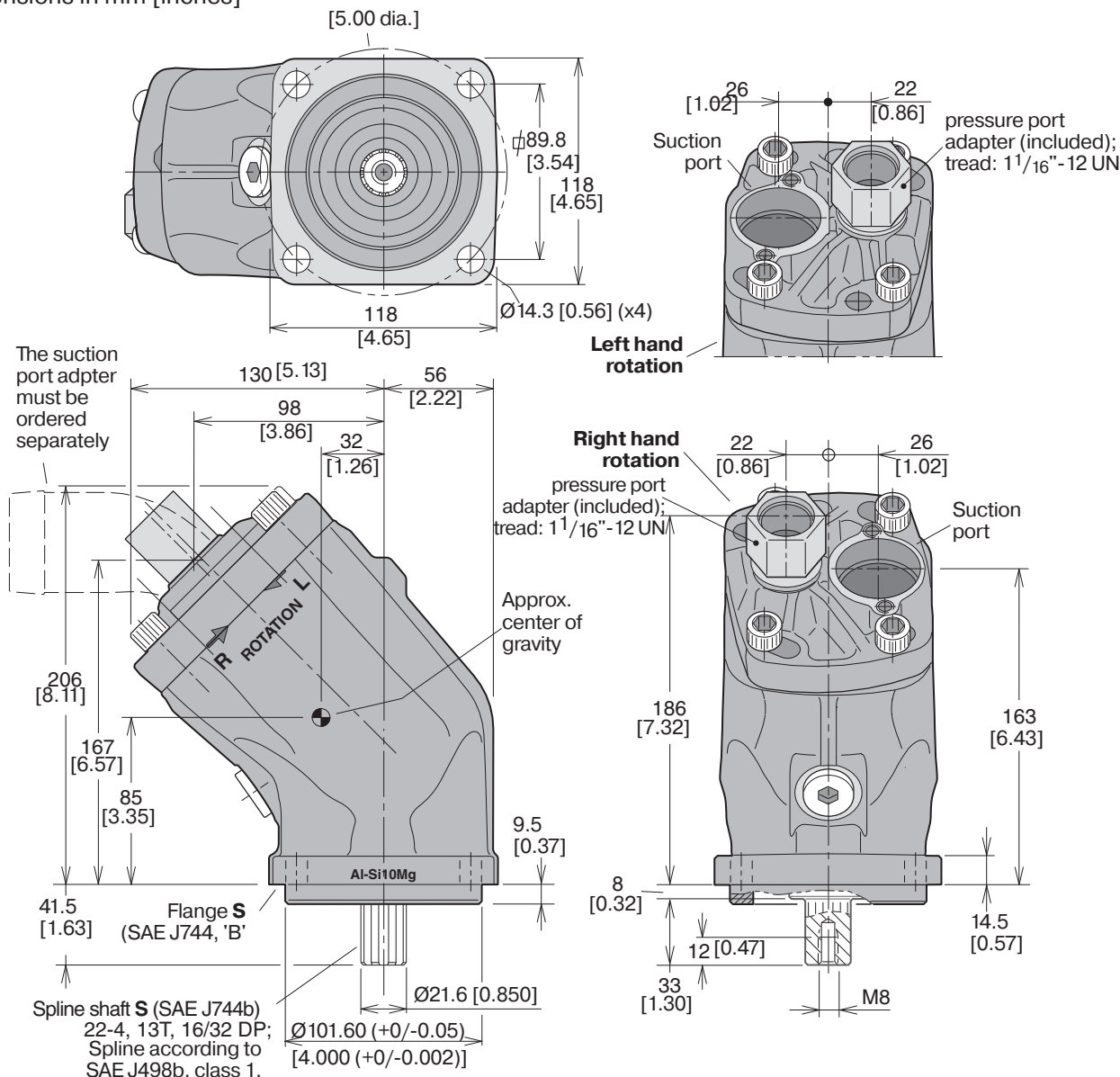
## Pump cross section



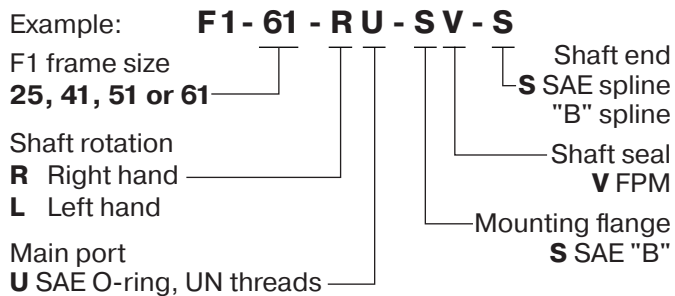
1. Input shaft
2. Bearings
3. Shaft seal
4. Housing
5. Timing gear
6. Barrel support
7. Piston with piston ring
8. Cylinder barrel
9. End cap

**Installation dimensions, F1-25, -41, -51 and -61 (SAE)**

Dimensions in mm [inches]



**Ordering code (SAE)**



**NOTE:** The pump **does not** include a suction fitting; it must be ordered separately. See page 63ff.

**Port size**

F1 frame size	Pressure port <sup>1)</sup>
-25	1 <sup>1</sup> / <sub>16</sub> " -12 UN
-41	1 <sup>1</sup> / <sub>16</sub> " -12 UN
-51	1 <sup>1</sup> / <sub>16</sub> " -12 UN
-61	1 <sup>1</sup> / <sub>16</sub> " -12 UN

<sup>1)</sup> BSP-to-SAE adapter (included)

**Standard SAE versions**

Designation	Ordering no.
F1-25-RU	378 1424
F1-25-LU	378 1425
F1-41-RU	378 1440
F1-41-LU	378 1441
F1-51-RU	378 1450
F1-51-LU	378 1451
F1-61-RU	378 1460
F1-61-LU	378 1461

## F1 Motor



<b>Contents</b> .....	<b>Page</b>
Pump and Line selection.....	13
Specifications.....	39
Ordering code.....	39
Installation.....	39
Port size.....	39
Standard versions.....	39
Suction fittings.....	63
Installation and start up.....	80



## Specifications

Motor frame size F1-	25-M	41-M	51-M	61-M	81-M	101-M	121-M
<b>Displacement</b> [cm <sup>3</sup> /rev]	25.6	40.9	51.1	59.5	81.6	102.9	118.5
<b>Max operating pressure</b> [bar]							
continuous	250	250	250	250	250	250	250
intermittent <sup>1)</sup>	350	350	350	350	350	350	350
<b>Max Shaft speed</b> [rpm]							
- continuous	2 300	2 000	1 800	1 700	1 500	1 400	1300
- intermittent	3 000	2 700	2 400	2 200	2 000	1 800	1700
<b>Torque</b> (theor.) [Nm]							
at 200 bar	81	130	162	189	259	327	376
at 350 bar	142	227	284	331	453	572	658
<b>Max output power</b> [kW]	45	64	72	76	95	108	117
<b>Weight</b> [kg]	8.5	8.5	8.5	8.5	12.5	12.5	12.5

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

## Ordering code

Example: **F1 - 81 - M**  
 F1 Motor frame size \_\_\_\_\_  
**25, 41, 51, 61, 81, 101 or 121**

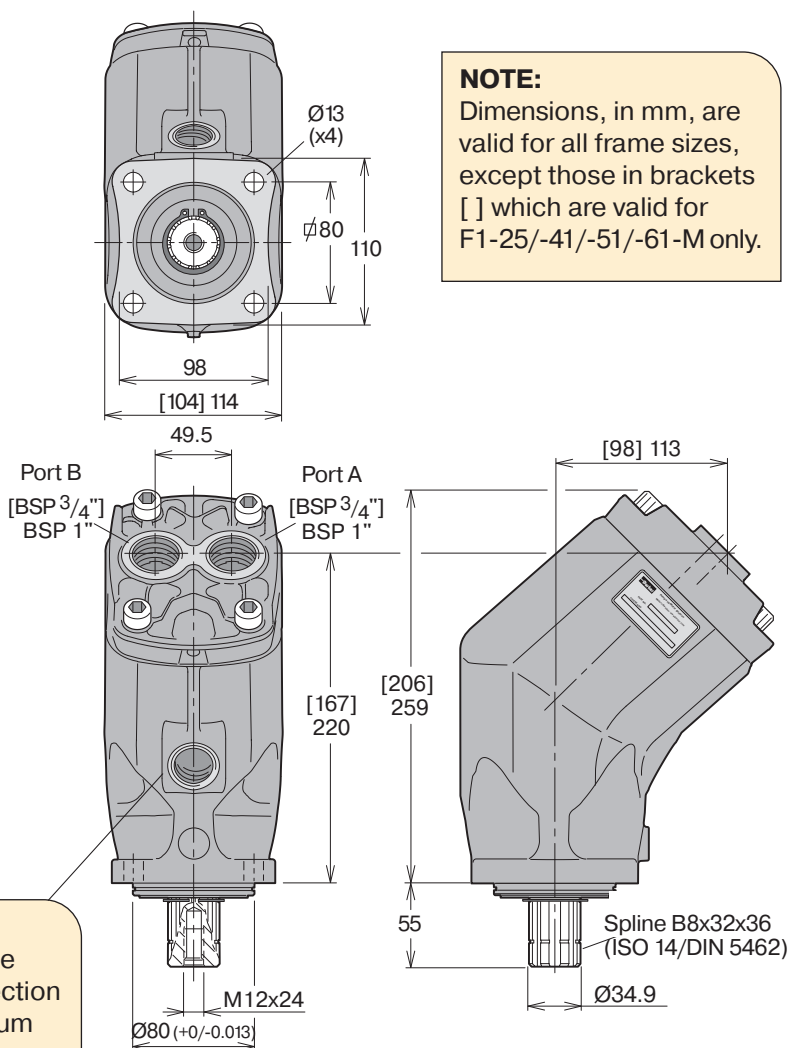
## Port size

F1 motor frame size	Port size
F1-25/41/51/61	3/4"
-81/101/121	1"

## Standard versions

Designation	Ordering no.
F1-25-M	378 1724
F1-41-M	378 1740
F1-51-M	378 1750
F1-61-M	378 1760
F1-81-M	378 1780
F1-101-M	378 1800
F1-121-M	378 4120

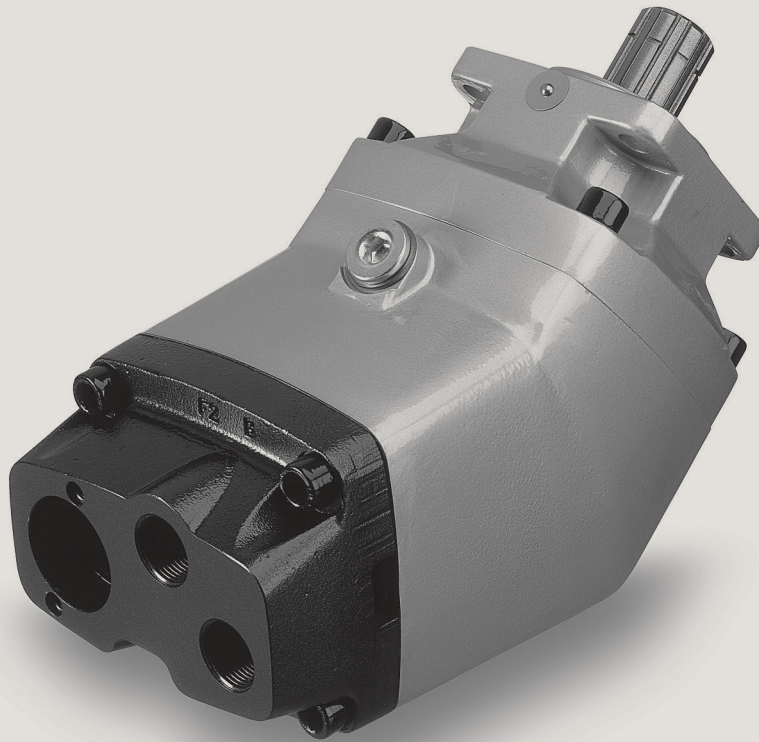
## Installation dimensions



**NOTE:**  
 Dimensions, in mm, are valid for all frame sizes, except those in brackets [ ] which are valid for F1-25/-41/-51/-61-M only.

**Note:**  
 Drain line must be mounted. Connection BSP 1/2". Maximum drain line pressure is 5 bar.

**F2 Twin-flow Pump**

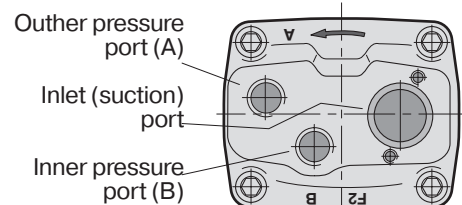


<b>Contents</b> .....	<b>Page</b>
Pump and Line selection.....	13
Specifications.....	41
Installation Dimensions.....	42
Ordering code .....	42
Standard versions .....	42
Suction fittings.....	63
Installation and start up .....	80

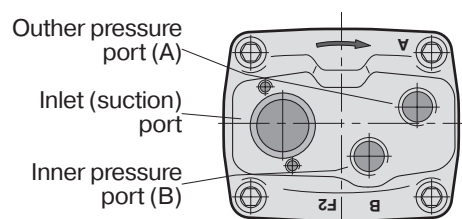
## Specifications

Frame size F2-	42/42	53/53	55/28	70/35	70/70
<b>Displacement [cm<sup>3</sup>/rev]</b>					
Port A	43	55	55	69	68
Port B	41	52	28	36	68
<b>Max operating pressure [bar]</b>					
continuous	350	350	350	350	300
intermittent <sup>3)</sup>	400	400	400	400	350
<b>Mass moment of inertia J [kgm<sup>2</sup>]</b>	0.0092	0.0091	0.0091	0.0090	0.0104
<b>Max Shaft speed [rpm]</b>					
(unloaded pump; low pressure)	2550	2550	2550	2550	- <sup>3)</sup>
<b>Max selfpriming speed [rpm]</b>					
Ports A <sup>1)</sup> and B <sup>1)</sup> pressurised	1800	1800	1800	1800	1650
Port A <sup>1)</sup> unloaded, pressure in port B	2100	2100	2100	2100	2100
<b>Max input power<sup>2)</sup> [kW]</b>	100	127	100	126	131
<b>Weight [kg]</b>	19	19	19	19	19

### 'Left hand' and 'right hand' end caps



End cap for right hand rotating pump



End cap for left hand rotating pump

<sup>1)</sup> Valid at an inlet pressure of 1.0 bar (abs.) when operating on mineral oil at a viscosity of 30 mm<sup>2</sup>/s (cSt).

<sup>2)</sup> Max 6 seconds in any one minute.

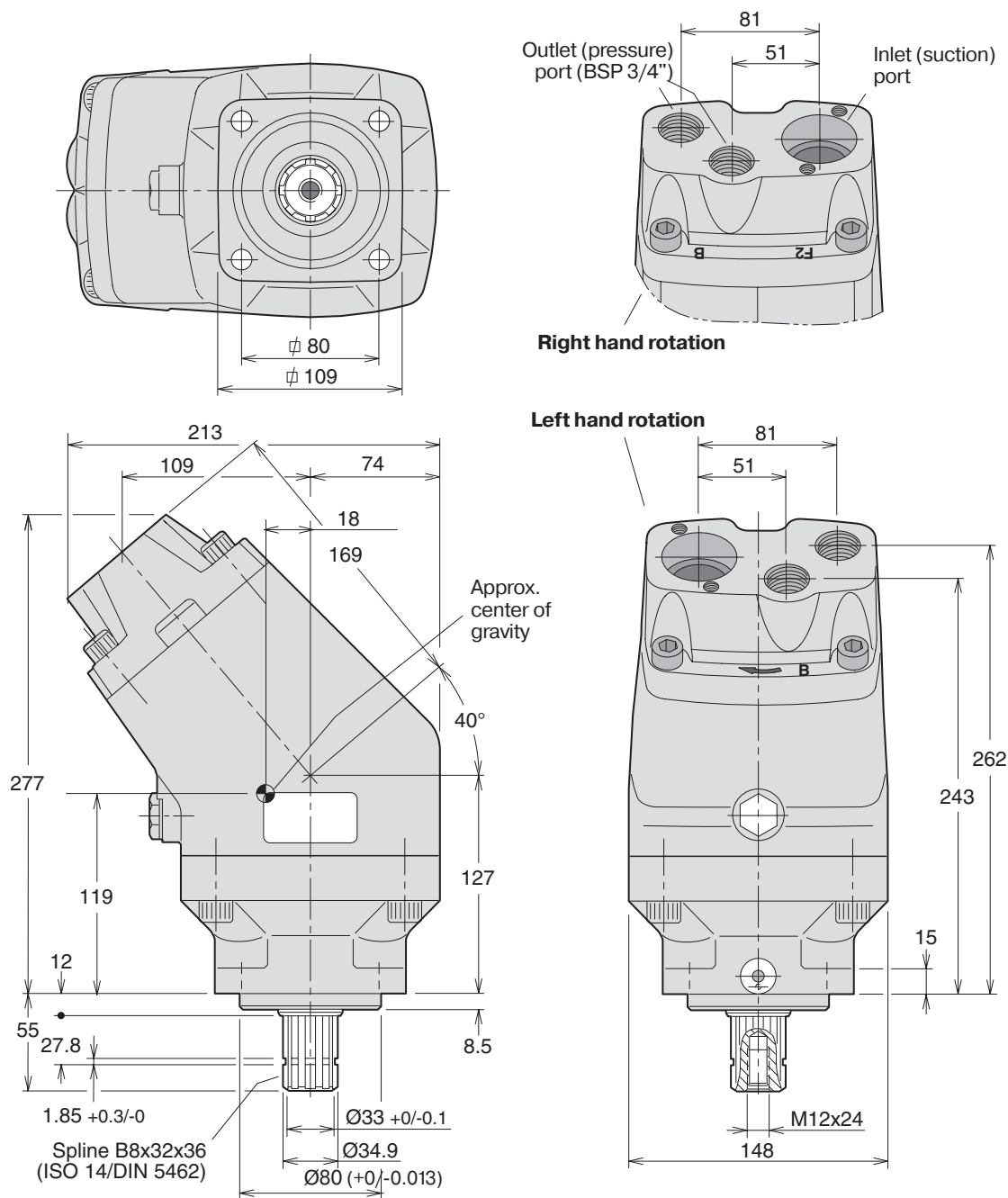
<sup>3)</sup> Not suitable for engine-PTO

## Flow vs. shaft speed (theoretical)

Pump speed [rpm]	800	1000	1200	1400	1600	1800	1900	2000	2100
<b>F2-53/53 flow [l/min]</b>									
Port A	43	54	65	76	86	97	-	-	-
Port B	42	52	62	73	83	94	99	104	109
Total (ports A + B)	85	106	127	149	169	191	-	-	-
<b>Note: 42/42 values is 80 % of 53/53 values 70/70 values is 130 % of 53/53 values</b>									
<b>F2-70/35 flow [l/min]</b>									
Port A	55	69	83	97	110	124	-	-	-
Port B	29	36	43	50	58	65	68	72	76
Total (ports A + B)	84	105	126	147	168	189	-	-	-
<b>Note: 55/28 values is 80 % of 70/35 values</b>									

## Shaft torque vs. pressure (theoretical)

Pressure [bar]	150	200	250	300	350
<b>F2-53/53 torque [Nm]</b>					
Port A	129	171	214	257	300
Port B	124	165	206	248	289
Total (ports A + B)	253	336	420	505	589
<b>Note: 42/42 values is 80 % of 53/53 values 70/70 values is 130 % of 53/53 values</b>					
<b>F2-70/35 torque [Nm]</b>					
Port A	164	219	274	329	383
Port B	86	114	143	171	200
Total (ports A + B)	250	333	417	500	583
<b>Note: 55/28 values is 80 % of 70/35 values</b>					



### Ordering code

Example: **F2 - 53/53 - L**

Frame size [cm<sup>3</sup>/rev]

**42/42**

**53/53**

**55/28**

**70/35**

**70/70**

Direction of rotation

**L** Left hand

**R** Right hand

#### NOTE:

- Before start-up, tighten the inspection port plug to 70 – 100 Nm.
- To change the direction of rotation, **the end cap must be replaced.**

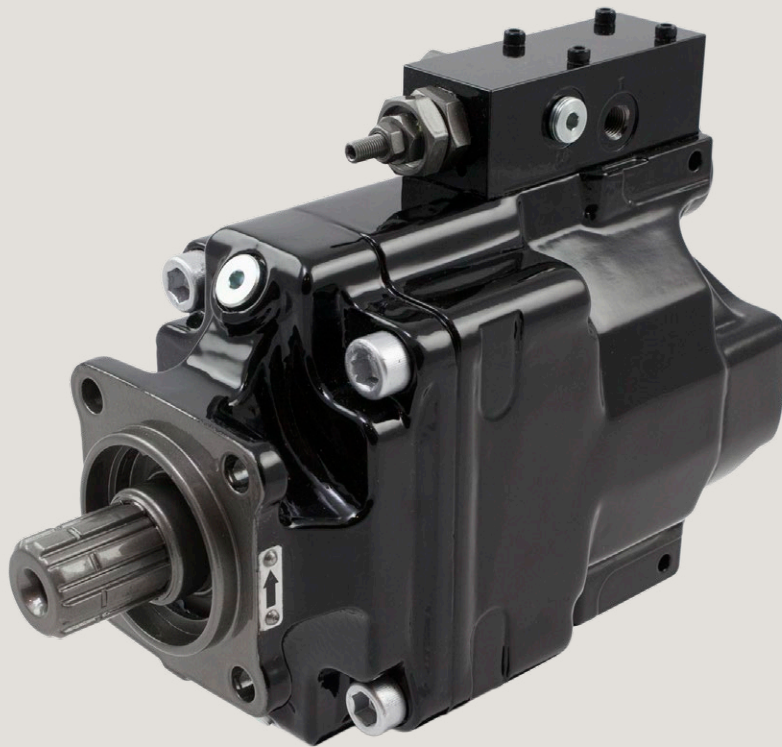
#### NOTE:

The pump **does not** include a suction fitting; it must be ordered separately. See page 63ff..

### Standard versions

Designation	Ordering no.
F2-42/42-R	378 4042
F2-42/42-L	378 4043
F2-53/53-R	378 1453
F2-53/53-L	378 1454
F2-55/28-R	378 4128
F2-55/28-L	378 4129
F2-70/35-R	378 1470
F2-70/35-L	378 1471
F2-70/70-R	378 4070
F2-70/70-L	378 4071

**VP1 Pump**



<b>Contents</b> .....	<b>Page</b>
Pump and Line selection.....	13
Specifications.....	55
VP1-045/-060/-075 cross section.....	55
Installation Dimensions, VP1-045, -060 and -075.....	56
LS valve block VP1-045/-060/-075.....	57
Through-shaft coupling VP1-045/-060/-075.....	57
VP1-095/-110/-130 cross section.....	58
LS control (for VP1-095/-110/-130).....	58
Installation Dimensions, VP1-095/-110/-130.....	59
System Information.....	60
Ordering information.....	60
VP1 in load sensing systems and Systems comparison.....	60
LS load sensing control function and LS control adjustments.....	61
Suction fittings.....	63
Installation and start-up for VP1.....	80

## Specifications

Frame size VP1 -	045	060	075	095	110	130
<b>Displacement</b> [cm <sup>3</sup> /rev]	45	60	75	95	110	128
<b>Max operating pressure</b> [bar]						
continuous	350	350	350	400	400	400
intermittent <sup>1)</sup>	400	400	400	420	420	420
<b>Mass moment of inertia J</b> [kgm <sup>2</sup> ]	0.00606	0.00606	0.00606	0.00681	0.00690	0.00690
<b>Shaft speed</b> <sup>2)</sup> [rpm]						
- short circuited pump (low press.)	3000	3000	3000	3000	3000	3000
- max selfpriming speed <sup>2)</sup>	3000	2700	2500	2300 <sup>3)</sup>	2200 <sup>3)</sup>	2100 <sup>3)</sup>
<b>Control type</b>	LS					
<b>Shaft end spline</b>	DIN 5462					
<b>Mounting flange</b>	ISO 7653-1985					
<b>Weight</b> (with control) [kg]	27					

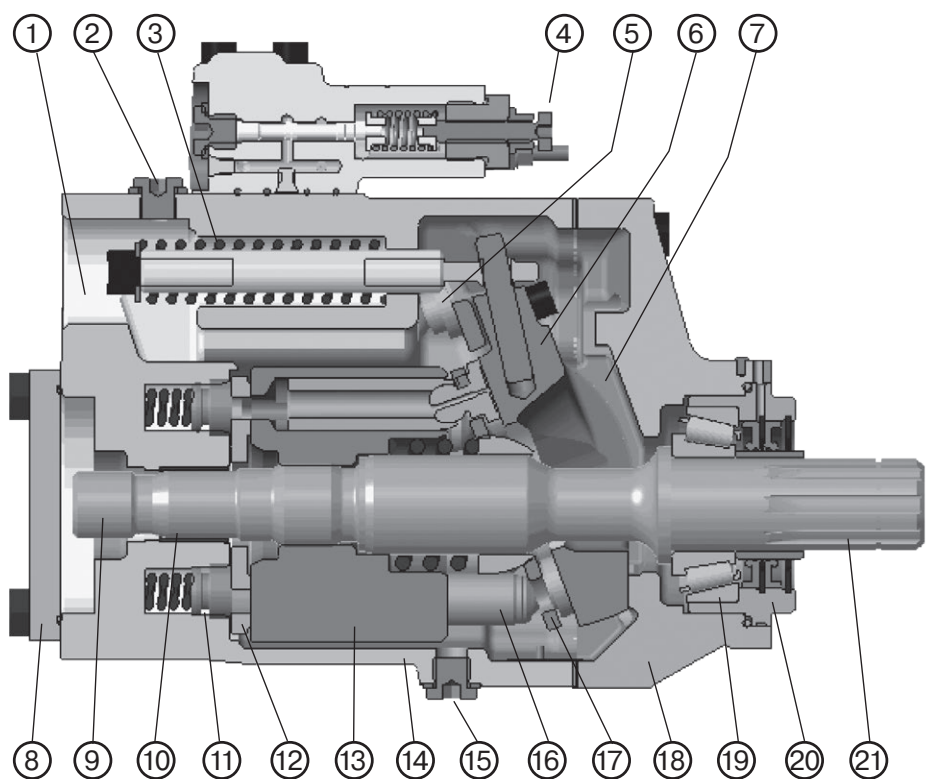
<sup>1)</sup> Max 6 seconds in any one minute.

<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).

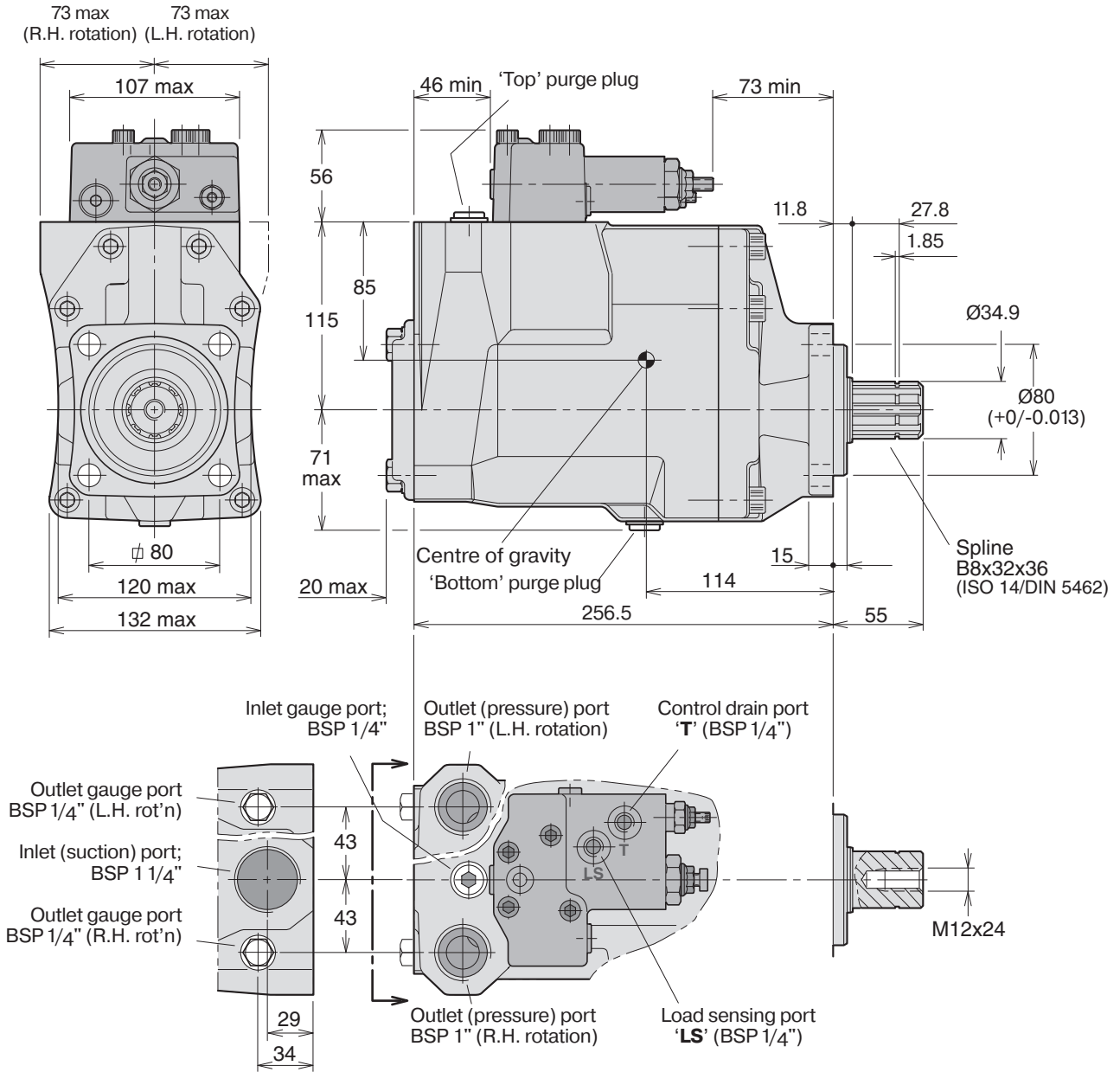
<sup>3)</sup> Valid with 3" inlet (suction) line

## VP1-045/-060/-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



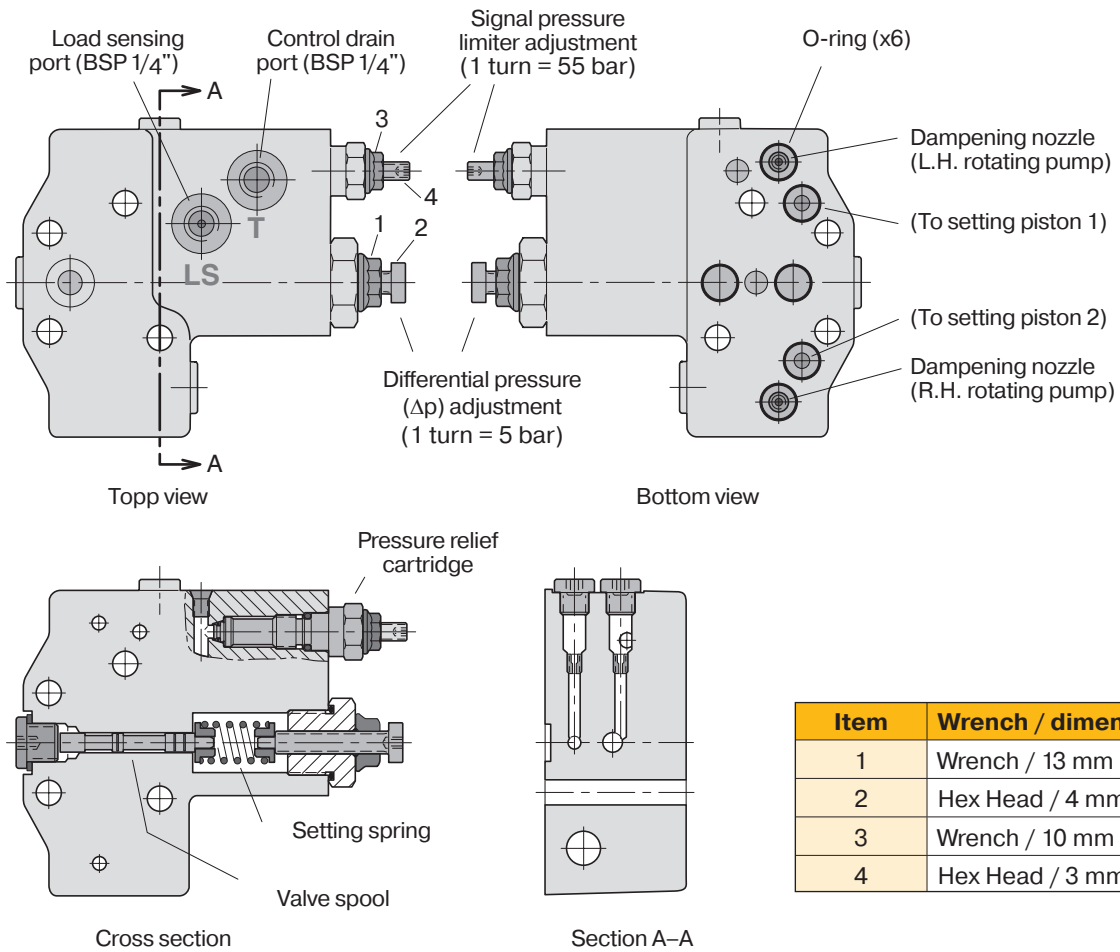
**Installation Dimensions VP1-045, -60 and -075**



**IMPORTANT**  
 The control is not drained through the pump case.  
 An external line must be installed between the control drain port 'T' and the reservoir.

**NOTE:** The pump **does not** include a suction fitting; it must be ordered separately. See page 63ff.

**LS valve block VP1-045/-060/-075**



Item	Wrench / dimension
1	Wrench / 13 mm
2	Hex Head / 4 mm
3	Wrench / 10 mm
4	Hex Head / 3 mm

Fig. 2. LS valve block.

**Through-shaft coupling VP1-045/-060/-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.

**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/-060/-075 in tandem is 420 Nm.

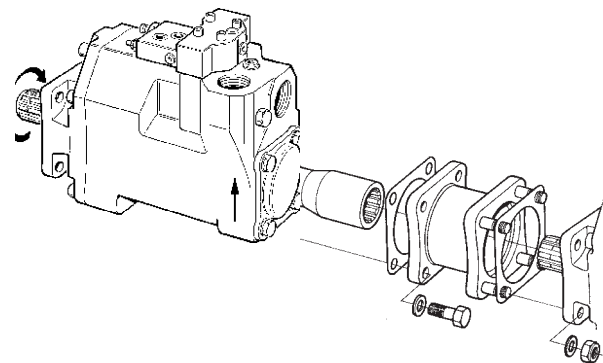
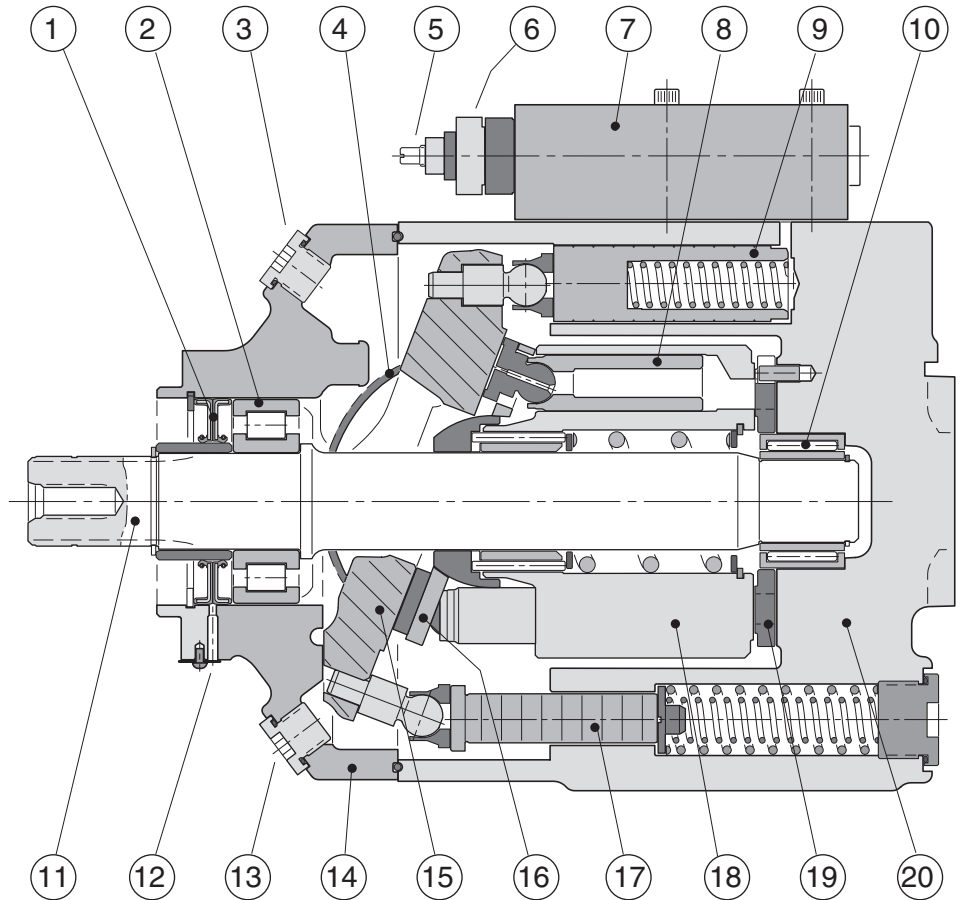


Fig. 3. Adaptor kit (P/N 379 7795) for tandem coupling.

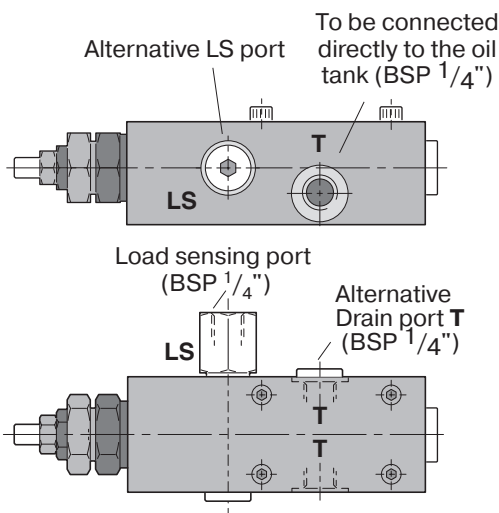


● **VP1-095/-110/-130 cross section**

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



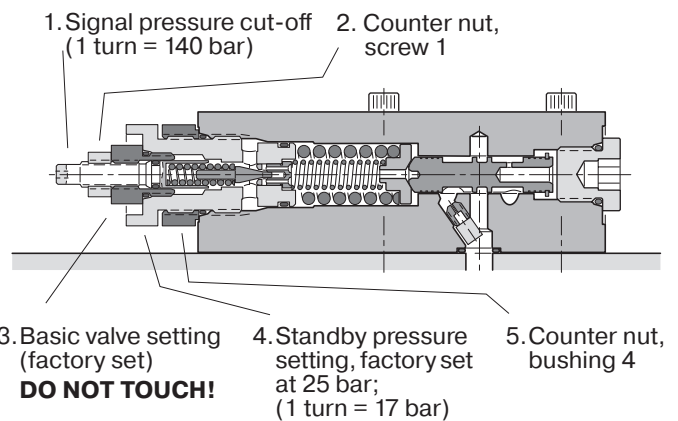
● **LS control (for VP1-095/-110/-130)**



LS control ports.

**NOTE:**

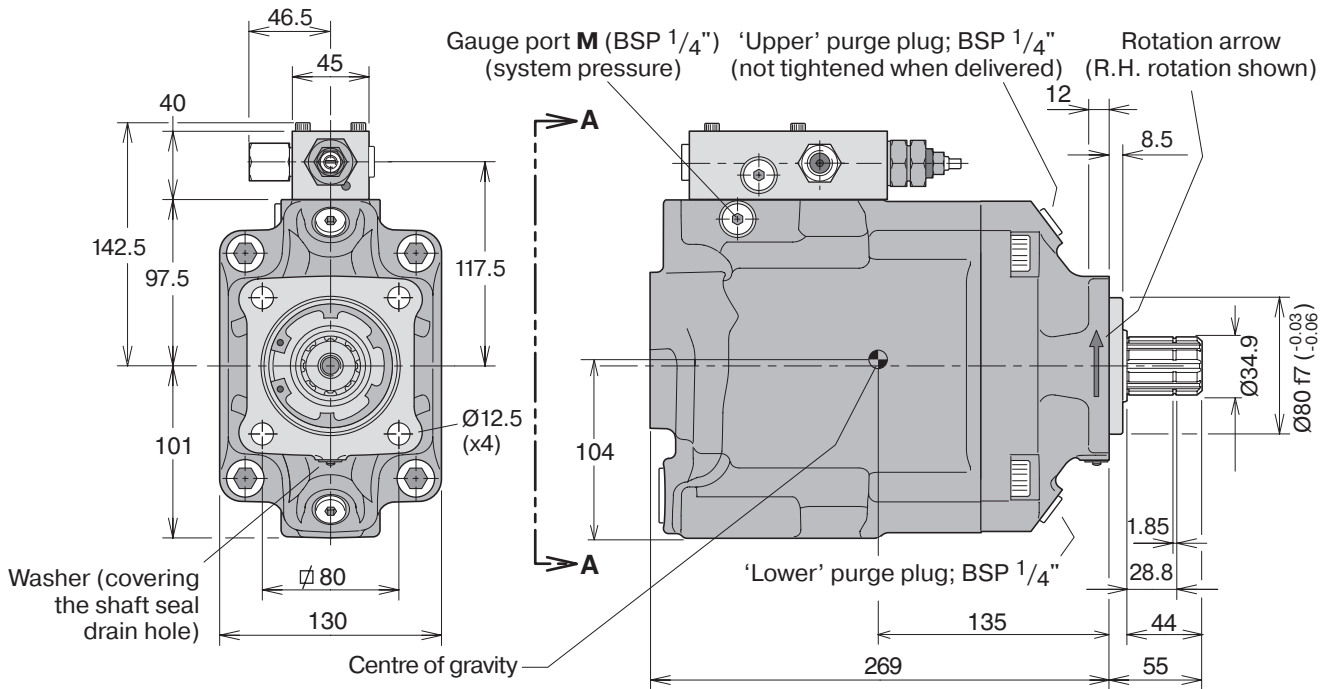
Always run a function, after adjusting the standby pressure or the max pressure setting, before you read the value.



LS control cross section.

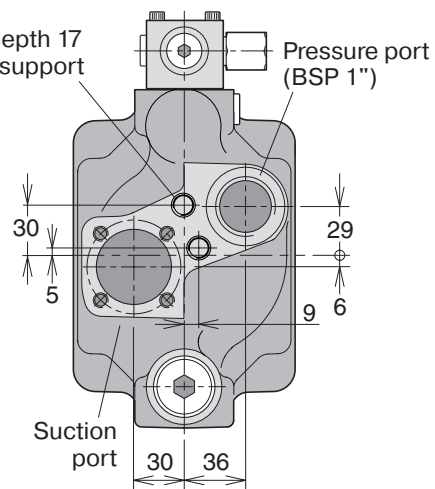
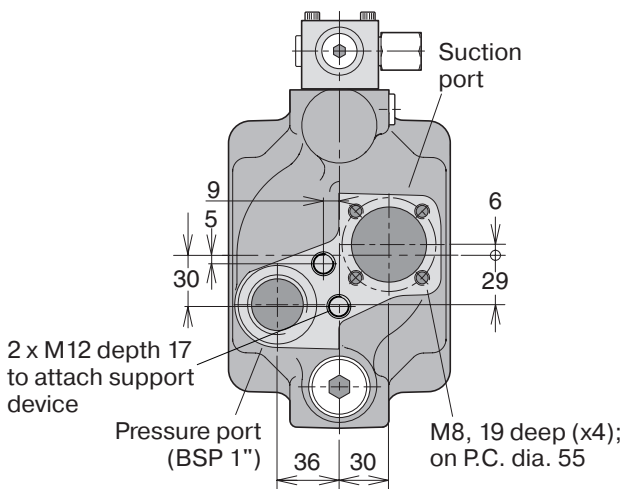
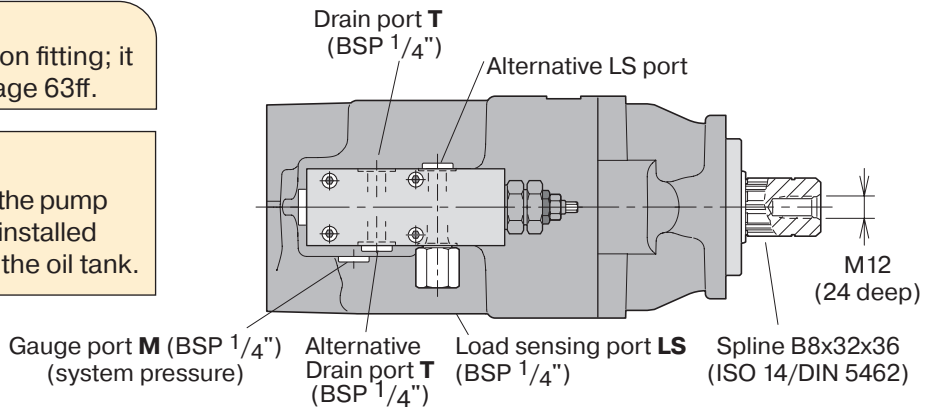
Item	Wrench / dimension
1	Hex Head Wrench / 4 mm
2	Wrench / 13 mm
3	<b>DO NOT TOUCH</b>
4	Wrench / 27 mm
5	Wrench / 27 mm

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



**NOTE:**  
 The pump **does not** include a suction fitting; it must be ordered separately. See page 63ff.

**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.



## Ordering information

Example: **VP1 - 045 - L**

Frame size **045, 060, 075, 095, 110 or 130**

Direction of rotation  
**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
VP1-060-R	372 2283	372 2285
VP1-060-L	372 2284	372 2286
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.

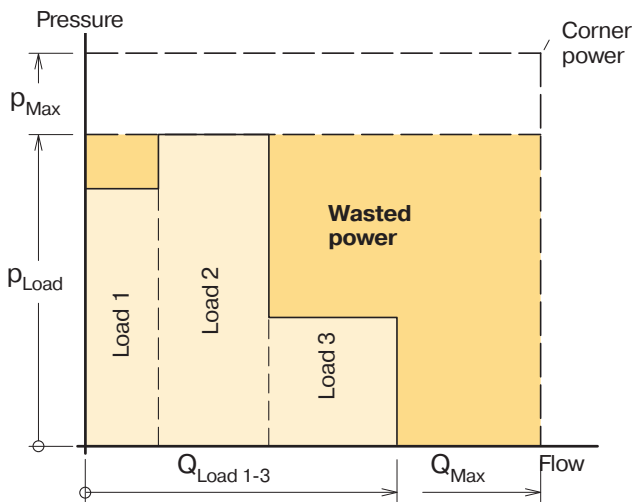


Diagram 1. Constant flow system with a fixed displacement pump.

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.

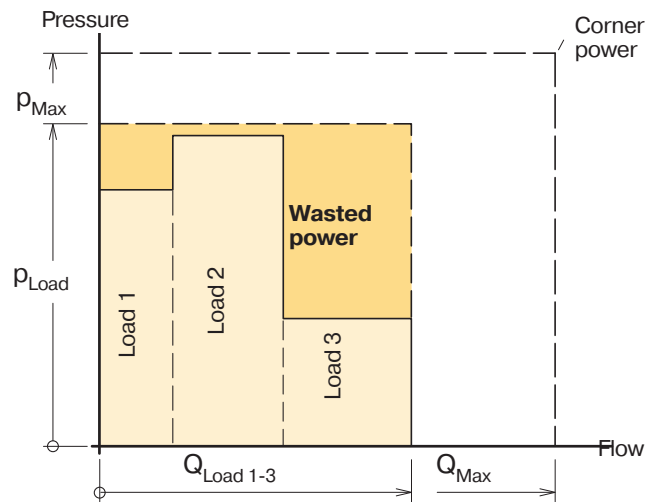


Diagram 2. Constant flow system with a variable displacement pump (e.g. VP1).

## Systems comparison

System Pump	Constant flow Fixed displ.	Load-sensing 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]	Max pressure intermittent [bar]
VP1-045/060/075	350	400
VP1-095/110/130	350	420

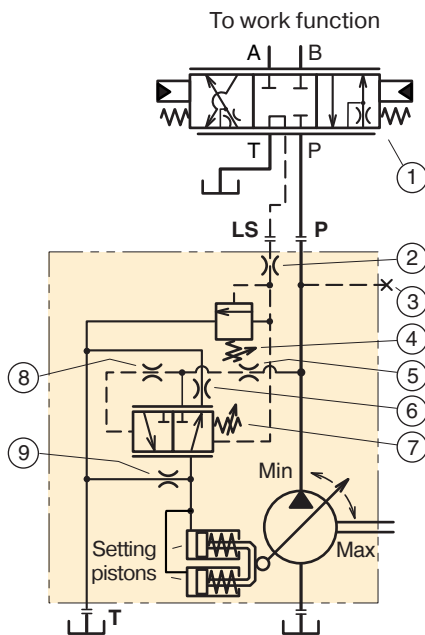
### LS load sensing valve

Pump size	Factory setting [bar]	Min pressure [bar]	Max pressure [bar]
VP1-045/060/075	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.

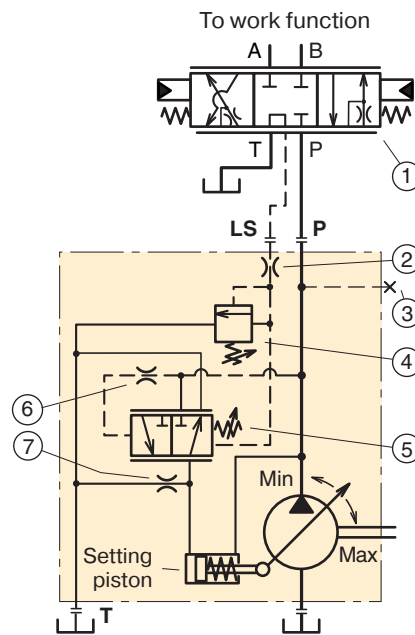
For additional information, contact Parker Hannifin.

### Hydraulic schematic for VP1-45/-060/-075



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 ( $\Delta p$ ) 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 (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)