



# **Truck Hydraulics**

*Fixed and Variable Displacement  
Pumps, Motors and Accessories*

*Catalogue HY30-8200/UK  
April 2007*



**F1**

**F2**

**T1**

**VP1**

**PTO info**

**Accessories**

**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 <sup>3</sup> .....	0,061 cu in
1 mm.....	0,039 in
$\frac{9}{5} \text{ }^\circ\text{C} + 32$ .....	$1^\circ\text{F}$
1 kW.....	1,34 hp

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# General Information

## 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.

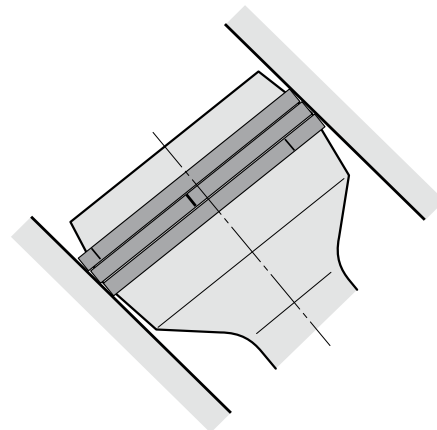


### Features of the F1 are:

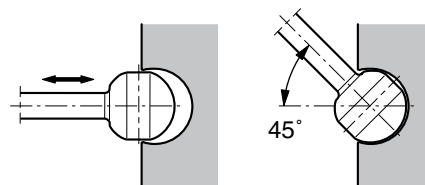
- High selfpriming speeds
- Operating pressures up to 400 bar
- High overall efficiency
- Low noise level
- Small installation dimensions
- Low weight

### ... thanks to:

- 45° bent-axis angle
- Optimal inlet port geometry in the connection top
- 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



*F1 piston with laminated piston ring.*



*F1 piston-to-shaft locking.*

See page 14

## 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 22



1

## 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 25



## 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.



### 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.

**See page 27**

## T1 Pump

The T1 fixed displacement pump is a further development of series T1, which was specifically designed to meet the requirements of light duty truck applications with short, non-frequent operating cycles such as tippers, and small loaders.

The design is very similar to that of the F1 series pumps but is even more compact. It utilises our well proven 40° and 45° concepts with spherical pistons and laminated piston rings, offering high volumetric and mechanical efficiencies and, thanks also to the small number of parts, unprecedented reliability.

- Shaft speed to 2300 rpm
- Operating pressure up to 350 bar
- High overall efficiency
- Low weight
- Small installed envelope
- Robust construction

The T1, with shaft and mounting flange configuration conforming to the European standard, can be installed on most European truck gearboxes. Suitable power-take-offs are also available from Parker Hannifin.

**See page 30**



### Typical T1 applications

- Front end tippers
- Under body tippers
- Light and low frequent used "hydraulic circuit"

## 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 running system with much reduced impact on the environment.

The VP1 is highly efficient, has a small installation envelop and is extremely light. It is reliable, economical and easy to install.

The three frame sizes, VP1-45, -75 and -120 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 VP1-45/-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.



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 VP1-45/-75)

#### Retainer plate

The retainer plate (refer to the cut-away illustration on page 35, chapter 7) is of a heavy duty design which makes the pump withstand high shaft speeds and fast speed changes.(e. g. engine PTO).

See page 34



## Accessories

### Adaptor kits and accessories for F1, F2, T1 and VP1 pumps

#### BLA

Boost unit.  
See chapter 8.

#### Fittings

Suction fittings and fitting kits  
See chapter 9.

#### Bypass valve

BPV-F1/-T1, BPV-F1-25 and 81, BPV-F2,  
See chapter 10.

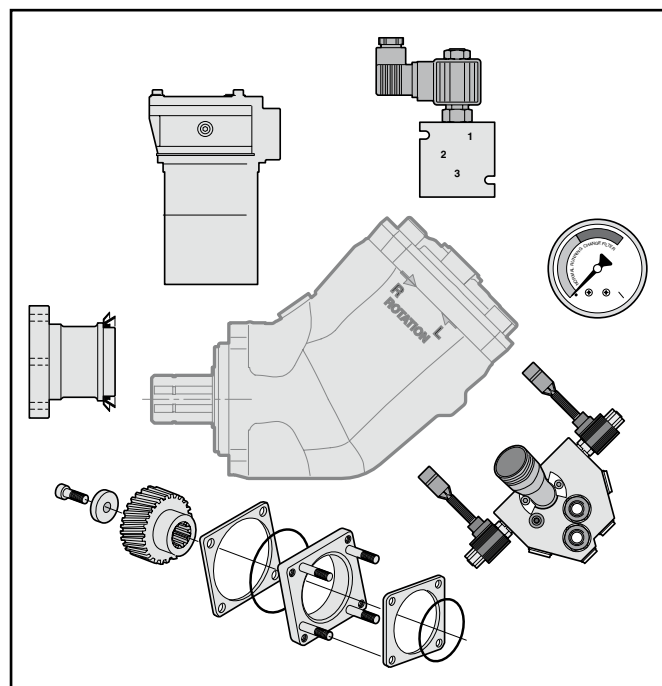
#### Unloading valve

BPV-VP1, BPV-L.  
See chapter 10.

#### Accessories

Universal PTO air valve kits, PTO adapter kits for engines, cardan shafts, pump couplings and mounting brackets, and splitter boxes (SB 1-1,18, 1-1,54)

See chapter 11.



# Pump and Line selection

Installation guide lines for  
F1, F2, T1  
and VP1 pumps

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## Pump selection

### F1 and T1

The following table shows pump flow at selected PTO gear ratios and engine rpm's.

PTO gear ratio	Engine speed [rpm]	Pump flow [l/min]						
		F1-25	F1-41	T1-51	F1-61	T1-81	F1-101	T1 121
1:0.8	800	16	26	33	38	52	66	76
	900	18	29	37	43	59	74	85
	1000	20	33	41	48	65	82	95
	1100	23	36	45	52	72	91	104
	1200	25	39	49	57	78	99	114
1:1.0	800	20	33	41	48	65	82	95
	900	23	37	46	54	73	93	107
	1000	26	41	51	60	82	103	119
	1100	28	45	56	65	90	113	130
	1200	31	49	61	71	98	123	142
1.1.25	800	26	41	51	60	82	103	119
	900	29	46	57	67	92	116	133
	1000	32	51	64	74	102	129	148
	1100	35	56	70	82	111	141	163
	1200	38	61	77	89	122	154	178
1:1.5	800	31	49	61	71	98	123	142
	900	35	55	69	80	110	139	160
	1000	38	61	77	90	122	154	178
	1100	42	67	84	98	135	170	196
	1200	46	74	92	107	147	185	213

**NOTE:**

- Make sure max torque and bending moment (due to the weight of the pump) of the utilised PTO are not exceeded. (The approx. center of gravity of the various pump sizes are shown in the installation drawings).
- Make sure max allowed output torque from the PTO is not exceeded.
- Contact Parker Hannifin if the inlet (suction) pressure is believed to be less than 1.0 bar (absolute); insufficient inlet pressure can cause noise and pump damage because of cavitation.

**Flow and torque formulas** (no regard to efficiency)

$$\text{Flow: } Q = \frac{D \times n}{1000} \text{ [l/min]}$$

where: D is pump displacement [cm<sup>3</sup>/rev]  
 n is shaft speed [rpm]

$$\text{Torque: } M = \frac{D \times p}{63} \text{ [Nm]}$$

where: D is pump displacement [cm<sup>3</sup>/rev]  
 p is utilised pressure [bar]

A suitable pump size for a truck application can be selected as follows:

**Operating conditions**

As an example, a cargo crane specifies:

- Flow: 60-80 l/min
- Pressure: 230 bar
- Diesel engine speed  $\approx$  800 rpm

**Determine pump speed**

As example a PTO with a Gear Ratio of 1:1.54.

The pump speed will be:

- $800 \times 1.54 \approx 1200$  rpm

**Select a suitable pump size**

Use diagram 1 and select a pump that will provide 60 - 80 l/min at 1200 rpm.

Follow line 'a' (1200 rpm) until it crosses line 'b' (70 l/min).

- F1-61 is a suitable choice

**Required input torque**

Make sure the PTO and the gear-box tolerates the pump torque. Use diagram 2 to obtain the required pump torque.

Follow a line from 'c' (230 bar) until it crosses the F1-60 line (the selected pump).

- Read 220 Nm (at 'd')

**NOTE:** A rule-of-thumb is to select the highest PTO ratio and the smallest pump size that meets the crane specification without exceeding the pump speed, pressure, and power limitations.

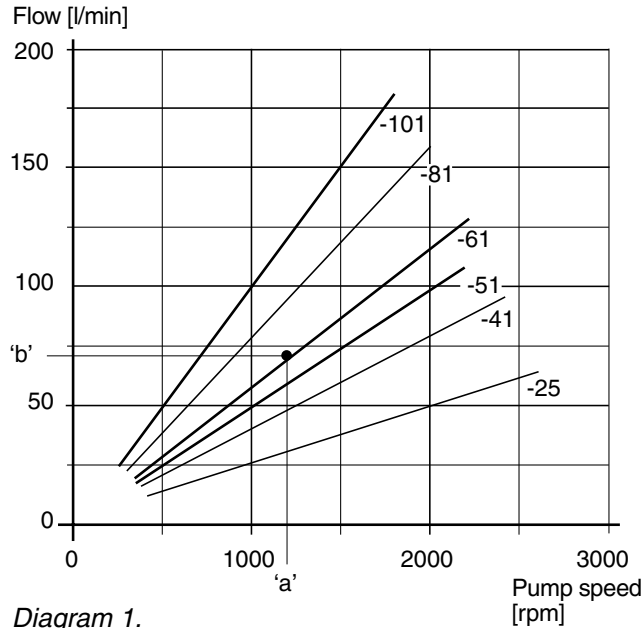


Diagram 1.

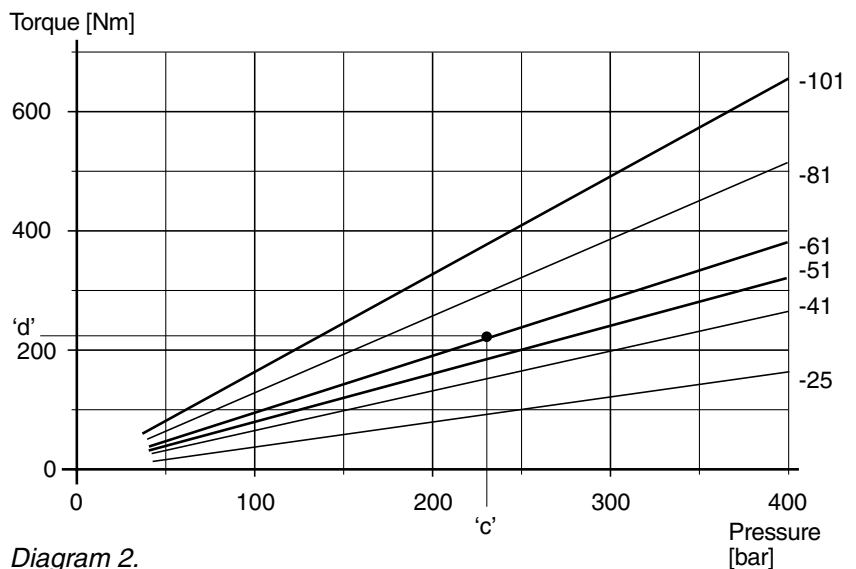


Diagram 2.

**Line selection**  
**all pumps**

Line type	Flow velocity [m/s]
Inlet (suction)	max 1.0
Outlet (pressure)	max 5.0

Flow rate [l/min]	Flow velocity [m/s] at selected line sizes [mm/inches]					
	19 / 3/4"	25 / 1"	32 / 1 1/4"	38 / 1 1/2"	51 / 2"	64 / 2 1/2"
25	1.5	0.8	0.5	0.4	0.2	0.1
50	2.9	1.7	1.0	0.7	0.4	0.3
75	4.4	2.5	1.6	1.1	0.6	0.4
100	(5.9)	3.4	2.1	1.5	0.8	0.5
150	(8.8)	(5.1)	3.1	2.2	1.3	(0.8)
200	-	-	4.1	2.9	1.6	1.0

Inlet (suction) line

Table 1. Outlet (pressure) line

In order to obtain sufficient inlet (suction) pressure to the pump, low noise level and low heat generation, flow speeds shown in table 2, right, should not be exceeded.

From table 1 (page 12), select the smallest line dimension that meets the flow speed recommendation; example:

- At 100 l/min, a 50 mm suction line and a 25 mm pressure line is needed.

**NOTE:** Long inlet (suction) lines, low inlet pressure (caused by e.g. a reservoir positioned below the pump) and/or low temperatures may require larger line dimensions.

Alternatively, the pump speed will have to be lowered to avoid pump cavitation (which may cause noise, deteriorating performance and pump damage).

Line type	Flow velocity [m/s]
Inlet (suction)	max 1.0
Outlet (pressure)	max 5.0

Table 2.

**Nomogram**

Flow - Line dimension - Flow velocity

Example 1  
 Pressure line  
 Q = 65 l/min  
 d = 3/4"  
 v = 3.8 m/s

Example 2  
 Suction line  
 Q = 50 l/min  
 v = 0.8 m/s  
 d = 1 1/2"

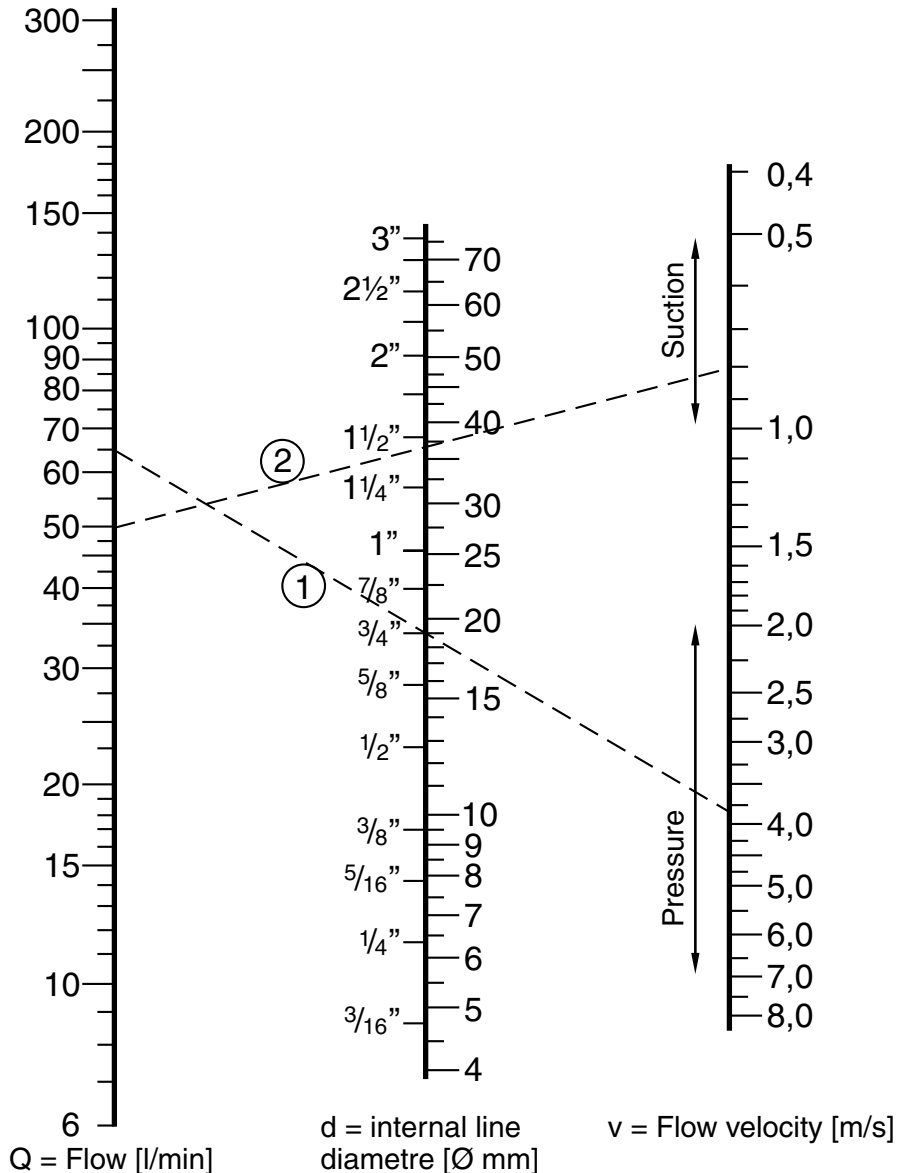


Table 3.

# F1 Pump

## F1-ISO



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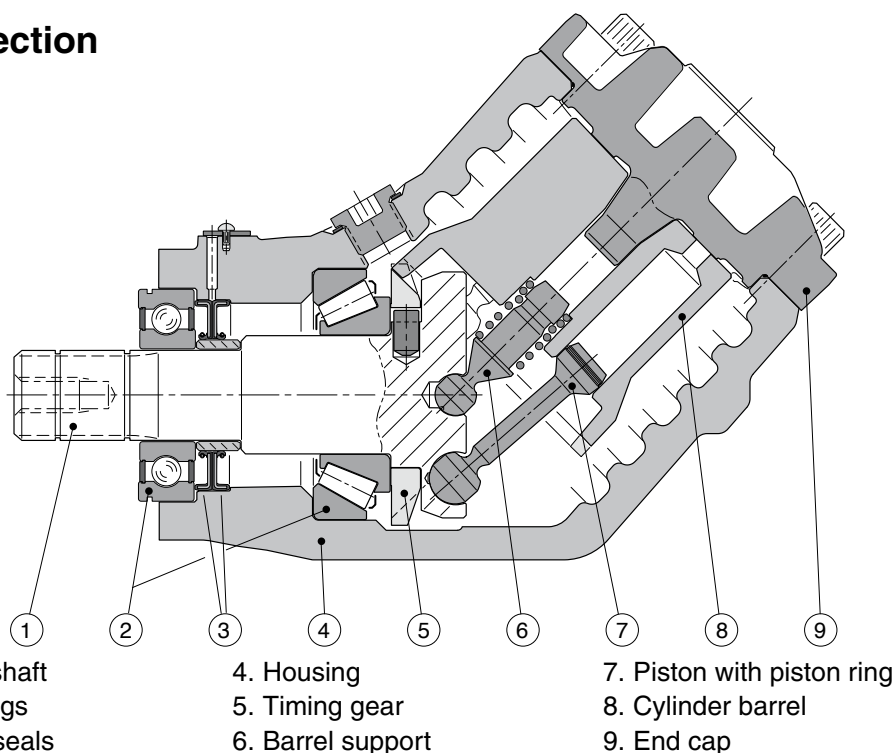
## F1-25 to -101, ISO Specifications

F1 frame size	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]						
at 350 bar	67	98	112	131	163 <sup>3)</sup>	185 <sup>3)</sup>
at 400 bar	56	86	97	113	143	160
<b>Max operating pressure</b> [bar]						
continuous	350					350
intermittent	400					400
<b>Shaft speed</b> [rpm]						
- short circuited pump (low press.)	2700	2700	2700	2700	2300	2300
- max speed at 350 bar <sup>2)</sup>	2600	2400	2200	2200	2000 <sup>3)</sup>	1800 <sup>3)</sup>
at 400 bar <sup>2)</sup>	2200	2100	1900	1900	1750	1550 <sup>3)</sup>
<b>Torque</b> <sup>1)</sup> [Nm]						
at 350 bar	142	227	284	331	453	572
at 400 bar	163	260	324	378	518	653
<b>Input power</b> [kW]						
- continuous	31	46	52	61	76	86
- intermittent <sup>4)</sup>	39	57	66	76	95	108
<b>Weight</b> [kg]	8.5	8.5	8.5	8.5	12.5	12.5

- 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) Valid with 2 1/2" inlet (suction) line.  
 With 2" suction line: F1-81 – max 1400 rpm (Q≈120 l/min);  
 F1-101 – max 1000 rpm (Q≈120 l/min).
- 4) Max 6 seconds in any one minute.

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

### Pump cross section

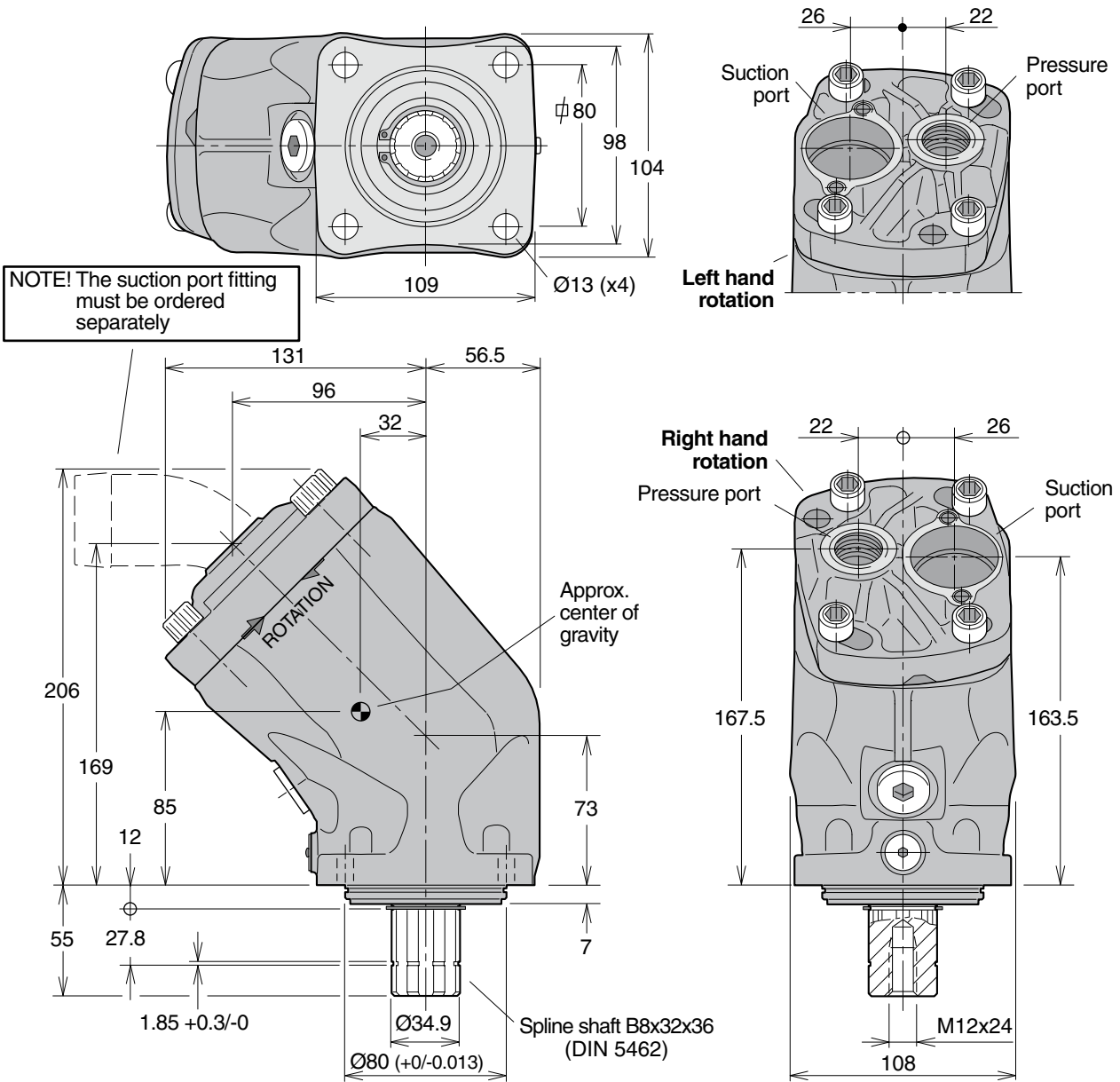


1. Input shaft
2. Bearings
3. Shaft seals

4. Housing
5. Timing gear
6. Barrel support

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

**Installation dimensions, 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

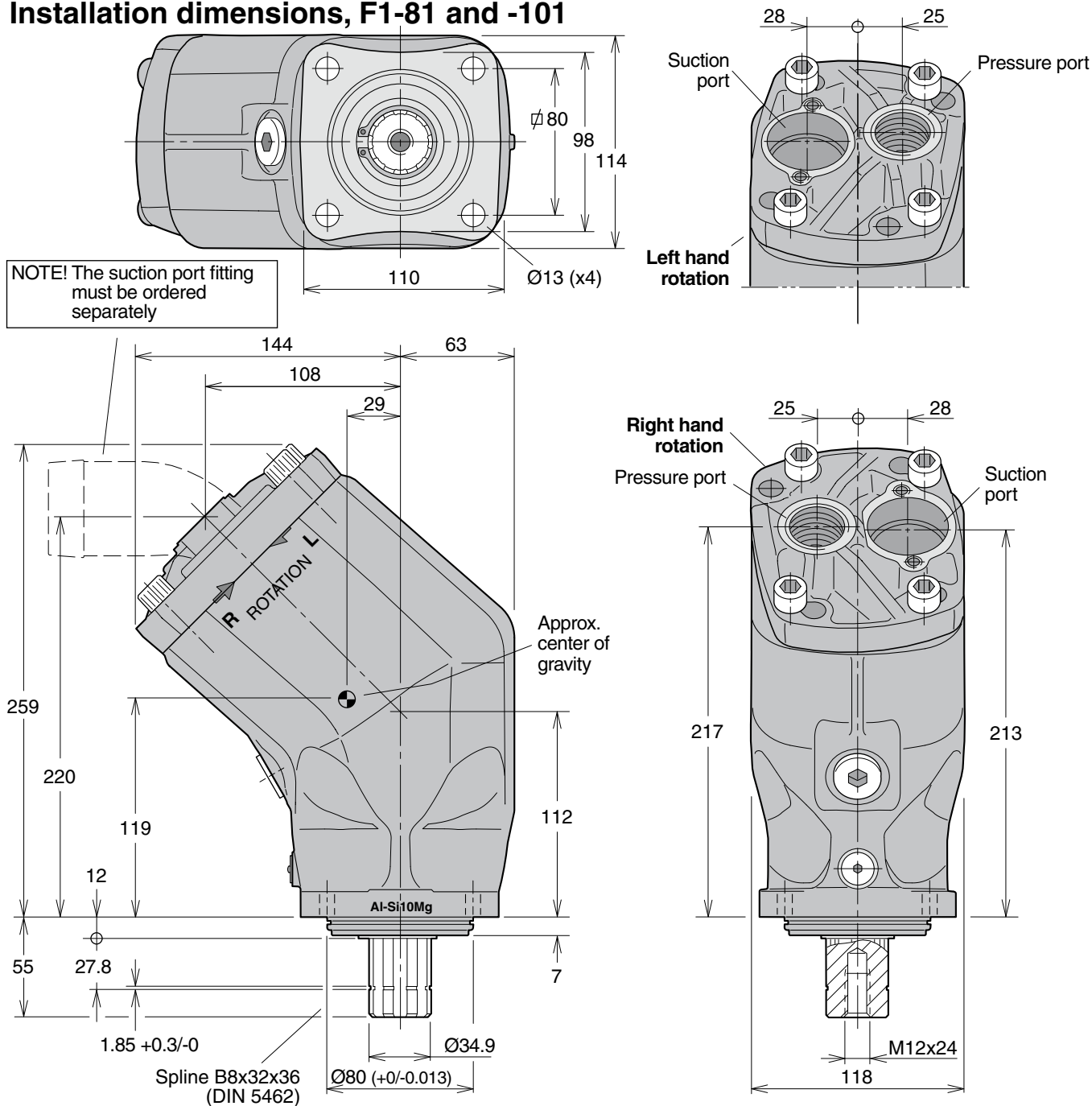
**NOTE:** The F1 pump **does not** include a suction fitting; it must be ordered separately. See chapter 9.

**Standard versions**

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



**Installation dimensions, F1-81 and -101**



**Port size**

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

1) BSP thread (fitting not included)

**Standard versions**

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

**NOTE:** The F1 pump **does not** include a suction fitting; it must be ordered separately. See chapter 9.

## F1-12 ISO with BSP port treads

### Specifications

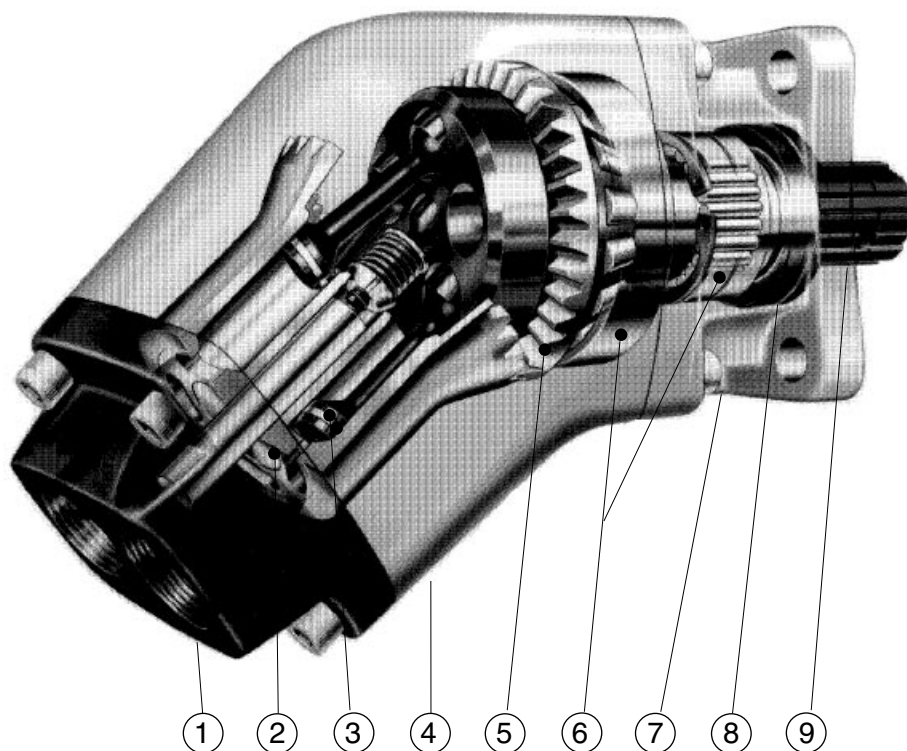
<b>F1 frame size</b>	<b>12</b>
<b>Displacement</b> [cm <sup>3</sup> /rev]	12
<b>Max flow</b> <sup>1)</sup> [l/min]	28
<b>Max operating pressure</b> [bar]	350
<b>Shaft speed</b> [rpm]	
- short circuited pump (low press.)	3100
- max selfpriming speed	2300
<b>Torque</b> <sup>1)</sup> [Nm]	67
<b>Input power</b> [kW]	
- continuous	16.1
- intermittent <sup>2)</sup>	21.7
<b>Weight</b> [kg]	6.7

1) Theoretical values

2) Max 6 seconds in any one minute.

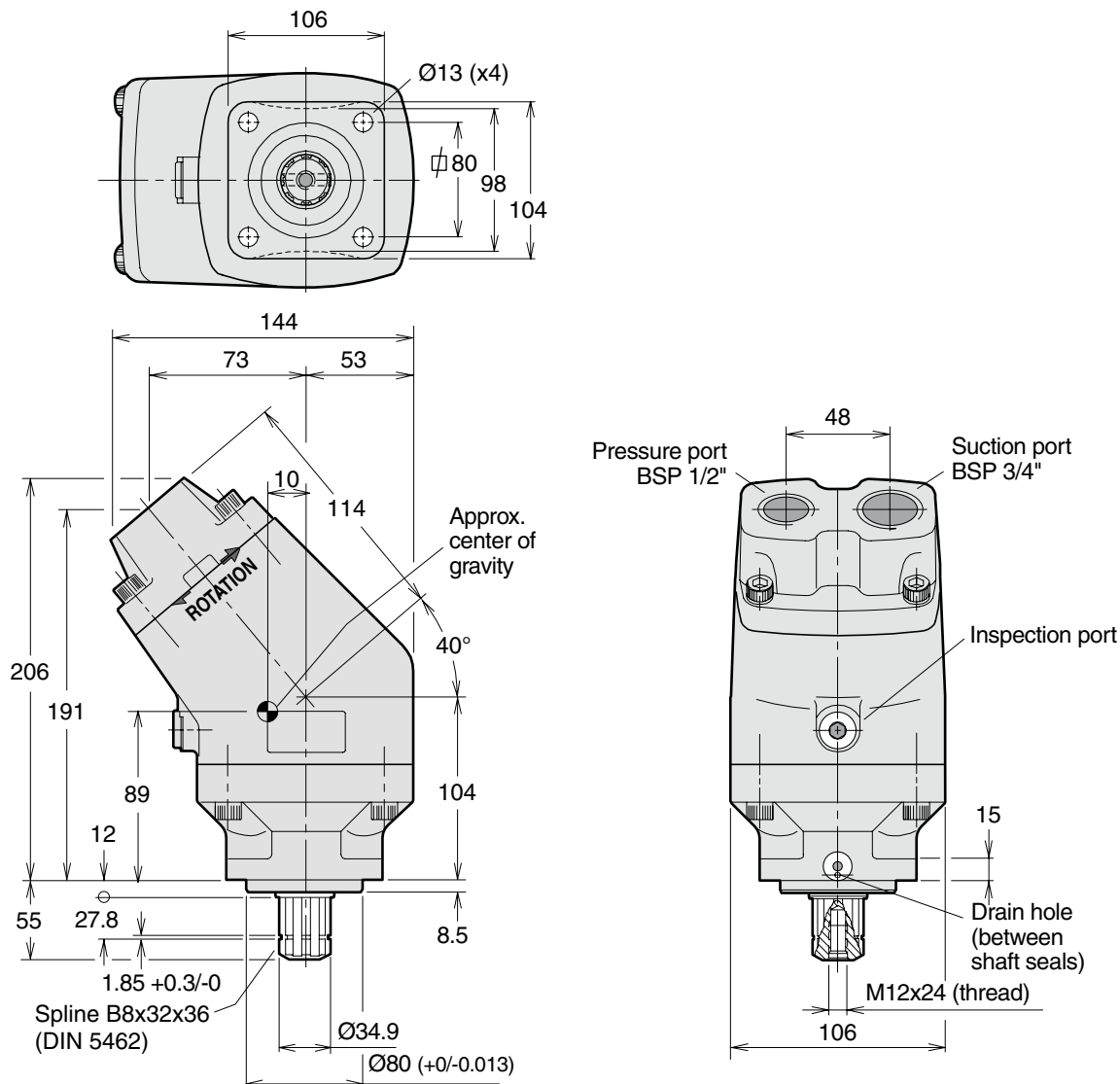
**NOTE:** For noise level information, contact Parker Hannifin

### 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                 |

**Installations dimensions, F1-12 with BSP port treads**



**Ordering code**

Example: **F1- 12 - R**

F1 frame size **12**

Shaft rotation

**R** Right hand

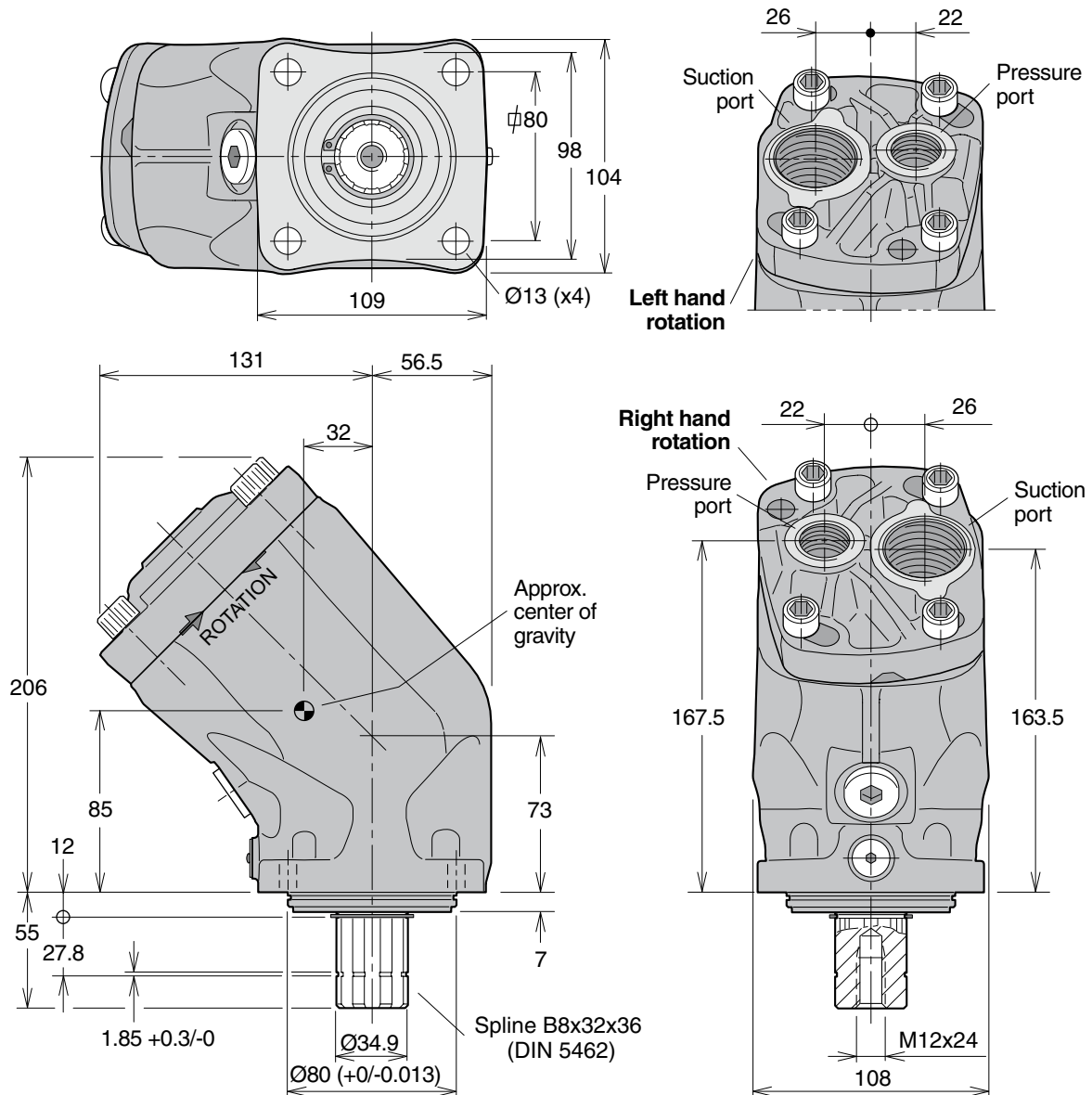
**L** Left hand

**Standard versions**

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

**NOTE:** The F1 pump **does not** include a suction fitting; it must be ordered separately. See chapter 9.

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



**Port size** (all ports are BSP)

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

**Standard versions**

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

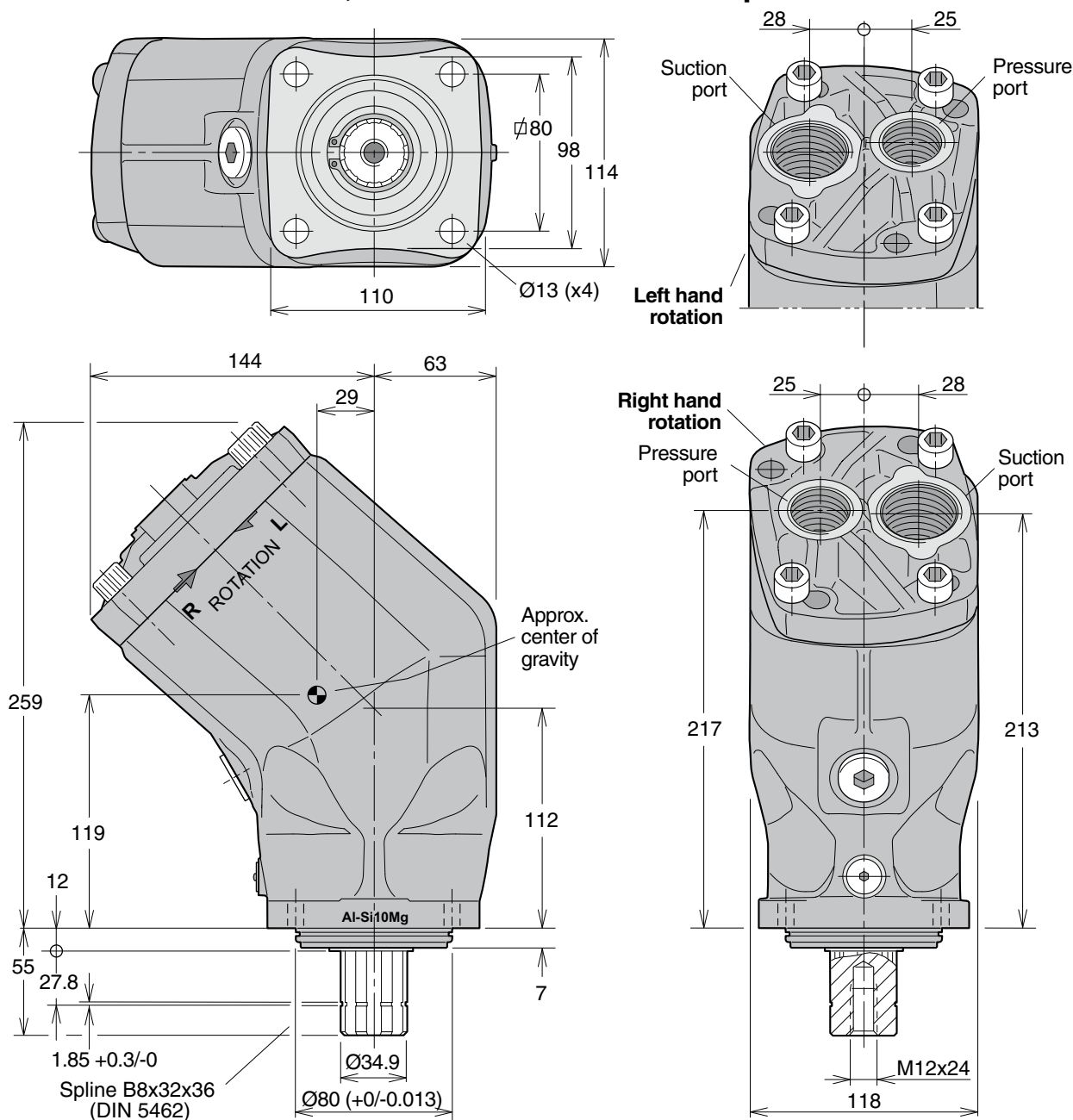
**Ordering code**

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

**Installations dimensions, F1-81 and -101 with BSP port treads**



**Port size** (all ports are BSP)

F1 frame size	Pressure port	Suction port
-81	1"	1 1/4"
-101	1"	1 1/4"

**Standard versions**

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

**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

# F1 Pump

## F1-SAE



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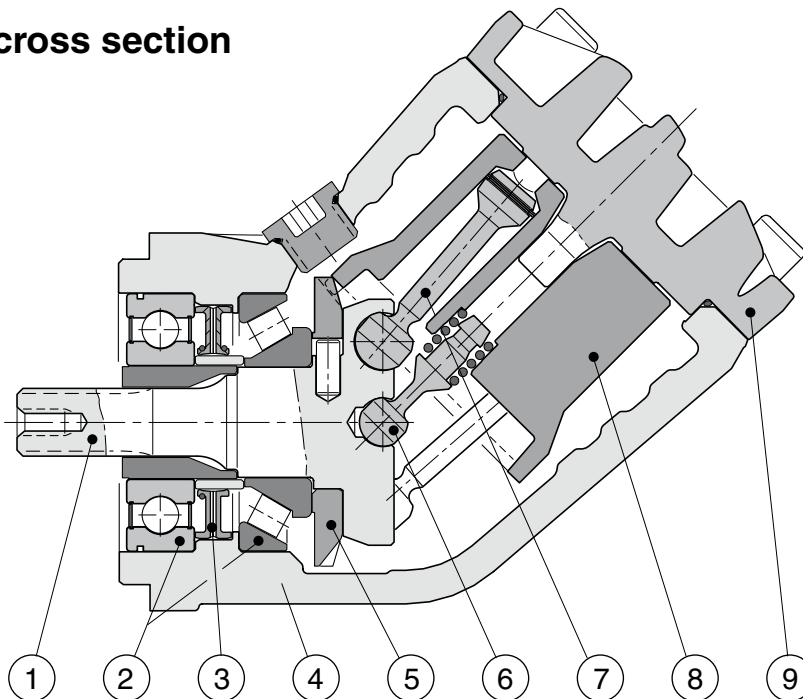
**Specifications**

F1 frame size	25	41	51	61
<b>Displacement</b> [cm <sup>3</sup> /rev] [cu in/rev]	25.6 1.56	40.9 2.50	51.1 3.12	59.5 3.63
<b>Max flow</b> <sup>1)</sup>				
at 350 bar [l/min]	67	98	112	131
at 5000 psi [gpm]	17.7	25.9	29.6	34.6
at 400 bar [l/min]	56	86	97	113
at 5000 psi [gpm]	14.8	22.7	25.6	29.8
<b>Max operating pressure</b>				
continuous [bar]/[psi]	———— 350/5000 ————			
intermittent [bar]/[psi]	———— 400/5800 ————			
<b>Shaft speed</b> [rpm]				
- short circuited pump (low press.)	2700	2700	2700	2700
- max speed at 350 bar <sup>2)</sup> /5000 psi <sup>2)</sup>	2600	2400	2200	2200
at 400 bar <sup>2)</sup> /5800 psi <sup>2)</sup>	2200	2100	1900	1900
<b>Torque</b> <sup>1)</sup>				
at 350 bar [Nm]	142	227	284	331
at 5000 psi [lbf ft]	105	168	210	244
at 400 bar [Nm]	163	260	324	378
at 5800 psi [lbf ft]	120	192	239	279
<b>Input power</b>				
- continuous [kW]	31	46	52	61
[hp]	42	62	70	82
- intermittent [kW] <sup>3)</sup>	39	57	66	76
[hp] <sup>3)</sup>	52	76	88	102
<b>Weight</b> [kg]	8.5	8.5	8.5	8.5
[lbs]	18.7	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.
- 3) Max 6 seconds in any one minute.

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

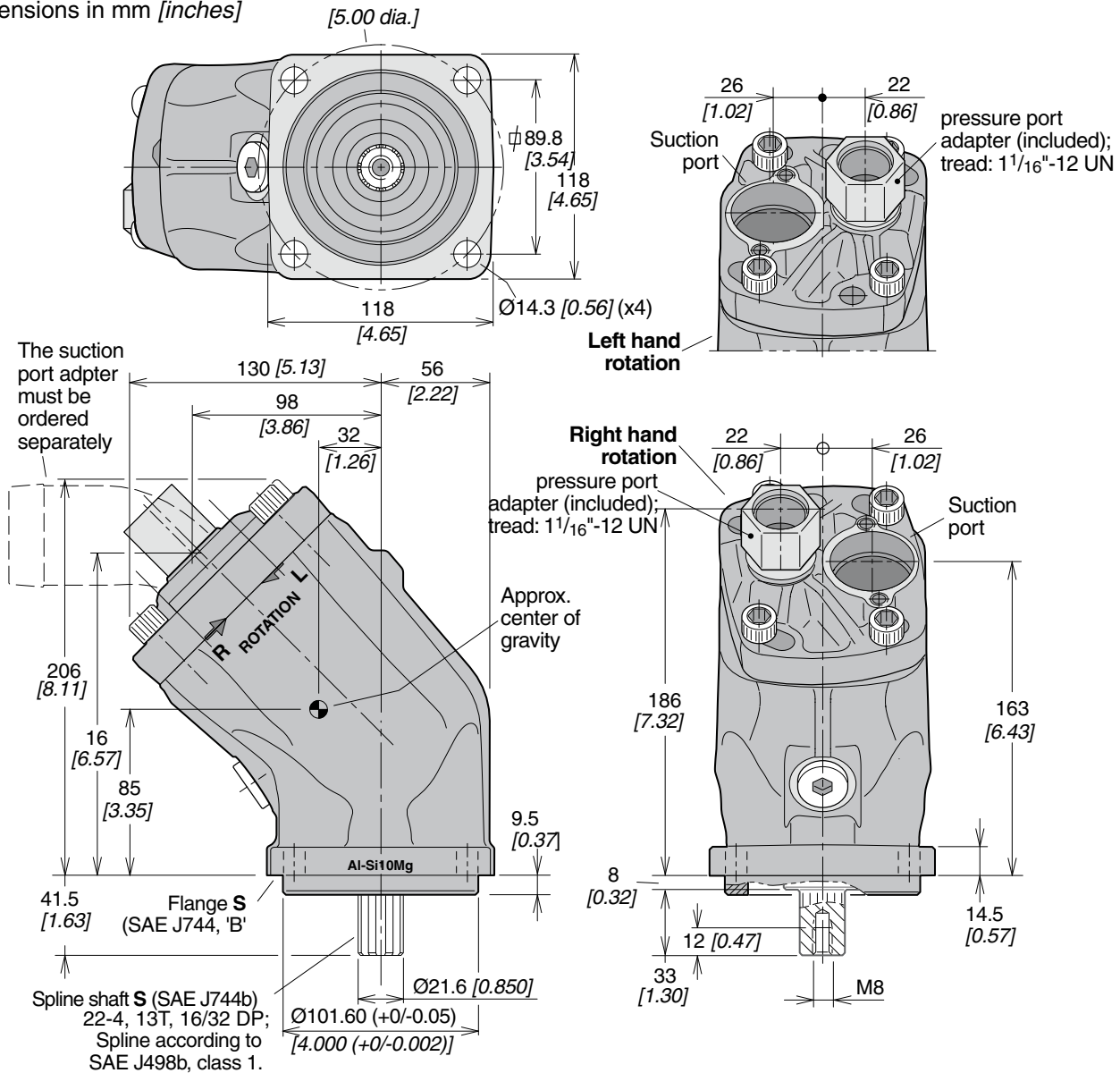
**Pump cross section**



- 1. Input shaft
- 2. Bearings
- 3. Shaft 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)**

Example:

**F1- 61 - R U - S N - S**

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

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

**Port size**

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

1) BSP-to-**SAE** adapter (included).

Shaft end  
**S** SAE spline "B" spline

Shaft seal  
**N** Nitrile

Mounting flange  
**S** SAE "B"

Main port  
**U** SAE O-ring, UN threads

**Standard SAE versions**

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

**NOTE:** The F1 pump **does not** include a suction fitting; it must be ordered separately. See chapter 9.



# F1 Motor



3

4

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Installation and start up .....	61	12

### 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	
- intermittent	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]								
- continuous	20	27	31	34	41	48	51	
- intermittent	26	37	41	44	54	62	67	
<b>Weight</b> [kg]	8.5	8.5	8.5	8.5	12.5	12.5	12.5	

### Ordering code

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

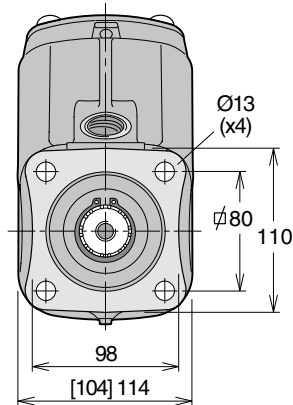
### Port size

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

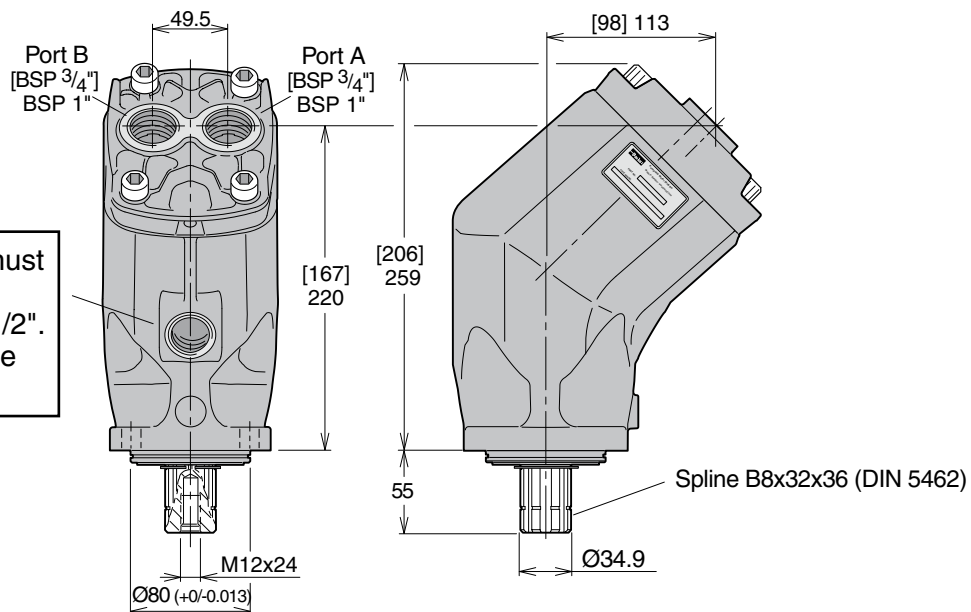
### Standard versions

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

# F2 Twin-flow Pump



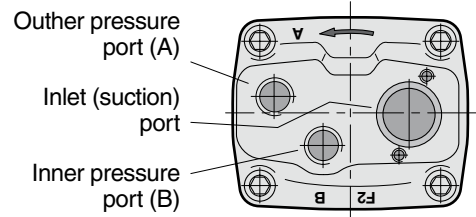
4  
5

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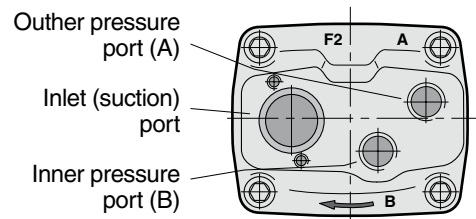
### Specifications

Frame size F2-	42/42	53/53	55/28	70/35
<b>Displacement</b> [cm <sup>3</sup> /rev]				
Port A	43	54	55	69
Port B	41	52	28	36
<b>Max operating pressure</b> [bar]				
continuous	350	350	350	350
intermittent	400	400	400	400
<b>Max shaft speed</b> [rpm]				
(unloaded pump; low pressure)	2550	2550	2550	2550
<b>Max selfpriming speed</b> [rpm]				
Ports A <sup>1)2)</sup> and B <sup>1)2)</sup> pressurised	1800	1800	1800	1800
Port A <sup>2)</sup> unloaded, pressure in port B	2100	2100	2100	2100
<b>Input power</b> [kW]				
Max intermittent <sup>3)</sup>	100	126	100	126
Max continuous	88	110	88	110
<b>Weight</b> [kg]	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

- Valid with 2 1/2" inlet (suction) line;  
 with 2" inlet line: 53/53 and 70/35 max 1 100 rpm  
 42/42 and 55/28 max 1400 rpm. (q≈120 l/min)
- Measured at 1.0 bar abs. inlet pressure.  
**Please note:** A lower inlet pressure affects pump performance.
- Max 6 seconds in any one minute.

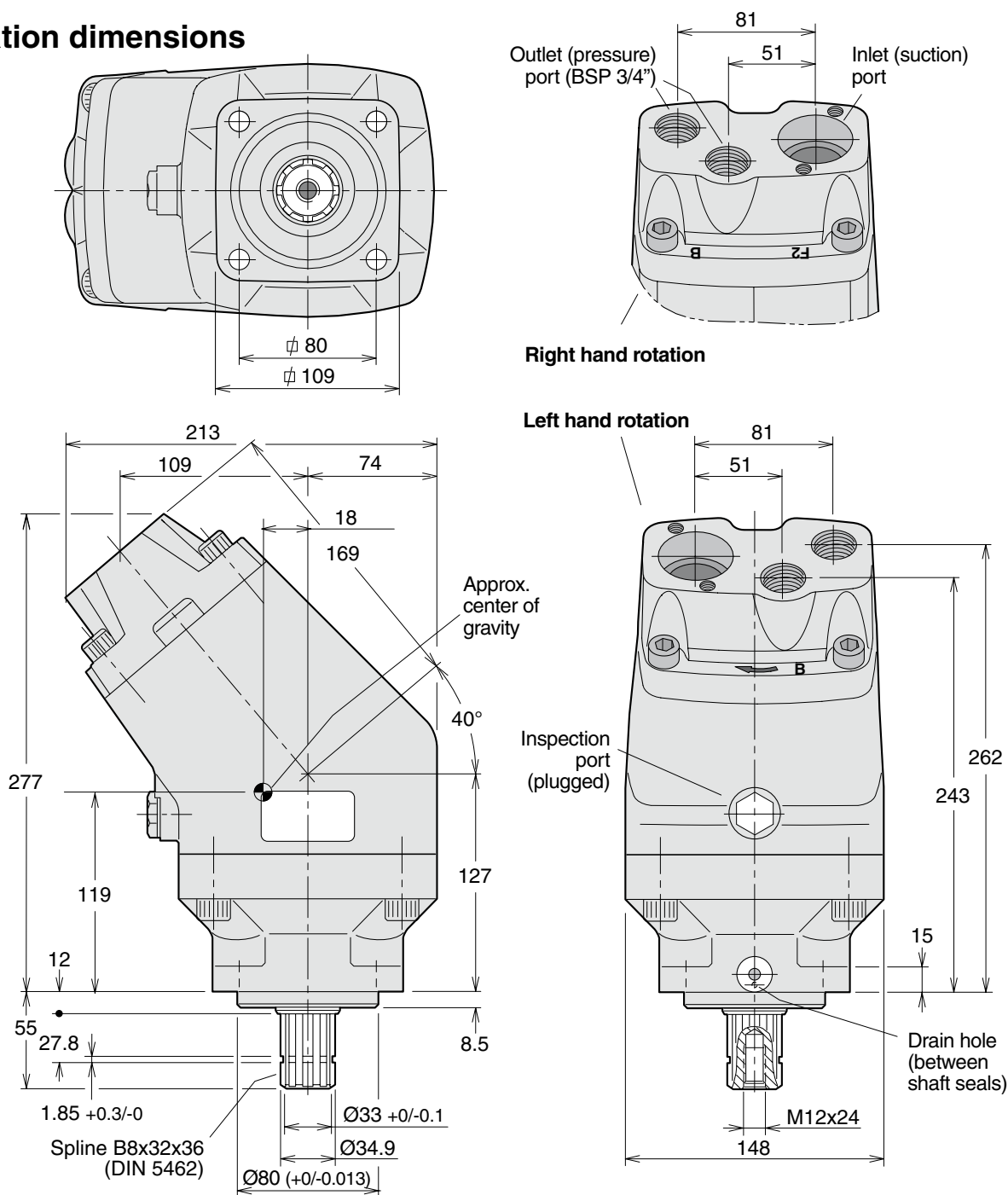
### Flow vs. shaft speed (theoretical)

Pump speed [rpm]	800	1000	1200	1400	1600	1800	1900	2000	2100
<b>F2-53/53 flow</b> [l/min]									
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</b>									
<b>F2-70/35 flow</b> [l/min]									
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</b> [Nm]					
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</b>					
<b>F2-70/35 torque</b> [Nm]					
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>					

**Installation dimensions**



**5**

**Ordering code**

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

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

**42/42**

**53/53**

**55/28**

**70/35**

Direction of rotation

**L** Left hand

**R** Right hand

**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

**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 F2 pump **does not** include a suction fitting; it must be ordered separately. See chapter 9.

# T1 Pump



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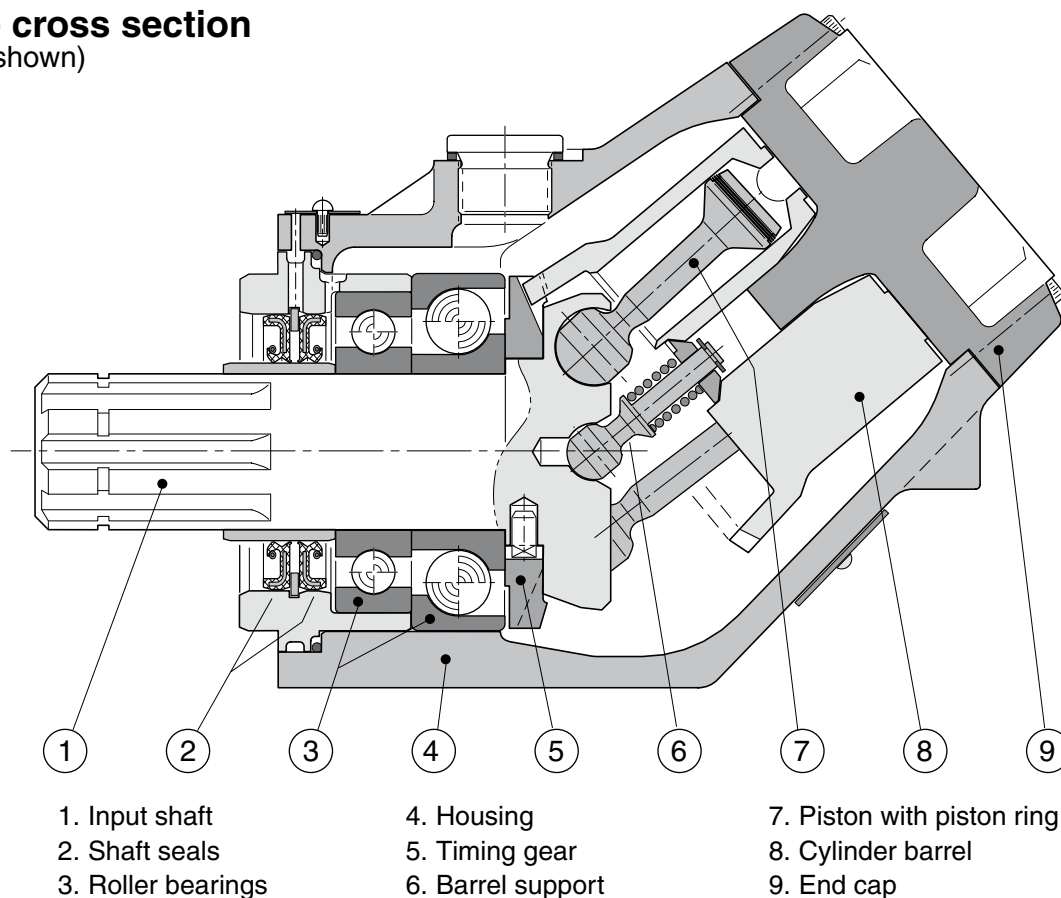
### Specifications

T1 frame size	51	81	121
<b>Displacement</b> [cm <sup>3</sup> /rev]	50.0	81.5	118,5
<b>Max flow</b> <sup>1)</sup> [l/min]	105	163 <sup>3)</sup>	190 <sup>3)</sup>
<b>Max operating pressure</b> [bar]	continuous	200	250
	intermittent <sup>4)</sup>	350	350
<b>Shaft speed</b> [rpm]			
short circuited pump (low press.)	2300	2300	2300
max speed <sup>2)</sup>	2100	2000 <sup>3)</sup>	1600 <sup>3)</sup>
<b>Torque</b> <sup>1)</sup> [Nm]			
at 200 bar	158	258	376
at 350 bar	278	453	658
<b>Input power</b> [kW]			
continuous	27	54	71
intermittent <sup>4)</sup>	34	67	89
<b>Weight</b> [kg]	7.2	8.5	12.5

- 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) Valid with 2 1/2" inlet (suction) line. With 2" suction line:  
 T1-81 – max 1400 rpm (Q≈120 l/min);  
 T1-121 – max 950 rpm (Q≈120 l/min).
- 4) Max 6 seconds in any one minute.

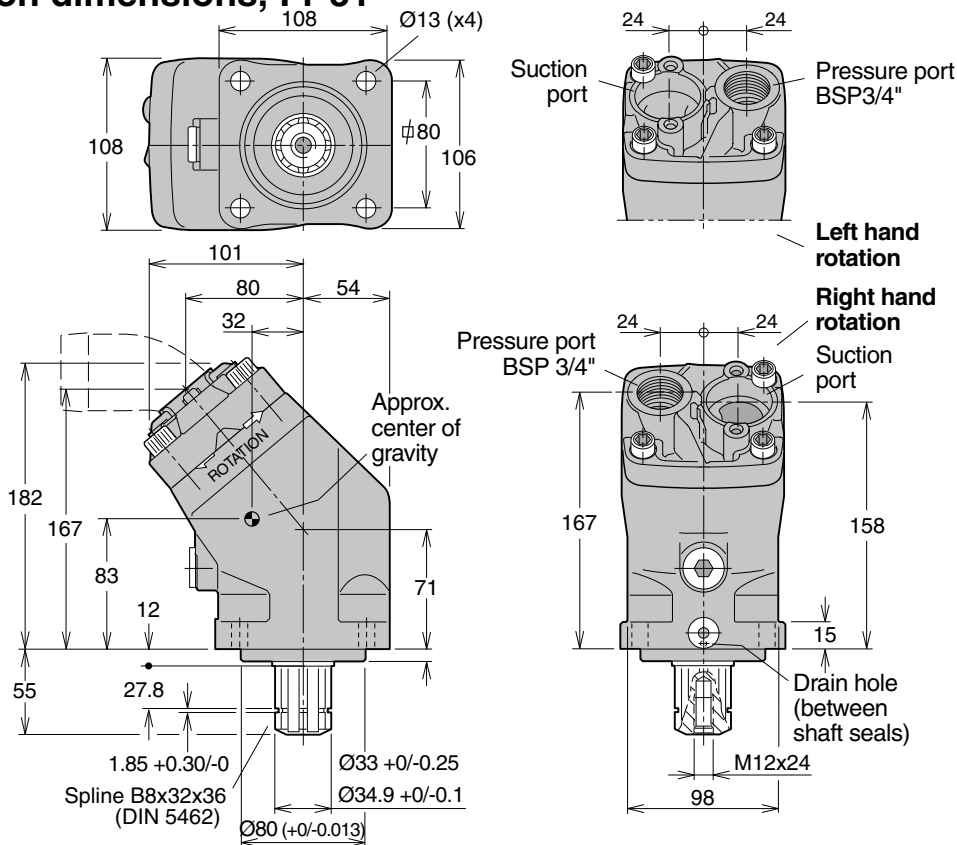
**NOTE:**  
 For noise level information, contact Parker Hannifin.

### Pump cross section (T1-51 shown)

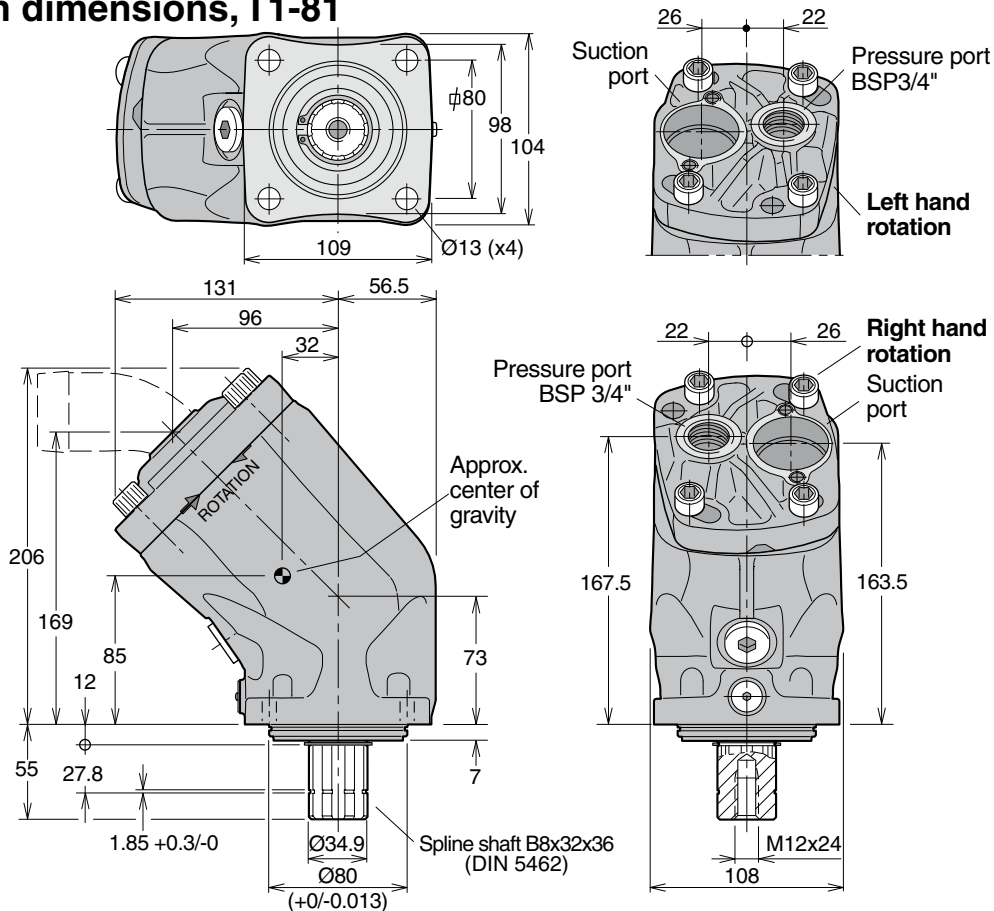


- 1. Input shaft
- 2. Shaft seals
- 3. Roller bearings
- 4. Housing
- 5. Timing gear
- 6. Barrel support
- 7. Piston with piston ring
- 8. Cylinder barrel
- 9. End cap

**Installation dimensions, T1-51**

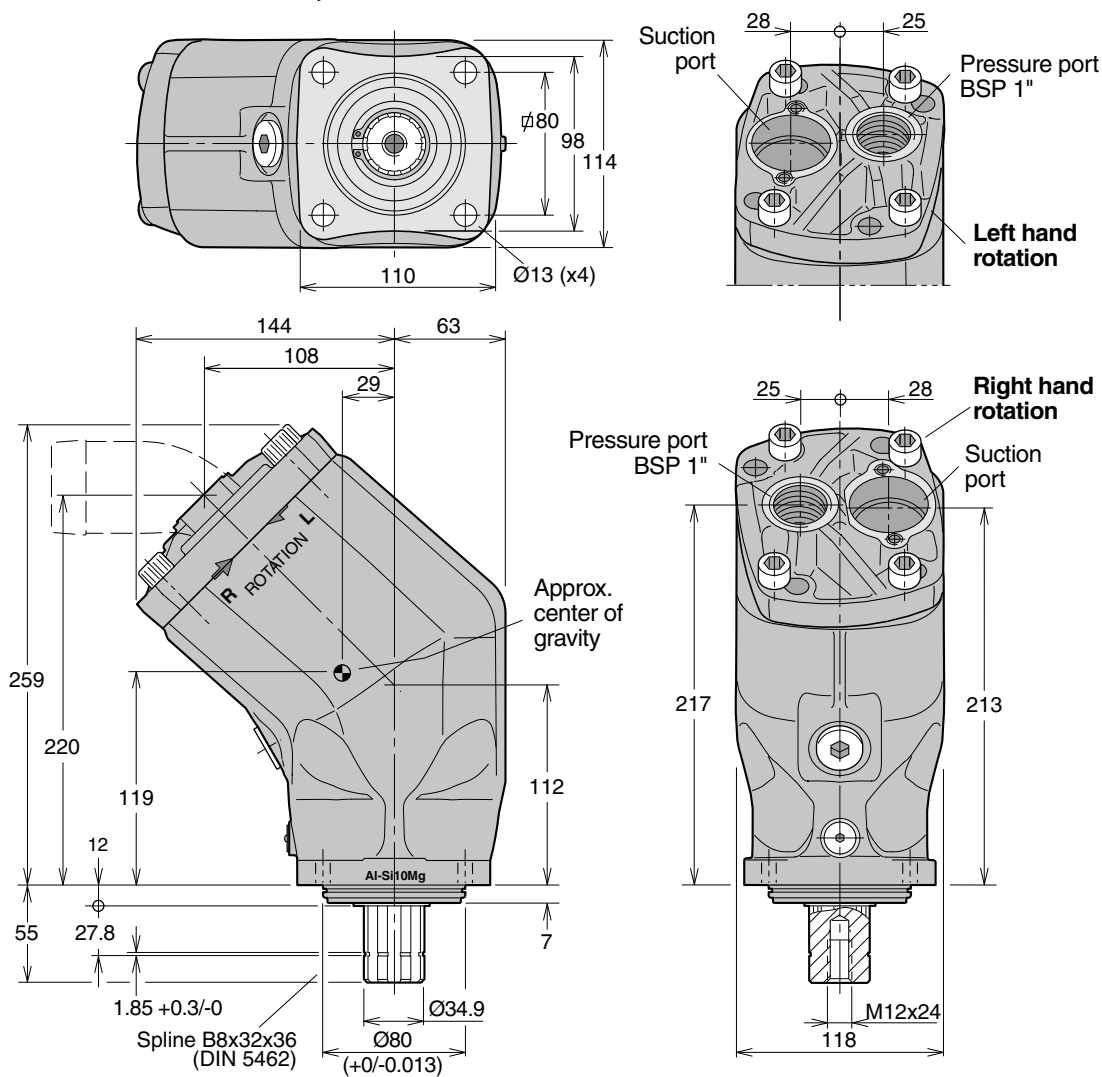


**Installation dimensions, T1-81**





**Installation dimensions, T1-121**



**6**

**Ordering code**

Example:

**T1 - 81 - R**

T1 frame size  
**51, 81 or 121**

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

**Standard versions**

Designation	Ordering no.
T1-51-R	378 2250
-L	378 2251
T1-81-R	378 2180
-L	378 2181
T1-121-R	378 2120
-L	378 2121

**Port size**

T1 frame size	Pressure port <sup>1)</sup>
-51	3/4"
-81	3/4"
-121	1"

1) BSP thread (fitting not included).

**NOTE:** The T1 pump **does not** include a suction fitting; it must be ordered separately. See chapter 9.

# VP1 Pump



## Contents

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### Specifications

Frame size	VP1-45	VP1-75	VP1-120
<b>Max displacement</b> [cm <sup>3</sup> /rev]	45	75	120
<b>Max pressure</b> [bar]			
continuous <sup>1)</sup>	350	350	300
intermittent <sup>2)</sup>	400	400	350
<b>Response time</b> [ms]			
max-to-min	20-30	20-40	20-40
min-to-max	90-120	100-140	100-140
<b>Selfpriming speed</b> <sup>3)</sup> [rpm]			
2" suction line, max	2200	1700	-
2 1/2" suction line, max	2400	2100	1900
<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 _____		

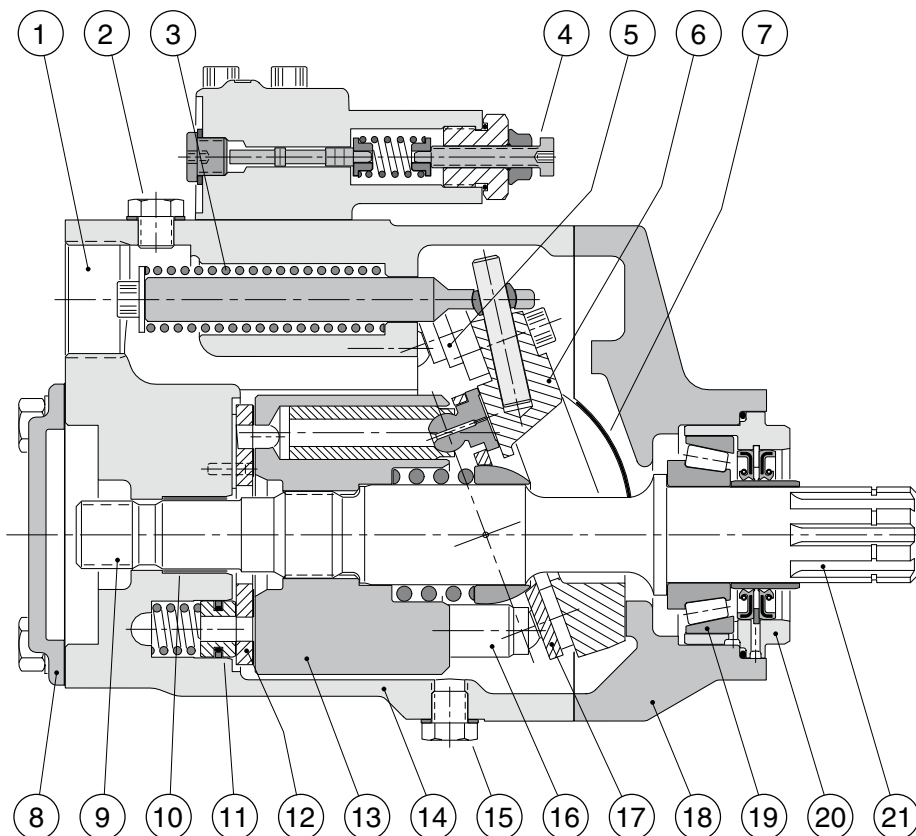
1) Refer to page 36, 'LS control'.

2) Max 6 seconds in any one minute.

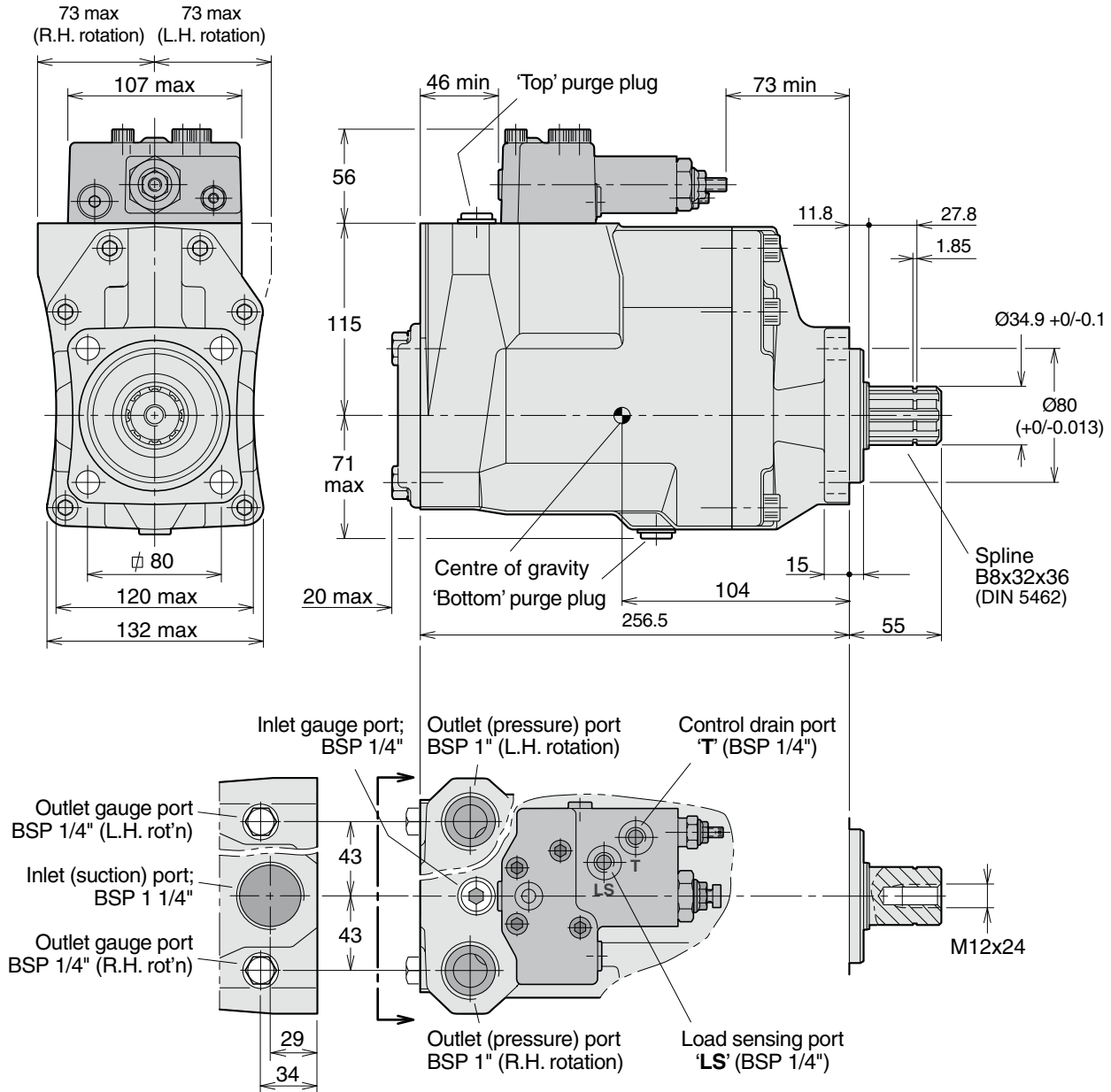
3) At an inlet pressure of 1.0 bar (abs.) with mineral oil at a viscosity of 30 mm<sup>2</sup>/s (cSt).

### VP1-45/-75 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. Bearing sleeve
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 (VP1-45 and -75)**



**IMPORTANT**

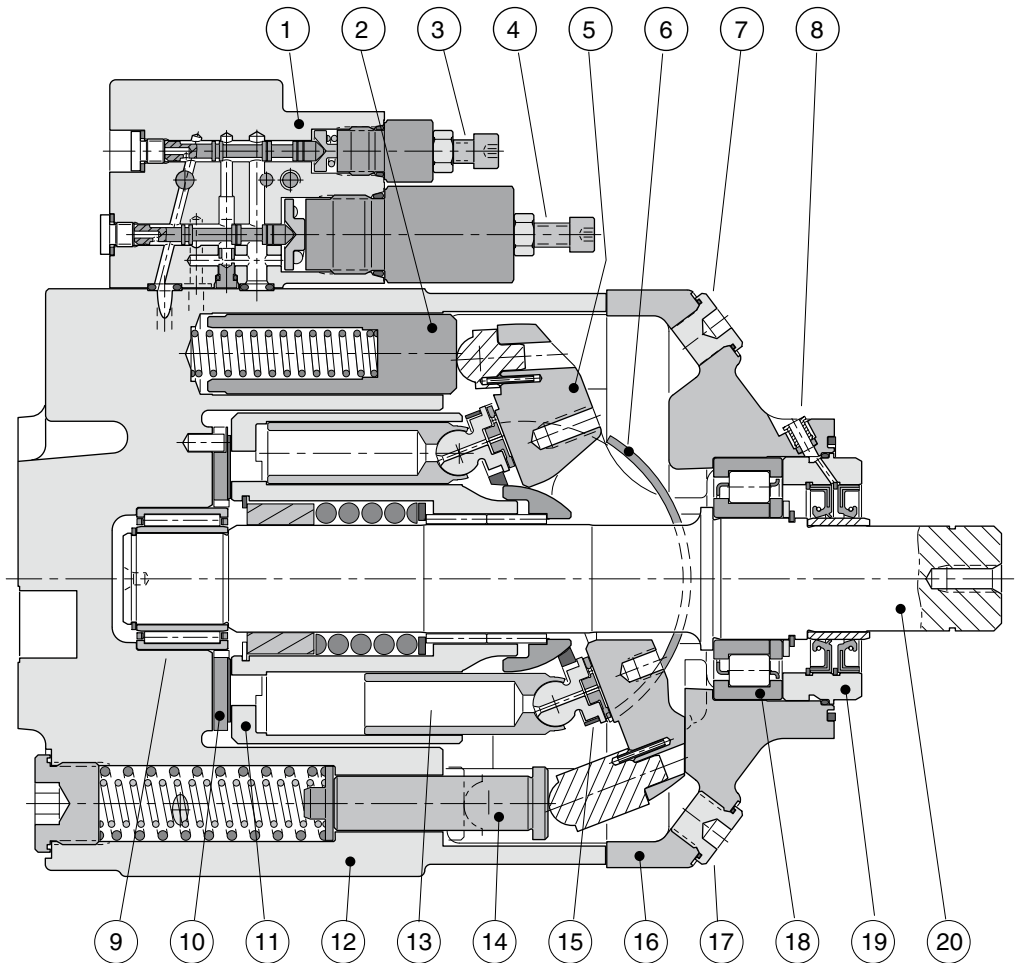
The control is *not* drained through the pump case. An external line *must be installed* between the control drain port 'T' and the reservoir.

**NOTE:**

The F1 pump **does not** include a suction fitting; it must be ordered separately. See chapter 9.

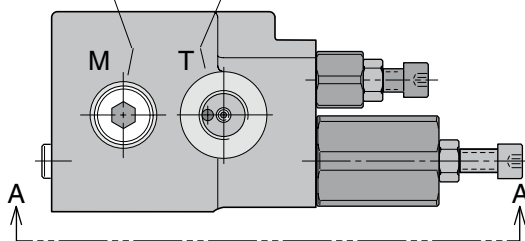
**VP1-120 cross section**

1. Control
2. Setting piston
3. Setting screw for LS control
4. Setting screw for pressure relief
5. Swash plate
6. Bearing shell
7. Purge plug
8. Drain for shaft seal
9. Needle bearing
10. Valve plate
11. Cylinder barrel
12. Barrel housing
13. Piston with piston shoe
14. Setting piston
15. Retainer plate
16. Bearing housing
17. Purge plug
18. Roller bearing
19. Shaft seals with carrier
20. Shaft

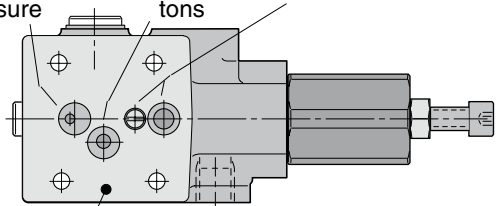


**Control type LS (for VP1-120)**

Gauge port, high pressure (G 1/4")    Direct connection to reservoir (G 3/8")



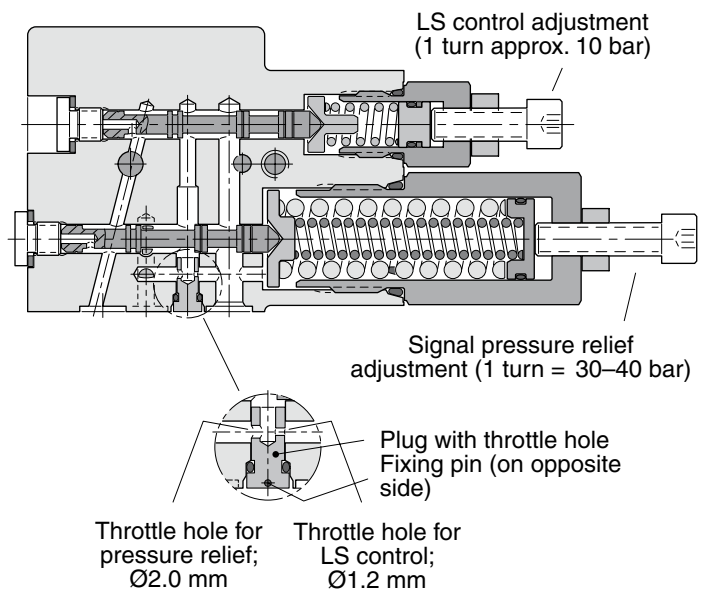
Port from high pressure    Port to other setting pistons    (No connection in pump housing)



To pump housing    Conn. LS (G 1/4")

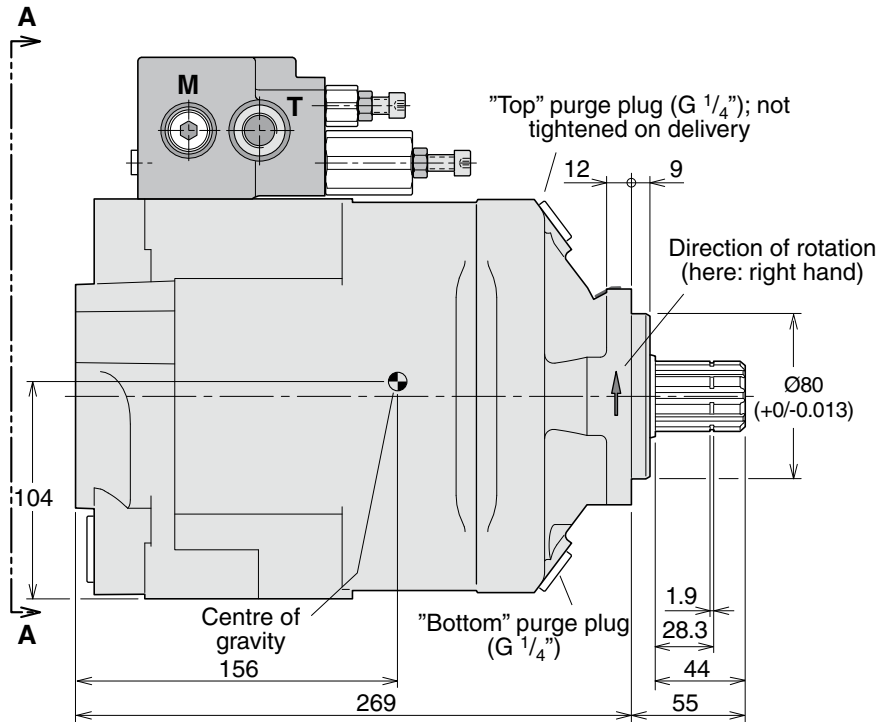
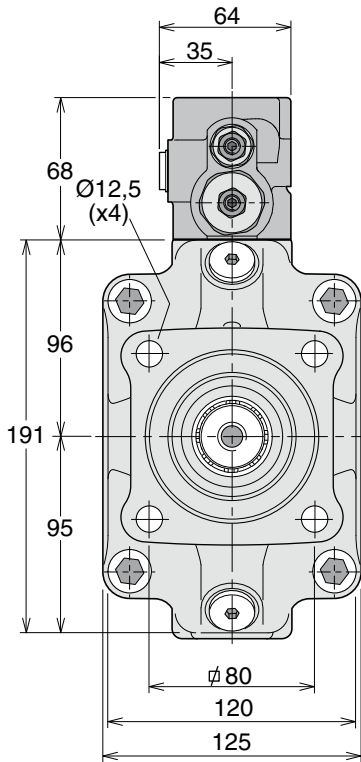
**View A-A**

**Cross section of VP1-120 control.**



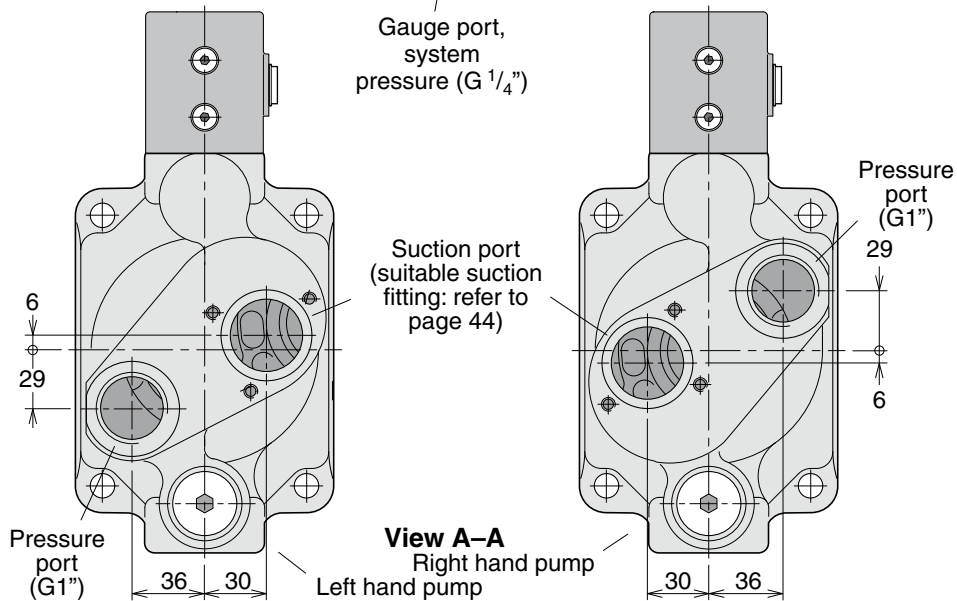
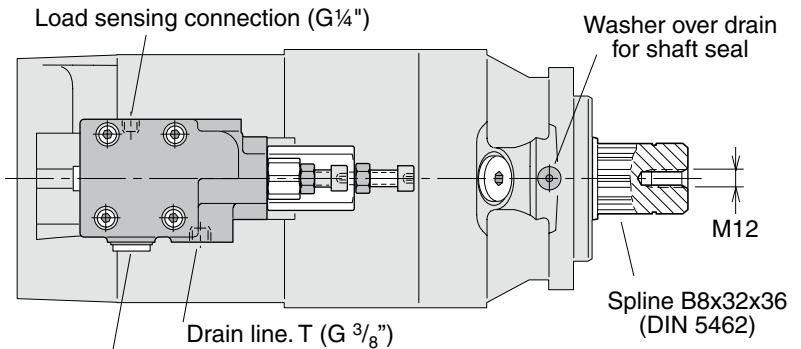
**Note:** See also the schematic on page 42.

**Installation dimensions (VP1-120)**



**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 F1 pump **does not** include a suction fitting; it must be ordered separately. See chapter 9.



### Ordering information

Example: **VP1 - 045 - L**

Frame size   

**45, 75 or 120**

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.
VP1-045-R	378 0334
VP1-045-L	378 0335
VP1-075-R	378 0336
VP1-075-L	378 0337
VP1-120-R	378 3182
VP1-120-L	378 3183

### 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.

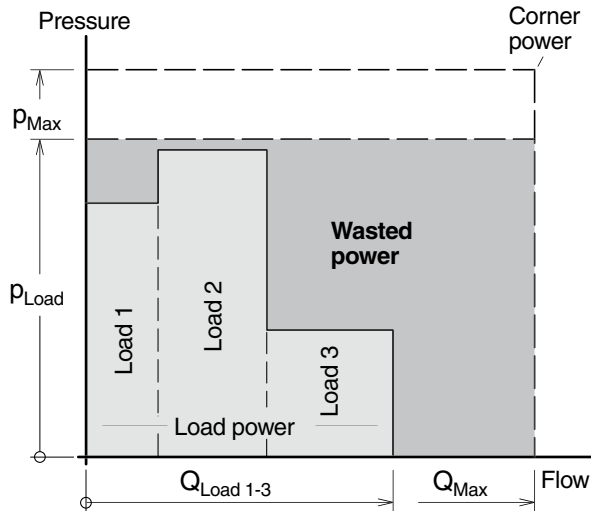


Diagram 1. Constant flow system with a fixed displacement pump.

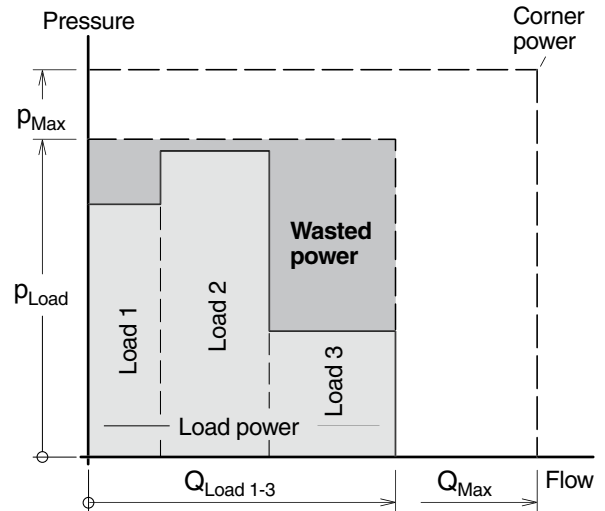


Diagram 2. Constant flow system with a variable displacement pump (e.g. VP1).

### Systems comparison

System 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.



## VP1-LS load sensing control

The VP1 pump with LS control can be used with any load sensing directional valve on the market.

The control governs the pump flow to the main hydraulic system as determined by the pressure differential,  $\Delta p$ , between the pump pressure and the LS load signal pressure.

At a certain 'opening' of the directional valve, the pump flow is kept constant (up to max specified rpm and pressure limits of the pump) even if the pump pressure changes due to increasing or decreasing work load.

The LS control (fig. 2) consists of a valve body, which installes on the main pump housing, a built-in spool-type load sensing control, and a pressure relief valve limiting the LS signal pressure. Both functions are adjustable.

The two-position, three-way spool valve is connected to

system pressure, the LS load signal and the two setting pistons (fig. 1).

In the no-flow mode, the pump maintains a stand-by pressure as determined by the setting of the valve spring (there is no pressure in the LS signal line from the directional valve).

The pressure limiter consists of a cartridge valve (fig. 2); the setting limits the LS signal pressure.

## LS load sensing control function VP1-45/75

Refer to the hydraulic schematic (fig. 1).

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

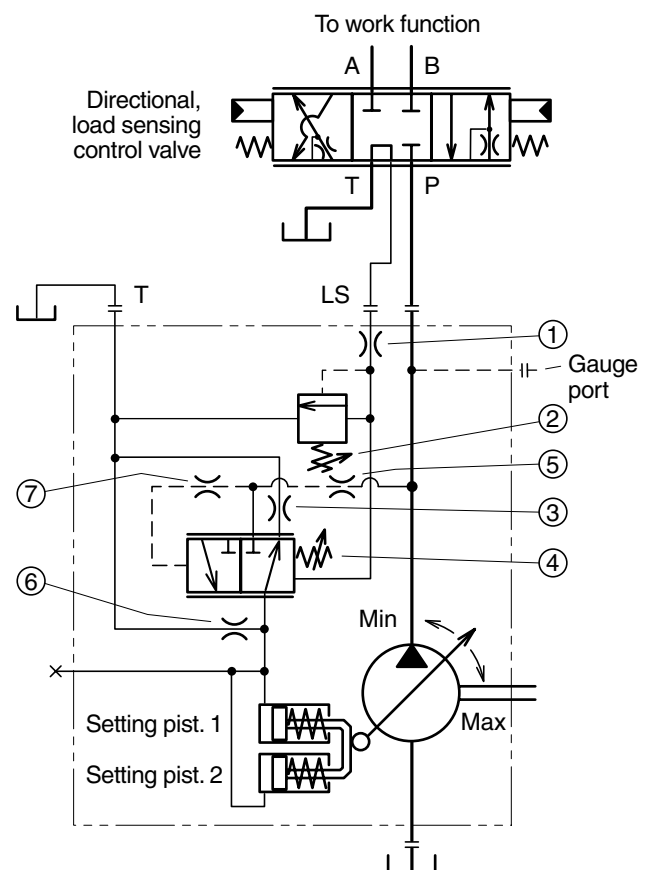
The cartridge is factory set at 350 bar but is adjustable from 275 to 350 bar.

### LS load sensing valve

From factory, the  $\Delta p$  is set at 25 bar but is adjustable up to 35 bar.

The 25 bar setting and the standard orifice sizes shown in fig. 2 will usually provide an acceptable directional valve characteristic as well as system stability.

For additional information, contact Parker Hannifin.



1. Load signal orifice (1.0 mm; fixed)
2. Signal pressure limiter adjustment
3. Return line nozzle (0.6 mm)
4. Differential pressure ( $\Delta p$ ) adjustment
5. System pressure dampening nozzle (2.0 mm)
6. Bleed-off nozzle (0.6 mm)
7. Dampening nozzle (fixed)

Fig. 1. Hydraulic schematic.



### LS valve block VP1-45/75

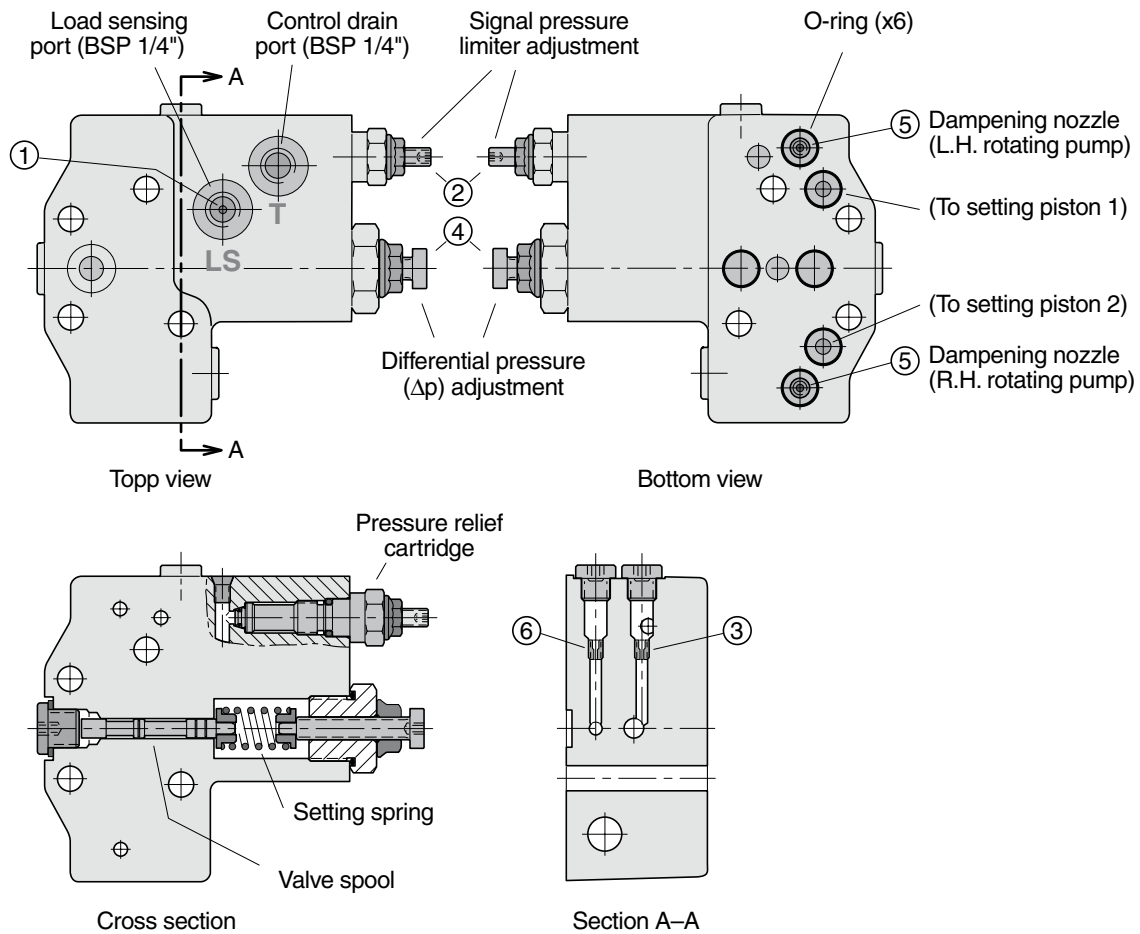


Fig. 2. LS valve block.

### 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.

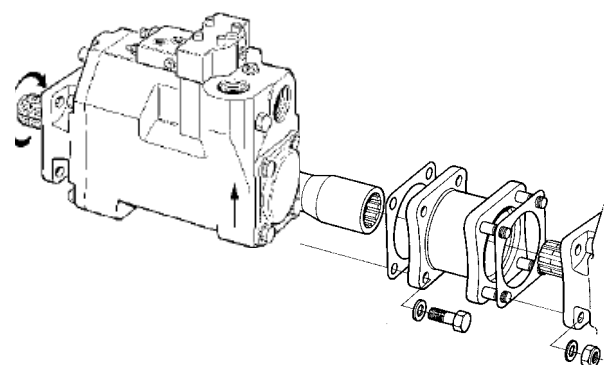


Fig. 3. Adaptor kit (P/N 379 7795) for tandem coupling.

#### IMPORTANT

Contact Parker Hannifin for additional information when considering tandem mounting a second VP1 pump.

**LS load sensing control function VP1-120**

Refer to the hydraulic schematic on the right.

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  $\Delta p$  over the spool and, consequently, also a pressure differential 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 and the forces acting on the valve spool are equal.

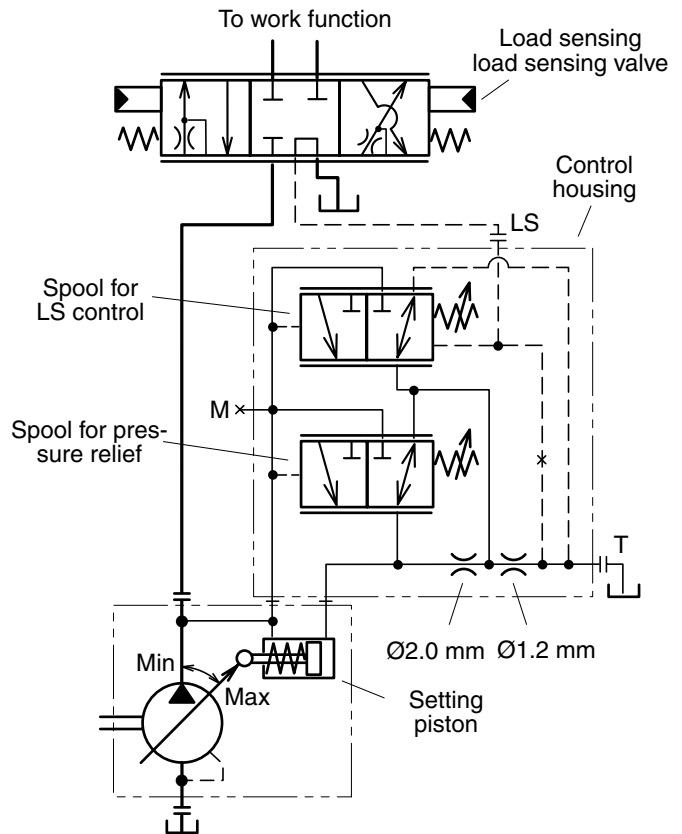
If there is no LS signal pressure (e.g. when the directional valve is in the neutral position) the pump only delivers sufficient flow to maintain the standby pressure as determined by the setting.

**Control adjustments**

- Signal pressure limiter  
 The valve is factory set at 300 bar but is adjustable to 350 bar.
- Standby pressure  
 $\Delta p$  is factory set at 35 bar but is adjustable between 28 to 40 bar.

The 35 bar setting and the standard orifice sizes shown (see also "Control type LS"), will usually provide an acceptable directional valve characteristic as well as physical system stability.

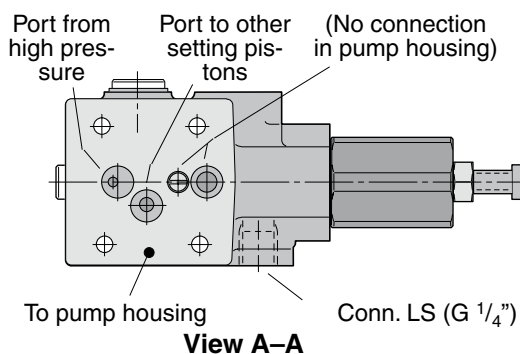
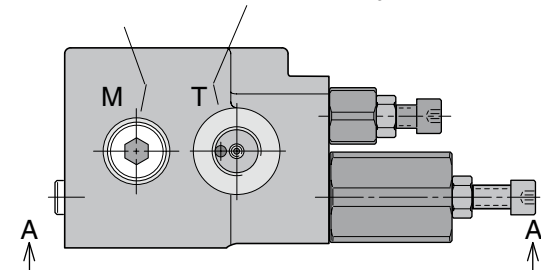
For additional information, contact Parker Hannifin.



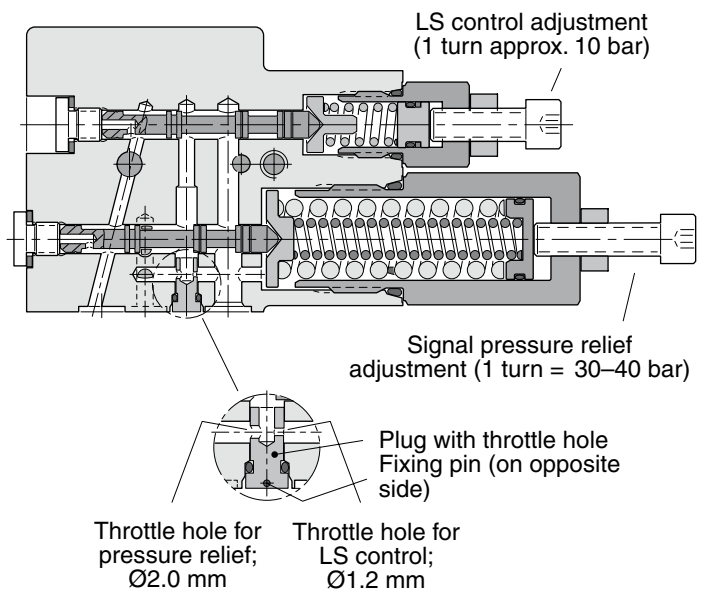
Hydraulic schematic for VP1-120.

**Control type LS (for VP1-120)**

Gauge port, high pressure (G 1/4") Direct connection to reservoir (G 3/8")



**Cross section of VP1-120 control.**



**Note:** See also the schematic above.

# BLA

## General information

The BLA boost unit simplifies the building of closed or semi-closed hydrostatic transmissions.

### Main features are:

- Replaces conventional charge pump and corresponding valves in many applications
- Allows pump speeds above normal selfpriming speed
- Suitable for system flow rates to 400 l/min
- Includes filter
- Simple construction - no moving/wear parts
- Cost-effective installation
- Small tank size
- Helps in building a low-cost hydrostatic transmission.

## Description

In a closed circuit hydrostatic transmission, a charge pump is normally included with the main pump, providing make-up fluid which replaces pump and motor volumetric losses. It also maintains sufficient pump inlet pressure to avoid cavitation.

The BLA boost unit replaces the charge pump in many applications, when the following conditions are met:

- The max-to-min pump flow ratio does not exceed 2:1
- System pressure changes gradually without frequent and pronounced pressure peaks
- The line length between pump and boost unit is relatively short.

There are two basic sizes of the BLA boost unit:

- BLA 4 (to 160 l/min pump flow)
- BLA 6 (to 400 l/min).

The main part of the unit is an aluminium housing with a built-in nozzle and an injector; refer to the cross section to the right.

When fluid flows from the motor outlet port through the unit and to the pump inlet port, the increased fluid velocity between the nozzle and injector creates a low pressure zone causing additional fluid to be drawn from tank into the main circuit.

Also, pressure increases after the injector, allowing the pump to be operated at speeds higher than the self-priming speed. The 'boost pressure' increases with flow.

The housing includes ports that should be connected to the pump and motor drain ports respectively.

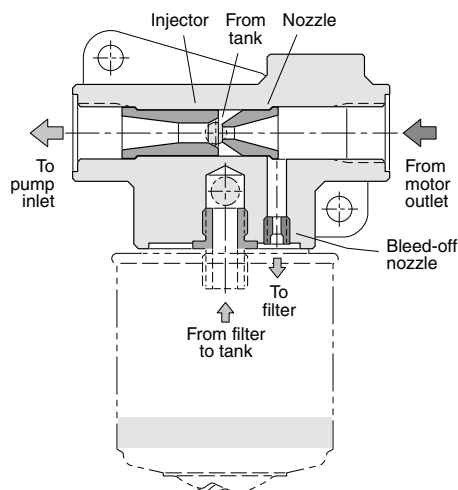
An additional bleed-off nozzle diverts approx. 10% of the main flow through the cartridge filter before being directed to the tank.

## Typical applications:

- Fan drives
- Propeller drives
- Generator drives
- Pump drives.

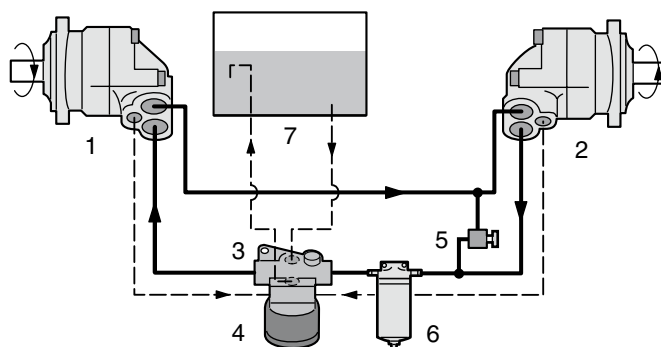
## Oil cooling

An oil cooler is usually required in the hydraulic system, in order to remove the heat that is generated in the main circuit. A full-flow oil cooler should be installed in the return line between the motor and the boost unit.



BLA boost unit cross section.

## Boost unit installation



- |  |                                     |
|--|-------------------------------------|
| 1. Pump                                  | 5. Pressure relief valve            |
| 2. Motor                                 | 6. Full-flow filter (when required) |
| 3. Boost unit (with injector and nozzle) | 7. Reservoir                        |
| 4. Filter cartridge                      |                                     |

**For more information please see our technical catalogue BLA boost unit HY17-8224/UK**

# Fittings

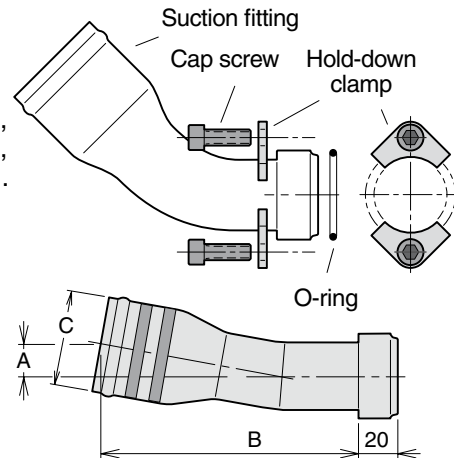
## Suction fittings

for series F1, F2 and T1 pumps

A 'suction fitting' consists of a straight, 45°, 90° or 135° suction fitting, clamps, cap screws and O-ring.

### 'Straight' suction fittings

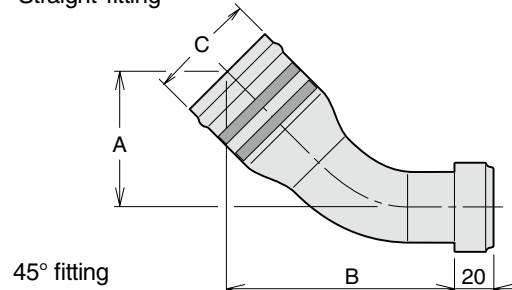
Ordering no.	A mm	B mm	C dia. mm (in.)
378 0635	0	85	38 (1½")
378 0636	17	136	50 (2")
378 0637 <sup>3)</sup>	25	145	63 (2½")
378 3523 <sup>3)</sup>	15	174	75 (3")
378 0973	17	136	45



### 45° suction fittings

Ordering no.	A mm	B mm	C dia. mm (in.)
378 1234 <sup>1)</sup>	60	104	32 (1¼")
378 0633 <sup>1)</sup>	60	104	38 (1½")
378 0364 <sup>2)</sup>	67	110	50 (2")
378 0634 <sup>3)</sup>	75	117	63 (2½")
378 3367 <sup>3)</sup>	88	129	75 (3")
378 1062	67	110	40
378 0975	67	110	45
378 0965	67	110	48

'Straight' fitting



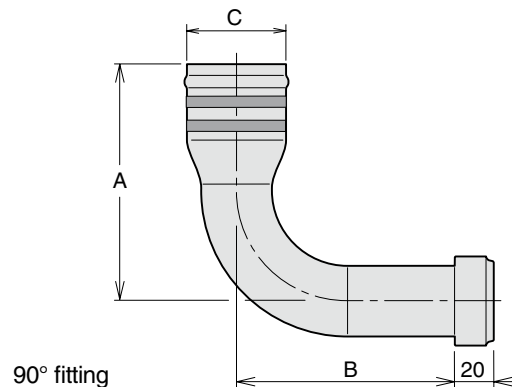
45° fitting

Suctions fittings for VP1-045/075 see page 45.

- 1) Suitable for frame size F1-25.
- 2) Suitable for frame size F1-41,-51,-61,-81, -101.
- 3) To be used for VP1-120 (3 clamps and 3 screws)

### 90° suction fittings

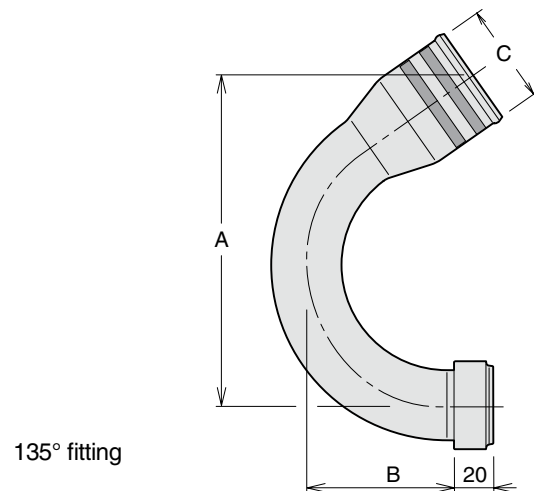
Ordering no.	A mm	B mm	C dia. mm (in.)
378 0978	126	83	38 (1½")
378 0979	135	83	50 (2")
378 1980 <sup>3)</sup>	147	103	63 (2½")
378 0976	135	83	45



90° fitting

### 135° suction fitting

Ordering no.	A mm	B mm	C dia. mm (in.)
378 1867	166	73	50 (2")



135° fitting

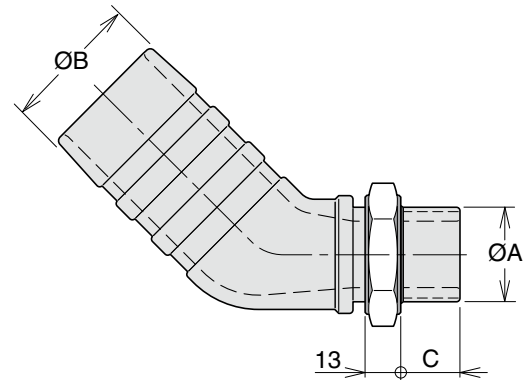
**NOTE:** A suction fitting *must be ordered separately* (not included with the pump). To choice the correct dimension of suction connection, see chapter 2.

**Suitable suction adapters for F1 with BSP port treads**

**45° adapter**

Ordering no.	A*	B	C
00509024216	1"	2"	18
00509021416	1 1/4"	2"	18
00509021916	1 1/4"	2 1/2"	18

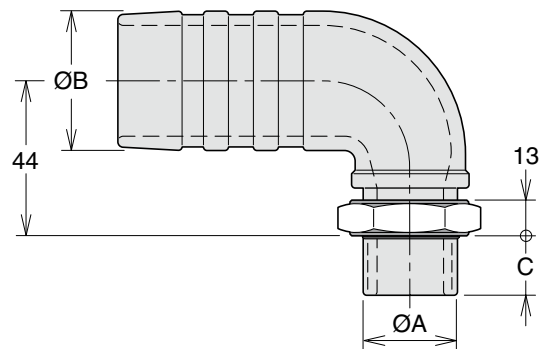
\* BSP threads



**90° adapter**

Ordering no.	A*	B	C
00509024116	1"	2"	18
00509021716	1 1/4"	2"	18

\* BSP threads

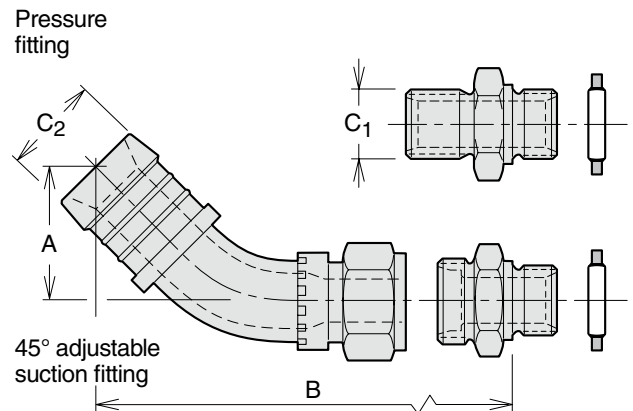


**Fitting kits for VP1 pumps**

**Kits with 45° suction fitting**

Pump size	Ordering no.	C <sub>1</sub>	ØC <sub>2</sub>	A	B
VP1-045/075	<b>379 9563</b>	BSP 3/4"	2"	71	154
VP1-045/075*	<b>379 9562</b>	BSP 1"	2 1/2"	64	147

\* Above 100 l/min



**9**

**NOTE:** A suction fitting *must be ordered separately* (not included with the pump). To choose the correct dimension of suction connection, see chapter 2.

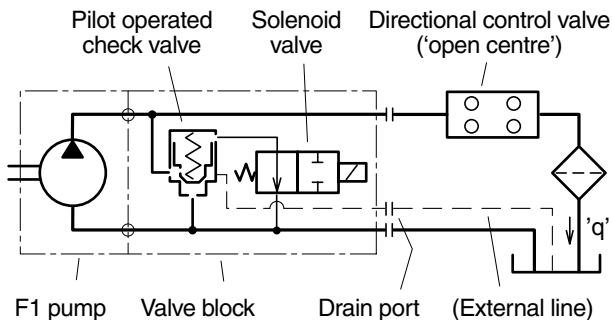
# Auxiliary Valves

## Bypass Valves and Unloading Valves for F1, F2, T1 and VP1 pumps

<b>Contents</b>	<b>Page</b>
<b>Bypass Valve</b>	
BPV-F1-25 and -81 bypass valve .....	47
BPV-F2 bypass valve.....	48
BPV-T1-51/81 and -121 bypass valve .....	49
<b>Unloading Valves</b>	
BPV-L line mounted bypass valve .....	50
BPV-VP1 unloading valve.....	51

### BPV-F1-25 and -81 bypass valve

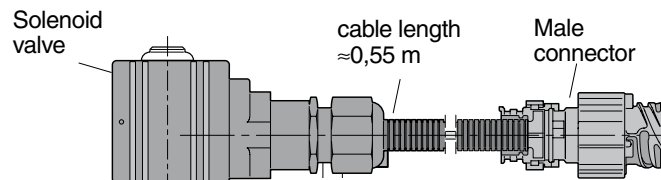
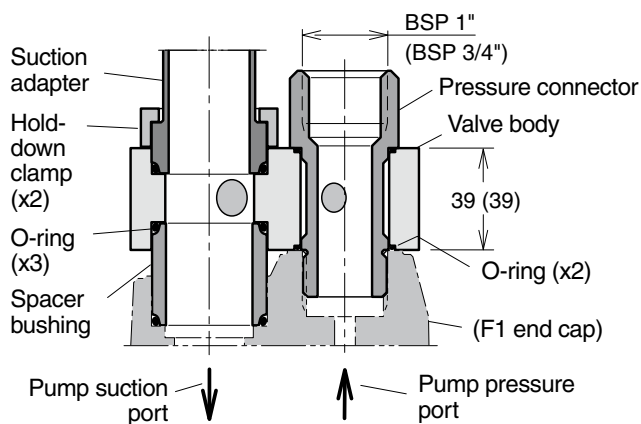
- The bypass valve is mainly utilised in applications where the F1 pump is driven from the crank-shaft through a cardan shaft, or when it is installed on an engine PTO.
- The BPV bypass valve should be engaged during transportation when the pump is operating constantly and the engine is running at max rpm; the hydraulic system is not sized for the large flow that would otherwise go through it.
- The BPV valve substantially reduces the energy loss during transportation.
- The valve installs directly on top of the pump end cap with a pressure port 'banjo' fitting and an inlet port spacer bushing with two cap screws; refer to the illustration to the right.
- As the BPV valve is symmetrical, it can be 'turned 180°' to prevent interference with chassis components; it can be utilised for either left hand or right hand pumps.
- The valve function must only be activated or released (by means of the 24 VDC solenoid) at *no-load* (below 20 bar) *system pressure*.



*Bypass valve schematic.*

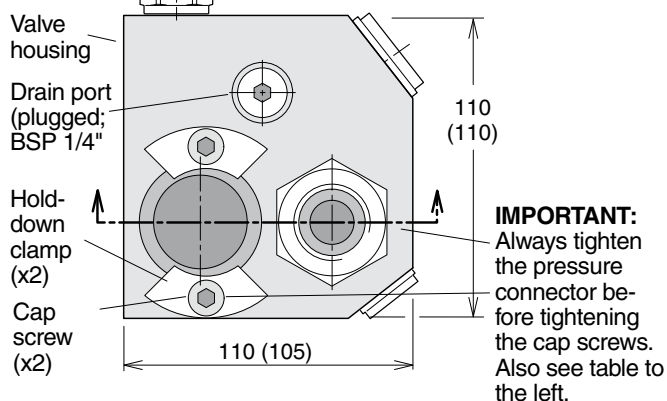
### IMPORTANT INFORMATION

- In order to prevent heat build-up in the pump during transportation, it is important that at least 5 l/min comes out of the filter at 'q' (refer to the schematic). This applies to an 'open center' system when the valve is in the bypass mode (non-activated solenoid).
- *Please note:*
  - a) If the flow at 'q' is less than 5 l/min (caused e.g. by a high pressure drop in the main system) when the valve is in the bypass mode, or
  - b) if the hydraulic system is of the 'closed center' type, then an external drain line **must be installed** from the bypass valve drain port directly to tank as shown in the schematic; a drain kit is available (see below).



Bypass valve, type	BPV-F1-25/-81
Max pressure, continuous [bar]	350
intermittent [bar]	400
Solenoid voltage [VDC]	24
Power requirement [W]	17
Operating mode	Activated solenoid: Check valve closed

Bypass valve kits	Ordering number	For F1 size	Torque press. connector to:
BPV-F1-25, 24 VDC	<b>378 1401</b>	-25/-41/	50 Nm
12 VDC	<b>378 1318</b>	-51/-61	
BPV-F1-81, 24 VDC	<b>378 1402</b>	-81/-101	100 Nm
12 VDC	<b>378 1319</b>		
O-ring kit	<b>378 0641</b>	Contains all five O-rings (as illustrated to the right); included in all valve kits	
Drain fitting kit F1-025	<b>378 1640</b>	Contains a drain line fitting a bonded seal and nozzle.	
Drain fitting kit other F1 and F2	<b>378 3039</b>	Contains a drain line fitting and a bonded seal.	



**IMPORTANT:** Always tighten the pressure connector before tightening the cap screws. Also see table to the left.

**NOTE:** Dimensions are shown for BPV-F1-81 (those for BPV-F1-25 are in paranthesis)

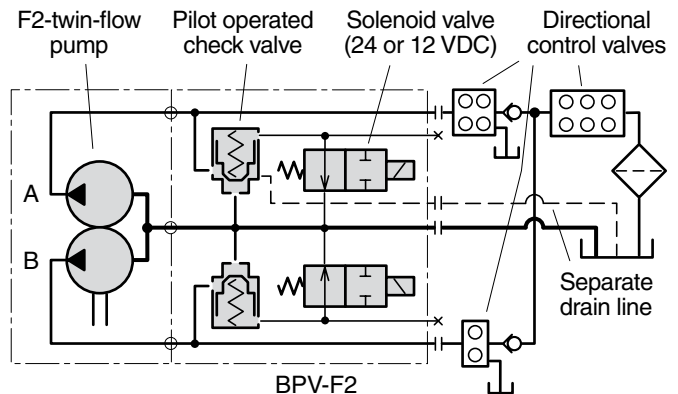
*Bypass valve installation and cross section.*

**BPV-F2 bypass valve**

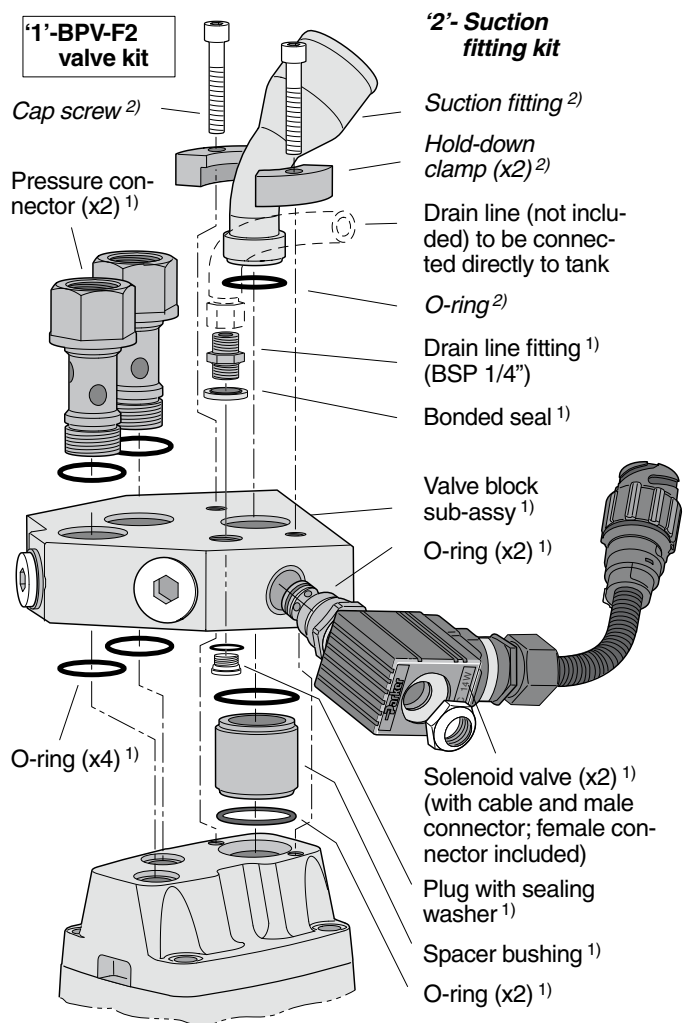
- An F2 twin pump fitted with a bypass valve can be utilised in applications where the pump is operating constantly i.e. when the pump is driven from the crankshaft through a propshaft, or when it is installed on a PTO. In addition, it can be used when, temporarily, one of the two circuits is not required; the power loss is thus reduced as the non-required flow is not forced through lines and 'open center' valves.
- In most cases, the bypass valve allows the pump to be driven at max engine rpm during transportation at a minimum load. This prevents pump cavitation and high heat generation which may otherwise be encountered at large flows.
- The BPV valve connects the outlet and inlet ports of the pump, and only a small oil flow goes through the system and to the reservoir.
- The valve is installed directly on top of the pump port surface with 'banjo' fittings and two cap screws (refer to the split view to the right).
- As the BPV valve is symmetrical it can be 'turned 180°' so as not to interfere with chassis components. The valve can accommodate left hand as well as right hand rotating pumps.
- The valve can only be engaged or disengaged (through the 24 or 12 VDC solenoid) at low system pressures (below 20 bar).

**IMPORTANT INFORMATION**

- In order to secure a cooling flow through the system, a separate drain line **must** be connected from the BPV-F2 drain line fitting (shown in the split view) directly to tank; refer also to the schematic.
- The pressure connectors must be tightened (to 50 Nm) before the suction fitting clamp screws are tightened.



*Bypass valve circuit schematic (example).*



*Bypass valve split view (with F2 end cap).*

**NOTE:** A suction fitting kit (parts designated '2' in the split view) is **not** included with the F2 pump; it must be ordered separately (refer to chapter 9).

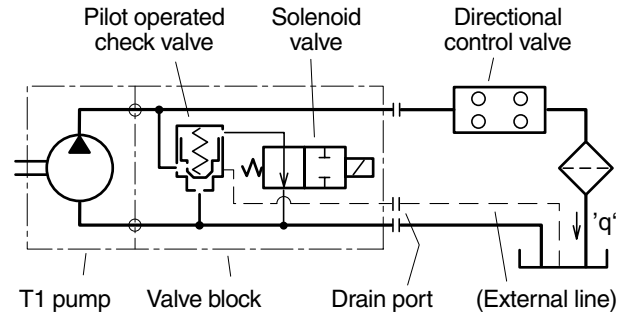
Bypass valve, type	<b>BPV-F2</b>	
Max pressure, continuous [bar]	350	
intermittent [bar]	400	
Solenoid voltage [VDC]	24 (12)	
standard (optional)		
Power requirement [W]	17 (each solenoid)	
Operating mode	Activated solenoid: Check valve closed	
Bypass valve kits	Ordering number	Torque press. connector to:
BPV-F2, 24 VDC	<b>378 1459</b>	50 Nm
12 VDC	<b>378 1567</b>	
O-ring kit	<b>378 0641</b>	Contains all five O-rings (as illustrated to the right); included in all valve kits

1) The BPV-F2 valve kit contains parts designated '1' in the split view to the right.  
 2) Contains all O-rings shown in the split view .



**BPV-T1-51/81 and -121 bypass valve**

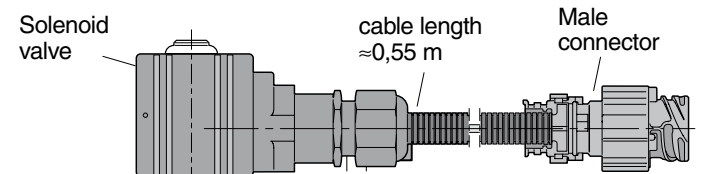
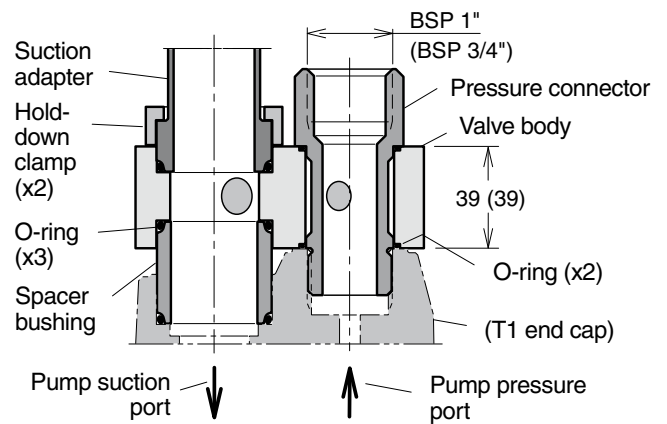
- The bypass valve is mainly utilised in applications where the T1 pump is driven from the crankshaft through a cardan shaft, or when it is installed on an engine PTO.
- The BPV bypass valve should be engaged during transportation when the pump is operating constantly and the engine is running at max rpm; the hydraulic system is not sized for the large flow that would otherwise go through it.
- The BPV valve substantially reduces the energy loss during transportation.
- The valve installs directly on top of the pump end cap with a pressure port 'banjo' fitting and an inlet port spacer bushing with two cap screws; refer to the illustration to the right.
- As the BPV valve is symmetrical, it can be 'turned 180°' to prevent interference with chassis components; it can be utilised for either left or right hand pumps.
- The valve function must only be activated or released (by means of the 24 VDC solenoid) at *no-load* (below 20 bar) *system pressure*.



*Bypass valve schematic.*

**IMPORTANT INFORMATION**

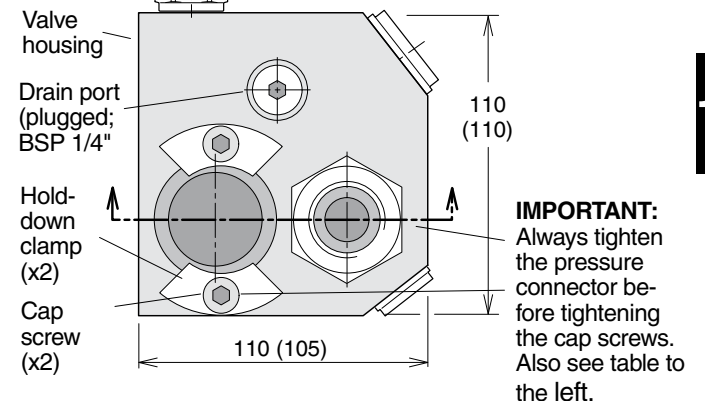
- In order to prevent heat build-up in the pump during transportation, it is important that at least 5 l/min comes out of the filter at 'q' (refer to the schematic). This applies to an 'open center' system when the valve is in the bypass mode (non-activated solenoid).
- *Please note:*
  - a) If the flow at 'q' is less than 5 l/min (caused e.g. by a high pressure drop in the main system) when the valve is in the bypass mode, or
  - b) if the hydraulic system is of the 'closed center' type (with a shunt), then an external line **must be installed** from the bypass valve drain port directly to tank as shown in the schematic; a drain fitting kit is available (below).



Bypass valve, type **BPV-T1-51/81 and -121**

Max pressure, continuous [bar]	200
intermittent [bar]	350
Solenoid voltage [VDC]	24 or 12
Power requirement [W]	17
Operating mode	Activated solenoid: Check valve closed

Bypass valve kits	Ordering number	Torque pressure connector to:
BPV-T-51/81, 24VDC	<b>378 1401</b>	50 Nm
12VDC	<b>378 1318</b>	" "
BPV-T1-121, 24VDC	<b>378 1402</b>	100 Nm
12VDC	<b>378 1319</b>	" "
O-ring kit	<b>378 0641</b>	Contains all five O-rings (as illustrated to the right) included in all valve kits
Drain fitting kit	<b>378 3039</b>	Contains a drain line fitting and a bonded seal.



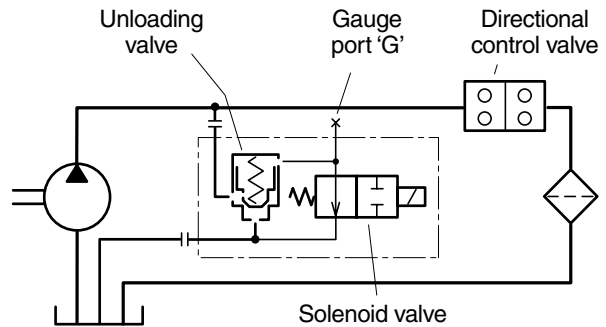
**NOTE:** Dimensions are shown for BPV-T1-121 (those for BPV-T1-81 are in paranthesis)

*Bypass valve installation and cross section.*

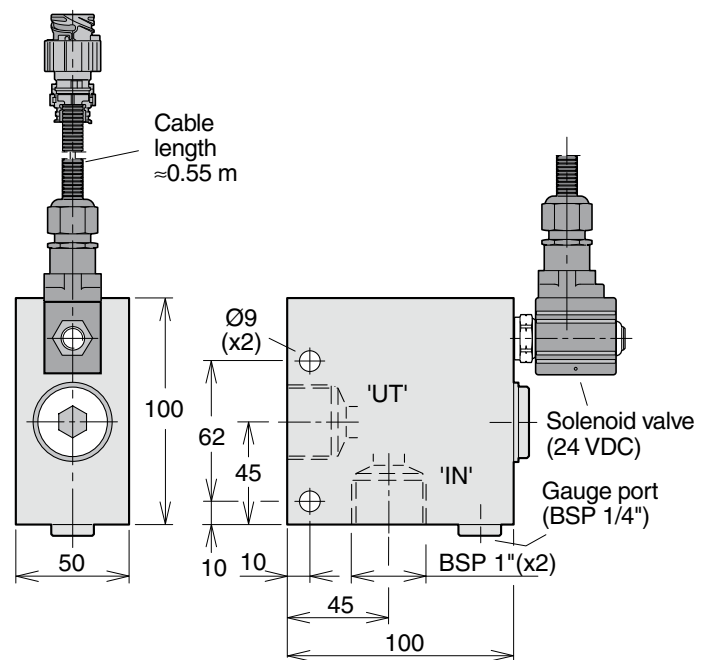
**10**

**BPV-L line mounted bypass valve**

- The unloading valve BPV-L is utilised in hydraulic systems where the fixed displacement pump is engaged constantly and no flow is required, i.e. during transportation. The flow is directed through the unloading valve which has a low pressure loss and less heat is being generated in the system.
- When the solenoid is activated the unloading valve closes and the pump flow is directed to the directional control valve or other user.

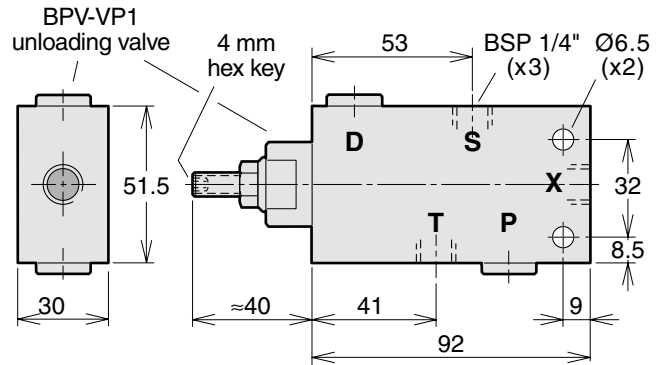


Unloading valve, type	<b>BPV-L</b>
Max operating pressure [bar]	350
Max flow [l/min]	250
Solenoid voltage [VDC]	24
Required power [W]	17
Operating mode	Activated solenoid: Check valve closed
Ordering number	<b>378 1487</b>

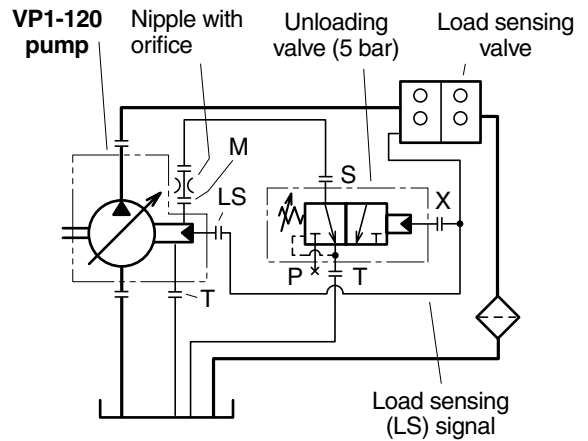
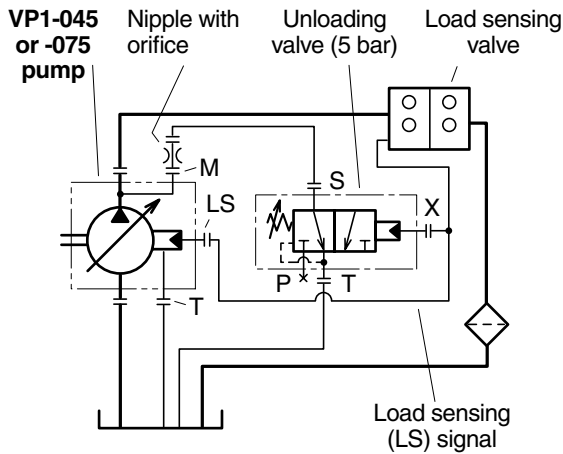


### BPV-VP1 unloading valve

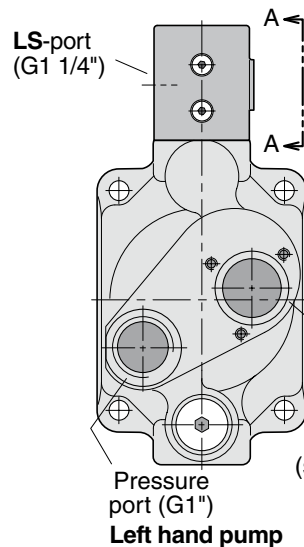
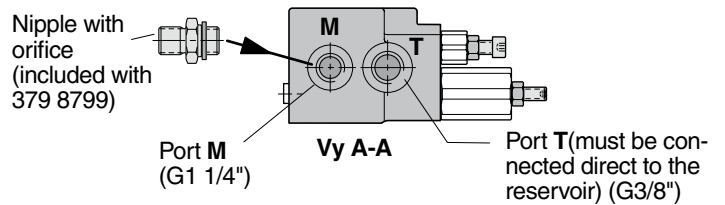
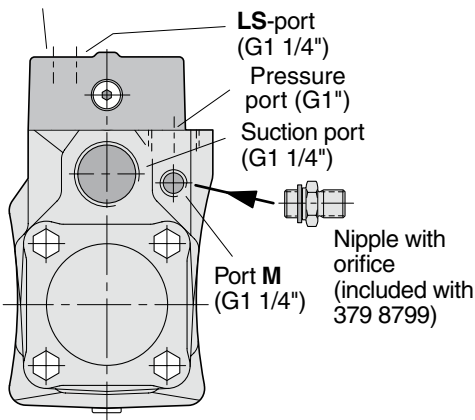
The BPV-VP1 unloading valve is utilised in hydraulic systems where the pump is operating constantly. The valve, which requires no additional control valve, allows the pump to operate on- or off-load up to its max selfpriming speed. The valve protects the pump from overheating in the off-load mode by allowing a small flow through the pump (refer to the schematic to the right). When a load sensing valve function is engaged, the bypass flow is cut off (as port 'X' is being pressurised).



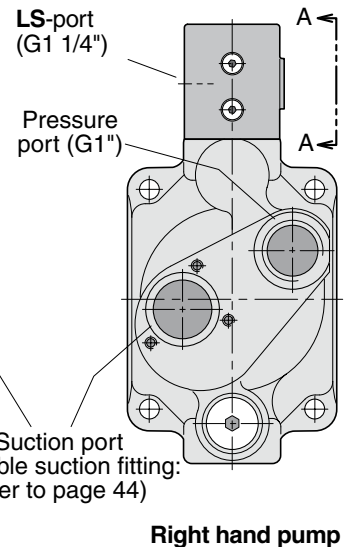
Valve type	Ordering number	Rated flow [l/min]	Max press. [bar]
BPV-VP1	<b>379 8799</b>	20	400



Port T (must be connected direct to the reservoir) (G1 1/4")



**Left hand pump**



**Right hand pump**

**10**

# Accessories

## Adapter kits and accessories for F1, F2, T1 and VP1 pumps

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### Air valve kit for Volvo PTO's

- The air valve kit is suitable for operating a Volvo PTO on Series FM and FH truck chassis (FH introduced Nov. -98). All parts required to operate the PTO are included in the kit (as shown below).
- The air valve can be combined with other air valves on the chassis; this means a simple installation with a common air supply and a minimum of hoses.
- All electrical wires are pre-installed on the chassis. The relay should be installed in socket K1-14 behind the dashboard cover.
- Function:  
 The relay makes sure the PTO is being disengaged as soon as the 'ignition key' is turned off.  
 To re-engage the PTO, the operator has to put the switch back to neutral, and then move it to the 'ON' position.



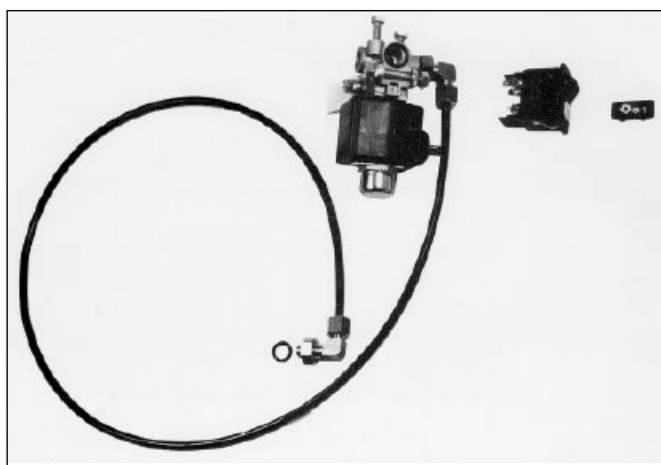
Air valve kit for Volvo PTO's.

PTO air valve kit	Volvo
Air valve nominal voltage [VDC]	24
Nominal current [A]	0.4
Required power [W]	9.6
Max air pressure [bar]	10
Air hose size	1/4"
Operating mode	Activated solenoid: Air valve open and PTO engaged.
Ordering number, series FM and FH <sup>1)</sup>	<b>378 1010</b>

1) Series FH(c) introduced Nov. -98.

### Air valve kit for Scania PTO's

- All parts required for operating a Scania PTO are included in the kit (shown below).
- The air valve kit is suitable for all Scania chassis, Scania Original PTO's, and PTO's from Parker Hannifin for Scania chassis.
- The air valve can be combined with other air valves on the chassis; this means a simple installation with a common air supply and a minimum of hoses.
- All electrical wires are pre-installed on the chassis.



Air valve kit for Scania PTO's.

PTO air valve kit	Scania
Air valve nominal voltage [VDC]	24
Nominal current [A]	0.4
Required power [W]	9.6
Max air pressure [bar]	10
Air hose size	1/4"
Operating mode	Activated solenoid: Air valve open and PTO engaged.
Ordering number	<b>370 5215</b>

### Universal PTO air valve kit

- The kit includes all parts required for maneuvering the PTO.
- The air valve kit is suitable for most PTO's with a metric M12x1.5 air connection.
- The air valve can be installed with other air valves on the chassis which means simple installation with common air supply and a minimum of hoses.
- The air valve can be connected to electrical wires usually pre-installed on the chassis.

PTO air valve kit	Universal
Air valve nominal voltage [VDC]	24
Nominal current [A]	0.4
Required power [W]	9.6
Max air pressure [bar]	10
Air hose size	1/4"
Operating mode	Activated solenoid: Air valve open and PTO engaged.
Ordering number	<b>370 8779</b>

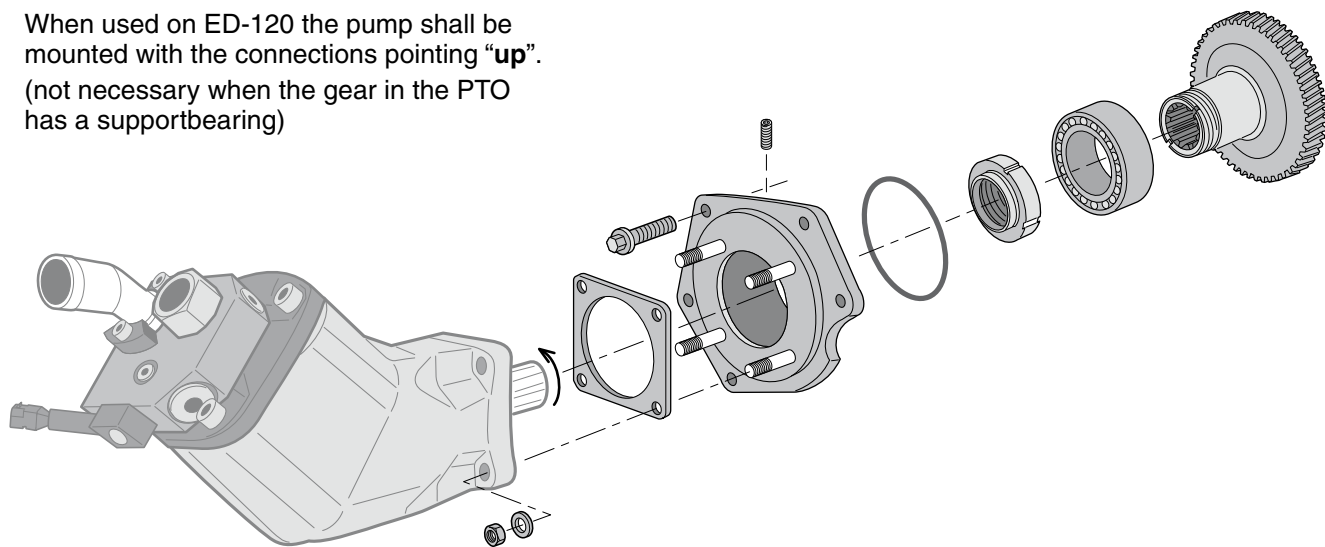
### PTO adapter kit for Scania ED 120 engines

The adapter also fit ED90, motor DC9-11, from September 2004 and later.

- With the adapter kit, a hydraulic pump (e.g. F1 or VP1) that meets the ISO standard can be installed on the PTO of the Scania 12 liter engine.
- The PTO gear is supplied with the chassis.
- **Please note:** The engine must be ordered with a PTO.

**NOTE!**

When used on ED-120 the pump shall be mounted with the connections pointing “up”.  
 (not necessary when the gear in the PTO has a supportbearing)



Gasket between pump and adapter is not included.

Max. torque [Nm]	600
Gear ratio (engine : pump)	1 : 1.19
Pump rotation	Right hand (clockwise)

PTO adapter kit	Ordering number
ED-90/120-F1/F2, bearing supported	<b>378 3080</b>
ED-90/120-VP1, bearing supported	<b>378 3081</b>

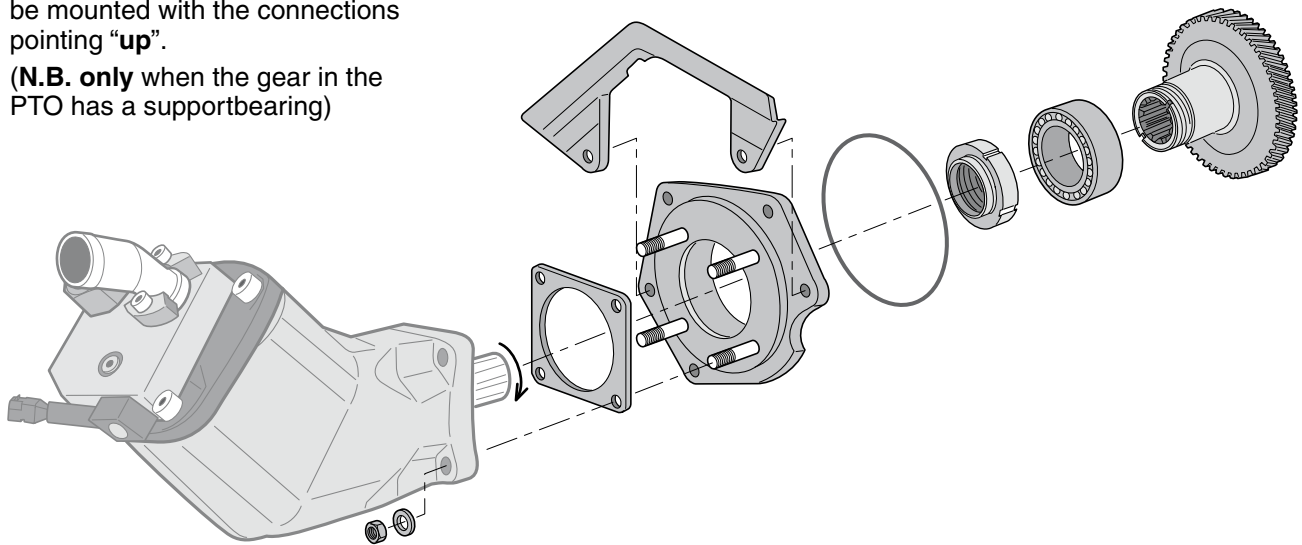
### PTO adapter kit for Scania ED 160 engines

- With the adapter kit, a hydraulic pump (e.g. F1 or VP1) that meets the ISO standard can be installed on the PTO of the Scania 16 liter engine.
- The PTO gear is supplied with the chassis.
- **Please note:** The engine must be ordered with a PTO.

**NOTE!**

When used on ED-160 the pump shall be mounted with the connections pointing **“up”**.

**(N.B. only** when the gear in the PTO has a supportbearing)



Gasket between pump and adapter is not included.

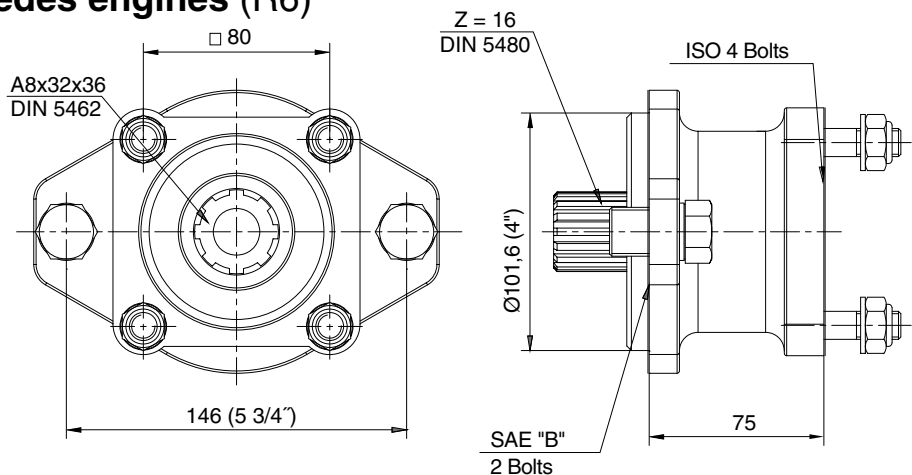
Max. torque [Nm]	600
Gear ratio (engine : pump)	1 : 1.19
Pump rotation	Left hand (counter clockwise)

PTO adapter kit	Ordering number
ED-160-F1/F2, bearing supported	<b>378 3082</b>
ED-160-VP1, bearing supported	<b>378 3083</b>

### PTO adapter kit for Mercedes engines (R6)

With the adapter kit, a hydraulic pump that meets the ISO standard can be installed on the PTO of the Mercedes R6 engines.

Torque continuous 300 Nm  
 Torque intermittent 330 Nm  
 Gear ratio (engine to pump) 1 : 1.26  
 Pump rotation Right hand  
 Ordering No. 0050706404

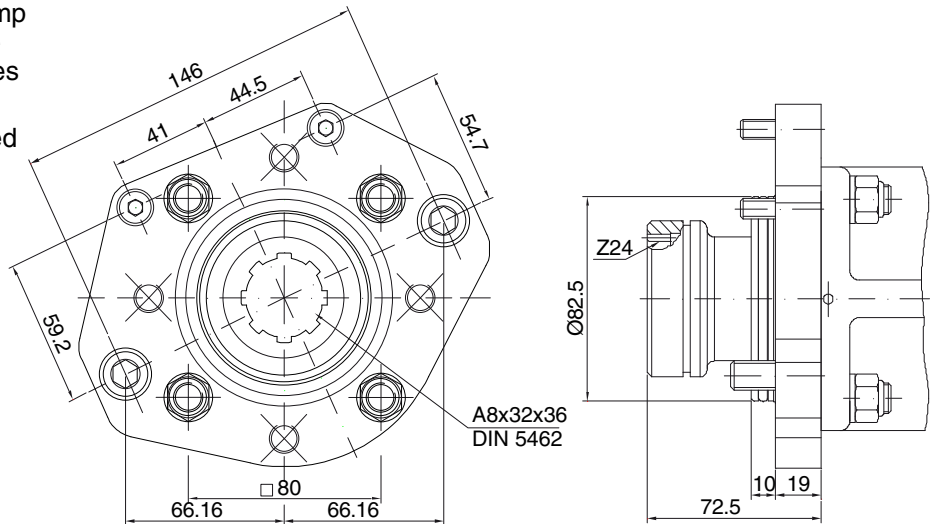


### PTO adapter kit for Mercedes engines (V6, V8)

With the adapter kit, a hydraulic pump that meets the ISO standard can be installed on the PTO of the Mercedes V6 and V8 engines.

This adapter (7012104), can be fitted on the original DC SAE -A adapter, delivered together with the new ACTROS from DC factory.

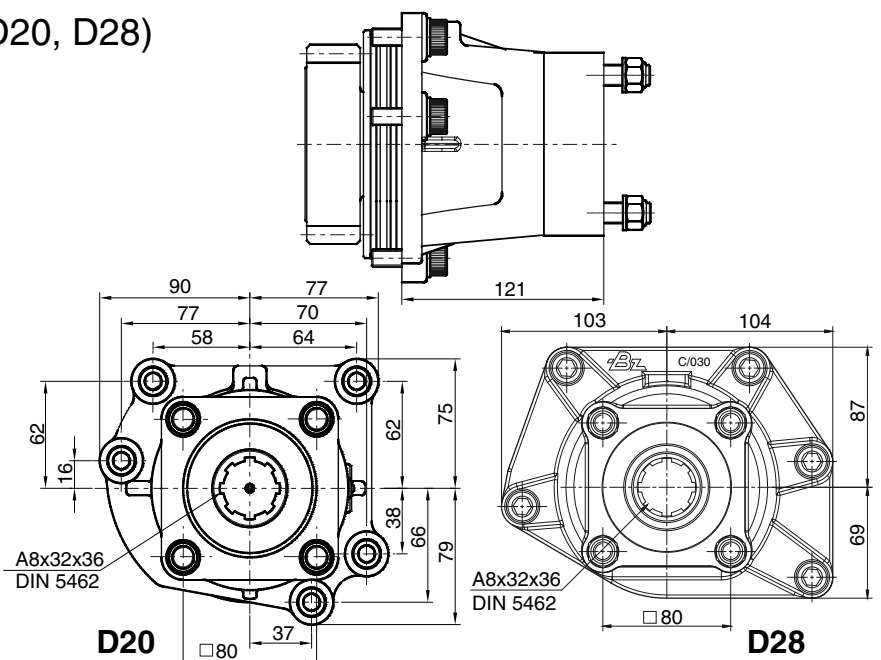
Torque continuous 390 Nm  
 Torque intermittent 470 Nm  
 Gear ratio (engine to pump) 1 : 1.075  
 Pump rotation Right hand  
 Ordering No. 00507012104



### PTO adapter kit for MAN (D20, D28)

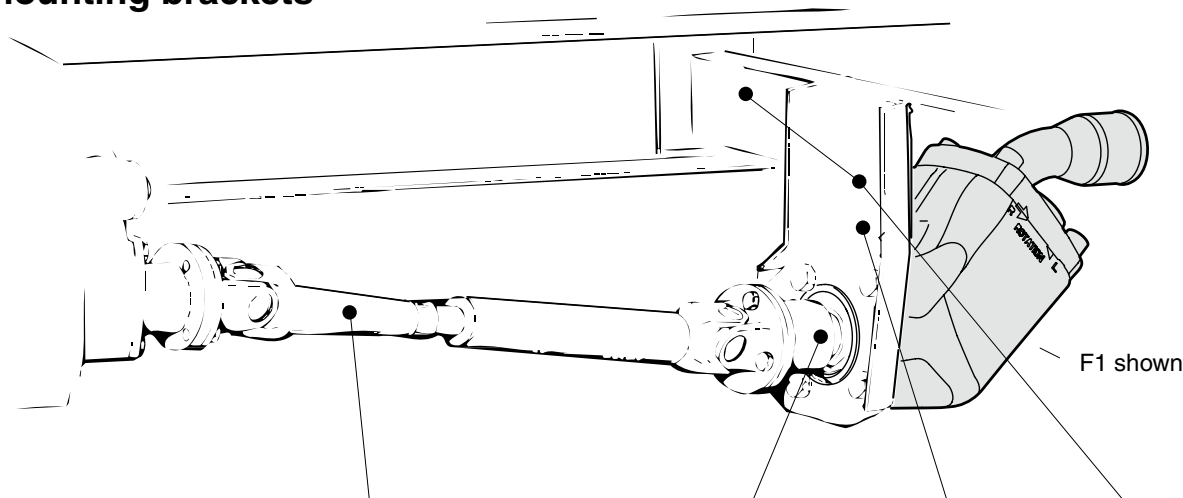
With the adapter kit, a hydraulic pump that meets the ISO standard can be installed on the PTO of the MAN D20 engines.

Torque continuous 400 Nm  
 Torque intermittent 570 Nm  
 Gear ratio (engine to pump) 1 : 1.233  
 Pump rotation Right hand  
 Ordering No:  
 D20 0050081903  
 D28 0050081703





## Cardan shafts, pump couplings and mounting brackets



Pump or splitter box type	Cardan shaft kit Type	Cardan shaft kit Ordering no.	Pump coupling Type	Pump coupling Ordering no.	Bracket ordering no.	Bracket kit ordering no.
F1 <sup>1)</sup>	SAE 88 <sup>1)</sup>	<b>073 001</b>	SAE 88 <sup>1)</sup>	<b>370 4628</b>	<b>379 7831</b>	<b>379 7832</b>
F1 (New)	"	"	"	<b>378 0644</b>	"	"
F1 (New)	SAE 97	<b>370 0315</b>	SAE 97	<b>378 0645</b>	<b>379 7831</b>	<b>379 7832</b>
F1	"	"	"	<b>370 4631</b>	"	"
F2	"	"	"	"	"	"
T1-51	"	"	"	"	"	"
VP1	"	"	"	"	"	"
SB154, SB118	SAE 97	<b>370 0315</b>	SAE 97/ DIN 90	Included with splitter box		<b>370 5220</b>

1) The SAE 88 cardan shaft and pump coupling can also be used to drive a series F2, T1-51 or VP1 pump providing max allowed shaft torque (below) is not exceeded.

### Cardan shaft specifications

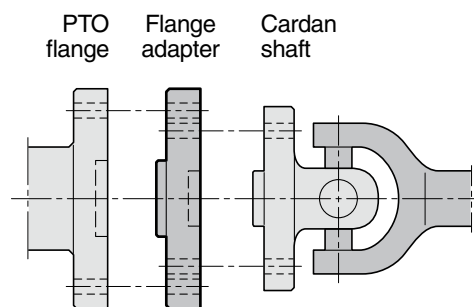
Cardan shaft type	Spicer designation	Max length [mm]	Diameter [mm]	Max torque peak/contin. [Nm]	Ordering number
SAE 88	K1140	1500 <sup>2)</sup>	45	600/300	<b>073 001</b>
SAE 97	K1310	1500 <sup>2)</sup>	50	1000/500	<b>370 0315</b>

2) One end not welded. Min length 350 mm.

### PTO flange adapters

Cardan shaft type	PTO flange type	Flange adapter ordering no.
SAE 88	SAE 116	<b>370 5895</b>
SAE 97	SAE 116	<b>370 5896</b>
SAE 116	SAE 97	<b>370 5897<sup>3)</sup></b>
DIN 90	DIN 100	<b>370 5898</b>
DIN 100	DIN 90	<b>370 5899<sup>3)</sup></b>

3) **WARNING!** The utilised cardan shaft torque limits (above) must not be exceeded.



**Pump couplings**

Designation	DIN 90 (fig. 1)
A	90
B	74.5
C	47 h7
D	M8
E <sub>1</sub>	61.5
VP1, F2, F1*	<b>370 4634</b>
F1	<b>378 0642</b>

**NOTE:** Max torque is limited by the cardan shaft.

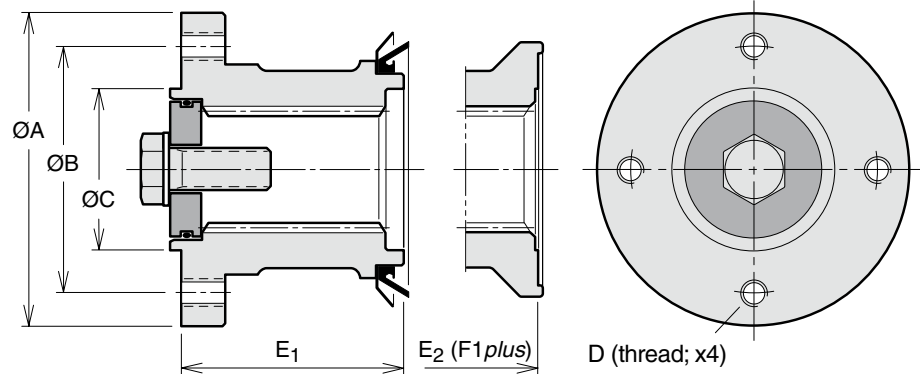


Fig. 1. DIN 90 (370 4634) (378 0642)

Designation	DIN 90 (fig. 2)
A	90
B	74.5
C	47 h7
D	8.2
E <sub>1</sub>	61.5
E <sub>2</sub> (F1)	57.2
VP1, F2, F1*	<b>370 7423</b>

**NOTE:** Max torque is limited by the cardan shaft.

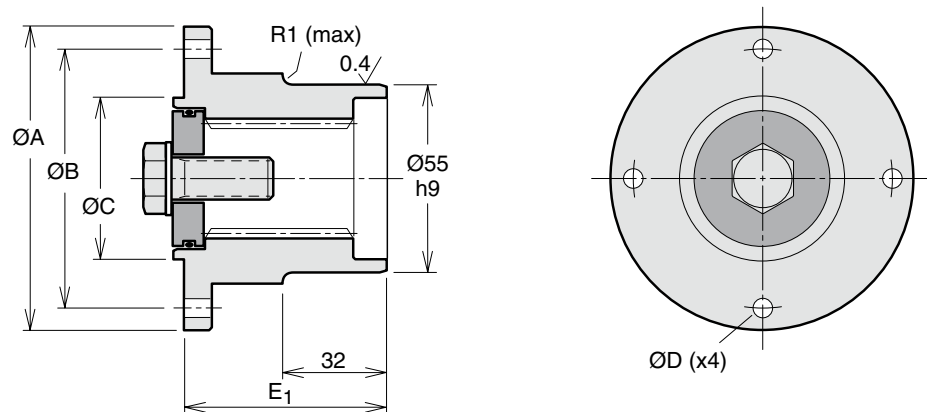


Fig. 2. DIN 90 (370 7423)

Designation	SAE88 (fig. 3)
A	88
B	69.9
C	57.15 H8
D	5/16" UNC
E <sub>1</sub>	65
E <sub>2</sub> (F1)	59.5
Max torque [Nm] interm./contin.	600/300
VP1, F2, F1*	<b>370 4628</b>
F1	<b>378 0644</b>

**NOTE:** Max torque is limited by the cardan shaft.

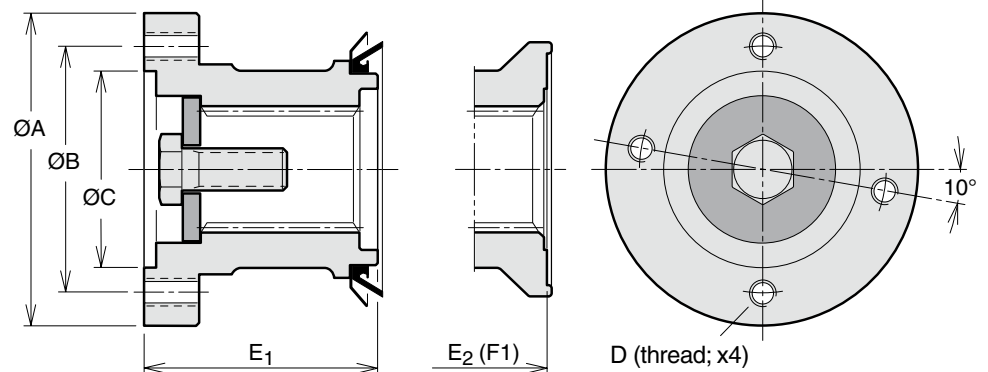


Fig. 3. SAE 88 (370 4628) (378 0644)

Designation	SAE97 (fig. 4)
A	97
B	79.4
C	60.33 H8
D	3/8" UNC
E <sub>1</sub>	65
E <sub>2</sub> (F1)	59.5
Max torque [Nm] interm./contin.	1000/500
VP1, F2, F1*	<b>370 4631</b>
F1	<b>378 0645</b>

F1\* Old versions

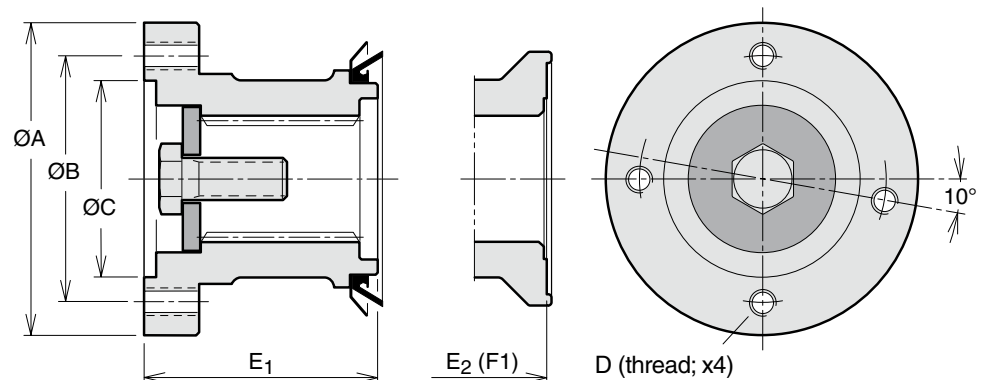


Fig. 4. SAE97 (370 4631) (378 0645)

### SB splitter boxes

- The splitter box is utilised to drive two pumps, providing two separate, independent flows.
- The high permissible input shaft torque allows two large pumps to be operated simultaneously; make sure, however, that the PTO and the cardan shaft will stand the intended load.
- Pump mounting flange and shaft end must meet the ISO standard.
- The splitter box is available with either of two gear ratios (input shaft-to-pump):  
**SB 118** - 1:1.18  
**SB 154** - 1:1.54
- The shipping carton contains all parts required for the installation of the two pumps.

### Recommendations

Use the following tables to verify that max pump rpm and max splitter box input torque are not exceeded.

Pump size	Max input speed [rpm]	
	SB 118	SB 154
F1-25	2200	1650
F1-41	2000	1550
F1-51	1850	1400
F1-61	1850	1400
F1-81	1650	1250
F1-101	1500	1150

Example: An SB 118 with an F1-025 and an F1-081 can be operated at max 1650 rpm ( splitter box input speed ) , and an SB 154 with the same pumps at max 1250 rpm ( 2 1/2 " )

Pump size	Pump input torque [Nm] at		
	250 bar	300 bar	350 bar
F1-25	101	122	142
F1-41	162	195	227
F1-51	203	243	284
F1-61	236	284	331
F1-81	324	388	453
F1-101	412	495	577

Example: An F1-041-at 350 bar requires 227 Nm and F1-061 at 300 bar 284 Nm

Total required splitter box input torque:

**SB 118:** (227 + 284) x 1.18 » 605 Nm.

**SB 154:** (227 + 284) x 1.54 » 787 Nm.

Compare with max permissible torque (interm. 1000 Nm; continuous 700 Nm).

**NOTE:** If the splitter box should be utilised at close to the max permissible torque and/or max the permissible speed, please contact Parker Hannifin

### Installation information

#### 1. Series F1 and T1 (fig. 2)

Valid: At continuous operation less than 30 min. and/or less than 80 kW continuous power output.

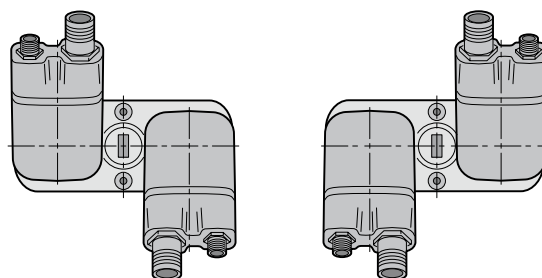
- Remove the uppermost drain plug and add 0.5 liter Shell Spirax AX (or similar fluid).
- Install the breather (and the 90° adapter, part no. 378 1069, if required).

**NOTE:** The F1 or T1 shaft seal **must not** be removed.

#### 2. Series F1 (right illustration, fig. 3)

Valid: At continuous operation more than 30 min. and/or more than 80 kW continuous power output.

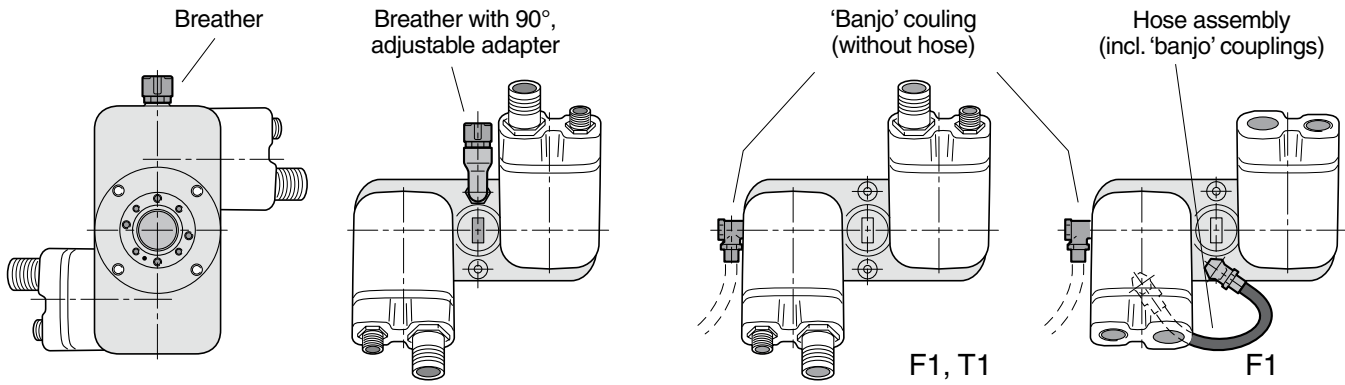
- Install hose kit 378 1085 between the lowest drain port on one of the pumps (see fig. 3) and the BPV-F1-25 och -81 avlastningsventiler lowest drain port of the splitter box.
- Install a drain hose between the drain port on the side of the splitter box and the reservoir; it must end below the lowest oil level in the reservoir. Utilise one of the banjo couplings included in hose kit 378 1085.



**NOTE:** The inlet (suction) ports of the pumps should always face the splitter box center, as shown, in order to counteract internal gear forces.

Fig. 1. F1-pumps installed on a splitter box.

Designation	SB 118	SB 154
Gear ratio (inp. shaft-to-pump)	1:1.18	1:1.54
Max input torque intermittent/continuous [Nm]	— 1000/700 —	
Max power	Housing oil temperature must not exceed 75 °C.	
Weight [kg]	— 11.5 —	
Ordering No, bearing supported	00506010699	00506010599



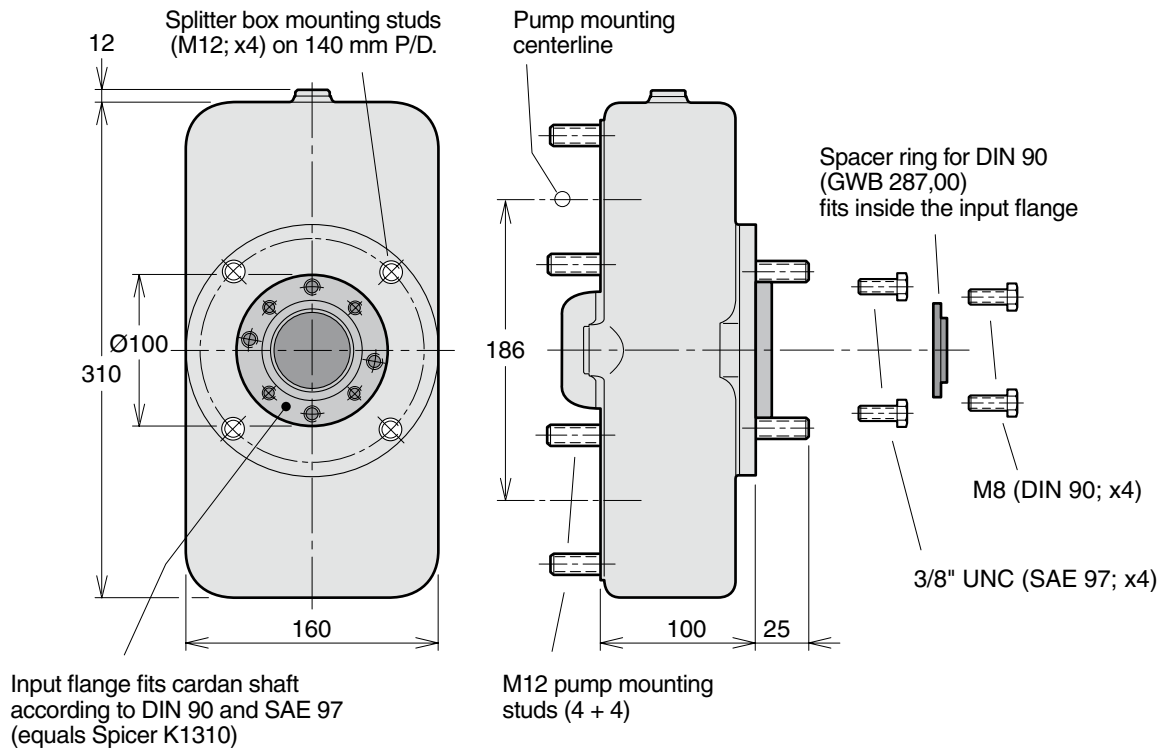
Breather kit (incl. 90°, adjustable adapter and seals):  
 Part no. 378 1069.

*Fig. 2. Breather installation on the splitter box.*

Hose kit (hose sub-ass'y and separate 'banjo' coupling):  
 Part no. 378 1085.

*Fig. 3. Forced cooling of the splitter box.*

**Splitter box installation**



Input flange fits cardan shaft according to DIN 90 and SAE 97 (equals Spicer K1310)

M12 pump mounting studs (4 + 4)

# Installation and start up

## Installing couplings, sleeves, and gears on the pump shaft.

This is a short installation and start up information.  
To have the complete and latest installation information, always see the installation info supplied together with the pump.

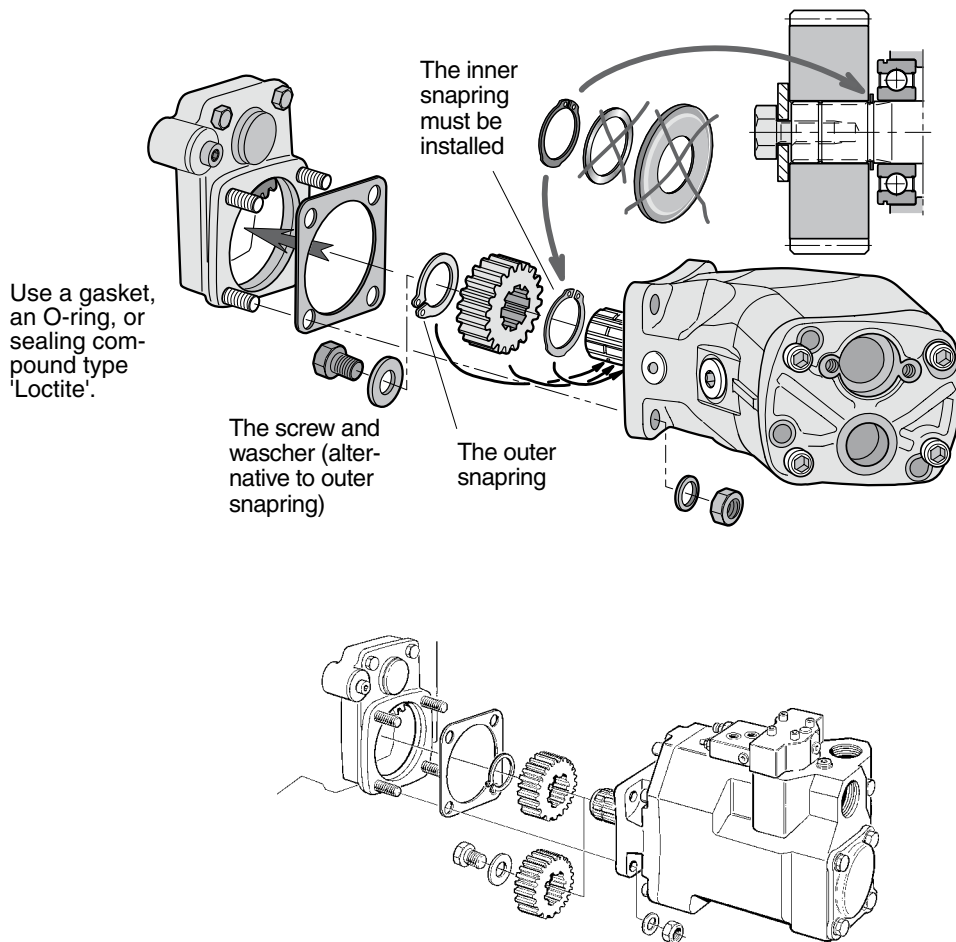


Fig. 6. VP1-to-PTO installation.

### IMPORTANT

Our special tool facilitates installing couplings, sleeves, and gears on the pump shaft. Force must never be used when installing these parts on the F1 shaft.

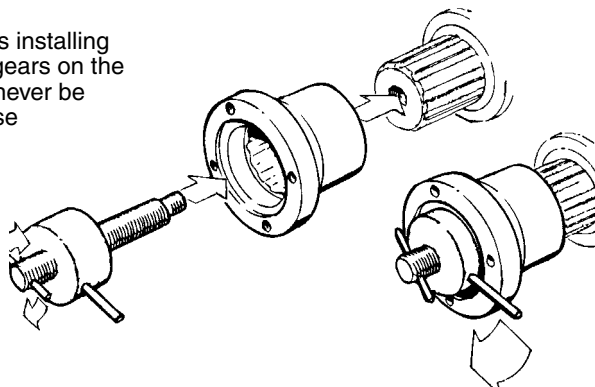


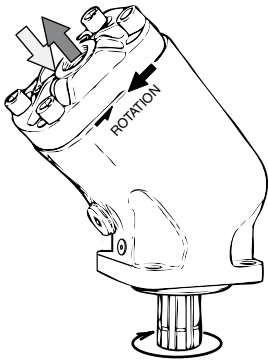
Fig. 7 Mounting tool.

**NOTE:** When considering installing an F1 on a splitter box, please refer to the installation information provided on pages 59- 60, chapter 11.

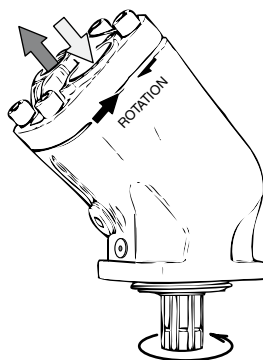
11

12

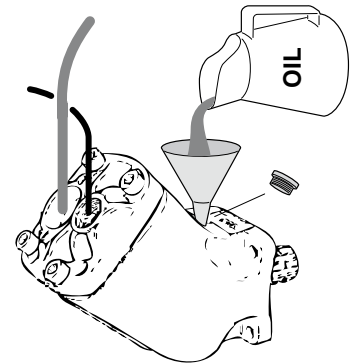
## Installation and start-up for F1, F2 and T1



Left hand (L.H.; counter clockwise) rotating pump.



Right hand (R.H.; clockwise) rotating pump.



Before start-up, the housing must be filled with hydraulic fluid.

### Direction of rotation

The pictures above show direction of flow vs. shaft rotation.

The direction of rotation can be changed (i. e. from right hand to left hand) by turning the end cap.

Remove the four cap screws and turn the end cap about half a turn while making sure it stays in contact with the barrel housing.

Re-fit the cap screws and torque to 80-100 Nm.

### Installation

The top illustration on page 61 shows two ways of installing a gear on the shaft of fixed displacement pumps. The pump shaft spline end usually fits directly in the PTO internal spline coupling.

**NOTE:** In order to obtain the longest bearing life, the pump should be installed according to the information shown on page 63 "Pump bearing life".

### Fluid viscosity

Recommended viscosity:  
 20 to 30 mm<sup>2</sup>/s (cSt).

Operating viscosity limits:

- Min 10 mm<sup>2</sup>/s; max 400 mm<sup>2</sup>/s.
- At start-up, max 4000 mm<sup>2</sup>/s.

### Fluids

The fixed displacement pumps data shown in the specifications for each pump in chapter 3 to 6 are valid when operating on high quality, mineral based hydraulic oil.

Type HLP (according to DIN 51524) hydraulic oil is suitable as well as biologically degradable fluids like natural and synthetic esters and polyalphaolefins.

The utilised hydraulic fluid shall meet one of the following Swedish standards:

- SS 15 54 34
- SMR Hydraulic Oil Standard 1996-2.

Contact Parker Hannifin for further information.

**NOTE:** - ATF (automatic transmission fluid) and API type CD engine oils may also be useable.  
 - Seals are made of nitrile rubber; make sure the utilised fluid is compatible with this material.

### Fluid temperature

Main circuit: Max 75 °C.

**NOTE:** When considering installing an fixed displacement pump on a splitter box, please refer to the installation information provided on pages 59 and 60, chapter 11.

### Drain line

Fixed displacement pumps don't need an external drain line as they are internally drained.

When the pump is mounted in a Engine-PTO we recommend a drain line from the bypassvalve directly to oiltank.

### Filtration

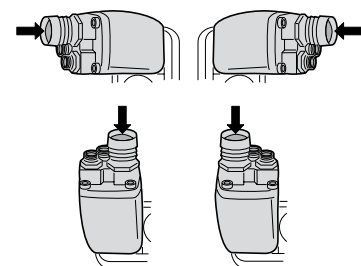
Filtration should follow ISO standard 4406: 1987, code 18/13.

To obtain the longest life of fixed displacement pumps, we recommend an oil cleanliness of 10 µm (absolute).

### Start-up

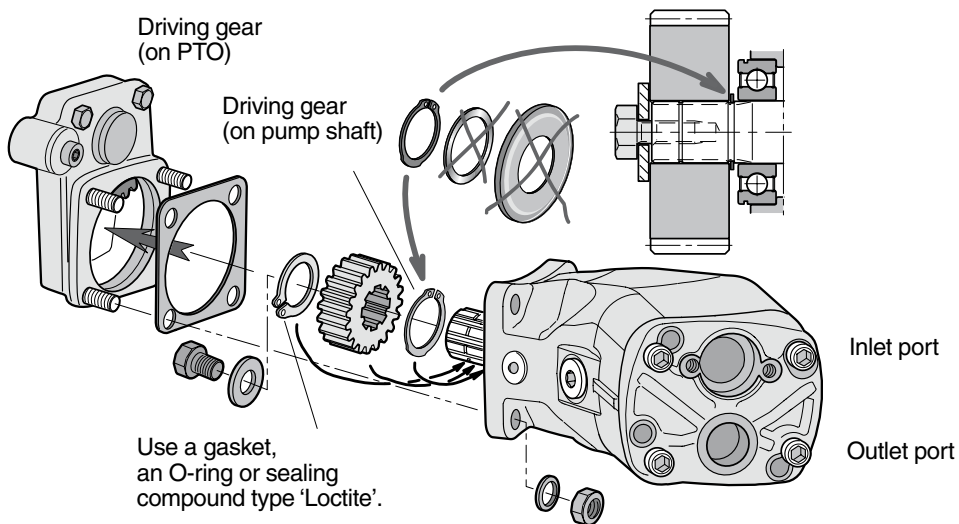
Make sure the entire hydraulic system is clean before filling it with a recommended hydraulic fluid. In particular, make sure the pump is filled (to at least 50%) as the internal leakage does not provide sufficient lubrication at start-up.

**NOTE:** - The suction port should always be above the pressure port when the pump is installed above the reservoir oil level.  
 - During operation, the pump must be filled with oil to at least 50%.



**T1-to-PTO installation**

- 'Left hand' and 'Right hand' rotation defined in the illustrations on page 62.
- The driving gear of the PTO and the driven gear of the pump are shown in the illustration below. (A right hand rotating pump is shown).



**Pump bearing life**

Bearing life is dependent on how the pump is installed on the PTO as shown in the illustrations below.

A pump mounted according to fig. 1 gives the lowest bearing life; the highest is obtained when installed according to fig. 3.

Parker Hannifin will assist in determining bearing life in a particular application.

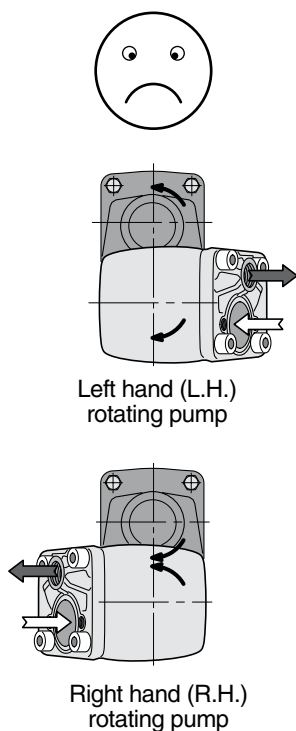


Fig. 1.

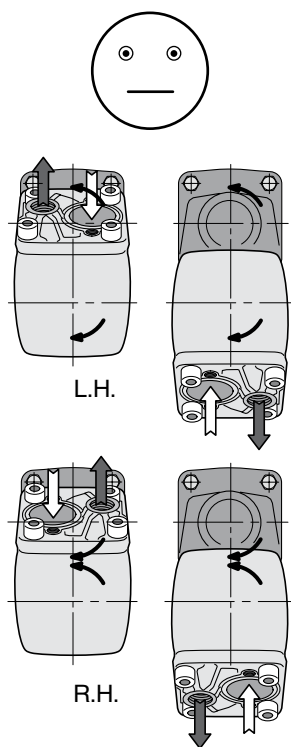


Fig. 2.

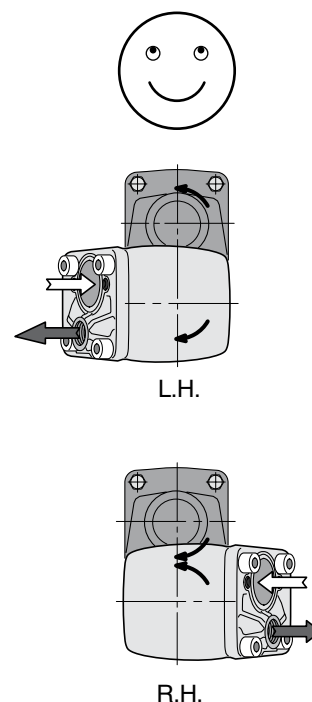


Fig. 3.

## Installation and start-up for VP1

### Direction of rotation

The basic VP1 pump is uni-directional; there is a left hand and a right hand version (indicated by the arrow on the side of the VP1 pump (fig. 4 and 5).

Consequently, the required direction of rotation must be stated when ordering the pump.

### Installation

The VP1 can be installed (close-coupled) directly on a PTO (which meets ISO DIN 5462).

Before start-up, the pump must be filled with hydraulic fluid and purged. Utilise the uppermost purge plug (refer to the installation drawing on pages 36 and 38, chapter 7).

Figure 6 (page 61) shows two ways of installing a gear on the VP1 shaft. On a non-geared or a geared PTO with support bearings, the pump shaft is usually installed directly in the internally splined PTO output shaft.

### Hydraulic fluids

The VP1 data shown in the specifications on page 35, chapter 7 are valid when operating on a high quality, mineral based fluid.

Hydraulic fluids type HLP (DIN 51524), ATF (auto-matic transmission fluids), and API type CD engine oils are suitable.

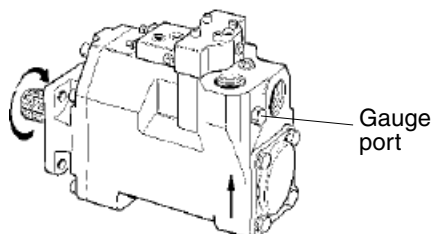


Fig. 4. Left hand rotating pump.

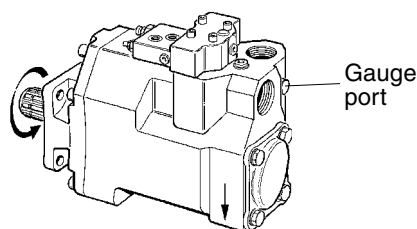


Fig. 5. Right hand rotating pump.

### Fluid temperature

Main circuit: Max 75 °C.

### Viscosity

Recommended viscosity: 20 to 30 mm<sup>2</sup>/s (cSt).

Operating viscosity limits: 10 to 400 mm<sup>2</sup>/s.

At start-up: Max 1000 mm<sup>2</sup>/s.

### Filtration

To obtain long VP1 life, we recommend a filtration level of:

- 25 µm (absolute) in clean environment or at low pressures.
- 10 µm (absolute) in contaminated environment or at high pressures.

Filtration should meet ISO standard 4406: 1987, code 18/13.

### Drain line

The LS valve *requires a separate drain line*; it should be routed directly to the reservoir (refer to fig. 8).

### Start-up

Make sure the entire hydraulic system is clean before filling it with a recommended fluid.

In addition, the VP1 pump must be purged to remove any entrapped air in the pump housing; utilise the uppermost purge port (fig. 8).

### IMPORTANT

As shown in fig. 8, the pump inlet must always be below the lowest reservoir oil level.

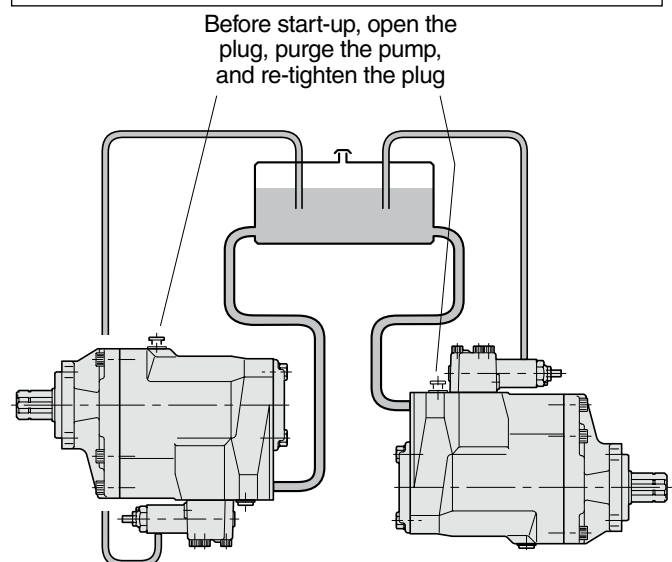


Fig. 8. VP1 should be installed below the reservoir fluid level.

*Purging should be performed when the pump is connected to the reservoir and the system is filled with fluid.*



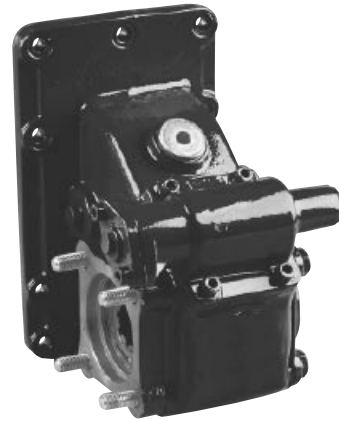
## Parker PTO's

Parker's power take-off units are designed to meet the requirement of the majority of today's truck applications. The PTO range covers a great many European trucks and is being continually updated to fit new gearboxes. The PTO's are used in a variety of applications such as Tippers, Hook Loaders, Skip Loaders and Cranes, and are specifically designed to close-couple pumps with the current ISO-Standard mounting flange. Alternatively, the units can be fitted with our cardan shaft adaptor to enable them to be used for a wide range of propshaft driven applications.

- Tailor made for the Parker Truck Hydraulics pumps Possibility to close-couple any ISO-standard pump
- Shaft-driven adaptor for other applications Competitively priced
- Easy to install
- Electrical indicator available on latest PTO's.

Parker can, with its range of PTO units, the F1, F2, T1 and VP1 truck pumps, and a great number of accessories, offer the total truck hydraulic package. Parker have in Europe become synonymous for extraordinary quality. Many body builders and chassis manufacturers now include our products as a standard part of their programme."

For detailed information please see catalogue HY17-8260/UK



SCANIA



VOLVO



ZF

## PTO's from Parker Chelsea

### A comprehensive range

Parker Chelsea PTO's are designed to offer more output and shaft options than any other manufacturer, to ensure total compatibility no matter what the vehicle or application. A large percentage of the world's major OEM and transmission manufacturers and bodybuilders depend upon PTO's and auxiliary power products from Parker Chelsea for applications such as trucks, refuse vehicles, fire tenders, construction vehicles like backhoe loaders, excavators, tele handlers, etc. Close coupled pumps are another important accommodation where Chelsea outputs meet both SAE and DIN standards.

For detailed information please see catalogue HY17-8259/UK

# CHELSEA®



### 660 Series PTO

Heavy duty 6-bolt PTO to suit most popular transmission types. Intermittent torque rating up to 500 Nm.



### 880/885 Series PTO

Heavy duty 8-bolt PTO's available with air shift, hotshift and constant mesh options. Intermittent torque rating up to 678 Nm.



### 236 Series PTO

'Air/Hotshift' PTO for medium and heavy duty transmissions. Intermittent torque rating up to 406 Nm.



## **WARNING**

**FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.**

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorised distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyse all aspects of your application, including consequences of any failure, and review the information concerning the product or system in the current product catalogue. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

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