

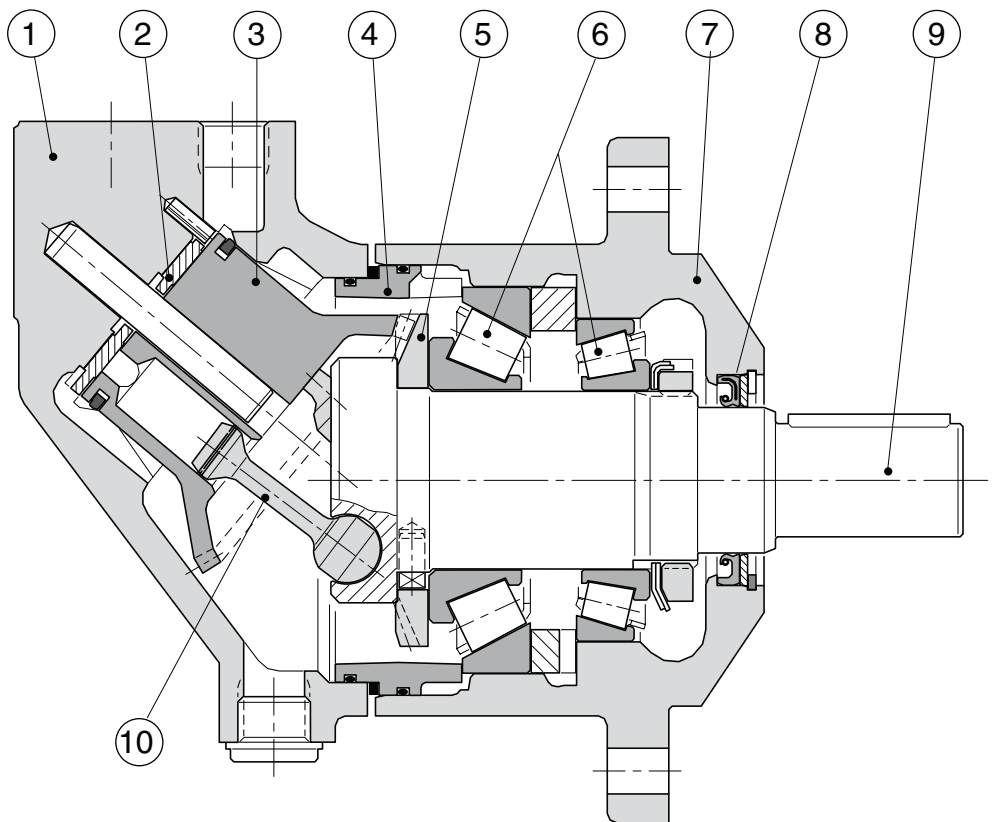
F11 and F12 are bent axis, fixed displacement heavy-duty motor/pump series. They can be used in numerous applications in both open and closed loop circuits.

- Series F11 is available in the following frame sizes and versions:
 - F11-5, -6, -10, -12, -14 and -19 with CETOP mounting flange and shaft end
 - F11-10, -12 and -14 with ISO flange and shaft
 - F11-10, -12, -14 and -19 with SAE flange and shaft
- Series F12 conforms to current ISO and SAE mounting flange and shaft end configurations. A very compact cartridge version is also available.
- Thanks to the unique spherical piston design, F11/F12 motors can be used at unusually high shaft speeds. Operating pressures to 480 bar provides for the high output power capability.
- The 40° angle between shaft and cylinder barrel allows for a very compact, lightweight motor/pump.

- The laminated piston ring offers important advantages such as low internal leakage and thermal shock resistance.
- The pump version has highly engineered valve plates for increased selfpriming speed and low noise, available with left and right hand rotation.
- The F11/F12 motors produce very high torque at start-up as well as at low speeds.
- Our unique timing gear design synchronizes shaft and cylinder barrel, making the F11/F12 very tolerant to high 'G' forces and torsional vibrations.
- Heavy duty roller bearings permit substantial external axial and radial shaft loads.
- The F11's and F12's have a simple and straight-forward design with very few moving parts, making them very reliable motors/pumps.
- The unique piston locking, timing gear and bearing set-up as well as the limited number of parts add up to a very robust design with long service life and, above all, proven reliability.

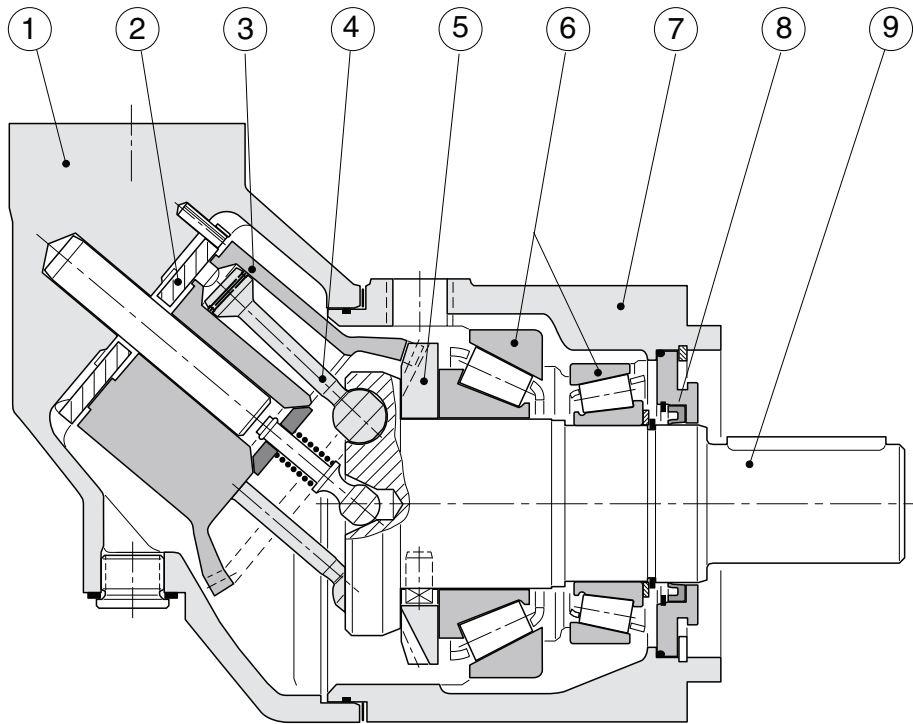
F11 cross section

1. Barrel housing
2. Valve plate
3. Cylinder barrel
4. Guide spacer with O-rings
5. Timing gear
6. Roller bearing
7. Bearing housing
8. Shaft seal
9. Output/input shaft
10. Piston with laminated piston ring



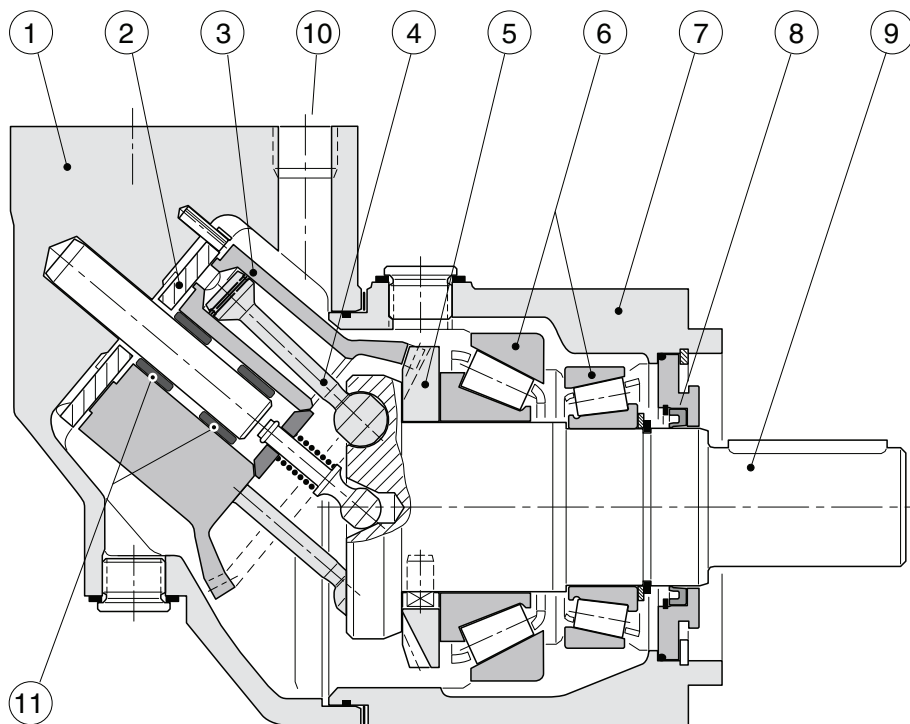
F12 cross sections

F12-30, -40, -60, -80 and -90
 (F12-60 shown)



- Legend:
- | | | |
|----------------------------|----------------------------|--|
| 1. Barrel housing | 5. Timing gear | 9. Output/input shaft |
| 2. Valve plate | 6. Tapered roller bearings | 10. Port E (F12-110 and -125) |
| 3. Cylinder barrel | 7. Bearing housing | 11. Needle bearings (F12-110 and -125) |
| 4. Piston with piston ring | 8. Shaft seal | |

F12-110 and -125
 (F12-110 shown)



Specifications

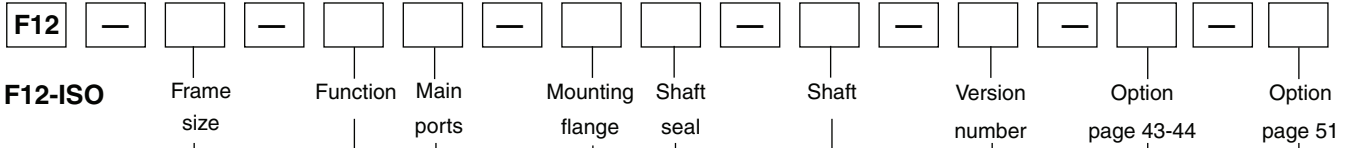
Hydraulic motor/pump

Series F11/F12

Frame size F11	-5	-6	-10	-12	-14	-19
Displacement [cm ³ /rev]	4.9	6.0	9.8	12.5	14.3	19.0
Operating pressure						
max intermittent ¹⁾ [bar]	420	—————				420
max continuous [bar]	350	—————				350
Motor operating speed [rpm]						
max intermittent ¹⁾	14 000	11 200	11 200	10 300	9 900	8 900
max continuous	12 800	10 200	10 200	9 400	9 000	8 100
min continuous	50	—————				50
Max pump selfpriming speed²⁾						
L or R function; max [rpm]	4 600	—	4 200	3 900	3 900	3 500
Motor input flow						
max intermittent ¹⁾ [l/min]	69	67	110	129	142	169
max continuous [l/min]	63	61	100	118	129	154
Main circuit temp.³⁾, max [°C]	80					80
min [°C]	-40					-40
Theoretical torque at 100 bar [Nm]	7.8	9.5	15.6	19.8	22.7	30.2
Mass moment of inertia						
(x10 ⁻³) [kg m ²]	0.16	0.39	0.39	0.40	0.42	1.1
Weight [kg]	4.7	7.5	7.5	8.2	8.3	11

Frame size F12	-30	-40	-60	-80	-90	-110	-125	-150	-250	
Displacement [cm ³ /rev]	30.0	40.0	59.8	80.4	93.0	110.1	125.0	150	242	
Operating pressure										
max intermittent ¹⁾ [bar]	480	—————			480	420	480	480	420	420
max continuous [bar]	420	—————			420	350	420	420	350	350
Motor operating speed [rpm]										
max intermittent ¹⁾	7 300	6 700	5 800	5 300	5 000	4 800	4 600	3 500	3 000	
max continuous	6 700	6 100	5 300	4 800	4 600	4 400	4 200	3 200	2 700	
min continuous	50	—————							50	
Max pump selfpriming speed²⁾										
L or R function; max [rpm]	3150	2870	2500	2300	2 250	2200	2 100	1 700	1 500	
Motor input flow										
max intermittent ¹⁾ [l/min]	219	268	347	426	465	528	575	525	726	
max continuous [l/min]	201	244	317	386	428	484	525	480	653	
Main circuit temp.³⁾, max [°C]	80								80	
min [°C]	-40								-40	
Theoretical torque at 100 bar [Nm]	47.6	63.5	94.9	127.6	147.6	174.8	198.4	238.1	384.1	
Mass moment of inertia										
(x10 ⁻³) [kg m ²]	1.7	2.9	5	8.4	8.4	11.2	11.2	40	46	
Weight [kg]	12	16.5	21	26	26	36	36	70	77	

1) Intermittent: max 6 seconds in any one minute.
 2) Selfpriming speed valid at sea level.
 3) See also installation information, operating temperature.



Frame size	
Code	Displacem. (cm ³ /rev)
030	30.0
040	40.0
060	59.8
080	80.4
090	93.0
110	110.1
125	125.0

Version number
 (assigned for special versions)

Frame size		30	40	60	80	90	110	125
Code Shaft								
D	DIN spline Optional	(x)	(x)	(x)	(x)	(x)	(x)	(x)
Z	" " Optional	(x)	(x)	(x)	(x)	(x)	(x)	(x)
K	Metric key Standard	x	x	x	x	x	x	x
P	" " Optional	(x)	-	-	-	-	-	-

Frame size		30	40	60	80	90	110	125
Code Function								
M	Motor	x	x	x	x	x	x	x
	Pump:							
L	counter clockw.	(x)	(x)	(x)	(x)	(x)	(x)	(x)
R	clockwise	(x)	(x)	(x)	(x)	(x)	(x)	(x)

Frame size		30	40	60	80	90	110	125
Code Option								
L01	Integr. flushing valve	(x)	(x)	(x)	(x)	(x)	- ³⁾	- ³⁾
MVR	Make-up valve clockwise rotation	(x)	-	-	-	-	-	-
MVL	Make-up valve counter clockwise rotation	(x)	-	-	-	-	-	-

Frame size		30	40	60	80	90	110	125
Code Main ports								
F	SAE 6000 psi flange	x	x	x	x	x	x	x

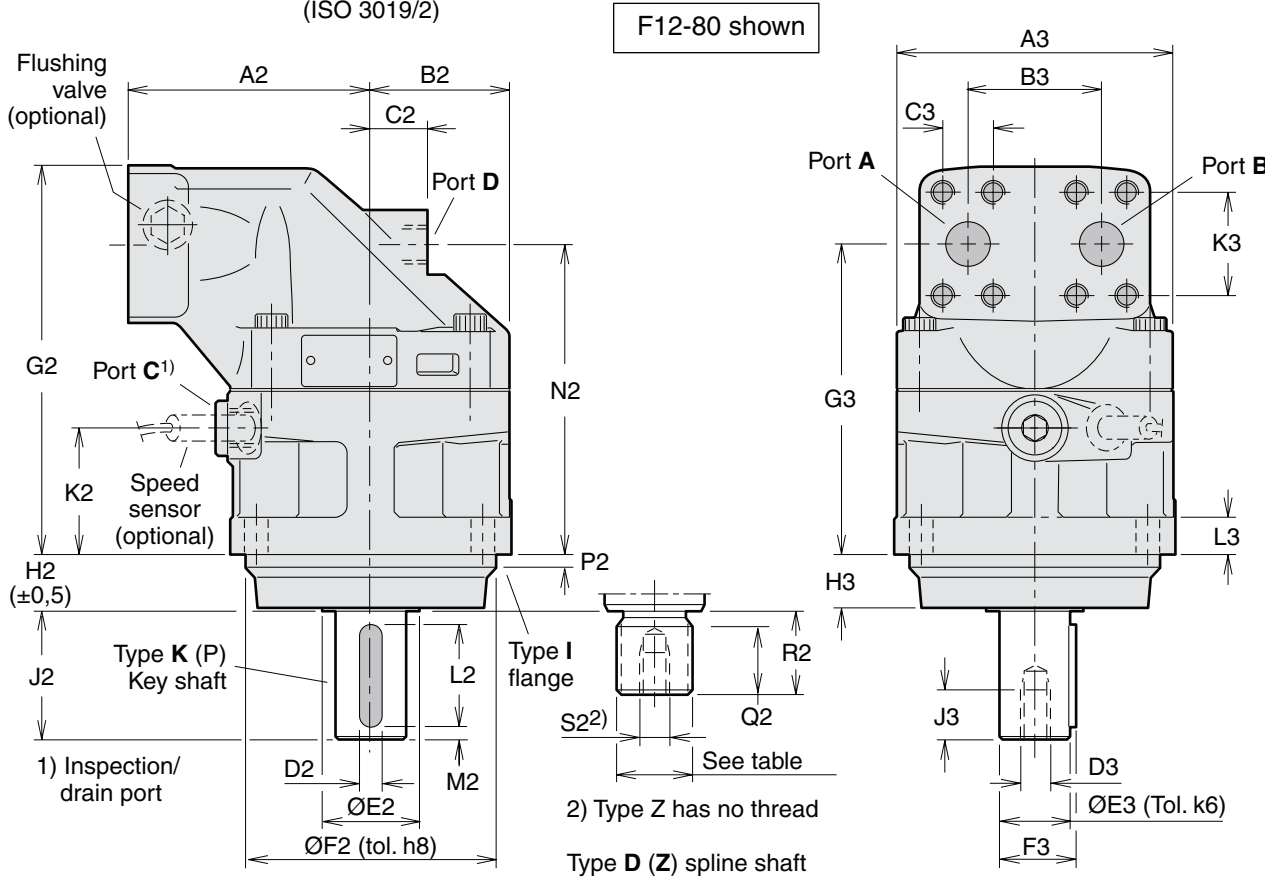
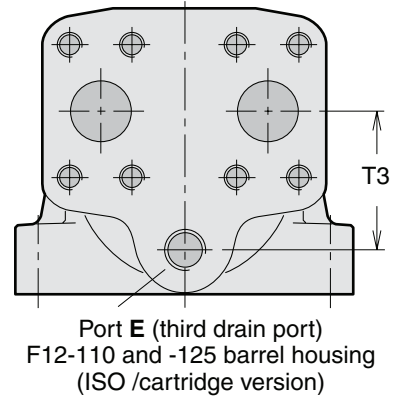
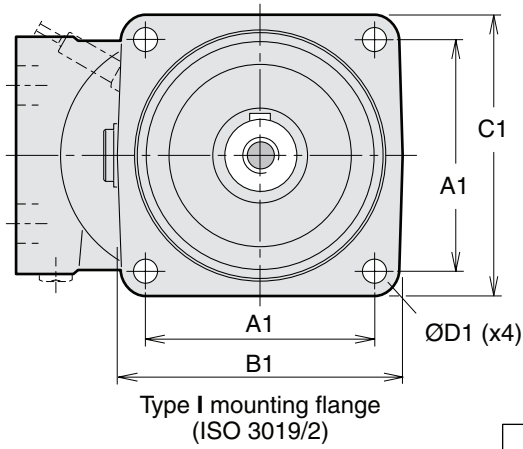
Frame size		30	40	60	80	90	110	125
Code Option								
P	Prepared for speed sensor	(x)	(x)	(x)	(x)	(x)	(x)	(x)

Frame size		30	40	60	80	90	110	125
Code Mounting flange								
I	ISO flange	x	x	x	x	x	x	x

Frame size		30	40	60	80	90	110	125
Code Shaft seal								
N	NBR ¹⁾ , low pressure	(x)	(x)	(x)	(x)	(x)	(x)	(x)
V	FPM ²⁾ , high temperature, high pressure	x	x	x	x	x	x	x

- x: Available (x): Optional -: Not available
 1) NBR - Nitrile rubber
 2) FPM - Fluor rubber
 3) F12-110 and -125: Accessory valve block (page 45)

F12-30, -40, -60, -80, -90, -110 and -125
 (ISO versions)



Dim.	F12-30	F12-40	F12-60	F12-80 F12-90	F12-110 F12-125
A1	88.4	113.2	113.2	127.2	141.4
B1	118	146	146	158	180
C1	118	142	144	155	180
D1	11	13.5	13.5	13.5	18
A2	100	110	125	135	145
B2	59	65	70	78	85
C2	25	26	22	32	38
D2	8	8	10	12	14
E2	33	42	42	52	58
F2	100	125	125	140	160
G2	172	173	190	216	231
H2	25.5	32.5	32.5	32.5	40.5
J2 ¹⁾	50	60	60	70	82
J2 ²⁾	50	-	-	-	-
K2	55	52	54	70.5	66.5
L2	40	50	50	56	70
M2	5	5	5	7	6
N2	136.5	137	154	172.5	179
P2	8	8	8	8	8
Q2	28	28	33	36	41
R2 ³⁾	35	35	40	45	50
R2 ⁴⁾	43	35	35	41	-
S2 ³⁾	M12 x24	M12 x24	M12 x28	M16 x36	M16 x36
S2 ⁴⁾	-	M12 x24	-	M12 x28	-
A3	122	134	144	155	170
B3	66	66	66	75	83
C3	23.8	23.8	23.8	27.8	31.8
D3	M12	M12	M12	M16	M16
E3	30	30	35	40	45
F3	33	33	38	43	49
G3	136.5	137	154	172.5	179
H3	23.5	30.5	30.5	30.5	38.5
J3	24	24	28	36	36
K3	50.8	50.8	50.8	57.2	66.7
L3	18	20	20	20	22
T3	-	-	-	-	68

- 1) Key shaft type K
- 2) Key shaft type P
- 3) Spline shaft type D
- 4) Spline shaft type Z
- 5) Special number 264

Ports	F12-30	F12-40	F12-60	F12-80 F12-90	F12-110 F12-125
A, B size	3/4"	3/4"	3/4"	1"	1 1/4"
Screw thread ¹⁾	M10 x20	M10 x20	M10 x20	M12 x20	M14 x26
C thread ²⁾	M22 x1.5	M22 x1.5	M22 x1.5	M22 x1.5	M22 x1.5
D thread ²⁾	M18 x1.5	M18 x1.5	M22 x1.5	M22 x1.5	M22 x1.5
E thread	-	-	-	-	M22 x1.5


A, B: ISO 6162 1) Metric thread x depth in mm
 2) Metric thread x pitch in mm.

Spline shaft (DIN 5480)

	Type D (standard)	Type Z (optional)
F12-30	W30x2x14x9g	W25x1.25x18x9g
-40	W32x2x14x9g	W30x2x14x9g
-60	W35x2x16x9g	W32x2x14x9g
-80	W40x2x18x9g	W35x2x16x9g
-90	W40x2x18x9g	W35x2x16x9g
-110	W45x2x21x9g	W40x2x18x9g
-125	W45x2x21x9g	W40x2x18x9g

Key shaft

	Type K (std)	Type P (opt.)	Type X (opt.)
F12-30	Ø30	Ø25	-
-40	Ø30	-	Ø35 ⁵⁾
-60	Ø35	-	-
-80	Ø40	-	-
-90	Ø40	-	-
-110	Ø45	-	-
-125	Ø45	-	-

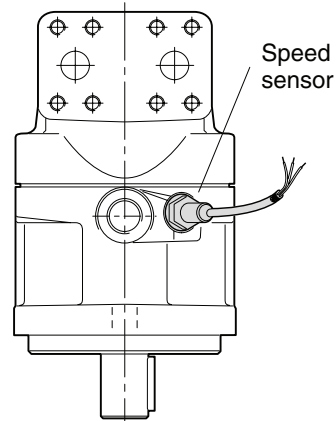
 = Max 350 bar operating pressure

A speed sensor kit is available for series F11/F12. A ferrostat differential (Hall-effect) sensor installs in a separate, threaded hole in the F11/F12 bearing housing.

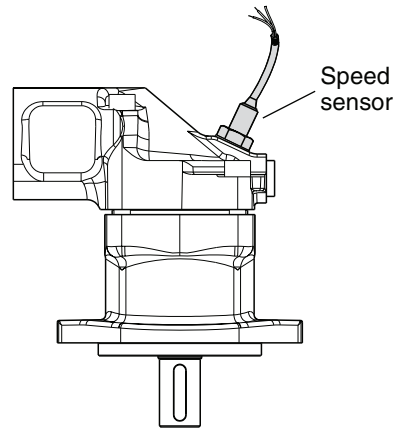
On F12 the speed sensor is directed towards the ring gear. On F11 the speed sensor is directed towards the pistons. The sensor output is a 2 phase shifted square wave signal within a frequency range of 0 Hz to 15 kHz.

- NOTE:**
- The motor bearing housing must be prepared for the speed pick-up; refer to the F11/F12 ordering codes (pages 7-12).
 - On F11 **the pistons position must be known before mounting.**
 - Additional information is provided in the Instruction (catalogue HY30-8301/UK).
 - The speed sensor is also shown in the illustrations on pages 19, 20, 23, 24, 26, 27, 30, 32, 34 and 36

Part number for Speed sensor is 378 5190.



F12 with speed sensor.



F11-14 with speed sensor.

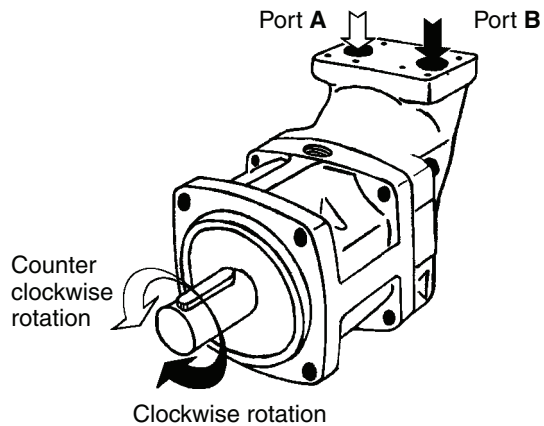
Direction of rotation

The M and H versions of series F11, and the M version of series F12, are bi-directional.

The L and R pump versions are uni-directional, allowing higher selfpriming speeds (refer to page 16).

The illustration to the right shows direction of flow versus shaft rotation. In a motor application, the shaft turns clockwise when port **B** (black arrow) is pressurized, and counter clockwise when port **A** (open arrow) is pressurized.

In a pump application where the shaft turns clock-wise, port B is the inlet port and should be connected to tank; when the shaft turns counter clockwise, port A is the inlet port.



Hydraulic fluids

Ratings and performance data for series F11/F12 are based on operating with good quality, contamination-free, petroleum-based fluids.

Hydraulic fluids type HLP (DIN 51524), automatic transmission fluids type A, or API CD engine oils can be used.

Fire resistant fluids (when used under modified operating conditions) and synthetic fluids may also be suitable.

For additional information, refer to Hydraulic Marketing Information System data base:

- Hydraulic fluid specifications
- Fire resistant fluids.

Operating temperature

The following temperatures should not be exceeded (type **N** shaft seals):

Main circuit 70 °C

Drain circuit: 90 °C.

FPM shaft seals (type **V**) can be used to 115 °C drain fluid temperature.

NOTE: The temperature should be measured at the utilized drain port.

Continuous operation may require case flushing in order to meet the viscosity and temperature limitations.

The following table shows operating speeds, above which flushing is usually required, as well as suggested flow through the case.

F11/F12 in series operation

When running F11/F12 in series at higher pressure levels,

Please contact Product Support, Pump and Motors in Trollhättan for further information.

NOTE:

When operating the F11/F12 as a pump above the selfpriming speed (valid for both the pump and motor versions), the inlet must be sufficiently pressurized. Increased noise and deteriorating performance may otherwise be experienced.

For further information refer to 'Selfpriming speed and required inlet pressure' on page 6.

Series F11

Frame size	Speed [rpm]	Flow [l/min]
F11-5	5500	1-2
F11-6	4500	2-3
F11-10	4500	2-3
F11-12	4500	2-3
F11-14	4500	2-3
F11-19	4000	2-4

Series F12

Frame size	Speed [rpm]	Flow [l/min]
F12-30	3500	4-8
F12-40	3000	5-10
F12-60	3000	7-14
F12-80	2500	8-16
F12-90	2500	8-16
F12-110	2300	9-18
F12-125	2300	9-18
F12-150	2200	10-20
F12-250	1800	12-22

Viscosity

The ideal operating range is 15 to 30 mm²/s [cSt].
 At operating temperature, the viscosity (of the drain fluid) should be kept above 8 mm²/s [cSt].
 At start-up, the viscosity should not exceed 1000 mm²/s [cSt]

Filtration

To obtain the highest service life of the F11/F12, the fluid cleanliness should meet or exceed ISO code 20/18/13 (ISO 4406).
 During normal operating conditions, a 10 µm (absolute) filter is recommended.

Case pressure

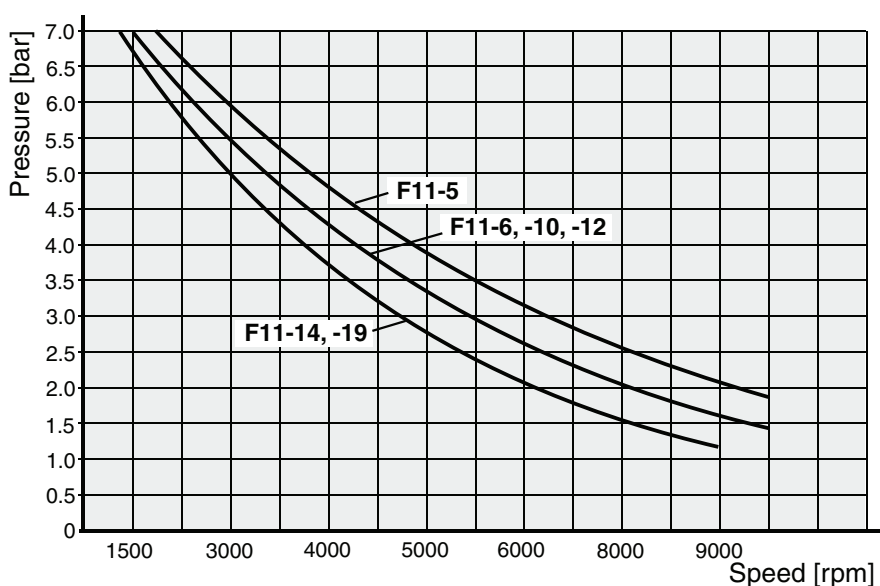
The service life of the shaft seal ring is affected by the speed of the motor and the case drain pressure and it can decrease with an increase in the frequency of pressure peaks.

Note, seal life can be shorter at unfavourable operating conditions (high temperature, low oil viscosity, contaminated oil).

The diagram below show the highest recommended case pressure as a function of shaft speed.

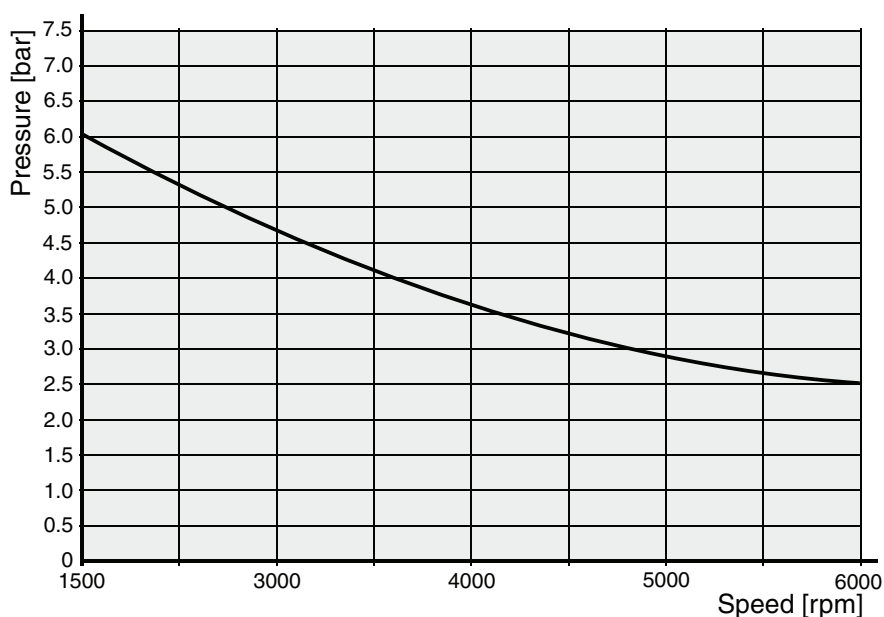
The case pressure must be equal to or greater than the external pressure on the shaft seal ring.

Serie F11



Valid for V seal, for other seals, please contact Parker Hannifin

Serie F12

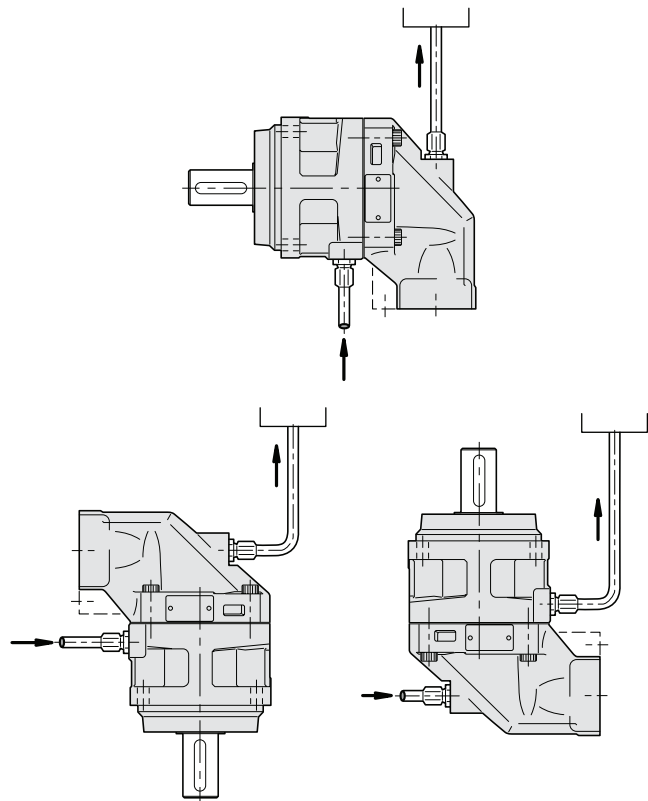
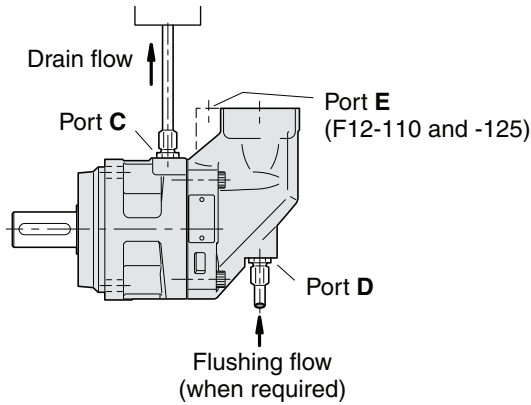


Valid for V seal, for other seals, please contact Parker Hannifin

Case drain connections

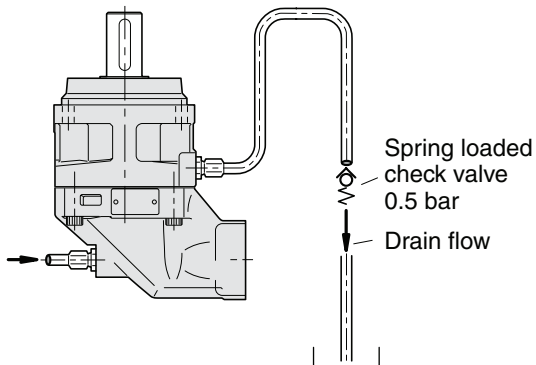
Series F11/F12 have two drain ports, **C** and **D**, while F12-110 and -125 have an additional port, **E**.

The uppermost drain port (such as port C in the illustration below) should always be utilized.



In mounting positions such as 'shaft up' (below) a spring loaded check valve should be installed in the drain line in order to insure a sufficiently high oil level in the case.

Preferably, the drain line should be connected directly to the reservoir.



Before start-up

Make sure the F11/F12 case as well as the entire hydraulic system is filled with a recommended fluid.

The internal leakage, especially at low operating pressures, is *not* sufficient to provide lubrication at start-up.

NOTE:

- To avoid cavitation and obtain a low noise level as well as reduced heat generation, tubes, hoses and fittings must be adequately dimensioned.
- Preferably, the suction line flow speed should be 0.5 to 1 m/s, and pressure line flow speeds 3 to 5 m/s.