



F12 Series Axial Piston Fixed Motors Service Manual



Basic formulas for hydraulic motors

Flow (q)

$$q = \frac{D \times n}{1000 \times \eta_v} \text{ [l/min]}$$

D - displacement [cm³/rev]

n - shaft speed [rpm]

η_v - volumetric efficiency

Torque (M)

$$M = \frac{D \times \Delta p \times \eta_{hm}}{63} \text{ [Nm]}$$

Δp - differential pressure [bar]
(between inlet and outlet)

η_{hm} - mechanical efficiency

η_t - overall efficiency

($\eta_t = \eta_v \times \eta_{hm}$)

Power (P)

$$P = \frac{q \times \Delta p \times \eta_t}{600} \text{ [kW]}$$

Basic formulas for hydraulic pumps

Flow (q)

$$q = \frac{D \times n \times \eta_v}{1000} \text{ [l/min]}$$

D - displacement [cm³/rev]

n - shaft speed [rpm]

η_v - volumetric efficiency

Torque (M)

$$M = \frac{D \times \Delta p}{63 \times \eta_{hm}} \text{ [Nm]}$$

Δp - differential pressure [bar]
(between inlet and outlet)

η_{hm} - mechanical efficiency

η_t - overall efficiency

($\eta_t = \eta_v \times \eta_{hm}$)

Power (P)

$$P = \frac{q \times \Delta p}{600 \times \eta_t} \text{ [kW]}$$

Conversion factors

1 kg.....	2.20 lb
1 N.....	0.225 lbf
1 Nm.....	0.738 lbf ft
1 bar.....	14.5 psi
1 l.....	0.264 US gallon
1 cm ³	0.061 cu in
1 mm.....	0.039 in
1°C.....	⁵ / ₉ (°F-32)
1 kW.....	1.34 hp

Conversion factors

1 lb.....	0.454 kg
1 lbf.....	4.448 N
1 lbf ft.....	1.356 Nm
1 psi.....	0.068948 bar
1 US gallon.....	3.785 l
1 cu in.....	16.387 cm ³
1 in.....	25.4 mm
1 °F.....	⁹ / ₅ °C + 32
1 hp.....	0.7457 kW



WARNING – USER RESPONSIBILITY

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

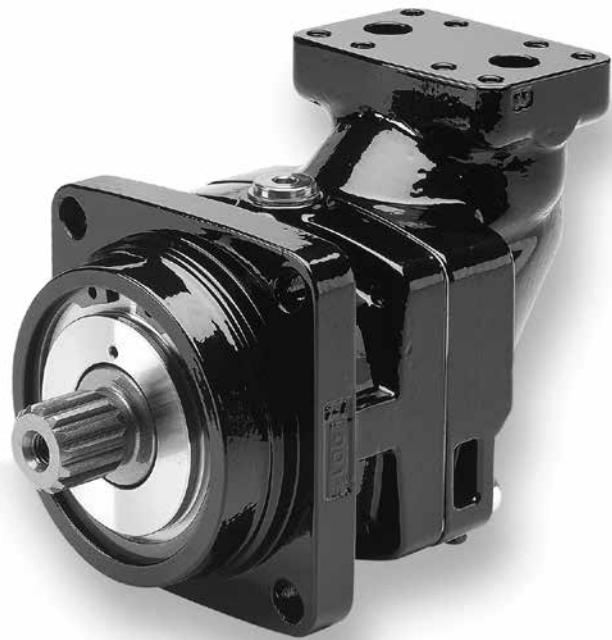
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The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

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Offer of Sale

Please contact your Parker representation for a detailed "Offer of Sale".



Series F11

F11 is a bent-axis, fixed displacement motor/pump. It can be used in numerous applications in both open and closed loop circuits.

The F11 series is available in sizes 5, 6, 10, 12, 14 and 19 cc (*0.3 to 1.16 cu in/rev*).

F11 Features

- Max intermittent pressure up to 420 bar (*6090 psi*) and continuous operating pressure up to 350 bar (*5075 psi*)
- Thanks to low weight pistons and a compact design of the rotating parts, the F11 tolerates very high speeds, up to 14000 rpm
- CETOP, ISO, SAW and SAE versions

Series F12

F12 is a bent-axis, fixed displacement motor/pump. It can be used in numerous applications in both open and closed loop circuits.

The F12 series is available in sizes 30, 40, 60, 80, 90, 110, 125, 152, 162, 182 and 250 cc (*1.83 to 14.8 cu in/rev*).

F12 Features

- Max intermittent pressure up to 480 bar (*6960 psi*) and continuous operating pressure up to 420 bar (*6090 psi*)
- The 7 or 9 piston design provides high start-up torque and smooth motor operation
- ISO, CETOP, SAW, Cartridge and SAE versions

General Features

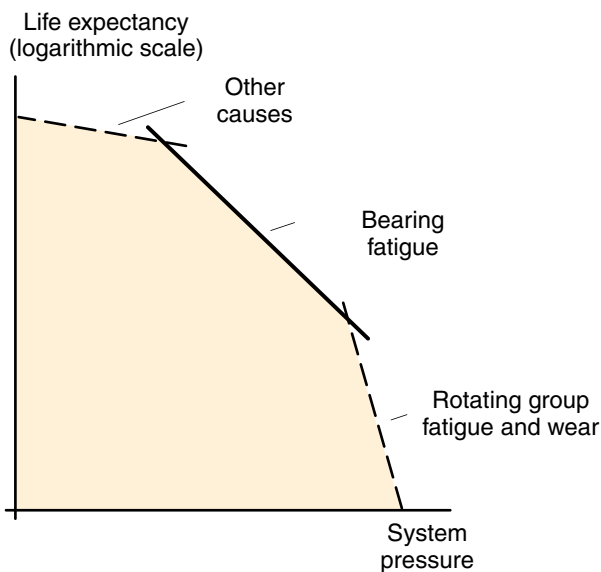
- The laminated piston ring offers important advantages such as unbeatable efficiency and thermal shock resistance
- High allowable speeds and operating pressures means high output power
- The unique piston locking, timing gear and bearing set-up as well as the limited number of parts add up to a very robust design with long service life and, above all, proven reliability.
- The 40° angle between shaft and cylinder barrel allows for a very compact, lightweight motor/pump.
- Small envelop size and a high power-to-weight ratio
- The motor version has highly engineered valve plates for high speed and low noise
- The pump version has highly engineered valve plates for increased self priming speed and low noise, available with left and right hand rotation.
- The F11's and F12's have a simple and straight-forward design with very few moving parts, making them very reliable motors/pumps.
- 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.

Bearing life

General information

Bearing life can be calculated for that part of the load/life curve (shown below) that is designated 'Bearing fatigue'. 'Rotating group fatigue and wear' and 'Other' caused by material fatigue, fluid contamination, etc. should also be taken into consideration when estimating the service life of a motor/pump in a specific application. Bearing life calculations are mainly used when comparing different frame sizes. Bearing life, designated B_{10} (or L_{10}), is dependent of system pressure, operating speed, external shaft loads, fluid viscosity in the case, and fluid contamination level.

The B_{10} value means that 90% of the bearings survive, at a minimum, the number of hours calculated. Statistically, 50% of the bearings will survive at least five times the B_{10} life.



Hydraulic unit life versus system pressure.

Bearing life calculation

An application is usually governed by a certain duty or work cycle where pressure and speed vary with time during the cycle.

In addition, bearing life depends on external shaft forces, fluid viscosity in the case and fluid contamination.

Parker Hannifin has a computer program for calculating bearing life and will assist in determining F11 or F12 motor/pump life in a specific application.

Required information

When requesting a bearing life calculation from Parker Hannifin, the following information (where applicable) should be provided:

- A short presentation of the application
- F11 or F12 size and version
- Duty cycle (pressure and speed versus time at given displacements)
- Low system pressure
- Case fluid viscosity
- Life probability (B_{10} , B_{20} , etc.)
- Operating mode (pump or motor)
- Direction of rotation (L or R)
- External shaft loads (Forces, Gear, Belt, Cardan or none)

For forces please provide:

- Axial load, Fixed radial load, Bending moment, Rotating radial load and distance flange to radial load.

For Gear please provide:

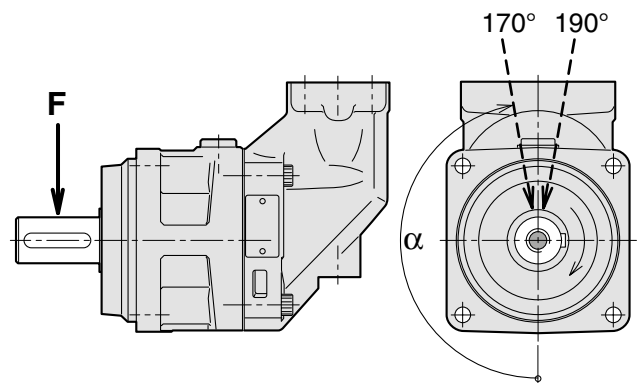
- Pitch diameter, Pressure angle, Spiral angle, Distance flange – gearwheel (mid) and Gearwheel spiral direction (R or L).

For Belt please provide:

- Pretension, Coefficient of friction, Angle of contact, Distance flange – pulley (mid) and Diameter pulley.

For Cardan please provide:

- Shaft angle, Distance flange – first joint and distance between joints
- Angle of attack (α) as defined below



The direction (α) of the radial load is positive in the direction of rotation as shown.

To obtain maximum bearing life, the radial load should, in most cases, be located between 170° and 190° .

F11/F12 Fan motors

F11/F12 motors, in frame sizes -5 to -40 cc (0.3 to 2.44 cu in/rev), are common in Fan applications. Some typical options are, built in check valve, pressure relief valve, cartridge flange and tapered shaft (refer to the schematic to the right).

The fan motor can be operated at very high speeds without reliability problems. The fan is usually installed directly on the motor shaft without additional bearing support. The F11/F12 has up to 95% overall efficiency which reduces the diesel consumption and minimizes the cooling demand.

Fan motor circuit

Because of the built-in anti cavitation valve, either left hand (L) or right hand (R) rotation must be specified when ordering the motor.

When the pump flow to the motor is shut off and the motor is operating at very high speeds, it is important that sufficient return port back pressure is available (port B in the schematic to the right).

The anti cavitation valve will then open and direct flow to the motor inlet port. If the inlet pressure is insufficient, motor cavitation will be experienced.

In an open circuit, back pressure can be created by a counter pressure valve installed in the return line; preferably, it should be pilot operated to minimize power losses. A back pressure of about 10 bar is sufficient in most applications.

For more drawings illustrating motors with make-up valve, see chapters 2, F11 and 3, F12.

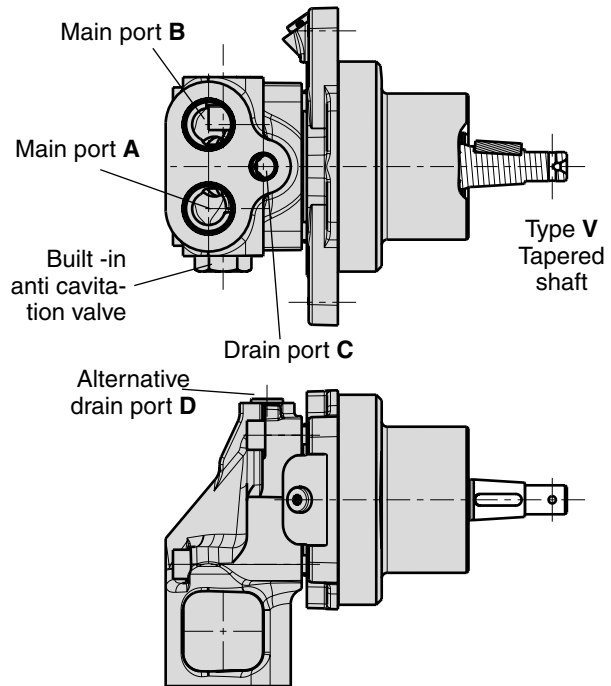
For more info about integrated pressure relief valves, see page 63.

Example of ordering code

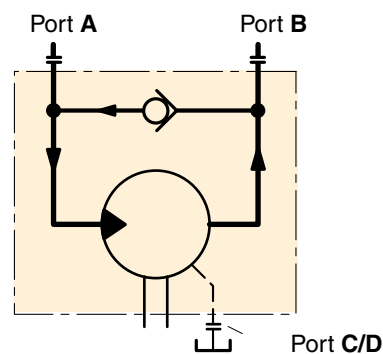
F11-010-MB-CV-K-000-MUVL-00

MUVL = Make up/anti cavitation valve, counter clockwise rotation

MUVR = Make up/anti cavitation valve, clockwise rotation



Fan motor (F11-10 left hand rotated shown).



Schematic Fan motor with anti cavitation valve

F11/F12 in saw motor applications

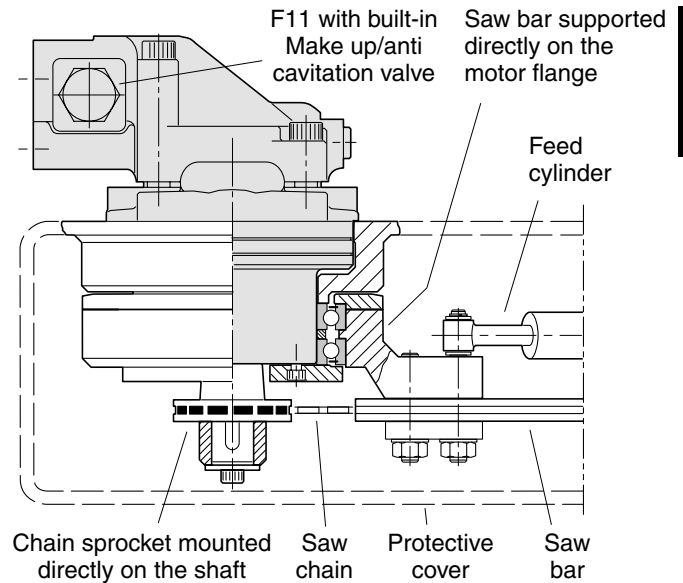
Series F11/F12 motors have proven suitable for demanding applications such as chain saws. Primarily due to the 40° bent-axis design, spherical pistons (with laminated piston rings) and gear synchronization, very high speeds are permissible. Not even low temperatures at start-up affect reliability.

Because of the built-in anti cavitation valve, either left hand (L) or right hand (R) rotation must be specified when ordering the motor.

When the pump flow to the motor is shut off and the motor is operating at very high speeds, it is important that sufficient return port back pressure is available.

The anti cavitation valve will then open and direct flow to the motor inlet port. If the inlet pressure is insufficient, motor cavitation will be experienced.

To further enhance the saw function and, at the same time, reduce weight, cost and installation dimensions, a specific saw motor has been developed (frame sizes F11-6, -10, -12, -14 19, F12-30 and -40; refer to the illustration to the right) which is specifically dedicated to bar saws. The motor allows the saw bar bearings to be mounted directly on the motor housing, and the sprocket installs on the motor shaft without additional bearings. Catalogue MSG30-8245/UK



Chain saw installation (example; F11-10 shown)

Parker Power Boost

A high speed F11 or F12 motor could be optimized with a Power Boost™, which means less fluid friction and oil compression. This can reduce power losses by up to 5 kW. The improved efficiency generates less heat, reducing the need for cooling and consequently improves fuel consumption.

Parker Power Boost is available for size F11-006, -010, -012, -014, -019 and F12-030.

When to order a motor with Power Boost it is to be specified with a B in last field in model code. Ex below.

F11-019-SB-CS-K-000-MUVL-B0



F12



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Frame size F12	-030	-040	-060	-080	-090	-110	-125	-152	-162	-182	-250
Displacement [cm ³ /rev]	30.0	40.0	59.8	80.4	93.0	110.1	125.0	149.8	163.1	179.8	242
[cu in/rev]	1.83	2.44	3.65	4.91	5.68	6.72	7.63	9.14	9.95	10.97	14.8
Operating pressure ³⁾											
max intermittent ¹⁾ [bar]	500	480	500	480	420	480	480	480	480	480	420
[psi]	7250	7000	7250	7000	6000	7000	7000	7000	7000	7000	6000
max continuous [bar]	450	420	450	420	350	420	420	420	420	420	350
[psi]	6500	6000	6500	6000	5 000	6000	6000	6000	6000	6000	5 000
Motor operating speed ³⁾ [rpm]											
max intermittent ¹⁾	8600	6700	6400	5300	5000	4800	4600	4000	4000	4000	3000
max continuous	7300	6100	5800	4800	4600	4400	4200	3700	3700	3700	2700
min continuous	50	50	50	50	50	50	50	50	50	50	50
Max pump selfpriming speed ²⁾											
L or R function; max [rpm]	3100	2800	2400	2200	2200	2000	2000	1700	1600	1500	1500
Motor input flow											
max intermittent ¹⁾ [l/min]	219	268	347	426	465	528	575	608	648	728	726
[gpm]	57.9	70.8	91.7	112.5	122.8	139.5	151.9	144.5	171.2	192.3	191.8
max continuous [l/min]	201	244	317	386	428	484	525	547	583	655	653
[gpm]	53.1	64.5	83.7	102.0	113.1	127.9	138.7	144.5	154.0	173.0	172.5
Drain temperature ³⁾ , max [°C]	115	115	115	115	115	115	115	115	115	115	115
[° F]	239	239	239	239	239	239	239	239	239	239	239
min [°C]	-40	-40	-40	-40	-40	-40	-40	-40	-40	-40	-40
[° F]	-40	-40	-40	-40	-40	-40	-40	-40	-40	-40	-40
Theoretical torque at 100 bar [Nm]	47.6	63.5	94.9	127.6	147.6	174.8	198.4	241	257	289	384.1
[lbf ft]	35.1	46.9	70.0	94.2	108.9	129.0	146.4	177.8	189.6	213.2	283.5
Mass moment of inertia											
(x10 ⁻³) [kg m ²]	1.7	2.9	5	8.4	8.4	11.2	11.2	21	21	21	46
(x10 ⁻²) [lbf ft ²]	4.03	6.88	11.86	19.93	19.93	26.58	26.58	79.83	79.83	79.83	109.16
Weight [kg]	11.5	15.7	18.6	25.7	25.7	33	33	40	40	40	77
[lb]	25.3	34.6	41	56.7	56.7	72.6	72.6	88	88	88	170

- 1) Intermittent: max 6 seconds in any one minute.
2) Selfpriming speed valid at sea level. Find more info on page 42
3) See also installation information. Page 69

Efficiency

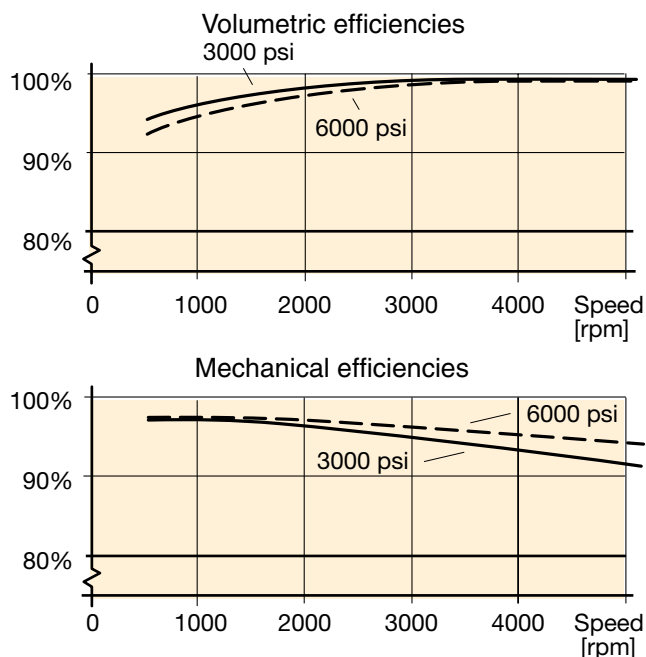
Because of its high overall efficiency, driving a motor/pump from series F12 requires less fuel or electric power.

Also, it allows the use of a small reservoir and heat exchanger, which in turn reduce cost, weight, and installation size.

The diagrams to the right show volumetric and mechanical efficiencies of an F12-030 motor.

F12-030 motors can be equipped with Power Boost which in high speed applications can decrease the mechanical losses by up to 15%, see page 7.

Contact Parker Hannifin for efficiency information on a particular F12 frame size that is being considered.



3

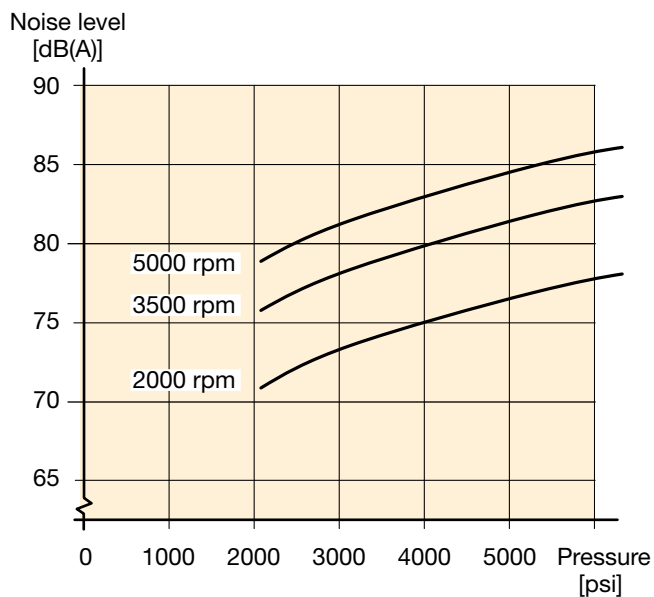
Noise level

Series F12 feature low noise levels from low to high speeds and pressures.

As an example, the diagram to the right shows the noise level of an F12-030 pump/motor.

The noise level is measured in a semi-anechoic room, 1 m behind the unit.

The noise level for a particular motor/pump may vary ± 2 dB(A) compared to what is shown in the diagram.



NOTE: Noise information for F12 frame sizes are available from Parker Hannifin.

Selfpriming speed and required inlet pressure

Series F12

When operating the F12 as a pump (with L or R valve plate) above the selfpriming speed, the inlet must be pressurized. Increased noise and deteriorating performance may otherwise be experienced.

Diagrams 2 and 3 shows required pump inlet pressure vs. shaft speed.

The F12 motor (type M valve plate) sometimes operates as a pump e.g. when used in a propel transmission and the vehicle is going downhill.

Minimum required inlet pressure versus shaft speed is shown in the diagrams.

The inlet pressure can be charged by external pump, pressurized reservoir or using BLA Boost unit.

Find more info about the BLA unit at page 68.

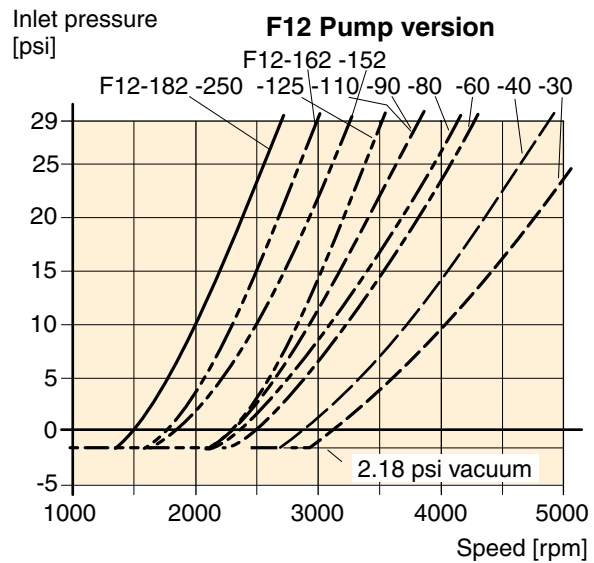


Diagram 2. Min. required pump (F12-L or -R) inlet press.

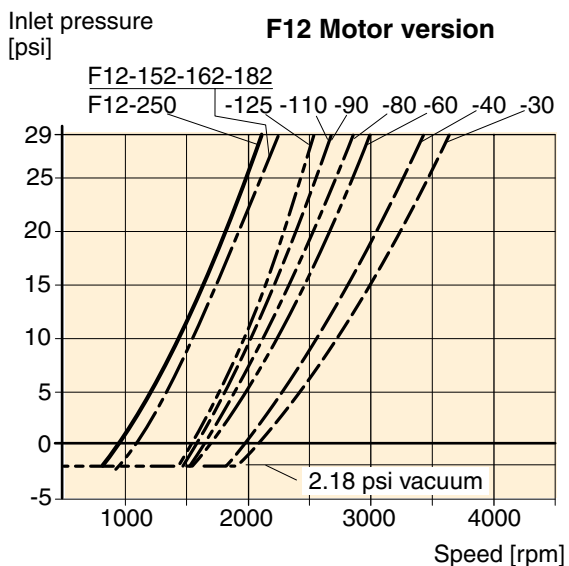
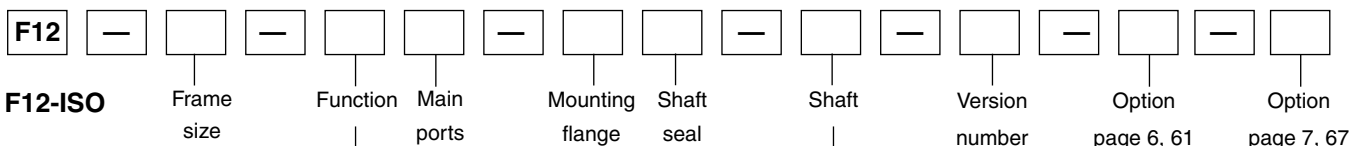


Diagram 3. Min. required motor (F12-M) inlet pressure.



Frame size		
Code	Displacem. (cm ³ /rev)	Displacem. (cu in/rev)
030	30.0	1.83
040	40.0	2.44
060	59.8	3.65
080	80.4	4.91
090	93.0	5.68
110	110.1	6.72
125	125.0	7.63
152	149.8	9.14
162	163.1	9.95
182	179.8	11.11

Frame size	30	40	60	80	90	110	125	152	162	182
Code	Function									
M	Motor	x	x	x	x	x	x	x	x	x
S	Motor, high speed	(x)	(x)	(x)	-	-	-	(x)	(x)	(x)
R	Pump, clockwise rotation	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)
L	Pump, counter clockwise rot'n	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)

For other versions, contact Parker Hannifin

Frame size	30	40	60	80	90	110	125	152	162	182
Code	Main ports									
F	SAE 6000 psi flange	x	x	x	x	x	x	x	x	x
D	SAE 6000 psi Horizontal	-	-	-	-	-	-	(x)	(x)	(x)
A	SAE 6000 psi Axial	-	-	-	-	-	-	(x)	(x)	(x)
K	SAE 6000 psi Rear	-	-	-	-	-	-	(x)	(x)	(x)
M	SAE 6000 psi Side	-	-	-	-	-	-	(x)	(x)	(x)

Frame size	30	40	60	80	90	110	125	152	162	182
Code	Mounting flange									
I	ISO flange	x	x	x	x	x	x	x	x	x
F	ISO 200 flange	-	-	-	-	-	-	x	x	x

- x: Available (x): Optional - : Not available
 1) F12-110 and -125: Accessory valve block (page 62)
 2) Pressure setting on page 63

NOTE: All combinations are not valid, please contact Parker Hannifin

Version number
 (assigned for special versions)

Frame size	30	40	60	80	90	110	125	152	162	182
Code	Shaft*									
D	DIN Spline, Standard	x	x	x	x	x	x	x	x	x
A	DIN Spline, Optional	-	(x)	-	-	-	-	-	-	-
Z	DIN Spline, Optional	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)
K	Metric key, Standard	x	x	x	x	x	x	x	x	x
J	Metric key, Optional	-	(x)	-	-	-	-	-	-	-
H	DIN Spline, Optional	-	-	-	-	-	-	(x)	(x)	(x)
G	Metric key, Optional	-	-	-	-	-	-	(x)	(x)	(x)
P	Metric key, Optional	(x)	-	-	-	-	-	(x)	(x)	(x)
V	Tapered shaft	(x)	(x)	(x)	-	-	(x)	(x)	-	-

*See also dimensional drawings on pages 46 and 48.

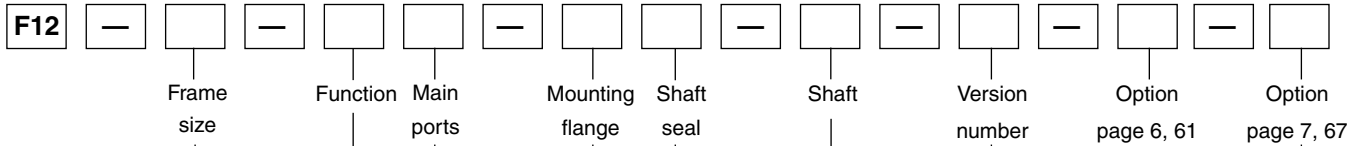
Frame size	30	40	60	80	90	110	125	152	162	182
Code	Option									
0000	Standard	x	x	x	x	x	x	x	x	x
L130	Flushing valve 1.3 mm orifice	(x)	(x)	(x)	(x)	(x)	- ¹⁾	- ¹⁾	-	-
MUVR	Make up/Anti cavitation valve clockwise rotation	(x)	-	-	-	-	-	-	-	-
MUVL	Make up/Anti cavitation valve counter clockwise rotation	(x)	-	-	-	-	-	-	-	-
P _{-R} ²⁾	Pressure relief valve clockwise rotation	(x)	(x)	(x)	-	-	-	-	-	-
P _{-L} ²⁾	Pressure relief valve counter clockwise rotation	(x)	(x)	(x)	-	-	-	-	-	-

Frame size	30	40	60	80	90	110	125	152	162	182
Code	Option									
P0	Prepared for speed sensor	x	x	x	x	x	x	x	x	x
PT	Prepared for speed sensor and Painted Black	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)
B0	Power Boost and Prepared for speed sensor	(x)	-	-	-	-	-	-	-	-
BT	Power Boost, Prepared for speed sensor and Painted Black	(x)	-	-	-	-	-	-	-	-

Frame size	30	40	60	80	90	110	125	152	162	182
Code	Shaft seal									
V	FPM, high pressure, high temperature	x	x	x	x	x	x	x	x	x

For other versions, contact Parker Hannifin





F12-Cartridge

Frame size		
Code	Displacem. (cm ³ /rev)	Displacem. (cu in/rev)
030	30.0	1.83
040	40.0	2.44
060	59.8	3.65
080	80.4	4.91
090	93.0	5.68
110	110.1	6.72
125	125.0	7.63

Version number
(assigned for special versions)

Frame size	30	40	60	80	90	110	125
Code	Shaft*						
C	DIN Spline, Std.	x	x	x	x	x	x
K	Metric key, Option	(x)	-	(x)	(x)	(x)	(x)
J	Metric key, Option	-	(x)	-	-	-	-
B	Spline DIN 5480	-	-	(x)	-	-	(x)
V	Tapered shaft	(x)	(x)	(x)	-	-	(x)

*See also dimensional drawings on page 50.

Frame size	30	40	60	80	90	110	125
Code	Function						
M	Motor	x	x	x	x	x	x
S	Motor, high speed	(x)	(x)	(x)	-	-	-

For other versions, contact Parker Hannifin

Frame size	30	40	60	80	90	110	125
Code	Option						
0000	Standard	x	x	x	x	x	x
L130	Flushing valve 1.3 mm orifice	(x)	(x)	(x)	(x)	(x)	(- ¹) (- ¹)
MUVR	Make up/Anti cavitation valve clockwise rotation	(x)	-	-	-	-	-
MUVL	Make up/Anti cavitation valve counter clockwise rotation	(x)	-	-	-	-	-
P__R ₂	Pressure relief valve clockwise rotation	(x)	(x)	(x)	-	-	-
P__L ₂	Pressure relief valve counter clockwise rotation	(x)	(x)	(x)	-	-	-

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

Frame size	30	40	60	80	90	110	125
Code	Mounting flange						
C	Cartridge	x	x	x	x	x	x

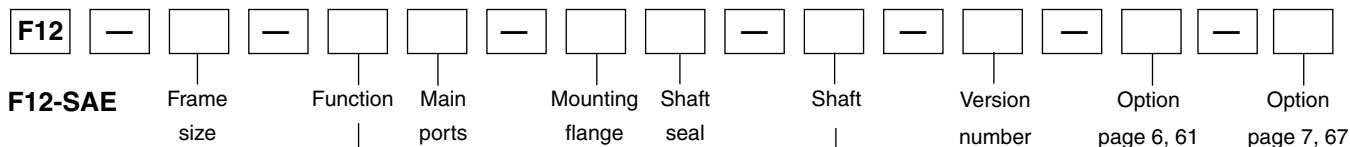
Frame size	30	40	60	80	90	110	125
Code	Option						
P0	Prepared for speed sensor	x	x	x	x	x	x
PT	Prepared for speed sensor and Painted Black	(x)	(x)	(x)	(x)	(x)	(x)
B0	Power Boost and Prepared for speed sensor	(x)	-	-	-	-	-
BT	Power Boost, Prepared for speed sensor and Painted Black	(x)	-	-	-	-	-

- x: Available (x): Optional - : Not available
 1) F12-110 and -125: Accessory valve block (page 62)
 2) Pressure setting on page 63

NOTE: All combinations are not valid, please contact Parker Hannifin

Frame size	30	40	60	80	90	110	125
Code	Shaft seal						
V	FPM, high pressure, high temperature	x	x	x	x	x	x

For other versions, contact Parker Hannifin



Frame size		
Code	Displacem. (cm ³ /rev)	Displacem. (cu in/rev)
030	30.0	1.83
040	40.0	2.44
060	59.8	3.65
080	80.4	4.91
090	93.0	5.68
110	110.1	6.72
125	125.0	7.63
152	149.8	9.14
162	163.1	9.95
182	179.8	11.11
250	242.0	14.76

Frame size	Code	Function	30	40	60	80	90	110	125	152	162	182	250
M	Motor		x	x	x	x	x	x	x	x	x	x	-
S	Motor, high speed		(x)	(x)	(x)	-	-	-	-	(x)	(x)	(x)	-
Q	Motor		-	-	-	-	-	-	-	-	-	-	x
R	Pump, clockwise rotation		(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)
L	Pump, counter clockwise rot'n		(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)

For other versions, contact Parker Hannifin

Frame size	Code	Main ports	30	40	60	80	90	110	125	152	162	182	250
S	SAE 6000 psi flange		x	x	x	x	x	x	x	-	-	-	-
U	SAE UN threads ⁴⁾		(x)	(x)	(x)	(x)	(x)	(x)	(x)	-	-	-	-
F	SAE 6000 psi flange ²⁾		-	-	-	-	-	-	-	x	x	x	x
D	SAE 6000 psi Horizontal ²⁾		-	-	-	-	-	-	-	(x)	(x)	(x)	-
A	SAE 6000 psi Axial ²⁾		-	-	-	-	-	-	-	(x)	(x)	(x)	-
K	SAE 6000 psi Rear ²⁾		-	-	-	-	-	-	-	(x)	(x)	(x)	-
M	SAE 6000 psi Side ²⁾		-	-	-	-	-	-	-	(x)	(x)	(x)	-

Frame size	Code	Mounting flange	30	40	60	80	90	110	125	152	162	182	250
S	SAE 4 bolt		x	x	x	x	x	x	x	x	x	x	x
R	SAE 4 bolt		-	-	-	(x)	(x)	-	-	-	-	-	-
T	SAE 2 bolt		x	x	x	-	-	-	-	-	-	-	-

x: Available (x): Optional - : Not available

- 1) F12-110 and -125: Accessory valve block (page 62)
- 2) Metric threads
- 3) Pressure setting on page 63
- 4) Not in combination with any valve options

NOTE: All combinations are not valid, please contact Parker Hannifin

Version number
 (assigned for special versions)

Frame size	Code	Shaft*	30	40	60	80	90	110	125	152	162	182	250
T	SAE key, Standard		x	x	x	x	x	x	x	x	x	x	x
R	SAE key, Optional		-	-	-	(x)	(x)	-	-	-	-	-	-
S	SAE Spline, Optional		x	x	x	x	x	x	x	x	x	x	x
F	SAE Spline, Optional		-	-	-	(x)	(x)	-	-	(x)	(x)	(x)	(x)
U	SAE Spline, Optional		-	-	-	(x)	(x)	-	-	-	-	-	-
K	Metric key, Standard		-	-	-	-	-	-	-	-	-	-	x
D	Spline DIN 5480		-	-	-	-	-	-	-	-	-	-	(x)
V	Tapered shaft		(x)	(x)	(x)	-	-	(x)	(x)	-	-	-	-

*See also dimensional drawings on pages 52 - 59.

Frame size	Code	Option	30	40	60	80	90	110	125	152	162	182	250
0000	Standard		x	x	x	x	x	x	x	x	x	x	x
L130	Flushing valve 1.3 mm orifice		(x)	(x)	(x)	(x)	(x)	(x) ⁻¹⁾	(x) ⁻¹⁾	-	-	-	-
MUVR	Make up/Anti cavitation valve clockwise rotation		(x)	-	-	-	-	-	-	-	-	-	-
MUVL	Make up/Anti cavitation valve counter clockwise rotation		(x)	-	-	-	-	-	-	-	-	-	-
P__R ³⁾	Pressure relief valve clockwise rotation		(x)	(x)	(x)	-	-	-	-	-	-	-	-
P__L ³⁾	Pressure relief valve counter clockwise rotation		(x)	(x)	(x)	-	-	-	-	-	-	-	-

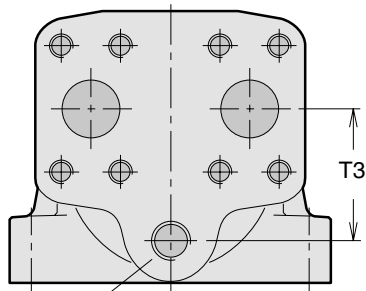
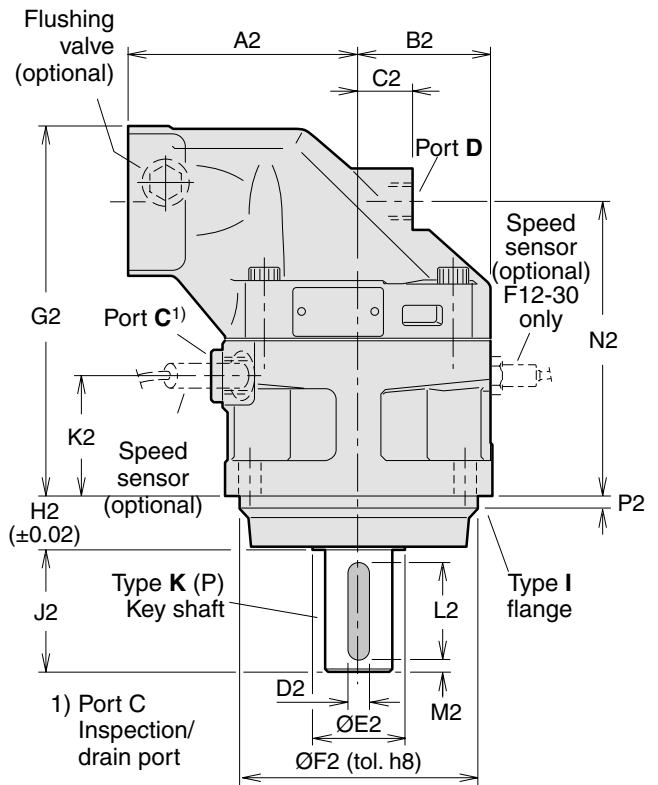
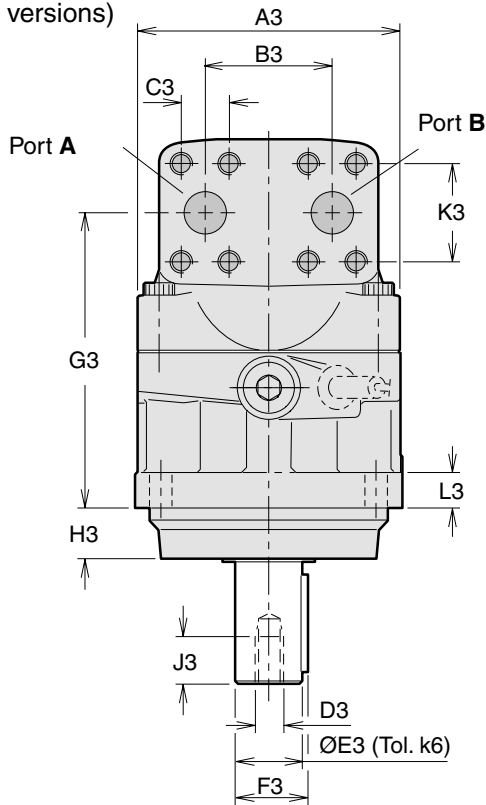
Frame size	Code	Option	30	40	60	80	90	110	125	152	162	182	250
P_	Prepared for speed sensor		x	x	x	x	x	x	x	x	x	x	x
B_	Power Boost and Prepared for speed sensor		(x)	-	-	-	-	-	-	-	-	-	-
_T	Painted Black		(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)

Frame size	Code	Shaft seal	30	40	60	80	90	110	125	152	162	182	250
V	FPM, high pressure, high temperature		x	x	x	x	x	x	x	x	x	x	x

For other versions, contact Parker Hannifin

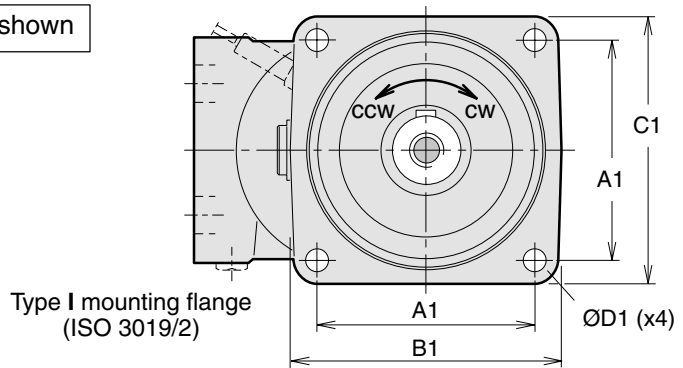


F12-30, -40, -60, -80, -90, -110 and -125
 (ISO versions)

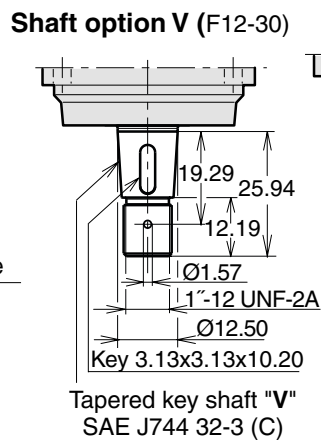
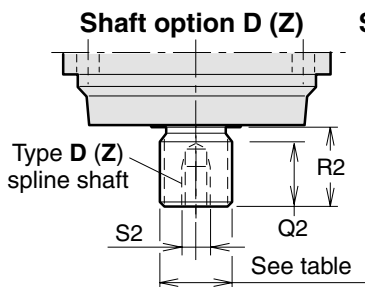


Port E (third drain port)
 F12-110 and -125 barrel housing
 (ISO /cartridge version)

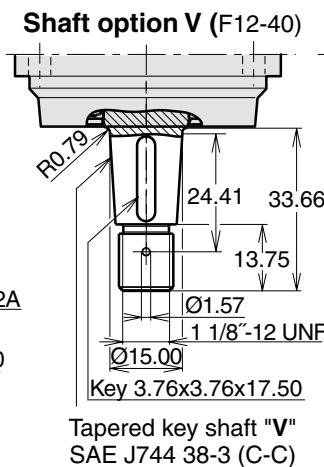
F12-80 shown



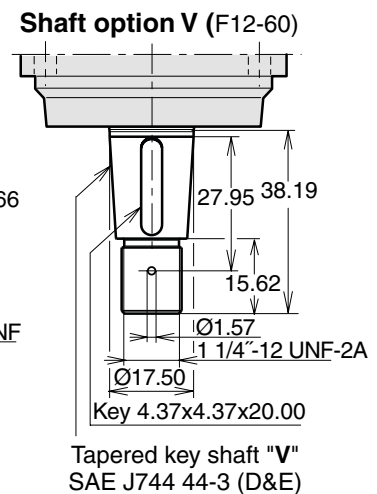
Type I mounting flange
 (ISO 3019/2)



Tapered key shaft "V"
 SAE J744 32-3 (C)



Tapered key shaft "V"
 SAE J744 38-3 (C-C)



Tapered key shaft "V"
 SAE J744 44-3 (D&E)

Dim.	F12-30	F12-40	F12-60	F12-80 F12-90	F12-110 F12-125
A1	3.48	4.46	4.46	5.01	5.57
B1	4.65	5.75	5.75	6.22	7.09
C1	4.65	5.59	5.67	6.10	7.09
D1	0.43	0.53	0.53	0.53	0.71
A2	3.94	4.33	4.92	5.32	5.71
B2	2.32	2.56	2.76	3.05	3.35
C2	0.98	1.02	0.87	1.26	1.50
D2	0.32	0.32	0.39	0.47	0.55
E2	1.30	1.65	1.65	2.05	2.26
F2	3.9370/ 3.9349	4.9213/ 4.9188	4.9213/ 4.9188	5.5118/ 5.5093	6.2992/ 6.2967
G2	6.77	6.81	7.48	8.50	9.09
H2	1.00	1.28	1.28	1.28	1.59
J2	1.97	2.36	2.36	2.76	3.23
K2	2.16	2.05	2.13	2.76	2.61
L2	1.58	1.97	1.97	2.21	2.76
M2	0.20	0.20	0.20	0.28	0.24
N2	5.37	5.39	6.06	6.79	7.05
P2	0.32	0.32	0.32	0.32	0.32
Q2	1.10	1.10	1.30	1.42	1.61
R2 ¹⁾	1.38	1.38	1.57	1.77	1.97
R2 ²⁾	1.69	1.38	-	1.38	1.77
S2 ^{1)*}	M12 x0.94	M12 x0.94	M12 x1.10	M16 x1.42	M16 x1.42
S2 ^{2)*}	no thread	M12 x0.94	no thread	M12 x1.10	M16 x36
A3	4.80	5.28	5.67	6.10	6.69
B3	2.60	2.60	2.60	2.95	3.29
C3	0.937	0.937	0.937	1.094	1.250
D3*	M12	M12	M12	M16	M16
E3	1.1817/ 1.1812	1.1817/ 1.1812	1.3787/ 1.3780	1.5755/ 1.5749	1.7724/ 1.7717
F3	1.30	1.30	1.50	1.69	1.91
G3	5.37	5.39	6.06	6.79	7.05
H3	0.93	1.20	1.20	1.20	1.52
J3	0.95	0.95	1.10	1.42	1.42
K3	2.000	2.000	2.000	2.250	2.626
L3	0.71	0.79	0.79	0.79	0.87
T3	-	-	-	-	2.68

* Metric thread (x depth in inches)

1) Spline shaft type D

2) Spline shaft type Z

3) Max operating pressure 5100 psi 350 bar

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 ^{*)}	M10 (0.79)	M10 (0.79)	M10 (0.79)	M12 (0.79)	M14 (1.02)
C thread ^{**)}	M22 x1.5	M22 x1.5	M22 x1.5	M22 x1.5	M22 x1.5
D thread ^{**)}	M18 x1.5	M18 x1.5	M22 x1.5	M22 x1.5	M22 x1.5
E thread ^{**)}	-	-	-	-	M22 x1.5

A, B: ISO 6162 *) Metric thread x (depth in inches)

***) Metric thread x pitch in mm.

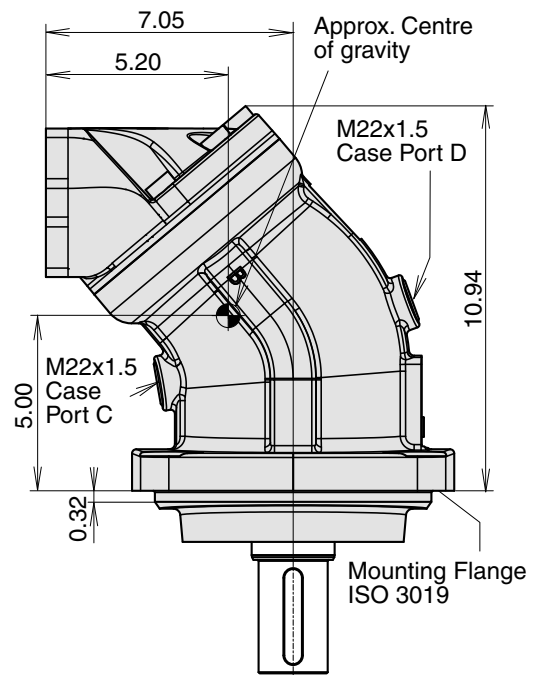
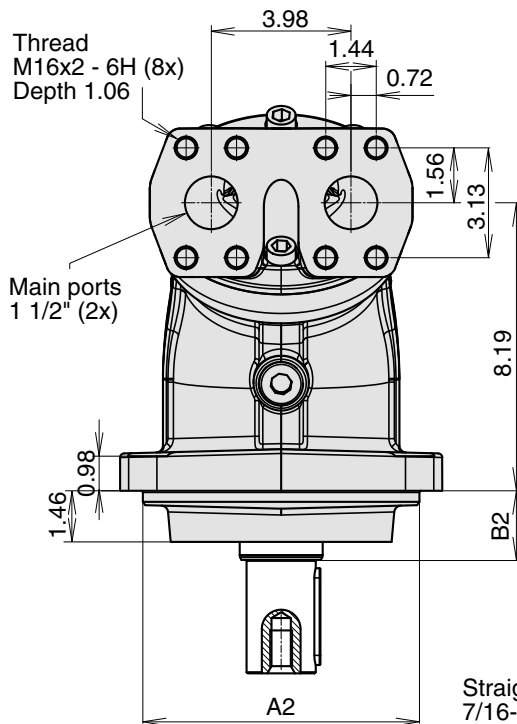
Spline shaft (DIN 5480)

	Type D (std)	Type A	Type Z (optional)
F12-30	W30x2x14x9g	-	W25x1.25x18x9g ³⁾
-40	W32x2x14x9g	W35x2x16x9g	W30x2x14x9g
-60	W35x2x16x9g	-	W32x2x14x9g
-80	W40x2x18x9g	-	W35x2x16x9g ³⁾
-90	W40x2x18x9g	-	W35x2x16x9g ³⁾
-110	W45x2x21x9g	-	W40x2x18x9g ³⁾
-125	W45x2x21x9g	-	W40x2x18x9g ³⁾

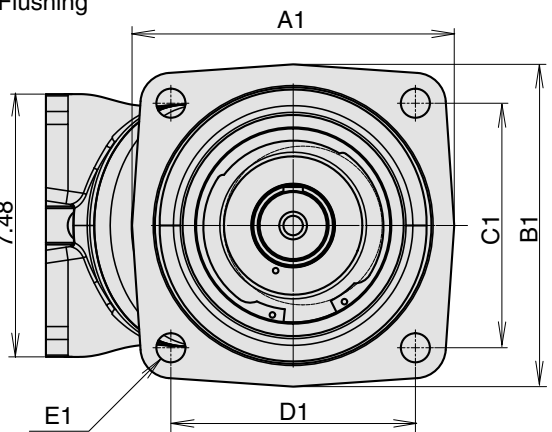
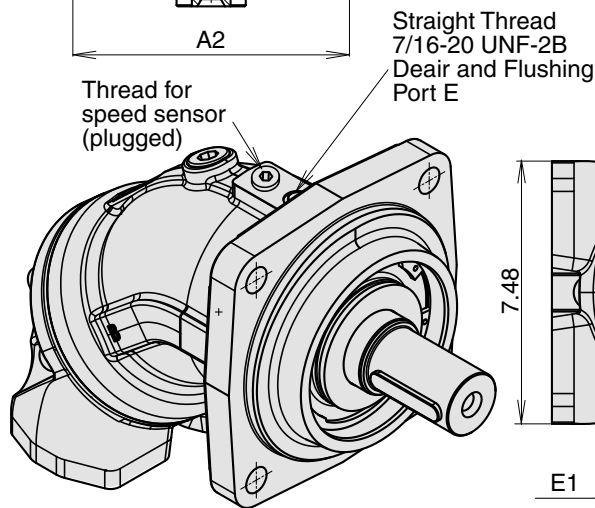
Metric key shaft (in mm)

	Type K (std)	Type P (opt.)	Type J (opt.)	Type V (opt.)
F12-30	Ø30	Ø25 ³⁾	-	32-3
-40	Ø30	-	Ø35	38-3
-60	Ø35	-	-	44-3
-80	Ø40	-	-	-
-90	Ø40	-	-	-
-110	Ø45	-	-	44-3
-125	Ø45	-	-	44-3

F12-152, -162 and -182
 (ISO versions)



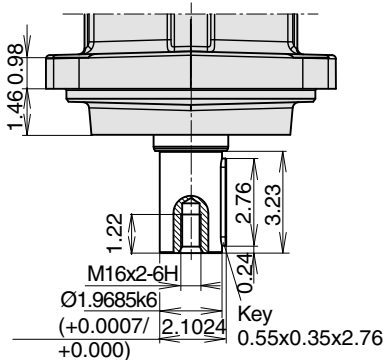
Main ports type F
 (90 deg Vertical)



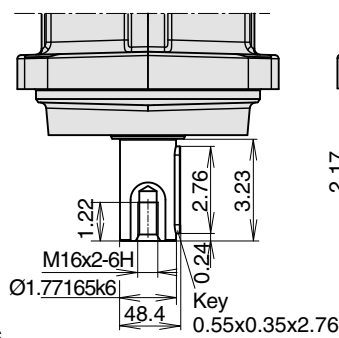
	ISO 180 (type I)	ISO 200 (type F)
A1	8.27	9.17
B1	8.27	9.17
C1	6.24	6.96
D1	6.24	6.96
E1	Ø0.71	Ø0.83
A2	7.0866 h8	7.874 h8

	Shaft G and H	Shaft D, Z, K and P
B2	1.97	1.57

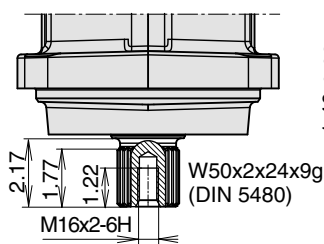
Shaft options K and G



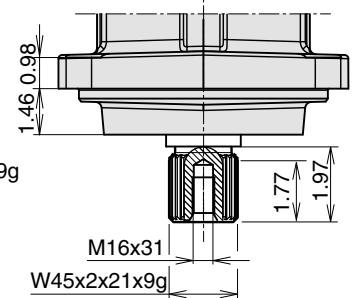
Shaft option P



Shaft option D

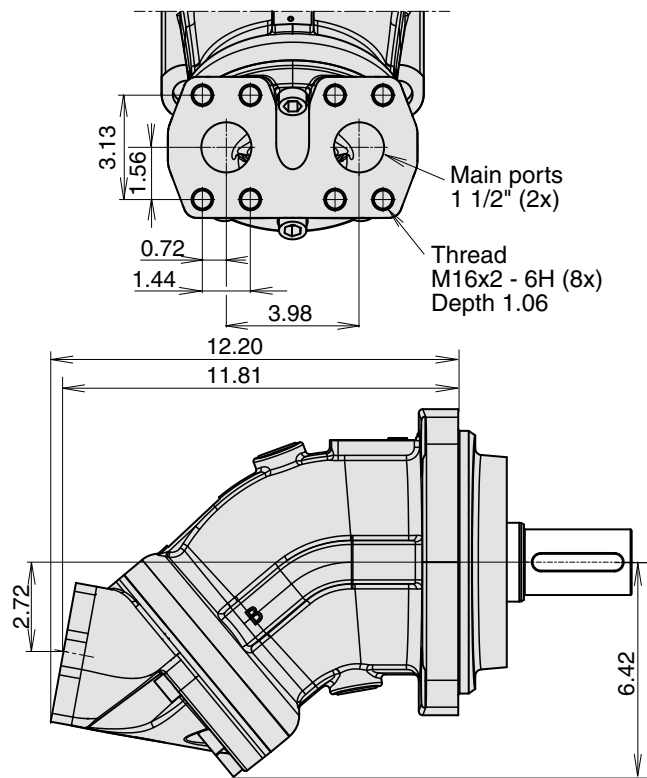


Shaft options Z and H

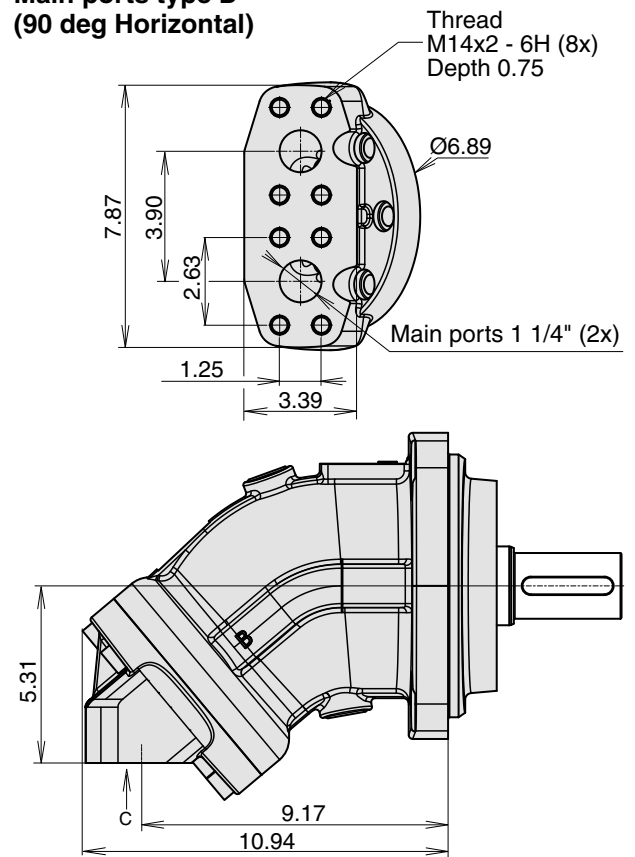


F12-152, -162 and -182
 (ISO versions)

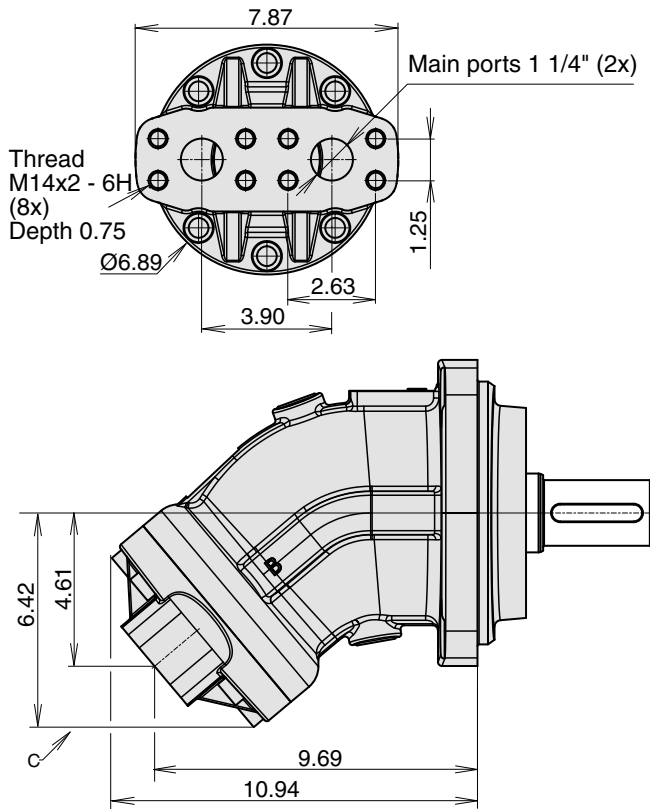
Main ports type A
 (180 deg Vertical)



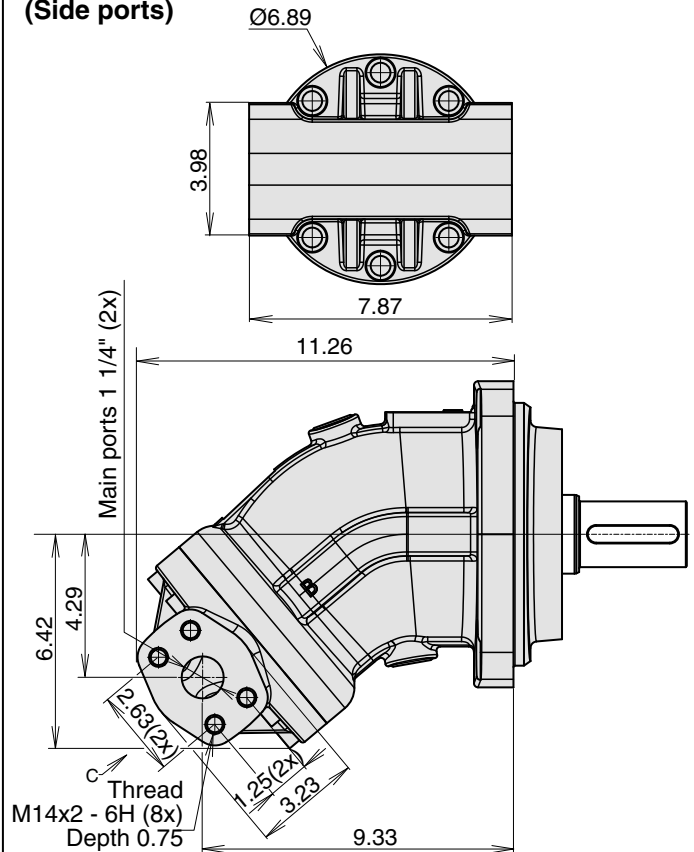
Main ports type D
 (90 deg Horizontal)



Main ports type K
 (40 deg rear)

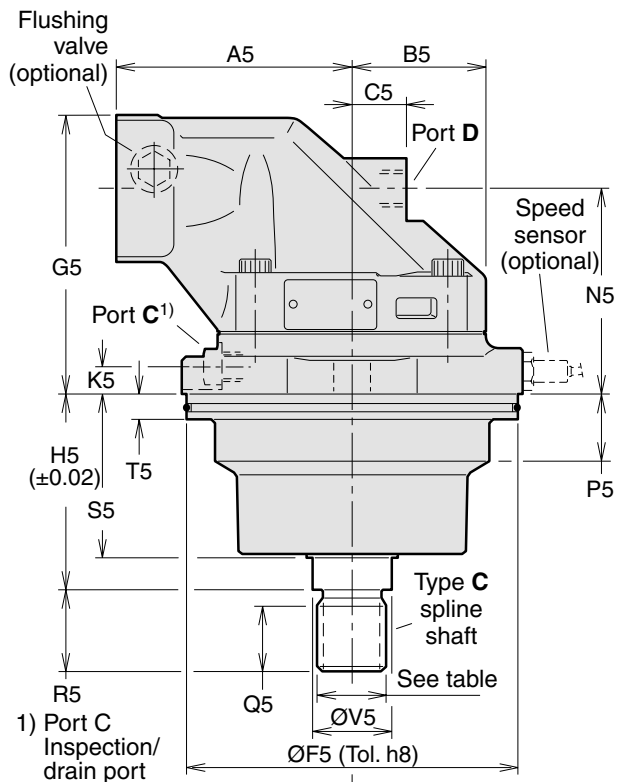
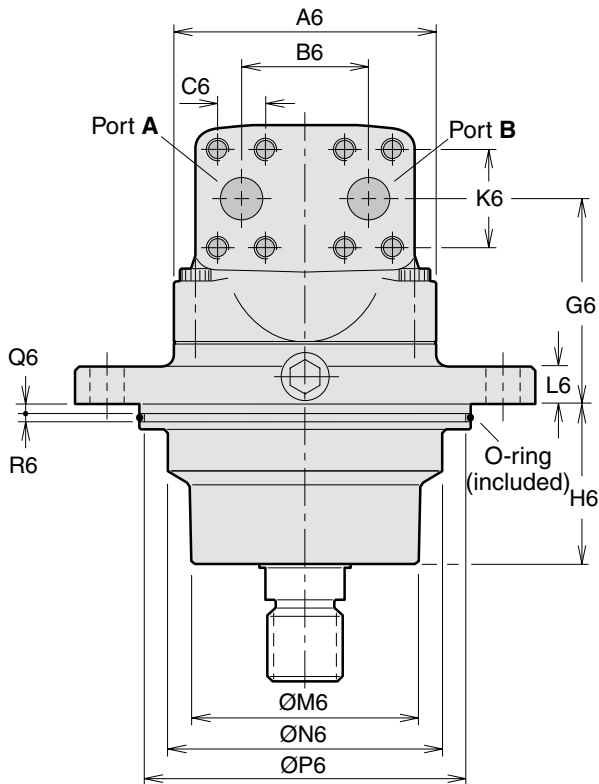


Main ports type M
 (Side ports)

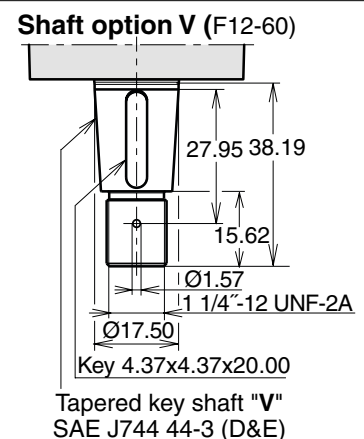
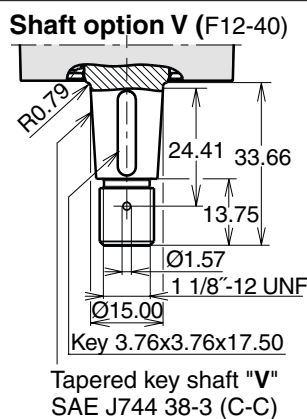
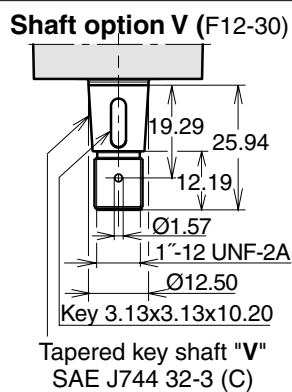
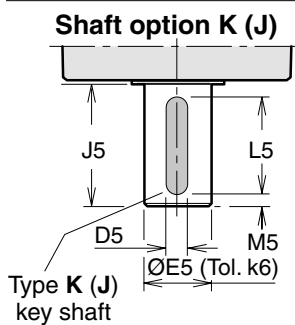
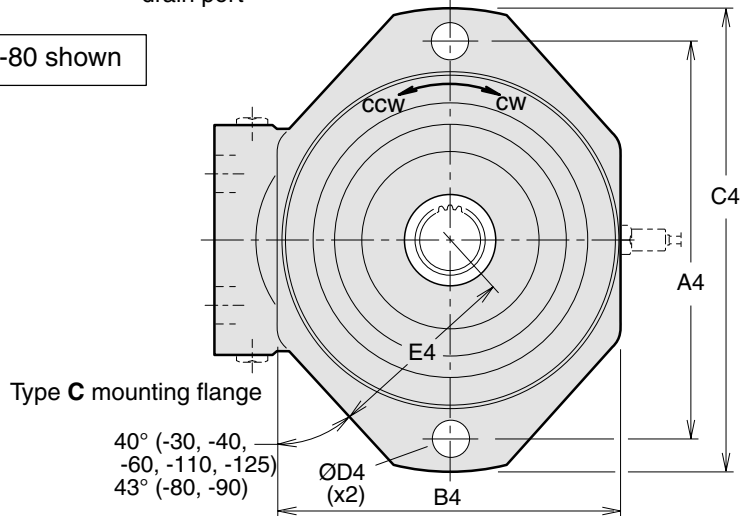
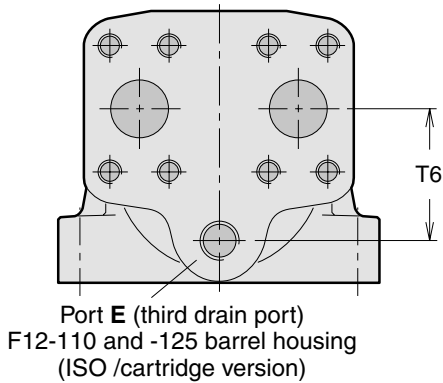


3

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



F12-80 shown



Dim.	F12-30	F12-40	F12-60	F12-80 F12-90	F12-110 F12-125
A4	6.30	7.87	7.87	8.82	9.84
B4	5.51	6.46	6.46	7.72	8.11
C4	7.40	9.25	9.25	10.24	11.26
D4	0.55	0.71	0.71	0.87	0.87
E4	3.03	3.74	3.74	4.33	4.57
A5	3.94	4.33	4.92	5.31	5.71
B5	2.32	2.56	2.76	3.05	3.35
C5	0.98	1.02	0.87	1.26	1.50
D5	0.31	0.31 ¹⁾ 0.39 ²⁾	0.39	0.47	0.55
E5	1.1817/ 1.1812	1.1817 ¹⁾ / 1.1812 ¹⁾ 1.3787 ²⁾ / 1.3780 ²⁾	1.3787/ 1.3780	1.5755/ 1.5749	1.7724/ 1.7717
F5	5.3150/ 5.3125	6.2992/ 6.2967	6.2992/ 6.2967	7.4803/ 7.4775	7.8740/ 7.8712
G5	5.00	5.24	5.75	6.18	6.89
H5	3.50	3.63	3.63	4.35	4.83
J5	1.97	2.36	2.36	2.76	3.23
K5	0.55	0.63	0.59	0.59	0.59
L5	1.57	1.97	1.97	2.20	2.76
M5	0.20	0.20	0.20	0.28	0.24
N5	3.58	3.82	4.33	4.49	4.84
P5	0.87	1.18	1.22	1.57	1.57
Q5	1.10	1.10	1.10	1.46	1.46
R5	1.38	1.38	1.38	1.77	1.77
S5	2.78	2.83	2.99	3.58	3.77
T5	0.59	0.59	0.59	0.59	0.59
V5	1.30	1.38	1.38	1.77	1.77
A6	4.80	5.28	5.67	6.10	6.69
B6	2.60	2.60	2.60	2.95	3.27
C6	0.937	0.937	0.937	1.094	1.250
G6	3.60	3.82	4.33	4.49	4.84
H6	2.74	2.80	2.91	3.52	3.69
K6	2.000	2.000	2.000	2.250	2.626
L6	0.63	0.71	0.71	0.79	0.79
M6	3.62	4.53	4.53	5.12	5.51
N6	4.33	5.00	5.31	6.06	6.30
P6	5.047	6.031	6.031	7.213	7.606
Q6	0.20	0.20	0.20	0.20	0.20
R6	0.20	0.20	0.20	0.20	0.20
T6	-	-	-	-	2.68

- 1) Key shaft type **K**
- 2) Key shaft type **B** (opt.).

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 ^{*)}	M10 (0.79)	M10 (0.79)	M10 (0.79)	M12 (0.87)	M14 (1.02)
C thread ^{**)}	M14 x1.5	M14 x1.5	M14 x1.5	M14 x1.5	M14 x1.5
D, E thread ^{**)}	M18 x1.5	M18 x1.5	M22 x1.5	M22 x1.5	M22 x1.5

A, B: ISO 6162 *) Metric thread x (depth in inches)
 **) Metric thread x pitch in mm.

Spline shaft (DIN 5480)

	Type C (standard)	Type B (optional)
F12-30	W30x2x14x9g	-
-40	W30x2x14x9g	-
-60	W30x2x14x9g	W35x2x16x9g
-80	W40x2x18x9g	
-90	W40x2x18x9g	
-110	W40x2x18x9g	W45x2x21x9g
-125	W40x2x18x9g	W45x2x21x9g

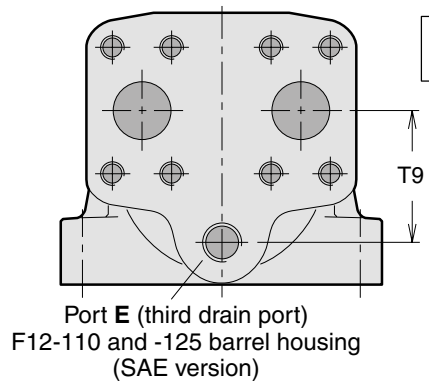
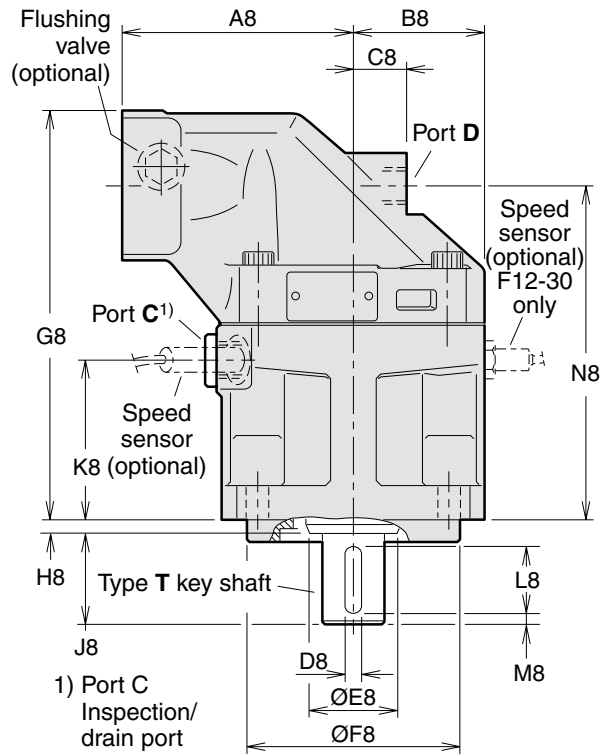
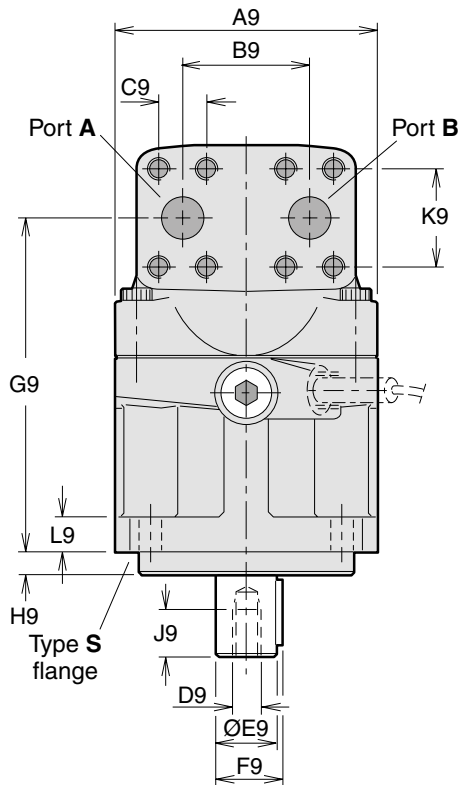
Metric key shaft (in mm)

	Type K (std)	Type J (opt.)	Type V (opt.)
F12-30	Ø30	-	32-3
-40	Ø30	Ø35	38-3
-60	Ø35	-	44-3
-80	Ø40	-	-
-90	Ø40	-	-
-110	Ø45	-	44-3
-125	Ø45	-	44-3

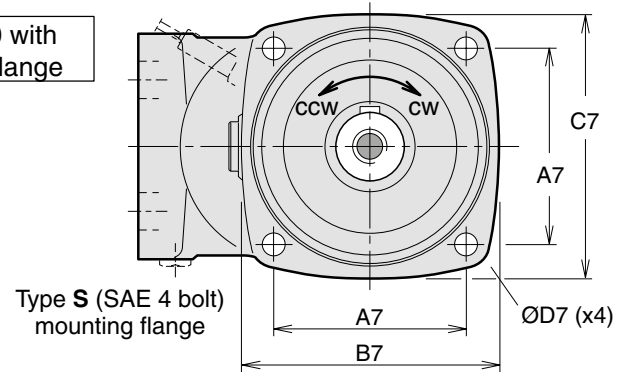
O-ring dimensions (in mm)

F12-30	127x4
-40	150x4
-60	150x4
-80	180x4
-90	180x4
-110	190x4
-125	190x4

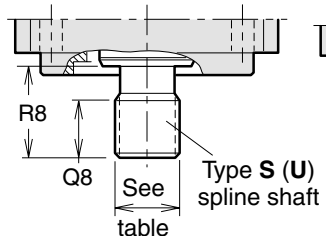
F12-30, -40, -60, -80, -90, -110 and -125
 (SAE versions with 4 bolt flange)



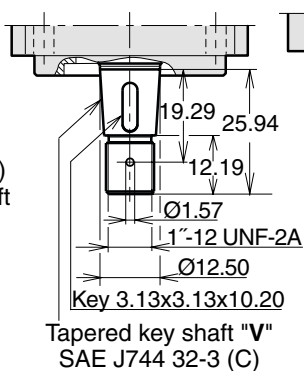
Shown: F12-80 with
 4 bolt flange



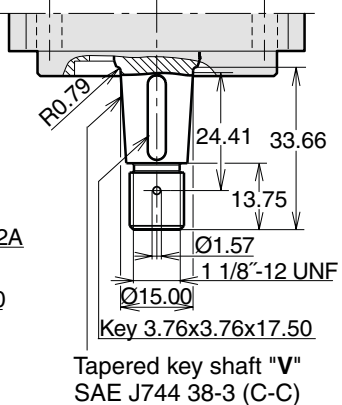
Shaft option S (U)



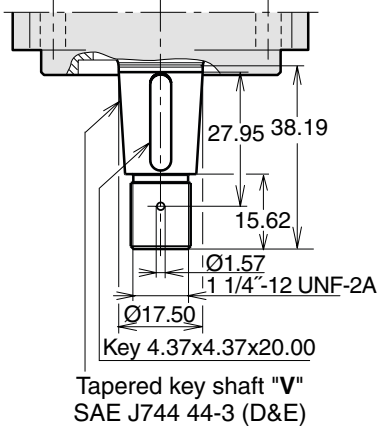
Shaft option V (F12-30)



Shaft option V (F12-40)



Shaft option V (F12-60)



Dim.	F12-30	F12-40	F12-60	F12-80 F12-90	F12-110 F12-125
A7	3.54	4.51	4.51	4.51	6.36
B7	4.65	5.83	5.83	6.10	8.03
C7	4.65	5.67	5.67	6.10	7.87
D7	0.55	0.55	0.55	0.55	0.83
A8	3.94	4.33	4.92	5.31	5.71
B8	2.32	2.56	2.76	3.05	3.35
C8	0.98	1.02	0.87	1.26	1.50
D8	0.25	0.31	0.31	0.38	0.44
E8	1.30	1.65	1.65	2.05	2.26
F8	4.000/ 3.998	5.000/ 4.998	5.000/ 4.998	5.000/ 4.998	6.000/ 5.998
G8	7.46	7.76	8.43	9.45	10.39
H8	0.31	0.31	0.31	0.31	0.31
J8	1.50	1.89	1.89	2.13	2.64
K8	2.83	2.99	3.11	3.74	3.90
L8	1.25	1.50	1.50	1.75	2.13
M8	0.10	0.16	0.16	0.16	0.29
N8	6.04	6.34	7.02	7.76	8.35
Q8 ¹⁾	1.02	1.06	1.06	1.14	1.54
Q8 ²⁾	-	-	-	0.91	-
R8 ¹⁾	1.30	1.89	1.89	2.13	2.63
R8 ²⁾	-	-	-	1.88	-
A9	4.80	5.28	5.67	6.10	6.69
B9	2.60	2.60	2.60	2.95	3.27
C9	0.937	0.937	0.937	1.094	1.250
D9*	5/16"-24	3/8"-24	3/8"-24	1/2"-20	5/8"-18
E9	1.000/ 0.998	1.250/ 1.248	1.250/ 1.248	1.500/ 1.498	1.750/ 1.748
F9	1.11	1.39	1.39	1.498	1.748
G9	6.06	6.34	7.02	7.76	8.35
H9	0.38	0.50	0.50	0.50	0.50
J9	0.63	0.75	0.75	1.02	1.26
K9	2.000	2.000	2.000	2.250	2.626
L9	0.71	0.79	0.79	0.79	0.87
T9	-	-	-	-	2.68

* UNF-2B thread

1) Spline shaft type **S**

2) Spline shaft type **U**

3) Max operating pressure 350 bar

Main ports A and B, type U (optional)	
F12-30	1 1/16" - 12 UN ³⁾
F12-40	1 5/16" - 12 UN ³⁾
F12-60	1 5/16" - 12 UN ³⁾
F12-80	1 5/16" - 12 UN ³⁾
F12-90	1 5/16" - 12 UN ³⁾
F12-110	1 5/8" - 12 UN ³⁾
F12-125	1 5/8" - 12 UN ³⁾

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**)	3/8"-16 (0.87)	3/8"-16 (0.79)	3/8"-16 (0.87)	7/16"-14 (1.06)	1/2"-13 (0.98)
C thread	7/8"-14	7/8"-14	7/8"-14	7/8"-14	1 1/16"-12
D thread	3/4"-16	3/4"-16	7/8"-14	7/8"-14	1 1/16"-12
E thread	-	-	-	-	1 1/16"-12

A, B: ISO 6162 C, D, E: O-ring boss (SAE J514)

** UN thread x (depth in inches)

Mounting flange (SAE J744)

	S (standard)	R (optional)
F12-30	SAE 'B', 4 bolt	-
-40	SAE 'C', 4 bolt	-
-60	SAE 'C', 4 bolt	-
-80	SAE 'C', 4 bolt	SAE 'D', 4 bolt
-90	SAE 'C', 4 bolt	SAE 'D', 4 bolt
-110	SAE 'D', 4 bolt	-
-125	SAE 'D', 4 bolt	-

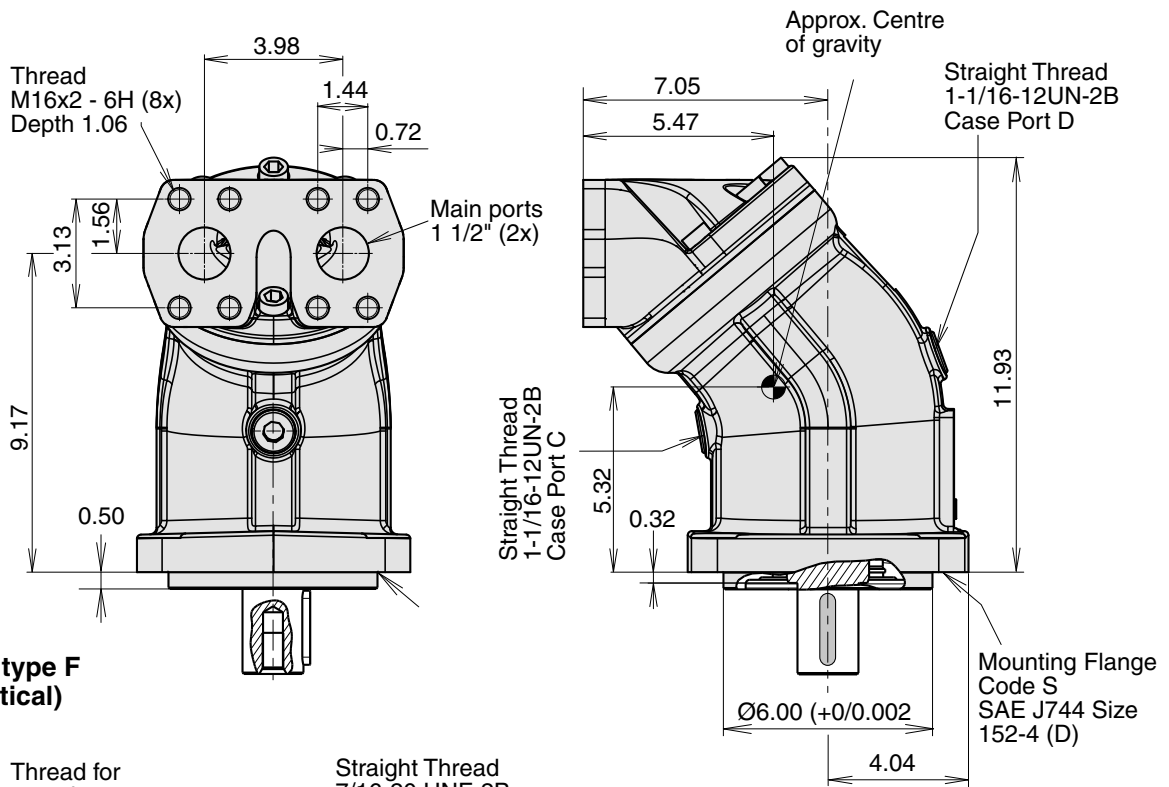
Spline shaft (SAE J498b, class 1, flat root, side fit)

	S (standard)	U (opt.)	F (optional)
F12-30	SAE 'B' 13T, 16/32 DP	-	-
-40	SAE 'C' 14T, 12/24 DP	-	-
-60	SAE 'C' 14T, 12/24 DP	-	-
-80	SAE 'C-C' 17T, 12/24 DP	SAE 'C' 14T, 12/24 DP ³⁾	SAE 'D' 13T, 8/16 DP
-90	SAE 'C-C' 17T, 12/24 DP	SAE 'C' 14T, 12/24 DP ³⁾	SAE 'D' 13T, 8/16 DP
-110	SAE 'D' 13T, 8/16 DP	-	-
-125	SAE 'D' 13T, 8/16 DP	-	-

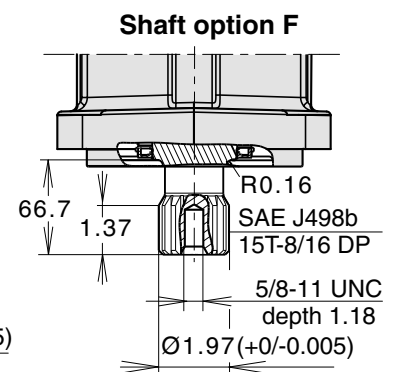
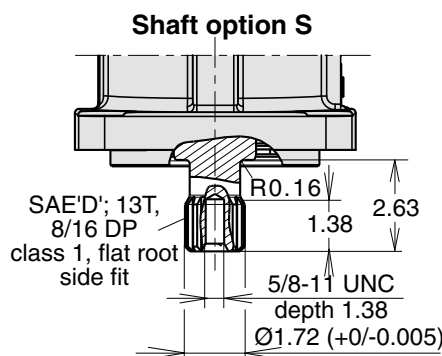
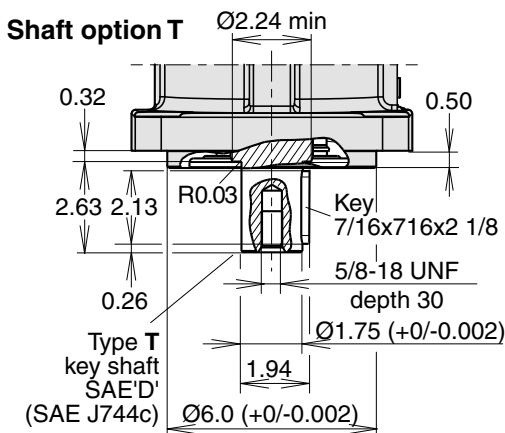
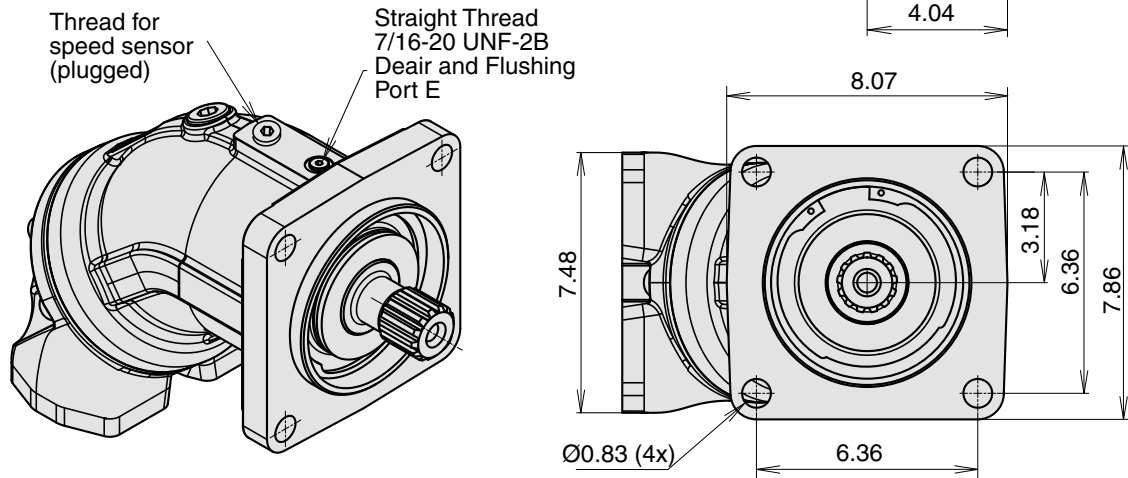
Key shaft (SAE J744)

F12	T (standard)	R (optional)	V (optional)
-30	SAE 'B-B' (Ø1")	-	32-3
-40	SAE 'C' (Ø1 1/4")	-	38-3
-60	SAE 'C' (Ø1 1/4")	-	44-3
-80	SAE 'C-C' (Ø1 1/2")	SAE 'D' (Ø1 3/4")	-
-90	SAE 'C-C' (Ø1 1/2")	SAE 'D' (Ø1 3/4")	-
-110	SAE 'D' (Ø1 3/4")	-	44-3
-125	SAE 'D' (Ø1 3/4")	-	44-3

F12-152, -162 and -182
 (SAE versions)

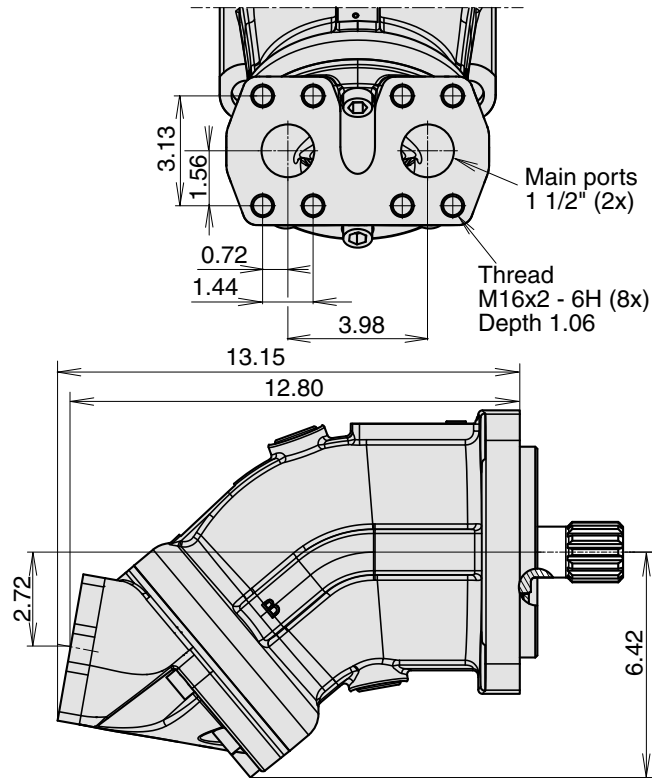


Main ports type F
 (90 deg Vertical)

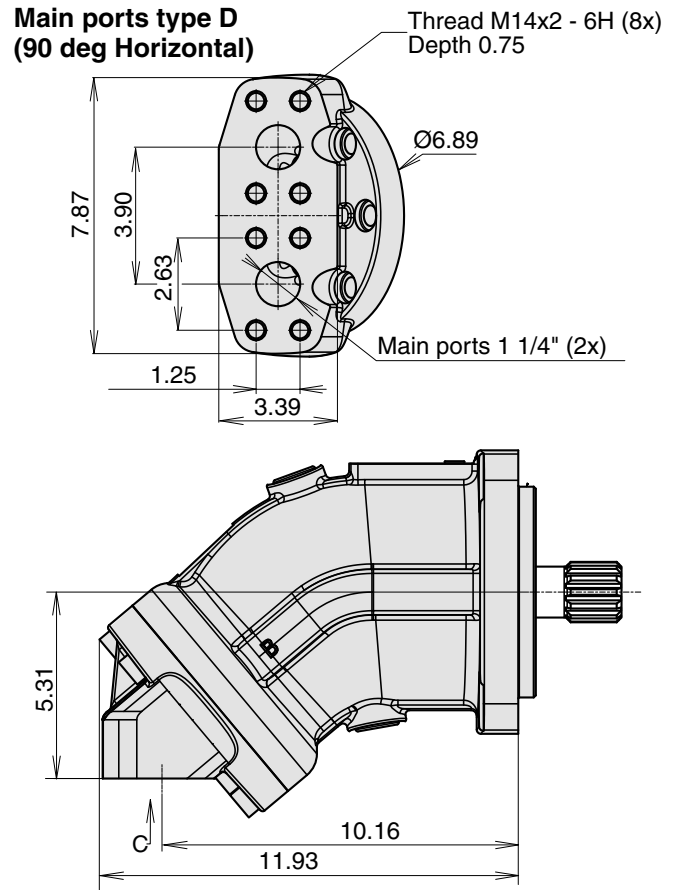


F12-152, -162 and -182
 (SAE versions)

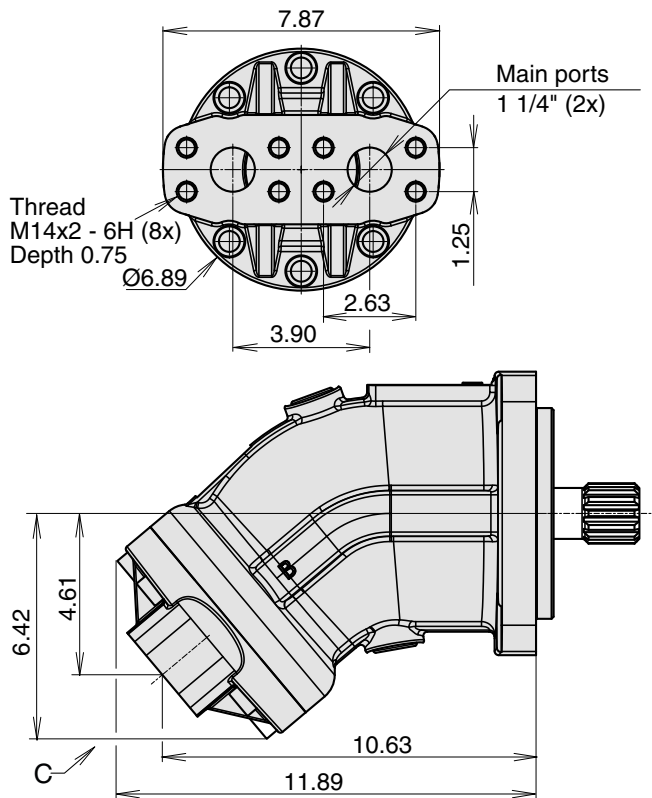
Main ports type A
 (180 deg Vertical)



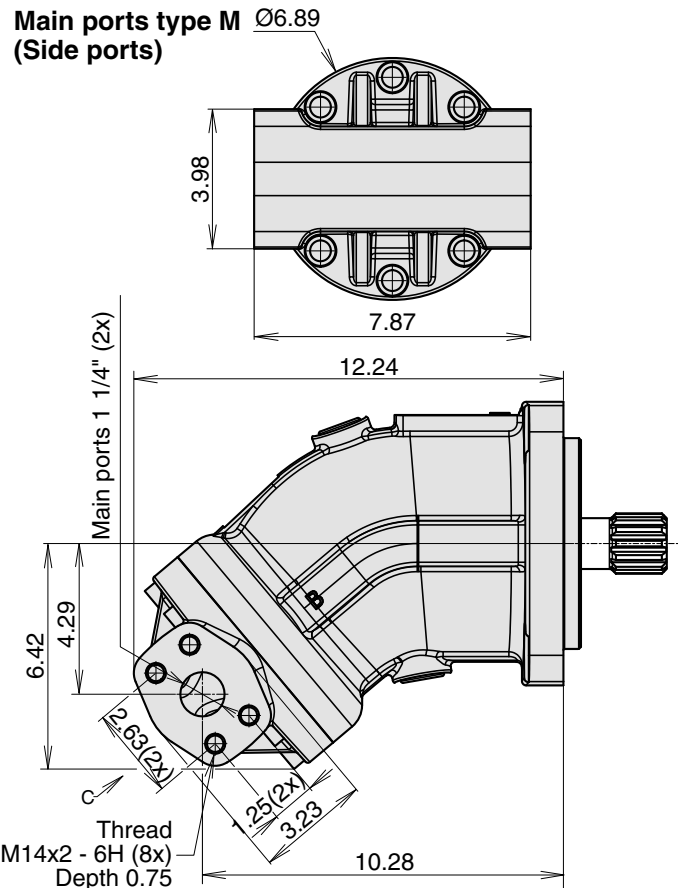
Main ports type D
 (90 deg Horizontal)



Main ports type K
 (40 deg rear)

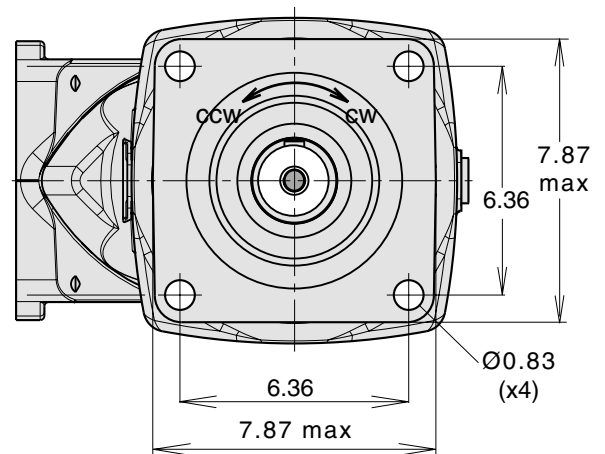
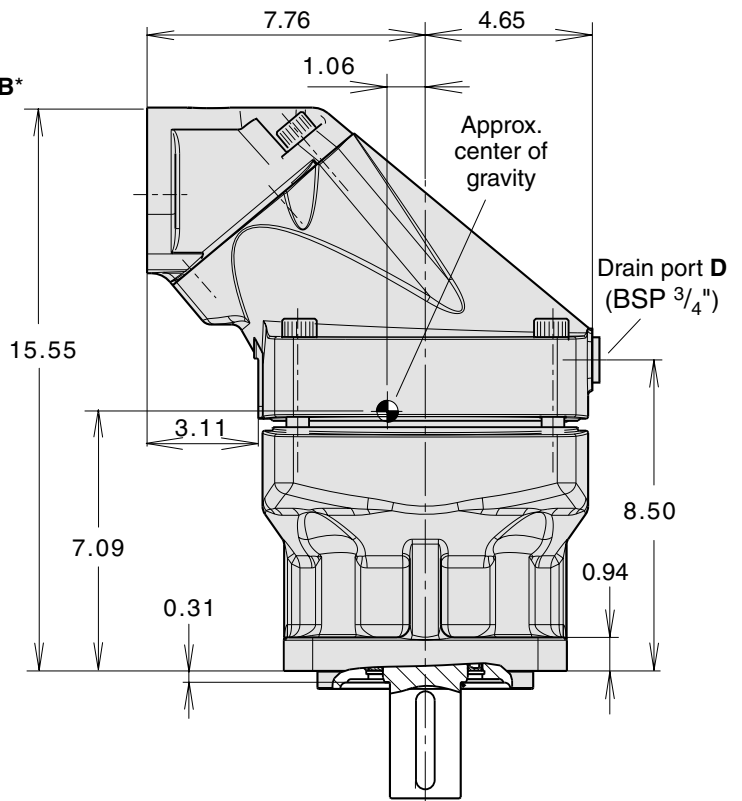
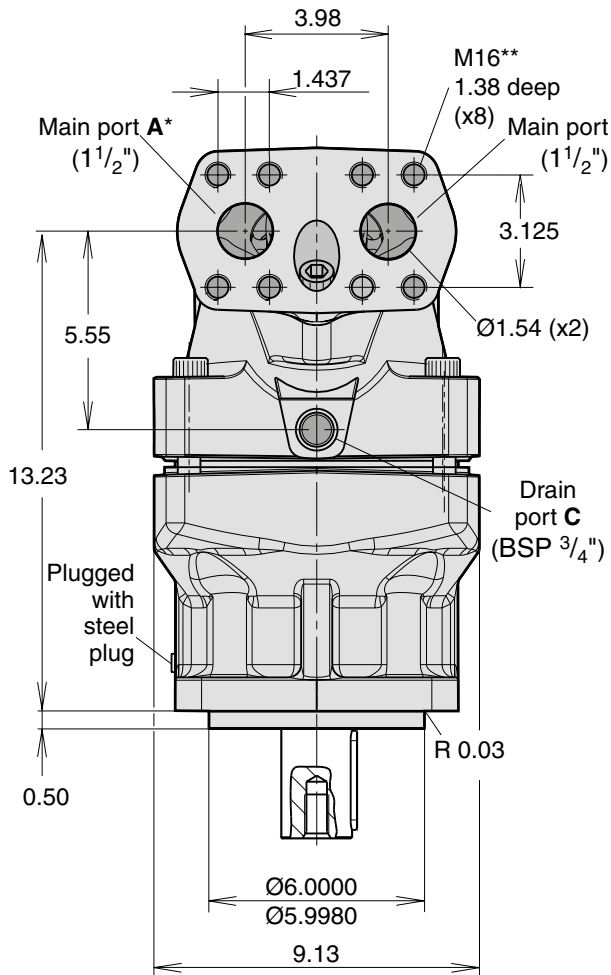


Main ports type M
 (Side ports)



3

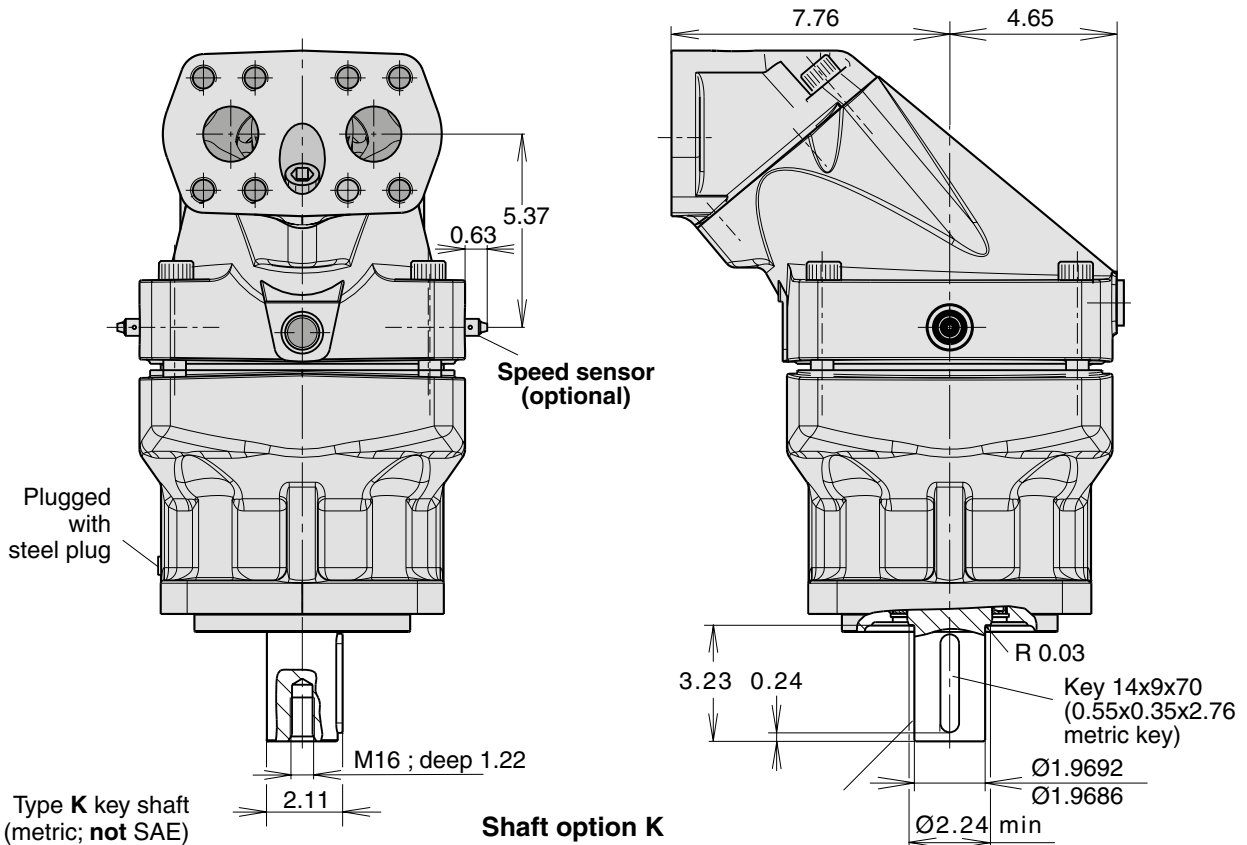
F12-250
 (SAE version)



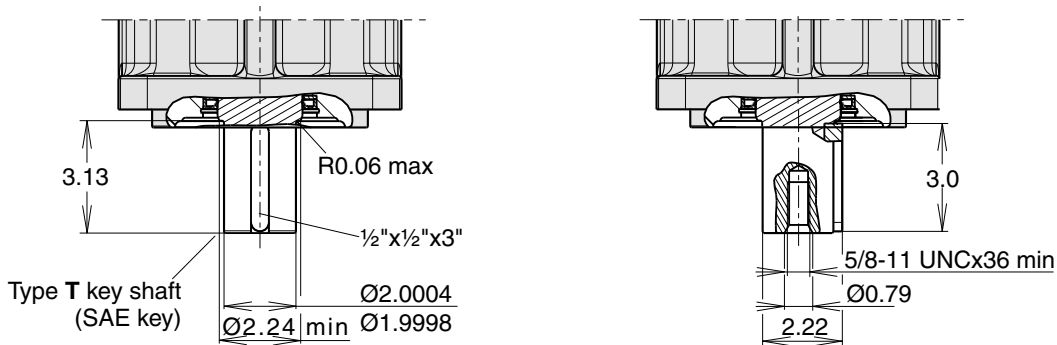
Type S mounting flange
 SAE 'D' (SAE J744c)

* 6000 psi flange (SAE J518c)
 ** Metric thread

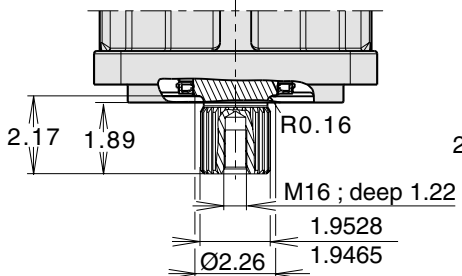
F12-250 Options (SAE version)



Shaft option T

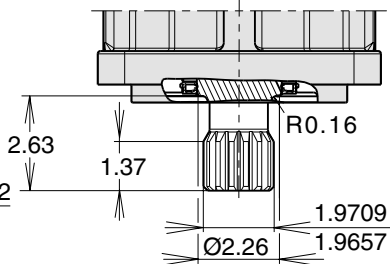


Shaft option D



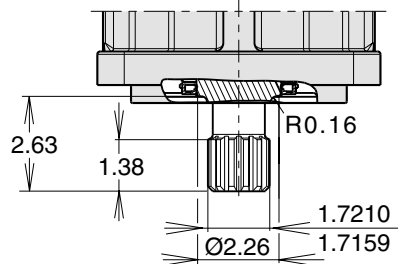
Type D spline shaft
 W50x2x24x9g
 DIN 5480 side fit

Shaft option F



Type F spline shaft
 SAE J498b, class 1;
 15T-8/16 DP;
 fillet root, side fit

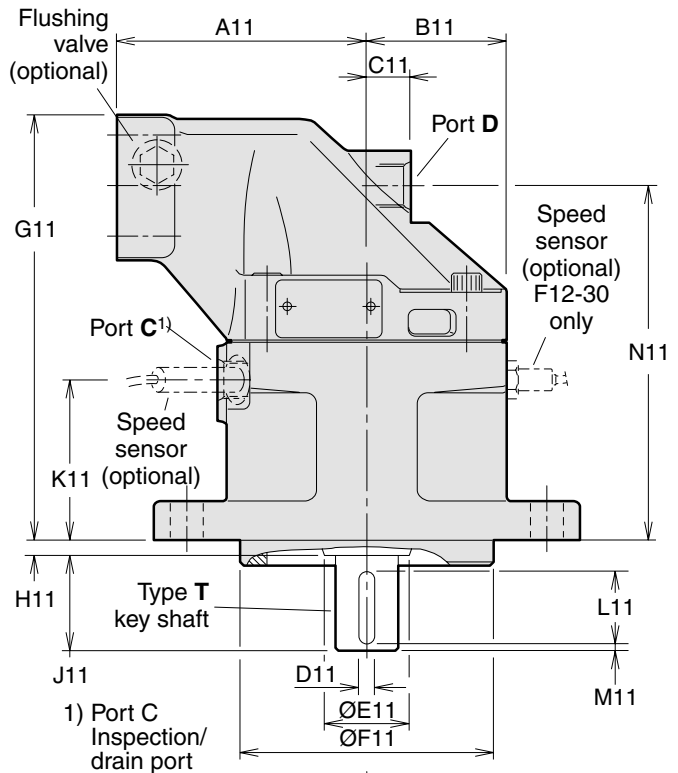
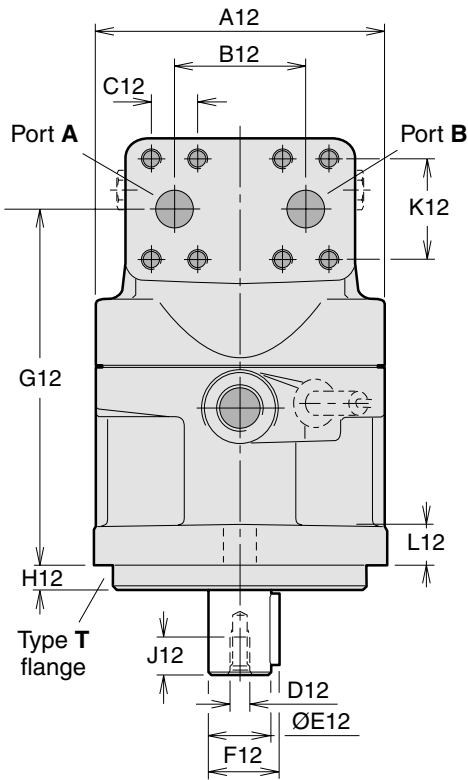
Shaft option S



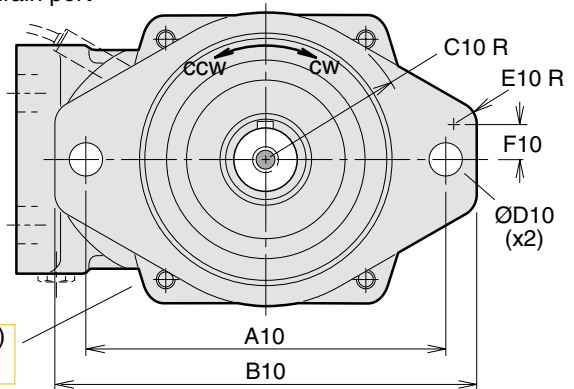
Type S spline shaft
 SAE J498b, class 1;
 30° involute spline;
 13T-8/16 DP;
 flat root, side fit

3

F12-30, -40, and -60
 (SAE versions with 2 bolt flange)



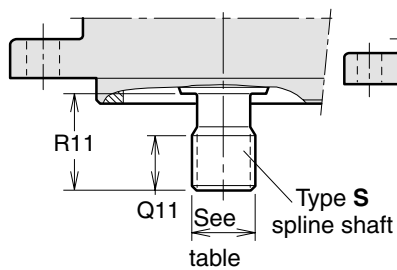
1) Port C Inspection/drain port



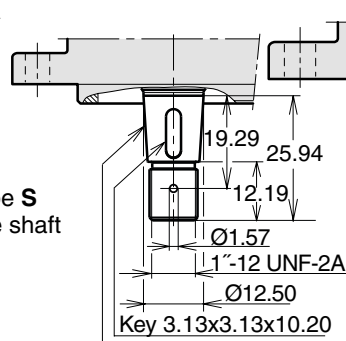
Shown: F12-60 with 2 bolt flange

Type T (SAE 2 bolt) mounting flange

Shaft option S

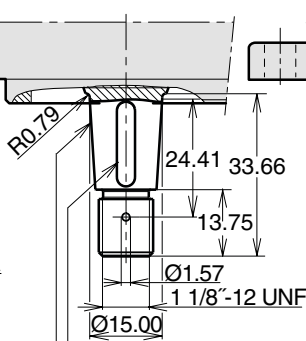


Shaft option V (F12-30)



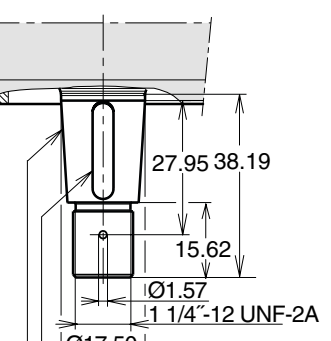
Key 3.13x3.13x10.20
 Tapered key shaft "V"
 SAE J744 32-3 (C)

Shaft option V (F12-40)



Key 3.76x3.76x17.50
 Tapered key shaft "V"
 SAE J744 38-3 (C-C)

Shaft option V (F12-60)



Key 4.37x4.37x20.00
 Tapered key shaft "V"
 SAE J744 44-3 (D&E)

Dim.	F12-30	F12-40	F12-60
A10	5.75	7.13	7.13
B10	6.93	8.46	8.46
C10	2.48	2.91	2.91
D10	0.57	0.69	0.69
E10	0.39	0.63	0.63
F10	0.39	0.61	0.61
A11	3.94	4.33	4.92
B11	2.32	2.56	2.76
C11	0.98	1.02	0.87
D11	0.25	0.31	0.31
E11	1.30	1.65	1.65
F11	4.000/ 3.998	5.000/ 4.998	5.000/ 4.998
G11	7.46	7.76	8.43
H11	0.31	0.31	0.31
J11	1.50	1.89	1.89
K11	2.80	3.03	3.21
L11	1.25	1.50	1.50
M11	0.10	0.16	0.16
N11	6.06	6.34	7.03
Q11	1.02	1.06	1.06
R11	1.30	1.89	1.89
A12	4.80	5.28	5.67
B12	2.60	2.60	2.60
C12	0.937	0.937	0.937
D12 ¹⁾	$5/16$ "-24	$3/8$ "-24	$3/8$ "-24
E12	1.000/ 0.998	1.250/ 1.248	1.250/ 1.248
F12	1.11	1.39	1.39
G12	6.06	6.34	7.03
H12	0.38	0.50	0.50
J12	0.63	0.75	0.75
K12	2.000	2.000	2.000
L12	0.71	0.79	0.79

1) UNF-2B thread

6) Max operating pressure 350 bar

Ports	F12-30	F12-40	F12-60
A, B size	19 ($3/4$ ")	19 ($3/4$ ")	19 ($3/4$ ")
Screw thread *)	$3/8$ "-16 (0.87)	$3/8$ "-16 (0.79)	$3/8$ "-16 (0.87)
C thread	$3/4$ "-16	$3/4$ "-16	$7/8$ "-14
D thread	$3/4$ "-16	$3/4$ "-16	$7/8$ "-14

A, B (main ports): SAE J518c (6000 psi)

C, D (drain ports): O-ring boss (SAE J514)

*) UN thread x (depth in inches)

Main ports A and B, type U (optional)	
F12-30	1 $1/16$ " - 12 UN ⁶⁾
-40	1 $5/16$ " - 12 UN ⁶⁾
-60	1 $5/16$ " - 12 UN ⁶⁾

O-ring ports according to SAE J514d

Mounting flange T (SAE J744)	
F12-30	SAE 'B', 2 bolt
-40	SAE 'C', 2 bolt
-60	SAE 'C', 2 bolt

Spline shaft S (SAE J498b, class 1, flat root, side fit)	
F12-30	SAE 'B' 13 T; 16/32 DP
-40	SAE 'C' 14 T; 12/24 DP
-60	SAE 'C' 14 T; 12/24 DP

Key shaft (SAE J744)

	T (Standard)	V (optional)
F12-30	SAE 'B-B' Ø1"	32-3
-40	SAE 'C' Ø1 $1/4$ "	38-3
-60	SAE 'C' Ø1 $1/4$ "	44-3

Accessories

Content	Page
Flushing valves for F12 motors.....	61
FV13 flushing valve block.....	62
Integrated pressure relief valve	63
Possible pressure settings.....	63
SR pressure relief / make-up anti-cavitation valve	64
SV pressure relief valve, Dimensions	66
MV Anti-cavitation valve / make up valve block	67
Speed sensor	67
BLA Boost Units	68

Integrated flushing valve (F12-30, -40, -60, -80, -90)

General information

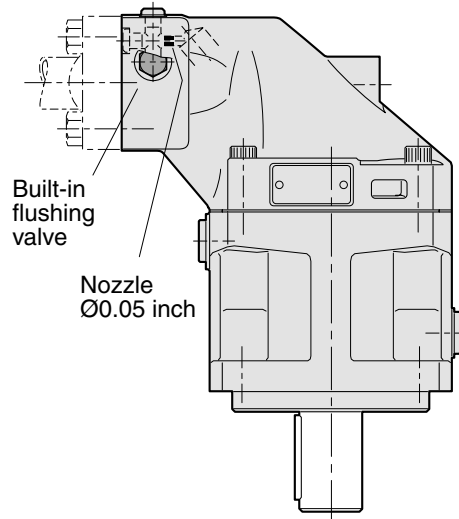
The integrated flushing valve supplies the motor with a cooling flow through the case which may be required when operating at high speeds and power levels.

In a closed loop hydrostatic transmission the flushing valve secures that cool fluid from the charge circuit is constantly added to the main circuit.

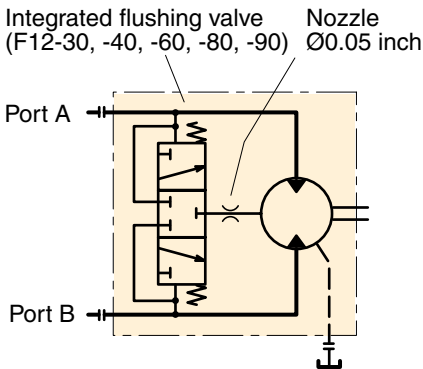
The flushing valve consists of a 'three-position', three-way spool valve which connects the low pressure side of the main hydraulic circuit with the motor case. The valve opens at a pressure differential between port A and port B of approximately 14 bar (200 psi).

In order to limit the flow, a nozzle with an orifice is available from Parker Hannifin. The diagram to the right shows flow versus differential pressure.

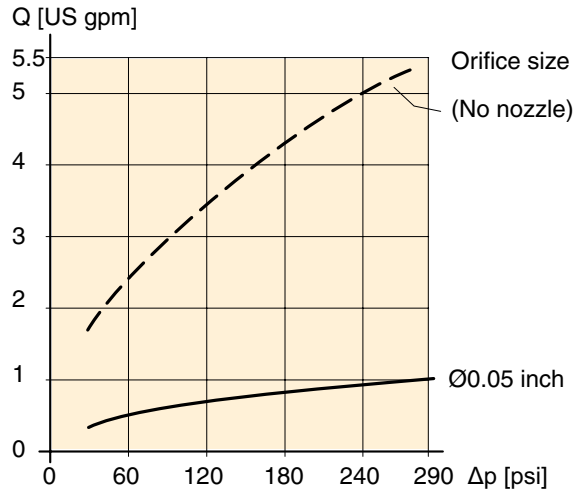
For general advise when flushing might be needed, see page 69.



4



Hydraulic schematic.



Flow versus pressure differential (port A or B to tank).

Ordering code

F12 - **080** - **MF** - **IV** - **K** - **000** - **L130** - **P0**

Standard F12 ordering code
 (for F12-30, -40, -60, -80, -90)

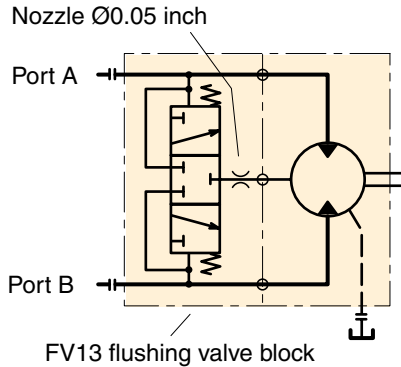
Code	Nozzle designation
L 130	Ø0.05 inch

NOTE: FV13 flushing valve block for F12-110 shown on next page.

FV13 flushing valve block (for F12-110, -125)

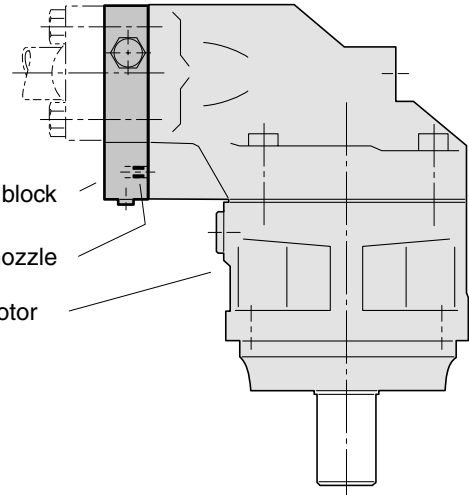
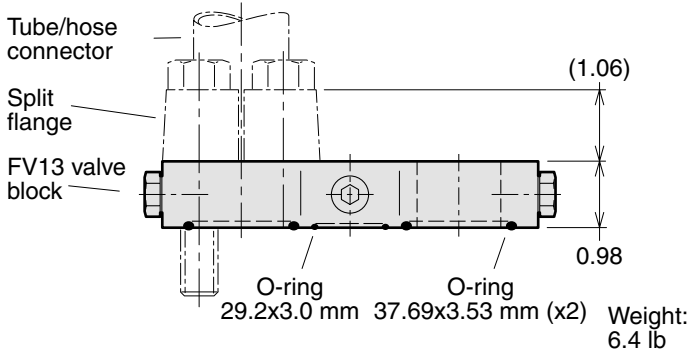
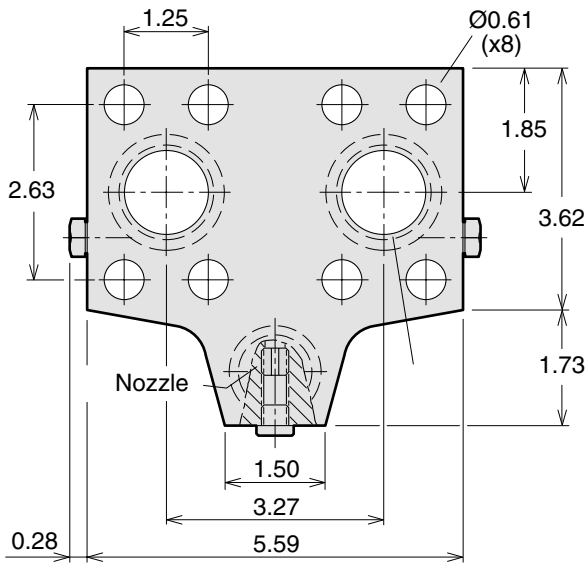
The FV13 for the F12-110 / -125 motor has the same function as the integrated flushing valve for the other F12 frame sizes. The valve block mounts between the motor port flange and the split-flange tube/hose connectors utilizing 'long' mounting screws (screw size M14x75 or 1/2"-13 UNC based on split-flange height as shown below).

The FV13 flushing valve kit contains the required O-rings (shown below) but no screws, split-flanges or tube/hose connectors.



Hydraulic schematic.

FV13 installation



FV13 Ordering code

FV	1	3	-	H	-	A	-	L130
Valve type	Version	Size	Seals	Techn. status	Nozzel			
Flushing valve	1	3	H	A	Code Nozzel L130 Ø0.05 inch			
Code Version		Code Size (SAE 6000 psi)		Code Seals		Code Techn. status		
1 Factory assigned		3 1 1/4" (for F12-110 / -125)		H Nitrile rubber		A Factory assigned		

FV13 restrictor nozzles

When required, a nozzle is utilized to restrict the flow through the F12-110, -125 motor case. The nozzle installs in the drilled and tapped (M10x1.0) drain line located in the valve block as shown to the left. The diagram on page 61 shows flushing flow versus differential pressure for selected orifice sizes.

The following table lists currently available nozzles and the corresponding FV13 ordering code designation.

Designation	Flushing valve Part number	Orifice size [inch]	Orifice Part number
L000 no nozzle	3780292		
L130 (std.)	3795623	0.05	379 4413

Integrated pressure relief valve

(F12-030, -040, -060)

Integrated pressure relief valves are available for F12-030, F12-040 and F12-060. These are designed to protect the motor from short duration pressure spikes. The motor could be ordered with non-adjustable pressure setting between 210 - 420 bar (3050 - 6090 psi). The motor has to be ordered as unidirectional, L or R, and this is specified in the ordering code as example below.

F12-030-MS-SV-S-000-P28L-P0

P=Pressure relief valve, 28 = 280 bar, L = left

Possible pressure settings

Code	Pressure bar	Pressure psi
21	210	(3050)
23	230	(3340)
25	250	(3625)
28	280	(4060)
30	300	(4350)
33	330	(4785)
35	350	(5075)
38	380	(5510)
40	400	(5800)
42	420	(6090)

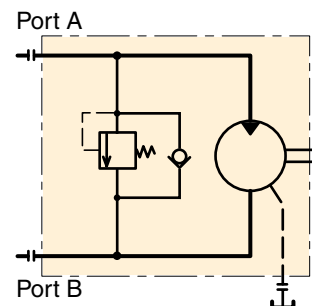


Diagram for PLC082 pressure relief valves integrated in F12-030

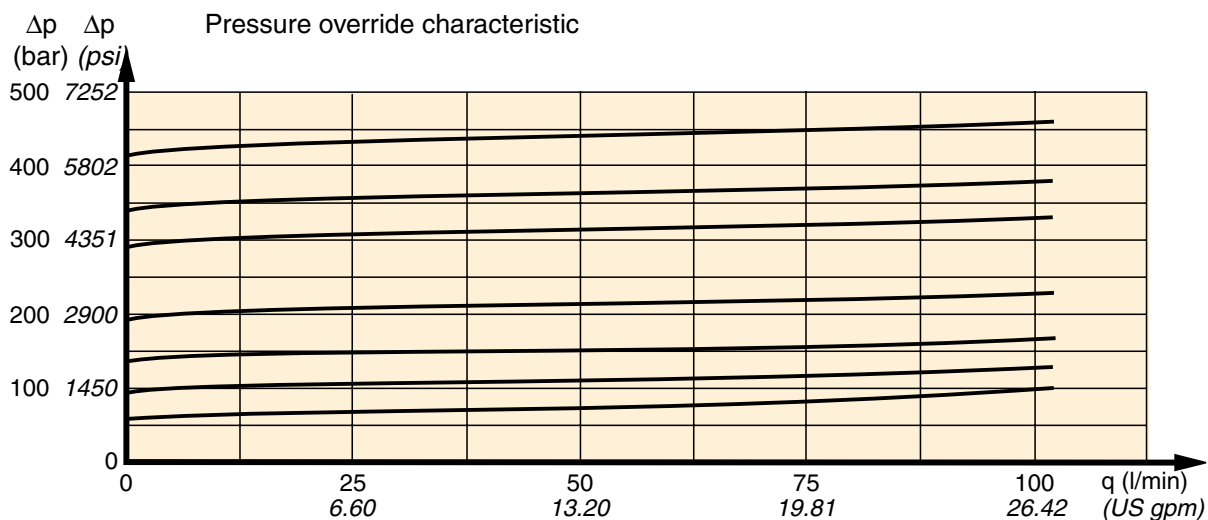
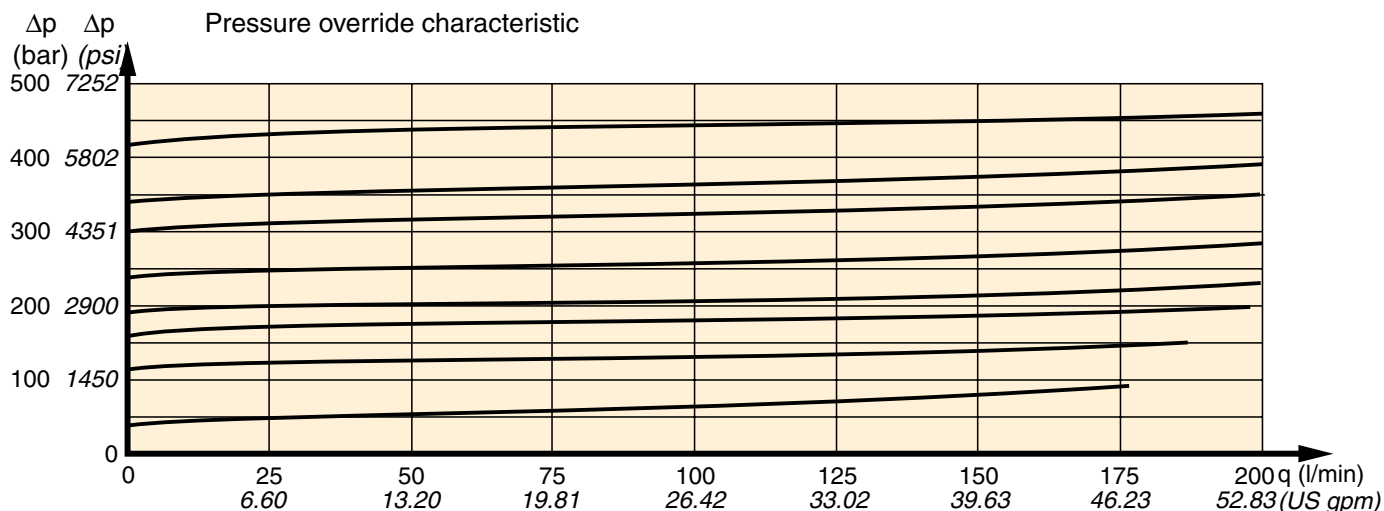


Diagram for PLC182 pressure relief valves integrated in F12-040 and F12-060



4

Pressure relief/anticav. valve for F12-motors Series F11/F12

SR pressure relief anti-cavitation valve

The SR pressure relief/make-up valve block for series F12 motors is designed to protect the motor and the main hydraulic lines from short duration pressure spikes. The valve block also provides an excellent make-up function.

The valve block installs directly on the motor port flange, and is available in 3 sizes:

- 1 3/4" for F12-30/-40/-60
- 2 1" for F12-80, -90
- 3 1/4" for F12-110, -125

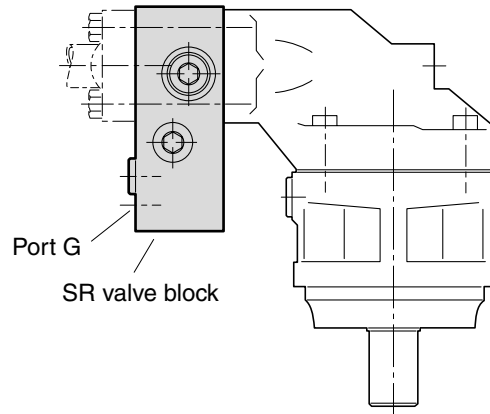
The SR valve block consists of a housing containing two high pressure relief cartridges and two separate check valves for anti-cavitation. Cartridges are available in non-adjustable pressure settings between 280 and 420 bar (4000 and 6000 psi respectively).

A make-up port (G) is also provided. In certain operating conditions, the motor (when operating as a pump) may cavitate because of insufficient inlet pressure.

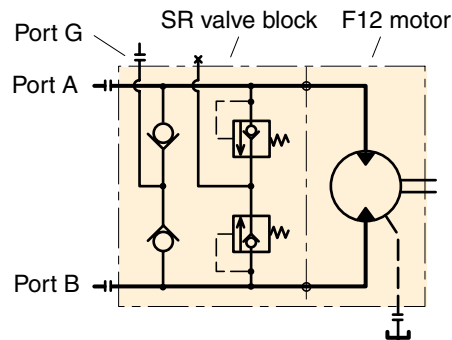
To prevent this, the G port should be pressurized. Contact Parker Hannifin for further information.

The pressure drop through the main ports (A-A' or B-B') is low. As an example, the pressure drop on size 1 (3/4") is 0.45 bar (6.5 psi) at 175 l/min (45 gpm), and on size 2 (1") 0.7 bar (10 psi) at 250 l/min (65 gpm).

NOTE: The valve block includes main port O-rings (facing the motor) but no mounting screws.



SR valve block location.



SR valve block schematic.

Ordering code

SR	1		-		/		-	00	-	H	F	-	A
Valve function	Version	Port size		Pressure settings				Serial number		Seals	Threads		Techn. status

Code Version

1	Factory assigned
---	------------------

Code Port size (SAE 6000 psi)

1	3/4"	For: F12-30, -40, -60
2	1"	For: F12-80, -90
3	1/4"	For: F12-110, -125

Code Pressure settings (A/B ports) [bar]

280, 300, 330, 350, 380, 400 or 420

Code Seals

H	Nitrile rubber
---	----------------

Code Threads (port G)

F	Metric
---	--------

Code Serial number

00	Factory assigned
----	------------------

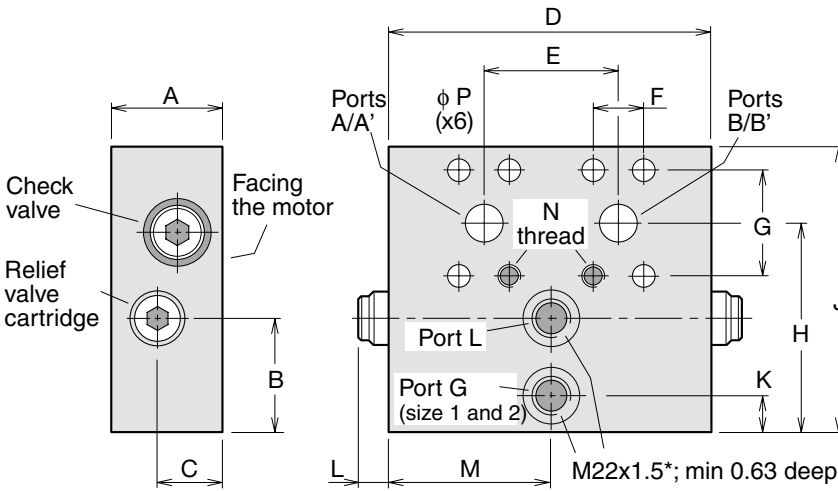
Code Techn. status

A	Factory assigned
---	------------------

Pressure bar	Pressure psi
280	(4060)
300	(4350)
330	(4785)
350	(5075)
380	(5510)
400	(5800)
420	(6090)

Pressure relief/anticav. valve for F12-motors Series F11/F12

SR pressure relief anti-cavitation valve, Dimensions



* Metric thread

Dim. [inch]	Size 1 (3/4")	Size 2 (1")	Size 3 (1 1/4")
A	2.17	2.24	2.24
B	2.17	2.17	0.98
C	1.26	1.26	1.02
D	6.18	6.30	6.30
E	2.60	2.95	3.27
F	0.94	1.09	1.25
G	2.00	2.25	2.63
H	4.06	4.29	3.46
J	5.51	5.91	5.31
K	0.71	0.71	-
L	0.71	0.71	0.71
M	3.09	3.15	-
N	M10 x18	M12 x20	M14 x23
P	0.43	0.51	0.61

Weight [lb]	Size 1 (3/4")	Size 2 (1")	Size 3 (1 1/4")
	16.3	20.1	18.8



SV pressure relief valve

General information

The SV pressure relief valve block for series F12 motors is designed to protect the motor and adjacent hydraulic components from short duration pressure peaks.

It installs directly on the motor port flange and is available in two sizes:

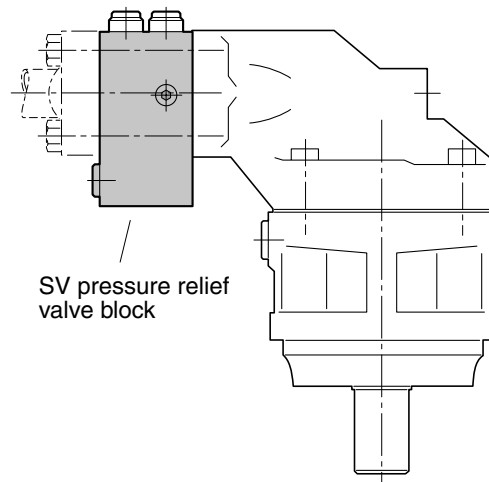
- '1': 3/4" for F12-30/-40/-60
- '2': 1" for F12-80/ -90

The valve block consists of a housing containing two high pressure relief cartridges with anti-cavitation function. Cartridges are available in non-adjustable pressure settings between 280 and 420 bar (4060 and 6090 psi).

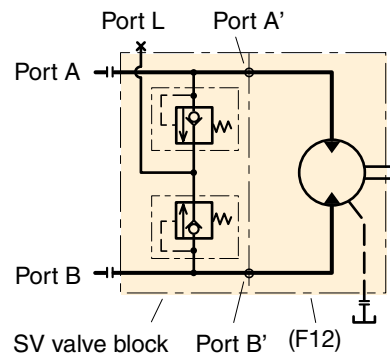
A make-up/drain port, L, is also provided. In certain operating conditions the motor may cavitate because of insufficient inlet pressure. To prevent this, the L port can be pressurized. When there is a risk of over-heating, the L port can also be utilized to take out part of the flow for cooling. Contact Parker Hannifin for further information.

The pressure drop through the main ports (A-A' or B-B') is low. As an example, the pressure drop on size 1 (3/4") is 0.45 bar (6.5 psi) at 175 l/min (45 gpm), and on size 2 (1") 0.7 bar (10 psi) at 250 l/min (65 gpm).

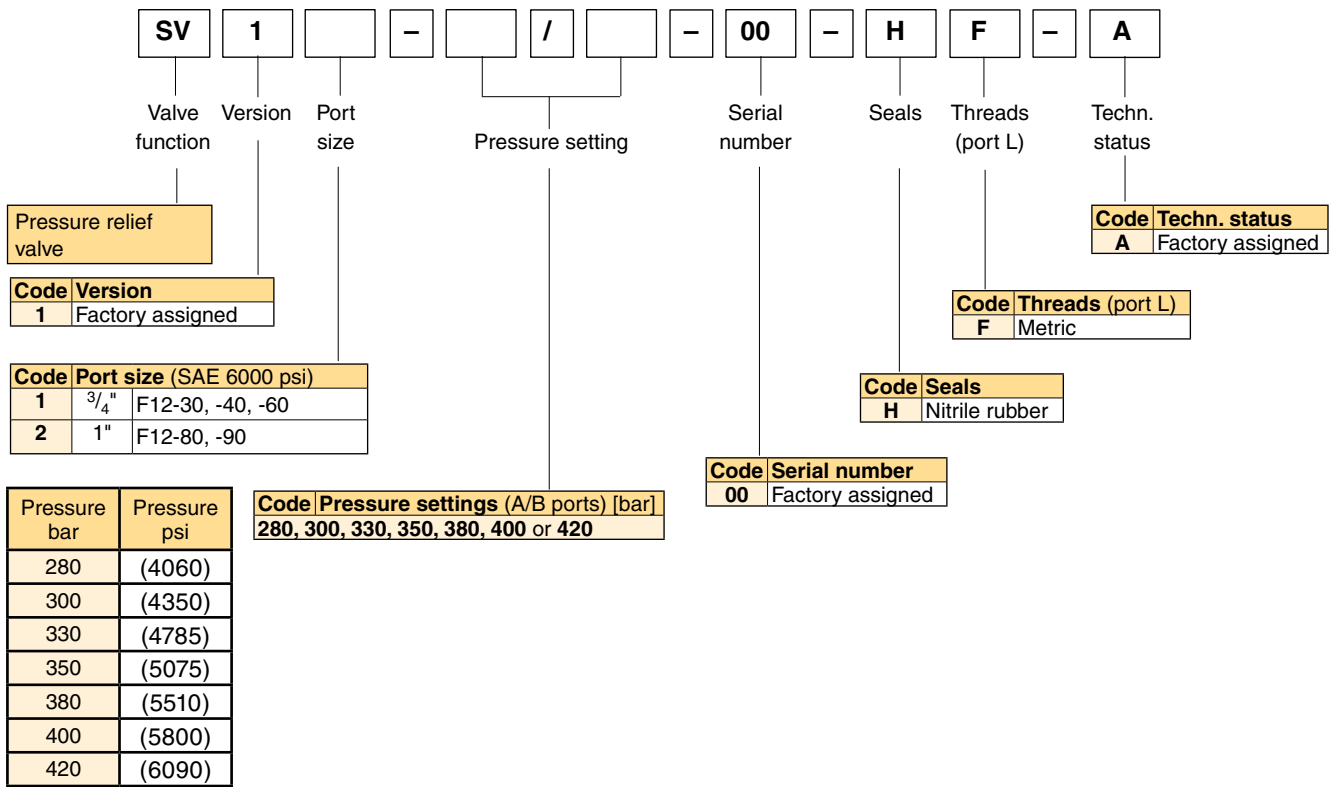
- NOTE:**
- The valve block includes main port O-rings (facing the motor) but no mounting screws.
 - The valve blocks can be used on all versions of series F12 motors.



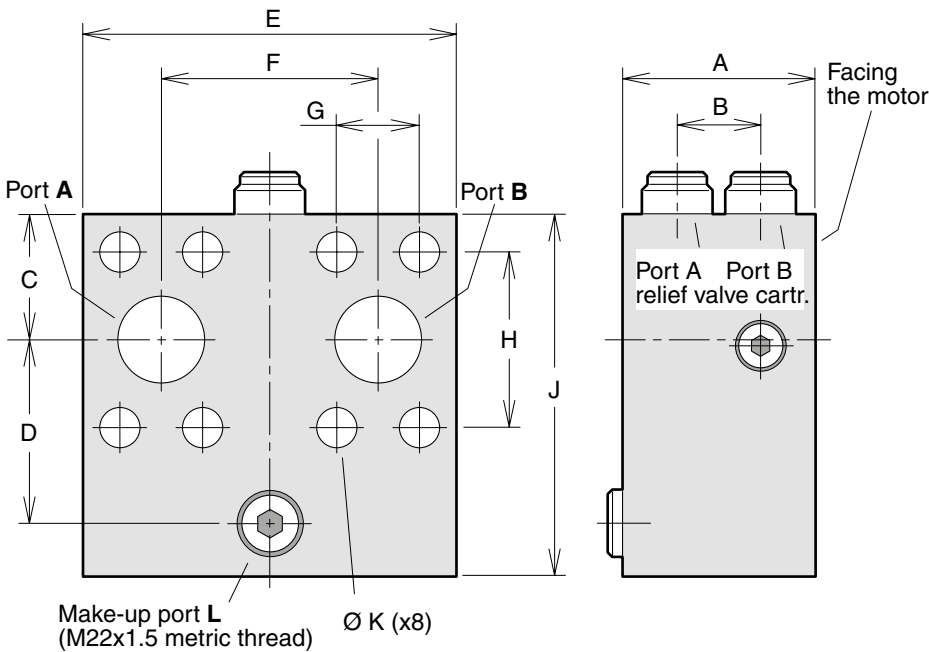
SV valve block installed on an F12 motor.



Hydraulic schematic.



SV pressure relief valve, Dimensions



Dim. [inch]	SV11	SV12
A	2.80	2.87
B	1.22	1.22
C	1.41	1.61
D	1.85	2.01
E	5.12	5.00
F	2.60	2.95
G	0.94	1.09
H	2.00	2.25
J	3.90	4.29
K	0.43	0.51
Weight [lb]	9.3	11.0

MV Anti-cavitation valve / make up valve block

The make-up valve block for series F12 motors is designed to prevent cavitation inside motor by directing flow to inlet port from return side.

The manifold is uni-directional but can be installed in either motor direction

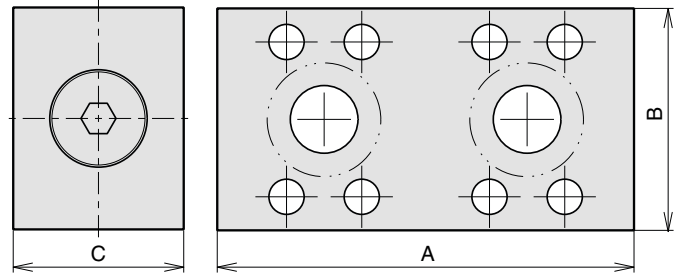
The valve block installs directly on the motor port flange, and is available in 2 sizes:

The valve block consists of one check valve for make-up function.

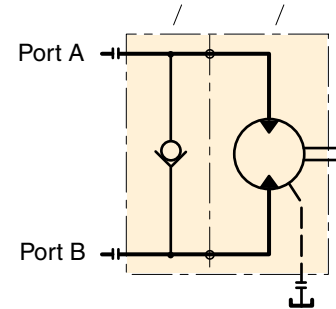
The make-up valve opens at a pressure of approx. 0,2 bar.

NOTE: The valve block includes main port O-rings (facing the motor) but no mounting screws.

Size	For Motor	A	B	C	Order number
1"	F12-80, -90	154	82	63	3720140
1½"	F12-152, -162, -182, -250	208.5	105	47	3784195



MV valve block F12 motor

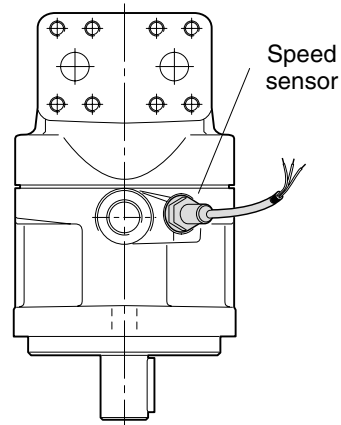


Speed sensor

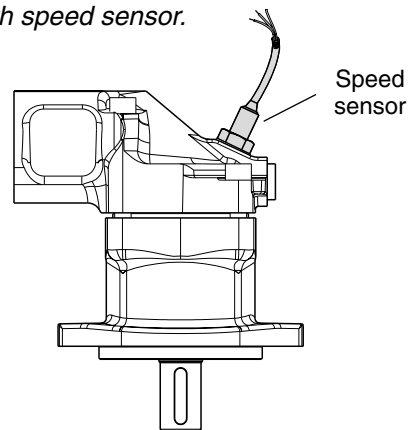
A wide range of speed sensor kits are available for series F11/F12.

The sensors are ferrostat differential (Hall-effect) 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 square wave signal within a frequency range of 0 Hz to 15 kHz.

- NOTE: - All F12 are prepared for speed sensor as standard, but F11 series must be specified in the ordering code refer to pages 12-14 (F11)
- **On F11 the pistons position must be known before mounting.**
 - The speed sensor is also shown in the illustrations on pages 17 to 37 and 46 to 59.



F12 with speed sensor.



F11-14 with speed sensor.

Order number	Electronic	Signals	Installation	Connector	Cable length	Installation instruction
3785190	NPN	2	M12*1 adjustable	Free leads	1000 mm	MSG30-8301-INST
3722481	NPN	2	M12*1 adjustable	M12 4 pin	260 mm	MSG30-8303-INST
3722480	NPN	1	M12*1 adjustable	AMP 3 pin	338 mm	MSG30-8304-INST

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 (106 USgpm)
- 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 (42 US gpm) pump flow)
- BLA 6 (to 400 l/min (106 US gpm) pump flow).

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.

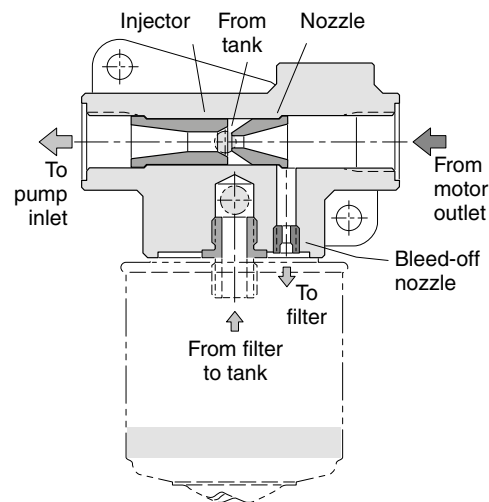
Oil cooling

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.

For more information please see our technical catalogue BLA boost unit MSG17-8224/UK

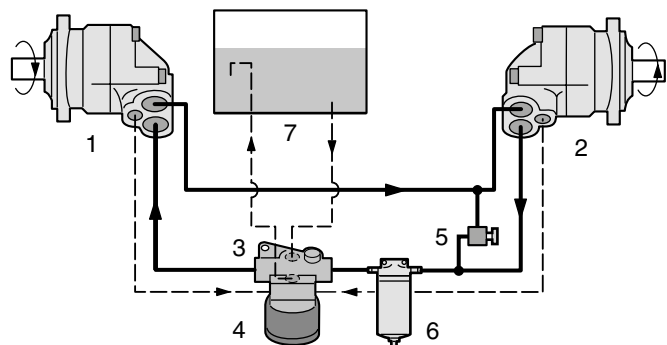
Typical applications:

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



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 | |

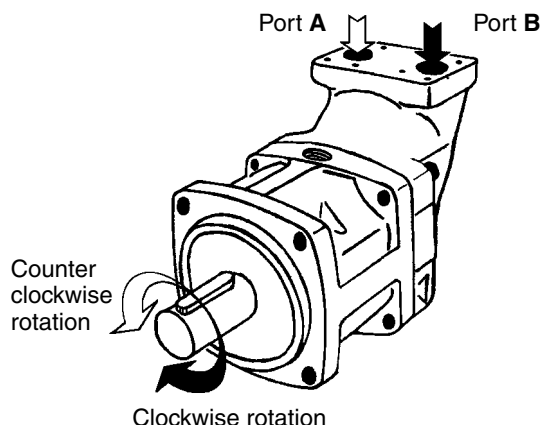
Direction of rotation

The motor versions are bi-directional.

The pump versions are uni-directional, allowing higher selfpriming speeds (refer to pages 9, 11 and 40, 42).

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.

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 pages 11 and 42.

Operating temperature

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

Main circuit 80 °C 176 °F

Drain circuit: 115 °C 239 °F.

NBR shaft seals (type **N**) can be used to 90 °C 194 °F 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 Parker Hannifin for further information.

Maximum Power

Corner power is the theoretical maximum power of a hydraulic machine, calculated by its maximum torque and maximum speed. In practice, calculated corner power is of no use as hydraulic machines are not intended to be run at maximum torque and maximum speed simultaneously. Maximum power that a F11/F12 motor can run at depends on ambient temperature, fluid temperature, viscosity, rate of power increase, flushing capacity.

Please contact Parker Hannifin for further information.

Series F11

Frame size	Speed [rpm]	Flow [l/min]	Flow [gpm]
F11-5	5500	1 - 2	0.25-0.5
F11-6	4500	2 - 3	0.5-0.8
F11-10	4500	2 - 3	0.5-0.8
F11-12	4500	2 - 3	0.5-0.8
F11-14	4500	2 - 3	0.5-0.8
F11-19	4000	2 - 4	0.5-1.0

Series F12

Frame size	Speed [rpm]	Flow [l/min]	Flow [gpm]
F12-30	3500	4 - 8	1.0-2.1
F12-40	3000	5 - 10	1.3-2.6
F12-60	3000	7 - 14	1.9-3.7
F12-80	2500	8 - 16	2.1-4.2
F12-90	2500	8 - 16	2.1-4.2
F12-110	2300	9 - 18	2.4-4.8
F12-125	2300	9 - 18	2.4-4.8
F12-150	2200	10 - 20	2.6-5.2
F12-250	1800	12 - 22	3.2-5.8

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 table below shows recommended case pressure as a function of shaft speed.

Shaft speed	[rpm]	1500	3000	4500	6000	max
F11-5, -6, -10, -12, -14, -19	[bar] [psi]	0.5 - 10 7.3-145	0.5 - 7.0 7.3-102	1.0 - 5.0 14.5-72	2.0 - 5.0 29-72	3.0 - 5.0 43-72
F12-30, -40, -60, -80, -90	[bar] [psi]	0.5 - 8 7.3-116	0.5 - 6.0 7.3-87	1.0 - 4.5 14.5-	2.0 - 4.0 29-58	-
F12-110, -125, -152, -162, -182 -250	[bar] [psi]	0.5 - 6 7.3-87	1.0 - 4.0 14.5-58	2.0 - 4.0 29-58	-	-

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

To secure correct case pressure and lubrication, a spring loaded check valve, 1-3 bar (14.5 - 43,5 psi), in the drain line (shown on next page) is recommended.

Note.
Contact Parker Hannifin for information when operating at high speeds.

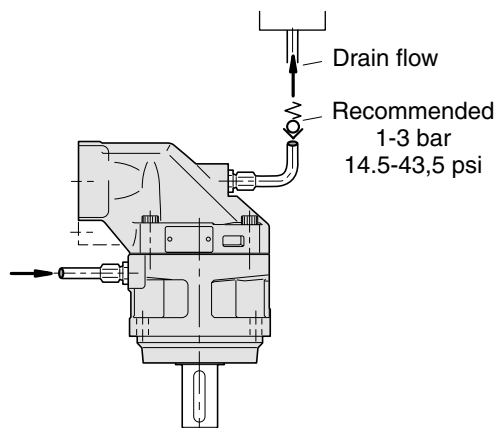
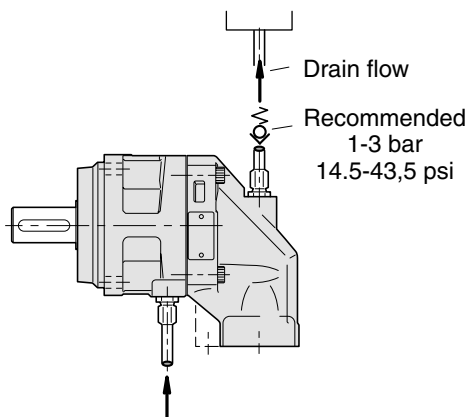
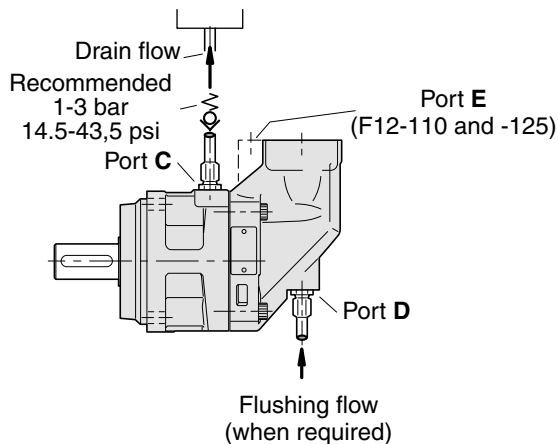
Required inlet pressure

The motor may operate as a pump under certain conditions.
 When this occurs, a minimum pressure must be maintained at the inlet port; increased noise and gradually deteriorating performance due to cavitation may otherwise be experienced.
 A 15 bar inlet pressure, measured at the motor inlet port, satisfies most operating conditions.
 Contact Parker Hannifin for more specific information on inlet pressure requirements.

Case drain connections

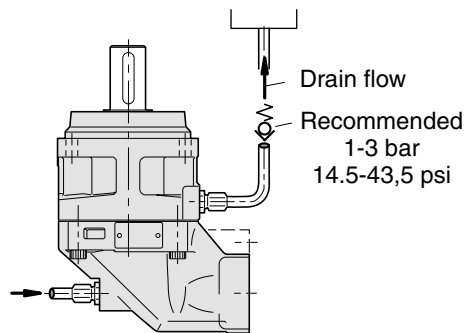
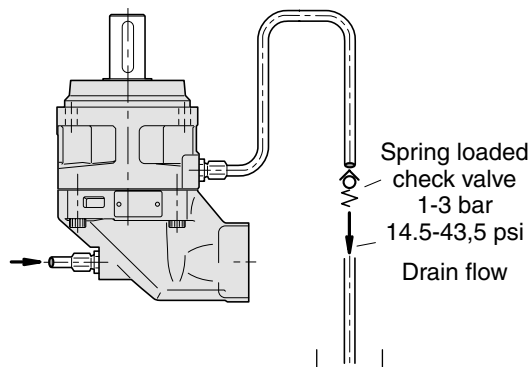
Series F11/F12 have two drain ports, **C** and **D**, while F12-110 and -125 have an additional port, **E**.

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 (1.6 to 3.3 ft/s), and pressure line flow speeds 3 to 5 m/s (9.8 to 16.4 ft/s).

5