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Hydraulic Motor/Pump

Series F10/F11/F12
Fixed Displacement



ENGINEERING YOUR SUCCESS.

Basic formulas for hydraulic motors

Flow (q)	D – displacement [cm ³ /rev]
$q = \frac{D \times n}{1000 \times \eta_v}$ [l/min]	n – shaft speed [rpm]
	η_v – volumetric efficiency
Torque (M)	Δp – differential pressure [bar] (between inlet and outlet)
$M = \frac{D \times \Delta p \times \eta_{hm}}{63}$ [Nm]	η_{hm} – mechanical efficiency
Power (P)	η_t – overall efficiency ($\eta_t = \eta_v \times \eta_{hm}$)
$P = \frac{q \times \Delta p \times \eta_t}{600}$ [kW]	

Basic formulas for hydraulic pumps

Flow (q)	D – displacement [cm ³ /rev]
$q = \frac{D \times n \times \eta_v}{1000}$ [l/min]	n – shaft speed [rpm]
	η_v – volumetric efficiency
Torque (M)	Δp – differential pressure [bar] (between inlet and outlet)
$M = \frac{D \times \Delta p}{63 \times \eta_{hm}}$ [Nm]	η_{hm} – mechanical efficiency
Power (P)	η_t – overall efficiency ($\eta_t = \eta_v \times \eta_{hm}$)
$P = \frac{q \times \Delta p}{600 \times \eta_t}$ [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	$\frac{5}{9}(\text{°F}-32)$
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	$\frac{9}{5}\text{°C} + 32$
1 hp	0.7457 kW

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Scan for Catalogue Boost Unit
Series BLA
MSG30-8224/UK



Scan for Manual Speed Sensor
Series F10/F11/F12 and V12/V14,
Valid for sensor 3722480
MSG30-8304-INST



Scan for Catalogue Hydraulic
Saw Motor - Series F11/F12
MSG30-8245/UK



Scan for Manual Speed Sensor
Series F10/F11/F12 and V12/V14,
Valid for sensor 3783883
MSG30-8302-INST



Scan for Manual Speed Sensor
Series F10/F11/F12 and V12/V14,
Valid for sensor 3785190
MSG30-8301-INST



Scan for Manual Speed Sensor
Series F10/F11/F12 and V12/V14,
Valid for sensor 3722481
MSG30-8303-INST



Scan for Installation & Startup Manual
Series F10/F11/F12
MSG30-8205-INST/EU



Scan for
Noise Installation Guideline

F10



F11



F12



Series F10

F10 is a bent-axis, fixed displacement motor/pump. It can be used in numerous applications in both open and closed loop circuits.

The F10 series is available in sizes 30, 37, 56, 80, 90, 107, and 125 cc

F10 Features

- Max intermittent pressure up to 350 bar and continuous operating pressure up to 300 bar
- The 7 piston design provides high start-up torque and smooth motor operation
- ISO, Cartridge and SAE versions

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.

F11 Features

- Max intermittent pressure up to 420 bar and continuous operating pressure up to 350 bar
- 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.

F12 Features

- Max intermittent pressure up to 500 bar and continuous operating pressure up to 450 bar
- The 7 or 9 piston design provides high start-up torque and smooth motor operation
- ISO, Cartridge, SAW 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.
- Our unique timing gear design synchronizes shaft and cylinder barrel, making the F10/F11/F12 very tolerant to high 'G' forces and torsional vibrations.
- Heavy duty roller bearings permit substantial external axial and radial shaft loads.

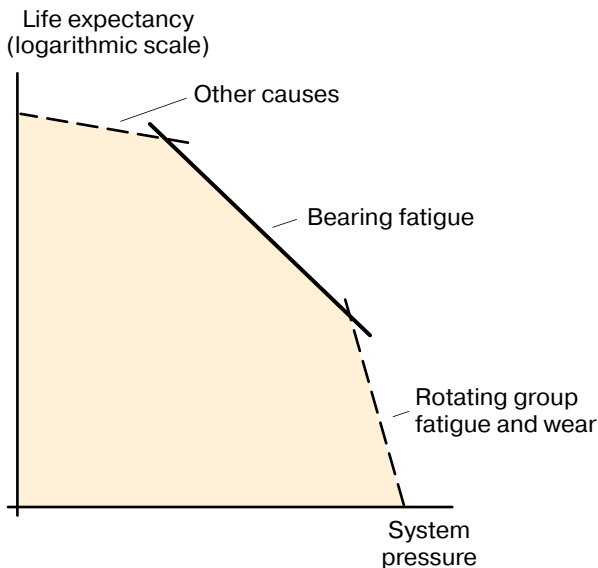
Bearing life

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 F10, 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
- F10, 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:

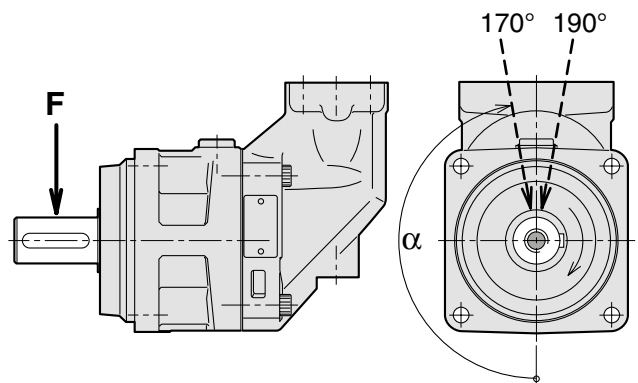
- Pitch diameter, Pressure angle, Spiral angle, Distance flange – gearwheel (mid) and Gearwheel spiral direction (R or L).

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° .

F10/F11/F12 Fan motors

F10/F11/F12 motors, in frame sizes -5 to -80 cc, 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 F10/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.

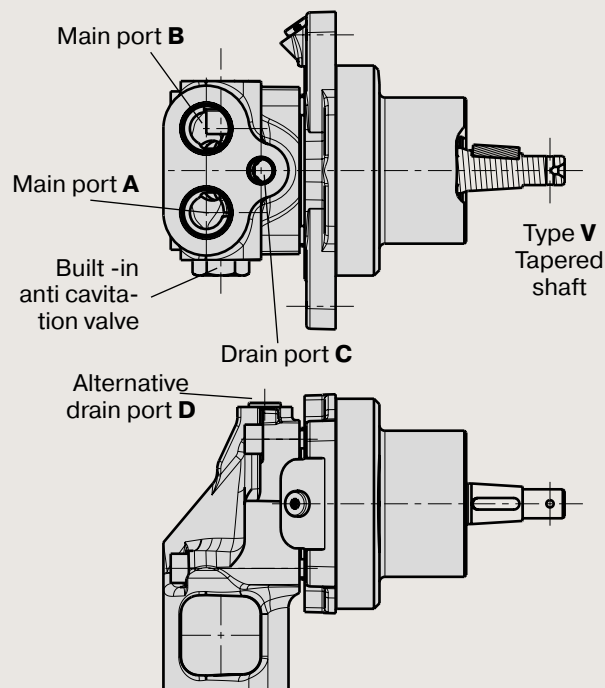
For more info about integrated pressure relief valves, see page 79.

Example of ordering code

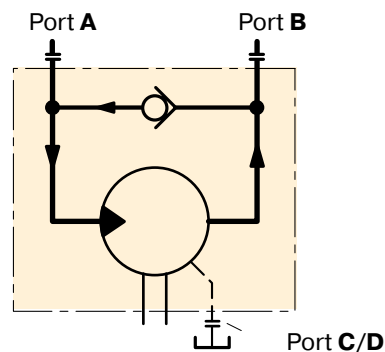
F11-010-MB-CV-K-000-**MU**VL-P0

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

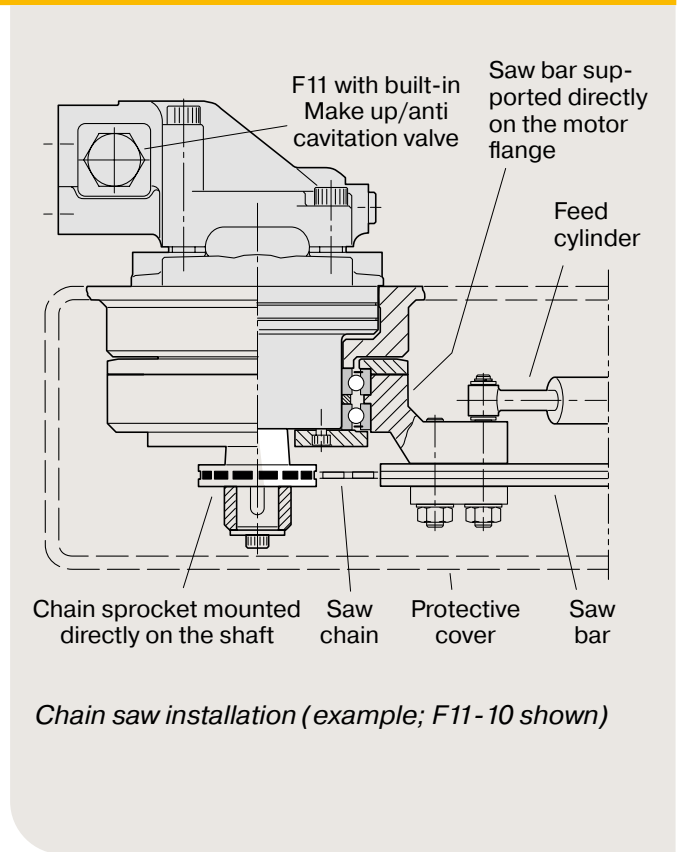
Series F11/F12 motors have proven suitable for demanding applications such as chain saws. Primarily due to the 40° bent-axis design, spherical pistons (with laminated piston rings) and gear synchronization, very high speeds are permissible. Not even low temperatures at start-up affect reliability.

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 F11-6, -10, -12, -14, -19 and F12-30.

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



F10



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Installation dimensions ISO	
F10-30, -37, -56, -80, -90, -107 and -125	16
Installation dimensions Cartridge	
F10-30, -37, -56, -80, -90, -107 and -125	18
Installation dimensions SAE	
F10-30, -37, -56, -80, -90, -107 and -125, 4 bolt flange	20
F10-30, -37, -56 and -80, 2 bolt flange	22

Frame size F10	-030	-037	-056	-080	-090	-107	-125
Displacement [cm ³ /rev]	30.0	37.0	54.4	78.6	93.0	104.0	125.0
Operating pressure							
max intermittent ¹⁾ [bar]	350	350	350	350	350	350	350
max continuous [bar]	300	300	300	300	300	300	300
Motor operating speed [rpm]							
max intermittent ²⁾	5400	4900	4200	3900	3800	3500	3100
max continuous	4900	4400	3800	3500	3400	3200	2800
min continuous	50	50	50	50	50	50	50
Max pump selfpriming speed ³⁾							
L or R function; max [rpm]	3100	3000	2300	2150	2000	1950	2000
Max power							
max continuous power [kW]	62	69	88	117	134	141	149
Drain temperature ⁴⁾ , max [°C]	115	115	115	115	115	115	115
min [°C]	-40	-40	-40	-40	-40	-40	-40
Theoretical torque at 100 bar [Nm]	47.6	58.7	86.3	124.7	174.8	198.4	241
Mass moment of inertia							
(x10 ⁻³) [kg m ²]	1.7	1.7	2.9	5.0	8.4	8.4	11.2
Weight [kg]	11.5	11.5	15.7	18.6	25.7	25.7	33.0

1) Intermittent: max 6 seconds in any one minute.

2) Intermittent maximum speed: Overspeed for unload acceleration processes, max 6 s per minute and $\Delta p < 150$ bar

3) Selfpriming speed valid at sea level. Find more info on page 11.

4) See also installation information. Page 85 – 87

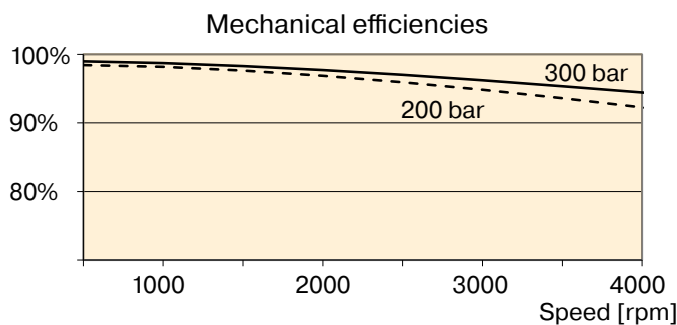
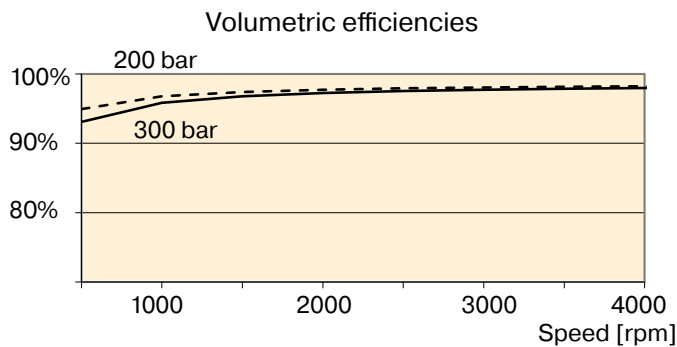
Efficiency

Because of its high overall efficiency, driving a motor/pump from series F10 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 F10-030 motor.

Contact Parker Hannifin for efficiency information on a particular F10 frame size that is being considered.



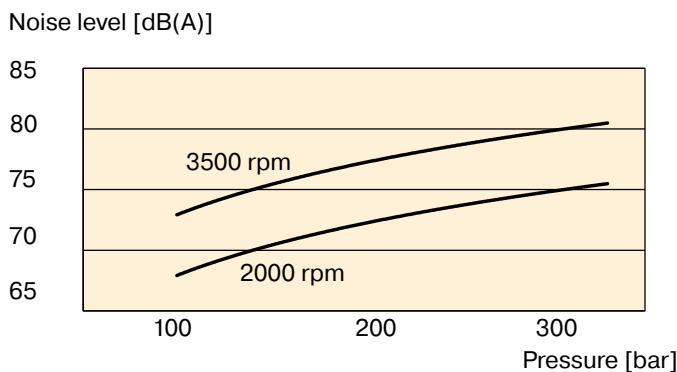
Noise level

Series F10 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 F10-030 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 F10 frame sizes are available from Parker Hannifin.

Selfpriming speed and required inlet pressure

Series F10

When operating the F10 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 F10 motor (type A 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 84.

F10 Pump version

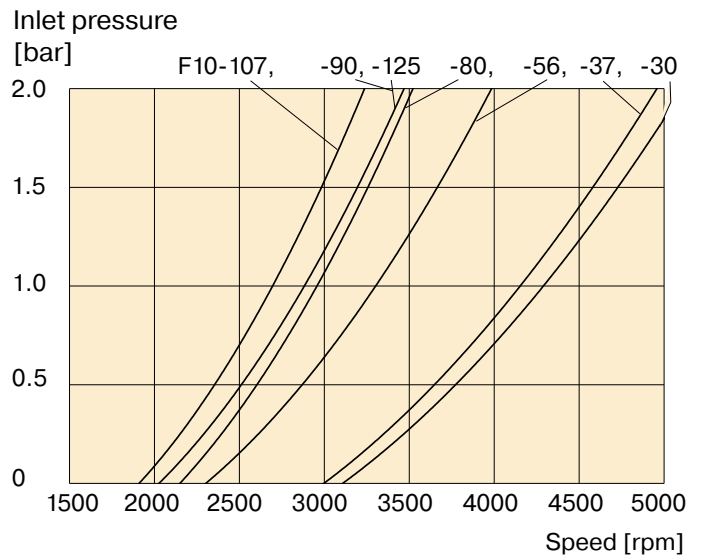


Diagram 2. Min. required pump (F10-L or -R) inlet press.

F10 Motor version

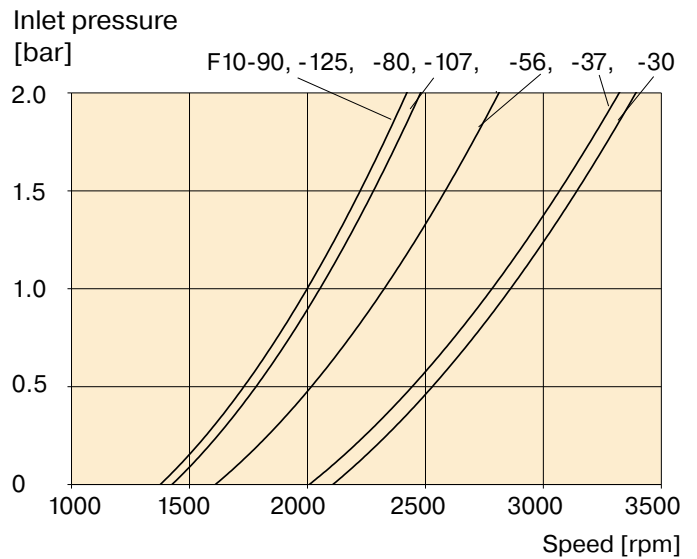
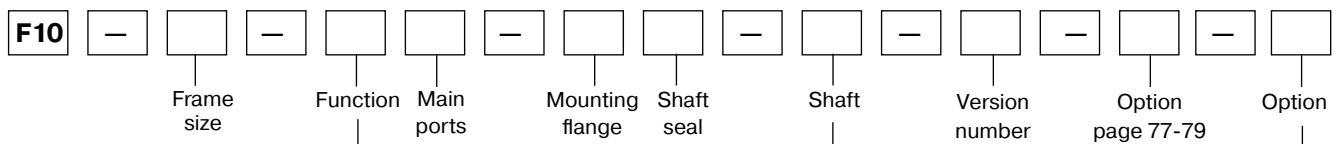


Diagram 3. Min. required motor (F10-A) inlet pressure.

F10-ISO



Frame size	
Code	Displacem. (cm ³ /rev)
030	30.0
037	37.0
056	54.4
080	78.6
090	93.0
107	104.0
125	125.0

Version number
(assigned for special versions)

Frame size	30	37	56	80	90	107	125
Code	Function						
A	Motor	x	x	x	x	x	x
R	Pump, clockwise rotation	(x)	(x)	(x)	(x)	(x)	(x)
L	Pump, counter clockwise rot'n	(x)	(x)	(x)	(x)	(x)	(x)

Frame size	30	37	56	80	90	107	125
Code	Shaft						
D	DIN Spline, Standard	x	x	x	x	x	x
A	DIN Spline, Optional	-	-	(x)	-	-	-
Z	DIN Spline, Optional	(x)	(x)	(x)	(x)	(x)	(x)
K	Metric key, Standard	x	x	x	x	x	x
J	Metric key, Optional	-	-	(x)	-	-	-
P	Metric key, Optional	(x)	(x)	-	-	-	-
V	Tapered shaft	(x)	(x)	(x)	(x)	-	-

Frame size	30	37	56	80	90	107	125
Code	Main ports						
F	SAE 6000 psi flange	x	x	x	x	x	x

Frame size	30	37	56	80	90	107	125
Code	Option						
0000	Standard	x	x	x	x	x	x
L130	Flushing valve 1.3 mm orifice	(x)	(x)	(x)	(x)	(x)	- ¹⁾
MUVR	Make up/Anti cavitation valve CW rotation	(x)	(x)	-	-	-	-
MUVL	Make up/Anti cavitation valve CCW rotation	(x)	(x)	-	-	-	-
P ₂₎ R	Pressure relief valve CW rotation	(x)	(x)	(x)	(x)	-	-
P ₂₎ L	Pressure relief valve CCW rotation	(x)	(x)	(x)	(x)	-	-

Frame size	30	37	56	80	90	107	125
Code	Mounting flange						
I	ISO flange	x	x	x	x	x	x

Frame size	30	37	56	80	90	107	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)

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

1) F10-125: Accessory valve block (page 78)

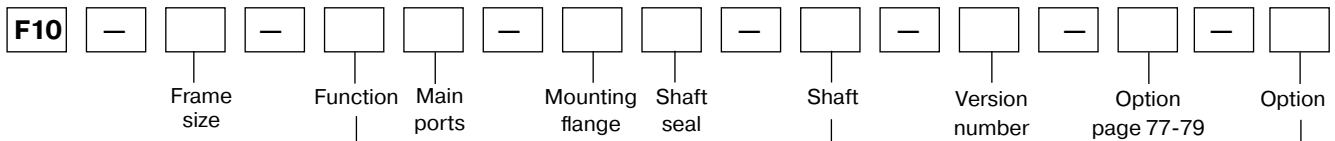
2) Pressure setting on page 79

Frame size	30	37	56	80	90	107	125
Code	Shaft seal						
V	FPM, high pressure, high temperature	x	x	x	x	x	x

NOTE:

All combinations are not valid, please contact Parker Hannifin

F10-Cartridge



Frame size	
Code	Displacem. (cm ³ /rev)
030	30.0
037	37.0
056	54.4
080	78.6
090	93.0
107	104.0
125	125.0

Version number
(assigned for special versions)

Frame size	30	37	56	80	90	107	125
Code Shaft							
C DIN Spline, Standard	x	x	x	x	x	x	x
K Metric key, Optional	(x)	(x)	(x)	(x)	(x)	(x)	(x)
J Metric key, Optional	-	-	(x)	-	-	-	-
V Tapered shaft	(x)	(x)	(x)	(x)	-	-	-
P Metric Key, Optional	(X)	(X)	-	-	-	-	-

Frame size	30	37	56	80	90	107	125
Code Function							
A Motor	x	x	x	x	x	x	x

Frame size	30	37	56	80	90	107	125
Code Option							
0000 Standard	x	x	x	x	x	x	x
L130 Flushing valve 1.3 mm orifice	(x)	(x)	(x)	(x)	(x)	(x)	- ¹⁾
MUVR Make up/Anti cavitation valve CW rotation		(x)	(x)	-	-	-	-
MUVL Make up/Anti cavitation valve CCW rotation		(x)	(x)	-	-	-	-
P ₂ R Pressure relief valve CW rotation	(x)	(x)	(x)	(x)	-	-	-
P ₂ L Pressure relief valve CCW rotation	(x)	(x)	(x)	(x)	-	-	-

Frame size	30	37	56	80	90	107	125
Code Main ports							
F SAE 6000 psi flange	x	x	x	x	x	x	x

Frame size	30	37	56	80	90	107	125
Code Option							
P0 Prepared for speed sensor	x	x	x	x	x	x	x
PT Prepared for speed sensor and Painted Black	(x)	(x)	(x)	(x)	(x)	(x)	(x)

Frame size	30	37	56	80	90	107	125
Code Mounting flange							
C Cartridge	x	x	x	x	x	x	x

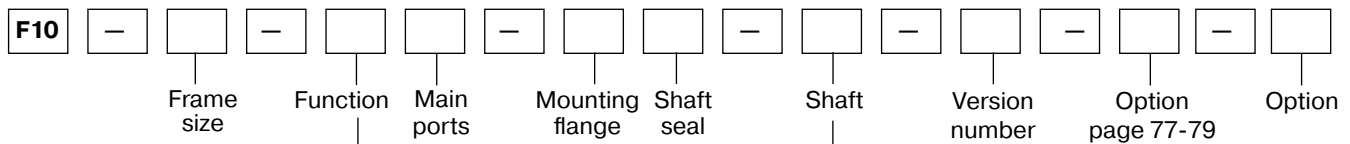
Frame size	30	37	56	80	90	107	125
Code Shaft seal							
V FPM, high pressure, high temperature	x	x	x	x	x	x	x

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

1) F10-125: Accessory valve block (page 78)
 2) Pressure setting on page 79

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

F10-SAE



Frame size	
Code	Displacem. (cm ³ /rev)
030	30.0
037	37.0
056	54.4
080	78.6
090	93.0
107	104.0
125	125.0

Frame size	30	37	56	80	90	107	125
Code	Function						
A	Motor						
R	Pump, clockwise rotation						
L	Pump, counter clockwise rot'n						

Frame size	30	37	56	80	90	107	125
Code	Main ports						
S	SAE 6000 psi flange						
U	SAE UN threads						

Frame size	30	37	56	80	90	107	125
Code	Mounting flange						
S	SAE 4 bolt						
R	SAE 4 bolt						
T	SAE 2 bolt						

Version number
 (assigned for special versions)

Frame size	30	37	56	80	90	107	125
Code	Shaft						
T	SAE key, Standard						
R	SAE key, Optional						
S	SAE Spline, Optional						
F	SAE Spline, Optional						
U	SAE Spline, Optional						
V	Tapered shaft						

Frame size	30	37	56	80	90	107	125
Code	Option						
0000	Standard						
L130	Flushing valve 1.3 mm orifice						
MUVR	Make up/Anti cavitation valve CW rotation						
MUVL	Make up/Anti cavitation valve CCW rotation						
P _R ₂₎	Pressure relief valve CW rotation						
P _L ₂₎	Pressure relief valve CCW rotation						

Frame size	30	37	56	80	90	107	125
Code	Option						
P0	Standard, prepared for speed sensor						
PT	Painted Black						

Frame size	30	37	56	80	90	107	125
Code	Shaft seal						
V	FPM, high pressure, high temperature						

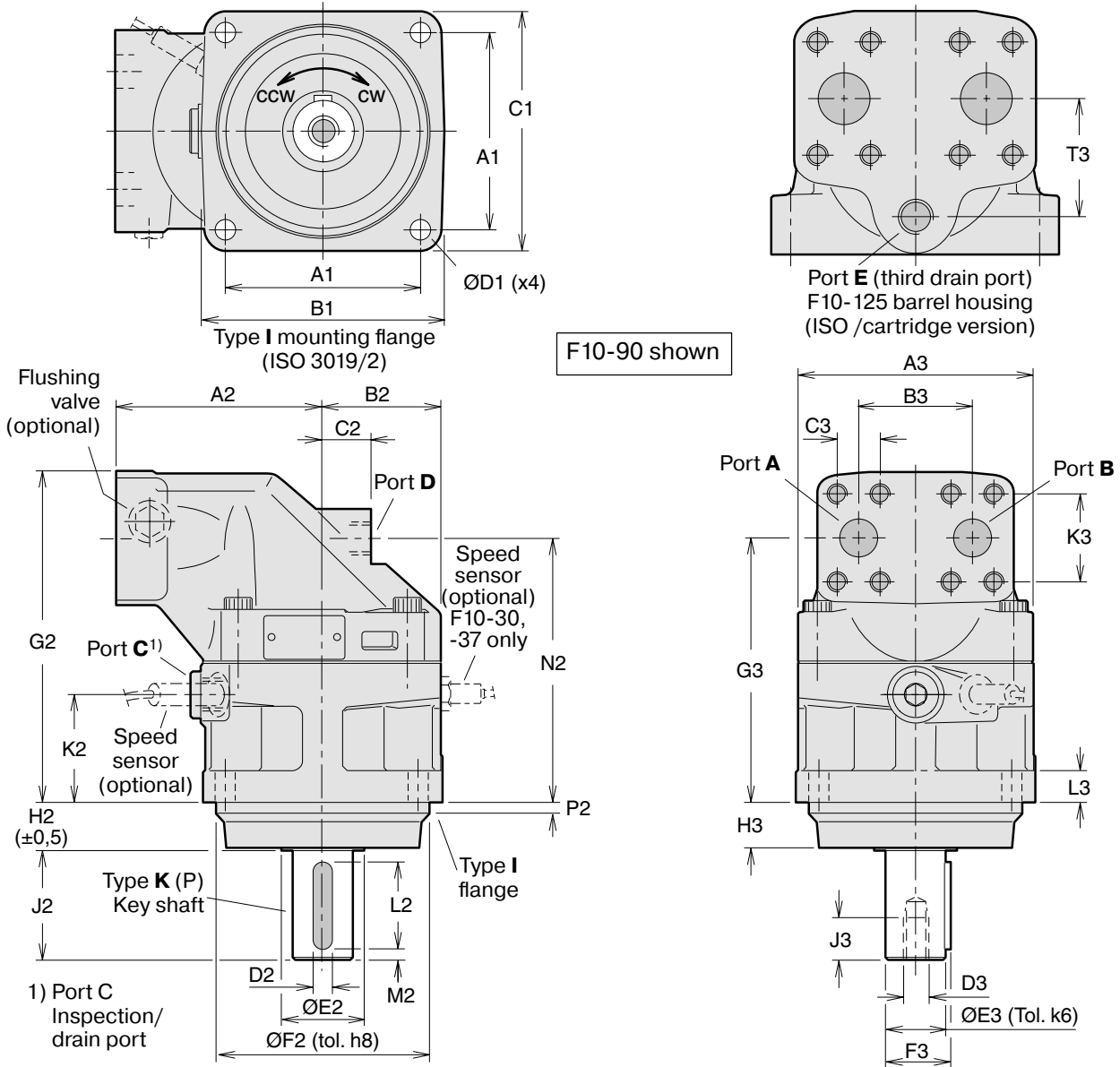
x: Available (x): Optional -: Not available

- 1) F10-125: Accessory valve block (page 78)
- 2) Pressure setting on page 79

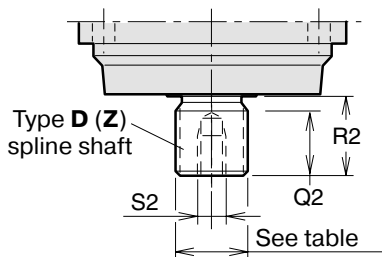
NOTE:

All combinations are not valid, please contact Parker Hannifin

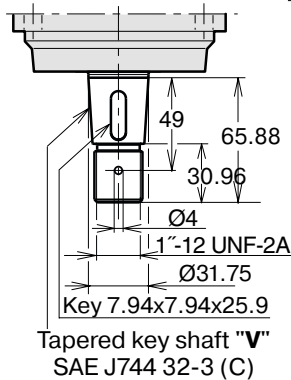
● F10-30, -37, -56, -80, -90, -107 and -125 (ISO versions)



Shaft option D (Z)

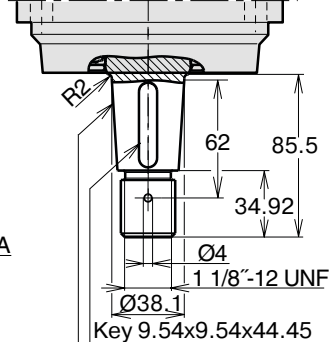


Shaft option V (F10-30, F10-37)



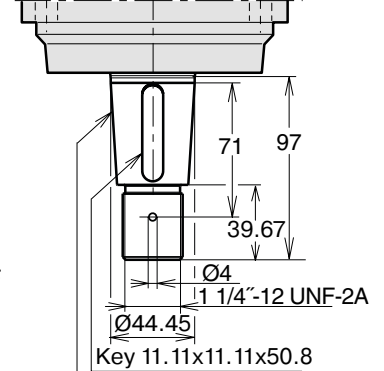
Tapered key shaft "V"
 SAE J744 32-3 (C)

Shaft option V (F10-56)



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

Shaft option V (F10-80)



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

Dim.	F10-30 F10-37	F10-56	F10-80	F10-90 F10-107	F10-125
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	35	45	45	55	60
F2	100	125	125	140	160
G2	172	173	190	216	231
H2	25.5	32.5	32.5	32.5	40.5
J2	50	60	60	70	82
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 ¹⁾	35	35	40	45	50
R2 ²⁾	43	35	35	35	45
S2 ¹⁾	M12x24	M12x24	M12x28	M16x36	M16x36
S2 ²⁾	no thread	M12x24	no thread	M12x28	M16x36
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
K3	50.8	50.8	50.8	57.2	66.7
L3	18	20	20	20	22
T3	-	-	-	-	68

Ports	F10-30 F10-37	F10-56	F10-80	F10-90 F10-107	F10-125
A, B size	3/4"	3/4"	3/4"	1"	1 1/4"
Screw thread ^{*)}	M10 x20	M10 x20	M10 x20	M12 x20	M14 x26
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 mm
**) Metric thread x pitch in mm

Spline shaft (DIN 5480)

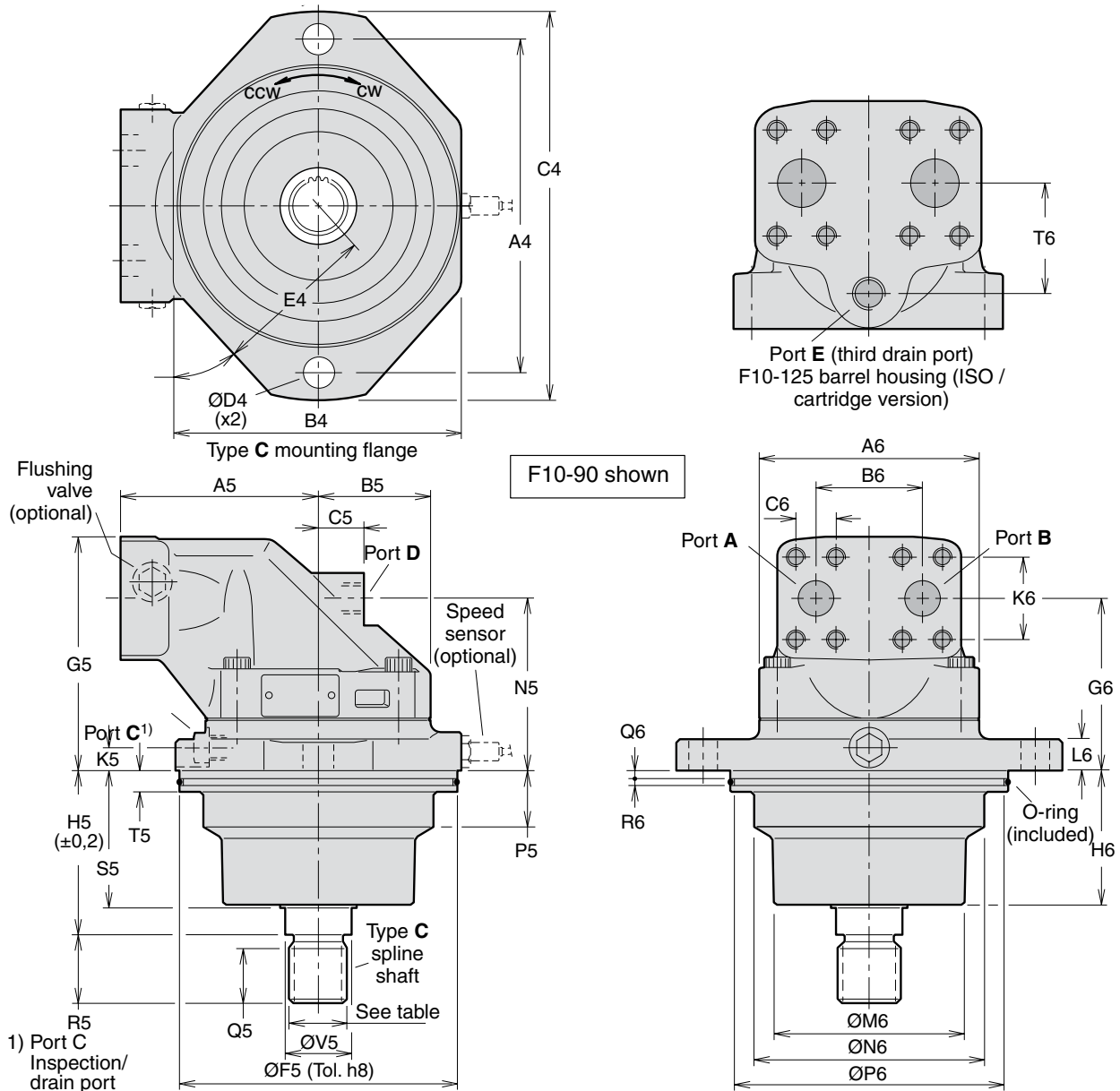
	Type D (standard)	Type A (optional)	Type Z (optional)
F10-30	W30x2x14x9g		W25x1.25x18x9g
-37	W30x2x14x9g		W25x1.25x18x9g
-56	W32x2x14x9g	W35x2x16x9g	W30x2x14x9g
-80	W35x2x16x9g		W32x2x14x9g
-90	W40x2x18x9g		W35x2x16x9g
-107	W40x2x18x9g		W35x2x16x9g
-125	W45x2x21x9g		W40x2x18x9g

Key shaft

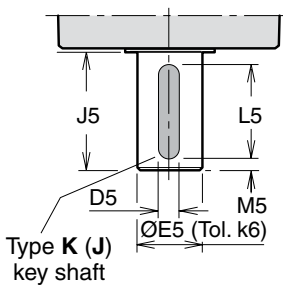
	Type K (std)	Type P (opt.)	Type J (opt.)	Type V (opt.)
F10-30	Ø30	Ø25	-	32-3
-37	Ø30	Ø25	-	32-3
-56	Ø30	-	Ø35	38-3
-80	Ø35	-	-	44-3
-90	Ø40	-	-	-
-107	Ø40	-	-	-
-125	Ø45	-	-	-

- 1) Spline shaft type D
2) Spline shaft type Z

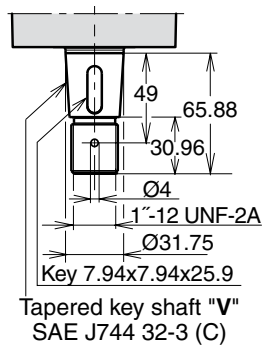
● F10-30, -37, -56, -80, -90, -107 and -125 (Cartridge version)



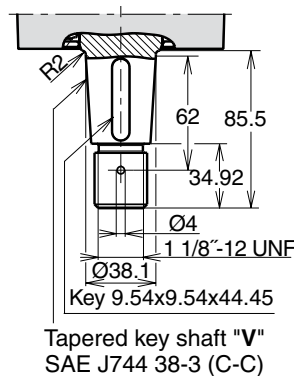
Shaft option K (J)



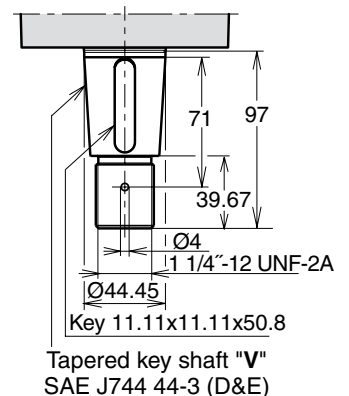
Shaft option V (F10-30, F10-37)



Shaft option V (F10-56)



Shaft option V (F10-80)



Dim.	F10-30 F10-37	F10-56	F10-80	F10-90 F10-107	F10-125
A4	160	200	200	224	250
B4	140	164	164	196	206
C4	188	235	235	260	286
D4	14	18	18	22	22
E4	77	95	95	110	116
A5	100	110	125	135	145
B5	59	65	70	77.5	85
C5	25	26	22	32	38
D5	8	8 ¹⁾ 10 ²⁾	10	12	14
E5	30	30 ¹⁾ 35 ²⁾	35	40	45
F5	135	160	160	190	200
G5	127	133	146	157	175
H5	89	92.3	92.3	110.5	122.8
J5	50	60	60	70	82
K5	14	16	15	15	15
L5	40	50	50	56	70
M5	5	5	5	7	6
N5	91	97	110	114	123
P5	22	30	31	40	40
Q5	28	28	28	37	37
R5	35	35	35	45	45
S5	70.5	72	76	91	95.7
T5	15	15		15	15
V5	32	35	35	45	45
A6	122	134	144	155	170
B6	66	66	66	75	83
C6	23.8	23.8	23.8	27.8	31.8
G6	91.5	97	110	114	123
H6	69.5	71	74	89.5	93.7
K6	50.8	50.8	50.8	57.2	66.7
L6	16	18	18	20	20
M6	92	115	115	130	140
N6	110	127	135	154	160
P6	128.2	153.2	153.2	183.2	193.2
Q6	5	5	5	5	5
R6	5	5	5	5	5
T6	-	-	-	-	68

Ports	F10-30 F10-37	F10-56	F10-80	F10-90 F10-107	F10-125
A, B size	3/4"	3/4"	3/4"	1"	1 1/4"
Screw thread	M10 x20	M10 x20	M10 x20	M12 x20	M14 x26
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

Spline shaft (DIN 5480)

	Type C (standard)
F10-30	W30x2x14x9g
-37	W30x2x14x9g
-56	W30x2x16x9g
-80	W30x2x18x9g
-90	W40x2x18x9g
-107	W40x2x18x9g
-125	W40x2x18x9g

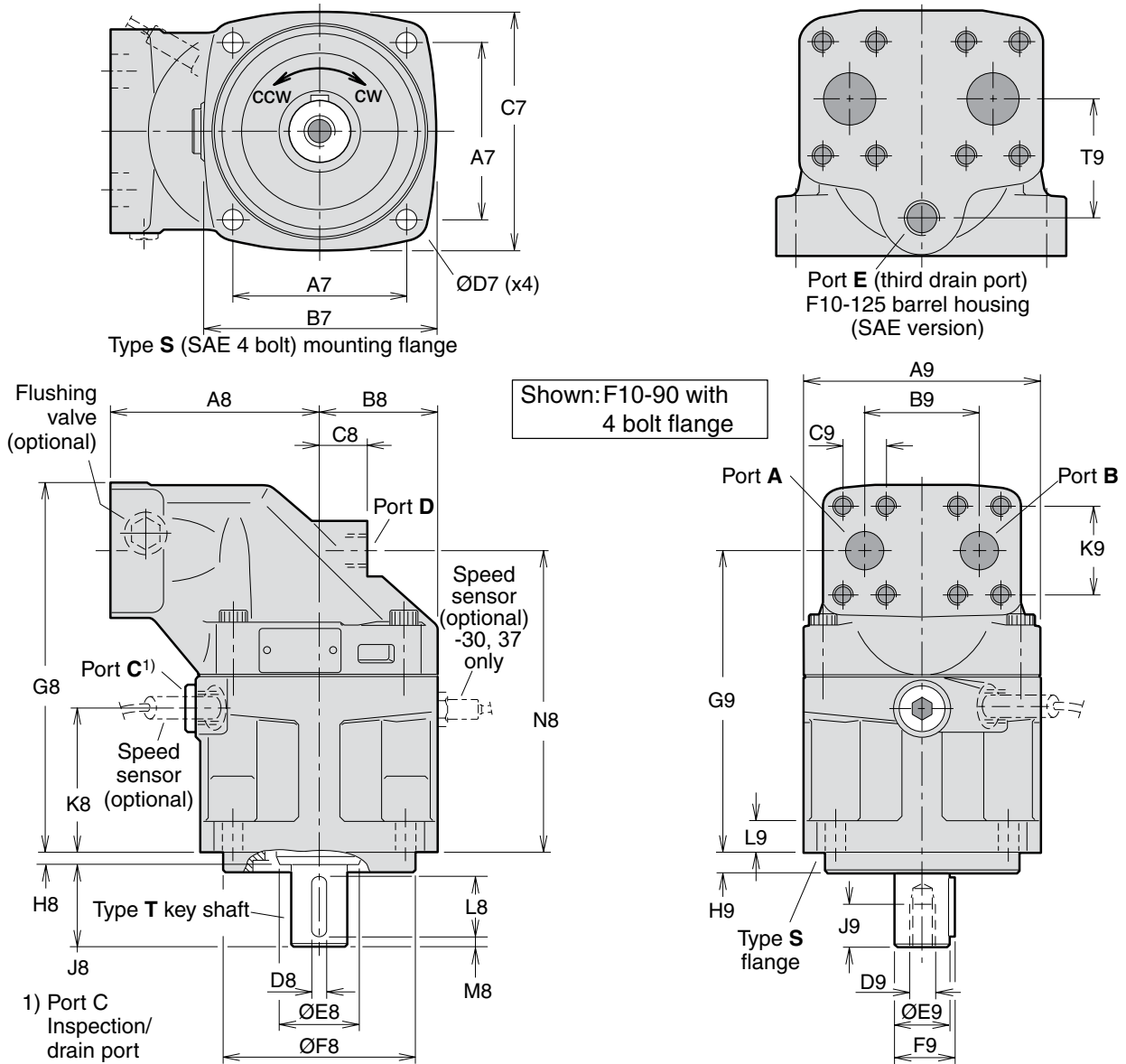
Key shaft

	Type K (standard)	Type J/P (optional)	Type V (optional)
F10-30	Ø30	Ø25 (P)	32-3
-37	Ø30	Ø25 (P)	32-3
-56	Ø30	Ø35 (J)	38-3
-80	Ø35	-	44-3
-90	Ø40	-	-
-107	Ø40	-	-
-125	Ø45	-	-

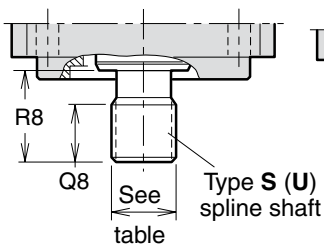
	O-ring dimensions
F10-30	127x4
-37	127x4
-56	150x4
-80	150x4
-90	180x4
-107	180x4
-125	190x4

- 1) Key shaft type K
2) Key shaft type J (optional)

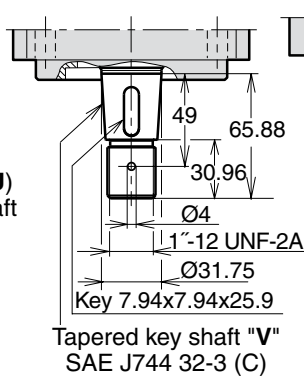
● **F10-30, -37, -56, -80, -90, -107 and -125** (SAE versions with 4 bolt flange)



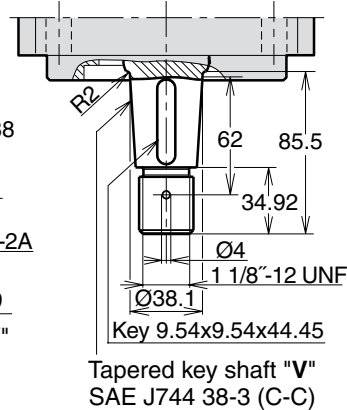
Shaft option S (U)



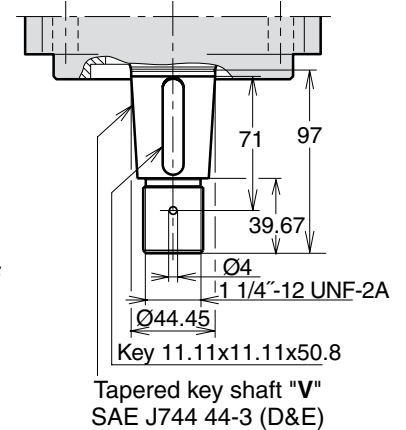
Shaft option V (F10-30, F10-37)



Shaft option V (F10-56)



Shaft option V (F10-80)



Dim.	F10-30 F10-37	F10-56	F10-80	F10-90 F10-107	F10-125
A7	89.8	114.5	114.5	114.5	161.6
B7	118	148	148	155	204
C7	118	144	144	155	200
D7	14	14	14	14	21
A8	100	110	125	135	145
B8	59	65	70	77.5	85
C8	25	26	22	32	38
D8	6.35	7.94	7.94	9.53	11.1
E8	35	45	45	55	60
F8	101.60/ 101.55	127.00/ 126.94	127.00/ 126.94	127.00/ 126.94	152.40/ 152.34
G8	189.5	197	214	240	264
H8	8	8	8	8	8
J8	38	48	48	54	67
K8	72	76	79	95	99
L8	31.8	38.1	38.1	44.5	54.1
M8	2.5	4	4	4	7.5
N8	31.8	38.1	38.1	44.5	54.1
Q8 ¹⁾	26	27	27	29	39
Q8 ²⁾	-	-	-	23	-
R8 ¹⁾	33	48	48	54	66.7
R8 ²⁾	-	-	-	48	-
A9	122	134	144	155	170
B9	66	66	66	75	83
C9	23.8	23.8	23.8	27.8	31.8
D9*	⁵ / ₁₆ "-24	³ / ₈ "-24	³ / ₈ "-24	¹ / ₂ "-20	⁵ / ₈ "-18
E9	25.40/ 25.35	31.75/ 31.70	31.75/ 31.70	38.10/ 38.5	44.45/ 44.40
F9	28.2	35.3	35.3	42.3	49.4
G9	153.8	161	178.3	197.1	212
H9	9.7	12.7	12.7	12.7	12.7
J9	16	19	19	26	32
K9	50.8	50.8	50.8	57.2	66.7
L9	18	20	20	20	22
T9	-	-	-	-	68

* UNF-2B thread

1) Spline shaft type S

2) Spline shaft type U

Main ports A and B, type U (optional)	
F10-30	1 ¹ / ₁₆ " - 12 UN
-37	1 ¹ / ₁₆ " - 12 UN
-56	1 ⁵ / ₁₆ " - 12 UN
-80	1 ⁵ / ₁₆ " - 12 UN
-90	1 ⁵ / ₁₆ " - 12 UN
-107	1 ⁵ / ₁₆ " - 12 UN
-125	1 ⁵ / ₈ " - 12 UN

Ports	F10-30 F10-37	F10-56	F10-80	F10-90 F10-107	F10-125
A, B size	³ / ₄ "	³ / ₄ "	³ / ₄ "	1"	1 ¹ / ₄ "
Screw thread**)	³ / ₈ "-16 x22	³ / ₈ "-16 x20	³ / ₈ "-16 x22	⁷ / ₁₆ "-14 x27	¹ / ₂ "-13 x25
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 mm.

Mounting flange (SAE J744)

	S (standard)	R (optional)
F10-30	SAE 'B', 4 bolt	-
-37	SAE 'B', 4 bolt	-
-56	SAE 'C', 4 bolt	-
-80	SAE 'C', 4 bolt	-
-90	SAE 'C', 4 bolt	SAE 'D', 4 bolt
-107	SAE 'C', 4 bolt	SAE 'D', 4 bolt
-125	SAE 'D', 4 bolt	-

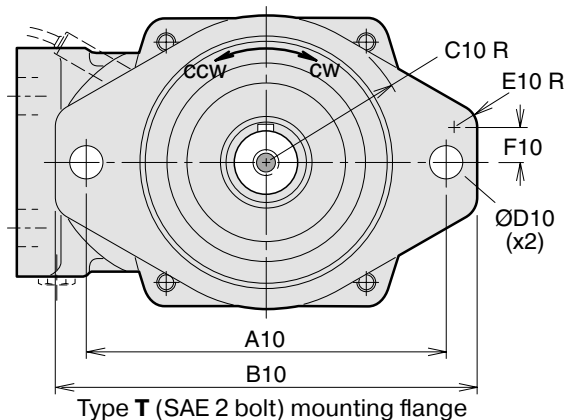
Spline shaft (SAE J498b, class 1, flat root, side fit)

	S (standard)	U (optional)	F (optional)
F10-30	SAE 'B' 13T, ¹⁶ / ₃₂ DP	-	-
-37	SAE 'B' 13T, ¹⁶ / ₃₂ DP	-	-
-56	SAE 'C' 14T, ¹² / ₂₄ DP	-	-
-80	SAE 'C' 14T, ¹² / ₂₄ DP	-	-
-90	SAE 'C-C' 17T, ¹² / ₂₄ DP	SAE 'C' 14T, ¹² / ₂₄ DP ³⁾	SAE 'D' 13T, ⁸ / ₁₆ DP
-107	SAE 'C-C' 17T, ¹² / ₂₄ DP	SAE 'C' 14T, ¹² / ₂₄ DP ³⁾	SAE 'D' 13T, ⁸ / ₁₆ DP
-125	SAE 'D' 13T, ⁸ / ₁₆ DP	-	-

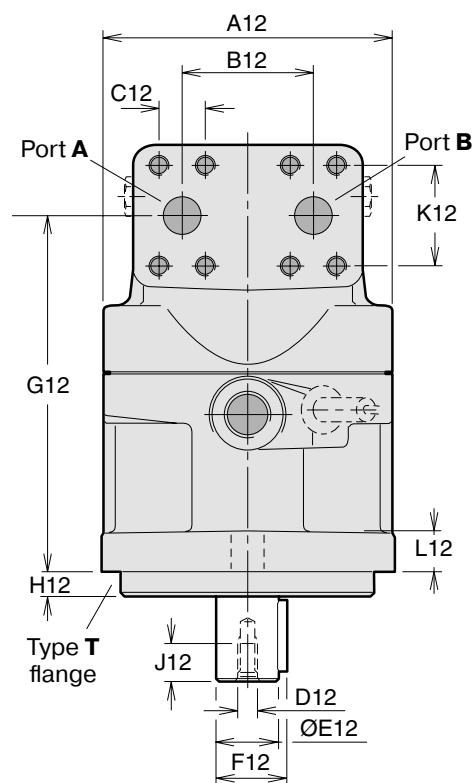
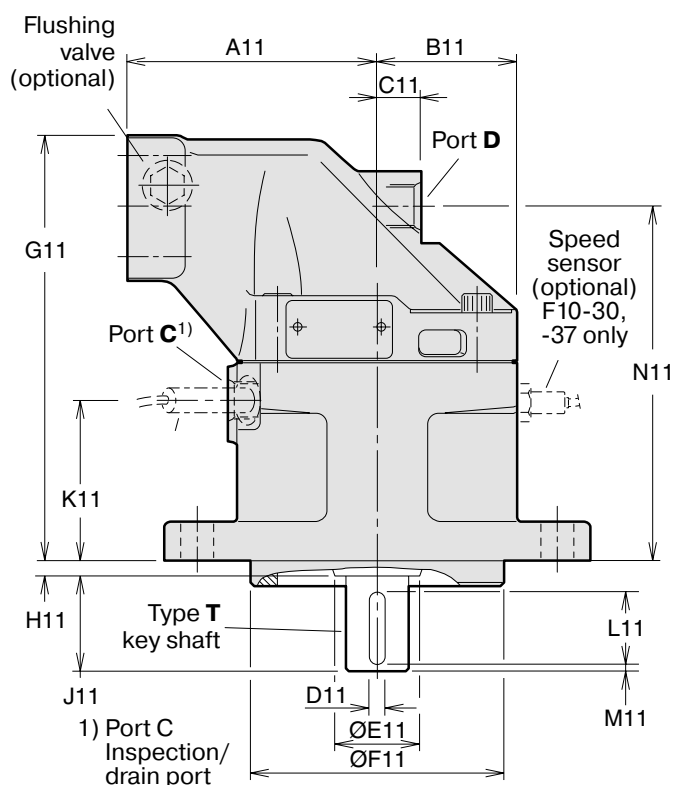
Key shaft (SAE J744)

	T (standard)	R (optional)	V (optional)
F10-30	SAE 'B-B' (Ø25.4 mm/1")	-	32-3
-37	SAE 'B-B' (Ø25.4 mm/1")	-	32-3
-56	SAE 'C' (Ø31.75 mm/1 ¹ / ₄ ")	-	38-3
-80	SAE 'C' (Ø31.75 mm/1 ¹ / ₄ ")	-	44-3
-90	SAE 'C-C' (Ø38.1 mm/1 ¹ / ₂ ")	SAE 'D' (Ø44.45 mm/1 ³ / ₄ ")	-
-107	SAE 'C-C' (Ø38.1 mm/1 ¹ / ₂ ")	SAE 'D' (Ø44.45 mm/1 ³ / ₄ ")	-
-125	SAE 'D' (Ø44.45 mm/1 ³ / ₄ ")	-	-

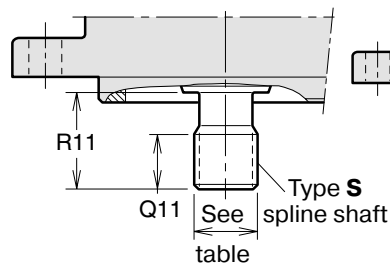
F10-30, -37, -56, and -80 (SAE versions with 2 bolt flange)



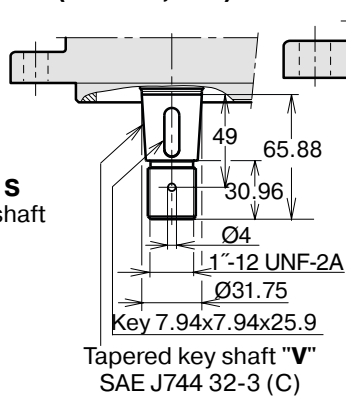
Shown: F10-80 with 2 bolt flange



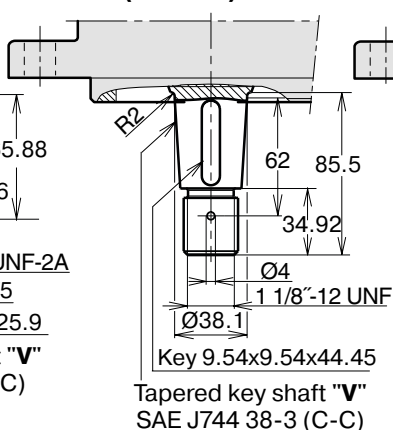
Shaft option S



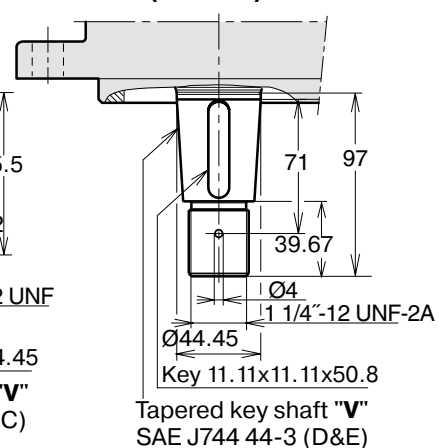
Shaft option V (F10-30, -37)



Shaft option V (F10-56)



Shaft option V (F10-80)



Dim.	F10-30 F10-37	F10-56	F10-80
A10	146	181	181
B10	176	215	215
C10	63	74	74
D10	14.4	17.5	17.5
E10	10	16	16
F10	10	15.5	15.5
A11	100	110	125
B11	59	65	70
C11	25	26	22
D11	6.35	7.94	7.94
E11	35	45	45
F11	101.60/ 101.55	127.00/ 126.95	127.00/ 126.95
G11	189.5	197	214
H11	8	8	8
J11	38	48	48
K11	71	77	81.5
L11	31.8	38.1	38.1
M11	2.5	4	4
N11	154	161	178.5
Q11	26	27	27
R11	38	48	48
A12	122	134	144
B12	66	66	66
C12	23.8	23.8	23.8
D12 ¹⁾	⁵ / ₁₆ "-24	³ / ₈ "-24	³ / ₈ "-24
E12	25.40/25.35	31.75/31.70	31.75/31.70
F12	28.2	35.2	35.2
G12	154	161	178.5
H12	9.7	12.7	12.7
J12	16	19	19
K12	50.8	50.8	50.8
L12	18	20	20

1) UNF-2B thread

Ports	F10-30 F10-37	F10-56	F10-80
A, B size	19 (³ / ₄ "")	19 (³ / ₄ "")	19 (³ / ₄ "")
Screw thread ^{**})	³ / ₈ "-16 x22	³ / ₈ "-16 x20	³ / ₈ "-16 x22
C thread	³ / ₄ "-16	³ / ₄ "-16	⁷ / ₈ "-14
D thread	³ / ₄ "-16	³ / ₄ "-16	⁷ / ₈ "-14
E thread	-	-	-

A, B (main ports): SAE J518c (6000 psi)
C, D (drain ports): O-ring boss (SAE J514)
*) UN thread

Main ports A and B, type U (optional)	
F10-30, -37	1 1/16" - 12 UN
-56	1 5/16" - 12 UN
-80	1 5/16" - 12 UN

O-ring ports according to SAE J514d

Mounting flange T (SAE J744)	
F10-30, -37	SAE 'B', 2 bolt
-56	SAE 'C', 2 bolt
-80	SAE 'C', 2 bolt

Spline shaft S (SAE J498b, class 1, flat root, side fit)	
F10-30, -37	SAE 'B' 13 T; 16/32 DP
-56	SAE 'C' 14 T; 12/24 DP
-80	SAE 'C' 14 T; 12/24 DP

Key shaft (SAE J744)

	T (standard)	V (optional)
F10-30, -37	SAE 'B-B' (Ø25.4 mm/1")	32-3
-56	SAE 'C' (Ø31.75 mm/1 1/4")	38-3
-80	SAE 'C' (Ø31.75 mm/1 1/4")	44-3

F11



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F11-005	31
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F11-014	36
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F11-012	42
F11-014	44
Installation dimensions SAE	
F11-006, -010	46
F11-012	48
F11-014	50
F11-019	52

Frame size F11	-005	-006	-010	-012	-014	-019
Displacement [cm ³ /rev]	4.9	6.0	9.8	12.5	14.3	19.0
Operating pressure						
max intermittent ¹⁾ [bar]	420	420	420	420	420	420
max continuous [bar]	350	350	350	350	350	350
Motor operating speed [rpm]						
max intermittent ¹⁾	14 000	11 200	11 200	10 300	9 900	8 900
max continuous ³⁾	12 800	10 200	10 200	9 400	9 000	8 100
min continuous	50	50	50	50	50	50
Max pump selfpriming speed ²⁾						
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
Drain temperature ³⁾ , max [°C]	115	115	115	115	115	115
min [°C]	-40	-40	-40	-40	-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	6.5	6.5	7.5	7.5	11

1) Intermittent: max 6 seconds in any one minute.

2) Selfpriming speed valid at sea level. Find more info on page 27

3) See also installation information. Page 85 – 87

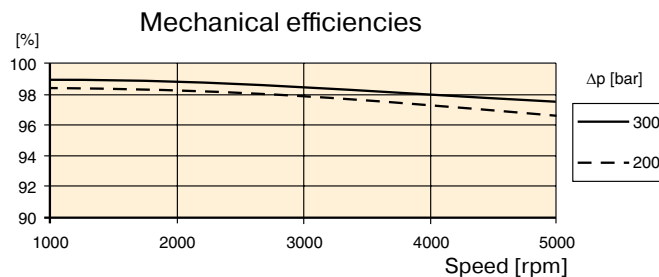
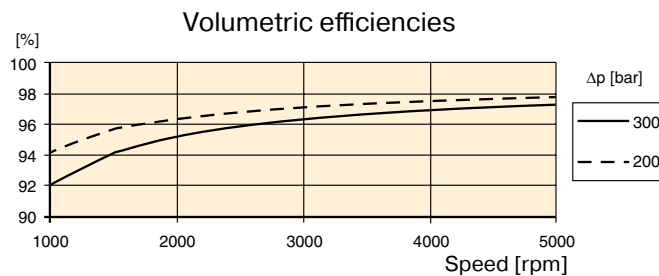
Efficiency

Because of its high overall efficiency, driving a motor/pump from series F11 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 F11-5 motor.

F11-19 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 F11 frame size that is being considered.



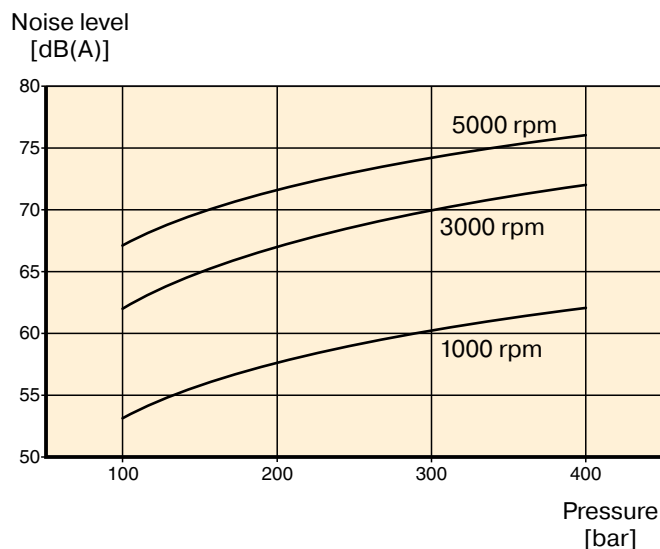
Noise level

Series F11 feature low noise levels from low to high speeds and pressures.

The noise level is measured in a semi-anechoic room, 1 m behind the unit. As an example, the diagram to the right shows the noise level of an F11-005.

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 F11/F12 frame sizes are available from Parker Hannifin.



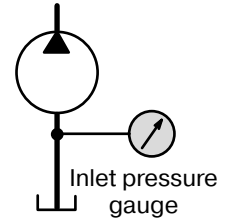
Selfpriming speed and required inlet pressure

Series F11

In pump applications, the F11 with function **L** (counter clockwise rotation) or **R** (clockwise rotation) is normally used. The L and R (pump) provide the highest self priming speeds (see table) as well as the lowest noise level. The **M** and **H** (motor) function can also be used as a pump, in either direction, but at a lower self priming speed.

Operating above the self priming speed (refer to Diagram 1) requires increased inlet pressure. As an example, at least 1.0 bar is needed when operating the F11-19-M as a pump at 3500 rpm. An F11 used as a motor (e.g. in a hydrostatic transmission), may sometimes operate as a pump at speeds above the selfpriming speed; this requires additional inlet pressure. Insufficient inlet pressure can cause pump cavitation resulting in greatly increased pump noise and deteriorating performance.

Function	L or R	M	H
F11-5	4600	3800	3200
F11-6		3100	
F11-10	4200	3100	2700
F11-12	3900	-	3000*
F11-14	3900	-	3000*
F11-19	3500	2400	2100



* Valve plate S

F11 Motor version

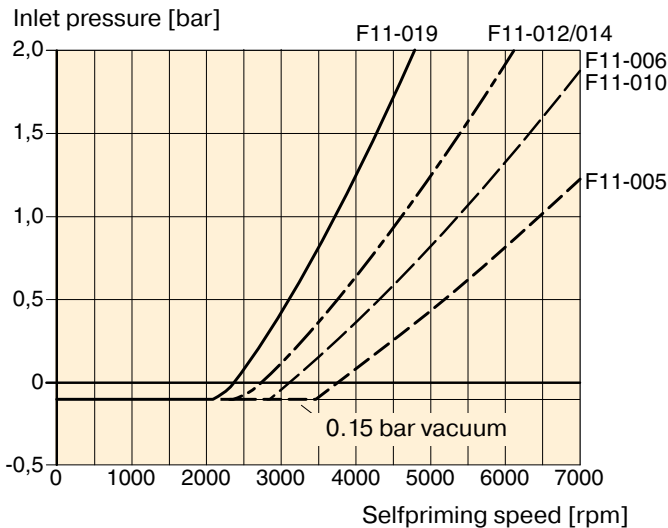


Diagram 1. Min required inlet pressure for Motor.

F11 Pump version

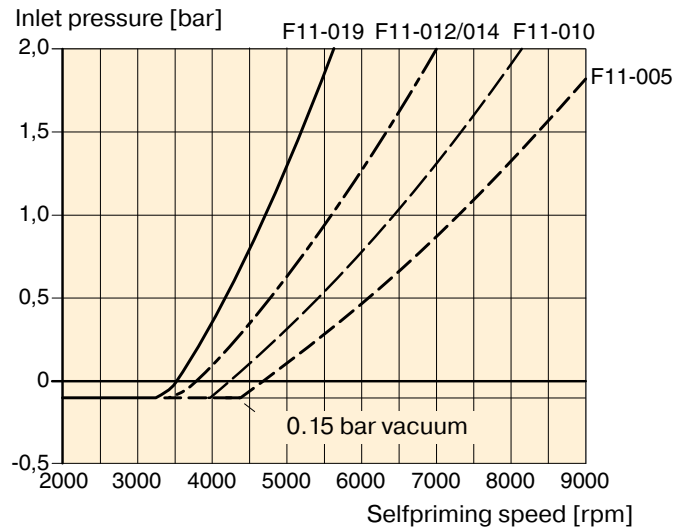
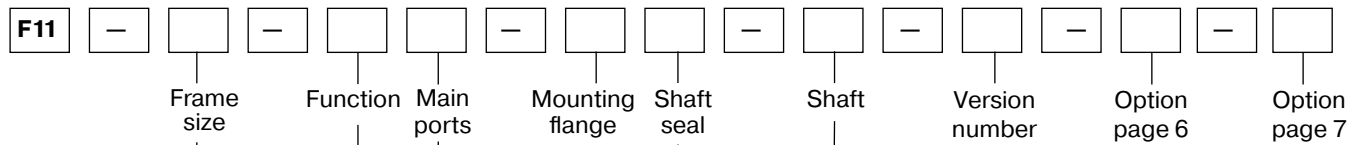


Diagram 2. Min required inlet pressure for Pump.

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 84.

F11-CETOP



Frame size	
Code	Displacem. (cm ³ /rev)
005	4.9
006	6.0
010	9.8
012	12.5
014	14.3
019	19.0

Version number
(assigned for special versions)

Frame size	5	6	10	12	14	19
Code Option						
0000 Standard	x	x	x	x	x	x
MUVR Make up/Anti cavitation valve clockwise rotation	-	(x)	(x)	(x)	(x)	(x)
MUVL Make up/Anti cavitation valve counter clockwise rotation	-	(x)	(x)	(x)	(x)	(x)

Frame size	5	6	10	12	14	19
Code Function						
M Motor	x	x	x	-	-	x
Q Motor, low noise	x	-	x	x	x	x
S Motor, high speed	-	-	(x)	(x)	(x)	(x)
H Motor, high pressure	(x)	-	(x)	-	-	(x)
R Pump, clockwise rot'n	(x)	-	(x)	(x)	(x)	(x)
L Pump, counter clockw.	(x)	-	(x)	(x)	(x)	(x)

For other versions, contact Parker Hannifin

Frame size	5	6	10	12	14	19
Code Main ports						
B BSP threads	x	x	x	x	x	x
U SAE, UN threads	(x)	(x)	(x)	(x)	(x)	(x)

Frame size	5	6	10	12	14	19
Code Shaft*						
K Metric key	x	x	x	x	x	x
J Metric key	(x)	(x)	(x)	(x)	-	-
P Metric key	-	-	-	-	(x)	-
A Spline, DIN 5480	-	(x)	(x)	(x)	-	-
D Spline, DIN 5480	x	x	x	x	x	x
S Spline, SAE	(x)	-	-	-	-	-
V Tapered shaft	-	(x)	(x)	(x)	(x)	-

*See also dimensional drawings on pages 31 – 39.

Frame size	5	6	10	12	14	19
Code Mounting flange						
C CETOP flange	x	x	x	x	x	x

Frame size	5	6	10	12	14	19
Code Shaft seal						
V FPM, high pressure, high temperature	x	x	x	x	x	x

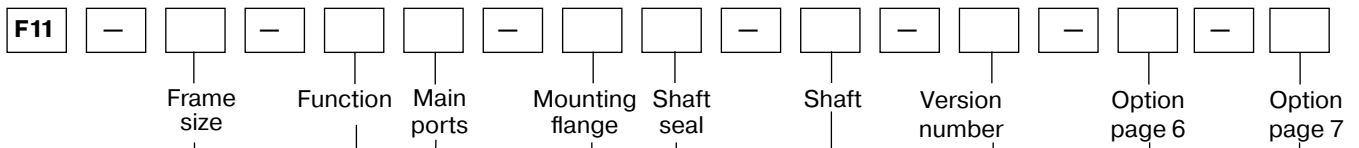
For other versions, contact Parker Hannifin

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

Frame size	5	6	10	12	14	19
Code Option						
00 Standard	x	x	x	x	x	x
P_ Prepared for speed sensor	-	x	x	x	x	x
B_ Power Boost and Prepared for speed sensor	-	(x)	(x)	(x)	(x)	(x)
_T Painted Black	(x)	(x)	(x)	(x)	(x)	(x)

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

F11-ISO



Frame size	
Code	Displacem. (cm ³ /rev)
006	6.0
010	9.8
012	12.5
014	14.3

Frame size		6	10	12	14
Code	Function				
M	Motor	x	x	-	-
Q	Motor, low noise	-	x	x	x
S	Motor, high speed	-	(x)	(x)	(x)
H	Motor, high pressure	-	(x)	-	-
R	Pump, clockwise rot'n	-	(x)	(x)	(x)
L	Pump, counter clockw.	-	(x)	(x)	(x)

For other versions, contact Parker Hannifin

Frame size		6	10	12	14
Code	Main ports				
F	Metric threads	-	x	x	x
B	BSP threads	x	(x)	(x)	(x)
M	Side ports, metric	-	(x)	(x)	(x)

Frame size		6	10	12	14
Code	Mounting flange				
I	ISO flange	x	x	x	x

Frame size		6	10	12	14
Code	Shaft seal				
V	FPM, high pressure, high temperature	x	x	x	x

For other versions, contact Parker Hannifin

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

Version number
 (assigned for special versions)

Frame size		6	10	12	14
Code	Option				
0000	Standard	x	x	x	x
MUVR	Make up/Anti cavitation valve clockwise rotation	(x)	(x)	(x)	(x)
MUVL	Make up/Anti cavitation valve counter clockwise rotation	(x)	(x)	(x)	(x)

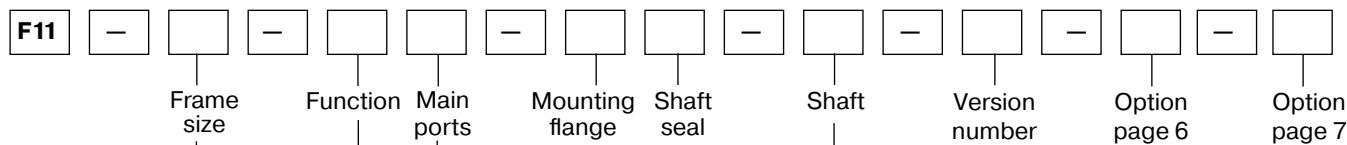
Frame size		6	10	12	14
Code	Shaft*				
K	Metric key	x	x	x	x
J	Metric key	(x)	(x)	(x)	-
P	Metric key	-	-	-	(x)
A	Spline, DIN 5480	(x)	(x)	(x)	-
D	Spline, DIN 5480	x	x	x	x
V	Tapered shaft	(x)	(x)	(x)	(x)

*See also dimensional drawings on pages 41 – 45.

Frame size		6	10	12	14
Code	Option				
00	Standard	x	x	x	x
P_	Prepared for speed sensor	x	x	x	x
B_	Power Boost and Prepared for speed sensor	(x)	(x)	(x)	(x)
_T	Painted Black	(x)	(x)	(x)	(x)

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

F11 - SAE



Frame size	
Code	Displacem. (cm ³ /rev)
006	6.0
010	9.8
012	12.5
014	14.3
019	19.0

Frame size		6	10	12	14	19
Code	Function					
M	Motor	x	x	-	-	x
Q	Motor, low noise	-	x	x	x	x
S	Motor, high speed	-	(x)	(x)	(x)	(x)
H	Motor, high pressure	-	(x)	-	-	(x)
R	Pump, clockwise rot'n	-	(x)	(x)	(x)	(x)
L	Pump, counter clockw.	-	(x)	(x)	(x)	(x)

For other versions, contact Parker Hannifin

Frame size		6	10	12	14	19
Code	Main ports					
U	SAE, UN threads	x	x	x	x	x
B	BSP threads	(x)	(x)	(x)	(x)	(x)

Frame size		6	10	12	14	19
Code	Mounting flange					
S	SAE flange	x	x	x	x	x

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

Version number
 (assigned for special versions)

Frame size		6	10	12	14	19
Code	Option					
0000	Standard	x	x	x	x	x
MUVR	Make up/Anti cavitation valve clockwise rotation	(x)	(x)	(x)	(x)	(x)
MUVL	Make up/Anti cavitation valve counter clockwise rotation	(x)	(x)	(x)	(x)	(x)

Frame size		6	10	12	14	19
Code	Shaft*					
T	SAE key	-	-	-	x	x
S	SAE spline	x	x	x	x	x
K	Metric key	x	x	x	-	-
J	Metric key	(x)	(x)	(x)	-	-
V	Tapered shaft	(x)	(x)	(x)	(x)	-

*See also dimensional drawings on pages 46 – 53.

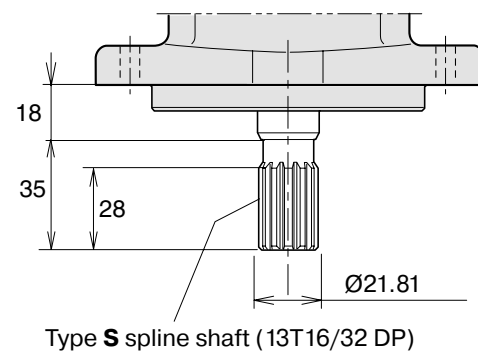
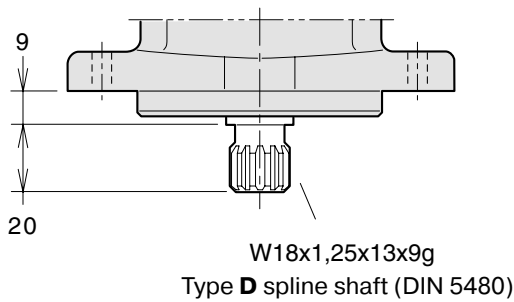
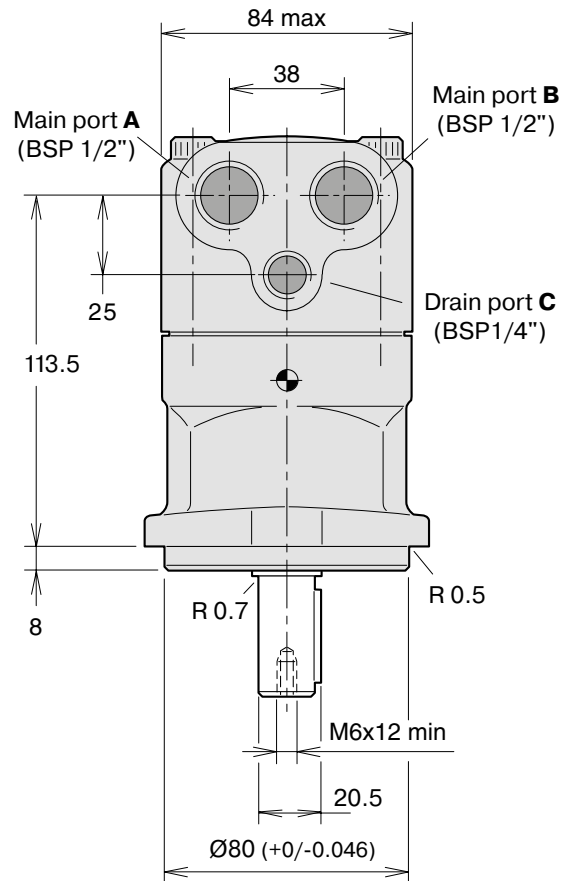
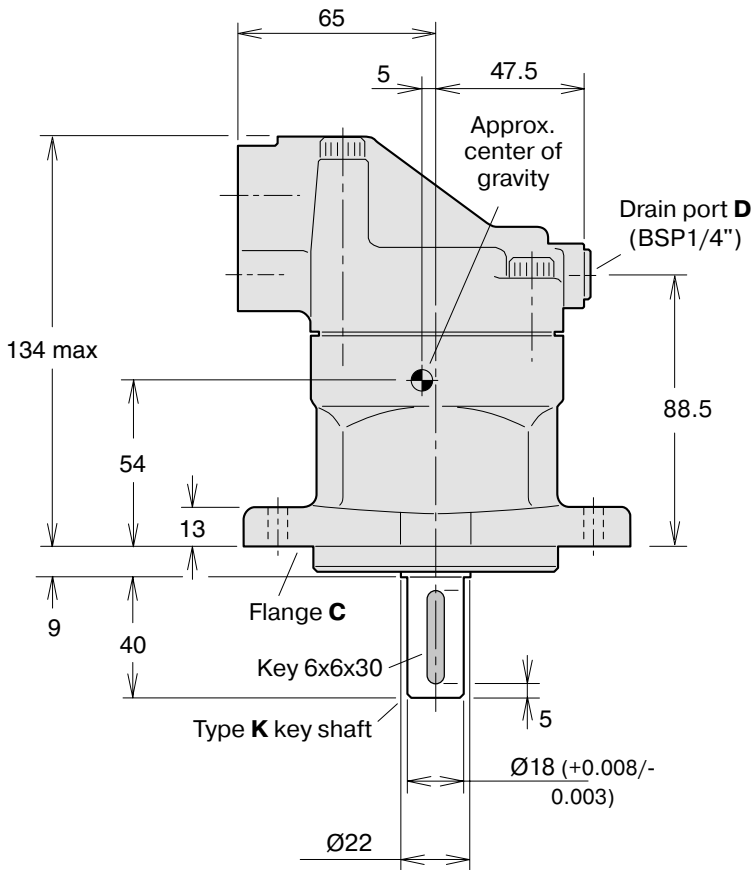
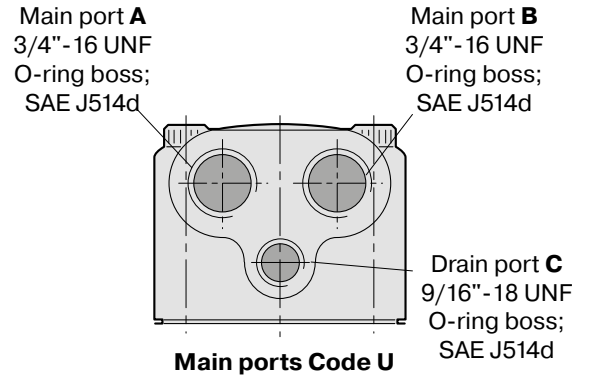
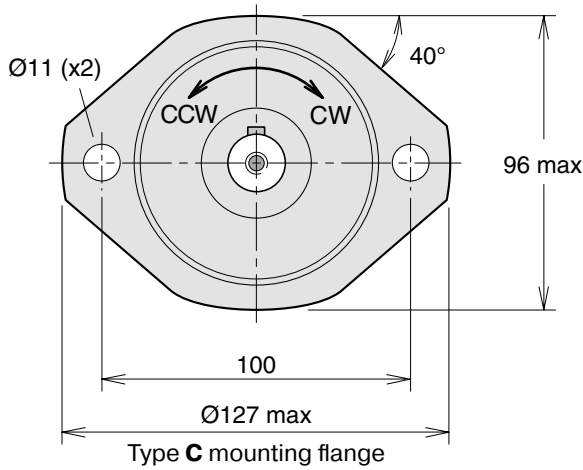
Frame size		6	10	12	14	19
Code	Shaft seal					
V	FPM, high pressure, high temperature	x	x	x	x	x

For other versions, contact Parker Hannifin

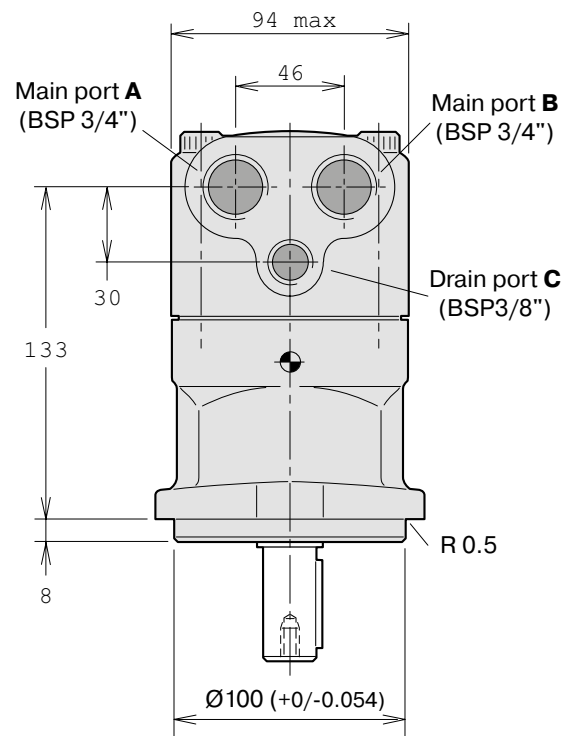
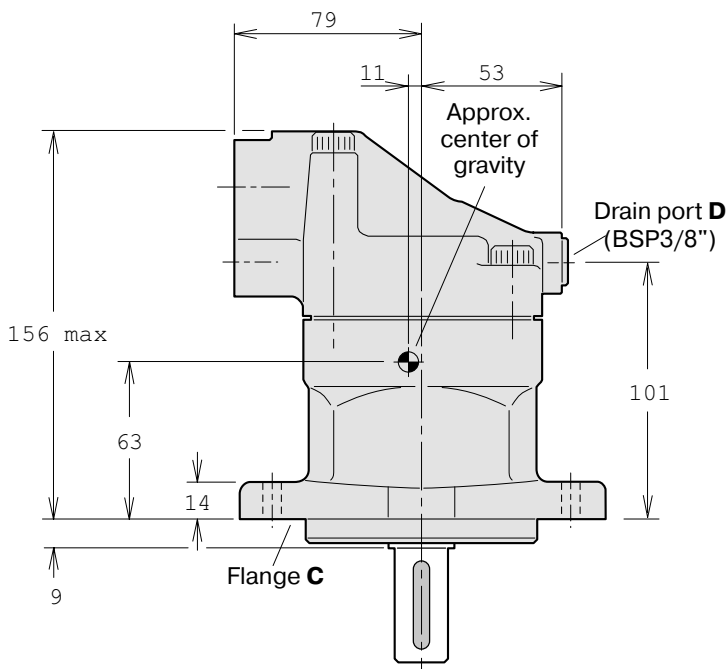
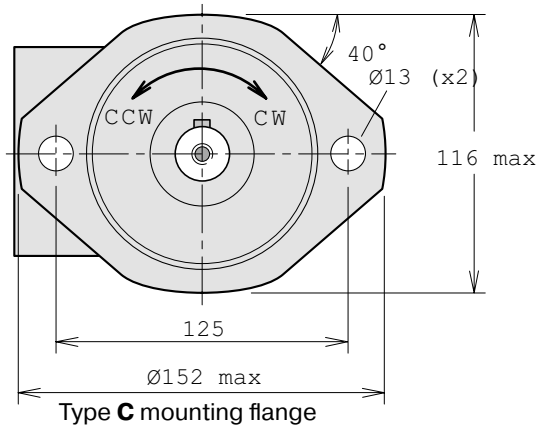
Frame size		6	10	12	14	19
Code	Option					
00	Standard	x	x	x	x	x
P_	Prepared for speed sensor	x	x	x	x	x
B_	Power Boost and Prepared for speed sensor	(x)	(x)	(x)	(x)	(x)
_T	Painted Black	(x)	(x)	(x)	(x)	(x)

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

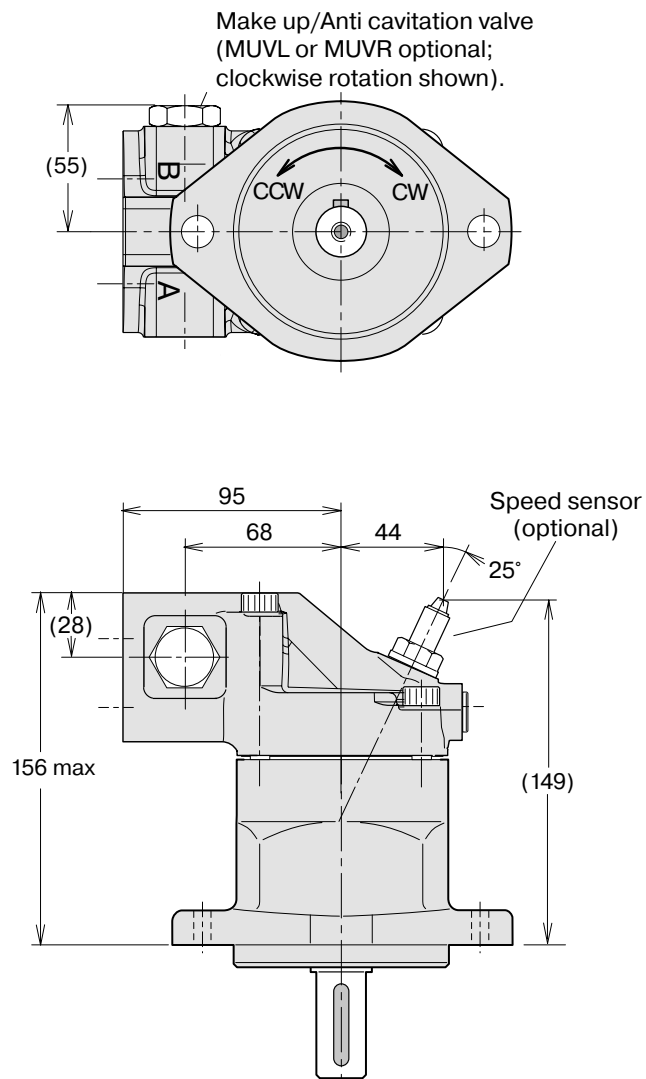
● **F11-005 (CETOP versions)**



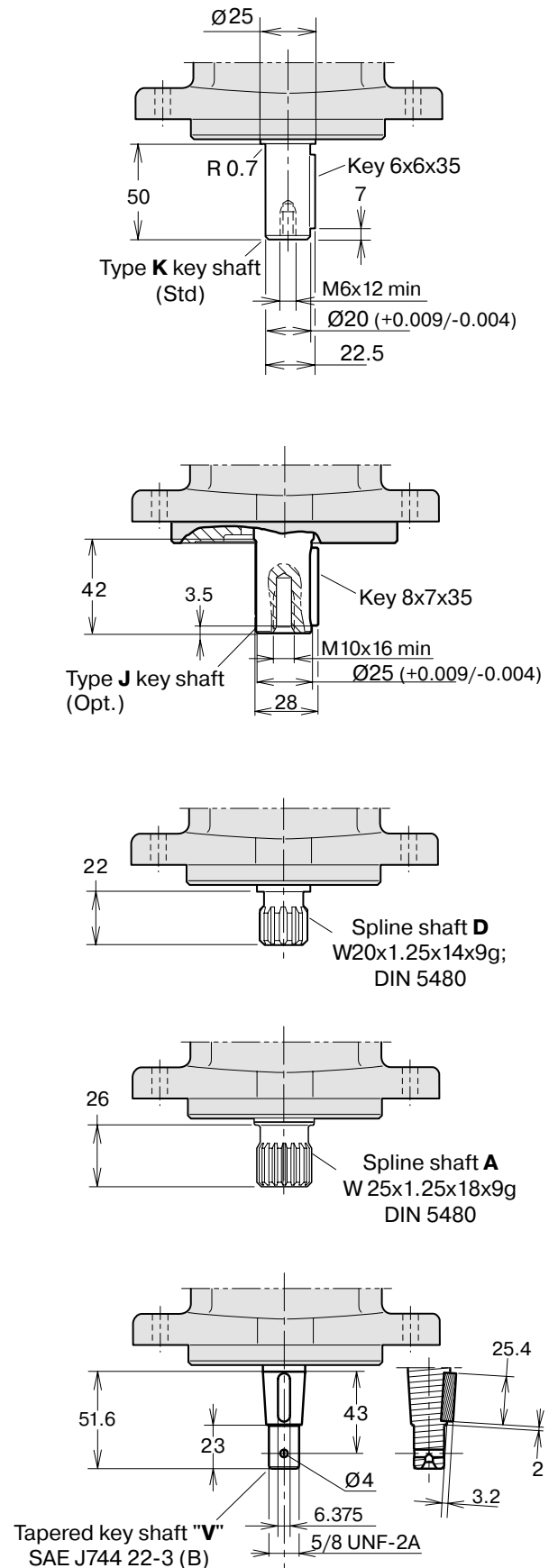
● **F11-006, -010 (CETOP versions)**



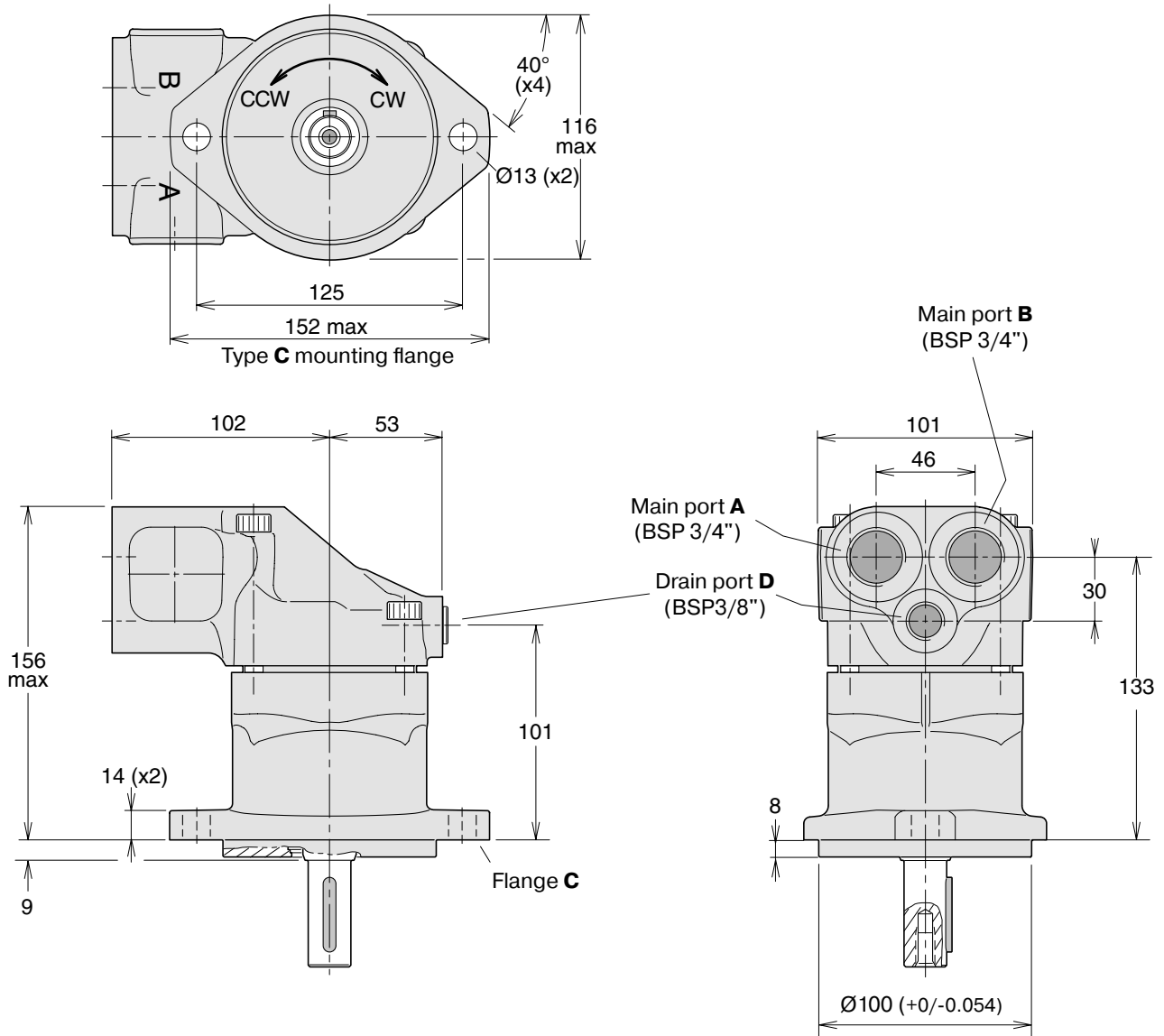
F11-006, -010 (CETOP versions)



Shaft options

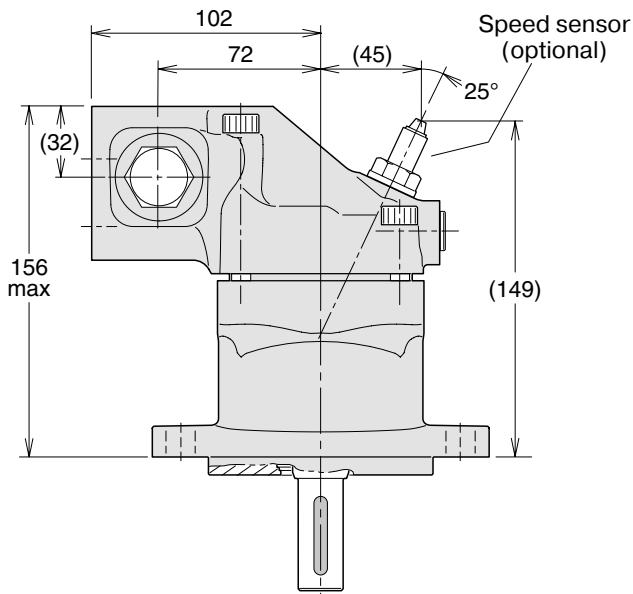
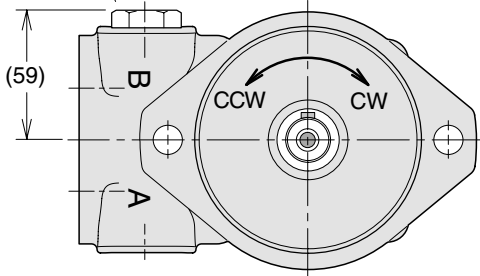


F11-012 (CETOP versions)

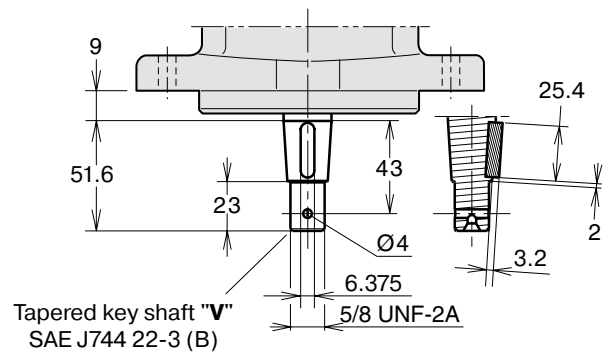
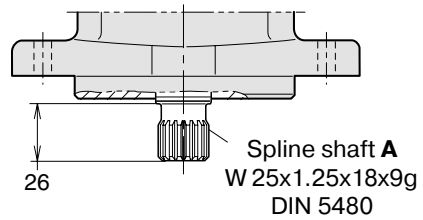
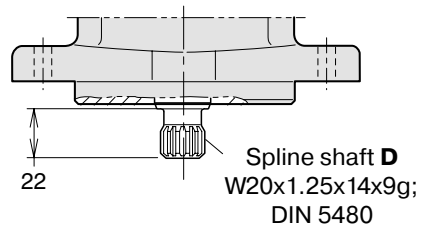
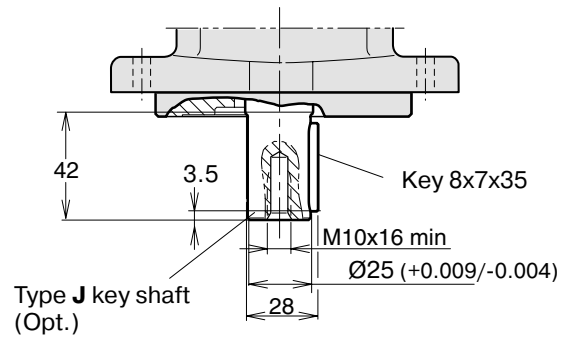
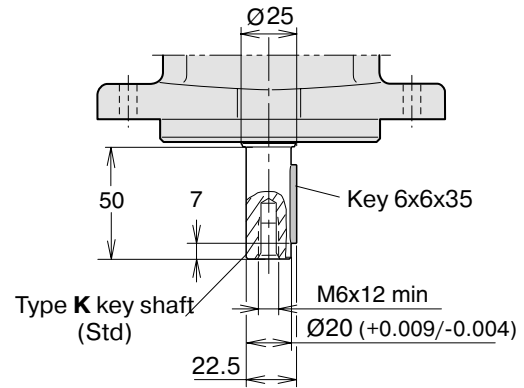


F11-012 (CETOP versions)

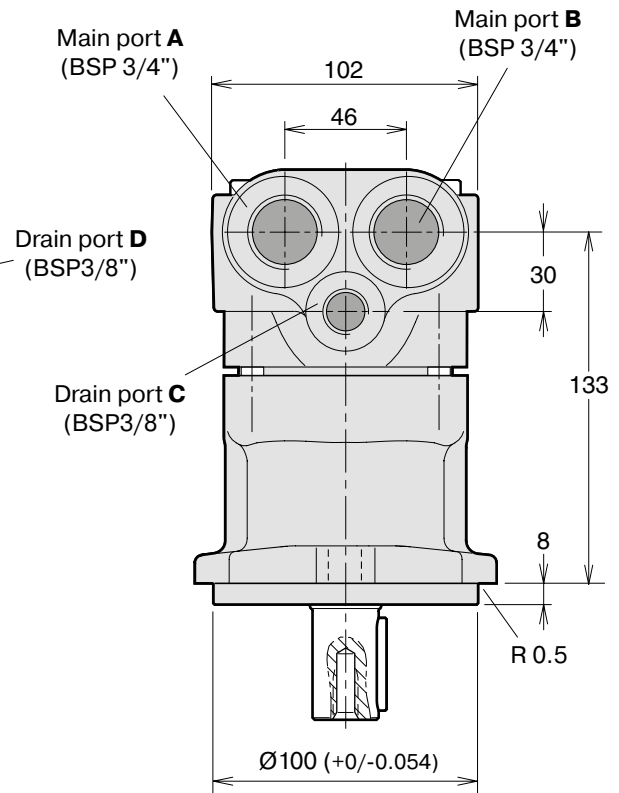
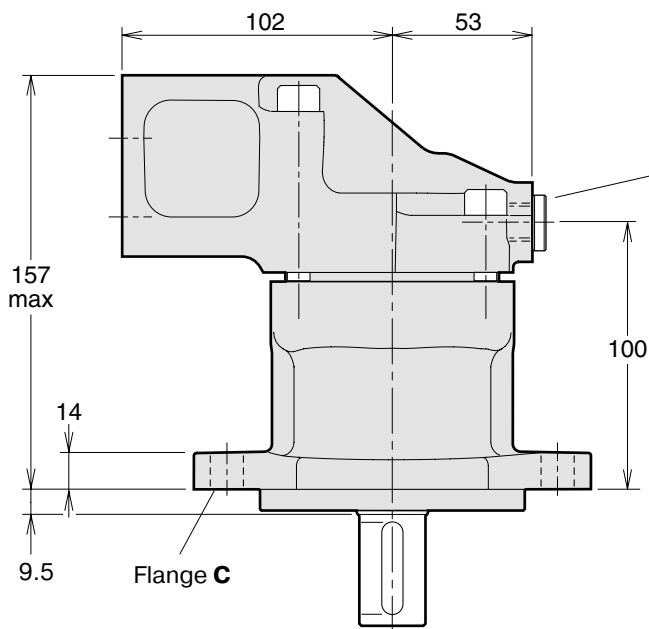
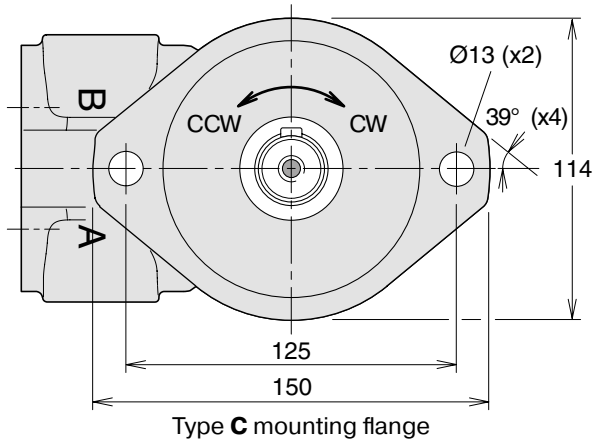
Make up/Anti cavitation valve
 (MUVL or MUVR optional;
 clockwise rotation shown)



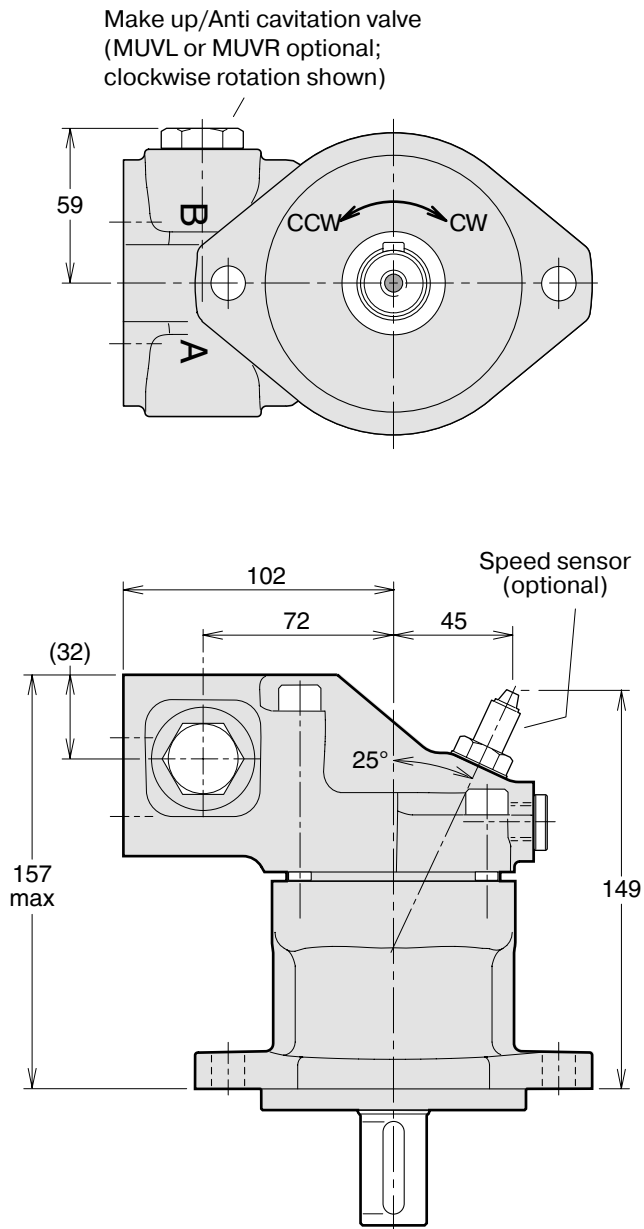
Shaft options



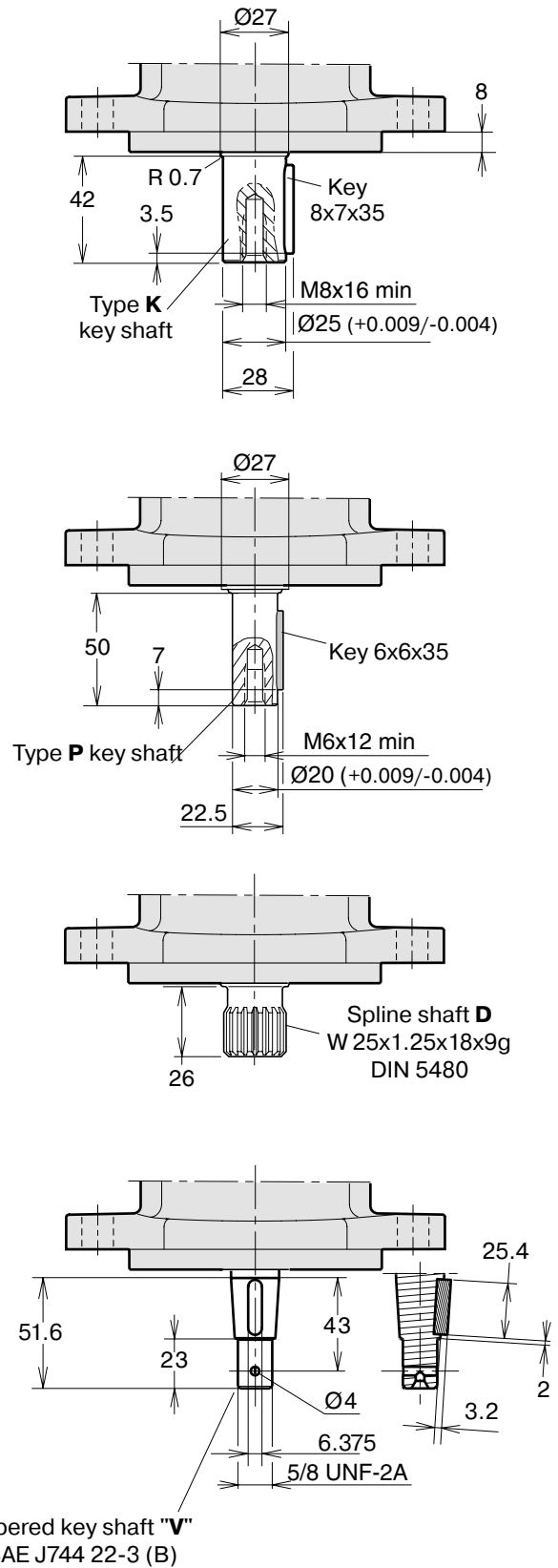
F11-014 (CETOP versions)



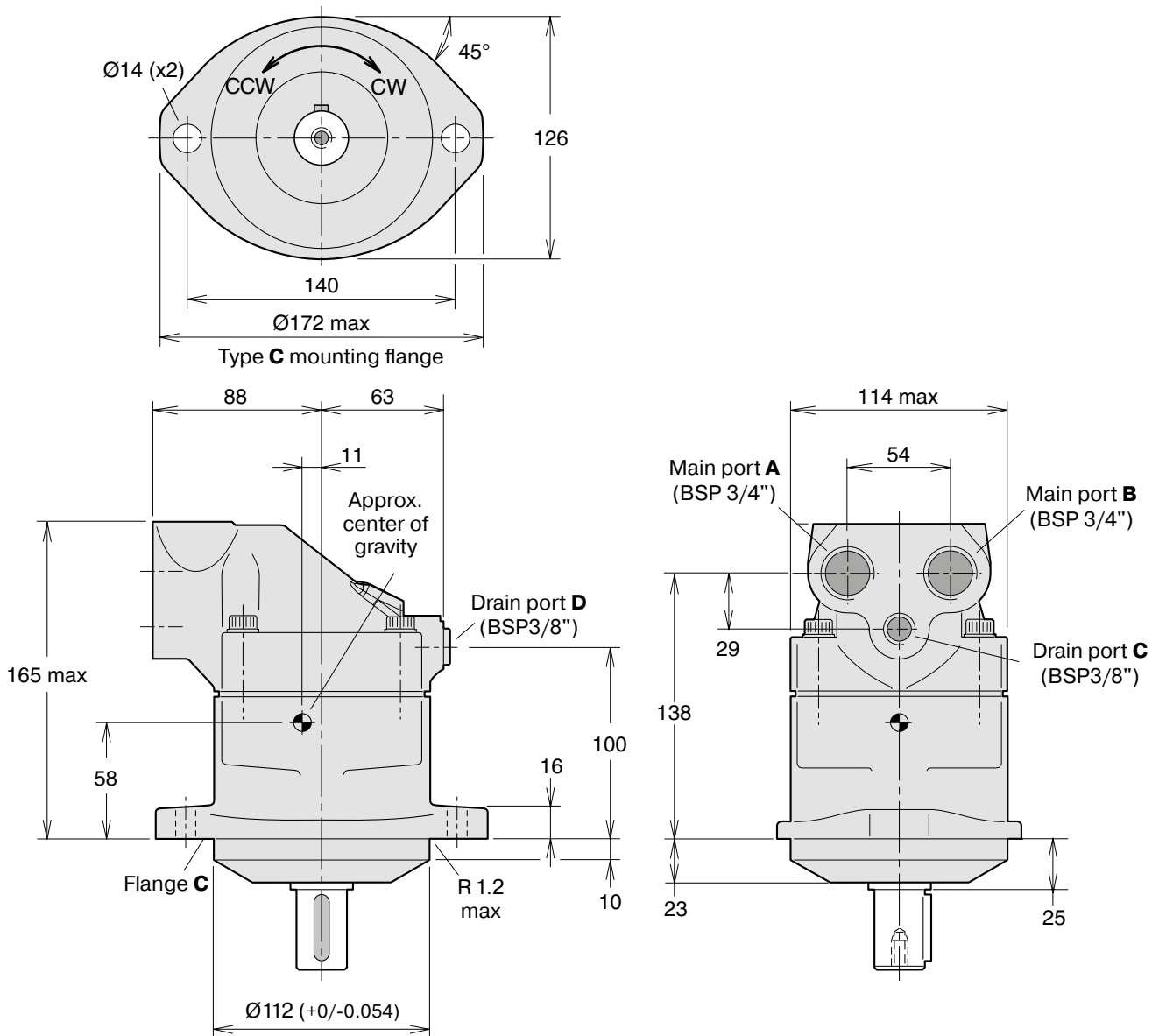
F11-014 (CETOP versions)



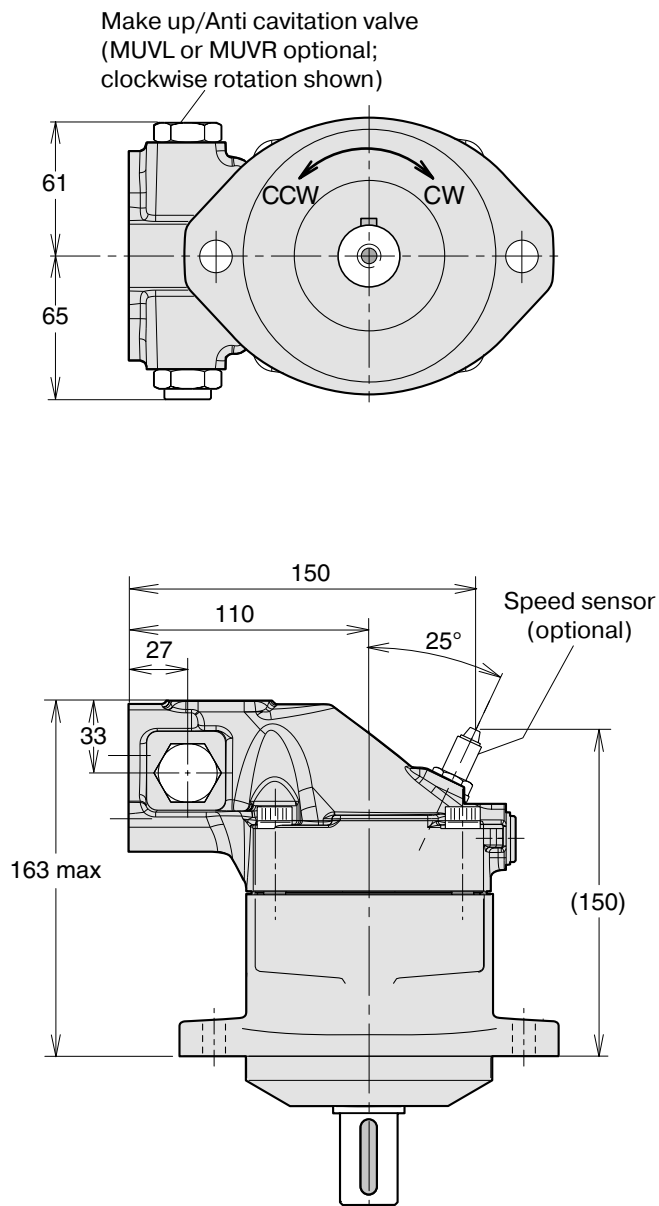
Shaft options



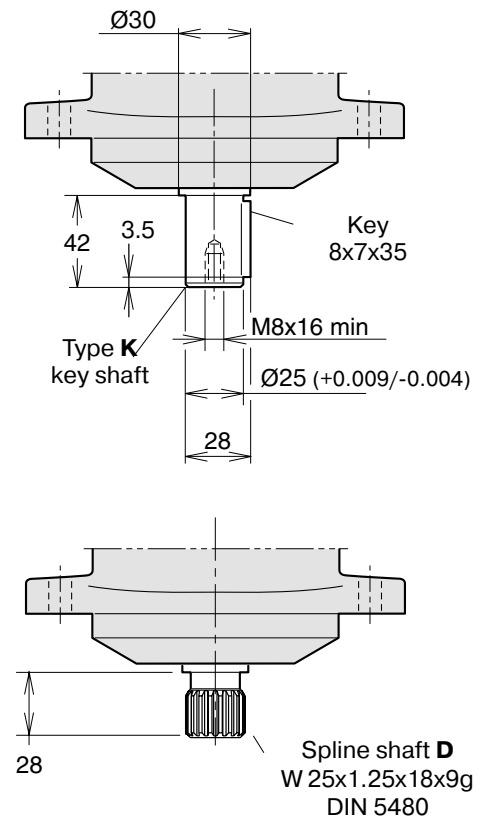
● **F11-019 (CETOP version)**



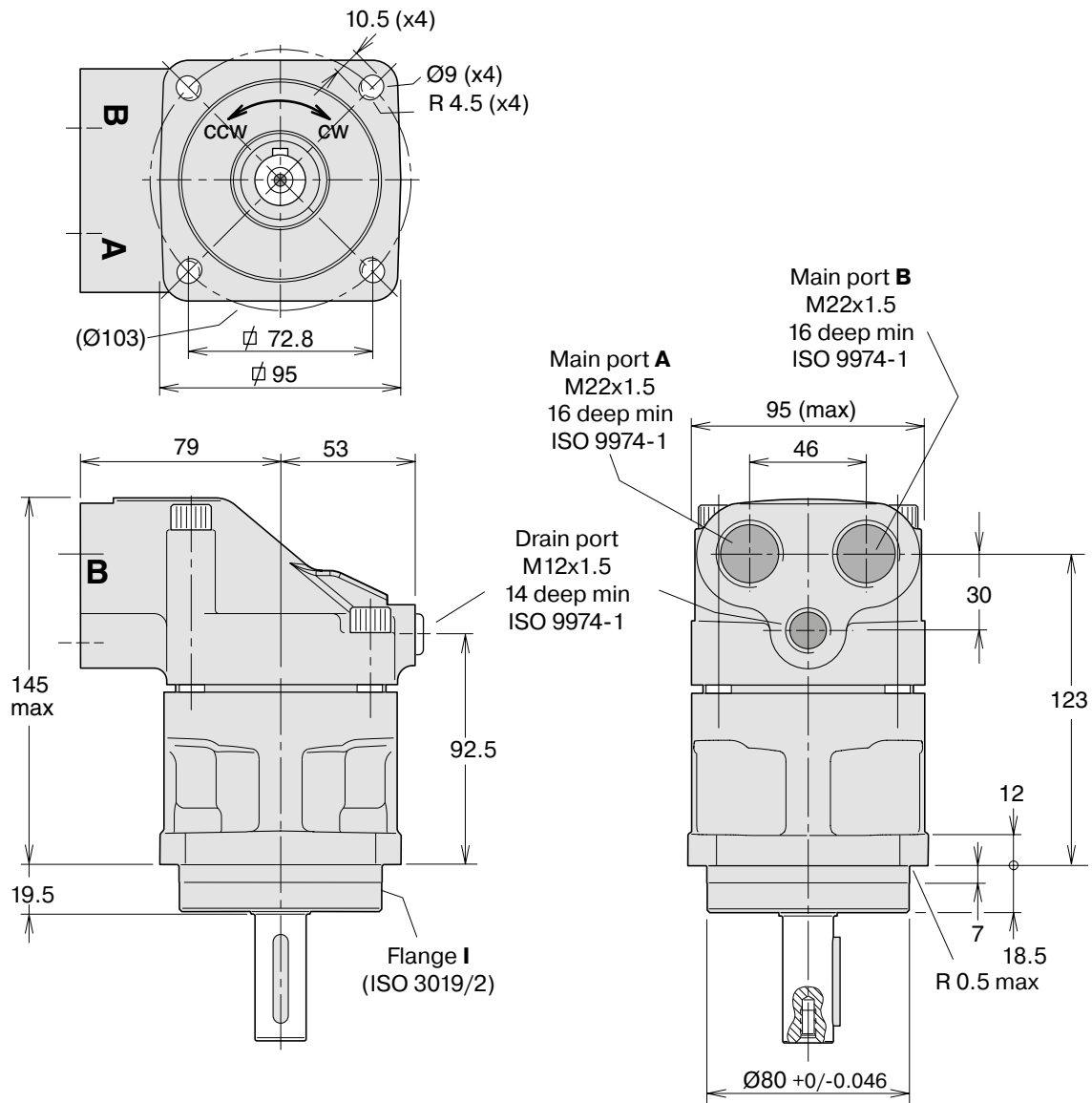
F11-019 (CETOP version)



Shaft options

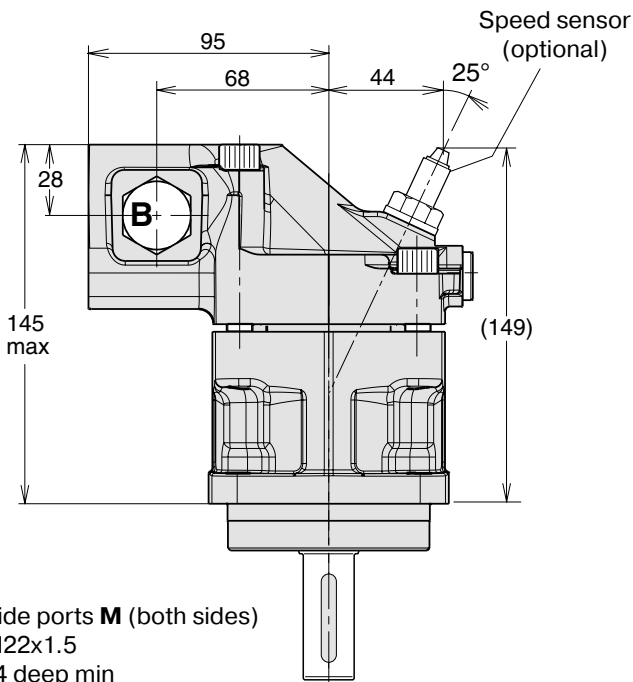
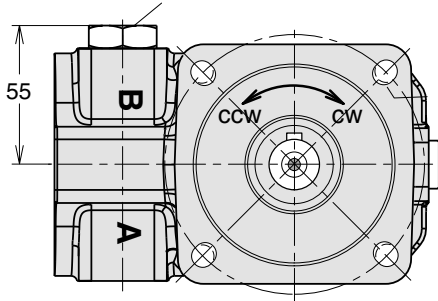


F11-006, -010 (ISO versions)

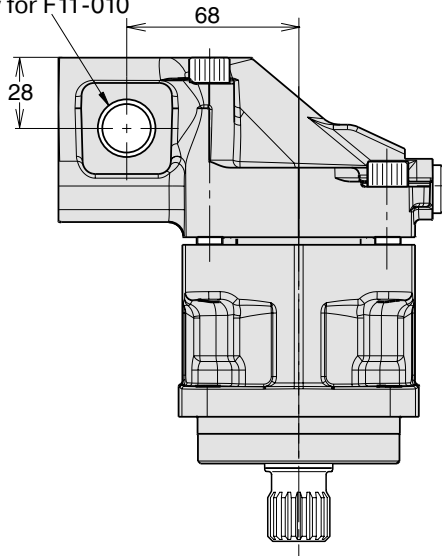


F11-006, -010 (ISO versions)

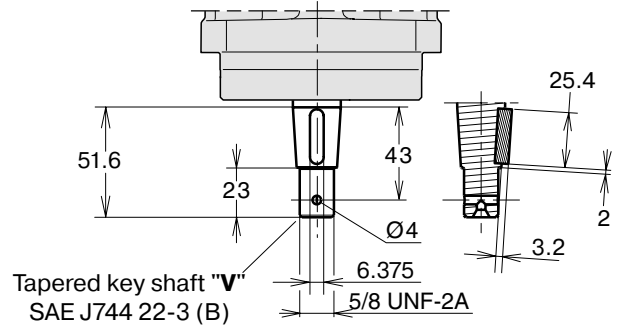
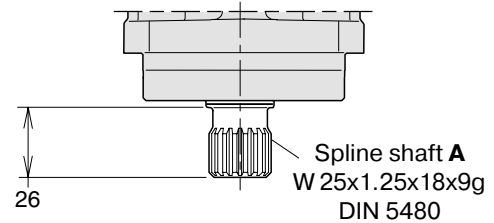
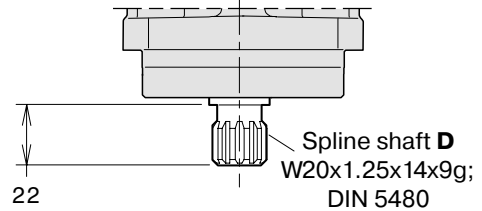
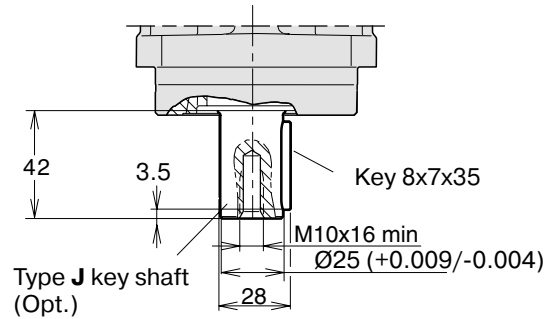
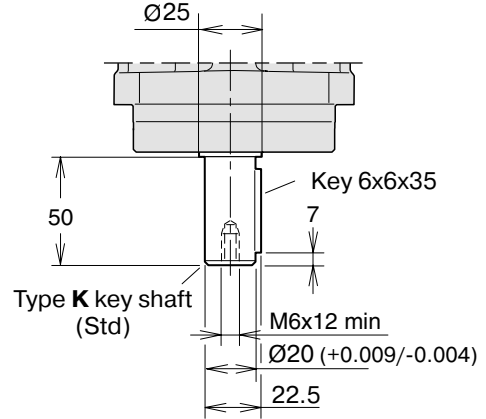
Make up/Anti cavitation valve
 (MUVL or MUVR optional;
 clockwise rotation shown)



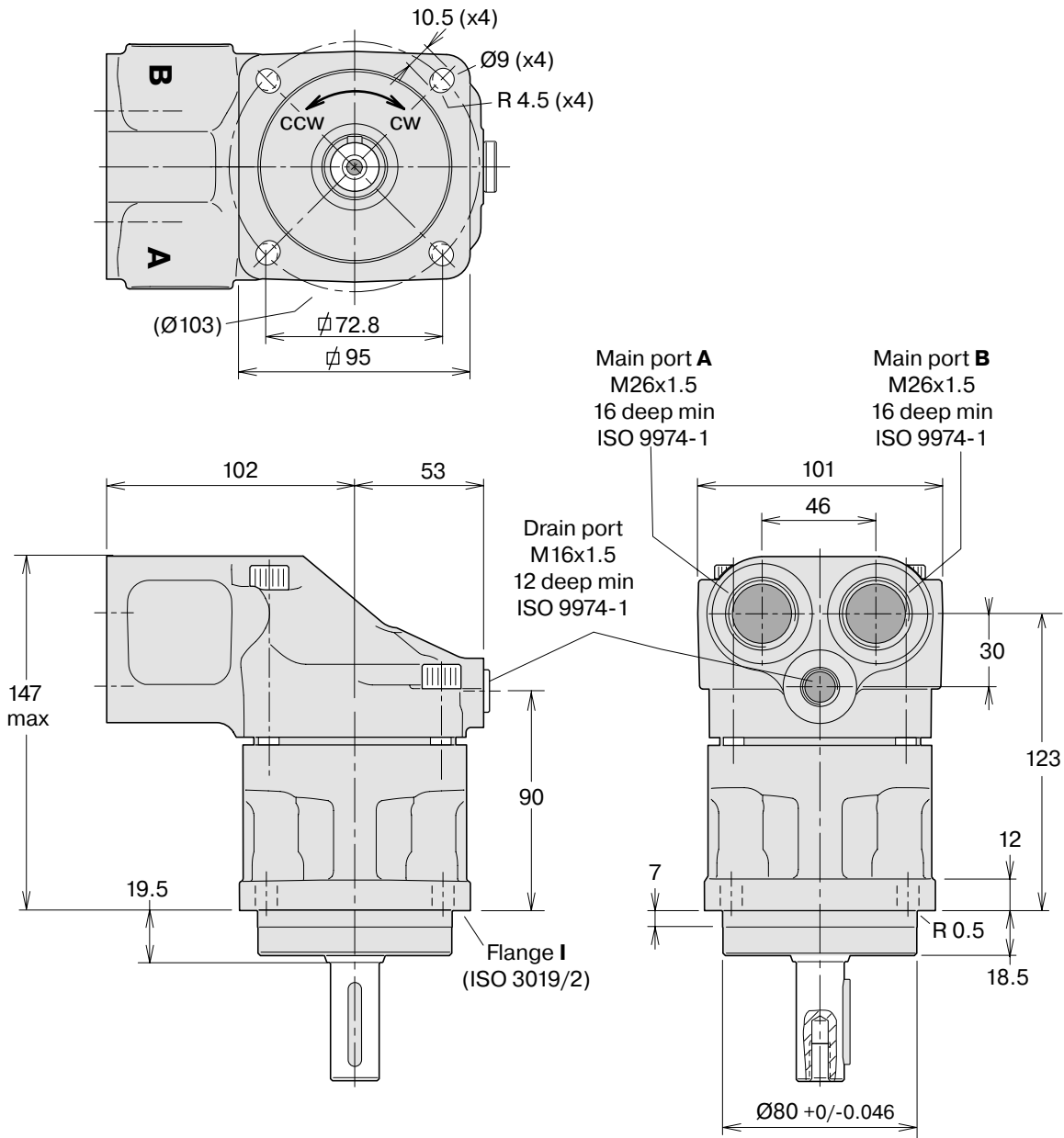
Side ports **M** (both sides)
 M22x1.5
 14 deep min
 ISO 9974-1
 Only for F11-010



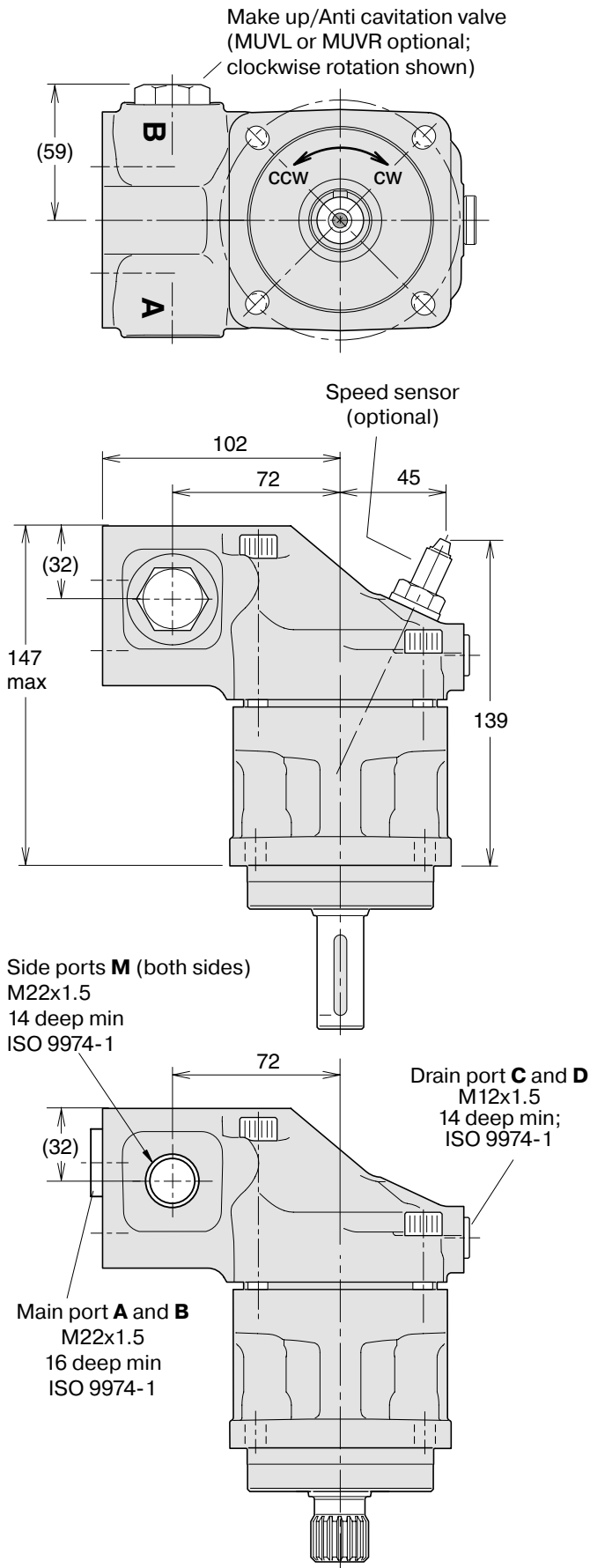
Shaft options



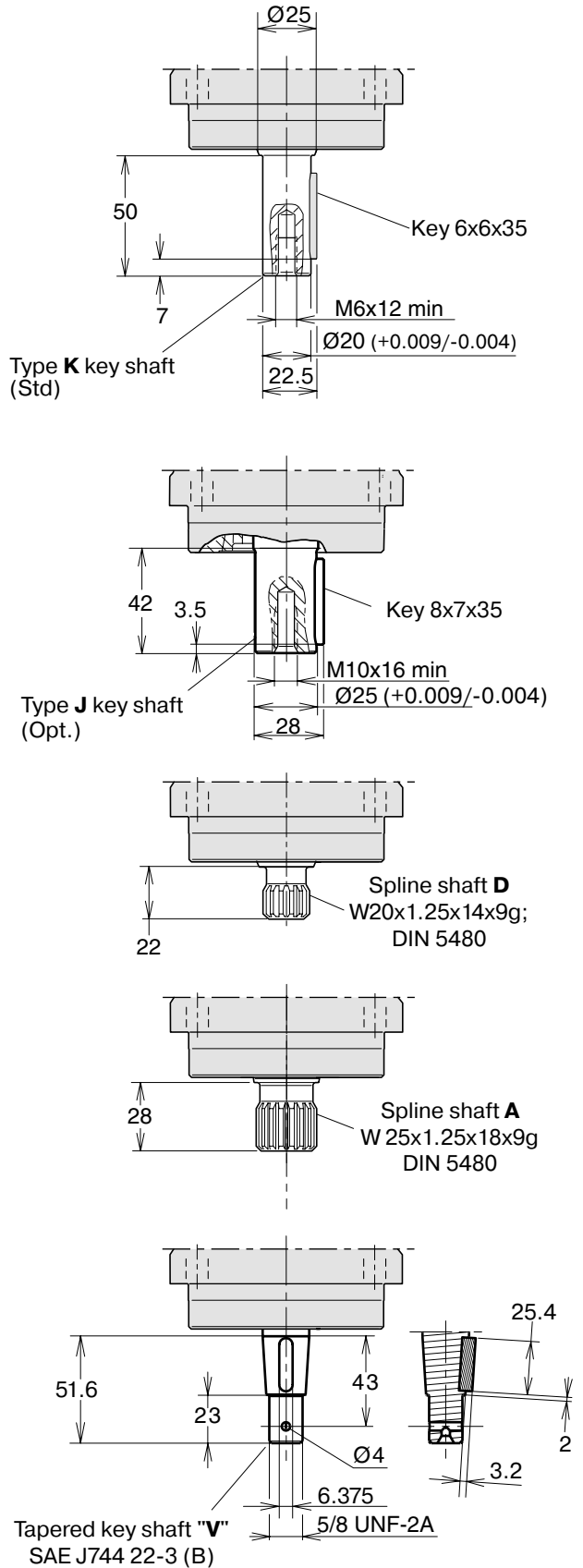
F11-012 (ISO versions)



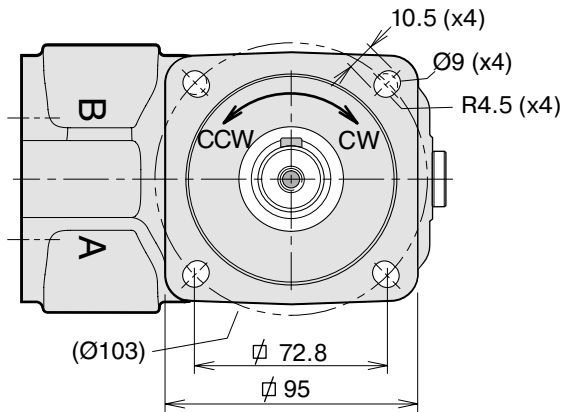
F11-012 (ISO versions)



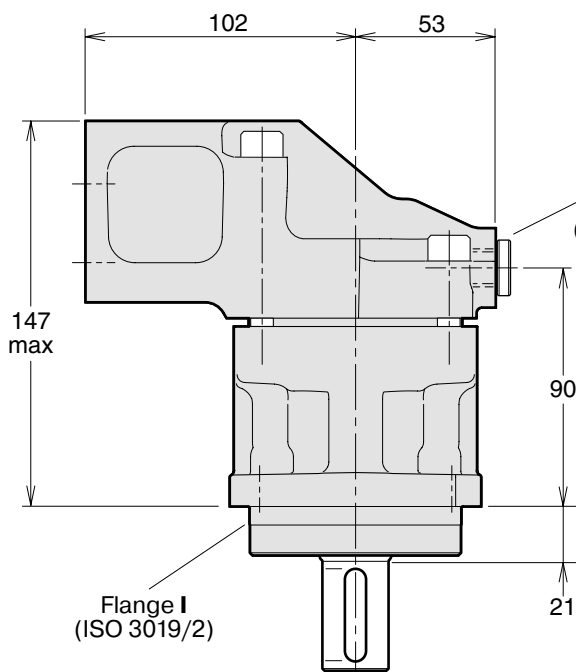
Shaft options



F11-014 (ISO versions)



Type I mounting flange (ISO 3019/2)

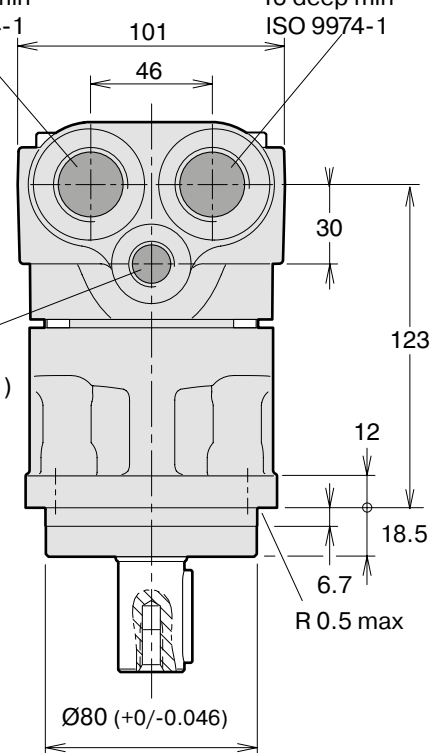


Drain port **D** M16x1.5
 (depth 12; ISO 9974-1)

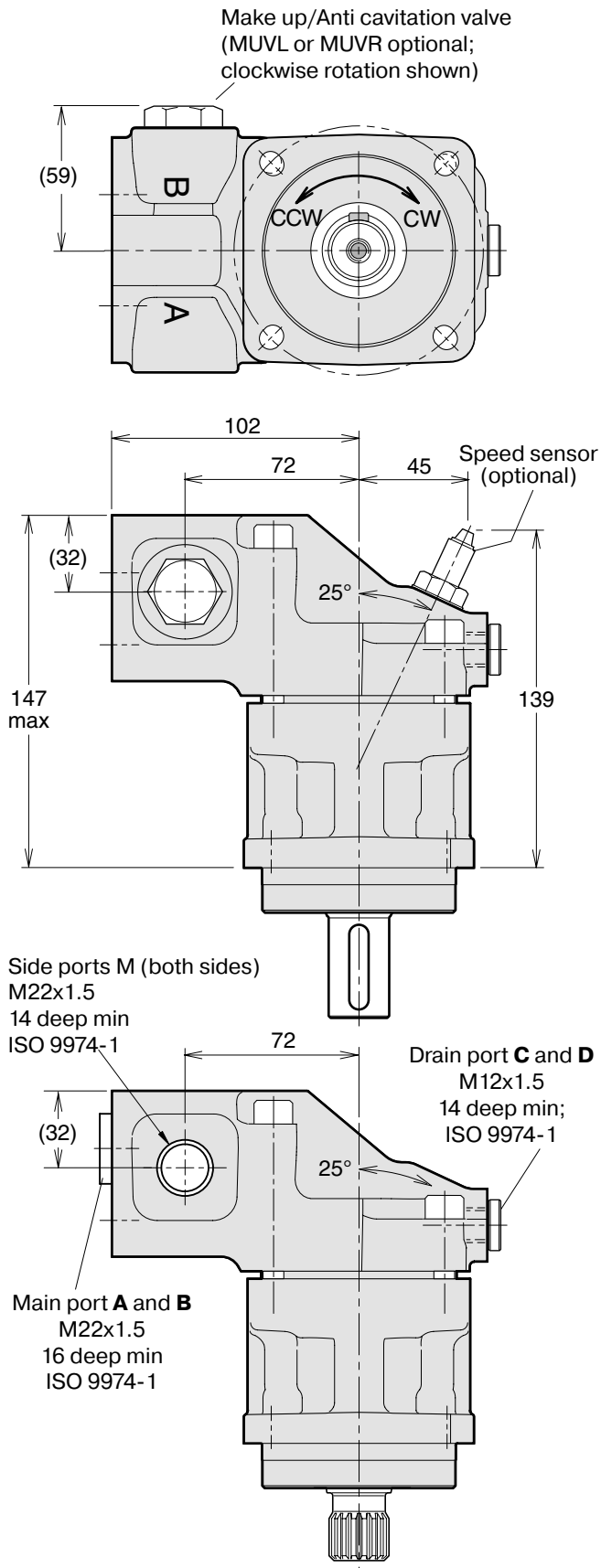
Drain port **C** M16x1.5
 (depth 12; ISO 9974-1)

Main port **A**
 M26x1.5
 16 deep min
 ISO 9974-1

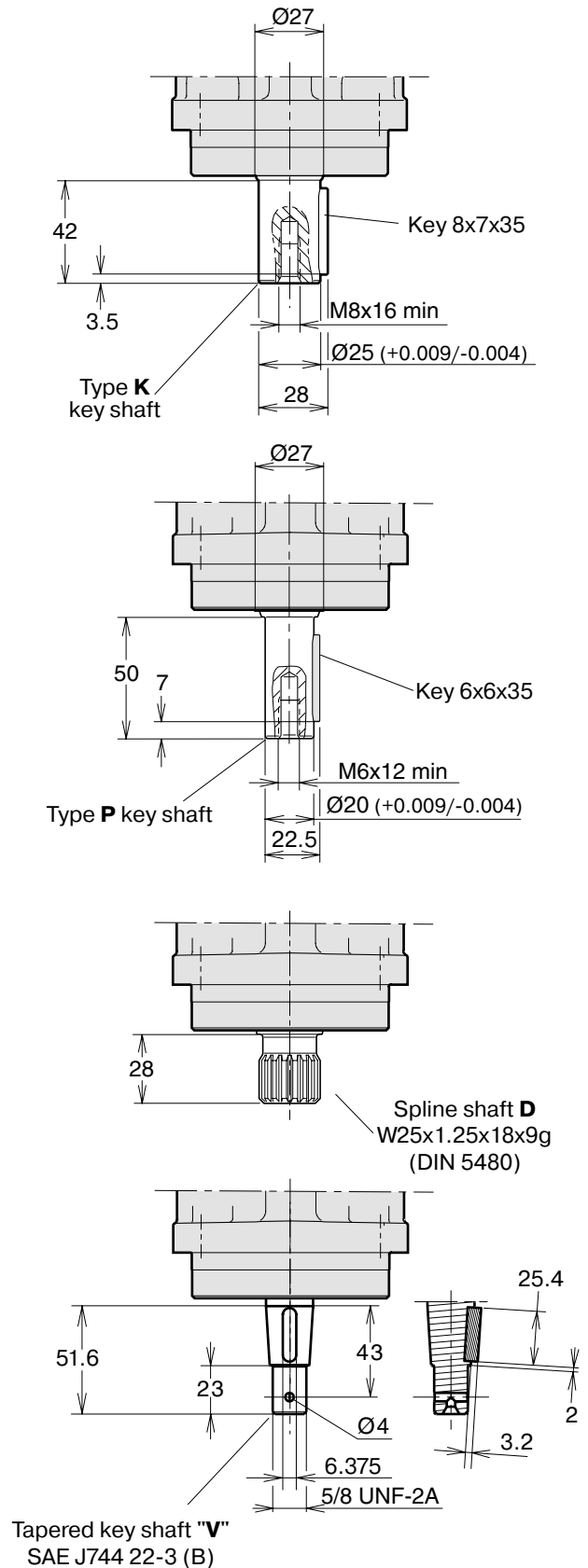
Main port **B**
 M26x1.5
 16 deep min
 ISO 9974-1



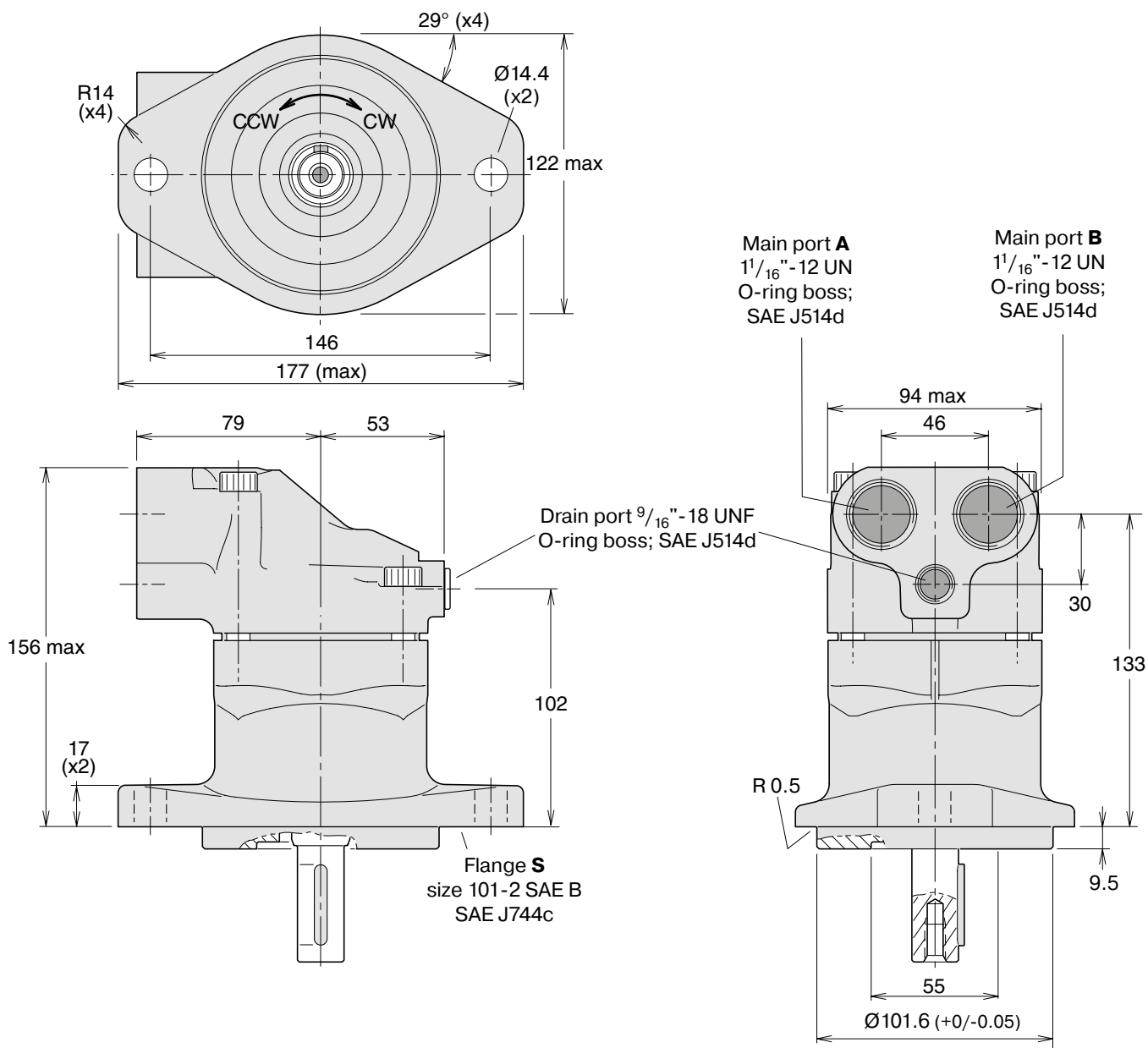
F11-014 (ISO versions)



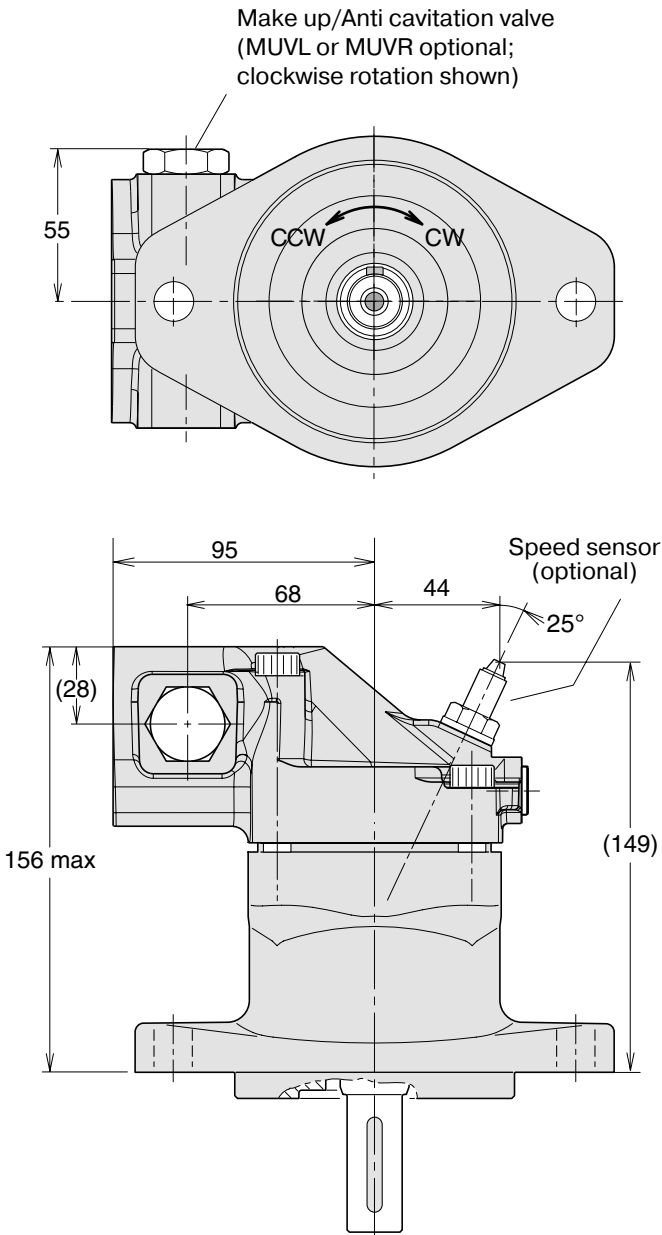
Shaft options



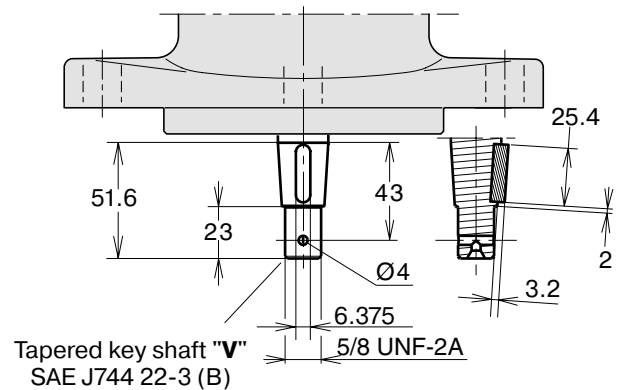
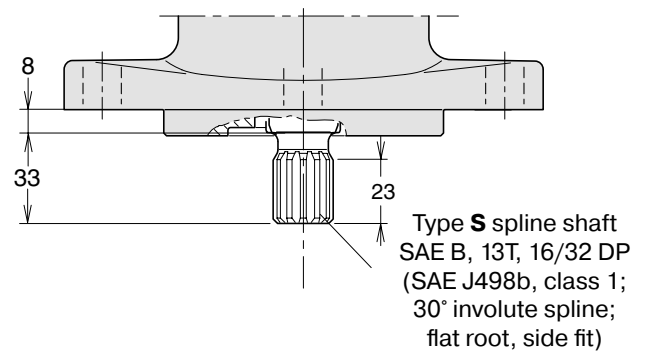
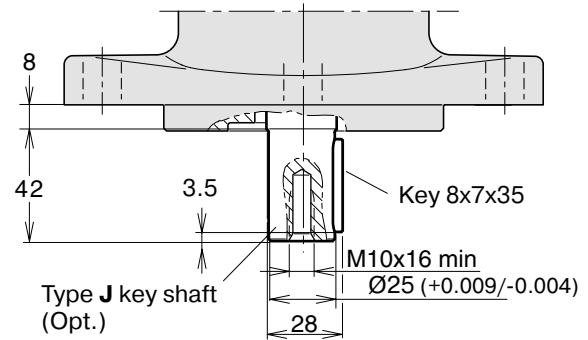
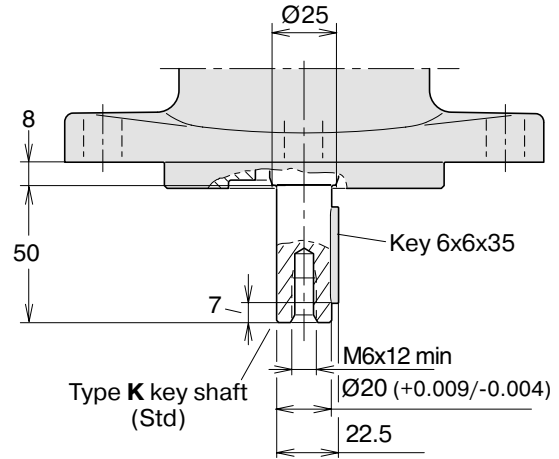
F11-006, -010 (SAE versions)



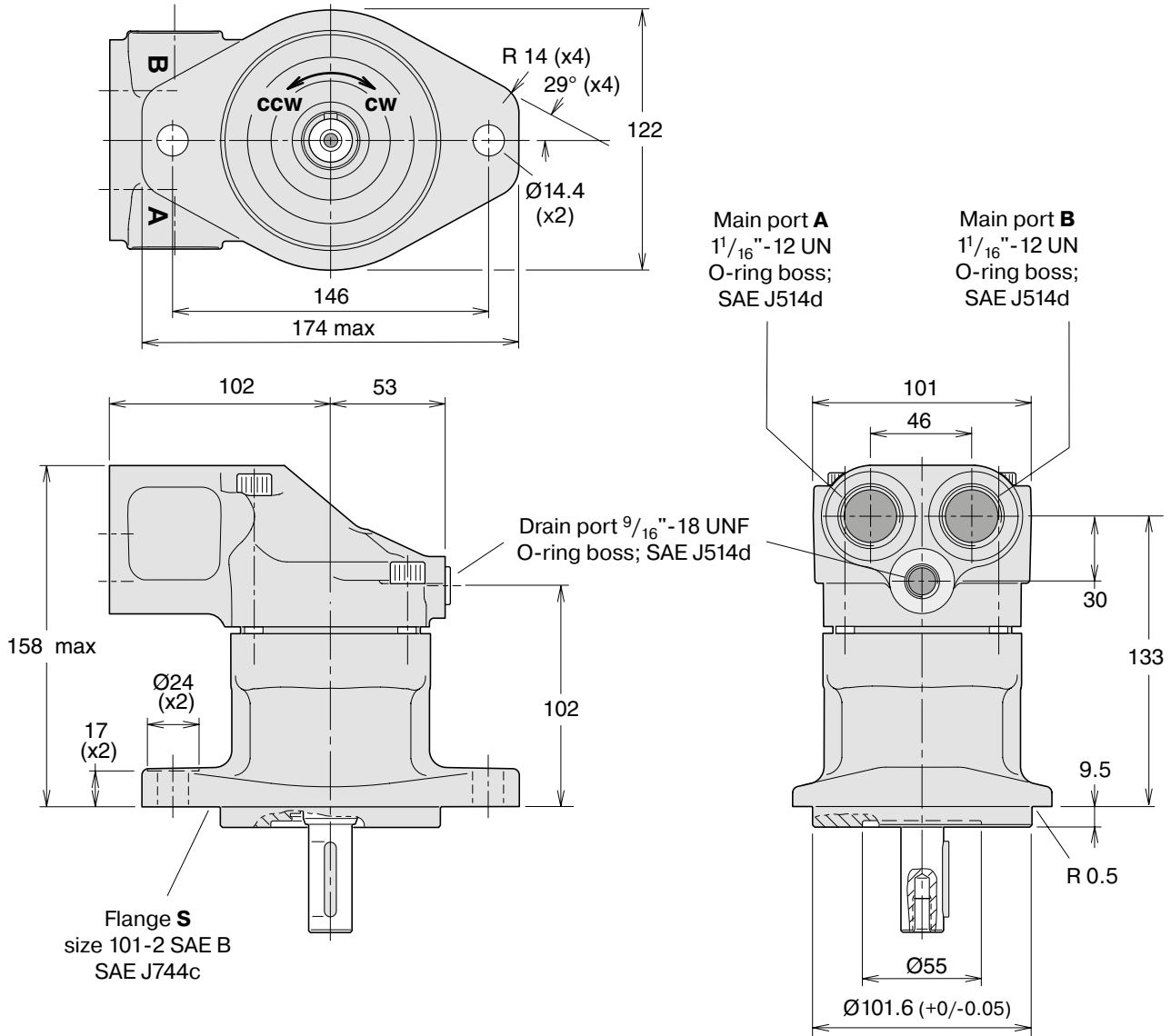
● **F11-006, -010 (SAE versions)**



Shaft options

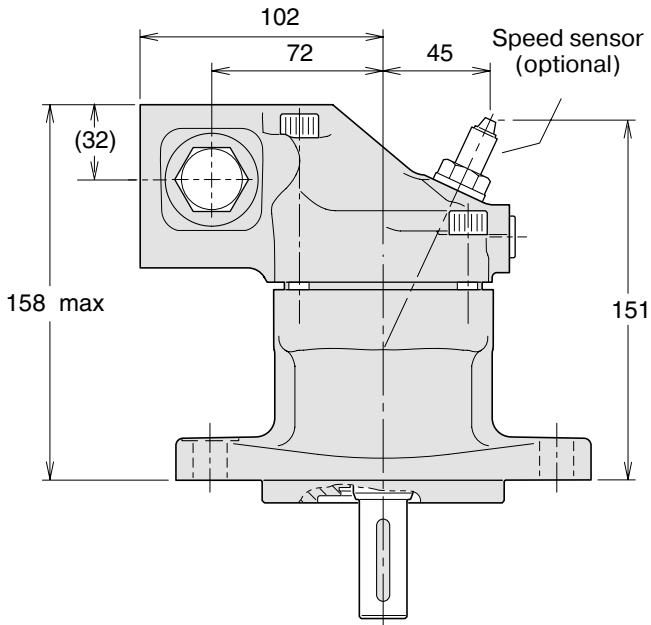
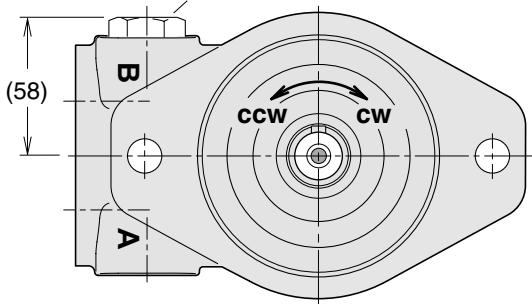


F11-012 (SAE versions)

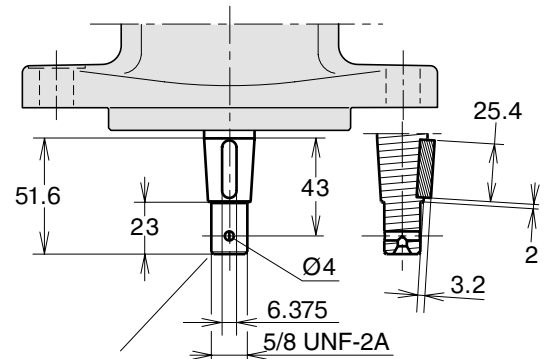
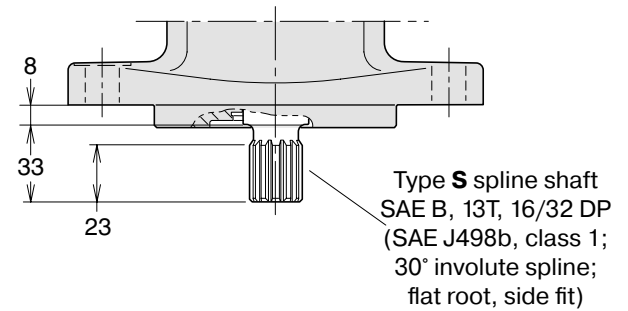
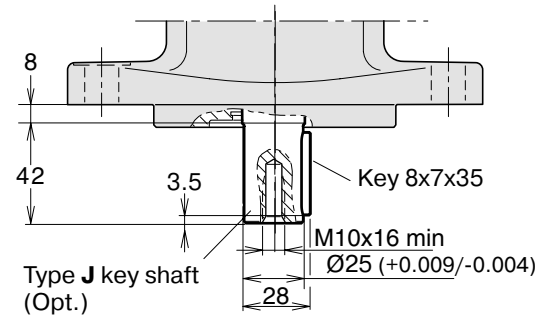
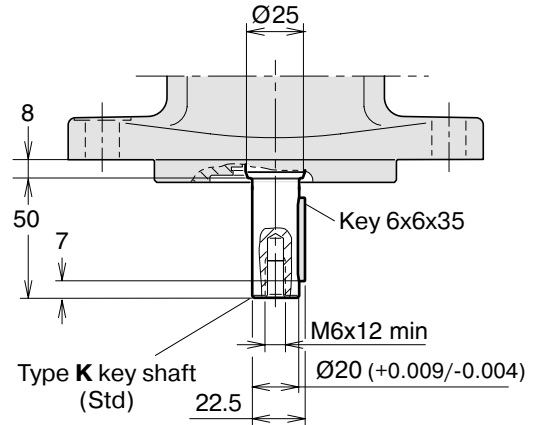


● **F11-012 (SAE versions)**

Make up/Anti cavitation valve
 (MUVL or MUVR optional;
 clockwise rotation shown)

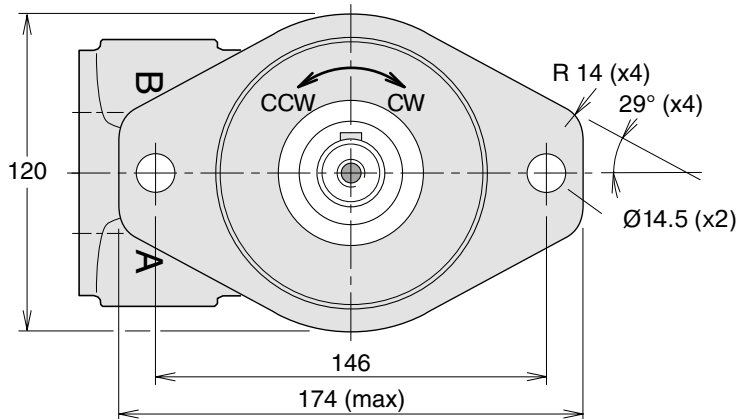


Shaft options



Tapered key shaft "V"
 SAE J744 22-3 (B)

● **F11-014 (SAE versions)**



Type **S** mounting flange SAE 'B' (SAE J744c)

