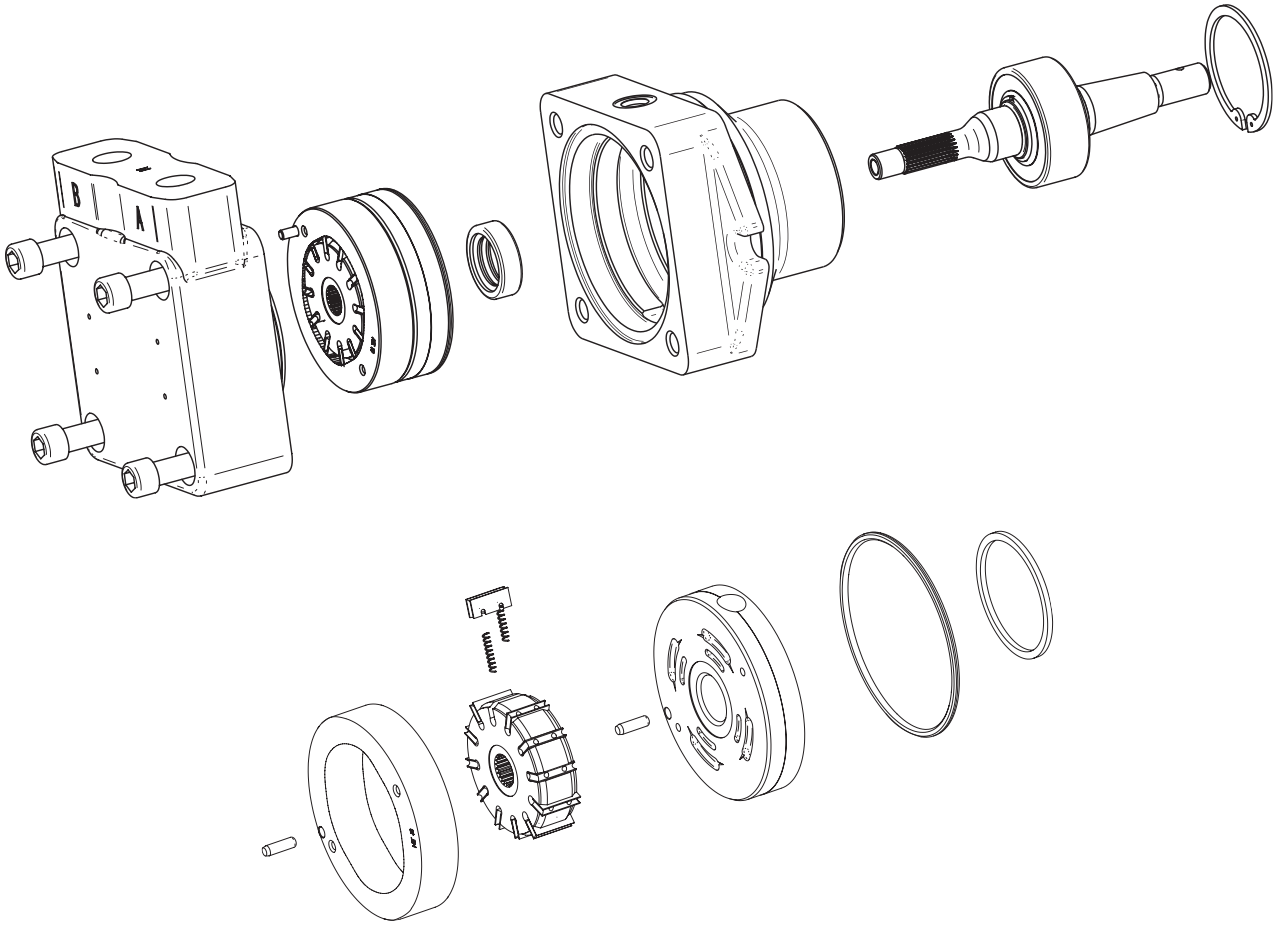


Hydraulic Motors - Overall Instructions
M5AF* / M5B*

Denison Vane Technology, fixed displacement

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

Parker

ENGINEERING YOUR SUCCESS.

1 . 1 . GENERAL :

All Parker Denison vane motors are individually tested to provide the best quality & reliability. Modifications, conversions & repairs can only be done by authorized dealers or OEM to avoid invalidation of the guarantee.

The motors are to be used within the design limits indicated in our sales bulletins. Please contact Parker Denison when tresspassing the catalogue limits.

Do not modify or work on the motor whenunder pressure.

Qualified personnel is required to assemble and set-up hydraulic devices.

Always conform yourself to the valid regulations (safety, electrical, environment...).

The following instructions are important to obtain a good service life time from the unit.

Internal parts of the motor are lubricated by the operating fluid itself ; therefore, preventive maintenance is limited to keep the fluid clean in the system, and an acceptable viscosity range.
The system filters should be replaced frequently. When possible, dirt should not be allowed to accumulate on the motor or around the shaft seal. Check frequently that all fittings and bolts are tight at correct torque.

ROTATION & PORTS INDICATION

The rotation and ports orientation are viewed from the shaft end.

R = CW stands for clockwise = right-hand rotation.
A inlet, B outlet
L = CCW stands for counter-clockwise = left-hand rotation.
A inlet, B outlet
N = Stands for bi-rotational, A inlet, B outlet = R (CW)
B inlet, A outlet = L (CCW)

DESCRIPTION

The M5* series is a new design of vane motor. It has been designed especially for severe duty applications which require high pressure, up to 300 bar (4500 PSI) for M5A, 320 bar (4600 PSI) for M5B and high operating speed (up to 6000 rpm).
The 12 vanes patented cartridge allows very low noise level whatever the speed is, a low torque ripple, and high efficiencies.

The M5* single vane motor consists of five basic components :
- the housing (housing and shaft seal)
- the pressure plate (plate, ball, adaptor and screw)
- the cartridge (cam ring, rotor, vanes and springs)
- the end cap (cap and needle bearing)
- the shaft assembly (shaft, ball bearing, retaining ring and key)

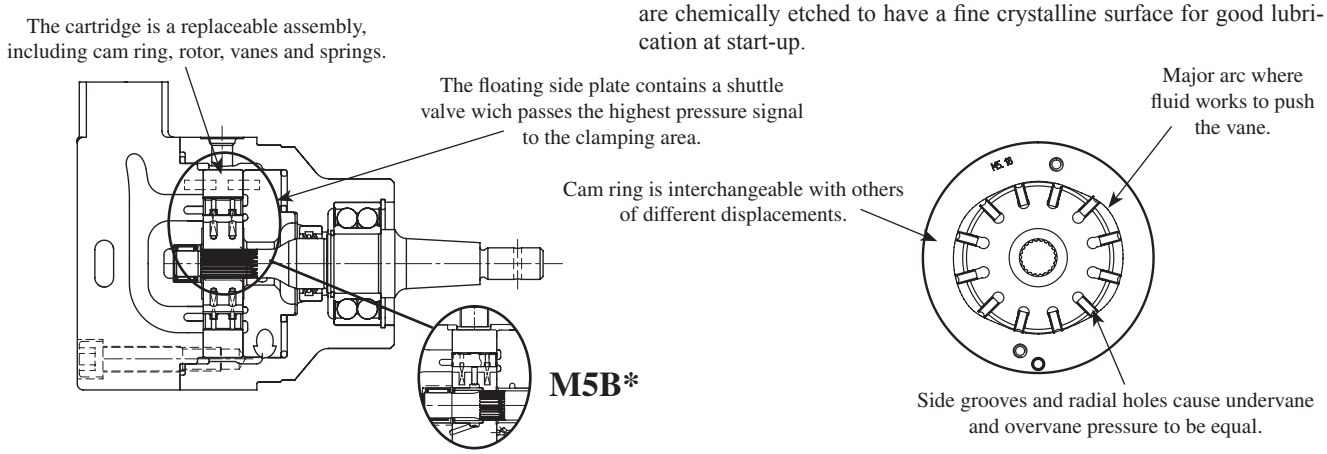
The design of the Parker Denison motors allows to change the cartridge, to renew the motor or to change the displacement to suit altered requirements for speed or torque.

APPLICATIONS

The M5*F motor has a stiff taper or cylindrical shaft and a high load capacity double ball bearing, and allows direct mounting on shaft (fan, belt drive, chain drive).
For uni-directional applications, the M5*F may be fitted with an internal valve which allows smooth dynamic braking, with a very simple hydraulic circuit, without risk of motor cavitation.
These uni-directional motors may be equipped with an internal drain (M5*F1).

OPERATION

Operation of these rugged hydraulic motors is simple.
The motor shaft is driven by the rotor. Vanes, closely fitted into the rotor slots, move radially to seal against the cam ring. The ring has two major and two minor radial sections joined by transitional sections called ramps. These contours and the pressures exposed to them are balanced diametrically.
Light springs urge the vanes radially against the cam contour, assuring a seal at zero speed, so that the motor can develop starting torque. The springs are assisted by the centrifugal force at higher speeds. Radial grooves and holes through the vanes equalize hydraulic forces on the vanes at all times.
Fluid enters and leaves the motor cartridge through openings in the side plates at the ramps. Each motor port connects the two diametrically opposed ramps.
The rotor is axially separated from the sideplate surfaces by the film of oil. The front sideplate is clamped against the cam ring by the pressure, maintening optimum clearance as dimensions change with temperature and pressure. A three way shuttle valve in the sideplate causes clamping pressure in port A or B, whichever is the highest.
Materials are chosen for long life efficiency. Vanes, rotor and cam ring are made out of hardened high alloy steels. Cast semi-steel sideplates are chemically etched to have a fine crystalline surface for good lubrication at start-up.



START-UP & CHECK-UP

Check that the assembly of the power unit is correct :

The distance between the suction pipe & the return lines in the tank should be at its maximum.

A bevel on both suction & return lines is recommended to increase the surface and so lower the velocity. We suggest a 45° minimum angle.

M5 velocities : inlet x < 6 m/s (x < 20 ft per sec.)
: return under pressure x < 6 m/s (x < 20 ft per sec.)
: return low pressure x < 3 m/s (x < 10 ft per sec.)
: Always insure that all return and suction lines are under the oil level to avoid forming aeration or vortex effect. This should be done under the most critical situation (all cylinders extended for example).
Straight and short pipes are the best.

$$V = \frac{Q\ (Lpm)}{6 \times p \times r^2\ (cm)} = m/s \qquad V = \frac{Q\ (GPM)}{3.12 \times p \times r^2\ (in)} = ft/s$$

The size of the air filter should be 3 times greater than the max. instant return flow (all cylinders in movement for example).

A coaxial drive is recommended. For any other type of drives, please contact Parker Denison.

Make sure that all protective plugs & covers have been removed.

PRIMING

The tank has been filled up with a clean fluid in proper conditions.

We recommend to flush the system with an external pump prior to the start-up.

It is important to bleed the air off the circuit and the motor itself.
Manually, fill the motor housing with fluid, and connect the motor to the circuit.
Start rotation in a jogging manner until a prime is picked up, and increase the speed from 500 to 1000 rpm.
Check that there is no leakage or air suction neither at the flanges (inlet, outlet, drain), nor at the shaft seal.
If the motor does not prime properly in the first minute, or pressure can not be obtained, it should be shut down and condition corrected.

COLD STARTING

The motor should be started at low pressure and low speed until the fluid warms up, before running it at high pressure or speed.

The first valve on the circuit should be open to tank.

We recommend the use of air bleed off valves.

Warning : this has to be done in low pressure mode as it could create a dangerous fluid leak. Make sure that the pressure cannot rise (open center valve to tank, pressure relief valve unloaded ...).

When oil free of air appears, tighten the connectors to the correct torque.

The motor should prime within a few seconds. If not, please consult the troubleshooting guide (pages 32 & 33).

If the motor is noisy, please troubleshoot the system.

1 . 2 . SHAFT & COUPLING DATA :

COUPLINGS AND FEMALE SPLINES

• The mating female spline should be free to float and find its own center. If both members are rigidly supported, they must be aligned within 0,15 TIR (0.006" TIR) or less to reduce fretting. The angular alignment of two splines axes must be less than ± 0,05 per 25,4 radius (± 0.002" per 1" radius).
• The coupling spline must be lubricated with a lithium molydisulfide grease, disulfide of molybdenum or a similar lubricant.
• The coupling must be hardened to a hardness between 29 and 45 HRC.
• The female spline must be made to conform to the Class 1 fit as described in SAE-J498b (1971). This is described as a Flat Root Side Fit.

KEYED SHAFTS

Parker Denison supplies the M5* series keyed shaft motors with high strength heat-treated keys. Therefore, when installing or replacing these motors, the heat-treated keys must be used in order to ensure maximum life in the application. If the key is replaced, it must be a heat-treated key between 27 and 34 R.C. hardness. The corners of the keys must be chamfered by 0,76 mm to 1,02 mm (0.03 to 0.04) at 45° to clear the radii in the key way.

The alignment of keyed shafts must be within tolerances given for splined shafts here above.

TAPERED KEY SHAFTS

The torque for a steel coupling and a nut, of at least grade 8.8 quality is 80 Nm (59 ft.lbs)

It is compulsory to install a castle nut + cotter pin when right hand rotation and bi-rotational.

SHAFT LOADS

These products are primarily designed for coaxial drives which do not impose axial or side loading on the shaft. Contact Parker Denison for specific applications.

1 . 3 . SPECIFIC POINTS :

MINIMUM REPLENISHMENT PRESSURE

Bar absolute at the B port for M5*F with an internal check valve*

Flow (l/min)	5	10	20	30	40	50	60
Mini pressure (bar)	1,3	1,8	2,5	3,0	4,2	6,2	9,0

* 100 l/min is the maximum flow allowed through the internal check valve.

VERTICAL MOUNT

When assembled vertically, always be careful to prevent any air from being trapped in the motor (behind the shaft seal for example).

MOTORS IN SERIES

Please contact Parker Denison.

PIPE

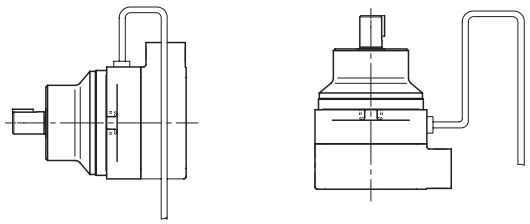
All fluid lines, either pipe, tubing or hose, must be of adequate size and strength to assure free flow to and from the motor. An undersized inlet line will restrict the fluid flow to the motor and prevent proper operation by creating turbulences and aeration.
If rigid pipe or tubing is used, the workmanship must be accurate in order to eliminate strain on the motor housing or the fluid connectors.
Sharp bends in lines should be eliminated whenever possible.
All the system piping must be cleaned with solvent or an equivalent cleaning agent before being connected to the motor.
Do not use galvanized pipe. Galvanized coating may flake off after continued use.

FLANGE CONNECTIONS

The motor has 4 bolt flange connections, conformable to ISO/DIS 6162, with metric or UNC threads.
Flange heads must be made of steel. Flange clamps must be made from a material with a minimum yield of 414 MPa (60000 PSI) and a minimum elongation of 3%.
Use hexagon head or socket head cap screws, phosphate coated and oil finished. They must be made from carbon steel, heat treated.
UNC screws must have a minimun strength of 827 MPa, and metric screws must be in conformity with class 8.8.
Mounting torque : 28 to 40 Nm (21 to 30 Lbf).

EXTERNAL DRAIN

The externally drained motors must have a drain line connected to the center housing drain connection of sufficient size to prevent back pressure in excess of 3.5 bar (50 PSI), returning directly to the reservoir below the surface of the oil, and as far away as possible from the suction pipe of the pump.
It is preferable to install the center housing with the drain hole upward to facilitate the purge of the motor.
If the motor is mounted shaft up, the drain line must have a bend above the motor to purge it and to be sure that the shaft seal is lubricated (see drawing).



EXTERNAL DRAIN MOTOR

This motor may be alternately pressurized on ports A and B to 300 bar (4350 PSI) max. Whichever port is at low pressure, it should not be subjected to more than 60% of the high pressure, eg : When 300 bar (4350 PSI) in A, B is limited to 200 bar (2850 PSI).

This motor must have a drain line connected to the center housing drain connection of sufficient size to prevent back pressure in excess of 3,5 bar (50 PSI), and returned to the reservoir below the surface of the oil as far away as possible from the suction pipe of the pump.

INTERNAL DRAIN MOTOR

This unidirectional motor may be pressurized only on the “A” port except during recirculation.
The outlet pressure must not be higher than 3,5 bar (50 PSI).

1 . 4 . FLUIDS :

RECOMMENDED FLUIDS

Petroleum base anti-wear R & O fluids (covered by Parker Denison HF-0 and HF-2 specifications).
Maximum catalogue ratings and performance data are based on operation with these fluids.

FIRE RESISTANT FLUIDS

They can easily be used in the M5* motor. These include phosphate or organic ester fluids and blends, water-glycol solutions and water-oil invert emulsions.

ACCEPTABLE ALTERNATE FLUIDS

The use of fluids other than petroleum base anti-wear R & O fluids requires that the maximum ratings of the motor will be reduced. In some cases, the minimum replenishment pressure must be increased.

HF-1 : non antiwear petroleum base.
HF-3 : water in oil emulsion.
HF-4 : water glycols.
HF-5 : synthetic fluids.
Max. press. int. : 240 bar (3500 PSI) (HF-1, HF-4, HF-5)
175 bar (2500 PSI) (HF-3)
Max. press. cont. : 210 bar (3000 PSI) (HF-1, HF-4, HF-5)
140 bar (2000 PSI) (HF-3)
Max. speed : 1800 RPM (HF-3, HF-4, HF-5)

VISCOSITY

Max. (cold start, low speed and pressure)	860 mm2/s (cSt)	(3900 SUS)
Max. (full speed and pressure)	100 mm2/s (cSt)	(500 SUS)
Optimum (max. lifetime)	30 mm2/s (cSt)	(140 SUS)
Min. (full speed and pressure, HF-1 fluid)	18 mm2/s (cSt)	(90 SUS)
Min. (full speed and pressure, HF-0 & HF-2 fluids)	10 mm2/s (cSt)	(60 SUS)

For cold starts, the motor should operate at low speed and pressure until fluid warms up to an acceptable viscosity for full power operation.

VISCOSITY INDEX

90 min.
Higher values extend the range of operating temperatures and lifetime.

TEMPERATURE

Max. fluid temperature (HF-0, HF-1 & HF-2)	+ 100° C	(+212 ° F)
Min. fluid temperature (HF-0, HF-1 & HF-2)	- 18° C	(- 0.4 ° F)

FLUID CLEANLINESS

The fluid must be cleaned before and during operation to maintain a contamination level of NAS 1638 class 8 (or ISO 19/17/14) or better. Filters with 25 micron (or better, ß10 ≥ 100) nominal ratings may be adequate but do not guarantee the required cleanliness levels.

WATER CONTAMINATION IN THE FLUID

Maximum acceptable content of water :
• 0,10 % for mineral base fluids.
• 0,05 % for synthetic fluids, crankcase oils, biodegradable fluids.
If the amount of water is higher, then it must be drained off the circuit.

1 . 5 . SEALS :

SEALS S1 : NBR (NITRILE BASE POLYMER)

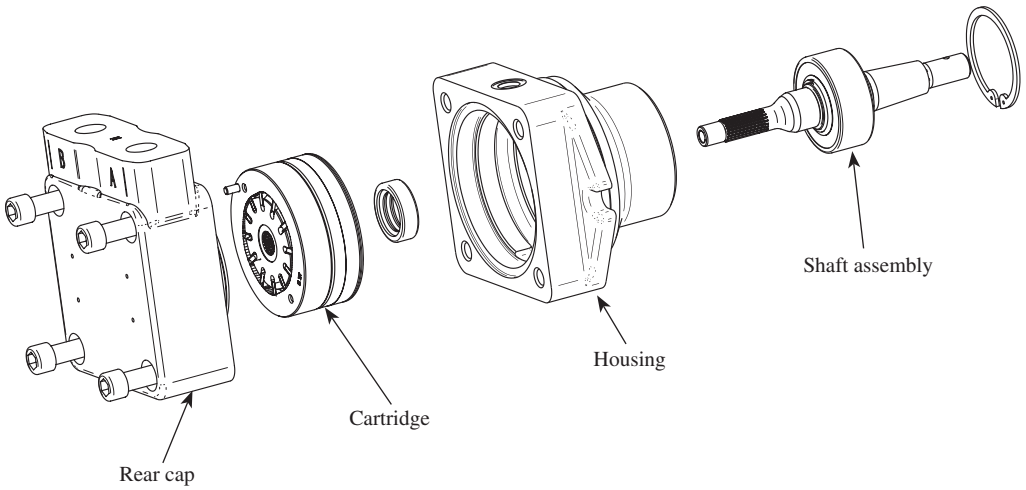
Standard applications: mineral oil, temperature less than + 90° C (+ 194° F).
Color identification code : none.
Operating temperature : - 40° C to + 107° C (- 40 to + 225° F).

SEALS S4 : EPR (ETHYLENE PROPYLENE POLYMER)

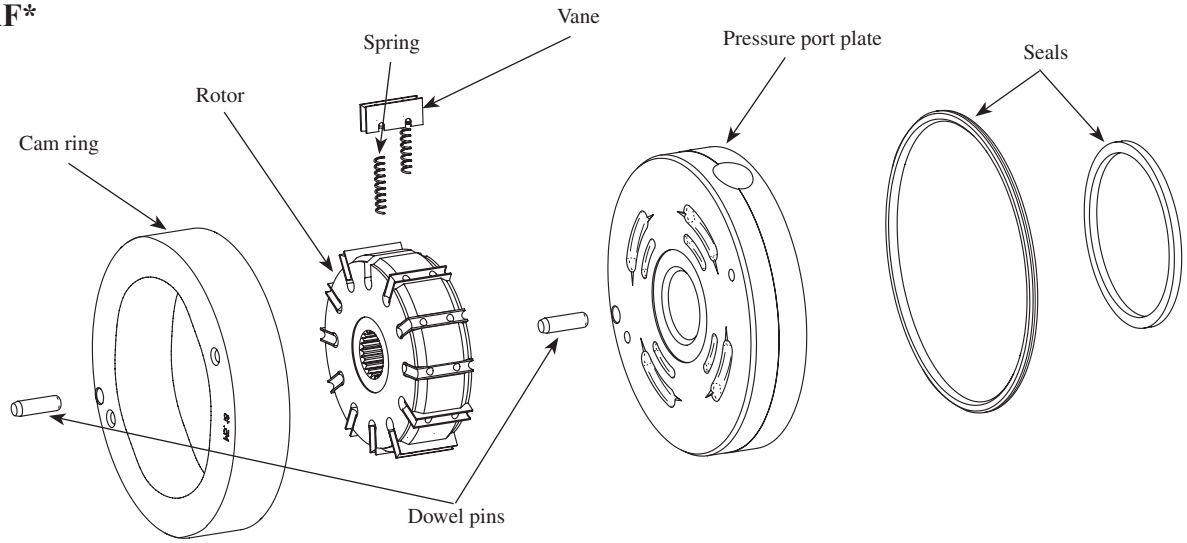
Use this seal type with fire resistant fluids.
Color identification code : purple seal, or white stripe on black seal.
Operating temperature : - 54° C to + 121° C (- 65 to + 250° F).
Special instruction : seals to this specification are to be lubricated with the fluid which they are to be used with or a commercial grade castor oil may be used as an installation lubricant.
Do not use a mineral base lubricant.

SEALS S5 : FPM (FLUOROCARBON)

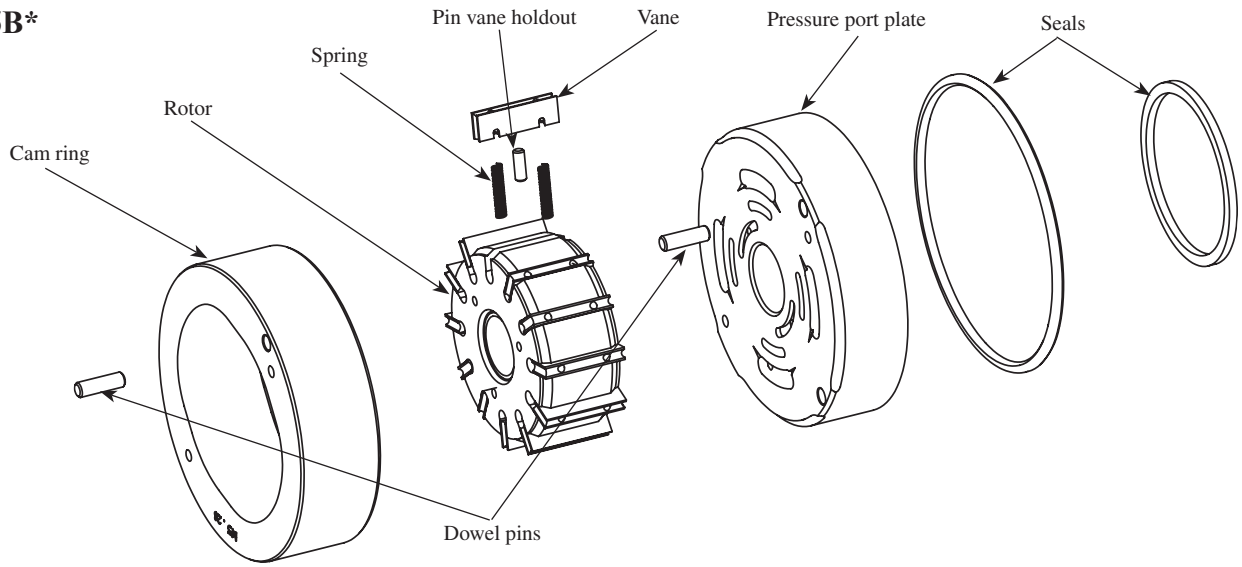
Use this seal type with fire resistant fluids and/or temperature higher than + 90° C (+ 194° F).
Color identification code : green seal, or green stripe on black seal.
Operating temperature : - 29° C to + 204° C (-20 to + 400° F).


Shaft assembly
Housing
Cartridge
Rear cap

M5AF*

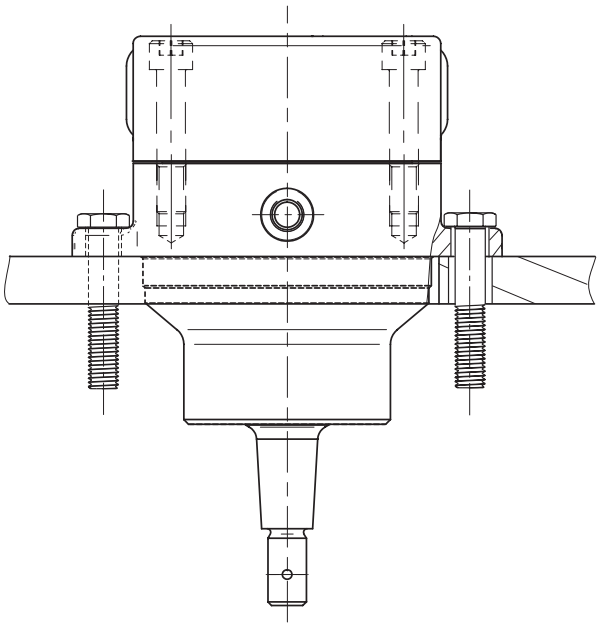

Vane
Spring
Pressure port plate
Seals
Rotor
Cam ring
Dowel pins

M5B*


Pin vane holdout
Vane
Pressure port plate
Seals
Spring
Rotor
Cam ring
Dowel pins

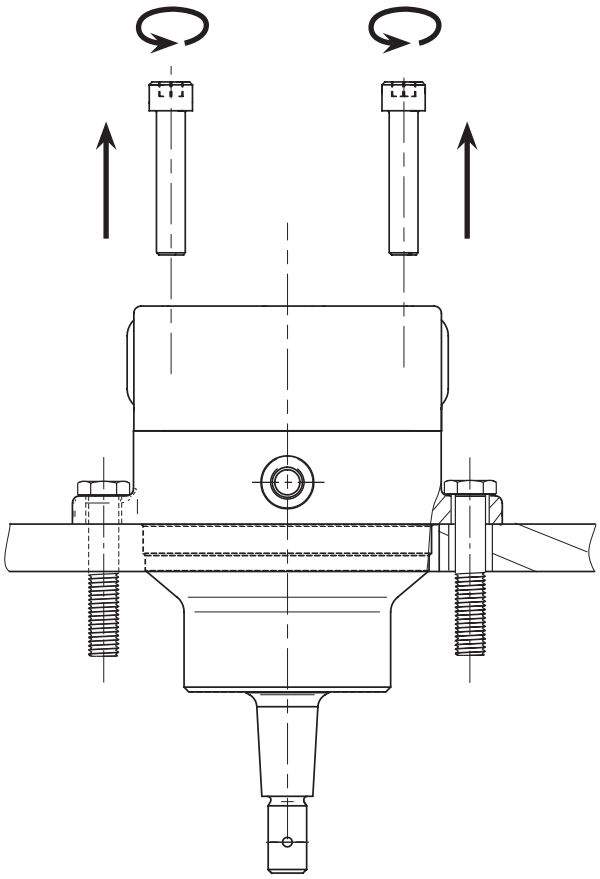
3 . 1 . DISASSEMBLY / ASSEMBLY
3 . 1 . a CHANGING CARTRIDGE :

1 . Install the motor on the table.



Two bolts will help untighten the 4 screws of the motor.

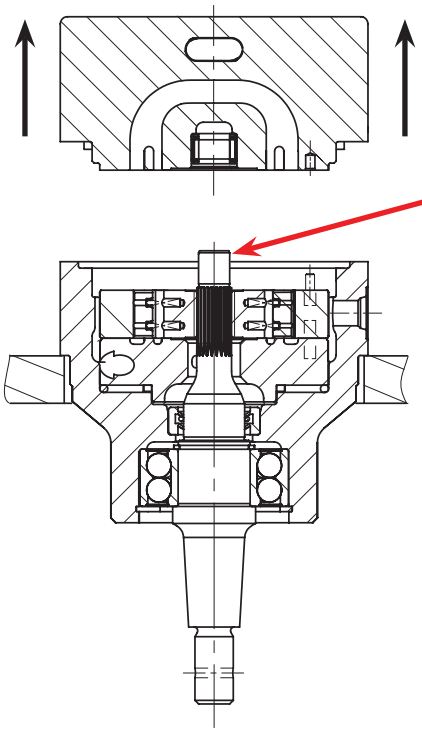
2 . Untighten the 4 screws.



3 . 1 . DISASSEMBLY / ASSEMBLY
3 . 1 . a CHANGING CARTRIDGE :

3 . Remove the rear cap.

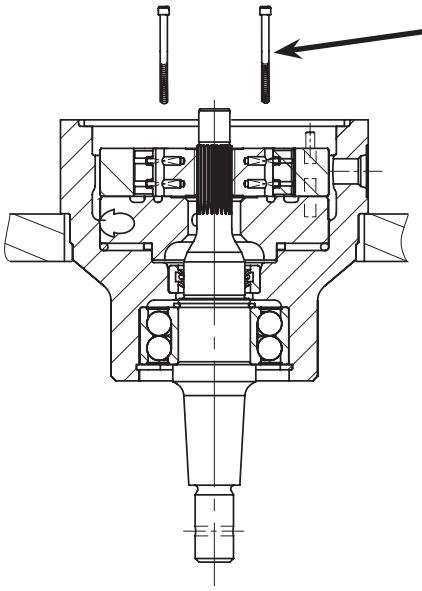
If exchanging the rear cap, check the seal and put back the new rear cap, go to page 19.



Be careful as some parts could "stick" to the rear cap and come with it. Some parts could then fall (cartridge or pressure plate).

Check if the seal is correctly placed on the rear cap.
If not, put it back correctly.

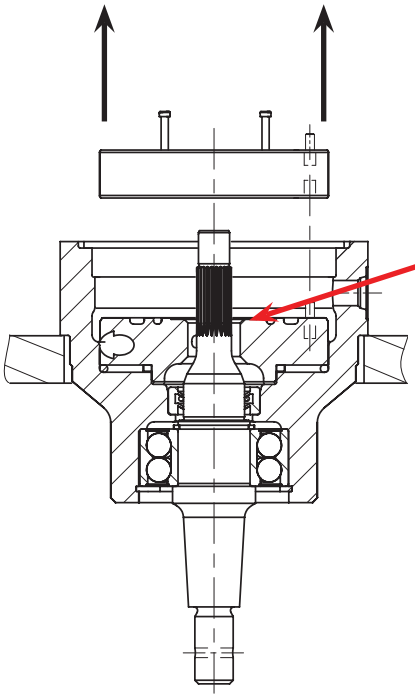
4 . Put two screws into the cam ring.



Retaining screws of the pump cartridge :
ref. : 317-10320-0

3 . 1 . DISASSEMBLY / ASSEMBLY
3 . 1 . a CHANGING CARTRIDGE :

5 . Pull-up the two screws to take out the cartridge assembly.



Carefully lift the cam ring and rotor assembly making sure that rotor is coming out with all the vanes staying in their slots.
Also beware that the pressure plate could stick to the cam ring an then fall down.

If you want to change the shaft / shaft seal, go to page 13.

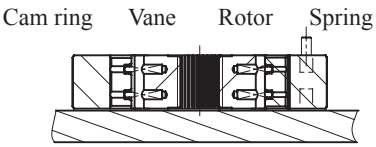
If you want to reassemble a new cartridge, go to page 16.

If you want to disassemble the cartridge, go to the next page.

3 . 1 . DISASSEMBLY / ASSEMBLY
3 . 1 . b CHANGING DISPLACEMENT :

6 . Cam ring change.

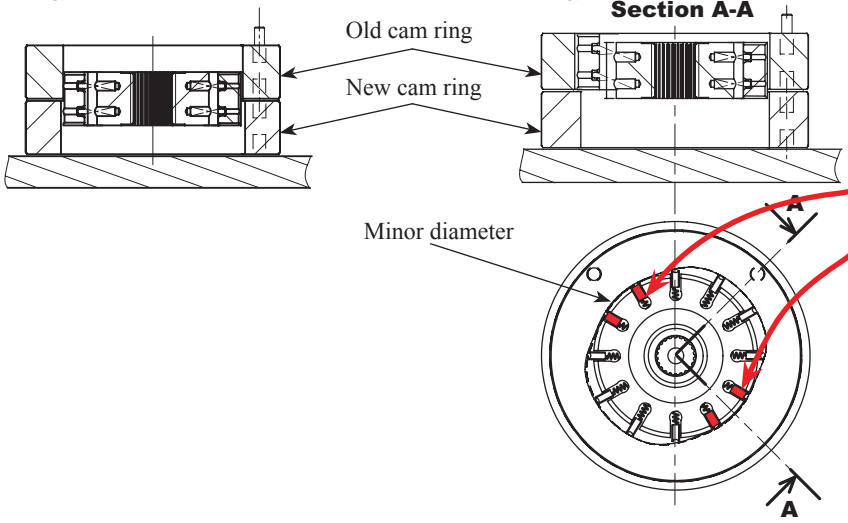
Two procedures :
1) displacement > previous
2) displacement < previous



The displacement to change (new cam ring) is of a bigger displacement than the previous displacement (old cam ring).

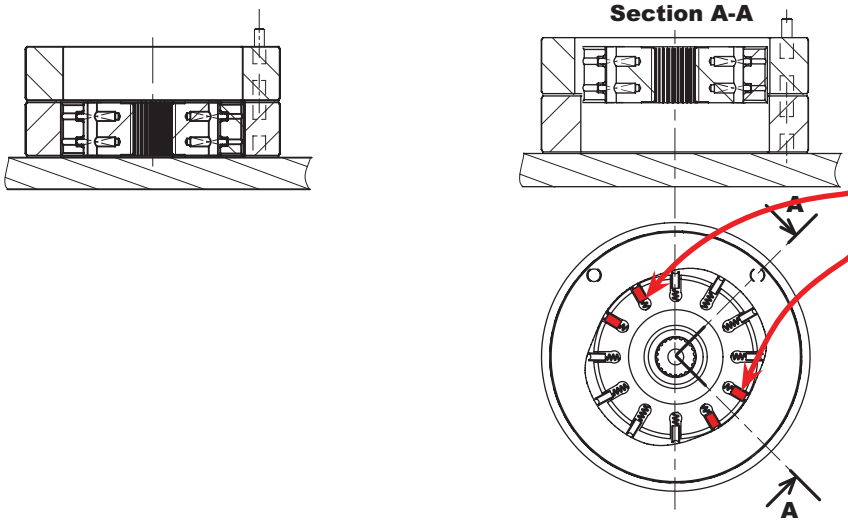
The displacement to change (new cam ring) is of a smaller displacement than the previous displacement (old cam ring).

Push the rotor/vanes/spring assy down.



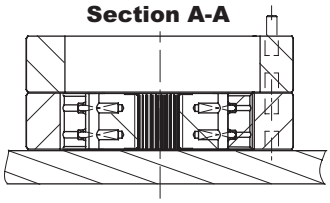
Push down 4 vanes in the minor diameter (red).

Now, push down the remaining vanes in the minor diameter.



Push down 4 vanes in the minor diameter (red).

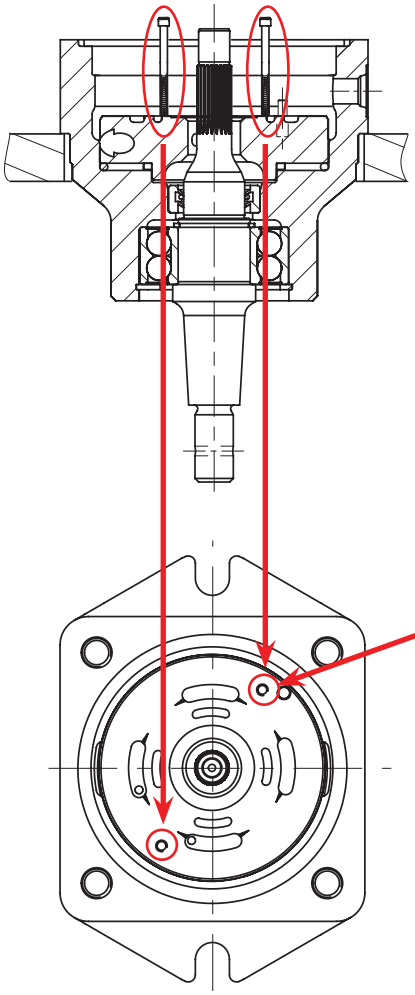
If you want to assemble the cartridge in the motor, go to page 16.



Push down the 4 remaining vanes and the rotor.

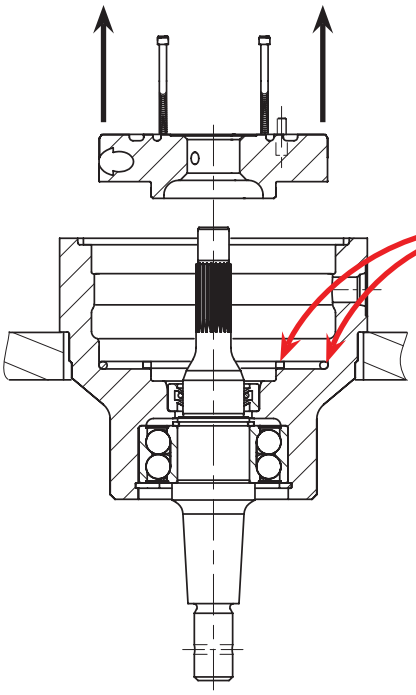
3 . 1 . DISASSEMBLY / ASSEMBLY
3 . 1 . c CHANGING SHAFT :

7 . Put two screws in the floating port plate to pull it out.



Threaded holes designed to pull out the port plate
Use screw ref.: 317-10320-0

8 . Pull out the floating port plate.



Pull out the two screws at the same time to avoid the floating port plate to block itself in the housing.

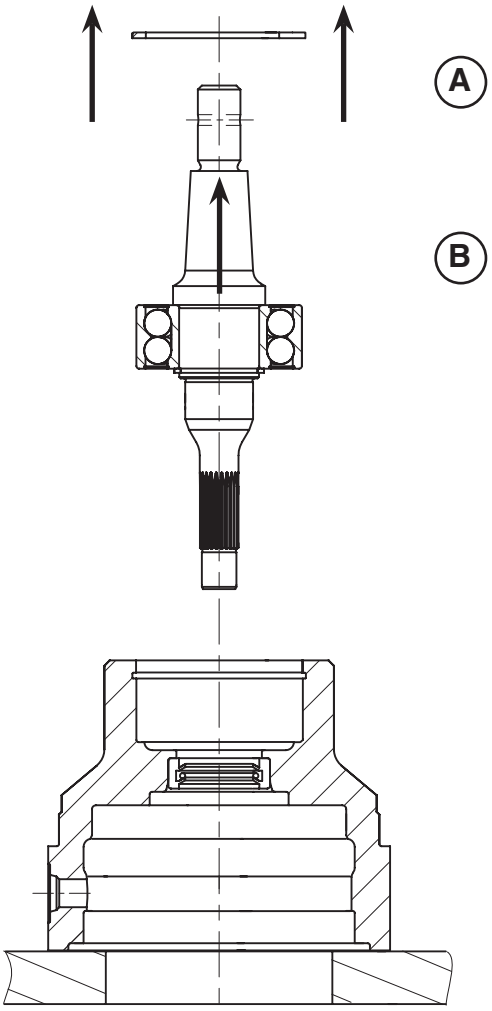
Be careful as the seals could stick to the port plate and then fall down.

3 . 1 . DISASSEMBLY / ASSEMBLY
3 . 1 . c CHANGING SHAFT :

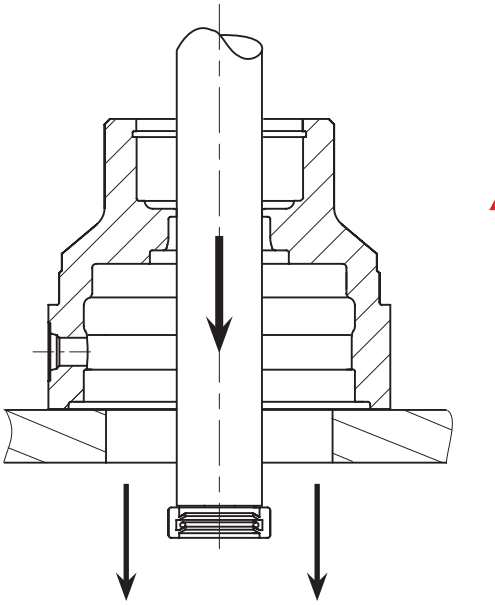
9 . Disassemble the shaft assembly.

A : Remove the circlip.

B : Pull-out the shaft assembly.



10 . Take the shaft seal out.

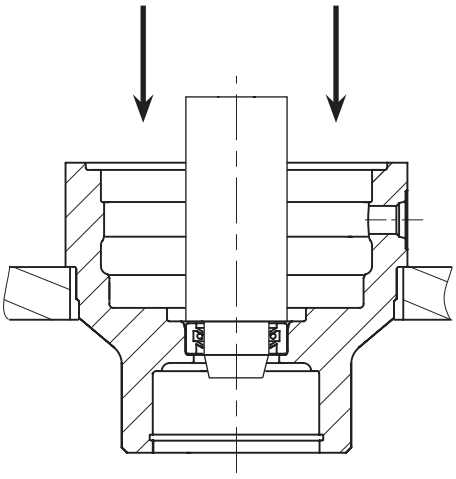


Always replace the shaft seal. (Disassembly is destructive.)

Seal driver dimensions:
Ø max. = 30,0
Ø min. = 25,4

3 . 1 . DISASSEMBLY / ASSEMBLY
3 . 1 . d ASSEMBLY :

11 . Install the new shaft seal (using the special tool, page 31).



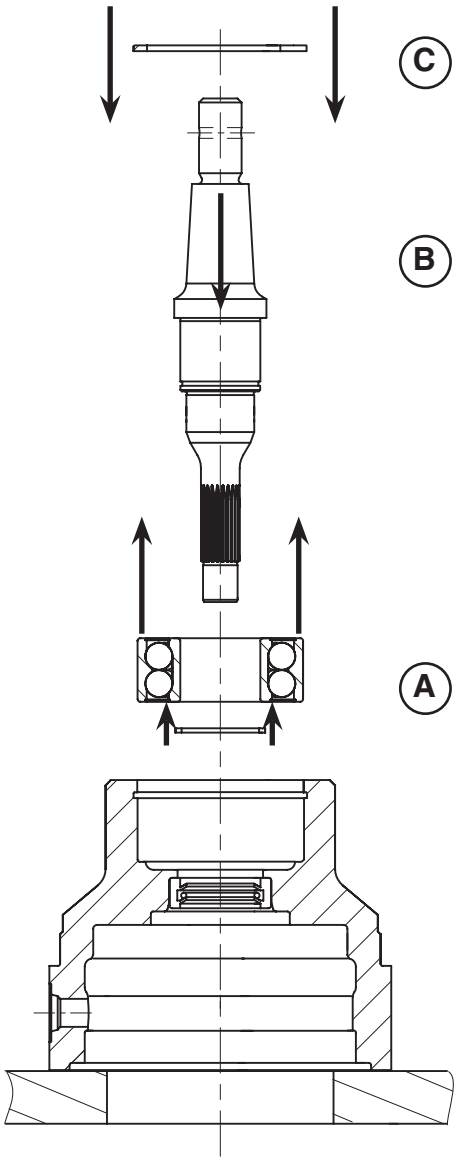
Press carefully to avoid damaging the seal.
Don't use a hammer.

12 . Shaft assembly.

A : Assemble the bearing on the shaft (push on the inner bearing cage).

B : Push the assy downwards (loose fit).

C : Insert the circlip into the housing.



Gently push the shaft assy as to avoid the destruction of the shaft seal.

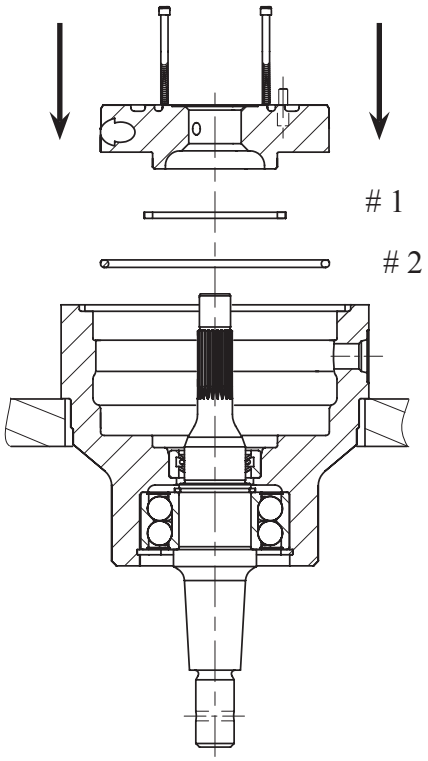
3 . 1 . DISASSEMBLY / ASSEMBLY
3 . 1 . d ASSEMBLY :

13 . Floating port plate assembly .

A : Insert the seal # 1 on the port plate (with some grease to «stick» it).

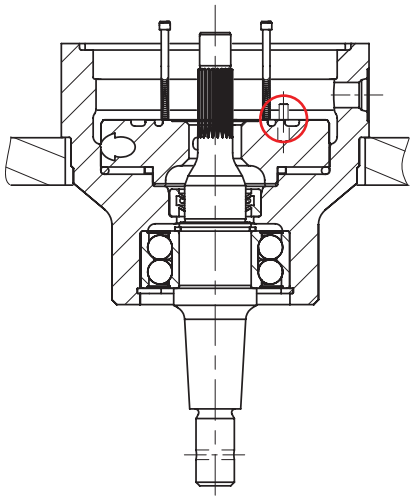
B : Insert the seal # 2 into the housing.

C : Fit the floating port plate into the housing.



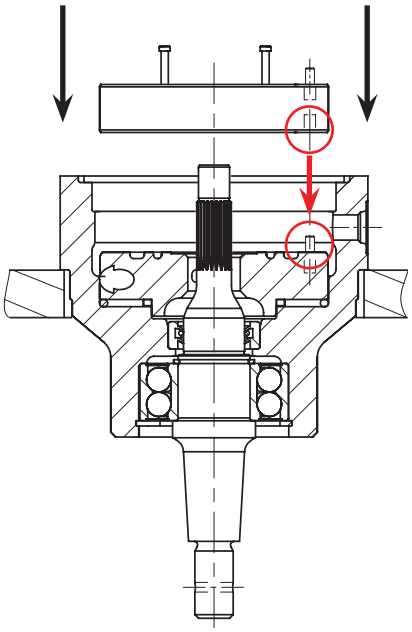
Make sure to maintain the floating port plate horizontal to avoid blocking it in the housing.

14 . Position the dowel pin in the floating port plate according to the desired rotation way.



3 . 1 . DISASSEMBLY / ASSEMBLY
3 . 1 . d ASSEMBLY :

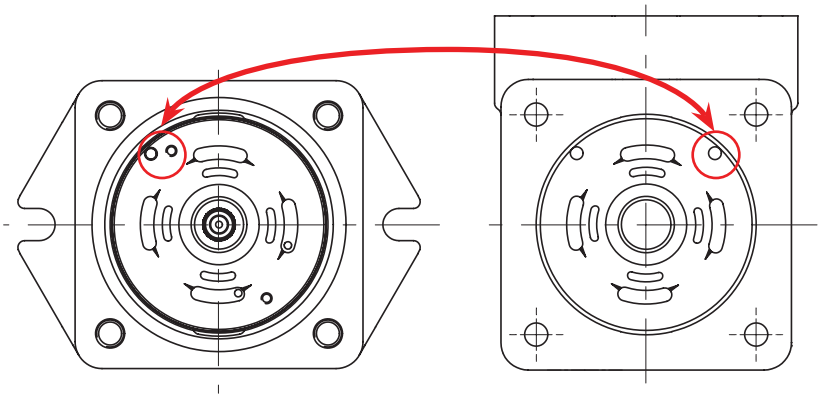
15 . Position the cartridge in the housing.



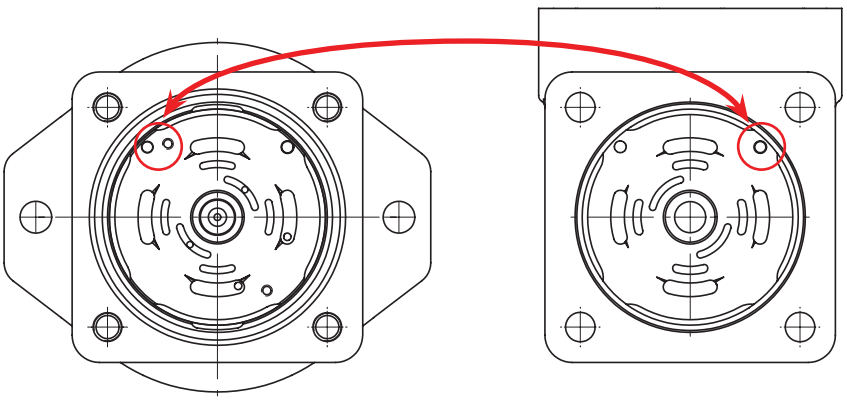
Check if the shaft rotates!

16 . Position the floating port plate according to the requested rotation way.

M5AF* - Right and bi-rotational



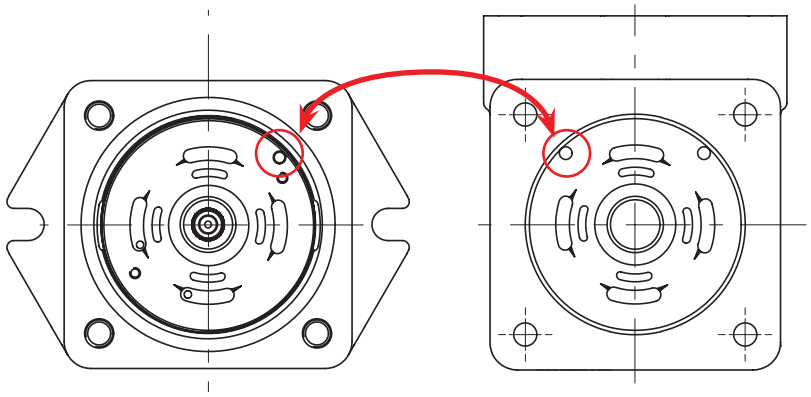
M5B* - Right and bi-rotational



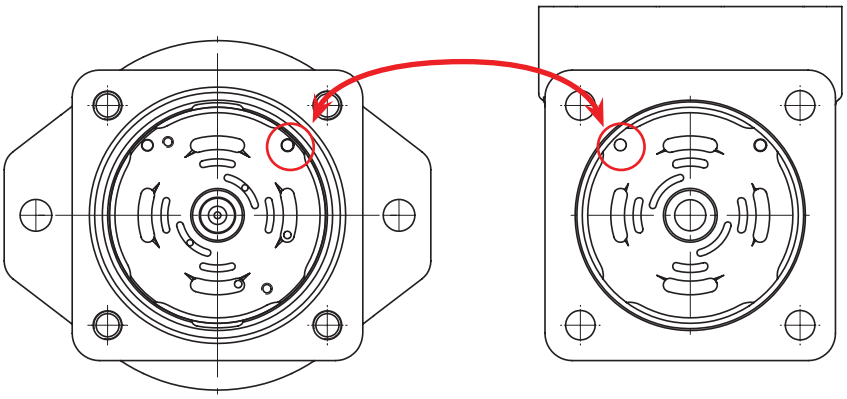
3 . 1 . DISASSEMBLY / ASSEMBLY
3 . 1 . d ASSEMBLY :

16 . Position the floating port plate according to the requested rotation way.

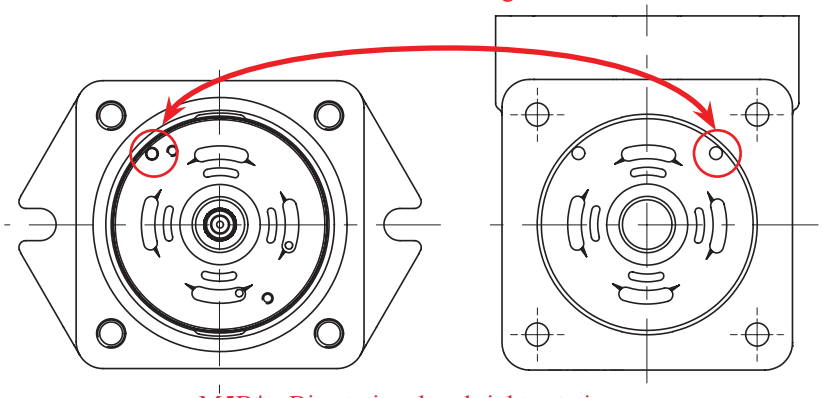
M5AF* - Left rotation



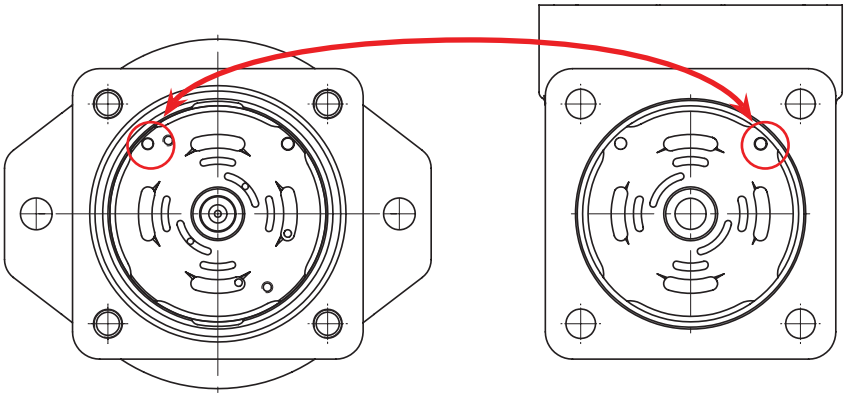
M5B* - Left rotation



M5AF* - Bi-rotational and right rotation



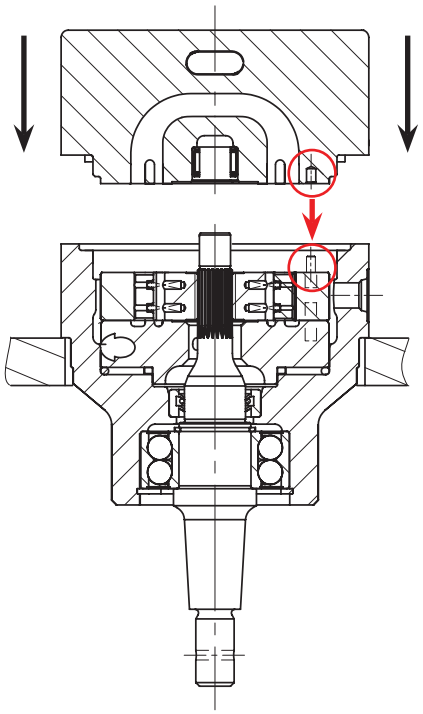
M5B* - Bi-rotational and right rotation



3 . 1 . DISASSEMBLY / ASSEMBLY
3 . 1 . d ASSEMBLY :

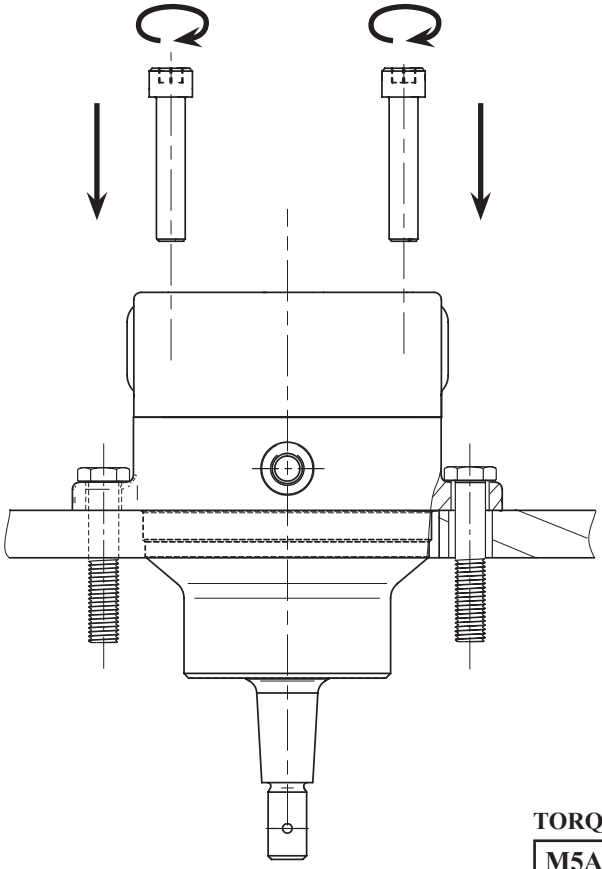
Apply the quad seal on to the rear cap. (add some grease to make sure the seal stays in its position).

17 . Position the rear cap.



Check that the seal remains correctly placed on the rear cap.

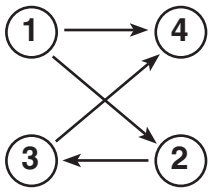
Be careful with the dowel pin positioning.



a) Always check if the shaft rotates.
If not, disassemble and go back to the previous step.

b) Check the porting configuration (see table page 30).

c) Tighten the 4 screws.



Step by step to avoid damaging the seals.

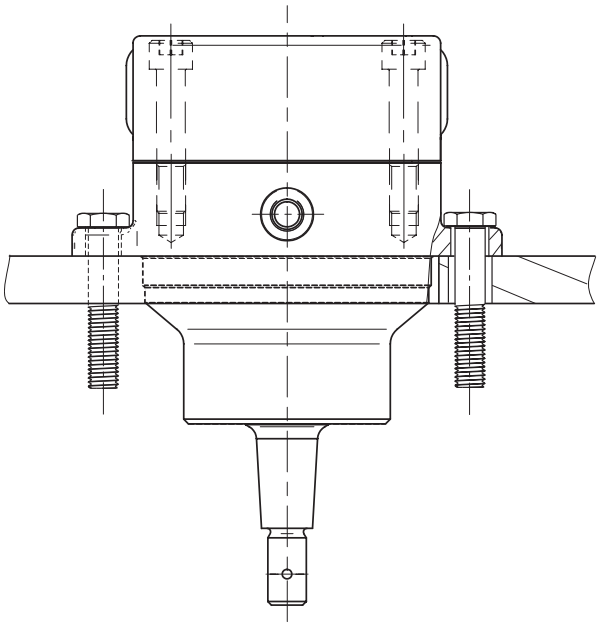
d) Always check if the shaft rotates.
If not, disassemble and go back to the previous step.

TORQUE REQUIREMENTS :

M5AF - M5AF1 **M5BF - M5BF1**	100 Nm	73.8 Ft.lbs

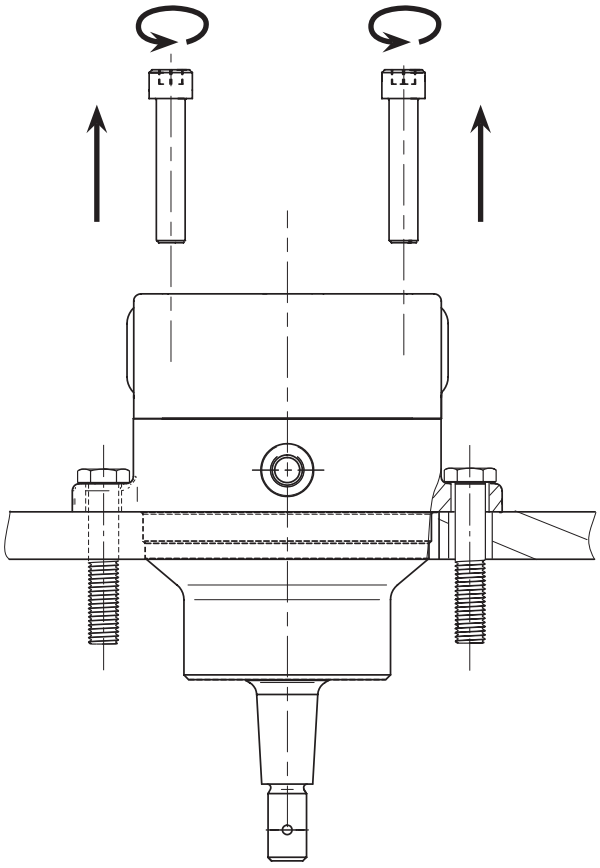
3 . 2 . CHANGING ROTATION :

1 . Install the motor on the table.



Two bolts will help untighten 4 screws of the motor.

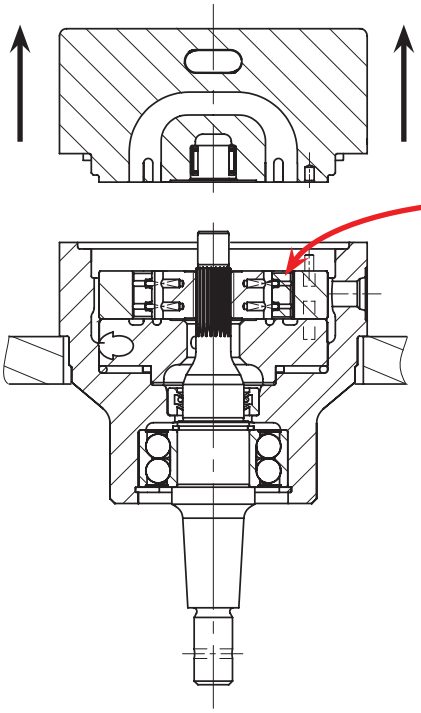
2 . Remove the 4 screws.



3 . 2 . CHANGING ROTATION :

The change of rotation way concerns uni-rotational motors with internal options (check valve, relief valve).
For bi-rotational motors, there are no rear cap options. Flow in A ⇨ CW rotation.
Flow in B ⇨ CCW rotation.

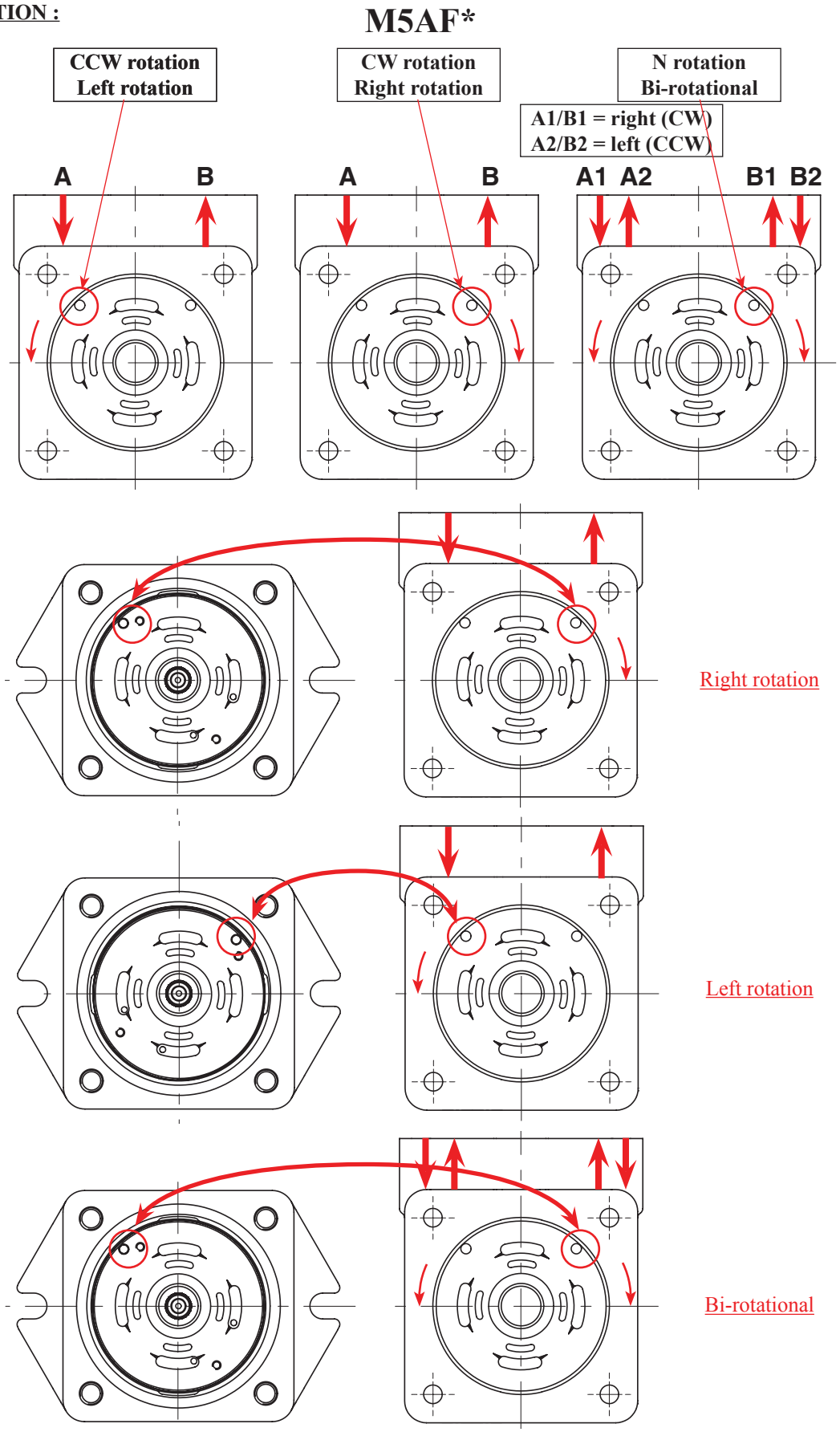
3 . Remove the rear cap.



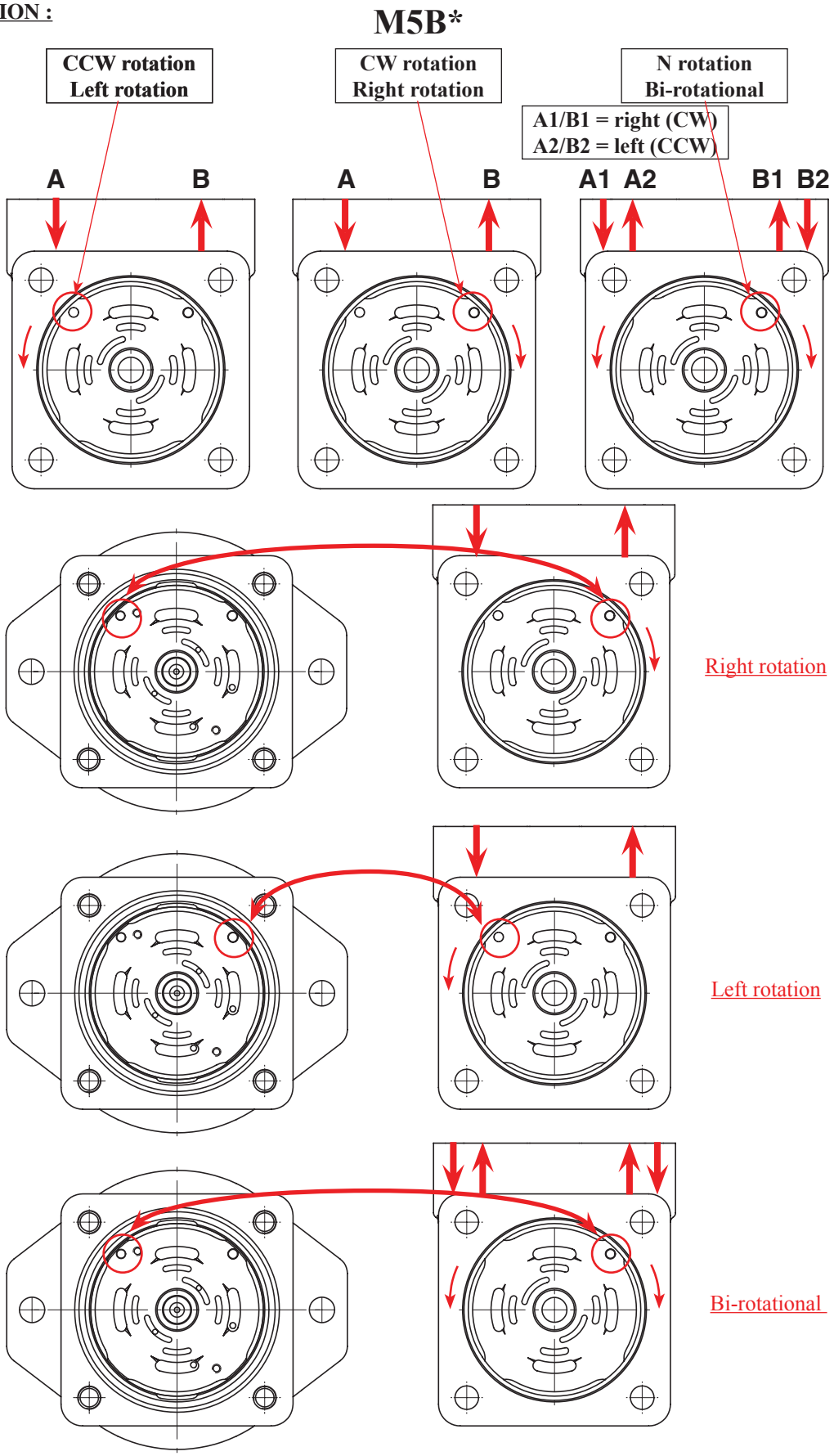
Be careful as some parts could "stick" to the rear cap and then fall down (cartridge or pressure plate).

3 . 2 . CHANGING ROTATION :

4 . Position the dowel pin depending on the desired rotation way.



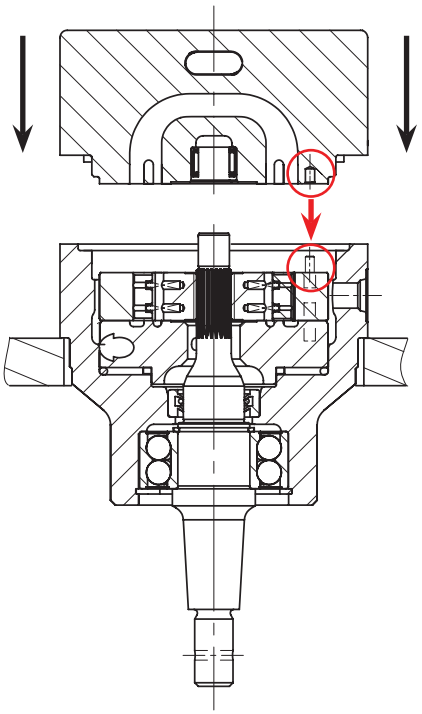
3 . 2 . CHANGING ROTATION :



3 . 2 . CHANGING ROTATION :

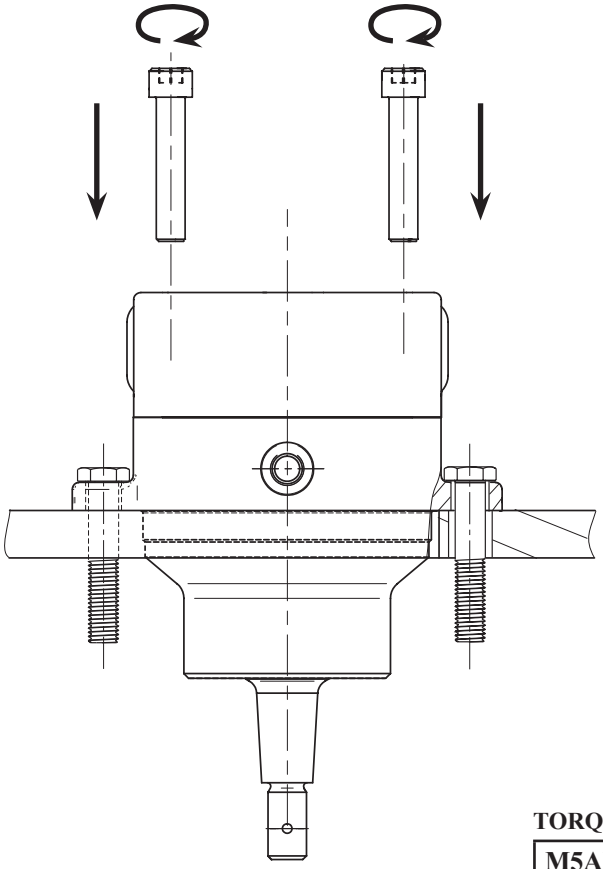
Apply the quad seal on to the rear cap. (add some grease to make sure the seal stays in its position).

5 . Position the rear port plate.



Check that the seal remains correctly placed on the rear cap.

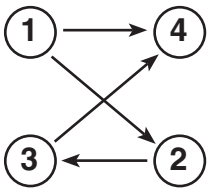
Be careful with the dowel pin positioning.



a) Always check if the shaft rotates.
If not, disassemble and go back to the previous step.

b) Check the porting configuration (see table page 30).

c) Tighten the 4 screws.



Step by step to avoid damaging the seals.

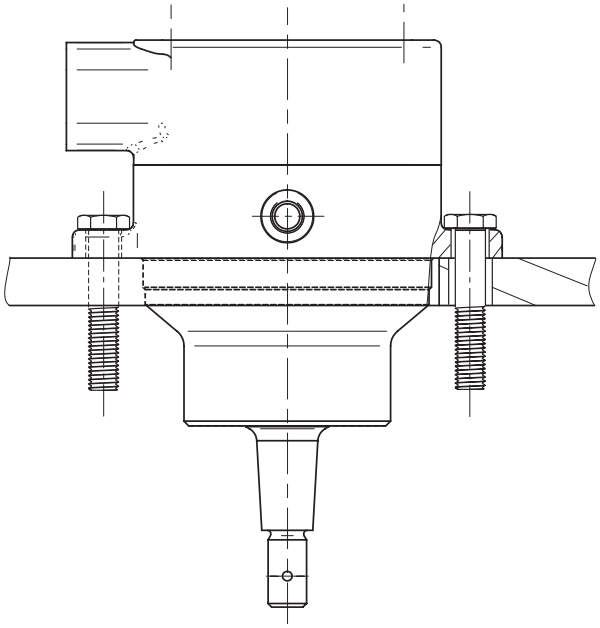
d) Always check if the shaft rotates.
If not, disassemble and go back to the previous step.

TORQUE REQUIREMENTS :

M5AF - M5AF1	100 Nm	73.8 Ft.lbs
M5BF - M5BF1		

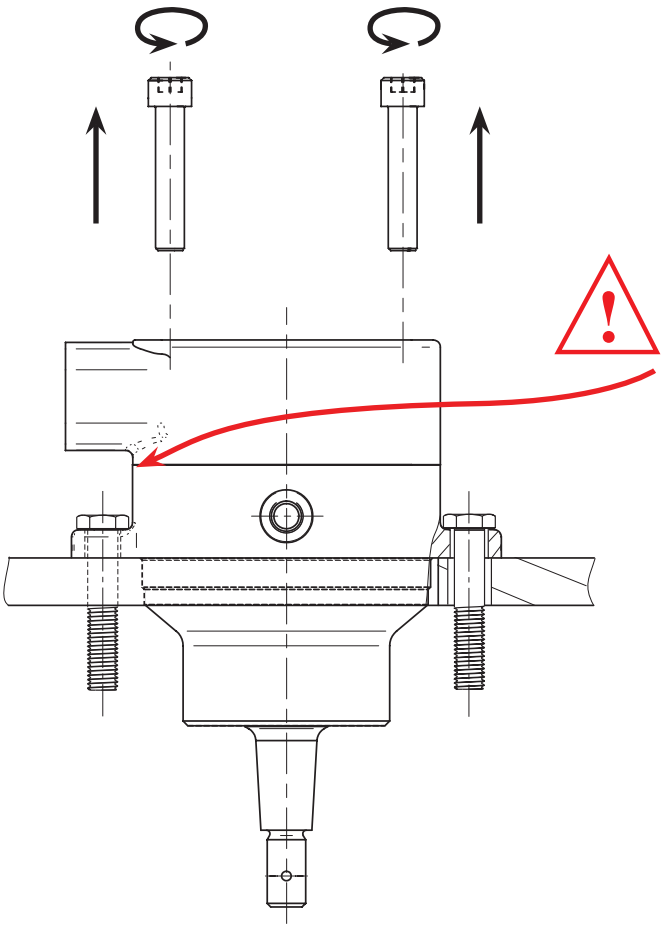
3 . 3 . CHANGING PORTING :

1 . Install the motor on a table.



Secure the motor with two screws.

2 . Remove the 4 screws.

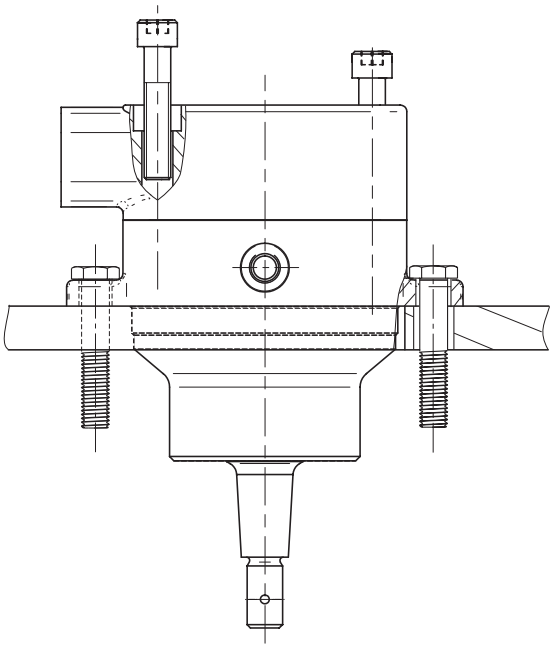


Do not lift the rear cap to prevent the dowel pin inside the motor from leaving their location.

Parker Hannifin
Denison Vane Pump Division
Vierzon - France

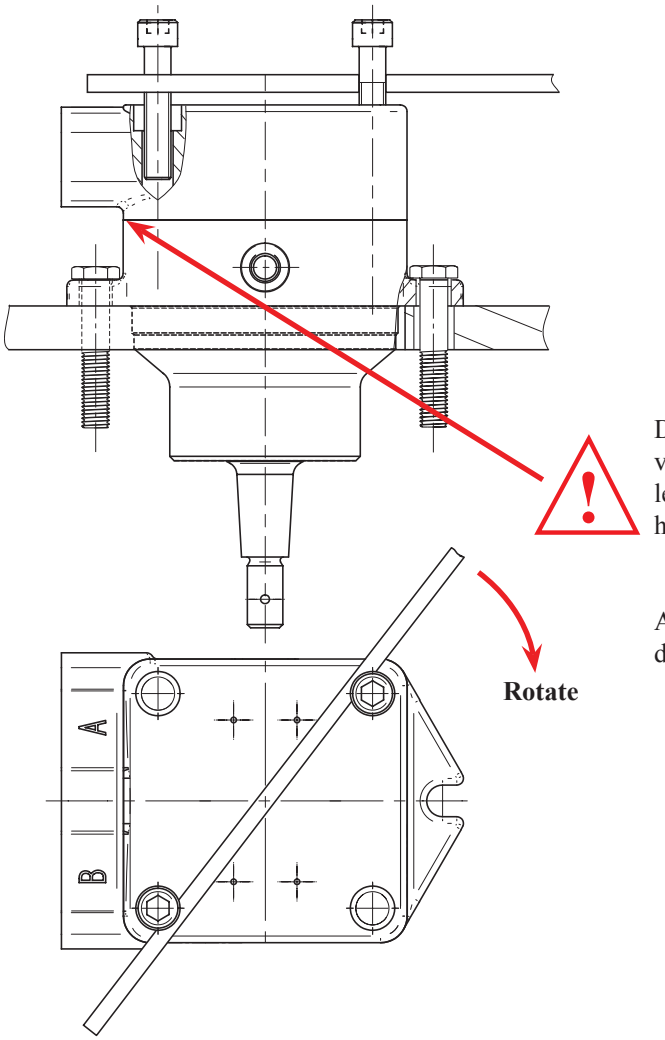
3 . 3 . CHANGING PORTING :

3 . Place two screws in the rear cap as shown.



4 . Lift the two screws high enough or do it with longer screws...

5 . Rotate the rear cap with a bar blocked between the two screws.



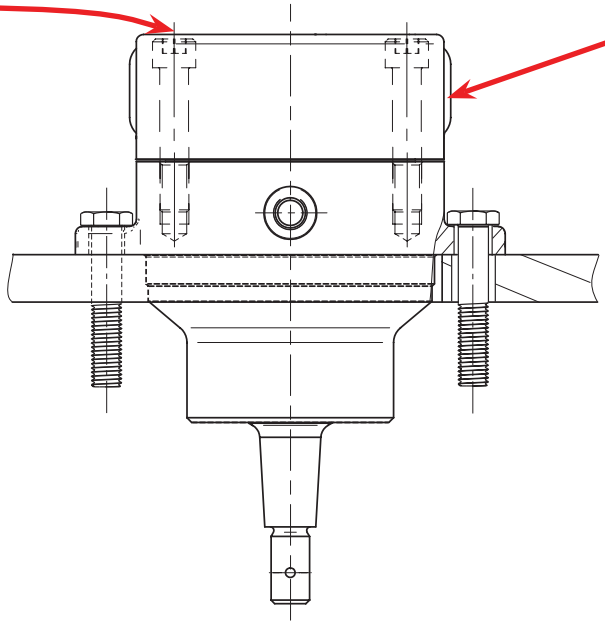
Do not lift the rear cap, preventing the dowel pin from leaving its position in the housing.

Always rotate in the same direction.

3 . 3 . CHANGING PORTING :

6 . Put the screws back.

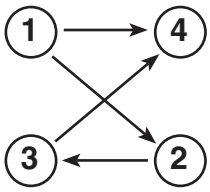
7 . Tighten to the correct torque (see table hereunder).



a) Always check if the shaft rotates. (a sligh torque due to the spring loaded resistance force).
Otherwise, please go back to the previous step.

b) Check the porting configuration (see table page 30).

c) Tighten the 4 screws.



Step by step to avoid damaging the seals.

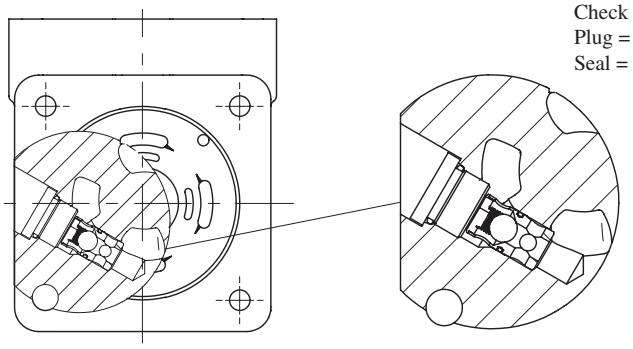
d) Always check if the shaft rotates.
If not, disassemble and go back to the previous step.

TORQUE REQUIREMENTS :

M5AF - M5AF1	100 Nm	73.8 Ft.lbs
M5BF - M5BF1		

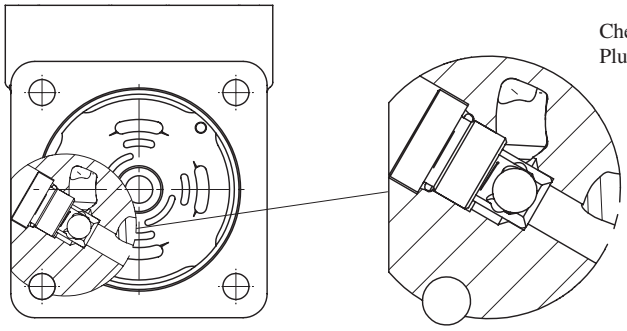
3 . 4 . VALVES :

M5AF & M5BF "A" design



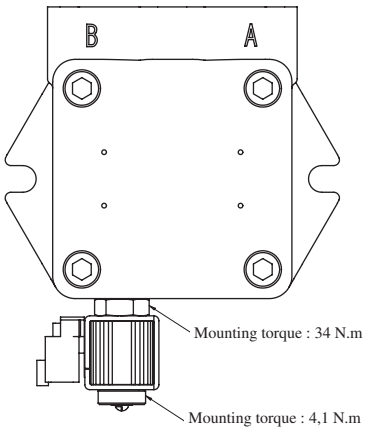
Check valve "A" design motor = S24 - 68701 - 0
Plug = 034 - 67276 - 0
Seal = 675 - 00116 - 0

M5AF & M5BF "B" design

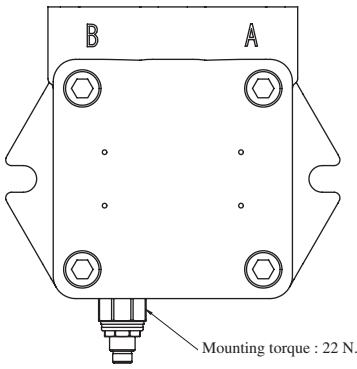


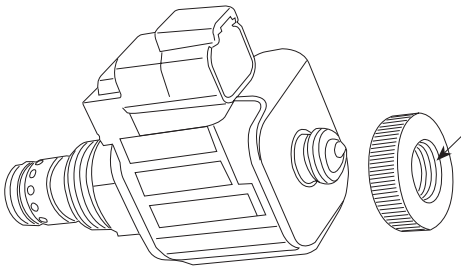
Check valve "B" design motor = S24 - 94046 - 0
Plug and seal included

Proportional pressure relief valve



Standard pressure relief valve





The coil's locking nut is having internal threads on one side only.
The threaded side must be located at solenoid's end.
The coil should not be free to rotate.

4 . 1 . KEY SHEET

Model No. **M5AF1 - 018 - 1 N 02 - B 1 - M 3 - AP21**

Series External drain
Series Internal drain

Displacement
Volumetric displacement (ml/rev.)
006 = 6,3 016 = 16,0 025 = 25,0
010 = 10,0 018 = 18,0
012 = 12,5 023 = 23,0

Type of shaft
1 = taper (non SAE)
2 = keyed (non SAE)

Direction of rotation (view on shaft end) - M5AF - M5AF1
R = Clockwise
L = Counter-clockwise
Direction of rotation (view on shaft end) - M5AF
N = Bi-rotational

Porting combination

Design letter

Seal class
1 = S1 BUNA N 5 = S5 - VITON

Modifications or special option
Ex. : AP21 = Anti-starve valve + proportional pressure relief valve set at 210 bar.
For a flow above 75 l/min a special cap is needed, please consult Parker Denison.

Drain variables - M5AF
2 = 9/16" 18 - SAE drain
3 = M12 x 1,5 metric drain
Drain variables - M5AF1
X = no drain connection

End cap variables - All motors except with proportional pressure relief valve [1)]
M = 3/4" - 4 bolts SAE flange J518 - Metric thread
0 = 3/4" - 4 bolts SAE flange J518 - UNC thread
Y[2)] = Metric threaded ports (ISO 6149) - M22 x 1,5
W[2)] = SAE str. threaded ports - 1"1/16-12 UNF-2B

[1)] For other end cap variables, please contact Parker Denison.
[2)] Anti-starve valve not available.

Model No. **M5BS - 036 - 1 N 02 - B 1 - M 3 - ..**

Series External drain
ISO 3019-2 - 100 A2/B4 HW
Series External drain
SAE B - J744

Displacement
Volumetric displacement (ml/rev.)
012 = 12,0 028 = 28,0
018 = 18,0 036 = 36,0
023 = 23,0 045 = 45,0

Type of shaft
1 = taper (SAE B)
2 = keyed (ISO E25M)
3 = splined (SAE B)
4 = splined (SAE BB)

Direction of rotation (view on shaft end)
N = Bi-rotational

Modifications

Drain variables - M5BS
2 = 9/16" 18 SAE drain
3 = M18 x 1,5 metric drain
Drain variables - M5B
3 = M18 x 1,5 metric drain

End cap variables
M = 3/4" - 4 bolts SAE flange J518 - Metric thread
0 = 3/4" - 4 bolts SAE flange J518 - UNC thread

Seal class
1 = S1 - BUNA N
5 = S5 - VITON

Design letter

Porting combination

Model No. **M5BF1 - 036 - 1 N 02 - B 1 - M 3 - AP21**

Series External drain
Series Internal drain

Displacement
Volumetric displacement (ml/rev.)
012 = 12,0 028 = 28,0
018 = 18,0 036 = 36,0
023 = 23,0 045 = 45,0

Type of shaft
1 = keyed taper (non SAE)
2 = keyed (SAE C)
W = keyed (ISO G32N)

Direction of rotation (view on shaft end) - M5BF - M5BF1
R = Clockwise
L = Counter-clockwise
Direction of rotation (view on shaft end) - M5BF
N = Bi-rotational

Porting combination

Design letter

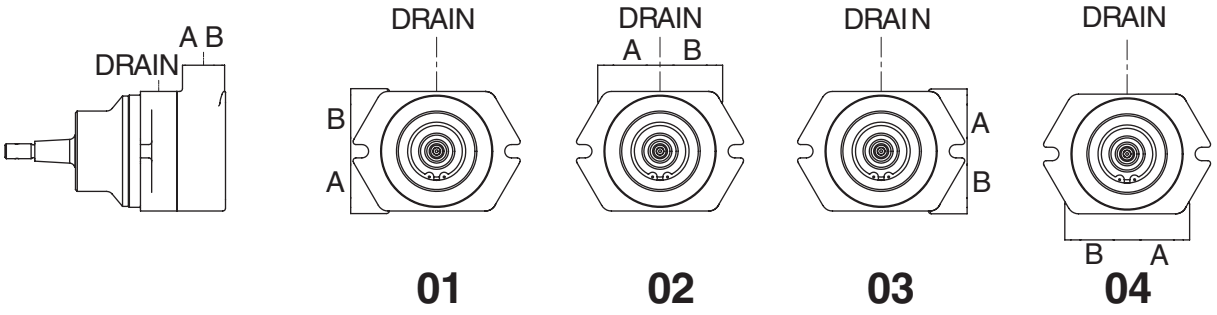
Modifications or special option
Ex. : AP21 = Anti-starve valve + proportional pressure relief valve set at 210 bar.
For a flow above 75 l/min a special cap is needed, please consult Parker Denison.

Drain variables - M5BF
2 = 9/16" 18 SAE drain
3 = M18 x 1,5 metric drain
Drain variables - M5BF1
x = no drain connection

End cap variables M5BF
M = 3/4" - 4 bolts SAE flange J518 - Metric thread
0 = 3/4" - 4 bolts SAE flange J518 - UNC thread
End cap variables M5BF1
M = 3/4" - 4 bolts SAE flange J518 - Metric thread

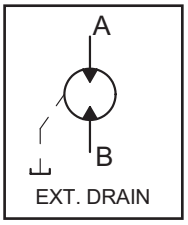
Seal class
1 = S1 - BUNA N
5 = S5 - VITON

4 . 2 . PORTING TABLES :



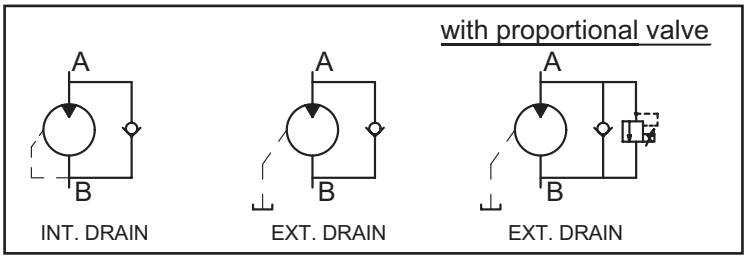
ROTATION :
BI-ROTATIONAL (N)

View from shaft end :
CW rotation A = inlet
B = outlet
CCW rotation A = outlet
B = inlet



R OR L ROTATION (New rotation concept - patent pending)*

View from shaft end :
CW & CCW rotations
A = inlet
B = outlet



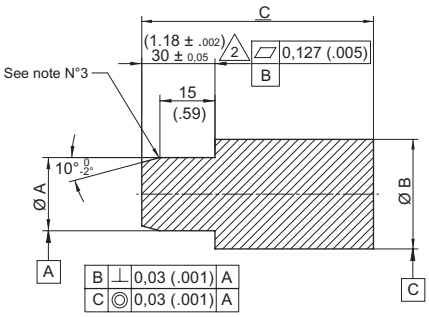
*** L or R rotation are featuring a new internal concept where A is always "in" and B is always "out".**

4 . 3 . TORQUE REQUIREMENTS :

M5AF - M5AF1	100 Nm	73.8 Ft.lbs
M5BF - M5BF1		

5 . 1 . SEAL DRIVER - DIMENSIONS :

Series	Tool N°	Ø A		Ø B		C	
		mm	inch	mm	inch	mm	inch
M5AF - M5AF1	DM3-418S0-1	25,27 24,40	0.995 1.000	37,82 37,98	1.489 1.495	145	5.708
M5B*				31,0	1.22		

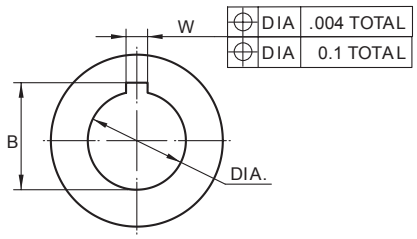


NOTES :

1. Remove all burrs and break sharp edges: 0.25/0.13 R (.010/.005 R).
2. Length 2 to be heat treated to RC 47/50.
3. Length 2 to have a 10-20 full length, with a smooth intersection between chamfer and dia. "A".
4. Grease O.D. of length 2 before installing the shaft seal on the tool to avoid damaging the seal. Material 4140 or equivalent.

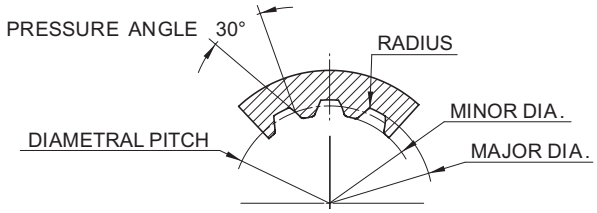
6 . 1 . FEMALE COUPLING DIMENSIONS :

CYLINDRICAL KEYED SHAFTS :



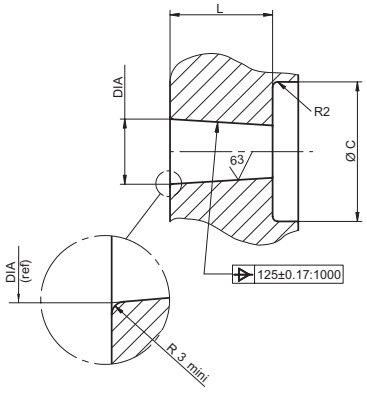
Shaft	M5AF/M5AF1	M5B/M5BS		M5BF	
	Code 2	Code 1	Code 2	Code 2	Code W
DIA	25,403/25,434 (1.000/1.001)	22,23/22,25 (.875/.876)	25,02/25,04 (.985/.986)	31,76/31,78 (1.250/1.251)	32,02/32,05 (1.261/1.262)
W	6,390/6,448 (.251/.254)	6,36/6,41 (.250/.252)	7,982/8,018 (.314/.317)	7,95/8,00 (.313/.315)	9,982/10,018 (.393/.394)
B	28,22/28,55 (1.111/1.124)	24,97/25,10 (.983/.988)	28,3/28,5 (1.114/1.122)	35,21/35,34 (1.386/1.391)	35,3/35,5 (1.390/1.398)

CYLINDRICAL SPLINED SHAFTS :

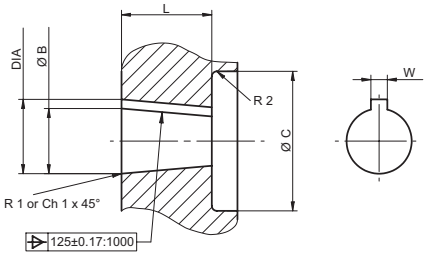


Shaft	M5B/M5BS - Code 3
Type	SAE B
Number of teeth	13
Pitch	16/32
Major dia.	22,221/22,500 (.875/.886)
Minor dia.	19,134/19,261 (.753/.758)
Pitch dia.	20,638 (.812)
Pin dia.	2,743 (.108)
Max. measurement between two pins	16,505/16,589 (.650/.653)
Radius max.	0,15 (.005)

TAPER KEYED SHAFTS :



Shaft	M5AF/M5AF1 Code 1
DIA	25,27/25,40 (.995/1.000)
Ø C	53,5/54,5 (2.106/2.146)
L	39,6/40,0 (1.559/1.575)



Shaft	M5BF Code 1
DIA	25,02/25,15 (.985/.990)
W	6,36/6,31 (.250/.248)
B	28,70/28,95 (1.130/1.140)
Ø C	52,5/53,5 (2.067/2.106)
L	35,2/35.45 (1.386/1.395)

7 . VANE TROUBLESHOOTING GUIDE :

1 . No rotation	a) Is the flow coming to the motor?	a-1)Check the circuit and the hydraulic schematic. Is the piping O.K.? a-2) Check the setting of the main pressure relief valve. At check if it is not set at an extremely low pressure. a-3) Check if the pump is delivering flow. a-4) Check if the directional valve(is) allowing the flow to go to the motor is check if the directional valve is allowing energized. If it is, check if the spool is in its correct position and not sticking in a position that would deviate the flow somewhere else. a-5) Check if a check valve would not have been improperly mounted.
	b) Is the torque required higher than the system settings?	b-1) Check if the pressure settings are correct. b-2) Check if the load is not superior to the torque capabilities of the motor.
	c) Is the pump OK?	c-1) Check if the pump is working correctly.
	d) Are the motors internal drain check valves working properly?	d-1) Check if a failing check valve would not allow some flow to go back to the tank and therefore limit the flow to the motor.
	e) How is the motor piped?	e-1) Check the nature of the connectors. If, for example, the “self sealing couplings” type connectors are well fitted into each other.
2 . Stalls easily	a) Is the load close to the limits of the system?	a-1) Check the relief valve setting and compare it to the theoretical pressure required to deliver the convenient torque.
	b) Are the motors internal drain check valves working properly?	b-1) Check if a failing check valve would not allow some flow to go back to the tank and therefore limit the flow to the motor.
	c) Is the flow going to the motor sufficient?	c-1) Check the minimum flow required by the motor. c-2) Check the flow of the pump or the valve feeding the motor.
3 . Not enough speed	a) Is the speed lower than desired?	a-1) Check the theoretical displacement of the motor versus the theoretical flow of the pump. a-2) Check that the flow of the pump is really coming to the motor. a-3) Check that the working pressure & speed are in accordance with the catalog values of the motor. a-4) Check the oil temperature. Check then that the low viscosity of the oil is not having a big effect on the internal leakage of the motor. a-5) Check the air bleed-off.
4 . Erratic speed	a) Is the motor loosing speed erratically?	a-1) Check if the limit of the allowable torque is not reached once a while. a-2) Check if the driven load does not transmit some inconstant load (like a high pressure piston water pumps using an unbalanced technology). a-3) Check if the flow coming from the pump is constant.

7 . VANE TROUBLESHOOTING GUIDE :

5 . Unusual noise level	a) Is the motor running?	a-1) Check if there is no air intake aerating the motor badly (through the front shaft seal for example). a-2) Check if the motor is not cavitating. It could be that the inertia of the load is such that it drives the motor faster than the flow coming from the pump. a-3) Check if the oil is suitable for the use. a-4) Check if the air bleed off has been done properly.
	b) When is the motor braking?	b-1) Check the back pressure to see if the replenishment pressure is not too low, leading to cavitation of the motor.
6 . Unusual heat	a) Is the oil arriving to the motor already hot?	a-1) Check if a cooler is required or, if there is one, if it is well dimensioned. a-2) If there is a cooler, check if it is working (example for water cooler : is the water flow open or sufficient). a-3) Check if the hydraulic circuit is not bringing back the flow directly to the inlet port. Doing so, it would create a very small closed circuit not able to cool down the fluid. a-4) Check the quality of the fluid. a-5) Check the velocity of the fluid (5 to 6 meters/second max.). a-6) Check the filtration unit, its capacity. a-7) Check if the heat does not come from an open bypass valve.
	b) Is the oil heating up when going through the motor?	b-1) Check the speed of rotation versus the catalog values. b-2) Check the pressure rating. b-3) Check the fluid type. b-4) Check the viscosity.
7 . Shaft seal leakage	a) Is the seal leaking when pressurized?	a-1) Check if the lips of the seal are not ruined (lack of lubricity leading to vulcanization of the rubber, external pollution...). a-2) Check if the shaft is not marked by a groove in the usual seal lip contact area. a-3) Check the shuttle valve. a-4) Check the pressure in the drain line on the motor. Long piping, elbows, small diameter, too high oil viscosity, other common drain flows in the same pipe can lead to high drain pressures. a-5) Check if there is no high overshoot at start-up that would create a high instant internal leakage. a-6) Check, when using a “quick coupling connector”, if it is correctly locked. a-7) Check the alignment of the shafts. a-8) Check if there is no unbalanced driven load that could create a gap between the shaft and the seal. a-9) Check if the radial force is not too high (belt drives for example).
	b) Is the seal leaking when standing still?	b-1) Check that the seal is not damaged. b-2) Check that the shaft does not have any scratches. b-3) Check that the ball bearing is not ruined. b-4) Check that the drain line does not create a back pressure.

⚠ 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.

This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.

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.

To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

Offer of Sale

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

Parker Hannifin
Denison Vane Pump Division
Vierzon - France

Hydraulics Group Sales Offices

Europe

Austria
Wiener Neustadt
Tel: +43 (0)2622 23501
Fax: +43 (0)2622 66212

Austria
Wiener Neustadt
(Resp for East Europe)
Tel: +43 (0)2622 23501-970
Fax: +43 (0)2622 23501-977

Belgium
Nivelles
Tel: +32 (0)67 280 900
Fax: +32 (0)67 280 999

Czech Republic
Klecany
Tel: +420 284 083 111
Fax: +420 284 083 112

Denmark
Ballerup
Tel: +45 4356 0400
Fax: +45 4373 3107

Finland
Vantaa
Tel: +358 20 753 2500
Fax: +358 20 753 2200

France
Contamine-sur-Arve
Tel: +33 (0)450 25 80 25
Fax: +33 (0)450 25 24 25

Germany
Kaarst
Tel: +49 (0)2131 4016 0
Fax: +49 (0)2131 4016 9199

Ireland
Dublin
Tel: +353 (0)1 466 6370
Fax: +353 (0)1 466 6376

Italy
Corsico (MI)
Tel: +39 02 45 19 21
Fax: +39 02 4 47 93 40

The Netherlands
Oldenzaal
Tel: +31 (0)541 585000
Fax: +31 (0)541 585459

Norway
Ski
Tel: +47 64 91 10 00
Fax: +47 64 91 10 90

Poland
Warsaw
Tel: +48 (0)22 573 24 00
Fax: +48 (0)22 573 24 03

Portugal
Leca da Palmeira
Tel: +351 22 9997 360
Fax: +351 22 9961 527

Slovakia
Ref. Czech Republic

Spain
Madrid
Tel: +34 91 675 73 00
Fax: +34 91 675 77 11

Sweden
Spånga
Tel: +46 (0)8 597 950 00
Fax: +46 (0)8 597 951 10

United Kingdom
Warwick
Tel: +44 (0)1926 317 878
Fax: +44 (0)1926 317 855

International

Australia
Castle Hill
Tel: +61 (0)2-9634 7777
Fax: +61 (0)2-9842 5111

Canada
Milton, Ontario
Tel: +1 905-693-3000
Fax: +1 905-876-0788

China
Shanghai
Tel: +86 21 5031 2525
Fax: +86 21 5834 3714

Asia Pacific Group
Hong Kong
Tel: +852 2428 8008
Fax: +852 2425 6896

India
Mumbai
Tel: +91 22 5613 7081/82-85
Fax: +91 22 2768 6841/6618

Japan
Tokyo
Tel: +(81) 3 6408 3900
Fax: +(81) 3 5449 7201

Latin America Group
Brazil
Tel: +55 51 3470 9144
Fax: +55 51 3470 9281

South Africa
Kempton Park
Tel: +27 (0)11-961 0700
Fax: +27 (0)11-392 7213

USA
Cleveland (industrial)
Tel: +1 216-896-3000
Fax: +1 216-896-4031
Lincolnshire (mobile)
Tel: +1 847-821-1500
Fax: +1 847-821-7600

Parker Hannifin is the world's premier supplier of motion and control systems and solutions, with sales and manufacturing facilities throughout the world. For product information and details of your nearest Parker sales office, visit us at www.parker.com or call free on 00800 2727 5374.

Catalogue HY29-0017-M1/UK
3M 01/2007 IRO