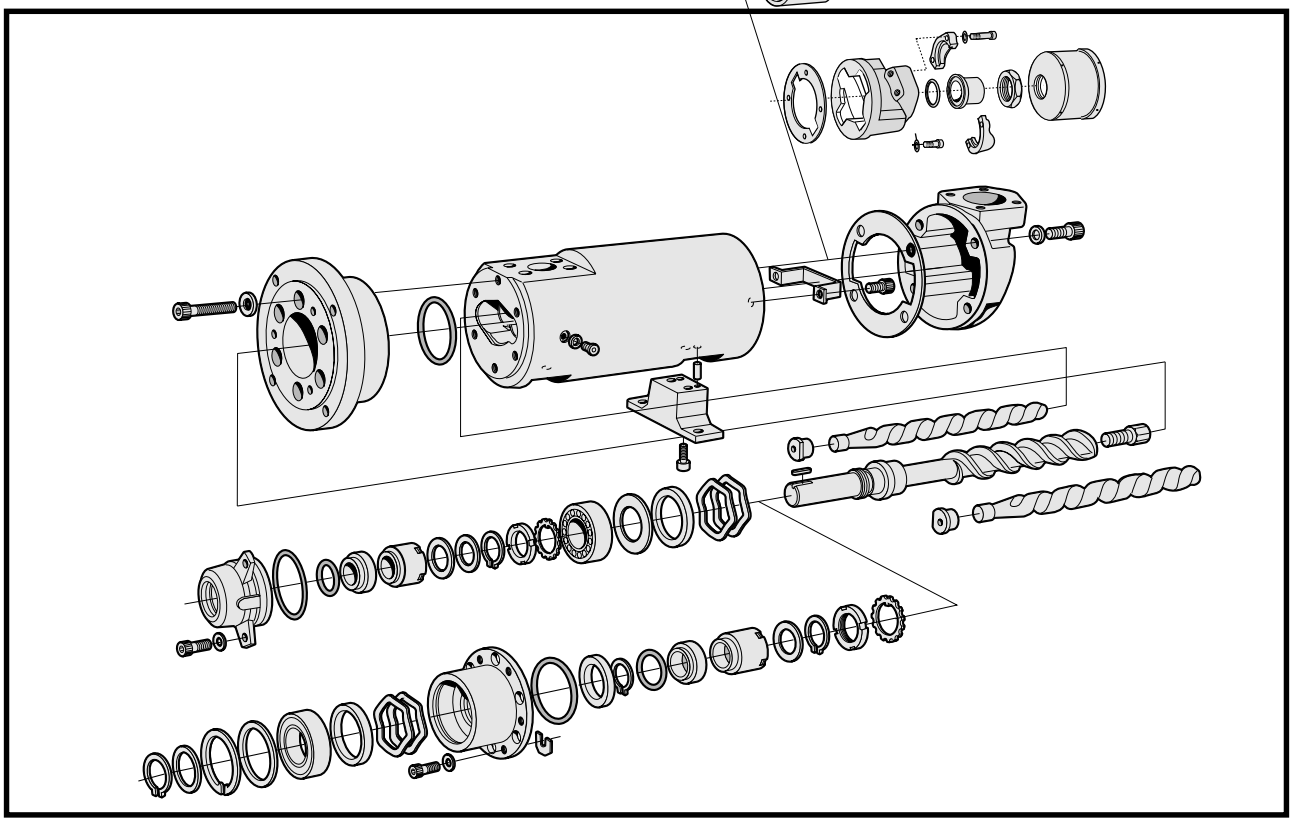
A Member of the
COLFAX PUMP GROUP

Screw pumps

D6

Maintenance and Service Instruction



This instruction is valid for all D6 pump models shown on page 2

D6 0612GB
July 2001

⚠ Before commencing any work, read this instruction carefully! Failure to comply with these instructions may cause damage and personal injury!

For more information about the pumps identification code, technical data and performance we refer to the D6 Product description. Fore more information about the pumps installation, Start-up and trouble shooting we refer to the IMO Installation and Start-up instruction for medium and high pressure pumps.

List of components

Valid for all D6 pumps in sizes 038 / 045 / 052 / 060 / 070. Rotor diameter and generation: K3 / N3

With version codes: S (R, T, V) (B, F, T, J) (Y, Z)

The version code is composed of the letters in the 4 columns. Also valid for: Pump option A101, A309.

Example of pump designation std: D6 038 N3 STBZ
Option: D6045K3 STBZ A101

Pos no	Denomination	Qty	G012	G050	G053	G054	G057	Note
102	Power rotor	1	x			x		
1030	Return valve	1	x			x		
120	Distance washer	1	x		x	x	x	1
122	Ball bearing	1			x	x	x	
123	Locking washer	1			x	x	x	2
124	Bearing nut	1			x	x	x	2
124	Retaining ring	2			x	x	x	1
124A	Support ring	1			x	x	x	1
139	Balancing ring	1	x			x		
139A	Shaft nut	1	x			x		1
139B	Washer	1	x			x		1
202	Idler rotor	2	x			x		
376	Balancing bush	2	x			x		
382	Screw	4						4
391	Plate	1						4
395	Supporting plate	1						
395A	Screw	1						
401	Pump body	1						
423	O-ring	1						3
427	Split flange	2						3
427A	Pipe weld	1						3
428	Screw	4						3
428A	Washer	4						3
451	Screw	6						
451A	Washer	6						
453	Screw	4						
453A	Washer	4						
463	Plug	1						
463A	T-ring	1			x	x	x	
489	Strainer	1						3, 4
491	Nut	1						3
501	Front cover	1						
506	O-ring	1			x	x	x	
507	Support ring	1						
507A	Locking washer	1						
507B	Washer	1						2
509	Mechanical shaft seal	1		x	x	x		
514	Retaining ring	1						1
514A	Support ring	1						1
520	Cover	1				x		
520A	O-ring	1			x	x	x	
521	Screw	3						
521A	Washer	3						
521B	Shims	1						1
523	Distance washer	1						

Explanations:

G012 = Rotor set CW-rotation

G050 = Shaft seal

G057 = Joint kit

Note:

1 Valid for xxxY

2 Valid for xxxZ

3 Valid for xxJx

4 Valid for xxTx

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Pos no	Denomination	Q-ty	G012	G050	G053	G054	G057	Note
523A	Spring	2						
523B	Shims	2						2
551	Inlet chamber	1						
556	Gasket	1			x	x	x	

Exploded view

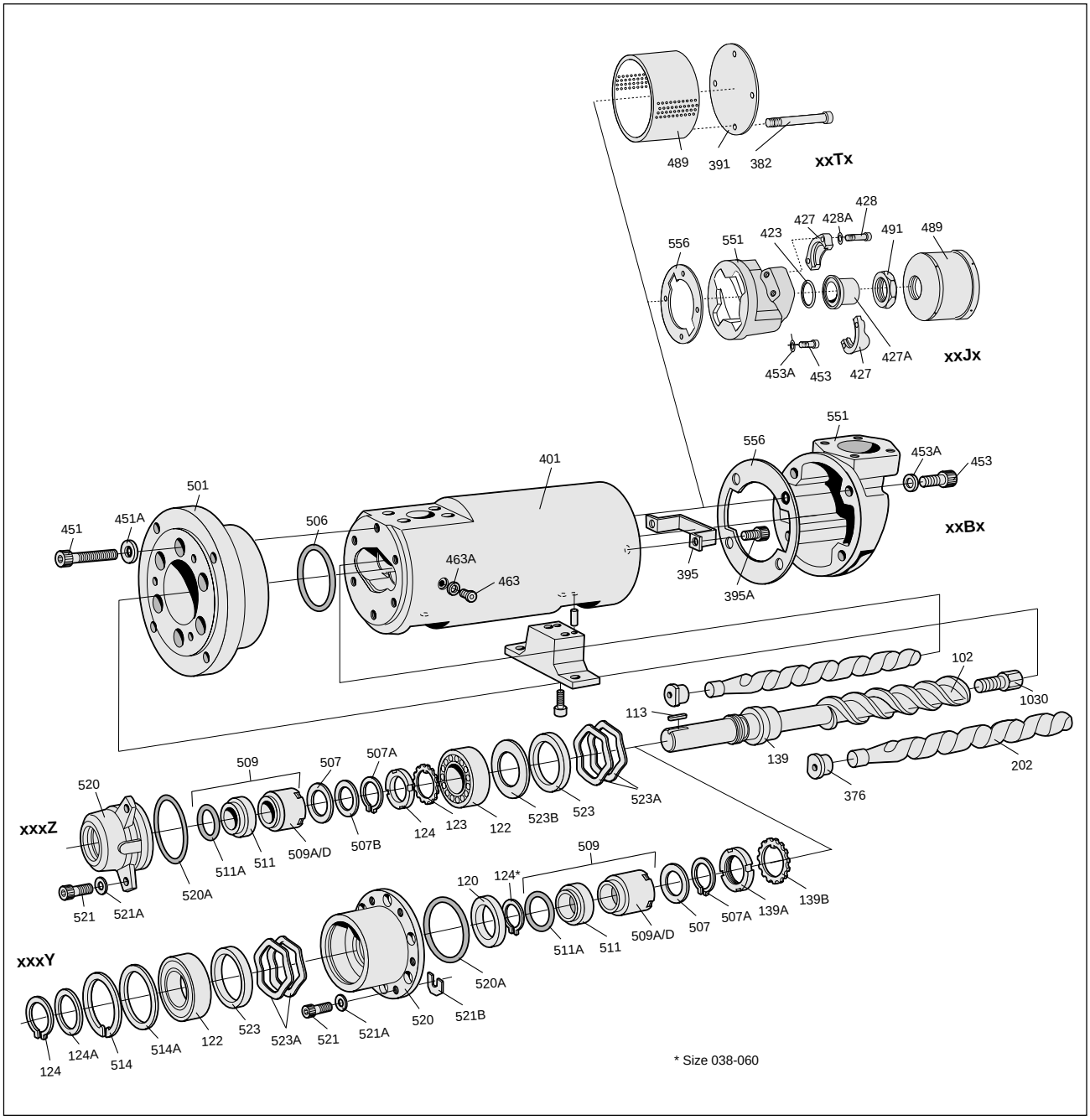

Fig.1

Ordering code

Pos no	Spare parts sets		Part numbers, sizes 038	045	052	060	070
G012	N-lead / I-lead	xxxZ	162958	162974	162990	163014	163030
	K-lead	xxxZ	162941	162966	162982	163006	163022
	N-lead	xxxY	163055	163071	163097	163113	163139
	K-lead	xxxY	163048	163063	163089	163105	163121
G050		xRxZ	120873	124610	134908	128728	164921
		xTxZ	172726	172049		168914	173047
		xVxY	159988	159855	159749	159541	159467
		xTxY				189455	
		xVxZ	121780	190338	190340	142299	168211
G057		xRxZ	185959	185967	185975	185983	185991
		xVxZ	189036				189037
		xxxY	186007	186015	186023	186031	186049

Recommendation for maintenance

Every shut down for service of a plant is costly. The time for repair should therefore be limited to a minimum which can be accomplished by keeping a spare pump. The changed pump can later be repaired at a suitable place and can then be used as a spare pump.

For maintenance the following spare parts kits are recommended:

Kit	Contents	To be used for
G057	Gasket, ball bearings, etc.	Dismantling of the pump.
G053	Minor kit G057 + shaft seal G050.	Normal scheduled inspection.
G054	Major kit, pump element G102 (CW)	Repair after damage or greater wear
Ordering Example		For IMO-pump D6 038N3 STBZ
Rotor set G012		Part no 162958
Shaft seal G050		Part no 172726

Fig. 2

Service intervals

The intervals for inspection and replacement of wear parts vary greatly with the properties of the pumped liquid and can only be determined by experience.
All internal parts of the D6-pump are lubricated by the pumped liquid. Pumping a liquid containing abrasive materials, or a liquid that is corrosive, will significantly reduce service life and call for shorter service intervals.
Wear in the pump may be indicated by:

- Vibration
- Noise
- Loss of capacity
- Reduction in flow or pressure
- Leakage

In installations where unplanned shut downs must be avoided, it is advisable to have a complete pump available for replacement, should any malfunction occur. Furthermore we recommend planned inspection and overhaul at regular intervals, not exceeding 3 years.
It is recommended always to have the spares included in the minor spare part kit available.

⚠ Before any maintenance work, ensure that the driver is deenergized and the pump hydraulically isolated.

⚠ Connecting and disconnecting of electric cables must be done only by personnel authorized to do such work.

⚠ If the operating temperature exceeds 60°C let the pump cool off before any service, maintenance or dismantling work is commenced to avoid burn injury.

⚠ All work carried out on the pump has to be performed in such a manner that risks for personal injury are observed!

⚠ When handling liquids that may harm skin use gloves and/or protective clothing.

⚠ When handling liquids which may involve fire hazards appropriate precautions to avoid danger are to be taken.

⚠ In case of failure for a system with elevated pressure, fluid jets may cause injury and/or damage.

⚠ Oil leakage may make the floor slippery and cause personal injury.

Sectional view

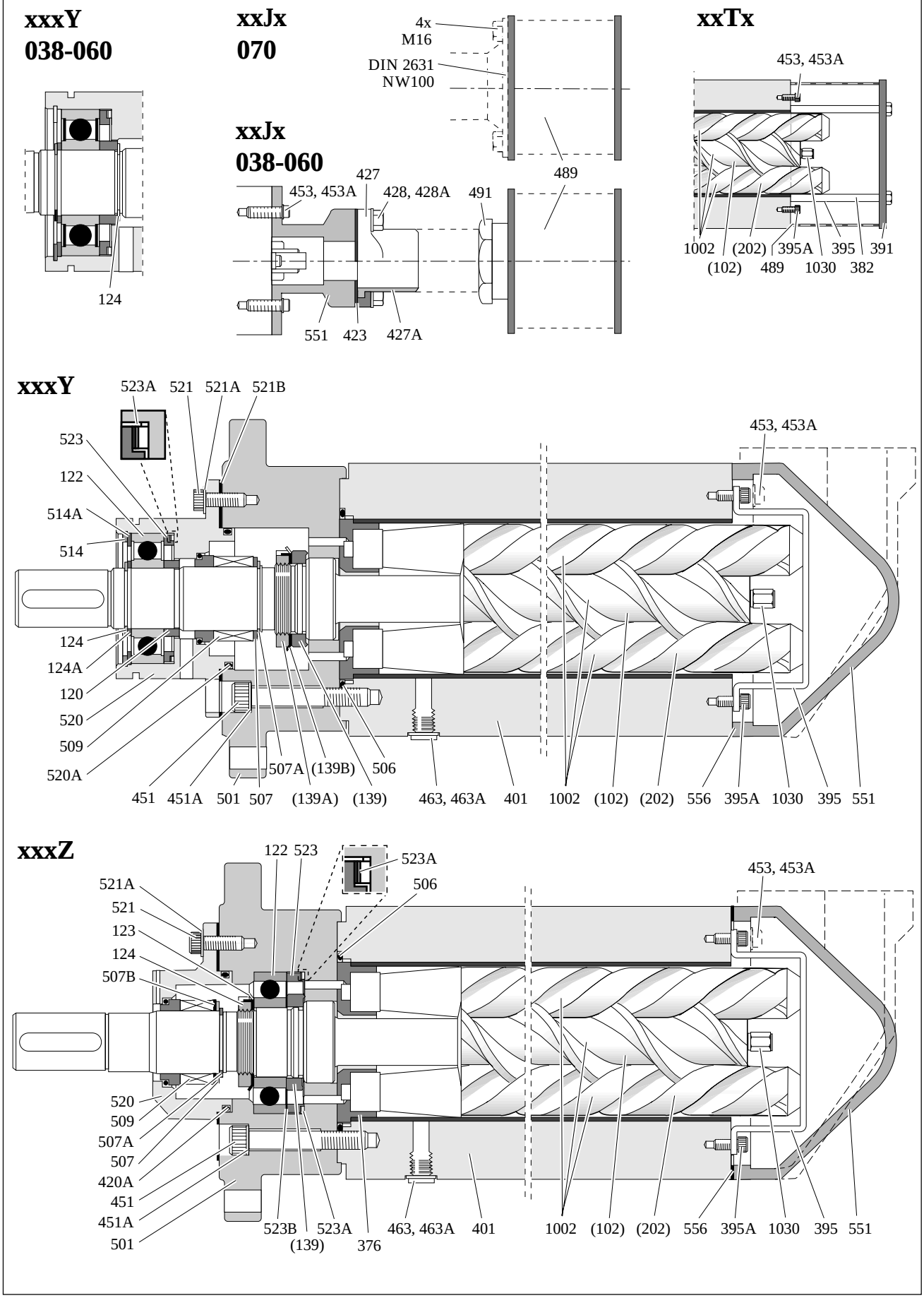

Fig. 3

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Inspection of rotors

If the pump is not able to maintain the pressure inspect the rotor parts by following the instructions in fig. 13.
Acceptable clearances can be determined only by experience of the actual application. As a rule of thumb the following values may apply:

- Between rotor and bores or bushings: 0.2 mm
- Between rotor flanks: 0.2 mm

For light duties (low pressure, medium viscosity) even bigger clearances may be acceptable but for low visc. / high pressure duties the limit will be lower.
Also watch if there are major scratches on these parts.

Useful tools

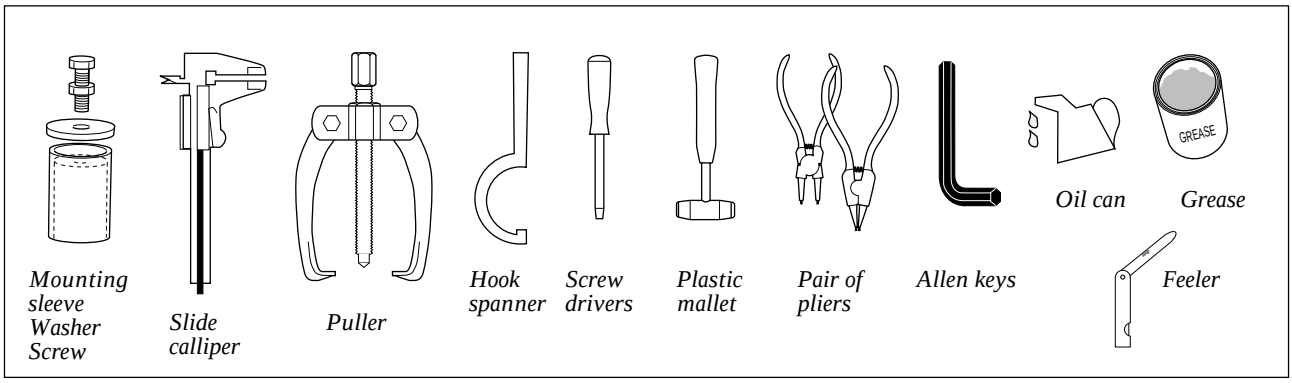


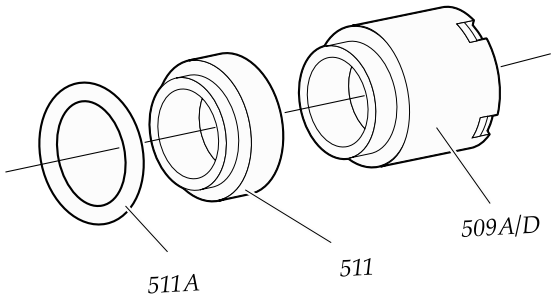
Fig. 4

Inspection of shaft seal

As the seal faces of a mechanical shaft seal are lubricated by the fluid, a certain leakage will always be present. Up to ten drops per hour can be considered as acceptable.
An external visual inspection of the pump is advisable at least every two days to assure that the shaft seal is not leaking too much. Excessively leaking shaft seals should be changed without delay, as the leakage normally will grow worse and cause additional damage.

Follow the instructions in the dismantling / mounting session.
When working with a shaft seal, cleanliness is of utmost importance. Avoid touching the seal faces. If necessary, the seal faces should be cleaned immediately prior to assembly, using a dustfree cloth and clean solvent.
Never use grease on the seal faces.

Shaft seal – assembly drawing



509A/D	*Rotating member*
511	*Seat*
511A	*O-ring*

ATTENTION

Be careful to mount these parts in right order and in right direction!
Look carefully at this drawing!

Fig. 5

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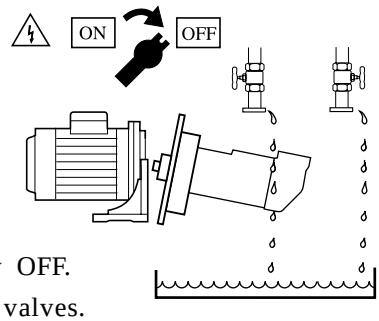
Internal ball bearing – Dismantling

A.



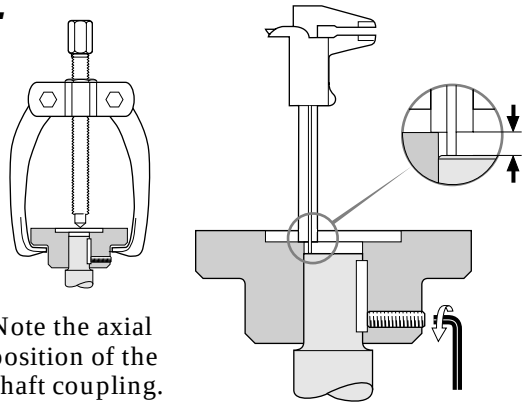
- Turn the electricity OFF.
- Close the valves.
- Remove the pump from the system.

ATTENTION

Use appropriate vessels to collect oil spillage when removing and opening the pump.

Fig. 6

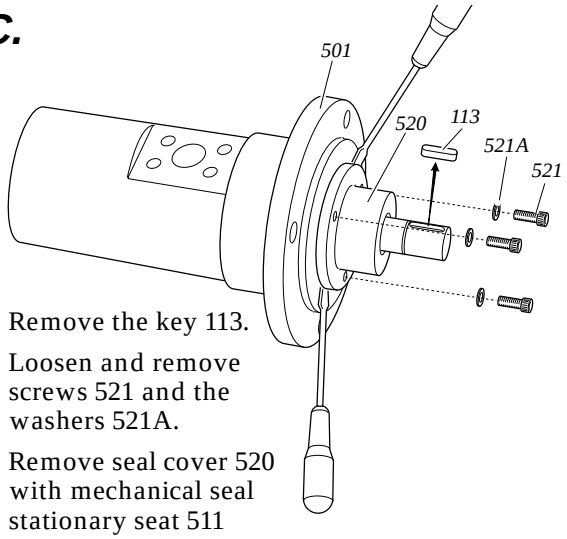
B.



- Note the axial position of the shaft coupling.
- Release the stop screw.
- Remove the coupling with a puller.

Fig. 7

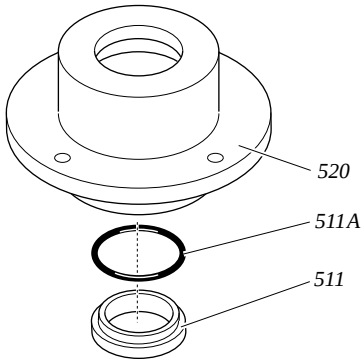
C.



- Remove the key 113.
- Loosen and remove screws 521 and the washers 521A.
- Remove seal cover 520 with mechanical seal stationary seat 511 from front cover 501.

Fig. 8

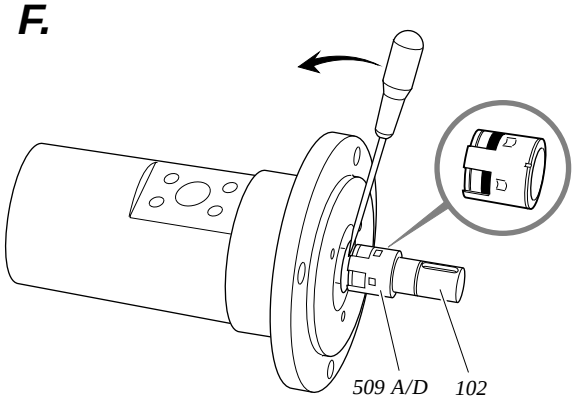
D.



- Push mechanical seal stationary seat 511 and O-ring 511A out of seal cover 520.

Fig. 9

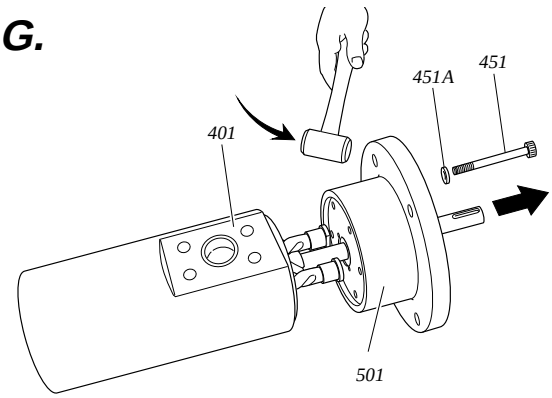
F.



- Push off mechanical seal rotating element 509 A / D from power rotor 102. (If only the shaft seal is to be replaced, dismantle only to this paragraph).

Fig. 10

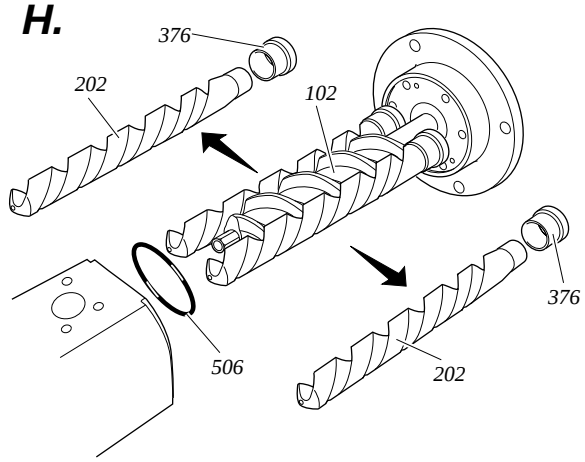
G.



- Loosen the screws 451 and washers 451A.
- Carefully loosen the front cover 501 from the pump body 401 with a plastic mallet.
- Remove the front cover 501 and rotor set in one move.

Fig. 11

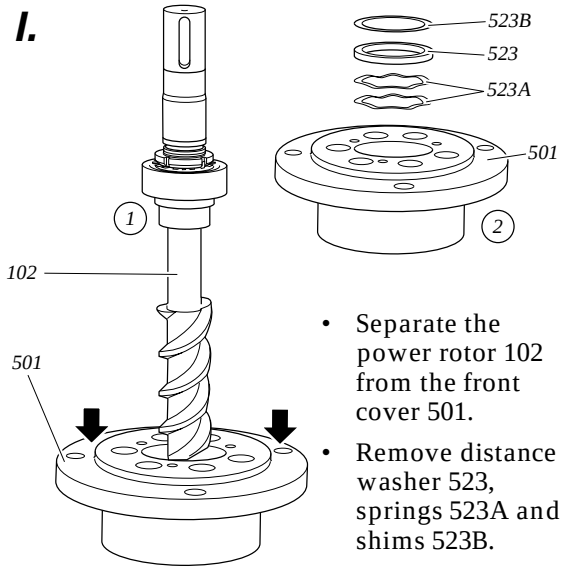
H.



- Inspect the rotors, balancing bushes 376 and O-ring 506 by separating them.

Fig. 12

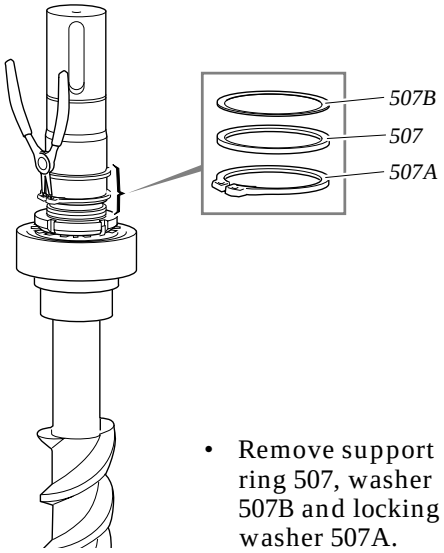
I.



- Separate the power rotor 102 from the front cover 501.
- Remove distance washer 523, springs 523A and shims 523B.

Fig. 13

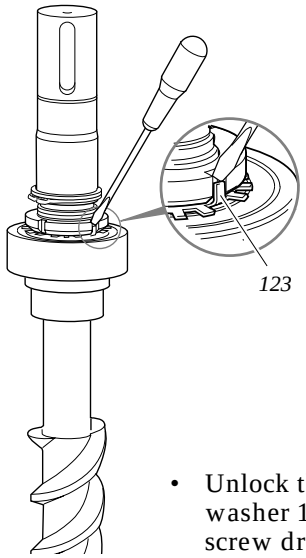
J.



- Remove support ring 507, washer 507B and locking washer 507A.

Fig. 14

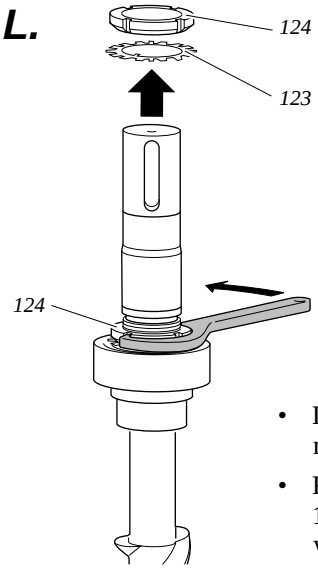
K.



- Unlock the locking washer 123 with a screw driver.

Fig. 15

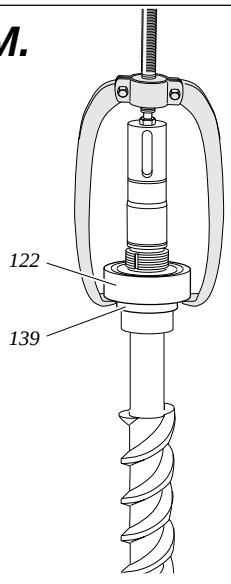
L.



- Loosen the bearing nut 124.
- Remove bearing nut 124 and the locking washer 123.

Fig. 16

M.



- Remove ball bearing 122. Keep the balancing ring 139 at its place on the shaft.

Fig. 17

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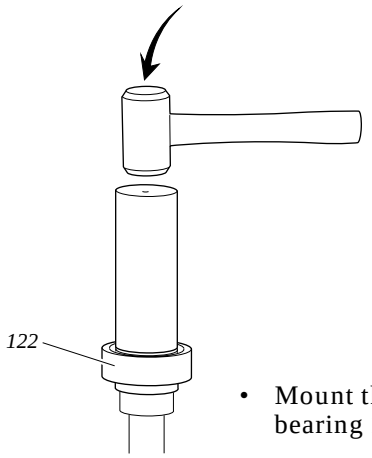
Reassembly

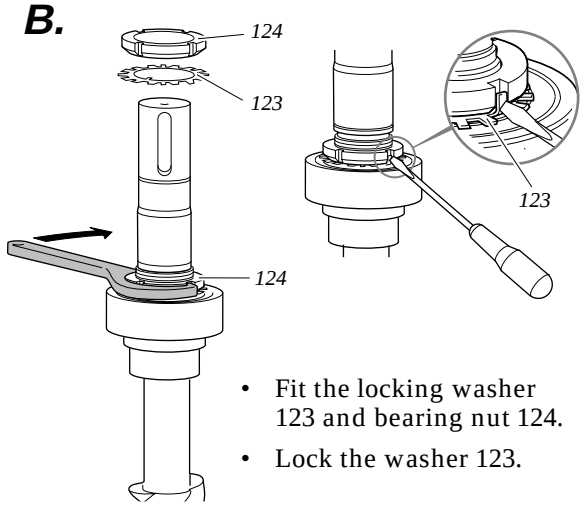
A.



- Mount the ball bearing 122.

Fig. 1

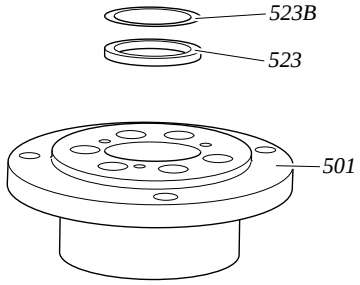
B.



- Fit the locking washer 123 and bearing nut 124.
- Lock the washer 123.

Fig. 19

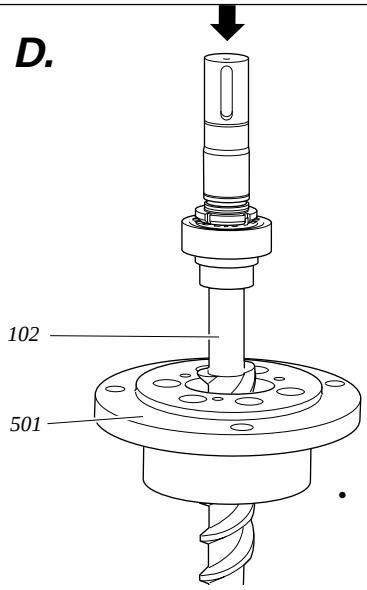
C.



- Mount the distance washer 523 and shims 523B in the front cover 501.

Fig. 20

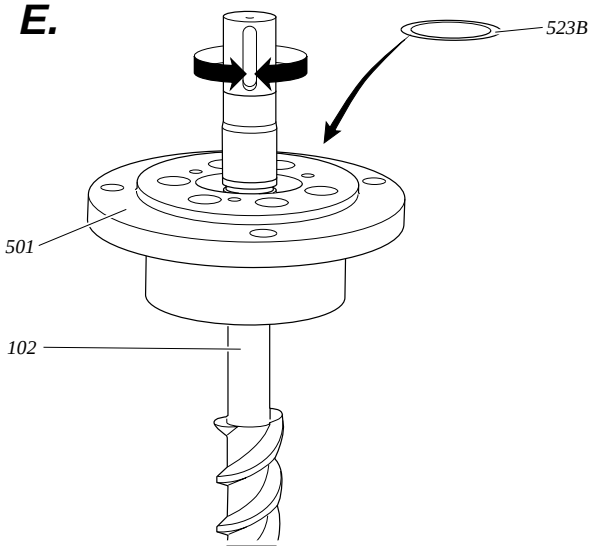
D.



- Fit the power rotor 102 in the front cover 501.

Fig. 21

E.

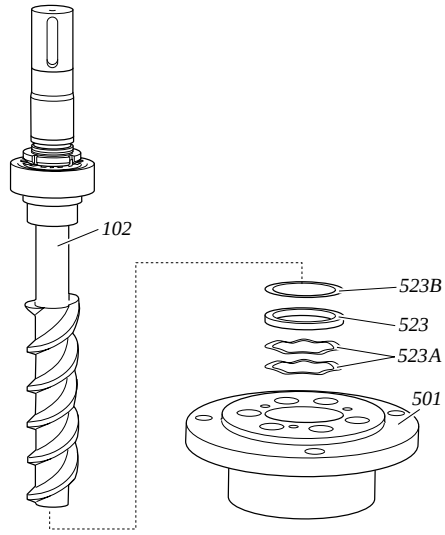


- Check all thickness combinations of the shims (523B) until the power rotor can easily be rotated by hand.

  When the thickness of the shims is such that the power rotor just starts to rotate easily, the thickness of the shims should be reduced by 0.1 mm to enable correct inwear of the balancing ring 139. The thickness of the shims may not exceed 0.4 mm when mounting. If this is the fact the ball bearing 122 might not be tightened to the balancing ring 139.

Fig. 22

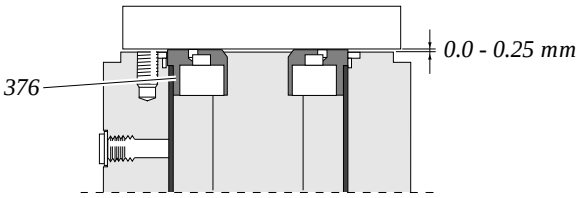
F.



- Lift the power rotor with ball bearing, the chosen shims set as well as distance washer 523 out of the front cover and mount the springs 523A in place. Put distance washer 523 and shims set 523B back in the front cover and push the power rotor carefully in its position.

Fig. 23

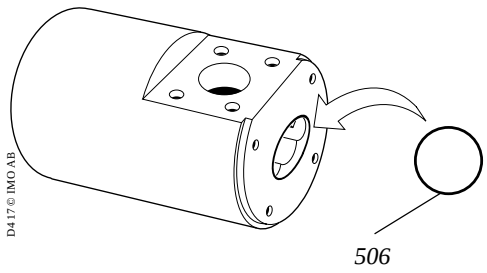
G.



- Check prior to assembly-by mounting the balancing bushes 376 in the pump body 401 and by placing a ruler over their end faces that the balancing bushes extend 0.0-0.25 mm above the end face on the pump body. If not, replace the balancing bushes.

Fig. 24

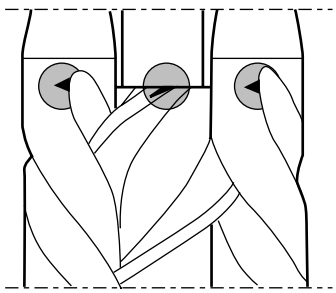
H.



- Fit the O-ring 506.
- Lubricate it with bearing grease if it is difficult to keep it in place.

Fig. 25

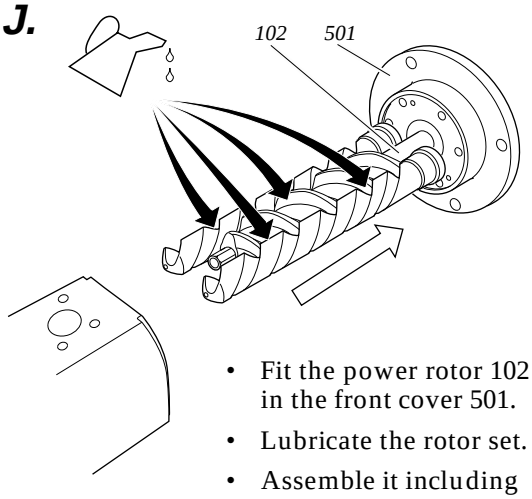
I.



- A nick has been filed on the power rotor thread on the outer diameter at the discharge end. This marked power rotor thread should be fitted into the female thread on the idler rotors marked in the same manner.

Fig. 26

J.



- Fit the power rotor 102 in the front cover 501.
- Lubricate the rotor set.
- Assemble it including balancing bushes 376.

Fig. 27

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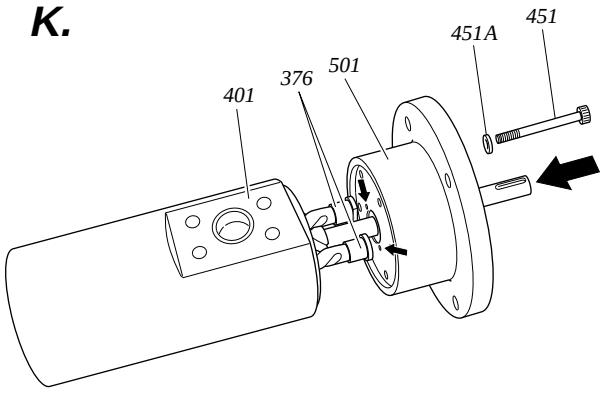
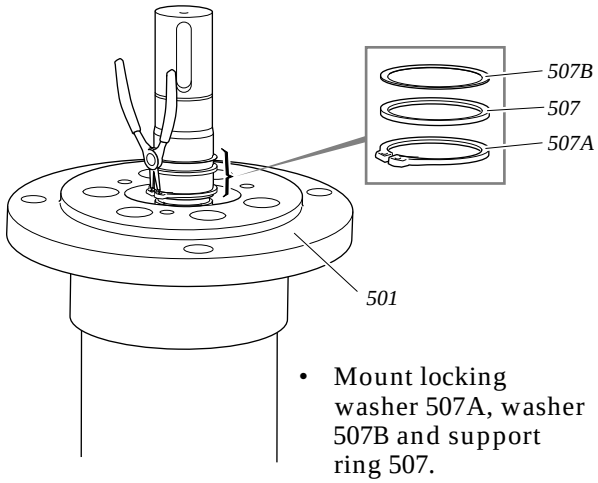
K.



- Turn the front cover 501 until the holes (see arrows) are in place behind the balancing bushes 376.
- Fit the front cover with the screws 451 and washers 451A.

Fig. 28

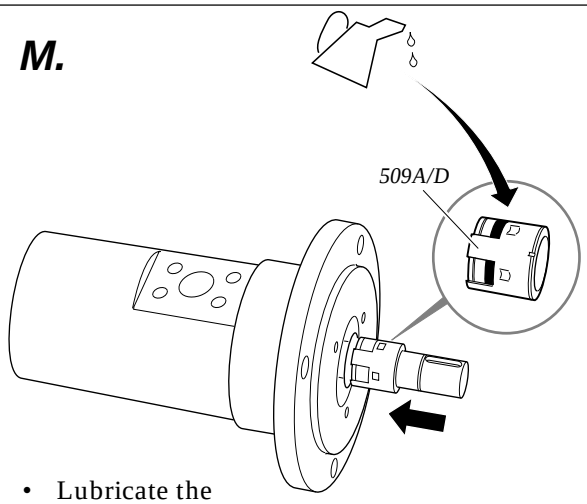
L.



- Mount locking washer 507A, washer 507B and support ring 507.

Fig. 29

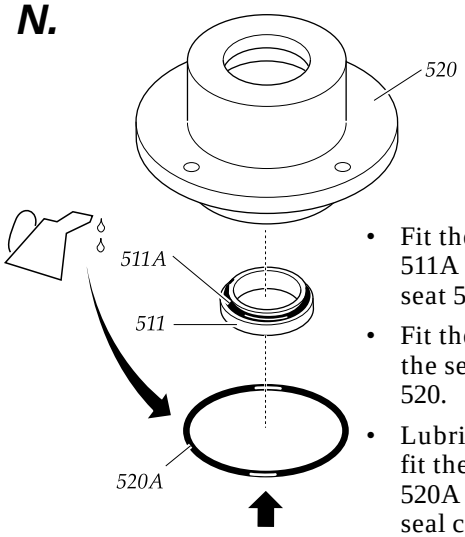
M.



- Lubricate the power rotor shaft and the shaft seal.
- Mount the rotating member 509A / D.

Fig. 30

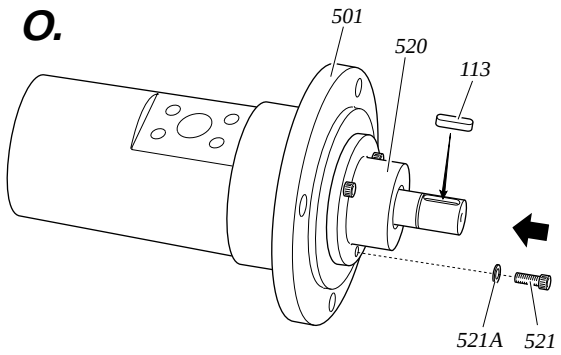
N.



- Fit the O-ring 511A in the seat 511.
- Fit the seat in the seal cover 520.
- Lubricate and fit the O-ring 520A on the seal cover 520.

Fig. 31

O.



- Fit the seal cover 520 on to the power rotor shaft 102.
- Fit the screws 521 and washers 521A and tighten them carefully.
- Fit the shaft key 113.

Fig. 32

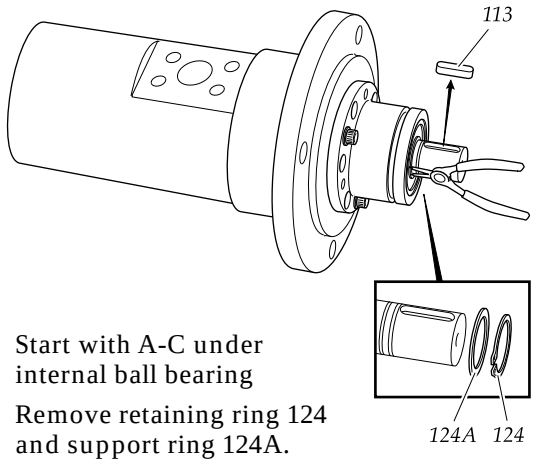
P.

- Fit the coupling half back into place and lock with the stop screw.
- Check that the axial position is the same as before dismantling. (See fig 7.)
- Put the pump back into the system and proceed according to instructions under ”Start-up” in the installation manual.

Fig. 33

External ball bearing – Dismantling

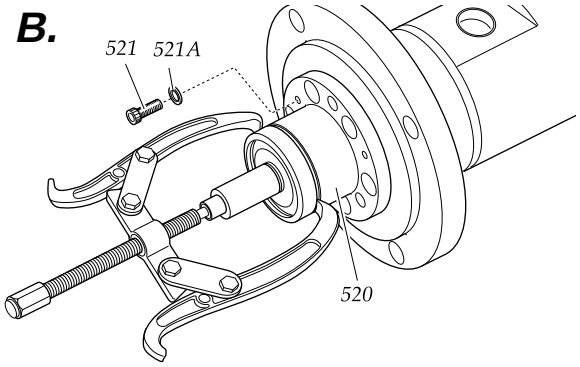
A.



- Start with A-C under internal ball bearing
- Remove retaining ring 124 and support ring 124A.

Fig. 354

B.

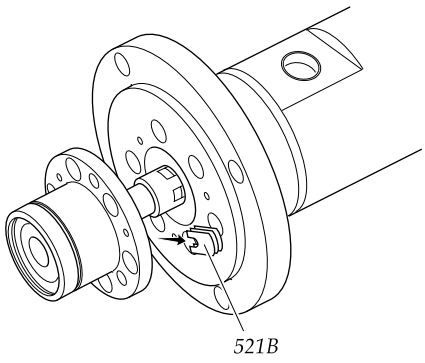


- Remove screws 521 and washers 521A.
- Fit the puller in the groove in seal cover 520.
- Pull off seal cover 520.

  Note: The seat will remain on the shaft.

Fig. 365

C.



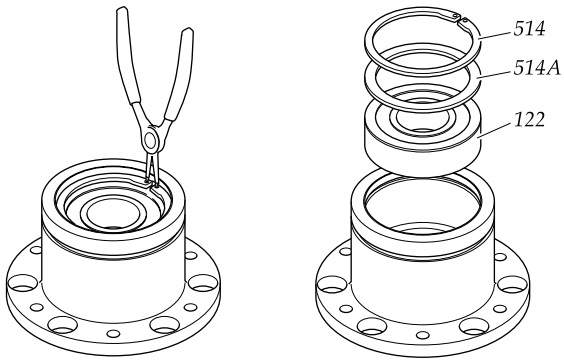
- Gather the shims 521B.

ATTENTION

Note the correct position of the shims.

Fig. 36

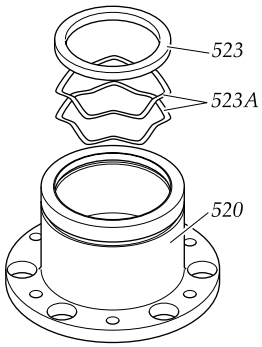
D.



- Remove the retaining ring 514, the support ring 514A and the ball bearing 122 from the seal cover 520.

Fig. 37

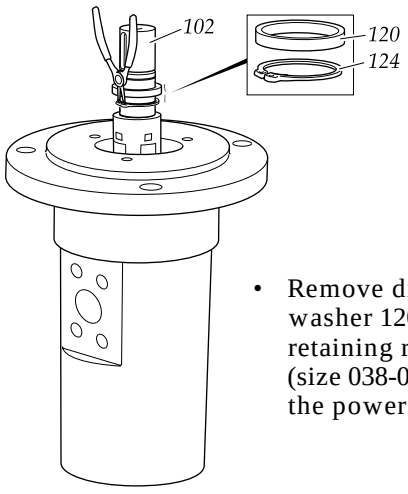
E.



- Remove distance washer 523 and the springs 523A from the seal cover 520.

Fig. 38

F.



- Remove distance washer 120 and retaining ring 124 (size 038-060) from the power rotor 102.

Fig. 39

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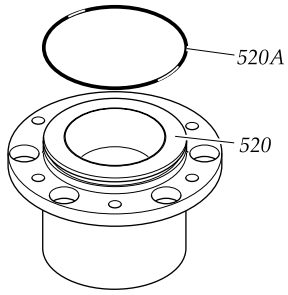
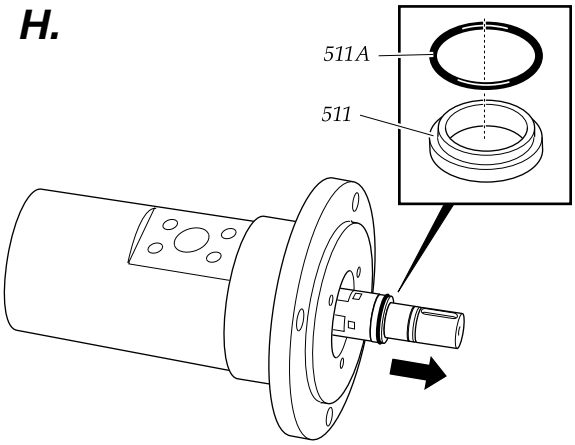
G.



- Remove O-ring 520A from the seal cover 520.

Fig. 40

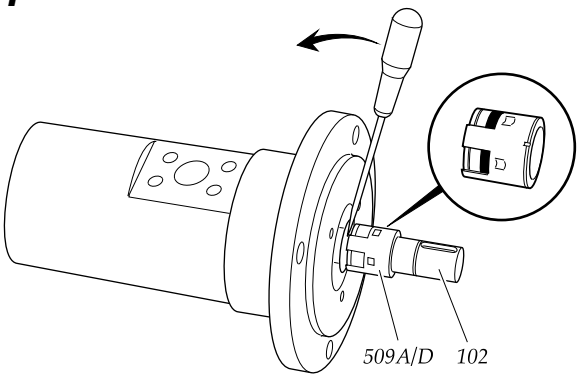
H.



- Remove the seat 511 from the power rotor 102.
- Separate the O-ring 511A from the seat 511.

Fig. 41

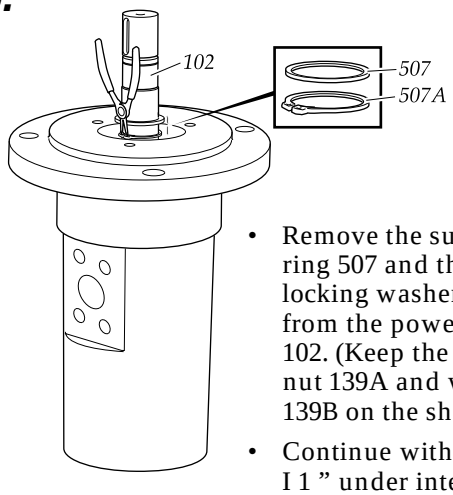
I



- Remove the rotating member 509A / D from the power rotor 102.

Fig. 42

J.

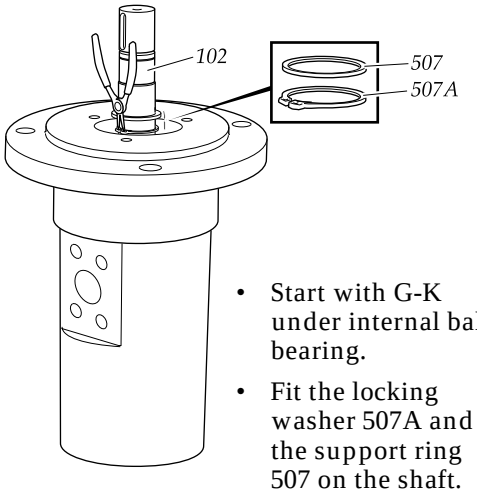


- Remove the support ring 507 and the locking washer 507A from the power rotor 102. (Keep the shaft nut 139A and washer 139B on the shaft).
- Continue with ”G, H, I 1 ” under internal ball bearing.

Fig. 43

Reassembly

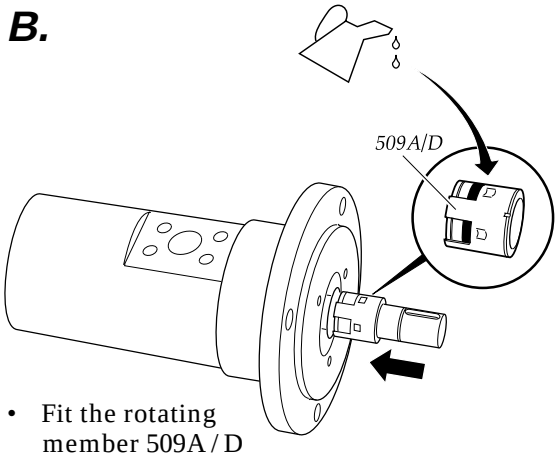
A.



- Start with G-K under internal ball bearing.
- Fit the locking washer 507A and the support ring 507 on the shaft.

Fig. 44

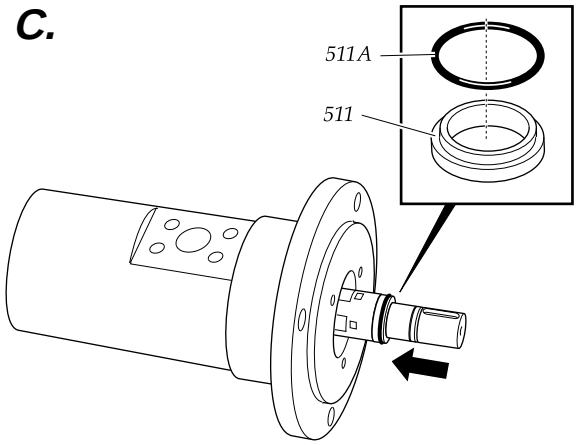
B.



- Fit the rotating member 509A / D back on the shaft.

Fig. 45

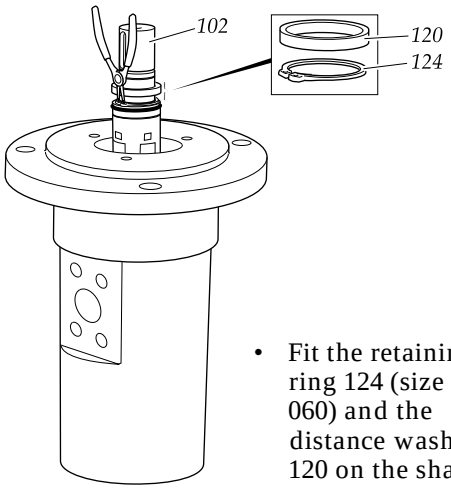
C.



- Fit the O-ring 511A on the seat 511.
- Fit the seat on the shaft.

Fig. 46

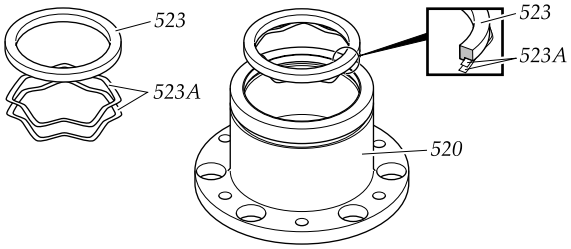
D.



- Fit the retaining ring 124 (size 038-060) and the distance washer 120 on the shaft.

Fig. 47

E.

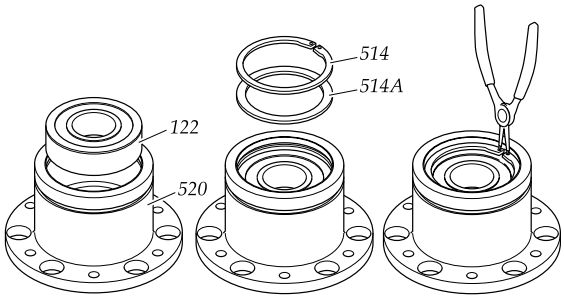


- Put the springs 523A and the distance washer 523 back in the seal cover 520.

Note: Be careful that the springs fit on the drive of the distance washer. It is important that the springs are mounted in each other.

Fig. 48

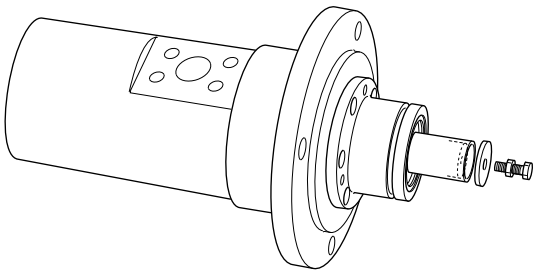
F.



- Fit a new ball bearing 122 in the seal cover 520.
- Fit the support ring 514A and the retaining ring 514 in the seal cover 520.

Fig. 49

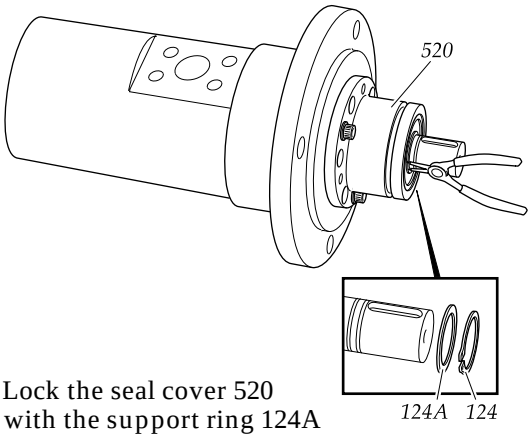
G.



- Put the seal cover 520 in place with help of a mounting sleeve, a washer and a screw.

Fig. 50

H.



- Lock the seal cover 520 with the support ring 124A and the retaining ring 124.

Fig. 51

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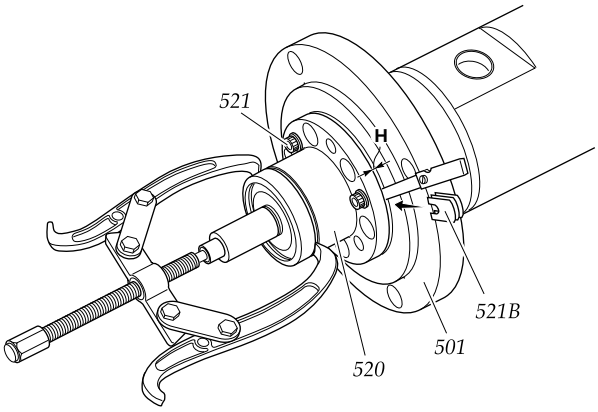
I.



- Use a puller to eliminate clearance in ball bearing and the spring flexibility.
- Measure the clearance H between seal cover (520) and front cover (501) using a feeler. Measurements to be made at the three screws (521). Use the average figure of the three measurements and choose from shims table the suitable combination of shims set (521B).
- Put shims around each of the screws (521) between the cover (520) and front cover (501). Take away the puller and tighten the screws (521).
- Check that the shaft can be turned.

  N.B. The shaft seal gives a certain turning resistance which is quite normal.

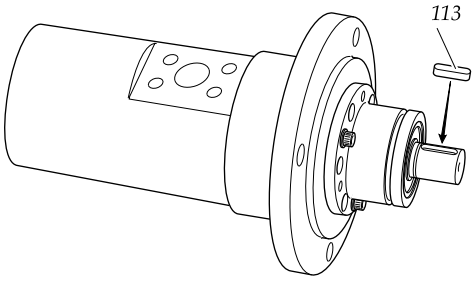
  Check before and after tightening that the shaft can be turned.

Fig. 52

Measured average figure H(mm) from	to	Tot. thickness shims to mount (mm)	Thickness combination to be chosen (mm)
0	0.04	Support ring to be surface ground to 0.1 mm	
0.04	0.14	0	
0.14	0.24	0.1	0.1
0.24	0.34	0.2	0.2
0.34	0.44	0.3	0.1-0.2
0.44	0.54	0.4	0.2-0.2
0.54	0.64	0.5	0.5 alt.0.2-0.2-0.1
0.64	0.74	0.6	0.5-0.1
0.74	0.84	0.7	0.2-0.5
0.84	0.94	0.8	0.1-0.2-0.5
0.94	1.04	0.9	0.2-0.2-0.5
1.04	1.14	1.0	0.5-0.5
1.14	1.24	1.1	0.5-0.5-0.1
1.24	1.34	1.2	0.2-0.5-0.5

Shims table

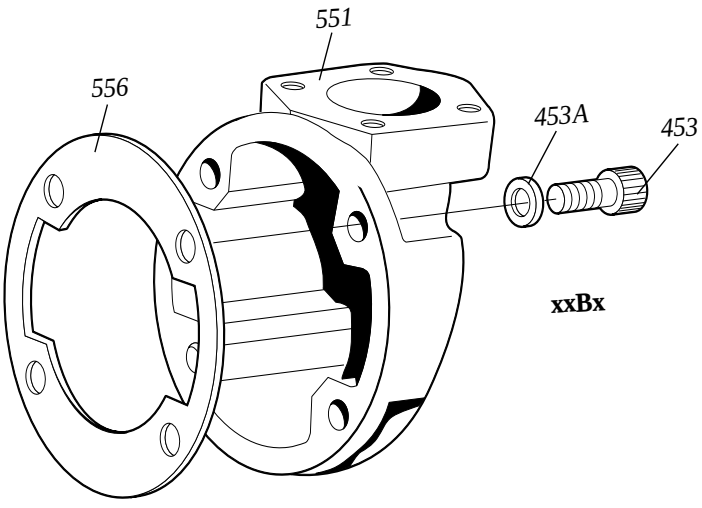
J.



- Fit the shaft key 113 and end up with ”P” under internal ball bearing.

Fig. 53

Replacing gasket 556



- Remove the inlet chamber 551 and gasket 556 by loosening the screws 453.
- Replace the gasket 556.
- Reassemble the parts.

Fig. 54

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