

ASSEMBLY INSTRUCTIONS

LIQUID RING PUMP



ASSEMBLY INSTRUCTIONS FOR
SAMSON LIQUID RING PUMPS, TYPES:

OCEAN MASTER[®] 250, 450 & TRUCK MASTER[®] 350, 600

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Date:	Revision:	Text:
13/05-15	A	Seal for ATEX pumps added.
19/06-15	B	Pictures of the ATEX grease cartridges added. Description of flush channel added.
01/04-16	C	Volume of grease in bearings modified. Minor corrections added.
23/05-16	D	Section on use of rental tools added. Minor corrections added.
07/06-16	E	Various ATEX corrections.
25/08-16	F	Text deleted on page 15 and page 16.
18/11-16	G	Section on KE200, KE300, KL400, KL500 added.
01/12-16	H	Section on KE200, KE300, KL400, KL500 removed.
07/03-17	I	Layout modified.
28/11-17	J	Implementation of assembly tools.
13/03-18	K	Logo updated.
23/01-19	L	Text about removing washer for shaft seal removed.
05/07-19	M	Layout updated.
20/08-20	N	Various ATEX corrections.



- Bolt, radial shaft seal and O-rings lubricated with a thin layer of grease prior to assembly, unless indicated otherwise.
- Document Test Report RE8.6-02-01 to be completed.
- For service see chapter 20.



- This symbol indicates that the step in question must be performed for ATEX pumps!
- Document RE8.6-02-03_ATEX Zone 0-1_Check sheet to be completed.

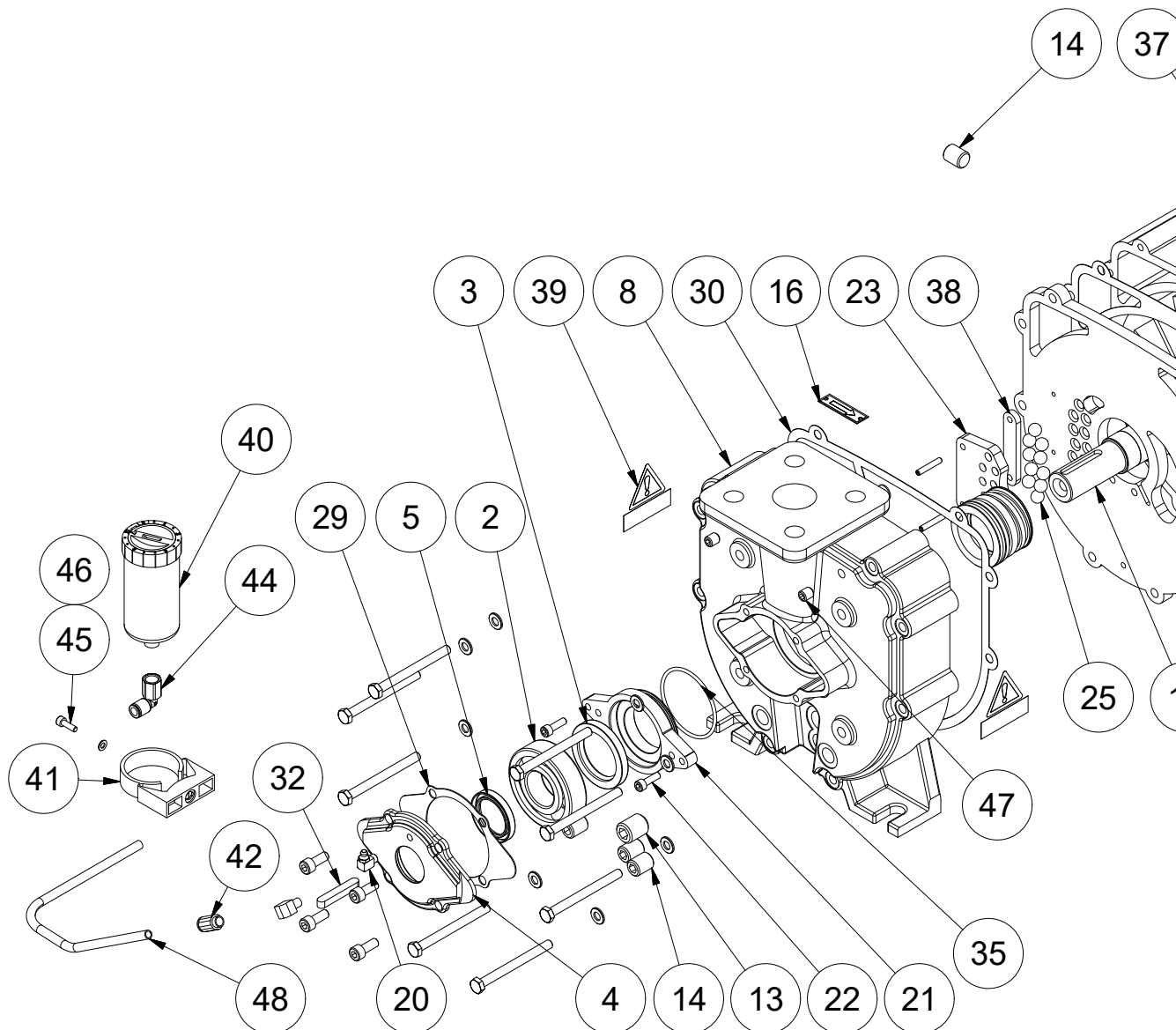
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1 Component overview

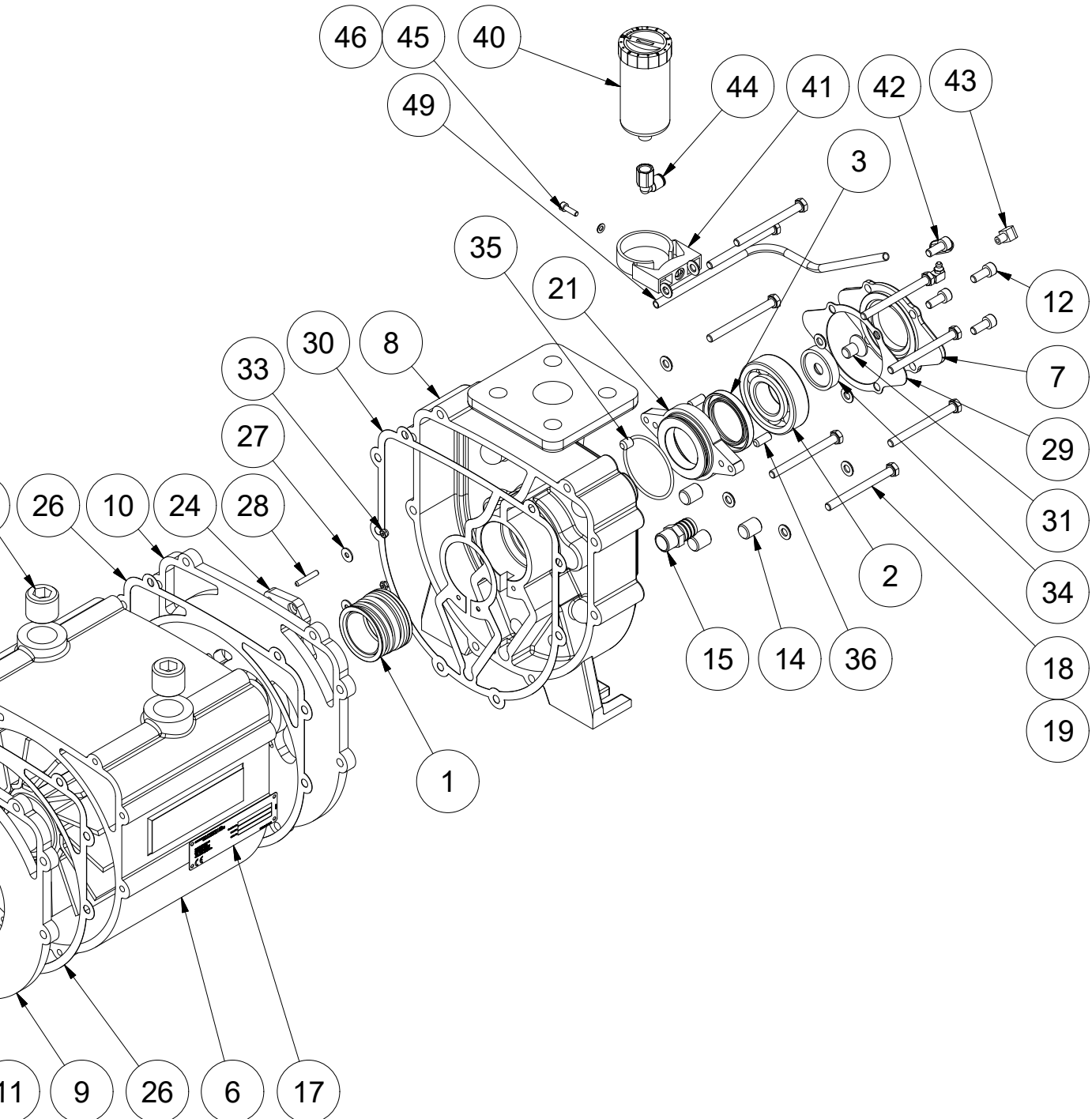


Product no.

OCEAN MASTER 250, 450 & TRUCK MASTER 350, 600

Product name:

Liquid ring pump



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Pos.	Part number	Description	Qty.	Material
1	922000042	Mechanical shaft seal	2	Steel
2	930000078	Ball bearing	2	Steel
3	1600003	Gasket set	1	-
4	1622072	Bearing cover DE	1	Cast iron
5	1600003	Gasket set	1	-
6*	1622036	Shell	1	Cast iron
	1622067	Shell	1	Coated
7	1622071	Bearing cover NDE	1	Cast iron
8	1622069	Pump housing	2	Cast iron
9*	1622038	Flow plate	1	Cast iron
	1622019	Flow plate	1	Stainless steel
10*	1622040	Flow plate	1	Cast iron
	1622020	Flow plate	1	Stainless steel
11*	1622043	Rotor R	1	Stainless steel
12	910300024	Allen screw	8	Steel
13	910300184	Plug	1	Brass
14	910300188	Plug	7	Brass
15	925000246	Hose nipple	1	Brass
16	-	Direction arrow	1	Aluminum
17	-	Identification plate	1	Stainless steel
18	910000020	Bolt	16	Steel
19	910100007	Washer	16	Steel
20*	915000197	Grease nipple	2	Steel
21	1622074	Adjustment plate	2	Cast iron
22	910300447	Allen screw	6	Stainless steel
23	1622024	Ball guide	1	Plastic
24	1622025	Ball guide	1	Plastic
25	962000047	Valve Ball	20	Plastic
26	1600003	Gasket set	1	-
27	910100149	Washer	4	Stainless steel
28	910300446	Socket set screw	4	Stainless steel
29	1600003	Gasket set	1	-
30	1600003	Gasket set	1	-

* -Type depends on the pump's configuration.

** -Optional. Not included as standard option.

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Pos.	Part number	Description	Qty.	Material
31	910300459	Allen screw	1	Steel
32	915000210	Parallel key	1	Steel
33	910200107	Lock nut	4	Stainless steel
34	1622075	Washer	1	Stainless steel
35	1600003	Gasket set	1	-
36	910300125	Socket set screw	2	Steel
37	910300182	Plug	2	Stainless steel
38	1622026	Spacer for ball guide	2	Stainless steel
39	1624020	Sticker Warning!	2	Plastic foil
40**	915000225	Automatic lubricator LAGD 125/WA2	2	Plastic / grease
41**	915000232	Clamp for automatic lubricator	2	Plastic
42**	944600239	Push-in nipple	2	Brass
43**	944600173	Elbow	2	Brass
44**	944600240	Elbow	2	Brass
45**	910300221	Allen screw	2	Steel
46**	910100002	Washer	2	Steel
47	910300281	Plug	4	Steel
48**	915000217	Plastic pipe	0,3 m	Plastic
49**	915000217	Plastic pipe	0,3 m	Plastic

* -Type depends on the pump's configuration.

**-Optional. Not included as standard option.

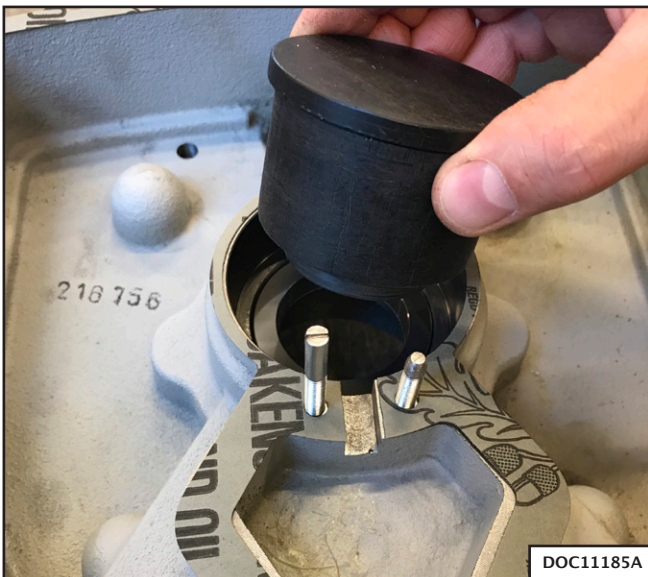
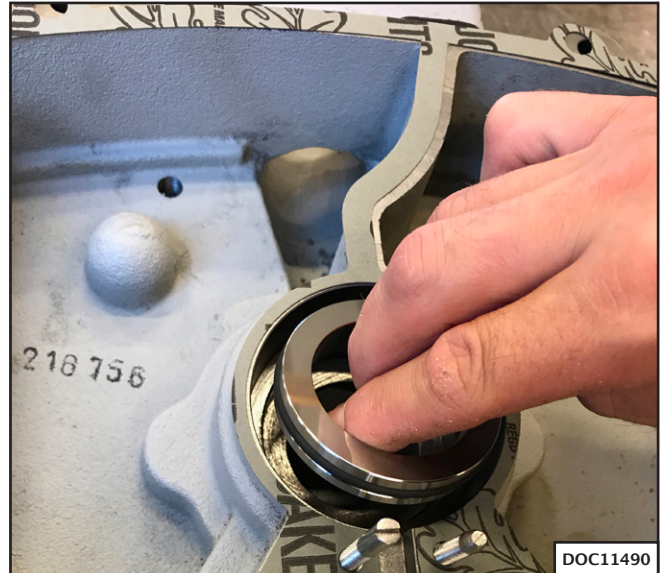
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2 Pump housing and shaft sealing ring



- Clean the pump housing on machined surfaces and use air pressure to blow into the holes.
- Clean the hole in the pump housing where the sealing ring will be mounted.
- Lubricate the hole in the pump housing for the sealing ring with a thin layer of grease.
- Insert plugs in the pump housing and hose nipple in the rear pump housing.

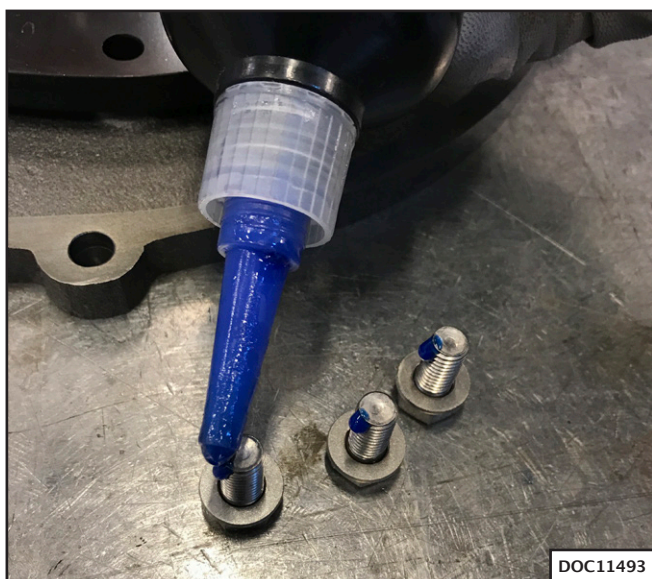
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- Mount the paper gasket correctly.
- NOTE. - The paper gasket can be rotated a half rotation incorrectly.
- Mount the sealing ring in both pump housings with the polished surface facing upwards using the plastic dorn. Press down the sealing ring all the way to the bottom.

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3 Flow plate, ball guide and balls



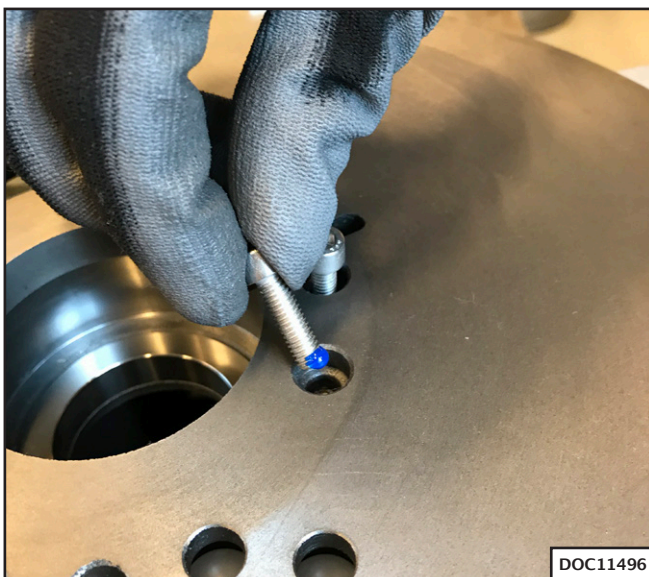
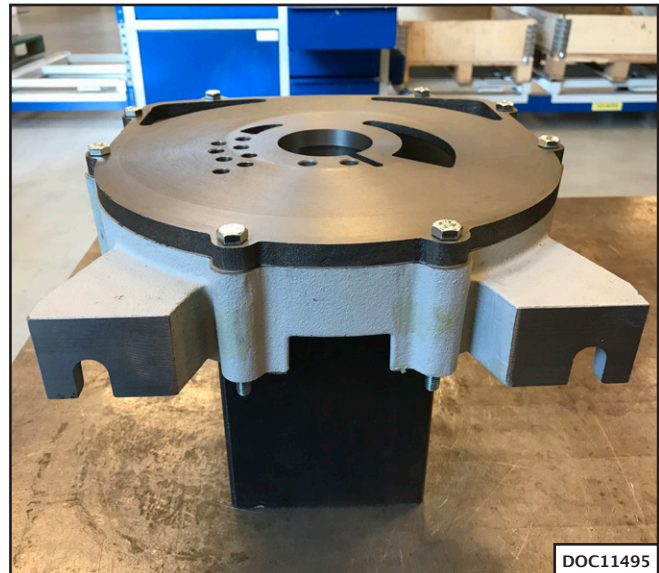
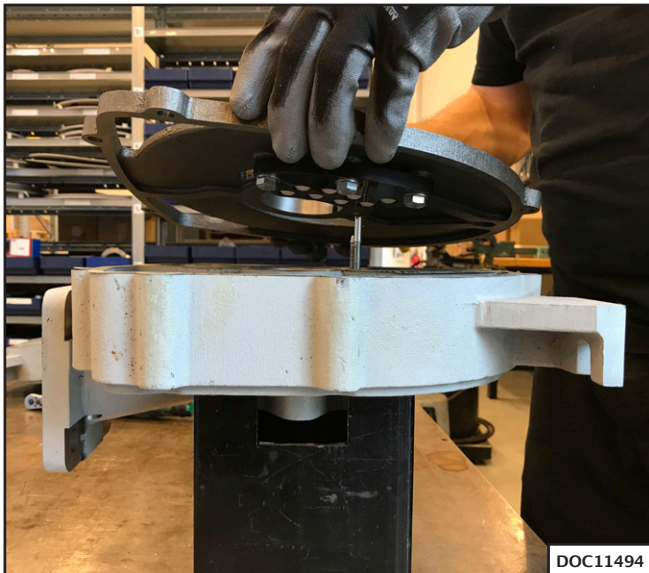
- Clean the flow plates, especially on the sealing surfaces and mount balls and ball guide. Apply screw locking to 3 M8x16 bolts and tighten to 7 Nm.



- 1 Close flush channel in flow plate, to ensure enough water flow during start-up.
Zone 0
- 2 Hose nipple to be mounted in both pump housings.
Zone 0

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4 Preparing the pump housing



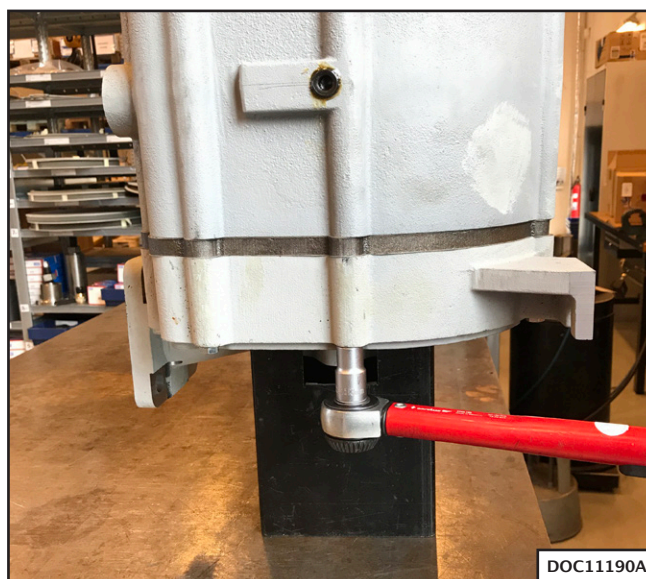
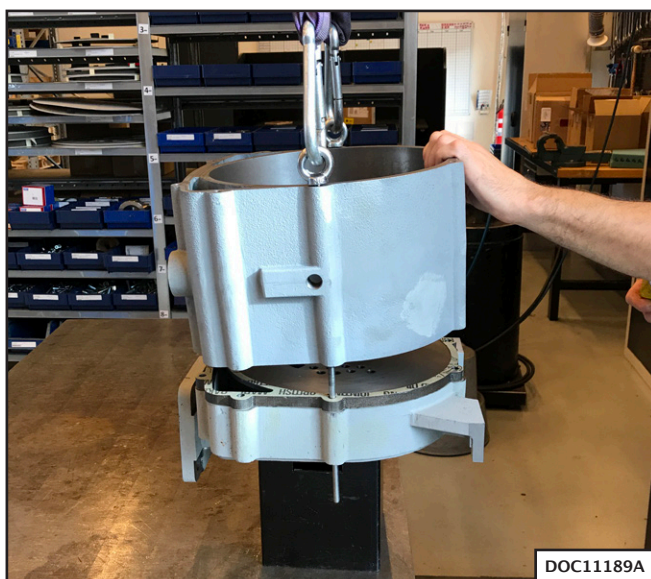
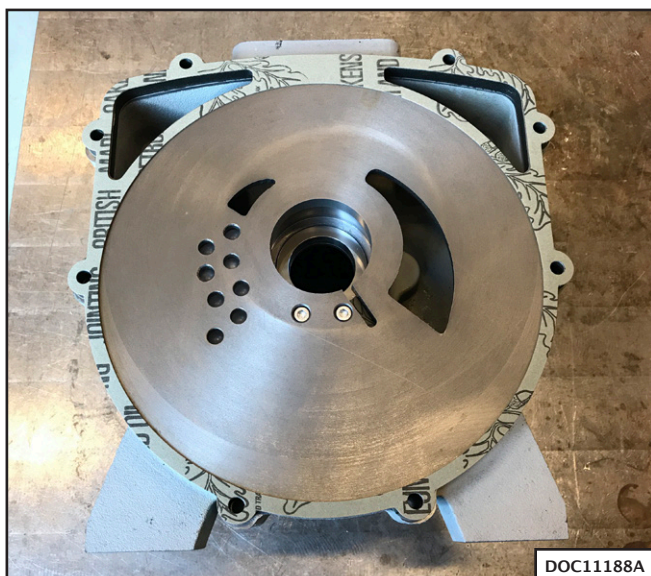
- Mount the flow plate above the pump housing with the paper gasket between them. This applies to both pump housings.
- NOTE. – The paper gasket must be mounted correctly (it can be rotated incorrectly).
- The flow plates are centred using a plastic dorn and 8 loosely mounted 8x90 mm bolts.
 - Then tighten 2 M6 bolts to 10 Nm.
 - Remove the 8 loosely mounted bolts now that the pump housing and flow plate are firmly fixed together.
 - The rear pump housing is completely assembled and should now be mounted onto the assembly base.

Selecting the correct flow plate for rear pump housing:

- For a **right pump**, the suction port (the large one) must become gradually larger when the rotor turns in the **clockwise direction**.
- For a **left pump**, the suction port (the large one) must become gradually larger when the rotor turns in the **counter-clockwise direction**.

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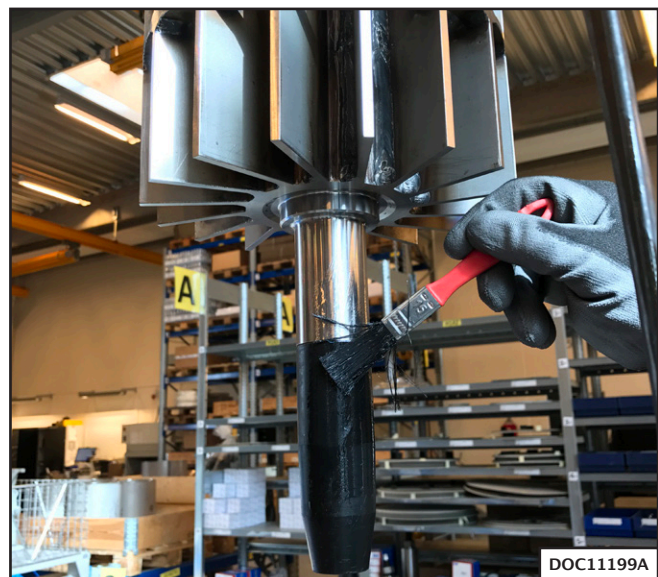
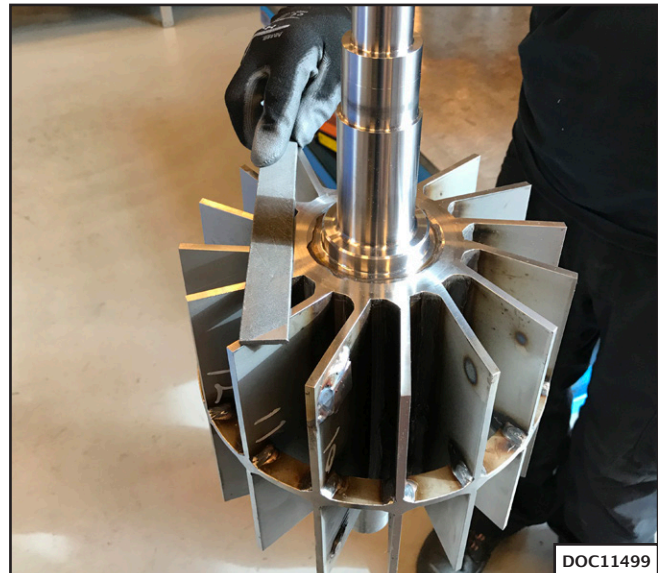
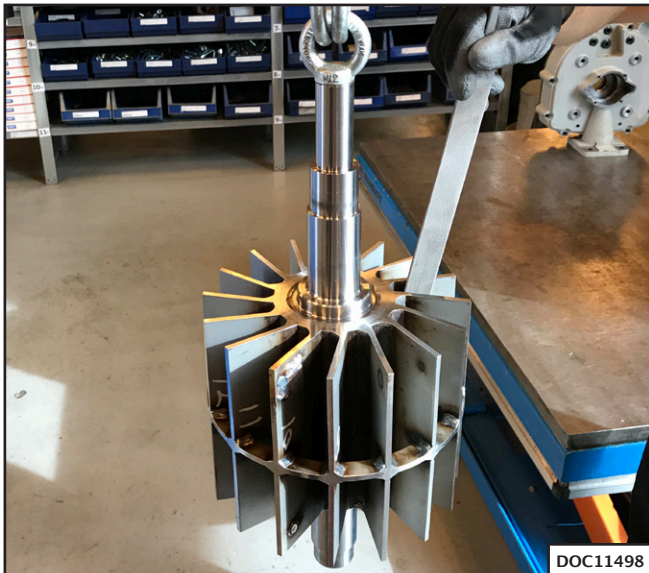
5 Assembly of pre-prepared rear pump housing and shell



- Mount a paper gasket, for example 0.8 mm above the flow plate.
- Clean the shell and check the sealing surfaces for defects.
- Use air pressure to blow into the thread holes in the shell for any shavings and dirt.
- Mount the pre-prepared shell above the paper gasket.
- Make sure that the shell is facing correctly: the 3/8" hole in the side of the shell must always face towards the pressure side/water side (same side as the ball guide and balls). The 2 x 1" thread holes in the shell must face upwards.
- Tighten the shell and rear pump housing with 8 M8x90 mm bolts to 25 Nm.

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6 Preparing of rotor



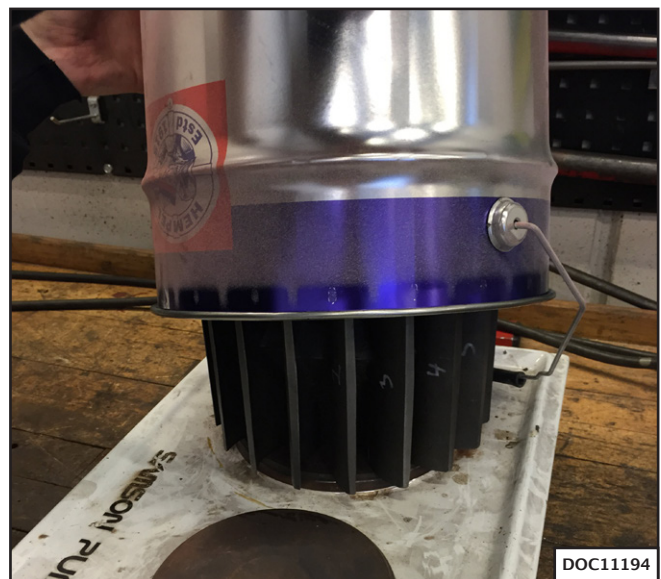
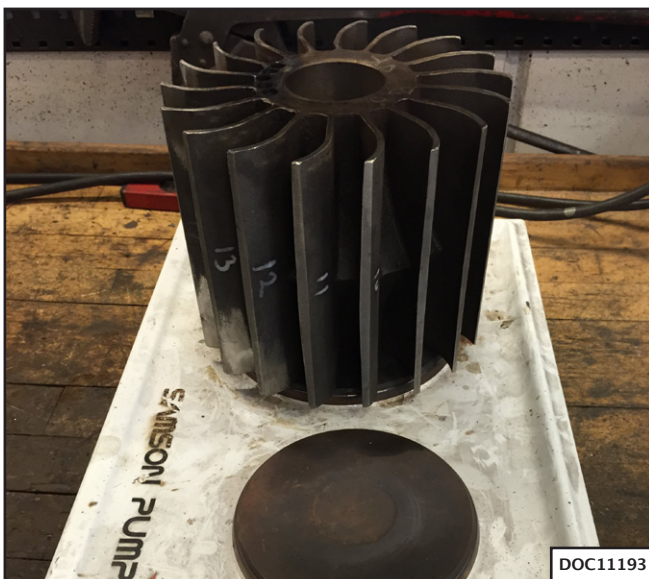
- Prepare the rotor by removing loose welding beads from both ends of the blades as well as from between the blades.
- Lubricate the plastic dorn and the rotor shaft with a thin layer of white oil.



3 Perform a visual inspection of the welds on the rotor. Zone 0

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7 Rotor crimping if required



Crimping of rotor: Only applies to KE200, KE300, KL400, KL500!

- Select the rotor and shaft according to the parts list.

Preparing the rotor:

- Remove edges from the balance holes.
- Remove the inside edge in the rotor with the belt sander, in order to ease the job of mounting the rotor shaft.
- Remove/blow out shavings from the inside of the shaft.
- Place rotor on a hotplate and heat up to approx. 150°C (this should take about 90 minutes)

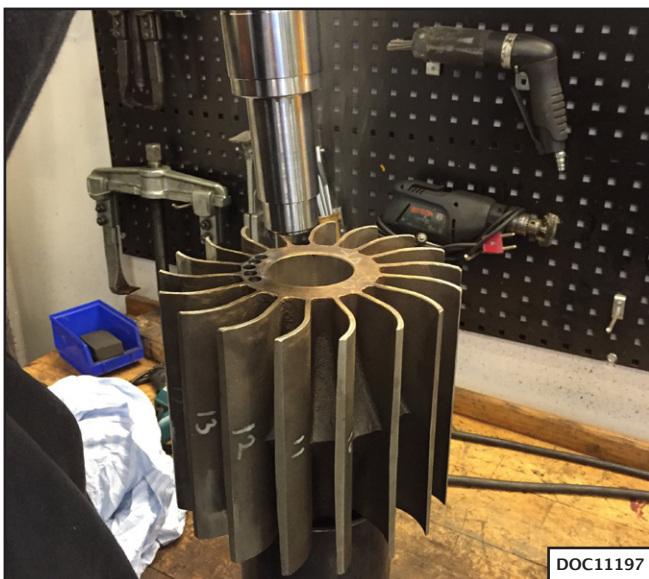
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DOC11195



DOC11196



DOC11197



DOC11198

Preparing of rotor: (to be carried out while the rotor is hot)

- Mount a special tool at the front end of the shaft, the groove side, and tighten 3 bolts. Note the engraving on the specialist tool.

e.g. The KE engraving must face downwards on the KE rotor and the KL engraving must face downwards on the KL rotor.

- When the rotor is a minimum of 150°C, place it on top of the assembly stand. Pay particular attention to the positioning of the rotor, whether it is right-facing/left-facing.
- Lower the shaft carefully down into the rotor with the groove side facing upwards.
- Once the completely crimped rotor has cooled down, the specialist tool can be removed.

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8 Mounting the shaft seal on the rotor



DOC11501



DOC11200A



DOC11201A

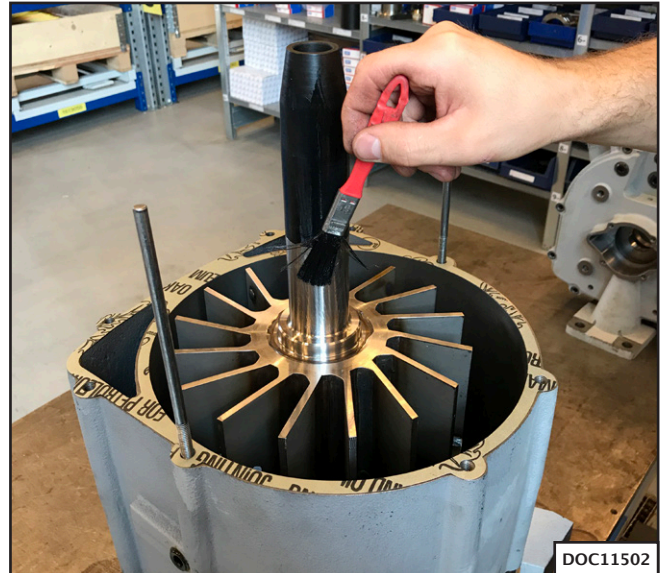
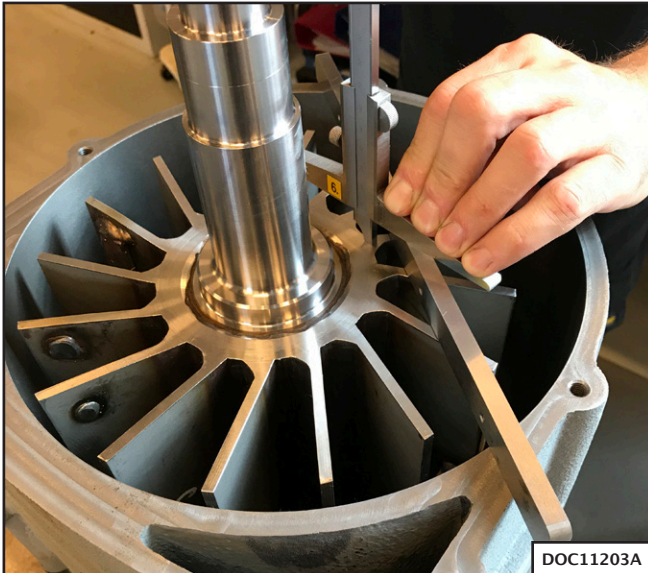


DOC11202A

- Mount a special tool (plastic dorn) at the rear end of the rotor shaft.
- Lubricate the plastic dorn, rotor shaft and inside of the shaft seal with a thin layer of white oil/grease.
- The shaft seal is mounted with the spring side first and the carbon ring outwards (away from the rotor blades).
- The plastic dorn must remain mounted on the rotor shaft and act as steering.
- Carefully lower the rotor down into the shell base first using a crane.
- Ensure that the crane is unloaded and that the rotor's blades are resting on the flow plate.

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9 Selecting the correct paper gasket thickness for the shell



Measure the distance from rotor blades to the edge of the shell using a depth gauge and straightedge. Measure 3 different spots and count the smallest result.

Example of measurement:

17.4 mm on depth gauge from shell to rotor blades (thickness of straight edge = 17.1 mm)

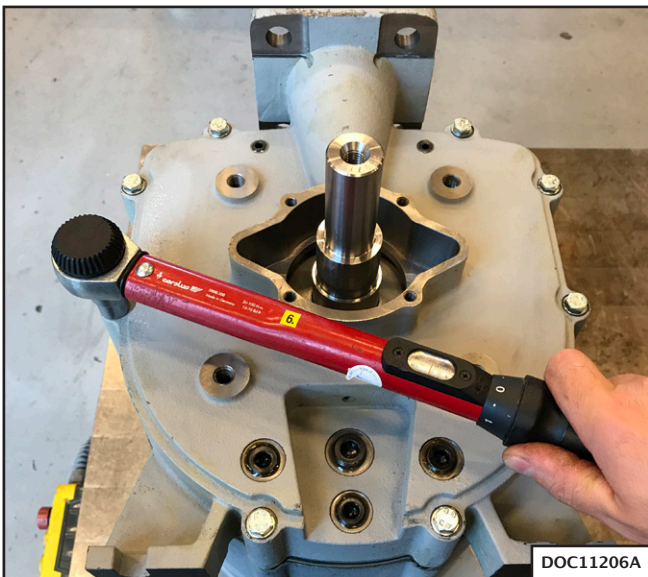
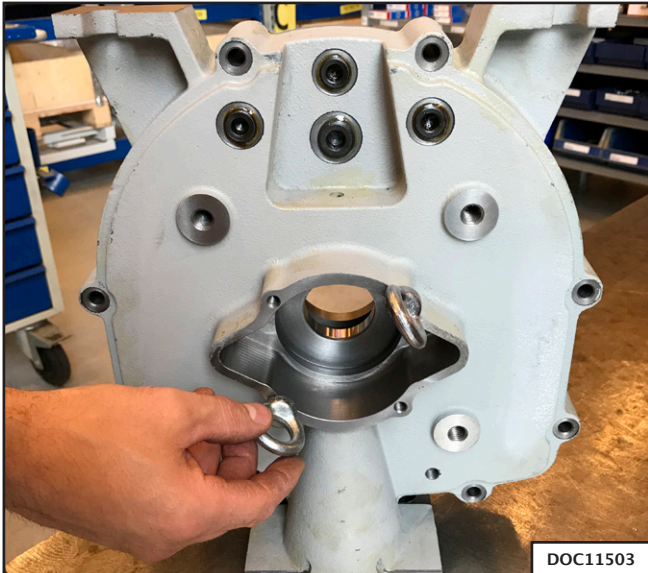
The distance from the rotor blades to the edge of the shell is 0.3 mm.

In this example a 0.4 mm gasket has been selected.

- Mount the correct sized paper gasket above the shell.
- Mount guide pins in two of the thread holes in the shell in order to hold the paper gasket in place.
- Mount a plastic dorn at the front of the rotor shaft.
- Lubricate the plastic dorn and the rotor shaft with a thin layer of white oil.
- Lubricate the shaft seal on the inside (on the rubber) with a little white oil or a thin layer of grease and mount it on the rotor shaft at the front using the plastic dorn.
- The shaft seal is mounted with the spring first and the carbon ring outwards (away from the rotor blades).
- The plastic dorn must remain mounted on the rotor shaft and act as steering.

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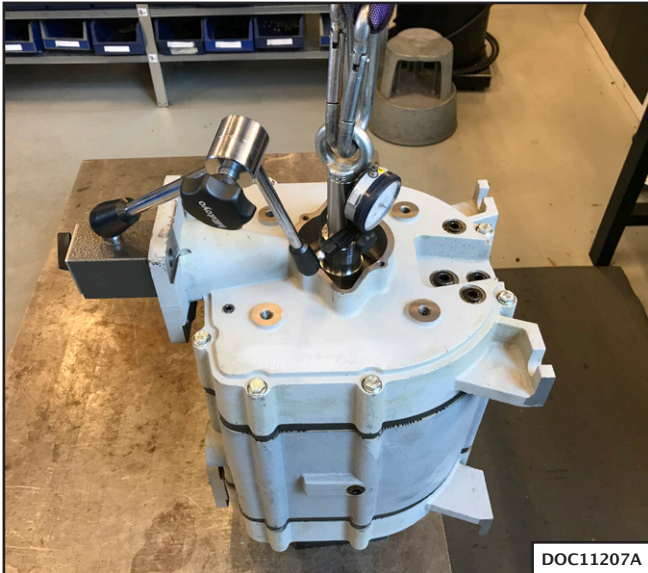
10 Assembly of front pump housing and shell



- Mount the front pump housing above the paper gasket using a crane.
- Remove the two guide pins which were in the shell.
- Cross tighten 8 M8x90 mm bolts to 25 Nm.

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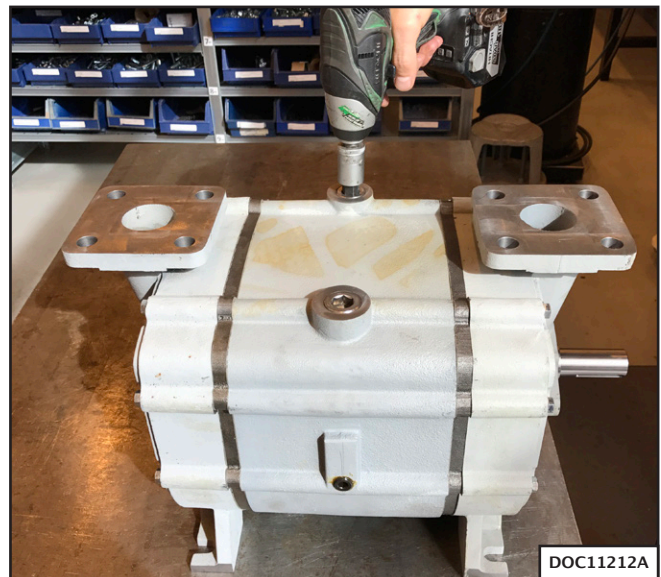
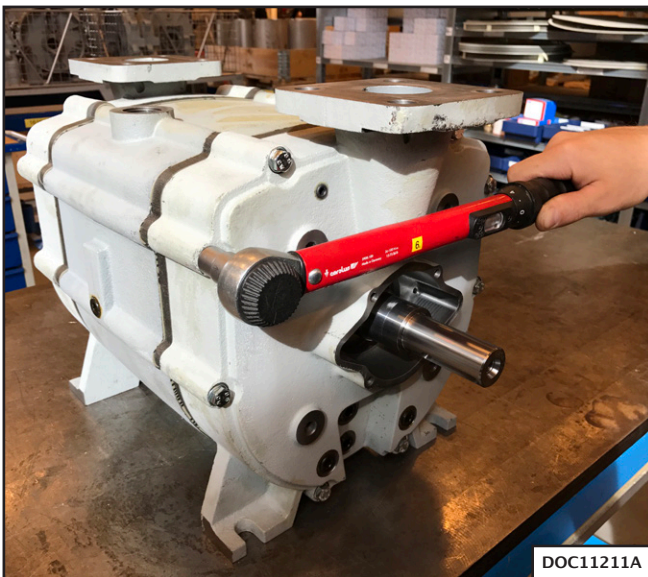
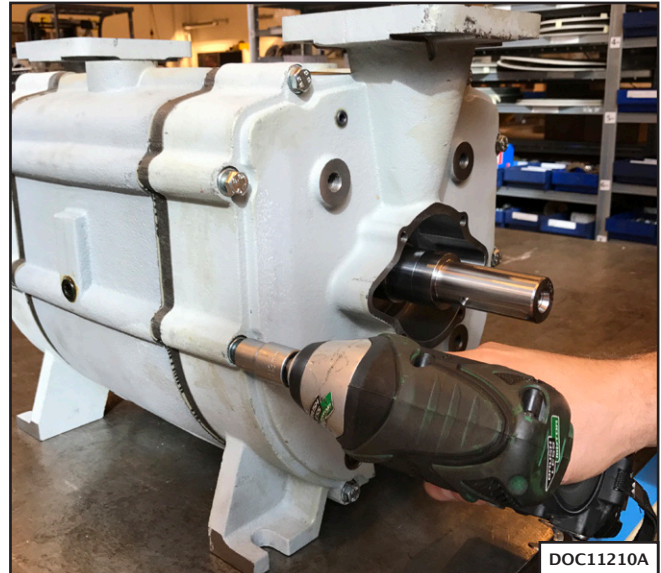
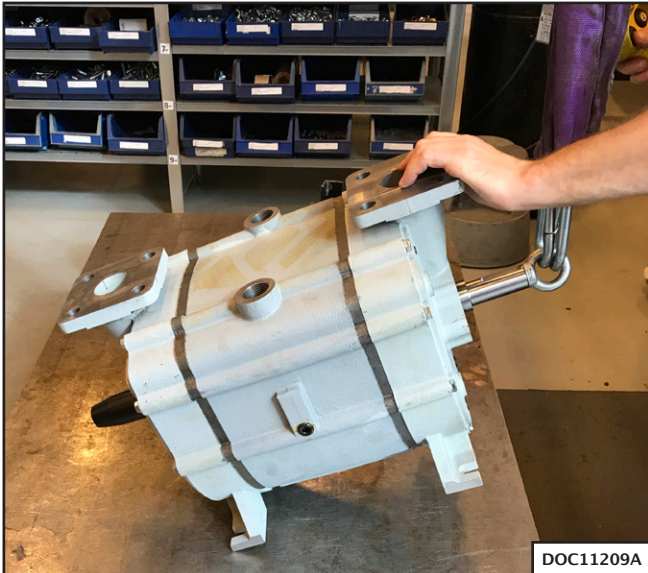
11 Calculating the rotor's total axial clearance without bearings mounted



- Remove the plastic dorn at the front in order to be able to mount the dial gauge.
- Mount the dial gauge on the pump housing and reset it.
- Using a crane, lift the rotor until it is against the front flow plate in order to measure the rotor's axial clearance inside the pump.
- The total clearance must be between 0.50–0.85 mm.
- If the measured clearance is not within this tolerance, remove the front pump housing and replace the gasket with one in a different size.

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12 Alignment of pumps / pump feet

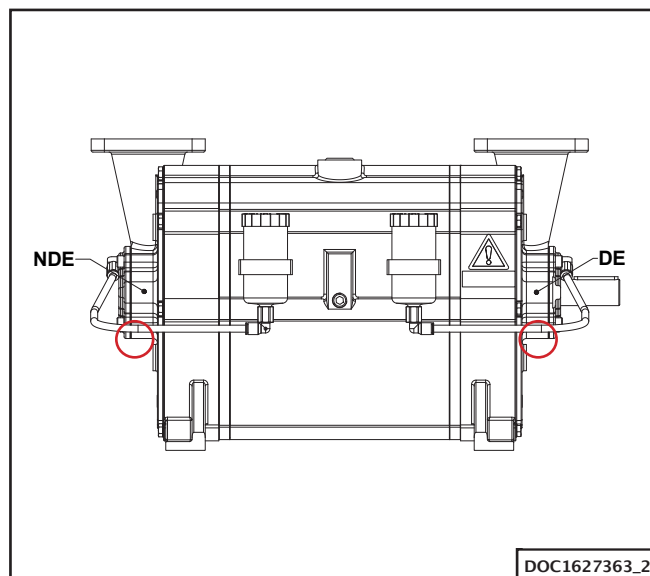
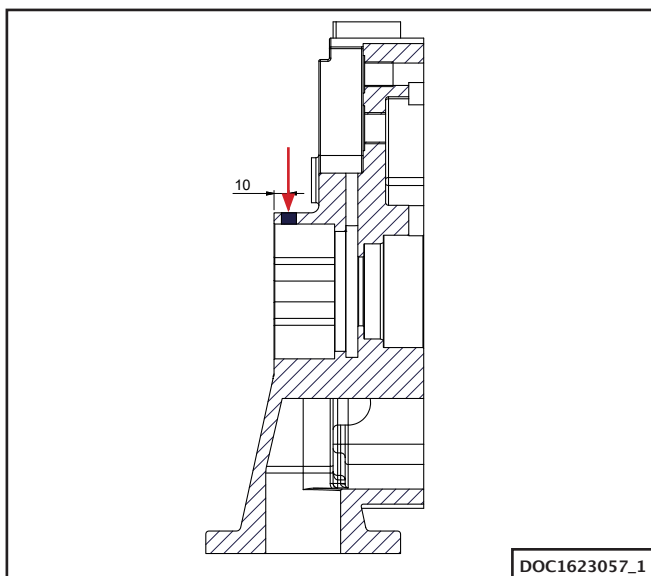


- Lift the pump off the assembly base and place it on its feet on the table.
- Loosen all M8x90 mm bolts in the pump housing, front and back, and straighten out pump on the table.
- The feet on the pump must lie flat on the table and the pump must not rock.
- Once the pump is straightened, tighten all M8x90 mm bolts in the pump housing to 25 Nm.
- Mount and tighten the two 1" caps at the top of the shell.

The pump is now straightened and assembled.

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Procedure below only applies to Zone 0 pumps



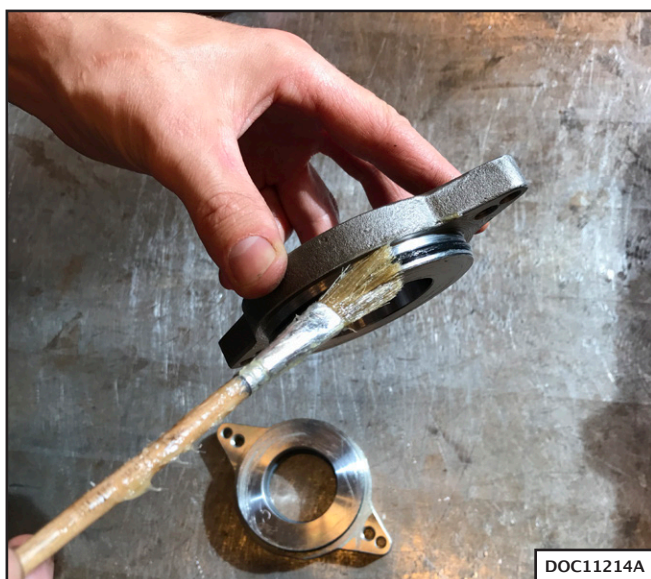
4 M10x1 threaded holes to be drilled in both pump housings. Zone 0

- Drill a $\varnothing 9$ mm hole in pump housing 10 mm from edge. See illustration.
- Cut M10x1 thread in the drilled hole.
- The operation is performed in both pump housings. (DE + NDE)

NOTE.- Be careful of the hole depth and avoid steel shavings inside pump!

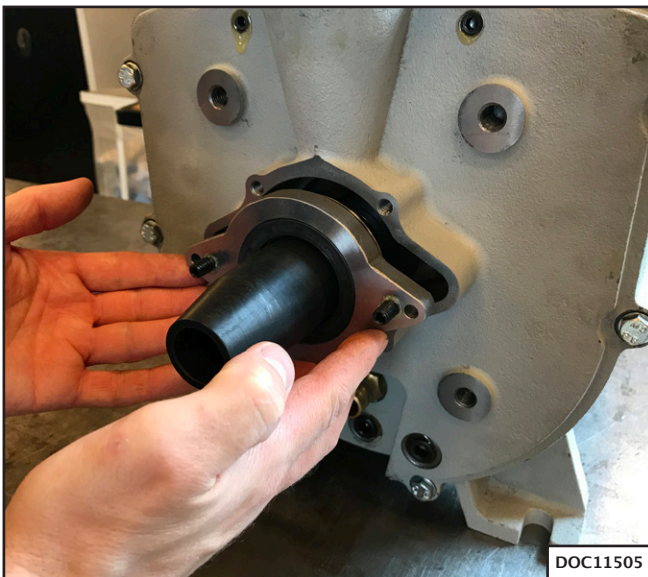
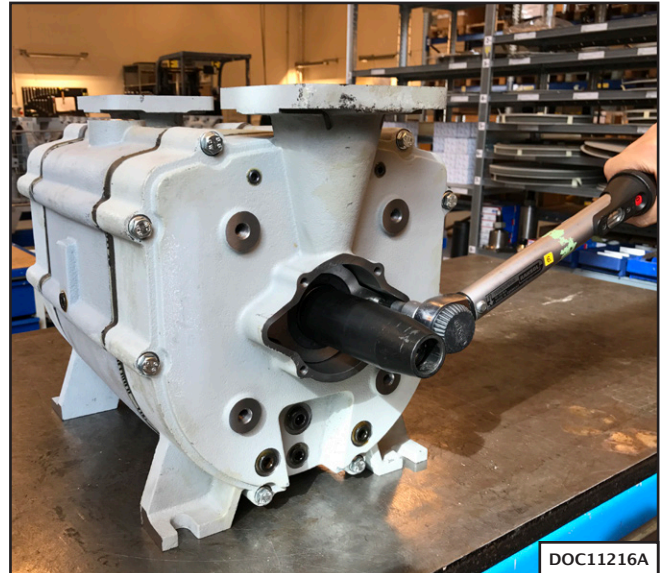
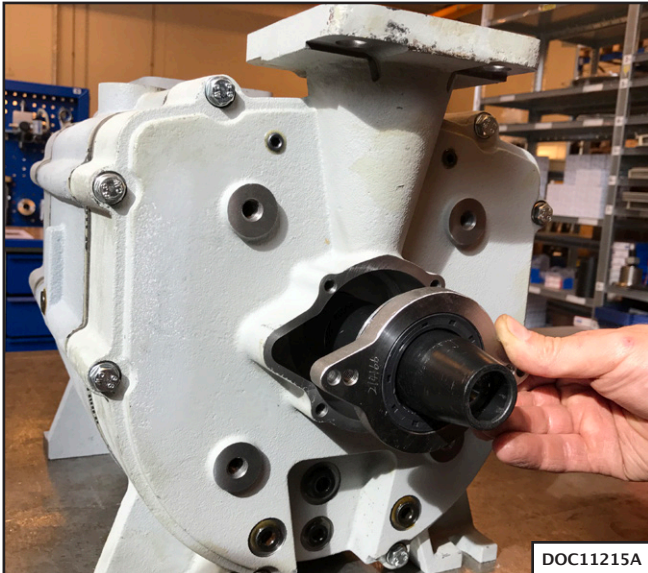
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13 Preparation of bearing housing and mounting of O-rings and radial shaft seals



- Mount radial shaft seals and O-rings in both adjustment plates and lubricate with grease.

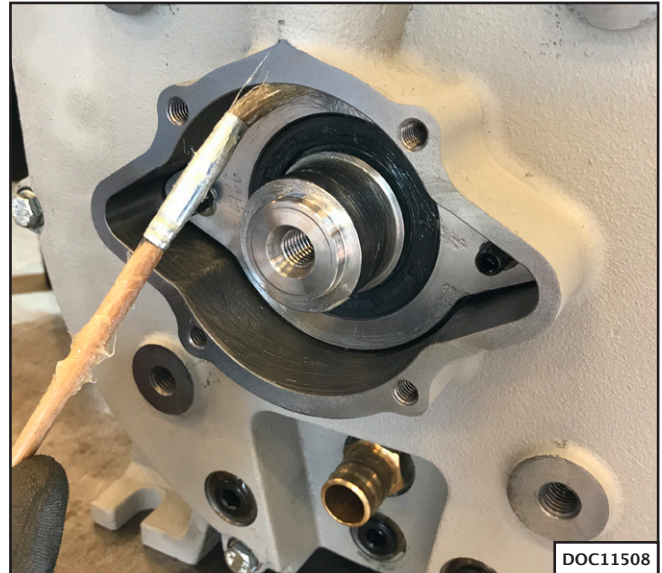
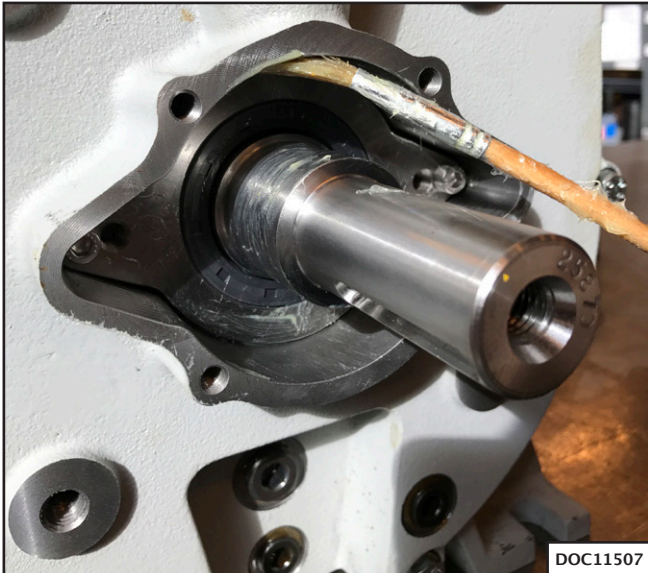
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- Both plastic dorns must be mounted on the rotor shaft (front and back) so as not to damage the radial shaft seal.
- Mount the adjustment plates in the front and rear pump housing.
- On the rear adjustment plate, mount 2 M8x20 set screws.
- Secure the front adjustment plate with 2 M6x20 bolts and tighten to 10 Nm.

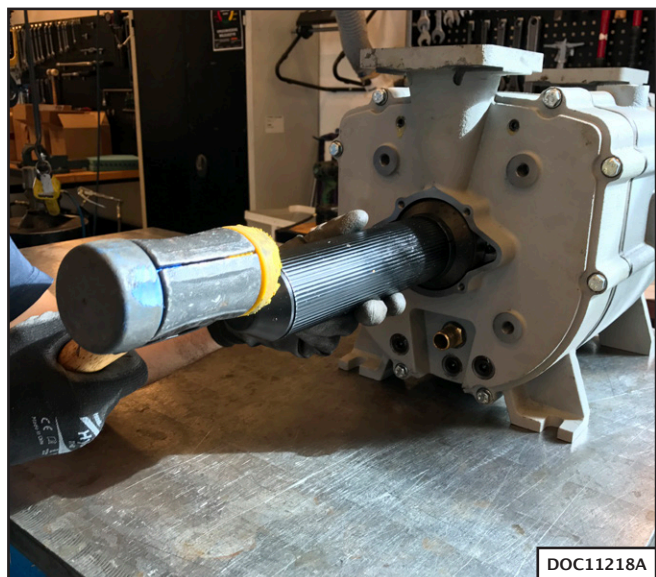
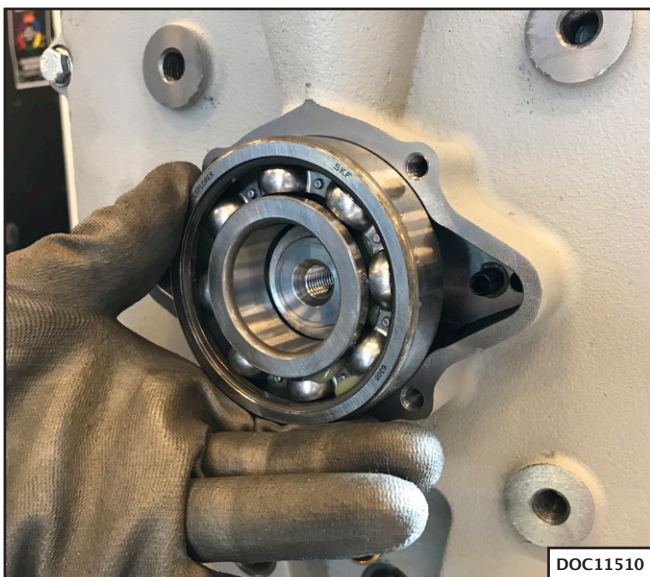
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14 Mounting of ball bearings



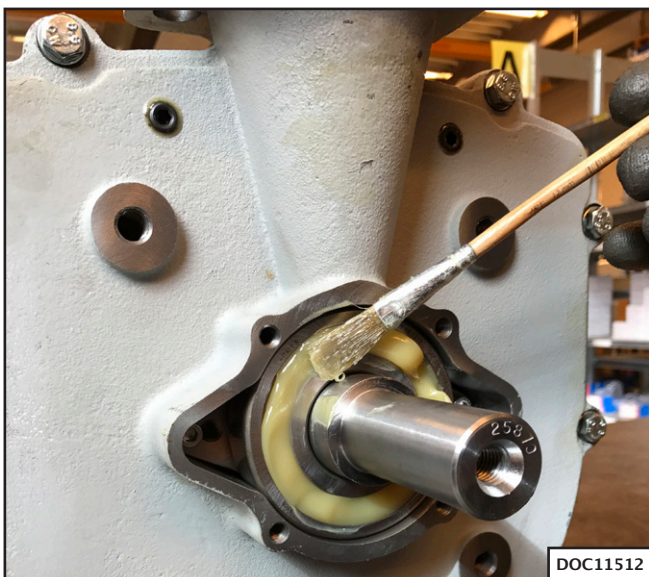
- Lubricate the bearing housing where the bearings will be mounted with a thin layer of grease.
- Lubricate the bearings with grease on the rear side (the side without writing) before mounting them.

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- Both bearings are mounted with the writing facing outwards, so that it is legible from the outside.
- Both bearings are mounted using a special tool (plastic dorn) and by hammering with a plastic hammer.
- The bearings must be hammered all the way down to the bottom, both at the front and back, until resistance can be felt and the hammer sound changes.

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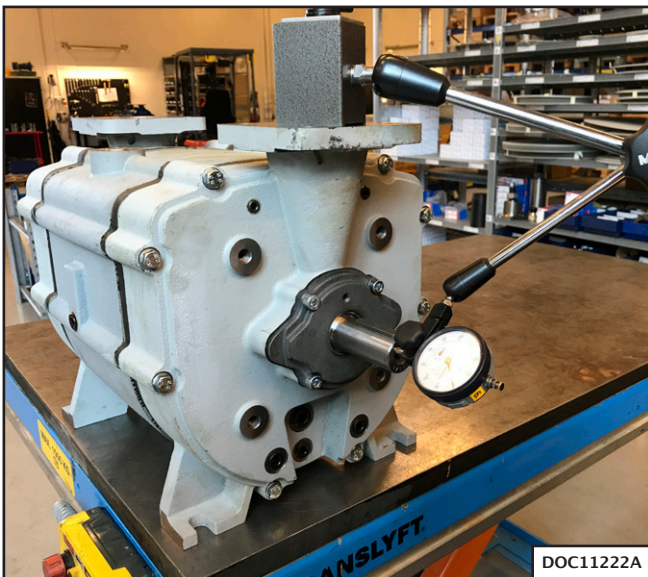
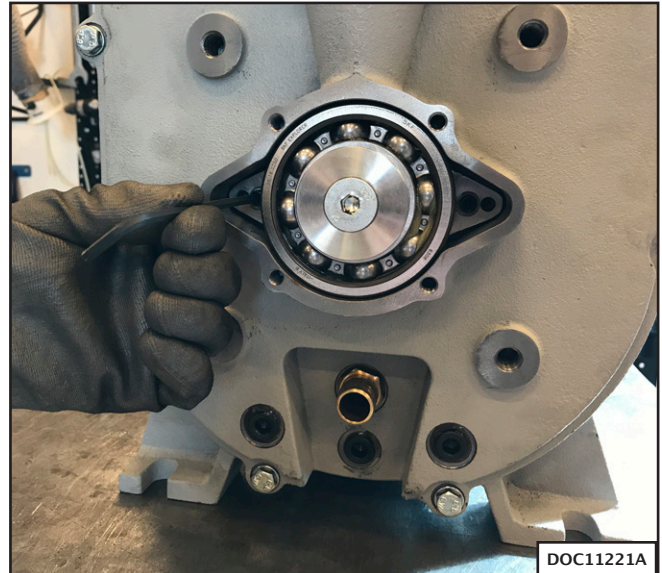


At the front of the pump:

- Mount the radial shaft seal in the front bearing cover and lubricate it with a thin layer of grease.
- Place the rubber gasket onto the bearing cover.
- Fill the front bearing with grease.
- Mount the prepared bearing cover, with thread hole facing upwards, and tighten the 4 M8x20 steel set screws in the bearing cover to 15 Nm.

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15 The total axial rotor clearance

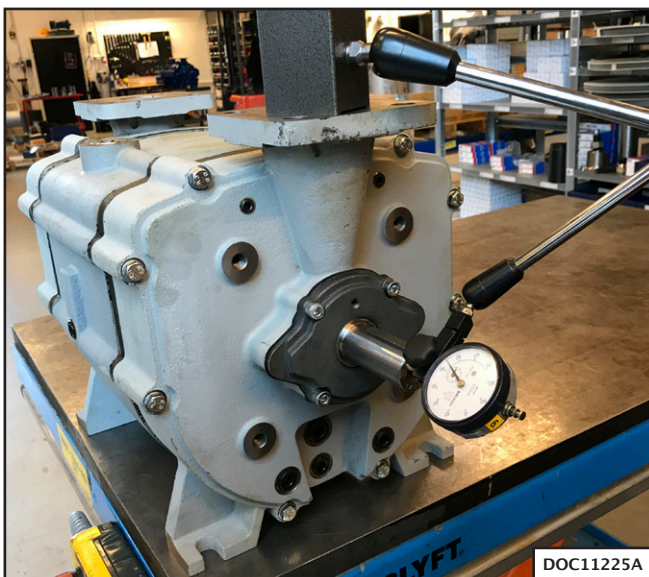
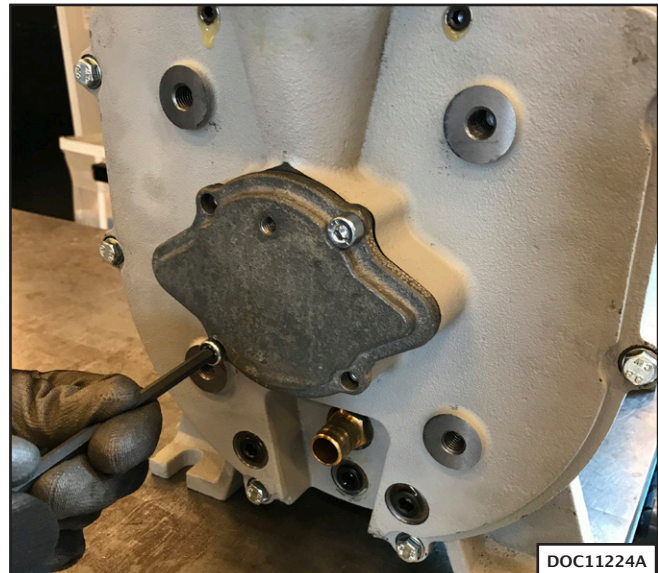


- Apply screw lock to the M12x20 socket head screws and mount the washer at the back of the rotor shaft. Tighten these to 55 Nm.

Finding the total axial rotor clearance:

- Tighten the set screws in the adjustment plate in order to pull the rotor towards the rear end of the pump until the rotor is against the rear flow plate and cannot be turned around.
- Mount the dial gauge in the front of the pump and reset the gauge (the needle must touch the rotor shaft).
- Then loosen the set screws again.

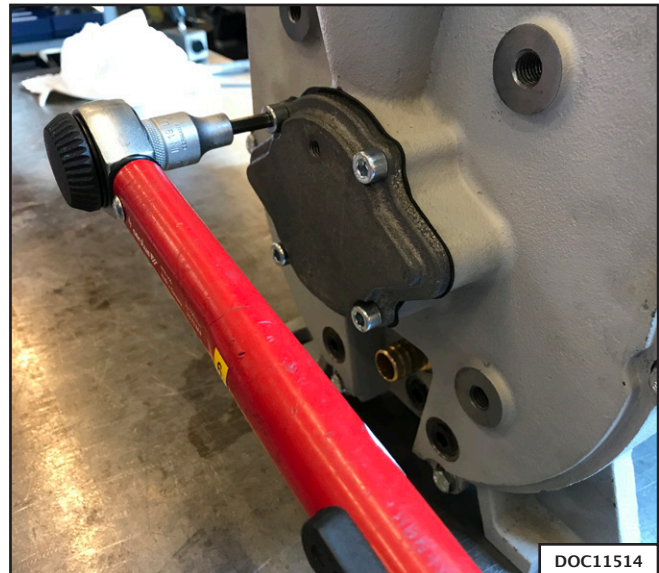
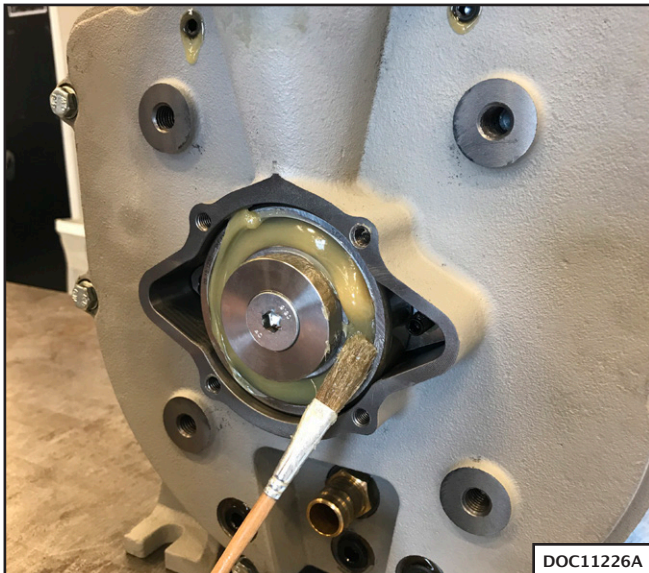
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- Push the rotor towards the front end using the shims between the rear bearing and the bearing cover.
- Carefully tighten the 4 outwards-facing M8x20 steel set screws in the rear bearing cover in order to push the rotor towards the front end of the pump until the rotor is against the front flow plate and cannot be turned around.
- Read the dial gauge. The measured value is the total axial rotor clearance.
- The measured value must be between 0.45 - 0.70. If the value is outside this tolerance, the pump must be disassembled and readjusted.

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16 Adjusting rotor to centre position



The rotor must now be adjusted to the centre position. The dial gauge must therefore show half of the total axial rotor clearance once the pump has been adjusted.

- Thereby achieving an equal distance from the rotor blades to the front and rear flow plates.
In order to achieve this, follow these steps:

- Start with the rotor pushed completely down against the front flow plate and the dial gauge showing the total axial rotor clearance in the pump.
- Pull the rotor towards the rear of the pump and away from the front flow plate by carefully tightening the 2 set screws in the adjustment plate (at the back of the pump) while reading the dial gauge.
- Continue tightening the 2 set screws until the dial gauge shows the half value of the total axial rotor clearance PLUS a further 0.10 mm.

Example of adjustment:

Total axial rotor clearance of 0.60 mm.

Tighten the set screws until the dial gauge shows $0.30 \text{ mm} + 0.10 \text{ mm} = \underline{0.20 \text{ mm}}$.

In total, the rotor must be pushed 0.40 mm away from the front flow plate towards the rear of the pump.

- Do not touch the set screws again once the rotor is in the desired position.
- Fill the rear bearing with grease before mounting the rear bearing cover.
- The rear bearing cover is mounted on the pump with a rubber gasket between them.
- Carefully tighten the rear bearing cover to 15 Nm at the same time as the dial gauge is read.
- The dial gauge must show that the rotor has been pushed 0.10 mm forwards towards the front of the pump when the bolts in the rear bearing cover are tightened to 15 Nm.
- If you reach 15 Nm on the bearing cover's bolts and the rotor still has not moved 0.10 mm towards the front of the pump, the correct-sized shim needs to be mounted between the rear bearing cover and the bearing.

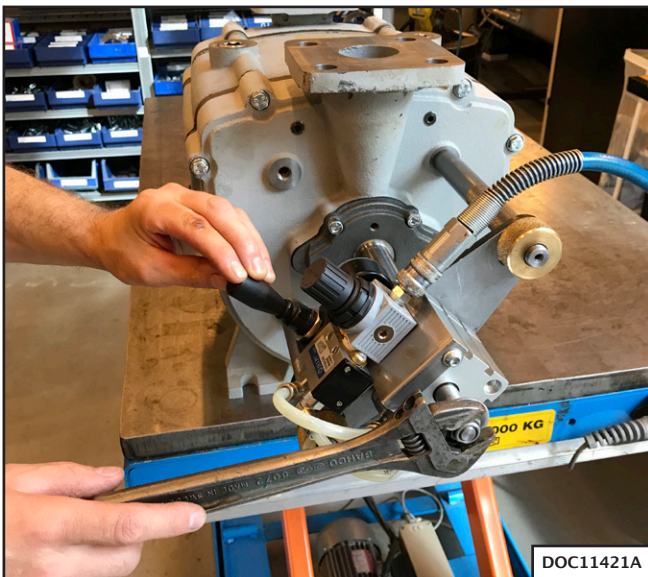
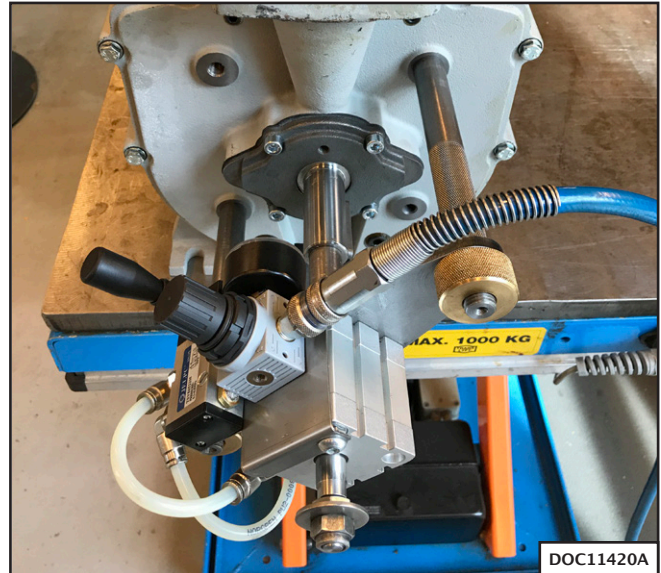
The final result of correct adjustment must be:

When the rear bearing cover is tightened to 15 Nm and squeezes the rubber gasket, then the rotor is pushed 0.10 mm further forwards towards the front of the pump. The rotor has thus been pushed forwards into the centre position.

In the example above, the dial gauge will now display 0.30 mm, because the total axial rotor clearance is 0.60 mm. The pump has been properly adjusted when the rear bearing cover is tightened to the torque and the rotor is in the centre position.

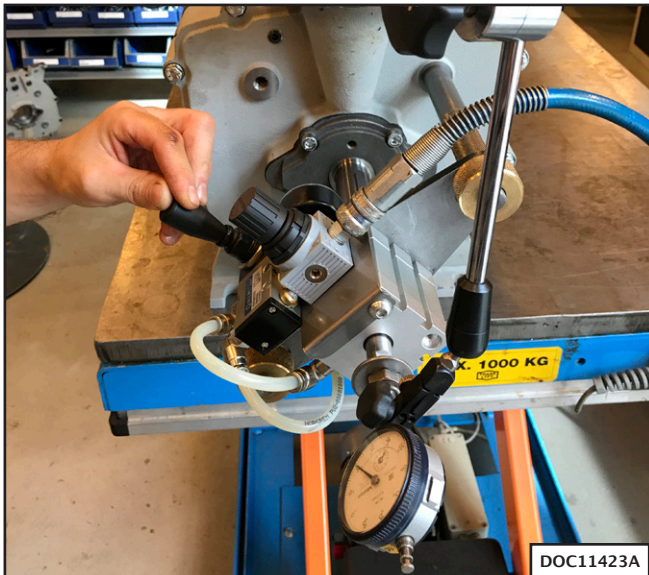
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17 Final measurement check of bearing clearance with special tool



- Mount the special tool at the front of the pump and apply air pressure. (Mounted in the end of the rotor shaft)
- Move the lever **forwards** and turn the rotor around using a 19 mm wrench.
- Move the lever **backwards** and turn the rotor around using a 19 mm wrench.
- The rotor must not touch the flow plates when it is rotated with the lever in either position.
- The rotor should move easily and without any kind of rumbling noise.
- Special tool must remain mounted.

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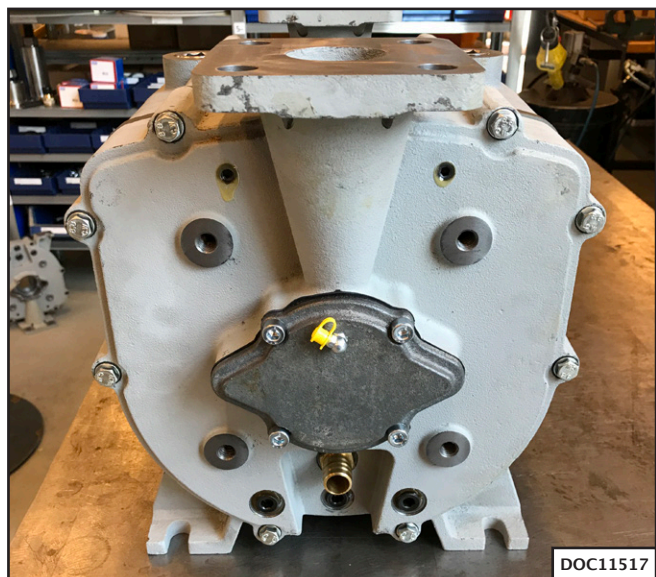
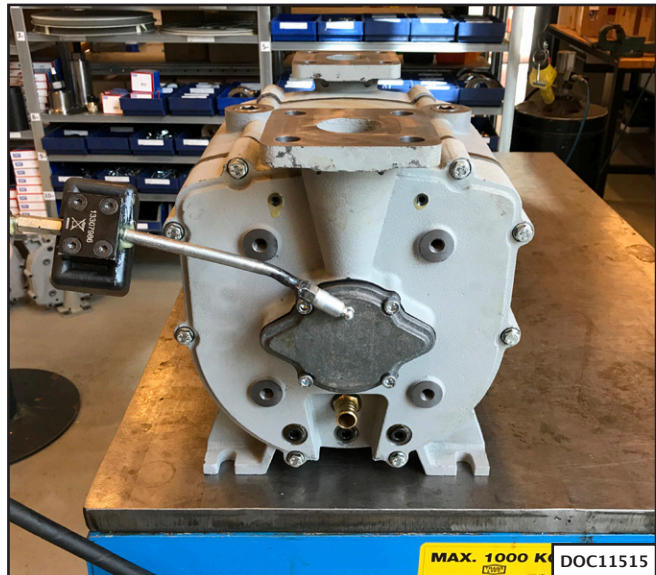


DOC11423A

- Mount the dial gauge on the pump. (The needle must touch the end of the piston on the special tool)
- Push the rotor towards the back end using the special tool.
- Reset the dial gauge.
- Push the rotor forwards using the special tool.
- Read the measured value.
- The value must be a minimum of 0.15 mm.
- Complete items 1 and 2 in the test report.
- For ATEX pumps, an ATEX special must be called and item 2 signed.
- Remove the special tool.

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18 Lubricating ball bearings



- Mount grease nipples in the front and rear bearing covers and lubricate the bearings with the correct amount of grease:
- Grease in bearings:

KE	Front 7 g	Rear 7 g
KL	Front 16 g	Rear 15 g
- Mount DBI caps on grease nipples.

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19 The pump's identification number



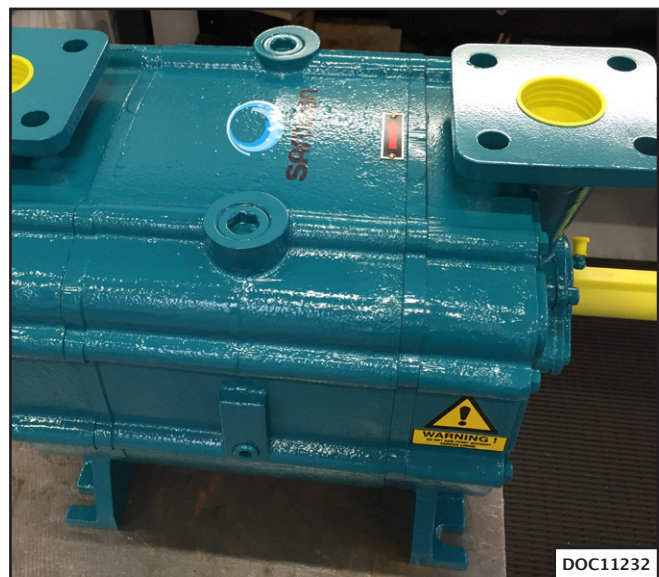
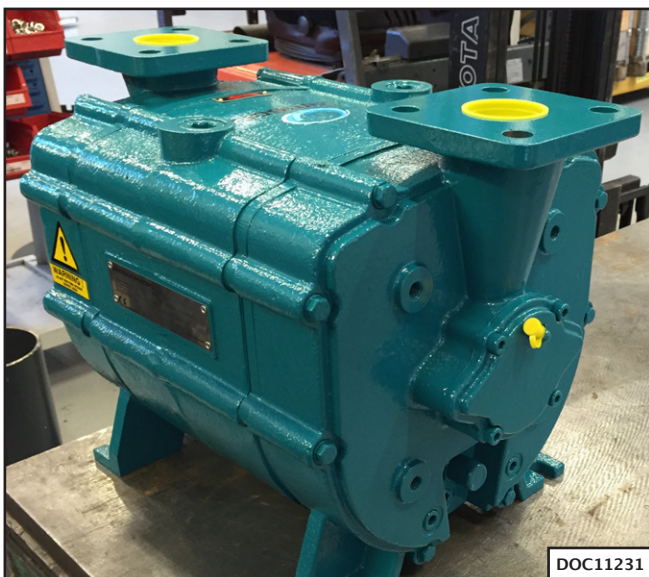
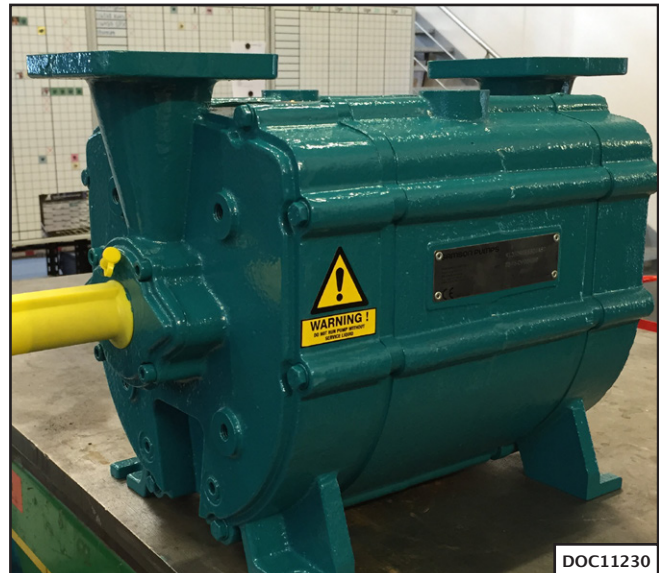
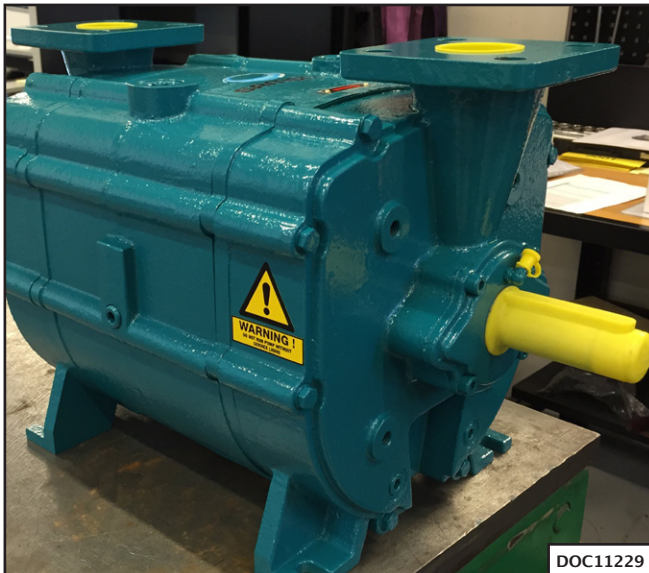
- The OP/LP number is hammered into the front pump housing.
- The pump is ready for testing.
- Upon completion of the test, items 1 to 7 must be filled out in test form RE8.2.4-02-01.
- After being tested and approved, deliver the pump to painter.



- 5 Test report RE8.6-02-01 filled out and signed by ATEX approval person. Zone 0+1
- 6 Operating test performed on test stand and Test rapport RE8.6-02-01 filled Zone 0+1
- 7 Checking bearing temperature in test stand. Zone 0+1
- 8 Insert plugs into all holes. Zone 0
- 9 M10x1 screws to be mounted in both ends. (Holes for temp. sensor) Zone 0
- 10 Attach DBI covers. Zone 0
- 11 Tighten screws and bolts as indicated in the assembly instructions. Zone 0+1

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21 Closing finish after painting of pump



- After the pump has been returned from the painter, the remaining steps must be carried out.
- Affix the directional arrow to the top of the shell; the direction is specified in the order. (Right/left-facing)
- Affix the warning triangle to both sides of the front pump housing.
- Mount the logo at the top in the middle of the shell, so it is readable from the front.
- With the correct tools, carefully affix the data plate onto the side of the shell (the opposite side to the thread hole).
- Attach yellow DBI caps to the suction/pressure, shaft and grease nipples.
- The pump is now ready for shipment.
- Grease cartridges must be mounted on ATEX pumps.
- ATEX pumps must be sealed.
- Water connections must be mounted on the following pumps:
- KE200, KE300, KL400, KL500.



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22 Mounting grease cartridges



Mounting grease cartridges on ATEX pumps:

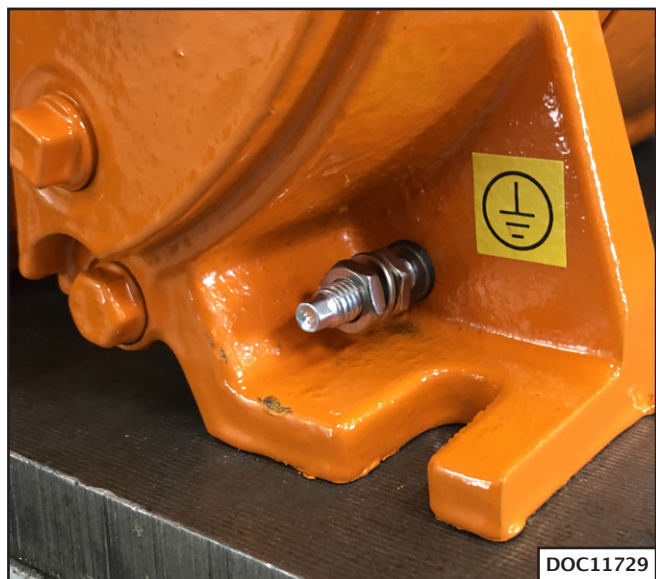
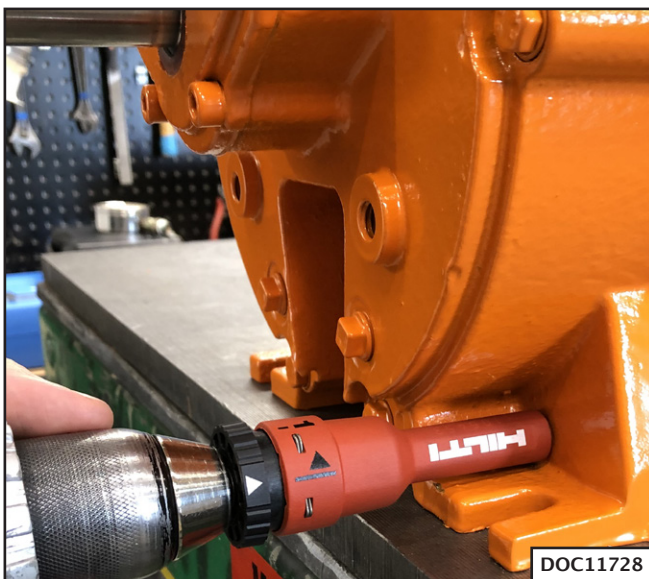
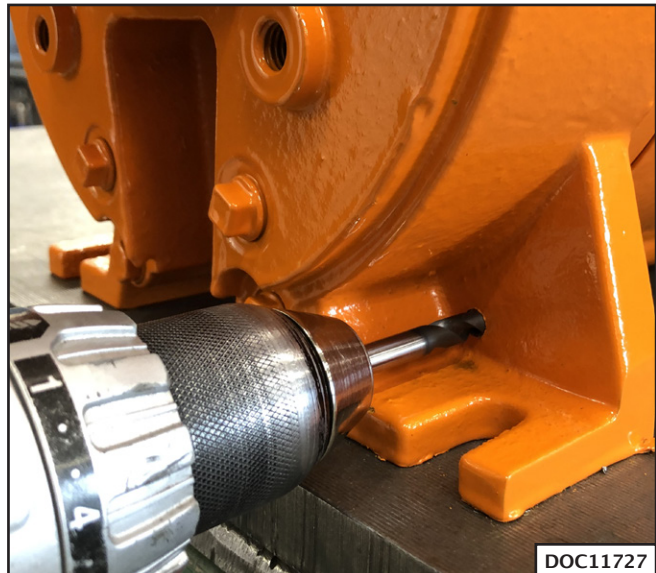
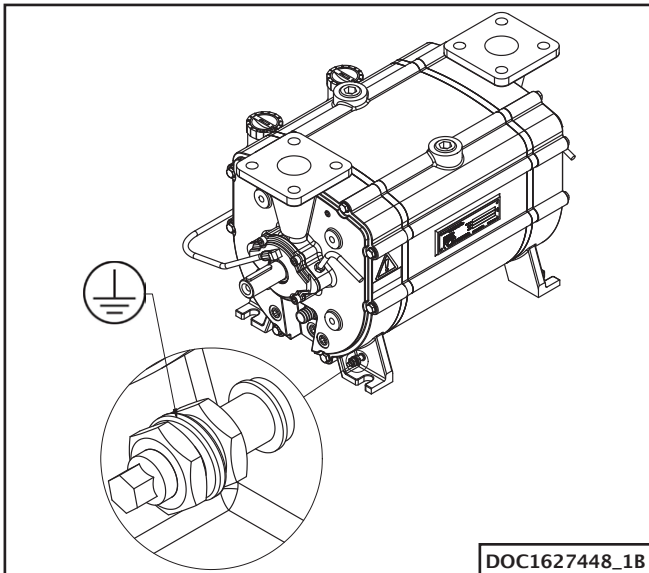
- Mount grease cartridges in the front and rear ends of the pump.
- The grease cartridges must NOT be activated.



14 Mount grease cartridges. Zone 0

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23 Mounting earth threaded stud

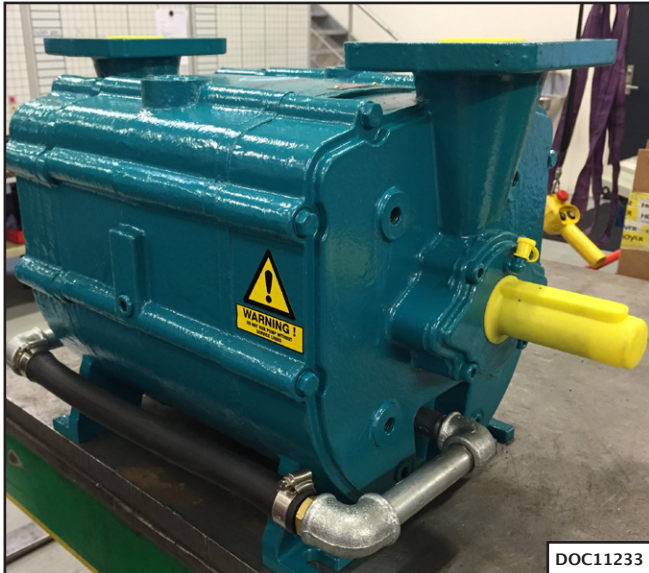


- Drill a hole with the special drill bit. Location of the hole to be approx. as on picture.
- Mount the special socket on a drill machine and insert a earth threaded stud in the socket.
- Start drilling until the special socket clicks and stop. The stud is mounted and tightened correctly.
- Mount 2 nuts and 1 spring washer between as shown on picture, inclusive earth sticker..



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24 Mounting of water connections

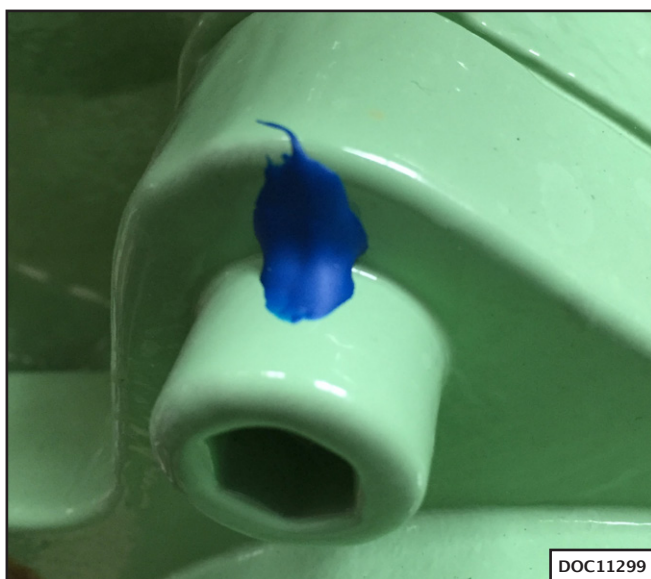
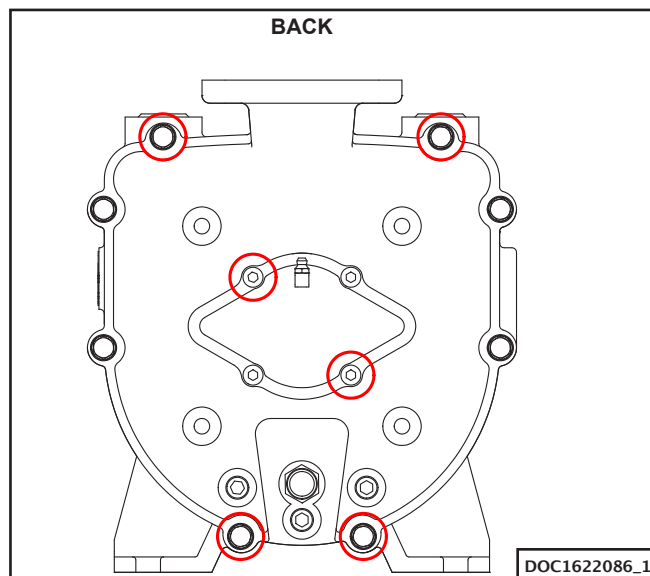
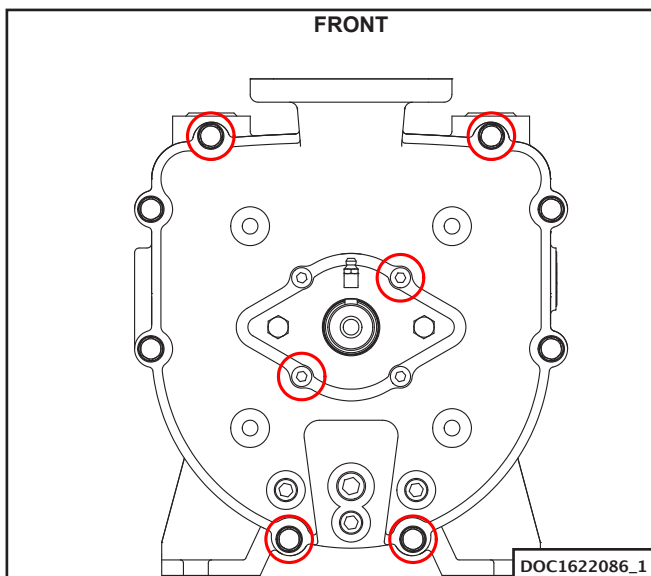


Mounting of water connections on KE200, KE300, KL400, KL500:

- Mount the water connections as shown in the pictures.
- Thread sealant is applied to all connections.

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25 Sealing of ATEX pumps



Sealing:

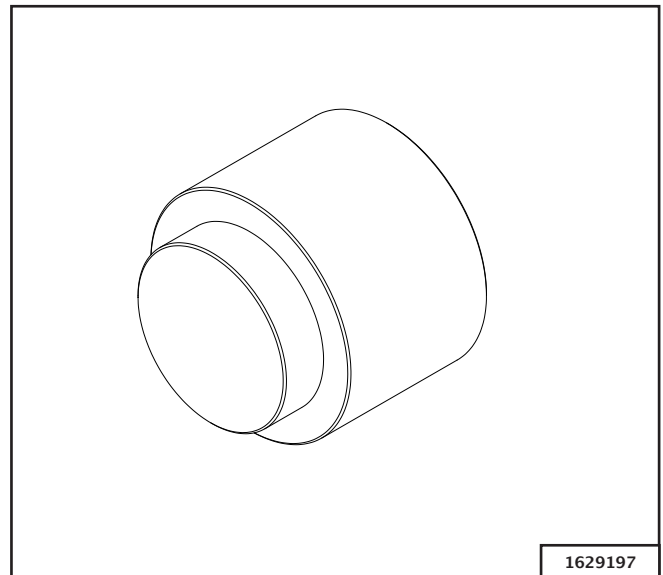
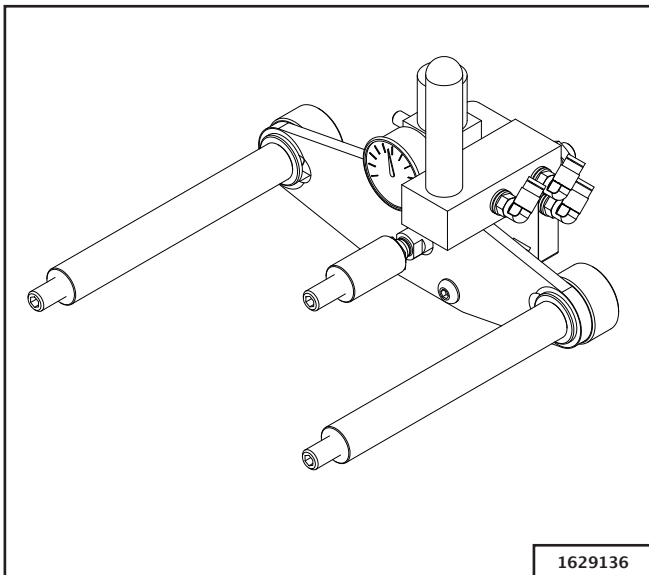
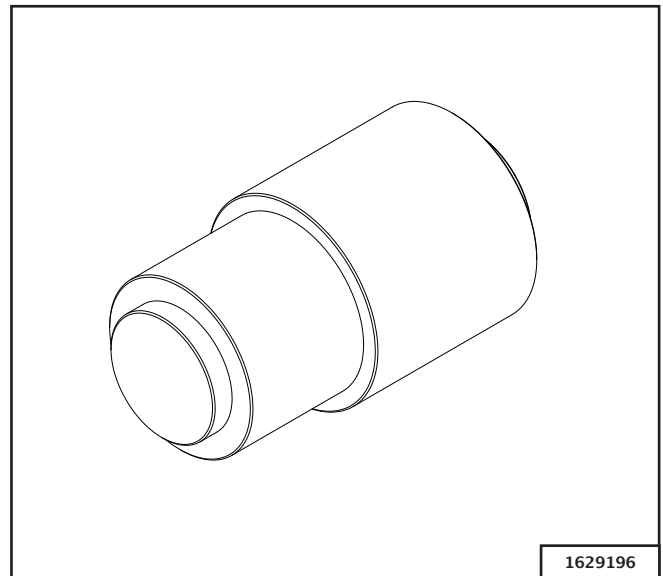
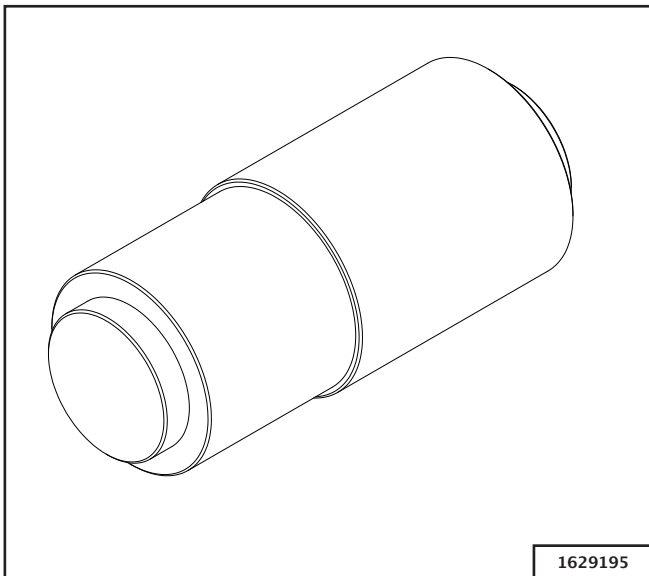
- Apply a drop of Loctite 7414 to the bolts marked red.



13 Pump sealed in accordance with the assembly instructions. Zone 1

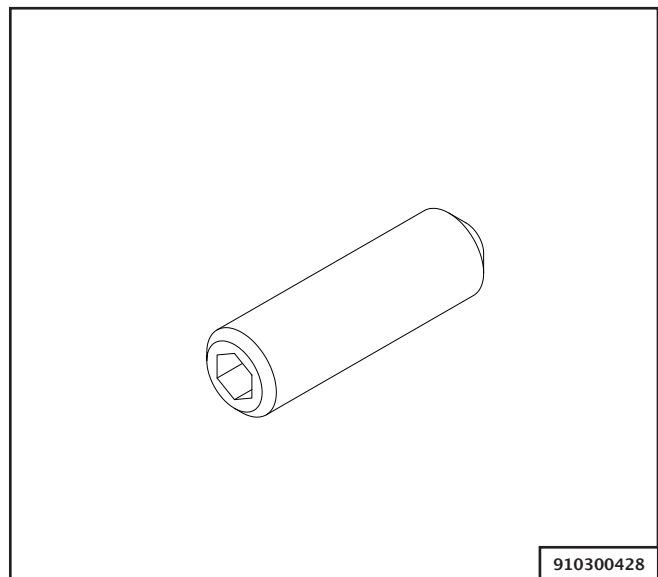
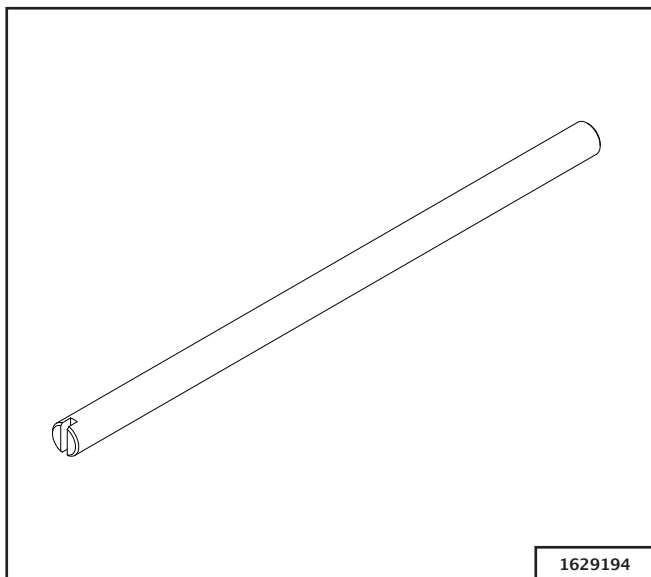
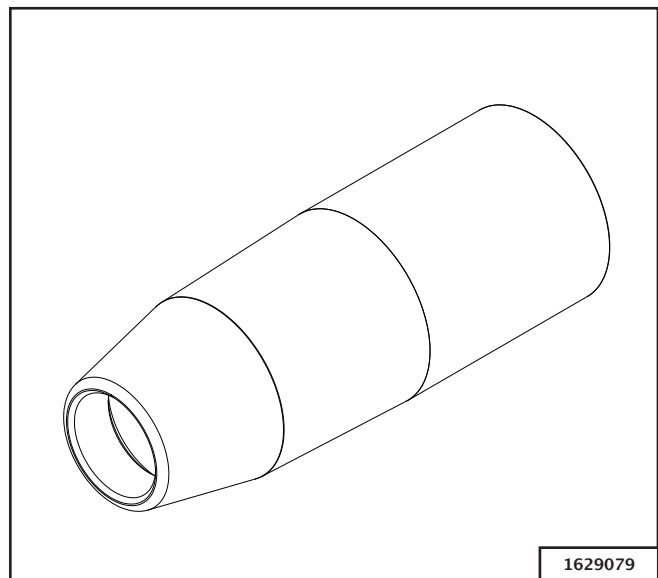
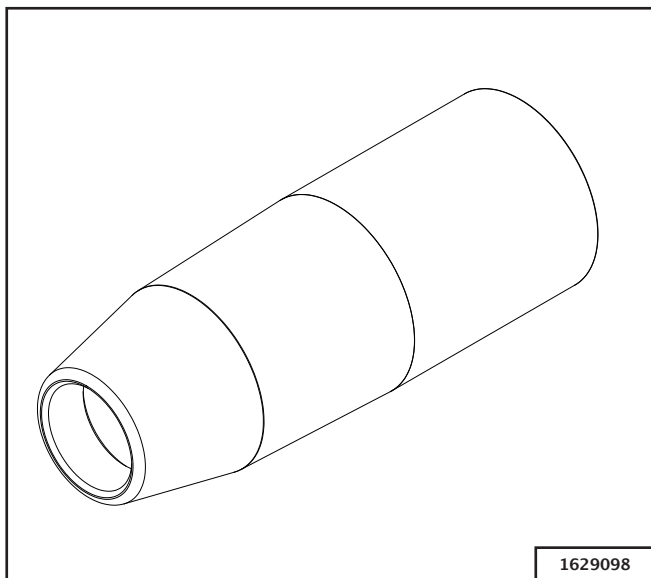
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26 Assembly tools – Samson Pumps



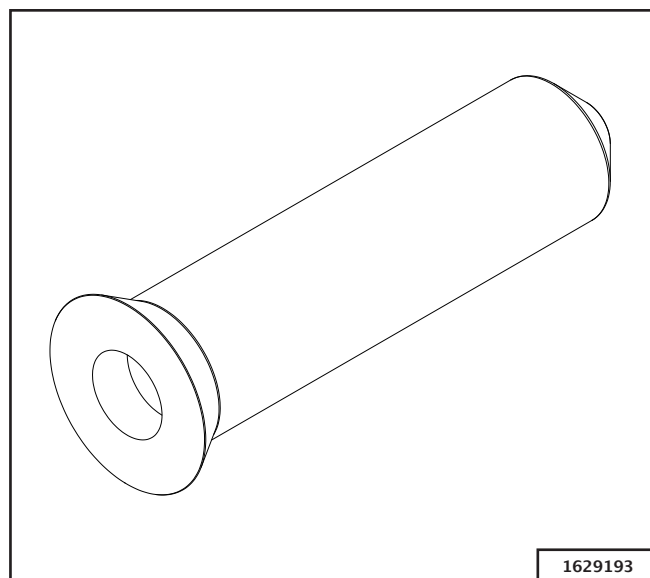
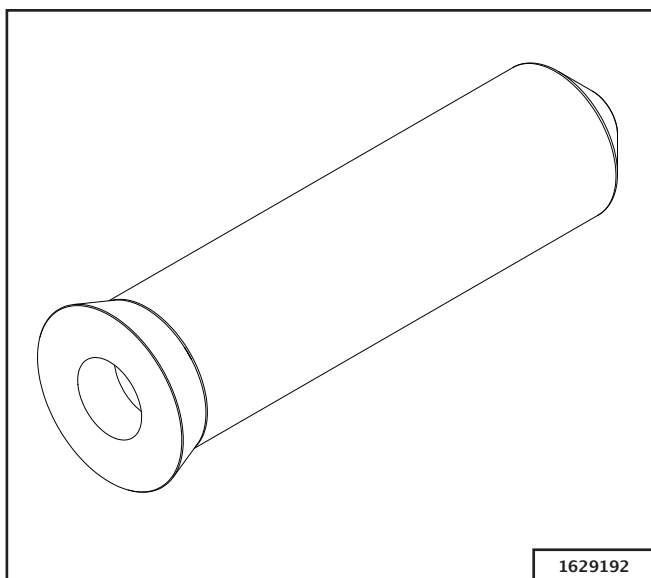
- **1629195** - Radial shaft seal tool Ø35.
- **1629196** - Radial shaft seal tool Ø40 + Ø45.
- **1629136** - Bearing tool.
- **1629197** - Mechanical shaft ring tool.

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- **1629098** - Mechanical shaft seals tool Ø35. 2 pcs.
- **1629079** - Mechanical shaft seals tool Ø40. 2 pcs.
- **1629194** - Guide pin M8. 2 pcs.
- **910300428** - Guide pin / socket set screw M6x20. 2 pcs.

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- **1629192** - Bearing mounting tool KE.
- **1629193** - Bearing mounting tool KL.

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27 Assembly tools – Standard

Recommended tools accessible:

Crane, compressed air, straps, carabiners, lifting hooks M10 and M12 for shell, rotor and pump housing.

Description	Specification
Nylon head hammer	-
Torque wrench ¼"	1-25 Nm
Torque wrench ½"	20-100 Nm
Allen wrench socket ½"	6 mm, 8 mm, 17 mm, 3/8", 3/16"
Allen wrench socket ¼"	5 mm
Socket ½"	13 mm
Socket ¼"	8 mm
Flat file	-
Straight edge	320 mm
Depth gauge	-
Magnetic stand + dial gauge	-
Cloth to clean parts	-
Hammer + Number and letter punches	-
Bearing grease	-
Whiteoil	-
Small brush	2 stk.
Grease gun	-
Adjustable open-end wrench 10"	-
Pipe wrench for water pipes	-
Combination wrench / adjustable open-end wrench for grease nipples	9 mm
Angled allen key	2,5 mm, 4 mm
Drill bit for direction arrow	2,2 mm
Drill bit til huller for identification plate	3,3 mm
Warranty seal	Loctite 7414
Thread sealant	-
Thread locker	-

SAMSON PUMPS

Samson Pumps is the only company in the world to specialise exclusively in liquid ring vacuum pumps. Samson pumps are made in Denmark and used around the globe. We offer worldwide delivery, and we export to more than 80 countries around the world.

For over 40 years, our name has been synonymous with the strongest pumps for vacuum trucks and tankers. We constantly adapt our products to meet the changing needs of our customers. Today, it is not enough to simply produce a pump. Products must be refined so the customer can concentrate on what they do best. We therefore offer a wide range of standardised components that allow our customers to build vacuum systems without the need for specialist in-house expertise.

Strength and durability are our hallmarks! We have often heard from customers that our pumps are working in many years, and in most cases without the need for maintenance or repair. This emboldens us to say that we have the strongest program of pumps on the market.