ASSEMBLY INSTRUCTIONS

LIQUID RING PUMP



ASSEMBLY INSTRUCTIONS FOR SAMSON LIQUID RING PUMPS, TYPES:

KM2200, KM2700 & TRUCK MASTER[®] 3400

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Date:	Revision:	Text:
13/05-15	А	Seal for ATEX pumps added.
01/04-16	В	Volume of grease in bearings modified. Various minor corrections.
07/06-16	С	Various ATEX corrections.
23/09-16	D	Text corrected on page 23.
22/03-17	E	Layout modified.
11/10-17	F	Implementation of assembly tools.
18/01-18	G	Bolt dimension changed on page 27.
13/03-18	Н	Logo updated.
23/01-19	1	Rotor adjustment tool updated.
01/04-19	J	ATEX modification.
16/05-19	К	Earth threaded stud mounting added.
21/05-19	L	Drill M8 threaded hole.
03/06-19	М	Various minor updates.
03/07-19	Ν	Tightening torque for special tool changed from 25 Nm to 10 Nm.
18/08-20	0	Various minor updates.
20/08-20	Ρ	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 10.



- 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



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				I		I	
Produ	ct no.			Pr	oduct name	1	
KM220	00 / KM2700 / Truc	k Master 3400		Lic	quid ring pur	np	
Pos.	Part number	Description		Qty.	Materia	ıl	
1.4	1620266	Rotor R		1	SS EN 1.4	4418 / AISI 316L	
1*	1620270	Rotor L		1	SS EN 1.4	4418 / AISI 316L	
2	1620181	Bearing cover NDE	<u>:</u>	1	Cast iron	EN-GJL-250, EN 1561	
3	1620179	Bearing housing		2	Cast iron	EN-GJL-250, EN 1561	
4	1620173	Pump housing		2	Cast iron	EN-GJL-250, EN 1561	
5	1620060	Foot bracket		2	Steel St.	37	
6	1620059	Foot bracket		2	Steel St.	37	
7	1620177	Shell		1	Cast iron	EN-GJL-250, EN 1561	
8	1620229	Flow plate		1	Bronze C	CuSn10-C EN 1982	
9	1620231	Flow plate		1	Bronze C	CuSn10-C EN 1982	
10	1620036	Rear cap		2	SS AISI 3	04	
11	930000297	Roler bearing sph	erical	1	Chrome	steel W.Nr. 1.3505	
12	1620208	Gasket set Truck I	Master 3400	1	-		
13	930200022	Shaft nut		2	Steel GB,	/T 8162-Q	
14	1620208	Gasket set Truck I	Master 3400	1	-		
15	1620208	Gasket set Truck I	Master 3400	1	-		
16	910300455	Allen screw		6	Steel DIN	V 912 FZB	
17	1620203	Bush		4	Sintered	Sintered Bronze DIN 1850	
18	1620208	Gasket set Truck I	Master 3400	1	-		
19	1620208	Gasket set Truck I	Master 3400	1	-		
20	1620208	Gasket set Truck I	Master 3400	1	-		
21	910300102	Allen screw		8	Steel DIN	V 912 FZB	
22	910100022	Washer		16	Steel DIN	125B FZB	
23	910300076	Allen screw		16	Steel DIN	V 912 FZB	
24	910300080	Allen screw		4	Steel DIN	V 912 FZB	
25	1620182	Bearing cover DE		1	Cast iron	EN-GJL-250, EN 1561	
26	1620052	Retainer		2	SS AISI 3	16	
27	922000259	Mechanical shaft s	seal	2	Viton / A	AISI 316 / Carbon	
29	1620193	Stop ring		2	SS W.Nr.	1.4404	
31	930000296	Ball bearing		1	Chrome	steel W.Nr. 1.3505	
32	1620208	Gasket set Truck I	Master 3400	1	-		
33	922100330	O-ring		2	Rubber N	NBR	
34	1620208	Gasket set Truck I	Master 3400	1	-		
35	1620208	Gasket set Truck I	Master 3400	1	-		
36	910300184	Plug		4	Steel DIN	1 906	
37	910300182	Plug		4	Steel DIN	1 906	

* -Type depends on the pump's configuration. **-Optional. Not included as standard option.

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Produ	ct no.	k Master M2400		Proc	duct name:	
	50 / KM2700 / Huc	.K Master M5400				
Pos.	Part number	Description		Qty.	Material	
39	915000050	Grease nipple		2	Steel VFZ	
40	-	Direction arrow		1	Aluminum	
41	910300188	Plug		5	Steel DIN 9	06
42	925000477	Hose nipple		3	Brass	
43	915000196	Parallel key		1	Steel DIN 6	885A
44	910300072	Allen screw		4	Steel DIN 9	12 FZB
45	910000480	Allen screw		8	Steel DIN 9	12 FZB
46	925200063	Elbow		1	SS AISI 316	
47	927000161	Hose		0,4 m	Rubber EPD	M
48	925000712	Barrel nipple		2	SS AISI 316	
49	925000788	Тее		1	SS AISI 316	
50	1620257	Service liquid supply pipe		1	SS AISI 304	
51	1624020	Sticker Warning!		2	Plastic foil FasCal 400	
52	-	Identification plate		1	SS AISI 316	
53	910300281	Plug		4	Steel DIN 9	06
54	925000842	Pipe clamp		2	Plastic PA	
55	910300471	Allen screw		4	SS AISI 316	
56**	915000225	Automatic lubricate	or LAGD 125/WA2	2	Plastic PA6	/ grease
57**	915000232	Clamp for automat	ic lubricator	2	Plastic PA6	
58**	944600173	Elbow		2	Steel S235	
59**	915000214	Push-in nipple		2	Brass	
60**	944600239	Push-in nipple		2	Brass	
61	918000276	Spring band hose o	lip	4	Steel CK75	
62**	910300448	Allen screw		2	SS AISI 316	
63	910100125	Washer		4	SS AISI 316	
64**	915000217	Plastic pipe		0,1 m	Plastic PA6	
65**	915000217	Plastic pipe		0,1 m	Plastic PA6	
66	910300185	Plug		8	Steel DIN 9	06

* -Type depends on the pump's configuration. **-Optional. Not included as standard option.

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2 Pump housing, flow plate & shell



- Clean sealing surfaces on pump housings and flow plates.
- One flush chanel must be downsized to Ø5,5 mm. This is done by drilling Ø5,5 mm hole in a 1/4" stainless steel plug and afterwards mounting the plug in the flush chanel in pump housing.
- The flush chanel that is beeing downsized that is in the same side as the hole in flow plate. See picture DOC11608.
- Mount paper gasket correctly on pump housing and flowplate afterwards.
- Tighten the 3 M10x130 bolts in flow plate to 25 Nm.

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Procedure below only applies to Zone 0 pumps





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

- Apply thread sealant on 1/4" stainless steel plugs and mount in threaded holes to close flush channels.
- 1/4" plugs to be mounted in both pump housings.

1

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- Grease the water nozzle and filler plugs with thread sealant and mount in pump housing.
- Place the rear pump housing on the assembly base with the flow plate facing up.
- Mount guide bushings in pump housing, followed by the rubber gasket on the pump housing.

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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- Clean shell.
- Carefully lower the shell over the rear flow plate until the plate is almost all the way at the bottom.
- Mount paper gasket (1 mm) from the inside, between the flow plate and shell.
- Lower the shell completely over the paper gasket and rubber gasket.
- The pilot hole in the shell must face upwards.
- Mount the bottom bolt (M16x50) in the pump housing and pump feet (M16x60) and tighten to 130 Nm.
- Cut off excess rubber gasket in both pump housings with a box cutter after they have been tightened together.

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- •
- •
- Mount filler plugs in the pilot hole in the shell. Mount the stop ring on the rear end of the rotor's shaft. Mount shaft nut in the rear end of the rotor (in order to protect the shaft's threads). •
- Lift the rotor at the front end using the lifting eye and crane. •

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3 Rotor and distances



- Prepare the rotor by removing loose welding beads from both ends of the blades as well as from between the blades.
- Carefully lower the rotor into the shell.

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- Ensure that the crane is unloaded and that the rotor's blades are resting on the flow plate.
- Mount the stop ring on the front end of the rotor's shaft.



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

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- Measure the distance from rotor blades to the edge of the shell using a depth gauge and straightedge.
- Measure three different spots and count the smallest result.
- Mount an appropriate paper gasket in the shell, depending on the measured distance.
- The total axial clearance of the rotor must be 1 mm + 0.2 mm.

Example of measured distance:

17.8 mm on depth gauge (thickness of straightedge = 17.1 mm)

Distance = 0.7 mm

Mount paper gasket (thickness 0.5). 0.7 mm + 0.5 mm = 1.2 mm

After tightening with torque, the total displacement of approx. 1.1 mm = OK

- Mount correct paper gasket on the shell's machined internal sealing surface.
- Mount guide bushings in shell.
- Mount rubber seal on top of shell.

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4 Final steps of pump assembly



- •
- Carefully mount the front pump housing on top of shell. Mount the top bolt (M16x50) in the pump housing and pump feet (M16x60) and tighten to 130 Nm. •

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- Measure the rotor's axial clearance using the crane and dial gauge.
- Mount the dial gauge on the rotor shaft and reset.
- Carefully lift the rotor until it makes contact with the top flow plate.
- Read the dial gauge.
- The axial clearance must be approx. 1 mm (+0.2 -0) when both pump housings are tightened to a torque of 130 Nm.
- If the axial clearance is beyond this range, repeat the process with thinner or thicker paper gaskets, depending on the measurement results.

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5 Adjusting the feet



- Carefully lift the pump from the assembly base and place it on the table. Hammer the OP/LP number on the top of the shell on the machined surface at the front pump housing.
- Slightly loosen the pump's feet, which will make it possible to adjust those with the special tool. •

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- Place the pump on the special tool at both the front and rear ends while the pump's feet are slightly loosened.
- When the tool is engaged with all the feet, tighten the bolts to 130 Nm.
- When correctly adjusted, the pump's feet will make contact to the table with the entire surface.

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6 Shaft seals and retainers



- Lubricate the machined surfaces of the pump housing with grease at the front and rear ends. Lubricate the rotor shaft with white oil at the front and rear ends.
- •

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- Mount the radial shaft seals in the shaft seal plate. The seals must face the right way, with the closed surface facing up.
- Lubricate the rubber lips of the radial shaft seal with a small amount of grease. Lubricate the O-rings and mounting surfaces in the retainers with grease.
- Lubricate O-rings in mechanical shaft seal with white oil or grease. •

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- Mount the mechanical shaft seals at the front and rear ends with the seal ring facing out and using the special tool.
- The friction surfaces (seal rings) must be clean and de-greased on both the carbon and metal parts.
- The shaft seals must be pressed all the way to the bottom using the special tool, until resistance from the stop ring can be felt.
- Carefully push the retainer with the carbon piece inside over the rotor shaft.

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- •
- •
- Tighten 2 bolts (M12x30) in the retainer to 75 Nm. Complete this step on both ends of the pump. Lubricate the rotor shaft with a thin layer of grease, where the bearing will be fixed, in the front and • rear ends of the pump.

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7 Bearing housing, bearing covers and bearings



- •
- Clean the bearing housing. Lubricate the bearing housing's internal machined surfaces with grease. Lubricate the rear covers with a thin layer of grease. •
- •
- Mount the rear covers in the bearing housing with M12x55 bolt, loosely tightened. •

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- •
- Mount bearing housings on pump housings at both ends. **NOTE-** Be careful with the radial shaft seal and be sure it does not become pinched or nicked. It is important for the leak detection hole to be facing downwards. Tighten 6 M12x40 bolts to 75 Nm.
- •

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Procedure below only applies to Zone 0 pumps





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

- Drill a Ø9 mm hole in bearing housing 10 mm from edge and a depth of 15 mm. See illustration.
- Cut M10x1 thread in the drilled holes.

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• The operation is performed in both bearing housings. (DE + NDE)

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

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- Lubricate bearings with grease on the rear side (the side without writing). Mount roller bearing in the front end of the pump. Mount ball bearings in the rear end of the pump.
- •
- •
- It is important for the writing on the bearings to be facing out. •
- Mount the bearing tool on the shaft. •

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- Press the bearings all the way to the bottom using the bearing tool, until resistance can be felt.
- The 2 rear cap bolts must be loose when the bearing is at the bottom.
- Mount lock washer in both ends (inclination on teeth facing out).
- Mount shaft nut in both ends of the pump (inclined edge facing lock washer).
- Tighten shaft nuts with spanner wrench.
- Carefully tighten the shaft nuts with a hammer and hook wrench until one of the milled grooves in the shaft nut pass out of a tooth on the lock washer.
- Use a pin punch to knock the tooth down in the milled groove.
- The shaft nuts are now locked.

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- Lubricate the machined surface of the bearing housing with grease (where bearing cover i mounted).
- Fully lubricate the outside of the rear bearing.
- Mount an O-ring in the bearing cover and lubricate it with grease, also lubricate the machined surface.
- Mount bearing cover and loosely tighten M12x40 bolts.
- Begge lejedæksler monteres med smørenipler i bund.
- Mount both bearing covers with grease nipple hole downwards.

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8 Adjusting rotor to centre position



The rotor must now be placed/mounted in the centre position inside the pump (same distance from rotor to the front and rear flow plate, respectively).

This is done by screwing the 4 bolts in the rear bearing housing as follows:

- Pull the rotor back towards the rear flow plate by tightening the 2 bolts where the bolt head is inside the bearing cover.
- Check the rotor to ensure it is completely against the rear flow plate and cannot be turned around.
- Mount a dial gauge on the rotor shaft in the front of the pump, and reset the gauge.
- Loosen the same 2 bolts (whose bolt heads are inside the bearing cover).
- Tighten the other 2 bolts (whose bolt heads are sticking out of the bearing cover). This will push the rotor forward towards the front flow plate.
- Check the rotor to ensure it is completely against the front flow plate and cannot be turned around.
- Read the dial gauge. The dial gauge must read between 1 and 1.2 mm, which is the total allowed axial rotor axial clearance in the pump.

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• The rotor must now be pulled back to half of the total axial clearance towards the rear flow plate, so that there is equal distance between the rotor and the front/rear flow plate. Example:

If the total clearance were 1 mm, the rotor would need to be pulled 0.5 mm towards the rear flow plate.

- The rotor is pulled back towards the rear flow plate by slowly and alternately tightening the 2 bolts in the bearing cover (where the bolt head is inside the bearing cover) while reading the dial gauge.
- When the rotor is in the centre position, first tighten the 2 bolts whose bolt heads are sticking out of the bearing cover to 30 Nm, and then tighten the 2 other bolts whose bolt heads are inside the cover to 30 Nm.
- The rotor is now in the centre position. The rotor can now be turned around in the pump without it touching the flow plates.

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9 Final check of the rotor's positioning



- Mount the special tool (specially machined bearing cover) in the front end of the pump.
- Tighten the specially machined bearing cover inwards to 10 Nm, and rotate the rotor.
- The rotor must not contact the flow plate in the rear end of the pump.
- Reset the dial gauge.
- Loosen the 2 bolts.
- Next, tighten the two other bolts in the cover to 10 Nm in order to pull the rotor forward.
- Check the rotor to ensure it rotates freely and without touching the flow plate in the front end of the pump.
- If the rotor moves freely in both directions, the pump is fully and properly adjusted.
- Properly mount the radial shaft seal in the front bearing cover, with closed side upwards, and lubricate its rubber lip with a small amount of grease.
- Lubricate the front bearing cover on the machined surface with grease.
- Fully lubricate the front bearing on the outside with grease.
- Mount the front bearing cover and tighten both pairs of bolts to 30 Nm.

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10 Test og service documentation



- Test report is located in the cabinet near the test stand.
- Complete items 1, 2, 3, 6 and 7 in Test Report RE8.6-02-01.
- For ATEX pumps, a signature will generally be required.
- For service order complete document Service Report RE8.5.1-05-01.
- Documents Test Report RE8.6-02-01 and ATEX Zone 0-1 Check sheet RE8.6-02-03 to be completed if it is relevant and gets affected by intervention.
- At service complete ID plate with a unique and traceable number in the marked field Order No. on illustration DOC107949_1.

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11 Lubricating bearings



- Mount grease nipples in both bearing covers and fill them with a sufficient amount of grease.
- Grease in bearings: Front 64 g
 - Rear 52 g
- Mount yellow DBI caps on grease nipples.
- Apply shaft key.

A table for grease in bearings can be found at the end of this assembly instruction manual.

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- The pump is now ready for testing.
- After being tested and approved, deliver the pump to painter.



- Test report RE8.6-02-01 filled out and signed by ATEX approval person. Zone 0+1
 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 skrews 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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12 Finishing pump after painting



- After the pump has been returned from the painter, the remaining steps must be carried out.
- Mount water supply/water hoses, data plate and directional arrow(s).
- The water supply is connected on the right side of the pump, unless otherwise specified in the specifications. For ATEX Zone 0 pumps, the water supply must NOT be mounted. Instead, insert threaded plugs in the threaded water supply holes.
- Affix the directional arrow to the front bearing housing; the direction is specified specifications (facing right/left).
- Insert plug into the water inlet.
- Attach yellow DBI covers to the suction/pressure and shaft.
- Carefully affix the data plate using the right tool(s).
- Affix warning stickers to both sides of the pump.
- Affix the logo to both sides of the pump.
- ATEX pumps must be sealed, according to sealing specifications in chapter 13.
- Grease cartridges must be mounted on ATEX pumps.



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13 Sealing the pump







Sealing:

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

13



Pump sealed in accordance with the assembly instructions. Zone 0+1

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14 Mounting grease cartridges



Mounting grease cartridges on ATEX pumps:

- Mount grease cartridges in the front and rear ends of the pump.
- Affix red sheet to both grease cartridges.
- The grease cartridges must NOT be activated.



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15 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 klicks and stop. The stud is mounted and tightened correctly.
- Mount 2 nuts and 1 spring washer between as shown on picture.



15 Mount earth threaded stud. Zone 0+1

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15 Assembly tools - Samson Pumps



- 1629171 Radial shaft seal tool Ø85 + Ø100.
- 1629117 Mechanical shaft seals tool.
- **1629134** Alignment tool. 2 pcs.
- 1629173 Rotor adjustment tool.

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- 1629115 Bearing mounting tool NDE.
- 1629116 Bearing mounting tool DE.
- **1629175** Bearing tool.

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16 Assembly tools - Standard

Recommended tools accessible:

Crane, compressed air, straps, carabiners, lifting hooks M12 for pump housing and M20 for rotor.

Beskrivelse	Specifikation
Nylon head hammer	-
Torque wrench ½"	25-100 Nm
Allen wrench socket ½"	8 mm, 10 mm, 14 mm, 17mm, 3/8", 3/16"
Box cutter	-
Flat file	-
Straight edge	320 mm
Depth gauge	-
Magnetic stand + dial gauge	-
Hammer + Number and letter punches	-
Bearing grease	-
Whiteoil	-
Small brush	2 pcs.
Grease gun	-
Ratchet wrench / adjustable open-end wrench	55 mm
Angled socket wrench / adjustable open-end wrench	24 mm
Hook wrench	80 / 90
Pin punch	7 mm
Bolt for rotating the rotor	M20x30
Combination wrench / adjustable open-end wrench for grease nipples	9 mm
Angled allen key	10 mm
Drill bit for direction arrow	2,2 mm
Drill bit til huller for identification plate	3,3 mm
Combination wrench / adjustable open-end wrench for water fitting	46 mm
Plier for water hoses	132
Thread sealant	-
Warranty seal	Loctite 7414

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Pump type	FRONT (DE)	REAR (NDE)
KE	7 g	7 g
KL	16 g	15 g
KS / TS	36 g	44 g
KM / TM	64 g	52 g

NOTE	Fill bearings	from both	sides	during	assembly	/!
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Notes:

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.

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