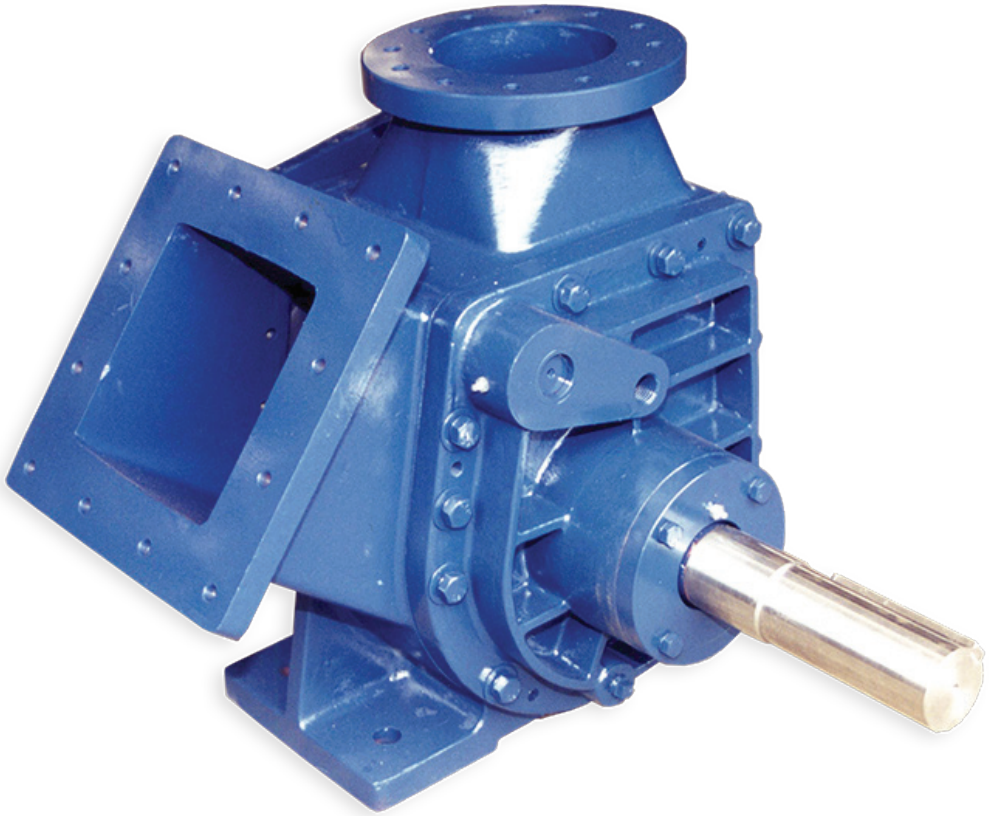
Operating and Maintenance Manual

RT SERIES

ROTOR LUBE PUMP

Ver. 2019-02



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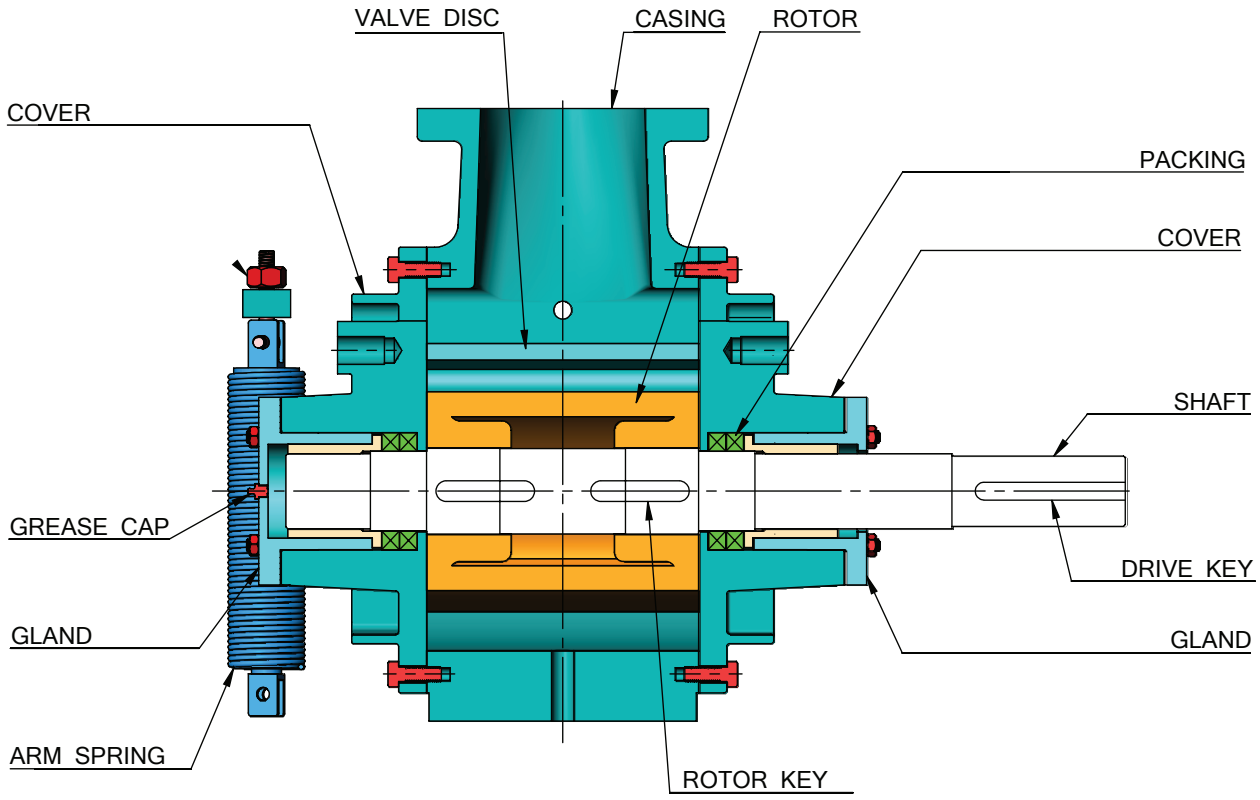
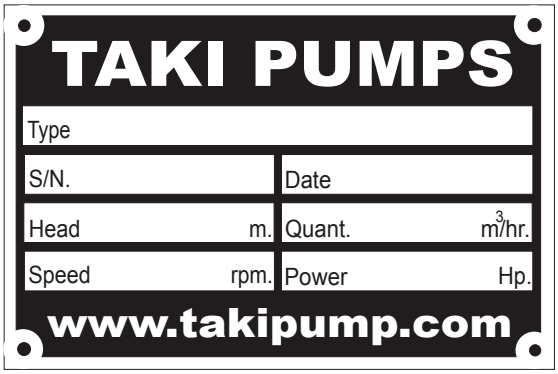
1. Introduction

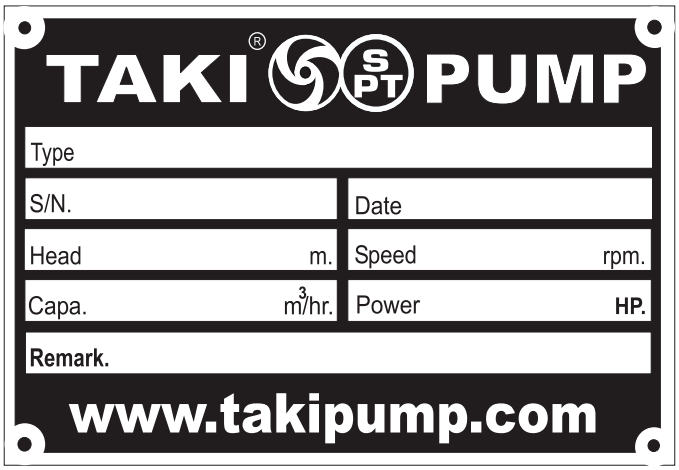
For pumping massecuites and magmas, the pump most commonly used in the sugar industry is the Rotor pump. It's a positive displacement pump, consisting of a rotor of elliptical section rotating inside the pump casing and on which rests spring loaded scraper, which performs the function of a flap valve. Once installed, they require minimum of maintenance. The part which breaks most frequently is the spring which loads the scraper. The spring may be under tension or under compression. In some more modem installations pneumatic cylinders have successfully replaced the conventional spiral springs, where as in less modem factories tractor tube rubbers are used for the necessary tension.

Rotors lube Pump



Name Plate





This user manual is valid for any pump which contains the same nameplate information as is displayed above.

The name plate must never be removed from the pump.
If the name plate is removed, it is not possible to identify the pump, and it will not be possible for warnings contained in this manual to relate to the specific pump application

The pump's serial number (S/N.) is displayed on name plate

Application

Designation ; Heavy Duty
Application ; Mainly pumping of highly viscous liquids
Typical applications ; massecuites and magmas

Pump sizes:

The Model RT is supplied in 2 pump size.
The pump size is defined on the basis of the pump's outlet.

By measuring the internal diameter of the pump's outlet, you can find the pump size in the table below.

Model	outlet	
	(mm)	(inches)
RT R2S	175	7"
RT R3S	250	10"

Transporting the pump

The pump must be secured properly on pallets or similar medium before transport and shipment. The pump must be transported with the usual degree of consideration, to avoid exposing it to impact and pressure.

Lifting the pump

If the pump's weight is more than the permitted allowance of kilos/pounds that people may lift according to local regulations, it must be lifted mechanically.
The table below – figure – shows the weight of the various pump sizes.
Pump weight in kg./lbs. (Bare pump)

Model	Kg.	Lbs.
RT R2S	500	1,102
RT R3S	910	2,006

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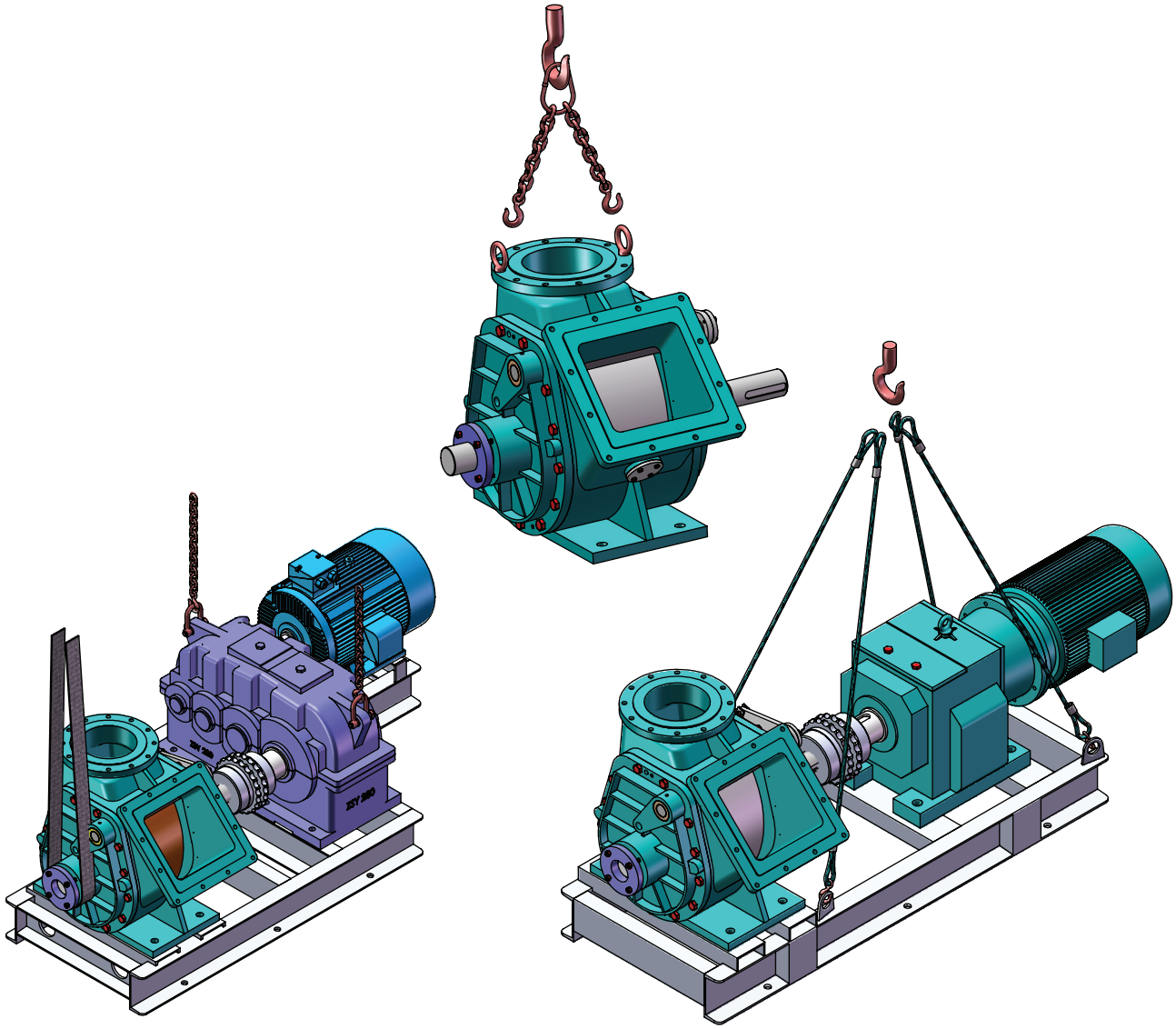

Lift the pump mechanically, if the pump's weight is more than the permitted allowance of kilo/pounds that people may lift.

Do not place fingers in the pump's ports when lifting or handling the pump.

The pump must be lifted using stable suspension points, so that the pump is evenly balances and the lifting straps are not lying over sharp edges.

The pump must be lifted in accordance with the lifting instructions figure.

Motors fitted with lifting eyes must not be used to lift the whole pump, only to lift the motor separately.

Flanges

The flanges material is must be steel or stainless steel. Gaskets need to be installed between the pump casing and the flanges. The material of the Gaskets should be adapted to the chemical and physical conditions of the fluid

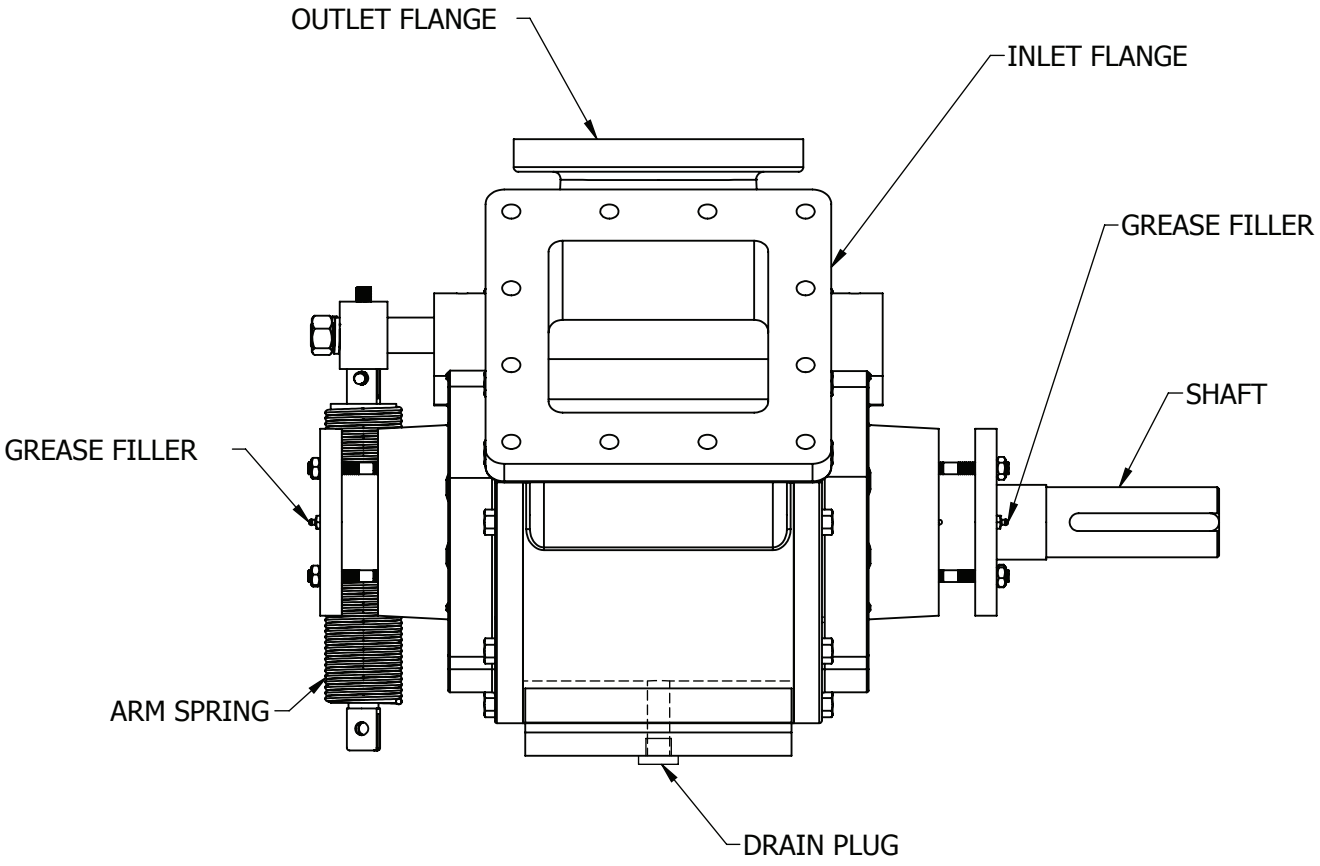

Figure 1.1

Drive Specification

The RT rotor lobe displacement pump needs a drive unit with suitable rotation speed and torque. The design of the drive unit (rotation speed and power) depends on the hydraulic conditions (i.e. capacity, pressure, viscosity) of the application.

Assembly of drive unit

The pump and the drive unit must be assembled carefully and free of distortion. The pump shaft and drive shaft have to be connected with a suitable coupling including guard for protection.

Complete with driving unit

Standard design

The pump and drive are connected to the baseplate, which is made from steel.

Gear drive (coupling guard, coupling unit)

1) RT Pump
2) Coupling
3) Coupling guard
4) Gear reduction unit
5) Motor
6) Base plate

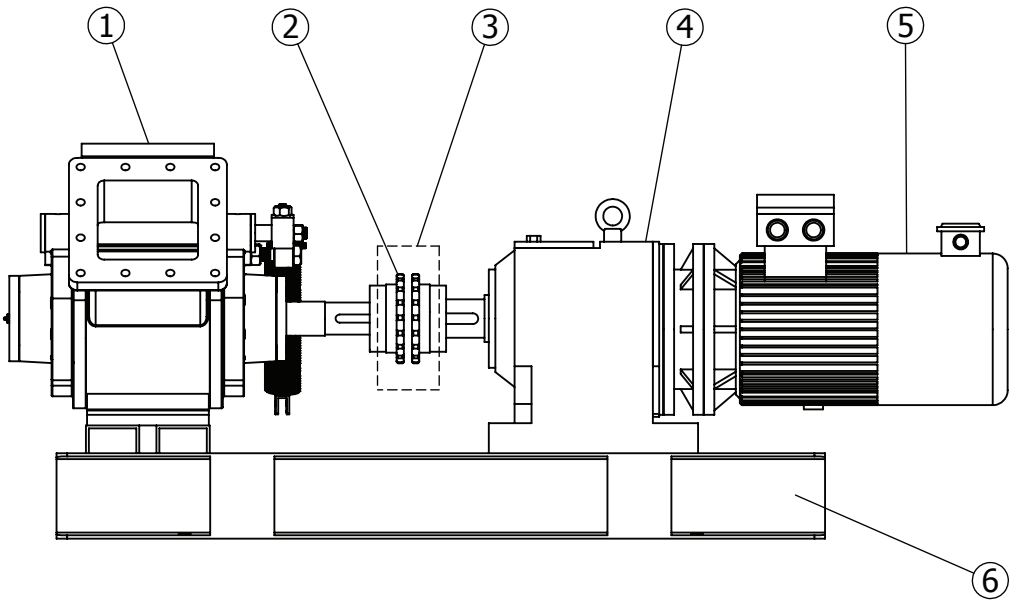

Figure 2.1

Lubricant

The pump must be put in grease as a lubricator at the first time of using. The grease must be a food grade.

There are 2 positions that needed grease.

1. Shaft bushing at the left and right cover (recommended food grade)
2. Ball bearing (optional if installed)

Installation

Safety

All work on the pump – including adjustments, repairs, pipe couplings, etc. Must be undertaken by professionally qualified staff.

When repair and maintenance work has been completed, any safety equipment provided must be refitted in its original state before the pump is started.

Never shut off the pump's suction and/or pressure side during operation.

If it is possible to block the pump's pressure line, the pump or pressure line must be fitted with a by-pass valve.

Motors fitted with lifting eyes must not be used to lift the whole pump, only to lift the motor separately.

The pump must be lifted in accordance with the instructions contained in this user manual – see section entitled "Lifting the pump".

If the pump's weight is over the permitted allowance of kilos/pounds that people may lift, it must be lifted mechanically – see section entitled "Lifting the pump".

It is forbidden to remain in the pump's working area without cause during operation.

The emergency stop must be positioned in close proximity to the pump.

The pump must be shielded when pumping liquids at high temperatures Warning signs must be displayed!

The pump must not be used to pump liquids at temperatures above those listed in the table under "HOT Liquids" – see section entitled "HOT Liquids"!

Flange coupling

Flange coupling must always be undertaken by skilled professionals.
Achieve parallelism between the flanges and observe the maximum tightening torque to prevent tension in the pump casing.

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Achieve parallelism between the flanges and observe the maximum tightening torque to prevent tension in the pump casing.

1. Before connecting the flange, check that the flanges are parallel, as any variance in parallelism will create tension in the pump casing. Aligning the pipe system or fitting compensators achieves parallelism.

2. Select the bolt size for flange on the basis of the pump size in the table in figure below.
You should not use bolts with a yield stress of more then 240 N/mm2, corresponding to quality 4.6 for pumps manufactured in grey cast iron.

3. Find the maximum tightening torque in the table in Figure below.

4. Cross-tighten the bolts using the uniform tightening torque shown in the table below.

Bolt size/maximum tightening torque					
Pump Size	Bolt	Maximum tightening torque			
		A Nm	A Lbft	B Nm	B Lbft
RT R2S	M16	75	55.3	200	147.5
RT R3S	M20	145	106.9	385	284

The bolt sizes available for connecting flanges, together with the maximum tightening torque depending on the pump size and material stated.

Column A pump material in grey cast iron
Column B pump material in steel

Foundation is nessary. RT pump is low speed and high torque. The foundation must be prepared according to the calculation before installation.

$$\text{Concrete thickness (mm)} = \frac{3 \times \text{total weight of pump unit (kg)}}{\text{base plate length(mm)} \times \text{base plate width(mm)} \times 2.3 \times 0.000001}$$

Concrete must be dry, smooth and not inclined

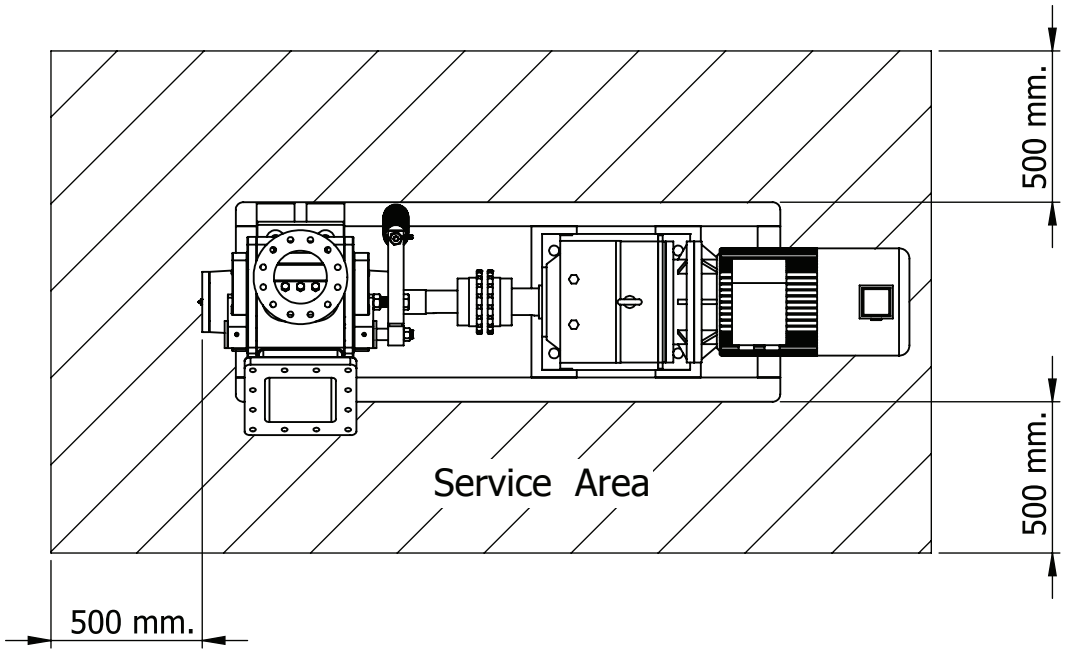


Figure 3.1

Recommend 500 mm around the pump unit (see figure 3.1)

Connecting the motor and the pump.

If you intend to use the pump in a potentially explosive environment, the pump must be connected to an explosion-proof motor.

Carefully shield the coupling between the pump and motor

1. Before connecting the motor and the pump, check that the pump shaft can revolve easily and regularly.

2. When connecting the motor with the pump, you must make sure that the pump shaft and the motor shaft are on precisely the same center line and that there are a few mm (about 0.10 inches) between the shaft end, as otherwise you run the risk of the pump being destroyed during operation.

3. Pump Model RT must be connected to the motor by means of an high torque coupling.

4. The pump and the motor are aligned as described in the following section.

Aligning the motor and the pump

The motor and the pump are aligned as follows.
Other couplings are aligned in accordance with the coupling supplier's instructions with regard to the maximum tolerances for eccentricity and non-parallelism.

1. Check the centering between the pump shaft and the motor shaft by means of straightedge. Place the straightedge over the two coupling pieces on the circumference – 90o apart.
Any misalignment will become evident in the form of a gap of light between the straightedge and the coupling hub.

2. Centering may deviate by a maximum of 0.05mm/0.002 inches when both halves of the coupling rotate.

3. Check the parallelism/gap between the halves of the coupling, using an air gap gauge. The gap may be a maximum of 0.5° – or when both halves rotate the gap deviation may not exceed 0.05mm/0.002 inches on the same point.

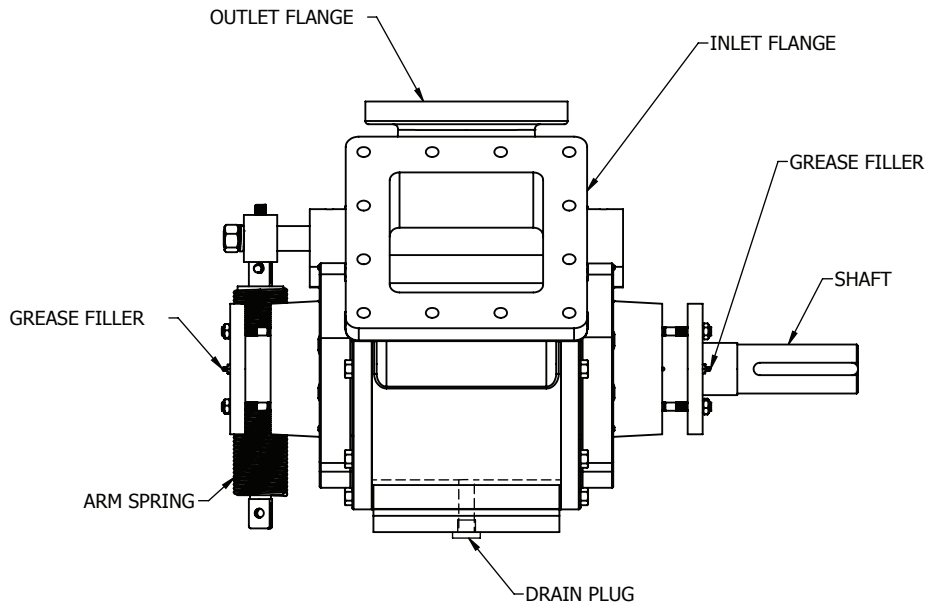
4. Inserting suitable intermediate layer of material between the pump's or the motor's base and base frame corrects alignment.

Insufficient alignment between pump and motor causes increased wear on the coupling elements.

Setting valve disc

RT pump have operation with valve disc.
if the valve disc setting in high position the pressure of pump will drop.
and if the valve disc setting in low position the rotor of pump will wear.

see video to show how to setting valve disc
with valve disc setter (CAM)
https://www.takipump.com/video/rt-set.mp4



install step

- install base plate and drive unit to the shaft (coupling, gear, motor)
- install Arm spring
- install pump unit at working foundation
- alignment pump
- install suction and dischange pipe then re-alignment
- fill grease

Before connecting the pipe

The pump should be filled with liquid before it is started. Before the pipes are fitted, the pump is filled with a volume of liquid that enables the liquid to start running out of the pump.

Clean out any impurities from the pipe system before the pump is connected to it.

Remove the protective sheet from the pump port before connecting the pipes.

The pump must be installed so there is no tension between the pipe and the pump casing.

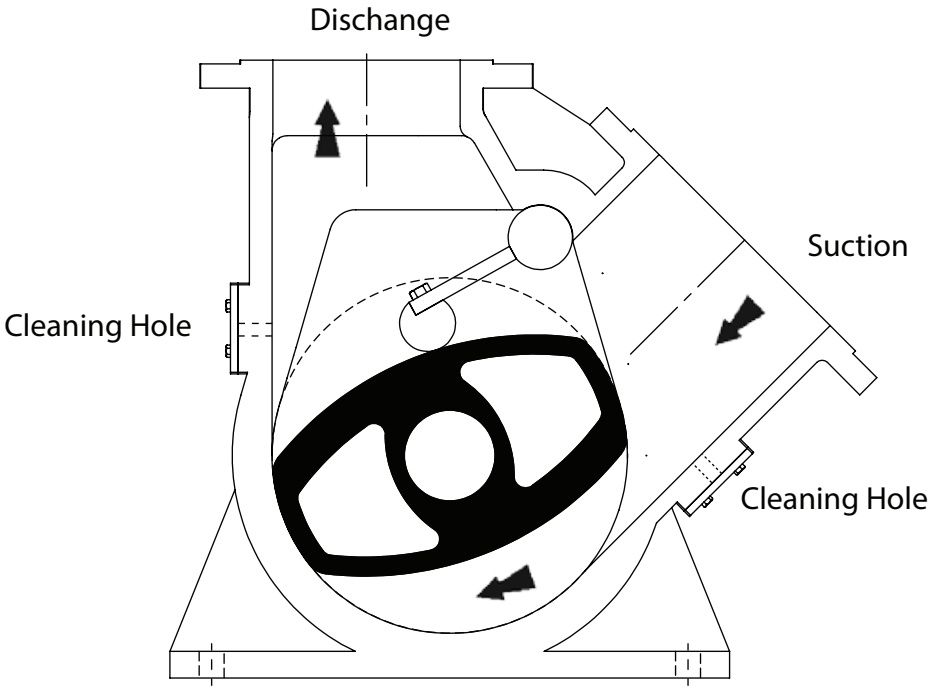


Figure 4.1

Emergency stop

Fit the pump unit with an emergency stop

If the pump is fitted as part of a total system, this must be provided with an emergency stop. The emergency stop is not included in pump unit (option)

When installing the pump, the emergency stop must be:
- Designed, set up and installed, and function in accordance with the prevailing standards and directives
- Positioned within easy reach, so that it is accessible to the operator/engineer during repairs, adjustment and maintenance of the pump
- Be tested regularly to check that it is full working order

Monitoring

Connect any monitoring and safety systems that are necessary for safe operation.

Connect and adjust any monitoring and safety system – manometer, flow meters, etc. – according to the operating condition.
.

Before starting the pump

Check the leak of electricity

Before starting the pump, check:
- That the pump shaft can be turned around freely.
- That the pump is connected to an explosion-proof motor,if the pump is set up in a potentially explosive atmosphere.
- That the pump's and motor's name plate are labeled with explosion protection.
- That the pump and motor are aligned precisely – see section entitled "Alignment between motor and pump".
- That the bearing – if they have lubrication nipples – are lubricated.
- That the ball bearings' maximum service life is observed.
- That all isolating valve in the suction and pressure pipe are fully open, to avoid the pressure being too high and the pump running dry.
- That the pump casing is filled with liquid to ensure the ability to self-prime
- That there is no coagulated liquid in the pump or the pipe system – after the last operation – that may cause blockage or breakdown.
- That the necessary monitoring and safety systems are connected and adjusted according to the operating conditions.

Before starting after preservation

Before starting - after preservation – check :
- That the pump is not corroded or dried out
- That slide bearings and the shaft seal's sliding surfaces are not dry.
- This check is performed by turning the pump shaft gently.
- That any preservative or anti-frost liquid is cleaned off before starting the pump – if these are not compatible with the pump liquid.
- That elastomers are replaced if they have been damaged by the anti-frost liquid used.
- That ball bearing and any elastomers are replaced if the pump has been in storage for more than 6 years, as the lubricating grease used for elastomers and ball bearings have a limited service life.

After starting the pump

Model RT may only run without liquid flow for the short period required for self-priming – with regard to the slide bearings and shaft seal.

After starting the pump, check :
- That the pump is drawing the liquid.
- That the speed is correct.
- That the direction of rotation is correct.
- That the pump is not vibrating or emitting a jarring sound.
- That the stuffing box are not becoming hot.
  Stuffing boxes with packing ring may, however, permitted a low level of leaking 10 -100 drops of leakage per minute
- That there are no leaks by the pump.
- That the operating pressure is correct.
- That the power consumption is correct.
- That all monitoring equipment is in full working order.
- That any pressurized water pipes, heating/cooling systems and lubricating systems, etc. are operating and in full working order.
- Running in the packing seal

Running in the packing seal - when first time starting the pump

when starting a new pump, the packing seal must be run in as described below :

1. Once the pump has started, the packing seal must leak more than 200 drops per minute to saturate the rings.
2. When the packing seal is saturated – after approx. 30 minutes' operation – the packing gland screws must be tightened gradually, so that the leakage is reduced.
3. Check that the staffing box does not become hot.
   If the staffing box become hot, loosen the packing rings slightly, after which you must check that the temperature is falling.
4. When the leakage is between 10-100 drops per minute, do not tighten the screws anymore.
   The number of drops per minute depends on the pump size, pressure and speed.
5. The packing seal must not be tightened so much that there is no leakage.
   The must leak continuously.
6. The leakage rate must be checked at regular intervals.

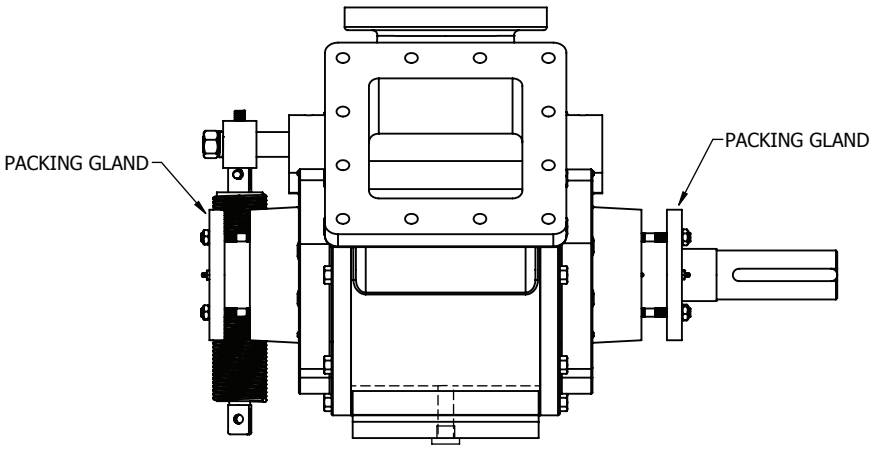
Adjusting the packing seal

The shaft seal must not be adjusted during operation.

It is important that the packing seal leaks during operation, as this provides lubrication and also releases the frictional heat is generated.

The packing seal with packing rings requires continuous adjustment, to make sure that the volume of leakage by the stuffing box is correct.
Depending on the speed, pressure, pump size and viscosity, the stuffing box must leak 10-100 drops per minute to remove the frictional heat that is generated between the shaft and the packing rings. If there is insufficient leakage, the heat generated can cause the gasket rings to harden and create increased wear on the shaft.

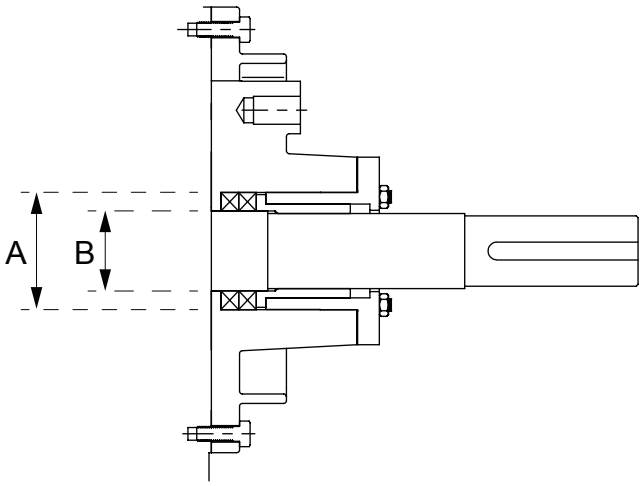
The leakage described above is achieved by tightening the packing rings axially, so that they apply a pressure against the shaft. This pressure restricts the flow of the liquid, as the play between the shaft and the packing ring is in the order of a few thousandths of a millimeter.



The location of the packing seal, the stuffing box and the packing gland on the pump.
The design of the shaft seal housing, does , however, depend on the individual pump application.

Repacking packing seal

1. Pull the packing gland back on the shaft once the screws have been removed.
2. The packing rings can now be pulled out using a packing extractor.
3. Check the shaft and the stuffing box thoroughly for wear, scratches and deposits.
4. Replace worn parts and remove deposits with care.
5. Always conduct a control measurement of the shaft and the stuffing box before specifying the packing dimension.
   !! Never use old packing rings when measuring
   The packing dimension is defined on basis of the following:



The A and B dimensions on the shaft and the stuffing box

The A and B dimensions obtained are inserted in the following formula to determine the packing dimension.

(A - B) / 2 = packing dimension

6. New packing rings are bought as spare part or produced as described in step 7.
7. Trim the new packing ring on the shaft or a mandrel of the same diameter as the shaft.
   Wrap the packing around the shaft/mandrel the number of times that packing ring are to be used, and cut through with a sharp knife.
8. If the packing rings are difficult to move into position, they can be rolled with a pipe or similar item.
   Never strike a gasket, as the fibers in the material will be destroyed and the sealing property will be significantly worsened.
9. Lubricate the individual rings with a little oil to facilitate installation.
10. Turn the ring openings so that the two rings lying alongside one another are diametrically offset.
11. Finally, tighten the packing gland gently by hand, and restart the pump.

Maintenance

The pump must be inspected and maintained on an ongoing basis in accordance with the schedule below

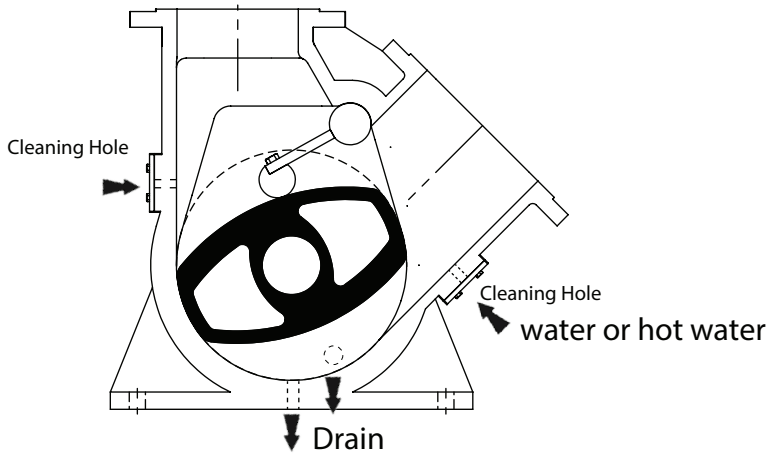
Maintenance
During daily inspection, check :
That the pump does not vibrate or emit jarring sounds
That lubricated slide bush or bearing are lubricated
That the operating pressure is correct
That any lubricating devices are in working order
That any circulation pipes – cooling, heating or pressurized water pipes are in working order
That power output and power consumption are correct
During weekly inspection, check :
That any filters and drainage holes are clean
That the areas around the stuffing box and the bush or bearing are free of dust
That the soft stuffing box is leaking 10-100 drops per minute
Whether flexible connecting elements are worn
During inspection every 2 months, check :
That the bush or bearing do not have too much play
That the by-pass valve (if fitted) opens at the correct pressure
That the by-pass valve (if fitted) is in working order

The figure shows which parts or what must be checked and maintained on the pump. And at what intervals this must be undertaken.

Emptying and cleaning the pump

Use suitable safety equipment with pump liquids at temperatures of more than +60°C/140°F

The system must be depressurized before emptying the pump



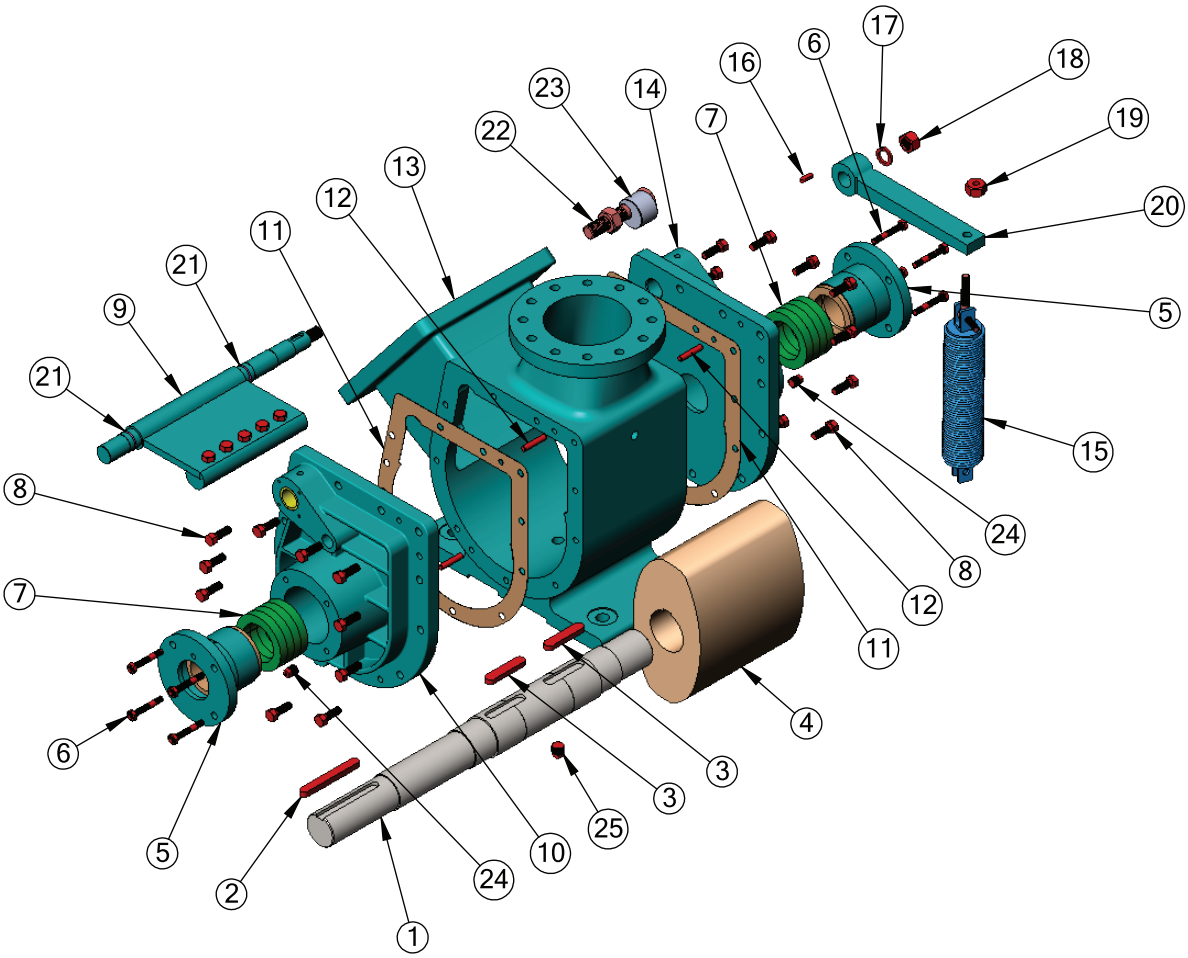
1. Stop the unit.
2. Empty the pipe system.
   Note that there is still liquid in the bottom of the pump casing and in the shaft seal housing, even if the pipe system is empty.
   - Close the valves on the suction side and the pressure side, if the system is equipped with these, so that the system is un-pressurized.
   - Place a collecting tank beside the pump and remove drain plug to take the volume of liquid contained in the part of the system to be emptied.
3. Cleaning the pump
   - Open the cleaning hole of the pump. fill water or hot water to get rid of the massecuite. then rotate the shaft manually to be water clear and emptied
   - Let the pump casing dry and use metal surface protection.

Please note that the drainage time is longer for highly-viscous liquids, as these find it difficult to make their way from the stuffing box house through the chamber between the rotor and the rear cover to the pump casing
Some special versions of the pump are fitted with one or more draining plugs, to facilitate the drainage of highly-viscous liquids.

Troubleshooting

Problem:								
1. Lack of co-ordination between pressure and flow rate								
2. The pump can not self-prime								
3. The pump loses liquid after self-priming								
4. The flow rate is too low								
5. The pump is making a noise								
6. Motor is overloaded								
7. The pump has jammed								
8. The pump wears quickly								
Cause:								
1. Too great a vacuum				x	x	x	x	
2. Cavitations				x	x	x		
3. Viscosity too high			x	x	x		x	x
4. Temperature too high		x	x				x	
5. The pump is drawing air				x	x	x	x	x
6. Pressure too high	x	x	x		x			
7. Defective valve			x	x	x			
8. The pump is corroded	x				x		x	
9. The pump is worn					x		x	
10. Impurities in the pump	x	x	x					
11. The stuffing box is over-tightened	x		x					
12. Fault in the motor			x					
13. Pipe too constricted or blocked					x		x	
14. Wrong speed							x	
15. The pump runs without liquid	x	x					x	
16. Liquid temp. too high – lack of lubricant	x	x						
17. Speed too low					x			
18. Speed too high				x				x
19. Suction line dipped in liquid							x	
20. Liquid being fed above liquid level				x				
21. Valve incorrectly adjusted					x			
22. The pump's shaft end is bent	x			x				
23. Coupling incorrectly aligned	x			x				
24. Pump twisted in relation to pipe system	x	x	x	x				
25. Leaking pipe/assemblies							x	

Disassembly the pump



https://takipump.com/video/rt-as.mp4

The following QR code will link to the video on. The video will clearly guide you how to disassembly and assembly RT pump (Please follow the steps) In case you have question or problem please contact sale@takipump.com

Reaming pressure in the pump can splash fluid out of the gap between pump casing and cover. Cover gap with suitable rag

Must remove the electricity before removing any part of the pump.

6.2. Disassembly the pump

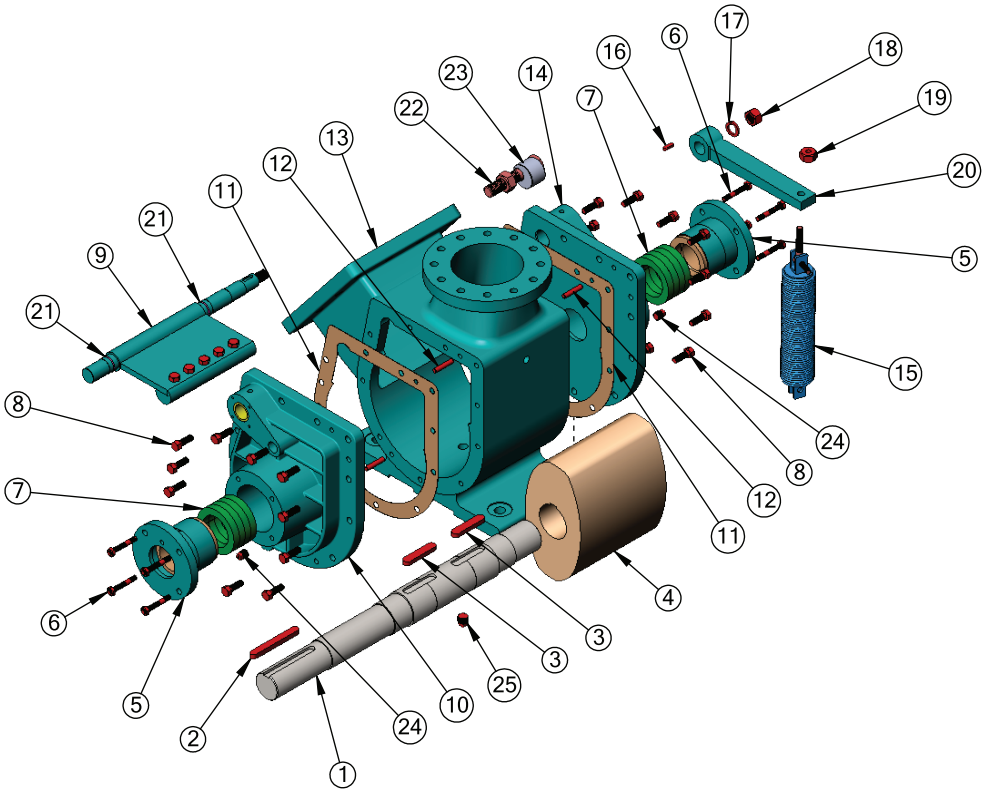
1) Remove the Nut level (19)
2) Remove the spring (15)
3) Remove the nut hex (18)
4) Remove the ring (17)
5) Remove the level (20)
6) Remove the valve disc key (16)
7) Remove stud + nut (6)
8) Remove Gland (5)
9) Remove Packing (7)
10) Remove coupling key (2)
11) Remove stud + nut (6)
12) Remove gland (5)
13) Remove packing (7)
14) Remove bolt(7)
15) Remove cover for coupling side (10)
16) Remove gasket (11)
17) Remove pin (12)
18) Remove valve disc set (9)
19) Remove shaft (1) + impeller (4) + impeller key (3) from the body
20) Remove impeller (3) from the shaft
21) Remove impeller key (3) from the shaft
22) Remove cover for end side (14)
23) Remove gasket (11)
24) Remove pin (12)

6.3 Disassembly the packing

1) Remove the Nut level (19)
2) Remove the spring (15)
3) Remove the nut hex (18)
4) Remove the ring (17)
5) Remove the level (20)
6) Remove the valve disc key (16)
7) Remove stud + nut (6)
8) Remove Gland (5)
9) Remove packing (7)

Spare Parts List

The spare parts list contains all parts in Rotor lube displacement pump as referring to the explosion drawing, the name of the part, material, and article number. There are 2 pumps in this series RT R2S and RT R3S



Part No.	Part Designation	Part No.	Part Designation
1.	Shaft	14.	Cover (CW)
2.	Drive key	15.	Arm spring
3.	Rotor key	16.	Valve disc key
4.	R otor	17.	Valve dise ring
5.	Gland	18.	Valve disc nut
6.	Gland stud & nut	19.	Spring nut
7.	Packing	20.	Valve disc arm
8.	Cover bolts	21.	Valve disc seal
9.	Valve disc set	22.	Valve disc nut
10.	Cover (CCW)	23.	Valve disc setter
11.	Cover gasket	24.	Cover drain plug
12.	Cover pin	25.	Casing drain plug
13.	Casing		

CW = Clockwise
CCW =Counter clock wise

Name	RT R2S Qty	Name	RT R3S Qty
HEX NUT 5/8X2”	22	HEX NUT 3/4X2”	26
HEX NUT 5/8X1”1/2	5	HEX NUT 5/8X1”1/2	5
SPRING 5/8	22	NUT 1/2X2”	2
NUT 1/2X2”	1	HEX NUT M30X80	1
HEX NUT M30X150	1	STUD 1/2X3”1/2	8
STUD 1/2X2”1/2	8	SCREW NUT 1/2	8
SCREWNUT M30X3.5	2	PIN M12X50	4
SCREWNUT ½	8	SPRING 3/4	26
SCRENUT	1	RING 1/2	8
SEAL40-60-10	1	PLUG 3/4	1
ORING 3.5X30	1	PLUG 1/2	2
PIN M12X50	4	HEX NUT 3/8X1”	8
PLUG1/2	2		
PLUG3/4	1		
KEY10X8X32	1		
HEXNUT3/8X1”	8		