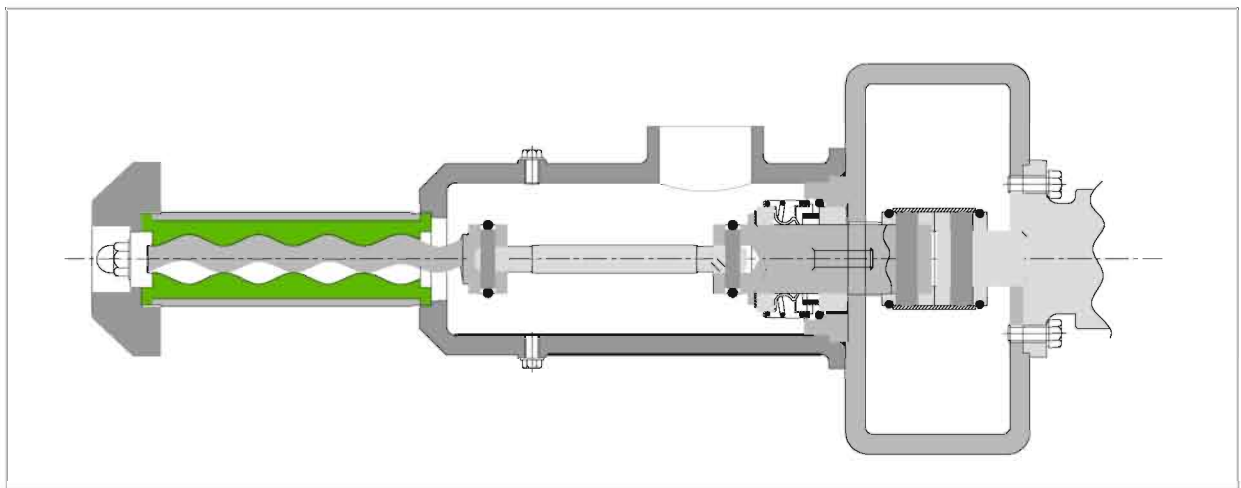


# **ROTOMAC PROGRESSIVE CAVITY PUMPS**

## **INSTALLATION, OPERATION & MAINTENANCE MANUAL**

**SERIES : 'MP & MW'**



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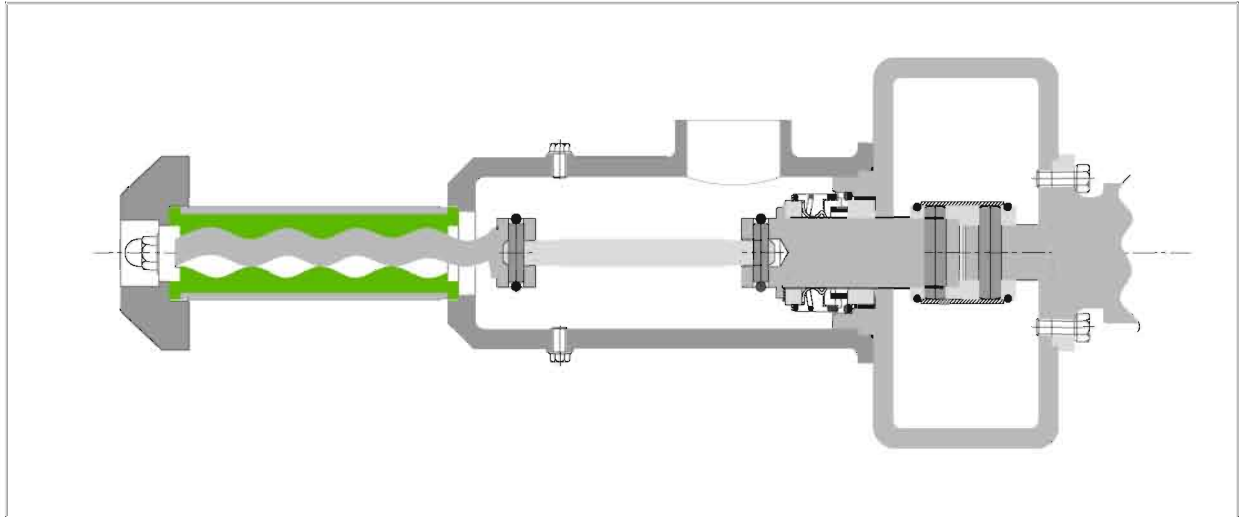
**ROTOMAC PROGRESSIVE CAVITY PUMPS ::#:: THE FINE ART OF PUMPOLOGY**

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# ROTOMAC PROGRESSIVE CAVITY PUMPS

## INSTALLATION, OPERATION AND MAINTENANCE MANUAL

### 'MP & MW' SERIES PUMPS



Sl. No.	Table of Contents	Page
1.	SPECIFICATION	01
2.	IMPORTANT NOTES	02
3.	INSTALLATION & SAFETY RECOMMENDATIONS	02
4.	PRE-OPERATIVE CAUTIONS	02
5.	STARTUP AND ROTATION	03
6.	GENERAL INFORMATION ON YOKE SHAFT & COUPLING ROD	03
7.	DISMANTLING	04
8.	REASSEMBLY	05
9.	MECHANICAL SEAL	06
10.	MAINTENANCE AND SERVICE	07
11.	FAULT FINDING & REMEDYING	08-09
12.	EXPLODED VIEW OF PUMP ASSEMBLY WITH PARTS LIST	10
13.	RECOMMENDED SPARES	11

<b>'ROTOMAC'</b>	<b>OPERATION AND MAINTENANCE MANUAL 'MP' &amp; 'MW' SERIES 'ROTOMAC' PUMPS</b>	Page: 01
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## 1. SPECIFICATION

1.1 **BASICS:** Screw Pumps are a special type of Positive Displacement Pumps in which flow through the Pumping elements is truly axial. The **ROTOMAC** design uses a helix of steep pitch, deep root and well rounded apex, which rotates eccentrically in a static housing of similar design but of twice the pitch. The disparity in pitch gives rise to a cavity between rotor and stator as the rotor rotates and oscillates at the same time. The geometry of the cavity is defined by the advancing line of frictional contact between rotor and stator. During operation all parts of the cavity advance steadily from the intake side to the delivery side of the stator. The **ROTOMAC** progressing cavity pump is therefore of the positive displacement type but, unlike other such pumps, has a uniform pulse-free output in strict linear dependence on the rotational speed. They are compact, efficient, accurate and comparatively silent in operation.

1.2 **THEORY:** In screw pumps, it is the intermeshing of the threads & close fit of the surrounding housing which create one or more sets of moving seals between pump inlet & outlet. These sets of seals act as a labyrinth & provide the screw pump with its positive pressure capability. The successive sets of seals form fully enclosed cavities, which move continuously from inlet to outlet. These cavities trap liquid at the inlet & carry it along to the outlet, providing a smooth flow.

1.3 **DESIGN CONCEPTS:** The **'ROTOMAC' 6L Rotor – Stator Geometry** with characteristic advantages is being applied in manufacture of the Rotor and Stator. The developed design proved to enhance the service life and reduce cost of operation by

- (a) Wear of Rotor/Stator is considerably reduced due to low peripheral speed of the rotor,
- (b) Lower axial forces are transmitted to the joints and pump bearings due to the reduction in cross sectional area of the rotor,
- (c) Improved efficiency because of better volumetric and mechanical efficiency.

### 1.4 SCOPE

1.4.1 **'MP' & 'MW' Series 'ROTOMAC' Pumps** are used for handling viscous / non viscous fluids, and pulped material in suspension. It is an ideal pump for dosing Flocculants, Lime Sulfate, Phosphoric Acid, Talfloc, etc. in Sugar Mills, Neem Oil in Fertilizer manufacturing, Medicinal Formulations/Syrups, Special/Medicinal Oils, Lotions, etc. in Laboratories.

1.4.2 This series of **'ROTOMAC' Pumps** are constructed in AISI-304/316/316L Stainless Steel housing/ wettable parts. The resilient, torsion free metal bonded Stators are made of Non-Contaminating Polymer depending upon the compatibility of the pumping fluid. The Pump suction & discharge connections are supplied with BSP threaded connections.

### 1.5 DUTY CONDITIONS:

**'MP' & 'MW' Series 'ROTOMAC' Pumps** should be installed only on specific duties for which they have been supplied. In case pumps are required to be used for other applications, manufacturer's prior recommendation should be sought in the interest of safety, plant efficiency and the pump life.

	Date	Name	Signature	Revision : 00
Approved	01.04.2014	AG		Document No.
Released	01.04.2014	AG		<b>RIPL: O&amp;MM: 16</b>

**2 IMPORTANT NOTES**

- 2.1 In order to achieve reliable performance and long service life, the pump must be checked and maintained at regular intervals, strictly according to the instructions.
- 2.2 These instructions should be placed at the disposal of operating and maintenance staff and should be carefully followed.
- 2.3 The manufacturer do not take any responsibility for damage occurring due to non-observance of these operating instructions.
- 2.4 Warning Plates on the pump showing correct direction of rotation, warning against Dry Running, must always be observed and kept completely legible.

**3 INSTALLATION AND SAFETY RECOMMENDATIONS**

- 3.1 **'MP' & 'MW' Series 'ROTOMAC' Pumps** must be installed with their base plates mounted on a flat surface, grouted and bolted, thus ensuring firm fixing and reduction in noise and vibration. Sufficient space to be left for removal of the stator during the maintenance work.
- 3.2 All pipe works should be independently supported to avoid any load on the pump.
- 3.3 To eliminate vibration, the pump must be checked for proper alignment with the drive unit before and after the pipe fittings.

It is recommended that a vacuum gauge be fitted to the pump suction branch and a pressure gauge fitted to the delivery branch to facilitate continuous monitoring of the pump operating conditions.

**3.4 When motor is being wired and checked for direction of rotation, the pump housing should be filled with water to prevent dry running of the pump and damage to the Stator**

Wiring works of all electrical equipments should be carried out by qualified personnel and complied with the relevant national regulations.

- 3.10 Care must be taken to protect all electrical items from oil and water.
- 3.11 Pump Safety Devices are to be ensured in place before starting the pump.

**4 PRE-OPERATIVE CAUTIONS**

- 4.1 THE 'ROTOMAC' PROGRESSIVE CAVITY PUMPS SHOULD NEVER BE RUN IN A DRY CONDITION, EVEN FOR A FEW REVOLUTIONS AS THIS WILL DAMAGE THE RUBBER STATOR.
- 4.2 AS THE PUMP REQUIRES HIGH STARTING TORQUE, USE OF ONLY DIRECT-ON-LINE STARTER IS RECOMMENDED WITH SQUIRREL CAGE INDUCTION MOTOR.
- 4.3 'ROTOMAC' PROGRESSIVE CAVITY PUMPS SHOULD NEVER BE STARTED AGAINST CLOSED VALVES.

	Date	Name	Signature	Revision : 00
Approved	01.04.2014	AG		Document No.
Released	01.04.2014	AG		<b>RIPL: O&amp;MM: 16</b>

**5. START-UP AND ROTATION**

5.1 The Pump Housing / Bucket (02) must be filled with the relevant pumping media before starting. In case of high viscosity media, fill with a liquid. This initial filling is not for priming purpose; but to provide the necessary lubrication to the rubber stator until the pump primes itself.

5.2 When the pump is stopped, sufficient product is trapped in, to provide lubrication for the next starting, but if the pump is lying idle or it has been dismantled for servicing / relocation, the pump must be filled with relevant product and given a few turns by hand before starting.

5.3 **'MP' & 'MW' Series 'ROTOMAC' Pumps** are normally arranged for counterclockwise rotation (viewing from the driving end) which results in the flange nearer to the driving end, being the suction. Pumps fitted with direction dependent seals should never be run in the opposite direction of the rotation arrow. In case where necessary, it is advisable to contact the Factory, to run the pump in the reverse direction so as to bring the delivery at the driving end.

5.4 Open the valves before starting the pump. Never run the pump against a closed outlet or inlet valve!

5.1 As the pump is having Mechanical Seal shaft sealing arrangement, there is zero leakage of the liquid from the shaft.

**6. GENERAL INFORMATION**

6.2 **YOKE SHAFT:**  
Yoke Shaft is manufactured as one solid piece with yoke heads, to carry the Universal Joint, which ensures a true concentric motion and does not disturb the gland packing/mechanical seal during operation.

6.3 **COUPLING ROD / AUGER CUM COUPLING ROD:**  
Extra long Coupling Rod / Auger cum Coupling Rod, connecting Yoke Shaft to the Rotor, minimize the wear and tear of the universal joints and increase the life of the pumps.

	Date	Name	Signature	Revision : 00
Approved	01.04.2014	AG		Document No.
Released	01.04.2014	AG		<b>RIPL: O&amp;MM: 16</b>

<b>'ROTOMAC'</b>	<b>OPERATION AND MAINTENANCE MANUAL 'MP' &amp; 'MW' SERIES 'ROTOMAC' PUMPS</b>	Page: 04
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**7. DISMANTLING:** To dismantle and carry out required servicing of the pump, please follow the procedure as detailed below:

7.1 Unscrew and remove the Dome Nuts & Sp. Washers (20 & 22) of the Tie Rod (19) and remove the End Cover (03).

7.2 Hold the Yoke Shaft (08) unscrew the Bonded Stator (12) from the Rotor (13). If the stator offers some resistance, pour a little water through the opening to ease out this stiffness. Remove the Stator (12) from the Pump Housing / Bucket (02) and draw out the Pump Housing / Bucket (02) from the rotating assembly.

7.3 Remove the O-Ring (11) from the Rotor head and knock out the Coupling Rod Pin (10). Remove the Rotor (13). Remove the O-Ring (11) from the Yoke Shaft head (08) and knock out the Coupling Rod Pin (10). Remove the Coupling Rod /Auger cum Coupling Rod (09).

7.4 Remove the 'O' Ring for Pin Retainer Sleeve (17) from the far end groove of the Coupler (14) and slide the Pin Retainer Sleeve (17) towards the drive end. Knock out the Coupler Pin (15) retaining the Yoke Shaft (08) and remove the Yoke Shaft (08).

7.5 Remove the Seal Clamping Plate (05), Mechanical Seal (06) & the Seal Washer (07) (where applicable) from the Yoke Shaft (08).

7.6 Remove the O-Ring (11) Body groove.

7.7 Remove the 'O' Ring for Pin Retainer Sleeve (17) from the other end groove of the Coupler (14) and slide the Pin Retainer Sleeve (17) towards the pump end. Knock out the Coupler Pin (15) retaining the Prime Mover Shaft (23) and remove the Prime Mover (23) from the Body (01) and Base Plate by unscrewing the 4 Hex. Head Bolts & Sp. Washers (21 & 22). Remove the Coupler (41), Pin Retainer Sleeve (16) and the O-Rings (11) from the Body (01).

7.8 Unscrew the Tie Rods (19) from the Body (01)

	Date	Name	Signature	Revision : 00
Approved	01.04.2014	AG		Document No.
Released	01.04.2014	AG		<b>RIPL: O&amp;MM: 16</b>

- 8. REASSEMBLY:** To reassemble the pump, please follow the procedure as detailed below:
- 8.1 Screw and tighten the Tie Rods (19) to the Body (01) .
  - 8.2 Mount the Prime Mover (23) to the Body (01). As the Prime Mover shaft is inserted through hole in the Body (01), slide one of the 'O' Ring for Pin Retainer Sleeve (17) over the Prime Mover shaft. Insert the Prime Mover shaft into the Coupler (14) with the Pin Retainer Sleeve (16) and the other O-Ring (17) mounted on the Coupler (14). Tighten the Prime Mover (23) with the Base Plate to the Body (01) with the 4 Hex. Head Bolts & Sp. Washers (21 & 22)
  - 8.3 Slide the Pin Retainer Sleeve and match the holes of the Coupler and Prime Mover shaft and insert the Coupler Pin (15). Slide the Pin Retainer Sleeve to retain the Pin.
  - 8.4 Take the Yoke Shaft (08). Slide the Seal Washer (07) (where applicable) on the Yoke shaft (08) so as to rest the same to the Yoke Shaft (08) head collar. Slide the Dynamic Mechanical Seal (06) over the Yoke shaft (08) seal face facing the end of the Yoke Shaft (08). Slide the Seal Clamping Plate (05) with the Static Seal face facing the dynamic seal and rest. While assembling the seal on the shaft, apply some glycerine to the shaft.
  - 8.5 Place the O-Ring for Pump Housing / Bucket (04) in the Body (01) groove. Insert the Yoke Shaft into the Coupler (14). Match the Holes of the Coupler (14) and the Yoke Shaft (08) and insert the Coupling Rod Pin for Coupler (15). Slide the Pin Retainer Sleeve (16) and mount the O-Rings (17) in their grooves on the Coupler (14)
  - 8.6 Take the Coupling Rod/Auger cum Coupling Rod (09) and insert one end into the Yoke Shaft (08). Align the holes and insert the Coupling Rod Pin (10) and place the O-Ring for Coupling Rod Pin (11) in its groove on the Yoke Shaft's head to retain the Coupling Rod Pin (10). Place another O-Ring for Coupling Rod (11) onto the Coupling Rod/Auger cum Coupling Rod (09).
  - 8.7 Take the Rotor (13) and insert the other end of the Coupling Rod/Auger cum Coupling Rod (09) into the head of the Rotor (13). Align the holes and insert the Coupling Rod Pin (10) and place the O-Ring for Coupling Rod Pin (11) in its groove on the Rotor's head (13) to retain the Coupling Rod Pin (10).
  - 8.8 Screw in and tighten the Filling & Drain Plugs (18&24) in their holes. Slide the Pump Housing / Bucket (02) over the rotating assembly and let that rest on the face of the Body (01) on the O-Ring for Pump Housing / Bucket (02). Hold the coupler assembly and screw in the Bonded Stator (12) on the Rotor (13) and the let the Bonded Stator (12) rests in the seat provided in front of the Pump Housing / Bucket (02).
  - 8.9 Mount the End Cover (03) through the Tie Rods (19) and let the End Cover (03) seat rests on the Bonded Stator (12). Tighten the Dome Nuts (20) to the required tightness keeping the Pump Housing (02) seated properly on the face of the Body (01) over the O-Ring for Pump Housing / Bucket (02) and the Bonded Stator (12) straight. The Pump Assembly is complete for connection of pipe lines.

	Date	Name	Signature	Revision : 00
Approved	01.04.2003	AG		Document No.
Released	06.04.2003	RPG		<b>RIPL: O&amp;MM: 16</b>

### 9. MECHANICAL SEAL

- 9.1 Mechanical Seal (06) is fitted over the Yoke Shaft (08) and the static seal ring ( lapped face facing forward ) in the recess of the Seal Clamping Plate(05).
- 9.2 Mechanical seal gives a perfect leak-proof joint. The seals are pre-loaded and assembled to give maximum efficiency. Care should be taken not to drop or scratch the lapped faces as this will render them incapable of forming a perfect seal.
- 9.3 Quenching and flushing plans are not available with this series of pumps.
- 9.4 **REMOVAL & FITTING OF MECHANICAL SEALS:** Removal of the Mechanical Seal from the Yoke Shaft is explained in 7.4 & 7.5 and the assembly of the same is as per 8.4.
- 9.5 Care is to be exercised for cleanliness and avoiding of foreign bodies in between the seal faces sliding surfaces. While assembling the seal on the shaft, apply some glycerine to the Yoke Shaft.

	Date	Name	Signature	Revision : 00
Approved	01.04.2014	AG		Document No.
Released	01.04.2014	AG		<b>RIPL: O&amp;MM: 16</b>



**10. MAINTENANCE AND SERVICE**

Due to a simple assembly design of the Progressive Cavity Pumps, they need a little attention and replacements but as per the Maintenance & Service practice, the following are attended at regular intervals:

**Cleaning:** The pump should be regularly rinsed or cleaned where sedimentation deposits of medium is likely.

**Temporary Shutdown:** If the pump is stopped temporarily for some time, the pump should be rinsed /cleaned if the medium tends to solidify/ harden and glue up the Mechanical Seal.

**Stator:** When the pump is stopped for a long period, the elastomer along the contact line between the rotor and stator may become permanently distorted and this will increase the breakaway torque. It is advised to remove the stator from the pump and the same is stored in air-tight package in a cool/dry place away from light.

This case applies to Standby Pumps as well and they are to be operated from time to time otherwise the pump may seize when being started up.

**Rotor:** When stored for a long period, support on wooden blocks and cover to protect from damage.

**Coupling Rod Pins:** Check the Coupling Rod Pins for Coupling Rod./ Auger cum Coupling Rod and the Coupler from time to time for wear& tear and replace if necessary.

**Lubrication** MP & MW series 'Rotomac' Pump yoke Shafts(08) are directly mounted on to the Prime Mover Shafts eliminating the bearings to support the Yoke Shafts(08) and a such, the bearings of the Prime Mover shall be lubricated with grease during the service of the same. Also, if the Prime Mover is a Geared Motor oil level should be maintained in the Gear Box.

	Date	Name	Signature	Revision : 00
Approved	01.04.2014	AG		Document No.
Released	01.04.2014	AG		<b>RIPL: O&amp;MM: 16</b>

11. FAULT FINDING & REMEDYING

Possible Problems

The pump is no longer starting																				
The pump is no longer sucking																				
The pumped medium is too little																				
The pressure is too low																				
The pumped medium is unstable																				
The pump is running loudly																				
The pump is stuck																				
The drive is overload																				
The stator life time is too short																				
The rotor life time is too short																				
The shaft seal is leaking																				
Failure to deliver liquid																				
Pump looses liquid after starting																				
Vibration																				
Stuffing box over-heats																				
Bearing over-heat																				
Bearing wear rapidly																				

The ROTOMAC pump is a well established product which was thoroughly tested before leaving the factory. If you use the pump in keeping with your Order specification and treat it in accordance with our operating and Maintenance Instructions, it will run satisfactorily for a long period of time.

Possible Causes (Remedy overleaf)

*																					In new pumps or stators : the static friction is too great.
*	*	*																			The pump electrical equipment is not compatible with the electrical supply.
	*																				The pressure is too high.
*																					There are foreign bodies in the pump.
*																					The temperature of the liquid medium is too high, the stator is too ductile.
*																					The stator has swollen, the elastomer is not compatible with the medium.
*																					The solids content of the medium is too high and leads to blockages.
*																					The liquid medium sediments or hardens when left to stand.
	*	*	*	*																	There is air or vapour in the suction pipe.
	*	*	*	*																	The suction pipe is leaking.
	*	*	*	*																	The shaft seal is leaking.
		*	*																		The rpm is too low.
	*	*	*																		With reduced diameter rotor : operating temperature has not been reached.
		*	*	*	*																The suction is too great or pressure too low (cavitation).
		*	*	*	*	*	*														The pump is running dry.
	*	*	*	*	*																The stator is worn out, or temperature of liquid is too low.
	*	*	*	*	*																The stator material is brittle.
	*	*	*	*	*																The rotor is worn out.
				*																	The joints are worn out.
				*																	The pump and drive are not axially aligned.
				*																	The elastic element of the coupling is worn out.
				*				*													The bearings are destroyed.
								*													The rpm is too high.
								*													The viscosity is too high.
								*													The specific weight of the medium is too high.
								*													The stuffing box is incorrectly tightened.
								*													The packing is not suited to the liquid medium.
*								*	*												Mechanical seal : rotation is incorrect.
								*													Mechanical seal : mechanical seal and mating ring have failed.
								*													Mechanical seal : elastomers damaged, swollen or brittle.
									*	*	*										NPSH available, too low.
										*	*										Insufficient lubrication of bearings.
									*												Excessive tension of the drive belts.

	Date	Name	Signature	Revision : 00
Approved	01/04/2014	A.G.		Document No. :
Released	01/04/2014	A.G.		RIPL : O & MM : 16

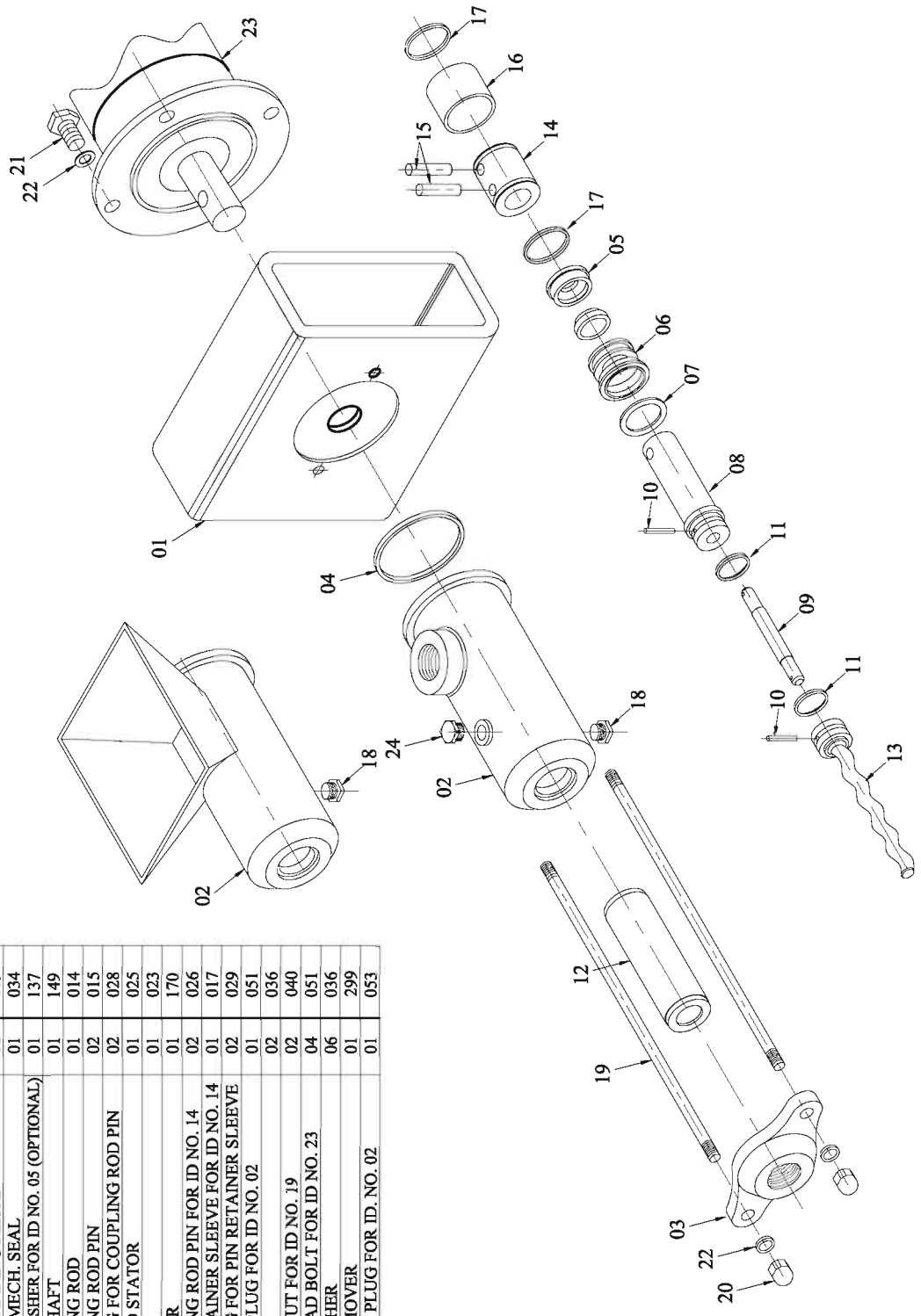
## 11. FAULT FINDING & REMEDYING

### Remedy

Fill the pump up, then pump through manually using a suitable appliance; if necessary use glycerine as lubricant in the stator.
Check order information. Examine electrical installation (possibly 2 phase operation).
Measure the pressure with a manometer and check against order details. Reduce the pressure or change the drive.
Remove foreign bodies and eliminate possible damage.
If the liquid medium temperature cannot be lowered, use a reduced diameter rotor.
Check whether the liquid medium agrees with the order requirements. Possibly change stator material.
Increase the liquid part of the medium.
Clean the pump and rinse through after each run.
Increase the suction liquid level, prevent turbulence and air bubble at the inlet.
Check seal and tighten pipe connections.
Stuffing box : tighten or renew. Mechanical seal : renew seals, eliminate solid deposits.
In the case of adjustable drives : increase the rpm. If necessary change the drive.
Warm up the pump (stator) to operating temperature first of all.
Decrease suction resistance, lower the temperature of the liquid medium, install the pump at a lower location.
Fill up the pump, provide for dry running protection, move the pipes.
Replace with a new stator or ensure correct liquid temperature.
Fit a new stator. Check the liquid medium agrees with order details; if necessary change the stator material.
Change rotor, establish the cause. Wear and tear, corrosion, cavitation; if necessary change to a different material or coating.
Replace relevant parts, carefully reseal and lubricate.
Re-align the unit.
Use a new connection and re-align the pump.
Replace bearing, lubricate, reseal. At higher temperatures observe the lubricant and the bearing.
In the case of adjustable drives : lower the rpm.
Measure the viscosity and compare with order details. If necessary adjust viscosity or change the drive.
Measure specific weight and compare with order details. If necessary adjust specific weight or change the drive.
Service stuffing box according to page 3 (6.1), if necessary renew worn shaft.
Replace fitted packing with another packing type.
Change electrical connection.
Replace relevant rings with new ones.
Replace elastomers. Check whether the liquid medium agrees with order details, if necessary change material.
Make necessary arrangement to meet the NPSH(r) of the pump.
Inspect and re-grease the bearings sufficiently.
Re-adjust the drive belts tension only to requirement without over tightening.

	Date	Name	Signature	Revision : 00
Approved	01/04/2014	A.G.		Document No. :
Released	01/04/2014	A.G.		RIPL : O & MM : 16

12. EXPLODED VIEW OF PUMP ASSEMBLY WITH PART LIST



PARTS LIST			
ID. No.	DESCRIPTION	No. Off	Part No.
01	BODY	01	073
02	PUMP HOUSING / BUCKET (OPTION)	01	003
03	END COVER	01	004
04	"O" RING FOR PUMP HOUSING	01	026
05	SEAL CLAMPING PLATE	01	009
06	SINGLE MECH. SEAL	01	034
07	SEAL WASHER FOR ID NO. 05 (OPTIONAL)	01	137
08	YOKE SHAFT	01	149
09	COUPLING ROD	01	014
10	COUPLING ROD PIN	02	015
11	"O" RING FOR COUPLING ROD PIN	02	028
12	BONDED STATOR	01	025
13	ROTOR	01	023
14	COUPLER	01	170
15	COUPLING ROD PIN FOR ID NO. 14	02	026
16	PIN RETAINER SLEEVE FOR ID NO. 14	01	017
17	"O" RING FOR PIN RETAINER SLEEVE	02	029
18	DRAIN PLUG FOR ID NO. 02	01	051
19	TIE ROD	02	036
20	DOME NUT FOR ID NO. 19	02	040
21	HEX HEAD BOLT FOR ID NO. 23	04	051
22	SP. WASHER	06	036
23	PRIME MOVER	01	299
24	FILLING PLUG FOR ID. NO. 02	01	053

Approved	01/04/2014	Name	Signature	Revision :00
Released	01/04/2014	A.G.		Document No. :
		A.G.		R IPL : O & MM : 16

**USE ONLY GENUINE "ROTOMAC" SPARE PARTS FOR REPLACEMENTS**

**13. RECOMMENDED STOCK OF WEAR PARTS FOR 2 YEARS TROUBLE FREE  
OPERATION**

(Under Normal Operating Conditions)

Part I D No.	Description of Spare Parts	No. off / Pump Large set	No. off / Pump Small set
12	Bonded Stator	2	1
13	Rotor	1	-
09	Coupling Rod /Auger cum Coupling Rod	1	-
10	Coupling Rod Pin	8	4
06	Single Mechanical Seal	1	-
04,11 & 17	'O' Ring set	2	1

**When sending enquiries for spares, please mention the following clearly:**

Pump Sl. No.	Pump Type	Code
Part No.	Description of Spare Parts	Quantity
Material of Construction (as per Bill of Material)		

**Address to:**

ROTOMAC INDUSTRIES PVT. LTD.  
 D-4A, PANKI INDUSTRIAL AREA, SITE-1,  
 KANPUR – 208 022 (U.P) INDIA  
 Tel: 2691704, 2691705 Fax: +91 (0512) 2691706  
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 Website: [www.rotomacpump.com](http://www.rotomacpump.com) / [www.rotomac.org](http://www.rotomac.org)

	Date	Name	Signature	Revision : 00
Approved	01.04.2014	AG		Document No.
Released	01.04.2014	AG		<b>RIPL: O&amp;MM: 16</b>