INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

FOREWORD

Thank you for your patronage of the Roto Pumps Ltd. We are happy to inform you that your Roto progressive Cavity Pump has been designed, manufactured & tested to give you a long, smooth and trouble-free operation. To get the best performance form the equipment we request you to carefully study the manual before, during and after installation of the pump. This manual is an essential part of the equipment and should be available at all times to the plant personal and kept in a safe place in the plant premises.

Should you have any doubts or queries, please do not hesitate to contact our nearest dealer or service center. Our experienced engineers would be happy to offer to you expert advice, should any of the following considerations be overlooked, the safely of personal and satisfactory operation of the pump may be endangered.

For your ready reference, our contact details are mentioned at the end of this manual.

GENERAL

1. Adequate ventilation must be provided in order to disperse dangerous vapors when pump is handling harmful or objectionable material.
2. Adequate lighting should be provided to ensure effective maintenance.
3. Usage with certain products may need a hosing facility to drain the pump to ease and simplify maintenance.
4. Suitable arrangement should be provided to carry out gland draining.
5. Adequate space must be provided for dismantling of the pump as per the dimensional drawing of the pump. (Refer enclosed dimensional drawing.)

STORAGE & HANDLING

HANDLING: For safe handling during installation and maintenance the following four points must be taken care of to avoid any damage to the component or personnel injury:

1. For lifting and assembling, use suitable lifting tackle and slings, if the pump or any of its component weighs more than 20 kg.
2. The position of slings will depend on specific pump model and mounted accessories
3. If eyebolts are provided, they should be used for lifting.
4. Experienced personnel should carry out handling.

STORAGE: Following points are advised for storage of pump and spares.

1. The Pump should be kept in moisture-free area, preferably, with protective covering.
2. Pump should be kept after draining out the pumping liquid and preferably after flushing it with water.
3. A small amount of light oil should be injected in the stuffing box after loosening the gland. For food application pumps, use a compatible vegetable or edible grease.
4. Anti rusting oil or suitable agent must be applied on metallic parts to be stored.
5. Refer manufacturer's instructions for storage of other items like gearbox, motor etc.

SYSTEM DESIGN AND INSTALLATION

SYSTEM DESIGN - At the system design stage, consideration must be given for the provision of filler plugs and installation of non-return and/or isolating valves. **ROTO** PUMPS are normally installed in a horizontal position with base plates mounted on a flat surface, grouted in and bolted, thus ensuring firm fixing, thereby reducing noise and vibration.

After bolting down the base frame, unit should be checked for correct alignment of the pump to its prime mover.

If the pump is mounted in any other way than described above, confirmation of installation must be agreed with **ROTO**.

ELECTRICAL –

Electrical connections should only be made using equipment suitable for both rating and environment. Normally the **ROTO** Pump should be installed with starting equipment arranged to give direct on line starting to ensure maximum starting torque. When the motor is being wired and checked for direction of rotation, ensure that the motor is not coupled with the pump. If any wiring or control device is to be fitted on the electrical equipment they must be set in accordance with their specific instructions.

Protection of all electrical equipment should be ensured for minimum safety requirements as per environment and fluid being pumped in accordance with applicable safety rules.

Earthing points of electrical equipments should be connected when the pump is fitted with electrical drives and it is essential that these be correctly connected as per the electrical equipment manufacturer's recommendation

DUTY CONDITIONS

Pumps should only be installed on duties for which **ROTO** has specified materials of construction, fluid, flow rates, pressure, temperature, speed etc. If the duty is changed, **ROTO'S** recommendations should be sought immediately in the interest of safety, plant efficiency and pump life.

ROTATION

Consult **ROTO** or its authorized representative if the direction of rotation of pump has to be changed after installation.

GUARDS

In the interest of safety of personnel and in compliance with statutory requirement of various countries, the pump pulleys and couplings must be enclosed with proper guards in the interest of safety of personnel.

Specific pumps may have auger feed screws with a wide suction flange. If the pump installation requires that these cannot be enclosed care must be taken to ensure that personnel cannot gain access while the pump is in operation and emergency stops device must be fitted nearby.

IMPORTANT SAFETY MEASURES

DO'S

1. Always fill the pump with fluid and give few turns to provide necessary lubrication before starting when subject to prolonged stoppage.
2. Always use a pressure relief device on delivery line for system safety.
3. Use only direct on-line starters for meeting starting torque requirement of pump.
4. Uncouple pump while motor is being wired and checked for rotation, to prevent dry running of pump.
5. Always consult **ROTO** in case of any change in operating parameters, like temperature, viscosity, percentage of solids, liquid composition etc,

6. Always use genuine **ROTO** spares for sustained pump performance and longer life of critical parts.

DON'TS

1. Never run the pump in a dry condition even for a few revolutions otherwise the rotor will damage the stator immediately.
2. Never run the pump against a closed inlet or outlet valve.
3. Never use foot valve for slurry applications.
4. Never vary flow rate by throttling suction and delivery line.
5. Never exceed recommended pump speed.
6. Never reverse the recommended direction of rotation of pump without consulting **ROTO**.
7. Never use local made or spurious spares that look alike but do not meet material standards or dimensional accuracy affecting life of critical components and performance of pump.
8. Care is required when adjusting the gland while pump is running.

COMMISSIONING - All nuts and bolts, securing flanges and base mounting fixtures, must be checked for tightness before operation. To eliminate vibration, the pump must be correctly aligned with the drive unit and the guards must be securely fixed in position. All the pipelines must be independently supported and use of expansion joints is desirable to eliminate the transmission of vibrations and stresses to the pipelines. When commissioning the plant, all the joints in the system must be checked thoroughly for leakage. If on starting, the pump does not appear to operate correctly, the pump must be shut down immediately and the cause of the malfunctioning must be established before operations are recommenced. It is recommended that depending upon plant system operation either a combined vacuum gauge and pressure gauge, or a vacuum gauge only, be fitted to the pump inlet port and a pressure gauge fitted to the outlet port to continuously monitor the pump operating conditions. It is further recommended that a pressure relief valve of adequate capacity should be installed on the discharge side of the pump.

START UP/RUNNING

DRY RUNNING - Pumps must be filled with liquid before starting (A threaded plug has been provided on the top of the pump housing for this purpose). The initial filling is not for priming purpose, but to provide the necessary lubrication of the stator until the pump primes itself. When the pump is stopped, sufficient liquid is normally trapped between the pumping elements to provide the necessary lubrication for restarting. If, however, the pump has been left standing for a long time or has been dismantled, it must be refilled with liquid and given a few turns before starting, to get sufficient lubrication between the rotor and stator.

If the pumping liquid is hazardous, then extreme care must be taken while initial filling of the pump using all safety and precautionary measures.

NEVER RUN THE PUMP IN A DRY CONDITION EVEN FOR A FEW REVOLUTIONS OTHERWISE THE STATOR WILL BE DAMAGED IMMEDIATELY

GLAND PACKING

The pump is normally fitted with gland packing, which required final adjustment during initial running period. Under normal working conditions the gland rings are to be tightened in a manner to permit a slight drip from the gland. This enhances life of the shaft as well as of gland packing. It is important to note that the gland packing never be over tightened to arrest the leakage completely. This can lead to excessive heat generation that can cause permanent damage to shaft and packing. Adjustment by tightening should only be made when the pump is running. Indication of slight drip from the gland packing will only be evident if the pump is running delivery on gland or with suction on gland with a flooded suction. If the pump runs with a vacuum on the gland, a flushing connection (or greaser) with lantern ring is recommended.

Where lantern rings are fitted in stuffing box; the flushing liquid inlet or outlet should be connected for proper circulation of the liquid.

MECHANICAL SEAL - When the pump is supplied with mechanical seal, it may be necessary to ensure proper flushing & quenching arrangement as per the seal manufacturer's recommendations, enclosed with this manual.

GLAND GUARDS - In the interest of safety of personnel and in compliance with statutory requirements of various countries, the pumps are fitted with gland-guards that can be easily removed for adjustment of gland sealing. It is responsibility of the user to make sure that the guards are placed back in position after necessary adjustments have been made.

PUMP OPERATING TEMPERATURE - The surface temperature range depends upon factors like ambient temperature and temperature of the fluid being pumped. If the external pump surface temperature goes above 50^0C, personnel must be made aware of these and suitable warnings or guarding must be employed.

INSPECTION

ADJUSTMENT OF GLAND PACKING - The gland packing should be inspected every day after starting the pump. Remove the gland guards to check the leakage. If the sealing is not proper it must be adjusted by tightening or loosening of gland nuts to attain the preferred level of sealing. Excessive tightening should be avoided, as it would result in excessive heat generation leading to permanent damage of both the packing and the drive shaft. Experienced personnel should carry gland adjustment carefully so that safety of the personnel is not endangered.

PERIODIC INSPECTION - To avoid unexpected failure of the pump, it is important that the pump is periodically dismantled and routine inspection of the pump is carried out as follows:

Inspection of the pumping elements for wear and tear, after every six months or if the discharge falls below acceptable levels.

Periodic bearings and universal joints inspection is necessary to maintain optimum performance. The most appropriate time to inspect is during periods of regular scheduled downtime for routine maintenance or for any other reason

LUBRICATION - The pump should be inspected periodically for lubrication of bearings to see if grease replenishment is required, and if so, grease should be added in accordance with the instructions given in assembly procedure.

MAINTENANCE OF WEARING COMPONENTS

ROTORS AND STATOR - The wear rate of these components depends on many factors, such as product abrasiveness, speed, pressure etc. One or possibly both

items will need to be replaced, when the pump performance has reduced to an unacceptable level.

DRIVE SHAFT – STUFFING BOX - The wear rate under gland area of the drive shaft depends on various factors like product abrasiveness, extent of tightening of the packing and speed of the pump. Periodic inspection and maintenance of the gland will maximize the life of the shaft. Replacement of the gland packing or both the gland packing and the drive shaft will be necessary when the shaft sealing becomes difficult to achieve.

UNIVERSAL JOINT - Universal joints should be examined when the pump is dismantled for any reason or for routine maintenance during periods of regular scheduled equipment down time. The joints should be cleaned and renewed with fresh grease before assembly.

Use only recommended grease as per specifications in this manual.

PUMPSET - When a pump unit is dismantled and reassembled, it has to be ensured that the following steps, as applicable, are covered

1. Correct alignment of pump and driver.
2. Use of appropriate couplings and bushes.
3. Use of appropriate belts and pulleys.

EXPLOSIVE PRODUCTS/ HAZARDOUS ATMOSPHERE - In certain instances, the product being pumped may be of a hazardous nature. In these installations, considerations must be given to provide suitable protection and appropriate warnings to safeguard personnel and plant.

SPECIAL INSTRUCTIONS

ROTATION

The RNA/RNB Series pumps are capable of taking rotation in both the directions but if a change of direction is required, consult ROTO or its authorized agents before doing so.

LUBRCATION

Bearings: Pumps should be periodically inspected to see if grease replenishment is required. If so, bearings should be cleaned and repacked with grease until the bearing chambers are one third full with grease.

Use one of the following recommended or equivalent grease:

1. SHELL Alvaina R3
2. BP Energrease LS#
3. Castro Spheerol AP#
4. Mobilux 3

UNIVERSAL JOINTS

The pin type universal coupling should be lubricated when the pump is dismantled due to some reason. To do so pack entire space between the coupling rod head and rotor or drive shaft bore with one of the following recommended or equivalent grease,after cleaning the components.

1. Shell Alvania grease 2
2. Mobilux 2
3. MP Grease 2
4. Castrol Spheerol AP2

Whenever Boot seal of EPDM materials are recommended or used, please ensure that only the following Silicone Grease compound is used for such applications.

1. MOLYCOTE 7 COMPOUND
2. OKS 1110 GREASE

NOTE: The above Greases also comply with food applications.

DISMANTLING & ASSEMBLY INSTRUCTIONS
FOR RDCA – 511 / 531 / 551 PUMPS

Before dismantling isolate all electrical circuits. Close all isolation valves on the suction and discharge pipes to the pumps for prevention of liquid escaping from the pipe work system. The persons carrying out the work should be adequately trained in general workshop practice, relevant to the class of work involved & aware about safety measures.

DISMANTLING INSTRUCTIONS: -

1. Unscrew the Hex. Nuts (15) fitted to the Tie Rods (7710) and remove the Spring Washers (16), Punched Washers (36), Straight Through End Cover (5310), Tie Rods (7710) and Foot (0760).

2. To remove the Bonded Stator (2220) from Pump Housing (5010), pour some water or soap solution into the Bonded Stator (2220) through the opening in the Pump Housing (5010) to ease the stiffness. Move out the Bonded Stator from the Rotor (2500) by rolling in the C.W.Direction looking from the drive end.

3. Unscrew the Hex Nuts (10) and remove Spring Washers (11), Punched Washer (37) and Hex. Head Bolts (09), withdraw Pump Housing (5010) taking due care to avoid any rubbing with the Rotor (2500). Rotor must be protected by some soft material like cloth.

4. In order to dismantle the Rotor (2500) from Coupling Rod (2610). UJ (20) has to be dismantled.
(Ref. CS-22-009)

   Remove BSR Retaining Ring (1922), Boot Seal Retainer (2810), drag out the Boot Seal (1510) & collect the grease. Remove the Spring Pin (01) from the Rotor (2500) & Coupling Rod (2610) Head Joint and then knock out the U.J.Pins (2920) from UJ Head (4010).

5. Repeat Step 4 to dismantle the Coupling Rod (2610) from Stub Shaft (4400).

6. Collect Stuffing Box Gasket (8120). Remove the Gland Guards (7620), loosen the Hex Nuts (08) and remove the Gland (5410) and Gland Packing (7500).

   Note: -

   In case of Mechanical Seal Proceed as under (Refer CS-32-004),

   Unscrew Hex Nuts (32), connecting Seal Plate (5451) and Mechanical Seal Housing (5861), remove Mechanical Seal Housing (5861) & Seal Plate Gasket (8190).

   Now remove Setscrews from drive collar of Mechanical Seal (30) and take out Mechanical Seal. Remove Seal Plate (5451) along with stationary seat of mechanical seal.

7. Unscrew the Hex Socket Set Screw (45) from the Pin Retainer (2850) & remove the Pin Retainer (2850) sliding towards the Head side. Knock out the Dowel Pin (2930). Take out the Stub Shaft (4400).

8. Unscrew the Hex Head Nut (42) and collect Spring Washer (43) & Punched Washer (44). Take out the Pump Lantern (1200) and also remove the Tap End Stud (41).

   Note: -

1. Clean all the parts and check them for wear / damage. The worn out / damaged parts should be replaced with original **ROTO** Spares.

2. In order to store dismantled parts use suitable antirust compound on the metallic surfaces of component.

ASSEMBLY INSTRUCTIONS: -

1. Tight the Tap End Stud (41) in the Pump Lantern (1200) align the Pump Lantern (1200) with Geared Motor (40) and connect it by tightening the Hex Nut (42) after putting the Punched Washer (44) and Spring Washer (42).

2. Align the Stub Shaft (4400) with the Geared Motor (40) at the proper place. Insert the Dowel Pin (2930) in the exact place of above fitment by slightly hammering. Fit the Pin Retainer (2850) above the Dowel pin (2930) and lock it by Hex. Socket Set Screw (45).

3. Take the Stuffing Box (5810) and fill the Gland Packing (7500) in its position and locate the gland (5410) as shown. Secure the Gland (5410) and Stuffing Box (5810) by Studs (07) & Hex Nuts (08). Insert this sub assembly over the Stub Shaft (4400) as shown in the Cross Sectional Drawing.

   In case of Mechanical Seal, proceed as under:-
   (Ref. CS-32-004)

   Locate Stationary Seal with Seal Ring in the Seal Plate (5451) in position applying even pressure. In case of Teflon O-ring with Stationary seat, fitment shall be made by applying pressure on to the Stationary seat under a small press or a Drill Machine Spindle, using a soft pack on the face of the seat, while driving the stationary seat in the Seal Plate (5451).

   - Fit the Seal Plate with Mechanical Seal Housing (5861) after putting the Gasket (8190) and locate the assembly on Pump Lantern (1200). Measure distance **'L1'** from shaft end to face of stationary seat. Now take out the mechanical seal housing assembly with seal plate. If operating length of mechanical seal is **'L2'** mark a distance **'L'** on the Stub shaft (4400) equal to **'L1-L2'** from UJ end of the Stub Shaft (4400).

   - Take out the Seal Plate (5451) from the Seal Housing (5861) by unscrewing the nuts (32).

   - Slide over the Seal Plate (5451) with Stationary Seat on to the Stub Shaft (4400) towards Pump lantern (1200) side.

   - Insert Rotary Part of the Mechanical Seal onto the Stub Shaft (4400), taking extreme care not to damage any part of the seal.

- Now tighten the Drive Collar of Mechanical Seal in place, on the mark at distance 'L' over the Shaft, with Setscrews. In case Shaft is Hard Chrome Plated, tighten the Setscrews on the Shaft after removing plating at places to be screwed, by a small hand grinder.

- Now fit Mechanical Seal Housing (5861) between Pump Housing (5010) and Pump lantern (1200). Pull Seal Plate (5451) to the Seal Housing (5861) and tighten in place with Studs (31) & Hex Nuts (32).

4. To assemble UJ (20) proceed as under: -
(Ref. CS-22-008)

   Clean the internal surface of UJ Head (4010) and place the BSR retaining Ring (1922) and Boot Seal Retainer (2810) over the Stub Shaft (4400). Offer the UJ Head (4010) to Stub shaft (4400) and after alignment of UJ Head and Shaft Holes, insert the UJ Pin (2920) and finally lock it by Spring Pin (01).

5. Offer the Coupling Rod (2610) to the UJ Head fitted on the Stub Shaft (4400). Taking care of alignment of UJ Head (4010) and Coupling Rod (2610) hole & insert the UJ Pin (2920) and lock it by Spring Pin (01).

6. Repeat point no. 4,5 for connecting the Coupling Rod (2610) (2500).

7. Now drag the Boot Seal (1510) in its position taking care that the left end of it rests on the grooves in the Stub Shaft (4400). Pour grease inside the joint to fit complete volume of Universal Joint ensuring that volume is filled and then locate the right side of Boot Seal (1510) in the groove provided in the Coupling Rod (2610).

Now complete the UJ assembly (20) by putting the Boot Seal Retainers (2810) in it's place and secured it by BSR Retaining Ring (1922) at both sides of the UJ (20).

8. Repeat point no. 6,7 for Boot Seal (1510) fitting on Rotor (2500) & Coupling Rod (2610).

9. Place the Stuffing Box Gasket (8120) at its location and drag the Pump Housing (5010) without touching the Rotor (2500) and connect it with Pump Lantern (1200) by tightening the Hex. Nut (10) after placing the Hex Head Bolts (09), Punched Washer (37) & Spring Washer (11).

10. To assemble Bonded Stator (2220), pour some water or soap solution into the Stator to ease the stiffness. Move the Bonded Stator (2220) towards the Pump Housing (5010) by rolling it over the Rotor (2500) in the Anti-Clockwise Direction looking from the drive end, till butts with the Pump Housing (5010).
11. Place the Foot (0760) in the position as shown and Offer the Straight Through End Cover (5310) to Bonded Stator (2220).

    Thread up one Hex Nut (15) and Spring Washer (16) & Punched Washers (36) each on two Tie Rods (7710) as the Foot (0760) has to be tightened by using Hex Nuts (15) and insert these Tie Rods in Straight Through End Cover (5310) and Pump Housing (5010) keeping the Punched Washers (36), Spring Washers (16) & Hex Nut (15) at the Foot (0760) side. Also insert two Tie Rods (7710) on top side and tight these Tie Rods (7710) by Hex Nuts (15), Punched Washers (36) & Spring Washers (16).

12. Place the Foot (0760) in the position as shown and Offer the Straight Through End Cover (5310) to Bonded Stator (2220).

    Thread up one Hex Nut (15) and Spring Washers (16) & Punched Washers (36) each on two Tie Rods (7710) as the Foot (0760) has to be using Hex Nuts (15) and insert the Tie Rods in Straight Through End Cover (5310) and Pump Housing (5010) keeping the Punched Washers (36), Spring Washers (16) & Hex Nut (15) at the Foot (0760) side. Also insert two Tied Rods (7710) on top side and tight these Tie Rods (7710) by Hex Nuts (15), Punched Washers (36) & Spring Washers (16).

13. After total assembly of the pump, put it on the flat surface to check that Foot (0760) are lying & matched with flat surface and also place the Gland Guards (7620).

14. Ensure that all the fasteners except Hex Nuts (08) are tightened properly.

ROTO PUMPS

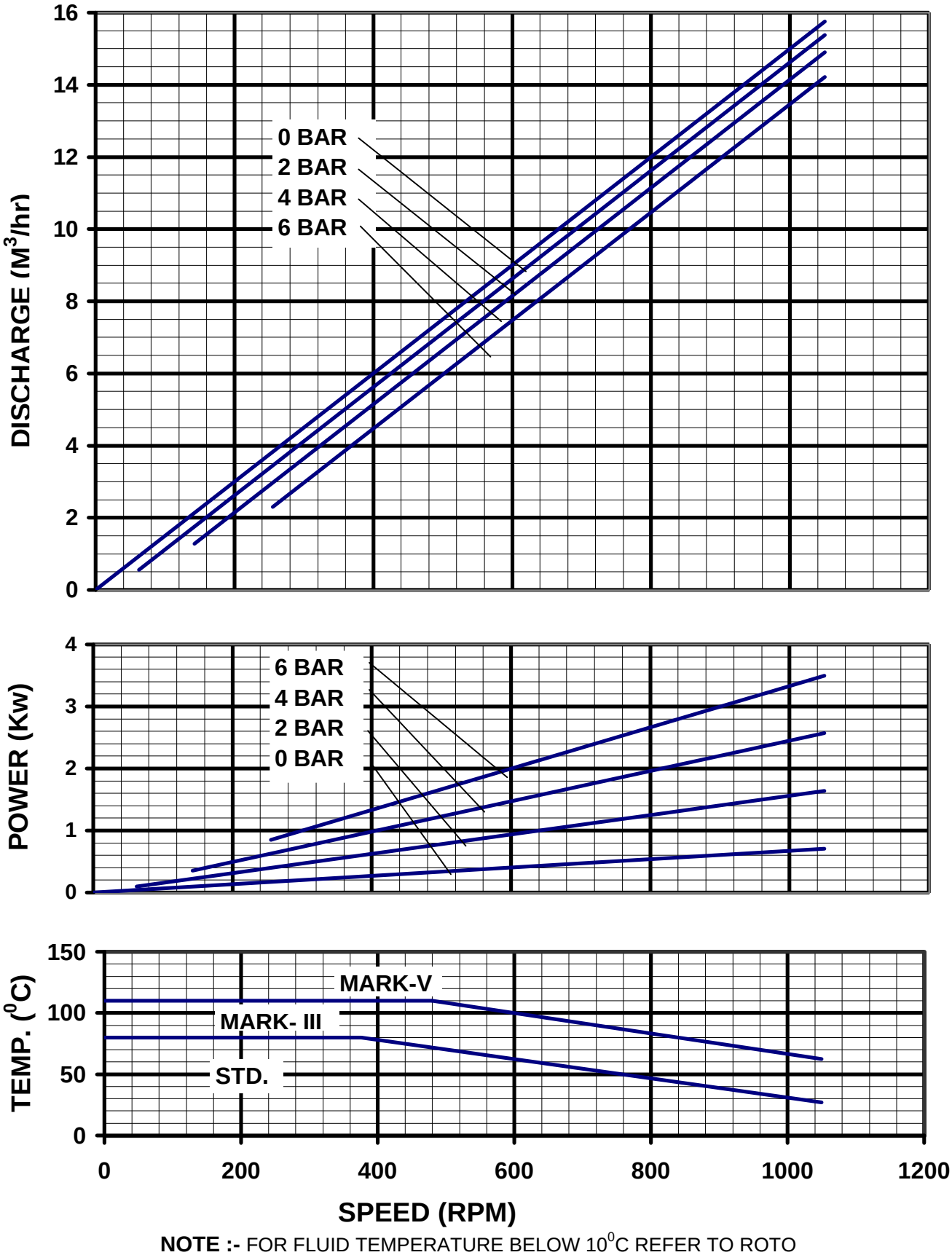
PERFORMANCE CURVE

STARTING TORQUE	:- 21.6 Nm.
STATOR HARDNESS	:- 70^0 Shore A

Tested on Water at 30^0c for RA & RR Stator

MODEL	D 551
GRAPH NO.	RS-369-02

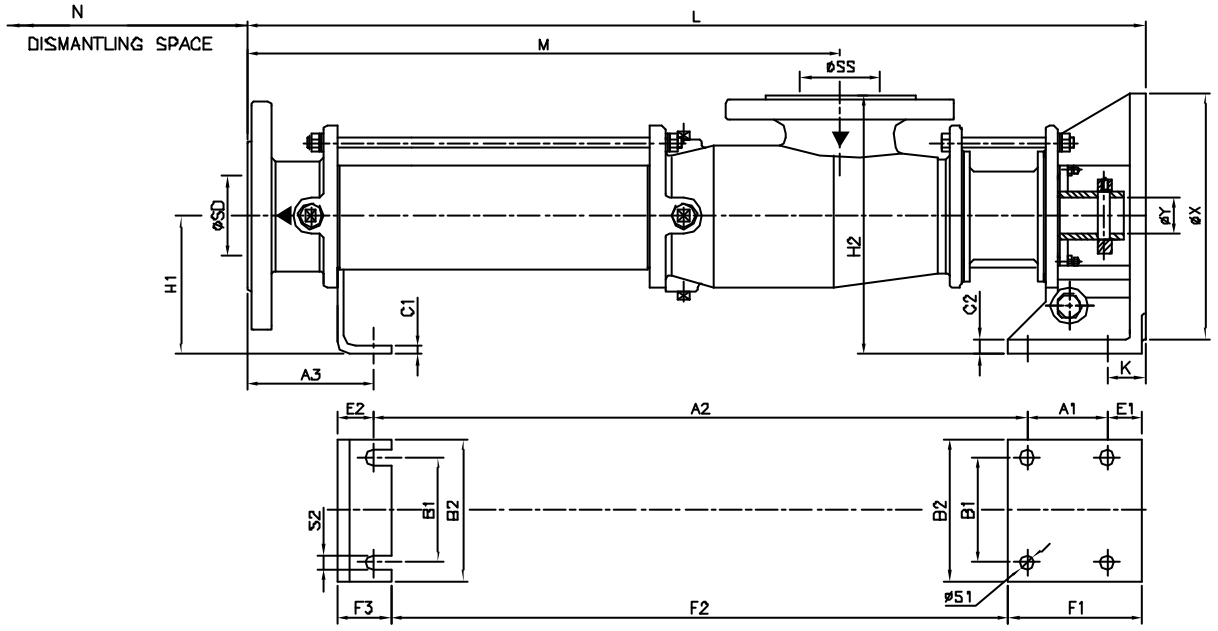
SOLID HANDLING CAPACITY
Soft & Compressible 28 mm
Hard & Angular 7 mm.



NOTE :- FOR FLUID TEMPERATURE BELOW 10^0C REFER TO ROTO

DIMENSIONAL DRAWING OF RDCA PUMP SERIES.

DRG. NO.
DD-32-001-02



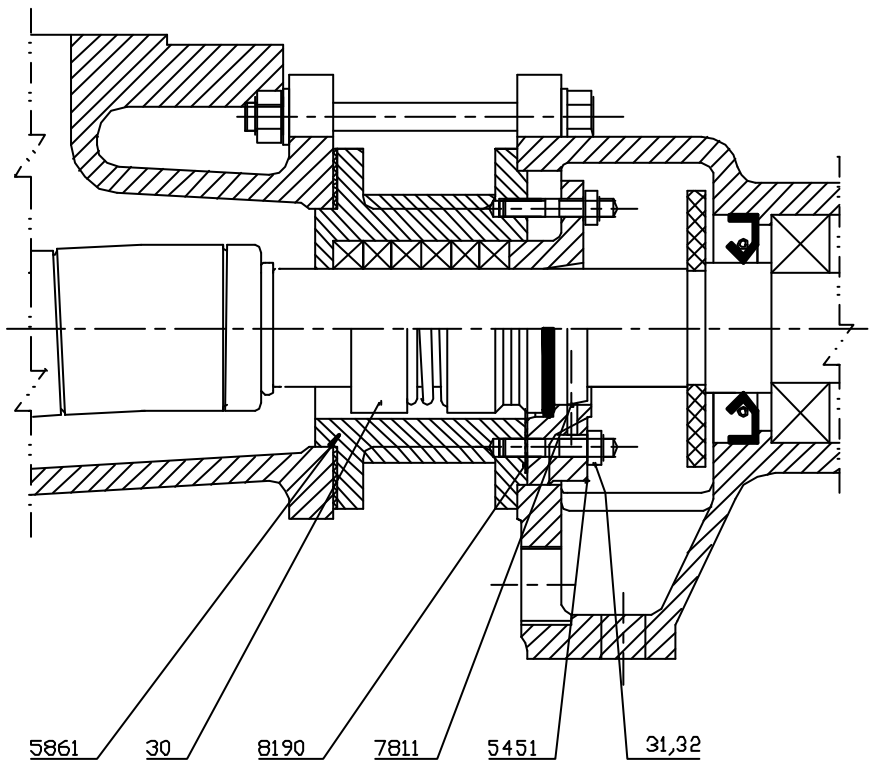
TYPE AND SIZE OF PUMP	BASIC DIMENSIONS																					FLANGE DIMENSIONS				Wt.(Kg.) (WITHOUT GEARED MOTOR)
	A1	A2	A3	B1	B2	C1	C2	E1	E2	F1	F2	F3	H1	H2	K	L	M	N	ØS1	S2	ØX (Max)	ØY (Max)	ØSD	RATING (BAR)	ØSS	RATING (BAR)	
RDCA-492	34	472	94	75	104	6	12	38	26	87	443	40	90	170	40	640	455	290	4-HOLES ø12	2-SLOTS 12	150	25	32	16	32	16	22.5
RDCA-511		387	96								358					557	343	180					50		50		21.5
RDCA-531		432									403					602	388	225									22.5
RDCA-551	65	531	103	85	115			29	30	109	502	44	112	212	31	730	482	290			200	30	65		65		35.5

NOTE :-
FLANGE DIMENSIONS ARE AS PER BS : 4504.

RDTD-31\D\NEW TECH BINDER\DD\DD-32-001-02.DWG

CROSS SECTIONAL ARRANGEMENT OF– MECHANICAL SEAL IN RDAA SERIES PUMPS.

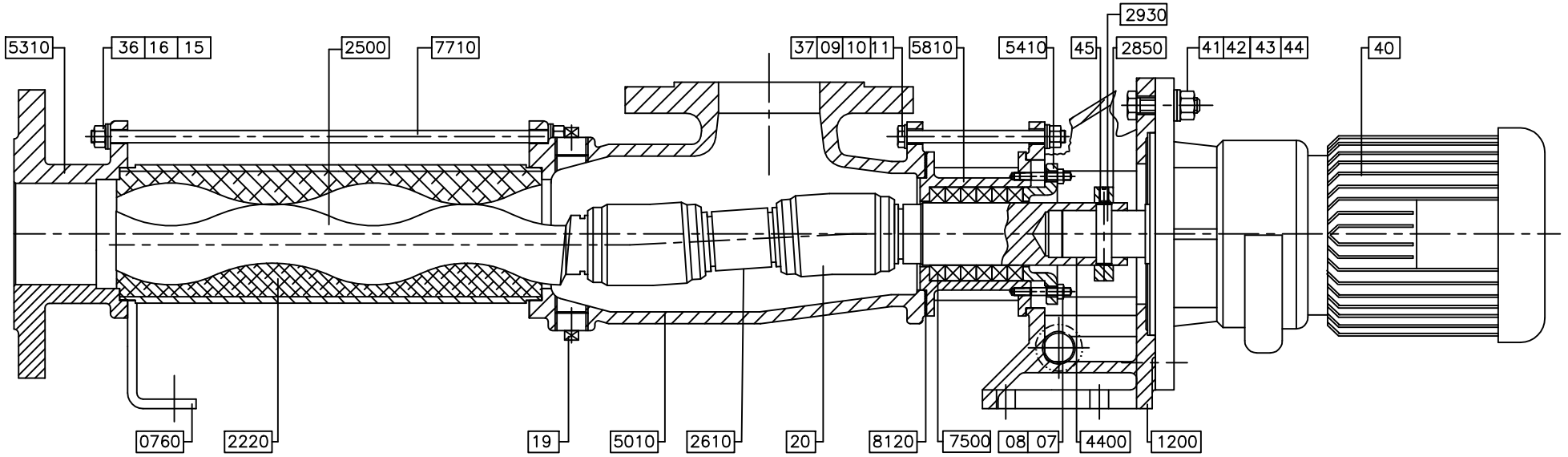
DRG. NO.
CS–32–004–00



PARTS TO BE ADDED IN STD. RDAA SERIES PUMP.			PARTS TO BE ADDED IN STD. RDAA SERIES PUMP.		
8190	SEAL PLATE GASKET	01			
7811	RETAINING PIN	01			
5861	MECHANICAL SEAL HOUSING	01	7500	GLAND PACKING	06
5451	SEAL PLATE	01	5810	STUFFING BOX	01
3211	SHAFT (UNPLATED)	01	5410	GLAND	01
32	HEX NUT (For Part No.–31)	02	3212	SHAFT (HCP)	01
31	STUD (For Part No –5451 & 5861)	02	08	HEX NUT (For PArt No.–07)	02
30	MECHANICAL SEAL	01	07	STUD (For Part No.–5410 & 5810)	02
PART NO.	NOMENCLATURE	NO. OFF	PART NO.	NOMENCLATURE	NO. OFF

CROSS SECTIONAL DRAWING OF RDCA 511/531/551 PUMPS

DRG. NO.
CS-32-001-00

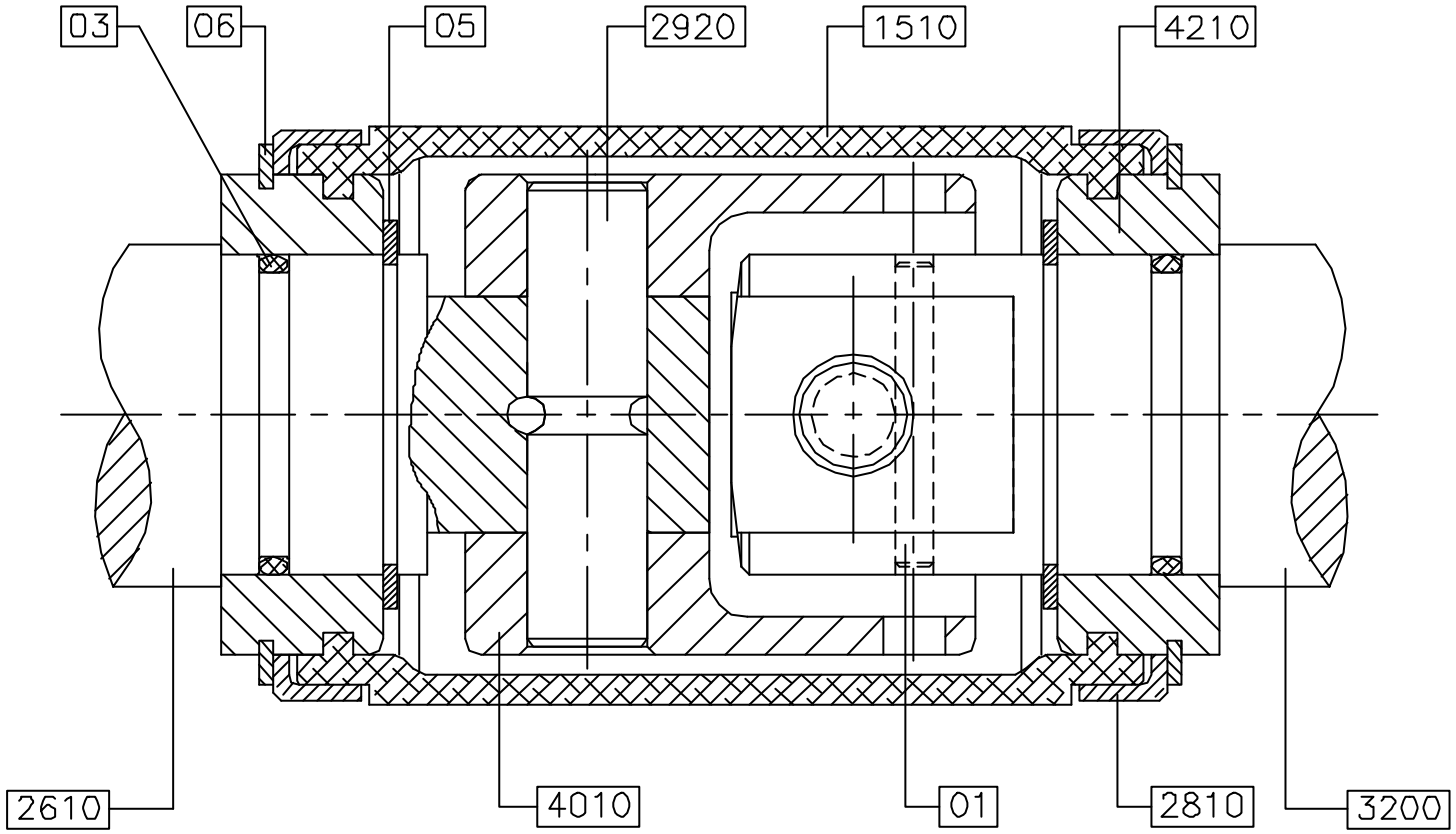


* NOT SHOWN IN THE DRAWING

SEQ. NO.	DESCRIPTION	NO. OFF	SEQ. NO.	DESCRIPTION	NO. OFF
8120	STUFFING BOX GASKET	01	45	HEX. SOCKET SET SCREW (For Part No.-2850)	01
*7950	NAME PLATE (ROTATIONAL)	01	44	PUNCHED WASHER (For Part NO.-41)	04
*7910	NAME PLATE	01	43	SPRING WASHER (For Part No.-41)	04
7710	TIE ROD	04	42	HEX. NUT (For Part No.-41)	04
*7620	GLAND GUARD	02	41	STUD/ HEX. Hd. BOLT (For Part No.-1200 & 40)	04
7500	GLAND PACKING	06	40	GEARED MOTOR	01
5810	STUFFING BOX	01	37	PUNCHED WASHER (FOR PART NO. 10)	04
5410	GLAND	01	36	PUNCHED WASHER (FOR PART NO. 15)	10
5310	STRAIGHT THROUGH END COVER	01	*25	DRIVE SCREW (FOR PART NO. 7910&7950)	06
5010	PUMP HOUSING	01	20	UNIVERSAL JOINT	02
4400	STUB SHAFT	01	19	TAPER PLUG	05
2930	DOWEL PIN	01	16	SPRING WASHER (FOR PART NO. 15)	10
2850	PIN RETAINER	01	15	HEX. NUT (FOR PART NO. 7710,5310,5010&0760)	10
2610	COUPLING ROD	01	11	SPRING WASHER (FOR PART NO.-10)	04
2500	ROTOR	01	10	HEX NUT (FOR PART NO. 09)	04
2220	BONDED STATOR	01	09	HEX. HEAD BOLT (FOR PART NO. 5010 & 1200)	04
1200	PUMP LANTERN	01	08	HEX NUT (FOR PART NO. 07)	02
0760	FOOT	01	07	STUD (FOR PART NO. 5410 & 5810)	02

CROSS SECTIONAL DRAWING UNIVERSAL JOINT FOR SIZE RUJA-016

DRG. NO.
CS-22-002-02



SEQ. NO.	DESCRIPTION	NO. OFF	SEQ. NO.	DESCRIPTION	NO. OFF
4210	U.J. RING	02			
4010	U.J. HEAD	01			
3200	SHAFT	01			
2920	U.J. PIN	02	06	EXTERNAL CIRCLIP	02
2810	BOOT SEAL RETAINER	02	05	EXTERNAL CIRCLIP	02
2610	COUPLING ROD	01	03	'O' RING	02
1510	BOOT SEAL	01	01	SPRING PIN	02