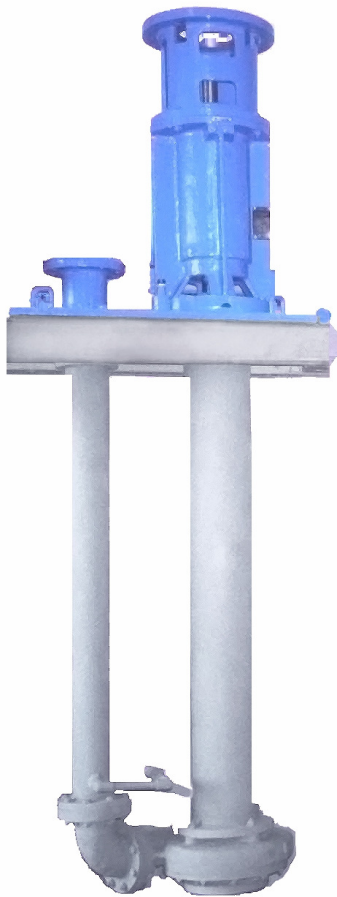


USER MANUAL

- ***INSTALLATION***
- ***OPERATION***
- ***MAINTENANCE***

**VERTICAL SUBMERGED TYPE CENTRIFUGAL PUMP – JACKETED
CONSTRUCTION – CANTILEVER DESIGN – MODEL CL-SJ3
SIZE – 50, 80, 100**



**These instructions must be read thoroughly prior to Installing,
Operating and Maintaining of this equipment.**

Designed to Meet Your Specifications!

INDEX

| | |
|---|-----------|
| 1. Introduction..... | 01 |
| 2. Inspection..... | 01 |
| 3. Storage and Handling..... | 01 |
| 4. Safety Precautions..... | 04 |
| 5. Installation..... | 04 |
| 5.1. Nozzle Loading..... | 06 |
| 6. Maintenance..... | 07 |
| 6.1. Required Tools/ Tackles..... | 07 |
| 6.2. Diagnosing Operating difficulties..... | 07 |
| 7. Servicing of "Chemlin" Pumps..... | 08 |
| 8. Recommended Spares..... | 10 |
| 9. Part list and Exploded Views..... | 11 |
| 10.Contact Details..... | 13 |

Vertical Submerged Type Centrifugal Pump Model : CL-SJ3 **Jacketed Construction, Cantilever Design,**

1. Introduction:

Chemlin range of Pumps is developed and manufactured with state-of-the-art manufacturing facility. The products are committed to continuous quality control and improvements using modern quality techniques, inspection procedures and instruments.

Chemlin manufactures products conforming to Indian / International Standards viz. ISO 2858, IS 5120, etc. and has ISO 9001:2008 Certification.

Proper care in Installation and Operation of Chemlin Pump will give trouble free performance over long period of operation.

The Pump must not be operated beyond the specified parameters. For any of the query regarding the suitability of the Pump for the application intended, contact 'Chemlin' for solution and proper guidance.

2. Inspection:

On receipt of the consignment, the Pump/Spares must be checked immediately against the necessary Dispatch/Shipping Documents and that there has been no damage in transportation. Any shortage and damage must be informed in writing to 'Chemlin' immediately within seven Days on receipt of the consignment and the matter to be taken up with the transporter/ Insurance agency.

3. Storage and Handling:

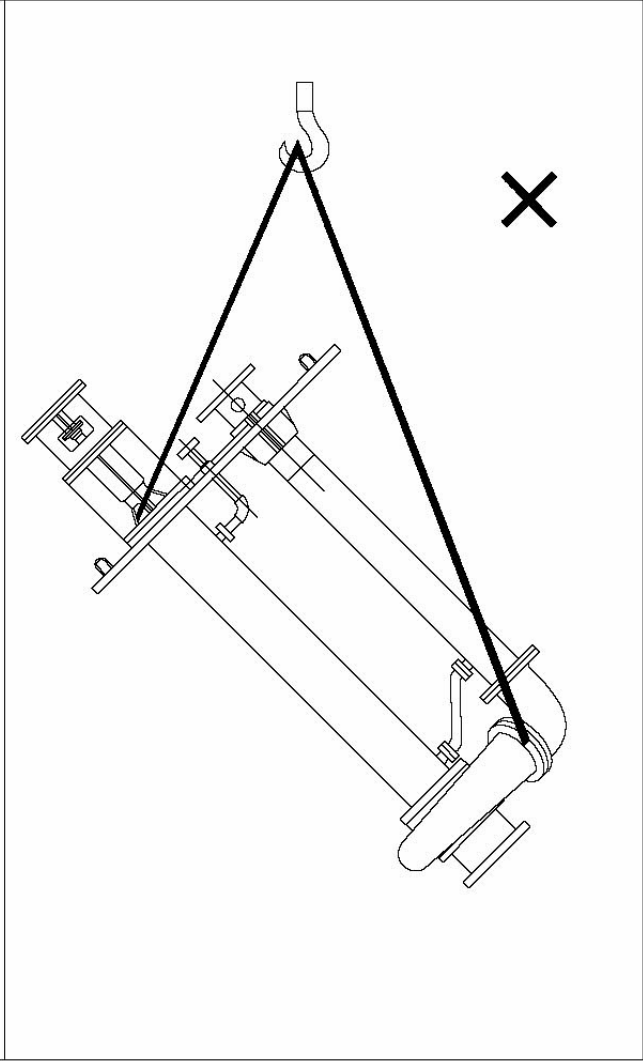
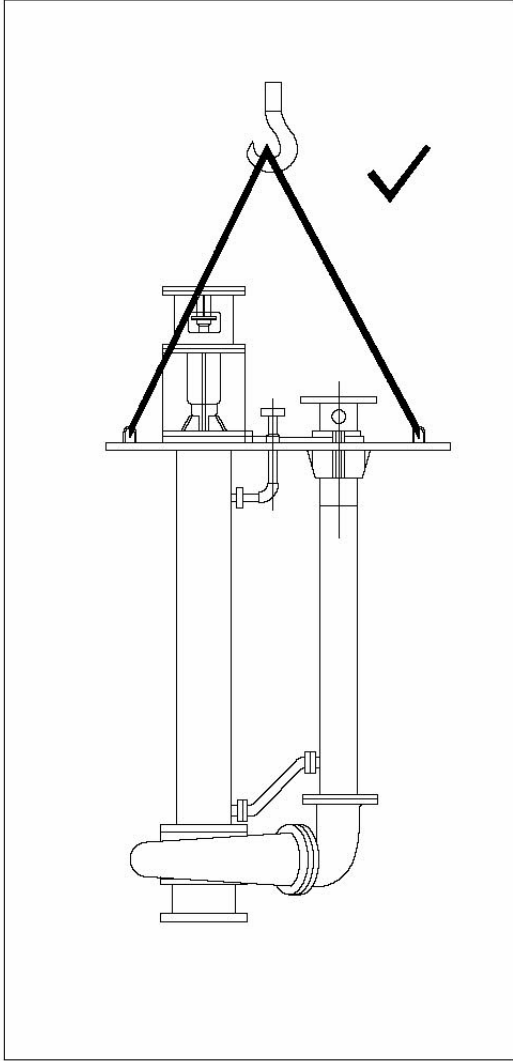
The Boxes or Cartons may be unloaded using Forklifts or suitable handling devices and stored in position with no strains applied on any part of the Pump.

The Pumps and Motors have integral lifting lugs or eyebolts, which are intended for use in only lifting the individual equipment. Take care to lift the components or assembly above the centre of gravity to avoid the flipping. Also there should not be any bend or damage to the steam connection pipes during handling.

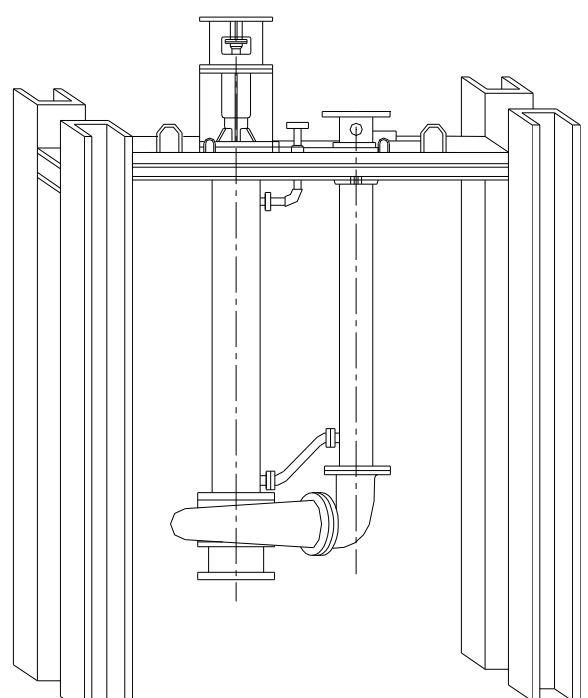
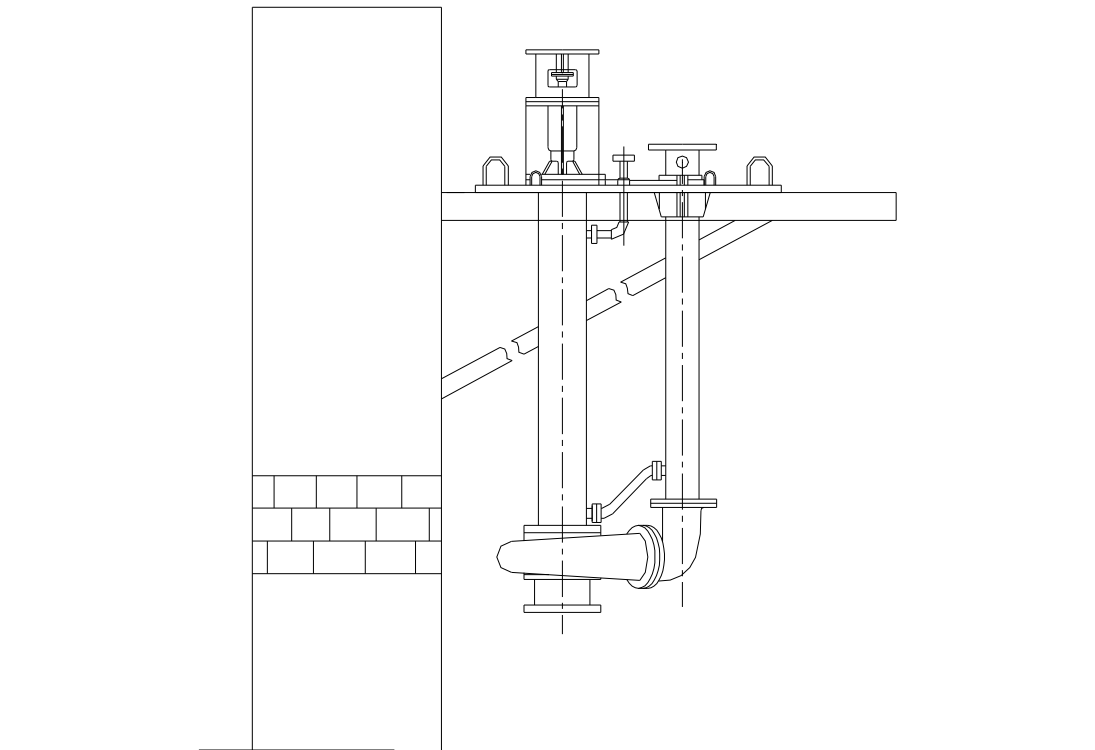
1. It is advisable that the pumping unit be stored vertically on a structural stand supporting the pump coverplate from below as shown in the drawing.
2. All loose un-mounted items to be packed in water proof material like plastic bag or box.
3. In case of assemblies ordered with external piping, individual components may be disassembled for easy handling.
4. Desiccant [Silica Gel] bags are to be placed inside the Pump and Component packages.
5. Generally pump openings are covered at the factory and should be retained to avoid access of dirt, dust particles and foreign matter while being stored.

When a new unit is not to be installed immediately then it should be stored in a Vertical Position and in clean and dry place, possibly indoors, insuring that all mounting surfaces are clean and coated with grease.

When the service life of the product or the components is over, the same should be recycled or disposed using environmentally acceptable methods. If the product contains harmful substances, care must be taken for disposing of safely using/wearing protective equipments.



Pump Storage Arrangement:



4. **Safety Precautions:**

- **Always** lock out the power to the pump driver when performing maintenance on the pump
- **Always** lock out the suction and discharge valves when performing maintenance on the pump
- **Never** operate the pump without safety devices installed.
- **Never** operate the pump with suction and/or discharge valves closed
- **Never** operate the pump out of its design specifications
- **Never** start the pump without making sure that the pump is primed
- **Never** use heat to disassemble pump
- **Never** attempt to remove the safety guards while operating.
- **Never** put hands in the openings of the pump while in operation.
- **Never** Step on the Pump/Piping connected to the Pump in case the pump is handling corrosive liquids.
- Inspect the entire system before start-up
- Monitor the system during operation and perform maintenance periodically or as required by the application.
- Before performing maintenance on the pump, check with appropriate personnel to determine if skin, eye or lung protection is required and how best to flush the pump
- When performing maintenance, pay special attention to all cautionary statements given in this manual.

Failure to observe safety precautions can result in personal injury, equipment damage or malfunction.

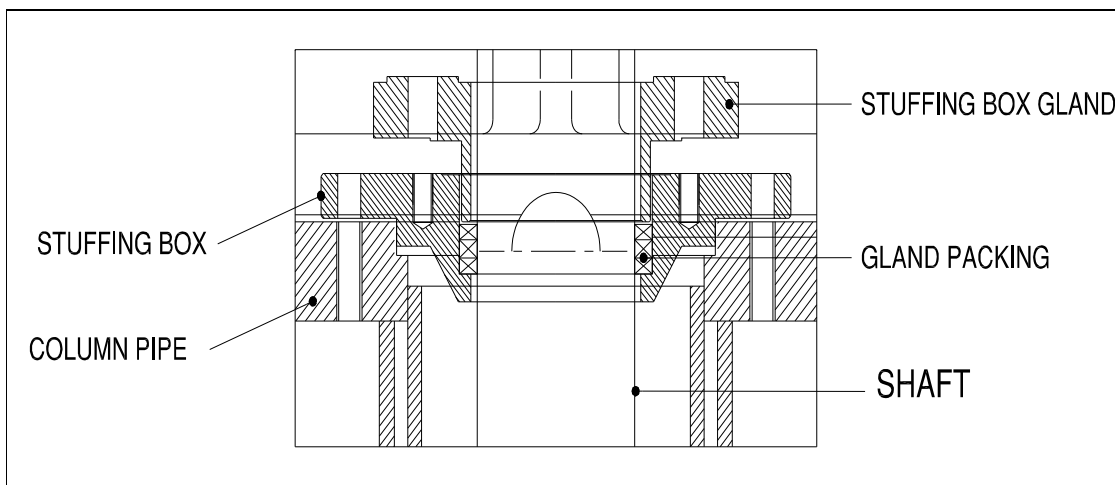
5. **Installation:**

All personnel involved in the operation, installation, inspection and maintenance of the Pumps must be qualified or trained to carry out the respective work. If not, necessary knowledge and skill, appropriate training and instructions must be provided. Customer can call for the training provided by supplier.

All plant safety requirements, health laws and regulations are to be followed.

01. Check that the submergence designed will maintain the liquid level within the proper range.
02. Check that the Pump is easily accessible for maintenance and inspection and has adequate ventilation.
03. Clean thoroughly all surface of pump. Remove pump Coverings and clean the flange faces.
04. The tank openings, which receive the pump coverplate, should be perfectly horizontal (within 1/32") and substantially rigid.
05. The foundation should provide rigid support for the pump and motor and should be sufficient to absorb any vibration.
06. A full-face asbestos gasket (1.5 mm) or an asbestos rope gasket may be used. Care should be taken that it is perfectly uniform.
07. Install and align the Pump.
08. It should be noted that the running clearances in the bearings are designed to maintain a flow of liquid for lubrication and any external stress or strain will distort the alignment & cause pump to bend. Operation in this condition will result in reduction of pump life.
09. Discharge line must be properly supported to avoid any strain and bending moments to the pump unit, which may result in internal misalignments causing failure of bearings & internal parts.
10. Pump shaft must be checked for freeness without packing stuffing box & before connecting motor coupling. This will help to track high spots in internal bearings. In case, the pump shaft does not rotate freely,

- Check the discharge pipeline above pump coverplate for stress on pump.
 - Check thickness of gasket on tank opening for evenness.
 - Check tightening of cover plate bolts. Pack stuffing box & tighten Gland reasonably.
11. When the Packing is compressed, the Gland must be in line with the Bearing Housing/Stuffing Box and Shaft. **[Fig. A]**
 12. Check direction of rotation of motor, which is shown on upper part of bearing housing, before connecting the motor coupling to pump couplings.
 13. Connect motor coupling to the pump ensuring proper alignment of coupling.
 14. Check lubrication of motor bearings.
 15. Don't run pump dry as the rotating parts may damage.
 16. The minimum liquid level 'at Pump starting' must be maintained according to the approved drawing.
 17. Before starting the pump, check that no foreign matter such as stones, bricks, welding slag etc. exists in tank. They will be drawn into the Pump and cause premature failure of the Pump. Also it is desirable to start, the pump with discharge valve partially open (1/4 to 1/3).
 18. Protection / Detection device should be installed to monitor the liquid temperature does not rise to an unsafe level.
 19. Power monitor/ Liquid Level indicators should be installed to stop the pump against dry run or start up empty.
 20. It is recommended that leakage/ hazardous gas detection system to be installed wherever necessary.
 21. It is recommended that condition monitoring systems to be installed for controlling surface temperatures at Ball bearing and vibrations of the pump system.

Fig. A***IMPORTANT**

DRY & SATURATED STEAM AT A PRESSURE OF 35 PSI (2.47 kg/cm²) SHOULD BE GIVEN TO PUMP JACKET. ANY OTHER PRESSURE OR TEMPERATURE WILL CHANGE VISCOSITY OF SULPHUR AND MAY FOUL THE WEAR PLATE AND JAM THE IMPELLER.

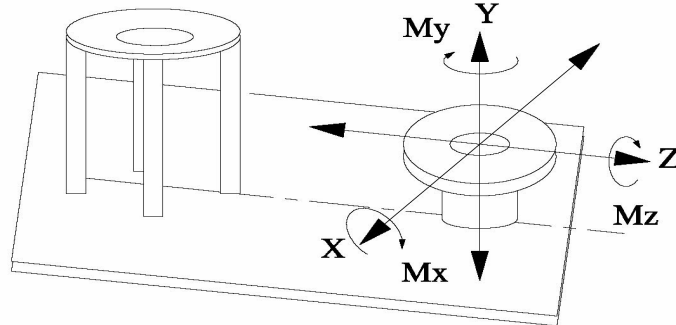
DIRECTION OF ROTATION-ANTI CLOCLWISE AS VIEWED FROM COUPLING END.

5.1. Nozzle Loading:

Discharge piping should be constructed to fit the discharge piping flange. The pump can accommodate fair amount of loads without affecting the operation of the pump. However, the installation should not impose unnecessary loads to the discharge flange.

The API 610 standard covers nozzle loads for horizontal pumps and vertically suspended pumps for nozzle sizes up to 16 in. (400 mm).

Generally, small pumps not anchored to their foundations can tolerate higher nozzle loads than anchored ones.



| Location/Orientation | Nozzle-Loading Force as a Function of Flange Size - SI Units | | | | |
|----------------------|--|------|------|------|------|
| | N | | | | |
| | Nominal Size of flange (DN) | | | | |
| | ≤50 | 80 | 100 | 150 | 200 |
| Each Top Nozzle | | | | | |
| <i>F_x</i> | 710 | 1070 | 1420 | 2490 | 3780 |
| <i>F_y</i> | 580 | 890 | 1160 | 2050 | 3110 |
| <i>F_z</i> | 890 | 1330 | 1780 | 3110 | 4890 |
| <i>FR</i> | 1280 | 1930 | 2560 | 4480 | 6920 |
| Each Side Nozzle | | | | | |
| <i>F_x</i> | 710 | 1070 | 1420 | 2490 | 3780 |
| <i>F_y</i> | 890 | 1330 | 1780 | 3110 | 4890 |
| <i>F_z</i> | 580 | 890 | 1160 | 2050 | 3110 |
| <i>FR</i> | 1280 | 1930 | 2560 | 4480 | 6920 |
| Each End Nozzle | | | | | |
| <i>F_x</i> | 890 | 1330 | 1780 | 3110 | 4890 |
| <i>F_y</i> | 710 | 1070 | 1420 | 2490 | 3780 |
| <i>F_z</i> | 580 | 890 | 1160 | 2050 | 3110 |
| <i>FR</i> | 1280 | 1930 | 2560 | 4480 | 6920 |
| | Moment (N-m) | | | | |
| Each Nozzle | | | | | |
| <i>M_x</i> | 460 | 950 | 1330 | 2300 | 3530 |
| <i>M_y</i> | 230 | 470 | 680 | 1180 | 1760 |
| <i>M_z</i> | 350 | 720 | 1000 | 1760 | 2580 |
| <i>MR</i> | 620 | 1280 | 1800 | 3130 | 4710 |

6. Maintenance:

i) Lubrication of Motor Bearings should be carried out according to the instructions of motor supplier.

ii) Bearing temperature may rise above normal initially but will stabilize (70°C or 160°F) depending on ambient temperature. Lubricate Upper Ball Bearing as required. Avoid frequent greasing. Over greasing is the reason for over heating of Bearing. It is advisable to pack half full of the Bearing with grease. Upper Bearing is double row angular contact type whereas Lower Bearing is single row deep groove bearing with both sides sealed. High melting point grease having good lubricating properties must be the lubricant.

iii) Teflon impregnated asbestos packing or its equivalent is used for packing Stuffing Box. While re-packing the Stuffing Box remove old packing, clean thoroughly the Stuffing Box and Shaft. Check Shaft for bending if any. Apply thin film of oil on shaft and in Stuffing Box. Insert required numbers of packing rings staggering joints by 90° and press them down the box by tightening the Gland Bolts. Then loose the nut and re-tight with fingers. Excessive tightening of gland nuts results in over heating of Gland. Insure Gland bore does not rub on Shaft. Refer table for number of rings of packing.

| Rings of Packing 10 mm Square Section | |
|---------------------------------------|-----------------|
| Pump size mm | Number of Rings |
| 50 | 4 |
| 65 | 4 |
| 80 | 4 |
| 100 | 4 |

*** Note: In case of Mechanical seal please write to us for specific guidance.**

iv) Sleeve bearing is lubricated by the pumped liquid and requires no external lubrication.

6.1. Required Tools/Tackles:

It is required to keep the following essential tools during disassembly/assembly of the pump for maintenance,

- Induction Heater for Bearings
- Files
- Dial Indicators
- Soft Mallet
- V-Blocks
- Set of Spanners
- Hand Wrenches
- Bearing Pullers
- Circlip Plyers

6.2. Diagnosing Operating Difficulties

A. Rise in Bearing Temperature

1. Over greasing of ball bearings
2. Misalignment in pump and motor coupling
3. Improper Installation of Ball Bearing
4. Damaged Ball Bearing
5. Shaft may be bent

B. Increased Power Consumption

1. Higher revolutions of motor
2. Liquid pumped may be of higher specific gravity than that for which the pump was designed.
3. Shaft may be bent
4. Excessive tightening of gland
5. Metal binding of rotating elements
6. Larger impeller diameter

C. Noise in Pump

1. Motor Ball Bearing may be worn out.
2. Misalignment between Pump & Motor Coupling
3. Tank frame receiving pump cover plate may not be rigid.
4. Shaft may have bent
5. Metal binding of rotating elements
6. Pump Ball Bearing may be damaged
7. Unbalanced Impeller due to partial clogging
8. Head may be lower than specified resulting in increase in discharge.

D. Insufficient or No Discharge

1. Low Liquid level in tank
2. Wrong direction of rotation
3. Impeller may be clogged, or suction cover may be choked
4. Discharge line is blocked.
5. Turbulence, Cavitation due to insufficient suction head, air or gas entrapment with liquid
6. Impeller diameter is smaller than required.
7. Damaged Impeller
8. Higher discharge head
9. Discharge valve in closed position

7. Servicing of "Chemlin" Vertical Cantilever Pump**7.1. Dismantling**

After taking out the Pump from Tank, remove Sulphur by passing steam through jacket and thereafter to casing to make the shaft free. Clean the Pump thoroughly inside and outside. Dismantle part by part as follows:

1. Remove Discharge Elbow (32)
2. Remove Suction Strainer & Suction cover (45)
3. Take out Suction Plate (142)
4. Remove Impeller Nut (19)
5. Remove Impeller (16)
6. Remove Motor Stool Bolts
7. Remove Motor stool (08)
8. Remove Ball Bearing Housing Cap (23)
9. Remove the Sleeve locking Bolts.
10. Remove Pump Shaft Assembly upwards
11. Remove Pump Half Coupling (03)
12. Remove Bearing Housing Bolts
13. Remove Ball Bearing Housing (07) backward.
14. Remove Snap Ring
15. Remove Lower Ball Bearing (60) by puller

16. Remove Adjusting Sleeve (100) backward
17. Remove Bearing Lock Nut and Washer
18. Remove Upper Ball Bearing (06) by Puller
19. Maintain Impeller Nut, Bearing Lock Nut and both keys on Shaft
20. If necessary remove steam connection between Column & Discharge Pipe.

7.2. Cleaning

Clean all parts thoroughly. Ball Bearing should be cleaned & kept carefully, ensuring that no foreign matter gets into it. Clean the Steam passages and make sure there is free flow of steam.

7.3. Inspection

Inspect the Wear Plate, Impeller Nut (19), Ball Bearing (06), and Nuts & Bolts for wear. Inspect the pump shaft for wear at Impeller. No attempts to be made to build the wear if any. Replace worn out parts with new parts. Inspect shaft for bending.

If the pump is in operation for more than 3 years, checkup the pipe jackets for Hydraulic leakage. **Hydraulic Test pressure to be minimum 1.5 times the Shut-off pressure on liquid pumped.**

7.4. Assembling

- Replace the studs in Volute, if necessary. Assemble the Volute (20) with Lower Boot (25) Flange and tighten the Cap Nuts (91) to hold the volute in position with flange.
- Assemble Column pipe and Discharge pipe with Base plate and bolt casing to lower flange of Column Pipe. Place Discharge Pipe Clamp (31) on Discharge Pipe and Bolt it to Base Plate.
- Insert Adjusting Sleeve on the Shaft and hold it against its outermost diameter. Then place Upper Ball Bearing on the Shaft and grease it properly. Place Bearing Lock Washer and tighten the Bearing lock nut and lock it. Then push Adjusting sleeve on the Upper ball bearing until it rests against the step in the Adjusting sleeve.
- Insert the Lower Ball bearing from the Impeller end side and press fit the same. Then insert the Shaft Assembly with fitted sleeve with cap into the Bearing Housing.
- Put Bearing Housing cap. Place Lower ball bearing and snap ring on the shaft. Then push the Bearing housing on Ball bearings until it touches the back face of Adjusting sleeve flange. Tighten bearing housing cap along with adjusting sleeve. Place Adjusting bolts in places.
- Put Coupling (03) on the shaft and tighten it by Grub screw. Lower the shaft assembly through column pipe from top. Tighten Bearing housing bolts. Keep the pump vertically on the stand.
- Place Impeller on the shaft and tighten the Impeller nut. Place Suction plate on suction cover. Place 'O' ring on Suction plate diameter. Then bolt suction cover along with suction plate to Casing from bottom.
- Place Gaskets between the joints of Volute, Discharge elbow and Discharge pipe and tighten the bolts uniformly. Care should be taken so that no strain is induced.

- If all the steps are carefully followed the shaft should be free from strain.
- Adjust frontal clearance by loosening or tightening adjusting bolts provided on bearing housing cap. Keep proper frontal clearance between Impeller and Suction plate & rear clearance between Impeller & Volute to achieve head and capacity.
- Lock the Adjusting bolt with lock nut. Place Motor stool on bearing housing. Repack Stuffing box. Rebuild the steam connections if they are removed. Store pump in vertical position only.

8. Recommended Spares:-

Following are the recommended spares, which should be maintained along with the pump.

| | |
|--|-------|
| 1. Impeller (16) | 1 No. |
| 2. Shaft (12) complete with Nuts (19, 21), & Keys (22) | 1 Set |
| 3. Ball Bearing (06, 60) | 1 No. |
| 4. Suction Plate (142) | 1 No. |
| 5. Set of Coupling Pins & Bushes (1, 2, 3) | 1 Set |
| 6. Split gland follower (24) | 1 Set |
| 7. Set of Packing Rings (64) | 1 Set |
| 8. Set of Nuts & Bolts (37) | 1 Set |
| 9. Set of Studs & Cap Nuts (91, 125) | 1 Set |

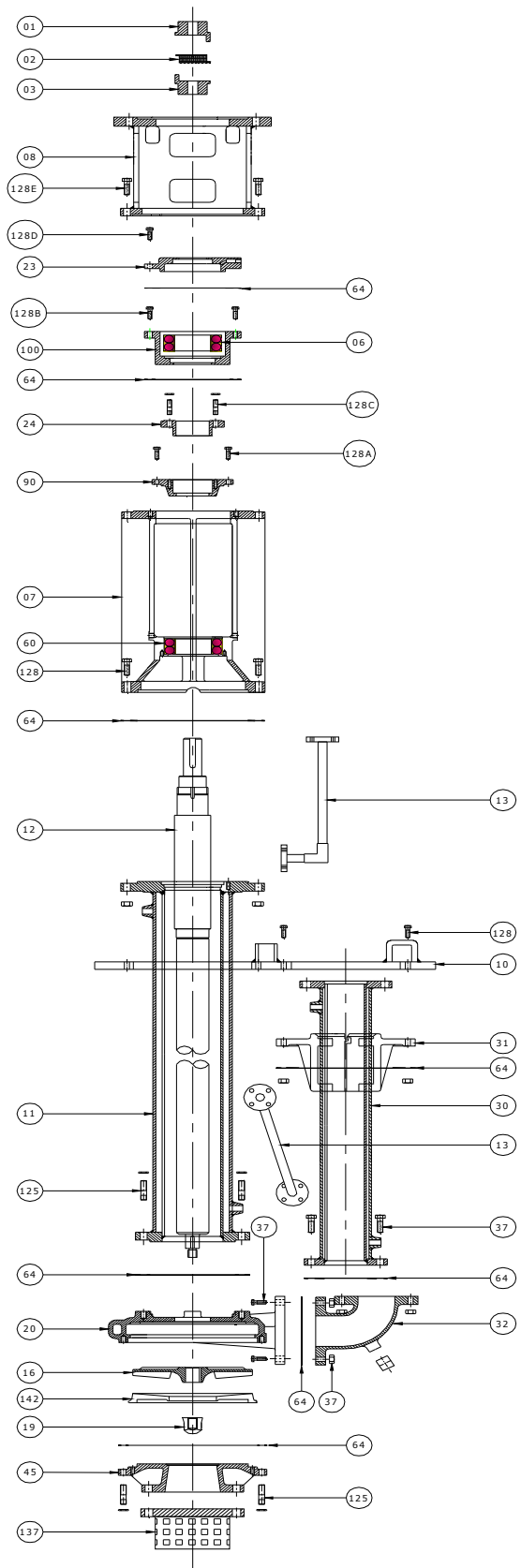
In case of Provision of Intermediate Bearing arrangement to the Pump, the Intermediate Bearing (33A) and the Intermediate Sleeve (34) also to be considered in the above set.

9. Part List & Exploded Views:-

9.1. Part List of Standard Construction, Cantilever Design – VCP Model (CL-SJ3)

| Part Name | Part No. |
|--------------------------|-----------------|
| Motor Half Coupling | 01 |
| Coupling Pins/Spiders | 02 |
| Pump Half Couplings | 03 |
| Ball Bearing (Upper) | 06 |
| Ball Bearing Housing | 07 |
| Motor Stool | 08 |
| Base Plate | 10 |
| Column Pipe | 11 |
| Shaft | 12 |
| Steam Pipe | 13 |
| Gland Packing | 14 |
| Impeller | 16 |
| Impeller Nut | 19 |
| Volute Casing | 20 |
| Shaft Keys | 22 |
| Ball Bearing Housing Cap | 23 |
| Stuffing Box Gland | 24 |
| Oil Seal | 26 |
| Discharge Pipe | 30 |
| 'C' Clamp | 31 |
| Discharge Elbow | 32 |
| 'O' Ring | 35 |
| Nuts with Bolts | 37 |
| Bearing Lock Washer | 43 |
| Bearing Lock Nut | 44 |
| Suction Cover | 45 |
| Ball Bearing (Lower) | 60 |
| Gasket Set | 64 |
| Stuffing Box | 90 |
| Cap Nut | 91 |
| Adjusting Sleeve | 100 |
| Snap Ring | 111 |
| Studs | 125 |
| Full Thread Bolts | 128A |
| Full Thread Bolts | 128B |
| Full Thread Bolts | 128C |
| Full Thread Bolts | 128D |
| Full Thread Bolts | 128E |
| Lifting Lugs/Eye Bolts | 129 |
| Suction Strainer | 137 |
| Suction Plate | 142 |

9.2. Exploded view-I: Standard Construction, Cantilever Design - VCP



10. CONTACT DETAILS:

Difficulties encountered other than mentioned in this manual may please be forwarded with complete details to the following:

Head Office:-

Chemlin Pumps & Valves Pvt. Ltd.,
F-5, "Atharva Estate", 268/2,
"E" Ward Tarabai Park,
Kolhapur : 416 003, (Maharashtra) India
Tel : (0231) 2653123, 2651964.
Fax : (0231) 2655389.

E-Mail : sales@chemlinindia.com
Website : www.chemlinindia.com

Works/Factory:-

Chemlin Pumps & Valves Pvt. Ltd.,
235/6, Poona-Bangalore Road
Kagal : 416 216, (Maharashtra) India
Tel : (02325) 244108

E-Mail : works@chemlinindia.com

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