Enriching Lives

Instructions on installation, operation and maintenance for Canned Motor Pump – i-CM

KIRLOSKAR BROTHERS LIMITED
A Kirloskar Group Company
Established 1888

WARRANTY

We warrant that the pump supplied from us is free from defective material and faulty workmanship. This warranty holds good for a period of 12 months from the date of commissioning the equipment or 18 months from the date of dispatch from our factory, whichever is earlier. Our liability in respect of any complaint is limited to replacing part/parts free of charge ex-works or repairs of the defective part/parts only to the extent that such replacement / repairs are attributable or arise solely from faulty workmanship or defective material.

This warranty holds good only for the products manufactured by us.

KIRLOSKAR BROTHERS LIMITED

INDEX

1) GENERAL

1.1 This booklet covers instructions for KIRLOSKAR make i-CAN Motor Pump type **i-CM**.

The booklet covers instructions for installation, operation & maintenance of following models of i-CM Pumps:

- i-CM32/16- 3.7KW/2P
- i-CM32/16- 5.5KW/2P
- i-CM32/20- 3.7KW/2P
- i-CM32/20- 5.5KW/2P
- i-CM32/20- 7.5KW/2P
- i-CM40/13- 3.7KW/2P
- i-CM40/16- 3.7KW/2P
- i-CM40/16- 5.5KW/2P
- i-CM50/13- 3.7KW/2P
- i-CM50/13- 5.5KW/2P
- i-CM50/13 -7.5KW/2P
- i-CM40/20A- 5.5KW/2P

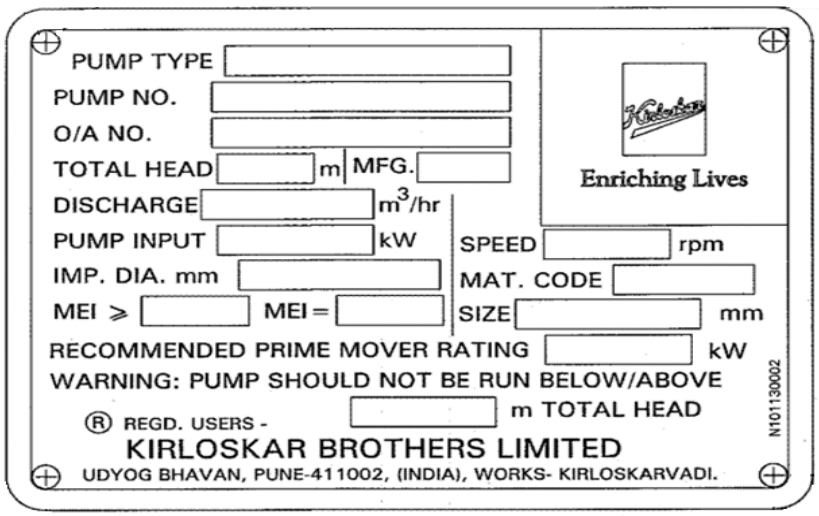
1.2 Applications:

i-CM pumps are mainly used for chemical and process handling applications which are free from suspended solids\particles.

1.3 Nameplate information:

Every pump has the following nameplate fitted on pump provided with necessary identification of the pump and it specific hydraulic characteristics.

The nameplate must not be removed. Loss of this plate could make identification impossible. This in turn could affect safety and cause difficulty in obtaining spare parts. Such accidental loss or damage if occur, contact KBL immediately.



1.4 Pumps when properly installed & given due care in operation & maintenance should operate satisfactorily for a long period.

1.5 When the pump is received, sometime before the actual use of pump, it should be inspected & located in dry place. The shaft should be rotated once in a month to prevent pitting of bearing surfaces.

1.6: **General Information**

Before performing any actions detailed within this instruction, the site Health and Safety instructions and the instructions in this document shall be read and fully understood. Whenever the equipment is operated, maintained or used in any way, the procedures detailed within these instructions shall be followed. The pump supplied by Kirloskar Brothers Limited (KBL) has been designed with safety in mind; where hazards cannot be eliminated, the risk has been minimized by the use of guards and other design features. Some hazards cannot be guarded against and the instructions below MUST BE COMPLIED WITH for safe operation. These instructions cannot cover all circumstances. It is the responsibility of the user of the equipment for maintaining safe working practices at all times. The pumps are supplied with stickers for hazard, caution & safety wherever these are applicable.

1.6.1 KBL products are designed for installation in designated areas, which are to be kept clean and free of obstructions that may restrict safe access to the controls and maintenance access points

1.6.2 Access to the equipment should be restricted to the personnel responsible for installation, operation and maintenance and they must be qualified, adequately trained and supplied with the appropriate tools for their respective tasks.

1.6.3 This product must be serviced by qualified personnel who are familiar with the design and

operation of this product and the system with the essential safety aspects involved.

1.6.4 KBL firmly insists that all personnel responsible for installation, operation and maintenance of the equipment must read the manual before any work is done.

1.6.5 Our guarantee will be valid only if the installation, operation, maintenance and repairs of this pump are carried out in accordance with these instructions. The plant operator is to make sure that the contents of these instructions are fully understood by the operating personnel. During operation, periodic inspections should be made to assure safe operation under the prevailing conditions

1.6.6 Ear defenders should be worn where the specified equipment noise level exceeds locally defined safe levels. Safety glasses or goggles should be worn where working with pressurized systems and hazardous substances. Other personal protection equipment must be worn where local rules apply.

1.6.7 Any modification may be made to the product only after consultation with the manufacturer. Using spare parts and accessories authorized by the manufacturer is a relevant safety aspect. Only genuine spare parts which are in accordance with the original delivery (in the parts list) are to be used.

1.7 **CAUTION** *DO NOT* wear loose or frayed clothing or jewellery, which could catch on the controls or becomes trapped in the equipment.

1.8 Operation of the equipment for the application other than for which it is supplied can increase the risk from hazards. Please consult KBL before making such change in the application of the equipment.

1.9 Improper installation, operation and maintenance of the product supplied by KBL could result in injury or death.

1.10 Within the manual, safety instructions are marked with safety symbol.

Important:

Before operating canned motor pump, please read these "Instruction Guidelines" and "Caution Notes for Your Safety" to avoid wrong operation or work. The same is necessary for your safety and avoiding disaster.

LOCK THE ROTOR USING LOCKING PLUG WHILE PUMP IS IN TRANSIT.

Refer To This Material Often And Make Workplace Safety.

DANGER & CAUTION

DANGER

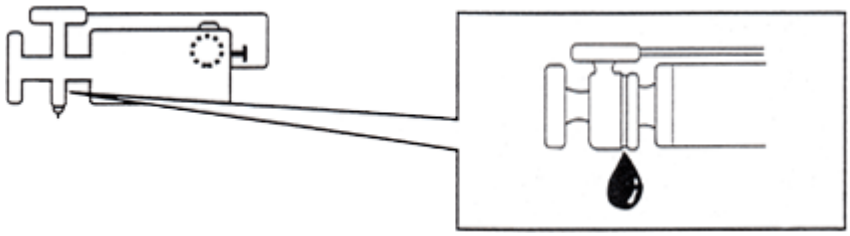
CAUTION

Ignoring this warning can cause personal injury and or damage to the pump.

DO NOT RUN DRY!

If the pump is allowed to run dry, the bearings, sleeves and other components can be damaged and serious overheating of the stator winding can occur.

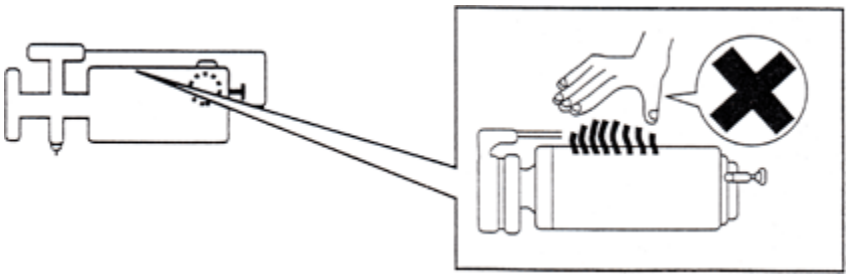
AVOID RAPID TEMPERATURE CHANGES!



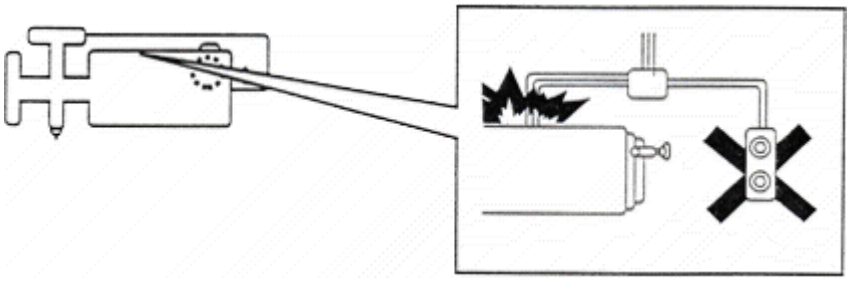
Sudden changes in temperature must be avoided. Rapid changes can cause leakage through gaskets. Published procedures for proper heating and cooling must be followed. If published procedures are not available consult to nearest KIRLOSKAR office before starting the pump.

HOT - DO NOT TOUCH!

Motor and pump can be hot, even when pumping is stopped.

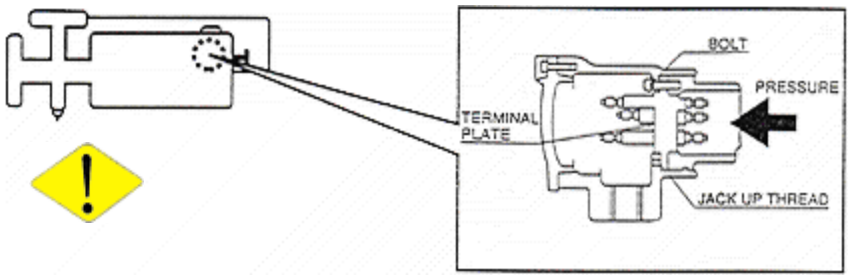


IF MOTOR TRIPS, DO NOT RESTART BEFORE DETERMINING THE CAUSE!



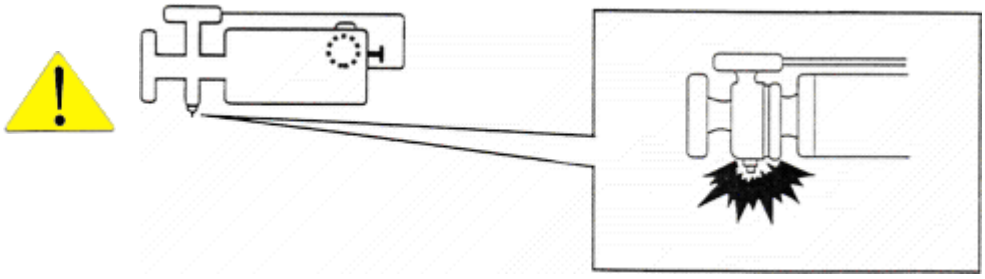
Restarting the motor before finding & rectifying the cause may result in excessive heat generation in the equipment thereby causing pump or motor failure.

DO NOT REMOVE INTERNAL BOLTS IN TERMINAL BOX!



If it is necessary to open the terminal box assembly for any reason, first ensure that mains supply is switched off. Then loose the bolts of terminal box cover by 2 or 3 turns to release internal pressure or liquid if any present in the assembly. You must take all safety measures before opening the terminal box assembly.

DO NOT REMOVE ANY BOLTS ON PUMP, MOTOR OR DRAIN PLUGS!



The internal pressure can be higher than the atmosphere. Always loose the drain plug slowly to relieve any internal pressure before attempting to dismantle the pump. You must take adequate precautions, as the liquid in the pump can be hazardous to personnel or the environment.

ALWAYS ASSUME THAT THERE IS LIQUID LEFT IN THE PUMP!

There is always possibility that the pump and motor may contain residual liquid in spite of proper draining out. Pay particular attention to the clearances between the shaft and the impeller, bearings, sleeves bearing housings and gaskets. You must take adequate precautions to protect personnel and the environment if the liquid could be considered hazardous.

2) CONSTRUCTION

The KIRLOSKAR make Canned Motor Pump 'i-CM' is of mono-block construction consisting of volute case pump and water cooled electric motor with class 'F' insulation. The driving electric motor is canned and is in built with the pump. The stator and rotor are hermetically sealed with a thin metal, "CAN".
The pump has no sealing device such as mechanical seal or gland packing and never allows any leakage of the liquid.
The liquid being pumped lubricates the bearings.
A portion of liquid coming from delivery casing enters into the rear cover. Openings are provided on the rear bearing housing through which it flows into the bearings & motor assembly. Thus the liquid lubricates the bearings & also removes the heat generated in the motor compartment. Further it passes through front bearing housing, thereby lubricating front bearing & taken out to the backside of impeller inside delivery casing.

For details refer cross-sectional drawing enclosed.

3) UNPACKING

1) After unpacking at site, ensure that the material received is free from any damage & is as per specifications.
2) If any part is found to be damaged or short supply, please report it to KIRLOSKAR BROTHERS LIMITED, PUNE.
3) Pump is handled from store to installation site with due care so as avoid any damage to the utility piping & pump internals.

3.1 Storage:

3.1.1: Temporary storage for up to six weeks.

If the pump unit is not be used immediately it should be stored carefully in a horizontal position, in a sheltered, dry location. Additional rust preventive should be applied to all unpainted carbon steel or cast iron parts, and should not be removed until final installation.

3.1.2: Long Term Storage.

If the pump is not to be installed and operated soon after arrival,

store it in a clean, dry place, having slow, moderate changes in ambient temperature. Step should be taken to protect the pump from moisture, dust, dirt, and foreign bodies. It is recommended that the following precautions to be taken:

a) Ensure that suction and discharge branches of the pump and all other openings are covered with cardboard, wood or masking tape to prevent foreign objects entering the pump.

b) If the pump is to be stored where there is no protective covering, it is advisable to cover the unit with a tarpaulin or other suitable covering.

4) INSTALLATION & PIPING CHECK POINTS:

During installation, please ensure the following –

- The pump mounting floor is leveled.
- The Stator Band bracket is firmly anchored to the floor with the help of foundation bolts.
- Check for alignment of piping with pump nozzles is correct by loosening suction & delivery flange nut-bolts, so that undue forces are not transferred to the pump. Ensure gaskets & orifice plates are provided as applicable. Ensure firm tightening after providing suitable supports to the piping & after completing flushing of suction – delivery piping between strainer & NRV.
- Verify that suction strainer element provided is as per recommended mesh size & suitable opening area.
- Check for correct installation of suction side compound gauge & delivery side pressure gauge.

5) ELECTRICAL CONNECTIONS:

- Check the Earthing connection is provided to the pump motor.
- Open terminal box cover & check the winding insulation resistance & continuity.
- Check for correct sizes, ratings & settings of relays/ contactors to suit the current drawn by the motor over the operating range. Complete wiring connections for power cables & control cables (for motor protection unit & temperature control unit) as per wiring diagrams & with recommended cable sizes.

6) UTILITY CONNECTIONS:

- Provide suitable drain piping with isolation valves to pump & motor drain connections.

7) OPERATION :

STOPING THE OPERATION / SHUT-DOWN:

1. Stop the power supply to pump.
2. Close delivery valve & vacuum equalizing valve.
3. Open drain valves on pump casing & motor
4. **Remove strainer element in suction piping, check & clean for clogging , if any & replace the strainer element.**

8) ASSEMBLY AND DISMANTLING OF THE PUMP:

Preparation for Assembly:

Clean all the parts with cleaner / acetone to remove dust, dirt and foreign particles, if any.

Assembly:

I) Bearing Housing Assembly:

Insert the bearing (3530001) in the front bearing housing (2400001) and rear bearing housing (2400101) with the slotted end of the bearing facing outwards.

Also confirm the orientation of bearing with respect to thrust washer (3630001). Insert bearing firmly till it touches the end of the bearing housing.

Tight set screw of bearings such that bearings can move slightly right and left.

II) Rotor Assembly:

Assemble thrust washer (3630001), shaft-sleeves (3100001) along with keys on the rotor.

Lock the shaft sleeve (3100001) & spacers at rear side with the help of lock washer and End Nut on the assembly.

Note: A figure in bracket indicates respective part nos.

III) Pump Motor Assembly:

Assemble the Rear bearing housing at rear end of stator assembly with help of bolts and washers.
Slowly insert the rotor assembly in the stator assembly till the rotor assembly rests on rear bearing face. Avoid hitting of rotor assembly on rear bearing face.
Also take necessary care to avoid rubbing of rotor assembly with stator liner while inserting rotor assembly.
Put the Front Bearing Housing assembly on the Stator assembly with the help of hexagonal socketed head cap screw.
Clamp the adapter plate/Liner Disc (9480001) on the stator assembly taking guide of the studs. Fix adapter plate (9480001) with the help of nut.
Put the front side spacer (3100101) on the rotor assembly.
Assemble and tighten the Impeller (1510001) on rotor assembly along with washer for Impeller , lock washer and Impeller Nut .
Lock the impeller nut.
Put Casing (1070001) on the adapter plate (9480001) by taking guide .Tight the casing.

Tighten drain plug in the casing.
Fix the Rear Bearing Housing (2400101) on the stator band assembly from back side.
Assemble the stand (9200001) & base (3800001).
Do the piping.

Check the axial lift of the rotor, which should be within 075 to 1.0 mm.

Check free rotation of rotor after assembly.

IV) Dis-assembly:

Disassembly of Pump Portion:

Disconnect the motor wiring. Mark the disconnected leads so that errors may be avoided during reconnection.

Disconnect the pump from suction & discharge piping.

Remove the studs & nuts of Pump Casing (1050001) & Adapter Plate (9480001). Remove casing.
Remove the Impeller (1510001) lock washer and nut. Then take out impeller

Dis-assembly of Rotor Assembly:

Remove shaft sleeve (3100001), Spacers, Thrust washer (3630001) along with keys (3240001 & 3240501) from front side of rotor.

Remove Rear Bearing Housing (2400001) from back side.

Remove the end nut from back side of rotor assembly by removing hexagonal nut & lock washer from rear side of rotor.

Remove shaft sleeve (3100001), Thrust washer (3630001) along with key (3240001) from rear side.

Store small components like keys and fasteners in a separate container in order to avoid loss of components during re-assembly.

Check 'O' rings / gaskets visually for any damage. Replace then if found damaged.

9) MAINTENANCE:

Inspection during operation

Ensure the Ammeter reading periodically during operation to check the following parameters, and stop the pump during any abnormal condition.
Ensure that the current drawn by the pump is within specified limit.
If the current drawn by the pump is more as compared to the rated current, then find out the cause, rectify it & then only put the pump in operation.
During operation Ammeter must show steady reading of current drawn by the pump. In case ammeter is deflecting abnormally, then pump needs attention.

Also take vibration readings on regular basis , so as to ascertain requirement of attending pumps for maintenance at early stages.

Periodical Inspection:

Conduct the regular inspection on KIRLOSKAR PUMP at least once a year to get optimum service from the equipment. The checkpoints and checking procedure for periodical inspection are summarized below.

Wear of Bearing

If the bearings are excessively worn out beyond the wear limit, then the stator liner & rotor sleeve can rub against each other, leading to damage of stator-liner/rotor sleeve.

Life of Bearing

Since bearings are used in the liquid, its life depends on the characteristics, temperature etc. of the liquid. Usually, the bearings are durable enough for half year or longer (approx. 4200 hr) of continuous operation in liquid, equivalent to water. Since some liquid & operation condition may decrease life of bearing, the bearings should be checked more often than twice in a year.

Table-1 shows wear limit for replacement of bearings.

When inspecting bearings, check shaft sleeves & thrust washers also. Generally, shaft sleeves & thrust washers have longer life than bearings.

However, it is undesirable to continuously use the sleeves and washers, which have defect on the surface because it will promote wear of bearings. In such case, it is recommended that they be replaced together with bearings at the time of replacement of bearings.

Table –1 Limit of Bearings Wear

Bearing Inside Dia ϕ D (mm)	Shaft Sleeve OD(mm)	Dia. Clearance Bearings to shaft sleeve(mm)	
35	34.9	Min. 0.2	Max. 0.23

Inspection of Stator Liner and Rotor Sleeve

Check Stator Liner and Rotor Sleeve for flaw caused by contact or biting of foreign matter.
In case flaw is in such degree that, it can be removed by polishing it with smooth polish paper, then the same can be reused.

10)TROUBLESHOOTING:

If delivery pressure gauge reading is substantially less, motor may be rotating in reverse direction. In case of reverse direction of rotation note the following & Take the corrective steps accordingly.

How to solve phase reversal problem:

Q1: Control Panel is not showing phase reversal but motor is rotating in reverse direction.

A1: Incoming supply terminated is correct but motor terminal phase sequence is wrong. Please interchange R & Y of Y & B or B & R at motor terminal only.

.

Q2: Control panel is tripping on phase reversal & motor is also rotating in reverse direction.

A2: Incoming supply phase sequence is incorrect, please interchange Y & B at incoming terminal only. Motor terminal sequence is correct.

Q3: Control panel is tripping on phase reversal but motor is rotating in correct direction.

A3: Incoming supply phase sequence is incorrect & also motor terminal phase sequence is incorrect. Please interchange Y & B terminals at incoming & also interchange Y & B at motor terminal.

Symptom, cause and remedy of troubles are summarized in . In many cases, trouble is generally caused by plural causes, which are affecting each other, so that a cause of trouble can not be easily defined.

However, it is recommended to use contents of following table as a guideline.

(As the pumps are manufactured with special design, almost every part may not be readily available from our stock. It is recommended therefore that when spare parts are used, they should be replenished promptly.)

TROUBLE SHOOTING CHART

Phenomenon	Cause	Remedy
Pump does not start	1,2,3,4	1,2,3,4
Pump does not deliver	13,15	13,15
Pump does not deliver rated flow	5,12,13,14,15,16	5,12,13,14,15,16
Pump does not deliver rated pressure	5,12,13,14,15,16,18	5,12,13,14,15,16,18
Insufficient Flow	5,8,9,12,14,16	5,8,9,12,14,16
Over Current of Motor	1,2,3,8,9,12,13,16,17,18	1,2,3,8,9,12,13,16,17,18
Over heating of motor	1,2,3,8,9,13,16,17,18	1,2,3,8,9,13,16,17,18
Vibration	6,7,8,9,10,11,12,14,19	6,7,8,9,10,11,12,14,19
Noisy operation	7,8,9,10,11,12	7,8,9,10,11,12
Bearing Seizure	3,6,7,10,12,19	3,6,7,10,12,19
When liquid temperature decreases, pump does not deliver and electric current increases.	15,16,17	15,16,17

Sr.No.	Cause	Remedy
01	Electric Power Supply.	Check wiring, motor winding, fuse etc.
02	Deterioration of Insulation Resistance.	Check insulation resistance, Remove moisture from motor.
03	Rotor Lock	Dismantle & check biting due to seizure of bearing or contact of rotor assembly.
04	Corrosion of Can	Repair or change stator assembly and rotor assembly. Change Can material.
05	Corrosion of Impeller	Repair or change. Change can material.
06	Wear of Corrosion of shaft sleeves	Change. If there are any problems, change material.

07	Wear of Bearings	Change
08	Contact of Impeller & casing or liner disk	Readjust. Change bearing
09	Defective Thrust Balance	Readjust.
10	Bending of shaft	Repair.
11	Vibration/Surging in piping system	Check piping system. Eliminate cause. Piping should be made not to have surging.
12	Mixture of foreign particles	Check piping system. Check strainer.
13	Wrong rotation direction	Reconfirm direction of rotation and correct wiring.
14	Clogging of Impeller	Clean and eliminate cause of clogging.
15	Excessive resistance (head) on discharge side	Re-select pump. Recheck piping system on discharge side.
16	Where liquid viscosity larger than specified	Adhere to that of specified.
17	Where specific gravity of liquid larger than specified	Return to that of specified.
18	Excessive flow delivered	Check discharge side valve to get rated flow.
19	Clogging of strainer	Check, clean.

Trouble shooting Summary

Problem	Possible Cause	Solution
Pump does not rotate Pump does not deliver the liquid.	Foreign matter in pump. Input power circuit breakers tripped. Bearings Damaged Pump running dry; no priming. Discharge pressure too high.	Remove foreign matter from pump. Reset circuit breakers. Check motor electrical circuits Repair pump Fill pump with liquid. Open discharge valve. Remove obstruction.
Pump is delivering less liquid.	Foreign matter in pump. Pump running dry; no priming. Discharge pressure too high. Suction pipe leaks.	Remove foreign matter from pump. Fill pump with liquid. Open discharge valve. Tight the pipe connections.
Fluctuation in pump discharge.	Air in suction line. Leakage in suction pipe.	Tight connections to stop leaks. Tight pipe connections.
Pump drawing more current than rated current. (Overload).	Foreign matter in pump. Discharge pressure too high.	Remove foreign matter from pump. Open discharge valve.
Noise in the pump.	Foreign matter in pump. Pump running dry without priming. Worn out bearings.	Remove foreign matter from pump. Fill pump with liquid. Replace bearings.
Leakage from the pump assembly.	Casing corroded or damaged. Leakage in cooling pipe.	Replace pump Locate the leakage and remove it, Or replace the pipe. Tight pipe connections.

11) List of Recommended spares

Sr.No.	Part Description	Part no.	Quantity (Nos.)
1	Bearings	3530001	2
2	Thrust washer front	3630001	1
3	Thrust Washer rear	3630001	1
4	Impeller nut	3300001	1
5	Gasket for Pump Casing & Adapter Plate	8750001	1
6	Gasket for Stator Assembly & Adapter Plate	8750101	1
7	Gasket for Stator Assembly & Rear Cover	8750201	1
8	Shaft sleeve	3100001	2

12) Part list:

Please refer to the C.S. drawing with part list Drg.no.**TC19414001-0**.

MAIN PART NO AND PART DESCRIPTION FOR: i-CM

ITEM	PART NAME
1070001	CASING
1510001	IMPELLER
1300101	STATOR
1890101	ROTOR
9480001	LINER DISC
2400001	FRONT BEARING HSG.
2400101	REAR BEARING HSG.
3100101	SLEEVE UNDER BEARING
3530001	BEARING BUSH
3630001	THRUST WASHER
1940101	TERMINAL COVER
9120001	TERMINAL BOX ASSEMBLY
9200001	STAND
3800001	BASE
8750001	GASKET FOR LINER DISC & CASING.
8750101	O RING FOR LINER DISC & STATOR BAND
8750201	GASKET FOR REAR BRG HOUSING & STATOR BAND
6180201	STATOR LINER
3110001	ROTOR LINER

13) TECHNICAL DATA

SPECIFICATIONS FOR GASKETS

Sr.No.	DESCRIPTION	SIZE	QTY.
1	FRONT SIDE GASKET FOR ADAPTER PLATE AND CASING	230 OD x 215 ID x 3THK.- i-CM32/20,i-CM40/20A 190 OD x 174 ID x 3THK i-CM32/16,i-CM40/16 160 OD x 140 ID x 3THK i-CM 40/13 i-CM50/13	01
2	FRONT SIDE GASKET FOR ADAPTER PLATE AND SATOR BAND	225 OD x 210 ID x 3THK.	01
3	GASKET FOR REAR COVER AND STATOR BAND	110 OD X 95 ID X 2.5THK	01

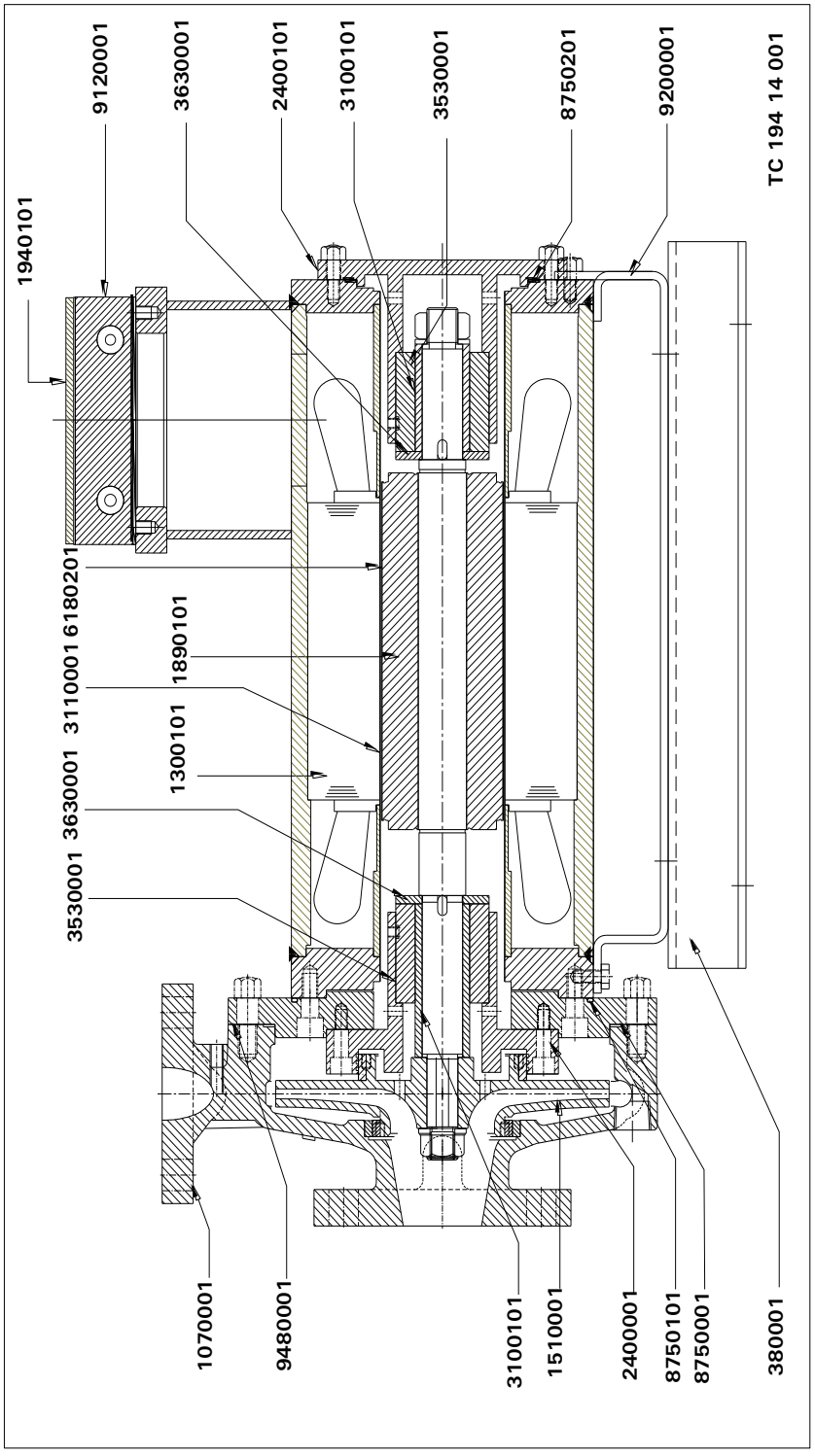
SPECIFICATION OF BEARINGS

Sr.No.	DESCRIPTION	SIZE	QTY.
1	BUSH BEARING FRONT SIDE	60 OD X 35 ID X 60L.	01
2	BUSH BEARING REAR SIDE	60 OD X 35 ID X 60L	01

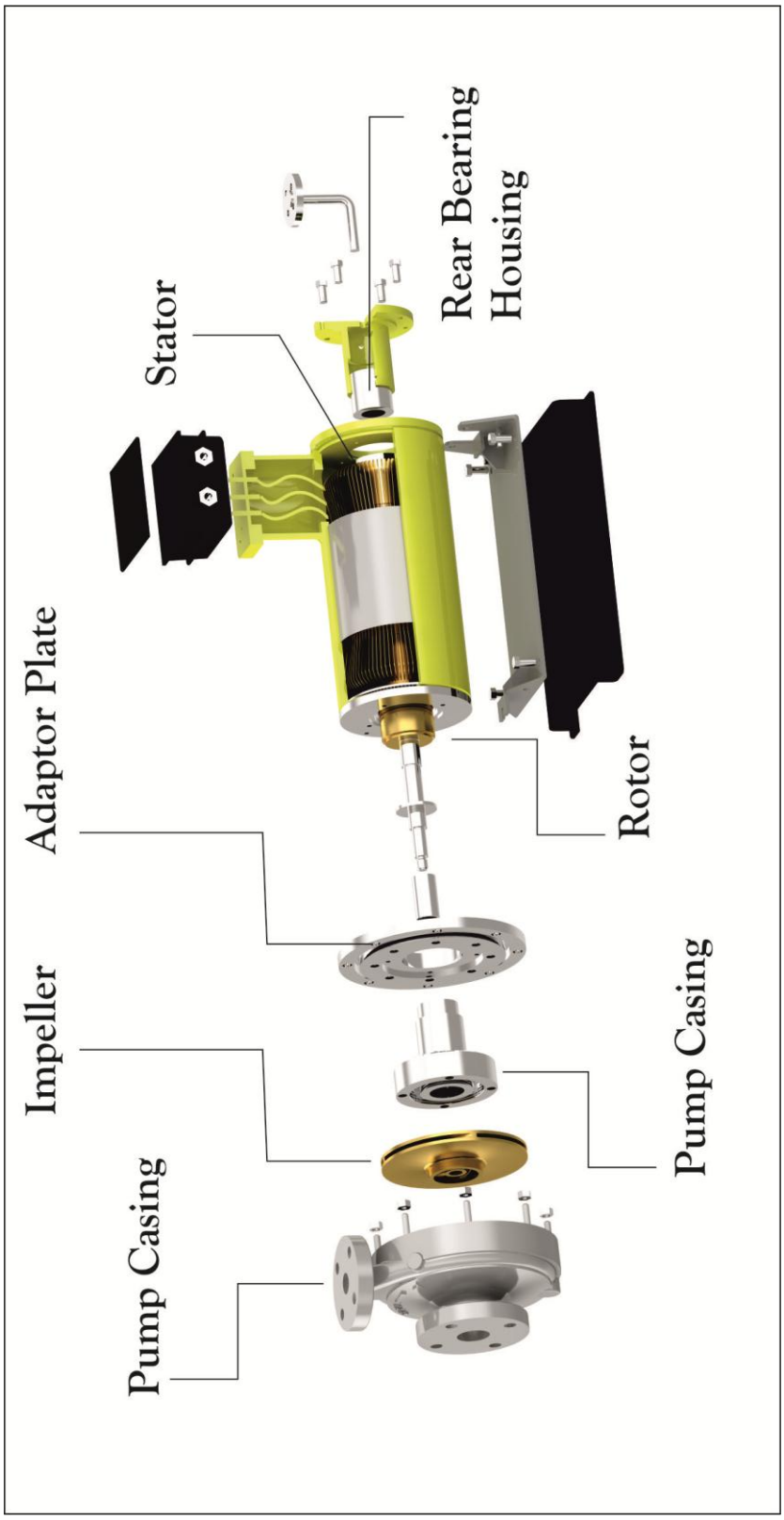
SPECIFICATIONS FOR THRUST WASHER

Sr.No.	DESCRIPTION	SIZE	QTY.
1	THRUST WASHER	60 OD X 26 ID X 5TH	02

14. CROSS SECTIONAL DRG:



15.EXPLODED VIEW:



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KIRLOSKAR BROTHERS LIMITED

A Kirloskar Group Company
Established 1888

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