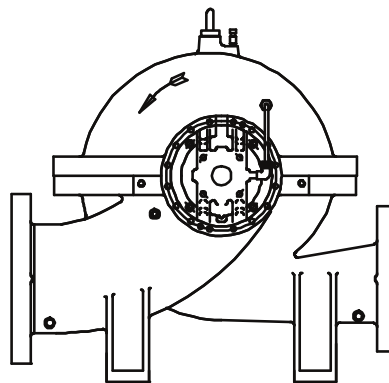
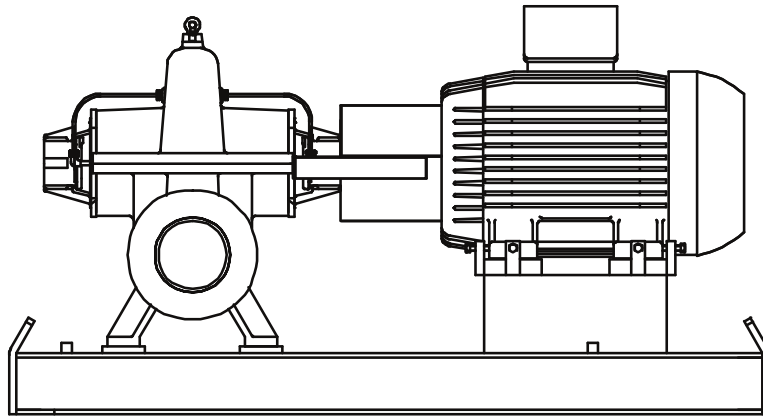




**KIRLOSKAR BROTHERS LIMITED**

Enriching Lives

# **THRUSTREAM EXTENDED RANGE Horizontal Split Case Centrifugal Pumps And Pump Sets**



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### Introduction

This manual gives the safety, installation, operation and maintenance instructions for pumps in the KBL **Thrustream Extended** range of horizontal split case centrifugal pumps for general water and industrial use.

Thrustream pumps are identified by their pump designation and by their size code, the first number is the delivery branch diameter and the second number is the nominal diameter of the impeller in centimetres.

The pump sizes covered by this manual are:

<i>Size</i>	<i>Module</i>
200/58	1E
300/34	
250/42	2E
250/51	
250/68	
300/59	
350/39	
300/48	3E
300/77	
350/44	
350/54	
350/66	
150/48-2	2 Stage
200/58-2	

This manual covers the Extended Range of Thrustream pumps that are built for use in the horizontal position. For information on pumps built for vertical applications, please refer to a separate manual that can be obtained from KBL.

# 1. General Information and Safety Instructions

The products supplied by KBL, have been designed with safety in mind. Where hazards cannot be eliminated, the risk has been minimised 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: **YOU** are responsible for using safe working practices at all times.

- 1.1 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.

A pump nameplate is fitted to each unit and 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. Should accidental loss or damage occur, contact KBL immediately.

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

- 1.3 KBL requires that all personnel that are responsible for installation, operation or maintenance of the equipment, have access to and study the product instruction manual **BEFORE** any work is done and that they will comply with all local and industry based safety instructions and regulations.

- 1.4 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 pressurised systems and hazardous substances. Other personal protection equipment must be worn where local rules apply.

- 1.5 Do **NOT** wear loose or frayed clothing or jewellery that could catch on the controls or become trapped in the equipment.

- 1.6 Check and confirm that the manual is the relevant copy by comparing the serial number on the identification plate with that on the manual.

- 1.7 Note any limits to the pump application specified in the contract documentation. Operation of the equipment outside these limits will increase the risk from hazards noted below and may lead to premature and hazardous pump failure.

- 1.8 Clear and easy access to all controls, gauges and dials etc. **MUST** be maintained at all times. Hazardous or flammable materials must **NOT** be stored in pump rooms unless safe areas or racking and suitable containers have been provided.

- 1.9 **IMPROPER INSTALLATION, OPERATION OR MAINTENANCE OF THIS KBL PRODUCT COULD RESULT IN INJURY OR DEATH.**

- 1.10 Within the manual, safety instructions are marked with safety symbols.



**Hazard**

This symbol refers to general mechanical aspects of safety.



**Hazard**

This symbol refers to electrical safety.

**ATTENTION**

This symbol gives warning of a hazard to the pump itself, which in turn, could cause a risk to personal safety.

# 2. Transport Handling and Storage Instructions

- 2.1 Transport

Horizontal Extended Thrustream pump sets are despatched fully assembled except where stability or handling constraints require the motor to be packed and delivered separately.

Pumps are protected against corrosion and packed for transport by normal road, rail and sea carriers.

## 2.2 Handling Crushing Hazard



When lifting the pump unit, use lifting equipment having a safe working load rating suitable for the weight specified. Use suitable slings for lifting any pump not provided with lifting points.

The use of suitable forklift truck and four-chain crane sling equipment is recommended but locally approved equipment of suitable rating maybe used.

Pump weight is shown on the general arrangement drawing supplied with each pump or pumpset.

## 2.3 Storage

### Shearing Hazard



Do NOT place fingers or hands etc. into the suction or discharge pipe outlets and do NOT touch the impeller. If rotated this may cause severe injury. To prevent ingress of any objects, retain the protection covers or packaging in place until removal is necessary for installation. If the packaging or suction and discharge covers are removed for inspection purposes, replace afterwards to protect the pump and maintain safety.

### 2.3.1 Temporary Storage for up to Six Weeks

If the pump is not to 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. Fit or retain in place the covers to the suction and discharge flanges and all other pipe connections. Rust preventive and flange covers should not be removed until final installation.

When pumps are not in use, the pump shaft (1800001) should be rotated several turns, every six weeks.

### 2.3.2 Long Term Storage

It is recommended that the pump is stored in a clean dry place that is not subject to a wide temperature variation. Pack the bearings with the specified grease and periodically inspect the bearing housings (2400001) to ensure that they are free from damp and moisture. Leave the covers for the suction and discharge flanges in place or replace with suitable covers to prevent ingress of dirt or moisture. Rotate the shaft (1800001) several turns monthly, to distribute the grease and prevent pitting of bearing surfaces.

If storage in the open cannot be avoided, cover the pump with a tarpaulin sheet, but allow dry air to circulate around the pump.

### 2.3.3 Exposed or Extreme Conditions Storage

For exposed storage or extreme variants in atmospheric or environmental conditions, please refer to KBL.

## 3. General Description

KBL Thrustream Pumps are a range of centrifugal pumps that are usually supplied as pump sets with electric motors but can be supplied separately for customers to fit to drivers of their own preference.

### 3.1 Pumps

The mechanical assembly comprises a rigid shaft, supported by grease-lubricated ball bearings at each end of the pump shaft. The pump casing is fitted with wear rings and houses a double entry shrouded type impeller mounted on a stiff shaft. Some pumps in the range are fitted with a pair of single side entry impellers. The seal chamber is housed in the casing inserts retained within the casing. Some impellers may be fitted with wear rings if required. When the upper half casing (1220001) is removed, the bearing housings (2400001), inserts, shaft (1800001) and impeller (1590001) assembly can be removed from the lower half casing for maintenance without disconnection of pipework.

The suction and discharge branch flanges are positioned horizontally at 90 degrees to and below the shaft centreline. The pump casings allow for construction to suit different rotations.

The standard pump is soft packed but the option to fit internal component mechanical seals or selected external cartridge mechanical seals is provided to suit customer's requirements. These pumps are normally supplied with a cast iron casing and impeller but bronze may be supplied where required. Other parts may be supplied in a variety of materials to suit the pump application.

In standard form, these pumps are designed to pump liquids at temperatures up to 80°C. Where pumps are needed to suit higher temperatures, please refer to KBL.

Note: 1) Head specified is the Duty Head generated by the pump only. 2) Suction pressure must be included when assessing the Maximum Working Pressure.

### 3.2 *Electric Motor Driven Pump sets*

Pump sets supplied are mounted on a substantial fabricated baseplate; the complete assembly is of a rigid construction, being intended for mounting on suitable foundations.

These pump sets are supplied fitted with a high efficiency electric motor adequately sized for the duty specified.

The proprietary flexible coupling has been selected to meet the power transmission and other operating requirements for the pump set

## 4. **Assembly and Installation**

### **Shearing Hazard**



Do NOT place fingers or hands etc. into the suction or discharge pipe outlets and do NOT touch the impeller (1590001), if rotated this may cause severe injury. To prevent ingress of any objects, retain the protection covers or packaging in place until removal is necessary for installation.

### 4.1 *Initial Inspection for Damage*

During transport and storage, accidental damage to the pump may have occurred. When the pump is to be installed, or in the event of a handling accident, carefully check that the pump is not damaged **before** installation and commissioning.

### 4.2 *Preparation for Mounting*

Before installation, check that the pump mounting location is suitable for accepting the pump. Refer to the certified General Assembly drawing, for details of pump installation dimensions.

### 4.3 *Location of Pump*

The pump should be located as near the liquid source as practical, with adequate accessibility for inspection and repair and sufficient headroom for lifting tackle if necessary.

Where pumps are electric motor driven, power source electrical characteristics should match those shown on motor data plate. A qualified electrical contractor should be used to make the electrical connection.

### 4.4 *Foundations*

The pump is to be mounted on a substantial floor or plinth and secured with suitable foundation bolts to minimise vibration. The foundation must have a flat level surface and be of sufficient depth to contain the foundation bolts. The pump unit should be installed with the flange faces set in a vertical position. Packers may be placed under the baseplate near the bolt holes to level the unit if the floor is uneven. The foundation bolts should be tightened and the shaft (1800001) alignment checked again before commissioning and putting the pump into operation.

### 4.5 *Pump Preparation*

#### **Abrasion & Entrapment Hazard**



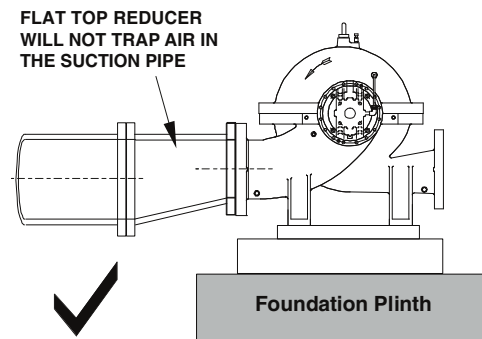
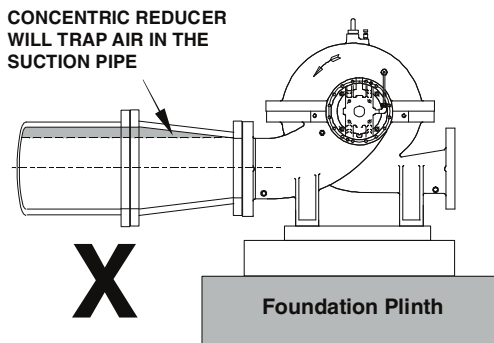
Do NOT touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed for maintenance they **MUST** be replaced before operating the equipment. For soft packed pumps the packing rings and related components are often supplied loose. Ensure that the packing is installed as per instructions in section 6.2 point 10 to 19.

Remove packaging but leave the flange covers in place, check that impeller (1590001) rotates freely by hand by turning the shaft (1800001).

If the pump has been in storage, remove any protective coatings. If the bearing housings (2400001) were filled with grease, flush and re-lubricate the bearings.

#### 4.6 Suction Pipework

The run of suction pipework must be such that air can NOT become trapped where it would be drawn into the pump on starting. The bore of the suction pipe is recommended to be one or two sizes larger than the pump suction branch and reducers if used must be eccentric to eliminate the possibility of an air pocket being formed.



Bends in the suction pipeline should be as large as possible, the pipe made as short and as straight as possible and all joints must be fully airtight. A gradual rise in the suction pipeline is recommended to prevent formation of air pockets. If fitting a foot valve, it should have a free area of one and a half times the area of the suction pipe.

Where pumping water at temperatures above 70 °C, care must be taken to ensure that enough pressure is available at the impeller (1590001) entry to prevent vaporisation. Expansion joints are recommended to prevent strain on the pump casing.

An appropriate fine strainer is recommended to prevent foreign matter from being drawn into the pump. A screen or basket strainer may also be required to hold back larger items. These should be sized to maintain the flow through them to below 0.6 m/s.

The suction pipe work must be flushed clean to ensure that site debris is not drawn into the pump when it is commissioned.

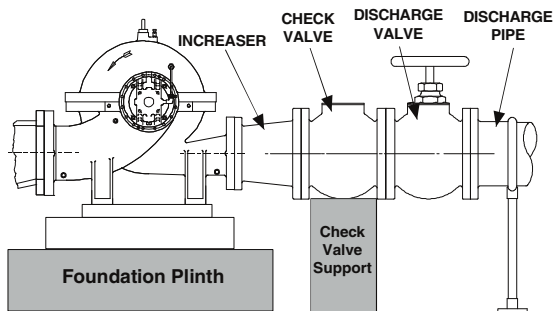
#### 4.7 Discharge Pipework

The bore of the discharge pipe should ideally be sized to ensure a flow velocity of 2.5 to 3 m/s is not exceeded. This is usually one size larger than the discharge branch. Pipework should be as short and straight as possible to reduce friction head loss.

A non-return valve is usually fitted to prevent the pump from excessive backpressure and reverse rotation and a discharge valve is usually fitted for isolation purposes to allow for inspection and maintenance on the pump.

Where adverse suction conditions may cause the pump to lose its prime, the use of an external automatic priming device, such as a vacuum pump, is recommended.

The suction and discharge pipe work must be independently supported and positioned such that no excessive forces and moments are exerted on the pump flanges.



Failure to support suction and delivery pipework may result in distortion of the pump casing, with the possibility of early pump failure.

#### 4.8 Guards

If guards have been removed to install packing or to check mechanical seal connections, they MUST be replaced to maintain safe operation of the pump.

#### 4.9 Coupling Alignment

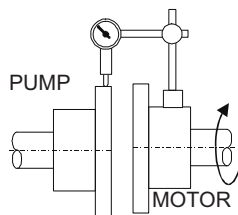
To minimise the bearing loading and to achieve full coupling and bearing life, it is recommended that the shafts (1800001) are aligned as accurately as possible i.e. well below the allowable misalignment of the coupling.

Refer to the coupling manufacturer's instructions or proceed generally thus:

### ATTENTION

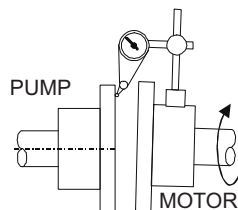
##### 1. Lateral Alignment

Mount a dial gauge on the motor shaft or coupling with the gauge running on the outer-machined surface of the pump coupling. Turn the motor shaft and note the total indicator reading.



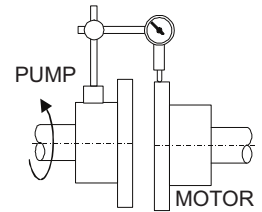
##### 2. Angular Alignment

Mount a dial gauge on the motor shaft or coupling to run on a face of the pump coupling as near the outside edge as possible. Turn the motor shaft and note the total indicator reading.



##### 3. Confirm Lateral Alignment

Mount the dial gauge on the pump shaft or coupling with gauge running on the outer machined surface of the motor coupling. Turn the pump shaft in the direction of pump rotation, and note the total indicator reading.



##### 4. Adjustment

For horizontal lateral adjustment move the motor using the motor jacking screws provided and for vertical and angular adjustment fit shims between the motor feet and the baseplate.

Note: Poor alignment is a major factor contributing to shortening of pump bearing and seal life. It is recommended that alignment is checked frequently and maintained at below 10% of the manufacturer's specified figure or 0.1mm.

As the pump and motor feet are accurately machined, any discrepancy may be due to foreign matter between any of the mating faces. These should be checked for cleanliness before assembly and before resorting to using shims under the motor feet.

Shaft alignment must be checked again after the final positioning of the pump unit and connection to pipe work as this may have disturbed the pump or motor mounting positions.

#### 4.10 Grouting

A space of about 25mm should be left between the top surface of the foundation plinth and the underside of the baseplate to allow for grouting.

Recommended grouting should comprise one part of cement to two parts of sand, with sufficient water to produce a heavy creamy consistency.

After the grout has dried, the alignment should be checked before commissioning and putting the pump into operation.

## 5. Commissioning and Operation

### 5.1 Commissioning Checks

These checks must be done after first installation and after pump maintenance that required removal of the rotating assembly.

#### Abrasion and Entrapment Hazard



Do NOT touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed for maintenance they MUST be replaced before operating the equipment.

Check that the rotating assembly is free to rotate by hand before connecting the power supply. Also check that the piping system has been properly connected with all joints tightened and instrumentation is in position.

Check that the pump is primed. Pumps should never be run dry as the pumped liquid acts as a lubricant for the close running fits surrounding the impeller (1590001). **Dry running can cause serious damage to the pump and seals.**

Prime the pump using an ejector, exhauster or vacuum pump. If a foot valve is used in the suction line the pump may be primed by venting and filling the casing with liquid. Open the air release valve to bleed any air trapped in the seal housing, as the seal must be lubricated and dry running often results in premature seal failure. Disconnect the pump drive by removal of the spacer from the coupling. Connect the electrical supply to the pump unit. Momentarily switch on motor and check direction of rotation. This should match the direction of rotation of the pump. For three phase electric motors, if the direction of rotation is incorrect, disconnect the supply and change over two of the three supply phases. Replace the coupling spacer.

### 5.2 Starting Procedure

**BEFORE A THRUSTREAM SERIES PUMP IS STARTED ALWAYS ENSURE THAT THE SUMP IS FILLED TO THE CORRECT LEVEL WITH LIQUID, AND THAT ANY LEVEL CONTROLS ARE FUNCTIONING CORRECTLY.**

Check that the suction valve is open and that the pump is primed.

Open the discharge valve to one quarter open to prevent hydraulic lock from occurring. Switch on the motor and allow it to build up to full operating speed. Slowly open discharge valve until the pump reaches the required duty condition.

Check that the motor is not overloading, unit is not vibrating or excessively noisy, the motor is not overheating, and that the pump is developing the correct flow and head requirements.

If the pump is operating at its normal speed, the pump should be shut down at once if any of the following defects are found:

- No liquid delivered.
- Not enough liquid delivered.
- Not enough pressure.
- Loss of liquid after starting.
- Vibration.
- Motor runs hot.
- Excessive noise from cavitation.
- Pump overheating.

Recommended corrective action for these faults is given in Section 7 Faults and Remedial Action.

### 5.3 During Operation



#### Hot Surfaces Hazard

Do NOT touch surfaces that during normal running will be sufficiently hot to cause injury.

These are marked with the HOT warning symbol. Note that these surfaces will **remain hot after the pump has stopped**: allow sufficient time for cooling before maintenance. Be cautious and note that other parts of the pump may become hot if a fault is developing.



#### Cold Conditions Hazard

Do NOT operate water pumps in temperatures below freezing point, without first checking that the pumped fluid is not frozen and the pump is free to turn. Pumps in these environments should be drained down during inactivity and reprimed before starting.



### Hazardous Noise



In addition to local or site regulations for noise protection, KBL recommends the use of Personal Ear Protection equipment in all enclosed pump rooms and particularly those containing diesel engines. Care must be taken to ensure that any audible alarm or warning signal can still be heard with ear defenders worn.

### Hazardous Gases, Mists, Sprays and Leaks



Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of toxic gases, skin and eye contact or penetration. Obtain and understand the hazardous substance (COSHH) data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures. Periodic Checks:

- a) Pump Bearings:  
Check the bearing temperatures do not exceed 80 °C as an increase may indicate the early stages of bearing trouble.
- b) Noise:  
Listen for any unusual noise or an increase in normal sound level.  
  
This may result from:
  - i) Loose fasteners for guards and other equipment.
  - ii) Air trapped in the pump i.e. the pump was not fully primed.
  - iii) Cavitation.
  - iv) Small solids in the liquid.
- c) Suction Gauge Reading:  
If this is lower than normal, investigate and check that valves in the suction pipework are fully open or that the suction lift may have increased.
- d) Discharge Gauge Reading:  
If this is lower than normal, check for a leak in the associated pipework or that a valve in the delivery line has been opened when normally it is partially closed.

#### 5.4 Stopping Procedure

Stop the motor then fully close the discharge valve.

## 6. Maintenance and Service

### General Introduction

KBL Thrustream Series pumps will provide many years of trouble free service when maintained in accordance with these instructions. In the event of failure of the pump it is recommended that KBL Service Department are called to investigate and carry out repairs. The following instructions are given to cover the main elements of strip and rebuild but do NOT include instructions for work that MUST be done by KBL Engineer.

The following hazards may arise during maintenance work:

### Fluid Pressure Jet Hazards



Check and ensure that the pump operates at below the Maximum Working Pressure specified in the manual or on the pump nameplate and before maintenance, ensure that the pump is drained down.

### Hazardous Materials



Wear a suitable mask or respirator when working with packing or gasket components that contain fibrous material, as these can be hazardous when the fibrous dust is inhaled. Be cautious if other supplier's components have been substituted for genuine KBL parts as these may then contain hazardous materials.

### Hazardous Gases, Mists, Sprays and Leaks



Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of toxic gases, skin and eye contact or penetration. Obtain and understand the hazardous substance (COSHH) data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

### Recommended Maintenance Schedule

<b>EVERY WEEK</b>	Visually check for leaks. Check for vibration. Adjust gland as necessary to maintain slight leakage. Hand test bearing housing for any sign of temperature. Voltage and current.
<b>EVERY MONTH</b>	Check bearing temperature with thermometer.
<b>EVERY 3 MONTHS</b>	Check grease lubricated bearings for saponification.
<b>EVERY 6 MONTHS</b>	Check the packing and replace if necessary. Check shaft or shaft sleeve for scoring. Check alignment of pump and motor. Check holding down bolts for tightness. Check coupling bush/rubber star.
<b>EVERY YEAR</b>	Check rotating element for wear. Checks wear ring clearances. Clean and regrease bearings. Measure total suction and discharge Head as a test of pipe connection

**BEFORE ATTEMPTING ANY MAINTENANCE ON A PUMP, PARTICULARLY IF IT HAS BEEN HANDLING ANY FORM OF HAZARDOUS LIQUID, ENSURE THAT THE UNIT IS SAFE TO WORK ON. THE PUMP MUST BE FLUSHED THOROUGHLY WITH A SUITABLE CLEANSER TO PURGE AWAY ANY OF THE PRODUCT LEFT IN THE PUMP COMPONENTS. THIS SHOULD BE CARRIED OUT BY THE PLANT OPERATOR AND A CERTIFICATE OF CLEANLINESS OBTAINED BEFORE STARTING WORK. TO AVOID ANY RISK TO HEALTH IT IS ALSO ADVISABLE TO WEAR PROTECTIVE CLOTHING AS RECOMMENDED BY THE SITE SAFETY OFFICER, ESPECIALLY WHEN REMOVING OLD SEALS OR GASKETS THAT MAY BE CONTAMINATED.**

### 6.1 Preparation for Maintenance

#### Electric Shock & Accidental Starting Hazard



ISOLATE the equipment before any maintenance work is done. Switch off the mains supply, remove fuses, apply lockouts where applicable and affix suitable isolation warning signs to prevent inadvertent re-connection.

During maintenance personnel should be aware of the risks of inhaling dangerous fumes or vapours.

No special tools are required for pump dismantling and re-assembly. However, it is important to ensure the suitable lifting equipment is available and that the work is carried out in a clean area.

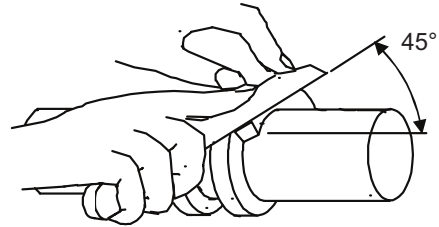
### 6.2 Repacking the Stuffing Box

Where a soft packed gland seal is fitted, it will be necessary to replace the packing rings periodically when the gland can no longer be tightened to reduce leakage to the normal level, or if the gland is overheating.

#### Packing Removal Procedure

1. Close the suction & discharge valves and release pressure from the casing, remove the gland retaining nuts and pull the split gland clear of the stuffing box.
2. Remove the gland plate and separate and remove the two halves of the gland.
3. Carefully withdraw the old packing rings and lantern ring, using a pair of extractor tools of the correct size placed on opposite sides of the pump shaft (1800001).
4. Clean the sleeve, the bore of stuffing box, the lantern ring and the split gland with a clean oily cloth.

- Check the sleeve for concentricity with the stuffing box bore and that the surface under the packing rings is free from scores, pitting or grooves.
- Examine the gland for general condition and replace if damaged.



### Packing Preparation

Champion Style (3116 or EQ.), Graphite cotton greasy packing is used in the standard supply. However packing suitable for liquid handled is also supplied against specific requirement.

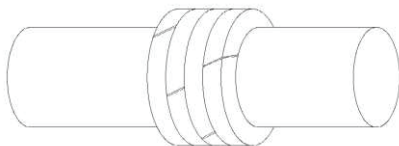
If the packing is to be cut from a coil or long length the size, number of rings and length is thus:

Gland packings are fitted with Impeller side  $2 + L + 4$  Gland side (arrangement for 1E, 2E & 3E module pumps) & With Impeller side  $2+L+2+L+1$  Gland side (Arrangement for 2-Stage module pumps) L = Lantern Ring.

### Stuffing Box Data

PUMP SHAFT MODULE	SLEEVE DIA. mm	PACKING SIZE		SIZE of RING ID/OD mm / mm	NO. OF RINGS PER BOX
		SQUARE SECTION mm	LENGTH of ONE RING mm		
1E	100	12	355	100/125	6
2E	120	12	415	120/144	6
3E	140	15	490	140/170	6
1 50/48-2	85	12	310	85/109	5
200/58-2	120	12	415	120/144	5

- Wrap the packing around a dummy shaft, of the same diameter as the sleeve



- To assist in cutting rings, two guide lines parallel to the shaft axis and separated by a distance equal to the packing section may be drawn on the spiral.

- Cut each ring from the spiral at an angle of  $45^\circ$  diagonally across the guidelines.

### Repacking Procedure

- Insert the first ring and tap it to the bottom of the stuffing box. Each following ring should be installed in the same manner and positioned in the stuffing box so that the 'split' is advanced  $120^\circ$ .
- Install the lantern ring(s) in the proper position(s) to align with the seal lubrication connection(s), allowing for movement of the ring deeper into the box as the packing is compressed.
- When all the rings have been inserted, the last packing ring should not protrude from the stuffing box face.
- Slide the gland into the stuffing box and ensure that it sits squarely against the last packing ring. Fit the gland plate and the gland retaining nuts on the studs and tighten evenly to finger pressure.
- Start the pump as per point 5.2, allow pressure to increase to normal level and ensure that air is not trapped in the pump casing.
- A soft packed gland must have slight steady leakage, and this should start soon after the pump reaches its normal operating pressure.
- If gland leakage stops, the pump will overheat leading to seal damage or premature pump failure. If overheating is detected, the pump must be stopped and allowed to cool and when restarted, gland leakage should start.
- If the pump overheats again, stop the pump restart it again, do not slacken the gland retaining nuts.

18. After the pump had been running for 10 minutes with steady leakage, tighten the gland nuts by one sixth of a full turn. Continue to adjust at 10-minute intervals, each time evenly, by one sixth of a full turn, until leakage is reduced to an acceptable level (30 drops per minute minimum).
19. Excessive gland pressure will cause damage by cutting off lubrication to the packing, and the packing will burn and damage the sleeve.

### 6.3 Maintenance of Mechanical Seals

Generally no maintenance is required on mechanical seals.

### 6.4 Bearing Lubrication

The ball bearings are supplied pre-loaded with appropriate grease. A grease nipple and V ring seals are fitted to the bearing housing (2400001) to ensure that any surplus grease is trapped inside the bearing housing.

It is important to know the weight of grease delivered by each stroke your grease gun to ensure application of the correct amount of grease.

It is recommended that the drive end bearings are topped up as per the Recommended Maintenance Schedule in Section 6.

Recommended Grease Lubricant:

International Standard	<b>DIN 51825: KP2 K-30</b>
As Supplied with a new pump.	TEXACO MULTIFAK ALL PURPOSE EP2

### 6.5 Bearing Replacement

Ball bearings will provide satisfactory service for their designed working life if they are correctly lubricated and inspected at the intervals shown in Section 6. -Recommended Maintenance Schedule.

### Bearing Specifications

Shaft Module	Bearing Specification
1E	DE-6214, NDE-6214/7214
2E	DE-6218, NDE-6218/7218
3E	DE-6220, NDE-6220/7220
SCT150/48-2	DE-6411, NDE-7411
SCT200/58-2	DE-6218, NDE-7218

A suitable bearing puller is required for removal of the bearings from the pump shaft (1800001). If a puller is not available, a hammer and soft metal drift may be used to tap evenly around the face of the inner ring.

Exerting force on the outer ring of a ball bearing can cause severe damage.

The work area and all tools used for bearing replacement must be clean and free of dust and grit to prevent contamination of a clean bearing and new grease.

**ATTENTION** Ball bearings should not be dismantled.

For pumps fitted with cartridge mechanical seals: Lock the seal before removing the retaining nuts and sliding the seals back from the face of the insert.

When replacing all the bearings, complete the replacement of the drive end bearings BEFORE commencing to replace the non-drive end bearings.

### Drive End Bearing Replacement Procedure

1. Remove the screws and slide the bearing covers (2700001 & 2710001) along the shaft (1800001) towards the water deflector (2360001).
2. Remove the screws to free the bearing housing (2400001) for removal.
3. Using a suitable puller, withdraw the bearing housing (2400001) from the shaft (1800001).
4. Using a suitable bearing puller on the inner race, pull the bearing (2600001) off the shaft (1800001).

5. Clean the bearing thoroughly with an approved cleaning fluid.
6. Dry the bearing with dry compressed air or with a clean soft cloth by hand.
7. DO NOT SPIN A CLEAN DRY BEARING.
8. Inspect the bearing for wear, fractures, cracks, corrosion or other damage, which may necessitate replacement.
9. Lightly oil the bearing and wrap in greaseproof paper to prevent contamination before reassembly.
10. Check that the shaft (1800001), bearing cover and housing are clean and undamaged.
11. It is recommended that new v-rings are fitted when bearings are replaced to ensure that contamination is prevented.
12. Slide the v-ring onto the shaft (1800001) wipe the seal recess in the bearing cover with grease and set in position on the shaft (1800001) against the bearing cover (2710001).
13. Heat the bearing (2600001) to approximately 100 °C (230 °F) using bearing hotplate, induction heater or oven. NOTE - Do not exceed 120 °C (248 °F).
14. Slide the heated bearing onto the shaft (1800001) to abut the shoulder. Ensure that the bearing sits fully and squarely against the shoulder.
15. Cool the bearing to room temperature and pack both sides with two/three ounces of recommended grease.
16. Coat the inside of the bearing housing (2400001) with grease and slide into place over the bearings.
17. If necessary use two screwed rods to pull the bearing housing (2400001) towards the bearing cover then fit four of the screws & tighten evenly to pull the bearing housings (2400001) into place, fit and tighten the remaining screws.
18. Fit the bearing cover (2710001) to the bearing housing (2400001) using screws.
19. Check that the shaft (1800001) rotates freely by hand.
20. Secure bearing housing (2400001) to the upper half casing (1220001) & lower half casing (1230001) & insert (9790001).
21. Fit the new v-ring on the shaft (1800001) to abut against the bearing housing (2400001).
22. Where applicable refit and set the mechanical seal.

#### Non-Drive End Bearing Replacement Procedure

1. Proceed as per the drive end bearing replacement procedure, paragraphs 1 and 2.
2. Remove the bearing cover (2700001) from the non-drive end bearing housing (2400001) and using a suitable puller, withdraw the bearing housing (2400001) from the shaft (1800001).
3. Using a suitable punch, flatten the lock washer and remove the bearing locknut (3360001) and the lock washer.
4. Replace the non-drive end bearing and as per the drive end bearing replacement procedure, paragraphs 4 to 16.
5. Place the locking washer onto the shaft (1800001) and screw on the bearing lock nut (3360001).
6. Fit and tighten the bearing locknut to 300 Nm and lift the tab of the lock washer.
7. Fit the bearing housing (2400001) as per the drive end bearing replacement procedure, paragraphs 17 to 20.
8. Refit the bearing cover (2700001).

#### 6.6 Mechanical Seal Replacement

Mechanical seals will need replacement when failure has occurred, they may not be replaced without removal of the rotating assembly unless the motor is disconnected and the coupling is removed from the pump shaft (1800001).

It is recommended that new mechanical seals are fitted when conducting a full pump strip-down for overhaul to give maximum operating life. Lock the mechanical seal before removing the retaining nuts and sliding the seals back from the face of the insert (9790001).

#### **Mechanical Seal Replacement Procedure**

- 1 Isolate the pump and drain the casing using the air vent valve (4500001) and drain plugs provided.
- 2 Disconnect the seal flush pipe, remove the four hexagon screws that retain the mechanical seal, and slide the seal assembly off the shaft (1800001).
- 3 Proceed as per the bearing replacement instructions, paragraphs 1 to 10.
- 4 Remove the nuts from the studs and withdraw the mechanical seal from the shaft (1800001).
- 5 Fit a new mechanical seal.
- 6 Reconnect the seal flush pipe.
- 7 Proceed as per the bearing replacement instructions, point 11 to 21.

#### **6.7 Pump Overhaul and Repairs**

Refer to a certified Pump Section drawing or the typical cross section drawing. Note the hazards outlined in Section 6.

#### **Impeller Inspection Procedure**

- 1 Isolate the pump and drain the casing using the air vent valve (4500001) and drain plug provided.
- 2 Remove the seal lubrication pipes from the inserts for soft packed pumps or from the mechanical seal.
- 3 Remove the screws that retain the bearing housings (2400001) to the lower half casing (1230001).
- 4 Remove the nuts from the casing studs securing the upper half casing (1220001) to the lower half casing (1230001).

- 5 Press or tap out the dowels.
- 6 Remove the nuts and bolts joining the upper half casing and lower half casing and remove the upper half casing, taking enough care not to damage the impeller (1590001) and casing (wear) ring. While removing the upper half casing, first slowly tighten the release bolts provided so that the upper half and lower half casing will be separated conveniently. The dowel pins inserted for location purpose should be removed before taking out the upper half casing away from the lower half casing.
- 7 If the lower half casing (1230001) is trapped between the bearing housings (2400001), release the remaining screws from the non-drive-end bearing housing and back it off by about 1mm.
- 8 Using the eyebolt and a suitable lifting device, lift the upper half casing (1220001) clear of the impeller (1590001), place to one side on a clean flat surface.
- 9 At this stage, the impeller (1590001) may be inspected for damage or blocking and cleaning if necessary.

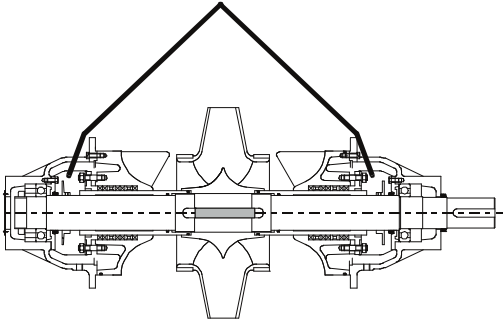
To check the pump shaft (1800001) and impeller (1590001) and to replace the wear rings or shaft sleeves, it is necessary to remove the rotating assembly from the lower half casing (1230001).

#### **Preparation for Removal of the Rotating Assembly**

Disconnect the motor coupling.

For pumps fitted with mechanical seals, refer to the seal manufacturer's instructions and lock the seal before removing the retaining screws and sliding the seals back from the face of the insert (9790001).

Provide a suitable lifting strap and support the weight of the rotating assembly thus:



#### Removal of the Rotating Assembly Procedure

1. Remove the remaining screws that retain the bearing housings (2400001) to the lower half casing (1230001).
2. Tap the inserts with a soft-faced hammer to break the seal between the insert and the lower half casing (1230001).
3. Lift the rotating assembly clear of the lower half casing (1230001) and support the shaft (1800001) on suitable V blocks.
4. If necessary, remove the casing wear ring dowels from the lower half casing (1230001).
5. With feeler gauges, check the clearance between the casing wear rings and the impeller (1590001). The Diametrical clearances between Impeller (1590001) and casing rings (1900001) should be

Minimum: 0.690 mm and maximum 0.939 mm (for special material)

Minimum: 0.440 mm and maximum 0.689 mm (for C.I./non ferrous material)

Note: Increase in the wear ring clearance allows increased internal leakage with resultant loss of pump performance, head and efficiency. When the clearance is double the original clearance, it is recommended that new wear rings are fitted. It is permissible to run the pump with increased clearance due to wear but the loss of pump efficiency will significantly increase the pump running costs.

#### Procedure to Dismantle the Rotating Assembly

1. Remove the screws and slide the bearing cover along the shaft (1800001) towards the liquid deflector.
2. Remove the screws to free the bearing housing for removal.

3. Using a suitable puller, withdraw the drive end bearing housing from the shaft (1800001).
4. Remove the bearing cover from the non-drive end bearing housing and using a suitable puller, withdraw the non-drive end bearing housing from the shaft (1800001).
5. Using a suitable punch, flatten the lock washer and remove the bearing locknut and the lock washer.
6. Using a suitable bearing puller on the inner race of each bearing, pull the bearings off the shaft (1800001).
7. Release the screws and remove the liquid deflectors from the shaft (1800001).
8. For pumps fitted with mechanical seals: Slide the mechanical seal assemblies off the shaft (1800001), remove the inserts and set aside for inspection.
9. *For pumps fitted with soft packed glands:* Remove the glands from the shaft (1800001) and remove the inserts complete with packing rings and lantern rings and set aside for inspection.
10. If not already removed, remove the casing wear rings and set aside for inspection and measurement.

*For Clockwise pump construction:*

11. Using a suitable 'C' spanner, unscrew and remove the non-drive end sleeve and go to step 13.

*For Counter Clockwise pump construction:*

12. Using a suitable 'C' spanner, unscrew and remove the drive end sleeve.

Note: Light tapping with a soft faced mallet may be needed to free the impeller (1590001) from the shaft (1800001), do not damage the impeller (1590001) if it is to be reused.

13. Using suitable pullers or levers, slide the impeller (1590001) of the shaft (1800001).
14. Scribe a line on the shaft (1800001) to mark the position of the locked sleeve or nut for reassembly.
15. Withdraw the impeller key (3200001) and unscrew and remove the remaining sleeve.

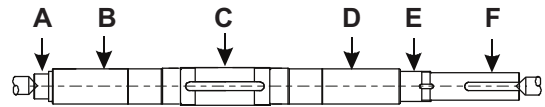
#### Cleaning and Inspection of Parts

1. Clean the bearings thoroughly with an approved cleaning fluid, kerosene or white spirit.
2. Dry the bearings with dry compressed air or with a clean soft cloth by hand and by spinning by hand. Confirm that the bearings rotate smoothly without slackness.
3. DO NOT OVERSPIN A CLEAN DRY BEARING.
4. Inspect the bearings for wear, fractures, cracks, corrosion or other damage to the running surfaces, which may necessitate replacement.
5. Coat the bearings with rust preventive oil and wrap in greaseproof paper.

Note: It is recommended that all 'V' rings, 'O' rings and gaskets are replaced by new parts during an overhaul. If 'O' rings are to be reused they should be left in place in their grooves and protected from contamination by oil and dirt.

6. Remove all O-rings from their grooves and discard where these are to be replaced.
7. Remove all grease and other deposits from all other parts using suitable cleaning fluid and a clean dry cloth.
8. Coat all unpainted carbon steel parts with a light smear of oil to prevent rust.
9. Measure the inside diameter of the wear rings (1900001) and the outside diameter of the wear ring surfaces on the impeller (1590001), calculate the clearance and compare these with dimensions in Section 6.7.

10. Mount the shaft (1800001) between point centres or on rollers, and place the stem of a dial indicator in contact with the shaft (1800001). Set the indicator dial at zero and turn the shaft (1800001) slowly by hand. Readings at any point A, B, C, D and E must not vary more than 0.05 mm (0.002").



11. For soft packed pumps: examine the shaft sleeves for wear, replace the sleeve if it is scored or has any visible surface damage.
12. If the shaft (1800001) runs true within tolerance, remount the shaft (1800001) as in step 10 but with the sleeve fitted in position, and check the sleeves run-out at the packing contact positions. Indicator readings must not vary more than 0.07 mm (0.003").
13. The sleeve can be re-ground to provide a new packing surface, to a maximum of 1.0 mm (0.04") below the initial diameter. Do not grind reduce sleeve diameter in the throat bush area unless scored. The surface finish of the sleeve should be 20-30 C.L.A.
14. Scour any rust or scale from internal iron non-fitting surfaces and immediately repair or renew any previous coating. Use WRC approved coating for pumps used for portable water.
15. Clean all threads with kerosene followed by wire brushing, dry and wrap shaft (1800001) threads with protective adhesive tape.
16. If the unit is not to be reassembled immediately, brush all bright iron and steel surfaces with Texaco Rust Proof Compound L or Rust Proof Compound Spray or a suitable equivalent rust preventive fluid.
17. Protect all parts (especially mechanical seal parts and faces) against loss, weather or mechanical damage.



### 6.8 Before reassembly:

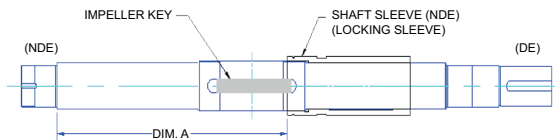
- 1 Re-examine all old parts intended for refitting. Worn, damaged or corroded parts should either be re-conditioned or, if beyond this, be discarded and replaced by new.
- 2 Ensure that all parts to be refitted (especially new parts) are free from burrs, with screw threads and abutting faces clean and free from damage.
- 3 Examine 'O' and 'V' rings and renew if showing wear, damage or deterioration.

### Pump Reassembly

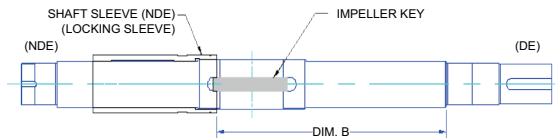
- 1 Lightly smear the shaft (1800001) with clean good quality grease or light oil.

For direction of rotation refer GA (General Arrangement) drawing.

#### For clockwise rotation:



#### For counter-clockwise rotation:



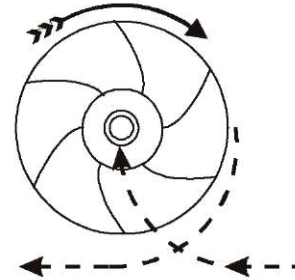
MODULE	DIM. 'A'	DIM. 'B'
1E	479	477
2E	579	577
3E	654	652
150/48-2	574	572
200/58-2	699	697

Note: The position of the impeller key (3200001) and the shaft sleeve (Locking Sleeve) is governed by the direction of rotation of the pump. For clockwise pumps they are fitted at the drive end of the shaft (1800001) slot and for counter-clockwise pumps they are at the non-drive end.

Where the location was not marked, please refer to the pump section drawing supplied or to KBL for dimensions A or B.

- 2 Screw the shaft sleeve onto the shaft (1800001) to the marked position. Turn the sleeve to the nearest slot to align with the keyway.

- 3 Place impeller key (3200001) into keyway and lock the shaft sleeve.
- 4 Check the impeller (1590001) for correct direction of rotation and slide onto shaft (1800001).



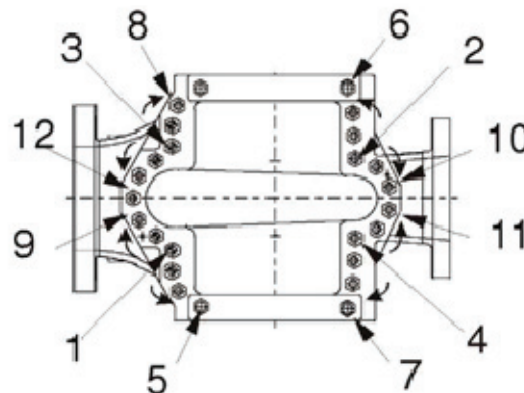
5. Screw opposite side shaft sleeve (Adjusting sleeve) onto shaft (1800001) to retain the impeller (1590001) against the locked shaft sleeve.
6. Slide the casing wear rings (1900001) onto the impeller (1590001).
7. Lightly grease and carefully fit new 'O' rings to the inserts.
8. Slide the inserts on to the shaft (1800001) with the guide vane at top position.
9. *For soft packed pumps:* Fit the packing, lantern rings and glands as per instructions in section 6.2.
10. Fit the liquid deflectors on the shaft (1800001) and secure with screws.
11. *For mechanical seals:* Slide mechanical seals into position inside the inserts.
12. Fit the mechanical seals to the shaft (1800001).

13. Fit new v-rings, bearing covers and slide them on the shaft (1800001), ready for assembly of the bearing housings (2400001).
14. Heat the bearings to approximately 100 °C (212 °F) using bearing hot-plate, induction heater or oven. NOTE: Do not exceed 120 °C (248 °F).
15. Slide the heated bearings onto the shaft (1800001) to abut the shoulder. Ensure that the bearings sit fully and squarely against the shoulder.
16. Place the locking washer onto the shaft (1800001) and screw on the bearing lock nut (3360001).
17. Fit and tighten the bearing locknut to 300 Nm and lift the tab of the lock washer.
18. Cool the bearings to room temperature and pack both sides with two/three ounces of recommended grease.
19. Coat the inside of the bearing housings (2400001) with grease and slide into place over the bearings. If necessary use two screwed rods to pull the bearing housing towards the bearing cover.
20. Secure the bearing housings (2400001) to the insert (9790001) with hex screws.
21. Check and install the dowel pins in the lower half casing (1230001) to locate the casing wear rings.
22. Place the rotating assembly into the pump casing lower half. Correct any excessive 'O' ring twisting or buckling. Check that the impeller (1590001) is centralised in the casing and that there are no rubs.
23. Install casing gasket with a light coat of commercial cup grease on both gasket surfaces. Carefully align the inner edge of the gasket with the insert 'O' rings.
24. Lower the upper half casing into place and install casing joint nuts.
25. NOTE: When installing upper half casing, make sure that the 'O' rings are not cut or pinched and that the casing gasket is hard against the 'O' rings.

26. Insert casing joint dowels and drive them home. Tighten the joint nuts to the specified torques

Thread Size	lb/ft	Nm
M16	120	160
M20	260	360
M24	440	600

27. Tighten the case screws in the following sequence:



- a) Tighten the four 'corner' screws marked 1, 2, 3 and 4.
  - b) Work outward along shaft (1800001) axis toward the stuffing boxes in opposite quarters tightening screws in regions 5, 6, 7 and 8.
  - c) Work outward along the branch and in opposite quarters tightening screws in regions 9, 10, 11 and 12.
  - d) Repeat the whole sequence (a to d).
28. Check that the shaft (1800001) turns freely by hand.
  29. Top up the bearing lubrication by applying several strokes with a grease gun.
  30. The pump is now ready for re-coupling to the motor and re-commissioning.

**Procedure for Dismantling of rotating assembly of Two Stage Pump**

Note: Two stage pumps are similar in construction to the single stage pump and instructions relating to maintenance and repair apply equally to both types.

The difference relates to the disassembly of the two impellers and the interstage plate. Proceed to disassemble the rotating assembly as for single stage pumps to step 10 of 'Procedure to dismantle the rotating assembly'.

*For Clockwise pump construction:*

1. Using a suitable 'C' spanner, unscrew and remove the non-drive end sleeve on a soft packed pump. For mechanical seal pump first remove the seal & then follow the step 1.

*For Counter Clockwise pump construction:*

2. Using a suitable 'C' spanner, unscrew and remove the drive end sleeve on a soft packed pump. For mechanical seal pump first remove the seal & then follow the step 2.

Note: Light tapping with a soft faced mallet may be needed to free the impeller from the shaft (1800001), do not damage the impeller if it is to be reused.

3. Using suitable pullers or levers, slide the first impeller of the shaft (1800001).
4. Withdraw the interstage ring (2040001) & bush (3130001) from the impeller spacer (2010001) and check the condition of the interstage bush (3130001) replace if worn.
5. Tap and pull the other impeller off the shaft (1800001) with the impeller spacer (2010001).
6. Withdraw the impeller key and unscrew and remove the locked shaft sleeve.

#### **Procedure for Assembly of 'rotating unit' of Two Stage Pump**

Proceed with shaft assembly as for single stage pumps up to step 3.

1. Select the first impeller for assembly, check the impeller for correct direction of rotation and slide onto shaft (1800001) to abut the locked shaft sleeve.
2. Fit new O rings to each side of the impeller spacer (2010001), slide on to the shaft (1800001) and fit the interstage bush (3130001) & ring with its O ring, ensuring that it is the correct way round to fit in the pump casing.

3. Screw free impeller locking nut or sleeve onto shaft (1800001) to retain the impellers against the locked impeller nut or sleeve.
4. Slide the casing wear rings onto the impeller.
5. Check that the dowels that retain the interstage plate are correctly fitted.

Continue with pump re-assembly from paragraph 7.

## 7. Faults and Remedial Action

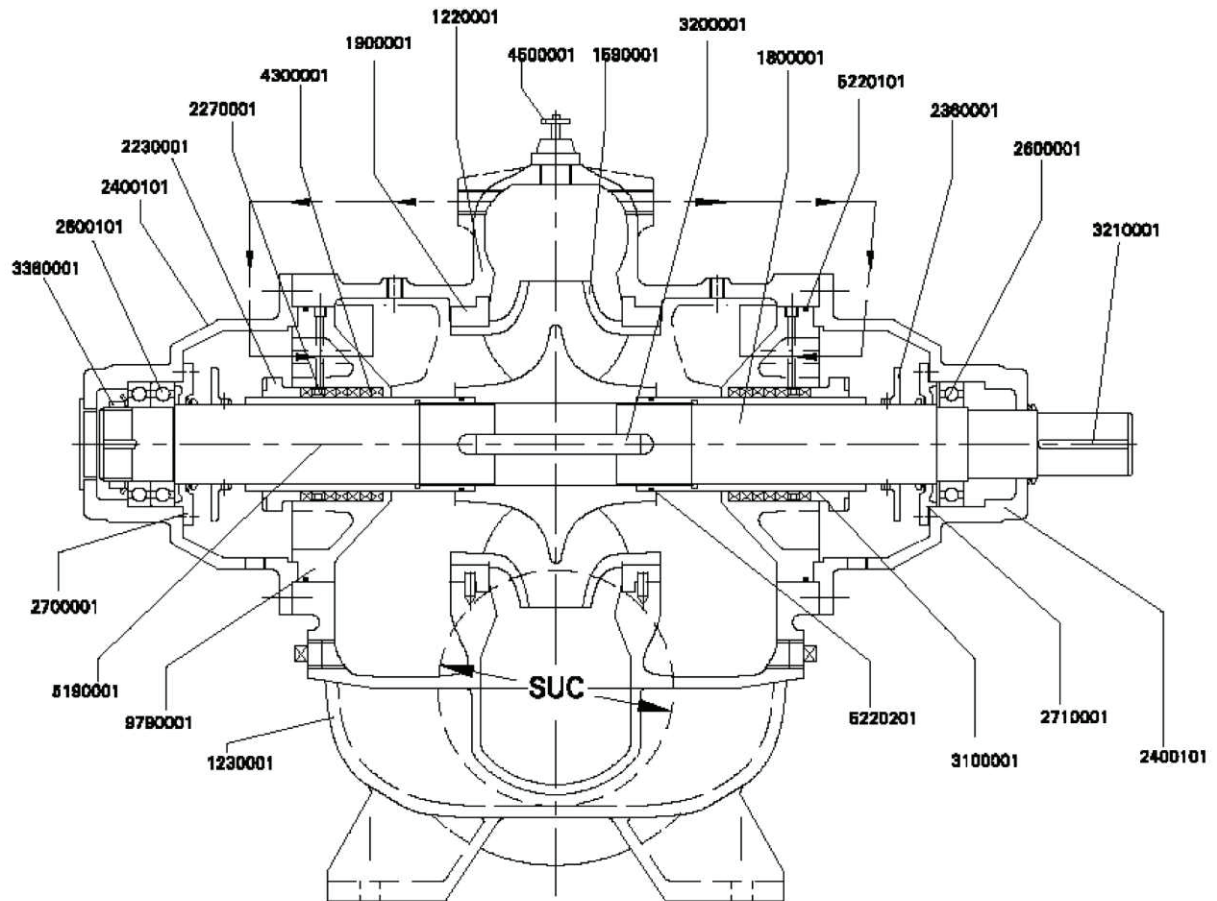
POTENTIAL FAULT OR DEFECT:				
				No liquid delivered.
				Insufficient liquid delivered.
				Liquid delivered at low pressure.
				Loss of liquid after starting.
				Excessive vibration.
				Motor runs hotter than normal.
				Excessive noise from pump cavitation.
PROBABLE CAUSES				
<input type="checkbox"/>				Pump not primed.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Speed too low.
<input type="checkbox"/>			<input type="checkbox"/>	Speed too high.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Air leak in suction pipework.
	<input type="checkbox"/>	<input type="checkbox"/>		Air leak in mechanical seal.
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Air or gas in liquid.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Discharge head too high (above rating).
		<input type="checkbox"/>		Suction lift too high.
	<input type="checkbox"/>			Not enough head for hot liquid.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Inlet pipe not submerged enough.
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Viscosity of liquid greater than rating
			<input type="checkbox"/>	Liquid density higher than rating.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Insufficient net inlet head.
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	Impeller plugged up or blocked.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Wrong direction of rotation.
	<input type="checkbox"/>	<input type="checkbox"/>		Excessive wear ring clearance.
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Damaged impeller.
			<input type="checkbox"/>	Rotor binding.
			<input type="checkbox"/>	Defects in motor.
			<input type="checkbox"/>	Voltage and/or frequency lower than rating.
			<input type="checkbox"/>	Foundation not rigid.
			<input type="checkbox"/>	Misalignment of pump and driver.
			<input type="checkbox"/>	Rotor out of balance.
			<input type="checkbox"/>	Shaft bent.
	<input type="checkbox"/>			Impeller too small.

CAUSE	REMEDIAL ACTION
Pump not primed.	Fill pump and suction pipe completely with fluid.
Speed too low.	Check that the motor is correctly connected and receiving the full supply voltage also confirm that the supply frequency is correct.
Speed too high.	Check the motor voltage.
Air leak in suction pipework.	Check each flange for suction draught, rectify as necessary.

CAUSE	REMEDIAL ACTION
Air leak in mechanical seal.	Check all joints, plugs and flushing lines, if fitted. Note that prolonged running with air in the mechanical seal will result in damage and failure of the seal.
Air or gas in liquid.	It may be possible to increase the pump performance to provide adequate pumping.
Discharge head too high (above rating).	Check that valves are fully open and for pipe friction losses. An increase in pipe diameter may reduce the discharge pressure.
Suction lift too high.	Check for obstruction of pump inlet and for inlet pipe friction losses. Measure the static lift, if above rating, raise the liquid level or lower the pump.
Not enough head for hot liquid.	Reduce the positive suction head by raising the liquid level.
Inlet pipe not submerged enough.	If the pump inlet cannot be lowered, provide a baffle to smother the inlet vortex and prevent air entering with the liquid.
Liquid density higher than rating.	Refer to KBL for guidance to increase the size or power of the motor or engine.
Insufficient net inlet head.	Increase the positive suction head by lowering the pump or raising the liquid level.
Impeller blocked.	Dismantle pump and clean the impeller.
Wrong direction of rotation.	Check driver rotation with the direction arrow on the pump casing.
Excessive wear ring clearance.	Replace the wear rings when the clearance exceeds the maximum tolerances.
Damaged impeller.	Replace if damaged or vanes are eroded.
Rotor binding.	Check for shaft run out, and replace if necessary.
Defects in motor.	Ensure that motor is adequately ventilated. Refer to manufacturers instructions.
Voltage and/or frequency lower than rating.	If voltage and frequency are lower than the motor rating, arrange for provision of correct supply.
Foundation not rigid.	Ensure that the foundation bolts are tight; check that foundations match KBL Recommendations.
Misalignment of pump and driver.	Check shaft run-out and replace if necessary.
Rotor out of balance	Check impeller for damage, replace as necessary.
Shaft bent.	Check shaft run-out and replace if needed.
Impeller too small.	Refer to KBL for options to fit a larger impeller.

## 8. Pump Details

### 8.1 Cross Section Drawing - Single Stage Pump - Clockwise Rotation:



## 8.2 Single Stage Pump Parts Identification List - (Numbers as shown on cross section drawing)

Note: Pump construction may vary slightly between the different pump sizes within each type, it is important to refer to the specific pump section drawing and to quote the pump serial number when ordering parts to ensure that the correct part is supplied in the original material of construction.

Item	Description	Qty
1220001	Casing Top Half	1
1230001	Casing Lower half	1
5190001	Casing Gasket	1
1590001	Impeller	1
1900001	Casing wear Ring	2
2270001	Lantern Ring	4
3100001	Sleeve - Locked (Soft Packed)	1
3100101	Sleeve - Free (Soft Packed)	1
5220201	O Ring - Shaft Sleeve	2
2230001	Gland	2
2700001	Bearing cover	2
4300001	Packing	10
9790101	Insert - Non Drive End	1
9790201	Insert- Drive End	1
5220101	O Ring Insert	2
2400101	Bearing Housing	2
2600101	Bearing Non-drive End	1
2600001	Bearing Drive End	2

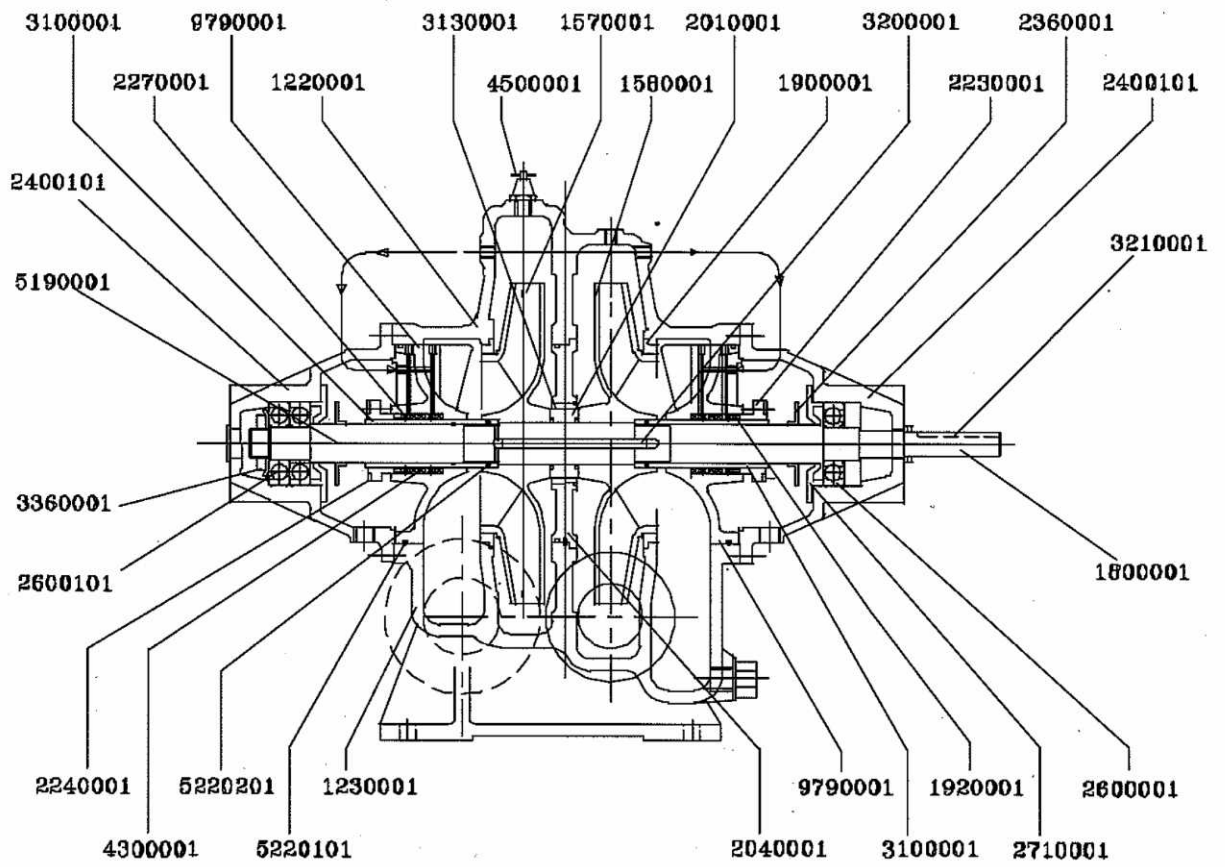
1800001	Pump Shaft	1
2360001	Deflector - Water	2
3360001	Bearing Lock Nut	1
4410001	Grease Nipple (Not Shown)	2
3200001	Key - Impeller	1
3210001	Key - Coupling	1
4500001	Air Vent Valve	1

### Parts for Pumps with Mechanical Seals:

2230001	Mechanical Seal	2
3100001	Sleeve - Locked (M/C seal)	1
3100101	Sleeve - Free (M/C seal)	1

Replacement parts should be obtained from KBL; use of parts from unapproved suppliers will invalidate the pump warranty. When ordering spare parts, please quote the pump serial number from the pump identification plate.

8.3 *Typical Pump Section Two Stage: Clockwise Rotation.*



#### 8.4 Two Stage Pump Parts Identification List - (Numbers as shown on cross section drawing)

Note: Pump construction may vary slightly between the different pump sizes within each type, it is important to refer to the specific pump section drawing and to quote the pump serial number when ordering parts to ensure that the correct part is supplied in the original material of construction.

Item	Description	Qty
1220001	Casing Top Half	1
1230001	Casing Lower half	1
5190001	Casing Gasket	1
2010001	Impeller Spacer (Two Stage)	1
1570001	Impeller (Two Stage)	1
1580001	Impeller (Two Stage)	1
1900001	Casing wear Ring	
2040001	Interstage ring	1
3130001	Interstage Neck Bush	1
1920001	Neck Ring	
2270001	Lantern Ring	2 / 4
3100001	Sleeve - Locked	1
3100101	Sleeve - Free	1
5220201	O Ring - Shaft Sleeve	2
2230001	Gland	2
4300001	Packing	5
9790101	Insert	1
9790201	Insert	1
5220101	O Ring Insert	
2400101	Bearing Housing Non-drive End	1
2400101	Bearing Housing Drive End	1
2600101	Bearing Non-drive End	1
2600001	Bearing Drive End	
1800001	Pump Shaft	1
3360001	Bearing Lock Nut	1
4410001	Grease Nipple	
3200001	Key - Impeller	1
3210001	Key - Coupling	1
4500001	Air Vent Valve	1
	St St Flexible pipe	2

#### Parts for Pumps with Mechanical Seals:

2230001	Mechanical Seal	2
3100001	Sleeve - Locked (M/C seal)	1
3100101	Sleeve - Free (M/C seal)	1

Replacement parts should be obtained from KBL; use of parts from unapproved suppliers will invalidate the pump warranty. When ordering spare parts please quote the pump serial number from the pump identification plate.



## 9. Standard Metric Nut and Bolt Torque Recommendations

This information is for reference only. The user must check that the torque figures listed here are applicable to the fasteners used. Nuts and bolts should be neither under nor over tightened.

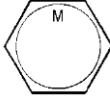


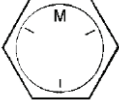

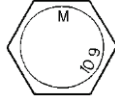

Grade of Bolt	Approximate Torque (Nm) for Bolt Diameters:									
	M5	M6	M8	M10	M12	M16	M20	M24	M30	M36
4.6	2.7	4.5	11	22	38	95	185	320	633	1110
8.8	6.9	11.7	28	56	98	244	476	822	1634	2855
10.9	9.4	15.9	38	77	134	332	646	1120	2223	3885
12.9	11.2	19.1	46.4	92	160	397	775	1342	2666	4660

**Note:** These torque figures are approximate, and for **un-plated** fasteners only. No allowance has been made for special finishes or lubricants, washers or mating surfaces.

### Bolt and Nut Grade Combinations

Grade of <b>BOLT</b>	4.6	8.8	10.9	12.9	Note: It is permissible to fit higher grade nuts than recommended.
Grade of <b>NUT</b>	4	8	12	12	

### Grade Identification

<b>BOLTS &amp; NUTS - Grade 4.6</b> BS4190 (ISO272, 885, 888 & 4759/1). Grade marking is optional. Normally there will be no mark other than the 'M' thus:			
<b>BOLTS - Grade 8.8</b> BS 3692 (ISO272, 4759/1). Grade marking is mandatory, may also have trade marks		<b>NUTS - Grade 8</b> Indented marks as a clock face, dot at 12.00, bar at 8.0, indicates grade 8 nut.	
<b>High Strength Friction Grip Bolts &amp; Nuts</b>			
BOLT		NUT	
BOLT Grade 10.9		NUT Grade 12	



**PUMP SPECIFICATION & OTHER DETAILS.**

Pump type	:	SCT 200/58,300/34,250/42,250/51,250/68,300/59,350/39,300/48,300/77,350/44,350/54,350/66,1 50/48-2,200/58-2
Qty	:	
Client	:	
Service	:	
Project	:	
KBL O/A No.	:	
Motor Rating	:	
Speed	:	
Make	:	
Frame	:	
Weight	:	
Pump Discharge	:	
Pump Head	:	
Pump Efficiency	:	
Pump Input	:	
Liquid Sp. Gravity	:	

**\*IMPORTANT: PUMP MUST BE OPERATED WITHIN THE WORKING RANGE AS SPECIFIED ON THE PERFORMANCE CURVE.**