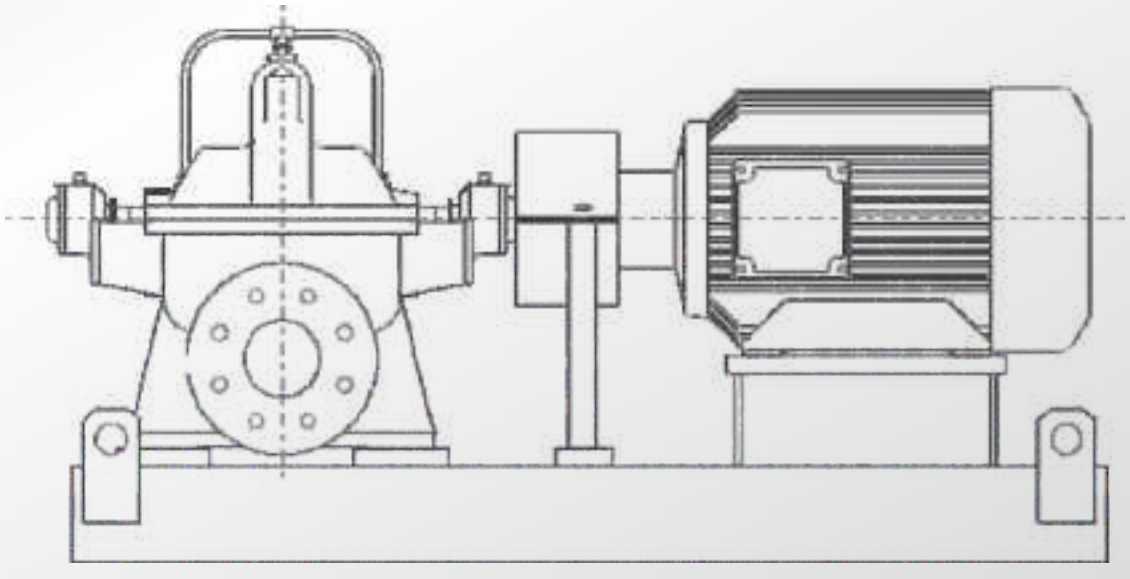
Enriching Lives

Instructions on Installation, Operation & Maintenance for Kirloskar Pump Type Horizontal Split-case Pump : Hydrostream LLC



KIRLOSKAR BROTHERS LIMITED
Established 1888
A Kirloskar Group Company

Enriching Lives

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Introduction

This manual gives the safety, installation, operation and maintenance instructions for KBL's Hydro-stream thru bore LLC Horizontal Axially Split Case range of centrifugal pumps (Grease lubricated, Gland /Mechanical seal packed) for general water and industrial use.

The pump sizes covered by this manual are

SINGLE STAGE PUMPS :

HL200/60EL (T)	**(BS08EL-(T))**
HL300/63AL(T)	**(BS12AL-(T))**
HL 250/47EL (T)	**(BR10EL-(T))**
HL300/51CL (T)	**(BR12CL-(T))**

TWO STAGE PUMPS :

HL125/40-2-HL (T)	**(BM05HL(T))**
HL150/45-2-HL (T)	**(BM06JL(T))**
HL200/48-2-DL (T)	**(BM08DL(T))**

This manual covers the ***Hydro-stream thru bore LLC Horizontal Axially Split Case range of centrifugal pumps*** (Grease lubricated, Gland /Mechanical seal packed) that are built for use in the horizontal position. For information on pumps built for vertical applications & lubrication other than Grease, 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 Pumps Ltd. 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

Hydro-stream thru bore LLC Horizontal Axially Split Case range of centrifugal 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.

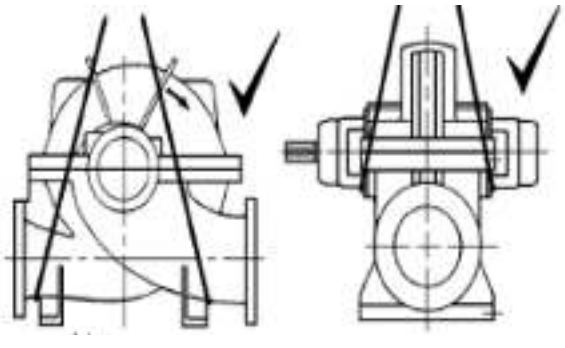
2.2 Handling

Crushing Hazard

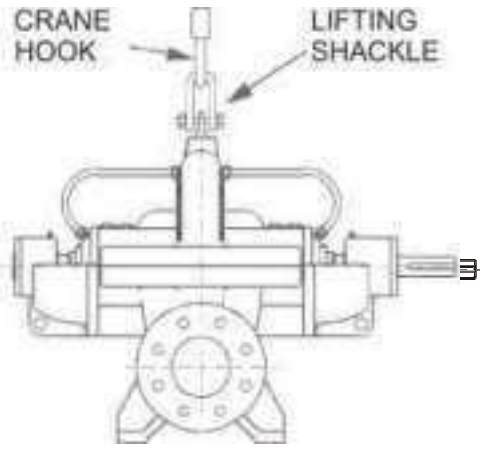
When lifting the pump unit, use lifting equipment having a safe working load rating suitable for the weight specified. Use suitable slings for lifting any pump not provided with lifting points.

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

Pumps are usually supplied on pallets for handling by forklift truck, to lift from the pallet the pump should be slung as shown.



Pump weight is shown on the General Arrangement drawing supplied with each pump or pump set.



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 preventative 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 preventative and flange covers should not be removed until final installation.

When pumps are not in use, the pump shaft (18001 or 18002) 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 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 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.

For special protection of electric motors and mechanical seals, refer to the manufacturer's instructions in Appendix.

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.**Hydro-stream thru bore LLC Horizontal Axially Split Case** centrifugal 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 bearings with a double entry shrouded type impeller fitted with serrated wear ring(s) and mounted between two removable bearing housings attached to the volute casing. Shaft and impeller assembly can be lifted from the bottom 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 Grease lubricated with mechanical seal. These pumps are normally supplied with a cast iron casing but we can supply in variety of material constructions requirements suitable for clear water/sea water application for casing & rest of the cast components of pump please refer to KBL.These pumps are designed to pump liquids at temperatures up to 80^{o}C. Where pumps are needed to suit higher temperatures, please refer to KBL.

Nameplate details are shown on the back cover of this manual, full pump specification can be supplied on a data sheet, if requested.

Note 1) The 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 are supplied 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 proprietary high efficiency electric motor adequately sized for the duty specified. For details of the motor supplied, refer to the manufacturer's instructions in Appendix I.

The proprietary flexible coupling has been selected to meet the power transmission and other operating requirements for the pump set. Coupling fitting and maintenance details are given in the manufacturer's instructions in Appendix II.

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, 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 base plate near the bolt holes to level the unit if the floor is uneven. The foundation bolts should be tightened and the shaft alignment checked again before commissioning and putting the pump into operation. For full installation instructions and guidance on the design of suitable foundations for pump sets refer to the KBL Guide to Pump Installation, obtainable on request from KBL.

4.5 Pump Preparation

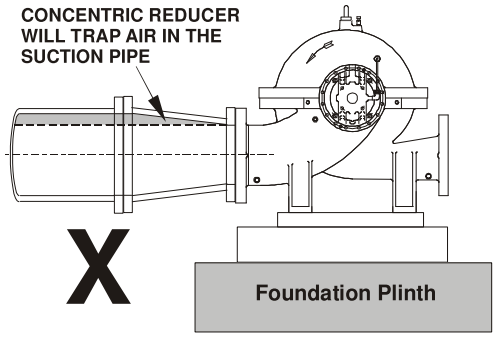
Abrasion & Entrapment Hazard :

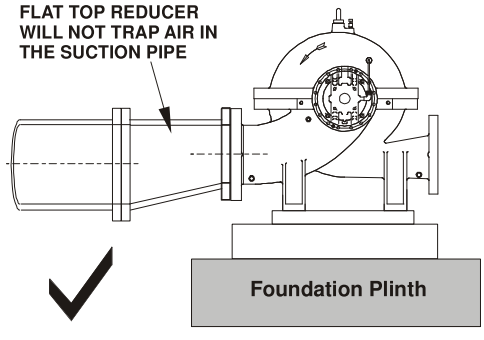
Do NOT touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed for maintenance they must be replaced before operating the equipment.

For soft packed pumps the packing rings and related components are often supplied loose. Ensure that the packing's are installed as per as per instructions in section 6.2 point 10 to 19.

4.6 Suction Pipe work

The run of suction pipe work 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 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.

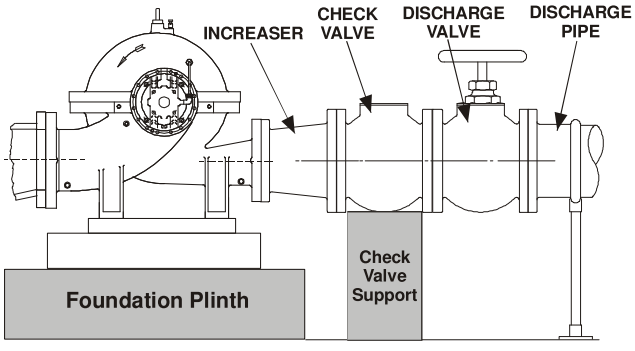
4.7 Discharge Pipework

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.



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

4.8 Guards

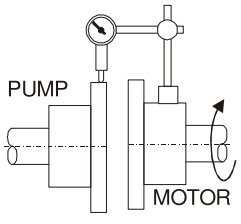
If guards have been removed to install packing or to check mechanical seal connections, they MUST be replaced to maintain safe operation of the pump. Refer to the General Arrangement drawing for specific fixing methods for the guarding supplied.

4.9 Coupling Alignment

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

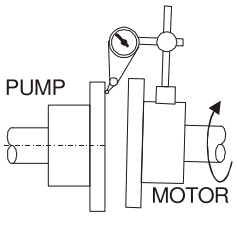
Refer to the coupling manufacturer's instructions or proceed generally thus:

1 **Lateral Alignment**



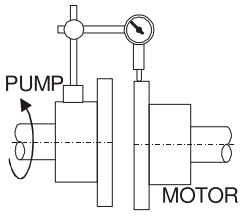
Mount a dial gauge on the motor shaft or coupling with the gauge running on the outer-machined surface of the pump coupling. Turn the motor shaft and note the total indicator reading.

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 base plate.

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 minimum should be left between the top surface of the foundation plinth and the underside of the base plate 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. **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 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.

ATTENTION

5.2 Starting Procedure

BEFORE STARTING ALWAYS ENSURE THAT THE SUMP IS FILLED TO THE CORRECT LEVEL WITH LIQUID, AND THAT ANY LEVEL CONTROLS ARE FUNCTIONING CORRECTLY.

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 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:

a) No liquid delivered.
b) Not enough liquid delivered.
c) Not enough pressure.
d) Loss of liquid after starting.
e) Vibration.
f) Motor runs hot.
g) Excessive noise from cavitation's.
h) 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 re- primed before starting.

Hazardous Noise :

In addition to local or site regulations for noise protection, KBL. Recommend 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 noxious and 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 pipe work 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 pipe work 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. **Hydro-stream thru bore LLC Horizontal Axially Split Case range of centrifugal pump** 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 an 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 data sheet or nameplate and before maintenance, ensures 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 noxious and toxic gases, skin and eye contact or penetration. Obtain and understand the hazardous substance data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

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.

Recommended Maintenance Schedule :

INSPECTION	REMARKS
Daily Checks:	
Visually check for leaks Hand test bearing housing for any s gn of temperature rise. Check for vibration.	 If bearing housing feels hot to touch, refer to Fault Finding Chart (Table 1). Maximum running temperatures are: Oil Lubricated 120°C (248°F). Grease Lubricated 90°C(194° F) Refer to Fault Finding Chart (Table 1).
If soft packed: 1. Adjust gland as necessary to maintain slight leakage . 2. Check that gland drains are clear If mechanical seal fitted: Check for leaks.	When gland fully in, change or add more packing. (refer to maintenance instructions). Renew as necessary
Weekly Maintenance:	
Lubrication - Oil Check oil level in bearing housings and top up if necessary.	Use Texaco Rando HD100 for pump speeds BELOW 1500 rpm and HD68 for speeds ABOVE 1500rpm or equivalent oils to ISO VG100 or ISO VG 68.
3 Monthly Maintenance:	
Lubrication – Grease Lubricate ball or roller bearings. **Lubrication - Oil** Drain and refill bearing housings with new oil.	 Use Texaco Multifak All Purpose EP2 grease or equivalent grease to DIN 51825 : KP2 K-30. Check that bearing housings are 2/3 full maximum. Overheating of bearings will occur if overfilled. Use Texaco Rando HD100 for pump speeds BELOW 1500 rpm and HD68 for speeds ABOVE 1500rpm or equivalent oils to ISO VG100 or ISO VG 68.
INSPECTION	**REMARKS (Continued)**
6 Monthly Maintenance:	
Check coupling alignment. Check coupling pins and bushes for wear Check holding-down bolts for tightness	Refer to maintenance instructions Renew as necessary
Yearly Maintenance:	
Lubrication - Grease Clean & regrease ball or roller bearings	
O ERHAUL	
An overhaul is to be carried out when pump performance falls below an acceptable level.	

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 lock-outs 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.

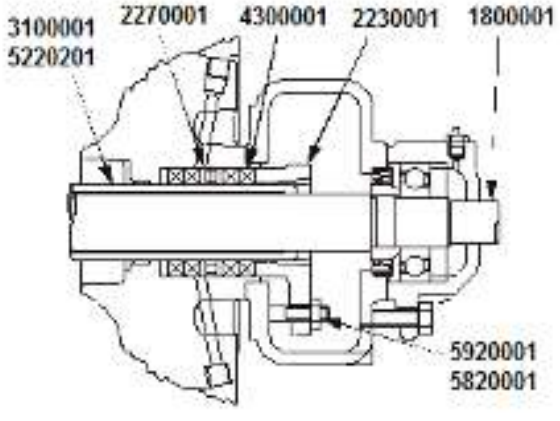
6.2 Repacking the Stuffing Box

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.

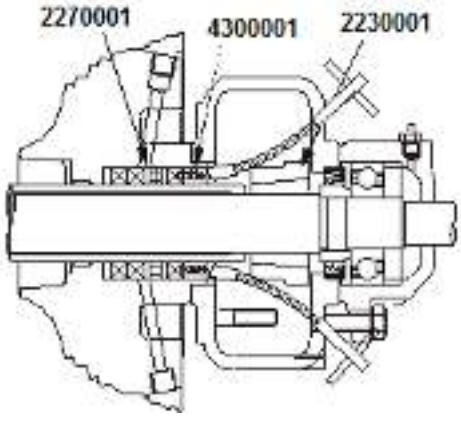
Packing Removal Procedure

1 Close the suction & discharge valves and release pressure from the casing, remove the gland retaining nuts (5920001) and pull the gland (2230001) clear of the stuffing box.

2 Carefully withdraw the old packing and lantern ring (2270001), using a pair of extractor tools of the correct size placed on opposite sides of the pump shaft (1800001).



3 Clean the sleeve, the bore of stuffing box, the lantern ring and the split gland with a clean oily cloth.



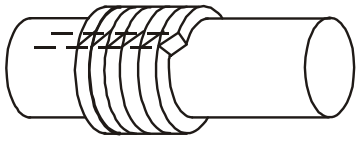
4 Check the sleeve for concentricity with the stuffing box bore and that that the surface under the packing rings is free from scores, pitting or grooves.

5 Examine the gland for general condition and replace if damaged.

Packing Preparation

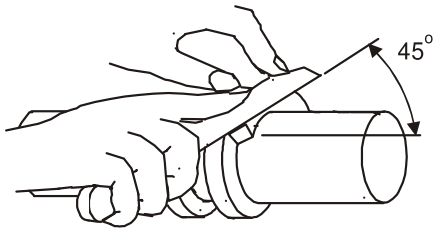
6 If the packing is to be cut from a coil or long length the size, number of rings and length is thus:

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



Pump Type	Sleeve Dia Mm	Packing Size		No Of Rings per Box
		Size mm	Total Length mm	
HL200/48-2-DL (T) (BM08DL(T))	105	16	4000	2+L+3
HL300/51CL (T) (BR12CL-(T))	105	16	4000	2+L+3
HL200/60EL (T) (BS08EL-(T))	105	16	4000	2+L+3
HL300/63AL(T) (BS12AL-(T))	113	16	4000	2+L+3
HL 250/47EL (T) (BR10EL-(T))	Not Applicable			
HL125/40-2-HL (T) (BM05HL(T))				
HL150/45-2-HL (T) (BM06JL(T))				

8 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.



9 Cut each ring from the spiral at an angle of 45° diagonally across the guidelines.

Repacking Procedure

10 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°.

11 Install the lantern ring(s) (22700) 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.

12. When the all the rings have been inserted, the last packing ring should not protrude from the stuffing box face.

13. Slide the split gland (22900) with clamping plate (22400) into the stuffing box and ensure that it sits squarely against the last packing ring. Fit the gland retainer and the gland retaining nuts on the studs and tighten evenly to finger pressure.

14. Start the pump as per paragraph 5.2, allow pressure to increase to normal level and ensure that air is not trapped in the pump casing.

15. A soft packed gland must have slight steady leakage, and this should start soon after the pump reaches it's normal operating pressure.

16. 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.

17. 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 .

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. They should be replaced if leakage occurs but if maintenance is required, the manufacturer's information is given in Appendix III.

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 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	**DIN 51825: KP2 K-30**
As Supplied with a new pump.	TEXACO MULTIFAK ALL PURPOSE EP2

Note Greasing points may be provided for the bearings on the electric motor fitted, refer to Appendix I for motor maintenance details.

6.1 Maintenance of Ball and Roller Bearings

These general instructions apply to all bearings that are fitted; where specific manufacturer's instructions are available they should be used.

Staff requiring more detailed information on bearing care should obtain literature from the bearing manufacturer.

For type of bearing fitted refer to Bearings Information in Section 9 (Table 4).

Care and maintenance of bearings is a matter of ensuring that:

Bearings are correctly lubricated at intervals as specified in the Routine Maintenance Chart (Table 2).

They are removed, cleaned and refitted with care.

a) Tools used and work areas are kept clean.

To remove a bearing use correctly suited withdrawal equipment. If other means are not available, a hammer and soft metal drift may be used to tap evenly around the circumference of the inner ring.

Damage can be caused by exerting force on the roller element or against the outer ring of a ball bearing.

Roller bearings are normally manufactured in two parts that can be separated for cleaning and examination. Ball bearings should not be dismantled.

Clean the bearings thoroughly with an approved cleaning fluid.

Dry the bearings by spinning with dry compressed air or by hand. DO NOT SPIN A CLEAN DRY BEARING.

Inspect the bearing for wear, fractures, cracks, corrosion or other damage that may necessitate bearing replacement.

For grease lubricated bearings, pack both sides of bearing with grease.

Check that the bearing, shaft and housing are clean and undamaged.

Clean the bearing cap and if grease lubricated, recharge with grease to a maximum of two thirds full.

Refit the bearing onto the shaft and press or tap into position.

Screw bearing locknuts on separately, successively tightening against bearing inner race and one another.

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

Pump Shaft	DE	NDE
BM08D(T)	7315 BECBP	6315 C3
BM05,BM06	7310 BECBP	6310 C3
HL200/60EL (T) (BS08EL-(T)) **HL300/51CL (T) (BR12CL-(T))** **Hl 250/47EL (T) (BR10EL-(T))**	7314 BECBP	6314 C3
HL300/63AL(T) (BS12AL-(T))	7316 BECBP	6314 C3

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

Ball bearings should not be dismantled.

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

Non-Drive End Bearing Replacement Procedure

1. Remove the hexagon screws and washers (5710001 & 8490001) and pull the bearing housing (2400201) off the bearing. If needed, a pair of pry bars may be used to lever the bearing housing off the bearing.
2. Using a suitable punch, flatten the lock washer (4150001) and unscrew the bearing locknut (3360001).
3. Fit a suitable bearing puller in place and pull the bearing off the shaft end.
4. Clean the bearing thoroughly with an approved cleaning fluid.
5. Dry the bearing with dry compressed air or with a clean soft cloth by hand.
6. DO NOT SPIN A CLEAN DRY BEARING.
7. Inspect the bearing for wear, fractures, cracks, corrosion or other damage, which may necessitate replacement.
8. Lightly oil the bearing and wrap them in greaseproof paper to prevent contamination before reassembly.
9. Check that the shaft and bearing housing are clean and undamaged.
10. It is recommended that a new 'V' ring seal (5000001) is fitted when bearings are replaced.
11. Wipe the 'V' ring seal recess in the support frame (2200001) with grease, slide the new 'V' ring seal onto the shoulder ring (1990001) and locate in the recess in the support frame.
12. Heat the bearing to approximately 100^0C (212^0F) using bearing hotplate, induction heater or oven. NOTE - Do not exceed 120^0C (248^0F).
13. Slide the heated bearing onto the shaft to abut the shoulder. Ensure that the bearing sits fully and squarely against the shoulder.
14. Cool the bearing to room temperature and coat both sides with two/three ounces of recommended grease.
15. Place the locking washer (4150001) onto the shaft and screw on the bearing lock nut (3360001).
16. Fit and tighten the bearing locknut to 300 Nm and lift the tab of the lock washer.
17. Coat the inside of the bearing housing (2400201) with grease and slide into place over bearing.
18. Fit four hexagon screws and washers (5710001 & 8490001), tighten evenly to pull the bearing housing into place.

Drive End Bearing Replacement Procedure

To inspect or replace the drive end bearings without removal of the rotating assembly from the pump casing, it is necessary to remove the pump shaft coupling and ensure that there is sufficient clearance between the pump shaft and the motor coupling. If a spacer coupling has not been used it may be necessary to demount the motor to achieve the required clearance.

1. Remove the four hexagon screws and washers (5710001 & 8490001) and pull the bearing housing (2400101) off the bearing. If needed, a pair of pry bars may be used to lever the bearing housing off the bearing.
2. Fit a suitable bearing puller in place and pull the bearing off the shaft end.
3. Clean the bearing thoroughly with an approved cleaning fluid.
4. Dry the bearing with dry compressed air or with a clean soft cloth by hand.
5. DO NOT SPIN A CLEAN DRY BEARING.
6. Inspect the bearing for wear, fractures, cracks, corrosion or other damage, which may necessitate replacement.
7. Lightly oil the bearing and wrap it in greaseproof paper to prevent contamination before reassembly.
8. Check that the shaft and bearing housing are clean and undamaged.
9. It is recommended that a new 'V' ring seal (5000001) is fitted when bearings are replaced.

10. Wipe the 'V' ring seal recess in the support frame (2200001) with grease, slide the new 'V' ring seal onto the shoulder ring (1990001) and locate in the recess in the support frame.
11. Heat the bearing (2400201) to approximately 100^0C (212^0F) using bearing hotplate, induction heater or oven. NOTE - Do not exceed 120^0C (248^0F).
12. Slide the heated bearing onto the shaft to abut the shoulder. Ensure that the bearing sits fully and squarely against the shoulder.
13. Cool the bearing to room temperature and coat both sides with two/three ounces of recommended grease.
14. Coat the inside of the bearing housing (2400201) with grease and slide into place over bearing.
15. Fit four hexagon screws and washers (5710001 & 8490001), tighten evenly to pull the bearing housing into place.
16. Refit the coupling and motor, check and adjust the alignment as per instructions in section.

6.6 Mechanical Seal Replacement

Mechanical seals will need replacement when failure has occurred, they may be replaced without removal of the rotating assembly

It is recommended that new mechanical seals are fitted when conducting a full pump strip-down for overhaul to give maximum operating life.

Mechanical Seal Replacement Procedure

1 For **drive end** seal replacement, proceed as per the relevant bearing replacement instructions, paragraphs 1 to 14 and for **non-drive end** seal replacement proceed as per the relevant bearing replacement instructions, paragraphs 1 to 12.

2 Isolate the pump and drain the casing using the air vent valves (308) and drain plugs (1P & 1M) provided.

3 Disconnect the seal flush pipe, remove the four hexagon screws (52A) that retain the mechanical seal, and slide the seal assembly off the shaft.

4 Fit a new mechanical seal as per the manufacturer's instructions.

5 Reconnect the seal flush pipe.

6 For **drive end** seal replacement, proceed as per the relevant bearing replacement instructions, paragraphs 18 to 28 and for **non-drive end** seal replacement proceed as per the relevant bearing replacement instructions, paragraphs 16 to 23.

6.7 Pump Overhaul and Repairs

Refer to a certified Pump Section drawing or the typical cross section drawing in Section 8. Note the hazards outlined in Section 6.

Impeller Inspection Procedure

1 Isolate the pump and drain the casing using the air vent valves (4500001) and drain plug (6100201) provided.

2 Remove the seal lubrication pipes (5600001) from the insert (9790001).

Remove the nuts (5800101) from the casing

3 studs (5900101 & 5900201) securing the top half casing (1220001) to the bottom half casing (1230001).

4 Press or tap out the spring dowels (6110001).

5 Using a pair of pry bars in the slots provided between the top and bottom casings, apply pressure to break the gasket seal.

6 Using the eyebolt and a suitable lifting device, lift the top half casing (1220001) clear of the impeller, place to one side on a clean flat surface.

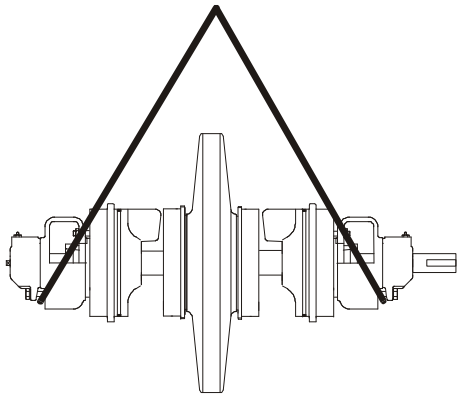
7 At this stage, the impeller may be inspected for damage or blocking and cleaning if necessary.

To check the pump shaft (1800001) and impeller (1590001) and to replace the wear rings (1900001) or soft packed seal sleeves (3100001& 3100101), it is necessary to remove the rotating assembly from the bottom half casing.

Preparation for Removal of the Rotating Assembly

Disconnect the motor coupling.

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



Removal of the Rotating Assembly Procedure

1. Tap the inserts (9790001) with a soft-faced hammer to break the seal between the insert and the bottom half casing (1230001).
2. Lift the rotating element out of the bottom half casing.
3. Lift the rotating assembly clear of the bottom half casing and support the shaft on suitable 'V' blocks with the impeller clear of the work surface.
4. If necessary, remove the case wear ring dowels (6100101) from the bottom half casing (1230001).

5 With feeler gauges, check the clearance between the case wear rings (1900001) and the impellers (159001), for acceptable clearance information refer following table

Pump Type		Maximum Clearance	Minimum Clearance
		Diametrical in mm	Diametrical in mm
8R12CL(T)	HL 300/51 CL	0.402	0.298
8S08EL (T)	HL 200/60 EL	0.402	0.298
8R10EL (T)	HL 250/47 EL	0.502	0.393
8S12AL (T)	HL 300/63 AL	0.407	0.298
8M05HL-(T)	HL 125/40-2-HL	0.346	0.250
8M06JL-(T)	HL 150/45-2-JL	0.092	0.000
8M08DL-(T)	HL 200/48-2-DL	0.502	0.393

Procedure to dismantle the Rotating Assembly

1. Remove both bearing housings and bearings as per the bearing replacement procedure paragraphs 1 to 9.
2. Remove the nuts (5920001) and slide the glands (2230001) off the end of the shaft (1800001) and remove the inserts (9790001 & 9790101) complete with packing rings (4300001) and lantern rings (2270001) and set aside for inspection.

Impeller removal:

3. If not already removed, remove the case wear rings (1900001) and set aside for inspection and measurement.

For Clockwise pump construction:

4. Using a suitable 'C' spanner, unscrew and remove the free - non-drive end sleeve (3100001).

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

5. Using suitable pullers or levers slide the impeller (1590001) of the shaft (1800001) from the non-drive end.
6. Withdraw the impeller key (3200001) and unscrew and remove the locked - drive end sleeve (3100101).

For Counter Clockwise pump construction:

7. Using a suitable 'C' spanner, unscrew and remove the free - drive end sleeve (3100001).
8. **Note:** Light tapping with a soft faced mallet may be needed to free the impeller from the shaft, do not damage the impeller if it is to be reused.
9. Using suitable pullers or levers slide the impeller (1590001) of the shaft (1800001) from the drive end.
10. Withdraw the impeller key (3200001) and unscrew and remove the locked – non-drive end sleeve (3100101).

Cleaning and Inspection of Parts

1. Clean the bearings thoroughly with an approved cleaning fluid, kerosene or white spirit.

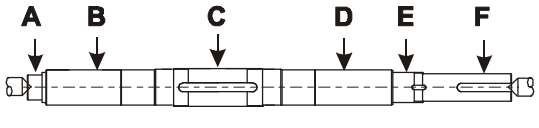
2. Dry the bearings with dry compressed air or with a clean soft cloth by hand and by spinning by hand. Confirm that the bearings rotate smoothly without slackness.
3. DO NOT OVERSPIN A CLEAN DRY BEARING.
4. Inspect the bearings for wear, fractures, cracks, corrosion or other damage to the running surfaces,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

Note: It is recommended that all 'V' ring seals, '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.

diameter of plain bearing, wear ring and interstage plate surfaces and the outside diameter of the shaft and wear ring surfaces on each impeller, calculate the clearance and compare these with dimensions in Section

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



11 Examine the shaft sleeves for wear, replace the sleeve if it is scored or has any visible surface damage.

12 If the shaft runs true within tolerance, remount the shaft as in 2 but with the sleeve fitted in position, and check the sleeves runout at the packing contact positions. Indicator readings must not vary more than 0.08mm (0.003")

13 The sleeve can be re-ground to provide a new packing surface, to a maximum of 1.0mm (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 potable water.

15 Clean all threads with kerosene followed by wire brushing, dry and wrap shaft 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 against loss, weather or mechanical damage.

Rotor Reassembly

Pump Assembly Instructions:

1 Re-examine all old parts intended for re-fitting. 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.

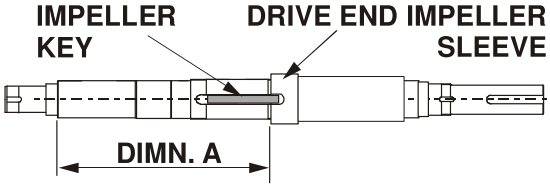
3 Examine 'O' and 'V' rings and renew if showing wear, damage or deterioration

Before Assembly

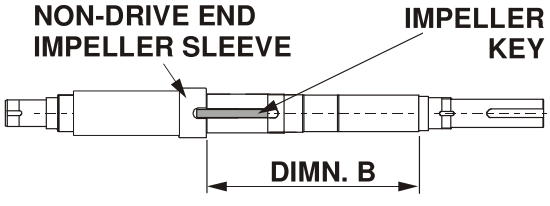
1 Lightly smear the shaft (1800001) with clean good quality grease.

Note: The position of the impeller key (3200001) and the locked sleeve (3100101) or impeller nut (3300001) is governed by the direction of rotation of the pump. **For clockwise pumps they are fitted at the drive end of the shaft key slot and for counter-clockwise pumps they are at the non-drive end.**

For clockwise rotation:



For counter-clockwise rotation:

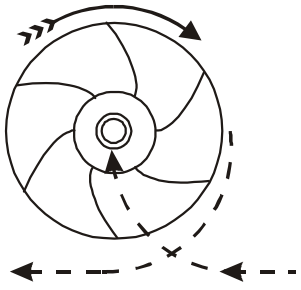


dimensions A or B.

Pump Model	Dim. ' A ' mm	Dim. ' B ' mm
	Clockwise	Counter Clockwise
HL 200/48-2-DL	535	531
HL 300/51 C/DL	651	646
HL 200/60 EL	535	530.5
HL 300/63 AL	625	594
HL 250/47 EL	583.5	571
HL 125/40-2-HL	390	385
HL 150/45-2-JL	457	453.5

2 Screw the locked sleeve (3100101) or impeller nut (3300001) onto the shaft (1800001) to the initial setting dimension shown in the table above. Turn the nut or sleeve to the nearest slot to align with the keyway.

3 Place impeller key (3200001) into keyway and tap the stepped end right home under impeller locking nut or sleeve.



4 Check the impeller for correct direction of rotation and slide onto shaft.

- For two stage pump Check the 1st & 2nd stage impeller for correct rotation along with interstage ring in between two impellers.

5. Screw free impeller locking sleeve (3100001) or nut (3100001) onto shaft to retain the impeller against the locked impeller nut or sleeve.

6 Position the casing wear rings (1900001) the correct way round and with dowel holes at the bottom and slide onto the impeller.

7. Lightly grease and carefully fit new 'O' rings to the inserts.

8. Slide the inserts (9790001 & 9790101) on to the shaft with the guide vane at the top position.

9. Locate the support frames in position and insert the lantern rings (2270001) and the glands (223001), then slide into position over the shaft to abut the inserts.

10. Fit washers and nuts (5900201 & 5800201) to retain the support frames.

11. Fit the packing (4300001), lantern rings (2270001) and glands (2230001) in position as per instructions in section 6.2.

12. Fit the shoulder ring (1990001) to abut the shoulder.

13. Heat the non-drive end bearing (2400201) to approximately 100^0C (212^0F) using bearing hot-plate, induction heater or oven. NOTE: - Do not exceed 120^0C (248^0F).

14. Slide the heated bearing onto the shaft to abut the shoulder or shoulder ring (1990001).

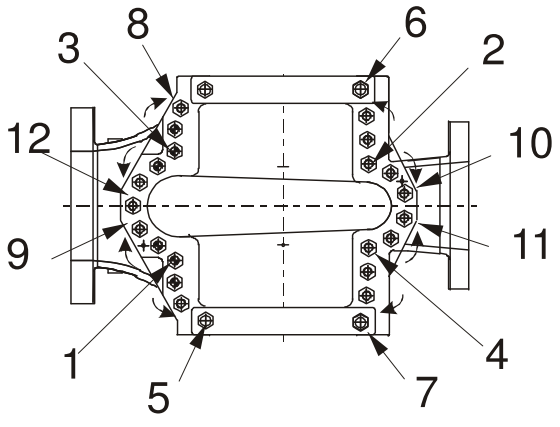
15. Cool the bearings to room temperature and coat both sides with two/three ounces of recommended grease.

16. For module 1T, fit the spacers (1980101).

17. Place the locking washer (4150001) onto the shaft and screw on the bearing lock nut (3360001).
18. Fit and tighten the bearing locknut to 300 Nm and lift the tab of the lock washer.
19. Repeat paragraphs 12 to 16 for the drive end bearing.
20. Coat the inside of the bearing housings (2400201) with grease and slide into place over each bearing.
21. Secure the bearing housings (2400201 & 2400101) to the inserts (9790001) with hexagon screws & washers (5710001 & 8490001).
22. Check and install the dowel pins (6100101) to locate the case wear rings (1900001).
23. Place the rotating assembly into the pump casing bottom half (1230001). Correct any excessive 'O' ring twisting or buckling. Check that the impeller is centralised in the casing and that there are no rubs.
24. Install casing gasket (5190001) 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.
25. Lower the upper half casing (1220001) into place and install casing joint nuts (5800101).
26. NOTE: When installing upper half casing, make sure that the 'O' rings (5220201) are not cut or pinched and that the gasket is hard against the 'O' rings.
27. Insert casing joint dowels (6110001) and drive them home. Tighten the joint nuts (5800101) to the specified torques

SCREW SIZE	TIGHTENING TORQUES CASING MATERIALS			
	Irons, Bronze	Steels, Stainless Steels, High Duty Irons		
	lbf ft	Nm	lbf ft	Nm
M16	65	88	100	135
M20	130	178	195	265
M24	220	300	330	450

30 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 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 - d).

31 Check that the shaft turns freely by hand.

32 Top up the bearing lubrication by applying several strokes with a grease gun.

33 The pump is now ready for re-coupling to the motor and re-commissioning.

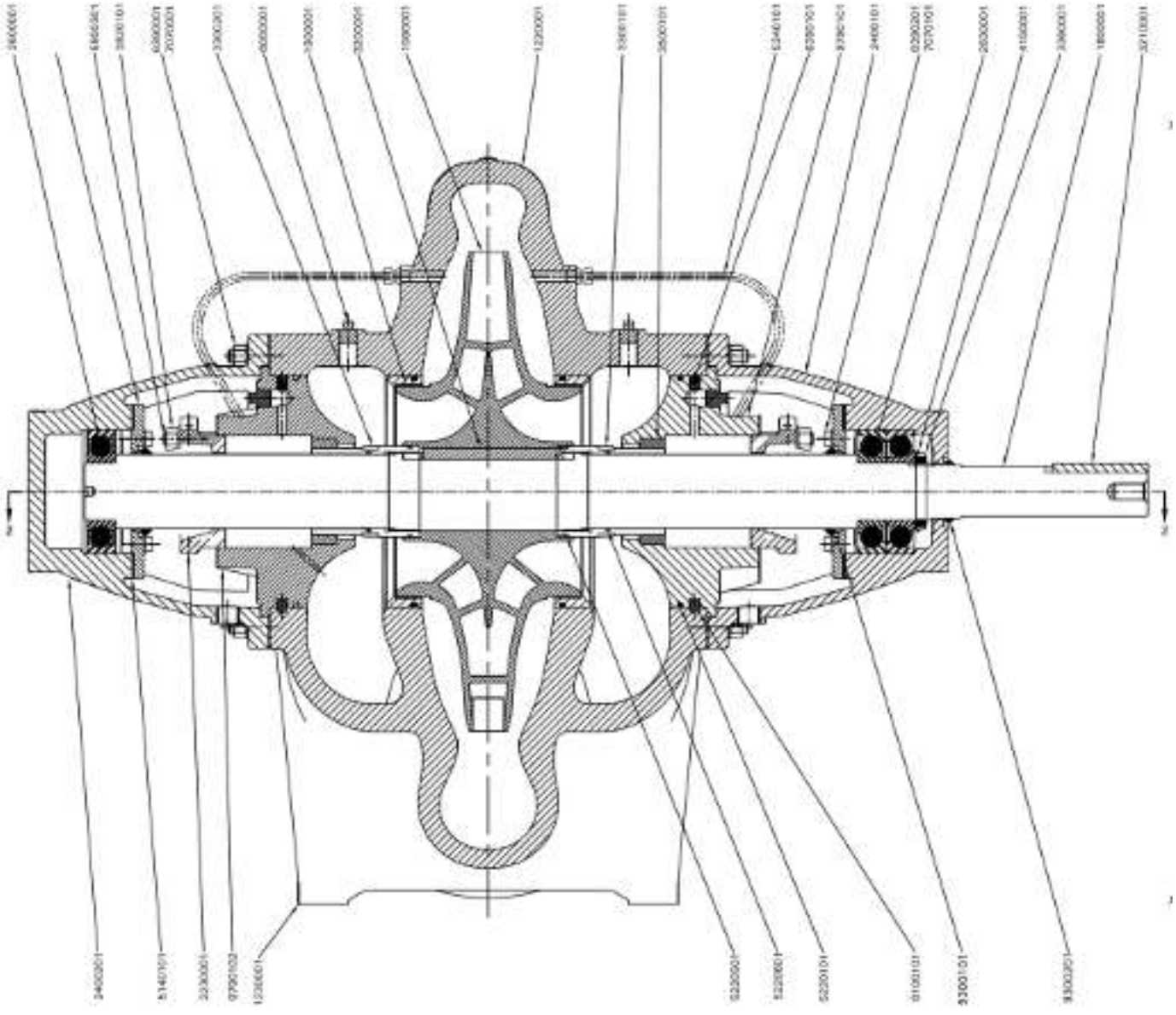
7. Faults and Remedial Action

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 cavitations.
						PROBABLE CAUSES
■						Pump not primed.
■	■	■				Speed too low.
				■	■	Speed too high.
■	■		■	■		Air leak in suction pipework.
	■		■			Air leak in mechanical seal.
		■	■	■		Air or gas in liquid.
■	■	■			■	Discharge head too high (above rating).
			■			Suction lift too high.
	■					Not enough head for hot liquid.
■	■		■	■		Inlet pipe not submerged enough.
	■	■			■	Viscosity of liquid greater than rating
					■	Liquid density higher than rating.
■	■		■	■		Insufficient nett inlet head.
■	■			■		Impeller plugged up or blocked.
■	■	■				Wrong direction of rotation.
	■	■				Excessive wear ring clearance.
	■	■		■		Damaged impeller.
					■	Rotor binding.
					■	Defects in motor.
					■	Voltage and/or frequency lower than rating.
				■		Foundation not rigid.
				■	■	Misalignment of pump and driver.
				■		Rotor out of balance.
				■	■	Shaft bent.
		■				Impeller too small.

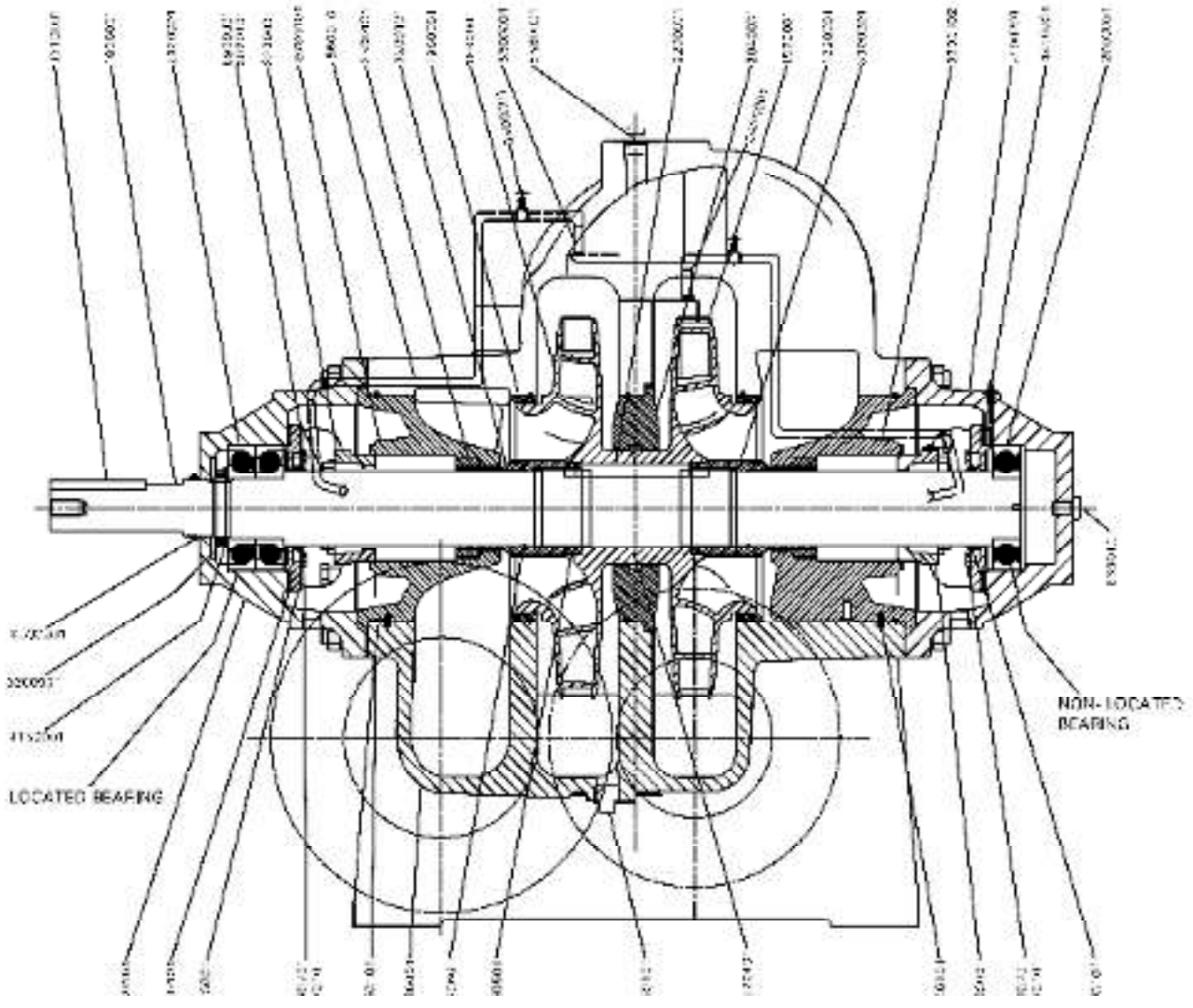
CAUSE	REMEDIAL ACTION
Pump not primed.	Fill pump and suction pipe completely with fluid.
Speed too low.	Check that the motor is correctly connected and receiving the full supply voltage also confirm that the supply frequency is correct.
Speed too high.	Check the motor voltage.
Air leak in suction pipework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

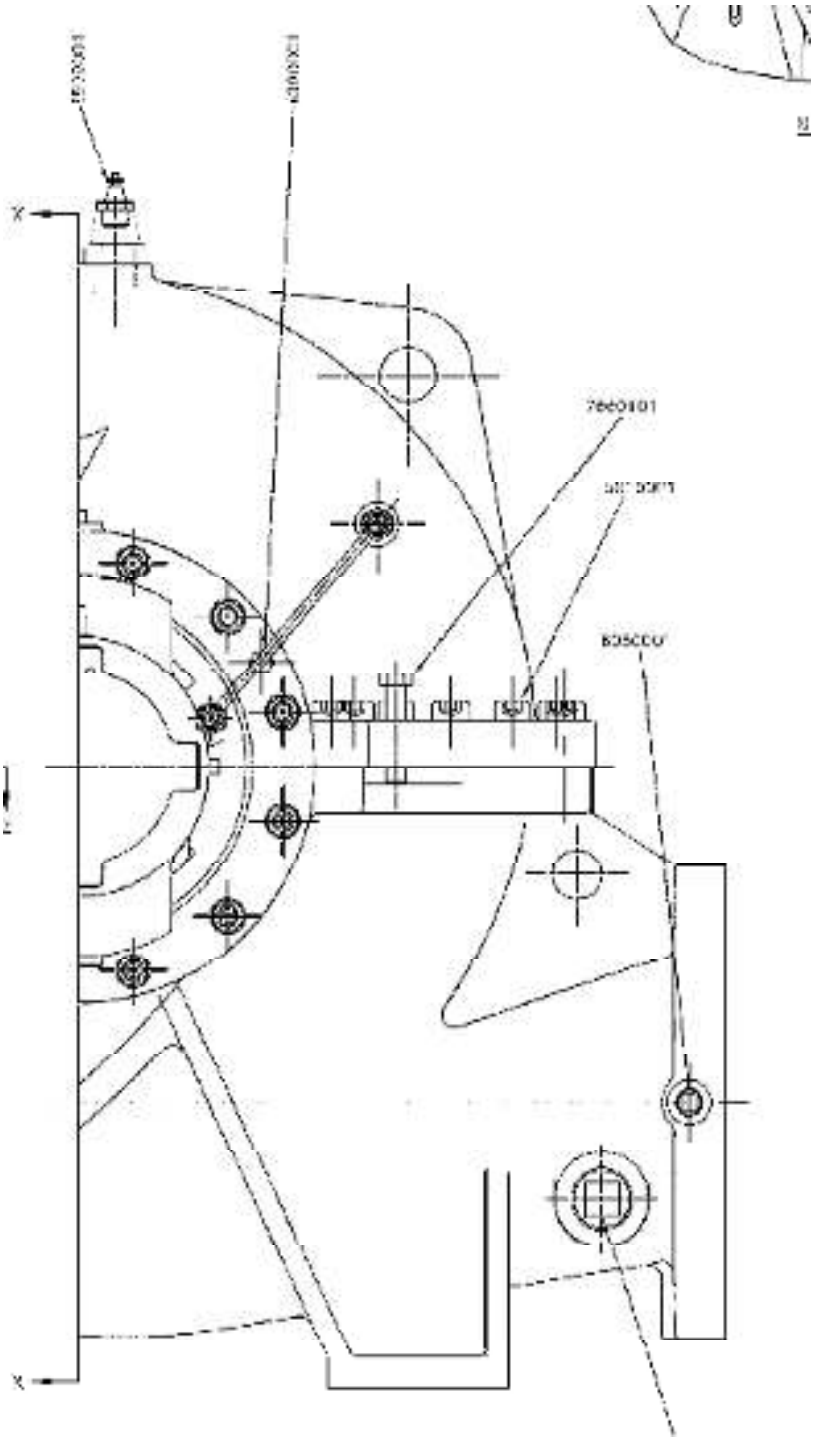
8. Pump Details:

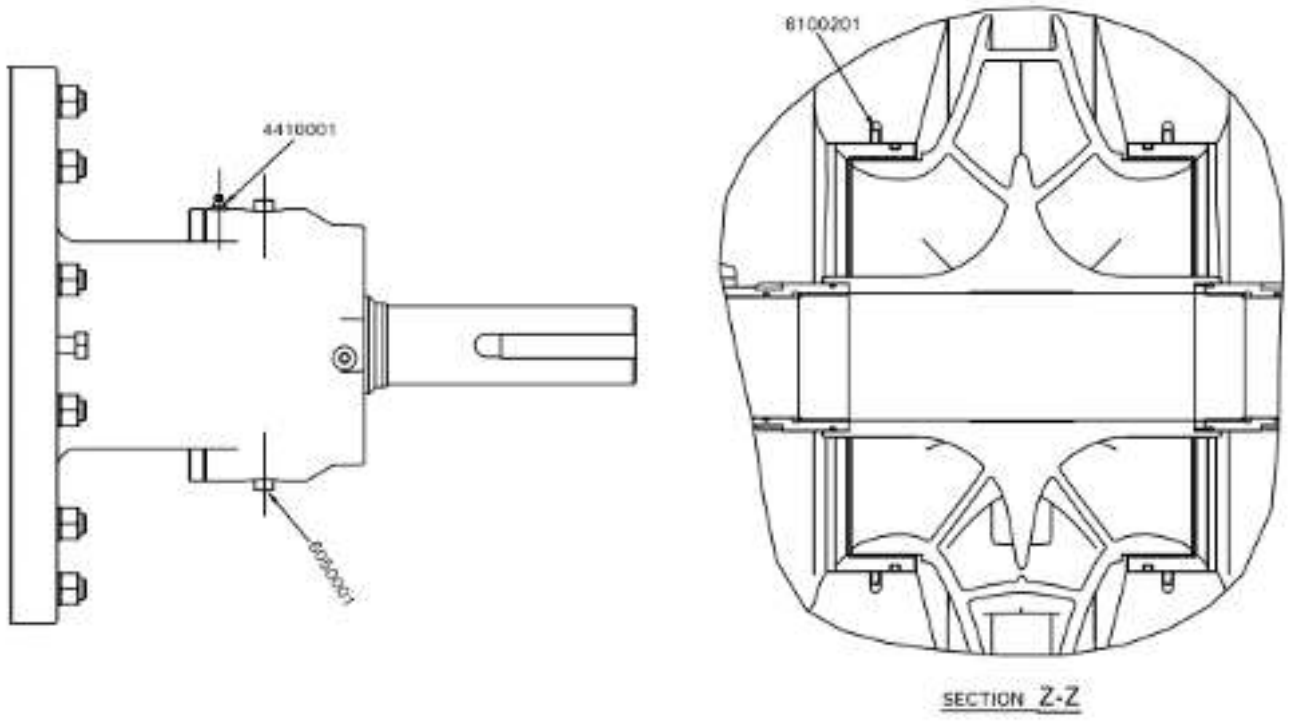
Pump Cross Section Drawing ; Single Stage Pump

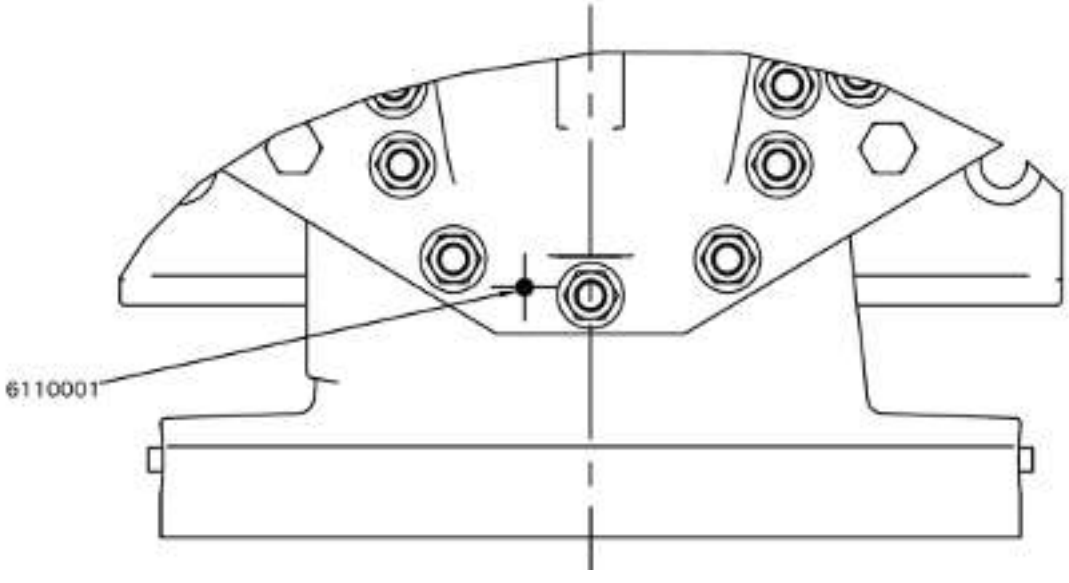


Pump Cross Section Drawing ; Two Stage Pump






4410001
6100201
SECTION Z-Z


6110001

ITEM	NAME	DESCRIPTION
46	5340101	FLEXIBLE PIPE
45	5190001	GASKET BET T/B CASING
44	2630001	SKF7314 BECBP
43	2600001	SKF6314 C3
42	4410001	GREASE NIPPLE
41	7660101	HEX SCREW
40	6300001	HEX SCREW
39	6390101	HEX SOCKET GRUB SCREW
38	6390201	HEX SCREW
37	5900301	STUD
36	6390001	HEX SCREW
35	3360001	BEARING LOCK NUT
34	5810001	CAP SCREW (FOR TOP & BTM)
33	5820101	DOUBLE CHMF HEX NUT
32	6060101	PIPE PLUG
31	6050001	PIPE PLUG
30	5500001	VENT VALVE
29	4150001	LOCK WASHER
28	7070001	SPRING WASHER
27	7070101	SPRING WASHER
26	6100201	CYLINDRICAL PIN
25	3200001	KEY-FOR IMPELLER
24	3210001	KEY-FOR COUPLING
23	9300201	V-RING
22	9300101	V-RING
21	5220101	O RING: WEAR WITH INSERT
20	5220501	O RING: SLEEVE WITH IMPELLER
19	5220601	O RING: SLEEVE WITH SHAFT
18	2710001	BEARING COVER DE & NDE (M/C)
17	1580001	IMPELLER
16	3500101	THROTTLE BUSH
15	1900001	WEAR RING
14	3300201	SLEEVE:SHAFT FREE
13	3300101	SLEEVE:SHAFT LOCKED
12	2400201	BRG HSG NDE (M/C)
11	2400101	BRG HSG DE (M/C)
10	5140101	GASKET BEARING CAP
9	9790102	INSERT NDE (M/C)
8	9790101	INSERT DE (M/C)
7	1230001	LOWER HALF CASING (M/C)
6	1220001	UPPER HALF CASING (M/C)
5	1800001	PUMP SHAFT
4	6110001	SPRING PIN FOR TOP & BOT 10DX40L
3	2230001	MECH SEAL
2	5560001	ADAPTOR NUT
1	6100101	LOCKING PIN FOR INSERT

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

Grade Identification

BOLTS & NUTS - Grade 4.6

BS4190 (ISO272, 885, 888 & 4759/1). Grade marking is optional. Normally there will be no mark other than the 'M' thus:

BOLTS – Grade 8.8

BS 3692 (ISO272, 4759/1). Grade marking is mandatory, may also have trade marks

NUTS - Grade 8

Indented marks as a clock face, dot at 12.00, bar at 8.0, indicates grade 8 nut.

High Strength **Friction Grip** Bolts & Nuts

BOLT		NUT		BOLT Grade10.9		NUT Grade 12	
							

10) Installation & Maintenance Record

Date	Summary of maintenance & repairs done - replacement parts fitted etc:	
	Initial Alignment TIR readings: First Lateral Check: …… Angular Check: …….. Confirmed Lateral Check: ……..	
	Final Alignment TIR readings: First Lateral Check: …… Angular Check: …….. Confirmed Lateral Check: ……..	
	Installed & Commissioned	Signed – *Commissioning Engineer*

PUMP SPECIFICATION & OTHER DETAILS .

Pump type	:	
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	:	

4.0 TECHNICAL DATA:

SR.NO.	ITEM	DESCRIPTION.
4.1	Pump type	
4.2	Delivery **A)** Size **B)** Flange drilling standard	
4.3	No of stages	
4.4	Direction of rotation	
4.5	Static weight (Kg) – A) Pump B) Motor	
4.6	Performance. A) Standard of testing. B) Working head range (MIN/MAX) C) Working capacity range (MIN/MAX). D) Speed. (Nominal) E) Max pump input power	
4.7	Hydrostatic test pressure	
4.2040 001	Max. working pressure (At shut-off)	
4.9	External cooling water requirement	
4.10	Min. submergence required at Duty Point for Vortex free operation.	-
4.11	Impeller type	Enclosed.
4.12	Gland Packing Size & No of rows.	

4.14	**Max. Permissible Clearance after running at Site**		
	Clearances Between	**Designed Clearances**	**Max. permissible clearances.**
	Shaft sleeve and line shaft Bearing (Thordon)		
	Impeller and impeller guide Piece		
	Shaft Sleeve and Rubber Bearing in line shaft.		
	Shaft Sleeve and Rubber Bearing in Bowl.		

Refer motor manual for additional details.

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

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