INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS

A Series - End Suction Pumps

FOREWORD

This manual provides instructions for the Installation, Operation and Maintenance of Amarinth C Series Pumps and **must be read before installation and start-up**.

The manual covers several different pump models. For supplementary and specific details for your pump model, please also refer to the following documents supplied as part of the package:

- Pump Data Sheet
- General Arrangement Drawing
- EC Declaration of Conformity / Incorporation (as appropriate)
- Component instructions (motor, bearings, seals, etc...)

The design, materials and workmanship used in the construction of Amarinth pumps ensures they are capable of a long and trouble-free service. The life of these pumps is enhanced and extended by correct application, installation, periodic inspection and maintenance. It has been compiled to assist operators in understanding the construction as well as the correct method of installing, operating and maintaining these pumps.

Amarinth Ltd will not be liable for physical injury, damage or delays caused by failure to observe the instructions for installation, operation and maintenance contained in this manual.

The manual was issued by Amarinth for the purchaser's use only, and should not be reproduced to a third party without our written consent. Further copies of this manual can be obtained at a nominal cost from the address below. Further information regarding any aspect of the manual should be obtained from the Technical Department of Amarinth Ltd.

These parts can be obtained by contacting:-

Amarinth Ltd
Bentwaters Parks
Rendlesham
Woodbridge
Suffolk IP12 2TW
Fax: 01394 462130
Tel: 01394 462120
E Mail: sales@amarinth.com
Or sign on to our web site, www.amarinth.com
Using your own individual Log-On Name and Password provided by Amarinth Ltd.

Amarinth Ltd provides a warranty of 18 months from date of delivery or 12 months from date of commissioning, which ever is soonest.

Warranty is only valid if genuine Amarinth parts are used.

NOTE!
The warranty is considered null and void if the pump is dismantled during the warranty period by anyone other than Amarinth personnel or their official agents, unless written approval has been given by Amarinth Ltd.
Also the use of the equipment on any other service other than which it was sold will nullify the warranty, unless written approval is obtained in advance from Amarinth Ltd.
Any bought-in proprietary items not of our manufacture are expressly excluded from our warranty. We will however, give warranty equivalent to the warranty (if any) which we may have received from the supplier of such parts.

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SECTION 1 SAFETY:

1.1 General Safety:

Please read these instructions before attempting to operate the pump.

A careful operator is the best operator. Most accidents can be avoided by observing the recommended precautions.

This equipment should only be operated by personnel who have been trained and instructed in its safe use.

Initial installation of the unit should be performed by Amarinth or an authorized service agent.

Use for purposes other than that intended and non-compliance with the safety regulations and accident regulations will endanger:

your life - your health - machinery and equipment - members of the public

Throughtout this manual these symbols & notes are used to indicate the following;

WARNING
Safety situations which may cause serious injury or loss of life.

CAUTION
Safety situations which may cause problems or damage to the equipment.

NOTE
To draw attention to procedures which it is essential to observe for correct operation.

Important Safety Information:

This equipment has been designed to operate according to, and restricted to, the conditions as agreed at the point of sale. The warranty may be invalidated if pumps are operated under any other conditions without written permission from Amarinth Ltd.

Qualified Personnel:

- Only authorised and qualified personnel are to install, operate and maintain the pump unit.
- Before commencing work all personnel should thoroughly study:
    - This manual.
    - The drawing/s and parts list, if specified in the order.
    - Any other ancillary drawings, data sheets and instructions.

Clothing

- Always wear the appropriate protective foot, hand, and eye and head gear.
- Use other protective equipment to protect against hazardous/toxic fluids.

Connections

- Never force piping to make a connection with the pump.
- Ensure fasteners are the correct size, number and material.
- Ensure all fasteners are tightened correctly in the right sequence.
- Never use corroded fasteners.

Operation

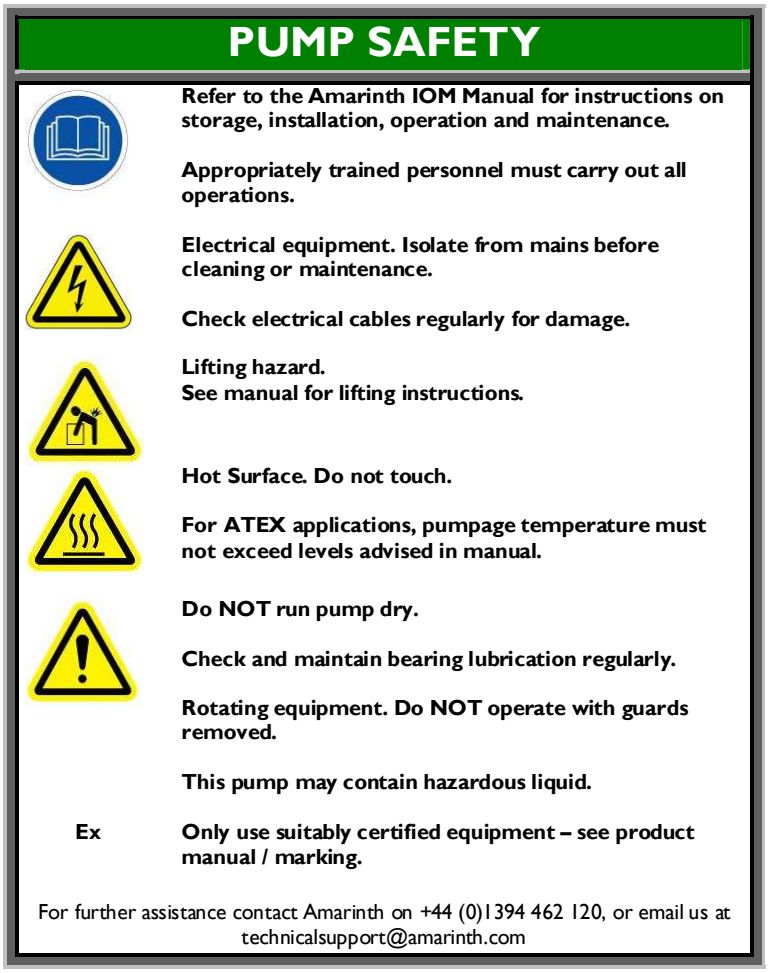
- Ensure compliance with all relevant site and international safety requirements.
- Do not attempt to work on the equipment whilst it is operational.
- Avoid touching any rotating components.
- Do not touch components under high pressure and/or at high temperature.
- Ensure all Guards are correctly installed.
- Do not operate the pump below the minimum flow rate or with suction or delivery valves closed.
- Do not open vent or drain valves or remove plugs while the system is pressurised.
- Due care must be practiced when operating equipment containing hazardous substances.
- Exercise diligence to avoid causing potentially dangerous situations.

Maintenance

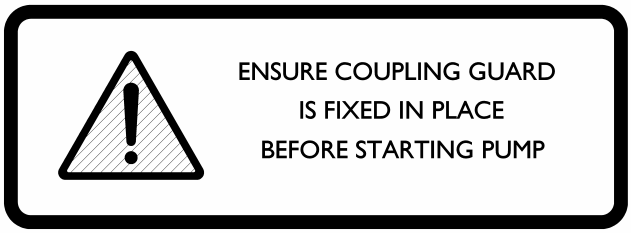
- Regularly maintain the equipment according to these instructions and schedules.
- Always use genuine **AMARINTH LTD** spare parts.
- Isolate the electrical supply and locked out before commencing any work on the pump.
- Ensure pump and system fluid is drained away and pump is not pressurised.
- Hazardous fluid leakage must be drained to a safe area to prevent harm to personnel or the environment.
- Before dismantling the pump or system check the fluid properties and apply neutralisation procedures as necessary.
- Due care must be practiced when operating electrical power equipment.
- In accordance with the Control of Substances Hazardous to Health Regulations 1988 (COSHH), care must be taken when dealing with gaskets, packing and similar materials, although in the form supplied they have no known hazardous properties.
- Further specific information may be obtained from Amarinth Ltd.
- On completion of any maintenance work, all safety and protective facilities must be re-installed and made operative again.

1.2 Safety Decals

General Safety Label



Coupling guard safety label



Rotation / Seal Safety Label

SECTION 2 GENERAL INFORMATION

Your pump will give you excellent and trouble-free service when the instructions in this manual are carefully followed.

The pump may be supplied as a bare shaft pump or as an assembly including pump, motor, coupling and baseplate.

Your product bears the **CE mark** where appropriate and documentation accompanying the pump includes an **EC Declaration of Conformity / Incorporation** to confirm that the product complies with relevant European Directives.

The pump is guaranteed as per the **WARRANTY** clause specified in our finally accepted terms and conditions of sale.

The WARRANTY is invalid if:

- The instructions in this manual are ignored.
- Due skill and care is not exerted when installing, operating and maintaining the unit.
- The equipment is operated under any other conditions than the conditions as agreed at the point of sale.
- Our written confirmation for suitability of the pump under changed operating conditions is not obtained.
- Replacement parts are not manufactured by Amarinth Ltd. (See page 2 for details)

NOTE
This instruction manual does not include any safety regulations which may apply to the installation site.

Your site engineer/operator is responsible for complying with such regulations.

2.1 Pump Description

The Amarinth Chemical (A) range consists of single stage, end suction with vertical centreline discharge centrifugal pumps for the oil, gas and petro-chemical industries. Pumps are designed for a minimum service life of 20 years with 2 years uninterrupted operation and to comply with exacting needs of API 610 9th Edition and the ATEX Directive, when applicable options are fitted.

The A Series pump is centreline mounted with C/L suction and discharge flanges, mounted on a steel fabricated API compliant baseplate with a flexible membrane spacer coupling and foot mounted motor.

All pumps are back pull out which enables the rotating assembly to be withdrawn without disturbing the system pipework. They are also of a modular construction which provides a high degree of interchangeability and commonality of parts with other pumps in the range. The design may allow interchangeability of full and part pump cartridge assemblies to suit other supplier's pumps on site. Each pump is constructed using materials and components suited to a specific application, if another application other than that originally specified is being considered apply in writing for approval from Amarinth Ltd.

Three sizes of bearing brackets are available lubricated with oil or grease.

The nominal shaft sizes at the mechanical seal are 25mm, 35mm and 45mm. The pump is designed to accept a range of API 682 compliant cartridge seals.

Within the bearing bracket double angular contact metal caged bearings in the back to back arrangement are used at the drive-end and a single deep grooved ball bearing at the non-drive end. The drive-end bearings are positively retained therefore endplay is minimised.

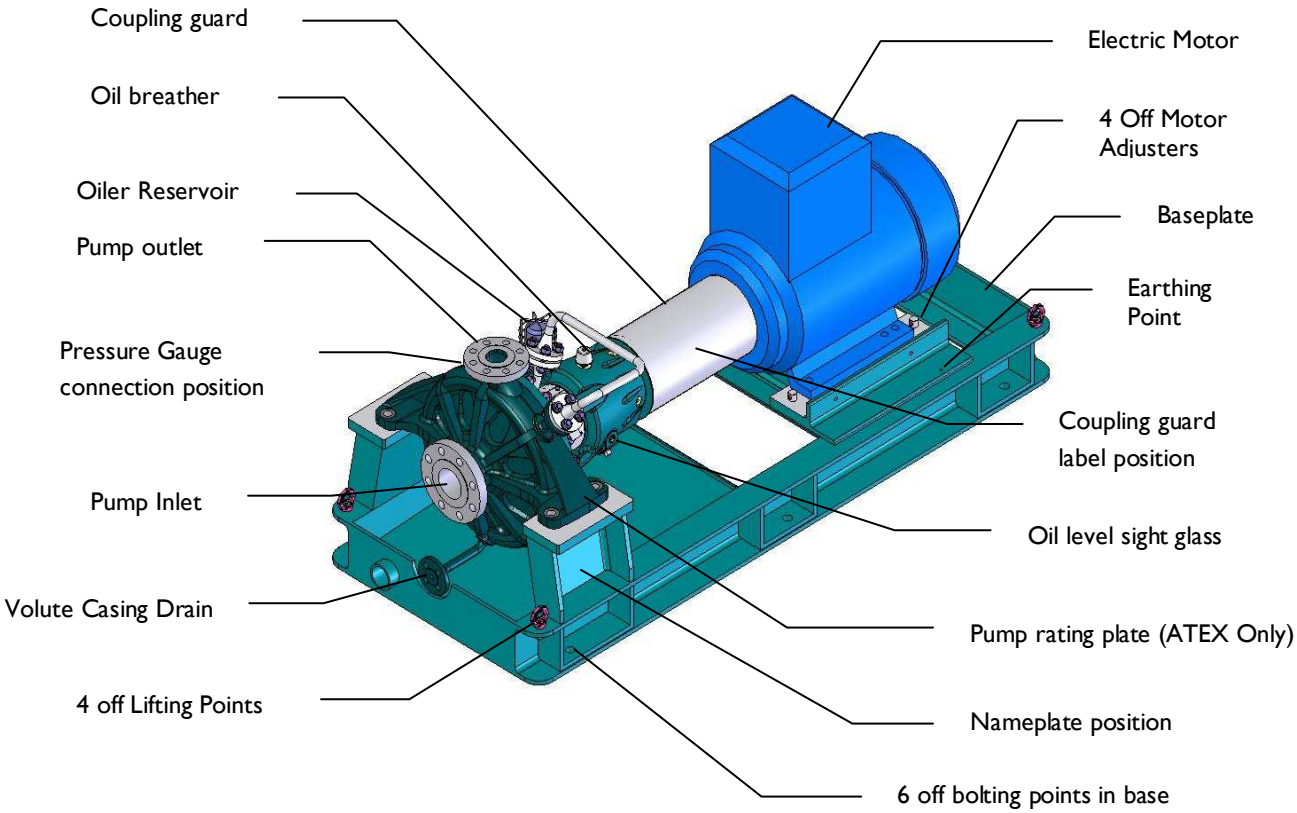
Oil lubrication is oil bath with a flinger from a constant level oiler. The circulation of oil is from the reservoir in the bearing bracket body and via the flinger to the outside surface. The oil then runs down the surface into cast and machined oil ways to the back of the D/E and ND/E bearings, returning to the reservoir when travelling through the bearings. The constant level oiler, which is locked in position after setting, is screwed onto pipework connected to the bearing bracket body and the oil bottle protected with a wire guard.

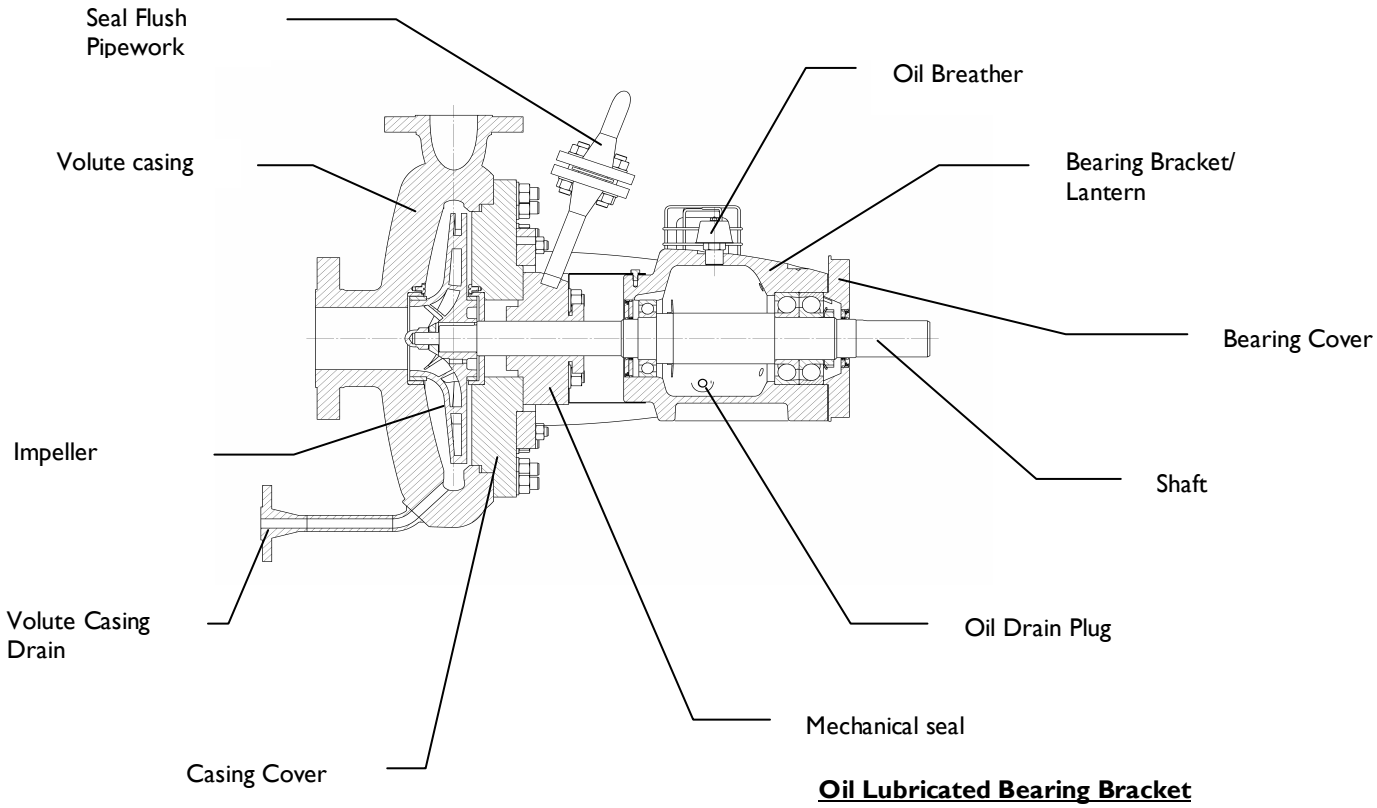
When lubrication is grease nipples are provided at the both the D/E and ND/E bearings for renewal.

Cooling is provided using a combination of fins, heat sinks and shaft fans. These are fitted to enable the oil bracket temperature rise to be less than 40°C above ambient.

The oil or grease is retained in the bearing bracket by proprietary non-contacting labyrinth type seals. Magnetic type seals, if a hermetically sealed bearing housing is required, can be fitted as an option.

2.2 General Arrangement

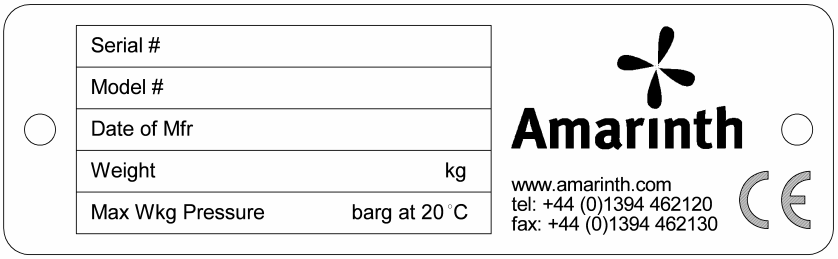




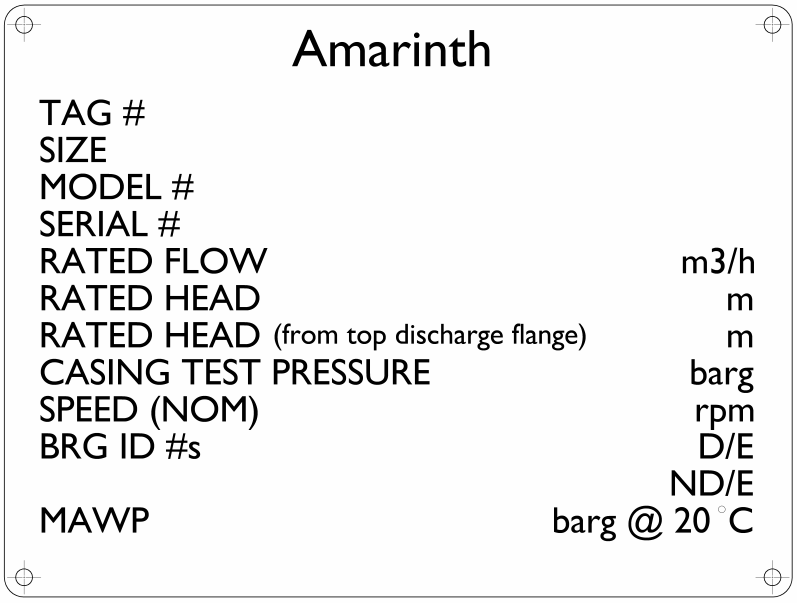
<u>Oil Lubricated Bearing Bracket</u>
(Grease Lubricated Versions also available)

2.3 Nameplates

Every pump assembly has a nameplate that provides information about the pump. On this range of pumps it is located on at the top of the bearing bracket housing – as shown in the General Arrangement Diagram.



It will also have an API compliant nameplate which gives further information about the pump, as shown in the illustration below.



WARNING
Adhere to all safety instructions.
Follow the correct working sequence in this manual.

3.1 Transportation

- Transportation should be free from shocks.
- Avoid transportation of pumps without its packaging.
- Do not transport packaged pumps upside down or stacked on top of each other.

3.2 Product Inspection

- As soon as the pump unit is received it should be carefully unpacked and checked against the contents list with the packaging for shortage and/or damage in transit.
- Damage or shortages should be reported within 7 days to Amarinth Ltd.

3.3 Storage

If the goods are going to be stored for longer than 3 weeks before commissioning, the following care should be taken:

- Re-install covers, gaskets, plugs and caps on flanged or threaded connections.
- Store in a covered space free from dust, sand, heat, moisture or corrosive vapours.
- The pump unit should be placed on hard, clean and dry surface.
- Do not stack boxes one over another. Store as marked.

Packaging materials must be restored to their original condition to maintain protection.

Follow the preservation schedule below.

PRESERVATION SCHEDULE	
EVERY WEEK	Rotate the pump/motor shafts approx' 2¼ turns by hand in a CW direction, to prevent damage to the pump bearings.
EVERY 6 MONTHS	Check the motor insulation resistance to earth using a 500-volt insulation tester. If the unit is stored in a hazardous area use an 'Ex' megger. Do not use a test voltage in excess of 500 V. If the insulation resistance has fallen below 1 megohm, the motor will require drying out in accordance with the manufacturer's recommendations.

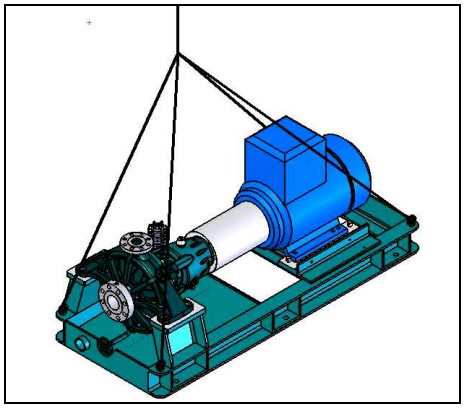
Long-term Storage:

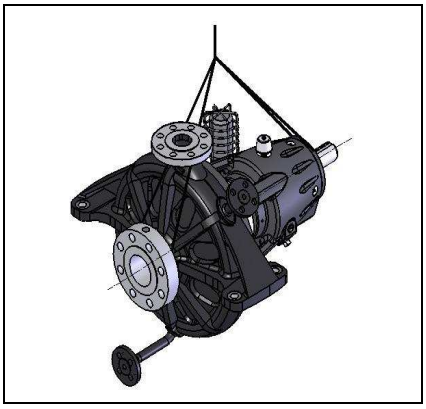
If the pumps to be stored longer than 12 months, please inform Amarinth Ltd as additional storage instructions may be necessary.

3.4 Handling the Equipment

WARNING
The pump must only be lifted using the lifting points detailed in the General Arrangement Diagram. Never use motor lifting eyes to lift the pump unit!
The Centre of Gravity for the assembly may not be central to the unit.

- Only use the designated lifting points when lifting the pump unit. (See L/H Illustration below)
- The pump must be handled with care.
- Ensure site-lifting procedures are adhered to.
- See typical lifting diagrams below.
- Note that the bareshaft pump should be lifted as shown in the R/H illustration below.





3.5 Installation

3.5.1 Foundations

- The pump should be sited as near to the liquid source as possible with adequate space for operation, maintenance and inspection. Ensure that the pump is above the source of supply in order to eliminate air locks, unless the source provides a positive suction protection.
- The foundation should be level, flat and be substantial enough to absorb vibration and provide a rigid support for the unit, so as to maintain pump/driver alignment.
- If the unit is to be grouted in position foundation bolts should be embedded in the concrete foundation and installed in pipe sleeves approximately 3 times larger than the bolts to allow for adjustment.
- Foundation bolt positions are according to API 610 Annex D and can be seen on the GA Drawing.
- Foundation bolt sizes are according to API 610 Annex D. These are specified on the GA Drawing, if supplied.
- For further recommendations on installation and installation design refer to API RP 686.

3.5.2 Levelling Baseplate

Lower baseplate onto foundation bolts.

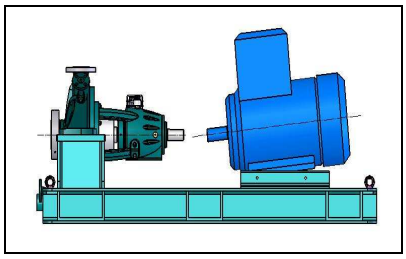
Using a spirit level across the baseplate, adjust the level to within ±2° by adjusting shims or wedges under the baseplate. The shims / wedges should be placed adjacent to the bolting positions.

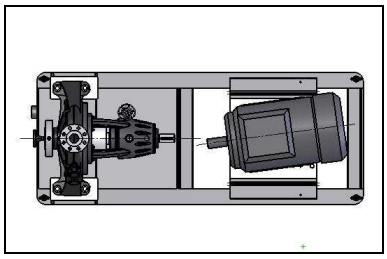
Once level the baseplate may be grouted in position, the bolts should be tightened evenly so as not to distort the baseplate. If full grouting is required, the grouting should now be applied.

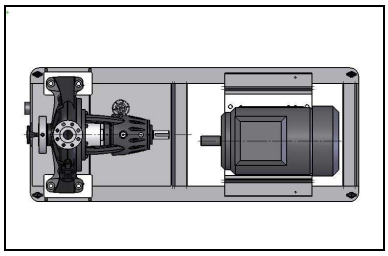
3.5.3 Alignment of Pump Components

The pump and motor are aligned at manufacture. However, every time the assembly or a component is moved, this alignment should be precisely checked to ensure correct performance.

Both angular and parallel alignment needs to be confirmed i.e. so that the motor and pump are not at an angle to each other and they are on the same centreline (see illustrations below).







The alignment can be checked with a straight edge / engineers square, dial indicators, or for best results, use a laser alignment tool.

The straight edge / engineers square should be used across the outside diameters of the coupling to ensure that the two halves are concentric and parallel.

Dial indicators or a laser alignment tool should be used to adjust for concentric and angular displacement. With dial indicators, rotate shafts together and take readings every ninety degrees (90°). Place shims under the motor to make adjustments. Ensure that mounting bolts are properly tightened while taking readings and after final adjustment then install coupling guard.

3.5.4 Piping Connections

WARNING
All suction and delivery pipework attached to the pump must be supported independently, and lined up naturally with the pump connections, so that dangerous strains are not imposed on the pump assembly which may cause misalignment and malfunction of the motor / pump.

- Pipework should be designed to minimise frictional losses, achieve low velocities and smooth flow within the discharge pipework. It is recommended that the size of the discharge pipework should be up to two sizes larger than the pump discharge. Sharp bends and other high loss fittings should be avoided where possible.
- The discharge pipework should include a regulating or isolating valve, and a non-return valve to prevent excessive backflow to the pump on shutdown.
- It is recommended that a pressure gauge connection is made between the pump discharge flange and any valves and fittings. A pressure gauge is advantageous in commissioning and in indicating pump performance loss and system problems.

- The pipework should be clean and free from scales, welding residues etc.
- It is recommended that the pump discharge pipework, if practicable, has a means of pressure relief to ensure reliable operation of the system.
- Pipework materials should be equal or superior to the pump materials.
- All pipework attached to the pump must be independently supported so that any forces and moments transmitted to the pump suction and discharge flanges do not exceed those laid down in API 610 9th Edition or as defined on the General Arrangement drawing – whichever is the lower.
- Ensure flange protection cover(s) are removed.
- The discharge flange bolting should be tightened to best site practice.
- All suction and delivery pipework joints must be air tight.
- The piping runs should be as short as possible to minimise friction losses, with, if possible, the suction pipe free from sharp bends.
- If elbows are used on the suction pipework there should be at least two pipe diameters of straight pipe between the elbow and suction inlet. Where used elbows should be long radius.
- The suction pipework should be one or two pipe sizes larger than the pump suction, with a reducer used at the suction connection. An eccentric reducer should be used with the horizontal side at the top.
- When suction strainers are used they should have at least a free area 3x the suction pipe area.
- Separate suction lines should be used when more than one pump is using the same source of supply.

CAUTION
The pump should never be throttled on the suction side. Throttling the flow from the Suction side may cause cavitation and result in damage to the pump.

- When operating a non self-priming pump with suction lift, a foot valve with a full operating area of not less than the bore of the pipe should be fitted.
- Suction pipework must slope downwards to the pump.
- An isolation valve should be installed in the suction line at least two pipe diameters from the pump connection to permit closing of the line for inspection or maintenance.
- The suction pipework must be adequately submerged below the supply liquid surface to prevent vortices and air entrainment.
- It is suggested that expansion loops or joints, if used, should be properly installed in suction and delivery lines when handling fluids at elevated temperatures. The installation should ensure that linear expansion of the piping will not impose stresses on the pump casing connections.
- The piping should be arranged to allow the pump to be flushed prior to removal on services handling corrosive liquids.
- All pipe parts, valves and fittings should be carefully cleaned prior to assembly.
- Isolation and check valves should be installed in the discharge line. The isolation valve is required for priming, flow regulation and to enable inspection and maintenance of the pump. The check valve should be located between the isolation valve and the delivery connection. The check valve will prevent pump or seal damage due to reverse flow through the pump when the motor is turned off.
- If pipe reducers are used in the delivery pipework they should be placed between the pump delivery connection and the check valve.

WARNING
NPSHa must always exceed NPSHr to ensure trouble free operation of the pump. The Hydraulic Institute design data should be referenced to obtain pipe friction values needed to evaluate suction piping.
Properly installed suction pipework is a necessity for trouble free pump operation. Ensure that the suction pipework is clean BEFORE connection to the pump.

Auxiliary Piping Connections (where fitted).

Standard pumps will have a API Plan 11seal flush as the cartridge mechanical seals used are in a parallel box arrangement. Other seal flush arrangements such as API Plan 21 & 31 can be fitted depending on whether the seal flush fluid needs to be cooled or fine inclusions removed.

Where an external seal flush or quench is used separate Piping Connection details will be supplied. Typically as follows:

API PLAN	EXTERNAL SERVICES REQUIRED
Mechanical Seal Flush 32	An external constant supply of clean, compatible liquid at approx 1 to 2 litres/min at a pressure of at least one half the pump closed valve differential pressure + system suction pressure + 1.0 barg.
Mechanical Seal Flush 52	A supply of suitable fluid to the unpressurized thermosyphon reservoir.
Mechanical Seal Flush 53	A supply of suitable gas to the thermosyphon reservoir at a pressure of at least one half the pump closed valve differential pressure + system suction pressure + 1.0 barg.
Mechanical Seal Flush 54	An external constant supply of clean, compatible liquid at approx 1 to 2 litres/min at a pressure of at least one half the pump closed valve differential pressure + system suction pressure + 1.0 barg.
Auxiliary Seal Quench 62	An external constant supply of clean, compatible liquid at approx 2 litres/min.

- It is recommended that electrical interlocks be fitted, to prevent the pump from being started without the lubricant supply in operation.
- All external services must be applied before, and maintained at all times, the pump is under system pressure.

3.5.5 Coupling Guard

CAUTION
In compliance with health and safety procedures, the pump may only be operated with the complete coupling guard fitted.

3.5.6 Electrical Connection

WARNING
Ensure that the electric supply is physically disconnected, or isolated and locked out, before working on the unit. Observe all national/site electrical safety procedures

- Ensure that the site electric supply is compatible with the drive motor, by checking the motor nameplate.
- With the mains supply isolated, connect the drive motor to the starter using appropriate standard electrical procedures and referring to the motor manufacturers installation procedures supplied with this product. Wiring diagrams are normally located in the motor terminal box. Ensure that all fitted motor accessories, i.e., thermistors, anti-condensation heaters, etc. are correctly wired.

CAUTION
Do not attempt to start the motor at this stage.

3.6 Commissioning

3.6.1 Direction of Rotation Check

WARNING
The pump may be damaged if run in the wrong direction.

Close the valve on the discharge side of the pump.

Energise the drive motor MOMENTARILY to ascertain the direction of rotation; this should be clockwise when viewed from the motor fan, as indicated by the arrow on the pump casing and label on the motor fan cowl.

If necessary, correct the direction of rotation, please refer to the relevant motor manufacturers instructions for details and observe all electrical safety procedures.

3.6.2 Lubrication

Pumps with grease lubricated bearing bracket bearings are pre-greased with lithium based NLGI No.3 lubricant, which is suitable for the majority of applications.

When the oil lubricated version is supplied the oil is emptied out for transportation purposes. Ensure that the recommended lubricant is used when refilling.

3.6.2.1Bearing Bracket

(Grease Lubrication)

The pump bearings must be periodically lubricated using the grease nipples in the D/E cover and N D/E bearing bracket body (3030). The interval is that recommended for continuous operation at a bearing running temperature below 70°C.

Lubrication should be carried out with the pump running, adding a small amount of grease every few minutes until each bearing is recharged. Do not over-grease. During re-greasing it is normal for bearing temperatures to rise, therefore a temperature check should be carried out.

The intervals must be halved for each 15°C increase in running temperature above 70°C.

For less arduous duties the intervals may be increased to suit the actual operating conditions, but must never exceed 12 months.

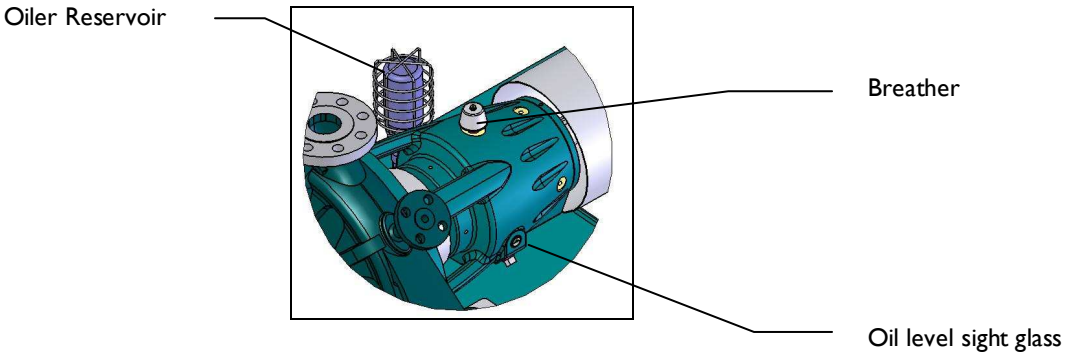
BEARING BRACKET SIZE	BEARING COVER O/D	RE-LUBRICATION INTERVAL			APPROX. QUANTITY PER BEARING
		<1800 RPM	1801-2799 RPM	2800-3600 RPM	
2	130 mm	12 months	9 months	6 months	6g
3	150 mm	6 months	4 months	3 months	9g
4	215 mm	3 months	2 months	1 month	18g

The operating range of any lubricant should be suitable for the minimum ambient temperature and the actual bearing running temperatures measured using a surface contact thermometer placed on the bearing housing.

Operating Range	-30 to +70°C	-10 to +100°C
Recommended Lubricant	Low temperature grease, i.e. BP Energrease FGL Shell Alvania RA	Lithium base NLGI No.3 grease, i.e. BP Energrease LS3 Shell Alvania R3 Castrol AP3

(Oil Lubrication)

The bearing oil level must be maintained, by periodically topping up the oiler so that oil is always visible in the reservoir. Actual oil consumption is negligible. A sight window in the side of the bearing bracket gives a visual indication of oil level, the line marking the maximum operating level. If the oiler is accidentally displaced it should be reset to maintain an oil level approximately 1mm below this line when the pump is stationary.



(The seal re-circulation pipework has been removed from this view for clarity)

Recommended lubricant grades:

The grade of lubricant should be suitable for the actual bearing running temperatures as measured using a surface contact thermometer placed on both ends of the bearing bracket.

Bearing running temp	Less than +25°C	+25 to +60°C	Over 60°C
ISO Viscosity Grade	ISO VG10	ISO VG32	ISO VG68

Approximate oil capacities (including oiler reservoir):

BEARING BRACKET SIZE	BEARING COVER O/D	CAPACITY
2	130 mm	0.25 litres
3	150 mm	0.30 litres
4	215 mm	0.45 litres

Oil change frequency:

The oil should be drained from the bearing bracket, and renewed at the intervals below.

Bearing running temp	Less than +50°C	+50 to + 75°C	+75 to +100°C
Oil change frequency	Every 12 months	Every 6 months	Every 3 months

Notes:

1. The ideal bearing running temperature for oil lubrication is 60°C as above this temperature oxidation of the oil increases exponentially with the rate approximately doubling for every 10°C rise above 60°C.

2. For high ambient temperatures especially when units are exposed to direct sunlight, care must be taken to ensure that sufficient cooling is available to maintain acceptable bearing temperatures.

3. The use of synthetic oils will in many cases offer improved bearing life and increased intervals between oil changes. Synthetic oils however attract a premium and are on average 4 to 5 times the price of mineral oil lubricants.

3.6.2.2 Motor Bearings

As several different motor types can be fitted, please refer to the relevant motor manufacturers instructions for details.

3.6.3 Bearing Bracket Temperature Monitoring

When first operating the pump, monitor the bearing temperatures for 48 hours as described below.

- Run the pump for approximately ½ hour.
- Stop the pump and with a contact thermometer, immediately check the temperature at both ends of the bearing bracket (3130).

CAUTION
Bearing temperatures must not exceed 100°C.

- If this exceeds 90°C, allow the bearing to cool below 30°C before restarting.
- Ensure all the guards are in place before re-running the pump.
- Repeat the process every hour until the temperature has stabilised for at least 3 hours.

3.6.4 Vibration

- If vibration readings measured on the ends of the bearing bracket exceed the figures below it is indicative of a pump or system problem. Pumps should be switched off and the cause of vibration investigated.

CAUTION
The vibration of the pump under normal operating conditions should not exceed the following:

Flow range	Unfiltered vibration velocity, mm/s RMS (Measured at the bearing bracket)
Within preferred operating region	**< 5,0**
Beyond preferred but within allowable operating region	**< 6,5**

SECTION 4 OPERATION

WARNING
Never operate a pump without all guards installed properly. Injury may occur if the pump is run without these.

4.1 Preparation for Start-Up

4.1.1 Check Lubrication

If oil lubricated, the oiler reservoir should be checked and topped up if necessary before start up.

If grease lubricated, the bearings should be recharged via the grease nipples.

Detailed methods for lubricating the bearing bracket can be seen in Sections 3 and 5 of this manual.

4.1.2 Prime Pump

For non self-priming pumps, fill and vent the pump and associated pipework. Ensure that the pump casing and suction pipework are completely filled with the liquid to be pumped.

Fully open any valves on the suction side of the pump. When system conditions permit, close the valve on the delivery side of the pump.

Start the drive motor, and when the pump has run up to full speed slowly open the delivery regulating valve until the required flow rate is obtained.

CAUTION
Observe pressure gauges. If discharge pressure is not quickly attained stop driver, ensure there are no leaks and then attempt to re-start.

CAUTION
Observe pump for vibration levels bearing temperature and excessive noise. If normal levels are exceeded, shut down and resolve.

Where self-priming attachments are fitted, fill the suction reservoir and fully open the discharge valve to allow air to be exhausted. Priming may take several minutes. If the pump becomes hot without priming, stop, drain, refill and eliminate suction leaks, reduce suction pipe volume or reduce suction lift.

4.2 Start Up

CAUTION
Do not attempt to start the pump before implementing the following.

- Disastrous damage will occur if the pump is run dry.
- The pump must not be run for prolonged periods against closed valve.
- The system pipework should be inspected on a regular basis to ensure pump does not operate against a blockage.
- Ensure that all services, including auxiliary quench services, are operational and at the required flow rate and pressure before the pump is started.
- On pumps with a pressurised flush to a mechanical seal, the flush pressure must be applied at all times the pump is operational.
- On thermosyphon systems, the reservoir must be filled to the correct level with compatible liquid and pressurised if applicable. Unless otherwise specified, the liquid level should be 50 to 60mm above the upper circulation connection.
- Before starting the drive motor, it should be inspected, following the manufacturer's inspection schedule.

4.2.1 Running at Rated Capacity (Normal Use)

NEVER throttle flow from the suction side. Always vary capacity with regulating valve in discharge line.

If the pumpage rated specific gravity or flow rate are exceeded, the Driver may overload.

Guard against cavitation damage to the pump by operating near the rated conditions.

4.2.2 Running at Reduced Capacity

WARNING
The pump MUST NOT be operated below minimum rated flows or with suction/discharge valve closed. An explosive hazard may be created.

If the pump is operated below minimum flow it could experience the following;

Increased vibration which can adversely affect the seals, bearings, stuffing box or mechanical seal.
Higher radial loads exert greater stresses on the shaft and bearings.
Heat build up which can cause vaporization of the pumpage resulting in scored or seized rotating parts.
Cavitation which can damage the internal surfaces of the pump.

4.2.3 Freezing Conditions

CAUTION
Liquid should be drained from inside of pump while idle to prevent it freezing and damaging the pump.

CAUTION
Ensure that the lubricant being used is suitable for operational and ambient conditions.

4.3 Switching Off

- Reduce pump flow rate to a minimum by closing the discharge valve.
- Isolate the motor and close any seal flush / quench valves.

WARNING
If hazardous/toxic fluids are being handled, appropriate personal protective equipment and handling procedures should be used / followed.

4.4 Taking the Pump Out Of Commission

When the pump is required to be out of service for a protracted period, the following procedure is recommended to ensure that it doesn't deteriorate:

Isolate the pump from the system by closing the delivery regulating and suction valves.

Switch off all power and isolate the unit electrically.

Ascertain the nature of the pumped liquid. Following all applicable national/site safety procedures, drain the pump and thoroughly wash out, using neutralising agent if necessary.

Dry the pump and flush through with a system-compatible inhibitor.

CAUTION
If pump liquid is allowed to freeze, the pump can be damaged. If the pump is to be left idle in freezing conditions, the liquid should be drained.

CAUTION
If pump is allowed to freeze the characteristics of the lubricant may change. If pump is to be left idle in freezing conditions the lubricant should be drained and renewed before the pump is re-started.

SECTION 5 MAINTENANCE

The pump has been designed, manufactured and tested before despatch to require minimal maintenance. In general there are no aspects of the pump which require regular maintenance, but the following procedures will ensure that maximum pump life is obtained.

The period between each major overhaul will depend on the pump application and the site conditions, but a service life of 24 to 36 months can be expected. Maintenance records should be kept, as this will help pinpoint causes of problems.

WARNING
Strictly adhere to the Product Safety Instructions.
The correct working sequence and compliance with the data in this manual are of the utmost importance in ensuring safe operation and handling!

5.1 Preventive Maintenance Schedules

Preventive maintenance schedules are the periodical checks and safety measures by which possibilities of failures and breakdowns are minimised.

5.1.1 Regular Checks

A record of the following should be maintained where possible:

- Discharge flow rate and corresponding head (pressure).
- Power consumption of the driver.
- Bearing housing and mechanical seal housing temperatures.
- Noise and vibration.
- Shaft alignment.

Significant change of any of the above parameters indicates a pump problem.
This should be investigated as soon as practicable.

Oil should be changed at least every 3 months (2000 hours) or sooner if there are any conditions that exist that may break down or contaminate the oil, like adverse ambient temperatures. If the oil appears to be cloudy or contaminated through the oil reservoir sight glass, it should be changed immediately.

5.1.2 Checks after each 3 years of operation

- The pump should be overhauled completely to check for wear / damage.
  Clearances between major rotating components (impeller/suction wear rings are very important.
- The pump bearings (3011 & 3012) should be replaced.
- The mechanical seal (4200) should be replaced.
- The auxiliary connections and their functioning should be checked.
- The discharge pipeline should also be checked for leakage etc.

- A full running test may be carried out to check whether there is any fault in the performance, in comparison with the original performance.
- Piping support should be checked so that the pipes do not induce unwanted stresses on the pump casing.

For replacement parts see Parts List and Spare Parts sections later in this manual.

5.2 Maintenance of Bearings

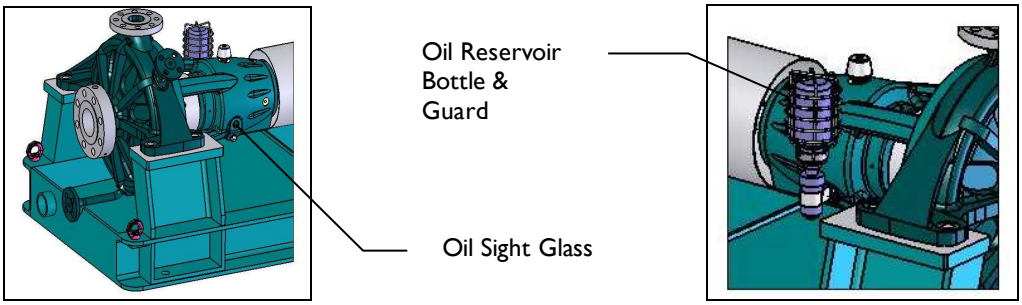
Pumps with grease lubricated bearing bracket bearings are pre-greased with lithium based NLGI No.3 lubricant, which is suitable for the majority of applications.

When the oil lubricated version is supplied ensure that the recommended lubricant is used when refilling.

5.2.1 Pump Bearings (Oil Lubrication)

WARNING
Pumps are shipped without oil and bearings must be lubricated on site.

Remove the oil reservoir bottle and add oil until it is 1mm below the line on the sight glass. Replace the oil reservoir bottle.



The bearing oil level must be maintained, by periodically topping up the oiler so that oil is always visible in the reservoir. Actual oil consumption is negligible. The sight window in the side of the bearing bracket gives a visual indication of oil level, the line marking the maximum oil level. If the oiler is accidentally displaced it should be reset to maintain an oil level approximately 1mm below this line when the pump is stationary.

The grade of lubricant should be suitable for the actual bearing running temperatures as measured using a surface contact thermometer placed on both bearing covers.

Bearing running temp.	< 25°C	25 to 60 degC	> 60°C
ISO Viscosity Grade	ISO VG10	ISO VG32	ISO VG68

Approximate oil capacities (including oiler reservoir):

Bearing Bracket Size	Bearing Cover O/D	Capacity
2	130 mm	0.25 litres
3	150 mm	0.30 litres
4	215 mm	0.45 litres

Oil Change Frequency:

The oil should be drained from the bearing bracket, and renewed at the intervals below.

Bearing running temp.	< 50°C	50 to 75 degC	75 to 100°C
Oil Change Frequency	Every 12 months	Every 6 months	Every 3 months

Please note:

- The ideal bearing running temperature for oil lubrication is 60°C as above this temperature oxidation of the oil increases exponentially with the rate approximately doubling for every 10°C rise above 60°C.
- All bearing running temperatures are measured using contact thermometers on bearing covers following stabilisation of the bearing temperature (new bearings often run hotter than expected but will stabilise over a 48 hour running period. Temperatures above 120°C are unacceptable and the machine should be shut down immediately).
- For high ambient temperatures especially when units are exposed to direct sunlight, care must be taken to ensure that sufficient cooling is available to maintain acceptable bearing temperatures.
- The use of synthetic oils will in many cases offer improved bearing life and increased intervals between oil changes. Synthetic oils however attract a premium and are on average 4 to 5 times the price of mineral oil lubricants.

5.2.2 Pump Bearings (Grease Lubrication)

The pump bearings must be periodically lubricated as tabled overleaf, via the grease nipples in the bearing covers. Lubrication should be carried out with the pump running, adding a small amount of grease every few minutes until each bearing is recharged. Do not over grease. During re-greasing it is normal for bearing temperatures to rise, therefore a temperature check should be carried out.

Recommended lubricants:

Operating Range	-30 to 70 degC	-10 to 100 degC
Recommended lubricant	Low temperature grease, i.e. BP Energrease FGL Shell Alvania RA	Lithium base NLGI No.3 grease i.e. BP Energrease LS3 Shell Alvania R3 Castrol AP3

5.2.3 Motor Bearing Lubrication

The drive motor bearings are pre-packed with grease, normally lithium based. Generally, motors of frame sizes less than 160 have 'sealed for life' bearings. Motors with frame sizes of 160 and above are also 'sealed for life' unless grease nipples are fitted; in which case the motor bearings must be periodically lubricated in accordance with the motor manufacturer recommendations.

5.3 Overhauling and Dismantling

- **Warranty is only valid if genuine Amarinth parts are used. See Page 2 for details**

CAUTION
ALWAYS USE **AMARINTH LTD** SPARE PARTS!
Pump performance / integrity may be affected if non Amarinth parts are used.

CAUTION
Pump components may have been changed due to site experience.
Please check new parts are to the latest specification before using.

The following documents should be referred to when dismantling:

General / Cross Sectional arrangement drawing and parts list.

Ancillary component drawings

Technical assistance may be obtained by contacting Amarinth Ltd, see page 2.

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5.3.1 Pump Rotating Assembly Removal

WARNING
Before the pump is dismantled in any way or removed from the system, the nature of the pump liquid must be ascertained, and the pump isolated and drained as detailed below.

WARNING
Ensure that the electrical supply is physically disconnected or isolated and locked out.

1. Reduce pump flow rate to a minimum by slowly closing the discharge valve.
2. Isolate power supply to the motor.
3. When **motor** has stopped isolate the **pump** from the system by completely closing the discharge and suction valves.
4. Decontaminate the **pump**.
5. Remove all external auxiliary piping connections etc. (if applicable).
6. Remove the **coupling guard**.
7. Disconnect **coupling**, by removing the spacer element.
8. Before dismantling any part of the pump, make sure that the pump does not contain any liquids hazardous to health and clean the pump properly according to best site practice.
9. If oil lubricated, drain oil from bearing bracket by removing the drain plug at the bottom of the bracket. Ensure oil reservoir and guard are removed **before** draining bearing bracket.
10. Disconnect the Seal Flush pipework by removing the studbolts from the flanged joints.
11. Take the weight of the impeller/bearing bracket assembly with a hoist and sling.

WARNING
The bearing bracket must be securely supported at all times during dismantling.

12. Remove the **nuts and washers** (1821 & 1822) securing the **casing cover** (1221) to the **volute casing** (1112) and carefully withdraw the impeller/bearing bracket assembly from the volute casing. If necessary two jacking screws (1824) may be used in the holes provided.
13. Move the impeller/bearing bracket assembly to a bench for further dismantling.
14. Remove casing **gasket** (4520).
15. Straighten the lugs on the **impeller lock washer** (2915).
16. Undo the **impeller nut** (2912), remove the **impeller lock washer** (2915) and **impeller hub cap** (2914) and carefully withdraw the **impeller** (2200).

CAUTION
Impellers can be heavy components.
Carefully remove to avoid injury.

17. Remove the **nuts & washers** (4801 & 4802) fixing the the **cartridge seal** (4200) to the **casing cover** (1221). Ensure the seal setting clamps are in place and the drive screws are loosened before loosening fixings.
18. Remove the **nuts & washers** (1821 & 1822) fixing the **bearing bracket/lantern** (3130) to the **casing cover** (1221). Carefully withdraw the **cartridge seal** (4200) from the **shaft** (2100).
19. Remove the bolts retaining the **bearing cover** (3261) at the drive end of the **bearing bracket** (3130) and lever the bearing cover away from the bearing bracket.
20. Press / tap the **shaft** (2100) with a soft hammer from the impeller end to remove the shaft and bearing assembly.
21. Remove the **'Vee' seal** (2540) from the **shaft** (2100).
22. Remove the **coupling hub** and **key** (6742).
23. Remove the bearing **locknut** (3712) and **lock washer** (3713).
24. If required, remove the **bearings** (3011 & 3012) from the **shaft** (2100).

The pump is now fully stripped.

5.3.2 Pump Removal from System

WARNING
Before the pump is dismantled in any way or removed from the system, the nature of the pump liquid must be ascertained, and the pump isolated and drained as detailed below.

WARNING
Ensure that the electrical supply is physically disconnected or isolated and locked out.

1. Reduce pump flow rate to a minimum by slowly closing the discharge valve.
2. Isolate power supply to the motor.
3. When **motor** has stopped isolate the **pump** from the system by completely closing the discharge and suction valves.
4. Decontaminate the **pump**.
5. Remove the external discharge and suction pipes.
6. Remove all external auxiliary piping connections etc. (if applicable).
7. Remove the **coupling guard**.
8. Disconnect **coupling**, by removing the spacer element.
9. If necessary, remove the **motor** holding down bolts and remove the motor with coupling half in accordance with best site practice.
10. Before dismantling any part of the pump, make sure that the pump does not contain any liquids hazardous to health and clean the pump properly according to best site practice.
11. If oil lubricated, drain oil from bearing bracket by removing the drain plug at the bottom of the bracket. Ensure oil reservoir and guard are removed **before** draining bearing bracket.
12. Taking the weight of the pump and bearing bracket with a hoist and sling, remove the pump bolts holding it down to the frame and remove to a bench for further dismantling.

5.3.3 Dismantling Pump Unit.

WARNING
The bearing bracket must be securely supported at all times during dismantling.

1. Remove the **nuts and washers** (1821 & 1822) securing the **casing cover** (1221) to the **volute casing** (1112) and carefully withdraw the impeller/bearing bracket assembly. If necessary two jacking screws (1824) may be used in the holes provided.
2. Move the impeller/bearing bracket assembly to a bench for further dismantling.
3. Remove **gasket** (4520).
4. Straighten the lugs on the **impeller lock washer** (2915).
5. Undo the **impeller nut** (2912), remove the **impeller lock washer** (2915) and **impeller hub cap** (2914) and carefully withdraw the **impeller** (2200).

CAUTION
Impellers can be heavy components.
Carefully remove to avoid injury.

6. Remove the **nuts and washers** (4801 & 4802) fixing the **cartridge seal** (4200) to the **casing cover** (1221). Ensure the seal setting clamps are in place and the drive screws are loosened before loosening fixings.
7. Remove the **nuts and washers** (1821 & 1822) fixing the **bearing bracket/lantern** (3130) to the **casing cover** (1221). Carefully withdraw the **cartridge seal** (4200) from the **shaft** (2100).
8. Remove the bolts retaining the **bearing cover** (3261) at the drive end of the **bearing bracket** (3130) and lever the bearing cover away from the bearing bracket.
9. Press / tap the **shaft** (2100) with a soft hammer from the impellor end to remove the shaft and bearing assembly.
10. Remove the **'Vee' seal** (2540) from the **shaft** (2100).
11. Remove the **coupling hub** and **key** (6742).
12. Remove the bearing **locknut** (3712) and **washer** (3713).
13. If required, remove the **bearings** (3011 & 3012) from the **shaft** (2100).

The pump is now fully stripped.

5.3.4 Refurbishment

WARNING
In the interests of safety, only components supplied or recommended by **AMARINTH LTD** should be used when refurbishing the pumps.
The use of non **AMARINTH LTD** parts would invalidate your warranty!

1. All pump components should be inspected and replaced if necessary.
2. All gaskets and O rings that have been disturbed should be renewed.
3. If a double shrouded impeller is fitted, the running clearance should be checked.

Wear Surface / Ring Outside Diameter	Recommended Maximum Diametral Clearance
Up to 200mm	1mm
Over 200mm	1.5mm

Measure the outside diameter of the impeller suction or wear ring and the bore of the casing or wear ring. If the difference is approaching the recommended maximum in the table above, new wear rings should be fitted as follows:

Note: If wear rings were not originally fitted, the impeller and casing will need machining to accept wear rings.

(a) Extract the wear rings after removing their securing socket set screws.
(b) Fit each new ring and drill two new securing holes 4.2mm diameter x 13mm deep, half in the wear ring and half in the mating component, spaced 90° apart.
(c) Tap out the holes to M5 x 10mm deep, and secure the wear rings using new M5 x 8mm socket set screws.

4. If an open impeller is fitted, the axial vane clearance should be checked as follows:

Hold the impeller tightly against its mating face inside the pump casing, and measure the depth from the outer face of the volute casing to the back face of the impeller vanes. If this measurement exceeds the maximum shown in the following table refurbishment or replacement is recommended.

Note: The Max Impeller Size is the final figure of the Pump Size.

Max Impeller Size	Maximum Permitted Dimension
140mm	24mm
175mm	27mm
225mm to 410mm	32mm

The impeller wear plate can be removed, from the pump casing, by unscrewing (RH thread).

5.3.5 Re-assembly

Pump re-assembly is generally in reverse order to disassembly; however, the following points should be observed:

1. To replace the bearings on the shaft heat to 130ºC, using an induction heater. Note N D/E bearing (3011) is a deep groove ball and the D/E bearings (3012) are a/c ball, used in a back to back configuration. After fitting bearings ensure the locknut and lockwasher (3712 & 3713) are fully tightened.
2. **Labyrinth Seals:** If the seals have been removed or replaced ensure that they are correctyly installed in their housing.
3. **Lip Seals:** If the seals have been removed or replaced ensure that they are correctly installed in their housing. The space between the seal and bearings must be packed with grease before the pump is run.
4. **Cartridge Seals:** These contain high precision components, and cleanliness and care in handling are essential. When fitting a cartridge seal follow the manufacturer's instructions. Ensure that any seal setting clamps are locked clear of the shaft before the pump is run.
5. Refit the impeller retaining nut (2913) with a securing compound compatible with the pumped fluid (e.g. Loctite 243 or equivalent).
6. Ensure that the gasket (4520) is properly seated on the casing cover (1221) joint face before fitting to the volute casing (1120).
7. When assembling spigotted components, gently tap the component fully home before tightening the fasteners. Tighten all casing nuts evenly in a diagonal sequence until metal-to-metal contact is achieved, using the following torque settings:

Fastener Location & Material	**Casing & Pipework** B8MX or Duplex Typical Proof Stress 550N/mm2		**General Fixings** B8M 316 S.S. Typical Proof Stress 205N/mm2	
	Typical Torque		**Typical Torque**	
Bolt Size	**Nm**	**lbf.ft**	**Nm**	**lbf.ft**
M10	47	33	12	8
M12	81	56	21	14
M14	130	91	33	23
M16	202	142	52	36
M20	315	220	101	70
M24	544	381	174	122
M30	886	620	346	242

WARNING
The pump must only be lifted using the lifting eyes provided (see section 1). Never use any motor lifting eyes to lift the complete pump unit!

8. When fitting the pump half coupling, ensure that the distance between its face and the face of the motor half coupling is in accordance with the coupling manufacturer figures.

9. To re-align the pump and motor see section 3.5.3.

10. If new pump bearings have been fitted, monitor bearing temperatures (see section 3)

5.4 Trouble Shooting

Problems in service can often be attributed to system faults or incorrect installation. Some common problems, with their causes and corrective actions are listed below:

Deficient Flowrate or Head

Type of Fault	Cause of Fault	Corrective Action
System fault:	Insufficient NPSHa. Viscosity or S.G too high. Solidification / crystallisation of fluid.	Correct system fault to obtain design conditions.
	Faulty valves or pipe fittings.	Check. Refurbish or replace components as necessary.
Installation fault:	Incorrect rotation.	For DOL starting only. Transpose two of the motor supply lines to obtain correct rotation (clockwise looking at drive end). For Star/Delta starting correct supply lines into the motor starter.
Pump fault:	Impeller blocked.	Disassemble pump (see Section 5). Remove blockage.
	Impeller/casing wear surfaces / rings worn.	Disassemble pump (see Section 5). Replace components as necessary.

Noise or Vibration

Type of Fault	Cause of Fault	Corrective Action
System fault:	Flow rate too low. Pump cavitating (insufficient NPSHa). Intermittent air/gas in system.	Correct system fault to obtain design conditions.
Installation fault:	Foundations inadequate.	Reinforce foundations as necessary.
Motor fault:	Motor components worn or damaged.	Remove motor. Replace components as necessary.
Pump fault:	Bearings lubrication failed. Pump bearings worn or damaged.	Remove and disassemble pump (see Section 5). Replace components as necessary.

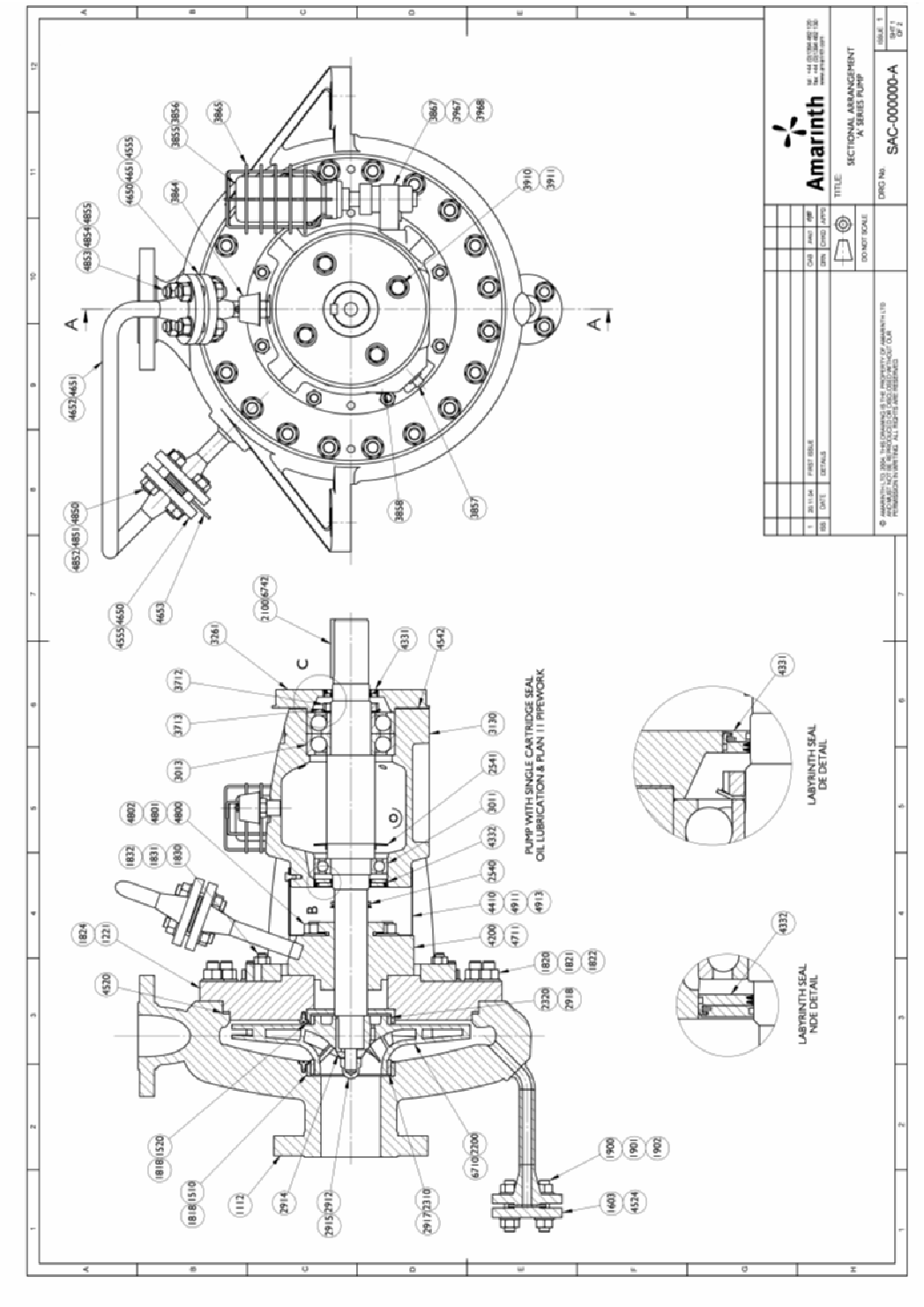
Motor Overload

Type of Fault	Cause of Fault	Corrective Action
Specification fault:	Motor unsuitable for site voltage.	Replace or rewind motor.
System fault:	Pump flow rate too high. Viscosity or S.G. too high.	Correct system fault to obtain design conditions.
Installation fault:	Impeller/casing rub (excessive piping loads to pump).	Support pipework to reduce forces & moments applied to pump.
Electrical system fault:	Incorrect site supply voltage.	Rectify supply fault.
Motor fault:	Motor components worn or damaged.	Remove motor. Replace components as necessary.
Pump fault:	Impeller/casing rub (worn or damaged pump components).	Remove and disassemble pump (see Section 5). Replace components as necessary.

SECTION 6 SECTIONAL DRAWINGS/PARTS LISTS

6.1 Main Equipment

An application specific Sectional Arrangement is generated for each product at the time of quotation to the customer. Please refer to these details. The SA Drawing below shows an API Plan 11. These are marked as * in the Parts List below.



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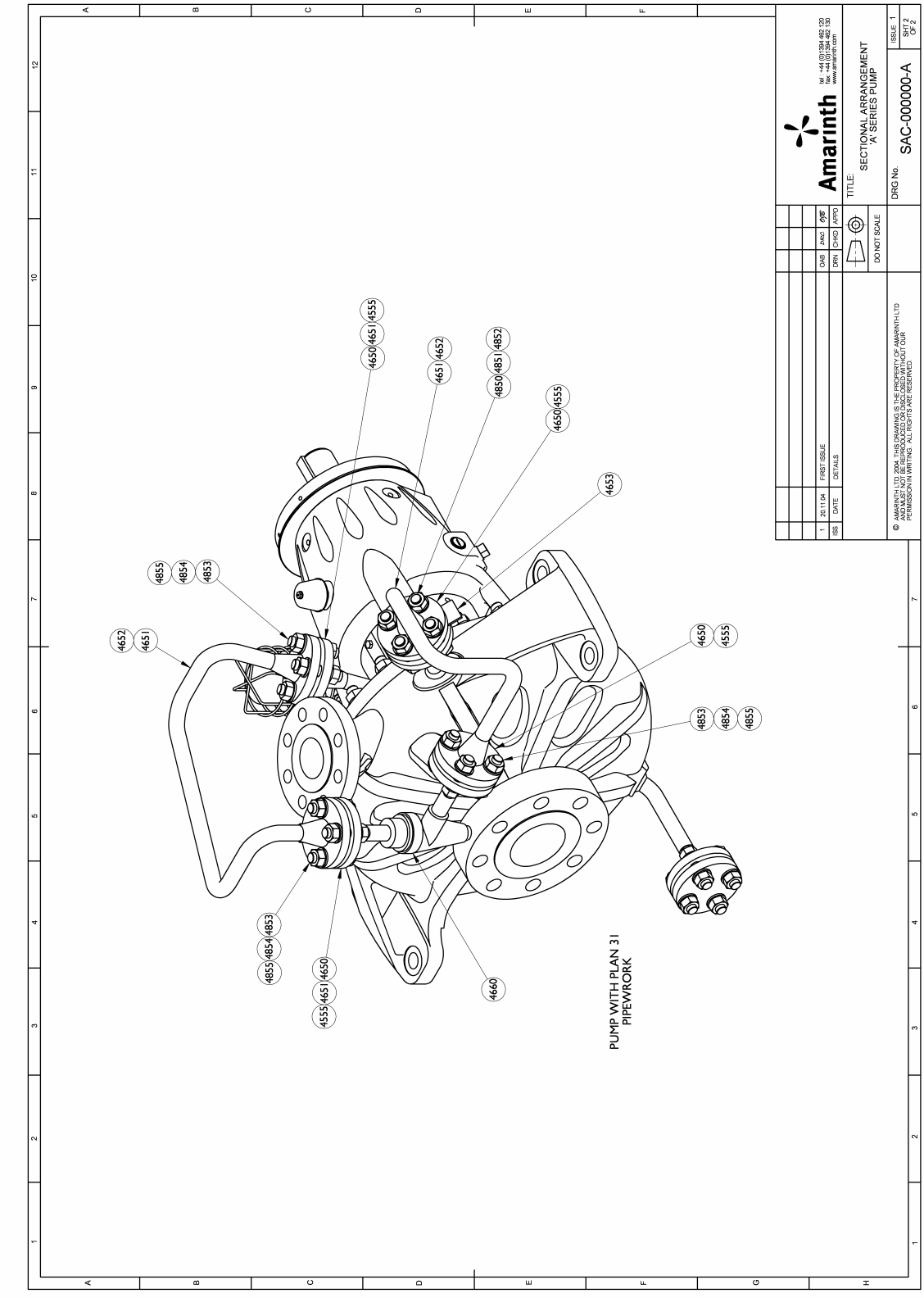
Additional parts for API Plan 31, marked as ** in the Parts List, are shown below ;



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Seq. No.	Description	Qty	UOM
1112	Casing – Volute	1	each
1221	Casing Cover	1	each
1510	Casing Wear Ring Plain	1	each
1520	Casing Wear Ring 'L' Shaped	1	each
1603	Flange – Blank – Drain	1	each
1818	Pan Head Screw – Wear Ring Casing	6	each
1820	Stud – Casing Cover	20	each
1821	Hex Nut – Casing Cover	20	each
1822	Washer – Casing Cover	20	each
1824	Hex Set Screw – Jacking	2	each
1830	Stud – Casing/Bearing Bracket	8	each
1831	Hex Nut – Casing/Bearing Bracket	8	each
1832	Washer – Casing/Bearing Bracket	8	each
1900	Stud – Drain Flange	4	each
1901	Hex Nut – Drain Flange	8	each
1902	Washer – Drain Flange	8	each
2100	Shaft	1	each
2200	Shrouded Impeller	1	each
2310	Impeller Wear Ring Plain Suction Side	1	each
2320	Impeller Wear Ring Plain Drive Side	1	each
2540	Vee Seal	1	each
2541	Oil Flinger	1	each
2912	Dome Hex Nut	1	each
2914	Impeller Hub Cap	1	each
2915	Lock Washer	1	each
2917/ 2918	Screw – Socket Grub	6	each
3011	Bearing – Deep Groove Ball	1	each
3013	Bearing – Thrust Ball A/C	2	each
3130	Bearing Bracket	1	each
3261	Bearing Cover	1	each
3712	Lock Nut	1	each
3713	Lock Washer	1	each
3855	Constant Level Oiler	1	each
3856	Pipe Hex nipple	1	each
3857	Plug – Bearing Bracket Drain	1	each
3858	Oil Sight Window	1	each
3864	Oil Breather	1	each
3865	Oiler Guard	1	each
3867	Oiler Bracket	1	each
3910	Hex Set Screw – Bearing Cover	4	each
3911	Washer – Bearing Cover	4	each
3967	Hex Set Screw – Oiler Bracket	1	each
3968	Washer – Oiler Bracket	1	each
4200	Cartridge Mechanical Seal	1	each
4331	Labyrinth Seal – DE	1	each
4332	Labyrinth Seal – NDE	1	each
4520	Gasket – Casing	1	each
4524	Gasket – Drain Flange	1	each
4542	Gasket – Bearing Cover	1	each
4555	Gasket – Recirc Flange	3*/5**	each
4650	Flange – Butt Weld – Recirc	3*/7**	each
4651	Pipe – Recirc	500*/ 1000**	mm
4652	Elbow – 90^0 – Recirc	3*/7**	each
4653	Orifice Plate – Recirc	1	each
4660	Cyclone Separator	0*/1**	each
4711	Plug – Seal Quench/Drain	2	each
4800	Stud – Seal	4	each
4801	Hex Nut – Seal	4	each
4802	Washer – Seal	4	each
4850	Stud Bolt – Recirc Flange Orifice	4	each
4851	Hex Nut – Recirc Flange Orifice	8	each
4852	Washer – Recirc Flange Orifice	8	each

Seq. No.	Description	Qty	UOM
4853	Stud Bolt – Recirc Flange	4*/12**	each
4854	Hex Nut – Recirc Flange	8*/24**	each
4855	Washer – Recirc Flange	8*/24**	each
6710	Key – Impeller	1	each
6742	Key – Coupling	1	each

6.2 Spares

Standard spare parts are available as detailed below.

Contact Amarinth for availability of other parts.

Spare Part Description	No. Off	Unit
Commissioning		
Mechanical Seal	1	EA.
Gasket Kit	1	EA.
Operating		
Mechanical Seal	1	EA.
Gasket Kit	1	EA.
Bearing Set	1	EA.
Labyrinth Seal Set	1	EA.
Impeller	1	EA.
Insurance		
Impeller	1	EA.
Shaft	1	EA.

6.3 Accessories

Please contact Amarinth for details

APPENDIX I – ATEX USERS GUIDE

Introduction

This guide is a supplement to the standard C Range pump manual for applications in potentially explosive environments – commonly known as ATEX applications.

For the pump to be used safely in an ATEX application, the guidelines provided here must also be applied – as well as the guidelines in the main manual and appended vendor manuals.

Product Certification & Coding

The pump and bearing bracket assembly (excluding the motor), commonly known as a bareshaft unit, with a oil lubricated bearing bracket, has been assessed in ambient temperature conditions between –20 and +40deg C as suitable for the following marking, if pumpage is < 125°C:

 **II 2G ck T4**

The pump unit can also comprise of a pump & bearing bracket assembly, coupling, coupling guard, motor and baseplate. The marking of these units will depend not only on the coding of the bareshaft pump but also the type and classification of the motor fitted.

The pump has not been classified for pumpage that may create potentially explosive zones (i.e. internal zone).

Installation Instructions

Warnings:

- The apparatus is ATEX Category 2, only to be installed in Hazardous Zones 1 or 2.
- The installer is to ensure that the equipment is located in areas that are known not to have an adverse affect on the housing material.
- Do not modify the enclosure as this will compromise the apparatus certificate.
- The correct cable must be selected for the service temperature.

Hazardous Area Installation Standards & Requirements:

The installer should refer to the latest edition of the following standards before operating in a Hazardous Area:

EN 1127-1 Explosive Atmospheres - Explosion prevention and protection, basic concepts and methodology.

EN 60079-14 Electrical apparatus for explosive gas atmospheres - Part14: Electrical installations in hazardous areas (other than mines)

EN 60079-17 Electrical apparatus for explosive gas atmospheres - Part17: Inspection and maintenance of electrical installations in hazardous areas (other than mines)

Preparation & Installation

A flow sensor should be fitted in the pipeline to ensure that fluid is always present when the pump is running.

The pump assembly MUST be comprehensively earth bonded through the base to ensure no possibility of electrostatic build up.

All equipment and instructions necessary should be present prior to commencing the installation.

Assembly and Dismantling

Installation or maintenance with steel tools should not occur where there is the possibility of the presence of substances of gas group IIC.

The pump should be installed in accordance with the standard installation instructions.

Any pipework / hosing used should be resistant to electrostatic discharge. If this is not practicable, cleaning of pipework should not be conducted using a dry cloth to avoid generating electrostatic charge.

All fittings, seals, gaskets and connections should be carefully checked to ensure that they are leak free prior to commissioning the pump.

Maintenance

Bearings shall be replaced after a period not exceeding 90% of the manufacturer's calculated rated life. See bearing manufacturer instructions for details.

HOT PARTS - do not work on the pump straight after switching it off – wait for the pump to cool down.

Operational parameters

DO NOT EVER run this pump dry. It will overheat rapidly and create an ignition hazard.

Following pump priming and start up, the seals should be carefully monitored to ensure that there is no leakage from the mechanical seal or system joints.

For oil lubricated systems, the oil level should be checked daily and topped up as necessary to ensure seals and bearings do not run unlubricated.

The fluid temperature at the pump inlet should be <125°C in order to achieve the ATEX temperature class T4.

The fluid temperature at the pump inlet should be <190°C in order to achieve the ATEX temperature class T3.

The fluid temperature at the pump inlet should be <290°C in order to achieve the ATEX temperature class T2.

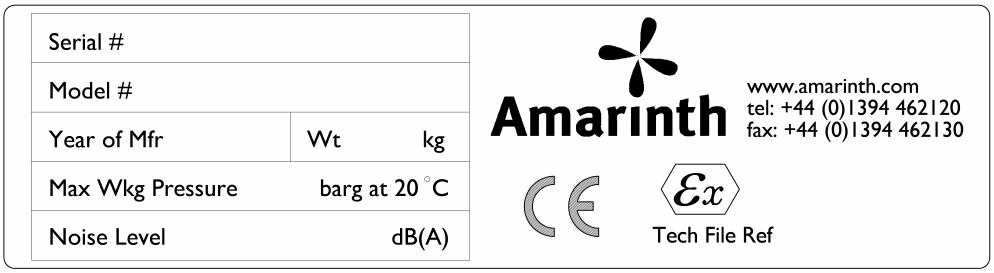
(Above surface temperature limits assume that the pump casing is un-lagged.)

Specifications:

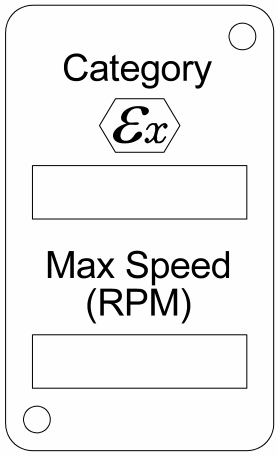
Motor IP Rating : IP55 to IP65, depending on customers requirements.
Motor Temperature Class : T4, T3, depending on customers requirements.
Motor Gas Group : IIA to IIC, depending on customers requirements.
Motor Environment (Gas) : Zone 1 & 2, depending on customers requirements.

Label Details and Information

As main details in IOM except:



Also, the pump itself, if constructed to be ATEX compliant, has a rating plate to confirm the maximum rating for the pump. The location of this is on the foot of the pump head, also as shown in the General Arrangement Diagram.



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APPENDIX II – Customer Documentation

Amarinth Limited uses good quality components from other OEM suppliers. Please refer to the manufacturers instructions (especially regarding ATEX addendums) supplied with this equipment.