



ISO PRO

ISO 5199 Standard
Centrifugal Pumps



Installation, Operation and Maintenance Manual



These instructions must be read prior to installing, operating, using and maintaining this equipment.



INSTALLATION, OPERATION AND MAINTENANCE MANUAL

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Section 1.....Introduction and Safety

1. GENERAL



These instructions must always be kept close to the product's operating location or directly with the product.

Pentair Southern Cross is committed to continual quality improvement. We are available at your service to answer any technical question and provide further information about the product relating to its Installation, Operation, Repair and Fault diagnostic services.

The instructions in this manual are intended to provide relevant information to the installer and operator to work with the product. Operating the product in compliance with these instructions is important to help ensure reliability in service and avoid risks.

Local regulations are not accounted for in these instructions. Ensure such local regulations are observed by all, including those installing the product. Always coordinate repair activity with operations personnel, and follow all plant safety requirements and applicable safety and health laws and regulations.

2. DISCLAIMER

The information in this manual is considered to be reliable. In spite of all the efforts made by Pentair Southern Cross to provide relevant information, not all circumstances can be accounted for. The content in this manual may appear insufficient in some areas. Contact Pentair Southern Cross for more information relating to your specific application if need be.

Pentair Southern Cross products are manufactured in compliance with ISO9001:2008 International Quality Management System Standard. Parts and Accessories have been designed, tested and incorporated into the products to help ensure their continued product quality and performance in use. Use of Non-Pentair Southern Cross supplied parts and accessories may adversely affect the performance and safety features of the products. Failure to properly select, install or use authorized Pentair Southern Cross parts and accessories is considered as misuse.

Damage or failure caused by misuse is not covered by Pentair Southern Cross warranty. In addition, any unauthorized modification to Pentair Southern Cross products or removal of original components may impair the safety of these products in their use and will be unwarrantable.

3. PERSONNEL QUALIFICATION AND TRAINING

All personnel involved in the operation, installation, inspection and maintenance of the unit must be qualified to carry out the work involved. If the personnel in question do not already possess the necessary knowledge and skill, appropriate training and instruction must be provided. Always coordinate repair activity with operations and health and safety personnel, and follow all plant safety requirements and applicable safety and health laws and regulations.

Section 1.....Introduction and Safety**4. SUMMARY OF SAFETY MARKINGS**

This document contains specific safety markings relating to various user instructions. The specific safety markings are:



A symbol to indicate safety instructions where non-compliance would affect personal safety and could result in loss of life.



A symbol to indicate electrical safety instructions where non-compliance would affect personal safety and could result in loss of life.



A symbol to indicate “hazardous and toxic fluid” safety instructions where non-compliance would affect personal safety and could result in loss of life.



A symbol to indicate safety instructions where non-compliance will involve some risk to safe operation and personal safety and would damage the equipment or property.



A symbol to indicate explosive atmosphere marking. It is used in safety instructions where non-compliance in the hazardous area would cause the risk of an explosion.



This sign indicates a Critical Instruction the Installer / Operator need to consider and follow.

Section 1 Introduction and Safety

5. MANDATORY SAFETY ACTION



ENSURE CORRECT LUBRICATION



START THE PUMP WITH OUTLET VALVE PARTLY OPENED

This is recommended to minimise the risk of overloading and damaging the pump and motor at full or zero flow. The pump outlet control valve may need to be adjusted to comply with the duty following the run-up process. (See section 5, Commissioning start-up, operation and shutdown.)



NEVER RUN THE PUMP DRY



INLET VALVES TO BE FULLY OPEN WHEN PUMP IS RUNNING

Running the pump at zero flow or below the recommended minimum flow continuously will cause damage to the pump itself and to the seal. Restriction of suction may cause cavitation resulting in damage to the pump.



PREVENT EXCESSIVE EXTERNAL PIPE LOAD

Do not use pump as a support for piping. Pipe supports and expansion couplings recommended.



DO NOT RUN THE PUMP AT ABNORMALLY HIGH OR LOW FLOW RATES

Operating at a flow rate higher than normal or at a flow rate with no back pressure on the pump may overload the motor and cause cavitation. Low flow rates may cause a reduction in pump/ bearing life, overheating of the pump, instability and cavitation/ vibration.



NEVER DO MAINTENANCE WORK WHEN THE UNIT IS CONNECTED TO POWER



HAZARDOUS LIQUIDS

When the pump is handling hazardous liquids care must be taken to avoid exposure to the liquid by appropriate setting of the pump, limiting personnel access and by operator training. If the liquid is flammable and/or explosive, strict safety procedures must be applied.

Gland packing must not be used when pumping hazardous liquids.



DRAIN THE PUMP AND ISOLATE PIPEWORK BEFORE DISMANTLING THE PUMP

The appropriate safety precautions should be taken where the pumped liquids are hazardous.



HANDLING COMPONENTS

Many precision parts have sharp corners and the wearing of appropriate safety gloves and equipment is required when handling these components. To lift heavy pieces above 25 kg (55 lb) use a crane appropriate for the mass and in accordance with current local regulations.



GUARDS MUST NOT BE REMOVED WHILE THE PUMP IS OPERATIONAL

The unit must not be operated unless coupling guard is in place. Failure to observe this warning could result in injury to operating personnel.



THERMAL SHOCK

Rapid changes in the temperature of the liquid within the pump can cause thermal shock, which can result in damage or breakage of components and should be avoided.



DO NOT APPLY HEAT TO REMOVE IMPELLER

Trapped lubricant or vapor could cause an explosion.

Section 1.....Introduction and Safety

6. SAFE NOISE LEVEL

ISO PRO pump noise level is dependent on a number of factors – the type of driver used, the operating conditions, pipe-work design and acoustic characteristics of the building. The below table is a guide to calculating the noise level for a pump unit with any given driver.

Approximate Noise Level Table

Driver Sound Level dB(A)	Correction For Unit - Add to motor noise level dB(A)
60 - 64	12.0
65 - 69	10.0
70 - 74	8.0
75 - 79	6.5
80 - 84	5.0
85 - 89	4.0

If pump unit noise level exceeds 85 dBA attention must be given to prevailing Health and Safety Legislation, to limit the exposure of plant operating personnel to the noise. The usual approach is to control exposure time to the noise or to enclose the machine to reduce emitted sound. You may have already specified a limiting noise level when the equipment was ordered, however if no noise requirements were defined then machines above a certain power level will exceed 85 dBA. In such situations consideration must be given to the fitting of an acoustic enclosure to meet local regulations.

7. LEAKAGE PREVENTION

The pump must only be used to handle liquids for which it has been approved to have the correct corrosion resistance. Avoid entrapment of liquid in the pump and associated piping due to closing of suction and discharge valves, which could cause dangerous excessive pressures to occur if there is heat input to the liquid. This can occur if the pump is stationary or running.

Bursting of liquid containing parts due to freezing must be avoided by draining or protecting the pump and ancillary systems.

8. SAFETY NOTE

- a. Read the instruction manual before installation, operation and maintenance of the equipment. Check and confirm that the manual is relevant copy by comparing pump type on the nameplate and with that on the manual.
- b. The products supplied by Pentair Southern Cross have been designed with safety in mind. Where hazards cannot be eliminated, the risk has been minimized by the use of guards and other design features. Some hazards cannot be guarded against and the instructions below must be complied with for safe operation. These instructions cannot cover all circumstances; You are responsible for using safe working practices at all times.
- c. Pentair Southern Cross 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

Section 1.....Introduction and Safety

- access points. A Pump Duty 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.
- d. Access to the equipment should be restricted to the personnel responsible for installation, operation and maintenance of pump unit, adequately qualified and supplied with appropriate tools for their respective tasks.
 - e. Pentair Southern Cross 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.
 - f. Hearing protection should be worn where the specified equipment noise level exceeds locally defined safe levels. Safety glasses or goggles should be worn when working with pressurised systems and hazardous substances. Other personnel protection equipment must be worn where local rules apply.
 - g. Do not wear loose clothing or jewelry which could catch on the controls or become trapped in the equipment.
 - h. Note the 'Limits of product application – permissible use' specified in the manual.
 - i. Operation of the equipment beyond these limits will increase the risk from hazards noted below and may lead to premature and hazardous pump failure.
 - j. 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.
 - k. Improper Installation, Operation or Maintenance of this Pentair Southern Cross Product could result in Injury or Death.

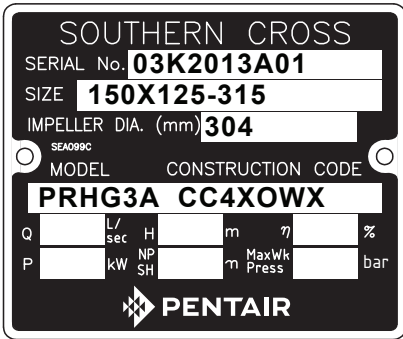
Section 2.....Pump Construction

1. CONFIGURATIONS

Southern Cross ISO-PRO is a single stage, horizontal, end suction process pump with overhung impeller and radially split casing. ISO-PRO is fully Compliant with ISO 5199. The range is designed for continuous service in clean water pumping applications.

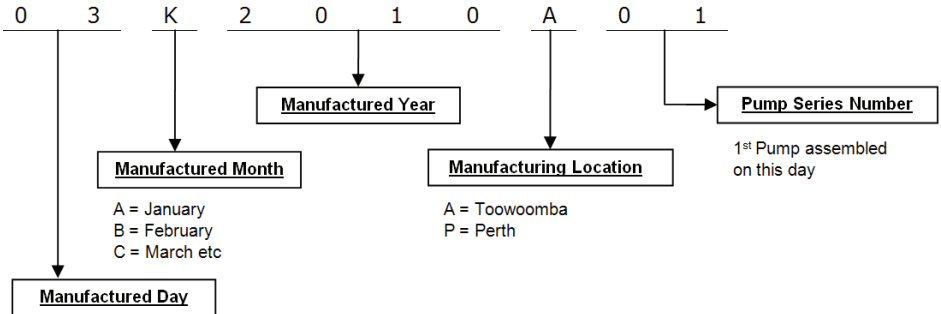
2. NOMENCLATURE AND NAME PLATE

A typical example of a Southern Cross Pump Name Plate is shown below.

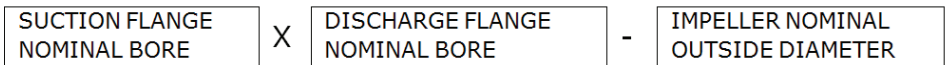


2.1 Serial Number

The pump serial number is stamped on the name plate as shown above. A typical serial number is described below.



2.2 Pump Size



2.3 Impeller Diameter (mm)

Actual outside diameter of the impeller in millimeters (if blank, the impeller is full-size)

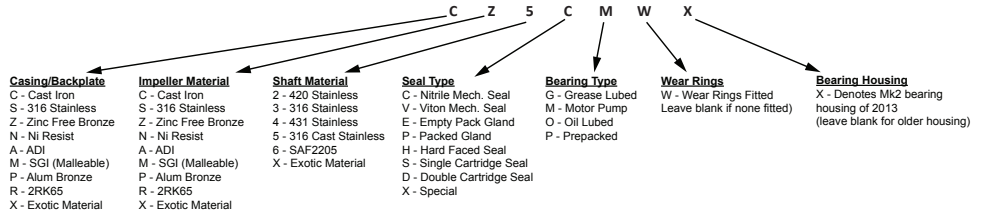
Section 2.....Pump Construction

2.4 Model

“Item Code” of pump (from work order)

2.5 Construction Code

This code defines construction material of various components in the pump.



3. DESIGN OF MAJOR PARTS

3.1 Pump Casing (All Pump Types)

The Casing type is Foot Mounted, ISO vertical, Centerline, End Suction, Top Discharge, one piece solid construction. A wear ring may be mounted in the casing to provide a close running clearance with the impeller Neck ring.

3.2 Impeller (All Models)

The impeller is a single suction, radial / Mixed flow, closed design. The impeller is dynamically balanced, keyed to the shaft. Renewable Neck rings can be press fit onto the impeller hubs (front and back) where needed. Double curvature impeller blades, provide highly efficient suction performance, higher speed capabilities and greater performance for reduced running costs and maintenance. Impeller is taper mounted and keyed to shaft and secured by Lock Washer and Impeller nut for positive locking.

3.3 Lock Washer (All Pump Types)

Lock washers are assembled between impeller and impeller nut. These Lock washers are manufactured by Nord-Lock. NORD-LOCK is a pair of washers with a wedge-locking action meeting DIN 25201 which is a unique method using tension instead of friction. The NORD-LOCK bolt securing system uses geometry to safely lock impeller onto the pump shaft.

3.4 Shaft (All Pump types)

The shaft is made of high grade stainless steel. It is precision machined over its entire length and has generous fillet radii at each change of section to reduce stress concentrations. Water slinger prevents intrusion of pumped fluid into shaft bearing.

3.5 Heavy Duty Bearing Housing

The pump has positively located dual bearings.

Section 2.....Pump Construction

Heavy duty roller bearings:

This pump is fitted with heavy duty roller bearings running in oil lubricated housing with oil flinger. Housing is fitted with breather and oil level plug and drain plugs. Available options include:

- Fitting deep groove grease lubricated bearings, either sealed for life or grease nipple lubricated
- Oil coolers
- Labyrinth shaft seals

Positively located dual bearings:

These ISO-Pro Pumps are fitted with positively located dual bearings at motor end and with a roller bearing at pump end. These bearings are oil lubricated. Available options include:

- Fitting deep groove grease lubricated bearings, either sealed for life or grease nipple lubricated
- Oil coolers
- Labyrinth shaft seals

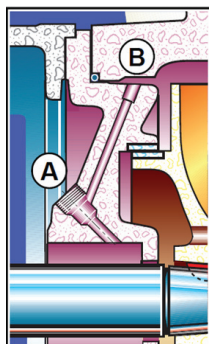
3.6 Pump Shaft Seals

As a standard, ISO-PRO Pumps are fitted with single, unbalanced, on-shaft mechanical seal.

Other seal options are available but are not limited to:

- Single balanced Mechanical Seal
- Single Balanced cartridge seals
- Double Balanced cartridge seals
- Packed Gland Seals

External clean water flushing and cooling can be supplied for high temperature, abrasive or toxic applications.



Upon customer request, Southern Cross ISO-PRO pumps maybe supplied with an empty shaft seal cavity to allow the dealer/customer to fit a seal to suit a particular application. It is important that the shaft seal is fitted according to the manufacturer's instructions. In the case of a packed gland, the gland needs to be adjusted so a slow drip of water is evident when the pump is operating. A drain hole is provided in the bearing housing (below the seal cavity) for use with a packed gland.

If the gland in the pump is to be lubricated with water from the pump body, ensure the plug (A) is fitted and the passage from the pump body to the seal cavity is clear. If the pump gland is to be lubricated from an external water supply, plug (B) must be fitted. Ensure passage from seal cavity to external water supply is clear before connecting water supply line.

3.7 Driver

The driver is normally an electric motor. Different drive configurations may be fitted such as internal combustion engines, turbines, hydraulic motors etc driving via couplings, belts, gearboxes etc.

3.8 Coupling and Coupling guards

The pump unit may be supplied with one type of the below three coupling:

- Flexible Shaft Coupling – standard
- Flexible Shaft Coupling - spacer
- Flexible Tyre Coupling

Flexible couplings are provided in various makes and models to suit customer preference. Refer to the relevant manufacturers Installation, Operation and Maintenance manual for coupling information.

As a standard, galvanised steel Guards and end shields are provided for safety.

3.9 Baseplate

Standard baseplates are made of Mild-steel plates folded galvanized. Non standard bases can be supplied to suit individual installation circumstances.

3.10 Accessories

Accessories may be fitted when specified by the customer at additional cost.

4. PERFORMANCE AND OPERATING LIMITS

This product has been selected to meet the specifications of your purchase order. These pumps are furnished for a particular service condition only. Changes in the hydraulic system or Operating Condition may affect the pump’s performance adversely. This is especially true if the changes reduce the pressure at the suction flange or if the liquid temperature is increased. Contact Pentair Southern Cross if there is a major change in the operating conditions to verify existing pumps’ adequacy.

Section 3.....Pump Lubrication

1. PUMPS FITTED WITH OIL LUBRICATED BEARINGS

1.1 Oil Specification

HOUSING MODULE	OIL LUBE	OIL SPECIFICATION
	QTY (ml)	
		<i>Preferred oils are those that have non foaming properties. Typically, turbine or hydraulic oils would be suitable. Viscosity of SAE20 to SAE30 (ISO VG 46 to 100). Automotive oils would be suitable in light duty cycles.</i>
1	450	Light Duty - Less than 8 hours/day or intermittent Tellus 46 or 68, or Turbo T46 or T68.
2	800	Heavy Duty - Greater than 8 hours/day or continuous Tellus 68, Turbo T68 or Madrella AS68.
3	1200	High Temperature - 100 to 150 degrees Celsius Turbo GT32 or Madrella AS68.
4	2300	Low Temperature - Less than 10 to -30 degrees Celsius Refrigerator Oil 68K.

Bearing housing temperature should not exceed 80 degrees Celsius in normal circumstances. Where higher temperatures are noted, use an oil of lower viscosity.

When pumping product of elevated temperature, it may be advisable to have oil cooling fitted to maintain an acceptable bearing housing temperature.
Consult dealer for maximum operating speeds

1.2 Change interval

TYPE OF SERVICE	HOURS OF SERVICE
LIGHT DUTY	Change oil after 2000 hours service
HIGH TEMPERATURE	Change oil after 1000 hours service
HEAVY DUTY	Change oil after 1000 hours service

1.3 Notes

- While Shell brand oils have been specified, equivalent oils manufactured by any reputable oil company are suitable alternatives.
- When changing oil, inspect for metal particles or other foreign matter, and for any signs of discolouration.
- The oils listed should not be taken as the only suitable oils. Any good quality oil possessing the properties specified may be used.
- It is never good practise to mix different oils.

1.4 Maximum angle of Incline

ISO PRO pumps should be run in the horizontal position. However, some applications require that the pump be run on an incline. For a standard oil lubricated pump, it is recommended that the pump angle not exceed 5° from the horizontal. If the application requires a greater angle of incline, Pentair Southern Cross recommend the use of regreasable bearings.

2. PUMPS FITTED WITH REGREASABLE BEARINGS

Section 3.....Pump Lubrication**2.1 Grease Specification**

Recommended grease type is Shell Alvania R3 or an equivalent high quality Lithium-based grease.

2.2 Change interval

Grease replenishment intervals (running hours) specified below are relevant to a pump running at 70°C Operating temperature and 1450rpm.

BEARING HOUSING	HOURS	GREASE QTY (g)
Group 1	6000	10
Group 2	4500	14
Group 3	3700	19
Group 4	3000	26

Section 4.....Transport and Storage**1. GOODS RECEIVING, UNPACKING AND INSPECTION**

Check Equipment against delivery / shipping documents for its completeness. Check for any damages caused due to transport. If any damage is found it should be reported to the carrier immediately. Any shortage and/or damage must be reported immediately to Pentair Southern Cross and must be received in writing within one month of receipt of the equipment. Later claims cannot be accepted.

Check any crate, boxes or wrappings for any accessories or spare parts that may be packed separately with the equipment or attached to side walls of the box or equipment.

Inspect the preservative coating on various parts. If necessary, renew preservative in areas where it has been rubbed or scraped.

Inspect all painted surfaces. If necessary, touch up the areas where paint has been chipped or scraped. Paints and preservatives used are either Pentair Southern Cross standard or 'special' as required by the contract specification. Refer to Pentair Southern Cross for the description of paints and preservatives used on this order if needed.

Inspect all covers over pump openings and piping connections. If covers or seals for the covers are damaged or lose, they are to be removed, and a visual inspection made of the accessible interior areas for accumulation of foreign materials or water. If necessary, clean and preserve the interior parts as noted above to restore the parts to the "as shipped" condition. Install or replace covers and fasten securely.

2. HANDLING

Boxes, crates, pallets or cartons may be unloaded using fork-lift vehicles or slings dependent on their size and construction.

3. LIFTING



Make sure that any equipment used to lift the pump or any of its components is capable of supporting the weights encountered. Make sure that all parts are correctly rigged before attempting to lift.



Mechanical Lifting device must be used for all pump sets in excess of 25 kg. Fully trained personnel must carry out lifting, in accordance with local regulations. The driver and pump weights are recorded on general arrangement drawing included into the job user's instruction.

3.1 To Lift Complete Pump Only

Make sure the lifting equipment is rated to lift the pump weight. Use certified slings and chains only. Rig lifting sling below discharge flange as shown in the figure.

3.2 To Lift unit with Folded Base-Plate

Pump, driver and base-plate can be lifted as a unit. Sling the unit from the eyelets provided in the base. Make sure straps are adjusted to obtain an even lift.



3.3 To Lift Unit with Welded Base-Plate

Pump, driver and base-plate can be lifted as a unit. Sling from all four (4) eye bolts provided on base-plate side rails. Failure to use all four (4) could result in permanent distortion of the base-plate. Use as long a sling as possible, or use a spreader arrangement.



Coupling bolting and spacer piece must be removed from between pump and driver half couplings before lifting base-plate with pumping element.

3.4 To Lift Driver

Refer to Manufacturer's Instructions.

Section 4.....Transport and Storage**4. STORAGE**

Store the pump in location away from vibration and Dampness

4.1 Short Term Storage (Maximum 6 months)

If at all possible, the pump and its component parts should be stored indoors where they will be protected from the elements. In no case should any pump element be subjected to extended periods of submergence or wetting prior to start up. If it is not possible to store the pump and its components indoors, precautions must be taken to protect them from the elements. Regardless of whether storage is indoors or outside, the storage area should be vibration free. All boxes marked for indoor storage should be stored indoors. When stored outdoors the pump and its components should be protected from dirt, dust, rain, snow, or other unfavorable conditions by heavy plastic sheets, canvas, or other suitable coverings. All equipment must be placed upon skids or blocks to prevent contact with the ground and surface contaminants. Equipment must be adequately supported to prevent distortion and bending. The pump shaft should be rotated, in the direction of rotation, at least 1 and 1/4 turns each week during the storage period and any other periods of standby.



Store the pump in a clean, dry location away from vibration. Leave piping connection covers in place to keep foreign material out of pump casing. Turn pump at intervals to prevent brinelling of the bearings and seal faces, if fitted, from sticking. Electric Motors (Pump Driver) should not be stored in damp places without special protection (Refer to Motor manufacturers instructions). The pump may be stored as above for up to 6 months.

4.2 Long Term Storage

Depending on the length of time the equipment has been stored, and the type of storage provided (i.e. Indoor: heated, unheated, earth floor, concrete floor. Outdoors: under roof, no roof, waterproof coverings, on concrete, on earth), the pump will require a full inspection before the scheduled installation date. This could include a visual inspection, partial or even a full dismantling of the equipment. This should be carried out by qualified personnel, or a Pentair Southern Cross representative. Dismantling the equipment may require the replacement of gaskets and seals. All costs involved during the inspection, dismantling, replacement of parts and reassembly will be at the expense of the customer. All necessary labour, tools and cranes required will be supplied by the customer.

5. PACKAGING

Goods are packed for Interstate Land Transport only unless otherwise specified in the contract. If transporting the goods overseas from buyers' location, they should be repacked appropriately.

1. SAFETY INSTRUCTIONS FOR ASSEMBLY & INSTALLATION

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

2. LOCATION

- Install the unit close to the source of the liquid to be pumped.
- When selecting the location, be sure to allow adequate space for operation as well as for maintenance operations involving dismantling and inspections of parts.
- Head room is an important consideration as an overhead lift of some type is required.

3. PART ASSEMBLIES

It is the responsibility of the installer to ensure that the motor is assembled to the pump and lined up.

CHECK ALIGNMENT



Prior to grouting, an initial alignment check in accordance with the alignment section of this document shall be performed to verify that coupling spacing and final alignment can be achieved without modifying the hold down bolts or the machine feet. This is necessary to ensure that the baseplate was not damaged during the transportation.

4. FOUNDATION

PUMP INSTALLATION AND FOUNDATION



There are many methods of installing pump units to their foundations. The correct method depends on the size of the pump unit, its location and noise vibration limitations. Non-compliance with the provision of correct foundation and installation may lead to failure of the pump and, as such, would be outside the terms of the warranty.

The foundation should be level and sufficiently rigid and substantial to prevent any pump vibration and to permanently support the baseplate at all points. The most satisfactory foundations are made of reinforced concrete. These should be poured well in advance of the installation to allow sufficient time for drying and curing.

Section 5.....Installation

5. INITIAL ALIGNMENT

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. If hot liquids (above 80 Deg C) are being pumped, alignment should be checked and reset with the pump and motor at their normal operating temperature.


PUMP ALIGNMENT AND THERMAL EXPANSION

The pump and motor will normally have to be aligned at ambient temperature and should be corrected to allow for thermal expansion at operating temperature.

5.1 Alignment Methods


Ensure pump and driver are isolated electrically and the half couplings are disconnected



Align the motor to the pump, not the pump to the motor

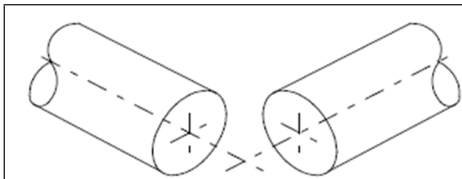


Adjustment to correct the alignment in one direction may alter the alignment in another direction. Always check in all directions after making any adjustment.

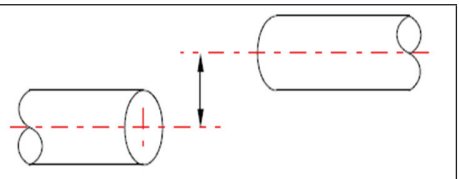


ALWAYS REMEMBER "A FLEXIBLE COUPLING IS NOT A UNIVERSAL JOINT"

Correct alignment is essential for the smooth operation of the pump. There are two types of misalignment between the pump shaft and the drive shaft, which are:

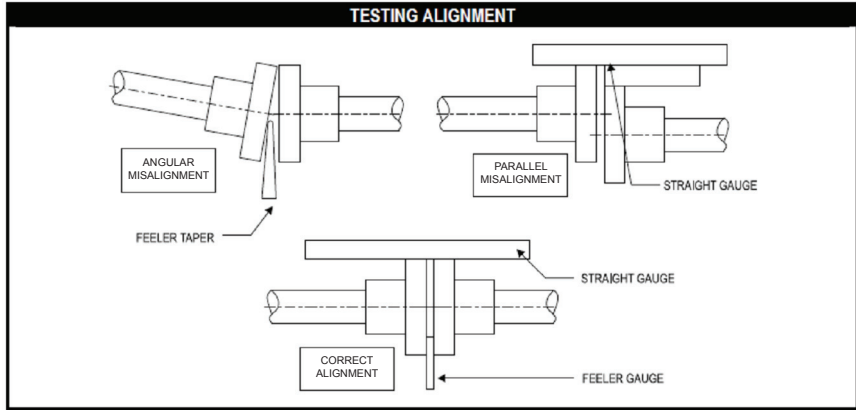


Angular misalignment - Shaft with axis concentric, but not parallel



Parallel misalignment - Shaft axis parallel, but not concentric

This misalignment is checked by using a straight edge or any other device as shown in figure given below. A spacer type flexible coupling is used to connect pump shaft to the driver. By using spacer type of coupling, the complete rotating unit can be removed from the volute without removing pump casing or rotor and without disconnecting piping connections. However other types of coupling can be supplied on request.



The alignment is achieved by adding or removing shims under the motor feet and also moving the motor horizontally as required. In some cases where the alignment cannot be achieved it will be necessary to move the pump before recommencing the above procedure.

5.2 Shims

The shims between the equipment feet and mounting surface should be clean and dry. This is especially critical for pumps in service for some time and need to be realigned. Water, dirt and rust may change the height of the shim pack over a period of time. Shims should be made large enough to support the weight of the equipment on its mounting foot. Do not use many thin shims as this may result in a spongy mounting. Move the equipment vertically by adding or removing the calculated thickness of shims.

6. ASSEMBLE COUPLING

- a) Assemble coupling as per the manufacturer's instructions.
- b) Install coupling guard

7. PIPING



DO NOT USE PUMP AS A SUPPORT FOR PIPING

7.1 Piping Good Practice

- a) In order to minimise friction losses and hydraulic noise in the pipework it is a good practice to choose pipework that is one or two sizes larger than the pump suction and discharge.
- b) Typically main pipework velocities should not exceed 2 m/s suction and 3 m/s on the discharge.

7.2 Suction Piping

- a) The inlet pipe should be one or two sizes larger than the pump inlet bore and pipe bends should be as large radius as possible.
- b) Double bends must be avoided in suction line and a straight run of pipe, equal to 8 or 10 times the

Section 5.....Installation

pipe diameter is desired directly upstream of the suction nozzle.

- c) Keep the suction pipe free of all air pockets.
- d) Pipework reducers should have a maximum total angle of divergence of 15 degrees.
- e) The piping should be inclined up towards the pump inlet with eccentric reducers incorporated to prevent air locks.
- f) Flow should enter the pump suction with uniform flow, to minimise noise and wear.

7.3 Bypass Line

Operation at low flows results in pump horsepower heating the liquid. A bypass may be required to prevent vaporisation and subsequent pump damage

7.4 Discharge Piping

- a) Install a check valve and an isolation valve in the discharge piping. The check valve will protect the pump against excessive pressure when the pump stops. It will also prevent the pump from running backwards.
- b) The check valve should be installed between the isolation valve and the pump nozzle in order to permit its inspection.
- c) Never throttle pump on suction side and never place a valve directly on the pump inlet or outlet nozzle.
- d) Pipework reducers should have a maximum total angle of divergence of 15 degrees.

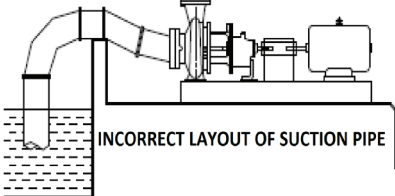
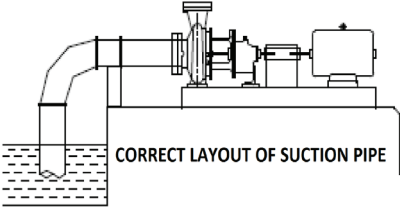
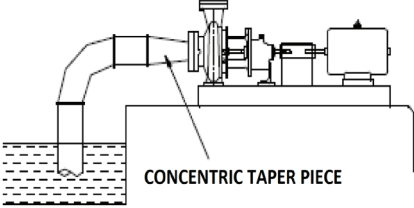
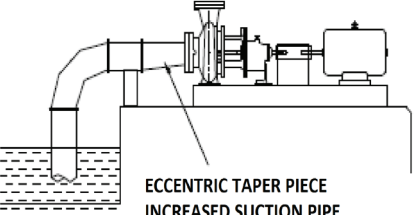
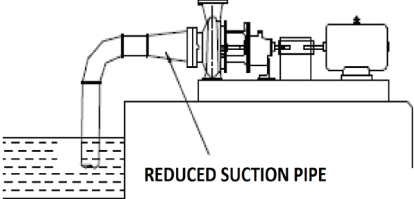
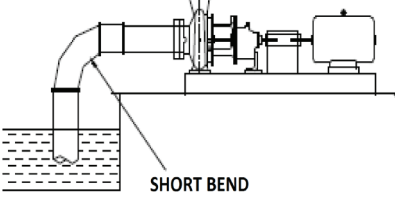
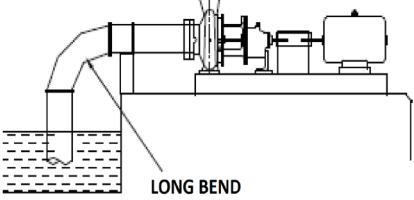
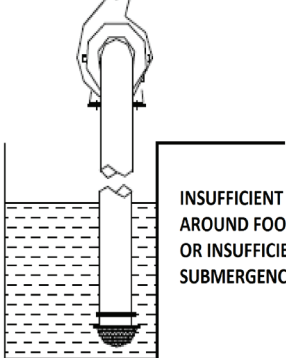
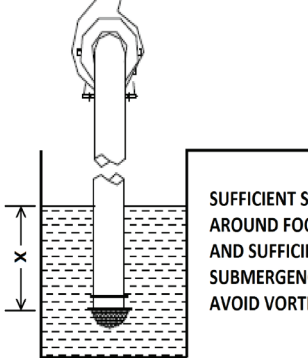
8. ELECTRICAL CONNECTIONS

- a) Electrical connections must be made by a qualified Electrician in accordance with relevant local national and international regulations.
- b) The motor must be wired up in accordance with the motor manufacturers instructions (normally supplied within the terminal box) including any temperature, earth leakage, current and other protective devices as appropriate. The identification nameplate should be checked to ensure the power supply is appropriate.
- c) A device to provide emergency stopping must be fitted.
- d) For electrical details on pump sets with controllers see the separate wiring diagram.
- e) Check the Direction of rotation of the motor before connecting the motor to the pump.

9. PROTECTION SYSTEMS

- a) The following protection systems are recommended particularly if the pump is installed in a potentially explosive area or is handling a hazardous liquid. If in doubt consult Pentair Southern Cross.
- b) If there is any possibility of the system allowing the pump to run against a closed valve or below minimum continuous safe flow a protection device should be installed to ensure the temperature of the liquid does not rise to an unsafe level.
- c) If there are any circumstances in which the system can allow the pump to run dry, or start up empty, a protection device should be fitted to stop the pump or prevent it from being started. This is particularly relevant if the pump is handling a flammable liquid.
- d) To prevent excessive surface temperatures at bearings it is recommended that the pump be fitted with an internal cooling loop.

Section 5.....Installation

INCORRECT PIPING	CORRECT PIPING
 <p data-bbox="210 359 501 383">INCORRECT LAYOUT OF SUCTION PIPE</p>	 <p data-bbox="703 359 980 383">CORRECT LAYOUT OF SUCTION PIPE</p>
 <p data-bbox="248 614 448 638">CONCENTRIC TAPER PIECE</p>	 <p data-bbox="730 718 929 766">ECCENTRIC TAPER PIECE INCREASED SUCTION PIPE</p>
 <p data-bbox="248 837 431 861">REDUCED SUCTION PIPE</p>	
 <p data-bbox="263 1069 364 1093">SHORT BEND</p>	 <p data-bbox="733 1069 828 1093">LONG BEND</p>
 <p data-bbox="319 1308 492 1404">INSUFFICIENT SPACE AROUND FOOT VALVE OR INSUFFICIENT SUBMERGENCE</p>	 <p data-bbox="812 1308 985 1428">SUFFICIENT SPACE AROUND FOOT VALVE AND SUFFICIENT SUBMERGENCE TO AVOID VORTEXING</p>

10. FINAL CHECKS

- a) Is the baseplate leveled?
- b) Check Foundation Bolts?
- c) Check the tightness of all bolts in the suction and discharge pipework.
- d) Piping Installed - Correct Vent, Gauge, Valve, Suction Strainer Locations?
- e) All Flange Bolting Correctly Torqued with appropriate gaskets in place?
- f) After connecting piping to the pump, rotate the shaft several times by hand to ensure there is no binding and all parts are free.
- g) Recheck the coupling alignment, as previously described, to ensure no strain on coupling is due to pipe. If pipe strain exists, correct piping.
- h) Coupling guard correctly installed?

Section 6.....Commissioning and Operation**1. SAFETY INSTRUCTIONS FOR COMMISSIONING & OPERATION**

- Do not touch any moving or rotating parts.
- Guards must be in place before operating the equipment.
- Check that the pump is primed. Pump should never be run dry as the pumped liquid acts as a lubricant for the close running fits surrounding impeller and damage will be incurred.
- Failure to supply the stuffing box or mechanical seal with cooling of flush water may result in damage and premature failure of the pump.
- Do not touch surfaces, which during normal running will be sufficiently hot to cause injury. 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.
- In addition to local or site regulations for noise protection, Pentair Southern Cross 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 be heard with hearing protection worn.



These operations must be carried out by fully trained and qualified personnel

2. PRE-COMMISSIONING PROCEDURE AND CHECKLIST

The following steps should be followed at initial start up and after the equipment has been overhauled:

- a) Confirm correct pump is fitted into the designated functional location.
- b) Prior to installing the pump, flush the suction side of the system to remove all deposit (slag, bolts etc). Remove all pre-commissioning screens and replace with operational units.
- c) Ensure the pump and piping is clean. Before putting the pump into operation, the piping should be thoroughly back flushed to remove any foreign matter which may have accumulated during installation. Take all possible care not to contaminate your system.
- d) Inspect all nozzle connections for
 - i. Missing bolts or loose bolts
 - ii. Missing gaskets
 - iii. Flange alignment / Misalignment
- e) Check Pipe work for
 - i. Correct sizing
 - ii. Any suction restrictions
 - iii. Make sure that all hold down bolts are in place and pulled down

Section 6.....Commissioning and Operation

- f) Check drive coupling for
 - i. Correct Alignment
 - ii. The presence of preload caused by misalignment
 - iii. All fasteners are tight
 - iv. Coupling has been fitted correctly
 - v. Coupling guard is correctly fitted and firm.
 - vi. Check that keys are secured in the correct position and locked down
 - vii. Turn shaft by hand and check for running clearance
- g) For oil lubricated Pumps, fill the bearing housing with the appropriate oil to the correct level. Bearings must receive a small amount of oil prior to starting to ensure adequate lubrication at start up. See section 3 for details.
- h) For Grease lubricated pumps, fill about 15 gms for grease to ensure adequate lubrication at start up. See section 3 for details.
- i) Install suction strainer if required.
- j) Check that the Electrical connection is completed and signed off
 - i. Have the safety lock out device removed.
 - ii. Bump start pump to check for correct orientation. If rotation is not correct refer to motor manual for appropriate connections to change rotation. Take appropriate precaution before working on the motor.
- k) If a Mechanical Seal is fitted, check
 - i. Quench or Flush is operational before startup
 - ii. Check that seal is located correctly
 - iii. Check that seal is locked to the shaft
 - iv. Remove setting Tabs



The unit must not be operated unless coupling guard is securely and completely bolted in place. Failure to observe the warning could result in injury to operating personnel

3. PRIMING

No pumping action occurs unless the pump casing is filled with liquid. Pump casing and suction pipe must therefore be completely filled with the liquid and thus all air removed before the pump is started. Several different priming methods can be used depending on the kind of installation and service involved.

- (a) Liquid level above pump level Pump is set below liquid level of source of supply so that liquid always flows to pump under positive head.
- (b) Priming with foot valve
 - i. When pump is installed on suction lift with foot valve at the end of suction line, fill pump with water from some outside source till all air is expelled and water flows through air vent.

Section 6.....Commissioning and Operation

ii. When there is liquid under some pressure in the discharge pipe, priming can be effected by bypassing the pressure liquid around the check and isolation valve. Of course, the initial priming must be affected from some outside source.

NOTE: In this case, the foot valve must be capable of withstanding pump pressure and possible surge.

(c) Priming by ejector: An ejector operated by steam, compressed air or water under pressure and connected to air vent on top of casing can be used to remove air from and prime the pump on suction lift installations.

(d) Priming by dry vacuum pump: a hand or power pump sucks in all the air from the casing and the Suction pipe, and thus primes the system.

4. LUBRICATION

Refer section 3. Re-lubricate as indicated in this Section 3.

5. RUNNING

On account of its simple construction, the centrifugal pump requires practically no attention while running. Lubrication of the bearings and manipulation of the glands are the only things that need attention from the operator.

6. PUMPS FITTED WITH WEAR RINGS

Casing and impeller wear rings are fitted in the casing and impeller to reduce the quantity of water leaking back from the high pressure side to the suction side. When these wear rings are worn out, the clearance becomes greater and more water passes back into the suction. They must be replaced from time to time to restore the pump efficiency to its normal value.

7. PUMP STARTUP

- a) Close discharge valve if valve is not already closed. Crack open the valve to assure minimal flow.
- b) Prepare the driver for start up in accordance with the driver manufacturer's instructions.
- c) Prime pump and ensure suction valve is open.
- d) If pump re-circulating line is used, ensure it is open, clear and free of obstructions.
- e) Turn on cooling liquid and assure correct flow exists (to cooler, insert gland etc.) as specified.
- f) Double check pump rotation by starting unit momentarily. The direction of input shaft rotation is clockwise when facing pump shaft from coupling end. Ensure that the pump coasts down to a gradual stop.
- g) Start the driver and bring it up to speed.
- h) As soon as the pump is up to rated speed slowly open discharge valve.
- i) This will avoid abrupt changes in velocity and prevent surging in the suction line.
- j) Perform the operating checks

Section 6.....Commissioning and Operation

8. PUMPS FITTED WITH MECHANICAL SEAL

- a) Before pumping dirty liquids it is advisable, if possible, to run in the pump mechanical seal using clean liquid to safeguard the seal face.
- b) External flush or quench should be started before the pump is run and allowed to flow for a period after the pump has stopped.
- c) Never run a mechanical seal dry, even for a short time.

9. STOP / START FREQUENCY

This depends on the driver manufacturers' recommendation. Check actual capability of the driver and control/starting system before commissioning.

10. DURING RUNNING THE PUMP

Check the following and regulate, if necessary

- a) The pump is running smooth.
- b) The flow of sealing liquid (if external liquid is provided for sealing purpose) is uninterrupted.
- c) If packed gland is used, Leakage through stuffing box is normal. There should be leakage of 60-80 drops per minute.
- d) The bearings are not getting heated up excessively.
- e) Head and capacity developed by the pump is as specified.
- f) Power consumption is within the limit.
- g) Ensure that there is no mechanical friction in the pump.
- h) Check suction and discharge pressure gauges.
- i) Check for excessive leakage at seal areas.
- j) Check for unusual noises.
- k) Check for vibrations.
- l) Stop the pump immediately, if any defects are noticed. Do not start the pump unless the defects are rectified. Report immediately to the supplier if it is not possible to rectify the defects.

11. STOPPING AND SHUTDOWN

- a) The centrifugal pumps can be shut down by switching off the power to the motor, with open or closed flow regulating valve. If there are no provisions against water hammer, it is recommended to close the flow regulating valve at pump discharge prior to stopping the pump, but ensure that the pump runs in this condition for no more than a few seconds.
- b) Avoid the use of instantaneous shut-off valves, such as solenoid valves. These can cause severe pump damage.
- c) If a non-return valve is not fitted, or the isolating valve at the discharge side is not completely closed, it may happen that during the shut-down the pump shaft will rotate in the opposite direction than is normal: in such cases absolutely avoid restarting the pump until the pump shaft has stopped rotating.
- d) After the first start-stop and if necessary, check pump/motor alignment and make sure that no external forces or moment rest on pump or piping.
- e) In the event the pump is shut down for an extended period of time it is recommended to completely drain the pump to prevent the possibility of freezing in the winter time and/or the possibility of corrosion due to stagnant liquid left in the pump.

1. SAFETY INSTRUCTIONS WHILE MAINTENANCE & SERVICING

- Before attempting any maintenance on a pump particularly if it has been handling any form of hazardous liquid, it should be ensured that the unit is safe to work on. The pump must be flushed thoroughly with suitable cleaner to purge away any of the product left in the pump components. 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 packing which may be contaminated.
- Check and ensure that the pump operates at below the maximum working pressure specified in the manual or on the pump nameplate and before maintenance, ensure that the pump is drained down.
- 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.
- 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 reconnection. In order to avoid the possibility of maintenance personnel inhaling dangerous fumes or vapors, it is recommended that the maintenance work be carried out away from the pump locations by removal of bearing housing and shaft assembly to a suitable to a suitable maintenance area.

2. MAINTENANCE CHECKLIST

Preventive maintenance schedule is the periodical checks and precautions by which possibilities of failure and breakdown are made very remote.

2.1 Daily Checks

- a) Pressure gauge reading.
- b) Bearing temperature.
- c) Leakage through stuffing box.
- d) Noise and vibration.
- e) Voltage and current.
- f) Constant flow of external sealing liquid if provided.
- g) Check all lubricant levels
- h) On grease lubricated pumps, check running hours since last recharge of grease or complete grease change.

2.2 Periodical Maintenance

- i) Replenish the grease.
- j) Change the stuffing box packing.
- k) Check the alignment of the pump set.
- l) Calibrate the measuring instruments.
- m) Check all paint or protective coatings.
- n) Check all power/instrument cable glands for tightness.
- o) Check the sealing connections for leakage etc.

Section 7.....Maintenance and Servicing
2.3 Overhauling:

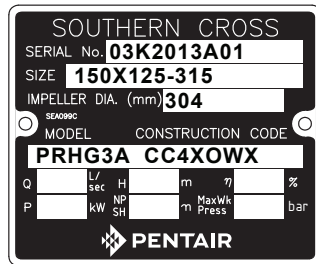
With normal daily operating spell, the pump will be due for overhaul after about 5000 working hours. This work should be done by skilled personnel.

3. SPARE PARTS
3.1 Ordering of spares

The pump size and serial number are shown on the pump nameplate. When ordering spares the nameplate should be referred and following information should be quoted:

- 1) Pump serial number
- 2) Pump size
- 3) Part name — (refer to spares parts list)
- 4) Part number — (refer to spares parts list)
- 5) Number of parts required

Pentair Southern Cross supplied spares should only be used as replacements. Any change to the original design specification (modification or use of a non-genuine part) will invalidate the pump's safety and warranty liability with Pentair Southern Cross.


3.2 Recommended spares

For start-up purposes:

PARTS	QTY
Seal and bearing kit	1
Mechanical seal or packing gland	1
Impeller washer	1
Casing 'O' ring	1

For normal maintenance:

PARTS	QTY
Seal and bearing kit	1
Wear rings (If installed in original pump)	2
Meachanical seal or packing gland	1
Shaft	1
Impeller	1
Impeller washer	1
Casing 'O' ring	1

4. MAINTENANCE SCHEDULE – 'ISO' PUMPS

The below schedule provides a suitable timetable to monitor pump and system performance, and will provide a guide to pending maintenance requirements by comparing the current situation with previous recordings.











Extreme or unusual operating environments should be taken into consideration, and shorter maintenance intervals are recommended.

Section 7.....Maintenance and Servicing

ITEM	PERIOD	ACTION
Bearings	Monthly	Check bearing temperatures by thermometer. If bearing temperature is above 80 Deg. C, it may be because of too much, or insufficient lubrication. If necessary, check the condition of the bearings. Regreaseable bearings should be supplied with fresh grease of the recommended grade. Check for lubricant leaks. Replace seals if leaking.
	3 Monthly	Oil lube bearings should be supplied with fresh oil of the recommended grade. Check old oil for metal particles or water. Check shaft for excessive free play.
Seal or Gland	3 Monthly	Check mechanical seal for leaks. Replace if leaking. Check packing for excessive leaks, and adjust or repack if necessary with the recommended grade and style of packing. When replacing packing, ensure that the lantern ring is aligned with the lubricant supply drillings. When repacking or replacing seals, check the condition of the shaft or sleeve. Replace if badly worn or corroded, and fit new bearings and seals. Check seal or gland flush piping for leaks, and repair or replace.
	Yearly	Check seal for wear, and replace if necessary. Check flush piping for scaling or blockages and clean and replace.
Flexible Coupling	6 Monthly	Check alignment of pump and motor. Re-align if necessary. Check for coupling wear and replace worn flexible element if necessary. Where frequent adjustment of alignment is necessary, check for cause (eg pipe loading, foundation failure, loose fasteners etc). If pipe loads are suspected, unbolt piping at suction and discharge flanges and check for mis-alignment. Check pipe supports and pack or adjust as required.
Pressure & Flow Recordings	3 Monthly	Check inlet and discharge pressure and rate of flow. Record these values and compare with previous recordings. A change in reading may indicate a fault in the system, wear or blockage in the pump. Investigate, and rectify as appropriate, as continued operation may result in untimely plant shutdown.
Valves & Fittings	6 Monthly	Check that ancillary fittings operate correctly. Improper function may cause premature pump failure.
Rotating Element	Yearly	Remove the rotating element and inspect for wear, scale buildup, or blockages. Clean unwanted deposits from components, as buildup will result in loss of performance. Check impeller running clearance. Replace defective components.

Section 7.....Maintenance and Servicing
6. DISMANTLING PROCEDURE
6.1 Tools required

A typical range of tools that will be required to maintain these pumps is listed below:

TOOL		WHERE USED
Open ended spanners (wrenches) to suit up to 2" (M50) screws/nuts		Undoing bearing cover
Tension wrench		Pretensioning impeller nut
Socket spanners (wrenches)		Undoing impeller nut
Socket sizes 28, 38, 48, 50 and 60 A/F		
Metric Allen keys (up to 10mm)		General disassembly
Screw driver set		Removing and assembling seals/gaskets
Soft mallet		Soft loosening assembled parts
Metal wedges		removing impeller off tapered pump shaft
Dial indicator		Checking impeller run-out
Shaft Locker		Holding shaft while undoing impeller nut

Section 7.....Maintenance and Servicing

If spacer type coupling has been fitted between the pump and driver, the pump casing can remain bolted to the suction and discharge pipes.

1. Remove the back plate to casing bolts. Jacking screw holes are provided in the back plate, to facilitate removal of the bearing housing shaft element.
2. Unscrew the impeller nut and remove the Nord-lock washer. Screw the impeller nut back on the shaft by hand and drive a pair of wooden wedges gently between the impeller and back plate, being careful not to distort the impeller. Remove the impeller nut and lift off impeller. Lift out impeller key.
3. Remove the bearing housing to back plate bolts and remove the back plate.



Some pumps do not have separate bearing housing to back plate bolts and these would have been removed in step (1).

4. Remove the bearing cover to bearing housing bolts. By tapping on the end of the shaft with a piece of wood, the shaft, bearing assembly and bearing cover can be removed.

A pump which has become worn in the body or impeller may be repaired by fitting bronze wear rings. These rings, with full instructions for machining the pump parts and fitting rings are obtainable from the nearest Southern Cross Dealer.


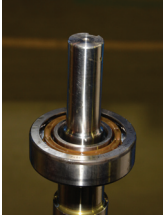





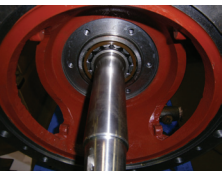


7. RE-ASSEMBLY PROCEDURE

Re-assemble the pump by following the procedure below, paying particular attention to the following:

1. Ensure gasket surfaces are clean.
2. Ensure shaft seal is fitted according to manufacturer's instructions.

Section 7.....Maintenance and Servicing

8. BEARING HOUSING ASSEMBLY

Step 1	Step 2	Step 3	Step 4
			
Fit oil slinger and wet end bearing inner race to shaft then place in appropriate press setup (>30t). *Note bearing orientation. Flange end towards center of shaft*	Slide on a drive end bearing so that the large face of the inner race is towards the impeller end of shaft as shown. Press assembly together.	After pressing first bearing, fit and press second drive bearing. *Note: Second bearing faces opposite direction*	Securely mount bearing housing before assembly.
Step 5	Step 6		Step 7
			
Fit lock washer and nut. Tighten nut then lock.	Fit shaft from driven end		Fit outer race to previously pressed on inner race.
Step 8	Step 9		
			
Fit oil seal to bearing cap.	Fit bearing caps to bearing housing.		

Section 7.....Maintenance and Servicing





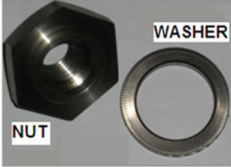



9. FITTING MECHANICAL SHAFT SEALS



Never use excessive force during installation;
 Surroundings for seal installation require a high degree of cleanliness.
 Seal face and seat should be checked for possible damage before installation.

Step 1	Step 2	Step 3	Step 4
<p>OIL OR GREASE MUST NEVER BE USED as an assembly agent</p>	<p>Fit the stationary seat into the machined recess in the pump back-plate making sure the rubber cap is properly fitted over the seat with the rubbing face exposed. Cover the rubbing face with a cardboard washer and using plenty of clean water or liquid soap as lubricant, feed the seat slowly and without interruption into position in the pump back-plate (If necessary use a distance sleeve)</p>		<p>Check that the seat is fully inserted and at right angles to the shaft axis</p>
Step 5	Step 6	Step 7	Step 8
<p>Thoroughly clean the rubbing faces of the stationary seat and rotating element with alcohol and paper tissues (not cloth) and do not touch the faces with bare fingers</p>	<p>Install the rotating assembly of the mechanical seal onto the shaft by place the carbon face onto the shaft so it contacts the mechanical seal seat. Use soap as lubricant.</p>	<p>Push the rotating assembly onto the shaft using a slow clockwise turn until the seal face contacts the stationary seat</p>	<p>Finally the spring should be carefully compressed as the impeller is installed</p>

Section 7.....Maintenance and Servicing
10. FITTING THE IMPELLER

Step 1	Step 2	Step 3	Step 4
			
Apply Loctite 641 on the shaft taper	Loctite 641 should be applied as shown in the above picture (Use Sparingly)	Apply Loctite 263 on the shaft thread (Use Sparingly) and place Mechanical Seal spring in place	Place the Impeller on the Shaft Taper
Step 5	Step 6	Step 7	Step 8
			
Clean Tapered Stainless steel Custom designed Nuts and Nord-Lock Washers	Place the Lock-washer and Impeller nut on the shaft	Tighten nut to the specified torque.	Clean up excess loctite around the nut and shaft

11. SOCKET SIZES AND RECOMMENDED TORQUE

ISO-PRO PUMP	IMPELLER NUT TIGHTENING TORQUE - Nm (ft.lbs)	SOCKET SIZES A/F (mm)
Group 1	80 (60)	28
Group 2	100 (75)	38
Group 3	360 (265)	50
Group 4	750 (550)	60

Section 7.....Maintenance and Servicing

12. GENERAL GUIDE TO USING ADHESIVES, SEALANTS AND LUBRICANTS DURING PUMP ASSEMBLY

La-Co SlicTite Pipe Thread Compound
OR
567 - Master Pipe Sealant (when fast setting required)

641 - Low Strength Retaining Compound
Note: Use sparingly

263 - High Strength Thread Locker
Note: Use sparingly

GA50 - Molybond Anti Seize Lubricant or Equivalent (Used during stainless steel pump assembly only)

680 - High Strength Retaining Compound (For press fitting wear-rings/neck-rings)

La-Co SlicTite Pipe Thread Compound
OR
567 - Master Pipe Sealant (when fast setting required)

Product images shown: Loctite Slic-Tite (white and red), Loctite 567 (white tube), Loctite 641 (red bottle), Loctite 263 (red bottle), Loctite 680 (red bottle), and Loctite GA 50 (yellow tube).

Section 8.....Pump Troubleshooting
1. PUMP TROUBLESHOOTING

When investigating trouble with Pentair Southern Cross pumps, always remember that pumps have been tested at the factory and are mechanically correct when sent out. Discounting the possibility of damage during transit, most of the trouble in the field is due to faulty installation. Investigation shows that the majority of troubles with centrifugal pumps result from faulty conditions on the suction side.

2. BREAK DOWN-CAUSE-CHECK POINTS

In case of breakdown we recommend the location of the fault by using the following table:

BREAKDOWN POINTS	CHECKPOINTS															
	1	7	8	9	10	11	12	13	14	15	17	18	19	23		
Pump does not deliver	25	26	56	57	58											
Pump delivers at reduced capacity	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
Delivery performance deteriorates	1	3	7	9	10	11	12	13	14	15	16	19	22	23		
Pump delivers too much	16	56	57	58												
Delivery is interrupted	1	3	6	7	8	9	10	11	12	13	14	15	16	19		
After stopping pump runs in reverse direction	22	23	25	26	56	57	58	62								
Very noisy	52															
Unsteady running of pump	1	2	5	6	7	8	11	12	13	15	19	20	22	54		
Stuffing box leaks excessively	19	20	22	31	32	33	35	36	37	38	39	40	43	44		
Fumes from stuffing box	47	48	49	50	51	54	55	58								
Pump rotor locked in standstill position	24	27	28	29	30	31	47	48	49	53						
Pump is heating up and seizing	22	23	24	25	26	27	28	29	30	41	42	43				
Bearing temperature increases	22	45	46	50												
Motor will not start	23	24	25	26	27	28	29	30	40	41	42	45	47	48		
Motor gets hot or burns out	49	50	54													
Motor is difficult to start	19	20	21	22	31	32	33	34	35	36	37	38	39	40		
	41	42	43	44	45	46	47	48	49	51	54	55	58			
	14	22	60													
	14	22	27	28	40	43	50	55	56	57	58	59	60	61		
	14	22	27	28	45	46	50	58	59	60						

Section 8.....Pump Troubleshooting

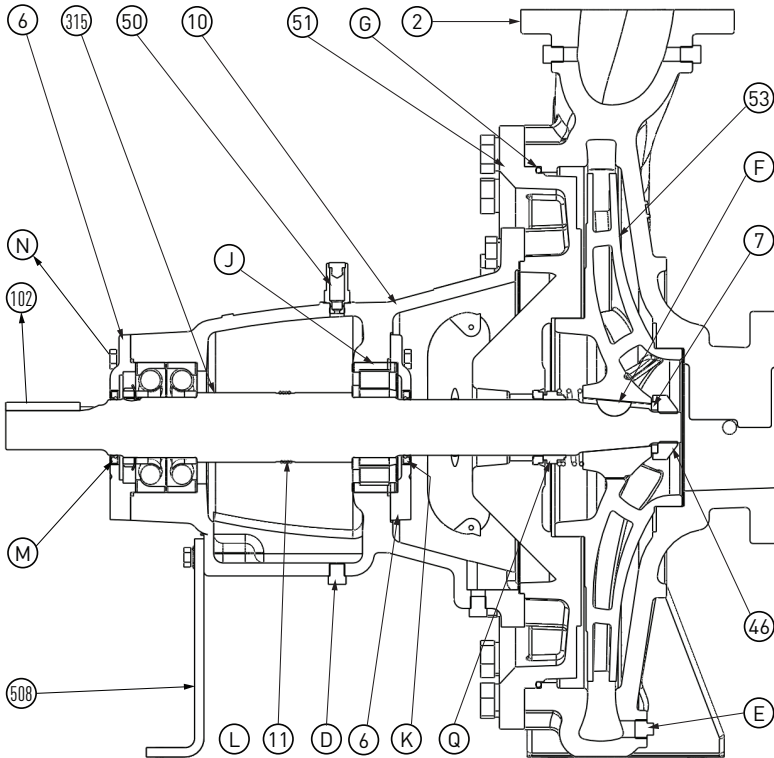
3. DESCRIPTION OF CHECK POINTS:

1	Suction pipe, foot valve choked.	32	Specified oil level not maintained.
2	Nominal diameter of suction line too small.	33	Insufficient lubrication of bearings.
3	Suction pipe not sufficiently submerged.	34	Bearings over-lubricated.
4	Too many bends in the suction line.	35	Oil/Grease quality unsuitable.
5	Clearance around suction inlet not sufficient.	36	Bearing incorrectly fitted.
6	Shut off valve in the suction line in unfavourable position.	37	Axial stress on bearings (no axial clearance for rotor).
7	Incorrect layout of suction line (formation of air pockets).	38	Bearings dirty.
8	Valve in the suction line not fully open.	39	Bearings rusty (corroded).
9	Joints in the suction line not leak-proof.	40	Axial thrust too great because of worn casing rings, relief holes obstructed.
10	Air leaking through the suction line and stuffing box etc.	41	Insufficient cooling water supply to stuffing box cooling.
11	Suction lift too high.	42	Sediment in the cooling water chamber of the stuffing box cooling.
12	Suction head too low (difference between pressure at suction connection and vapour pressure too low).	43	Alignment of coupling faulty or coupling loose.
13	Delivery liquid contains too much gas and/or air.	44	Elastic element of coupling worn.
14	Delivery liquid too viscous.	45	Pump casing under stress.
15	Insufficient venting.	46	Pipeline under stress.
16	Number of revolutions too high.	47	Shaft runs untrue.
17	Number of revolutions too low.	48	Shaft bent.
18	Incorrect direction of rotation (electric motor incorrectly connected, leads of phases on the terminal block interchanged).	49	Rotor parts insufficiently balanced.
19	Impeller clogged.	50	Rotor parts touching the casing.
20	Impeller damaged.	51	Vibration of pipe work.
21	Casing rings worn out.	52	Non-return valve gets caught.
22	Separation of crystals from the flow of pumping liquid (falling below the temperature limit/ equilibrium temp).	53	Contaminated delivery liquid.
23	Sealing liquid line obstructed.	54	Obstruction in delivery line.
24	Sealing liquid contaminated.	55	Delivery flow too great.
25	Lantern ring in the stuffing box is not positioned below the sealing liquid inlet.	56	Pump unsuitable for parallel operation.
26	Sealing liquid omitted.	57	Type of pump unsuitable.
27	Packing incorrectly fitted.	58	Incorrect choice of pump for existing operating conditions.
28	Gland tightened too much/slanted.	59	Voltage too low/power supply overloaded.
29	Packing not suitable for operating conditions.	60	Short circuit in the motor.
30	Shaft sleeve worn in the region of the packing.	61	Setting of starter of motor too high.
31	Bearing worn out.	62	Temperature delivery liquid too high.

Section 8.....Pump Troubleshooting

4. ORDERING PARTS:

Please refer to spare parts list provided.

5. CROSS SECTION AND PARTS LIST


ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
2	Volute Casing	102	Shaft Key	J	Bearing - Impeller End
6	Bearing Cover	301	Bearing Housing	K	Dust Seal - Impeller End
7	Impeller Lock Washer	315	Shaft	L	Oil Level Plug (NS)
11	Oil Thrower	508	Support Foot	M	Dust Seal - Pulley End
14	Water Slinger	D	Oil Drain Plug	N	Bearing - Pulley End
46	Impeller Nut	E	Casing Plug	P	Gland Flushing Plug (NS)
50	Oil Breather	F	Impeller Key	Q	Mechanical Seal
51	Backplate	G	Casing O-Ring	R	Packed Gland (NS)
53	Impeller			(NS)	Part Not Shown



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