Installation, Operation and Maintenance Manual

HDS – Submersible Pumps

Agitator

Document No. – A1540

Vulcan Pumps LLC
A Brownlee-Morrow Company

Thank you for purchasing a Vulcan HDS pump. We take pride in every product we build.

To insure that you receive the highest quality product, we have enclosed a quality assurance checklist signed by the Assembler and Shop Foreman.

For information regarding installation and maintenance please refer to the Operation and Instruction Manual or contact your local distributor.

Thanks Again,

Malcolm Morrow

A Brownlee-Morrow Enterprises Company

Forged For Life!

7450 Cahaba Valley Rd. | Birmingham, AL. 35242
P 1.800.624.7069 | F 205.995.9603 | www.vulcanpumps.com

VULCAN SUBMERSIBLE PUMP ASSEMBLY QUALITY ASSURANCE CHECKLIST

Important Information for future reference. Do not discard this page!

DOCUMENT NBR	BMC-103
EFFECTIVE DATE	1/1/2013

Customer:
Customer PO#
Manufacurer: Vulcan
Model: HDS
Size:
Serial #
Shop #

COMPONENTS

Verify components are present, conduct visual inspection, and confirm assembly.

Casing	☐ Visual	☐ Assembly	Casing Gaskets	☐ Visual	☐ Assembly
Impeller	☐ Visual	☐ Assembly	O-Rings/Gaskets	☐ Visual	☐ Assembly
Suction Cover	☐ Visual	☐ Assembly	Agitator/Extension Kit	☐ Visual	☐ Assembly
Motor Cover	☐ Visual	☐ Assembly	Pump Stand	☐ Visual	☐ Assembly

TAGGING/NAMEPLATE

Tag pump with proper identification information.

Vulcan Pumps Nameplate	☐ Included
Vulcan Pumps Sticker	☐ Included
Motor Plate	☐ Included
Special Tagging	☐ Included

ACCESSORIES/OPTIONS

Note or check any accessories included and shipped with pump.

Moisture Detection Relay	☐ Included		
Control Panel	☐ Included	Spray Ring	☐ Included

MOTOR

Document or check the following motor information.

Serial #		Insulation	☐ F ☐ H ☐ High Ambient
HP		Frame Size	Shaft Mat'l.
RPM		Enclosure	☐ TENV ☐ TEXP
Ph/Hz/V		Seal Type	☐ ISS ☐ STD/XP ☐ Super Slurry Seal

ADDITIONAL CHECKS

Note or check the following information.

Impeller Trim	☐ Yes ☐ No
Impeller Diameter	
Impeller Balance	☐ Completed
Impeller Clearance	
Flanges Covered	☐ Completed
Painting	☐ Completed
Discharge Size	

INSTALLATION/OPERATION MANUALS

Confirm the following manuals are included with shipment.

Pump	☐ Included
Motor	☐ Included

Shop Check By: _____ Date_____

SHIPPING

Boxes Secure	☐ Completed
Proper Skidding	☐ Completed

Shipping Check By: _____ Date_____

Approval			
Name	**Signature**	**Title**	**Date**
Malcolm Morrow	**M.M.**	**President**	**23 January 2014**

Revisions History			
Revision No.	**Signature**	**Date of Change**	**Change Summary**
0	**RJ. R**	**23 January 2014**	**Initial Release**

Contact

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1.0 General

1.1 Introduction

The Vulcan HDS submersible pump has been designed and manufactured to handle the toughest pumping applications and environments. It is our desire to provide our customers with high quality products and service that exceeds their application expectations.
This manual is intended to assist technical personnel with the installation, operation and maintenance of the HDS submersible pump. It is our recommendation that this manual be thoroughly reviewed and understood prior to performing any installation, operation or maintenance related activities. Please contact your local Vulcan representative if you have any questions related to the instructions and procedures within this manual.

1.2 Transportation & Storage

WARNING!

BEFORE LOADING AND UNLOADING EQUIPMENT PLEASE REFER TO SECTION 3.2 HANDLING & LIFTING!

1.2.1 Transportation

The pump is required to be transported in a vertical position in the normal operating orientation. The standard shipping packaging is comprised of the pump support stand secured to an open pallet with the pump and motor and motor cables wrapped in shrink wrap. Optional crating is available; please contact your local Vulcan representative for crate details and pricing.

1.2.2 Storage

1.2.2.1 Short Term Storage

New pumps being stored less than three months time before installation require storage in a dry environment at temperatures ranging from 10°C (50°F) to 49°C (120°F), relative humidity must not exceed 60%. The shaft must be rotated 15 times every 30 days.

1.2.2.2 Long Term Storage

1.2.2.2.1 New Pump Long Term Storage

New pumps being stored more than three months time before installation must adhere to the following procedures:

- Notify Vulcan Pumps in writing that the equipment is to be stored more than three months time prior to installation and the proper long term storage procedures have been adhered to.
- Pumps must be stored in a long term storage crate.
- Pumps must be stored in a dry environment at temperatures ranging from 10°C (50°F) to 49°C (120°F), relative humidity must not exceed 60%.
- Minimum winding resistance (5 Meg ohms) must be checked every 30 days.
- The shaft must be rotated 15 revolutions every 30 days.

1.2.2.2.2 Used Pump Long Term Storage

Used pumps being put into long term storage more than two months time before installation should adhere to the following procedures:

- Pump wet end and motor should be disassembled, cleaned and inspected for wear and damage.
- All originally painted parts should be touched up or repainted.
- Pump should be reassembled and stored in an upright position.

WARNING!

DAMAGED PUMP PARTS SHOULD BE REPLACED TO ENSURE SAFE AND PROPER PERFORMANCE OF THE PUMP!

- Pumps must be stored in a long term storage crate.
- Pumps must be stored in a dry environment at temperatures ranging from 10°C (50°F) to 49°C (120°F), relative humidity must not exceed 60%.
- Minimum winding resistance (5 Meg ohms) must be checked every 30 days.
- The shaft must be rotated 15 times every 30 days.

1.2.2.2.3 Spare Parts Long Term Storage

Spare Parts do not come with rust inhibitor protection for long term storage, unless specified on the order. New pump parts being stored for more than three months time before installation must adhere to the following procedures:

- Cast and machined wet end parts should be stored in a dry environment
- Mechanical Seal Assemblies should be kept sealed in their original packaging and kept in a dry environment
- Elastomer components should be stored in a sealed polyethylene bag, kept in a dry environment and away from of exposure to UV rays.

1.3 Receiving Inspection

Each pump requires inspection immediately upon arrival at site. Ensure that any irregularities and (or) damages caused during the shipping process is reported to the transportation company and Vulcan Pumps. Make any claims for lost or damaged items to the transportation company.

Note: Pump Accessories are usually packed in separate boxes, containers and crates. Inspect all boxes, containers and crates before recycling.

1.3.1 Receiving Inspection Mechanical Seal

The pump mechanical seal was visually inspected for oil leaks prior to assembling the pump wet end components. It is possible that the pumps were subjected to rough handling during the shipping process and it is recommended that the motor seal area be inspected for oil leaks prior to installation.

1.3.2 Receiving Inspection Electric Submersible Motor

For electric submersible motor receiving inspection refer to:

Baldor® - Reliance® AC Submersible Motors
Installation & Operation Manual, MN414
Section 1 General Information

1.4 Warranties

Seller warrants that the products covered by this contract conform to applicable drawings and specifications accepted in writing by Seller, will be free from defects in material and workmanship, will be merchantable and will perform in accordance with the detailed specifications accepted in writing by Seller.

These warranties extend for a period of twelve (12) months from the date of purchase by Buyer. Buyer's exclusive remedy and Seller's sole duty under these warranties is to repair or replace the product. Normal wear and tear on Seller's product shall not constitute a warranty defect.

THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, WHICH EXTEND BEYOND THOSE SET FORTH ABOVE. THE WARRANTY OF MERCHANTABILITY IS LIMITED TO THE PERIOD SPECIFIED ABOVE.

These warranties are contingent upon the product being stored, installed, maintained, and operated in accordance with good engineering practices and the instructions contained in the installation, operation and maintenance manual. Failure to do so shall operate to void all warranties.

Seller's total responsibility for damages whether arising in contract or tort arising out of or relating to the performance of the product or the warranties hereunder shall be strictly limited to

the contract price for the product. In no event shall Seller be liable for any incidental or consequential damages such as lost profits, loss of use of productive facilities or equipment, expenses or damages incurred in reliance on the product's performance or lost production whether suffered by buyer or any third party.

Seller warrants that the products comply with OSHA standards on drive guard design and construction (if applicable) in effect at the time of manufacture and makes no other warranty with respect to any other standards. Seller shall not be responsible for failure of parts to fit properly due to deterioration of or modification to Buyer's existing equipment for which such parts are furnished.

Seller makes no warranty or guarantee that the product supplied hereunder will comply with the performance of Buyer's existing equipment.
Seller reserves the right to furnish substitutes for material not available or whose use is restricted.

The use of (a) non-OEM components or (b) non-OEM pump spare parts and/or (c) non-approved modifications to the product and/or (d) failure to install a moisture detection relay and/or (e) failure to connect the thermal overload protection wiring will operate to void all warranties.

We reserve the right to change the design, construction or material of any part without incurring the obligation of installing such changes on pumps already delivered.

2.0 Safety

Installation and Operational safety is the upmost importance in the design and operation of our pumps. It is imperative that the equipment is installed and operated in accordance with the instructions and guidelines outlined within this manual.

Safe installation, operation and maintenance activities are the responsibility of the end user. It is our recommendation that this manual be thoroughly reviewed and understood by all personnel prior to performing any installation, operation or maintenance related activities. Please contact your local Vulcan representative if you have any questions related to the instructions and procedures within this manual.

It is the responsibility of the end user to use trained and qualified personnel for the installation, operation and maintenance of the pump. It is also the responsibility of the end user to follow safety standards that comply with regional and industry specific safety standards and procedures. This manual does not relieve installation, operation and maintenance personnel of the responsibility of exercising normal good judgement in the installation, operation and maintenance of the pump.

2.1 Safety Definitions

Within this manual the words WARNING!, CAUTION! AND ELECTRICAL! are used to indicate areas where the installer, operator and maintenance personnel need to exhibit extra care and attention.

2.1.1 Vulcan Pump Safety Definitions

WARNING!

IF IGNORED COULD LEAD TO SERIOUS INJURY OR DEATH!

CAUTION!

IF IGNORED COULD LEAD TO SERIOUS DAMAGE TO THE PUMP OR ASSOCIATED EQUIPMENT!

ELECTRICAL!

IF IGNORED COULD LEAD TO ELECTRICAL SHOCK, BURNS OR ARC FLASH!

2.1.2 Baldor® - Reliance® Electric Submersible Motor Safety Definitions

For electric submersible motor safety definitions refer to:

Baldor® - Reliance® AC Submersible Motors
Installation & Operation Manual, MN414
Section 1 General Information

2.2 General Safety Precautions

WARNING!		NEVER APPLY HEAT TO REMOVE THE IMPELLER!
WARNING!		NEVER USE HEAT TO DISASSEMBLE PUMP COMPONENTS!
WARNING!		ALWAYS LOCK OUT POWER TO THE ELECTRIC MOTOR BEFORE PERFORMANING ANY MAINTENANCE!
WARNING!		NEVER MOVE PUMP WITHOUT PROPER MECHANICAL ASSISTANCE!
WARNING!		FLANGED CONNECTIONS – USE CORRECT FASTENER SIZE AND MATERIAL!
WARNING!		ENSURE ALL FASTENERS ARE TIGHTENED TO SPECIFIED TORQUE!
WARNING!		ENSURE PROPER PERSONAL PROTECTION EQUIPMENT IS WORN AT ALL TIMES!
WARNING!		PUMP PARTS MAY HAVE BEEN USED IN THE TRANSPORT OF HARMFUL AND DANGEROUS CHEMICALS!
WARNING!		WORN PUMP PARTS MAY HAVE SHARP EDGES!
WARNING!		DAMAGED PUMP PARTS SHOULD BE REPLACED TO ENSURE SAFE AND PROPER PERFORMANCE OF THE PUMP!
CAUTION!		OPERATING THE PUMP WITHOUT CLEANING OUT THE SUMP PRIOR TO INSTALLATION MAY CAUSE DAMAGE TO THE PUMP ASSEMBLY!
CAUTION!		ALWAYS CALCULATE THE SLURRY SYSTEM OPERATING POINT PRIOR TO PURCHASING OR INSTALLING A PUMP!
CAUTION!		NEVER STOP THE PUMP WHILE SOLIDS ARE IN THE DISHCARGE PIPE!
CAUTION!		ENSURE MOISTURE SENSOR RELAY IS PROPERLY INSTALLED AND OPERATIONAL!
CAUTION!		ENSURE MOTOR OVER TEMPERATURE PROTECT SYSTEM IS PROPERLY INSTALLED AND OPERATIONAL!

For electric submersible motor General Safety Precautions refer to:

Baldor® - Reliance® AC Submersible Motors
Installation & Operation Manual, MN414
Section 1 General Information

3.0 Installation

Ensure that all regional and industry specific safety standards and procedures are understood and followed prior to and during the installation process. All electrical work must be performed by a certified electrician.

3.1 Pump Mounting and Positioning

The pumps can be directly mounted on the sump floor supported entirely by the pump stand. The sump floor must be level to prevent the pump from tipping over during operation. If the sump floor is soft then the pump must be connected to a lifting apparatus with limited slack to prevent the pump from burrowing into the soft floor.

3.2 Handling and Lifting

The HDS Submersible pumps are equipped with integral lifting lugs, designed to support weight of the pump assembly for pump installation and removal. The weight of the pump is listed on the pump data sheet in section 7.4 and also located on the pump nameplate. Ensure that the lifting capacity of the rigging and lifting equipment is rated to lift the weight of the pump assembly.

For lifting methods refer to:

Baldor® - Reliance® AC Submersible Motors
Installation & Operation Manual, MN414
Section 2 Installation & Operation

WARNING!

DO NOT MOVE THIS EQUIPMENT WITHOUT MECHNICAL ASSISTANCE!

WARNING!

FORK LIFT TRUCKS AND HEAVY MACHINERY OPERATING!

3.2.1 Vulcan Pumps Optional Lifting Bail

Vulcan Pumps offers an optional lifting bail that allows for a central lifting point, designed for cold temperature operation, 122°F to -58°F (+50°C to -50°C). Contact your Vulcan Pumps representative for more details.

3.3 Pipe Connections

Discharge piping and hose must be mounted and supported in such a manner that it does not transmit stress to the pump casing. It is recommended that heavy duty, steel wire reinforced elastomeric discharge hose be installed rather than traditional rigid discharge pipe. If rigid discharge pipe is being installed then it is recommended that reinforced expansion joints be incorporated into the discharge line.

The discharge flange details are as follows:

Pump Model	Flange Size (in)	Bolts mm (in)	Nuts	Qty	Torque
50L	2	M16x45	N/A	4	111 lb-ft (150 Nm)
75L / 75M	3	M16x50	N/A	4	111 lb-ft (150 Nm)
100L / 100M	4	M16x50	N/A	8	111 lb-ft (150 Nm)
150L	6	M20x55	N/A	8	221 lb-ft (300 Nm)
150M	6	M20x90 ¾"x3.5"	M20 ¾"	8	221 lb-ft (300 Nm) 200 lb-ft (275 Nm)
200L / 200M	8	M20x ¾"x3.75"	M20 ¾"	8	221 lb-ft (300 Nm) 200 lb-ft (275 Nm)

All Flanges are 150#, Flat Face, ANSI B16.5

3.3.1 Optional Water Jacket Piping

If the pump is operating and the motor is drawing amps for more than 15 minutes below the minimum water level, then a water jacket is required to cool the submersible motor, to prevent the motor from overheating and possibly damaging the electric motor windings.

Cooling water Supply

Water Supply	Clean mill duty water free from sand and grit.
Water Supply Flow Rate	5-10 USGPM (1.14 – 2.27 M^3/hr)
Maximum Water Supply Temperature	104°F 40°C (40°C) Continuous Duty
Minimum Water Inlet Pressure	((Submergence Depth (ft) x S.G.)/2.31) + 5 PSIG ((Submergence Depth (m) x S.G.)/.102) + 34.5 KPA
Maximum Water Inlet Pressure	((Submergence Depth (ft) x S.G.)/2.31) + 10 PSIG ((Submergence Depth (m) x S.G.)/.102) + 69 KPA

Notes:

1. If one water supply line is utilized to supply both a water jacket and jet ring then it is recommended to use a pressure reducing valve before the water jacket inlet fitting to ensure the maximum water jacket working pressure is not exceeded.

2. Ensure that adequate cooling water is supplied to the water jacket while the pump is in operation. Failure to supply adequate cooling water during operation can result in overheating of the motor windings and possibly damage the electric motor.

3.3.2 Optional Jet Ring Piping

If a jet ring is utilized please contact your local Vulcan Pumps representative for the specific jet ring data sheet.

3.4 Electrical Installation

All electrical installations should conform to all regional and industry specific electrical standards. All electrical work must be performed by a licensed electrician. Always check the motor data on the motor name plate to ensure that the electrical input parameters matches the motor nameplate parameters.

WARNING!

ALWAYS LOCK OUT & DISCONNECT POWER TO THE ELECTRIC MOTOR BEFORE PERFORMANING ANY MAINTENANCE!

3.4.1 Moisture Sensor Relay

Vulcan Pumps electric submersible motors come equipped with two moisture sensor probes in the oil chamber. Vulcan Pumps requires the installation and operation of an approved moisture sensor relay to qualify for motor warranty.

Suitable Moisture Sensor Relay Brands and Models

Brand	Model
WARRICK®	2810
AMETEK®	8040
PUMP SAVER®	460-15-100-SLD

CAUTION!

AN APPROVED MOISTURE SENSOR RELAY MUST BE INSTALLED TO PREVENT DAMAGE TO THE ELECTRIC MOTOR! FAILURE TO INSTALL & OPERATE AN APPROVED MOISTURE SENSOR RELAY WILL VOID THE MOTORS WARRANTY!

For moisture sensor protection information refer to:

Baldor® - Reliance® AC Submersible Motors
Installation & Operation Manual, MN414
Section 2 Installation & Operation

3.4.2 Thermal Device

Vulcan Pumps electric submersible motors come equipped with two thermostats as standard that provide Over Temperature Protection. Vulcan Pumps requires the thermostats to be properly installed to the holding coil of the magnetic starter.

CAUTION!

MOTOR THERMOSTAT OVER TEMPERATURE PROTECTION MUST BE INSTALLED AND OPERATIONAL TO VALIDATE THE MOTORS WARRANTY!

Optional Thermal Devices

Options	Description
Standard	(2) Normally Closed Thermostats
Option 1	(3) Thermistors
Option 2	(6) Thermistors
Option 3	(6) RTD's

Note: Bearing temperature monitoring is not available.

Please contact your local Vulcan Pumps representative if you have any questions relating to available Thermal Devices.

For thermal protection information refer to:

Baldor® - Reliance® AC Submersible Motors
Installation & Operation Manual, MN414
Section 2 Installation & Operation

3.4.3 Optional Ground-Fault / Ground-Check Monitoring

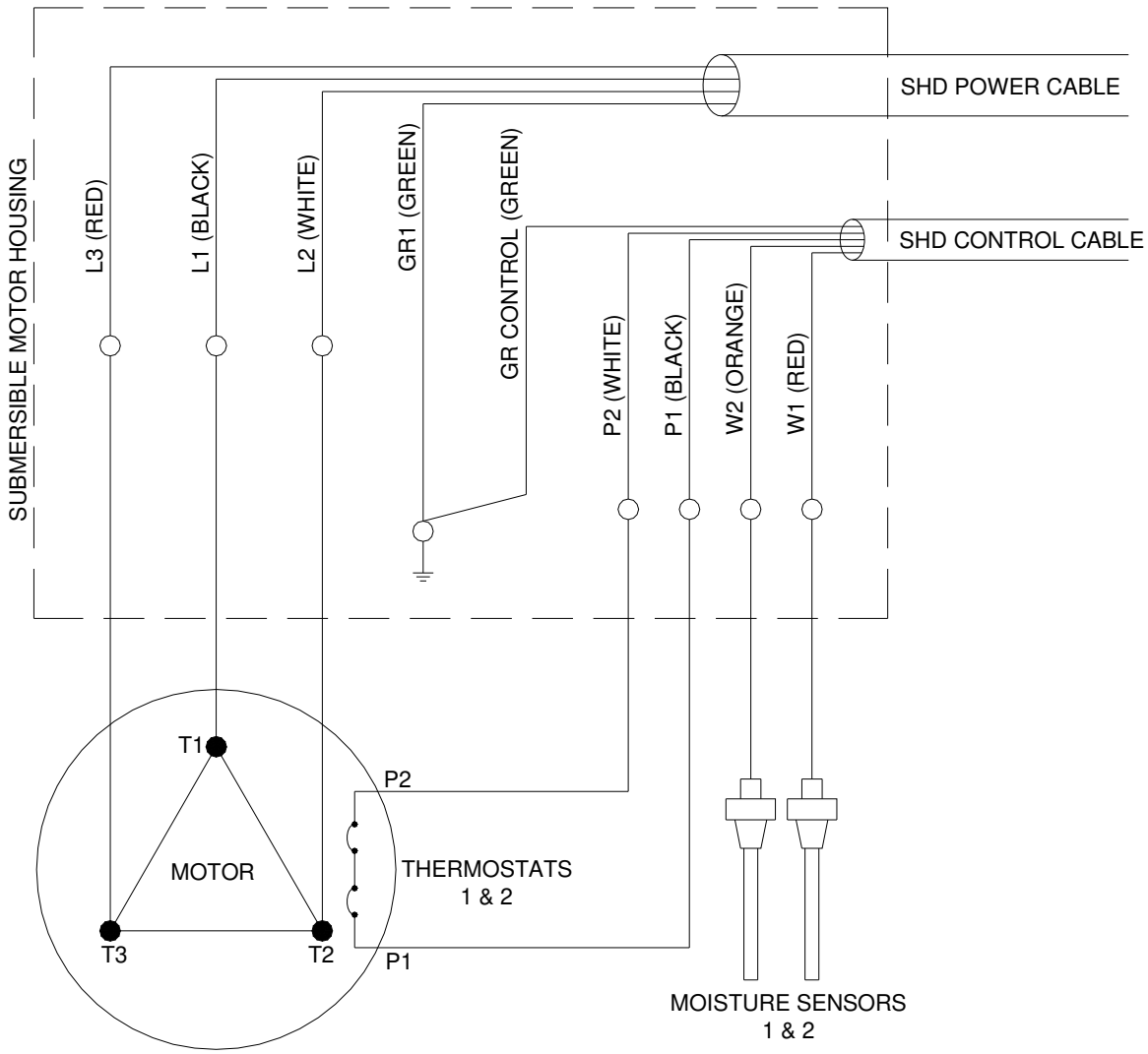
Vulcan Pumps offers customers the option of ground-fault / ground-check monitoring equipment to comply with regional and industry specific electrical standards. The equipment continuously monitors the integrity of the ground wire to protect portable equipment from hazardous voltages caused by ground faults. This monitoring system meets the CSA-M421-00 Use of Electricity in Mines standard. Please contact your local Vulcan Pumps representative if you have any questions relating to Ground-Fault / Ground-Check Monitoring.

3.4.4 Electric Submersible Motor Installation

For the electric submersible motor installation refer to:

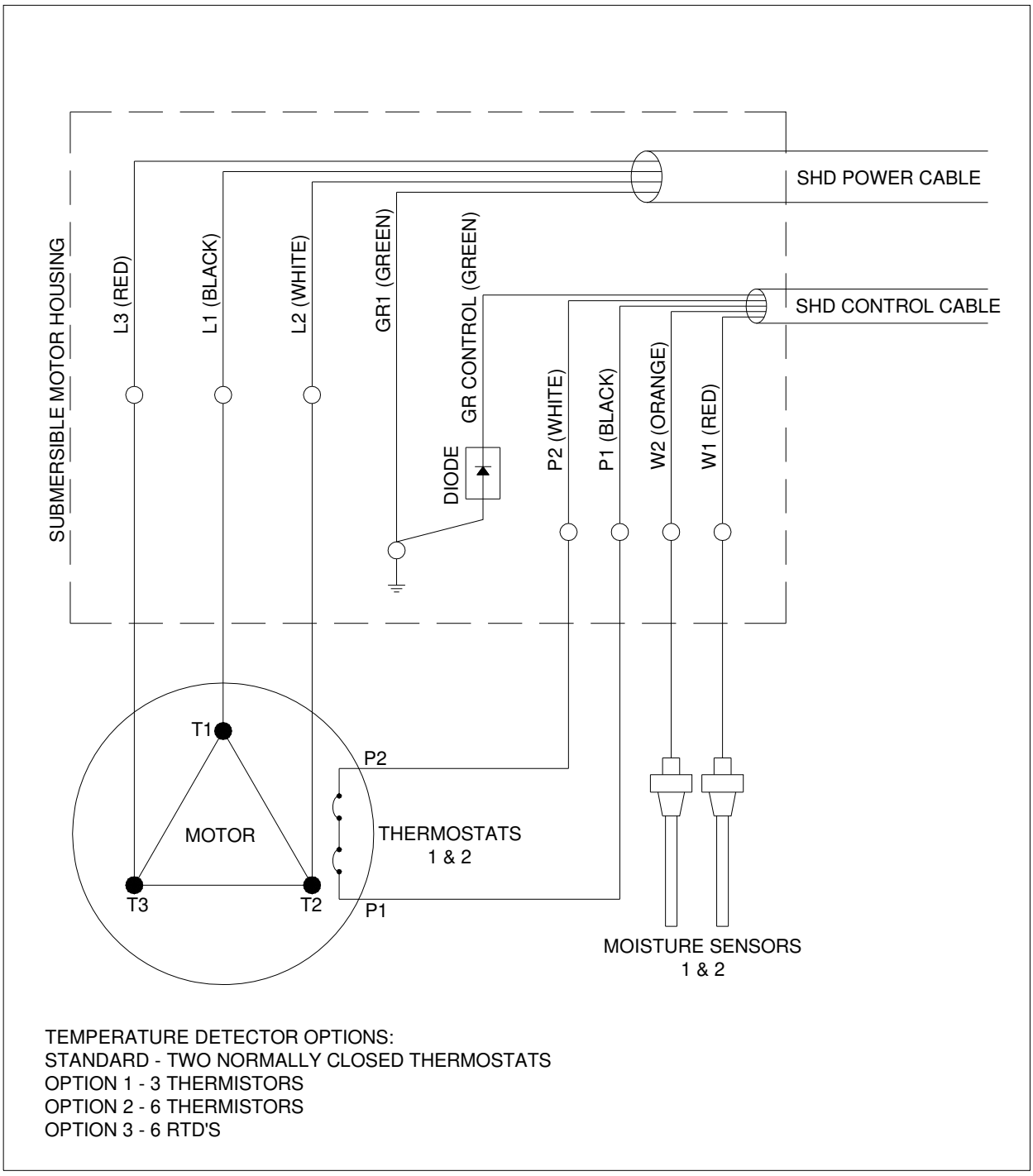
Baldor® - Reliance® AC Submersible Motors
Installation & Operation Manual, MN414
Section 2 Installation & Operation

3.4.5 Wiring Schematic (Standard)



TEMPERATURE DETECTOR OPTIONS:
STANDARD - TWO NORMALLY CLOSED THERMOSTATS
OPTION 1 - 3 THERMISTORS
OPTION 2 - 6 THERMISTORS
OPTION 3 - 6 RTD'S

3.4.6 Wiring Schematic (Optional Ground-Fault / Ground-Check Monitoring)



4.0 Operation

4.1 Pump Start-Up Check List

Power and Control Cables	Check the power and control cables for damage such as cuts and tears in the out cable jacket.
Electrical Power	Ensure the power supply parameters match the motor nameplate data. Check fuses on each leg to prevent single phasing of the motor.
Control Systems	Check the moisture sensor relay and temperature sensor system to ensure they are functioning and working correctly.
Electrical Connections	Ensure all power and control cable connections are correctly installed and the motor is properly grounded.
Rotation Check (Bump Test)	Ensure the pump is rotating CCW when viewed from the suction side of the pump. If the rotation is incorrect, switch two of the motor legs in the control panel.
Pipe Connections	Check all pipe connection bolt torques to ensure proper installation. Ensure all pipes and hoses are properly supported and are not pinched.
Cooling Water-Optional	Check to see cooling water is flowing through the water jacket and into the sump.
Flush Water-Optional	Check to see the jet ring flush water is spraying out of the jet ring nozzles.
Sump	Check to see that all construction debris and foreign objects have been removed from the sump.
Discharge Valve	If possible ensure that the discharge valve is closed prior to start-up. Once the pump is running open the discharge valve.

4.2 Pump Start-Up

It is recommended to commission your Vulcan Pump starting with a clean sump using clean mill water as the medium. In cases where there is solids build up in the sump it is recommended to dig out the solids prior to commissioning or re-installing the pump, this will allow the pump to securely sit on the sump floor and eliminate construction debris and foreign objects from getting into the pump during start-up. Once the pump is installed and commissioned, process solids can be reintroduced into the sump.

If the sump cannot be cleaned out, the following procedures are recommended. Slowly lower the pump into the solids / liquid mixture. It is imperative that the mixture of the slurry does not exceed the applications maximum slurry concentration. If the maximum concentration is exceeded, the flow rate of the pump is drastically reduced, which translates into a lower discharge pipe velocity. The solids / liquid mixture requires a minimum discharge line velocity to ensure the solids mixture stays in suspension and does not settle out plugging the discharge pipe. It is recommended to monitor the output of the discharge line to ensure a consistent flow rate of liquid and solids material.

Once the pump has found a stable operating condition, monitor the motor amperage draw. If possible monitor the pump discharge pressure and flow rate. It is recommended that amperage draw, discharge pressure and flow rate readings be recorded frequently to identify any changes in the pump performance that could indicate possible problems with the pump or motor.

CAUTION!

ALWAYS CHECK THE MOTOR AMPERAGE DRAW TO ENSURE THE MOTOR IS NOT BEING OVERLOADED?

CAUTION!

OPERATING THE PUMP WITHOUT CLEANING OUT THE SUMP PRIOR TO INSTALLATION MAY CAUSE DAMAGE TO THE PUMP ASSEMBLY!

CAUTION!

ALWAYS CALCULATE THE SLURRY SYSTEM OPERATING POINT PRIOR TO PURCHASING OR INSTALLING A PUMP!

4.3 Pump Shut Down

CAUTION!

NEVER STOP THE PUMP WHILE SOLIDS ARE IN THE DISHCARGE PIPE!

Always flush the entire discharge line with clean liquid prior to shutting down the pump.

4.3.1 Pump Standby - Cold Temperature Applications

If the pump is removed from the sump when it is not being used, ensure the following:

1. Drain all of the liquid from the wet end components, water jacket, jet ring and piping. Water expands when it freezes and can cause damage to equipment.
2. The oil in the motor seal cavity can thicken during standby and some of the elastomers must not be operated in cold temperatures. Ensure that the pump is pre-heated prior to start-up.

5.0 Maintenance

Ensure that all regional and industry specific safety standards and procedures are understood and followed prior to and during the installation process. All electrical work must be performed by a certified electrician.

5.1 Maintenance Safety

WARNING!

ALWAYS LOCKOUT & DISCONNECT POWER TO THE ELECTRIC MOTOR BEFORE PERFORMANING ANY MAINTENANCE!

WARNING!

DO NOT MOVE THIS EQUIPMENT WITHOUT MECHANICAL ASSISTANCE!

WARNING!

PUMP PARTS MAY HAVE BEEN USED IN THE TRANSPORT OF HARMFUL AND DANGEROUS CHEMICALS!

It is imperative that Operation and Maintenance Personnel adhere to the regional and industry specific health and safety standards. We recommend the following procedures as a minimum:

- Follow MSDS and Internal Company Documentation for solids / liquid mixture safe handling procedures.
- Always wear appropriate personal protection equipment before starting work.
- Flush the pump and parts with a non-reactive safe liquid before disassembly.
- Once flushed dismantle the pump parts and clean with water.

5.2 Preventative Maintenance

The pump operating condition should be monitored on an ongoing basis. It is recommended that amperage draw, discharge pressure and flow rate readings be recorded frequently to identify any changes in the pump performance that could indicate possible problems with the pump or motor.

If the pump amperage, discharge pressure and flow rate have a significant change then it is recommended to remove the pump from service and complete a mechanical and electrical inspection.

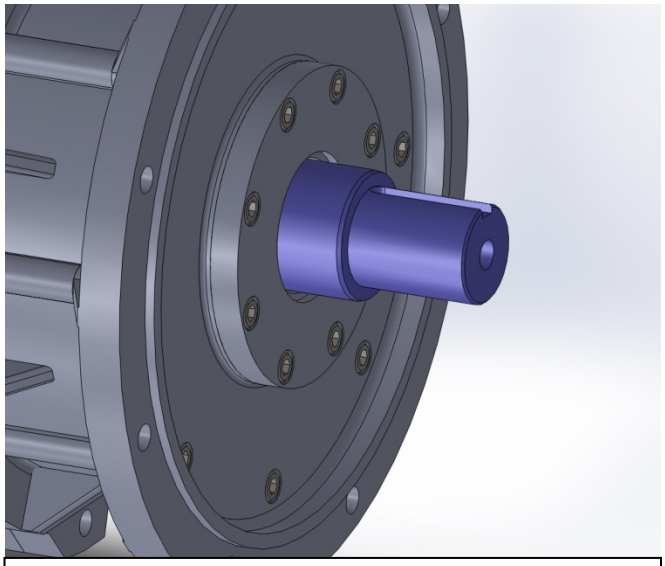
The motors seal leak detection moisture sensor system protects the motor from damage to the motor components. If the Inboard Mechanical Seal fails, the moisture sensor system detects the failure and shuts down the pump.

The motor thermostats protect the motor from damage to the motor components due to overheating. If the thermostats detect a high temperature the pump will shut down.

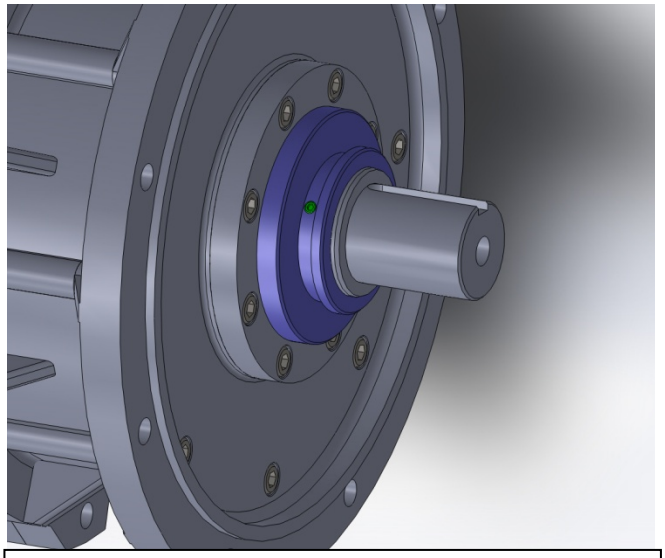
5.3 Maintenance Tools and Equipment

HDS	**50L / 75L / 100L - A**	**150L / 75M / 100M - A**	**200L / 150M / 200M - A**
Allen Wrench	3/8”	1/2"	5/8”
Allen Wrench	3mm	3mm	5mm
Allen Wrench	4mm	4mm	8mm
Allen Wrench	10mm	14mm	14mm
Torque Wrench	1.7 – 221 lb-ft (2.3 kN – 300 Nm)		
Box Wrench	1” (24mm)		2” (50mm)
Box Wrench	13/16” (20mm)		1-7/16 (36mm)
Anti Seize	Nickel Based		
Loctite ®	262 High Strength		
Grease	Teflon Grease		

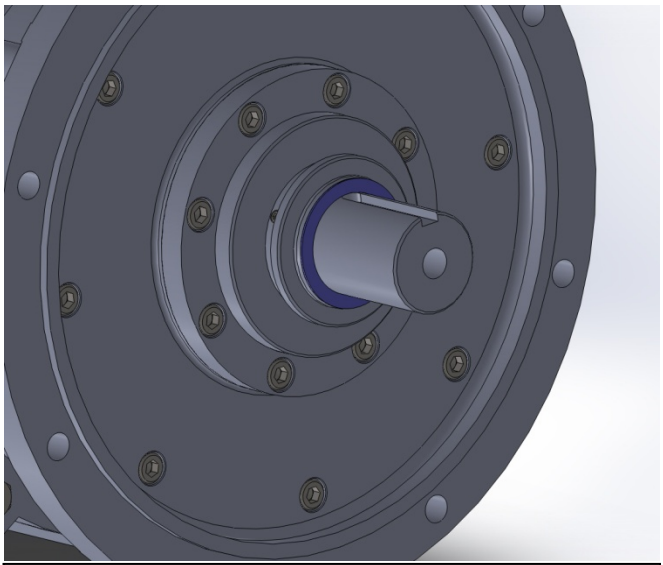
5.4 Wet End Component Installation



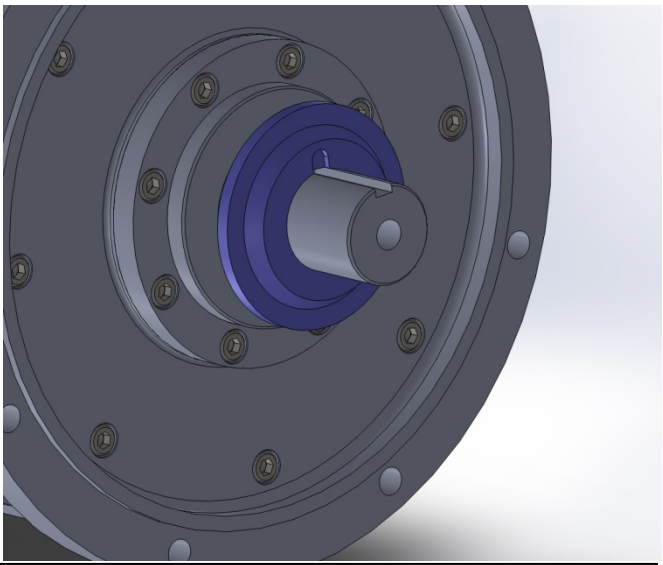
Apply Anti Seize to Motor Shaft.



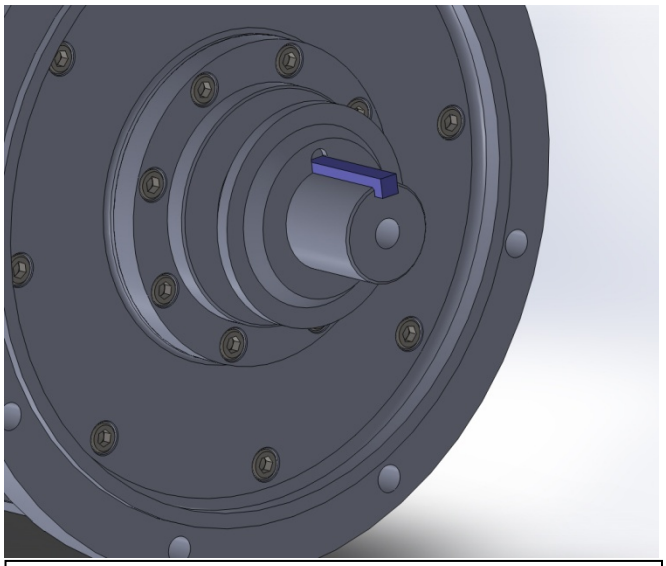
Motor Models: Run Dry Slurry Seal Only
Pack the motor lip seal with Teflon Grease. Install the Motor Deflector onto the shaft; ensure a 0.02" (0.5mm) gap between the seal chamber cover plate and Motor Deflector. Tighten set screws.



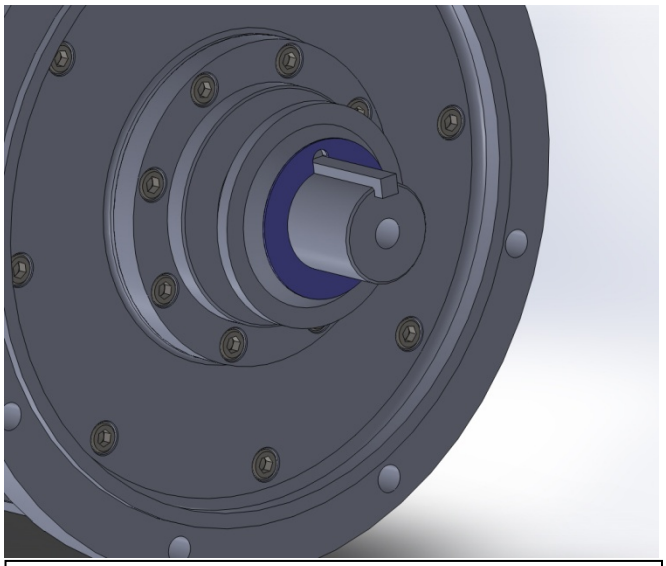
Install the Deflector Gasket (073.2).



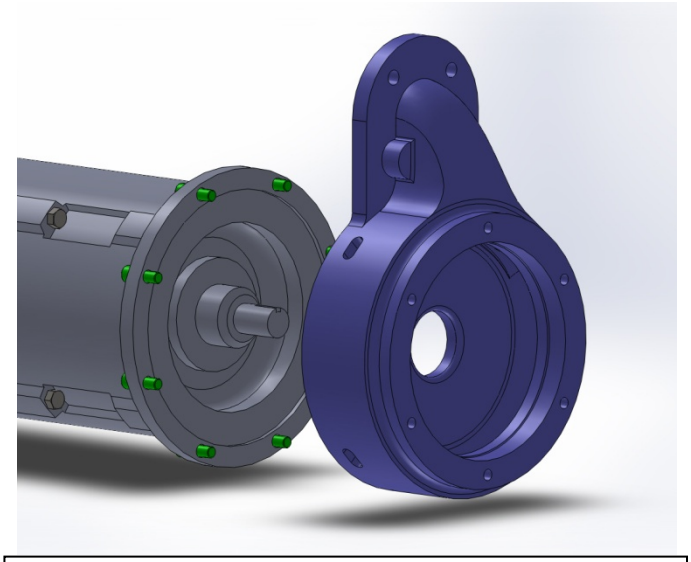
Install the Impeller Deflector (040) onto the shaft. Align the Impeller Deflector with the motor shaft key seat.



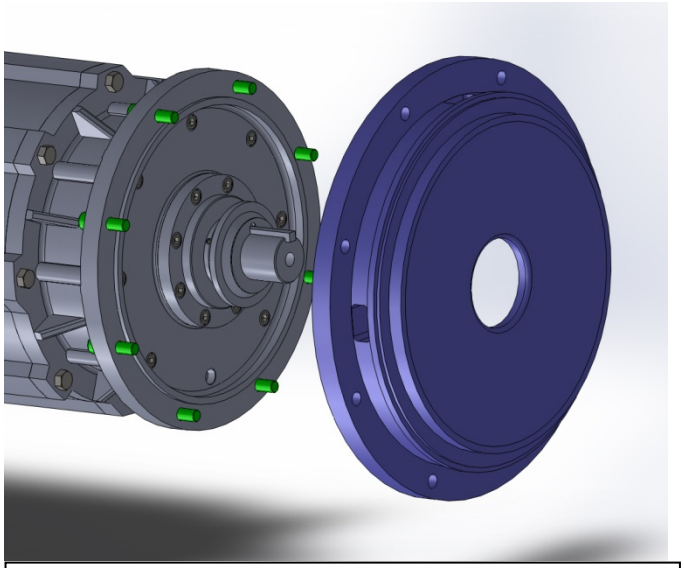
Insert the Drive Key (032) into the key seat.



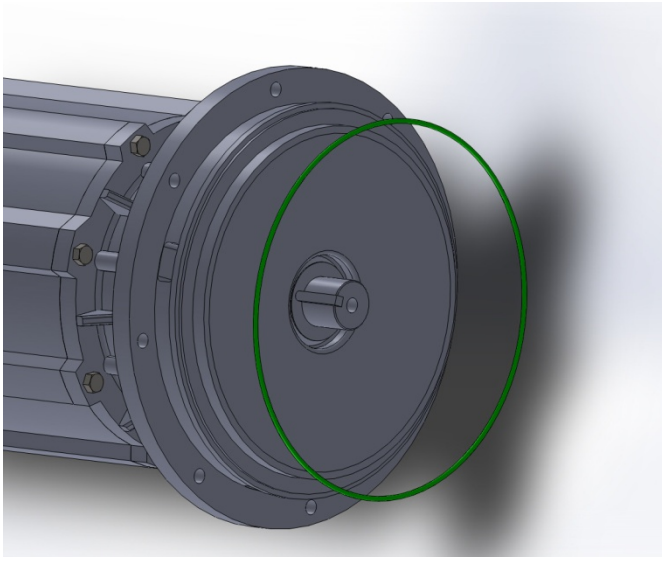
Install the Impeller Gasket (073.1).



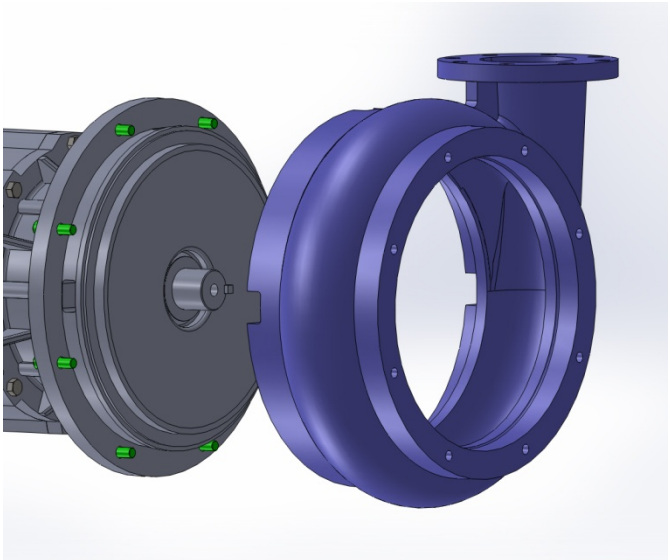
HDS Models: 50L, 75L, 100L, 150L, 75M, 100M, 200L
Lift the Casing (100) into position. Insert Lock Washers (901.4) over the Socket Head Cap Screws (901.1), apply Anti Seize, thread into the Casing and tighten to specified torque.
CASINGS REQUIRE THE ASSISTANCE OF LIFTING EQUIPMENT!



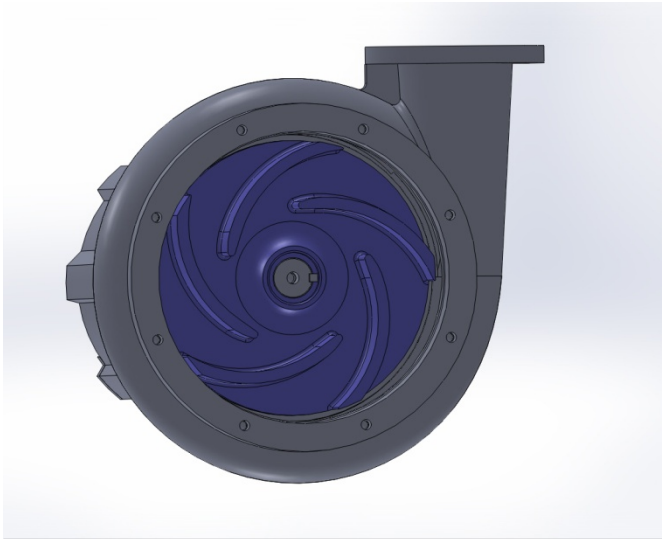
HDS Models: 150M, 200M
Lift the Motor Side Liner (011) into position. Insert Lock Washers (901.4) over the Socket Head Cap Screws (901.1), apply Anti Seize, thread into the Motor Side Liner and tighten to specified torque.
MOTOR SIDE LINERS REQUIRE THE ASSISTANCE OF LIFTING EQUIPMENT!



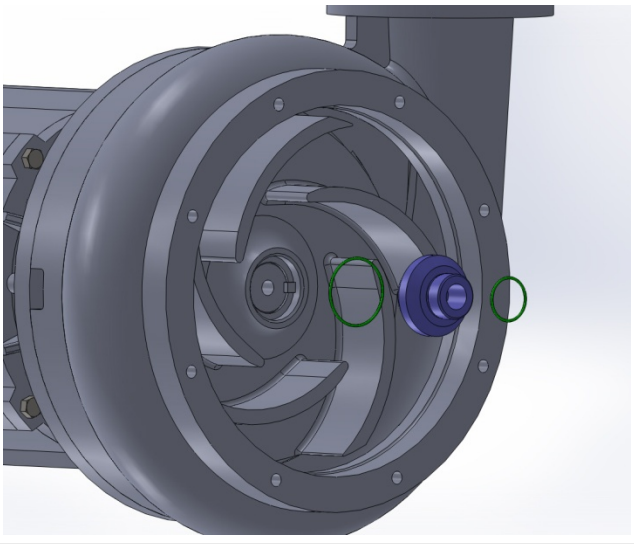
HDS Models: 150M, 200M
Position the O-Ring (073.1) on the Motor Side Liner (011) spigot.



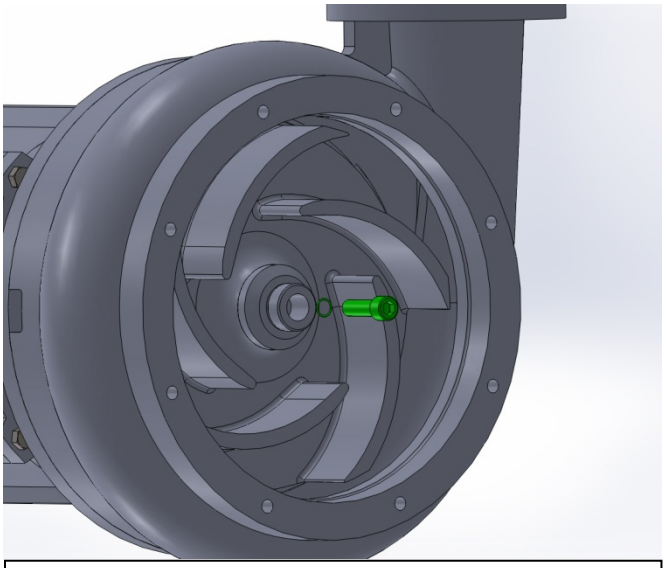
HDS Models: 150M, 200M
Lift the Casing (100) into position. Insert Lock Washers (901.4) over the Socket Head Cap Screws (901.1), apply Anti Seize, thread into the Casing and tighten to specified torque.
CASINGS REQUIRE THE ASSISTANCE OF LIFTING EQUIPMENT!



Install the Impeller (200) by sliding onto the motor shaft.



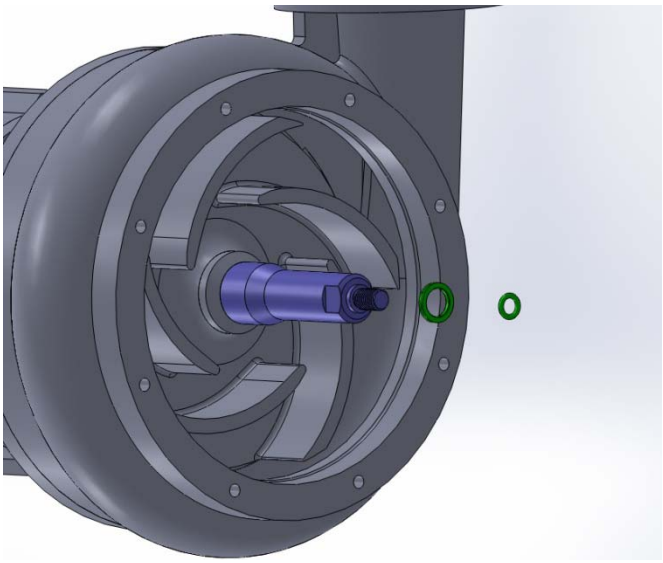
Install the O-Rings (104.2, 104.3) onto the Shaft Adapter (071). Install the Shaft Adapter into the impeller bore lining up the slot in the Shaft Adapter face with the Drive Key (032).



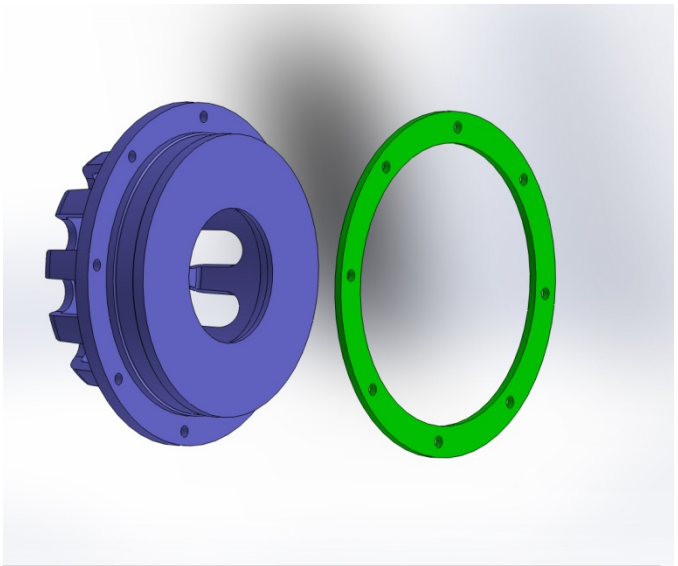
HDS Model	Impeller Bolt Torque
50L, 75L, 100L	55 lb-ft (75 Nm)
150L, 75M, 100M	110 lb-ft (150 Nm)
200L, 150M, 200M	200 lb-ft (275 Nm)

Impeller Blocking
The Impeller (200) will have to be blocked when the Impeller Bolt Fastener (901.3) is being tightened. A piece of wood can be used as a wedge between the casing and impeller.

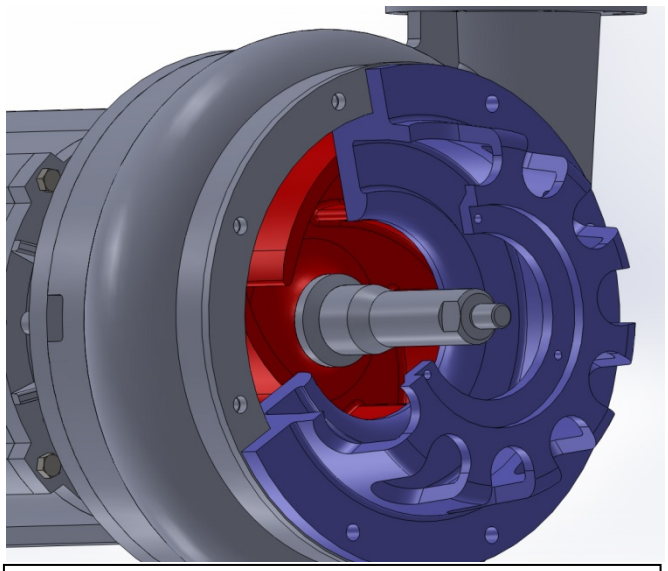
Install the O-Rings (104.1) onto the Impeller Bolt Fastener (901.3), apply Locktite® 262 onto the Impeller Bolt, thread into the shaft and tighten to the specified torque.



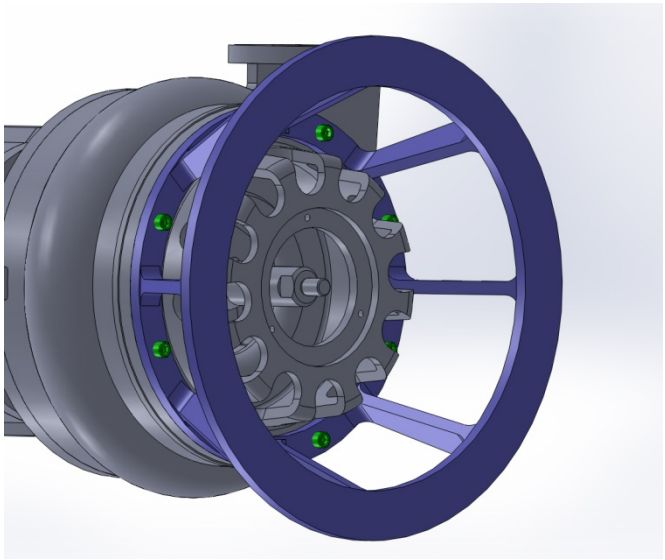
Apply Anti-Seize to the Shaft Adapter (071). Thread the Shaft Extension (258) onto the Shaft Adapter and tighten. Install the Washer (901.7) onto shaft extension spigot, followed by the O-Ring (104.4). The Impeller will have to be blocked for the shaft extension installation.



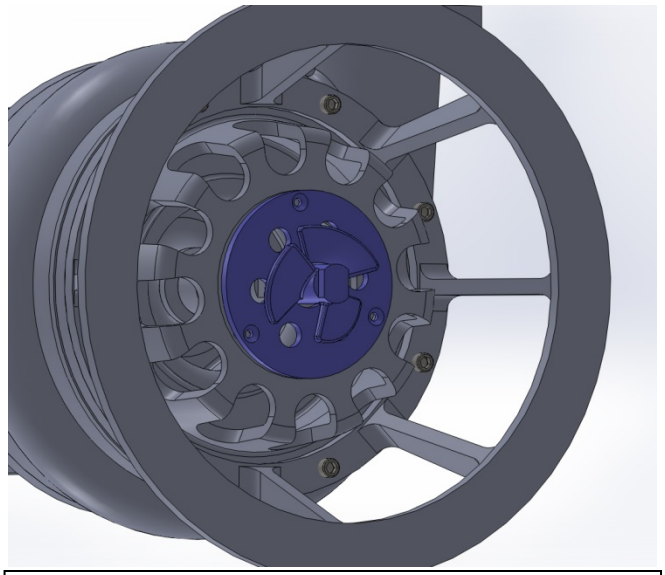
Slide the Suction Gaskets (073.3) onto the Suction Cover (009) and align the holes.



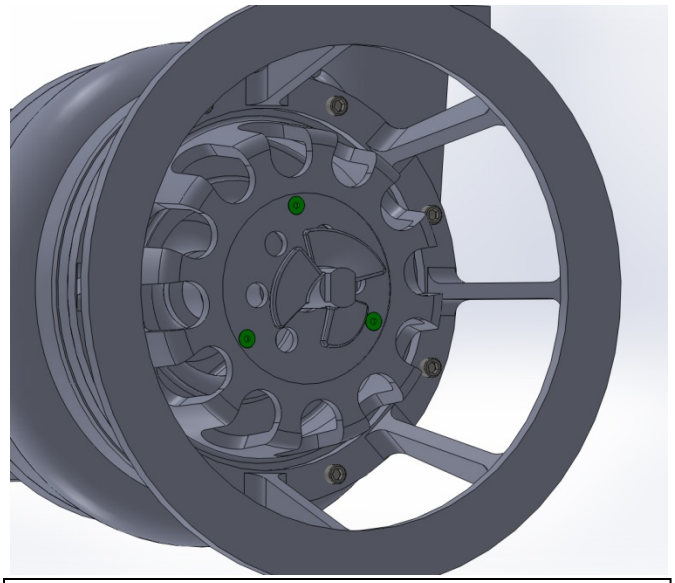
Install the Suction Cover (009) and Suction Gaskets (073.3) on the Casing (100). Verify the clearance between the Impeller (200) face and Suction Cover. Clearance should be 1/32" – 1/16" (0.8mm – 1.6mm). Adjust the clearance by adding or removing gaskets. Spin the Impeller to ensure there is no contact with the suction cover.



Install the Pump Stand (233) by aligning the mounting holes. Insert Lock Washers (901.4) over the Socket Head Cap Screws (901.2), Anti Seize, thread into the Casing and tighten to specified torque.



Apply Anti Seize to the Shaft Extension (258) thread and install the Agitator (260) through the Suction Screen (209). Securely tighten the Agitator by using a box wrench on the Agitator Flats and one on the Shaft Extension Flats.



Align the Suction Screen (209) mounting holes with the Suction Cover (009). Apply Anti Seize to the Countersunk Head Cap Screws (901.6) and thread into the Suction Cover.

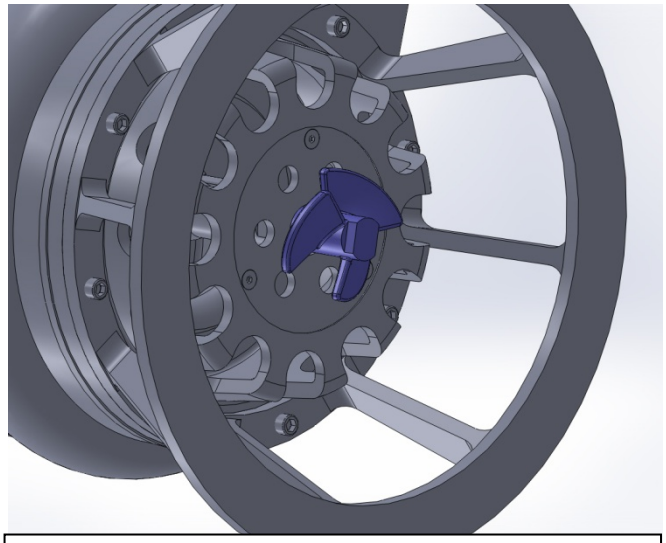
5.5 Wet End Component Disassembly

WARNING!

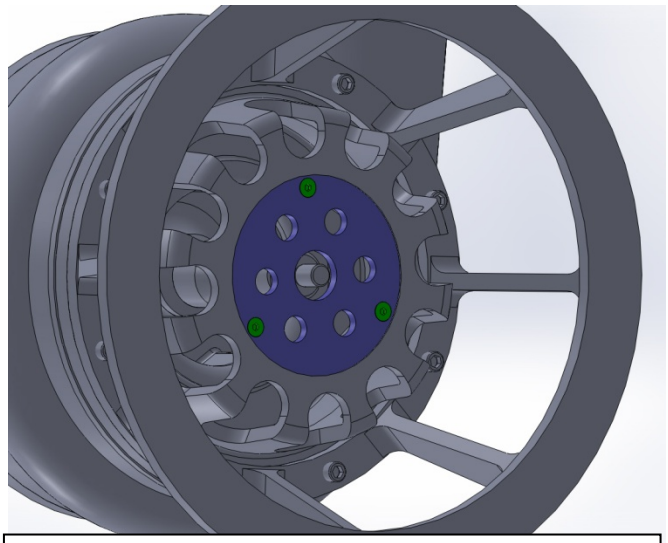
WORN PUMP PARTS MAY HAVE SHARP EDGES!

WARNING!

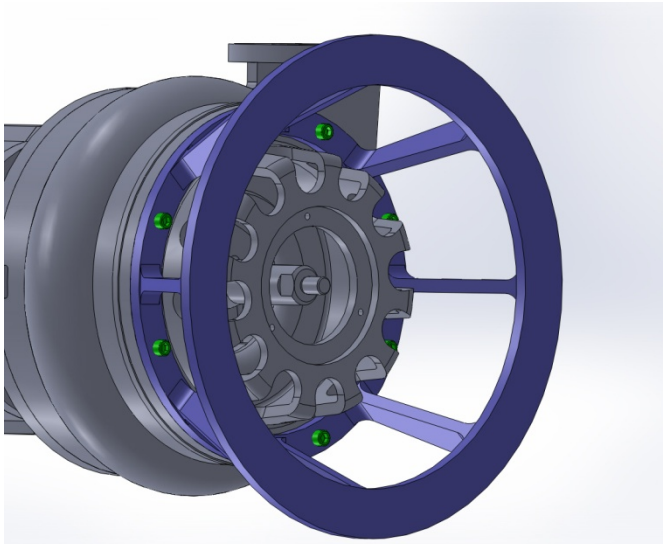
DAMAGED PUMP PARTS SHOULD BE REPLACED TO ENSURE SAFE AND PROPER PERFORMANCE OF THE PUMP!



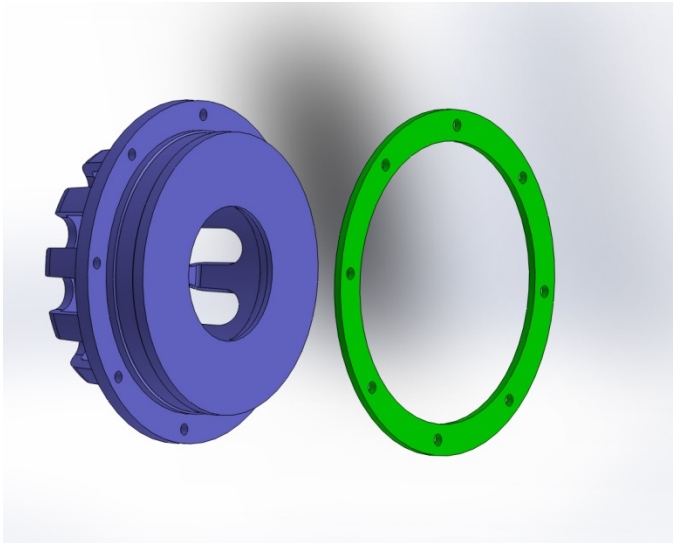
Remove the Agitator (260). Use a box wrench on the Agitator Flats and one on the Shaft Extension Flats.



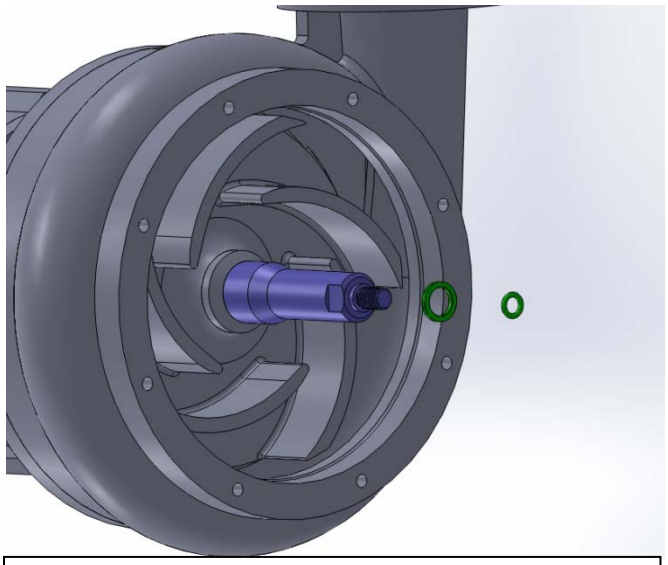
Remove the Countersunk Head Cap Screws (901.6) and Suction Screen (209).



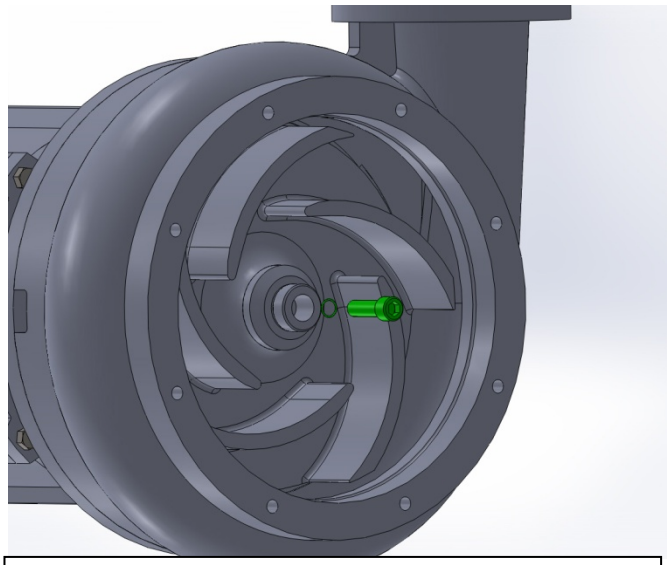
Remove Socket Head Cap Screws (901.2), Lock Washers (901.4) and Pump Stand (233).



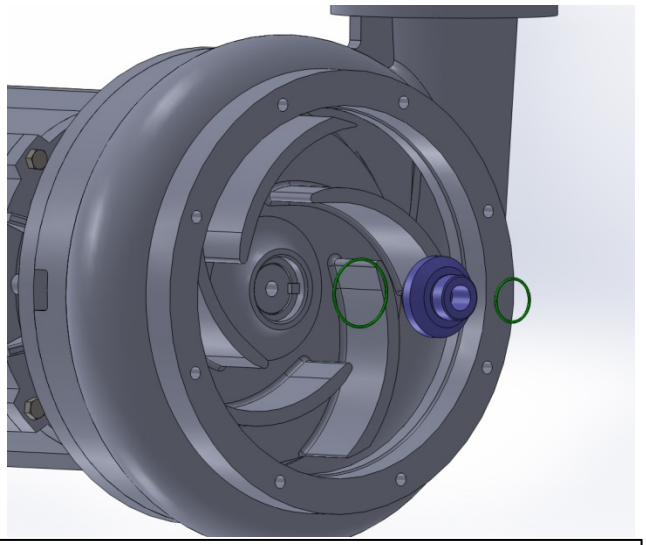
Remove the Suction Cover (009) and Suction Gaskets (073.3).



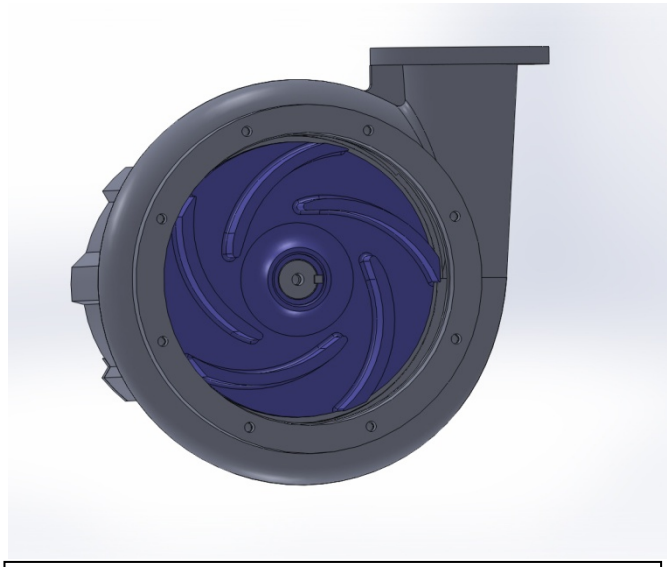
Remove the Shaft Extension (258), Washer (901.7) and O-Ring (104.4). The Impeller will have to be Blocked, to prevent rotation while removing the Shaft Extension.
DO NOT REUSE LOCK WASHER & O-RINGS!



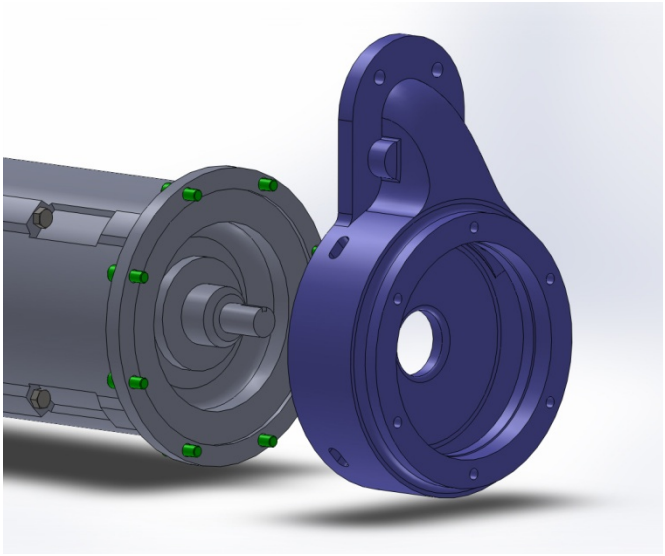
Remove the Impeller Bolt Fastener (901.3) and O-Rings (104.1). The Impeller will have to be Blocked, to prevent rotation while removing the Impeller Bolt Fastener.
DO NOT REUSE IMPELLER BOLT!



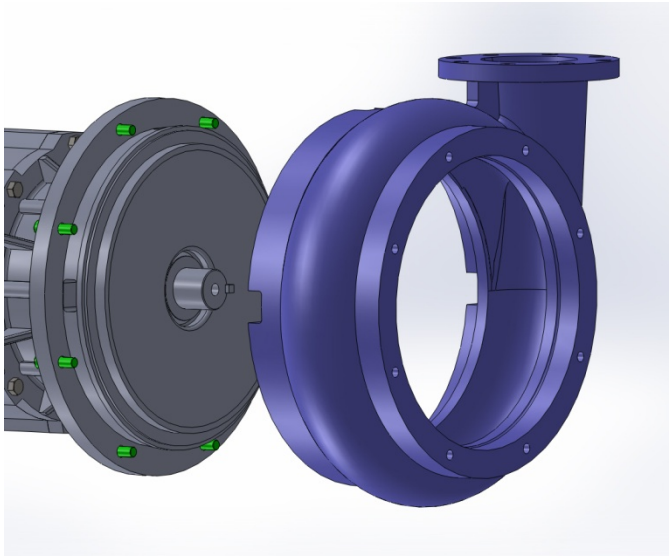
Remove the Shaft Adapter and O-Rings (104.2, 104.3). **DO NOT REUSE O-RINGS!**



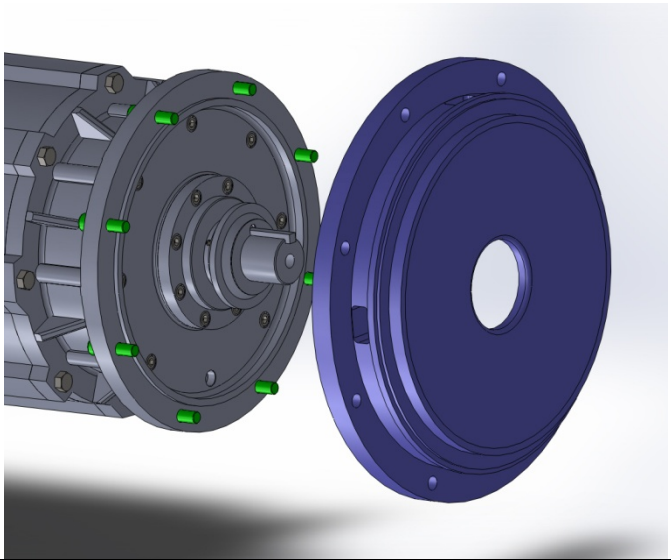
Remove the Impeller (200) by sliding off the motor shaft.



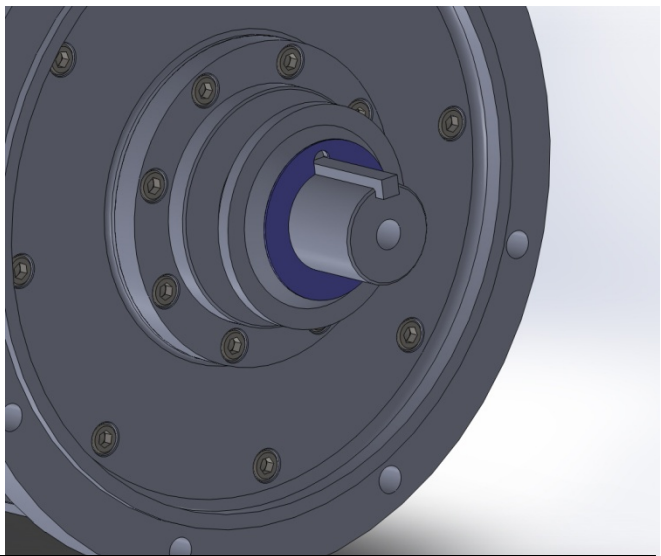
HDS Models: 50L, 75L, 100L, 150L, 75M, 100M, 200L
Remove Socket Head Cap Screws (901.1) and Lock Washers (901.4) and remove the Casing (100).
CASINGS REQUIRE THE ASSISTANCE OF LIFTING EQUIPMENT!



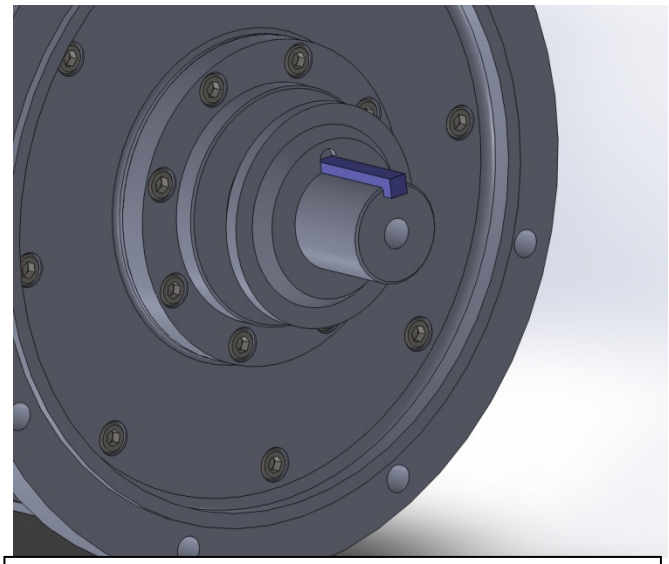
HDS Models: 150M, 200M
Remove the Socket Head Cap Screws (901.1), Lock Washers (901.4) and remove the Casing (100).
CASINGS REQUIRE THE ASSISTANCE OF LIFTING EQUIPMENT!



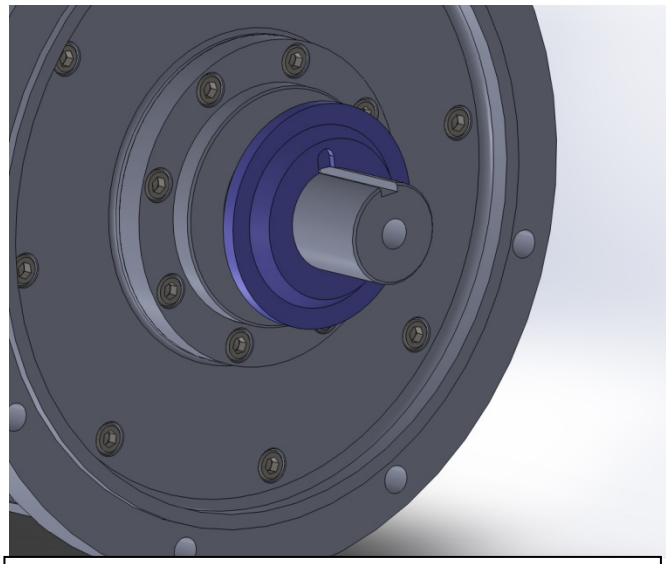
HDS Models: 150M, 200M
Remove the Socket Head Cap Screws (901.1), Lock Washers (901.4) and Motor Side Liner (011). Remove the Casing O-Ring (104.5)
MOTOR SIDE LINERS REQUIRE THE ASSISTANCE OF LIFTING EQUIPMENT!
DO NOT REUSE O-RING!



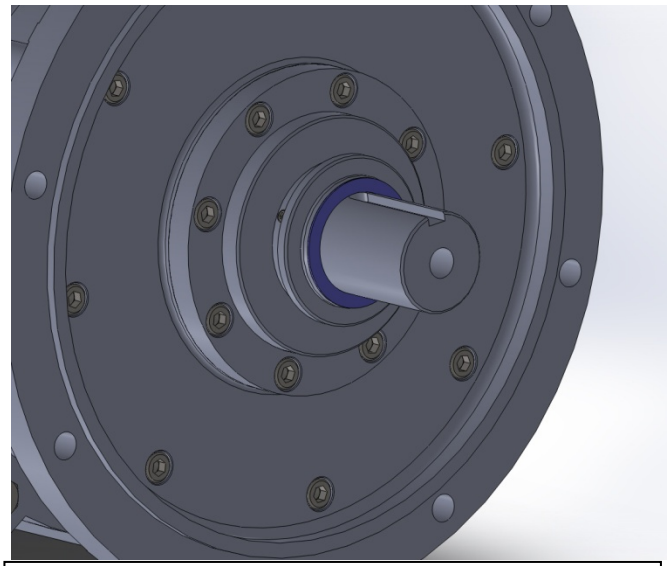
Remove the Impeller Gasket (073.1).
DO NOT REUSE THE IMPELLER GASKET!



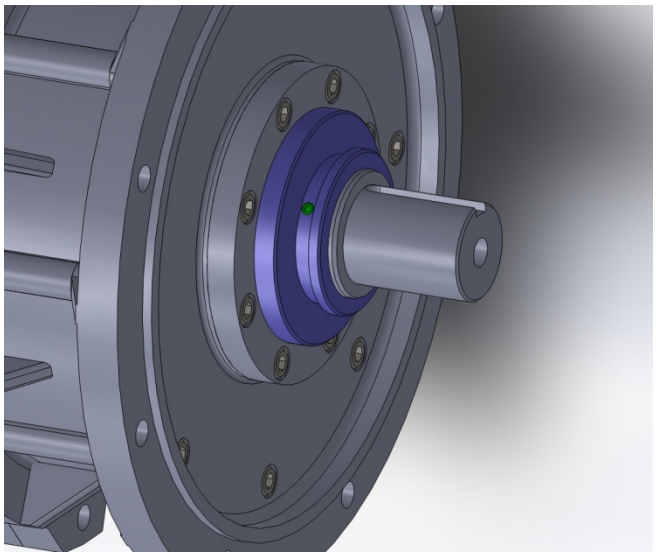
Remove the Drive Key (032) from the key seat.
DO NOT REUSE THE DRIVE KEY!



Remove the Impeller Deflector (040) from the motor shaft.



Remove the Deflector Gasket (073.2).
DO NOT REUSE THE DEFLECTOR GASKET!



Motor Models: Run Dry Slurry Seal Only
Remove the Motor Deflector from the motor Shaft.
DO NOT REUSE THE MOTOR DEFLECTOR V-RING!

5.6 Fastener Assembly Torque / Assembly Pre-Load

Assembly Torque / Assembly Pre-Load					
Size	**Class**	**Tightening Torque**		**Assembly Pre-Load**	
		lb-ft (lb-in)	**Nm**	**lbf**	**kN**
M4	316SS A4-70	1.7 (20)	2.3	612	2.7
M5		3.4 (41)	4.6	1002	4.5
M6		5.8 (69)	7.9	1415	6.3
M8		13.3	18	2600	11.6
M10		26.5	36	4126	18.4
M12		45.7	62	6033	26.9
M16		111	150	11415	50.8
M20		221	300	18389	81.8
Torque / Pre-Load Values are based on a 0.08 Coefficient of Friction (Anti Seize Lubricant)					

6.0 Trouble Shooting

6.1 Fault Tracing

Use the following fault tracing logic to aid in troubleshooting the pump and motor; it is assumed that the pump has been previously operating without any problems. Fault tracing should be performed by a licensed Electrician and should conform to all regional and industry specific electrical standards. In order to properly carry out fault tracing a multi-meter, test lamp and wiring diagram must be used.

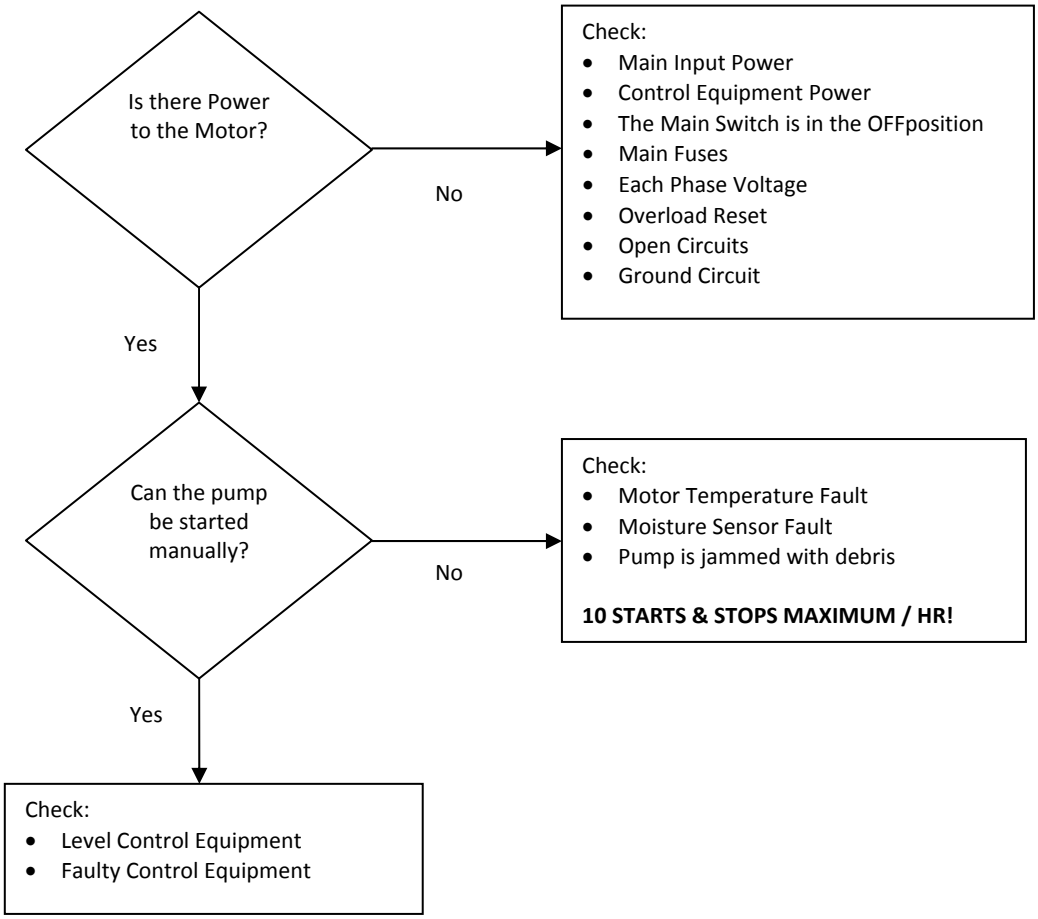
WARNING!

ALWAYS LOCKOUT & DISCONNECT POWER TO THE ELECTRIC MOTOR BEFORE PERFORMANING ANY MAINTENANCE!

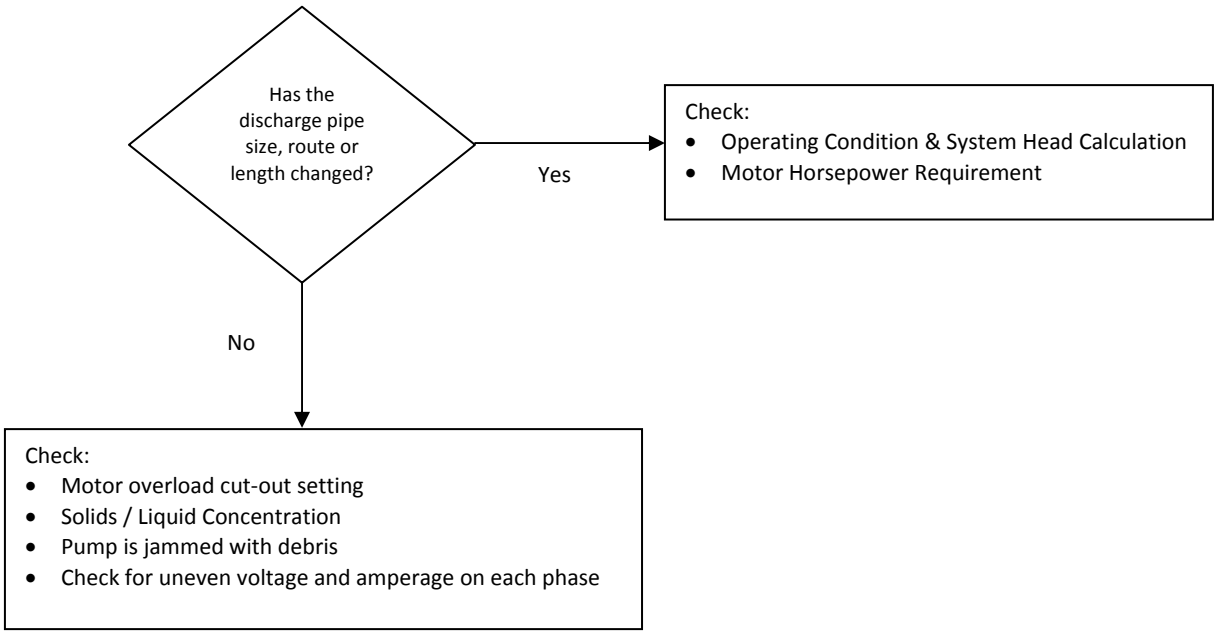
For the electric submersible motor installation, operation and maintenance refer to:

Baldor® - Reliance® AC Submersible Motors
Installation & Operation Manual, MN414

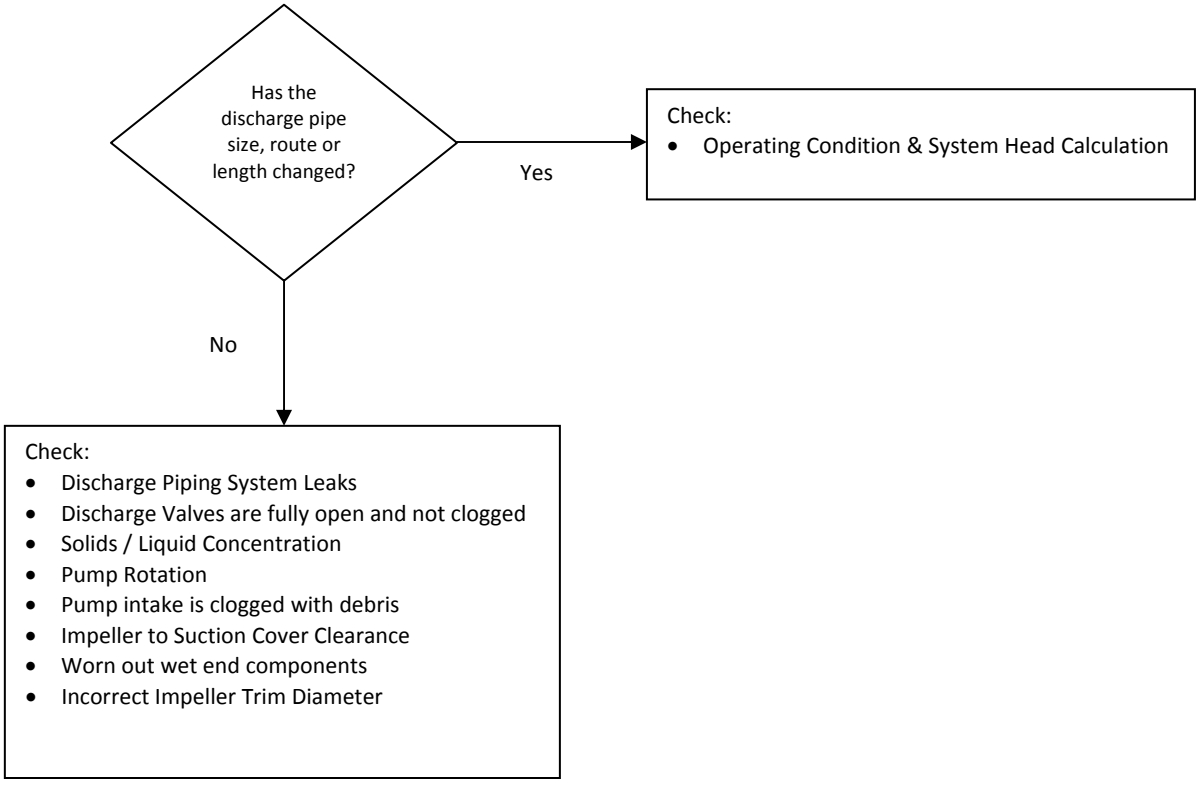
6.1.1 Pump Does Not Start



6.1.2 Pump Starts but Motor Trips Out



6.1.3 Pump is Operating with Limited to No Flow



7.0 Pump Data

7.1 HDS Cross Section & Bill of Materials

7.1.1 HDS 50L-A / A1175
7.1.2 HDS 75L-A / A1181
7.1.3 HDS 100L-A / A1187
7.1.4 HDS 150L-A / A1193
7.1.5 HDS 200L-A / A1199
7.1.6 HDS 75M-A / A1205
7.1.7 HDS 100M-A / A1211
7.1.8 HDS 150M-A / A1217
7.1.9 HDS 200M-A / A1223

7.2 HDS General Arrangement Drawings

7.2.1 HDS 50L-A 180TY / A1415
7.2.2 HDS 50L-A 210TYS / A1416
7.2.3 HDS 75L-A 180TY / A1417
7.2.4 HDS 75L-A 210TYS / A1418
7.2.5 HDS 100L-A 180TY / A1419
7.2.6 HDS 100L-A 210TYS / A1420
7.2.7 HDS 150L-A 250TY / A1421
7.2.8 HDS 150L-A 320TYS / A1422
7.2.9 HDS 200L-A 320TY / A1423
7.2.10 HDS 200L-A 360TYS / A1424
7.2.11 HDS 200L-A L360TYS / A1425
7.2.12 HDS 75M-A 250TY / A1430
7.2.13 HDS 75M-A 320TYS / A1431
7.2.14 HDS 100M-A 250TY / A1432
7.2.15 HDS 100M-A 320TYS / A1433
7.2.16 HDS 150M-A 320TY / A1434
7.2.17 HDS 150M-A 360TYS / A1435
7.2.18 HDS 150M-A L360TYS / A1436
7.2.19 HDS 200M-A 320TYS / A1437
7.2.20 HDS 200M-A 360TYS / A1438
7.2.21 HDS 200M-A L360TYS / A1439

7.3 HDS Performance Curves - Agitator

7.3.1 HDS 50L-A 1800 RPM / A1235
7.3.2 HDS 50L-A 1200 RPM / A1238
7.3.3 HDS 75L-A 1800 RPM / A1241
7.3.4 HDS 75L-A 1200 RPM / A1244
7.3.5 HDS 100L-A 1800 RPM / A1247
7.3.6 HDS 100L-A 1200 RPM / A1250
7.3.7 HDS 150L-A 1800 RPM / A1253
7.3.8 HDS 150L-A 1200 RPM / A1256
7.3.9 HDS 200L-A 1200 RPM / A1259
7.3.10 HDS 75M-A 1800 RPM / A1265
7.3.11 HDS 75M-A 1200 RPM / A1268
7.3.12 HDS 100M-A 1800 RPM / A1271
7.3.13 HDS 100M-A 1200 RPM / A1274
7.3.14 HDS 150M-A 1200 RPM / A1277
7.3.15 HDS 150M-A 900 RPM / A1280
7.3.16 HDS 200M-A 1200 RPM / A1283

7.4 Pump Data Sheet / Name Plate

8.0 Electric Submersible Motor Maintenance

WARNING!

ALWAYS LOCKOUT & DISCONNECT POWER TO THE ELECTRIC MOTOR BEFORE PERFORMANING ANY MAINTENANCE!

It is required that all electric submersible motor maintenance work should be performed by a Certified Baldor® - Reliance® repair facility.

For electric submersible motor maintenance refer to:

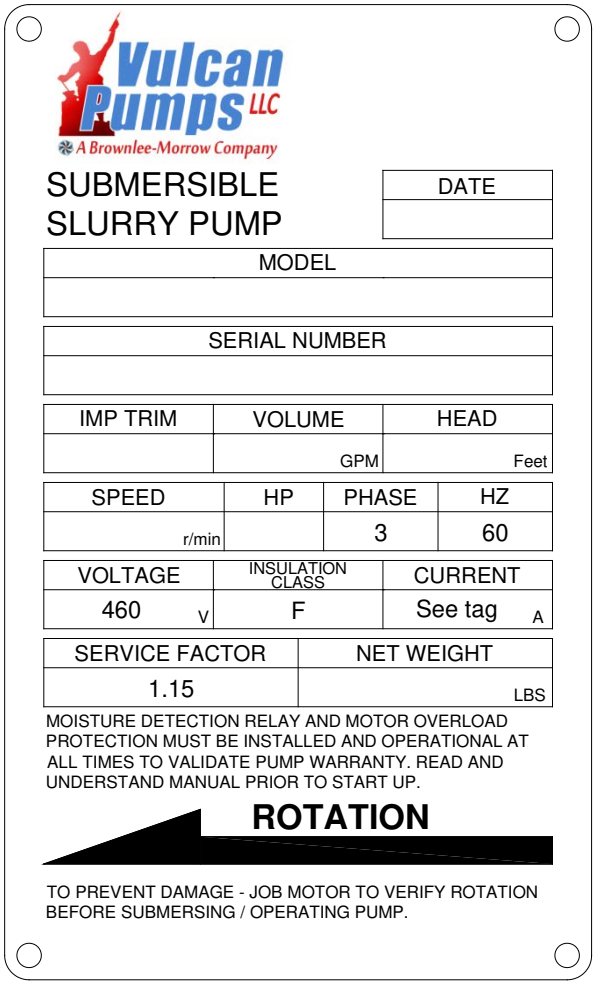
Baldor® - Reliance® AC Submersible Motors
Installation & Operation Manual, MN414

CAUTION!

FAILURE TO USE A CERTIFIED Baldor® - Reliance® REPAIR FACILITY COULD VOID THE MOTORS WARRANTY!

8.1 Baldor® - Reliance® AC Submersible Motors Installation & Operation Manual, MN414

7.4 Name Plate Data Sheet



SUBMERSIBLE
SLURRY PUMP

DATE

MODEL

SERIAL NUMBER

IMP TRIM	VOLUME	HEAD
	GPM	Feet

SPEED	HP	PHASE	HZ
r/min		3	60

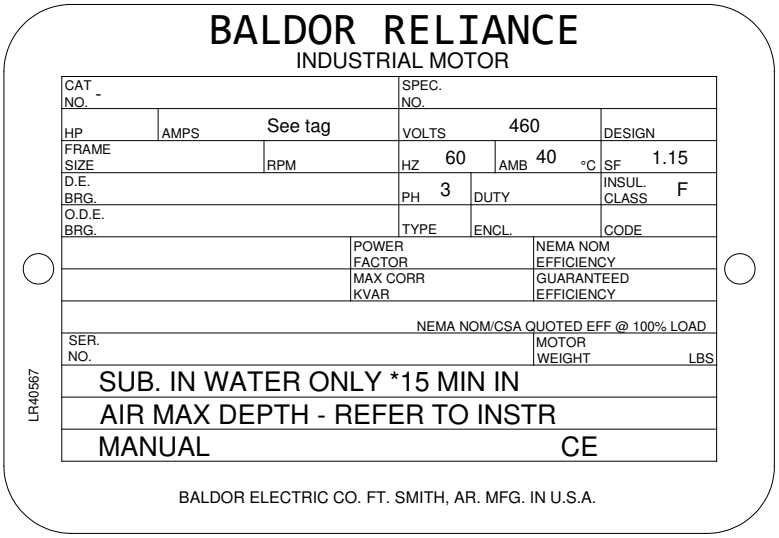
VOLTAGE	INSULATION CLASS	CURRENT
460 V	F	See tag A

SERVICE FACTOR	NET WEIGHT
1.15	LBS

MOISTURE DETECTION RELAY AND MOTOR OVERLOAD PROTECTION MUST BE INSTALLED AND OPERATIONAL AT ALL TIMES TO VALIDATE PUMP WARRANTY. READ AND UNDERSTAND MANUAL PRIOR TO START UP.

ROTATION

TO PREVENT DAMAGE - JOB MOTOR TO VERIFY ROTATION BEFORE SUBMERSING / OPERATING PUMP.



BALDOR RELIANCE
INDUSTRIAL MOTOR

CAT NO. -			SPEC. NO.		
HP	AMPS See tag		VOLTS 460		DESIGN
FRAME SIZE	RPM		HZ 60	AMB 40 °C	SF 1.15
D.E. BRG.			PH 3	DUTY	INSUL. CLASS F
O.D.E. BRG.			TYPE	ENCL.	CODE
	POWER FACTOR		NEMA NOM EFFICIENCY		
	MAX CORR KVAR		GUARANTEED EFFICIENCY		
NEMA NOM/CSA QUOTED EFF @ 100% LOAD					
SER. NO.			MOTOR WEIGHT LBS		

SUB. IN WATER ONLY *15 MIN IN
AIR MAX DEPTH - REFER TO INSTR
MANUAL CE

LR40567

BALDOR ELECTRIC CO. FT. SMITH, AR. MFG. IN U.S.A.

BALDOR • RELIANCE

AC Submersible Pump Motors

Installation & Operating Manual

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Section 1
General Information

Overview This manual contains general procedures that apply to Baldor•Reliance Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the **Warning and Caution** statements.
A **Warning** statement indicates a possible unsafe condition that can cause harm to personnel.
A **Caution** statement indicates a condition that can cause damage to equipment.

Important: **This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor District Office for more information or clarification.**

Before you install, operate or perform maintenance, become familiar with the following:

- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Installation and Use of Electric Motors and Generators.
- The National Electrical Code
- Local codes and Practices

Limited Warranty

www.baldor.com/support/warranty_standard.asp

Safety Notice: This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.

Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

WARNING: **The Adjustable Speed Controller may apply hazardous voltages to the motor leads after power to the controller has been turned off. Verify that the controller is incapable of delivering hazardous voltages and that the voltage at the motor leads is zero before proceeding. Failure to observe this precaution may result in severe bodily injury or death.**

WARNING: **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

WARNING: **Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.**

WARNING: **Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.**

WARNING: **Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. Protection should be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.**

WARNING: **This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.**

WARNING: **Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.**

WARNING: **Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.**

WARNING: **Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.**

WARNING: **Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.**

Safety Notice Continued

WARNING: **Pacemaker danger – Magnetic and electromagnetic fields in the vicinity of current carrying carrying conductors and permanent magnet motors can result result in a serious health hazard to persons with cardiac pacemakers, metal implants, and hearing aids. To avoid risk, stay way from the area surrounding a permanent magnet motor.**

WARNING: **Incorrect motor rotation direction can cause serious or fatal injury or equipment damage. Be sure to verify motor rotation direction before coupling the load to the motor shaft.**

WARNING: **Do not use non UL/CSA listed explosion proof motors in the presence of flammable or combustible vapors or dust. These motors are not designed for atmospheric conditions that require explosion proof operation.**

WARNING: **Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate along with CSA listed logo. Specific service conditions for these motors are defined in NFPA 70 (NEC) Article 500.**

WARNING: **UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.**

WARNING: **Thermostat contacts automatically reset when the motor has slightly cooled down. To prevent injury or damage, the control circuit should be designed so that automatic starting of the motor is not possible when the thermostat resets.**

Caution: **To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.**

Caution: **If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG1 and MG2 standards to avoid equipment damage.**

Caution: **Never raise or lower the motor/pump by the power cords. Use lifting eyes provided in the motor casting (opposite drive end) and attache a cord/cable to lift the weight of the motor and pump. Failure to lift this motor properly may seriously damage the lead connections and water seals and seriously damage the motor.**

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor District Office or an Authorized Baldor Service Center.

Receiving

Each Baldor•Reliance Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Handling

The motor must be stored shaft down in its' original packaging until it is to be into service. The motor should only be lifted using the lifting eyes provided, see Figure 2-1.

Caution: **Never raise or lower the motor/pump by the power cords. Use lifting eyes provided in the motor casting (opposite drive end) and attach a cord/cable to lift the weight of the motor and pump. Failure to lift this motor properly may seriously damage the lead connections and water seals and seriously damage the motor.**

1. Only use the lifting eyes provided to lift the motor. Never attempt to lift the motor by the power cords.
2. Be sure the motor is stored shaft down until ready to install.

Section 2
Installation & Operation

Overview Installation should conform to the National Electrical Code as well as local codes and practices.

All Baldor•Reliance Submersible Pump Motors Include thermal devices as standard.
Normally, there are four conditions during which a submersible sewage pump may be operated in gases or vapors.

1. When the wet well is being dewatered.
2. When the pump motor assembly is being lowered down the guide rails.
   The flow from the pump is needed during the installation process to ensure that solids are cleared from the discharge flange area to ensure proper seating.
3. When low−level cutoff controls fail.
4. When low−level sensors are positioned at the bottom of the pump assembly.

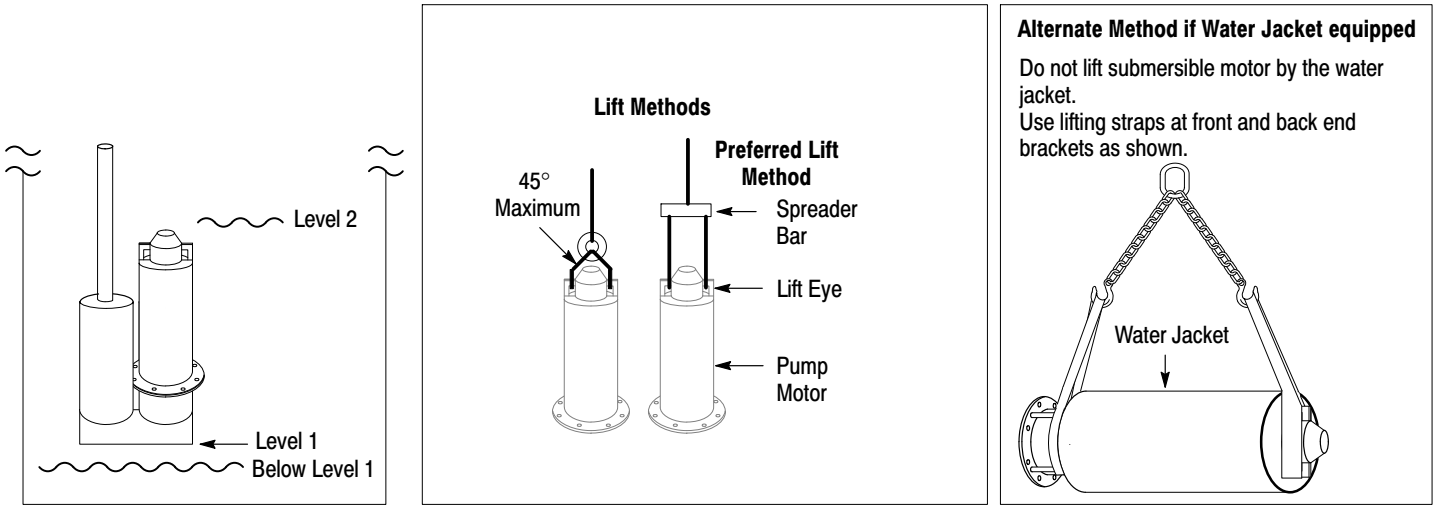
Continuous Operation Gasses Or Vapors

Be sure you have selected the correct motor for your application. The horsepower rating of the motor is determined by the pump design, impeller size & head and flow conditions.

Operating time is a function of pit size, pump capacity, and flow conditions. Only the pump manufacturer can ensure that the pump motor is properly applied for continuous in−gas or vapor operation. As with any motor product, it is essential that proper consideration be given to the load characteristics to ensure the motor will not be overloaded. Should such an overload occur, thermostats embedded in the windings will provide a signal to deenergize the motor. However, proper consideration of the application will prevent such an overload.

Caution: **Lift using Lift Eyes only. Lifting by power cords will cause motor damage. Use spreader bar to evenly distribute lift force. Angle of lift rope (no spreader bar) should not exceed 45° from vertical, excessive lift angle can damage motor.**

Figure 2-1



The following load conditions should be noted, refer to Figure 2-1:

1. Below Level 1 (below the pump) fluid is not pumped and no load is reflected to the motor.
2. One pump should always be sized sufficiently large to draw the well down (even under maximum flow conditions). The maximum amount of time the motor will operate fully loaded and uncovered is the amount of time required to draw the well down from Level 2 (top of the motor) to the bottom of the pump.
3. Time described in 2 should not be greater than 15 minutes.
4. These notes do not make allowance for the following:
   a. The heat exchanger effect of the attached pump. It is pumping a relatively cool fluid and will remove some heat.
   b. The motor does not operate fully loaded completely in gas. It is fully loaded as the motor is being uncovered.
   c. !f the well is being drawn down from the top of the motor and the maximum flow conditions exist, the influent flow will usually provide excellent cooling of the pump motor.

WARNING: **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

WARNING: **The Adjustable Speed Controller may apply hazardous voltages to the motor leads after power to the controller has been turned off. Verify that the controller is incapable of delivering hazardous voltages and that the voltage at the motor leads is zero before proceeding. Failure to observe this precaution may result in severe bodily injury or death.**

Installation

When the submersible pump motor leaves the factory it is ready for installation. No adjustment, venting or oil filling is required.

Considerations

1. The user must select a motor starter and over−current protection suitable for this motor and Its application. Consult motor starter application data as well as the National Electric Code and/or other local codes.
2. Maximum submergence of motor is not to exceed 160 ft (49m) in depth and or 100 PSI (690 kpas) at the external motor seal for Tandem Seal designs. For slurry seal designs the maximum external motor seal pressure is 15 PSI (103 kpas).
3. Thermal Protectors must be connected. Leads marked P1 and P2 (See Figure 2-2).
4. Moisture Sensing Probes must be connected. Leads marked W1 and W2. (See Figure 2-3).
5. Check your power supply against final nameplate connection voltage.
6. Motor will operate properly with frequency not more than ±5% and voltage not more than ±10% above or below nameplate rating.
7. Performance within this range will not necessarily be the same as the established performance at exact rated voltage and frequency.
8. For three phase motors only: To reverse direction of a three phase motor, interchange any two motor lead connections at the starter.

Installation Procedure

To prevent damage to the motor, do not use force to drive pump on (drive impeller onto motor shaft) or to remove pump from motor shaft.

1. Turn off and lockout all power and verify the voltage at the motor starter connectors are zero.
2. Connect the motor power leads to the connectors in the motor starter. (See “Grounding”).

Note: The motor lead cable assembly for all Submersible Pump Motors has 3 marked power leads plus two ground leads, two thermal leads and two moisture sensing probe leads.

3. **Three Phase Motors ONLY.**
   a. Turn off and lockout all power and verify the voltage at the motor starter connectors are zero.
   b. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.
   c. Remove all unused shaft keys and loose rotating parts to prevent them from flying off.
   d. Momentarily apply power and check the direction of rotation of the motor shaft.
      Motors are designed for bi−directional shaft rotation. When voltages in an A−B−C phase sequence are applied to leads U/T1, V/T2, W/T3 clockwise shaft rotation facing the opposite drive end will result. If shaft rotation is incorrect, change the direction of rotation as follows:
      i. Turn off and lockout all power and verify that the voltage at the motor leads is zero.
      ii. Reverse any two of three motor power leads at the motor starter.
      iii. Restore power and verify correct rotation.
      iv. Turn off and lockout all power and verify that the voltage at the motor leads is zero.
4. Connect the two Thermal Protectors at the motor starter as shown in Figure 2-2.
5. Connect the two Moisture Sensing Probes at the motor starter as shown in Figure 2-3.
6. Follow pump manufacturer’s instructions and mount the pump on the motor shaft.
7. Secure the pump case to the motor flange.
8. Attach drain piping to pump.
9. Use spreader bar and lifting eyes (see Figure 2-1) to lower the motor/pump assembly to the proper depth. Be sure that motor wires are not damaged (contact with metal objects etc.)
10. Set control parameter values (if applicable) according to motor nameplate values.

Grounding In the USA consult the National Electrical Code, Article 430 for information on grounding of motors and generators, and Article 250 for general information on grounding. In making the ground connection, the installer should make certain that there is a solid and permanent metallic connection between the ground point, the motor or generator terminal housing, and the motor or generator frame. In non−USA locations consult the appropriate national or local code applicable.

Motors with resilient cushion rings usually must be provided with a bonding conductor across the resilient member. Some motors are supplied with the bonding conductor on the concealed side of the cushion ring to protect the bond from damage. Motors with bonded cushion rings should usually be grounded at the time of installation in accordance with the above recommendations for making ground connections. When motors with bonded cushion rings are used in multimotor installations employing group fusing or group protection, the bonding of the cushion ring should be checked to determine that it is adequate for the rating of the branch circuit over current protective device being used.

There are applications where grounding the exterior parts of a motor or generator may result in greater hazard by increasing the possibility of a person in the area simultaneously contacting ground and some other nearby live electrical parts of other ungrounded electrical equipment. In portable equipment it is difficult to be sure that a positive ground connection is maintained as the equipment is moved, and providing a grounding conductor may lead to a false sense of security.

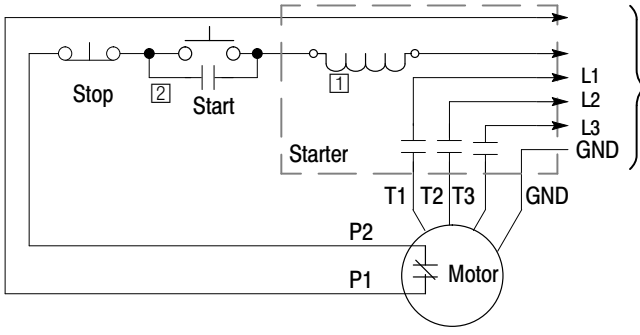
Select a motor starter and over current protection suitable for this motor and its application. Consult motor starter application data as well as the National Electric Code and/or other applicable local codes.

Adjustable Frequency Power Inverters used to supply adjustable frequency power to induction motors produce wave forms with lower order harmonics with voltage spikes superimposed. Turn−to−turn, phase−to−phase, and ground insulation of stator windings are subject to the resulting dielectric stresses. Suitable precautions should be taken in the design of these drive systems to minimize the magnitude of these voltage spikes. Consult the drive instructions for maximum acceptable motor lead lengths, and proper grounding.

Thermal Protection

Thermostat leads marked P1 & P2 must be connected in series with the stop button of the 3−wire pilot circuit of the magnetic motor controller, so that the thermostat will open the circuit before dangerous temperatures are reached. Thermostats are automatic reset for use in a normally closed circuit where the thermostat is connected In series with the holding coil of the magnetic starter. Thermostats provide “Over Temperature” Protection in accordance with NEMA MG 1−12.53. Thermostats do not provide winding over temperature protection (locked rotor). It is suggested that over current protection be used in the motor starter to ensure locked rotor protection.

Figure 2-2 Thermal Protection Circuit



AC Line

Volts AC	Continuous Amps	Inrush Amps
110−120	3.0	30
220−240	1.5	15
440−480	0.75	7.5
550−600	0.6	6.0

P1 & P2 N.C. Thermostat Leads (N.O. Contacts unacceptable to UL)
1 Starter Holding Coil
2 Holding Coil Contacts (N.O.)

	Motor Power Cable Lead Color				
	Black	**White**	**Red**	**Orange**	**Green**
Polyphase	T1	T2	T3	−	Ground
Single Phase	T1	T4	TA	−	Ground

Moisture Protection

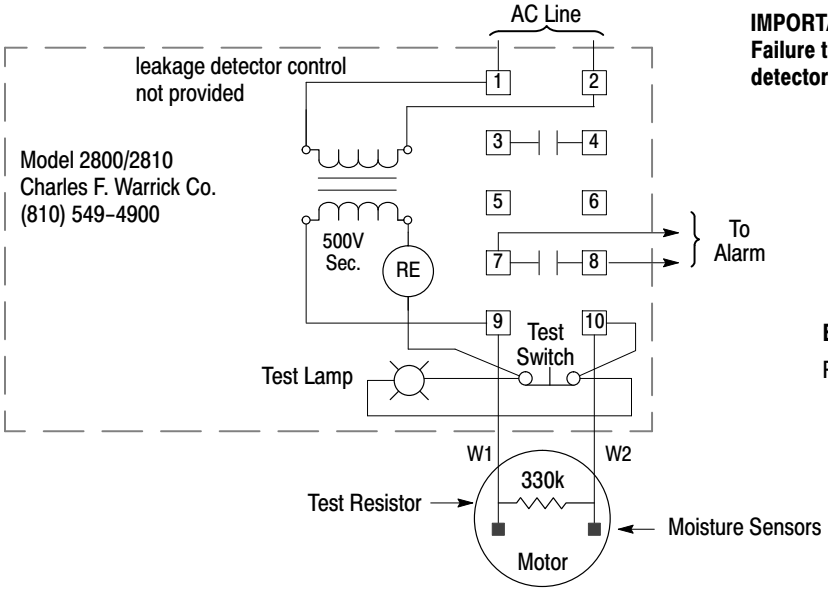
The submersible moisture protection system consists of the non−wicking cable cap assembly and the dual moisture sensing probes. The cable cap assembly prevents moisture from wicking through the cable assembly even when the cable jacket has been punctured.

Dual moisture sensing probes (Warrick type) extend into the oil chamber located between the tandem mechanical seals. Should the outer seal fail, water will enter the oil chamber through the labyrinth slinger paths and create a water/oil emulsion in the oil chamber. The moisture detector control applies 500 volts to the moisture probes.

The presence of water in the oil chamber increases the conductivity sufficiently to increase current flow through the probe circuit which illuminates a warning light and activates a relay to de−energize the motor. The leakage detector control must be purchased separately from
Charles F. Warrick Co. Normandy Ct. Royal Oak, MI 48073 (810) 549−4900.

The leakage detector control system must be connected for the warranty and the U/L listing to be valid. For information on the relay, see www.gemssensors.com (look for Model 2800/2810 relay).
It's circuit diagram is shown in Figure 2-3.

Figure 2-3 Moisture Sensing Circuit



IMPORTANT:
Failure to properly connect and use this leakage detector system voids motor warranty.

Control Cable Lead Color

Black	White	Red	Orange	Green
P1	P2	W1	W2	Ground

ORDER BY COMPONENT NUMBER ----- *−280O−XXX

AC SUPPLY LINE VOLTAGE & FREQUENCY	
1	115V 50/60 Hz
2	230V 50/60Hz
4	480V 50/60Hz

Line voltage are nominal values and may range from nominal minus 15% to nominal plus 10%.

CONTACT CONFIGURATION	TERMINAL PAIR		
	3−4	5−6	7 8
A	•	N.O.	•
B	•	N.C.	•
C	N.O.	•	N.O.
D	N.C.	•	N.O.
E	N.C.	•	N.C.
F	N.O.	N.O.	N.O.
G	N.C.	NO.	N.O.
H	N.C.	N.C.	N.O.
J	N.C.	N.C.	N.C.
N.O.	NORMALLY OPEN		
N.C.	NORMALLY CLOSED		
•	NONE PROVIDED		

NEMA TYPE ENCLOSURE	
1	1
4	2, 4, 6

Installation (for reference only)

Note: Since changes occur, always refer to installation and connection documentation from the manufacturer and follow their procedures.

All type 2800−XXX controls are identified by a specific component number which follows the format 2800−XXX where the X's are replaced by numbers and letters indicative of the A−C supply line voltage and frequency, contact configuration and enclosure. Each control has a data label on the right hand side of the terminal block. In addition, each enclosed control has another data label on the outside of the enclosure cover.

Mount the control on a vertical surface with the transformer on the left hand side and accomplish all indicated wiring. Terminals on the control are numbered and are in the same relative position as the terminals shown on the wiring diagram.

Terminal pair 1 −2 must be continuously energized from an A−C supply line of electrical characteristics shown on the data label. Contacts must be wired into the electrical load circuit(s) of the warning devices as required. Each contact used for load duty must be wired in series with the load and that series branch circuit connected across a power source compatible with the load.

Wiring must be provided from the moisture detector sensor probe leads W1 and W2 to terminals 9 and 10 of the 2800−XXX control. Control leads should not be installed in the same conduit as power leads. Induced voltage can cause false moisture signals.

Contact Operation

Normally open load contacts close and normally closed load contacts open when the sensor probes detect the influx of moisture within the motor.

Test Procedure

A normally closed pushbutton and neon indicating lamp are provided as means of checking the moisture sensing components. When the pushbutton is depressed, the indicating lamp will be illuminated to indicate (A) power is supplied to the control, (B) the control is operative, and (C) wiring to the moisture sensing probes in the motor is intact. This procedure should be performed periodically to confirm integrity of circuit. Signal devices The signal device may be audible (bell, buzzer, horn or siren) or visible (incandescent or neon lamp) or both − a signal device of your choice may be obtained from your local electrical supply house.

Signal Devices

The signal device may be audible (bell, buzzer, horn or siren) or visible (incandescent or neon lamp) or both − a signal device of your choice may be obtained from your local electrical supply house.

System Operation

It is recommended that upon indication (by warning light, etc.,) of outer seal failure that the motor be removed from the installation and the oil and outer seal be replaced as soon as possible. If reconditioning is not performed within a 30 day period it is recommended that the inner seal be thoroughly inspected and replaced if required.

WARNING: Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. Protection should be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

WARNING: Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.

WARNING: Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.

Operation

During operation, observe the motors performance. It should run smoothly with little noise.
Motor operation may stop for one of the following trip conditions:

1. If moisture infiltrates the motor, the moisture detector circuit will activate.
2. If the motor overheats, the Thermal Protection circuit will activate.
3. Other condition detected by motor starter (over current, overvoltage, etc. if equipped)

Unbalanced voltage or single−phase operation of poly phase motor may cause excessive heating and ultimate failure. Only a slight unbalance of voltage applied to a poly phase motor will cause large unbalanced currents and resultant overheating. Periodic checks of phase voltage, frequency and power consumption of a motor (measured at the motor starter) while in operation are recommended; such checks assure the correctness of frequency and voltage applied to the motor and yield an indication of the load offered by the apparatus which the motor drives.
Comparisons of this data with previous no load and full−load power demands will give an indication of the performance of the complete machine. Any serious deviations should be investigated and corrected.

If a problem with the motor occurs, contact your Baldor District Office for repair.

Should the lead connector assembly be damaged or the integrity of the encapsulation be in question, it is required that a replacement lead connector assembly be ordered from Baldor, contact your Baldor District Office. Renewal instructions will be provided with the replacement parts.

Baldor District Offices

UNITED STATES

ARIZONA

PHOENIX
4211 S 43RD PLACE
PHOENIX, AZ 85040
PHONE: 602-470-0407
FAX: 602-470-0464

ARKANSAS

CLARKSVILLE
1001 COLLEGE AVE.
CLARKSVILLE, AR 72830
PHONE: 479-754-9108
FAX: 479-754-9205

CALIFORNIA

LOS ANGELES
6480 FLOTILLA
COMMERCE, CA 90040
PHONE 323-724-6771
FAX: 323 721 5859

HAYWARD
21056 FORBES STREET
HAYWARD, CA 94545
PHONE: 510-785-9900
FAX: 510-785-9910

COLORADO

DENVER
3855 ForestStreet
Denver, CO 80207
PHONE 303-623-0127
FAX: 303-595-3772

CONNECTICUT

WALLINGFORD
65 SOUTH TURNPIKE ROAD
WALLINGFORD, CT 06492
PHONE: 203-269-1354
FAX: 203-269-5485

FLORIDA

TAMPA/PUERTO RICO/
VIRGIN ISLANDS
3906 EAST 11TH AVENUE
TAMPA, FL 33605
PHONE 813-248-5078
FAX: 813 247 2984

GEORGIA

ATLANTA
62 TECHNOLOGY DR.
ALPHARETTA, GA 30005
PHONE: 770-772-7000
FAX: 770-772-7200

ILLINOIS

CHICAGO
4 SAMMONS COURT
BOLINGBROOK, IL 60440
PHONE: 630-296-1400
FAX: 630-226-9420

INDIANA

INDIANAPOLIS
5525 W MINNESOTA STREET
INDIANAPOLIS, IN 46241
PHONE: 317-246-5100
FAX: 317-246-5110

IOWA

DES MOINES
1800 DIXON STREET, SUITE C
DES MOINES, IA 50316
PHONE: 515-263-6929
FAX: 515-263-6515

MARYLAND

BALTIMORE
6960 SANTA BARBARA RD.
SUITE 22-24
ELKRIDGE, MD 21075
PHONE: 410-579-2135
FAX: 410-579-2677

MASSACHUSETTS

BOSTON
6 PULLMAN STREET
WORCESTER, MA 01606
PHONE: 508-854-0708
FAX: 508-854-0291

MICHIGAN

DETROIT
5993 ProgressDrive
STERLING HEIGHTS, MI 48312
PHONE: 586-978-9800
FAX: 586-978-9969

MINNESOTA

MINNEAPOLIS
21080 134TH AVE. NORTH
ROGERS, MN 55374
PHONE: 763-428-3633
FAX: 763-428-4551

MISSOURI

ST LOUIS
422 INDUSTRIAL DRIVE
MARYLAND HEIGHTS, MO 63043
PHONE: 314-298-1800
FAX: 314-298-7660

KANSAS CITY
1501 BEDFORD AVENUE
NORTH KANSAS CITY, MO 64116
PHONE: 816-587-0272
FAX: 816-587-3736

NEW YORK

AUBURN
ONE ELLIS DRIVE
AUBURN, NY 13021
PHONE: 315-255-3403
FAX: 315-253-9923

NORTH CAROLINA

GREENSBORO
1220 ROTHERWOOD ROAD
GREENSBORO, NC 27406
PHONE: 336-272-6104
FAX: 336-273-6628

OHIO

CINCINNATI
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